COBHAM

SAILOR 65xx GNSS/DGNSS

User manual

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Safety summary

Observe the following general safety precautions during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment. Thrane & Thrane A/S assumes no liability for the customer's failure to comply with these requirements.

Ground the equipment

To minimize shock hazard, connect the GNSS/DGNSS Receiver to an electrical ground and follow the cable instructions.

Warranty limitation

IMPORTANT - The SAILOR 6286 DGNSS Antenna - Active and the SAILOR 6285 GNSS Antenna - Active are sealed waterproof units (classified IPx6 & IPx8). To create and maintain its waterproof integrity the antenna was assembled in a controlled environment using special equipment. The antennas and the GNSS/DGNSS Receiver are not user maintainable units, they should under no circumstances be opened except by authorized personnel. Unauthorized opening of the unit will invalidate the warranty.

Installation and service

Installation and general service must be done by skilled service personnel.

Compass safe distance

Compass safe distance: 30 cm (Standard magnetic compass), 20 cm (Emergency magnetic compass) from the GNSS/DGNSS Receiver.

Preface

Approvals

The GNSS/DGNSS Receiver is approved to MED 2011/75/EU and fulfills the requirements in the standards:

IEC 61108-1 Ed. 2.0, 2003

IEC 61108-2 Ed. 1.0, 1998

IEC 61108-4 Ed. 1.0, 2004

IEC 61162-1 Ed. 4.0, 2010

IEC 61162-2 1998

IEC 61162-450 2011

IEC 60945 Ed. 4, 2002

MSC.302(87)

The approvals of the GNSS/DGNSS Receiver are constantly monitored. New national approvals will be applied for and granted and new test standards may come into force. Therefore the above list may not be complete. Contact your authorized dealer for more information.

About the manual

Intended readers

This manual is a user manual for the GNSS/DGNSS Receiver. This manual is intended for anyone who is using or intends to use this system. It is important that you observe all safety requirements listed in the beginning of this manual, and operate the system according to the guidelines in this manual.
Note that this manual does not cover installation of the system. For information on installation refer to the installation manual. Part numbers for related manuals are listed in the next section.

Related documents

The following table shows the documents related to this manual and to the GNSS/DGNSS Receiver.

Title and description	Document number
SAILOR 6588 GNSS/DGNSS Receiver, Installation manual	98-145263
SAILOR 6004 Control Panel, Installation manual	98-136644
SAILOR 6588 GNSS/DGNSS Receiver, Installation guide	98-140656
SAILOR 6286 DGNSS Antenna - Active, Installation guide	98-141644
SAILOR 6285 GNSS Antenna - Active, Installation guide	98-136019

Typography

In this manual, typography is used as indicated below:
Bold is used for the following purposes:

- To emphasize words.
  Example: "Do **not** touch the antenna".
- To indicate what the user should select in the user interface.
  Example: "Select **SETTINGS** > **LAN**".

Italic is used to emphasize the paragraph title in cross-references.

Example: "For further information, see *Connecting Cables* on page...".

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Chapter 1 Introduction

Chapter 2 Operation

Chapter 3 Service & maintenance

App. A Specifications

Introduction

This chapter introduces the GNSS/DGNSS Receiver and gives an overview of the system and services. It has the following sections:

- *Introduction to GNSS and DGNSS*
- *The GNSS or DGNSS system*
- *System components*

Introduction to GNSS and DGNSS

Overview

A GNSS receiver processes the signals transmitted by the satellites of Global Navigation Satellite Systems (GNSS). The GNSS receiver determines the position, velocity, and precise time by processing the signals broadcast by GNSS satellites.

A DGNSS receiver (Differential GNSS) is an enhancement to a GNSS receiver. It can utilize a global network of ground-based reference stations for improved position accuracy. The ground-based reference stations compare their known fixed positions with the positions calculated from the received GNSS satellite signals. The differences are transmitted via radio beacons to the DGNSS Receiver, which can use them to calculate a more precise position. In order to be able to apply high-quality corrections, the selected reference station must be near the DGNSS receiver to ensure that they both observe roughly the same GNSS satellites.

The GNSS or DGNSS system

The GNSS/DGNSS Receiver is available in variants as listed in the following table. Depending on the antenna used the Receiver will either be a GNSS or a DGNSS Receiver. Using the SAILOR 6285 GNSS Antenna - Active gives a GNSS Receiver variant and the SAILOR 6286 DGNSS Antenna - Active gives a DGNSS Receiver variant. Both variants can be controlled by the SAILOR 6004 Control Panel. The Control Panel is connected to the GNSS/DGNSS Receiver through a LAN connection. The variants include the DGNSS or GNSS app for the Control Panel. The app is an integrated part of the GNSS/DGNSS Receiver.

Variant	DGNSS Receiver	GNSS antenna	DGNSS antenna	Control Panel
SAILOR 6560 GNSS System	x	x		x
SAILOR 6561 GNSS Basic	x	x		
SAILOR 6570 DGNSS System	x		x	x
SAILOR 6571 DGNSS Basic	x		x	

Table 1: System variants

Features

- Position calculation with GPS and/or GLONASS satellites.
- Reception and use of differential corrections from SBAS, RTCM SC-104 via a serial interface or the integrated radio beacon receiver.[1]
- RAIM calculation according to IEC 61108-1. Estimates the calculated positions accuracy and monitors the signal integrity.
- SBAS corrections from EGNOS, MSAS, WAAS, GAGAN and SDCM.
- Automatic or manual radio beacon station selection.[1]

1. DGNSS only

- Support for other datums, including a user defined.
- Calculation of magnetic variation based on the last known position and date.
- Serial inputs and outputs according to IEC 61162-1/2. Fully configurable for each port.
- Light Weight Ethernet interface according to IEC 61162-450. Fully configurable.
- Alert management according to MSC.302. Fully configurable.
- Support for High Speed Craft (HSC).
- Antenna offset correction.
- Anchor Watch.
- Two Trip Counters and a total counter.
- Speed log output.
- Pulse Per Second (PPS) output.
- Interface for ThraneLink applications and INS available.
- Touch screen on the SAILOR 6004 Control Panel.
- Possibility for multiple-receiver setup with up to three GNSS/DGNSS Receivers.
- Up to four Control Panels on the same GNSS/DGNSS Receiver.

System configuration

The following figure shows the units of a GNSS or DGNSS system.

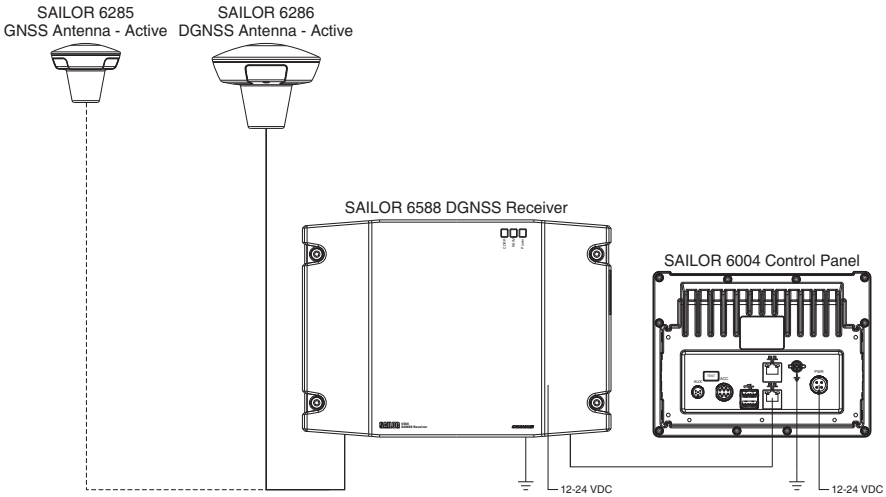

Figure 1: System configuration

System components

SAILOR 6588 DGNSS Receiver

The DGNSS Receiver is the main unit in a DGNSS or GNSS position system. The DGNSS Receiver is always on, provided there is DC power. It has a connector for the GNSS or DGNSS antenna, a ground connection, spring-loaded terminals for DC power (12–24 VDC) and two LAN connectors. The DGNSS Receiver has spring-loaded terminals for connection to various inputs and outputs.

Figure 2: SAILOR 6588 DGNSS Receiver

SAILOR 6285 GNSS Antenna - Active

The SAILOR 6285 GNSS Antenna - Active is a robust, sealed and waterproof GPS and GLONASS antenna (classified IPx6 & IPx8).

Figure 3: SAILOR 6285 GNSS Antenna - Active

SAILOR 6286 DGNSS Antenna - Active

The SAILOR 6286 DGNSS Antenna - Active is a robust, sealed and waterproof GPS and GLONASS antenna. This antenna also has an antenna for receiving differential corrections from radio beacon stations in the LW frequency band.

Figure 4: SAILOR 6286 DGNSS Antenna - Active

SAILOR 6004 Control Panel

The Control Panel is the user interface for the GNSS/DGNSS Receiver. Alerts are shown in the display. The Control Panel has a touch screen and a buzzer for alert tones. The display can be dimmed. The Control Panel has a color LCD screen and the nominal viewing distance is 0.9 m.

Figure 5: SAILOR 6004 Control Panel

Operation

This chapter has the following sections:

- *To get started*
- *Position*
- *Anchor Watch*
- *Trip Counters*
- *Settings*
- *Alert and notification management*
- *List of alerts*
- *Multiple receivers*

To get started

As soon as DC power is provided the GNSS/DGNSS Receiver is on.

To switch on the Control Panel push the power button. Operate the Control Panel by tapping the touch screen. To switch off the Control Panel push and hold the power button for 2 seconds and follow the instructions on the screen.

Note If the remote switch in the Control Panel is wired and it is switched on, you can only use the Power button to reboot the Control Panel, you cannot switch it off.

To dim the display of the Control Panel

Turn the dim knob of the Control Panel to increase or decrease the display brightness or tap **Auto**. To dim to level zero push the power button once. If an alert appears while the display is in level zero, the display returns to the latest dim value and the alert is displayed.

Startup screen

The Control Panel is a multipurpose touch display on which the DGNSS or GNSS application has been installed during the installation of the GNSS/DGNSS Receiver. The startup screen provides an icon-based application menu including the DGNSS or GNSS application. To start the DGNSS or GNSS application tap the DGNSS or GNSS icon on the Control Panel display.

Figure 6: Startup screen (example for DGNSS)

The application menu also includes the general Control Panel System application providing application management and general Control Panel settings. For details see the installation manual of the Control Panel.

Bottom bar

The general bottom bar of the Control Panel is always available below the startup application menu or the currently running application.

Figure 7: Bottom bar

The left side of the bottom bar contains general navigation icon buttons:

 Back button

Tap the back button to return to the previous screen/page of the current application or close the current application. If you tap this icon when being in the GNSS or DGNSS menu screen, you navigate to the startup screen.

Hide keyboard button

Tap the hide keyboard button to remove the on screen keyboard. This button replaces the back button when the on screen keyboard is shown.

Home button

Tap the home button to return to the startup screen.

The right side of the bottom bar contains indication icons (if there are any active indications) from alert or notifications and contains also the UTC time. Tap this area to open the alert and notifications list.

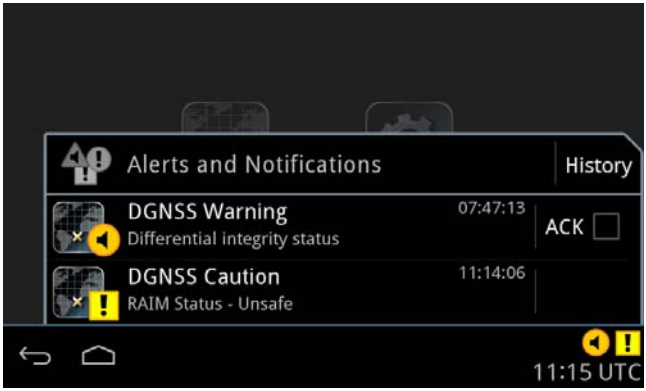

Figure 8: Alerts and notifications

Tap the same area again or tap the back button to close the list. See *Alert and notification management* on page 33 for more details on alerts and notifications.

GNSS/DGNSS menu screen

Tap the **DGNSS** or **GNSS** icon on the startup screen to display the menu screen. From this screen you access the main functions of the GNSS/DGNSS Receiver.

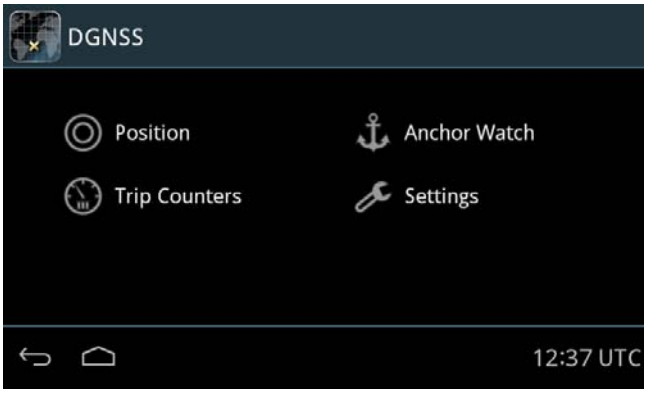

Figure 9: Menu screen (example for DGNSS)

Tap **Position**, **Anchor Watch**, **Trip Counters** or **Settings** to proceed.

Note The following sections describe the DGNSS app. The functionality that is not available in the GNSS system will be marked as DGNSS only.

Position

The **Position** screen gives an overview of the current position and other relevant status information. This screen has the tabs **Overview** and **Quality**. Lists of GNSS satellites, SBAS satellites, beacons and beacon messages can be accessed through the icon in the upper right corner. When no position is calculated or the connection to the GNSS/DGNSS Receiver is lost, the position information in this screen is frozen and the text color is changed to yellow.

Figure 10: Position screen (example)

The following paragraphs describe the **Overview** tab.

Top information line

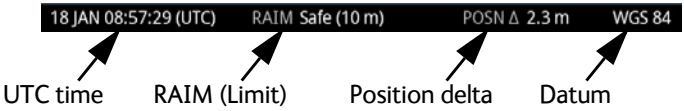

Figure 11: Top information line

The UTC time in the position screen is the time of the displayed position. When the position is lost this time does not change.

The RAIM status gives an indication of the quality of the calculated position. A result of the RAIM calculation is the estimated position

accuracy, indicated in **POSN**Δ field in the top information line. The estimated position accuracy is compared to the RAIM accuracy limit yielding the RAIM status. The RAIM accuracy limit is shown in parentheses. You can set the accuracy limit in **DGNSS > Settings > Accuracy RAIM**.

Status	Explanation
Safe	The RAIM status is safe. The position accuracy is below the set accuracy limit.
Caution	The RAIM status is caution. There are not enough satellites available to calculate RAIM.
Unsafe	The RAIM status is unsafe. The position accuracy has exceeded the set accuracy limit.

Table 2: RAIM status

The datum used for the current position is displayed to the right. For example WGS 84. You can set the datum in **DGNSS > Settings > General > Datum**.

Latitude and longitude of the calculated position

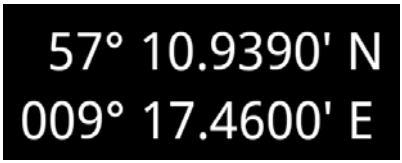

Figure 12: Latitude and longitude (example)

"LED" status section:

The color "LED"s indicate the status of the system. Green color of the "LED" means no issues (i.e. satellite system is used for position or valid beacon data currently received) and amber color means there is an issue (i.e. satellite system is not used for position or no valid beacon data currently received).

Figure 13: “LED” status section (example)

Depending on the selected satellite system, the name of the system and an "LED" is listed in the LED status section. You can configure which systems to use in **DGNSS > Settings > General > Use GNSS Systems**.

The name of the GNSS System may have a prefix, see the following table.

Prefix	Configured differential use
None	No differential corrections
D	Use of differential corrections from a beacon
S	Use of differential corrections from SBAS

Table 3: Prefix of GNSS systems

When the use of differential corrections is configured, the status of the corrections is displayed with a text corresponding to the mode and a status “LED”. You can configure differential corrections in **DGNSS > Settings > General > Differential Beacon Correction**.

Text	Mode	DGNSS	GNSS
AUTO XXX	Automatic mode, the beacon is automatically selected by the DGNSS Receiver. XXX is the reference ID of the beacon.	X	
MAN XXX	Manual mode, the beacon is manually selected by the user. XXX is the reference ID of the beacon.	X	
Xxx.x kHz	The DGNSS Receiver has tuned to the frequency Xxx.x kHz. The frequency has been either manually configured or was provided by an external device.	X	
Ext. RTCM	Differential corrections come from an external source.		X

Table 4: Status of the differential corrections

COG/SOG section

This section displays the Course Over Ground (COG) and the Speed Over Ground (SOG). The COG and SOG are calculated together with the position and are only shown when the position is updated.

COG is the average direction travelled in the time set by COG Smoothing (**DGNSS > Settings > General > COG Smoothing**).

SOG is the average speed, calculated over the SOG Smoothing time (**DGNSS > Settings > General > SOG Smoothing**).

Figure 14: COG/SOG section

Magnetic variation

MAG VAR is the magnetic variation which displays the angle between magnetic north and true north.

Figure 15:Magnetic variation

The magnetic variation changes with time and location on earth. It can either be input manually or automatically calculated using a build-in model which is able to predict the Earth's magnetic field over a 5 year period. If the expiry date for the build-in model is exceeded, the magnetic variation is still calculated but with the expiry date used as input to the model instead of the actual date. A caution is raised to notify the user that the expiry date has been exceeded and that the firmware should be updated with new model data.

Note The magnetic variation calculation is disabled when the datum is set to User Defined.

Quality tab

The **Quality** tab provides more detailed information about the current position.

- **Satellites in view** shows the number of satellites above the minimum elevation mask.
- **Satellites in use** shows the number of satellites used for calculating the position.
- **Correction age** is the age of the currently applied differential corrections.
- **Correction reference** is the reference ID of the radio beacon station in use.

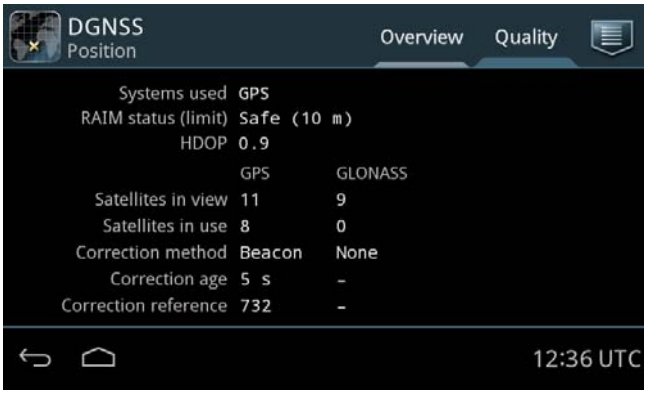

Figure 16: Quality of the position data

When using SBAS corrections, **Correction method** shows **SBAS** and **Correction reference** shows the set SBAS correction system. You can set the **SBAS Correction System** in **DGNSS > Settings > SBAS**

Correction System. **Correction age** is left blank as this information is not available for SBAS corrections.

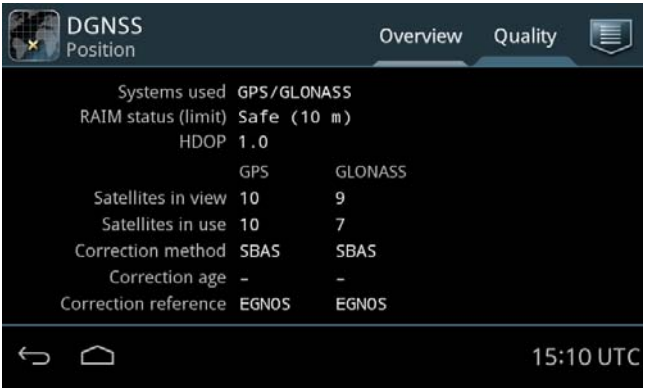

Figure 17: Using SBAS corrections

Lists of GNSS and SBAS satellites, beacons and beacon messages

Tap  to display lists and details of the following:

- GNSS satellites (GPS or GLONASS)
- SBAS satellites
- Beacons[1]
- Beacon messages[1]

In the list of SBAS satellites you can tap a satellite and display further details.

DGNSS only: In **Beacons** you can do the following:

- Tap **Current** to see the currently selected beacon.
- Tap **Nearest** to see a list of the nearest 10 beacons and select one.
- Tap **All** to see a list of all beacons known to the DGNSS Receiver.

1. DGNSS only.

The beacons shown in the tab **All** are from the internal database. The database is updated from almanac data sent from the beacon stations around the world. The database can contain 2000 stations.

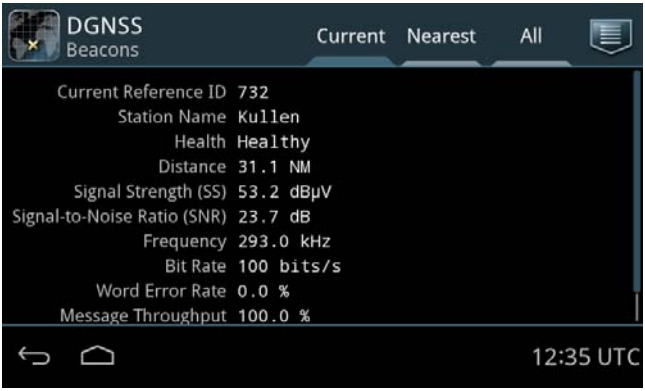

Figure 18: DGNSS Beacons - Current beacon

The signal strength is good if it is higher than 30 dBµV. The signal-to-noise ratio is good if it is higher than 8 dB.

There are several ways to configure the beacon selection:

- Tap > **Automatic Mode** to have the DGNSS Receiver automatically decide which beacon to use to achieve the most precise position.
- Tap > **Manual Mode** to manually select the frequency and bit rate of the desired beacon. The frequency range is 283.5 - 325.0 kHz, bit rates are Auto, 25, 50, 100 and 200.

To lock the DGNSS Receiver to use a specific beacon do as follows:

1. Tap **Nearest** or **All**,

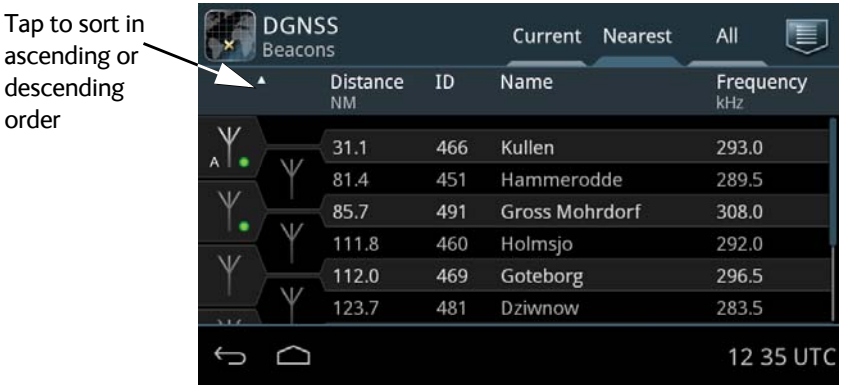

Figure 19: List of closest beacons

The selected, active beacon is always the first entry in the list. It has a white antenna symbol. Next to the antenna symbol is an indicator, showing the status of the beacon station. If there is no indicator it is not possible to receive the beacon station at the moment.

You can sort the beacon list by Distance, Id, Name and Frequency by tapping the item in the heading line.

Beacon indicator	Explanation
A	Current beacon. Automatically selected.
M	Current beacon. Manually selected.
Green dot	Healthy beacon.
Yellow dot	Unhealthy beacon. Do not use under any circumstances.
Gray dot	Unmonitored beacon. Do not use unless no other station is available.

Table 5: Beacon indicators

2. Tap a beacon. A window pops up showing the details of the transmit station.

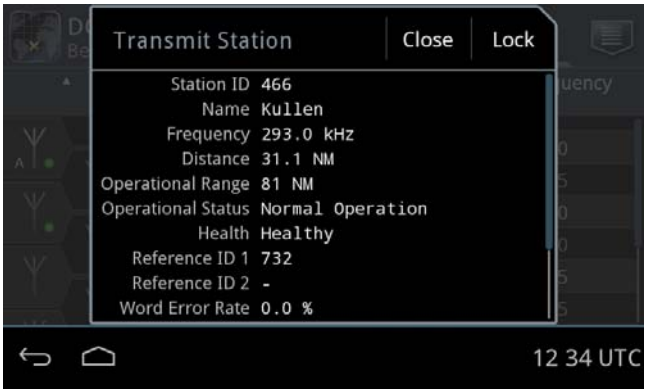

Figure 20: Details for a selected beacon

3. Tap **Lock** and tap **OK** to confirm.

To unlock select **Automatic mode** or lock on another beacon.

Anchor Watch

The anchor watch feature informs you if the vessel has moved and has exceeded the intended anchoring position (Watch reference position). The GNSS/DGNSS Receiver will come up with an alert if the alert distance (**Alert dist**) is exceeded.

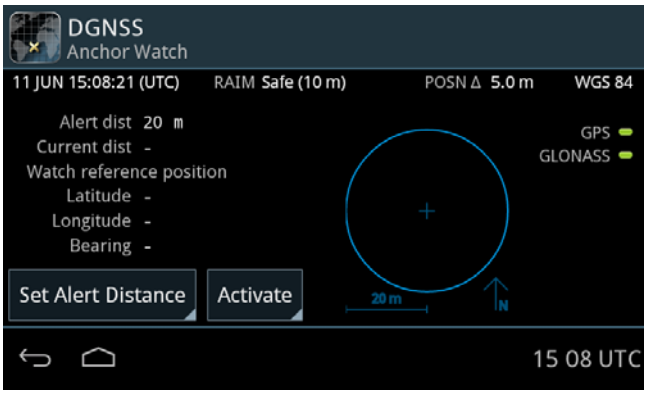

Figure 21: Anchor Watch

Tap the button **Activate** to activate the anchor watch.

To set the alert distance, do as follows:

1. Tap the button **Set Alert Distance**.
2. Swipe to set the desired alert distance.
3. Tap **OK** to confirm.

Figure 22: Alert Distance for Anchor Watch (example)

When Anchor Watch is active multiple indicators appear: The double circle indicates the position of the vessel (1), the cross in the middle indicates the Watch reference position (2) and the outer circle indicates the alert distance (3).

The position of the vessel is always shown relative to the Watch reference position. If the position of the vessel exceeds the alert distance the alert distance circle will shrink to be able to show the position of the vessel beyond the alert distance.

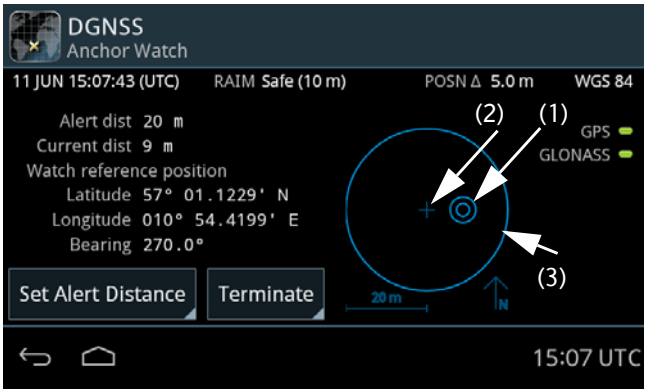

Figure 23: Anchor Watch - vessel and watch reference position

4. To terminate the Anchor Watch function tap the button **Terminate**.

Trip Counters

The GNSS/DGNSS Receiver has two trip counters and a total counter. The trip counters are updated when the system is switched on and a valid position is available. When the system is switched on, but there is no valid position, the travelled distance will be added to the counters when a position is obtained again. The trip counter one and two can be reset. The total counter is reset after a reset to factory default settings of the GNSS/DGNSS Receiver.

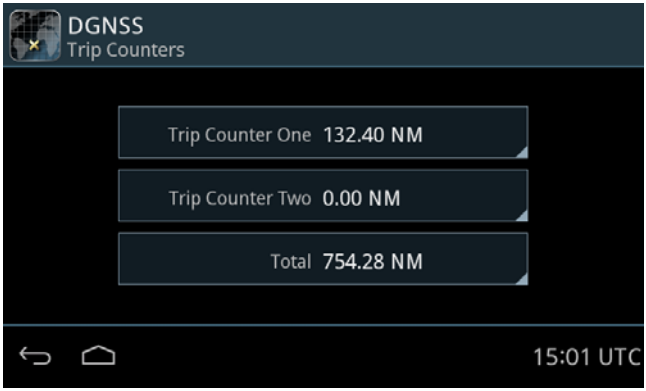

Figure 24: Trip Counters (example)

To see details about the trip, tap the trip counter of interest.

Figure 25: Trip Counter (example)

To reset a counter do as follows:

1. Tap the trip counter you want to reset.
2. Tap **Reset** and **OK** to confirm.

Settings

Note If multiple Control Panels are connected to the GNSS/DGNSS Receiver the operator shall be aware of the possibility that complementary Control Panels may be operated simultaneously. The latest setting values in the GNSS/DGNSS Receiver are always synchronized to all Control Panels.

The GNSS/DGNSS Receiver has several sets of settings: General, Radio Beacons and Alerts. You can set these according to your requirements.

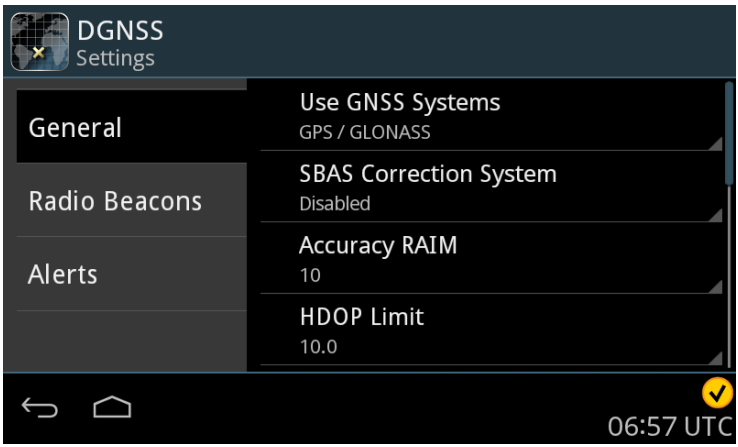

Figure 26: Settings

To change a setting

To change a setting, do as follows:

1. Tap **DGNSS > Settings**
2. Tap the tab **General**, **Radio Beacons** or **Alerts**.
3. Swipe upwards to display further settings.
4. Tap the setting you want to change.
5. Select or set the setting according to your requirements.
6. Tap **Apply**.

Settings – General

General	Description
Use GNSS Systems	Select one of the following: • GPS (default) • GLONASS • GPS / GLONASS
SBAS Correction System	Select one of the following: • Disabled (no SBAS correction) (default) • Automatic (Selects the most suitable correction system, see below) • EGNOS (Europe) • MSAS (Japan) • WAAS (North America and Hawaii) • GAGAN (India) • SDCM (Russia) Enabling the use of an SBAS Correction System is on your own responsibility. Note that beacon corrections have precedence over SBAS corrections.
Accuracy RAIM	Select the RAIM accuracy limit used in the RAIM calculations. An alert will be reported when the limit is exceeded. Default: 10 m
HDOP Limit	Swipe to change the HDOP limit. An alert will be reported when the limit is exceeded. Default: 4

Table 6: General settings

General	Description
Minimum Satellite Elevation	Set the minimum satellite elevation above the horizon. Default value: 5 degrees Satellites with a low elevation may have a bad signal-to-noise ratio (SNR). Increase the elevation angle to exclude satellites with a low elevation angle. This reduces the number of satellites used to calculate the position which may therefore be less accurate. In the tab **Position > Quality** you can see the number of satellites in view and in use. In the **Position** screen tap  and select GNSS Satellites. Here you can see lists of satellites.
Datum	Swipe to select the geodetic datum that the GNSS/DGNSS Receiver should use. • WGS 84 (default) • WGS 72 • User Defined • SGS 85 (MIT '93) • PE 90 (used with GLONASS) • IHO Datum • SK 42 • SK 95 • HSC 2011 For User Defined and IHO Datum see *To set a local Datum* on page 29.
COG Smoothing	Adjustment of the responsiveness. Increase this setting to avoid rapid fluctuations in COG. The greater the smoothing value is set to, the longer will it take for the COG to reflect when the ship turns. Default: 5 s

Table 6: General settings (Continued)

General	Description
SOG Smoothing	Adjustment of the responsiveness. Increase this setting to avoid rapid fluctuations in SOG. The greater the smoothing value is set to, the longer will it take for the SOG to reflect changes in ship speed. Default: 5 s
Zone Time	Swipe to set the zone time. Format: +/- hh:mm Default: 00:00 This offset is transmitted in the NMEA sentence ZDA.
Magnetic Variation Configuration	Configure the magnetic variation (MAG VAR): • Automatic: The magnetic variation is calculated using the build-in model of earth magnetic field. The magnetic variation depends on the last calculated position and date. • Manual: Input the magnetic variation in degrees, E/W. Default value: 000.0˚ E NOTE: The magnetic variation calculation is disabled when the datum is set to User Defined.

Table 6: General settings (Continued)

General	Description
Distance Unit	Select a distance unit: • Nautical Miles (default) • Nautical Miles, feet < 1 NM • Nautical Miles, meters < 1 NM • Kilometers • Kilometers, meters < 1 NM • Statute Miles • Statute Miles, feet < 1 mi • Statute Miles, meters < 1 mi
Velocity Unit	Select a velocity unit: • Knots (default) • Kilometers per hour • Stature Miles per hour

Table 6: General settings (Continued)

To set a local Datum

IHO Datum

The local datums are implemented according to the "Users handbook on datum transformations involving WGS84", 3rd. edition from the International Hydrographic Organization.

To set up an IHO datum do as follows:

1. Tap **Settings**.
2. Swipe upwards to display **Datum**, then tap **Datum**.
3. Swipe to select **IHO Datum** in the list on the right side of the screen.

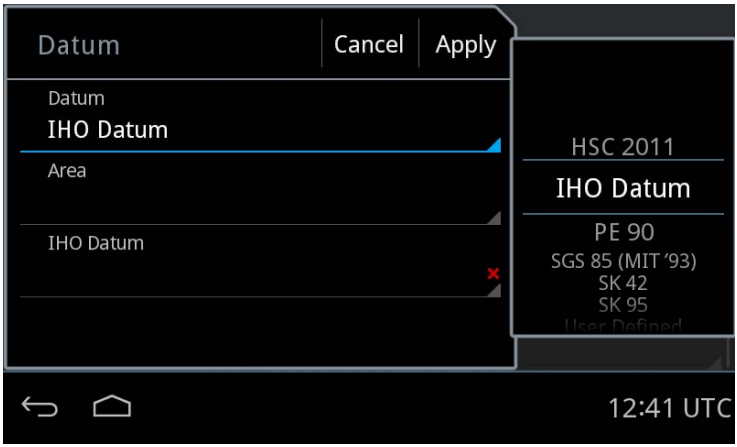

Figure 27: IHO Datum setup

4. Tap **Area**, then select on the right side the area for which the datum is used.
5. Tap **IHO Datum** and swipe on the right side of the screen to select the local geodetic datum from the list.

In some of the datums you must select a **Subdivision**. See an example in the next figure.

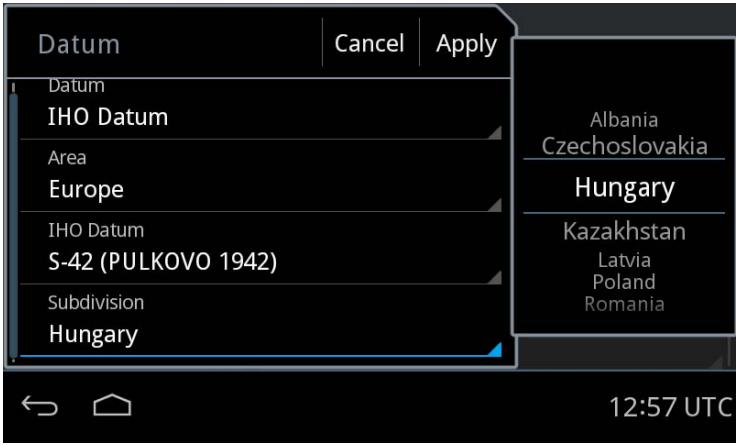

Figure 28: Selection of a subdivision (example)

6. Tap **Apply** to use the datum for position calculation.

User Defined

If you want to use a local datum that is not in the list you can enter a user defined datum. Note that the values in the user defined datum are relative to WGS 84.

To set up a user defined datum do as follows:

1. Tap **Settings**.
2. Swipe upwards to display **Datum**, then tap **Datum**.
3. Swipe to select **User Defined** in the list on the right side of the screen.
4. Tap each field and enter the values corresponding to the map you are using in the number pad.

   If the entered value is not in the valid range a red x is shown on the right side of the value field.

5. To display the valid range tap and hold the field.

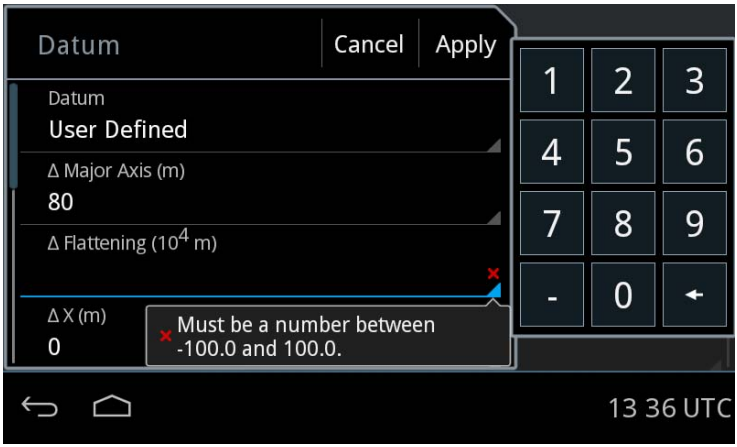

Figure 29: To display the valid range (example)

Settings – Radio Beacons

Radio Beacons	Description
Differential Beacon Correction	Select one of the following: • Enabled (default) • Disabled In GNSS systems the setting **Differential Beacon Correction** is replaced by **External RTCM Correction**.
RTCM Correction Age	This parameter sets the maximum allowed age for correction data. Range: 10-900 s Default: 120 s Note: When increasing the allowed correction age, ensure that the new setting meets your requirements as accuracy may degrade with increasing correction age.

Table 7: Settings for radio beacons

Settings – Alerts

The following alerts can be set to enabled (default) or disabled in the GNSS/DGNSS Receiver:

- HDOP Exceeded (password protected)
- Loss of Position (password protected)
- Differential Integrity Status (password protected)
- RAIM Status - Unsafe
- RAIM Status - Caution
- Heading Lost
- Anchor Watch Alert

Password protection

Some alert settings are password protected against unauthorised or accidental use. This is marked with a padlock.

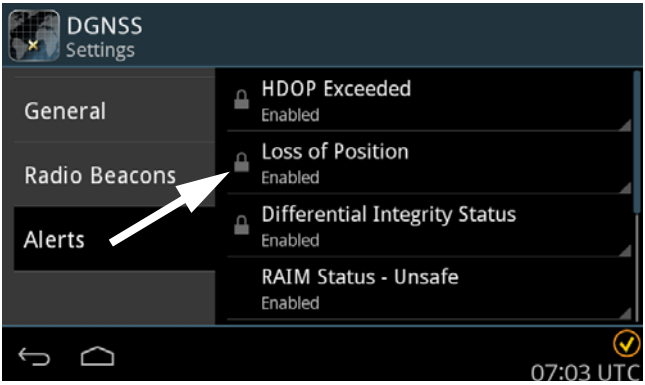

Figure 30: Password protection – example

To unlock a setting with password protected parameters do as follows:

1. Tap the setting you want to change.
2. Enter the user level password (default: **user**).
3. Tap **Apply**.
4. Change the setting and tap **Apply**.

When leaving **Settings**, it is locked again.

For information how to change the user level password see the installation manual of the Control Panel.

Alert and notification management

Alert management is handled by the Control Panel. Note that the following description is a general description of alerts and notification.

Note The GNSS/DGNSS Receiver reports alerts of the type warning or caution.

Introduction to alerts and notifications

Alerts are reported and indicated by icons in the bottom bar of the Control Panel display. An alert is presented together with its alert text. An alert can be of the type alarm, warning or caution. If an alarm is not acknowledged the audible alarm signal (3 beeps) is repeated every seventh second until it is acknowledged. If a warning is not acknowledged the audible warning signal (2 beeps) is repeated every minute until it is acknowledged. The audible warning signal also disappears if the condition is rectified.

The alert list is prioritized. The most important alert is an alarm, then warning and finally caution. The most important active alerts move to the top of the list, after that the alerts with the same importance are sorted by activation time.

You can display the current list of active, unacknowledged alerts and notifications by tapping the lower right corner of the Control Panel display where the alert indication and UTC time is displayed.

Icons for alerts and notification

The following table shows the icons for alerts and notification with a description.

Icon	Name	Icon description
	Active - unacknowledged alarm	A flashing red triangle. A symbol of a loudspeaker in the middle of the triangle. This alert is accompanied by an audible alarm signal (3 beeps). This icon is displayed when there is an active unacknowledged alarm.
	Active – silenced alarm	A flashing red triangle. A symbol of a loudspeaker with a prominent diagonal line through it. This icon is displayed when there is an active silenced alarm.
	Active – acknowledged alarm	A red triangle. An exclamation mark in the middle of the triangle. This icon is displayed as long as the alarm condition is present.
	Active - responsibility transferred alarm	A red triangle. An arrow pointing towards the right in the middle of the triangle. This icon is displayed as long as the alarm condition is present.
	Rectified – unacknowledged alarm	A flashing red triangle. A tick mark in the middle of the triangle. This icon is displayed when the alarm condition has been rectified but not yet acknowledged.

Table 8: Icons for alerts and notification

Icon	Name	Icon description
	Active - unacknowledged warning	A flashing yellow circle with a symbol of a loudspeaker in the middle of the circle. This alert is accompanied by an audible warning signal (2 beeps). This icon is displayed when there is an active unacknowledged warning.
	Active – silenced warning	A flashing yellow circle. A symbol of a loudspeaker with a prominent diagonal line through it. This icon is displayed when there is an active silenced warning.
	Active – acknowledged warning	A yellow circle with an exclamation mark in the middle of the circle. This icon is displayed as long at the warning condition is present.
	Active - responsibility transferred warning	A yellow circle. An arrow pointing towards the right in the middle of the circle. This icon is displayed as long at the warning condition is present.
	Rectified – unacknowledged warning	A flashing yellow circle with a tick mark in the middle of the circle. This icon is displayed when the warning condition has been rectified but not yet acknowledged.
	Caution	A yellow square with an exclamation mark in the middle of the square. A caution alert disappears automatically when the caution situation is cleared.
	Notification	A notification can be that a new software version is available.

Table 8: Icons for alerts and notification (Continued)

Alert history

The alert history contains alerts of the last 24 hours (or maximum1000 entries).The alert history is cleared when you switch off the Control Panel. The alerts and notifications are not saved. To display the alert history with alerts and notifications do as follows

1. Tap the **lower right corner** (UTC time).
2. Tap **History** to display a list of alerts and notifications. You can swipe through the list.
3. Tap an alert to display specific alert information.

Alert acknowledgement

Active alarms and warnings must be acknowledged. When all active alarms and warnings are acknowledged the icons stop flashing. To acknowledge an alert do as follows:

1. Tap the flashing icon in the lower right corner to display the list with alerts and notifications.
2. Tap the check box next to **ACK** to acknowledge the alert.

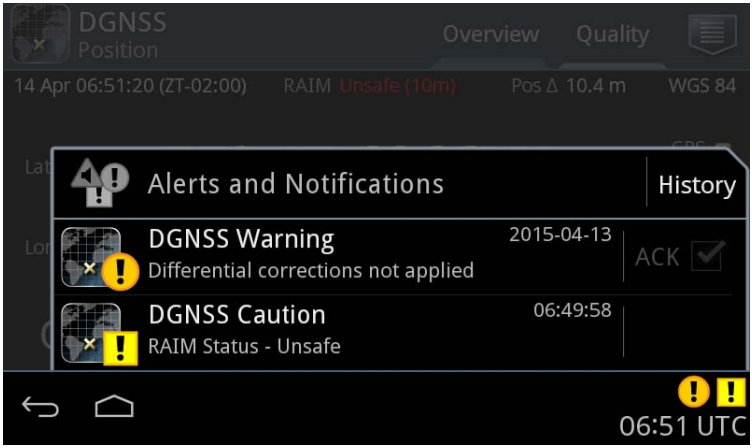

Figure 31: Alerts and notifications (example for DGNSS)

List of alerts

The following alerts may be reported, depending on which alerts are enabled in **DGNSS > Settings > Alerts**.

W: Warning

C: Caution

Alert	Consequence	Reason	Remedy
Anchor Watch Alert (W) (ALR, ACK: ID 167) (ALC, ALF, ACN: ID 10167)		Distance from current position to reference position (anchoring position) exceeds alert distance.	Relocate the vessel.
Differential Integrity Status (W) (ID 215)	Possibly degraded position accuracy.	Station is marked unhealthy or un-monitored. The receiver has not received from station for 10 seconds or more. Word Error Rate (WER) has exceeded 10%.	Select an alternative station.
Heading Lost/invalid (W) (ALR, ACK: ID 32) (ALC, ALF, ACN: ID 10032)	The system will not be able to apply antenna offset.	Heading data from an external device has not been received for 30 seconds.	Reconnect the external device delivering heading data.

Table 9: List of alerts

Alert	Consequence	Reason	Remedy
HDOP Exceeded (C) (ID 210)	Degraded position accuracy.	HDOP has exceeded the user defined threshold.	Improve GNSS reception conditions. Bad reception conditions can be caused by electromagnetic noise, broken antenna/cable or nearby large structures. Make the receiver use more satellites by changing to GPS/GLONASS mode, disable corrections and/or decreasing satellite elevation limit.
Loss of position (W) (ID 212)	No position fix.	GNSS reception conditions are bad. The antenna has disconnected.	
RAIM Status: Caution (C) (ALC, ALF, ACN: ID 10163)	The accuracy level is unknown.	The receiver is using less than 6 satellites.	
RAIM Status: Unsafe (C) (ALC, ALF, ACN: ID 10162)	Possibly unreliable position fix.	The user defined accuracy limit has been exceeded.	

Table 9: List of alerts (Continued)

Alert	Consequence	Reason	Remedy
Alert Magnetic Model Expired (C) (ALC, ALF, ACN: ID 10168)	Possibly an inaccurate value for the magnetic variation (MAG VAR) is being calculated.	The expiry date for the build-in model of Earth's magnetic field has been exceeded.	Update the firmware to a version including the latest model coefficients. Consider to manually enter an accurate value for the local magnetic variation for temporary use.
Connection lost to receiver (W)	The system is unable to report a position.	The receiver is not powered on. The connection between the Control Panel and the receiver has been cut.	Reboot the receiver. Repair the connection between the Control Panel and the receiver.

Table 9: List of alerts (Continued)

Multiple receivers

The SAILOR 6588 DGNSS Receiver can be configured to act as primary, secondary or tertiary GNSS receiver, where each receiver can be controlled on the same SAILOR 6004 Control Panel.

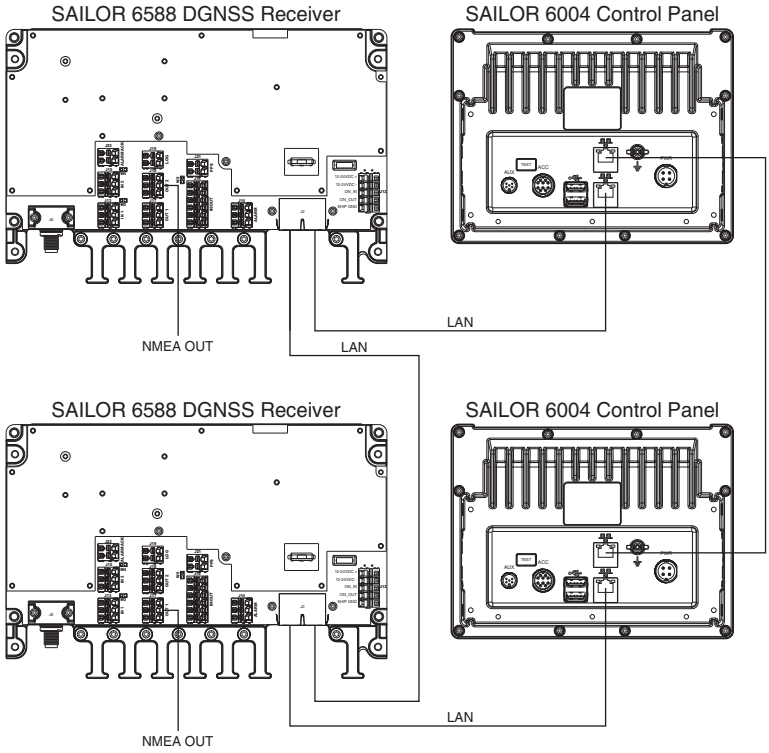

Figure 32: Multiple receivers in one system

Refer to the installation manual, where setup of such a system is explained in details.

When configured with multiple receivers the start screen will look different from a stand-alone system. Two or three GNSS or DGNSS icons are shown, each with a number in the bottom left corner, corresponding to the device role of the receiver from which the alert is reported.

1 is the primary receiver.

2 is the secondary receiver.

3 is the tertiary receiver.

Figure 33: Roles of the GNSS/DGNSS Receiver

Tap the **GNSS** or **DGNSS** icon on the startup screen to display the menu screen for each receiver.

Alerts and notifications in a multiple-receiver system

Alerts and notifications are reported by icons in the bottom bar of the Control Panel, like in a stand-alone system with only one receiver. The only difference is that the icons have a number in the bottom left corner, corresponding to the device role of the receiver.

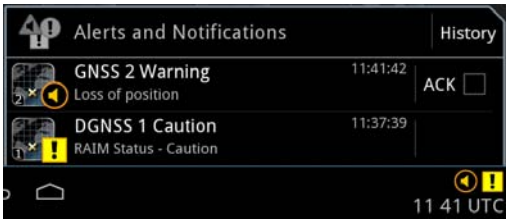

Figure 34: Alerts and notifications from GNSS/DGNSS Receivers

Service & maintenance

This chapter has the following sections:

- *Maintenance*
- *Troubleshooting guide*
- *Service and repair*

Maintenance

Maintenance of the GNSS/DGNSS Receiver and antennas can be reduced to a maintenance check at each visit of the service staff. Inspect the unit for mechanical damages, salt deposits, corrosion and any foreign material. Due to its robust construction and ruggedness the unit has a long lifetime. Anyway it must carefully be checked at intervals not longer than 12 months – dependent on the current working conditions.

Contact for support

Contact an authorized dealer for technical service and support of the GNSS/DGNSS Receiver and antennas. Before contacting the authorized dealer you can go through the troubleshooting guide to solve some of the most common operational problems.

Software version

- GNSS/DGNSS Receiver:
  Tap **System > Applications**.
  Tap the icon in the upper right corner
  Tap **Device List**
  Tap the GNSS/DGNSS Receiver.
- GNSS/DGNSS App: Tap **System > Applications > DGNSS**
- Control Panel: Tap **System > About > Version**

On these pages you also find the serial number of the unit.

Service interface

Important As long as the service engineer is logged into the Service Interface, the GNSS/DGNSS Receiver does not calculate positions. The Control Panel application shows a Connection lost error.

All tasks related to installation, service and maintenance are described in the installation manual.

Only a service engineer should access the Service Interface directly from the display of the Control Panel. This is useful for software update directly via the Control Panel.

Do as follows:

1. Tap **System > Applications**.
2. Tap  **> Device list**.
3. Tap the device.
4. Tap  .

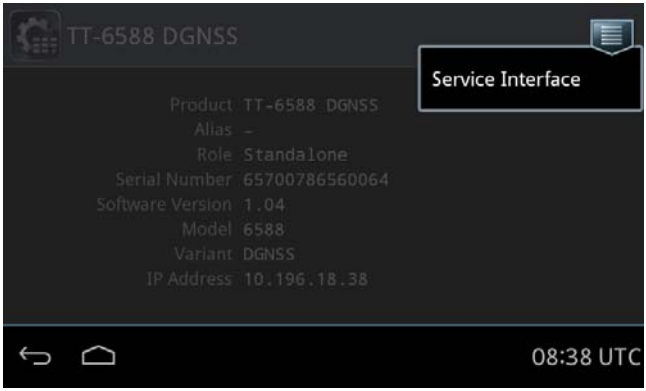

Figure 35: Access of the Service Interface

5. Tap **Service Interface**.

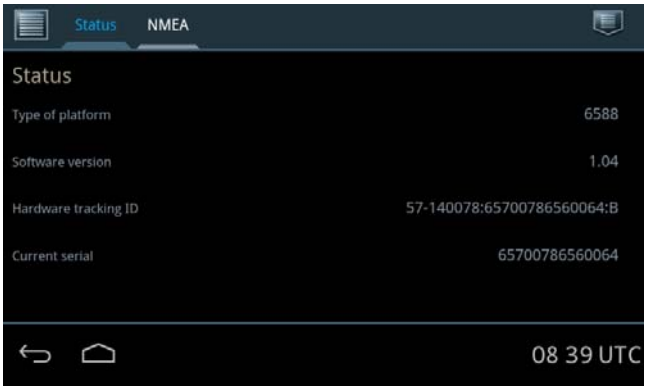

Figure 36: Access the Service Interface

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6. The service engineer can now tap  and **Login** and enter user name and password (administrator level).

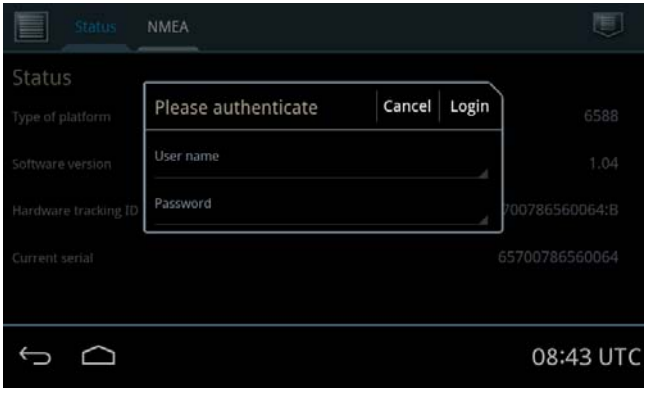

Figure 37: Login page of the Service Interface

System LEDs

Figure 38: LEDs on the GNSS/DGNSS Receiver

LED	Description
Power	**Green**: Power on.
RAIM	This LED indicates the quality of the position data. The RAIM accuracy in metres is set in the Control Panel. **Green**: The RAIM status is safe. **Yellow**: The RAIM status is caution.There are not enough satellites available to calculate RAIM accuracy. **Red**: The RAIM status is unsafe.
CORR	This LED indicates if a correction source is used. A correction source can be SBAS or a beacon. **Red**: No correction source used. **Green with 1 s interval**: Beacon station is used **Green with 3 s interval**: SBAS used

Table 10: LEDs on the GNSS/DGNSS Receiver

Troubleshooting guide

Problem	Symptom	Remedy
The DGNSS Receiver fails to turn on.	The green power LED is off.	If the power cable is connected directly to the GNSS/DGNSS Receiver then check that the white wire in the power cable is connected to the black wire (-DC). For further details see the Installation manual. Use a volt meter to verify that the 12-24 VDC is OK on the power cable. Check if the fuse is blown.
No position fix with GPS and/or GLONASS	The system status LED in the screen **Overview** corresponding to the satellite system is amber.	Check the antenna cable to the antenna. Check that the antenna has free line of sight to the satellites.
Position is wrong		Check if the correct datum is selected. (**Settings > General > Datum**)
No update of position data	All dynamic data (time/date, position) is colored amber on the Control Panel. COG and SOG are shown with ---.-.	Check the power supplies, cabling, Ethernet connection between the GNSS/DGNSS Receiver and the Control Panel. Restart both units: GNSS/DGNSS Receiver: remove and connect power, Control Panel: use on/off button. Check that no one has logged into the Service Interface.
The time in the bottom right corner shows --:--		Select the time source via the System app. See the SAILOR 6004 installation manual.

Table 11: Troubleshooting

Problem	Symptom	Remedy
No beacon correction	The (lower) beacon status "LED" in the **Overview** screen is absent. The CORR LED on the receiver is lit and red.	Check if **Differential Beacon Correction/External RTCM Correction** (DGNSS/GNSS) is enabled in **Settings > Radio Beacons**.
	The (lower) "LED" in the **Overview** screen is amber. The CORR LED on the receiver is lit and red. WARNING: "Differential Integrity status" is active.	Check the antenna cable to the antenna. Check beacon selection mode is correct. Use for example **Automatic Mode**.
No SBAS correction	The CORR LED on the receiver is lit and red.	Check if **SBAS Correction Systems** is enabled in **Settings**.
Missing output of Magnetic variation/Course over ground, degrees magnetic in RMC/VTG sentence	Alert on connected device requiring Magnetic variation/Course over ground, degrees magnetic in RMC/VTG sentence.	Make sure the datum is configured to WGS 84.

Table 11: Troubleshooting (Continued)

Problem	Symptom	Remedy
Device failure		If any of the checks and tests described in this section does not assist in resolving the difficulties experienced in the operation and/or performance of the installation, a fault may have developed in the GNSS/DGNSS System. When contacting an authorized representative, be sure to provide as much information as possible describing the observed behavior - also including the type of the GNSS/DGNSS units, serial number, and software release version. You find this information in the setup menu of the connected Control Panel.

Table 11: Troubleshooting (Continued)

Service and repair

Should your Cobham SATCOM product fail, please contact your dealer or installer, or the nearest Cobham SATCOM partner. You will find the partner details on www.cobham.com/satcom where you also find the Cobham SATCOM Self Service Center web-portal, which may help you solve the problem. Your dealer, installer or Cobham SATCOM partner will assist you whether the need is user training, technical support, arranging on-site repair or sending the product for repair. Your dealer, installer or Cobham SATCOM partner will also take care of any warranty issue.

Applicable SAILOR part numbers

The table below shows the applicable part numbers:

Part number	Description
406560A-00500	GNSS System
406561A-00500	GNSS Basic
406570A-00500	DGNSS System
406571A-00500	DGNSS Basic
406588A-00500	DGNSS Receiver
406004A-00500	Control Panel
406285A-00500	GNSS Antenna - Active
406286A-00500	DGNSS Antenna - Active

Table 12: Part numbers

Accessories

The following accessories are included in the delivery:

Part number	GNSS/DGNSS Receiver
37-207073-000	RJ45 Cat5e STP LAN cable, 5 m
67-138959	Accessory kit containing: 1 A fuse, fuse puller, mounting tool for spring loaded terminals, cable tie, 5 screws M4x20 Torx A2, 5 screws ST ø3.9x33, T20 PAN head, self-tapping

Table 13: Part numbers for included accessories (GNSS/DGNSS Receiver)

Part number	SAILOR 6285 GNSS Antenna - Active
41-135855	GNSS Antenna bracket

Table 14: Part numbers for included accessories (SAILOR 6285 GNSS Antenna - Active)

Part number	SAILOR 6286 DGNSS Antenna - Active
41-141001	DGNSS Antenna bracket
67-141936	Screw kit for DGNSS/GNSS antenna: 4 screws, Tuflock, M4x8 mm

Table 15: Part numbers for included accessories (SAILOR 6286 DGNSS Antenna - Active)

To remove the cover

To remove the cover, do as follows:

1. Loosen the 4 screws marked in the figure below.

Figure 39: Removal of the cover

2. Remove the cables from the spring-loaded terminals and the connectors.
3. Remove the cover of the GNSS/DGNSS Receiver by moving it upwards, away from the mounting surface.

To replace the fuse

One fuse (1 A) is installed in the GNSS/DGNSS Receiver.

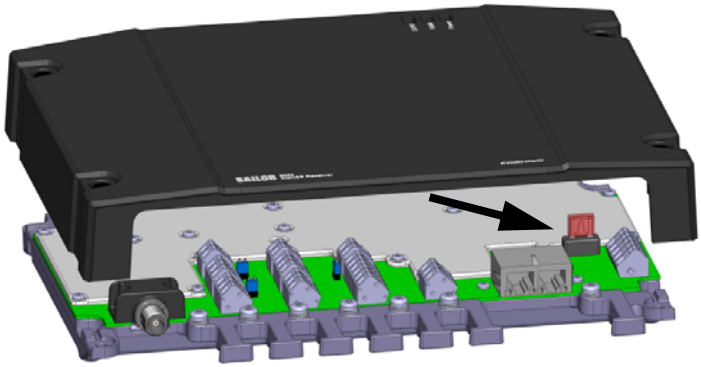

Figure 40: Location of the 1 A fuse

If the fuse is blown, do as follows:

1. Track down why the fuse was blown and solve the problem, e.g. incorrect polarity at the DC supply.
2. Power down the GNSS/DGNSS Receiver.
3. Remove the cover by loosening the 4 screws.
4. Take out the old fuse. Use the fuse puller.
5. Insert the new fuse. The fuse rating is 1 A.

To repack for shipment

Should you need to send the product for repair, please read the below information before packing the product.

The shipping carton has been carefully designed to protect the GNSS/DGNSS Receiver and its accessories during shipment. This carton and its associated packing material should be used when repacking for shipment. Attach a tag indicating the type of service required, return address, part number and full serial number. Mark the carton FRAGILE to ensure careful handling.

Note | Correct shipment is the customer's own responsibility.

If the original shipping carton is not available, the following general instructions should be used for repacking with commercially available material.

1. Wrap the defective unit in heavy paper or plastic. Attach a tag indicating the type of service required, return address, part number and full serial number.
2. Use a strong shipping container, e.g. a double walled carton.
3. Protect the front- and rear panel with cardboard and insert a layer of shock-absorbing material between all surfaces of the equipment and the sides of the container.
4. Seal the shipping container securely.
5. Mark the shipping container FRAGILE to ensure careful handling.

Failure to do so may invalidate the warranty.

Specifications

This appendix contains the technical specifications and a list of the supported NMEA sentences.

SAILOR 6588 GNSS/DGNSS Receiver

Item	Specification
GNSS receiver	30 channel GPS, GLONASS and SBAS receiver
Position-Fix time cold start	< 45 s
PPS accuracy	±15 ns
Weight	1.3 kg
Dimensions (L x W x H)	190 x 270 x 24.5 mm
Equipment class	Protected, according to IEC 60945
Input voltage	10.8 VDC to 31.2 VDC
Power consumption	5 W (0.2 A @24 VDC input voltage)
Heat dissipation	< 10 W
Operating temperature	-15 ˚C to +55 ˚C (Operational)
Storage temperature	-30 ˚C to +70 ˚C (Storage)
Compass Safe Distance	30 cm (standard magnetic compass) 20 cm (Emergency magnetic compass)
Beacon receivers	283.5 - 325 kHz MSK three parallel receivers
Connector for GNSS or DGNSS antenna	TNC female
Connection to Control Panel	LAN

Table 16: GNSS/DGNSS Receiver specifications

SAILOR 6285 GNSS Antenna - Active

Item	Specification
Dimensions	Ø: 91 mm, H: 77.5 mm
Weight	0.15 kg
Mounting	Bracket mount on pipe, thread 1” x 14 TPI
Equipment class	Exposed, according to IEC 60945
Antenna type	Active patch antenna
Frequency	1570 to 1608 MHz
Impedance	Nominal 50 Ohm
Polarization	Circular right-hand
Coverage	Hemispherical
Selectivity	45 dB down at center ±25 MHz
Gain	28 dB
Supply voltage	5 ±1 VDC
Current consumption	Approx. 30 mA
Connector	TNC female
Cable	Coax cable, <10 dB cable loss
Operating temperature	-40 ˚C to +55 ˚C
Storage temperature	-40 ˚C to +70 ˚C

Table 17: SAILOR 6285 GNSS Antenna - Active specifications

SAILOR 6286 DGNSS Antenna - Active

Item	Specification
Dimensions	Ø: 142 mm, H: 53 mm
Weight	0.57 kg
Mounting	Bracket mount on pipe, thread 1 1/4" x 11 TPI
Equipment class	Exposed, according to IEC 60945
Antenna type	Active patch antenna for GNSS combined with a H-Field antenna for beacons
Frequency	1560 to 1608 MHz for GNSS 283.5 to 325 kHz for beacons
Impedance	Nominal 50 Ohm
Polarization	Circular right-hand for GNSS
Coverage	Hemispherical
Selectivity	30 dB down at center ±42 MHz for GNSS
Gain	25 dB
Supply voltage	5 ±1 VDC
Current consumption	Approx. 50 mA
Connector	TNC female
Cable	Coax cable, <10 dB cable loss
Operating temperature	-40 ˚C to +55 ˚C
Storage temperature	-40 ˚C to +70 ˚C

Table 18: SAILOR 6286 DGNSS Antenna - Active specifications

SAILOR 6004 Control Panel

Item	Specifications
Mounting method	Flush mount or bracket
Voltage	10.8 to 31.2 VDC
Power consumption	Typical: 18 W active Peak: 42 W 3.15 A internal fuse (non-serviceable)
Audio input	Up to 6 W in 8 Ohm
Interfaces	2 x Ethernet (10/100 Mbit/s) Accessories connector Auxiliary connector
Compliance	• IEC 60945 • IEC 60950-1
IP rating	IP54[a]
Ambient temperature	-15 ˚C to 55 ˚C
Storage temperature	-30 ˚C to 80 ˚C
Compass safe distance	0.6 m
Dimensions W x H x D	191 mm x 145 mm x 61 mm (without mounting bracket)
Weight	1.1 kg (1.25 kg with mounting bracket)
Resolution of the display	800x400 pixels
Screen size	152.5 x 91.44 mm

Table 19: Control Panel specifications

a. Estimated.

NMEA sentences

The following NMEA sentences are supported:

Compliance	Sentence
IEC61108-1	For positioning reporting: DTM, GBS, GGA, GLL, GNS, GSV, RMC, VTG, ZDA
IEC61108-4	For control and status reporting: MSK and MSS
Heading sensor	HDT, VHW, HDG, THS
Alarm management	ALR, ALC, ALF, ACN, ACK
INS support	HBT

Table 20: Supported NMEA sentences

Each NMEA sentence is described in detail in the installation manual.

D

DGNSS Differential GNSS

E

EGNOS European Geostationary Navigation Overlay Service.

G

GAGAN GPS And Geo Augmented Navigation, to improve the accuracy of a GNSS receiver by providing reference signals.

GAGAN GPS and Geo Augmented Navigation, to improve the accuracy of a GNSS receiver by providing reference signals.

GLONASS GLObal'naya NAvigatsionnaya Sputnikovaya Sistema. Global Navigation Satellite System in English. ,

GNSS Global Navigation Satellite Systems

GPL General Public License

GPS Global Positioning System. A system of satellites, computers, and receivers that is able to determine the latitude and longitude of a receiver on Earth by calculating the time difference for signals from different satellites to reach the receiver. ,

H

HDOP Horizontal Dilution Of Precision

HSC High-Speed Craft, e.g. air-cushion vehicles (such as hovercraft) and hydrofoil boats.

I

IEC International Electrotechnical Commission. The international standards and conformity assessment body for all fields of electrotechnology.

IHO International Hydrographic Organization

INS Integrated Navigation System.

IP	Ingress Protection. An international classification system for the sealing effectiveness of enclosures of electrical equipment against the intrusion into the equipment of foreign bodies (i.e. tools, dust, fingers) and moisture. This classification system uses the letters "IP" followed by two or three digits. An "x" is used for one of the digits if there is only one class of protection; e.g. IPX4 which addresses moisture resistance only.

L

LAN	Local Area Network
LGPL	Lesser General Public License
LW	Long Wave

M

MAG VAR	Magnetic Variation ,
MSAS	Multi-functional Satellite Augmentation System. It supports differential GPS to supplement the GPS system by reporting on the reliability and accuracy of those signals. ,
MSK	Minimum Shift Keying
MSS	NMEA sentence for status information of beacon receivers

N

NMEA	National Marine Electronics Association (standard). A combined electrical and data specification for communication between marine electronic devices such as echo sounder, sonars, anemometer (wind speed and direction), gyrocompass, autopilot, GPS receivers and many other types of instruments. It has been defined by, and is controlled by, the U.S.-based National Marine Electronics Association.

P

PPS	Pulse Per Second.

R

RAIM	Receiver Autonomous Integrity Monitoring.
RTCM	Radio Technical Commission for Maritime Services

S

SBAS	Satellite Based Augmentation System

SBAS Satellite Based Augmentation System.

SDCM System for Differential Corrections and Monitoring, a component of GLONASS. ,

SNR Signal to Noise Ratio

T

TPI Threads Per Inch

W

WAAS Wide Area Augmentation System, a navigation aid to improve accuracy and integrity of the GPS signal. ,

WER Word Error Rate

WGS World Geodetic System