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Caution
No single navigation aid should ever be relied upon as the exclusive means for navigating a vessel. The navigator is responsible for checking all aids available to confirm his position. Electronic aids are intended to assist, not replace, the navigator.

Software
This manual reflects the capabilities of C-Nav1000 Navigation Display software version 5.1.2 and Navigation Sensor software 6.8-S6.

Operators Manual, Part Number and Revision
Part number SAA7000 109-143, revision H.
This manual is a replacement for the earlier manual SAA7000 109-143 rev G.

Safety Instructions
Note the following compass safe distances:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Standard Magnetic Compass</th>
<th>Steering Magnetic Compass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>0.6 Meters</td>
<td>0.3 meters</td>
</tr>
<tr>
<td>Navigation Sensor (GPS and DGPS)</td>
<td>0.6 Meters</td>
<td>0.4 Meters</td>
</tr>
</tbody>
</table>
**Disposal Instructions**

Broken or unwanted electrical or electronic equipment parts shall be classified and handled as ‘Electronic Waste’. Improper disposal may be harmful to the environment and human health. Please refer to your local waste authority for information on return and collection systems in your area.

**Contact Details**

**For Information on New Products and Dealers:**
Please visit our home page www.cnavgps.com

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1 PRODUCT DESCRIPTION

1.1 System Overview

The Navigation System is available in two configurations: GPS and DGPS. Both configurations feature a Display. The GPS configuration also features a GPS Navigation Sensor and an MGA-2 GPS antenna, while the DGPS configuration features a DGPS Navigation Sensor and an MGL-4 combined GPS/Beacon antenna.

The Display provides a graphical interface to the system. Via the display it is possible to create, edit and modify routes and waypoints, navigate following a route, plot the route, view sensor data, perform setup as well as supervise the systems status.

The GPS Navigation Sensor features a high-precision GPS receiver, capable of receiving WAAS, EGNOS and MSAS differential corrections. The DGPS Navigation Sensor has all the features of the GPS Sensor, as well as a dual channel beacon receiver for reception of IALA radio beacon DGPS corrections.

The Navigation Sensor is connected to the antenna, either an MGA-2 GPS antenna or an MGL-4 combined GPS/Beacon antenna. The MGL-4 antenna is capable of receiving and interpreting both radio beacon and satellite signals.

Together the Display and the Navigation Sensor provides three configurable serial user ports, of which two are bidirectional and one used only for output of data. There are also a binary Speed Log and an Alarm Output port, as well as an Alarm Acknowledge input port.

Figure 1 - Overview of the Navigation System
1.2 Main Features

The main features of the Navigation System are:

- High resolution, sunlight readable, 6" graphic day and night display.
- Signal integrity monitoring calculations (RAIM) according to the IEC 61108-1 (2nd edition) standard. The RAIM function detects whether expected user defined navigation accuracy is achieved.
- Reception and use of differential corrections from SBAS, from the serial interface in RTCM SC-104 format and, in the DGPS configuration, from IALA radio beacons.
- Automatic or manual SBAS satellite selection modes.
- Navigational views with next waypoint information and cross-track error visualization.
- Display of latitude, longitude, speed over ground and course over ground.
- Up to five user defined views providing a large variety of graphical as well as numerical presentation options according to customer preferences.
- Capability to handle and store up to 2000 individually named waypoints and up to 100 different routes.
- Man Over Board (MOB) and Event Mark functionality.
- Two trip log counters with indication of average speed and accumulated time during motion.
- Anchor Watch position deviation alarm.
- Scheduled Alerts, user configurable time alarms and time to ETA alarms.
- Time frame related to UTC or user defined local offset.
- Synchronization of waypoint/route database and settings with an external Navigation system in dual redundant installations.
- Input and output of IEC 61162-1 sentences configurable on sentence level and per port, providing control over interpreted, ignored and transmitted sentences.
- User interface design centered on modes of operation corresponding to typical operator activities such as voyage planning, status monitoring and ship navigation.
- Upgradeable without hardware modifications due to fully integrated DSP solution.
- Output of GPS positioning information on User port 1 and 2, enabling external systems to connect to and use the GPS information from the Navigation Sensor.
- Meets the following standards:
  - IMO Performance Standard for GPS.
  - IEC 61162-1, second edition.
2 CONCEPTS AND TERMINOLOGY

This chapter describes some of the commonly used terms of this Operator's Manual, and the implied meaning when used in this manual.

Waypoint
A waypoint is a position on the earth's surface, represented by latitude and longitude, which is given a unique name. A waypoint is typically used for navigation direct to a certain position or as part of a route.

MOB Waypoint
A waypoint created when using the Man Over Board (MOB) functionality. The system can store up to 20 MOB waypoints at the same time, if more are created the oldest one is deleted. It is not possible to use MOB waypoints in routes.

Route
A route is a named, ordered sequence of waypoints, which together describes a path from the start to the end waypoint. The route that currently is being sailed is called the active route.

Active Route
The active route is the route currently being sailed and used for navigation. When starting to sail a route, a copy of the route is made into the active route. Changes made to the active route do not affect the source route, unless the active route is explicitly stored. Only one route can be active at any point in time.

Leg
A leg is the segment of a route between two consecutive waypoints. A route with the waypoints A, B and C has two legs: “A to B” and “B to C”. For each leg in a route, the navigation algorithm and RAIM accuracy level can be set.

RAIM
RAIM is a GPS integrity monitoring scheme that evaluates the quality of the position data and is able (under normal circumstances) to detect a satellite malfunction that results in a large range error.

RAIM Accuracy Level
The RAIM accuracy level is the radius that is used to calculate current RAIM status.

RAIM Status
The RAIM status can be one of safe, caution and unsafe, and is indicated by the LEDs on the front of the Display.
Navigation Algorithm
The navigation algorithm is the algorithm used for calculating the course to steer to reach the next waypoint. It is also used for calculating the distance to the waypoint. The navigation algorithm can be either great circle or rhumb line.

Great Circle Navigation
The great circle navigation algorithm calculates a course line that is the shortest path between two points on the surface of the earth. Using this navigation algorithm, course to steer when navigating towards a waypoint is not constant. The resulting track of this navigation algorithm will differ from the straight line drawn on a Mercator projected chart.

Rhumb Line Navigation
The rhumb line navigation algorithm calculates a course line that corresponds to a straight line on a Mercator projected chart, and cuts across all meridians at the same angle.

Waypoint Pass Criterion
The criterion used to determine when a waypoint in the active route is considered passed. The waypoint pass criterion can be any of Manual, Distance, Bisector Line and Perpendicular Line.

Manual Waypoint Pass Criterion
Using this pass criterion, the waypoint is only considered passed when the operator skips the waypoint.

Distance Waypoint Pass Criterion
Using this pass criterion, the waypoint is considered passed once the ship has reached an imaginary circle around the waypoint. See illustration to the right. The radius of the circle is configurable.

Bisector Line Waypoint Pass Criterion
Using this pass criterion, the waypoint is considered passed once the ship has reached an imaginary bisector line of the angle between current and next leg. See illustration to the right.

Perpendicular Line Waypoint Pass Criterion
Using this pass criterion, the waypoint is considered passed once the ship has reached an imaginary line perpendicular to current leg. See illustration to the right.
3 GETTING STARTED

3.1 Front Panel Keys

Figure 2 - Front Panel Keys

1 - STATUS
Not used in the Navigation System.

2 - MODE
Used for changing mode of operation, which can be set to any of Navigate, Plan Voyage, Alarms & Msgs and Config.
3 - ALPHANUMERIC KEYS

These keys are used for entering text and numbers. To write a number in a numeric field press the key once. To write a character in a text field press once for the first character associated with the key, twice for the second character and so on.

4 - ARROW KEYPAD

\(\wedge\ \vee\) (Up and down on \textbf{ARROW KEYPAD}) Moves the field and list highlight up and down and the cursor position when editing a field.

\(<\ >\) (Left and right on \textbf{ARROW KEYPAD}) Jumps between pages in lists, moves the field highlight left and right and moves the cursor position when editing a field.

5 - ESC

Returns display to previous page, or restores a data field's previous value.

6 - FUNCTION KEYS

These keys have different functions depending on the current view. The function is displayed above each key on the screen. In some views, additional pages of function keys may be accessed with the \textbf{PAGE} key.

7 - ENTER

Used to start editing a field and for confirming data entry. Also used to view or edit a highlighted route, leg or waypoint.

8 - PAGE

Provides access to additional pages of function keys in certain views. A small arrow in the bottom right corner of the display is used to indicate that more pages are available.

9 - DISPLAY

Provides controls for fast configuration of backlight, contrast, LED illumination and button illumination. Two separate configurations are available, for day and night operation.

10 - MOB

Used to mark the spot of an event or when a person has fallen overboard. To mark an event, press the key momentarily. To activate the Man Over Board (MOB) function, press the key for at least 5 seconds.

11 - POWER

Used for turning the Display on and off. To turn the power off, press and hold the key for 3 seconds.
3.2 How to Operate the Display

3.2.1 Views and Function Keys

The user interface is built upon a number of views, organized in four different modes. The different views are reached with the function keys below the screen and the ESC and PAGE keys on the right side of the front panel. The mode is changed by pressing the MODE key followed by the function key corresponding to the desired mode.

Use the function keys to step into a specific view and ESC to get back one level. PAGE provides access to additional pages of function keys in some views. An example view is shown below. In the following sections of the manual the views of the Navigation System are described.

![Display Example](image)

Figure 3 - Display

The function keys are view-specific and the function of each key is specified with a label on the screen. Note that unlabelled keys are not active in that specific view. Also, in some views the function keys might serve as switches, e.g. toggling a parameter.

The status bar of the system is present in all views at the top of the screen, and further described in section 3.4 “Status Bar” on page 19.

3.2.2 Change Settings

Several of the views in the Navigation System contain parameters that can be edited. To edit a parameter, select it by using the < > keys and press ENTER. Then enter data in one of four ways:

- **Numbers**: Press the ALPHANUMERIC KEY that corresponds to each digit. To delete a digit, press function key Backspace.

- **Text**: Press the ALPHANUMERIC KEY that corresponds to each character. Press the key once for the first character, twice for the second character and so on. Press the key marked with a dot twice, where allowed, to bring up a menu for entering special characters. To delete a character, press function key
**Backspace.** To change between upper and lower case letters, press function key *Caps Lock* (if present).

- **List of predefined values:** Use the \(\bigvee\ \bigwedge\) keys to select between the predefined values.

- **Bar graph data:** Use the < > keys to increment or decrement the parameter.

Press *ENTER* when done. If desired, use the \(\bigvee\ \bigwedge\ < >\) keys to select a new parameter to be edited, else press function key *Apply and Exit*.

Use the *ESC* key to undo changes and to return to the previous view.

### 3.2.3 Alarm Pop-Ups

The Display features alarm and alert pop-ups that can appear any time during operation. To acknowledge an alarm or alert message, press *ENTER*. An example is shown below.

![NEW ALARM](image)

**Figure 4 - Alarm Pop-Up**

For more information on alarms and alerts see the Reference chapter, section Alarm Pop-Ups on page 46. For alarm definitions see Appendix, section 5.1 "Alarm Messages" on page 157.

### 3.2.4 Turning On and Off the Display

To turn on the Display, press the *POWER* key. The LEDs on the display will blink momentarily, indicating that the Display is starting up. Any alarm active when the display is started will be indicated by Alarm pop-ups, as described above. Press *ENTER* to acknowledge any present alarm and the corresponding pop-up will be removed.

The Display will power up in the Navigate mode, showing the Position Target List view. The different modes and the basic operation of the Navigation System are described in the following sections.

To power off the Display, press and hold the *POWER* key for 3 seconds, until the screen goes black.
3.3 System Modes

The user interface of the Display has four different system modes, which each correspond to different types of user activities.

The four modes are Navigate, Plan Voyage, Alarms & Msgs and Config. Current mode is changed by pressing the **MODE** key, which will bring up the function key labels illustrated below. Press the corresponding function key to enter the desired mode.

![Function Keys for selecting system mode](image)

Figure 5 - Display System Modes

The different modes are described below, with illustrations of typical mode views.

3.3.1 Navigate Mode

![Navigate Mode](image)

Figure 6 - Navigate Mode

The Navigate mode is used under normal ship operation. It supports viewing bearing and distance to the next waypoint, skipping waypoints, plotting the active route, editing the active route, monitoring cross-track error and viewing sensor information such as current depth, speed, heading and position. It also supplies functions for viewing current GPS and Beacon status. This mode is described in detail on page 48 and onwards in the Reference chapter.
3.3.2 Plan Voyage Mode

The Plan Voyage mode supports viewing, creating and deleting waypoints and routes, as well as starting to sail a route or sailing directly to a specific location. This mode is described in detail on page 79 and onwards in the Reference chapter.

3.3.3 Alarms & Msgs Mode

The Alarms & Msgs mode supports functions for monitoring current system status. This includes functions for viewing present and previous alarms, definition of scheduled time alerts, clearing the alarm log and viewing received DGPS messages. This mode is described in detail on page 110 and onwards in the Reference chapter.
3.3.4 Config Mode

The Config mode comprises functions used to setup and configure the Navigation System. It includes functions for modifying visual and sound settings, navigation settings, disable and enable different alarms, used units, GPS and beacon settings, serial port settings and viewing system information. This mode is described in detail on page 119 and onwards in the Reference chapter.

3.3.5 Functions Accessible Regardless of Mode

Functions associated with the MODE, DISPLAY, MOB and POWER keys are accessible regardless of mode. These keys provide functionality for switching system mode, changing display settings, marking the position in case of accident (MOB) or other event (event mark) and for turning the display on and off.

3.4 Status Bar

The top of the screen of the Display always displays a summary of the system's status. See illustration below.

Figure 9 - Config Mode

Figure 10 - Status Bar
If a valid navigation position is available, it is displayed to the left. The position shown in the status bar is always that of the Navigation Sensor. The status icons are displayed in the middle, and to the right current RAIM accuracy level (in meters) and time is shown. It is possible to select whether displayed time shall refer to UTC or a local time frame defined by an offset setting in the Time view as described in section 4.11.2 "Time Config" on page 122.

As an option, the position displayed in the status bar may be replaced by the name of the waypoint the system currently is navigating towards. Which data to display can be selected in Config mode by the ‘Status Information’ parameter in the Nav Config view (See section 4.11.4 "Nav Config" on page 125).

![Figure 11 - Status Information](image)

3.4.1 Status Icons

The status icons that can be displayed are:

- 📬 Unread DGPS message.
- ⚠️ Active Alarms.

Redundant operation status, being one of:

- 🔒 Redundant operation active.
- 🔒 Redundant operation active. Synchronizing from external unit.
- 🔒 Redundant configuration has been enabled, but no communication is established

GPS status, being one of:

- 💫 DGPS based on external differential corrections applied through the User 1 port.
- ✈️ DGPS based on corrections from the internal radio beacon receiver (DGPS version).
- 📯 DGPS based on SBAS differential corrections.
Navigating without differential corrections.

No valid position information.

No communication with the Navigation Sensor.

DGPS Integrity Alert, displayed immediately to the right of GPS status when active.

HDOP status indication (active if HDOP is above 4).

The icons are also described in section 4.2 "Icon Description" on page 42 in the Reference chapter.

3.4.2 RAIM Accuracy Level

The RAIM accuracy level specifies (in meters) the desired position accuracy used to calculate current RAIM status. RAIM is a GPS integrity monitoring scheme that evaluates the quality of position data and compares it to the specified accuracy level.

The LEDs on the front of the display will show the RAIM status. The green LED indicates safe state; the calculated position accuracy is better than the set accuracy level. The yellow LED indicates caution state; the system is unable to safely determine if the position accuracy is better or worse than the set accuracy level. The red LED indicates unsafe state; the calculated position accuracy is worse than the set accuracy level. The LEDs and RAIM states are further described in section 4.1 "Status LEDs" on page 41.

The used RAIM accuracy level is the latest specified accuracy level, either specified manually or by a leg setting in the sailed route. An underlined accuracy level indicates that a manually entered RAIM level overrides RAIM levels set in the active route. This is illustrated in the figure to the left.

For details of this and on how to set current RAIM accuracy level, see page 57 in the Reference chapter.
3.5 Show Current Position

The Display will power up in the Position view. The Position view shows current position, speed over ground (SOG) and course over ground (COG) as reported by the Navigation Sensor. If no position information is available from the Navigation Sensor, the view shows the last available values and the time they were acquired. For details on this view, refer to the Reference chapter, section 4.8.2 "Position" on page 51.

![Position view](image)

Figure 12 - Position view

The view is present in Navigate mode, accessed by pressing Mode followed by the function key **NAVIGATE**. The view is then accessed by pressing function key **Position**.

3.5.1 Create Waypoints

Waypoints are the basis for ship navigation. A waypoint is a position on the earth surface that is given a unique name and stored in the memory of the Display. Waypoints can be entered in several different ways, and used for building routes as well as for direct navigation to a specific position.

Creating waypoints is performed in the Waypoint List view in Plan Voyage mode. Plan Voyage mode is accessed by pressing the **MODE** key followed by the **PLAN VOYAGE** function key. The Waypoint List view is then accessed by pressing function key **Waypoint List**.
3.5.2 Create New Waypoint

Access the Waypoint List view as described above. Press the function key *Create New WP*. The Create Waypoint view is displayed.

![Create Waypoint view](image)

To name the waypoint, select the Name field using ^ and press ENTER. The field becomes editable and the following function keys are displayed.

![Function keys](image)

Enter a descriptive name for the waypoint you are creating, using the alphanumeric keypad. Use the Backspace function key to erase characters, and the Capslock function key to change between upper and lower case letters. Press ENTER when done.

The Lat and Lon values are per default set to the latitude and longitude of current position. If a different position is desired, select each field to modify using ^ v, press ENTER and use < > keys to select the digits to alter. Enter new digits using the alphanumeric keypad and press ENTER when done.

To create the waypoint, press function key Apply and Exit.
3.6 Sail to a Waypoint

The Navigation System supports sailing directly to a waypoint. Starting to sail to a waypoint is done in Plan Voyage mode, just as creating waypoints. The mode is accessed by pressing the `MODE` key followed by the `PLAN VOYAGE` function key. The Sail To function is present in the Route List view, accessed by function key `Route List`. The view is illustrated below.

![Route List view](image)

The Route List view can also be accessed from the Navigate mode as follows. Press the `MODE` key followed by the `NAVIGATE` function key. Then press the `PAGE` key in order to access a second page of function keys that includes the `Route List` key.

In the Route List view, press the function key `Sail To WPT/POS` to sail to a specific location. The following view is displayed.

![Sail To WPT/POS view](image)

**Figure 15 - Route List view**

**Figure 16 - Sail To WPT/POS view**
To select the destination waypoint, press function key *Select DEST*. This brings up the Select Waypoint view.

<table>
<thead>
<tr>
<th>Name</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ålmarund</td>
<td>61°21.170' N</td>
<td>022°41.469' E</td>
</tr>
<tr>
<td>Langsund</td>
<td>58°52.527' N</td>
<td>018°10.037' E</td>
</tr>
<tr>
<td>Salto</td>
<td>61°55.134' N</td>
<td>021°52.511' E</td>
</tr>
<tr>
<td>Storgrund</td>
<td>58°31.738' N</td>
<td>017°01.576' E</td>
</tr>
<tr>
<td>Svartskar</td>
<td>58°39.179' N</td>
<td>017°08.315' E</td>
</tr>
<tr>
<td>Videskar</td>
<td>58°31.236' N</td>
<td>017°01.168' E</td>
</tr>
<tr>
<td>Vindö</td>
<td>59°43.141' N</td>
<td>019°55.112' E</td>
</tr>
</tbody>
</table>

Figure 17 - Select Waypoint view

Use the \(^\wedge\) \(^\vee\) keys to highlight the desired waypoint. The find and sort functions, described in the Reference chapter in section 4.8.9 “Route List” on page 78, can also help in finding the correct waypoint. Once the desired waypoint has been highlighted, press function key *Select Waypoint* to select it as destination.

<table>
<thead>
<tr>
<th>From Current Position</th>
<th>To Storgrund</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT 58°41.7192' N</td>
<td>LON 17°19.3728' E</td>
</tr>
<tr>
<td>Bearing 223</td>
<td>Range 13.67 Nm</td>
</tr>
</tbody>
</table>

Figure 18 - Selected Waypoint

Press function key *Sail* to start sailing to the selected destination. The Nav view is shown, as described and illustrated in section 4.8.3 on page 58.
3.7 Create Route

A route is a sequence of waypoints, which is used to navigate from a start waypoint to an end waypoint. The Navigation System supports up to 100 different routes.

Planning and creating a route is done in the Plan Voyage mode. This mode is accessed by pressing Mode followed by the function key **PLAN VOYAGE**. The Route List view is then accessed by pressing function key **Route List**. The view lists all existing routes in the system, with information on the number of waypoints and length of each route. For a detailed description of the Route List view and all its function keys, refer to the Reference chapter, page 81.

![Route List view](image1.png)

Create a new route by pressing the function key **Create New RTE**. The Create Route view is displayed. Use 
\[ and \] to select the Name field and press **ENTER**.

![Create Route view](image2.png)
Enter a descriptive name for the route you are creating, using the alphanumeric keypad. Use the **Backspace** function key to erase characters, and the **Capslock** function key to change between upper and lower case letters. Press **ENTER** when done.

Once a name for the route has been entered, press ‹ to bring focus to the still empty waypoint list of the route. This brings forth the function keys for modifying waypoints in the route, as visualized in the following figure.

![Figure 21 - Function keys for modifying waypoints](image)

A walk-through on how to insert waypoints into the route is given below.

### 3.7.1 Insert Waypoints into the Route

To insert waypoints into an empty route, press function key **Insert Waypoints**. Once pressed, the Insert Waypoints view is displayed.

![Figure 22 - Insert Waypoints view](image)

The view lists all existing waypoints in the system, sorted alphabetically. The view is described in detail in section 4.9.3.2 on page 95 of this manual.

If the desired waypoint exists in the list, use ‹ ‾ to highlight it and press the **Insert Waypoint** function key.

If no suitable waypoint exists, create one by pressing the **Create New WPT** function key. The Create Waypoint view is shown. Enter a name for the waypoint and its position, as previously described in section 3.5.1 "Create Waypoints" on page 22. Once the waypoint has been created by pressing **Apply and Exit**, the Insert Waypoints view is shown again. Use ‹ ‾ to highlight the created waypoint and press the function key **Insert Waypoint** to insert it into the route.

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Add more waypoints to the route by repeating the procedure(s) described above. Once a waypoint has been inserted, a number will appear in a small box to the right of the waypoint indicating the insertion order into the route.

![Waypoint Insertion](Image)

Figure 23 - Insert Waypoints view

When all (or a suitable number of) waypoints have been inserted press the **Return** function key. The Create Route view is displayed again with the waypoints added.

![Route Creation](Image)

Figure 24 - Create Route view

To insert more waypoints into the route, select the desired location for the waypoint in the route and press one of the function keys **Insert WPT After** or **Insert WPT Before**. The former inserts waypoints after the highlighted position, whereas the latter inserts the waypoints before the highlighted position. Repeat the procedure described above to select and insert desired waypoints.
3.7.2 Adjusting Navigational Algorithm and RAIM Accuracy Level

To modify the settings for the legs in the route, press function key **Route Legs** while remaining in the Create Route view. This makes the view display the legs in the route, as illustrated below.

![Figure 25 - Route Legs](image)

The column marked “A” indicates the navigation algorithm set for each leg. An R indicates rhumb line and a G great circle navigation. The “RAIM” column shows the RAIM accuracy setting set for each leg. A “-” indicates that sailing the leg leaves the present RAIM level unchanged, while a number indicates that a RAIM accuracy level has been set for the leg.

Use ▲▼ to highlight the leg to adjust settings for. Once highlighted, press **ENTER**. This brings up the Edit Leg view.

![Figure 26 - Edit Leg view](image)
To modify the navigation algorithm, select the **Navigation Algorithm** field using \( \land \) and press **ENTER**. Select the desired navigation algorithm using \( \land \vee \) and press **ENTER** again when done.

To set a RAIM accuracy level for the leg, use \( \vee \) to select the RAIM Accuracy field and press **ENTER**. Use \( \vee \) to select the Level entry and press **ENTER**. A box to enter the accuracy level appears, as illustrated to the right.

Use \( > \) to bring focus to the box and press **ENTER**. Use the alphanumeric keypad to enter the desired accuracy level. Use the **Backspace** function key to erase digits. Press **ENTER** when done.

Press **Apply and Exit** to store the changes.

---

**Figure 27 - Navigational algorithm and RAIM accuracy level**
3.7.3 Finish Creating a Route

Once the correct waypoints exist in the route and navigation algorithm and RAIM accuracy level have been specified for the legs where necessary, finish creating the route by pressing function key **Apply and Exit** in the Create Route view. This brings up the Route List view again, with the newly created route included.

![Route List view with newly created route](image)

3.8 Review an Existing Route

To review the details of an existing route, go to the Route List view. The view can, if in another view in the Plan Voyage mode, be accessed by pressing the **ESC** key a few times until the top level view of the mode is reached, followed by the **Route List** function key. The mode is accessed by pressing **MODE** followed by function key **PLAN VOYAGE**.

Select the desired route using ^ ^ and press the **ENTER** key. The View Route view is displayed.
When first entered, this view displays the waypoints that the route is made up of. To walk through the route, use \( \wedge \) \( \vee \) to scroll through the list. To view the full name, position and time of creation for a specific waypoint, highlight the waypoint using \( \wedge \) \( \vee \) and press **ENTER** or the View Waypoint function key. The View Waypoint view is displayed as illustrated below. To leave the view and get back to the View Route view, press **ESC**.

Press function key Route Legs to display the legs the route is made up of. The following view is shown.
Use \(\uparrow, \downarrow\) to scroll through the list. For each leg, the initial bearing to head on each leg is shown, as well as its length. The navigation algorithm and any RAIM level set on that leg is also displayed. To get details of a specific leg, select it using \(\uparrow, \downarrow\) and press ENTER or the View Leg function key. The View Leg view is shown, as illustrated below.

Press ESC to return to the View Route view.

When done reviewing the route, press the Sail Forward or Sail Reverse function keys to sail the route, or press the Esc key to return to the Route List view.

### 3.9 Start Sailing a Route

Access the Route List view. The view is present in Plan Voyage mode, accessed by pressing the MODE key followed by the PLAN VOYAGE function key. If in another view in...
the mode, pressing **ESC** a few times will bring up the top level view of the mode with function keys for accessing the main views of the mode. Press function key **Route List**.

A short-cut to the Route List view is also available by a function key at the second page of the top level view in Navigate mode as described on page 48 of this manual.

Highlight the route to sail using `^` `v`, and press the function key **Sail Route**. The Sail Route view is displayed, illustrated below.

- Press function key **Sail Forward** to start sailing the route in the direction it is shown. Use Sail Reverse to sail the route in its reverse direction.

  Once a route is to be sailed, a copy of the selected route is made into the active route and the Nav view is displayed, as illustrated below.
For information on how to navigate following a route, see the next section.
3.9.1 Navigate Towards a Waypoint and Follow a Route

Navigating towards a waypoint and on a route is done in Navigate mode. To enter this mode, press the *MODE* key followed by the function key *NAVIGATE*. If in another view in this mode, press *ESC* a few times to bring up the top view of the mode. Press function key *Nav* to show the Nav view. This view contains several vital functions to aid the operator in navigating towards waypoints and following routes. The view is illustrated below.

![Figure 36 - Nav view](image)

When sailing towards a waypoint using the Sail To function, and when sailing towards the first waypoint of the active route, the view shows distance and bearing towards the next waypoint. When having passed the first waypoint of the active route, the view also starts displaying current cross-track error.

To navigate towards the next waypoint, keep current course over ground (COG) close to the bearing to the next waypoint (BRG). In the lower rectangle, current course deviation is illustrated by the distance between the bold vertical bar and the thin center line. To steer to the next waypoint, make the bold vertical bar stand over the center line. The rectangle can represent a course deviation of ± 30°.

Once the first waypoint of the active route has been reached, the view begins displaying current cross-track error. The cross-track error is the distance between current position and the planned track, and is visualized by the distance between the boat symbol and the thin center line. The cross-track error scale of the rectangle is visualized by the Limit value. See the illustration below.

![Figure 37 - Cross-track error and course deviation](image)
To more quickly reduce the cross-track error, steer back towards a point on current leg closer to you than the next waypoint. While steering back to current leg, current course indicator should stand on the opposite side of the center line compared to the cross-error symbol, as illustrated above.

If desired, current cross-track error can be set to zero by pressing the function key **Reset XTE**. It is also possible to manually skip the next waypoint by pressing function key **Skip Waypoint**.

The view is described in detail in section 4.8.3 “Nav” on page 58 in the Reference chapter. The cross-track error limit is configured in the Nav Config view, described on page 125.

### 3.9.2 Plot the Active Route

The position of the ship and the active route can be graphically visualized in the Plot view. To enter this view press the **MODE** key followed by the function key **NAVIGATE**. If in another view in this mode, press **ESC** a few times to bring up the top view of the mode. Press function key **Plot**. The view plots the waypoints and legs of the active route. The waypoint currently used for navigation is indicated by a double circle. The plot also visualizes cross-track error limit of current leg, as shown below.

![Figure 38 - Cross-track error limit of current leg](image)

Use the function keys **Zoom In** and **Zoom Out** to increase or decrease the scaling of the plot. By pressing the function key **Show Track** the sailed track is shown as well. Refer to page 69 for a detailed description of the view.

### 3.9.3 View the Active Route

To see the total and remaining length of the active route, enter the Active Route view from the top level view in Navigate mode by pressing function key **Active Route**. The view also illustrates the remaining waypoints of the route and includes functions for editing the active route, setting an ETA target and manually selecting which waypoint in the route to navigate towards. It is also possible to end the active route by pressing the
function key **End Route**. Optional views with display of additional information are also available.

The view is described in detail in section 4.8.4 “Active Route” on page 61.

![Active Route view](image)

**3.9.4 Alarm List and Status**

Current alarm status can be viewed under the Alarm List view, in the Alarms & Msgs mode. To enter the mode, press the **MODE** key followed by the **ALARMS & MSGS** function key. Then press function key **Alarm List** to enter the view. Active alarms are marked with an exclamation mark (!).

![Alarm List view](image)

On entrance, the view only shows status of enabled alarms. To show alarms that have been disabled, press the function key **Disabled Alarms**. For more information on alarm...
3.9.5 Visual Settings

The display backlight, contrast, LED illumination, button illumination and day or night settings can be changed in the Visual Config view. Changes made in this view directly affect the corresponding visual setting.

To enter this view, press the DISPLAY key. The following view is shown:

To change between day and night settings, press Switch to Day or Switch to Night. The day and night settings are stored separately, so different settings can be specified for day and night operation. To change backlight, contrast, LED illumination or button illumination, press the corresponding function key. Regardless if the Backlight, Contrast, Led Illum. or Button Illum. function key is pressed, a view with a bar graph is shown as illustrated below.

Figure 41 - Visual Config view

Figure 42 - Visual Config view, bar graph
Use < > to decrease or increase the value of the selected setting. The corresponding screen or illumination setting is directly affected as the bar is moved.

To restore the settings to factory default, press PAGE in order to view a second page of function key. Press the function key Restore Default. A confirmation dialog appears, press ENTER to confirm.

To exit the Visual Config view, press DISPLAY or ESC.
4  REFERENCE

4.1  Status LEDs

The following sections describe the status indicating light emitting diodes (LEDs) of the Display and Navigation Sensor.

4.1.1  Display LEDs

The three LEDs located above the screen of the Display are used to indicate the RAIM accuracy status of the ship’s current GPS position.

4.1.1.1  Green LED (Safe state)

The green LED indicates, when lit, safe state. It is lit if the probable position error is less than the RAIM accuracy level with more than 95% certainty.

4.1.1.2  Yellow LED (Caution state)

The yellow LED indicates, when lit, caution state. It is lit if the system cannot safely determine if the position accuracy is better or worse than the current RAIM accuracy level. It is also lighted if no position is available.

4.1.1.3  Red LED (Unsafe state)

The red LED indicates, when lit, unsafe state. It is lit if the position error exceeds the current RAIM accuracy level with more than 95% certainty.

4.1.2  Navigation Sensor LEDs

4.1.2.1  PWR LED

The red LED marked “PWR” indicates, when lit, that power is applied to the Navigation Sensor.

4.1.2.2  GPS LED

The yellow LED marked “GPS” indicates, when continuously lit, that the Navigation Sensor has obtained a solid GPS lock.

4.1.2.3  CORR LED

The yellow LED marked “CORR” indicates, when continuously lit, that the Navigation Sensor has achieved a solid radio beacon lock or a SBAS lock with a bit error rate (BER) better than 150. If the SBAS BER is higher than 150 but the receiver is still locked, this LED will blink showing that the lock is marginal. This LED is also lit while using external DGPS corrections input through the User1 port.
4.1.2.4 DGPS LED

The green “DGPS” LED indicates that the Navigation Sensor has achieved a differentially corrected position. It is continuously lit when the range residuals in the position solution have settled below a threshold value.

4.2 Icon Description

The following sections describes the different icons that can appear on the screen of the Display.

Message Symbols

Unread DGPS message.

Redundant Operation Status Symbols

Redundant operation active.

Redundant operation active. Synchronizing from external unit.

Redundant configuration enabled. No communication with external unit.

GPS Status Symbols

Position available and corrected using externally input corrections.

Position available and corrected using corrections from the internal radio beacon receiver (DGPS version only).

Position available and corrected using SBAS differential corrections.

Position available, not differentially corrected.

No valid position information.

No communication with the Navigation Sensor.

DGPS Integrity Alert active. Details of alert displayed in the GPS Status View.

The HDOP value has exceeded limit.

Miscellaneous Symbols

Active Alarm(s).
4.3 Adjust Settings

If desired, some presentation and navigation characteristics of the Display can be adjusted to the user's preferences. The most central parameters that can be adjusted are briefly described below.

4.3.1 SOG and COG Smoothing

The Navigation System supports smoothing of SOG and COG values for more stable readings. See section 4.11.7.1 “GPS Config” on page 131.

4.3.2 Source of Differential Corrections

The Navigation System can be set to use IALA radio beacon (DGPS version only) or SBAS differential corrections. It is also possible to turn off the use of differential corrections or use external corrections in RTCM SC-104 format received on User Port 1. See section 4.11.7.1 “GPS Config” on page 131.

4.3.3 Beacon Receiver Tuning Mode (DGPS version only)

The tuning and bit rate modes of the DGPS sensor internal beacon receiver can be set to manual or automatic modes as described in section 4.11.7.2 on page 134.

4.3.4 Maximum Age of Differential Corrections

The maximum allowed age of differential corrections can be configured. Default is 120 seconds. See section 4.11.7.1 “GPS Config” on page 131.

4.3.5 Adjust Enabled and Disabled Alarms

Enable alarms for those alarm conditions that indications are desired for. Per default, several of the alarms are disabled. Alarms that are invalid in the specific system configuration can remain disabled. If not, such alarms will always be active. Adjusting alarms is described in section 4.11.5 on page 128.

4.3.6 Route Leg Default Navigation Algorithm

The default navigation algorithm for created legs can be set to one of Great Circle and Rhumb Line. The factory default is Rhumb Line. The different algorithms are described in chapter 2 on page 11, and selection of default algorithm in section 4.11.4 “Nav Config” on page 125.

4.3.7 Waypoint Pass Criterion

The waypoint pass criterion can be set to one of Manual, Distance, Bisector Line and Perpendicular Line. The different pass criteria are described in chapter 2 on page 11 and selection of criterion in section 4.11.4 “Nav Config” on page 125.
4.3.8 Cross-Track Error Limit

The cross-track error limit determines the allowed cross-track error, and thus also when the XTE Limit Exceeded alarm shall be raised. The parameter is described in section 4.11.4 “Nav Config” on page 125.

4.3.9 Distance or Time for Waypoint Approach Alarm

The distance to or estimated time before arrival at the next waypoint where an Approaching Waypoint alarm is raised can be configured, as described in section 4.11.4 “Nav Config” on page 125.

4.3.10 UTC or Local Time Frame

It can be selected whether displayed time shall refer to UTC or a to user defined local time frame with constant offset from UTC. Refer to section 4.11.2 “Time Config” on page 122.

4.3.11 Range, Speed and Depth Units

The units used for displaying range, speed and depth values can be configured. Configuration of units is described in section 4.11.6 “Units Config” on page 129.

4.3.12 Route Leg Default RAIM Accuracy Level

The default RAIM accuracy level set when specifying accuracy level for a leg. Configuration of the parameter is described in section 4.11.4 “Nav Config” on page 125.

4.3.13 Position or Next Waypoint in Status Bar

Status bar information at the top left corner of the display can be selected between current position (if available), or the name of the waypoint that the system currently is navigating towards. Refer to section 4.11.4 “Nav Config” on page 125.

4.4 Man Over Board

The MOB (Man Over Board) key can be used to simultaneously mark a position and starting to navigate towards it, for quick response to emergency situations.

To activate the MOB function, press and hold the MOB key for at least 5 seconds.

Once activated, a MOB waypoint is created and the Navigation System will start navigating towards that waypoint. The active route is suspended until the MOB functionality is deactivated. The Display will show a scalable Plot view, plotting the position of both the MOB waypoint and the ship, as well as displaying the bearing and distance to the MOB waypoint and the ship’s current speed and course over ground. See illustration below.
Clear MOB and resume navigation on active route

1. Press function key Clear MOB.
2. Answer Yes to the confirmation dialog and press Enter.

Show Time In Water (TIW)

1. Press function key Show TIW. Press function key Show Time Act. to return to showing the time MOB was activated.

The system can store up to 20 MOB waypoints at the same time. If more MOB waypoints are created, the oldest will be removed. If the information in a MOB waypoint is to be stored for long term reference, it is therefore recommended to copy it to another medium or store it in a normal, non-MOB waypoint (which is easily achieved using the Create Wp From function key in the Waypoint List view, described on page 98 and onwards).

MOB waypoints are named “MOB date time” and shown in the Waypoint List view.

4.5 Event Mark

The Mob key can, as well as being used for emergency situations as described above, also be used to quickly create a waypoint for easy marking of current position. To create a waypoint for the current position, press the Mob key momentarily. **Hold it down no more than 1 second.**

Pressing **MOB** momentarily brings up the following view.
The Lat and Long values will be set up to position of the ship when the MOB key was pressed. The waypoint is also given a default name. To change its name, do the following:

1. Select the Name field using " up. Press ENTER.
2. Use the alphanumeric keypad to enter name text, and the Backspace function key to erase characters. Use function key Capslock to change between upper and lower case letters.
3. Press ENTER when done.

Press Apply and Exit to create the waypoint. Press ESC to abort creating the waypoint. The Create Waypoint view is described in detail on page 104.

4.6 Alarm Pop-Ups

There are two types of pop-up windows, alarms and alerts. Pop-up windows can appear any time during system operation to notify the user of an event or alarm condition. To acknowledge an alarm or an alert and close the pop-up window, press ENTER. Active alarms are listed in the Alarm List view described on page 111. For explanation of different alarms, see Appendix, section 5.1 “Alarm Messages” on page 157.
It is possible to disable alarms that are invalid for the specific system configuration. If not disabled, such alarms will otherwise always be active. For example, if no depth sensor is connected to the system then the alarm Depth Data Lost should be disabled. This is described in section 4.11.5 on page 128.

4.7 Changing System Mode

The Display has four system modes: Navigate, Plan Voyage, Alarms & Msgs and Config. The system modes corresponds to the kind of operation the user is performing. An overview of the different modes is present in section 3.3 “System Modes” on page 17. Each mode is also described in detail in the following sections of this chapter.

**Accessing Navigate mode views from a different mode**

1. Press **MODE** key.
2. Press function key **NAVIGATE**.
3. To show the second page of main views, press **PAGE**.
4. Press the function key associated with the desired view.

**Accessing Plan Voyage mode views from a different mode**

1. Press **MODE** key.
2. Press function key **PLAN VOYAGE**.
3. Press the function key associated with the desired view.

**Accessing Alarms & Msgs mode views from a different mode**

1. Press **MODE** key.
2. Press function key **ALARMS & MSGS**.
3. Press the function key associated with the desired view.

**Accessing Config mode views from a different mode**

1. Press **MODE** key.
2. Press function key **CONFIG**.
3. To show the second page of main views, press **PAGE**.
4. Press the function key associated with the desired view.
4.8 Navigate Mode

The *Navigate* mode contains a set of views related to typical ship navigation tasks during normal voyage operation. The mode is entered by pressing the *Mode* key followed by function key **NAVIGATE**. Press **ESC** a few times anywhere in the mode for access of top level function keys.

4.8.1 Navigate Mode Overview

The top level function keys of the *Navigate* mode are illustrated below. Press **ESC** a few times anywhere in the mode to bring them up.

![Figure 46 - Navigate, First Page](image)

A second page of function keys becomes available by pressing the **PAGE** key as illustrated below.

![Figure 47 - Navigate, Second Page](image)

- *Position* shows the last calculated position, speed and course over ground and has subviews for GPS and radio beacon status, satellite information and RAIM.
- *Nav* shows textual and graphical information on the next waypoint as well as current speed and course over ground, cross-track error and ETA.
- *Active Route* lists the remaining waypoints in the active route and enables functions for editing the route, setting ETA target and manually selecting which waypoint in the route to navigate towards.
• *Plot* shows a plot of the waypoints and legs of the active route and the cross-track error limit of current leg.

• *User Defined* gives access to up to five user configurable views, capable of displaying different types of navigation and sensor data.

• *Trip Logs* provides functions for calculation of travelled distances and average speeds.

• *Anchor Watch* provides a function for activation of an alarm when the deviation from a reference position exceeds a preset range.

• *Route List* provides a short-cut to the *Route List View* from which it is possible to activate a route or select a waypoint for navigation.
A graphical overview of the different views present in *Navigate* mode are shown in the next diagram.

![Diagram of different views in Navigate mode]

**Figure 48 - Overview of the Different Views in the Navigate Mode**

Note: The *Beacon Status* view and subviews is only present when using the DGPS Navigation Sensor.

The views are further described below.
4.8.2 Position

The Position view shows the last calculated position, speed over ground (SOG) and course over ground (COG). The position shown is always the position of the Navigation Sensor. The position is represented by latitude and longitude. Current time, in UTC or local time, is also displayed. The view can contain four subviews, GPS Status, Beacon Status, Satellite Information and Set RAIM. The Beacon Status view is only present if an DGPS Navigation Sensor is used as the navigation sensor.

If the navigation system not is able to calculate new position information, the latest valid information is shown in conjunction with the time when it was calculated. The icon in the status bar will indicate that no new position information is available. See section 4.2 “Icon Description” on page 42 for further details on the icons.

Note: COG is based on track angle which requires that the ship is moving. Thus, COG data is not displayed when the SOG value is below 0.3 knots.

View GPS Status

1. Press function key GPS Status.
2. See “GPS Status” on page 52.

View Beacon Status

1. Press function key Beacon Status.
2. See section “Beacon Status” on page 53.

Note: The Beacon Status view is only present when using a DGPS Navigation Sensor.

View satellite information

1. Press function key Satellite Info.

Figure 49 - Position view
2. See section “Satellite Info” on page 55.

**Set RAIM accuracy**

1. Press function key **Set RAIM**.
2. See section “Set RAIM” on page 57

4.8.2.1 GPS Status

The GPS Status view displays information related to the current navigation solution.

- Operating mode: **NO GPS** (no navigation solution), **GPS** (GPS only navigation solution) or **DGPS** (differentially corrected navigation solution).
- Number of GPS satellites from which signal is received and number of GPS satellites currently used in the navigation solution.
- DGPS warning, related to an active DGPS **Integrity Alert**. The warnings that can be displayed are:
  - **No Signal**. A correction source for GPS other than None has been selected in the GPS Configuration view and more than ten seconds have passed since new differential corrections were applied to the navigation solution.
  - **Station Unhealthy**. Correction source **Beacon** has been selected and the radio beacon station in use indicates an unhealthy status.
  - **Station Unmonitored**. Correction source **Beacon** has been selected and the radio beacon station in use indicates an unmonitored status.
  - **Poor signal**. Correction source **Beacon** has been selected and the word error rate of the received signal in use exceeds 10%.
- DGPS reference station ID. The reference identity of the currently applied differential corrections (if any).
- DGPS correction age. The time difference between navigation solution and reference time for the applied corrections (if any).
- DGPS correction source: **Beacon, SBAS, External** or None (-).
- Beacon receiver tuning mode: **Manual** or **Frequency Scan**. Only displayed when correction source is **Beacon**.
- RAIM accuracy limit.
- RAIM status: **Safe, Caution** or **Unsafe**.
The RAIM status is also indicated by the LEDs on the front of the display unit. The green LED corresponds to the safe state, the yellow to caution state and the red to unsafe state.

4.8.2.2 Beacon Status

The Beacon Status view shows information related to the DGPS Navigation Sensor’s beacon reception. The view is only accessible if an DGPS Navigation Sensor is used as navigation sensor. The header will include DGPS warning information if beacon is selected as correction source and a DGPS Integrity Alert is active. The header will display ‘Not in Use’ if a correction source another than beacon is selected. Use \( \wedge \vee \) to scroll in the list with following information.

- Reference Station ID: The reference identity of received corrections from the tuned beacon station.
- Tuned frequency.
- Tuning mode. Current beacon receiver frequency selection mode: Manual or Frequency Scan. When tuning mode is manual, a function key Auto Tuning is available for simple switch over to automatic tuning mode (frequency scan).
- Signal quality as determined by current word error rate. The signal is regarded as poor when word error rate exceeds 10%.
- Health indication received from the tuned beacon station.
- Message throughput.
- Word error rate, percentage of bad data words in the last 25 words received.
- SNR, signal to noise ratio. All values above 15 are good SNRs for the beacon signal.
- Signal strength.
- Bit rate.
- Beacon receiver bit rate selection mode: *Manual* or *Auto*.
- Firmware version for the internal beacon receiver.

![Figure 51 - Beacon Status view](image1)

![Figure 52 - Beacon Status view](image2)

To view a list of the closest beacon stations with information on each station, press the function key *Closest Stations*. 
In the Closest Beacon Stations view it is possible to view more information on each station by using \( \wedge \) \( \vee \) to scroll in the list and then press function key **Extended Info** for the desired beacon station.

To manually lock on a specific beacon station, scroll down to the desired station by using \( \wedge \) \( \vee \) and press the function key **Lock on Station**. A confirmation dialog appears, press **ENTER** to confirm.

### 4.8.2.3 Satellite Info

The *Satellite Information* view shows information relating to GPS satellites that the Navigation Sensor is receiving or expecting to receive signals from. The view displays the ID, elevation and azimuth of each satellite, and current signal to noise ratio (SNR) of each satellite’s signal. The elevation value represents the satellite’s angular height above the horizon. The azimuth value represents the satellite’s angular horizontal position, counted clockwise from north.

Use \( \wedge \) \( \vee \) to scroll in the list.
4.8.2.4 SBAS Info

The SBAS Information view shows information relating to the one or two geostationary SBAS satellites that the Navigation Sensor is receiving or expecting to receive signals from. The view is reached from the Satellite Information view by function key SBAS Info. Identity (PRN number) and longitude of the satellite as well as elevation and azimuth angle from the current position to the satellite and bit error rate of the received signal is provided by the view. Additionally, when using SBAS as correction source the reference id of applied corrections is displayed in the header of the view. The header will display ‘Not in Use’ if a correction source another than SBAS is selected.
4.8.2.5 Set RAIM

The Set RAIM view is used to modify the used RAIM accuracy level. The RAIM accuracy level is always set in meters. In the case the active route has RAIM accuracies specified for any of its legs, a RAIM accuracy level specified in this view will override the RAIM settings in the active route. If this is the case, you will be warned before any RAIM level is set.

When overriding active route RAIM accuracy levels, the RAIM accuracy level indication will appear underlined, as illustrated in the figure to the right. When overriding, accuracy levels specified in the active route does not affect the used RAIM accuracy level. To stop RAIM overriding, enter the Set RAIM view and press the Cancel Override function key that is present in this view when the override condition is active. The override RAIM condition is also automatically cancelled when reaching the end of the active route.

![RAIM Accuracy Level](image)

Figure 57 - RAIM Accuracy Level

**Set RAIM accuracy level (in meters)**

1. Press **ENTER**.
2. Use the alphanumeric keypad to enter new the RAIM accuracy level in meters. Use the **Backspace** function key to erase digits. Press **ENTER** when done.
3. Press function key **Apply and Exit** to store the changes.
4. If the active route contains any set RAIM accuracy levels, a warning pop-up will be displayed.
5. Press ENTER to confirm that the set RAIM accuracy level should override the RAIM settings in the active route. Press > and ENTER to abort.

**Cancel override condition**

1. Press the function key Cancel Override.
2. Note that this function key only is present when the override condition is active.

4.8.3 Nav

The Nav view presents fundamental navigation data and aids the user in navigating towards a waypoint and following a route. It presents information such as the bearing and range to the next waypoint, the ship’s current course over ground (COG) and speed over ground (SOG) and current cross-track error (if sailing on a route). The view is also an entry point to the three partially different subviews: Show Next Wp, Show ETA and Show Wp Info. Show Next Wp shows a close-up plot of the next waypoint. Show Wp Info shows the name of the active route, of the previous waypoint and of the current waypoint. Show ETA shows current Estimated Time of Arrival to the end point of the route as well as target ETA (if defined).

Note: COG is based on track angle which requires that the ship is moving. Thus, COG data is not displayed when the SOG value is below 0.3 knots.
The rectangle in the lower part of the view visually represents current navigation information, as illustrated in the figure above. The difference between present course and the course to head to exactly navigate towards next waypoint is illustrated by the distance between the bold vertical bar and the center line. The bold vertical bar represents current course and the center line represents the bearing to the next waypoint. To steer towards the waypoint, make the bold vertical bar stand over the center line. The rectangle can represent a course deviation of ± 30°.

If sailing on a route and having reached the first waypoint, the rectangle also presents current cross-track error, illustrated by the distance between the boat symbol and the center line. The cross-track error limit determines the scale of the rectangle; when the boat symbol is outside the rectangle the cross-track error limit has been exceeded and the XTE Limit Exceeded alarm will be raised (if enabled).

**Reset cross-track error**

1. Press function key *Reset XTE*.

The cross-track error is set to zero by inserting an temporary waypoint at the current position in the active route. The temporary waypoint will not be saved if the active route is saved.

**Skip next waypoint**

1. Press function key *Skip Waypoint*.

**Show next waypoint plot**

1. Press function key *Show Next WPT*.
2. The central region of the display shows a close-up of the remaining leg to the next waypoint oriented upwards. Initial bearing of next leg in the route and estimated time to go (TTG) to the next waypoint are also displayed. The plot is scaled such that the distance from the mid point lower edge of the plot area to the next waypoint equals current distance to the waypoint, unless this distance is less than 100 meters. As the waypoint is approached, it is possible to increase resolution by hiding the plot as described in the next step and then re-open it.

![Next waypoint plot](image)

Figure 60 - Next waypoint plot

3. Hide the close-up by pressing function key **Hide Next**.

**Show estimated time of arrival (ETA)**

1. Press function key **Show ETA**.

2. Estimated time of arrival to the final waypoint in the active route is displayed. If a target ETA has been set, it is displayed as well along with the speed necessary to reach the destination in time.

![Estimated time of arrival](image)

Figure 61 - Estimated time of arrival
3. Hide the display of ETA by pressing function key **Hide ETA**.

Note: The calculation of ETA and TTG is dependent on the average SOG time parameter described in section 4.11.4 “Nav Config” on page 125.

**Show waypoint information**

1. Press function key **Show WPT Info**.
2. The following view is displayed, including the name of the active route and the next and previous waypoint.

![Waypoint information](image)

Figure 62 - Waypoint information

4.8.4 **Active Route**

The Active Route view shows information of the active route, including route name, route length, number of total and remaining waypoints, ETA and details of the remaining waypoints.

From this view it is possible to access the Edit Active Route, Set Target ETA and Set Next Wp subviews. The Edit Active Route subview can be used to modify legs and waypoints of the active route. The Set Target ETA view can be used to set a target for Estimated Time of Arrival. The Set Next Wp view can be used to change the waypoint in the active route that currently is being navigated towards. The latter is useful to quickly skip to a certain position in the active route or to unpass a previously passed waypoint.

The Active Route view is illustrated below. It displays the remaining waypoints in the route. For the first waypoint in the list, current bearing and remaining distance to it is displayed. For the other waypoints, initial distance and bearing to it calculated from the waypoint before it is displayed. For each remaining waypoint the navigation algorithm and RAIM setting used when sailing towards that waypoint is shown.
Alternate information sets relating to the active route can be displayed using the function key initially labeled Show Position as follows.

Press function key **Show Position**. Latitude and longitude of each waypoint is displayed.

Press function key **Show Acc Dist**. Accumulated distance along the route to each waypoint is displayed.
Press function key *Show WPT ETA*. Estimated time of arrival to each waypoint in the route is displayed.

Press function key *Show WPT T.ETA* (available only if a target ETA has been set). Target arrival time at each waypoint corresponding to the target ETA for the complete route is displayed.
Press function key **Show BRG/DIST**. The default initial view of bearing and range between waypoints is displayed once again.

**Edit the active route**

1. Press function key **Edit Route**. The Edit Active Route view is displayed, as described in section 4.8.4.1.

**Set target ETA (Estimated Time of Arrival)**

1. In the Active Route view press function key **Set Target ETA**. The ETA view is shown, as illustrated below.
2. Press **ENTER** to start editing the target ETA corresponding to a goal for the arrival time at the final waypoint in the active route. The value is entered on the form MM-DD HH:MM (month, day, hour and minute). Use the alphanumeric keypad to enter digits. Use < > to select which digits to edit.

3. Press **ENTER** when done.

4. Press function key **Apply and Exit.**

**Unset target ETA**

1. Press function key **Set Target ETA.** The ETA view is shown, as illustrated above.

2. Press function key **Clear Target ETA**

**Change waypoint to navigate towards**

1. In the Active Route view press function key **Set Next WPT.** The Set Next Waypoint view is shown, as illustrated below.

   ![Figure 69 - Set Next Waypoint view](image)

   2. Highlight the waypoint that should be set as waypoint to navigate towards using ▲▼.

3. Press function key **Select Waypoint.**

**Stop sailing current route**

1. In the Active Route view press function key **End Route.** A pop-up request for confirmation will be displayed before the active route is terminated.
4.8.4.1 Edit Active Route

The Edit Active Route view is used to modify the active route. It displays all waypoints and legs in the active route, regardless if they are passed or not and including waypoints created when resetting cross-track error in the Nav view. It is possible to modify navigation algorithm and RAIM setting for each leg, as well as remove, modify and insert waypoints. Changes made to the active route leaves the original route unaffected. It is however possible to save the active route and thus update the original route to reflect changes made.

Note: Waypoints named “XTE Reset-..” have been inserted into the route when resetting the cross-track error. When saving changes, they will not be stored. The original route will not be affected by changes made to legs towards or between such waypoints, nor will such legs be created in the original route. These waypoints are not viewed as part of the planned route.

When entered, the view displays the legs of the route, as illustrated below.

Press function key **Route Waypoints** to display the waypoints of the active route and the associated function keys, as illustrated in the below figure.

![Figure 70 - Edit Active Route](image)

![Figure 71 - Active Route Waypoints](image)

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REFERENCE
**Change navigation algorithm for a leg in the active route and**

**Change RAIM accuracy for a leg in the active route**

1. Show route legs, by pressing function key **Route Legs** if necessary.
2. Select the leg to modify using \( \wedge \vee \). Press **ENTER** or function key **Edit Leg**.
3. The Edit Leg view is displayed. See below. 

![Edit Leg View](image)

**Figure 72 - Edit Leg view**

4. To change the used navigation algorithm, select the Navigation Algorithm field using \( \wedge \) and press **ENTER**. Use \( \wedge \vee \) to highlight the desired algorithm, and press **ENTER** when done.

5. To change the RAIM accuracy level for the leg, select the **RAIM Accuracy** field using \( \vee \) and press **ENTER**. Select the desired RAIM setting using \( \wedge \vee \). Select unchanged to set the leg to not affect the RAIM level at all. Select level to specify a RAIM accuracy level to switch to when navigating on the leg. Press **ENTER**.

6. If level was selected above, then use > to bring focus to the right box that appeared when level was selected. Press **ENTER** and enter the RAIM accuracy level using the alphanumeric keypad. Use the **Backspace** function key to erase digits. Press **ENTER** when done.

7. Press the function key **Apply and Exit** to save changes made.

**Insert waypoints into the active route**

1. Show route waypoints, by pressing function key **Route Waypoints** if necessary.
2. Use \( \wedge \vee \) to highlight the waypoint after which the new waypoint should be inserted.
3. Press the function key **Insert Wps After**.
4. The Insert Waypoints view is displayed (described on page 95). Highlight the first desired waypoint to insert using \( \wedge \vee \), possibly with the aid of the different sort and find functions present in the view.

5. Press function key **Insert Waypoint**.

6. Repeat the procedure of highlighting and inserting waypoints until the desired waypoints are selected for insertion into the route.

7. Press function key **Return**.

**View or edit a waypoint**

1. Highlight the waypoint to view or edit using \( \wedge \vee \) and press **ENTER** or the **View Waypoint** function key.

2. The View Waypoint view is displayed, as described on page 101.

3. If desired, press function key **Edit Waypoint** to edit the waypoint.

4. The Edit Waypoint view is displayed, as described on page 101.

**Remove waypoint from the active route**

1. Highlight the waypoint using \( \wedge \vee \).

2. Press function key **Remove Waypoint**.

**Update the original route with the changes made in the active route**

1. Press function key **Store Route**.
4.8.5 Plot

The Plot view displays a plot over the active route, indicating the ship’s position, waypoints, legs and cross-track error limit range for current leg. It is possible to zoom in and out in the plot, as well as turning on plotting of the ship’s sailed track. The waypoint currently being used for navigation is indicated by a filled symbol in the plot.

Note: COG is based on track angle which requires that the ship is moving. Thus, COG data is not displayed when the SOG value is below 0.3 knots.

![Figure 73 - The Plot view](image)

**Show more details in the plot**

1. Press function key *Zoom In*

**Show less details in the plot**

1. Press function key *Zoom Out*.

**Show / Hide Track**

1. Press function key *Show Track* to turn on plotting of the ship’s track, and function key *Hide Track* turn it off.

**Skip next waypoint**

1. Press function key *Skip Waypoint*. 
4.8.6 User Defined

The User Defined Views view provides functionality for creation of up to five user defined views. The information shown in the fields of each view can be configured as described below. The different types of information that can be shown (if available) are listed in the table below.

Table 1 - User Defined Views

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty</td>
<td>No information displayed in this field.</td>
</tr>
<tr>
<td>Alg, WPT</td>
<td>Current nav algorithm (GC or RL) and the name of the waypoint that the system currently is navigating to.</td>
</tr>
<tr>
<td>Algorithm</td>
<td>Current nav algorithm (GC or RL).</td>
</tr>
<tr>
<td>BRG</td>
<td>Bearing to next waypoint. Can be displayed in big (B), medium (M) or small (S) format.</td>
</tr>
<tr>
<td>COG</td>
<td>Course over ground. Can be displayed in big (B), medium (M) or small (S) format. COG data is not displayed when SOG is below 0.3 knots.</td>
</tr>
<tr>
<td>Dialog Title</td>
<td>Name of view: ‘User Defined View #’ where # is a number from 1 to 5 depending on the current view.</td>
</tr>
<tr>
<td>DPT</td>
<td>Depth information input through the serial interface. Can be displayed in big (B), medium (M) or small (S) format.</td>
</tr>
<tr>
<td>ETA</td>
<td>Estimated time of arrival to the end waypoint of the current active route.</td>
</tr>
<tr>
<td>ETA Target</td>
<td>A user input value for target time of arrival to the end waypoint of the current active route.</td>
</tr>
<tr>
<td>From WPT</td>
<td>Name of the previous waypoint in the current active route. Can be displayed in big (B), medium (M) or small (S) format.</td>
</tr>
<tr>
<td>HDG (t)</td>
<td>True heading information input through the serial interface. Can be displayed in big (B), medium (M) or small (S) format.</td>
</tr>
<tr>
<td>HDOP</td>
<td>Horizontal dilution of precision.</td>
</tr>
<tr>
<td>Leg Plot</td>
<td>A plot oriented with the bearing of the current leg upwards.</td>
</tr>
<tr>
<td>Next BRG</td>
<td>Bearing of the next leg in the current active route. Can be displayed in big (B), medium (M) or small (S) format.</td>
</tr>
<tr>
<td>Next WPT</td>
<td>The name of the waypoint the system currently is navigating towards. Can be displayed in big (B), medium (M) or small (S) format (length).</td>
</tr>
<tr>
<td>Plot</td>
<td>A plot with zoom functionality oriented with north upwards. A big (B), small (S) and a wide (W) version is available.</td>
</tr>
<tr>
<td>Position</td>
<td>Current latitude and longitude. Can be displayed in big (B) and small (S) format.</td>
</tr>
</tbody>
</table>

Continued
Table 1 - User Defined Views (Continued)

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNG</td>
<td>Distance to the next waypoint in big (B) medium (M) and small (S) formats.</td>
</tr>
<tr>
<td>Route</td>
<td>The name of the current active route. Available in big (B), medium (M) and small (S) format.</td>
</tr>
<tr>
<td>Route Info</td>
<td>Number of remaining waypoints and remaining length of the current active route.</td>
</tr>
<tr>
<td>SOG</td>
<td>Current groundspeed in big (B), medium (M) and small (S) format.</td>
</tr>
<tr>
<td>Target SOG</td>
<td>Required groundspeed in order to reach the final waypoint of the current active route at the set target ETA. Available in big (B) and medium (M) sized formats.</td>
</tr>
<tr>
<td>Time Local</td>
<td>Date and time in local time frame with the currently set offset from UTC.</td>
</tr>
<tr>
<td>Time UTC</td>
<td>Date and time in UTC time frame.</td>
</tr>
<tr>
<td>TTG</td>
<td>Remaining time to next waypoint at current (filtered) groundspeed. Available in big (B) medium (M) and small (S) sized formats.</td>
</tr>
<tr>
<td>WCV</td>
<td>Waypoint closure velocity—current velocity component towards next waypoint. Big (B), medium (M) and small (S) format.</td>
</tr>
<tr>
<td>XTE Bar</td>
<td>Graphic display of cross track error and difference between current COG and bearing to next waypoint. Available in big (B) and small (S) size formats.</td>
</tr>
</tbody>
</table>

Depending on the position on the screen, only a subset of the user defined options may be available depending on the available remaining screen space.

A User Defined Views view with three user views is illustrated below.

![User Defined Views](image)

Figure 74 - User Defined view
Create a new user defined view

1. In the User Defined Views view, press function key Create New. The following view is displayed:

![Figure 75 - Create user defined view](image)

2. Go to a desired position on the view to insert data using < >

3. Press ENTER and scroll down the list of available options to select the parameter that is to be displayed. Press ENTER again.

4. Repeat steps 2 and 3 above as many times as necessary. As an example, after a while it may look like this:

![Figure 76 - Create user defined view (example)](image)
5. Press function key **Apply** to view the result. In this example it may look like this:

![Figure 77 - User Defined view (example)](image)

6. If necessary, press function key **Edit** and repeat the procedure from point 2 to point 5 above to include any changes. When satisfied press **Esc** to return to the User Defined Views view.

**View or edit a user defined view**

1. In the User Defined Views view, press function key **User View #** where # is a number 1 to 5 depending on the view.
2. If required, press function key **Edit**.
3. Edit the contents of the view. Press function key **Apply** when satisfied.

In addition to **Edit**, User defined views will always include the function keys **Reset XTE** and **Skip Waypoint**. These have the same functionality as in the Nav view described on page 58. Additional function keys may be added depending on the selected items to display (e.g. zoom keys for plots).

**Create default user defined views**

1. In the User Defined Views view, press function key **Create Defaults**.
2. Creation of default views will remove any existing user defined views so use with caution. A warning will be displayed with request for confirmation. Press **ENTER** to confirm.

**Delete a user defined view**

1. In the User Defined View to be deleted, press function key **Edit**.
2. Press function key **Delete View**. A warning will be displayed.
3. Press **ENTER** to confirm and delete the view.
4.8.7 Trip Logs

The Trip Logs view shows a status summary of the three trip logs in the system. Two individual trip logs (#1 and #2) are available as well as a ‘total’ trip log.

The trip logs accumulate travelled distance during the on time of the navigation system. Trip logs #1 and #2 are individually resettable and will also provide accumulated time moving and average speed since last reset.

To access the Trip Logs view, go to the top level in Navigate mode. Press Page if necessary to bring up the second page of function keys and press Trip Logs. The Trip Logs view displays accumulated distance and average speeds as illustrated below.

```
58°45.2419 N
17°35.7435 E

TRIP LOGS

Trip Log #1: 20. NM (15.0 kn)
Trip Log #2: 15. NM (15.0 kn)
System Total: 3526.9 NM
```

Figure 78 - Trip Logs view

**View trip log details**

1. Press function key Trip Log #1 or Trip Log #2 to access the corresponding Trip Log view. This view is further described below.
4.8.7.1 Trip Log Details

The details of the two user resettable trip logs are displayed in the Trip Log #1 and Trip Log #2 views as illustrated below.

![Trip Log #1](image)

Accumulated distance since last reset, average speed during the time the system has been in motion as well as position and time of last reset is displayed.

**Reset trip log**

1. Press function key **Reset Trip Log**. A warning will be displayed with request for confirmation.
2. Press **ENTER** to confirm and reset the trip log.

If a valid GPS position is available, it will be captured and used as the starting position for the trip log. If no valid position is available, position will be captured the next time a valid position is available.

Note: Position displacement that occur when the display is switched off will not be included in the accumulated trip distance. Position displacement that occur when the display is switched on but no valid GPS position is available will be included in the trip distance when a valid position is received, provided that a valid position has been available at least some time after the display was switched on.

**Toggle between trip log #1 and #2**

1. Press function key **Next Trip Log**.
4.8.8 Anchor Watch

The Anchor Watch view provides functionality for activation of an alarm when the displacement from a reference position exceeds a certain limit.

Note: In order for an external or audible anchor watch alarm to be generated, the anchor watch alarm must be enabled as described in section 4.11.5 on page 128 of this manual.

To access the Anchor Watch view, go to the top level in Navigate mode. Press PAGE if necessary to bring up the second page of function keys and press Anchor Watch. The Anchor Watch view will be displayed.

Figure 80 - Anchor Watch view
Setting the Anchor Watch alarm distance

2. Press function key **Set Alarm Dist**. The following view is displayed.

![Anchor Watch alarm distance](image)

Figure 81 - Anchor Watch alarm distance

2. Press **ESC** and edit the Alarm value with the aid of function key **Backspace**, < > and the numerical keys.

3. When finished press function key **Apply**.

Note: The acceptable alarm distance must be within 1 to 1500 meters. The unit used for definition of the anchor watch alarm limit as well as for display of the current range to the reference position is configurable, as described in section 4.11.6 “Units Config” on page 129 of this manual.
**Activating Anchor Watch**

1. Press function key *Begin Watch*. The current position at the time will be captured as a reference position. The distance to the reference position will be calculated and compared to the alarm limit on a regular basis. The bearing and range from current position to reference position is displayed as illustrated below.

![Anchor Watch activated](image)

If the calculated range exceeds the alarm distance, the anchor watch alarm will be activated. Actions caused by the activation is pending on the current setting of the alarm configuration parameter as described in section 4.11.5 on page 128 of this manual.

Note: If the range subsequently falls below the alarm limit the anchor watch alarm condition will be deactivated. It will re-activate any time the range exceeds the alarm limit again.

**Terminating Anchor Watch**

1. Press function key *Terminate Watch*. A warning will be displayed with request for a confirmation.
2. Press *ENTER* to terminate the Anchor Watch.

4.8.9 Route List

The *Route List* function key at the top level in Navigate mode provides a short-cut to the Route List view in Plan Voyage mode. It is further described in section 4.9.2 “Route List” on page 81 of this manual.
4.9 Plan Voyage Mode

The Plan Voyage mode contains views for voyage planning, viewing and creating waypoints and routes, and starting to sail a route. To get to the Plan Voyage views, press **MODE** followed by function key **PLAN VOYAGE**. Press **ESC** one or a few times anywhere in the mode for access of top level function keys.

4.9.1 Plan Voyage Mode Overview

The top level function keys of the mode are illustrated below.

- Route List is used to view, create, modify and delete routes, as well as sail directly to a location and sail an existing route.
- Waypoint List is used to view, create, modify and delete waypoints.
- Tide is used to view, create and modify tidal data.
Below is a graphical overview of the different views present in Plan Voyage mode.

The views are further described below.

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**REFERENCE**

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4.9.2 Route List

All stored routes are edited and controlled in the Route List view and its subviews. This excludes the active route, which is the route that currently is being sailed and handled completely separate in the Active Route view, described on page 61.

The Route List view presents the routes currently stored in the system, and provides subviews to view and edit a route as well as create a new route. The Route List view also contains functionality to delete routes and find a route by name.

The view contains two pages of function keys as shown below.

![Figure 85 - Route List view](image)

The second page of function keys is accessed by pressing the **PAGE** key.

![Figure 86 - Second page of function keys](image)

The name, number of waypoints and length of each route is displayed in the view. The unit of length is user configurable, see section 4.11.6 “Units Config” on page 129.

Hint: Use < > to jump between pages of routes in the list.

**Sail a route**

1. Highlight the route to sail using \^\_\^.
2. Press function key **Sail Route**. This brings up the Sail Route view, described on page 83. Press function key **Sail Forward** or **Sail Reverse** to sail the route.
Sail directly to a specific location
1. Press function key Sail To WPT/POS.
2. The Sail To view is displayed. See “Sail To” on page 84.

Edit a route
1. Highlight the route to edit using \n.\n2. Press function key Edit Route.
3. The Edit Route view is displayed. See page 86.

Create a new route
1. Press function key Create New Rte.
2. The Create Route view is displayed. See “Create Route” on page 90.

Create a new route from an existing route
1. Highlight the route to use as a base for the new route in the list using \n.\n2. Press the function key Create Rte From.
3. The Create Route view is displayed. The new route is initially identical to the highlighted route, except that it has a default name. See “Create Route” on page 90.

Find a route by name
1. Press function key Find Name.
2. Use the alphanumeric keypad to enter a (part of) a name. Use the Backspace function key to erase characters. Press ENTER when done.
3. The route with the closest matching name is highlighted in the list.

View a route
4. Highlight the route to view using \n.\n5. Press ENTER or function key View Route.
6. The View Route view is displayed. See “View Route” on page 91.

Delete a route
1. Highlight the desired route using \n.\n2. Press function key Delete Route.
3. If confident in deleting the route, use < > to select Yes to the confirmation message. Press ENTER.
Delete all routes

1. Press function key **Delete All Routes**.
2. If confident in deleting ALL routes, use < > to select Yes to the confirmation message. Press **ENTER**.

Note: **All** routes will be permanently erased from the Navigation System!

**Upload route and associated waypoints from the Navigation System to external system**

1. Highlight the route to upload using ^ v. Use the find function described above as aid in finding the correct route.
2. Press function key **Upload Route**. The route and its waypoints will be transmitted to the external system.

Individual waypoints as well as the complete set of all waypoints can be uploaded from the Waypoint List view, as described on page 98. In order for a upload to occur, the output port connected to the external system must be configured with the appropriate NMEA messages enabled. See section 5.2 on page 160 in the Appendix chapter for more information on uploading waypoints and routes.

4.9.2.1 **Sail Route**

The Sail Route view shows details of a specific route, including name, length, legs and waypoints. It provides functionality for sailing the route in forward or reverse direction. Either the waypoints or the legs of the route are shown. Each waypoint is displayed together with its name and position, and for each leg the length and initial bearing of the leg is shown, as well as the algorithm used to calculate bearing in the leg. The navigation algorithm can be either G (Great Circle) or R (Rhumb Line). Any set RAIM accuracy level for the leg is also shown.

Note: The navigation algorithm used when sailing towards the first waypoint in a route or towards a single waypoint is determined by the Navigation Algorithm parameter set in the Nav Configuration view.

---

**Figure 87 - Sail Route view**

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REFERENCE

SAA7000 109-143, H          Page 83
Hint: Use < > to jump between pages of waypoints in the list.

**Sail the route**

1. Press the function key **Sail Forward** to sail the route from the first waypoint to the last. Press the function key **Sail Reverse** to sail the route from last waypoint to the first.

Note: Valid position information is required to sail a route.

**Show legs in route (when showing waypoints)**

1. Press function key **Route Legs**.

**Show waypoints in route (when showing route legs)**

1. Press function key **Route Waypoints**.

4.9.2.2 Sail To

Pressing function key **Sail To WPT/POS** brings forth the Sail To view, which is used to sail from current position to a destination waypoint. Either an existing waypoint can be used, or a new destination waypoint created. The new waypoint can be created by either specifying latitude and longitude or by specifying a range and bearing from current position.

```
58° 37.5569 N
17° 06.7248 E

From Current Position
LAT 58° 37.4190' N  LDN 17° 06.6015' E
Bearing -- Range -- NM
To
LAT LDN
```

![Figure 88 - Sail To view](image.png)

**Sail to an existing waypoint**

1. Press function key **Select Dest**.

2. The Select Waypoint view is displayed. The view is described in section 4.9.3.1 “Select Waypoint” on page 93.
3. Highlight the waypoint to sail to using ▲▼. Use the sort and find functions as aid in finding the correct waypoint.

4. Press function key **Select Waypoint** to select the highlighted waypoint as destination.

5. Press function key **Sail** to start sailing to the waypoint.

*Sail to a new waypoint created by specifying latitude and longitude*

1. Press function key **Create Lat/Long**.

2. The Create Waypoint view is displayed.

3. Enter name and position as described in section 4.9.5.3 on page 104. Press function key **Apply and Exit** when done.

4. Press function key **Sail** to start sailing to the waypoint.
Sail to a new waypoint created by specifying range and bearing

1. Press function key Create Rng/Br.
2. The following view is displayed.

![Figure 90 - Create Waypoint](image)

3. Use < to select the Bearing field and press ENTER.
4. Use the alphanumeric keypad to enter a bearing in degrees. Use the Backspace function key to erase digits. Press ENTER when done.
5. Use > to select the Range field and press ENTER.
6. Use the alphanumeric keypad to enter a range. Use Backspace function key to erase digits. Press ENTER when done.
7. Press the function key Use Calculated to use the newly calculated position.
8. The Create Waypoint view is displayed. Set a suitable name and, if necessary, adjust the position values as described in section 4.9.5.2 “Edit Waypoint” on page 101.
9. Press function key Apply and Exit when done.
10. Press function key Sail to start sailing to the waypoint.

4.9.2.3 Edit Route

The Edit Route view enables the user to modify a route. It is possible to insert waypoints as well as existing routes into the route being edited. It is also possible to remove and edit waypoints and change the navigation algorithm and RAIM setting for each leg in the route. The route name can also be modified.

A waypoint or route inserted first or last in the route, results in the creation of a new leg from or to that waypoint. Such a leg will initially gain the following default settings:
Navigation Algorithm will be set to the default navigation algorithm specified in the “Nav Config” view, described on page 125. The factory default setting is rhumb line.

The RAIM Accuracy setting will be set to unchanged, meaning that starting to sail the leg does not modify the RAIM accuracy level.

A waypoint or route that is inserted in between two existing waypoints is however seen as splitting the original leg in two. Both the leg to and from the inserted waypoint or route will in this case have the same settings as the original leg had.

Press function key **Apply and Exit** when done editing the route.

The Edit Route view contains two pages of function keys as shown below.

![Figure 91 - Edit Route view](image)

The second page of function keys is accessed by pressing the **PAGE** key.

![Figure 92 - Second page of function keys](image)

Hint: Use < > to jump between pages of waypoints in the list.

Note: When the route contains no waypoints, the function keys **Insert Waypoints** and **Insert Route** will be present instead of the **Insert Wps After, Insert Wps Bef, Insert Route After and Insert Route Before** function keys.
**Change name of route**

1. Select the Name field using ▲▼ and press **ENTER**.
2. Use the alphanumeric keypad to enter name text, and the **Backspace** function key to erase characters. Use function key **Capslock** to change between upper and lower case letters.
3. Press **ENTER** when done.

**Insert waypoints into the route**

1. Use ▲▼ to highlight the position before or after the list position where waypoints should be inserted.
2. Press function key **Insert Wps After** or **Insert Wps Bef**.
3. The Insert Waypoints view is displayed (described on page 95). Highlight the desired waypoint in the list using ▲▼, possibly with the aid of the different sorting and finding functions present in the view.
4. Press function key **Insert Waypoint**. A small ‘1’ will be appended in a box to the right of the waypoint in the list.
5. If more waypoints are to be inserted immediately after the just inserted waypoint, highlight the next desired waypoint and press **Insert Waypoint** once again. A small ‘2’ will be appended.
6. Repeat the procedure of highlighting and inserting waypoints per above until all the desired waypoints have been selected for insertion at the specific position in the route.
7. Press function key **Return** in order to return to the Edit Route view.
8. Repeat the procedure from point 1 to point 7 above as many times as necessary to insert the desired waypoints into the route.

**Change navigation algorithm for a leg in the route and Change RAIM accuracy for a leg in the route**

1. Show route legs, by pressing function key **Route Legs**.
2. Select the leg to modify using ▲▼. Press **ENTER** or function key **Edit Leg**.
3. The Edit Leg view is displayed. See below.
4. To change the used navigation algorithm, select the Navigation Algorithm field using \( \wedge \) and press **ENTER**. Use \( \wedge \vee \) to highlight the desired algorithm, and press Enter when done.

5. To change the RAIM accuracy level for the leg, select the RAIM Accuracy field using \( \vee \) and press **ENTER**. Select the desired RAIM setting using \( \wedge \vee \). Select unchanged to set the leg to not affect the RAIM level at all. Select level to specify a RAIM accuracy level to switch to when navigating on the leg. Press **ENTER**.

6. If level was select above, then use \( > \) to bring focus to the right box that appeared when level was selected. Press **ENTER** and enter the RAIM accuracy level using the alphanumeric keypad. Use the **Backspace** function key to erase digits. Press **ENTER** when done.

7. Press function key **Apply and Exit** to save made changes.

**Remove waypoint from the route**

1. Highlight the waypoint using \( \wedge \vee \).

2. Press function key **Remove Waypoint**.

**Replace waypoint in the route**

1. Use \( \wedge \vee \) to highlight the waypoint to replace.

2. Press the function key **Replace Waypoint**.

3. The Select Waypoint view is displayed (described on page 93). Use \( \wedge \vee \) to highlight the new waypoint to use, possibly with the aid of the different sorting and finding functions present in the view.

4. Press function key **Select Waypoint**.

Note: The new waypoint will replace the old waypoint. All leg information will remain unchanged.
**Insert existing route into the route being edited**

1. Highlight the position before or after the position where the waypoints of the route should be inserted, using ^ v.
2. Press function key **Insert Rte After** or **Insert Rte Before**.
3. The Select Route view is displayed (described on page 97). Highlight the desired route in the list using ^ v, possibly with the aid of the different sorting and finding functions present in the view.
4. Press function key **Select Route**.

**View or edit a waypoint**

1. Highlight the waypoint to view or edit using ^ v and press ENTER or **View Waypoint** function key.
2. The View Waypoint view is displayed, as described on page 101.
3. If desired, press function key **Edit Waypoint** to edit the waypoint.
4. The Edit Waypoint view is displayed, as described on page 101.

**Reverse the route**

1. Press the **Reverse Route** function key.

4.9.2.4 Create Route

The Create Route view is used to create a new route. A default name is supplied, but should be changed to a descriptive name for the new route. The function keys present in the view are identical to those in the Edit Route view, described on page 86 and onwards.

Press function key **Apply and Exit** to create the route when done editing.
**Specify name of route**

1. Select the Name field using ▲ ▼ and press ENTER.
2. Use the alphanumeric keypad to enter name text, and the Backspace function key to erase characters. Use function key Capslock to change between upper and lower case letters.
3. Press ENTER when done.

**Insert waypoints and edit leg information**

1. Press ▼ to bring focus to the (initially empty) waypoint list. Use the function keys that appear to insert waypoints and edit leg information. The function keys are the same as for the Edit Route view, described on page 86 and onwards.

4.9.2.5 Create Route From

The Create Route view is displayed with information entered from the source route.

4.9.2.6 View Route

The View Route is similar to the Sail Route view described on page 83, as it shows the same details of the route. Either the waypoints or the legs of the route are shown. Each waypoint is displayed together with its name and position, and for each leg the length and initial bearing of the leg is shown, as well as the algorithm used to calculate course in the leg. The navigation algorithm can be either G (Great Circle) or R (Rhumb Line). Any set RAIM accuracy level for the leg is also shown.

![Figure 95 - View Route](image)

Hint: Use < > to jump between pages of waypoints in the list.

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REFERENCE

SAA7000 109-143, H    Page 91
**Sail the route**

1. Press the function key **Sail Forward** to sail the route from the first waypoint to the last. Press the function key **Sail Reverse** to sail the route from last waypoint to the first.

Note: Valid position information is required for starting to sail a route.

**Edit the route**

1. Press function key **Edit Route**.
2. The Edit Route view is shown. See page 86.

**Show legs in route (when showing waypoints)**

1. Press function key **Route Legs**.

**Show waypoints in route (when showing route legs)**

1. Press function key **Route Waypoints**.

**View waypoint details**

1. Ensure that the list is showing waypoints. Press function key **Route Waypoints** if currently showing route legs.
2. Highlight the waypoint to view in the list using \( \wedge \vee \) and press **ENTER** or function key **View Waypoint**.
3. The View Waypoint view is displayed. See page 101.

**View leg details**

1. Ensure that the list is showing route legs. Press function key **Route Legs** if showing waypoints.
2. Highlight the leg to view in the list using \( \wedge \vee \) and press **ENTER** or function key **View Leg**.
3. The View Leg view is displayed, as illustrated below.
4.9.3 Route Related Views

This section describes views related to the subviews present in Route List.

4.9.3.1 Select Waypoint

The Select Waypoint view is used to select a specific waypoint, for example as a Sail To destination. It lists all existing waypoints, and it is possible to sort the list by different criteria and search for waypoints by name.

The view contains two pages of function keys, which can be toggled by pressing the PAGE key. The first page is shown below.

Figure 97 - Select Waypoint
The second page of function keys is shown below

Figure 98 - Second page of function keys

Hint: Use < > to jump between pages of waypoints in the list.

**Select waypoint**
1. Highlight the waypoint to select using \( \wedge \vee \). Use the sort and find functions described below as aid in finding the correct waypoint.
2. Press function key **Select Waypoint**.

**View details of waypoint**
1. Highlight the waypoint to view using \( \wedge \vee \). Use the sort and find functions described below as aid in finding the correct waypoint.
2. Press **ENTER**. The View Waypoint view, described on page 101, is shown.

**Find waypoint by name**
1. Press function key **Find Name**.
2. Use the alphanumeric keypad to enter (part of) a name. Use **Backspace** to erase characters. Press **ENTER** when done.
3. The waypoint with the closest matching name is highlighted in the list.

**Create a new waypoint**
1. Press function key **Create New WPT**.
2. The Create Waypoint view is displayed. See page 104.

**Create a new waypoint from an already existing waypoint**
1. Highlight the waypoint to use as base for the new waypoint using \( \wedge \vee \). Use the sort and find functions described below as aid in finding the correct waypoint.
2. Press function key **Create WPT From**.
3. The Create Waypoint view is displayed, with position values taken from the highlighted waypoint. See page 104.

**Sort waypoints by name, distance or time last modified**
1. Press function key Sort By Name, Sort By Distance or Sort By Time depending on desired sorting criteria.
4.9.3.2 Insert Waypoints

The Insert Waypoints view is used to select one or several specific waypoints for insertion into a route during creation or editing of routes. It is similar to the Select Waypoint view described in the previous section.

The view contains two pages of function keys, which can be toggled by pressing the PAGE key. The first page is shown below.

Figure 99 - Insert Waypoints

The second page of function keys is shown below.

Figure 100 - Second page of function keys

Hint: Use < > to jump between pages of waypoints in the list.
Insert waypoints

1. Highlight the first waypoint to insert using \( \wedge \). Use the available sort and find functions as aid in finding the correct waypoint.

2. Press function key Insert Waypoint to select the waypoint for insertion. A small ‘1’ will be appended in a box to the right of the waypoint position.

3. Repeat the procedures of highlighting and inserting waypoints until all waypoints needed have been selected. Selected waypoints will be numbered in insertion order.

![Waypoints Table]

<table>
<thead>
<tr>
<th>Name</th>
<th>Latitude</th>
<th>Longitude</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Almagund</td>
<td>61°21.170’ N</td>
<td>022°41.469’ E</td>
<td>3</td>
</tr>
<tr>
<td>Langesund</td>
<td>58°52.527’ N</td>
<td>018°10.037’ E</td>
<td>6</td>
</tr>
<tr>
<td>MOE 200409...</td>
<td>58°32.403’ N</td>
<td>017°02.129’ E</td>
<td></td>
</tr>
<tr>
<td>Salto</td>
<td>61°55.134’ N</td>
<td>021°52.511’ E</td>
<td>1</td>
</tr>
<tr>
<td>Storgund</td>
<td>58°31.739’ N</td>
<td>017°01.576’ E</td>
<td></td>
</tr>
<tr>
<td>Stormo</td>
<td>61°55.134’ N</td>
<td>021°52.511’ E</td>
<td></td>
</tr>
<tr>
<td>Svartskar</td>
<td>58°39.179’ N</td>
<td>017°08.315’ E</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 101 - Insert Waypoints

4. Press function key **Return** to insert the selected waypoints into the route.

Find, create, view and sort waypoints

These functions are identical to those described for the Select Waypoint view described in the previous chapter.
4.9.3.3 Select Route

The Select Route view is used to insert a route into a route under editing. It is accessed from the Create Route and Edit Route views.

The name, number of waypoints and length of each route is shown. Use < > to jump between pages in the list.

**Insert highlighted route**

1. Highlight the route to insert using ∧ ∨. Use find function described below as aid in finding the correct route.
2. Press function key *Select Route*.

**View a route**

1. Highlight the route to view using ∧ ∨.
2. Press *ENTER*. The View Route view is displayed. See section 4.9.2.6 “View Route” on page 91.
3. Press function key *Select Route* to insert the route being viewed.

**Find a route by name**

1. Press function key *Find Name*.
2. Use the alphanumeric keypad to enter a (part of) a name. Use the *Backspace* function key to erase characters. Press *ENTER* when done.
3. The route with the closest matching name is highlighted in the list.
4.9.4 Waypoint List

The Waypoint List view and subviews provides functionality to view, create, modify and delete waypoints. The list of waypoints can be sorted by name, time last modified and distance, and the list can be search by specifying (part of) a waypoint name. Each waypoint is presented with its name and position.

Detailed information about each waypoint, including time of last modification, can be accessed in the View Waypoint subview. The Edit Waypoint and Create Waypoint subviews are used to edit and create waypoints, respectively.

The view contains three pages of function keys, which can be shown by pressing the PAGE key one or multiple times. The first page is shown below.

![Waypoint List](image)

Figure 103 - Waypoint List

The second and third pages of function keys are shown below.

![Second page of function keys](image)

Figure 104 - Second page of function keys

![Third page of function keys](image)

Figure 105 - Third page of function keys

Hint: Use < > to jump between pages of waypoints in the list.
Find waypoint by name
1. Press function key Find Name.
2. Use the alphanumeric keypad to enter (part of) a name. Use Backspace to erase characters. Press ENTER when done.
3. The waypoint with the closest matching name is highlighted in the list.

Edit a waypoint
1. Select the waypoint to edit using ∧ ∨. Use the sort and find functions described below as aid in finding the correct waypoint.
2. Press function key Edit Waypoint.
3. The Edit Waypoint view is displayed. See page 101.

Create a new waypoint
1. Press function key Create New WPT.
2. The Create Waypoint view is displayed. See page 104.

Create a new waypoint from an already existing waypoint
1. Highlight the waypoint to use as base for the new waypoint in the list, using ∧ ∨. Use the sort and find functions described below as aid in finding the correct waypoint.
2. Press function key Create WPT From.
3. The Create Waypoint view is displayed, with position values taken from the highlighted waypoint. See page 104.

Sail to a waypoint
1. Highlight the desired waypoint using ∧ ∨. Use the sort and find functions described below as aid in finding the correct waypoint.
2. Press function key Sail To WPT.
3. Bearing and distance to the selected waypoint is displayed. Confirm by pressing function key Sail.

Sort waypoints by name, distance or time last modified
1. Press function key Sort By Name, Sort By Distance or Sort By Time depending on desired sorting criteria.

View waypoint
1. Select the waypoint to edit using ∧ ∨. Use the sort and find functions described below as aid in finding the correct waypoint.
2. Press ENTER or function key View Waypoint.
3. The View Waypoint view is displayed. See page 101.
**Delete a waypoint**

1. Select the waypoint to edit using \( \wedge, \vee \). Use the sort and find functions described below as aid in finding the correct waypoint.

2. Press function key **Delete Waypoint**.

3. Use \(<, >\) to select **Yes** to the confirmation message and press **ENTER**, if you are confident in deleting the waypoint.

**Delete all waypoints**

1. Press function key **Delete All Waypoints**.

2. If confident in deleting ALL waypoints and routes, use \(<, >\) to select **Yes** to the confirmation message. Press **ENTER**.

Note: **All** waypoints and routes will be permanently erased from the Navigation System!

**Upload a waypoint from the Navigation System to external system**

1. Highlight the waypoint to upload using \( \wedge, \vee \). Use the sort and find functions described above as aid in finding the correct waypoint.

2. Press function key **Upload Waypoint**. The waypoint will be transmitted to the external system.

**Upload all waypoints from the Navigation System to external system**

1. Press function key **Upload All Wps**. All waypoints will be transmitted to the external system.

In order for a waypoint transfer to occur, the output port connected to the external system must be configured with the NMEA WPL message enabled. See section 5.2 on page 160, in the Appendix chapter for more information on uploading waypoints and routes.

4.9.5 Waypoint Related Views

This section describes views used for viewing, editing and creating waypoints. Most of these views can be accessed from the Waypoint List view, but also from other views.
4.9.5.1 View Waypoint

The view presents the full latitude and longitude values of a waypoint, its name as well as the time when the waypoint was last created or modified.

![View Waypoint](image)

Figure 106 - View Waypoint

4.9.5.2 Edit Waypoint

The Edit Waypoint view is used to modify an existing waypoint. Both name and position can be changed. The position can be modified by:

- Manually specifying latitude and longitude.
- Taking latitude and longitude from current position.
- Specifying a bearing and a range to move the waypoint by.

If the edited waypoint is part of one or more existing routes, a warning dialog will be shown when entering the view (and also when saving changes), as illustrated below.

![Warning dialog](image)

Figure 107 - Warning dialog
Press the function key **Continue** to edit the waypoint. Note that any changes made will affect all the routes that the waypoint is a part of. To leave the other routes unmodified, press **Cancel** and create and use a new waypoint instead. Tip: Use the **Create WPT From** function key present in the Waypoint List and Select Waypoint views.

The Edit Waypoint view is illustrated below.

The function key **Apply and Exit** is used to store changes made to the waypoint.

### Change name of waypoint
1. Select the Name field using Λ. Press **ENTER**.
2. Use the alphanumeric keypad to enter name text, and the **Backspace** function key to erase characters. Use function key **Capslock** to change between upper and lower case letters.
3. Press **ENTER** when done.

### Modify latitude or longitude of waypoint
1. Select the LAT or LON field using Λ ν. Press **ENTER**.
2. Use < > to select the digit to modify, and enter the new digit using the alphanumeric keypad.
3. Press **ENTER** when done.

### Take waypoint position from current position
1. Press function key **Current Position**.
Move waypoint by bearing and range

1. Press function key Bearing/Range.
2. The following view is shown.

![Figure 109 - Move waypoint by baring/range]

3. Use < to select the Bearing field. Press ENTER.
4. Use the alphanumeric keypad to enter the bearing in degrees. Use Backspace to erase digits. Press ENTER when done.
5. Use > to select the Range field. Press ENTER.
6. Use the alphanumeric keypad to enter a range. Use Backspace to erase digits. Press ENTER when done.
7. Press the function key Use Calculated to use the newly calculated position.
4.9.5.3 Create Waypoint

The Create Waypoint view is used to create a new waypoint. The functions present in this view are the same as for the Edit Waypoint view. Refer to section 4.9.5.2 “Edit Waypoint” on page 101 for details.

This view can either be accessed by pressing the **Create New WPT** or **Create WPT From** function keys in the Waypoint List or Select Waypoint views. If accessed by pressing the **Create New WPT** function key, the position of the created waypoint is by default set to the current position. If accessed by pressing the **Create WPT From** function key, the position is set to the position of currently highlighted waypoint in the waypoint list.

![Figure 110 - Create Waypoint](image)

Press function key **Apply and Exit** to complete creating the waypoint.

4.9.6 Tidal

The Navigation Display, software version 5.0.94 onwards, can be used for calculation of tidal predictions based on user input of data from the Admiralty Tide Tables published by the U.K Hydrographic Office.

The user is required to input data for the specific port and select the point in time for which the prediction is to be calculated.

The tidal prediction features in the Navigation Display are centered around three views; the Port List, Tide Plot and Tide Table views, available in the Plan Voyage mode.

Note that meteorological effects (e.g. wind and barometric pressure) as well as other factors not accounted for in the generalized tidal models may cause significant deviation between actual and predicted tide.
4.9.6.1 Calculation Method and Source Data

The tidal predictions are calculated by the so called ‘simplified harmonic method’. Harmonic constants and other parameters required are included in publications below. Note that the algorithms applied are specifically adapted for this data. Tidal parameters obtained from other sources shall not be used with the Navigation Display tidal calculations.

Predictions calculated according to this method will not be fully consistent with the tabulated high/low and hourly predictions from the Admiralty tide tables. This is due to the fact that the tabulated values are based on a more extensive data set compared to the limited number of parameters used by the simplified harmonic method.

The source data is split between volumes with different geographical coverage as follows:

U.K Hydrographic Office ADMIRALTY TIDE TABLES (ATT)

- Volume 1 (NP 201): United Kingdom and Ireland (including European channel ports)
- Volume 2 (NP 202): Europe (excluding United Kingdom and Ireland), Mediterranean Sea and Atlantic Ocean
- Volume 3 (NP 203): Indian Ocean and South China Sea
- Volume 4 (NP 204): Pacific Ocean

Optionally, for European ports, ATT Volume 1 and European part of Volume 2 can be substituted by:

TIDAL HARMONIC CONSTANTS, EUROPEAN WATERS (NP 160).

4.9.6.2 Input of Tidal Parameters

Tidal data for a new port is entered as follows:

1. Enter Plan Voyage mode by pressing the MODE key followed by function key Plan Voyage.
2. Press the function key Tide. The Tide Plot view is shown.
3. Press function key Select Location to enter the Port List view.
4. Press function key Add Port
5. Input data for the tidal parameters from the relevant volume of ATT, part III. Press function key Apply and Exit when done in order to store the data in the port list.
The following data can be input for each port:

**ID**
Port No. from ATT part III.

**Name**
Place name from ATT part III.

**Zone**
UTC offset time zone (UTC time – Local Time) in hours and minutes from ATT part III. This information is important since ATT data is referenced to a local time in port with this offset from UTC. Enter this data as defined in ATT regardless of adjustments for other local time offsets (e.g. daylight savings time). See further notes on treatment of time offset in sections below.

**Position**
Latitude & longitude of port. This is optional information that is not required for calculation of tide. If entered, the current distance to the actual port will be shown in the list of tidal stations. Position is not listed in ATT part III.

**ML (Z0)**
This is mean level in meters from ATT part III. For most stations this is a fixed value. Tables of seasonal corrections and fortnightly variations as required for some stations can be entered as described below.

**ML Seasonal**
Seasonal corrections to the mean level value as defined for some ports. If so, this parameter shall be set to ‘Use Table’ which will provide a new function key Edit Table. Use this key to access an editable list of values for each month and input the corrections listed in ATT part III.

**ML Fortnightly**
Fortnightly variations in mean level as defined for some ports. If so, this parameter shall be set to ‘Use Table’ which will provide a new function key Edit Table. Use this key to access an editable list of parameters to be entered from a supplementary table in ATT. When used, a lock icon will be displayed next to the ML(Z0) parameter in the list and the ML(Z0) value will be replaced by a ‘W’. This indicates that the actual value used will be deduced from the fortnightly parameters.

**M2(G)**
Harmonic constant from ATT part III.

**M2(H.m)**
Harmonic constant from ATT part III. Fixed value used for most ports.

**M2 Seasonal**
Seasonal depending values of M2(H.m) as defined for some ports. If so, this parameter shall be set to ‘Use Table’ which will provide a new function key Edit Table. Use this key to access an editable list of values for each month and input values listed in ATT part III. When used, a lock icon will be displayed next to the M2(H.m) parameter in the list and the M2(H.m) value will be replaced by a ‘v’. This indicates that the actual value used will be deduced from the seasonal table.

**S2(G)**
Harmonic constant from ATT part III.

**S2(H.m)**
Harmonic constant meters from ATT part III. Fixed value used for most ports.
S2 Seasonal  Seasonal depending values of S2(H.m) as defined for some ports. Function is equivalent to M2 as described above.
K1(G)  Harmonic constant from ATT part III.
K1(H.m)  Harmonic constant from ATT part III.
O1(G)  Harmonic constant from ATT part III.
O1(H.m)  Harmonic constant from ATT part III.
f4  Shallow water correction from ATT part III.
F4  Shallow water correction from ATT part III.
f6  Shallow water correction from ATT part III.
F6  Shallow water correction from ATT part III.

4.9.6.3  Tidal Predictions

Once port data has been entered, tidal predictions can be generated as follows:

1. Enter Plan Voyage mode by pressing the **MODE** key followed by function key **Plan Voyage**.
2. Press the function key **Tide**. The Tide Plot view is shown.
3. Press function key **Select Location** to enter the Port List view.
4. Use the arrow key pad to step through the list and select the port for which a prediction is to be generated. Press function key **Use Port** or **ENTER** in order to select it.
5. The Tide Plot view is shown with a graphical prediction for the current day or a previously selected date. In order to calculate predictions for another day use function key **Select Date** to access an almanac or use the arrow key pad to toggle up/down one day for each step.
6. By toggling the arrow key pad left/right a cursor will be moved along the plot. Time and height values for the cursor are displayed to the right of the plot area. It is also possible to step the cursor between local high and low points using function keys **Set Prev H/L** and **Set Next H/L**.
7. While data for the current day is shown, a small diamond cursor will indicate the actual time. Value of current tide will also be displayed as 'Tide Now'
8. The function key **Table** will replace the graphical view with a table of local low and high points of the actual day. The maximum high and minimum low values for the actual day are displayed with bold characters. Up to eight values can be displayed in a table view. If there are more data points for a particular day, two views will be available that can be selected by the left/right arrow key pad. This is indicated by labels 1/2 or 2/2 together with a small arrow in the right bottom part of the view.
Typical examples of Tide Plot and Tide Table views are shown in the figures below:

Figure 111 – Tide Plot view

Figure 112 – Tide Table view

4.9.6.4 Units of Predicted Tide

Predicted tide can be displayed in meters, feet or fathom units as defined by the ‘Depth Unit’ configuration parameter. This parameter is accessed from the Units Configuration view in Configuration mode.
4.9.6.5  Treatment of Local Time Frames

For each port, a ‘Zone’ parameter shall be entered as defined in ATT part III. This parameter defines the relationship of data published in ATT with respect to UTC.

When a tide prediction is generated, a graph will be displayed for 00 to 24 hours of a selected date. This time will be in UTC or with any user selectable local time offset as defined in the Time Configuration view. If UTC is used, times will be denoted ‘UTC’. If a local time frame is used, times will be denoted ‘LOC’. This is in analogy with how all times generally are treated by the display.

Thus, it is important to realize that a tide displayed in ‘LOC’ time not necessary is the local time in port defined by the ‘Zone’ parameter. If this is desired, the user must manually define a local time in the Time Configuration view that corresponds to the ‘Zone’ value for the actual port.

To make things more complicated, the ‘Zone’ parameter in ATT part III is defined as (UTC time – Local Time) and thus being negative when moving eastwards from Greenwich. On the other hand, the local time offset in the Time Configuration view is to be added to UTC and thus positive when moving eastwards. Thus, a negative ‘Zone’ value is equivalent to a positive offset of time configuration and vice versa.

Thus, in general: always enter ‘Zone’ for the port as indicated in ATT part III and select local time offset in Time Configuration view to obtain the desired local time frame for which the prediction is to be obtained.

Examples of ‘Zone’ setting and corresponding local time configuration are shown in the following two figures.

![Figure 113 – Insert port data](image)
4.10 Alarms & Msgs Mode

The Alarms & Msgs mode is used to view the status of the Navigation System. It contains views and functions for viewing current and past alarms, clearing the alarm log and reading DGPS messages. This mode also provides functionality for definition of time related scheduled alerts.

To reach Alarms & Msgs mode, press MODE followed by function key ALARMS & MSGS. Press ESC one or a few times anywhere in the mode for access of top level function keys.

4.10.1 Alarms & Msgs Mode Overview

The top level functions keys of the mode are illustrated below. Press ESC one or a few times anywhere in the mode to bring them up.
- Alarm List indicates which alarms that are active in the system. It also contains logs for viewing past and present alarms.
- DGPS Message lists all received DGPS messages, and supports reading and deleting them. The view is only present when using a DGPS Navigation Sensor.
- Scheduled Alerts provides access to functions for definition and inspection of time related alerts.

Below is a graphical overview of the different views present in Alarms & Msgs mode.

![Graphical overview](image)

The views are further described below. The DGPS Message view is only present when using a DGPS Navigation Sensor.

### 4.10.2 Alarm List

The Alarm List view lists current status of all alarms. Active alarms are presented in the top of the list and are marked with an exclamation mark (!). The view contains the Alarm Log subview which shows the log of all alarms that has been activated in the system. It is also possible to show only active alarms, both active and inactive alarms or disabled alarms by toggling the function keys **Show/Hide Inactive** and **Disabled/Enabled Alarms**. All alarms are described in section 5.1 “Alarm Messages” on page 157 in the Appendix. The Alarm List view is illustrated below.
1. Press function key **Alarm Log**.

2. The following view is displayed. The view contains an entry for each time an alarm has been active, and shows the time of activation and deactivation (if the alarm has been deactivated).

3. Press function key **ESC** to return to the main view.

### Clear the alarm log

1. Press function key **Alarm Log**. The above view is displayed.

2. Press function key **Clear Log**. The alarm history will be erased.
4.10.3 DGPS Message

The DGPS Message view allows the user to read and delete received DGPS messages.

Note: The view is only present when using a DGPS Navigation Sensor.

Read a received DGPS Message

1. Highlight the message to read using \( \uparrow \downarrow \).
2. The message body is displayed in the lower region of the view. If necessary, press function key Read to see the entire message.

Delete a received DGPS Message

1. Highlight the message to delete using \( \uparrow \downarrow \).
2. Press function key Delete.

4.10.4 Scheduled Alerts

The Scheduled Alerts view allows the user to create and inspect alerts scheduled to activate alarms at certain points in time.

There are two types of alerts that may be scheduled. Time Alerts are activated at a specific time and may be reactivated at a certain time interval. ETA Alerts will be activated at a certain time prior to ETA of the current active route.

When a scheduled alert is activated, it is treated like any other type of alarm in the system. Thus, the user may decide if scheduled alerts should be disabled, provide warning messages on the display and/or generate external alarms. This is determined by settings in the Alarm Configuration view as described on page 128 of this manual.

The Scheduled Alerts view is illustrated below.
A list of the currently defined alerts is displayed together with the next (estimated) activation time for each alert.

**Create Time Alert**
1. Press function key *Create Time Alert*.
2. The Create Time Alert view is displayed. See section 4.10.5.1.

**Create ETA Alert**
1. Press function key *Create ETA Alert*.
2. The Create ETA Alert view is displayed. See section 4.10.5.2.

**Edit Scheduled Alert**
1. Highlight the alert to edit using \^\_\^.
2. Press function key *Edit Alert*.
3. The Edit Time Alert or Edit ETA Alert view is displayed. See section 4.10.5.3.

**Delete Scheduled Alert**
1. Highlight the alert to delete using \^\_\^.
2. Press function key *Delete Alert*.
3. A warning with request for confirmation is displayed. Press ENTER to delete the alert.

**View Scheduled Alert**
1. Highlight the alert to view using \^\_\^.
2. Press ENTER or function key *View Alert*.
3. The View Time Alert or View ETA Alert view is displayed. See section 4.10.5.5.
4.10.5 Scheduled Alert Related Views

This section describes views used for creating, editing and viewing scheduled alerts. These views are accessed from the Scheduled Alerts view.

4.10.5.1 Create Time Alert

The Create Time Alert view is used to create alerts that will be activated at specific times and repeated at certain time intervals. The view is illustrated below.

The function key Apply and Exit is used to store the alert settings when done.

**Define alert text**

1. Select the Alert Text field using \(\wedge\vee\), press ENTER.
2. Use the alphanumeric keypad to enter text, and the Backspace function key to erase characters. Use function key Capslock to change between upper and lower case letters. The text will be displayed when the alert is activated.
3. Press ENTER.

**Define first activation time**

1. Select the Start Time field using \(\wedge\vee\), press ENTER.
2. Use the alphanumeric keypad to enter date and time when the alert is to be activated for the first time.
3. Press ENTER.

Note: Time is entered in UTC or local time depending on the current time configuration of the system. Internally however, the alert start time will be converted to UTC. Thus, the alarm will be activated at the same UTC time regardless if the local time offset has been changed.

**Define alert type and repetition interval**
1. Select the Type field using \( \wedge \wedge \), press **ENTER**.
2. Select between Single (alert will be activated once) or Recurring (alert will be reactivated at a certain interval) using \( \wedge \wedge \), press **ENTER**.
3. If Recurring was selected, new fields for input of the repetition interval will be displayed. Select the Hours field (if required) using \( \wedge \wedge \), press **ENTER** and enter the repetition interval in hours with the alphanumeric keypad.
4. Press **ENTER**.
5. Press > and enter a value in the Minutes field if required.

![Figure 122 - Create Time Alert](image)

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REFERENCE
SAA7000 109-143, H Page 116
4.10.5.2 Create ETA Alert

The Create ETA Alert view is used to create alerts that will be activated at a specific time prior to ETA of the active route. The view is illustrated below.

![Figure 123 - Create ETA Alert](image)

The function key **Apply and Exit** is used to store the alert settings when done.

**Define alert text**

1. Select the Alert Text field using ^v, press ENTER.
2. Use the alphanumeric keypad to enter text, and the Backspace function key to erase characters. Use function key Capslock to change between upper and lower case letters. The text will be displayed in the warning dialog on the display when the alert is activated.
3. Press ENTER.

**Define alert type**

1. Select the Type field using ^v, press ENTER.
2. Select between Single (alert will be activated in the current or next active route only) or Every Route using ^v, press ENTER.
**Define activation time before ETA**

1. Select the Hours field using ▲▼, press **ENTER**.
2. Enter the appropriate value through the alphanumeric keypad. Press **ENTER**.
3. Press > and enter a value in the Minutes field if required.

Note: ETA alerts will be activated once in every route only. Thus, the alert will not reactivate if the time before ETA criterion will be fulfilled duplicate times due to variations in speed.

4.10.5.3 Edit Time Alert

The Edit Time Alert view is used to change settings for a specific time alert. The view is identical to the Create Time Alert view described above, with the edited alert settings entered.

4.10.5.4 Edit ETA Alert

The Edit ETA Alert view is used to change settings for a specific ETA alert. The view is identical to the Create ETA Alert view described above, with the edited alert settings entered.

4.10.5.5 View Time Alert

The View Time Alert view is used to view the settings for a specific time alert. The view is identical to the Edit Time Alert view described above, except that contents not can be edited and with the function key **Apply and Exit** replaced by **Edit**. Press the **Edit** function key to access the Edit Time Alert view if necessary.

4.10.5.6 View ETA Alert

The View ETA Alert view is used to view settings for a specific ETA alert. The view is identical to the Edit ETA Alert view described above, except that contents not can be edited and with the function key **Apply and Exit** replaced by **Edit**. Press the **Edit** function key to access the Edit ETA Alert view if necessary.
4.11 Config Mode

The Config mode is used to configure the Navigation System. To get to the Config views, press Mode followed by function key CONFIG. Press ESC one or a few times anywhere in the mode for access of top level function keys.

4.11.1 Config Mode Overview

Use the PAGE key to toggle between the pages of top level function keys.

Figure 124 - Configuration, First Page

Figure 125 - Configuration, Second Page
The main views of Config mode are introduced below:

- **Time** allows the user to define a local time offset from UTC and choose if displayed time values shall be in local or UTC time frames.
- **Display Config** allows the user to configure settings for the Display, both visual and sound settings.
- **Nav Config** allows the user to configure navigation parameters.
- **Alarm Config** allows the user to configure which alarms that should be used and if they should trigger the external alarm signal.
- **Units Config** allows the user to configure the used units.
- **GPS/DGPS Config** allows the user to configure GPS, DGPS, Beacon and SBAS settings.
- **Redund Config** allows the user to configure the system to interact with another nav system in order to synchronize database and settings between the units.
- **I/O Config** allows the user to configure input and output sentences and port communication rates.
- **System Info** allows the user to view current system information including software and hardware versions as well as memory usage.
- **Restore System Configuration** allows the user to set all parameters in display and/or navigation sensor to factory default.
Below is a graphical overview of the different views present in the mode.

Note: The Beacon Config and Beacon Database view with subviews are only present when using the DGPS Navigation Sensor.

The views are further described below.
4.11.2 Time Config

The Time Configuration view is used to define a local time offset from UTC and to select whether displayed time values shall be in local or UTC time frames. The Time Configuration view is illustrated below.

![Time Configuration view](image)

**Figure 127 - Time Configuration view**

**Change local time offset**

1. Edit the +/- field if required by selecting it using `< >` and press **ENTER**. Use `∧` `∨` to set the desired sign and press **ENTER** again.

2. Edit the hours field if required by selecting it using `< >` and press **ENTER**. Use the numeric keyboard together with function key **Backspace** to enter the desired value. Press **ENTER** when done.

3. Repeat the procedure to edit the minutes field if required.

**Select time frame for display**

1. Press function key **Use UTC** to display all times in UTC. Press function key **Use Local** to display all times with the current local offset from UTC. This will be indicated by ‘LOC’ displayed after the time values instead of ‘UTC’.

**Note:** To output the time settings in the local time zone offset fields in ZDA messages on the serial interface, the parameter **Output in ZDA** needs to be enabled in Nav Config dialog (for more information about the parameter and this function, see section 4.11.4).
4.11.3 Display Config

The Display Configuration view contains two subviews, the Visual Configuration and Sound Configuration views. The former is used to configure display illumination settings and the latter the sounds played at different events.

4.11.3.1 Visual Config

The Visual Configuration view allows the user to adjust display backlight, contrast, LED intensity and button illumination. Two separate settings are provided, for day and for night operation.
Change display setting

1. Select Day Settings or Night Settings with < >.
2. Select the setting you want to change using < > and press ENTER.
3. Modify the setting with < > and press ENTER. Repeat step 1 to 3 if necessary.
4. Press function key **Apply and Exit**.

Note: As described in section 3.9.5 “Visual Settings” on page 39, it is also possible to change visual settings by pressing the **DISPLAY** key.

Restore to factory default setting

1. Press function key **Restore Default**.
2. A warning with request for confirmation is displayed. Press ENTER to restore to factory default setting.

Switch between day mode and night mode

1. Press function key **Switch to Night** (only visible when in day mode) or **Switch to Day** (only visible when in night mode).

4.11.3.2 Sound Config

The Sound Configuration view allows the user to associate an event with a specific sound. The settings can be restored to their default values.

![Sound Configuration](image)

Figure 130 - Sound Configuration view
**Change settings**

1. Select the setting you want to change using \( \wedge \vee \) and press **ENTER**.
2. Select the desired value in the drop-down list using \( \wedge \vee \), and press **ENTER**.
3. Press function key **Apply and Exit**.

**Restore a parameter to factory default setting**

1. Use \( \wedge \vee \) to select the parameter to return to the factory default setting.
2. Press function key **Get Default**.
3. Press function key **Apply and Exit** to save the changes.

4.11.4 Nav Config

The Navigation Configuration view is used to configure navigation parameters including navigation algorithm, waypoint pass criterion, range unit, waypoint change distance (for “distance” waypoint pass criterion), cross-track error alarm limit and waypoint approach alarm distance or time. The parameters are described below.

**WPT Pass Criterion**

The Waypoint Pass Criterion parameter specifies the method used to determine when a waypoint is considered passed. The parameter can be set to one of Manual, Distance, Bisector Line or Perpendicular Line. The different waypoint pass criteria are described in chapter 2 on page 11.

**WPT Pass Distance**

The Waypoint Pass Distance parameter specifies the distance to the waypoint where it is considered passed when using the Distance waypoint pass criteria.

**Start Sail From**

It is possible to select whether an initial ‘from’ waypoint shall be inserted when starting an active route.

When this function is activated, the current position will be grabbed and stored in the active route as an initial ‘from’ waypoint with identifier ‘t1’. This waypoint will not be added to the waypoint database (functionality in line with XTE reset waypoints).

If ‘t1’ subsequently is manually selected as the next waypoint in the route, function will be identical as the prior implementation when navigating towards first waypoint (no XTE computed and current position output as ‘from’ waypoint with identifier ‘t0’ in active route RTE message).

It is now possible to insert a waypoint at current position using the ‘reset XTE’ function also while navigating towards the first waypoint in a route.
**Default RAIM**

This field sets the default RAIM accuracy level to appear when specifying a RAIM accuracy level for a leg in a route. See section 0 “RAIM Accuracy Level” on page 11 for more information.

**Navigation Algorithm**

The Navigation Algorithm parameter specifies the default navigation algorithm for newly created legs. The algorithm can either be set to Rhumb Line or Great Circle. The difference between these algorithms are described in chapter 2 on page 11. This parameter also determines the navigation algorithm used when sailing towards the first waypoint in a route or towards a single waypoint.

**XTE Limit**

The Cross-Track Limit parameter specifies the cross-track error limit used when navigating. If the cross-track error becomes larger than the set XTE Limit, the XTE Limit Exceeded alarm is raised and remains active until the cross-track error becomes less than the set XTE Limit, or navigation along the active route stops.

**Approach Distance**

The Approach Distance parameter specifies the distance from next waypoint where the Waypoint Approaching (Distance) alarm is raised.

**Approach Time**

The Approach Time parameter specifies the estimated time (in minutes) before arrival to the next waypoint when the Waypoint Approaching (Time) alarm is raised.

**RTE Nav Algorithm**

The RTE Navigation Algorithm specifies the navigation algorithm that is set for routes received from external systems, for example from ECDIS systems. See section 5.2.1 “Download Waypoints and Routes” on page 160 in the Appendix chapter for more information.

**RTE/Rnn WP Limit**

With Navigation Display software 5.0.96 and onwards, it is now possible to configure the maximum number of remaining waypoints in the active route that shall be transmitted in RTE and Rnn messages. Previously, only the four next waypoints were transmitted per default. This value can now be configured between 4 and 13 with the RTE/Rnn WP Limit parameter. The default value is 4.
Average ETA SOG

The Average ETA SOG parameter defines the time period over which average speed is calculated when estimating time of arrival (ETA) to the end of the active route and Time To Go (TTG) to the next waypoint.

Status Information

The Status Information parameter defines whether current position (when available) from the navigation sensor or the name of the next waypoint is to be displayed in the status bar at the upper left corner of the display.

-Local Time Zone Offset- Output in ZDA

The Output in ZDA parameter defines if the local time zone offset set in the Time Config dialog (see section 4.11.2) should be output in ZDA messages. When the parameter is set to Disabled the local time zone offset fields in ZDA messages will be null fields. When set to Enabled the local time zone offset fields in ZDA messages will be defined by the settings in Time Config dialog. If UTC time is used the fields will be zeros in ZDA messages.

The Navigation Configuration view is illustrated below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Leg Defaults</td>
<td></td>
</tr>
<tr>
<td>WPT Pass Distance</td>
<td>0.25 NM</td>
</tr>
<tr>
<td>WPT Pass Criterion</td>
<td>Distance</td>
</tr>
<tr>
<td>Start Sail From</td>
<td>No Waypoint</td>
</tr>
<tr>
<td>Default RAIM</td>
<td>15 m</td>
</tr>
<tr>
<td>Navigation Algorithm</td>
<td>Rhumb Line</td>
</tr>
</tbody>
</table>

Figure 131 - Navigation Configuration view

Change a parameter

1. Select the parameter to edit using ^ v and press ENTER.
2. If the parameter is selected using a drop-down box, use ^ v to select the desired option in the drop-down box. If the parameter is a numeric value, use the alphanumeric keypad to enter the desired value. Use the Backspace function key to erase digits.
3. Press ENTER when done.
4. Press function key Apply and Exit to save the changes.
**Restore factory default setting**

1. Use \( \uparrow \downarrow \) to select the parameter to return to the factory default setting.
2. Press function key **Get Default**.
3. Press **Apply and Exit** to save the changes.

### 4.11.5 Alarm Config

The Alarm Configuration view is used to configure the action the system should perform when a specific alarm is raised. The possible settings for each alarm are:

- **Disabled.** The alarm will not be indicated when active.
- **Popup.** An alarm pop-up will be displayed when the alarm becomes active. See section 3.2.3 “Alarm Pop-Ups” on page 16.
- **External.** The Alarm Output signal will be activated when the alarm is active, typically triggering a visual alarm indicator and/or alarm bell. This setting will also generate alarm messages on the serial interface provided that the NMEA ALR message has been enabled on the specific port.
- **Popup & External.** The alarm will result in both an alarm pop-up dialog and external alarm signal being activated.

It is possible to disable alarms that are of no interest for the operator by setting them to **Disabled**.

In this view it is also possible to enable and disable the use of an external alarm acknowledge momentary switch for acknowledging alarms. This is controlled by the Allow External Ack parameter. An external acknowledge input signal will acknowledge all active alarms.

With Navigation Display software 5.0.96 and onwards, it is now possible to configure whether the external alarm discrete output will be reset as soon as all active alarms (of alarm types configured as ‘external’) have been acknowledged or will remain set as long as any (‘external’) active alarm condition is present. This is determined by the ‘Ack Disables Ext ALR’ parameter in the Alarm Configuration view in Configuration mode as illustrated below. The default setting of ‘Ack Disables Ext ALR’ is ‘Yes’. This corresponds to the behavior of the discrete alarm output in previous versions of the Navigation system before this setting was available.

Specific external navigation alarms may be acknowledged through the serial interface using the NMEA ‘ACK’ sentence.
**Change setting**

1. Use \( ^{\uparrow} \) \( ^{\downarrow} \) to select the parameter to modify and press **ENTER**.
2. Select the desired value in the drop-down list using \( ^{\uparrow} \) \( ^{\downarrow} \), and press **ENTER**.
3. Press function key **Apply and Exit** to save the changes.

**Restore factory default setting**

1. Use \( ^{\uparrow} \) \( ^{\downarrow} \) to select the parameter to return to the factory default setting.
2. Press function key **Get Default**.
3. Press function key **Apply and Exit** to save the changes.

**4.11.6 Units Config**

The Units Configuration view is used to configure used units of measurements in the system. The configurable types of units are described below.

**Range Unit**

The unit used when displaying range values. Can be set to one of Nautical Mile, Kilometers and Statute Mile. The Navigation Display Software 5.0.96 and onwards has an improved range resolution. A range value (in NM, Km or Statute miles) not exceeding 1.0 in the given unit will now be displayed without the leading zero. Range resolution at short range is thus increased to three decimals.

**Speed Unit**

The unit used when displaying speed values. Can be set to one of Knots, kilometers per hour (km/h) and miles per hour (mph).
**Depth Unit**
The unit used for displaying depth. Can be set to one of meters, feet or fathoms.

**Anchor Range Unit**
The unit used to specify and display the alarm limit and current range to reference position in the Anchor Watch views. Can be set to one of meters or feet.

Note: RAIM accuracy level is always input and displayed in meters regardless of selected units.

![Units Configuration view](image)

**Change setting**
1. Use \( \uparrow \downarrow \) to select the parameter to modify and press **ENTER**.
2. Select the desired value in the drop-down list using \( \uparrow \downarrow \), and press **ENTER**.
3. Press function key **Apply and Exit** to save the changes.

**Restore factory default setting**
1. Use \( \uparrow \downarrow \) to select the parameter to return to the factory default setting.
2. Press function key **Get Default**.
3. Press function key **Apply and Exit** to save the changes.
4.11.7 GPS/DGPS Config

The view contains the GPS Configuration and SBAS Configuration subviews. When an DGPS Navigation Sensor is used, the view will also include the Beacon Configuration and Beacon Database subviews. The views are used to configure GPS, SBAS and Beacon settings of the Navigation Sensor.

4.11.7.1 GPS Config

The GPS Configuration view allows the user to configure current GPS settings of the Navigation Sensor. The following fields can be changed.

**Elevation Mask**

This parameter sets the elevation cutoff mask angle, in degrees, for the GPS. Any satellites below this mask angle will be ignored, even if available. The value should be between 0 and 60 degrees, and the default value is 5 degrees.

**Correction Age**

This field sets the maximum allowed age (in seconds) for correction data. The Navigation Sensor is able to use old correction data for extended periods of time. The default setting is 120 seconds. The lowest allowed value is 10 seconds and the highest 900 seconds. When increasing the allowed correction age, ensure that the new setting meets your requirements as accuracy will degrade with increasing correction age.

**Correction Source**

This parameter sets the source for differential corrections. Valid settings are:

- Beacon. In this setting the system will use signals from IALA radio beacon stations as source for differential corrections. This setting is only available when using a DGPS Navigation Sensor (the DGPS configuration).
- SBAS. This setting makes the system use SBAS satellite signals as source for differential corrections.
- User Port 1. This setting will command the system to apply external differential corrections received in RTCM SC-104 format on the User 1 port. The User 1 port will not be available for output of serial data from the system if this setting is selected.
- None. This setting makes the system operate in autonomous mode, not using any differential corrections.

 ATTENTION: Both the EGNOS and MSAS satellite based augmentation systems (SBAS) are currently under development. Signals from these systems are therefore used entirely at your own risk.
**SOG Smoothing Parameter**

The SOG Smoothing parameter allows you to adjust the level of responsiveness of the speed over ground (SOG) measurement, as displayed by the Display and provided in the $GPVTG and $GPRMC sentences. The default value is zero, and increasing the value will increase the level of SOG smoothing.

The setting of this parameter depends upon the expected dynamics of the vessel. If a ship is highly dynamic, this value should be set to a lower value since the filtering window needs be shorter in time, resulting in a more responsive measurement. However, if a vessel is very large and has much more resistance to change in its motion, this value can be increased to reduce measurement noise. The following formula provides some guidance on how to set this value. **If unsure on which value to set, it’s best to be conservative and leave this parameter at the default setting of 0.0 seconds.**

SOG smoothing = 10 / maximum acceleration (in m/s²).

**COG Smoothing Parameter**

The COG Smoothing parameter allows you to adjust the level of responsiveness of the course over ground (COG) measurement, as displayed by the Display and provided in the $GPVTG and $GPRMC sentences. The default value is zero, and increasing the value will increase the level of COG smoothing.

As with the SOG smoothing parameter, the setting of this parameter depends upon the expected dynamics of the vessel. If a ship is highly dynamic, this value should be set to a lower value since the filtering window needs be shorter in time, resulting in a more responsive measurement. However, if a vessel is very large and has much more resistance to change in its motion, this value can be increased to reduce measurement noise. The following formula provides some guidance on how to set this value initially. It is however recommended that you test how the revised value works in practice. **If unsure on which value to set, it’s best to be conservative and leave this parameter at the default setting of 0.0 seconds.**

COG smoothing = 10 / maximum rate of change in course (in °/s).

Note: The ship needs to be moving to calculate a valid COG value. Do not use COG values output while the ship is at rest as a basis for adjusting this parameter.

The GPS Configuration view is illustrated below.
Change setting

1. Select the parameter to edit using and press ENTER.
2. If the parameter is selected using a drop-down box, use to select the desired option in the drop-down box. If the parameter is a numeric value, use the alphanumeric keypad to enter the desired value. Use the function key to erase digits.
3. Press ENTER when the correct parameter value has been entered.
4. Press function key Apply and Exit.

Restore factory default setting

1. Use to select the parameter to return to the factory default setting.
2. Press function key Get Default.
3. Press function key Apply and Exit to save the changes.
4.11.7.2 Beacon Config

The Beacon Configuration view is used to configure beacon receiver parameters of the DGPS Navigation Sensor. This includes setting the frequency and bit rate mode, as well as the radio beacon frequency and bit rate if manual mode is used.

Note: The Beacon Configuration view is only present when using a DGPS Navigation Sensor.

**Tuning Mode**

The Tuning Mode parameter sets the frequency selection mode of the DGPS Navigation Sensor internal radio beacon receiver. The mode can be Frequency Scan, Manual or Database (Auto). The Database mode is only available when the Beacon Database is enabled. In Frequency Scan mode, the beacon receiver will search available frequencies and tune to the strongest beacon signal. In this mode, the Navigation Sensor continuously performs background search to discover higher quality DGPS signals. While performing background searches, the Navigation Sensor continues to receive differential corrections from the current radio beacon station.

In Manual tuning mode, the DGPS Navigation Sensor tunes to the specified beacon frequency for receiving DGPS signals.

In Database mode, the receiver will search for the closest station based on its current location and distance to the internal list of station locations. The frequency and bit rate specified in the station database will be used and therefore these parameters are locked when the **Tuning Mode** parameter is set to **Database (Auto)**.

**Frequency**

The Frequency parameter is used to set the frequency to use for receiving DGPS signals, when the frequency mode parameter is set to manual. Valid frequencies are between 283.5 and 325 KHz, at 0.5 kHz intervals. This parameter is locked when **Tuning Mode** is set to **Frequency Scan** or **Database (Auto)**.

**Bit Rate Mode**

The Bit Rate Mode parameter sets the bit rate mode, to either Automatic or Manual. In Automatic mode the DGPS Navigation Sensor will automatically select the correct bit rate to use for demodulating the radio beacon signal. In Manual mode, the DGPS Navigation Sensor will use the specified bit rate.

This parameter is locked to **Auto** when **Tuning Mode** is set to **Database (Auto)** since the bit rate specified in the database will be automatically used.

**Bit Rate**

The Bit Rate parameter is used to set the bit rate used for demodulation of the DGPS signal, when using the manual bit rate mode. The bit rate can be set to one of 50, 100 and 200 bps. This parameter is locked when **Bit Rate Mode** is set to **Auto**.
**Beacon Database**

The Beacon Database parameter is used to enable or disable the Beacon Database. When the parameter is set to off, the Beacon Database view will not be available. See section 4.11.7.3 for more information about the Beacon Database.

![Beacon Configuration View](image)

**Figure 135 - Beacon Configuration view**

**Change Tuning Mode, Bit Rate Mode or Bit Rate**

1. Select the parameter to edit using ^ and press **ENTER**.
2. Use ^ and ^ to select the desired mode in the drop-down box and press **ENTER**.
3. Press function key **Apply and Exit**.

**Change Frequency**

1. Select the parameter using ^ and press **ENTER**.
2. Use the alphanumeric keyboard enter the desired value. Use the **Backspace** function key to erase digits. Press **ENTER** when done.
3. Press function key **Apply and Exit**.

**Restore factory default setting**

1. Use ^ and ^ to select the parameter to return to the factory default setting.
2. Press function key **Get Default**.
3. Press function key **Apply and Exit** to save the changes.
4.11.7.3 Beacon Database

The Beacon Database view is used for inspection of the internal radio beacon station database.

Note: The Beacon Database view is only present when using an DGPS Navigation Sensor and when the parameter Beacon Database is set to on, see section 4.11.7.2 Beacon Config for more details.

The beacon station list can be sorted by station id number, station name or by the calculated distance to the station with function keys Sort By Id, Sort By Name and Sort By Distance respectively.

Available information about a particular station in the list can be viewed by highlighting it (using ∧ ∨) and pressing function key Extended Info. The Beacon Station view is displayed as described in section 4.8.2.2 Beacon Status on page 53 of this manual.

![Beacon Station List](image)

Figure 136 - Beacon Station List

4.11.7.4 SBAS Config

The SBAS Configuration view is used for control of SBAS satellite tracking for the two dedicated SBAS channels of the Navigation sensor.

With the PRN Search Mode parameter, search mode can be set to either Automatic or Manual.

In Manual search mode, the Navigation sensor will try to acquire signals from satellites with id (PRN) numbers input by the parameters PRN 1 and PRN 2 in the view. If only one particular satellite is to be tracked, input same number for both parameters.

In Automatic search mode, the Navigation Sensor will try to identify and track SBAS signals without user control of satellite selection.
4.11.8 Redund Config

The Redundant System Configuration view is to be used in a redundant or dual system configuration.

The Redundant System Configuration view is illustrated below.

The Mode parameter can be set to Stand-Alone (default), Redundant Master, Redundant Slave, Dual Display Master or Dual Display Slave. When redundant or dual configuration not is to be used, the parameter shall be set to Stand-Alone. In a redundant or dual configuration, one unit shall be set to Master and the other unit to Slave. Press function key **Apply and Exit** to save the changes.
4.11.8.1 Redundant Mode

In a redundant system configuration two interconnected navigation systems automatically synchronize their internal data bases and some settings.

The systems to be synchronized are to be interconnected by their User 3 serial ports' 'AUX' ports (or by the 'AUX' port of the combined system and the User 3 port of an Navigation system). These ports are thus not available for other purposes in this configuration.

During synchronized operation, any changes to a synchronized item performed by the user at one system will also be incorporated in the other system. This applies regardless if the change is made through a manual input or by the serial interface.

It is the responsibility of the user not to input conflicting information to the two systems, such as different waypoints with identical names. The general rule is that the last change will override any previous inputs in such a case.

The following items are synchronized:

- Waypoints.
- Routes.
- Active Route.
- XTE reset function.
- MOB function.
- RAIM setting.
- Target ETA.
- Waypoint pass criterion (Nav Config).
- Waypoint pass distance (Nav Config).
- Default RAIM value (Nav Config).
- Nav Algorithm (Nav Config).
- XTE limit (Nav Config).
- Approach distance (Nav Config).
- Default nav algorithm for received routes (Nav Config).
- Averaging time for SOG used in ETA and TTG calculations (Nav Config).

When the Mode parameter is set to anything but Stand-Alone, communication with an external unit is to be expected. Current status of redundant operation is indicated by icons in the status bar at the top of the display as follows:

- Redundant operation active.
- Redundant operation active. Synchronizing from external unit.
Redundant configuration has been enabled but no communication is established.

When initial contact is established between two units their internal contents are compared. If they are different, a warning will be displayed as illustrated below.

Select which unit to perform initial synchronization to or use the Later option to perform any desired changes before synchronization begins. In the latter case, function keys **Synch This** and **Synch Remote** will be available in the Redundant System Configuration view.

Note 1: At the initial synchronization, all contents in both systems will be set equal to the contents of the system that synchronization is made from. Unique contents of the other (receiving) system will be erased.

Note 2: During the initial synchronization process, the receiving unit (as indicated by the **R** icon) will have a large numbers of its functions temporarily disabled. For instance, any active route or active MOB function will be terminated and any attempts to modify the route/waypoint database (either by manual inputs or by the serial interface) will be rejected.

Once initial synchronization is performed, changes to synchronized items will be applied to both systems automatically without the need for special actions by the operator.
4.11.8.2 Dual Display Mode

The Navigation System supports a dual display mode where two Navigation Displays can be interconnected and used together with a single Navigation Sensor. One of the displays (the primary display or dual display master) will have the full functionality of the Navigation System whereas the other display (the secondary display or dual display slave) will be somewhat limited in terms of mainly configuration related tasks. Normal operational functions and databases for waypoints and routes will be shared by both displays.

Dual Display Configuration and Initial Synchronization

1. In the Port Rate Configuration view make sure that the User 3 port rate is set to 57600 in both displays. This view is accessed by pressing the MODE key followed by function key Config, the PAGE key, function keys I/O Config and Port Rate Config.

2. The displays must be configured for operation in dual display mode. This is determined by the ‘Mode’ parameter in the Redundant System Configuration view. This view is accessed by pressing the MODE key followed by function key Config, the PAGE key and function key Redund Config. In the primary and secondary displays, set the ‘Mode’ parameter to ‘Dual Display Master’ and ‘Dual Display Slave’ respectively.
3. A warning will be displayed with request for confirmation as illustrated below. Press the **ENTER** key to accept.

![Warning dialog](image)

4. An ‘R’ icon will be shown in the status bar at the top of the display as an indication of connection between the two displays. A crossed-over ‘R’ icon with additional text ‘No Com’ indicates that there is a problem with the connection. In this case, check electrical connection between the User 3 ports on the displays (Rx lines on one display connected to the Tx lines with same polarity on the other display and vice versa). Also recheck that the User 3 port rate is 57600 in both displays per above.

5. The databases and settings of both displays will now be compared. If they differ, the user will be requested to select which of the displays to synchronize from. The contents of the selected display will be transferred.
to and overwrite the previous contents of the other display unit. The Later option can be used to perform any desired changes before synchronization begins. In this case, function keys *Synch This* and *Synch Remote* will be available in the Redundant System Configuration view.

![Figure 144 - Synchronize dialog](image)

**Figure 144 - Synchronize dialog**

6. During synchronization, small chevrons will be displayed below the ‘R’ icon on the display unit receiving data. If a large number of waypoints and routes are to be transferred, initial synchronization may take a few minutes. During this time some functionality (e.g. the active route) will be temporarily disabled. It is recommended that no attempt to modify the database in either system is done during this period. Once initial synchronization has been performed, changes to synchronized items will be applied to both displays automatically without the need for any actions by the operator.

![Figure 145 - Icons during synchronization](image)

**Figure 145 - Icons during synchronization**
**Dual Display Operation**

During operation, most normal tasks can be performed from either display. Most functions are also synchronized between the displays. However, there are some functions that work individually in each display and also some functionality that is available in the primary display only. In general, normal operation of the system can be performed from either display while system configuration tasks e.g. definition of serial output messages and GPS receiver settings shall be performed from the primary display.

The following functions are synchronized between the displays in the dual display mode of operation: The following items are synchronized:

- Waypoint and route databases
- Active route
- Anchor Watch function
- MOB function
- RAIM settings
- Acknowledge of alarms
- Time configuration
- Nav, Alarm and Units configuration settings

The following functions works independently in each display:

- Trip logs
- Tidal calculations
- Display configurations
- Compass & depth input configurations

The following functions are available in the primary display only:

- Scheduled alerts
- Beacon receiver ‘Auto’ tuning function key in Beacon Status view
- SBAS Information view
- Upload of waypoints and routes to external equipment
- All GPS/DGPS configuration settings
- User 1 & 2 port rate settings
- Serial port output settings
- Wp/Rte Input configuration settings
- Nav configuration ‘RTE/Rnn Wp Limit’ parameter
- Alarm configuration parameters ‘Use External Ack’ and ‘Ack Disables External Alarm’
- Navigation Sensor SW/HW version

It will be indicated where information is not available in the secondary display as illustrated by the example below.

![Dual Display example](image)

**Figure 146 - Dual Display example**

4.11.9 I/O Config

The I/O Configuration view contains three subviews, used to configure the used input sentences, transmitted output sentences and port speed settings. The subviews are Input Config, Output Config and the Port Rate Config. The Port Rate Config view also contains functionality for viewing the data received on the ports (suitable for troubleshooting).

4.11.9.1 Input Config

The Port Input Configuration view contains subviews for specification of sentences that shall be interpreted and used for navigation. It is possible to define sentences to use for sensor data (heading and depth) and for receiving waypoint and route information. For each type of data, the used sentences can be limited in the following ways:

**Input Port**

This parameter makes it possible to only use sentences received on a particular port for the type of data.

**Input Sentence**

This parameter makes it possible to only use a specific NMEA sentence for the type of data.
### Input Talker ID

This parameter makes it possible to only use sentences from a specific talker (having a specific NMEA talker ID) for the type of data.

The Port Input Configuration view is illustrated below.

![Port Input Configuration](image)

**Figure 147 - Port Input Configuration**

#### 4.11.9.2 Compass Config

The Compass Configuration view allows the user to limit the heading sentences used for navigation by specifying Input Port, Input Sentence and Input Talker ID as described above.

![Compass Configuration](image)

**Figure 148 - Compass Configuration**
Configure heading (compass) sentences
1. Select the parameter to modify using ▲▼ and press ENTER.
2. Use ▲▼ to select the desired option in the drop-down box. Press ENTER when done.
3. Press function key Apply and Exit.

Restore factory default setting
1. Use ▲▼ to select the parameter to return to the factory default setting.
2. Press function key Get Default.
3. Press function key Apply and Exit to save the changes.

4.11.9.3 Depth Config
The Depth Configuration view allows the user to limit the depth sentences used for navigation by specifying Input Port, Input Sentence and Input Talker ID as described above. In addition, the following parameters can be configured to specify an offset to add to the received depth data.

Use NMEA Offset
If yes, any depth offset information available in the DPT sentence is added to the depth value taken from this sentence.

Use Manual Offset
If yes, the manually specified offset is added to the reported depth (regardless from which sentence it is taken).

Manual Offset
Specifies the size of the manual offset.

Manual Offset Sign
Specifies the sign of the manual offset. If positive the manual offset is added to the reported depth. If negative the manual offset is subtracted from the reported depth.
Configure depth sentences

1. Select the parameter to modify using ▲ ▼ and press ENTER.
2. Use ▲ ▼ to select the desired option in a drop-down box.
   Use the alphanumeric keypad to enter a number, and the Backspace function key to erase digits.
3. Press ENTER when done.
4. Press function key Apply and Exit.

Restore factory default setting

1. Use ▲ ▼ to select the parameter to return to the factory default setting.
2. Press function key Get Default.
3. Press function key Apply and Exit to save the changes.

4.11.9.4 WPT/RTE Input

The Waypoint/Route Input Configuration view allows the user to limit the waypoint and route input sentences used by the Display by specifying Input Port and Input Talker ID, as described on page 144. The Route Sentence can also be specified. If set to RNN (which is only provided for NMEA backward compliance) only active routes can be input to the system. See section 5.2 in Appendix for more details.
Configure used waypoint and route sentences

1. Select the parameter to modify using ^ v and press ENTER.
2. Use ^ v to select the desired option in the drop-down box. Press ENTER when done.
3. Press function key Apply and Exit.

Restore factory default setting

1. Use ^ v to select the parameter to return to the factory default setting.
2. Press function key Get Default.
3. Press function key Apply and Exit to save the changes.

4.11.9.5 Output Config

The Port Output Configuration view is used to configure which sentences are output on the User Ports of the Navigation System, and how often they are sent. In the Output Configuration subview for each user port, current load on the port is displayed. This gives an indication on how much of the port’s baud rate that is used up by the enabled sentences. Only turn on the sentences that you intend to use.

If no response is received from the Navigation Sensor, the Navigation Sensor dependant sentences will be locked.

For a list of output sentences available on the different serial ports, refer to the Navigation System installation manual (P/N SAA7000 109-142).

The Port Output Configuration view is illustrated below.
Modify sentences sent on a specific port

1. Press the function key corresponding to the port to modify output sentences for. The following view is displayed.

2. Highlight the sentence to modify output for using ▲▼.

3. To set the output interval, press ENTER and use ▲▼ to select the desired frequency to output the sentence at, or select Disabled to disable output of the selected sentence. Press ENTER when done.

Restore factory default setting

1. Use ▲▼ to select the parameter to return to the factory default setting.

2. Press function key Get Default.

3. Press function key Apply and Exit to save the changes.
4.11.9.6 RTCM output on User 2 Port

It is possible to output correction data from the internal DGPS beacon receiver in RTCM format on the user 2 port. This function is available only if the Navigation Display is used together with an DGPS Navigation Sensor with routing software version 1.07 or higher.

To determine current system type and current version of routing software proceed as described in section 4.11.11.

If this function is available, an ‘RTCM’ option will be added to the list of output messages in the User 2 Port Output Configuration view as illustrated below.

![User Port 2 Output Configuration](image)

Figure 153 - User Port 2 Output Configuration

It is possible to interleave RTCM output data with the ordinary NMEA style text messages on the User 2 port. However, this may be a problem for receiving equipment and thus it is recommended that all other User 2 Port output messages shall be set to ‘Disabled’ when this feature is used.

The baud rate for RTCM output data is controlled by the ‘User Port 2’ rate parameter in the Port Rate Configuration view. Selectable rates are 4800, 9600 and 19200.

4.11.10 Port Rate Config

The Port Rate Configuration view allows the user to configure the communication rate used for the serial ports in the Navigation System, and the output rate of the Speed Log Output binary port. The view also makes it possible to view the data that is received on the different serial ports.

The rate for the Speed Log Output binary port can be set to one of Disabled, 100, 200, 300 or 400 pulses per nautical mile (P/Nm). The default setting is that Speed Log output is disabled. The output pulse period has a resolution of 50 ms providing a resolution of 0.5 knots up to 10-20 knots depending on pulse rate with a working range up to 30 knots.
The communication rate for a port is locked if no response is received from the Navigation Sensor. The communication rate for User port 1 and 2 are locked if no response is received from the Navigation Sensor.

<table>
<thead>
<tr>
<th>Port</th>
<th>Rate</th>
<th>Checksum</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Port 1</td>
<td>38400 bps</td>
<td>Always</td>
</tr>
<tr>
<td>User Port 2</td>
<td>9600 bps</td>
<td>Always</td>
</tr>
<tr>
<td>User Port 3</td>
<td>57600 bps</td>
<td>Always</td>
</tr>
<tr>
<td>R4 Sensor</td>
<td>57600 bps</td>
<td>Always</td>
</tr>
<tr>
<td>Speed Log Output</td>
<td>57600 bps</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

Figure 154 - Port Rate Configuration

**Change communication rate**
1. Select port to change communication rate (baud rate) for using \(\wedge\ \vee\) and press **ENTER**.
2. Use \(\wedge\ \vee\) to select the desired communication rate in the drop-down box and press **ENTER**.
3. Press function key **Apply and Exit**.

**Change Speed Log output rate**
1. Select the Speed Log Output parameter using \(\wedge\ \vee\). Press **ENTER**.
2. Use \(\wedge\ \vee\) to select the desired speed log output frequency in the drop-down list. Press **ENTER** when done.
3. Press function key **Apply and Exit** when done.

**Restore factory default setting**
1. Use \(\wedge\ \vee\) to select the port to return to the factory default setting.
2. Press function key **Get Default**.
3. Press function key **Apply and Exit** to save the changes.

**View received data**
1. Select serial port to view received data on using \(\wedge\ \vee\). It is not possible to view received data on User Port 2, as it only supports output data.
2. Press function key **View Raw Data**. The following view is displayed.
3. Use function key **Freeze** to stop the update of raw data on the screen. Use **Resume** function key to view more data.

4. Press **ESC** when done.

4.11.11 System Info

The System Information view provides subviews for general system information. It contains subviews for: viewing software and hardware versions, displaying the results of the Display's last performed built-in integrity tests and for viewing the current memory usage of the Display.

**View software and hardware versions**

1. Press the function key **SW/HW Versions**.
2. The below view is displayed.
Figure 156 - Software/Hardware Versions

The view shows the software versions of the different components present in the Display and Navigation Sensor as well as the display’s hardware revision and GPS module serial number. The current system configuration -- GPS or DGPS -- is also indicated at the top of the screen.

**View the result of the Display’s last performed built-in integrity tests**

1. Press function key **Display BIIT Info**.
2. A view displaying the built in test result is shown, as illustrated below.

Figure 157 - Built in Test Information
View current memory usage of the Display

1. Press function key Memory Usage.
2. The Memory Usage view is shown, as illustrated below.

![Memory Usage Table]

<table>
<thead>
<tr>
<th>Function</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Database</td>
<td>1 %</td>
</tr>
<tr>
<td>Waypoints In Routes</td>
<td>0 %</td>
</tr>
<tr>
<td>Waypoint Database</td>
<td>2 %</td>
</tr>
<tr>
<td>MOB Waypoints</td>
<td>35 %</td>
</tr>
<tr>
<td>DGPS Messages</td>
<td>0 %</td>
</tr>
</tbody>
</table>

Figure 158 - Memory Usage

The memory usage is measured for:

- **Route Database** percentage of number of routes used.
- **Waypoints in Routes** percentage of route storage used.
- **Waypoint Database** percentage of waypoint storage used.
- **MoB Waypoints** percentage of MOB waypoint storage used.
- **DGPS Message** percentage of DGPS message storage used.
4.11.12 Restore Sys. Conf.

The *Restore System Configuration* view allows the user to restore the default settings for either the Display or the Navigation Sensor.

**Restore Display configuration**

1. Press function key **Restore Display**.
2. Answer **Yes** to the confirmation message if confident in restoring all configuration parameters of the Display.

**Restore Sensor configuration**

1. Press function key **Restore Sensor**.
2. Answer **Yes** to the confirmation message if confident in restoring all configuration parameters of the Navigation Sensor. A progress bar will be displayed during restore of sensor configuration.
3. The display needs to be rebooted when the sensor configuration has been restored. This is done automatically after 15 s but the user can manually reboot the display when the progress bar has disappeared.

![Figure 159 – Restore System Configuration](image)
5   APPENDIX

5.1   Alarm Messages

The alarm messages that can occur in a Navigation System are listed below.

Table 2 - Navigation Alarm Messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>151</td>
<td>NAV: HDOP Limit Exceeded</td>
</tr>
<tr>
<td>152</td>
<td>NAV: Position Data Lost</td>
</tr>
<tr>
<td>153</td>
<td>NAV: DGPS Position Data Lost</td>
</tr>
<tr>
<td>154</td>
<td>NAV: GPS Not Initialized</td>
</tr>
<tr>
<td>155</td>
<td>NAV: GPS Connection Lost</td>
</tr>
<tr>
<td>156</td>
<td>NAV: XTE Limit Exceeded</td>
</tr>
<tr>
<td>157</td>
<td>NAV: Approaching Waypoint (Distance)</td>
</tr>
<tr>
<td>170</td>
<td>NAV: Approaching Waypoint (Time)</td>
</tr>
<tr>
<td>159</td>
<td>NAV: Serial Waypoint Download Failed</td>
</tr>
<tr>
<td>160</td>
<td>NAV: Serial Route Download Failed</td>
</tr>
<tr>
<td>161</td>
<td>NAV: Heading Data Lost</td>
</tr>
<tr>
<td>162</td>
<td>NAV: Depth Data Lost</td>
</tr>
<tr>
<td>163</td>
<td>NAV: RAIM Status - Caution</td>
</tr>
<tr>
<td>164</td>
<td>NAV: RAIM Status - Unsafe</td>
</tr>
<tr>
<td>166</td>
<td>NAV: Redundant System Connection Lost</td>
</tr>
<tr>
<td>167</td>
<td>NAV: Anchor Alarm Distance Exceeded</td>
</tr>
<tr>
<td>168</td>
<td>NAV: Scheduled Alert</td>
</tr>
<tr>
<td>169</td>
<td>NAV: DGPS Integrity Alert</td>
</tr>
</tbody>
</table>
5.1.1 Navigation Alarms Description

**NAV: HDOP Limit Exceeded**
This alarm is active when the HDOP (horizontal dilution of precision) exceeds 4.0.

**NAV: Position Data Lost**
This alarm is active when no valid position information is available from the Navigation Sensor.

**NAV: DGPS Position Data Lost**
This alarm is active when a differentially corrected position is not available.

**NAV: GPS Not Initialized**
The alarm is active when the display is not able to configure or receive the current configuration from the Navigation Sensor.

**NAV: GPS Connection Lost**
This alarm is active if the communication between the GPS and the display unit does not work.

**NAV: XTE Limit Exceeded**
This alarm is active if the current cross-track error is greater than the configured cross-track error limit.

**NAV: Approaching Waypoint (Distance)**
This alarm is active when the distance to next waypoint is shorter than the approach distance configured in the Nav Config view, described on page 125.

**NAV: Approaching Waypoint (Time)**
This alarm is active when the estimated time to go to next waypoint is shorter than the waypoint approach time configured in the Nav Config view, described on page 125.

**NAV: Serial Waypoint Download Failed**
This alarm is raised if serial download of waypoint information has failed.

**NAV: Serial Route Download Failed**
This alarm is raised if serial download of route information has failed.

**NAV: Heading Data Lost**
This alarm is active when no valid heading data is received.
**NAV: Depth Data Lost**
This alarm is active when no valid depth data is received.

**NAV: RAIM Status - Caution**
This alarm is active when the RAIM status is caution.

**NAV: RAIM Status - Unsafe**
This alarm is active when the RAIM status is unsafe.

**NAV: Redundant System Connection Lost**
No connection to an external nav system in redundant system configuration.

**NAV: Anchor Alarm Distance Exceeded**
This alarm is active when the anchor watch function is in operation and the range limit has been exceeded.

**NAV: Scheduled Alert**
This alarm is active when a scheduled time or ETA alert has been activated.

**NAV: DGPS Integrity Alert**
This alarm is active when any of the following conditions apply:

- No DGPS Signal: A correction source for GPS other than None has been selected in the GPS Configuration view and more than ten seconds have passed since a new set of differential corrections were applied to the navigation solution.
- Station Unhealthy: Beacon has been selected as correction source for GPS and the radio beacon station in use indicates an unhealthy status.
- Station Unmonitored: Beacon has been selected as correction source for GPS and the radio beacon station in use indicates an unmonitored status.
- Poor Signal: Beacon has been selected as correction source for GPS and word error rate of the received signal in use exceeds 10%.
5.2 Transfer Waypoint and Routes

The Navigation System supports both download and upload of waypoints and routes from/to ECDIS and other external systems. The system also supports continuous output of the current active route. Waypoints and routes are transferred using the WPL and RTE sentences. The WPL and RTE sentences are interpreted according to the IEC 61162-1 (2000) standard. The Rnn sentence is supported but for NMEA backward compliance only. It can only be used to output and receive active routes.

5.2.1 Download Waypoints and Routes

Waypoints and complete routes can be received on both user port 1 and 3, using the WPL and RTE sentences. Active route can also be received using the Rnn sentence. Which sentences that should be interpreted can be configured in the Wp/Rte Input view, described on page 147.

Received routes are assigned the navigation algorithm specified by the parameter RTE Nav Algorithm, described in section 4.11.4 “Nav Config” on page 125. The Navigation System can store a maximum of 2000 waypoints and 100 routes.

5.2.1.1 Waypoint and Complete Route Downloads

Received waypoints and complete routes will be stored in the Display, and will automatically replace any existing waypoints/routes with the same name.

5.2.1.2 Working Route Downloads

A working route indicated by the Message mode field being set to ‘w’ in the RTE sentence that is received by the Navigation System will automatically become the new active route of the system, and replace any existing active route.

Routes received using the Rnn sentence will also automatically become the new active route. The ‘nn’ part of the Rnn sentence is interpreted in the same way as the Route identifier field of the RTE sentence, i.e. as route name.

The first received waypoint of a working route will become the first ‘from’ waypoint and the second waypoint received will become the first ‘to’ waypoint of the active route. This is in accordance with the interpretation of the RTE sentence for working routes as defined in IEC standard 61162-1.

5.2.2 Upload Waypoints and Complete Routes

Uploaded waypoints and routes will be output using the WPL and RTE sentences, on the serial port where the sentence WPL/RTE Upload is enabled. See section “Output Config” on page 148 for details on enabling output sentences.

To upload a waypoint, go to the Waypoint List view described on page 98 and use the Upload Waypoint function key to transmit information about the highlighted waypoint on the configured serial port(s). It is also possible to upload the complete set of waypoints with a function key labelled Upload All Wps. To upload a complete route, go to the Route List view described on page 81 and use the Upload Route function key to transmit information about the highlighted route and all associated waypoints.
5.2.3 Output Working Route and Remaining Waypoints

The system supports output of the current active route (the working route) and the remaining waypoints of the route. The active route can be transmitted both using WPL/RTE and WPL/RNN sentences. Usage of WPL/RTE is recommended.

When navigating towards the first waypoint of the route, the ship’s current position is output as the origin waypoint. This waypoint is named “t0” when using WPL/RTE and “0000” when using WPL/RNN.

When transmitting active route data using WPL/RNN, the waypoints in the active route are given a number corresponding to their position in the route, starting from “0001”. The “NN” field in RNN is always “00”.

The number of remaining waypoints of the active route that are outputted is determined by the RTE/Rnn WP Limit parameter described in section 4.11.4.

Enabling output sentences is described in section 4.11.9.5 “Output Config” on page 148.
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