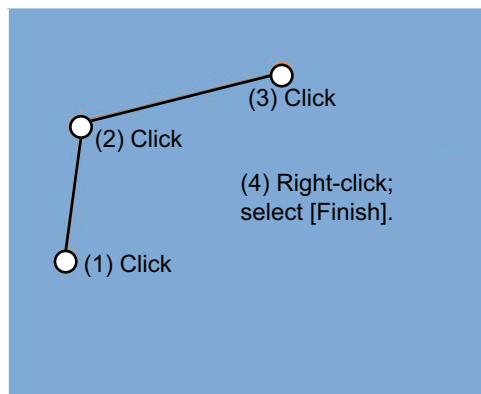


13. USER CHARTS

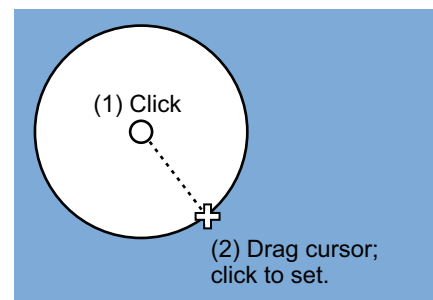
- Click the [New] button on the [User Chart] dialog box to create a new chart.



- Click the desired object (button) on the palette.
- Put the cursor on the location where to insert the object then push the left button. See the figure below for how to construct lines, areas and circles.

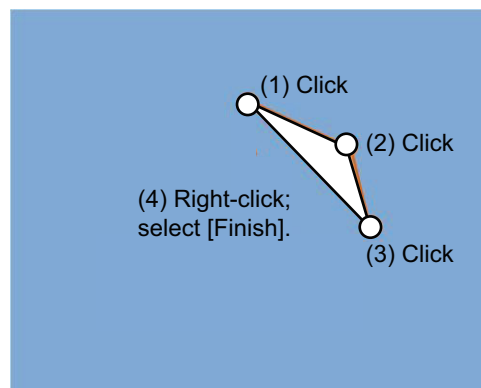


How to create a line



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

How to create a circle

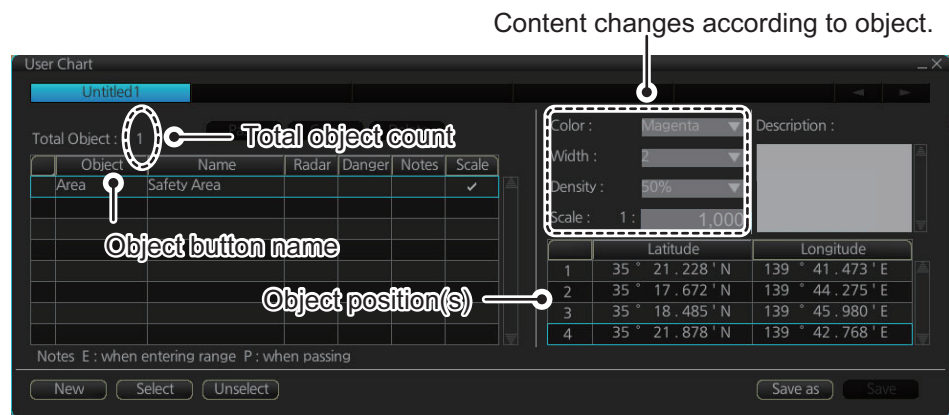


How to create an area

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



[User Chart] dialog box (Area)

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.

- To enter a name for the object, click the appropriate location in the [Name] window then use the software keyboard or the Control Unit to enter a name.

Object	Specifications
Area	[Color]: Red, green, blue, magenta, orange, brown, black, yellow [Width]: 1, 2, 3, 4, 5 [Density]: 0%, 25%, 50%, 75% [Scale] (Auto Zoom): 1:1,000 and 1:70,000,000
Circle	[Color]: Red, green, blue, magenta, orange, brown, black, yellow [Width]: 1, 2, 3, 4, 5 [Density]: 0%, 25%, 50%, 75% [Size]: 0.1 to 100.0 NM [Scale] (Auto Zoom): 1:1,000 and 1:70,000,000
Label	[Color]: Red, green, blue, magenta, orange, brown, black, yellow [Style]: Label, point, circle, rhombus, pin [Label]: Enter text in input box. The text appears to the side of the object. The character string depends on the [Style] setting. Note: Character string location depends on the label type. Point: Character string is centered on the point of latitude/longitude. Others: Character string with the latitude/longitude points is left-justified.
Tide	[Style]: Measured value, predicted position [Direction]: 0°-359.9° [Time]: 00:00-23:59 [Speed]: 0.0-10.0 kn
Line	[Color]: Red, green, blue, magenta, orange, brown, black, yellow [Width]: 1, 2, 3, 4, 5 [Style]: Coast (coastline), voyage (navigation line), route, water depth (contour) [Scale] (Auto Zoom): 1:1,000 and 1:70,000,000
Clearing line	[Style]: Avoidance line (below), Evacuation line (above), [Direction]: 0°-359°

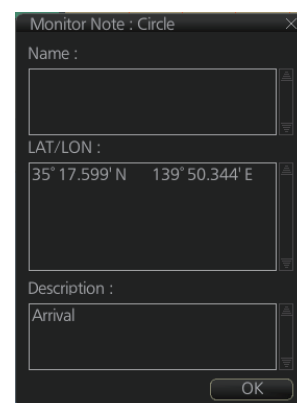
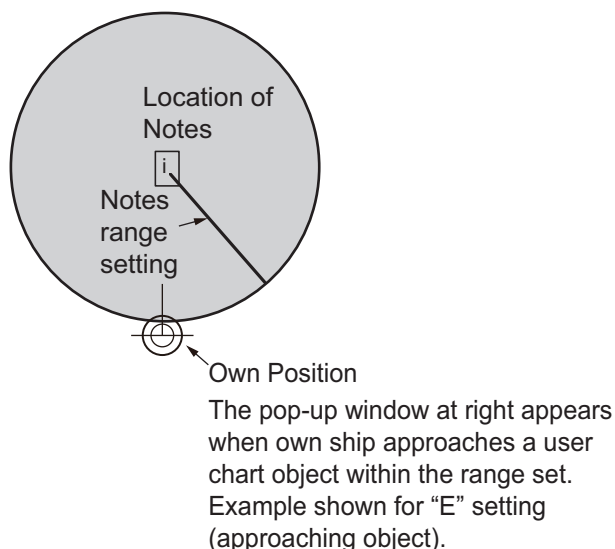
Object style can also be changed from the user chart palette. Right click object button, then select desired style from the context menu.

13. USER CHARTS

7. To enter the object name, click the appropriate location in the [Name] field. Then enter a name.
Note: For circles and areas you can display the object name on the object (see page 8-11)
8. **Label, line, clearing line, area, circle:** Click the corresponding box in the [Radar] column to hide or show the checkmark to display or don't display the object on the radar overlay. For other objects go to step 9.
Note: The clearing line setting is fixed to ON. (The checkmark is greyed out.)
9. **Label, line, clearing line, area, circle:** Click the corresponding box in the [Danger] window to hide or show the checkmark to use or don't use the object in chart alert calculation. For the tidal mark, go to step 12.
10. **Line, area, circle:** Do as shown below to add Notes data. For other objects go to step 12.
 - 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 set the message display method.
 - E: Message appears when your ship approaches the user chart object. For a line, message appears when you are "x" miles from the line, which is set with [Range of notes].
 - P: Message appears when your ship is 10NM beyond the user chart object.
 - Blank: No message display.
 - 3) For a line, enter the distance from the line position in the [Range of notes] input box.**Note:** You cannot select both Danger and Notes for these symbols; select either Danger or Notes.

What are Notes?

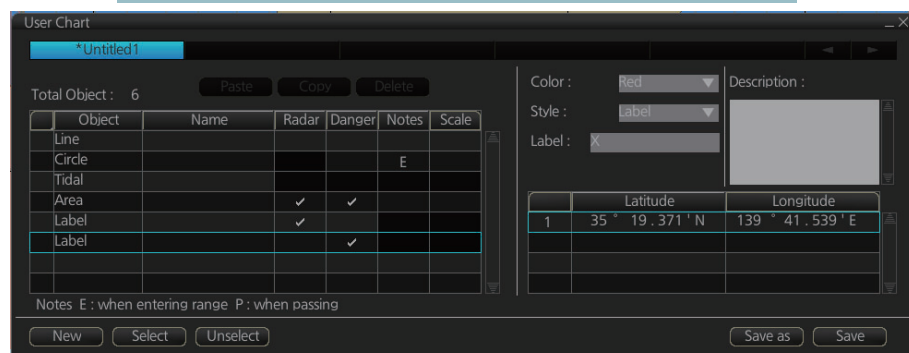
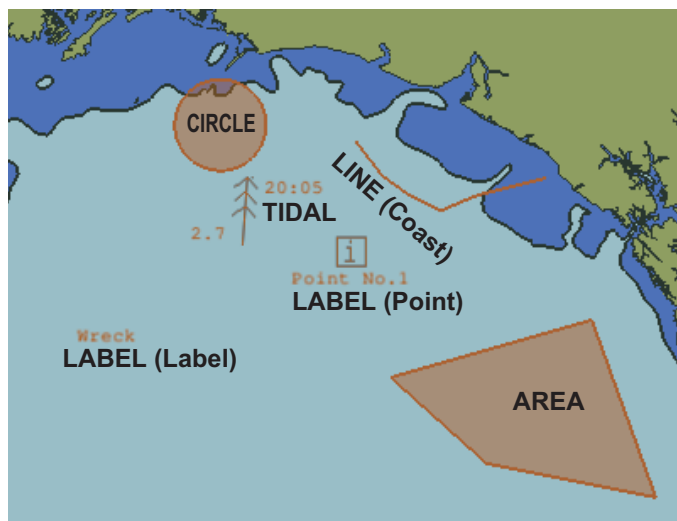
"Notes" provide, in the Voyage navigation mode, messages for the operator relative to your vessel's position. When own ship is x miles from an area or circle chart object, a message appears in the [Monitor Note] dialog box. If alerting to the critical area is enabled, the [Critical Area] alert will be generated at the same time as the dialog box is displayed. The message appears for a line (set in [Range of notes]) when own ship is within x miles of the line or x miles after passing the line.



11. **Line, Area, Circle:** Click the [Scale] drop down menu to set the scale to use in auto zoom. For other objects go to step 12.
12. To continue entering the same symbol, click a new location on the screen and do step 5. To enter a different symbol, do steps 4 and 5.
13. 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.
14. The [Save as 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 “E” which means the message set in the [Description] box when the own ship enters the circle will be shown.
- 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.



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.

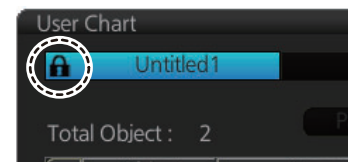
13.4 How to Edit Objects on a User Chart

User chart object locations and names can be edited using the procedure below.

- Referring to step 1 and step 2 in section 13.3, show the [User Chart] dialog box.
- Click [Select] to show the [Select User Chart] dialog box.

Note: If a user chart is linked to a protected route, the lock icon appears in the following location, and you cannot save the chart after editing. Remove the protection from the route before editing the chart, referring to section 12.10.

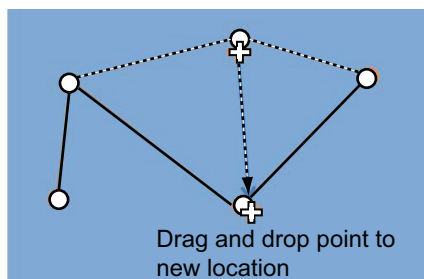
 - [Protected] column of the [Select User Chart] dialog box
 - Left of the user chart name indication in the [User Chart] dialog box
- Select the chart with objects to edit, then click [OK]. The selected chart's objects appear in the [User Chart] dialog box. The chart objects also appear on the currently displayed chart.
- Edit the chart object information as required. You can also edit the objects on the chart display.



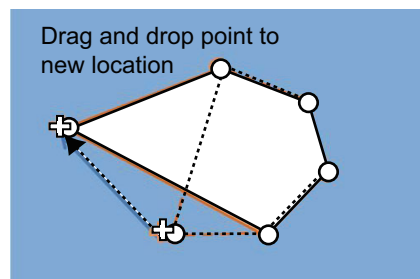
How to move objects

Drag and drop the object. For circles, polygons, etc, click the outer line of the area to drag and drop.

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 delete points in lines and areas

Place the cursor on the point to delete, right-click to show the context menu, then select [Delete]. The point is removed and the object is redrawn.

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].

Note: You can also insert a point from the [User Chart] dialog box with the following procedure.

- 1) Select the line or area from the [User Chart] dialog box.
- 2) At the bottom-right of the User Chart dialog, where the Latitude/Longitude appears, right-click the location for the new point. The context menu appears.
- 3) Click [Insert Before] or [Insert After] as required to insert a new point.
- 4) Adjust the latitude and longitude for the new point as required.
- 5) Click [Save] to save the changes and close the [User Chart] dialog box.

13**13.5 How to Delete Objects from a User Chart**

You can delete objects from a user chart with the following procedure.

1. Referring to step 1 and step 2 in section 13.3, show the [User Chart] dialog box.
2. Click [Select] to show the [Select User Chart] dialog box.
3. Select the chart with objects to delete, then click [OK]. The selected chart's objects appear in the [User Chart] dialog box. The chart objects also appear on the currently displayed chart.
4. Click the box to the left of the object to delete. A check mark appears. You can select multiple objects in this manner.
5. Click the [Delete] button to remove the marked object(s).
Note: You can also delete an object from the context menu. Right-click the object to delete to show the context menu, then select [Delete].
6. Click [Save] to save the changes and close the [User Chart] dialog box.

13.6 How to Copy User Chart Objects

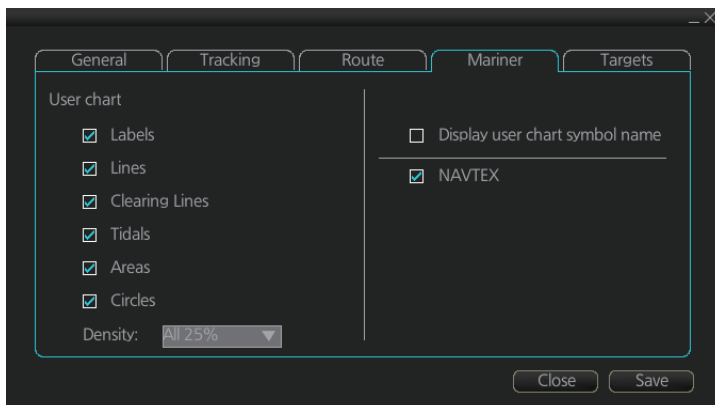
You can copy user chart objects from one chart (the “origin” chart), then paste them onto a different user chart (“destination” chart) with the following procedure.

1. Referring to step 1 and step 2 in section 13.3, show the [User Chart] dialog box.
2. Click [Select] to show the [Select User Chart] dialog box.
3. Select the “origin” chart, then click [OK].
4. Repeat step 2 and step 3 to select the “destination” chart.
5. On the [Select User Chart] dialog box, click the tab for the “origin” chart.
6. Check the box(es) for the object(s) you want to copy.
7. Click the [Copy] button.
8. On the [Select User Chart] dialog box, click the tab for the “destination” chart.
9. Click [Paste]. The objects selected at step 6 are copied to the chart.
10. Click [Save] to save the changes and close the [User Chart] dialog box.

13.7 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 [Density].

Note: Alpha blending technology is used for transparency effects.

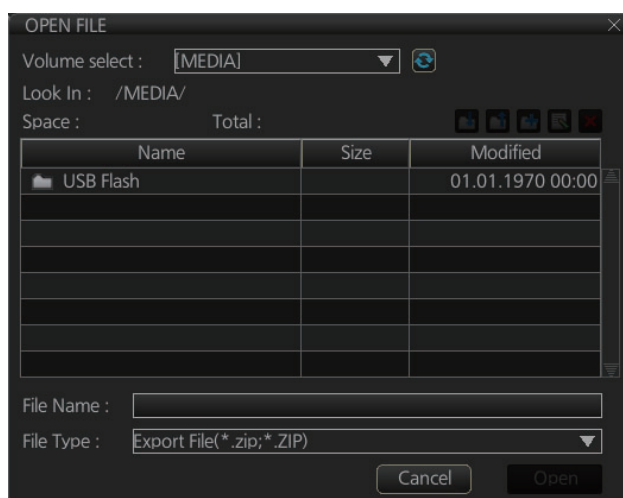


13.8 How to Import User Chart Data

13.8.1 User chart created on other units

Do as follows to import user charts created on other units (FMD-3xxx, FAR-3xxx):

1. Set the USB flash memory to the USB port on the Control Unit.
2. Click the [] button on the status bar, then select [Settings]. A confirmation pop up window appears.
3. Click OK to show the [Settings] menu.
4. Click the [File Import] tab, then click the [Select file to import] button. The open file dialog box appears.

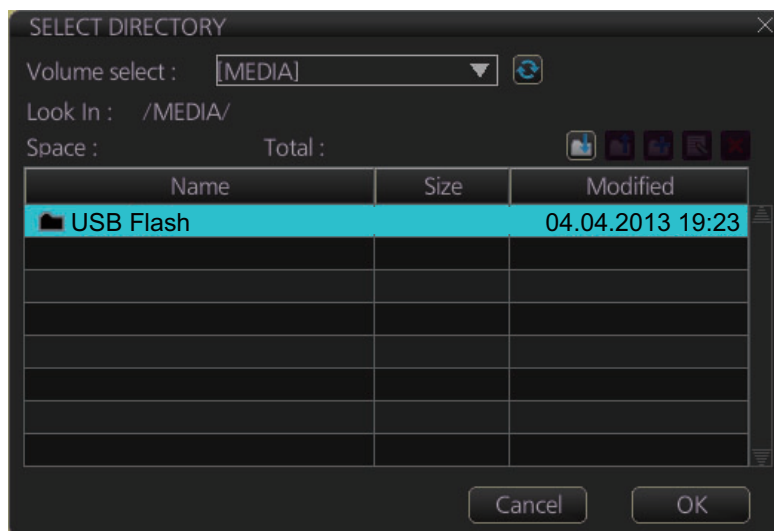


5. Select the file to import, then click the [Open] button. The open file dialog closes.
6. Click the box to the left of [Route/User chart] in the "Select data to import:" section of the [File Import] tab.
7. Click [Import].

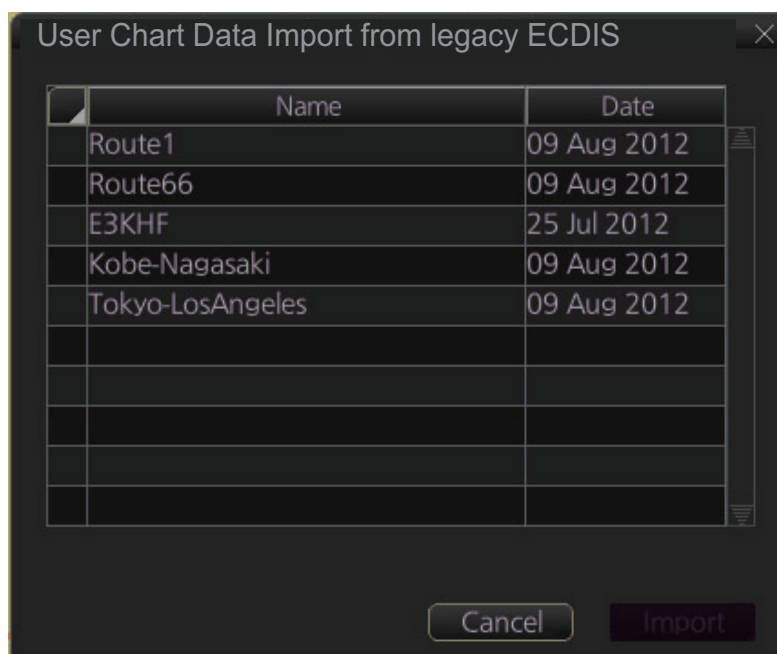
13.8.2 How to import a user chart created with ECDIS FEA-2x07

User charts created at the ECDIS FEA-2x07 can easily be imported to this unit. 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.



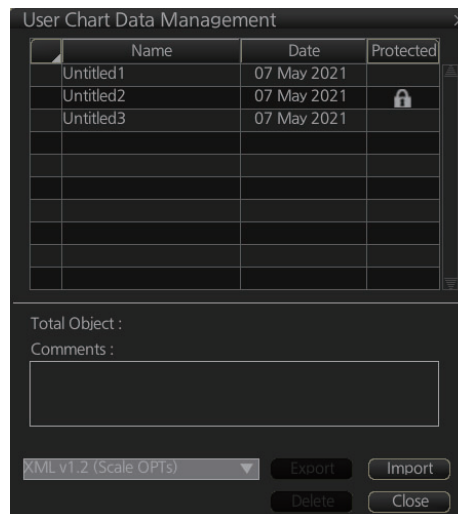
5. Check the user chart(s) to import then click the [Import] button.

13.8.3 XML format user chart

You can import XML user charts type v1.0, v1.1/v1.2/v1.3.

Note: For XML v1.3, an object can contain a maximum of 1000 lines. If more than 1000 line objects are detected during import, an error message appears. Decrease the amount of points to enable import.

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 [User Chart] buttons to display the dialog box shown right.
4. Check the files to import.
5. Select XML input format from the drop-down list.
6. Click the [Import] button to import files. After the importing is completed, click the [Close] button.

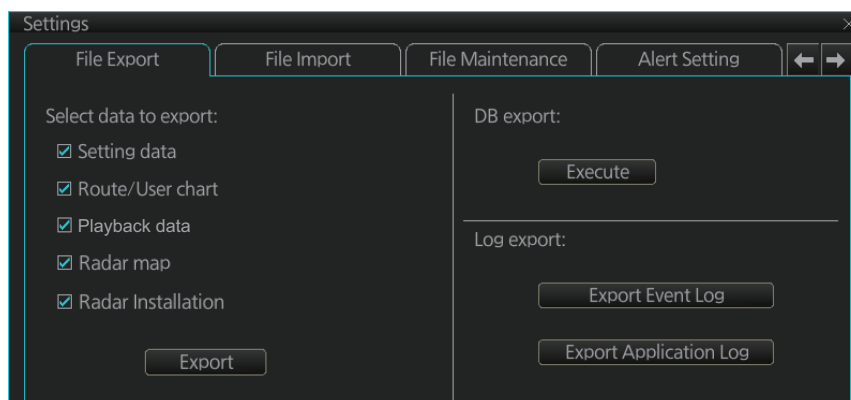


13.9 How to Export User Chart Data

You can save user chart data to a USB flash memory and share the data with other units (FMD-3xxx or FAR-3xxx).

13.9.1 How to export user chart data created on this unit

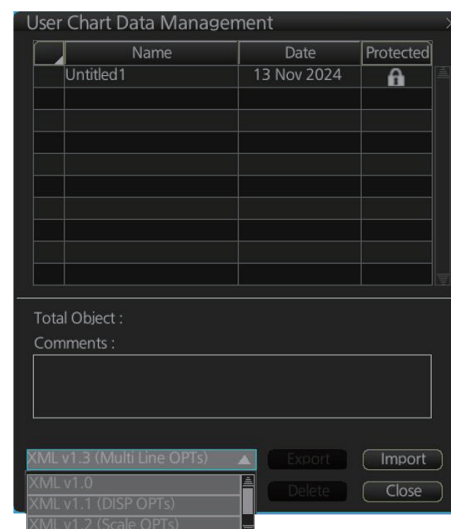
1. Set the USB flash memory to the USB port on the Control Unit.
2. Click the [] button on the status bar, then select [Settings]. A confirmation pop up window appears.
3. Click OK to show the [Settings] menu.
4. Click the [File Export] tab.



5. Check [Route/User chart], then click the [Export] button.

13.9.2 XML format user chart

1. Set the USB flash memory to the USB port on the Control Unit.
2. Click the [PLAN] button on the Status bar to go to the Voyage planning mode.
3. Click the [Manage Data] button on the InstantAccess bar™ followed by the [User Chart] button. The [User Chart Data Management] dialog box appears.
4. Check the user charts to export.
5. Select XML output format from the drop-down list, referring to the table below.



Format	No. of input points for Object	Pin/auto zoom support
XML v1.0	(Maximum 5 files x 300 maximum points per file)	No
XML V1.1 (DISP OPTs)	Up to 100,000 points (total of 5 files) See section 13.1 for details.	No
XML v1.2 (scale/PS OPTs)		Yes
XML v1.3 (Multi Line OPTs)		

Note 1: If the user chart you want to export uses labels (style: pins) or the auto-zoom function, select [XML v1.3 (Multi Line OPTs)] for XML v1.3, or [XML v1.2 (scale / PS OPTs)] for XML v.1.2. If selected to [XML v1.0] or [XML v1.1 (DISP OPTs)], the output is as follows:

- **[Label]:** The style setting is converted to a label instead of a pin.
- **[Auto zoom]:** Auto zoom is disabled.

Note 2: Select [XML v1.3] when the user chart to export contains multi line objects*. (Only available selection when user chart contains multi line objects.)

*: Multi line object: A line object that contains more than one line in the object.

6. Click the [Export] button. The [SELECT DIRECTORY] pop up window appears.
7. Select the destination folder then click the [OK] button.
8. Click [Close].

13.10 How to Delete User Charts

Note: A user chart cannot be deleted if it is linked to a protected route.

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.

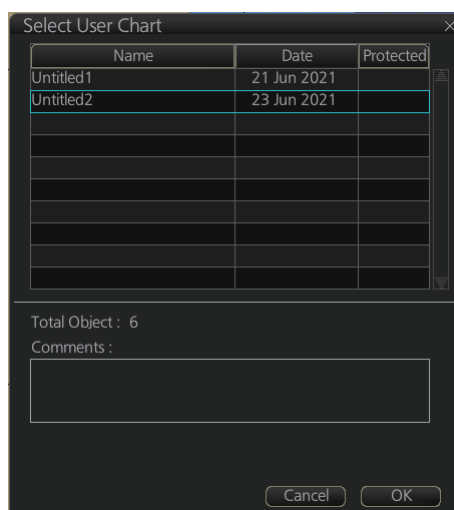


13.11 User Chart Reports

This chart radar generates reports for the selected user chart. If connected to a printer, reports can be printed by clicking the [Print Text] button. To output the report as a PDF file click the [Export Text]. 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 [User Chart] button to show the [Select User Chart] dialog box.



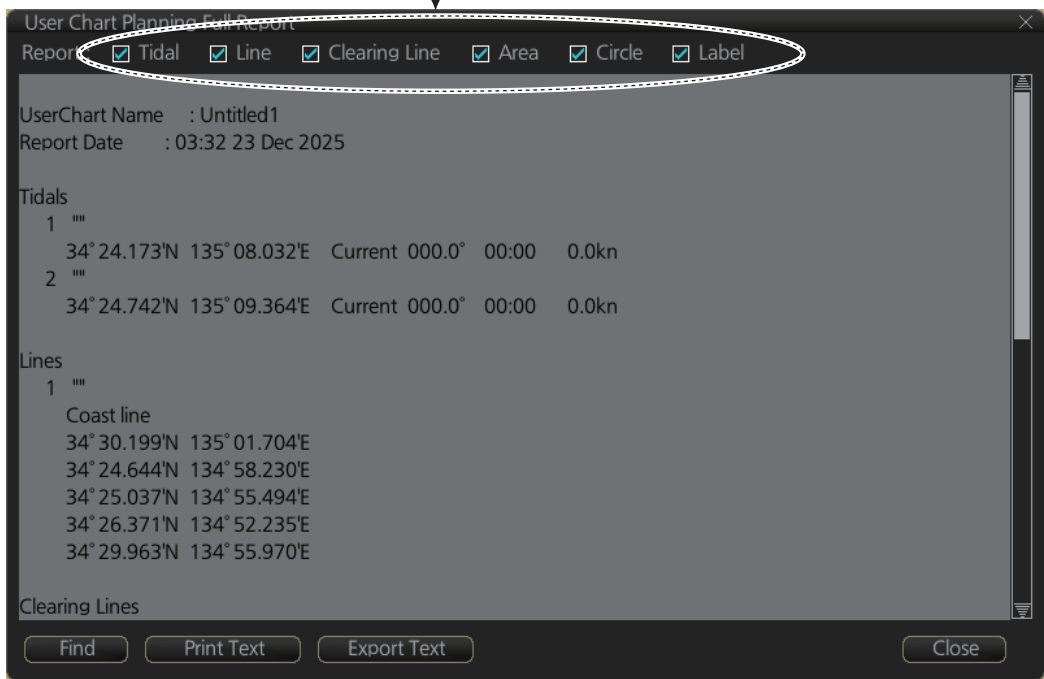
3. Select the appropriate user chart then click the [OK] button to show the selected report. See the next several pages for examples of reports.

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.

Color, line thickness, transparency are not output.

Check the report(s) to display.



13

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

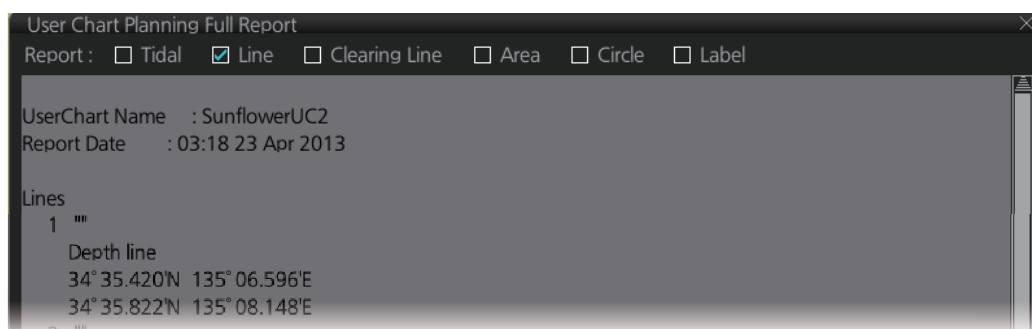


Line report

The Line report provides the following information.

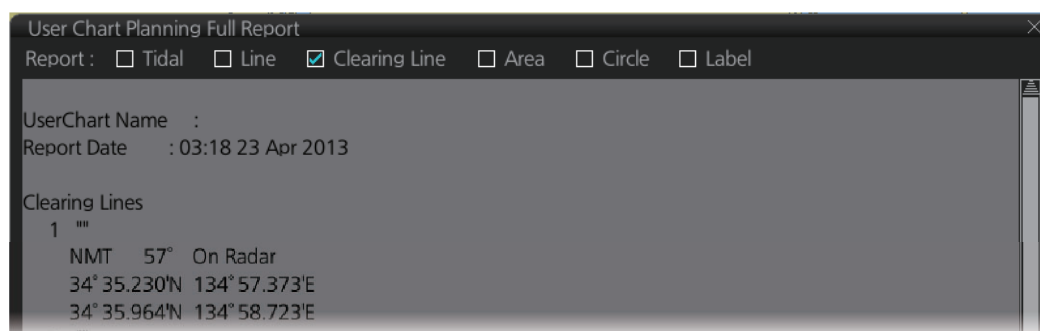
- Name of line
- Latitude and longitude position of each point on the line
- [On Radar] appears with those lines selected to show on the radar overlay. (Checkmark in the [Radar] column of [User Chart] dialog box. See section 13.3.)
- [Danger] appears with those lines selected to show on the radar overlay. (Checkmark in the [Danger] column of [User Chart] dialog box. See section 13.3.)
- [Has Notes] appears with those lines selected to show on the radar overlay. (Checkmark in the [Has Notes] column of [User Chart] dialog box. See section 13.3.)

Color and line thickness are not output.

**Clearing line**

The Clearing line report shows the following information.

- Name of clearing line
- Latitude and longitude position of each point on a clearing line
- [On Radar] appears with those lines selected to show on the radar overlay. (Checkmark in the [Radar] column of U[ser Chart] dialog box. See section 13.3.)
- [Danger] appears with those lines selected to show on the radar overlay. (Checkmark in the [Danger] column of [User Chart] dialog box. See section 13.3.)

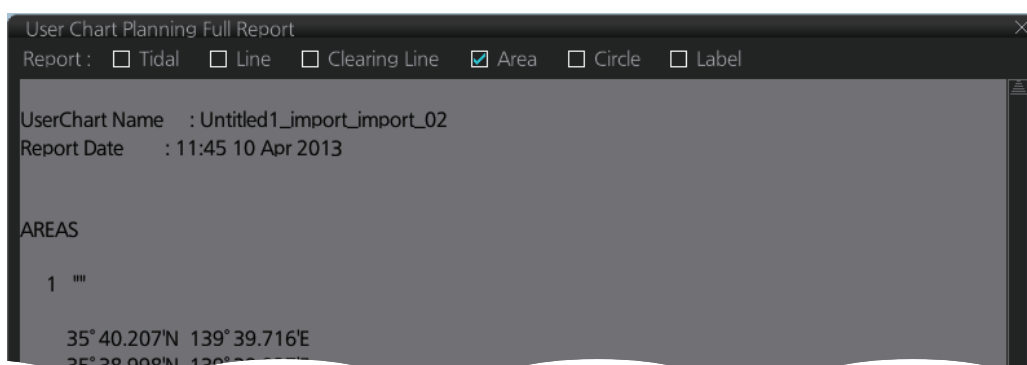


Area report

The area report provides the following information

- Name of area
- Latitude and longitude position of each point of the area
- [On Radar] appears with those lines selected to show on the radar overlay. (Checkmark in the [Radar] column of [User Chart] dialog box. See section 13.3.)
- [Danger] appears with those lines selected to show on the radar overlay. (Checkmark in the [Danger] column of [User Chart] dialog box. See section 13.3.)
- [Has Notes] appears with those lines selected to show on the radar overlay. (Checkmark in the [Has Notes] column of [User Chart] dialog box. See section 13.3.)

Color, line thickness, transparency are not output.



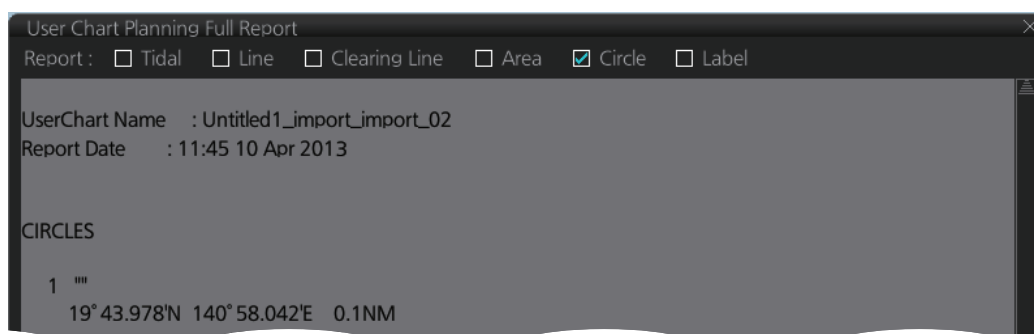
13

Circle report

The Circle report provides the following information.

- Name of circle
- Latitude and longitude position of circle and its radius
- [On Radar] appears with those lines selected to show on the radar overlay. (Checkmark in the [Radar] column of [User Chart] dialog box. See section 13.3.)
- [Danger] appears with those lines selected to show on the radar overlay. (Checkmark in the [Danger] column of [User Chart] dialog box. See section 13.3.)

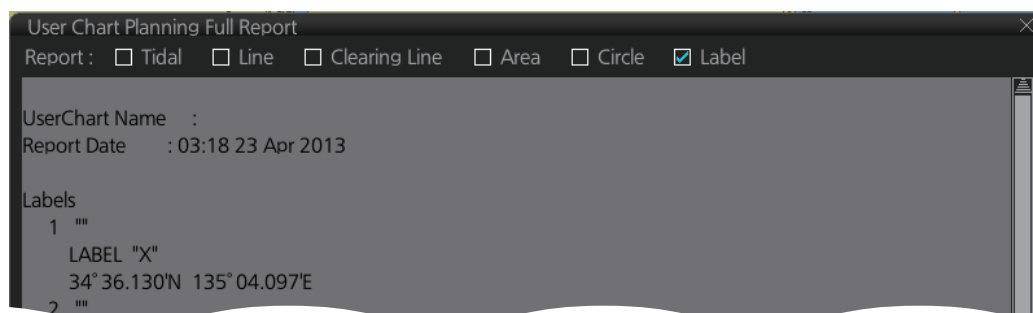
Color, line thickness, transparency are not output.



Label report

The Label report provides the following information.

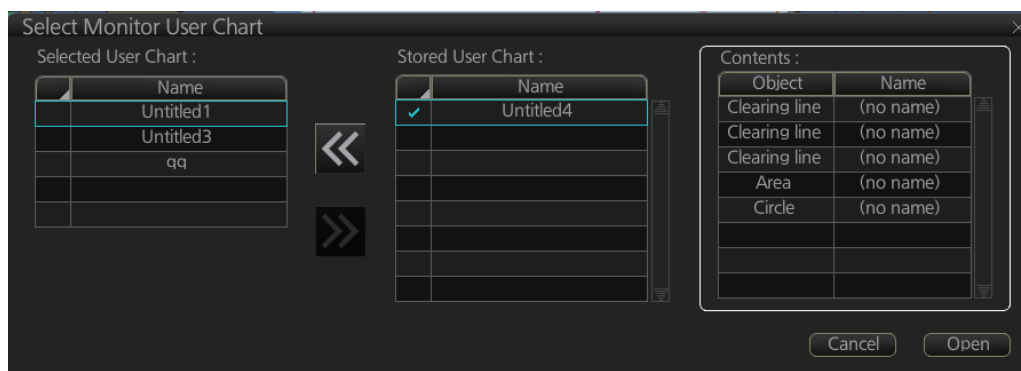
- Name of label
- Latitude and longitude position of each label
- [On Radar] appears with those lines selected to show on the radar overlay. (Checkmark in the [Radar] column of [User Chart] dialog box. See section 13.3.)
- [Danger] appears with those lines selected to show on the radar overlay. Color is not output. (Checkmark in the [Danger] column of [User Chart] dialog box. See section 13.3.)



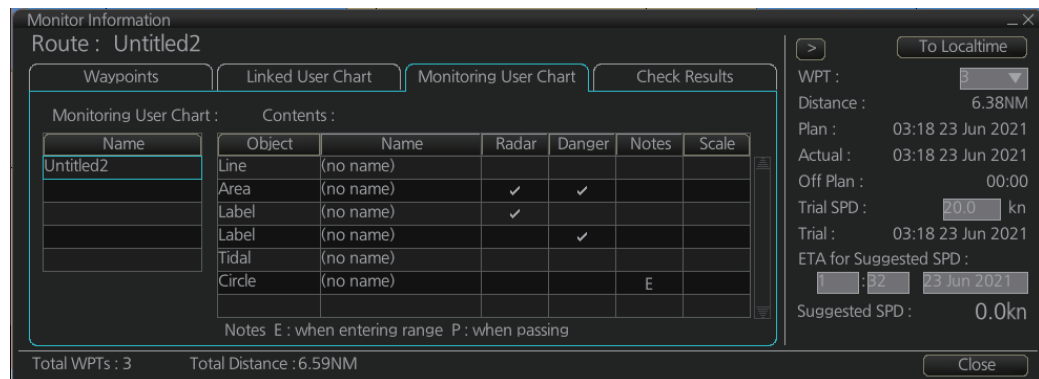
13.12 How to Select the User Chart(s) to Use in Route Monitoring

Do the procedure below to monitor a user chart without linking it to a route. Click the [NAVI] button on the Status bar then do as shown below.

1. Click the [Voyage], [User Chart] and [Select/Unselect] buttons on the InstantAccess bar™ to open the [Select Monitor User Chart] dialog box. The [Select Monitor User Chart] can also be selected by right clicking anywhere inside the [Route] information box (right side of screen) and then clicking [Monitor User Chart].



2. Check the chart(s) to use in the [Stored User Chart] window, then click the [<<] and [Open] buttons. The [Monitor Information] dialog box automatically appears, and shows the user charts selected for use in route monitoring. Click a user chart name to see details, in the [Contents] window.



How to cancel use of a user chart during route monitoring

To cancel only a user chart during route monitoring, get into the Voyage navigation mode, then click the [Voyage], [User Chart], [Select/Unselect] buttons on the InstantAccess bar™ to show the [Select Monitor User Chart] dialog box. From the [Selected User Chart] list, select the user chart(s) to cancel, then click the [>>], and [Open] buttons.

To cancel both route and user chart in route monitoring, get into the Voyage navigation mode, then click the [Voyage] and [Stop Monitor] buttons on the InstantAccess bar™.

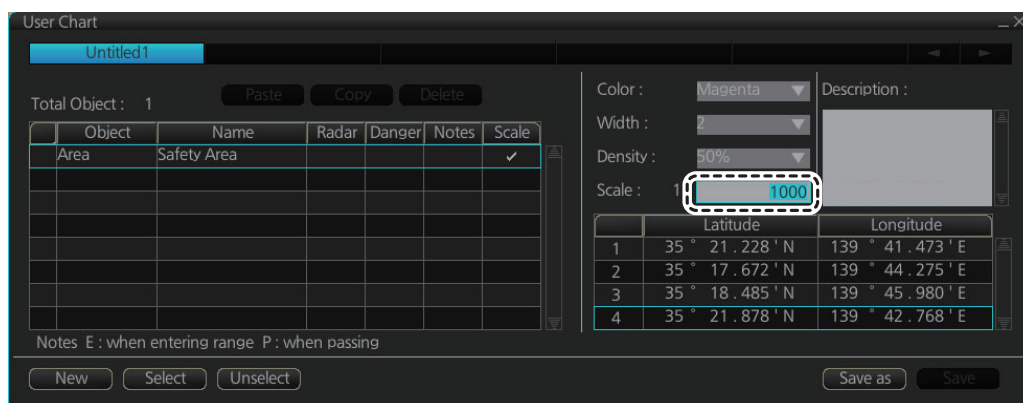
13.13 Auto Zoom

Auto zoom automatically switches the display scale to the specified scale when the ship nears a designated object (area, circle, line). The previous scale is restored once the ship passes the object. This feature is useful if you frequently use a specific scale along a route.

1. Click the [PLAN] button on the Status bar to go to the Voyage planning mode.
2. Click the [Planning] and the [User Chart] buttons on the InstantAccess bar™ to show the user chart palette and the [User Chart] dialog box.
3. If the user chart is not displayed, do the following:
 - 1) At the bottom of the [User Chart] dialog box, click the [Select] button to show the [Select User Chart] dialog box.
 - 2) Select desired user chart, then click the [OK] button.
4. Select the object to auto-zoom. Objects that can use auto zoom are areas, circles, and lines.

13. USER CHARTS

- Put a checkmark in the [Scale] column. The scale input box (circled in the figure below) appears.



The screenshot shows the 'User Chart' dialog box with the following elements:

- Title Bar:** 'User Chart' with a close button.
- Tab:** 'Untitled1'.
- Buttons:** 'Paste', 'Copy', 'Delete'.
- Table:** A table with 6 columns: Object, Name, Radar, Danger, Notes, Scale. The first row has 'Area' in the Object column, 'Safety Area' in the Name column, and a checkmark in the Scale column.
- Form Fields:** 'Color' (Magenta), 'Width' (2), 'Density' (50%), and 'Scale' (1000, which is circled with a dashed red line).
- Description:** A text area for the chart's description.
- Table:** A table with 3 columns: Latitude, Longitude, and an unlabeled column. It contains 4 rows of coordinates.
- Notes:** 'Notes E : when entering range P : when passing'.
- Buttons:** 'New', 'Select', 'Unselect', 'Save as', 'Save'.

Object	Name	Radar	Danger	Notes	Scale
Area	Safety Area				✓

	Latitude	Longitude
1	35 ° 21 . 228 ' N	139 ° 41 . 473 ' E
2	35 ° 17 . 672 ' N	139 ° 44 . 275 ' E
3	35 ° 18 . 485 ' N	139 ° 45 . 980 ' E
4	35 ° 21 . 878 ' N	139 ° 42 . 768 ' E

- Select scale to use in auto zoom. The scale range is 1;1,000 to 1:70,000,000..
- Click the [Save] button.

Monitor the user chart. When the ship nears the object selected here, the auto zoom feature is activated.

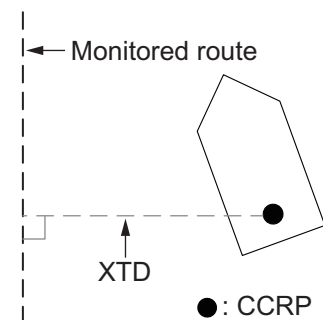
14. HOW TO MONITOR ROUTES

Route monitor is a means for permanent monitoring of the ship's behavior relative to the monitored route. The [Monitor 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 [Monitor Information] dialog box.
- Each leg has information about planned course to steer.

Note 1: In order to display charts with correctly updated situation, always use current date as Update Review 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.

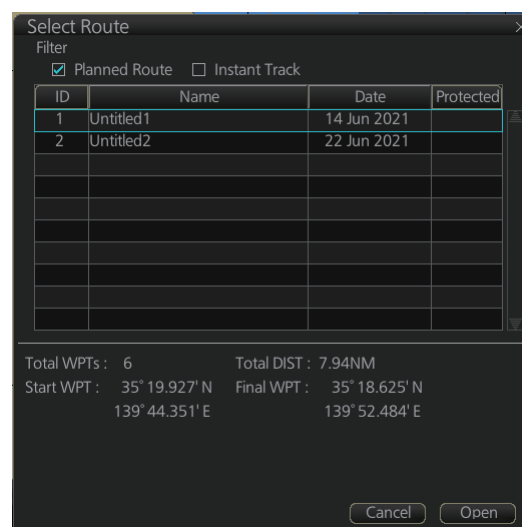
Note 2: XTD is the distance, in a straight line, from the monitored route to the CCRP. CCRP is set at installation. Where more than one CCRP is set, select the CCRP to use from the [CCRP] page of the [Settings] menu (see section 22.13).



14.1 How to Start Route Monitoring

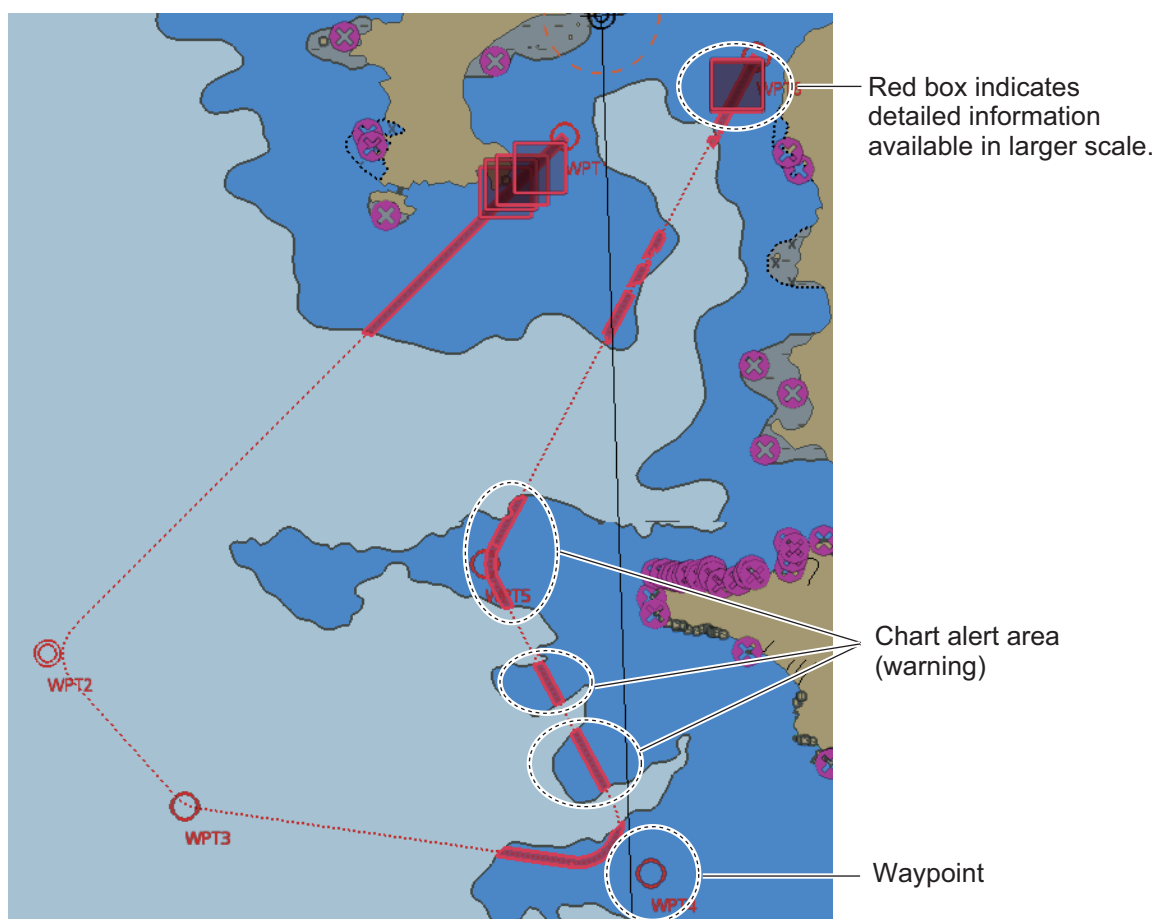
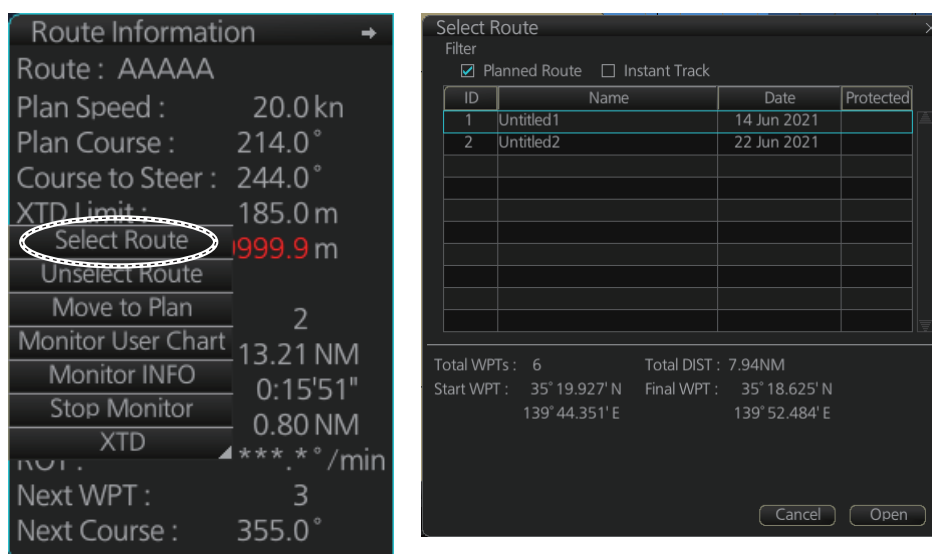
Method 1: InstantAccess bar™

In the Voyage navigation mode, click the [Voyage], [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 Information] box to show the context-sensitive menu, 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 WPT 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.
 - "Bad Leg WPT XX to WPT XX" (XX=waypoint no.). The length of a leg is too short, making it impossible for the ship to accomplish a turn. Lengthen the offending leg to accomplish the turn.
 - "Bad Turn at WPT XX" (XX=waypoint no.). The calculated ROT exceeds the maximum ROT, making it impossible for the ship to accomplish a turn. Increase the radius of the turn or lower the planned speed.
 - "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.
- The route check which occurs after selecting a route can take longer with C-MAP charts. Wait until the completion of the check.
- If, in the radar mode, route monitoring is stopped, the Alert "Route Failure" appears. If this occurs, switch to the Chart for Radar mode. The "Monitoring Failed" pop-up window 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, open the [System Sensor Settings] menu, manually enter speed, heading and position, check the checkbox for [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.
- When chart alerts are unchecked while planning a route (see section 11.1.2) and route monitoring is activated, a message appears in the permanent warning box.
 - [Safety Contour] unchecked: "Indication of crossing safety contour is Off. (in monitoring)"
 - [Areas to be Avoided] unchecked: "Indication of navigational hazards is Off. (in monitoring)"
 - Other alerts unchecked: "Indication of some prohibited areas or areas with special conditions is Off. (in monitoring)"
- If this radar is connected in the network to an FMD-3005/3200/3300 ECDIS that is interfaced with an IEC 62065 Ed.2 compliant TCS (YDK Technologies PT-900, Tokyo Keiki PR-9000, EMRI FAP-3000, Raytheon Anschutz NP-5400), the Alert "WPT xx Approach" (xx: waypoint number) is generated at each waypoint if the TCS is not connected to the ECDIS in route monitoring. Note that TCS is only available on FMD-3005/3200/3300.

14.2 How to Stop Route Monitoring (Manual, Auto)

You can stop route monitoring in two ways:

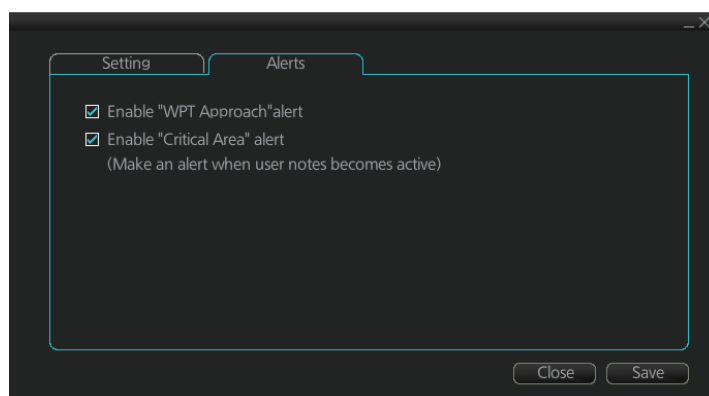
- In the Voyage navigation mode, click the [Voyage] and [Stop Monitor] buttons. Route monitoring is also stopped automatically.
- In the Voyage navigation mode, click the [Voyage], [Route] and [Unselect] buttons.

When the Alert "Route Failure" occurs, route monitoring is stopped automatically. See the Troubleshooting table in section 25.9 for details.

14.3 How to Enable Route Monitoring Alerts

You can enable or disable the route monitoring alerts: [WPT Approach] and [Critical Area].

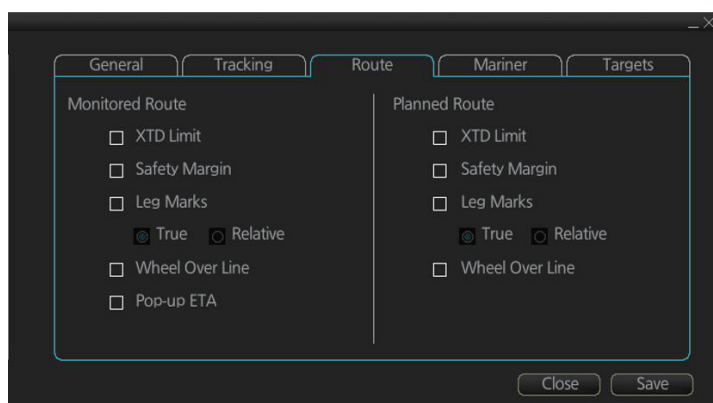
1. Open the menu, then select [Route], [Monitoring], [Settings], [Alerts].



2. Enable or disable the route monitoring alerts, referring to the description below.
 - [Enable "WPT Approach" alert]: Enable or disable the [WPT Approach] alert, which alerts you when the wheel over point has been approached.
 - [Enable "Critical Area alert"]]: Enable or disable the [Critical Area] alert, which alerts you when you are entering a user chart notes area.
3. Click the [Save] button to save the settings.

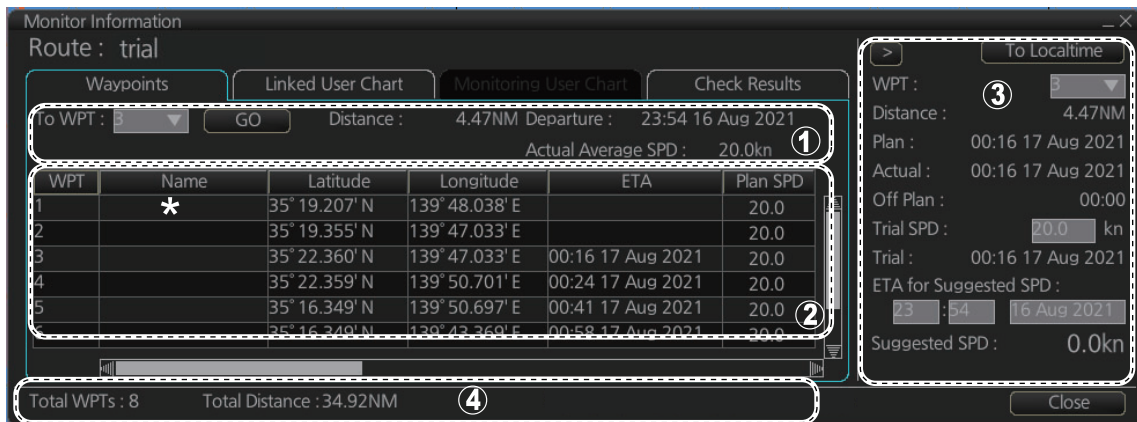
14.4 How to Select What Parts of a Route to Display

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.



14.5 How to View Waypoint Information

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



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

Leg/°	Leg/NM	ROT°/min	STR mode	RAD/NM	XTD Limit/m	Safe SPD	Margin/m	Local Time
280.2	0.17	23.87	Rhumbline	0.80	185	22.1	40	+00:00
0.0	2.65	23.87	Rhumbline	0.80	185	22.1	40	+00:00
90.0	2.66	23.87	Rhumbline	0.80	185	22.1	40	+00:00
180.0	5.66	23.87	Rhumbline	0.80	185	22.1	40	+00:00
270.0	5.66	23.87	Rhumbline	0.80	185	22.1	40	+00:00
0.0	8.66	23.87	Rhumbline	0.80	185	22.1	40	+00:00

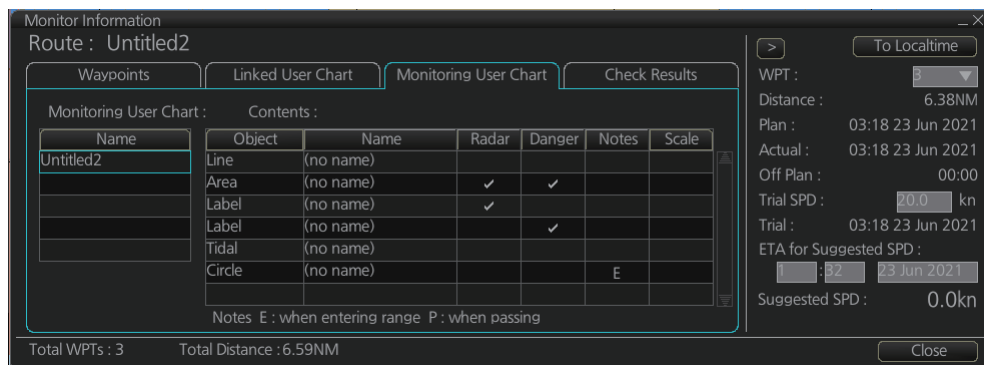
14

No.	Item	Description
1	[To WPT], [GO] button	The system chooses 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]	The average speed over the ground, measured every 30 seconds.
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 (rhumb line or great circle), turning radius, radius/NM, radius/min, XTD limit, speed max, margin, and local time. *: The bearing to a leg and the display method for leg distance can be changed. See "Leg/NM" on page 12-6.
3	[WPT], [Distance]	Select a WPT to find the distance to that waypoint from current position.
	[Plan]	When planned speed is used in navigation, ETA to selected waypoint appears
	[Actual]	When using current speed in navigation, ETA to selected waypoint is shown.
	[To Localtime]	Switch between UTC and local time for ETA. For local time, the settings used in the creation of the route are used for the ETA calculation. See section 12.4.1.
	[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.
	[Trial SPD]	The input range is a minimum of 0.1 to a maximum of 99.9 knots. It can be set in 0.1 knot units. The default value is the COG at the start of route monitoring.

3	[Trial]	Displays the ETA to the specified target obtained by trial speed.
	[ETA for Suggested SPD]	The ETA for the trial speed entered.
	[Suggested SPD]	Displays the ETA obtained at the suggested ship speed.
	[Start Calculate]	Click to start calculation. The button label changes to [Stop Calculate].
4	[Total WPTs]	The total number of waypoints in the route.
	[Total Distance]	The total distance of the route.

14.6 How to View User Chart Information Linked Monitoring Route

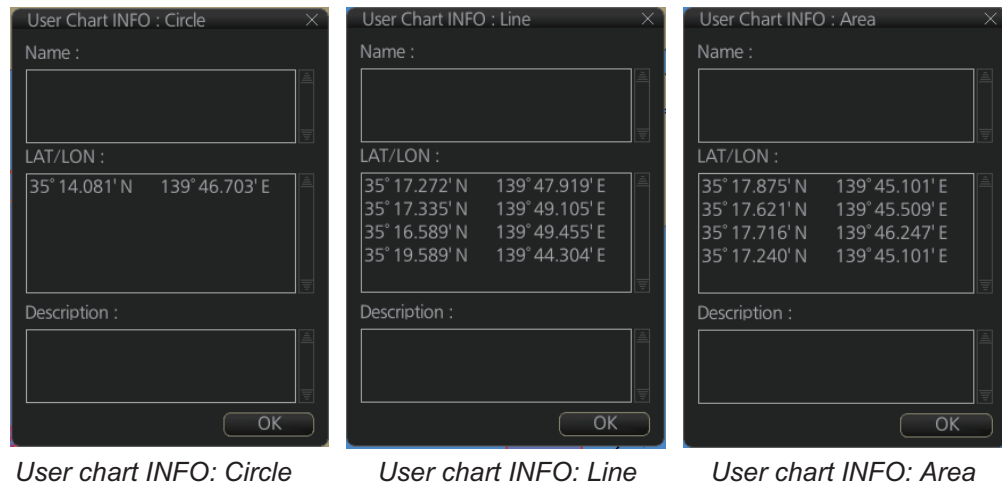
1. In monitoring route mode, click the [Voyage] and [Monitor INFO] buttons on the InstantAccess bar™ to show the [Monitor Information] dialog box.
2. Click the [Linked User Chart] tab.



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. For the [Check ETA] window, see the preceding page.

14.7 How to View User Chart Object Information in Route Monitoring

In route monitoring, you can cursor pick user chart objects to show their information. Put the cursor on the user chart symbol to show the pop-up menu. Select [User Chart INFO] from the pop-up menu. Below are some examples of user chart info.



14

14.8 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 [Voyage], [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.

14.9 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.

14. HOW TO MONITOR ROUTES

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 21.4.

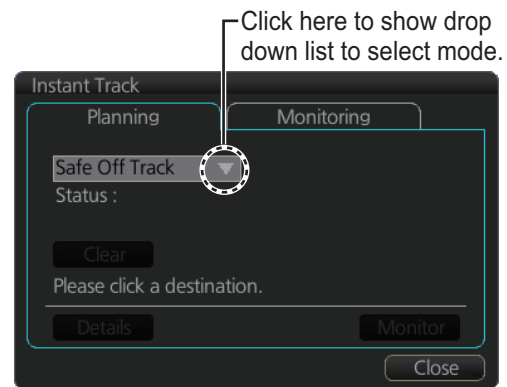
14.9.1 Safe off track mode

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.

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

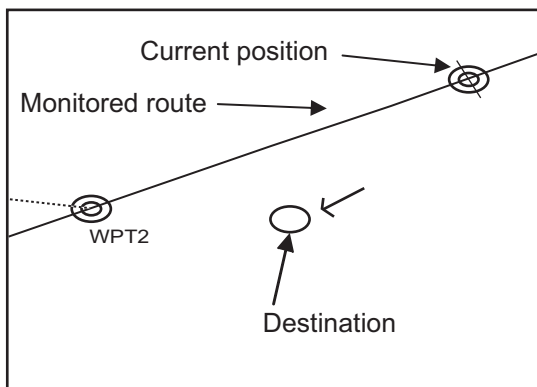
Note 1: If a monitored route is active, the [Back to Track] mode can also be selected.

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

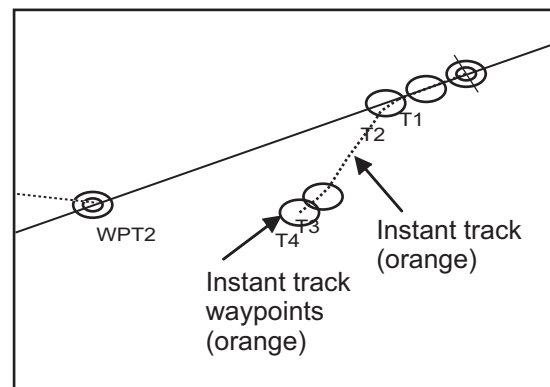


When monitored route is active

2. 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 14.9.3 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.

14.9.2 Back to track mode

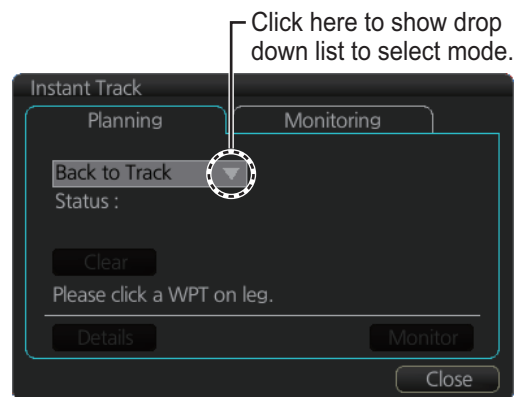
When the vessel goes off track, the Alert "Off Track Alarm" appears in the [Alert] box. To create an instant track to return to the monitored route, use the [Back to Track] mode as follows:

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

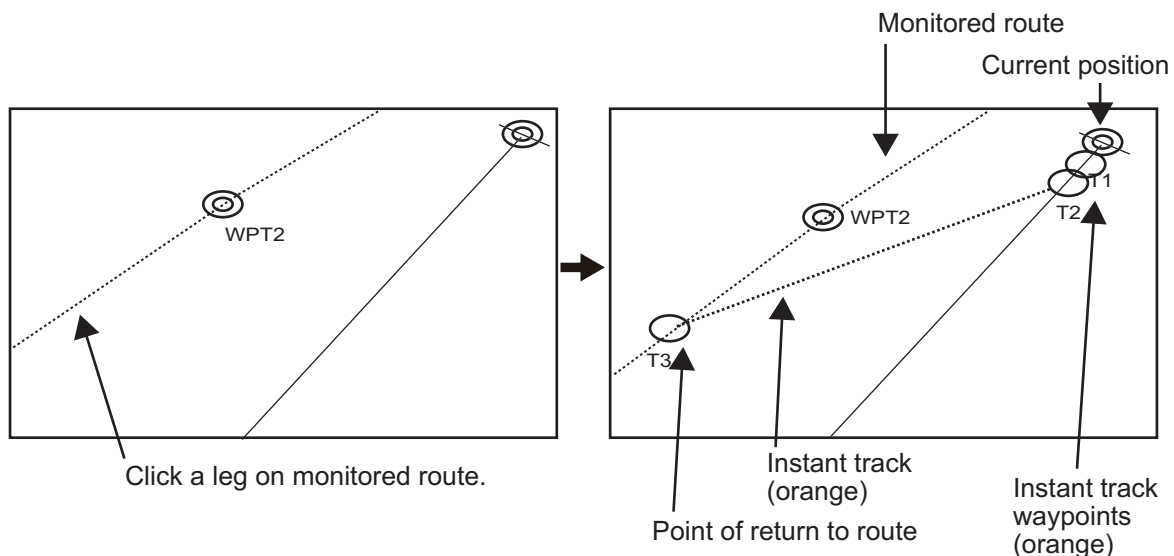
Note 1: If a monitored route is active, the [Safe Off Track] mode can also be selected.

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.

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



When monitored route is active



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 14.9.3 for all the instant track messages and their meanings.

14.9.3 Instant track messages

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

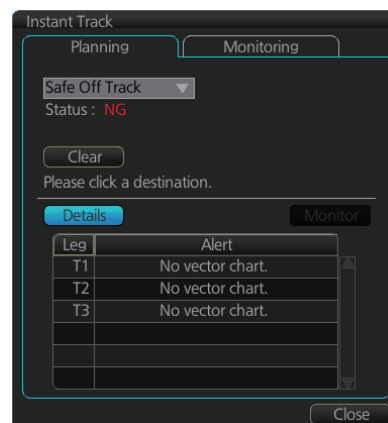


Message	Meaning	Color
(1) Instant Track mode		
"Back to Track"	Back to track mode	White
"Safe Off Track"	Safe off track mode	White
(2) Check result, error message		
"Could not create the Track."	The track could not be created.	Yellow
"Too far destination from own ship."	Selected destination is 50 NM or more from current position.	Yellow
"ROT data is not inputted correctly"	No ROT data input, or data is incorrect. Cannot create instant track.	Yellow
"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

14.9.4 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.

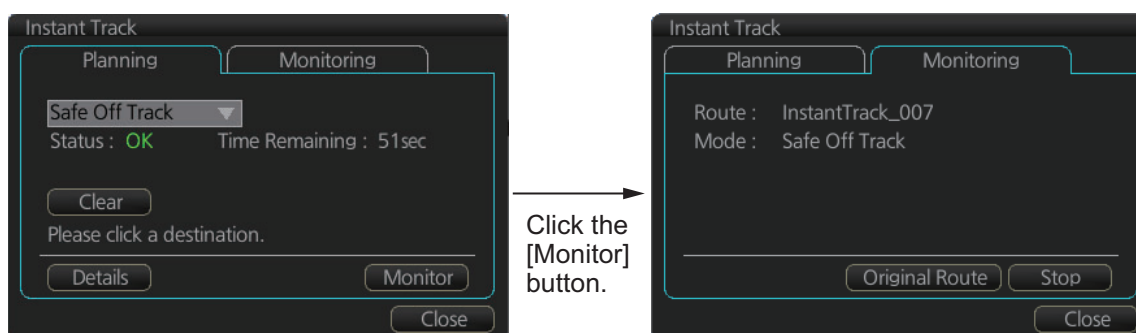
Note: If the Status is not [OK], an alert (alarm or warning priority, depending on set-ting) appears in the Alert box.



14.9.5 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 canceled, 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.

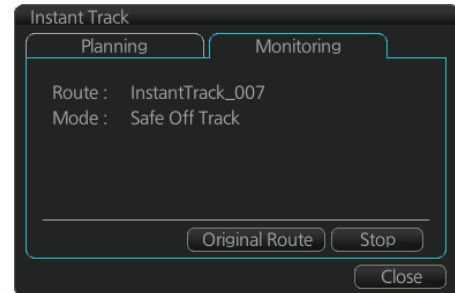
Monitoring condition	Result
Instant track route monitoring.	- An instant track route under creation is deleted. No route can be created. - The [Stop] button is pushed or the instant track route is followed until its completion. - After the instant track route is completed, an error message appears and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

Note: If there is no original route (safe off-track mode only) or the original route is not checked, the message "Not checked against ENC chart" appears in the permanent warning box.

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.

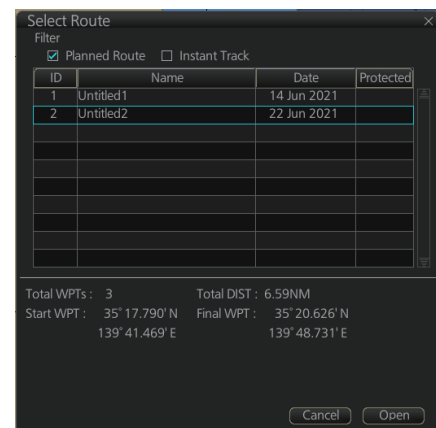
For the [Back to Track] mode, the instant track mode is canceled when the vessel returns to the monitored route. The instant track is grayed out to show that is inactive.



14.9.6 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.

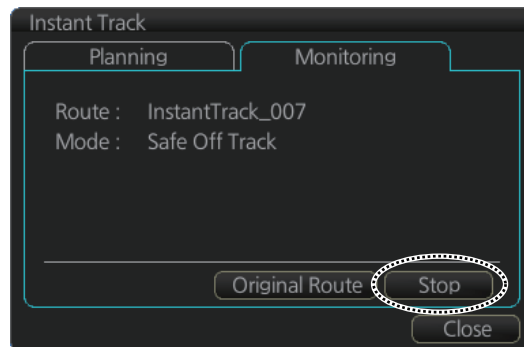
1. While monitoring an instant track route, click the [Original Route] button on the [Monitoring] page in the [Instant Track] dialog box to show the [Select Route] dialog box. Check [Planned Route] to show a list of planned routes, or check [Instant Track] to show a list of instant track routes.
2. Select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

14.9.7 Button label and unit state

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

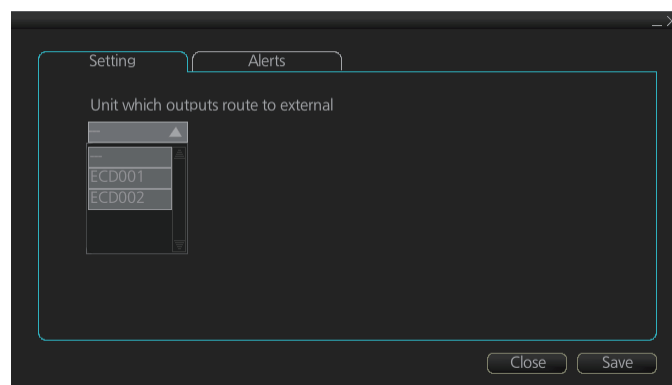


Instant track state	Button label
Creating	[Monitoring]
Monitoring	[Stop]
Return to original route after back to track mode	[Reset] (Instant track route is erased - another instant track route can be created.)

14.10 How to Share Route Data with Other Units

A monitored route can be shared with other units (FMD-3xxx, FAR-3xxx) via LAN. Data is sharing is done automatically. Follow the procedure below to select the unit that is to output monitored route data to external devices.

1. Open the menu, then select [Route], [Monitoring] and [Setting] to show the [Setting] dialog box.
2. In the [Unit which outputs route to external] field, the units that can output sentences from this unit are shown. If there is no device that can output, nothing will be displayed in the list.



3. Click the unit(s) where to output route data.
4. Click the [Save] button to save settings, then click the [Close] button to finish.

15. NAVIGATION TOOLS

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

- TT/AIS (see chapters 3 and 4)
- Echo*¹
- Parallel index lines
- Look-ahead
- Range rings
- Predictor
- Anchor watch
- Under keel clearance
- Curved EBL*²
- Divider

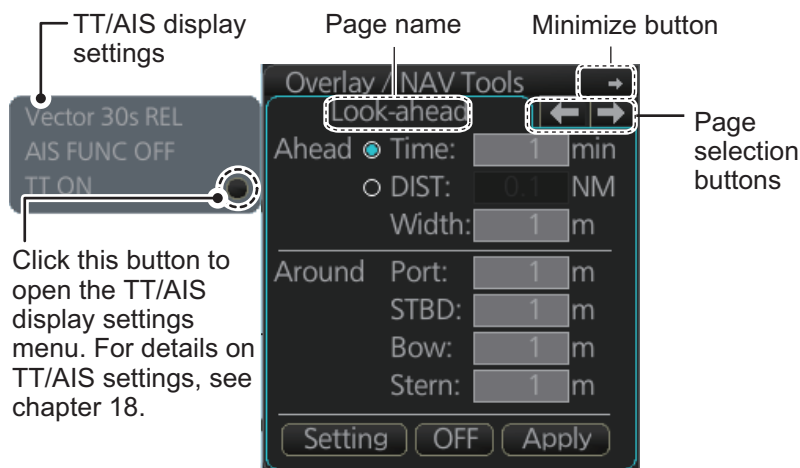
*¹: Shown only when the [Echo] page is enabled at installation. Not available for B types.

*²: Shown only when a EC-3000/3005 with TCS functionality (optional specification) is connected to the network.

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. There are two methods to access the NAV Tools.

- Click the page selection buttons to show the desired page.
- Right-click the Overlay/NAV Tools box to show the context-sensitive menu, then click the desired page.



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

15.2 Radar Overlay

If the Echo page is enabled at installation, you can show the radar echoes “overlaid” on the chart (Voyage navigation mode only).

Note: For B type radars, the [Echo] page is not available.



This equipment has many features to support exact match in scale and orientation of the chart and radar echo image. Exact match of the radar echo image and chart is an essential security feature. If the radar echo image and the chart display match, then the mariner can rely on what he sees and the mariner also gets a very good confirmation that his navigation sensors (such as gyro and position receivers) operate properly and accurately. However, if the mariner is unable to achieve exact match, it is a very strong indication that something is wrong and he should not rely on what he sees.

Selected scale of displayed chart also defines scale of radar overlay. When you change the chart scale, the scale of the radar overlay is automatically changed. The table below shows the standard scale and equivalent radar range.

Radar range (nm)	Standard scale	Radar range (nm)	Standard scale
0.25	1:4,000	6	1:90,000
0.5	1:8,000	12	1:180,000
0.75	1:12,000	24	1:350,000
1.5	1:22,000	48	1:700,000
3	1:45,000	96	1:1,500,000

15.2.1 How to show the radar overlay

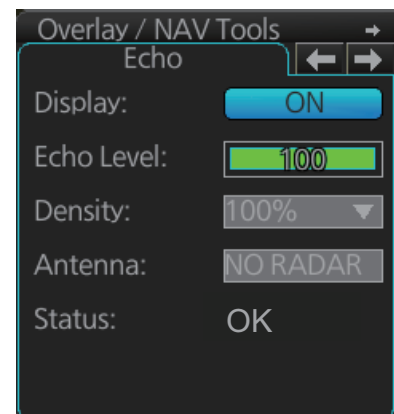
Radar echoes can be output to the ECDIS and shown on its display. Like details on S57 charts, the radar overlay can be displayed or removed from the chart display. The transparency of the echo display can be set from the [Echo] page in the [Overlay/NAV Tools] box. To activate and setup the radar overlay, do the following:

1. With the system in [RADAR] mode, begin radar transmission.
Note: While the system is preparing for radar transmission, the radar overlay is not shown on the chart display.

2. Switch the system to [CHART for RADAR] mode, then select the [Echo] page from the [Overlay/NAV Tools] box.

3. Click the [ON/OFF] button at [Display] to show [ON] (radar overlay ON) to activate the overlay. "Status: OK" appears under [Antenna] if the radar signal is being received. "Status: No Data" is displayed if there is no radar signal.

Note: The radar display, TT symbols and AIS symbols can also be hidden by clicking [CLEAR RADAR] on the Status bar.



4. [Echo Level] adjusts the sensitivity of the radar picture. To adjust, put the cursor on the slider bar and roll the scrollwheel.
5. [Density] controls the "see through" behavior of the radar overlay. [100%] overlays the radar echo on the chart without modification. "75%" displays radar echoes faintly, and "25%" displays radar echoes somewhat faintly. It is recommended to use 25% or 50% when navigating narrow channels, so as not to conceal land-masses.
6. Click the [Antenna] drop-down list to select the radar that is to feed radar echoes.

15.2.2 Error Between Radar Echo Image and Chart

There are several reasons why the radar echo image and chart display do not match exactly. The mismatch is a combination of several reasons and removing one reason doesn't solve the mismatch perfectly. There is a fundamental difference between the radar echo image and corresponding chart feature. The radar echo is a reflection from the real life target and the actual position of the real life target is the front edge of the radar echo. Therefore, the radar echo should start from the chart feature and exist as far as the radar pulse length goes.

How to compensate for bearing error

Bearing error occurs in the following instances:

- Gyro error
- Inaccurate chart
- Improper installation parameters (radar overlay bearing offset)

How to compensate for position error

Position is caused by the following:

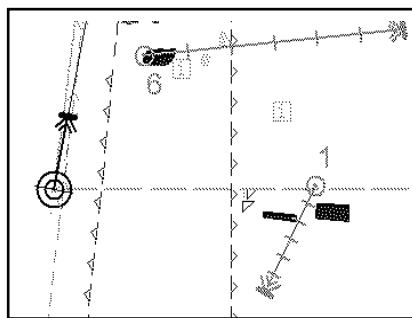
- Inaccurate position
- Position offset
- Inaccurate chart
- Improper installation parameters (conning position offset, position receiver antenna offset, radar overlay range offset)

15.2.3 Error Sources for Radar Echo Image and TT Mismatch

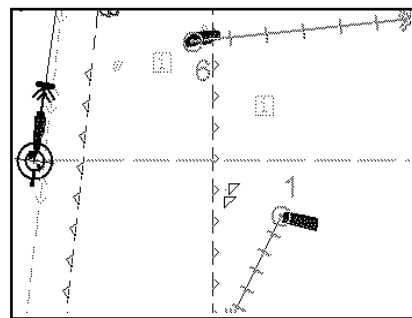
There are several reasons why the radar echo image and tracked target symbols do not match exactly.

1. Different gyro value at radar overlay and at ECDIS.
2. Improper installation parameters (radar overlay bearing offset, radar overlay range offset, conning position offset).

The example below shows how different gyro value set at radar overlay and at ECDIS affect the display of the ECDIS.



*Different gyro value at
radar and ECDIS*

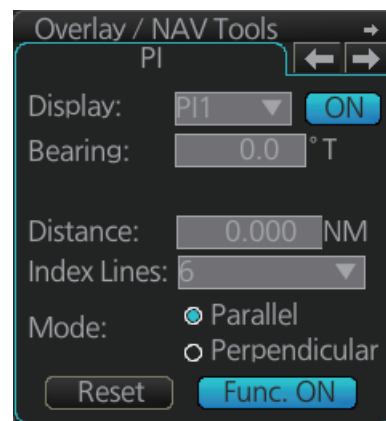


*Equal gyro value at
radar and ECDIS*

15.3 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. There are 16 sets of PI lines (PI 1 to PI 16) and you can turn them on or off individually. Select the PI line to process with the [Display] pull-down list then click the [ON] or [OFF] button as appropriate. One, two, three or six lines can be shown - the actual number of lines shown depends on the line interval.

Only one set can be shown.



15.3.1 How to activate, deactivate PI lines

Select the PI line(s) set to activate or deactivate with the [Display] drop-down list. Activate or deactivate the set selected with the [ON], [OFF] button.

The [Func. ON], [Func. OFF] button globally activates, deactivates all PI lines selected to [ON].

15.3.2 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].

15.3.3 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].

15.3.4 PI line mode

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

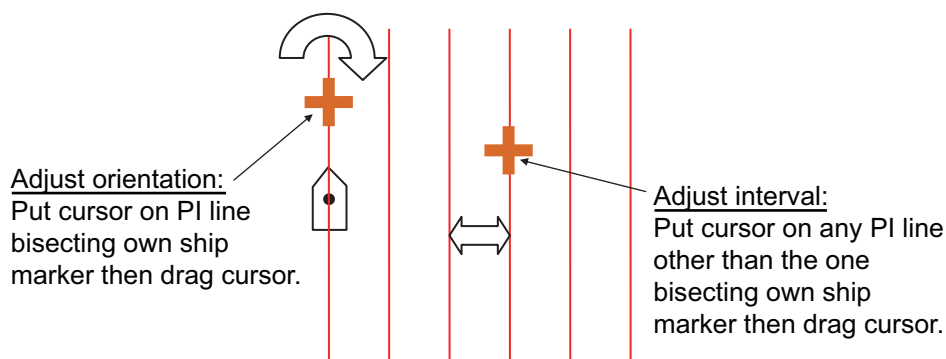
15.3.5 How to adjust PI line orientation, PI line interval

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

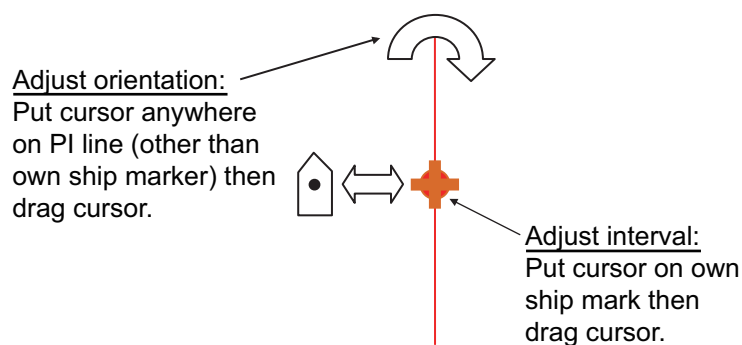
How to adjust PI line orientation, PI line interval from the menu

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

15.3.6 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] button to reset the parallel lines.

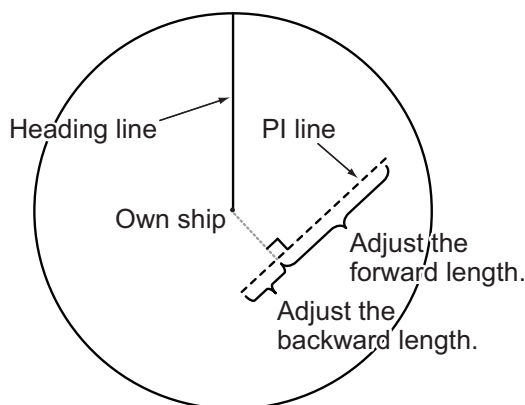
15.3.7 How to adjust PI line length

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] and [PI Lines].



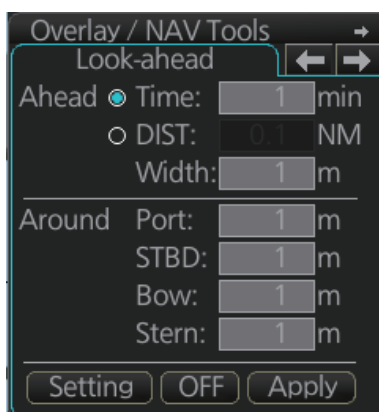
2. If not already displayed, click the [ON/OFF] button to display the PI line whose length you want to adjust.
3. Click the value in [Forward] and [Backward] columns to adjust their lengths, referring to the illustration below.



4. Click the [Save] button to finish.

15.4 Look-ahead

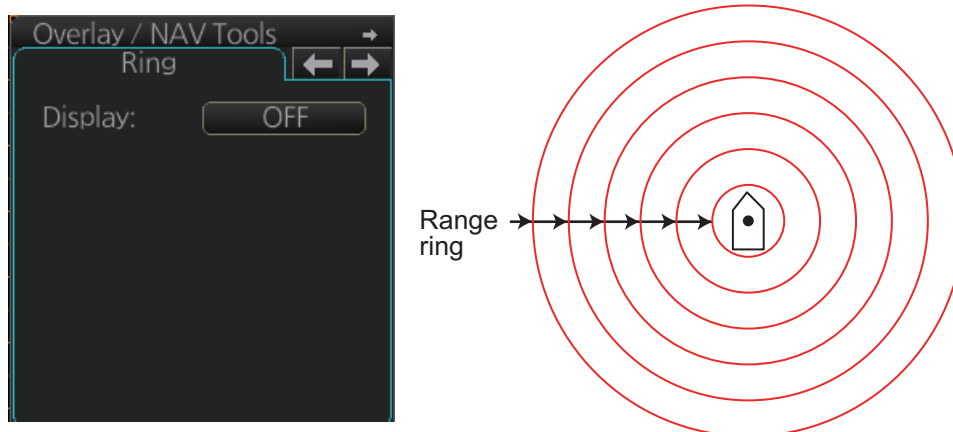
Look-ahead sets the area ahead and around own ship for which to check for safe navigation. See section 11.2 for how to activate own ship check.



15.5 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.

Note: You can turn on/off the range rings from the context-sensitive menu. Right-click the screen in the Voyage navigation or Voyage planning mode, then click [Range Ring ON]/[Range Ring OFF].



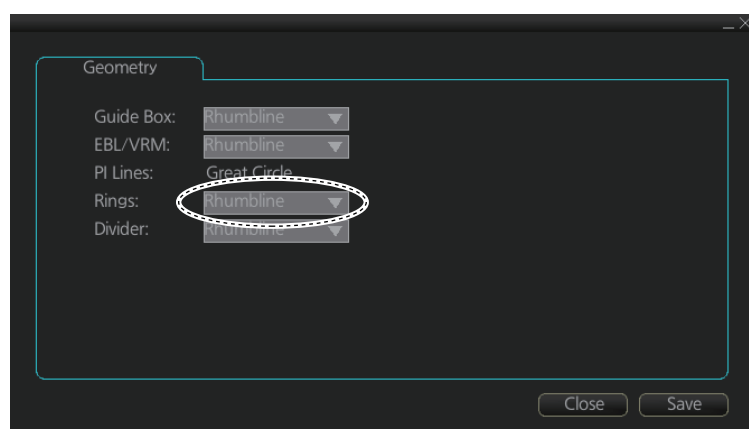
The interval between rings changes with the chart scale as shown in the table below.

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		

How to select the range calculation method

The range calculation method for the EBL and VRM can be selected to Rhumbline or Great Circle. Do as follows to select a calculation method.

1. Open the menu, then select [NAV Tools] and [Geometry] to show the [Geometry] page.

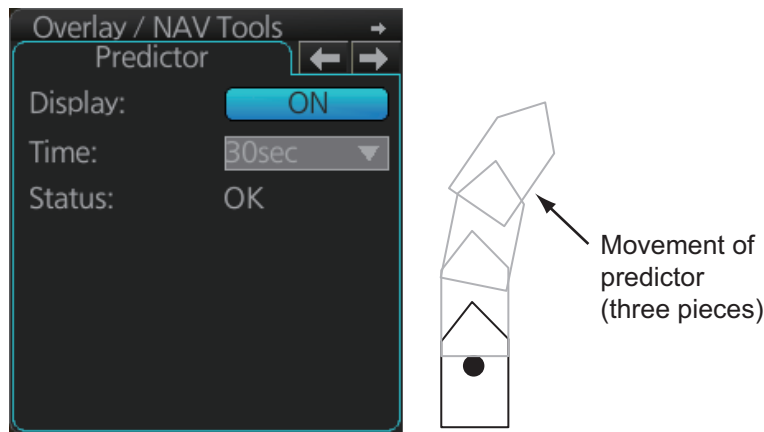


2. Select [Rhumbline] or [Great Circle] with the drop down list box for [Rings].
3. Click the [Save] button to save the setting, then click the close button to finish.

15.6 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].



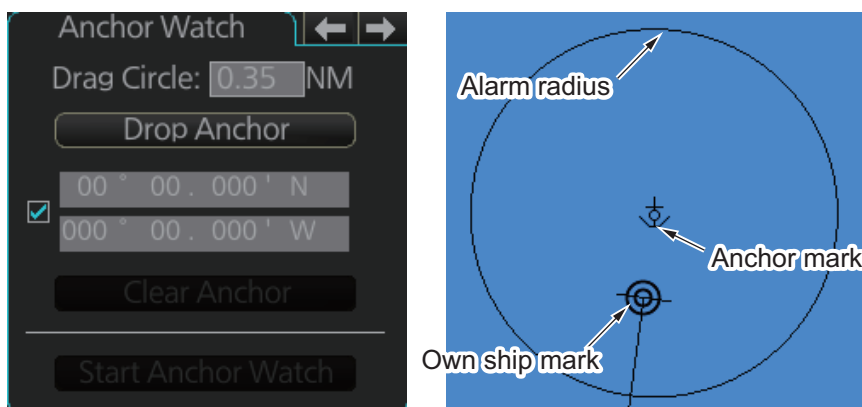
The Predictor is updated every three seconds internally and the status of the predictor is shown with [Status] as shown in the table below.

Indication	Status
OK	Speed is suitable, in accordance with estimation of ship's dynamics.
Not Enough Speed	Speed is too low, in accordance with estimation of ship's dynamics.
Not Available. Reset Filter May Restore.	Calculation not possible, in accordance with estimation of ship's dynamics.

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.

15.7 Anchor Watch

The anchor watch feature checks to see if your ship is drifting when it should be at rest. The anchor mark appears at the location of your ship's anchor. You can adjust the location for the anchor (see section 22.13).



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.
The anchor mark and alarm radius circle appear. You can adjust the location of the anchor mark and the alarm radius by drag and dropping them.
Note: A latitude and longitude position can be set as the anchor watch position. Put a checkmark in the box below the [Drop Anchor] button to show the latitude and longitude input boxes. Enter latitude and longitude 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.

If your ship drifts more than the anchor watch setting, the Alert "Anchor Watch" appears. The alert is escalated from warning level to alarm level if the alert is not acknowledged within two minutes. Also, if your vessel returns to within the tolerable radius, the alert is status is automatically changed to rectified.

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]. Also, if the anchor watch alert is active and the [Stop Anchor Watch] button is clicked, the alert is also acknowledged and rectified.

15.8 UKC (Under Keel Clearance)

15.8.1 UKC overview

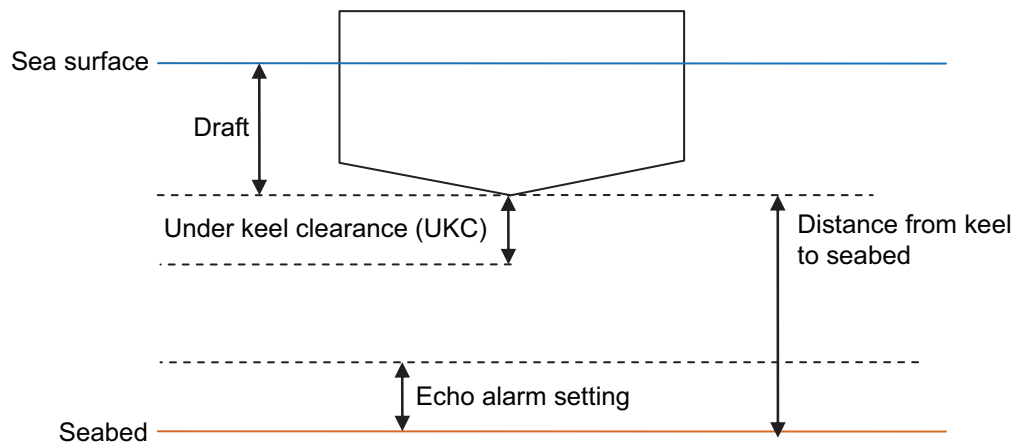
UKC is the distance between the deepest point of the vessel's hull and the seabed. The UKC feature continuously checks the ship's draught setting and actual speed.

When a look-ahead area is set and the depth within the set area gets shallower than the UKC, the Alert "UKC Limit" is generated.

UKC takes into account the amount of hull subsidence (Squat Effect). The evaluation criteria for the Alert "UKC Limit" is not based solely on the distance from the keel to the seabed, UKC or draught.

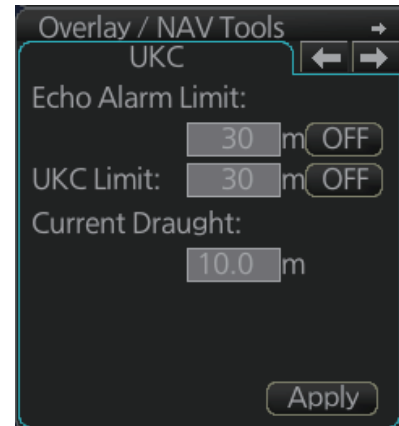
Note: When conducting a route check, UKC is calculated based on the planned speed for each leg.

The Echo Alarm Limit is compared with the depth (raw data) from the sensor. If the depth is smaller than the echo alarm limit, the Alert "Depth Limit" and "Actual UKC Limit" are generated.



15.8.2 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. Click the [Apply] button.

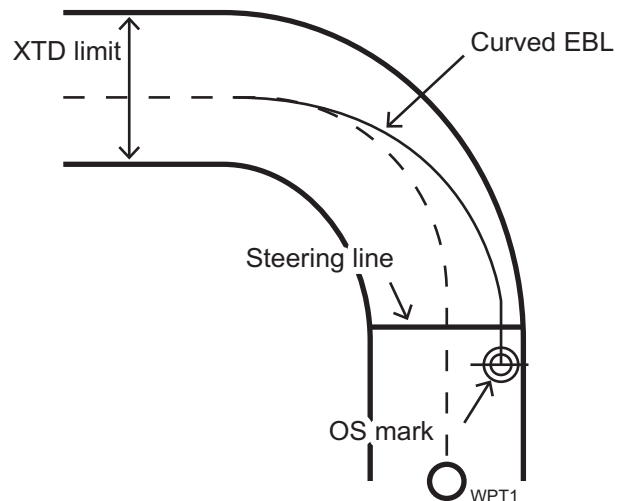
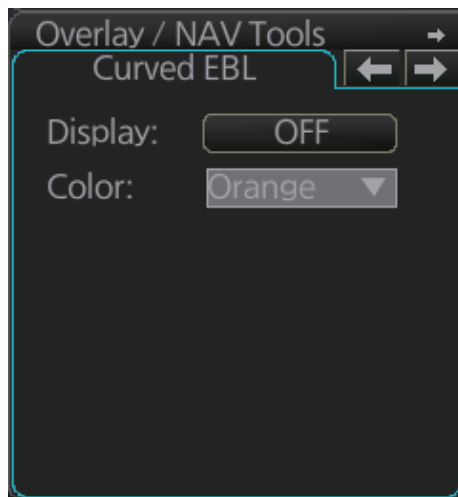


15.9 Curved EBL

The [Curved EBL] function shows the planned steering radius. You can use this function to determine the best location to begin a turn. You can also use the [Curved EBL] function to determine whether a turn is conducted as planned.

To show/hide the [Curved EBL], click the [ON]/[OFF] button on the [Curved EBL] page of the [Overlay/NAV Tools] box. The line color can be changed among red, green, blue, magenta, orange, brown, black and yellow.

Note: This function is only available when a EC-3000/3005 with TCS functionality (optional specification) is connected to the network.



15.10 Divider

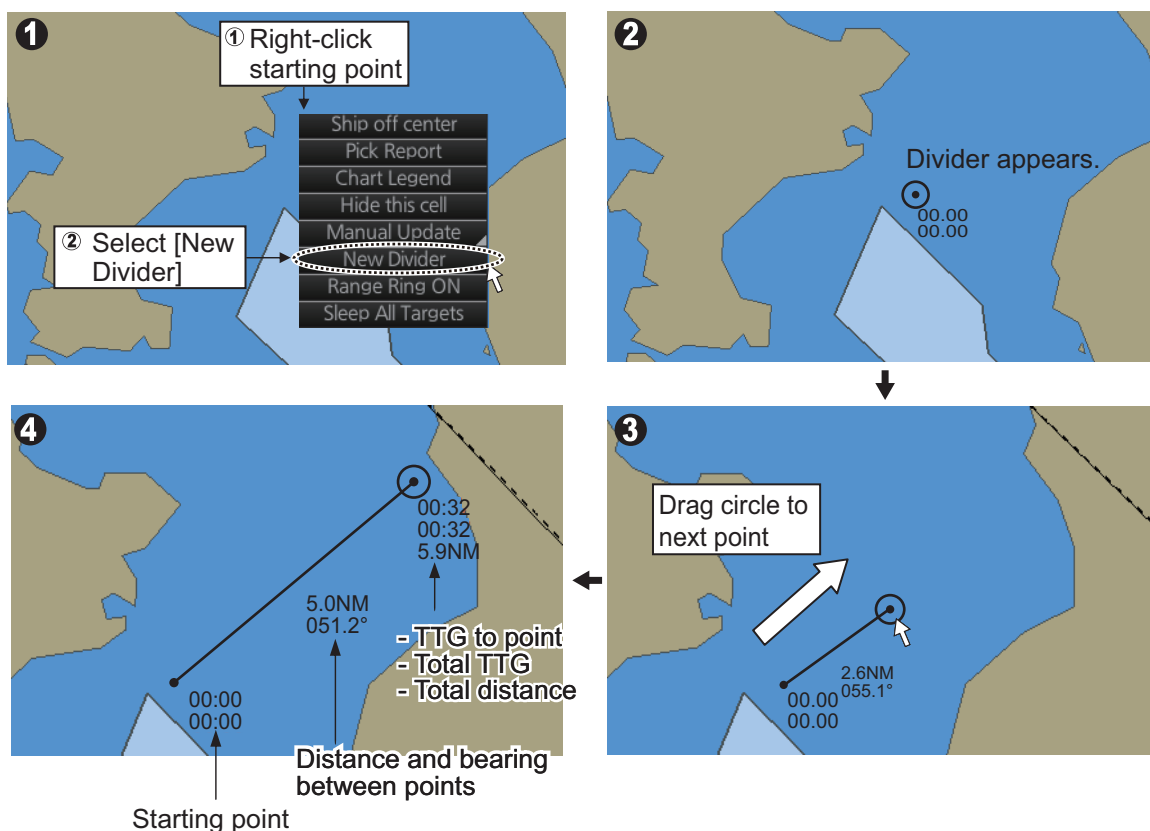
The divider performs the following calculations:

- Range and bearing between two points
- TTG between two points
- Total TTG from start to end
- Total distance from start to end

The divider is available in the Voyage navigation and Voyage planning modes. Only one divider can be displayed. The divider is neither saved nor shared among other units (FMD-3xxx or FAR-3xxx).

15.10.1 How to use the divider

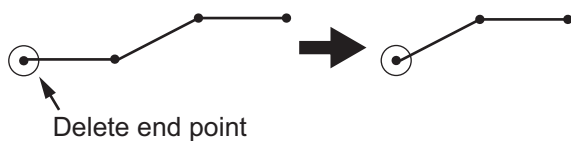
Do as shown below to use the divider.



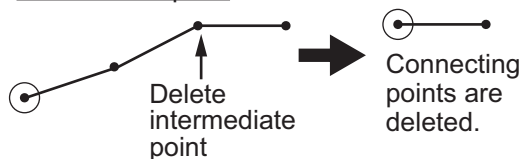
How to delete points

Point(s) can be deleted. Put the cursor on a point, right click, then select [Delete Points] from the pop-up menu. The point(s) deleted depends on the point selected.

End point

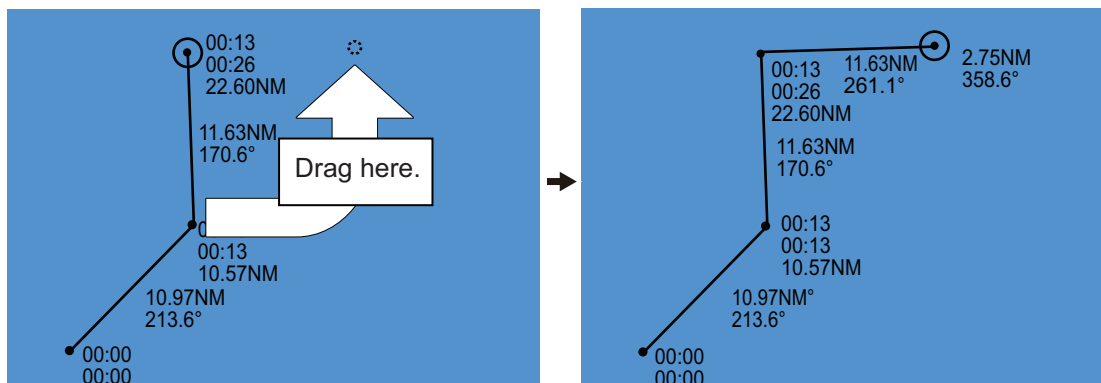


Intermediate point



15. NAVIGATION TOOLS

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



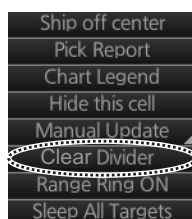
Note: If you drag a point to the edge of the displayed area, the chart scrolls in that direction.

15.10.2 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 latitudes higher than 85°.
- In the split screen display, the divider is viewable on both the main and sub views, but is operable only on the main view.

15.10.3 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].

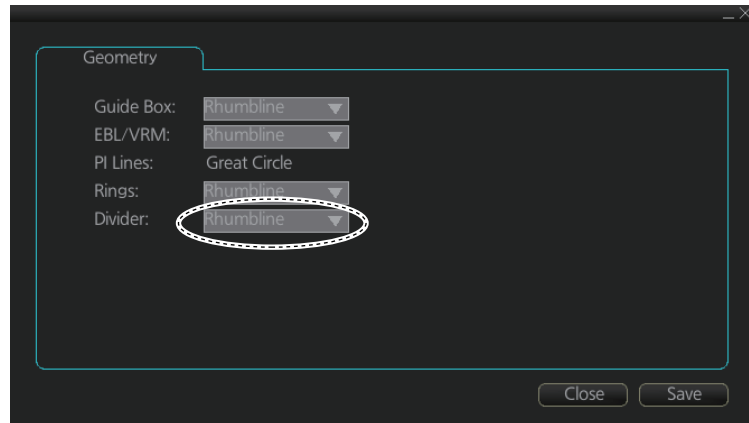


Context-sensitive menu
(Voyage navigation mode)

15.10.4 How to select the calculation method for the divider

The range calculation method for the divider can be selected to Rhumbline or Great Circle. Do as follows to select a calculation method.

1. Open the menu, then select [NAV Tools] and [Geometry] to show the [Geometry] page.



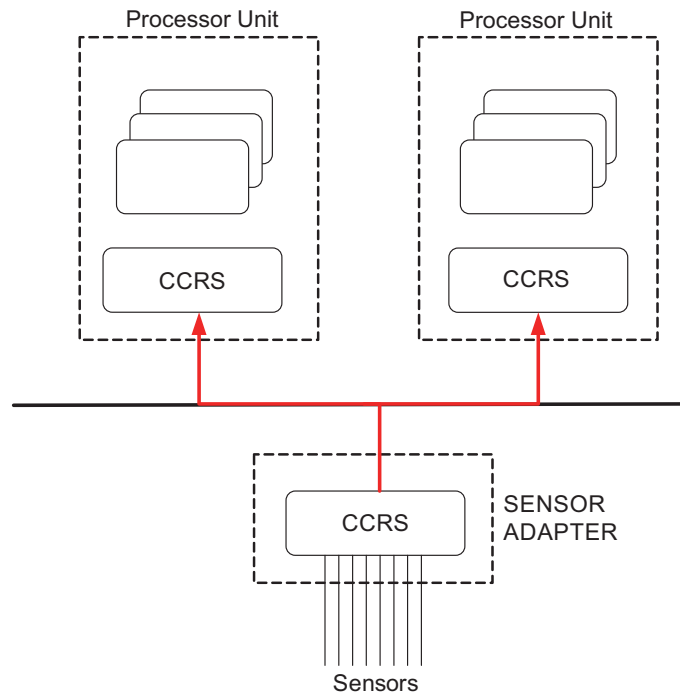
2. Select [Rhumbline] or [Great Circle] with the drop down list box for [Divider].
3. Click the [Save] button to save the setting, then click the close button to finish.

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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 sentence'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] menu. To access these menus, do one of the following:

- Radar and chart radar mode: Right-click the Sensor information, datum box then click [Select Setting].
- Chart mode: Right-click anywhere in the Sensor information box to show the context-sensitive menu, then click [Open MENU].

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. Also, navigation sensor settings are synchronized with all FMD-3xxx and FAR-3xxx units on the same network. For the speed sensor, if [Local] is selected in the [SPD] page, the settings on the speed sensor settings are not be synchronized.

16.2.1 Sensors menu description

[HDG] page

Selected	Sensors
	GYO001

[Data Source]: Check [Auto] or [Select] to use the sensor in the sensor list as data source. When you set heading manually, check [DR].

- [Auto]: Check for automatic sensor selection
- [Select]: Check for manual sensor selection

[DR]: Set heading manually when there is no heading sensor available. Deactivate the AIS function to set heading manually. For how to deactivate the AIS function, see section 4.1.

[Gyro Correction]: Set correction manually for the heading value.

[SPD] page

SPD

←

→

☒ System
 ☐ Local

Stabilization Mode:

☒ Bottom
 ☐ Water

Sensor Type:

☒ GPS
 ☐ LOG

Data Source:

☒ Auto
 ☐ Select

Priority	Sensors
1	GPS001
2	GPS002

☐ DR

1.5 kn

☐ Reference SPD

Drift :

☐ Set Drift

0.0 *T

0.0 kn

PRIM : GPS1

Status : OK

Cancel

OK

[System]/[Local]: Select [System] to synchronize the speed sensor settings with all FMD-3xxx and FAR-3xxx units on the same network. Select [Local] to avoid synchronizing speed sensor settings between units to set the ship's speed independently from the system speed sensors. However, DR (Dead Reckoning) still uses system sensor speed.

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

Note: You can set the stabilization mode from the stabilization mode box at the top left of the screen.

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

[Data Source]: Check [Auto] or [Select] to use the sensor in the sensor list as data source. When you set speed manually, check [DR].

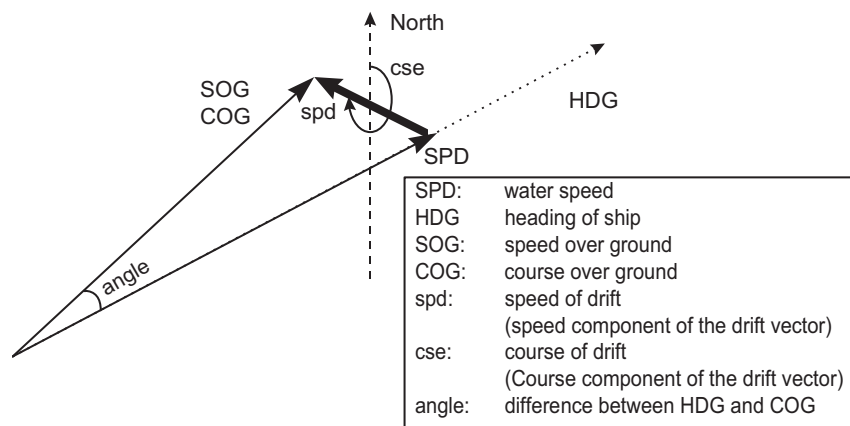
- [Auto]: Check for automatic sensor selection
- [Select]: Check for manual sensor selection

[DR]: Set speed manually when there is no heading sensor available. Deactivate the AIS function to set speed manually. For how to deactivate the AIS function, see section 4.1.

[Reference SPD]: Check to use radar as the source for speed and course. To use [Reference SPD], turn off the AIS function and check [Bottom] and [Local] on the [SPD] page. For how to turn off the AIS function, see section 4.1.

[Set Drift]: Check the [Set Drift] checkbox to manually set speed and course of drift. Only available when [Water] in [Stabilization Mode] is checked and AIS function is deactivated. For how to deactivate the AIS function, see section 4.1.

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



[COG/SOG] page

Priority	Sensors
1	GPS001

[Data Source]: Check [Auto] or [Select] to use the sensor in the sensor list as data source.

- [Auto]: Check for automatic sensor selection
- [Select]: Check for manual sensor selection

[GPS smoothing]: When the sensor in the sensor list has smoothing parameter, enter the value same as the smoothing for the sensor. If not, keep the default value (0 s). To apply the setting, restart all units in the same network.

Note: This menu items appears only on the sensor menu in the chart mode.

[POSN] (Position) page

Priority	Sensors
1	GPS001

☐ DR 35° 18' 120" N
139° 44' 189" E

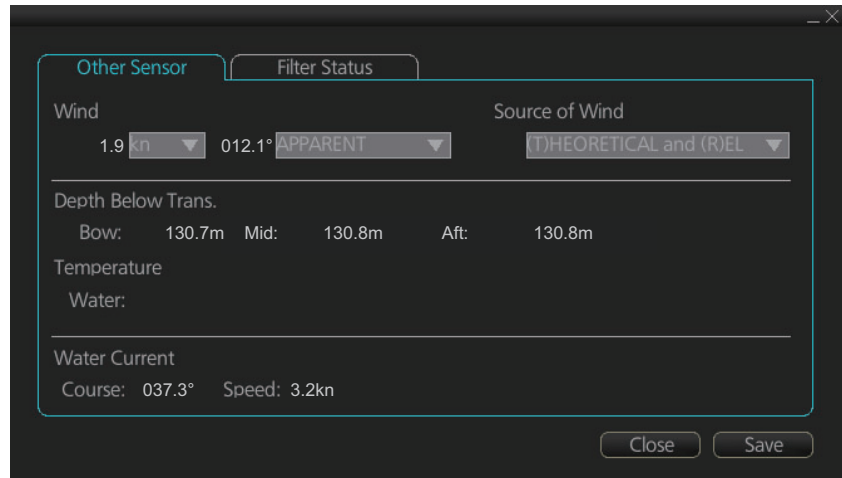
The sensor label (here, GPS001, GPS002) indicates the name of the sensor.

[Data Source]: Check [Sensors] to use a sensor in the [Sensors] list, or click [DR] to enter position manually.

[DR]: When a sensor cannot be used, select [DR], then enter position manually. Deactivate the AIS function to enter position manually. For how to deactivate the AIS function, see section 4.1. The sensor list is grayed out when DR is in effect.

[Other Sensor] page

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



[Wind]: Select wind unit, wind reference, and wind source. See section 16.8.

[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.

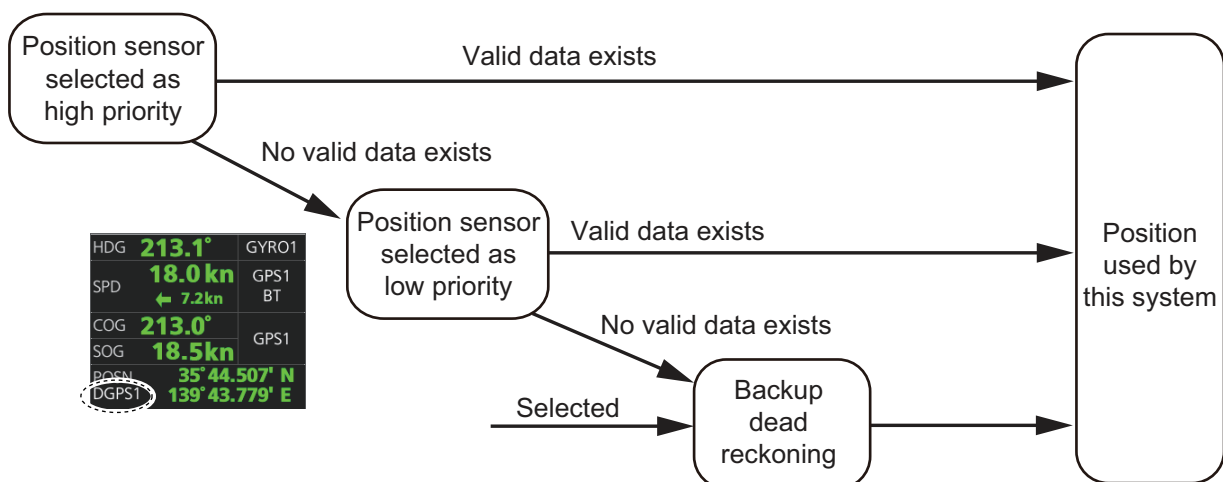
16.3 Source of Position

16

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.



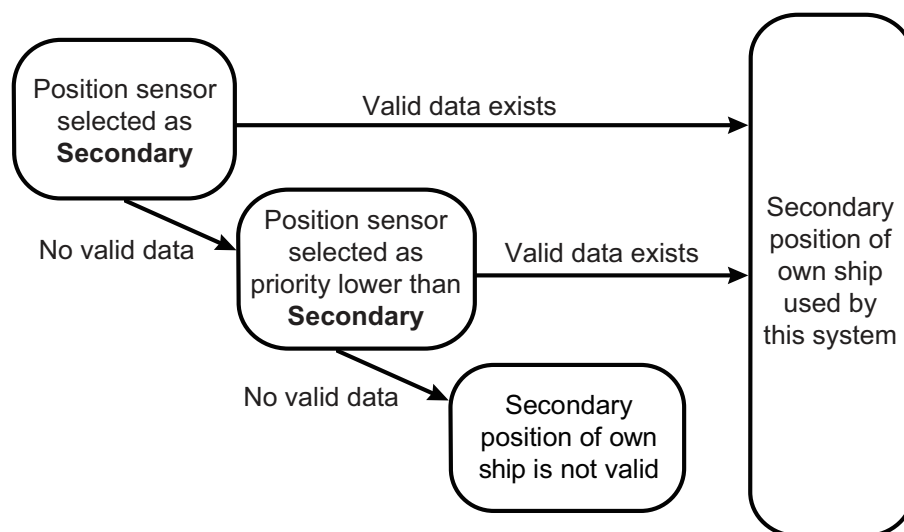
16.4 Primary and Secondary Positions of Own Ship

This system displays position in one of four methods

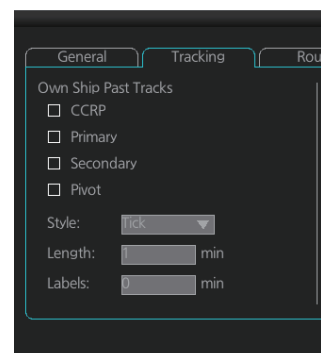
- **CCRP position:** CCRP
- **Primary position:** Position generated by position source chosen as highest priority.
- **Secondary position:** Position generated by position source chosen as 2nd highest priority.
- **Pivot position:** Ship's pivot point position.

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.



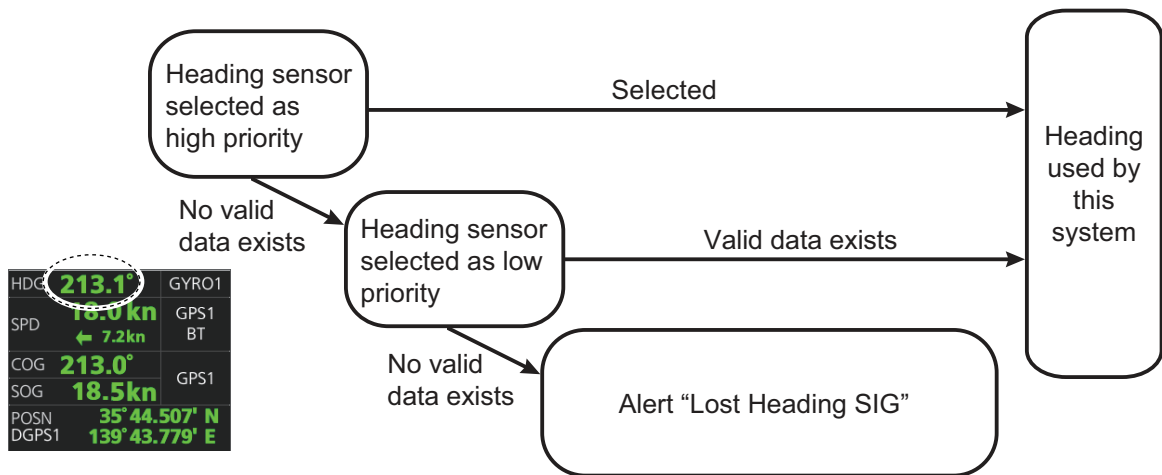
System, primary and secondary positions of your ship may be plotted on the chart radar display with the past tracks feature. You can control their visibility, etc. from the [Tracking] page of the [Symbol Display] menu, shown in the right figure. In this example, past tracks are plotted using the primary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



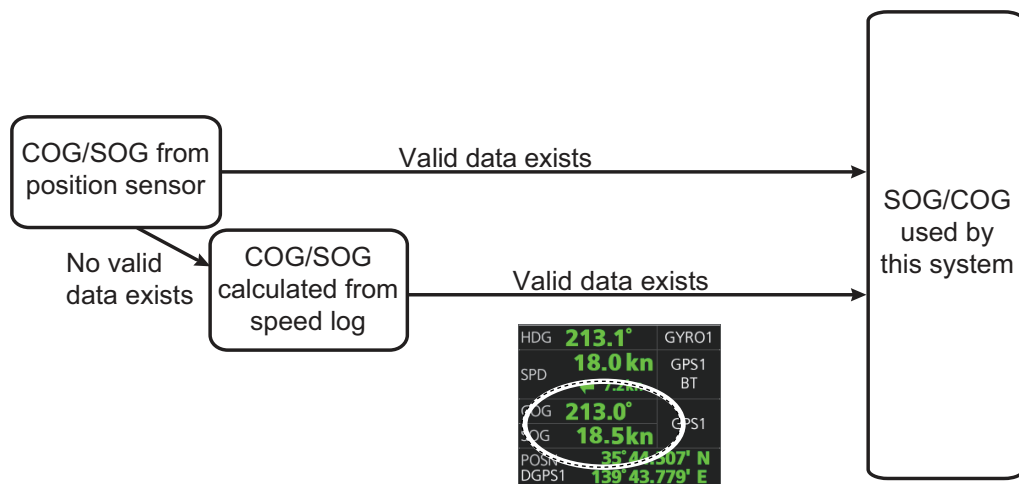
16.5 Source of Navigation Data

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.

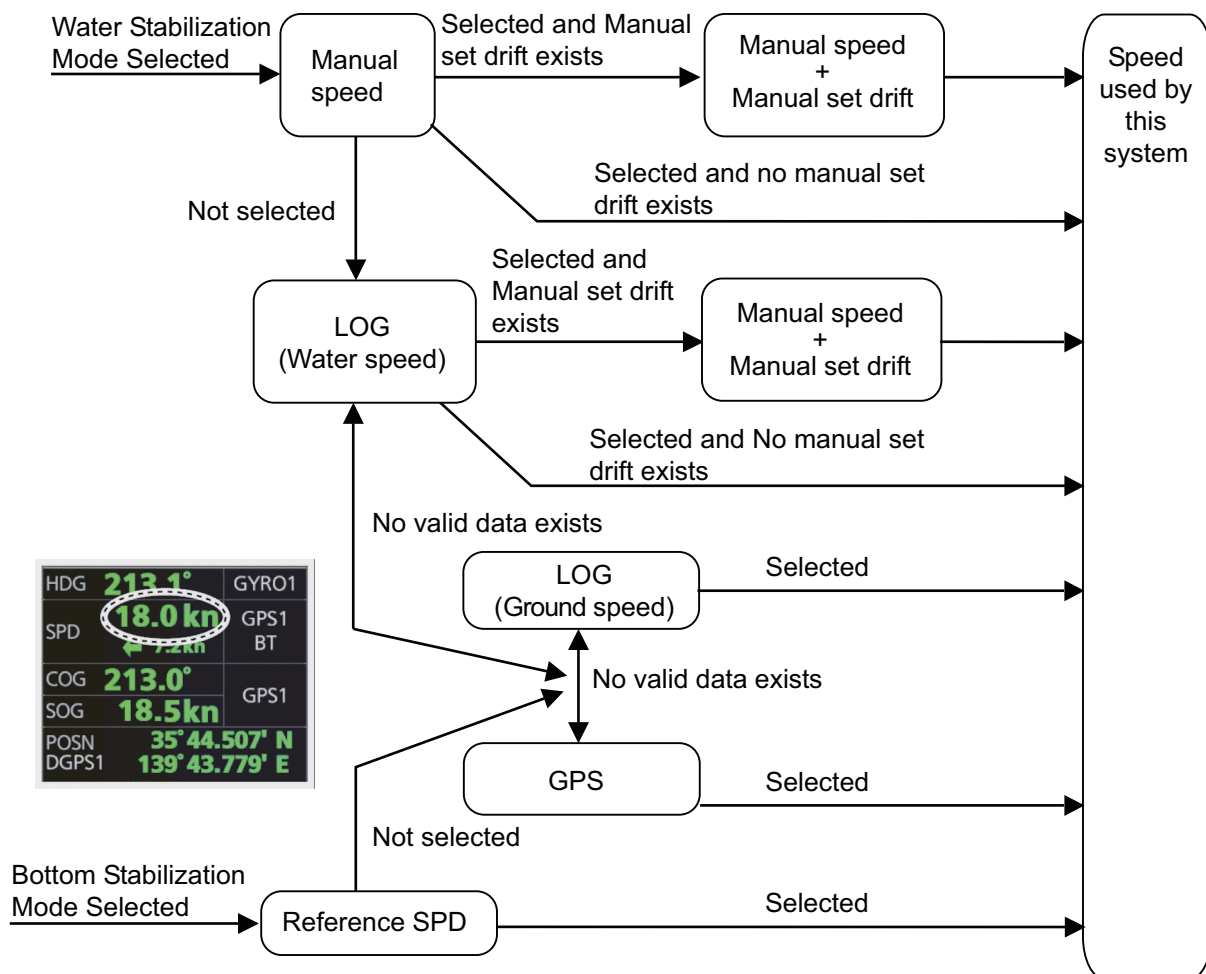
Heading used by the system is shown at the top-right position on the chart radar display. In the example shown below, heading is received from a gyrocompass and it is shown without additional text, meaning the value is referenced to true North.



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 the following cases occur, the system generates the respective alerts:

- When no heading source is available: Alert "Lost Heading SIG"
- When no speed source is available: Alert "Lost SDME Signal"
- When no GPS COG/SOG data is available: Alert "Lost COG/SOG SIG"
Note: When the stabilization mode is set to [Bottom] and sensor type selection is set to [GPS], this alert is prioritized as "Warning". For other settings, prioritized as "Caution."
- When no LOG (ground speed) data is available: Alert "Lost LOG (BT) SIG"
Note: When the stabilization mode is set to [Bottom] and sensor type selection is set to [LOG], this alert is prioritized as "Warning". For other settings, prioritized as "Caution."
- When no LOG (water speed) data is available: Alert "Lost LOG (WT) SIG"
Note: When the stabilization mode is set to [Water] and sensor type selection is set to [LOG], this alert is prioritized as "Warning". For other settings, prioritized as "Caution."

16.6 Filter Status

This equipment 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.

This equipment performs the consistency check required by the IEC-61924-2 (INS standards), for heading, turning rate, position, COG/SOG, and CTW/STW data. The result, shown on the [Filter Status] page of [Other Sensor Settings] menu, is either [Passed], [Low Accuracy], [Doubtful], [Failed], [Excluded], or [Not Available].

The meaning for check result is as follows:

[Passed]: Data is available for comparison and data is normal.

[Low Accuracy]: Data signal strength is low, but data is normal.

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

[Failed]: Data is available (or not available) for comparison and data is abnormal.

[Excluded]: Value is greatly changed.

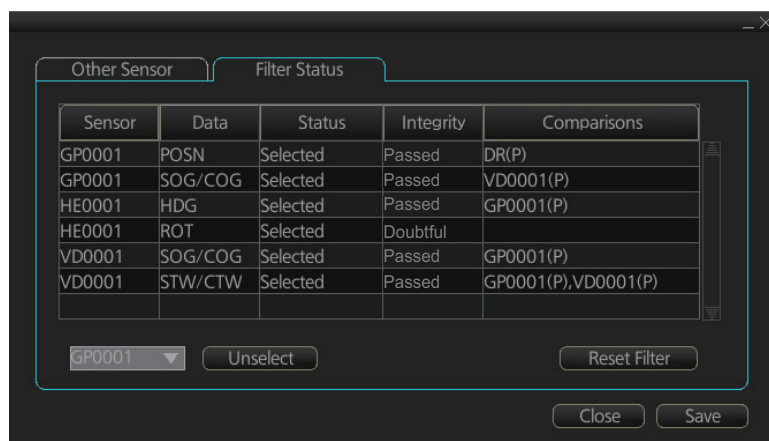
[Not Available]: Sentence is abnormal or improper.

For heading data, If there is only one gyro, the judgment is "Doubtful" when the ship is stopped because there is no COG for comparison. When the ship begins to move, the judgment 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] or [Failed] . The integrity evaluation is [Doubtful] 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 1: 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].

Note 2: When the filter is reset for this system, all networked equipment's filters are reset.

16.7 Position Alignment

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

16.7.1 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. (You are asked if you want to align position; click the [Yes] button to proceed.) 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.

Note: The position offset value is synchronized with all FMD-3xxx and FAR-3xxx units on the same network.

16.7.2 How to cancel position alignment

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

16.8 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.

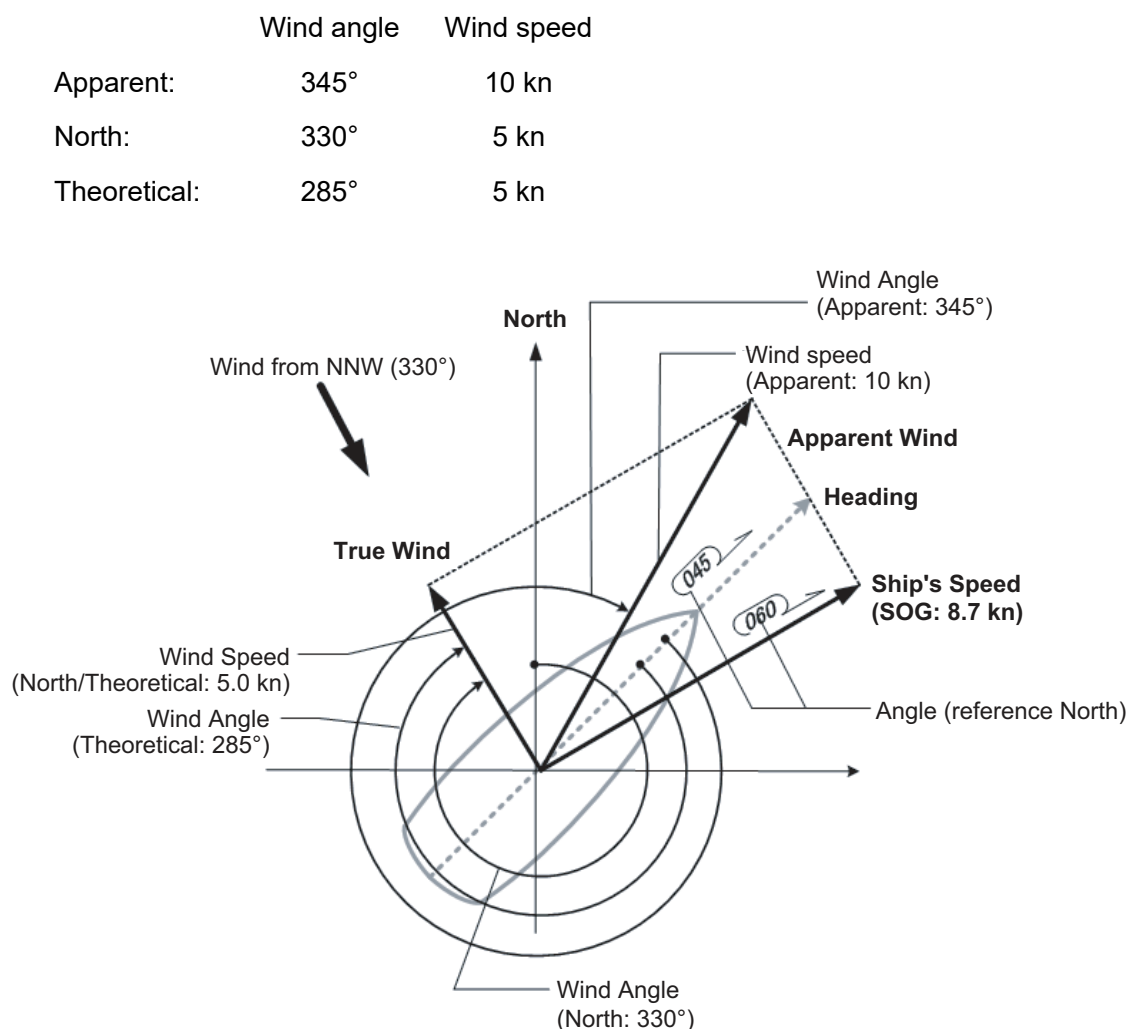
The wind values are as shown below.

Ship information:

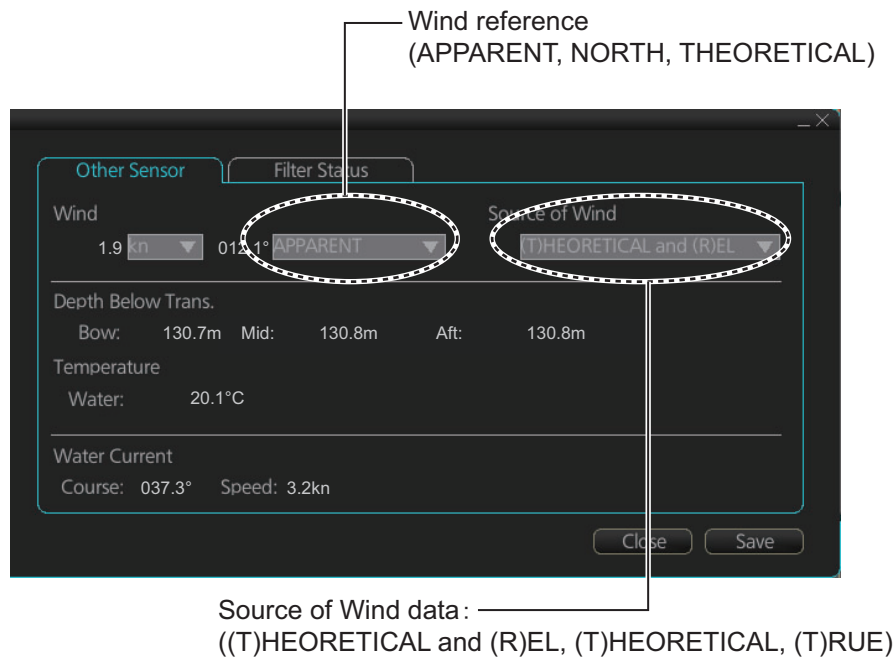
COG: 60°

SOG: 8.7 kn

Heading: 45°



Apparent, North (true wind referenced to North), Theoretical (true wind referenced to heading) may be selected from the [Other Sensor Settings] menu. If the wind indication is not accurate; for example, the wind is blowing from the North but the wind direction displays otherwise, check if the format is Theoretical. If it is, switch to another format.

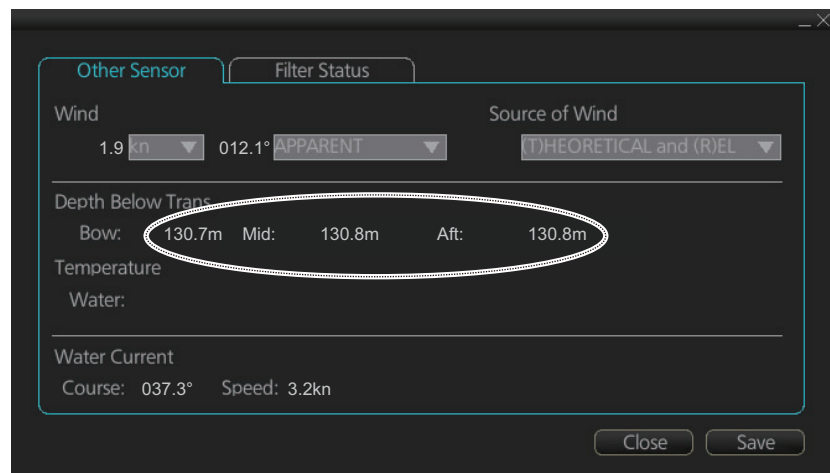


16.9 Depth Sensor

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.



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 "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. The maximum number of messages that can be stored is as follows:

- Addressed message: Max. 100 messages (a maximum of 20 messages can be protected.)
- Broadcast message: Max. 100 messages (a maximum of 20 messages can be protected.)
- AtoN message: Max. 25 messages (message cannot be protected.)
- SART message: Max. 25 messages (message cannot be protected.)

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.

