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Installation Manual

Seapath® 385 series

GNSS Aided Inertial Navigation System

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Seapath 385

GNSS aided Inertial Navigation System

Installation manual

110-0060204/E

Document history

Document number: 110-0060204 / Revision E		
Rev. A	February 2024	First issue.
Rev. B	May 2024	Updated accuracy values for roll and pitch. New wiring drawing. Updated table "Wiring for cable between Processing Unit and MGC Junction Box".
Rev. C	August 2024	Updated topic "Survey accuracy values".
Rev. D	May 2025	Added NTRIP client configuration.
Rev. E	September 2025	Antenna mounting kit is now optional item.

Document information

- Product: Seapath 385
- Document: Installation manual
- Document part number: 110-0060204
- Revision: E

Copyright

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:

Kongsberg Discovery AS

support.seatex@kd.kongsberg.com. If you need information about our other products, visit http://www.kongsberg.com/discovery.

Table of contents

About this manual

Purpose of manual

The purpose of this publication is to provide the descriptions and procedures required to install and configure the Seapath 385 product.

MGC and MRU components

This publication does not include the installation of the Motion Gyro Compass (MGC) and the Motion Reference Unit (MRU). Refer to the *MGC Installation Manual* and the *MRU Installation Manual* for information about these items.

Target audience

The publication is intended for technical personnel such as skilled shipyard and factory workers, electricians, qualified engineers, and naval architects.

License information

An export license is required for the export of the Inertial Measurement Units MGC and MRU.

Registered trademarks

Subscriptions

If you want to use the Seastar® high performance position services from Fugro Norway AS, this requires a subscription. For a subscription, contact Seastar® GNSS support.

- https://fsp.support/seastar/index.php?tab=contacts

Maintenance purposes

This publication is also intended as reference material for the maintenance personnel. Keep this publication for later use.

Seapath 385

Topics

System description

The Seapath 385 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 inertial technology and processing algorithms with multi-frequency GPS, GLONASS, Galileo and Beidou satellite signals.

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 385 series is delivered in the following product range:

Seapath with MRU (Motion Reference Unit)

- Seapath 385-3 with MRU 3 to 0.010° roll and pitch accuracy

- Seapath 385-5 with MRU 5 to 0.008° roll and pitch accuracy
- Seapath 385-5+ with MRU 5+ to 0.005° roll and pitch accuracy

Note:

The MRU 3 model part of Seapath 385-3 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 385-3 will be degraded.

Seapath with MGC (Motion Sensor and Gyro Compass)

- Seapath 385-R2 with MGC R2 to 0.008° roll and pitch accuracy
- Seapath 385-R3 with MGC R3 to 0.007° roll and pitch accuracy
- Seapath 385-R4 with MGC R4 to 0.005° roll and pitch accuracy

The advanced Seapath navigation algorithms integrate the RTK GNSS data with the inertial sensor data. This gives the Seapath 385 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 to provide position, velocity and also heading measurements when GNSS is not available.

The Seapath 385 software has improved algorithms for position drift after GNSS dropout. The plots show typical position drifts.

Figure 1: Position drift in meters after GNSS dropout in minutes for MGC R2, R3, R4

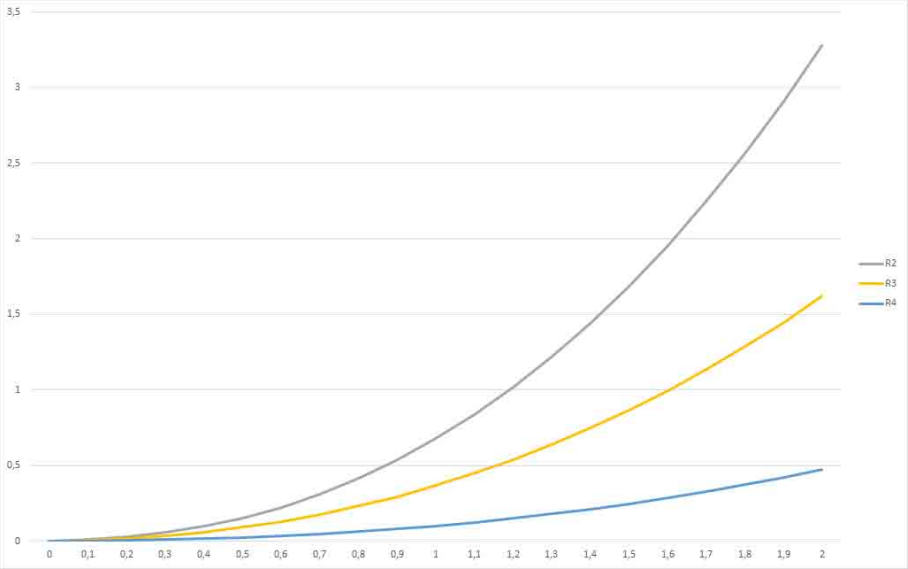
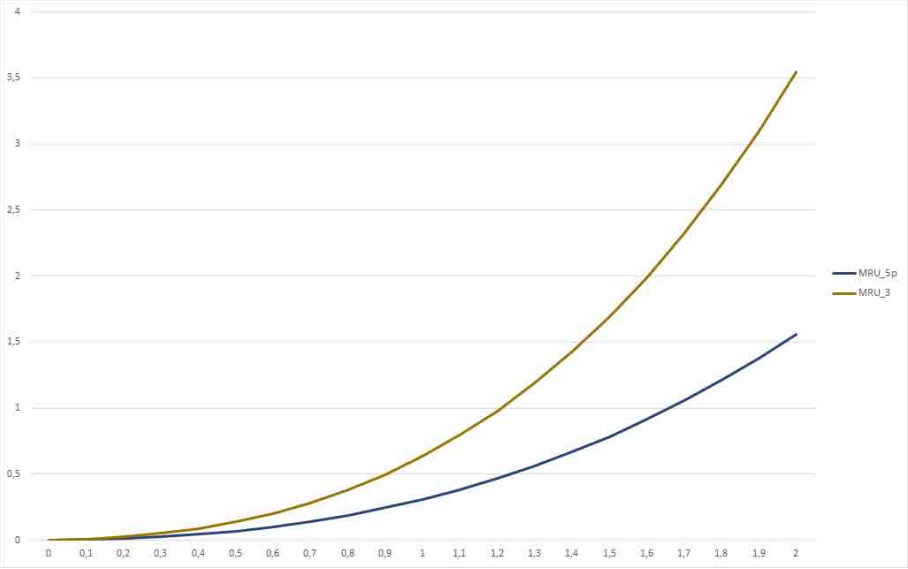


Figure 2: Position drift in meters after GNSS dropout in minutes for MRU 3, 5, 5+



The product has a total of 16 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.

For surveys where RTK position accuracy is not required in real-time, the Seapath has the possibility to log raw satellite data for post processing. Centimetre position

accuracy can be achieved through download of satellite orbit and clock data from the internet and by post processing the satellite data.

By utilising standard DGNSS, Fugro Seastar® XP2/G2/G4/G4+, VERIPOS Ultra/Ultra[2], C-NavC[1], C-NavC[2] 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.

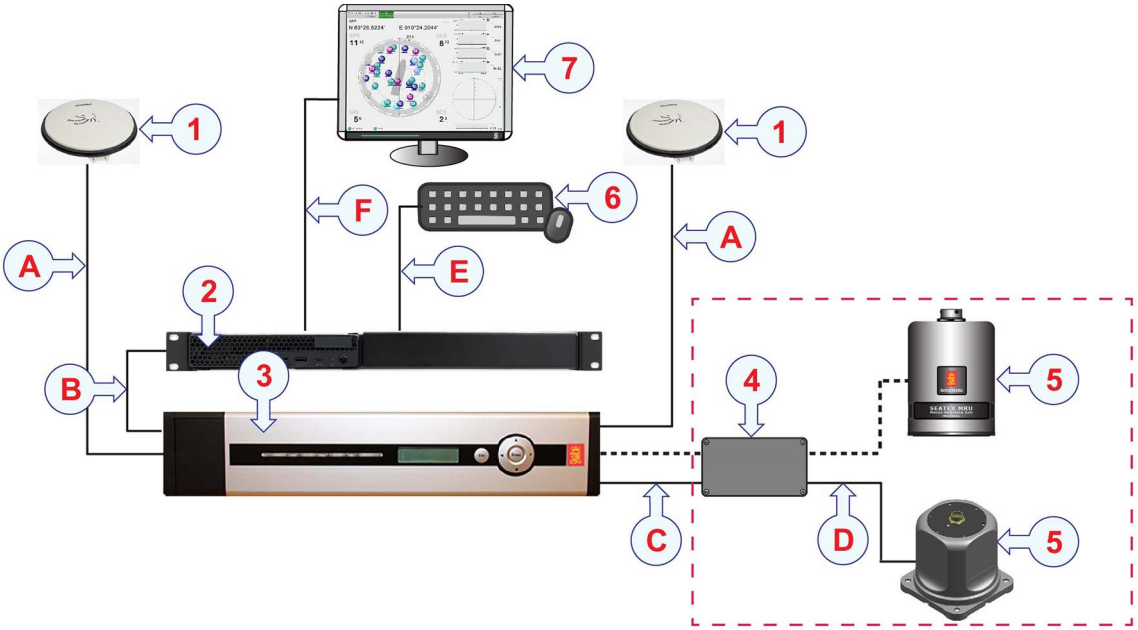
The combination of GNSS signals and inertial data enables much better performance than each of the signals alone, with high output data rate (up to 200 Hz), zero delay on output data, data available in up to eight different monitoring points and a total of eight configurable serial lines and five configurable Ethernet LANs.

This Seapath product is a two-module solution with a Processing Unit and an HMI Unit connected via Ethernet. The Processing Unit runs all critical computations independent of the user interface on the HMI Unit to ensure continuous and reliable operation. The HMI Unit present the vessel motion in a simple and easy-to-understand format to ensure that the decision making based on the available data is as efficient as possible.

System diagram

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

The Inertial Measurement Unit connected to the Processing Unit can either be a Motion Sensor and Gyro Compass (MGC) or a Motion Reference Unit (MRU). The IMU components in the red square are not a part of a standard delivery.



Units

1. *GNSS antennas*
2. *HMI Unit*
3. *Processing Unit*
4. *IMU Junction Box*
5. *Inertial Measurement Unit (MGC or MRU) (Not part of standard delivery)*
6. *Keyboard and mouse (Not part of standard delivery)*
7. *Display (Not part of standard delivery)*

Cables

A. *Antenna cables*

B. *Ethernet cable*

C. *Processing Unit to IMU junction box cable*

D. *IMU cable (Attached to IMU junction box)*

E. *Keyboard/mouse cable*

F. *HDMI cable/Display Port cable (Not part of standard delivery)*

Scope of supply

The Seapath system comprises the Processing Unit, the HMI Unit with operational software, GNSS antennas and user documentation. The basic items are included in the delivery. Additional optional items can be purchased from Kongsberg Discovery AS.

Basic items

- 1 ea Processing Unit (2U)
- 1 ea HMI Unit (1U)
- 2 ea GNSS antenna
- 2 ea Interconnection cables

  One for Processing Unit end of coax cable. One for antenna end of coax cable.
- 1 ea Inertial Measurement Unit

  MGC or MRU (a part of this delivery or an existing unit)
- 1 ea Ethernet switch kit (8-port)
- 2 ea End-user documentation

Additional required items

The following additional items are required for installation and/or operation. They can be ordered from Kongsberg Discovery AS or purchased locally.

- 1 ea 19" rack for mounting of the rack components

  Minimum 4U space is required if rack-mountable keyboard/mouse is used
- 1 ea Keyboard and mouse
- 1 ea Display

  Recommended resolution 1280 x 1024. Minimum resolution 1024 x 768.
- 2 ea GNSS antenna cables

Additional optional items

The following additional optional items can be used together with the Seapath 385.

- 1 ea Inertial Measurement Unit

  MGC or MRU (a part of this delivery or an existing unit)
- 1 ea DGNSS Receiver
- 1 ea Antenna bracket of 2.5 or 4 metres baseline length
- 2 ea GNSS antenna mounting kit

Main system units

Topics

Processing Unit description

The Processing Unit runs the processing software. The unit receives GNSS signals from the external antenna. The signals are processed and the calculated position and velocity data are sent to external equipment.

The unit has interfaces to an IMU and other external equipment.

The unit is a 2U unit designed to fit standard 19-inch racks. It is typically installed on the bridge or in the instrument room. The unit comprises the following main parts.

- Solid state disks.
- I/O board with serial communication, Ethernet and 1PPS.
- Computer module.
- GNSS receiver(s)
- Power supply.

The power on/off switch, local area network (LAN) port and USB connection are located behind the lid to the left on the front panel. Push lid on left side to open. These ports are individually galvanically isolated.The rear panel of the unit contains communication interface ports for interfacing to external equipment.

Related concepts

Processing Unit interfaces, page 183

HMI Unit description

The HMI Unit holds the operator software which is used for configuration of the system and

performance monitoring. You can have several HMI Units connected to one Processing Unit.

The unit is a 1U unit designed to fit standard 19-inch racks. It is typically installed on the bridge or in the instrument room.

The front panel of the unit contains a configurable USB port and the on/off button.

The rear panel of the unit contains a power inlet, a Display Port, four USB ports, one HDMI port and five Ethernet ports.

Related concepts

HMI Unit interfaces, page 191

GNSS antenna description

The GNSS antenna receives signals from GPS, GLONASS, BeiDou and Galileo systems. It supports all GNSS constellations and frequencies. The antenna has L-Band signal reception. The multi-point antenna feed provides stable phase centre and enhanced multipath rejection. It is able to track low elevation satellites.

The antenna is enclosed in a durable, waterproof housing. It meets MIL-STD-810G specifications for vibration and salt fog.

The internal thread is 5/8 x 11 (standard marine mount). The GNSS antenna has a type TNC connector.

Power is supplied on the coaxial cable from the Processing Unit.

- **Manufacturer**: NovAtel
- **Manufacturer's website**: http://www.novatel.com/

Product restrictions

Topics

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 Processing Unit, HMI Unit or the Inertial Measurement Unit (IMU) housing has been opened by the customer in an attempt to carry out repair work.
- The IMU is not shipped in the original transportation box.
- The IMU has been exposed to extreme shock and vibrations.
- Incorrect power connection.
- Short-circuiting of antenna cables during operation of the system.

Restrictions in export

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

- MGC R2/R3/R4
- MRU 5+/5

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.

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.

It is designed for use on-board marine surface operated vehicles with a linear acceleration less than ±45 m/s^2 (±4.5 g). And an angular rate range less than ±75°/s.

Specifications are valid without multipath, without shadowing of antennas and for typical survey operations.

Health and safety

Operation or troubleshooting of this equipment will not imply any risk for high voltages, explosions or exposure to gas. The equipment complies with IEC 61010-1/EN 61010-1 standards regarding product safety (low voltage).

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 385 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 385 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 385 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 385 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.

Related tasks

Setting up NTRIP client, page 141

Preparations

Topics

Mechanical drawings

Outline dimension drawings are included in this manual.

Unless otherwise specified, all measurements are in millimetres. The drawings are not to scale.

Related concepts

Drawings, page 165

Necessary tools and equipment

We assume that you are equipped with a standard set of tools. This tool set must comprise the normal tools for electronic and electromechanical tasks. This includes different screwdriver types, pliers, spanners, a cable stripper, etc. Each tool must be provided in different sizes. We recommend that all tools are demagnetized to protect your equipment.

Unless otherwise stated, all mounting hardware (such as bolts, nuts, washers, screws etc.) referred to in this document is to be supplied by the customer or the shipyard.

Location of hardware units

Topics

Processing Unit and HMI Unit location

Consider these factors when installing the unit.

- The unit is designed for indoor installation. The best location is typically in the instrument room or on the bridge.
- The unit fits on rails in a 19-inch rack or console.
- The unit has an internal fan and requires free airflow from the rear and out to the sides It is recommended that ventilation or air conditioning is provided to keep the ambient operating temperature at around 20 °C.
- Avoid placing the unit in locations with heavy vibrations, strong electronic fields (close to transformers) and/or excessive heat.
- Keep the area around the unit free from dust and static electricity.
- All connections to the unit are at the rear of the unit. Available space for cable connections and servicing must be provided.

Related concepts

Installing the Seapath units, page 58

Related references

Processing Unit dimensions, page 166
HMI Unit dimensions, page 168

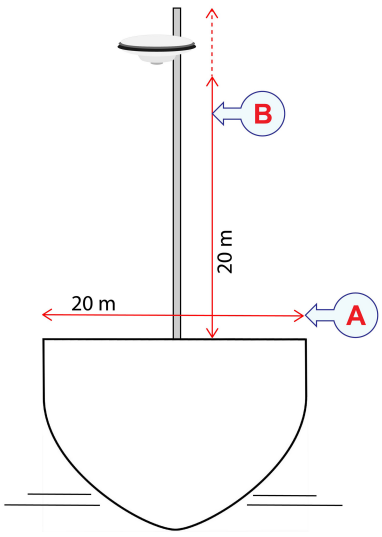
GNSS antenna location

Before mounting the antenna, select a location for best possible performance.

Consider these factors when installing the antenna.

- The antenna should have an unobstructed line-of-sight to the sky.
- Mount the antenna as high as possible.
- Mount the antenna in a location protected from direct illumination of radar beams and other transmitting antennas.

  Seapath is more sensitive to blocking and reflections (multipath) of GNSS signals than GNSS sensors which only use pseudo-range data. This is because Seapath also uses carrier phase measurements for heading determination, and both GNSS antennas need to see at least four common satellites at the same time.
- Mount the antenna away from areas which experience high vibrations, excessive heat, electrical interference and strong magnetic fields.
- Mount the antenna as far as possible away from reflective objects and water bodies.
- In order to reduce problems due to multipath effects, the antennas have to be mounted above the nearest deck at a height witch is equal to the width of this deck, or higher.



A. *Width of deck*

B. *Height of antenna must be equal to width of deck or higher*

- Mount the antenna bracket in such a way that the torsion movement relative to the vessel's hull is kept at an absolute minimum.

Note:

If the antenna bracket supplied by Kongsberg Discovery is not used, it is important that the antennas are rigidly mounted so that the distance between the antennas does not change due to vibrations or accidental dislocation.

- The antenna baseline length is recommended in the range 2.5 to 4.0 metres, but the length can be selected freely (no limitation in length). Maximum heading accuracy is achieved at 4.0 metres baseline.

Related concepts

Installing GNSS/DGNSS antennas, recommended practice, page 31
Antenna arrangements for various vessel types, page 35
Installing antenna cables, recommendations, page 36

Related tasks

Mounting the GNSS antennas as stand-alone units, page 50
Mounting the GNSS antennas on antenna bracket, page 54

Related references

GNSS antenna dimensions, page 169

Display location

Consider these factors when installing the display.

- The best location is typically on a table in the instrument room or on the bridge. A location on the ceiling is also possible.
- Place the display close to the HMI Unit in order to reduce the length of the Display Port/HDMI cable.
- It is recommended that the area around the display is kept free from dust and static electricity.
- For best readability, the display must be protected from glare and have the correct height and angle.

The display is not a standard part of the delivery. This is a commercial item that can be purchased locally.

Installing GNSS/DGNSS antennas, recommended practice

GNSS and DGNSS antennas are critical for operation and their location on the vessel must have high priority. Antenna location, separation and cable quality should be considered, as incorrect or inadequate installation can lead to poor positioning performance or complete loss of position. If the antenna is installed in a poor location, it can suffer from masking, multipath or interference from other radio sources which can affect the position performance.

Antenna location and separation

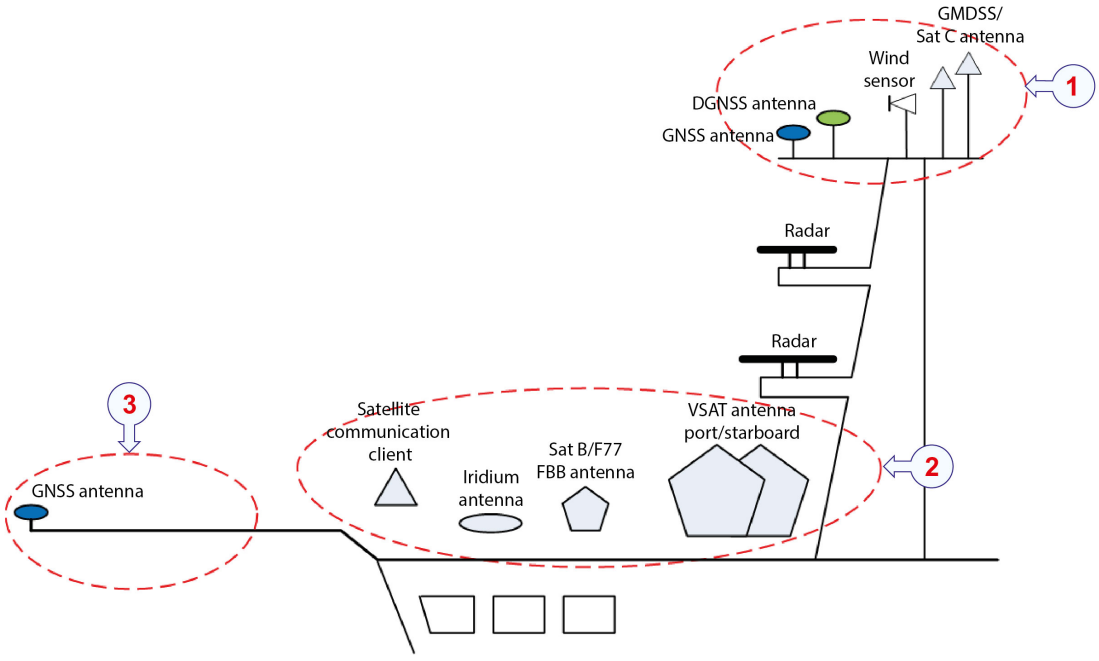
GNSS and DGNSS antennas should be separated both horizontally and vertically to reduce the risk of in-band interference, lightning strike and mechanical damage. If space is limited, DGNSS antennas should get the better location.

Antenna separation can be problematic for vessels with limited space in the main mast. A possible solution can be to locate GNSS/DGNSS antennas on the port and starboard sides of the instrument mast. A helideck location is also an option for GNSS antennas.

For drilling units the top of the derrick is also a possible location for GNSS/DGNSS antennas.

Operation in arctic areas require special attention for DGNSS antennas and the antenna location must be customized for each vessel. Depending on the operation, it might be required to double or triple the number of DGNSS antennas to avoid heading dependency due to local shading and roll and/or pitch.

A general antenna arrangement including satellite communication is illustrated.



Antenna locations

1. *Protected area*
2. *Open area (risk of interference)*
3. *Helideck*

Masking

The GNSS antenna should have an unobstructed line of sight to the sky. The signals from the satellite propagate by line-of-sight, which means that if the antenna cannot see the satellite, the reception will be severely impaired, if it occurs at all.

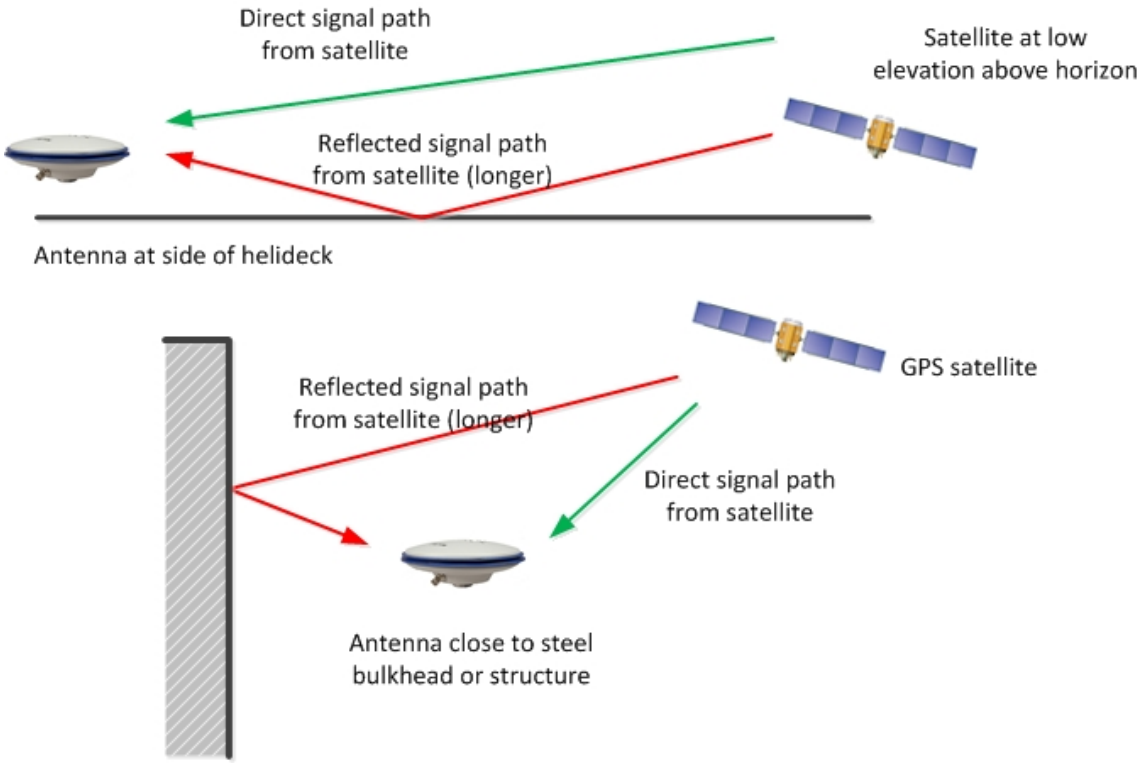
Potential obstructions are other masts and antennas, cranes, rigs and fixed platforms, buildings in ports, high cliffs or hills close to shore. The impact of this can be anything from degraded performance to a complete loss of positioning.

Crowded mast

Good antenna location

Multipath

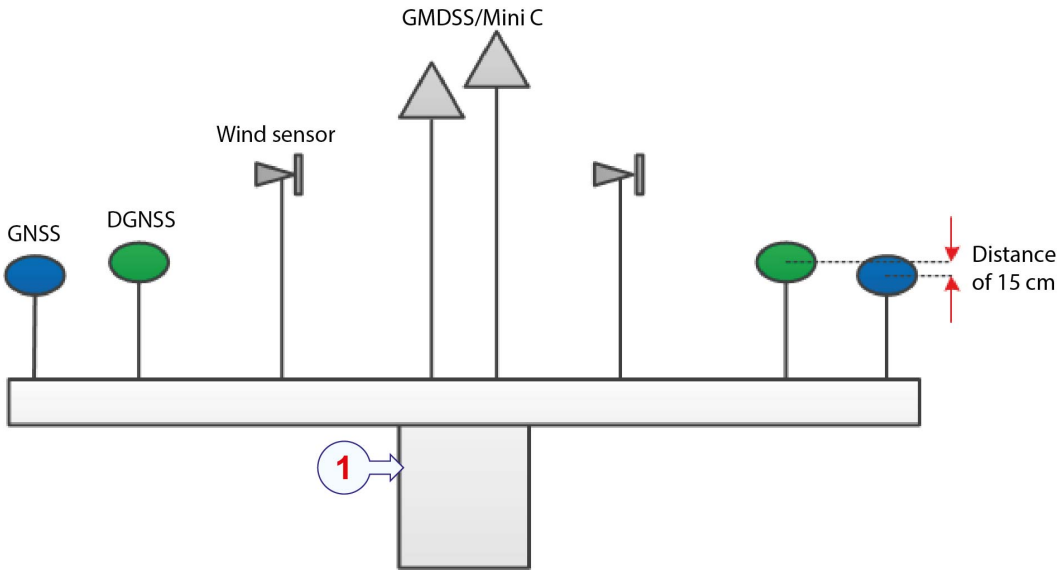
Inappropriate location of the antenna can result in the antenna receiving reflections of the incoming signal as well as the signal itself (multipath). The reflected multipath signal takes a longer path than the direct signal, introducing an error into the position calculation.



Interference from other radiating sources

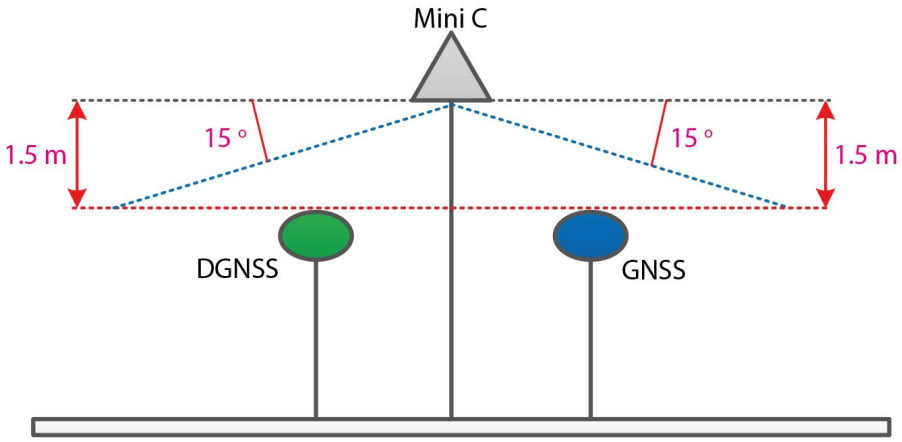
Interference can be caused by close proximity to other radiating sources. Installing GNSS antennas in close proximity to satellite communication systems operating in or nearby GPS/GLONASS frequency bands (1.2 to 1.6 GHz) should be avoided (i.e. Sat C, Iridium). Ideally the antenna should be situated at a minimum of 3 metres from other radiating sources. As this is not always practically possible, a compromise location must be sought.

A typical antenna distribution is illustrated.



1. *Radar mast/instrument mast*

GNSS/DGNSS antennas must not be placed within the Mini C antenna beam (15 degrees below the Mini C antenna's horizontal plane). The vertical separation should be at least 1.5 metres.



During installation, comprehensive tests should be carried out for potential interference by conducting transmissions from each RF source for extended periods, individually and simultaneously.

Related concepts

GNSS antenna location, page 29
Technical specifications, page 170

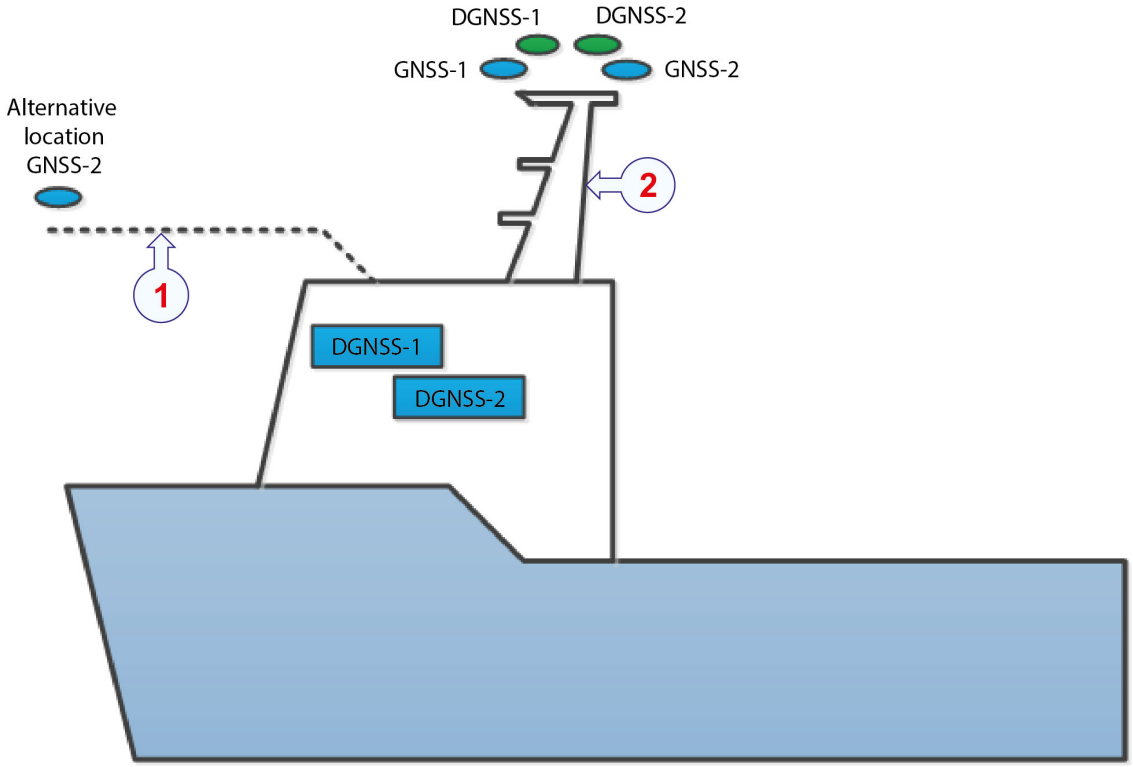
Related tasks

Mounting the GNSS antennas as stand-alone units, page 50
Mounting the GNSS antennas on antenna bracket, page 54

Antenna arrangements for various vessel types

The illustrations show typical antenna arrangements for various types of vessels.

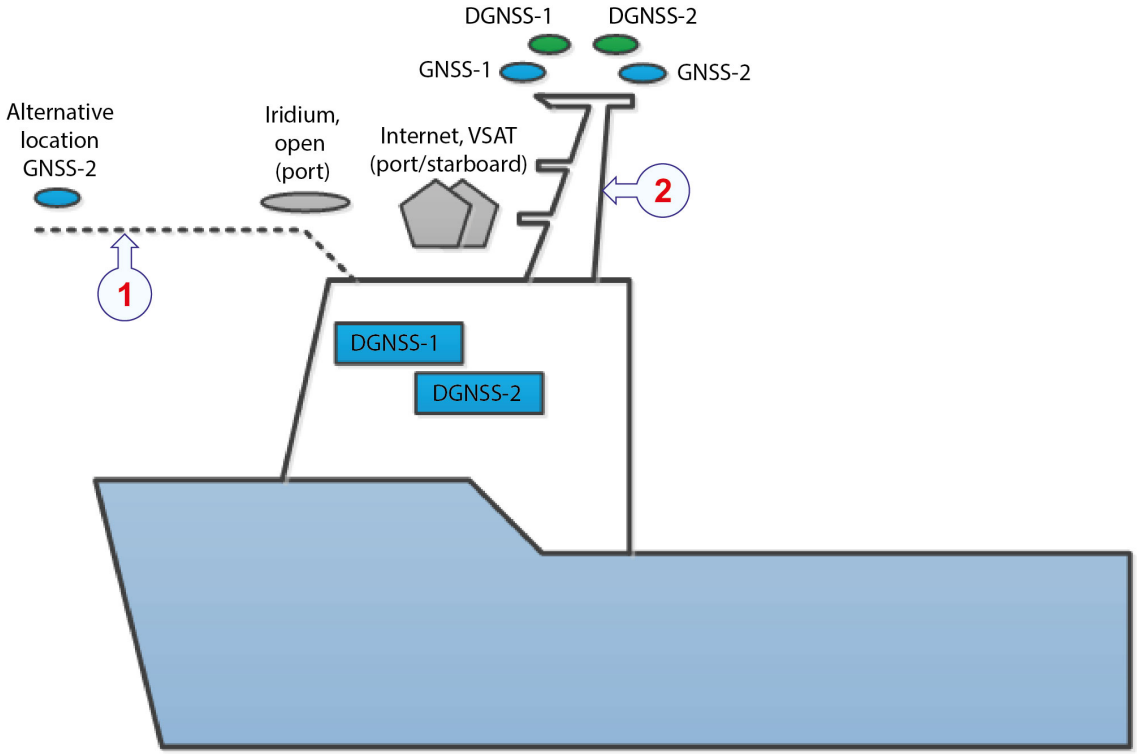
Survey vessel arrangement



Antenna locations

1. *Helideck*
2. *Radar mast*

Arctic/ice breaker arrangement



Antenna locations

1. *Helideck*
2. *Radar mast*

Related concepts

GNSS antenna location, page 29

Related tasks

Mounting the GNSS antennas as stand-alone units, page 50
Mounting the GNSS antennas on antenna bracket, page 54

Installing antenna cables, recommendations

Correct handling, installation and connection of the antenna cable(s) are vital for optimum system performance.

As the signals involved are basically weak radio frequency (RF) signals, it is important to consider which type of cable to use and how best to install and connect the antenna cables.

Attenuation of GNSS signals should be considered when selecting the cable type, as signal loss will determine the maximum length of the cable. The number of connectors which will attenuate the radio signal must be taken into account. Other components, such as lightning protectors, should also be considered.

Note that a too powerful radio signal may cause saturation of the receiving circuitry in shorter cable runs. Then it may be necessary to use signal attenuators or cables with higher attenuation levels.

The maximum length for each of the antenna coaxial cables is 100 metres for the cable type normally delivered with the system (½" Superflex).

As far as practically possible, antenna cables should be kept separate from other cables which may cause electrical interference. Such as power cables and radio transmitter cables.

Outdoor cable connections should be sealed with self-amalgamating tape or similar to keep out water. Make sure that all cable connectors are properly fastened.

Do not twist cables or force cables into sharp bends. This may damage the cables and cause system failure.

Avoid high temperature exposure for the cables. Make sure that the cable runs are not close to hot working areas or touching hot surfaces.

Secure the cables with clamps if you have long cable runs. It is recommended to label the cables for identification purposes.

After installation, make sure that any excess cable is looped and clamped or tied safely away from any control cables, fuel lines, hydraulic lines or moving parts. It is recommended to form loops with a cable bend radius of at least 150 mm.

Related concepts

GNSS antenna location, page 29
Terminating coaxial cables, page 38

Related tasks

Mounting the GNSS antennas as stand-alone units, page 50
Mounting the GNSS antennas on antenna bracket, page 54

Related references

Cable specifications, page 178

Terminating coaxial cables

Related concepts

Installing antenna cables, recommendations, page 36

Topics

About coaxial cable termination

If you do not have a coaxial cable with a connector attached, you must attach the connector to the cable yourself.

You can strip the coaxial cable with or without the use of a stripping tool. A stripping tool is a commercial item and can be purchased in any hardware store.

Connector definitions

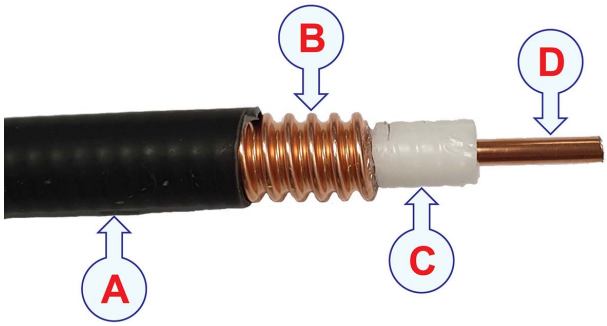
A. *Connector head*

B. *Cable entry*

C. *Back nut*

Cable definitions

This is a superflexible RFF ½" coaxial cable.



A. *Cable jacket*

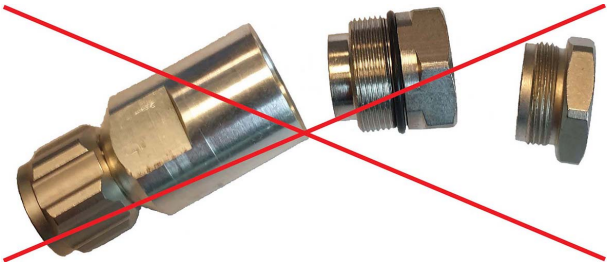
B. *Outer conductor*

C. *Dielectric insulation*

D. *Inner conductor*

You must NOT separate the connector.

The connector is OK.



The connector is NOT OK.

Terminating coaxial cables with stripping tool

If you do not have a coaxial cable with a connector attached, you must attach the connector to the cable yourself.

Prerequisites

The following specific items are required for this task:

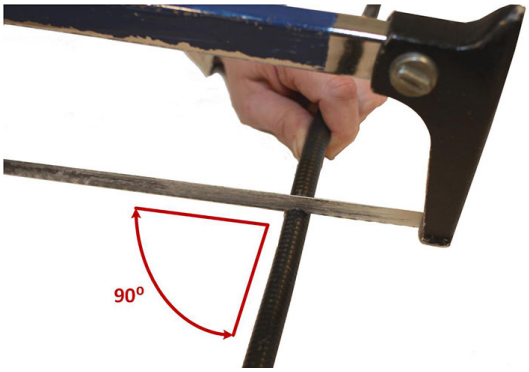
1. Metal-cutting saw
2. Spanners, 21 mm, 22 mm
3. Utility knife
4. Abrasive paper
5. Stripping tool

Context

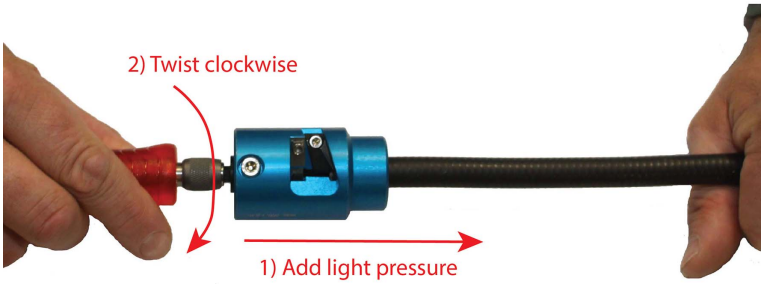
This procedure applies to a superflexible RFF ½" coaxial cable.

Procedure

1. Cut the cable off square, perpendicular to the cable axis.



2. Strip the cable.
   a. Hold the cable and place the stripping tool on the end of the cable.
   b. With a light pressure, press the stripping tool onto the cable while twisting the stripping tool clockwise.



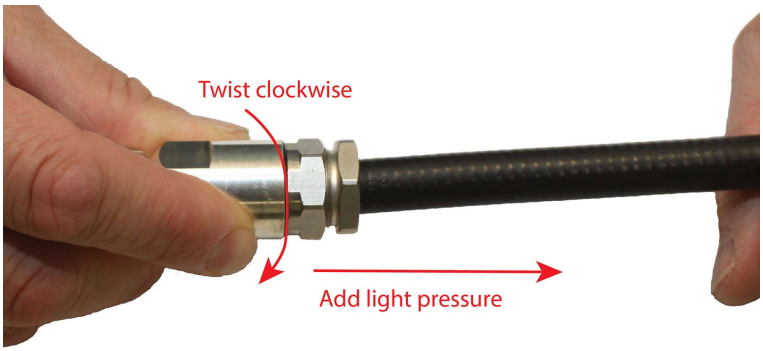
   c. Pull back the cable.

   The cable should now look like this.

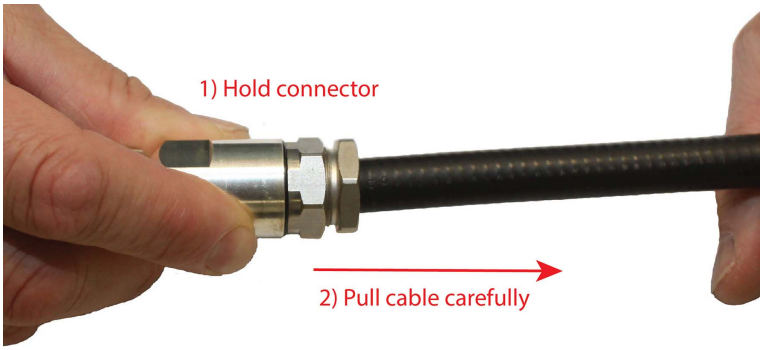
   Make sure that the cut looks clean and smooth, so that when you screw the connector onto the cable end, the outer conductor will not be damaged.

3. Carefully clean the inner conductor. Use the abrasive paper.

4. Mount the connector.
   a. Push the connector onto the prepared cable end until it stops.
   b. Screw the connector onto the cable until it stops. Do not use excessive force.

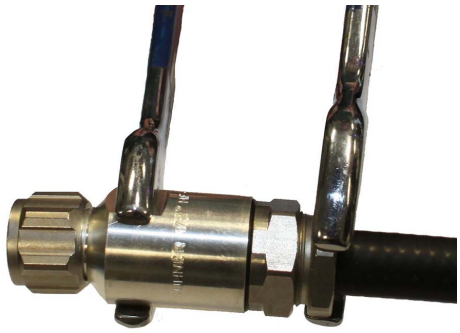


5. Check the connector seat.
   a. Pull the cable while holding the connector. The cable should not be pulled out of the connector.



6. Tighten the connector cable entry.
   a. Use the spanners to hold the connector head and the cable entry.
   b. Tighten with a torque of approximately 25 Nm. Rotate the cable entry only.

7. Tighten the back nut.
   a. Use the spanners to tighten the back nut of the connector until it stops.



8. Fasten the mated connector pair. Tighten with a torque of approximately 3 Nm.

9. Apply water protection.
   a. Cover both connectors with self-vulcanising tape.
   b. Apply a layer of electrical tape on top to protect against ultraviolet (UV) radiation. UV rays will harden the self-vulcanising tape and reduce the water protection.
   c. You can also use heat shrink or cold shrink tube to waterproof the connector.

Terminating coaxial cables without stripping tool

If you do not have a coaxial cable with a connector attached, you must attach the connector to the cable yourself.

Prerequisites

The following specific items are required for this task:

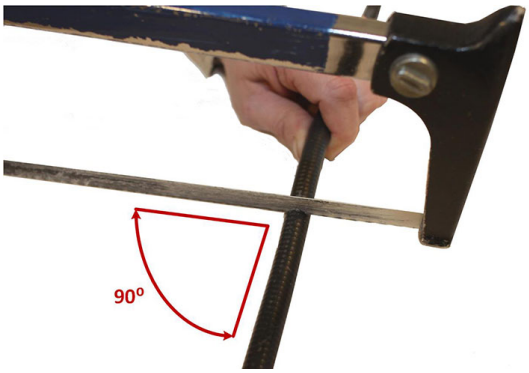
1. Metal-cutting saw
2. Spanners, 21 mm, 22 mm
3. Utility knife
4. Abrasive paper
5. File tool
6. Measurement tool

Context

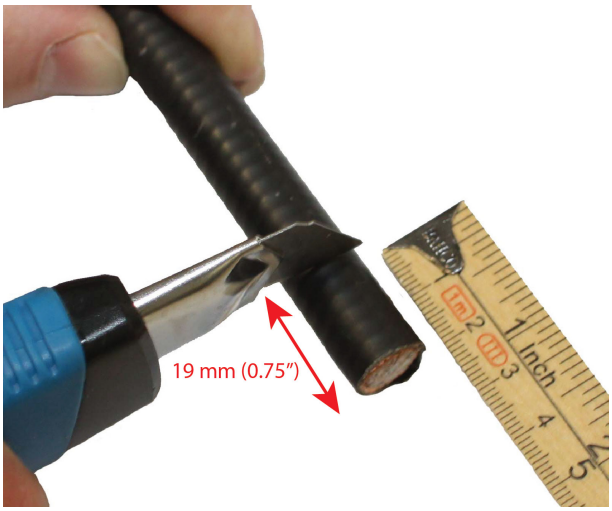
This procedure applies to a superflexible RFF ½" coaxial cable.

Procedure

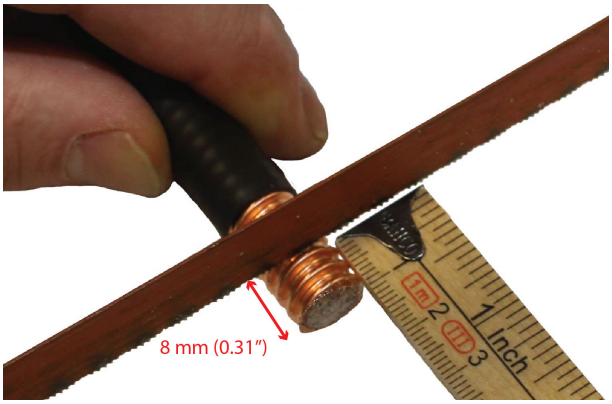
1. Cut the cable off square, perpendicular to the cable axis.



2. Strip the cable.
   a. Cut back the cable jacket 19 mm (0.75") from the cable end.
      Be careful so you do NOT damage the inner conductor.

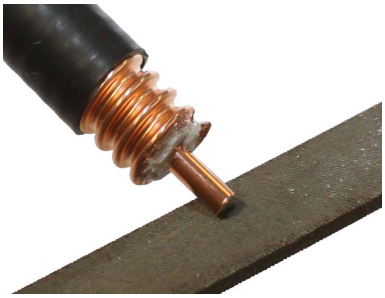


b. Cut back the outer conductor 8 mm (0.31") from the cable end.



c. Remove the dielectric insulation..

d. Chamfer the inner conductor by using the file.



3. Carefully clean the inner conductor. Use the abrasive paper.

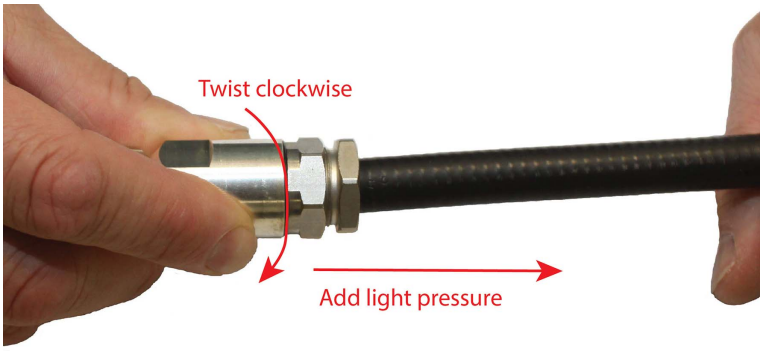
   The cable should now look like this.

   Make sure that the cut looks clean and smooth, so that when you screw the connector onto the cable end, the outer conductor will not be damaged.

4. Mount the connector.

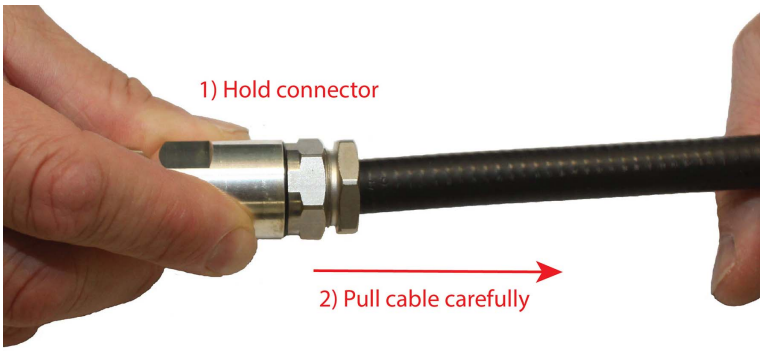
   a. Push the connector onto the prepared cable end until it stops.

   b. Screw the connector onto the cable until it stops. Do not use excessive force.



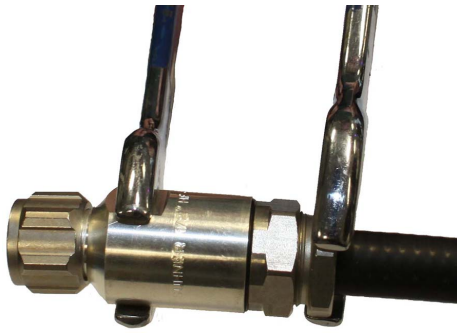
5. Check the connector seat.

   a. Pull the cable while holding the connector. The cable should not be pulled out of the connector.



6. Tighten the connector cable entry.
   a. Use the spanners to hold the connector head and the cable entry. Rotate the cable entry only.
   b. Tighten with a torque of approximately 25 Nm.

7. Tighten the back nut.
   a. Use the spanners to tighten the back nut of the connector until it stops.



8. Fasten the mated connector pair. Tighten with a torque of approximately 3 Nm.

9. Apply water protection.
   a. Cover both connectors with self-vulcanising tape.

b. Apply a layer of electrical tape on top to protect against ultraviolet (UV) radiation. UV rays will harden the self-vulcanising tape and reduce the water protection.

c. You can also use heat shrink or cold shrink tube to waterproof the connector.

Lightning protection

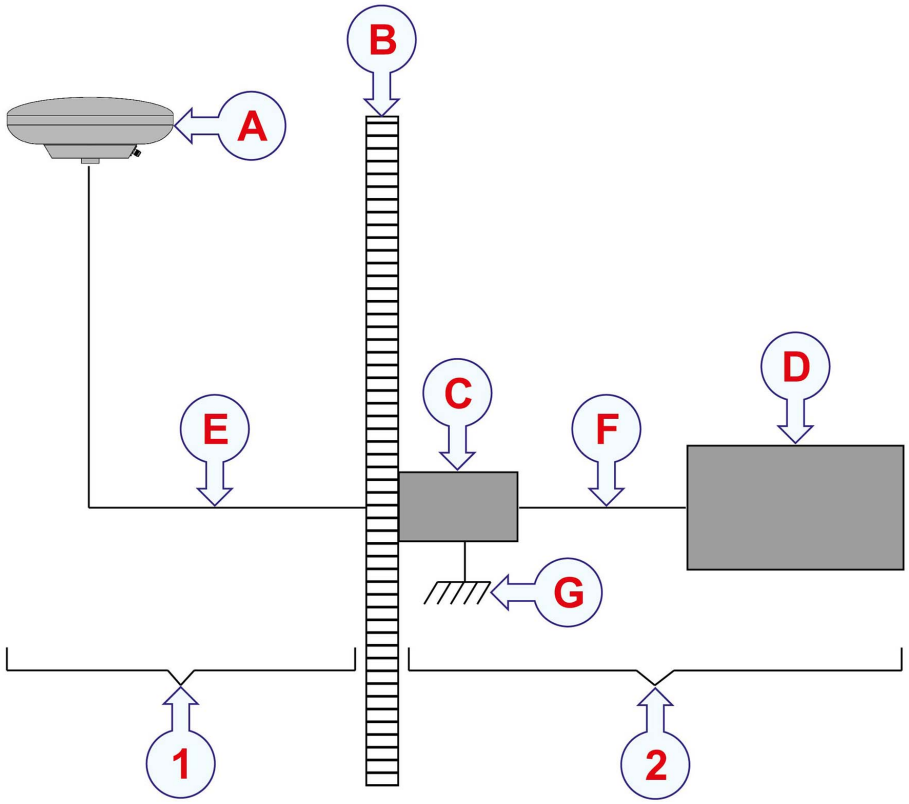
We recommend that you use lightning protection to protect the equipment in case of a stroke of lightning.

The strike of lightning onto a vessel can seriously harm equipment on-board. The heavy current can be conducted through cables and equipment. Lightning protection equipment may protect against over voltages from a strike of lightning by reducing the voltage or by breaking the electrical circuit. However, installation of lightning protection equipment does not guarantee that the equipment in the other end is safe from damage by lightning strokes.

The placement of the lightning arrester is dependent on its design and weather proofing (IP rate). In this example the arrestor is placed indoors.

A possible installation is illustrated.

Please contact Kongsberg Discovery AS for recommendations regarding such equipment.



A. *Antenna*

B. *Ship structure*

C. *Lightning protector*

D. *Processing Unit/Demodulator/Receiver*

E. *Coaxial cable*

F. *Coaxial cable*

G. *Earth strap to ship structure*

1. *Outdoor environment*
2. *Indoor environment*

Related concepts

Support information, page 26

Rack requirements

This product can be delivered with or without a rack. If the product is delivered with a rack, the rack components are pre-installed in the rack. If the product is delivered without a rack, the rack units must be installed in a rack which is already in place on site. This applies to the Processing Unit and the HMI Unit.

Consider the following to determine whether your rack is suitable for the installation.

- The rack must be securely mounted to the floor.
- The rack must be a standard 19-inch rack.
- The Processing Unit will need at least 450 mm installation depth. If an optional monitor drawer is to be installed, the depth of the rack must be at least 600 mm.
- The rack should have an air inlet on top and bottom or ventilation splits on the sides. The rack unit may have ventilation. Forced ventilation may be required if the rack contains several electronic modules.
- The rack must be mounted in such a way that the minimum cable bends are not exceeded.
- The rack must be connected to a grounded outlet.

Related concepts

Installing the Seapath units, page 58

Related tasks

Installing the rack, page 59
Installing the system units in a rack, page 59

Related references

Processing Unit dimensions, page 166
HMI Unit dimensions, page 168

Installing the GNSS antennas

Topics

Mounting the GNSS antennas as stand-alone units

The GNSS antenna receives signals from GPS, GLONASS, BeiDou and Galileo systems.

Prerequisites

- A 1" open-end wrench.
- Coaxial cable with a male N-connector.

Check the antenna cable for short-circuiting before attaching the cable to the antenna and the Processing Unit. For example with a multimeter.

Context

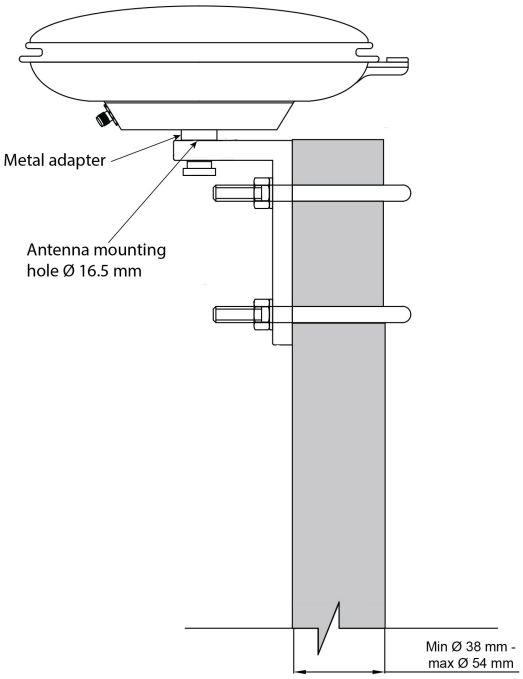
The antenna is not by default delivered with a mounting arrangement. You must either prepare your own mounting arrangement or you can buy the optional mounting kit from Kongsberg Discovery.

The cable recommended for the antenna is a 1/2" superflexible cable. Interconnection cables are included in the delivery.

The antenna cable must be as straight as possible. Do not crush or crimp the cable with tie-downs, as this will affect the electrical properties of the cable.

The GNSS receiver(s) provides the necessary power through the antenna RF connector.

The cable(s) should be labelled for identification purposes.



Note:

The metal adapter at the bottom of the antenna is fixed in place. Do not attempt to remove it.

CAUTION:

If the antenna cable is attached to the Processing Unit, do not attach the antenna cable to the antenna with the unit powered on. If the antenna cable is short-circuited with power on, the GNSS receiver within the unit can be damaged.

Note:

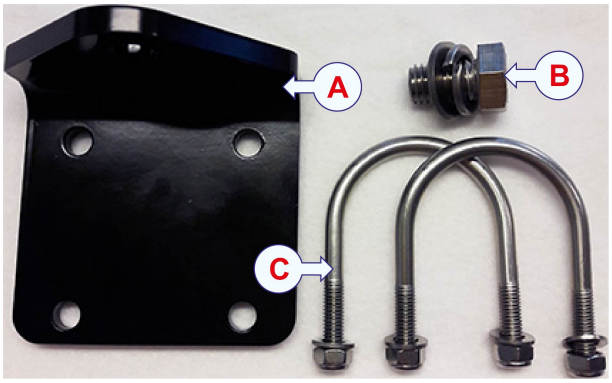
If you use metal cable ties to fasten the cable, use polyester coated metal ties.

Optional mounting kit

The antenna can be delivered with an optional mounting kit. The antenna mounting bracket is designed for mounting on both horizontal and vertical pipes. Maximum diameter for the pipe is 54 mm. Minimum diameter for the pipe is 38 mm.

Important:

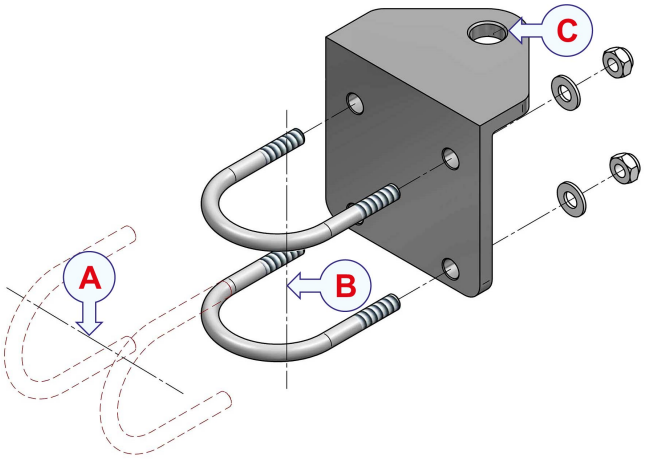
If you do not mount the antenna to the mounting bracket immediately during bracket installation, remember to keep the bolt and washers for later use.



A. *Antenna mounting bracket*

B. *Bolt with washers*

C. *U-bolts, Washers*



A. *Horizontal mount*

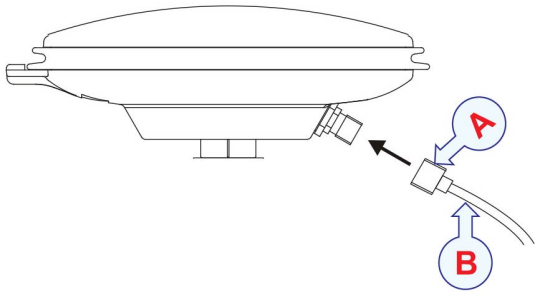
B. *Vertical mount*

C. *Antenna mounting hole, Ø* 16.5 mm

Procedure

1. **Individual mounting arrangement**:
   a. Mount the antenna with the mounting arrangement you have prepared.
2. **Use of optional mounting kit**:
   a. Attach the antenna mounting bracket to a pipe or similar using the U-bolts.
   b. Enter the bolt with the washers through the hole at the top of the mounting bracket.
   c. Screw the antenna to the bolt.
3. Remove the dust cap from the antenna connector.

4. Connect the antenna interconnection cable to the antenna. Connect the ½" superflexible cable to the other end of the interconnection cable.



A. *Connector*

B. *Coaxial cable*

5. Wrap outdoor cable connections with waterproof self-vulcanising and UV resistant tape. An alternate way of waterproofing is to use heat shrink hose with glue. The hose should cover the whole connector and part of the cable.
6. Fasten the cable securely with cable ties so that it does not loosen or move after installation.

   If you use metal cable ties, be careful not to tighten them too much so that they damage the cable insulation. Damage to the cable outer sheath will cause water penetration and destroy the cable.
7. Route the connector at the other end of the antenna cable to the Processing Unit. A short interconnection cable is often needed in order to secure cable runs into the rack.

Related concepts

GNSS antenna location, page 29
Installing GNSS/DGNSS antennas, recommended practice, page 31
Antenna arrangements for various vessel types, page 35
Installing antenna cables, recommendations, page 36
Terminating coaxial cables, page 38

Related tasks

Cabling for the rack units, page 72

Related references

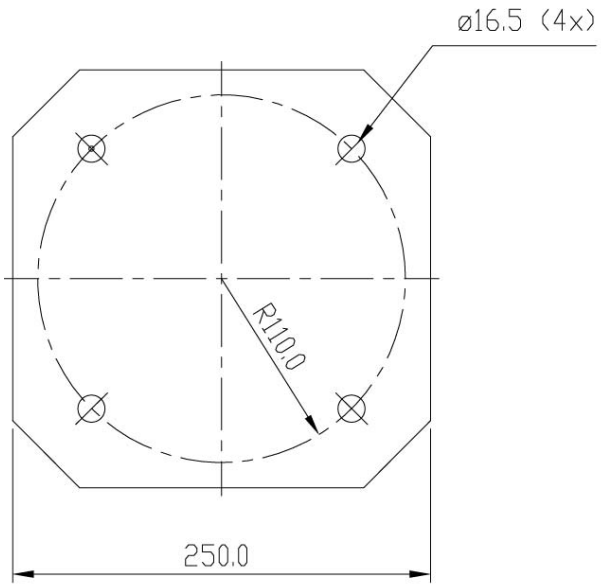
GNSS antenna dimensions, page 169

Mounting the GNSS antennas on antenna bracket

The GNSS antenna receives signals from GPS, GLONASS, BeiDou and Galileo systems.

Prerequisites

Make a holder for the antenna bracket. The holder must be properly fastened to the mast in the preferred orientation, horizontal or vertical. The holder is not a part of the Seapath delivery.



- A 1" open-end wrench.
- Coaxial cable with a male N-connector.

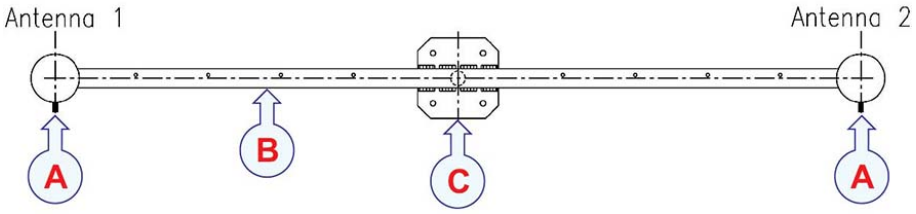
Check the antenna cable for short-circuiting before attaching the cable to the antenna and the Processing Unit. For example with a multimeter.

Context

Antenna orientation

Depending on the antenna type, the labelling on the antenna housing, either text or arrows, or the connector location, is used to determine the mounting direction.

The illustration shows the antennas oriented with the connectors pointing in the same direction. The antennas are not marked, and are interchangeable, but here they are labelled Antenna 1 and Antenna 2 for reference.



A. *Antennas with connector pointing in the same direction*

B. *Antenna bracket*

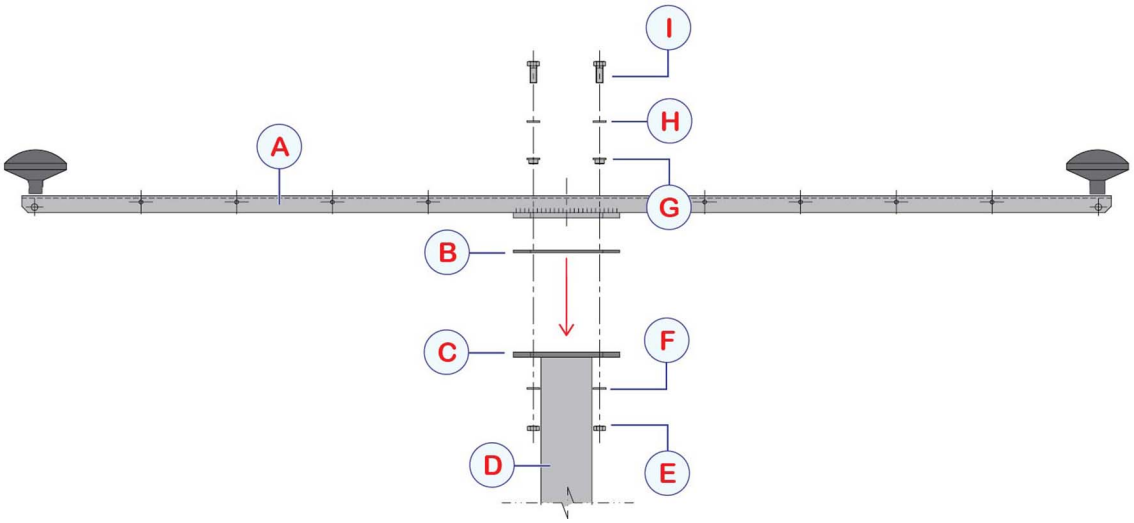
C. *Antenna holder*

The normal orientation of the antenna bracket is along ship with Antenna 1 located aft. It can be mounted in any orientation, provided it is approximately horizontal.

Important:

Both antennas have to be oriented in the same direction when mounted on the antenna bracket. If not, the system will have a degraded heading performance.

Antenna installation components



A. *Antenna bracket*

B. *Thermoplastic insulation plate (PET)*

C. *Antenna holder*

D. *Mast*

E. *4 nuts M6*

F. *4 washers*

G. *4 thermoplastic bushings*

H. *4 washers*

I. *4 screws M6*

Cables

The cable recommended for the antenna is a 1/2" superflexible cable. Interconnection cables are included in the delivery.

The antenna cable must be as straight as possible. Do not crush or crimp the cable with tie-downs, as this will affect the electrical properties of the cable.

The cable(s) should be labelled for identification purposes.

CAUTION:

If the antenna cable is attached to the Processing Unit, do not attach the antenna cable to the antenna with the unit powered on. If the antenna cable is short-circuited with power on, the GNSS receiver within the unit can be damaged.

The GNSS receiver(s) provides the necessary power through the antenna RF connector.

Note:

The metal adapter at the bottom of the antenna is fixed in place. Do not attempt to remove it.

Procedure

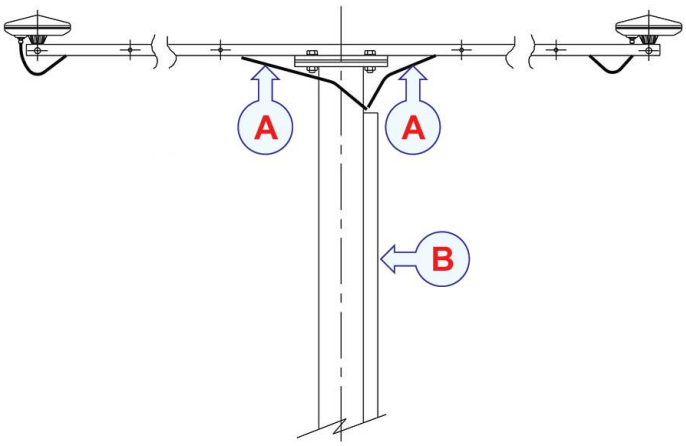
1. Find a suitable location for the antenna holder.
2. Bring the antenna bracket, the two antennas and the antenna cables as close as possible to the location of the antenna holder.
3. Mount the antennas to the antenna bracket while the bracket and antennas are still down on deck. Both antennas must be oriented in the same direction.
4. Fasten the antennas to the bracket with screws and locking washers.
5. Connect the antenna cables to both antennas.
   Use the interconnection cables between the antenna and the superflex cable.
6. Seal the connection between the antenna and the antenna cable against water penetration by using waterproof self-vulcanising tape.
7. Strap the antenna cables inside the antenna bracket.
8. Place the delivered insulation plate between the antenna holder and the antenna bracket.
9. Lift the antenna bracket with the antennas to the preferred direction on the holder.

10. Place the four bushings in the mounting holes before you enter the screws.

    This is to ensure galvanic isolation of the antenna bracket from the mast and to prevent corrosion.

11. Secure the nuts with washers or by using self-locking nuts.

12. Run the cables inside a cable duct or secure the cables to the mast with cable ties.



A. *Antenna cables*

B. *Cable duct*

13. Attach the interconnection cables to the superflex cable and connect the cables to the connectors at the rear of the Processing Unit.

Related concepts

GNSS antenna location, page 29
Installing GNSS/DGNSS antennas, recommended practice, page 31
Antenna arrangements for various vessel types, page 35
Installing antenna cables, recommendations, page 36
Terminating coaxial cables, page 38

Related tasks

Cabling for the rack units, page 72

Related references

GNSS antenna dimensions, page 169

Installing the Seapath units

Topics

System units pre-installed in a rack

The Seapath system can be delivered with or without a rack. If the product is delivered with a rack, the rack units are pre-installed in the rack.

The rack units in this system are:

- Processing Unit
- HMI Unit

With pre-installed units you must mount the rack in a suitable location and do the cabling for the system.

Related tasks

Installing the rack, page 59
Cabling for the rack units, page 72

Installing the rack

If your system is delivered with the rack units pre-installed, you must mount the rack in a suitable location.

Context

Make sure that there is a minimum distance of 20 mm free space behind the rack due to air outlet at the rear of the rack. Also make sure that there is enough space behind the rack for cable connections.

Make sure that all cables are long enough to accommodate service from the front. The cables should be long enough to make it possible to pull each unit to the front of the rack for disconnection of cables.

The front of the cabinet must be available during normal operation.

Procedure

1. Place the rack in a suitable location in an indoor environment. In the instrument room or on the bridge.
2. Fasten the rack to the floor with bolts or similar mounting equipment. Make sure that the rack is securely fastened.

Related concepts

Rack requirements, page 48
System units pre-installed in a rack, page 58

Related tasks

Cabling for the rack units, page 72

Installing the system units in a rack

If your system is delivered without a rack, the Processing Unit and the HMI Unit shall be mounted in a 19–inch rack or cabinet. In addition you must carry out the cabling and interface configuration.

Context

Important:

If you have a rack-mountable keyboard in your system, make sure that you have enough space in the rack for the keyboard.

A rack-mountable keyboard and mouse will require 1U space in the rack.

The cable strain relief bracket allows for flexibility in the cables without putting stress on the vulnerable points on the cable.

Note:

The Processing Unit has a plastic film on top, and it may have one underneath, to protect the unit from transportation scratches. Remove this film before operation as the plastic film will reduce the heat transfer from the unit and thus cause an increase in the temperature inside the unit.

Procedure

1. Find a suitable location for the Processing Unit and the HMI Unit.

   Typically on the bridge or in the instrument room.

2. Remove any plastic film from the Processing Unit.

3. Place the units on rails or shelves in a 19-inch rack.

   This is to make sure that the units are supported both at the front and at the rear. Minimum 10 cm free space is needed behind the units for connection of cables.

4. Fasten each unit with four screws in the front.

Result

You are now ready to connect the necessary cables to the Processing Unit and the HMI Unit.

Related concepts

Rack requirements, page 48
Interface descriptions, page 183

Related tasks

Cabling for the rack units, page 72

Related references

Processing Unit dimensions, page 166
HMI Unit dimensions, page 168

Surveying sensors on vessels

Topics

About sensor survey

In order to achieve the specified accuracy of the Seapath system, the different sensor parts of the system have to be surveyed. The position (coordinates) and/or orientation (mounting angles) of each sensor shall be referred to the vessel coordinate system.

The sensors which are used in this system are:

- The MGC or MRU (position and orientation)
- The GNSS antenna (position and orientation, alternatively two positions)
- The external gyro compass (orientation)

For information and drawings of the MGC or MRU, refer to their respective installation manuals.

Related tasks

Entering antenna location parameters, page 104
Setting MGC location and mounting angles, page 111
Setting MRU location and mounting angles, page 114

Vessel coordinate system

The vessel coordinate system is established in order to define the relative physical locations and orientations of systems and sensors. It is a Cartesian coordinate system using three axes: X, Y and Z. X is positive forwards, Y is positive toward starboard and Z is positive downwards.

The coordinate system must be well defined. It is usually established by surveying and documenting coordinates of several points on the vessel. The X axis is in the longitudinal direction of the vessel. The Y axis is in the transverse direction of the vessel. The Z axis is perpendicular to the X and Y axes.

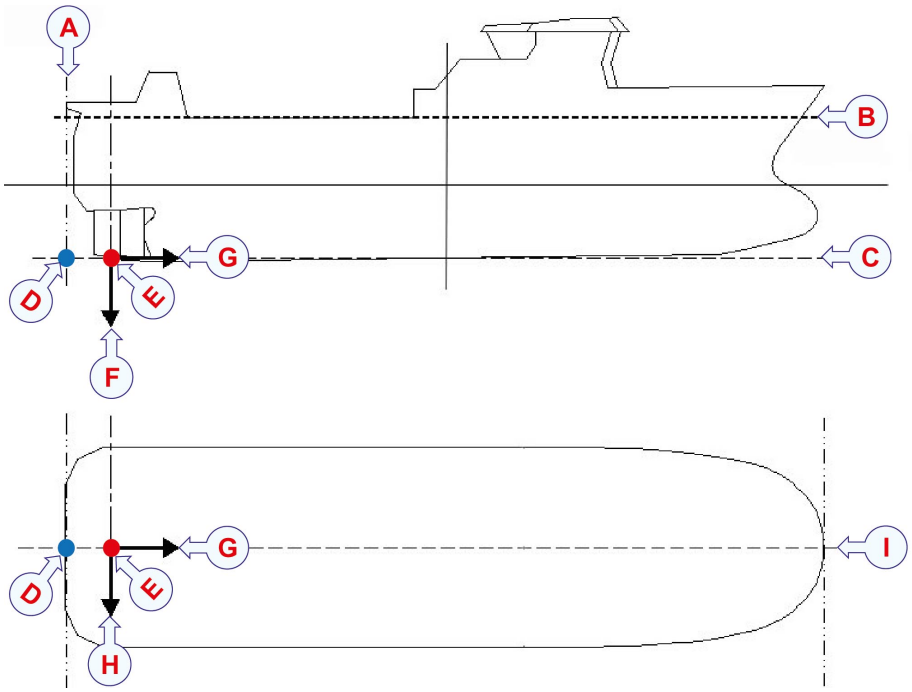
The X and Y axes constitute the reference plane on the vessel. This can be a best-fit plane on the main deck or a best-fit plane through the draught marks on the hull.

When establishing the vessel coordinate system, the origin can be freely chosen. Typical choices for origin are frame 0 at keel level, the vessel's centre of gravity (CG) or the location of the Inertial Measurement Unit. But any convenient point can be used.

In addition to the coordinate system it is useful to have an approximate X, Y and Z offset from the common reference point (CRP) to origin. The common reference point (CRP) is defined to be the intersection between stern, centre line and keel.

The chosen conventions must be made clear to all parties involved. Both to the survey personnel performing the survey and to the users of the survey results. Any deviation from the defined coordinate system should be well described in both text and drawings to avoid common misunderstandings.

The illustration shows the definition of origin on the vessel and positive X, Y and Z axes directions.



A. *Stern*

B. *Main deck*

C. *Keel*

D. *CRP (common reference point)*

E. *Origin*

F. *+Z axis*

G. *+X axis*

H. *+Y axis*

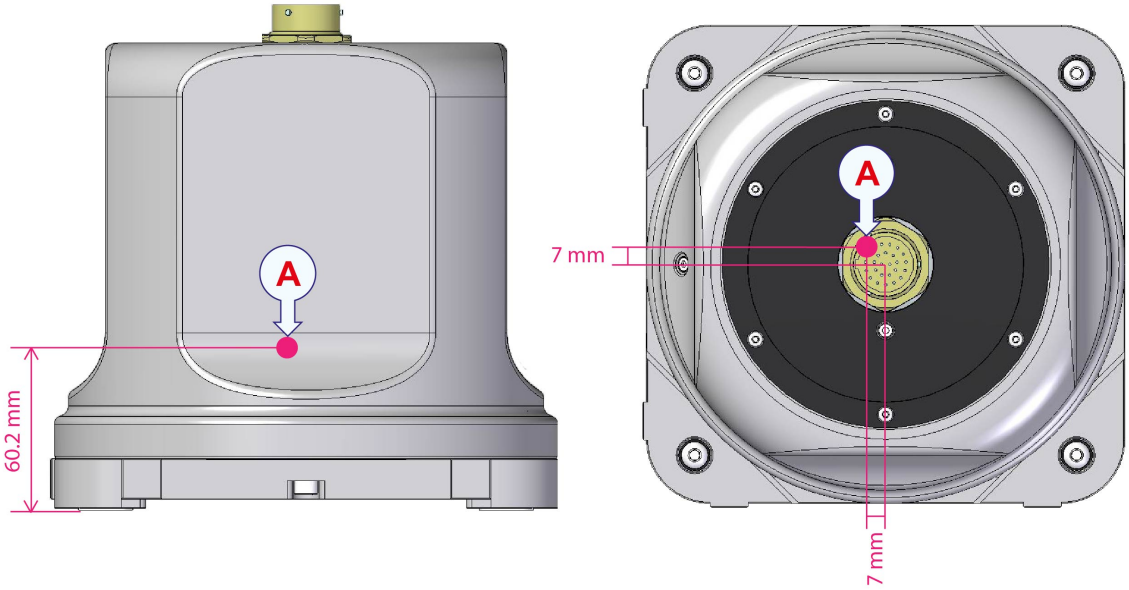
I. *CL (centre line)*

Surveying the MGC Sensor Unit

For the MGC (Motion Sensor and Gyro Compass) the following should be surveyed.

- The position (X, Y, Z) of the sensor point on the MGC.
- The mounting angles in roll, pitch and yaw (heading).

Sensor point for the MGC

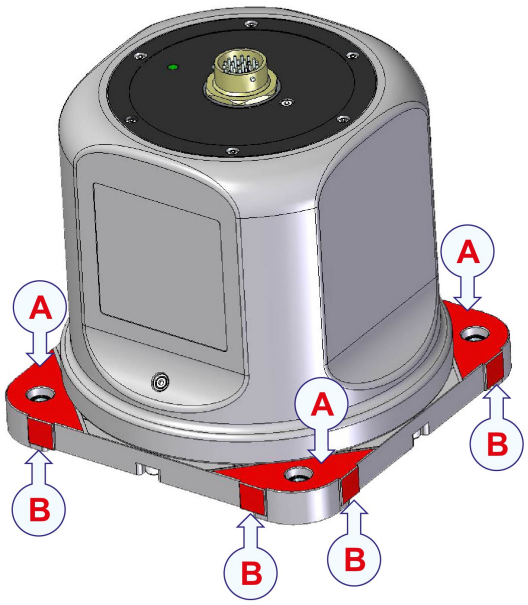


A. *Sensor point on MGC*

MGC alignment surfaces

The MGC bottom plate designed with alignment surfaces where you can place prisms for surveying the offset angles in roll, pitch and heading by use of a theodolite.

The illustration shows the alignment surfaces for roll and pitch alignment and heading alignment.

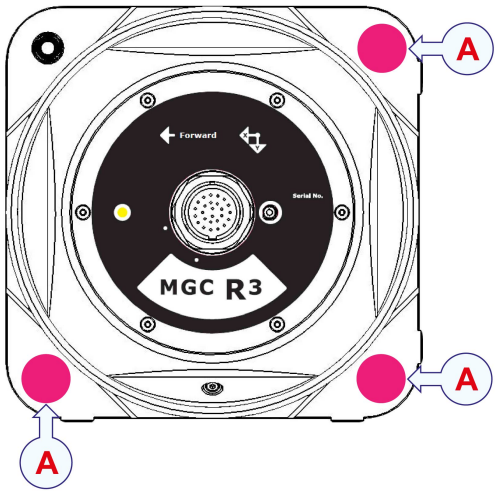


A. *Alignment surface for roll and pitch*

B. *Alignment surface for heading*

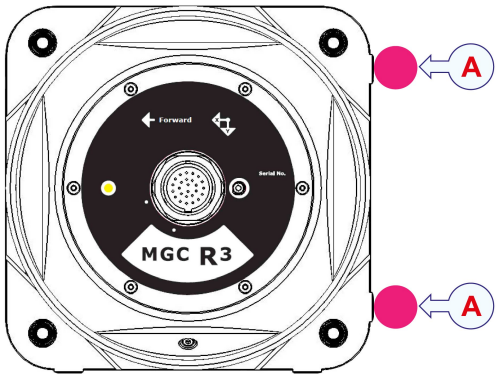
For the roll and pitch alignments, space for prisms is made in three corners of the MGC bottom plate. The surface on these locations is prepared specially to make it flat and aligned (parallel) with the sensors inside the unit.

A. *Space for prism*



For the heading alignment two sides of the bottom plate has two protruding squared surfaces. Place the prisms against these surfaces when measuring the heading of the MGC towards the vessel axis.

A. *Space for prism*



Related concepts

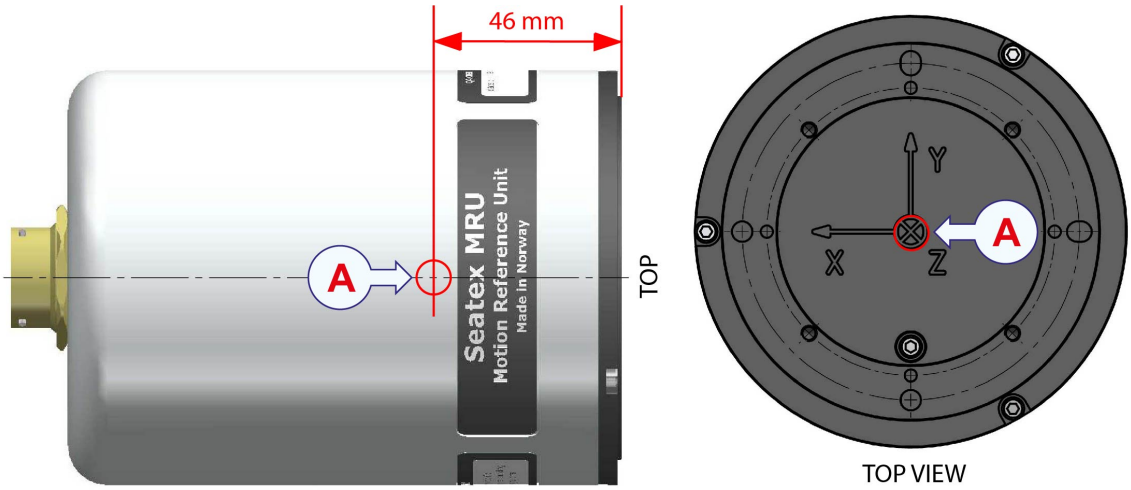
Survey accuracy values, page 70

Surveying the MRU

For the MRU (Motion Reference Unit) the following should be surveyed.

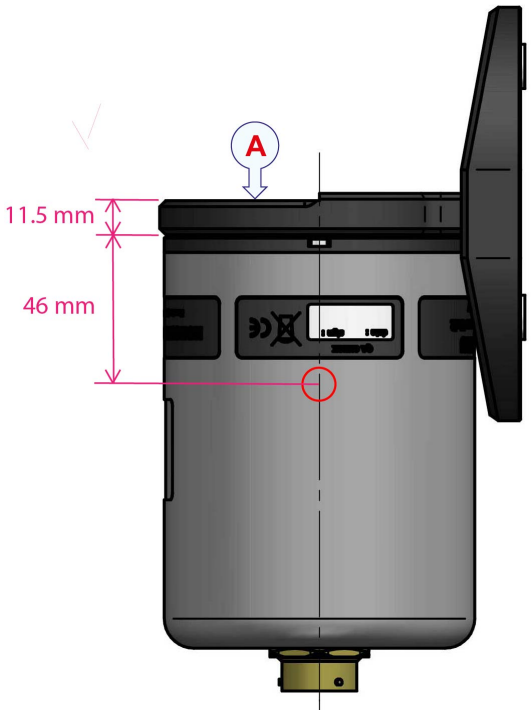
- The position (X, Y, Z) of the sensor point on the MRU.
- The mounting angles in roll, pitch and yaw (heading).

Sensor point and position for the MRU



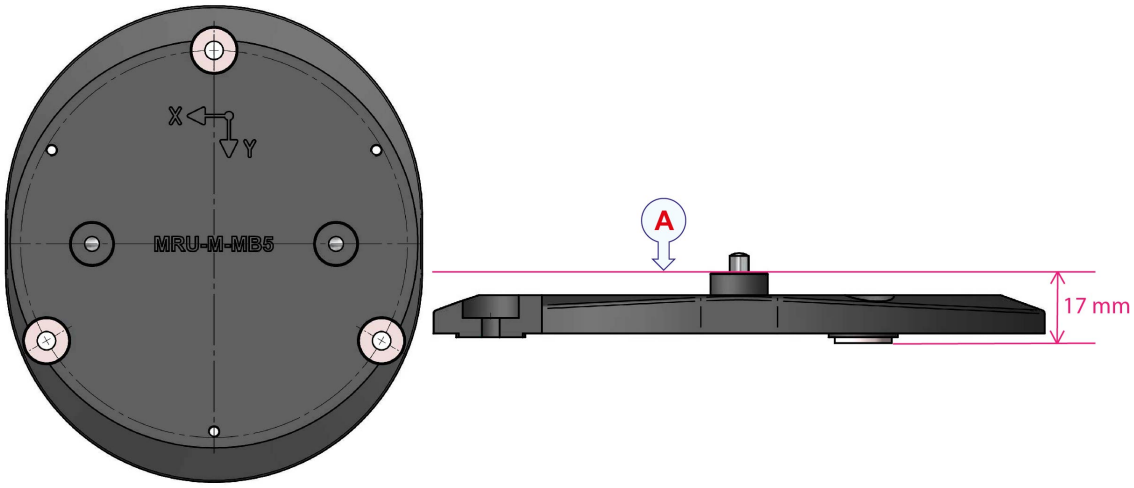
A. *Sensor point and position (0, 0, 0) for all MRU units*

Thickness of MRU wall mounting bracket from alignment surface



A. *Sensor plane on wall mounting bracket*

Thickness of MRU floor mounting bracket over the deck



A. *Sensor plane on floor mounting bracket*

Note:

The mounting bracket allows for easy replacement with another MRU without affecting the orientation calibration. This is due to the precision of the dowel pins within the bracket. Therefore, when an MRU is replaced with another unit, there is no need for a re-survey of the position and angle if the mounting bracket is in the same location.

Related concepts

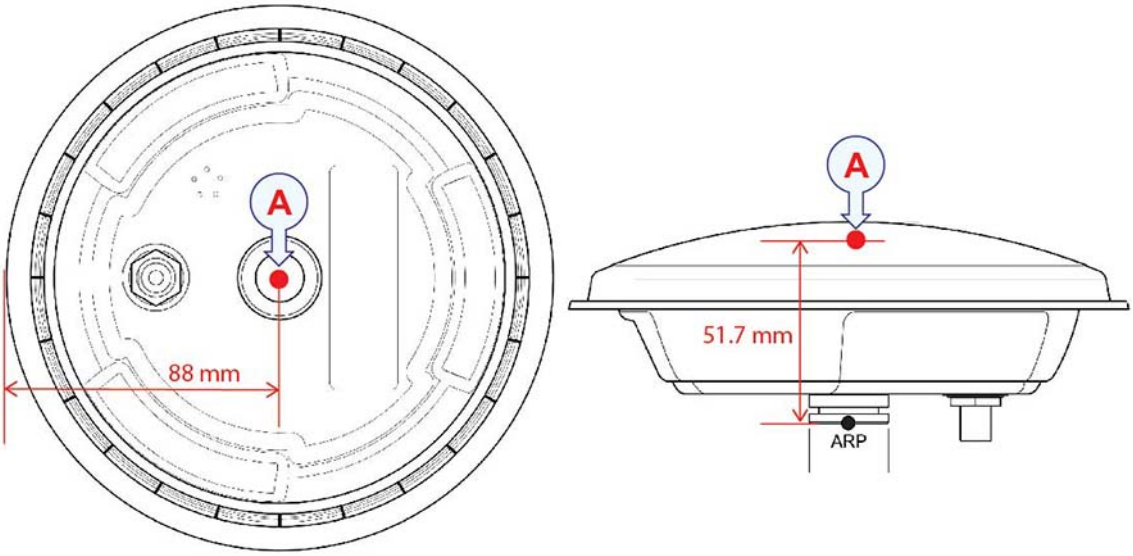
Survey accuracy values, page 70

Surveying the GNSS antenna

For the GNSS antenna the following should be surveyed.

- The position (X, Y, Z) of the sensor point on the antenna disc. Antenna #1.
- The angular offset between the line from the phase centre on antenna #1 to the phase centre of antenna #2 and the vessel centre line (CL).

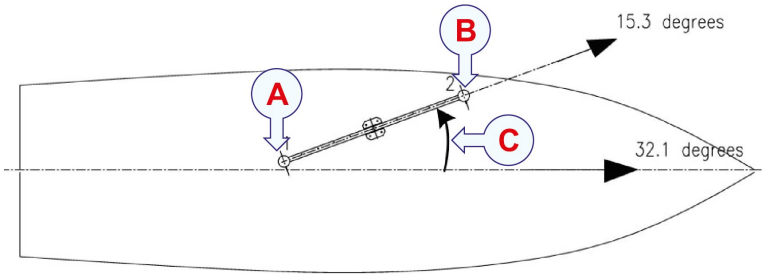
Sensor point on the antenna



A. *Antenna phase centre*

Heading offset

The illustration shows a heading offset of 16.8 degrees (32.1 - 15.3 9) between the vessel centre line and the heading. From antenna #1 to antenna #2.



A. *Antenna #1*

B. *Antenna #2*

C. *Heading offset*

Note:

The heading offset should be confirmed against the GNSS heading log, typically during gyro calibration.

Related concepts

Survey accuracy values, page 70

Related tasks

Entering antenna location parameters, page 104

Surveying the external gyro compass

For the external gyro compass the following should be surveyed.

- The offset between the gyro compass heading and the vessel centre line (CL).

Note:

The heading offset must be surveyed to an accuracy better than 1°.

Static gyro calibration/verification (heading log) should be done after the gyro system is installed and fully operational. This can be performed in dock or alongside a quay.

Dynamic gyro calibration/verification and attitude control (heading, roll, pitch control) must be performed at sea.

Determining the system coordinates

The coordinates for the sensor positions, the navigation reference point (NRP) and the monitoring points (MP) relative to origin must be determined and input to the operator software.

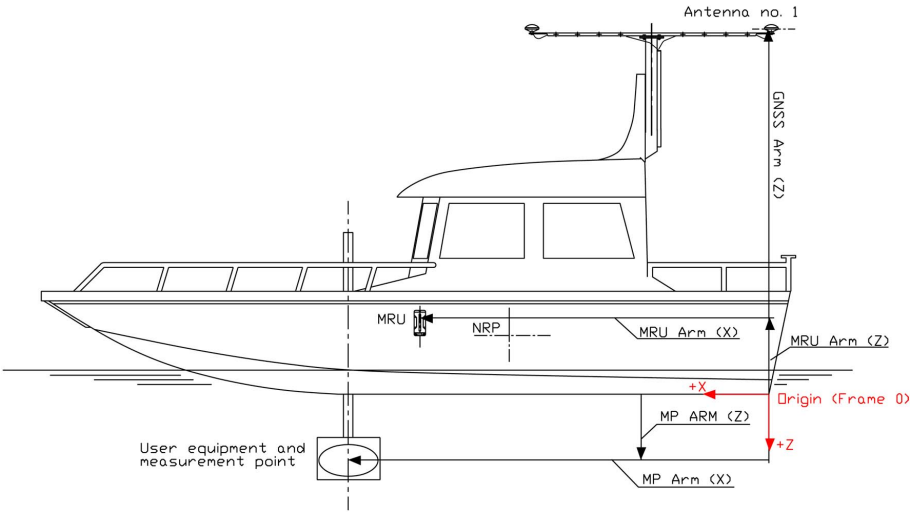
- The distance vector from origin to the GNSS antenna(s). (Coordinates for the GNSS antenna(s).)
- The distance vector from origin to the MGC or MRU location. (Coordinates for the MGC or MRU location.)
- The distance vector from origin to the selected navigation reference point (NRP) location. (Coordinates for the selected NRP location.)
- The distance vector from origin to each of the monitoring points. (Coordinates for each of the monitoring points.) Maximum eight monitoring points (MP) in this system.

All these distance vectors have to be measured or calculated based upon drawings or previously measured points. These coordinates must be measured within a specific accuracy.

Positive directions for these parameters are:

- X – positive forwards
- Y – positive towards starboard
- Z – positive downwards

The illustration shows the coordinates for the different components.



Related concepts

Survey accuracy values, page 70

Related tasks

Setting vessel dimensions and reference points, page 102
Entering antenna location parameters, page 104
Setting MGC location and mounting angles, page 111
Setting MRU location and mounting angles, page 114
Setting monitoring points, page 120

Survey accuracy values

The system must be surveyed according to the given accuracy level. If not, the performance of the system will be degraded.

MGC

- The coordinates for the GNSS antenna position (X, Y, Z): < 0.01 metre
- The coordinates for the MGC sensor point (X, Y, Z): < 0.01 metre
- The coordinates for the selected navigation reference point (NRP) location (X, Y, Z): < 0.01 metre
- The coordinates for the user defined monitoring points (MP) (X, Y, Z): < 0.01 metre
- The MGC offset angles (roll, pitch) with the vessel axis: < 0.01°
- The MGC heading offset angle with the vessel axis: < 0.01°

MRU

- The coordinates for the GNSS antenna position (X, Y, Z): < 0.01 metre
- The coordinates for the MRU sensor point (X, Y, Z): < 0.01 metre
- The coordinates for the selected navigation reference point (NRP) location (X, Y, Z): < 0.01 metre
- The coordinates for the user defined monitoring points (MP) (X, Y, Z): < 0.01 metre
- Offset angles (roll, pitch, yaw) with the vessel axis: < 0.01°

Related concepts

Surveying the MGC Sensor Unit, page 63
Surveying the MRU, page 65
Surveying the GNSS antenna, page 67
Determining the system coordinates, page 69

Related tasks

Setting MGC location and mounting angles, page 111
Using Mounting Wizard to determine MGC mounting angles, page 112
Setting MRU location and mounting angles, page 114
Using Mounting Wizard to determine MRU mounting angles, page 116
Setting monitoring points, page 120
Setting vessel dimensions and reference points, page 102
Entering antenna location parameters, page 104

Cable layout and interconnections

Topics

Cabling for the rack units

The Seapath system relies on communication between each system unit and between the Seapath system and external devices. It is very important that all cables are correctly installed, that the proper cable types have been used, and that all cables are connected correctly.

Prerequisites

Make sure that you have the cable types recommended for the installation.

Context

The cables which are attached to the rear of the unit must be long enough for the unit to be pulled out of the rack for service purposes. There must be enough slack of cables be able to pull out the HMI Unit in full length. The minimum cable bends must not be exceeded. For the antenna cables it may be necessary to use a short interconnection cable in order to route the cables properly into the rack. All cables connected to the unit must be screened.

Note:

If the antenna cable is attached to the Processing Unit, do not attach the antenna cable to the GNSS antenna with the unit powered on. If the antenna cable is short-circuited with power on, the GNSS receiver within the unit can be damaged.

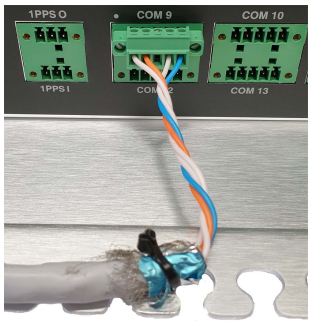
Note:

Make sure that the antennas and antenna cables are properly connected to the Processing Unit before you apply power to the Processing Unit. If you connect or disconnect an antenna or antenna cable when the Processing Unit is already powered, this may permanently damage the antenna port on the Processing Unit or the antenna itself.

If the antenna is short-circuited with power on, the receiver within the Processing Unit will be damaged.

Note:

Do not place the cable between the tongues on the cable relief at the rear of the unit, but fasten the cable with strips as illustrated.



Procedure

1. Connect the cables from the GNSS antennas to the connectors marked GNSS 1 and GNSS 2 at the rear of the Processing Unit.
2. Connect the Processing-Unit-to-Junction-box cable to the MRU terminal on the Processing Unit.

   Terminate the cable according to the tables for the Inertial Measurement Unit which you have in your system.
3. Run the cable from the MRU terminal on the Processing Unit through one of the free glands on the Junction box.

   Terminate the cable according to the tables for the Inertial Measurement Unit which you have in your system.

4. Connect the cables for output data from the Processing Unit to external equipment to the ports COM 1, COM 2 or the terminals COM 9 through COM 14, analog output signals or the Ethernet connections.
   a. Fasten the serial cable to the cable relief bracket with cable strips. This allows the cable to move without breaking away from the plug or connector.
   b. Ground the cable shield by fastening the cable shield to the cable relief bracket. Use cable strips. This eliminates the potential for noise inducing ground loops. The cable shield should only be grounded at one end.
   c. Connect the shields for all listener (RX) cables to the talker (TX) chassis only.
5. Connect the 100 - 240 VAC vessel power supply to the power connector at the rear of the Processing Unit.
6. Connect the 100 - 240 VAC vessel power supply to the power connector at the rear of the HMI Unit.
7. Connect the cable from the display, the mouse and the keyboard to the corresponding connectors at the rear of the HMI Unit.
8. Connect an Ethernet cable from the LAN1 port at the rear of the Processing Unit and to the LAN1 port on the HMI Unit to the dedicated network switch, or a direct connection between the two LAN1 ports.

Result

When all the cables are connected, you are ready to turn on the Processing Unit and the HMI Unit. The power switch on the Processing Unit is located behind the lid to the left on the front of the unit. The power switch on the HMI Unit is located at the front of the unit. The left LED indicator on the front panel of the Processing Unit should now become red. When the software us up and running, the left LED indicator on the front panel becomes green. The installation is now complete and you are ready to set up the configuration parameters. This is done through the **NAV Engine** and the **Operator SW** submenus on the **System** menu.

Related concepts

Required system configuration, page 101
Operator software configuration, page 145
System units pre-installed in a rack, page 58

Related tasks

Mounting the GNSS antennas as stand-alone units, page 50
Mounting the GNSS antennas on antenna bracket, page 54
Installing the rack, page 59
Installing the system units in a rack, page 59
Terminating the Processing Unit to MGC COMPASS junction box cable, page 76
Terminating the Processing Unit to MGC/MRU junction box cable, page 82

Related references

Cable specifications, page 178

Connecting the Seapath with MGC COMPASS

For the physical installation of the MGC COMPASS, refer to the *MGC COMPASS Installation manual*.

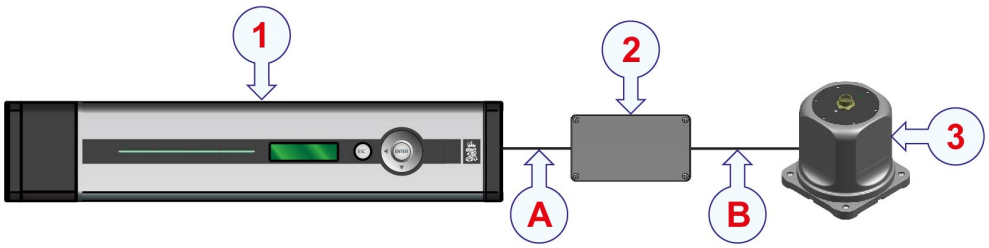
Terminating the Processing Unit to MGC COMPASS junction box cable

The MGC COMPASS is connected to the Processing Unit via a junction box. The cable between the junction box and the Processing Unit is terminated in the junction box in one end and with a 10–pin terminal for the Processing Unit in the other end. The cable is used for power and interface to the MGC COMPASS.

Context

When an MGC is connected to a Processing Unit, a junction box is used to make the wiring easier. You must terminate the Processing Unit end of the cable. Then run the cable into the junction box and terminate the other end of the cable into the J10a/J10b terminal (power), the J11a/J11b terminal (Sensor Unit connection) and the J1 terminal (external communication).

The MGC COMPASS is supplied with 24 V DC power from the MRU terminal on the Processing Unit.



1. *Processing Unit*
2. *Junction box*
3. *MGC COMPASS*

A. *Processing Unit to Junction box cable*

B. *Junction box to MGC COMPASS cable (pre-installed)*

Important:

- *The cable between the Processing Unit and the junction box must be shielded in order to fulfil the MGC power and EMC requirements. The cable must be connected to ground in both ends.*
- *Make sure that the shield around each pair in the cable is individually isolated on the 10-pin terminal on the Processing Unit. The outer shield is connected to pin 3 Screen on this terminal, which is an open end (not connected to earth).*
- *Insert an isolated wire between pin 3 (GND1) and pin 28 (GND5) on the user side in the J1 terminal in the junction box.*

A. *Power connections*

B. *Sensor Unit connection*

C. *COM ports*

Important:

The cable illustrated in the table Wiring for cable between Processing Unit and MGC junction box is for the cable delivered by Kongsberg Discovery AS.

You can also use a regular ship cable.

Table 1: Power terminal in the Junction Box

J10a		J10b	
Pin	**Signal**	**Pin**	**Signal**
1	PWR1+	1	PWR2+
2	PWR0–	2	PWR0–

Table 2: Sensor Unit cable connections in the JB7 Junction Box - J11A terminal

J11A terminal				
Pin	**Signal**		**Pair no.**	**Colour**
1	MTX1_A-	RS-422A-, output data from MGC	2b	Orange
2	MTX1_B+	RS-422B+, output data from MGC	2a	White
3	MRX1_A-	RS-422A-, input data to MGC	3b	Green
4	MRX1_B+	RS-422B+, input data to MGC	3a	White
5	MRX2_A-	RS-232, data to MGC	7a	Red
6	MRX2_B+		14a	Black
7	MTX2_A-	RS-232, data from MGC	7b	Orange
8	MTX2_B+		14b	Brown
9	MRX3_A-	RS-422A- or RS-232, input to MGC	8a	Red
10	MRX3_B+	RS-422B+ or RS-232, return to MGC	8b	Green
11	MRX4_A-	RS-422A- or RS-232, input to MGC	9a	Red
12	MRX4_B+	RS-422B+ or RS-232, return to MGC	9b	Brown
13	DISP0	Internal control	12a	Black
14	DISP1	Internal control	12b	Orange

Table 3: Sensor Unit cable connections in the JB7 Junction Box - J11B terminal

J11B terminal				
Pin	**Signal**		**Pair no.**	**Colour**
1	PWR-	Power supply (0 V)	1b	Blue
2	PWR+	Power supply (+24 V)	1a	White
3	RJ-1	TD+, Ethernet	4a	White
4	RJ-2	TD-, Ethernet	4b	Brown
5	RJ-3	RD+, Ethernet	6a	Red
6	RJ-6	RD-, Ethernet	6b	Blue
7	Alert	MGC alert	5a	White
8	GND	MGC ground	5b	Grey
9	XIN	Signal to MGC	10b	Grey
10	CGND	Communication ground	10a	Red
11	EOUT	Signal from MGC, 5 Volt level	11b	Blue
12	XOUT	Signal from MGC, 5 Volt level	11a	Black
13	DISP2	Internal control	13a	Black
14	VDD	5 Volt out, max. 20 mA	13b	Green

Table 4: J1 terminal in the JB7 Junction Box

J1 terminal					
Pin	Signal		Pin	Signal	
1	TX1_B+	COM1, RS-422 output	16	TX4_B+	COM4, RS-422 output
2	TX1_A-	COM1, RS-422 output	17	TX4_A-	COM4, RS-422 output
3	GND1	COM1, signal ground	18	GND4	COM4, signal ground
4	RX1_B+	COM1, RS-422 input	19	RX4_B+	COM4, RS-422 input
5	RX1_A-	COM1, RS-422 input	20	RX4, A-	COM4, RS-422 input
6	TX2_B+	COM2, RS-422 output	21	TX5_B+	COM5, RS-422 output
7	TX2_A-	COM2, RS-422 output	22	TX5_A-	COM5, RS-422 output
8	GND2	COM2, signal ground	23	GND5	COM5, signal ground
9	RX2_B+	COM2, RS-422 input	24	RX5_B+	COM5, RS-422 input
10	RX2A-	COM2, RS-422 input	25	RX5_A-	COM5, RS-422 input
11	TX3_B+	COM3, RS-422 output	26	TXP_B+	COMP, RS-422 output
12	TX3_A-	COM3, RS-422 output	27	TXP_A-	COMP, RS-422 output
13	GND3	COM3, signal ground	28	GND5	COM5, signal ground
14	RX3_B+	COM3, RS-422 input	29	PPS_B+	PPS input
15	RX3_A-	COM3, RS–422 input	30	PPS_A-	PPS input

Table 5: MRU terminal at the rear of the Processing Unit

Pin no.	**Signal description**
1	GND
2	LGND
3	NC
4	MRU_1PPS_N
5	MRU_1PPS_P
6	TX_B
7	TX_A
8	RX_B
9	RX_A
10	24V_MRU

Table 6: Wiring for cable between Processing Unit and MGC Junction Box

Processing Unit/MGC	Signal	Pair	MGC Junction Box	Sensor Unit connector
Pin		Pin	Pin	Pin
3	NC	Screen		
10	24V_MRU	1	1 (J10a or b)	R
1	GND	1	2 (J10a or b)	B
8	MRU_RX_B	2	1 (J1)	C
9	MRU_RX_A	2	2 (J1)	T
6	MRU_TX_B	3	4 (J1)	S
7	MRU_TX_A	3	5 (J1)	P
4	MRU_1PPS_N (PPS_B+)	4	29 (J1)	
5	MRU_1PPS_P (PPS_A-)	4	30 (J1)	

Procedure

1. Connect the connector on the Sensor Unit cable into the connector at the top of the Sensor Unit.
2. Terminate the wires at the other end of the Sensor Unit cable into the J11a and J11b terminals.
3. Terminate the power wires in the cable from the Processing Unit into the J10a and J10b terminals.
4. Terminate the signal wires in the cable from the Processing Unit to COM1, pin 1 to 5, into the J1 terminal.
5. Terminate the wires for PPS input in the cable from the Processing Unit to pin 29 and 30 into the J1 terminal.
6. Connect the cables for output data from Seapath to external equipment to the COM1 or COM2 ports or to the COM9 to COM14 terminals on the Processing Unit.

Related tasks

Cabling for the rack units, page 72

Related references

Cable specifications, page 178

Connecting the Seapath with MRU or MGC

For the physical installation of the MGC or MRU, refer to the their respective installation manuals.

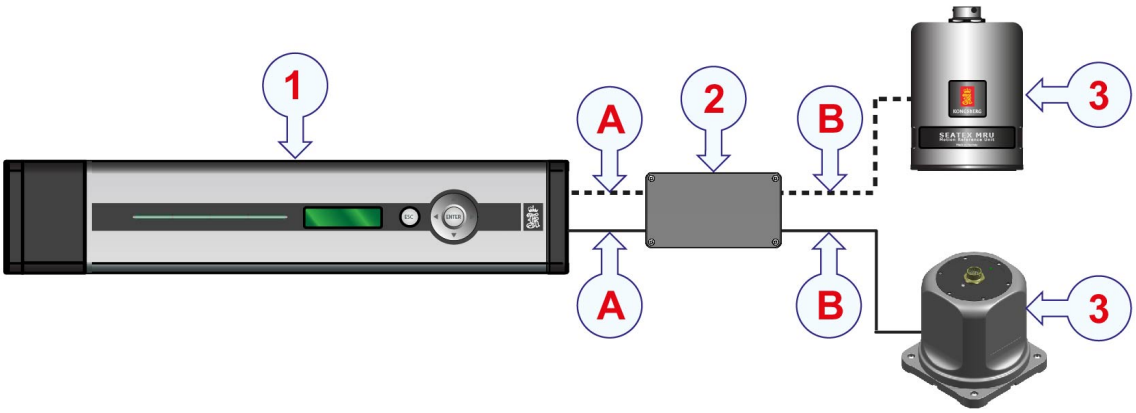
Terminating the Processing Unit to MGC/MRU junction box cable

The Inertial Measurement Unit (MGC or MRU) is connected to the Processing Unit via a junction box. The cable between the junction box and the Processing unit is terminated in the junction box in one end and with a 10–pin terminal for the Processing Unit in the other end. The cable is used for power and interface to the MGC or MRU. The cable from the junction box to the MGC/MRU is pre-terminated in the junction box with a connector in the other end.

Context

When an MGC or MRU is connected to a Processing Unit, a junction box is used to make the wiring easier. You must terminate the Processing Unit end of the cable. Then run the cable through one of the free glands on the junction box and terminate the other end of the cable to the P2 terminal (user external interfaces and power) and P3 terminal (earth).

The MGC/MRU is supplied with 24 V DC power from the MRU terminal on the Processing Unit.



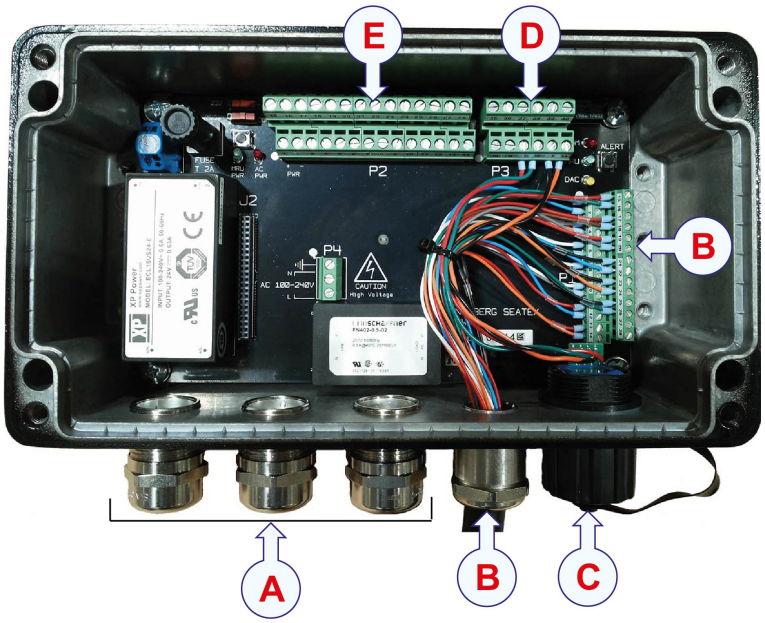
1. *Processing Unit*
2. *Junction box*
3. *MGC/MRU*

A. *Processing Unit to Junction box cable*

B. *Junction box to MGC or MRU cable (pre-installed)*

Important:

- *Make sure that the cable shield is in contact with the gland for grounding before the cable is fastened to the box. Use the required number of clips to fasten the cable to the wall.*
- *Make sure that the shield around each pair in the cable is individually isolated on the 10-pin terminal on the Processing Unit.*
- *Make sure that the outer shield is connected to pin 3 (screen) on the 10-pin MRU terminal, which is an open end (not connected to earth).*
- *The junction box housing is grounded to earth through the screws used for mounting the box to the wall or floor. If the surface on which the junction box is mounted is NOT connected to earth, one of the junction box mounting screws must be connected to earth by connecting a wire from the screw to an object which is connected to earth.*
- *Fill the cable glands which are not used with self-bounding tape. Press the self-bounding tape together as a ball and fill it into the gland. Tighten the gland properly afterwards to ensure that it is watertight. This is in order to fulfil the enclosure protection specification.*



A. *User configurable external interfaces are COM 2 and Ethernet*

B. *Cable to Inertial Measurement Unit, MGC or MRU (default pre-installed)*

C. *Ethernet cable*

D. *Relay and earth shield, P3*

E. *Termination of user external interfaces, P2*

Table 7: P2 terminal in the JB3 junction box (external interface)

Pin no.	Signal description
1	PWR+ (Power+)
2	PWR- (Power-)
3	Com1_Out_B
4	Com1_Out_A
5	Com1_In_B
6	Com1_In_A
23	XIN (to MGC/MRU)
24	CGND

Table 8: P3 terminal in the JB3 junction box (earth)

Pin no.	Signal description
40 (CHASSIS)	Earth

Table 9: MRU terminal at the rear of the Processing Unit

Pin no.	Signal description
1	GND
2	LGND
3	NC
4	MRU_1PPS_N
5	MRU_1PPS_P
6	TX_B
7	TX_A
8	RX_B
9	RX_A
10	24V_MRU

Table 10: Wiring for cable between Processing Unit and MGC/MRU JB3 junction box

Pin no. Processing Unit (MRU terminal)	Colour	Pin no. Junction Box
3	Screen	Chassis (P3)
10	1 White	1 (P2)
1	1 Blue	2 (P2)
8	2 White	3 (P2)
9	2 Blue	4 (P2)
6	3 White	5 (P2)
7	3 Blue	6 (P2)
5	4 White	23 (P2)
2	4 Blue	24 (P2)

Important:

The cable illustrated in the table Wiring for cable between Processing Unit and MGC/MRU JB3 junction box is for the cable delivered by Kongsberg Discovery AS.

You can also use a regular ship cable.

Procedure

1. Terminate the 10-pin MRU terminal at the rear of the Processing Unit according to the table *Wiring for cable between Processing Unit and MGC/MRU JB3 junction box*.
2. Enter the other end of the cable through one of the free cable glands on the junction box.
3. Terminate the P2 and P3 terminal in the junction box according to the table *Wiring for cable between Processing Unit and MGC/MRU JB3 junction box*.
4. Seal the cable glands which are not used.

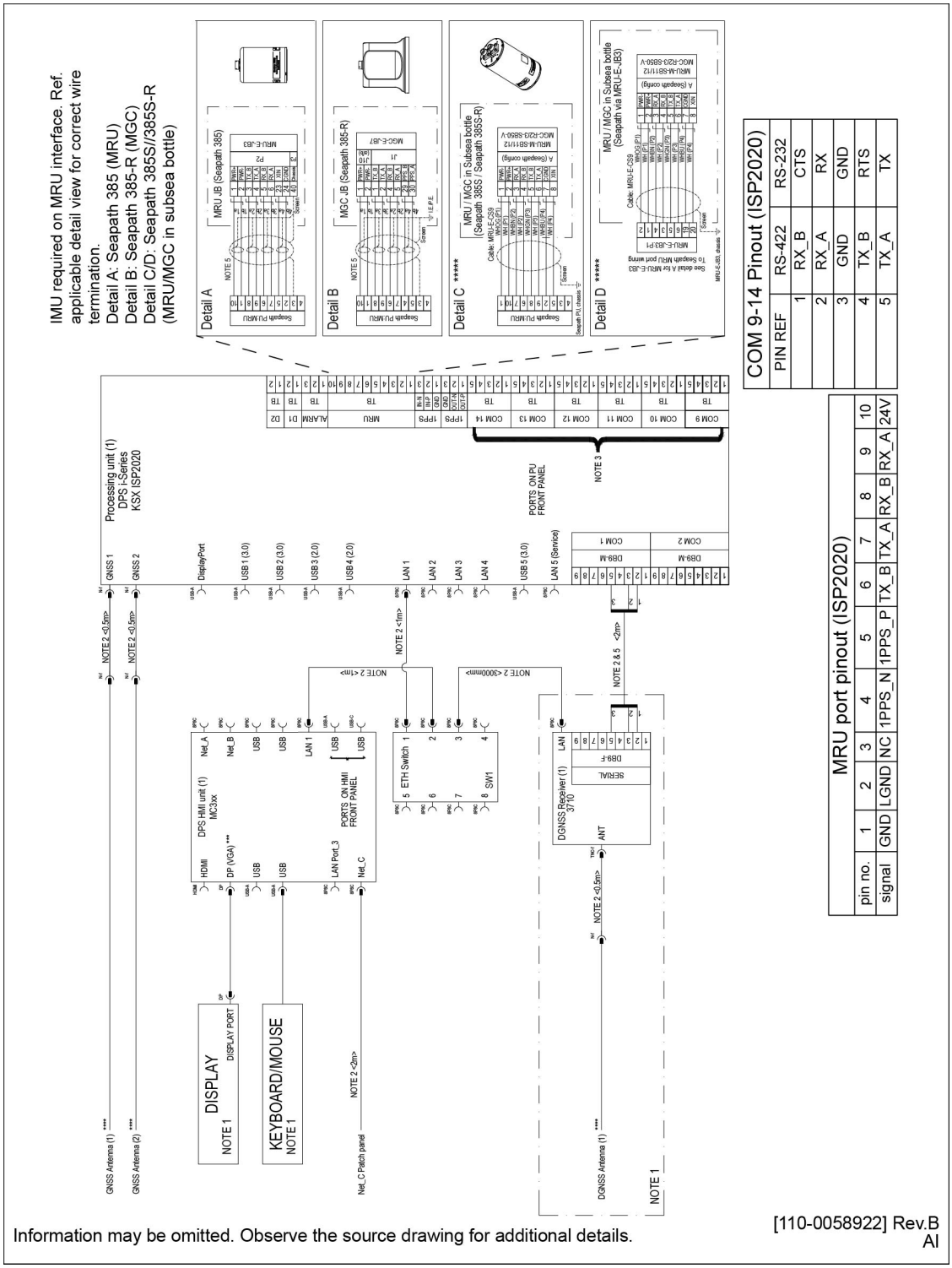
Related tasks

Cabling for the rack units, page 72

Related references

Cable specifications, page 178

Wiring diagram



Notes:
1) Item must be ordered separately
2) Item included in respective product/accessory option
3) External COM ports, user configurable
5) Primary DGNSS receiver shal be interfaced by serial line (COM1), additional receivers may be interfaced by Ethernet connection.

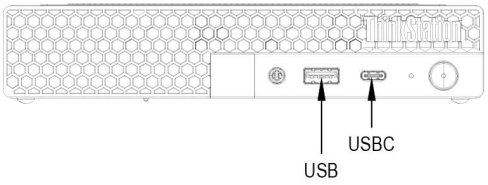
Where MGC/MRU is powered from UPS (typical), “24V” and “GND” wires shall not be used for connection between Seapath and MGC/MRU.

Markings:
All connectors, cables & components should be marked in accordance with marking & labelling specification 161013.

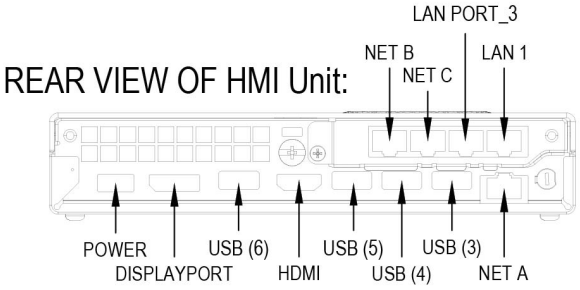
****) Installation specific cable not included in cable kit.

DisplayPort (DP++) to VGA adapter included for connection to legacy monitors.

FRONT VIEW OF HMI Unit:



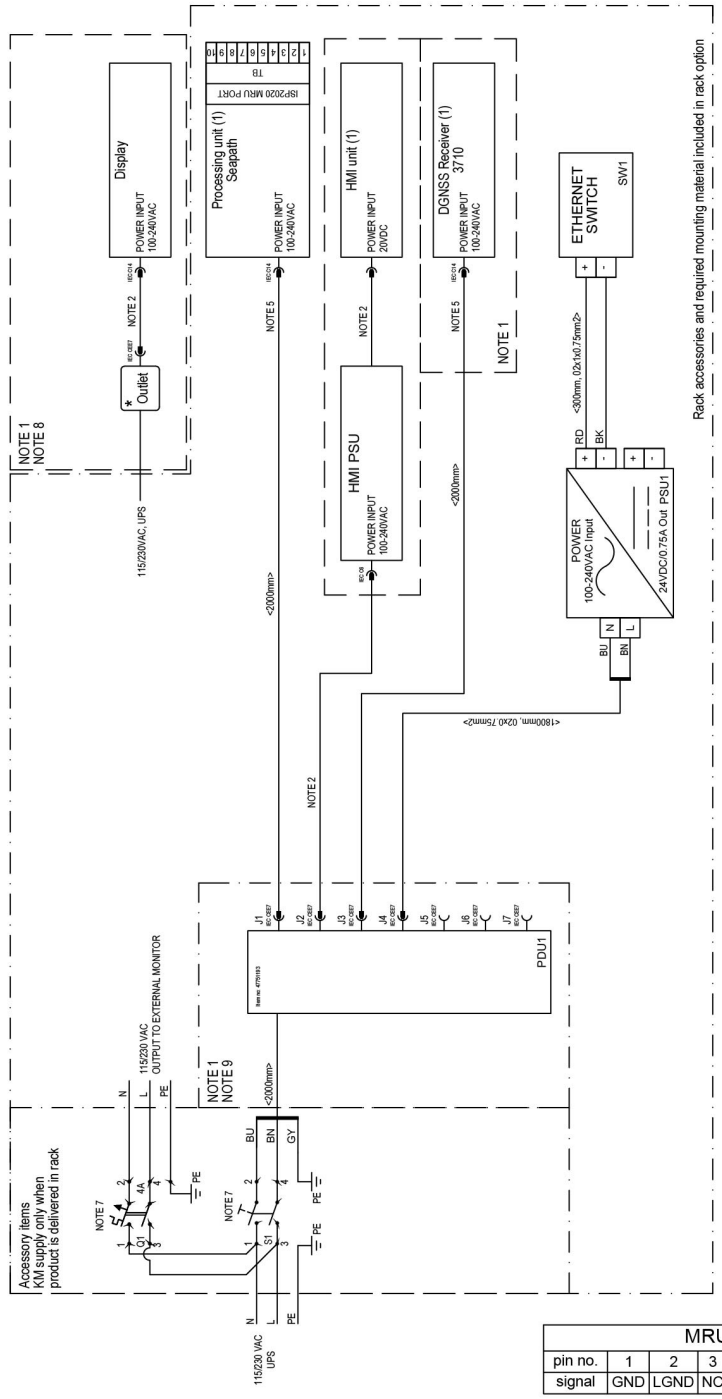
REAR VIEW OF HMI Unit:



Information may be omitted. Observe the source drawing for additional details.

[110-0058922] Rev.B
AI

Power diagram



Notes:
1) Item must be ordered separately
2) Item included in respective product/accessory option
5) Power cable with IEC-lock included
7) S1/Q1 marked “230 VAC”
8) A compatible display i required
9) PDU does not fit in smaller racks. For products ordered in 6U rack, power is distributed through terminal block.

Item (brackets) for installation must be ordered separately.
Excessive cables to be rolled up and fastened.
Supply from same UPS/redundancy group as main unit

Markings:
All connectors, cables & components should be marked in accordance with marking & labelling specification 161013.

Wirings:
If not otherwise specified:
- All wirings are 1.5 mm²
- Use suitable ferrules with sleeve

Wiring colours:
BN: 115/230 VAC: L
BU: 115/230 VAC: N
RD: +24 VDC
BK: 0 V
YL/GN: PE/IE

(IE to be marked with red shrinkable sleeve in both ends, L = 10 mm)

*) Yard supply, not supplied by KD

MRU port pinout (ISP2020)										
pin no.	1	2	3	4	5	6	7	8	9	10
signal	GND	LGND	NC	1PPS_N	1PPS_P	TX_B	TX_A	RX_B	RX_A	24V

Information may be omitted. Observe the source drawing for additional details.

[110-0058930] Rev.A
AI

Setting to work

Topics

Setting to work summary

When all hardware units have been installed, and all the cables have been connected, the Seapath system can be turned on and set to work.

Prerequisites

- All system units have been installed.
- All system cables are connected.
- All cable connections are made.
- Correct operating power is available. The system operates on 100 - 240 VAC from the vessel's mains power supply.

- All external devices which shall communicate with the Seapath are available and operational.
- All relevant personnel and tools are available.

Procedure

1. Verify that all hardware and cable installation have been made correctly.
2. Turn on the Processing Unit by pressing the power switch located under the lid at the front of the unit.
3. Turn on the HMI Unit.
4. Turn on the display.
5. Set up the Seapath system for operational use.
   The Seapath operator software is pre-installed on the HMI Unit.
6. Set up interfaces to external devices.
7. Create a backup with the system configuration and software installation.
8. Verify that the Seapath system is operational.

Related concepts

LED indicators Processing Unit, page 91
LED indicators HMI Unit, page 93
Installing the Seapath units, page 58
Cable layout and interconnections, page 72
How the configuration of the system works, page 94
Required system configuration, page 101

Related tasks

Turning on the Seapath system, page 91
Mounting the GNSS antennas as stand-alone units, page 50
Mounting the GNSS antennas on antenna bracket, page 54

Turning on the Seapath system

When you have verified that all hardware units and cables have been properly installed, and that the supply power is correct, you can turn on the Seapath system for the first time.

Context

The software is pre-installed and the system will start automatically after it has been turned on.

Procedure

1. Make sure that the serial connections, the network cable(s), the antenna cable(s) and the power cable(s) are connected.
2. Turn on the Processing Unit by pressing the power switch located under the lid at the front of the unit.
3. Turn on the HMI Unit.
4. Turn on the display.
5. Observe that the Power/SW LED on the Processing Unit is red during the initialization phase.

   When the Power/SW LED on the Processing Unit turns green, the units are running.

Result

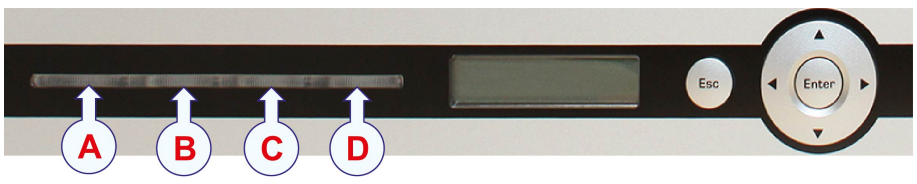
The system is now ready for configuration.

Related concepts

LED indicators Processing Unit, page 91
LED indicators HMI Unit, page 93

LED indicators Processing Unit

At the front of the Processing Unit there are four LED indicators (Light Emitting Diode). These LEDs show the Processing Unit status at any time.



A. *Power/SW LED*

B. *Inertial Measurement Unit (IMU) LED*

C. *System health LED*

D. *Network card LED*

Power/SW LED

This LED indicates power and software status.

- During start-up the LED is red.
- When the software is up and running, it turns green.

Inertial Measurement Unit (IMU) LED

The LED indicates the status of the Inertial Measurement Unit (MGC or MRU).

- The LED is green when there is contact with the Inertial Measurement Unit (MGC or MRU) and PPS and data are OK.
- The LED is yellow when there is contact with the MGC or MRU but PPS or data are missing.
- The LED is red when there is no contact with the Inertial Measurement Unit (MGC or MRU).

System health LED

- The LED is normally off. Other states indicate internal error.

Network card LED

This LED indicates the status of the four network cards.

- The LED is green when all four network cards are OK.
- The LED is red if there is an error on one or more of the network cards.

Related tasks

Turning on the Seapath system, page 91

LED indicators HMI Unit

The HMI Unit does not have any LEDs which show the status of the unit. The LED on the on/off button turns white when the unit is turned on.

Related tasks

Turning on the Seapath system, page 91

How the configuration of the system works

Topics

Entering the system configuration

The setup parameters are available from:

- The **System** menu > **NAV Engine** > **Standard** for system setup.
- The **System** menu > **Operator SW** for display views setup.

To be able to make changes to the setup you must be in *Configuration* mode for standard configuration tasks or *Engineering* mode for advanced configuration and diagnostic tasks.

Note:

Advanced NAV Engine configuration is for service personnel only.

NAV Engine Configuration description

You can set up the system parameters from the **NAV Engine Configuration** dialog box.

The dialog box consists of a list of configuration options, a parameter settings section, an exit button and three buttons which each has different properties with regard to configuration changes.

Apply

Select **Apply** to apply the configuration changes to the system. This button is disabled until you have made changes to the configuration. The button will be disabled when there are no changes to apply.

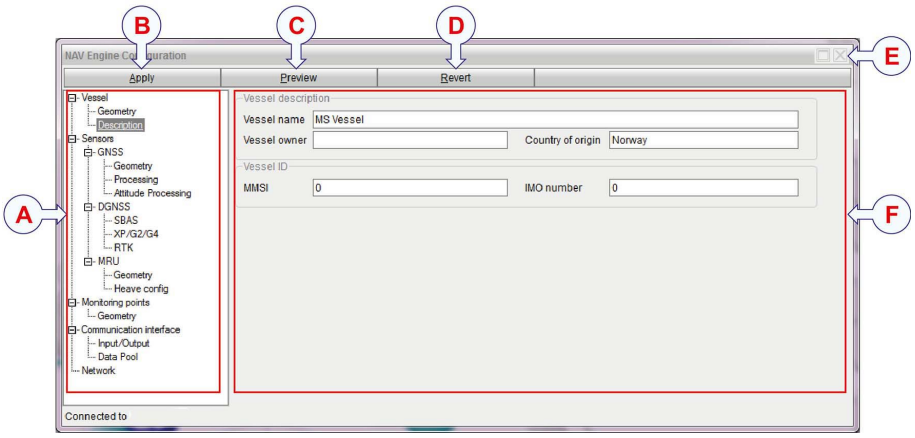
Preview

Select **Preview** to see which parameters have changed since the configuration was loaded. Changed settings are highlighted in bold face. This button is disabled until you have made any changes to the configuration.

Please note that monitoring point changes are displayed in the coordinate system in which they are actually stored by the configuration. For example related to the navigation reference point rather than origin.

Revert

Select **Revert** to reject all changes you made since the configuration was loaded. The button is disabled until changes have been made.



A. *Configuration options list*

B. *Apply confirmation changes button*

C. *Preview last configuration settings button*

D. *Revert to previous settings button*

E. *Exit NAV Engine Configuration*

F. *Parameter settings section*

Operator software configuration description

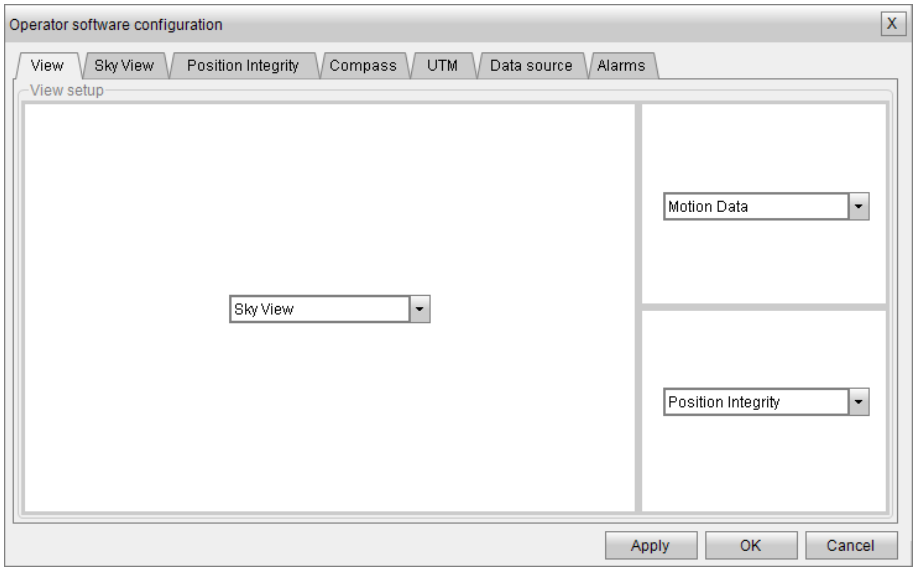
You can adjust the appearance of the display views through the **Operator software configuration** dialog box.

The dialog box contains tab pages for various presentation options. 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** dialog box.
- **Apply button**: Selecting the **Apply** button will save the changes but the c dialog box will not close.
- **Cancel button**: Selecting the **Cancel** button will close the **Operator software configuration** 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.*



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.

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.

Communication interface description

You must set up the communication interfaces for the system to be able to communicate with and interface to other systems and equipment.

Context

The communication interfaces are set in **NAV Engine Configuration** under **Communication** > **Input/Output**. The **Input/Output list** shows all input and output ports which are available in the system. When you select an **Interface** in the **Input/Output list**, the **Configuration details** part for that particular interface will appear in the lower part of the page. These details will change based on the interface type you have selected, Serial or Ethernet. You must select either **Serial** or **Ethernet** for all available interfaces before you select the specific parameters for a particular interface.

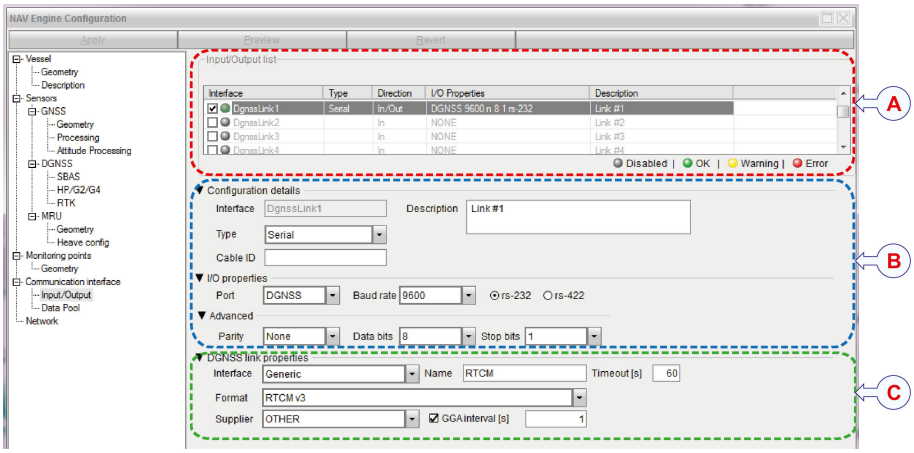
Select the arrow next to the group headings to show or hide the information.

To be able to get a properly working system you must set up these communication interfaces:

- MGC/MRU
- Telegram out

Note:

You are not able to configure the GnssReceiver interface and the MRU interface.



A. *Selected interface in Input/Output list*

B. *Type of interface selection: Serial or Ethernet*

C. *Specific configuration details for the selected interface*

This procedure sums up the steps you have to go through to set up the communication interfaces for the system.

Procedure

1. Select the **System** menu > **NAVEngine** > **Standard**.
2. Select **Communication interface** > **Input/Output**.
3. Select the interface you want to set up in the **Input/Output list**.

   Observe that the **Configuration details** parameters appear at the lower part of the page.
4. Select which type of interface you want to use from the **Type** list: Serial or Ethernet.
5. Select the wanted I/O parameters. These will vary depending on the type of interface you selected.
6. Select the specific parameters you want for the interface you selected.
7. Select **Apply** to save your settings without closing the dialog box.

Related concepts

Setting up input to and from the MRU, page 125

Related tasks

Setting up input to and from the MGC, page 124
Setting up the Telegram out interface, page 126
Selecting heading input format from a gyro compass, page 133
Setting up the DGNSS correction link parameters, page 135
Enabling and/or disabling use of GNSS link, page 136

Using the Serial interface

The Serial interface allows you to decide how the Processing Unit shall communicate with and interface to other equipment.

Context

If you have decided to use a Serial interface, you must set up the port number, the baud rate and select RS-232 or RS-422 mode.

Procedure

1. Select the **System** menu > **NAVEngine** > **Standard**.
2. Select **Communication interface** > **Input/Output**.
3. Select the interface you want to set up in the **Input/Output list**.

   Observe that the **Configuration details** parameters appear at the lower part of the page.
4. Select **Serial** in the **Type** list.
5. Type an informative text about the interface in the **Description** box. This is optional.
6. Type a short identification text for the cables connected to the Processing Unit in the **Cable ID** box This is optional.
7. Select which port to use from the **Port** list.

   The serial port number corresponds with the number on the Processing Unit.
8. Select which baud rate you want to use from the **Baud rate** list.

   Maximum baud rate is 115200 bits/second.
9. Depending on which port you selected, select if you want to use RS-232 or RS-422 for the electrical interface.
10. Select the properties for the interface you selected in the **Input/Output list**.

Result

You are now ready to set the specific parameters for the interface you have selected. See separate sections for selection details.

Related concepts

Setting up input to and from the MRU, page 125

Related tasks

Setting up input to and from the MGC, page 124
Setting up the Telegram out interface, page 126
Selecting heading input format from a gyro compass, page 133
Setting up the DGNSS correction link parameters, page 135
Enabling and/or disabling use of GNSS link, page 136

Related references

Communication interface - Serial or Ethernet, page 243

Using the Ethernet interface

The Ethernet interface allows you to decide how the Processing Unit shall communicate via the internet protocol (IP) network.

Context

Broadcasting is a method of transferring a message to all recipients simultaneously. Unicast transmission is the sending of messages to a single network destination identified by a unique address. Multicast (one-to-many or many-to-many distribution) is group communication where information is addressed to a group of destination computers simultaneously.

Procedure

1. Select the **System** menu > **NAVEngine** > **Standard**.
2. Select **Communication interface** > **Input/Output**.
3. Select the interface you want to set up in the **Input/Output list**.
   Observe that the **Configuration details** parameters appear at the lower part of the page.
4. Select **Ethernet** in the **Type** list.
5. Type a short identification text for the cables connected to the Processing Unit in the **Cable ID** box This is optional.
6. Select the wanted connection type: Broadcast, Unicast or Multicast.
   - **Local interface**: The LAN port on the Processing Unit.
   - **Local port**: When receiving, this is the port on which the unit listens.
   - **Remote port**: When transmitting, this is the port to which the unit sends.

- **IP address Unicast**: The target IP address, to which the unit is receiving or sending.
- **IP address Multicast**: The multicast group address. Recommended range: 239.255.000.000 to 239.255.255.255.

Note:

It is recommended to use the same port number for both Local and Remote ports.

7. Depending on the connection type you have selected, select which local interface you want to use from the **Local interface** list.
8. Select the properties for the interface you selected in the **Input/Output list**.

Result

You are now ready to set the specific parameters for the interface you have selected. See separate sections for selection details.

Related concepts

Setting up input to and from the MRU, page 125

Related tasks

Setting up input to and from the MGC, page 124
Setting up the Telegram out interface, page 126
Selecting heading input format from a gyro compass, page 133
Setting up the DGNSS correction link parameters, page 135
Enabling and/or disabling use of GNSS link, page 136

Related references

Communication interface - Serial or Ethernet, page 243

Required system configuration

Topics

Selecting heave filter options, page 119
Setting monitoring points, page 120
Setting up input to and from the MGC, page 124
Setting up input to and from the MRU, page 125
Setting up the Telegram out interface, page 126

Setting vessel dimensions and reference points

You must define the dimensions and the reference points for the vessel which hosts the Seapath system and the origin of the vessel coordinate system.

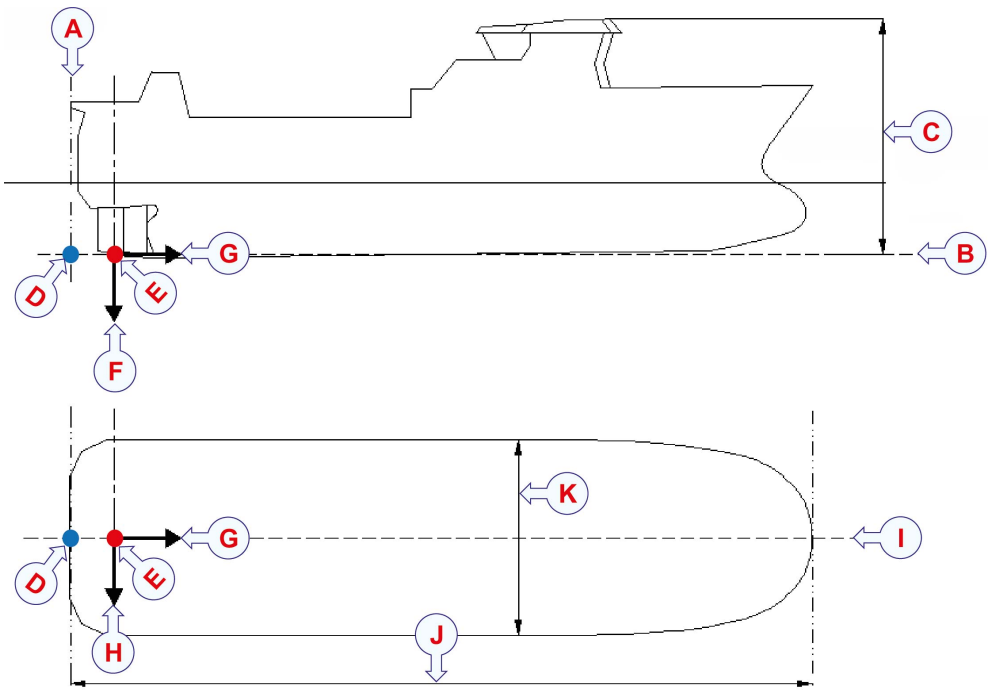
Prerequisites

The navigation reference points you type here must be measured or defined before you start the configuration process.

Context

This is information you need in order to specify correct location of various sensors, equipment and monitoring points on a vessel. The information you enter here will help you later in the configuration process. The drawing is correctly scaled based on the vessel dimensions to make sure that the various points are correctly indicated. The measurement unit of the entered coordinates is metres.

The illustration shows different vessel dimensions and location of origin. If a survey report is available, the vessel origin should be located in the common reference point (CRP) used in the report.



A. *Stern*

B. *Keel*

C. *Overall height*

D. *CRP (common reference point)*

E. *Origin*

F. *+Z axis*

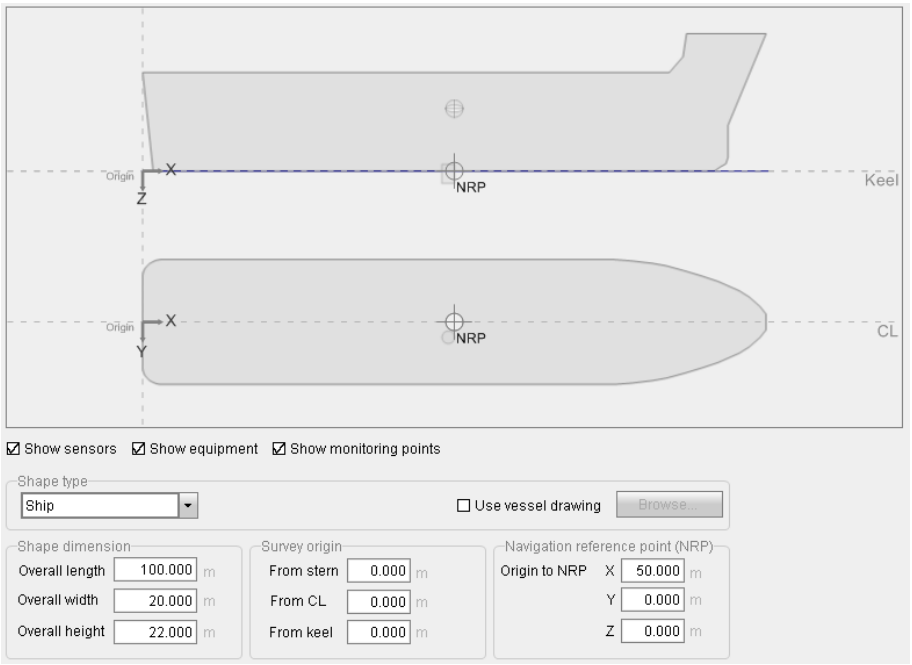
G. *+X axis*

H. *+Y axis*

I. *CL (centre line)*

J. *Overall length*

K. *Overall width*



Procedure

1. Select the **System** menu > **NAVEngine** > **Standard**.
2. Select **Vessel** > **Geometry**.
3. Select the shape of your vessel from the **Shape type** list or select **Use vessel drawing** if you have a specific vessel shape file you want to use. Select the **Browse** button to search for the wanted file.

   If you select **Use vessel drawing**, the **Shape dimension** parameters will be locked.
4. Type the overall length, width and height dimensions of your vessel.
5. Type the parameters for location of origin (survey origin).
6. Type the navigation reference point location, X, Y, Z.
7. Select **Show sensors**, **Show equipment** and/or **Show monitoring points** if you want to display these objects in the vessel illustration.

8. Select **Apply** to save your settings without closing the dialog box.

Related concepts

Determining the system coordinates, page 69
Survey accuracy values, page 70

Related tasks

Importing vessel shape from file, page 129
Entering antenna location parameters, page 104

Related references

Vessel Geometry page, page 226

Entering antenna location parameters

The antenna position is a critical parameter in the system. It is used for Inertial Measurement Unit (IMU) integration and calculation of monitoring points and heading.

Prerequisites

The distance vector from the origin to the GNSS antenna #1 has to be measured before you can enter the parameters into the configuration.

Context

You can either drag and place the antenna symbol in the vessel illustration or you can enter the parameters directly into the table.

Important:

If you move the antenna after the system has been installed and configured, you must update the distance vector measurements and re-configure the antenna location. This must be done both for the Seapath system and for the connected DP (dynamic positioning) system.

Calibration Wizard

The **Calibration wizard** will help you to calculate the position of the two antennas more accurately.

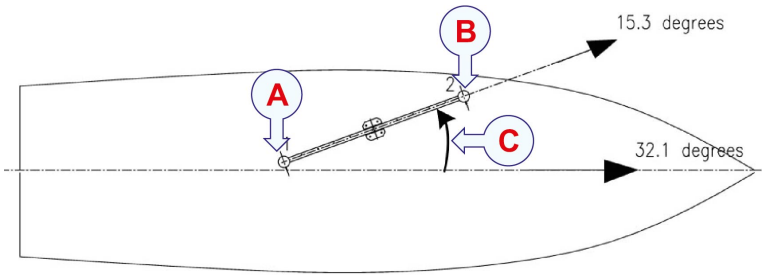
Note:

*Before you start the **Calibration wizard**, make sure that all configuration changes, including the correct MGC/MRU mounting angles, are applied by pressing the **Apply** button on the menu bar. See **Sensors** > **MGC/MRU** > **Geometry** for mounting angles.*

Also, verify that the roll, pitch and heading measurements are indicated as valid (green) in the status indicators on the top bar.

Heading offset calculation example

If the reference heading is found to be 32.1 degrees and the GNSS heading after the calibration is 15.3 degrees, the Determined heading offset will be 32.1 - 15.3. Observe that the heading offset is positive counterclockwise, and in the range [0,360> degrees.



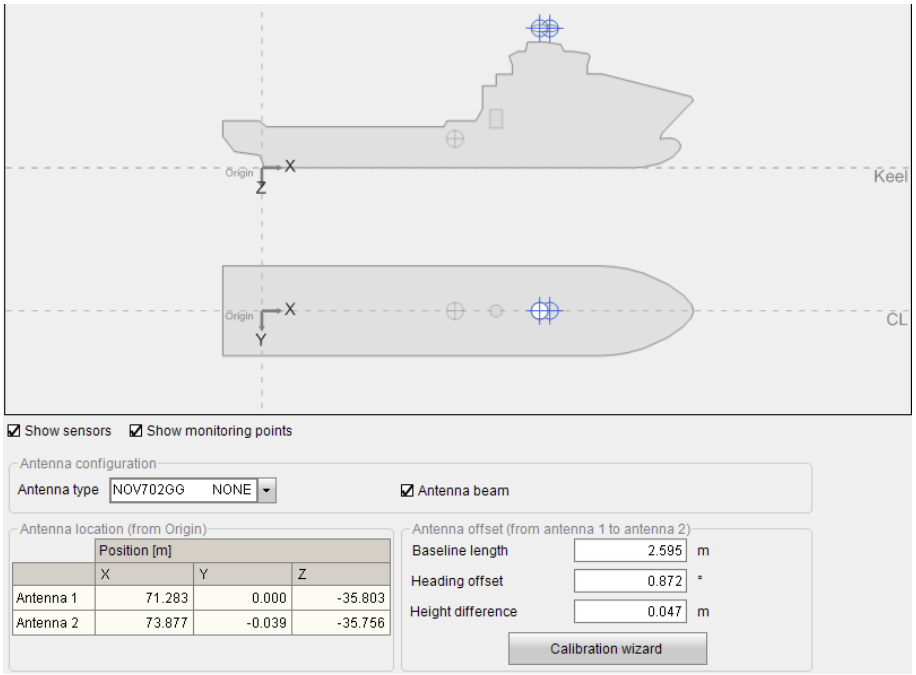
A. *Antenna 1*

B. *Antenna 2*

C. *Heading offset*

Note:

*The antenna cable connected to **GNSS1** at the rear of the Processing Unit, will be GNSS antenna #1 in the installation.*



The illustrations in this procedure shows the **Calibration wizard** when the **Antenna beam** box in deselected.

Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **GNSS** > **Geometry**.
2. Select **Show sensors**, **Show monitoring points** if you want to display these objects in the vessel illustration.
3. Select **Antenna type**.
4. Select the **Antenna beam** check box if the antennas are mounted on a beam. Clear the box if the antennas are mounted separately.
5. Type the surveyed antenna coordinates, X, Y, Z, for **Antenna 1**.

   If the **Antenna beam** check box is selected, type the **Baseline length**, **Heading offset** and **Height difference** values measured earlier into the **Antenna offset (from antenna 1 to antenna 2)** boxes. The co-ordinates for **Antenna 2** will be updated accordingly.

   If the **Antenna beam** check box is not selected, type the surveyed X, Y, Z co-ordinates for **Antenna 2**. Or you can type the **Baseline length**, **Heading offset** and **Height difference** values.
6. Make sure that the antenna has been located in the expected spot in the vessel illustration.

   If the antenna symbol does not appear where you expect it to in the vessel illustration, observe the GNSS antenna co-ordinates, the vessel dimensions and the entered location of origin.

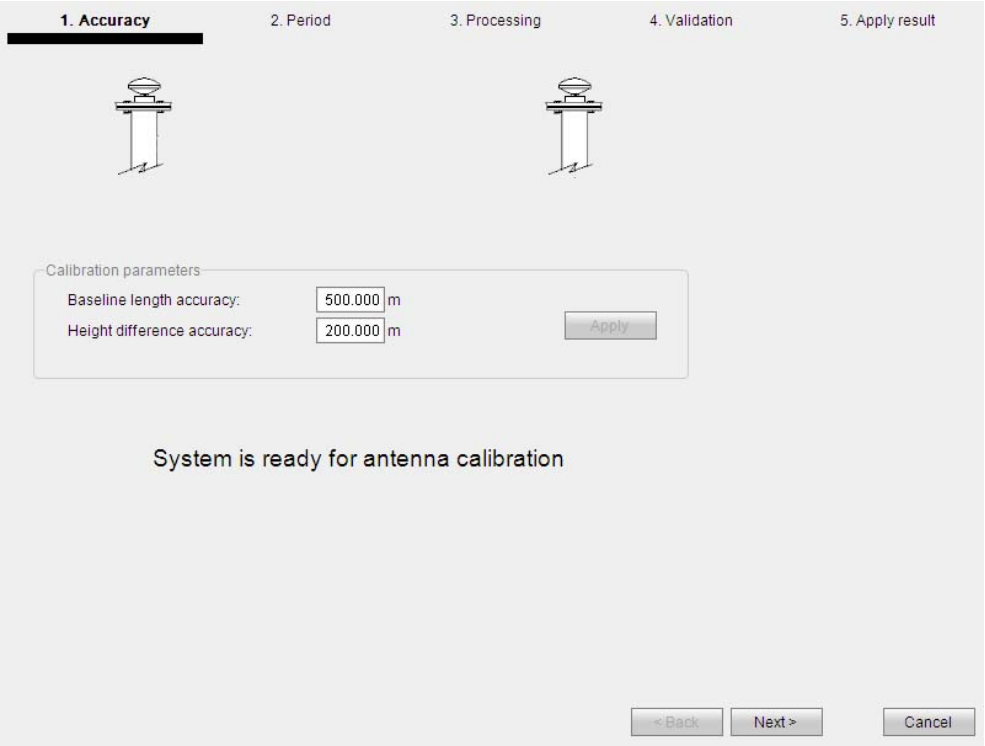
7. Select the **Calibration wizard** button to start the calibration of the antenna baseline and height difference.

   The system will indicate when calibration measurements are ready.

8. In Step 1 **Accuracy**, modify the **Baseline length accuracy** and the **Height difference accuracy** values if needed.

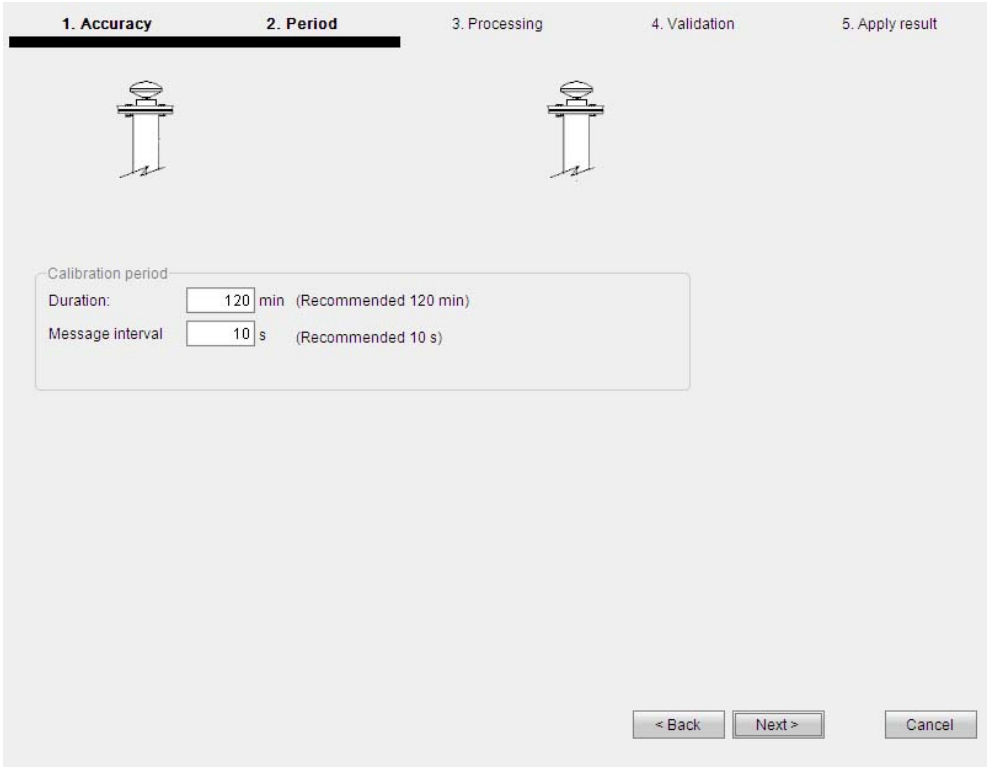
   Select **Apply** to restart the calibration measurements.

   The **Next** button will be enabled as soon as measurements are ready.

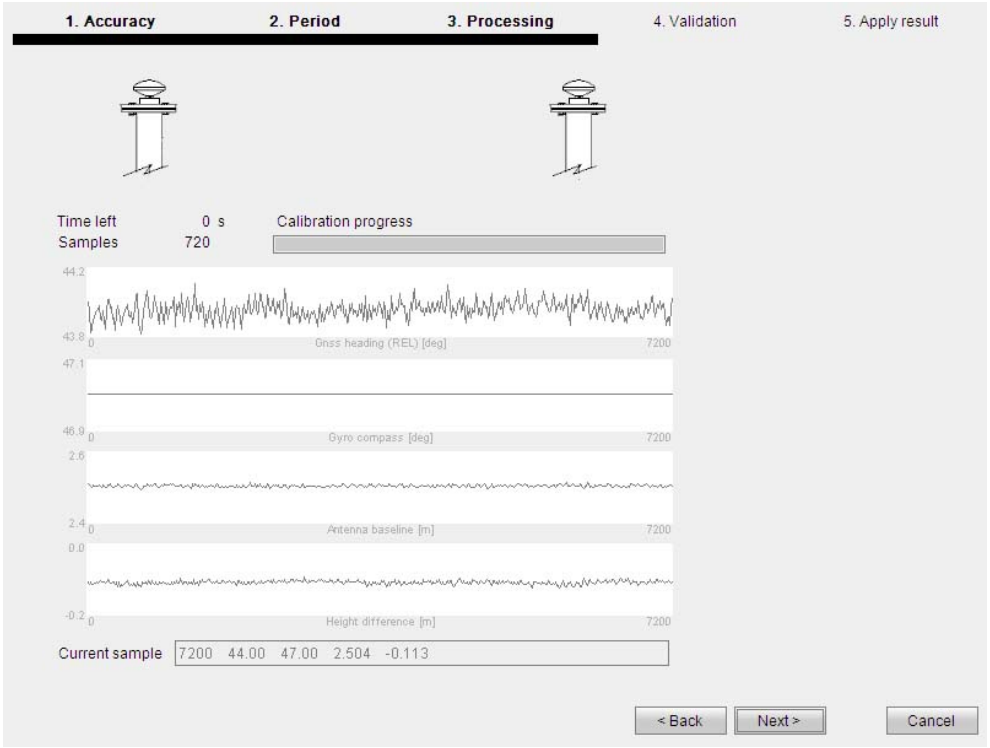


9. Select **Next** to continue to Step 2 **Period**.

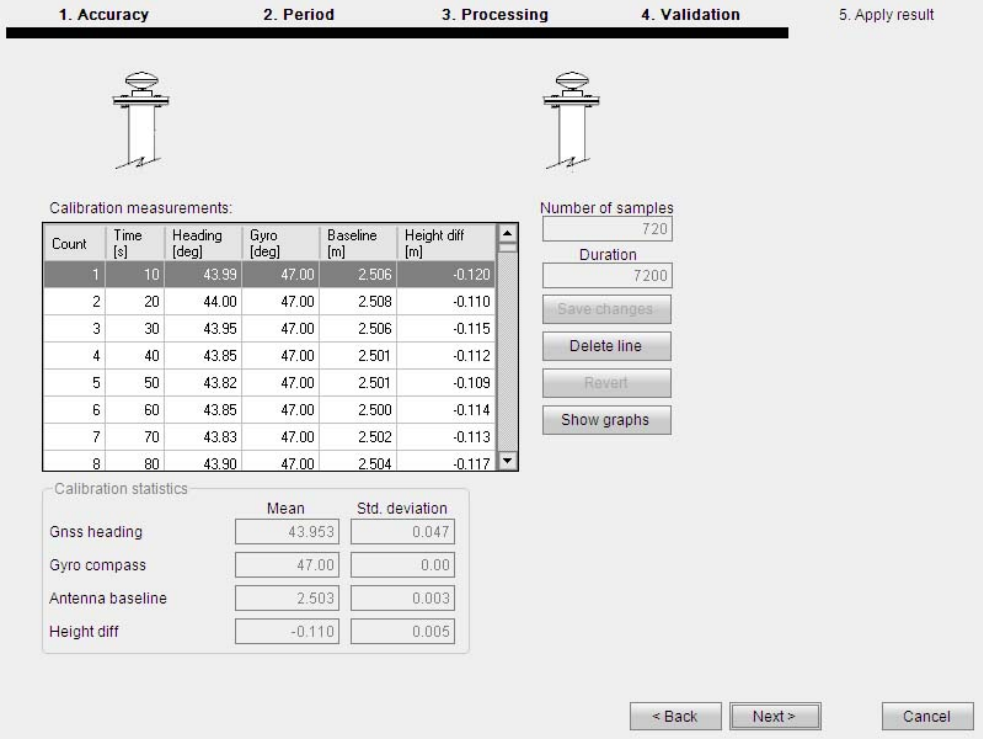
10. Modify the **Duration** and **Message interval** values of the calibration period if needed. It is recommended to use the default values.



11. Select **Next** to start the calibration logging.



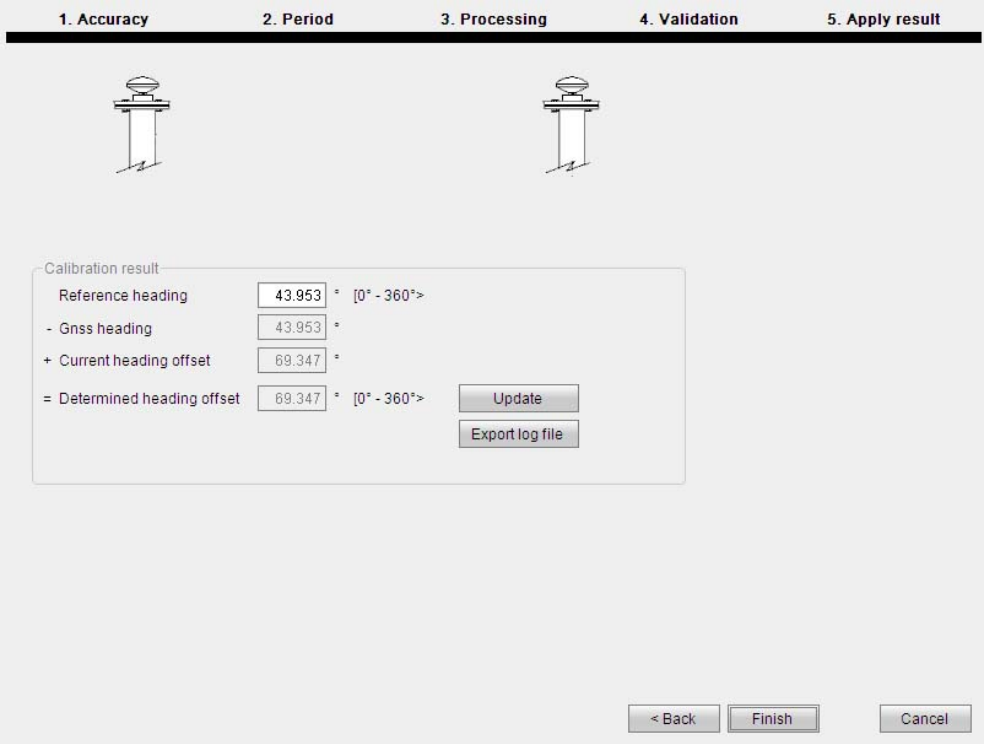
12. Select **Next** to proceed to Step 4 **Validation** for inspection of the logged data.



13. Delete possible wild points by selecting the corresponding row in the table. Select **Delete line**.

14. When the calibration result has been found acceptable, select **Next** to proceed to step 5, **Apply result**.

15. Type the mean value for the vessel **Reference heading**. Select **Update** in order to calculate the heading offset.



16. Select **Export log file** if the calibration data are wanted for post processing.
17. Select **Finish** to accept the result and exit the antenna Calibration Wizard.
18. Select **Apply** to save your settings without closing the dialog box.

Related concepts

About sensor survey, page 61
Surveying the GNSS antenna, page 67
Determining the system coordinates, page 69
Survey accuracy values, page 70

Related tasks

Setting vessel dimensions and reference points, page 102

Related references

Sensors GNSS Geometry page, page 229

Setting MGC location and mounting angles

The physical location of the MGC relative to the origin and its mounting angles is required for the Seapath system to be able to calculate position, roll, pitch and heading correctly.

Prerequisites

For accurate location of the MGC (Motion Sensor and Gyro Compass) a survey has to be carried out.

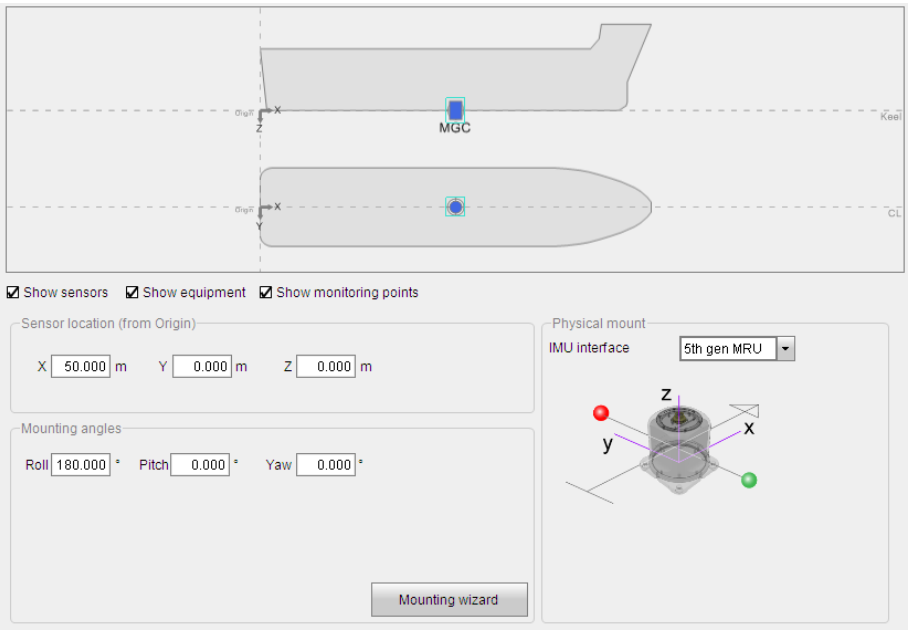
Context

The MGC measures the roll, pitch, yaw and heave motions of the vessel. Under **MGC Geometry** you must define the physical location of the unit related to the origin location you created under **Vessel Geometry**.

In the **MGC Geometry** page you enter the MGC location parameters, the X, Y and Z coordinates in meters, and the MGC mounting angles, the roll, pitch and yaw parameters in degrees. Look at the vessel illustration in the page to help you enter the correct signs for the coordinates. The illustration will show if the MGC appears at the expected location on the vessel.

If something looks out of place, check the signs and X, Y, Z coordinates you typed for the unit location and/or return to the **Vessel Geometry** page and check the vessel shape dimensions, the origin location and the navigation reference point (NRP) location.

The MGC mounting angles can either be input manually or determined by use of the Mounting wizard. The Mounting Wizard is located under **NAV Engine Configuration** > **Sensors** > **MGC** > **Geometry**.



Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **MGC** > **Geometry**.
2. Select the type of unit which is connected to your vessel.
3. Type the X, Y and Z coordinates in metres from Origin to the unit location.
4. Type the unit's mounting angles in degrees for roll, pitch and yaw.

   If the mounting angle values are not known to you, use the Mounting Wizard to calculate these values.
5. Select **Apply** to save your settings without closing the dialog box.

Related concepts

About sensor survey, page 61
Determining the system coordinates, page 69
Survey accuracy values, page 70

Related tasks

Using Mounting Wizard to determine MGC mounting angles, page 112

Related references

Sensors MGC Geometry page, page 231

Using Mounting Wizard to determine MGC mounting angles

Use the Mounting Wizard to determine the roll, pitch and yaw mounting angles in degrees for the MGC.

Prerequisites

The MGC offset angles have to be available from a survey report or through other methods with similar accuracy.

Context

The mounting bracket offset angles which have to be entered are roll, pitch and yaw.

Note:

If the mounting bracket offset angles exceed 45 degrees, another main rotation should be selected.

Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **MGC** > **Geometry**.

2. Select the `Mounting Wizard` button and use the wizard to calculate the roll, pitch and yaw mounting angles.

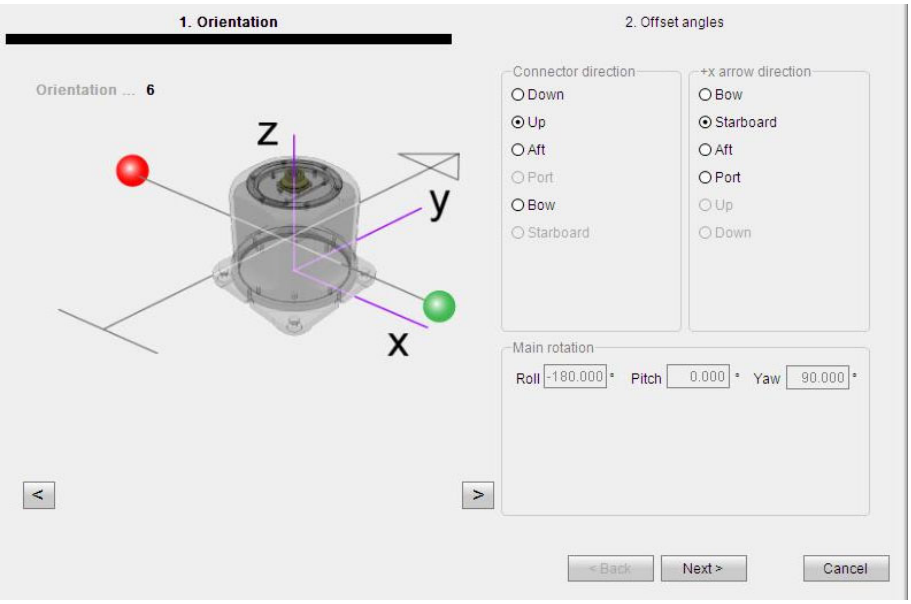
   The red circle indicates Port. The green circle indicates Starboard. The arrow points in the bow direction.

3. In step 1, **Orientation**, you shall determine the orientation of the unit. There are two ways to determine the orientation.

   a. Select the < or > buttons to turn the unit around in 90-degree steps, axis by axis. Click until the correct mounting orientation of the unit has been found.

      Observe that the parameters for roll, pitch and yaw under**Main rotation** are automatically updated with the actual main rotation of the unit.

   b. Select the **Connector direction** options or the **+x arrow direction** options to select the unit orientation.

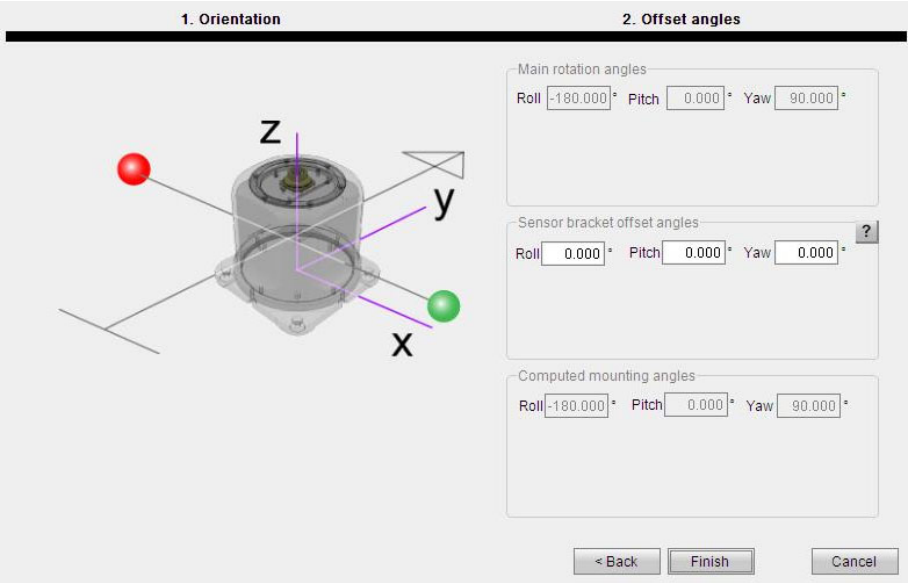


4. Select `Next` to continue to step 2, **Offset angles**.

   Observe that the roll, pitch and yaw mounting angles are now indicated under **Main rotation angles**.

5. Type the surveyed unit bracket offset angles in degrees for roll, pitch and yaw.

   The system calculates the mounting angles automatically and the values appear under **Computed mounting angles**.



6. Select `Finish` when you are ready to complete the offset angle setting.
   This will exit the wizard and take you back to the initial **MGC Geometry** page.
7. Select **Apply** to save your settings without closing the dialog box.

Related concepts

Survey accuracy values, page 70

Related tasks

Setting MGC location and mounting angles, page 111

Related references

Sensors MGC Geometry page, page 231
Sensors MGC Geometry - Mounting Wizard, page 232

Setting MRU location and mounting angles

The physical location of the MRU relative to the origin and its mounting angles is required for the Seapath system to be able to calculate position, roll, pitch and heading correctly.

Prerequisites

For accurate location of the MRU (Motion Reference Unit) a survey has to be carried out.

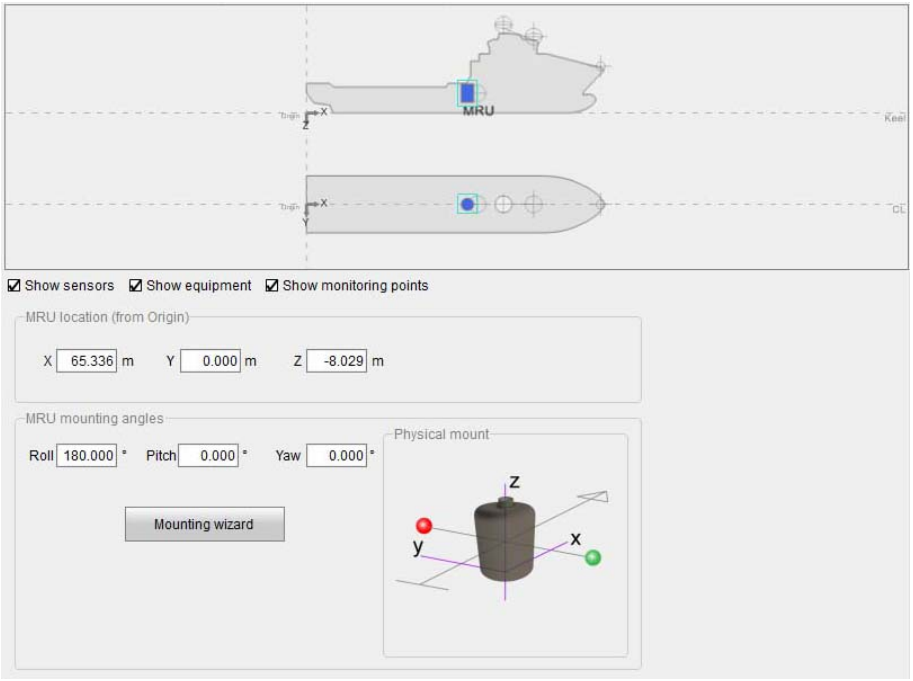
Context

The MRU measures the roll, pitch, yaw and heave motions of the vessel.Under **MRU Geometry** you must define the physical location of the unit related to the origin location you created under **Vessel Geometry**.

In the **MRU Geometry** page you enter the MRU location parameters, the X, Y and Z coordinates in meters, and the MRU mounting angles, the roll, pitch and yaw parameters in degrees. Look at the vessel illustration in the page to help you enter the correct signs for the coordinates. The illustration will show if the MRU appears at the expected location on the vessel.

If something looks out of place, check the signs and X, Y, Z coordinates you typed for the unit location and/or return to the **Vessel Geometry** page and check the vessel shape dimensions, the origin location and the navigation reference point (NRP) location.

The MRU mounting angles can either be input manually or determined by use of the Mounting wizard.The Mounting Wizard is located in the **NAV Engine Configuration** > **Sensors** > **MRU** > **Geometry**.



Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **MRU** > **Geometry**.
2. Type the X, Y and Z coordinates in metres from Origin to the unit location.
3. Type the unit's mounting angles in degrees for roll, pitch and yaw.

   If the mounting angle values are not known to you, use the Mounting Wizard to calculate these values.
4. Select **Apply** to save your settings without closing the dialog box.

Related concepts

About sensor survey, page 61
Determining the system coordinates, page 69
Survey accuracy values, page 70

Related tasks

Using Mounting Wizard to determine MRU mounting angles, page 116

Related references

Sensors MRU Geometry page, page 234
Sensors MRU Geometry - Mounting Wizard, page 236

Using Mounting Wizard to determine MRU mounting angles

Use the Mounting Wizard to determine the roll, pitch and yaw mounting angles in degrees for the MRU.

Prerequisites

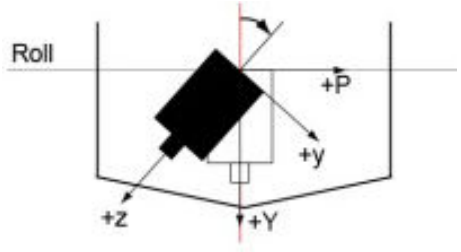
The MRU mounting bracket offset angles have to be available from a survey report or through other methods with similar accuracy.

Context

The mounting bracket offset angles which have to be entered are roll, pitch and yaw.

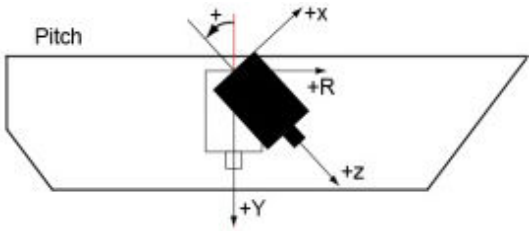
Roll offset angle

The angle between the ship's Y-axis and the projection of the unit's z-axis in the ship’s PY-plane. Positive roll offset angle if the bracket tilts to starboard.



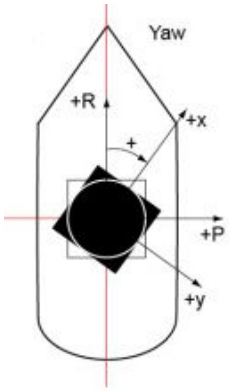
Pitch offset angle

The angle between the ship’s Y-axis and the projection of the unit's z-axis in the ship’s RY-plane. Positive pitch offset angle if the bracket tilts to stern.



Yaw offset angle

The angle between the ship’s R-axis and the projection of the unit's x-axis in the ship’s RP-plane. Positive yaw offset angle if the bracket is rotated clockwise.



Note:

If the mounting bracket offset angles exceed 45 degrees, another main rotation should be selected.

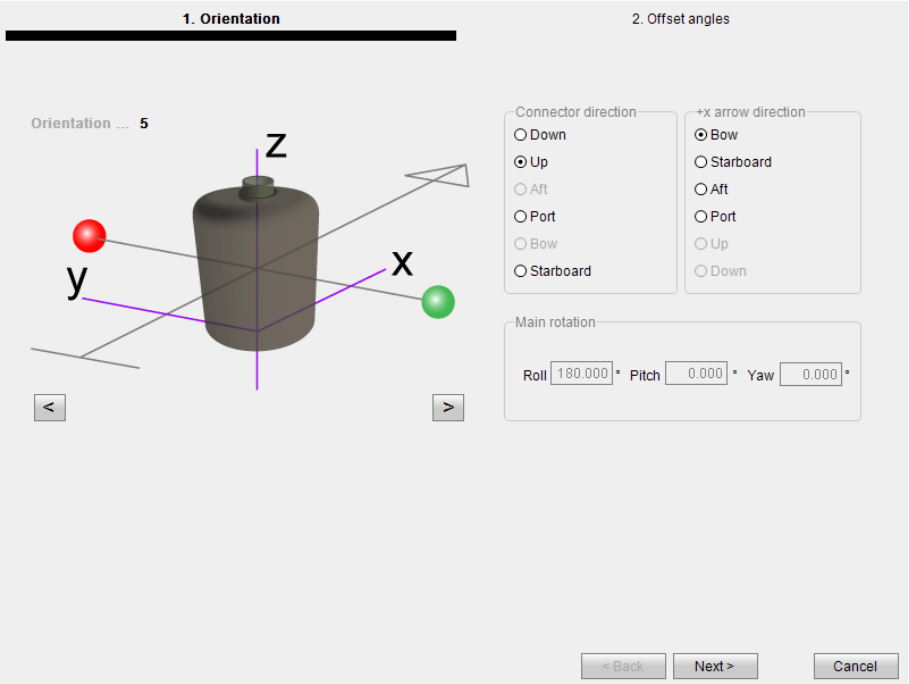
Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **MRU** > **Geometry**.
2. Select the `Mounting Wizard` button and use the wizard to calculate the roll, pitch and yaw mounting angles.

   The red circle indicates Port. The green circle indicates Starboard. The arrow points in the bow direction.
3. In step 1, **Orientation**, you shall determine the orientation of the unit. There are two ways to determine the orientation.
   a. Select the < or > buttons to turn the unit around in 90-degree steps, axis by axis. Click until the correct mounting orientation of the unit has been found.

      Observe that the parameters for roll, pitch and yaw under**Main rotation** are automatically updated with the actual main rotation of the unit.

   b. Select the **Connector direction** options or the **+x arrow direction** options to select the unit orientation.

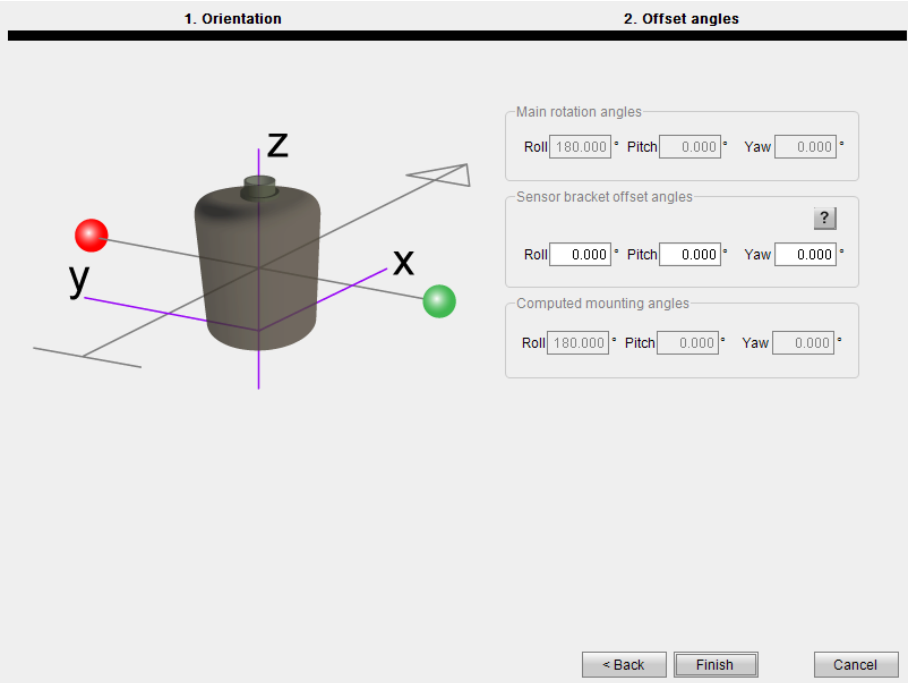


4. Select `Next` to continue to step 2, **Offset angles**.

   Observe that the roll, pitch and yaw mounting angles are now indicated under **Main rotation angles**.

5. Type the surveyed unit bracket offset angles in degrees for roll, pitch and yaw.

   The system calculates the mounting angles automatically and the values appear under **Computed mounting angles**.



6. Select `Finish` when you are ready to complete the offset angle setting.
   This will exit the wizard and take you back to the initial **MRU Geometry** page.
7. Select **Apply** to save your settings without closing the dialog box.

Related concepts

Survey accuracy values, page 70

Related tasks

Setting MRU location and mounting angles, page 114

Related references

Sensors MRU Geometry page, page 234
Sensors MRU Geometry - Mounting Wizard, page 236

Selecting heave filter options

The heave configuration parameters allow you to tune the heave parameters to the vessel motion characteristics for the actual weather conditions. This is important when using real-time heave measurements in order to achieve optimum heave performance.

Context

Before a survey and/or during operation check the heave performance and tune the heave parameters until the best heave performance is achieved. An alternative is to select **Automatic** or **GNSS aided** and let the system automatically choose the best settings.

Procedure

1. Select the **System** menu > **NAVEngine** > **Standard** > **Sensors** > **MGC/MRU** > **Heave config**.
2. Select the **heave filter** mode you want to use from the **Options** list.
3. If you select **Hydrographic survey** or **General purpose**, type the wanted filter period.
   Values are between 1 and 25 seconds.

Or you can select **Automatic** or **GNSS aided** for the system to estimate the heave filter parameters.

4. Select the **Roll/Pitch dependent** box if you want the heave measurements dependent on the roll and pitch measurements.

   There are separate selections for the real time heave and the delayed heave (PFreeHeave).

5. Select **Apply** to save your settings without closing the dialog box.

Related references

Sensors MRU/MGC Heave config page, page 238

Setting monitoring points

You must define the locations on the vessel for which you want the system to calculate the position.

Prerequisites

To get exact coordinates from origin to each monitoring point, each monitoring point has to be measured or calculated based upon drawings or previously measured points.

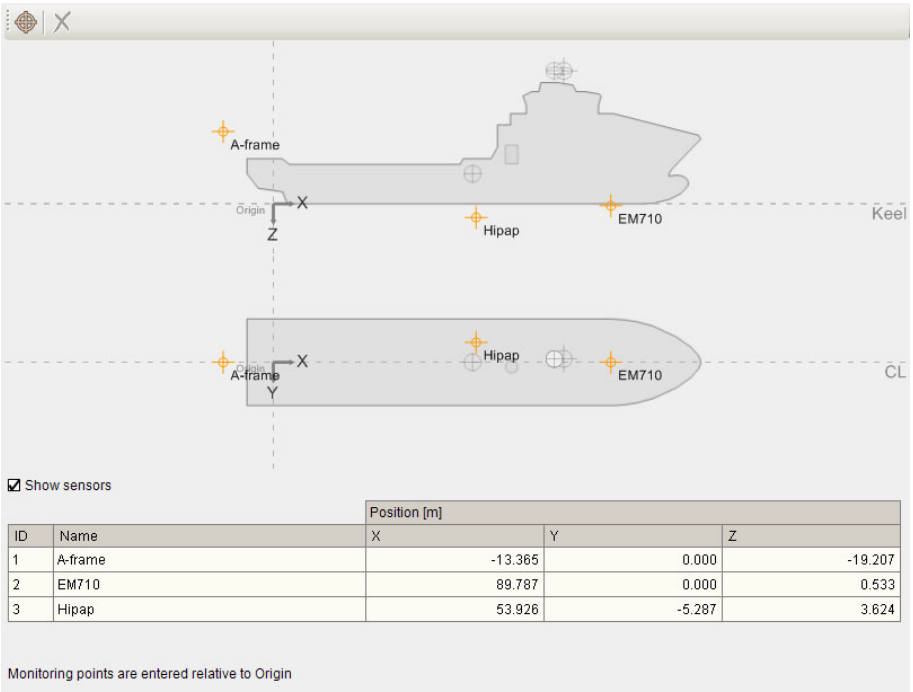
Context

You must define points (monitoring points) on the vessel where you want the position measurements to be output. The monitoring points are given relative to origin (positive forward, towards starboard and down). The position of a monitoring point relative to the origin is indicated in the vessel illustration when the cursor is over the monitoring point. As soon as a monitoring point has been defined, its location is indicated in the vessel illustration. If a monitoring point appears incorrect, check the signs and the coordinates input for each monitoring point and the vessel dimensions and the entered location of origin in the **Vessel Geometry** page.

The system supports up to eight user definable monitoring points.

Deleting a monitoring point

You can delete a monitoring point by selecting the wanted point in the table and clicking the `Delete` button,  .

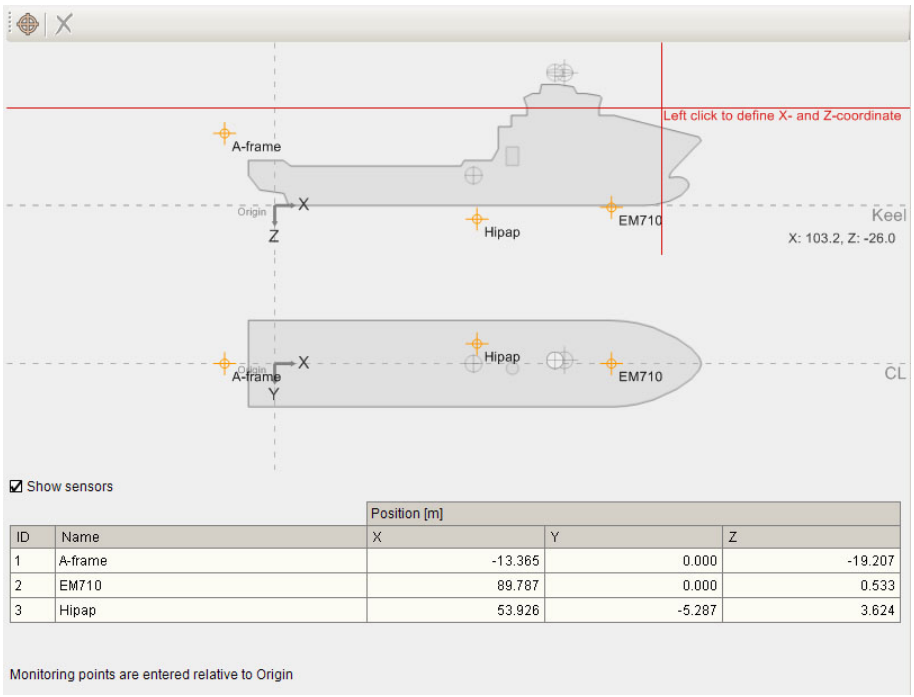


Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Monitoring points** > **Geometry**.

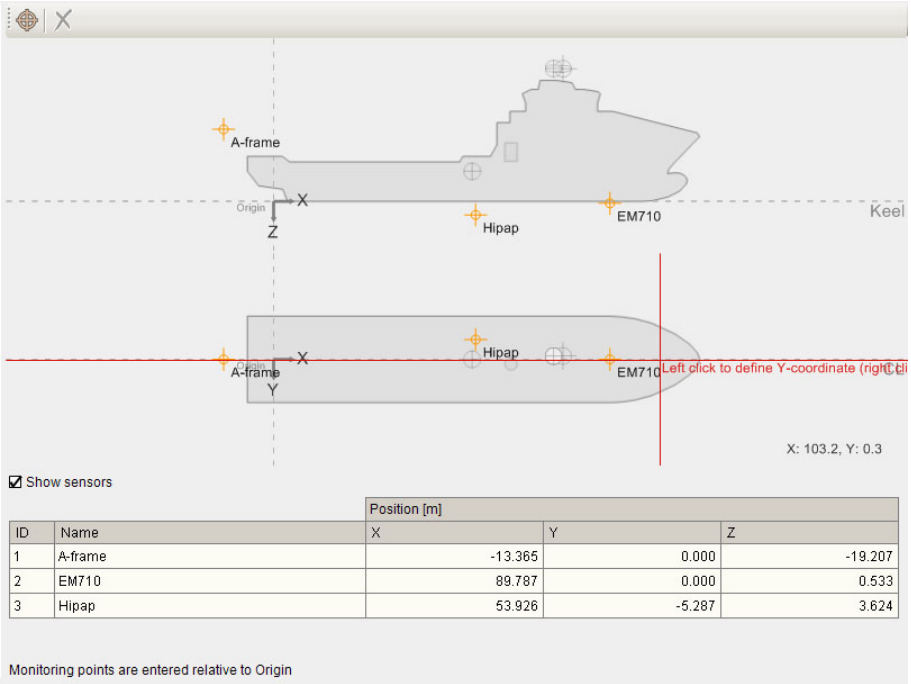
2. Select the Add button  at the top of the page to add a monitoring point.
   Observe that the cursor changes to two red lines which will help you to place the new monitoring point in the vessel illustration.

3. Drag the cursor to the location on the upper vessel illustration where you want to add the X and Z coordinates for your monitoring point and left-click the mouse button.

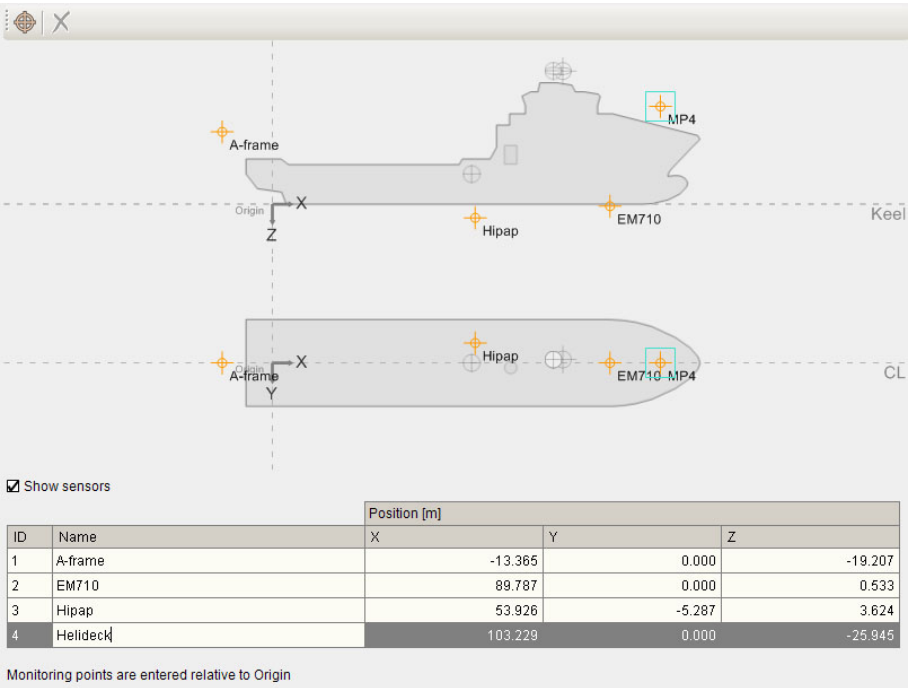


4. Continue and drag the cursor to the location in the lower vessel illustration where you want to add the **Y** coordinate for your monitoring point and left-click the mouse button.

   Observe that the coordinates for the new monitoring point appear in the monitoring points table. The table will also help you to get the wanted location for your monitoring point.



5. Select the **Name** column in the table and type an identifying name for your monitoring point. Press `Enter` to confirm.



6. Select the **X**, **Y** and **Z** columns and adjust the coordinates by typing the exact location of the monitoring point. If necessary. Press `Enter` to confirm.

7. Select **Apply** to save your settings without closing the dialog box.

Related concepts

Determining the system coordinates, page 69
Survey accuracy values, page 70

Related references

Monitoring points Geometry page, page 241

Setting up input to and from the MGC

Set up the MGC interface to prioritise heading input and position output.

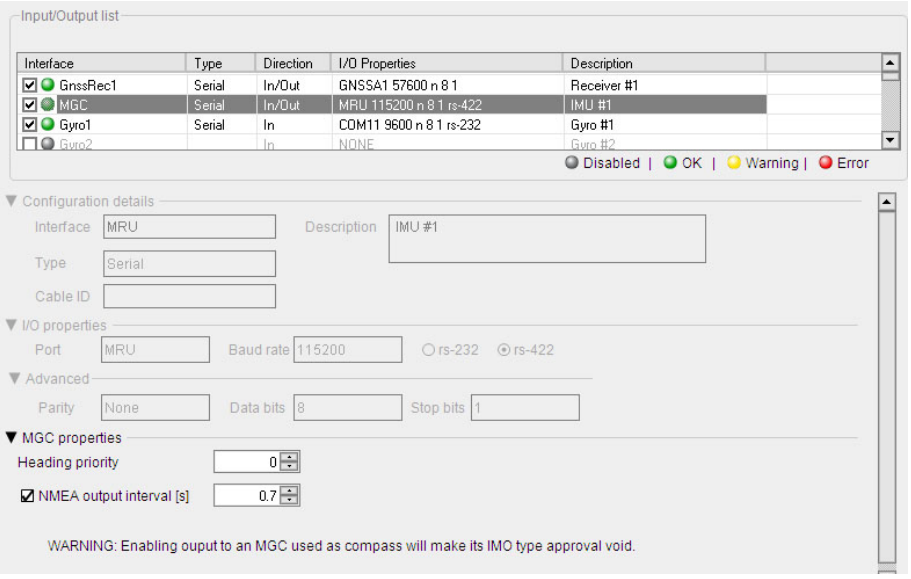
Context

The MGC is detected in the system when the MGC is connected to the Processing Unit. The MGC interface cannot be set up by the operator. It is automatically set up when the units are connected.

However, if you have several heading input sources in your system, you can set up which priority the MGC shall have in your system.

***WARNING*:**

Enabling output to an MGC used as compass will void the IMO type approval.



Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.

2. Select the MGC interface you want to set up in the **Input/Output list**.

   Observe that the **Configuration details** parameters appear at the lower part of the page. Continue to **MGC properties**.

3. Type a number for which priority the MGC heading input shall have in the system.

4. Select the **NMEA output interval** check box to enable output of NMEA GGA, VTG and ZDA messages to the MGC. Select the wanted interval in seconds between the message outputs.

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

Related tasks

Communication interface description, page 97
Using the Serial interface, page 99
Using the Ethernet interface, page 100

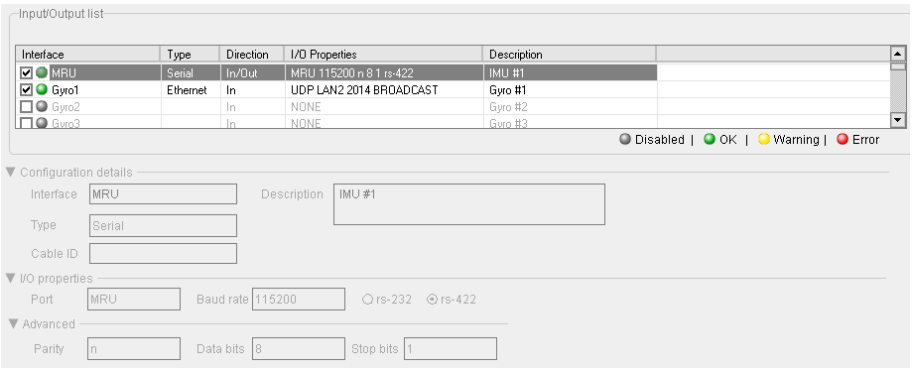
Related references

Communication interface - MGC interface page, page 246

Setting up input to and from the MRU

The Motion Reference Unit (MRU) is automatically detected in the system when the MRU is connected to the Processing Unit.

The MRU interface cannot be set up by the operator. It is automatically set up when the units are connected.



Related tasks

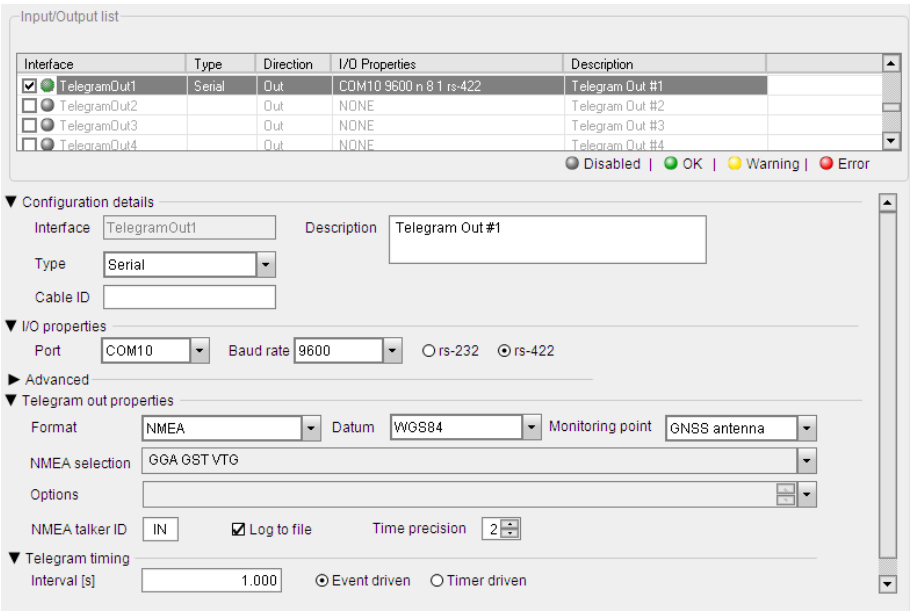
Communication interface description, page 97
Using the Serial interface, page 99
Using the Ethernet interface, page 100

Setting up the Telegram out interface

The **TelegramOut** function allows you to enable and set up data messages transmitted to external equipment.

Context

Up to 16 serial and/or network interfaces can be configured.



Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.
2. Select the **TelegramOut** interface you want to set up in the **Input/Output list**.

   Observe that the **Configuration details** parameters appear at the lower part of the page.
3. Select either **Ethernet** or **Serial** in the **Type** list.

   Enter the appropriate parameters for the selected interface type.
4. Continue to **Telegram out properties.**.
5. Select the wanted output telegram format from the **Format** list.

   If you select NMEA as telegram format, the **NMEA selection** list becomes active.
6. If NMEA is selected, select the wanted NMEA telegrams to use from the **NMEA** list.
7. Select the wanted datum format from the **Datum** list.
8. Select the wanted monitoring point from the **Monitoring point** list.

9. Type the talker ID of NMEA messages sent from this output in the **NMEA talker ID** box.

   The default value is IN for systems with an Inertial Measurement Unit (IMU) connected. The default value is GP for systems without an IMU connected.

10. Select the **Log to file** box if you want to log the measurements to file internally in the Seapath system.

11. Select the wanted number of decimals in the time field in the NMEA telegrams containing time information from the **Time precision** box

12. Under **Telegram timing**, type the wanted output interval for the messages.
    - **Event driven**: This parameter outputs data only when the data are calculated or when a change occurs. Output data are delayed.
    - **Timer driven**: This is the interval between each sample, Type the wanted interval in seconds in the **Interval** box. The range is 0.01 to 3000 seconds.

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

Related tasks

Communication interface description, page 97
Using the Serial interface, page 99
Using the Ethernet interface, page 100

Related references

Communication interface - TelegramOut interface page, page 249
Data output specifications, page 176
Datum specifications, page 178

Additional system configuration

Topics

Entering vessel identification parameters

The vessel **Description** parameters allow you to enter information about the vessel which is needed for identification purposes.

Context

Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Vessel** > **Description**.
2. Type the name of your vessel. This box cannot be empty. The default value is **VESSEL**.
3. Type the name of the **vessel owner**. This is optional information.
4. Type the **country of origin** for the vessel. This is optional information.
5. Type the MMSI number assigned to the vessel. The default value is 0.
6. Type the IMO number assigned to the vessel. The default value is 0.
7. Select **Apply** to save the settings.

Related references

Vessel Description page, page 228

Importing vessel shape from file

You can load a vessel model from file in order to get accurate dimensions for your vessel.

Context

The pre-defined scalable vessel shapes represent the actual vessel outline only in rare cases. In order to configure the accurate location of various sensors, equipment and monitoring points, it is recommended to load a separate vessel model from file.

The system supports two types of two dimensional outlines: side view (towards starboard) and top view. Three file types are available: **Vessel models** (*.svm), **Vessel vector images** (*.svi) and **Old vessel images** (*.txt).

The vessel image file must meet the following requirements:

- The vessel data have to be in an ASCII file generated by Excel, Notepad or similar tools.
- The file head includes Overall length (LOA), Overall width, Overall height and Stern to Origin data in metres.
- Profile (side view) data in X and Z coordinates must be in metres, related to the origin. The coordinates are specified clockwise from a point aft of the origin, and the last coordinate has to equal the first coordinate to form a closed polygon.
- The top view data in X and Y coordinates must be in metres. The first coordinate has to be aft of the origin along the centre line. Successive coordinates are specified clockwise, and the last coordinate has to equal the first to form a closed polygon.

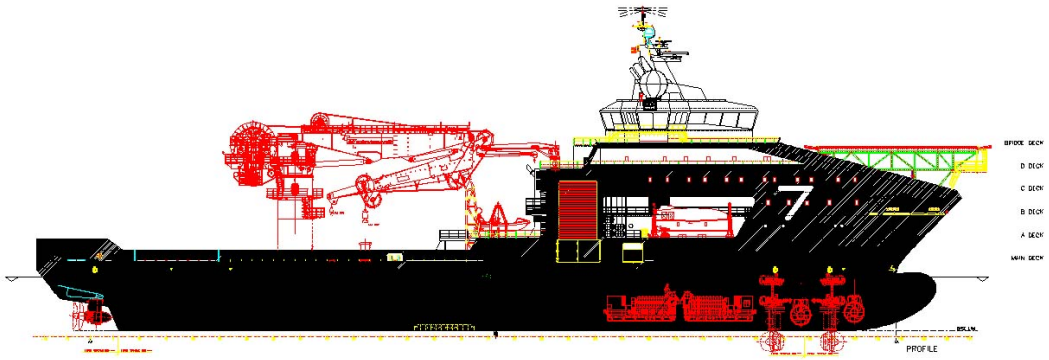
Vessel image files can be created by Kongsberg Discovery AS upon customer request. General arrangement (GA) drawings or similar are required to create vessel image files.

Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Vessel** > **Geometry**.
2. Select **Use vessel drawing**. The **Shape dimension** parameters will be locked.
3. Type the parameters for the location of origin (survey origin).
4. Type the navigation reference point location.X, Y, Z.
5. Select **Apply** to save the settings.

Vessel shape from file

The illustration shows an example of a GA drawing of a multi-purpose vessel.



A user text file from Notepad may look like this.

mpv.svi - Notepad

File Edit Format View Help

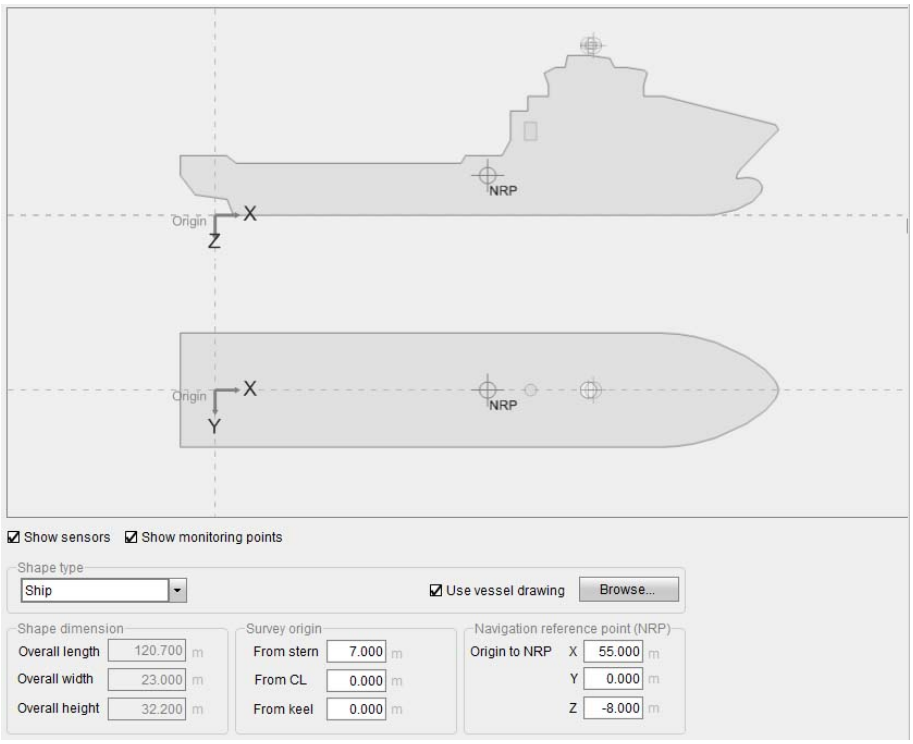
```
%Vessel Data [m]
%LOA = 120.70
%Width = 23.00
%Height = 32.20
%Aft to AP = 7.00

%Profile coordinates in (X,Z) [m]
0.00,-3.55
2.44,-3.19
3.69,0.00
98.60,0.00
101.00,-0.14
105.20,-1.12
108.36,-2.70
110.09,-4.51
110.35,-5.20
110.40,-5.43
110.40,-5.69
.
.
.
.
63.10,-24.00
63.10,-21.00
59.62,-21.00
59.62,-15.13
57.87,-12.99
49.65,-10.50
4.25,-10.50
2.31,-12.00
-7.00,-12.00
-7.00,-8.00
-4.00,-4.11
0.00,-3.55

%Profile cutout
-23.20,-36.48
-23.20,-10.24
23.20,-10.24
23.20,-36.48
-23.20,-36.48

%Top view coordinates in (X,Y) [m]
-7.00,0.00
-7.00,11.50
90.30,11.50
.
.
.
113.60,0.57
113.70,0.00
```

The vessel shape in the **NAV Engine Configuration** looks like this.



In the example, only the port side of the vessel top view is defined in the file. Symmetry is assumed, so this is sufficient to draw a symmetric vessel shape. If the vessel is not symmetric, use the section code **%Top view coordinates in (X,Y) [m] Complete** and give the coordinates along the complete shape, defined clockwise.

It is possible to define cutouts within the profile or top view polygons. For profile cutout, use **%Profile cutout n**, where **n** identifies the cutout.

Related tasks

Setting vessel dimensions and reference points, page 102

Related references

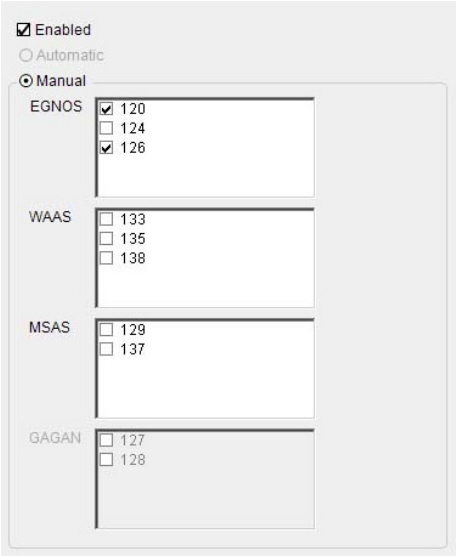
Vessel Geometry page, page 226

Selecting SBAS satellites

The SBAS parameters allow you enable tracking of SBAS satellites. You can set up automatic or manual tracking of the SBAS satellites.

Context

Maximum two SBAS satellites can be tracked by the receiver. If you manually select two SBAS satellites, the system will automatically use data from the best satellite. If no specific satellite is selected, the system will select and use data from the best of the available satellites.



Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **DGNSS** > **SBAS**.
2. Select **Enable** to enable tracking of SBAS satellites.
3. If you want the system to track SBAS satellites automatically, select **Automatic**.
4. If you want to select which SBAS satellites to use yourself, instead of automatic selection by the system, select **Manual**
5. Select which SBAS satellites to use. You can select maximum two satellites.
6. Select **Apply** to save the settings.

Related references

Sensors DGNSS SBAS page, page 240

Enabling Fugro high precision services

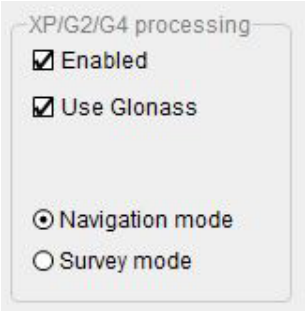
The **XP/G2/G4** parameters allow you to use high precision services to improve the accuracy of the GNSS signals which results in a more accurate position.

Prerequisites

A Fugro demodulator has to be connected and activated. A valid subscription to the Fugro high performance positioning service is required.

Context

You must enable the use of high precision services as this setting is not enabled by default.



Procedure

1. Select the **System** menu > **NAVEngine** > **Standard**.
2. Select **Sensors** > **DGNSS** > **XP/G2/G4**
3. Select the **Enabled** box to enable the use of high precision services.
4. Select **Glonass** if you want the system to use GLONASS corrections.
5. If you want more reliability during difficult conditions, select **Navigation mode** or if you want high accuracy, select **Survey mode**.
6. Select **Apply** to save the settings.

Related references

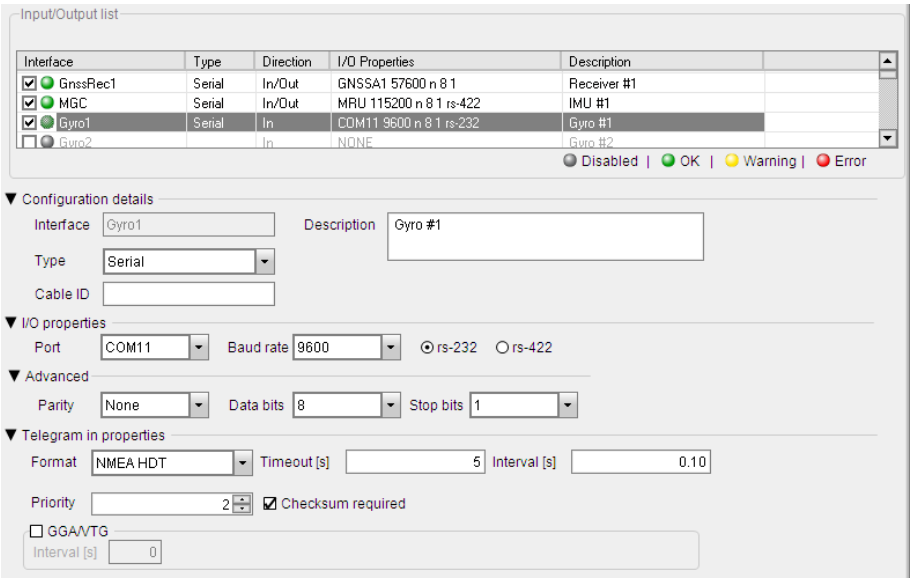
Sensors DGNSS XP/G2/G4 page, page 248

Selecting heading input format from a gyro compass

Heading input from a gyro compass or similar can be input to the Seapath system as a backup to improve reliability.

Context

Heading input from a gyro compass, or heading input from the DP system, are used in the position filter and can be used to display heading and speed in the displays.
In addition, heading is necessary to use the built-in lever arm compensation. Several types of heading formats are accepted by the system.



Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.
2. Select the **Gyro** interface you want to set up in the **Input/Output list**.

   Observe that the **Configuration details** parameters appear at the lower part of the page.
3. Select either **Ethernet** or **Serial** in the **Type** list.

   Enter the appropriate parameters for the selected interface type.
4. Continue to **Telegram in properties.**.
5. Select the wanted gyro telegram from the **Format** list.
6. Type the wanted **Timeout** age limit in seconds.

   If the age of the gyro message exceeds this limit, the gyro message is invalid.
7. Type the wanted **Interval** for seconds between the incoming telegrams
8. Type a number for which priority the heading input shall have in the Seapath system
9. Select the **Checksum required** box if you want NMEA checksum to be required.

   This selection is selected by default. This is the recommended setting.
10. Select the **GGA/VTG** box if you want the system to send GGA and VTG messages to the gyro at specified intervals.
11. Select **Apply** to save the settings.

Related tasks

Communication interface description, page 97
Using the Serial interface, page 99
Using the Ethernet interface, page 100

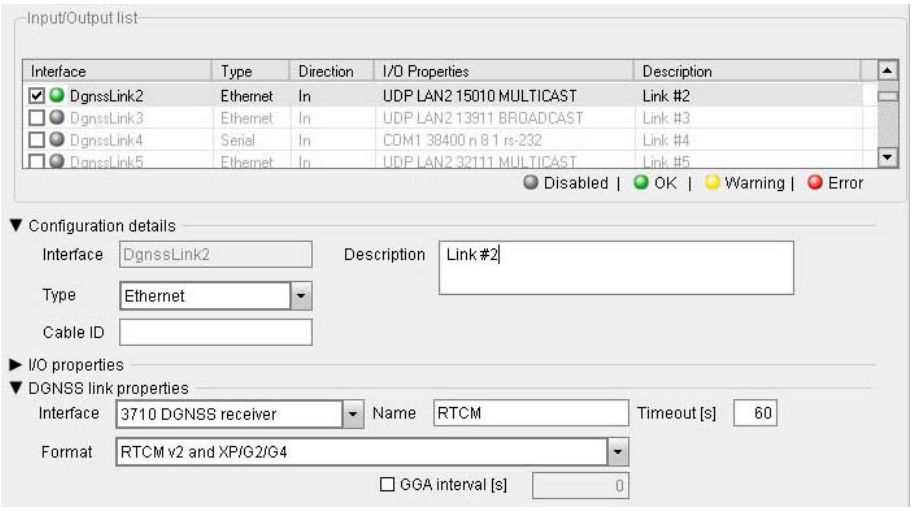
Related references

Communication interface - Serial or Ethernet, page 243
Communication interface - Gyro interface page, page 251

Setting up the DGNSS correction link parameters

You can set up the system to receive various types of corrections which will improve the position accuracy.

Context



Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.
2. Select the **DGNSSLink** interface you want to set up in the **Input/Output list**.
   Observe that the **Configuration details** parameters appear at the lower part of the page.
3. Select either **Serial** or **Ethernet** in the **Type** list.
   Enter the appropriate parameters for the selected interface type.
4. Continue to **DGNSS link properties**.
5. Select the wanted interface from the **Interface** list.
   The content of the **Format** list will depend on this selection.

6. Select the wanted format from the **Format** list.
7. Type the name of the DGNSS correction link.
   This name will be displayed in the DGNSS link status bar at the bottom of View 1.
8. Type the correction **Timeout** age limit in seconds.
   If the age of the corrections exceeds this limit, the corrections are invalid.
9. Select the **GGA Interval** box if you want the system to send GGA messages to the DGNSS receiver. Type the wanted interval in seconds between the telegrams.
10. Select **Apply** to save the settings.

Related tasks

Communication interface description, page 97
Using the Serial interface, page 99
Using the Ethernet interface, page 100

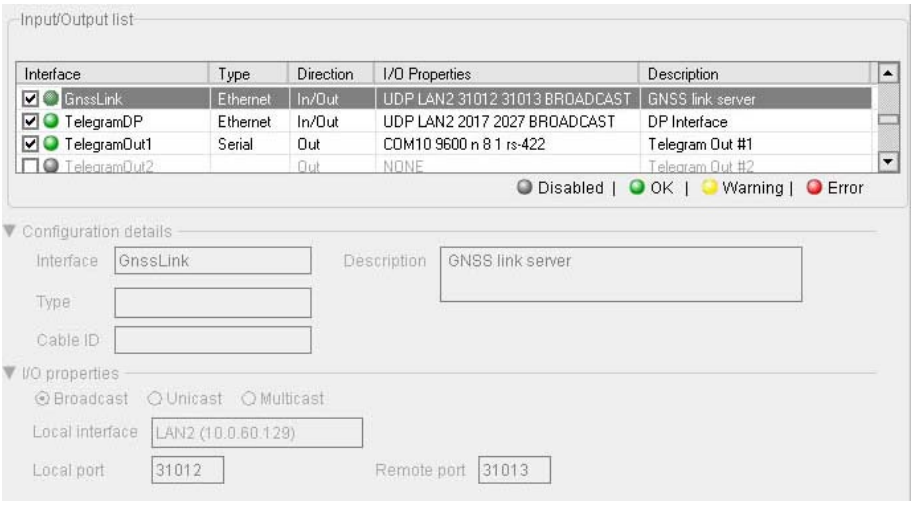
Related references

Communication interface - Serial or Ethernet, page 243
Communication interface - DgnssLink interface page, page 247

Enabling and/or disabling use of GNSS link

If you have a Kongsberg Discovery AS system which needs GNSS data, you can send these data from the Seapath by enabling the **GNSSLink** parameter.

Context



Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.

2. Select the **GNSSLink** interface you want to enable/disable in the **Input/Output list**.
3. Select **Apply** to save the settings.

Related tasks

Communication interface description, page 97
Using the Serial interface, page 99
Using the Ethernet interface, page 100

Adding extra serial ports

You can add more serial ports to the system than those available in the Processing Unit.

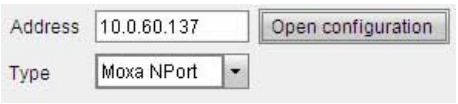
Context

A serial port extender can be delivered as an option for connection to the Processing Unit. The extender is an 8-port RS-232/422/485 serial device server, type Moxa NPort 5650I-8-DT.

The serial port extender is used to provide more serial ports to the system than those available in the Processing Unit. The extender is configured via a web page displayed in the Standard **NAV Engine Configuration** after selecting the correct IP address for the serial port extender in the **Address** box and selecting `Open configuration`.

Note:

The extended serial ports are not as accurate with regard to timing as COM 9 to COM 14 and are not recommended used for timing critical outputs.



Procedure

1. Install the serial port extender according to the instructions supplied with the product.
2. Connect the serial port extender to a LAN port at the rear of the Processing Unit and to the HMI Unit.

   Use a network switch between the Processing Unit and the HMI Unit.
3. Connect power to the serial port extender with the supplied power adapter.
4. On the serial port extender, select a free IP address on the network for the serial port extender.

   Get the IP address from the vessel's network administrator.

5. If the serial port extender is not new, it is recommended to reset to factory default.To reset, press and hold **Reset** with a pointed object for 5 seconds.
6. On the front panel of the serial port extender, select **Main Menu** > **Network setting** > **IP address** and enter the chosen IP address.
7. Select **Main Menu** > **Network setting** > **Netmask** and change the subnet mask if necessary.
8. Select **Main Menu** > **Save/Restart**.
9. Select the **System** menu > **NAVEngine** > **Standard**.
10. Select **Communication interface** > **Serial port extender**.
11. Type the IP address for the serial port extender in the **Address** box.
12. Select MOXA Nport as **Type**.
13. Select `Open configuration` to open the web configuration page.

14. Select **Main Menu** > **Serial settings**.
15. Set **Flow control** to **None** for all ports.
16. Set **Interface** to RS-422 or RS-232 for each port to match the connected equipment.
    No other configuration changes should be mad in the web browser.
17. Submit and activate the configuration.
18. Close the web browser.
    You are now back in the **NAV Engine Configuration**.
19. Select **Apply** to save the settings.
20. Restart the Processing Unit.

Result

After restart the serial ports are available in the **NAV Engine Configuration** > **Communication interface** > **Input/Output**. **Serial** interface, under **I/O properties**.

Change of interface type between RS-422 and RS-232 must be made from the web browser.

Related references

Communication interface - Serial port extender page, page 252

Changing the Processing Unit IP address

You must enter the Internet Protocol (IP) address for the Processing Unit so it can communicate on the local area network (LAN).

Context

Under **Interface settings** you can modify the IP address of the physical interface selected in the **Interface** list.

The Processing Unit communicates with the operator software (HMI Unit) using multicast UDP/IP. Any client may join the configured multicast group provided that the network hardware between the Processing Unit and the client supports multicast forwarding.

The default IP address for the Processing Unit is:

- LAN 1: 192.168.1.10
- LAN 2: 192.168.2.10
- LAN 3: 192.168.3.10
- LAN 4: 192.168.4.10
- LAN 5: 192.168.5.10

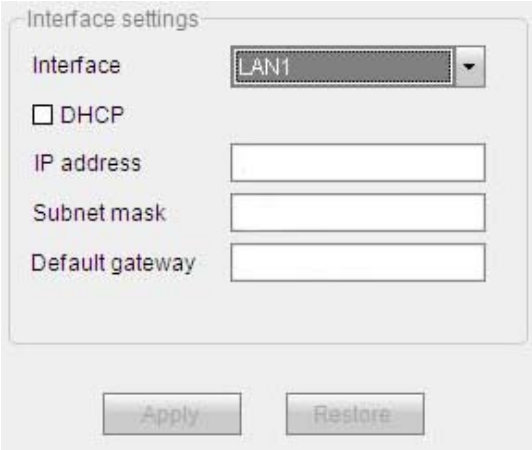
The default IP address for the HMI Unit is: 192.168.1.100.

The default multicast address for the Processing Unit is: 239.255.0.3.

The default subnet mask for the Processing Unit is: 255.255.255.0.

Changing the Processing Unit IP address might also require a change in the HMI Unit address.

Contact the network administrator for advice on IP address assignments.



Procedure

1. Select the **System** menu > **NAV Engine** > **Standard** > **Network**.
2. Select the interface for which you want to change the IP address.
3. Type the new IP address for the interface.This is recommended.

   Or you can select the **DHCP** box if the IP address is given by a DHCP server. The rest of the parameters will then be disabled.
4. Type the subnet mask address for this interface.
5. Type the IP address for the default gateway.
6. Select **Apply** to save the settings.
7. Restart the Processing Unit for these changes to take effect and or the new settings to be used by NAV Engine.

Further requirements

To restart the Processing Unit, select the **System** menu > **Restart** > **Processing Unit**.

If you select `Restore`, you will return to the previous interface settings.

Related tasks

Changing the HMI Unit IP address, page 141

Related references

Network page, page 253

Changing the HMI Unit IP address

Some situations may occur where the network administrator asks you to change the HMI Unit's Internet Protocol (IP) address.

Prerequisites

You must be in *Engineering* mode to be able to make changes to these settings.

Context

The default IP address for the HMI Unit is: 192.168.1.100.

Procedure

1. Select **Tools** > **Windows Shell**.
2. Type `Control` and press `Enter`.
3. Select **Network** > **Sharing Center**.
4. Select the connection you want to change. For example LAN1.
5. Select **Properties**.
6. 5. Select **Internet Protocol Version 4 (TCP/IPv4)** > **Properties**.
7. Select **Use the following IP address** and type the preferred **IP address**, **Subnet mask** and **Default gateway**.
8. Select **OK**.
9. Close the other dialog boxes.

Related tasks

Changing the Processing Unit IP address, page 139

Setting up NTRIP client

An NTRIP client is provided to ease access to external corrections provided over an internet connection. The Seapath unit needs to have access to internet trough one of it's Ethernet devices.

Prerequisites

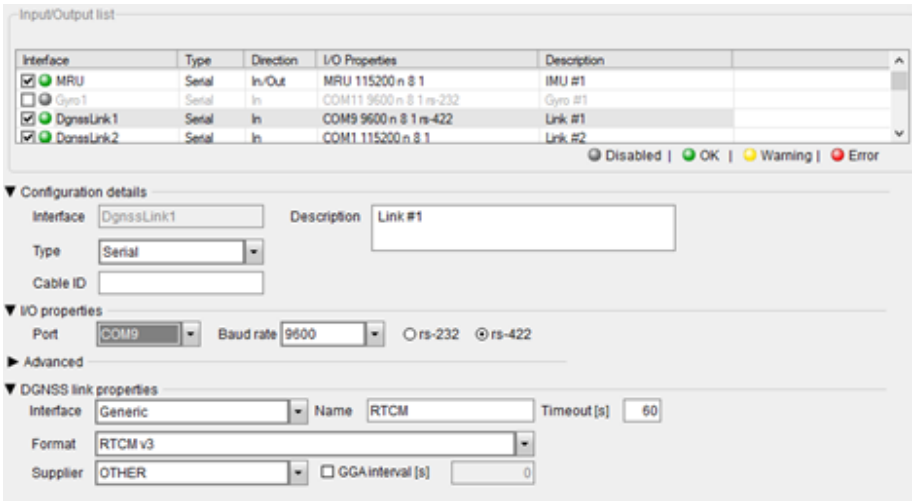
You must enable a DGNSS link in **NAV Engine** > **Standard** before you can set up an NTRIP client. The NTRIP client configuration is done from **NAV Engine** > **Advanced** configuration.

Context

The Seapath software release 2.03.00 introduces an NTRIP client.

Procedure

1. **DGNSS link setup**:
   a. Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.
   b. Select the **DGNSSLink** interface you want to set up in the **Input/Output list**.
      It does not matter which DGNSSLink you use for this purpose.
      Observe that the **Configuration details** parameters appear at the lower part of the page.



   c. Select either **Serial** or **Ethernet** in the **Type** list. It does not matter which you choose for the NTRIP functionality.

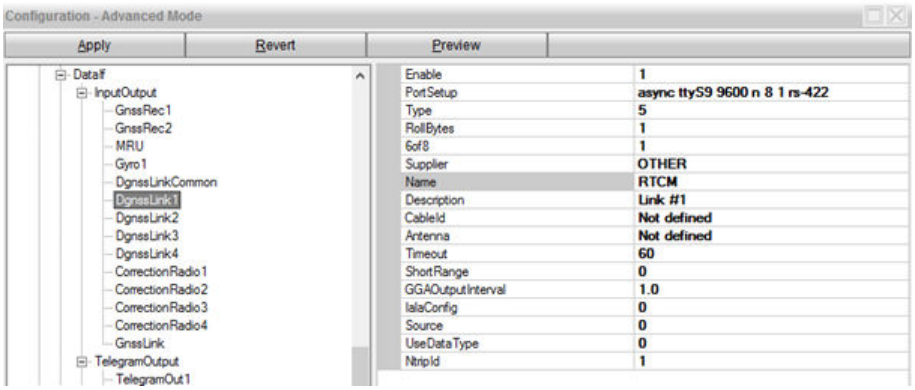
Note:

The COM port, UDP port or IP address are not important as long as the settings do not give conflicting settings for other IO settings.

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

2. **Modifying the DGNSS link parameter**:
   a. Select the **System** menu > **NAV Engine** > **Advanced**.

b. Navigate to **InputOutput**, select the DGNSS link you set up previously.



c. Set **GGAOutputInterval** to 1.

This parameter is set to match the requirements for the NTRIP network. In this example it is 1 Hz.

d. Set **Ntripid** to 1.

This parameter is set to match the NTRIP client link ID to be configured. In this example it is 1.

3. **Configuring the NTRIP client**:

a. Select the **System** menu > **NAV Engine** > **Advanced**.

b. Navigate to **NTRIP 1**.

c. Set the **IP** parameter to the requirement for the NTRIP network IP address.

d. Set the **Port** parameter to the requirement for the NTRIP network.

e. Set the **MountPoint** parameter to the available mount points from the NTRIP network.

Note:

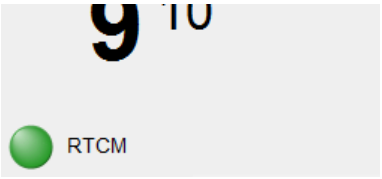
The input value must be preceded by / (forward slash). For example: / CPOSRTCM32

f. Set the **Protocol** parameter: 0 = TCP. 1 = UDP.

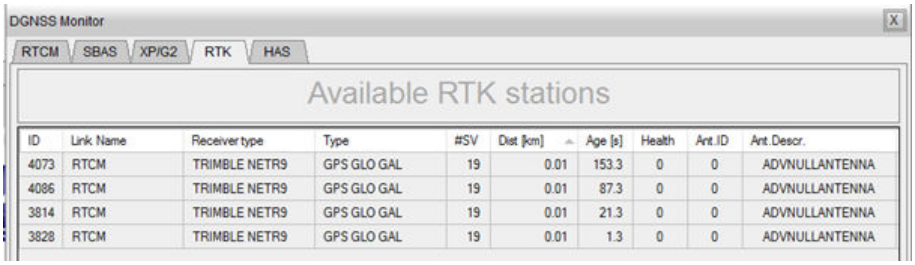
g. Select **Apply** to save the settings.

Result

When the settings are applied, a successful connection will be displayed as a green RTCM link lamp in the DGNSS link status bar.



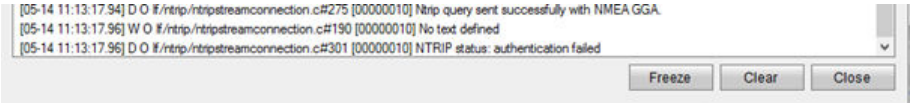
Select the link lamp to get more information about the received DGNSS data. The information is available in the **RTK** tab in the **DGNSS Monitor**.



Further requirements

If the RTCM link lamp turns red you can find debug information for Seapath NAV Engine by selecting the **Alarm** menu > **NAV Engine debug**

The illustration shows an example of wrong user name and password, which results in authentication failure.



This information must be provided to the Kongsberg Discovery AS customer support for further fault finding of the issue.

Related concepts

Support information, page 26

Related references

Communication interface - DgnssLink interface page, page 247

Operator software configuration

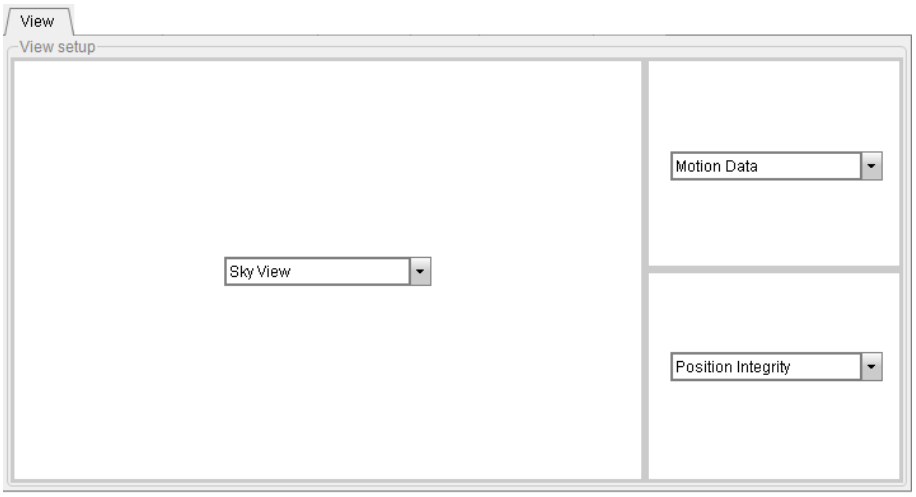
Topics

Selecting the position of views in the display

The **View** page allows you to select the contents of each view when the HMI (Human Machine Interface) application starts.

Context

Two views cannot have the same contents. When one view is selected as contents in View 1, other contents will automatically be selected for View 2.



Procedure

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

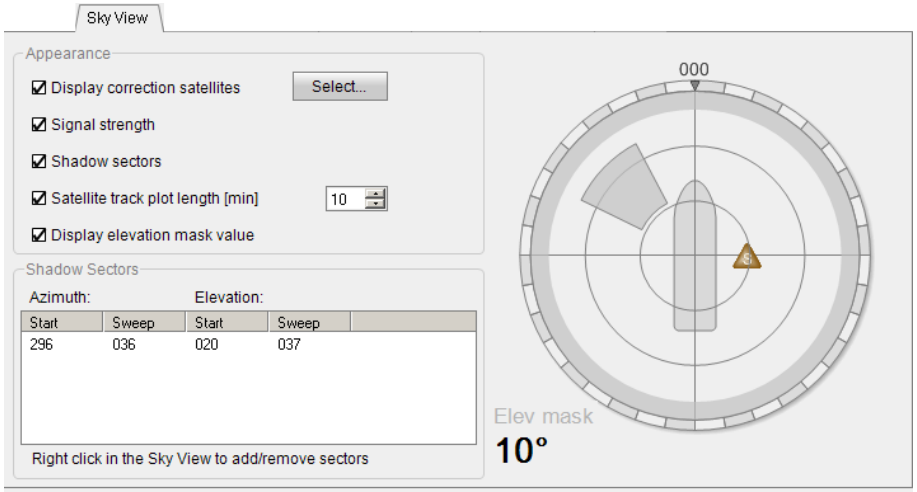
Related references

Operator software configuration - View page, page 254

Selecting the appearance of the Sky view

The *Sky View* can contain various information. You can define what information and objects you want to appear in the *Sky View*.

Context



Procedure

1. Select the **System** menu > **Operator SW** > **Sky View**.
2. Select **Display correction satellites.** Observe that the `Select` button appears.
3. Select this button to open the **Select Correction Satellites** dialog box.
4. Select the satellites you want to appear in the Sky view. Select **OK**.
5. Select **Signal strength** if you want to display the signal bar under the satellites in the Sky view.
6. Add shadow sectors to be able to display them in the Sky view.
   a. Place the cursor over the sky view area to the right in the Sky view page.
   b. Right-click and select **Add sector**.
      Observe that the sector appears in the sky view area and in the table under **Shadow Sectors**.The table shows your shadow sectors.
   c. Hover the cursor over the shadow sector. Observe that the cursor changes to arrow symbols.
   d. Drag the arrows horizontally and vertically to create your shadow sector. Observe the **Azimuth** and **Elevation** values in degrees.
7. Delete shadow sectors if they are no longer applicable.
   a. Select a sector in the sky view area to the right in the **Sky View** page.

b. Right-click and select **Remove sector**.

Observe that the shadow sector disappears from the sky view area and from the table.

8. Select **Satellites track plot length** if you want to show this in the Sky view. Observe that the **Satellite track plot length** list appears.
9. Select the wanted value for the satellite track plot length in minutes.
10. Select **Display elevation mask value** if you want the value to appear in the Sky view.
11. Select **Apply** to save the settings.

Related references

Operator software configuration - Sky view page, page 255

Adjusting the Integrity view

The **Position Integrity** tab allows you to adjust the scaling of the Integrity view.

Context

Procedure

1. Select the **System** menu > **Operator SW** > **Position Integrity**.
2. Type the **Max ellipse EPE** in metres.
3. Type the steps for **Ellipse diagram resolution**.
4. Select **Apply** to save the settings.

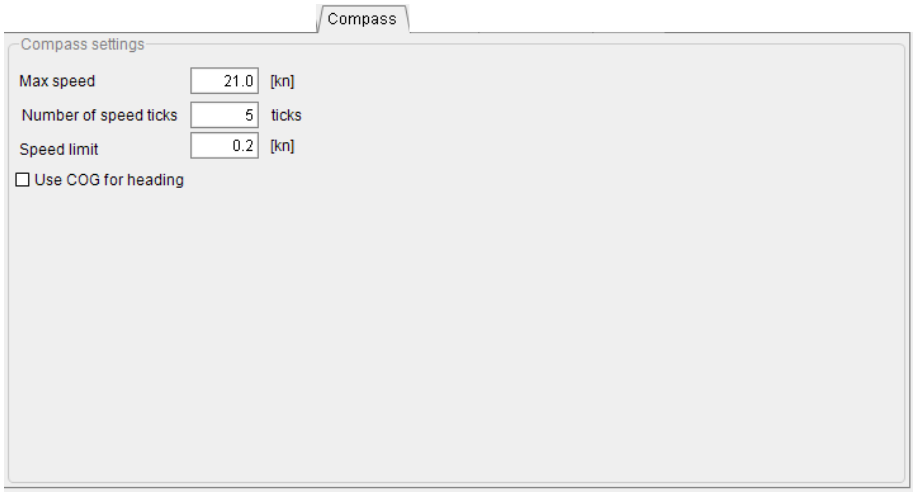
Related references

Operator software configuration - Position Integrity page, page 257

Adjusting the Compass view

The **Compass** page allows you to adjust the speed scaling of the Compass view.

Context



Procedure

1. Select the **System** menu > **Operator SW** > **Compass**.
2. Type the maximum vessel speed, **Max speed**, to be displayed in the Compass view.
3. Type the number of circles to be displayed, **Number of speed ticks**.
4. Type the lower **Speed limit** for when COG (Course Over Ground) and SOG (Speed Over Ground) shall be displayed in the Compass view.
5. Select the **Use COG for heading** box if true heading is unavailable.
6. Select **Apply** to save the settings.

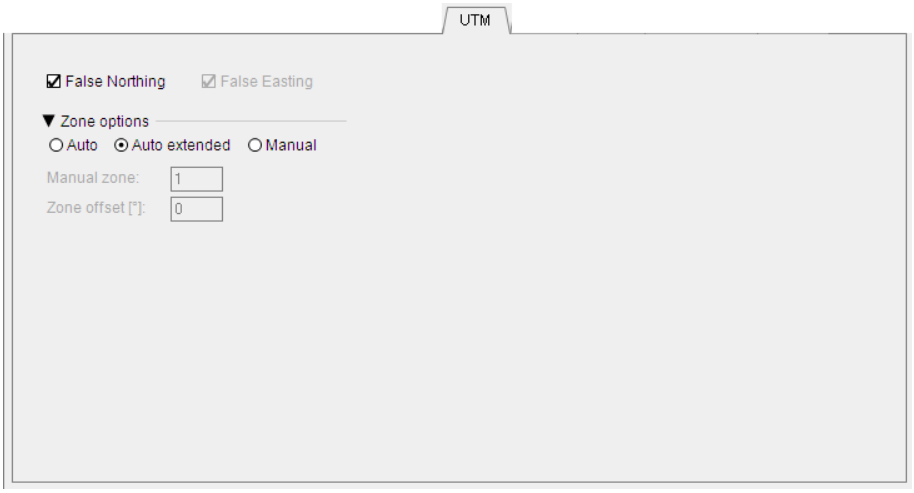
Related references

Operator software configuration - Compass page, page 258

Adjusting UTM presentation

You can control how UTM positions are treated by the application. UTM is the Universal Transverse Mercator coordinate system.

Context



Procedure

1. Select the **System** menu > **Operator SW** > **UTM**.
2. Clear the **False Northing** check box if you want positions south of the equator o be presented as negative values in the Position data when displaying position as UTM.
3. Select which **zone options** you want to use. If you select Manual:
   a. Type the value for the zone you want to use.
   b. Type the zone offset for this zone, range 1 to 60.
4. Select **Apply** to save the settings.

Related references

Operator software configuration - UTM page, page 259

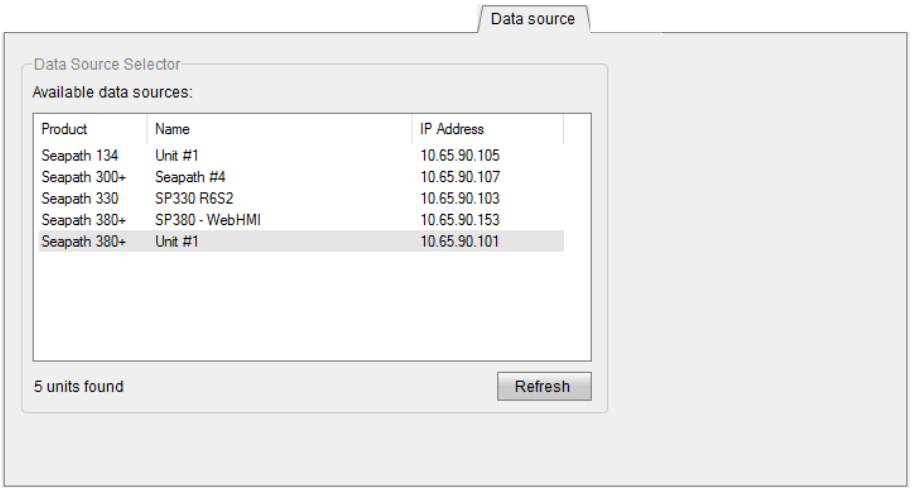
Selecting the Seapath Operator software data source

You can select the data source which the operator software (Seapath HMI) receives its data from.

Context

The operator software will automatically detect the default IP address for the Processing Unit. If you want to receive data from another unit, you can select which unit from this page.

Select **Refresh** to update the list of available units. If the wanted data source is not displayed in the list, you can check the network connections and that all equipment is switched on.



Procedure

1. Select the **System** menu > **Operator SW** > **Data Source**.
2. Select the wanted data source from the list.
3. Select **Apply** to save the settings.

Related references

Operator software configuration - Data source page, page 260

Selecting reception of alarm messages

You can define how to receive alarm messages.

Prerequisites

UDP Broadcast is the default (and recommended) setting. Defining a multicast address for alarm message distribution requires advanced network configuration skills.

Context

Procedure

1. Select the **System** menu > **Operator SW** > **Alarms**.
2. Select the wanted connection type: **UPD Multicast** or **UDP Broadcast**.
3. Select **Apply** to save the settings.

Related references

Operator software configuration - Alarms page, page 261

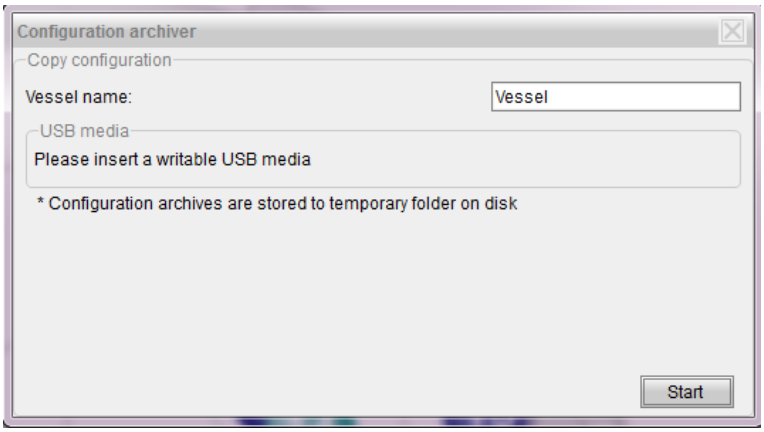
Creating a backup of the configuration and software installation

If you have a complex configuration setup in your system, it can be useful to make a copy of this configuration in case you should need it later. The **Copy Configuration** tool will copy the system configuration to a disk based archive file or to a USB flash drive.

Context

Note:

This procedure will only copy the configuration setup and not a full image of the installed system.



Note:

If a USB flash drive is not inserted, the archive will be stored in a temporary location on the local disk. In this case, the archive will only be available for restore until the next reboot.

Procedure

1. Insert a USB flash drive into the USB port at the front of the HMI Unit.
2. Select the **Tools** menu > **Copy Configuration**.
3. The configured vessel name is automatically entered into the **Vessel name** box but you can change this if you want.
4. Select **Start** to copy the configuration files to the USB flash drive.

   The copied configuration will be stored as a compressed archive (ZIP file) under the **ConfigBackup** folder in the root of the USB flash drive.

Result

You can use the USB flash drive with the copied configuration to restore the system configuration at a later date.

Restoring the configuration backup

If you need to restore the configuration setup to your system, you can use the USB flash drive with a copy of your configuration which you created with the **Copy Configuration** tool.

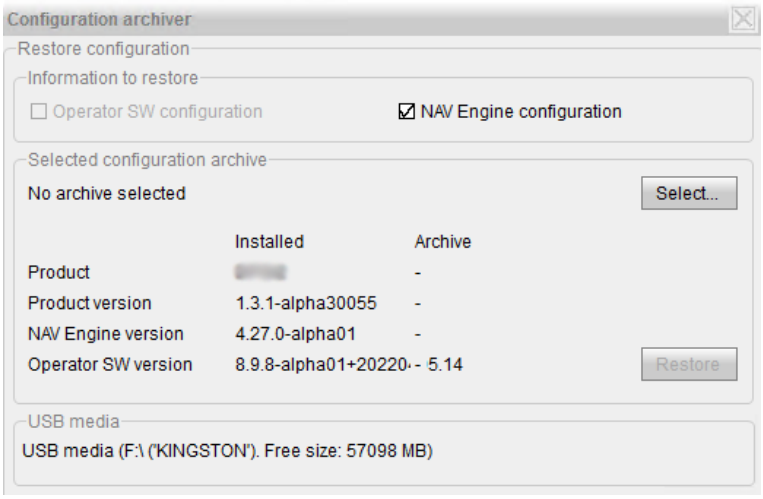
Prerequisites

A USB flash drive with the Seapath application must be available.

Context

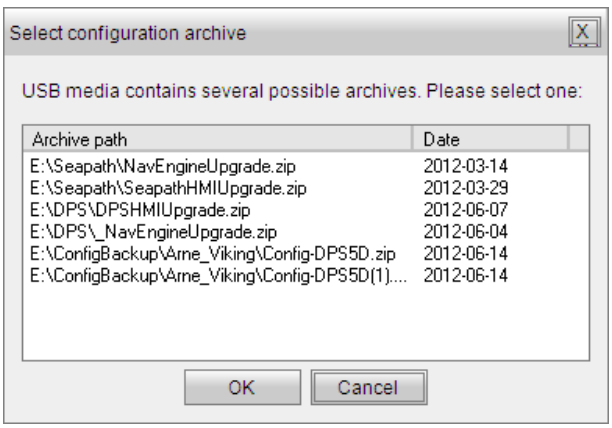
Note:

*The **Restore Configuration** tool will stop NAV Engine before restoring the configuration. NAV Engine will be restarted automatically.*



Procedure

1. Insert a USB flash drive into the USB port on HMI Unit.
2. Select the **System** menu > **Change system mode** > **Engineering**.
3. Type the password: **stx**. The password is not case sensitive.
4. Select the **Tools** menu > **Restore configuration**.
5. Select **NAV Engine configuration**.
6. Select **Select...**
7. Select the wanted configuration archive from the list. Select **OK**.



8. Select at least one option under **Information to restore** in the **Configuration archiver** dialog box. This will enable the **Restore** button.
9. Select **Restore** to restore the wanted configuration.

Seapath operator software on external computer

Topics

Installing the Seapath operator software on external computer

This software is used to set the configuration parameters for the Seapath and to monitor the performance of the Seapath system. The operator software is pre-installed on the HMI Unit but you can also install it on an external computer.

Prerequisites

Generate a USB flash drive for the operator software from the software download link received from Kongsberg Discovery customer support.

Procedure

1. Insert the USB flash drive with the software into a USB port on the external computer.
2. Open the removable disk drive to which the USB flash drive is connected.
3. Locate and run the installation file `SeapathHmiInstaller.exe`.
4. Follow the instructions on the screen in order to complete the installation of the **Seapath HMI** program.
5. When you reach the last step, clear the **Run the application** check box if you do not want to start the operator software immediately after installation.
6. Remove the USB flash drive from the computer when the installation is finished.

Removing the Seapath operator software from external computer

When you do not need the Seapath anymore, you can remove it from the external computer.

Procedure

1. Open the **Control panel** on your computer and select **Programs and Features**. This is the dialog box where you remove programs.
2. Locate the **Seapath series** program in the list.
3. Select **Uninstall** to remove the program.
4. Follow the instructions on the screen.

Starting the Seapath operator software on external computer

When you have installed the operator software on the external computer, you must start the software to be able to operate the Seapath system.

Context

There are two ways to start the operator software.

Procedure

1. Double-click the **Seapath Operator SW** icon on the desktop to start the software.
2. Select the Windows Start button and type Seapath in the search box.
   Select **Seapath Operator SW**.

Stopping the Seapath operator software

You can stop the Seapath application on the external computer.

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.

System backup and restore

Topics

Processing Unit procedures

Topics

Preparing a USB flash drive for backup and restore purposes

The **ISP Backup and Restore** (IBR) tool is a special tool installed on a USB flash drive which supports backup and restore of the Processing Unit in the Seapath system.

Prerequisites

You have received an email or a USB flash drive with the `ibr-*.zip` file from Kongsberg Discovery AS. A USB flash drive suitable for the purpose must be available.

A USB flash drive with the ISP Backup and Restore (IBR) may have been be produced at installation and kept together with the product manual. If this flash drive cannot be located, you will have to make a new one.

Context

This procedure will prepare the USB flash drive with the **ISP Backup and Restore** (Integrated Sensor Platform) tool which you can use to create a backup of the system image and to restore this image.

Note:

The USB flash drive will be reformatted as a part of the creation process. Existing content will be lost.

Procedure

1. Insert the USB flash you want to use into your Windows 10 computer.
2. Format the USB flash drive. Use the Windows 10 **Disk Management** tool.
   a. Press the `Windows` key and type `diskmgmt`.
   b. Delete any existing partitions on the USB flash drive. Right-click and select **Delete Volume**.
   c. Create two new partitions. Right-click the disk and select **New Simple Volume**. Follow the Wizard.
   d. The first partition:
      - Size: 1024 MB
      - File system: Select `FAT32`
      - Volume label: Type `IBR`
   e. The second partition:
      - Size: The rest of the flash drive.
      - File system: Select `FAT32`
      - Volume label: Type `PRODBKUP`
3. Unzip the contents of the most recent version of the `ibr-*.zip` file which you have received onto the first partition.
4. Remove the USB flash drive.

Backing up the Processing Unit image to a USB flash drive

We strongly advice you to create your own backup once the installation has been completed. Your backup will then include the operating system, the Seapath 385 software, as well as all the interface parameters that you have defined.

Prerequisites

You have prepared a USB flash drive with the **ISP Backup and Restore** (IBR) tool.

This procedure is performed on the Processing Unit. A keyboard and a mouse must be connected to the Processing Unit in order to perform this procedure.

Context

This procedure will stop all output from the system for about 15 minutes.

Procedure

1. Insert the USB flash drive with the **IBR** tool into the Processing Unit.
2. Turn on the Processing Unit.
3. Select **ISP Backup and Restore** (IBR) or wait 30 seconds for the program to open.
4. Select **System backup**.
5. Select **Yes**.
   Wait for the backup process to finish.
6. Select **OK**.
7. Select **Power off the system**
8. Remove the USB flash drive.
9. Restart the Processing Unit.

Result

An updated copy of the latest system image is now stored on the USB flash drive.

Restoring Processing Unit image from backup flash drive

You can restore the system image from the backup copy you made on a USB flash drive. Restoring the system image from the USB flash drive is useful if the system for some reason should fail.

Prerequisites

You have created a USB flash drive with a copy of the system image.

This procedure is performed on the Processing Unit. A keyboard and a mouse must be connected to the Processing Unit in order to perform this procedure.

Context

This procedure will stop all output from the system for about 15 minutes.

Note:

All settings and configurations on the unit on which the restore is performed, will be cleared and replaced by the contents of the USB flash drive with the system image backup.

Procedure

1. Select the **System** menu > **Shutdown** > **Processing Unit**.
2. Turn off the Processing Unit.
3. Insert the USB flash drive.
4. Turn on the Processing Unit.
5. Select **ISP Backup and Restore** (IBR) or wait 30 seconds for the program to open.
6. Select **System restore**.
7. Select **Yes**.
   Wait for the restore process to finish.
8. Select **OK**.
9. Remove the USB flash drive.
10. Turn on the Processing Unit.

Result

A system identical to the one at the time the backup, was created.

HMI Unit procedures

Topics

Preparing a USB flash drive for backup and restore purposes

You must prepare a USB flash drive for backup and restore of the HMI Unit in the Seapath system.

Prerequisites

A bootable recovery USB flash drive is included with the delivery. In case this drive is lost, a flash drive with at least 32 GB storage capacity may be used.

Context

This procedure describes how to prepare a bootable USB flash drive, in case the HMI Unit recovery flash drive included with the delivery has been lost. A bootable flash drive is required to create bootable backup media. Multiple backups may be stored to the same bootable backup media.

Procedure

1. Stop the operator software if it is running.
2. Stop the StxAppLauncher process from the Task Manager. Ctrl+Shift+Esc.
3. Insert the empty USB flash drive into the high speed port at the front of the HMI Unit.
4. Press the Windows key.
5. Select **Hard Disk Manager 16**.
6. Select **Paragon Hard Disk Manager 16**.
7. Select the **Home** tab.
8. Select **Recovery Media Builder**. Select **Next**.
9. Select **Removable Media Builder**.
10. Select the USB drive. Select **Next**.
11. Select **Yes** to accept writing the recovery environment to the USB flash drive. Select **Next**.

    The recovery media will now be created.
12. Select **Finish**.
13. Remove the USB flash drive.

Creating a backup of the HMI Unit on external USB device

When the system installation has been verified, we recommend to perform a backup of the system installation. A backup can be created on a USB flash drive, a USB hard disk or the internal hard disk.

Prerequisites

The USB device shall have at least 20 GB available space. It is strongly recommended that the backup is stored on an external bootable media in case the HMI Unit recovery flash drive included with the delivery has been lost.

Note:

Be aware that the time required to create a USB flash drive backup depends on the quality and speed of the flash drive. The time required can be up to 45 minutes with a low quality flash drive.

Use the left USB port on the HMI Unit when creating a backup, as this is a high speed port (10 GBit per second).

Context

This procedure explains how to make a backup of the HMI Unit to an external USB device using the pre-installed Paragon HDM software.

If you create a backup of the HMI Unit to an external USB device, the backup will still be available in case of a disk failure.

Procedure

1. Start the HDM software by pressing the Windows key.
2. Select **Hard Disk Manager 16** > **Paragon Hard Disk Manager 16**.
3. Select the **Tools** menu > **Create single backup**.
4. On the **Welcome** page, select **Next**.
5. On the **Name** page, type a name and description for the backup. Select **Next**.
   Type extra information in the **Description** box if needed.
6. On the **Source** page, select **Files and folders**.
7. Select C, D and E disks.
8. For the D and E disks, make sure that only **System Volume Information** is selected.
9. Select **Next**.
10. On the **Target** page, select **External devices**. Select the USB flash drive or USB hard disk. Select **Next**.
11. On the **Finish** page you can review the backup summary. You can go back and make corrections if needed.
12. Select **Finish**.
    The backup starts immediately. The backup to the USB flash drive may take up to 45 minutes to complete.
13. When the backup process has completed to 100 %, you should inspect the target media to make sure that the backup has been created.
    In the Paragon HDM software you can select the backup entry to review the backup information.

Creating a backup of the HMI Unit on internal hard disk

When the system installation has been verified, we recommend to perform a backup of the system installation. A backup can be created on a USB flash drive, a USB hard disk or the internal hard disk.

Context

This procedure explains how to make a backup of the HMI Unit to the internal hard disk using the pre-installed Paragon HDM software.

Note:

This backup will be unavailable in case of a total disk failure.

A backup to the internal hard disk takes typically 5 minutes.

Procedure

1. Start the HDM software by pressing the Windows key.
2. Select **Hard Disk Manager 16** > **Paragon Hard Disk Manager 16**.
3. Select the **Tools** menu > **Create single backup**.
4. On the **Welcome** page, select **Next**.
5. On the **Name** page, type a name and description for the backup. Select **Next**.
   Type extra information in the **Description** box if needed.
6. On the **Source** page, select **Files and folders**.
7. Select C, D and E disks.
8. For the D and E disks, make sure that only **System Volume Information** is selected.
9. Select **Next**.
10. On the **Target** page, select **Local volumes** > **Data (E:)**.
11. On the **Finish** page you can review the backup summary. You can go back and make corrections if needed.
12. Select **Finish**.
    The backup starts immediately.
13. When the backup process has completed to 100 %, you should inspect the target media to make sure that the backup has been created.
    In the Paragon HDM software you can select the backup entry to review the backup information.

Restoring image from external USB device

If you experience problems with the system, or has a complete disk failure, you can restore the image of the HMI Unit from the USB flash drive or external USB hard disk with a copy of the HMI Unit.

Prerequisites

The bootable USB device with a backup of the HMI Unit image must be available.

Make sure that the hard disk has at least 250 GB storage space.

Context

The backup you created is a complete image of the system disk. The restore process has to be run from an external boot device.

***WARNING*:**

Do not try to restore from a backup created for the 2010 1U HMI Unit.

Procedure

1. Insert the USB recovery flash drive containing the wanted backup archive into the HMI Unit.
2. Turn on the HMI Unit.
3. Press and hold the F12 key during start-up until the **Startup Device Menu** appears.
4. Select the USB HDD from the list. Press Enter.
5. Wait for the Paragon tool to load.

   This may take some time due to network auto-configuration in WinPE. Disconnect all Ethernet cables if you want to minimize boot time.
6. On the **Tools** menu, select **Restore backup**. Select **Next**.
7. Select **External devices**.
8. Locate the name of the backup you want to restore in the root of the USB flash drive. Select **Next**.
9. The **Check backup before restore** dialog box appears. To skip checking, select the **Skip backup integrity verification** box. Select **Skip**.
10. Under **Objects to restore**, select **Files and folders**. Select all available boxes. Select **Next**.
11. Under **What method should be used to restore the files?**, select **Restore files to the original location while overwriting files with identical names**. Select **Next**.

12. Select **Finish**.
    The restore process will start. Wait for the process to complete to 100 %.
13. Select **Close**.
14. Remove the USB recovery flash drive. Store the flash drive in a safe place.
15. Select **Restart** from the **Shutdown/Restart** button in the upper right corner.

Restoring image from internal hard disk

If you experience problems with the system, you can restore the image of the HMI Unit from the USB flash drive or USB hard disk with a copy of the HMI Unit.

Procedure

1. Start the HDM software by pressing the Windows key.
2. Select **Hard Disk Manager 16** > **Paragon Hard Disk Manager 16**.
3. Select the **Tools** menu > **Restore backup**. Select **Next**.
4. Select **Local volumes**.
5. Locate the name of the backup from **Data (E:)**. Select **Next**.
6. The **Check backup before restore** dialog box appears. To skip checking, select the **Skip backup integrity verification** box. Select **Skip**.
7. Under **Objects to restore**, select **Files and folders**. Select all available boxes. Select **Next**.
8. Under **What method should be used to restore the files?**, select **Restore files to the original location while overwriting files with identical names**. Select **Next**.
9. Select **Finish**.
    The restore process will start. Wait for the process to complete to 100 %.
10. Select **Close**.
11. Select **Restart** from the **Shutdown/Restart** button in the upper right corner.

Drawings

Topics

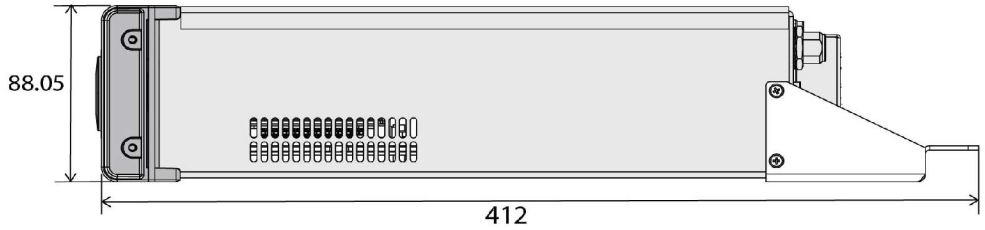
About the drawings

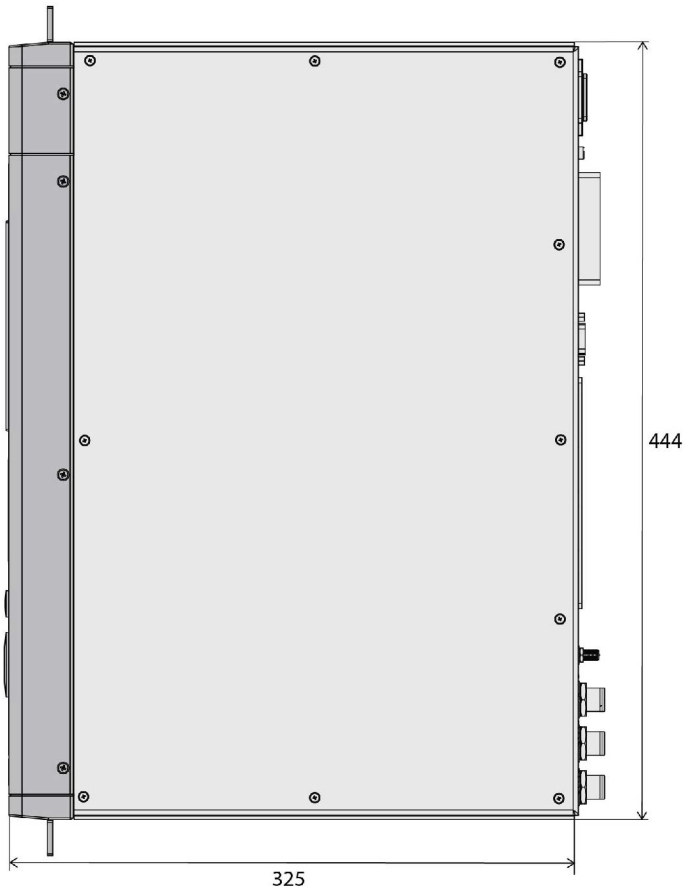
These drawings are for information and planning purposes only.

Unless otherwise specified, all measurements are in millimetres. The drawings are not to scale.

Information may be omitted. Observe the source drawings for additional details.

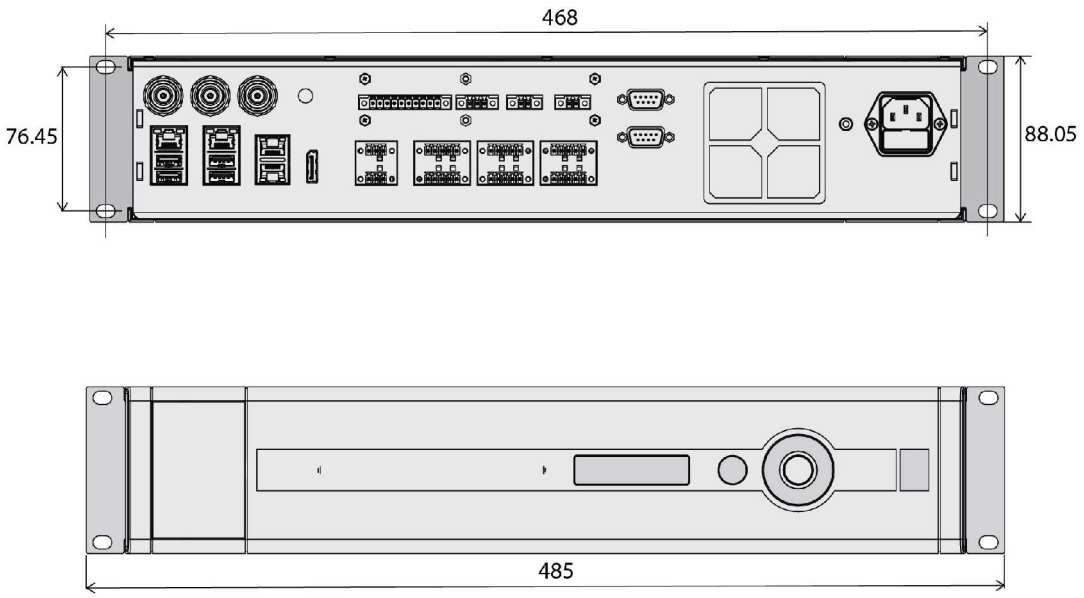
Processing Unit dimensions





All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

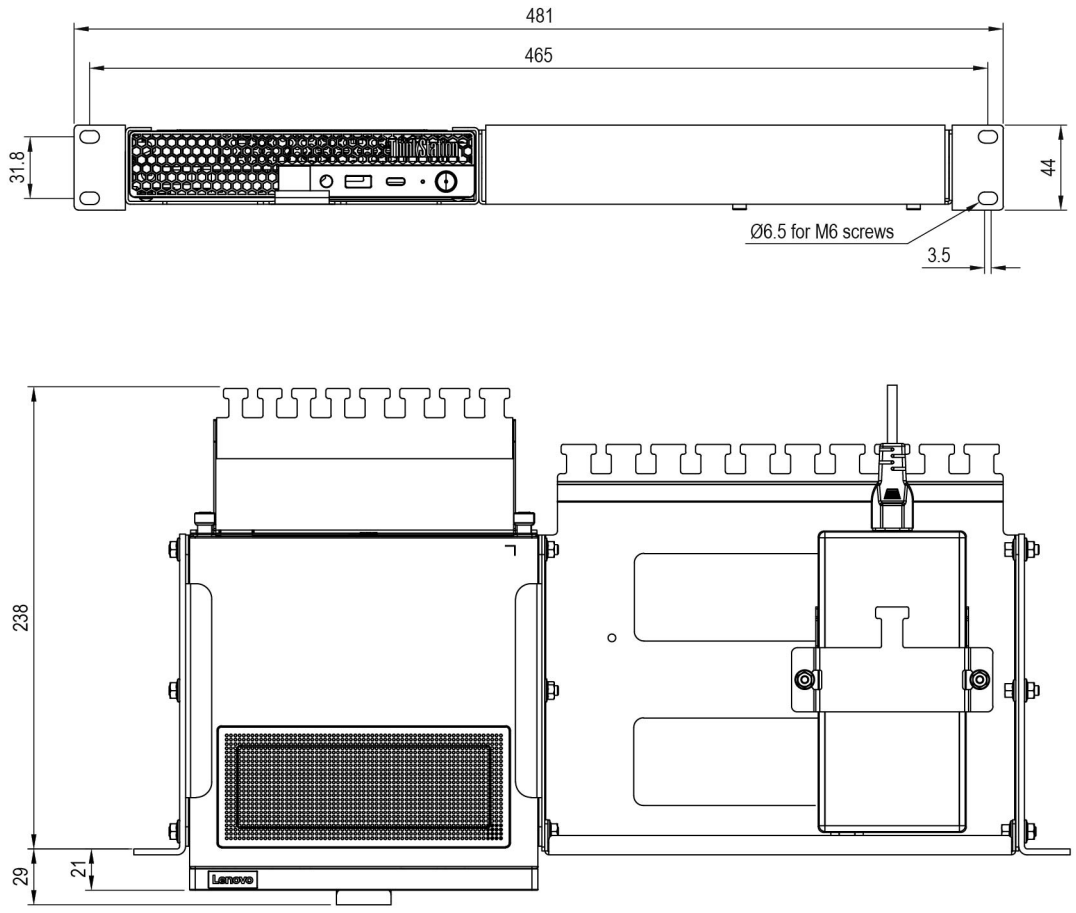
[Adlink: SeatexISP2020] Rev.1
AI



All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[Adlink:SeatexISP2020] Rev.1
AI

HMI Unit dimensions

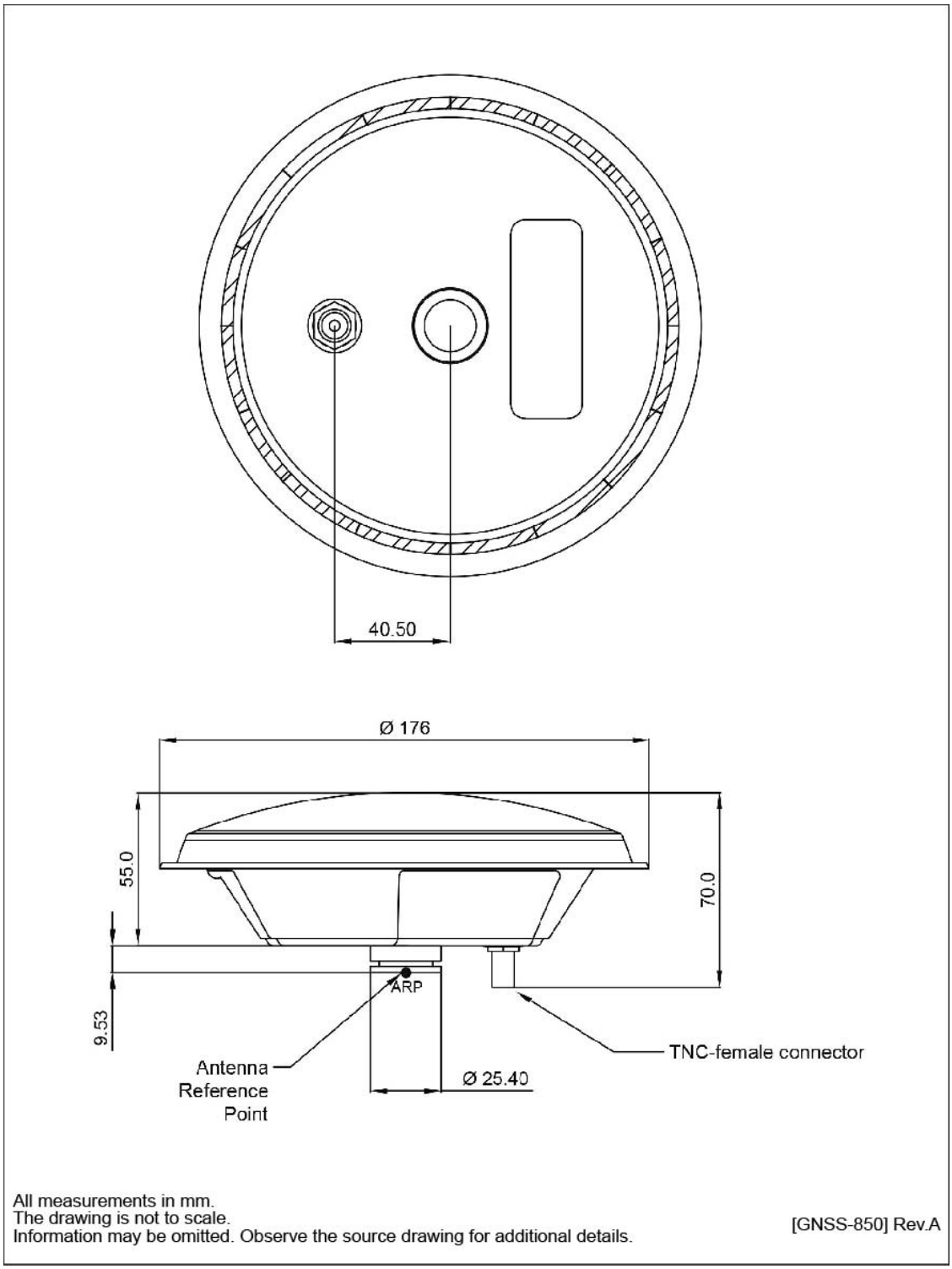


All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[110-0010711] Rev.A
AI

GNSS antenna dimensions

NovAtel GNSS-850



Technical specifications

Related concepts

Installing GNSS/DGNSS antennas, recommended practice, page 31

Topics

Performance specifications

Roll and pitch

MRU

- **Roll and pitch accuracy ±5° amplitude**: 0.010° RMS - Seapath 385-3
- **Roll and pitch accuracy ±5° amplitude**: 0.008° RMS - Seapath 385-5
- **Roll and pitch accuracy ±5° amplitude**: 0.005° RMS - Seapath 385-5+

MGC

- **Roll and pitch accuracy ±5° amplitude**: 0.008° RMS - Seapath 385-R2
- **Roll and pitch accuracy ±5° amplitude**: 0.007° RMS - Seapath 385-R3
- **Roll and pitch accuracy ±5° amplitude**: 0.005° RMS - Seapath 385-R4

All roll and pitch values are with Automatic Online Calibration (AOC).

Heading accuracy

MRU

- **Heading accuracy with 2.5-metre antenna baseline**: 0.07° RMS - Seapath 385-3
- **Heading accuracy with 2.5-metre antenna baseline**: 0.04° RMS - Seapath 385-5 and 5+
- **Heading accuracy with 4-metre antenna baseline**: 0.05° RMS - Seapath 385-3
- **Heading accuracy with 4-metre antenna baseline**: 0.03° RMS - Seapath 385-5
- **Heading accuracy with 4-metre antenna baseline**: 0.02° RMS - Seapath 385-5+

MGC

- **Heading accuracy with 2.5-metre antenna baseline**: 0.03° RMS - Seapath 385-R2
- **Heading accuracy with 2.5-metre antenna baseline**: 0.02° RMS - Seapath 385-R3
- **Heading accuracy with 2.5-metre antenna baseline**: 0.01° RMS - Seapath 385-R4
- **Heading accuracy with 4-metre antenna baseline**: 0.02° RMS - Seapath 385-R2
- **Heading accuracy with 4-metre antenna baseline**: 0.01° RMS - Seapath 385-R3
- **Heading accuracy with 4-metre antenna baseline**: 0.007° RMS - Seapath 385-R4

Heave accuracy and heave motion

MRU

- **Heave accuracy (real-time output)**: 5 cm or 5 %, whichever is highest (RMS)
- **Heave motion periods (real-time output)**: 0 - 18 seconds - Seapath 385-3
- **Heave motion periods (real-time output)**: 0 - 25 seconds - Seapath 385-5 and 5+
- **Heave accuracy for 10 s motion period (real-time output)**: 2 cm or 2 %, whichever is highest (RMS) - Seapath 385-3
- **Heave accuracy for 10 s motion period (real-time output)**: 1 cm or 1 %, whichever is highest (RMS) - Seapath 385-5 and 5+
- **Heave accuracy (delayed signal, PFreeHeave®**: 1 cm or 1 %, whichever is highest (RMS)
- **Heave motion periods (delayed signal, PFreeHeave®**: 0 - 50 seconds

MGC

- **Heave accuracy (real-time output)**: 5 cm or 5 %, whichever is highest (RMS) - Seapath 385-R2, R3 and R4
- **Heave motion periods (real-time output)**: 0 - 25 seconds - Seapath R2, R3 and R4
- **Heave accuracy for 10 s motion period (real-time output)**: 1 cm or 1 %, whichever is highest (RMS) - Seapath R2, R3 and R4
- **Heave accuracy (delayed signal, PFreeHeave®**: 1 cm or 1 %, whichever is highest (RMS) - Seapath R2, R3 and R4
- **Heave motion periods (delayed signal, PFreeHeave®**: 0 - 50 seconds

Position accuracy

MRU/MGC

- **Position accuracy with DGNSS**: 0.5 m RMS or 1 m 95 % CEP
- **Position accuracy with SBAS**: 0.5 m RMS or 1 m 95 % CEP
- **Position accuracy with Fugro Seastar® XP2/G2/G2+/G4/G4+**: 0.05 m RMS or 0.1 m 95 % CEP
- **Position accuracy with VERIPOS Ultra/Ultra²**: 0.05 m RMS or 0.1 m 95 % CEP
- **Position accuracy with C-NavC¹, C-NavC²**: 0.05 m RMS or 0.1 m 95 % CEP
- **Position accuracy with RTK (x and y)**: 1 cm + 1 ppm RMS

  The accuracy is dependent on GPS satellite geometry, environment, ionospheric conditions and distance to the reference station. Excessive multipath, GPS signal obstructions or interference may also reduce the performance.
- **Position accuracy with RTK (z)**: 2 cm + 1 ppm RMS

  The accuracy is dependent on GPS satellite geometry, environment, ionospheric conditions and distance to the reference station. Excessive multipath, GPS signal obstructions or interference may also reduce the performance.

Position drift, horizontal

MRU

- **Typical position drift 1 minute after GNSS dropout (RTK)**: 1.6 m, Seapath 385-3
- **Typical position drift 1 minute after GNSS dropout (RTK)**: 0.6 m, Seapath 385-5
- **Typical position drift 1 minute after GNSS dropout (RTK)**: 0.3 m, Seapath 385-5+

MGC

- **Typical position drift 1 minute after GNSS dropout (RTK)**: 0.6 m, Seapath 385-R2
- **Typical position drift 1 minute after GNSS dropout (RTK)**: 0.2 m, Seapath 385-R3
- **Typical position drift 1 minute after GNSS dropout (RTK)**: 0.08 m, Seapath 385-R4

Velocity accuracy

MRU/MGC

- **Velocity accuracy**: 0.03 m/s RMS or 0.07 m/s 95 % CEP

Interface specifications

Processing Unit

- **Serial ports**: 6 non-dedicated isolated ports, RS-232/RS-422*)

  Isolated COM 1 and COM 2, 9-pin D-Sub, RS-232

  *) The number of serial ports can be expanded by using a serial port extender.
- **Baud rate**: Up to 115 200 bytes/sec
- **LAN**: 5 Ethernet ports
- **USB**: 2 USB 2.0, 3 USB 3.0

HMI Unit

- **LAN**: 5 ports, rear
- **USB**: 1 port, front; 4 ports, rear
- **USB C**: 1 port, front

Weights and outline dimensions

Processing Unit

- **Outline dimensions**:
  - **Depth**:
    - **Minimum**: 357 mm (Includes connectors on the rear panel)
    - **Maximum**: 412 mm (Includes cable relief bracket)
  - **Width**: 485 mm (Will fit in a 19" rack)
  - **Height**: 88.1 mm (2U)
- **Weight**: 5.4 kg

HMI Unit

- **Outline dimensions**:

  - **Depth**: 274 mm
  - **Width**: 481 mm
  - **Height**: 44 mm
- **Weight**: 3.7 kg

GNSS antenna

- **Make and model**: NovAtel GNSS-850
- **Outline dimensions**:
  - **Diameter**: 176 mm
  - **Height**: 55 mm
- **Weight**: 0.5 kg
- **Connector**: TNC connector (Female)

Antenna mounting bracket, 2.5 metres

- **Part number**: M320-21
- **Outline dimensions**:
  - **Length**: 2560 mm
  - **Width**: 75 mm
  - **Height**: 40 mm
- **Weight**: 6.6 kg

Power specifications

Processing Unit

- **Voltage**: 100 – 240 VAC, 50/60 Hz
- **Power consumption**: 75 W (Maximum)

  The power consumption shown is with the Inertial Measurement Unit connected.
- **Power backup**: None. Connection to UPS recommended.

HMI Unit

- **Voltage**: 100 - 240 VAC, 50/60 Hz
- **Power consumption**: 170 W (Maximum)
- **Power backup**: None. Connection to UPS recommended.

GNSS antenna

- **Make and model**: NovAtel GNSS-850
- **Input voltage**: +3.8 - +18 VDC

  5 VDC is supplied by the Processing Unit.
- **Current**: 60 mA (Max.)

Environmental specifications

Processing Unit

- **Operating temperature**: -15 - 55 °C

  Do not operate for more than 10 hours at maximum temperature.
- **Recommended operating temperature**: Room temperature (20 °C)
- **Storage temperature**: -20 - 70 °C

  Long term storage temperature: 5 - 35 °C (Recommended)
- **Operating humidity**: 5 - 95 % relative, non-condensing
- **Storage humidity**: < 55%
- **Ingress protection (IP) code**:
  - **Front**: IP42
  - **Rear**: IP21
- **Standards**:
  - **Electromagnetic compatibility**: IEC 60945/EN 60945 (Immunity and radiation), IACS E10
  - **Vibration**: IEC 60945/EN 60945, IACS E10
- **Enclosure material**: Aluminium
- **MTBF (designed for)**: 100 000 h

HMI Unit

- **Operating temperature**: 10 - 35 °C
- **Recommended operating temperature**: Room temperature (20 °C)
- **Storage temperature**: -40 - 60 °C
- **Operating humidity**: 20 - 80 %

- **Storage humidity**: 10 - 90 %
- **Type approval**: Type approved by ABS, BV, CCS, DNV, KR, LR, RS, NKK, PRS and RINA. IACS E10, IEC 60945.

GNSS antenna

- **Make and model**: NovAtel GNSS-850
- **Operating temperature**: -40 - 85 °C
- **Storage temperature range**: -55 - 85 °C
- **Humidity**: 95% non-condensing
- **Ingress protection**: IP69K

Related concepts

Storage, page 264

Frequency specifications

GNSS antenna

- **Make and model**: NovAtel GNSS-850
- **Upper band**: 1569 ± 43 MHz
- **Lower band**: 1232 ± 68 MHz
- **LNA gain**: 29 dB (typical)

GNSS receiver

- **GPS**: L1, L2, L5
- **GLONASS**: L1, L2, L3, L5
- **Galileo**: E1, E5 a/b, E6
- **BeiDou**: B1, B2, B3
- **QZSS**: L1, L2, L5, L6

Data output specifications

Processing Unit

- **Message format**:

- Simrad EM 3000
- Seapath binary format 26
- Calibration format
- Echo sounder format 9 and 18, TSS1
- RD Instrument ADCP proprietary NMEA format "PRDID"
- KM binary
- 1 PPS time tag, NMEA ZDA message and Trimble compatible messages
- RTCM v3, raw GNSS output
- PFreeHeave® format
- IMU raw data output
- Post-processing1
- NMEA 0183 v3.0, Proprietary

- **Message types NMEA**:
  - DTM, GBS, GGA, GLL, GNS, GRS, GSA, GST, GSV, HDT, RMC, ROT, THS VBW, VER, VTG, ZDA.
  - NMEA proprietary: PSXN20, PSXN21, PSXN22, PSXN23, PSXN24, PBFG.

Related concepts

Telegram specifications, page 193

Related tasks

Setting up the Telegram out interface, page 126

Data input specifications

- **DGNSS corrections**: Seastar® XP2, Seastar® G2/G2+/G4/G4+, RTCM-SC104 v. 2.2, 2.3, 3.0 and 3.2, VERIPOS Ultra/Ultra[2], C-NavC[1], C-NavC[2], Trimble CMR
- **Gyro compass**: NMEA 0183 HDM, HDT, HRC, PSXN10, PSXN23, Robertson LR22 BCD format, EM3000
- **Display control**: Display Dimming and Control (DDC)

Related concepts

Telegram specifications, page 193

Datum specifications

Processing Unit

- **Datum types**: NAD27, ED50, WGS84, MINNA, ARATU Bahia, ARATU Campos, ARATU ES, ARATU Santos, SIRGAS2000 and CAMACUPA.

Up to five user defined datums.

These datum types can only be selected if the corrections input to the product are in WGS84. Or if no corrections are input.

Related tasks

Setting up the Telegram out interface, page 126

Cable specifications

Data cable

Specifications for cables connected to the communication ports.

- **Clamping range**: 0.08 - 1.50 mm^2 (Maximum)
- **Cable types**: 0.50 - 1.50 mm^2
  - Solid H05(07) V-U
  - Stranded H07 V-R
  - Flexible H05(07) V-K
  - Flexible with ferrule
  - Flexible with plastic collar
- **Stripping length**: 6.0 mm

Cable from Processing Unit to IMU Junction box

- **Type**: 4 x 2 x 0.75 mm^2, individually shielded, twisted pairs
- **Diameter**: 13 mm (±1 mm)
- **Flame retardation**: IEC 332-3/A

GNSS antenna cable

- **Type**: ½" superflex 50 BHF
- **Attenuation**: 14 dB/100 m (at 1.6 GHz)
- **Length:**: 100 m, max. length (each cable)

- **Diameter**: 13.5 mm
- **Bend radius**: 30 mm, max.
- **Flame retardation**: IEC 60332-3
- **Coax connectors**: Huber+Suhner 11_N-50-9-9

If the antenna cables are not delivered by Kongsberg Discovery, make sure that the cables meet the following electrical specifications.

- **Insertion loss**: 15 dB (at 1.6 GHz), max.
- **Characteristic impedance**: 50 ohm (nominal)

The antenna connectors on the Processing Unit are of N-type male. On the GNSS antennas both TNC-type female and N-type female are available. Optionally, an interconnection cable for transfer of connector type from TNC on the antenna to N-type on the antenna cable, can be delivered.

Related concepts

Installing antenna cables, recommendations, page 36

Related tasks

Cabling for the rack units, page 72
Terminating the Processing Unit to MGC COMPASS junction box cable, page 76
Terminating the Processing Unit to MGC/MRU junction box cable, page 82

Manufacturer’s conformity declaration

This product is in compliance with relevant directives and product standards.

KONGSBERG

EU DECLARATION OF CONFORMITY

Manufacturer's name:	**Kongsberg Discovery AS**
Manufacturer's address:	**Havnegata 9, N-7010 Trondheim, Norway**

declares that the product:

Product name:	**Seapath 385 series**
Models:	**Seapath 385 and Seapath 385-R**

is in conformity with the **Radio Equipment Directive, RED, 2014/53/EU** and with reference to ETSI guide **ETSI EG 203 367,** using relevant sections of the following product standards:

Essential Requirements	**Standards**
Health and Safety (Article 3.1(a))	EN 61010-1:2010/A1:2019/AC:2019-04
EMC (Article 3.1(b))	IEC/EN 60945:2002 + Corr1:2008
Spectrum (Article 3.2)	ETSI EN 303 413 V1.2.1 (2021-04) ETSI EN 300 330 V2.1.1 (2017-02)

Test References
Report EMC: E22068.00, issued by Nemko Scandinavia AS.
Report Spectrum: 459605-01-R00, issued by Nemko Scandinavia AS.
Report Safety: ISP2020_Safety_001, issued by Kongsberg Seatex AS.

The product is compliant with RoHS Directive **2015/863/EU** with reference to standard **EN63000:2018**.

Supplementary Information
Report E22068.00 covers all variants of the Seapath 385 model series.
The Seapath 385 series equipment is environmentally compliant with IEC/EN 60945:2002, IACS E10 rev8:2021 and DNV-CG-0339:2021.

Date and signature
2025-04-30

Ane Dalsnes Storsæter, Vice President

Doc item: 110-0062663/B

NMEA telegram output options

When you set up the **TelegramOut** interface, the contents of some of the available NMEA telegrams may be modified according to options listed in the **Options** list in the NAVEngine configuration. This is for example useful when interfacing to older equipment.

This list holds a description of the various options.

Output residuals on Ashtech RRE format (GRS)

Use this option if you have enabled the GRS sentence and want the residuals output on the Ashtech RRE format instead.

Send VHW message after VTG using ground speed from VTG

Use this option when a VHW sentence is needed, and vessel heading and vessel speed relative to the water are not available. When this option is enabled, an NMEA VHW sentence is output, using SOG as Speed, and COG as heading. The VHW sentence is output immediately after the VTG sentence.

Output empty fields in NMEA HDT and NMEA THS messages also for reduced accuracy

Use this option when you want to set invalid heading (empty HDT/THS field) when heading status is reduced (low accuracy).

Use inertial roll, pitch and heave only

Use this option if you want the output of roll, pitch and heave to be calculated from IMU measurements only (no GNSS).

Use time from dataset in NMEA ZDA message

GNSS systems: Use this option if you want the time stamp in the NMEA ZDA message to be equal to the time stamp of the GNSS data set and the GGA message.

Disable additional GNS messages when diffcorr is used for both GPS and GLONASS

Use this option if you do not want additional NMEA messages if differential corrections are used for both GPS and GLONASS.

Limit correction age to 9.9 sec in GGA

Use this option if your system does not handle correction ages above 9.9 seconds in the GGA sentence. If this option is enabled, the correction age will increase and stop at 9.9 seconds even if the correct correction age is more than 9.9 seconds.

Use GNSS solution only

Integrated systems only: Use this option if you want to output position based on GNSS only (no IMU).

Set GGA quality indicator to 5 if converged high precision

Use this option if you want the Quality Indicator in the NMEA GGA sentence set to 5, when position solution is converged clock orbit or float filter (XP, G2, Ultra, Apex etc).

Freeze NMEA position if invalid

Use this option if you want the position output to use the last known valid position when the current position becomes invalid.

Use current GNSS info if only integrated position is valid

Integrated systems only: Use this option if you want to output current HDOP, number of satellites and corrections age in the GGA message though the GNSS position is invalid and the integrated position is valid.

Allow more than 12 satellites in GGA message

The NMEA standard limits the number of satellites in the GGA sentence to 12. Use this option if you want the GGA sentence to use the actual number of satellites.

Use modified quality indicator in GGA message

Use this option if you want the quality indicator in the NMEA GGA sentence to be replaced by GQI.

Use external attitude for lever arm compensation

Use this option if you want to use external attitude for lever arm compensation and velocity decomposition.

Use DQI(0-9) as GGA quality indicator

DP only: Use this option if you want to use talker DP and output DQI instead of NMEA Quality Indicator for GGA.

Send each NMEA telegram in separate UDP datagram

Use this option if TelegramOut is configured to send on UDP, and you want each NMEA telegram to be sent in a separate UDP telegram.

Use 2 decimals instead of 1 for velocity in NMEA VTG and RMC

Use this option if you want the velocity field in NMEA VTG and NMEA RMC messages to contain 2 decimals instead of the default 1.

Stop GGA, GLL, GNS and RMC output if invalid position

Use this option if you want the output of the position telegrams to stop if the position is invalid.

Interface descriptions

Related tasks

Installing the system units in a rack, page 59

Topics

Processing Unit interfaces

Topics

Front interfaces Processing Unit

The power on/off switch, local area network (LAN) port and USB connection are located behind the lid to the left on the front panel. Push lid on left side to open.

LAN 5 is type RJ-45, 10/100/1000 Mbits/s.

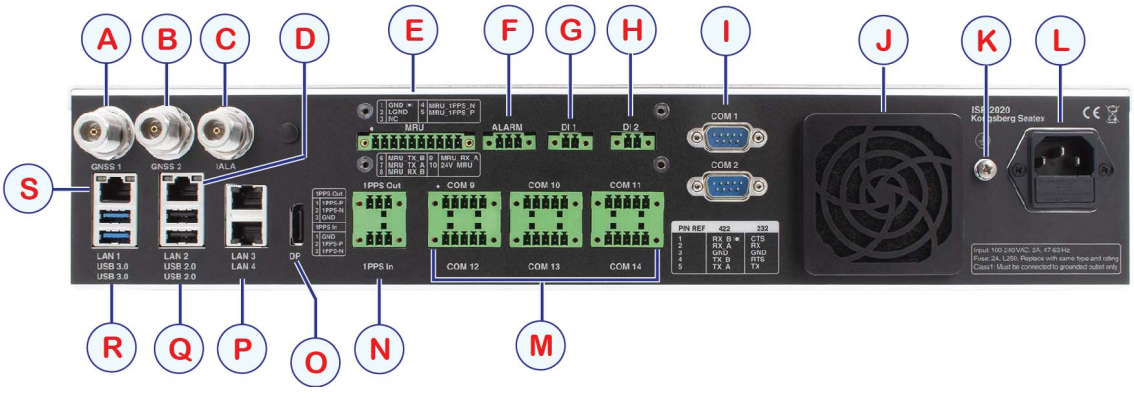
Connector name	Connector type	Connected to
LAN 5	RJ-45, 10/100/1000 Mbit/s	For support purposes
USB	USB 3.0	For software update and data logging

Rear interfaces Processing Unit

The rear panel of the unit contains communication interface ports for interfacing to external equipment. These ports are individually galvanically isolated.

Note:

All terminal pin numbering goes from left (no. 1) to right.



	Connector name	Connector type	Connected to
A	GNSS 1	N connector 50 Ohm female	GNSS antenna
B	GNSS 2	N connector 50 Ohm female	DPS i2, i3, i4: Not used, DPS i6: GNSS antenna
C	Not used	N/A	N/A
D	LAN 2	RJ-45, 10/100/1000 Mbit/s	User configurable
E	MRU	10-pin terminal, RS-422	MGC/MRU

	Connector name	Connector type	Connected to
F	ALARM	3-pin terminal, Relay	External alarm system
G	D1	2-pin terminal	When activated from external device, DGNSS/GNSS power is turned off
H	D2	2-pin terminal	Spare input
I	COM 1	9-pin DSub male, RS-232	User configurable
I	COM 2	9-pin DSub male, RS-232	User configurable
K	GND	Ground	Ground
L	Power	100 - 240 VAC	Input of 100 - 240 VAC
M	COM 9	5-pin terminal, RS-232/422	User configurable
M	COM 10	5-pin terminal, RS-232/422	User configurable
M	COM 11	5-pin terminal, RS-232/422	User configurable
M	COM 12	5-pin terminal, RS-232/422	User configurable
M	COM 13	5-pin terminal, RS-232/422	User configurable
M	COM 14	5-pin terminal, RS-232/422	User configurable
N	1PPS	2 x 3-pin terminal	External equipment
O	DP	DisplayPort	Not used
P	LAN 3	RJ-45, 10/100/1000 Mbit/s	User configurable
P	LAN 4	RJ-45, 10/100/1000 Mbit/s	User configurable
Q	USB 2.0	USB 2.0	Keyboard/Mouse
Q	USB 2.0	USB 2.0	Keyboard/Mouse
R	USB 3.0	USB 3.0	User configurable
R	USB 3.0	USB 3.0	User configurable
S	LAN 1	RJ-45, 10/100/1000 Mbit/s	HMI Unit and serial port extender

RS-422 A and B signal definition

Signal state definition according to the IEC 61162-1 standard from the International Electrotechnical Committee.

The idle, marking, logical 1, OFF or stop bit states are defined by a negative voltage on line A with respect to line B. The active, spacing, logical 0, ON or start bit states are defined by a positive voltage on line A with respect to line B. It should be noted that the above A with respect to B levels are inverted from the voltage input/output requirements of standard UARTs and that many line drivers and receivers provide a logic inversion.

With reference to the table showing the pin layout for the serial ports on the rear panel screw terminals, note that the separate GND (ground) pin for each port is isolated from the chassis and shall act as a common signal intended to be connected between the talker (-TX) and the listener side (RX) of other equipment, for example the corresponding isolated GND (ground) pin or common pin. The purpose of the common signal is to increase the reliability of the hardware transmission. It must not be connected to the chassis or the cable screen. This applies to both sides of a connection. The cable screen shall be connected to the equipment chassis on one side only, preferably talker side, -TX.

COM 1 and COM 2

COM 1 and COM 2 at the rear of the Processing Unit are 9-pin DSub male. These ports are RS-232 only. They are not NMEA 0183 electrical compliant ports.

These ports are not intended for use with long cables. They should only be used internally in the rack.

Note:

The COM 1 and COM 2 ports are not as accurate with regard to timing as COM 9 to COM 14. Thus they are not recommended used for timing critical outputs.

The table shows the pin layout on the COM 1 and COM 2 ports.

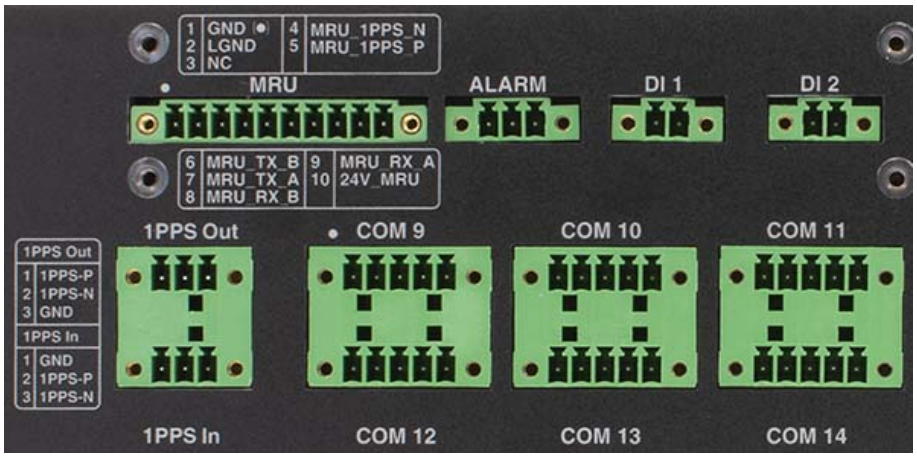
Pin no.	RS-232	Pin no.	RS-232
1	DCD1	6	DSR1
2	RXD1	7	RTS1
3	TXD1	8	CTS1
4	DTR1	9	RI1
5	GND		

Rear panel ports

The illustration shows the screw terminal pin layout for the ports located on the rear panel.

Note:

All terminal pin numbering goes from left (no. 1) to right.



MRU

The MRU connector is used for power and interface to the Inertial Measurement Units, MGC or MRU. Usually when an MGC or an MRU is connected to a Processing Unit, a junction box is used to make the wiring easier.

The table shows the pin layout of the MRU terminal.

Pin no.	Signal
1	GND
2	LGND
3	NC
4	MRU_1PPS_N
5	MRU_1PPS_P
6	MRU_TX_B
7	MRU_TX_A
8	MRU_RX_B
9	MRU_RX_A
10	24V_MRU

Note:

The A and B lines for RX and TX are reversed compared to the older HWP2010 Processing Unit.

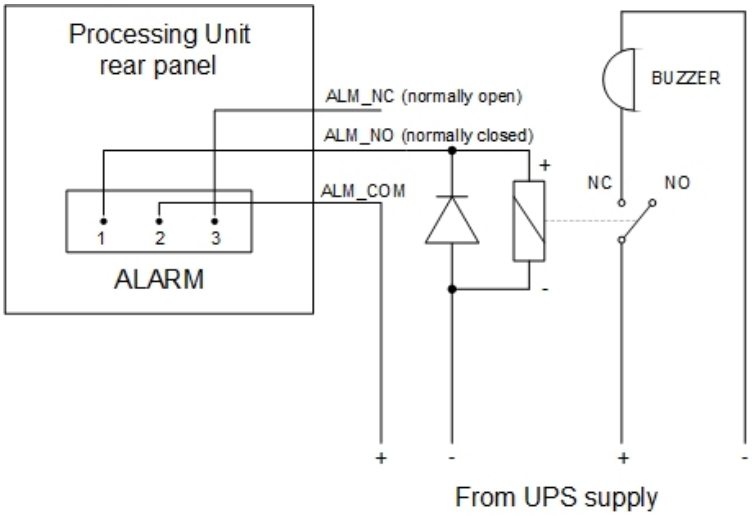
Alarm signal

The Processing Unit has a built-in alarm functionality. It can be connected to an external alarm. An alarm will open the alarm relay. The alarm relay can be used to trigger an external alarm. The external alarm can be connected to the 3-pin ALARM terminal.

The table shows the pin layout of the ALARM terminal.

Pin no.	Signal
1	Alarm_NO
2	Alarm_Com
3	Alarm_NC

The illustration shows how an external alarm can be connected to the ALARM terminal at the rear of the Processing Unit.



1PPS signal

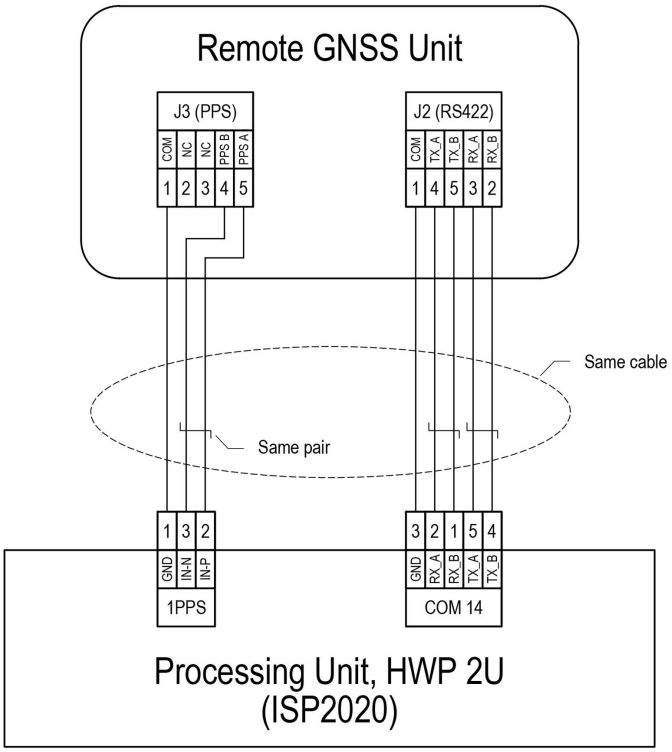
A 1 pulse-per-second (1PPS) signal synchronized with GNSS time is available from the PPS port at the rear of the Processing Unit. The port has galvanic separation. This 1PPS signal originates from the GNSS receiver within the Processing Unit. The 1PPS signal is buffered and fed to the terminal at 120 Ohm. The 1PPS signal is active high and has a pulse width of 10 ms. The 1PPS is generated exactly once every second with its rising edge synchronised to GPS time.

Both the positive P and the negative N signal shall be connected for long cables. For example cables outside the rack.

The table shows the pin layout on the 1PPS port.

Pin no.	Signal name	Direction (Port)	Edge	Compatibility (description on old HW, HWP2010)
1	1PPS P	1PPS Out	Rising	1PPS TX_A
2	1PPS N	1PPS Out	Falling	1PPS TX_B
3	GND isolated	1PPS Out		GND isolated
1	GND isolated	1PPS In		GND isolated
2	1PPS P	1PPS In *)	Rising	1PPS RX_A
3	1PPS N	1PPS In *)	Falling	1PPS RX_B

*) When a Remote GNSS Unit is used, the 1PPS signal from the remote unit shall be connected to this input port.



Serial lines

This system communicates with external equipment through the RS-232 or RS-422 configurable serial input and output lines.

The table shows the pin layout of the serial input and output lines.

Pin no.	Signal name	
	RS-422	**RS-232**
1	RX_B	CTS
2	RX_A	RX
3	GND	GND
4	TX_B	RTS
5	TX_A	TX

Note:

The A and B lines for RX and TX are reversed compared to the older HWP2010 Processing Unit.

Ethernet connection

The unit has the possibility to input and output data on individually configurable network ports. The format and update rate are configured for each port in the **NAV Engine Configuration** dialog box.

The unit has five Ethernet connections (LAN). LAN 1, LAN 2, LAN 3 and LAN 4 at the rear of the unit. LAN 5 at the front of the unit.

LAN 1 to 5

These local area networks (LAN) are high capacity (10/100/1000 Mbps). They are of type auto crossover and auto-negotiation.

The table shows the pin layout for these LANs connected to different network capacities.

10/1000 or 100/1000 Mbps Ethernet			1000/1000 Mbps Ethernet		
Pin no.	**Signal**	**Description**	**Pin no.**	**Signal**	**Description**
1	TX_DA+	Transceive data +	1	BI_DA+	Bi-directional pair +A
2	TX_DA-	Transceive data –	2	BI_DA-	Bi-directional pair –A
3	RX_DB+	Receive data +	3	BI_DB+	Bi-directional pair +B

10/1000 or 100/1000 Mbps Ethernet			1000/1000 Mbps Ethernet		
Pin no.	Signal	Description	Pin no.	Signal	Description
4			4	BI_DC+	Bi-directional pair +C
5			5	BI_DC-	Bi-directional pair –C
6	RX_DB-	Receive data –	6	BI_DB-	Bi-directional pair –B
7			7	BI_DD+	Bi-directional pair +D
8			8	BI_DD-	Bi-directional pair –D

Cables

To connect the unit network, use twisted pair (TP) cable with RJ-45 connectors.
To comply with the IEC 60945 standard, shielded (screened) cable has to be used.
Recommended cable type is minimum CAT-5e. A Category 5e cable is an enhanced version of Category 5 that adheres to more stringent standards. It is capable of transmitting data at speeds of up to 1000 Mbps (1 Giga bit per second). The maximum length of the cable which can be used is 100 metres (328 ft).

HMI Unit interfaces

Topics

Front interfaces HMI Unit, page 191

Rear interfaces HMI Unit, page 192

Front interfaces HMI Unit

The front panel of the unit contains a configurable USB port and the on/off button.

	Connector name	Connector type	Connected to
A	USB	USB	User configurable
B	USB	USBC	User configurable

Rear interfaces HMI Unit

The rear panel of the unit contains a power inlet, a Display Port, four USB ports, one HDMI port and five Ethernet ports.

Connect the display to either the Display Port or the HDMI port.

	Connector name	Connector type	Connected to
A	Net_B	RJ45	Spare
B	Net_C	RJ45	Remote support
C	Port_3	RJ45	K-Master (DP)
D	LAN_1	RJ45	Processing Unit
E	Power	DC power inlet	Power supply. Input of 100 - 240 VAC.
F	DisplayPort	DisplayPort	Display (optional)
G	HDMI	HDMI	Display (optional)
H	4 x USB	USB	Keyboard/Mouse. User configurable
I	Net_A	RJ45	Spare

Telegram specifications

Related references

Data output specifications, page 176
Data input specifications, page 177

Topics

NMEA DDC

The NMEA DDC sentence provides controls for equipment display dimming presets and a display brightness percentage.

The sentence is as specified in NMEA standard 0183, version 4.0.

Format

```
$--DDC,a,xx,a,a*hh
```

Description

1. **a**: Display dimming preset

   D = Day time setting

   K = Dusk setting

   N = Night time setting

   O = Backlighting off setting

2. **xx**: Brightness percentage, 00 - 99

3. **a**: Colour palette

   D = Day time setting

K = Dusk setting

N = Night time setting

O = Backlighting off setting

4. **a**: Sentence status flag. This shall not be a null field.

   R = Status report

   C = Configuration or command to change a setting

NMEA DTM

The DTM sentence contains local geodetic datum and datum offsets from a reference datum.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc*hh
```

Description

1. **ccc**: Local datum code. Null field.
2. **a**: Local datum subdivision code
3. **x.x**: Latitude offset, minutes, North/South
4. **a**: North/South
5. **x.x**: Longitude offset, minutes, East/West
6. **a**: East/West
7. **x.x**: Altitude offset, metres, (+/—)
8. **ccc**: Reference datum code (WGS84 = W84)
9. ***hh**: Checksum

NMEA GBS

The NMEA GBS sentence is used to support RAIM (Receiver Autonomous Integrity Monitoring). It reports the integrity checks of the position quality of the position solution.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--GBS,hhmmss.ss,x.x,x.x,x.x,xx,x.x,x.x,x.x*hh
```

Description

1. **hhmmss.ss**: UTC of the GGA or GNS fix associated with this sentence. Hours, minutes and seconds.
2. **x.x**: Expected error in latitude.
3. **x.x**: Expected error in longitude.
4. **x.x**: Expected error in altitude.
5. **xx**: ID number of most likely failed satellite.GPS: 1–32, WAAS: 33–64, GLONASS: 65–96.
6. **x.x**: Probability of missed detection for most likely failed satellite.
7. **x.x**: Estimate of bias in metres on lost likely failed satellite.
8. **x.x**: Standard deviation of bias estimate.
9. ***hh**: Checksum

NMEA GGA

The NMEA GGA sentence transfers the time, position and fix related data from a global positioning system (GPS).

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--
GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh
```

Description

1. **hhmmss.ss**: UTC of position (Hours, minutes and seconds)
2.
3. **llll.ll**: Latitude (Degrees, minutes and fractions of minutes)
4. **a** : Latitude sector, North/South
5. **yyyyy.yy**: Longitude (Degrees, minutes and fractions of minutes)

6.

7. **a** : Longitude sector,
8. **x**: GPS quality indicator. This shall not be a null field.

   0 = Fix not available or invalid

   1 = GPS/GLONASS, Fix valid

   2 = DGPS/DGLONASS, Fix valid

   5 = Float RTK fix

   6 = Estimated (dead reckoning) Mode
9. **xx**: Number of satellites in use, 00 - 12
10. **x.x**: Horizontal dilution of precision (HDOP)
11. **x.x**: Altitude, ref: mean-sea level (geoid)
12. **M**: Altitude unit, M = Metres
13. **x.x**: Geoidal separation

    The difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface.
14. **M**: Geoidal separation unit, M = Metres
15. **x.x**: Age of differential GPS data

    Time i seconds. Null field if DGPS is not used.
16. **xxxx**: Differential reference station ID, 0000 - 1023
17. ***hh**: Checksum

NMEA GGK

The NMEA GGK datagram is used to decode the PTNL, Time, Position, Type and DOP (Dilution of Precision) string of the NMEA 0183 output.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--
GGK,hhmmss.ss,ddmmyy,nnnnn.nnnnnnnn,a,yyyyy.yyyyyyyy,a,x,zz,w.w,EHTe
eeeee,u*hh<CR><LF>
```

Description

1. **hhmmss.ss**: Coordinated Universal Time (UTC) of the current position
2. **ddmmyy**: Day, month and year
3. **nnnnn.nnnnnnnn**: Latitude, Degrees, minutes and hundredths
4. **a**: Direction of latitude
   - **N** = North
   - **S** = South
5. **yyyyy.yyyyyyyy**: Longitude, Degrees, minutes and hundredths
6. **a**: Direction of longitude
   - **E** = East
   - **W** = West
7. **x**: Quality indicator for the GPS (Global Positioning System) (Refer to the NMEA standard for further information about the GPS quality indicator.)
8. **zz**: Number of satellites in use
9. **w.w**: PDOP (Position dilution of precision)
10. **EHTeeeeee**: Ellipsoidal height of fix
11. **u**: Unit of height measurement
12. ***hh**: Checksum

NMEA GLL

The NMEA GLL sentence transfers the latitude and longitude of vessel position, the time of the position fix and the current status from a global positioning system (GPS).

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--GLL,llll.ll,a,yyyyy.yy,a,hhmmss.ss,A,a*hh
```

Description

1. **llll.ll**: Latitude (Degrees, minutes and fractions of minutes)
2. **a** : Latitude sector,
3. **yyyyy.yy**: Longitude (Degrees, minutes and fractions of minutes)

4. **a** : Longitude sector,
5. **hhmmss.ss**: UTC of position (Hours, minutes and seconds)
6. **A**: Status

   A = The data are valid.

   V = The data are not valid.
7. **a**: Mode indicator

   A = Autonomous

   D = Differential

   N = The data are not valid.
8. ***hh**: Checksum

NMEA GNS

This sentence provides position fix data for GPS, GLONASS, possible future satellite systems and systems combining these.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--GNS,hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c,xx,x.x,x.x,x.x,x.x,x.x*hh
```

Description

1. **hhmmss.ss**: UTC of position (Hours, minutes and seconds)
2. **llll.ll**: Latitude
3. **a**: North/South
4. **yyyyy.yy**: Longitude
5. **a**: Longitude/West
6. **c--c**: Mode indicator. The first character indicates the use of GPS/GLONASS satellites.

   N = No fix

   A = Autonomous mode

   D = Differential mode
7. **xx**: Number of satellites in use, 00 – 99

8. **x.x**: HDOP
9. **x.x**: Antenna altitude, Metres, Ref: mean-sea level (geoid)
10. **x.x**: Geoidal separation, Metres, Difference between the earth ellipsoid and mean-sea level
11. **x.x**: Age of differential data
12. **x.x**: Differential reference station ID
13. ***hh**: Checksum

NMEA GRS

This message is used to support Receiver Autonomous Integrity Monitoring (RAIM). It reports the range residuals in the position solution.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--
GRS,hhmmss.ss,x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x*hh
```

Description

1. **hhmmss.ss**:UTC time of the GGA or GNS fix associated with this sentence (Hours, minutes and seconds)
2. **x**: Mode indicator, 1 or 0
3. **x.x ..... x.x**: Range residuals in metres for satellites used in the navigation solution. Order must match order of the satellite ID numbers in GSA. When GRS is used, GSA and GSV are generally required.
4. ***hh**: Checksum

NMEA GSA

The NMEA GSA sentence transfers the satellites used in the navigation solution and the dilution of precision (DOP) values.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--GSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x*hh
```

Description

1. **a**: Mode

   M = Manual

   A = Automatic

2. **x**: Mode

   1 = Fix not available

   2 = 2D

   3 = 3D

3. **xx**: Identification numbers for satellites used in solution

   Satellite numbers 1 - 32 for GPS satellites

   Satellite numbers 33 - 64 for WAAS satellites

   Satellite numbers 65 - 96 for GLONASS satellites

4. **x.x**: PDOP(Position dilution of precision)
5. **x.x**: HDOP(Horizontal dilution of precision)
6. **x.x**: VDOP(Vertical dilution of precision)
7. ***hh**: Checksum

NMEA GST

The NMEA GST sentence transfers pseudo-range error statistics.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--GST,hhmmss.ss,x.x,x.x,x.x,x.x,x.x,x.x,x.x*hh
```

Description

1. **hhmmss.ss**: UTC of position (Hours, minutes and seconds)
2. **x.x**: RMS value of the standard deviation of the range inputs to the navigation process

3. **x.x**: Standard deviation of semi-major axis of error ellipse (Metres)
4. **x.x**: Standard deviation of semi-minor axis of error ellipse (Metres)
5. **x.x**: Orientation of semi-major axis of error ellipse (Degrees from true north)
6. **x.x**: Standard deviation of latitude error (Metres)
7. **x.x**: Standard deviation of longitude error (Metres)
8. **x.x**: Standard deviation of altitude error (Metres)
9. ***hh**: Checksum

NMEA GSV

The NMEA GSV sentence transfers the number of satellites in view (SV), satellite identification numbers, elevation, azimuth and signal–noise ratio (SNR) value. Four satellites maximum per transmission. Additional satellite data sent in second or third message.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--GSV,x,x,xx,xx,xx,xxx,xx,.....,xx,xx,xxx,xx*hh
```

Description

1. **x**: Total number of messages, 1 - 9
2. **x**: Message number, 1 - 9
3. **xx**: Total number of satellites in view
4. **xx**: Satellite identification number

   Satellite numbers 1 - 32 for GPS satellites

   Satellite numbers 33 - 64 for WAAS satellites

   Satellite numbers 65 - 96 for GLONASS satellites
5. **xx**: Elevation in degrees, 90° maximum
6. **xxx**: Azimuth in degrees, True, 000 - 359
7. **xx**: SNR, 00 - 99 dB-Hz, null when not tracking
8. **.....,xx,xx,xxx,xx**: A variable number of “Satellite identification number, Elevation, Azimuth, SNR” sets, maximum four sets per message.

9. ***hh**: Checksum

NMEA HDT

The NMEA HDT sentence contains the actual vessel heading in degrees true produced by any device or system producing true heading.

Note:

This is a deprecated sentence which has been replaced by THS.

Format

```
$--HDT,x.x,T*hh<CR><LF>
```

Description

1. **x.x**: Heading, degrees true.
2. **T**: Heading, degrees true.
3. ***hh**: Checksum

NMEA RMC

The NMEA RMC datagram transfers the time, date, position, course and speed data from a global navigation satellite system (GNSS) receiver.

Format

```
$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,xxxxxx,x.x,a,a*hh
```

Description

1. **hhmmss.ss**:
2. Coordinated Universal Time (UTC) of the current position **A**: Status

   A = The data are valid.

   V = Navigation receiver warning.
3. **llll.ll,a**: Latitude North/South
4. **yyyyy.yy,a**: Longitude East/West

5. **x.x**: Speed over ground (knots)
6. **x.x**: Course over ground (Degrees (True))
7. **xxxxxx**: Date: ddmmyy
8. **x.x,a**: Magnetic variation, East/West (Degrees)

   E = Easterly variation, subtracts from True course

   W = Westerly variation, adds to True course
9. **a**:

   Mode indicator A = Autonomous mode

   D = Differential mode

   E = Estimated (dead reckoning) mode

   M = Mode indicator mode

   S = Simulator mode

   N = The data are not valid.
10. ***hh**: Checksum

NMEA ROT

The NMEA ROT sentence contains rate of turn and direction of turn information.

Format

```
$--ROT,x.x,A*hh<CR><LF>
```

Description

1. **x.x**: Rate of turn, °/min, "-" = bow turns to port.
2. **A**: Status.

   A = Data valid.

   V = Data invalid.
3. ***hh**: Checksum

NMEA VBW

The NMEA VBW datagram contains water- and ground-referenced vessel speed data.

Format

```
$--VBW,x.x,x.x,A,x.x,x.x,A,x.x,A,x.x,A*hh<CR><LF>
```

Description

1. **x.x**: Speed relative to water (knots)
2. **x.x**: Speed relative to water (knots)
3. **A**: Status, Speed relative to water,

   A = The data are valid.
4. **x.x**: Speed relative to ground, Longitudinal (knots)
5. **x.x**: Speed relative to ground, Transverse (knots)
6. **A**: Status, Speed relative to ground

   A = The data are valid.
7. **x.x**: Speed relative to water, Stern, Transverse (knots)
8. **A**: Status, Speed relative to water, Stern

   A = The data are valid.
9. **x.x**: Stern, Transverse (knots)
10. **A**: Status, Speed relative to ground, Stern

    A = The data are valid.

    V = The data are not valid.
11. ***hh**: Checksum

Note:

Transverse speed: " – " = port. Longitudinal speed: " – " = astern.

NMEA THS

The NMEA THS sentence contains the actual vessel heading in degrees true produced by any device or system producing true heading.

This sentence includes a "mode indicator" field providing critical safety related information about the heading data.

Note:

This sentence replaces the HDT sentence.

Format

```
$--THS,x.x,a*hh<CR><LF>
```

Description

1. **x.x**: Heading, degrees true.
2. **T**: Mode indicator. This field should not be null.

   A = Autonomous

   E = Estimated (dead reckoning)

   M = Manual input

   S = Simulator mode

   V = Data not valid (including standby)
3. ***hh**: Checksum

NMEA VER

The NMEA VER sentence provides identification and version information about a device. This sentence is produced as a reply to a query sentence.

The sentence is as specified in NMEA standard 0183, version 4.0.

Format

```
$--VER,x,x,aa,c--c,c--c,c--c,c--c,c--c,c--c,x*hh
```

Description

1. **x**: Total number of sentences needed, 1 - 9
2. **x**: Sentence number, 1 - 9
3. **aa**: Device type
4. **c--c**: Vendor identification

5. **c--c**: Unique identifier. Max 15 characters.
6. **c--c**: Manufacturer serial number. Max. 32 characters.
7. **c--c**: Model code (product code). Max. 32 characters.
8. **c--c**: Software revision. Max. 32 characters.
9. **c--c**: Hardware revision. Max. 32 characters.
10. **x**: Sequential message identifier. Message identification number from 0 - 9.
11. ***hh**

    : Checksum

NMEA VTG

The NMEA VTG sentence transfers the actual course and speed relative to the ground.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh
```

Description

1. **x.x**: Course over ground, Degrees (True)
2. **T**: Course over ground, marker
3. **x.x**: Course over ground, Degrees (Magnetic)
4. **M**: Course over ground, marker
5. **x.x**: Speed over ground, knots
6. **N**: Speed over ground, knots
7. **x.x**: Speed over ground, km/h
8. **K**: Speed over ground, km/h
9. **a**: Mode indicator. This shall not be a null field.

   A = Autonomous

   D = Differential

   N = The data are not valid.
10. ***hh**: Checksum

NMEA ZDA

The NMEA ZDA sentence contains the universal time code (UTC), day, month, year and local time zone.

The sentence is as specified in NMEA standard 0183, version 3.0.

Format

```
$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh
```

Description

1. **hhmmss.ss**: UTC of position (Hours, minutes and seconds)
2. **xx**: Day UTC, 01 - 31
3. **xx**: Month UTC, 01 - 12
4. **xxxx**: Year UTC
5. **xx**: Local time zone, 00 - ±13 hrs
6. **xx**: Local time zone, minutes, 00 – +59
7. ***hh**: Checksum

PSXN20

The proprietary PSXN20 NMEA sentence contains quality indicators for roll, pitch, heading and position.

The sentence destination is positioning reference systems.

The sentence is based on NMEA sentence format.

Format

```
$PSXN,20,x,x,x,x*hh<CR><LF>
```

Description

1. **$**: Start character.
2. **PSXN**: Seatex ID.
3. **Message number**: 20.
4. **x**: horiz-qual - Horizontal position and velocity quality.

0 = Normal

1 = Reduced performance

2 = Invalid data

5. **x**: hgt-qual - Height and vertical velocity quality.

   0 = Normal

   1 = Reduced performance

   2 = Invalid data

6. **x**: head-qual - Heading quality.

   0 = Normal

   1 = Reduced performance

   2 = Invalid data

7. **x**: rp-qual - Roll and pitch quality.

   0 = Normal

   1 = Reduced performance

   2 = Invalid data

8. ***hh**: Checksum.
9. **<CR><LF>**: End of sentence.

PSXN21

The proprietary PSXN21 NMEA sentence contains system restart status.

The sentence is based on NMEA sentence format.

Format

```
$PSXN,21,x*hh<CR><LF>
```

Description

1. **$**: Start character.
2. **PSXN**: Seatex ID.
3. **Message number**: 21.
4. **x**: Event code.

1 = System restart

5. ***hh**: Checksum.
6. **<CR><LF>**: End of sentence.

PSXN22

The proprietary PSXN22 NMEA sentence contains calibration values for input gyro compass.

The sentence destination is positioning reference systems.

The sentence is based on NMEA sentence format.

Format

```
$PSXN,22,d.dd,d.dd*hh<CR><LF>
```

Description

1. **$**: Start character.
2. **PSXN**: Seatex ID.
3. **Message number**: 22.
4. **d.dd**: gyro-calib - Gyro calibration value since system start-up in degrees.
5. **d.dd**: gyro-offs - Short-term gyro offset in degrees.
6. ***hh**: Checksum.
7. **<CR><LF>**: End of sentence.

PSXN23

The proprietary PSXN23 NMEA sentence contains attitude and heave data calculated in the Seapath system.

The sentence destination is PRS monitoring systems.

The sentence is based on NMEA sentence format.

Format

```
$PSXN,23,x.x,x.x,x.x,x.x*hh<CR><LF>
```

Description

1. **$**: Start character.
2. **PSXN**: Seatex ID.
3. **Message number**: 23
4. **x.x**: Roll in degrees. Positive with port side up.
5. **x.x**: Pitch in degrees. Positive with bow up.
6. **x.x**: Heading, degrees true.
7. **x.x**: Heave [m]. Positive down.
8. ***hh**: Checksum (delimiter and field).
9. **<CR><LF>**: End of sentence.

PSXN24

The proprietary PSXN43 NMEA sentence contains angular and vertical velocities calculated in the Seapath system.

The sentence destination is PRS monitoring systems.

The sentence is based on NMEA sentence format.

Format

```
$PSXN,24,x.x,x.x,x.x,x.x*hh<CR><LF>
```

Description

1. **$**: Start character.
2. **PSXN**: Seatex ID.
3. **Message number**: 24
4. **x.x**: Roll rate in degrees per second. Positive with port side up.
5. **x.x**: Pitch rate in degrees per second. Positive with bow up.
6. **x.x**: Yaw rate in degrees per second. Positive clockwise.
7. **x.x**: Vertical velocity [m/s]. Positive down.
8. ***hh**: Checksum (delimiter and field).
9. **<CR><LF>**: End of sentence.

Seapath Binary 26

This binary format consists of a fixed-length message using 1, 2 and 4–byte signal and unsigned integers. The signed integers are represented as two-complement numbers. For the multi-byte elements, the most significant byte is transmitted first. The total number of bytes is 52.

Format

Element	Scaling	Format	Bytes	Value
Header		Unsigned	1	AA Hex
Header		Unsigned	1	53 Hex
Time, seconds	seconds	Integer	4	
Time, fraction of second	0.0001 second	Unsigned	2	0 - 9999
Latitude	2^{30} = 90 degrees	Integer	4	-2^{30} - 2^{30}
Longitude	2^{30} = 90 degrees	Integer	4	-2^{31} - 2^{31}
Height	centimetres	Integer	4	
Heave real-time	centimetres	Integer	2	
North velocity	centimetres/ second	Integer	2	
East velocity	centimetres/ second	Integer	2	
Down velocity	centimetres/ second	Integer	2	
Roll	2^{14} = 90 degrees	Integer	2	-2^{15} - 2^{15}
Pitch	2^{14} = 90 degrees	Integer	2	-2^{15} - 2^{15}
Heading	2^{14} = 90 degrees	Unsigned	2	0 - 2^{16}
Roll rate	2^{14} = 90 degrees/ second	Integer	2	-2^{15} - 2^{15}
Pitch rate	2^{14} = 90 degrees/ second	Integer	2	-2^{15} - 2^{15}
Yaw rate	2^{14} = 90 degrees/ second	Integer	2	-2^{15} - 2^{15}
Delayed heave time, seconds	seconds	Integer	4	
Delayed heave time, fraction of second	0.0001 second	Unsigned	2	0 - 9999

Element	Scaling	Format	Bytes	Value
Heave, delayed	centimetres	Integer	2	
Status word		Bit-fields	2	
Checksum		Unsigned	2	

Description

Checksum is calculated as a 16-bit Block Cyclic Redundancy Check of all bytes between, but not including the Header and Checksum fields. The CRC algorithm is described in a separate section. Time is divided in an integer seconds part and a fractional second part. The integer seconds part of time is counted from 1970-01-01 UTC time, ignoring leap seconds.

Latitude is positive north of the Equator. Longitude is positive east of Greenwich. Height is above the ellipsoid. Heave is positive down. Roll is positive with port side up. Pitch is positive with bow up.

The status word consists of 16 single bit flags numbered from 0 to 15, where 0 is the least significant bit.

A 1 value (true) means:

Bit no.	Interpretation
0	Reduced horizontal position and velocity performance
1	Invalid horizontal position and velocity data
2	Reduced heave and vertical velocity performance
3	Invalid heave and vertical velocity data
4	Reduced roll and pitch performance
5	Invalid roll and pitch data
6	Reduced heading performance
7	Invalid heading data
8	Invalid delayed heave data

The remaining bits in the status word are reserved for future expansion.

Simrad EM 3000

The Simrad EM 3000 is a proprietary datagram format created by Simrad for use with digital motion sensors. It holds roll, pitch, heave and heading information. The datagram contains a 10-byte message.

Format

Data description	Example	Format	Valid range
Sync byte 1 / Sensor status **[1]**	90h to Afh = sensor status	1U	00h, 90h to Afh
Sync byte 2	Always 90h	1U	144
Roll LSB **[2]**		1U	
Roll MSB **[2]**		1U	
Pitch LSB **[2]**		1U	
Pitch MSB **[2]**		1U	
Heave LSB **[2]**		1U	
Heave MSB **[2]**		1U	
Heading LSB **[2]**		1U	
Heading MSB **[2]**		1U	

Description

LSB = least significant byte

MSB = most significant byte.

1. **Sync byte 1 / Sensor status**
   - **00h**: This value is sync byte 1.
   - **90h**: This value indicates valid measurements with full accuracy.
   - Any value from **91h** to **99h** indicates valid data with reduced accuracy (decreasing accuracy with increasing number).
   - Any value from **9Ah** to **9Fh** indicates non-valid data but normal operation (for example configuration or calibration mode).
   - Any value from **A0h** to **AFh** indicates a sensor error status.
2. **All data are in 2's complement binary.**

   Resolution is 0.01 degrees for roll, pitch and heading, and 1 cm for heave.
   - Roll is positive with port side up with valid range ±179.99 degrees.
   - Pitch is positive with bow up with valid range ±179.99 degrees.

- Heave is positive up with valid range ±9.99 m.
- Heading is positive clockwise with valid range 0 to 359.99 degrees.

If a value is outside the valid range, it is assumed to be non-valid, and rejected.

Note:

Heave is logged as positive downwards (the sign is changed) including roll and pitch induced lever arm translation to the transmit transducer.

You can define how roll is assumed to be measured, either with respect to the horizontal plane (the *Hippy 120* or *TSS* convention), or to the plane tilted by the given pitch angle (i.e. as a rotation angle around the pitch tilted forward pointing x-axis).

The latter convention (called *Tate-Bryant* in the POS/MVdocumentation) is used inside the system in all data displays and in the logged data. A transformation is applied if the roll is given with respect to the horizontal.

Note:

This format was originally designed for use with the early multibeam echo sounders manufactured by Kongsberg Discovery. In the original version of the format (Simrad EM 1000), the first synchronisation byte was always assumed to be zero. The sensor manufacturers were then requested to include sensor status in the format using the first synchronisation byte for this purpose.

KM Binary datagram format

KM Binary is a proprietary datagram format created by Kongsberg Discovery for general use.

Format

Data description	Unit of measurement	Format	No. of bytes
Start ID	#KMB	char	4U
Datagram length		uint16	2U
Datagram version (=1)		uint16	2U
UTC seconds	s	uint32	4U
UTC nanoseconds	ns	uint32	4U
Status		uint32	4U

Data description	Unit of measurement	Format	No. of bytes
Latitude	deg	double	8F
Longitude	deg	double	8F
Ellipsoid height	m	float	4F
Roll	deg	float	4F
Pitch	deg	float	4F
Heading	deg	float	4F
Heave	m	float	4F
Roll rate	deg/s	float	4F
Pitch rate	deg/s	float	4F
Yaw rate	deg/s	float	4F
North velocity	m/s	float	4F
East velocity	m/s	float	4F
Down velocity	m/s	float	4F
Latitude error	m	float	4F
Longitude error	m	float	4F
Height error	m	float	4F
Roll error	deg	float	4F
Pitch error	deg	float	4F
Heading error	deg	float	4F
Heave error	m	float	4F
North acceleration	m/s^2	float	4F
East acceleration	m/s^2	float	4F
Down acceleration	m/s^2	float	4F
Delayed heave:			
UTC seconds	s	uint32	4U
UTC nanosecond	ns	uint32	4U
Delayed heave	m	float	4F

Description

Data format	Little endian (the least significant byte is transmitted first). Float is according to IEEE - 754.
Datagram length	The total number of bytes in the datagram
Datagram version	The version is incremented if the datagram format is changed.

Timestamp format	Epoch 1970-01-01 UTC time
Position and height	At user-defined sensor reference point. Position in decimal degrees. • Latitude: Negative on Southern hemisphere • Longitude: Negative on Western hemisphere • Height: Positive above ellipsoid
Positive roll	Port side up
Positive pitch	Bow up
Positive heave	Downwards, at user-defined sensor reference point
	True north
Error fields	Sensor data quality: RMS-1= not implemented

Status

One bit per status info, 1= active

Bit	
	Invalid data:
0	Horizontal position and velocity
1	Roll and pitch
2	
3	Heave and vertical velocity
4	Acceleration
5	Delayed heave
Reduced performance:	
16	Horizontal position and velocity
17	Roll and pitch
18	
19	Heave and vertical velocity
20	Acceleration
21	Delayed heave

Calibration format 7

The Calibration format 7 is used when calibrating the GNSS antenna installation. The format is a columnar ASCII text format.

Format

Element	Columns	Scaling	Decimals	Value
Time	1 - 7	seconds	1	0.0 - 86399.9
Heading	10 - 15	degrees	2	0.00 - 359.99
Gyro heading	18 - 23	degrees	2	0.00 - 359.99
Baseline	26 - 31	metres	3	
Height	34 - 38	metres	2	
Term	39 - 40			CR-LF

Description

Each record consists of numbers on ASCII format separated by spaces and terminated by carriage return and linefeed (values 10 and 13). Leading spaces are used, so the numbers are separated by two or more spaces, and spaces may occur before the first number on the record.

Time is counted since last midnight UTC time. Heading is true heading from the GNSS phase measurement, which is not the same as the heading output on the other formats. Gyro heading is from an external gyro, 0.00 if no gyro is connected. Baseline is the slant range between the antenna centres from the GNSS phase measurement. Height is the height difference between the antennas from the GNSS phase measurement. Height is positive if antenna 1 is above antenna 2.

The data are intended for calibration of the antenna installation, so no data are output unless the GNSS phase measurements are valid.

Echo sounder format 9

The Echo sounder 9 format is used when connecting Simrad EA500 and other echo sounders. The format is a proprietary ASCII text format with fixed-length records.

Format

Element	Columns	Scaling	Format
Header	1 - 7		:000000
Heave	9 - 13	1 cm	sdddd
Warning	14		space or "?"
Roll	15 - 19	0.01 degree	sdddd
Pitch	21 - 25	0.01 degree	sdddd

Element	Columns	Scaling	Format
Term	26 - 27		CR-LF

Description

Heave is positive up. Roll is positive with the port side up.

Pitch is positive with the bow up. The zeroes in the header occupy the columns used for acceleration when this format is output from other systems. Seapath does not output acceleration.

"s" is the sign character, space if positive and "-" if negative. "dddd" is a decimal number with leading zeroes where appropriate.

The warning character is space if data are normal, "?" if data are invalid or they are of reduced quality.

Columns between elements are filled with spaces.

The definition of the attitude angles in this format is different from the Euler angles definition used elsewhere. The difference appears in the roll angle, where:

$roll_{echo\text{-}sounder}$=arcsin[sin($roll_{Euler}$)*cos($pitch_{Euler}$)]

Echo sounder format 18, TSS1

The Echo sounder 18, TSS1, format is used when connecting Seapath to Seabeam and other echo sounders The format is a proprietary ASCII text format with fixed-length records.

Format

Element	Columns	Scaling	Format
Header	1 - 7		:000000
Heave	9 - 13	1 cm	sdddd
Warning	14		"F" or "f"
Roll	15 - 19	0.01 degree	sdddd
Pitch	21 - 25	0.01 degree	sdddd
Term	26 - 27		CR-LF

Description

Heave is positive up. Roll is positive with the port side up. Pitch is positive with the bow up.

The zeroes in the header occupy the columns used for acceleration when this format is output from other systems. Seapath does not output acceleration.

"s" is the sign character, space if positive and "-" if negative. "dddd" is a decimal number with leading zeroes where appropriate.

The warning character is "F" if data are normal, "f" if data are invalid or they are of reduced quality.

Columns between elements are filled with spaces.

The definition of the attitude angles in this format is different from the Euler angles definition used elsewhere. The difference appears in the roll angle, where:

$roll_{echo\text{-}sounder}$=arcsin[sin($roll_{Euler}$)*cos($pitch_{Euler}$)]

RDI ADCP

The RDI format is used when connecting RDI ADCP equipment. The format is a proprietary ASCII text format.

Format

```
$PRDID,sddd.dd,sddd.dd,ddd,dd,<CR><LF>
```

Description

- **sddd.dd**: pitch - Pitch, degrees. s is the sign character, "+" or "-". ddd.dd is a decimal number with leading zeroes where appropriate. Positive with the bow up.
- **sddd.dd**: roll - Roll, degrees. s is the sign character, "+" or "-". ddd.dd is a decimal number with leading zeroes where appropriate. Positive with the port side up.
- **ddd.dd**: head - Heading, degrees true, with leading zeroes where appropriate.
- **<CR><LF>**: term - End of sentence (2 bytes, values 13 and 10).

1PPS, NMEA ZDA format 13

This 1PPS time tag message is output once per second, approximately 0.5 seconds before the time pulse. The 1PPS, NMEA ZDA format 13 contains the UTC time when

the message is output. The next time pulse appears at the first integer second after the time in the message. The format is ASCII text using the ZDA message.

Format

```
$INZDA,hhmmss.ss,x,x,yyyy,,*hh<CR><LF>
```

Description

- **hhmmss.ss**: UTC time. hh = hours (00 - 23), mm = minutes (00 - 59), ss.ss = seconds (00.00 - 59.99)
- **x**: Day of month (01 - 31)
- **x**: Month of year (01 - 12)
- **yyyy**:Year
- **hh**: Checksum
- **<CR><LF>**: End of sentence (2 bytes, values 13 and 10).

This format is recommended used together with 1PPS signal output on the 1PPS terminal at the rear of the Processing Unit. This since the message is output synchronised with the 1PPS signal and is easier/faster to decode than the standard NMEA output with a number of NMEA messages included.

1PPS, Trimble format 14

This 1PPS time tag message is output once per second, approximately 0.5 seconds before the time pulse. The message contains the UTC time of the next time pulse. The message format is fixed length ASCII text.

Format

Element	Columns	Format
Header	1 -3	UTC
Date	5 - 12	yy.mo.da
Time	14 - 21	hh:mm:ss
Fix type	23	digit or "?"
No. of satellites	24	digit or "?"
Term	25 - 26	CR-LF

Description

"yy.mo.da" is year (00 - 99), month of year (01 - 12) and day of month (01 - 31). "hh:mm:ss" is hours (00 - 23), minutes (00 - 59) and seconds (00 - 59). Fix type is "5" for 3D fix with accurate time, "?" for no fix (time from receiver clock). No. of satellites is"1" - "8" for 1 - 8 satellites tracked, "9" for 9 or more satellites tracked, "?" for no fix (time from receiver clock).

Columns between elements are filled with spaces.

PFreeHeave

The PfreeHeave® format is used to improve the accuracy on the real-time heave.

Format

Element	Scaling	Format	Bytes	Value
Header		Unsigned	1	AA Hex
Header		Unsigned	1	52 Hex
Time, seconds	Seconds	Integer	4	
Time, fraction of second	0.0001 second		2	0 - 9999
Heave	Centimetres	Integer	2	
Status word		Bit-fields	1	
Checksum		Unsigned	2	

Description

The PFreeHeave® format consists of a fixed-length message using 1-, 2- and 4-byte signed and unsigned integers. The signed integers are represented as two-complement numbers. For the multi-byte elements, the most significant byte is transmitted first. The total number of bytes is 13.

The PFreeHeave output is delayed by a few minutes due to processing. The time fields contain time of validity for the data.

Checksum is calculated as a 16-bit Block Cyclic Redundancy Check (CRC) of all bytes between, but not including the Header and Checksum fields. Time is divided in an integer seconds part and a fractional second part. The integer seconds part of time is counted from 1970-01-01 UTC time, ignoring leap seconds.

Heave is positive down. The status field is zero if heave is valid, non-zero if heave is invalid.

Related references

Cyclic redundancy check (CRC) algorithm, page 223

RTCM format 80

This format is used to output raw GNSS data for post processing of the position. All data are output in the GNSS antenna only and applies for both antennas.

This protocol is based on the RTCM Standard 10403.2, *Differential GNSS services*, version 3 with Amendments 1 and 2. Refer to this standard for a description of the output properties.

Cyclic redundancy check (CRC) algorithm

The 16-bit Block Cyclic Redundancy Check (CRC) algorithm is used to calculate the checksum in some formats. The algorithm is described in C and Fortran source code.

C code

```
#define POLY 0x8408
unsigned short blkcrc(
   unsigned char *bufptr,       /* message buffer */
   unsigned long len            /* number of bytes */
   )
{
   unsigned char i;
   unsigned short data;
   unsigned short crc = 0xffff;

   if (len == 0L) {
      return ~crc;
   }

 do {
      for (i=0, data = (unsigned short) (0xff & *bufptr++);
           i < 8;
           i++, data >>= 1) {
         if ((crc & 0x0001) ^ (data & 0x0001)) {
            crc = (crc >> 1) ^ POLY;
         } else {
            crc >>= 1;
         }
      }
   } while (--len);

   crc = ~crc;
   data = crc;
   crc = (crc << 8) | ((data >> 8) & 0xff);

   return crc;
}
```

Fortran code

```
SUBROUTINE blkcrc(inbuffer, len, crc)

INTEGER*2 len, i , bit
INTEGER*4 crc, data, poly
CHARACTER inbuffer*(*)

poly = 16#8408
crc  = 16#FFFF
data = 0

IF (len.EQ.0) THEN
    crc = 0
    RETURN
END IF

DO i = 1, len
    data = ICHAR(inbuffer(i:i))
    DO bit = 1, 8
        data = IAND(data,16#FF)
        IF (IAND(crc,16#01).EQ.(IAND(data,16#01))) THEN
            crc = ISHL(crc,-1)
        ELSE
            crc = ISHL(crc,-1)
            crc = IEOR(crc, poly)
        END IF
        data = ISHL(data,-1)
    END DO
END DO

data = IEOR(crc,16#FFFF)
crc = IOR(ISHL(data,8),IAND(ISHL(data,-8),16#FF))

END
```

Related references

PFreeHeave, page 222

Functions and dialog boxes

Topics

NAV Engine Configuration

Topics

Vessel Geometry page

Here you can set the vessel dimensions and reference points for the vessel on which the Seapath system is installed as well as defining the origin of the vessel coordinate system.

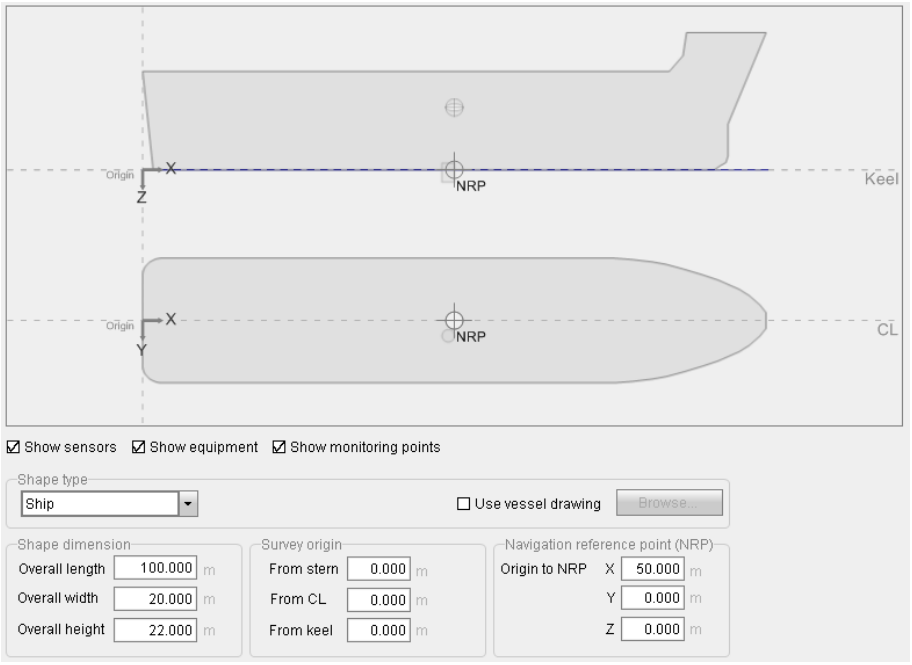
Prerequisites

The navigation reference points you type here must be measured or defined before you start the configuration process.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Vessel** > **Geometry**.

Example



Description

The pre-defined scalable vessel shape types rarely represent the actual outline of your vessel. In order to configure the accurate location of the various sensors, equipment and monitoring points on your vessel, you can load a separate vessel model from file. Select **Use vessel drawing** and browse for your specific vessel model file.

Details

Show sensors, **Show equipment**, **Show monitoring points**

These items are displayed in the vessel illustration when you select the boxes.

Shape type

It defines the shape of the vessel which hosts the system. You can select between Ship, Rig, Jackup (3 leg) and Jackup (4 leg). These are all scaled according to the dimensions given in the **Shape dimension** section.

Use vessel drawing

The general shape outline can be overridden by an actual shape defined in a drawing file. Supported file extensions are **Vessel models(*.svm)**, **Vessel vector images (*.svi)** and **Old vessel images (*.txt)**. This file can be created or edited in

a text editor. When a valid drawing file has been loaded, the dimensions are defined by the loaded shape and the **Shape dimension** parameters are locked.

Shape dimensions

It holds parameters for the overall length of the vessel from stern to bow, the overall width of the vessel and the overall height, which is the distance from the highest point of the vessel to the keel.

Survey origin

All point locations in the configuration refer to the origin. The location of the origin is defined using the distance from stern, centre line (CL) and keel. The location of origin is often referred to as the common reference point (CRP) in survey reports. The distance from stern is the distance from the aft point of the ship to origin along the X axis. The distance from CL is the distance from the vessel's centre line, positive towards starboard. The distance from keel is the distance from the keel, positive downwards.

Navigation reference point (NRP)

The Navigation Reference Point location (NRP) is the reference point for all measurements in the system. The recommended NRP is near the centre of gravity (CG), but it can be freely chosen. It is always defined related to the origin.

Related tasks

Setting vessel dimensions and reference points, page 102

Importing vessel shape from file, page 129

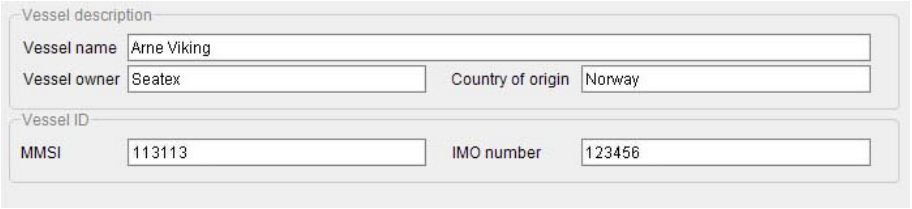
Vessel Description page

The vessel **Description** parameters allow you to enter information about the vessel which is needed for identification purposes.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **GNSS** > **Geometry**.

Example



Details

Vessel name

This is the name of the vessel.

Vessel owner

This is the owner of the vessel.

Country of origin

This is the country in which the vessel is registered.

MMSI

This is the nine-digit Maritime Mobile Service Identity (MMSI) number which uniquely identifies your vessel.

IMO number

This is the International Maritime Organization (IMO) number which uniquely identifies your vessel.

Related tasks

Entering vessel identification parameters, page 128

Sensors GNSS Geometry page

Here you can enter the coordinates for the antenna location(s) on-board your vessel.

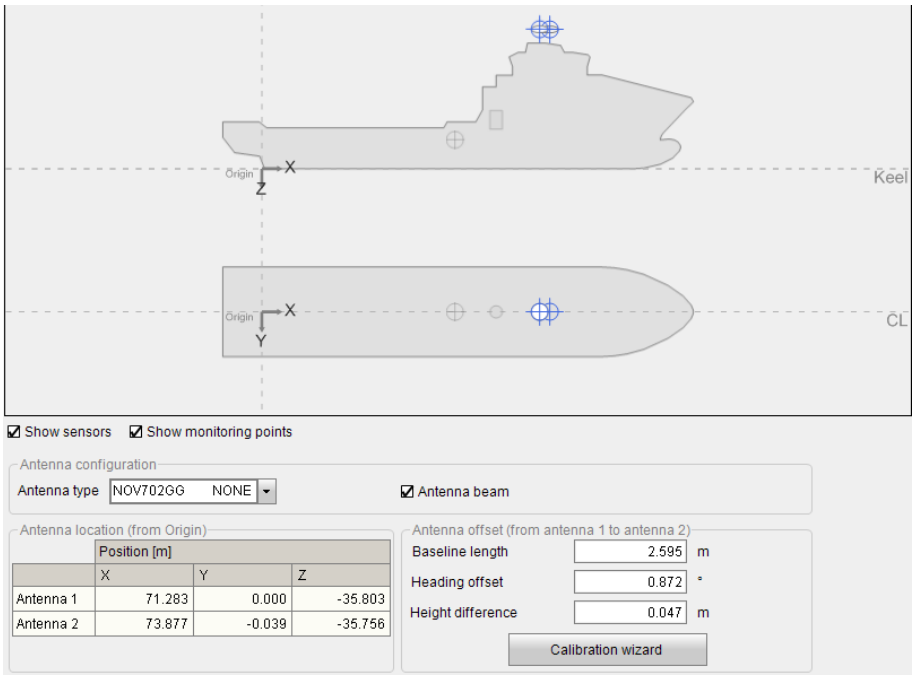
Prerequisites

The distance vector from the origin to the GNSS antenna has to be measured before you can enter the parameters into the configuration.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **GNSS** > **Geometry**.

Example



Details

Show sensors, Show monitoring points

These items are displayed in the vessel illustration when you select the boxes.

Antenna type

A correct selection of **Antenna type** is only important when raw GNSS data are output from the Seapath for post-processing of the position accuracy. The selection **GENERIC** as antenna type is used for all single-frequency antennas (L1) and for installations that shall not use RTCM output for post-processing. Other antenna types than the ones listed, are input in the configuration by using the **Advanced** option in the **NavEngine Configuration**.

NONE means that there is no antenna dome or choke ring included.

Antenna location (from Survey origin)

Position: X, Y, Z. This is the surveyed antenna co-ordinates.

Antenna beam

Select this box if the GNSS antennas are mounted on a beam and not independently.

Calibration Wizard

The **Calibration wizard** will help you to calculate the offset (length, heading and height) from antenna 1 to antenna 2.

Related tasks

Entering antenna location parameters, page 104

Sensors MGC Geometry page

Here you can enter the physical location, as well as the mounting angels, for the Inertial Measurement Unit (IMU) on your vessel. The location is relative to origin. The IMU is either an MGC (Motion Sensor and Gyro Compass) or an MRU (Motion Reference Unit).

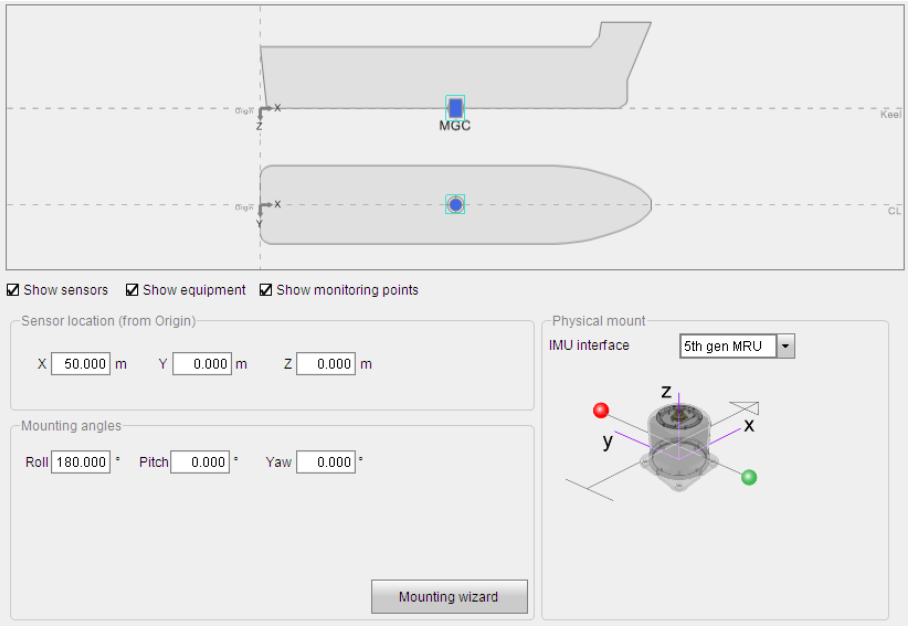
Prerequisites

For accurate location of the MGC (Motion Sensor and Gyro Compass) a survey has to be carried out.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **MGC** > **Geometry**.

Example



Details

Show sensors, Show equipment, Show monitoring points

These items are displayed in the vessel illustration when you select the boxes.

Sensor location (from origin)

This is the position of the MGC in X, Y, Z coordinates in metres from Origin. The sensor unit (IMU) location has to be measured. The default position of the IMU is in the vessel Origin.

IMU interface

Select the Inertial Measurement Unit connected to this product.

Mounting angles

This is the mounting angles of the Inertial Measurement Unit in degrees for roll, pitch and yaw. The Mounting Wizard is a helpful tool to obtain the correct roll and pitch compensation.

`Mounting wizard` button

Select this button and the Mounting wizard will assist you with the determination of the MGC mounting angles.

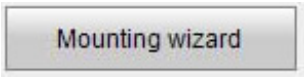
Related tasks

Setting MGC location and mounting angles, page 111

Using Mounting Wizard to determine MGC mounting angles, page 112

Sensors MGC Geometry - Mounting Wizard

Use the Mounting Wizard to determine the roll, pitch and yaw mounting angles in degrees for the MRU.



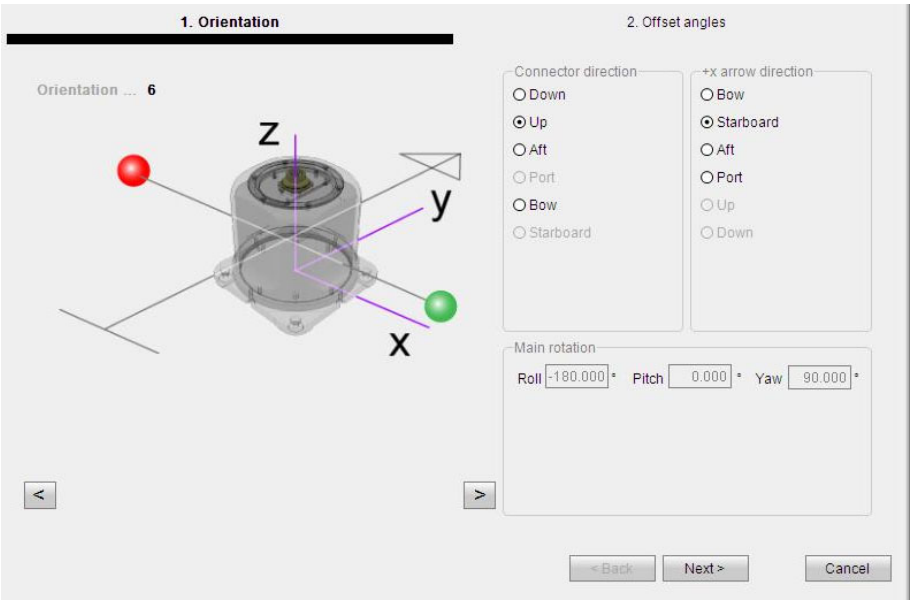
Prerequisites

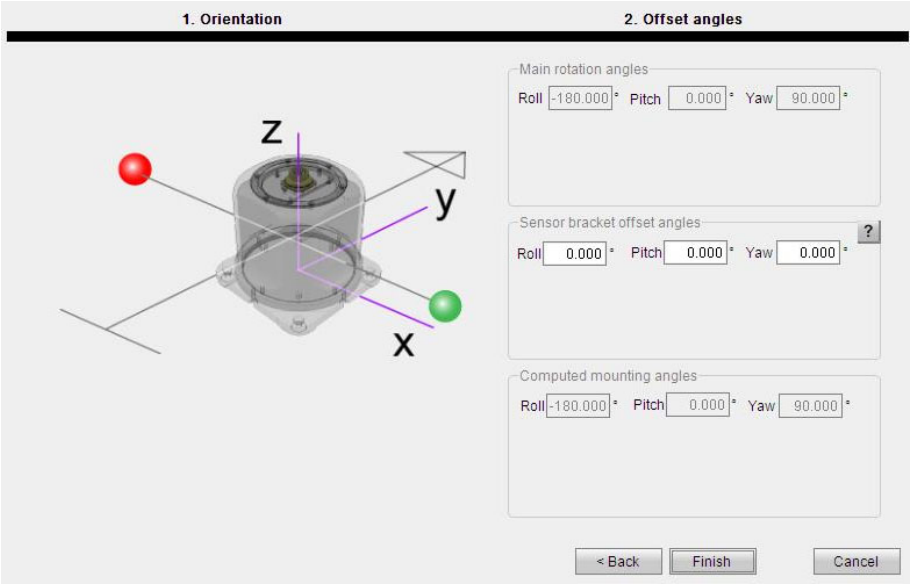
The MGC offset angles have to be available from a survey report or through other methods with similar accuracy.

How to open

Select the `Mounting Wizard` button in the **Sensors MGC Geometry** page.

Example



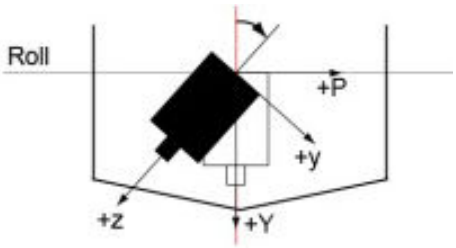


Description

The `Mounting Wizard` will help you to determine the offset angles of the sensor unit mounting bracket. The mounting bracket offset angles which have to be entered are roll, pitch and yaw.

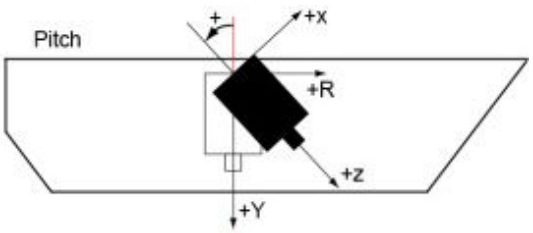
Roll offset angle

The angle between the ship's Y-axis and the projection of the unit's z-axis in the ship's PY-plane. Positive roll offset angle if the bracket tilts to starboard.



Pitch offset angle

The angle between the ship's Y-axis and the projection of the unit's z-axis in the ship's RY-plane. Positive pitch offset angle if the bracket tilts to stern.



Yaw offset angle

The angle between the ship’s R-axis and the projection of the unit's x-axis in the ship’s RP-plane. Positive yaw offset angle if the bracket is rotated clockwise.

Details

Connector direction

This is the direction in which the connector on the sensor unit points. The selections are Down, Up, Aft, Port, Bow or Starboard.

+x arrow direction

This is the direction in which the +x arrow on the sensor unit points. The selections are Bow, Starboard, Aft, Port, Up or Down.

Main rotation/Main rotation angles

This is the designated installation orientation of the MGC/MRU in the vessel, as indicated by **Connector direction** and **+ arrow direction**. These angles are multiples of 90 degrees.

Sensor bracket offset angles

This is the surveyed offset angles from the designated installation orientation.

Computed mounting angles

This is the actual installation orientation of the MGC/MRU in the vessel, computed from the main rotation and sensor bracket offset angles.

Related tasks

Using Mounting Wizard to determine MGC mounting angles, page 112

Sensors MRU Geometry page

Here you can enter the physical location, as well as the mounting angels, for the Inertial Measurement Unit (IMU) on your vessel. The location is relative to origin. The IMU is either an MGC (Motion Sensor and Gyro Compass) or an MRU (Motion Reference Unit).

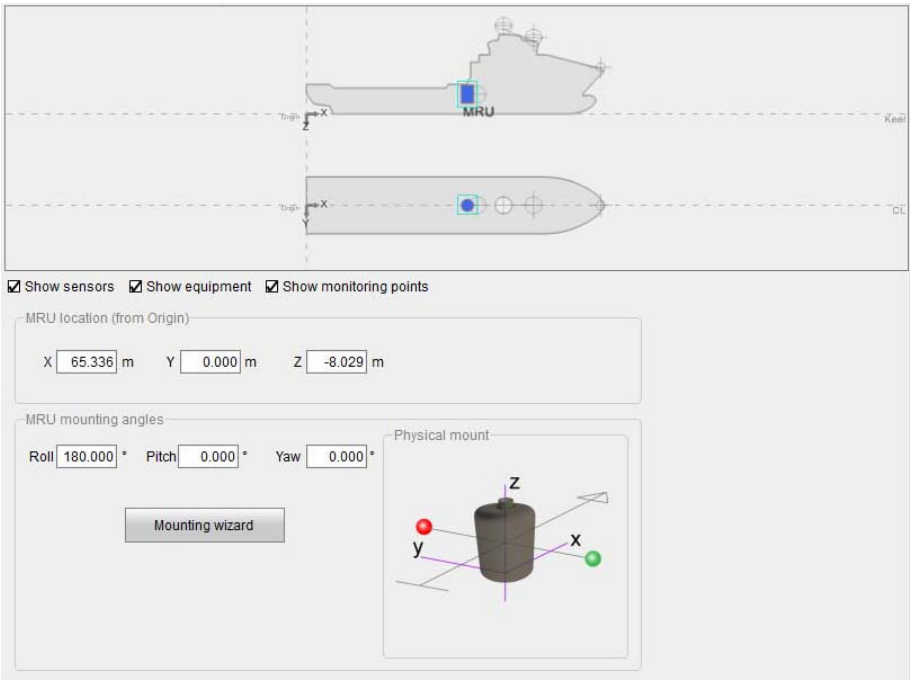
Prerequisites

For accurate location of the MRU (Motion Reference Unit) a survey has to be carried out.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **MRU** > **Geometry**.

Example



Details

Show sensors, Show equipment, Show monitoring points

These items are displayed in the vessel illustration when you select the boxes.

Sensor location (from origin)

This ist he position of the MRU in X, Y, Z coordinates in metres from Origin. The sensor unit (IMU) location has to be measured. The default position of the IMU is in the vessel Origin.

IMU interface

Select the Inertial Measurement Unit connected to this product. 5th generation MRU or MGC.

Mounting angles

This is the mounting angles of the Inertial Measurement Unit in degrees for roll, pitch and yaw. The Mounting Wizard is a helpful tool to obtain the correct roll and pitch compensation.

`Mounting wizard` button

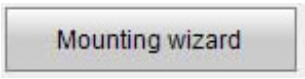
Select this button and the Mounting wizard will assist you with the determination of the MGC mounting angles.

Related tasks

Setting MRU location and mounting angles, page 114
Using Mounting Wizard to determine MRU mounting angles, page 116

Sensors MRU Geometry - Mounting Wizard

Use the Mounting Wizard to determine the roll, pitch and yaw mounting angles in degrees for the MRU.



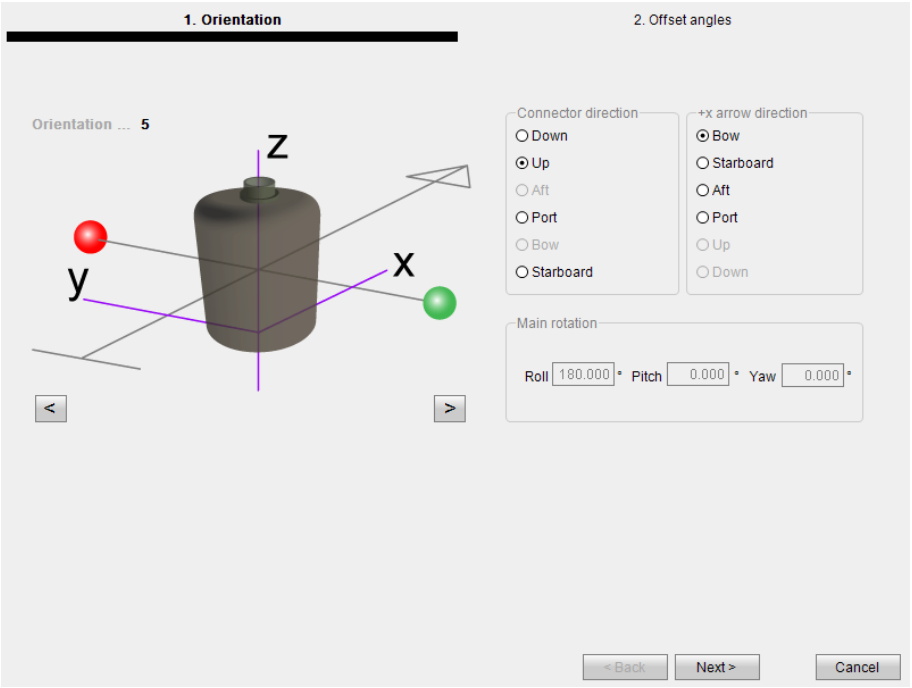
Prerequisites

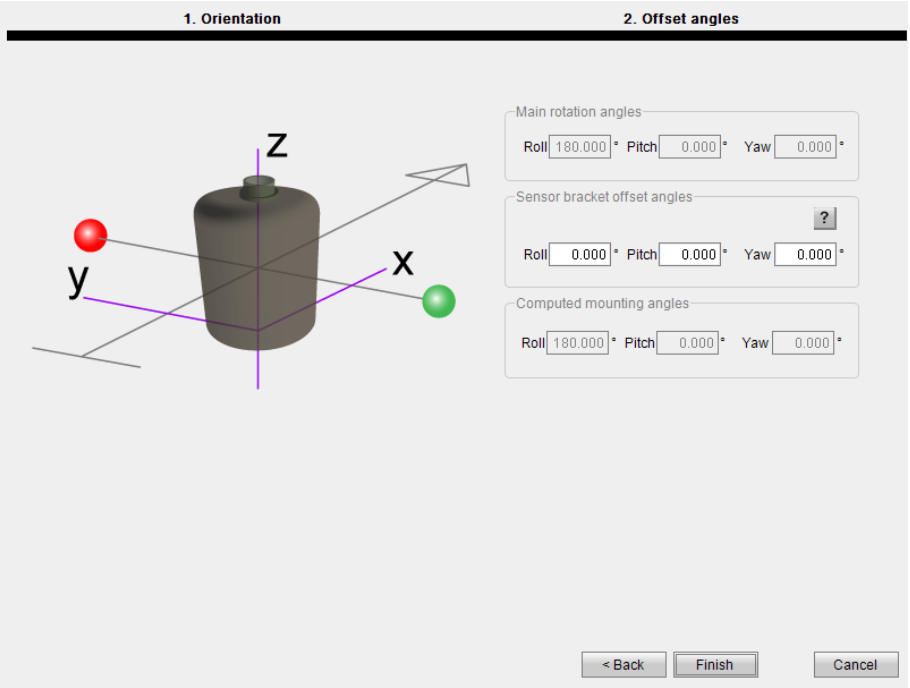
The MRU mounting bracket offset angles have to be available from a survey report or through other methods with similar accuracy.

How to open

Select the `Mounting Wizard` button in the **Sensors MRU Geometry** page.

Example



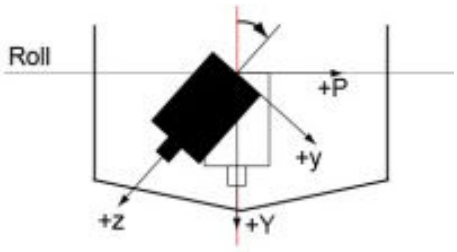


Description

The `Mounting Wizard` will help you to determine the offset angles of the sensor unit mounting bracket. The mounting bracket offset angles which have to be entered are roll, pitch and yaw.

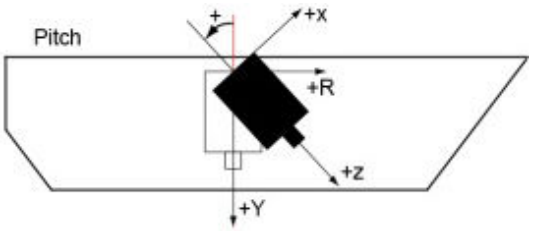
Roll offset angle

The angle between the ship's Y-axis and the projection of the unit's z-axis in the ship's PY-plane. Positive roll offset angle if the bracket tilts to starboard.



Pitch offset angle

The angle between the ship's Y-axis and the projection of the unit's z-axis in the ship's RY-plane. Positive pitch offset angle if the bracket tilts to stern.



Yaw offset angle

The angle between the ship's R-axis and the projection of the unit's x-axis in the ship's RP-plane. Positive yaw offset angle if the bracket is rotated clockwise.

Details

Connector direction

This is the direction in which the connector on the sensor unit points. The selections are Down, Up, Aft, Port, Bow or Starboard.

+x arrow direction

This is the direction in which the +x arrow on the sensor unit points. The selections are Bow, Starboard, Aft, Port, Up or Down.

Main rotation/Main rotation angles

This is the designated installation orientation of the MGC/MRU in the vessel, as indicated by **Connector direction** and **+ arrow direction**. These angles are multiples of 90 degrees.

Sensor bracket offset angles

This is the surveyed offset angles from the designated installation orientation.

Computed mounting angles

This is the actual installation orientation of the MGC/MRU in the vessel, computed from the main rotation and sensor bracket offset angles.

Related tasks

Setting MRU location and mounting angles, page 114
Using Mounting Wizard to determine MRU mounting angles, page 116

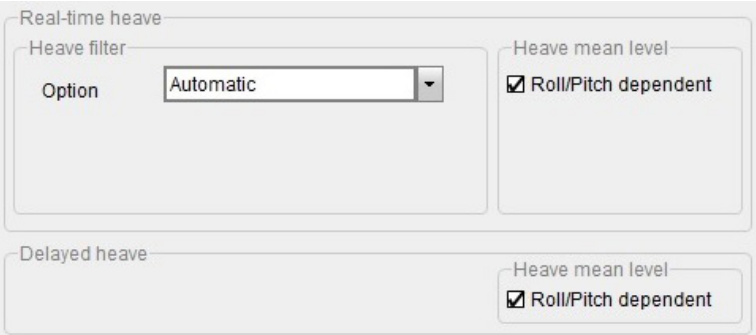
Sensors MRU/MGC Heave config page

The **Heave config** parameters allow you to tune the heave parameters to the vessel motion characteristics for the actual weather conditions. This is important when using real-time heave measurements in order to achieve optimum heave performance.

How to open

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

Example



Description

You can select the heave filter options from the **Options** list. In the list you can select between four different heave filter modes: *Hydrographic survey*, *Automatic*, *GNSS aided* and *General purpose*.

It you select other options than Automatic, you must enter an expected heave period.

Details

Hydrographic survey

Select **Hydrographic survey** when the heave phase and amplitude have to be output correctly in real time. This mode is typically selected when the heave output signal from the system is to be used for heave compensation of echo sounders and offshore crane systems.

Automatic

Select **Automatic** when the vessel is operating in various sea states or when the average heave period is unknown. The *Automatic* filter mode estimates the average heave period and automatically sets the filter period in real time during operation. The Automatic filter mode uses the Hydrographic survey filter structure.

GNSS aided

Select **GNSS aided** when RTK DGNSS corrections are available or the GNSS velocity measurements are accurate. In this mode the heave and height measurements are determined by blending vertical acceleration and GNSS height measurements in a Kalman filter. This combination makes it possible to measure wave slopes and the tide in real time with high precision ideal for hydrographic work. The height measurements are provided with centimeter accuracy and independent of wave frequency. If RTK is not available, the algorithm will use the GNSS velocity measurements for aiding the heave. If GNSS velocities are not available, the Automatic algorithm is used.

General purpose

Select **General purpose** when the heave phase is of no importance. This mode is typically selected when the system is to be used for measuring the heave height and period on oceanographic buoys.

Period

An expected average heave period has to be set to the heave filter unless the automatic mode is chosen. The settling time for the heave measurements from power-on or after a turn will be about 10 times the selected period, T_0.

Roll/Pitch dependent

Select the **Roll/Pitch dependent** check box to enable whether the heave mean level should be dependent on the roll and pitch measurements or not. When enabled, the heave position in the monitoring points (MP) has now longer zero mean level, instead its value depends on the vessel tilt at any time. This option is useful especially in applications where the distance between the MP and the sea level is to be determined, like in echo sounder installations with depth changes due to changes in vessel trim and list. If not enabled, the heave will always have zero mean level. There are separate selections for the real-time heave and the delayed heave (PFreeHeave).

Related tasks

Selecting heave filter options, page 119

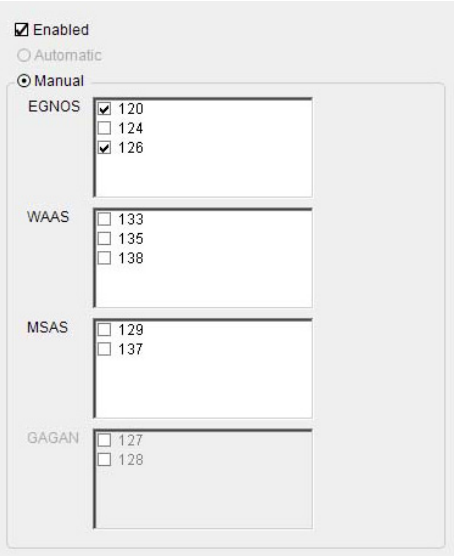
Sensors DGNSS SBAS page

The SBAS parameters enable the system to track SBAS satellites.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **DGNSS** > **SBAS**.

Example



Details

Enable

Select this box if you want your system to track SBAS satellites.

Automatic

If you select **Automatic**, the GNSS receiver will select which SBAS satellites to track. This option may be unavailable for some systems.

Manual

Here you must select which SBAS satellites the system shall track. If two SBAS satellites are selected, the system will automatically use data from the best satellite. If only one SBAS satellite is selected, only correction data from this satellite will be used in the computations.

If no specific SBAS satellite is selected, the system will select and use data from the best of the available satellites.

If the selected satellite is not available, the system will not use the SBAS correction data in the computations.

Maximum two SBAS satellites can be tracket by the GNSS receiver.

Related tasks

Selecting SBAS satellites, page 131

Monitoring points Geometry page

Here you can define the locations on the vessel for which you want the system to calculate the position.

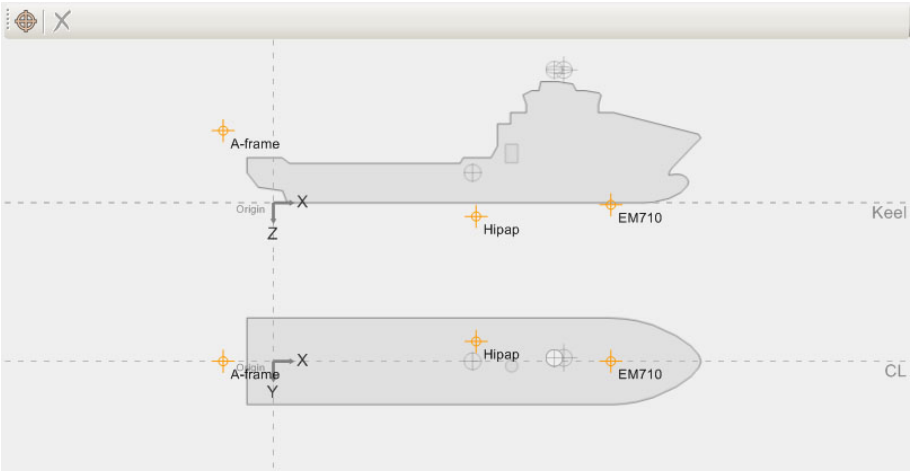
Prerequisites

To get exact coordinates from origin to each monitoring point, each monitoring point has to be measured or calculated based upon drawings or previously measured points.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Monitoring points** > **Geometry**.

Example



		Position [m]		
ID	Name	X	Y	Z
1	A-frame	-13.365	0.000	-19.207
2	EM710	89.787	0.000	0.533
3	Hipap	53.926	-5.287	3.624

Monitoring points are entered relative to Origin

Description

The toolbar at the top contains two icons. One for adding a monitoring point,  , and one for deleting a monitoring point,  .

The monitoring points are entered relative to Origin.

Details

Show sensors, Show equipment

These items are displayed in the vessel illustration when you select the boxes.

ID

This is the ID number for the given monitoring point.

Name

This is the name you give the monitoring point.

Position: X, Y, Z

These are the surveyed co-ordinates in metres for the various monitoring points.

Related tasks

Setting monitoring points, page 120

Communication interface - Input/Output

Here you can set the parameters for communication with external equipment.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.

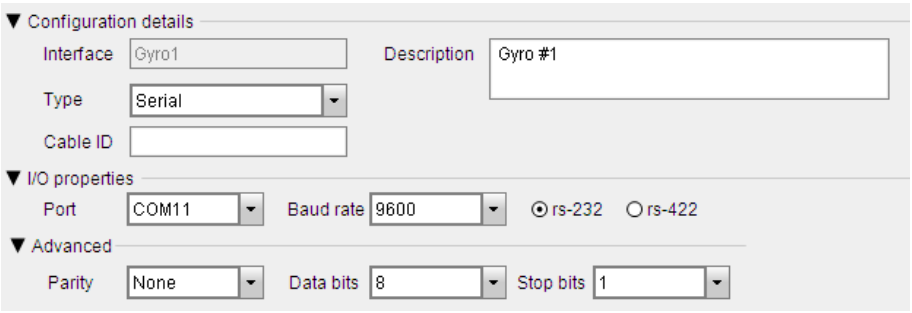
Communication interface - Serial or Ethernet

When you have selected an interface in the **Input/Output list**, you must select which type of communication you want for that interface. You can select between serial or Ethernet communication.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.

Example



Description

When you select a communication interface from the **Input/Output** list, various parameters will appear at the lower part of the page, depending on your choice of interface. Some of these parameters are common for all interfaces.

The Serial interface allows you to decide how the Processing Unit shall communicate with and interface to other equipment.

The Ethernet interface allows you to decide how the Processing Unit shall communicate via the internet protocol (IP) network.

Configuration details

Interface

This is the interface you have selected from the **Input/Output list**.

Description

Here you can type an informative text about the interface you have selected.

Type

Here you can select which type of communication you want for your interface. You can select between communication via **Serial** line or **Ethernet**.

The selection you make here, will affect the parameters which appear under **I/O properties**.

Cable ID

Here you can type a short identification text for the cable connected to the Processing Unit. The **Cable ID** box is optional. It is intended for installation documentation.

I/O properties - Serial interface

Port

Select which port to use for the serial communication. The serial port number corresponds with the number on the Processing Unit.

Baud rate

Select which baud rate to use for the serial communication.

RS-232/RS-422

Select if you want to use RS-232 or RS-422 for the electrical interface. This selection depends on the **Port** you selected.

Advanced

Under **Advanced** you are able to modify the parity, stop bits and data bits. These parameters should be left unchanged. If these parameters are to be modified, they should only be modified by skilled personnel.

I/O properties - Ethernet interface - Broadcast

Broadcasting is a method of transferring a message to all recipients simultaneously.

Local interface

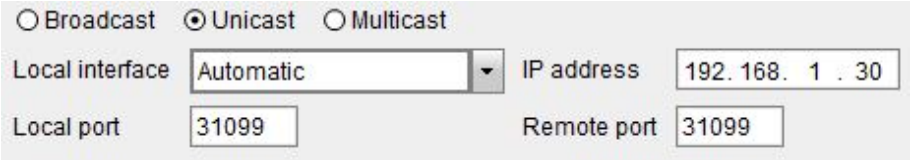
This is the LAN port on the Processing Unit.

Port

This is one of the LAN ports on the Processing Unit.

I/O Properties - Ethernet interface - Unicast

Unicast transmission is the sending of messages to a single network destination identified by a unique address.



Local interface

Select which local interface you want to use from the list.

IP address

This is the target IP address, to which the unit is receiving or sending.

Local port

When receiving, this is the port on which the unit listens.

Remote port

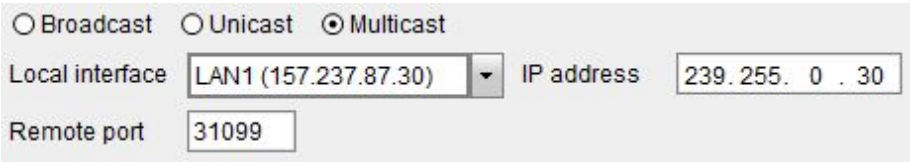
When transmitting, this is the port to which the unit sends.

Note:

It is recommended to use the same port number for both Local and Remote ports.

I/O Properties - Ethernet interface - Multicast

Multicast (one-to-many or many-to-many distribution) is group communication where information is addressed to a group of destination computers simultaneously.



Local interface

This is the LAN port on the Processing Unit.

IP address

This is the multicast group address. Recommended range: 239.255.000.000 to 239.255.255.255.

Remote port

When transmitting, this is the port to which the unit sends.

Related tasks

Using the Serial interface, page 99
Using the Ethernet interface, page 100
Selecting heading input format from a gyro compass, page 133
Setting up the DGNSS correction link parameters, page 135

Communication interface - MGC interface page

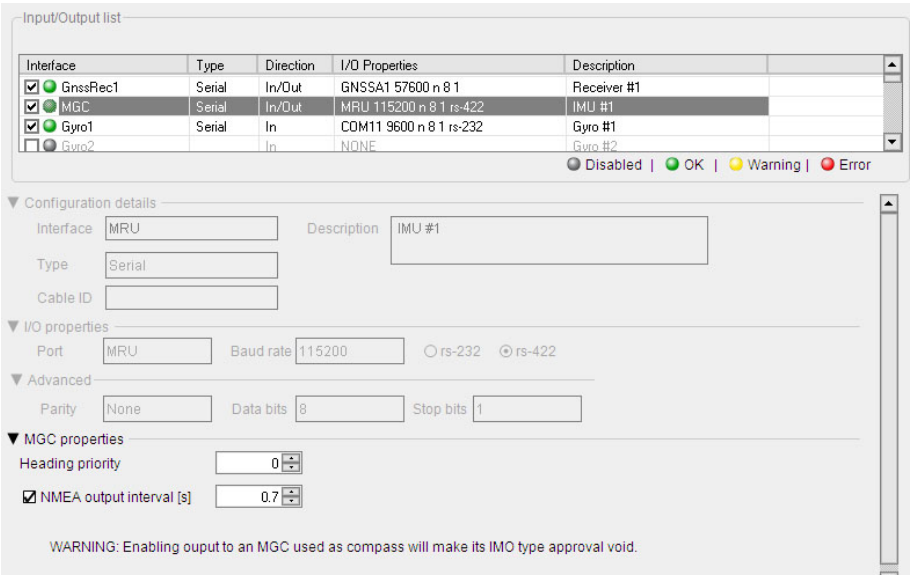
Here you can select which priority the MGC heading input shall have in the system if you have several heading sources in your system. You can also select interval for message output.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.

Select the **MGC** interface in the **Input/Output list**.

Example



Description

WARNING:

Enabling output to an MGC used as compass will void the IMO type approval.

Details

Heading priority

Set priority for the heading input from the MGC in your system.

NMEA output interval

Enable output of NMEA GGA, VTG and ZDA messages to the MGC and at which interval the message shall be output.

Related tasks

Setting up input to and from the MGC, page 124

Communication interface - DgnssLink interface page

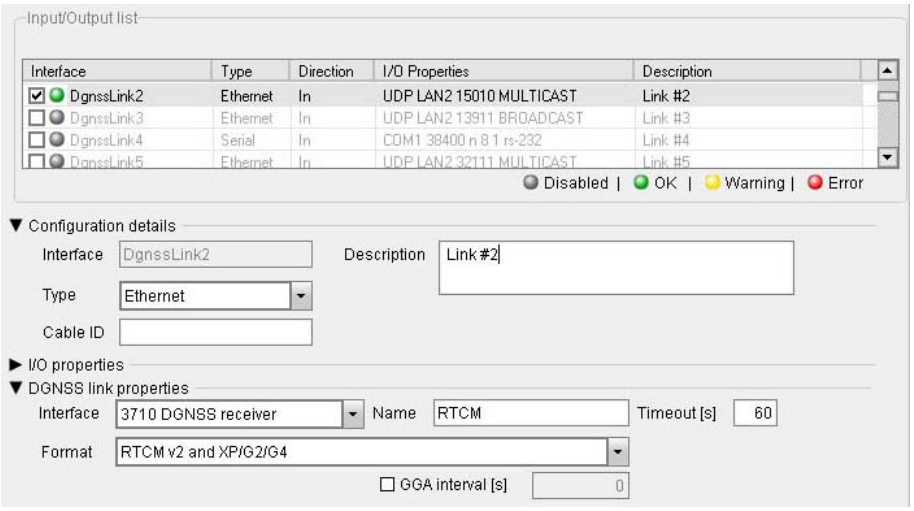
Here you can set up the system to receive various kinds of corrections which will improve the position accuracy.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.

Select the **DgnssLink** interface in the **Input/Output list**.

Example



Details

Interface

Select which external equipment you want to interface. Some configuration parameters are dependent on the interface selection.

Name

Type the name you want to give the DGNSS correction link.

Timeout

This is an age limit. If the age of the corrections exceeds this limit, the corrections are invalid.

Format

This is the format types which are supported by the system.

GGA interval

If this option is selected, the system sends GGA messages to the DGNSS receiver at specified intervals in seconds.

Related tasks

Setting up the DGNSS correction link parameters, page 135
Setting up NTRIP client, page 141

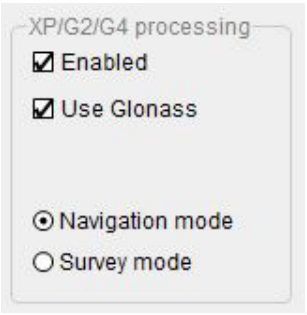
Sensors DGNSS XP/G2/G4 page

The **XP/G2/G4** parameter allows you to use high precision services to improve the accuracy of the GNSS signal. This will result in a more accurate position.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Sensors** > **DGNSS** > **XP/G2/G4**.

Example



Details

Enabled

Select **Enabled** if you want to enable the use of high precision services in the position solution.

Use Glonass

Select **Use Glonass** if you want to enable the use of GLONASS corrections in the position solution.

Navigation mode

Select **Navigation mode** if you want more reliability on the position solution during difficult GNSS conditions.

Survey mode

Select **Survey mode** if you want continuous output of data even under difficult GNSS conditions and uncertainty on data quality.

Related tasks

Enabling Fugro high precision services, page 132

Communication interface - TelegramOut interface page

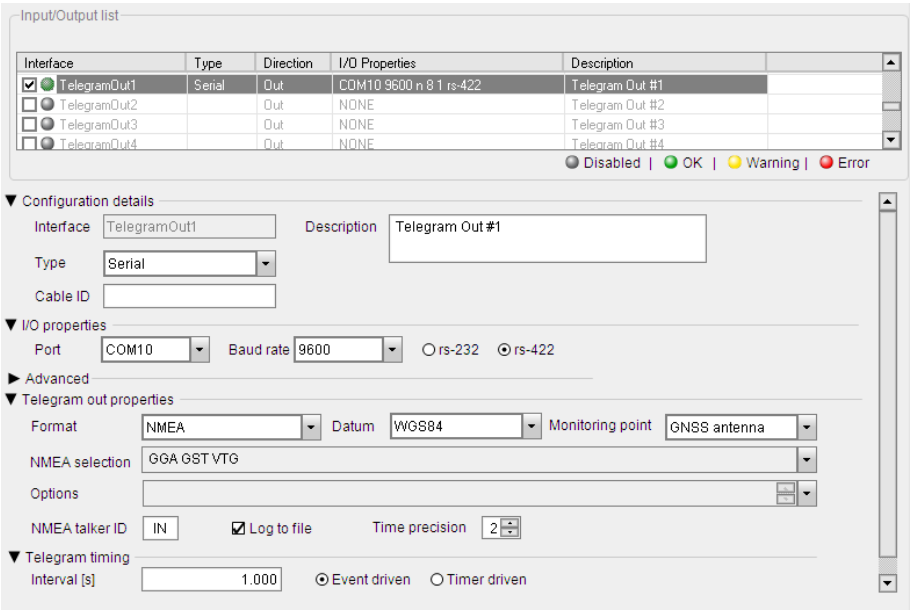
Here you can enable and set up data messages which are transmitted to external equipment.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.

Select the **TelegramOut** interface in the **Input/Output list**.

Example



Telegram out properties

Details

Format

This is the format of the output telegram.

Datum

The datum selection is only valid if the datum on the corrections input to the product are in WGS84 or no corrections are input. If the corrections input are in

another datum than WGS84, you must select WGS84. The datum of the output will then be on the same datum as the datum on the corrections input to the product. The other choices can only be used when the system navigates in WGS84 datum.

Monitoring point

This is a point on the vessel for which you want the position measurements to be output.

NMEA selection

The NMEA selection option is activated if the **Format** is selected as NMEA. Select between a number of NMEA telegrams.

Note:

To output $DPGGA sentence, enable GGA and select the Use DQI(0-9) as GGA quality indicator option.

Options

The contents of some of the available NMEA telegrams can be modified according to options listed in the **Options** list. This is for example useful when interfacing to older equipment.

NMEA talker ID

The talker ID of NMEA messages sent from this output. The default value is IN for systems with an Intertial Measurement Unit (IMU) connected. The default value is GP for systems without an IMU connected.

Log to file

This option logs the measurements to file internally in the Seapath system.

Time precision

This is the number of decimals in the time field in NMEA telegrams which contain time information.

Telegram timing properties

Details

Interval

This is the interval between each sample. It can be selected in the range 0.005 to 3000 seconds.

Event driven

The output of data is driven by receipt of IMU (Inertial Measurement Unit) data to the Processing Unit. **Event driven** data is valid for the point in time the

sensors within the IMU are sampled. The option is recommended used when transmission in real time is not required.

Timer driven

When using timer driven output the data will be output in real time. (0 ms delay.) **Timer driven** output is recommended used when the data is preferred in real-time. For example when the system which receives the data time-stamp these data when receiving them.

Related tasks

Setting up the Telegram out interface, page 126

Communication interface - Gyro interface page

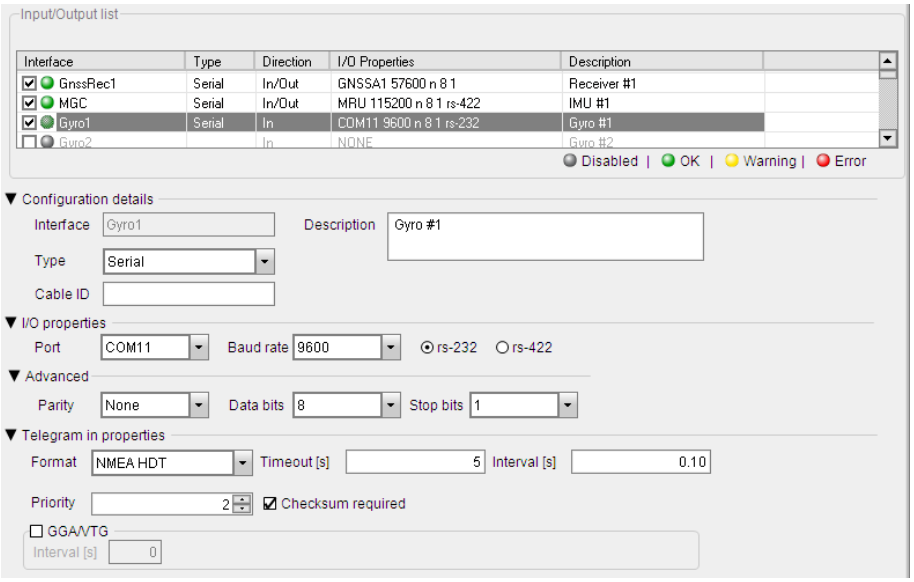
Here you can set up the system to receive heading input from a gyro compass or similar.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Communication interface** > **Input/Output**.

Select **Gyro** in the **Input/Output list**.

Example



Description

Gyro interface is for external heading input to the system. External heading may be received on either serial line or Ethernet.

Details

Telegram in properties

Format

This is the format of the input telegram.

Timeout

This is an age limit. If the age of the heading message exceeds this limit, the heading message is invalid. [s].

Interval

This is the expected interval in seconds between incoming telegrams.This option can be configured.

Priority

This is the priority of the gyro interface. If more than one gyro interface is defined and available, one is selected for use, based on the specified priority.

Checksum required

This option enables or disables NMEA checksum requirement. The option is default set to **Enabled**. This is the recommended setting.

GGA/VTG

If this option is selected the system sends GGA and VTG messages to the gyro at specific intervals.

Related tasks

Selecting heading input format from a gyro compass, page 133

Communication interface - Serial port extender page

Here you can add more serial ports to the system than those available in the Processing Unit.

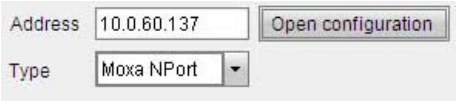
Prerequisites

You must have installed a serial port extender device.

How to open

Select the **System** menu > **NAVEngine** > **Standard** > **Communication interface** > **Serial port extender**.

Example



Details

Address

This is the IP address for the MOXA extender unit. Consult the network administrator on the vessel for the IP address.

Type

This is the currently supported extender type.

Open configuration

Select this button to open a web browser for configuration of the serial port extender.

Related tasks

Adding extra serial ports, page 137

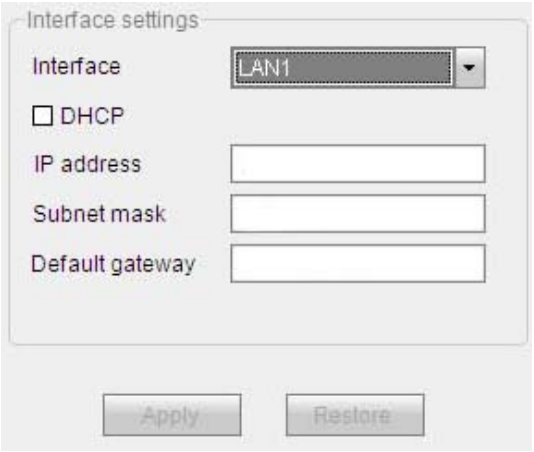
Network page

Here you can change the IP address for the Processing Unit.

How to open

Select the **System** menu > **NAV Engine** > **Standard** > **Network**.

Example



Details

Interface

This is the interface for which you want to change the IP address.

DHCP

Select this box if the IP address is given by a DHCP server. This selection will disable the rest of the parameters.

IP Address

This is the new IP address for the interface.

Subnet mask

This is the subnet mask for the interface.

Default gateway

This is the default gateway for the Processing Unit.

Note:

Only one default gateway can be set up.

Apply button

Select **Apply** to save the settings.

Restore button

If you select `Restore`, you will return to the previous interface settings.

Related tasks

Changing the Processing Unit IP address, page 139

Operator software configuration

Topics

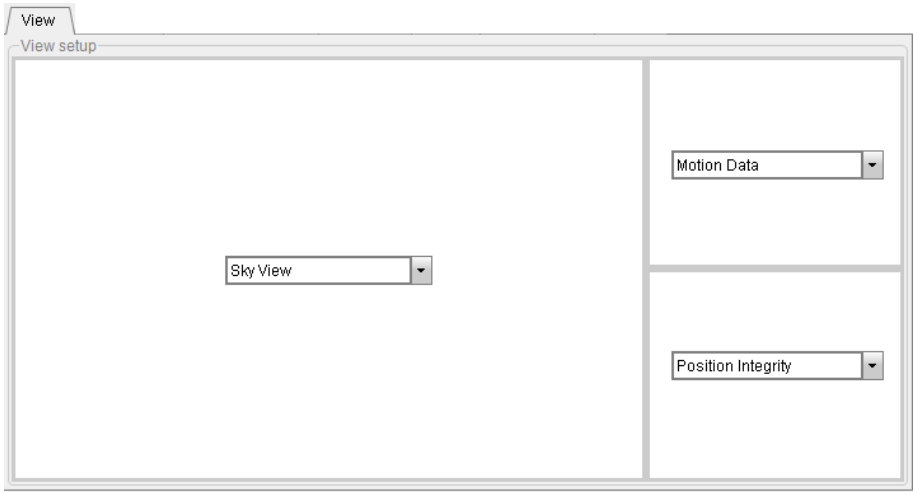
Operator software configuration - View page

Here you can select which view you want to appear where in the display when the HMI (Human Machine Interface) application starts.

How to open

Select the **System** menu > **Operator SW** > **View**.

Example



Description

The **View** page has the same layout as the views in the display. You can select which information you want to appear in the various views.

Two views cannot have the same contents. When one view is selected as contents in View 1, other contents will automatically be selected for View 2.

Related tasks

Selecting the position of views in the display, page 145

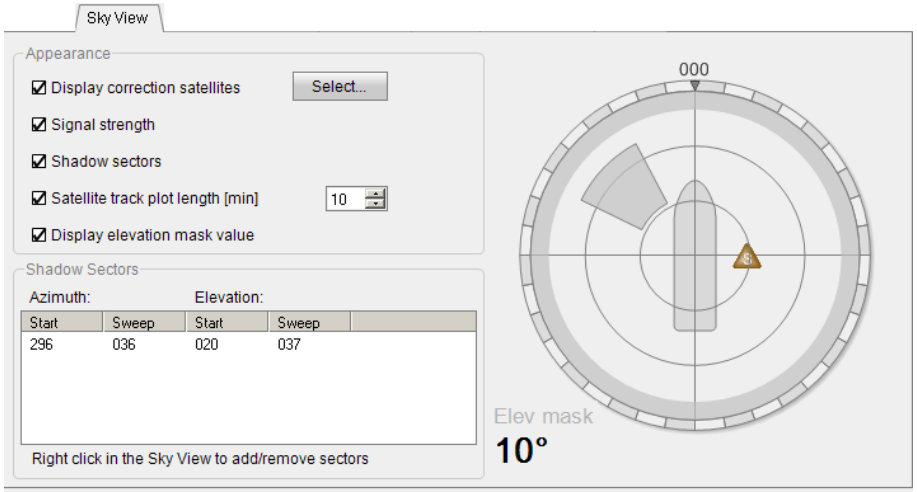
Operator software configuration - Sky view page

Here you can define the appearance of the *Sky View*.

How to open

Select the **System** menu > **Operator SW** > **Sky View**.

Example



Details

Display correction satellites

This option allows you to show correction satellites such as Inmarsat and Spotbeam in the Sky view. The satellite positions are predefined. You must enable the satellites which you want to appear in the Sky view where they are shown as brown triangles. Spotbeam satellites are marked with an S while Inmarsat satellites are marked with an I. When you hover the cursor over a correction satellite in the Sky view, a tooltip with satellite name, azimuth, elevation and position will appear.

Signal strength

This option allows you to display a signal bar under the satellites in the Sky view. The signal bar indicates the signal-to-noise ratio for the satellite, and the longer the bar, the stronger the signal.

Note:

*The **Signal strength (L2)** option is only available on dual frequency, single receiver systems.*

Shadow sectors

This option allows you to show the shadow sectors in the Sky view. You must add a shadow sector before you can display it in the Sky view. A shadow sector is just an indicator and does not influence the position solution in any way. The shadow sector refers to the vessel centre and will follow the vessel heading. Azimuth start describes the starting angle of the sector in degrees (0 to 360) related to North. Azimuth sweep describes the size in degrees. Elevation start describes the starting angle of the sector in degrees (0 to 90) where 0 degrees is the horizon and 90 degrees is straight above the antenna.

Satellite track plot length

This option assists in determining if a satellite is rising or falling in elevation. The **Satellite track plot length** option defines how long the length of the track plot should be. When you select this option, the track plot starts to increase. The maximum length of the track plot is 720 minutes.

Display elevation mask value

When you select **Display elevation mask value**, the configured elevation mask is indicated in the lower left corner of the Sky view.

Related tasks

Selecting the appearance of the Sky view, page 146

Operator software configuration - Position Integrity page

Under **Position Integrity** you can adjust the scaling of the Integrity view.

How to open

Select the **System** menu > **Operator SW** > **Position Integrity**.

Description

This is the estimated position error in North/South direction. The value is metres.

The error ellipse indicates a statistical error in the position solution. The smaller the ellipse, the more accurate and reliable position.

Details

Max ellipse EPE

Max ellipse EPE indicates the radius of the outer circle (grey area) in the Integrity view.

Ellipse diagram resolution

The **Ellipse diagram resolution** indicates the number of steps from the centre to the outer circle.

Related tasks

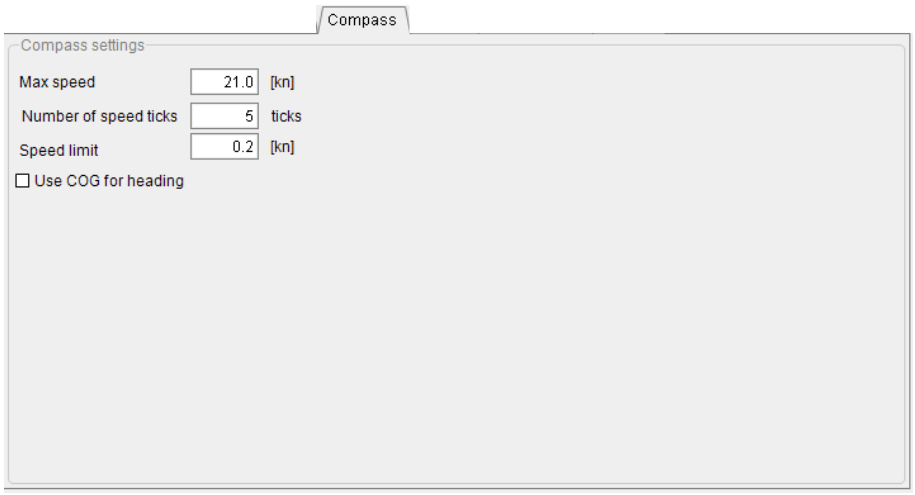
Adjusting the Integrity view, page 147

Operator software configuration - Compass page

The **Compass** page allows you to adjust the speed scaling of the Compass view.

How to open

Select the **System** menu > **Operator SW** > **Compass**.



Details

Max speed

This is the maximum vessel speed in knots.

Number of speed ticks

This is the resolution of the graphical presentation of the speed in the compass.

Speed limit

This is the lower speed limit in knots for when the COG (Course Over Ground) and SOG (Speed Over Ground) shall be displayed in the view.

Use COG for heading

Select this box if you do not have true heading.

Related tasks

Adjusting the Compass view, page 148

Operator software configuration - UTM page

This page allows you to control how UTM positions are treated by the application. UTM is the Universal Transverse Mercator coordinate system.

How to open

Select the **System** menu > **Operator SW** > **UTM**.

Example

Details

False Northing,

When you select **False Northing**, positions south of the equator will always be presented as positive in the Position data area in the display. A fixed offset of 10 000 000 m is added to the northing value to avoid negative coordinates in the southern hemisphere.

False Easting

When you select **False Easting**, a fixed offset of 500 000 m is added to the true easting value to avoid negative coordinates.

The UTM standard uses false northing and false easting, that is the coordinates are never negative.In case negative northing or easting is wanted, clear the **False Northing** check box.

Note:

*It is not possible to clear the **False Easting** check box.*

Zone options: **Auto**

When selecting **Auto** zone, the system zone is automatically calculated in accordance with the inserted coordinates.

Zone options: **Auto extended**

The UTM zone is automatically calculated by default. The **Auto extended zone** option is only applicable between 56 degrees to 64 degrees north and 3 degrees to 6 degrees east. The 32V zone is extended west to 3 degrees east, so when selecting the **Auto extended zone** in this area, zone 32V is used. When outside the current area and **Auto extended zone** is selected, the used zone is equal to the zone used when selecting **Auto** zone.

Zone options: **Manual**

Selecting **Manual** zone makes it possible to define which **Manual zone** and **Zone offset** to use. The **Zone offset** option allows a fixed offset to be applied to the longitudinal degrees. The UTM zone can be offset up to ±3 degrees. The zone offset is typically used where the maps used have an offset. The zone range is from 1 to 60.

Related tasks

Adjusting UTM presentation, page 149

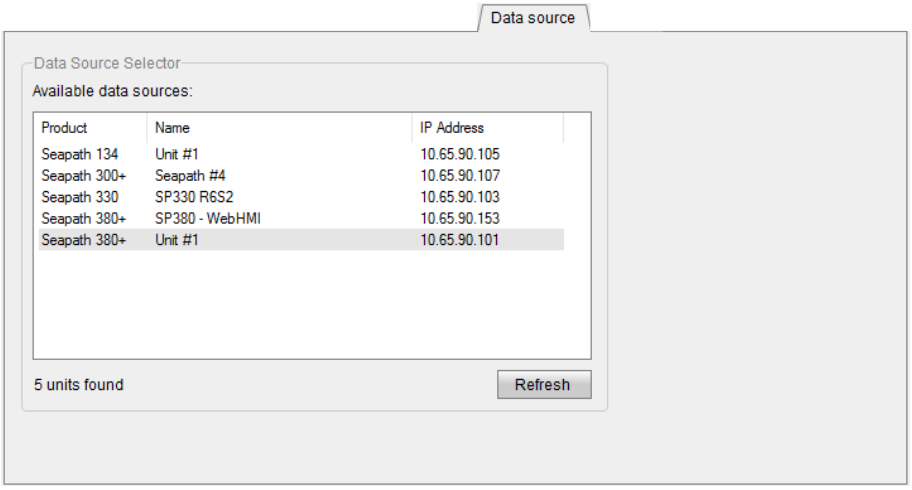
Operator software configuration - Data source page

This page allows you to select the data source from which the computer with the Seapath operator software installed on.

How to open

Select the **System** menu > **Operator SW** > **Data Source**.

Example



Details

Available data sources

This is a list of available Seapath sources in the system.

Refresh

Select **Refresh** to updated the list of available units. If the wanted data source is not displayed in the list, you can check the network connections and that all equipment is switched on.

Related tasks

Selecting the Seapath Operator software data source, page 149

Operator software configuration - Alarms page

Here you can define how to receive alarm messages.

How to open

Select the **System** menu > **Operator SW** > **Alarms**.

Example

Description

UDP Broadcast is the default (and recommended) setting. Defining a multicast address for alarm message distribution requires advanced network configuration skills.

Details

UDP Multicast

If the operator software configuration which is performed, is not in the same network as the Processing Unit, IP multicast is required. To enable multicast, select **UDP Multicast** and enter the multicast address to use for reception of alarms.

UDP Broadcast

Select this option if alarm messages are transmitted to all network units.

Related tasks

Selecting reception of alarm messages, page 150

Equipment handling

Topics

Taking delivery

When the equipment arrives at its destination:

- Perform an inspection immediately to register any damage that may have occurred in transit.
- If you find any damage, both the insurance company and the shipping agent must be informed immediately.

Unpacking and handling

Care should be taken when unpacking and handling the equipment. A visual inspection should be made to check that the equipment has not been damaged during shipment and that all components and parts are present according to the packing list.

The equipment contains delicate electronic components – handle with care and avoid shocks.

The equipment can be lifted by hand.

Storage

After the equipment in the boxes has been inspected and it has been verified that no damage has occurred, the equipment must be stored in its original packaging until the time of installation. The storage premises must be dry and well protected.

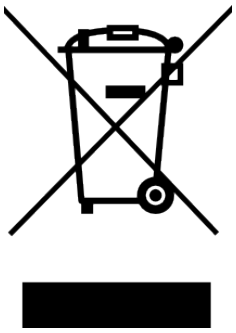
Verify that the location meets the environmental requirements defined for the equipment.

Related references

Environmental specifications, page 175

Disposal

At the end of the product lifetime, all parts and products must be disposed of in an environmentally-friendly way.



All electrical and electronic parts and components must be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or local authorities. The correct disposal and separate collection of your old appliance will help prevent potential negative consequences for the environment and human health. This is a precondition for reuse and recycling of used electrical and electronic equipment. For more detailed information about disposal of your old appliance, please contact your local authorities or waste disposal service.

All disposal of mechanical, electromechanical, electronic and chemical waste - including all types of batteries - must take place according to national and international rules and regulations. Observe the relevant Waste Electrical and Electronic Equipment (WEEE) regulations.

The equipment can be returned to Kongsberg Discovery AS if there is no local WEEE collection. The equipment is marked with this waste pictogram.

Free and open source software

Topics

General information

Some of the software components in this product are free and open source software. These components are released under the licenses given here.

The source code for the relevant software components may be available upon request.

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Index

Numerics

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W

X

Y

Z