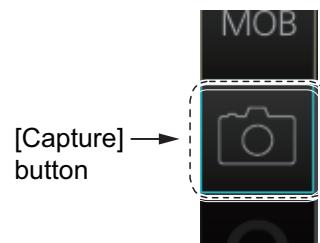


1.21 How to Take a Screenshot of the Display

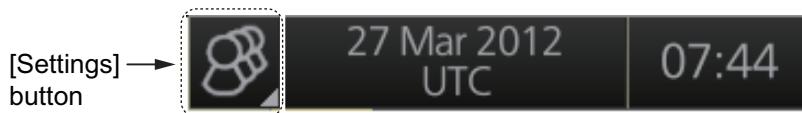
Click the [Capture] button on the InstantAccess bar™ to take a screenshot and save it to the SSD (Solid State Drive). You can save a maximum of 100 screenshots. When the capacity for screenshots is reached, the oldest screenshot is automatically deleted to make room for the latest. You cannot take a screenshot when a menu or a dialog box is opened.



Screenshots can be copied to a USB flash memory. For how to process screenshots, see section 22.11.

1.22 The Settings Menu

The [Settings] button gives you access to the user profiles and the [Settings] menu. The [Settings] menu has facilities for screenshot management, file management, diagnostic tests and customizing. See chapter 22.

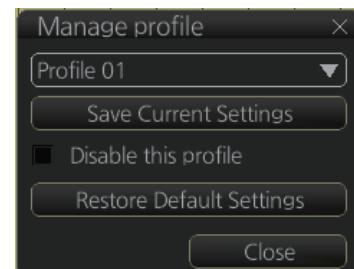


1.23 User Profiles for Radar, Chart Radar

The [Settings] button lets you store ten sets of custom settings and color settings (echoes, TT and AIS symbols and echo trails). This allows individual users to quickly set the system according to their preferences.

1.23.1 How to create a profile

1. Set the settings (echoes, TT and AIS symbols, echo trail, etc.) as desired.
2. Click [] on the Status bar then click [Manage Profile].
3. Select a profile number from the “Profile” drop-down list.
Note: Profiles 06-10 are disabled in the default setting. To enable a disabled profile, select the profile to enable from the “Profile” drop-down list then uncheck [Disable this profile].
4. Click [Save Current Settings].



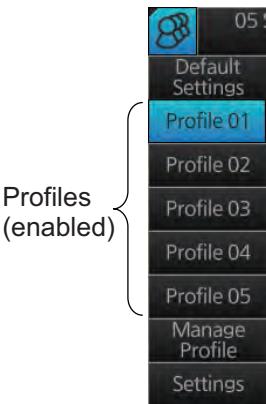
1.23.2 How to disable a profile

1. Click [] on the Status bar then click [Manage Profile].
2. Select a profile number from the “Profile” drop-down list.
3. Check [Disable this profile].

The profile enabled at section 1.23.3 cannot be disabled.

1.23.3 How to activate a profile

1. Click [] on the Status bar.
2. Click the profile number to activate. The confirmation message "Attention: Settings will be changed to Profile XX. Do you wish to continue?" appears.
3. Click [Yes].



1.23.4 How to restore a profile to the default settings

1. Click [] on the Status bar then click [Manage Profile].
2. Select a profile number from the [Profile] drop-down list.
3. Click [Clear Profile]. The confirmation message "Attention: This profile will be restored to the default. Do you wish to continue?" appears.
4. Click [Yes].

1.23.5 How to change the settings on the current display to the recommended settings

1. Click [] on the Status bar.
2. Click [Default Settings]. The confirmation message "Attention: Settings will be changed to the default. Do you wish to continue?" appears.
3. Click [Yes]. The settings on the following table are changed to the recommended settings.

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

Radar Mode

Items	Settings
RAIN, SEA	AUTO
GAIN	80
EAV	No change
Automatic Clutter Elimination (ACE)	OFF
TUNE	No use
TX CH	No change
RANGE	6 NM, 6 SM, 6 km, 6 kyd
VRM1	0.25 NM, 0.25 SM, 0.25 km, 0.25 kyd
VRM2	OFF (No change)
EBL1	ON (No change)
EBL2	OFF (No change)
Presentation mode	North-up TM Note: Head-up RM with no heading or position data.
Off Center	The ship's position is put beyond 75% of the range scale.
Trail	Trail time: 6 min, Trail mode: True-G
Past POSN	OFF
Lost TGT	OFF

Items	Settings
TT ACQ	No change Note: TT OFF with no heading data.
Vector	Vector time: 6 min, Vector reference: REL
AZ1, AZ2 (acquisition zone)	OFF
AIS	DISP ALL Note: FUNC OFF with no heading or position data.
Association	TT (>)
CPA/TCPA	CPA: 2 NM, TCPA: 12 min
AIS CPA	AUTO ACT ALL
Display mode	RADAR
MAP (Radar map)	No change
Route	No change
Alert	AZ1/AZ2: OFF, Lost TGT: OFF
Antenna connection status	No change
RANGE RING	OFF
PI LINE	PI1 to PI6: OFF Number of PI line, mode, bearing range truncate: No change
SPD (Own Ship Sensor Setting)	Stabilization Mode: Bottom* Sensor Type: GPS* Sensor Setting: No change (System or Local)

*: These settings can not be applied, the settings are changed according to the priority order of SPD.

Chart mode

Item	Settings
[Route Information] menu	
Route information page	unit of "XTD" m
[System Sensor Settings]/[Local Sensor Settings] menu	
SPD page	Stabilization Mode Bottom
[Other Sensor Settings] menu	
Other Sensor page	Wind m/s
[Basic Setting] menu	
Basic Setting page	TM Reset 90%
[Chart Display] menu	
General page	Symbols Paper Chart
	Boundaries Plain
	Four Shades Unchecked
	Full Light Lines Unchecked
	Scale MIN Checked
	Shallow Pattern Unchecked
	Shallow Water Dangers Checked
	Unknown Checked
	Accuracy Unchecked
	Highlight Date Dependent Unchecked
	Highlight INFO Unchecked
	Highlight Document Unchecked
General page	Contour Labels Unchecked
	LAT/LON Grid Unchecked

1. OPERATIONAL OVERVIEW

Item		Settings
Text page	Important Text	Checked
NtoM page	Temporary Notices	Unchecked
	Preliminary Notices	Unchecked
	No Information	Unchecked
[Symbol Display] menu		
General page	Ship Outlines	OFF
	AIS Outlines	OFF (grayed out)
Tracking page	CCRP	Checked
	Primary	Checked
	Secondary	Checked
	Pivot	Checked
	Length	720 min
	Labels	30 min
Mariner page	Labels	Checked
	Lines	Checked
	Clearing Lines	Checked
	Tidals	Checked
	Areas	Checked
	Circles	Checked
[Chart Alert] menu		
Chart Alert page	Safety Contour	Keeps previous setting
	Safety Depth	Keeps previous setting
	Safety Contour check box	Checked
	Dangerous or special areas *1	Checked
	Navigational Hazard check box	Checked
	Navigation Hazard Alert level	C (Caution)
(TT/AIS) [Setting] menu		
Setting.1 page	Sleeping Class A	OFF
	Sleeping Class B	OFF
	Physical AtoN	ON
	Virtual AtoN	ON
	MAX Range	ON, 6 NM
Chart scale/presentation mode box		
Chart scale	3 NM	
Presentation mode	North Up TM	
[Overlay/NAV Tools] box		
Look-ahead page	Ahead	Time, 6 min
Echo page *2	Display	OFF
TT/AIS page	TT display	OFF
	AIS display	OFF
	Vector	6 min, T.GND
	Past POSN	OFF
Other functions		
Brilliance	CALIB	
Viewing Date - Display Date	Auto: Today	
Split Screen	Full Screen (no split)	
Chart database mode	CUSTOM	

Item	Settings
TM Reset function	Enabled
Own track	Disabled
Log - NAV Log - Detail dialog	Show Track

*1: Chart alert objects other than the following:

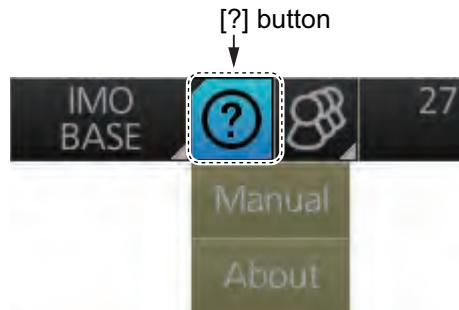
- Safety Contour
- No Vector Chart
- Sounding UKC Limit
- Not up-to-date
- Navigational Hazard
- UKC Limit
- Non-official ENC
- Permit Expired

*2: Available only when the [Echo] page is enabled at installation.

1.24 How to View Chart Software Version No., Chart System Information, and Operator's Manual

You can show chart program no., chart system information, and the operator's manual as follows:

1. Click the Display mode button at the left end of the Status bar to select [CHART for RADAR].
2. Click the [?] button on the Status bar.



3. Select [Manual] to show the operator's manual, or [About] to show chart and system information.

On the [About] screen, click the [Version] tab to show the chart software version no., conning software version no., S52 presentation library version, ENC user permit no., and C-MAP SDK software version no. Click the [System 1] tab to show system information: CPU type, RAM capacity, SSD free/SSD capacity, Equipment ID and dongle information. [Function] shows this unit's capabilities. Click the [System 2] tab to show the startup time for this equipment.

The information shown in the following illustration may be different from those on your system.

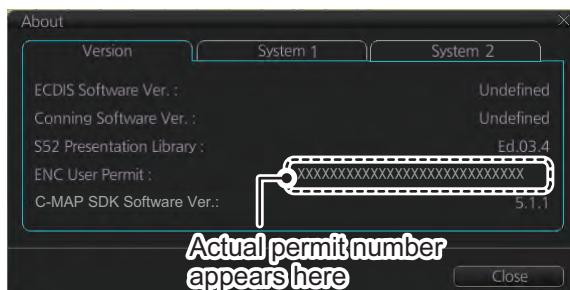
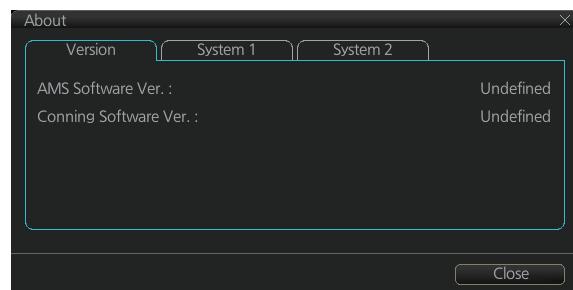
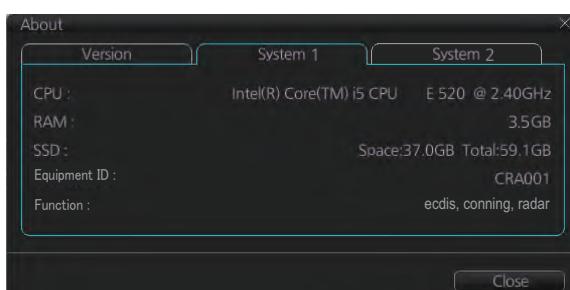


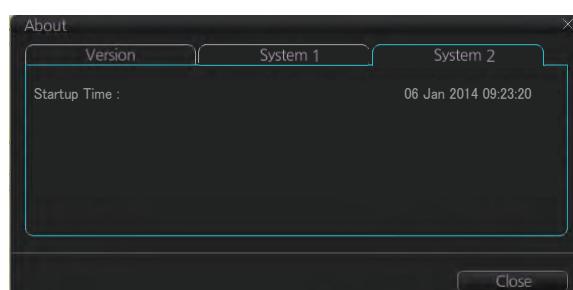
Chart [Version] tab



Conning [Version] tab



[System 1] tab



[System 2] tab

1.25 Tips (operational guidance)

This radar provides operational tips for the display area, InstantAccess bar™ and Mark box. To get a tip, simply put the cursor on the object. For example, put the cursor on the [BRILL] button on the InstantAccess bar™. The tip "Adjust brilliance" appears.



If you do not need the tips, you can turn them off with [TIPS GUIDANCE] in the [INITIAL SETTING] menu.

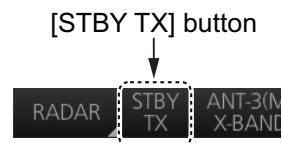
1. OPERATIONAL OVERVIEW

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2. RADAR, CHART RADAR OPERATION

2.1 How to Transmit

After the power is turned on, "STBY" appears at the screen center, meaning the radar is ready to transmit radar pulses. You can transmit by pushing the **STBY TX** key on the Control Unit, or clicking the [STBY TX] button on the Status bar.



The radar is initially set to previously used range and pulse length. Other settings such as brilliance levels, VRMs, EBLs and menu option selections are also set to previous settings.

The **STBY TX** key (or [STBY TX] button) toggles the radar between STBY and TRANSMIT state. The antenna is stopped in stand-by and rotates in transmit.

When the antenna stops, it faces the bow. However, wind and other factors may cause the antenna to move slightly.

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.

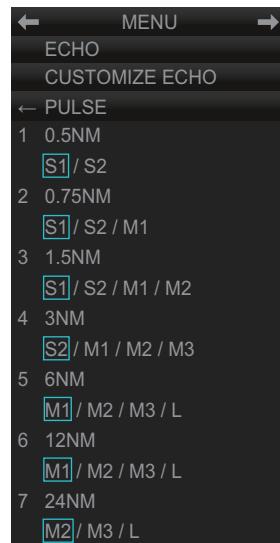
Pulse length indication	Pulse length (μs)
S1	0.07/5.0
S2	0.18/7.5
M1	0.3/12.5
M2	0.5/17.5
M3	0.7/18.3
L	1.2/18.3

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.

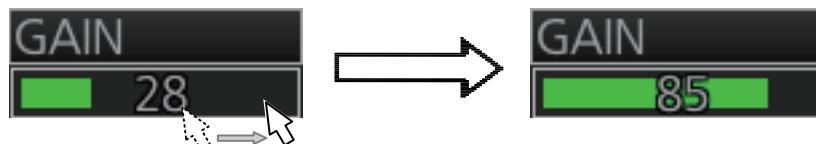
Adjust the gain so background noise is just visible on the screen.

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

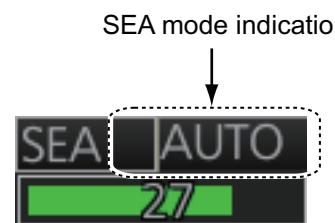
2.4.1 How to reduce sea clutter automatically

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 on the size of echoes.

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

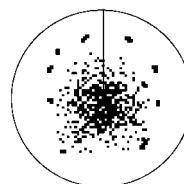
Control Unit: Push the **A/C SEA** control to display [AUTO] on the SEA mode indication on the Status bar.

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

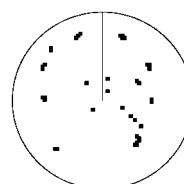


2.4.2 How to reduce sea clutter manually

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.

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.

2.5 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.

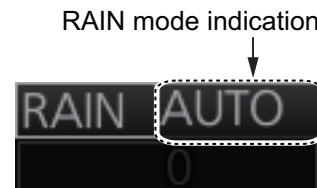
When both sea clutter and rain clutter are reduced the sensitivity is decreased more than when only one is adjusted. For that reason adjust them carefully.

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

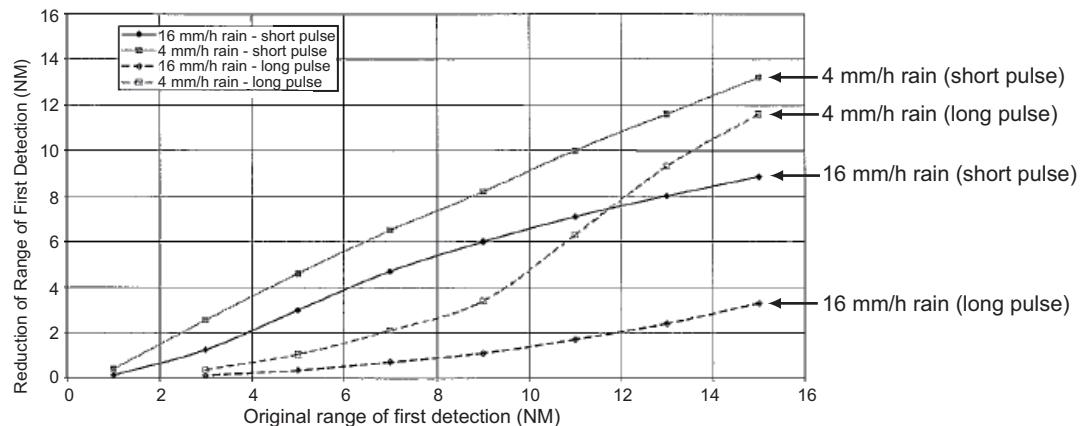
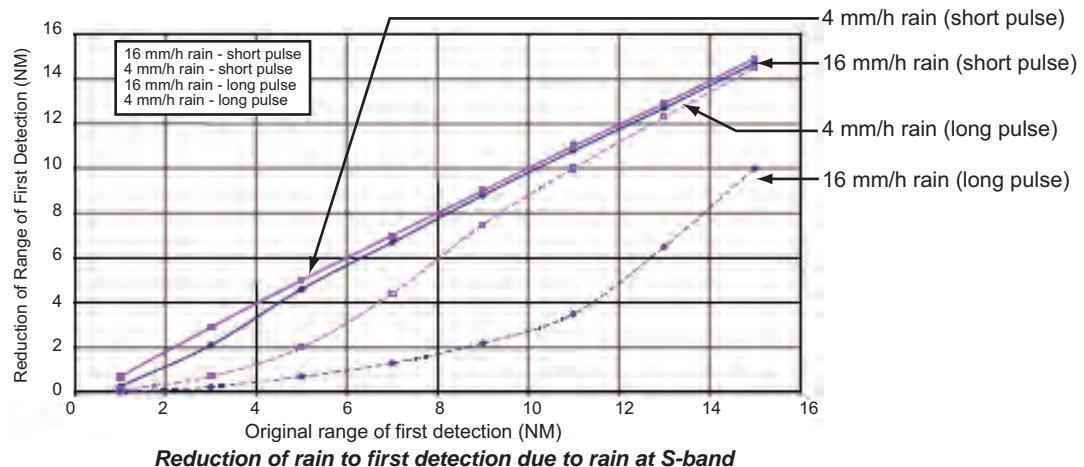
Control Unit: Push the **A/C RAIN** control to display [MAN] on the RAIN mode indication on the Status bar. While watching the radar picture, adjust the **A/C RAIN** control to reduce the clutter.

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:



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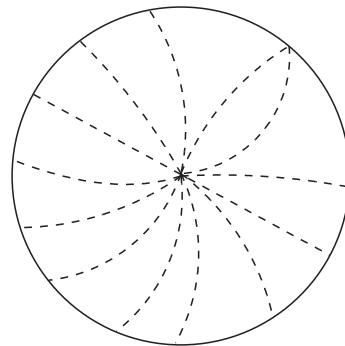
Accordingly the short pulse may be preferable in rain on ranges < 10NM.

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.

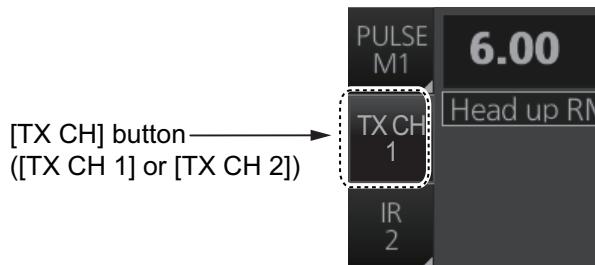
There are three levels of interference rejection depending on the number of transmissions that are correlated.



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 with the **A/C SEA** control. 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 2.31) or [SART] (see section 2.33) is ON, [EAV] is OFF and the indication is grayed out.

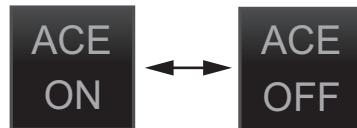
2.9 Automatic Clutter Elimination (ACE) Function

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.

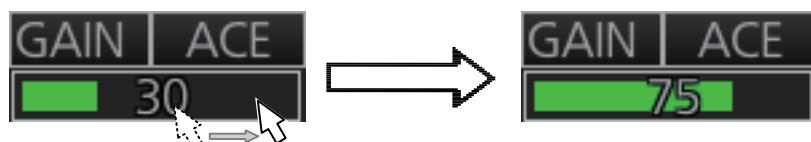


Note: When [PERFORMANCE MON] (see section 2.31) or [SART] (see section 2.33) is ON, [ACE] is OFF and the indication is grayed out.

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 paragraph 2.9.4).
- [3 SUPPRESS SECTOR]: Set the angular range for suppression of false echoes (see paragraph 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 (see paragraph 2.39.2). 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.

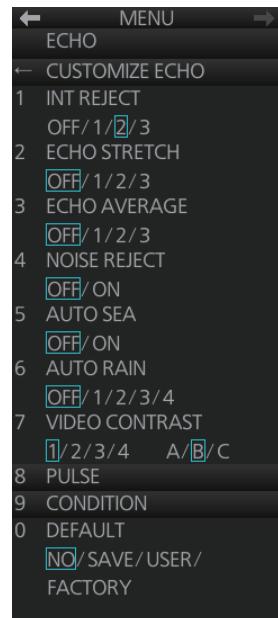
2.10 Noise Rejector

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.

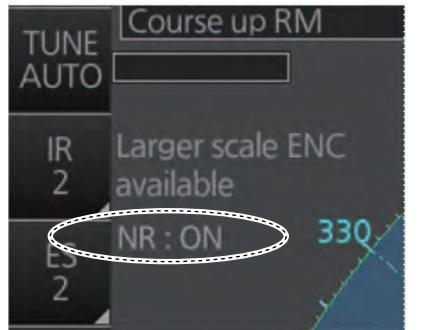
Note: Use this function with caution. Weak target echoes may disappear from the screen or the range resolution may worsen.

You can remove this noise as follows:

1. Open the menu then select [1 ECHO].
2. Select [1 CUSTOMIZE ECHO] menus 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.	ROUGH SEA	Optimum setting for operation in rough seas.
CANAL	Optimum setting for operating in a canal.	HARD RAIN	Optimum setting for rough weather or heavy rain.
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.

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.

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 CONTRAST
OCEAN	2	2	3	ON	OFF*	OFF*	3-B
CANAL	2	OFF	OFF	OFF	OFF*	OFF*	2-B
BERTH-ING	2	OFF	OFF	OFF	OFF*	OFF*	2-B
CONGES-TION	2	OFF	2	OFF	OFF*	OFF*	1-B
ROUGH SEA	2	OFF	2	OFF	OFF*	OFF*	2-A

2. RADAR, CHART RADAR OPERATION

	INT REJECT	ECHO STRETCH	ECHO AVERAGE	NOISE REJECT	AUTO SEA	AUTO RAIN	VIDEO CONT- RAST
HARD RAIN	2	OFF	OFF	OFF	OFF*	ON	2-A
CUSTOM1	2	OFF	OFF	OFF	OFF*	OFF*	1-B
CUSTOM2	2	2	1	OFF	OFF*	OFF*	2-B

*: Manual

PULSE LENGTH

	0.5 NM	0.75 NM	1.5 NM	3 NM	6 NM	12, 24 NM
OCEAN	S2	M1*	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
CUSTOM1	S1	S2	S2	M1	M1	L
CUSTOM2	S2	S2	M1	M2	M3	L

*: 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
CUSTOM1		0	80	MAN-30	MAN-0	OFF
CUSTOM2		0	80	MAN-30	MAN-0	OFF

2.12.1 How to select a customized echo

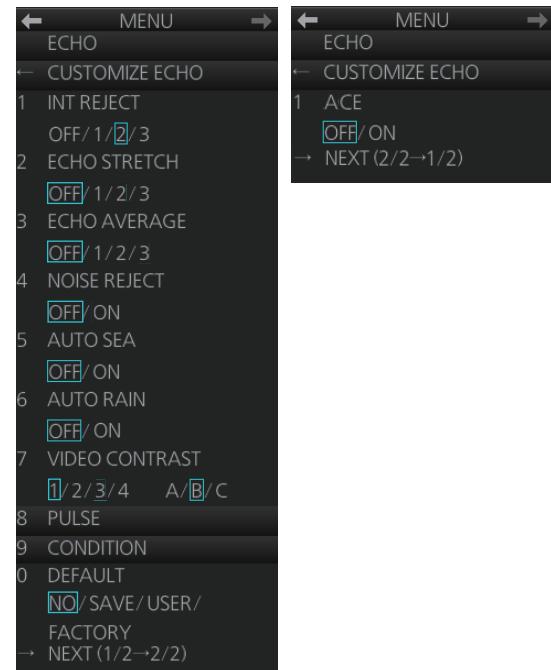
Click the [Customize Echo] button on the Status bar to select a customize echo option from the drop-down list.



2.12.2 How to edit a customized echo

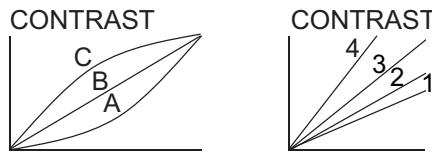
You can edit a customized echo as below.

1. Select a customize echo option to edit (see paragraph 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].



2. RADAR, CHART RADAR OPERATION

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 waterline) 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 paragraph 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].

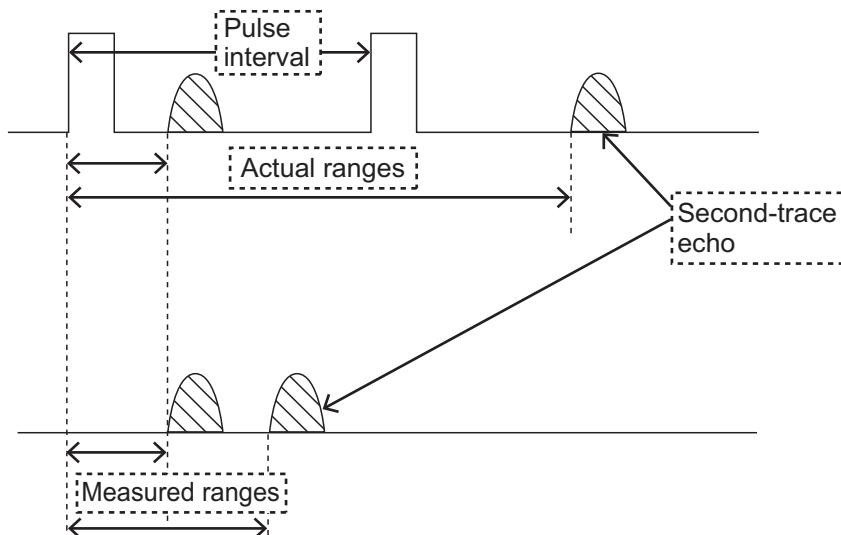
2.12.4 How to restore a user customized echo to the factory default settings

You can erase a customized echo options to restore its factory default options (see the tables on pages 2-12 and 2-13).

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 Presentation Modes

This radar has the following presentation modes in the radar mode:

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.

Stern-up: Unstabilized.

True Motion (TM)

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

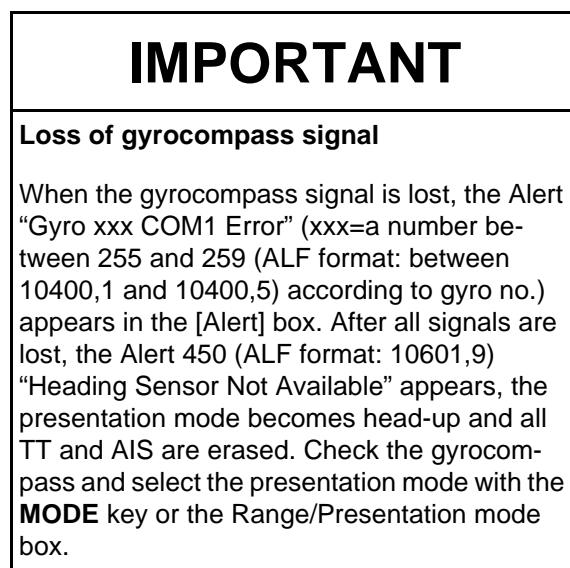
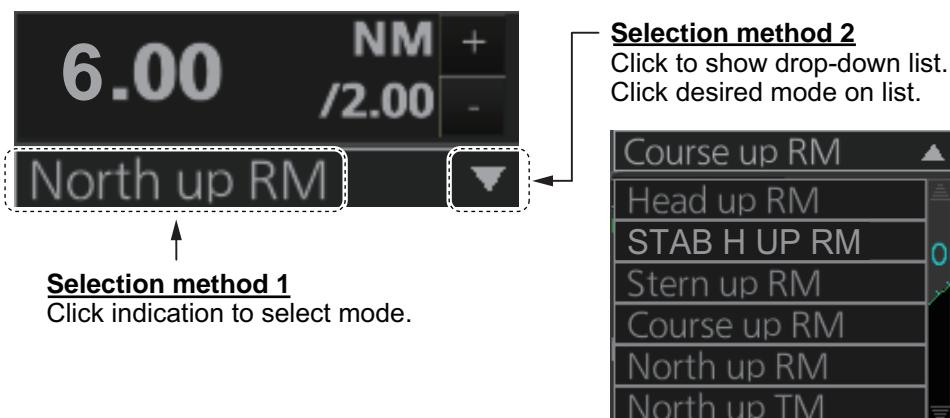
Mode availability

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

*: Not available with IMO or A type.

2.14.1 How to select a presentation mode**How to select a presentation mode from the Control Unit**

Push the **MODE** key consecutively to select radar presentation mode desired. The Range/Presentation mode box shows the current presentation mode.

How to select a presentation mode from the Range/Presentation mode box

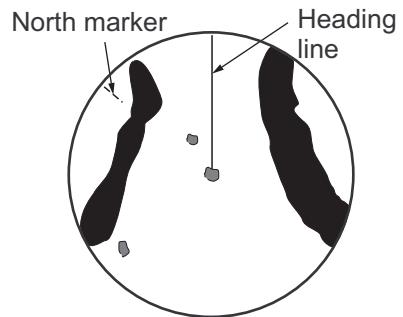
2.14.2 Description of presentation modes

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.

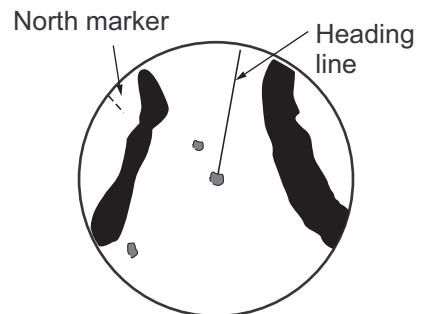
The short line on the bearing scale is the north marker, which indicates heading sensor north. A failure of all the heading sensor inputs will cause the heading readout to disappear, and the Alert 450 (ALF format: 10601,9) "Heading Sensor Not Available" or "Gyro xxx COM1 Error" (a number between 255-259 (ALF format: between 10400,1 and 10400,5) according to gyro no.) appears in the [Alert] box.



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.



STAB Head-up mode

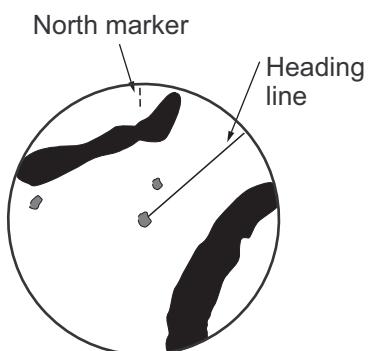
Radar echoes are shown in the same way as in the head-up mode. The difference from the normal head-up presentation lies in the orientation of the bearing scale. The bearing scale is heading sensor stabilized. That is, it rotates in accordance with the heading sensor signal, enabling you to know own ship's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

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 450 (ALF format:



2. RADAR, CHART RADAR OPERATION

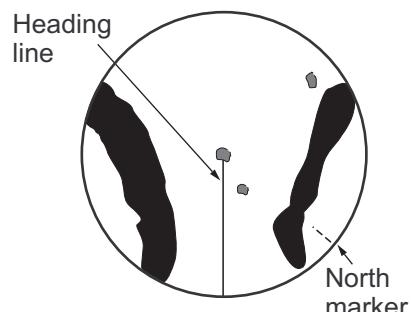
10601,9) "Heading Sensor Not Available" or "Gyro COM1 Error" (a number between 255-259 (ALF format: between 10400,1 and 10400,5) according to gyro no.) appears in the [Alert] box.

Stern-up mode

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

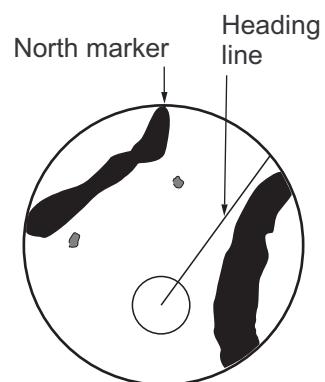
The target pips are painted at their measured distances and in their directions relative to own ship's stern.

The short line on the bearing scale is the north marker, which indicates stern sensor north.



True motion mode

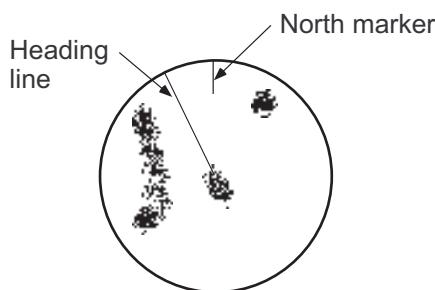
Own ship and other moving objects move in accordance with their true courses and speed. In ground stabilized TM, all fixed targets, such as landmasses, appear as stationary echoes. In the sea stabilized TM without set and drift inputs, the landmass can move on the screen. Note that true motion is not 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.



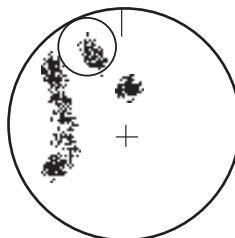
If the position of the CCRP results in a part of the bearing scale not being distinguishable, that part of the bearing scale is indicated with appropriate reduced detail.

A failure of the heading sensor input will cause the heading readout to disappear, and the Alert 450 (ALF format: 10601,9) "Heading Sensor Not Available" or "Gyro COM1 Error" (a number between 255-259 (ALF format: between 10400,1 and 10400,5) according to gyro no.) appears in the [Alert] box.

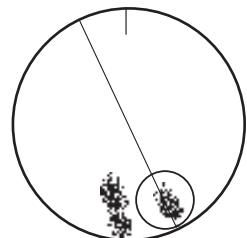
When own ship reaches a point corresponding to 50% of the radius of the display, own ship position is automatically reset to a point of 75% radius opposite to the extension of the heading line passing through the display center. You can also reset the own ship symbol manually by pushing the **CU/TM RESET** key, or click 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

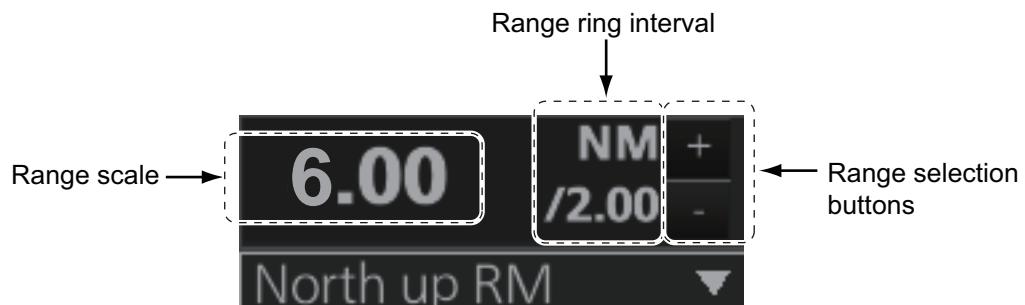
2.14.3 How to reset the course-up automatically

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 the 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: The IMO- and A-type radars do not have the 1 NM, 2 NM, 4 NM, 8 NM, 16 NM and 32 NM ranges.

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/Presentation 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

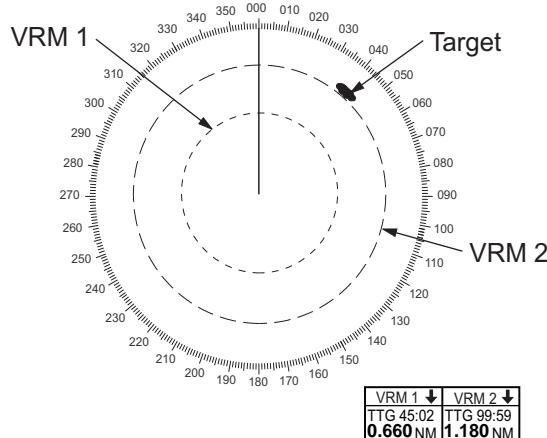
The range to a target may be measured three ways: with the fixed range rings, with the cursor, or with the VRM.

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/Presentation 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 [RANGE RING] on the [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

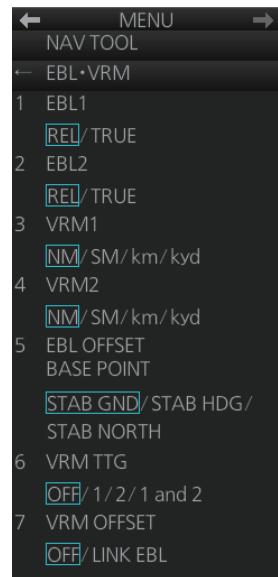
1. Click the title bar on a VRM box to activate the corresponding VRM.
2. Click the VRM box.
3. Use the trackball to align the active variable range marker with the inner edge of the target of interest and read its distance at the bottom-right position on the screen. Each VRM remains at the same geographical 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.

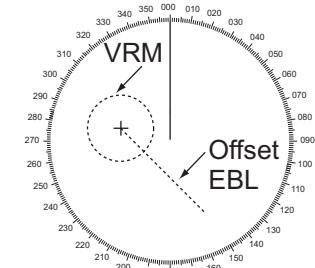
1. Open the menu then select [3 NAV TOOL] and [2 EBL•VRM] (B type) or [2 EBL•VRM•CURSOR] (IMO and A types) to display the [EBL•VRM] menu ([EBL•VRM•CURSOR] menu for the IMO and A types).
2. **For the B-type radar**, select [3 VRM1] or [4 VRM2] as appropriate. Spin the scrollwheel to select desired unit then push the left button.
3. Select [6 VRM TTG] and then select the VRM(s) that are to show/hide the TTG indication. [OFF] shows no TTG indication.
4. The [LINK EBL] option for [7 VRM OFFSET] automatically activates the corresponding VRM when the offset EBL is enabled.
5. Close the menu.



B-type radar



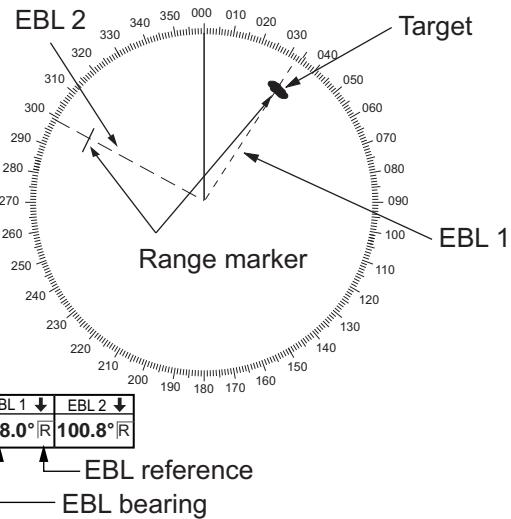
IMO- and A-type radars



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

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. 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 presentation 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 [EBL•VRM] menu ([EBL•VRM•CURSOR] menu with the IMO- and A-type radars).

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

How to assess risk of collision from the Control Unit

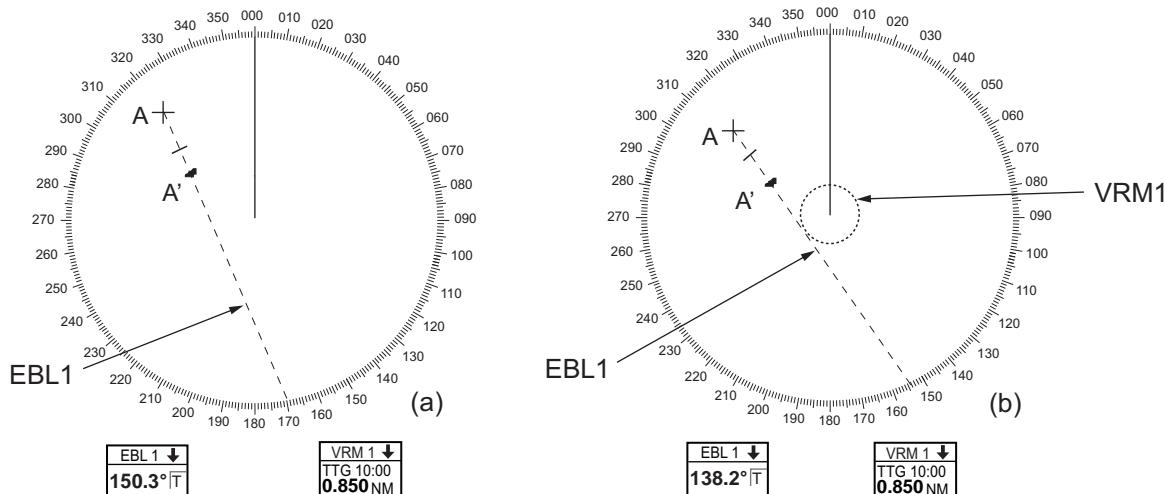
1. Press the **EBL 1** or **EBL 2** key to activate an EBL.
2. Put the cursor on a target that appears as a threatening target (A in the figure on the next page).
3. Press the **EBL OFFSET** key to shift the EBL origin to the cursor location.
4. Wait approx. three minutes. Operate the **EBL rotary** control 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.
5. If relative motion is selected, it is also possible to read CPA by using a VRM as shown in the left figure on the next page. If the EBL passes through the sweep origin (own ship) as illustrated in the right figure on the next page, the target ship is on a collision course.

To return the EBL origin to the center of the screen, press the **EBL OFFSET** key.

How to assess risk of collision from the context-sensitive menu

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.



2.18.2 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] (B type) or [2 EBL•VRM•CURSOR] (IMO and A types) menus to display the [2 EBL•VRM] (B type) or [2 EBL•VRM•CURSOR] (IMO and A types) menu.
2. Select [5 EBL OFFSET BASE POINT].
3. Select [STAB GND], [STAB HDG], or [STAB NORTH] as appropriate.

STAB GND: Reference to latitude and longitude. Origin position is always fixed regardless of your ship's movement.

STAB HDG: Reference to heading. The relationship of relative bearing between origin position and own position is kept always.

STAB NORTH: Reference 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

How to measure the range and bearing between two targets from the Control Unit

1. Press the **EBL 1** key to activate EBL1.
2. Operate the trackball to place the origin of the EBL 1 on a target of interest.
3. Press the **EBL OFFSET** key.
4. Operate the **EBL rotary** control to bisect the other target of interest.
5. Press the **VRM 1** key to activate VRM 1.
6. Operate the **VRM rotary** control until the range marker on the EBL is 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.

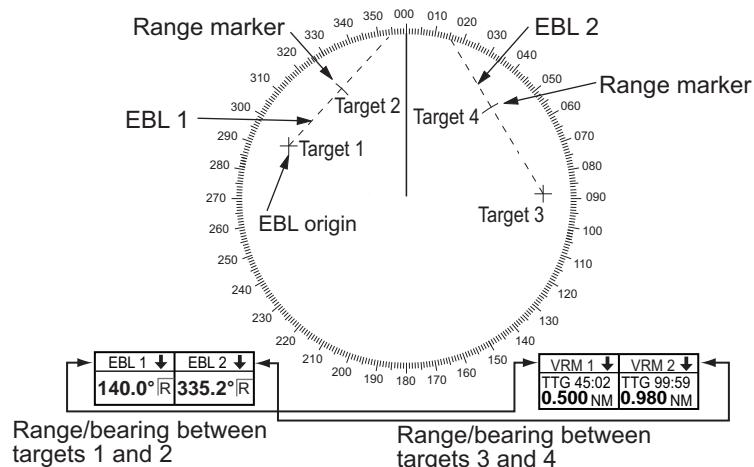
Bearing is shown relative to own ship with suffix "R" or as a true bearing with suffix "T". To return the EBL origin to the screen center, push the **EBL OFFSET** key.

How to measure the range and bearing between two targets from the track-ball module

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.

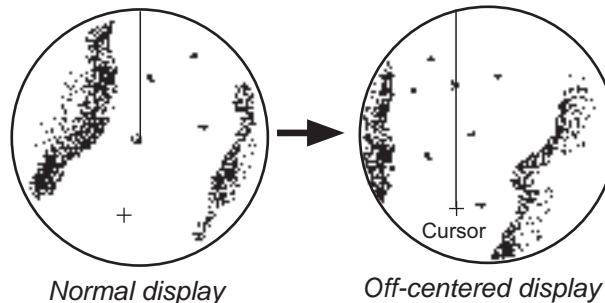
You can repeat the same procedure on third and fourth targets (targets 3 and 4) by using the EBL 2 and the VRM 2.

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, click the EBL box.



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 presentation 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 Control Unit

1. Put the cursor on the position within the display area where you want to move the sweep origin.
2. Press the **OFF CENTER** key to move the sweep origin to the cursor position.

To cancel off-centering, press the **OFF CENTER** key again.

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.

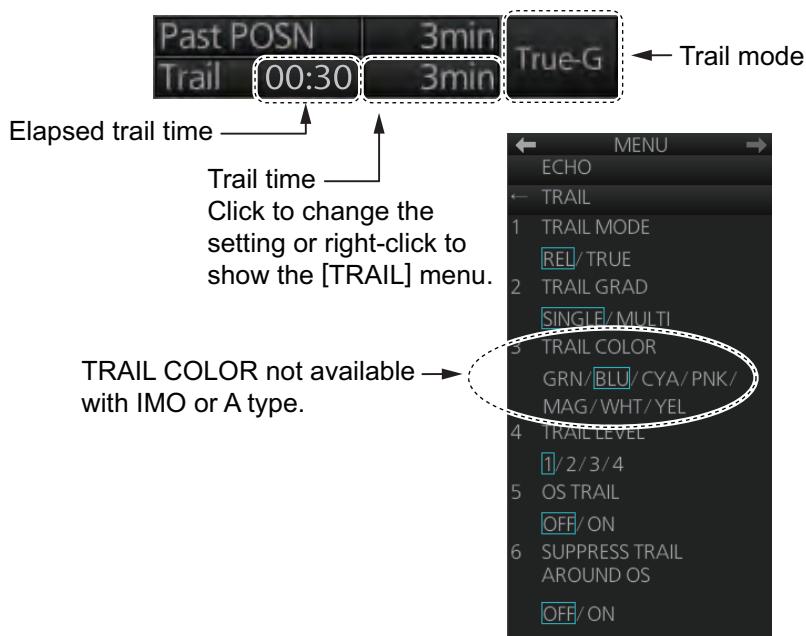
To cancel the off-center in the above-mentioned conditions, first select a larger range, then cancel the off-center.

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

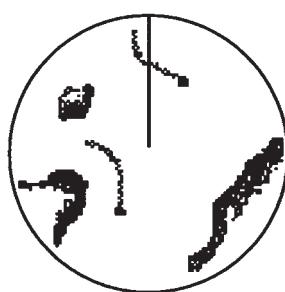
Trail-related indications are located at the bottom-right position on the screen. Several trail-related operations can be done from the [TRAIL] menu, which you can show by right-clicking the Trail time indication. You can also left-click the trail time indication to change the trail time.



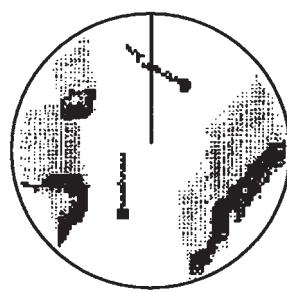
2.21.2 True or relative target trails

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

Four controls are available to select a trail time.

- **Control Unit:** Push the **TRAIL** key.
- **Trackball module:** 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, TRAIL key	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.

Control Unit: Press and hold down the **TRAIL** key until trails disappear.

Context-sensitive menu: 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.

Control Unit: Press the **TRAIL** key to show [OFF] in the trail time indication.

Trackball module: 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 1.16) and set [Stabilization Mode] to Bottom (GPS) or Water (speed log).

2.21.7 Target trail attributes on the TRAIL menu

	<p>[1 TRAIL MODE]: Switch the trail mode to [REL] or [TRUE].</p> <p>[2 TRAIL GRAD]: The afterglow of the target trails can be shown in a single tone or gradual shading.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   <div style="display: flex; justify-content: space-around; align-items: center;"> Monotone (SINGLE) Gradual shading (MULTI) </div> </div> <p>[3 TRAIL COLOR]: The trail color can be selected from the colors shown in the left figure. This feature is not available with the IMO or A type.</p> <p>[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.</p> <p>[5 OS TRAIL]: Show or hide trail for own ship.</p> <p>[6 SUPPRESS TRAIL AROUND OS]: You can prevent the display of sea clutter in true trails about your ship, to clear the radar picture.</p>
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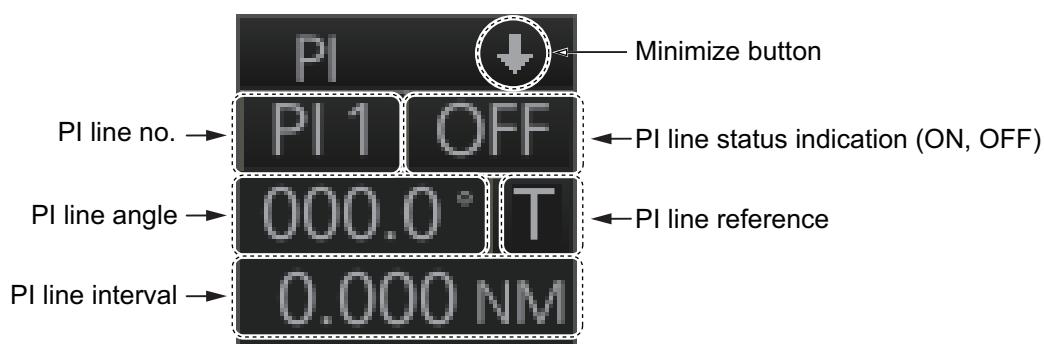
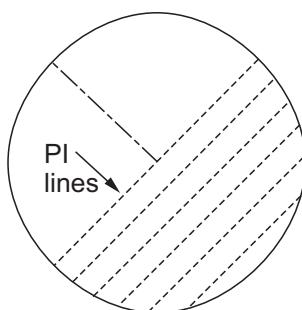
Note: [6 SUPPRESS TRAIL AROUND OS] is automatically turned on when [5 OS TRAIL] is activated. The possible ON/OFF combinations between [5 OS TRAIL] and [6 SUPPRESS TRAIL AROUND OS] are as shown in the table below.

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 six 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, erase a PI line

How to display, erase a PI line from the Control Unit

Displaying a PI line: Press the **INDEX LINE** key until desired PI line no. appears.

Erasing a PI line: Press the **INDEX LINE** key until desired PI line no. appears. Press and hold down the **INDEX LINE** key to erase the PI line.

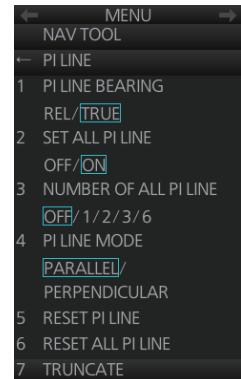
How to display, erase a PI line from the trackball module

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

2.22.2 How to enable/disable PI lines

The PI line function can be enabled or disabled at any time. Disable this function to hide all PI lines and also disable the PI line box. To use the PI line box, enable this function.

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], then select [OFF] to disable the PI line function, or select [ON] to enable the PI line function.
4. Close the menu.



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].
Note: This setting cannot be changed if [2 SET ALL PI LINE] is set to [OFF] in the [PI LINE] menu.
4. Close the menu.

For individual PI line

1. Select the PI line no. to set the number of PI lines referring to paragraph 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 bearing reference for the PI line

PI line bearing reference can be relative to your ship's heading (Relative) or referenced to North (True).

Note: This function is not available with IMO type. The setting is fixed to [True].

1. Open the menu.
2. Select [3 NAV TOOL] and [1 PI LINE] to show the [PI LINE] menu.
3. Select [1 PI LINE BEARING].
4. Select [REL] or [TRUE].
5. Close the menu.

2.22.6 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.

2.22.7 How to reset PI lines

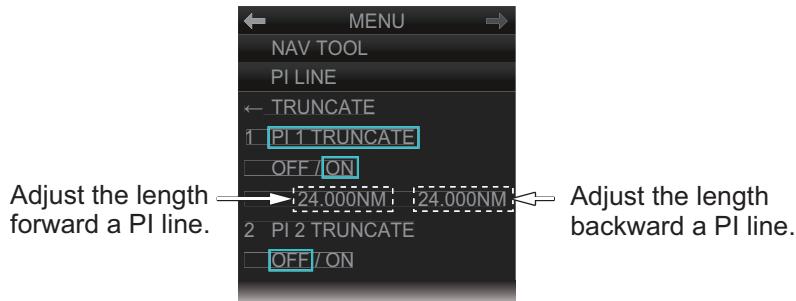
You can automatically return all or selected PI lines to default orientation, 0-degrees for parallel orientation, 90-degrees for perpendicular orientation. This is faster than doing it manually.

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.

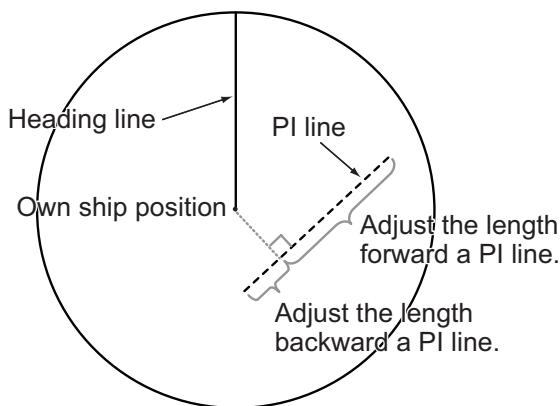
2.22.8 How to adjust PI line length

You can adjust the length of each PI line. This function is available when [2 SET ALL PI LINE] is set to [1].

1. If not already displayed, display a PI line to adjust the length referring to paragraph 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 (or 2, 3, 4, 5, 6) TRUNCATE].



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



7. Close the menu.

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. 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 with the following procedure.

1. Open the menu then select [4 INFORMATION BOX] and [3 ZOOM DISPLAY].
2. Select the appropriate 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 presentation 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, push the **HL OFF** key on the Control Unit, or click the [HL OFF] button on the InstantAccess bar™. Release the respective control to redisplay the heading line, etc.

2.24.2 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:

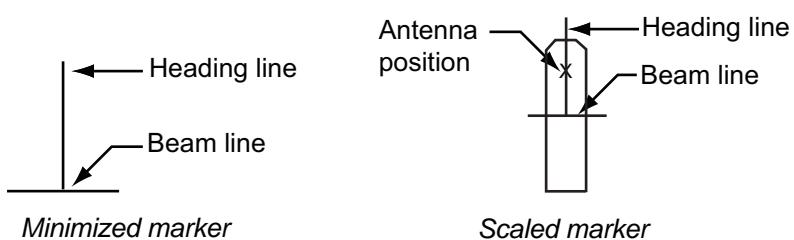
1. Open the menu then select [5 MAP•MARK] and [1 MARK SETTING].
2. Select [6 STERN MARK].
3. Select [ON] or [OFF] as appropriate.

2.24.3 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.

2.24.4 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 [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.

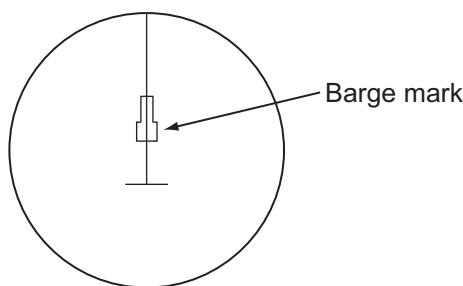
2.24.5 Vectors

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

<p>[RED] and [YEL] are added with A and B types.</p>	<p>[TARGET VECTOR] menu [1 REF TARGET VECTOR]: Turn the vector for the reference target on or off.</p>
<p><u>[OWN SHIP VECTOR] menu</u></p> <p>[1 VECTOR STAB IND]: Turn ON to show double arrow for ground tracking; single arrow for water tracking.</p> <p>[2 TIME INCREMENTS]: A short horizontal line can be marked on the own ship vector in one-minute intervals to show approximate later positions.</p> <p>[3 OWN SHIP VECTOR]: Turn vector OFF, or show ship's heading or course with a vector.</p> <p>[4 VECTOR COLOR]: Set the vector color for own ship.</p>	

2.24.6 Barge marker

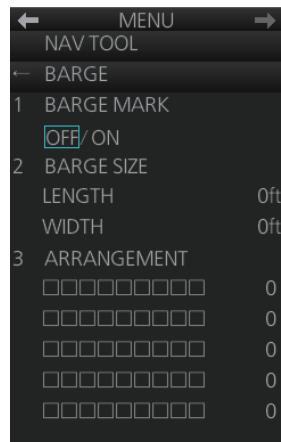
The length and breadth of the total barge size can be displayed as a simple rectangle on the radar display. Up to five rows of barges and nine barges per row can be shown.



This feature is available with an installation preset. Set up barge information with the procedure on the following page:

2. RADAR, CHART RADAR OPERATION

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.

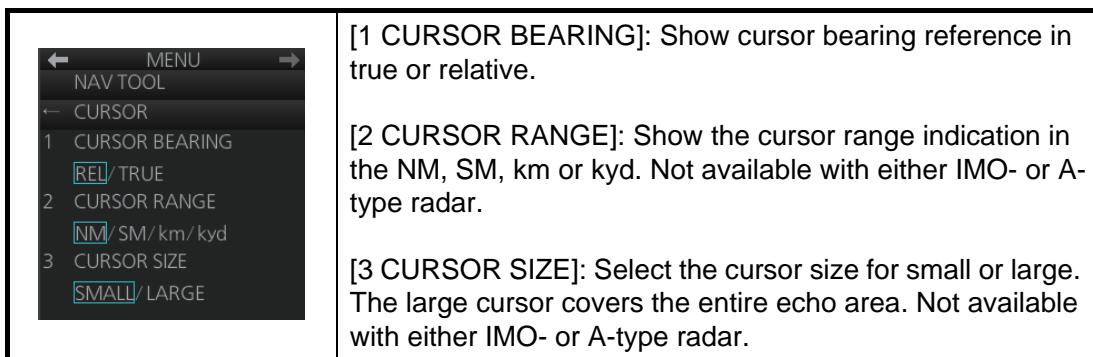
2.24.7 Antenna marker

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 Cursor

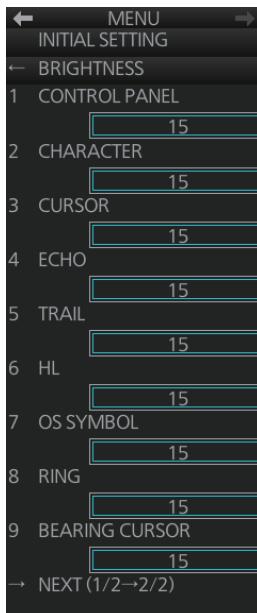
The cursor measures the range and bearing to an object, selects menu items, selects location for mark entry, etc. For the B-type radar, you can select cursor attributes (bearing reference, range unit and size for the cursor) on the [CURSOR] menu in the [NAV TOOL] menu. For the IMO- and A-type radars you can select only the cursor bearing reference, with [1 EBL•CURSOR BEARING] in the [EBL•VRM•CURSOR] menu of the [NAV TOOL] menu.



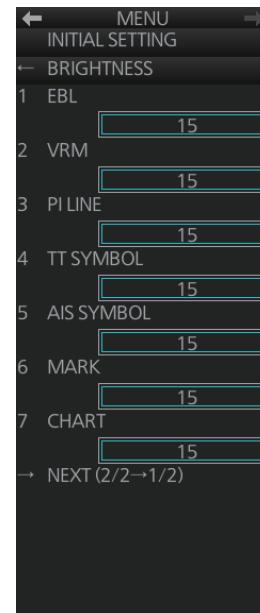
2.25 How to Adjust Brilliance of Screen Data

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	Adjust brightness of	Item	Adjust 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		

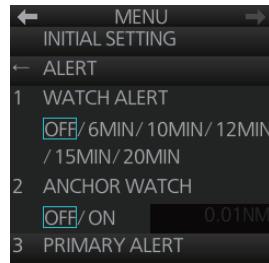
3. Spin the scrollwheel to set brilliance level.

4. Close the menu.

2.26 Watch Alert

The watch alert provides a flashing visual alert at regular intervals to remind you to monitor the radar picture for safety or other purposes.

To enable the watch alert, open the [8 INITIAL SETTING] menu followed by the [4 ALERT] menu. Select [1 WATCH ALERT] and set desired watch interval. The [Watch] box appears at the bottom-left position. (The watch interval can also be selected from the [Watch] box when the watch alert feature is active. Right-click the time indication in the [Watch] box to show a drop-down list of watch intervals. Select a watch interval from the list.)



The timer counts down from the interval set and when the time interval elapses;

- the buzzer sounds
- the visual Alert 500 (ALF format: 10499) "Watch Alert" flashes in orange in the [Alert] box
- the watch alert timer freezes at "0:00".

Stop the flashing visual alert with the **ALARM ACK** key on the Control Unit or click the [Alert] box.

After the alert is acknowledged the count-down sequence is repeated.

Note: The countdown can be restarted, before the count reaches 0:00, by clicking the countdown indication in the watch box.

2.27 Information Box

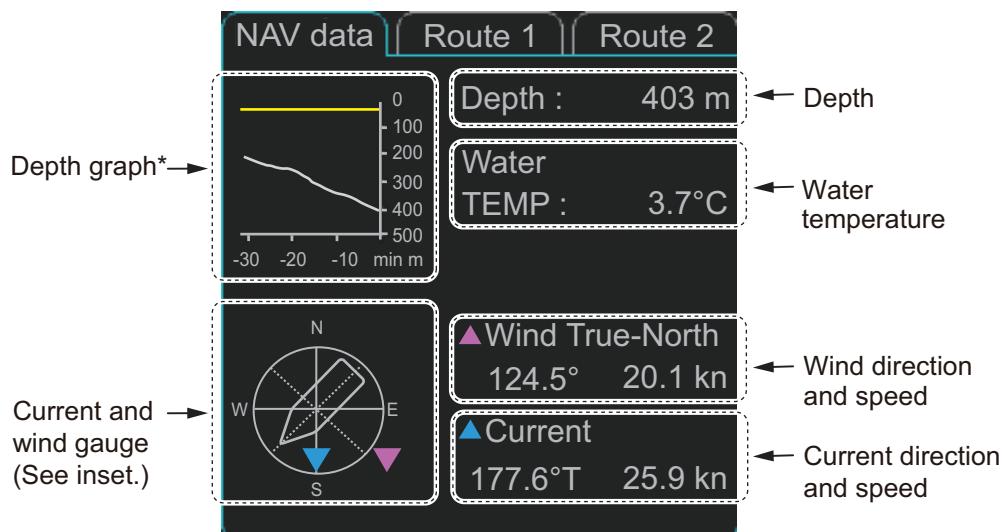
The information box shows navigation data and, when following a route set on the chart display, route information is also shown.

2.27.1 Information box contents

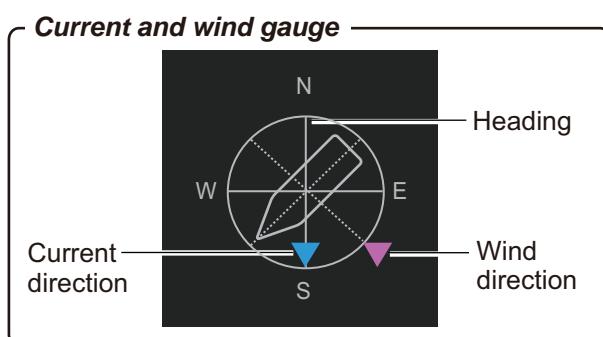
Navigation data

- 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.



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



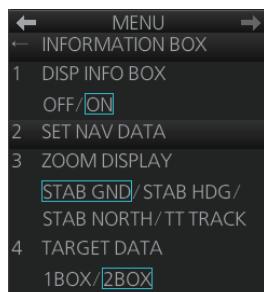
Route information

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. Click the [Route 1] or [Route 2] tab to find route information.

NAV data	Route 1	Route 2
Route : ROUTE10		
Plan Speed :	10.2kn	
Plan Course :	123.2°T	
Course to Steer :	123.2°T	
XTD Limit :	250.2 m	
XTD :	45.4 m	
NAV data	Route 1	Route 2
To WPT :		2
DIST to WOP :		1.70 NM
Time to Go:		0h10m27s
Turn RAD:		0.80 NM
ROT:		0.0°/min
Next WPT :		3
Next Course :		123.7°T

2.27.2 How to show the information box

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

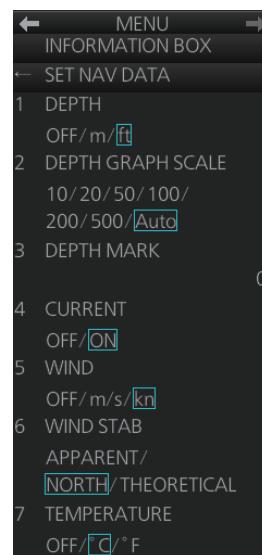


2. Select [1 DISP INFO BOX] then [ON].
3. Close the menu.

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].
3. Set up the nav data referring to the table below.



Item	Description
[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.

Note: Appropriate sensors are required to display any data. The wind vector shows a direction from which the wind blows in, 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.

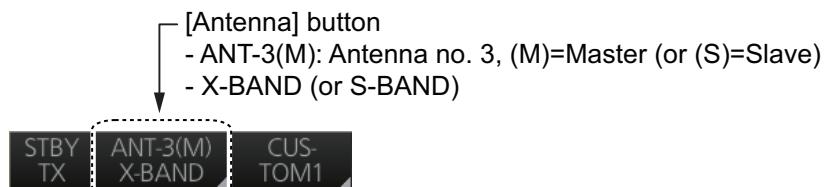
4. Close the menu.

2.28 Interswitch

The interswitch uses a network to transfer multiple radar signals to the monitor units connected in the network. A master/slave 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.

← MENU →
 INITIAL SETTING
 ← ANT SELECT

ANT 1 : X-BAND	25UP	Main Top
ANT 2 : S-BAND	30UP	Main 2nd
ANT 3 : X-BAND	12	Fore
ANT 4 : X-BAND	12	Aft

OWN RADAR No. : 2

1 DISP1
 2 DISP2
 3 DISP3
 4 DISP4
 5 STORE INTER-SW
 NO/YES

Using the information displayed in this example the antenna system configuration would look something like this.

ANT1 ANT2 ANT3 ANT4

DISP1 DISP2 DISP3 DISP4

HUB-3000

Antenna Unit
 Power Supply Unit
 Processor Unit

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.

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 [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 Master display unit for one antenna unit. If two antenna units are set as masters, the display last-set as master becomes the master and all other displays are automatically changed to slave.
- An antenna unit without a Master display cannot be selected on the sub display units. If there is no antenna unit set as master, the lowest number display is automatically set as master.
- If the Alert 750 (ALF format: 10740,3) “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 Master or Slave (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 2.37) is active.

Compatibility of display and operation

- When connecting with FCR-2xx9 series radar

The FCR-2xx9 is compatible with the FAR-3xx0 in display and operation. For example, when switching the antenna from FAR-3xx0 to FCR-2xx9, the image for FCR-2xx9 is displayed on the screen and each function is operative, and vice versa.

2. RADAR, CHART RADAR OPERATION

- When connecting with FAR-2xx7 series radar

When switching the antenna from FAR-3xx0 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-3xx0, 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	Master Display Option	Slave Display Option
AIS function	Independent	Desired value can be set	Desired value can be set
Brilliance			
Echo trails			
EBL			
Lat/long data			
Presentation 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	Dependent control	Item commonly controlled	Item commonly controlled
Echo averaging			
IR			
Automatic Clutter Elimination (ACE)			
Picture setting (Customize echo)			
Performance monitor	Common control	Item commonly controlled	Item commonly controlled
SART			
STBY TX			
Tuning			
TT Lost alert			
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.