

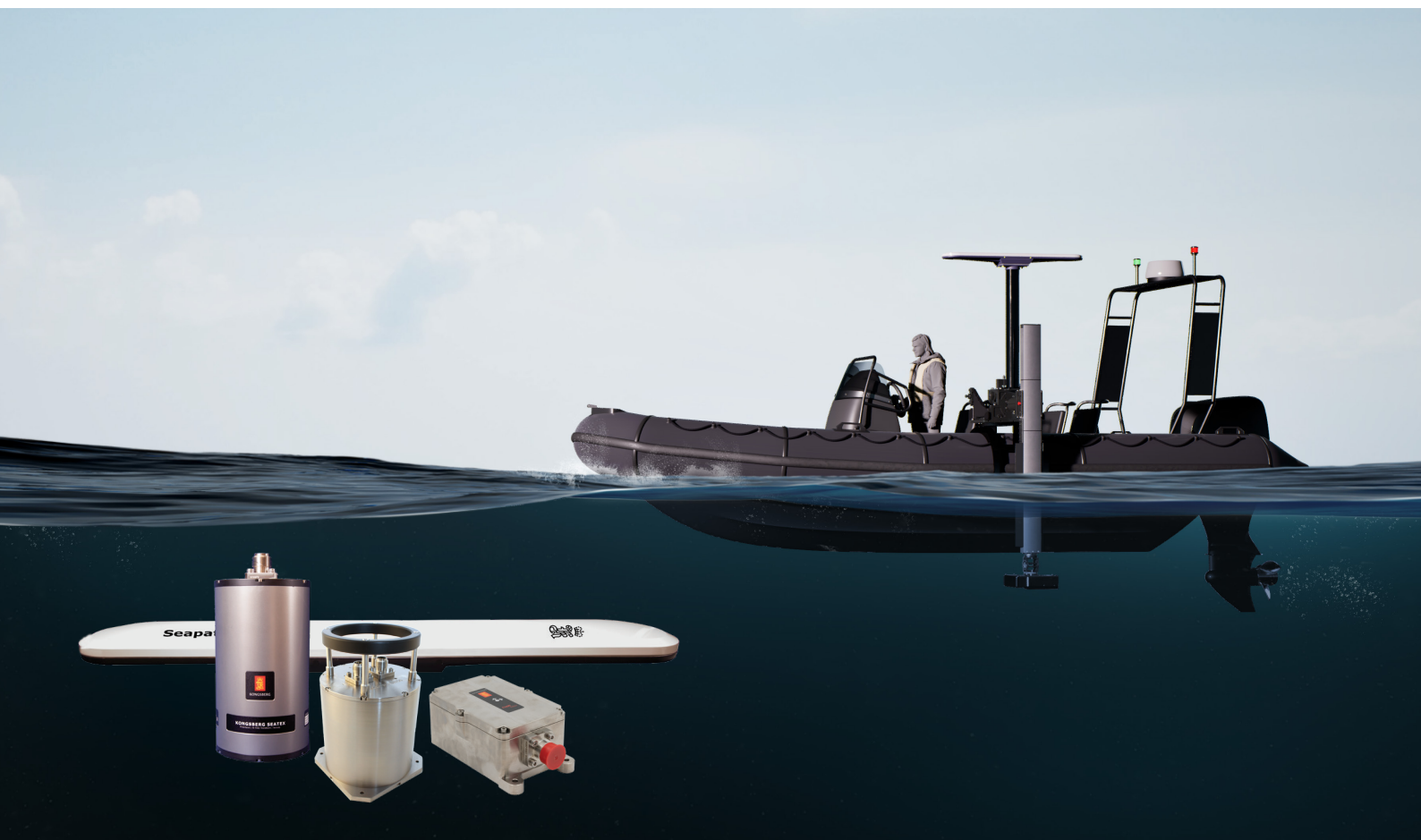


KONGSBERG

Operator manual

Seapath[®] 130-series

Compact GNSS aided Inertial Navigation System



COMPANY SHARED



KONGSBERG

Seapath 130
Compact GNSS aided Inertial Navigation
System
Operator manual

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Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. You must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.

Kongsberg Discovery disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

Disclaimer

Kongsberg Discovery AS endeavours to ensure that all information in this document is correct and fairly stated, but does not accept liability for any errors or omissions.

Support information

If you require maintenance or repair, contact Kongsberg Discovery's support organisation. You can contact us using the following address: support.seatex@kd.kongsberg.com. If you need information about our other products, visit <http://www.kongsberg.com/discovery>.

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Seapath 130

Topics

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System description

The Seapath 130 is developed specifically for hydrographic surveying where high precision heading, position, velocity, roll, pitch, heave and timing are critical measurements. The product combines state-of-the-art dual frequency GNSS receivers (GPS, GLONASS, Galileo, BeiDou), inertial technology and processing algorithms in a compact and portable package.

The main component is the Sensor Unit. It contains the motherboard, GNSS antennas and GNSS receivers. The Sensor Unit is to be mounted on top of a vessel mast or pole.

The product also consists of an Inertial Measurement Unit (IMU). This can be an MRU (Motion Reference Unit), a miniMRU or an MGC (Motion Sensor and Gyro Compass). The IMU is mounted inside a subsea bottle on top of the transducer.

The Seapath operator software is installed on a connected computer for configuration and monitoring.

All the components are connected through a spider cable with IMU connection, three configurable serial lines, DGNSS (Differential GNSS) correction input, 1PPS output, network communication and power inlet.

The Seapath software includes Automatic Online Calibration (AOC) that significantly improves the roll and pitch accuracy. With the AOC functionality, recalibration of the IMU is now longer required.

The Seapath 130 series is delivered in the following product range:

Seapath with MRU (Motion Reference Unit)

- Seapath 130-3 with MRU 3 to 0.010° roll and pitch accuracy
- Seapath 130-5 with MRU 5 to 0.008° roll and pitch accuracy
- Seapath 130-5+ with MRU 5+ to 0.005° roll and pitch accuracy

Note:



The MRU 3/miniMRU 40 model part of Seapath 130-3/130-40 has to be mounted in a fixed direction relative to the vessel and that is with the connector pointing up or down. Else the performance of the Seapath 130-3/130-40 will be degraded.

Seapath with miniMRU

- Seapath 130-40 with miniMRU 40 to 0.010° roll and pitch accuracy
- Seapath 130-60 with miniMRU 60 to 0.008° roll and pitch accuracy

Seapath with MGC (Motion Sensor and Gyro Compass)

- Seapath 130-R2 with MGC R2 to 0.008° roll and pitch accuracy
- Seapath 130-R3 with MGC R3 to 0.007° roll and pitch accuracy

The advanced Seapath navigation algorithms integrate the RTK GNSS data with the inertial sensor data. This gives the Seapath 130 unique advantages compared to stand alone RTK products. The Seapath product's accurate roll, pitch and heading measurements allow the RTK antenna position to be referenced to any point on the vessel where accurate position and velocity are required. All the data from Seapath have the same time stamp and the output is in real-time. Subdecimetre position accuracy can be achieved through download of satellite orbit and clock data from internet and by post processing of satellite and IMU (Inertial Measurement Unit) data. The Seapath is robust against GNSS dropouts by using the inertial sensor for dead reckoning navigation in order to provide position, velocity and also heading measurements when GNSS is not available.

The Seapath 130 software has improved algorithms for position drift after GNSS dropout. The plots show typical position drifts.

Figure 1: Typical position drift in meters after GNSS dropout in minutes for MGC R2 and R3

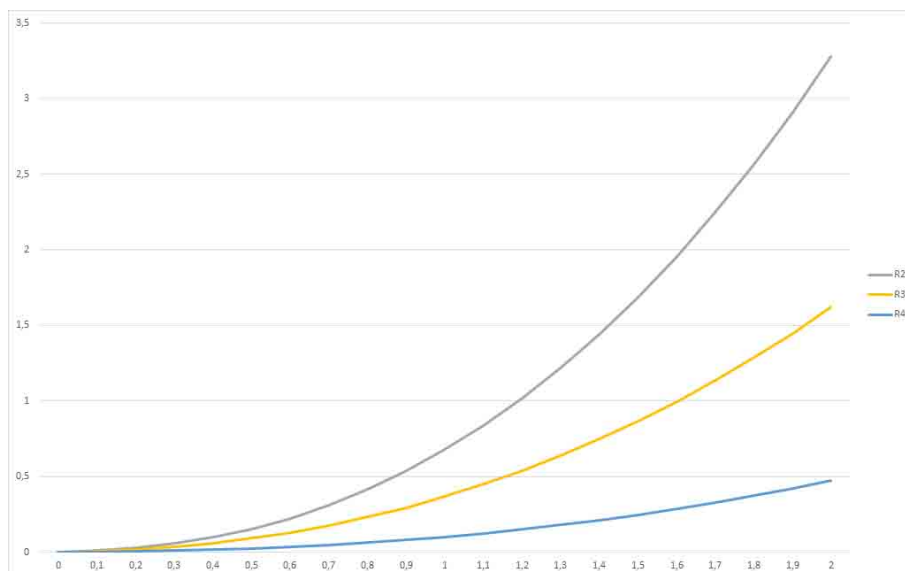
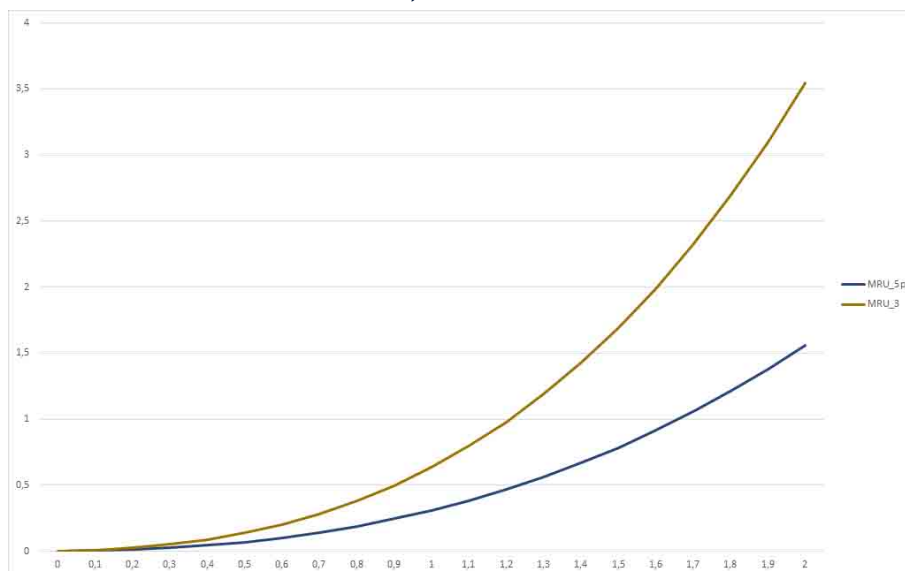


Figure 2: Typical position drift in meters after GNSS dropout in minutes for MRU 3, 5 and 5+



The product has three configurable RS-232/422 serial lines and Ethernet ports for output of motion data and NMEA messages to the multibeam and survey computer. Input of DGNSS corrections of various quality and sources are input on a configurable RS-232/422 serial line or Ethernet.

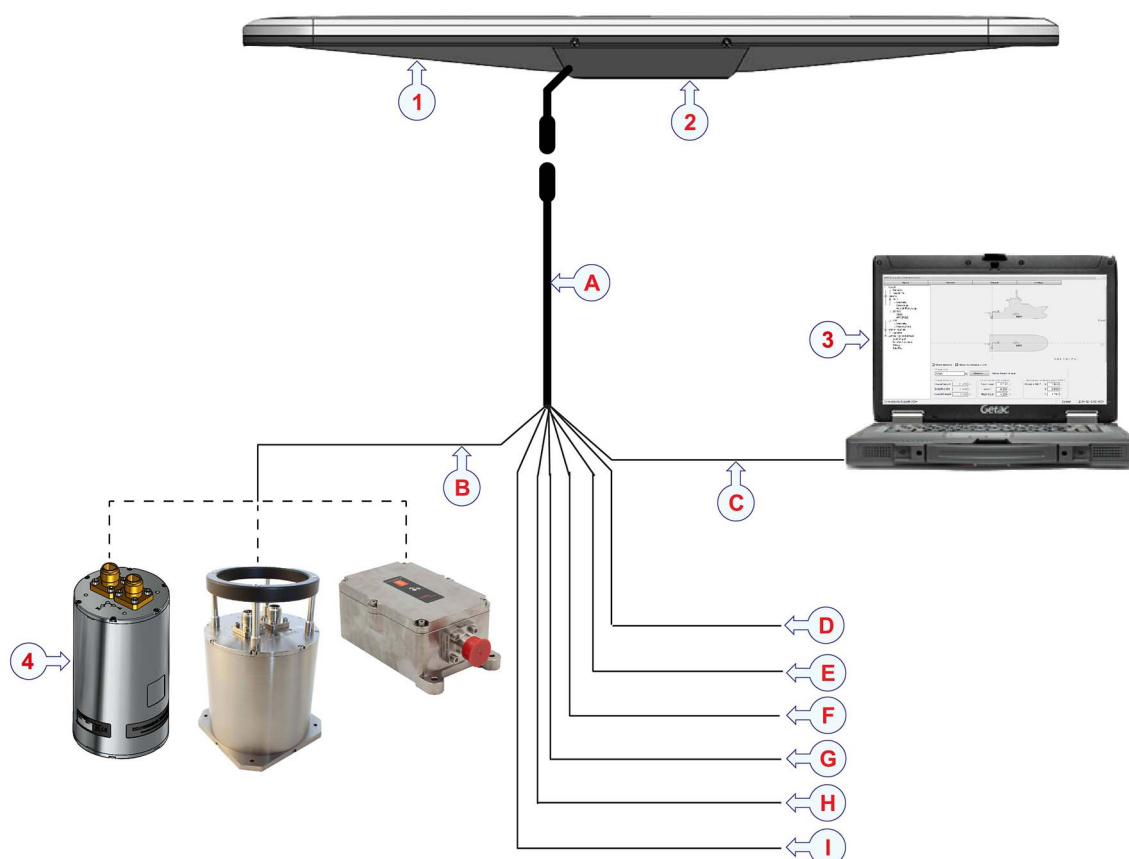
By utilising standard DGNSS, Fugro Seastar® XP2/XP3/G2/G4/G4+, VERIPOS Ultra/ Ultra², C-NavC¹, C-NavC² and RTK corrections, this system is a unique solution for

hydrographic surveying and dredging work which demand the most comprehensive, most accurate surveying data available.

System diagram

The system diagram identifies the main components of a Seapath system.

The Inertial Measurement Unit (IMU) connected to the Sensor Unit can either be a Motion Sensor and Gyro Compass (MGC), a Motion Reference Unit (MRU) or a miniMRU.



Units

- | | |
|---|---|
| 1. Sensor Unit with 1-metre cable, male connector | 3. Operator software installed on external computer (Not part of standard delivery) |
| 2. Mounting bracket | 4. Inertial Measurement Unit (MGC, MRU or miniMRU) in subsea bottle |

Cables

- | | |
|---|--|
| A. <i>Cable to Sensor Unit, part of spider cable, 20 metres length, female connector</i> | F. <i>Output serial line for motion data to multibeam or survey computer, 9-pin DSub connector, 5 metres length</i> |
| B. <i>IMU umbilical cable with 8-pin SeaCon connector, 15 metres length</i> | G. <i>Output serial line for NMEA data , 9-pin DSub connector, 5 metres length</i> |
| C. <i>Ethernet cable to external computer and other users, 5 metres length</i> | H. <i>1PPS output, 9-pin DSub connector, 5 metres length</i> |
| D. <i>Input serial line cable for DGNSS corrections, 9-pin DSub connector, 5 metres</i> | I. <i>24 VDC input, 5 metres length</i> |
| E. <i>Output serial line cable for DGNSS corrections, 9-pin DSub connector, 5 metres</i> | |

Note: _____



Input/output serial line for DGNSS corrections is the same cable.

Product restrictions

Restrictions in export

Export of these Inertial Measurement Units (IMU) requires an export license.

- MGC R2/R3
- MRU 5+/5/H
- miniMRU 50/60

Important:

Notice to customer/importer/end user.

The inertial sensor specified here is shipped from Norway in accordance with the Ministry of Foreign Affairs' Official Notification on Export Control and U.S. Export Administration Regulations (EAR).

The inertial sensor will be subject to restrictions from your national export control authorities if resold, transferred or otherwise disposed from your country.

Resale, transfer or otherwise disposal of the inertial sensor to countries, persons or entities under UN, US, EU or Norwegian embargo/sanctions, is prohibited.

Any valid and approved export license granted to Kongsberg Discovery AS from the Norwegian Ministry of Foreign Affairs or the U.S. Government, is not an authorization for you to resell, transfer or other disposal of the inertial sensor.

Limited warranty

Changes or modifications to the product not explicitly approved by Kongsberg Discovery AS will void the warranty.

The liability of Kongsberg Discovery AS is limited to repair of this product only under the given terms and conditions stated in the sales documents. Consequential damages such as customer's loss of profit or damage to other systems traceable back to this product's malfunctions, are excluded.

The warranty does not cover malfunctions of the product resulting from the following conditions.

- The Sensor Unit housing has been opened by the customer.
- The IMU housing has been opened by the customer.
- The Sensor Unit is not shipped in the original transportation box.
- The IMU is not shipped in the original transportation box.
- The Sensor Unit has been exposed to extreme shock and vibrations.
- The IMU has been exposed to extreme shock and vibrations.
- Incorrect power connection.

Restrictions in use

The system requires certain conditions in order to operate.

The Seapath function is based on GNSS signals and requires free sight to the sky. A minimum of four visible satellites. A position dilution of precision (PDOP) value less than six. Otherwise normal conditions.

MRU/miniMRU

It is designed for use on-board marine surface operated vehicles with a linear acceleration less than $\pm 40 \text{ m/s}^2$ ($\pm 4g$). And an angular rate range less than $\pm 75^\circ/\text{s}$.

MGC

It is designed for use on-board marine surface operated vehicles with a linear acceleration less than $\pm 45 \text{ m/s}^2$ ($\pm 4g$). And an angular rate range less than $\pm 125^\circ/\text{s}$.

Specifications are valid without multipath, without shadowing of antenna and with vessel in motion.

The Seapath product is intended for use in maritime survey and navigation applications.

Using Seapath as NTP server

The Seapath can be used as an NTP (Network Time Protocol) server for clock synchronization of connected computer systems.

An accuracy better than one millisecond can be achieved in local area networks under ideal conditions.

In order to use the Seapath as the NTP server, the NTP clients have to be configured with the Seapath IP address as the server. How this is done depends on the client software in use. Nothing in the Seapath has to be configured. The NTP server on the Seapath runs in standard mode with the PPS (pulse-per-second) as reference.

Network security

If the Seapath 130 product is connected to a local area network, data security is important.

Equipment manufactured by Kongsberg Discovery is often connected to a local area network (LAN). When you connect a computer to a local area network you will always

expose the data on that computer. All the other computers connected to the same network may be able to access your data. Several threats are imminent:

- Remote computers can read your data.
- Remote computers can change your data.
- Remote computers can change the behavior of your computer, for example by installing unwanted software.

Usually, two parameters are used to define the threat level:

1. The likelihood that any remote computer will do any of the above.
2. The damage inflicted if a remote computer succeeds doing any of the above.

Kongsberg Discovery has no information about your complete system installation. Products provided by Kongsberg Discovery are always regarded as stand-alone offline systems. They are regarded as stand-alone even though they may be connected to a local area network for sensor interfaces or data distribution.

Note:



No network safety applications are installed on Kongsberg Discovery computers. The computer is not protected against viruses, malware or unauthorized access by external users.

Securing the Seapath 130 system has no meaning unless you have established a policy that secures all the computers on the network. This policy must include physical access by trained and trusted users. The customer or end user of the Seapath 130 system is responsible for defining and implementing a security policy and providing the relevant network security applications.

Note:



Kongsberg Discovery will not accept any responsibility for errors or damages caused by unauthorized use of or access to the Seapath 130 system.

Support information

If you need technical support for your product you must contact a Kongsberg Discovery office. A list of all our offices is available on our website.

- **Company name:** Kongsberg Discovery AS
- **Address:** Havnegata 9, N-7010 Trondheim, Norway

- **Telephone:** +47 33 03 41 00
- **Telephone, global 24h support:**
 - Europe, the Middle East and Africa: +47 33 03 24 07
 - Asia Pacific: +65 97 11 24 07
 - Americas: +15 04 303 5244
- **E-mail address:** support.seatex@kd.kongsberg.com
- **Website:** <http://www.kongsberg.com/discovery>

KM-Support App

Kongsberg Discovery support is also available in the KM-Support App. Our support application is available for free in the App Store and Google Play.

Getting started

Topics

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[Operating principles, page 19](#)

[User preference procedures, page 22](#)

Turning on/off procedures

Topics

[Turning the system on/off, page 16](#)

[Starting the Seapath operator software, page 17](#)

[Stopping the Seapath operator software, page 18](#)

Turning the system on/off

There is no on/off switch to turn on the Seapath system. It starts up when power is connected.

Prerequisites

Make sure that all system cables are correctly connected.

Procedure

1. Make sure that all cables are connected to the Sensor Unit and the Inertial Measurement Unit (IMU).

2. Apply 24 VDC power to the system.

The power connection for the spider cable is according to the table.

Signal	Sensor Unit (wire colours)	IMU (wire colours)
PWR+ (+24 VDC)	Brown	Green
PWR- (0 VDC)	White	Yellow

To turn off the system, disconnect the input power.

Starting the Seapath operator software

You must start the Seapath operator software to be able to operate the Seapath system.

Prerequisites

You have installed the Seapath operator software on an external computer.

Context

There are two ways to start the operator software.



Procedure

1. Double-click the **Seapath Operator SW** icon on the desktop.
2. Select the Windows Start button:
 - a. Type Seapath in the search box.
 - b. Select **Seapath Operator SW**.

Related concepts

[System menu](#), page 61

Stopping the Seapath operator software

You can stop the Seapath operator software on your computer when it is no longer in use.

Context

Note: _____



The system will still calculate and output data if you stop the operator software.

Procedure

1. Select the **System** menu > **Stop** > **Operator SW**.
The message **This will end the application. Are you sure?** appears.
2. Select **Yes** to confirm

Related concepts

[System menu](#), page 61

Restarting the Seapath system

Sometimes it may be necessary to restart the Seapath system. For example if an unexpected event should occur or to confirm changes to the configuration.

Context

Note: _____



When you restart the whole system, all processing, calculation and output stops for about two minutes. It can take up to 15 minutes before the system is back to full accuracy performance.

Procedure

1. Select the **System** menu > **Restart** > **Sensor Unit**.
The message **This will restart the system. Are you sure?** appears.
2. Select **Yes**.
The system restarts automatically and is fully operational after 15 minutes.

Operating principles

Topics

[System architecture, page 19](#)

[Navigation, page 19](#)

[Operator software configuration description, page 20](#)

[Changing system modes, page 20](#)

[Browsing or switching display views, page 21](#)

System architecture

The Seapath 130 is a two-module solution with a Sensor Unit and an external computer with the operator software connected via Ethernet.

The Sensor Unit runs the processing software which handles all critical computations independent of the user interface on the external computer. This ensures a continuous and reliable operation. The software is used for performance monitoring, configuration and system troubleshooting.

The system starts automatically after power has been applied. It is operated through the operator software application installed on an external computer. For performance monitoring the software includes a number of views that can be adjusted to different operations.

Normally, the system outputs signals on the serial lines, analog channels and Ethernet ports without any involvement from the user. After power on, it takes up to 30 minutes before full accuracy on all data is obtained. Since there normally is no reason to turn off the system, it should be left running continuously.

Navigation

The Seapath 130 has a graphical configuration and user interface. Use a mouse and keyboard to operate the system from the application menus and to navigate and select in the menus. Some commands may also be executed by use of key combinations.

The Seapath 130 is operated and configured from the System menu.

Related concepts

[System menu, page 61](#)

Operator software configuration description

You can adjust the appearance of the display views through the **Operator software configuration** dialog box.

Operator software configuration contains tab pages for various presentation options and each page contains two confirmation buttons with different properties and a cancel button.

- **OK** button: Selecting the **OK** button will save the changes and close the **Operator software configuration**.
- **Apply** button: Selecting the **Apply** button will save the changes but the **Operator software configuration** dialog box will not close.
- **Cancel** button: Selecting the **Cancel** button will close the dialog box and changes will not be saved.

Note: _____



*The position properties selected in the **Operator software configuration** dialog box are only for display purposes.*

Related concepts

[System menu](#), page 61

Changing system modes

The system has three modes: *Operation*, *Configuration* and *Engineering*. To be able to make changes to the setup you must be in *Configuration* or *Engineering* mode.

Context

The *Configuration* or *Engineering* modes are password protected. The password is **STX**. The password is not case sensitive. It is not possible to change the password.

☐ Operation	
☐ Configuration	Ctrl+E
☒ Engineering	Ctrl+A

You can change the system mode via the **System** menu or using key commands directly from the display.

Procedure

1. **Via System menu**
 - a. Select the **System** menu > **Change system mode**.
 - b. Select either **Configuration** or **Engineering**.
 - c. Type the password: **stx**.
 - d. Select **OK**.

2. With keyboard commands

- a. In the display:
 - Press CTRL+E to enter *Configuration* mode
 - Press CTRL+A to enter *Engineering* mode
- b. Type the password: **stx**.
- c. Select **OK**.

Result

You are now able to carry out changes and/or set system parameters.

Related concepts

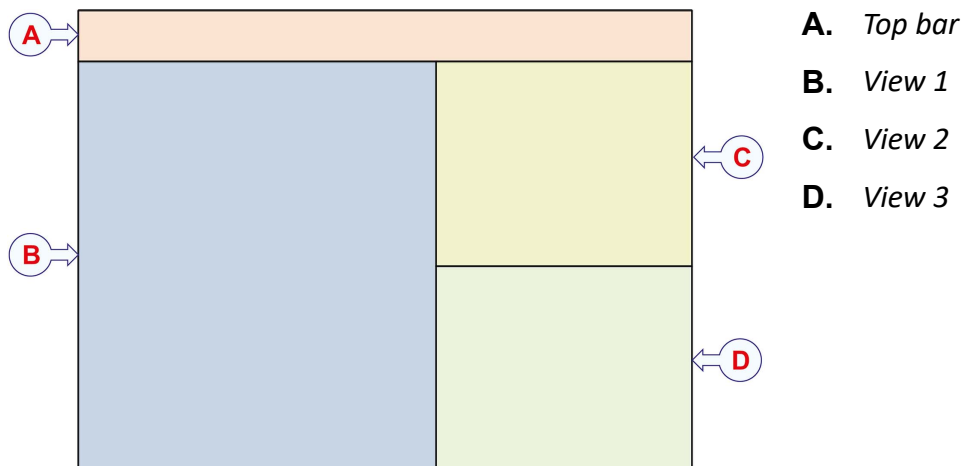
[System menu](#), page 61

Browsing or switching display views

The display is divided into three view sections: View 1, View 2 and View 3.

Context

You can select which view you want to appear in these sections. You can switch views from the **View** menu or using keyboard commands directly in the display.



Procedure

1. Selecting from View menu

- a. Select the **View** menu

View	
Browse top views	F2
Browse bottom views	Shift+F2
Toggle top view	F3
Toggle bottom view	Shift+F3

- b. Select **Browse top views** to browse to the next available view in View 2.
 - c. Select **Browse bottom views** to browse to the next available view in View 3.
 - d. Select **Toggle top view** to switch the content of View 1 and View 2.
 - e. Select **Toggle bottom view** to switch the content of View 1 and View 3.
2. **Using keyboard commands**
 - a. Press F2 key to browse to the next available view in View 2.
 - b. Press F3 key to switch the content of View 1 and View 2.
 - c. Press Shift+F2 keys to browse to the next available view in View 3.
 - d. Press Shift+F3 keys to switch the contents of View 1 and View 3.

Related concepts

[View menu](#), page 54

User preference procedures

Topics

[Selecting colour palette for display](#), page 22

[Selecting presentation format for display](#), page 23

[Selecting default position of views in display](#), page 24

Selecting colour palette for display

You can select a colour scheme for the display which suits your current light conditions.

Context

The **Palette** function provides colour schemes for the display presentation. Night, Dusk and Day.

You can select the colour palette from the **View** menu or using keyboard commands directly in the display.

- **Day white:** This is the recommended colour palette for daylight use.

- **Day black:** This palette has dark background and bright colours.
- **Night:** This is a special colour palette for night operations which will not weaken the night sight of the system operator.

Display mode	
☒ Day white	
☐ Day black	F7
☐ Night	F8

Procedure

1. **Selecting from the View menu**
 - a. Select the **View** menu.
 - b. Select the wanted palette: **Day white**, **Day black** or **Night**.
2. **Using keyboard commands**
 - a. Press the F7 key to toggle between the day palettes.
 - b. Press the F8 key to switch to the night palette.

Related concepts

[View menu](#), page 54

Selecting presentation format for display

You can select which formats to use for the presentation of various data in the display.

Context

The display formats you can modify are: Date, time, position, datum and unit system.

Display format	
◀ Date format	
◀ Time format	
◀ Position format	
◀ Datum	
◀ Unit system	

Procedure

1. Select the **View** menu.
2. Select the display format you want to modify.
3. Select the wanted parameter from the shortcut menu.

Related concepts

[View menu](#), page 54

Selecting default position of views in display

You can select a default appearance of the views in the display so they will appear in the same position each time you start the Seapath application.

Context

The display is divided into three view sections: View 1, View 2 and View 3. You can select which view you want to appear in these sections.



Procedure

1. Select the **System** menu > **Operator SW**.
2. Select **View**.
3. Select which view you want for View 1, View 2 and View 3 from the drop-down lists.
4. Select **Apply** to save the settings.

Related concepts

[System menu](#), page 61

Operating procedures

Topics

[Tuning heave measurement performance, page 25](#)

[Acknowledging events, page 27](#)

[Exporting log data, page 28](#)

[Exporting system data with FTP, page 29](#)

[Post-processing of raw data, page 30](#)

Tuning heave measurement performance

Before a survey and/or during operation, check the Seapath heave performance and tune the heave parameters until the best heave performance is achieved.

Context

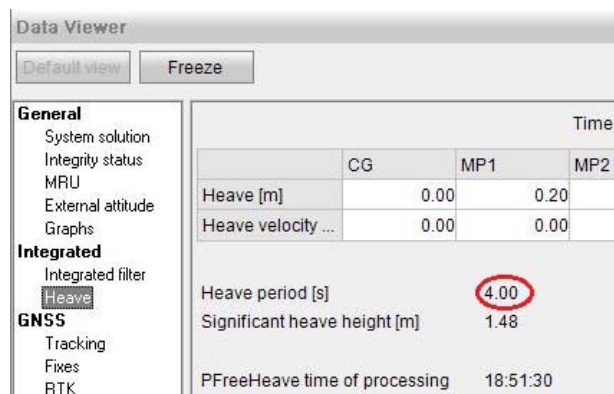
When using the Seapath for real-time heave measurements, it is important to tune the heave period to the vessel size and motion characteristics for the actual weather conditions. The configuration parameter **Heave filter mode** defines default values of the heave period. In order to achieve optimum heave performance, these values have to be tuned for the actual vessel and weather conditions.

The simplest option is to select **Automatic** or **GNSS aided** heave filter mode in **NAV Engine configuration** and let the system estimate the heave filter parameters during operation.

Or you can manually tune the heave measurement performance by checking the heave period parameter in the **Data Viewer** and then enter this value in the **NAV Engine configuration**.

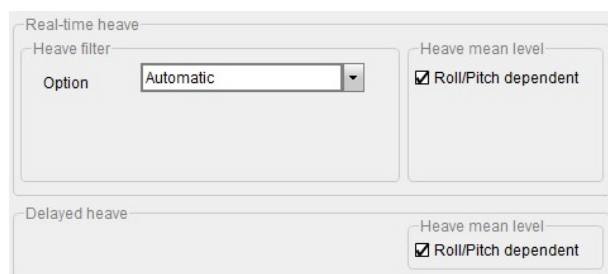
Note: _____

i If you decide to let the system automatically estimate the heave filter parameters, by selecting **Automatic** or **GNSS aided**, you do not need to observe the heave period parameter in the **Data Viewer**.



Procedure

1. Select the **Tools** menu → **Data Viewer**.
2. Under **Integrated**, select **Heave**.
3. Observe the **Heave period [s]** parameter and close the **Data Viewer**.
4. Select the **System** menu → **NAVEngine** → **Standard**.
5. Select **MRU** → **Heave config**.
6. Select **Hydrographic survey** or **General purpose** from the **Options** list.
7. Type the **Period** parameter which you observed in the **Data Viewer**.
Allowed values are between 1 and 25 seconds. The default value is 10 seconds.



8. Or you can select **Automatic** or **GNSS aided** for the system to estimate the heave filter parameters.
9. Select the **Roll/Pitch dependent** box if you want the heave measurement dependent on the roll and pitch measurements.
10. Select **Apply** to save the settings.

Related concepts

[Tools menu](#), page 59

Acknowledging events

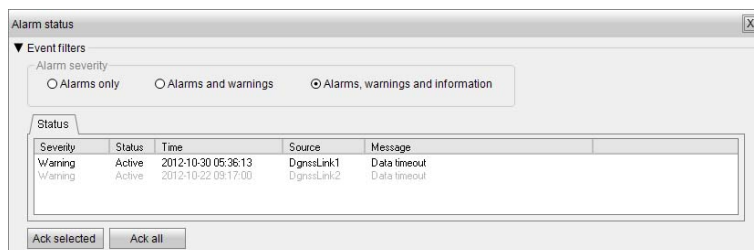
The top bar will show if the system has one or more event situations.

Context

These events can range from informational messages to warnings and alerts. If a situation has been handled, and there is no need for it to be displayed, it can be acknowledged and thus removed from the top bar.

Procedure

1. Observe the alarm(s) in the top bar.
2. **Acknowledging events from the top bar:**
 - a. Select the Event severity symbol, letter **A**, **W** or **I**, for the event to acknowledge the event directly.
Observe that the event disappears from the top bar.
 - b. Or you can select the **Event list** button, , to open the **Event list** and view all events.
 - c. Select the Event severity symbol in the list to acknowledge an event.
3. **Acknowledging events from the Alarm menu:**
 - a. You can select the **Alarm** menu → **Ackn. all events** to acknowledge all events.
Observe that there are no events in the top bar.
 - b. You can select the **Alarm** menu → **Status** to acknowledge events from the **Alarm status** dialog box.



Related concepts

[Alarm menu](#), page 58

Exporting log data

The **Data Export** tool is used to retrieve log data from the Seapath system.

Context

The log data can be used for documentation, post-processing or diagnostic purposes.

The available categories from which to select data for export, are:

- Sensor data (for example IB log files)
- Post processing data
- Telegram output (for example exported NMEA telegrams)
- Configuration
- Diagnostics (for example alarms, internal diagnostics)

Data Export tool

Start time (UTC)

Jun 2012

M	Tu	W	Th	F	Sa	Su
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Hours

0	1	2	3	4	5
6	7	8	9	10	11
12	13	14	15	16	17
18	19	20	21	22	23

Minutes

0	15	30	45
---	----	----	----

Duration

- 0 + Days - 6 + Hours

Period: 2012-06-19 01:36 to 2012-06-19 07:36

Estimated size: ~196.0 MB

USB media

Drive: E: Free size: 14.6 GB

Customize Export Exit

Procedure

1. Insert a USB flash drive into an USB port on the external computer with the Seapath Operator software installed.
If you do not insert a USB flash drive, the files will be written to local disk.
2. Select the **Tools** menu > **Data Export**.
3. Select the start time for the data export from the calendar.
4. Select the duration of the exporting period.

5. Select **Customize** if you want to change which data files you want to export.
Select which data you want to export and if you want to split the output file into smaller files.
6. Select **Export**.
A progress bar will appear on the screen.
7. Close the dialog box when the logging session is finished.
8. Remove the USB flash drive.

Result

The log files are now zipped and stored on the USB flash drive inside a folder named: DataExport.

Related concepts

[Tools menu](#), page 59

Exporting system data with FTP

The Seapath system contains an FTP (File Transfer Protocol) server which can be used to export files to your computer.

Prerequisites

You must be familiar with the Sensor Unit's internet protocol (IP) address to be able to connect to it. The default IP address for the Sensor Unit is: 192.168.1.10.

FTP client software must be installed on your computer. For installation, see documentation for the chosen FTP client.

Context

The directory structure on the FTP server:

/data/user/loghost

Data from telegram outputs where **Log to file** has been selected in the **NAV Engine Configuration** → **Communication interface** → **Input/Output**. The file name extensions are .1nn (lowercase L, not one), where **nn** is the two-digit output number.

/data/user/other

Other directories are used for diagnostic and maintenance purposes. Instructions are given from customer support if these types of files are needed.

Procedure

1. Start the FTP client software on your computer and connect to the Sensor Unit's IP address.
2. Log in by typing the user name and password
 - **User name:** navigator
 - **Password:** navigator

The user name and password are case sensitive.
3. Select Binary or Text transfer mode depending on how the data shall be used. Binary transfer mode is usually the correct choice for machine-readable data.
4. Transfer the wanted files.
5. Disconnect.

Post-processing of raw data

Topics

[About post-processing of raw data, page 30](#)

[Setting up Seapath for post-processing output, page 31](#)

[Post-processing of raw data in TerraPos, page 32](#)

About post-processing of raw data

Seapath can output raw GNSS (Global Navigation Satellite Systems) and IMU (Inertial Measurement Unit) data for post-processing with Field Group's TerraPos.

It is recommended to log the data on the Kongsberg Discovery K-Controller system or on another connected logging system. Alternatively, the data can be logged internally in the Seapath system. If logged internally on Seapath, use FTP (File Transfer Protocol) to download files from the Seapath disk. Log in with user name "navigator", password "navigator" and binary transfer mode. The files are found on the user/loghost directory. Use the Ethernet port on the Sensor Unit (192.168.1.4). The log files have the following extension:

- The **TelegramOut15** interface number is used to log raw GNSS data and IMU data to file by the format **Post-processing 1**. The file extension for the raw data log file will be *.15.

Note: _____

i Make sure to retrieve the data logged internally on the Sensor Unit periodically if you need it. When the internal disk reaches 80 % of capacity, it will delete the oldest 120 minutes of logged data. The more logging you enable, the faster the disk will fill up.

Setting up Seapath for post-processing output

The outputs must be set up and connected to the optional external logging system before the data collection starts.

Context

This procedure describes how to set the Telegram out interface and, under the **Telegram out properties**, how to set up one output with the following format:

- **Post-processing 1** (including both raw IMU and GNSS data).

Select **Log to file** on the outputs if the data shall be logged internally in the Seapath system.

A possible selection is indicated in the procedure.

Interface	Type	Direction	I/O Properties	Description
☒ TelegramOut15		Out	NONE	Telegram Out #15
☐ TelegramOut16	Ethernet	Out	UDP any 9901 9901 UNICAST	Telegram Out #16
☐ AnalogOut1	Analog	Out	Gain: 0.0000, offset: 0.0000	Analog Out #1
☐ AnalogOut2	Analog	Out	Gain: 0.0000, offset: 0.0000	Analog Out #2

● Disabled | ● OK | ● Warning | ● Error

▼ Configuration details

Interface: TelegramOut15 Description: Telegram Out #15

Type: None

Cable ID:

▼ Telegram out properties

Format: Post-processing 1 ☒ Log to file

Procedure

1. Select the **System** menu → **NAVEngine** → **Standard**.
2. Select **Communication interface** → **Input/Output**.
3. Select the **TelegramOut15** interface in the **Input/Output list**.
Observe that the configuration details for **Telegram out properties** appear at the lower part of the page.
4. Select **Type** for output on data on **Serial line**, **Ethernet** or **None**.
5. As **Format**, select **Post-processing 1**.
6. Select **Log to file** if you want data logged internally.

7. Select **Apply** to save the settings.

Related concepts

[System menu](#), page 61

Post-processing of raw data in TerraPos

After you have logged the raw data you can process these data using the TerraPos position and attitude post-processing software.

Prerequisites

Contact Kongsberg Discovery by email: seatex.sales@kd.kongsberg.com and request the TerraPos software and license.

Context

The TerraPos software integrates satellite positioning and inertial sensors for a full six degrees of freedom solution. It uses Precise Point Positioning (PPP) technology to provide true autonomy: anywhere, anytime - without worrying about base stations or reference networks.

Post-Processed Kinematics (PPK) is also available through selection of a value for **Base station service** (CORS). Alternatively, the base station files can be added manually by adding a DGNSS setup file. The DGNSS setup is created by selecting the **Tools** menu → **Edit DGNSS setup**.

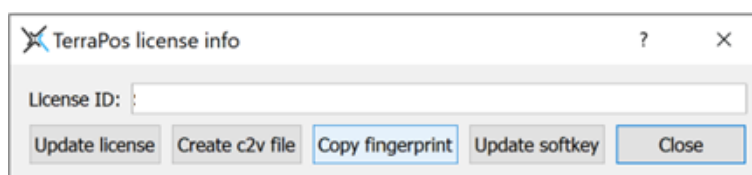
Note: _____



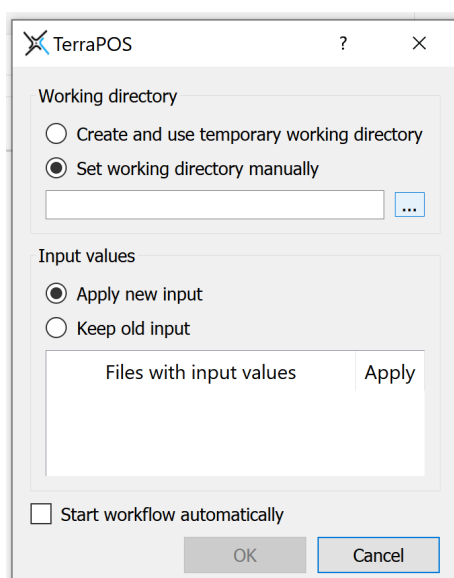
In the procedure below, you only install the TerraPos software once. If TerraPos is already installed and the softkey updated, you go to Processing data.

Procedure

1. Installing TerraPos software:
 - a. Request the TerraPos software.
 - b. Install the software using the standard options.
 - c. Open the TerraPos application and select **Tools** → **License Tool** → **Copy fingerprint**.



- d. Send the fingerprint to the Kongsberg Discovery sales office.
You will now receive a file by email.
 - e. Select **Tools** → **License Tool** → **Update softkey**.
2. Processing data:
- a. Select **Workflows** → **Seapath** → **Seapath INS**.
 - b. Select a **Working directory** for where to store the files associated with the project.
You can let the system create a directory by selecting **Create and use temporary working directory** or you can select which directory you want to use by selecting **Set working directory manually**.



- c. Select if you want to **Apply new input** or if you want to **Keep old input**.
- d. Select **OK**.

- e. Type a **TerraPos** project name.

The screenshot shows the 'Input' tab of the Seapath 130 software interface. It is divided into two main sections: 'Workflow and location' and 'Input'.

Workflow and location:

Property	Value
Workflow template	C:/ProgramData/Terratec/TerraPos/system-files/workflo...
Working directory	C:/seatex/Data_and_files/Regen/202311155/terrapos

Input:

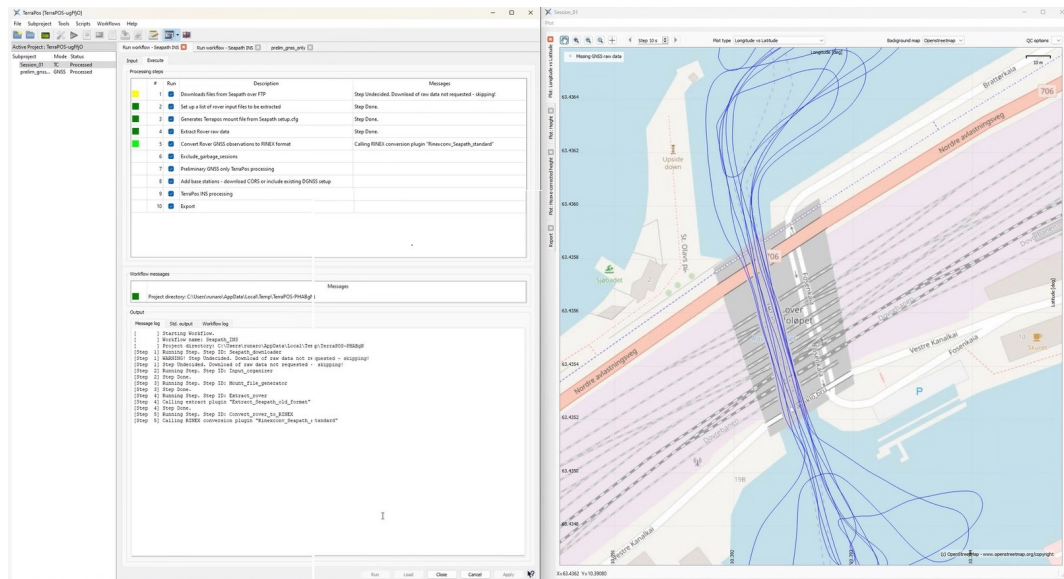
Sub-tabs: Mandatory, Optional, Advanced

Property	Value
TerraPos project name	Regen_20231115
Seapath raw data directory	release
Export format	sbt
Transformation	Euref89nor
Height system	
Map projection	
Zone	Automatic
Hemisphere	Automatic

Buttons at the bottom: Run, Load, Close, Cancel, Apply, and a help icon.

- f. In **Seapath raw data directory**, select the directory where you have stored the Seapath raw data on format **Post-Processing 1**.
- g. Select data format, **Export format**.
- h. Select datum, **Transformation**.
If you do not select anything here, the default datum is ITRF.

- i. Select **Run** to run the workflow.



User interface

Topics

[Display organisation, page 36](#)

[Top bar description, page 37](#)

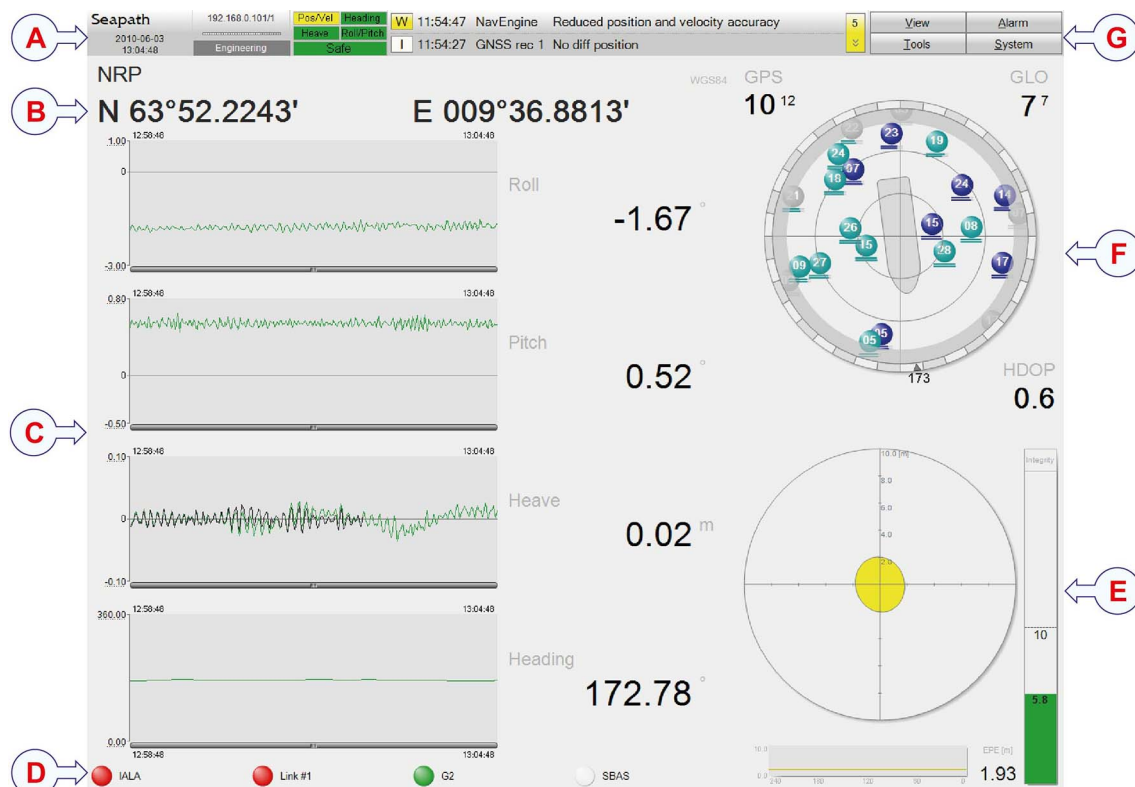
[DGNSS link status bar, page 42](#)

[Display views, page 43](#)

Display organisation

The illustration shows the various parts of the display in this system. Various user preference settings can change the appearance of some parts of the display.

The DGNSS link bar is hidden by default but can be activated if corrections are enabled.



A. Top bar (with Application menu)

B. Position data

C. View 1

D. DGNSS link status bar

E. View 3

F. View 2

G. Application menu

Top bar description

Topics

[Top bar overview, page 38](#)

[System modes, page 38](#)

[Event system description, page 39](#)

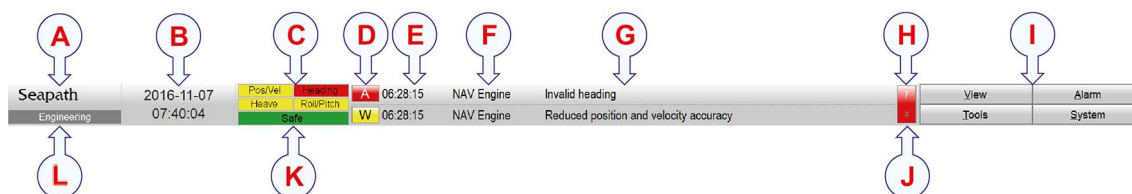
[System status, page 40](#)

[Data quality status, page 40](#)

[Application menu, page 41](#)

Top bar overview

The top bar holds system and system status information as well as the Application menu with the various menus in the system.



- A.** Type of system
- B.** Current date and time
- C.** Data quality status
- D.** Event severity symbol
- E.** Event time tag
- F.** Event source
- G.** Event message
- H.** Number of acknowledged events
- I.** Application menu
- J.** Event list button
- K.** System status
- L.** System mode (indicated only in Engineering or Configuration mode)

Related concepts

[System modes](#), page 38

[Event system description](#), page 39

[System status](#), page 40

[Data quality status](#), page 40

[Application menu](#), page 41

System modes

The system has three modes: *Operation*, *Configuration* and *Engineering* mode. The mode you are operating in, is indicated in the system mode area of the top bar.

You can change the system mode from the **System** menu. A password is required to switch from *Operation* to *Engineering* or *Configuration* mode. The password is **STX**. It is not possible to change the password. The password is not case sensitive.

The system will return to *Operation* mode after 30 minutes of user inactivity.

Operation

This is the default mode. In this mode it is not possible to start any external applications, diagnostic tools or re-configure the system. A password is not required to switch to this mode.

Configuration

In this mode it is possible to change settings related to the connected sensors, applications and system-wide settings.

Engineering

This mode is primarily intended for field engineers during initial installation, fault diagnostics and system-wide re-configuration.

Related concepts

[System menu](#), page 61

[Top bar overview](#), page 38

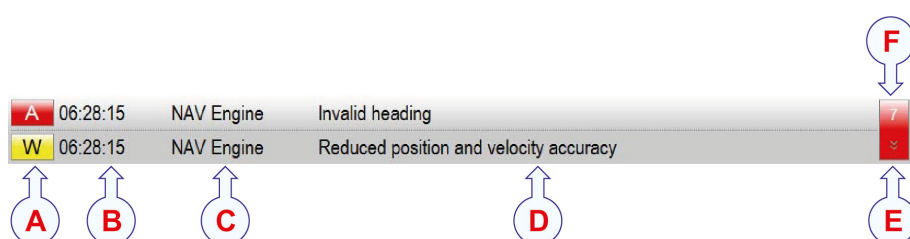
Event system description

The event system handles events regarding the safety and operation of the system. An event is a notification to the operator of some condition in the system or the controlled process that may need attention.

Events which appear in the Seapath application can be set up with different alarm types. These alarm types have different severity levels. The Event severity symbol indicates:

-  **Alarm:** Alarms – **high** priority
-  **Warning:** Warnings – **medium** priority
-  **Information:** Information messages– **low** priority

An event message is acknowledged by selecting the Event severity symbol, letter **A**, **W** or **I**, in the top bar. When an event is acknowledged, it disappears from the **Event list**. However, the event can still be viewed in the alarm status under the **Alarm** menu.



- | | |
|---------------------------------|---|
| A. Event severity symbol | D. Event message |
| B. Event time tag | E. Event list button |
| C. Event source | F. Number of unacknowledged events |

Select the **Event list** button to open the **Event list**. Here you can see all the unacknowledged events. Select the button again to close the list.

A	06:28:15	NAV Engine	Invalid heading	7
W	06:28:15	NAV Engine	Reduced position and velocity accuracy	8
W	06:28:15	NAV Engine	Reduced heave accuracy	
W	06:28:15	NAV Engine	Reduced roll and pitch accuracy	
W	06:28:15	NAV Engine	Reduced heading accuracy	
I	15:05:19	GnssRec2	No diff position	
I	06:28:15	GnssRec1	No raw data	

Related concepts

[Top bar overview](#), page 38

System status

The system has three system states. The system status describes the position integrity level. It is indicated in the Status box of the top bar. The background colour of this box helps indicate the system status. The system states are:



Related concepts

[Top bar overview](#), page 38

[System status](#), page 71

Data quality status

The system's data quality status indicators indicate the status of the system measurements.

- Horizontal position and velocity
- Heave
- Roll and pitch
- Heading

Pos/Vel	Heading
Heave	Roll/Pitch

The colour codes represent:

- **Green:** Normal operation. The input data has good quality.
- **Yellow:** Reduced performance. The input data has reduced quality.
- **Red:** The data are invalid or there is no input data.

Related concepts

[Top bar overview](#), page 38

Related tasks

[Investigating why all data quality status indicators are black](#), page 73

[Investigating why all data quality status indicators are red](#), page 74

[Investigating red Pos/Vel data quality indicator](#), page 74

[Investigating yellow Pos/Vel data quality indicator](#), page 75

[Investigating yellow Heave and Roll/Pitch data quality indicator](#), page 77

[Investigating red Heading data quality indicator](#), page 77

[Investigating yellow Heading data quality indicator](#), page 78

[Investigating yellow Heave indicator in top bar](#), page 79

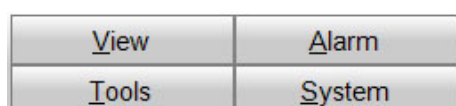
[Investigating yellow Roll/Pitch indicator in top bar](#), page 80

Application menu

The four menu buttons located to the far right on the top bar make up the Application menu.

Select a button to open the menu and reveal a drop-down list of sub-menus. You can also use the ALT key and the underlined letter to open the menu. For example ALT+V will open the **View** menu.

The Application menu offers various operational, visual and setup options.



View

This menu allows you to select colour palette for the display presentation, switch between views, select format for the display presentation and to display the DGNSS link status bar and/or position data in the main view.

Alarm

This menu allows you to acknowledge alarms and view the status of active alarms.

Tools

This menu allows you to select operational tools and tools to use for various diagnostic purposes.

System

This menu allows you to set up the system, change system mode, see system version, stop and log off the system.

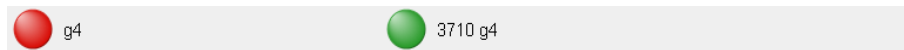
Related concepts

[Top bar overview](#), page 38

DGNSS link status bar

The DGNSS link status bar holds status information regarding GNSS differential correction data links.

This bar is by default disabled in this system but it can be activated if corrections are enabled.



The colour of the circle indicates the status of the link.

- **Grey:** Link not enabled.
- **Yellow:** Data received but not used.
- **Green:** Data are available and OK.
- **Red:** No data available.

Select the link symbol to open the **DGNSS Monitor** tool for more detailed information about the link status.

Related concepts

[Tools menu](#), page 59

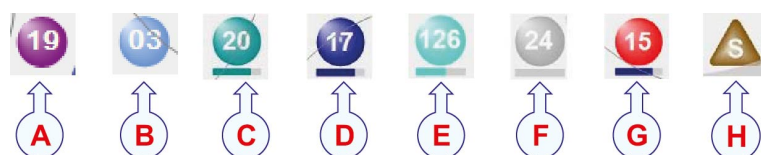
- | | |
|---|--|
| A. <i>Number of used GPS satellites</i> | J. <i>GLONASS satellite</i> |
| B. <i>Number of tracked GPS satellites</i> | K. <i>Galileo satellite</i> |
| C. <i>Number of used Galileo satellites</i> | L. <i>GPS satellite</i> |
| D. <i>Number of tracked Galileo satellites</i> | M. <i>Vessel heading</i> |
| E. <i>Number of used BeiDou satellites</i> | N. <i>Elevation mask</i> |
| F. <i>Number of tracked BeiDou satellites</i> | O. <i>Shadow sector</i> |
| G. <i>Number of used GLONASS satellites</i> | P. <i>Correction satellite</i> |
| H. <i>Number of tracked GLONASS satellites</i> | Q. <i>Signal-to-noise ratio indicator</i> |
| I. <i>BeiDou satellite</i> | R. <i>Satellite under elevation mask</i> |
| | S. <i>Satellite under shadow sector</i> |

Description

The satellites are presented according to satellite geometry. The grey outer circle represents the elevation mask. The satellite azimuth angle is according to the north-south axis.

The number of GPS and/or GLONASS, Galileo and BeiDou satellites tracked and used in the position solution, is presented in the corners of the display.

The satellite colours represent type of satellite and condition of satellite.



- | | |
|------------------------------------|--|
| A. <i>Galileo satellite</i> | E. <i>SBAS satellite</i> |
| B. <i>BeiDou satellite</i> | F. <i>Not tracked or disabled satellite</i> |
| C. <i>GPS satellite</i> | G. <i>Rejected satellite</i> |
| D. <i>GLONASS satellite</i> | H. <i>Correction satellite</i> |

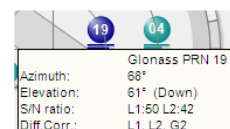
The satellites with grey colour are disabled as they are not used directly in the position fix. Satellites with red colour are faulty and not used in the position fix.

The bar(s) at the bottom of each satellite represent(s) the signal-to-noise level for the satellite, and the longer the bar, the stronger the signal.

The upper bar indicates signal strength on L1 and the lower bar indicates signal strength on L2.



When you hover the cursor over a satellite symbol, an information box will appear with the status of the satellite including azimuth, elevation, L1/L2 signal-to-noise ratio and differential correction availability.



	19	04
	Glonass PRN 19	
Azimuth:	68°	
Elevation:	61° (Down)	
S/N ratio:	L1:60 L2:42	
Diff.Corr.:	L1, L2, G2	

If the vessel has a gyro interfaced, the display shows the vessel's true heading.

The shadow sector represents areas with obstructions. You can add shadow sectors. Adding shadow sectors will have no effect on calculations but will assist in explaining why some satellites are not used in the position fix.

You can select the appearance of the Sky view from the **System** menu → **Operator SW** → **Sky view**. Here you can enable or disable the correction satellites, the signal strength bars, the track plot length, shadow sectors and the elevation mask.

For more details on the Sky view, refer to the *Installation manual*.

Related concepts

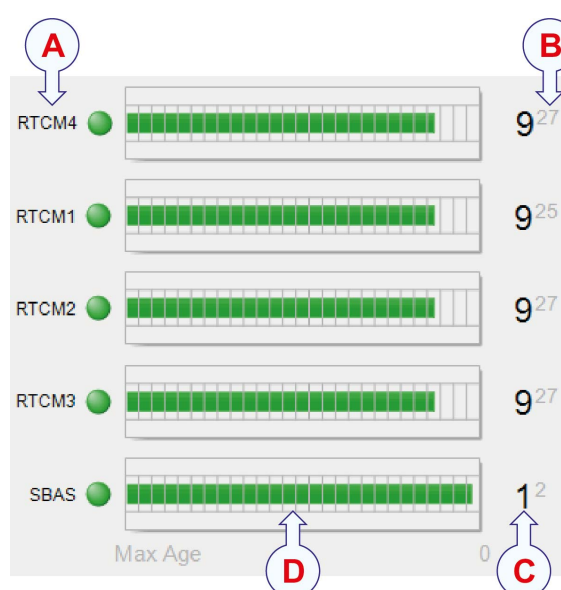
[System menu](#), page 61

DGNSS view

This view indicates the status and age of the available correction links. The link status for all links is indicated with a colour.

How to open

You can select if you want this view to appear as View 1, View 2 or View 3. Press the F3 key to switch between views in View 1 and View 2. Press the SHIFT+F3 key to switch between View 1 and View 3.



- A.** Name of correction link
- B.** Number of available reference stations
- C.** Number of reference stations used in the position solution
- D.** Age of correction data

Description

The link status for all links is indicated with a colour.

- **Green:** Correction data are received and used in the position solution.
- **Yellow:** Correction data are received but not used.
- **Red:** No correction data are received through that link.
- **Grey:** The link has been disabled for some reason.

Status of up to 9 correction links can be displayed. Each link is identified by a name. The name is defined in the **NAV Engine Configuration** dialog box, **Communication interface** → **Input/Output**. The number of reference stations used in the position calculation and the number of reference stations available, are indicated for each correction link.

Each correction link is presented as a circle and with a bar which indicates the quality as the age of the corrections received through that link.

If a bar is green, the correction signals are newer. The older the signals are, the shorter the bar is.

If the bar is grey, the age of the corrections has exceeded the maximum age and the corrections from the link are not in use. You can set the maximum age for using differential corrections in the NAVEngine Advanced configuration but this feature is for advanced users only.

If you select one of the link buttons, the **DGNSS Monitor** appears. This view lists details of all available reference stations from all correction links.

Related concepts

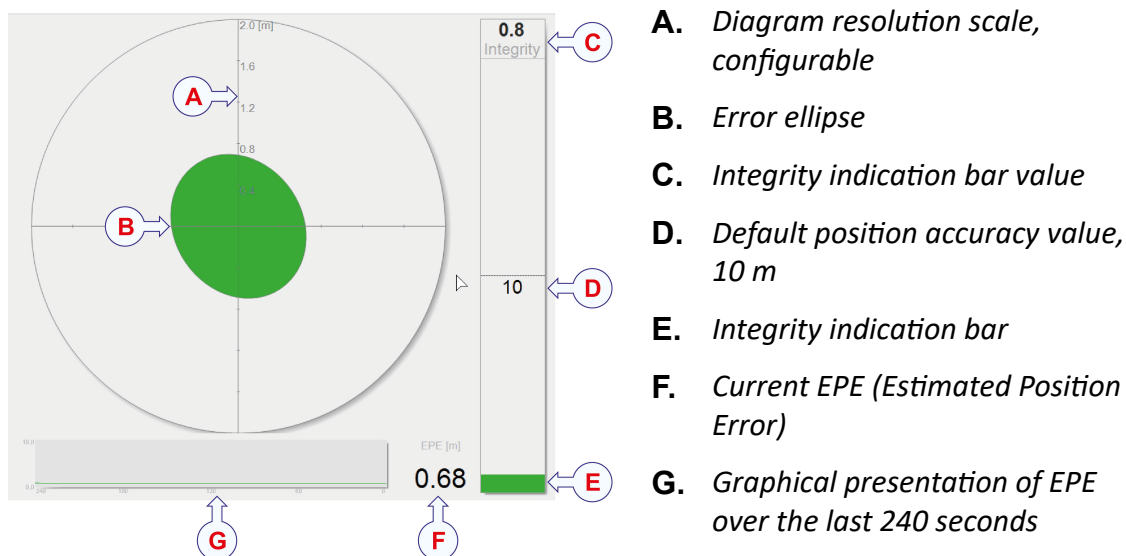
[Tools menu](#), page 59

Integrity view

This view indicates the integrity of the system position.

How to open

You can select if you want this view to appear as View 1, View 2 or View 3. Press the F3 key to switch between views in View 1 and View 2. Press the SHIFT+F3 key to switch between View 1 and View 3.



Description

The error ellipse describes the position quality and the geometry of the position solution. The colour of the ellipse indicates the quality/integrity of the position. The colours used are the same as in the System status field of the top bar.

A RAIM exclusion and detection algorithm is implemented to detect satellite failure. The integrity indication for different position accuracy levels is expressed in three states that satisfy the requirements. The states are Safe, Unsafe and Caution. These states are indicated with different colours (green, yellow and red) on the error ellipse in the *Integrity* view.

The position accuracy level is configurable from the **NAV Engine Configuration** → **Advanced** (the value is displayed as the outer circle on the axis). Default value is 10 m.

The system integrity value is often referred to as the horizontal external reliability. It gives an indication of how large a horizontal position error might be, at the condition of an arbitrary undetected satellite failure.

The colour of the error ellipse indicates the integrated position solution status.

Green - safe

The position solution is OK.

Green indicates that the system accuracy is below the selected accuracy level and that a single satellite failure cannot make the actual horizontal position error exceed the selected integrity limit (95 % confidence level).

Yellow - caution

The position solution is reduced.

Yellow indicates that the system accuracy is below the selected position accuracy level but a single satellite failure might not be detected. If such a satellite failure is detected, the actual horizontal position error might exceed the selected integrity limit (95 % confidence level). With only four satellites (three when height aiding is chosen), there is no way to detect a satellite failure, and the system will always be in the state Caution or Unsafe. The expected accuracy and HDOP might still be reasonably low.

Red - unsafe

There is no position solution available.

Red indicates that the system accuracy is above the selected accuracy level (95 % confidence level).

The position accuracy level is configurable (95 %) from the **NAV Engine Configuration** → **Advanced**. The value is displayed as the outer circle on the axis. The default value is 10 metres.

The **EPE** (Estimated Position Error) is a position quality parameter for the DGPS position. The figures are 95 % CEP (Circular Error Probability). The unit is metres. The time span in the graphical plot of the EPE is 240 seconds in the horizontal axis.

Related concepts

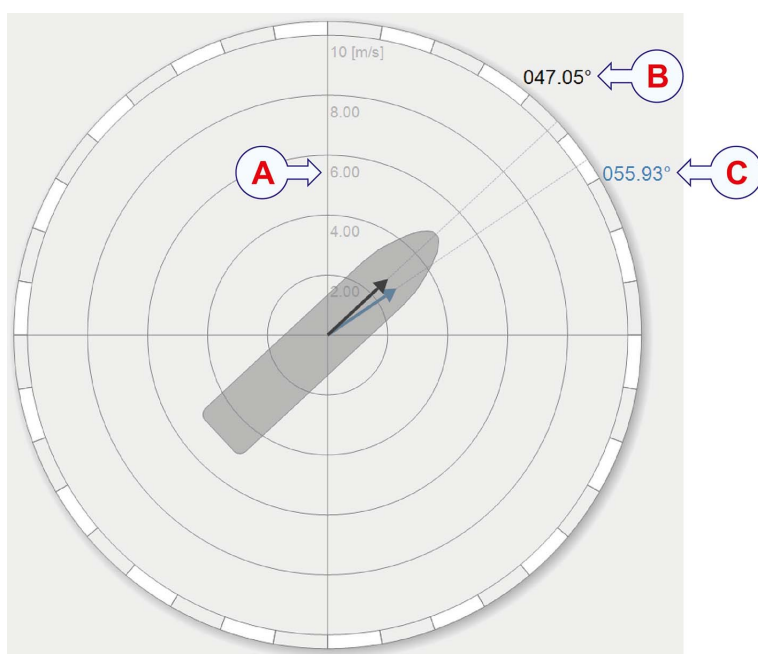
[System menu](#), page 61

Compass view

The Compass view shows the vessel heading, course over ground (COG) and speed over ground (SOG). The arrow heads indicate the speed according to the speed scale.

How to open

You can select if you want this view to appear as View 1, View 2 or View 3. Press the F3 key to switch between views in View 1 and View 2. Press the SHIFT+F3 key to switch between View 1 and View 3.



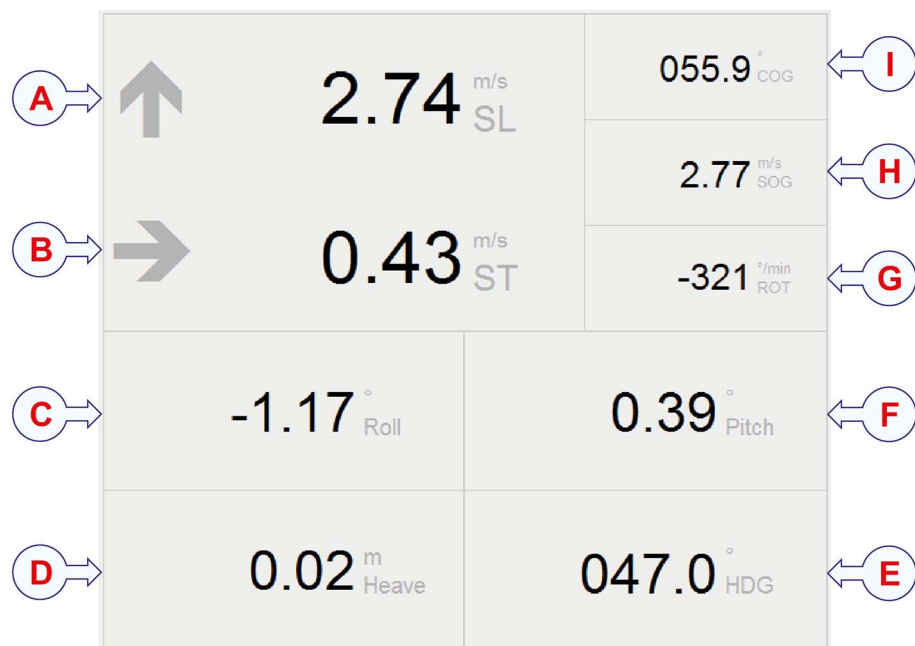
- A.** Speed scale
- B.** Vessel heading (HDG) and speed along ship (SL)
- C.** Vessel speed over ground (SOG) and course over ground (COG)

Motion data view

The main function of the Motion data view is to give information about the speed and heading of the vessel.

How to open

You can select if you want this view to appear as View 1, View 2 or View 3. Press the F3 key to switch between views in View 1 and View 2. Press the SHIFT+F3 key to switch between View 1 and View 3.



- | | |
|---|---|
| A. Vessel speed along ship (SL) | F. Vessel pitch |
| B. Vessel speed transverse ship (ST) | G. Vessel rate of turn (ROT) |
| C. Vessel roll | H. Vessel speed over ground (SOG) |
| D. Vessel heave | I. Vessel course over ground (COG) |
| E. Vessel heading (HDG) | |

Description

Longitudinal and transversal speed (SL and ST) are presented together with arrows indicating forward/aft and port/starboard directions. The arrows and the vessel's course over ground (COG) are not displayed if the speed over ground (SOG) is less than 0.1 m/s.

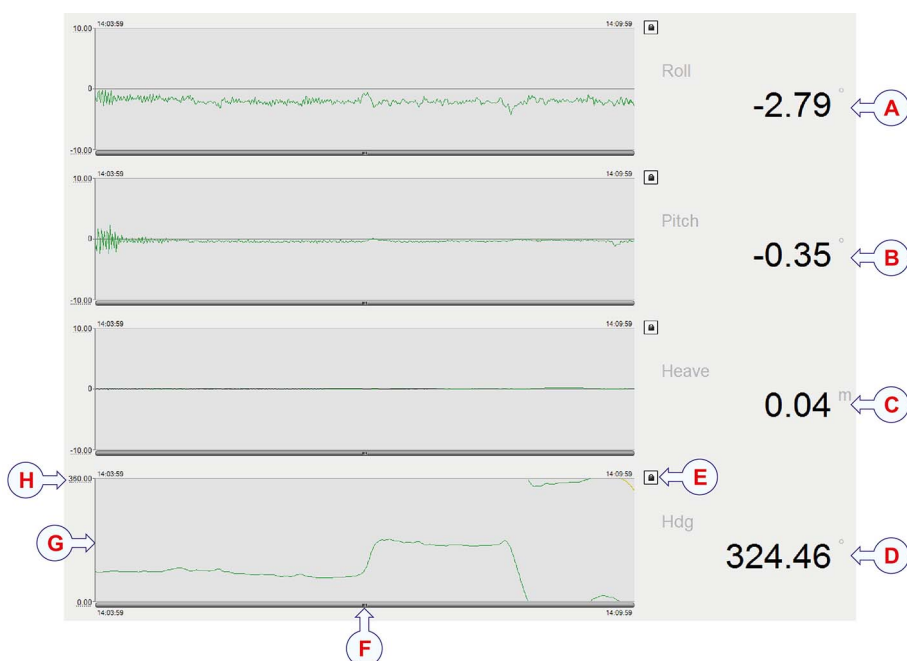
Also the vessel roll, pitch, heave and rate of turn (ROT) are shown in this view.

Time series view

This view plots roll, pitch, heave and heading as time series.

How to open

You can select if you want this view to appear as View 1, View 2 or View 3. Press the F3 key to switch between views in View 1 and View 2. Press the SHIFT+F3 key to switch between View 1 and View 3.



- | | |
|------------------------------|---------------------------------|
| A. Roll in degrees | E. Lock/unlock time axis |
| B. Pitch in degrees | F. Time axis |
| C. Heave in metres | G. Y axis 0 |
| D. Heading in degrees | H. Y axis scale, max. |

Description

The colour of the time series graph indicates the data quality.

- **Green:** The system performance is normal.
- **Yellow:** The system has reduced accuracy.
- **Red:** The data are invalid.

In the time series for heave both real-time heave and delayed heave are presented in the same time series. Therefore, the heave time series is always 2 minutes delayed in time in order to be able to present both measurements in the same curve and for the same sample.

You can zoom in parts of each plot and pan the time series by dragging the active controls. You can lock the time axis for the time series you want to take a closer look at by selecting the padlock symbol.

Menu system

Topics

[Application menu \(Menu system\), page 53](#)

[View menu, page 54](#)

[Alarm menu, page 58](#)

[Tools menu, page 59](#)

[System menu, page 61](#)

Application menu (Menu system)

Access to the menu system is in the Application menu part of the top bar.

Select the menu buttons to reveal the menu items and select the menu items to reveal the sub-menus.

<u>V</u> iew	<u>A</u> larm
<u>T</u> ools	<u>S</u> ystem

View

This menu holds user preference selections for which colour palette to use for the current light conditions. Here you can maximize the main view and switch and toggle between the various display views. You can select which format to use for presentation of data in the display, such as date and time format, position format, unit measurement system. Position data can be displayed at the top of View 1. DGNSS link status and the status of the position sources used in the system can be displayed at the bottom of View 1.

Alarm

This menu allows you to acknowledge alarms, or events, which have occurred in the system. You can also see status details for the alarms which are active.

The NAV Engine debug option is for advanced users and shows output of status messages for NAV Engine and is used for troubleshooting purposes.

Tools

This menu holds various tools used for planning and operation and tools used for diagnostic purposes. Which tools are available will differ according to type of product purchased.

System

This menu allows you to select which object to use as monitoring point on your vessel. It also holds the NAV Engine configuration and the operator software configuration. This is where you change the system mode or performs a restart, stop or shutdown of the system. This is also where you find various information about the system, such as contact details, software version and equipment information. This menu holds a quick help with shortcut keys for switching display views and changing the colour palette.

View menu

The **View** menu provide selections for colour palette, switching between views, display format presentation and display of DGNSS link status bar and/or position data in View 1.

How to open

Select **View** in the Application menu on the top bar.

Display mode

Display mode controls the selection of colours used by the HMI. Select the menu item which corresponds to the desired mode or colour palette.

You can press the F7 key to toggle between the day palettes and the F8 key to switch to the night palette.

View	Alarm
Tools	System
Display mode	
☒ Day white	
☐ Day black	F7
☐ Night	F8
View	
Maximize main view	F5
Browse top views	F2
Browse bottom views	Shift+F2
Toggle top view	F3
Toggle bottom view	Shift+F3
Display format	
☐ Date format	
☐ Time format	
☐ Position format	
☐ Datum	
☐ Unit system	
Bars	
☒ DGNSS links	
☒ Position data	

Day white

Day white is the recommended colour combination for daylight use.

Day black

The **Day black** colour combination uses bright colours, but has a dark background.

Night

Night is a special palette with very low contrast on black background, intended to be used during night without weakening the night sight of the operator.

View

The display is divided into three view sections: View 1, View 2 and View 3. View allows you to decide which view you want to appear in these sections.

Note: _____

 *Browsing or switching views using F2 and F3 is not stored. The only way to ensure that the selected contents is displayed every time the software starts, is to make the selection in the **View** tab in the **Operator software configuration** dialog box.*

Figure 3: Browsing views with F2 key

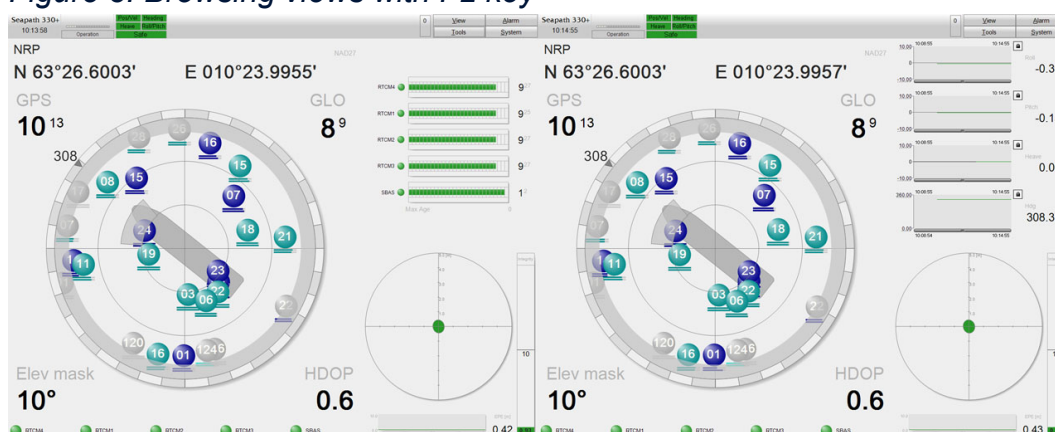
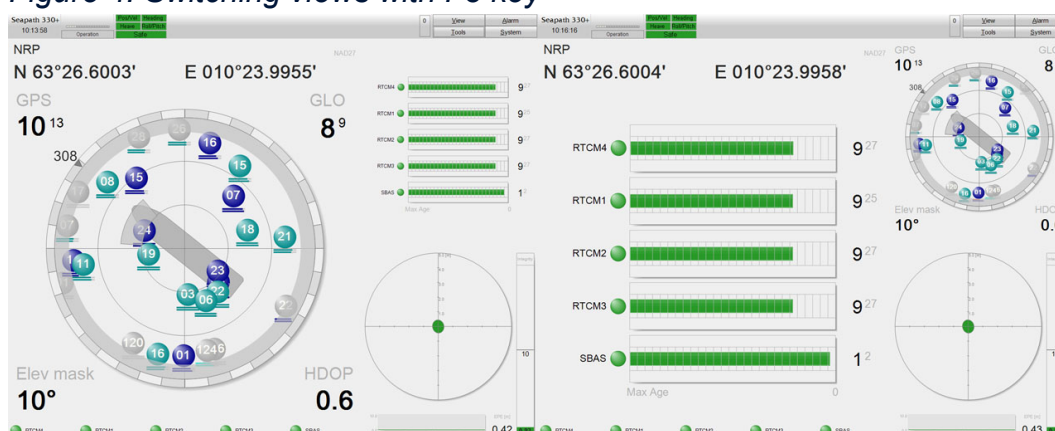


Figure 4: Switching views with F3 key



Maximise main view

Maximise main view allows you to make View 1 cover the whole screen. This has the same effect as pressing the F5 key.

Browse top views

Browse top views allows you to browse to the next available view in View 2. This has the same effect as pressing the F2 key.

Browse bottom views

Browse bottom views allows you to browse to the next available view in View 3. This has the same effect as pressing the SHIFT+F2 key.

Toggle top view

Toggle top view allows you to switch the contents of View 1 and View 2. This has the same effect as pressing the F3 key.

Toggle bottom view

Toggle bottom view allows you to switch the contents of View 1 and View 3. This has the same effect as pressing the SHIFT+F3 key.

Display format

Display format provides alternatives to modify the presentation of various data types. When selecting a view menu item of this group, or hovering the mouse cursor over it, a sub-menu will appear to the left, containing option items for selecting the wanted format.

Date format

Date format allows you to select between various date formats. The selected format is used in displayed fields presenting data information. For example the data part of the top bar.

Time format

Time format allows you to select between AM/PM and 24-hour display of time values. This applies to all displayed fields presenting time information. For example current date and time and event information in the top bar.

Position format

Position format allows you to select between decimal seconds (for example N63°26'31.92"), decimal minutes (for example N63°26.5320') and UTM (Universal Transverse Mercator).

Datum

Datum allows you to select the datum in which positions are presented. Be aware that this selection is only valid if the datum on the corrections input to the product is in WGS84 or if no corrections are input. If the corrections input are in another datum than WGS84, you must select WGS84. See the Installation Manual for available selections.

Unit system

Unit system allows you to select the length and speed units used in the various views. Two types of unit system selections are available: Fixed units and Auto-scaling units. Each alternative indicates the distance unit, then the speed unit. Auto-scaling units will change from short range unit to long range unit (indicated in parenthesis) when the number of digits in the displayed value exceeds a certain limit.

Available fixed units:

- NM: knots
- m: m/s
- ft: ft/s

Available auto-scaling units:

- M (km): km/h
- m (NM): knots
- ft (NM): knots

Bars

Bars allows you to decide whether various status bars shall appear at the bottom or top of View 1 or not.

DGNSS links

The **DGNSS links** option allows you to display the DGNSS Link status bar at the bottom of View 1.

Position data

The **Position data** option allows you to display the vessel position and datum at the top of View 1.

Related tasks

[Browsing or switching display views](#), page 21

[Selecting colour palette for display](#), page 22

[Selecting presentation format for display](#), page 23

Alarm menu

The **Alarm** menu allows you to acknowledge alarms, or events, which have occurred in the system. You can also see status details for the alarms which are active.

How to open

Select **Alarm** in the Application menu on the top bar.

<u>V</u> iew	<u>A</u> larm
<u>T</u> ools	<u>S</u> ystem
Acknowledge alarm	F10
Ackn. all alarms	Ctrl+F10
Status...	Ctrl+H
Expert mode	
NAV Engine debug	

Acknowledge alarm

Select the **Acknowledge alarm** option to acknowledge the topmost event viewed in the top bar. You can also press F10 or select the **Event severity** symbol in the top bar.

The **Acknowledge alarm** option is disabled if no alarms are available in the **Event list** in the Top bar. Acknowledged alarms are still available in the alarm log, but removed from the Top bar view.

Ackn. all alarms

Select the **Ackn. all alarms** option to acknowledge all the events viewed in the **Event list** in the top bar at once. You can also press Ctrl+F10. The **Ackn.all alarms** option is disabled if no alarms are available in the top bar.

Status

Select **Status** to open the **Alarm status** dialog box. You can also press Ctrl+H. This dialog box allows you to see all the active alarms. Use the radio buttons to filter the alarms according to alarm severity. You can also acknowledge the selected alarm or all alarms. When an alarm message is acknowledged, but still active, the alarm message text will be grey. The alarm message will only be removed from the list when it becomes inactive.

Expert mode

Expert mode contains parameters which can be used for troubleshooting. They are for advanced users only.

NAV Engine debug

NAV Engine debug is output of status messages for NAV Engine. This option is for advanced users and troubleshooting purposes.

Related tasks

[Acknowledging events](#), page 27

Tools menu

The **Tools** menu provides applications for configuration tasks and various diagnostic and logging purposes.

How to open

Select **Tools** in the Application menu on the top bar.

Utilities

Utilities holds applications for prediction of satellite geometry, export of system data, copying and restoring the system configuration.

<u>V</u> iew	<u>A</u> larm
<u>T</u> ools	<u>S</u> ystem
Utilities	
Data Export	
Copy Configuration	
Restore Configuration	
Diagnostics	
DGNSS Monitor	
Data Viewer	
Port Monitor	
Explorer	
Windows shell	
Log	
Screen dump	
NAV Engine Log	

Data Export

The **Data Export** tool allows you to copy log data to a USB flash drive, either for documentation, post-processing or diagnostics purposes. You can select the start time and the duration of the data export.

Copy Configuration

The **Copy Configuration** tool allows you to copy the complete system configuration to a disk based archive file or to a USB flash drive. You can use the USB flash drive with the copied configuration to restore the system configuration at a later date. The use of this application is described in detail in the *Installation Manual*.

Restore Configuration

The **Restore Configuration** tool restores all relevant configurations from a disk based archive file or from a USB flash drive. The use of this application is described in detail in the *Installation Manual*.

Note: _____

 *A configuration archive can only be restored from the same type of unit (Remote HMI or Processing Unit) on which it was created.*

Diagnostics

Diagnostics holds applications for advanced users for diagnostic purposes only.

DGNSS Monitor

The **DGNSS Monitor** tool shows information about available reference stations.

Data Viewer

The **Data Viewer** tool shows raw data information about the satellites which are tracked by the receiver, position fix information, correction data and Processing Unit status. You can use this tool for system verification and diagnostics.

Port Monitor

The **Port Monitor** tool shows the data traffic on all serial and net ports.

Explorer

The **Explorer** tool opens Windows Explorer where you can view the file system of the HMI Unit.

Windows Shell

The **Windows Shell** tool opens a Windows command shell.

Log

Log is for advanced users for diagnostic purposes only.

Screen dump

The **Screen dump** tool creates screen dumps of the operator software. You can store the screen dump image on the local disk or on a USB flash drive.

NAV Engine Log

The **NAV Engine Log** tool opens the Windows Explorer in the root folder for the NAV Engine log data. If the NAV Engine software is not running on the same unit as the operator software, an FTP (File Transfer Protocol) session is opened on the Processing Unit to which the operator software is connected, rather than a session on the local file system.

Note: _____



*It is recommended to use the **Data Export** tool rather than **NAV Engine Log**.*

Related concepts

[DGNSS link status bar](#), page 42

[DGNSS view](#), page 45

[Recalibration of the Inertial Measurement Unit](#), page 64

Related tasks

[Tuning heave measurement performance](#), page 25

[Exporting log data](#), page 28

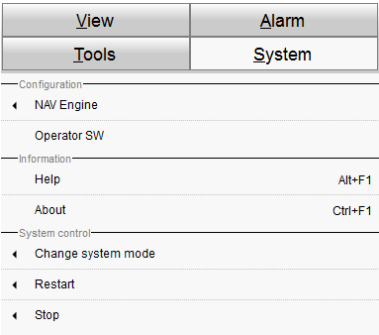
System menu

The **System** menu allows you to configure the system, specify the contents of the views, change the system modes, stop and log off the system in a controlled way.

How to open

Select **System** in the Application menu on the top bar.

Some menu items may be disabled depending on the system mode selection. Disabled menu items appear with light grey text. Change system mode to *Configuration* or *Engineering* to activate the disabled menu items.



Configuration

Configuration allows you to enter the system setup parameters and to enter the display setup settings.

NAV Engine

The **Standard** option opens the **NAV Engine Configuration** dialog box from which you can set up your system to be ready for operation. The **Advanced** option is for advanced users only. It is used for diagnostic and troubleshooting purposes.

Operator SW

The **Operator SW** option opens the **Operator software configuration** dialog box with the tab pages where you can set up visual parameters for the display views.

Information

Information contains quick help and product version information.

Help

The **Help** option displays the **Quick Help** information sheet with basic information regarding navigation and selection.

About

About displays the **About** dialog box which contains various information about the system, such as contact details and software version. Select **Details** to see more equipment information.

System control

System control allows you to change the mode in which the system shall operate, to stop the operator software and NAV Engine, to restart the sensor unit, the NAV Engine and the GNSS receivers and to log off the system in a controlled way.

Change system mode

Change system mode allows you to change the system's operating mode. Switching to *Configuration* or *Engineering* mode requires a password. This password is always "stx" and is not possible to change. The password is not case sensitive.

The system will return to *Operation* mode after 3 minutes of user inactivity.

You can also access *Engineering* or *Configuration* mode by key commands directly from the display.

- Press the Ctrl+E keys to enter *Configuration* mode
- Press the Ctrl+A keys to enter *Engineering* mode.

This opens the password dialogue directly.

Restart

From the **Restart** option you can stop and immediately start:

- The NAV Engine
- The Sensor Unit
- The GNSS receivers

When restarting the NAV Engine or the Sensor Unit, the system will stop all processing, calculation and output from the system for about 2 minutes.

When selecting **GNSS Receivers** both receivers will be restarted.

Restarting the GNSS receiver(s) will cause position drop-out for a few minutes.

Stop

From the **Stop** option you can stop:

- The NAV Engine
- The Operator SW

Stopping the **NAV Engine** will stop data processing. Stopping the **Operator SW** will close the Seapath application but the system will still calculate and output data.

Related concepts

[Navigation](#), page 19

[Operator software configuration description](#), page 20

[System modes](#), page 38

[Sky view](#), page 43

[Integrity view](#), page 46

Related tasks

[Starting the Seapath operator software](#), page 17

[Stopping the Seapath operator software](#), page 18

[Changing system modes](#), page 20

[Selecting default position of views in display](#), page 24

[Setting up Seapath for post-processing output](#), page 31

[Checking the product version](#), page 67

Maintenance

Topics

[Recalibration of the Inertial Measurement Unit, page 64](#)

[Upgrading the Sensor Unit software, page 65](#)

[Checking the product version, page 67](#)

[Repairs and parts replacement, page 67](#)

Recalibration of the Inertial Measurement Unit

The Seapath software estimates the bias in the accelerometers and therefore a recalibration of the unit is no longer required.

Motion Sensor and Gyro Compass

For Seapath installations with product software version 1.11.00 or later installed, recalibration of the MRU, miniMRU and MGC units is no longer required.

This is only valid for installations on vessels in motion with heading changes, not stationary vessel.

Note: _____



This is valid for the Seapath as a system (outputs from the Seapath Sensor Unit) and not for data that is output directly from the MGC Junction Box such as the JB3, JB4, JB7 and so on. For MGC units that outputs data separately, even if it is part of Seapath, recalibration will still be recommended unless the MGC is operation in INS mode. See the Seapath 130 Installation Manual on how to set-up the MGC as an inertial navigation system (INS).

Estimated accelerometer bias

You can find the estimated accelerometer bias values by using the **Data Viewer** tool, which is located on the **Tools** menu.

The unit [μg] is used for the estimated accelerometer biases and is equal to $1\text{e-}5 \text{ m/s}^2$. A horizontal accelerometer bias of $200\mu\text{g}$ (200 micro-g) will lead to an angle offset of 0.01° if the bias is not corrected for. Over time the X-axis accelerometer measures the static (mean) pitch angle and the Y-axis accelerometer measures the static (mean) roll angle. It is the estimated accelerometer biases in the X and the Y that are of interest. In the X axis the accelerometer bias has been corrected with $28.374\mu\text{g}$ since the unit was calibrated. This correspond to 0.00142° pitch angle offset if the unit is disconnected from the Seapath Sensor Unit or the pitch measurements are output from the MGC Junction Box. It will be similar for the Y-axis accelerometer bias and the static roll angle.

The accelerometer bias values are illustrated.

Data Viewer		
Default view Freeze		
General System solution Integrity status IMU External attitude Graphs Integrated <input checked="" type="button" value="Integrated filter"/> Heave	Filter time	2023-06-20 08:54:04
	Position	N 63°26.34445' E 010°23.93490' H 37.282
	Velocity [m/s]	North: -0.002 East: -0.003 Down: -0.002
	Attitude [°]	Roll: 0.305 Pitch: 1.622 Heading: 140.523
	Accelerometer bias [μg]	X: -28.374 Y: -16.888 Z: -263.235
	Gyro bias [°/h]	X: -0.00084 Y: -0.01562 Z: -0.00711

Related concepts

[Tools menu](#), page 59

Upgrading the Sensor Unit software

We recommend that you keep your product updated with the latest software version.

Prerequisites

The default IP address for the Sensor Unit is: 192.168.1.10.

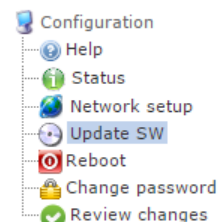
Context

With the newest product software you will be able to enjoy the latest features and functionalities.

Note: _____



This procedure assumes that the Sensor Unit operates on processing software version 2.01.00 or newer.



Procedure

1. Open a browser and type: `http://<the default Sensor Unit IP address>` in the address bar.
2. Type the default login credentials:
 - User name: `scompact`
 - Password: `1234`

The user name is case sensitive.

3. Enter the **Configuration** menu > **Update SW**.
4. Select the provided update package zip file.
5. Select **Upload**.

Wait up to 10 seconds for the file to be transferred.

6. Select **Install**.

The unit will then start to unpack the update package. The unpacking procedure can take up to 3 minutes. When finished, the web server will display the message `Installation successful` as well as a log of the installation procedure.

```
Upload: updatepackage_SP13x-2.01.00.zip
Type: application/x-zip-compressed
Size: 54667.27 Kb
Stored in: uploaded/updatepackage_SP13x-2.01.00.zip
```



Note: _____



Do not power off the unit while performing an update as this may damage the unit.

Important:

It is important that you clear the cache of the web browser after you have performed a software update.

Result

If the update was successful, the unit will restart.

Should the update be unsuccessful, try again and contact Kongsberg Discovery AS customer support.

Checking the product version

For software updates, or contact with customer support, it is useful to know the product version of this product.

Procedure

1. Select the **System** menu > **About**.
2. Observe the current Seapath system product version.
3. Select **Details** to view more detailed information about the system. Such as serial numbers, software version, firmware version etc.
4. Select **Close** to close the dialog box.

Related concepts

[System menu](#), page 61

Repairs and parts replacement

Topics

[Returning equipment to manufacturer](#), page 68

[Repairing the Sensor Unit](#), page 68

[Replacing the Sensor Unit](#), page 69

[Repairing the Inertial Measurement Unit \(IMU\)](#), page 69

[Replacing the IMU subsea bottle or housing](#), page 70

Returning equipment to manufacturer

Malfunctioning equipment should be returned to the manufacturer for repair.

Context

When you contact the customer support department, you will receive an RMA number (Return Material Authorisation) which will identify your service request. Use this number for all correspondence regarding your service request.

Procedure

1. Contact the manufacturer's customer support department
 - by phone: +47-33032407
 - by e-mail: support.seatex@kd.kongsberg.com
2. Provide information about the equipment to the customer support department
 - what type of equipment you want to return
 - the serial number for this equipment
 - why you want to return the equipment
 - your company name and address
3. In return you will receive an RMA number (Return Material Authorization) for reference purposes.
4. Include this RMA number as a reference with the equipment when you send it back to the manufacturer.

Related concepts

[Support information](#), page 14

Repairing the Sensor Unit

The Sensor Unit is not designed for customer maintenance. All repairs and modifications of the unit must be done by qualified personnel. Except installation of new software versions.

A failed unit should be shipped back to Kongsberg Discovery AS or other agreed service point for repair.

Related concepts

[Support information](#), page 14

Replacing the Sensor Unit

If the unit fails, it can be replaced by a spare unit. Local repair is not possible.

Prerequisites

Turn off all power to the system.

Context

The replacement unit is delivered with the latest version of the software.

Procedure

1. Disconnect the spider cable from the unit.
2. Unscrew the four screws which hold the unit to the mounting bracket.
3. Remove the unit from the mounting bracket.
4. Place the spare unit in the mounting bracket.
5. Refasten the four screws which hold the unit to the mounting bracket.
6. Reconnect the spider cable.

Repairing the Inertial Measurement Unit (IMU)

The Inertial Measurement Units in this system are the Motion Reference Unit (MRU), the Motion Sensor and Gyro Compass (MGC) or the miniMRU with their respective subsea bottles.

All repairs and modifications of the IMU and subsea bottles, except for installation of new software versions and user configuration, have to be carried out by Kongsberg Discovery AS.

CAUTION: _____



Opening the IMU housing will result in permanent damage to the unit and you should under no circumstances make any attempt to do so.

A failed unit should be shipped back to Kongsberg Discovery AS or other agreed service point for repair.

Related concepts

[Support information](#), page 14

Replacing the IMU subsea bottle or housing

You may want to install a spare subsea bottle or housing. For example if your bottle/housing is in for recalibration or pressure testing.

Context

The Inertial Measurement Units (IMU) in this system are the Motion Reference Unit (MRU), the Motion Sensor and Gyro Compass (MGC) or the miniMRU with their respective subsea bottles/housing.

Procedure

1. Disconnect the cable from the subsea bottle/housing.
2. Unscrew the M6 screws which hold the subsea bottle to the mounting structure.
3. Remove the subsea bottle or housing and replace it with a new one.
4. Refasten the M6 screws which hold the subsea bottle or housing to the mounting structure.
5. For MRU/MGC: Reconnect the cable to connector A on the connector lid.
6. For miniMRU: Reconnect the cable to the housing.

Troubleshooting

Topics

[System status, page 71](#)

[Investigating the "No connection" message, page 72](#)

[Investigating problems with output to external equipment, page 72](#)

[Investigating why all data quality status indicators are black, page 73](#)

[Investigating why all data quality status indicators are red, page 74](#)

[Investigating red Pos/Vel data quality indicator, page 74](#)

[Investigating yellow Pos/Vel data quality indicator, page 75](#)

[Investigating red Heave and Roll/Pitch data quality indicator, page 76](#)

[Investigating yellow Heave and Roll/Pitch data quality indicator, page 77](#)

[Investigating red Heading data quality indicator, page 77](#)

[Investigating yellow Heading data quality indicator, page 78](#)

[Investigating yellow Heave indicator in top bar, page 79](#)

[Investigating yellow Roll/Pitch indicator in top bar, page 80](#)

[Investigating echo sounder depth error, page 80](#)

[Improving heading calculation for high dynamic vessels, page 81](#)

[Enhancing performance by using GLONASS in RTK solution, page 82](#)

[Setting up Sensor Unit data distribution channel, page 83](#)

System status

The error conditions in the system are usually observed by looking at the system status field of the top bar.

The quality status information output on serial lines or Ethernet is the same as the data quality status indicated in the top bar.

Related concepts

[System status](#), page 40

Investigating the "No connection" message

If the top bar shows No connection, this can be due to a power failure or network problems.

Context

If the Sensor Unit does not receive power, the top bar will show No connection.

The Sensor Unit communicates through Ethernet and network problems will show this situation with the message No connection in the top bar.

Make sure that the correct IP address for the Sensor Unit is selected in the Seapath operator software in the **System** menu > **Operator SW** > **Data Source**.

Procedure

1. Power failure
 - a. Make sure that the Sensor Unit receives power.
2. Network problems
 - a. Make sure that you have the correct IP address for the Sensor Unit.
The default IP address of the Sensor Unit is given in the *Seapath 130 Installation Manual*.
 - b. Make sure that the external computer with the Seapath Operator software is set up to the same subnet as the Sensor Unit.

Investigating problems with output to external equipment

During operation situations may occur where the external equipment receives no data from the Sensor Unit.

Context

The system is connected to external equipment either through Ethernet or serial interface.

See a description of the external output configuration of the Sensor Unit in the *Seapath 130 Installation Manual*.

Procedure

1. Make sure that the Sensor Unit has power.
2. If Ethernet connection is used, make sure that you have the correct IP address for the Sensor Unit.
3. Make sure that the serial lines, the network cables and the cable connectors are not damaged.
4. Make sure that the external output configuration of the Sensor Unit is set up correctly in the **Nav Engine Configuration** dialog box > **Communication Interface** > **Input/Output**.

Investigating why all data quality status indicators are black

During normal operation it takes a minute from the Sensor Unit receives power until the four data quality status indicators in the top bar turn red.

Context

If the data quality status indicators are still black after three minutes, this must be investigated.

If the data quality indicators are still not turning red, contact your nearest Kongsberg Discovery office.

Pos/Vel	Heading
Heave	Roll/Pitch

Procedure

1. Power failure
 - a. Make sure that the Sensor Unit receives power.
2. Network problems
 - a. Make sure that you have the correct IP addresses for the Sensor Unit.
The default IP address of the Sensor Unit is given in the *Seapath 130 Installation Manual*.
 - b. Make sure that the external computer with the Seapath Operator software is set up to the same subnet as the Sensor Unit.

Related concepts

[Data quality status](#), page 40

Investigating why all data quality status indicators are red

During normal operation it takes up to 30 minutes from the Sensor Unit receives power until full accuracy on all data is obtained and the four data quality status indicators in the top bar change colour from red.

Context

If the data quality status indicators are still red after 30 minutes, this must be investigated.

If the data quality indicators are still red, contact your nearest Kongsberg Discovery office.

Pos/Vel	Heading
Heave	Roll/Pitch

Procedure

1. Make sure that the IMU (Inertial Measurement Unit) cable is properly connected to the Sensor Unit.
2. If it is not properly connected, turn off the power, reconnect the cable and turn the power back on.
3. Make sure that the installation location of the Sensor Unit complies with the instructions given in the *Seapath 130 Installation Manual*.

Related concepts

[Data quality status](#), page 40

Investigating red Pos/Vel data quality indicator

During operation situations may occur where the Sensor Unit does not receive any data from the GNSS receivers.

Context

Should such a situation occur, the **Pos/Vel** data quality status indicator in the top bar will turn red.

Procedure

1. Make sure that the Sensor Unit is not damaged.
If the unit is damaged it must be shipped back to Kongsberg Discovery AS for repair.
2. Make sure that the installation location of the Sensor Unit complies with the instructions given in the *Seapath 130 Installation Manual*.

Related concepts

[Data quality status](#), page 40

Investigating yellow Pos/Vel data quality indicator

During operation situations may occur where the system experiences reduced position/velocity.

Context

Should such a situation occur, the **Pos/Vel** data quality status indicator in the top bar will turn yellow.

A reduced position/velocity function may be due to lack of differential corrections or an incorrect antenna or IMU offset setup.

Procedure

1. Make sure that the DGNSS link is properly set up in the **NAV Engine Configuration**.
Select the **System** menu → **NAV Engine** → **Standard** → **Communication interface** → **Input/Output** → **DGNSSLink**.
2. Make sure that the vessel is in range of a radio reference station.
If the reference station is too far away or it is in the shadow of geographical obstructions or other equipment on board, reception may be unreliable or missing. The location of the reference stations connected to system is shown in the **DGNSS Monitor** under the **Tools** menu.
3. Make sure that the reference station is functioning.
Confirm the status of the reference station with the responsible authorities or contact your nearest Kongsberg Discovery AS office.
4. Make sure that the antenna or the IMU (Inertial Measurement Unit) offset setup is correct.
Make sure that the lever arms from NRP to antenna #1 and to the IMU are correct.
Select the **System** menu → **NAV Engine** → **Standard** → **Sensors** → **MRU/MGC** → **Geometry**. Make sure that the sign for each of the vector components is correct.

Related concepts

[Data quality status](#), page 40

[System menu](#), page 61

Investigating red Heave and Roll/Pitch data quality indicator

If the **Heave** and **Roll/Pitch** data quality indicators in the top bar are red, a possible cause can be that the Sensor Unit does not receive any data from the IMU (Inertial Measurement Unit); MGC, MRU or miniMRU.

Context

Use the **Port Monitor** tool to check for no data reception from the Inertial Measurement Unit.

Refer to the user manuals for the Motion Sensor and Gyro Compass (MGC), Motion Reference Unit (MRU) or miniMRU for troubleshooting of these units.

Pos/Vel	Heading
Heave	Roll/Pitch

Procedure

1. Make sure that the MGC/MRU/miniMRU cable is properly connected to the subsea bottle or housing.
2. Make sure that the MGC/MRU/miniMRU has power.
3. Make sure that you have selected the correct type of Inertial Measurement Unit for your system in the **NAV Engine Configuration** dialog box > **Sensors** → **MGC/MRU Geometry**.
4. Make sure that data are received on the MRU/MGC/miniMRU connector on the Sensor Unit by selecting the **Tools** menu > **Port Monitor** > **MGC** or **MRU**.

Result

If the above steps are OK, refer to the IMU troubleshooting sections.

Related concepts

[Tools menu](#), page 59

Investigating yellow Heave and Roll/Pitch data quality indicator

If the **Heave** and **Roll/Pitch** data quality indicators in the status indicators on the top bar are yellow, a possible cause can be that the data received from the Inertial Measurement Unit (IMU) are unstable.

Context

Use the **Data Viewer** tool to check for unstable data reception from the Inertial Measurement Unit.

If the system still does not receive signals from the Inertial Measurement Unit after you have carried out the checks below, then the IMU has most likely failed and it has to be shipped to Kongsberg Discovery AS for repair.

Pos/Vel	Heading
Heave	Roll/Pitch

Procedure

1. Select the **Tools** menu > **Data Viewer** > **PPS and time**. Check if the **Status** parameter under **PPS information** indicates **Sync**.
If this is the case, the Sensor Unit and the MGC/MRU are probably synchronized with GPS.
2. In order to be sure that the Sensor Unit receives MGC/MRU data on time, select the **Tools** menu > **Data Viewer** > **Time delay**.
The time delay for the **Raw MRU** parameter should be 0.020 seconds or less. If the time delay is greater than 0.020, the MGC/MRU cable carrying the PPS signal from the Sensor Unit is not properly connected.

Related concepts

[Data quality status](#), page 40

[Tools menu](#), page 59

Investigating red Heading data quality indicator

During operation situations may occur when the system does not receive any GNSS data from the antennas.

Context

Should such a situation occur, the **Heading** data quality status indicator in the top bar turns red. It indicates a problem with the heading calculation.

Procedure

1. Make sure that the antenna baseline parameters in the antenna configuration are set up correctly.
Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **GNSS** > **Geometry**.
If needed, re-measure and perform a new calibration of the antenna baseline.
2. Make sure that the system receives data from the GNSS receivers.
 - a. Use the **Port Monitor** tool to see if data are coming in to the system.
Select the **Tools** menu > **Port Monitor**. Select **GNSSA1** for antenna #1 and **GNSSB1** for antenna #2.
 - b. If no data appear on the **Port Monitor**, reset the GNSS receiver by selecting the **System** menu > **Restart** > **GNSS Receiver**.

Related concepts

[Data quality status](#), page 40

[System menu](#), page 61

[Tools menu](#), page 59

Investigating yellow Heading data quality indicator

During operation situations may occur when the system experiences reduced heading performance.

Context

If the system experiences reduced heading, the **Heading** data quality status indicator in the top bar turns yellow.

Procedure

1. Make sure that the IMU (Inertial Measurement Unit) is working as intended.
2. Make sure that the antenna baseline parameters in the antenna configuration are set up correctly.
Select the **System** menu → **NAV Engine** → **Standard** → **Sensors** → **GNSS** → **Geometry**.
If needed, re-measure and perform a new calibration of the antenna baseline.
3. Make sure that the system receives data from the GNSS receivers.
 - a. Use the **Port Monitor** tool to see if data are coming in to the system.
Select the **Tools** menu → **Port Monitor**. Select **GNSSA1** for antenna #1 and **GNSSB1** for antenna #2.

- b. If no data appear on the **Port Monitor**, reset the GNSS receiver by selecting the **System** menu > **Restart** > **GNSS Receiver**.
4. If the **Heading** indicator is still yellow, the GNSS receiver boards within the Sensor Unit may be damaged. Then the Sensor Unit must be shipped back to Kongsberg Discovery AS for repair.

Related concepts

[Data quality status](#), page 40

[System menu](#), page 61

[Tools menu](#), page 59

Investigating yellow Heave indicator in top bar

During operation situations may occur when the system experiences reduced performance in heave.

Context

Should such a situation occur, the **Heave** data quality status indicator in the top bar turns yellow. This situation may be caused by reduced performance in heave or depth errors in the centre beam of an echo sounder.

Note: _____



Be aware that the Seapath outputs heave measurements in the Navigation Reference Point (NRP) and not in the transducer location unless the vector from the NRP to the transducer head (Monitoring Point, MP) is entered into the operator software and defined on the output data string. Please note that the horizontal vector components from the NRP to MP are defined positive forward, to starboard and down.

Procedure

If there are oscillations in heave or in the depth of the centre beams, make sure that you have selected the correct **Heave filter** mode and **Heave period**.

Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **MRU/MGC** > **Heave config**.

Related concepts

[Data quality status](#), page 40

[System menu](#), page 61

Investigating yellow Roll/Pitch indicator in top bar

During operation situations may occur when the system experiences reduced performance in roll and pitch.

Context

Should such a situation occur, the **Roll/Pitch** data quality status indicator in the top bar turns yellow.

This situation may occur if the Sensor Unit's x-arrow is not properly aligned with the ship's longitudinal axis. A misalignment of only one degree will reduce the performance when exposed to heavy motions due to cross-coupled roll and pitch measurements.

Procedure

1. Make sure that the Sensor Unit yaw offset according to the ship's longitudinal axis is accurately measured and entered into the configuration software.
Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **MRU/MGC** > **Geometry**.
2. Make sure that the Sensor Unit is correctly calibrated.
Find out when the Sensor Unit was last calibrated. If it has been several years since the last calibration, contact Kongsberg Discovery AS customer support to check whether the Sensor Unit needs recalibration.

Related concepts

[Data quality status](#), page 40

[System menu](#), page 61

Investigating echo sounder depth error

Sometimes the system may experience depth errors in the outer beams on a multi-beam echo sounder.

Procedure

1. Make sure that the mounting angle around the z-axis is correct.
The oscillations in the depth of the outer beams are correlated with the pitch angle of the vessel. The sensor unit x-axis has to be parallel with the ship's longitudinal axis as long as the echo sounder transducer head is aligned with the ship axes.

2. Make sure that the distance vector from origin to the IMU and the GNSS antenna is correct, both with regard to length and sign.

The oscillations in the depth of the outer beams are correlated with the roll angle of the vessel. Make sure that the distance vector from the ship's origin to the IMU (Inertial Measurement Unit) is input correctly both when it comes to the length and the sign. Also make sure that the vector from origin to GNSS antenna no. 1 is input correctly both when it comes to the length and sign. Make sure that the sign in the vertical direction has a negative sign. This sign shall always be negative. Look at the background vessel in the **NAV Engine Configuration** to make sure that the arms and vector signs look correct.

3. Make sure that the measurements from the data sources are handled correctly. There is incorrect synchronisation of the Seapath and the multi-beam data (timing error). Make sure that the measurements from the two data sources are handled correctly and that a timing error has not occurred. Post-processing of the Seapath and the multi-beam data can be used to analyse whether incorrect synchronisation is the reason for the depth errors.

Improving heading calculation for high dynamic vessels

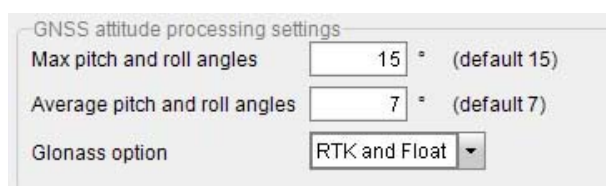
Sometimes vessels may experience situations with unstable heading calculations.

Context

The **GNSS Attitude Processing** settings in the **NAV Engine Configuration** allows you to improve heading calculations for vessels which experience a roll of more than 15 degrees.

If the vessel has a roll and pitch above 15 degrees, the system will have problems with heading calculations. The maximum values can be changed if the vessel has an unusual characteristic.

With the **Glonass option** parameter you can decide whether GLONASS satellites shall be used in the heading solution or not. The default setting is **RTK and Float**.



GNSS attitude processing settings

Max pitch and roll angles	15 °	(default 15)
Average pitch and roll angles	7 °	(default 7)
Glonass option	RTK and Float ▼	

Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **GNSS** > **Attitude Processing**.
2. Type the wanted degrees for **Max pitch and roll angles**.
3. Type the wanted degrees for **Average pitch and roll angles**.
4. In the **Glonass option** drop-down list, select if you want GLONASS satellites to be used in the heading solution.
 - **Off**: GLONASS satellites are not used.
 - **RTK and Float**: This is the default values.
 - **Float only**: This option should only be used by advanced users after advice from Kongsberg Discovery AS customer support.
5. Select **Apply** to save the settings.

Related concepts

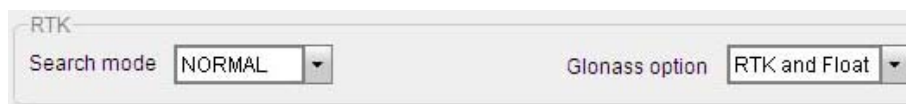
[System menu](#), page 61

Enhancing performance by using GLONASS in RTK solution

The RTK (Realt Time Kinematic) parameters allow you to enhance the precision of position data which are derived from satellite-based positioning systems, such as GPS and GLONASS.

Context

These settings can be changed to optimise the performance in RTK mode.



Search mode

The default search mode is **Normal**. **Safe** mode is recommended used under difficult conditions with much multipath or ionospheric activity and for long baselines. **Fast** mode is recommended used when a fast RTK solution is required.

Note: _____



*In **Fast** mode the probability for an incorrect solution from the system will increase.*

Glonass option

The default setting is **RTK and Float**. The **RTK and Float** option is recommended used under conditions where the RTK correction source is known (own local reference station). The **Float only** option is used when the system has problems with getting an RTK solution. The **Off** option is used when the RTK corrections include only dual frequency GPS corrections.

Procedure

1. Select the **System** menu → **NAVEngine** → **Standard**.
2. Select **Sensors** → **DGNSS** → **RTK**.
3. In the **Search mode** drop-down list, select the wanted search mode if you do not want the default mode **Normal**.
4. In the **Glonass option** drop-down list, select the wanted parameter if you do not want the default parameter **RTK and Float**.
5. Select **Apply** to save the settings.

Related concepts

[System menu](#), page 61

Setting up Sensor Unit data distribution channel

You can select the distribution channel for data from the NAV Engine software running on the Sensor Unit to the operator software (HMI).

Context

Important:

*The **UDP address** and **UDP port** parameters entered here have to match the **IP Address** and **IP Port** settings in the **Data Source** tab in the **Operator software configuration**.*

Data pool parameters	
Processing unit name	Unit #1
Network interface name	LAN2 (10.0.60.211)
UDP address	239.255.0.60
UDP port	31000

Procedure

1. Select the **System** menu > **NAVEngine** > **Standard** > **Communication interface** > **Data Pool**.
2. Type an identifying name for the Sensor Unit in the **Processing unit name** box.
3. Type the **UDP address** to which the NAV Engine shall send data.
4. Type the **UDP port** to which the NAV Engine shall send data.
5. Select **Apply** to save the settings.
6. Select the **System** menu > **Operator SW** > **Data Source** to change the operator software settings to reflect the new data pool parameters.

Related concepts

[System menu](#), page 61

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