EIVA

ScanFish III

User manual

Version 2.1

Contents

1 Introduction

The ScanFish III is a sophisticated underwater remotely operated towed vehicle (ROTV) for use in oceanographic operations in conjunction with a multitude of other equipment and software.

The ScanFish III is a wing-shaped ROTV with port and starboard flaps for low drag and good control. Inside the ScanFish III body, there is room for carrying sensor equipment, with access to the water column through openings in both side panels. It is also possible to have equipment mounted on top of and below the body of the ScanFish III.

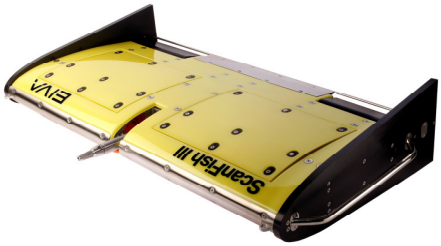


Figure 1 The ScanFish III

The ScanFish III is towed behind a ship for propulsion. It moves up and down in the water column as desired using its flaps. It features an internal motion sensor with an accelerometer, a magnetometer, a gyroscope, an echo sounder for measuring elevation from seabed, and a pressure sensor for measuring depth. This enables the ScanFish III to be steady in the water, even at high speeds, because of continuous and autonomous control of the flaps. This, in turn, makes it a stable platform for underwater operations.

The ScanFish III features three basic operating modes:

- Fixed Depth mode: the ScanFish III maintains a stable depth beneath the surface
- Follow Seabed mode: the ScanFish III maintains a stable elevation above the seabed despite fluctuating bottom conditions
- Undulate mode: the ScanFish III moves up and down in the water column in an undulation pattern

While in operation, the ScanFish III is connected via Ethernet to the surface for constant monitoring and control. For some models, the uplink also enables constant transmission of data from a variety of sensors to EIVA NaviPac or other software.

Distinct models with distinct features exist to cover a variety of operational needs. These are described in Chapter 2 ‘System overview’.

2 System overview

2.1 Distinct models

2.1.1 Description

The ScanFish Rocio

The ScanFish Rocio is designed for oceanographic surveying. It is equipped with six payload ports for communication with different sensors. Communication can be serial (RS-232/422/485), analogue (ADC) and digital (Ethernet). All payload ports are accessible via Ethernet from computers connected to the ScanFish III Power & communications.

The ScanFish Rocio has multiple brackets for internal mounting of equipment (eg sound velocity profiling (SVP) sensors, water pumps, additional multiplexers, etc). It can also be fitted with brackets for external mounting of equipment (eg cameras and laser optical plankton counters (LOPC)).

The ScanFish Katria

The ScanFish Katria is designed for wide-sweep magnetometer surveys. It features a reinforced skeleton and two side extensions that give the ScanFish Katria a total width of 5.051 metres. Towed from the side extensions are four Geometrics G-882 Marine Magnetometers. The magnetometers are towed at a distance of 4 metres to avoid picking up interference from the ScanFish Katria's stainless steel skeleton.

The ScanFish Konia

The ScanFish Konia is designed for sound velocity profiling. It features an integrated SVP sensor mounted inside the ScanFish III body. This enables continuous collection of up-to-date SVP data from the entire water column through the ScanFish III's Undulate mode and real-time data uplink.

The ScanFish Tropheus

The ScanFish Tropheus is designed for unexploded ordnance (UXO) operations. It is completely integrated with side-scan sonar (SSS). The SSS is towed underneath and behind the ScanFish III in a special foldable tow arm.

2.1.2 Features

Feature	Rocio	Katria	Konia	Tropheus
Real-time flight data	●	●	●	●
High-speed surveying (up to 10 kn)	●		●	●
6 x payload ports	●			
Power supply (24 V & 48 V DC) for instruments	●			
Integrated SVP sensor			●	
Full integration with side-scan sonar				●
Space for internal mounting of extra sensors	●			

Table 1 ScanFish III features

2.2 Components of a ScanFish III ROTV system

A standard ScanFish III ROTV system includes the components listed in Table 2. The specific components of individual systems vary based on the individual order.

Item	Rocio	Katria	Konia	Tropheus
EIVA ScanFish III ROTV	●	●	●	●
EIVA ScanFish III Flight software	●	●	●	●
EIVA ScanFish III Power & communications (topside unit)	●	●	●	●
Cable termination and tow point	●	●	●	●
Deck cable (30 m)	●	●	●	●
Rejection wires	●	●	●	●
Multiplexer	●			
Side-scan sonar				●
Magnetometers		●		
AML Smart-X SVP sensor			●	
Case	●	●	●	●
Cradle				●

Table 2 ScanFish III components

2.3 Options extra

As an extra option it is possible to retrofit 3D steering to the ScanFish series or as part of a new unit. The 3D steering options makes horizontal movement control possible for the ScanFish series. Figure 2 below illustrates a ScanFish III fitted with the 3D steering option on both starboard and port sides.

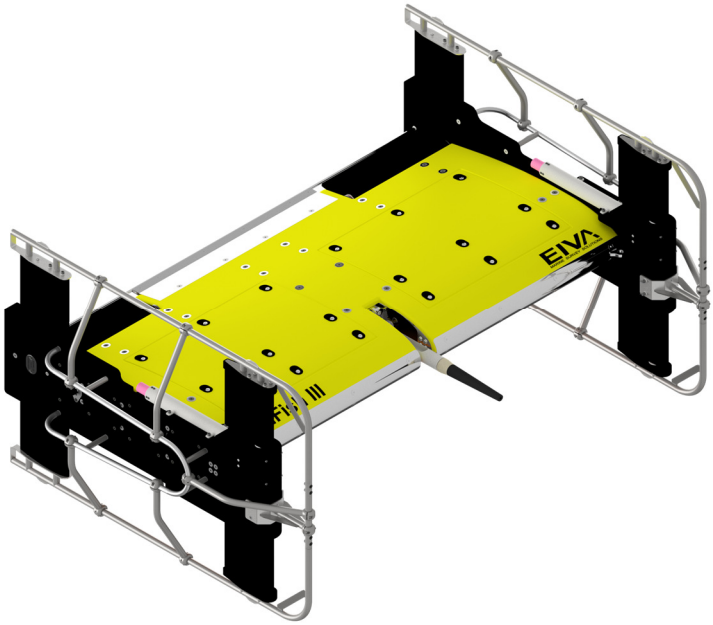


Figure 2 ScanFish 3D steering

The 3D steering option can be fitted to all the ScanFish series, see Table 3 below.

Table 3 Options extra

Feature	Rocio	Katria	Konia	Tropheus
3D steering	●	●	●	●

2.4 Full system integration

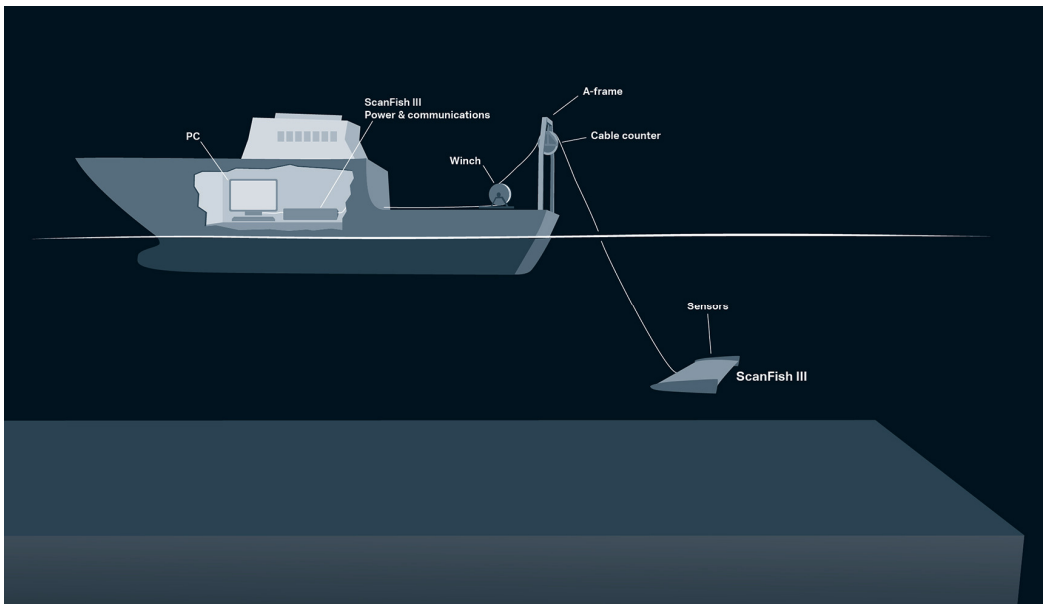


Figure 3 Illustration of a fully integrated ScanFish III system

In order to utilise a ScanFish III system, it needs to be integrated into a larger survey setup. The following items and objects are needed for ScanFish III operation:

- A ship, as a base of operations and for towing the ScanFish III
- An A-frame or crane or similar, for lifting the ScanFish III in and out of the water
- A winch with slip ring and tow cable, for towing the ScanFish III and connecting the tow cable to the deck cable
- A cable counter (optional), for managing cable length and calculating approximate distance from the vessel to the ROTV
- A deck cable, for connecting the winch and tow cable to the ScanFish III Power & communications
- A ScanFish III Power & communications, a power supply and communications link for the ScanFish III and sensors
- A computer, for running the ScanFish III Flight software and data collection
- A ScanFish III
- Sensors, for collection of relevant data

3 Quick start guide

Important: This is a quick guide to getting started with using the ScanFish III. It is *not* a full description of procedures for handling the ScanFish III. For explicit directions, see the relevant following sections. It is important to read and understand the explicit instructions for handling the ScanFish III, not least for safety reasons.

Before you begin:

- Check that the system is complete and that nothing is missing and/or damaged
- Check that the system is connected correctly
    - ScanFish III > Tow point > Slip ring > Deck cable > ScanFish III Power & communications > Computer
- Make sure that the computer is running and has the ScanFish III Flight software installed (see Section 6.1 'Installation of the ScanFish III Flight software')

Operation:

- Connect the AC power and the power on the ScanFish III Power & communications
- Wait for the connection to automatically be established (see Section 5.3 'Connecting to the ScanFish III')
- Make sure the payload communication (COM) ports are configured (for the ScanFish Rocio / ScanFish Konia only) (see Chapter 8 'Payload communications')
- Perform the pre-flight check as defined in Section 9.1 'Pre-flight'
- Deploy the ScanFish III (see Section 9.2 'Deployment of the ScanFish III')

4 ScanFish III overview

4.1 Technical overview

Type	Value	Tolerance
Input voltage	300 V	±5%
Maximum power consumption	300 W	Not applicable
Available external power[1]	50 W on 24 V 130 W on 12 V	±5%
Maximum depth	400 m	Not applicable
Minimum recommended operating sea depth	5 m	Not applicable
Maximum tow speed	10 kn	Not applicable
Uplink data bandwidth[2]	1–7 Mbit/s	±20%
External communication[3]	RS-232/422/485, Ethernet, ADC	Not applicable

Table 4 ScanFish III technical overview

4.1.1 Skeleton and body parts

The entire ScanFish III skeleton and all metal parts are made of marine grade corrosion resistant stainless steel W1.4404/AISI 316L.

For information on the chemical resistance of the acrylic shells, see Chapter 10 'Polycarbonate chemical resistance'

The side panels are made of polyethlyen high density (PEHD).

[1] Available external power may vary depending on specific model/application.
[2] Data bandwidth varies with cable length/application. This is set and fixed at fabrication according to customer specifications.
[3] Configuration is customer-specific. See description of specific model and order.

4.2 Top view of the ScanFish III

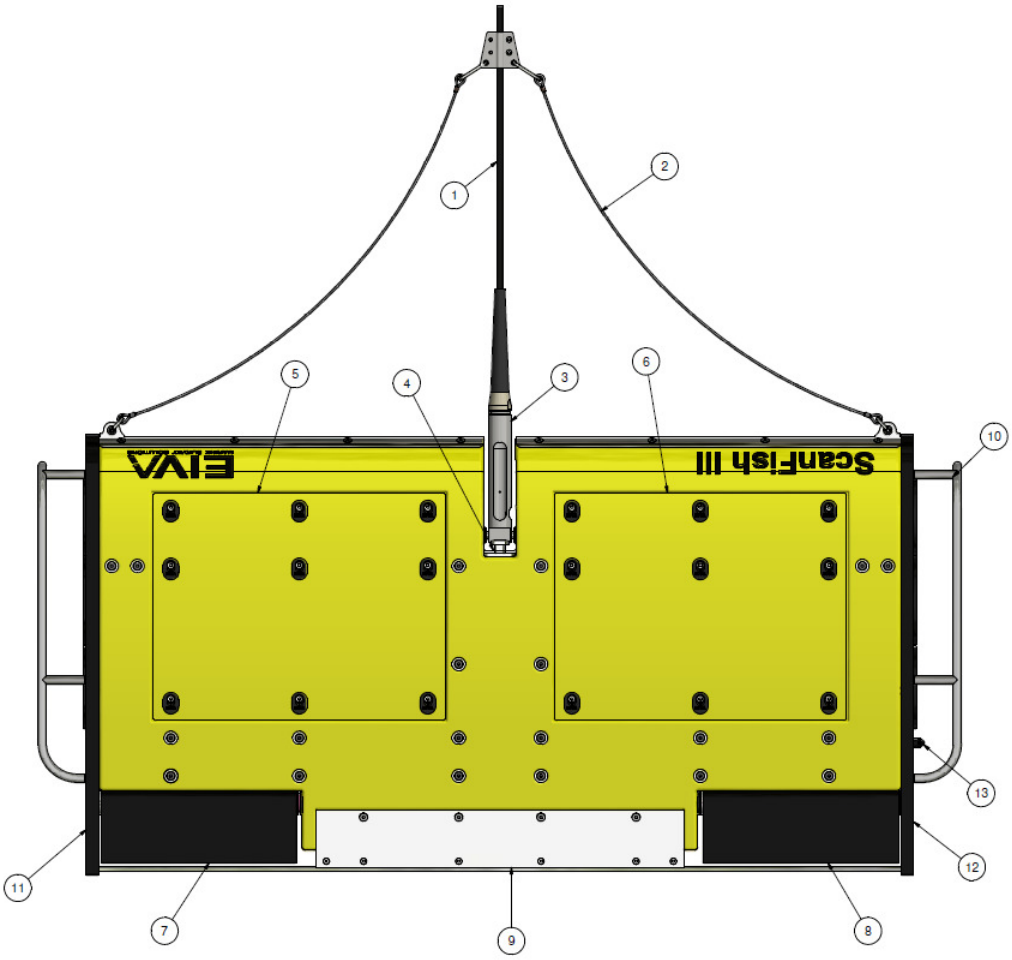


Figure 4 Top view of the ScanFish III

1. Tow cable
2. Deflection wires
3. Cable termination
4. Tow point
5. Hatch, port
6. Hatch, starboard
7. Flap, port
8. Flap, starboard
9. Tail guard
10. Side guard
11. Side plate 2D, port
12. Side plate 2D, starboard
13. Depth sensor

4.3 Bottom view of the ScanFish III

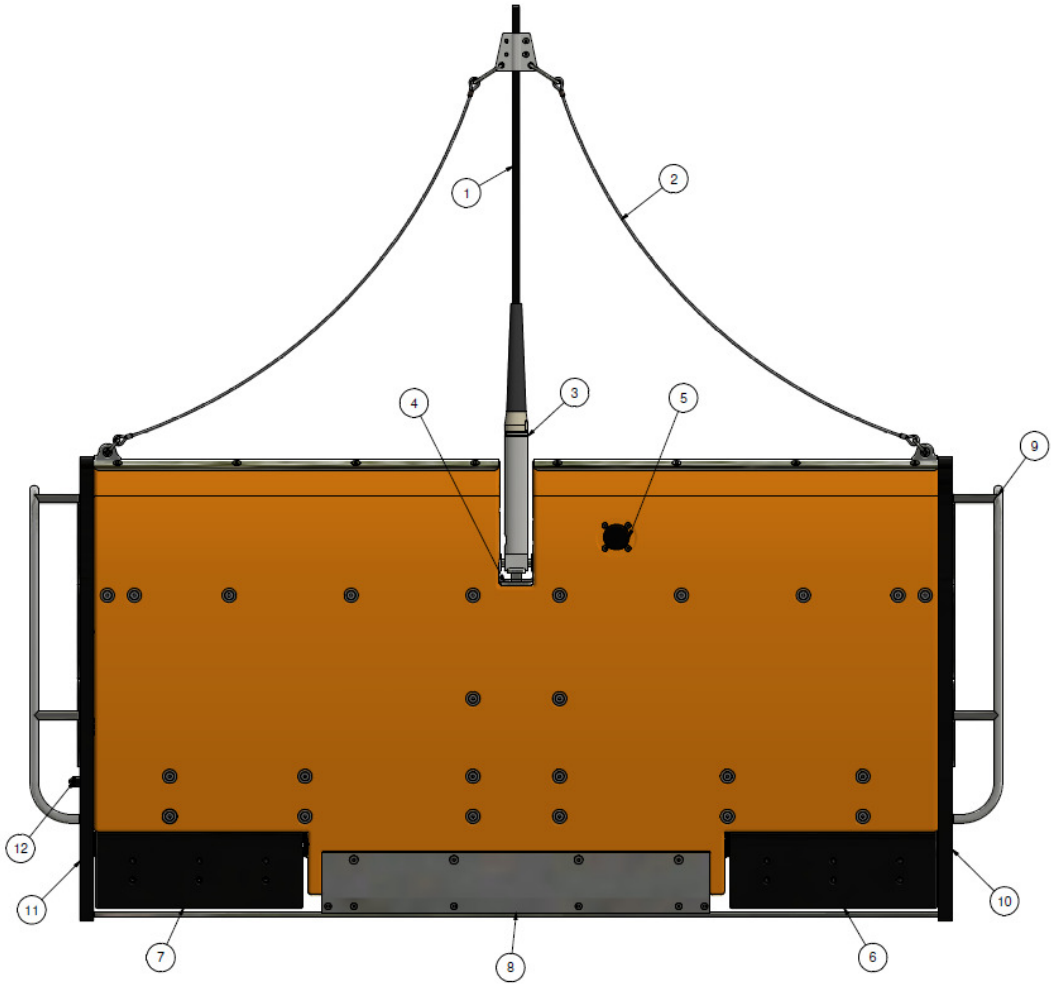


Figure 5 Bottom view of the ScanFish III

1. Tow cable
2. Deflection wires
3. Cable termination
4. Tow point
5. Altimeter
6. Flap, port
7. Flap, starboard
8. Tail guard
9. Side guard
10. Side plate 2D, port
11. Side plate 2D, starboard
12. Depth sensor

4.4 Hatches

4.4.1 Top hatches

The top hatches can be removed by unscrewing the screws in each of the nine oval screw supports. Do not loosen screws without the oval screw support.

Figure 6 Oval screw support

Removing the hatch gives access to the inside of the ScanFish III for maintenance and/or replacement of parts.

When mounting the hatches, be sure to fasten all screws – but do not over-tighten. Never deploy the ScanFish III without hatches or with screws missing.

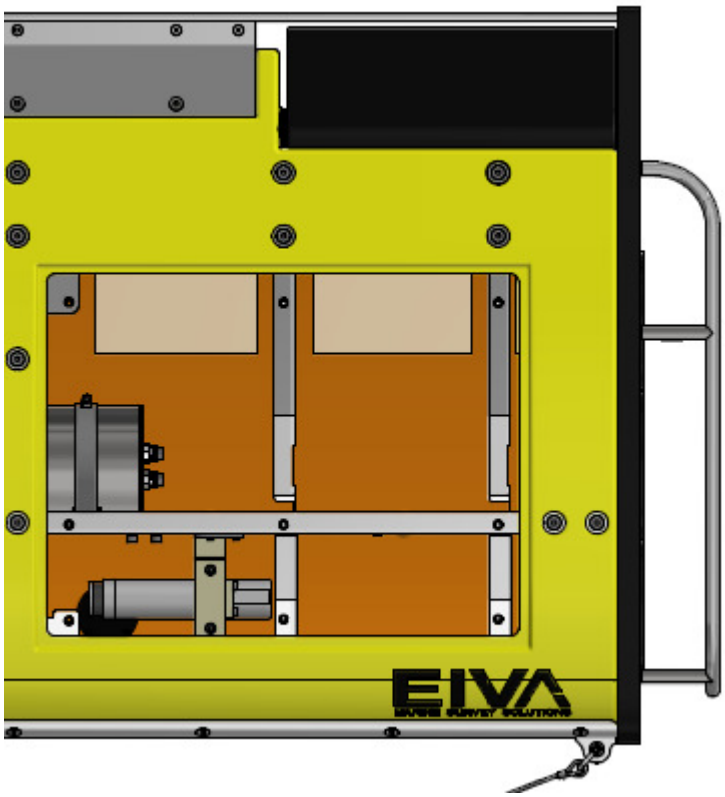


Figure 7 Top view of the ScanFish III with port hatch removed

4.4.2 Side hatches

The side panels of the ScanFish Rocio, the Scanfish Katria and the ScanFish Konia have round side hatches that each can be removed by unscrewing four screws. There are three side hatches on each side of the ScanFish Rocio and the ScanFish Katria, and one side hatch on each side of the ScanFish Konia. The ScanFish Tropheus does not have any side hatches.

The side hatches can be seen in the illustration in Figure 8. These hatches allow payload equipment to access the water column if needed, while the side guards protect extruding equipment.

Special hatches that have smaller openings for better mounting of cables or small sensors can be made to order.

4.5 Flaps

The flaps can move 40º ±2º in either direction. The centre position is 0º. Positive angle is downward in the direction indicated by the arrow in Figure 8.

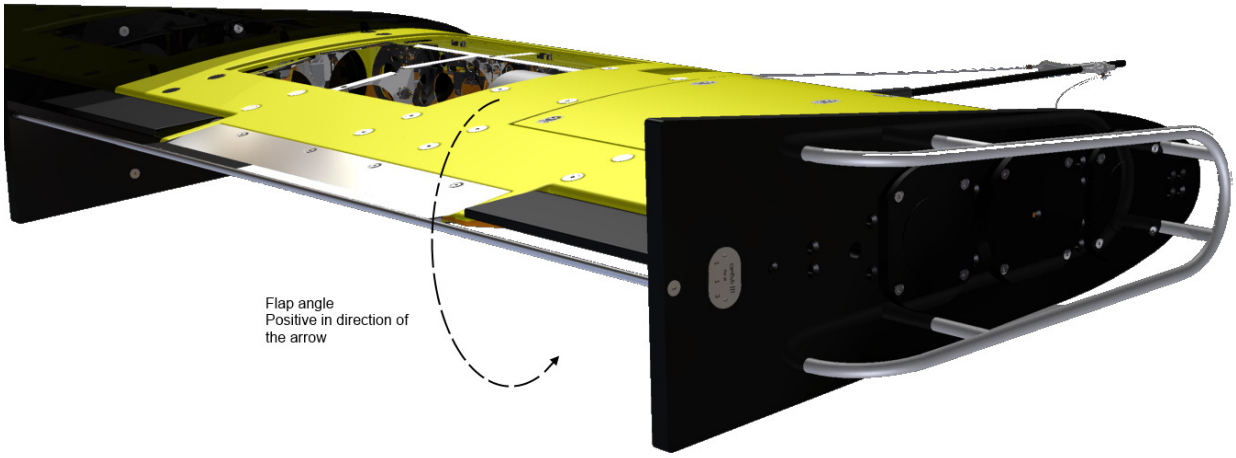


Figure 8 Positive direction of flap angle: the ScanFish III is pictured with the starboard flap at approximately -10º

4.6 Internal view

In the ScanFish III, the controller, which contains communications, power supply, payload connections and control systems, is located in the centre of the body. The altimeter is mounted on the port side of the tow point.

Payload equipment such as sensors, analogue/digital I/O modules, water pumps, multiplexers, magnetometers etc can be mounted in the ScanFish III side hatches.

The controller can be shifted left/right to accommodate sensor positioning and properly balance the ScanFish III. The altimeter, however, is fixed in its position.

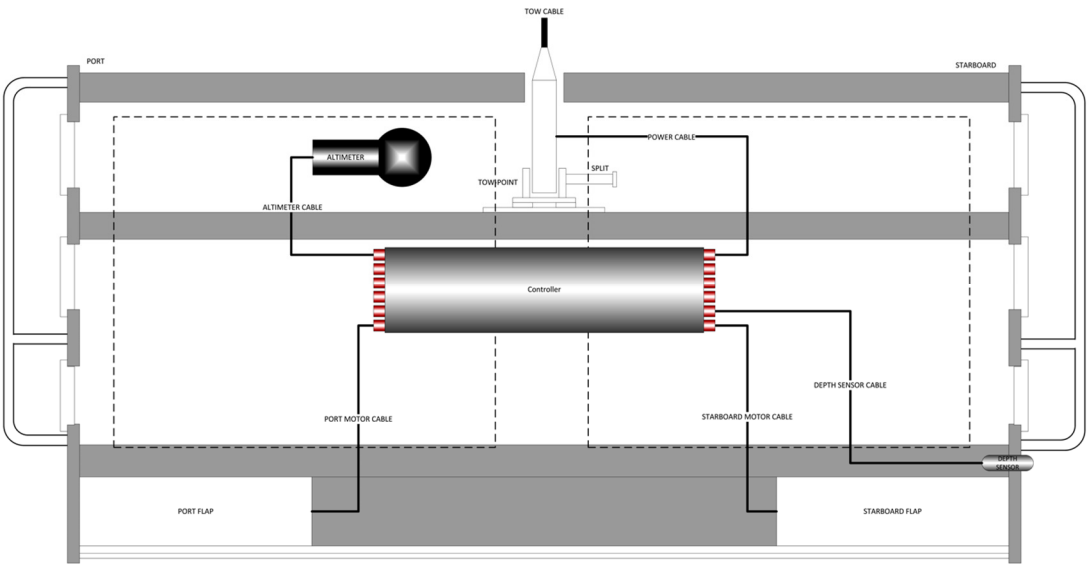


Figure 9 Internal view of the ScanFish III seen from the top

4.7 Assembly of deflection wires

Figure 10 ScanFish III deflection wire bracket

The purpose of the deflection wires is to prevent the ScanFish III from getting caught in fishing nets and similar items.

4.7.1 Mounting of the deflection wires on the tow cable

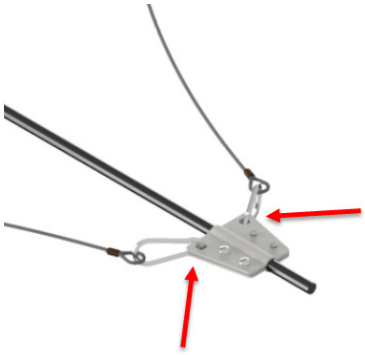


Figure 11 Tow cable deflection wire bracket

Mount the deflection bracket on the tow cable and mount the shackles for the deflection wires as marked by the red arrows. Take care not to damage the tow cable by over-tightening the screws in the bracket.

Caution: Do not use the deflection wires for lifting the ScanFish III, and do not attach or connect other items to the wires/brackets. The deflection wires may not be able to deflect all objects in the water, so take care when using the ScanFish III. Avoid sailing through water containing debris or objects that could harm the ScanFish III in the case of a collision or by getting caught up in the system, as this may damage the ScanFish III and the tow cable. The deflection wire is only designed for the standard ScanFish III.

4.8 Dynamic specifications

4.8.1 Ascend speed and descend speed

Ascend and descend speeds, for the Undulate mode, are user configurable, but EIVA recommends the default setting. Ascend and descend speeds cannot be configured with different values; they must be the same as one another.

Direction	Min speed (m/s)	Default (m/s)	Max speed (m/s)
Ascend	0.1	0.6	3
Descend	0.1	0.6	3

Table 5 ScanFish III ascend and descend speeds

4.8.2 Weight of the ScanFish III

The weight of the ScanFish III depends on the customer configuration. With the default configuration, the weight is as shown in

Rocio 3D	**122**	**54**
Katria 3D*	152	89

Table 6.

ScanFish III series	Weight (kg)	
	Air	Freshwater
Rocio	75	36
Katria*	134	71
Rocio 3D	122	54
Katria 3D*	152	89

Table 6 ScanFish III weight

*Excl G882 magnetometers and poles

4.8.3 ScanFish III drag

This is the calculated theoretical drag for the ScanFish III (not including cable), for use in winch calculations. The drag is for normal operation. If the ScanFish III malfunctions, collides, etc, the drag can be much greater.

ScanFish III series	Drag force	
	[N]	[kg]
Rocio	100	10.2
Katria*	280	28.5
Rocio 3D	120	12.2
Katria 3D*	300	30.5

Table 7 ScanFish III drag

*Drag at 4 [knt] STW

4.8.4 Line turns

5 ScanFish III Power & communications

5.1 Overview

5.1.1 Connector/indicator layout

Figure 12 ScanFish III Power & communications front view

1 Power on/off – Power indicator
2 Indicator light

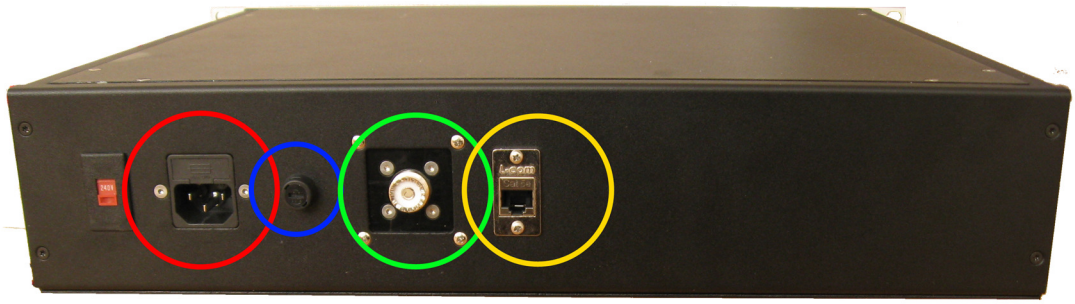


Figure 13 ScanFish III Power & communications rear view

Red: AC power in (IEC C14 connector) – Fuse 1 (in connector)
Blue: Fuse 2 – DC
Green: Deck cable connecter (UHF Connector)
Yellow: RJ-45 Ethernet connector

5.1.2 Technical specifications

Type	Value	Tolerance
Input voltage	110–230 V	±20 V
Maximum power consumption	310 W	Not applicable
Fuse 1 - AC	2 A	Slow blow
Fuse 2 - DC	1 A	Slow blow
Ingress Protection rating	IP40	Not applicable
Communication	BASE10 Ethernet (LAN)	Not applicable

Table 8 ScanFish III Power & communications technical specifications

5.2 Connecting the ScanFish III Power & communications

1. Connect the Ethernet (RJ-45) cable to LAN or host computer
2. Connect the ScanFish III to the ScanFish III Power & communications through deck/tow cable
3. Connect the power cord to the AC supply

5.3 Connecting to the ScanFish III

1. Complete the steps in Section 5.2 'Connecting the ScanFish III Power & communications'
2. Turn on the ScanFish III Power & communications
3. Wait for the ScanFish III Power & communications to establish connection
4. The indicator light will turn solid green upon connection

5.4 Indicator light

Colour	Indication
Solid red	No connection – the ScanFish III is not connected, or noise is too severe
Blinking red	Trying to establish connection
Solid orange	Connected, but with communication errors
Solid green	Connection is good

Table 9 ScanFish III Power & communications indicator light interpretation

6 The ScanFish III Flight software

6.1 Installation of the ScanFish III Flight software

The ScanFish III Flight software includes a setup wizard that will guide you through the installation.

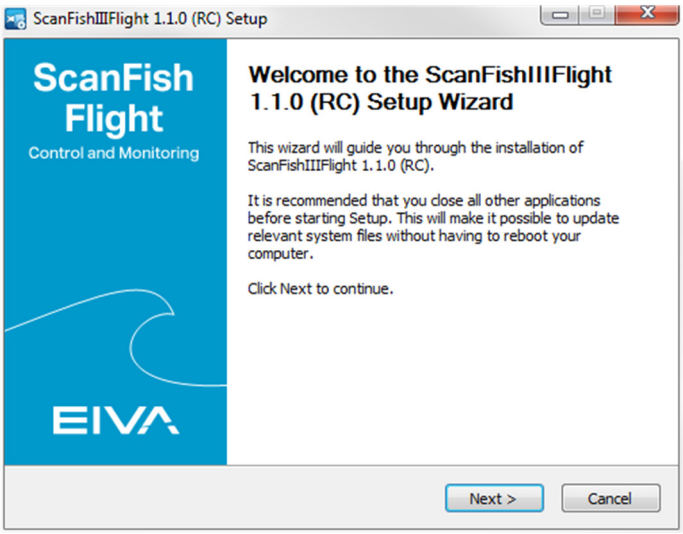


Figure 14 ScanFish III Flight software setup wizard

Click **Next >** to continue.

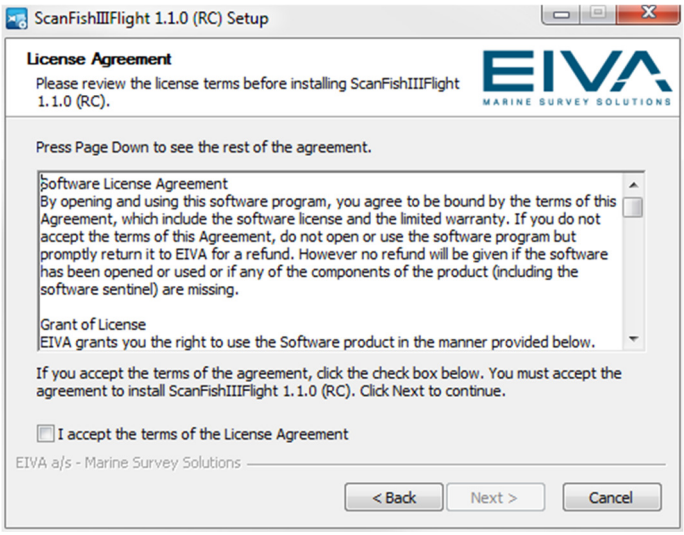


Figure 15 End-user licence agreement (EULA)

Read the license conditions, and if accepted, select the **I accept the terms of the License Agreement** check box, after which you can install the software.

If you do not accept the license conditions, click **Cancel** and abort the installation.

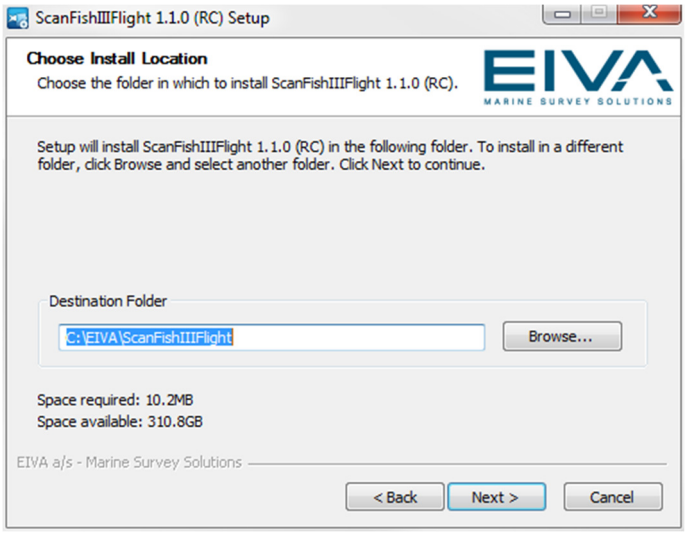


Figure 16 Install location

Use the default destination folder or choose a different location for the installation, and then click **Next >**.

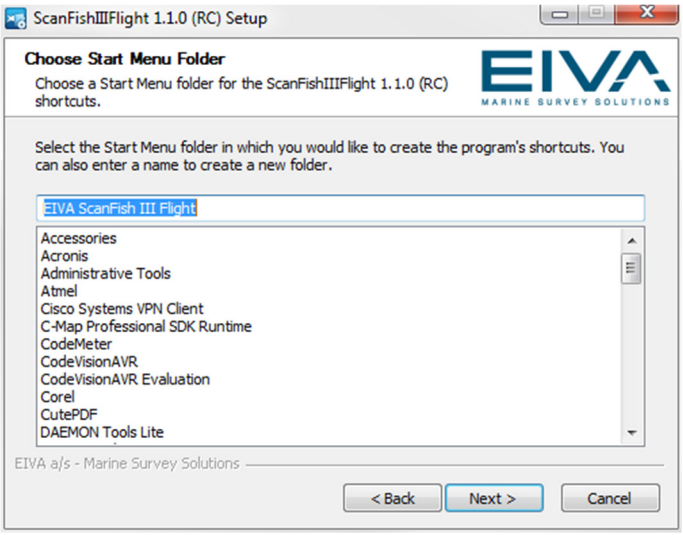


Figure 17 Start menu folder selection

Use the default **Start** menu folder or choose a different **Start** menu folder in which to save the ScanFish III Flight software's shortcuts, and then click **Next >**.

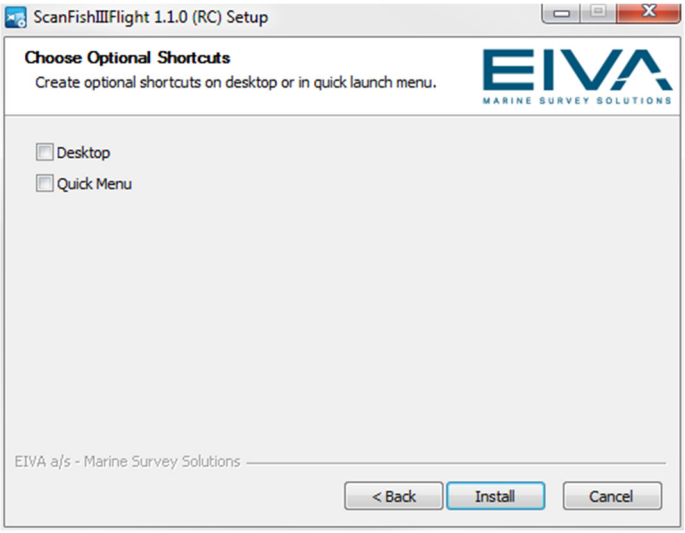


Figure 18 Optional shortcuts

Select the check boxes if you want a shortcut created on the Desktop and/or the Quick menu, and then click **Install**.

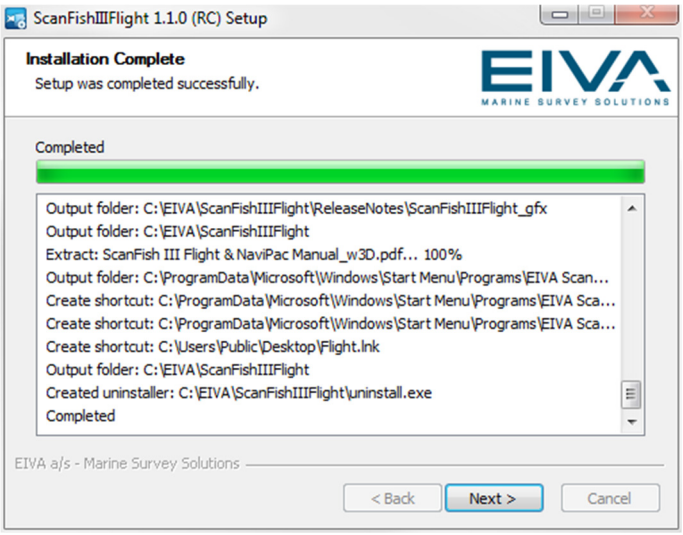


Figure 19 Installation progress

The installation is quickly completed on modern computers. Click **Next >** to continue to the final setup wizard screen.

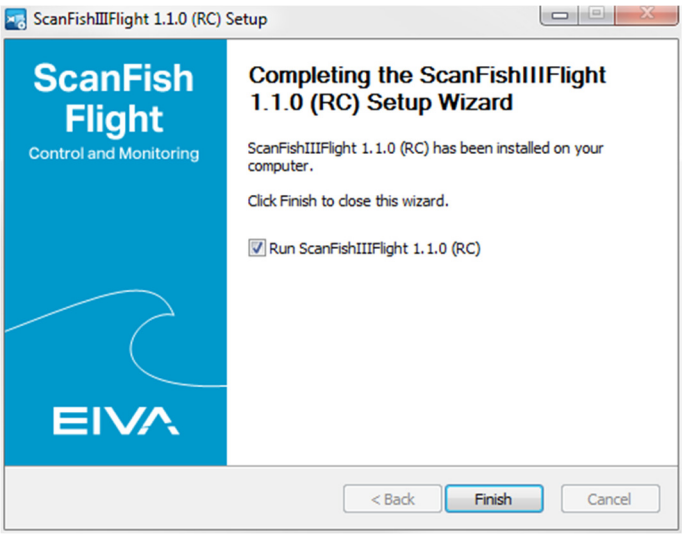


Figure 20 Installation completed

Leave the **Run ScanFish3 Flight** check box selected and click **Finish** to close the setup wizard and launch the ScanFish III Flight software, or clear the **Run ScanFish3 Flight** check box to finish the installation without running the ScanFish III Flight software.

6.2 Getting started

When the ScanFish III Flight Software is started, the user interface is setup in the default layout, as shown in Figure 21. Information on how to rearrange and reconfigure the layout is provided in Section 6.5 'Configuring the display layout'.

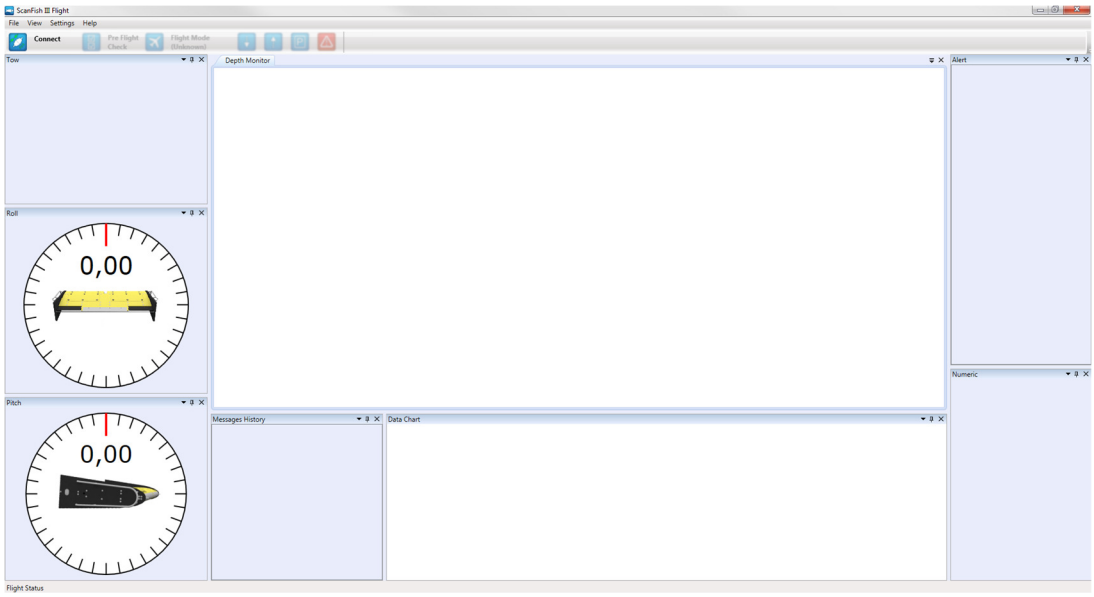


Figure 21 The ScanFish III Flight software at startup

6.2.1 Connecting to the ScanFish III

Initially, the ScanFish III must be connected to the ScanFish III Power & communications, and the ScanFish III Flight software must in turn be run on a computer connected to the ScanFish III Power & communications. This is illustrated on the right side of Figure 22.

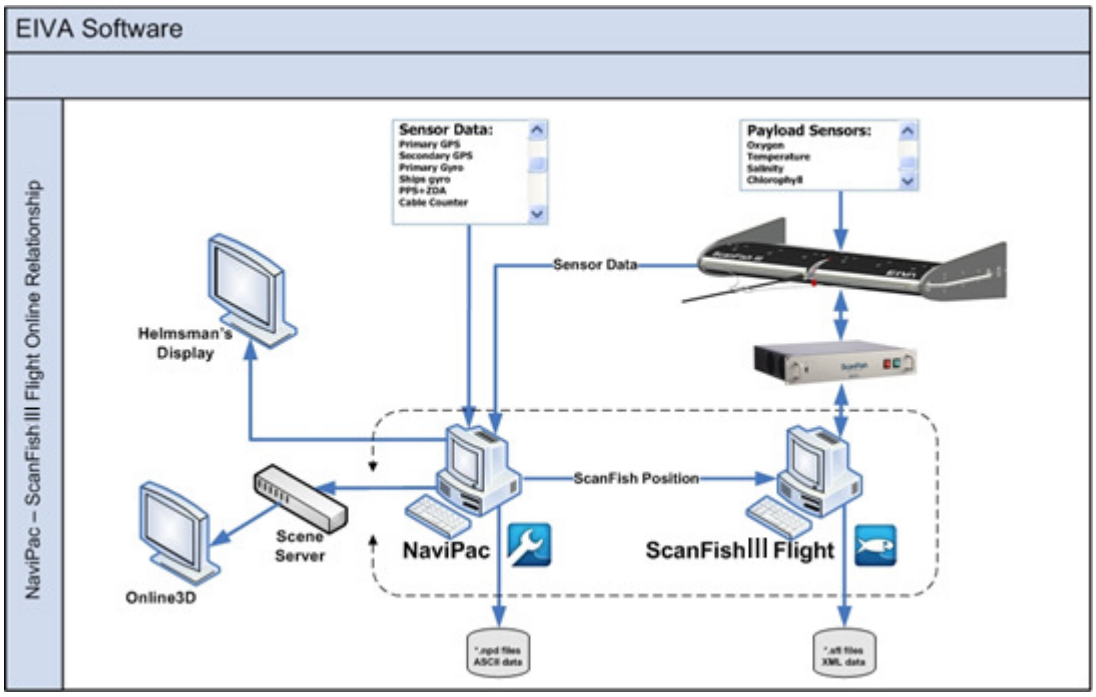


Figure 22 ScanFish III Flight software relations and dataflow

Once the physical network configurations are in place, the software connections must be established. The IP address of the ScanFish III must be configured in the ScanFish III Flight software. This configuration can be done by clicking **Settings** > **Options** > **Fish** > **Fish connection**. The **Fish connection** property is shown in Figure 23.

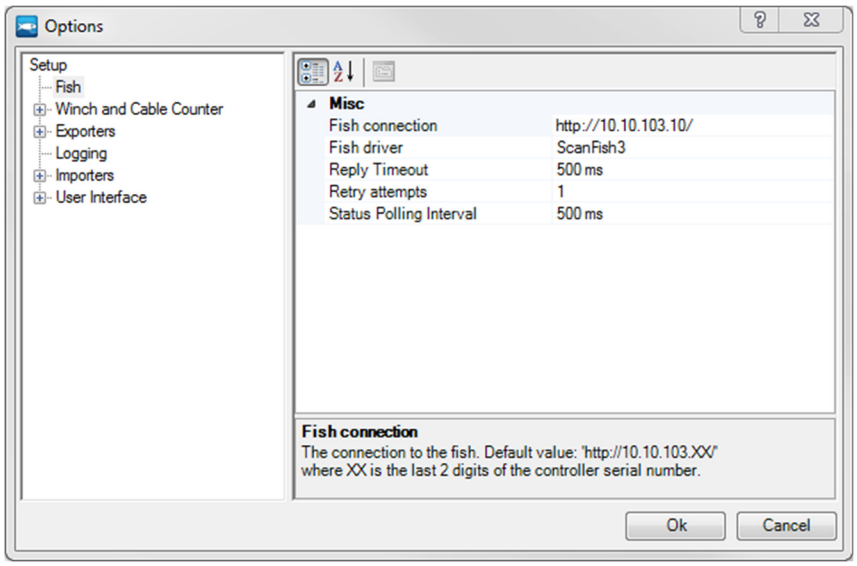


Figure 23 Options dialogue box with focus on Fish properties

The IP address of the ScanFish III is by default 'http://10.10.103.*xx*', where *xx* is the last two digits of the ScanFish III's serial number.

Once the settings are acceptable, the user must click **Ok** at the bottom of the dialogue box. To connect to the ScanFish III, click the **Connect** button on the toolbar. The ScanFish III Flight software will then begin connecting to the ScanFish III. Once a connection has been established, the user must follow the operating instructions for how to operate the ScanFish III, including the pre-flight check and visual inspection, before deployment into the water (see Section 6.3.2.1.2 'Pre Flight Check' for further details on this issue).

6.2.2 The display layout

The display layout of the ScanFish III Flight software can be configured to meet the individual needs of the user. The ScanFish III Flight software main window consists of a number of dockable panels that can be toggled on/off by the user under **View** > **Dockable views**.

The panels can float freely inside the ScanFish III Flight software main window. They can also be docked to the edges of the windows, or they can float onto a secondary screen if one is present.

In Figure 24, a typical example of a ScanFish III Flight software display layout is provided.

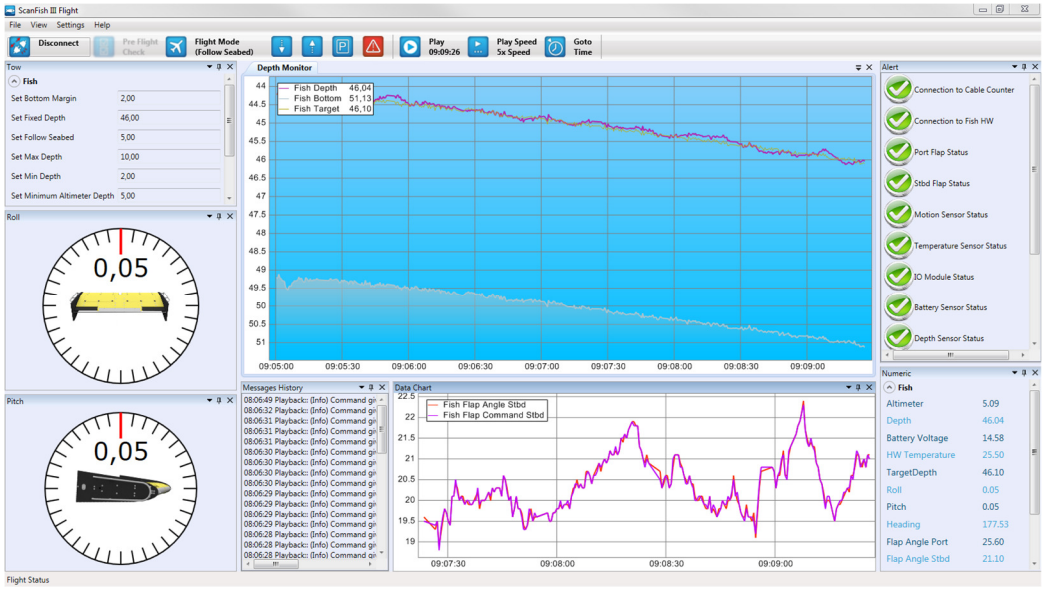


Figure 24 The ScanFish III Flight software display layout

The display layout is saved automatically and will be used the next time the ScanFish III Flight software is started. Further details on how the display is configured are given in Section 6.5 'Configuring the display layout'.

6.3 Main tools

The ScanFish III Flight software is organised in different menus and panels that together make the user interface as illustrated in Figure 25. The various tools are as follows:

- Main menu
- Toolbar
- Main window
- Status bar

Figure 25 The ScanFish III Flight software tools

6.3.1 The main menu

The ScanFish III Flight software main menu has four menu items: **File**, **View**, **Settings** and **Help**.

6.3.1.1 The File menu

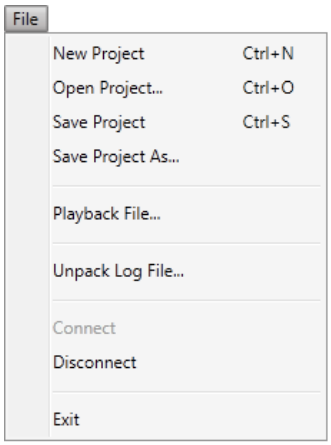


Figure 26 File menu

The **File** menu shown in Figure 26 has the following menu items:

- **New Project** (Ctrl + N): This menu item facilitates the creation of a new setup. Note that the ScanFish III Flight software will not allow the user to create a new setup when a connection to the ScanFish III has been established or when the software is running in playback mode.
- **Open Project** (Ctrl + O): With this menu item, a previously saved project (Flight Setup) can be loaded. The extension of the project is .sf3f.
- **Save Project** (Ctrl + S): This menu item allows the user to save the current project (Flight Setup). If the project has not been saved previously, the user is prompted to select a name for the project.
- **Save Project As**: This menu item allows the user to save the current project (Flight Setup) under a name selected by the user.
- **Playback File**: This menu item will make the ScanFish III Flight software enter playback mode. Prior to that however, the user is prompted to select a file to perform the playback on. The ScanFish III Flight software will automatically record all data from the ScanFish III during flight, and these files, with extension .sfl, are used for the playback. Details on the playback mode are given in Section 6.4 'Playback mode'.

- **Unpack Log File**: This menu item will extract the compressed log files (extension .sfl) to an ASCII text file that can be used for error detection. Observe that the ratio between the file sizes is approximately 1:50. During extraction, a progress bar is shown (Figure 27), and when extraction is completed, a completion message will appear (Figure 28).
- **Connect**: This menu item will start the connection process between the software and the ScanFish III in accordance with the settings defined in **Options** > **Fish** > **Fish Connection** (see Section 6.2.1 'Connecting to the ScanFish III' for further details).
    - Note that the **Connect** menu item is only active when no connection has been established.
- **Disconnect**: This menu item will disconnect the software from the ScanFish III. The menu item is only active when a connection has been established or when the ScanFish III Flight software is executed in playback mode.
- **Exit**: This menu item stops the ScanFish III Flight program. Note that the user is not prompted to confirm whether he wants to stop the software or not. If, however, the program is connected to the ScanFish III, the user will be instructed to disconnect before attempting to exit.

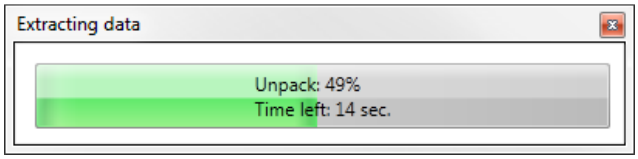


Figure 27 Progress bar

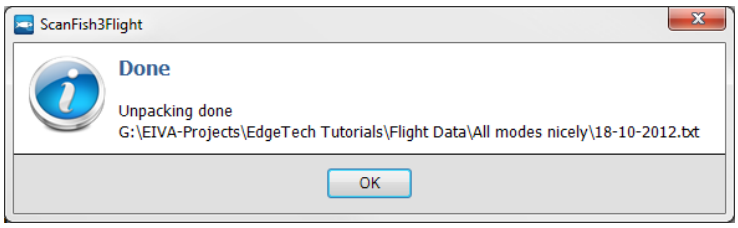


Figure 28 Completion message

6.3.1.2 The View menu

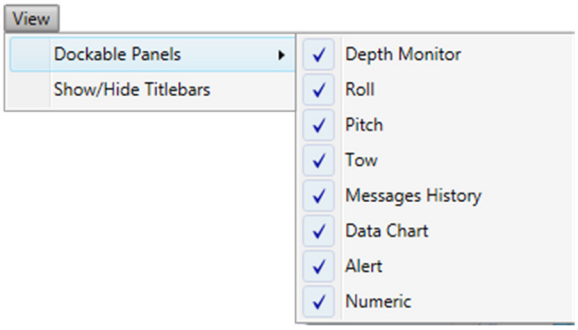


Figure 29 View menu

The **View** menu shown in Figure 29 is related to the view of the eight different panels. The ScanFish III Flight software main window consists of a number of dockable panels that can be toggled on/off and moved inside as well as outside the main window. Details on the panels are given in Section 6.5 'Configuring the display layout'.

6.3.1.3 The Settings menu

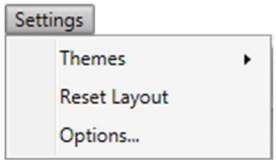


Figure 30 Settings menu

The **Settings** menu shown in Figure 30 has three menu items: **Themes**, **Reset Layout** and **Options**.

6.3.1.3.1 Themes

Themes is a submenu that is shown in Figure 31:

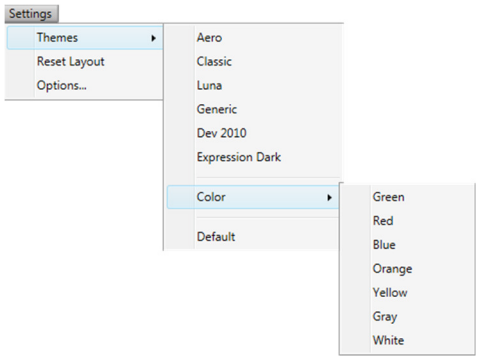


Figure 31 Themes submenu

The user can choose different, predefined themes from this submenu. Each theme will supply predefined background and frame colours for the panels. Displayed from left to right in Figure 32, the themes selected for the **Numeric** panel are: **Aero**, **Classic**, **Luna**, **Dev 2010** and **Expression Dark**. The **Numeric** panel on the far right is created by pointing to **Themes** on the **Settings** menu, pointing to **Color**, and then clicking **Red**.

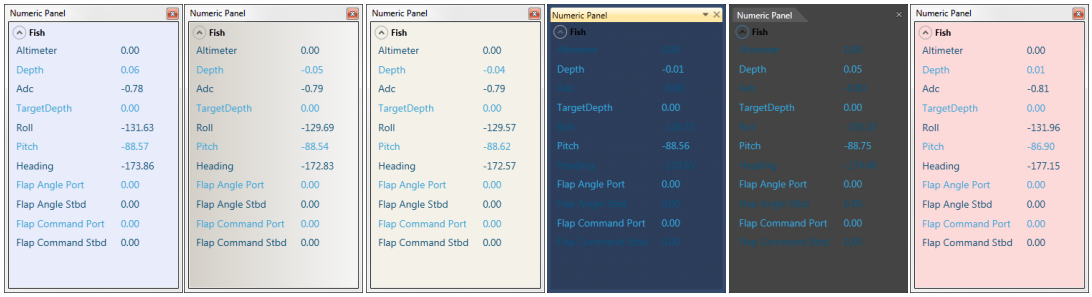


Figure 32 The ScanFish III Flight software colour themes

6.3.1.3.2 Reset Layout

When the user clicks **Reset Layout,** the ScanFish III Flight software will reset panel positions and size to the default layout, which is shown in Figure 24.

6.3.1.3.3 Options

Clicking **Options** on the **Settings** menu opens the **Options** dialogue box, which allows the user to modify the configuration of the software. For this task, five different items are available in the **Setup** list, as shown in Figure 33:

- **Fish**
- **Winch and Cable Counter**
- **Exporters**
- **Logging**
- **Importers**
- **User Interface**

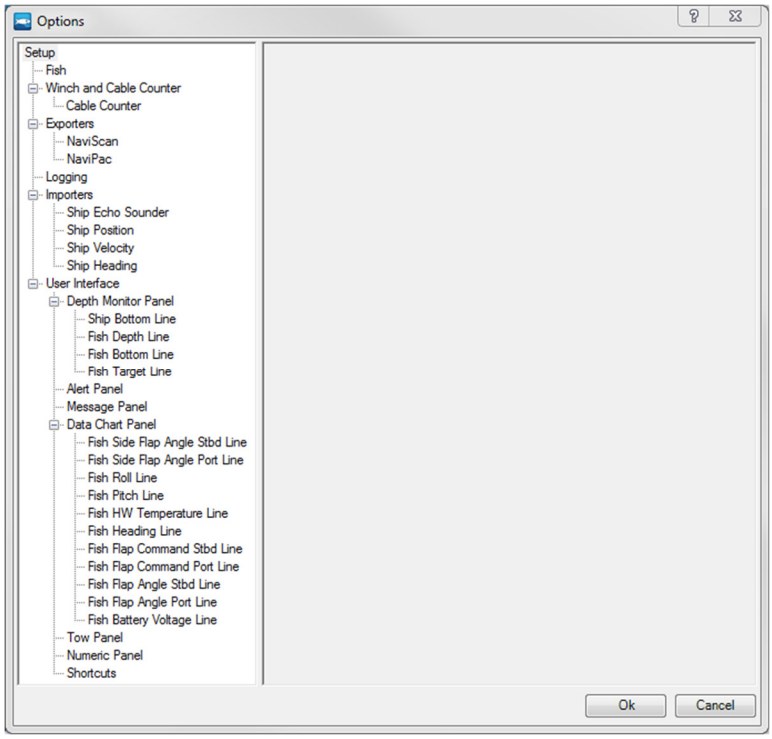
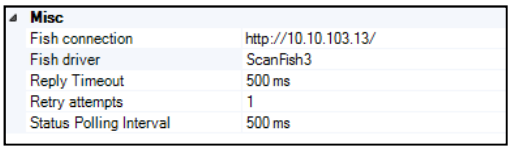


Figure 33 Options dialogue box at startup

When **Fish** is selected, the properties shown in Figure 34 will appear in the properties pane on the right side of the **Options** dialogue box.



Misc	
Fish connection	http://10.10.103.13/
Fish driver	ScanFish3
Reply Timeout	500 ms
Retry attempts	1
Status Polling Interval	500 ms

Figure 34 Fish properties

- In **Fish connection**, the user can define the connection to the ScanFish III by entering the IP address. Note that the default value is 'http://10.10.103.*xx*', where *xx* is the last two digits of the ScanFish III's serial number.
- The **Fish driver** must be 'ScanFish3', which is the only driver implemented. The user can choose 'None' if the ScanFish III Flight software should be used without a ScanFish III.
- **Reply Timeout** is used to define timeout settings for communication with the ScanFish III. Note that the actual intervals might vary slightly, however, the default value of '500 ms' will work in most cases.
- **Retry attempts** is used to define how many times the software will attempt to contact the ScanFish III before alerting the operator about a lost connection.
- **Status Polling Interval** is used to define the interval between statuses being requested from the ScanFish III.

Winch and Cable Counter properties are described in Section 6.7 'Software Interfaces'.

Exporters is described in Section 6.7.2 'Cable Counter Data Export' and Section 6.7.3 'Fish Data'.

Logging is associated with the constant logging of all ScanFish III flight data during flight. The files logged can be used as input for the playback mode, as described in Section 6.4 'Playback mode'.

When **Logging** is selected, the properties shown in Figure 35 will appear in the properties pane on the right side of the **Options** dialogue box.

Misc	
Log Expiration Date	7 days
Logging Folder	c:\temp\ScanFish\Log\

Figure 35 Logging properties

- **Log Expiration Date** allows the user to only keep logs/files that were created within a specified time range. Note that even though it is not possible to disable logging, with this property, the ScanFish III Flight software can be configured to automatically delete files stored in the default logging folder that are older than the number of days specified here.
- In **Logging Folder**, the user can specify the folder in which the ScanFish III Flight software will save logs. The default folder is C:\temp\ScanFish\Log\. It is, however, recommended to use a dedicated (project) folder for the logging in order to avoid inadvertently deleting files that have been logged in connection with a previous session or project.

User Interface can be expanded to show seven subitems. Each of them is associated with a particular panel that can be activated and shown in the ScanFish III Flight software main window. Further details are given in Section 6.5 'Configuring the display layout'.

- **Depth Monitor Panel**
- **Alert Panel**
- **Message Panel**
- **Data Chart Panel**
- **Tow Panel**
- **Numeric Panel**
- **Shortcuts**

Selecting **Depth Monitor Panel** will open the properties displayed in Figure 36. The properties allow for the changing of colours associated with the **Depth Monitor** panel. Details on how to handle the panel can be found in Section 6.5 'Configuring the display layout'.

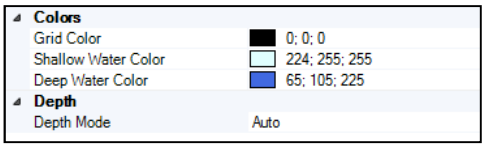


Figure 36 Depth Monitor Panel properties

- **Grid Color** facilitates definition of the colour of the grid of the **Depth Monitor** panel. When the user clicks **Grid Color** (or any property associated with definition of colour), a colour selection box as displayed in Figure 37 will open. Note that it is divided into three tabs: **Custom** (left), **Web** (middle) and **System** (right). The user can choose between the large variety of colours supplied, and it is also possible to define custom colours, based on an RGB colour scheme, by manually typing in the three components.

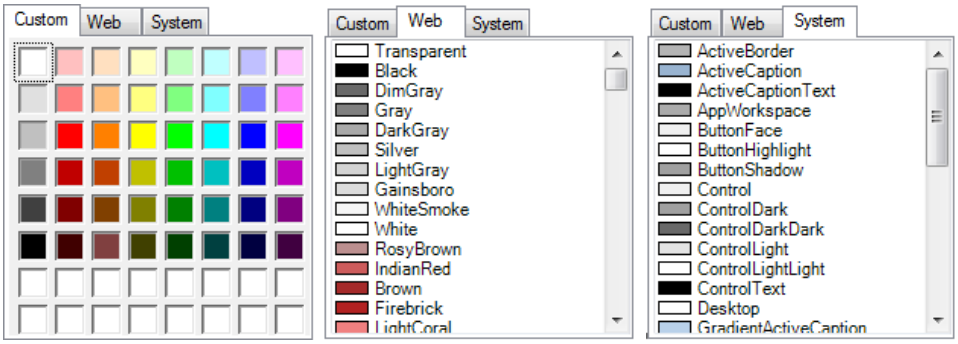


Figure 37 Colour selection box

- **Shallow Water Color** is used together with **Deep Water Color** to make a faded transition, in terms of colouring, between the shallow and the deep water visualisation in the **Depth Monitor** panel.
- **Depth Mode** is used to facilitate definition of the two depth modes, Auto mode and Fixed mode. Auto mode does not require any settings to be defined, whereas for Fixed mode, the user must specify the maximum and minimum depths, as shown in Figure 38.

Depth	
Depth Mode	Fixed
Minimum Depth	0 meter
Maximum Depth	50 meter

Figure 38 Depth Mode properties

Additionally, with a series of subitems under **Depth Monitor Panel**, it is possible to define the colour and other properties of the lines associated with **Ship Bottom Line**, **Fish Depth Line**, **Fish Bottom Line** and **Fish Target Line**. In the particular case shown in Figure 39, the **Fish Bottom Line** properties are displayed:

Misc	
Color	116; 251; 165
Draw as Bottom	True
Max Data Points	100
Pen Size	2 pixel

Figure 39 Fish Bottom Line properties

- **Color** is defined in connection with the **Grid Color** definition described earlier in this section.
- **Draw as Bottom** is a Boolean that allows the user to specify whether the line should be drawn with a fading effect to resemble the ocean bottom.
- **Max Data Points** defines the number of data points to be displayed simultaneously.
- **Pen Size** defines the size (thickness) of the line. The default value is '2 pixel'.

Alert Panel allows for definitions associated with the **Alert** panel. Details on how to handle the panel can be found in Section 6.5 'Configuring the display layout'. The properties for **Alert Panel** are shown in Figure 40.

Ok	
Color	0; 0; 0
Background Color	0; 255; 255; 255
Warning	
Color	0; 0; 0
Background Color	0; 255; 255; 255
Alert	
Color	255; 0; 0
Background Color	0; 255; 255; 255

Figure 40 Alert Panel properties

Note that the properties are divided into three categories, each linked to an alert status (**Ok**, **Warning** and **Alert**), and each alert status has the same subdivision. The subdivision is:

- **Color** defines the colour of the text for the alert status in question.
- **Background Color** defines the colour of the background for the alert status in question.

Message Panel is associated with the **Messages History** panel. The properties for **Message Panel** are shown in Figure 41. The properties are divided into four categories, one for the overall background and one each for the three message types: **Message**, **Warning** and **Alert**.

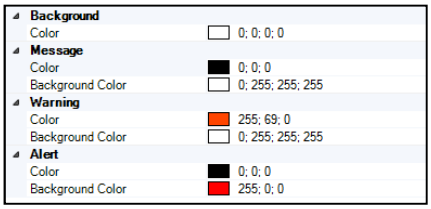


Figure 41 Message Panel properties

- Background **Color** is used to define the overall colour of the background of the **Message History** panel.
- Message **Color** is used to define the colour in which the messages are written. Note that the settings for Warning **Color** and Alert **Color** can be defined in the same way.
- Message **Background Color** is used to define the background colour upon which the messages are written. The settings for the Warning **Background Color** and Alert **Background Color** can be defined in the same way.

Data Chart Panel is associated with the **Data Chart** panel. Details on how to handle the panel can be found in Section 6.5 'Configuring the display layout'. The properties for **Data Chart Panel** are shown in Figure 42.

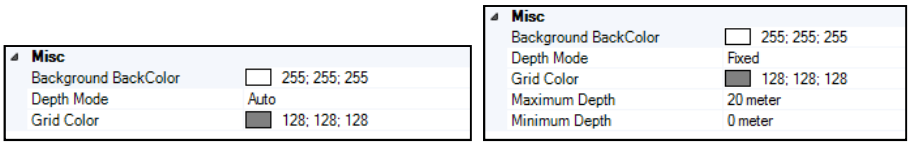


Figure 42 Data Chart Panel properties

- **Background BackColor** is used to define the colour of the background of the **Data Chart** panel.
- **Depth Mode** is used to facilitate definition of the two depth modes, Auto mode and Fixed mode. Auto mode does not require any settings to be defined (see Figure 42 on the left), whereas for Fixed mode, the user must specify the maximum and minimum depths (see Figure 42 on the right).
- **Grid Color** defines the colour of the grid of the **Depth Monitor** panel.

Tow Panel is associated with the **Tow** panel. The properties for **Tow Panel** are shown in Figure 43.

Background	
Color	0; 0; 0; 0
Misc	
Touch Size	25

Figure 43 Tow Panel properties

- **Color** is used to define the colour of the background of the **Tow** panel.
- **Touch Size** is used to define the size of the text field after an item has been selected for editing. This is shown in Figure 44 (prior to and after editing shown on the left, and during editing shown on the right).

Figure 44 Touch Size prior to and during editing

Numeric Panel is associated with the **Numeric** panel. The properties for Numeric Panel are shown in Figure 45. The only property available is associated with the Background **Color** that is used to define the overall background colour of the panel.

Background	
Color	0; 0; 0; 0

Figure 45 Numeric Panel properties

Shortcuts enables the user to set keyboard shortcuts for the different flight modes. The default shortcuts are shown in Figure 46.

Misc	
Panik	Esc
Parking	Alt+0
On Deck	Alt+1
Surface	Alt+2
Fixed Depth	Alt+3
Follow Seabed	Alt+4
Undulate Down	Alt+5
Undulate Up	Alt+6

Figure 46 Shortcuts properties

6.3.1.4 The Help menu

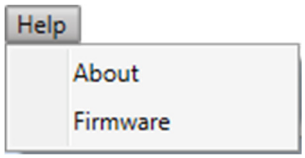


Figure 47 Help menu

The **Help** menu has two menu items, **About** and **Firmware**.

Clicking **About** opens the **About** window, which shows the software version number (Figure 48 on the left).Links to online support and offline release notes are available by clicking the **Ellipsis** (**…**) button (Figure 48 on the right).

Figure 48 About window

Clicking **Firmware** opens the **Firmware Information** window, which shows the firmware version of the ScanFish III (Figure 49) if any is connected.

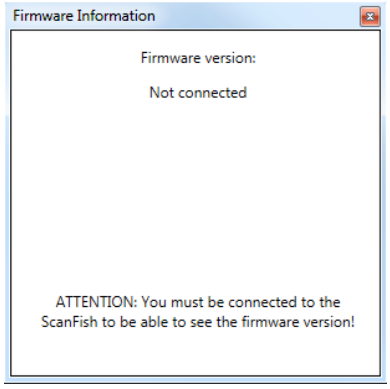


Figure 49 Firmware Information window

6.3.2 The toolbar

The ScanFish III Flight software toolbar contains ten buttons/features (see Figure 50). The toolbar is always shown in the ScanFish III Flight software window. It cannot be hidden. Some buttons may be unavailable, depending on the present status and/or mode of the ScanFish III. In the toolbar shown in Figure 50, the **Disconnect** button is available instead of the **Connect** button, and the **Pre Flight Check** button is unavailable because a connection is established to the ScanFish III and the ScanFish III is in operation, respectively.

Note that none of the buttons (except **Connect**/**Disconnect**) available from the toolbar are accessible from any other location in the software.

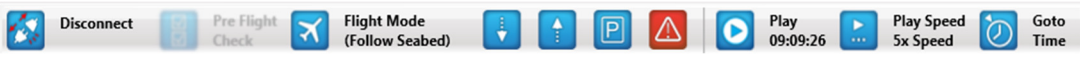


Figure 50 The ScanFish III Flight software toolbar

The toolbar is divided into two parts separated by a vertical line (see Figure 50):

- One part with seven buttons associated with online situations. This part is located on the left of the toolbar.
- One part with three buttons associated with the playback mode. This part is located on the far right of the toolbar.

6.3.2.1 Online toolbar tools

The online part of the toolbar has the following buttons:

- **Connect/Disconnect**
- **Pre Flight Check**
- **Flight Mode**
- **Undulate Down**
- **Undulate Up**
- **Parking**
- **Emergency Up**

6.3.2.1.1 Connect/Disconnect

The **Connect**/**Disconnect** button of the online toolbar is used to establish/terminate a connection between the ScanFish III Power & communications and the ScanFish III. When no connection is established, the button is labelled **Connect**, as shown in Figure 51 on the left. Once the connection to the ScanFish III is established, the button is labelled **Disconnect**, as shown in Figure 51 on the right.

Figure 51 Connect/Disconnect button

The action associated with the button is similar to the action associated with the menu items **File** > **Connect** and **File** > **Disconnect** that is described in Section 6.3.1.1 'The File menu'.

Before establishing the connection, however, the physical connections must be in place, and the IP address of the ScanFish III must be configured in the ScanFish III Flight software under **Settings** > **Options** > **Fish** > **Fish connection**, as shown in Figure 52. Details on the **Fish** settings are given in Section 6.3.1.3.3 'Options'.

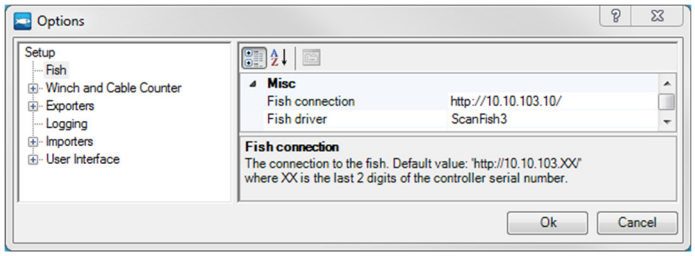


Figure 52 Fish properties

If the software is not capable of establishing the connection to the ScanFish III within the timeout and retry attempts ranges specified in the **Fish** properties, an error message is issued in the **Messages History** panel, as shown in Figure 53. Note that a similar error alert is issued in the **Alert View** panel:

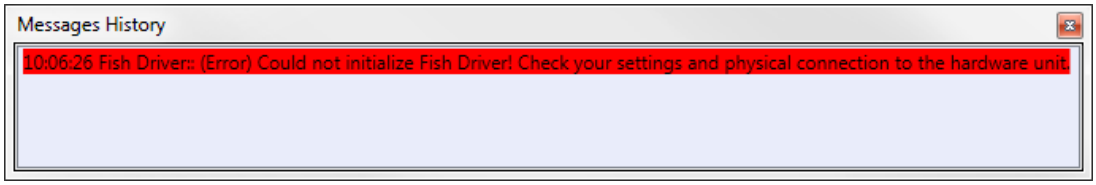


Figure 53 Messages History panel

6.3.2.1.2 Pre Flight Check

The Pre Flight Check mode is a mode that the ScanFish III will automatically enter into when powered up. It includes an automatic diagnostic test that, if successful, will allow the ScanFish III to go directly into the On Deck mode (for details on this mode, see Section 6.3.2.1.3 'Flight mode').

The automatic pre-flight check includes the following:

- Check of the flap motor(s)
- Check of the depth sensor
- Check of the motion sensor
- Check of the temperature sensor
- Check of the I/O module
- Check of the battery sensor

In particular, the user must check that both flaps are moving to their extreme positions (up and down) and back again to the initial position. At the same time, the user must check that the depth sensor shows a value of approximately '0.00' once the check has been completed.

Appropriate alerts will be given if any of the checks fail. **Important**: It is strongly recommended that these checks be supplemented by a thorough visual inspection of the ScanFish III. Details on this, as well as of the automatic pre-flight check, are given in Section 9.1 'Pre-flight'.

6.3.2.1.3 Flight mode

The ScanFish III can enter a series of different flight modes. These are accessible from the **Flight Mode** button on the online toolbar. Note that when the ScanFish III Flight software is started, the default mode is Power on mode. The available flight modes are:

- **On Deck**
- **Surface**
- **Parking**
- **Fixed Depth**
- **Follow Seabed**
- **Undulate Down**
- **Undulate Up**

When one of the modes is selected, the **Flight Mode** button label will change accordingly, as demonstrated in Figure 54.

Figure 54 Flight Mode button

The different modes must be entered and selected by the user. This is done from the menu that opens after clicking the **Flight Mode** button (see Figure 55).

Figure 55 Flight Mode menu

The main characteristics of the flight modes are:

- In On Deck mode, the ScanFish III is ready to be deployed and will consequently not attempt to navigate. This mode must always be employed when handling the ScanFish III on deck and during the initial stages of deployment.
- In Surface mode, the ScanFish III will go to or stay at the water surface and wait to be given commands to either dive or to be taken out of the water.
- Parking mode can be entered by selecting **Parking** from the menu that opens after clicking the **Flight Mode** button or by clicking the **Parking** button directly on the online toolbar. This mode will send the ScanFish III to the parking depth, whose parameters are defined in the **Tow** panel. See Section 6.3.2.1.4 'Parking' for further details.
- In Fixed Depth mode, the ScanFish III will remain at a predefined fixed depth beneath the surface that has been defined in the **Tow** panel.
- In Follow Seabed mode, the ScanFish III will maintain a fixed height above the seabed that has been defined in the **Tow** panel. This mode is particular useful in connection with side-scan sonar surveys.
- In Undulate Down mode and Undulate Up mode, the ScanFish III will move in an undulating, continuous V-pattern between maximum depth and minimum depth at a predefined undulate rate defined in metres per second (for both the ascent and the descent) in the **Tow** panel. Note that the only difference between the two Undulate modes is the initial undulation direction.

6.3.2.1.4 Parking

When Parking mode is selected by clicking the **Parking** button, the ScanFish III will go to the parking depth defined in the **Tow** panel (see Figure 56). Details on how this panel is configured are given in Section 6.5 'Configuring the display layout'.

Note that the Parking mode can also be entered through the **Flight Mode** menu, as described in Section 6.3.2.1.3 'Flight mode'.

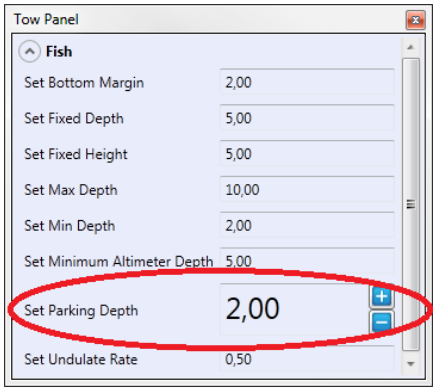


Figure 56 Tow panel

6.3.2.2 Playback toolbar tools

The playback part of the toolbar has three buttons:

- **Pause/Play**
- **Play Speed**
- **Goto Time**

The buttons are only available when playback mode is activated. More details on the playback mode are found in Section 6.4 'Playback mode'.

6.3.2.2.1 Pause/Play

Like the other two playback buttons, the **Pause/Play** button is only available when playback is activated. Clicking **Pause** will pause the progress of the playback, and the button label will now change to **Play** to indicate that the next time the user clicks the button, playback will resume. Figure 57 shows the button as it appears while in **Play** mode (left) and **Pause** mode (right). Note that the current time position is included the label in both modes.

Figure 57 Pause/Play button

6.3.2.2.2 Play Speed

When the user clicks the **Play Speed** button, a menu will open, as shown in Figure 58 on the left. From this menu, it is possible to choose playback speed.

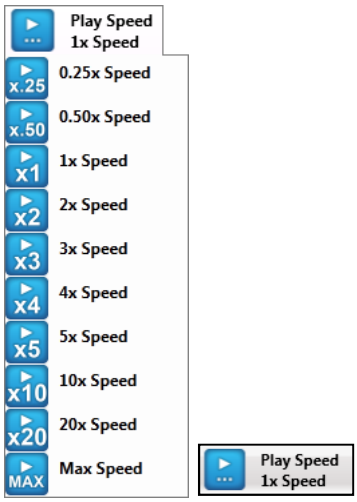


Figure 58 Play Speed drop-down menu

The default playback speed is always **1x Speed** when first initiating the playback mode. This means that the playback speed is set at the rate of 1:1 with respect to the acquisition speed. From the **Play Speed** menu, it is possible to change the playback speed to one of the other options shown in Figure 58. Once a playback speed has been selected, the selected value will be included in the button label, as shown in Figure 58 on the right. Note that the maximum speed (**Max Speed**) is 60x.

6.3.2.2.3 Goto Time

When the user clicks the **Goto Time** button, the dialogue box shown in Figure 59 will open, allowing the user to choose a time position that the playback should jump to. When the dialogue box opens, the current time position is displayed.

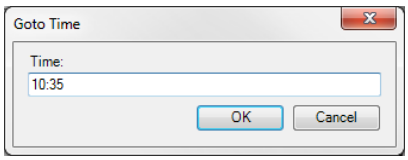


Figure 59 Goto Time dialogue box

Once the user has entered a time position and clicked **OK**, the playback will jump to the selected time position, and the playback will begin from there. Note that both the hour and minute components must be specified in order for the playback to jump backward/forward. Should the user enter a time position outside the range of the present file, the playback operation will temporarily stop. Choosing a time position inside the range covered will make the playback begin from there.

6.3.3 The main window

The layout of the main window can be defined by the user. The window consists of a number of dockable panels that can be toggled on/off using the **View** menu. In addition, the panels can float freely inside the ScanFish III Flight software main window. They can be docked to the edges of the windows, or they can float onto a secondary screen if one is present. Further details on how the main window can be configured are given in Section 6.5 'Configuring the display layout'.

6.3.4 The status bar

The status bar does not have any information displayed at present (it will constantly display 'Flight Status').

6.4 Playback mode

As stated in Section 6.3.1.1 'The File menu', the ScanFish III Flight software automatically records all data from the ScanFish III during flight. The ScanFish log files that have been recorded can be used to enter playback mode. In playback mode, it is possible to show the situation as it actually occurred during flight/acquisition.

The playback mode is initiated by clicking **Playback File** on the **File** menu, which opens a dialogue box that prompts the user to select a file to perform the playback on, as shown in Figure 60. Note that the files recorded during flight have the extension .sfl.

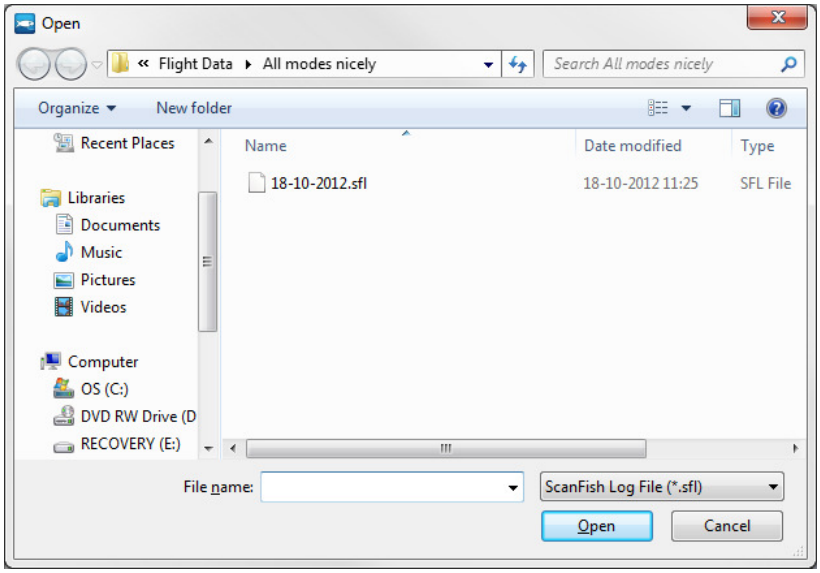


Figure 60 Open dialogue box associated with the playback mode

The ScanFish III Flight software will immediately jump to the first record in the log file and begin the playback from here at a 1:1 speed. The functions associated with the playback

toolbar (**Pause**/**Play**, **Play Speed** and **Goto Time**) now become active and can be used to control the playback. Generally, the functions available during flight mode are also available in playback mode.

Note that a few exceptions to this general rule apply. When in playback mode:

- It is not possible to change the flight mode
    - As a consequence of this, no alterations can be made to the depth requirements in the different modes (normally executed from the **Tow** panel)
- Settings for **Fish** and **Cable Counter** cannot be changed
- Settings for **Logging** cannot be changed

6.5 Configuring the display layout

The display of the ScanFish III Flight software can be configured to meet the individual needs of the users. The ScanFish III Flight software main window consists of a number of dockable panels that can be toggled on/off using the **View** menu, as shown in Figure 61.

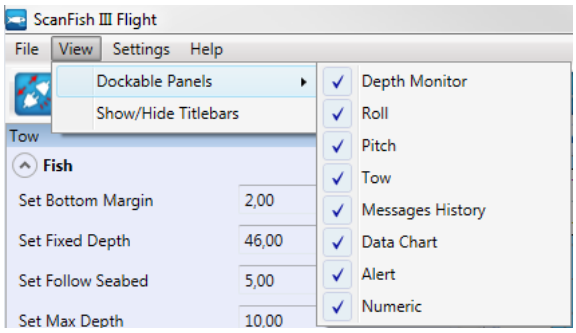


Figure 61 Dockable panels

The panels can float freely inside the ScanFish III Flight software main window. They can be docked to the edges of the windows, or they can float onto a secondary screen if one is present. When moving a panel and holding it over a position where docking is possible (around the edges and in the middle of the main window), a set of arrow markers will appear. The user must point to the appropriate arrow and leave the panel there. The software will automatically position, align and resize the panel to match the surrounding panels. The example in Figure 62 shows the **Roll** panel being docked below the **Pitch** panel. Selecting the Left/Right arrow will place the panels side by side, and selecting the Centre marker will place the panels in the same spot but on different tabs. Dragging a tab into another position will turn the tab into a separate panel again.

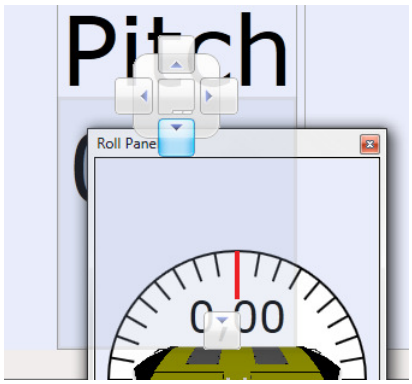


Figure 62 Docking the Roll panel beneath the Pitch panel

In Figure 63, a typical example of a ScanFish III Flight software display layout is shown.

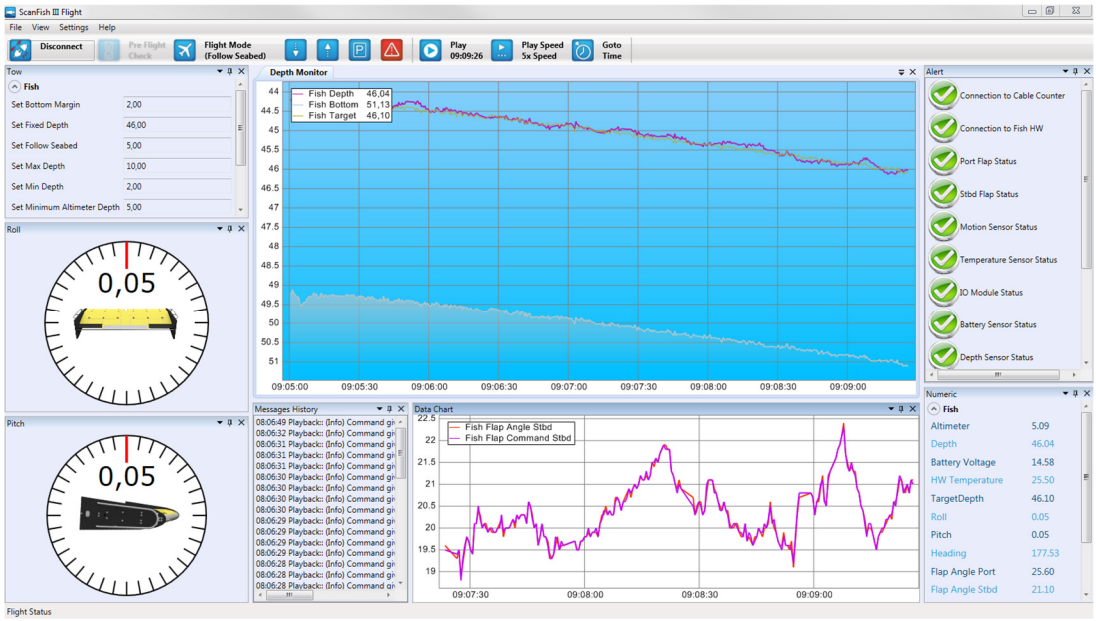


Figure 63 The ScanFish III Flight software display layout for Follow Seabed mode

The layout is saved automatically and will be used the next time the ScanFish III Flight software is started.

Information on how to define and configure the layout with the available panels is described in Section 6.6 'Display panels'. The various panels are described in the order of their listing under **Views** > **Dockable Panels**.

6.6 Display panels

6.6.1 The Depth Monitor panel

The **Depth Monitor** panel, shown in Figure 64, displays a graphical, scrolling time series view of the ScanFish III depth, the seabed/bottom depth and the target depth.

It is possible to export the contents into PDF documents or comma-separated (CSV) files from a menu that appears when right-clicking in the **Depth Monitor** panel. The panel (user interface) properties of the **Depth Monitor** panel can be modified under **Settings** > **Options** > **User Interface** > **Depth Monitor Panel**.

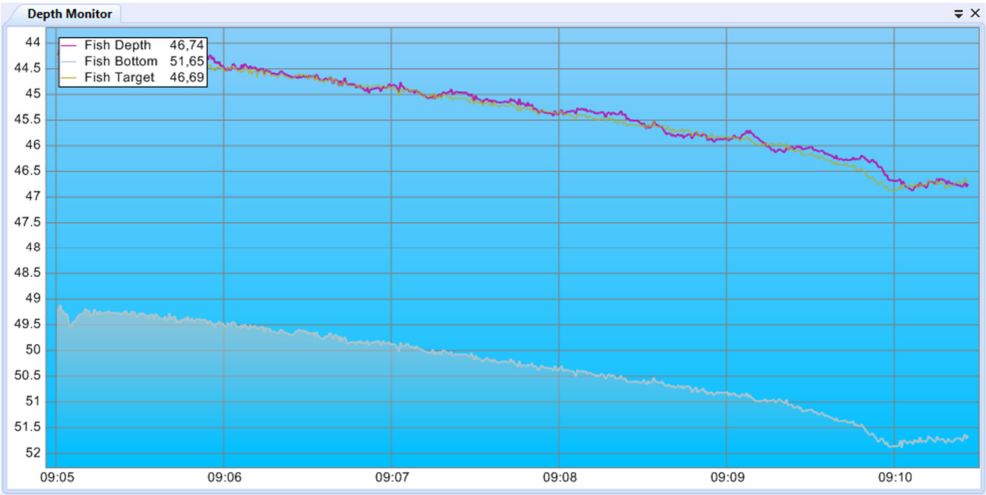


Figure 64 Depth Monitor panel

6.6.2 The Roll panel

The **Roll** panel shown on the left in Figure 65 shows a live 3D model of the ScanFish III as well as a numerical roll value (given in degrees). The 360° perimeter of the circle in which the 3D model is shown is divided into 10° increments in the example in Figure 65. The red marker here indicates the actual reading of the roll value.

When the size of the panel is made adequately small, the 3D model will disappear, and only the numerical value will be displayed (see Figure 65 in the middle).

The **Roll** panel will be displayed with a red background in case of extreme behaviour, such as when roll is very high or the ScanFish III is upside down (see Figure 65 on the right).

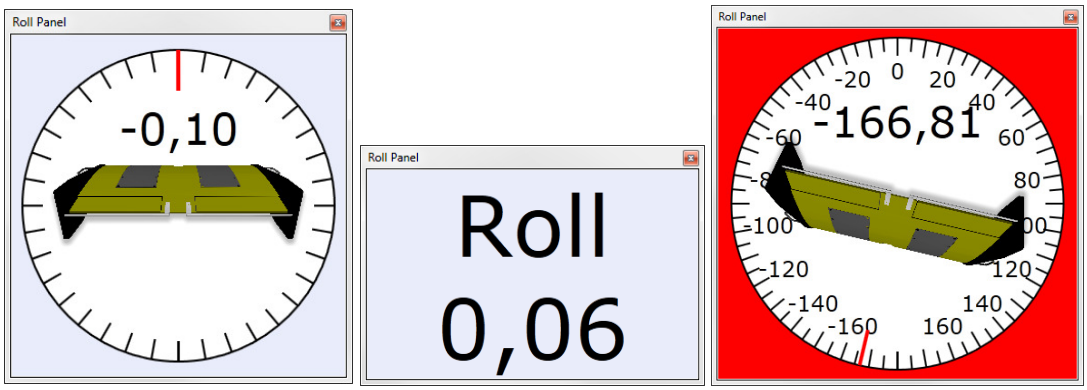


Figure 65 Roll panel

6.6.3 The Pitch panel

The **Pitch** panel, shown in Figure 66, is similar to the **Roll** panel. It shows a live 3D model of the ScanFish III as well as a numerical pitch value (given in degrees). The 360° perimeter of the circle in which the 3D model is shown is divided into appropriate increments for the present resolution/size of panel (5° in the example in Figure 66). The red marker here indicates the actual reading of the pitch value. When the size of the panel is made adequately small, the 3D model will disappear, and only the numerical value will be displayed.

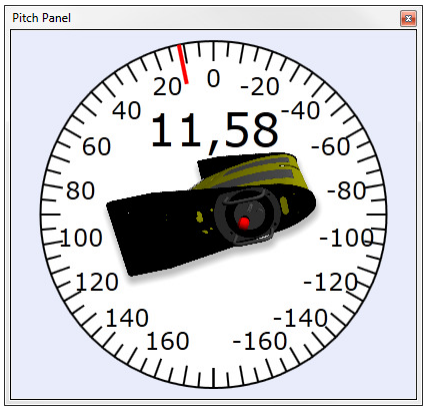


Figure 66 Pitch panel

6.6.4 The Tow panel

The **Tow** panel, shown in Figure 67, serves a dual purpose. By default, it will display the present basic towing-related property settings of the ScanFish III:

- **Set Bottom Margin**
- **Set Fixed Depth**
- **Set Fixed Height**
- **Set Max Depth**
- **Set Min Depth**
- **Set Minimum Altimeter Depth**
- **Set Parking Depth**
- **Set Undulate Rate**

These settings can be changed during flight by clicking the relevant property's field. As a result, the selected field will increase in size, and **Plus** (**+**) and **Minus** (**-**) buttons that facilitate alteration of the values will appear (see Figure 67 on the right). Once the value has been changed and the user clicks elsewhere, the settings will be applied. Further details on the **Tow** panel properties are given in Table 10.

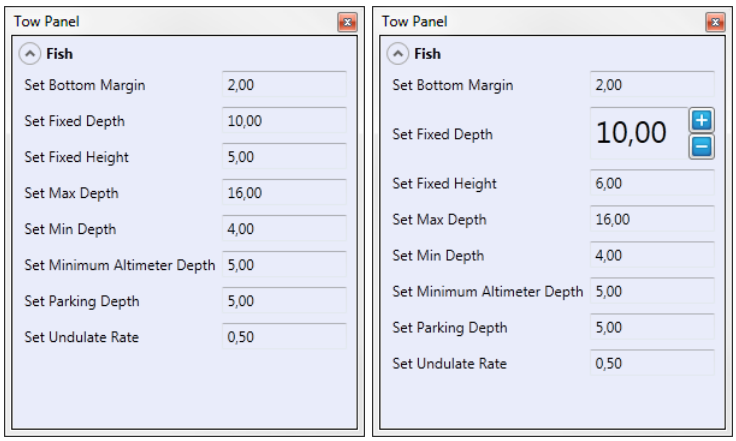


Figure 67 Tow panel

In Table 10, descriptions of the available properties in the **Tow** panel are given along with recommendations for some settings.

Property	Description	Recommended setting
Set Bottom Margin	The minimum height in metres above the seabed that the ScanFish III must stay above. This is a safety setting, and if the ScanFish III should ever find itself closer to the seabed than the defined height limit, it will automatically rise.	The defined setting should take into consideration the features of the seabed – that is, a smaller distance can be used for a seabed with smaller variations and/or fewer obstructions.
Set Fixed Depth	The depth in metres below the water surface that the ScanFish III must attempt to stay at when in Fixed Depth mode.	
Set Fixed Height	The height in metres above the seabed that the ScanFish III must attempt to stay at when in Follow Seabed mode.	
Set Max Depth	The maximum depth in metres below the water surface that the ScanFish III will descend to when in Undulate mode (lower limit).	The defined setting should take into consideration the installation (eg the cable length). The maximum depth should always be considerably less than the cable length.
Set Min Depth	The minimum depth in metres below the water surface that the ScanFish III will ascend to when in Undulate mode (upper limit).	
Set Minimum Altimeter Depth	The minimum depth in metres below the water surface for when the altimeter will be used. This is useful if the surface water has a lot of turbulence.	
Set Parking Depth	The depth in metres below the water surface that the ScanFish III will go to when Parking mode is selected (by clicking the Parking button in the main window).	The parking depth should be less than the overall depth in the area of sailing. A parking depth of 0 m (at the surface) is not recommended since this will make it difficult for the ScanFish III to dive when this is required.
Set Undulate Rate	The ascend/descend speed in metres per second at which the undulation is performed.	Note that a steep ascent/descent will generate very high drag, and that the ScanFish III can pull with a force of up to 10 kN if ordered to climb vertically.

Table 10 Tow panel property settings

6.6.5 The Messages History panel

The **Messages History** panel, shown in Figure 68, contains status and action messages. Note that the messages shown in Figure 68 are related to a playback situation.

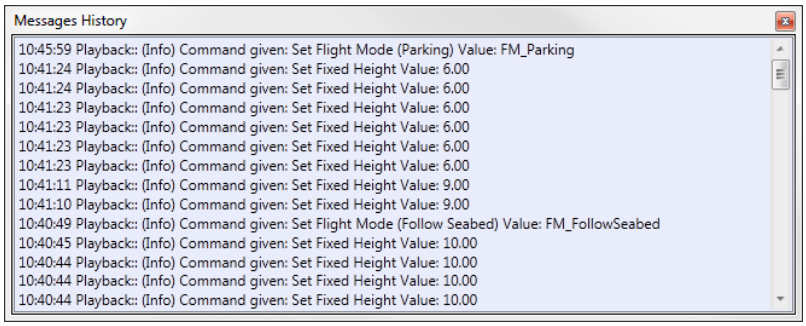


Figure 68 Messages History panel

Information message text is in black. If a warning message is issued, the text will be in orange, and if an error message is issued, the text will be in black with a red background, as shown in Figure 69.

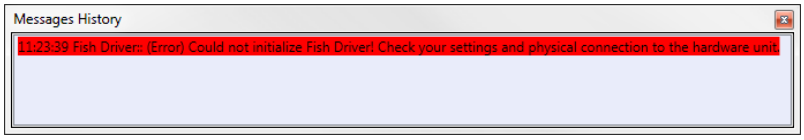


Figure 69 Messages History panel when an error message is issued

6.6.6 The Data Chart panel

The **Data Chart** panel, shown in Figure 70, can be used to display a number of different time series charts in a single panel. By default, the panel is empty, as shown in Figure 70 on the left). However, when various data sources are selected, the panel will become populated, as shown in Figure 70 on the right.

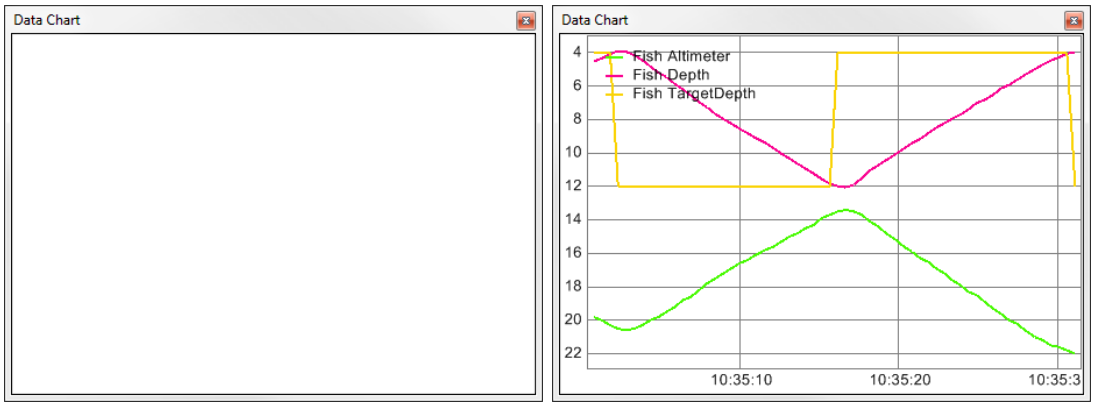


Figure 70 Data Chart panel at startup (left) and when populated (right)

The data sources available for display can be toggled on and off from the menu that appears when right-clicking in the panel. The available data sources, given in sequence, are:

- **Fish Battery Voltage**: Displays the ADC of the ScanFish III
- **Fish Altimeter**: Displays the altitude of the ScanFish III
- **Fish Depth**: Displays the depth of the ScanFish III
- **Fish Flap Angle Port**: Displays the flap angles for port
- **Fish Flap Angle Starboard:** Displays the flap angles for starboard
- **Fish Flap Command Port**: Displays the command sent to the port flap
- **Fish Flap Command Starboard**: Displays the command sent to the starboard flap
- **Fish Heading**: Displays the ScanFish III heading
- **Fish Pitch**: Displays the ScanFish III pitch
- **Fish Roll**: Displays the ScanFish III roll
- **Fish Target Depth**: Displays the target depth as defined via the **Tow** panel

The **Data Chart** panel allows the user to dump the present **Data Chart** charts to a PDF file (see Figure 71). Similarly, the data from the **Data Chart** can be exported to a CSV file that allows for further analysis of the data in other software environments, such as spreadsheets. These features are available when right-clicking in the **Data Chart** panel.

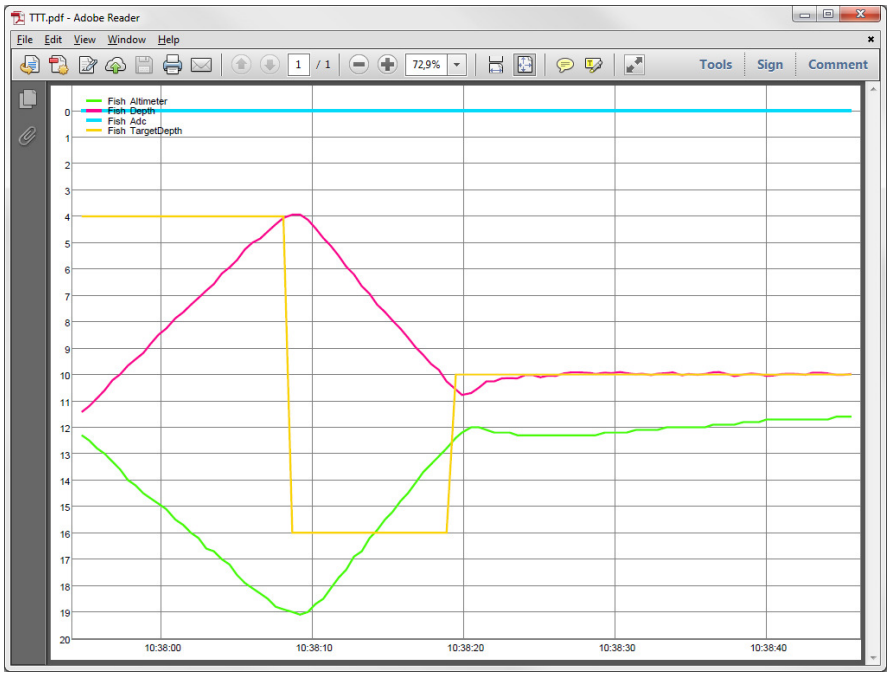


Figure 71 Exported PDF file of Data Chart charts

6.6.7 The Alert panel

The **Alert** panel, shown in Figure 72, shows the current status of the different parts of the ScanFish III. When operating normally, all status indicators are displayed with a green check mark.

In Figure 72 on the left, there is an error alert for the **Connection to Cable Counter** status indicator. On the right, the **Alert** panel is shown with no error alerts.

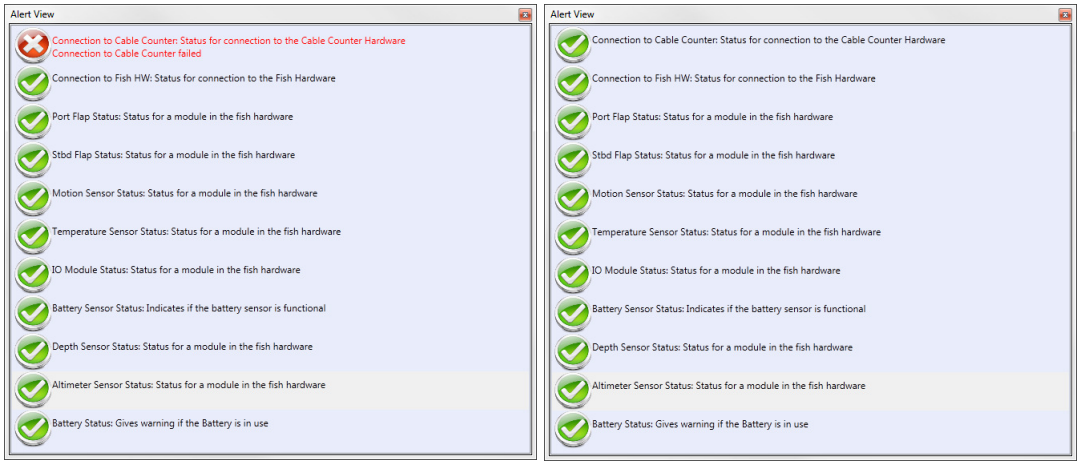


Figure 72 Alert panel, with and without error alerts

6.6.8 The Numeric Panel

The **Numeric** panel, shown in Figure 73, shows real-time numerical readings of the different ScanFish III data measurements. The sequence can be changed by right-clicking a measurement, which will open a dialogue box where you can select **Move Up** or **Move Down**, as shown in Figure 73 on the right. Note that this dialogue box also allows for alteration of the text colour.

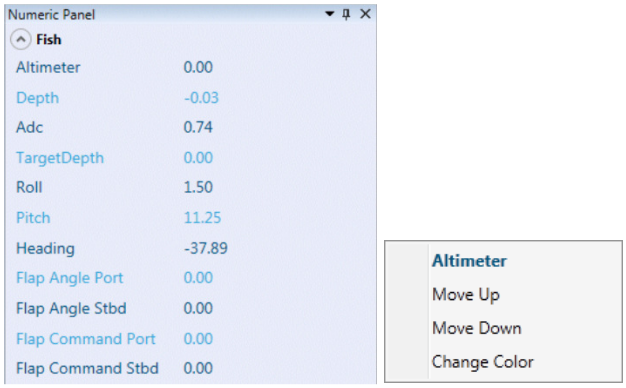


Figure 73 Numeric panel

The measurements are predefined and are, to a large extent, similar to the items available for graphical display in the **Data Chart** panel. Only the default sequence differs slightly:

- **Altimeter**: Displays the altitude of the ScanFish III
- **Depth**: Displays the depth of the ScanFish III
- **Battery Voltage**: Displays the ADC of the ScanFish III
- **TargetDepth**: Displays the target depth as defined via the **Tow** panel
- **Roll**: Displays the heading of the ScanFish III in a chart
- **Pitch**: Displays the pitch of the ScanFish III in a chart
- **Heading**: Displays the roll of the ScanFish III in a chart
- **Flap Angle Port**: Displays the flap angle for port numerically
- **Flap Angle Stbd**: Displays the flap angle for starboard numerically
- **Flap Command Port**: Displays the port flap command sent to the ScanFish III
- **Flap Command Stbd**: Displays the starboard flap command sent to the ScanFish III

6.7 Software Interfaces

As mentioned in Section 6.3.1.3.3 'Options', the **Exporters** item is divided into two subitems: **NaviScan** and **NaviPac**. By selecting either **NaviScan** or **NaviPac**, the properties shown in Figure 74 and Figure 75 will appear in the properties pane on the right side of the **Options** dialogue box. The properties allow for the export of cable counter data as well as export of ScanFish III data.

Misc	
Enable Export	False
NaviScan connection	udp://127.0.0.1:8899/

Figure 74 Data export properties for NaviScan

Misc	
Cable Counter Data Export	udp://127.0.0.1:8897/
Enable Export	False
Fish Data Export	udp://127.0.0.1:8898/

Figure 75 Data export properties for NaviPac

Enable Export is related to the **Fish Data Export** as well as to the **Cable Counter Data Export**. It is a Boolean that has the value 'False' by default.

6.7.1 Cable Counter data import

A cable counter can be interfaced with the ScanFish III Flight software for control, display and usage of information. When later exported, the software combines the cable length information with depth information to estimate the actual layback of the ScanFish III. The instrument selection is made under **Settings** > **Options** > **Winch and Cable Counter** > **Cable Counter** > **Type**.

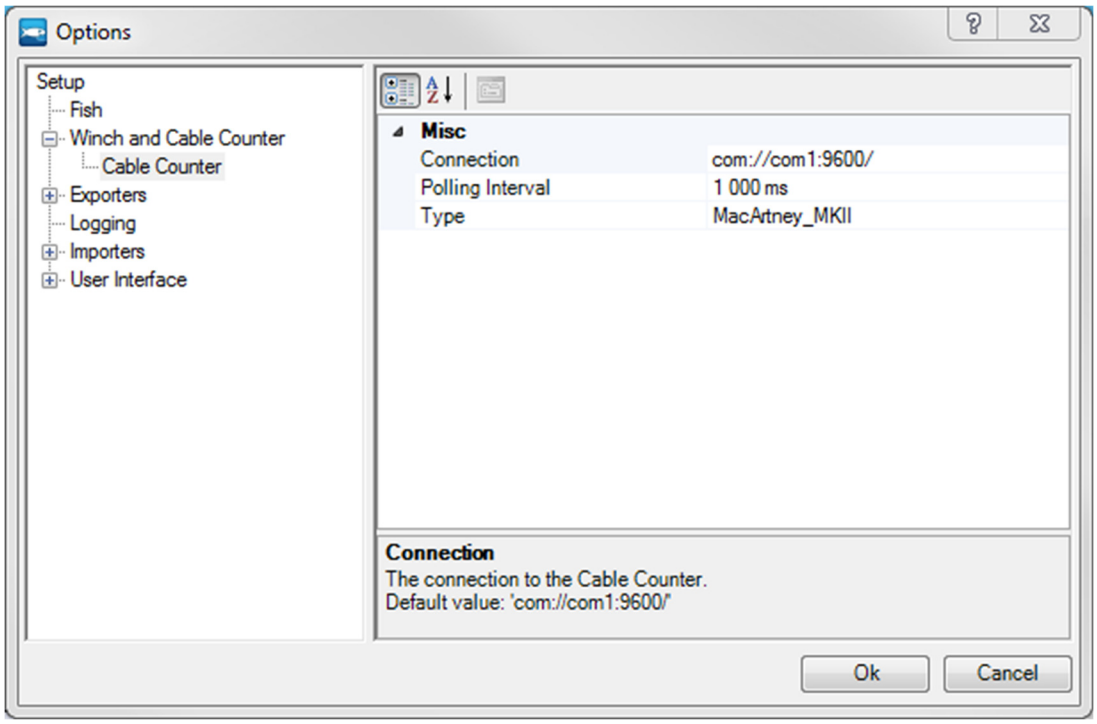


Figure 76 Cable Counter settings

Format	`L=(\d+(\.\d*)?)m +\rS=(\d+(\.\d*)?)m/m +\r`
Example	L=34.00m <CR>S=12.34m/m <CR>
Connection type	UDP or RS232

Table 11 MacArtney MKII Cable Counter instrument properties

Format	`L=(\d+(\.\d*)?)m+\r`
Example	L=34.00m<CR>
Connection type	UDP or RS232

Table 12 MacArtney EdgeTech Cable Counter instrument properties

6.7.2 Cable Counter Data Export

Format	`L=<length>\r`
Example	L=123.45<CR>
Connection type	UDP or RS232

Table 13 Compensated cable out (layback)

The cable out is compensated for vehicle depth (simple triangle calculation) and thus defines the 2D layback information – that is, the lateral distance from the ship to the ROTV. The data export can be interfaced with NaviPac via the **Generic Cable Counter** instrument.

6.7.3 Fish Data Export

Format	`$SF,Fish,<heading>,<roll>,<pitch>,<depth>,<altimeter>\r\n`
Example	$SF,Fish,12.12,1.13,-4.14,115.25,16.16<CR><LF>
Connection type	UDP or RS232

Table 14 Export to NaviPac

The data can be used in NaviPac via generic data input.

Format	`D<depth> T00.00 R<altimeter>\r\n`
Example	D151.15 T00.00 R16.16<CR><LF>
Connection type	UDP or RS232

Table 15 Export to NaviScan

The data can be used in NaviScan via the PSA900 instrument.

7 ScanFish III Flight software & NaviPac integration

7.1 ScanFish III Flight software settings

As detailed in Section 6.3.1.3.3 'Options', the **Exporters** item is divided into two subitems: **NaviScan Export** and **NaviPac Export**. By selecting **NaviPac Export**, the properties will appear in the properties pane on the right side of the **Options** dialogue box, as shown in Figure 77. The properties allow for the export of cable counter data as well as export of ScanFish III data.

Misc	
Cable Counter Data Export	udp://127.0.0.1:8897/
Enable Export	False
Fish Data Export	udp://127.0.0.1:8898/

Figure 77 Data export properties for NaviPac

- **Cable Counter Data Export** allows for the export of cable counter information between the ScanFish III Flight software and NaviPac. The exporter supports UDP as well as RS-232 (serial) connection types. The default port when using UDP interfacing is 8897. Note that the cable out is compensated for vehicle depth through a simple triangle calculation that automatically uses the depth sensor information and thus defines the 2D layback information. The format of the output is: *L=<length>\r*. Example: L=123.45<CR>
- **Enable Export** is related to **Fish Data Export** as well as to **Cable Counter Data Export**. It is a Boolean that has the value 'False' by default.
- **Fish Data Export** allows for export of a variety of information that can be logged in NaviPac. The exporter supports UDP as well as RS-232 (serial) connection types. The default port when using UDP interfacing is 8898. The format of the output is: *$SF,Fish,<heading>,<roll>,<pitch>,<depth>,<altimeter>\r\n*. Example: $SF,Fish,12.12,1.13,-4.14,115.25,16.16<CR><LF>

7.2 NaviPac settings

The dedicated NaviPac configuration that allows for integration with the ScanFish III Flight software is much simpler than what was the case with previous versions of the ScanFish Flight software and the ScanFish III itself.

7.2.1 Cable counter data

Within NaviPac, the cable counter information can be used to position the ScanFish III and thereby associate the various sensor information with a geographical reference.

The cable counter information must be interfaced by utilising **Generic Cable Counter** as a dynamic positioning instrument, as shown in Figure 78.

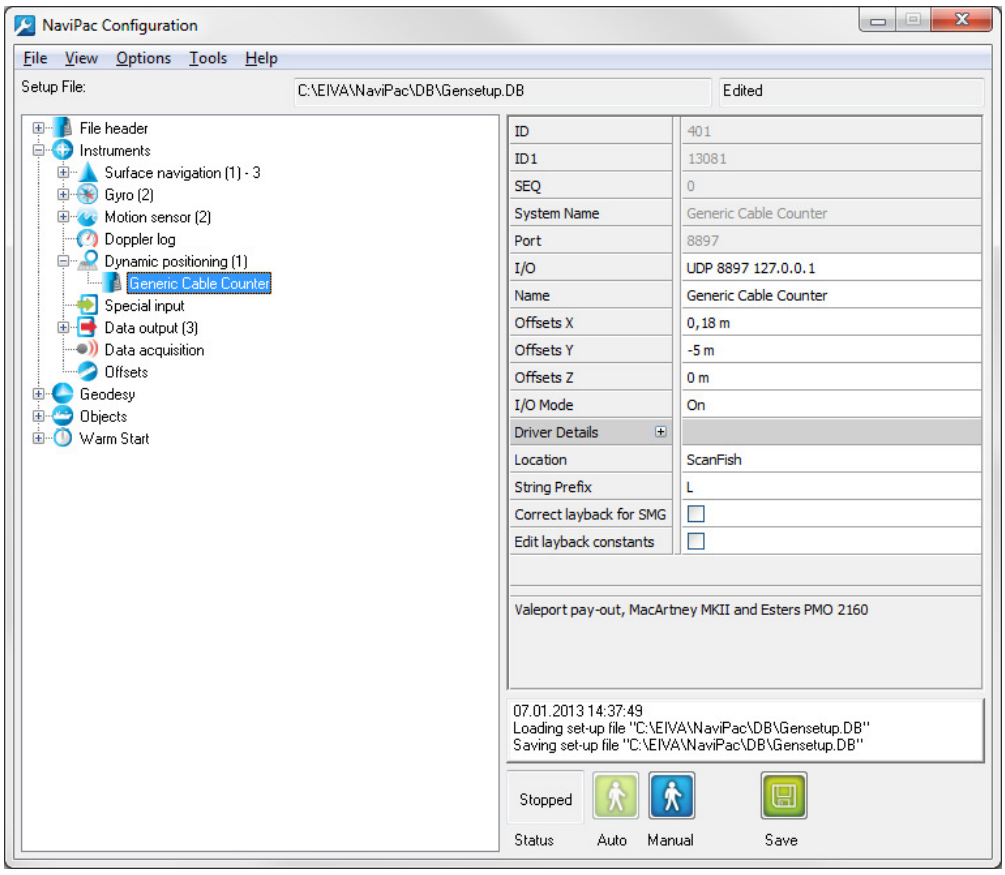


Figure 78 Example of ScanFish III-based cable counter settings in NaviPac

Important comments regarding the main properties of the **Generic Cable Counter** instrument shown in Figure 78 are as follows:

- **System Name**: Read-only. Displays the NaviPac-defined instrument name (‘Generic Cable Counter’).
- **I/O**: Edit I/O settings. The interface settings in NaviPac must correspond to the interface settings in the ScanFish III Flight software (see Section 6.3.1.3.3 ‘Options’ for details). Note that the port number is the default port when using an UDP/IP interfacing.

- **Name**: Allows for entering a user-defined name for the instrument. The default value is the NaviPac-defined system name ('Generic Cable Counter'); however, any name can be entered here.
- **Offset X**, **Offset Y** and **Offset Z**: Together, these three settings specify the position of the sheave/winch from which the ScanFish III is towed in the local coordinate system of the vessel.
- **Location**: the **ScanFish** object (see Figure 79) must be selected, because this is the object to be positioned with the instrument.
- **String prefix**: The instrument supports a series of formats, however the ones presently supported by the ScanFish III Flight software (MacArtney_MKII (default) and MacArtney_EdgeTech) both require 'L' to be the string prefix.
- **Correct layback for SMG**: The check box for this property must be cleared, because the cable counter data have already been corrected (by default) in the ScanFish III Flight software to the horizontal level.

Prior to actually configuring the **Generic Cable Counter** instrument, the **ScanFish** object must be configured, as shown in Figure 79.

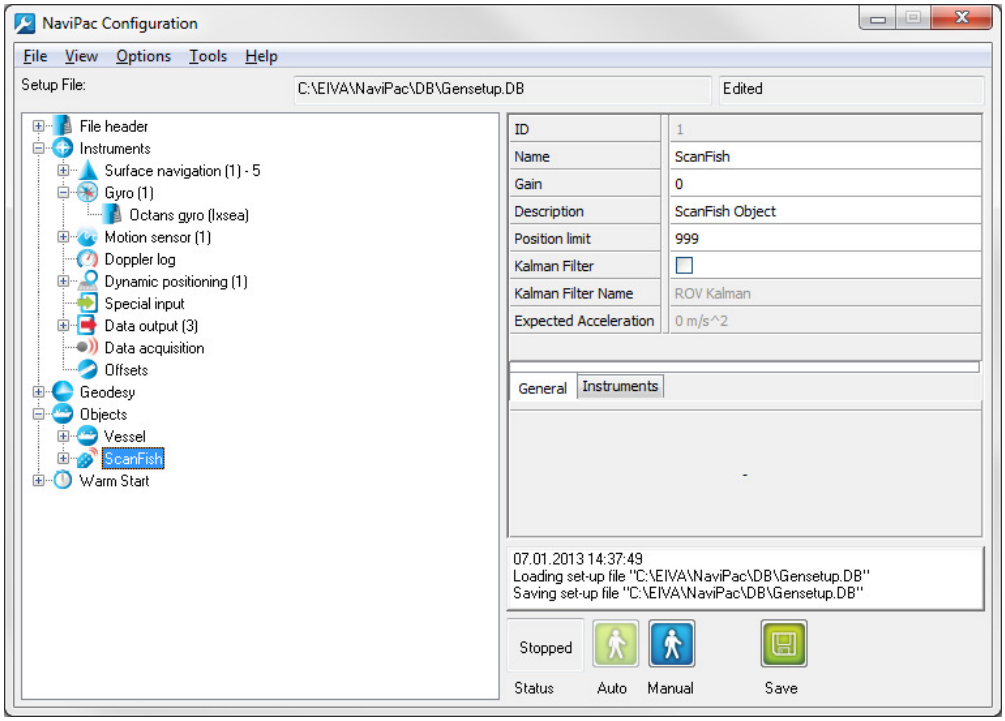


Figure 79 Definition of the ScanFish object

Important comments regarding the main properties related to the **ScanFish** object shown in Figure 79 are as follows:

- **Name**: Allows for entering a user-defined name for the instrument. The default value is 'NOT DEFINED'. Change the name of this object to 'ScanFish'.

- **Gain**: NaviPac uses an exponential filter to calculate the speed (SNG) and course (CMG) of the object. The value entered defines the smoothness of the filter, with values very close to 0 being used to show raw observations and values very close to 1 being used to show highly smoothed data. Though a value between 0.8 and 1 gives the best results under normal conditions, values closer to 0 could be used in the present context because of the nature of the position calculation. However, the user is encouraged to spend ample time determining the optimum settings for the specific configuration. Please note that this has no influence on the position calculated, which is still based on the raw observations.
- **Description**: Allows for entering a user-defined description of the instrument. This field is by default blank.
- **Kalman Filter**: The check box for this property must be cleared, because it uses all available information to improve the position calculations. This is not relevant in the present context, since normally no DVL is available and the motion/gyro is most often not of a quality that justifies this kind of usage in NaviPac.

For the remaining properties, use the default settings, which are shown in Figure 79.

7.2.2 Interfacing sensors

Data originating from the dedicated oceanographic instruments mounted on the ScanFish III can be logged in NaviPac as ordinary sensors. A wide variety of sensors are available in the NaviPac sensor instrument library, so the following two examples have only been included in order to illustrate some representative configuration scenarios.

A typical ScanFish III instrument is interfaced into NaviPac as a data acquisition instrument. This is done by right-clicking **Data acquisition** in the NaviPac Configuration **Instruments** list and then in the menu that appears, clicking **Add new item**. The dialogue box shown in Figure 80 appears and prompts the user to select the data type of the desired instrument.

In the first example, the user must select **Science and Oceanographic** (in principle, all data acquisition instruments and other instrument types can be interfaced and logged).

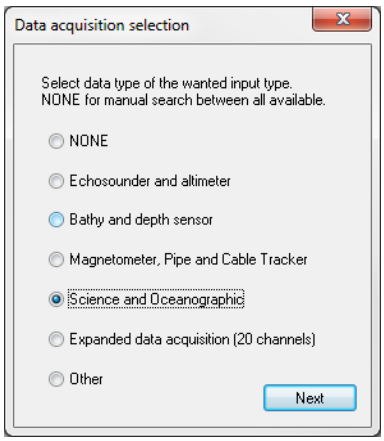


Figure 80 Data acquisition selection dialogue box (data type selection)

Clicking the **Next** button in the **Data acquisition selection** dialogue box opens the **Add new instrument dialogue**, which is shown in Figure 81. This dialogue box lists the supported instrument types. When an instrument type has been selected (in the present context, **AMT Dissolved Oxygen**), the dialogue box will appear as shown in in Figure 81 on the right.

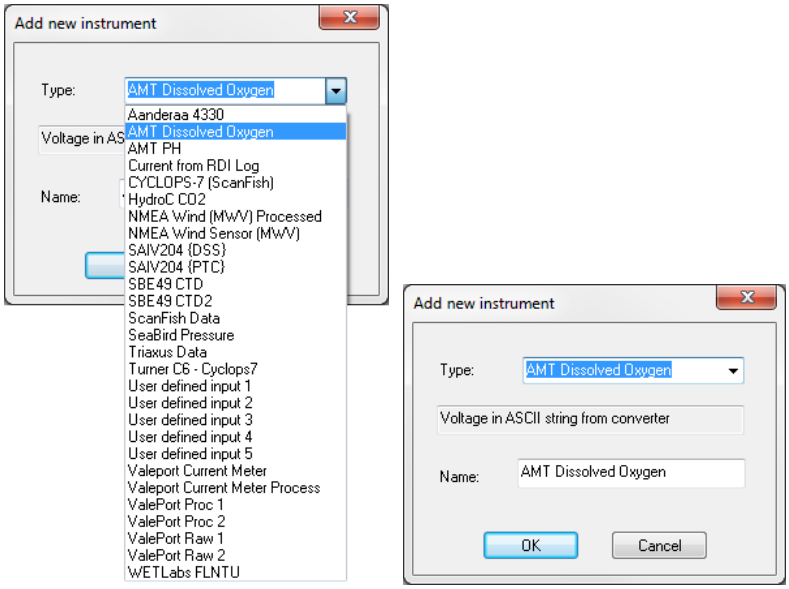


Figure 81 Science and Oceanographic instrument type list (left) and selection (right)

Clicking **OK** in the **Add new instrument** dialogue box after selecting the **AMT Dissolved Oxygen** instrument type will open the **Instrument I/O** dialogue box, shown in Figure 82. The **AMT Dissolved Oxygen** instrument is interfaced via an AD converter to a simple ASCII string. The first step of the interfacing is shown in Figure 82, in which the user selects the various I/O settings.

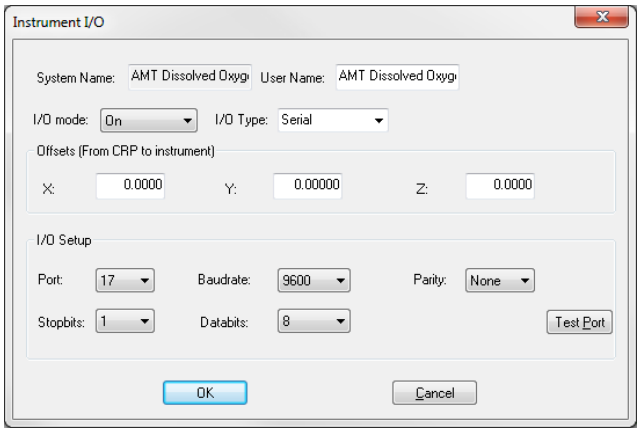


Figure 82 Instrument I/O dialogue box

Some of the instrument's property settings can only be configured in the **Instrument I/O** dialogue box. Other property settings must be configured later, in the properties pane. Once the user accepts the I/O settings by clicking **OK** in the **Instrument I/O** dialogue box, however, the instrument will appear in the **Instruments** list and its properties will appear in the properties pane, as shown in Figure 83.

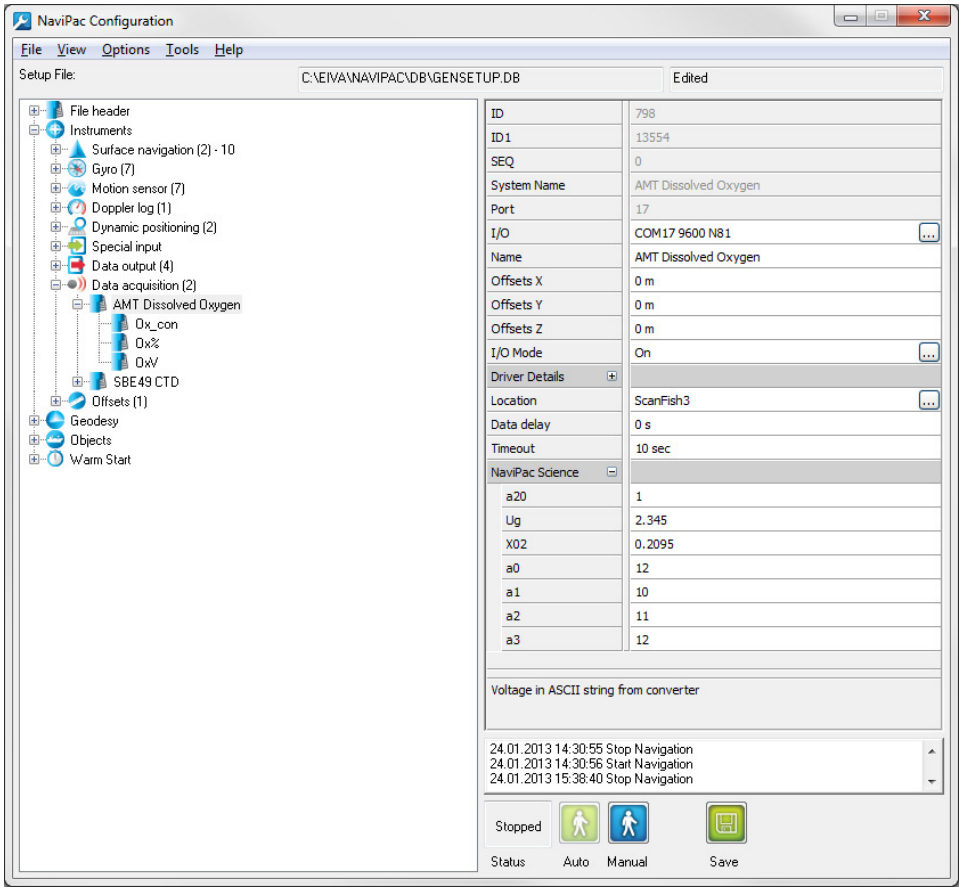


Figure 83 AMT Dissolved Oxygen instrument configuration

The **AMT Dissolved Oxygen** instrument is interfaced via an AD converter to a simple ASCII string. NaviPac stores raw voltage, oxygen percentage and concentration in the three channels that are available for each data acquisition instrument. Based on the ASCII string received, NaviPac will calculate the oxygen percentage and the concentration using the formulas and the calibration constant supplied by the manufacturer, AMT (Analysenmesstechnik GmbH).

In Online mode, NaviPac will perform the conversions and make them available to the user in a variety of ways. Figure 84 on the left shows data in the **NaviPac Rawdata** window. The raw data coming in is shown in the **Raw Data** field in the upper part of the window, whereas NaviPac's interpretation is visualised in the lower part of the window.

A more visual way of displaying the instrument data in NaviPac is using the **Dataacq** window, shown in Figure 84 on the right. This window facilitates alphanumerical as well as graphical presentation of data acquisition instrument data. The **Dataacq** window is available in NaviPac version 3.9.3 and earlier.

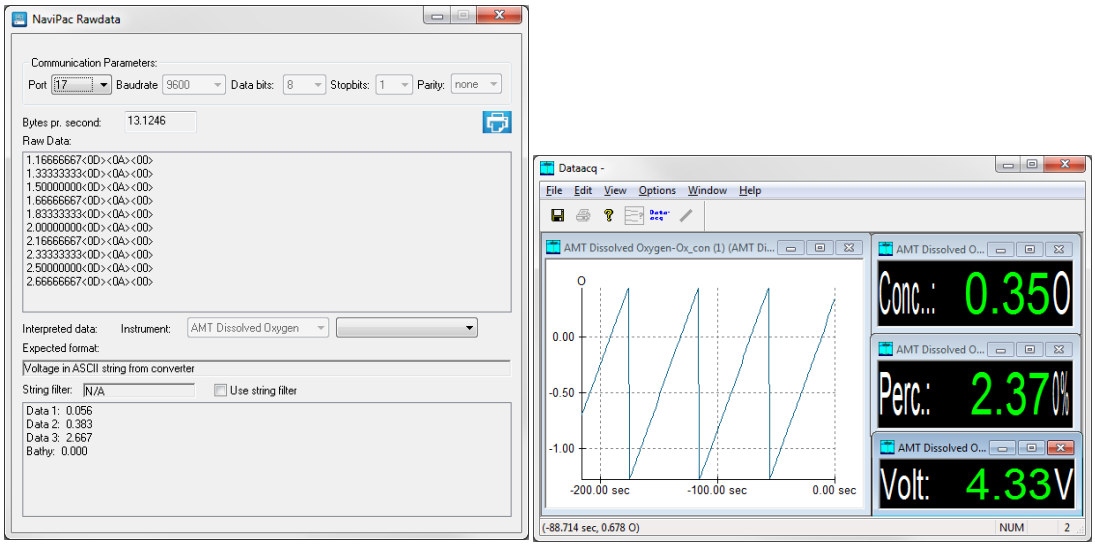


Figure 84 NaviPac Rawdata window (left) and Dataacq window (right)

The window shown in Figure 85 is the **DataMon** window, which is available in NaviPac version 3.9.4 and later. It is the successor of the **Dataacq** window and offers the user a much higher degree of freedom and flexibility when it comes to designing the visualisation windows. The configuration of the **DataMon** window is shown in Figure 86.

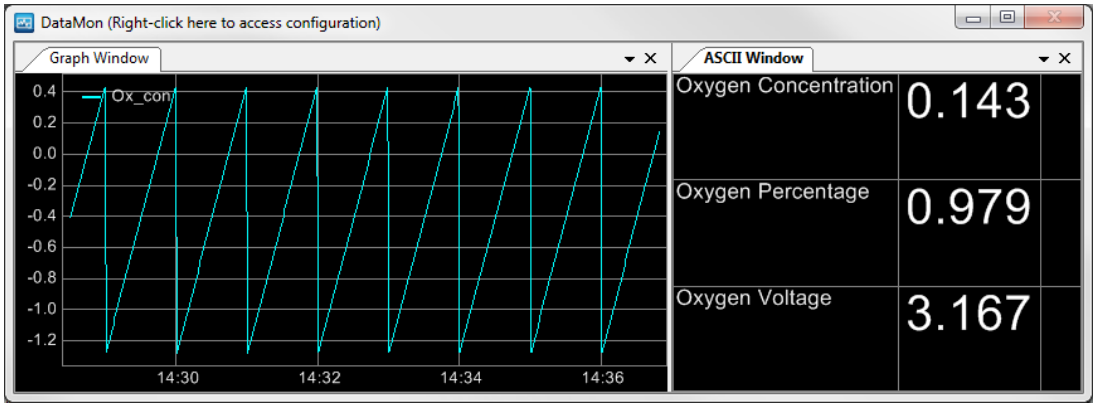


Figure 85 DataMon window with AMT data

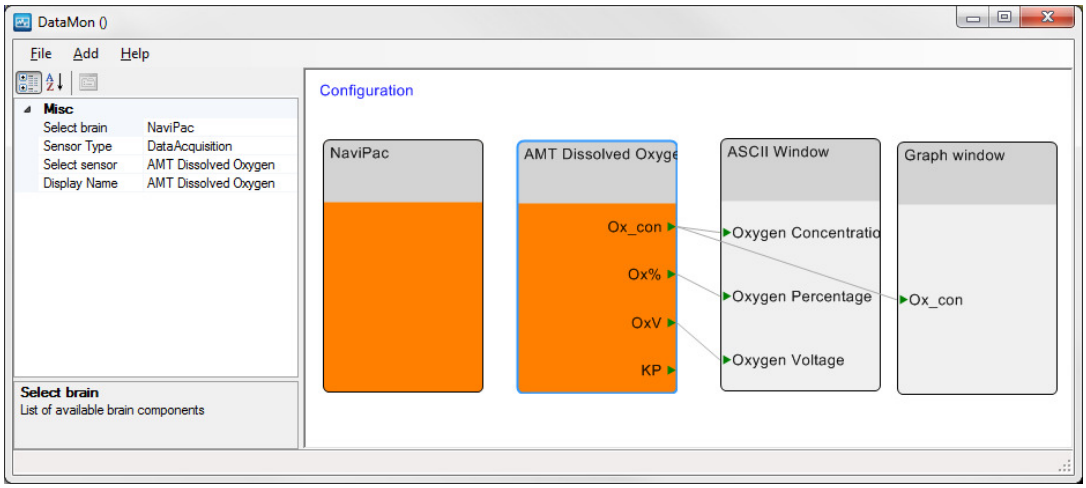


Figure 86 Configuration of the DataMon window

The second example is associated with the **SBE49 CTD** data acquisition instrument, shown in Figure 87. This is basically a CTD probe that inputs conductivity, temperature, pressure (converted to depth by NaviPac), salinity and sound velocity. The incoming string has the format *TT.TTTT, CC.CCCC, PPPP.PP,SS.SSSS,VVVV.VVVV<cr><lf>*, where T is temperature, *C* is conductivity, *P* is pressure, *S* is salinity and *V* is sound velocity.

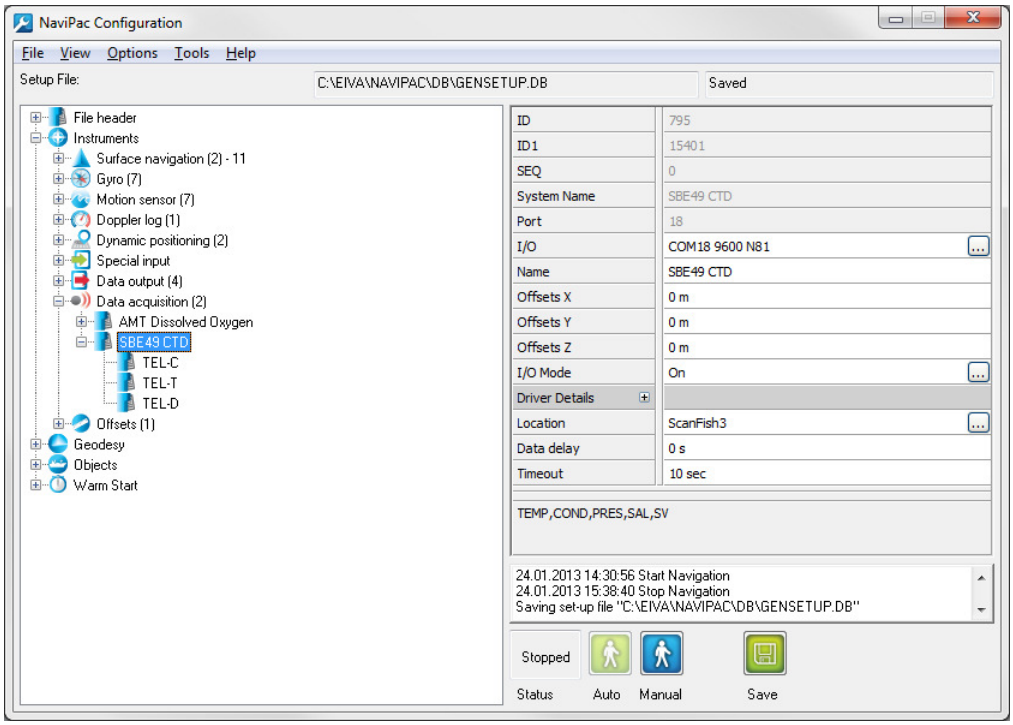


Figure 87 SBE49 CTD instrument configuration

However, NaviPac only uses the three channels associated with the CTD information. This is illustrated in the **DataMon** window shown in Figure 88, where the three channels are shown in an alphanumerical presentation of the NaviPac interpretation in the **CTD From NaviPac** panel. Note that TEL-C, TEL-T and TEL-D are conductivity, temperature and depth, respectively.

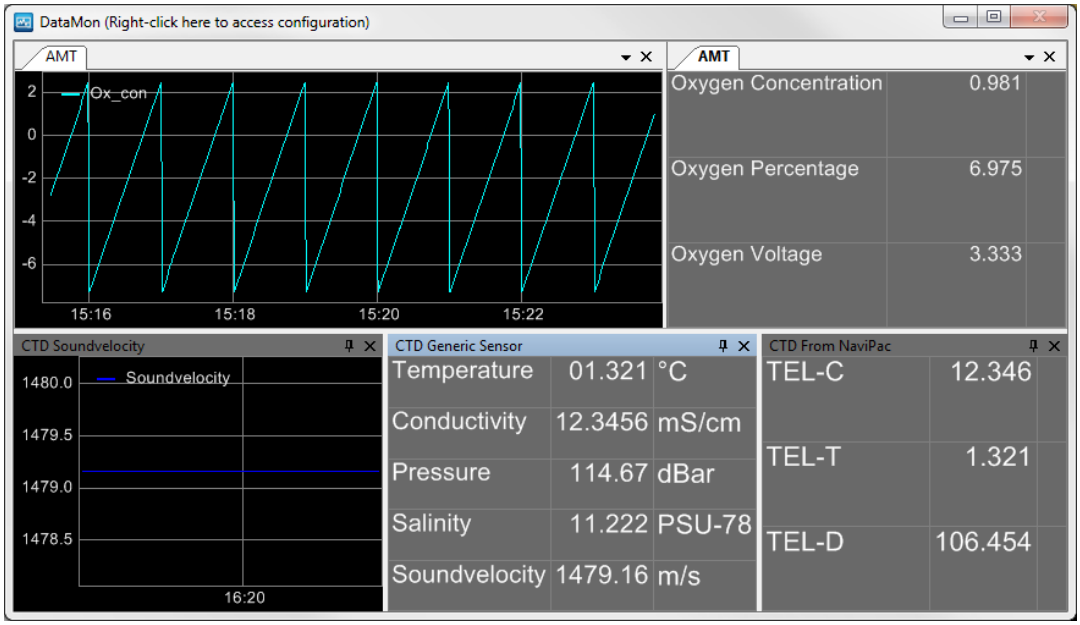


Figure 88 DataMon window visualising data from the AMT (top) and the CTD sensor (bottom)

In the **CTD Generic Sensor** panel in the bottom of the **DataMon** window in Figure 88, **DataMon** shows an interpretation of all the observations coming into the port from the sensor. Note that the NaviPac interpretation (**CTD from NaviPac**) and the DataMon interpretation (**CTD Generic Sensor**) can be shown simultaneously.

The DataMon interpretation has been achieved by bypassing the NaviPac interfacing and interpretation. This can be relatively easily accomplished by setting up the configuration of the **DataMon** window, as shown in Figure 89.

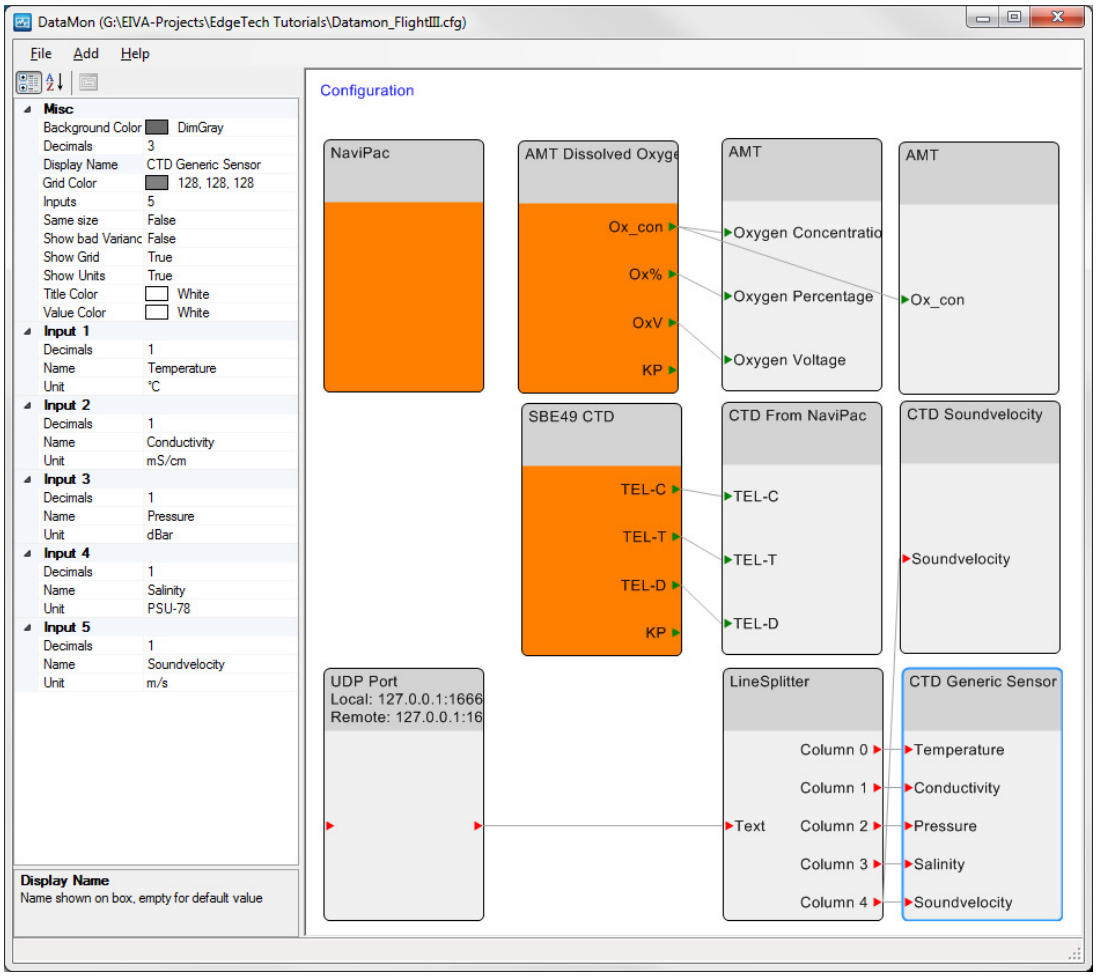


Figure 89 Configuration of the DataMon window shown in Figure 88

Note that the **DataMon** window is described in details in the associated Help articles as well as in the DataMon manual that is available from the **Help** menu in the **DataMon** configuration window.

7.2.3 Helmsman's Display

In the **Helmsman's Display**, a number of views can be used to display information related to the ScanFish III. This information is displayed in the views marked in the red rectangle in the **Helmsman's Display** in Figure 90. For each of the items to be shown in NaviPac version 3.9.3 and earlier, a Dynamic Object view must be defined.

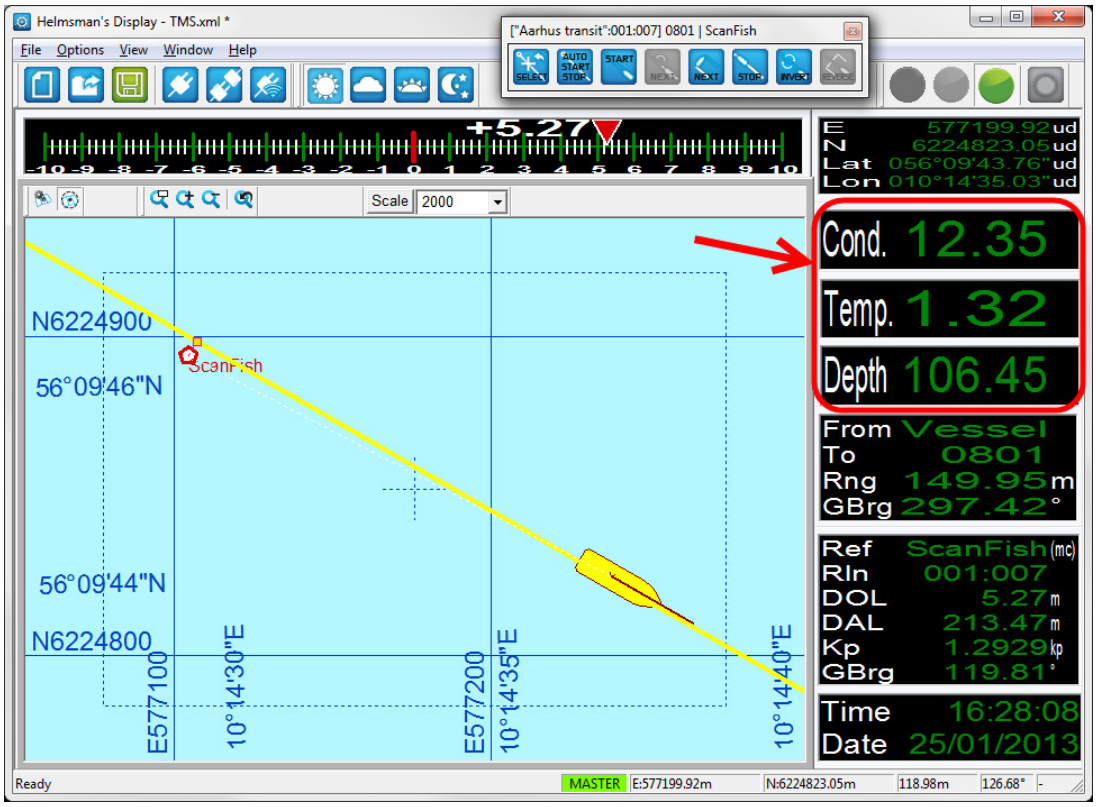


Figure 90 Data acquisition instrument information shown in Helmsman's Display dynamic object views

In NaviPac version 3.9.4 and later, a more flexible method of visualising data acquisition instruments is possible. An example of so-called multiple data acquisition (Multiple DAQ) view is shown in Figure 91, where it can be seen that all channels associated with a data acquisition instrument can be visualised together in a single view.

Figure 91 Multiple DAQ view in the Helmsman's Display

7.2.4 Data logging

The **LogData** window is used to control the standard data logging within NaviPac. The user can choose between logging in three different ASCII text formats:

- General format: A general format that will contain all information including events and raw instrument data.
- Survey format: An XYZ ASCII record format to be read by the dedicated NaviPac interpreter in NaviEdit. All position, depth and attitude (gyro, roll, pitch and heave) values are logged together with all relevant data acquisition data.
- Custom format: A format that can be customised by the user based on the configuration settings.

As a general rule, the survey format should be used when the user wishes to log data that must be used for further processing and presentation in NaviEdit and other programs. When the purpose is to log data that can readily be presented as it is, the custom format should be selected. However, generally, the recommendation is to always log in all three formats.

8 Payload communications

The payload ports on the ScanFish III with serial communication are connected to a Digi PortServer. In order to connect to these ports, the virtual COM ports must be installed on the host computer.

In this case, the host computer is the computer connecting to the COM ports, not necessarily the computer running the ScanFish III Flight software. It just needs to be connected to the same LAN as the ScanFish III Power & communications.

For information on the installation of the virtual COM ports on a computer, please see Section 8.1 'Requirements' and Section 8.2 'Digi PortServer'.

8.1 Requirements

- ScanFish III
- ScanFish III Power & communications
- Computer
    - Windows 7
    - Ethernet
    - Digi PortServer driver (available from Digi website: http://www.digi.com/support/supporttype?type=drivers)
- Ethernet cable

8.2 Digi PortServer

1. Connect the ScanFish III as described in the user manual
2. Connect the host computer to the same LAN as the ScanFish III Power & communications
3. Start up the computer, and, in the computer's network settings, select the following specific IP address and subnet mask:
    - IP address: 10.10.103.*xxx* (insert available IP address)
    - Subnet mask: 255.0.0.0

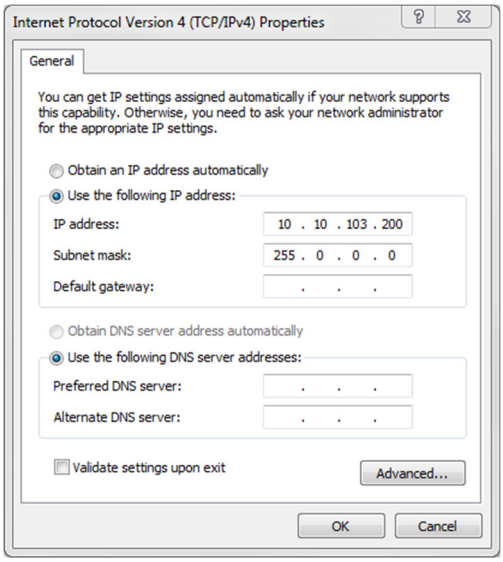


Figure 92 IPv4 properties for setup of Digi PortServer

4. Run the Digi PortServer driver setup
5. The PortServer's IP addresses are:
    - Primary: 10.10.103.101
    - Secondary (optional): 10.10.103.102
6. Install designated payload sensor software

It is recommended to check for updates from Digi and install the newest drivers for the model PortServer TS 4 MEI here:

http://www.digi.com/support/supporttype?type=drivers

After the Digi configuration, make sure you have the ports available in **Device Manager** under **Control Panel**, and find out which COM port numbers on the computer have been assigned to each payload port.

8.3 Advantech ADAM module (optional)

The ADAM module is set up with the IP address '10.10.103.103'.

To see data, use Advantech software, EIVA NaviPac or other designated third-party software.

9 Procedures for use of the ScanFish III

9.1 Pre-flight

This section describes the procedure that must be followed before each deployment. This consists of both software checks and visual inspection. The purpose of the pre-flight check is to ensure that the ScanFish III is ready for deployment. Never deploy without completing a successful pre-flight check.

Never perform a pre-flight check while the ScanFish III is deployed in the water. The pre-flight check must always be performed with the ScanFish III on deck (or for the ScanFish Tropheus only, in the cradle).

1. Make sure that the ScanFish III flaps are free of any obstructions, and inform relevant personnel of the upcoming pre-flight check. **Caution: Never touch the flaps while the ScanFish III system is turned on due to the risk of personnel injury. The flaps are very strong and may not stop if obstructed by a hand/finger.**
2. Visually check for signs of oil leakage around the flaps. If there are signs of oil, replace the flap motor. Do not use a leaking flap motor.
3. Visually check for signs of cracks in the ScanFish III outer shells and skeleton. Do not deploy if any cracks are discovered in either the shells or the skeleton.
4. Check all outer screws, and tighten them if loose.
5. **For the ScanFish Tropheus only** – Check the cotter pin (split pin) and locking ring in the foldable tow arm. Do not proceed if either one is corroded, broken or missing.

Figure 93 Cotter pin (left) and locking ring (right)

6. Check shackles – they must all be fastened securely.
7. Turn on the ScanFish III Power & communications and start the ScanFish III Flight software.[4]
8. Select **Pre Flight Check** mode in the ScanFish III Flight software.
9. Visually check that both flaps are moving to their extreme positions (up and down) and back again to the initial position.
10. In Pre Flight Check mode, the ScanFish III Flight software will check the ScanFish III system and all ScanFish III sensors. Alert statuses will be presented in the ScanFish III Flight software – green check marks for passed checks and red crosses for failed checks. The background will also flash red in the **Alert** panel in case of a failed check. Do not proceed if ScanFish III Flight software reports any failed checks.
    - In case of a failed check, the error must be corrected, and the ScanFish III Flight software pre-flight check in Pre Flight Check mode must be repeated from the beginning.
    - If the ScanFish III Flight software pre-flight check in Pre Flight Check mode is successful, you can proceed with deployment of the ScanFish III.
11. Make sure the pressure sensor reading has reset to approximately '0.00' when the ScanFish III is above water.
12. Note that The ScanFish III has an internal battery backup system that keeps the battery charged during normal operation. If the ScanFish III has been used in System Failure mode due to a power supply failure and/or communications failure during deployment, or if the ScanFish III has not been used for several months, the battery may be discharged. Please allow the ScanFish III to charge the battery for two to three hours before deployment. **Important**: Charging must be done with the ScanFish III turned on and submerged in water in order to prevent overheating.
13. Ensure that the ScanFish III is not turned on for more than 20 minutes while on deck. The ScanFish III will overheat if used without the cooling effect of the water. In warm and sunny weather (25ºC and above), this time limit should be reduced to about 10 minutes.
14. In the ScanFish III Flight software, set the desired parking depth parameter. Ensure that the chosen parking depth is less than the overall depth in the area of sailing in order to minimise the risk of the ScanFish III crashing into the seabed. A parking depth of 2 metres is recommended and normally safe.

[4] See Section 5.3 'Connecting to the ScanFish III' for detailed instructions on how to do this.

9.2 Deployment of the ScanFish III

This section describes the procedure that must be followed in order to ensure successful deployment of the ScanFish III. Deployment must be performed immediately following a successful pre-flight check. Do not rely on a pre-flight check performed hours ago – in that case, you must complete a new successful pre-flight check before deployment. Do not deploy the ScanFish III in icy water, and avoid sailing through water containing debris or objects that could harm the ScanFish III in the case of a collision or by getting caught up in the system, as this may damage the ScanFish III and the tow cable. Make sure that both hatches are securely fastened. Never deploy without hatches or with screws missing. Always act responsibly and stay focused on safety.

1. Make sure the ScanFish III is in On Deck mode.
2. Keep vessel speed between 2 to 3 knots.
3. Lift the ScanFish III up from the deck (or for the ScanFish Tropheus only, from the cradle) by winding up the cable and/or by using the A-beam.
4. Deploy the ScanFish III carefully by winding out cable and/or using the A-beam.
5. Make sure that the ScanFish III is positioned correctly when deployed into the water.
6. When the ScanFish III touches the water surface, change the flight mode to Surface mode.
7. Increase the vessel speed to 4 knots while slowly winding out the cable. Very fast winding may result in the ScanFish III having no speed through the water and therefore being out of control. Increase vessel speed to keep the ScanFish III in control if spooling out very quickly.
8. Set the ScanFish III to Parking mode. The purpose of Parking mode is to place the ScanFish III at a safe depth and still have full dynamic control. Always choose Parking mode when the ScanFish III is idle or not collecting data.
9. Release adequate cable length needed for the planned survey operation.
10. Keep the vessel speed between 4 to 10 knots while in operation.

9.3 While operating

This section describes how to operate the ScanFish III, and it discusses precautions for the use of ScanFish III. Please ensure that recommendations and precautions are followed in order to ensure safe operation.

- Sudden changes in vessel speed and/or direction may temporarily influence the performance of the ScanFish III because the dynamics of the water change. The ScanFish III will adapt to the new conditions in less than a minute, and performance will restored to normal. Do not make sharp turns with the vessel if the ScanFish III is within a few metres from the seabed – the ScanFish III will lose speed, and this could cause a fatal crash with the seabed. If sharp turns are necessary, set the

ScanFish III to Parking mode and wind up the some cable before turning. After turning the vessel, wind out the cable and select the desired flight mode in the ScanFish III Flight software.

- Sudden changes in cable length due to winding out/up may temporarily influence the performance of the ScanFish III because the dynamics of the water change. The ScanFish III will adapt to the new conditions in less than a minute, and performance will be restored to normal.
- Always ensure that the ScanFish III's height above seabed is at a safe level, based on the features of the seabed. If the height is very low and the seabed has steep slopes or large objects in the path of the ScanFish III, the risk of collision is high.
- The ScanFish III has a bottom anti-collision feature that will force the ScanFish III to ascend quickly if the height gets below the defined limit. **Important**: Do not use this feature to keep a very low height above the seabed – it is an emergency feature for avoiding collisions. Combinations of low height, high/low vessel speed and steep slopes/large objects on the seabed may still result in fatal collision.
- Make sure that the ScanFish III Flight software is monitored at all times while operating the ScanFish III – sudden changes in roll or pitch of the ScanFish III may require immediate attention and possibly also immediate recovery.
- In case of problems keeping the roll between -2° and 2°, vessel speed should be immediately lowered, the flight mode should be changed to Surface mode, the cable should be wound up and the ScanFish III should be recovered as quickly as possible.
- If the ScanFish III experiences a power supply failure, it will switch to internal battery backup and begin ascent to the surface. This will generate an alert. Recover the ScanFish III immediately.
- If the ScanFish III Flight software experiences a communications failure with the ScanFish III, it will generate an alert. At the same time, the ScanFish III will enter into System Failure mode and begin ascent to the surface, powered by either the ScanFish III Power & communications or the internal battery. Recover the ScanFish III immediately. Allow the ScanFish III to charge for two to three hours before the next pre-flight check and deployment. **Important**: During this charging period, the ScanFish III must be turned on and submerged in water in order to prevent overheating.
- If the altimeter is blocked by an object hanging under the ScanFish (eg an external sonar system), the ScanFish III will assume that the seabed is rising with a predetermined slope. This will result in the ScanFish III ascending slowly to the surface. If the object is removed, the ScanFish III will resume normal operation.
- Pre-flight check, deployment and operation of the ScanFish III with a discharged backup battery is possible, but this is done so at your own risk and is not recommended. A discharged backup battery will charge during the first two to three hours of normal operation, but it is strongly recommended to charge the battery before use. In case of a power failure with a discharged backup battery, the ScanFish III will not ascend to the surface and may collide with the seabed.

9.4 Depth vs. cable length and speed

The ScanFish III is able to operate and keep itself at any depth within the range specified in Table 4 in Section 4.1 'Technical overview'. In order to do this effectively, a sufficient amount of cable has to be wound out in accordance with depth and speed requirements.

Examples of required cable length are displayed in the chart in Figure 94.

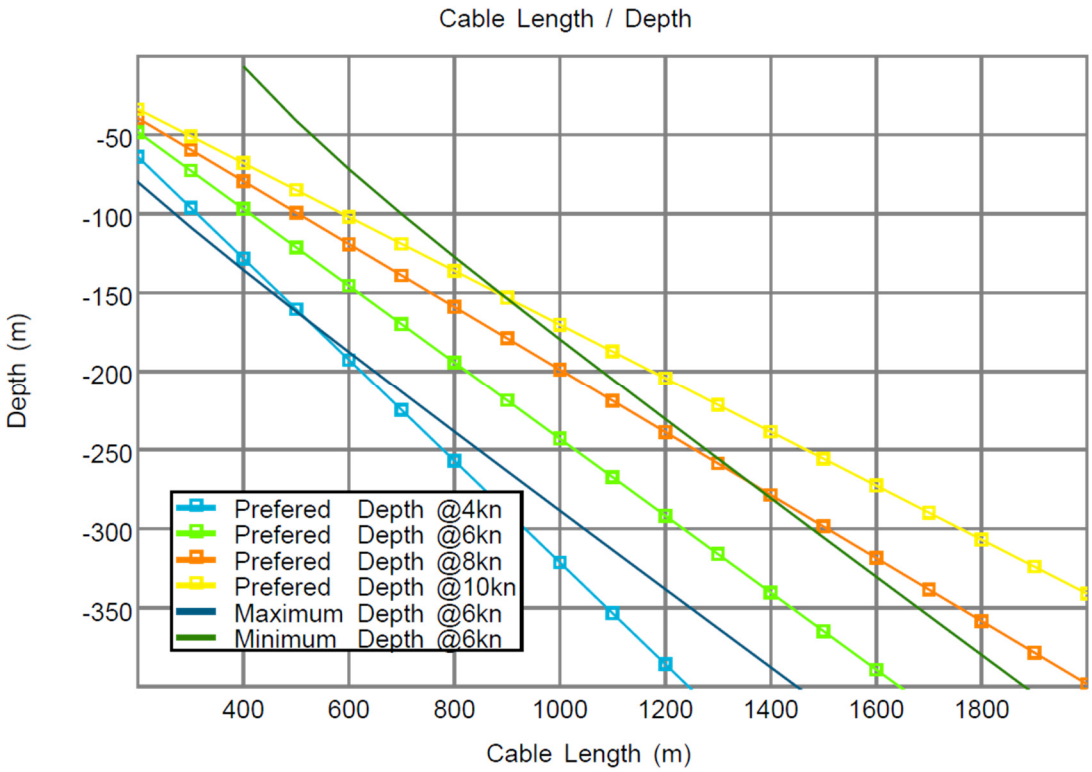


Figure 94 Depth vs. cable length – type of cable A302799 (11.43 mm)

Caution: The data in the chart in Figure 94 are estimated guidelines and as such are affected by sea conditions, specific payload configuration and tow cable configuration. These guidelines are to be used with caution until verified by actual sea trials.

9.5 Recovery procedure

This section describes the procedure that must be followed in order to ensure successful recovery of the ScanFish III. Always act responsibly and stay focused on safety.

1. Set the ScanFish III to Parking mode.
2. Set the vessel speed to approximately 4 knots, and wind up the cable. Winding up the cable when the vessel is travelling at a high speed can cause the actual speed of the ScanFish III through the water to exceed 10 knots. Avoid this by reducing the vessel speed to be in accordance with the winding speed.
3. When the ScanFish III is between 20 to 50 metres behind the vessel, set the ScanFish III to Surface mode and wait until the ScanFish III reaches the surface.
4. Recover the ScanFish III by winding up the cable and/or using the A-beam.
5. When the ScanFish III leaves the water, change the flight mode to On Deck mode. This will stop movement of the flaps and disconnect the internal battery.
6. Rinse the ScanFish III with fresh water on the outside and the inside through the openings around the tow point. Make sure that all internal parts are rinsed with fresh water. Hatches may be opened in order to rinse the internal parts properly.
7. Protect the ScanFish III from direct sunlight, excessive heat and icy conditions with a reflective cover when stored on the deck.

9.6 Storing of the ScanFish III

When not in use, the ScanFish III needs to be stored properly. Do not store the ScanFish III resting on its shells or on sharp edges in general. Take care that The ScanFish III is always thoroughly supported to minimise static stress on the structure.

- The cradle should be used for short-term storage (eg between daily operations) of the ScanFish Tropheus. Always use the straps to firmly secure the ScanFish III to the cradle to prevent it from falling down or being picked up by strong winds and/or water. Alternatively, the case can be used for short-term storage of the ScanFish Tropheus.
- The case can be used for short-term storage of the ScanFish Rocio, the ScanFish Katria and the ScanFish Konia.
- The case should be used for long-term storage – ensure that the ScanFish III is dry before long-term storage.
- If not being stored in the cradle or case, ensure that the ScanFish III rests on its side panels with the tow point facing upwards and tail facing downwards. Secure the ScanFish III firmly to prevent it from tilting.
- Do not store the ScanFish III for long periods on deck or in wet/moist conditions.

9.7 Inspection and maintenance

Frequent inspection of the ScanFish III is important in order to prevent failures, fatal crashes and/or personal injury. The recommended frequency of inspection depends on the amount of use and the conditions of use. The more severe the conditions and the more frequent the use, the more frequently inspection should be performed.

- Frequently check that the side guards are securely fastened to the POM side panels. Do not use the ScanFish III if the side guards are loose or broken.
- Frequently check the tow point, including the spindle and safety clip, for wear. Do not use the ScanFish III if any parts are bent, broken or worn.
- Frequently check cables and connectors. If connector pins exhibit signs of corrosion, they must be replaced. If cables are cracked or worn, they must be replaced.
- Spray the connectors with thin silicone oil whenever they are unplugged and before storage.
- Spray the connectors again with thin silicone oil before re-connecting.
- Frequently check shackles for wear. Ensure that they are all firmly secured.
- **For the ScanFish Tropheus only** – Frequently check the locking ring and cotter pin in the foldable tow arm. If corroded, broken or missing, please replace immediately. These are spare parts. Never remount the same cotter pin – once dismounted, the cotter pin must be discarded and replaced.

Figure 95 Cotter pin (left) and locking ring (right)

- The ScanFish III outer shells are made of very robust polycarbonate. Review Chapter 10 'Polycarbonate chemical resistance' for an overview of the resistance of polycarbonate to specific chemicals. If the outer shells have been exposed to and damaged by a chemical, they must be replaced before use. The outer shells are not standard spare parts and must be ordered from EIVA.

9.8 Calibration of the ScanFish III Controller

Caution: Before starting this procedure, contact EIVA ScanFish Support for access to the internal firmware setup. Changes in the internal firmware can result in unstable and fatal behaviour. Unsupervised changes are done at your own risk.

In order to calibrate the motion sensor in the ScanFish III Controller, the following procedure must be followed. This involves moving the ScanFish III around and setting calibration values. These values can change depending on configuration and location; therefore, they cannot simply be copied from one ScanFish III system to another.

It is important that this calibration takes places on land, as the sensors need to be at complete rest when they are calibrated.

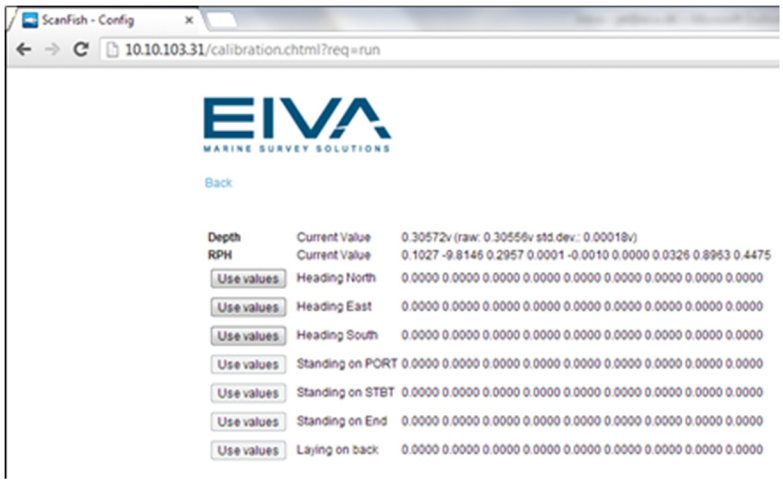


Figure 96 The ScanFish III browser interface - Calibration page

1. Connect the ScanFish III to the ScanFish III Power & communications and power up.
2. In the ScanFish III browser interface, click **Calibration**.
3. Lay the ScanFish III down, resting on its side panels with hatches facing up.
4. Turn the ScanFish III to face north – wait 30 seconds – click **Use Values** for Heading North.
5. Turn the ScanFish III to face south – wait 30 seconds – click **Use Values** for Heading South.
6. Turn the ScanFish III to face east – wait 30 seconds – click **Use Values** for Heading East.
7. Stand the ScanFish III on its left side – wait 30 seconds – click **Use Values** for Standing on PORT.
8. Stand the ScanFish III on its right side – wait 30 seconds – click **Use Values** for Standing on STBT.

9. Stand the ScanFish III with the tow point facing up – wait 30 seconds – click **Use Values** for Standing on End.
10. Lay the ScanFish III on its back, hatches facing down – wait 30 seconds – click **Use Values** for Laying on back.
11. Flip the ScanFish around to the starting position, with hatches facing up. Launch the ScanFish III Flight software and connect to the ScanFish III.
12. Verify that roll and pitch values are close to '0'.
13. Lift the ScanFish III from all angles and verify consistency with the roll and pitch panels (Figure 97, bottom left).

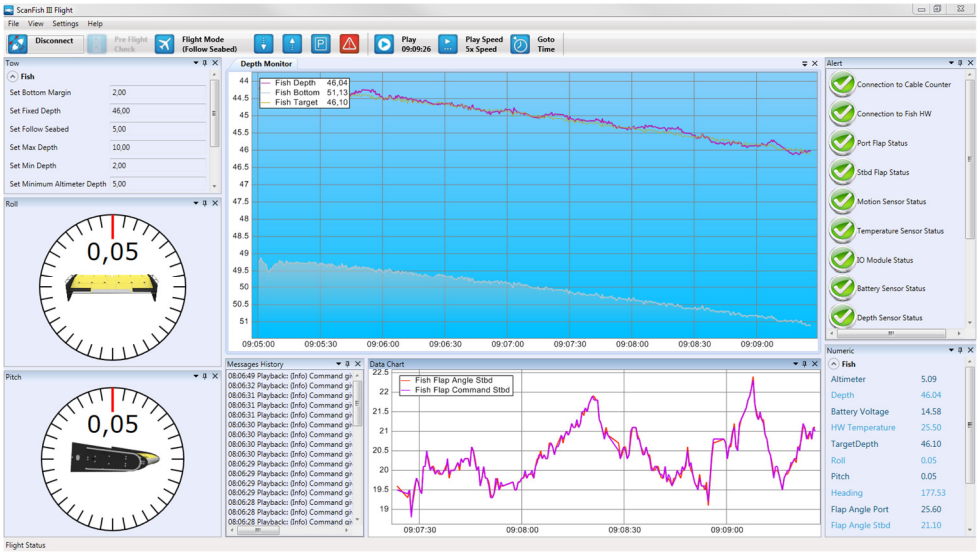


Figure 97 The ScanFish III Flight software

14. In the ScanFish III browser interface under **Factory Setup**, set the **Done** value to 'True'.
15. Restart the ScanFish III and verify that the ScanFish III Flight software still works.

10 Polycarbonate chemical resistance

The ScanFish III shells are made of Acryl, whose resistance to different reagents varies. Therefore it is **very important** to be careful and review the list in Table 16 before exposing the shells to chemicals and/or cleaning agents.

Caution: The information in Table 16 has been supplied to EIVA by reputable sources but is to be used *only* as a guide. Before application, test the reagent on a spare part or on a hidden spot of the shell. Ratings of chemical resistance listed in this table apply at the specified exposure periods and temperature. EIVA has no knowledge of possible effects beyond this. EIVA neither warrants (neither expressly nor implied) that the information in this chart is accurate or complete nor that any reagent is suitable for any purpose.

Reagent	Polycarbonate temperature 20°C	50°C
Acetaldehyde	S	N
Acetone	N	N
Acetic acid	E	B
Aluminium hydroxide	S	N
Ammonium chloride	E	E
Ammonium hydroxide 5%	S	N
Ammonium hydroxide 28%	N	N
Amyl chloride	N	N
Aniline	S	N
Benzaldehyde	S	N
Benzene	N	N
Boric acid	E	E
Bromine	S	N
Bromoform	N	N
Butadiene	N	N
Butyl acetate	N	N
Butyl alcohol	B	S
Butyric acid	S	N
Calcium hydroxide	N	N
Calcium hypochlorite	S	N
Carbon disulphide	N	N

Reagent	Polycarbonate temperature 20°C	50°C
Carbon tetrachloride	N	N
Cellosolve	S	N
Chlorine in air	E	B
Chlorine (moist)	B	S
Chloroform	N	N
Citric acid	E	E
Cresol	N	N
Cyclohexane	E	B
p-Dichlorobenzene	N	N
Diethylene glycol	B	S
Diethylene formamide	N	N
Dioxane	B	S
Ethyl acetate	N	N
Ethyl alcohol	E	B
Ethyl chloride	N	N
Ethyl ether	N	N
Ethylene chloride	N	N
Ethylene oxide	S	N
Formaldehyde	E	B
Formic acid	E	S
Gasoline	S	S
Hexane	N	N
Hydrochloric acid 35%	N	N
Hydrofluoric acid	N	N
Hydrogen peroxide	E	E
Kerosene	B	S
Lactic acid	E	B
Methyl alcohol	B	S
Methyl ethyl ketone	N	N
Methyl isobutyl ketone	N	N
Methylene chloride	N	N
Mineral oil	E	B

Reagent	Polycarbonate temperature 20°C	50°C
Nitric acid 1-10%	E	B
Nitric acid 50%	B	S
Nitric acid 65%	S	N
Nitrobenzene	N	N
Perchloric acid	N	N
Petroleum ether	S	N
Phenol	E	N
Phosphoric acid 85%	E	B
Potassium bichromate	E	B
Potassium hydroxide conc.	N	N
Potassium permanganate	E	B
Propane	S	N
Propylene glycol	S	N
Silver nitrate	B	S
Sodium hydroxide conc.	S	S
Sodium hypochlorite	N	N
Sulfuric acid 20%	B	S
Sulfuric acid 98%	E	B
Tetrahydrofuran	N	N
Thionyl chloride	N	N
Toluene	N	N
Trichloroacetic acid	S	N
sim-Trichloroethane	N	N
Trichloroethylene	N	N
Turpentine	S	N
Urea	N	N
Xylene	N	N

Table 16 Polycarbonate chemical resistance

E = Excellent resistance, no etching

B = Good resistance, little etching after 30 days' exposure to chemical

S = Fair resistance, etching after 7 days' exposure to chemical

N = Not recommended

11 Failure diagnostics

This section describes a variety of failures and provides information on how to correct failures found either during visual inspection, during the ScanFish III Flight software pre-flight check in Pre Flight Check mode, or during normal operation. The descriptions of methods to correct failures are general and may not cover all failure situations. If in doubt, please contact the supplier for further details and recommendations. The ScanFish III may need to be sent in for repair.

11.1 Visual inspection shows that the flap motor is leaking oil

1. The flap motor needs to be replaced before use. Do not use a leaking flap motor, as this may cause the motor to stop responding without warning while the ScanFish III is deployed, leading to a high risk of a fatal crash into the seabed. A deployed ScanFish III that is out of control due to failing flaps may cause the tow cable/connection to break and/or serious damage to the ScanFish III itself.

11.2 Visual inspection shows cracks in the outer shells and/or skeleton

1. Do not deploy the ScanFish III if the outer shells and/or skeleton have cracks or are damaged.
2. Parts of the skeleton and/or shells can be replaced when needed.
3. If the ScanFish III is severely damaged (eg due to being dropped or by crashing hard into the seabed), the entire skeleton and shells should be replaced.

11.3 Visual inspection shows missing paint spots on the inside of the shells

1. This has no functional effect and can easily be repaired with touch-up paint. Please consider the chemical resistance of polycarbonate to ensure that any touch-up paint is compatible.
2. Be careful not to scratch the inner surface of the shells in order to prevent paint from being damaged.

11.4 Visual inspection shows missing/broken oval screw supports on the hatches

1. Replace the missing or broken oval screw supports with spare parts.
2. Do not deploy the ScanFish III with missing or broken oval screw supports.

Figure 98 Oval screw support

11.5 Pre-flight check reports a failure in the flap motor (port/starboard)

1. Inspect the flap motor cable at the controller – check that the pins in the connectors are clean and do not show signs of corrosion. If no problems are spotted during the visual check of the connectors, spray them with thin silicone oil and reconnect.
2. Check the cable for wear – if damaged, the cable must be replaced. See Section 12.4 'Replacing a flap cable' for information on replacing cables.
3. If the cable looks to be in good condition but the pre-flight check still reports a failure, the flap motor may be damaged and must be replaced. See Section 12.3 'Replacing a flap' for information on replacing flaps.
4. Run a new pre-flight check without fastening the new flap motor yet – this test can be performed without exchanging the black POM flaps. The rod in the end of the flap motor should turn and return to middle position, and the pre-flight check should no longer report an error alert for 'Port/Stbd Flap Status'. If this is the case, the problem is solved. The new flap motor needs to be fastened, and the ScanFish III needs to be assembled before a final pre-flight check is performed to confirm that the new system is ready.
5. If the pre-flight check still reports a failure in the new flap, the cable must be replaced. See Section 12.4 'Replacing a flap cable' for information on replacing cables. After replacing the cable, perform new pre-flight checks with both the original and the new flap motor to diagnose whether the flap motors themselves actually have a failure.
6. If the pre-flight check still reports a failure with both the original and the new flap motor and the cable has been replaced, the controller has an internal failure and must be replaced. See Section 12.6 'Replacing the controller' for information on replacing the controller.

11.6 Pre-flight check reports a failure in the depth sensor

1. Check the cable that connects the depth sensor to the controller. Check that the pins in the connectors are clean and do not show signs of corrosion. If no problems are spotted during the visual check of the connectors, spray them with thin silicone oil and reconnect.
2. Check the cable for wear – if damaged, the depth sensor and cable must be replaced. See Section 12.5 'Replacing the depth sensor' for information on replacing the depth sensor. The depth sensor is not a standard spare part and needs to be ordered from EIVA.
3. If the pre-flight check still reports a failure, the controller must be replaced due to an internal failure. See Section 12.6 'Replacing the controller' for information on replacing the controller.

11.7 Pre-flight check reports a failure in the motion sensor

1. The motion sensor is an internal part of the controller; therefore, the controller must be replaced due to an internal failure. See Section 12.6 'Replacing the controller' for information on replacing the controller.

11.8 Pre-flight check reports a failure in the temperature sensor status

1. If the temperature is too high, turn off the ScanFish III for a few hours and/or submerge the ScanFish III in water to cool down the controller quickly. This will normally solve the problem.
2. If the problem is not solved by turning off the ScanFish III or by submerging the ScanFish III in water, the controller must be replaced due to an internal failure. See Section 12.6 'Replacing the controller' for information on replacing the controller.

11.9 Pre-flight check reports a failure in the I/O module

The controller must be replaced due to an internal failure. See Section 12.6 'Replacing the controller' for information on replacing the controller.

11.10 Pre-flight check reports a failure in the battery sensor

1. The internal battery may be discharged too much. Allow the ScanFish III to charge for a few hours. **Important**: during this charging period, the ScanFish III must be turned on and submerged in water in order to prevent overheating.
2. If charging does not solve the problem, the controller must be replaced due to an internal failure. See Section 12.6 'Replacing the controller' for information on replacing the controller.

11.11 Pre-flight check reports a failure in the altimeter

1. Check the cable that connects the altimeter to the controller. Check that the pins in the connectors are clean and do not show signs of corrosion. If no problems are spotted during the visual check of the connectors, spray them with thin silicone oil and reconnect.
2. Check the cable for wear – if damaged, the cable must be replaced. See Section 12.4 'Replacing a flap cable' for information on replacing cables.
3. If the pre-flight check still reports a failure, the altimeter must be replaced. See Section 12.7 'Replacing the altimeter' for information on replacing the altimeter.
4. If replacing the altimeter does not solve the problem, the controller must be replaced due to an internal failure. See Section 12.6 'Replacing the controller' for information on replacing the controller.

11.12 While operating, the ScanFish III cannot reach the desired depth and/or cannot keep within the defined depth tolerance

1. Ensure that the cable length is adjusted for the actual operation – too short a length of cable makes the ScanFish III sensitive to the movements of the vessel in high waves due to the vessel pulling on the cable. Wind out more cable.
2. The flaps may be obstructed or defective. Recover the ScanFish III and perform a pre-flight check.

11.13 While operating, the ScanFish III keeps undulating a few metres up and down when in Fixed depth / Follow seabed mode

1. Ensure that the cable length is adjusted for the actual operation – too short a length of cable makes the ScanFish III sensitive to the movements of the vessel in high waves due to the vessel pulling on the cable. Wind out more cable.
2. Ensure that the altimeter is not obstructed – if the ScanFish III is towing a side-scan sonar – that is, it is a ScanFish III Tropheus – make sure that the correct tow arm is used.
3. One or both flaps may be defective. See Section 11.15 'While operating, the ScanFish III cannot keep the roll between -2° and 2°'.
4. Check for excessive water flow in front of the flaps. Check for the presence of the sealing rubber and metal bar behind both flaps. If missing, the ScanFish III cannot control the water flow – do not use the ScanFish III if either of these parts are missing or broken.

11.14 While operating, the ScanFish III Flight software reports connection and/or power problems

1. Recover the ScanFish III immediately. Check the cable and connectors for wear and corrosion. Check that the pins in the connectors are clean and do not show signs of corrosion. If no problems are spotted during the visual check of the connectors, spray them with thin silicone oil and reconnect.
2. Check the ScanFish III Power & communications – check the cables and connectors for wear and corrosion. Replace fuses if any are broken.
3. Check the slip rings in the winch for wear. Replace any broken or worn down slip rings.
4. If none of the previous steps solve the problem, the controller must be replaced due to an internal failure. See Section 12.6 'Replacing the controller' for information on replacing the controller.

11.15 While operating, the ScanFish III cannot keep the roll between -2° and 2°

1. Recover the ScanFish III immediately. Check the cable and connectors for wear and corrosion. Check that the pins in the connectors are clean and do not show signs of corrosion. If no problems are spotted during the visual check of the connectors, spray them with thin silicone oil and reconnect.
2. One or both flaps may be defective. Perform a pre-flight check. Check for excessive play of the flaps while the ScanFish III is powered. The flaps should be firm and not having excessive play. **Caution: Be careful not to obstruct the flaps with hands or fingers. Safety comes first.**

Figure 99 ScanFish III flap play check

3. Check for the presence of the sealing rubber and metal bar behind both flaps. If missing, the ScanFish III cannot control the water flow – do not use the ScanFish III if either of these parts is missing or broken.

11.16 Visual inspection shows that the locking ring or cotter pin in the foldable tow arm is corroded/broken/missing (ScanFish Tropheus only)

1. Do not deploy the ScanFish Tropheus with a corroded, broken or missing locking ring or cotter pin, as the foldable tow arm may fall apart.
2. Even if only one of the parts is corroded, missing or broken, you should always replace both the locking ring and the cotter pin. Never reuse the cotter pin. See Section 12.8 'Replacing the locking ring and cotter pin in the foldable tow arm (ScanFish Tropheus only)' for information on replacing the locking ring and cotter pin.

11.17 While operating, the ScanFish III keeps seeking to the surface (ScanFish Tropheus only)

1. The view of the altimeter may be blocked by an object. The object could be an external sensor mounted under the ScanFish III that is obstructing the built-in altimeter. Ensure that any external sensors are secured out of the way of the altimeter.
2. Ensure that the position of the tow arm is correct.

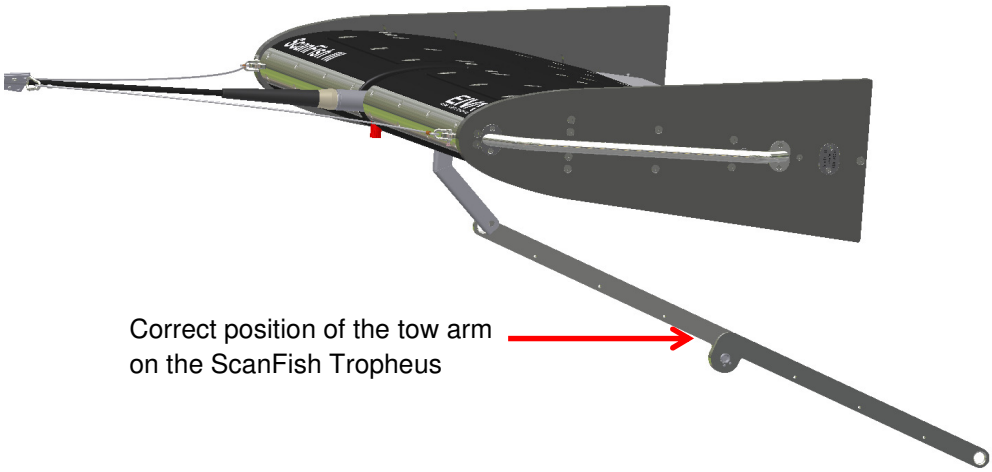


Figure 100 The ScanFish Tropheus with foldable tow arm

3. If none of the previous steps solve the problem, the altimeter may be defective, and the altimeter should be replaced. See Section 12.7 'Replacing the altimeter' for information on replacing the altimeter.

12 Repair

This section describes the procedures to be followed when attempting to correct failures found during visual inspection, during the pre-flight check or during normal operation.

Important: If in doubt, do not proceed with repair and instead contact EIVA for further advice. Repair of the ScanFish III requires technically-skilled personnel and appropriate tools and parts.

Some of the repairs to the ScanFish III require removal and refitting of one or both POM side panels in order to access the components that need replacing.

12.1 Removal of POM side panels

1. First, place the ScanFish III on a flat surface – protect the ScanFish III from getting scratched.

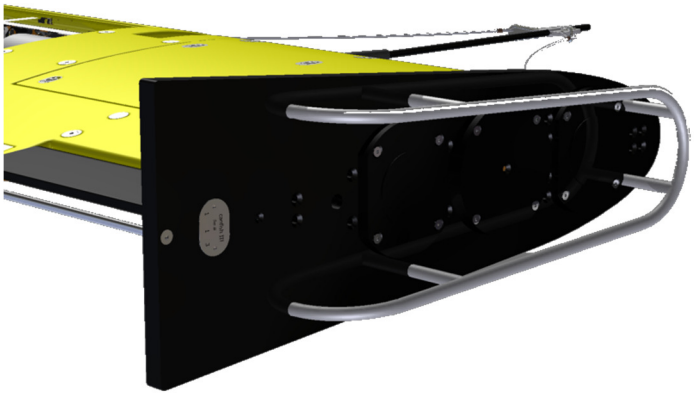


Figure 101 ScanFish III POM side panel

2. Identify the black POM side panel to be removed.
3. Place a supporting beam (preferably made of a soft material, such as wood, so as not to scratch the shells) under the ScanFish III shells so that the ScanFish III is supported when the side panel is removed. This will prevent excessive strain on the body during removal of the POM side panel.
4. Unscrew the side guard.
5. Unscrew the POM side panel. **Important**: On the side where the depth sensor is located, make sure that the side panel is not removed completely until the depth sensor has been loosened from the side panel. To loosen the depth sensor, feed cable from inside the ScanFish III and slowly separate the side panel from the shell. Then, loosen the depth sensor bracket on the inside of the side panel.

6. **Note:** Removing the two screws inside the red circle shown in Figure 102 loosens a bracket inside the ScanFish III. Keep the bracket, as it must be remounted later.

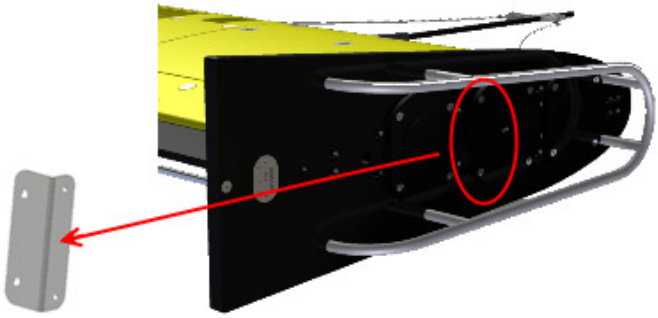


Figure 102 Internal side bracket

7. Make sure that the flaps are supported when the POM side panel is being removed.
8. Repeat steps 1–7 for removal of the other side panel if needed.

12.2 Refitting of POM side panels

1. On the side where the depth sensor is located, remount the depth sensor in the POM side panel – pull the depth sensor cable from the inside of the ScanFish III while refitting the side panel to prevent the depth sensor cable from getting bent or damaged.
2. Screw on the side panel. **Important**: If the screws seem harder to turn than normal, immediately unscrew them and replace with new screws to avoid them getting stuck. Use oil on the screws to ensure a smooth insertion. Remember to remount the bracket on the inside of the ScanFish III. Do not over-tighten the screws.

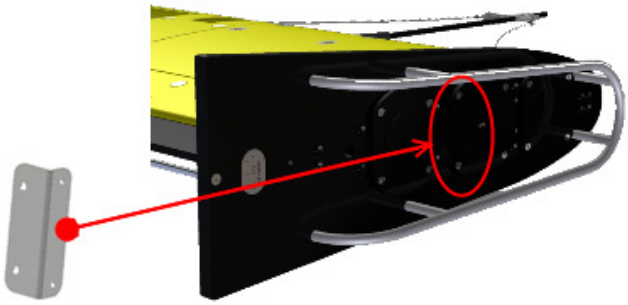


Figure 103 Internal side bracket

3. Make sure that the flaps are not obstructed by the side panels.
4. Make sure that the depth sensor cable is not resting up against any sharp edges of the skeleton. Use cable fasteners to secure the depth sensor cable if needed.
5. Screw on the side guard. Do not over-tighten.
6. Position the ScanFish III on deck (or for the ScanFish Tropheus only, in the cradle).
7. Perform a pre-flight check to ensure that the system is fully functional.

12.3 Replacing a flap

Figure 104 ScanFish III flap motor without POM flap parts (left) and with POM flap parts (right)

Important: Never disassemble the flap motor. It is a non-serviceable unit filled with special oil. Always use a new spare part and send in the failing unit for repair at EIVA. Only the POM flap parts may be removed and refitted to the new flap motor.

1. Remove the POM side panel on the side of the flap to be removed.
2. The flap can now be pulled out of the body – make sure that the cable is fed by pushing from the inside of the ScanFish III.
3. When the connector and cable are visible, unplug the cable from the flap. Perform a visual check for signs of wear or corrosion. If corroded or if the cable must be replaced, this is the time to do it. **Important**: If the cable must be replaced, remove the spiral protection from the old cable and mount on the new cable.
4. Remove the black POM flap parts – unscrew the screws in the POM flap parts. The POM flap parts are not spare parts and should be reused unless damaged.

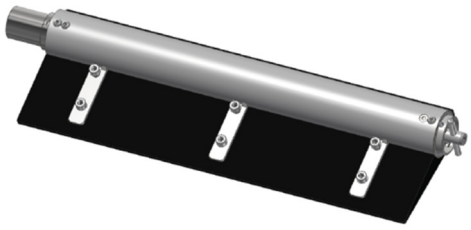


Figure 105 ScanFish III flap motor with one of two POM flap parts removed

5. Mount the POM flap parts on the new flap motor – take care not to over-tighten the screws in the POM flap parts. If damaged, new POM flap parts must be ordered from EIVA.
6. Check that the pins in the connectors are clean and do not show signs of corrosion.
7. If no corrosion is found, spray the connectors with thin silicone oil and reconnect the cable to the flap.
8. Pull the cable from the inside of the ScanFish III and push the flap into the body to prevent the cable from getting bent when inserting the flap.
9. Refit the POM side panel.
10. Position the ScanFish III on deck (or for the ScanFish Tropheus only, in the cradle).
11. Perform a pre-flight check to ensure that the system is fully functional.

12.4 Replacing a flap cable

1. Follow the 'Replacing a flap' procedure steps 1–3.
2. Replace the cable – remember to reuse the spiral protection from the old cable for the new cable.
3. Follow the 'Replacing a flap' procedure steps 6–11.

12.5 Replacing the depth sensor

The depth sensor is mounted in the POM side panel and cannot be disconnected from the cable. Do not try to disassemble – there are no serviceable parts inside. Please note that a depth sensor is not included as part of the standard spare part kit.

1. Unplug the depth sensor cable from the controller.
2. Remove the POM side panel.
3. Replace the depth sensor.
4. Check the cable for wear. If damaged, the cable must be replaced.
5. Check that the pins in the connectors are clean and do not show signs of corrosion. If no problems are spotted during the visual check of the connectors, spray them with thin silicone oil and reconnect. Refit the POM side panel.
6. Position the ScanFish III on deck (or for the ScanFish Tropheus only, in the cradle).
7. Perform a pre-flight check to ensure that the system is fully functional.

Figure 106 Depth sensor

12.6 Replacing the controller

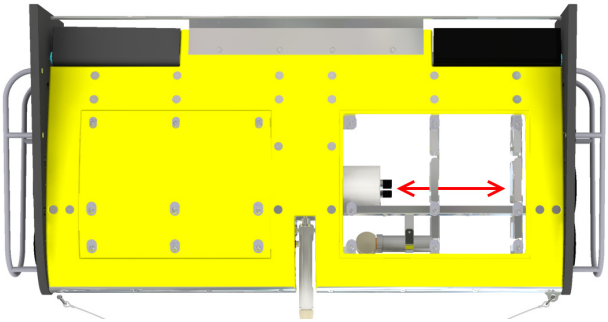


Figure 107 The ScanFish III seen from above, illustrating the correct way to remove the controller

Important: Only remove and insert the controller in the direction illustrated in Figure 107 – do not bend or loosen parts in the skeleton.

The controller is located in the middle of the ScanFish III. It is removed through the side hatches in the POM side panels. Do not try to remove the controller through the hatch-opening by bending the skeleton. This will damage the structure of the skeleton.

Important: Never disassemble the controller. It is a pressure-tested container, and the warranty will be void if disassembled. Please use a new spare controller and send the faulty controller to EIVA for repair. Please note that you will need to configure a new IP address for the new controller.

1. Remove both side hatches in order to access the controller.
2. Mark up or label all cables to the controller to ensure correct re-fitting later.
3. Mark up or label the position of the controller and the brackets.
4. Unplug all cables to the controller.
5. Unplug all connectors to the controller.
6. Check the cables for wear. If damaged, the cables must be replaced.
7. Check that the pins in the connectors are clean and do not show signs of corrosion.
8. Loosen the controller and remove the brackets on the controller.
9. Slide the controller out through the side hatches of the ScanFish III.
10. Slide in the new controller. **Important**: Make sure the new controller is inserted in the correct direction.
11. Fasten the controller with the brackets – make sure it aligns with the markings. A misaligned controller may shift the weight of the ScanFish III and result in partially lost control.
12. Spray all connectors with thin silicone oil before reconnecting.
13. Plug in all cables – make sure that they match with the markings made.
14. Refit both side hatches.

15. Perform ScanFish III calibration – see Section 9.8 'Calibration of the ScanFish III Controller'.
16. Position the ScanFish III on deck (or for the ScanFish Tropheus only, in the cradle).
17. Perform a pre-flight check to ensure that the system is fully functional.

12.7 Replacing the altimeter

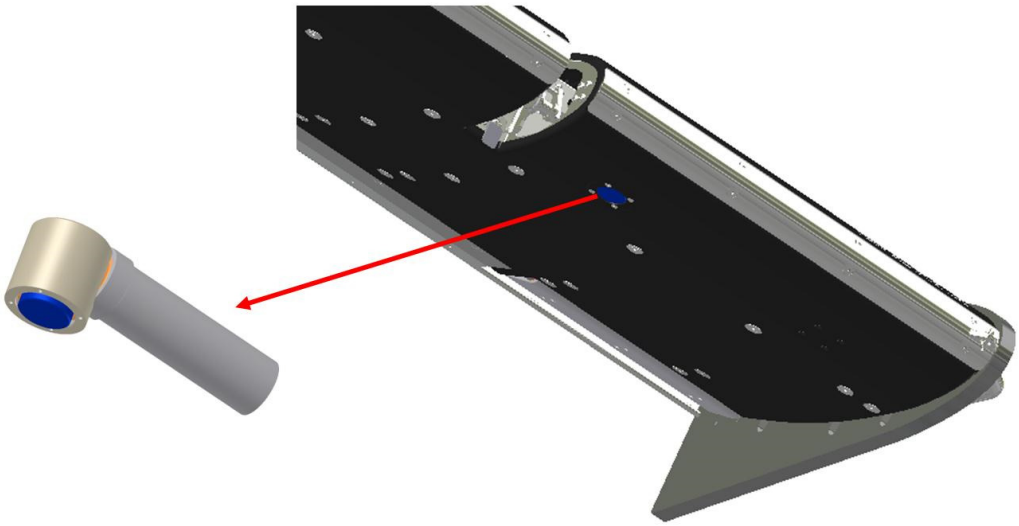


Figure 108 Altimeter and its location in the ScanFish III

The altimeter is located on the bottom side of the ScanFish III.

Important: Never disassemble the altimeter sensor. It is a pressure-tested sensor, and the warranty is void if disassembled. Please use a new spare altimeter sensor and send the faulty altimeter to EIVA for repair.

1. Remove the left/port top hatch.
2. Unplug the altimeter cable at the altimeter.
3. Unscrew the inner altimeter bracket from the skeleton.
4. Unscrew the four screws in the shell.
5. Unplug the connectors and remove the faulty altimeter.
6. Mount the new altimeter sensor with the four screws.
7. Mount the inner altimeter bracket on the skeleton.
8. Check the cable for wear. If damaged, the cable must be replaced.
9. Check that the pins in the connectors are clean and do not show signs of corrosion. Spray the connector with thin silicone oil before reconnecting.
10. Plug in the altimeter cable.
11. Refit the left/port hatch.
12. Position the ScanFish III on deck (or for the ScanFish Tropheus only, in the cradle).
13. Perform a pre-flight check to ensure that the system is fully functional

12.8 Replacing the locking ring and cotter pin in the foldable tow arm (ScanFish Tropheus only)

The locking ring and cotter pin must be replaced if corroded, broken or missing. Never deploy the ScanFish III with corroded, broken or missing parts.

1. Dismount the foldable tow arm from the ScanFish III and external sonar.
2. Place the foldable tow arm with the locking ring facing upwards.
3. Dismount the cotter pin and discard.
4. Dismount the locking ring and discard.
5. **Important**: Never disassemble any other parts in the foldable tow arm besides the locking ring and cotter pin
6. Mount the new locking ring.
7. Mount the new cotter pin and make sure to split and wrap it around the spindle, so it does not fall out. Make sure to wrap it all the way around so as to avoid sharp edges, as this may damage the cable between the ScanFish III and the side-scan sonar.

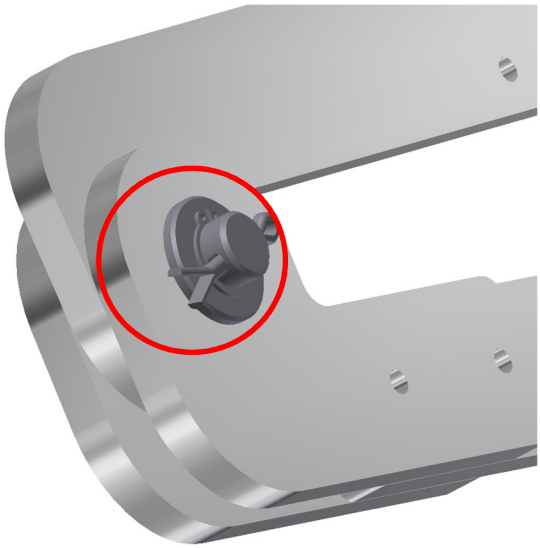


Figure 109 Foldable tow arm with cotter pin and locking ring circled

13 Assembly of the cradle (optional)

13.1 Cradle parts

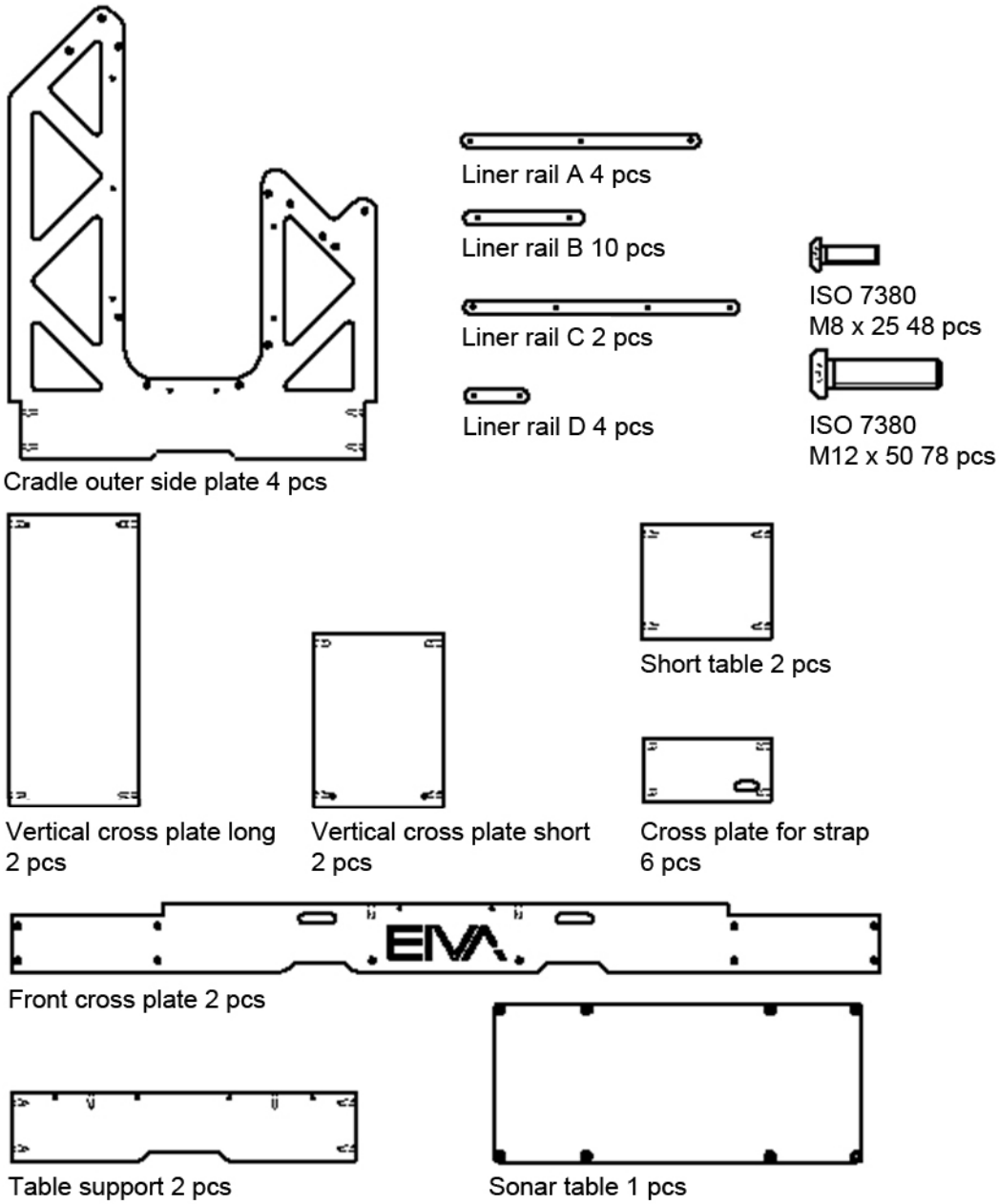


Figure 110 ScanFish III cradle parts (rubber liners not shown here)

13.2 Assembly of the ScanFish III support stands

Item	Quantity	Part number	Description
1	1	CR-13 cradle vertical cross plate, long	
2	3	CR-15 cradle cross plate for strap	
3	2	CR-31 cradle outer side plate	
4	1	CR-18 cradle vertical cross plate, short	
5	1	CR-22 cradle short table	
6	1	CR-19 cradle rubber side liner	
7	2	CR-25 cradle liner rail A	
8	4	CR-24 cradle liner rail B	
9	2	CR-27 cradle liner rail D	
10	24	ISO 7380 – M12 x 50	Hexagon socket button head screw
11	18	ISO 7380 – M8 x 25	Hexagon socket button head screw

Table 17 Parts list for the support stands

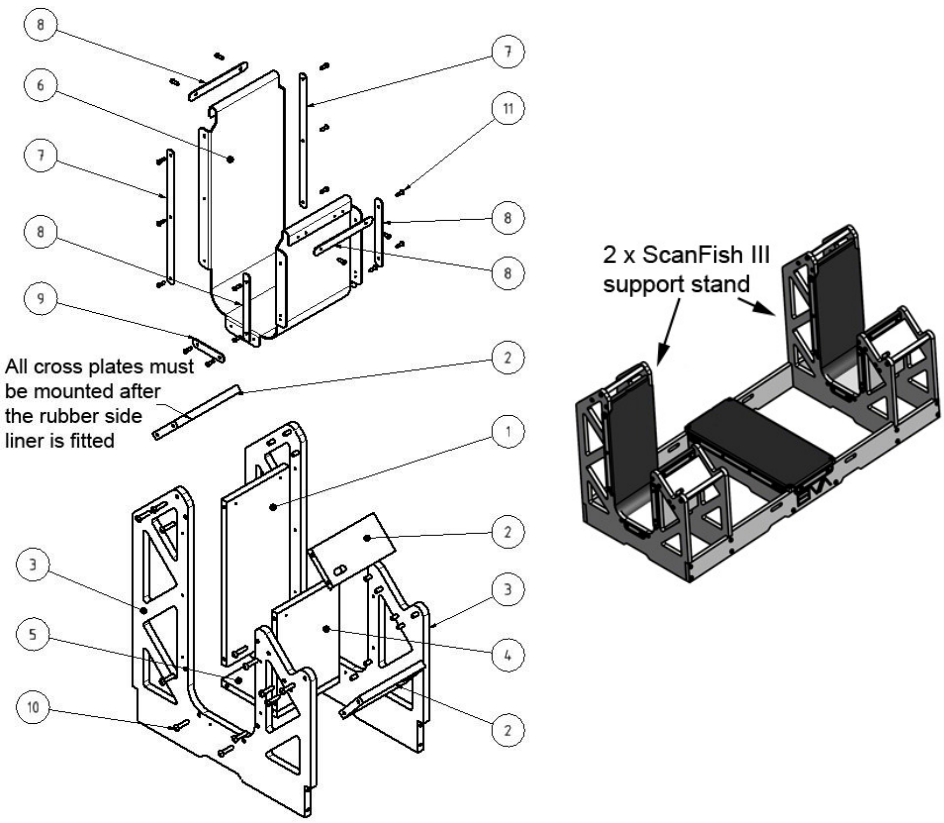


Figure 111 Assembly of the support stands

13.3 Assembly of the sonar support pad

Item	Quantity	Part number	Description
1	2	CR-41 cradle table support	
2	1	CR-37 cradle sonar table	
3	1	CR-23 cradle rubber table liner	
4	2	CR-24 cradle liner rail C	
5	4	ISO 7380 – M12 x 50	Hexagon socket button head screw
6	8	ISO 7380 – M8 x 25	Hexagon socket button head screw

Table 18 Parts list for the sonar support pad

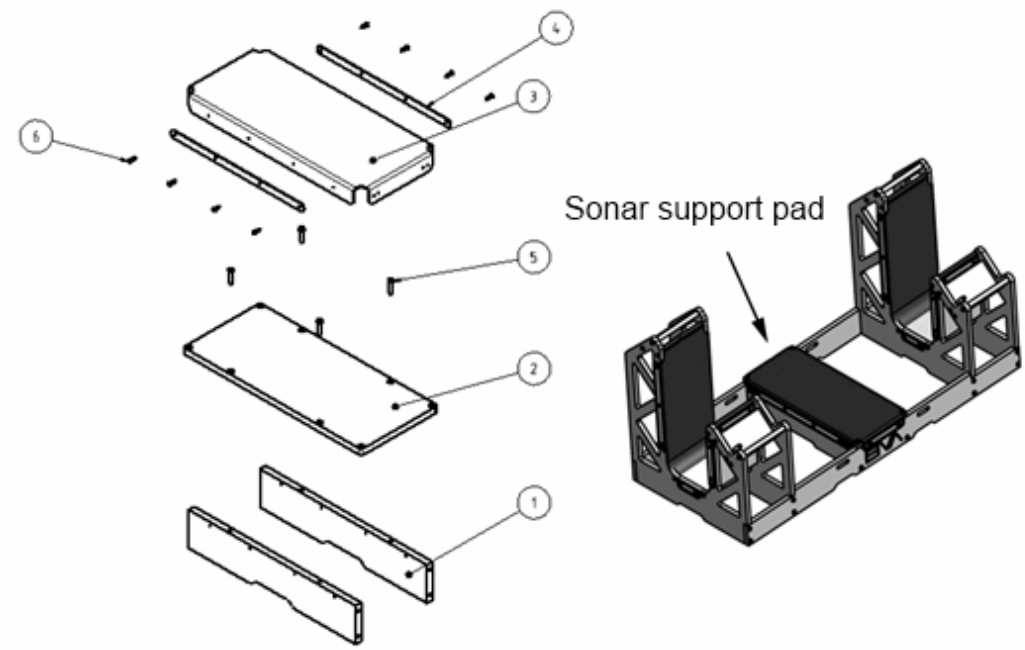


Figure 112 Assembly of the sonar support pad

13.4 Final assembly of the cradle

Item	Quantity	Part number	Description
1	2	ScanFish III support stand	
2	1	Sonar support pad	
3	2	Lower frame	
4	2	CR-25 cradle liner rail B	
5	28	ISO 7380 – M12 x 50	Hexagon socket button head screw

Table 19 Parts list for the cradle

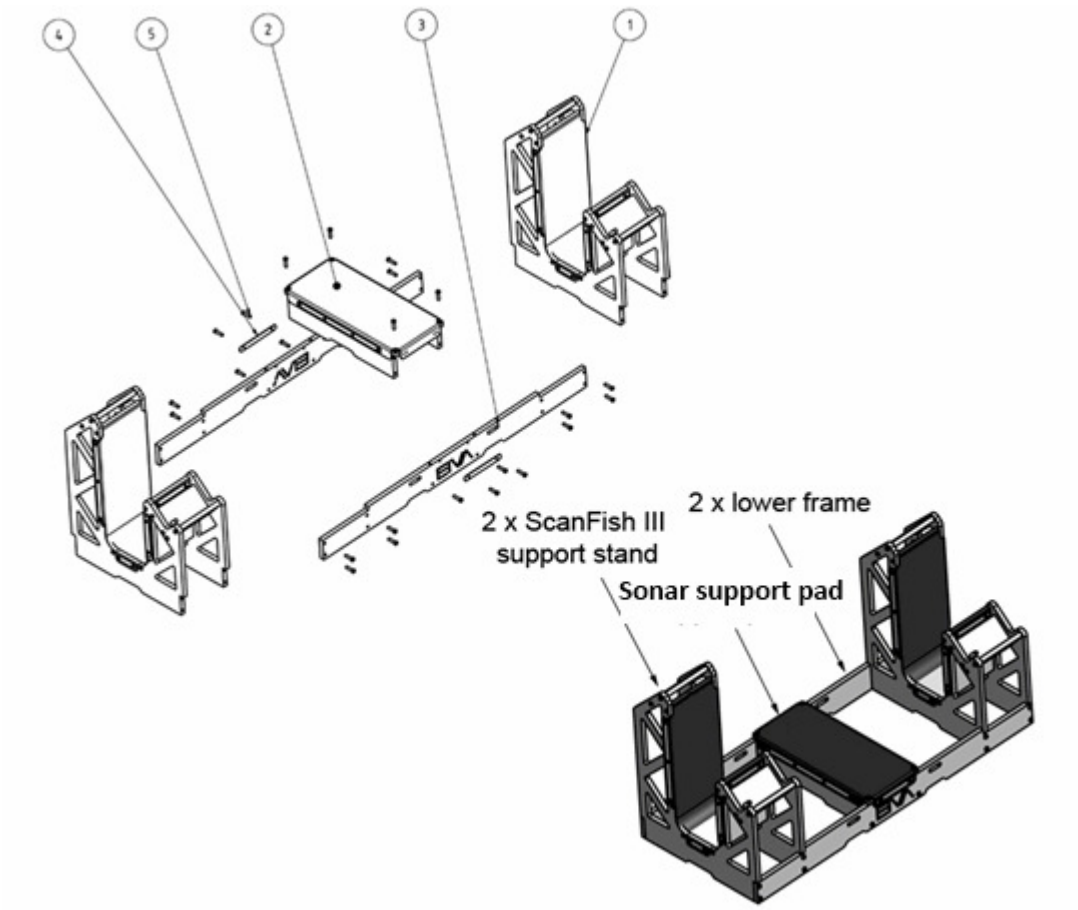


Figure 113 Final assembly of the cradle

14 Version descriptions

Version number/date	Description
2.0 / 02.10.2014	First release of combined ScanFish III ROTV and ScanFish III Flight software manual
2.1 / 20.03.2019	Update of mechanical sections

Table 20 Version descriptions