

INSTRUCTION MANUAL

RADAR DISPLAY

Model **FMD-3005/FMD-3200/FMD-3200-BB/FMD-3300**



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FOREWORD

Introduction

This manual provides the operating procedures for the radar mode of the ECDIS FMD-3005, FMD-3200, FMD-3300, FMD-3200-BB. The radar mode is available with the ECDIS software version no. 2450074.01.51 or later.

Note: This manual refers to any of the above-mentioned ECDIS units as “FMD-3xxx”.

The radar mode displays the radar targets, TT (tracked targets) and AIS targets sent from a FAR-3xxx series radar. The radar controls transmission and radar picture processing functions such as gain, rain clutter, sea clutter, interference and pulse length.

For non-radar items see the operator’s manual for the above-mentioned ECDIS.

1. OPERATIONAL OVERVIEW

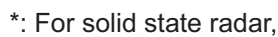
1.1 Controls



No.	Control	Description
1	EBL rotary encoder	Adjusts active EBL.
2	EBL 1, EBL 2	Activates or deactivates respective EBL.
3	BRILL	Rotate: Adjusts the brilliance of a FURUNO or Hatteland Technology monitor. Push: Selects a color palette.
4	A/C RAIN	Rotate: Suppresses rain clutter. Push: Toggles between manual and automatic rain clutter adjustment.
5	A/C SEA	Rotate: Suppresses sea clutter. Push: Toggles between manual and automatic sea clutter adjustment.
6	GAIN	Adjusts the sensitivity of the radar receiver.
7	VRM rotary encoder	Adjusts active VRM.
8	VRM 1, VRM 2	Activates or deactivates respective VRM.
9	UNDO	Undoes text input.
10	RANGE	Selects radar range.
11	VIEW/HIDE	Shows, hides PI box, Mark box, Drop 1 and Drop 2 boxes, and Trail box.
12	ACQ/ACT	TT: Acquires cursor-selected target, for target tracking. AIS: Activates cursor-selected sleeping AIS target.
13	TARGET DATA	Displays the detailed data for selected TT, AIS object, in the TT/ AIS information box.
14	TARGET CANCEL	TT: Stops tracking cursor-selected tracked target. AIS: Sleeps cursor-selected activated AIS target.

1.2 Radar Display

The illustration below shows the radar functions available with the FURUNO 19-inch monitor unit. The layout for other monitors may be slightly different.

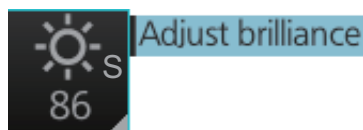


1-2

No.	Name	Description
3	Menu	Drop-down menu with various radar and chart functions.
4	Information box	Provides various navigation data and route information.
5	TT/AIS setting box	Sets the parameters for TT and AIS objects.
6	Trail box	Sets the parameters for the target trails.
7	Alert box	Shows alert messages by alert name and alert source. - Unacknowledged or regenerated alerts flash in red (alarm) or yellow-orange (warning). - Acknowledged alerts are shown in normal video.
8	Acquisition zone box	Sets an acquisition zone for TT, AIS.
9	VRM boxes	Shows the range and TTG to the VRM1, VRM2.
10	Target list button	Displays the TT and AIS object list.
11	Trial maneuver box	Sets the parameters for the trial maneuver.
12	Drop mark 2 box	Shows the bearing and range to the drop mark 2.
13	EBL boxes	Shows the bearing to the EBL1, EBL2.
14	Mark box	Selects the mark to inscribe on the radar display.
15	Drop mark1 box	Shows the bearing and range to the drop mark 1.
16	PI line box	- Adjusts the direction and width of the parallel index lines. - Activates or deactivates the parallel index lines.
17	Watch box	Counts down the time remaining until the buzzer sounds to alert the operator to view the radar picture. The watch alert function is available only for B-type.
18	InstantAccess bar™	Quick access to often-used radar, chart radar and chart functions. For radar and chart radar functions, see section 1.4. For chart functions, see chapter 2 in the ECDIS manual.
19	Tuning bar	Shows tuning status. (No function with solid state radar.)
20	Range/Presentation mode box	- Selects the radar range. - Selects the presentation mode.
21	REF point box	Selects the reference point (antenna or CCRP) for measurements (range, bearing, etc.) and markers (position, etc.)
22	Stabilization mode box	Selects the stabilization mode (Bottom or Water).
23	Heading line	Indicates ship's heading.
24	Bearing scale	The bearing scale provides an estimate of the bearing to a target.
25	Cursor position box	This box shows - Latitude and longitude of the cursor position. - Range and bearing to the cursor position. - TTG to the cursor position.
26	EBL1	Measures the bearing to a target.
27	EBL2	
28	VRM1	Measures the range to a target.
29	VRM2	
30	Drop mark 1	Finds the range and bearing to drop mark position.
31	Drop mark 2	
32	Antenna marker	A cross marks antenna position.
33	Own ship marker	An inverted "T" marks your ship's position.
34	Stern marker	Marks location of stern.
35	North marker	Marks North.
36	Range rings	Provide an estimate of the range to a target.

Tips guidance

When most boxes on the display are selected, their operational guidance is displayed. The BRILL box (see section 1.4), for example, displays the operational guidance [Adjust brilliance].

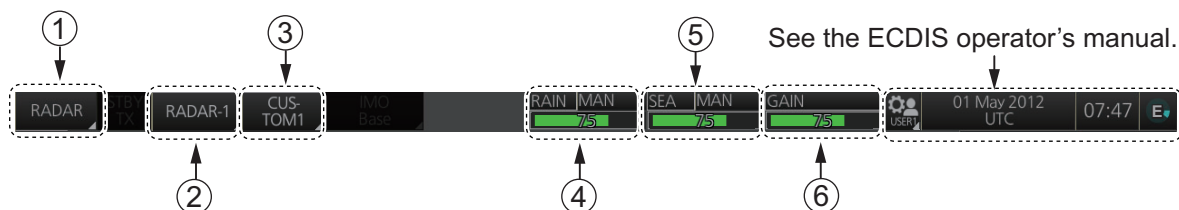


To turn off the tips guidance, do the followings:

1. Open the menu (see section 1.6).
2. Select [8 INITIAL SETTING] and [7 TIPS GUIDANCE].
3. Select [OFF].
4. Close the menu.

1.3 Status Bar

The Status bar is displayed at the top of screen in all modes. In the radar mode, this bar provides buttons for selection of the mode and antenna. For the other controls on the bar, see the ECDIS operator's manual.



No.	Name	Description
1	Operating mode	Selects the operating mode, [ECDIS], [RADAR], [CONNING] or [AMS].
2	Antenna	Selects a radar antenna.
3	Customize echo	Presets the radar controls for specific navigation purpose; for example, congested waters.
4	RAIN*	Reduces rain clutter.
5	SEA*	Reduces sea clutter.
6	GAIN*	Adjusts the gain of the radar receiver.

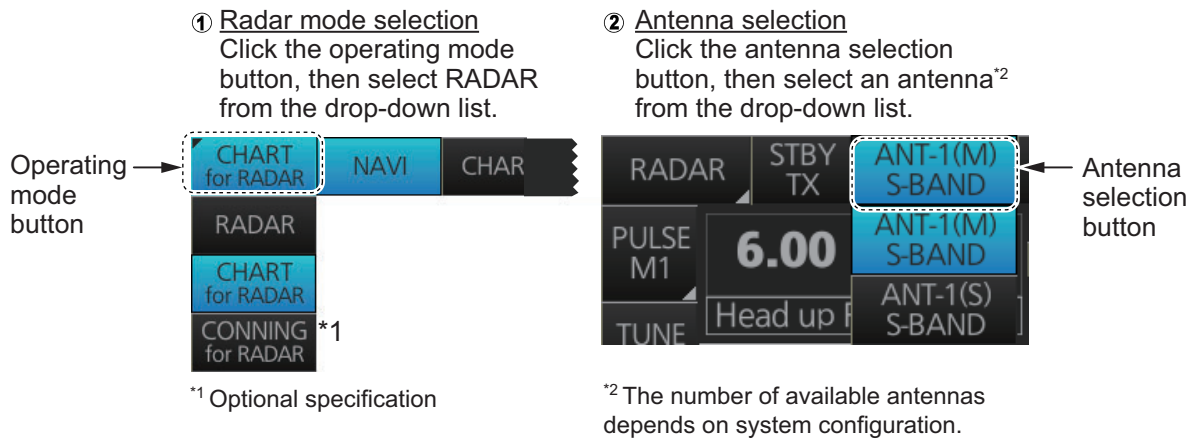
*: The indication is grayed out when the Automatic Clutter Elimination (ACE) function is [ON].

1.4 InstantAccess Bar™

The InstantAccess bar™ runs vertically along the left edge of the screen and is displayed always. This bar provides the functions shown in the figure below.

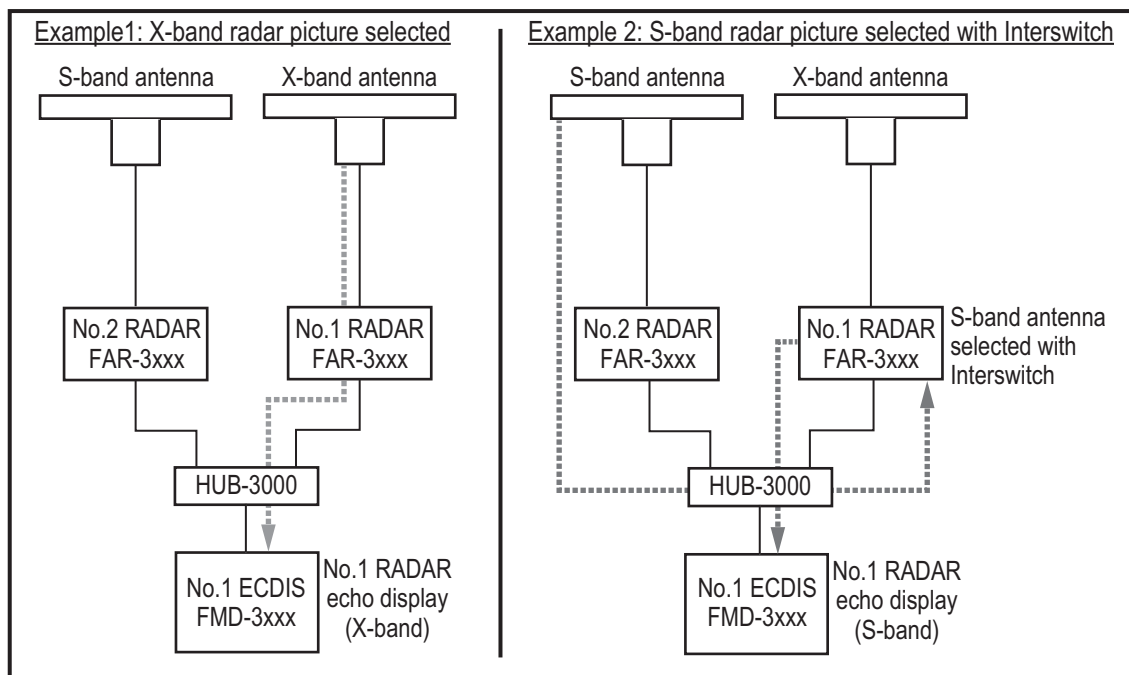
	Selects the radar pulse length.
	TUNE: Selects the radar receiver tuning method, automatic or manual, and manually tunes the radar receiver. TX CH (for solid state radar): Selects the transmit frequency from [TX CH 1] or [TX CH 2].
	Activates or deactivates the interference rejector.
	Activates or deactivates the echo stretch.
	Activates or deactivates the echo averaging when Automatic Clutter Elimination (ACE) function is off.
	Activates or deactivates the Automatic Clutter Elimination (ACE) function. Automatic Clutter Elimination (ACE) automatically sets the gain, rain and sea clutter controls according to the sea and rain clutter states.
	Temporarily erases everything within the radar display but radar echoes.
	See * below.
	Shows or hides the radar map marks on the radar display, in the radar mode.
	Shows or hides the electronic chart.
	*: - Puts the ship's heading at the top of the screen in course-up mode the moment this button is pressed. - Resets the ship's position to a point of 75% radius opposite to the extension of the heading line passing through the display center in true motion modes.
	Shows the [VOYAGE DATA] menu, to set your ship's AIS data.
	Displays screen for "received AIS messages".
	Selects a color palette. The "S" or "L" at the right edge of the button indicates color palette adjustment method, S for System, L for Local. See section 23.7 in the ECDIS operator's manual.
	Adjusts the brilliance of a FURUNO monitor. The "S" or "L" at the right edge of the button indicates brilliance adjustment method, S for System, L for Local. See section 23.7 in the ECDIS operator's manual.
	Marks man overboard position.
	Takes a screenshot. See ECDIS operator's manual.
	Restores previous condition. (Not displayed on 19-inch monitor.)

1.5 How to Select the Radar Mode and Antenna



Note: If the radar signal is not being received, the Alert "No ANT Echo Signal" appears in the Alert box. Check that the antenna is physically connected and powered.

The illustration below shows an example of how to select radars with the [RADAR-1] option.

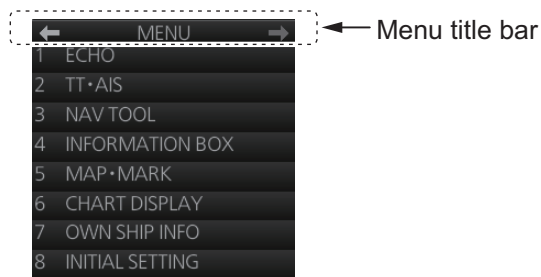


1.6 Menu Overview

The menu consists of eight main menus and several sub menus. You can operate the menu with the Radar Control Unit or trackball module. The system closes open menus whenever there is no menu operation for 30 seconds.

1.6.1 Basic menu operation

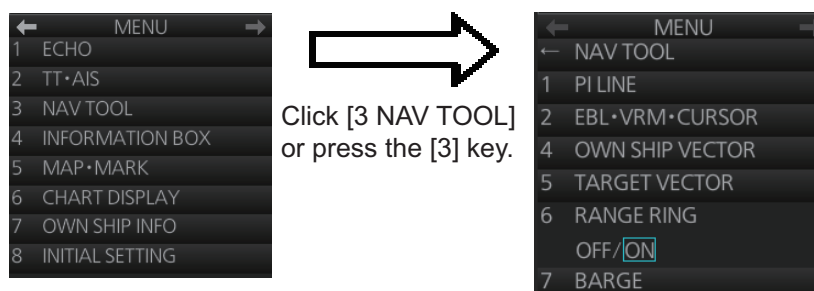
1. Click the menu title bar at the right side of the display.



2. Select a menu.

Keyboard: Press the corresponding numeric key. For example, press the [3] key to show the [NAV TOOL] menu.

Trackball module: Click the menu desired. The current selection is highlighted in blue.



3. Select a menu item.

Keyboard: Press the corresponding numeric key.

Trackball module: Click the menu item desired. The current selection is highlighted in blue.

4. Select a menu option.

Keyboard: Press the corresponding numeric key. The current selection is highlighted in orange.

Trackball module: Spin the scrollwheel. The current selection is highlighted in orange.

5. Push the left button to confirm your selection.

Note: Hereafter, "select" in a menu operating procedure means to press the applicable numeric key on the Control Unit or push the left button on the trackball module.

Keys, buttons to use in menus

Right button: Go back one layer, or close menu when main menu is displayed.

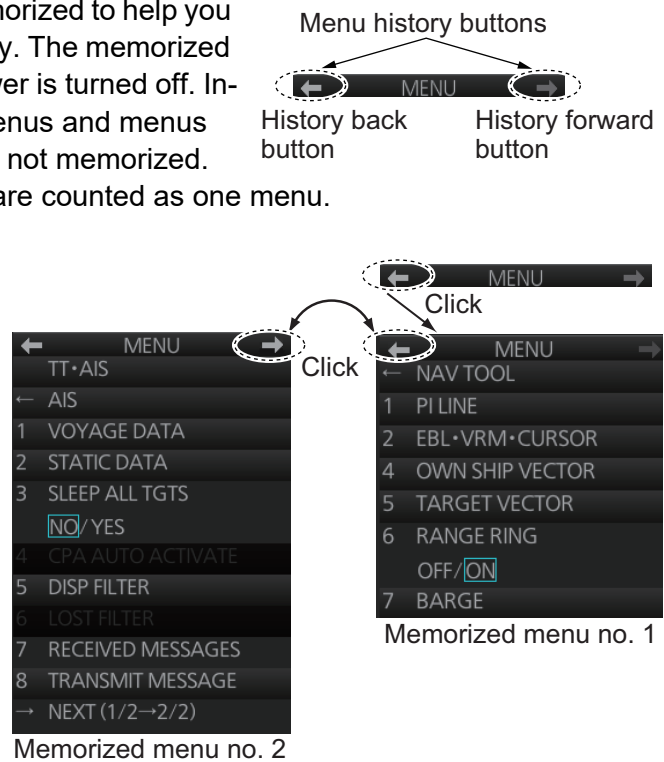
Left button: (1) Click menu title bar to go back one layer, or close menu when main menu is displayed, (2) Click the left arrow on the menu title bar to return to the main menu, in no.2 layer or higher.

1.6.2 Menu history feature

The 10 last-used menus are memorized to help you go to recently used menus quickly. The memorized menus are cleared when the power is turned off. Installation- and service-related menus and menus where no operation occurred are not memorized. Menus accessed multiple times are counted as one menu.

Click the memory history buttons on the menu title bar to navigate through the last-used menus.

For example, the last two used menus are [NAV TOOL] and [AIS].



1.6.3 How to enter numeric data

Select the numeric data, then do one of the following:

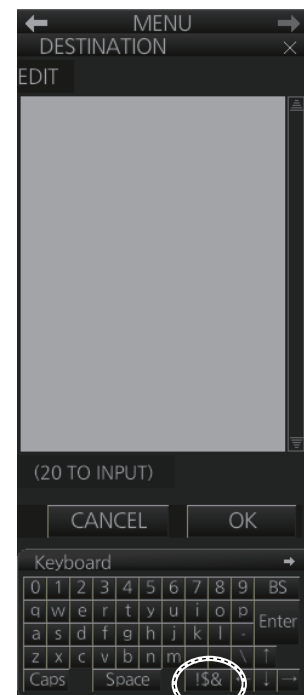
Keyboard: Use the ten keys to enter data.

Trackball module: Spin the scrollwheel to set data then push the left button.

1.6.4 How to enter alphanumeric character data

Some operations display a software keyboard to enter alphanumeric character data.

To enter characters, click applicable characters on the software keyboard. You can switch between letter input and symbol input by clicking the key circled in the right illustration.

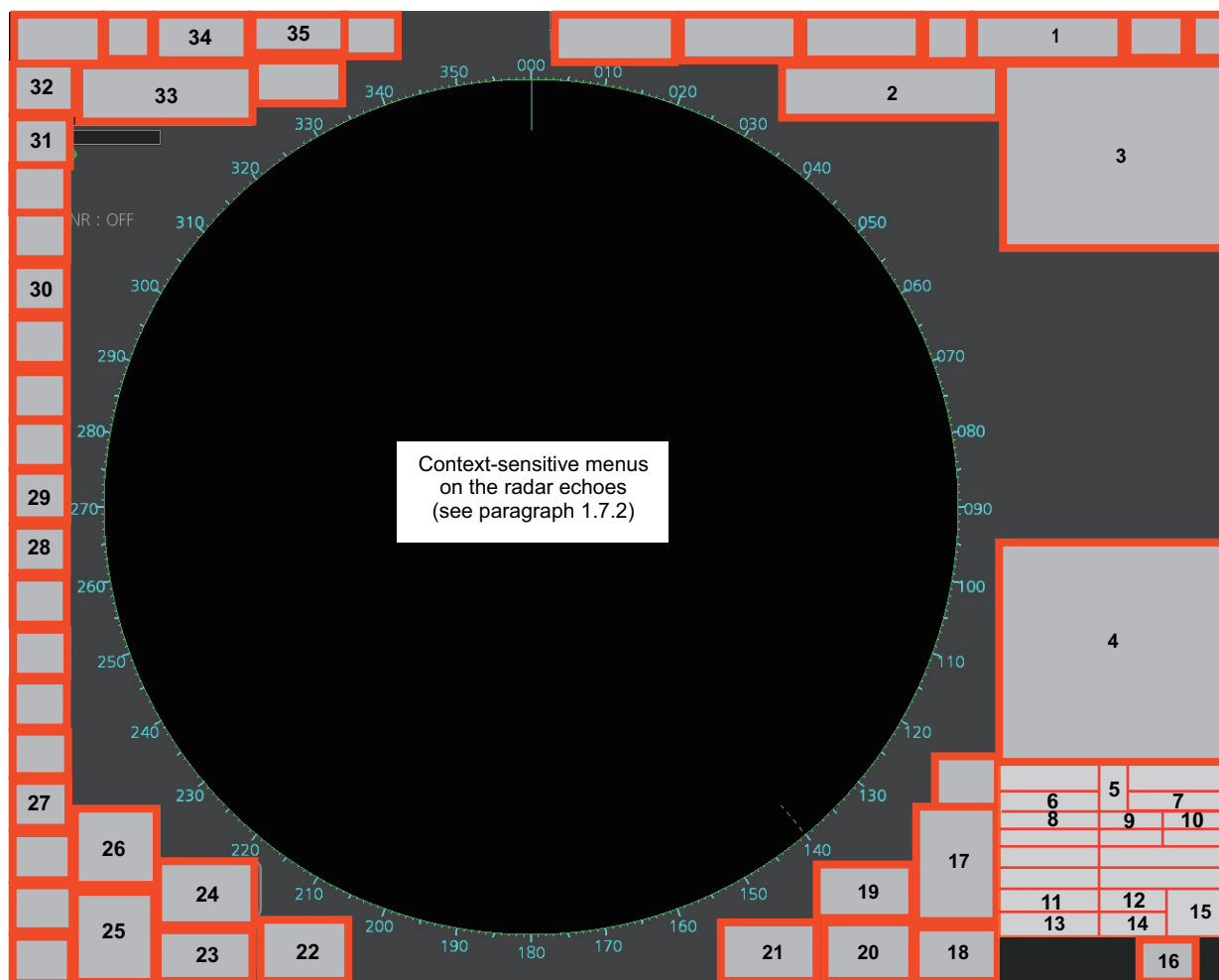


1.7 Context-Sensitive Menus

Context-sensitive menus are available with many of the boxes and buttons surrounding the display area and objects within the display area. Right-click the boxes and buttons marked with numerals in the illustration below to show the related context-sensitive menus. If a menu is not operated within 30 seconds, it is automatically closed.

For context-sensitive menus in the chart mode, see the chapter on chart overview.

1.7.1 Context-sensitive menus outside the display area



No.	Box name	Menu	No.	Box name	Menu
1	Adjust Local Time	Adjust Local Time	2	Cursor Position	Range-Bearing Position, X-Y Position, Cursor Menu
3	Sensor Information, Datum Box	Filter Reset, Sensor Setting	4	AIS Info	Expanded AIS Data, AIS Message
5	Association	Association TT/AIS, Association Menu	6	TT	OFF / MAN / AUTO / MAN/AUTO, TT Menu, Symbol Menu
7	AIS	DISP OFF / FILT / ALL, AIS Menu, Symbol Menu, AIS DISP Filter Menu	8	Vector	OS Vector Menu, Target Vector Menu

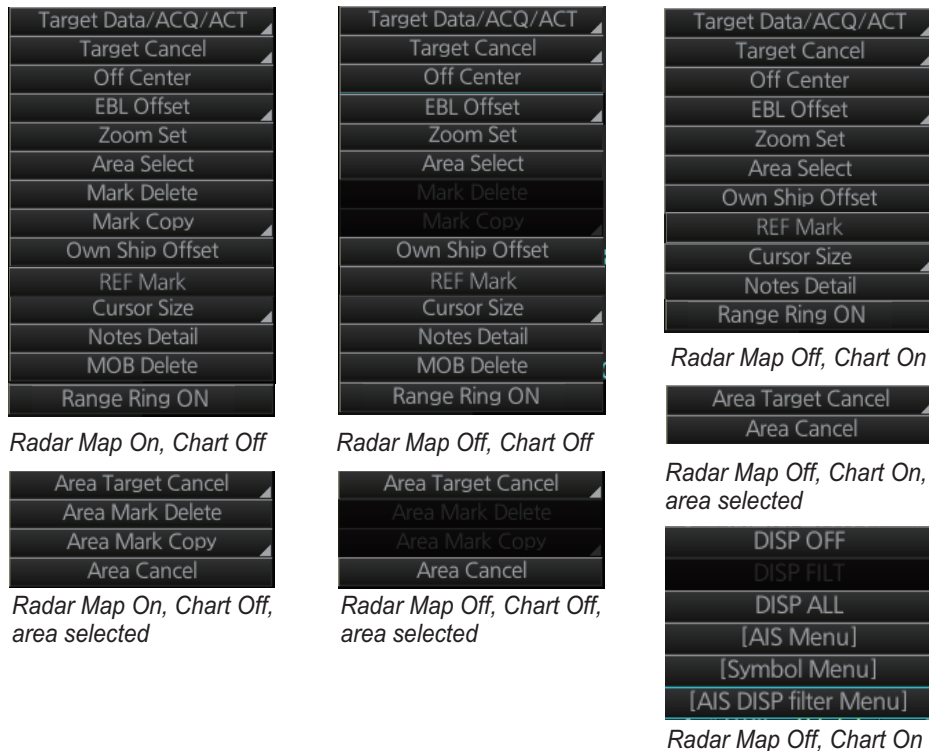
1. OPERATIONAL OVERVIEW

No.	Box name	Menu	No.	Box name	Menu
9	Vector Time	Vector Time (30 s - 60 min), OS Vector Menu, Target Vector Menu	10	Vector Reference	True-G(S), REL, OS Vector Menu, Target Vector Menu
11	PAST POSN	PAST POSN Menu	12	PAST POSN time	PAST POSN Time (OFF, 30 s - 6 min), PAST POSN Menu
13	Trail	Trail All Clear, Trail Menu	14	Trail Time	Trail Time (OFF, 15 s - 30 min, CONT), Trail Menu
15	Trail/PAST POSN Reference	True-G(S), REL, PAST POSN Menu, Trail Menu	16	Alert List	Alert List/Log Window
17	Trial	Trial Mode, Trial Maneuver Menu	18	AZ	Acquisition Zone Menu
19	Drop Mark 2	Drop2 Off	20	VRM 2	VRM2 Off, EBL•VRM Menu
21	VRM 1	VRM1 Off, EBL•VRM Menu	22	EBL 2	EBL2 Off, EBL•VRM Menu
23	EBL 1	EBL1 Off, EBL•VRM Menu	24	Drop Mark 1	Drop1 Off
25	Mark	Mark Color (B-type only), Mark Position, MAP File, Edit Map Comment, Map•Mark Menu	26	PI Line	Number of PI Line, Reset PI Line, PI Menu
27	Brill Menu	Brill Menu	28	Chart ON/OFF	Chart Display Menu
29	MAP ON/OFF	Radar Map Menu, Route Menu, Event Menu, User Chart Menu	30	ACE	Automatic Clutter Elimination (ACE) Menu
31*	TUNE	Tune Initialize	32	PULSE	Pulse Menu
33	RANGE	Range Scales (0.125 - 96.0 NM)	34	Antenna Selection	Dual Radar, ANT Select Menu
35	Customize Echo	Customize Echo Menu			

*: For solid state radar, this menu is not displayed.

1.7.2 Context-sensitive menu in the display area

Right-click anywhere in the display area to show the context-sensitive menu.



Menu description

[Target Data/ACQ/ACT]: Activate sleeping AIS target; show AIS target data.

[Target Cancel]: Sleep activated AIS target.

[Off Center]: Offcenter the display.

[EBL Offset]: Offset EBL1, EBL2 (to measure range and bearing between two targets).

[Zoom Set]: Select zoom area.

[Area Select]: Select the area where to delete or copy marks. When an area is created, the following menu items are available.

[Area Target Cancel]: Cancel tracking on targets within the area selected.

[Area Mark Delete]: Delete all marks within the area selected.

[Area Mark Copy]: Copy all marks within the area selected.

[Area Cancel]: Cancel the area created.

[Mark Delete]: Delete cursor-selected mark. Grayed out when radar map is off.

[Mark Copy]: Copy cursor-selected mark. Grayed out when radar map is off.

[Own Ship Offset]: Apply an offset to own ship position. Click to show the box shown right (top right corner on the display). Set the cursor where to offset and click. To release the offset, open the context-sensitive menu, then click [Reset Own Ship Offset].



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

[REF Mark]: Make cursor-selected target a reference target (for use in TT). Grayed out unless TT is active.

[Cursor Size]: Select cursor size, large or small.

[Notes Detail]: Show details about cursor-selected Notes.

[MOB Delete]: Delete selected MOB mark.

[Range Ring ON/OFF]: Show, hide the range rings.

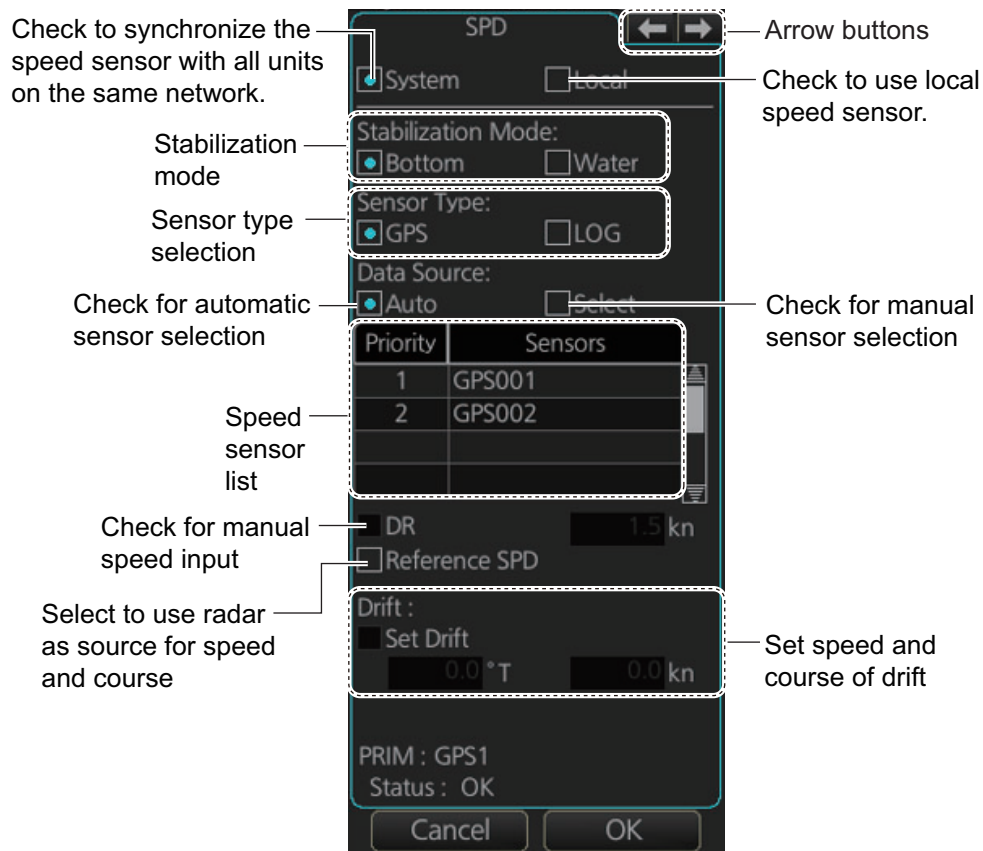
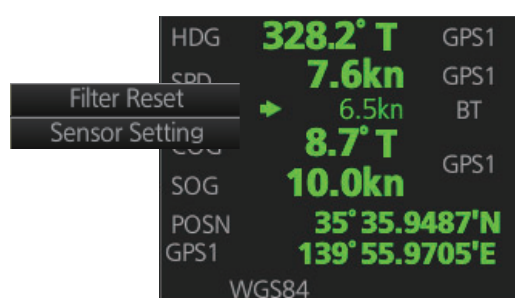
1.8 How to Enter Ship Speed

The TT and azimuth stabilized orientation modes require own ship speed input and compass signal. The speed can be entered automatically from a speed log (STW, SOG) or GPS (SOG), or manually on the menu.

1. Right-click anywhere in the Sensor information, datum box to show the context-sensitive menu.

2. Click [Sensor Setting].

3. Use the arrow buttons to select the [SPD] page.



4. Check [System] or [Local].

- [System]: Synchronize the speed sensor settings with all FMD-3xxx and FAR-3xxx units on the same network.

- [Local]: Avoid synchronizing speed sensor settings between units to set the ship's speed independently from the system speed sensors. However, DR (Dead Reckoning) still uses system sensor speed.

5. Do one of the following:

Automatic speed input

- 1) Check [Auto] at [Data Source].
- 2) Select [Bottom] or [Water] at [Stabilization Mode] to set the stabilization method. Select [Bottom] for GPS or [Water] for a speed log.
Note: You can set the stabilization mode from the stabilization mode box at the top left of the screen.
- 3) Check [GPS] or [LOG] at [Sensor Type] to select the source of speed data.

Manual speed input

- 1) Confirm that AIS is disabled.
- 2) Select [Water] at [Stabilization Mode].
- 3) Select [DR].
- 4) Use the scrollwheel or keyboard to input speed.
 - Scrollwheel: Spin the wheel to set speed.
 - Keyboard: Enter speed with numeric keys.

Note: For set and drift, see section 3.11.

6. Click the [Save] button to save settings.
When [System] is checked, after the speed is entered manually you are asked "AIS Function of all units will be turned off. Do you wish to continue?" Click the [OK] button. The confirmation message appears the first time [DR] is selected on the [HDG], [POSN] or [SPD] page.
7. Click the [Close] button to close the menu.

Notes on speed input

- IMO Resolution A.823(19) for TT requires that a speed log to be interfaced with a TT should be capable of providing through-the-water speed (forward speed).
- A single-axis water log cannot measure speed when the wind is coming from the leeway direction.
- When AIS is active, [DR], [Reference SPD] and [Set Drift] are shown in gray to indicate that they are not available for selection.
- Reference speed is not shared among units.
- To use [Reference SPD], turn off the AIS function and check [Bottom] and [Local] on the [SPD] page.

1.9 How to Enter Heading

Heading can be entered manually or automatically.

Note 1: The following sensor settings are synchronized with all FMD-3xxx and FAR-3xxx units on the same network.

Note 2: When the vessel is in high latitudes (over 85°), data from the gyrocompass is not used. The internal filter data is used for heading calculation. In this case, the heading source in the sensor information box appears as "FILT". However, high latitudes are not supported in RADAR mode.

1. Right-click anywhere in the Sensor information, datum box to show the context-sensitive menu.
2. Click [Sensor Setting].
3. Use the arrow buttons to select the [HDG] page.
4. Do one of the following:

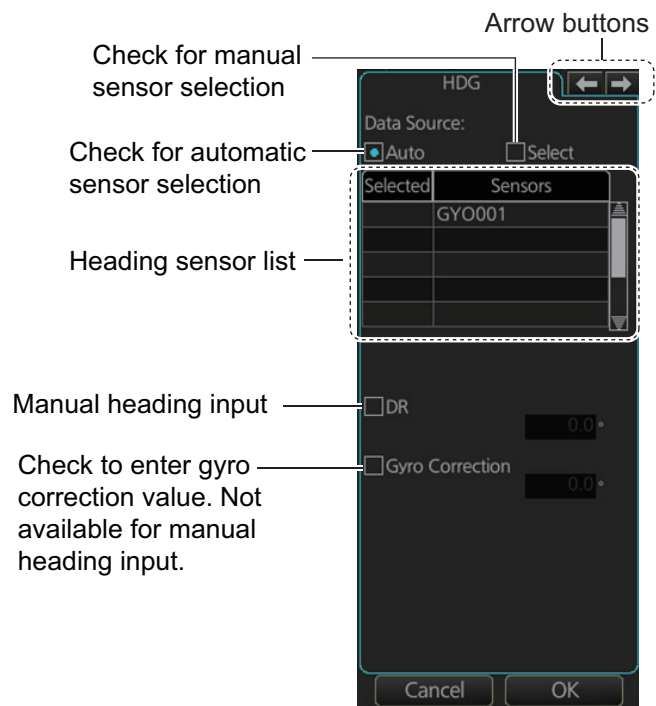
Automatic heading input

Check [Auto] at [Data Source].

Note: To apply correction to the gyrocompass indication, check [Gyro Correction], then spin the scrollwheel to set the correction value.

Manual heading input

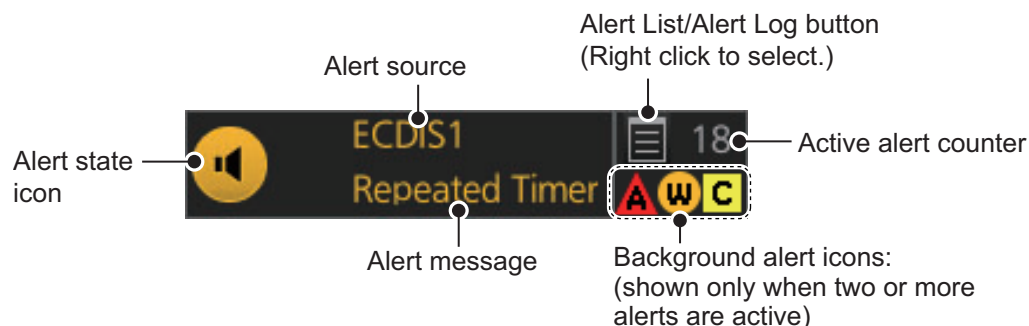
- 1) Confirm that AIS is disabled.
- 2) Select [DR].
- 3) Use the scrollwheel or keyboard to input heading.
 - Scrollwheel: Spin the wheel to set heading.
 - Keyboard: Enter heading with numeric keys.
5. Click the [OK] button to save settings.
After the heading is entered manually you are asked if you are sure to disable the AIS function on all units. Click the [OK] button. The confirmation message appears the first time DR is selected on the [HDG], [POSN] or [SPD] page.
6. Click the [Close] button to close the menu.



1.10 Alert Box, Alert List

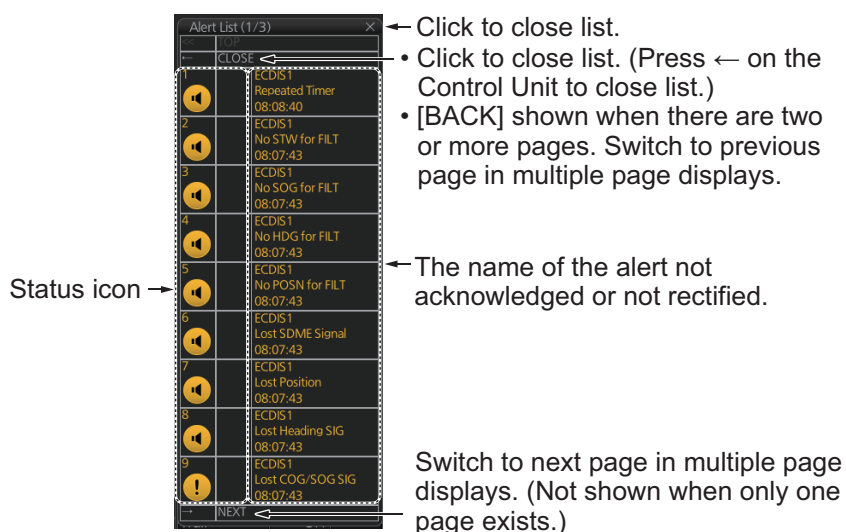
1.10.1 Alert box

When an alert condition is found, the applicable alert message and alert source appear in the [Alert] box. For the alarm- and warning-type alerts a buzzer sounds.



1.10.2 Alert list bar

The alert list bar displays the status of the latest 900 system alerts, in order of generation, latest to the earliest. To display the list, click the [Alert List/Alert Log] button in the [Alert] box. A maximum of nine alerts are shown per page. Unacknowledged alerts are displayed in flashing red (alarm) or flashing yellow-orange (warning). The ZDA sentence is required to display time in the list.



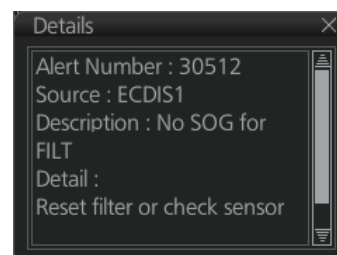
How to acknowledge or rectify an alert from the list

Control Unit: Press applicable numeric key.

Trackball module: Click alarm name.

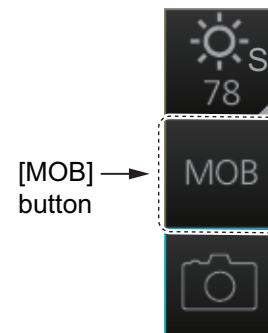
How to find details about an alert

Click the status icon in the list to show details about an alert.



1.11 How to Mark MOB Position

Use the MOB (man overboard) feature to mark the position of man overboard on the display screen. Click the [MOB] button (in any mode) on the InstantAccess bar™.



The MOB mark instantly appears at the geographical position of your ship when the button is clicked.

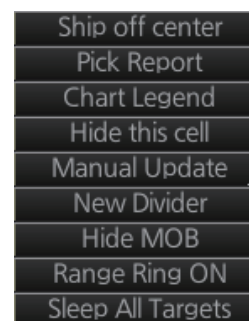


Up to 100 MOB marks can be saved. When the capacity for MOB marks is reached, the oldest mark is automatically erased to make room for the latest.

To hide an MOB mark, get into the Navigation voyage mode ([NAVI]) or Voyage planning mode ([PLAN]), right-click the mark to show the context-sensitive menu then select [Hide MOB].

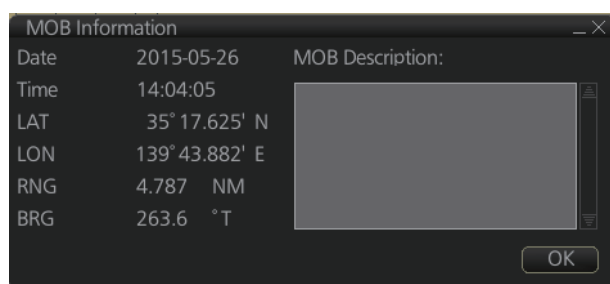
To delete an MOB mark, right-click the mark to show the context-sensitive menu then select [MOB Delete].

Exercise caution when using this feature in strong tide or current. The person will not be at the MOB position for a very long time. To show the range and bearing to the MOB considering the tidal current, right-click the MOB mark to show the context-sensitive menu, then select [Maneuver MOB]. To hide the range and bearing data, right-click the MOB mark, then select [Clear Maneuver].



How to find MOB information

Put the cursor on a MOB mark and click. Text can be entered in the [MOB Description] window. Click the [OK] button to save the text and close the window.



1.12 How to Change the Settings on the Current Display to the Recommended Settings

1. Click  on the Status bar, then click [Default Settings]. Alternately, long click . The confirmation message "Settings will be changed to the default. Do you wish to continue?" appears.
2. Click [Yes].

The settings in the table below are changed to the recommended settings.

Note 1: This function is not available when using the interswitch function (see section 2.28).

Note 2: When there is an unacknowledged alert and you click [Default Settings], the error message "Default Settings is not available because some alerts have not been acknowledged." appears. Acknowledge all alerts to restore the recommended settings.

Items	Recommended settings		Default settings for Profile01 to 10
RAIN	No change		Auto (0)
SEA	No change		Auto
GAIN	No change		80
TUNE (other than solid state radar)	TUNE AUTO		
TX CH (for solid state radar)	No change		
RANGE	6 NM		
RANGE RING	OFF		
VRM1	ON (0.25 NM)		
VRM2	ON (No change)		ON (0.0)
EBL1	ON (No change)		ON (0.0)
EBL2	ON (No change)		ON (0.0)
PI LINE	No change		OFF
Presentation Mode	North-up TM Note: Head-up RM with no heading or position data.		
Vector Mode	Relative		True
Vector Time	6 min		
Stabilization	Sea ^{*1}		Ground
Off Center	The ship's position is put beyond 75% of the range scale.		
Target Trail	Trail time: 6 min, Trail mode: True-G		
PAST POSN	OFF		
Target Tracking	Continued		MAN
AUTO ACQ	AZ: OFF CPA AUTO ACTIVE: OFF		
Graphical AIS reported target display	ON (DISP FILT, DISP Filter OFF)		
Graphical AIS data report display	ON (DISP FILT, DISP Filter OFF)		
Graphical AIS locating device display	ON (DISP FILT, DISP Filter OFF)		
Association	ON (Priority AIS)		
Operational Alerts	ON (Lost Target ALL)		

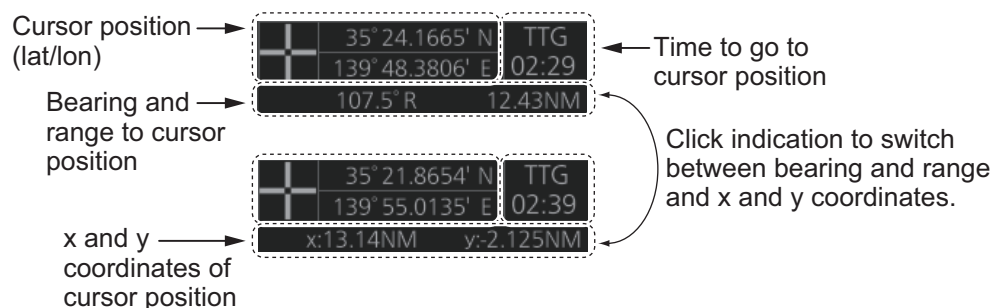
1. OPERATIONAL OVERVIEW

Items	Recommended settings	Default settings for Profile01 to 10
Collision Warnings	ON (CPA: 2 NM, TCPA: 12 min)	
Display of maps, navigation lines and routes	Last setting	Off
Display of Charts	OFF	

2. RADAR OPERATION

2.1 Cursor Position

Cursor data appears in the cursor position box at the top-right position on the display. The appearance of the box is slightly different between the 23-inch and 19-inch displays, although the content is the same.



The indication below the cursor position can show the range and bearing to the cursor or x-y coordinates of the cursor position. Click that indication and select [Range-Bearing Position] or [X-Y Position] as appropriate. For the x-y coordinate display, the y-axis is the heading line, right/top is "plus" and left/lower is "minus".

Note 1: The cursor bearing can be selected to true or relative with [1 EBL•CURSOR BEARING] in [Cursor Menu]. Right-click the cursor position area, then select [Cursor Menu].

Note 2: The cursor position is shown as "---.-" when the cursor is not within the effective display area.

2.2 Pulse Length

The pulse length in use is displayed at the top-left position on the screen, using the indications shown in the table below.

Pulse length indication	Pulse length (μs)	
	Magnetron radar	Solid state radar (P0N/Q0N)
S1	0.07	0.07/5.0
S2	0.15	0.18/7.5
M1	0.3	0.3/12.5
M2	0.5	0.5/17.5
M3	0.7	0.7/18.3
L	1.2	1.2/18.3

Appropriate pulse lengths are preset to individual range scales and function keys. If you are not satisfied with the current pulse length settings, you can change them as shown below.

2.2.1 How to select a pulse length

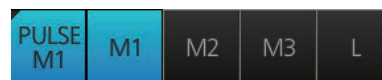
You can select the pulse length for the 0.5 to 24 NM range scales as shown below.

1. Open the menu then select [1 ECHO], [1 CUSTOMIZE ECHO] and [8 PULSE] menus to show the [PULSE] menu.
2. Do one of the following:
Control Unit: Press appropriate numeric key to select corresponding item number.
Trackball module: Click appropriate item.
3. Select desired option by pressing the numeric key pressed at step 2 or spinning the scrollwheel.
4. To confirm selection, press the **ENTER** key on the Control Unit, or push the left button.



2.2.2 How to change the pulse length

1. Click the [Pulse] button at the top of the InstantAccess bar™.
2. Click a pulse length.



2.3 How to Adjust the Sensitivity

The **GAIN** control (or [Gain] button) adjusts the sensitivity of the receiver. The proper setting is such that the background noise is just visible on the screen. If you set up for too little sensitivity, weak echoes may be missed. On the other hand excessive sensitivity yields too much background noise; strong targets may be missed because of the poor contrast between desired echoes and the background noise on the screen.

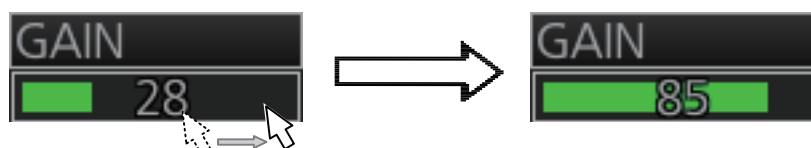
Adjust the gain so background noise is just visible on the screen.

Note: For adjustment of gain when the Automatic Clutter Elimination (ACE) function is ON, see subsection 2.9.2.

To adjust the sensitivity, do one of the following:

Control Unit: While monitoring the radar image and the gain slider bar, operate the **GAIN** control to adjust the sensitivity.

Trackball module: For coarse adjustment, put the cursor within the slider bar area then push the left button. For fine adjustment, put the cursor at the end of the slider bar then roll the trackball while pushing and holding down the left button. Release the button to finish.



Put cursor on slider bar and push and hold left button. Drag cursor to new location then release left button.

2.4 How to Suppress Sea Clutter

Echoes from waves cover the central part of the display with random signals known as sea clutter. The higher the waves, and the higher the antenna above the water, the further the clutter will extend. When sea clutter masks the picture, suppress it with the **A/C SEA** control (or [SEA] on the Status bar), either manually or automatically.

When both sea clutter and rain clutter are reduced, the sensitivity is decreased more than when only one is adjusted. For that reason adjust them carefully.

The echo average (see section 2.8) is useful for reducing reflections from the sea surface. However, high-speed targets are harder to detect than stationary ones when the echo average is active.

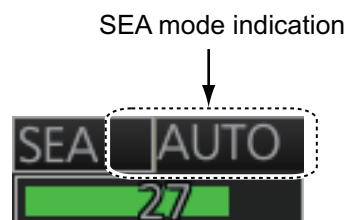
2.4.1 How to reduce sea clutter automatically

Auto A/C SEA allows for fine-tuning of the A/C SEA circuit, within ± 20 dB. Lower the auto A/C SEA level because the average value of the original input echo is low in areas where there are no sea surface reflections. For example, when the ship is alongside a quay and the radar picture shows echoes from both land and sea, you can observe the size of echoes because the STC curve is different depending size of echoes.

To get automatic adjustment of sea clutter, do one of the following:

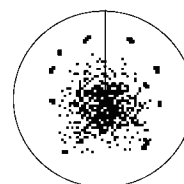
Control Unit: Push the **A/C SEA** control to display [AUTO] on the SEA mode indication on the Status bar.

Trackball module: Click the SEA mode indication on the Status bar to display [AUTO].

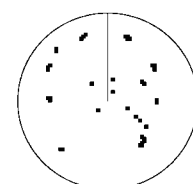


2.4.2 How to reduce sea clutter manually

The **A/C SEA** control reduces the amplification of echoes at short ranges (where clutter is the greatest) and progressively increases amplification as the range increases, so amplification will be normal at those ranges where there is no sea clutter.



Sea clutter at screen center



A/C SEA adjusted; sea clutter suppressed

The proper setting of the A/C SEA should be such that the clutter is broken up into small dots, and small targets become distinguishable. If the setting is set too low, targets will be hidden in the clutter, while if the setting is too high, both sea clutter and targets will disappear from the display. In most cases adjust the control until clutter has disappeared to leeward, but a little is still visible windward.

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Be careful not to remove all sea clutter, because you may erase weak echoes. Further, the possibility of losing weak echoes is greater when you use both A/C SEA and A/C RAIN to reduce clutter.

To reduce sea clutter manually, do one of the following:

Control Unit: Push the **A/C SEA** control to display [MAN] on the SEA mode indication on the Status bar. Rotate the **A/C SEA** control to adjust the sea clutter.

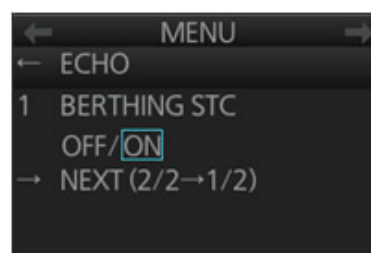
Trackball module: Click the SEA mode indication on the Status bar to display [MAN]. For coarse adjustment, put the cursor within the slider bar area then push the left button. For fine adjustment, put the cursor at the end of the slider bar then roll the trackball while pushing and holding down the left button. Release the button to finish.

2.4.3 How to use the BERTHING STC function

The [BERTHING STC] function allows you to show the main bang echo, even with the range set at 0.5 NM or less, with AUTO SEA at maximum setting. This is particularly useful when attempting to berth, as it gives a clearer view of the berthing area and your ship's location.

To use the [BERTHING STC] function, do as follows.

1. Open the menu.
2. Select [1 ECHO].
3. Select [NEXT (1/2→2/2)] to show page 2.
4. Select [1 BERTHING STC].
5. Select [ON] to activate, or [OFF] to deactivate this function.



2.5 How to Suppress Rain Clutter

The vertical beam width of the antenna is designed to see surface targets even when the ship is rolling. However, by this design the unit will also detect rain clutter (rain, snow, or hail) in the same manner as normal targets.

The **A/C RAIN** control adjusts the receiver sensitivity as the **A/C SEA** control does but rather in a longer time period (longer range). The higher the setting, the greater the anti-clutter effect. When echoes from precipitation mask solid targets, adjust the **A/C RAIN** control to split up these unwanted echoes into a speckled pattern, making recognition of solid targets easier.

Be careful not to remove all rain clutter, because you can erase weak echoes. Further, the possibility of losing weak echoes is greater when you use both A/C RAIN and A/C SEA to reduce clutter.

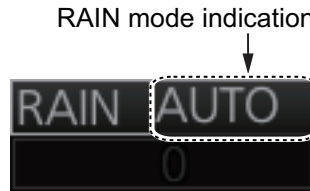
When both sea clutter and rain clutter are reduced the sensitivity is decreased more than when only one is adjusted. For that reason adjust them carefully.

The echo average (see section 2.8) is useful for reducing reflections from the sea surface. However, high-speed targets are harder to detect than stationary ones when the echo average is active.

2.5.1 How to reduce rain clutter automatically

Control Unit: Push the **A/C RAIN** control to display [AUTO] on the RAIN mode indication on the Status bar.

Trackball module: Click the RAIN mode indication on the Status bar to display [AUTO].



2.5.2 How to reduce rain clutter manually

Control Unit: Push the **A/C RAIN** control to display [MAN] on the RAIN mode indication on the Status bar. While watching the radar picture, adjust the **A/C RAIN** control to reduce the clutter.

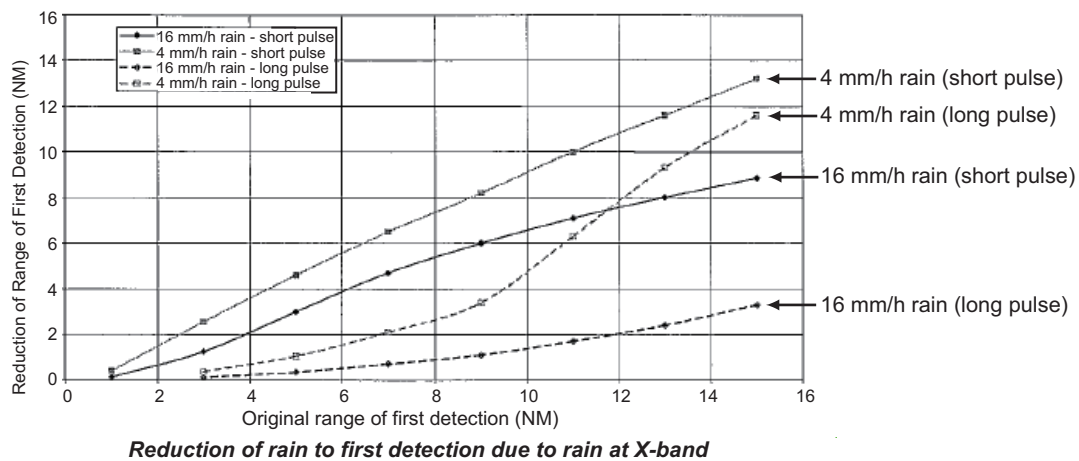
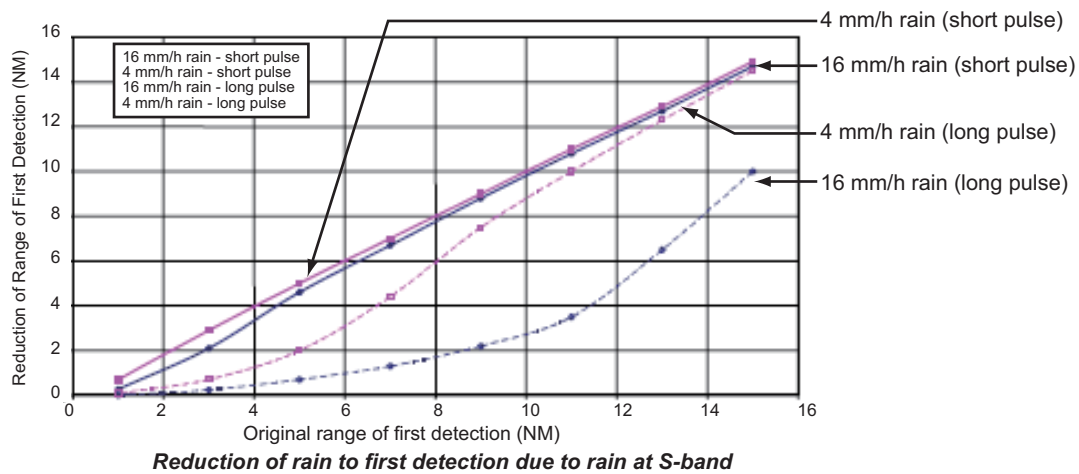
Trackball module: Click the RAIN mode indication on the Status bar to show [MAN]. For coarse adjustment, put the cursor within the slider bar area then push the left button. For fine adjustment, put the cursor at the end of the slider bar then roll the trackball while pushing and holding down the left button. Release the button to finish.

Note: The detection range is reduced when the RAIN is used to show targets in rain. Generally, the amount of rain, TX pulse length and TX frequency are factors in determining how the detection range is affected. The figures shown below illustrate this occurrence.

How to interpret the graph

Using the X-band graph as an example, a radar target originally detected on the 8 NM range can only be detected in rain at ranges shown below:

2. RADAR OPERATION

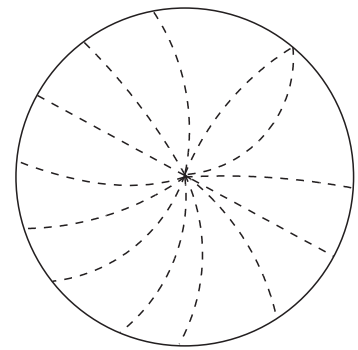


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Accordingly the short pulse may be preferable in rain on ranges < 10NM.

2.6 Interference Rejector

Mutual radar interference may occur in the vicinity of another shipborne radar operating in the same frequency band. It is seen on the screen as a number of bright spikes either in irregular patterns or in the form of usually curved spoke-like dotted lines extending from the center to the edge of the picture. Activating the interference rejector circuit can reduce this type of interference.



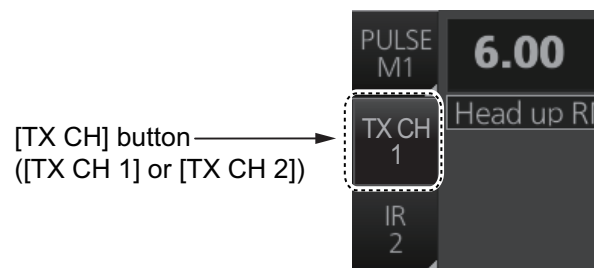
The interference rejector is a kind of signal correlation circuit. It compares the received signals over successive transmissions and reduces randomly occurring signals.

There are three levels of interference rejection depending on the number of transmissions that are correlated.

Click the [IR] button on the InstantAccess bar™ then click desired rejection level. The higher the number the greater the degree of interference rejection.



For solid state radar: When there are a lot of interference, switch the [TX CH]. Click the [TX CH] button on the InstantAccess bar™ then click [1] or [2].



2.7 Echo Stretch

The echo stretch feature enlarges targets in the range and bearing directions to make them easier to see, and it is available on any range. There are three levels of echo stretch, 1, 2 and 3. The higher the number the greater the amount of stretching.

The echo stretch magnifies not only small target pips but also returns from the sea surface, rain and radar interference. For this reason, suppress those types of interference before activating the echo stretch.

Click the [ES] button on the InstantAccess bar™ then click desired echo stretch level.



2.8 Echo Averaging

The echo averaging feature, which requires heading, position and speed data, effectively reduces sea clutter. Echoes received from stable targets such as ships appear on the screen at almost the same position every rotation of the antenna. On the other hand, unstable echoes such as sea clutter appear at random positions.

To distinguish real target echoes from sea clutter, echoes are averaged over successive picture frames. If an echo is solid and stable over successive frames, it is presented in its normal intensity. Sea clutter is averaged over successive scans and its brilliance reduced, making it easier to discriminate real targets from sea clutter.

Echo averaging uses scan-to-scan signal correlation technique based on the true motion over the ground of each target. Thus, small stationary targets such as buoys will be shown while reducing random echoes such as sea clutter. True echo averaging is not however effective for picking up small targets running at high speeds over the ground.

Note 1: With echo average active it is harder to detect high-speed targets than stationary ones.

Note 2: Do not use echo averaging under heavy pitching and rolling; loss of targets can result.

Note 3: When the heading sensor signal is lost, [EAV] is turned OFF and the indication is grayed out.

Before using the echo averaging function, reduce sea clutter (see section 2.4). Leave a little sea clutter on the screen so as not to erase weak targets. Then, do as follows:

Click the [EAV] button on the InstantAccess bar™ then click desired setting.



OFF: Echo averaging is OFF.

1, 2: Detects targets hidden in sea clutter. "2" is more effective than "1" in detecting targets hidden in strong sea clutter. However, "1" is more effective than "2" in displaying high-speed targets. Select the setting best suited to your objective.

3: Stably displays unstable targets; distinguishes high-speed craft from sea clutter.

When the Automatic Clutter Elimination (ACE) function is ON (see section 2.9), the indication for the [EAV] button is grayed out.

Note: When [PERFORMANCE MON] (see section 2.29) or [SART] (see section 2.32) is ON, [EAV] is OFF and the indication is grayed out.

2.9 Automatic Clutter Elimination (ACE) Function

This radar has the Automatic Clutter Elimination (ACE) function. This function detects sea and rain clutter from received echoes' range and bearing trend and automatically reduces sea and rain clutter according to the Automatic Clutter Elimination (ACE) threshold setting.

Note: Use this function with caution. Weak target echoes may disappear from the screen.

2.9.1 How to turn the Automatic Clutter Elimination (ACE) function on/off

Click the [ACE] button on the InstantAccess bar™ to turn the Automatic Clutter Elimination (ACE) function on or off. When the Automatic Clutter Elimination (ACE) function is [ON], the indications for [RAIN] and [SEA] on the Status bar are grayed out.

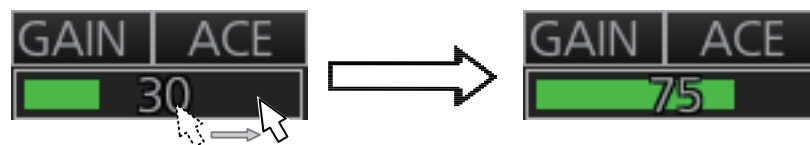


Note: When [PERFORMANCE MON] or [SART] (see section 2.32) is ON, [ACE] is OFF and the indication is grayed out.

2.9.2 How to adjust the gain in the Automatic Clutter Elimination (ACE) mode

Control Unit: Rotate the **GAIN** control to adjust the sensitivity.

Trackball module: For coarse adjustment, put the cursor within the slider bar area on the Status bar then push the left button. For fine adjustment, put the cursor at the end of the slider bar then roll the trackball while pushing and holding down the left button. Release the button to finish.

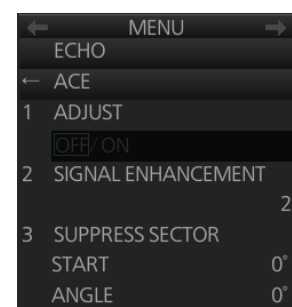


Put cursor on slider bar and push and hold left button.
Drag cursor to new location then release left button.

2.9.3 Automatic Clutter Elimination (ACE) menu

Open the menu then select the [1 ECHO] and [0 ACE] menus to show the [ACE] menu.

- [1 ADJUST]: No use.
- [2 SIGNAL ENHANCEMENT]: Set the level for the high sensitivity mode (see subsection 2.9.4).
- [3 SUPPRESS SECTOR]: Set the angular range for suppression of false echoes (see subsection 2.9.5).



2.9.4 How to get the high sensitivity

When Automatic Clutter Elimination (ACE) function is [ON], the high sensitivity mode operates while pushing the **GAIN** control. You can select the level for the high sensitivity mode as follows:

1. Open the menu then select [1 ECHO].
2. Select [0 ACE] and [2 SIGNAL ENHANCEMENT].
3. Select the level from [1], [2] or [3].
4. Close the menu.

2.9.5 How to suppress the false echoes

The echo signals can appear on the screen at positions where there is no target or disappear when there are targets. You can suppress the false echoes.

1. Open the menu then select [1 ECHO].
2. Select [0 ACE] and [3 SUPPRESS SECTOR].
3. Select [START] then set the start angle from which you can suppress the false echoes.
4. Select [ANGLE] then set the angle range to which you can suppress the false echoes.
5. Close the menu.

2.10 Noise Rejector

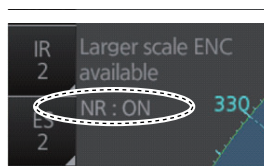
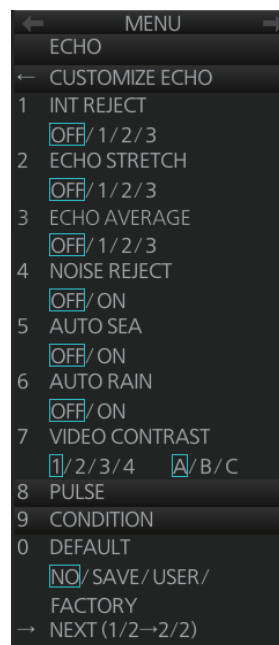
White noise may show itself on the screen as random "speckles" spread over the entire radar image. This equipment reduces the white noise then improves the on-screen S/N ratio by processing the weighted moving average filter for the received echoes in the range direction.

Note: Use this function with caution. Weak target echoes may disappear from the screen or the range resolution may worsen.

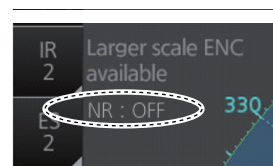
You can remove this noise as follows:

1. Open the menu then select [1 ECHO].
2. Select [1 CUSTOMIZE ECHO] menu to show the [CUSTOMIZE ECHO] menu.
3. Select [4 NOISE REJECT].
4. Select [OFF] or [ON] as appropriate.
5. Close the menu.

The status of the noise rejector is indicated at the top-left position, [NR: ON] or [NR: OFF].



Noise Rejector ON



Noise Rejector OFF

2.11 Wiper

The wiper feature automatically reduces the brilliance of unwanted weak echoes, such as noise, sea clutter and rain clutter, to clear the picture. There are two wiper settings, 1 and 2. The difference between 1 and 2 is that the brilliance is lowered more slowly in 2.

To use the wiper feature, do the following:

1. Open the menu then select [1 ECHO].
2. Select [8 WIPER].
3. Select [OFF], [1] or [2] as appropriate.
4. Close the menu.

2.12 How to Preset Controls for Specific Navigation Purpose

Every time your navigating environment or task changes, you must adjust the radar, which can be a nuisance in a busy situation. Instead of changing radar settings case by case, it is possible to assign the function keys to provide optimum settings for often-encountered situations.

The radar's internal computer offers several picture preset options to be assigned to each function key for your specific navigating requirements. For instance, one of the presets is labelled [HARD RAIN], and is designed to be used in heavy rain.

Two user-programmable presets are also provided (labeled [CUSTOM1], [CUSTOM2]), so that you can have the radar automatically adjusted to those conditions that are not covered by the provided setup options.

Below are the preset options provided with this radar.

Label	Description	Label	Description
OCEAN	Optimum setting for long range detection, on a range scale of 6 NM or larger.	HARD RAIN	Optimum setting for rough weather or heavy rain.
CANAL	Optimum setting for operating in a canal.	ICE (optional specification)*	Optimum setting for showing areas of ice on the sea surface.
BERTHING	Optimum setting when berthing.	CUSTOM1	User-defined custom settings.
CONGESTION	Optimum setting for short range navigation (for example, a harbor) using a range scale of 1.5 NM or less.	CUSTOM2	User-defined custom settings.
ROUGH SEA	Optimum setting for operation in rough seas.		

* See "About the ICE custom setting (optional specification)" on page 2-13.

Each picture option defines a combination of several radar settings for achieving optimum setup for a particular navigating situation. These include interference rejector, echo stretch, echo average, noise rejector, automatic anti-sea and anti-rain clutters, video contrast, pulse length and sea and radar conditions.

2. RADAR OPERATION

Adjusting these features from the [CUSTOMIZE ECHO] menu changes the original function key settings. To restore the original settings for a particular customize option, it is necessary to select the default setting. For this reason, we recommended that you use the user-programmable presets ([CUSTOM1] or [CUSTOM2]) when frequent adjustment of the radar image is necessary.

	INT REJECT	ECHO STRETCH	ECHO AVERAGE	NOISE REJECT	AUTO SEA	AUTO RAIN	VIDEO CONT- RAST
OCEAN	2	2	3	ON	OFF* 1	OFF* 1	3-B
CANAL	2	OFF	OFF	OFF	OFF* 1	OFF* 1	2-B
BERTH- ING	2	OFF	OFF	OFF	OFF* 1	OFF* 1	2-B
CONGES- TION	2	OFF	2	OFF	OFF* 1	OFF* 1	1-B
ROUGH SEA	2	OFF	2	OFF	OFF* 1	OFF* 1	2-A
HARD RAIN	2	OFF	OFF	OFF	OFF* 1	ON	2-A
ICE	2	OFF	OFF	OFF	OFF* 1	OFF* 1	ICE
CUSTOM1	2	OFF	OFF	OFF	OFF* 1	OFF* 1	1-B
CUSTOM2	2	2	1	OFF	OFF* 1	OFF* 1	2-B

*1: Manual

PULSE LENGTH

	0.5 NM	0.75 NM	1.5 NM	3 NM	6 NM	12, 24 NM
OCEAN	S2	M1*2	M1	M3	L	L
CANAL	S1	S2	M1	M2	M3	L
BERTHING	S1	S1	S2	M1	M3	L
CONGESTION	S1	S2	S2	M1	M2	L
ROUGH SEA	S1	S1	S2	M1	M2	M3
HARD RAIN	S1	S2	S2	M1	M2	L
ICE	S1	S1	S1	S2	M1	M1/M2
CUSTOM1	S1	S2	S2	M1	M1	L
CUSTOM2	S2	S2	M1	M2	M3	L

*2: S2 for solid state radar.

CONDITION

	STC ANT HEIGHT	LOW LEVEL ECHO	GAIN	SEA	RAIN	ACE
OCEAN	Set at installation	0	80	MAN-30	MAN-0	OFF
CANAL		0	80	MAN-30	MAN-0	OFF
BERTHING		0	80	MAN-30	MAN-0	OFF
CONGESTION		0	80	MAN-30	MAN-0	OFF
ROUGH SEA		0	80	MAN-60	MAN-0	OFF
HARD RAIN		0	80	MAN-60	AUTO	OFF
ICE		0	80	MAN-30	MAN-0	OFF
CUSTOM1		0	80	MAN-30	MAN-0	OFF
CUSTOM2		0	80	MAN-30	MAN-0	OFF

About the ICE custom setting (optional specification)

The [ICE] custom setting sets up the radar to detect areas of ice on the sea surface. With ICE active, the following restrictions apply.

- Turn off [COMBINE FUNC] in the radar installation menu to enable the [ICE] custom setting. See the installation manual.
- EAV 2, EAV 3, video contrast and ACE are inoperative.
- The video contrast setting for the performance monitor is fixed at [ICE] also.
- When a FAR-3xxx operates as the main radar, and a FAR-2xx7 as a sub radar, the areas of ice will not be displayed in the correct echo color on the FAR-2xx7. For this reason, do not use this radar combination when ICE is active.

2.12.1 How to select a customized echo

Click the [Customize Echo] button on the Status bar to select a customize echo option from the drop-down list.



2.12.2 How to edit a customized echo

You can edit a customized echo as below.

1. Select a customize echo option to edit (see subsection 2.12.1).

2. Right-click the [Customize Echo] button on the Status bar then click [Customize Echo Menu].

3. Set the items below referring to the sections shown.

[1 INT REJECT]: section 2.6

[2 ECHO STRETCH]: section 2.7

[3 ECHO AVERAGE]: section 2.8

[4 NOISE REJECT]: section 2.10

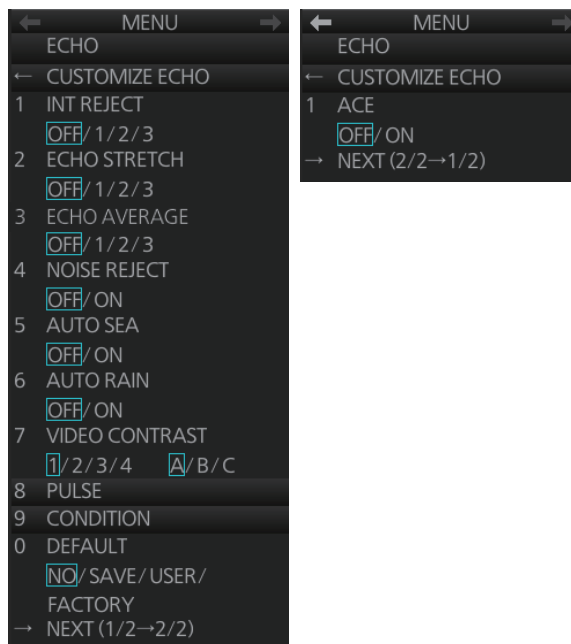
[5 AUTO SEA]: section 2.4

[6 AUTO RAIN]: section 2.5

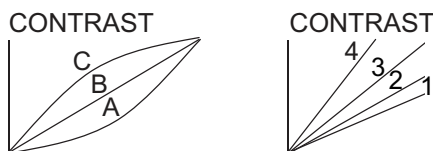
[8 PULSE]: section 2.2

[1 ACE]: section 2.9

4. Click [7 VIDEO CONTRAST].



5. Spin the scrollwheel to select 1, 2, 3 or 4 (Dynamic Range) or A, B, C (Curve) as appropriate then push the left button. Refer to the description and illustration below.



1-4: Control dynamic range. 1 provides the widest dynamic range; 4 is the narrowest dynamic range.

A: The mid-level in the curve is low, so this setting is suitable for suppressing rain clutter.

B: Curve between A and C.

C: The mid-level in the curve is high, so this setting is suitable for detecting distant targets.

6. Click [9 CONDITION].
7. Click [2 STC ANT HEIGHT].
8. Spin the scrollwheel to select appropriate radar antenna height (above the water-line) then push the left button.
9. If necessary, select [3 LOW LEVEL ECHO] to reject low level echoes. The setting range is 0-8. The higher the figure, the stronger the low level echo that is erased.
10. To save the custom settings, select [SAVE] from [0 DEFAULT].

2.12.3 How to restore a user customized echo to the saved settings

If you get lost in operation while adjusting the settings for a user customized echo, you can easily restore the settings for that user customized echo saved at subsection 2.12.2).

1. Right-click the [Customize Echo] button on the Status bar then click [Customize Echo Menu].
2. Click [0 DEFAULT].
3. Select [USER].

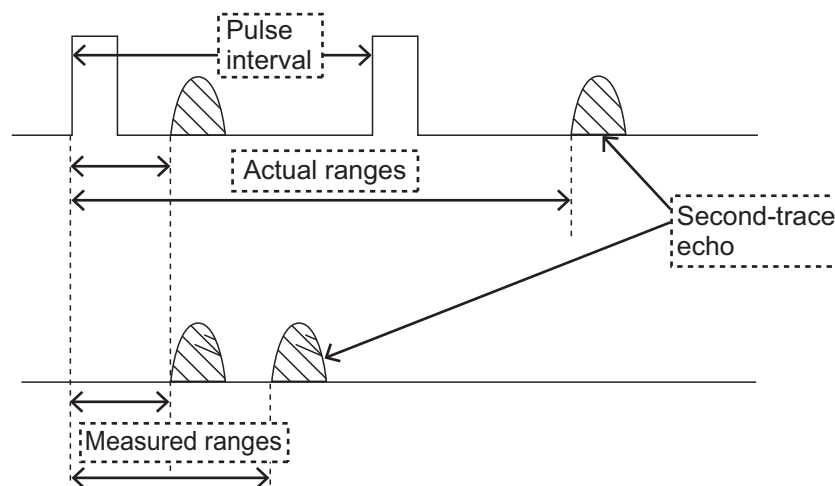
2.12.4 How to restore a user customized echo to the factory default settings

You can erase a customized echo options to restore its factory default options (see the tables on page 2-11).

1. Click the [Customize Echo] button on the Status bar to select [CUSTOM1] or [CUSTOM2] for which you want to restore its factory default settings.
2. Right-click the [Customize Echo] button on the Status bar then click [Customize Echo Menu].
3. Click [0 DEFAULT].
4. Select [FACTORY].

2.13 How to Suppress Second-trace Echoes

In certain situations, echoes from very far distance targets may appear as false echoes (second-trace echoes) on the screen. This occurs when the return echo is received one transmission cycle later, or after a next radar pulse has been transmitted.



This equipment lengthens the pulse repetition period to reject the false echoes.

Note: This function decreases the number of echoes hits. Carefully use this function so that the possibility of detecting small targets and high-speed craft does not lessen.

To reject second-trace echoes, open the [1 ECHO] menu then set [5 2ND ECHO REJ] to [ON] then close the menu.

2.14 Orientation Modes

This radar has the following orientation modes:

Relative Motion (RM)

Head-up: Unstabilized.

STAB H UP: Head-up with compass-stabilized bearing scale (True Bearing) where the bearing scale rotates with the compass reading.

Course-up: Compass-stabilized relative to ship's orientation at the time of selecting course-up.

North-up: Compass-stabilized with reference to North.

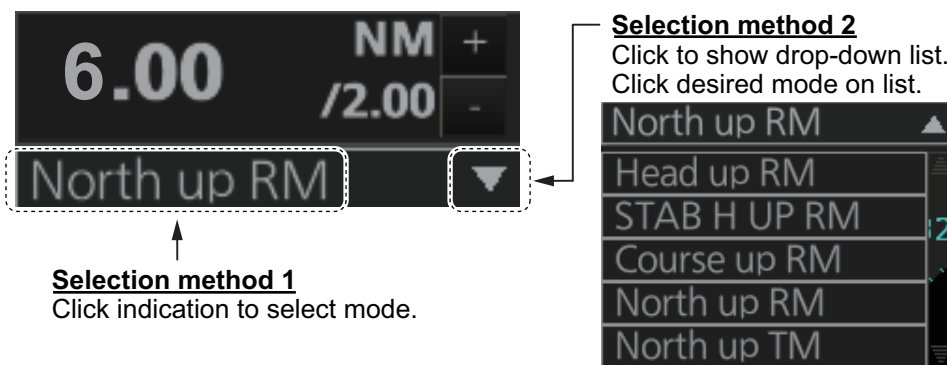
True Motion (TM)

North-up: Ground- or sea-stabilized with compass and speed inputs.

Mode availability

Orientation mode	Availability	
	Radar	Chart radar
Head-up RM	Yes	No
STAB H UP RM	Yes	No
Course-up RM	Yes	Yes
North-up RM	Yes	Yes
North-up TM	Yes	Yes

2.14.1 How to select a orientation mode



IMPORTANT

Loss of gyrocompass signal

When the gyrocompass signal is lost, the Alert "Lost Gyro x COM" (x: gyro no.) appears in the [Alert] box. After all signals are lost, the Alert "Lost Heading SIG" appears, the presentation mode becomes head-up and all TT and AIS are erased. Check the gyrocompass and select the presentation mode with the **MODE** key or the Range/Presentation mode box.

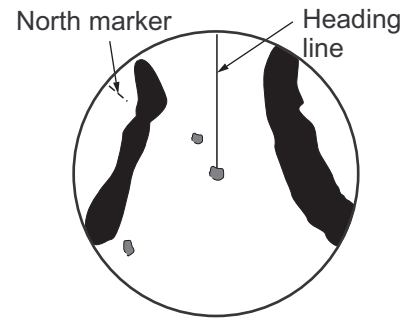
2.14.2 Description of orientation modes

Head-up mode

The head-up mode is a display in which the line connecting own ship and the top of the display indicates own ship's heading.

The target pips are painted at their measured distances and in their directions relative to own ship's heading.

The short line on the bearing scale is the north marker, which indicates heading sensor north. A failure of all the heading sensor inputs will cause the heading readout to disappear, and the Alert "Lost Heading SIG" or "Lost Gyro x COM" (x: gyro no.) appears in the [Alert] box.



STAB Head-up mode

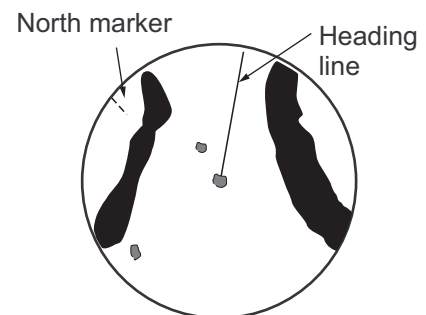
Radar echoes are shown in the same way as in the head-up mode. The difference from the normal head-up orientation lies in the orientation of the bearing scale. The bearing scale is heading sensor stabilized. That is, it rotates in accordance with the heading sensor signal, enabling you to know own ship's heading at a glance.

This mode is available when the radar is interfaced with a gyro heading sensor. If the gyro heading sensor fails, the bearing scale returns to the state of head-up mode.

Course-up mode

The course-up mode is an azimuth stabilized display in which a line connecting the center with the top of the display indicates own ship's intended course (namely, own ship's previous heading just before this mode has been selected).

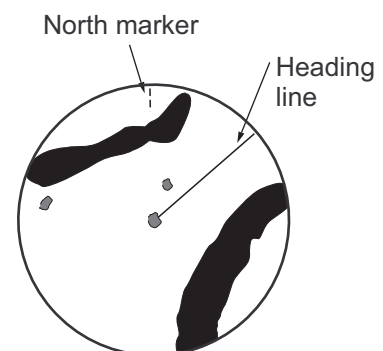
Target pips are painted at their measured distances and in their directions relative to the intended course, which is maintained at the 0-degree position. The heading line moves in accordance with ship's yawing and course change. This mode is useful for avoiding smearing of the picture during course change.



North-up mode

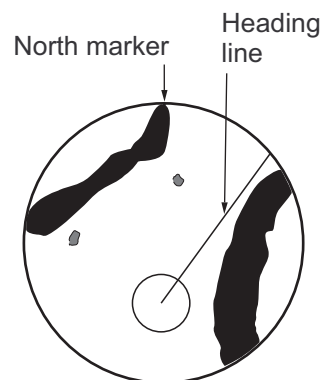
The north-up mode paints target pips at their measured distances and in their true (heading sensor) directions from own ship, north bearing maintained at the top of the screen. The heading line changes its direction according to the ship's heading. Requires heading signal.

If the compass fails, the presentation mode changes to head-up and the north marker disappears. A failure of the heading sensor input will cause the heading readout to disappear, and the Alert "Lost Heading SIG" or "Lost Gyro x COM" (x: gyro no.) appears in the [Alert] box.



True motion mode

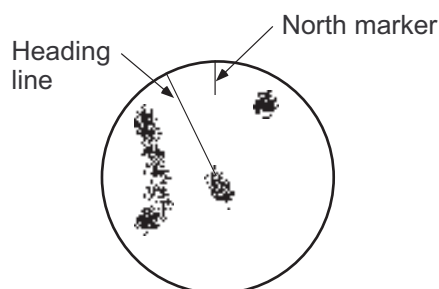
Own ship and other moving objects move in accordance with their true courses and speed. In ground stabilized TM, all fixed targets, such as landmasses, appear as stationary echoes. In the sea stabilized TM without set and drift inputs, the landmass can move on the screen. Note that true motion is not available on the 96 NM or higher range scale range scale. If COG and SOG (both over the ground) are not available on the TM mode, enter the set (tide direction) and drift (tide speed) manually referring to a Tide Table.



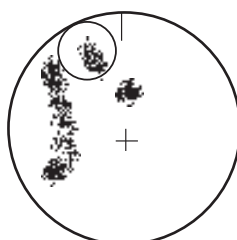
If the position of the CCRP results in a part of the bearing scale not being distinguishable, that part of the bearing scale is indicated with appropriate reduced detail.

A failure of the heading sensor input will cause the heading readout to disappear, and the Alert "Lost Heading SIG" or "Lost Gyro x COM" (x: gyro no.) appears in the [Alert] box.

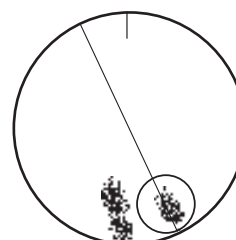
When own ship reaches a point corresponding to 50% of the radius of the display, own ship position is automatically reset to a point of 75% radius opposite to the extension of the heading line passing through the display center. You can also reset the own ship symbol manually by clicking the [CU/TM reset] button on the InstantAccess bar™.



(a) True motion is selected



(b) Own ship has reached a point 50% of display radius



(c) Own ship is automatically reset to 75% of display radius

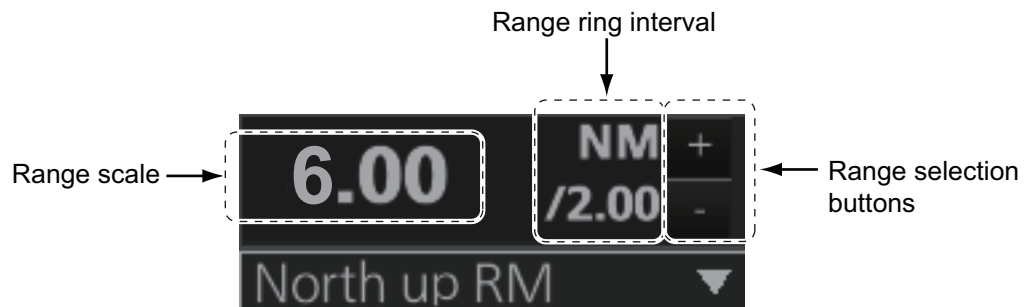
2.14.3 How to reset the course-up automatically

The heading line moves in accordance with ship's yawing and course change. During course-up mode, you can reset the heading line automatically to match the course.

1. Open the menu then select [8 INITIAL SETTING] and [6 AUTO COURSE UP RESET].
2. Select [ON].
3. Spin the scrollwheel to set the angle (22.5 to 45.0°) then push the left button. When the angle between the heading line and course reaches the setting, the heading line automatically matches the course.

2.15 How to Select the Range Scale

The selected range scale and range ring interval are shown at the top-left position on the screen. When a target of interest comes closer, reduce the range scale so that it appears in 50-90% of the display radius.



Note: This radar does not have the 1 NM, 2 NM, 4 NM, 8 NM, 16 NM and 32 NM.

How to select a range scale from the Control Unit

Use the **RANGE** key to select range desired. Hit the "+" part of the key to raise the range; the "-" part to lower the range.

How to select a range scale from the Range/Orientation mode box

Method 1: Click the range scale indication.

Method 2: Click the range selection buttons. Click the "+" button to raise the range; the "-" button to lower the range.

Method 3: Right-click the range scale indication to show a drop-down list of available ranges then click a range.

2.16 How to Measure the Range to a Target

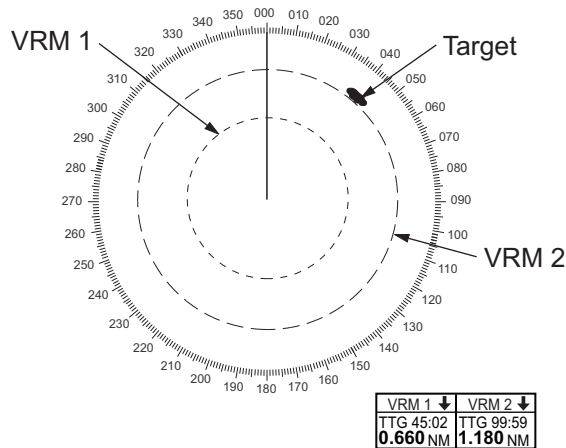
The range to a target may be measured three ways: with the fixed range rings, with the cursor, or with the VRM

Use the range rings to obtain a rough estimate of the range to a target. They are the concentric solid circles about own ship, or the sweep origin. The number of rings is automatically determined by the selected range scale and their interval is displayed in the Range/Orientation mode box at the top-left position on the screen. Count the number of rings between the center of the display and the target. Check the range ring interval and judge the distance of the echo from the inner edge of the nearest ring.

The range rings can be turned on/off with [6 RANGE RING] in the [3 NAV TOOL] menu.

2.16.1 How to measure the range by using a VRM

There are two VRMs, No. 1 and No. 2, which appear as dashed rings so that you can distinguish them from the fixed range rings. The two VRMs can be distinguished from each other by the different lengths of their dashes; the dashes on the No. 2 VRM are longer.



How to measure the range from the Control Unit

1. Press the **VRM 1** or **VRM 2** key to display desired VRM.
2. Rotate the **VRM rotary** control to align the active variable range marker with the inner edge of the target of interest and read its distance at the bottom-right position on the screen. Each VRM remains at the same geographical distance when you operate the range control. This means that the apparent radius of the VRM ring changes in proportion to the selected range scale.

To erase a VRM, press the **VRM 1** or **VRM 2** key to erase corresponding VRM.

How to measure the range from the trackball module

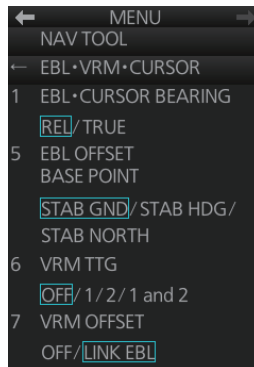
1. Click the title bar on a VRM box to activate the corresponding VRM.
2. Click the VRM box.
3. Spin the scrollwheel or use the trackball to align the active variable range marker with the inner edge of the target of interest and read its distance at the bottom-right position on the screen. Each VRM remains at the same geographical distance when you operate the range control. This means that the apparent radius of the VRM ring changes in proportion to the selected range scale set the outer edge of the VRM on the inner edge of the target.
4. To anchor the VRM, push the left button.

To turn off a VRM, click the arrow in the applicable VRM box. The VRM disappears and the VRM box is minimized.

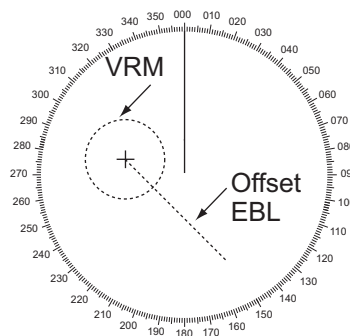
2.16.2 How to set VRM attributes

You can customize the VRMs to suit your needs.

1. Open the menu then select [3 NAV TOOL] and [2 EBL•VRM•CURSOR] to display the [EBL•VRM•CURSOR] menu.



2. Select [6 VRM TTG] and then select the VRM(s) that are to show/hide the TTG indication. [OFF] shows no TTG indication.
3. The [LINK EBL] option for [7 VRM OFFSET] automatically activates the corresponding VRM when the offset EBL is enabled.

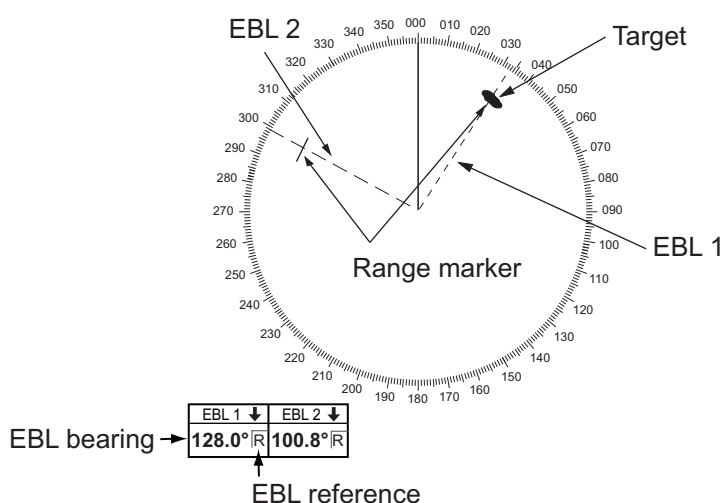


4. Close the menu.

2.17 How to Measure the Bearing to a Target

Use the Electronic Bearing Lines (EBLs) to take bearings of targets. There are two EBLs, No. 1 and No. 2. Each EBL is a straight dashed line extending from the own ship position up to the circumference of the radar picture. The two EBLs can be distinguished from each other by the different lengths of their dashes; the dashes on the No. 2 EBL are longer.

Each EBL carries a range marker, or a short line crossing the EBL at right angles. Its distance from the EBL origin is indicated at the VRM readout whether or not the corresponding VRM is displayed. The range marker changes its position along the EBL with the rotation of the VRM control. To operate this marker, rotate the **VRM rotary** control on the Control Unit, or put the cursor in the applicable VRM box and roll the scrollwheel.



2.17.1 How to measure the bearing with an EBL

How to measure the bearing from the Control Unit

1. Press the **EBL 1** or **EBL 2** key to display desired EBL.
2. Rotate the **EBL rotary** control to bisect the target with the EBL. Read the bearing to the target at the appropriate EBL box.

To erase an EBL, press the **EBL 1** or **EBL 2** key to erase corresponding EBL.

How to measure the bearing from the trackball module

1. Click the title bar on a EBL box to activate the corresponding EBL.
2. Click the EBL box.
3. Spin the scrollwheel or use the trackball to bisect the target with the EBL.
4. To anchor the EBL, push the left button.

To turn off an EBL, click the arrow in applicable EBL box. The EBL disappears and the EBL box is minimized.

2.17.2 How to select bearing reference

An EBL box has an "R" (relative) if the EBL bearing is relative to own ship's heading; "T" (true) if it is referenced to the north. True or relative indication is available regardless of orientation mode.

To change the bearing reference, click the EBL reference indication to display R or T as appropriate. The bearing reference can also be selected on the [2 EBL•VRM•CURSOR] - [1 EBL•CURSOR BEARING] menu.

Note: When the gyrocompass heading changes, the EBL and its indication change as follows:

Course-up, relative:	EBL indication remains the same, EBL moves.
Course-up, true:	EBL indication and EBL remain unchanged.
Head-up, relative:	EBL indication and EBL remain unchanged.
Head-up, true:	EBL indication remains the same, EBL moves.
North-up, relative:	EBL indication remains the same, EBL moves.
North-up, true:	EBL indication and EBL remain unchanged.

2.18 Collision Assessment by Offset EBL

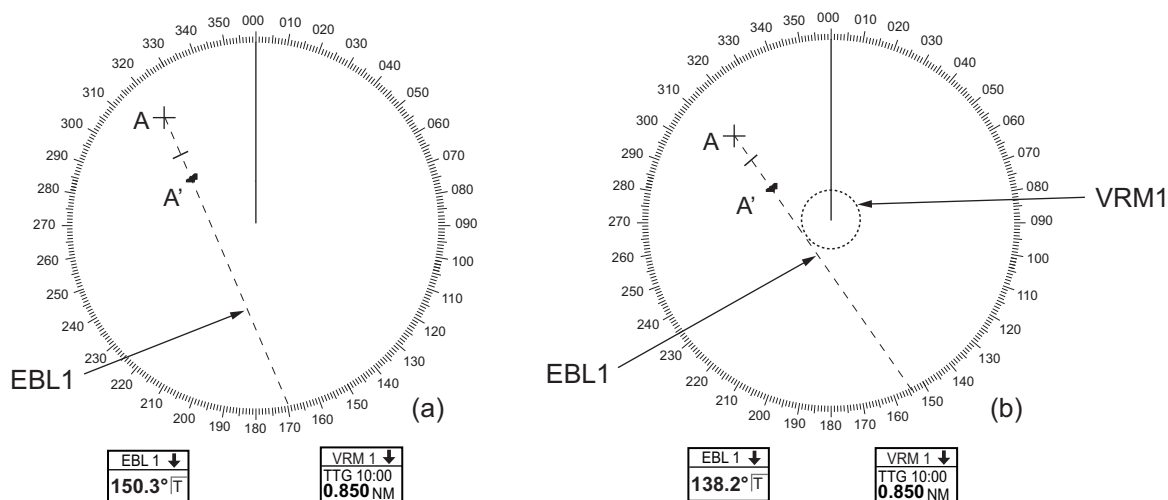
The origin of the EBL can be placed anywhere with the trackball to enable measurement of range and bearing between two targets. This function is also useful for assessment of the potential risk of collision. It is possible to read CPA (Closest Point of Approach) by using a VRM as shown in Figure (a) on the next page. If the EBL passes through the sweep origin (own ship) as illustrated in Figure (b), the target ship is on a collision course.

2.18.1 How to assess risk of collision

1. Right-click the display area to show the context-sensitive menu.
2. Select [EBL Offset] and then [EBL 1] or [EBL 2].
3. Put the cursor on a target that appears as a threat (A in the figure below).
4. Push the left button to shift the EBL origin to the cursor location.
5. Spin the scrollwheel or use the trackball to bisect the target at the new position (A'). The EBL indication shows the target ship's course, which may be true or relative depending on the EBL bearing reference setting.
6. It is also possible to read CPA by using a VRM as shown in left-hand figure below. If the EBL passes through the sweep origin (own ship) as illustrated in the right-hand figure below, the target ship is on a collision course.

To return the EBL origin to the center of the screen, click the EBL box.

2. RADAR OPERATION



2.18.2 Point of reference for origin point of offset EBL

The origin point of the offset EBL can be ground stabilized (geographically fixed), north stabilized (true) or referenced to your ship's heading (relative).

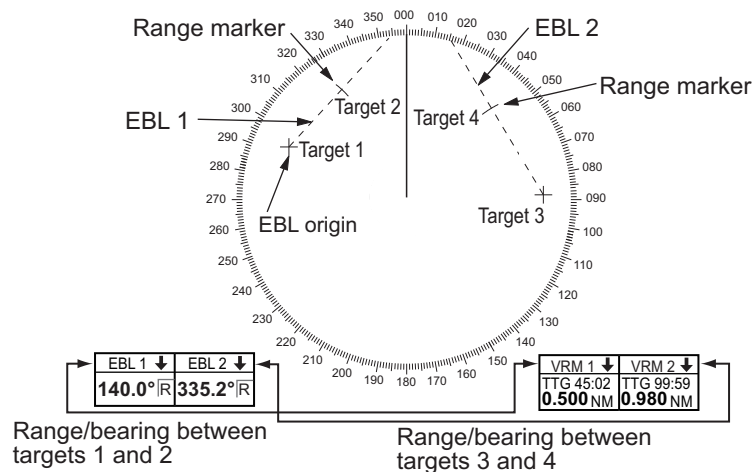
1. Open the menu then select the [3 NAV TOOL] and [2 EBL•VRM•CURSOR] menus to display the [2 EBL•VRM•CURSOR] menu.
2. Select [5 EBL OFFSET BASE POINT].
3. Select [STAB GND], [STAB HDG], or [STAB NORTH] as appropriate.
STAB GND: Referenced to latitude and longitude. Origin position is always fixed regardless of your ship's movement.
STAB HDG: Referenced to heading. The relationship of relative bearing between origin position and own position is kept always.
STAB NORTH: Referenced to North. The relationship of true bearing between origin position and own position is kept always.
4. Close the menu.

2.19 How to Measure the Range and Bearing Between Two Targets

1. Right-click the display area to show the context-sensitive menu.
2. Select [EBL Offset] then [EBL 1].
3. Put the origin of the EBL on a target of interest.
4. Push the left button to anchor the EBL.
5. Put the cursor on the EBL 1 box then spin the scrollwheel or use the trackball to bisect the other target of interest.
6. Put the cursor on the VRM 1 box then spin the scrollwheel to put the range marker on the EBL on the inside edge of target 2.

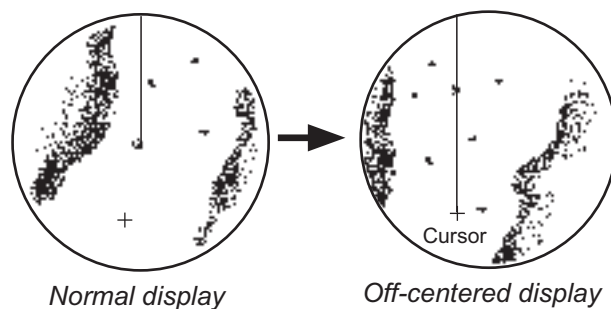
You can repeat the same procedure on third and fourth targets (targets 3 and 4) by using the EBL 2 and the VRM 2.

Bearing is shown relative to own ship with suffix "R" or as a true bearing with suffix "T". To return the EBL to its origin, open the context-sensitive menu then select [Reset EBL].



2.20 How to Off-center the Display

Own ship position, or sweep origin, can be displaced to expand the view field without switching to a larger range scale. The sweep origin can be off-centered to the cursor position, but not more than 75% of the range in use; if the cursor is put beyond 75% of the range scale, the sweep origin will be off-centered to the point of 75% of the limit.



This feature is available on the ranges between 0.125 and 48 NM and any orientation mode other than true motion.

If the position of the CCRP results in a part of the bearing scale not being distinguishable, that part of the bearing scale is indicated with appropriate reduced detail.

How to off-center the display from the context-sensitive menu

1. Put the cursor in the display area then right-click to show the context-sensitive menu.
2. Select [Off Center].
3. Put the cursor where to put the sweep origin, and push the left button.

To cancel the off-center display, do steps 1 and 2 above, then click the display area.

If you cannot cancel off-center...

When the conditions shown below are met, off-center cannot be cancelled. This is because the radar antenna position is located at a position greater than 75% of the effective radar display.

- Own ship marker is large.
- The distance between the antenna position and the conning position is large.

- Short-distance display range.

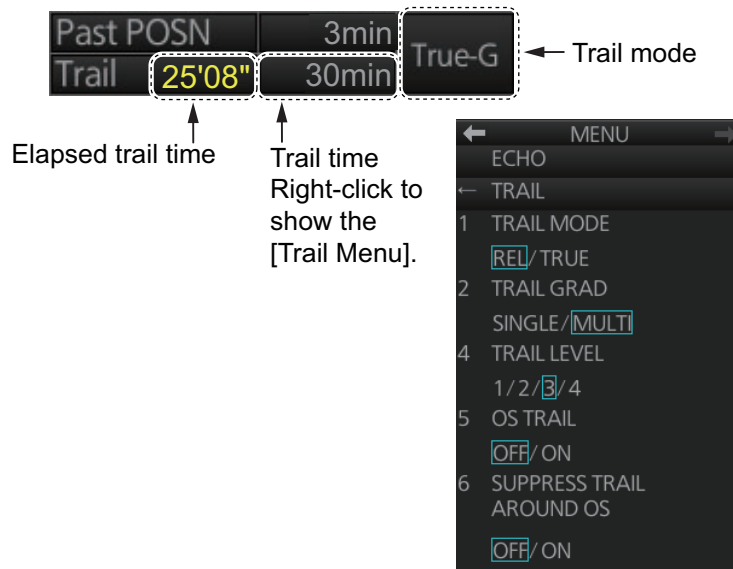
To cancel the off-center in the above-mentioned conditions, first select a larger range, then cancel the off-center.

2.21 Target Trails

The trails of the radar echoes of targets may be displayed in the form of synthetic afterglow. Target trails are selected either relative or true and may be sea or ground stabilized. True motion trails require a compass signal, and position and speed inputs.

2.21.1 Target trails-related indications

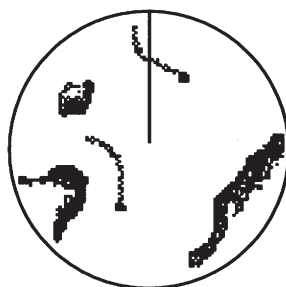
Trail-related indications are located at the bottom-right position on the screen. Several trail-related operations can be done from the [Trail Menu], which you can show by right-clicking the Trail time indication.



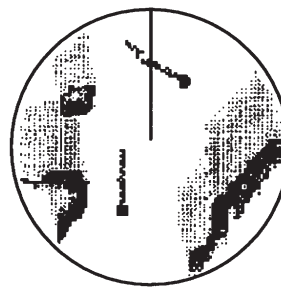
2.21.2 True or relative target trails

You may display echo trails in true or relative motion. Relative trails show relative movements between targets and own ship. True motion trails present true target movements in accordance with their over-the-ground speeds and courses.

Click the Trail mode indication to select [True-G], [True-S] or [REL] as appropriate.



True target trails
(No smearing of stationary targets)



Relative target trails
(Targets moving relative to own ship)

2.21.3 Trail time

Trail time, the trail plotting interval, can be selected with the scrollwheel, left button or right button.

The trail timer counts up the trail time and is erased once the terminal count is reached. For example, if the trail time is six minutes, the timer is erased when trails have been plotted six minutes. The maximum time of count up for continuous plotting is 29'59".

Note: Caution is advised when using the trail timer, as the trail accuracy of other ship's echoes may be lowered.

How to select a trail time

Three controls are available to select a trail time.

Put the cursor on the Trail time indication at the bottom-right position then operate the control (left button or scrollwheel). For the right button, a context-sensitive menu appears. Click the desired time.

The times available depend on the control used as shown in the table below.

Control	Available setting
Left button, right button	OFF, 15 sec, 30 sec, 1 min, 3 min, 6 min, 15 min, 30 min, CONT(inuous)
Scrollwheel	OFF, 15 sec, 30 sec, 1-30 min (30 sec intervals), CONT(inuous)

2.21.4 How to reset target trails

All trails can be erased (including those in the memory) and restarted to start trails fresh.

Right-click the Trail box to show the context-sensitive menu then select [Trail All Clear].

2.21.5 How to temporarily remove all target trails from the display

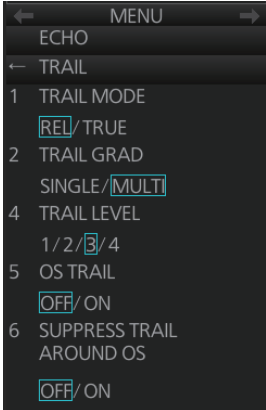
You can temporarily remove all trails from the display. Trails are removed but are continued internally.

Click the trail time indication to display [OFF].

2.21.6 Trail stabilization in true motion

True motion trails can be ground stabilized or sea stabilized. The [Trail time] indication shows current stabilization as [True-G] or [True-S]. To change the stabilization mode, open the [SPD] page of the sensor settings menu (see section 1.8) and set [Stabilization Mode] to Bottom (GPS) or Water (speed log).

2.21.7 Target trail attributes on the TRAIL menu



[1 TRAIL MODE]: Switch the trail mode to [REL] or [TRUE].

[2 TRAIL GRAD]: The afterglow of the target trails can be shown in a single tone or gradual shading.



Monotone
(SINGLE)



Gradual shading
(MULTI)

[4 TRAIL LEVEL]: The level (intensity) of the afterglow that extends from radar targets can be adjusted. The higher the number the greater the intensity of the afterglow.

[5 OS TRAIL]: Show or hide trail for own ship.

[6 SUPPRESS TRAIL AROUND OS]: You can prevent the display of sea clutter in true trails about your ship, to clear the radar picture.

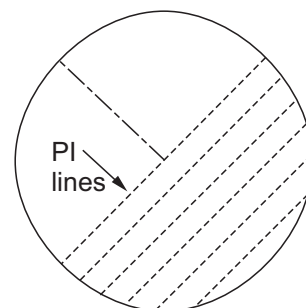
Note: [6 SUPPRESS TRAIL AROUND OS] is automatically turned on when [5 OS TRAIL] is activated. The possible ON/OFF combinations between [5 OS TRAIL] and [6 SUPPRESS TRAIL AROUND OS] are as shown in the table below.

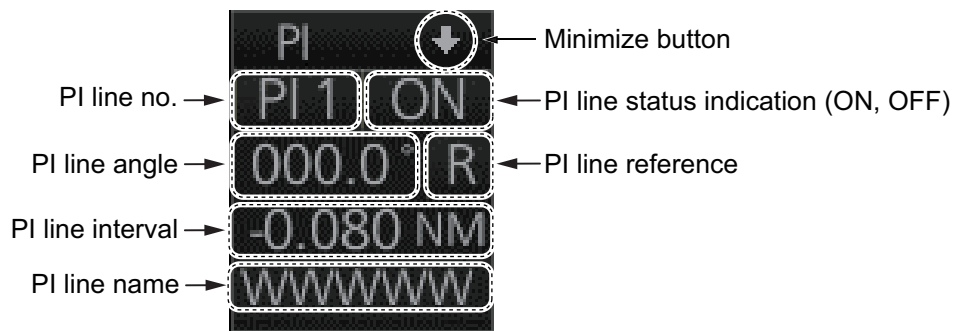
Setting	ON/OFF pairings available			
[5 OS TRAIL]	OFF	ON	OFF	ON
[6 SUPPRESS TRAIL AROUND OS]	OFF	ON	ON	OFF
Remarks	No OS trail	-	-	Setting not possible

2.22 Parallel Index (PI) Lines

PI lines are useful for keeping a constant distance between own ship and a coastline or a partner ship when navigating. Up to 16 sets of PI lines are available depending on the maximum number of PI lines selected on the menu.

Control of the orientation and interval of the PI lines is done from the PI line box, which is at the bottom-left position.





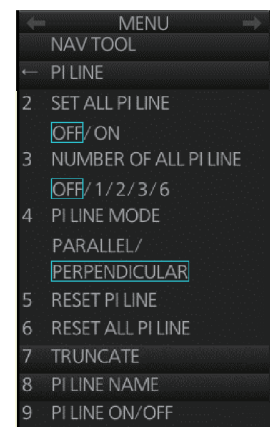
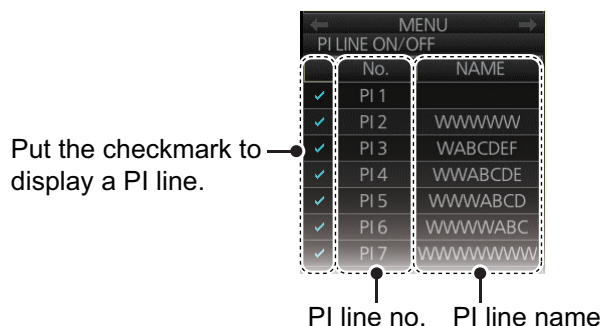
2.22.1 How to display, hide a PI line

How to display, hide a PI line from the trackball module

Click the PI line no. indication to select a PI line. Click the PI line status indication ([ON], [OFF]) to display or hide a PI line.

How to display, hide a PI line from the menu

1. Open the menu.
2. Select [3 NAV TOOL] and [1 PI LINE] to show the [PI LINE] menu.
3. Select [9 PI LINE ON/OFF].



4. Put a checkmark(s) for the PI line no. to be displayed.
5. Close the menu.

2.22.2 How to hide all PI lines

1. Open the menu.
2. Select [3 NAV TOOL] and [1 PI LINE] to show the [PI LINE] menu.
3. Select [2 SET ALL PI LINE].
4. Select [OFF] to hide all PI lines. The PI line box is grayed out.

2.22.3 How to adjust PI line orientation, PI line interval

1. If not already displayed, display a PI line.
2. Put the cursor on the PI line angle indication then spin the scrollwheel to set the angle (000 to 359.9).
3. Put the cursor on the PI line interval indication then spin the scrollwheel to adjust the PI line interval.

2.22.4 How to select the number of PI lines to display

You can select the number of PI lines to display among 1, 2, 3 or 6.

For all PI lines

1. Open the menu.
2. Select [3 NAV TOOL] and [1 PI LINE] to show the [PI LINE] menu.
3. Select [3 NUMBER OF ALL PI LINE] and the desired number of PI lines among [1], [2], [3] or [6].
4. Close the menu.

For individual PI line

1. Select the PI line no. to set the number of PI lines referring to subsection 2.22.1.
2. Right-click the PI line box to show the context-sensitive menu then select [Number of PI Line].
3. Select the desired number of PI lines among [1], [2], [3] or [6].

Note: The actual number of lines visible can be less depending on line interval.

2.22.5 How to select the PI lines orientation

1. Open the menu.
2. Select [3 NAV TOOL] and [1 PI LINE] to show the [PI LINE] menu.
3. Select [4 PI LINE MODE].
4. Select [PARALLEL] or [PERPENDICULAR].
[PARALLEL]: PI lines are displayed in parallel to your ship's heading when PI line angle is set to 0°.
[PERPENDICULAR]: PI lines are displayed in perpendicular to your ship's heading when PI line angle is set to 0°.
5. Close the menu.

2.22.6 How to reset PI lines

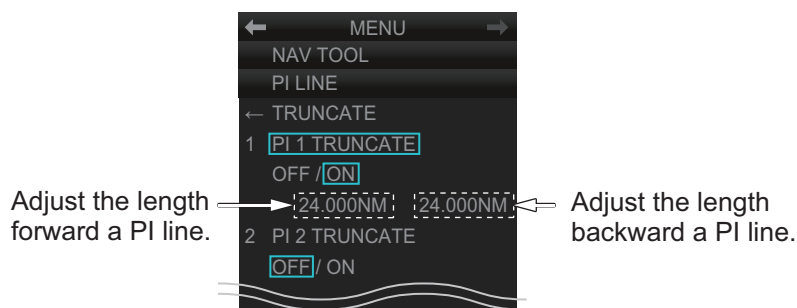
You can automatically return all or selected PI lines to default orientation, 0-degrees for parallel orientation, 90-degrees for perpendicular orientation. This is faster than doing it manually.

1. Open the menu.
2. Select [3 NAV TOOL] and [1 PI LINE] to show the [PI LINE] menu.
3. Select [5 RESET PI LINE] (reset currently displayed line) or [6 RESET ALL PI LINE] as appropriate. The confirmation message "Attention: Do you wish to reset PI No.x line setting?" or "Attention: Do you wish to reset all PI line settings?" appears. Click the [OK] button to reset the PI line(s).
4. Close the menu.

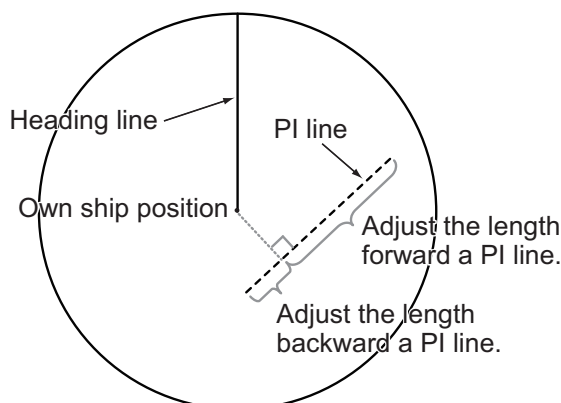
2.22.7 How to adjust PI line length

You can adjust the length of each PI line. This function is available when [3 NUMBER OF ALL PI LINE] is set to [1].

1. If not already displayed, display a PI line to adjust the length referring to subsection 2.22.1.
2. Open the menu.
3. Select [3 NAV TOOL] and [1 PI LINE] to show the [PI LINE] menu.
4. Select [7 TRUNCATE].
5. Select [ON] in [PI 1 (to PI 16) TRUNCATE].



6. Set the length (setting range: 0.000 to 24.000 NM).

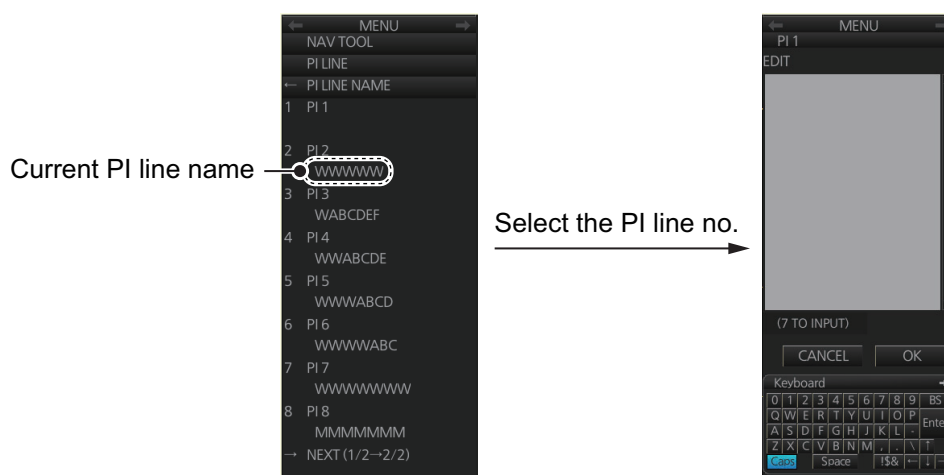


7. Close the menu.

2.22.8 How to register the PI line name

Do as follows to register the PI line name.

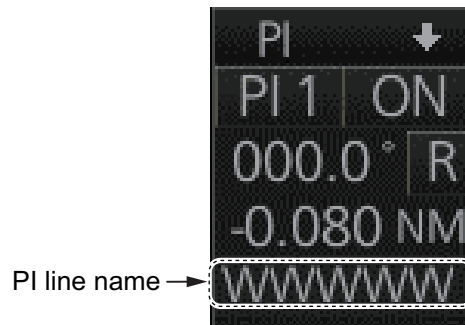
1. Open the menu.
2. Select [3 NAV TOOL] and [1 PI LINE] to show the [PI LINE] menu.
3. Select [8 PI Line Name].
4. Select the PI line no. for which you want to register the name.



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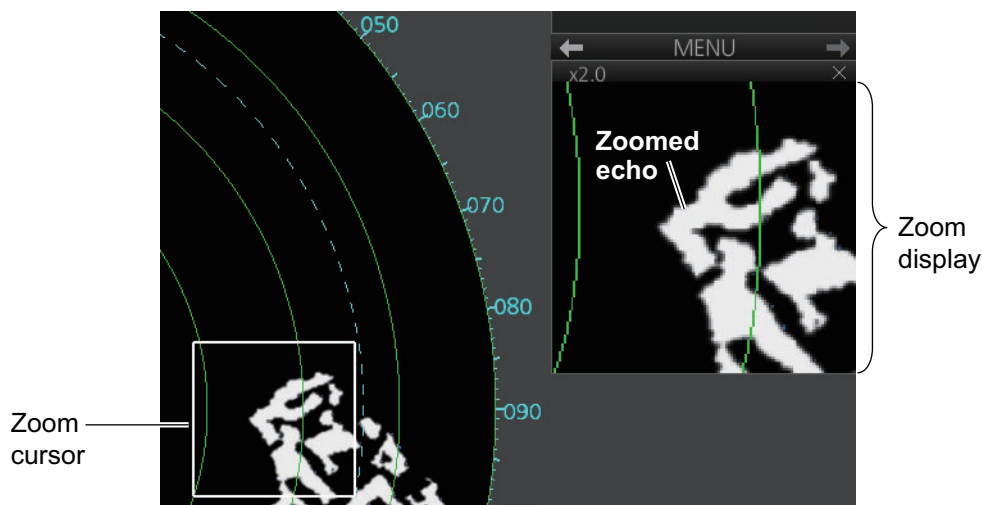
5. Enter the PI line name (max. seven characters), then click the [OK] button.
6. Close the menu.

The registered PI line name is displayed on the PI line box.



2.23 Zoom

The zoom function enlarges an area of interest in the information area (magnification range: 1.0, 1.5, 2.0, 2.5, 3.0; 2.0 is default). To use the zoom display, right-click the operational area to show the context-sensitive menu then select [Zoom Set]. Roll the trackball to put the zoom cursor on the area to zoom. Spin the scrollwheel to change the magnification then push the left button to confirm the magnification and the position. See the zoom display at the right side of the screen.



To deactivate the zoom function, right-click the operational area to show the context-sensitive menu then select [Zoom Off].

Zoom display format

You can select the zoom display format.

1. Open the menu then select [4 INFORMATION BOX] and [3 ZOOM DISPLAY].
2. Select the zoom display format.
[STAB GND]: Ground stabilized zoom (Geographically fixed).
[STAB HDG]: Heading stabilized zoom (Relative).
[STAB NORTH]: North stabilized zoom (True).
[TT TRACK]: Tracked targets are zoomed.
3. Close the menu.

2.24 Markers

2.24.1 Heading line

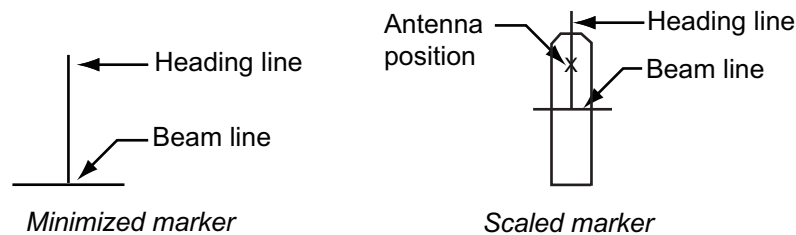
The heading line indicates the ship's heading in all orientation modes. The heading line is a line from the own ship position to the outer edge of the radar display area and appears at zero degrees on the bearing scale in head-up mode. It changes its orientation in the north-up and true motion modes according to orientation.

Temporarily erasing the heading line

To temporarily extinguish the heading line (and anything but radar echoes within the display area) to look at targets existing dead ahead of own ship, click the [HL OFF] button on the InstantAccess bar™. Release the respective control to redisplay the heading line, etc.

2.24.2 Own ship marker

The own ship marker is displayed at your ship's position. It can be turned on or off and its configuration selected from the [1 MARK SETTING] menu. Two configurations are available: minimized marker and scaled marker. The scaled marker is scaled according to the length and beam of the vessel. If the beam width or length of the marker (set at installation) gets smaller than 3 mm, the marker is replaced with the minimized marker. Ship's dimensions should be entered at installation to use the scaled marker.



1. Open the menu then select [5 MAP•MARK] and [1 MARK SETTING].
2. Select [4 OWN SHIP MARK].
3. Select [MIN] or [SCALED] as appropriate.
 [MIN]: Show the minimized own ship marker.
 [SCALED]: Show the scaled own ship marker.

2.24.3 Stern marker

The stern marker, which is a dotted line, appears opposite to the heading line and marks your ship's stern. To display or erase this marker, do the following:

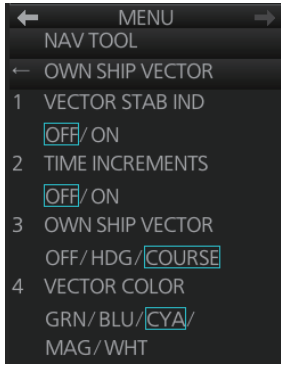
1. Open the menu then select [5 MAP•MARK] and [1 MARK SETTING].
2. Select [6 STERN MARK].
3. Select [ON] or [OFF] as appropriate.

2.24.4 North marker

The north marker appears as a short dashed line. In the head-up mode, the north marker moves around the bearing scale in accordance with the compass signal.

2.24.5 Vectors

You can show or hide the vector for own ship and reference targets, on the [3 NAV TOOL] menu.



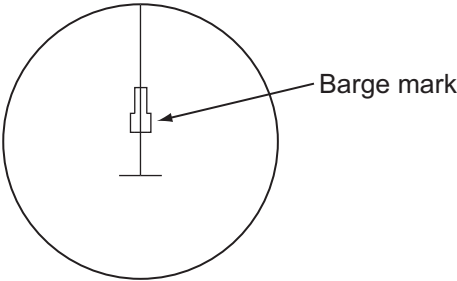
[4 OWN SHIP VECTOR] menu
[1 VECTOR STAB IND]: Turn ON to show double arrow for ground tracking; single arrow for water tracking.
[2 TIME INCREMENTS]: A short horizontal line can be marked on the own ship vector in one-minute intervals to show approximate later positions.
[3 OWN SHIP VECTOR]: Turn vector OFF, or show ship's heading or course with a vector.
[4 VECTOR COLOR]: Set the vector color for own ship.



[5 TARGET VECTOR] menu
[1 REF TARGET VECTOR]: Turn the vector for the reference target on or off.

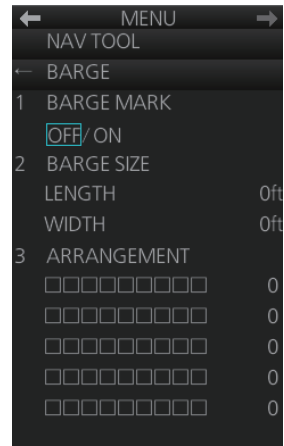
2.24.6 Barge marker

Barge marks, with scaled length and breadth, can be shown to mark the location of barges. A maximum of five in the port/starboard direction and nine in the bow/stern direction can be shown.



This feature is available with an installation preset. Set up barge information as follows:

1. Open the menu then select [3 NAV TOOL].
 2. Select [7 BARGE].
 3. Select [1 BARGE MARK].
 4. Select [ON] to turn on the barge mark.
 5. At [2 BARGE SIZE], enter length (three digits) and width (two digits) of the total number of barges.
 6. Select [3 ARRANGEMENT].
 7. Enter the number of barges that will be in front of your vessel, row by row:
 - 1) Select a barge row.
 - 2) Spin the scrollwheel to set the number of barges in the row. (The maximum number is nine.) The numerical indication to the right of the squares changes with scrollwheel operation.
 - 3) Push the left button to confirm your selection. The squares on the row are "filled" according to the number of barges selected at step 2.
 8. Close the menu.
- The radar display now shows the barge mark on the display.



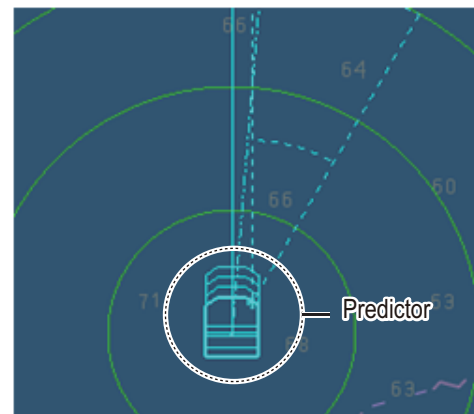
2.24.7 Antenna marker

The antenna marker appears as a blue cross at the antenna location. The marker can be shown or hidden as follows:

1. Open the menu then select [5 MAP•MARK] and [1 MARK SETTING].
2. Select [5 ANTENNA MARK].
3. Select [ON] or [OFF] as appropriate.

2.24.8 Display 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, which you set on the [Predictor] page in the [Overlay/NAV Tools] box. 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.



1. Open the menu then select [5 MAP•MARK] and [1 MARK SETTING].
2. Select [NEXT (1/2→2/2)].
3. Select [3 DISP PREDICTOR].
4. Select [ON] or [OFF] as appropriate.

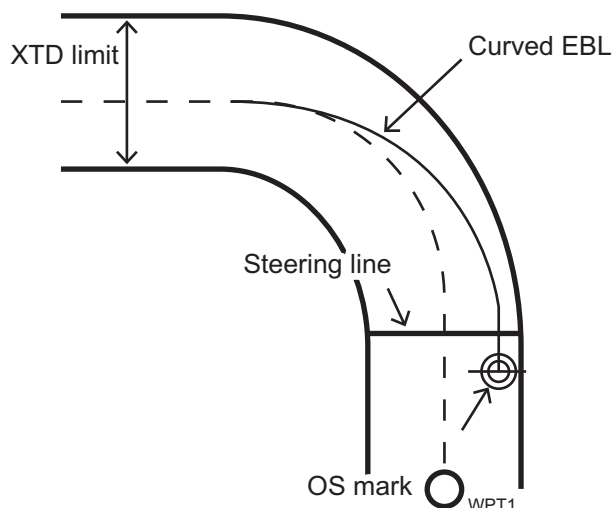
2.24.9 Curved EBL

The [Curved EBL] function, available in the chart radar mode, 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-3000/3005 with TCS functionality (optional specification) is connected to the network.

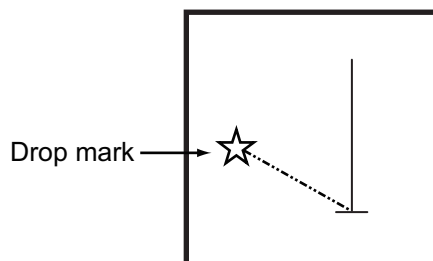
1. Open the menu and select [5 MAP•MARK] and [MARK SETTING].
2. Select [DISP CURVED EBL] from page 2 of the [MARK SETTING] menu.
3. Select [ON] to display the curved EBL, [OFF] to hide the curved EBL.
4. Close the menu.



2.25 Drop Mark

The drop mark is used to find the angle and distance from a point to your ship. This can be useful for marking a point to avoid while navigating to a destination. The drop marks can be shown or hidden on the screen. Up to five drop marks can be shown on this radar display.

The Drop mark box shows the angle and distance between the drop mark and your ship.



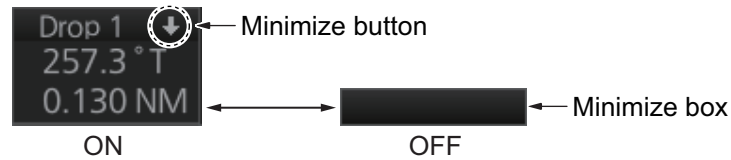
Note: The drop mark feature requires position data.

2.25.1 How to show, hide the drop mark box

The drop mark box can be shown or hidden by trackball.

OFF: Click the minimize button on the [Drop mark] box.

ON: Click the minimize box.



2.25.2 How to inscribe a drop mark

Click the drop angle or distance area on the desired Drop mark box at the bottom of the screen. Click a position on the display area where to put a drop mark, and a drop mark is inscribed at the position selected. The angle and distance to the point appear in the corresponding Drop mark box.

2.25.3 Drop mark bearing reference

The bearing of a drop mark is automatically referenced to True or Relative according to the orientation mode set at the main radar.

Orientation mode set at main radar	Bearing reference in the ECDIS radar mode
Head-up RM	Relative
STAB Head-up RM	
Course-up RM	True
North-up RM	
North-up TM	

2.25.4 How to erase a drop mark

Erase drop marks from menu

1. Open the menu then select the [5 MAP•MARK] and [1 MARK SETTING] menus.
2. Select [7 DROP MARK].
3. Select [ON] or [OFF].
4. Close the menu.

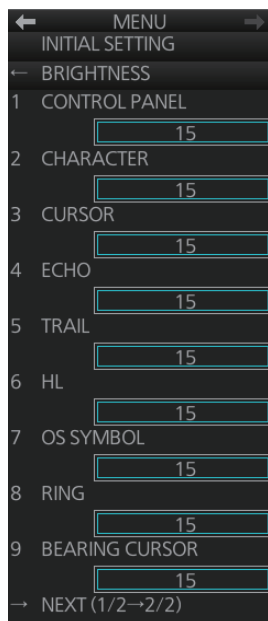
Erase drop mark by trackball

Right-click the applicable Drop mark box to show the context-sensitive menu, then select [Drop1 Off] (or [Drop2 Off]). The drop mark and its data are erased.

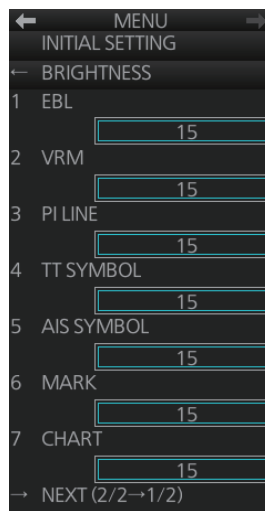
2.26 How to Adjust Brilliance of Screen Data

You can adjust the relative brilliance levels of various markers and alphanumeric read-outs displayed on the screen.

1. Right-click the [BRILL] button on the InstantAccess bar™ then select [Brill Menu].



[BRIGHTNESS] menu, page 1



[BRIGHTNESS] menu, page 2

2. Click the brilliance adjustment bar of the item to adjust.

Page 1		Page 2	
Item	Adjusts brightness of	Item	Adjusts brightness of
[1 CONTROL PANEL]	backlighting of keys on Control Unit	[1 EBL]	EBLs, blind sector
[2 CHARACTER]	Alphanumeric characters	[2 VRM]	VRMs
[3 CURSOR]	Cursor	[3 PI LINE]	PI lines
[4 ECHO]	Radar echoes	[4 TT SYMBOL]	TT symbols, AZ area, TT vector, TT past posn
[5 TRAIL]	Target trails	[5 AIS SYMBOL]	AIS symbols, AIS vector, AIS past posn
[6 HL]	Heading line, stern line	[6 MARK]	Radar map marks, route, waypoint/MOB mark, anchor watch, drop1/2, zoom, north mark, user chart
[7 OS SYMBOL]	Own ship symbol, barge mark, antenna mark, own ship track, own ship vector	[7 CHART]	Chart-related objects
[8 RING]	Fixed range rings		
[9 BEARING CURSOR]	Bearing cursor		

3. Spin the scrollwheel to set brilliance level.
4. Close the menu.

2.27 Information Box

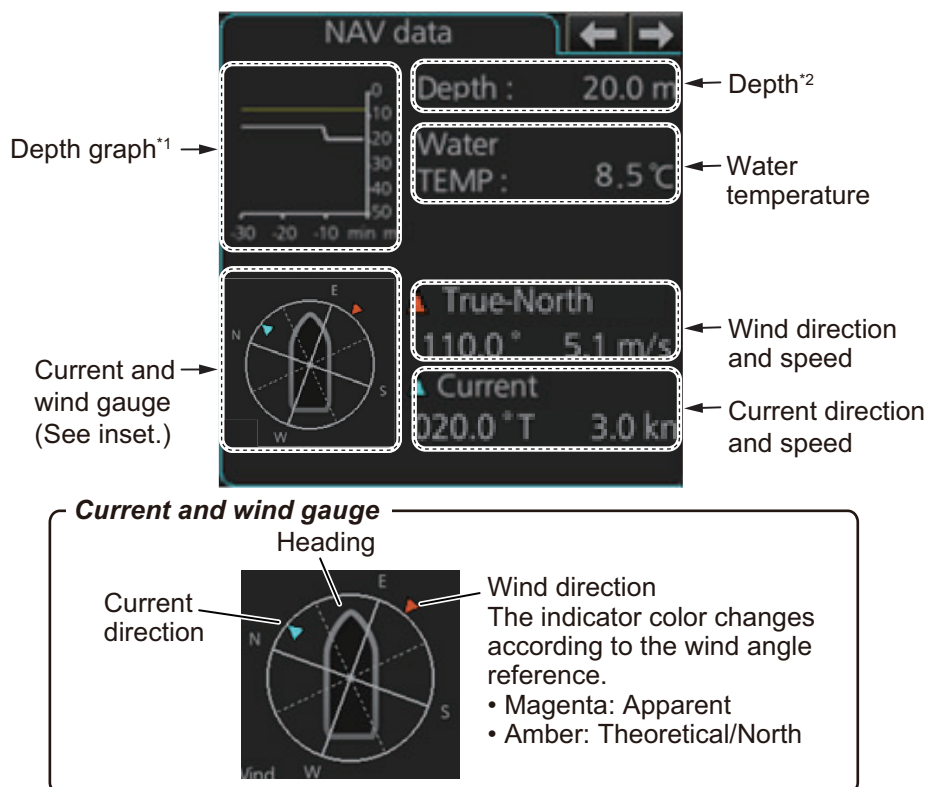
The information box shows navigation data and, when following a route set on the chart display, route information is also shown. You can navigate the information tabs by clicking the arrow buttons ([←] or [→]) at the top-right of the information box.

2.27.1 Information box contents

Navigation data

- Depth, analog and graph
- Current (tide) direction and speed
- Wind direction and speed
- Water temperature
- Current and wind gauge

Nav data requires appropriate navigation sensors and IEC 61162-1/2 sentences output from the sensor. If there is no sentence or data input, asterisks (*) appear at the corresponding indication.



*1 When a depth is set for [DEPTH MARK] in the [SET NAV DATA] menu, the set depth is indicated with a yellow line.

*2 When the FE-800 is used, the depth indication changes as follows:

Depth REF. TRANSD	1
Fore : 25.0 m	2
Aft : 35.0 m	3

- **1**: Shows the reference point for depth readings.
 - [REF. TRANSD]: Depth from transducer
 - [REF. SURF]: Depth from surface
 - [REF. KEEL]: Depth from keel
- **2**: Shows the depth at fore transducer. Shown when the fore transducer is connected.
- **3**: Shows the depth at aft transducer. Shown when the aft transducer is connected.

2. RADAR OPERATION

Route information

The route 1 information displays route name, plan speed, plan course, course to steer, XTD limit and XTD (off track). The route 2 information displays waypoint no., distance to WOP (wheel over point), time to go, planning turn radius, turn rate, next waypoint no., bearing to next waypoint.

ROUTE1	
Route : ROUTE10	
Plan Speed :	10.2 kn
Plan Course :	123.2 °T
Course to Steer :	123.2 °T
XTD Limit :	250.2 m
XTD :	45.4 m

Route 1

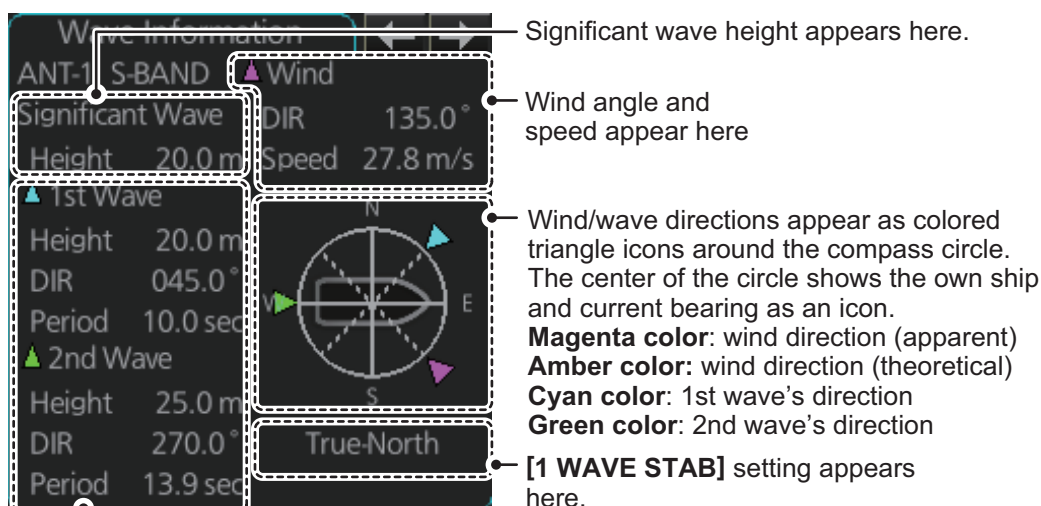
Route 2	
To WPT :	2
DIST to WOP :	1.05 NM
Time to Go:	5:16'20"
Turn RAD :	0.8 NM
ROT :	***.°/min
Next WPT :	3
Next Course :	180.8 °

Route 2

Wave data display

You can view wave data when a PC (with the wave analysis software installed) is connected to the same network as this radar. The software requires radar echo data in order to calculate and display wave data.

Note: To use the wave data display, connection with the analysis PC and software setup must be done at installation. Consult your local dealer.



Wave information appears here.

[HEIGHT]: Wave height

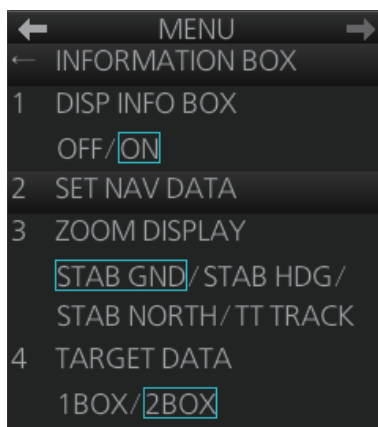
[DIR]: Direction from which the wave is approaching.

[PERIOD]: Time until the wave meets own ship.

For details regarding the wave data display, see the manual supplied with the software (OMC-36181).

2.27.2 How to show the information box

1. Open the menu and select [4 INFORMATION BOX].

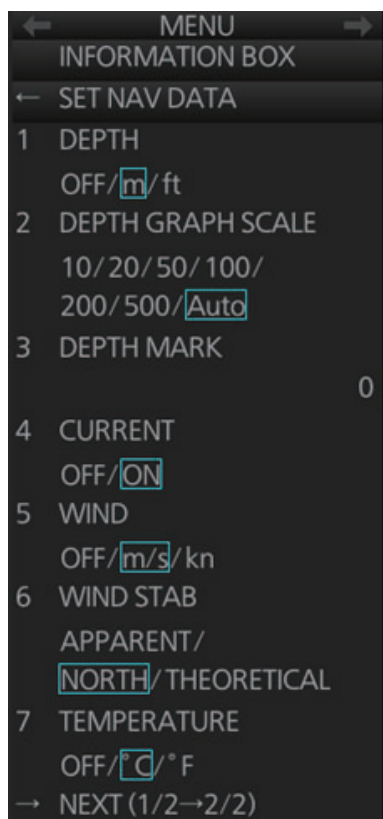


2. Select [1 DISP INFO BOX] then [ON].
3. Close the menu.

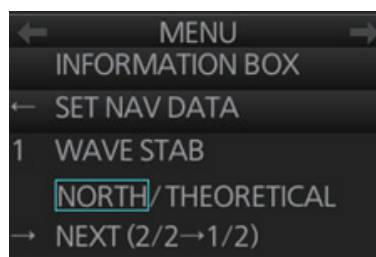
2.27.3 How to turn NAV data on/off

Wind, depth, ocean current and water temperature may be set up as follows:

1. Open the menu then select [4 INFORMATION BOX].
2. Select [2 SET NAV DATA].



Page 1



Page 2

3. Set up the nav data display referring to the table on the next page.

2. RADAR OPERATION

Item	Description
Page 1	
[1 DEPTH]	Selects the unit of depth measurement, or turn depth indication off.
[2 DEPTH GRAPH SCALE]	Selects depth scale range. The depth for the last 30 minutes is plotted with a yellow line. The [Auto] setting automatically adjusts the scale according to depth.
[3 DEPTH MARK]	Selects the depth at which to show the depth mark.
[4 CURRENT]	Turns the current (tide) display on (current relative to North) or off.
[5 WIND]	Selects the unit of wind speed measurement.
[6 WIND STAB]	Selects Wind vector format, among three choices: [APPARENT]: Apparent wind measured by wind meter, with ship's bow as reference. [NORTH]: Apparent wind minus ship's movement, with North as reference. [THEORETICAL]: Apparent wind minus ship's movement, with ship's bow as reference.
[7 TEMPERATURE]	Selects the unit of water temperature measurement, or turns water temperature indication off.
Page 2	
[1 WAVE STAB]	Set the stabilization for the echo data output for wave analysis. [NORTH]: Apparent wave minus ship's movement, with North as reference. [THEORETICAL]: Apparent wave minus ship's movement, with ship's bow as reference. Note: This menu item appears only when setup and connection with a wave analysis PC is done at installation.

Note: Appropriate sensors are required to display any data. The wind vector shows a direction from which the wind blows, relative to own ship heading, and is labeled "T". Wind velocity is a true wind speed as a result of compensating for own ship's speed and orientation. Ocean current (tide) is shown relative to bow in head-up, cursor gyro and course-up, and reference to North in north-up and true motion.

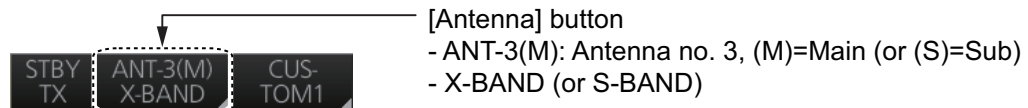
4. Close the menu.

2.28 Interswitch

The interswitch uses a network to transfer multiple radar signals to the monitor units connected in the network. A main/sub relation can be set for a single radar signal and that signal can be shown on multiple displays. Up to four antennas and four display units can be connected. Set the radar display and antenna groups from the [Antenna] button on the Status bar.

When you switch to a different antenna, the heading skew and timing adjustment (set at installation) for that antenna are automatically applied.

The [Antenna] button on the Status bar shows current antenna selection.



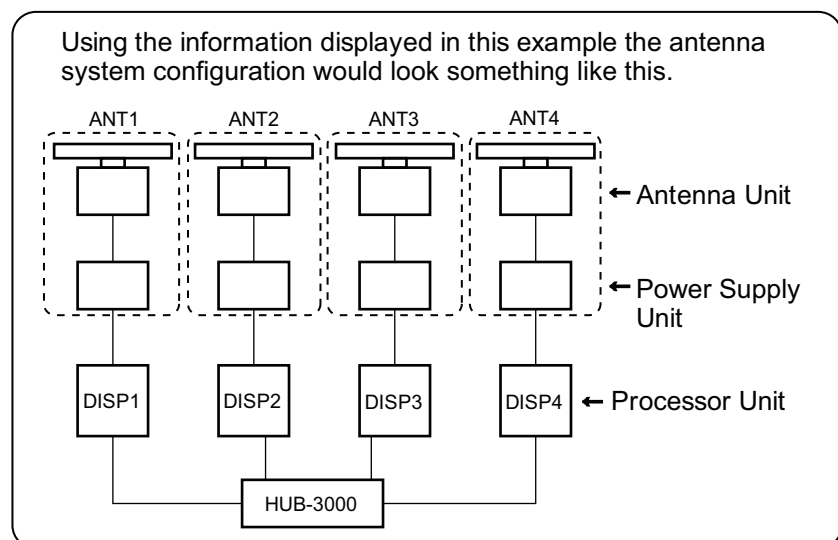
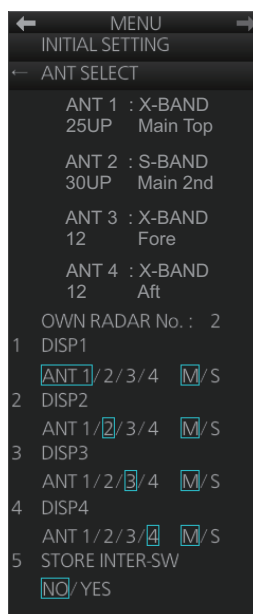
Note: Switch to a different antenna or change the interswitch settings in the standby mode.

2.28.1 Displaying antenna information

The [ANT SELECT] menu shows:

- Radar band, output power and antenna position of each antenna currently powered. (If an antenna is not powered, its data area is blank.)
- Current antenna and display combinations.

To show antenna information, open the menu then select the [8 INITIAL SETTING] and [5 ANT SELECT] menus.



2.28.2 How to preset antenna and display combinations

You can preset the antenna and display combinations for each antenna and display in the radar system. As an example, the procedure below shows how to select the no. 1 antenna unit for the no. 2 display unit.

2. RADAR OPERATION

1. Open the menu then select the [8 INITIAL SETTING] and [5 ANT SELECT] menus.
2. Select the display unit for which to select an antenna (at the next step). For example, select [DISP2] to select the no. 2 display unit.
3. Select [ANT 1] and [M].
4. Repeat steps 2 and 3 to set other display and antenna combinations.
5. Click [5 STORE INTER-SW] and select [YES] to save your selections.
6. Close the menu.

Antenna selection considerations

- An antenna unit cannot be controlled from multiple display units. Select one Main display unit for one antenna unit. If two antenna units are set as mains, the display last-set as main becomes the main and all other displays are automatically changed to sub.
- An antenna unit without a Main display cannot be selected on the sub display units. If there is no antenna unit set as main, the lowest number display is automatically set as main.
- If the Alert "EXT Radar COM Error" appears, do one of the following as applicable:
 - If only your antenna is not displayed on the [ANT SELECT] display, the LAN line in the Processor Unit may be faulty. In this case, use the standalone mode.
 - If the antenna that was in use does not appear on the [ANT SELECT] display, the LAN line in other Processor Unit may be faulty. In this case, see the preceding page for how to select a different antenna unit.
- When the Network fails, the Interswitch does not work, but standalone operation is possible.
- Radar functions are controlled independently, dependently or commonly depending on selection as Main or Sub (see the table on the next page).
- When connecting with the FAR-2xx7 series radar, the maximum number of acquired targets ([NUMBER OF TT]) should be set to 100 in the [RADAR INSTALLATION] menu. The service man only can set the [RADAR INSTALLATION] menu. Contact your dealer.
- Do not use the interswitch function when the icing prevention feature (see section 2.34) is active.

Compatibility of display and operation

- When connecting with FAR-2xx7 series radar
When switching the antenna from FAR-3xxx to FAR-2xx7, the image for FAR-2xx7 is displayed on the screen and each function is operative. However, when switching the antenna from FAR-2xx7 to FAR-3xxx, the following functions are not operative.
 - Automatic Clutter Elimination (ACE) function
 - Selection of the transmit frequency by the [TX CH] button for solid state radar

Radar Functions	Control	Main Display Option	Sub Display Option
AIS function	Independent	Desired value can be set	Desired value can be set
Brilliance			
Echo trails			
EBL			
Lat/long data			
Orientation mode			
Speed data			
TT, AIS on/off			
TT, AIS track interval			
Vector mode			
Vector time			
VRM			
Range			
Reference Point			
A/C SEA			
A/C RAIN			
Auto Rain			
Gain			
Echo stretch			
Echo averaging			
IR			
Automatic Clutter Elimination (ACE)			
Picture setting (Customize echo)	Dependent control	Desired value can be set	Cannot control
Performance monitor			
SART			
STBY/TX			
Tuning			
TT Lost alert	Common control	Item commonly controlled	Item commonly controlled
TT CPA/TCPA alert			
TT ALARM ACK			
TT acquire			
TT/AIS AZ			

2.28.3 How to select an antenna

For the ship that carries multiple antennas, you can select the antenna to use. Click the [Antenna] button to select the antenna.

2.28.4 How to restore own antenna

To release the interswitch and revert to viewing the radar image from own antenna, right click the [Antenna] button on the Status bar, then select [Reset Antenna]. You are asked if you are sure to reset the antenna; click the [Yes] button to revert to own antenna.

2.29 Performance Monitor

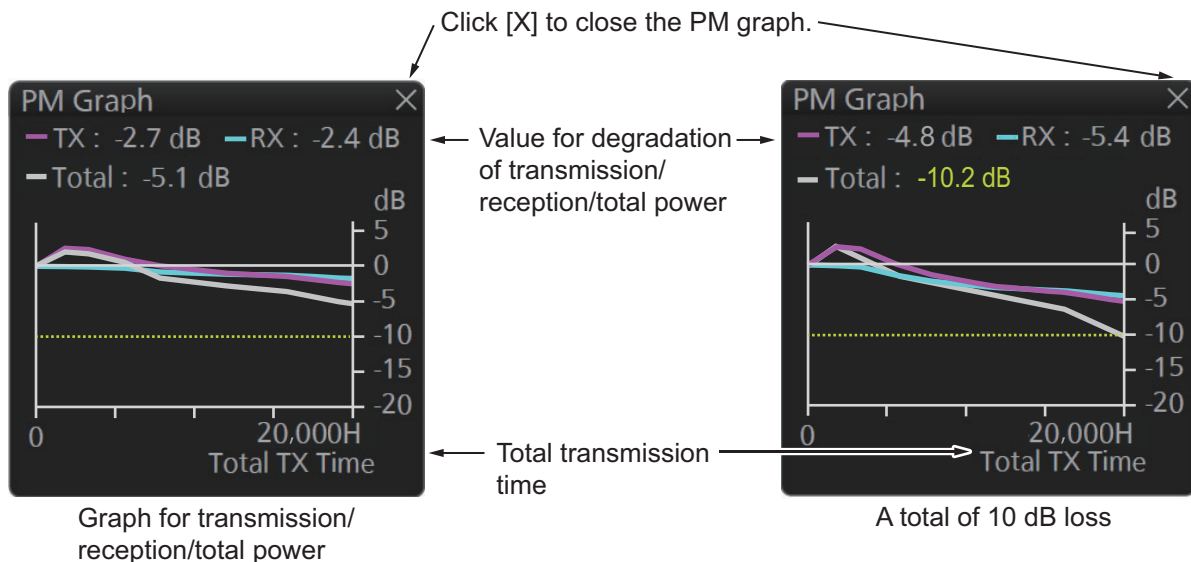
The performance monitor, installed in the antenna unit, produces a visual indication on the radar display screen when the radar transmitter power and the radar receiver sensitivity and tuning are within the prescribed limits. A graph is also provided and it shows degradation of TX/RX/Power over time.

How to activate, deactivate the performance monitor

To activate, deactivate the performance monitor, do the following.

Note: Activate, deactivate the performance monitor in TX (transmit) state.

1. Set the radar in TX (transmit) state.
2. Open the menu then select the [1 ECHO] menu.
3. Select [6 PERFORMANCE MON].
4. Select [ON] or [GRAPH ONLY] as appropriate.
[ON]: Activate the performance monitor. The performance monitor graph is displayed.
[GRAPH ONLY]: Display the performance monitor graph. (The performance monitor is not executed.)
5. Select [0], [2], [3], [5] or [6] in [ARC] (see "How to set the number of arcs" on page 2-48).
6. Close the menu after 30 seconds.
7. When selecting [ON] or [GRAPH ONLY], the performance monitor graph is displayed in the information box.



8. Open the menu then select the [1 ECHO] menu.
9. Select [6 PERFORMANCE MON].
10. Select [OFF] to deactivate the performance monitor.
11. Close the menu. The icon "PM xARCS" (x: setting value of [ARC]) appears in the message area on the status bar (see section 1.2) when the performance monitor is active.

Note: If the blind sector and the direction of the "PM" antenna overlap one another, turn off the blind sector in order to display echoes correctly.

The radar is automatically set as follows when the performance monitor is activated.

Item	Setting at activation of PM	Adjustable while PM is active	Setting at deactivation of PM
CONDITION	Setting stored	No	Setting before activation
CUSTOM-IZE ECHO	Grayed out, setting stored	No	Return to active display
EAV	OFF	No	Setting before activation
ES	OFF	No	Setting before activation
GAIN	70 * ¹	Yes* ³	Setting before activation
IR	OFF	No	Setting before activation
LOW LEVEL ECHO	Setting stored	No	Setting before activation
NOISE REJECT	OFF	No	Setting before activation
OFF center	OFF	Yes	Setting at deactivation
Presentation Mode	Setting stored * ²	Yes	Setting at deactivation
PULSE	LONG	No	Setting before activation
RAIN	0	No	Setting before activation
RAIN AUTO	MAN	No	Setting before activation
RANGE	24 NM, 24 SM, 48 km, 48 kyd	Yes * ⁴	Setting at deactivation
SEA	0	No	Setting before activation
SEA AUTO	MAN	No	Setting before activation
TUNE	AUTO	No	Setting before activation
VIDEO CONTRAST	4B* ⁵	No	Setting before activation
WIPER	OFF	No	Setting before activation

*¹ Gain is automatically set according to [PM GAIN ADJ] if it was adjusted at installation.

*² North-up RM is selected when the mode is North-up TM.

*³ The setting is not memorized.

*⁴ The performance monitor is deactivated if the range is changed.

*⁵ "ICE" video contrast setting is used when the ICE mode is active.

2. RADAR OPERATION

How to check radar performance

The range scale is automatically set to 24 NM. The radar screen will show arcs. You can set the number of arcs. If the radar transmitter and receiver are in good working order in as much as the original state when the monitor was turned on, the innermost arc should appear between 8.0 NM and 19.8 NM. The performance monitor can observe a total of 10 dB loss in the transmitter and receiver.

Note 1: The location of the arcs changes with the setting of [ARC].

Note 2: When [ARC] (the number of arcs) is set to [0] (see "How to set the number of arcs" below), there are no arc indications. Only the performance monitor graph is displayed in the information box.

How to set the number of arcs

1. Open the menu then select the [1 ECHO] menu. Select [6 PERFORMANCE MON].
2. Select [0], [2], [3], [5] or [6] in [ARC].
3. Close the menu.

Note: The lengths and location of the arcs may change with the direction in which the antenna unit is installed. Judge the strength of the echo that appears within 60° from arc location to confirm if the radar is working properly or not.

Turn off the performance monitor when finished.

The following illustrations in the table are the examples when [ARC] is set to [5].

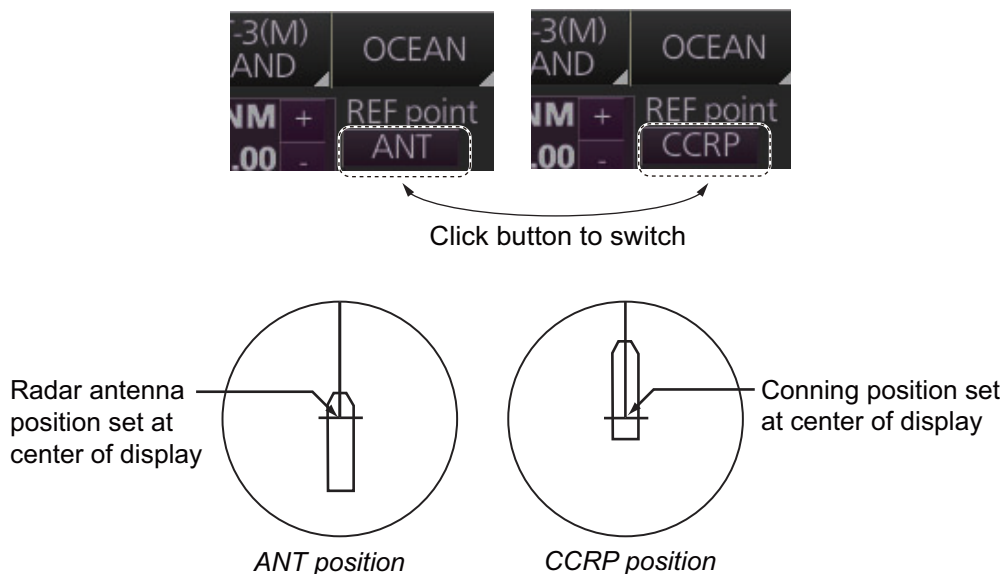
Display	Transmitter, receiver state
	Transmitter: Normal Receiver: Normal
	Transmitter and receiver: No arc indicates 10 dB loss. Contact your dealer for advice. (For a magnetron radar, have a technician check the magnetron.)

Note: The location of the arcs changes with the setting of [ARC].

2.30 CCRP (Common Consistent Reference Point)

The reference position for measurements (range, bearing, etc.) and markers (heading line, stern mark, etc.) can be the antenna position or CCRP, which is a location on own ship to which all horizontal measurements, for example range, bearing, relative course, relative speed, closest point of approach (CPA) or time to closest point of approach (TCPA), are normally referenced.

To select the reference position, click the button below [REF point] at the top-left position to select [ANT] or [CCRP] as appropriate.



The position of the own ship marker changes according to reference position as above. If the CCRP is positioned outside of the effective display area, the bearing scale is indicated with the appropriate reduced detail.

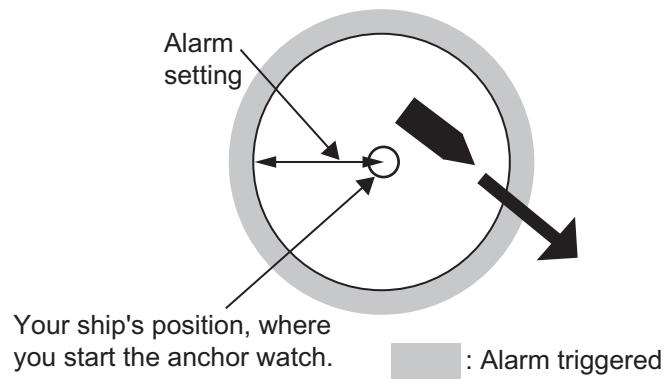
Range and bearing are measured and graphics are drawn according to reference point as shown in the table below.

Category	Item	Reference point	
		CCRP	Antenna position
Range and bearing measurement	EBL	Range and bearing measured from CCRP	Range and bearing measured from antenna position
	VRM		
	Cursor		
	PI line		
	Range ring		
	Drop mark		
Graphics	Heading line	Drawn from CCRP	Drawn from antenna position
	Stern mark		
	Beam line		
	Own ship vector		
	Own ship track		
Bearing cursor		Drawn with CCRP at center	Drawn with antenna position at center
Course, speed		Calculated with CCRP at center	Calculated with antenna position at center

Category	Item	Reference point	
		CCRP	Antenna position
CPA, TCPA		Calculated with CCRP at center	Calculated with antenna position at center
BCR, BCT		Calculated from bow position	
Own ship data	Heading	Data from sensor, regardless of reference point selected	
	Speed		
	Course over ground		
	Speed over ground		
	Own L/L	Location of the CCRP	

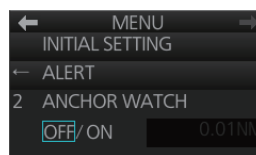
2.31 Anchor Watch

The anchor watch is used to monitor if the ship is staying at anchor. If your vessel travels more than the distance set here, the Alert "Anchor Watch" appears in the [Alert] box and the audio alarm sounds.



How to activate, deactivate the anchor watch

1. Open the menu then select [8 INITIAL SETTING] and [4 ALERT] menus.



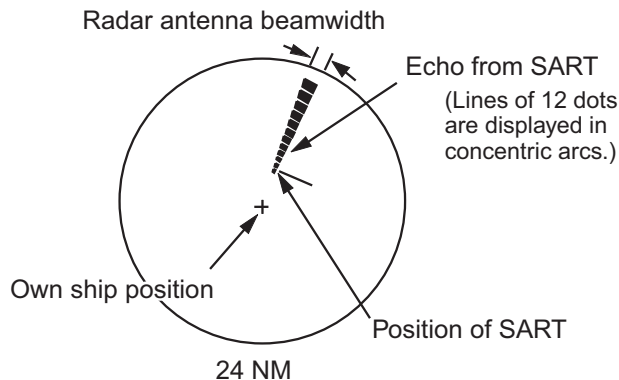
2. Select [2 ANCHOR WATCH].
3. Select [ON] or [OFF]. Use the scrollwheel to set the alarm radius (0.01 to 9.99 NM).
4. Close the menu.

2.32 SART

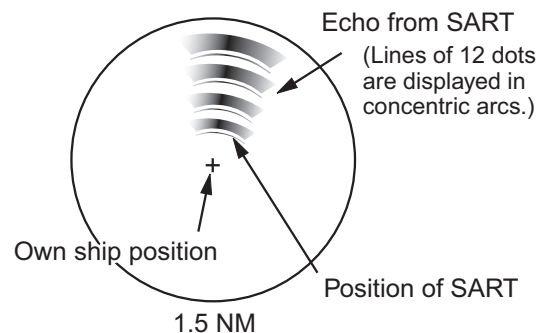
2.32.1 What is an SART?

A Search and Rescue Transponder (SART) may be triggered by any X-band (3 cm) radar within a range of approximately 8 NM. Each radar pulse received causes it to transmit a response which is swept repetitively across the complete radar frequency band.

Screen A: When SART is distant



Screen B: When SART is close



2.32.2 How to receive an SART

This radar is equipped with a feature that optimally sets up the radar for SART detection. This feature automatically detunes the radar receiver out of its best tuning condition. This erases or weakens all normal radar echoes, but the SART marks are not erased because the SART response signal scans over all frequencies in the 9 GHz band. When the radar approaches the SART in operation, the SART marks will enlarge to large arcs, blurring a large part of the screen.

Note: For solid state radar, the SART function is not available.

1. Open the menu then select the [1 ECHO] menu.
2. Select [7 SART].
3. Select [ON].
4. Close the menu. The icon "SART" appears in the Message area on the status bar (see section 1.2) when the SART function is active.

When the SART is activated the radar controls are automatically set as follows.

Item	Setting at activation of SART feature	Adjustable during activation of SART feature	Setting at deactivation of SART feature
CONDITION	Setting stored	Yes	Setting at deactivation
CUSTOMIZE ECHO	Grayed out, setting stored	No	Return to active display
EAV	OFF	No	Setting before activation
ES	OFF	No	Setting before activation
GAIN	Setting stored	Yes	Setting at deactivation
IR	OFF	No	Setting before activation

2. RADAR OPERATION

Item	Setting at activation of SART feature	Adjustable during activation of SART feature	Setting at deactivation of SART feature
LOW LEVEL ECHO	Setting stored	Yes	Setting at deactivation
NOISE REJECT	OFF	No	Setting before activation
OFF center	OFF	Yes	Setting at deactivation
Orientation Mode	Setting stored * ¹	Yes	Setting at deactivation
PULSE	LONG	No	Setting at deactivation
RAIN	Setting stored	Yes	Setting at deactivation
RAIN AUTO	MAN	No	Setting before activation
RANGE	12 NM, 12 SM, 24 km, 24 kyd	Yes * ²	Setting at deactivation
SEA	Setting stored	Yes	Setting at deactivation
SEA AUTO	Setting stored	Yes	Setting at deactivation
TUNE	Setting stored	Yes	Setting at deactivation
VIDEO CONTRAST	Setting stored	Yes	Setting at deactivation
WIPER	Setting stored	Yes	Setting at deactivation

*¹ North-up RM selected when the mode is North-up TM.

*² The SART feature is deactivated if the range is changed.

2.33 Echo Color

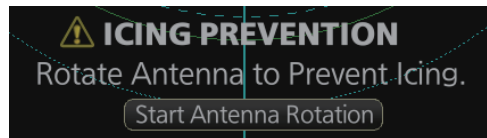
The default echo color is yellow. To change echo color, do the following:

1. Open the menu then select the [1 ECHO] and [3 ECHO COLOR] menus.
2. Select [YEL] (yellow), [GRN] (green), or [WHT] (white).
3. Close the menu.

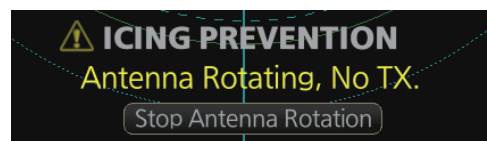
2.34 Icing Prevention

You can rotate the antenna (24 rpm) without transmission to keep the antenna from freezing.

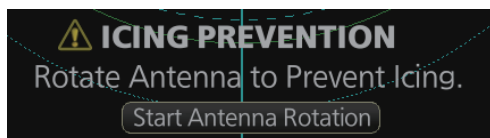
1. Open the menu then select the [8 INITIAL SETTING] and [0 ICING PREVENTION] menus.
2. Select [ON]. The following message appears at the bottom of the screen.



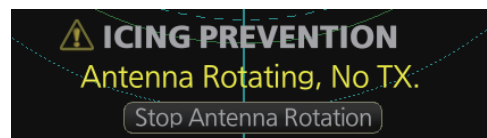
3. Click [Start Antenna Rotation] to rotate the antenna without transmission. The message changes as follow.



To stop the antenna rotation, click [Stop Antenna Rotation].



When the antenna stops



When the antenna rotates

2.35 Shuttle Ferry

The shuttle ferry feature changes the screen orientation by 180°. This feature requires an external switch (local supply).

There are two variations: Standard display ([SHUTTLE FERRY] is turned OFF) and reversed display ([SHUTTLE FERRY] is set for [MODE1] or [MODE2]).

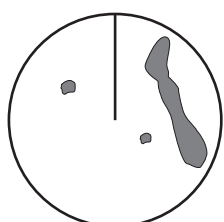
Note 1: Have a FURUNO dealer or representative install the necessary external switch.

Note 2: The shuttle ferry feature requires gyro data. The feature is disabled when gyro data is lost.

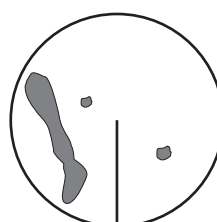
When the display is reversed the following is done:

- Radar echoes are rotated 180°.
- Bearing for speed data is corrected by 180°.
- Wind direction based on speed input is corrected by 180°.
- With [MODE 2] active, the gyro value is corrected by 180°.

Note: [MODE 1] uses externally corrected gyro data, therefore gyro data is not re-calibrated.



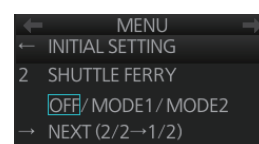
Normal display
Gyro input is displayed normally.



Reversed display
Gyro input is displayed 180° opposite to normal.

To activate or deactivate the shuttle ferry mode do as follows:

1. Open the menu then select the [8 INITIAL SETTING] menu.
2. Select [NEXT (1/2→2/2)].
3. Select [2 SHUTTLE FERRY] and the mode desired.
[OFF]: Deactivate the shuttle ferry mode.
[MODE1]: Activate the shuttle ferry mode. Gyro data is not re-calibrated 180° opposite to normal.
[MODE2]: Activate the shuttle ferry mode. Gyro data is re-calibrated 180° opposite to normal.
4. Close the menu.



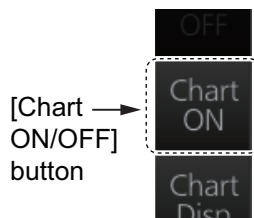
When the shuttle ferry feature is active, the indication [Reverse] appears at top left corner on the display.



2.36 Chart Radar Functions

2.36.1 How to switch between radar and chart radar modes

Click the [CHART ON/OFF] button on the InstantAccess bar™ to show or hide the chart.



Indication on button and corresponding mode

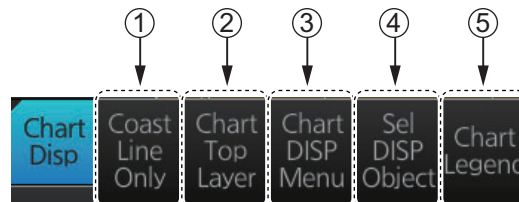
[Chart ON]: Chart radar mode active. (Chart and radar picture are displayed.)

[Chart OFF]: Radar mode active. (Only the radar picture is displayed.)

When the GPS position is lost, the chart radar mode cannot be used. When this occurs, the label on the button shows [Chart OFF] and the button is grayed out.

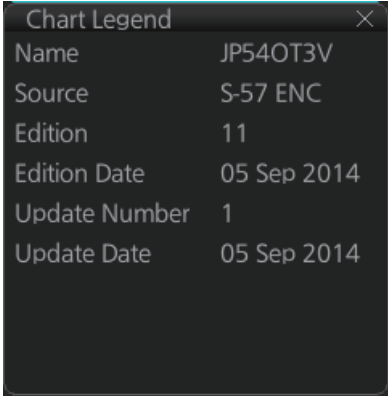
2.36.2 How to show or hide chart objects

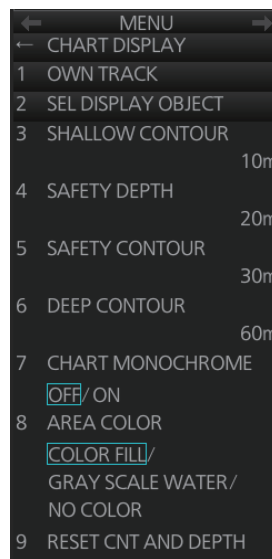
The [Chart Disp] button on the InstantAccess bar™ has several buttons which control chart object visibility.



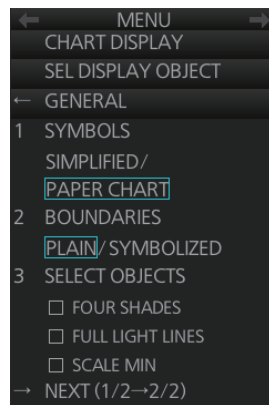
No.	Item	Function
1	[Coast Line Only]	Hold down the left button to temporarily display only the coastline. Chart symbols (depth contours, navigation buoys, etc.) are temporarily erased from the screen.
2	[Chart Top Layer]	Hold down the left button to temporarily put the chart objects (buoy, light-house, etc.) on the top layer.
3	[Chart DISP Menu]	Show the [CHART DISPLAY] menu, where you set safety contours, safety depth, etc. See the figure on page 2-56 for the content of this menu. Note: This menu can also be shown by right-clicking the [CHART ON/OFF] button and selecting [Chart Display Menu].
4	[Sel DISP Object]	Show the [SEL DISPLAY OBJECT] menu, where you can select the chart objects and text to show or hide. See the figure on page 2-57 for the content of this menu.

2. RADAR OPERATION

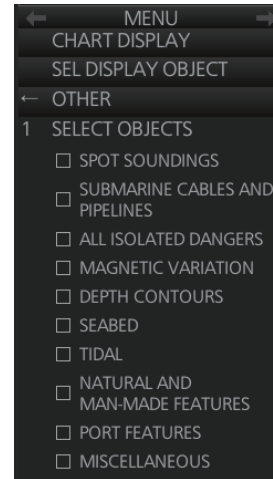
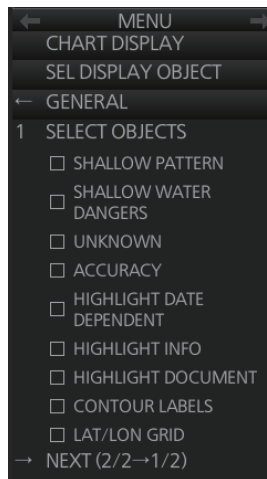
No.	Item	Function
5	[Chart Legend]	Show the chart legend for the current chart. 



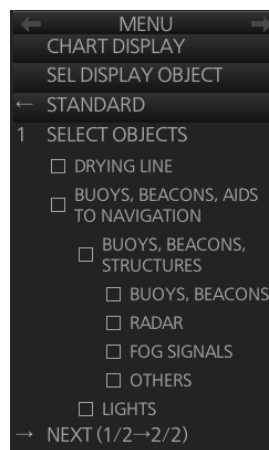
[CHART DISPLAY] menu



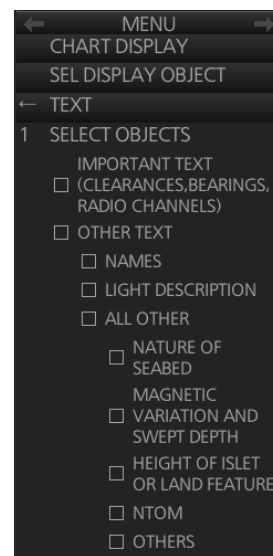
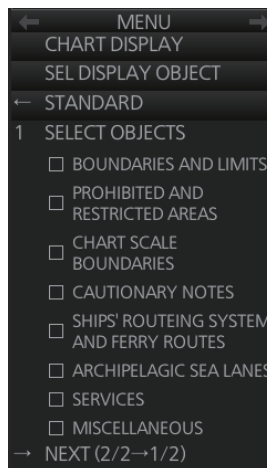
[GENERAL]



[OTHER]



[STANDARD]



[TEXT]

[SEL DISPLAY OBJECT] menu

2.36.3 How to create and recall custom sets of chart display objects

You can create one custom set of chart display objects and recall them when required. For example, you can create a custom set of chart display objects to display when you navigate a certain coastline.

How to create a custom set of chart display objects

1. Open the menu then select the [6 CHART DISPLAY] and [2 SEL DISPLAY OBJECT] menus.
2. Open the [3 GENERAL], [4 STANDARD], [5 OTHER] and [6 TEXT] menus.
3. Open the [1 SELECT OBJECTS] ([3 SELECT OBJECTS] for [2 GENERAL]) menu and turn objects and text on or off as appropriate.
4. Return to the [SEL DISPLAY OBJECT] menu.
5. Select [1 SAVE TO PERSONAL] to save the settings. The confirmation message "Attention: Do you wish to overwrite current settings to PERSONAL?" appears.
6. Click the [OK] button to save the settings.

How to activate the custom set of chart display objects

Click the [Chart database] button (see subsection 2.36.4) on the Status bar then select [PERSONAL].

2.36.4 Chart database information

You can select the quantity of objects and text to display on the chart radar screen, with the [Chart database] button on the Status bar. There are four different pre-defined settings available and one user-definable ([PERSONAL]). Indication of selected setting appears on the label of the [Chart database] button. The [Chart ON/OFF] button (on the InstantAccess bar™) must be ON to show the [Chart database] button. The [Chart database] button is grayed out if the [Chart ON/OFF] button is OFF.

[Chart database] button	Selection	Setting in [SEL DISPLAY OBJECT] menu
	[IMO Base]	Nothing checked in [GENERAL], [STANDARD], [OTHER] or [TEXT].
	[IMO Primary]	Nothing else checked but [BUOYS, BEACONS] in [STANDARD]. This is the "Primary Chart Information Set (PCIS)", based on IEC 62388 Ed.2 section 12.1.5.1, IEC61174 and IMO Resolution MSC.232(82).
	[IMO Standard]	All objects checked in [STANDARD]; nothing checked in [GENERAL], [OTHER] or [TEXT].
	[IMO All]	Everything checked in [STANDARD] or [OTHER]; nothing checked in [GENERAL] or [TEXT].
	[PERSONAL]	Use the settings recorded for [GENERAL], [STANDARD], [OTHER] and [TEXT].

2.36.5 How to set value for shallow contour, safety depth, safety contour and deep contour

You can set values for shallow contour, safety depth, safety contour and deep contour, on the [CHART DISPLAY] menu. Colors used for depth presentation on the electronic chart are controlled by setting values for shallow contour, safety depth, safety contour and deep contour. Soundings on the electronic chart, which are equal to or less than the value of safety depth, are highlighted. For details, see the ECDIS operator's manual.

Note: The shallow contour cannot be set higher than the safety contour.

1. Open the menu then select the [6 CHART DISPLAY] menu.
2. Select [3 SHALLOW CONTOUR], [4 SAFETY DEPTH], [5 SAFETY CONTOUR], or [6 DEEP CONTOUR].
3. Spin the scrollwheel to set the value then push the left button.
4. Close the menu.

To reset the value for shallow contour, safety depth, safety contour and deep contour, open the menu then select [6 CHART DISPLAY] - [9 RESET CNT AND DEPTH] menus. The message "Do you wish to restore default contour and depth settings?" appears. Select [Yes].

2.36.6 Chart display

You can select color and tone for chart display.

1. Open the menu then select the [6 CHART DISPLAY] menu.
2. Select [7 CHART MONOCHROME].
3. Select [OFF] or [ON].
[OFF]: Displays chart in multi color.
[ON]: Displays chart in monochrome.
4. Select [8 AREA COLOR].
5. Select [COLOR FILL], [GRAY SCALE WATER], or [NO COLOR].
[COLOR FILL]: Displays chart in multi color.
[GRAY SCALE WATER]: Displays water area in gray scale.
[NO COLOR]: Does not fill the chart.
6. Close the menu.

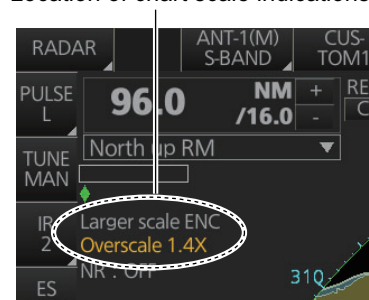
2.36.7 Chart scale indications

The system alerts you to the availability of larger scale ENC and overscale, at the top-left position.

When the radar display range is higher than the chart scale of the ENC chart, the indication, "Larger scale ENC" is displayed. For example, the radar range is 24 NM and the range available with the ENC chart is less than 12 NM.

When the radar display range is lower than the chart scale of the ENC chart, the indication "Overscale

Location of chart scale indications



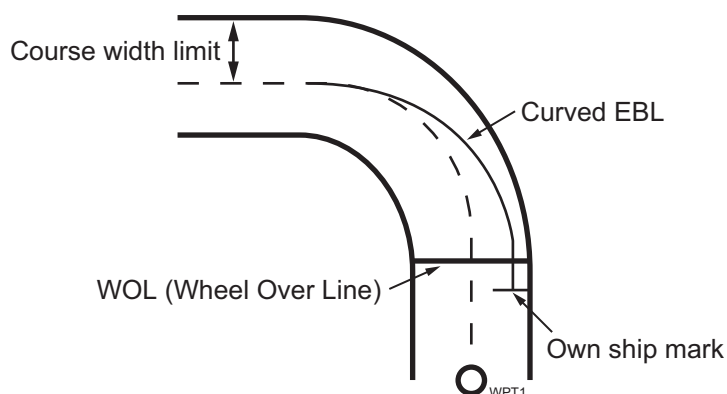
2. RADAR OPERATION

x.xx" (x.xx=overscale factor). For example, the radar range is 0.25 NM and the chart scale is 0.5 NM.

If both conditions exist, both indications are displayed.

2.36.8 Curved EBL

The curved EBL, which shows radius of the steering plan, can be displayed on the EC-DIS and radar screens. This function is useful for selecting starting position of turning of ship. Also, you can monitor the steering against the planning course.



Note: This function is available when connecting the EC-3000/3005, which has TCS (Track Control System) function, on the same network.

1. Open the menu then select [5 MAP•MARK] and [1 MARK SETTING].
2. Go to page 2, select [2 DISP CURVED EBL].
3. Select [ON] to display the curved EBL.
4. Close the menu.

2.36.9 Chart status

The indication "Chart Status" appears at the top-right position on the screen when the display date for the currently displayed chart has passed.

2.36.10 Chart alert function

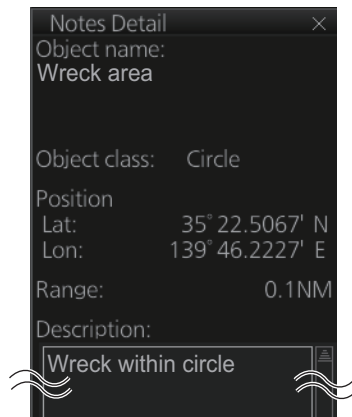
The chart alert function operates in chart mode only. There are two types of chart alerts: your ship's predicted course, and route alert.

For the ship's predicted course alert, the operator sets a safety contour. The operator also sets the parameters for own ship predicted movement.

For the route alert, route planning and route monitoring functions are available.

2.36.11 Notes details

"Notes" provides messages for the operator relative to a specific ship position. The chart radar compares the Notes position and own ship position and displays the Notes when own ship is at the distance from the Notes specified in route planning. To display the Notes at other times, right-click the display area to show the context-sensitive menu, then select [Notes Detail]. In the example below the Notes about a wreck are shown.



- [Object name]: The name assigned to the Notes.
- [Object class]: The type of object (point, line, area or circle) linked to the Notes.
- [Position]: Position of the object in latitude and longitude.
- [Range]: The range to the object.
- [Description]: A description of the object, input in the Voyage planning mode.

2. RADAR OPERATION

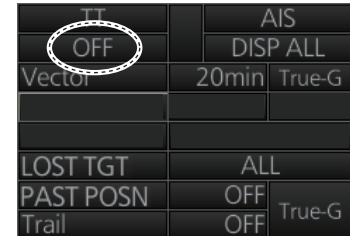
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3. TARGET TRACKING (TT)

3.1 How to Show, Hide the TT Display

Click the TT mode indication at the bottom-right position to show [OFF] to hide the TT display, or [AUTO]*, [MAN]* or [MAN/AUTO]* to show the TT display. You can right-click the TT mode indication to show a context-sensitive menu with the choices shown above. In this case, click the applicable option.

* The indication shown depends on the setting of [TT SELECT] in the [TT•AIS] - [TT] menus.



3.2 How to Input Your Ship's Speed

The TT requires own ship's speed and heading data. The speed can be STW, SOG, or echo-referenced speed (based on 3 max. stationary objects) taken from this radar. Manual input is also possible.

For automatic or manual speed input, see section 1.8.

3.2.1 Echo-referenced speed input

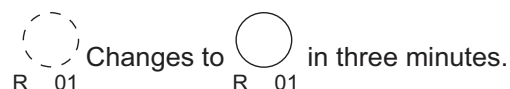
The use of echo-referenced speed is recommended when:

- The speed log is not operating properly or not connected to the radar.
- The vessel has no device that can measure ship's leeward movement (Doppler sonar, speed log, etc.) when leeward movement cannot be disregarded.

If you select echo-referenced speed, the TT calculates own ship's speed relative to a fixed reference target. The number of targets may be 1, 2 or 3. They appear as tracked targets, each denoted with a small circle. When a plural number of objects are selected, the mean value is used.

Note: This feature is not available when the AIS is active.

1. Right-click the display area to show the context-sensitive menu then select [REF Mark].
2. Select a small fixed island or any radar prominent point located at 0.1 to 24 NM from own ship.
3. Use the trackball to put the cursor (+) on the target selected at step 2.
4. Push the left button to insert the reference mark.



5. Repeat steps 2-4 to continue entering reference marks. Three may be entered.
6. Right click the Sensor information, datum box then select [Sensor Setting]. Open the [SPD] page and put a checkmark at [Reference SPD]. Click the [OK] button to finish.

3. TARGET TRACKING (TT)

Notes on speed input by reference target

- Reference targets are only used for the calculation of true speed.
- Do not use reference target generated true speed to calculate relative speed. Relative speed data is not accurate because response to speed change is slow, hampering the TT's ability to accurately judge the possibility of collision.
- Select a stationary target as a reference target to calculate own ship speed as ground tracking speed. Do not choose a moving target as a reference target. A moving target produces error in the vector for TT and AIS, which results in wrong collision avoidance information. Further, an unstable stationary target produces inaccurate speed data and the target itself may become lost.
- When a reference target is lost or goes out of the acquisition range, the reference target mark flashes and the Alert "REF Target Lost" appears in the [Alert] box. If all reference targets are lost, the speed indication disappears. Select a different reference target if the currently selected one is lost.
- When all tracked targets are deleted, the reference target mark is also deleted and the target-based speed becomes invalid.
- Loss of reference target will affect the calculation of true speed and true course of targets. Further, own ship speed will be inaccurate.

How to cancel echo-referenced speed input

Right click the Sensor information, datum box then select [Sensor Setting]. Open the [SPD] page and select a speed sensor.

3.3 Automatic Acquisition

This radar can acquire and track a maximum of 200 targets. The number of automatically and manually acquired targets is determined by the setting of [TT SELECT] in the [TT•AIS] - [TT] menus.

A target just acquired automatically is marked with a dashed circle and a vector appears within one minute to indicate the target's motion trend. Within three minutes, the initial tracking stage is finished and the target becomes ready for stable tracking. At this time, the dashed circle changes to a solid circle.

3.3.1 How to enable auto acquisition

1. Right-click the TT mode indication then select [TT Menu] to show the [TT] menu.
2. Select [1 TT SELECT] and the acquisition condition.

Menu setting	Acquisition condition
[MANUAL 200]	200 targets manually, Not available for auto acquisition
[MANUAL 150 • AUTO 50]	50 targets automatically, 150 targets manually
[MANUAL 100 • AUTO 100]	100 targets automatically, 100 targets manually
[MANUAL 50 • AUTO 150]	150 targets automatically, 50 targets manually
[AUTO 200]	200 targets automatically, Not available for manual acquisition

3. Close the menu.

Note: The TT indication in the TT/AIS setting box shows [AUTO], [MAN/AUTO] or [MAN] depending on the acquisition condition selected.

3.3.2 How to set an automatic acquisition zone

You can set an automatic acquisition zone to automatically track any targets entering the zone. The acquisition zone can be fan-shaped or polygonal. The maximum tracking range is set during the installation.

Fan-shaped zone of AZ1: The range is fixed at 3 - 6 NM (width 0.5 - 1.0 NM).

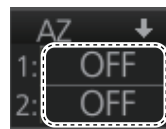
Fan-shaped zone of AZ2: The range is available between 0.7 - 24 (or 32) NM (width 0.5 - 1.0 NM)

Polygon zone of AZ2: The zone can be set within the range of 0.125 NM to 96 NM.

Note: When processing two acquisition zones, create the zones in numerical order and turn them off in reverse numerical order.



To set the zone for AZ2,
first set the zone for AZ1.



To turn off the zone for AZ1,
first turn off the zone for AZ2.

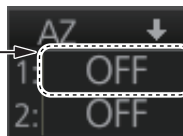
When the automatic acquisition zone is set, AIS function is automatically turned on if it is off.

When a target enters an acquisition zone, the following occurs:

- the buzzer sounds
- the Alert "TT New Target" appears in the [Alert] box
- the symbol of the target is red and flashes

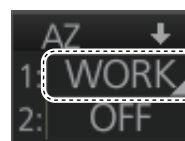
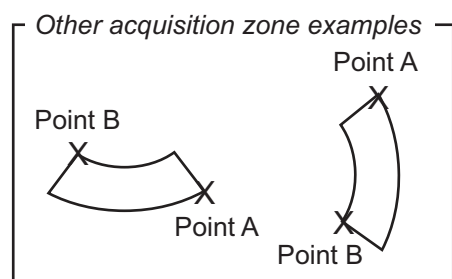
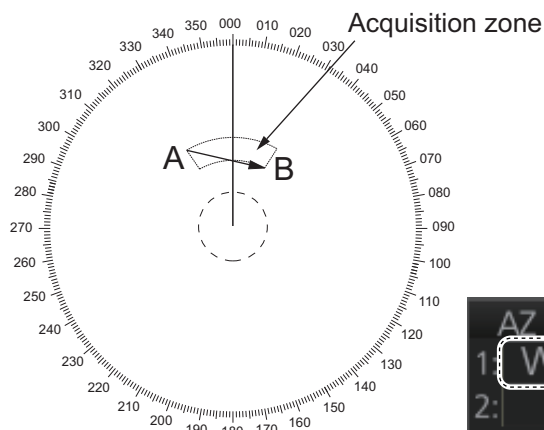
1. Click one of the boxes AZ1 or AZ2 at the bottom-right of the screen. The indication in the AZ box changes from [OFF] to [SET].

For example,
click here for
AZ1.



2. Click point A.

3. Click point B. The indication in the AZ box changes from [SET] to [WORK].



3. TARGET TRACKING (TT)

Note: If the range scale is changed to less than half of the acquisition zone, the AZ box shows [OUT]. If the left button is pushed in this state, the acquisition alarm zone goes into [SLEEP] state (inactive).

How to sleep, deactivate an acquisition zone

Use the trackball to select the appropriate AZ box. Sleep or deactivate the acquisition zone as appropriate:

Sleep acquisition zone: Click applicable AZ box and select [SLEEP] momentarily to remove the acquisition zone from the screen. To reactivate and display the acquisition zone, click applicable AZ box and select [WORK].

Deactivate acquisition zone: Click applicable AZ box and select [OFF].

Acquisition zone stabilization

The acquisition zone may be referenced to heading or North. Open the menu then select the [TT•AIS] and [1 ACQUISITION ZONE] menus. Set [1 AZ STAB] to [STAB HDG] or [STAB NORTH] as appropriate. For a polygon acquisition zone, stabilization can be selected to [2 AZ POLYGON].

3.4 Manual Acquisition

This radar can acquire and track a maximum of 200 targets. The number of automatically and manually acquired targets is determined by the setting of [TT SELECT] in the [TT•AIS] - [TT] menus.

3.4.1 How to set manual acquisition conditions

1. Right-click the TT mode indication then select [TT Menu] to show the [TT] menu.
2. Select [1 TT SELECT] and the acquisition condition (see subsection 3.3.1).
3. Close the menu.

3.4.2 How to manually acquire a target

Acquire a target from the Control Unit

Use the trackball to put the cursor on the target you want to acquire. Push the **ACQ/ACT** key.

Acquire a target by the trackball module

1. When the target to acquire and the AIS symbol overlap one another, right-click the screen to show the context-sensitive menu then select [Target Data/ACQ/ACT] and [TT Only] to acquire the target.
2. Put the cursor on the target to acquire then push the left button.

The plotting symbol is drawn by a dashed circle during the initial acquisition stage. A vector appears approximately one minute after acquisition. The vector indicates the motion trend of the target. If the target is consistently detected for three minutes, the plotting symbol changes to a solid circle. If acquisition fails, the target symbol blinks.

Note 1: For successful acquisition, the target should be within 24 NM (or 32 NM, depending on initial setting) from own ship and not obscured by sea or rain clutter.

Note 2: When a target being tracked nears another target being tracked, the targets may be "swapped". When two targets acquired either automatically or manually come close to each other, one of the two may become a lost target. If this occurs, manual re-acquisition of the lost target may be necessary after the two have separated.

Note 3: You can reuse a target number. This is useful when you acquire the "wrong" target. Drag and drop the symbol onto the correct target.

3.5 How to Stop Tracking Targets (including reference targets)

3.5.1 How to cancel tracking on individual tracked targets

Cancel tracking on a target from the Control Unit

1. Use the trackball to put the cursor (+) on the TT or reference target to cancel tracking.
2. Push the **TARGET CANCEL** key.

Cancel tracking on a target by the trackball module

1. Right-click the screen to show the context-sensitive menu.
2. Select [Target Cancel] and [Any] or [TT Only] as applicable.
3. Click the TT or reference target to cancel tracking.

3.5.2 How to cancel tracking on all TTs

Cancel tracking on all target from the menu

1. Right-click the TT mode indication on the bottom-right of the screen then select [TT Menu] to show the [TT] menu.
2. Select [2 ALL CANCEL].
3. Select [YES].
4. Close the menu.

Cancel tracking on all target from the Control Unit

Long-press the **TARGET CANCEL** key to erase all displayed TT target data.

3.6 TT Symbols

The symbols used in this equipment comply with IEC 62288.

Symbol	Default color	Name	Description
	Green	Past position marker	Past position point
	Green	Target under acquisition	Plotting symbol selected for a target acquired manually is shown in broken lines.
	Red	Target under automatic acquisition	Thick, broken circle around an echo to indicate the target under acquisition and initial stage of tracking, before steady-state tracking.
	Green	Acquired target	Solid circle with vector indicating steady state tracking (within three minutes after acquisition)
	Red	Acquired target in ACQ zone (before acknowledgment)	Solid circle with vector indicating steady state tracking (within three minutes after acquisition)
	Red	Dangerous target	Dangerous TT (thick, solid circle)
	Green	Reference target	Used to calculate own ship's over-the-ground speed (echo-referenced speed) for ground stabilization.
	Green	Association target	Association TT is shown in AIS symbol and TT data.
	Red	Association dangerous target	Association dangerous TT is shown in AIS symbol and TT data.
	Red	Lost target	Lost TT is shown with cross mark.
	Green	Target selected	TT selected to show its data.
T	White	Trial maneuver	Displayed (flashing) during trial maneuver test.
S	White	TT test	Displayed (flashing) during TT test.

3.7 TT Symbol Brilliance, Color

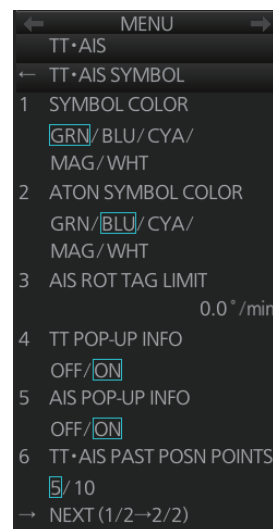
3.7.1 TT symbol brilliance

1. Right-click the [BRILL] button on the InstantAccess bar™ then select [Brill Menu].
2. Go to page 2, select [4 TT SYMBOL] then spin the scroll-wheel to adjust the brilliance.
3. Close the menu.



3.7.2 Color for TT symbol

1. Right-click the TT mode indication then select [Symbol Menu] to show that menu.
2. Select [1 SYMBOL COLOR] and desired color.
3. Close the menu.



3.8 How to Display TT Data

The target bearing is show in relative bearing in the head-up mode and true bearing in the course-up, north-up and true motion modes, with the suffix "R" (Relative) or "T" (True).

The target speed and course are shown as speed over the ground or speed through the water depending on speed source.

3.8.1 How to display target data for individual TT

You can show the data for two (19-inch display) or three (23-inch display) tracked targets in the information box area.

From the control unit

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

By trackball module

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

TT data

- Two target data can be displayed on a TT data box. To erase data from a data box, click the appropriate close data button ("A" or "B" as shown in the figure below). To erase a data box, click the close data button ("C" as shown in the figure below).
- The basic target data display for a TT consists of the following information:
 - TT no. Target numbering starts from "1". 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 over the ground (SOG) and true course over the ground (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)

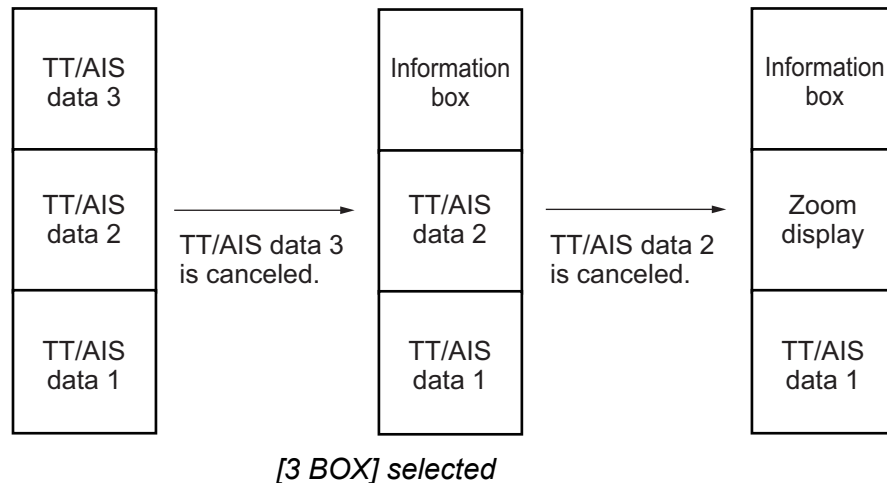
Title bar →	TT				
TT no. →		001	X	002	X
Bearing →	BRG	137.0° T		138.5° T	
Range →	RNG	8.587NM		8.726NM	
Course over ground →	T COG	040.0° T		062.5° T	
Speed over ground →	T SOG	9.81kn		7.35kn	
CPA →	CPA	5.724NM		5.847NM	
TCPA →	TCPA	-33'24"		-35'48"	
Bow crossing range →	BCR	-7.171NM		-7.326NM	
Bow crossing time →	BCT	-12'05"		-13'03"	

Target data box

You can select the number of the target data box.

1. Open the menu then select [4 INFORMATION BOX] and [4 TARGET DATA].
2. Select the number of the data box from [1 BOX], [2 BOX] or [3 BOX].
Note: [3 BOX] is available only for 19-inch monitor.
3. Close the menu.

The target data are displayed from bottom up in order of acquisition. When target data box(es), information box and zoom display are available, target data box(es) has priority.



3.8.2 TT pop-up information

The TT pop-up shows abbreviated TT data (target no., COG, SOG, CPA and TCPA) for the selected TT. Simply put the cursor on the TT symbol to show the pop-up. The pop-up can be enabled or disabled with [4 TT POP-UP INFO] in the [TT•AIS] - [TT•AIS SYMBOL] menus.

```

TT(34)
COG: 359.9°T
SOG: 10.00kn
CPA: 3.572NM
TCPA: <99'59"

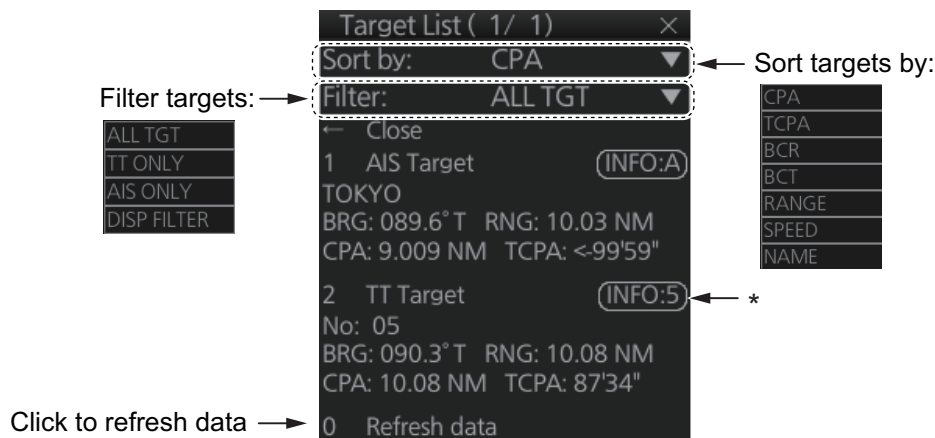
```

3. TARGET TRACKING (TT)

3.8.3 Target list

The target list shows the data for all tracked targets and AIS objects. To show the list, click the [Target List] button at the right side of the screen. (The button is light-blue when the target list is displayed.)

To close the list, click the Close button (X) on the list.



*,

[INFO] column: Click to show/hide the target information for each target.

The information displayed varies depending on the target selected.

AIS objects: The order in which the targets appear in the details window is displayed (A, B or C). For example, a target with the indication "B" in the [INFO] column appears in the second object details box. "C" is not shown for 19" monitors.

TT targets: The target number (01 to 200) appears.

Reference targets: The reference number (R01 to R03) appears.

How to sort the list

You can sort the list by CPA, TCPA, BCR, BCT, RANGE, SPEED or NAME, with the [Sort by] drop-down list.

How to filter the list

The list shows all tracked targets and AIS objects received. If you do not need to see all targets you can filter unnecessary ones. Use the [Filter] drop-down list to select what targets to filter: Show all targets, TT only, AIS objects only, or show only the AIS objects that meet the criteria set on the [DISP FILTER] menu.

3.9 Vector Modes

Target vectors can be displayed relative to own ship's heading (Relative) or North (True).

Note: IMO recommends the use of the true vector mode in sea stabilization or relative vector mode for collision avoidance.

3.9.1 Description of vectors

Stabilization modes

It is important to select the optimum stabilization mode for the radar display. To assess risk of collision the relative motion of a target gives the clearest indication of CPA and may be monitored by observing either the direction of the target's relative trail, or the CPA predicted by the relative vector. By default, relative motion displays relative target trails and true motion displays true target trails. Where true target trails is selected, a sea stabilized display will indicate all targets' motion through the water. A ground stabilized display will indicate all targets' motion over the ground.

In coastal, estuarial and river waters where a significant set and drift may be experienced, a sea stabilized display will produce significant target trails from all fixed (stationary) objects possibly producing an unacceptably high level of clutter and masking. In such circumstances a ground stabilized display may reduce its effect and enable the observer to detect clearly the trails of moving targets, thus enhancing the observer's situational awareness.

However, the display should be considered only as an approximation of the course and speed made good over the ground. Among other factors, the accuracy of the ground-stabilization is affected by inaccuracies in speed and heading inputs as well as radar measurement imprecision and will require the display to be readjusted periodically. The information displayed should be interpreted with due regard to these factors.

Note: It should be noted that in determining a target's aspect by radar; the calculation of its true track is dependent on the choice and accuracy of the own ship's course and speed input. A ground-stabilized target plot may accurately calculate the ground track of the target, but the target's heading may be significantly different from its track when experiencing set, drift or leeway. Similarly, a sea stabilized target plot may be inaccurate when own ship and the target, are experiencing different rates of set, drift or leeway.

Ground stabilization and sea stabilization

Target vectors can be ground stabilized or sea stabilized in the True Motion mode. To select speed over the ground or speed through the water data, open the [SPD] page from the [Sensor Settings] menu. Select for ground stabilization or for sea stabilization. The Vector mode indication shows the stabilization mode in the true motion as [True-G] or [True-S].

Sea stabilization is a mode where own ship and all targets are referenced to the sea using a compass heading and single-axis log water speed inputs in the true motion mode. Ground stabilization is a mode where own ship and all targets are referenced to the ground using the ground track or set and drift inputs. If the accuracy seems un-

3. TARGET TRACKING (TT)

satisfactory, enter set and drift corrections. Note that set and drift should not be used when the radar is displaying AIS objects.

True vector

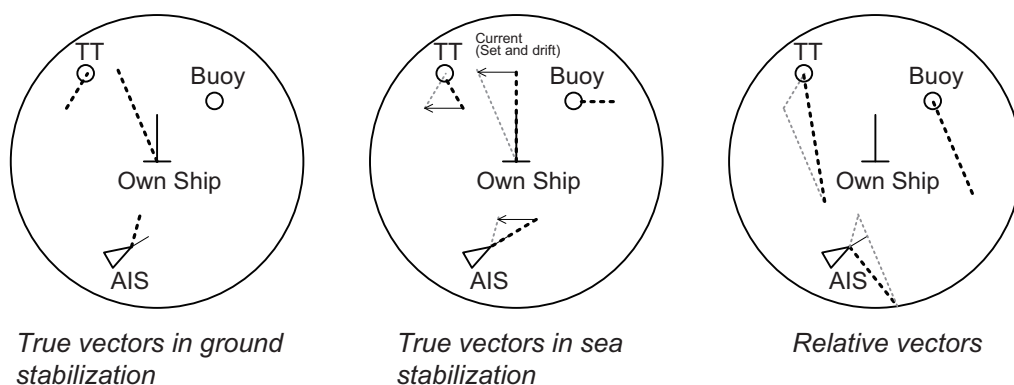
In the true motion mode, all fixed targets such as land, navigational marks and ships at anchor remain stationary on the radar screen with vector length zero. But in the presence of wind and/or current, the vectors appear on fixed targets representing the reciprocal of set and drift affecting own ship unless set and drift values are properly entered.

In the true vector mode, there are two types of stabilization: ground stabilization (True-G) and sea stabilization (True-S). The stabilization mode is automatically selected according to speed selection, as shown in the table below. Manual selection is available with [Stabilization Mode] in the [SPD] page in the [Sensor Settings] menu.

Speed selection	True vector mode
LOG(WT)	True-S
LOG(WTC)	True-G
LOG(BT)	True-G
GPS(BT)	True-G
REF(BT)	True-G
MAN(WT)	True-S
MAN(WTC)	True-G

Relative vector

Relative vectors on targets that are not moving over the ground such as land, navigational marks and ships at anchor will represent the reciprocal of own ship's ground track. A target whose vector passes through own ship is on a collision course. (Dotted lines in the figure are for explanation only.)



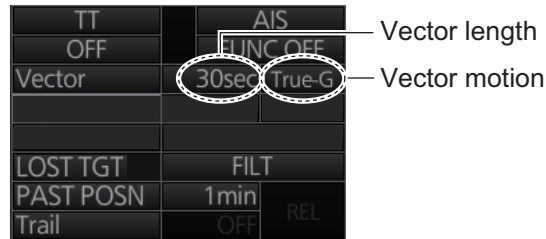
3.9.2 Vector motion and length

Vectors may be displayed in true or relative motion. Vector time (or the length of vectors) can be set between 30 seconds and 60 minutes.

The vector tip shows an estimated position of the target after the selected vector time elapses. It can be valuable to extend the vector length to evaluate the risk of collision with any target.

For vector motion, click the vector motion indication at the right side of the screen to select relative or true vector mode.

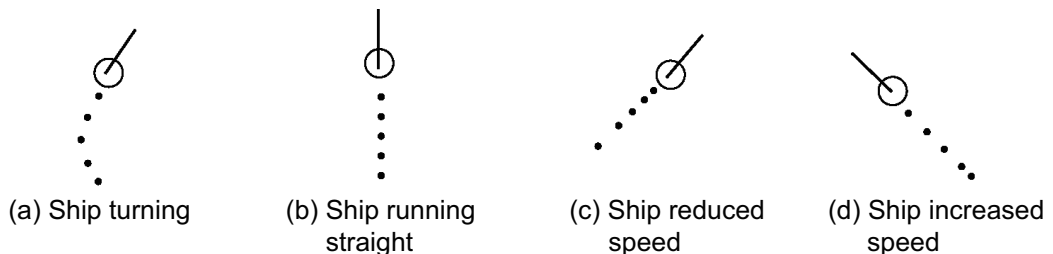
For vector length, click the vector time indication at the right side of the screen to select time among 30 seconds, 1 minute, 3 minutes, 5 minutes, 6 minutes, 10 minutes, 20 minutes, 30 minutes, 45 minutes and 60 minutes. Or, spin the scrollwheel to select the length from 30 seconds or 1 - 60 minutes, in one-minute intervals.



3.10 Past Position Display

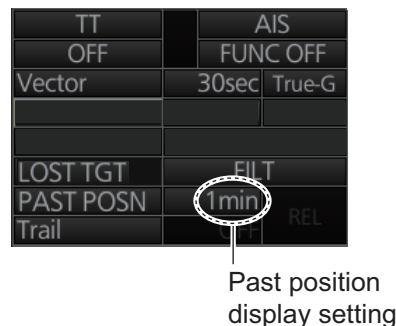
The past position display shows equally time-spaced dots marking the past positions of any targets being tracked.

If a target changes its speed, the spacing will be uneven. If it changes the course, its plotted course will not be a straight line. See the illustration below for dot pattern and ship status.



3.10.1 How to enable, disable the past position display

Click the indication circled in the figure below to enable, disable the past position display and set the plot interval.



3.10.2 Past position points

You can show 5 or 10 past position points per tracked target. Right-click the past position indication then select [PAST POSN Menu]. Set [6 TT•AIS PAST POSN POINTS] to [5] or [10].

3.11 How to Enter Set and Drift

Set, the direction in which a tidal current flows, can be manually entered in 0.1-degree steps. Drift, the speed of the tide, can also be entered manually in 0.1 knot steps.

When course through water and speed through water are available, activate set and drift to get course over ground and speed over ground.

Set and drift corrections are beneficial for increasing the accuracy of vectors and target data. Refer to the tide table on board the ship for setting information. These values are applied to all targets. If stationary targets have vectors, set and drift values should be adjusted until they lose vectors.

Note: Turn off the AIS function in order to enter set and drift.

To enter set and drift do the following:

1. Right-click the Sensor information then select [OS Info Menu] to show the [OWN SHIP INFO] menu.
2. Select [1 SYSTEM SETTING].
3. Use the right and left arrow buttons to select the [SPD] page.
4. Set [Stabilization Mode] to [Water].
5. Click the [Set Drift] box to show a checkmark in the box.
6. Put the cursor in the course input box then spin the scrollwheel to select the set.
7. Put the cursor in the drift input box then spin the scrollwheel to select the drift.
8. Click the [OK] button to save the settings.
9. Close the menu.

Note: Set and drift should be checked periodically for correctness.



Set speed and course of drift

3.12 Trial Maneuver

The trial maneuver feature simulates the effect of own ship's movement against all tracked targets, without interrupting the updating of target information. It is available for use with the TT and AIS functions. For more accurate results, use relative motion and sea stabilization (water tracking).

3.12.1 Types of trial maneuvers

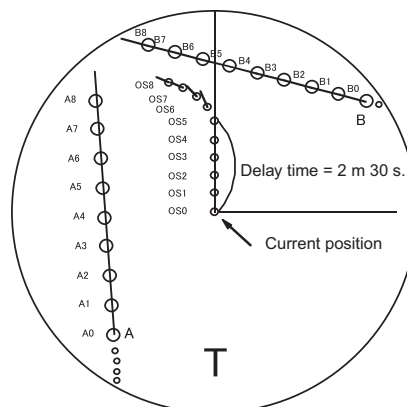
There are two types of trial maneuvers: dynamic and static.

Dynamic trial maneuver

A dynamic trial maneuver displays predicted positions of the tracked targets and own ship. You enter own ship's intended speed and course with a certain "delay time." Assuming that all tracked targets maintain their present speeds and courses, the targets' and own ship's future movements are simulated in one-second increments indicating their predicted positions in 30-second intervals as illustrated below.

The delay time represents the time lag from the present time to the time when own ship will actually start to change her speed and/or course. You should therefore take into consideration own ship's maneuvering characteristics such as rudder delay, turning delay and acceleration delay. This is particularly important on large vessels. How much the delay is set the situation starts immediately and ends in a minute.

In the example shown below, own ship will advance straight ahead (even after a maneuver) for a delay time of 2:30 and alters speed and course until operator-specified intended speed and course are achieved (position OS7 in this example).

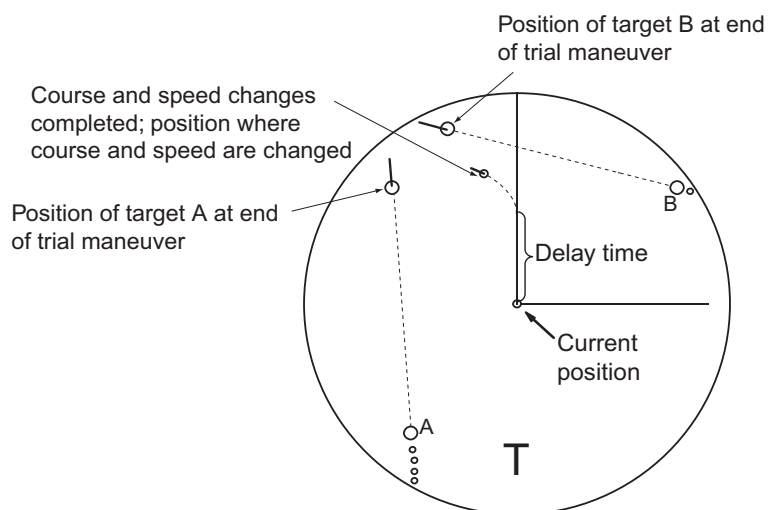


Static trial maneuver

The static trial maneuver shows the relationship between your ship and tracked targets at the completion of the trial maneuver. Enter expected course and speed and delay time until start of a maneuver and the expected position of your ship and TTs at the end of the trial maneuver are shown on the display.

By shortening and extending the trial time you can find the safe time to make a maneuver. Thus, the static trial maneuver will be convenient when you wish to know the maneuver result immediately.

3. TARGET TRACKING (TT)



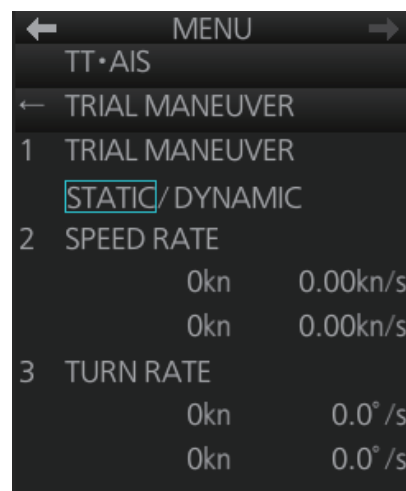
3.12.2 How to do a trial maneuver

To do a trial maneuver:

1. Right-click the DELAY setting in the [Trial] box (see step 6) then select [Trial Maneuver Menu].
2. Select [1 TRIAL MANEUVER] then select [STATIC] or [DYNAMIC] as appropriate.
3. Select [2 SPEED RATE] then set the speed rate with the scrollwheel.
4. Select [3 TURN RATE] then set the turn rate with the scrollwheel.

Note: Two sets of trial speed and trial turn rate combinations are provided. This is done to provide accurate trial maneuver results for various ship's speeds and turn rates.

5. Close the menu.
6. Find the [Trial] box at the right side of the screen.



7. Right-click the Trial title bar, select [Trial Mode] then select a trial mode, [Static] or [Dynamic].
8. Click the Trial ON/OFF indication to show [ON].
9. Click the Trial course indication. Spin the scrollwheel to set the trial course.
10. Click the Trial speed indication. Spin the scrollwheel to set the trial speed.

11. Click the [DELAY] indication. Spin the scrollwheel to set the amount of delay. This is the time after which own ship takes a new situation, not the time the simulation begins. Change the delay time according to own ship loading condition, etc.

The time indication depends on trial mode:

Dynamic mode: The position of your ship and TTs is updated and displayed every 30 seconds.

Static mode: The position of your ship and TTs when set course and speed are reached are displayed. The progress time until the position is reached is indicated on the display. The trial time can be changed from the Trial time indication. Put the cursor in the Trial time indication and roll the scrollwheel. The position of targets at the end of selected time is shown. Increase or decrease the time to get a safe maneuver. When the cursor is removed from the box the original positions of your ship and TTs are restored. If a maneuver is unsafe, change speed, course and delay until it is safe.

The trial maneuver takes place with the letter "T" displayed at the bottom of the screen. The time appears at the top-right position on the display. If any TT is predicted to be on a collision course with own ship (that is, the target ship comes within preset CPA/TCPA limits), the target plotting symbol flashes. If this happens, change own ship's trial speed, course or delay time to obtain a safe maneuver.

Terminating a trial maneuver

The termination method depends on the trial mode as follows:

Dynamic mode: The trial is terminated when 60 minutes is shown in the Trial time indication.

Static mode: The trial is terminated when you terminate the trial maneuver manually.

To terminate the trial maneuver manually, click the Trial ON/OFF indication to show [OFF].

3.13 TT Alerts

There are two situations that cause the TT to trigger visual and audio alerts. To acknowledge the audio alerts, click the [Alert] box or press the **ALARM ACK** key on the control unit.

Message	Category	Description
TT Target Lost	Warning	Tracked target lost. Check target.
REF Target Lost	Warning	Tracked target used for speed input is lost. To continue using reference target for speed input, select another tracked target.

3. TARGET TRACKING (TT)

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4. AIS OPERATION

Note: AIS operations require the WGS-84 Datum. Make sure the GPS connected to the radar is set to WGS-84.

4.1 How to Deactivate the AIS Display

Long-click the AIS status indication at the bottom-right position to display [FUNC OFF] to deactivate the AIS function (sleep all AIS targets). To activate AIS, push the left button again.

TT	AIS	
OFF	FUNC OFF	
Vector	30sec	True-G
LOST TGT	FILT	
PAST POSN	1min	REL
Trail	OFF	

Note 1: If the AIS function is activated while any of the following items are active, the manually entered information will be invalidated. Also, you cannot enable the following items while the AIS function is activated.

- Manual speed, heading or position ([DR] checkbox on [SPD], [HDG] or [POSN] page is active)
- Manual set & drift ([Set Drift] checkbox on [SPD] page is active)
- Speed is calculated from reference targets (see section 3.2.1)

Note 2: For the IMO- and A-type radars, the AIS function is always deactivated in standby.

4.2 How to Show, Hide the AIS Display

Objects that are being tracked by an AIS transponder can also be shown on the display. Click the AIS mode indication to select [DISP OFF], [DISP FILT] or [DISP ALL].

TT	AIS	
OFF	DISP ALL	
Vector	20min	True-G
LOST TGT	ALL	
PAST POSN	OFF	True-G
Trail	OFF	

[DISP OFF]: Turn off the AIS display. (Tracking continues internally.)

[DISP FILT]: Filter AIS objects according to the settings of the AIS display filter. See section 4.4.

[DISP ALL]: Display all AIS objects.

4.3 AIS Symbols

AIS objects

AIS objects are marked with an appropriate symbol as shown in the table below.

Symbol	Name	Description
	AIS target past position point	Mark past position.
	Sleeping AIS target	Sleeping AIS symbol. (Lines are thinner than Active AIS symbol.)
	Activated AIS target	Activated AIS target, with vector for course and speed. (Lines are thicker than sleeping AIS symbol.) Color can be changed with the menu.
	Activated AIS target, true scale symbol	Activated AIS target with symbol shown in true scale. Association AIS symbol or activate AIS symbol is displayed within the ship's symbol when activated. This symbol disappears when the size of the true scale symbol is smaller than 3 mm on the display.
	AIS SART	AIS SART (search and rescue radar transponder), includes AIS MOB, EPIRB-AIS
	AIS SART Test	AIS SART (search and rescue radar transponder) test.
	Selected AIS target	AIS and TT target declared as "association target". AIS symbol and AIS data are used.
	Heading - turn indicator	Target's direction of turning.
	SAR aircraft - fixed wing	SAR aircraft - fixed wing
	SAR aircraft - helicopter	SAR aircraft - helicopter
	AIS Base Station	AIS base station
	Synthetic Target	VTs generated synthetic target.
	Synthetic Target - Distress	Synthetic target in vessel distress situations.

Symbol	Name	Description
	AIS target selected	Target selected to display its data.
	SAR vessel	SAR (Search And Rescue) vessel.
	Lost AIS target	Intersecting diagonal lines are put on the AIS symbol and flash. The lost function applies only to AIS data reports and AIS position transponders.
	Non HDG/COG sleeping AIS target	Sleeping AIS target symbol without HDG and COG. Dashed line.
	Non HDG/COG activated AIS target	Activated AIS target symbol without HDG and COG. Dashed line.
  	Unread AIS message (Note 4)	AIS symbol with unread or viewing AIS message.

Note 1: AIS symbols are momentarily erased after the screen is redrawn when the heading is changed from the head-up mode.

Note 2: When no AIS data is received, the Alert "Lost AIS COM" appears in the [Alert] box. Check the AIS transponder. The priority for this alert changes as follows:

- **When the AIS function is disabled:** Prioritized as Warning.
- **When the AIS function is disabled:** Prioritized as Caution.

Note 3: An AIS object is declared a lost target if it is not detected in five consecutive reporting periods.

Note 4: [UNREAD MSG SYMBOL] on [TT•AIS SYMBOL] menu (radar mode) or [Unread AIS MSG] on [Targets] page (chart for radar mode) must be turned on to show the unread AIS message symbol.

Note 5: Physical and virtual AIS AtoN symbols that may appear are listed in the table on the next page.

4. AIS OPERATION

AIS AtoN symbols

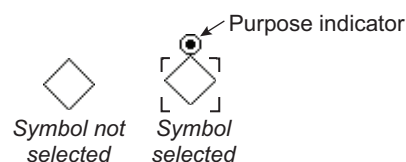
The table below shows all the AIS physical and AIS virtual AtoN symbols.

Note: Synthetic AtoN is described as basic shape.

AIS Physical AtoN Symbol*1	AIS Virtual AtoN Symbol	Default Color	Meaning
		Blue	Basic shape
		Blue	RACON
		Blue	Emergency wreck mark
		Blue	North cardinal mark
		Blue	East cardinal mark
		Blue	South cardinal mark
		Blue	West cardinal mark
		Blue	Port hand mark
		Blue	Starboard hand mark
		Blue	Isolated danger
		Blue	Safe water
		Blue	Special mark

AIS Physical AtoN Symbol ^{*1}	AIS Virtual AtoN Symbol	Default Color	Meaning
Off Posn 	—	Line: Yellow ^{*2} Char: Yellow ^{*2}	Off position ^{*3}
Unlit 	—	Line: Blue Char: Yellow ^{*2}	Off or dimmed lighting installations
Racon err 	—	Line: Blue Char: Yellow ^{*2}	RACON error
Error 	—	Line: Blue Char: Yellow ^{*2}	Abnormal lighting installation, or AIS AtoN with abnormal lighting installation and racon installation
Missing 	—	Line: Yellow ^{*2} Char: Yellow ^{*2}	Missing ^{*3}
		Blue	Mobile AtoN, basic shape
		Blue	Self-propelled, but direction not reported or unavailable mobile AtoN
		Blue	Tethered mobile AtoN
		Blue	Mobile AtoN with COG information. Arrow mark points in course direction of COG within $\pm 22.5^\circ$ sectors.

*1: A physical AtoN symbol is displayed with purpose indicator only when they are selected. See the example below.



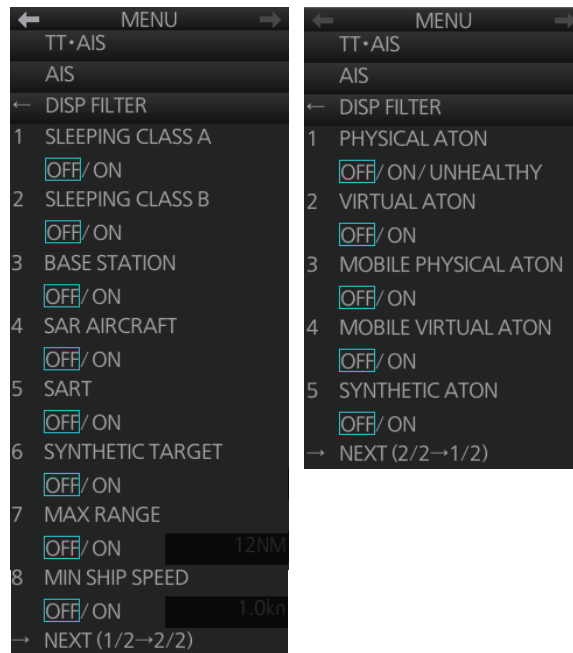
*2: Color not changeable.

*3: “Unlit”, “Racon err” and “Error” may be included.

4.4 How to Filter AIS Objects

If the screen becomes cluttered with AIS objects, you can filter out unnecessary AIS objects, from the [DISP FILTER] menu.

1. Right-click the AIS mode indication then click [AIS Menu] to show that menu.



2. At [1 SLEEPING CLASS A] - [6 SYNTHETIC TARGET] on page1 and [1 PHYSICAL ATON] - [5 SYNTHETIC ATON] on page 2, disable or enable tracking of respective item as appropriate. Select [ON] to filter out objects. When [1 PHYSICAL ATON] is set to [UNHEALTHY], only physical AtoN symbols with an error ("Off Posn", "Unlit", "Racon err", "Error" or "Missing") are displayed.
3. Select [7 MAX RANGE] and set the maximum range to display an AIS target. A sleeping AIS object not within the range set here is not displayed.
4. Set the minimum ship speed for AIS targets, with [8 MIN SHIP SPEED]. Any sleeping AIS object whose speed is slower than that set here will not be displayed.
5. Close the menu.

Note: This function does not apply to activated targets.

4.5 How to Activate Targets

When you convert a sleeping target to an activated target, an activated target's course and speed are shown with a vector. You can easily judge target movement by monitoring the vector.

Note: You can activate only AIS targets (class A and B AIS targets and SAR vessels).

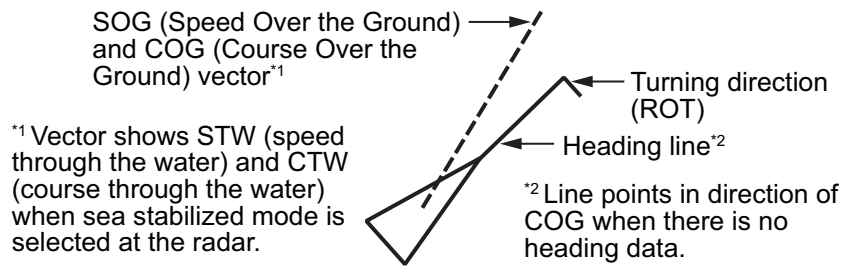
4.5.1 How to activate a specific target

From the Control Unit

Select the target with the cursor then press the **ACQ/ACT** key.

By the trackball module

Click the AIS target symbol.



4.6 How to Sleep Targets

Note: You can sleep only AIS targets (class A and B AIS targets and SAR vessels).

4.6.1 How to sleep an activated AIS target

You can "sleep" an activated AIS target as shown below when the screen becomes filled with targets that might prevent important radar and AIS targets from being identified. The targets that have been activated automatically cannot be "slept."

From the Control Unit

Put the cursor on the AIS target to sleep then press the **TARGET CANCEL** key.

By the trackball module

1. Right-click the screen to show the context-sensitive menu.
2. Select [Target Cancel] and [Any] or [AIS Only] as applicable.
3. Click the AIS target to sleep.

4.6.2 How to sleep all activated AIS targets

Sleep all activated targets from the menu

1. Open the menu then select [2 TT•AIS] and [4 AIS].
2. Select [3 SLEEP ALL TGTS] then [YES].
3. Close the menu.

Sleep all activated targets from the AIS box

Long-click the AIS mode indication at the bottom-right position to display [FUNC OFF] then click [DISP ALL] to sleep all AIS targets redisplayed.

TT	AIS	
OFF	DISP ALL	
Vector	20min	True-G
LOST TGT	ALL	
PAST POSN	OFF	True-G
Trail	OFF	

4.7 How to Display AIS Object Data

You can display an AIS object data by selecting it on the display.

4.7.1 AIS pop-up information

The AIS pop-up shows abbreviated AIS data (COG, SOG, CPA, TCPA and destination) for the selected AIS object. Simply put the cursor on the AIS object to show the pop-up. The pop-up can be enabled or disabled with [5 AIS POP-UP INFO] in the [2 TT•AIS] - [5 TT•AIS SYMBOL] menus.

VESSEL B
 COG: 090.0° T
 SOG: 14.00kn
 CPA: 57.06NM
 TCPA: 76'36"
 DEST: DESTIN...

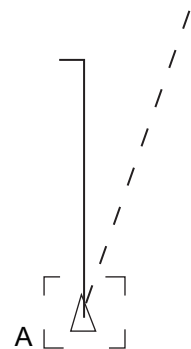
4.7.2 Basic AIS data

From the Control Unit

1. Use the trackball to put the cursor on the activated AIS symbol you want to know its data.
2. Press the **TARGET DATA** key.
3. The selected object is marked with a broken square and AIS data is shown in the AIS data box when the object is correctly selected.

By the trackball module

Click the AIS object. The selected object is marked with a broken square and AIS data is shown in the AIS data box when the object is correctly selected. The following figure is an display example for an AIS object. The contents on the basic AIS data change according to the AIS type. See section 4.7.4.



					Message icon*1	
AIS no. (information display order) →	AIS A					
Vessel name →	TOKYO					
Bearing →	BRG 089.6° T	HDG			← Heading	
Range →	RNG 10.03NM	090.0° T				
Course over ground →	COG 090.0° T	ROT			← Rate of turn	
Speed over ground →	SOG 0.10kn	+000.0° /min				
CPA →	CPA 8.945NM	STATUS			← Navigation status	
TCPA →	TCPA <99'59"	Under way				
Bow crossing range →	BCR 19.87NM	using				
Bow crossing time →	BCT <99'59"	engine				
Position →	24° 30.048' N					
	151° 10.999' E					

*1: The icon appears when an AIS message is received from an AIS object. Click the icon to show the AIS message(s). A maximum of the two latest messages is displayed.

Note 1: AIS is not available in dead reckoning when the radar type is selected to [IMO] on the [INSTALLATION] menu.

Note 2: If the TCPA value is negative, this means that you have already passed the closest point and the AIS object is going away from your ship.

Note 3: For target data box, see "Target data box" on page 3-9.

4.7.3 Expanded AIS data

The expanded AIS data display provides additional information about an AIS object, including call sign, MMSI No., IMO No., etc. To display expanded AIS data, show the basic AIS data for an object, right-click the data display then select [Expanded AIS Data]. The following figure shows the expanded AIS data for an AIS object. The contents on the expanded AIS data change according to the AIS type. See section 4.7.4.

	←	MENU	→
Title bar →		Target Information	X
Vessel name →		Name:	FURUNO
Call sign →		Call:	WG27CQ
Position →		L/L:	00° 04.514' N 000° 03.672' W
Type of position sensor →		POS sensor:	GPS
Position quality (HIGH or LOW)/ Availability of RAIM ^{*1} →		POS QLTY.:	HIGH RAIM
Course over ground →		COG:	141.0° T
Speed over ground →		SOG:	10.00kn
Navigation status →		NAV status:	Under way using engine
MMSI No. →		MMSI No.:	123456789
IMO No. →		IMO No.:	123456789
Length of vessel →		Length:	180m
Width of vessel →		Width:	32m
Draught of vessel →		Ship draught:	8.0m
Destination →		DEST.:	KOBE
ETA at destination →		ETA:	20/JUL 19:20
AIS class/Version of AIS transponder ^{*2} →		AIS class:	Class A version:0
Association (On or Off) →		Association:	Off
Ship and cargo type →		Ship and Cargo Type:	Tanker(s) All ships of this type
Number of times the AIS message was relayed →		Repeat Indicator:	0
Availability of DTE ^{*3} (Data Terminal Equipment) →		DTE:	not available

*1. "RAIM" (Receiver Autonomous Integrity Monitoring) appears after position quality indication when RAIM is in use.

*2. Version of AIS transponder is shown only for the class A AIS targets.

*3. Message sent to AIS object when DTE (Data Terminal Equipment) cannot be used.

4.7.4 AIS object type and available AIS data

The AIS data available depends on the AIS object type. The table below shows the data available for each AIS object type.

Display item	Class A	Class B	Base station	SAR aircraft	AtoN	SART	Synthetic (DISTRESS)	Synthetic (VTS)
Name	✓	✓	✓	✓	✓	✓	✓	✓
Call	✓	✓	—	✓	—	—	—	✓ ^{*1}
L/L	✓	✓	✓	✓	✓	✓	✓	✓
POS sensor	✓	✓	✓	✓	✓	—	—	—
POS QLTY.	✓	✓	✓	✓	✓	✓	—	—
POS indicator	—	—	—	—	✓	✓	—	—
COG	✓	✓	—	✓	—	✓	—	✓
SOG	✓	✓	—	✓	—	✓	—	✓
NAV status	✓	—	—	— ^{*2}	✓ ^{*3}	✓	—	—
MMSI No.	✓	✓	✓	✓	✓	✓	—	✓ ^{*4}
IMO No.	✓	—	—	—	—	—	—	✓ ^{*5}
Length	✓	✓	—	✓	✓	—	—	✓
Width	✓	✓	—	✓	✓	—	—	—
Ship draught	✓	—	—	—	—	—	—	—
DEST.	✓	—	—	—	✓	—	—	—
ETA	✓	—	—	—	—	—	—	—
Start date	—	—	—	—	—	—	✓	—
End date	—	—	—	—	—	—	✓	—
AIS class	✓	✓	—	—	—	—	—	—
Association	✓	✓	—	—	—	—	—	—
Ship and Cargo Type	✓	✓	—	—	✓	—	—	—
Repeat Indicator	✓	✓	✓	✓	✓	✓	✓	✓
DTE	✓	✓	—	—	—	—	—	—

^{*1}: Displayed when Call Sign is enabled during VTS.

^{*2}: Where the selected AIS object is an aircraft, the aircraft's altitude appears.

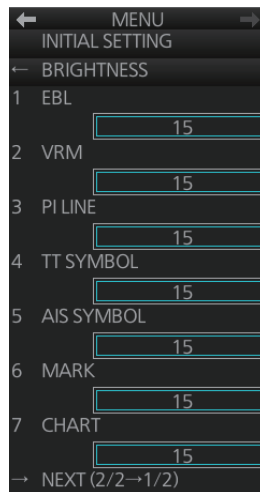
^{*3}: Mobile, RACON/Light (at AtoN) are used as AtoN status.

^{*4}: Displayed when MMSI No. is enabled during VTS.

^{*5}: Displayed when IMO No. is active during VTS.

4.8 AIS Symbol Brilliance

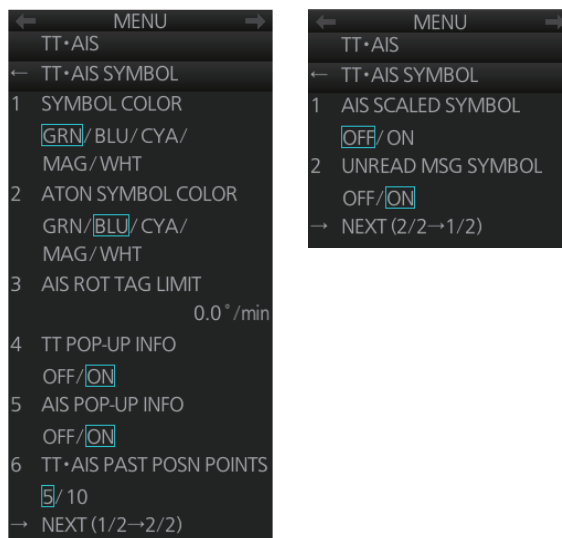
1. Right-click the [BRILL] button on the InstantAccess bar™, then select [Brill Menu].



2. Go to page 2, select [5 AIS SYMBOL] then spin the scrollwheel to adjust the brilliance.
3. Close the menu.

4.9 AIS Symbol Color

1. Right-click the AIS mode indication then click [Symbol Menu] to show that menu.



Page 1

Page 2

2. Select [1 SYMBOL COLOR] and desired color.
3. Close the menu.

4.10 How to Enable, Disable the AIS Lost Target Alert

The [LOST TGT] indication (at the bottom-right position) enables, disables the lost alert. Click the indication to select [OFF], [FILT] or [ALL] as appropriate.

[OFF]: Disables the lost alert.

[FILT]: Get the alert against the objects set at the radar. If some menu item on the [LOST FILTER] menu is set to [ON], the [FILT] indication is shown in yellow.

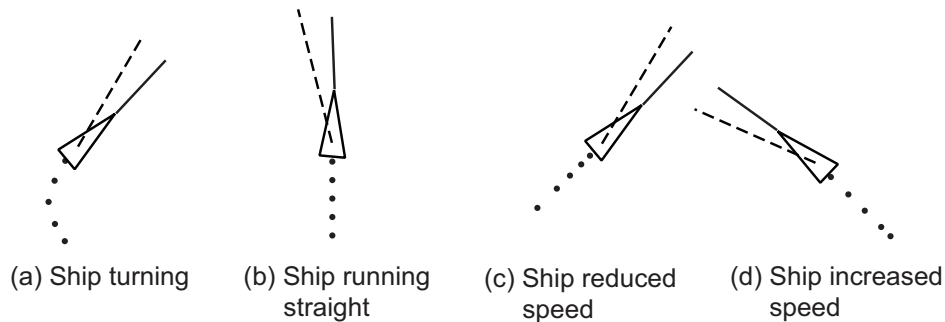
[ALL]: Get the alert against all lost objects.

TT		AIS
OFF		FUNC OFF
Vector	30sec	True-G
LOST TGT	FILT	
PAST POSN	1min	REL
Trail	OFF	

4.11 How to Display AIS Past Positions

The past position display shows equally time-spaced dots marking past positions of activated AIS targets. If a target changes its speed, the spacing will be uneven. If it changes course, its plotted course will not be a straight line.

Below are sample past position displays.



4.11.1 How to enable/disable the past position display, select past position reference

Click the indications circled in the right figure to set the plot interval (or disable the display) and the past position reference (true or relative).

TT		AIS
OFF		FUNC OFF
Vector	30sec	True-G
LOST TGT	FILT	
PAST POSN	1min	REL
Trail	OFF	

Plot interval, past position display ON/OFF

Past position reference

4.11.2 Past position points

You can show 5 or 10 past position points per AIS target. Right-click the past position indication then click [PAST POSN Menu]. Set [6 TT•AIS PAST POSN POINTS] to [5] or [10].

4.12 How to Display True or Relative Speed Vectors

AIS targets vector can be displayed relative to your ship's heading (relative) or with reference to the North (True).

Vector time (or the length of vectors) and orientation mode can be set at the bottom-right position on the screen. For further information, see section 3.9.

4.13 Association of TT and AIS Targets

An AIS-equipped ship is usually displayed by two symbols on the radar 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 chart for radar mode, with the [TT/AIS] page in the [Overlay/NAV Tools] box. All settings are mutually shared.

Note: Only activated class A and B AIS targets are subject to the association function.

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 [2 TT•AIS] - [6 ASSOCIATION] - [1 ASSOCIATION TGT] menus. To turn off association, click the location to remove the arrow.



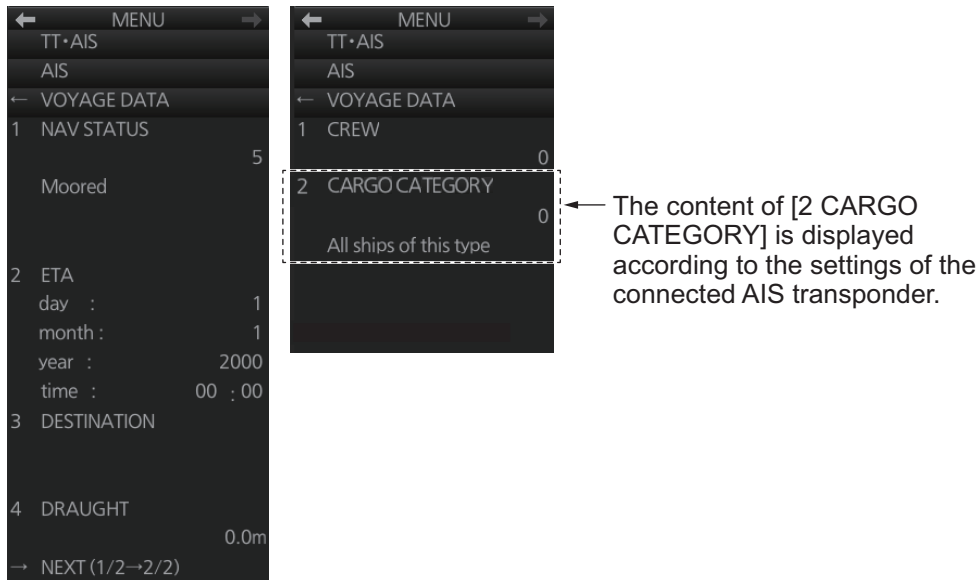
Note: You can also select the method by right-clicking the location. Click desired association method.



4.14 Voyage Data

Before you embark on a voyage, set your navigation status, ETA, destination, draught and the number of crew, on the [VOYAGE DATA] menu.

- Click the [OWN AIS] button on the InstantAccess bar™ to show the [VOYAGE DATA] menu.



- Select [1 NAV STATUS] then use the scrollwheel to set the applicable two-digit nav status code, referring to the table below.

No.	Nav status	No.	Nav status
00	Underway using engine	08	Under way sailing
01	At anchor	09	Reserved for high speed craft
02	Not under command	10	Reserved for wing in ground
03	Restricted maneuverability	11	power-driven vessel towing astern (regional use)
04	Constrained by her draught	12	power-driven vessel pushing ahead or towing alongside (regional use)
05	Moored	13	Reserved for future use
06	Aground	14	AIS-SART (active)
07	Engaged in fishing	15	Not defined

- Select [2 ETA] then use the scrollwheel to enter ETA: day (two digits), month (two digits), year (four digits) and time (four digits).
- Select [3 DESTINATION] then use the software keyboard to enter the name of your destination, using a maximum of 20 characters.
- Select [4 DRAUGHT] then use the scrollwheel to enter ship's draft (0.0 to 25.5 (m)).
- Go to page 2 of the menu, select [1 CREW] then use the scrollwheel to enter the number of crew (0000 to 8191).

7. If necessary, select [2 CARGO CATEGORY] then use the scrollwheel to set the applicable cargo type code, referring to the table below.

No.	Cargo type	No.	Cargo type
0	All ships of this type	5	Reserved for future use
1	Carrying DG, HS, or MP, IMO hazard or pollutant category X	6	Reserved for future use
2	Carrying DG, HS, or MP, IMO hazard or pollutant category Y	7	Reserved for future use
3	Carrying DG, HS, or MP, IMO hazard or pollutant category Z	8	Reserved for future use
4	Carrying DG, HS, or MP, IMO hazard or pollutant category OS	9	No Additional Information

8. Close the menu.

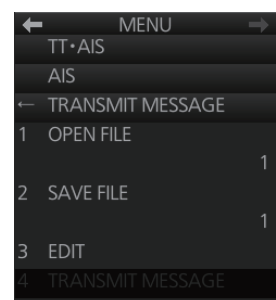
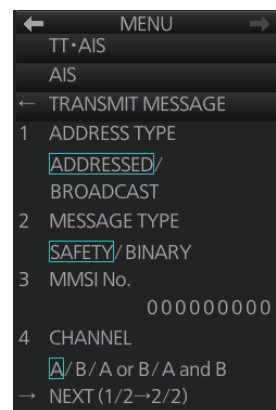
4.15 AIS Messages

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.

4.15.1 How to create and transmit a new AIS message

You can create and send an AIS message as follows:

- Right-click the AIS mode indication then click [AIS Menu] to show that menu.
- Open the [8 TRANSMIT MESSAGE] menu.
- At [1 ADDRESS TYPE], select [ADDRESSED] to send the message to a specific AIS-equipped ship, or [BROADCAST] to send the message to all AIS-equipped ships within VHF communication range. For [ADDRESSED], enter MMSI of ship at [3 MMSI No.].
- At [2 MESSAGE TYPE], select [SAFETY] for safety message, or [BINARY] for routine message.
- At [4 CHANNEL], select the channel over which to broadcast your message. The choices are [A], [B], [A or B] or [A and B].
- Click [NEXT] to go to the next page.
- Select [3 EDIT]. A text input box appears together with the software keyboard. Use the software keyboard to enter your message. The number of characters that may be entered depends on message type, and the number of characters available appears below the text box.
Safety message broadcast: 90 characters
Binary message broadcast: 86 characters



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Safety message addressed to MMSI: 85 characters

Binary message addressed to MMSI: 80 characters

8. To save the file, select [2 SAVE FILE].
9. To transmit the message, click [4 TRANSMIT MESSAGE]. The confirmation message "Attention: Do you wish to transmit AIS message?" appears. Click the [OK] button to transmit the message.

Note: If [1 ADDRESS TYPE] is set to [ADDRESSED] and you enter an MMSI for an AIS that the DTE (Data Terminal Equipment) is unavailable, the following message appears and the message cannot be sent.

"AIS messages cannot be sent because the addressed AIS has no DTE."

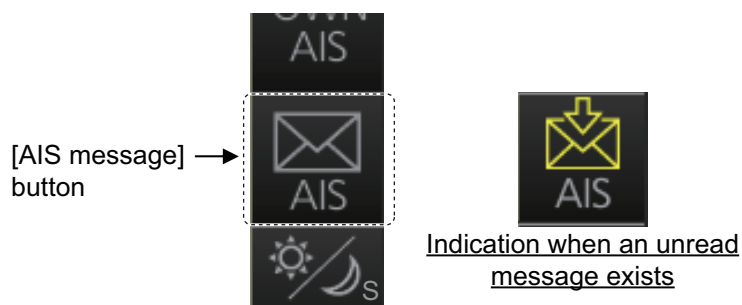
4.15.2 How to transmit a saved AIS message

If you have saved some previously transmitted AIS messages, you can edit one and send it as follows:

1. Right-click the AIS mode indication then click [AIS Menu] to show that menu.
2. Open the [8 TRANSMIT MESSAGE] menu.
3. Go to page 2 of the menu, select [1 OPEN FILE] then select the number of the message to transmit.
4. Select [3 EDIT] to edit the message.
5. To save the message, select [2 SAVE FILE].
6. To transmit the message, select [4 TRANSMIT MESSAGE]. The confirmation message "Attention: Do you wish to transmit AIS message?" appears. Click the [OK] button to transmit the message.

4.15.3 How to display received AIS messages

When you receive an AIS message, the Alert "AIS MSG Received" appears. When an unread AIS message exists, the [AIS message] button on the InstantAccess bar™ is displayed in yellow and changed as follows.



AIS received messages list

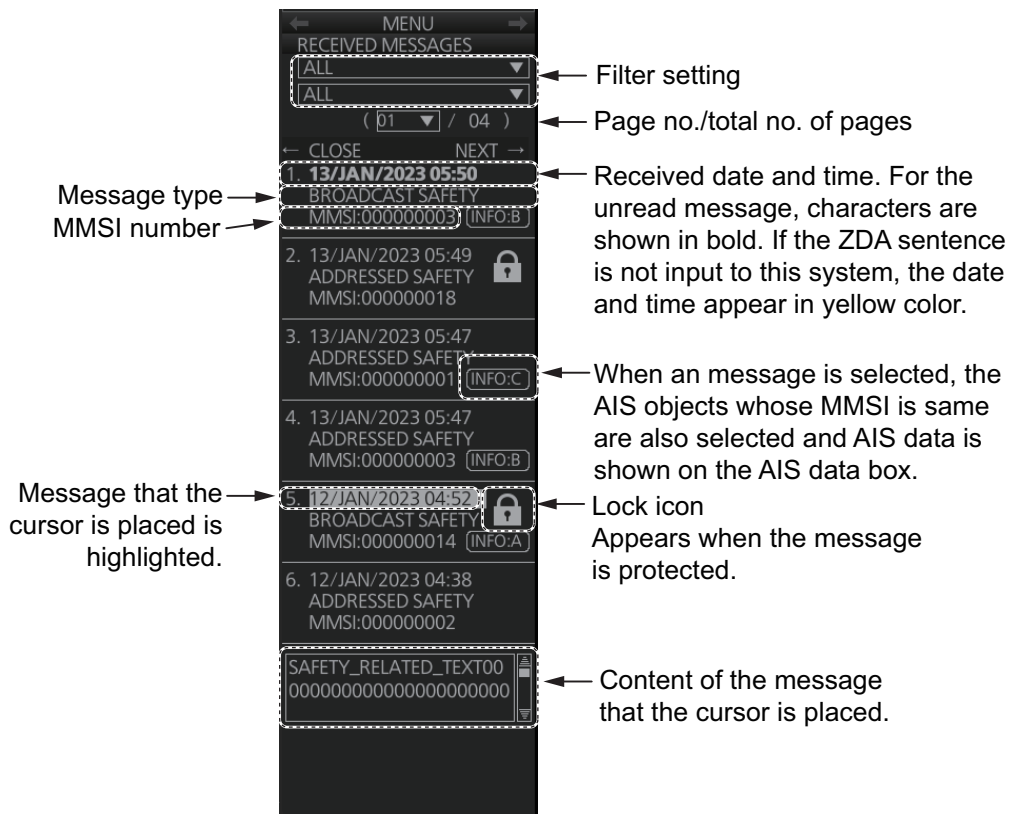
Received AIS messages are stored in the AIS received message list. The maximum number of messages that can be stored is as follows:

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

When the memory capacity is reached and a new message is received, the oldest message (excluded the protected message) is automatically deleted to make room for the latest. The AtoN messages are deleted after 18 minutes. When the AtoN or SART is lost, the messages whose MMSI is same with the lost object are automatically deleted.

Do as follows to show the AIS message.

1. Right-click the AIS mode indication then click [AIS Menu] to show that menu.
2. Select [7 RECEIVED MESSAGES] to show the received message list.



How to filter the message list

When you want to filter the message list, use the filter setting on the top of the message list.

- **Upper filter setting:**

- [ALL]: Show all received messages.
- [TARGET]: Show the AIS message from the AIS-equipped ships, SAR aircrafts and AIS base stations.
- [SART]: Show the AIS message from the SART.
- [ATON]: Show the AIS message from the AtoN.

- **Lower filter setting:**

- [ALL]: Show all received messages.
- [ADDRESSED]: Show only the addressed messages.
- [BROADCAST]: Show only the broadcast messages.
- [PROTECTED]: Show only the protected messages.
- [UNREAD]: Show only the unread messages.

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3. Click an AIS message in the list to show its contents.

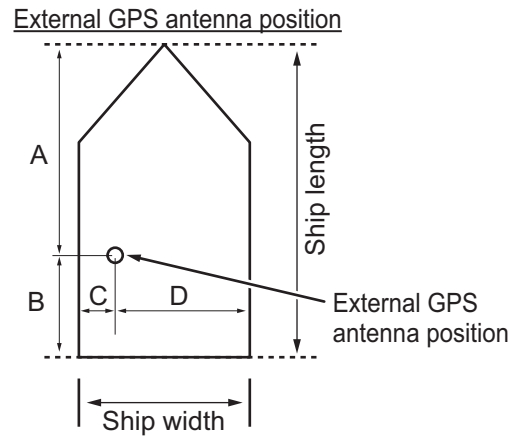
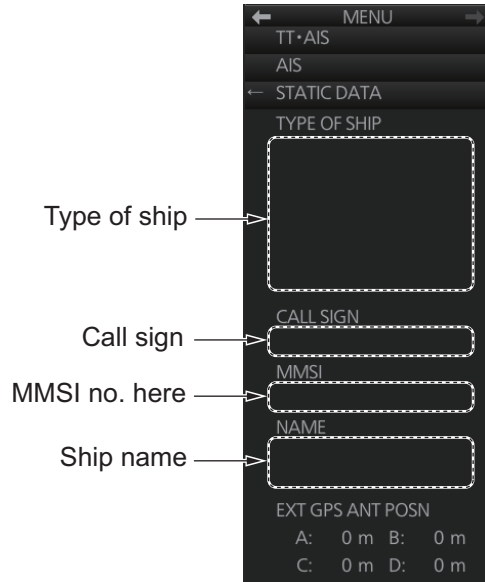


- Click the [CLOSE] window button to close the window.

4.16 How to View Own Ship Data

Own ship's static data (type of ship, call sign, MMSI, name and position of external GPS antenna) can be viewed as follows:

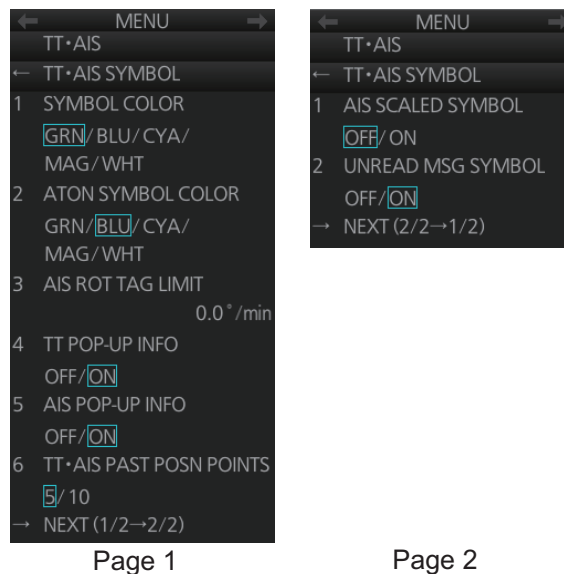
1. Right-click the AIS mode indication then click [AIS Menu] to show that menu.
2. Select [2 STATIC DATA].



3. Close the menu.

4.17 Other AIS Features

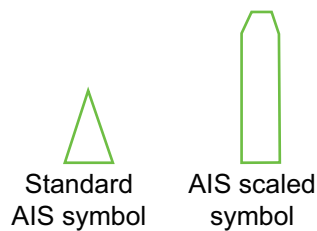
The [TT•AIS SYMBOL] menu additionally provides the AIS related features described below.



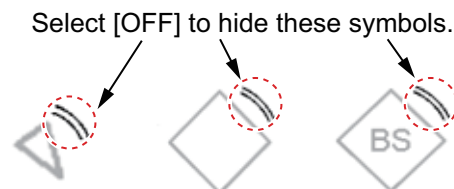
[2 ATON SYMBOL COLOR]: Select the ATON symbol color.

[3 AIS ROT TAG LIMIT]: The ROT marker appears on the heading line of an AIS object and points in the direction of the turn when the ship's rate of turn is greater than that set here.

[1 AIS SCALED SYMBOL]: The AIS symbol can be shown as a simple triangle or a symbol scaled according to a vessel's dimensions. Go to page 2 of the menu, then set [1 AIS SCALED SYMBOL] to [ON] to show the AIS scaled symbol.



[2 UNREAD MSG SYMBOL]: Select [OFF] to hide the unread message or message displaying symbols.



4.18 AIS Alerts

The table below shows all the AIS alerts that may appear (in the Alert box). To acknowledge the audio alerts, click the [Alert] box or press the **ALARM ACK** key on the control unit.

Message	Category	Description
CPA/TCPA	Alarm	CPA and TCPA of an activated AIS target are below value set on the menu.
Active AIS 95%	Warning	Number of displayed active AIS targets is more than 95% of maximum value.
Active AIS Full	Warning	Number of displayed active AIS targets is 100% of maximum value.
AIS Capacity 95%	Warning	Number of AIS targets is 95% of maximum capacity.
AIS Capacity 95%	Warning	Number of AIS targets is 95% of maximum capacity.
AIS Capacity Full	Warning	Number of AIS targets is 100% of maximum capacity.
AIS DATREP Full	Caution	100% of memory capacity for AIS data report is filled
AIS Display 95%	Warning	Number of displayed AIS targets is more than 95% of maximum value.
AIS Display Full	Warning	Number of displayed AIS targets is 100% of maximum value.
AIS MSG Send ERR	Caution	AIS message could not be sent.
AIS SART Full	Caution	100% of memory capacity for AIS locating device is filled
AIS SYN TGT Full	Caution	100% of memory capacity for AIS synthetic target is filled.
Lost AIS COM	Warning	AIS is turned off, or there is a problem with network.

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5. RADAR MAP AND TRACK

5.1 About the Radar Map

A radar map, which functions to indicate safety-related areas and objects, consists of a layer of operator-entered marks and lines overlaid on the radar display. The marks entered from the main display are shown, and additional marks can be entered from the ECDIS radar mode. Waypoints, events, routes, user charts can be shown or hidden as required.

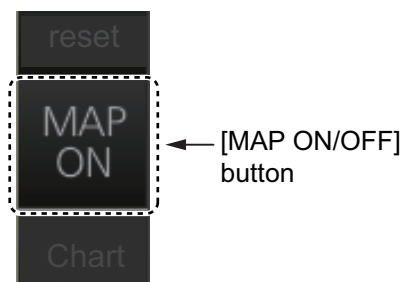
The radar map marks and lines entered in the ECIDS radar mode can be deleted, copied, imported and exported. Radar map marks entered on the main display cannot be processed.

The orientation mode is selected from the main radar.

The radar map does not affect any radar function.

5.2 How to Show, Hide the Radar Map Display

Click the [MAP ON/OFF] button to display [MAP ON] or [MAP OFF] as appropriate.



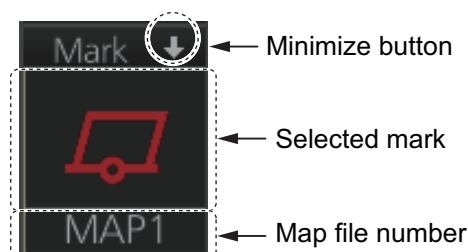
5.3 How to Enter Radar Map Marks and Lines

Marks and lines can be entered in the radar mode. (Marks cannot be entered in the chart radar mode.) These marks and lines can be displayed in red, green, blue, cyan, magenta, yellow or white. (Some marks, lines and colors may not be available depending on the specifications of your radar.)

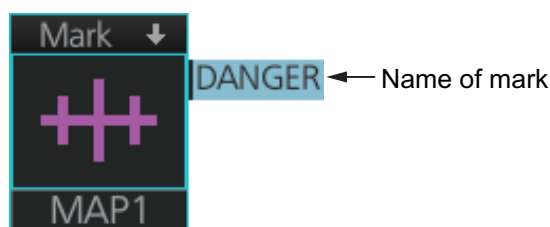
The capacity for map storage is 10 maps/4,000 points per map. When 4,000 marks and lines have been entered into a map, the message "MARK FULL" replaces the mark icon in the [Mark] box and no more marks and lines can be entered into that map. In this case save the marks/lines to another map file or erase some marks from the full map file in order to save the mark.

The procedure below shows how to enter a mark, including mark selection, mark entry method, and save location. You can skip steps in the procedure where it is not necessary to complete the corresponding action.

1. Put the cursor on the mark shown in the [Mark] box at the bottom-left position on the display.



2. Spin the scrollwheel to select a mark. The name of the mark appears to the right of the mark.

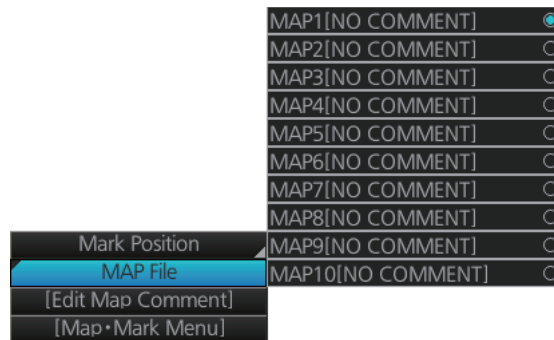


3. Select mark position and where to save the mark as follows:
 - 1) Right-click the [Mark] box to show the context-sensitive menu then click [Mark Position].



- 2) Select the mark input method. The choices are [CURSOR], [OWN SHIP] and [L/L]. For L/L, the mark is entered at the L/L position entered at [2 MAP MARK L/L] on the [5 MAP•MARK] - [1 MARK SETTING] menus.

- 3) At the context-sensitive menu, click [MAP File] then click the map file number where to save the mark.



4. **For entry with the cursor**, use the trackball to put the cursor on the location desired. (You can see the range and bearing from own ship to the cursor location by monitoring the Cursor position box.) Push the left button to inscribe the mark or line point.

Note: To continue entering the same mark or line under the same conditions, do the following at the next time of entry.

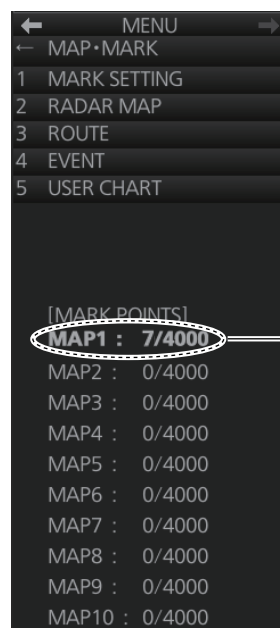
Entry by cursor: Click the location where to put a mark.

Entry by ship's position, or manual input of latitude and longitude: Click the mark icon.

5.4 How to Find Number of Map Points Used

You can show the number of points used in each radar map file.

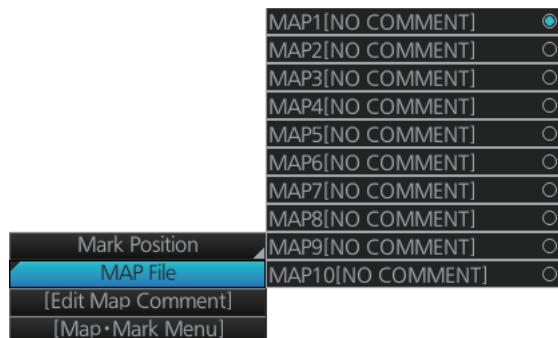
Right-click the [Mark] box then select [Map•Mark Menu]. See [MARK POINTS] at the bottom of the menu to see how many mark points have been used per map file. In the example below 7 points out of 4,000 points have been used in Map 1.



Map no., no. of points used/total no. of points

5.5 How to Select the Radar Map to Display

1. Right-click the [Mark] box to show the context-sensitive menu.
2. Click [MAP File] and then click the map no. you want to display.

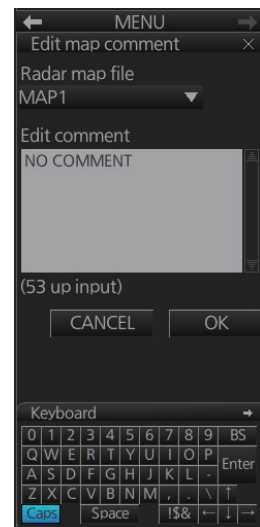


5.6 How to Attach a Comment to a Radar Map, Find Comment for a Map

5.6.1 How to attach a comment to a radar map

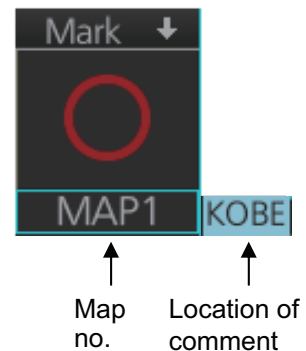
You can attach a comment to radar maps you have created, to help you distinguish your maps.

1. Right-click the [Mark] box to show the context-sensitive menu.
2. Click [Edit Map Comment]. A text input box appears together with the software keyboard, as shown in the right figure.
3. Select the map no. with the [Radar map file] drop-down list.
4. Enter your comment in the text input box. The number of characters available appears below the box.
5. Click the [OK] button to finish.



5.6.2 How to find the comment for a map

Put the cursor on the map no. indication. The comment is displayed to the right of the map no. In the example below the comment is "KOBE".

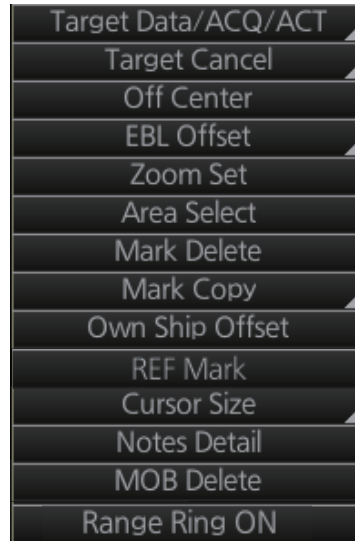


5.7 How to Erase Radar Map Marks and Lines

A total of 4,000 marks and lines is allotted per map. When this amount is exceeded in a map, no more map marks or lines may be entered into the map unless you erase some unnecessary marks or lines.

5.7.1 How to erase individual radar map marks and lines

1. Right-click the display area to show the context-sensitive menu.

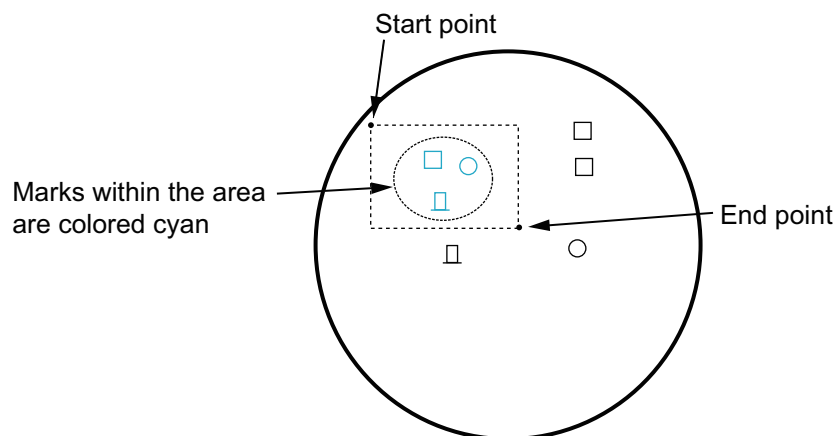


2. Click [Mark Delete].
3. Click the mark or line to erase.

5.7.2 How to erase map marks and lines in an area

You can erase all marks and lines within an area as follows:

1. Right-click the display area to show the context-sensitive menu.
2. Click [Area Select].
3. Specify the area as follows:
 - 1) Put the cursor on the start point and push the left button.
 - 2) Drag the cursor diagonally to the end point and push the left button.



5. RADAR MAP AND TRACK

4. Right-click the display area to show the context-sensitive menu.



5. Click [Area Mark Delete] to delete the marks and lines in the area selected.

5.7.3 How to erase all radar map marks and lines in a map file

You can erase all radar map marks and lines in the map file currently displayed. Be absolutely sure you want to erase the marks and lines - erased marks and lines cannot be restored.

1. Right-click the [Mark] box, select [Map•Mark Menu] and [1 MARK SETTING].
2. Select [8 MAP MARK ALL DELETE]. The confirmation message "Attention: Do you wish to delete all map mark?" appears. Click the [OK] button to erase all marks and lines.
3. Close the menu.

5.8 How to Copy Radar Map Marks and Lines

5.8.1 How to copy individual radar map mark and line to another map file

You can copy individual mark and line from the currently displayed radar map to the radar map file of your choice.

1. Right-click the display area to show the context-sensitive menu.
2. Click [Mark Copy] then click the map file no. where to copy the mark.

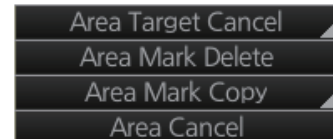


3. Put the (light-blue) cursor on the mark or line then click.

5.8.2 How to copy radar map marks and lines within an area to another map file

You can copy radar map marks and lines within an area of the currently displayed radar map to the radar map file of your choice.

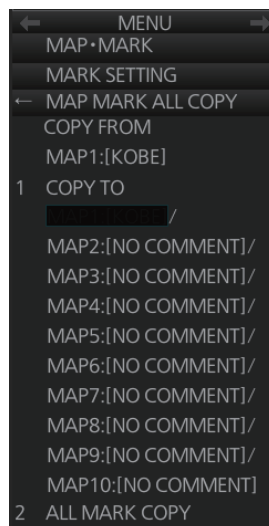
1. Right-click the display area to show the context-sensitive menu.
2. Click [Area Select].
3. Specify the area as follows.
 - 1) Put the cursor on the start point and push the left button.
 - 2) Drag the cursor diagonally to the end point and push the left button.
4. Right-click to show the context-sensitive menu.
5. Click [Area Mark Copy] then click the map file number where to copy the marks and lines.



5.8.3 How to copy all radar map marks and lines in a map file to another map file

You can copy all radar map marks and lines in the currently displayed radar map to the radar map file of your choice.

1. Display the map file of which to copy all its marks and lines. See section 5.5.
2. Right-click the [Mark] box then click [Map•Mark Menu].
3. Select [1 MARK SETTING].
4. Select [9 MAP MARK ALL COPY].



5. Select [1 COPY TO] then select where to copy the map marks and lines.
6. Select [2 ALL MARK COPY]. The confirmation message "Attention: Do you wish to copy all map mark?" appears. Click the [OK] button to copy.
7. Close the menu.

5.9 How to Export a Radar Map

You can export a radar map to a USB flash memory.

Note: This function is available only in standby mode.

1. Set the USB flash memory in the USB port on the Control Unit.
2. Open the menu then select the [5 MAP•MARK] and [1 MARK SETTING] menus.
3. Go to page 2 of the menu, select [1 MAP MARK MANAGE]. The confirmation message "Attention: Do you wish to open map convert window?" appears.
Note: The [1 MAP MARK MANAGE] menu is available only in standby mode.
4. Click the [OK] button to show the [Map Convert] dialog box.



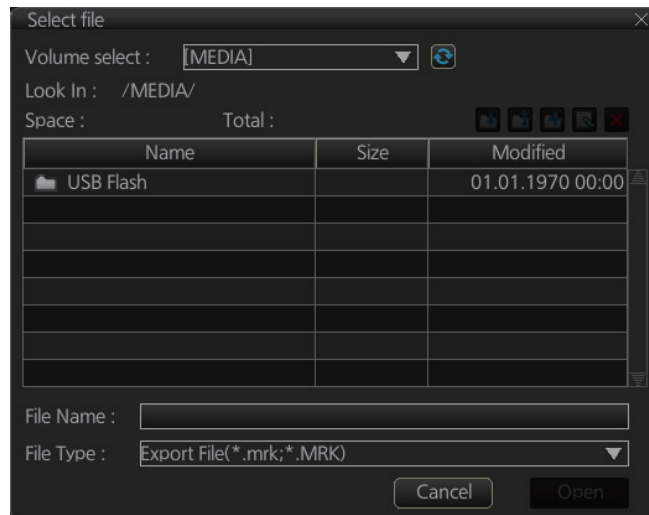
5. Check [Export] at the top-left position of the dialog box.
6. Check the radar map(s) (Map1 to Map10) to export.
7. Click the [Export] button to show the [Save file] dialog box.
8. Select the USB flash memory as the destination to save then click the [Save] button. After the data export is completed, the message "x file(s) have exported success." appears (x is the number of the radar map(s)).
9. Click the [OK] button.

5.10 How to Import a Radar Map

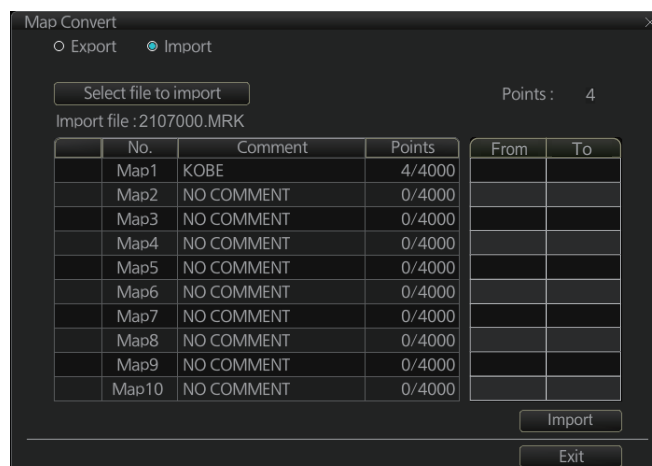
You can import a radar map created on another equipment (FAR-3xxx or FAR-2xx7). Copy the radar maps to a USB flash memory.

Note: This function is available only in standby mode.

1. Set the USB flash memory that contains the radar map(s) to import in the USB port on the Control Unit.
2. Open the menu then select the [5 MAP•MARK] and [1 MARK SETTING] menus.
3. Go to page 2 of the menu, select [1 MAP MARK MANAGE]. The confirmation message "Attention: Do you wish to open map convert window?" appears.
Note: The [1 MAP MARK MANAGE] menu is available only in standby mode.
4. Click the [OK] button to show the [Map Convert] dialog box.
5. Check [Import] at the top-left position of the dialog box then click the [Select file to import] button to show the [Select file] dialog box.



6. Select the folder that contains the file to import then click the [Open] button to show the [Map Convert] dialog box.



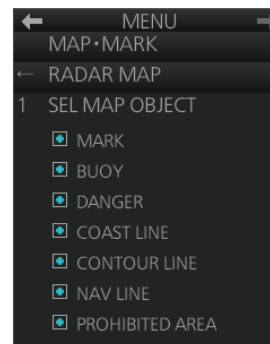
7. Check the radar map(s) (Map1 to Map10) to which the data created on another equipment are imported.
8. Click the [Import] button to import the data to the radar map(s) selected at step 7.

Note: When importing a radar map created on another FAR-2xx7, the radar maps marks and lines are converted.

5.11 How to Show, Hide Radar Map Features

You can show or hide radar map objects as follows:

1. Open the [MAP•MARK] menu, then select [2 RADAR MAP].
2. Turn objects on or off as appropriate.
3. Close the menu.



5.12 Track

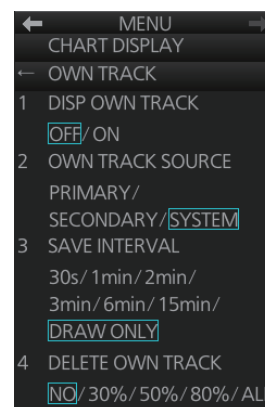
5.12.1 How to set up ship's track

The track traces your ship's movement. This radar records track at the interval you set on the [OWN TRACK] menu, and the recording interval determines the maximum recording time. The longer the interval the longer the recording time, as shown in the table below.

When the memory for track becomes full, the oldest track is deleted to make room for the latest. For that reason you may want to adjust the recording interval so as to keep the track on the display for a longer time.

Save Interval	Max. Recording Time	Save Interval	Max. Recording Time
30 s	6 days 22 hr 40 min	3 min	41 days 16 hr
1 min	13 days 21 hr 20 min	6 min	83 days 8 hr
2 min	27 days 18 hr 40 min	15 min	208 days 5 hr

1. Open the menu, then select the [6 CHART DISPLAY] and [1 OWN TRACK] menus.
2. Select [1 DISP OWN TRACK].
3. Select [ON] to show your ship's track or [OFF] to hide the track.
4. Select [2 OWN TRACK SOURCE].
5. Select the navigation sensor that is to feed the position data to use to plot your ship's track, among [PRIMARY], [SECONDARY] and [SYSTEM].
[PRIMARY]: Navigation sensor having first priority.
[SECONDARY]: Navigation sensor having second priority.
[SYSTEM]: Plot own ship's track using system-fed position.
6. Select [3 SAVE INTERVAL].
7. Select how often to save your ship's track, among [30s], [1min], [2min], [3min], [6min] and [15min]. [DRAW ONLY] draws the track but does not save it.
8. Close the menu.



5.12.2 How to erase track

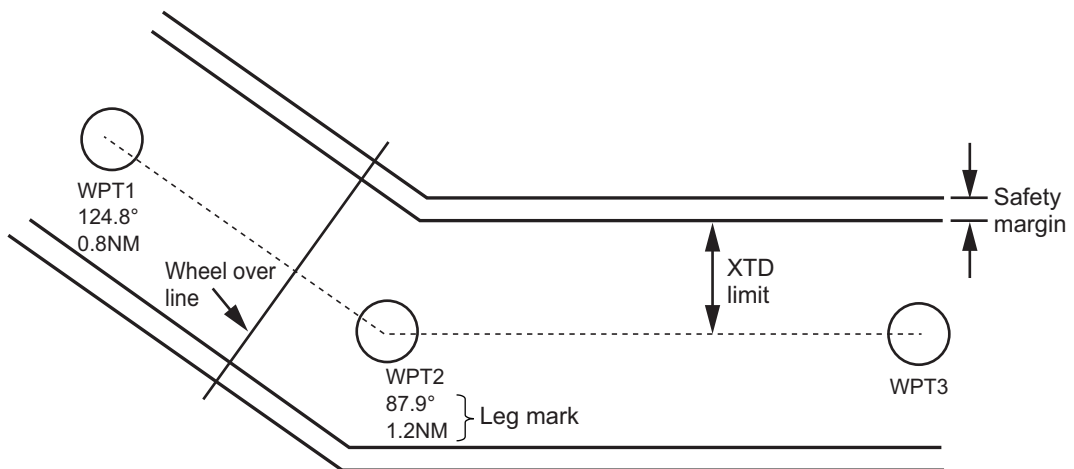
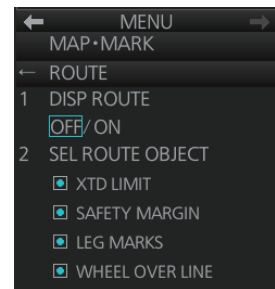
When the display becomes filled with track, for example, your ship traces the same route several times, you may want to delete some or all of your track from the display.

1. Open the menu then select the [6 CHART DISPLAY] and [1 OWN TRACK] menus.
2. Select [4 DELETE OWN TRACK]
3. Select the percentage of track to delete among [30%], [50%], [80%] and [ALL].
4. Close the menu.

5.13 Route Display

The route selected for navigation at the ECDIS can be shown on the radar display. (See the ECDIS operator's manual for information about routes.) You can show or hide the entire route, and show or hide elements of the route (channel limits, safety margin, leg marks and wheel over line).

1. Open the [MAP•MARK] menu, then select [3 ROUTE].
2. Turn the route display on or off at [1 DISP ROUTE].
3. Turn the XTD limit, safety margin, leg marks and wheel over line displays on or off at [2 SEL ROUTE OBJECT].

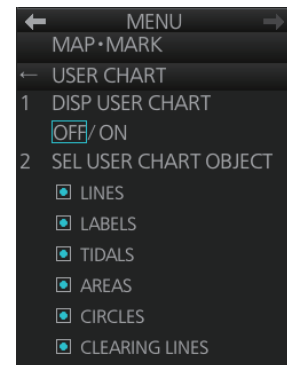


4. Close the menu.

5.14 User Chart Display

The active user chart created on the ECDIS can be shown in the radar mode. See the ECDIS operator's manual for information about the user chart.

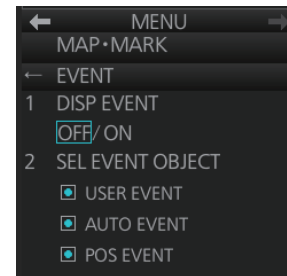
1. Open the [MAP•MARK] menu, then select [5 USER CHART].
2. Show or hide the user chart on the radar display with [1 DISP USER CHART].
3. Show or hide the user chart objects on the radar display with [2 SEL USER CHART OBJECT].
4. Close the menu.



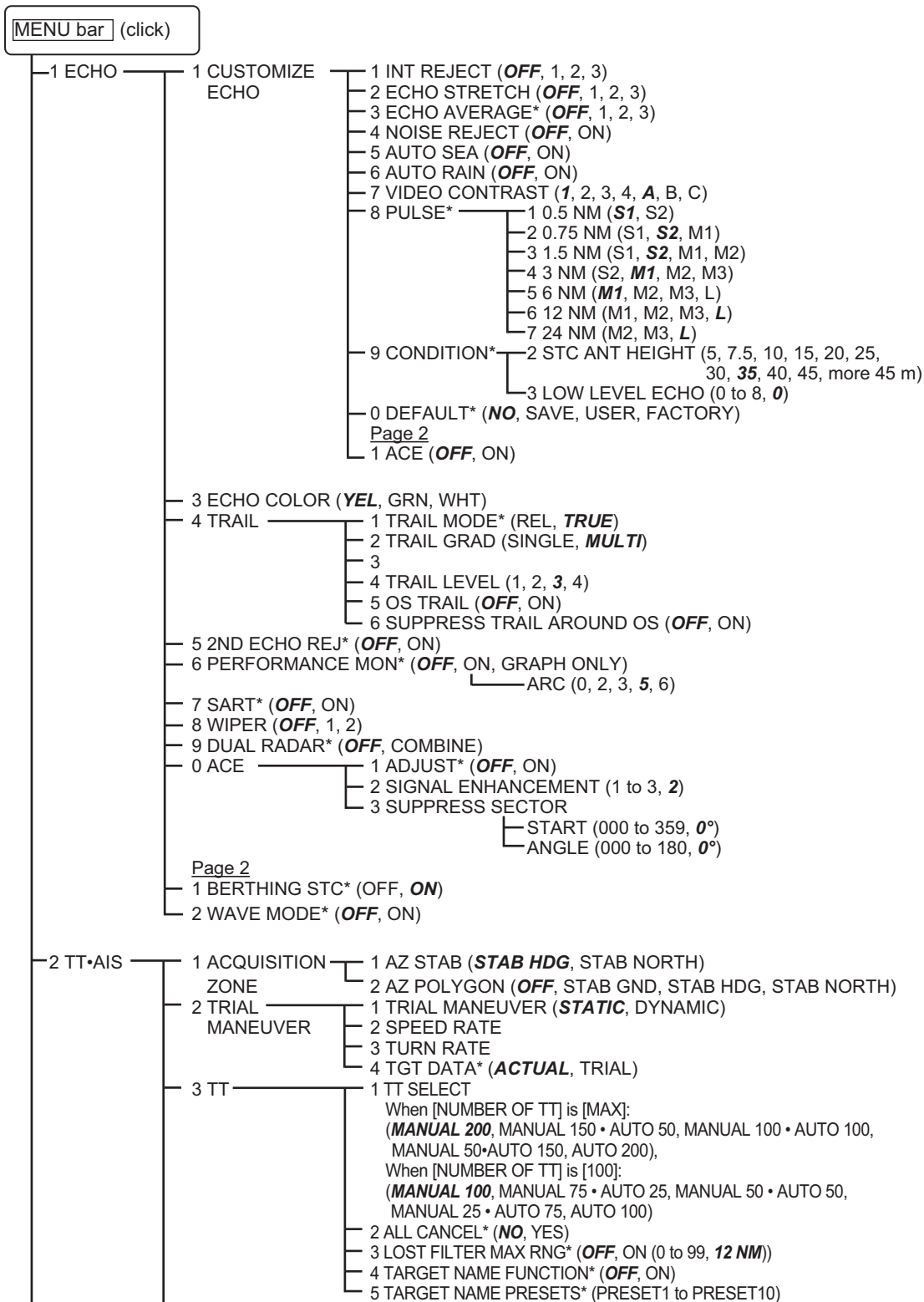
5.15 Event Display

You can show or hide event marks on the radar map display.

1. Open the [MAP•MARK] menu, then select [4 EVENT].
2. Show or hide the user chart on the radar display with [1 DISP EVENT].
3. Show or hide the user chart objects on the radar display with [2 SEL EVENT OBJECT].
4. Close the menu.



APPX. 1 MENU TREE



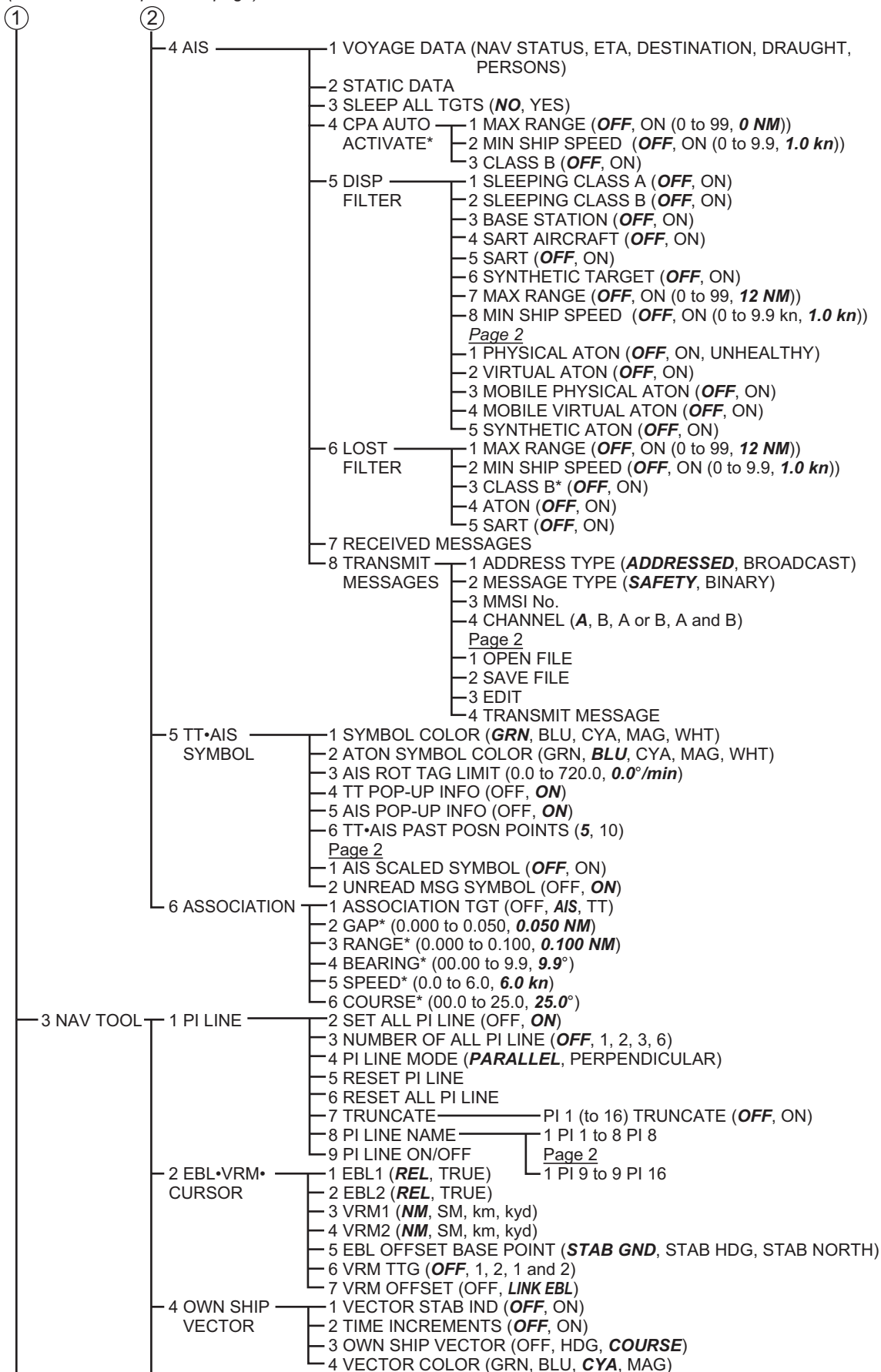
*: Not available with the FMD-3xxx.

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APPX. 1 MENU TREE

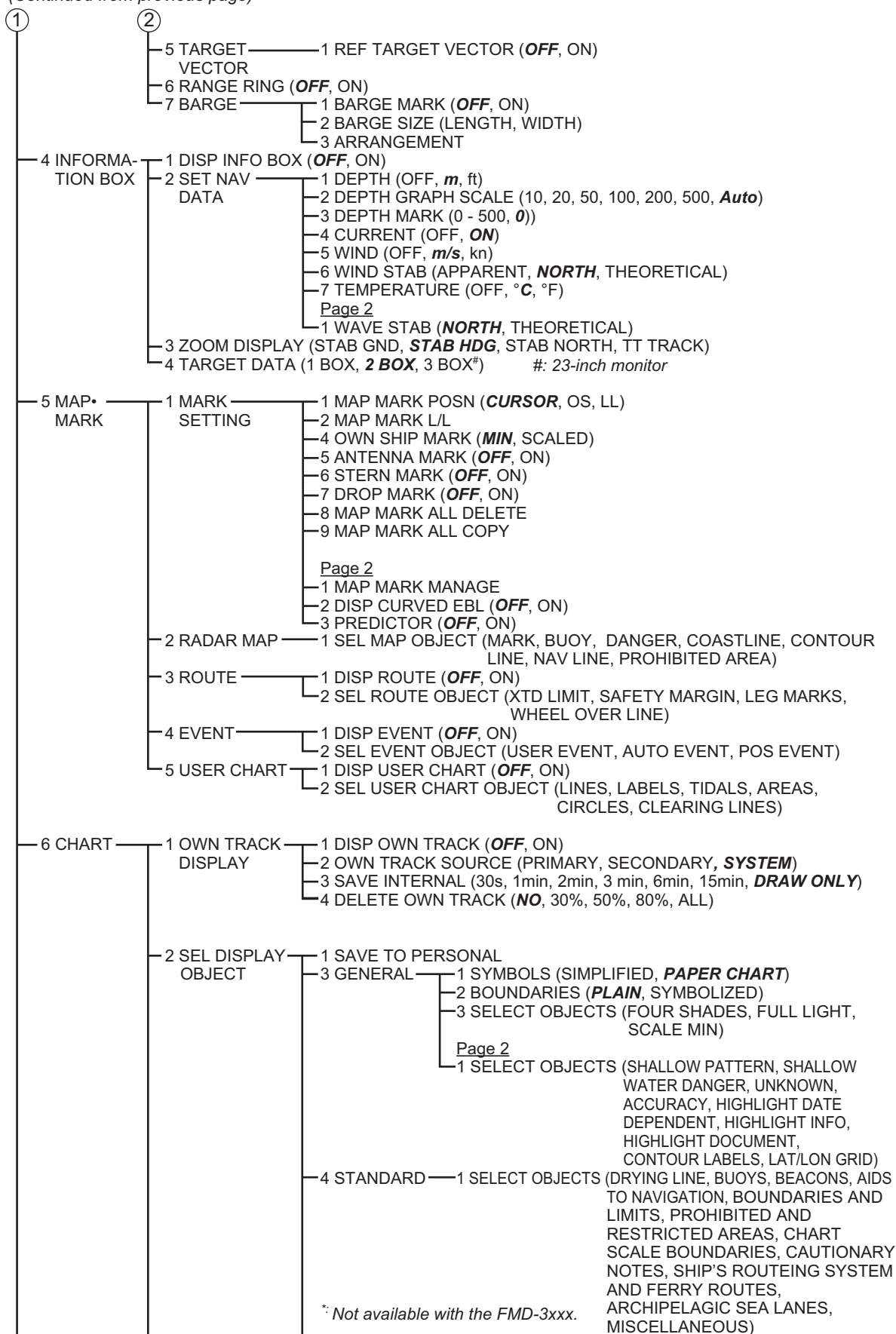
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*: Not available with the FMD-3xxx.

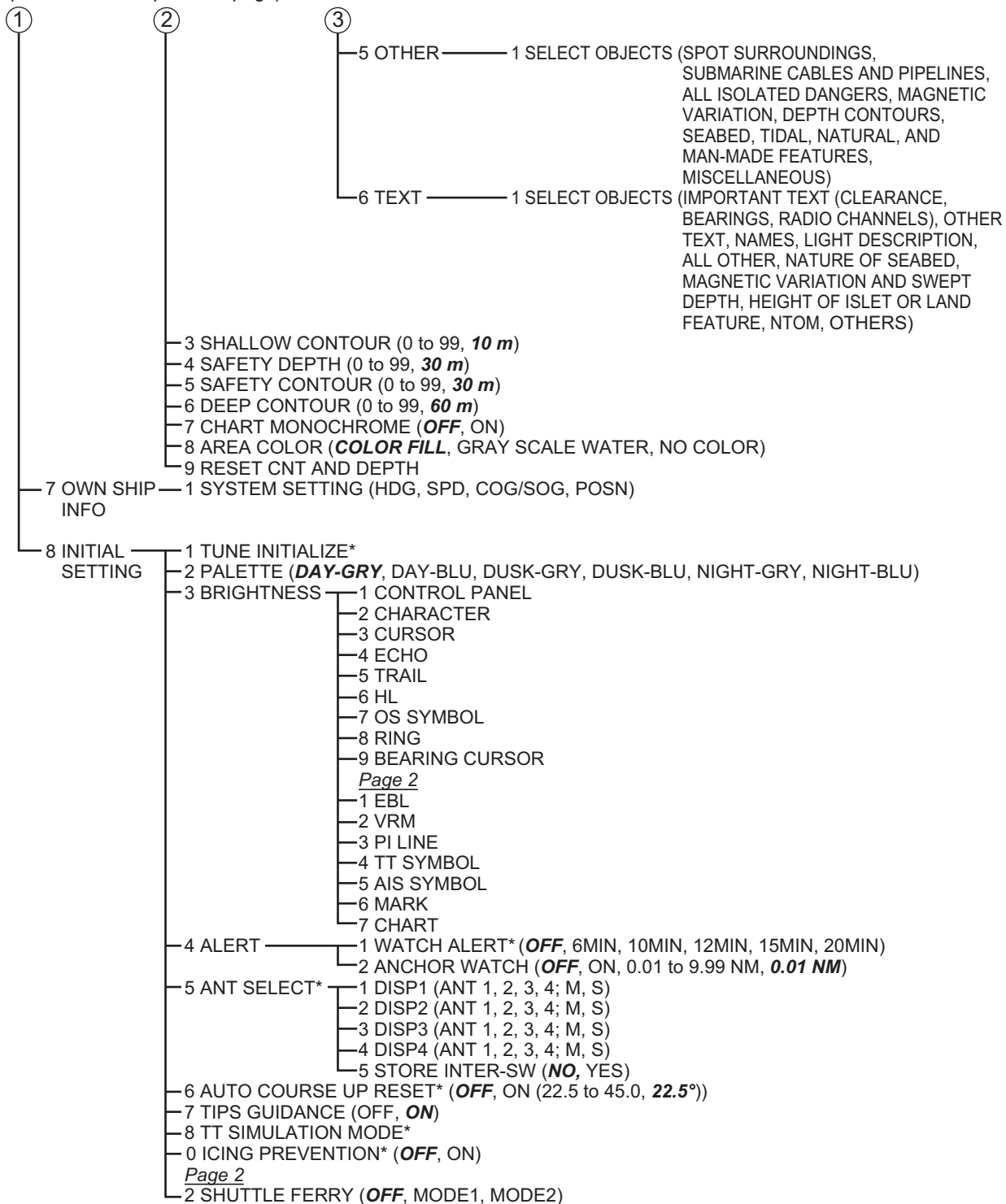
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*: Not available with the FMD-3xxx.

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