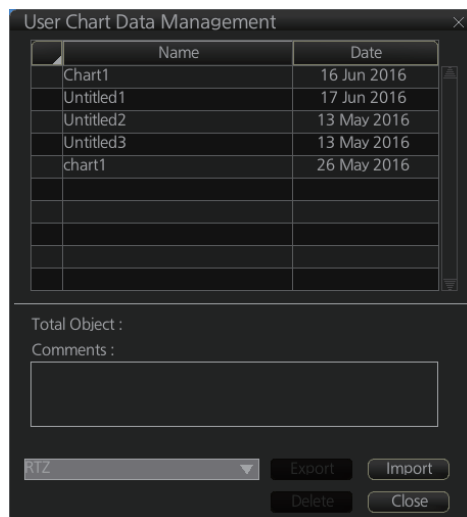


13.10 How to Delete User Charts

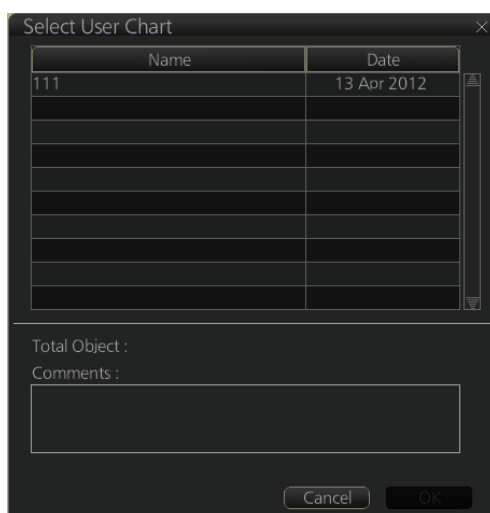
1. Click the [PLAN] button on the Status bar to get into the Planning navigation mode.
2. Click the [Manage Data] button on the InstantAccess bar™ followed by the [User Chart] button.



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

13.11 User Chart Reports

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

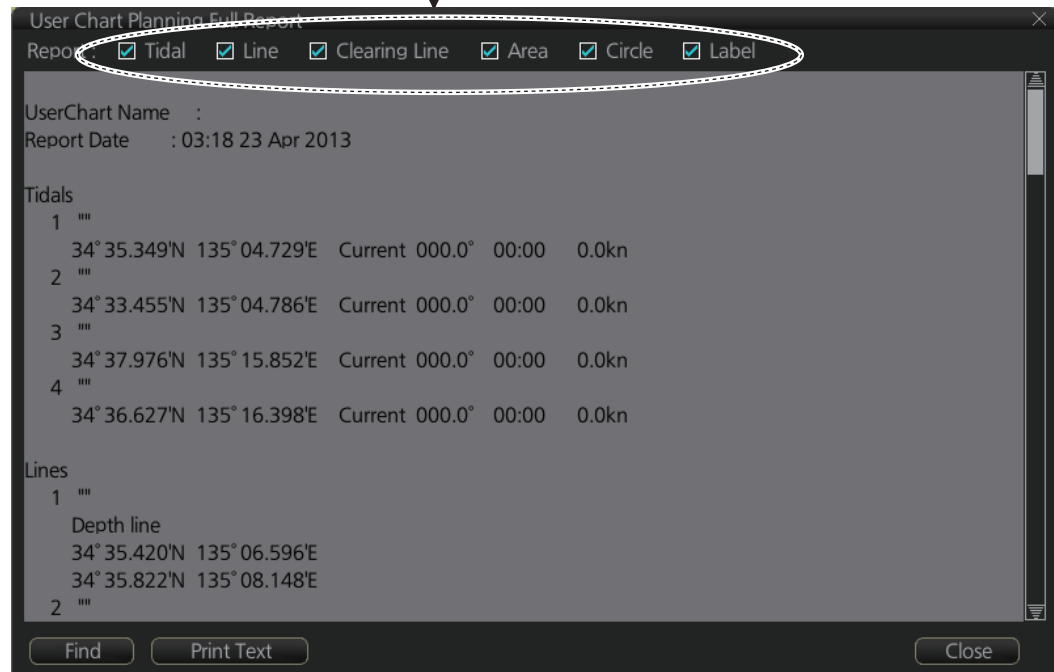


3. Select the appropriate user chart then click the [OK] button to show the selected report. See the next several pages for examples of reports.

Full report

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

Check the report(s) to display.



Tidal report

A tidal report provides:

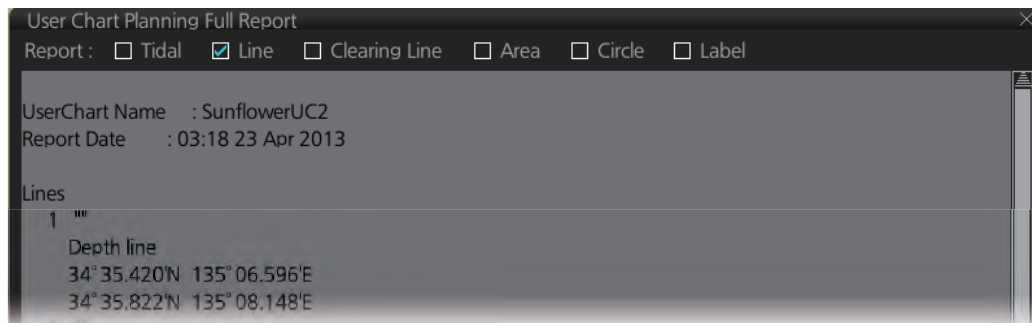
- Position of the tidal
- Type of tidal (current or predicted)
- Speed and direction of the tidal
- Time of the tidal



Line report

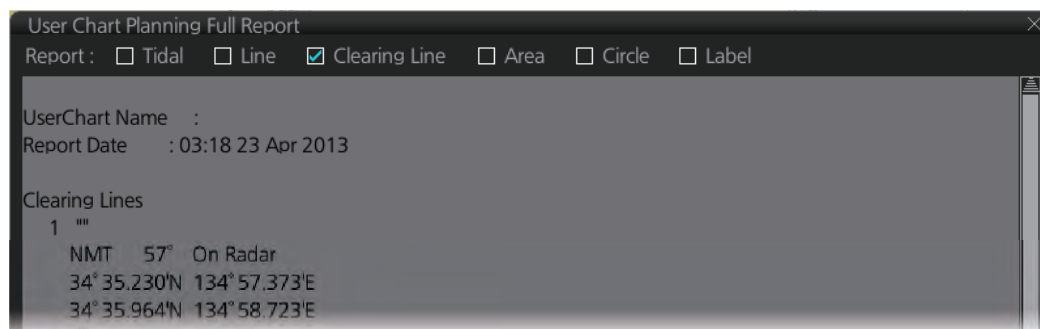
A line report provides:

- Line name
- Latitude and longitude position of each point on the line
- Where a check mark is input in the column for [Radar], [Danger] or [Notes] on the [User Chart] dialog box, "On Radar", "Danger" or "Has Notes" appears in the report.

**Clearing line**

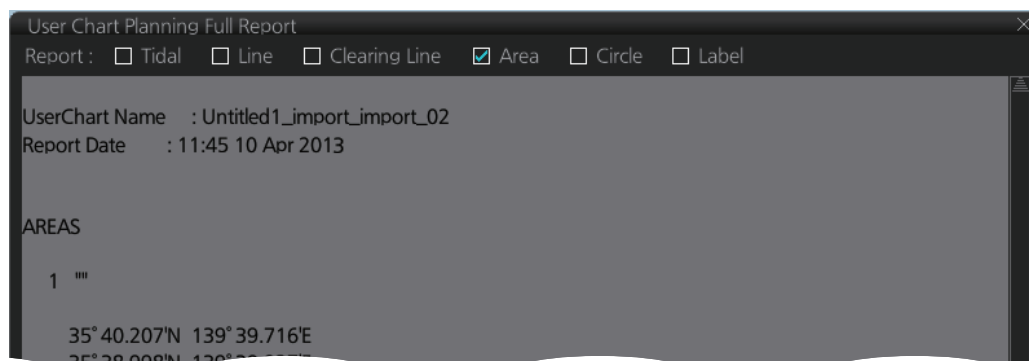
The Clearing line report shows the name and position of clearing lines entered on the chosen user chart selected.

- "On radar" is shown if the area is shown on the radar overlay.
- "Danger" is shown when a check mark is input in the column for [Danger] on the [User Chart] dialog box

**Area report**

An area report provides:

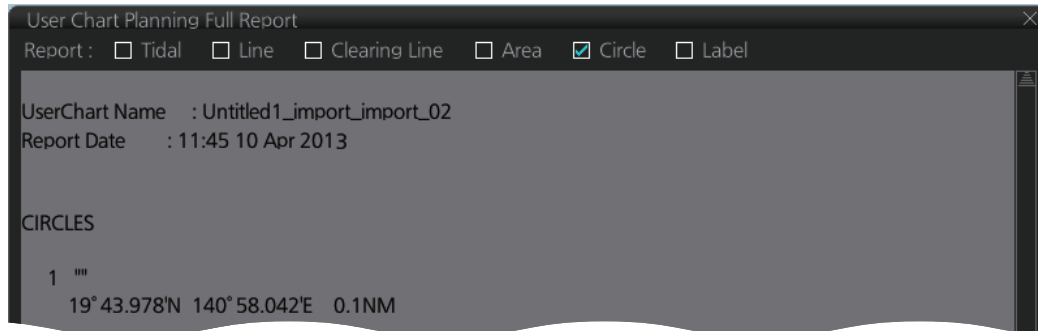
- Area no. and area name
- The latitude and longitude position of each point of the area
- The description of the area
- Where a check mark is input in the column for [Radar], [Danger] or [Notes] on the [User Chart] dialog box, "On Radar", "Danger" or "Has Notes" appears in the report.



Circle report

The circle report provides:

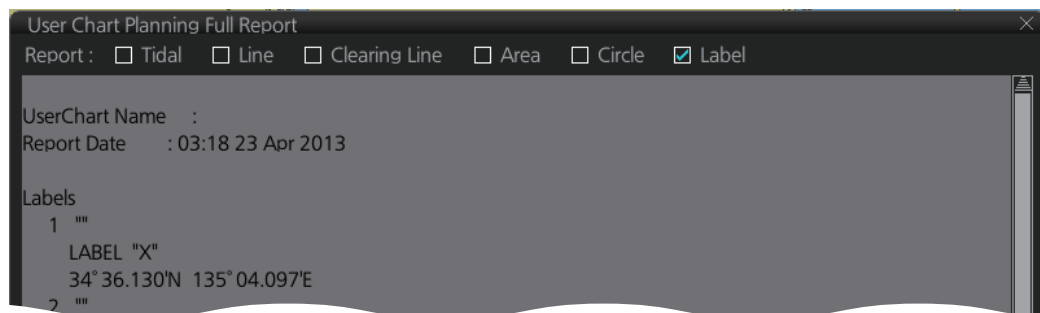
- The position and radius of circles drawn on a user chart.
- Where a check mark is input in the column for [Danger] or [Notes] on the [User Chart] dialog box, "Danger" or "Has Notes" appears in the report.



Label report

A label report provides:

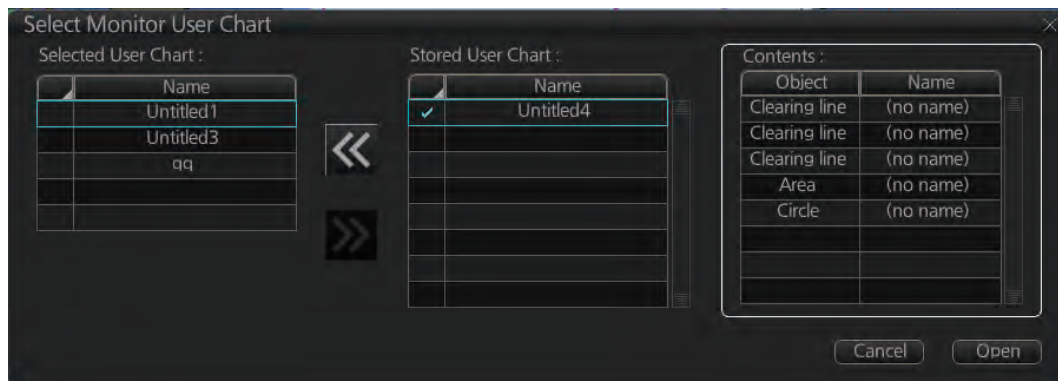
- Latitude and longitude position of each label
- Name of each label
- Where a check mark is input in the column for [Danger] or [Notes] on the [User Chart] dialog box, "Danger" or "Has Notes" appears in the report.



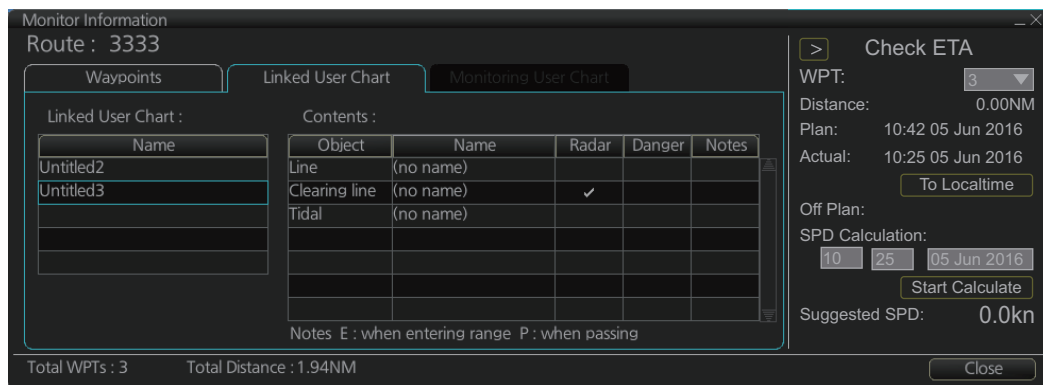
13.12 How to Select the User Chart(s) to Use in Route Monitoring

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™.

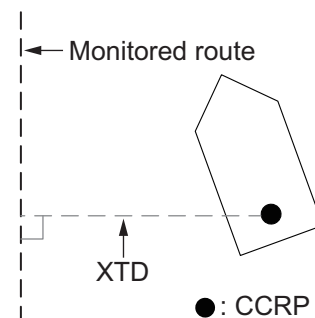
14. HOW TO MONITOR ROUTES

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.

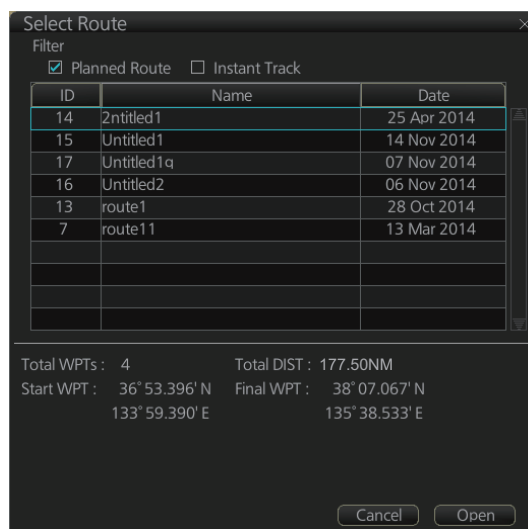
Note 2: XTD is the distance, in a straight line, from the monitored route to the CCRP. CCRP is set at installation. Where more than one CCRP is set, select the CCRP to use from the [CCRP] page of the [Settings] menu (see section 22.13).



14.1 How to Start Route Monitoring

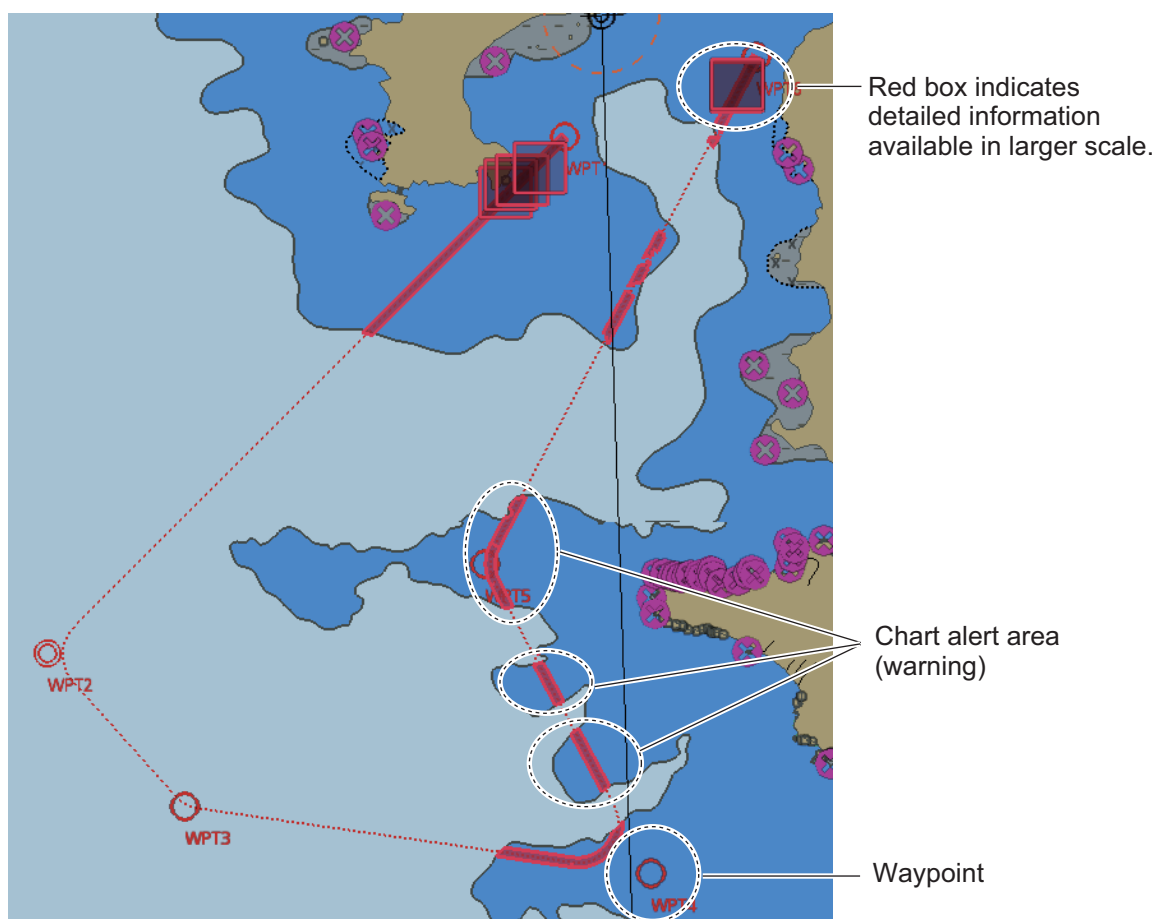
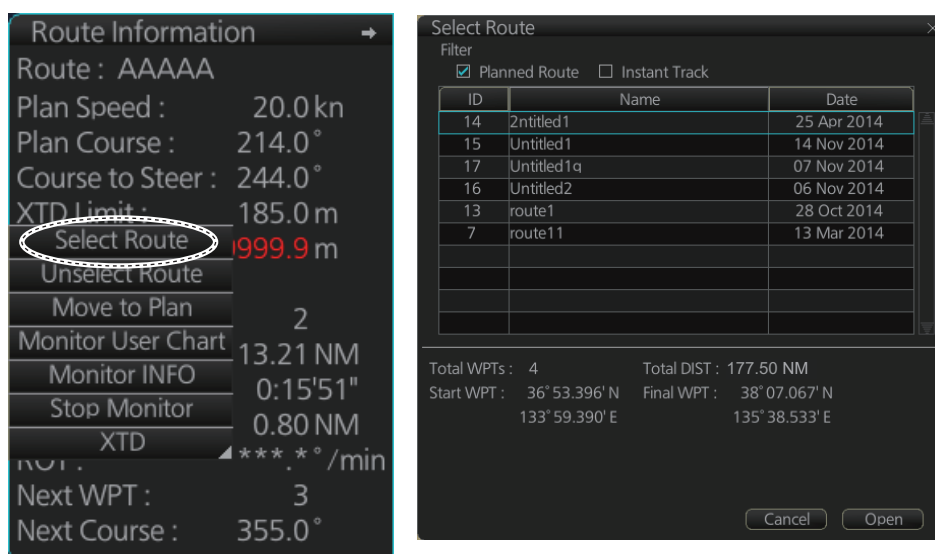
Method 1: InstantAccess bar™

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 waypoint XX" (XX=waypoint no.). Geometry of the route makes it impossible for the ship to accomplish a turn. Modify the route to make the turn possible.
 - "Unchecked / Check condition differs". The route has not been checked. Check the route, on the [Alert Parameters] page.
 - "Monitored in the NAVI mode". The route is currently being monitored.
 - "More than one WPT needed". The route has only one waypoint. Add more waypoints to the route.
 - "Route monitoring cannot be started. Please check ship's position and conditions." Click the [OK] button to close the message. Check ship's position and conditions of the route.
- If you have small-scale chart(s) on display that have the whole eastern/western (0-180°E/0-180°W) hemisphere and a part of the other hemisphere on display, there is a limitation to display a route. To avoid this, set chart center so that the whole eastern/western hemisphere is not on the screen.
- 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 691 (ALF format: 10800,1) "RM Stop - Exceed Max XTE", 692 (ALF format: 10800,2) "RM Stop - Disconnect Sensors", or 693 (ALF format: 10800,3) "RM Stop - Other Causes" appears. If this occurs, switch to the chart 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 grayed out) and an alert appears when the signal for position, speed or heading is lost. To restore route monitoring, change the sensor system from System to Local (from the Sensor Information box), manually enter the lost data, check [Set Drift], then switch to the DR mode.
- Route data is sent to the radar at the start of route monitoring or when the ship transits a waypoint. If a route is not displayed on the radar, stop then restart monitoring at the radar chart. A route is erased from the radar when route monitoring is stopped or the radar chart is restarted. To redisplay the route, stop then restart monitoring at the radar chart.
- 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-3200/3300 ECDIS that is interfaced with an IEC 62065 Ed.2 compliant TCS (YOKOGAWA PT-900, Tokyo Keiki PR-9000, EMRI FAP-3000), the alert 174 (WPT Approach) 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-3200/3300.

14.2 How to Stop Route Monitoring (Manual, Auto)

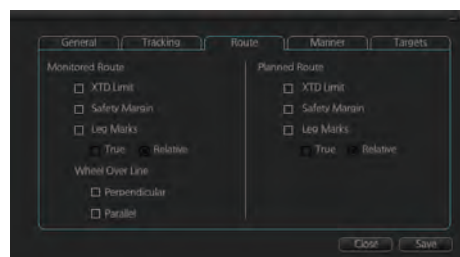
You can stop route monitoring in two ways:

- 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 alert 691 (ALF format: 10800,1), 692 (ALF format: 10800,2) or 693 (ALF format: 10800,3) occurs, route monitoring is stopped automatically. See the Troubleshooting table in section 25.5 for details.

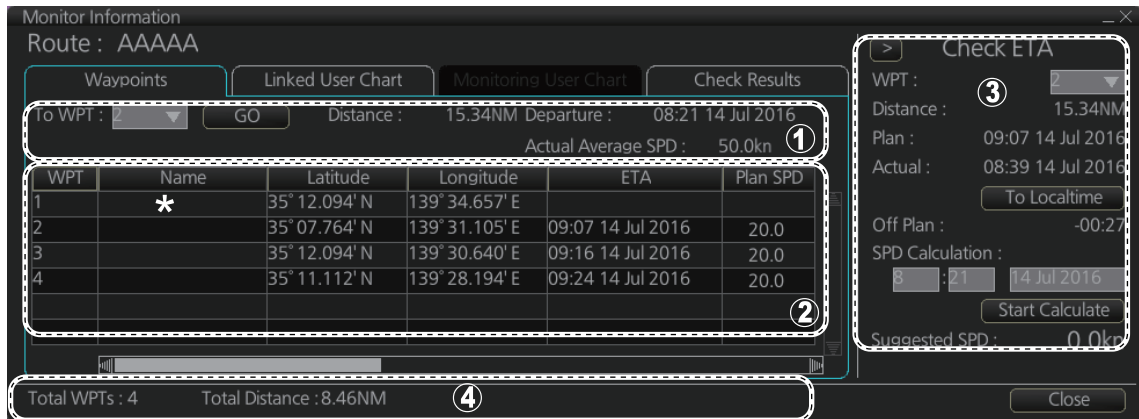
14.3 How to Select What Parts of a Route to Display

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



14.4 How to View Waypoint Information

Click the [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.

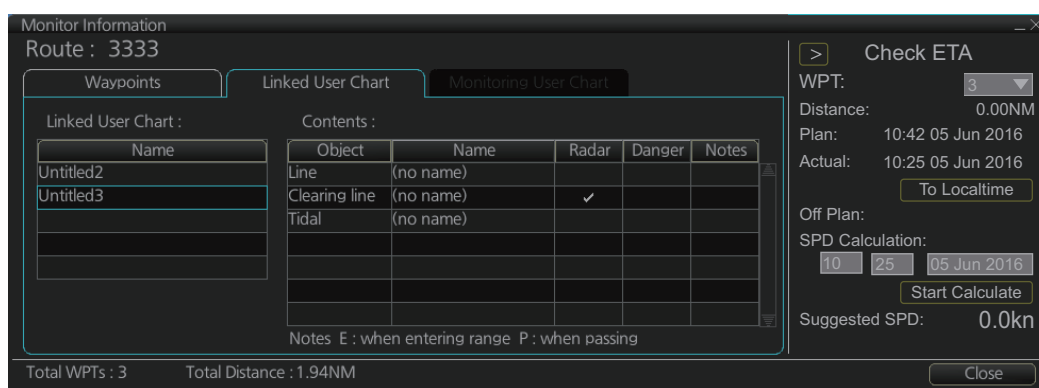
Leg/°	Leg/NM	STR mode	RAD/NM	XTD Limit/m	SPD MAX	Margin/m	Local Time
214.0	2.95	Rhumbline	0.80	185	22.1	40	+00:00
355.0	2.89	Rhumbline	0.80	185	22.1	40	+00:00
243.9	2.62	Rhumbline	0.80	185	22.1	40	+00:00

No.	Item	Description
1	[To WPT], [GO] button	The system selects a next waypoint automatically. Check that the To waypoint is the desired one. The system will automatically advance to a next waypoint when you pass the To waypoint. The default [To WPT] is WPT2. If you desire a different one, select it here and the click the [GO] button.
	[Distance]	Distance from current position to selected waypoint.
	[Departure]	The time the route was selected for monitoring.
	[Actual Average SPD]	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 ([Rhumbline] or [Greatcircle]), radius, XTD limit, speed max, margin and local time. *: The bearing to a leg and the display method for leg distance can be changed. For details, see paragraph 12.4.1. Can be changed. See "Leg/NM" on page 12-5.
3	[Check ETA] window	Parameters for checking ETA. The arrow to the left of [Check ETA] collapse or display the [Waypoints], [Linked User Chart] and [Check Results] tabs.
	[WPT], [Distance]	Select a WPT to find the distance to that waypoint from current position.
	[Plan]	The planned ETA to the selected waypoint.
	[Actual]	The actual ETA to the selected waypoint, if current speed is maintained.
	[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.
	[SPD Calculation]	Enter speed and ETA (time and date) to find the speed to use to arrive by the ETA.

3	[Start Calculate] button	Click to start calculation. The button label changes to [Stop Calculate].
	[Suggested SPD]	The system calculates suggested speed so that ETA to the WPT selected would be same as planned ETA if type of optimization was "Time table".
4	[Total WPTs]	The total number of waypoints in the route.
	[Total Distance]	The total distance of the route.

14.5 How to View User Chart Information Linked Monitoring Route

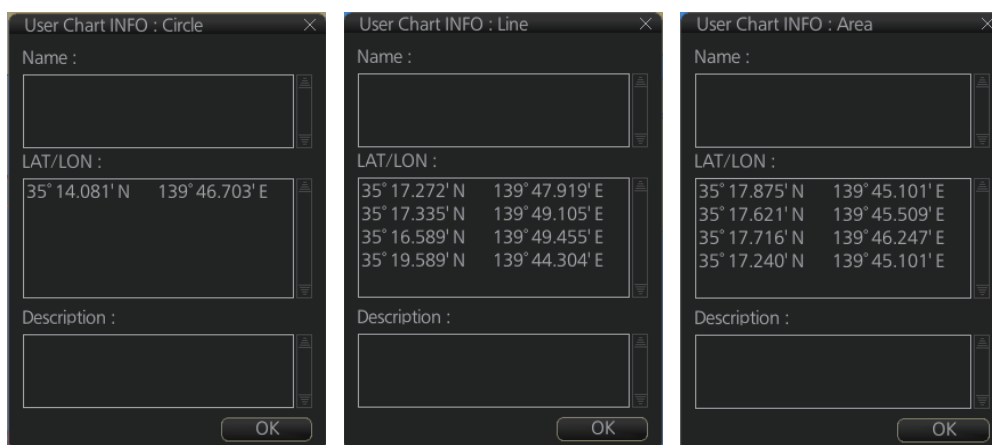
1. In monitoring route mode, click the [Voyage] and [Monitor INFO] buttons on the InstantAccess bar™ to show the [Monitor Information] dialog box.
2. Click the [Linked User Chart] tab.



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.

14.6 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.



User chart INFO: Circle

User chart INFO: Line

User chart INFO: Area

14.7 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.

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

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

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

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

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

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

Condition	Mode	Manual mode switching
Neither monitored route nor instant track route active.*	[Safe Off Track]	No
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> 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.

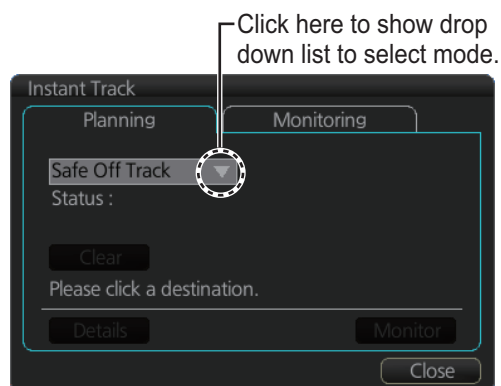
14.8.1 Safe off track mode

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.

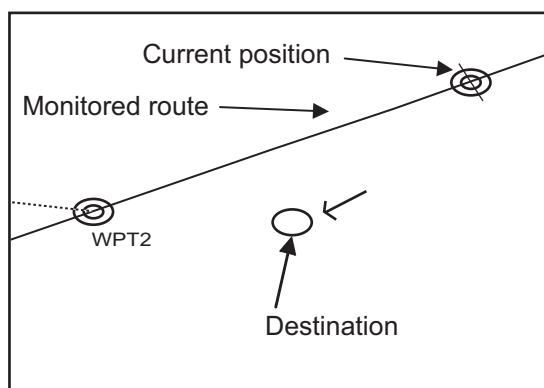
Note 1: If a monitored route is active, the [Back to Track] mode can also be selected.

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

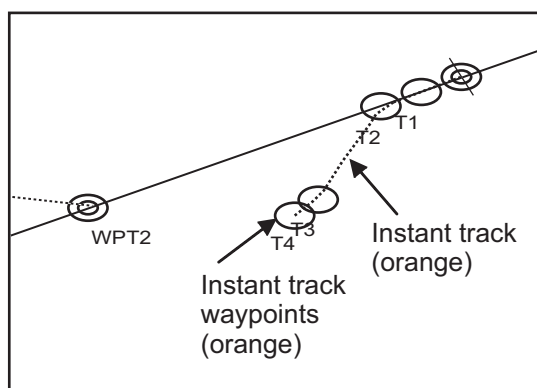


When monitored route is active

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 14.8.3 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.

14.8.2 Back to track mode

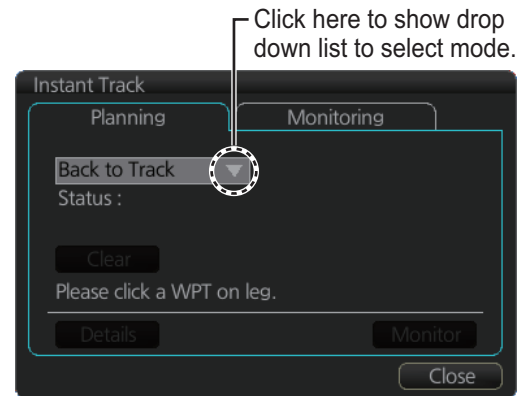
When the vessel goes off track, the Alert 172 (ALF format: 172) "Off Track Alarm" appears in the [Alert] box. To create an instant track to return to the monitored route, use the [Back to Track] mode as follows:

1. When the monitored route is active, click [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.

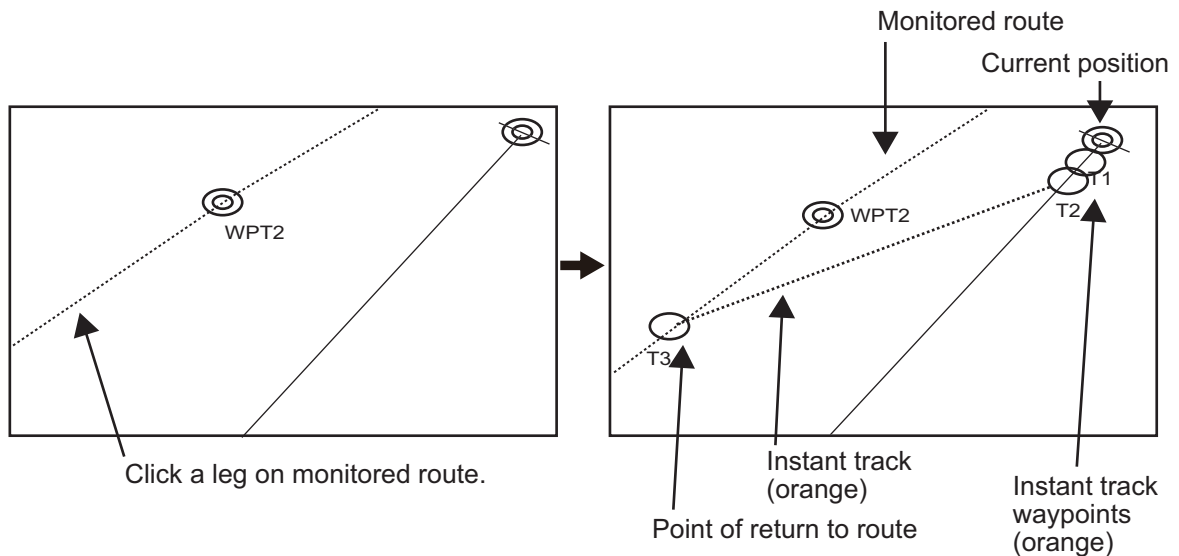
Note 1: If a monitored route is active, the [Safe Off Track] mode can also be selected.

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.

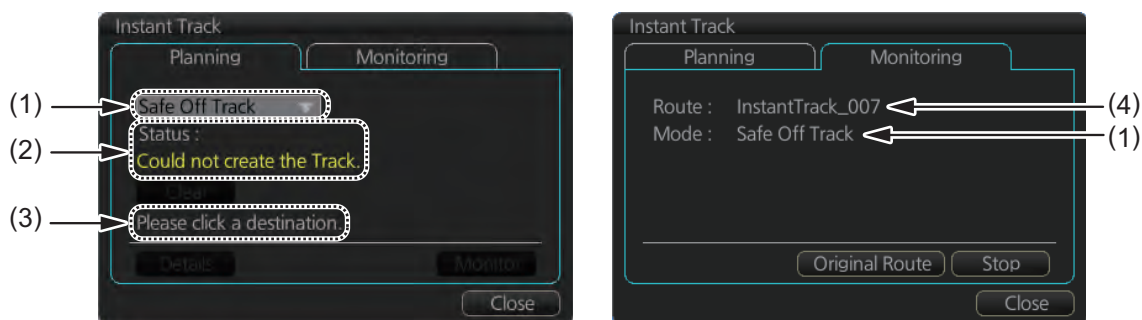
During the calculation, the [Instant Track] dialog box shows "Checking" in the [Status] field. If, after completion of the calculation, the track is suitable, the message "OK" replaces "Checking". The track and its waypoints, labeled [T1] - [T3], are colored orange. The track is saved to the database 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 14.8.3 for all the instant track messages and their meanings.

14.8.3 Instant track messages

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

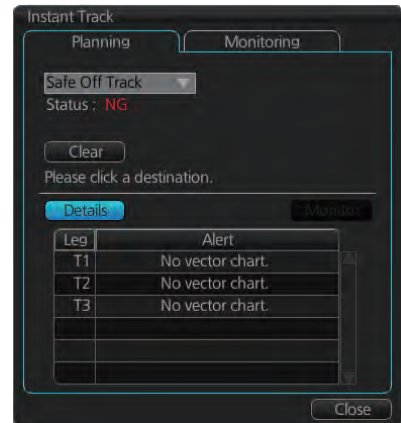


Message	Meaning	Color
(1) Instant Track mode		
"Back to Track"	Back to track mode	White
"Safe Off Track"	Safe off track mode	White
(2) Check result, error message		
"Could not create the Track."	The track could not be created.	Yellow
"Too far destination from own ship."	Selected destination is 50 NM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

14.8.4 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.

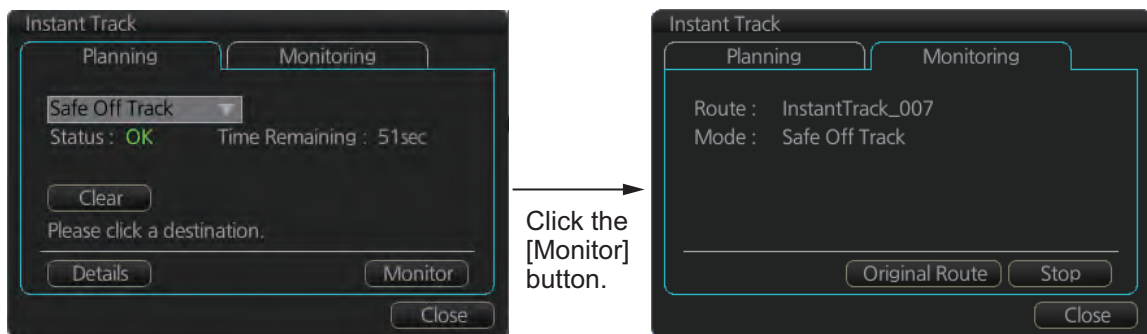
Note: If the Status is not [OK], an alert (alarm or warning priority, depending on set-ting) appears in the Alert box.



14.8.5 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.

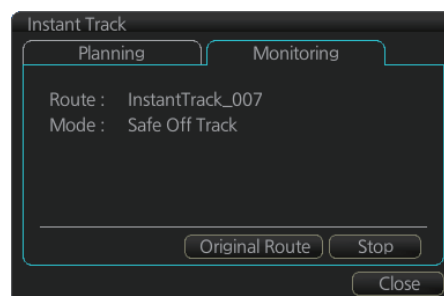
Monitoring condition	Result
Instant track route monitoring.	<ul style="list-style-type: none"> An instant track route under creation is deleted. No route can be created. The [Stop] button is pushed or the instant track route is followed until its completion. After the instant track route is completed, 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.

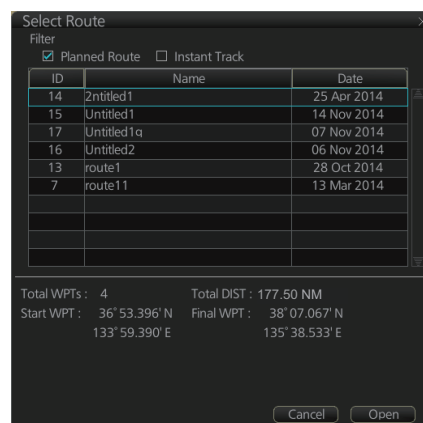
For the [Back to Track] mode, the instant track mode is canceled when the vessel returns to the monitored route. The instant track is grayed out to show that is inactive.



14.8.6 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.

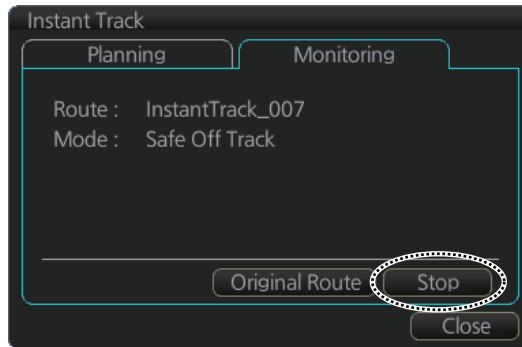
1. While monitoring an instant track route, click the [Original Route] button on the [Monitoring] page in the [Instant Track] dialog box to show the [Select Route] dialog box. Check [Planned Route] to show a list of planned routes, or check [Instant Track] to show a list of instant track routes.
2. Select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

14.8.7 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.)

14.9 How to Share Route During Route Monitoring

With multiple EC-3000 units, you can share the route monitored on the master EC-3000 unit with other units (FMD-3x00, FCR-2xx9 or FAR-3xx0).

Follow the procedure below to enabling the route sharing feature.

1. Open the menu, select [Monitoring] from the [Shared] menu to show the [Setting] dialog box.



2. Right click the equipment ID of the unit to show the pop-up menu. Select [MASTER], [BACKUP], [SYNC] or [CLEAR] as appropriate.
 [MASTER]: Assigns selected unit as the master unit. One unit must be assigned as the master unit.
 [BACKUP]: When route monitoring starts on the master, the route and its information are displayed on the backup.
 [SYNC]: Selected unit receives and displays the route data output from the master, and monitors the route displayed on the master.
 [CLEAR]: Removes the selected unit from route monitoring sharing.
Note: To restore the original setting for units, click the [Status] column, then select [Reset].
3. Click the [Save] button to save settings, then click the [Close] button to finish.

14. HOW TO MONITOR ROUTES

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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

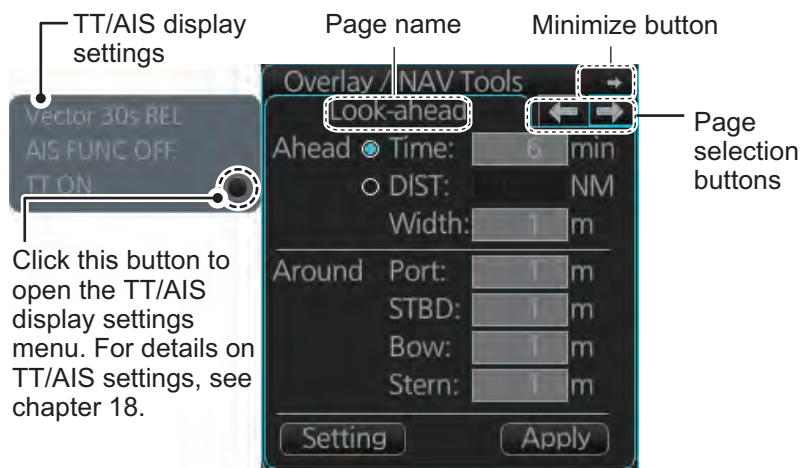
*¹: Shown only when the [Echo] page is enabled at installation. Not available for B types.

*²: Shown only when a EC-3000 with TCS functionality is connected to the network.

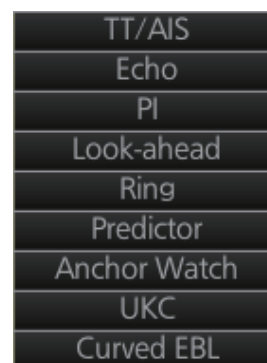
15.1 How to Access the NAV Tools in the Overlay/NAV Tools Box

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 ECDIS 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

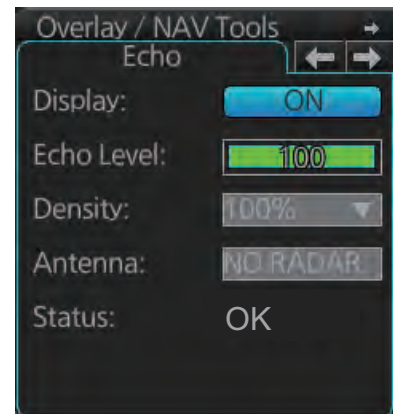
Radar echoes can be output to the ECDIS and shown on its display. Like details on S57 charts, the radar overlay can be displayed or removed from the chart display. The transparency of the echo display can be set from the [Echo] page in the [Overlay/NAV Tools] box. To activate and setup the radar overlay,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

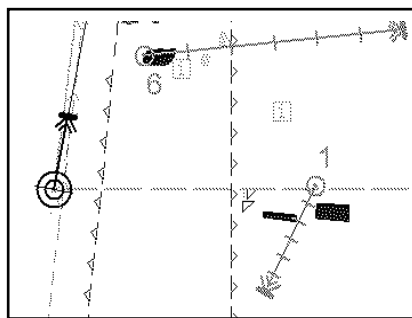
- Inaccurate position
- Position offset
- Inaccurate chart
- Improper installation parameters (conning position offset, position receiver antenna offset, radar overlay range offset)

15.2.3 Error Sources for Radar Echo Image and TT Mismatch

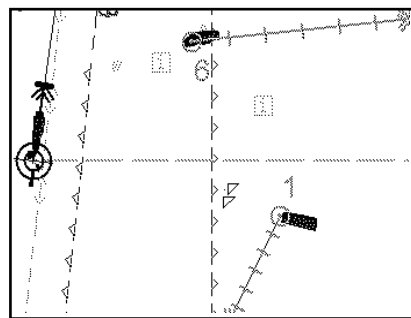
There are several reasons why the radar echo image and tracked target symbols do not match exactly.

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 six sets of PI lines (PI-P6) 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].

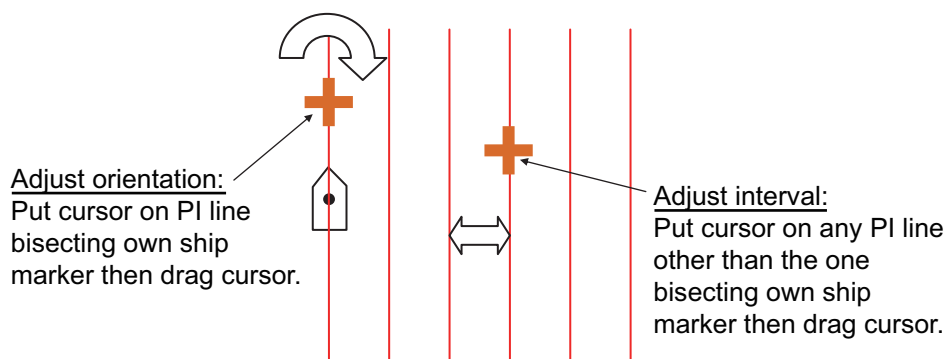
15.3.5 How to adjust PI line orientation, PI line interval

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

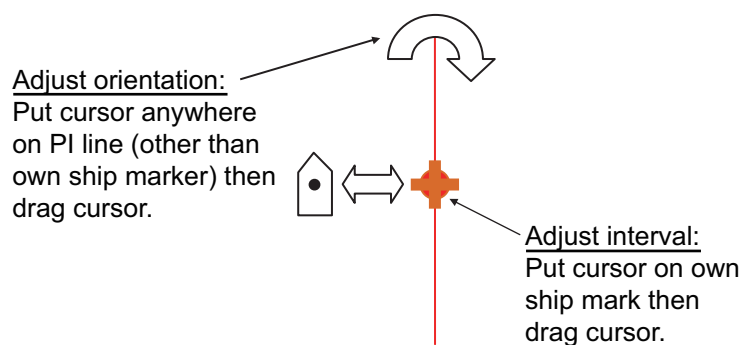
How to adjust PI line orientation, PI line interval from the menu

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.

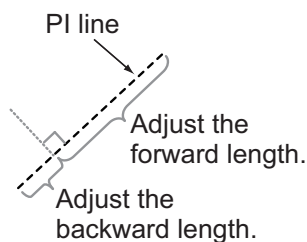
15.3.7 How to adjust PI line length

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].



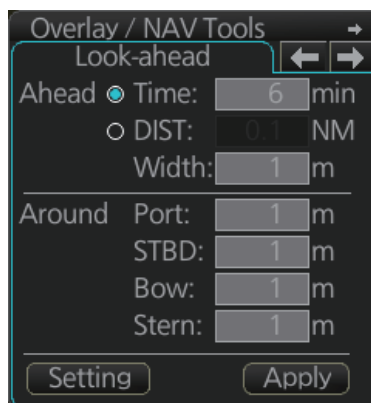
2. If not already displayed, click the [ON/OFF] button to display the PI line whose length you want to adjust.
3. Click the value in [Forward] and [Backward] columns to adjust their lengths, referring to the illustration below.



4. Click the [Save] button to finish.

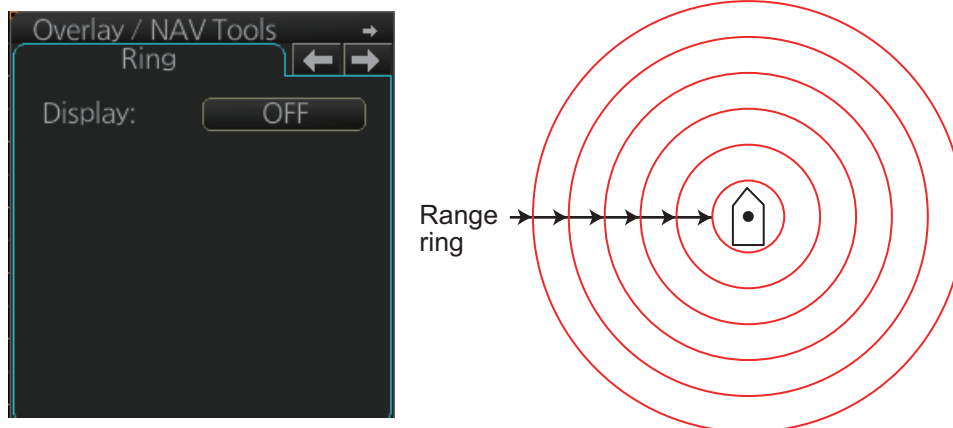
15.4 Look-ahead

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.



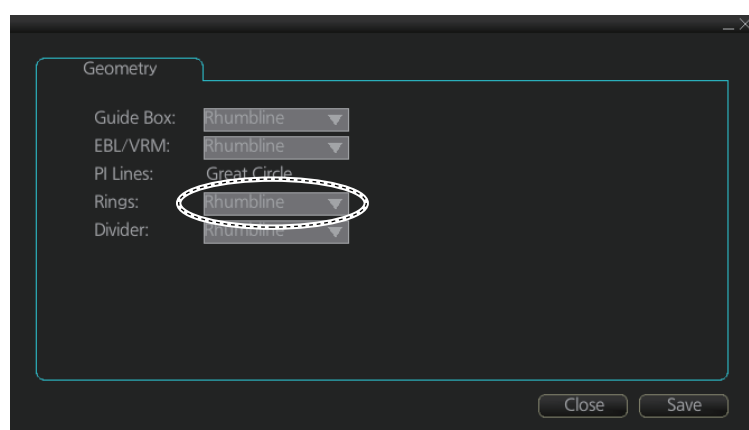
The interval between rings changes with the chart scale as shown in the table below.

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].



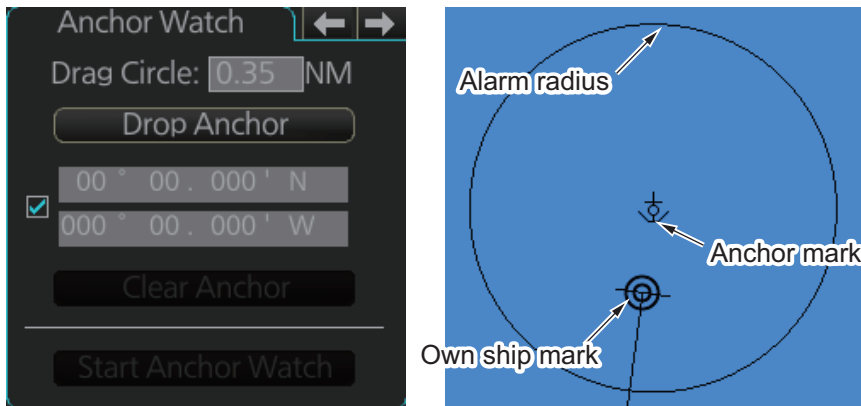
The Predictor is updated every three seconds internally and the status of the predictor is shown with [Status] as shown in the table below.

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 495 (ALF format: 10802) "Anchor Watch Setting" 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 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 Actual UKC feature continuously checks the ship's draught setting (UKC), and actual depth.

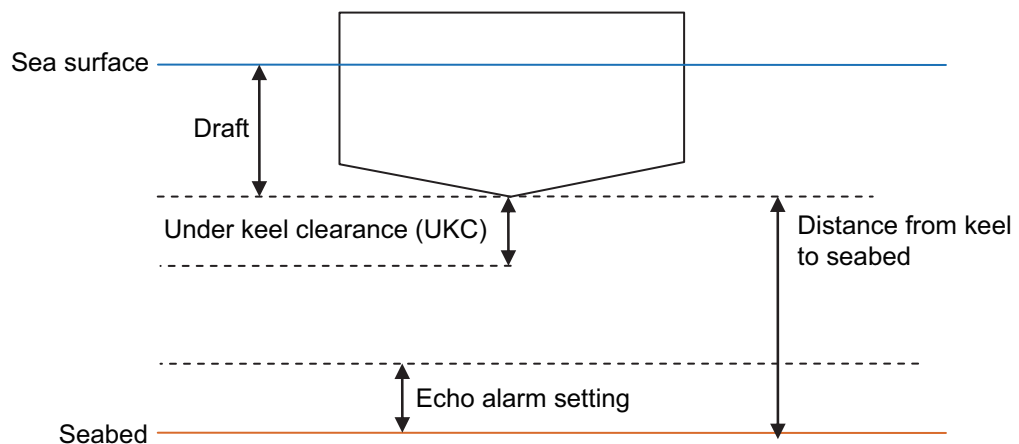
When a look-ahead area is set and the depth within the set area gets shallower than the UKC, the Alert 30173 "UKC Limit" is generated. Further, if the actual depth (calculated from the transducer) is shallower than the UKC, the Alert 30644 "Actual UKC Limit" is generated.

If the current depth is less than the echo alarm setting the Alert 30801 "Depth Limit" also is generated. Depth data is required to use the UKC and Echo Alarm functions.

UKC takes into account the amount of hull subsidence (Squat Effect). The evaluation criteria for Alert 30173 "UKC Limit" and Alert 30644 "Actual UKC Limit" are not based solely on the distance from the keel to the seabed, under keel clearance or draught.

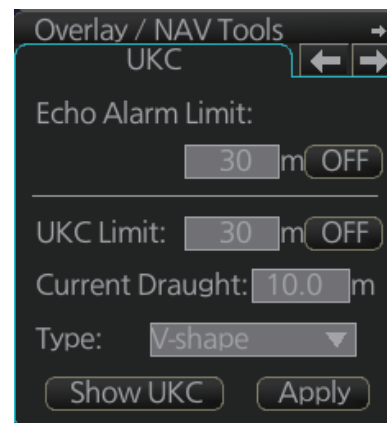
Note 1: When conducting a route check, UKC is calculated based on the planned speed for each leg.

Note 2: The sensor value shown is the depth to the transducer. Convert the value to the distance to the keel.



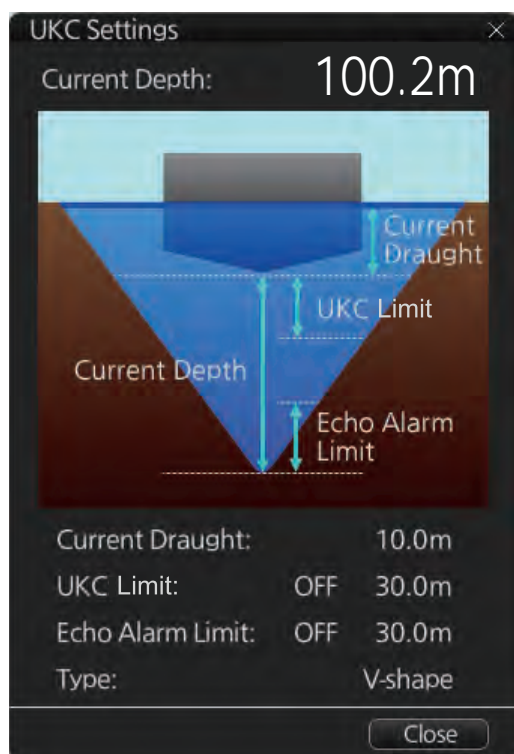
15.8.2 How to set UKC

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. Use [Type] to set the shape of your ship's hull to show on the [UKC] window, [V-shape] or [Concave]. See the figure in section 15.8.2.
6. Click the [Apply] button.

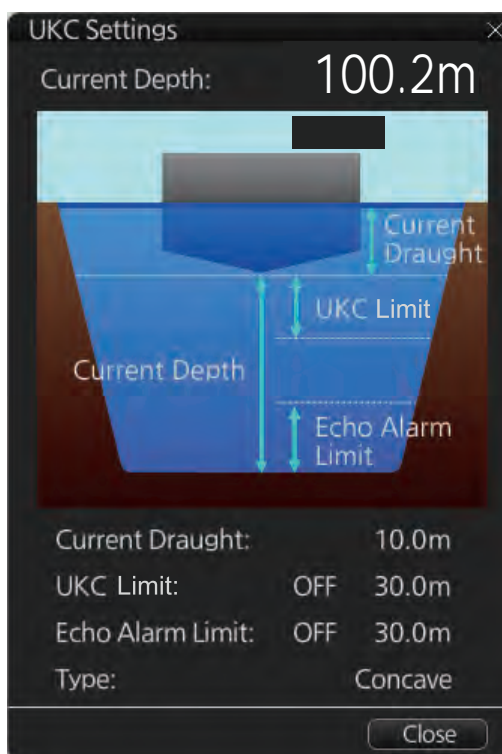


15.8.3 UKC window

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



V-shape hull presentation



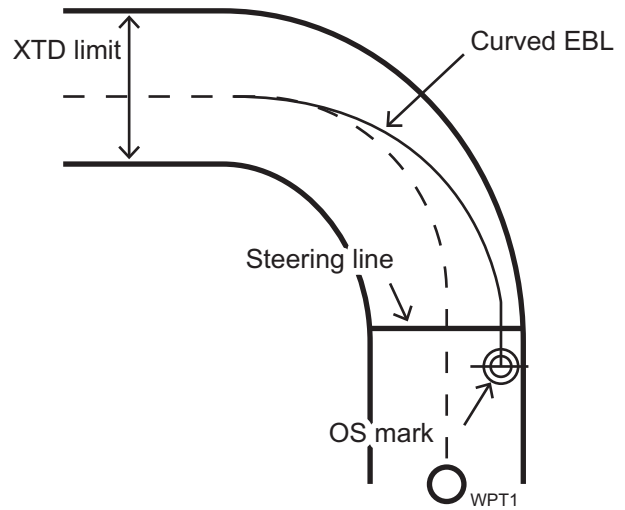
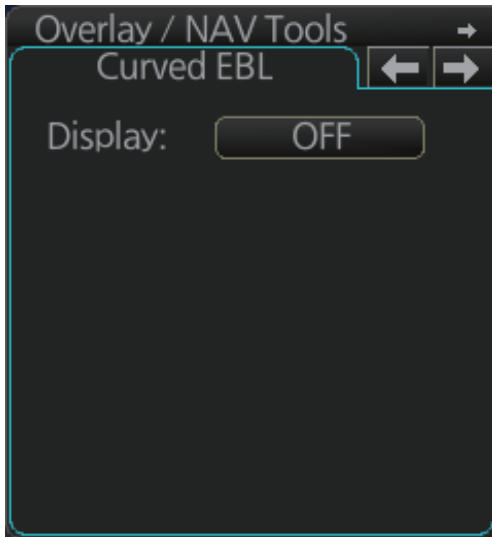
Concave hull presentation

15.9 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.

Note: This function is only available when a EC-3000 with TCS functionality is connected to the network.



15.10 Divider

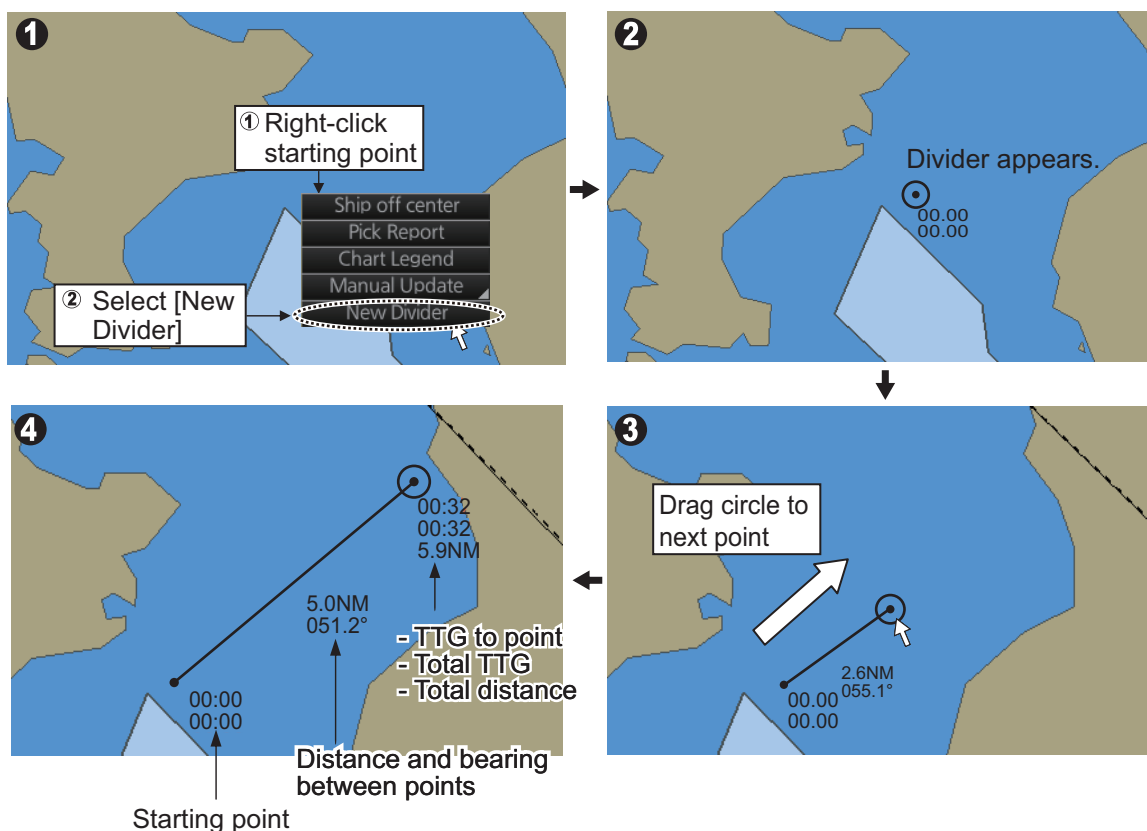
The divider performs the following calculations:

- 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-3x00, FCR-2xx9 or FAR-3xx0).

15.10.1 How to use the divider

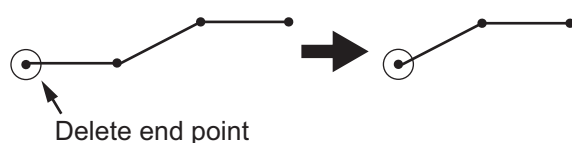
Do as shown below to use the divider.



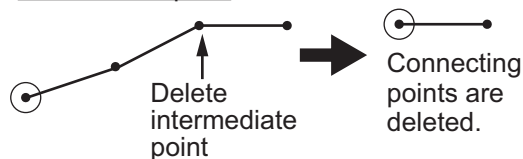
How to delete points

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.

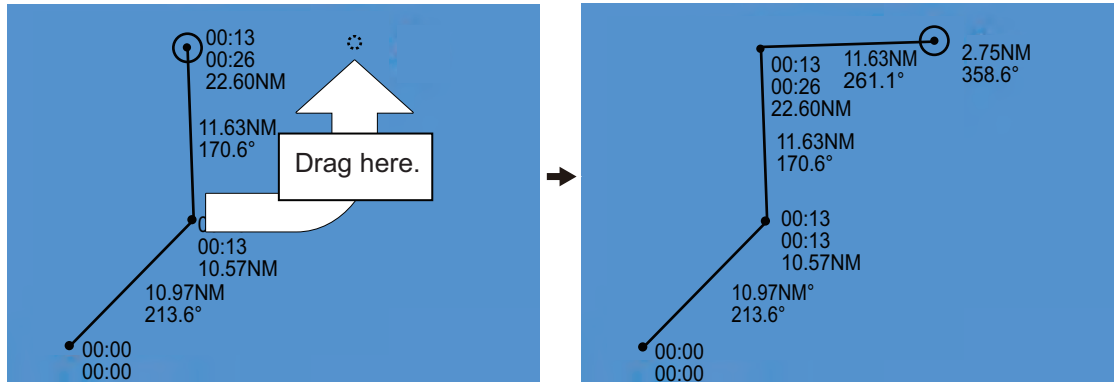
End point



Intermediate point



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



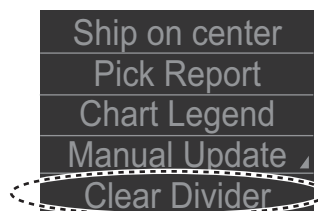
Note: If you drag a point to the edge of the displayed area, the chart scrolls in that direction.

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

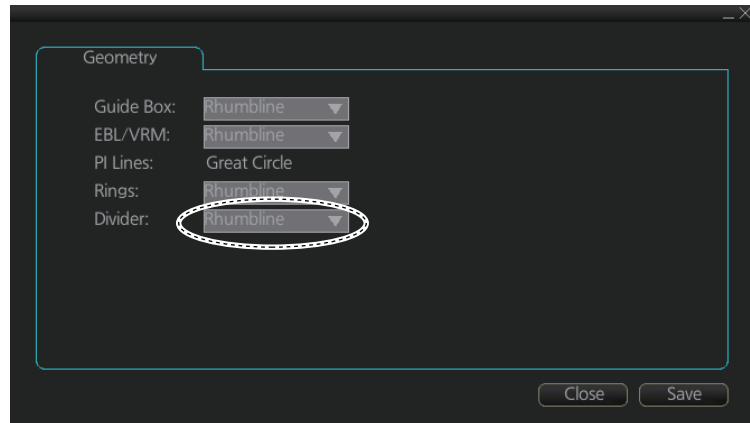
Get into the Voyage navigation or Voyage planning mode then right-click the screen to show the context-sensitive menu. Select [Clear Divider].



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.

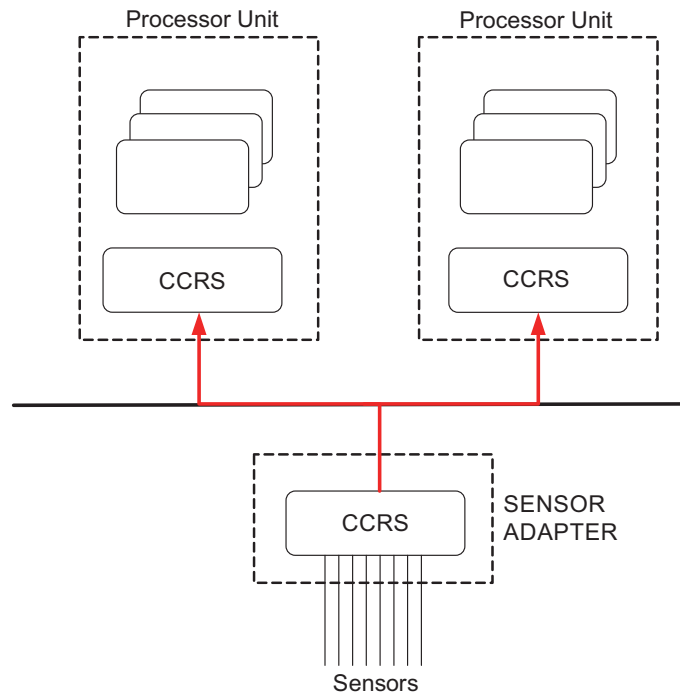


2. Select [Rhumbline] or [Great Circle] with the drop down list box for [Divider].
3. Click the [Save] button to save the setting, then click the close button to finish.

16. NAVIGATION SENSORS

16.1 CCRS

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



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

Check for validity, legitimacy

The system checks received sentences for validity and legitimacy.

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

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

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

Types of CCRS

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

Representative sensors

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

16.2 How to Select Navigation Sensors

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

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

16.2.1 Sensors menu description

[HDG] page (Local Sensor)

HDG

Data Source:

Sensors

Priority	Sensors
1	ECD001/FILTER
2	GYO001

Analog Gyro

Adjust

0.0°

Manual

0.0°

Cancel

OK

- [Sensors]: Select the heading sensor to use.
- [Analog Gyro]: No use.
- [Manual]: Set heading manually when there is no heading sensor available. (Not shown on IMO type.)
- [Gyro Correction]: Set correction manually for the heading value. (Not available with the [System Sensor Setting] menu.)

[SPD] page (System Sensor)

SPD

Stabilization Mode:
☒ Bottom ☐ Water

Sensor Type:
☒ GPS ☐ LOG

Data Source:
☒ Sensors

Priority	Sensors
1	GPS001

☐ Manual 12.5 kn
☐ Reference SPD
 Drift :
☐ Set Drift 0.0 °T 0.0 kn

Cancel OK

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

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

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

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

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

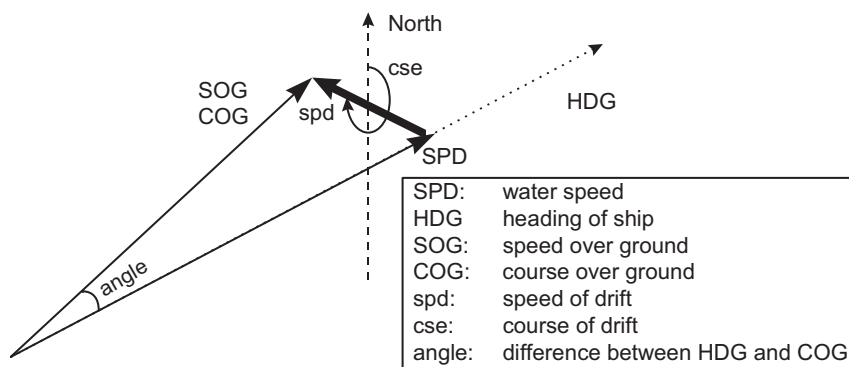
[Set Drift]: Check the [Set Drift] checkbox to manually set speed and course of drift. Note that you can select manual drift only if you check [Water] in [Stabilization Mode].

Angle = Difference between heading and COG

Spd = Speed component of the drift vector

Cse = Course component of the drift vector

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



[COG/SOG] page

Priority	Sensors
1	GPS001

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

[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. When the position source is changed based on priorities and signal validity to another position source, then you get the Alert 472 (ALF format: 10602,1) "Position Source Change".

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

[Other Sensor] page

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

The screenshot shows a software interface for configuring various sensors. The 'Other Sensor' tab is active, displaying settings for Wind, Depth Below Trans., Temperature, and Water Current. The Wind section has input fields for speed (1.9), unit (kn), reference (012.1°), and source (APPARENT). The Depth Below Trans. section shows Bow, Mid, and Aft depths (all 130.7m, 130.8m, and 130.8m respectively). The Temperature section shows Water temperature. The Water Current section shows Course (037.3°) and Speed (3.2kn). There are 'Close' and 'Save' buttons at the bottom right.

[Wind]: Select wind unit, wind reference, and wind source. See section 16.9.

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

[Temperature]: Water surface temperature.

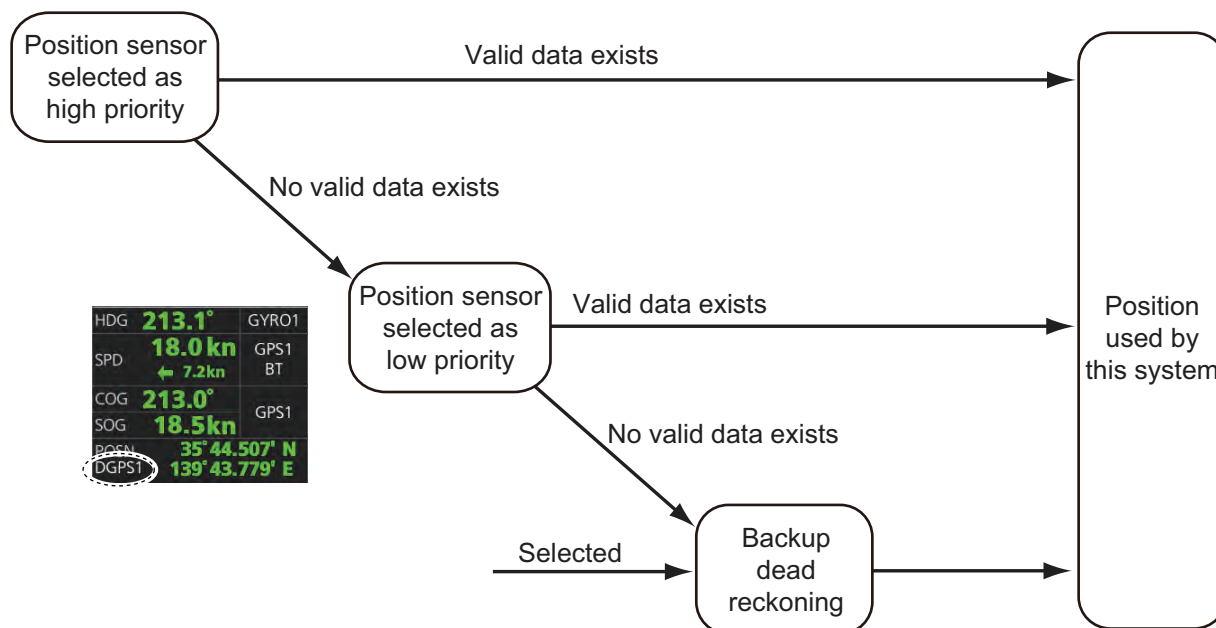
[Water Current]: Tide at own ship's position.

16.3 Source of Position

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

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

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



If the system changes the source of position because of lost sensor data, the system immediately generates the Alert 472 (ALF format: 10602,1) "Position Source Change".

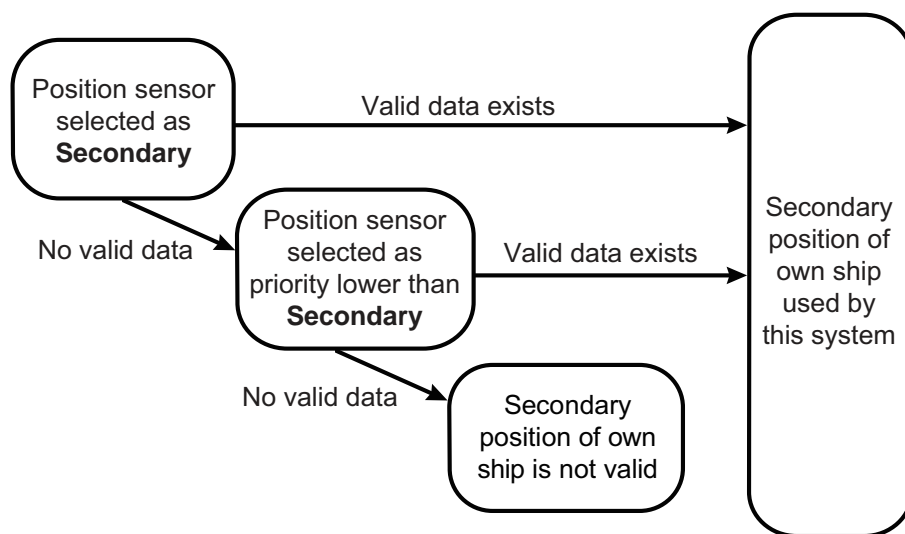
16.4 Primary and Secondary Positions of Own Ship

This system displays position in one of four methods

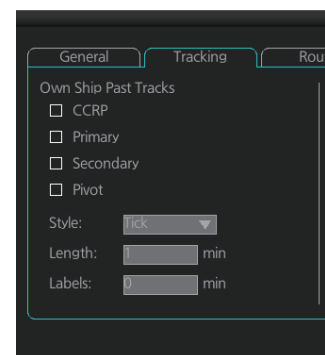
- **CCRP position:** CCRP
- **Primary position:** Position generated by position source chosen as highest priority.
- **Secondary position:** Position generated by position source chosen as 2nd highest priority.
- **Pivot position:** Ship's pivot point position.

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.



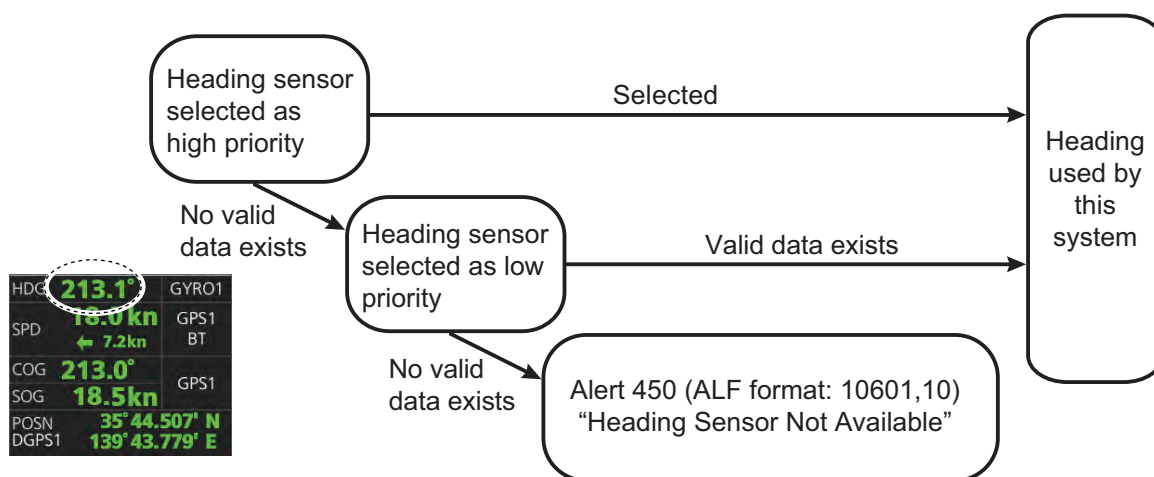
System, primary and secondary positions of your ship may be plotted on the chart radar display with the past tracks feature. You can control their visibility, etc. from the [Tracking] page of the [Symbol Display] menu, shown in the right figure. In this example, past tracks are plotted using the primary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



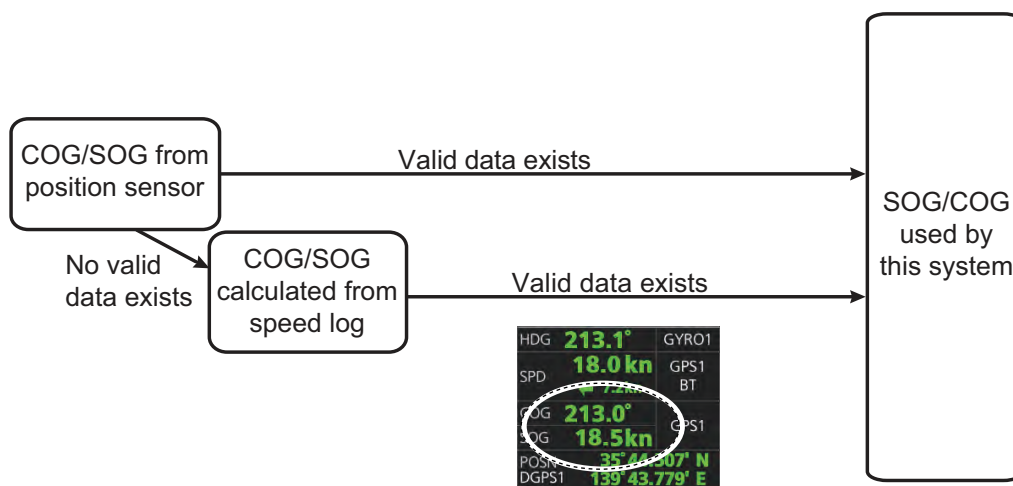
16.5 Source of Navigation Data

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.

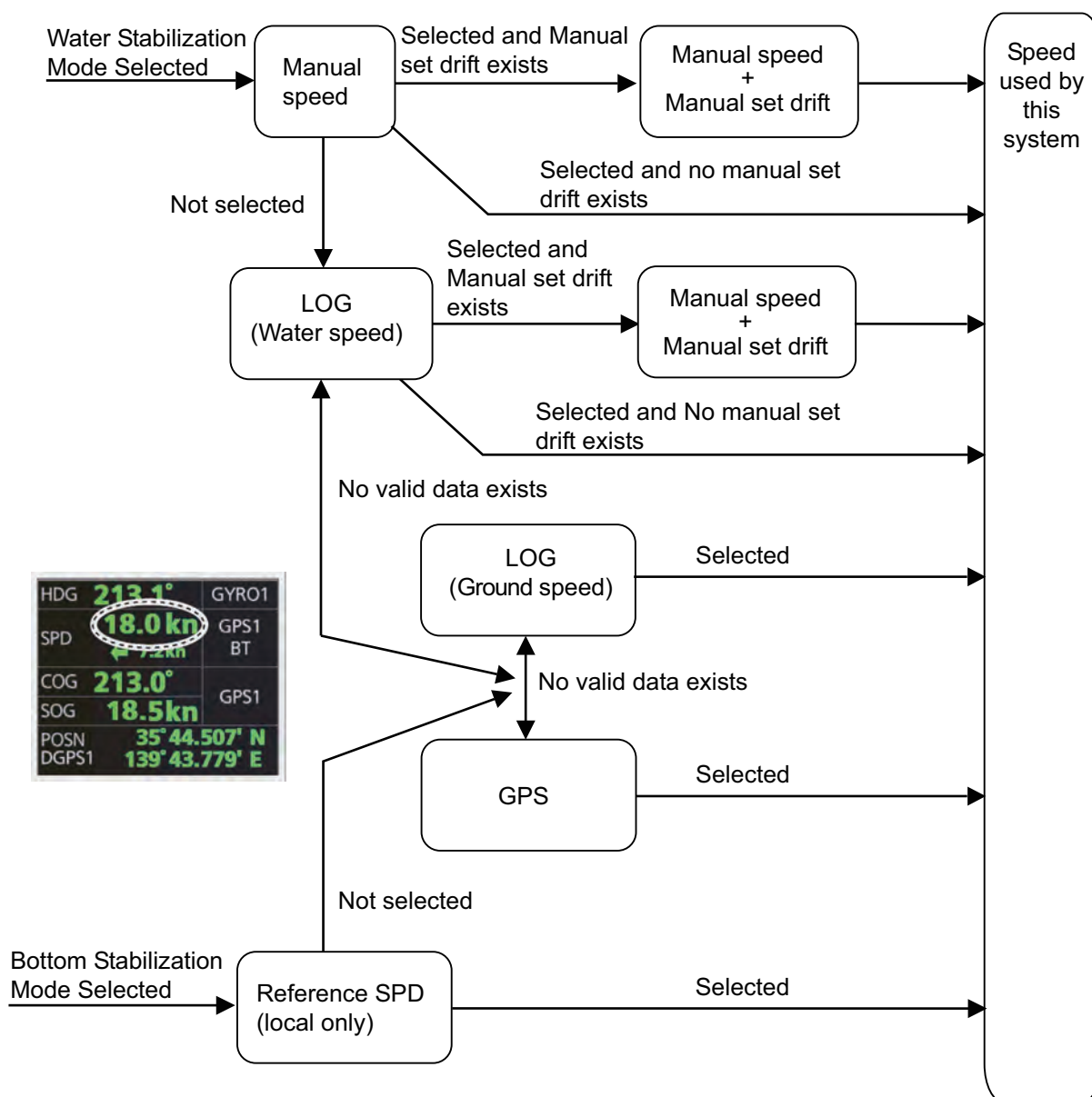
Heading used by the system is shown at the top-right position on the chart radar display. In the example shown below, heading is received from a gyrocompass and it is shown without additional text, meaning the value is referenced to true North.



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

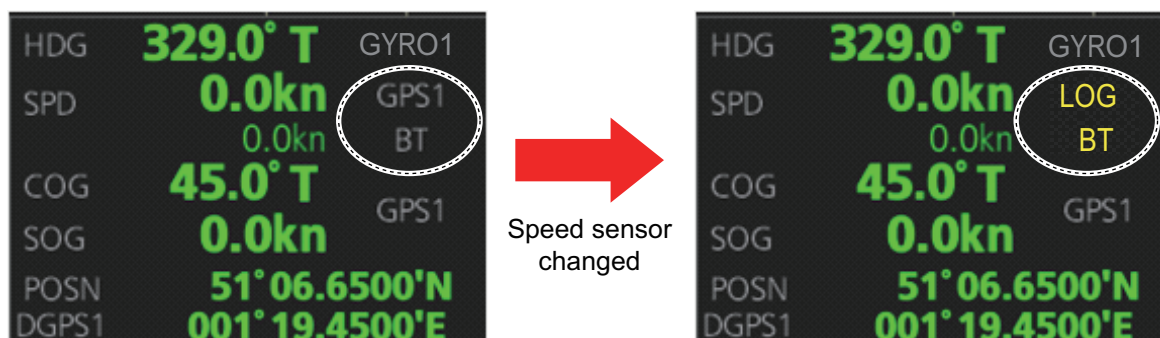
It is possible that the operator has not chosen any speed or heading sensors, or that the chosen sensors do not have any valid values. This kind of a situation is critical for the system, because it cannot even perform dead reckoning.

When no heading source is available, the system generates the Alert 450 (ALF format: 10601,9) "Heading Sensor Not Available."

When no speed source is available, the system generates the Alert 453 (ALF format: 10601,10) "SDME Sensor Not Available." When no COG/SOG data is available, the system generates the Alert 279 (ALF format: 10601,6) "COG/SOG Not Available."

16.6 Switching of Sensor and Indication

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



16.7 Filter Status

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

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

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

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

The integrity check result appears in the following locations:

- [Local Sensor Setting] and [System Sensor Setting] menus. The figure below shows the result for the heading sensor GYRO1.

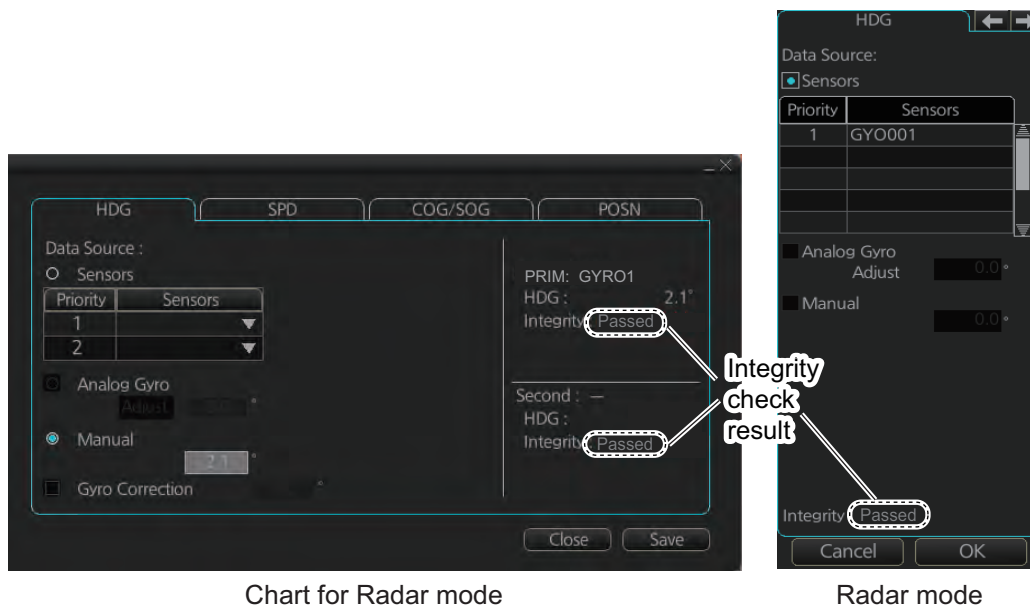


Chart for Radar mode

Radar mode

- [Filter Status] page in the [Other Sensor Setting] menu. See the next page.

Note: Depending on settings selected at installation, the integrity check result colors can be changed.

[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.

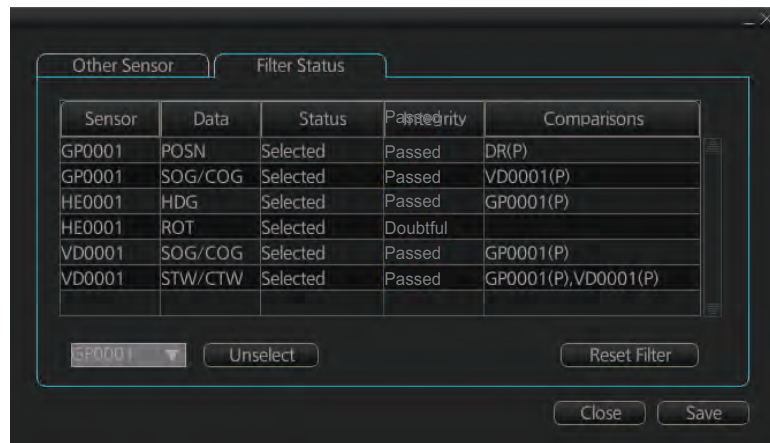
[Not Available]: Sentence is abnormal or improper.

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	<ul style="list-style-type: none"> • Comparison with other position sensors. • Comparison with dead reckoning position.
Heading	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.

16.8 Position Alignment

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

If position alignment is in use, the Alert 640 (ALF format: 10803) "Chart Align: Over 30 Min." is generated every 30 minutes to remind the user to align position. The alert is automatically erased in 10 seconds.

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

16.8.1 How to align position

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

Position may be aligned on the chart radar display by moving own ship position or by moving radar target position. To align position, get into the Voyage navigation mode, click the [Offset] button at the top-right position on the screen. (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.

16.8.2 How to cancel position alignment

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

16.9 Wind Sensor

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

Apparent: Windmeter-measured wind speed and direction.

Wind angle reference: Heading

North: True wind angle, true wind speed

Wind angle reference: True North

Theoretical: True wind angle, true wind speed

Wind angle reference: Heading

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

The wind values are as shown below.

Ship information:

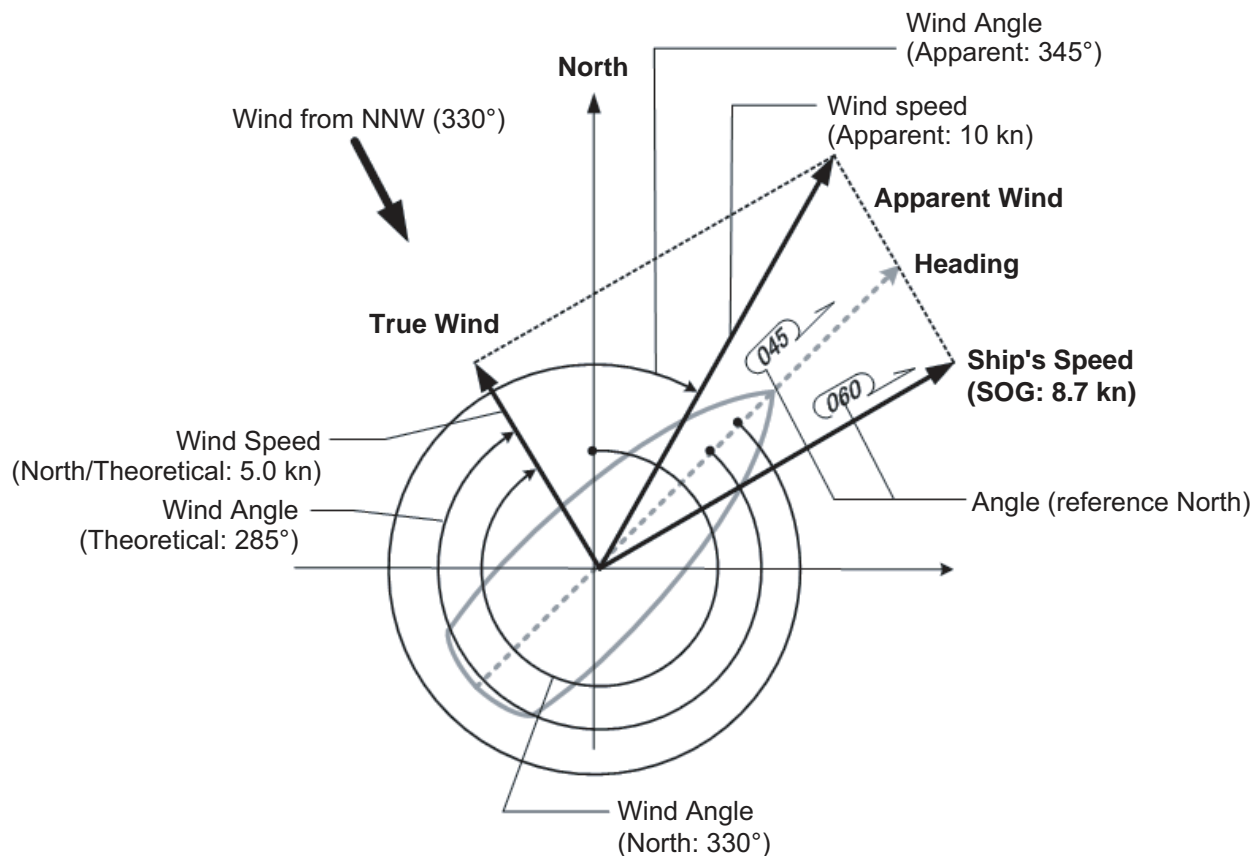
COG: 60°

SOG: 8.7 kn

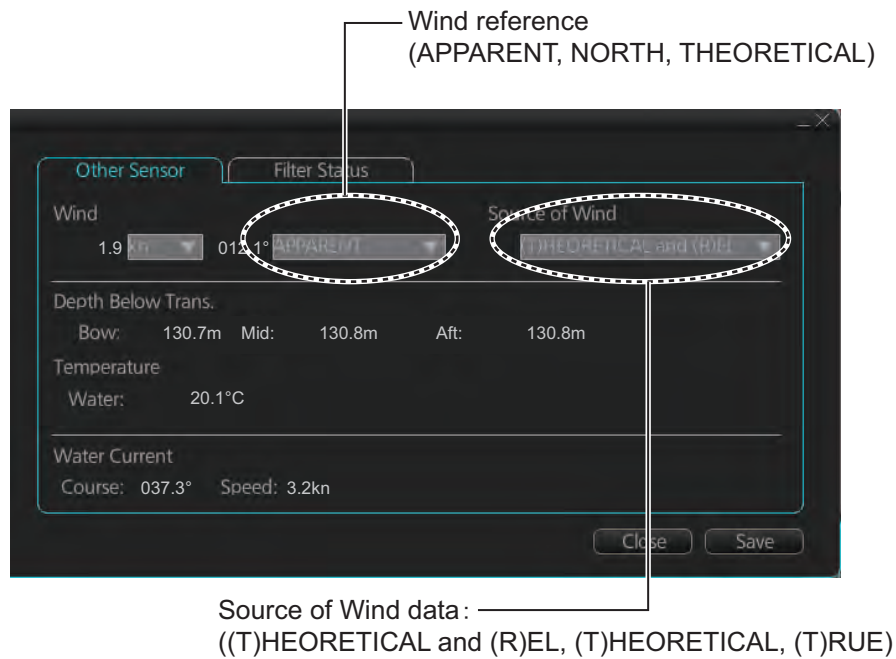
Heading: 45°

16. NAVIGATION SENSORS

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



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.

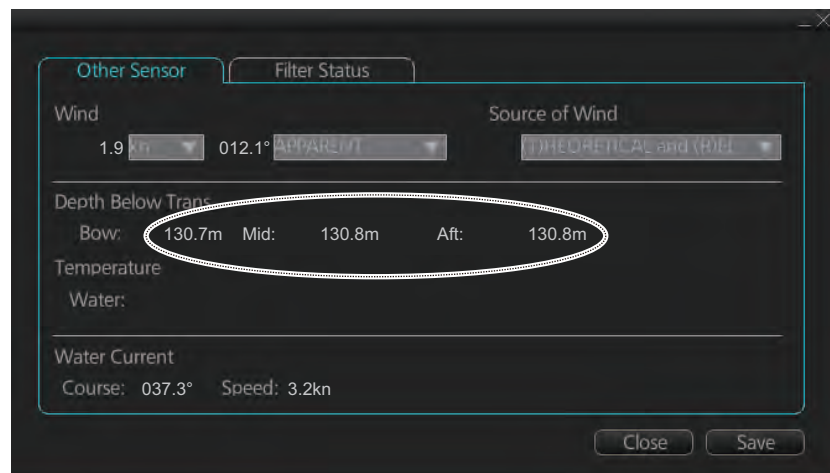


16.10 Depth Sensor

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

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

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



The system displays depth value as depth below the transducer. If required, you can get an alert when the measured depth is less than the "Echo Alarm Limit" setting at the [UKC] page in the [Overlay/NAV Tools] box. The system generates the Alert 485 (ALF format: 10801) "Depth Limit".


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17. AIS SAFETY, NAVTEX MESSAGES

17.1 AIS Safety Messages

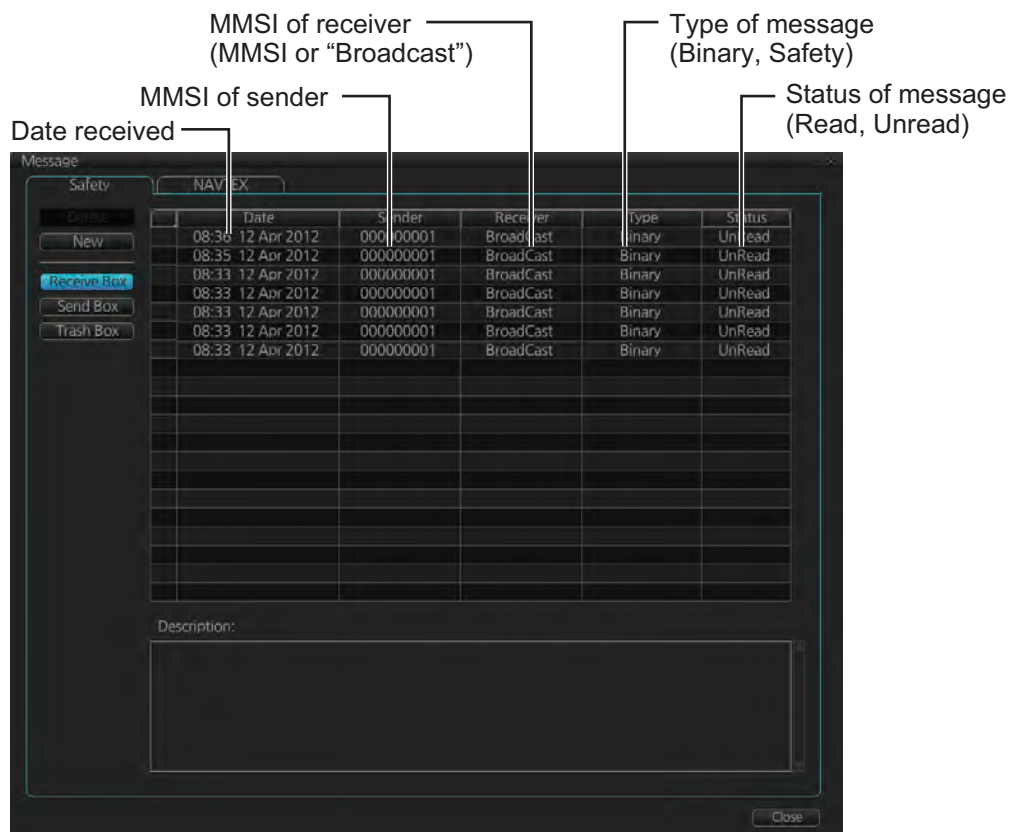
You can send and receive messages via the VHF link, to a specified destination (MMSI) or all AIS-equipped ships within communication range of your ship. Messages can be sent to warn of safety of navigation, for example, an iceberg sighted. Routine messages are also permitted. Short safety-related messages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

17.1.1 How to send an AIS safety message

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

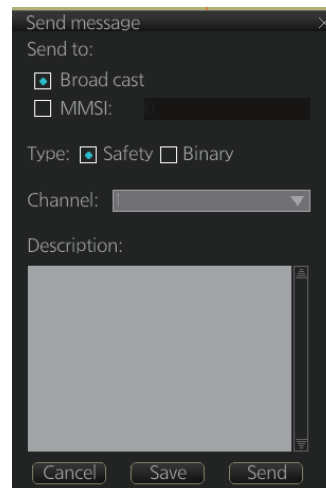


1. In the Voyage navigation mode, click the [MSG] and [Safety MSG] buttons on the InstantAccess bar™ to show the [Message] dialog box.



17. AIS SAFETY, NAVTEX MESSAGES

- Click the [New] button.
- At [Send to], select where to send the message. Select [Broadcast] to send the message to all AIS-equipped ships within communication range, or select [MMSI] and enter the MMSI of the ship where to send the message.
- At [Type], select the type of message, [Safety] or [Binary] (routine).
- At [Channel], select the channel to use to send the message.
- At [Description], enter the text of your message. The no. of characters available depends on the type of message.
Safety message broadcast: 90 characters
Binary message broadcast: 86 characters
Safety message addressed to MMSI: 85 characters
Binary message addressed to MMSI: 80 characters
- Click the [Send] button to send the message.

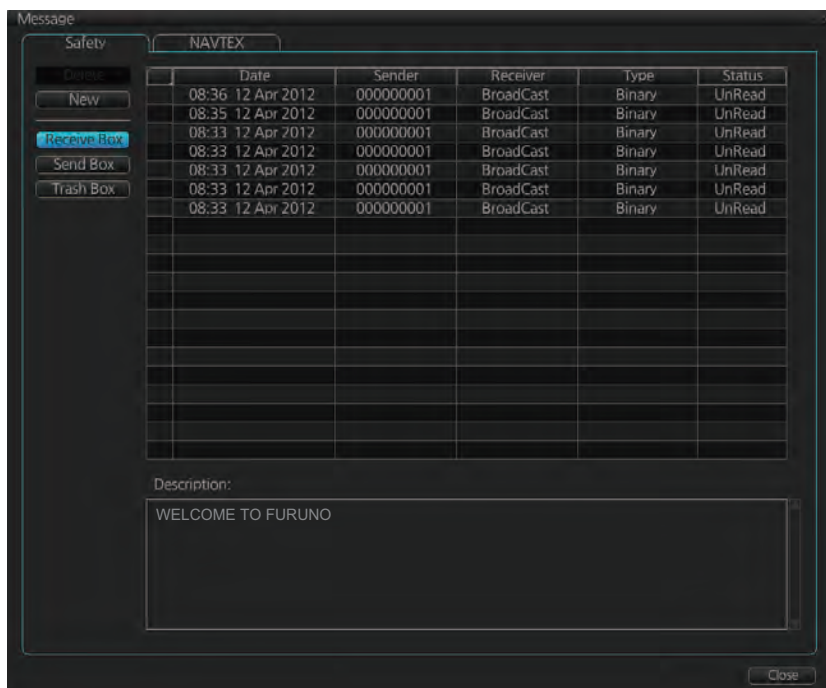


Send message dialog box. Fields include: Send to: ☒ Broadcast, ☐ MMSI: [text field]; Type: ☒ Safety, ☐ Binary; Channel: [dropdown]; Description: [text area]. Buttons: Cancel, Save, Send.

17.1.2 How to display received and sent AIS safety messages

When an AIS message is received, the Alert 539 (ALF format: 10540,1) "AIS Message Received" appears. Do the following to view the message.

- In Voyage navigation mode, click the [MSG] and [Safety MSG] buttons on the InstantAccess bar™.
- Click the [Receive Box] or [Send Box] button as appropriate.
- Click a message to view its contents.



Message list and details screen. The top section shows a list of messages with columns: Date, Sender, Receiver, Type, and Status. The bottom section shows the message description: WELCOME TO FURUNO.

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

Description: WELCOME TO FURUNO

17.1.3 How to delete received and sent AIS safety messages

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

How to delete a received or sent message

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

How to delete received or sent messages permanently

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

17.2 Navtex Messages

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

Navtex messages can be received and read.

The [Receive Box] can store up to 500 messages. When the [Receive Box] is full and a new message is received, the system automatically deletes messages, in order, from the oldest message.

Note: If the message "Database access failure occurred. NAVTEX messages cannot be received." appears, your Navtex database may be corrupted. Consult your dealer for advice.

17.2.1 How to receive Navtex messages

To display a received NAVTEX message, do the following:

1. In Voyage navigation mode, click the [MSG] and [NAVTEX MSG] buttons on the InstantAccess bar™.
2. Click the message to view. The text of the message appears in the [Description] box.

Message protection status:
P = Protected
Blank = Un-protected

Date received

Frequency/Message ID

Type of message

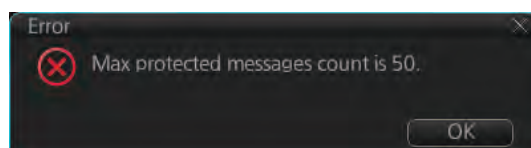
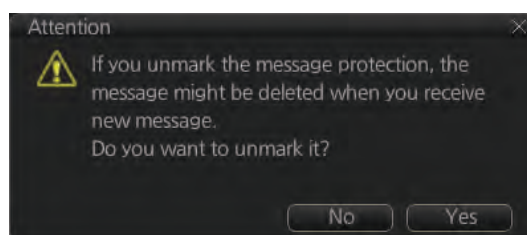
Message status: Read or Unread

Where coordinates are included in the message, the latitude and longitude are displayed here. The chart is also appropriately marked with the MSI marker.

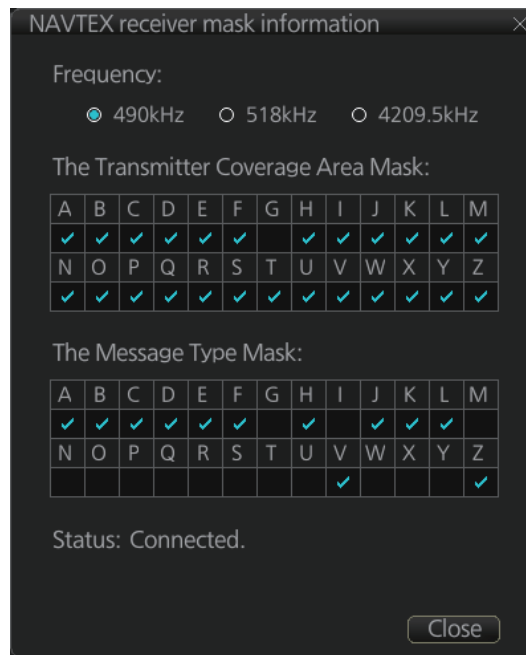
Where the selected message has a date range, the dates are displayed here.

Date	Code	Message type	Status
17:01 28 Jun 2016	518kHz/GA50	Navigation warning	Read
17:00 28 Jun 2016	518kHz/GA53	Navigation warning	Read
15:07 28 Jun 2016	518kHz/G888	Meteorological warning	Read
15:04 28 Jun 2016	518kHz/HB73	Meteorological warning	Read
17:27 27 Jun 2016	518kHz/IA77	Navigation warning	Read
17:25 27 Jun 2016	518kHz/IA88	Navigation warning	Read
17:12 27 Jun 2016	518kHz/HA37	Navigation warning	Read
17:05 27 Jun 2016	518kHz/GA47	Navigation warning	Read

- You can filter the displayed messages.
To filter by date: Enter the date range for displayed messages in the [Date Range(UTC)] input area. To clear the filter, click the [Clear] button. Check the Filter by Date box to activate the filter.
To filter by distance: Check the [Filter by Distance] box to activate the [Distance from Own Ship] input area. Enter the appropriate distance (setting range: 1 to 100 NM).
- To protect a message, or remove the protection, click the protection status column for the message. When removing protection, the confirmation window shown below appears. Select [Yes] or [No] as appropriate.
Note: You can protect up to 50 messages. When you try to protect more than 50 messages, the message shown below appears.



- You can check the settings for the Navtex receiver (if connected). Click the [Receiver] button to show the settings.



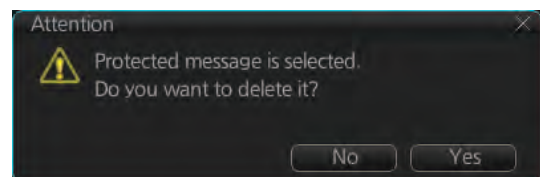
17.2.2 How to delete received Navtex messages

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

How to delete received Navtex messages

1. Click the [MSG] and [NAVTEX MSG] buttons on the InstantAccess bar™.
2. Click the [Receive Box] button.
3. Click the selection column (indicated in the figure at section 17.2.1) to show a checkmark in the box. (All messages can be checked or unchecked with the context-sensitive menu. Right-click the box to the left of "P" then select [Select All] or [Deselect All] as applicable.)
4. Click the [Delete] button. The selected message is sent to the [Trash Box]. The [Trash Box] can hold up to 200 messages.

Note: If a protected message is selected for deletion, the confirmation message shown to the right appears. Click [Yes] to delete the protected message or [No] to cancel deletion.



How to deleted received Navtex messages permanently

1. Click the [MSG] and [NAVTEX MSG] buttons on the InstantAccess bar™.
2. Click the [Trash Box] button.
3. Click the selection column (indicated in the figure at section 17.2.1) to show a checkmark in the box. (All messages can be checked or unchecked with the context-sensitive menu. Right-click the box to the left of "P" then select [Select All] or [Deselect All] as applicable.)
4. Click the [Delete] button.

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18. TT AND AIS DISPLAYS

Tracked targets and AIS targets can be overlaid on the chart. Only the differences between the radar and chart TT and AIS displays are described here.

The data of received radar-tracked targets must have reference to ground. If the data does not meet that criteria, target vectors are not shown and the indications COG and SOG in the TT info data box show [missing].

18.1 TT Display

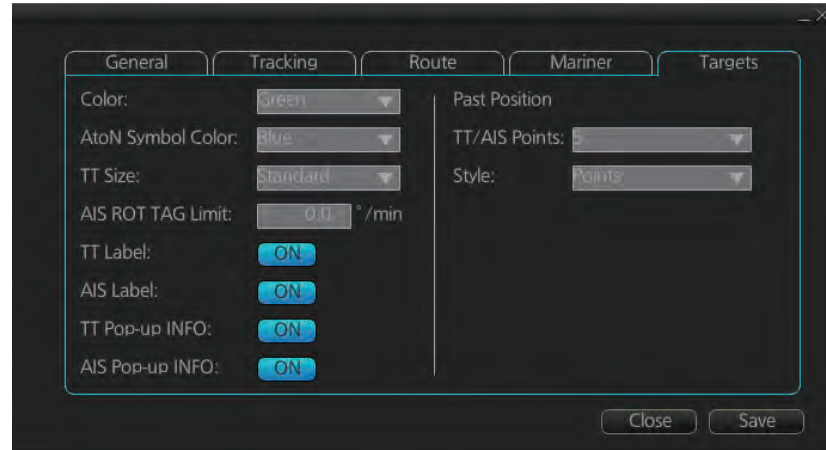
18.1.1 TT symbols

Refer to paragraph 3.7.1.

18.1.2 TT symbol color and size

Do the following to select TT symbol color and size. Note that the color of the AIS symbol is also changed.

1. Click the [DISP], [SET] and [Symbol DISP] buttons on the InstantAccess bar™ to show the [Symbol Display] menu.
2. Click the [Targets] tab.

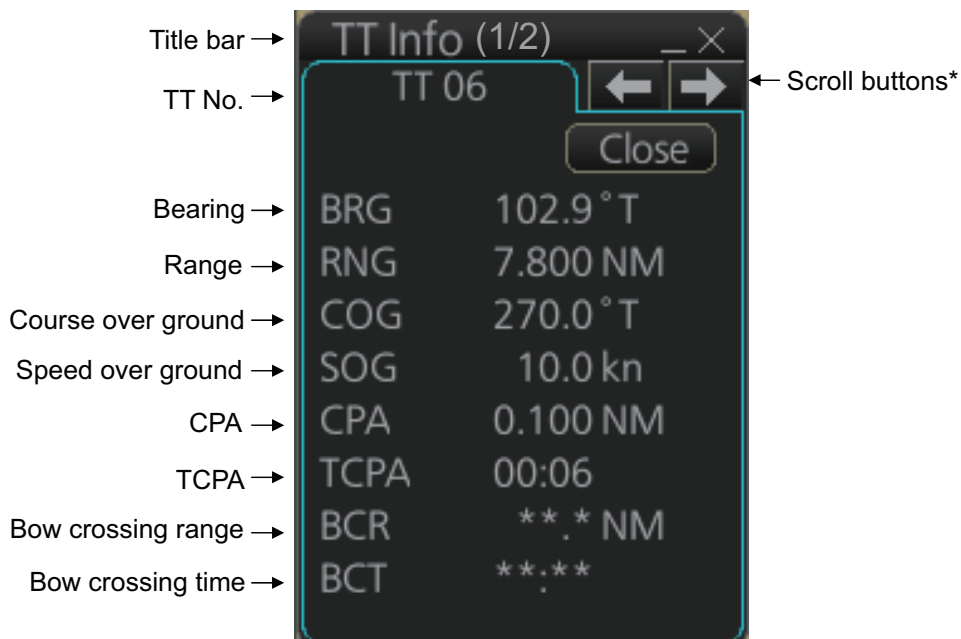


3. Select the color among, green, blue, black, magenta and brown, with the [Color] pull-down list.
4. Select the size from standard or small, with the [TT Size] pull-down list.

18.1.3 How to display tracked target data

Control Unit: Put the cursor on a target then push the **TARGET DATA** key.

Trackball module: Click the target for which you want to show its data.



*: Scroll buttons appear only when there is more than one TT target's data displayed.

To erase data from a data box, click the close (×) button.

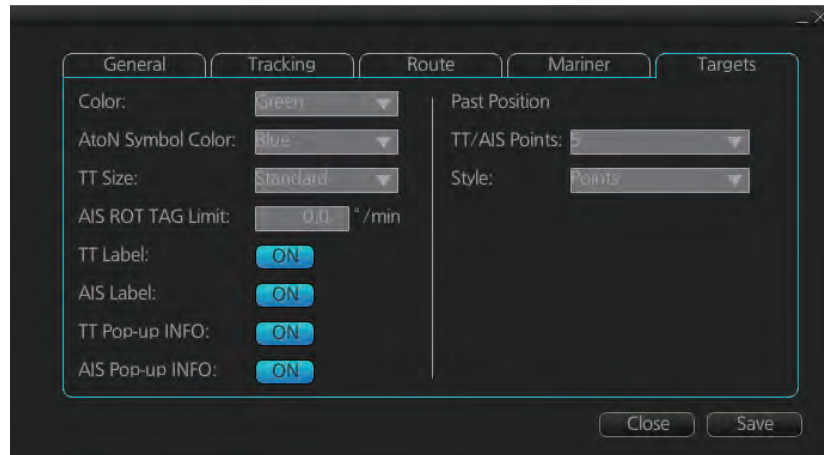
The basic target data display for a TT consists of the following information:

- Target's number. Target numbering starts from "01". When a target is erased the number will not be reused until the power is re-set or more than 200 targets are acquired.
- Bearing (BRG) and distance (RNG) of the target from own ship
- True speed (SOG) and true course (COG) of the target
- CPA and TCPA. A negative TCPA value means that you have already passed the closest point and the TT is going away from own ship.
- Bow Crossing Range (BCR) and Bow Crossing Time (BCT)

18.1.4 Past position point attributes

You can define past position point attributes for tracked targets by points and style.

1. Click the [DISP], [SET] and [Symbol DISP] buttons on the InstantAccess bar™ to show the [Symbol Display] menu.
2. Click the [Targets] tab.

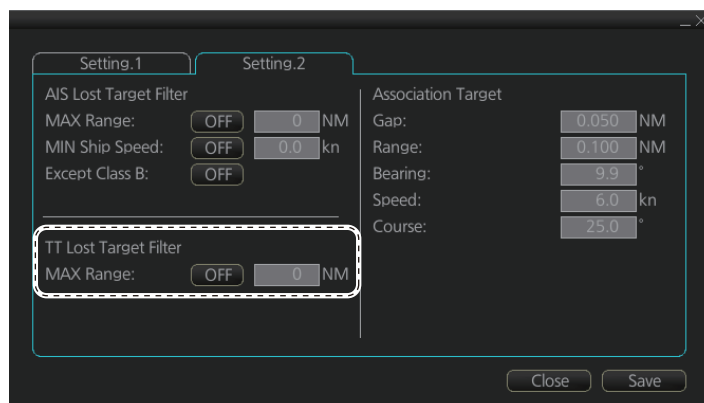


3. At [TT Points], select the number of points to show.
4. At [Style], select the style for the past position points. The choices are [Points] and [Points and Dots].

18.1.5 How to set the TT lost target filter

If you are in a congested area the lost target alert may sound against many AIS targets. In this case, you can prevent the alarm from sounding against TT that are beyond a certain range and/or smaller than a specific length.

1. Open the MENU and select [TT/AIS] and [Setting] then click the [Setting.2] tab.



2. In the [TT Lost Target Filter] window, set the maximum range to track a target. [MAX Range]: The maximum range at which to track a lost target. A tracked target not within this range is not tracked.
3. Click the [ON/OFF] button to show ON or OFF as appropriate.

18.1.6 TT recording functions

Tracked target information is saved to the [Danger Targets] log. See section 19.5.

18.2 AIS Display

18.2.1 AIS symbols

Refer to section 4.3.

18.2.2 Voyage data

Before you embark on a voyage, set your navigation status, ETA, destination, draught and the number of persons onboard, on the [Voyage Data] page in the [NAV Status] menu. The data entered here is reflected to the AIS transponder.

1. Open the MENU then click both [NAV Status] in the [TT/AIS] menu and the [Voyage Data] tab.

2. Click the [Navigational Status] drop-down list then select your navigational status, from the list below.

- | | |
|------------------------------|-------------------------------------------------------------------------|
| • Underway using engine | • Reserved for high speed craft |
| • At anchor | • Reserved for wing in ground |
| • Not under command | • Power driven vessel towing astern (regional use) |
| • Restricted maneuverability | • Power driven vessel pushing ahead or towing along-side (regional use) |
| • Constrained by her draught | • Reserved for future use |
| • Moored | • AIS-SART (active) |
| • Aground | • Not defined |
| • Engaged in fishing | |
| • Under way sailing | |

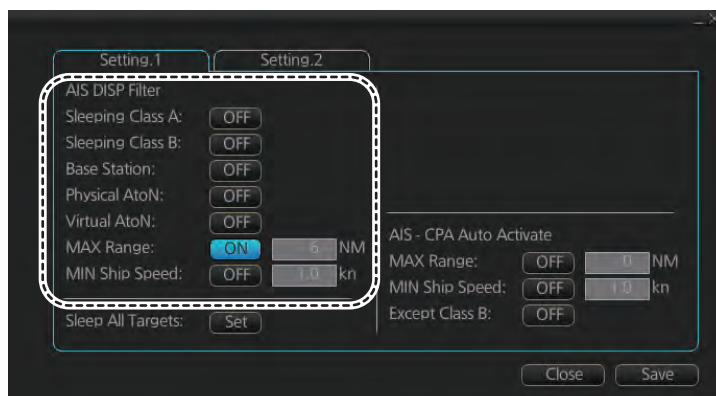
3. Enter the number of persons onboard (0-8191) at [Persons].
4. Enter ship's draught (0.0 - 25.5 (m)) at [MAX Draught].
5. Enter your ETA at [ETA].
[Day]: two digits; [Month]: Three-character abbreviation; [Year]: Four digits
6. Enter your destination at [Destination], using a maximum of 20 characters.
7. Use the [Cargo Type] pull-down menu to specify the type of cargo your vessel is carrying.

- All ships of this type
- Carrying DG, HS, or MP, IMO hazard or pollutant category X
- Carrying DG, HS, or MP, IMO hazard or pollutant category Y
- Carrying DG, HS, or MP, IMO hazard or pollutant category Z
- Carrying DG, HS, or MP, IMO hazard or pollutant category OS
- Reserved for future use (x4)
- No additional information

8. Click the [Save] button to save the settings.

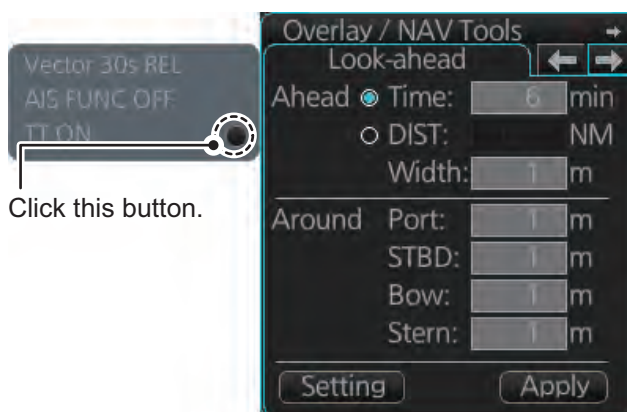
18.2.3 How to filter AIS targets

1. Right-click [AIS] on the [TT/AIS] page in the [NAV Tools/Overlay box], select [Setting] and open the [Setting.1] page.



Note: You can also access the [Setting.1] page with one of the following methods:

- From the main menu, select [TT/AIS], [Settings] and [Setting.1].
- Click the TT/AIS settings radio button (indicated in the figure below) from the Overlay/NAV Tools box. (The radio button is not available when the TT/AIS page is displayed.)



2. In the [AIS DISP Filter] window, set each item referring to the description below.
 - Click the buttons of [Sleeping Class A] and [Sleeping Class B] to show [OFF] or [ON] to hide or show those targets.
 - Click the button of [Base Station] to show [OFF] or [ON] to hide or show AIS base stations.
 - Click the button of [Physical AtoN] to show [OFF] or [ON] to hide or show Physical AtoN targets.
 - Click the button of [Virtual AtoN] to show [OFF] or [ON] to hide or show Virtual AtoN targets.
 - Set the maximum range with [MAX Range]. Any target beyond the range set here will not be displayed.
 - Set the ship speed for AIS targets, with [MIN Ship Speed]. Any AIS target whose speed is lower than that set here will not be displayed.
3. Click the [Save] button to save settings. Click the [Close] button to close the dialog box.

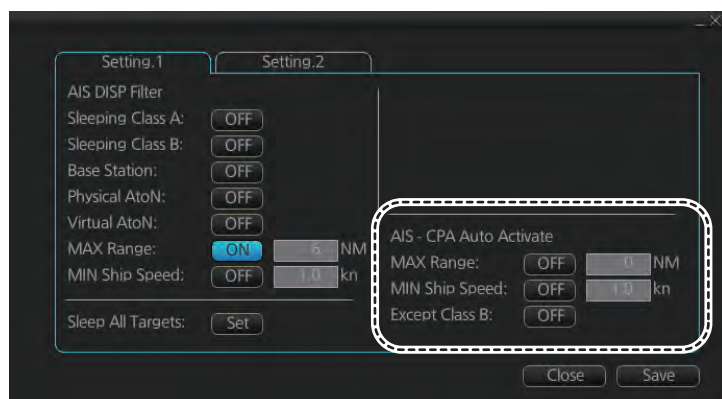
Note: AIS and tracked target viewing limitations are as follows:

AIS and tracked targets are displayed on top of chart 1:1,000,001 for S57 charts.

18.2.4 How to set conditions for automatic activation of sleeping targets

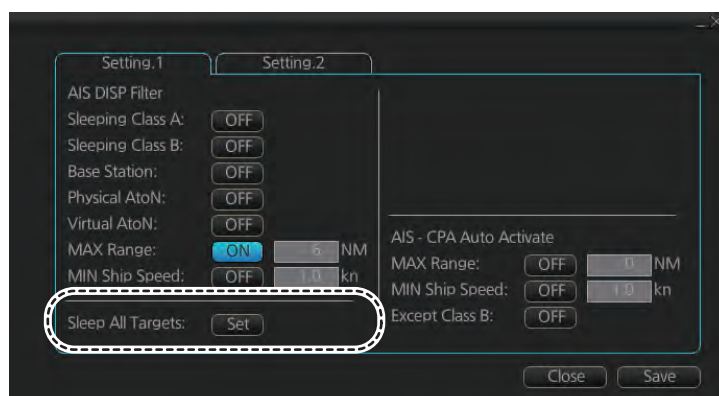
The AIS target automatic activation feature is turned on or off from the [TT/AIS] page in the [Overlay/NAV Tools] box. Set the conditions for automatic activation as shown below. The CPA/TCPA alarm must be active to get automatic activation of AIS targets.

Right-click [AIS] on the [TT/AIS] page in the [NAV Tools/Overlay box], select [Setting] and open the [Setting.1] page.



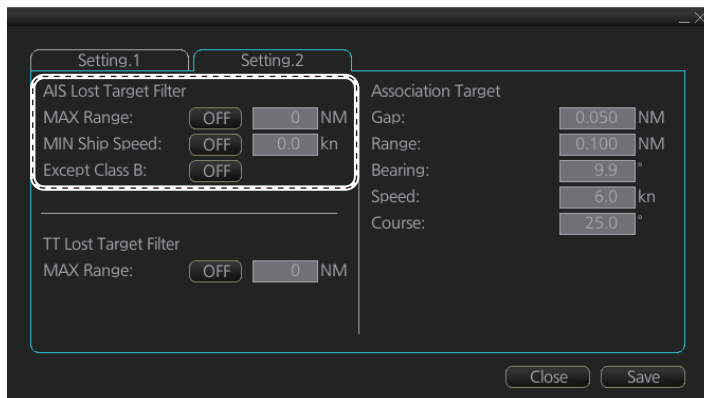
18.2.5 How to sleep all activated targets

You can sleep all activated targets. Right-click [AIS] on the [TT/AIS] page in the [NAV Tools/Overlay box], select [Setting] and open the [Setting.1] page. Click the button to the right of [Sleep All Targets] then click the [Set] button.



18.2.6 How to set the AIS lost target filter

You can select what AIS targets to exclude from the AIS lost target alert, on the [Setting.2] page in the [TT/AIS] menu.



[MAX Range]: Set the max. range at which a target must be to be declared a lost target.

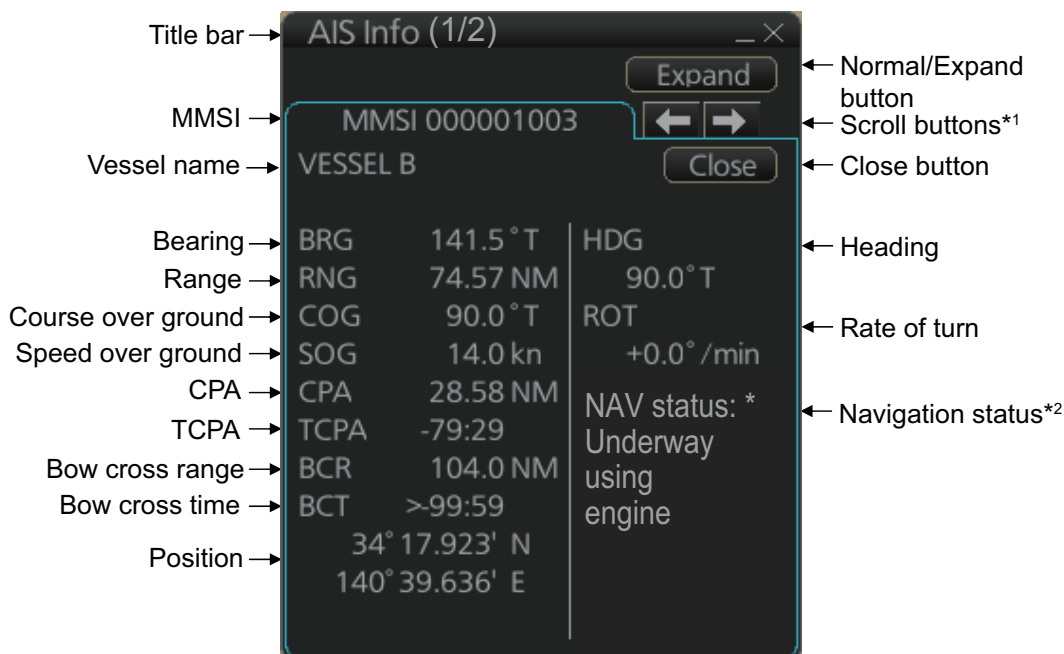
[MIN Ship Speed]: A tracked target whose speed is slower than set here does not trigger the lost target alarm.

[Except Class B]: Exclude class B AIS targets from the AIS lost target alert.

18.2.7 How to display AIS target data

Normal data

Put the cursor on an activated target then push the left button.



*1: Scroll buttons appear only when there is more than one AIS target's data displayed.

*2: [Altitude] appears when the selected target is an AIS SART aircraft.

Expanded data

Put the cursor on a desired AIS target then push the left button. Click the [Expand] button (level of detail) on the [AIS Info] box to show expanded AIS data.

The screenshot shows the 'AIS Info (2/5)' window with the following data:

Title bar	AIS Info (2/5)		Normal	← "Level of detail" button
MMSI	MMSI 000001003		← Scroll buttons*1	
Vessel name	VESSEL B		Close	← Close button
Bearing	BRG	141.6° T	HDG	← Heading
Range	RNG	74.82 NM	90.0° T	
Course over ground	COG	90.0° T	ROT	← Rate of turn
Speed over ground	SOG	14.0 kn	+0.0° /min	
CPA	CPA	33.86 NM	NAV status:	
TCPA	TCPA	-78:41	Underway	
Bow cross range	BCR	121.1 NM	using	
Bow cross time	BCT	>99:59	engine	
Position	34° 17.922' N 140° 39.777' E			← Navigation status*2
Position sensor	POS sensor:	GPS		
Position sensor accuracy (HIGH, LOW)	POS ACC.:	HIGH		
Call sign	Call sign:	CALL2		
IMO No.	IMO No.:	IMO2222222		
Length	Length:	300m		
Width	Width:	11m		
Draught	Ship draught:	12.2m		
Destination	Destination:	DESTINATION2		
ETA	ETA:	31/DEC 23:59		
AIS version no.	AIS version:	1		
Ship & Cargo type	Ship & Cargo type:	Reserved for future use Carrying DG, HS, or MP, IMO hazard or pollutant category Y		
Association condition	Association:	OFF		

*1: Scroll buttons appear when there are multiple AIS targets.

*2: Where the selected AIS target is an aircraft, the STATUS box shows the aircraft's altitude.

18.2.8 How to display own ship data

You can see own ship's data on the [Own Ship] page in the [NAV Status] menu. Open the menu then click both [NAV Status] in the [TT/AIS] menu and the [Own Ship] tab.

Own Ship		Voyage Data	
MMSI:	457804356	Length(LOA):	223.2 m
Name:	FURUNO Voyager	Width:	31.8 m
Call Sign:	JZ5890312	Ref Bow:	3.3 m
Type:	0	Ref Port:	2.8 m
Description:	All ships of this type		

18.3 Association

An AIS-equipped ship is usually displayed by two symbols on the chart display. This is because the AIS ship position is measured by a GPS navigator (L/L) whereas the radar detects the same ship by PPI principle (range and bearing relative to own ship radar antenna).

To avoid the presentation of two target symbols for the same physical target, use the "association" function. If target data from both AIS and TT are available and if the association criteria are fulfilled, either the AIS or TT symbol is presented according to the association method selected.

Association will not happen between AIS and TT if the AIS target is sleeping or the AIS target is lost.

All association settings, including ON/OFF, can also be controlled from the radar mode, with the [TT/AIS] setting box (see section 4.14). All settings are mutually shared.

18.3.1 How to select association method

Click the location circled below to show "<" to select AIS symbol for associated target, or ">" to select TT symbol for associated target. This setting overrides the corresponding item on the [TT/AIS] menu. To turn off association, click the location to remove the arrow.

Overlay / NAV Tools		
TT/AIS		
TT	<	AIS
MAN		DISP ALL
Vector	3min	REL
CPA/TCPA	0.5NM	1min
AIS CPA	AUTO ACT ALL	
Lost TGT	FILT	
Past POSN	OFF	REL

Note: You can also select the method by right-clicking the location. Click desired association method.

Association: OFF
Association: TT
Association: AIS

18.3.2 How to set the conditions for association

To set the criteria for association, right-click [AIS] on the [TT/AIS] page in the [NAV Tools/Overlay] box, select [Setting] and open the [Setting.2] page. For setting details, see paragraph 4.14.2.

