1.10 How to Customize Operation

Several operation items can be customized to suit your needs.

1. Open the [MAIN MENU].
2. Select [INITIAL SETTING], then press the **ADJUST** knob.
3. Select [OPERATION], then press the **ADJUST** knob.
4. Referring to the table below, select the appropriate menu item to customize.

Menu items	Description	Available settings
WHEEL DRIVE	Set the direction of the wheel drive.	[NORMAL], [REVERSE]
KEY BEEP	Adjust the key operation sound.	[OFF], [LOW], [MID], [HIGH]
OWN SHIP VECTOR	Adjust how the own ship vector is displayed.	[OFF], [HDG], [COURSE]
STERN UP RM	HEAD UP RM display is reversed.	[ON], [OFF]
GUIDANCE*	Turn operational guidance on/off.	[ON], [OFF]
SHUTTLE FERRY	Set the shuttle ferry mode to use.	[OFF], [MODE1], [MODE2]
SENSITIVITY	Adjust sensitivity for optional mouse/ trackball.	[1], [2], [3], [4], [5]

*: Non-IMO radars only.

5. Rotate the **ADJUST** knob to select the appropriate setting, then press the knob.
6. Close the menu.

1.11 How to Select the Interface for Heading Input

When a gyrocompass is connected, the ship's heading is displayed on the right side of the screen, in the data display area.

Heading input can be selected as follows:

1. Place the cursor on the [HDG] box at the top-right of the screen, then press the **right button**. The [HDG] context menu is displayed.
2. Select [HDG SOURCE], then press the **ADJUST** knob.
3. Select [AD-10] or [SERIAL] as appropriate, then press the **ADJUST** knob. This refers to the type of connection, [AD-10] is for AD-10 format (FURUNO original) connection, [SERIAL] is for serial connections.
4. Close the menu.

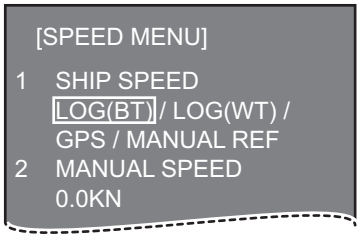
Note: The heading sensor must be able follow a minimum ROT of 20° per second. Heading sensors with a lesser capability may degrade the performance of echo averaging, trails and TT. The data refresh rate should also be as short as possible. If the refresh rate is too long, the ability to follow courses lessens, thereby affecting the performance of echo averaging, trails and TT.

1.12 How to Set Own Ship's Speed

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

1.12.1 Automatic speed input (log or GPS navigator)

1. Select the [SPD] box at the top right corner of the screen, then press the **right button**. The [SPEED] box menu is displayed.
2. Select [SHIP SPEED], then press the **ADJUST** knob.
3. Select the appropriate source for automatic speed input, then press the **ADJUST** knob.



Selection	Explanation	Stabilization Mode
[LOG (BT)]*	Log, speed over ground (SOG).	Ground stabilization
[LOG (WT)]	Log, Speed Thru Water (STW)	Sea stabilization
[GPS]	Speed input by GPS navigator	Ground stabilization
[MANUAL]	Manually input speed	Sea stabilization
[REF]	Echo-referenced speed input	Ground stabilization

*: Set and drift may be required to display [LOG (BT)] correctly in deep waters. To adjust set and drift do the following:

1) From the [SPEED MENU], select [SET DRIFT], then press the **ADJUST** knob.
2) Select [ON], then press the **ADJUST** knob.
3) Select the set angle, then press the **ADJUST** knob.
4) Select the drift speed, then press the **ADJUST** knob.

4. Close the menu.

Notes on speed input

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 lee-way.

- IMO Resolution A.823(19) for TT recommends that a speed log to be interfaced with a TT should be capable of providing through-the-water speed (forward speed).
- Be sure not to select a [LOG] option when a speed log is not connected. If the log signal is not provided, the ship speed readout at the top of the screen will be blank. In the event of a log error, enter speed manually.
- The [SPD] is shown as "*.* kn" and the label "LOG(BT)" or "LOG(WT)" (in yellow-orange) appears and the alert buzzer sounds if no log signal is present for 30 s.
- With the serial speed inputs and [SOG] selection, if the type of data is changed from [SOG] to [STW] the label "LOG(BT)" (in yellow-orange) appears and the alert buzzer sounds.
- On the IMO type with AIS in use, [MANUAL] and [REF] are shown in gray to indicate they are not available for selection.
- A single-axis water log cannot measure speed when the wind is coming from the lee-way direction.

1.12.2 Manual speed input

If the speed log is not working, enter speed manually as below. In this case the speed data type is shown as "MANUAL" and is speed thru water (STW). Manual speed input is not available on the IMO radar when the AIS feature is active.

1. Select the [SPD] box at the top right corner of the screen, then press the **right button** to display the [SPEED] menu.
2. Select [SHIP SPEED], then press the **ADJUST** knob.
3. Select [MANUAL], then press the **ADJUST** knob.
4. Select [MANUAL SPEED], then press the **ADJUST** knob.
5. Rotate the **ADJUST** knob to set speed.
6. Press the **ADJUST** knob to confirm the new setting.
7. Close the menu.

1.13 How to Set the Own Ship Position

You can select the data source for own ship's position as follows:

1. Place the cursor on the [OS POSN] box in the data display area, then press the **right button**. The [OWN SHIP POSN] menu is displayed.
2. Select [NAV AID] or [MANUAL L/L] as appropriate, then press the **ADJUST** knob.
3. Select the appropriate setting, referring to the list below, then press the **ADJUST** knob.
   - [NAV AID]: Using navigational aids. Select the navigational aid in use. Available options are: [GPS1], [GPS2], [LAN], [INS] or [DEAD RECKONING].
   - [MANUAL L/L]: Manual input of own ship coordinates.

   Note: Where [NAV AID] is set to [LAN], [INS] or [DEAD RECKONING], the indication "DR" is displayed at the bottom of the [OS POSN] box.
4. To set [MANUAL L/L], do the following:
   1) Rotate the **ADJUST** knob to set the value.
   2) Press the **ADJUST** knob to move the cursor to the next digit.
   3) Repeat steps 1 and 2 to set the latitude and longitude.
5. To share [OS POSN] data across the same network, do the following:
   1) Select [SIO DATA LAN OUTPUT], then press the **ADJUST** knob.
   2) Select [ON], then press the **ADJUST** knob to share data. To disable [OS POSN] data sharing, select [OFF], then press the **ADJUST** knob.

   Note: A navigational aid must be selected at [NAV AID] to share [OS POSN] across the same network.
6. Close the menu.

1.14 User Settings

The user functions shown in the table below can be reset to their default settings by enabling the [PILOT SETTING] option in the [USER SET] menu. Functions not shown in the table below maintain their previous setting.

The unit an store two separate user settings, for the functions listed below, in the internal memory. These settings can also be recalled. Functions not shown the table below cannot be stored or recalled.

Function		Setting(s)	Menu/On-screen box
GAIN		Maintained as per previous setting.	[GAIN] box
SEA		[AUTO]	[SEA] box
RAIN		[AUTO]	[RAIN] box
TUNE		[AUTO]	[TUNE] box
Range		[6 NM]	[RANGE] box
Range rings		[OFF]	[MAIN MENU] → [NAVTOOL] → [RANGE RING]
VRM1	Display	[ON]	[VRM1] box
	Distance	[0.250 NM]	
VRM2	Display	[OFF]	[VRM2] box
	Distance	[0.000 NM]	
EBL1	Display	[ON]	[EBL1] box
	Bearing	Maintained as per previous setting.	
	Reference	[TRUE]	[MAIN MENU] → [NAVTOOL] → [EBL•VRM•CURSOR] → [EBL•CURSOR BEARING]
EBL2	Display	[OFF]	[EBL2] box
	Bearing	[000.0°]	
	Reference	[TRUE]	[MAIN MENU] → [NAVTOOL] → [EBL•VRM•CURSOR] → [EBL•CURSOR BEARING]
PI Lines	Display	[OFF]	[PI Line] box
	Interval		
	Orientation		
	Bearing (True or Relative)		[MAIN MENU] → [NAVTOOL] → [PI LINE] → [PI LINE BEARING] *1
	Number of PI lines		[MAIN MENU] → [NAVTOOL] → [PI LINE] → [SET ALL PI LINE]
	Mode (Parallel or Perpendicular)		[MAIN MENU] → [NAVTOOL] → [PI LINE] → [PI LINE MODE]
Presentation Mode		[NORTH UP TM]	[PRESENTATION MODE] box
Stabilization mode (Sea/ Ground)		[GPS] (Ground)	[SPEED] → [SHIP SPEED]
Off-centering		On-centering	**OFF CENTER** key.*2
Target trails	Display, time	[ON], [6 MIN]	[TRAIL MODE] box
	Mode	[TRUE]	[PAST POSN] box

Continued on following page

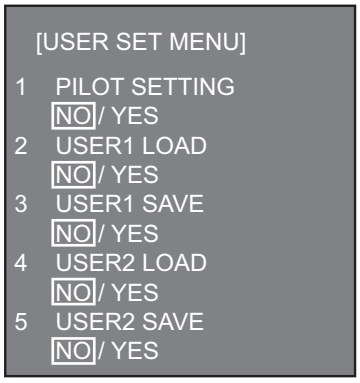
Function		Setting(s)	Menu/On-screen box
Continued from previous page			
Vector mode		[REL]	[VECTOR] box
Vector time		[6 MIN]	
AZ1		[OFF]	[AZ1] box
AZ2		[OFF]	[AZ2] box
TT acquisition mode		[MAN50]	[TT TARGET] → [TT SELECT]
AIS display		[DISP ALL]	[AIS] box
Association		[ON] (TT > AIS)	[MAIN MENU] → [TT•AIS] → [ASSOCIATION] → [ASSOCIATION TGT]
Lost Target Alert		[OFF] (Disabled)	LOST TARGET ALERT box
CPA/ TCPA alarm	ON/OFF	[ON]	[CPA LIMIT] box
	CPA	[2 NM]	
	TCPA	[12 MIN]	

*1: This menu is not available for IMO type and the setting is fixed to [TRUE].

*2: Has the same effect as selecting True Motion presentation mode.

1.14.1 How to reset the user settings

1. Select the [USER SET] box, then press the **right button** to display the [USER SET MENU].
2. Select [PILOT SETTING], then press the **ADJUST** knob.
3. Select [YES], then press the **ADJUST** knob.
4. Close the menu.



Note 1: Items not shown in the above table keep their previous settings when [PILOT SETTING] is activated.

Note 2: TT tracking is continued after [PILOT SETTING] is activated.

Note 3: The radar map displays the same map as before [PILOT SETTING] is activated.

1.14.2 How to store/load user settings

1. Select the [USER SET] box, then press the **right button** to display the [USER SET MENU].
2. Select [USER1(2) LOAD] or [USER1(2) SAVE] to recall or save user settings, respectively, then press the **ADJUST** knob.
3. Select [YES], then press the **ADJUST** knob.
4. Close the menu.

When loading settings, the following points apply:

- If the newly loaded settings cannot be applied to items not listed in the table above, then these items keep their previous settings.
- TT tracking is continued after the settings are loaded.
- The radar map displays the same map as before the settings were loaded.

1.15 How to Start/Stop Transmission

The radar is ready to transmit when the message "STBY" is displayed on screen. Transmission can be started using one of the following procedures:

- Using the control unit: Press the STBY TX key.
- Using the on-screen box: Select the [STBY/TX] box on the screen, then press the **left button**.

How to stop antenna rotation

Antenna rotation can be stopped using one of the following procedures:

- Turn the antenna switch off.
- Turn antenna rotation off from the menu (See installation manual).

Screen freeze

The on-screen display is not refreshed if the screen has frozen. An audio alarm is released 30 seconds after a screen freeze. The ALERT ACK key flashes and a Contact Alert Signal is also released. To return the radar to normal operation, turn the radar off, then on again.

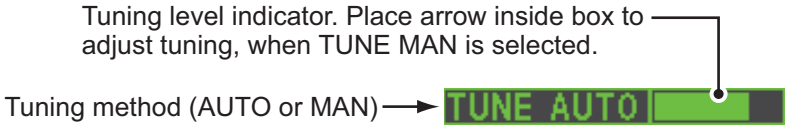
Quick start

Provided that the radar was in use and the magnetron (transmitter tube) is still warm, you can switch to transmit mode without the three minute warm-up time. If the radar was turned off by mistake or you wish to restart the radar promptly, press the **POWER** switch within ten seconds after the power is turned off.

1.16 How to Tune the Receiver

1.16.1 How to choose the tuning method

1. Select the [TUNE] box at the top of the screen to change the tuning method. The tuning box is displayed as "TUNE AUTO" or "TUNE MAN", depending on the currently selected tuning method.
2. Press the **left button** to change the tuning method.
3. Rotate the **ADJUST** knob to adjust the tuning level, then press the knob to apply the setting.



1.16.2 How to initialize tuning

Automatic tuning is initialized at installation. However, if you feel that the automatic tuning is not functioning properly, re-initialize it by following the procedure below.

1. Open the [MAIN MENU].
2. Select [ECHO], then press the **ADJUST** knob.
3. Select [TUNE INITIALIZE], then press the **ADJUST** knob.
   The indication "TUNE INITIALIZE" appears in the [ALERT] box during the initialization.
4. Close the menu.

1.16.3 How to tune the receiver manually

1. Select the 48-mile range from the [RANGE] box. Press the **left button** to lower the range; the **right button** to raise the range.
2. Select manual tuning following the procedure in paragraph 1.16.1.
3. Place the arrow on the tuning bar area in the [TUNE] box.
4. Rotate the **ADJUST** knob to adjust tuning. The best tuning point is where the bar graph swings maximum. The tuning control position is indicated with a triangle, displayed inside the tuning bar.

1.17 How to Select a Pulselength

The pulselength in use is displayed at the upper-left position of the screen using the indications shown in the table below.

FAR-1518/FAR-1528 (PULSE) indication	FAR-1513/FAR-1523 (PULSE) indication
S1 (short pulse 1)	S (short pulse)
S2 (short pulse 2)	M (medium pulse)
M1 (medium pulse 1)	L (long pulse)
M2 (medium pulse 2)	
M3 (medium pulse 3)	
L (long pulse)	

Appropriate pulselengths are preset to individual range scales and function keys. If you are not satisfied with the current pulselength settings, you can change them as shown in "How to adjust the pulselength" on page 1-19.

1.17.1 How to adjust the pulselength

The pulselength can be adjusted using the procedure below.

1. Place the cursor in the [PULSE] box at the top left corner of the screen.
2. Press the **left button**, **right button** or rotate the **ADJUST** knob to cycle through pulselengths. The order in which the pulselengths are cycled is shown in the table below.

Method	Cycle order
Left button	Decreases the pulselength.
Right button	Increases the pulselength.
ADJUST knob (clockwise)	Increases the pulselength.
ADJUST knob (counter-clockwise)	Decreases the pulselength.

Note: Available pulselengths are restricted depending on the currently selected range. See the table below for details.

FAR-1518/FAR-1528		FAR-1513/FAR-1523	
Range	**(PULSE) indication**	**Range**	**(PULSE) indication**
0.5 NM	S1, S2	1.5 NM	S, M
0.75 NM, 1.5 NM	S1, S2, M1	3 NM	M, L
3 NM	S2, M1, M2, M3		
6 NM	M1, M2, M3, L		
12 NM, 24 NM	M2, M3, L		

1.18 How to Adjust Sensitivity

The gain control 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 display.

To adjust receiver sensitivity, adjust the gain control so background noise is just visible on the screen.

1. Place the cursor in the [GAIN] box at the top of the screen.

2. Rotate the **ADJUST** knob anticlockwise to decrease the gain, or clockwise to increase the gain. The setting range is [0] to [100].

1.19 How to Reduce 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 extends. When sea clutter masks the picture, reduce it with the A/C SEA control, either manually or automatically.

Note 1: 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.

Note 2: The echo average (see "Echo Averaging" on page 1-24) 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.

1.19.1 How to select the method of clutter adjustment

1. Place the cursor in the [SEA AUTO] or [SEA MAN] (whichever is shown) at the top of the display.

2. Press the **left button** to display [SEA AUTO] or [SEA MAN] as appropriate.

1.19.2 How to automatically reduce sea clutter

Auto A/C SEA allows for fine tuning of the A/C SEA circuit, within ±20 dB. Accordingly, with the bar reading set to 50, gain is not lowered to minimum as with manual A/C SEA on close-in ranges. Further, the auto A/C SEA level is low 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 the echoes because the STC curve changes with the size of the echoes.

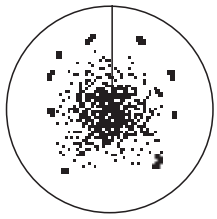
Note: The auto A/C function can erase weak target echoes. Adjust the control carefully, watching the display.

1. Select [SEA AUTO], following the procedure in paragraph 1.19.1.
2. Place the arrow in the A/C SEA level indicator at the top of the display.
3. While observing the A/C SEA level indicator, rotate the **ADJUST** knob clockwise to increase the A/C SEA or counter-clockwise to decrease it. The setting range is [-50] to [50].

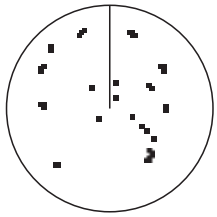
1.19.3 How to manually reduce sea clutter

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.

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.



Sea clutter at screen center



A/C SEA control adjusted; sea clutter reduced

1. Select [SEA MAN], following the procedure in paragraph 1.19.1.
2. Place the arrow in the A/C SEA level indicator at the top of the display.
3. While observing the A/C SEA level indicator, rotate the **ADJUST** knob clockwise to increase the A/C SEA or counter-clockwise to decrease it. The setting range is [0] to [100].

1.20 How to Reduce Rain Clutter

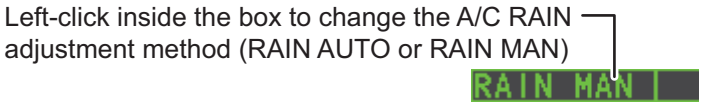
Use the AUTO RAIN and A/C RAIN to reduced rain clutter. AUTO RAIN reduces rain clutter in the picture and A/C RAIN reduces clutter picked up by the antenna.

Note 1: 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.

Note 2: The echo average (see "Echo Averaging" on page 1-24) 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.

1.20.1 How to automatically reduce rain clutter

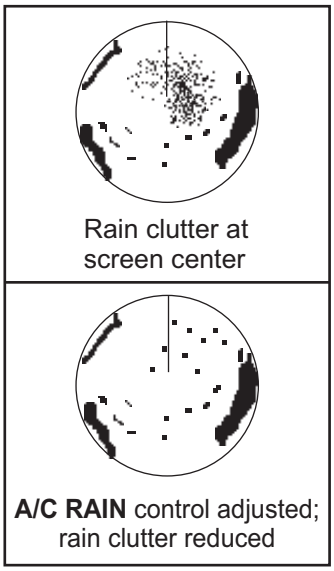
Select the [RAIN] indication at the top-right of the screen, then press the **left button** to select [RAIN AUTO].



1.20.2 How to manually reduce 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 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.



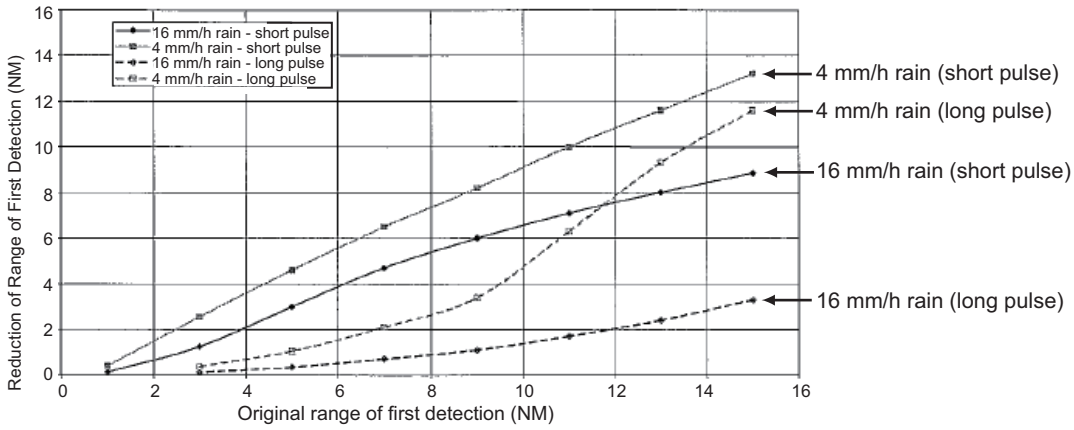
1. Select the [RAIN] indication at the top-right of the screen, then press the **left button** to select [RAIN MAN].

2. While observing the A/C RAIN level indicator, rotate the **ADJUST** knob clockwise to increase the A/C SEA or counter-clockwise to decrease it. 100 levels (0-100) are available.

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 figure below illustrates this.

How to interpret the graph

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



Reduction of rain to first detection due to rain at X-band

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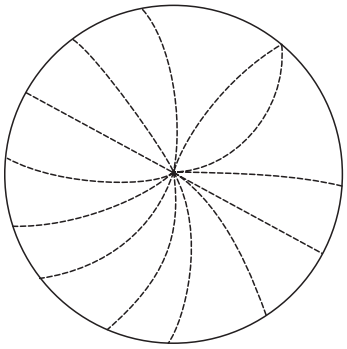
Accordingly, the short pulse may be preferable in rain on ranges less than 10 NM.

1.21 Interference Rejector

Mutual radar interference can 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.



Example of interference

To adjust the interference rejector, select the [IR] box at the left side of the screen, then press the **left button** to cycle through the rejection levels. The available settings, in cyclic order, are: [OFF] → [1] → [2] → [3] → [OFF]...

Level [3] provides the highest level of rejection.

1.22 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 types of echo stretch, 1, 2 and 3, and the higher the number the greater the amount of stretch.

Note: The echo stretch magnifies not only small target pips but also returns (clutter) from sea surface, rain and radar interference. For this reason, make sure these types of interference have been sufficiently reduced before activating the echo stretch.

To set echo stretch, select the [ES] box at the left side of the screen, then press the **left button** to cycle through the settings.

The cyclic order is [OFF] → [1] → [2] → [3] → [OFF]...

1.23 Echo Averaging

The echo averaging feature 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 the echo averaging function under heavy pitching and rolling; loss of targets can result.

Note 3: Echo averaging requires heading, position and speed data.

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:

Select the [EAV] box at the left side of the screen, then press the **left button** to select the desired level of echo averaging.

- [OFF] : Echo averaging is not enabled
- [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 current conditions. For effective monitoring of high-speed craft, you should use [2] together with Wiper.
- [3] : Stably displays unstable targets; distinguishes high-speed craft from sea clutter.

1.24 Automatic Clutter Elimination (ACE) Function

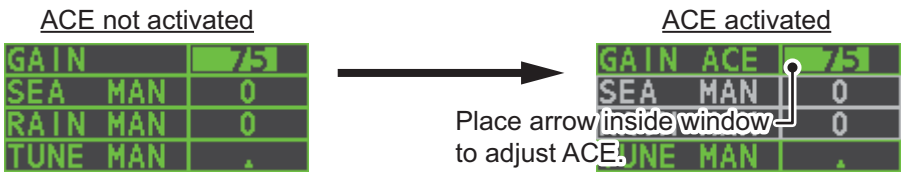
This radar has the Automatic Clutter Elimination (ACE) function. This function detects sea and rain clutter from received echoes' range and bearing trend and automatically reduces sea and rain clutter according to the Automatic Clutter Elimination (ACE) threshold setting.

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

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

Select the [ACE] box at the top left of the operational display area, then press the **left button** to switch the [ACE] function [ON] or [OFF].

When [ACE] is activated, the [SEA] box and [RAIN] box are gray colored and cannot be adjusted. The [GAIN] box changes to [GAIN ACE], as shown in the figure below.



Note: When [PERFORMANCE MON] (see section 1.46) or [SART] (see section 2.3) is [ON], [ACE] is disabled and cannot be activated.

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

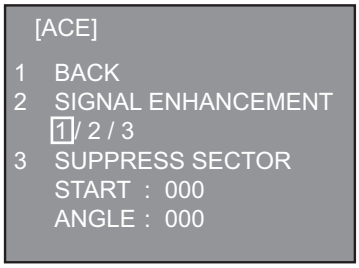
Rotate the **F3** knob to adjust the sensitivity. (For default function key settings only.)

ACE can also be adjusted by placing the cursor inside the [GAIN ACE] level, then rotating the **ADJUST** knob.

1.24.3 How to get high sensitivity

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

1. Open the [MAIN MENU].
2. Select [ECHO], then press the **ADJUST** knob.
3. Select [0 ACE] (For non-IMO radars) or [9 ACE] (IMO radars), then press the **ADJUST** knob.
4. Select [SIGNAL ENHANCEMENT], then press the **ADJUST** knob.
5. Select the level from [1], [2] or [3].
6. Close the menu.



1.24.4 How to suppress false echoes

The echo signals can appear on the screen at positions where there is no target or disappear when there are targets (see section 2.2). You can suppress the false echoes.

1. Open the [MAIN MENU].
2. Select [ECHO], then press the **ADJUST** knob.
3. Select [0 ACE] (For non-IMO radars) or [9 ACE] (IMO radars), then press the **ADJUST** knob.
4. Select [SUPPRESS SECTOR], then press the **ADJUST** knob.
5. Rotate the **ADJUST** knob to set the starting angle for sector to be suppressed, then press the **ADJUST** knob.
6. Rotate the **ADJUST** knob to set the angle range of the sector to be suppressed, then press the **ADJUST** knob.
7. Close the menu.

1.25 Noise Rejector

White noise can 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 by placing the cursor inside the [NR] box at the left side of the screen, then press the **left button** to select [ON] or [OFF].

1.26 Wiper

The wiper feature automatically reduces the brilliance of weak signals (noise, sea clutter, rain clutter, etc.) and unwanted signals such as radar interference to clear the picture of unwanted echoes. Its effect depends on the wiper setting used and whether each averaging is turned on or off, as described below.

	Wiper setting 1	**Wiper setting 2**
Echo averaging OFF	Condition A	Condition A
Echo averaging ON(1/2/3)	Condition A	Condition B

Condition A: The brilliance of unwanted weak echoes, such as noise, sea clutter and rain clutter, is reduced to clear up the picture. The difference between wiper setting [1] and [2] is that brilliance is lowered more slowly in [2].

Condition B: Echo averaging is automatically activated when the wiper feature is turned on, allowing you to instantly see how the picture is affected with echo averaging turned off and turned on.

To activate the wiper feature, do the following:

1. Open the [MAIN MENU].

2. Select [ECHO], then press the **ADJUST** knob.
3. Select [WIPER], then press the **ADJUST** knob.
4. Rotate the **ADJUST** knob to cycle through and select the desired setting. The options, in order, are: OFF → 1 → 2 → OFF...
   With the desired setting selected, press the **ADJUST** knob.
5. Close the menu.

1.27 How to Preset Controls for a 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 [HEAVY RAIN], and is designed to be used in heavy rain.

Two user-programmable presets are also provided (labeled as [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
[CUSTOM1]	User-defined custom settings.	[CUSTOM2]	User-defined custom settings.
[NEAR]	Optimum setting for short range detection using a range scale of 3 NM or less on calm seas.	[FAR]	Optimum setting for long range detection, on a range scale of 6 NM or larger.
[HEAVY RAIN]	Optimum setting for rough weather or heavy rain.	[SHIP]	Optimum setting for detecting other vessels.

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.

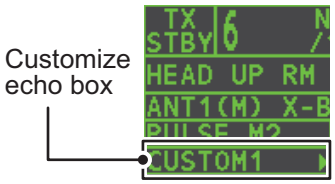
Adjusting these features from the [CUSTOMIZE ECHO] menu changes the original function key settings. To restore the original settings for a particular customize option, it is necessary to select the default setting. For this reason, we recommended that you use the user-programmable presets ([CUSTOM1]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

Default settings

		CUSTOM1	CUSTOM2	NEAR	FAR	HEAVY RAIN	SHIP
GAIN	MODE	MAN	MAN	MAN	MAN	MAN	MAN
	LEVEL	85	85	85	85	85	85
SEA	MODE	MAN	AUTO	MAN	MAN	MAN	MAN
	LEVEL	30	30	30	30	40	30
RAIN	MODE	MAN	MAN	MAN	MAN	MAN	MAN
	LEVEL	0	0	0	0	40	25
INT REJECT		1	1	1	1	2	2
ECHO STRETCH		1	2	OFF	3	OFF	2
ECHO AVERAGE		1	2	1	2	2	1
NOISE REJECT		OFF	ON	OFF	OFF	ON	ON
VIDEO CONTRAST TYPE		2-B	2-B	2-B	3-B	1-B	2-B
ACE		OFF	ON	OFF	OFF	ON	ON
ACE GAIN		80	80	80	80	80	80
PULSE (FAR-1518/1528)	0.5NM	S1	S1	S1	S1	S1	S1
	0.75NM	S1	S1	S1	S2	S1	S2
	1.5NM	S1	S2	S1	M1	S1	M1
	3NM	S2	M1	S2	M2	S2	M2
	6NM	M2	M2	M1	M3	M1	M3
	12NM	M3	M3	M2	L	M2	L
	24NM	L	L	M3	L	M3	L
PULSE (FAR-1513/1523)	1.5NM	S	S	S	M	S	M
	3NM	M	M	M	M	M	M
CONDITION	NEAR STC CURVE	3	3	3	3	3	3
	STC ANT HEIGHT (m)	Set at installation.					
	LOW LEVEL ECHO	0	0	0	0	0	0

1.27.1 How to select a customized echo

Left-click [CUSTOMIZE ECHO] box at the top left of the screen to cycle through the options and select a customized echo option. The available options, in cyclic order, are: [CUSTOM1] → [CUSTOM2] → [NEAR] → [FAR] → [HEAVY RAIN] → [SHIP].

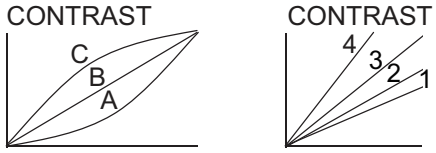


1.27.2 How to edit a customized echo

1. Select a customize echo option to edit (see paragraph 1.27.1).
2. Select the [CUSTOMIZE ECHO] box, then press the right button to display the [CUSTOMIZE ECHO] menu.
3. Set the items below referring to the sections shown.

• [INT REJECT]	: section 1.21	• [HATCHING]	: section 1.37
• [ECHO STRETCH]	: section 1.22	• [NOISE REJECT]	: section 1.25
• [ECHO AVERAGE]	: section 1.23	• [PULSE]	: section 1.17
• [TARGET ANALYZER]	: section 1.37	• [ACE]	: section 1.24

4. Select [VIDEO CONTRAST TYPE], then press the **ADJUST** knob.
5. Select [1], [2], [3] or [4] (Dynamic Range) or [A], [B], [C] (Curve) as appropriate then press 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. Select [9 CONDITION], then press the **ADJUST** knob.
7. Select [2 NEAR STC CURVE], then press the **ADJUST** knob.
8. Select the appropriate setting for the current sea conditions, then press the **ADJUST** knob. The available settings are: [2], [2.5], [3], [3.5], [4.2]. A higher setting is recommended for rough weather.
9. Select [1 STC ANT HEIGHT], then press the **ADJUST** knob.
10. Select the radar antenna height (above the waterline), then press the **ADJUST** knob.
11. If necessary, select [2 LOW LEVEL ECHO] to reject low level echoes. The setting range is [0] to [8]. The higher the figure, the stronger the low level echo that is erased.
12. To save custom settings, select [SAVE] from [0 DEFAULT], then press the **ADJUST** knob.

1.27.3 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 1.27.2.

1. Select the [CUSTOMIZE ECHO] box, then press the right button to display the [CUSTOMIZE ECHO] menu.
2. Select [0 DEFAULT], then press the **ADJUST** knob.
3. Select [USER], then press the **ADJUST** knob.

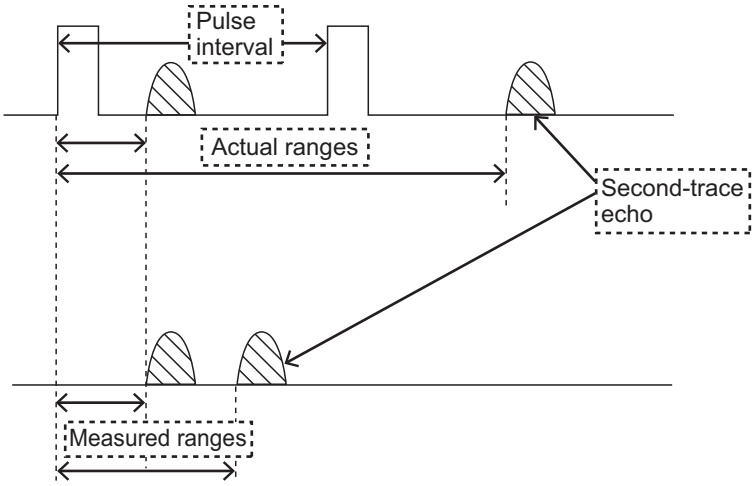
1.27.4 How to restore a user customized echo to the factory default settings

You can restore customized echo options to their factory default (see the table on page 1-28).

1. Select the [CUSTOMIZE ECHO] box, then press the right button to display the [CUSTOMIZE ECHO] menu.
2. Select [0 DEFAULT], then press the **ADJUST** knob.
3. Select [FACTORY], then press the **ADJUST** knob.

1.28 How to Reject Second-trace Echoes

In certain situations, echoes from very distance targets can 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 false echoes.

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

To reject second trace echoes, do the following:

1. Open the [MAIN MENU].
2. Select [ECHO], then press the **ADJUST knob**.
3. Select [2ND ECHO REJ], then press the **ADJUST knob**.
4. Select [ON], then press the **ADJUST knob**. Select [OFF] to disable rejection.
5. Close the menu.

1.29 Presentation Modes

This radar has the following presentation modes available:

Relative Motion (RM)

HEAD UP	: Not stabilized
STAB HEAD UP	: Head-up with compass 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 COURSEUP.
NORTH UP	: Compass-stabilized with reference to North.
STERN UP	: The radar image is rotated 180°. Graphics and relative and true bearings are also rotated 180°.

True Motion (TM)

Land objects and sea are stationary. Requires compass and speed data.

1.29.1 How to select an presentation mode

Select the [PRESENTATION MODE] box at the top left corner of the screen, then press the **left button** to select a presentation mode.

HEAD UP RM *

*= Other modes:
STERN UP RM, STAB HEAD UP RM,
COURSE UP RM, NORTH UP RM, NORTH UP TM

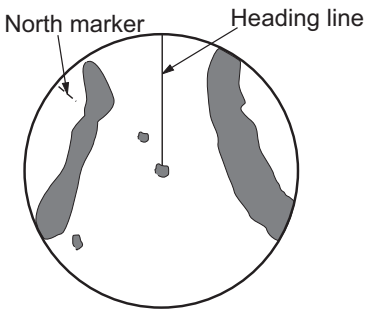
Loss of gyrocompass signal

When the compass signal is lost, "GYRO" appears in yellow-orange in the [ALERT] box, the presentation mode automatically becomes HEAD UP, and TT and AIS targets, map and chart are erased. After restoring the compass signal, "HEADING SET" appears in the [ALERT] box. Stop the alert with the [ALERT ACK] key or select the [ALERT] box, then press the **left button** and then check the GYRO data.

1.29.2 Description of presentation modes

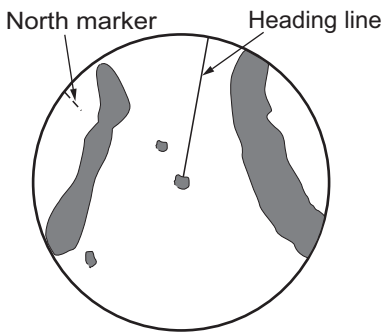
HEAD UP mode

A display without azimuth stabilization in which the line that connects the center with the top of the display indicates your heading. Targets are shown at their measured distances and their directions relative to your heading. The short dotted line on the bearing scale is the north marker.



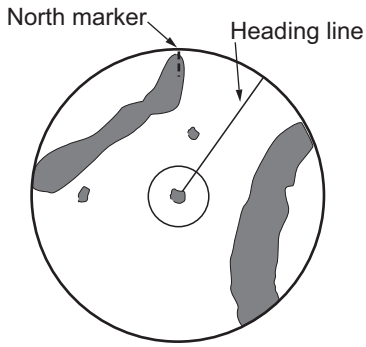
COURSE UP mode

The radar picture is stabilized and displayed with the currently selected course at the top of the screen. When you change the heading, the heading line moves with the course selected. If you select a new course, select the course up mode again to display the new course at the top of the display. Targets are shown at their measured distances and their directions relative to the set course, which is at the 0-degree position. The heading line moves according to the yawing and any course change.



NORTH UP mode

Targets are shown at their measured distances and their true (compass) directions from your ship. North is at the top of the screen. The heading line changes its direction according to your heading.



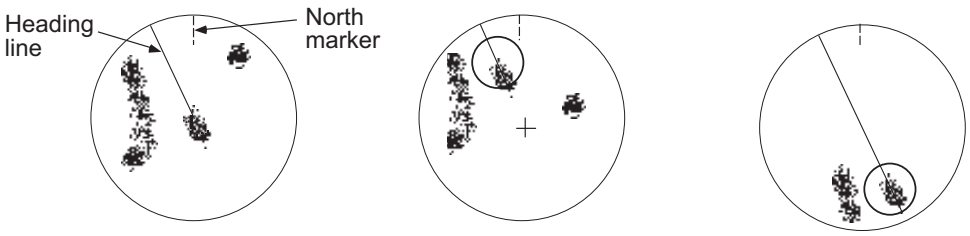
STAB HEAD UP mode

Radar echoes are shown in the same way as in the HEAD UP mode. The difference from 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 gyrocompass. If the gyrocompass fails, the bearing scale returns to the state of HEAD UP mode.

True motion mode

Your ship and other objects in motion move with their true courses and speed. All fixed targets, like landmasses, appear as fixed echoes in ground stabilized TM. When your ship reaches a point that is 50% of the radius of the display, the position is reset. The ship appears at 75% radius opposite to the extension of the heading line on the display center. You can manually reset your ship symbol if you highlight the [CU/TM RESET] indication at the top of the screen, then press the **left button**.



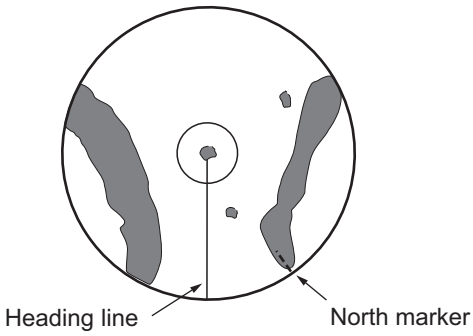
(a) True motion is selected

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

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

STERN UP mode

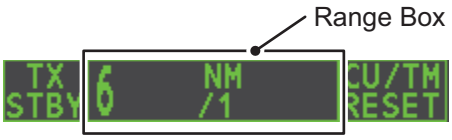
The STERN UP mode rotates the HEAD UP mode picture, relative and true bearings and display graphics 180°. This mode is useful on dual-radar tugboats when backing up; one radar shows HEAD UP and another shows STERN UP. To enable the STERN UP mode, turn on [STERN UP] on the [OPERATION] menu.



1.30 How to Select a Range Scale

The selected range scale, range ring interval and pulselength are shown at the upper left corner 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.

1. Place the cursor in the [RANGE] box at the top left corner of the screen.



2. Press the **left button** to lower the range; the **right button** to raise the range. You can also select the range by rotating the **ADJUST** knob then pressing the **ADJUST** knob when the cursor is inside the range box.

1.31 How to Measure Range

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

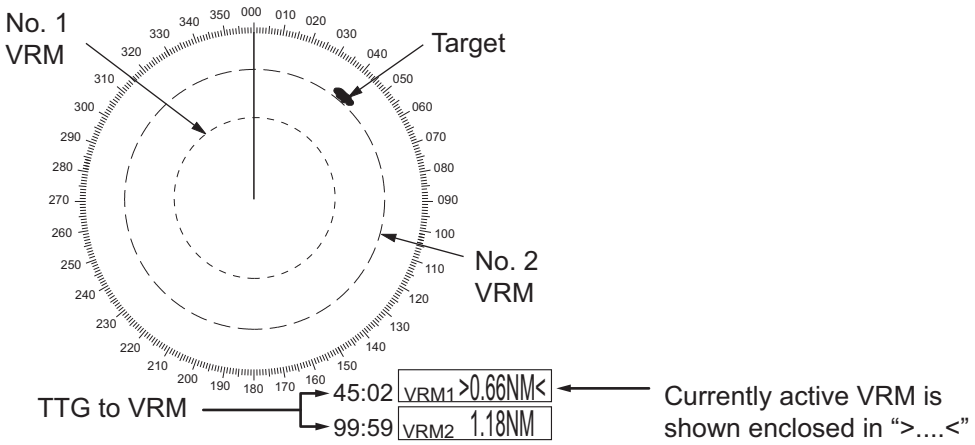
Use the fixed range rings to get an estimate of the range to a target. The rings are the concentric solid circles on the display. The number of rings is automatically set by the current range scale. The distance between the rings is the range ring interval, and the current interval appears at the upper-left position on the screen. To measure the range to a target with the range rings, count the number of rings between the center of the display and the target. Check the range ring interval and estimate the distance of the echo from the inner edge of the nearest ring.

1.31.1 How to show/hide the range rings

1. Open the [MAIN MENU].
2. Select [NAVTOOL], then press the **ADJUST knob**.
3. Select [RANGE RING], then press the **ADJUST knob**.
4. Rotate the **ADJUST** knob to select [ON] or [OFF] as appropriate, then press the **ADJUST knob**.
5. Close the menu.

1.31.2 How to measure range with the variable range marker (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.



There are two methods for measuring range with the VRMs, using the VRM key and on-screen menu box operation.

Using the VRM key

1. Press the VRM key to display the VRMs. Press the VRM key again to switch between active VRMs. The currently active VRM marker is displayed as shown in the figure on the previous page.
2. Rotate the **ADJUST** knob to align the active VRM with the inner edge of the target, then read the distance at the lower right of the screen. In the above example, the VRM reads "0.66NM".
   Each VRM remains at the same geographical distance when you operate the **RANGE** key or the [RANGE] box. This means that the apparent radius of the VRM ring changes in proportion to the selected range scale.
3. Press and hold the VRM key to erase the selected VRM.

On-screen menu box operation

1. Select the appropriate VRM box.
2. The guidance box reads "VRM ON/". Press the **left button** to turn on the VRM. The guidance box now reads "VRM SET L = DELETE /".
3. Press the **left button** again and the cursor jumps to inside the operational display area. The guidance box now reads "VRM FIX / EXIT".
4. Rotate the **ADJUST** knob to set the distance for VRM.
   Note: The maximum VRM distance is set by the current display range and can be set as high as twice the distance of the display range.
5. Press the **left button** to anchor the VRM and fix its readout, or press the **right button** to cancel and return the VRM to its previous location (range).
6. Press and hold the VRM key to erase the selected VRM.

1.31.3 How to set the VRM unit of measurement

VRMs can be displayed in the following units of measurement:

- NM (Nautical Miles)
- SM (Statute Miles)
- KM (Kilometers)
- KYD (Kiloyards)

To change the unit of measurement, do the following:

1. Open the [MAIN MENU].
2. Select [NAVTOOL], then press the **ADJUST** knob.
3. Select [EBL•VRM], then press the **ADJUST** knob.
4. Select [VRM1] or [VRM2] as appropriate, then press the **ADJUST knob**.
5. Select the unit of measurement, then press the **ADJUST** knob.
6. Close the menu.

1.31.4 How to show TTG to VRM

TTG (Time To Go) to a selected VRM can be displayed as follows:

1. Open the [MAIN MENU].
2. Select [NAVTOOL], then press the **ADJUST** knob.
3. Select [EBL•VRM•CURSOR], then press the **ADJUST** knob.
4. Select [VRM TTG], then press the **ADJUST knob**.
5. Select [OFF], [1], [2] or [1&2] as appropriate, then press the **ADJUST** knob.
   - [OFF] No TTG to VRM displayed.
   - [1] TTG to VRM1 displayed.
   - [2] TTG to VRM2 displayed.
   - [1&2] TTG to VRM1 and VRM2 displayed.

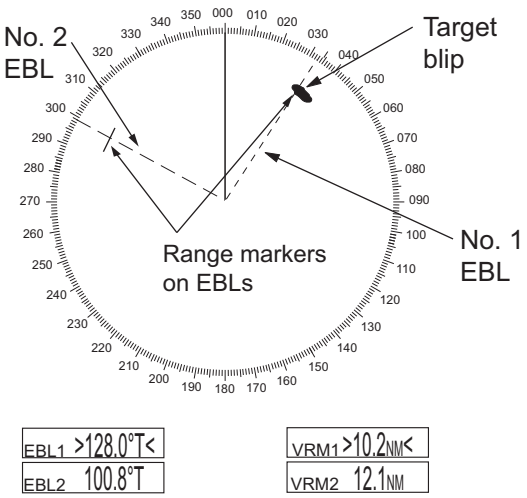
TTG indication → 01:15 VRM1 >3.682NM<

6. Close the menu.

1.32 How to Measure Bearing

The Electronic Bearing Lines (EBLs) are used to take bearings of targets.There are two EBLs, EBL1 and EBL2. Each EBL is a straight dashed line extending out 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 EBL2 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.



1.32.1 Methods to measure bearing

There are two methods for measuring bearing, using the EBL key and on-screen menu box operation.

Using the EBL key

1. Press the EBL key to display EBL1. Press the key again to change between EBLs. The currently active EBL is displayed as shown in the figure below.

2. Rotate the **ADJUST** knob clockwise or counterclockwise until the active EBL bisects the target of interest, and read its bearing at the lower-left corner of the screen.

3. Press and hold the EBL key to erase the active EBL.

On-screen menu box operation

1. Select the appropriate EBL box.
2. The guidance box reads "EBL ON/". Press the **left button** to turn on the EBL.The guidance box now reads "EBL SET L=DELETE /".
3. Press the **left button** again and the cursor jumps to inside the operational display area. The guidance box now reads "EBL FIX L=DELETE/".
4. Rotate the **ADJUST** knob clockwise or counterclockwise until the active EBL bisects the target of interest, then press the **ADJUST** knob to anchor the EBL. Read the bearing at the lower-left corner of the screen.

5. Press and hold the EBL key to erase the active EBL.

1.32.2 True or relative bearing

The EBL readout is affixed by "R" (relative) if it 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.

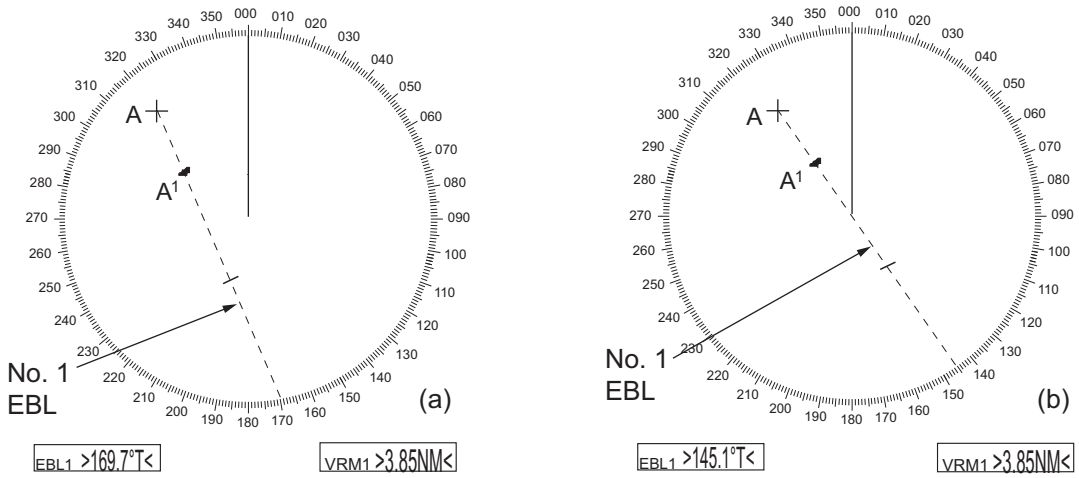
1. Open the [MAIN MENU].
2. Select [NAVTOOL], then press the **ADJUST** knob.
3. Select [EBL•VRM], then press the **ADJUST** knob.
4. Select [EBL1] or [EBL2] as appropriate, then press the **ADJUST** knob.
5. Select the [REL] or [TRUE] as appropriate, then press the **ADJUST** knob.
6. Close the menu.

Note: The EBL and its indication change according to gyrocompass changes as follows:

Gyro heading	EBL changes
HEAD UP/relative	EBL indication and EBL marker are unchanged.
HEAD UP / true	EBL indication does not change, however the EBL marker moves accordingly
COURSE UP / relative	EBL indication does not change, however the EBL marker moves accordingly.
COURSE UP / true	EBL indication and EBL marker are unchanged.
NORTH UP / relative	EBL indication does not change, however the EBL marker moves accordingly
NORTH UP / true	EBL indication and EBL marker are unchanged.

1.33 Collision Assessment by Offset EBL

The origin of the EBL can be placed anywhere with the touchpad to enable measurement of range and bearing between any 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 (a) in the illustration below. If the EBL passes through the sweep origin (own ship) as shown in (b) in the illustration below, the target ship is on a collision course.



1.33.1 How to assess risk of collision using the offset EBL

There are two methods for assessing risk collision. You can use the touchpad or the [CURSOR] menu.

Using the touchpad

Note: The [EBL OFFSET] function must be assigned to a function key (F1, F2 or F3) for this method. See section 1.9 for how to assign the function keys.

1. Press the EBL key to display or activate the EBL (EBL1 or EBL2).
2. Place the cursor on a target appearing as threatening (indicated as “A” in the figure above).
3. Press the **EBL OFFSET** function key and the origin of the active EBL shifts to the cursor position. Press the **EBL OFFSET** function key again to anchor the EBL origin.
4. After waiting for a few minutes (at least 3 minutes), operate the **ADJUST** knob until the EBL bisects the target at the new position (A^1). The EBL readout shows the target ship's course, which can be true or relative depending on the EBL bearing reference setting.
   Note: If relative motion is selected, it is also possible to read CPA by using a VRM as shown in left-hand figure at the top of the next page. If the EBL passes through the sweep origin (own ship) as illustrated in the right-hand figure above, the target ship is on a collision course.
5. To return the EBL origin to the own ship's position, press the **EBL OFFSET** function key.