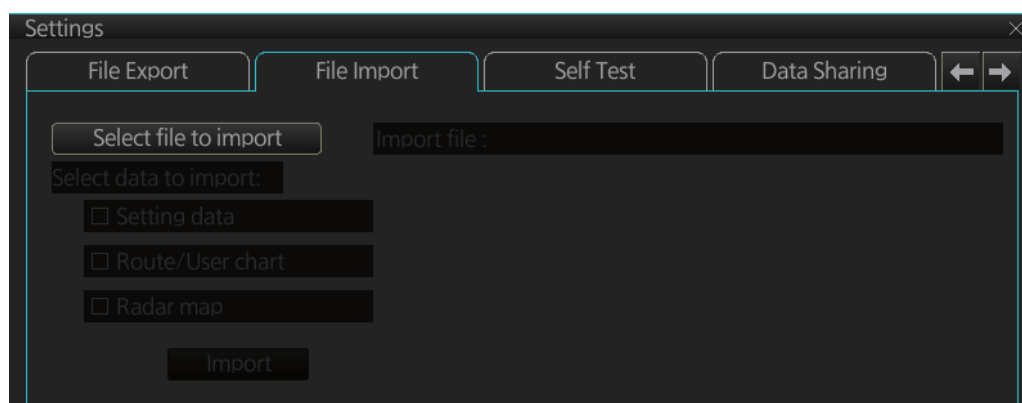


12.8 How to Import Routes

12.8.1 How to import FMD-3xx0, FCR-2xx9, FAR-3xx0 route data

You can import a route created on another FMD-3xx0, FCR-2xx9, FAR-3xx0.

1. Set the USB flash memory that contains the route data to import in the USB port on the Control Unit.
2. Click the [] button on the Status bar and select [Settings]. The confirmation message appears.
3. Click the [OK] button.
4. Click the [File Import] tab.



5. Click the [Select file to import] button to select the file to import.
6. Check the data to import, at [Select data to import].
7. Click the [Import] button.

12.8.2 How to import FEA-2x07 route data

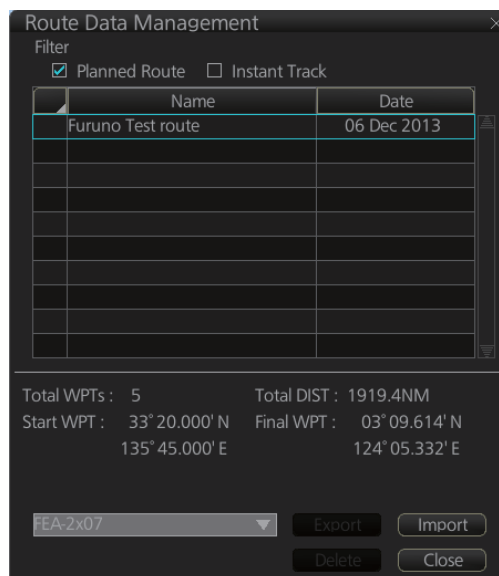
Routes created at an ECDIS FEA-2x07 can easily be imported to this ECDIS. Copy the routes to a folder in a USB flash memory then follow this procedure. Note that FEA-2x05-created routes cannot be imported.

1. Set the USB flash memory to the USB port on the Control Unit.
2. Activate the Voyage planning mode.
3. On the InstantAccess bar, click the [Manage Data], [Data Import] and [Route] buttons to show the [SELECT DIRECTORY] dialog box.
4. Select the folder that contains the route(s) to be imported then click the [OK] button.
5. Check the route(s) to import then click the [Import] button.



12.8.3 How to import csv, ASCII format route data

1. Set the USB flash memory to the USB port on the Control Unit.
2. Activate the Voyage planning mode.
3. On the InstantAccess bar, click the [Manage Data], [Route] and [Route Data Management] buttons to show the [Route Data Management] dialog box.
4. At the drop-down list, select the import format. The choices are [FEA-2x07], [CSV Position], [ASCII WPT Name Position], [ASCII Full], [CSV Route Sheet], [RTE Format].
5. Click the [Import] button.
6. Select the file to import then click the [Open] button.
7. Click the [Close] button to close the dialog box.

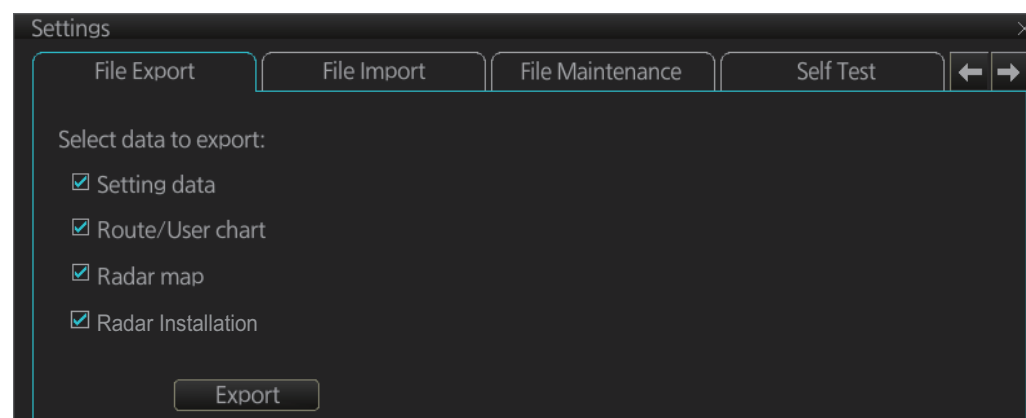


12.9 How to Export Route Data

12.9.1 How to export FAR-3xx0 route data

You can export route data to share the data with other FCR-2xx9, FMD-3xx0, FAR-3xx0 units.

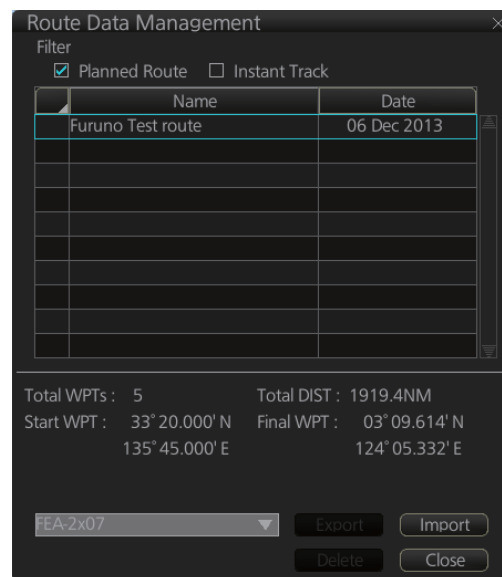
1. Set a USB flash memory in the USB port on the Control Unit.
2. Click the [Settings] button on the Status bar and select [Settings]. The confirmation message appears.
3. Click the [OK] button.
4. Click the [File Export] tab.



5. At [Select data to export], check only [Route/User chart].
6. Click the [Export] button to save the data to the USB flash memory.

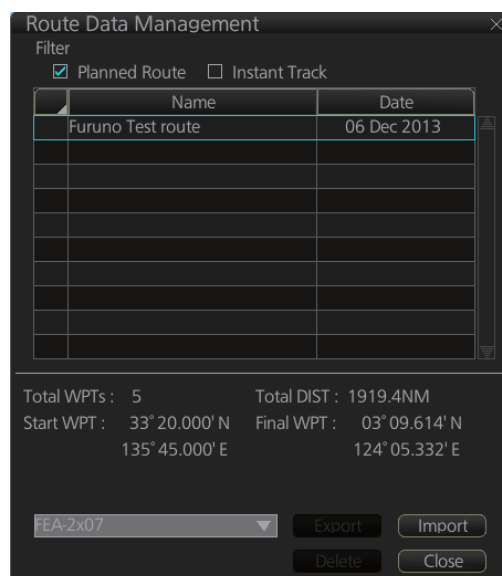
12.9.2 How to export route data in FEA-2x07, csv, ASCII format

1. Set the USB flash memory to the USB port on the Control Unit.
2. Activate the Voyage planning mode.
3. On the InstantAccess bar, click the [Manage Data], [Route] and [Route Data Management] buttons to show the [Route Data Management] dialog box.
4. At the drop-down list, select the export format. The choices are [FEA-2x07], [CSV Position], [ASCII WPT Name Position], [ASCII Full], [CSV Route Sheet], [RTE Format].
5. Check the route(s) to export then click the [Export] button.
6. Click the [OK] button.
7. Click the [Close] button to close the dialog box.



12.10 How to Delete Routes

1. Click the [PLAN] button on the Status bar to get into the Planning navigation mode.
2. Click the [Manage Data] button on the InstantAccess bar followed by the [Route] button.



3. Put a checkmark in the check box to the left of the route name.
4. Click the [Delete] button. The confirmation message appears.
5. Click the [OK] button.
6. Click the [Close] button to close the dialog box.

12.11 Reports

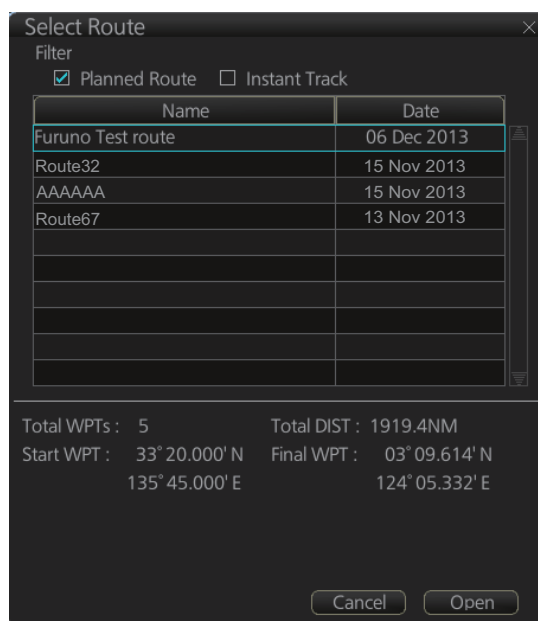
This chart radar generates reports for waypoints in the selected route. If connected to a printer, reports can be printed by clicking the [Print Text] button. Text in reports can be searched with the [Find] button.

To generate a report, do the following:

1. Click the [Plan] button to go to the Voyage planning mode.
2. Click the [Report] button followed by the [Route] button. Click applicable “report” button.



The following dialog box appears.

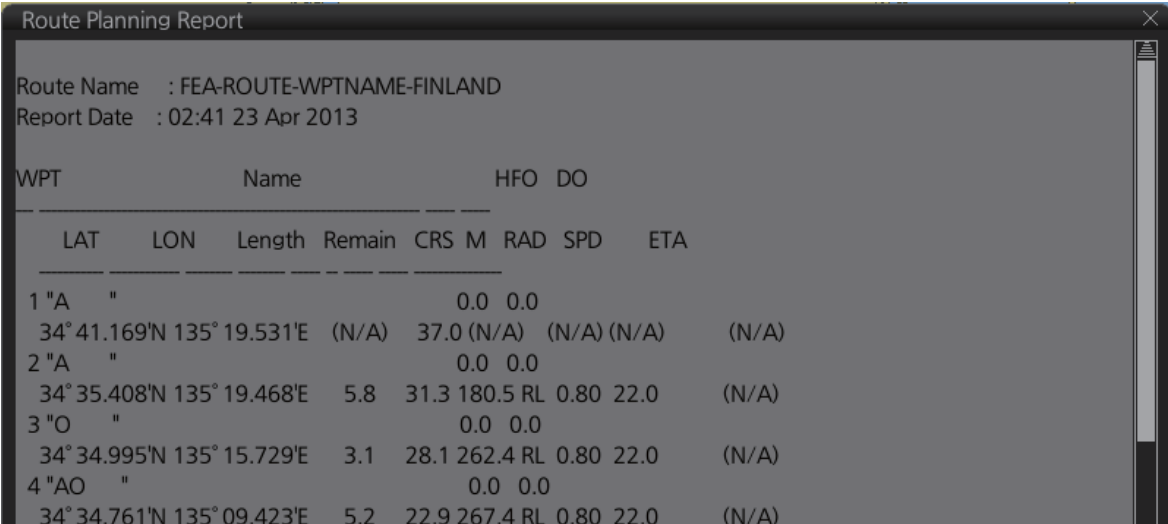


3. Select the appropriate route then click the [Open] button to show the selected report. See the next several pages for examples.

WPT table report

The WPT report contains the following information:

- Route name
- Date of report
- Waypoint no.
- Length of waypoint
- Distance remaining in route
- Position in latitude and longitude
- Planned courses and steering methods (RL (RhumbLine), GC (GreatCircle))
- Turning radius
- Planned speeds
- Estimated times of arrival (ETA)
- ETD from waypoint 1 (start point)
- ETA to waypoint "x" (final waypoint)
- Total length of route
- Estimated time required to run route using planned speeds and courses

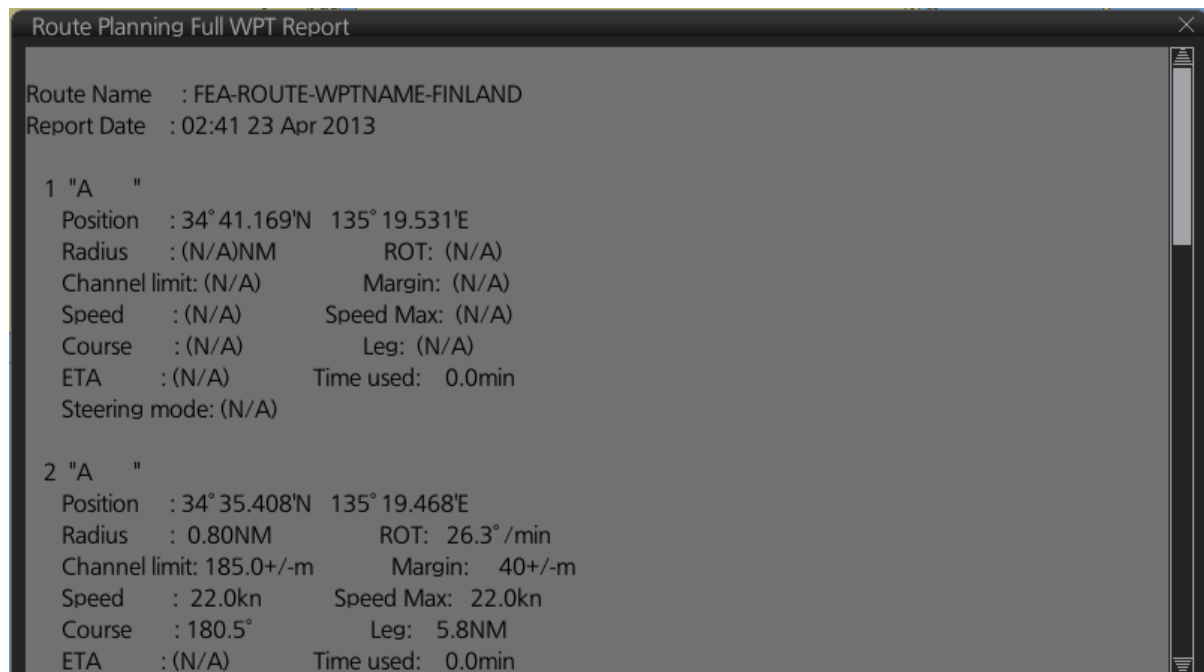


Route Planning Report									
Route Name : FEA-ROUTE-WPTNAME-FINLAND									
Report Date : 02:41 23 Apr 2013									
WPT	Name		HFO		DO				
	LAT	LON	Length	Remain	CRS	M	RAD	SPD	ETA
1 "A	"						0.0	0.0	
	34° 41.169'N	135° 19.531'E	(N/A)		37.0	(N/A)	(N/A)	(N/A)	(N/A)
2 "A	"						0.0	0.0	
	34° 35.408'N	135° 19.468'E	5.8		31.3	180.5	RL	0.80	22.0
3 "O	"						0.0	0.0	
	34° 34.995'N	135° 15.729'E	3.1		28.1	262.4	RL	0.80	22.0
4 "AO	"						0.0	0.0	
	34° 34.761'N	135° 09.423'E	5.2		22.9	267.4	RL	0.80	22.0

Full WPT report

You can generate a full waypoint report for the route selected. The report includes the following for each waypoint.

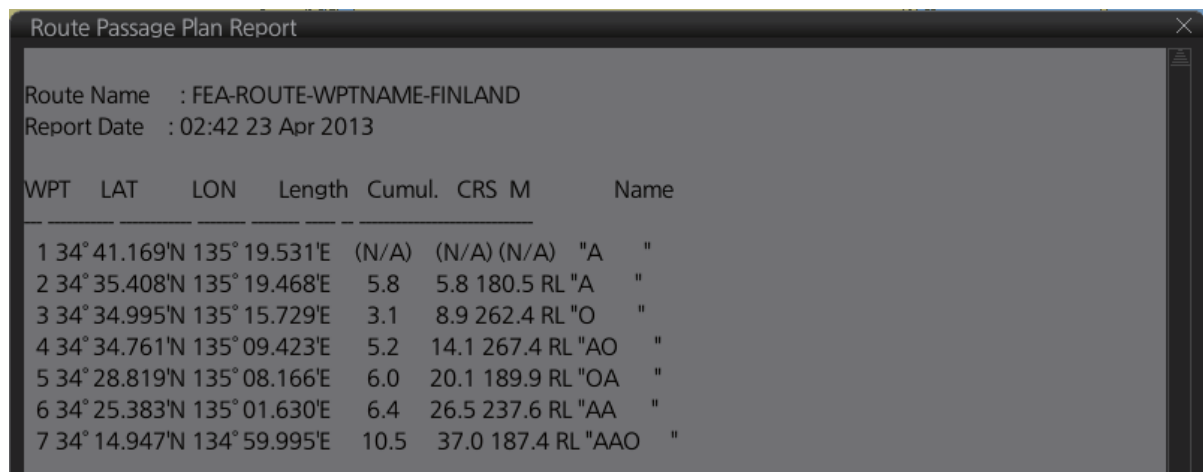
- Route name
- Date of report
- Waypoint no.
- Position in latitude and longitude
- Planned radius
- Channel limit
- Planned speed
- Planned course
- ETA
- Steering mode (rhumb line or great circle) to each waypoint
- ROT
- Margin for channel limit
- Speed Max
- Leg length
- Time used



Passage plan report

The passage plan report generates waypoint information for each waypoint in the route selected.

- Route name
- Date of report
- Waypoint no.
- Position in latitude and longitude
- Length
- Cumulative length
- Planned course
- Steering method (RL or GC)
- Name of waypoint



Route Passage Plan Report

Route Name : FEA-ROUTE-WPTNAME-FINLAND
Report Date : 02:42 23 Apr 2013

WPT	LAT	LON	Length	Cumul.	CRS	M	Name
1	34° 41.169'N	135° 19.531'E	(N/A)	(N/A)	(N/A)	"A	"
2	34° 35.408'N	135° 19.468'E	5.8	5.8	180.5 RL	"A	"
3	34° 34.995'N	135° 15.729'E	3.1	8.9	262.4 RL	"O	"
4	34° 34.761'N	135° 09.423'E	5.2	14.1	267.4 RL	"AO	"
5	34° 28.819'N	135° 08.166'E	6.0	20.1	189.9 RL	"OA	"
6	34° 25.383'N	135° 01.630'E	6.4	26.5	237.6 RL	"AA	"
7	34° 14.947'N	134° 59.995'E	10.5	37.0	187.4 RL	"AAO	"

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13. USER CHARTS

13.1 Introduction

User charts are overlays that the user creates to indicate safety-related objects and areas. They can be displayed on both the radar display and the electronic chart. These charts are intended for pointing out safety-related items like position of important navigation marks, safe area for the ship, etc. User charts areas can be used to activate alerts and indications based on user-defined danger symbols, lines and areas. When route or own ship estimated position is going to cross a user chart symbol, line or area that is defined as a dangerous one, an alert or indication is generated by the system. See the chapter on chart alerts.

A user chart consists of various objects (points, lines, text, symbols, etc.). The maximum number of points per user chart is 200 (a circle is one point, a rectangle is four points). You may link up to five user charts to a route, for a max. of 1,000 user chart points per route.

The user chart is displayed on the radar display and its position and shape is based on the ship's actual position. When own ship is moving in the area covered by the user chart, the elements of the user chart are superimposed on the radar, with a maximum of 80 of the nearest elements displayed.

13.1.1 Objects of user charts

Below is a description of the objects used in a user chart.

- **Tidal:** There are two types of tidsals, current and predicted.
- **Line:** You can define four different types of lines. Lines can be used in chart alert calculation and/or display on the radar:
 - **Navigation lines:** Displayed on both the radar display and the chart display. Navigation lines are reference lines for coast line.
 - **Coast line:** Displayed on both the radar and the chart display. Coastal line is usually a well-defined (by chart digitizer) multi-segment line showing the coastline. The user is able to create this type of line in case there is no suitable chart available over desired area in S57 format.
 - **Depth contour:** Displayed on both the radar and chart display. Depth line shows the chosen depth levels. The user is able to create this type of line in case there is no suitable chart available over desired area in or S57 format.
 - **Route line:** Displayed on both the radar display and the chart display. Route lines are zones for anchoring, traffic separation lines, etc.
- **Clearing line:** A clearing line is used to define a line which a vessel can sail to avoid navigational hazards. A clearing line can be of the NMT (Not More Than) or NLT (Not Less Than) type. Displayed on the chart display only.
- **Area:** The operator can define closed areas, which the system can use to detect safe water areas. If route or estimated ship position is going to cross the area, the system generates a warning to the user. These areas can be used to specify safe

areas as defined by the master or by the policy of the ship's owner. They are always available regardless of the type of chart material used.

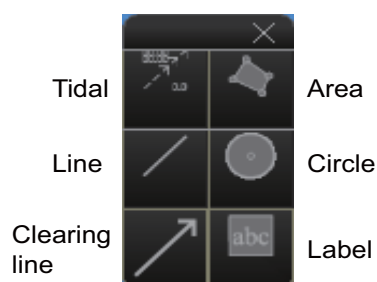
- **Circle:** The operator can define an area with a circle, which can define a location to avoid. If route or estimated ship position is going to cross the area, the system generates a warning to the user. These areas can be used to specify safe areas as defined by the master or by the policy of the ship's owner. They are always available regardless of the type of chart material used.
- **Label:** There are two types of labels: point and label. A "point" (i) is mainly used to denote position of objects, such as buoys, light houses, fixed targets, wrecks, etc. Points can be used in chart alert calculation. A "label" provides user-entered text to show on the display.

13.2 How to Create a User Chart

You can create and modify a user chart in the Voyage planning mode.

To make a complete user chart, do the following:

1. Click the [PLAN] button on the Status bar to go to the Voyage planning mode.
2. Click the [Planning] and [User Chart] buttons on the InstantAccess bar to show the user chart palette and the [User Chart] dialog box.



3. Click the [New] button on the [User Chart] dialog box to create a new chart.
4. Click the desired object (button) on the palette. The [Tidal], [Line], [Clearing line] and [Label] buttons have multiple choices. Right-click the respective button to show a context sensitive menu. The choices available for each object are shown below.

Tidal: Current, Predicted

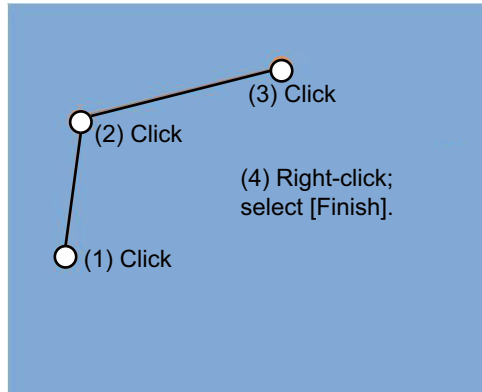
Line: Coast, Nav, Route, Depth

Clearing line: NMT (Not More Than), NLT (Not Less Than)

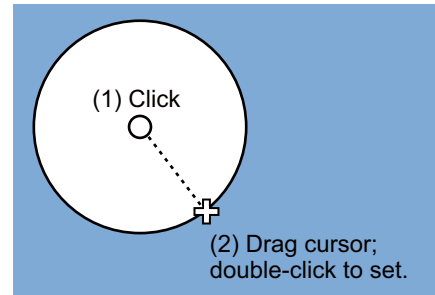
Label: Label, Point

5. Put the cursor on the location to insert the object then push the left button. See the figure below for how to construct lines, areas and circles. For the “Tidal” object, you can set Orientation, Strength and Time from the dialog box. With the “Label” object you can enter text and show that text on the screen.

Note: An object can also be put at the center of the screen. Do steps 1-4 in this procedure. On the [User Chart] dialog box, right-click the box to the left of [Object] then select [Add Object] from the pop-up menu.

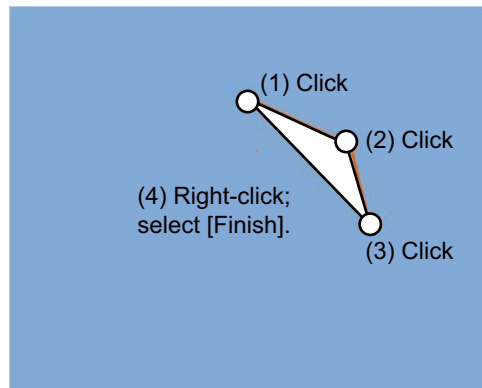


How to create a line



- 1) Put cursor where to locate center of circle then click.
2) Drag cursor to set radius; double-click to set.

How to create a circle



How to create an area

6. When you insert an object, the following is done in the [User Chart] dialog box:
- Name of the object button appears in the [Object] window
 - Latitude and longitude position of the object is displayed
 - Total object count is updated
7. To enter a name for the object click the appropriate location in the [Name] window then use the software keyboard on the Control Unit to enter a name.
8. To show the object on the radar display, click the corresponding box in the [Radar] window to show a checkmark in the box.

For the label, line, clearing line, area and circle, click the corresponding box in the [Danger] window to use or don't use the object in chart alert calculation. Show a red checkmark to use the object in chart alert calculation.

For the area, circle and line, you can add Notes as shown below. See the description and figure below for a description of Notes.

- 1) Enter the text for the Notes in the [Description] box.
- 2) Click the box in the [Notes] window of the [User Chart] dialog box to show a checkmark.

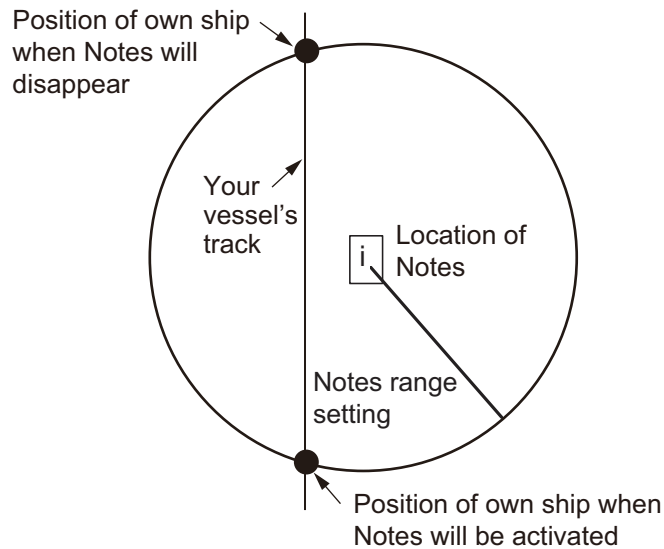
13. USER CHARTS

- 3) At the [Range of notes] (shown only for line) input box, enter the distance from the Notes position at which to display the Notes.

Note: You cannot select both [Danger] and [Notes] for these symbols; select either [Danger] or [Notes].

What are Notes?

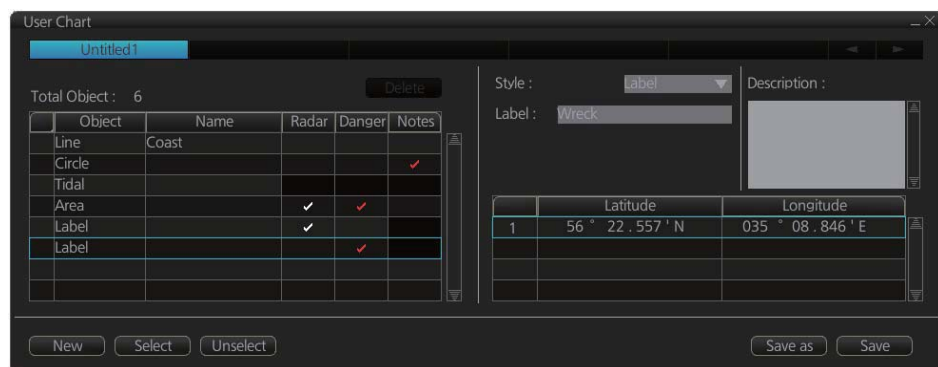
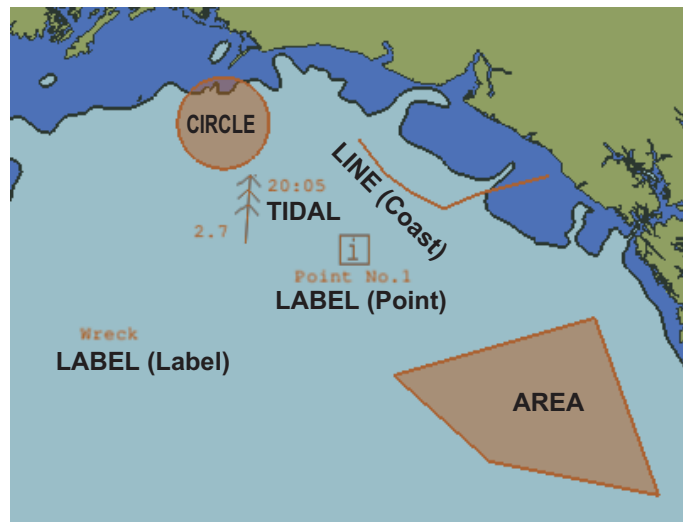
"Notes" provides messages for the operator relative to your vessel's position in the Voyage navigation mode. The system compares Notes position and when own ship is x miles from the Notes it generates a message.



9. To continue entering the same symbol, click a new location on the screen and do step 3. To enter a different symbol, do steps 3 and 4.
10. After you have entered all necessary objects, click the [Save] button.
Note: If the [Save] button is not shown, update the user chart to show the button.
11. The [Save user chart] window appears. Enter a name for the user chart then click the [Save] button.

The figure on the next page shows a user chart and the corresponding entries in the [User Chart] dialog box.

- The Line with the name "Coast" is a coastline.
- The Circle has the Notes "Arrival No.1," which means the message "Arrival No.1" will be shown on the screen when the ship is 1 NM from the position of the center of the circle.
- The Tidal marks line marks a tidal (current).
- The Area has Radar and Danger checked. This means the area is shown on the radar display and is used in chart alert calculation.
- The Label with the name "Point No. 1" is a point label and is also shown on the radar display.
- The Label with the name "Wreck" is a common label and has Danger checked; it is used in chart alert calculation.



Note: The following combinations of object and display are not allowed:

- Tidal object with Radar, Danger, Notes
- Clearing line with Radar, Notes
- Label with Notes

How to use the Undo feature

The Undo feature, available when creating a route and a user chart, can be accessed from the [UNDO] button on the InstantAccess bar, use double-click, or the context-sensitive menu. In user chart creation the feature is used with object and text input as follows:

Tidal, Circle, Current, Label: Delete last-entered object.

Area, Line: Erase last-entered point. For [Area], the area must have at least four points. And for a [Line], there must be at least three points.

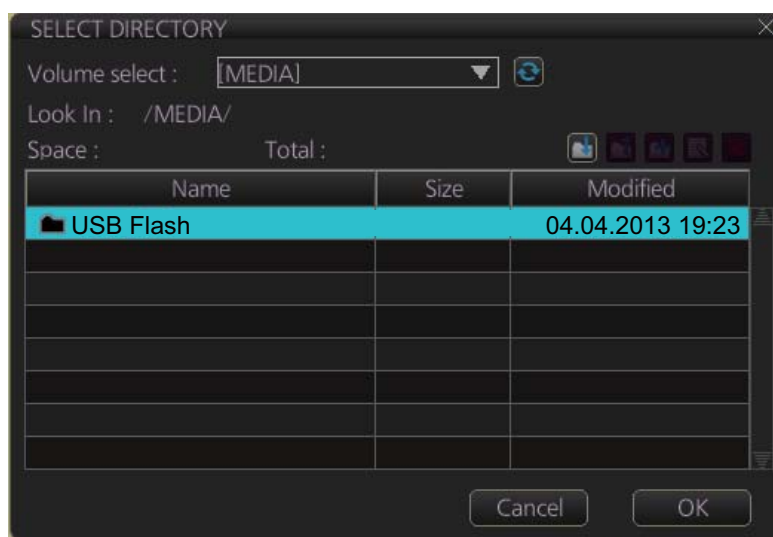
Text input: Erase last-entered character or character string.

Note: The [UNDO] button is not displayed on the FURUNO 19-inch monitor unit.

13.3 How to Import a User Chart Created with ECDIS FEA-2x07

User charts created at the ECDIS FEA-2x07 can easily be imported to this ECDIS. Copy the user charts to a folder (see chapter 17 in the operator's manual of the FEA-2x07) in a USB flash memory then do as follows. Note that FEA-2x05 created user charts cannot be imported.

1. Set the USB flash memory to the USB port on the Control Unit.
2. Activate the Voyage planning mode.
3. Click the [Manage Data], [Data Import] and [User Chart] buttons to show the [SELECT DIRECTORY] dialog box.



4. Select the folder that contains the user chart(s) to be imported then click the [OK] button.



5. Check the user chart(s) to import then click the [Import] button.

13.4 How to Edit Objects on a User Chart

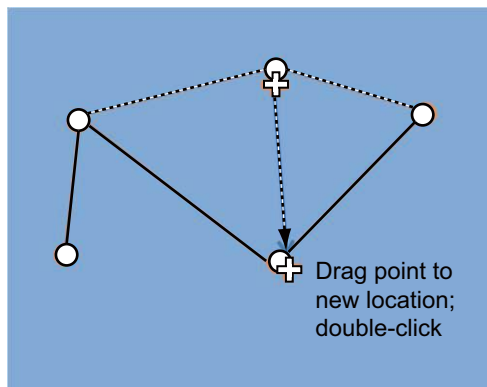
Do steps 1 and 2 in section 13.2 to show the [User Chart] dialog box then click the [Select] button. Select the user chart to edit then click the [Open] button. Follow the appropriate instructions below.

13.4.1 How to edit objects on the chart area

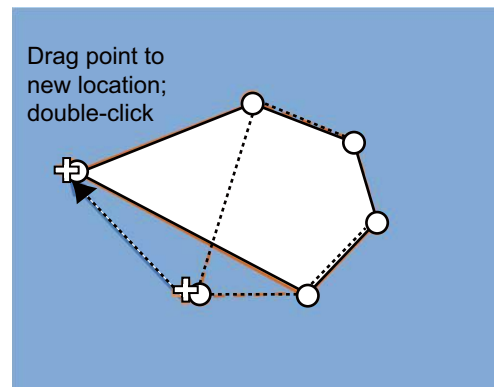
How to move objects

Drag and drop the object.

How to change corner points in lines and areas



How to change corner point on a line



How to change corner point in an area

How to insert a corner point on a line or area

Put the cursor on the location where to insert a corner point, right-click the display area to show the context-sensitive menu then select [Insert].

13.4.2 How to edit objects from the User Chart dialog box

The latitude and longitude position, object name and description of an object can be edited from the [User Chart] dialog box.

1. Open the [User Chart] dialog box (see steps 1 and 2 in section 13.2).
2. Double click the item to edit and use the scrollwheel to edit.

13.5 How to Delete Objects from a User Chart

How to delete an object

Right-click the object to show the context-sensitive menu and select [Delete].

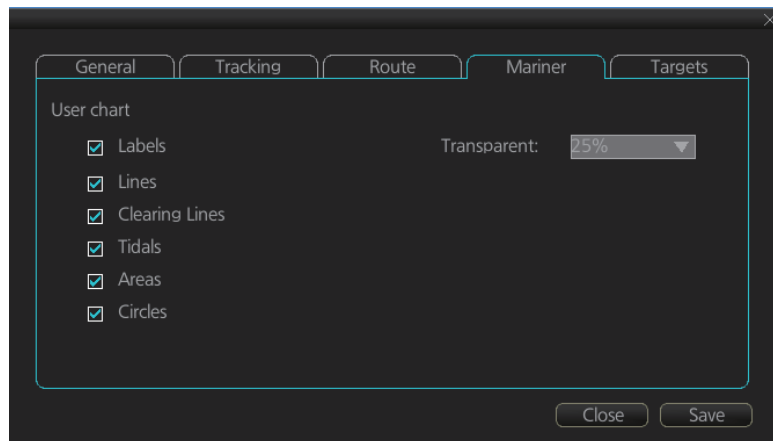
How to delete a point on a line

Put the cursor on the point to delete then right-click to show the context-sensitive menu. Select [Delete Point]. The line is redrawn.

13.6 How to Select the User Chart Objects to Display

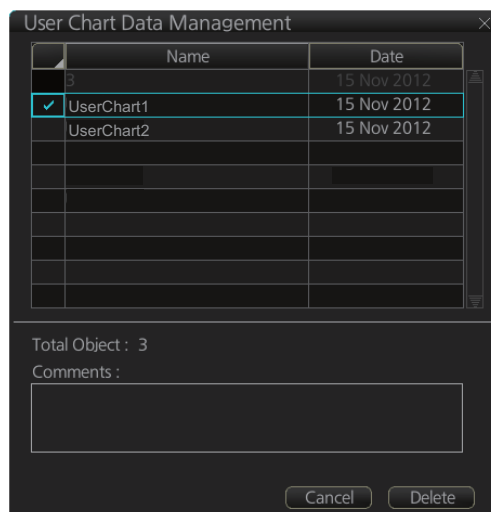
User charts can be displayed on the electronic chart. Open the [Mariner] page in the [Symbol Display] menu and check the user chart items to display. Select the degree of transparency for the objects with [Transparent].

Note: Alpha blending technology is used for transparency effects.



13.7 How to Delete User Charts

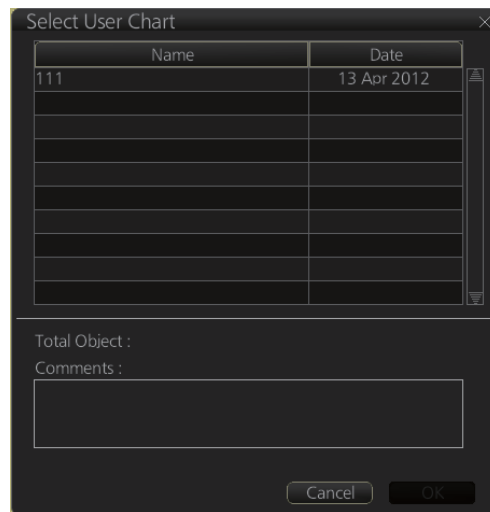
1. Click the [PLAN] button on the Status bar to get into the Planning navigation mode.
2. Click the [Manage Data] button on the InstantAccess bar followed by the [User Chart] button.



3. Check the user chart(s) to delete.
4. Click the [Delete] button.

13.8 User Chart Reports

1. Click the [Plan] button to go to the Voyage planning mode.
2. Click the [Report] button followed by the [User Chart] button to show the [Select User Chart] dialog box.

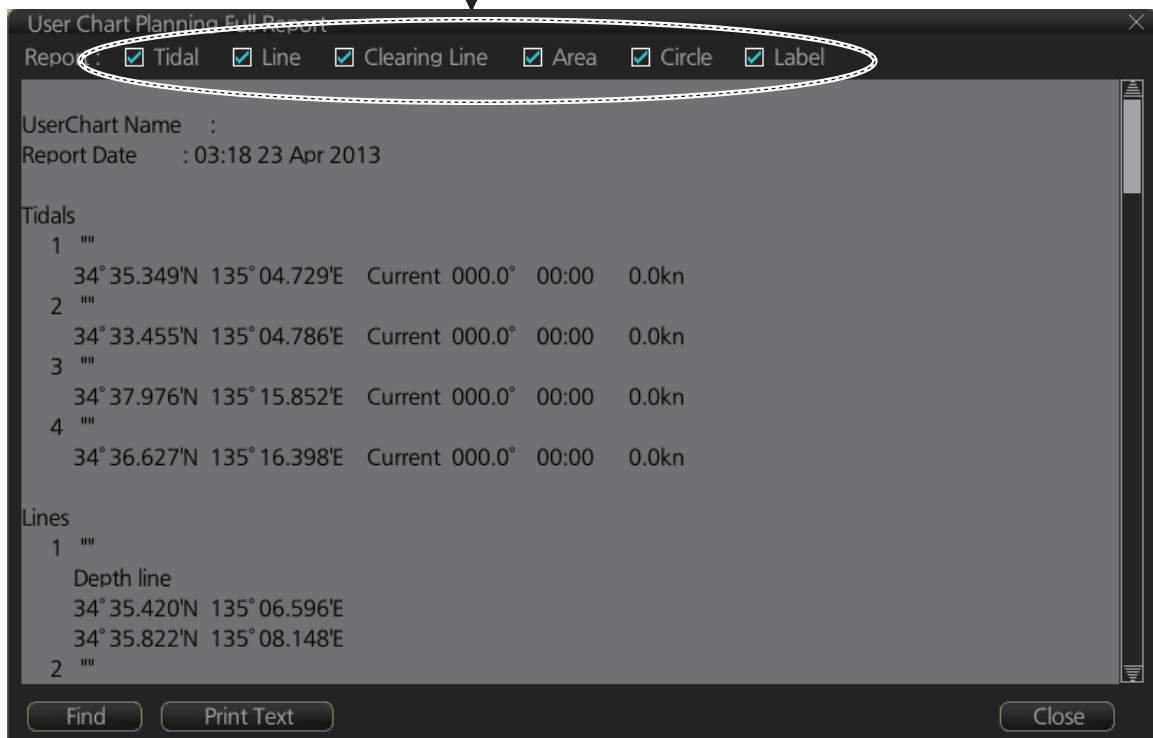


3. Select the appropriate user chart then click the [OK] button to show the selected report. See the next several pages for examples of reports.

Full report

The full report contains information about each tidal, line, clearing line, area, circle and label in the user chart selected. Check or uncheck the boxes at the top of the display to select the report(s) to display.

Check the report(s) to display.

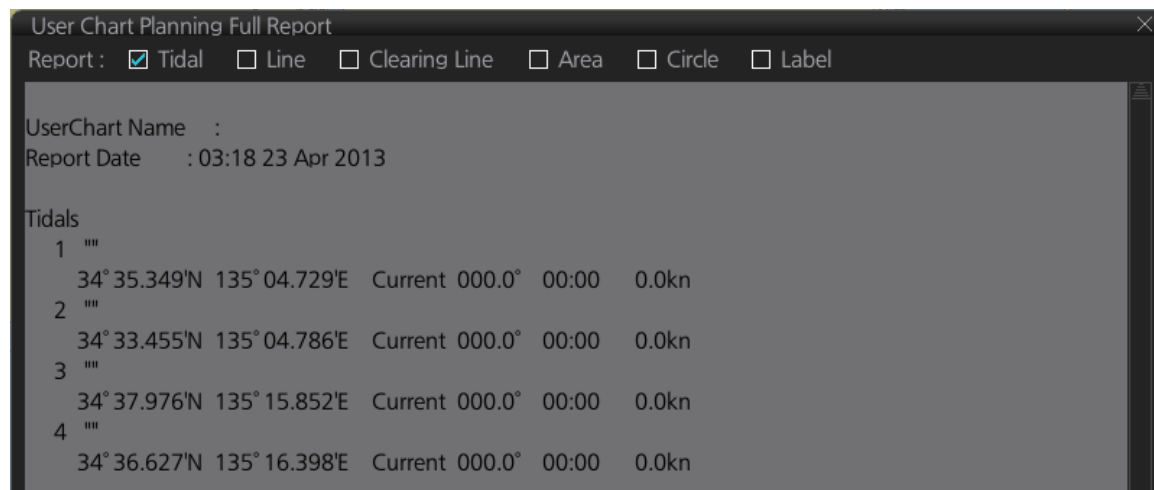


13. USER CHARTS

Tidal report

A tidal report provides

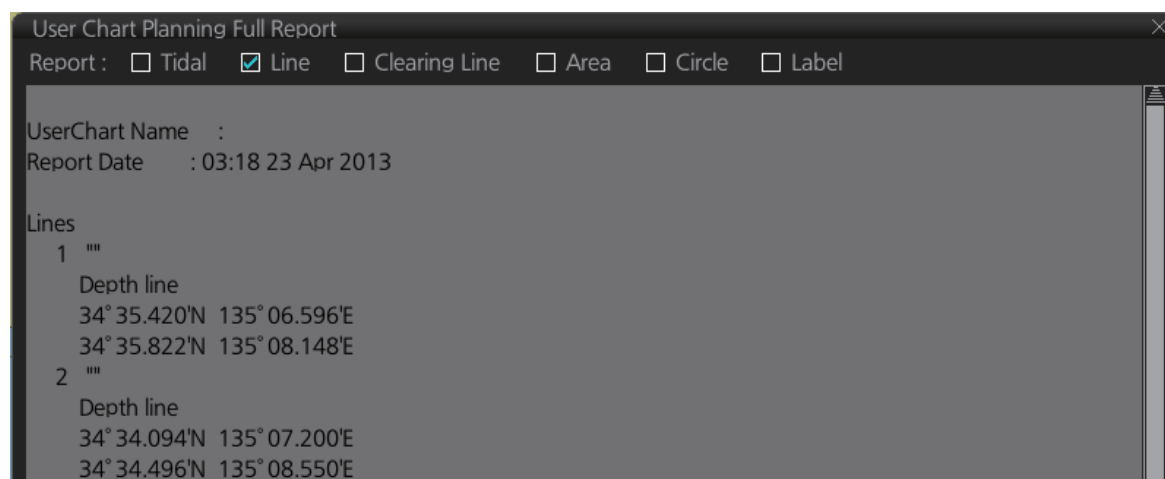
- Position of the tidal
- Type of tidal (current or predicted)
- Speed and direction of the tidal
- Time of the tidal



Line report

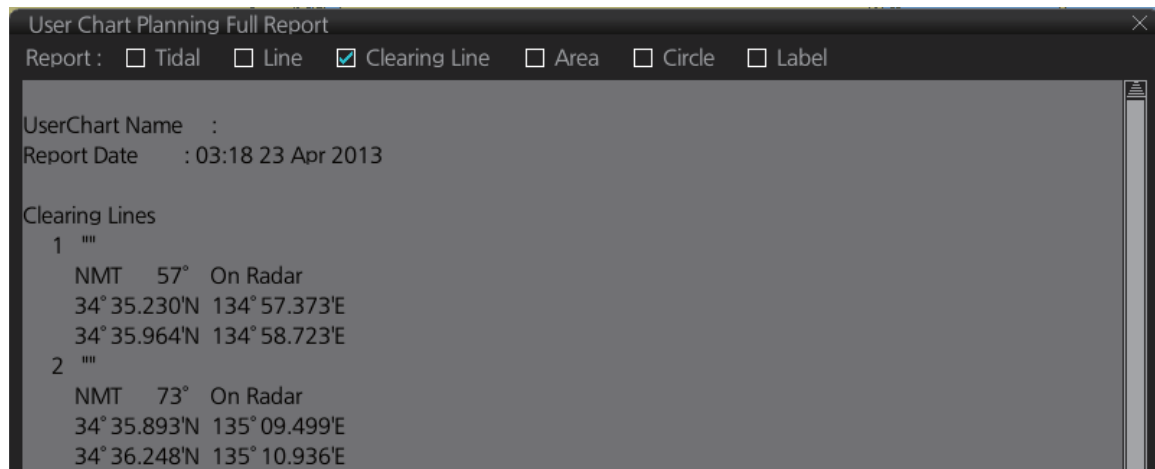
A line report provides

- Line name
- Latitude and longitude position of each point on the line



Clearing line

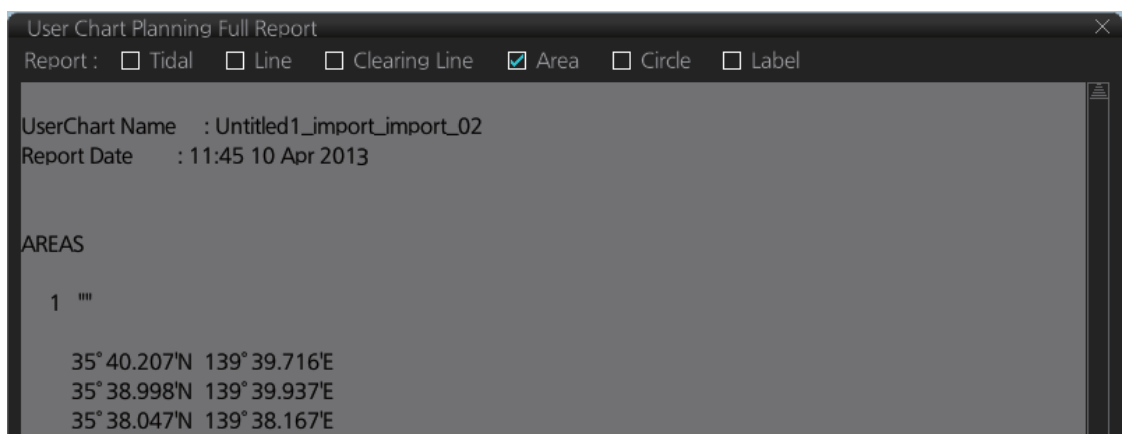
The Clearing line report shows the name and position of clearing lines entered on the chosen user chart selected.



Area report

An area report provides

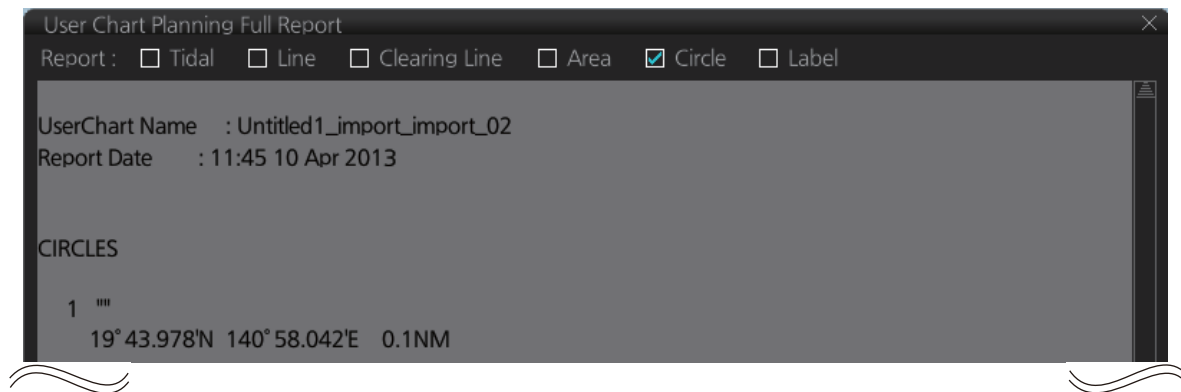
- Area no. and area name
- The latitude and longitude position of each point of the area
- The description of the area
- "On radar" is shown if the area is shown on the radar overlay.



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Circle report

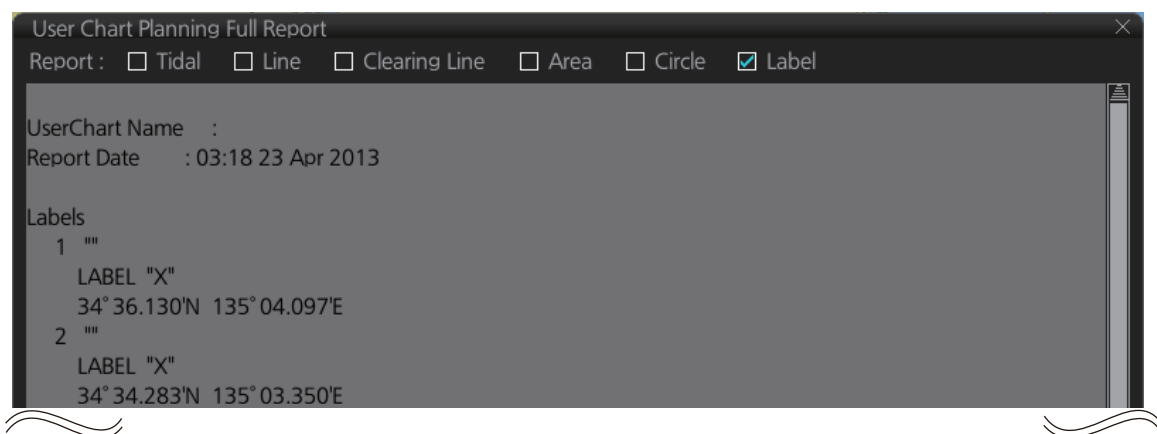
The circle report provides the position and radius of circles drawn on a user chart.



Label report

A label report provides

- Latitude and longitude position of each label
- Name of each label
- "On radar" is shown if the label is shown on the radar overlay.



14. HOW TO MONITOR ROUTES

Route monitor is a means for permanent monitoring of the ship's behavior relative to the monitored route. The [Route Information] box displays the data on the ship's position relative to the monitored route. The monitored route consists of the following information, displayed in the electronic chart area:

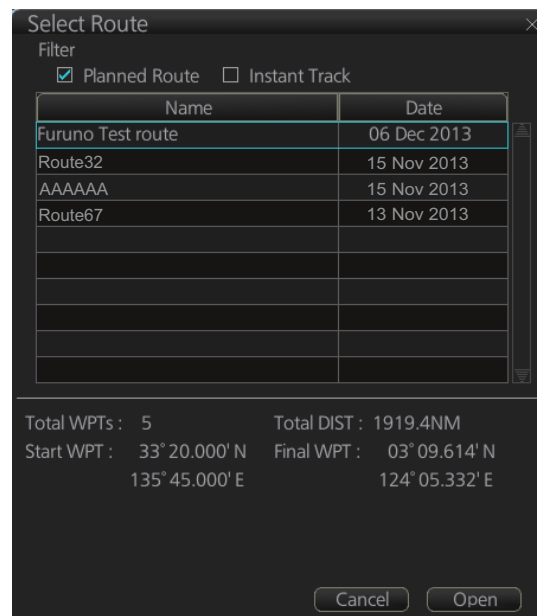
- The route is displayed with red dots.
- The limits of channels of each leg are displayed with solid red lines. These limits are used to detect chart alerts when you are monitoring the route. See chapter 11 for how to set those limits.
- Each leg has information about planned speed, shown in the [Route Information] box.
- Each leg has information about planned course to steer.

Note: In order to display charts with correctly updated situation, always use current date as Approved until and Display date during your voyage. If your voyage lasts more than one week, set current date at least once per week during your voyage. See section 9.2 for how to set those dates.

14.1 How to Start Route Monitoring

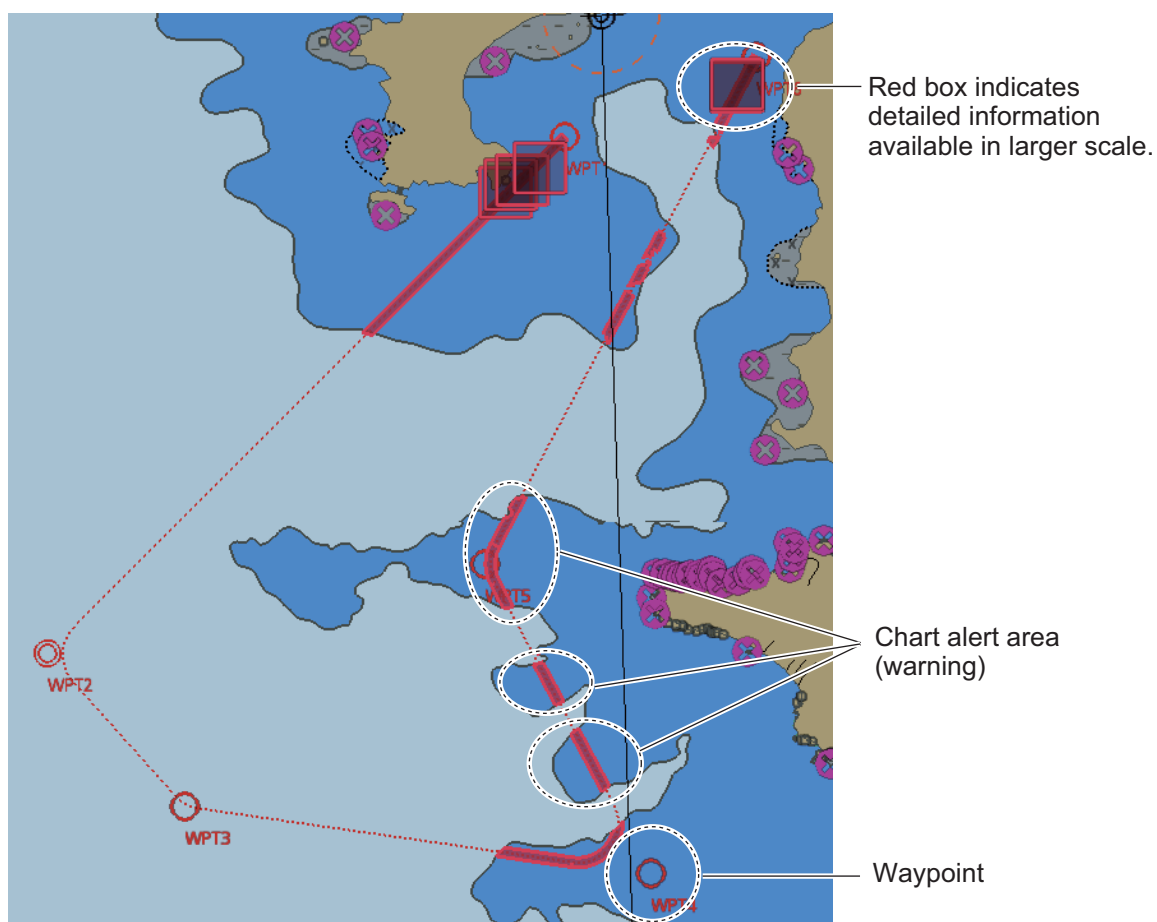
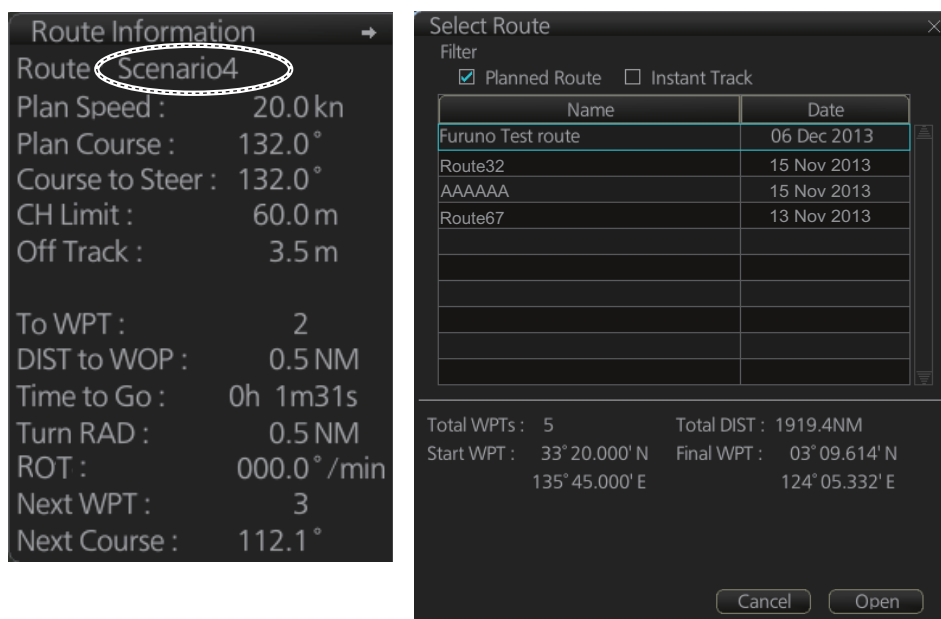
Method 1: InstantAccess bar

In the Voyage navigation mode, click the [Route] and [Select] buttons on the InstantAccess bar. Click a route then click the [Open] button.



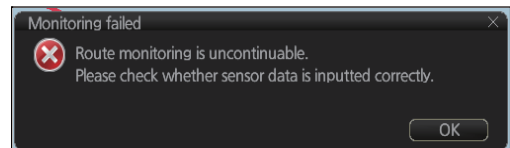
Method 2: Selection from the Route information box

Right-click the route name location in the [Route Information] box then select [Select Route] to show the [Select Route] dialog box. Select a route then click the [Open] button.



About monitoring routes

- When you select a route for monitoring, the messages shown below appear, on the [Select Route] dialog box or in a message window, when a route cannot be opened for monitoring.
 - "Impossible turn at waypoint XX" (XX=waypoint no.). Geometry of the route makes it impossible for the ship to accomplish a turn. Modify the route to make the turn possible.
 - "Unchecked / Check condition differs". The route has not been checked. Check the route, on the [Alert Parameters] page.
 - "Monitored in the NAVI mode". The route is currently being monitored.
 - "More than one WPT needed". The route has only one waypoint. Add more waypoints to the route.
 - "Route monitoring cannot be started. Please check ship's position and conditions." Click the [OK] button to close the message. Check ship's position and conditions of the route.
- If you have small-scale chart(s) on display that have the whole eastern/western (0-180°E/0-180°W) hemisphere and a part of the other hemisphere on display, there is a limitation to display a route. To avoid this, set chart center so that the whole eastern/western hemisphere is not on the screen.
- If, in the radar mode, route monitoring is stopped, the alert 691 "RM Stop - Exceed Max XTE", 692 "RM Stop - Disconnect Sensors", or 693 "RM Stop - Other Causes" appears. If this occurs, switch to the Chart for Radar mode. The pop-up shown below appears. Click the OK button. Find the reason why route monitoring was stopped and then restart route monitoring.
- Route monitoring is temporarily stopped (route is greyed out) and an alert appears when position, speed or heading is lost. To restore route monitoring, change the sensor system from System to Local (from the Sensor Information box), manually enter the lost data, check [Set Drift], then switch to the DR mode.
- Route data is sent to the radar at the start of route monitoring or when the ship transits a waypoint. If a route is not displayed on the radar, stop then restart monitoring at the radar chart. A route is erased from the radar when route monitoring is stopped or the radar chart is restarted. To redisplay the route, stop then restart monitoring at the radar chart.

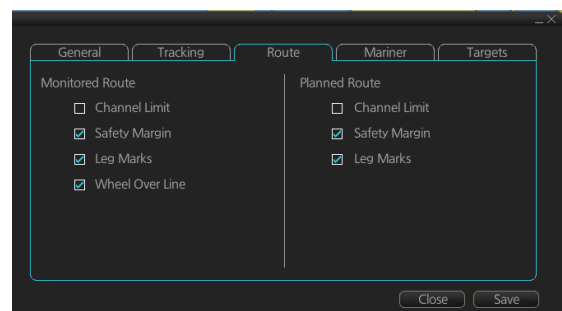


14.2 How to Stop Route Monitoring (Manual, Auto)

In the Voyage navigation mode, click the [Route] and [Unselect] buttons. Route monitoring is also stopped automatically. See "route monitoring is stopped" in the Troubleshooting table in section 24.5 for details.

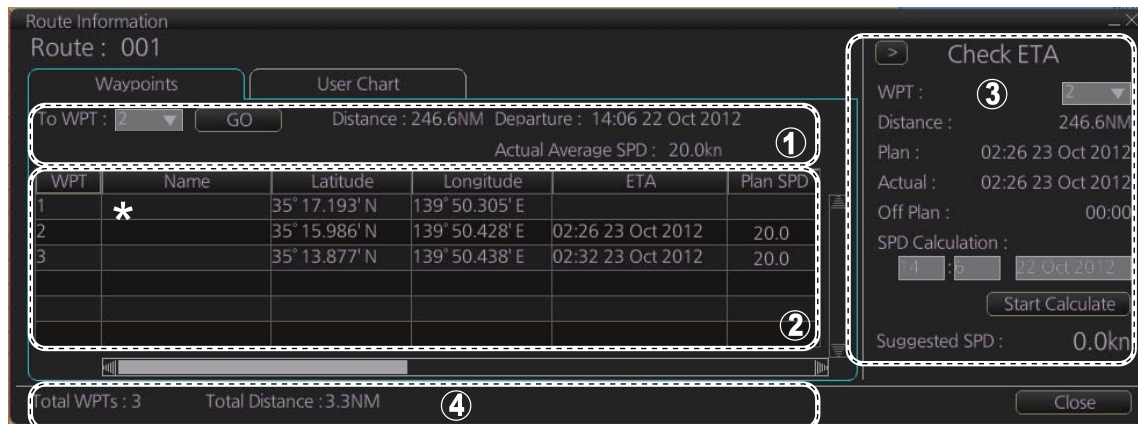
14.3 How to Select What Parts of a Route to Display

You can specify what parts of the monitored route to display. Click the [DISP], [SET] and [Symbol DISP] buttons on the InstantAccess bar. Click the [Route] tab.



14.4 How to View Waypoint Information

Click the [Route] and [Route INFO] buttons on the InstantAccess bar to show the [Route Information] dialog box. Click the [Waypoints] tab to show waypoint information.



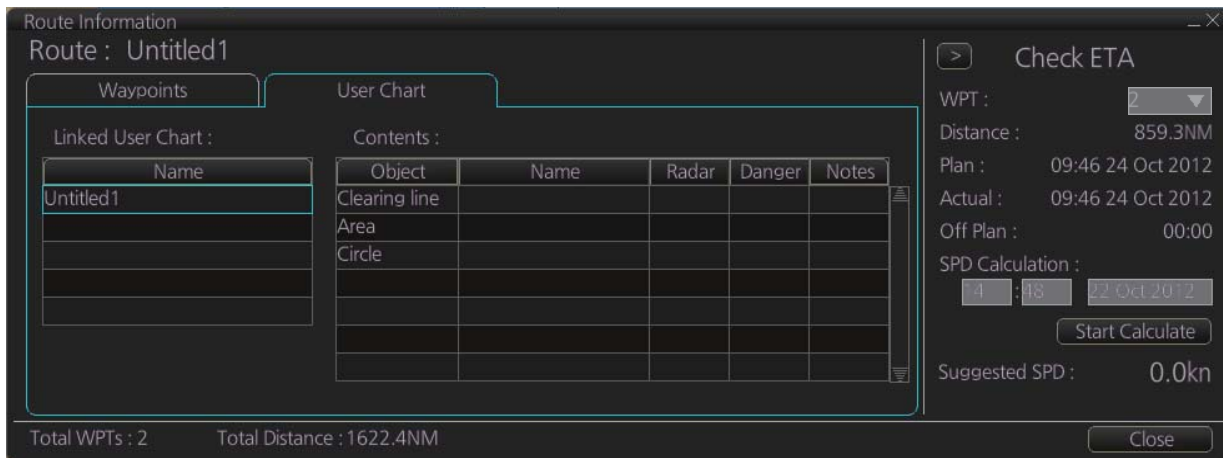
* Scroll list horizontally to view items shown in the right figure.

WPT	Leg/°	Leg/NM	STR mode	RAD/NM	CH limit/m	SPD MAX	Margin/m
1							
2	154.0	3.6	Rhumbline	1.00	185	22.1	40
3	151.0	2.5	Rhumbline	1.00	185	22.1	40

No.	Item	Description
1	[To WPT], [GO] button	The system selects a next waypoint automatically. Check that the To waypoint is the desired one. The system will automatically advance to a next waypoint when you pass the To waypoint. The default [To WPT] is WPT2. If you desire a different one, select it here and the click the [GO] button.
	[Distance]	Distance from current position to selected waypoint.
	[Departure]	The time the route was selected for monitoring.
	[Actual Average SPD]	Actual speed
2	Waypoint list	The waypoint list provides for each waypoint WPT no., name, latitude and longitude position, ETA, plan speed, bearing and distance to leg, steering mode ([Rhumbline] or [Greatcircle]), radius, channel limit, speed max, and margin.
3	[Check ETA] window	Parameters for checking ETA. The arrow to the left of [Check ETA] collapse or display the [Waypoints] and [User Chart] tabs.
	[WPT], [Distance]	Select a WPT to find the distance to that waypoint from current position.
	[Plan]	The planned ETA to the selected waypoint.
	[Actual]	The actual ETA to the selected waypoint.
	[Off Plan]	The time difference between planned ETA and calculated ETA to final WPT, when different. The indication is prefixed with "-" if earlier than planned; "+" if later than planned.
	[SPD Calculation]	Enter speed and ETA (time and date) to find the speed to use to arrive by the ETA.
	[Start Calculate] button	Click to start calculation. The button label changes to [Stop Calculate].
	[Suggested SPD]	The system calculates suggested speed so that ETA to the WPT selected would be same as planned ETA if type of optimization was "Time table".
4	[Total WPTs]	The total number of waypoints in the route.
	[Total Distance]	The total distance of the route.

14.5 How to View User Chart Information

In the Voyage navigation mode, click the [Route] and [Select] buttons on the InstantAccess bar, select a route, click the [Open] button, then click the [User Chart] tab.



The [Linked User Chart] list shows all the user charts linked with the monitored route and their contents. Click a user chart name to show the contents of the chart in the [Contents] window. Items with a checkmark are activated. For the [Check ETA] window, see the preceding page.

14.6 How to Change Monitored Route to Planned Route

The monitored route can be transferred to the Voyage planning mode. This is useful when you don't need the route for monitoring but want to edit it. To transfer the monitored route, click the [Route] and [Move to Plan] buttons on the InstantAccess bar.

Up to five planned routes can be shown on the display. If you try to display another route, the route list appears. Deselect a route in order to transfer the monitored route to the Voyage planning mode.

Note: When the monitored route is changed to a planned route, using the [Move to Plan] function, the operating mode changes from the Navigation voyage mode to the Voyage planning mode.

14.7 How to Use Instant Track to Return to or Deviate from Monitored Route

The instant track feature provides a temporary track, consisting of four waypoints, to return to or deviate from the monitored route. Correct data from navigation sensors is essential to this function.

There are two instant track modes: [Safe Off Track] and [Back to Track].

[Safe Off Track]: This mode provides a track from the monitored route to a safe location to avoid collision or the like.

[Back to Track]. This mode creates a track to follow to return to the monitored route when the vessel goes outside the channel limits.

The mode is automatically selected according to whether a monitored route is active or not and the amount of off course. Further, if a monitored route is active while following the instant track route, the instant track mode can be changed manually.

Condition	Mode	Manual mode switching
Neither monitored route nor instant track route active.*	[Safe Off Track]	No
- Both monitored route and instant track route are active.* - The absolute value of off track is within the channel limit setting.	[Safe Off Track]	Yes
- Both monitored route and instant track route are active.* - The absolute value of off track is outside the channel limit setting.	[Back to Track]	Yes

* An additional instant track route can continuously be created and monitored while monitoring the instant track route.

The parameters for the track (channel limit, turn radius, etc.) can be set on the [Instant Track] page. See section 21.2.

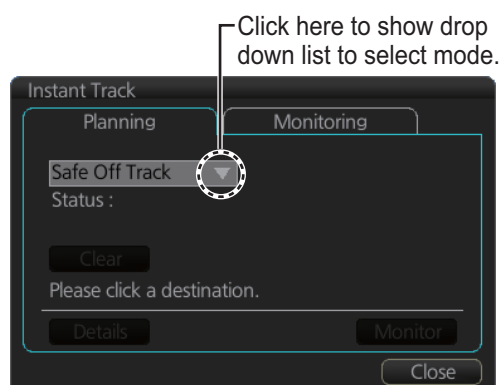
14.7.1 Safe off track mode

If it becomes necessary to deviate from the monitored route; for example, to avoid collision, use the [Safe Off Track] mode to create an instant track to a safe location. An instant track can be created without a monitored route.

- When the monitored route is active, click the [Instant Track] button on the InstantAccess bar to show the [Instant Track] dialog box. The message "Please click a destination." appears on the [Planning] page.

Note 1: If a monitored route is active, the [Back to Track] mode can also be selected.

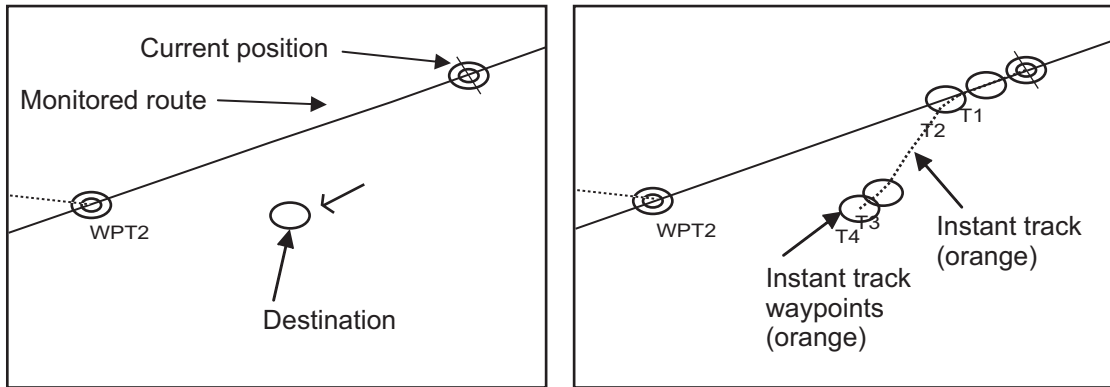
Note 2: If a monitored instant track route is already active, an instant track mode different from the currently active one can be selected.



When monitored route is active

- Click a destination. The location is marked with an orange circle and arrow. The message "Please click a point to decide an angle." appears in the [Instant Track] dialog box. The location must be within 50 NM of current position.

3. Roll the trackball to select the angle of approach to the destination then click.



- ① Click destination point .
A circle and arrow appear.

- ② Click a location to set desired angle of approach.
Instant track is drawn.

The system uses ship position, speed, angle of approach to create an instant track route. The track is also checked for hazardous objects and the like against the chart alerts.

During the calculation, the [Instant Track] dialog box shows "Checking" in the [Status] field. If, after completion of the calculation, the track is suitable, the message "OK" replaces "Checking". The track and its waypoints, labeled [T1] - [T4], are colored orange. The track is saved to the database as "InstantTrack_XXX" (XXX=001 - 400).

If clicking the [Clear] button while or after creating the track, the track is erased from the screen.

If there is a problem with the track, an error message appears and the track is erased from the screen. See section 14.7.3 for all the instant track messages and their meanings.

To return to the monitored route, click a waypoint on a leg of the route to create an instant track route to use to return to the monitored route.

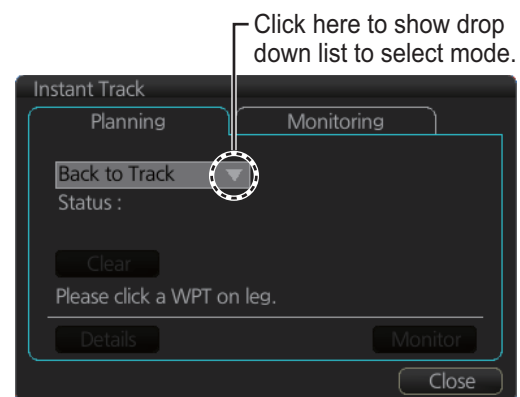
14.7.2 Back to track mode

When the vessel goes off track, the alert "172 Off Track Alarm" appears in the [Alert] box. To create an instant track to return to the monitored route, use the [Back to Track] mode as follows:

1. When the monitored route is active, click the [Instant Track] button on the InstantAccess bar to show the [Instant Track] dialog box. The message "Please click a WPT on Leg." appears on the [Planning] page.

Note 1: If a monitored route is active, the [Safe Off Track] mode can also be selected.

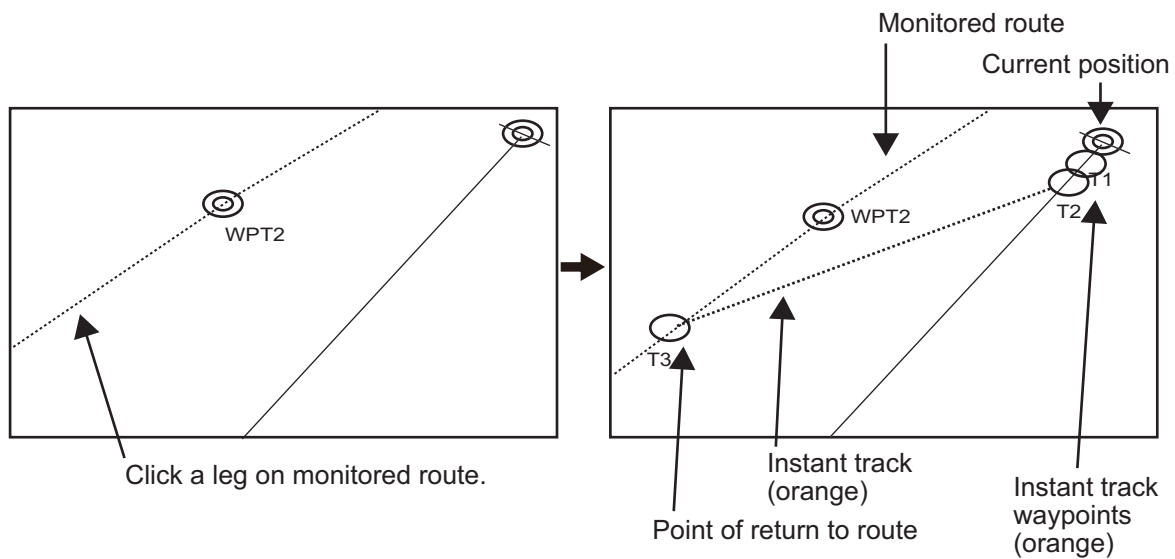
Note 2: If a monitored instant track route is already active, an instant track mode different from the currently active one can be selected. Further, a completely new instant track route to the original monitored route can be created.



When monitored route is active

14. HOW TO MONITOR ROUTES

- Click a leg or a waypoint on the monitored route. The location must be within 50 NM of current position.



The system uses ship position, speed and final waypoint to create a track. The track is also checked for hazardous objects and the like against the chart alerts.

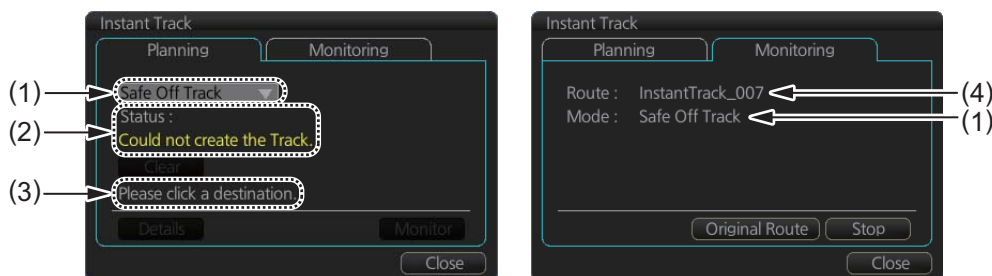
During the calculation, the [Instant Track] dialog box shows "Checking" in the [Status] field. If, after completion of the calculation, the track is suitable, the message "OK" replaces "Checking". The track and its waypoints, labeled [T1] - [T3], are colored orange. The track is saved to the database as "InstantTrack_XXX" (XXX=001 - 400).

If clicking the [Clear] button while or after creating the track, the track is erased from the screen.

If there is a problem with the track, an error message appears and the track is erased from the screen. See section 14.7.3 for all the instant track messages and their meanings.

14.7.3 Instant track messages

The table below shows all the instant track messages and their meanings.

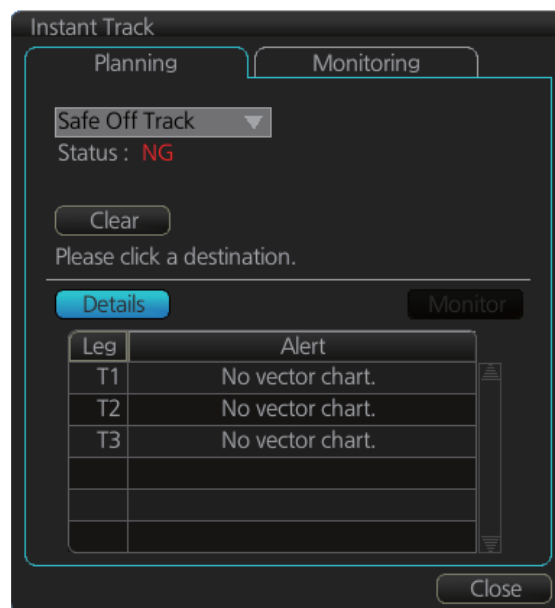


Message	Meaning	Color
(1) Instant Track mode		
"Back to Track"	Back to track mode	White
"Safe Off Track"	Safe off track mode	White
(2) Check result, error message		
"Could not create the Track."	The track could not be created.	Yellow
"Too far destination from own ship."	Selected destination is 50 NM or more from current position.	Yellow

Message	Meaning	Color
"Checking..."	Checking route.	Red
"OK"	Instant track checked and is suitable to follow.	Green
"NG"	Instant track check failed.	Red
"Check error."	Route check error.	Red
"Instant Track is expired."	Route monitor timeout.	Red
"Too many WPTs in monitoring route."	More than 190 waypoints are in the monitored route. (Instant track cannot be created.)	Red
(3) User operation message		
"Please click a destination."	Select a destination in the [Safe Off Track] mode.	White
"Please click a point to decide an angle."	Set the angle of approach in the [Safe Off Track] mode.	White
"Please click a WPT on leg."	Click a waypoint on a leg in the [Back to Track] mode	White
(4) Name of instant track route		
InstantTrack_XXX (XXX: 001 - 400)	Name of monitored instant track route	White

14.7.4 Instant track details

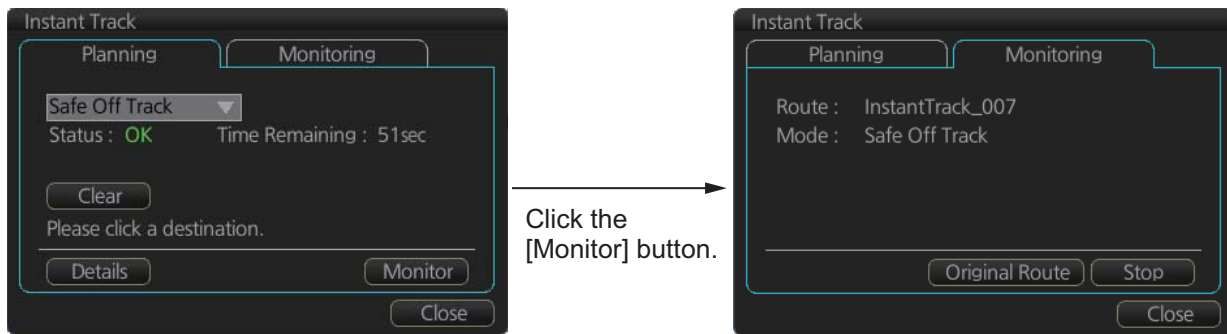
You can see the location and alert type found in an instant track by clicking the [Details] button on the [Planning] page in the [Instant Track] dialog box.



14.7.5 How to monitor, stop monitoring an instant track route

How to monitor an instant track route

If the route check results is "OK", click the [Monitor] button on the [Planning] page in the [Instant Track] dialog box to start monitoring the instant track route. Click the button before the time remaining counts to zero, otherwise the instant track will be cancelled, followed by the message "Instant Track is expired." After the [Monitor] button is clicked the [Monitoring] page is opened. The [Monitoring] page shows the name of the instant track and the instant track mode.



The vessel follows the instant track route in the same method as a monitored route, which is grayed out to indicate it is inactive. For the instant track route connected to a monitored route, the previous instant track route is also grayed out to show it is inactive. Any additional instant track routes are erased.

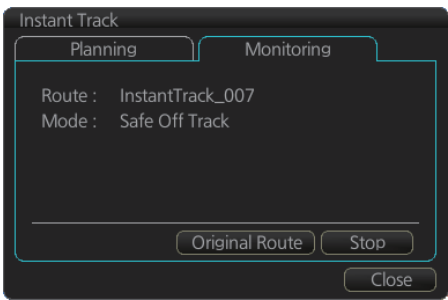
To close the [Instant Track] dialog box, click the [Close] button. (The system continues monitoring the instant track route.)

The following occurs when sensor data is lost while using the instant track function.

Monitoring condition	Result
Instant track route monitoring.	- An instant track route under creation is deleted. No route can be created. - The [Stop] button is pushed or the instant track route is followed until its completion. - After the instant track route is completed, an error message appears and the [Instant Track] dialog box closes.
No monitored route	An instant track route under creation is deleted.
Monitored route active	After the route is completed, an error message appears and the [Instant Track] dialog box closes.

How to stop monitoring an instant track route

Click the [Stop] button on the [Monitoring] page in the [Instant Track] dialog box to stop monitoring the instant track route. The system returns to monitoring the monitored route and the [Planning] page of the [Instant Track] dialog box opens.

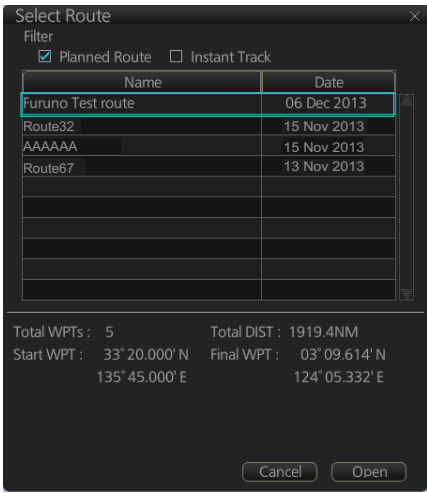


For the [Back to Track] mode, the instant track mode is canceled when the vessel returns to the monitored route. The instant track is grayed out to show that is inactive.

14.7.6 How to change a monitored route when following an instant track route (safe off track mode only)

Do the following to change a monitored route while following an instant track route.

1. While monitoring an instant track route, click the [Original Route] button on the [Monitoring] page in the [Instant Track] dialog box to show the [Select Route] dialog box. Check [Planned Route] to show a list of planned routes, or check [Instant Track] to show a list of instant track routes.

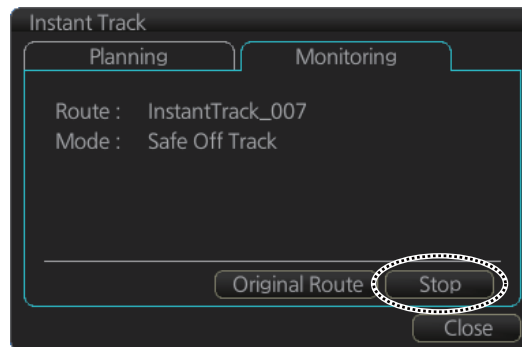


2. Select the route to use. The original route or the instant track route currently in use cannot be selected.
3. Click the [Open] button to close the dialog box. The vessel starts following the newly selected route.

When an instant track route is completed, the vessel starts following the route selected at step 2.

14.7.7 Button label and equipment state

The label on the button at the position circled in the figure below changes according to the state of the instant track.



Instant track state	Button label
Monitoring	[Stop]
Return to original route after back to track mode	[Reset] (Instant track route is erased - another instant track route can be created.)

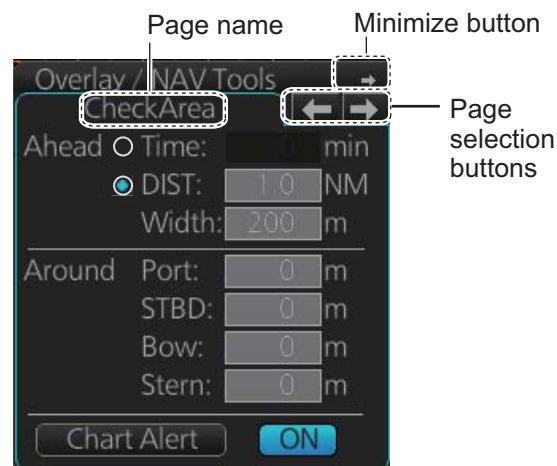
15. NAVIGATION TOOLS

This chapter presents the various navigation tools available with the system. With the exception of the mini conning display and the divider, the tools listed below are in the [Overlay/NAV Tools] box.

- TT/AIS (see chapters 3 and 4)
- Parallel index lines
- Check area
- Range rings
- Predictor
- Anchor watch
- Under keel clearance
- Mini conning display
- Divider

15.1 How to Access the Nav Tools in the Overlay/NAV Tools Box

The [Overlay/NAV Tools] box is located at bottom-right position on the screen. Use the page selection buttons to select desired page.



[Overlay/NAV Tools] box ([CheckArea] page)

15.2 Parallel Index (PI) Lines

The parallel index lines are useful for keeping a constant distance between own ship and a coastline or a partner ship when navigating. Up to six sets of PI lines are available and as many as six can be shown. One, two, three or six lines can be shown. (The actual number of lines shown depends on the line interval.)



The bearing can be set two ways: with the scrollwheel or dragging the PI line on the screen.

15.2.1 How to activate, deactivate PI lines

Select the PI line set to activate or deactivate with the [Display] drop-down list. Activate or deactivate the set selected with the [ON/OFF] button. Only one set can be shown.

15.2.2 PI line bearing reference

PI line bearing reference may be relative to own ship's heading (Relative) or referenced to North (True). Select [True] or [REL].

15.2.3 Number of PI lines to display

The maximum number of PI lines to display may be selected from 1, 2, 3 or 6 lines as below. The actual number of lines visible may be less depending on line interval. Select the number of lines to display at [Index Lines].

15.2.4 PI line mode

The PI line mode can be set for parallel (0-degrees) or perpendicular (90-degrees). Select [Parallel] or [Perpendicular] at [Mode].

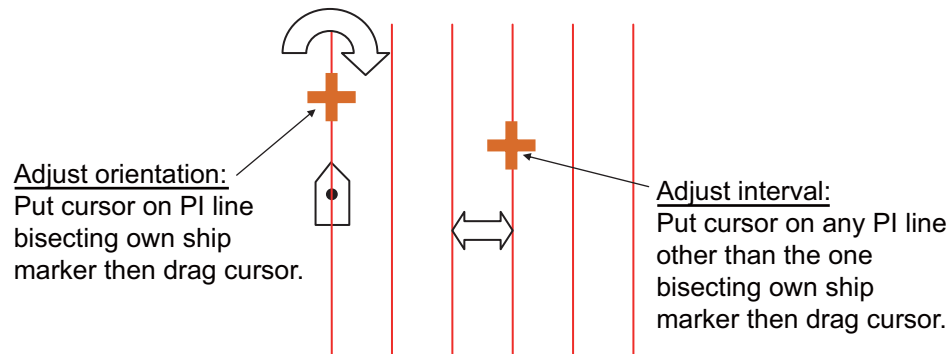
15.2.5 How to adjust PI line orientation, PI line interval

There are two ways to adjust PI line orientation and PI line interval: through the menu and on the screen.

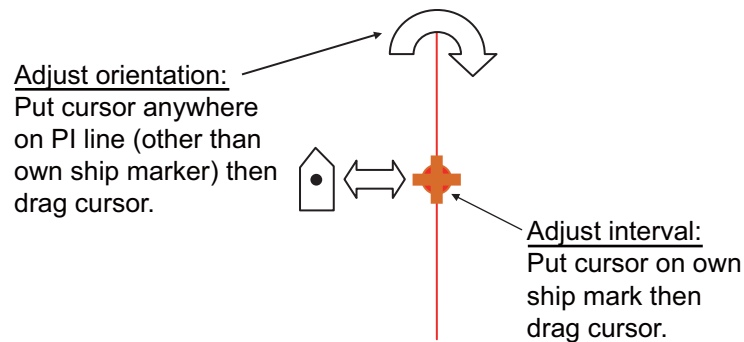
How to adjust PI line orientation, PI line interval from the menu

1. Set the orientation with [Bearing].
2. Set the line interval with [Distance].

How to adjust PI line orientation, PI line interval on the screen



How to adjust orientation and interval, multiple PI lines



How to adjust orientation and interval, single PI line

15.2.6 How to reset the PI lines

You can automatically return PI lines to default orientation, 0-degrees for parallel orientation, 90-degrees for perpendicular orientation. This is faster than doing it manually. Click the [Reset PI Lines] button to reset the parallel lines.

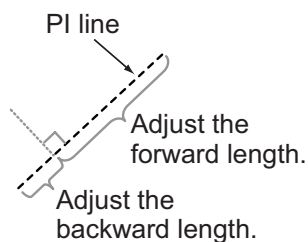
15.2.7 How to adjust PI line length

You can adjust the forward and backward lengths of a PI line when [Index Lines] is set to 1.

1. Open the MENU and select [NAV Tools], [PI Lines] and [Truncate].



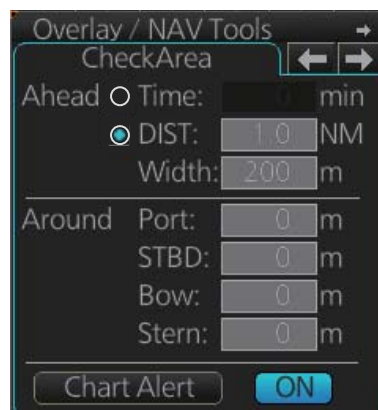
2. If not already displayed, click the [ON/OFF] button to display the PI line whose length you want to adjust.
3. Click the value in [Forward] and [Backward] columns to adjust their lengths, referring to the illustration below.



4. Click the [Save] button to finish.

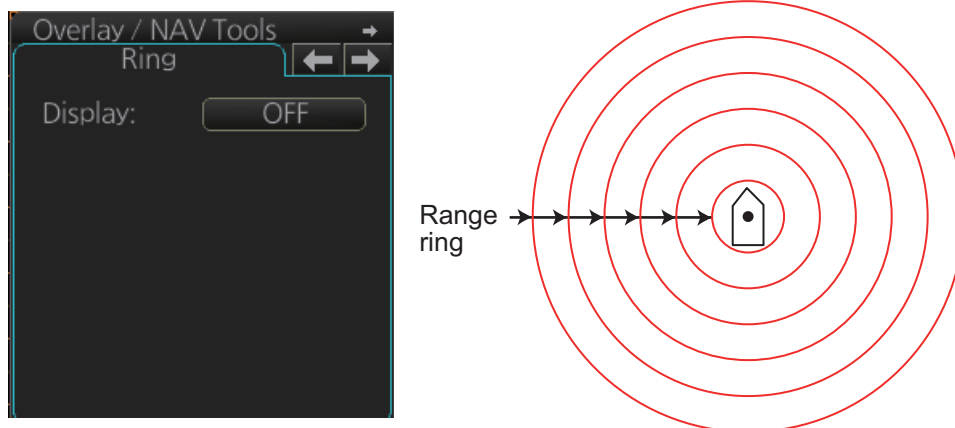
15.3 Check Area

Check area sets the area ahead and around own ship for which to check for safe navigation. See section 11.2 for how to activate own ship check.



15.4 Ring

The range rings are the concentric set of rings on the chart display. They provide an estimation of the range to an object. You can turn them on or off from the [Ring] page.



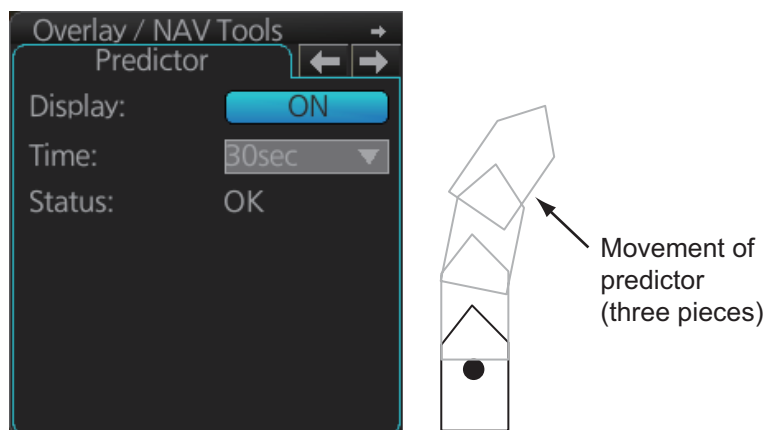
The interval between rings changes with the chart scale as shown in the table below.

Chart scale	Ring interval (nm)	Chart scale	Ring interval (nm)
1:1,000	0.025	1:100,000	2.0
1:2,000	0.05	1:200,000	4.0
1:5,000	0.10	1:500,000	8.0
1:10,000	0.25	1:1,000,000	16.0
1:20,000	0.5	1:2,000,000	20.0
1:50,000	1.0		

15.5 Predictor

The predictor is a tool for estimating your ship's future positions and behavior. The on-screen predictor graphic consists of three pieces of your ship, drawn in true scale to successive future positions. The position of the third symbol will be your approximate position at the end of the time interval selected. The predictor is calculated using current speed and rate of turn. Docking speed components (transversal bow speed, transversal stern speed, transversal center speed and rate of turn) are assumed to be stable during the prediction period. The predictor can be used in every steering-state, including manual steering.

To activate and set the Predictor, show the [Predictor] page. Turn the display on or off with [Display]. Set the time (30, 60, 90, 120, 150, 180 seconds), with [Time].



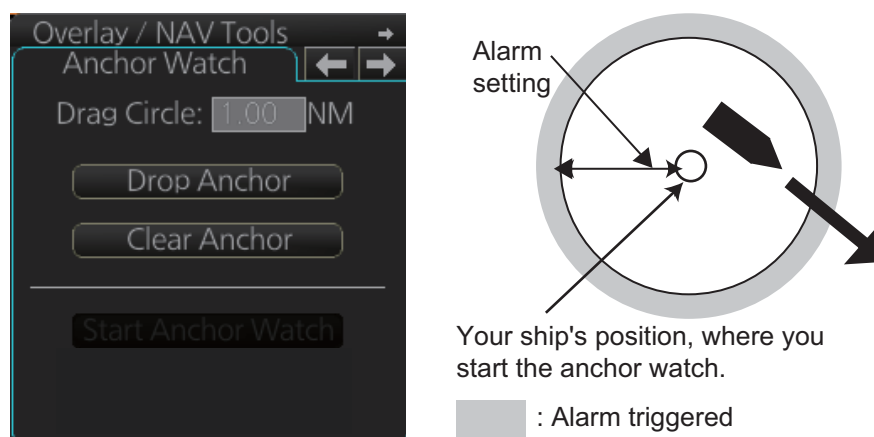
The Predictor is updated every three seconds internally and the status of the predictor is shown with [Status] as shown in the table below.

Indication	Status
OK	Speed is suitable (0.5 kn or higher).
Not Enough Speed	Speed is too low to use the Predictor.
Not Available. Reset Filter May Restore.	Predictor is not being received.

Note: The ship speed must be 0.5 kn or higher. The predictor may not be displayed or may not work properly if the speed is lower than that value.

15.6 Anchor Watch

The anchor watch feature checks to see if your ship is drifting when it should be at rest.



To set the anchor watch:

1. Select the [Anchor Watch] page.
2. Set the alarm radius (in nautical miles) with [Drag Circle].
3. Drop the anchor then click the [Drop Anchor] button.
4. Click the [Start Anchor Watch] button to start the anchor watch.

If your vessel travels more than the distance set here, the corresponding caution is generated.

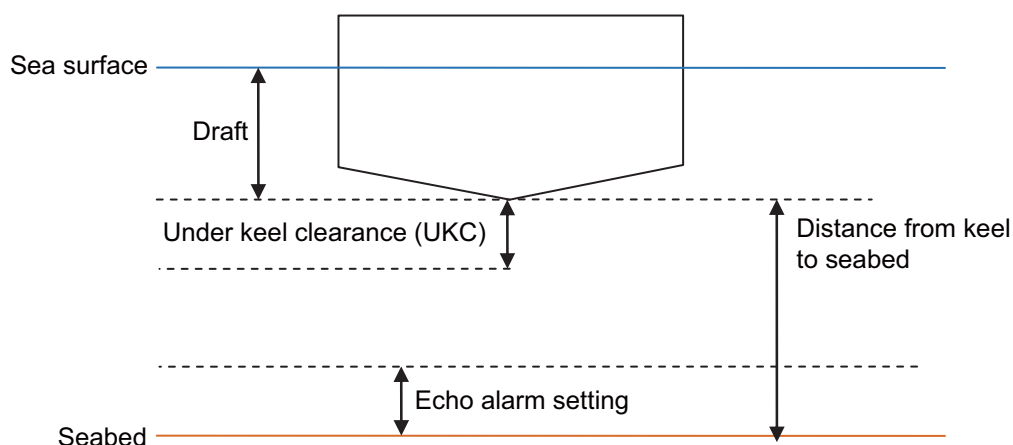
To continue to use the anchor watch, click the [Clear Anchor] button to set the alarm about your current position. To stop the anchor watch, click the [Stop Anchor Watch] button. The caution is not generated even if your ship drifts more than the distance set with [Drag Circle].

If your ship drifts more than the anchor watch setting, the Alert 495 "Anchor Watch Setting" appears.

15.7 UKC (Under Keel Clearance)

15.7.1 UKC overview

The UKC is the distance between the deepest point of the vessel's hull and the seabed. The UKC feature continuously checks ship's draught setting (UKC), and actual depth. When the depth gets shallower than the UKC, the Alert 634 "UKC Limit" is generated. And if the current depth is less than the echo alarm setting the echo alarm also is generated. Depth data is required to use the UKC function.



Note: The sensor value shown is the depth to the transducer. Convert the value to the distance to the keel.

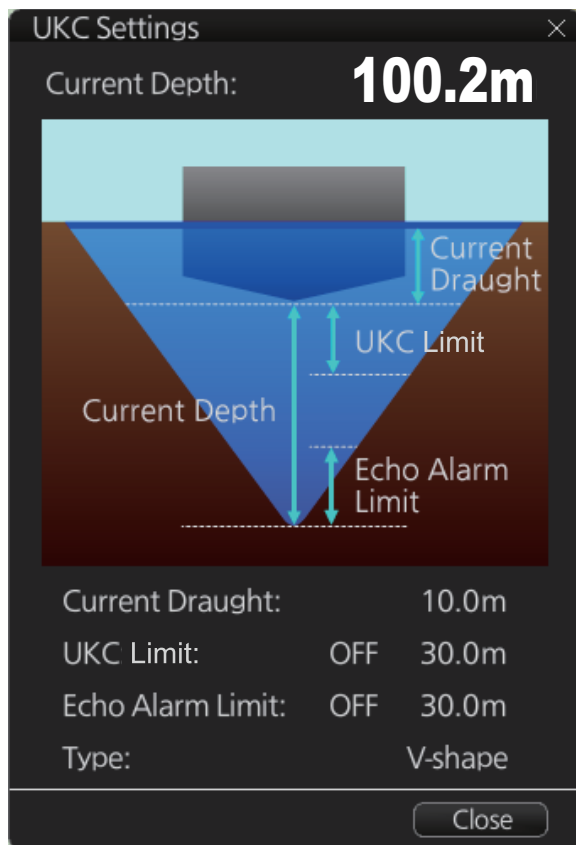
15.7.2 How to set UKC

1. Select the [UKC] page from the [Overlay/NAV Tools] box.
2. Use [Echo Alarm Limit] to set the distance for the echo alarm. To activate the alarm, click the [ON/OFF] button to show [ON].
3. At [UKC Limit], set ship's UKC limit. To activate the UKC feature, click the [ON/OFF] button to show [ON].
4. Use [Current Draught] to set your ship's draft. Be sure to change the setting whenever the draft changes.
5. Use [Type] to set the shape of your ship's hull to show on the [UKC] window, [V-shape] or [Concave]. See the figure on the next page.

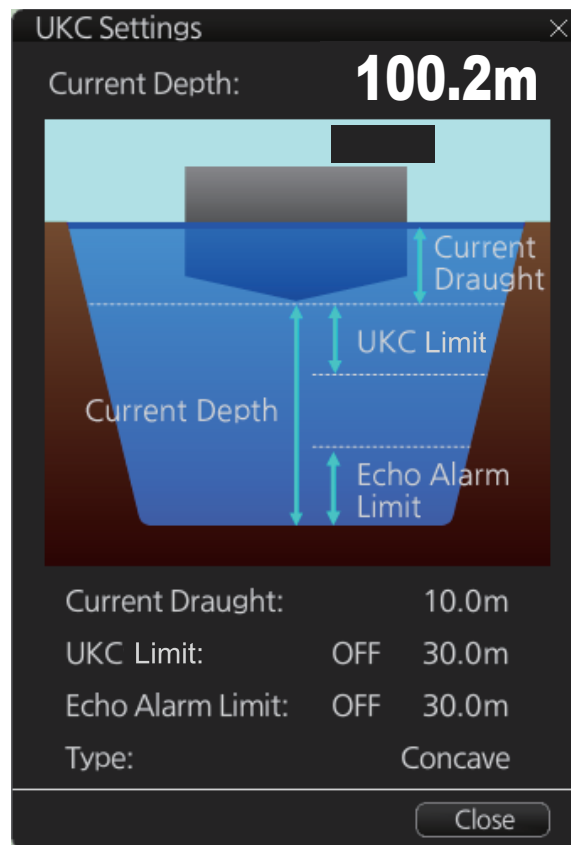


15.7.3 UKC window

The UKC window provides a visual graphic of the relationship between UKC, draft and current depth. The window can be shown or hidden as desired and located anywhere within the electronic chart area. To show the window, click [Show UKC Window] on the [UKC] page. To move the window, drag and drop.



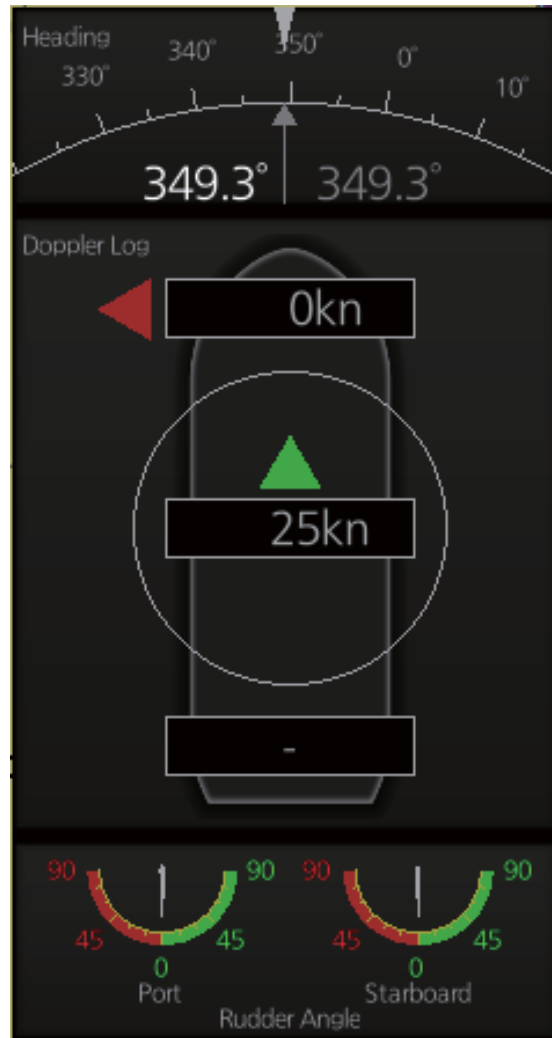
V-shape hull presentation



Concave hull presentation

15.8 Mini Conning Display

The mini conning display, available in the Voyage navigation mode, provides various navigation information and is set during the installation. The display example below shows heading, doppler log speed and rudder angle. To show or hide the mini conning display, click the [Mini Conning] button on the InstantAccess bar.



To shift the mini conning display, right-click the mini conning display to show the context-sensitive menu. Click an option: [Left Top], [Left Middle], [Left Bottom], [Right Top], [Right Middle] or [Right Bottom].

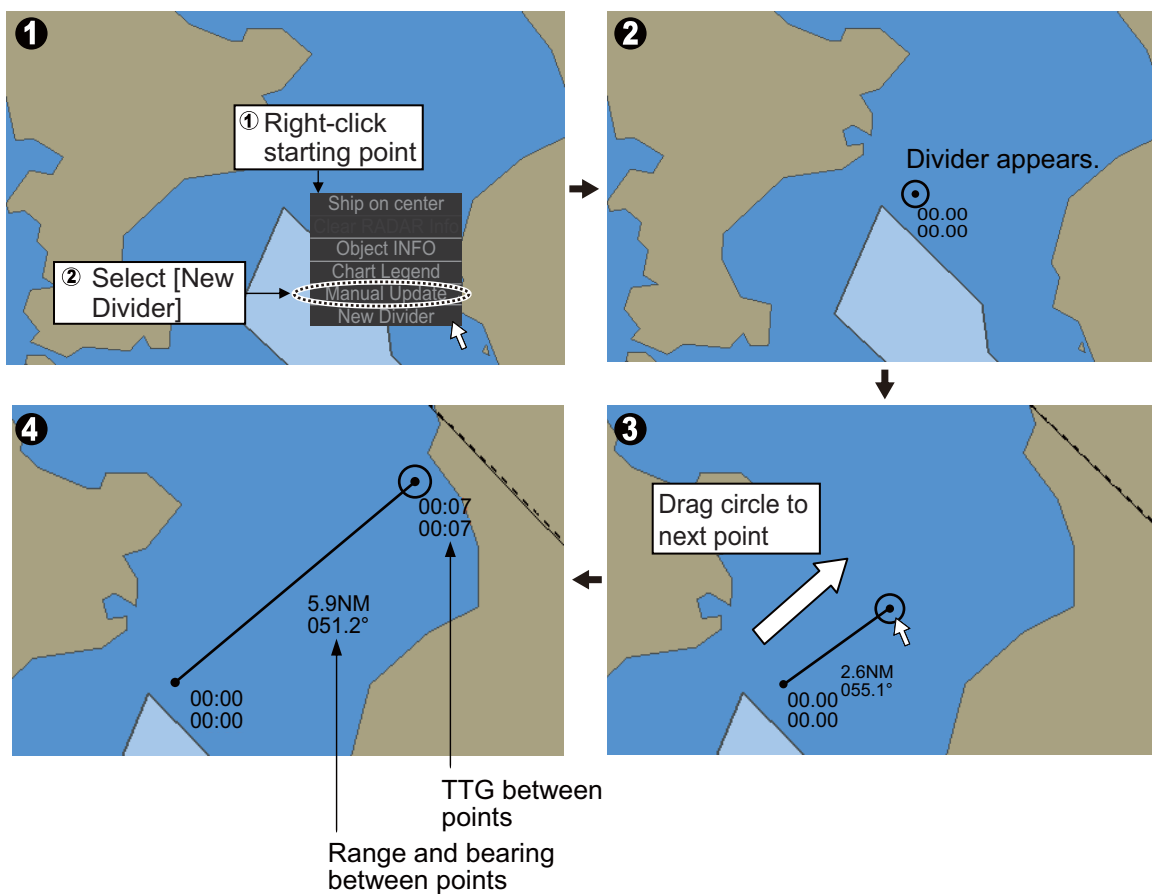
15.9 Divider

The divider, available in the Voyage navigation and Voyage planning modes with rhumb line navigation, measures the range, bearing and TTG between points, like using a dividers on a paper chart.

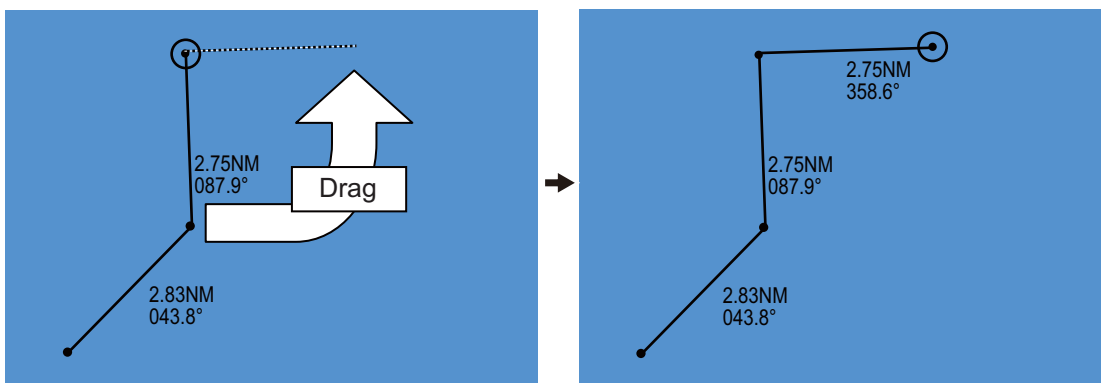
Only one divider can be displayed. The divider is neither saved nor shared among chart radar units.

15.9.1 How to use the divider

Do as shown below to get the range, bearing and TTG between points.



You can also drag from an intermediate point to make another point.

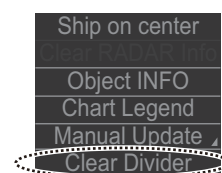


15.9.2 Usage characteristics, limitations

- The distance between points is shown to the hundredths decimal place up to 100 NM and to the tenths decimal place thereafter.
- A maximum of 50 points can be inserted, and the maximum measurable distance between two points is 240.0 NM.
- The TTG value is rounded to the nearest decimal place. Therefore, the displayed total TTG may not equal the sum of all the TTGs.
- The TTG is measurable to 99:00. If the TTG is higher, the TTG indication is ">99:00".
- The ship's speed must be at least 0.5 kn to calculate TTG.
- The divider cannot be used in latitude higher than 85°.

15.9.3 How to deactivate and erase the divider

Get into the Voyage navigation or Voyage planning mode then right-click the screen to show the context-sensitive menu. Select [Clear Divider].

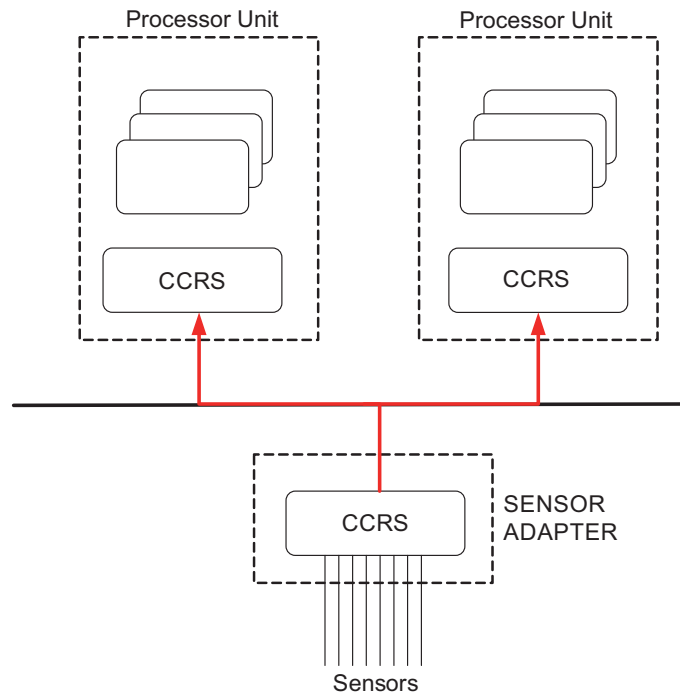


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16. NAVIGATION SENSORS

16.1 CCRS

This chart radar employs a Consistent Common Reference System (CCRS) for the acquisition, processing, storage and distribution of sensor information. The CCRS ensures that all parts of the system uses the same source and values, e.g., speed through water, heading, etc. The illustration below shows the CCRS diagram.



The CCRS process NMEA0183 and IEC 61162-1 sentences. No other types of data (video signals, etc.) are processed.

Check for validity, legitimacy

The system checks received sentences for validity and legitimacy.

Validity check: A sentences's checksum, status (A/V), Mode indicator and setting values are checked. (If checksum error is found, the sentence is disaffirmed.

Legitimacy check: The range and accuracy of a sentence is checked.)

If the check for both is OK a valid flag results. If either is invalid, the invalid flag is given.

Types of CCRS

There are two types of CCRS: System and Local. The System CCRS integrates all navigation devices. In the Local CCRS each navigation device operates independently.

Representative sensors

If the system has multiple like sensors, the CCRS selects the representative sensor. Generally, the system uses common representative sensors; however, independent representative sensors (local representative sensors) can also be used.

16.2 How to Select Navigation Sensors

The operator can select navigation sensors to use for navigation and view their current values on the applicable page in the [System Sensor Setting] and [Local Sensor Setting] menus. To access these menus, right-click the Sensor information, datum box then click [Select Sensor] followed by [Setting].

The descriptions in this section show the sensor menus in the radar mode. The sensor menus in the chart mode mirror those in the radar mode, although the layout is different. Any change made in a sensor menu is reflected to the companion sensor menu, to synchronize the data between the modes.

16.2.1 Sensors menu description

[HDG] page (Local Sensor)

Priority	Sensors
1	GYO001
2	GYO002

☐ Analog Gyro Adjust 0.0°
☐ Manual 0.0°
☐ Gyro Correction 0.0°

[Sensors]: Select the heading sensor to use.

[Analog Gyro]: No use.

[Manual]: Set heading manually when there is no heading sensor available. (Not shown on IMO type.)

[Gyro Correction]: Set correction manually for the heading value. (Not available with the [System Sensor Setting] menu.)

[SPD] page (System Sensor)

[Stabilization Mode]: Select the water stabilization mode: Select [Bottom] for ground stabilization, or select [Water] for sea stabilization.

[Sensor Type]: Select [GPS] in case of a GPS navigator, or [LOG] for speed log.

[Data Source]: Check [Sensors] to use a sensor in the [Sensors] list, or click [Manual] to enter speed manually. Use [Manual] when no speed source is available.

[Manual]: Input speed manually. Check [Water] in [Stabilization Mode] and deactivate the AIS function to enable entry.

[Reference SPD]: Check to use radar as the source for speed and course. (Only available with the Local Sensor Setting and checking [Bottom] in [Stabilization Mode].)

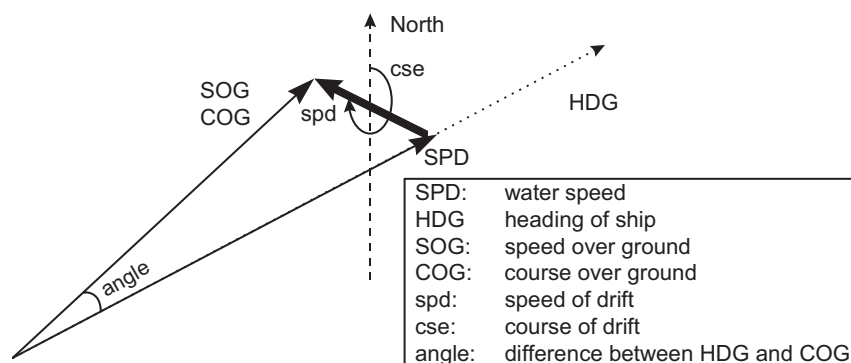
[Set Drift]: Check the [Set Drift] checkbox to manually set speed and course of drift. Note that you can select manual drift only if you check [Water] in [Stabilization Mode].

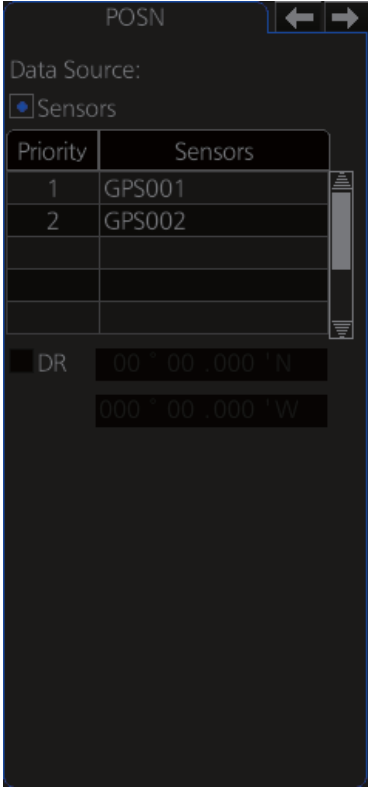
Angle = Difference between heading and COG

Spd = Speed component of the drift vector

Cse = Course component of the drift vector

Vector defined by (SOG and COG) is equal to vector sum of vectors defined by (SPD and HDG) and (set and drift).



[POSN] (Position) page

The screenshot shows the [POSN] (Position) page with a dark background. At the top, the title "POSN" is displayed. Below it, the "Data Source:" section has a radio button labeled "Sensors" which is selected. A table with two columns, "Priority" and "Sensors", lists two sensors: "1" with "GPS001" and "2" with "GPS002". Below the table, there is a checkbox labeled "DR" and two input fields for coordinates: "00 ° 00 .000 ' N" and "000 ° 00 .000 ' W".

Priority	Sensors
1	GPS001
2	GPS002

☐ DR 00 ° 00 .000 ' N
000 ° 00 .000 ' W

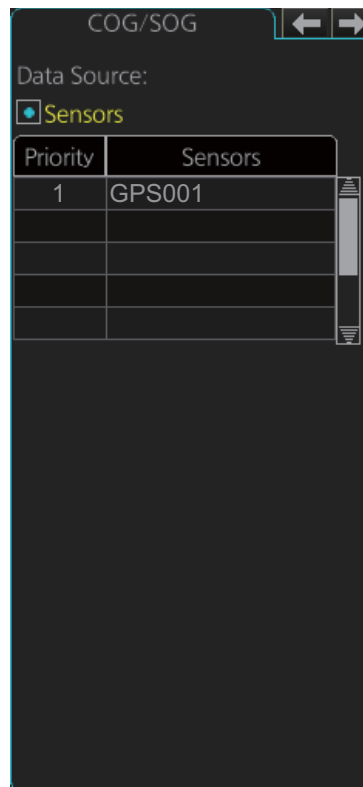
The sensor label (here, GPS001, GPS002) indicates the name of the sensor.

[Data Source]: Check [Sensors] to use a sensor in the [Sensors] list, or click [DR] to enter position manually. When the position source is changed based on priorities and signal validity to another position source, then you get the Alert 471 "Position Source Change".

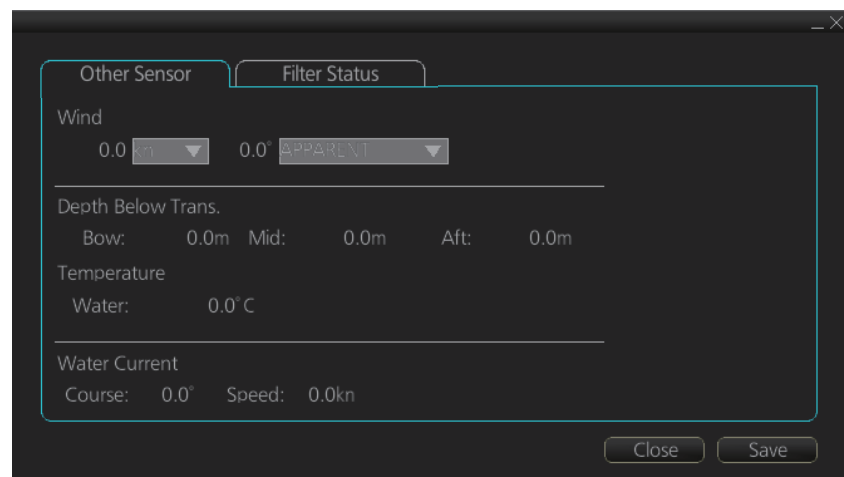
[DR]: Check [DR] when no position source is available.

[COG/SOG] page

Select the source (GPS receiver) for speed over the ground and course over the ground.

**[Other Sensor] page**

To show the [Other Sensors] page, open the menu and select [Other Sensor Settings] in the chart mode.



[Wind]: Wind (True, Theoretical or Apparent) speed (kn or m/s) and direction are displayed. See section 16.9.

[Depth Below Trans]: Depth from hull at bow and aft to bottom. A depth alert value may be entered to alert you when the depth is within the value set.

[Temperature]: Water surface temperature.

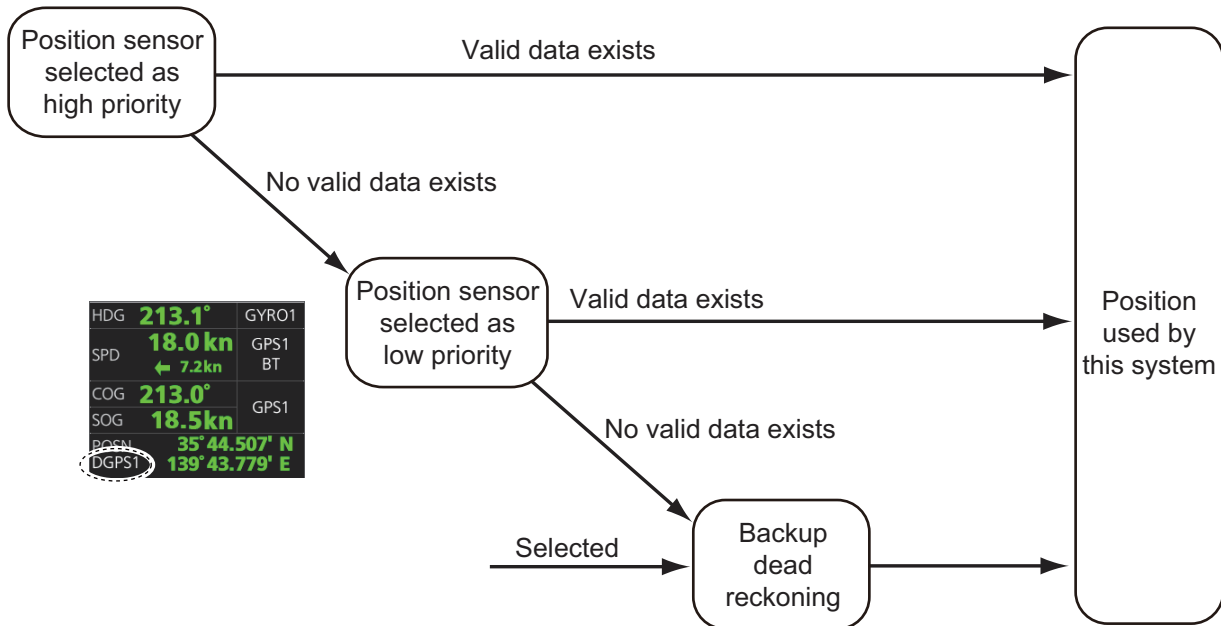
[Water Current]: Tide at own ship's position.

16.3 Source of Position

The figure below shows how source for position is chosen. The position sensors have either primary or secondary as input for their calculation. DGPS position sensors are considered more accurate than other position sensors.

The latitude and longitude position is shown at the top-right position on the chart radar display, and in the example below the position source is DGPS. Other indications that may be displayed in the position area are as follows:

- [DR]: Shown in yellow when position source is dead reckoning.
- [DGPS], [GPS]: Name of position source.



If the system changes the source of position because of lost sensor data, the system immediately generates the Alert 472 "Position Source Change".

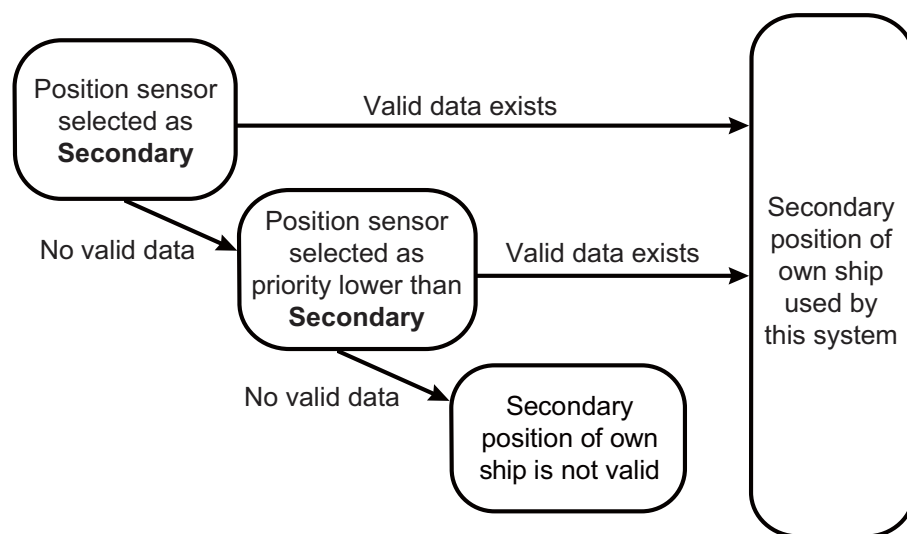
16.4 Primary and Secondary Positions of Own Ship

The system has three different positions for own ship: System position, Primary position and Secondary position.

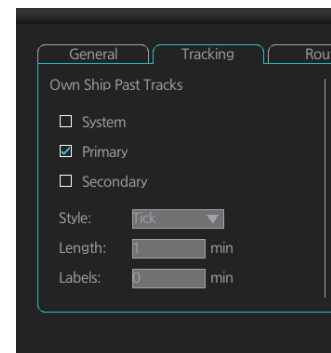
- **System position:** CCRP
- **Primary position:** Position generated by position source with highest priority.
- **Secondary position:** Position generated by position source chosen as 2nd highest priority.

The position source for primary position of own ship is chosen as Primary on the [POSN] page of the [Sensor] menu.

The position source for secondary position of own ship is chosen as Secondary on the [POSN] page of the [Sensor] menu. Secondary position of own ship is not available as latitude/longitude value for the user.



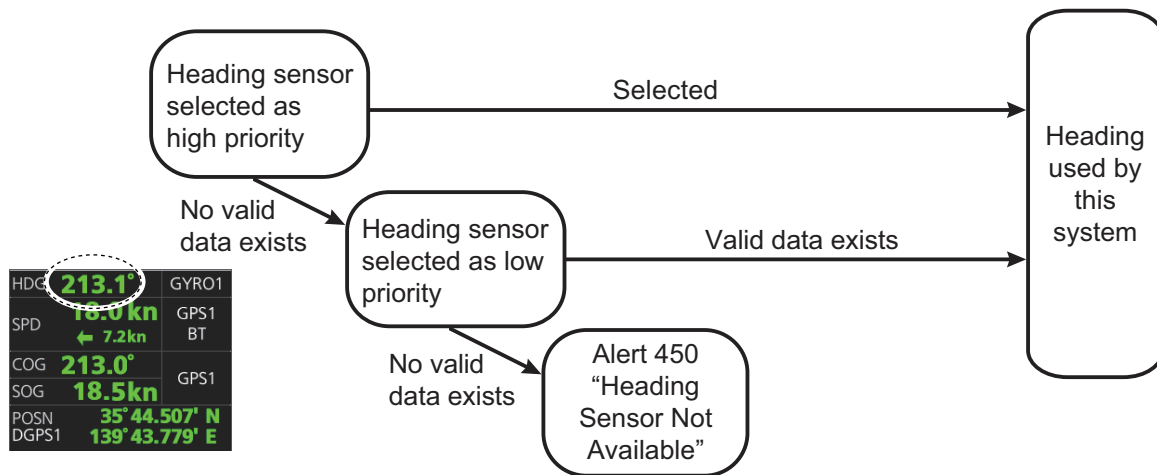
System, primary and secondary positions of your ship may be plotted on the chart radar display with the past tracks feature. You can control their visibility, etc. from the [Tracking] page of the [Symbol Display] menu, shown in the right figure. In this example, past tracks are plotted using the primary position-fixing equipment.



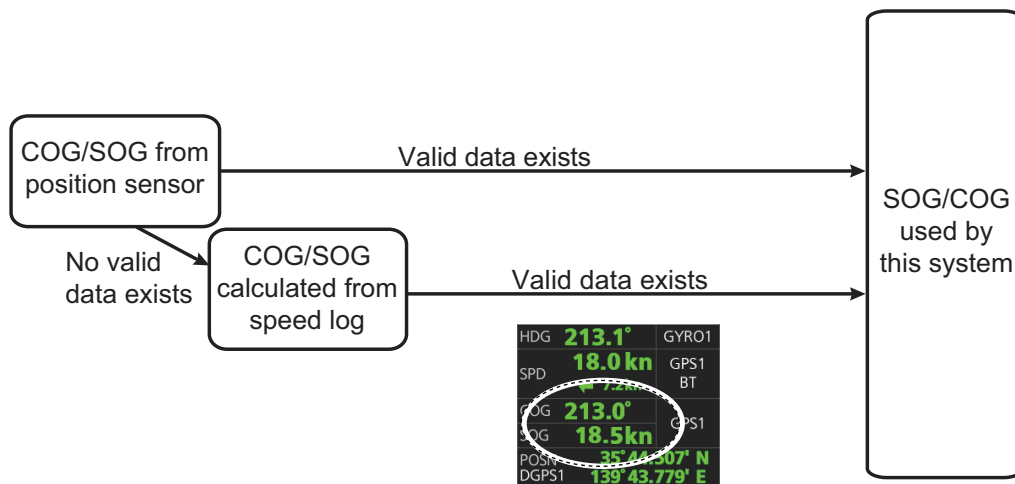
16.5 Source of Navigation Data

The figure below shows how various sources of navigation data are chosen. "SOG, COG" is speed over the ground and course over the ground, respectively. "SPD" is speed through the water. "Drift" is the difference between speed through the water and speed over ground.

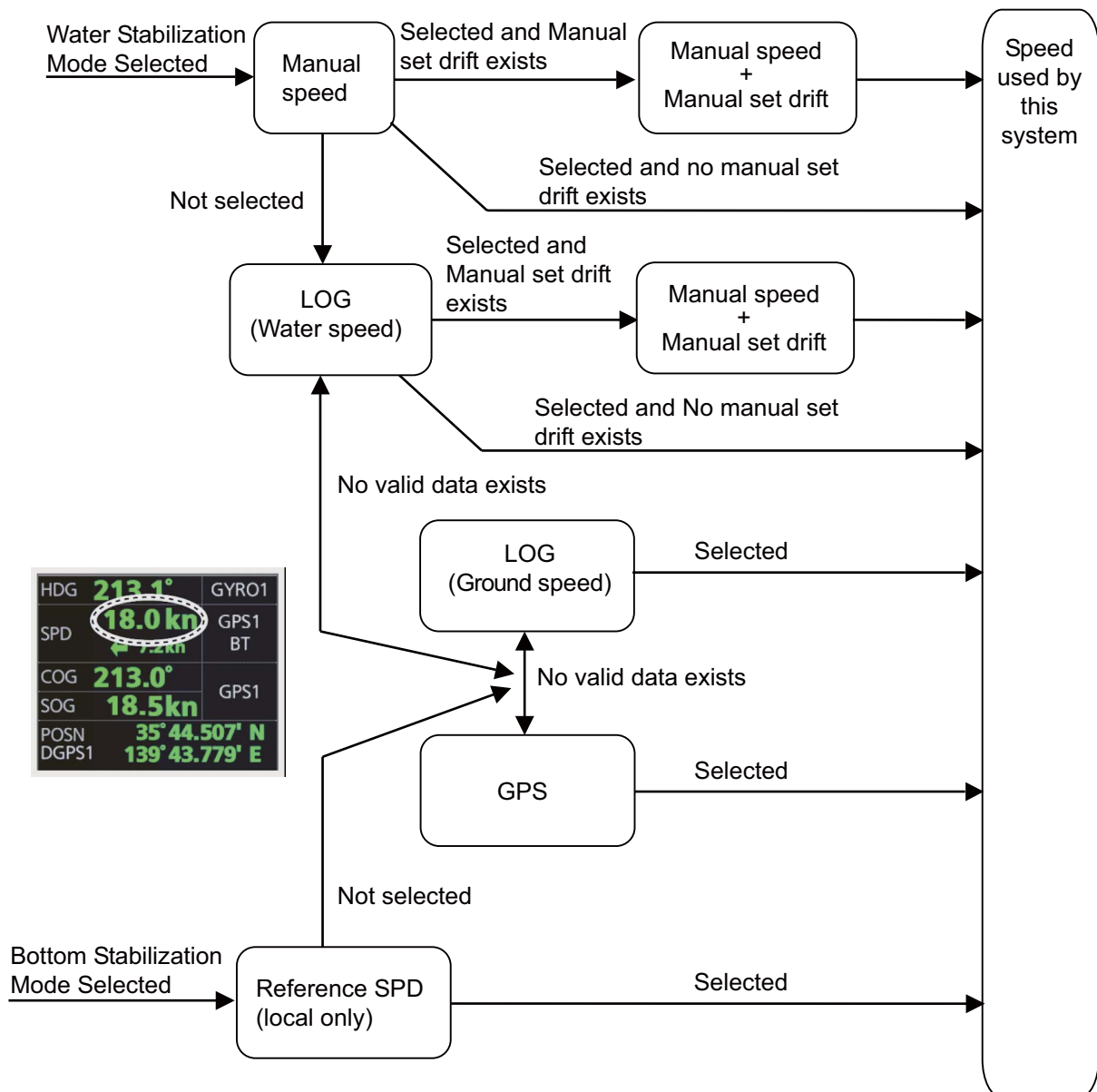
Heading used by the system is shown at the top-right position on the chart radar display. In the example shown below, heading is received from a gyrocompass and it is shown without additional text, meaning the value is referenced to true North.



SOG/COG used by the system is shown at the top-right position on the chart radar display. In the example below, COG and SOG are from chosen position sensors and this is indicated with the text "GPS*" or "LOG*" (* is the number of sensors).



Speed used by the system is shown at the top-right position on the chart radar display. The figure below shows the source of water speed is used for drift calculation.



Alert related to SOG, COG, speed and heading components

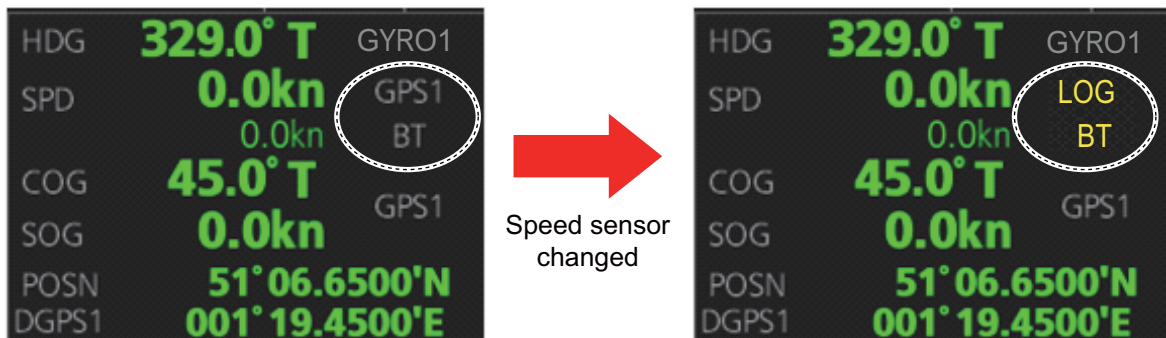
It is possible that the operator has not chosen any speed or heading sensors, or that the chosen sensors do not have any valid values. This kind of a situation is critical for the system, because it cannot even perform dead reckoning.

When no heading source is available, the system generates the Alert 450 "Heading Sensor Not Available."

When no speed source is available, the system generates the Alert 453 "SDME Sensor Not Available." When no COG/SOG data is available, the system generates the Alert 279 "COG/SOG Not Available."

16.6 Switching of Sensor and Indication

When a sensor cannot be used because of some problem, the system automatically switches the sensor. When this occurs the name of the newly selected sensor appears in yellow.



16.7 Filter Status

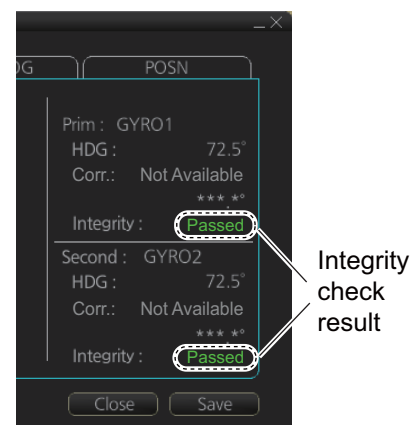
The ECDIS incorporates a filter that receives raw sensor data, checks sensor integrity and processes multiple sensor data to produce a continuous estimate of ship's position and motion.

By default, the filter uses data from all available sensors for filtering and integrity monitoring. The exception is heading data; only the selected heading device affects the output of the filter, but other heading sensors (including magnetic compasses) are used for integrity monitoring.

Sensors may be excluded manually or automatically. An excluded sensor participates in neither integrity monitoring or filtering. The filter automatically excludes a sensor from use if the sensor fails the first level of integrity check (for example, if a sudden jump is detected). If the actual integrity check fails for some reason and the filter is able to identify the faulty sensor, the faulty sensor is automatically excluded.

Sensor integrity is determined by: (1) monitoring the statistical accuracy of each sensor independently and analyzing the input values and using the information of the type of sensor, and (2) monitoring the difference between pairs of sensors. The system checks heading, rate of turn, position, COG/SOG and CTW/STW data for integrity, in accordance with INS regulations (IEC-61924-2). The result is either [Passed], [Doubtful], [Failed], [Excluded] or [Not Available]. The integrity check result appears in the following locations:

- [Local Sensor Setting] and [System Sensor Setting] menus. The right figure shows the result for the heading sensor GYRO1.
- [Filter Status] page in the [Other Sensor Setting] menu. See the next page.



[Passed] (green): Data is available for comparison and data is normal

[Doubtful] (yellow): Data is not available for comparison, but data is normal.

[Failed] (orange): Data is quite away from predicted value based on a comparison.

[Excluded] (orange): Data is greatly changed compared with predicted value.

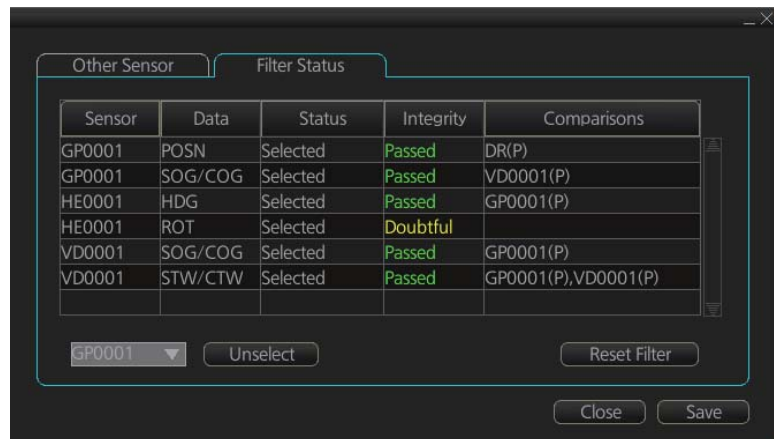
[Not Available] (orange): Sentence status or mode indicator is abnormal.

For heading data, If there is only one gyro, the judgement is "Doubtful" when the ship is stopped because there is no COG for comparison. When the ship begins to move, the judgement is changed to "Passed" because there is COG for comparison.

The methods of integrity monitoring are outlined in the table below.

Sensor	Comparison
Position	- Comparison with other position sensors. - Comparison with dead reckoning position.
Heading	- Comparison with other heading sensors. - Comparison with a COG sensor (used only if other heading sensors are not available and if COG is high enough).
Speed over the ground	- Comparison with other SOG sensors. - Comparison with water speed sensors is a secondary option (used only if other SOG sensors are not available).
Speed through the water	- Comparison with other STW sensors. - Comparison with STW sensors is a secondary option (used only if other STW sensors are not available).
Rate of turn	Comparison with other rate of turn sensors.

The status and integrity of all sensors can be monitored from the [Filter Status] page in the [Other Sensor Settings] menu. Sensors can also be unselected and the filter re-set from this page.



The [Status] column indicates sensor status as follows:

- [Selected] (sensor selected for use in filter)
- [Unselected] (sensor not used in filter)
- [Not Available] (no sensor information)
- [Excluded] (automatically excluded sensor)

The [Integrity] column indicates sensor integrity as either [Passed] (green characters) or [Failed] (red characters). The integrity evaluation is [Doubtful] (yellow characters) when there are no other sensors to compare with.

The [Comparisons] column shows the sensors compared and the integrity evaluation of compared sensors in parentheses. Using the illustration above as an example, SOG/COG data fed from GP0002 is compared with the sensors GP0001 and VD0001. The integrity evaluation for the compared sensors is [Passed].

To unselect a sensor manually, select the sensor from the drop-down list at the bottom left corner of the page, click the [Unselect] button then click the [Save] button. [Unselected] appears in the [Status] column. To reselect an unselected sensor, select the sensor from the drop-down list, click the [Select] button. [Selected] appears in the [Status] column

The [Reset Filter] button functions to recover from sensor failure. When the button is operated:

- Automatically excluded sensors are re-included.
- All data history is erased.
- Output values are re-estimated using new data.
- Integrity monitoring is restarted using new data.

Note: The filter can also be reset from the context-sensitive menu. Right-click anywhere in the Sensor information box to show the context-sensitive menu then select [Filter Reset].

16.8 Position Alignment

The position alignment feature functions to fine tune ship's position by using radar echo target and chart material.

If position alignment is in use, the Alert 640 "Chart Align: Over 30 Min." is generated every 30 minutes to remind the user to align position. The alert is automatically erased in 10 seconds.

Note: This feature is effective with the chart radar unit whose data source for FILT is assigned the highest priority.

16.8.1 How to align position

If the radar echo targets' symbols are not positioned correctly on the chart, there is either position error or gyro error or some combination of these errors.

Position may be aligned on the chart radar display by moving own ship position or by moving radar target position. To align position, get into the Voyage navigation mode, click the [Offset] button at the top-right position on the screen, put the cursor on the correct position then click. The amount of offset, in bearing and range, appears to the right the [Offset] button.



The latitude and longitude position indication is shown in yellow characters when the position align feature is active.

16.8.2 How to cancel position alignment

Click the [Offset] button to cancel the position offset.

16.9 Wind Sensor

The chart radar can display and output wind data in the following three formats:

Apparent: Windmeter-measured wind speed and direction.

Wind angle reference: Heading

North: True wind angle, true wind speed

Wind angle reference: True North

Theoretical: True wind angle, true wind speed

Wind angle reference: Heading

The illustration below shows wind speed and direction with given ship data.

The wind values are as shown below.

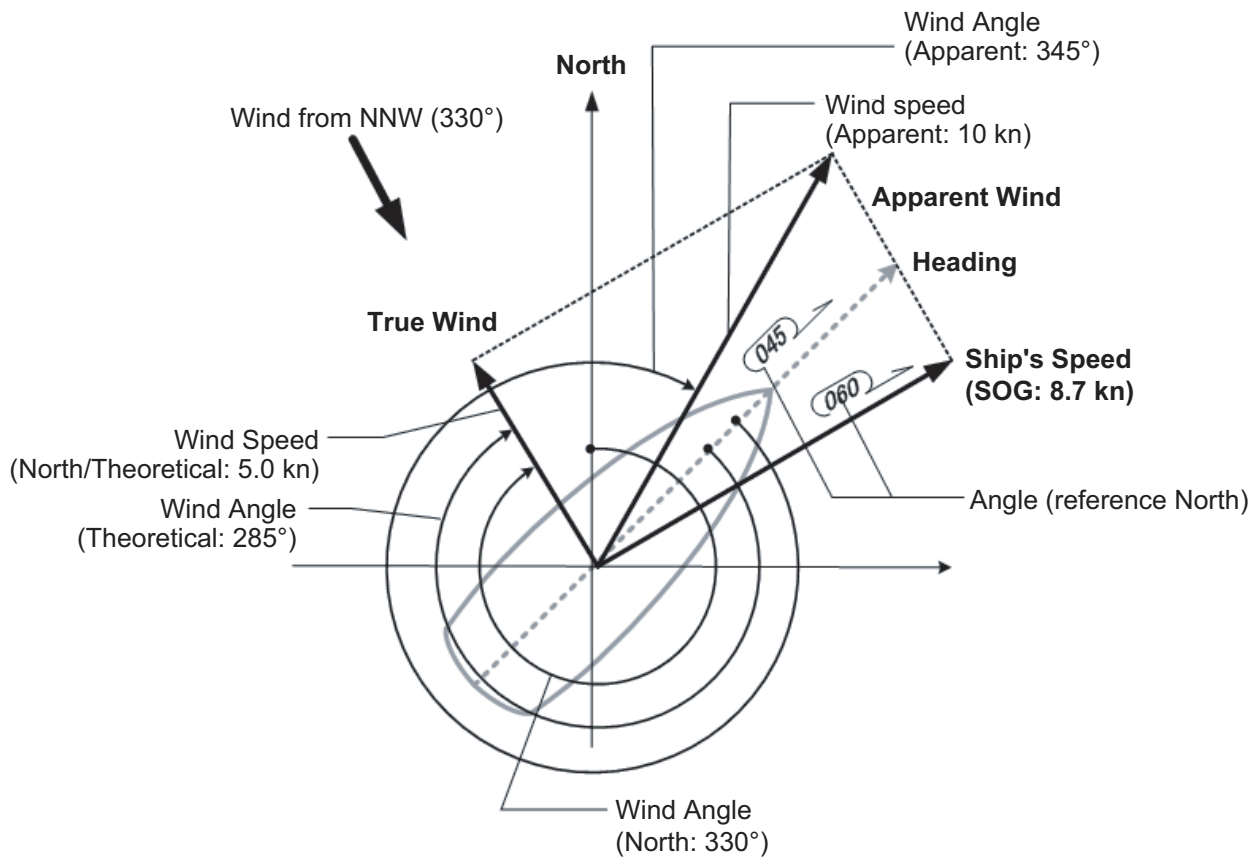
Ship information:

COG: 60°

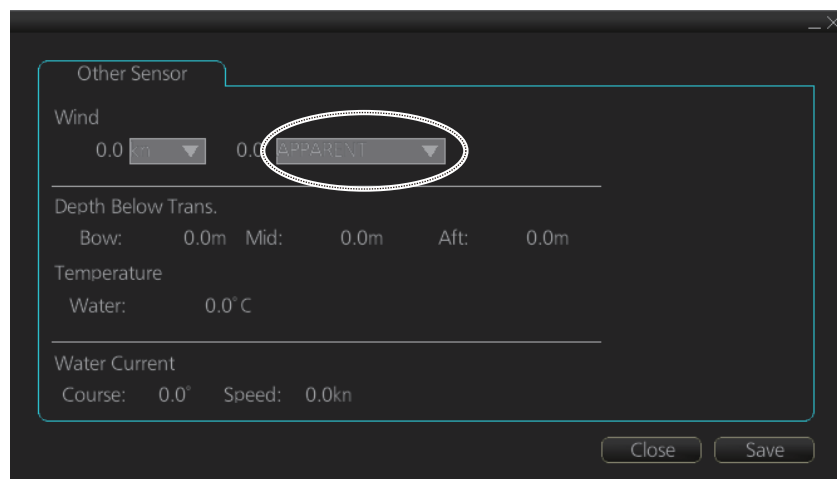
SOG: 8.7 kn

Heading: 45°

	Wind angle	Wind speed
Apparent:	345°	10 kn
North:	330°	5 kn
Theoretical:	285°	5 kn



Apparent, north or theoretical wind may be selected from the [Other Sensor Settings] menu.



16.10 Depth Sensor

The depth output from a depth sensor (for example, echo sounder) is shown on the [Other Sensor] page in the [Other Sensor Settings] menu.

The content of the [Other Sensor] page depends on sensors connected.

In this example there are three transducers (bow, mid and aft) installed.

Other Sensor

Wind
0.0 kn 0.0° APPARENT

Depth Below Trans
Bow: 130.7m Mid: 130.8m Aft: 130.8m

Temperature
Water: 0.0° C

Water Current
Course: 0.0° Speed: 0.0kn

Close Save

The system displays depth value as depth below the transducer. If required, you can get an alert when the measured depth is less than the "Echo Alarm Limit" setting at the [UKC] page in the [Overlay/NAV Tools] box. The system generates the Alert 485 "Depth Limit".

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17. AIS SAFETY, NAVTEX MESSAGES

17.1 AIS Safety Messages

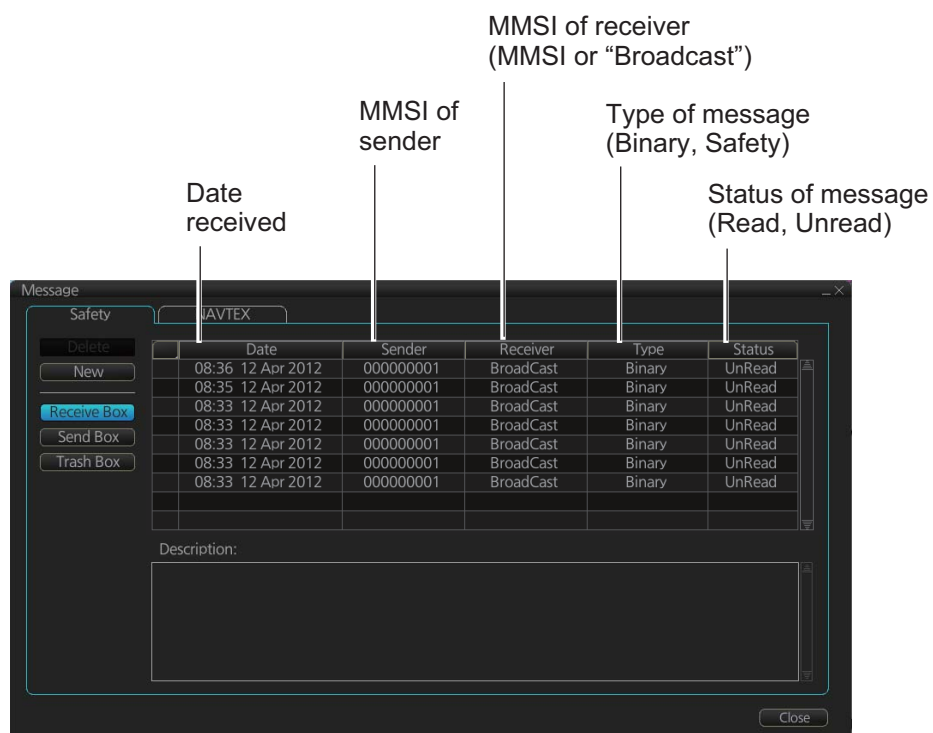
You can send and receive messages via the VHF link, to a specified destination (MMSI) or all AIS-equipped ships within communication range of your ship. Messages can be sent to warn of safety of navigation, for example, an iceberg sighted. Routine messages are also permitted. Short safety-related messages are only an additional means to broadcast safety information. They do not remove the requirements of the GMDSS.

17.1.1 How to send an AIS safety message

Note: If you are using the Trackball Control Unit RCU-026, display the software keyboard ([DISP] button, [], [ON] on the InstantAccess bar) before starting this procedure.

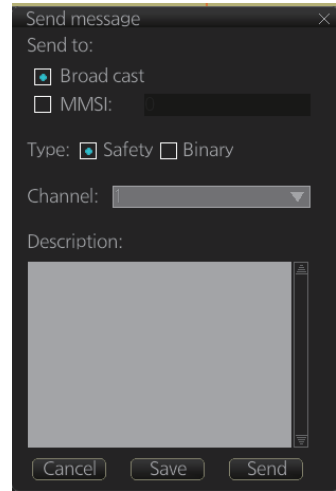


1. In the Voyage navigation mode, click the [MSG] and [Safety MSG] buttons on the InstantAccess bar to show the [Message] dialog box.



17. AIS SAFETY, NAVTEX MESSAGES

2. Click the [New] button.
3. At [Send to], select where to send the message. Select [Broadcast] to send the message to all AIS-equipped ships within communication range, or select [MMSI] and enter the MMSI of the ship where to send the message.
4. At [Type], select the type of message, [Safety] or [Binary] (routine).
5. At [Channel], select the channel to use to send the message.
6. At [Description], enter the text of your message. The no. of characters available depends on the type of message.
Safety message broadcast: 161 characters
Binary message broadcast: 156 characters
Safety message addressed to MMSI: 156 characters
Binary message addressed to MMSI: 151 characters
7. Click the [Send] button to send the message.



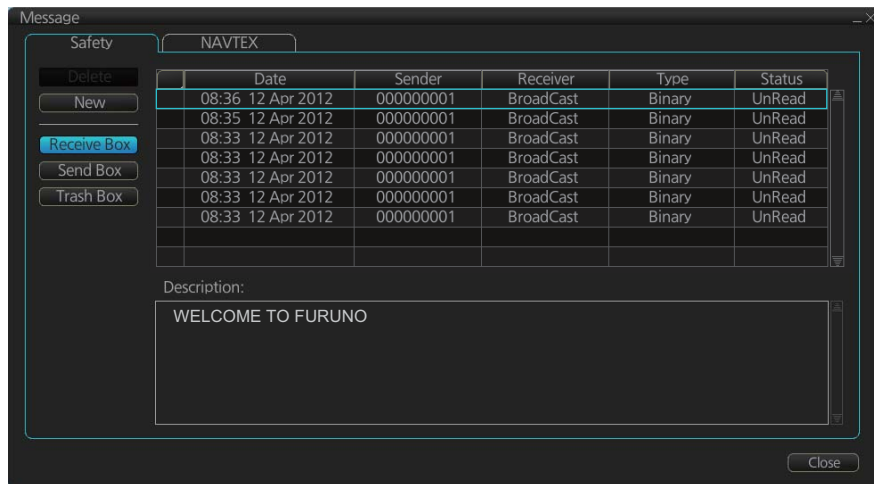
Send message dialog box. Fields include: Send to: (Broadcast selected, MMSI: empty), Type: (Safety selected, Binary unselected), Channel: (dropdown), Description: (text area). Buttons: Cancel, Save, Send.

17.1.2 How to display received and sent AIS safety messages

When an AIS message is received, the Alert 539 "AIS Message Received" appears. Do the following to view the message.

How to display the Messages dialog box, view a message

1. Click the [MSG] and [Safety MSG] buttons on the InstantAccess bar.
2. Click the [Receive Box] or [Send Box] button as appropriate.
3. Click a message to view its contents.



Message dialog box. Tabs: Safety, NAVTEX. Left sidebar: Delete, New, Receive Box (selected), Send Box, Trash Box. Main table:

	Date	Sender	Receiver	Type	Status
	08:36 12 Apr 2012	000000001	BroadCast	Binary	UnRead
	08:35 12 Apr 2012	000000001	BroadCast	Binary	UnRead
	08:33 12 Apr 2012	000000001	BroadCast	Binary	UnRead
	08:33 12 Apr 2012	000000001	BroadCast	Binary	UnRead
	08:33 12 Apr 2012	000000001	BroadCast	Binary	UnRead
	08:33 12 Apr 2012	000000001	BroadCast	Binary	UnRead

Description: WELCOME TO FURUNO

Close button.

17.1.3 How to delete received and sent AIS safety messages

Note: A large amount of messages may take some time to delete.

How to delete a received or sent message

1. Click the [Receive Box] or [Send Box] as appropriate.
2. Click the box that is before the date to show a checkmark. (All messages can be checked or unchecked with the context-sensitive menu. Right-click the box to the left of "Date" then select [Check All] or [Uncheck All] as applicable.)
3. Click the [Delete] button.

How to delete received, sent messages permanently

1. Click the [Trash Box] button.
2. Click the box that is before the date to show a checkmark. (All messages can be checked or unchecked with the context-sensitive menu. Right-click the box to the left of "Date" then select [Check All] or [Uncheck All] as applicable.)
3. Click the [Delete] button.

17.2 Navtex Messages

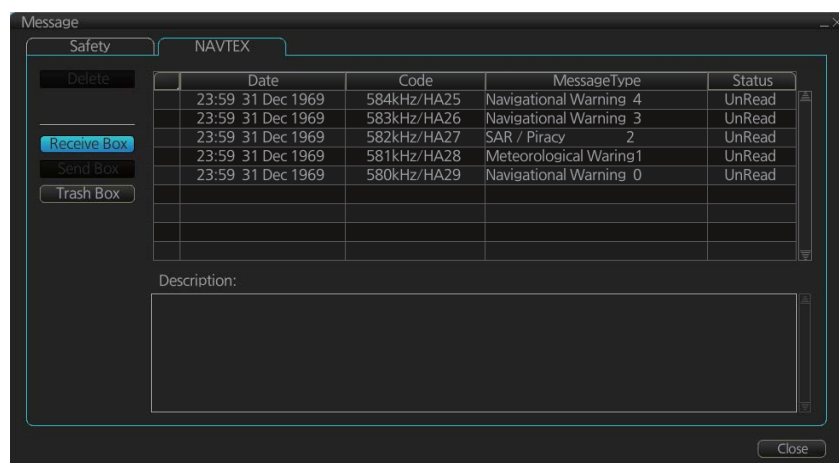
Navtex (Navigational Telex) is an international automated medium frequency direct-printing service for delivery of navigational and meteorological warnings and forecasts, as well as urgent marine safety information to ships.

Navtex messages can be received and read in the Voyage navigation mode.

17.2.1 How to receive Navtex messages

To display a received NAVTEX message, do the following:

1. Click the [MSG] and [NAVTEX MSG] buttons on the InstantAccess bar.



2. Click the message to view. The text of the message appears in the [Description] box.

17.2.2 How to delete received Navtex messages

Note: A large amount of messages may take some time to delete.

How to delete received Navtex messages

1. Click the [MSG] and [NAVTEX MSG] buttons on the InstantAccess bar.
2. Click the [Receive Box] button.
3. Click the box that is before the date to show a checkmark in the box. (All messages can be checked or unchecked with the context-sensitive menu. Right-click the box to the left of "Date" then select [Select All] or [Deselect All] as applicable.)
4. Click the [Delete] button.

How to deleted received Navtex messages permanently

1. Click the [MSG] and [NAVTEX MSG] buttons on the InstantAccess bar.
2. Click the [Trash Box] button.
3. Click the box that is before the date to show a checkmark in the box. (All messages can be checked or unchecked with the context-sensitive menu. Right-click the box to the left of "Date" then select [Select All] or [Deselect All] as applicable.)
4. Click the [Delete] button.