

# **FURUNO**

## **OPERATOR'S MANUAL**

### **MULTI-COLOR LCD RADAR**

**FR-8045**

**FR-8065**

**FR-8125**

**MODEL**      **FR-8255**

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**PRODUCT NAME: MARINE RADAR**

**ECF**

(Elemental Chlorine Free)

The paper used in this manual  
is elemental chlorine free.

**FURUNO ELECTRIC CO., LTD.**

9-52 Ashihara-cho,  
Nishinomiya, 662-8580, JAPAN

• FURUNO Authorized Distributor/Dealer

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(GREG ) FR-8045/8065/8125

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0 0 0 1 7 8 5 0 2 1 0

# IMPORTANT NOTICES

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## General

- This manual has been authored with simplified grammar, to meet the needs of international users.
- The operator of this equipment must read and follow the descriptions in this manual. Wrong operation or maintenance can cancel the warranty or cause injury.
- Do not copy any part of this manual without written permission from FURUNO.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and equipment specifications can change without notice.
- The example screens (or illustrations) shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by FURUNO will cancel the warranty.
- All brand and product names are trademarks, registered trademarks or service marks of their respective holders.
- Ricoh bitmap font is a trademark or registered trademark of Ricoh Company, Ltd.

## How to discard this product

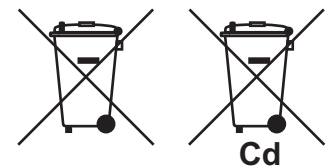
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (<http://www.eiae.org/>) for the correct method of disposal.

## How to discard a used battery

Some FURUNO products have a battery(ies). To see if your product has a battery, see the chapter on Maintenance. Follow the instructions below if a battery is used. Tape the + and - terminals of battery before disposal to prevent fire, heat generation caused by short circuit.

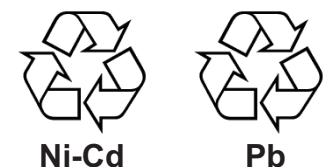
### In the European Union

The crossed-out trash can symbol indicates that all types of batteries must not be discarded in standard trash, or at a trash site. Take the used batteries to a battery collection site according to your national legislation and the Batteries Directive 2006/66/EU.



### In the USA

The Mobius loop symbol (three chasing arrows) indicates that Ni-Cd and lead-acid rechargeable batteries must be recycled. Take the used batteries to a battery collection site according to local laws.



### In the other countries

There are no international standards for the battery recycle symbol. The number of symbols can increase when the other countries make their own recycle symbols in the future.



# SAFETY INSTRUCTIONS

Read these safety instructions before you operate the equipment.



## WARNING

Indicates a condition that can cause death or serious injury if not avoided.



## CAUTION

Indicates a condition that can cause minor or moderate injury if not avoided.



Warning, Caution



Prohibitive Action



Mandatory Action



## WARNING






### Radio Frequency Radiation Hazard






The radar antenna sends the electromagnetic radio frequency (RF) energy. This energy can be dangerous to you, especially your eyes. Do not look at the radiator or near the antenna when the antenna is rotating.

The distances at which RF radiation levels of 100 W/m<sup>2</sup> and 10 W/m<sup>2</sup> exist are shown in the table.

**Note:** If the antenna unit is installed at a close distance in front of the wheel house, prevent the transmission in that area to protect passengers and crew from microwave radiation. Set the [Sector Blanks] in the [System] menu.

Model		100W/m <sup>2</sup>	10W/m <sup>2</sup>
FR-8045	XN-12A	N/A	1.1m
	XN-13A	N/A	1.0m
FR-8065	XN-12A	N/A	1.9m
	XN-13A	N/A	1.7m
FR-8125	XN-12A	N/A	2.1m
	XN-13A	N/A	1.9m
FR-8255	XN-12A	0.6m	4.6m
	XN-13A	0.4m	3.1m

 <b>WARNING</b>	
	<p><b>ELECTRICAL SHOCK HAZARD</b> Do not open the equipment.</p> <p>Only qualified persons can work inside the equipment.</p>
	<p><b>Turn off the power before you service the antenna unit. Post a warning sign near the power switch not to turn on the power while you service the antenna unit.</b></p> <p>Prevent the potential risk of being struck by the rotating antenna and exposure to RF radiation hazard.</p>
	<p><b>Do not disassemble or modify the equipment.</b></p> <p>Fire or electrical shock can occur.</p>
	<p><b>Turn off the power immediately if water leaks into the equipment or smoke or fire is coming from the equipment.</b></p> <p>Failure to turn off the equipment can cause fire or electrical shock.</p>

 <b>WARNING</b>	
	<p><b>Use the correct fuse.</b></p> <p>A wrong fuse can damage the equipment and cause fire.</p>
	<p><b>Keep heater away from the equipment.</b></p> <p>Heat can change the equipment shape and melt the power cord, which can cause fire or electrical shock.</p>
	<p><b>Do not put liquid-filled containers on the top of the equipment.</b></p> <p>Fire or electrical shock can occur if a liquid spills into the equipment.</p>
	<p><b>Do not operate the equipment with wet hands.</b></p> <p>Electrical shock can occur.</p>



## WARNING



**Do not depend on one navigation device for the navigation of the ship. The navigator must check all aids available to confirm position. Electronic aids are not a replacement for basic navigation principles and common sense.**

- The ARPA automatically tracks an automatically or manually acquired radar target and calculates its course and speed, indicating them by a vector. Since the data from the auto plotter depend on the selected radar targets, the radar must be optimally tuned for use with the auto plotter, to ensure required targets will not be lost or unnecessary targets like sea returns and noise will not be acquired and tracked.
- A target is not always a landmass, reef, ship, but can also be returns from the sea surface and from clutter. As the level of clutter changes with the environment, the operator must correctly adjust the **A/C SEA**, **A/C RAIN** and **GAIN** controls so that the target echoes do not disappear from the radar screen.



## CAUTION

**The plotting accuracy and response of this ARPA meets IMO standards. The tracking accuracy is affected by the following:**

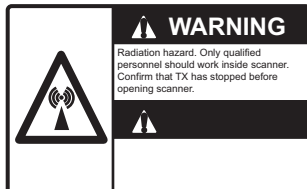
- The tracking accuracy is affected by course change. One to two minutes is required to restore vectors to full accuracy after a sudden course change. (The actual amount depends on gyrocompass specifications.)
- The amount of tracking delay is inversely proportional to the relative speed of the target. Delay is on the order of 15-30 seconds for high relative speed; 30-60 seconds for low relative speed.

**The data from ARPA and AIS are intended for reference purposes only.**

Check all available navigation aids to determine target movement.

### WARNING LABELS

Warning labels are attached to the equipment. Do not remove any label. If a label is missing or damaged, contact a FURUNO agent or dealer about replacement.



### ANTENNA UNIT

Name: Warning Sticker  
 Type: 03-142-3201-0  
 Code No.: 100-266-890-10

### TFT LCD

The high quality TFT (Thin Film Transistor) LCD displays 99.999% of its picture elements. The remaining 0.001% may drop out or light, however this is an inherent property of the LCD; it is not a sign of malfunction.

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# FOREWORD

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## **A word to the Owner of the FR-8045/FR-8065/FR-8125/FR-8255 Multi-color LCD Radar.**

Congratulations on your choice of the FURUNO FR-8045/FR-8065/FR-8125/FR-8255 Multi-color LCD Radar. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

Since 1948, FURUNO Electric Company has enjoyed an enviable reputation for innovative and dependable marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

This equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless installed, operated and maintained properly. Please carefully read and follow the recommended procedures for operation and maintenance.

We would appreciate feedback from you, the end-user, about whether we are achieving our purposes.

Thank you for considering and purchasing FURUNO equipment.

## **Features**

The FR-8045/FR-8065/FR-8125/FR-8255 series displays ships, land masses, etc. on a LCD screen. This equipment can be operated using the keys, knob controls or the Cursorpad.

The main features are listed below.

- Bright 12.1-inch LCD, visible in direct sunlight.
- Easy to understand user interface with on-screen menus.
- Full-screen Echo area display provides a wider range around the vessel.
- User-programmable function keys.
- Optional Auto Plotter ARP-11 is available for ARPA operation.
- AIS data can be displayed with the connection of a FURUNO AIS Transponder/Receiver.
- Echoes can be displayed multiple colors.

**Note:** The Chinese font used in this equipment is Ricoh Company Ltd.'s Ricoh bitmap font.

中文字型由北京字研技术开发中心提供

## Radar Type and Function Availability

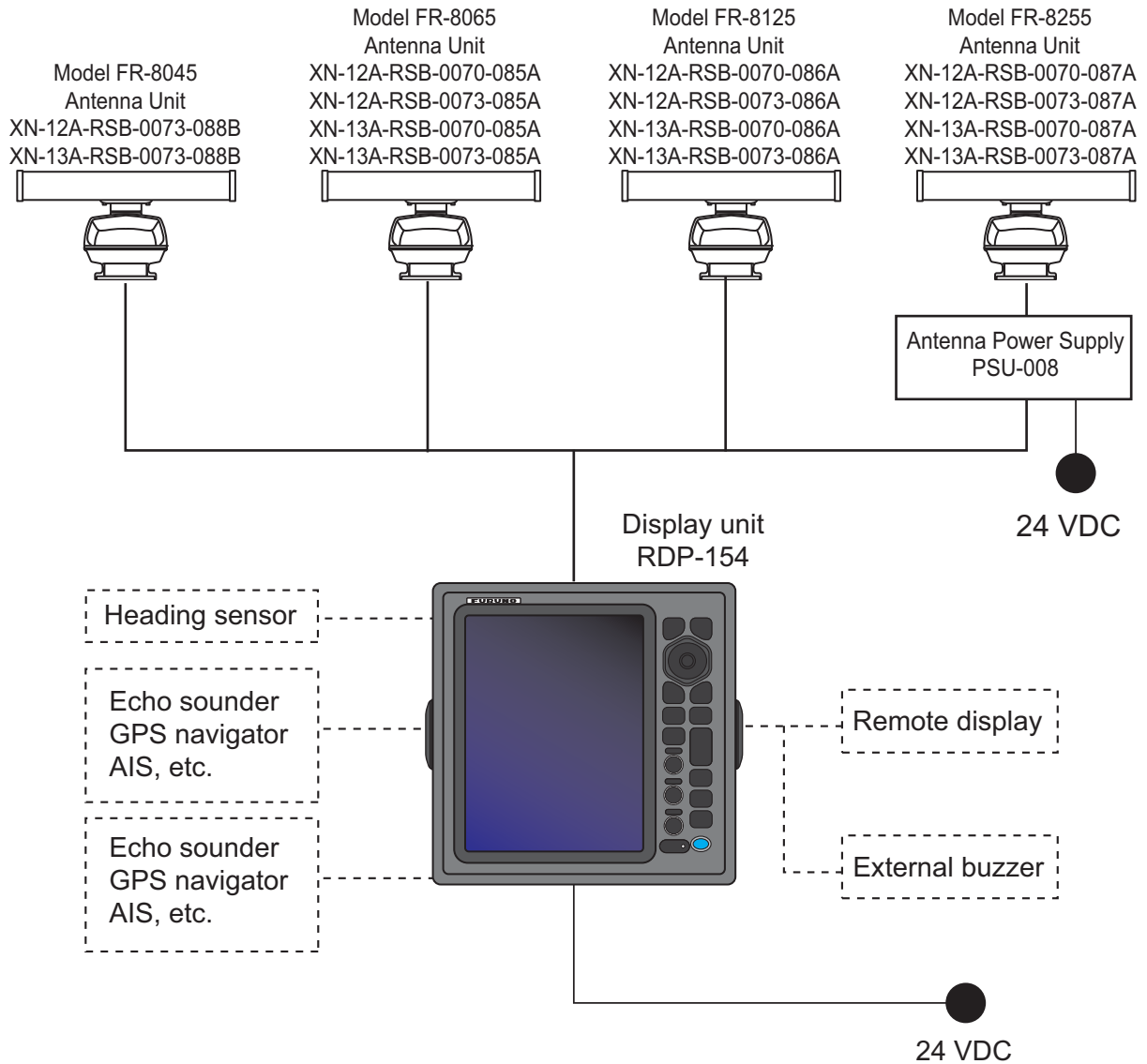
This radar series is available in four types: [River], [Sea], [IEC] and [Russian-River], and function availability depends on type. The table below shows type and function availability.

[River]: For river, [Sea]: For sea, [IEC]: IEC compliant radar, [Russian-River]: For Russian river

### Type and function availability

Item	Type			
	River	Sea	IEC	Russian-River
Automatic menu closure	Menu does not close automatically.		Menu closes automatically when there is no menu operation for 10 seconds.	
Effective radius dot count	300 dots		262 dots	
Echo color	Select the echo display color among [Yellow], [Green], [Orange] or [Multi].		Select the echo display color among [Yellow], [Green] or [Orange].	
Echo color customizing	Can customize the echo display color.		Can not customize the echo display color.	
Echo area	Select the display area from [Normal] or [Full Screen].		Can not select. Display area is circle only.	
Base text display	Can show or hide the base text indications.		Can not hide the base text indications.	
Range preset	Select the radar ranges to use.			Can not select the radar ranges to use.
Unit defaults 1) range 2) speed	1) KM 2) km/h, m/s	1) NM 2) kn		1) KM 2) km/h, m/s
Bearing scale	Graduation every 1°, 5°, 10°, 30°, no numeric indication, displayed in the effective radius		Graduation every 1°, 5°, 10°, 30°, numeric indication every 30°, displayed out of the effective radius	
VRM unit	Can set the VRM unit independently from the range unit.		Can not set the VRM unit independently from the range unit.	
Range unit	Can change the range unit when transmitting.		Can not change the range unit in transmit. Only in standby.	
AIS symbol color	Select the AIS symbol color from [Green], [Red], [Blue], [White] or [Black].		Select the AIS symbol color from [Green], [Blue], [White] or [Black].	
Vector reference	Select the display mode for the vector from [Relative] or [True].		[True]	
Pulselength	<ul style="list-style-type: none"> <li>• 2NM/4KM/2SM: MP</li> <li>• 4NM/8KM/4SM: LP</li> </ul>			<ul style="list-style-type: none"> <li>• 2NM/4KM/2SM: SP or MP</li> <li>• 4NM/8KM/4SM: MP or LP</li> </ul>
The rule for the numbering of ARPA targets	Non-IEC system		IEC system	
Marks temporary hidden by pressing and holding the <b>CANCEL/HL OFF</b> key	Heading line, all marks (EBL, VRM, target alarm zone, etc.)		Heading line, vector of your ship (with ARP-11)	

# SYSTEM CONFIGURATION

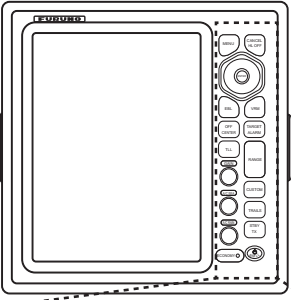
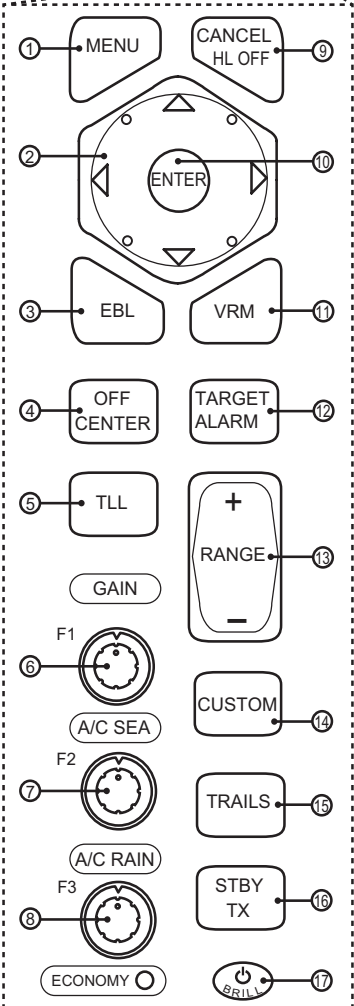


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# 1. OPERATION

## 1.1 Controls

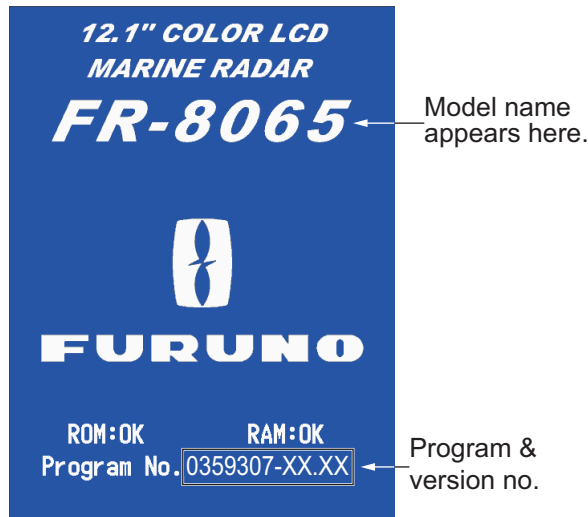
The display unit has 16 keys which have labels with their functions, three knob controls and a CursorPad. When you correctly operate this equipment, the unit beeps one time. If your operation is not correct, the unit beeps three times.

	No.	Control	Description
	1	<b>MENU</b>	Open/close the menu.
	2	<b>CursorPad</b>	Select the menu items and options. Move the cursor. (Shown like ◀, ▶, ▲, ▼ & ▾ in the manual.)
	3	<b>EBL</b>	Measure the bearing to a target.
	4	<b>OFF CENTER</b>	Off-center the display.
	5	<b>TLL</b>	Send the latitude and longitude of a target to a navigation plotter. Enter an origin mark at the cursor position on the radar display.
	6	<b>GAIN</b>	Rotating: Adjust the sensitivity of the radar receiver.
	7	<b>A/C SEA</b>	Rotating: Reduce the sea clutter.
	8	<b>A/C RAIN</b>	Rotating: Reduce the rain clutter.
	6,7,8	<b>F1,F2, F3</b>	Push: Activate the function given to the key.
	9	<b>CANCEL/HL OFF</b>	Erase the heading line while you press this key. Cancel the last entry in menu operation. Cancel the tracking of ARPA target. Remove data of selected ARPA or AIS target from the data box. Return one layer in a multiple level menu.
	10	<b>ENTER</b>	Save selected menu option. Acquire an ARPA target. Select the ARPA or AIS target to display its data.
	11	<b>VRM</b>	Measure the range to a target.
	12	<b>TARGET ALARM</b>	Set the target alarm, which checks for the targets in the operator-set area.
	13	<b>RANGE</b>	Select the detection range.
	14	<b>CUSTOM</b>	Set the radar controls for one-touch operation of radar.
	15	<b>TRAILS</b>	Plot the radar echo movement.
	16	<b>STBY/TX</b>	Transmit the radar pulses or put the radar in standby.
17	<b>Brill</b>	Short Press: Turn on the power. Adjust the brilliance. Long press: Turn off the power.	

## 1.2 How to Turn the Radar On/Off and Transmit

Press the  key to turn on the radar. To turn off the radar, press and hold the key until the screen turns off.

When you turn on the power, the initialization screen appears followed by the start-up screen. The start-up screen shows the model name, program number and the results of the ROM and RAM check, "OK" or "NG" (No Good). If "NG" appears, contact your dealer for instruction.





*Start-up screen*

After the self-tests have completed, the bearing scale and a digital timer appear. The digital timer counts down the time necessary to warm the magnetron, which transmits the radar pulses. The time to warm the magnetron is 90 seconds for FR-8045/FR-8065 and FR-8125 radars, 180 seconds for FR-8255 radar.

After the timer reads 0:00, the STBY screen appears. The STBY screen has three types. (See paragraph 1.44.2.) The radar is ready to transmit the radar pulses. Press the **STBY/TX** key to transmit the radar pulses.

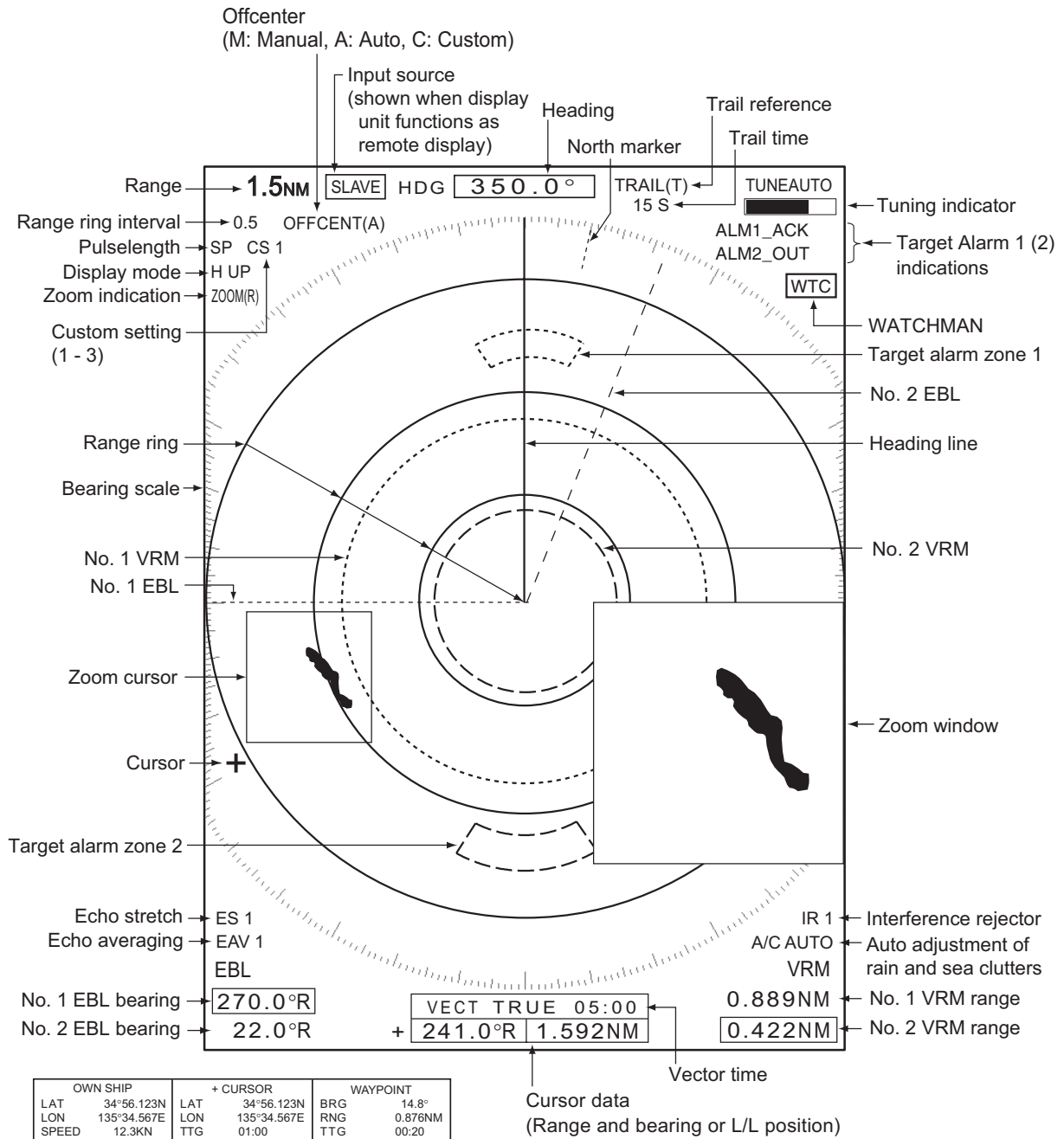
The **STBY/TX** key switches between standby and transmit. The antenna rotates in transmit and is stopped in standby. The magnetron gets old with use. To increase the life of the magnetron, set the radar in standby when you do not use the radar.

### **Quick start**

If the magnetron is still warm, you can get the radar to TRANSMIT without the warm up time. When the  key is turned off by accident, turn on the  key within 10 seconds after you turn off the power.



# 1.3 Display Indications




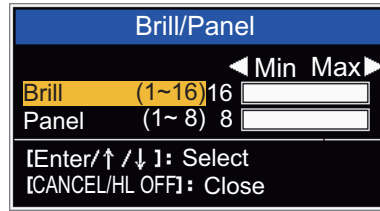
**Nav data:** Appears at screen bottom when [Data Box] in the [Display] menu is set to [Nav] or [All]. Appropriate sensors required to display nav data.

*Display indications*


## 1.4 How to Adjust Display Brilliance, Panel Dimmer

You can adjust the display brilliance and panel dimmer as follows:

1. Press the  key to show the [Brill/Panel] dialog box.



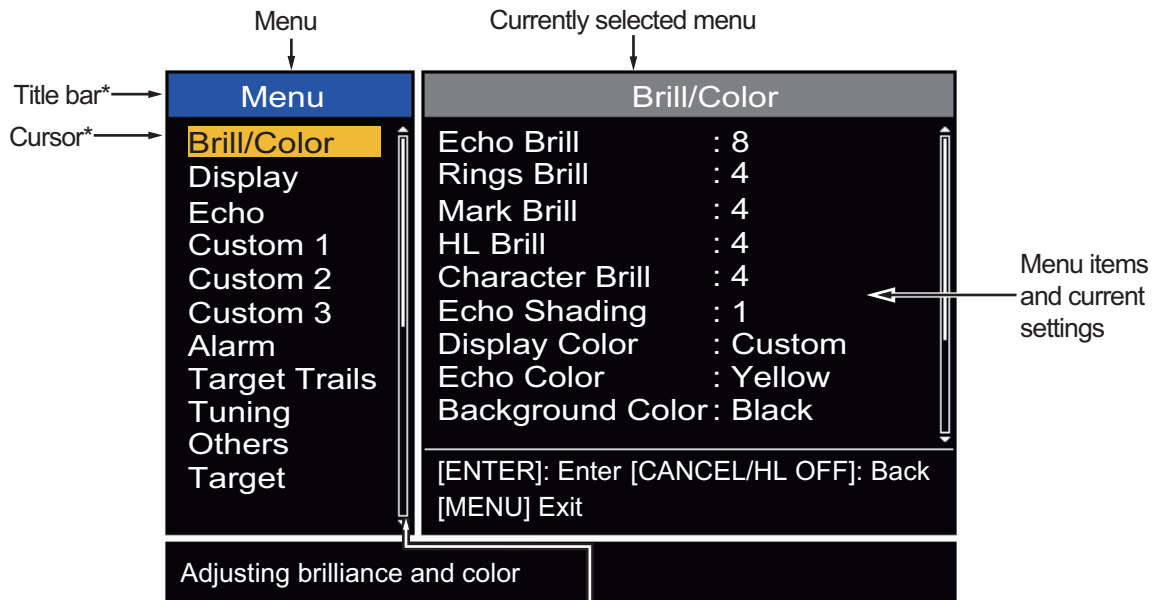
*Brill/Panel dialog box*

2. Press the [ENTER] key (or ▲, ▼) to select [Brill] or [Panel].
3. Use ◀ or ▶ to adjust. (For brilliance you can also use the  key.)
4. Press the **CANCEL/HL OFF** key to close the window.

## 1.5 Menu Description

This FR-8045/FR-8065/FR-8125/FR-8255 series has 15 menus and 6 sub menus. Below is the basic procedure for menu operation.

1. Press the **MENU** key to open the menu.



Guide message

(The simple explanation for the current menu.)

Scroll bar (Indicates menus currently not shown in menu window. Black vertical line indicates location in menu.)

You can see the menus and sub menus currently not shown by using ▲ or ▼.)

\*: Title bar in currently controlled column is blue; cursor selection is yellow.

Title bar of inactive column is gray.

*Menu*

- Use ▲ or ▼ to select a menu or sub-menu. The cursor (yellow) in the [Menu] column indicates the menu currently selected. The menu items in the right-hand window change according to the menu selected.

### **Menu Description**

**[Brill/Color]:** Adjust the brilliance and color.

**[Display]:** Set up the display features.

**[Echo]:** Adjust the radar echo.

**[Custom 1] - [Custom 3]:** Adjust the user settings.

**[Alarm]:** Set up the alarm features.

**[Target Trails]:** Process the trails of radar targets.

**[Tuning]:** Adjust the radar tuning.

**[Others]:** Set up other items.

**[Target]:** Set up the targets configuration.

**[ARPA]:** Set up the ARPA targets.

**[AIS]:** Set up the AIS targets.

**[GPS]:** Set up the GP-320B (Black-Box GPS).

**[System]**

**[Initial]:** Initial Setting.

**[Tests]:** Diagnostic self test, LCD test and ARPA test. See section 6.7 to 6.9.

**[Sector Blanks]:** Set sector blanks to prevent the transmission in a certain area.

**[Units]:** Set up units.

**[Installation] and [Factory]:** For use by the installer. See Installation Manual.

- Press the **ENTER** key to switch the cursor to the menu items column. The cursor in the menu column now turns gray and the cursor in the menu items column is yellow. The control moves to the menu items column.  
To switch the cursor from the menu items column to the menu column, use the **CANCEL/HL OFF** key. The color of the title bar of the active column is blue and of the inactive column in gray.
- Use ▲ or ▼ to select a menu item and press the **ENTER** key. A window with options for the related menu item appears.



*Display Color options*



*Echo Brill setting window*

### *Example windows*

- Use ▲ or ▼ to select an option or numeric value.
- Press the **ENTER** key to save your selection. To close the window without saving, press the **CANCEL/HL OFF** key.
- Press the **MENU** key to close the menu.

**Note:** The menus on the [IEC] and [Russian-River] types close automatically when there is no menu operation for 10 seconds, according to IEC regulations. The following menus and screens are excluded from this regulation:

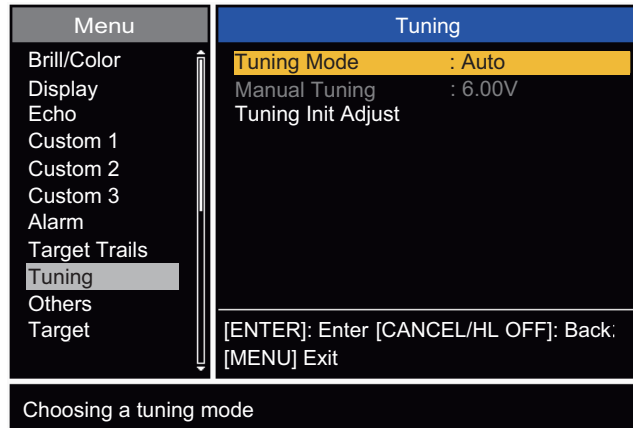
[Alarm message], [Alarm status], [Tuning Init Adjust], [GPS self test], [GPS satellite monitor], [System self test], [System LCD pattern], and [Auto installation setup]. The menus do not close automatically in the [River] or [Sea] configuration.

## 1.6 Tuning

In default, the radar receiver can be tuned automatically after you set the radar to TX.

If you require fine tuning in manual, do the following:

1. Transmit the radar and select the maximum range with the **RANGE** key.
2. Press the **MENU** key to open the menu.
3. Use ▲ or ▼ to select [Tuning] and press the **ENTER** key.



*Tuning menu*

4. Use ▲ or ▼ to select [Tuning Mode] and press the **ENTER** key.



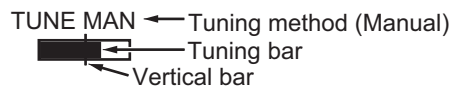
*Tuning Mode options*

5. Use ▲ or ▼ to select [Manual] and press the **ENTER** key.
6. Use ▲ or ▼ to select [Manual Tuning] and press the **ENTER** key.



*Manual Tuning setting window*

7. Use ▲ or ▼ to adjust the tuning while you look at the tuning bar in the upper-right corner of the display. The best tuning point is where the tuning bar moves to a maximum value. The vertical bar on the tuning bar shows the tuning voltage.



8. Press the **ENTER** key.
9. Press the **MENU** key to close the menu.

**Note:** If the automatic tuning does not give the correct tuning, run the [Tuning Init Adjust] again.

## 1.7 Display Modes

This radar has the display modes shown below. All modes except head up require a heading signal. The true motion mode additionally requires position data.

### Relative Motion (RM)

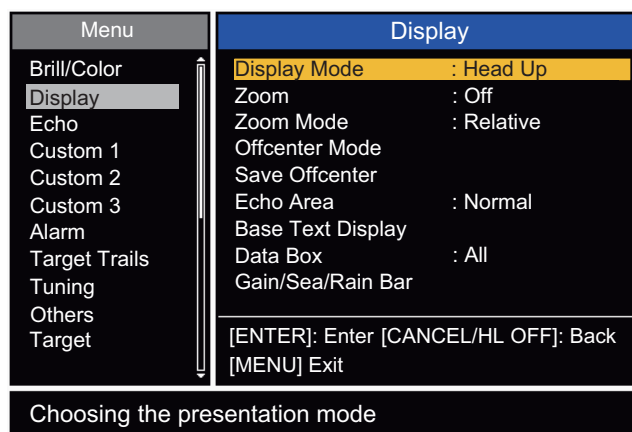
- [Head Up] (H UP)
- [Course Up] (C UP)
- [North Up] (N UP)
- [True View] (TRUE VIEW)

### True Motion

- [True Motion] (TM)

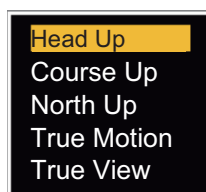
### 1.7.1 How to select the display mode

1. Press the **MENU** key to open the menu.
2. Use ▲ or ▼ to select [Display] and press the **ENTER** key.



#### *Display menu*

3. Use ▲ or ▼ to select [Display Mode] and press the **ENTER** key.



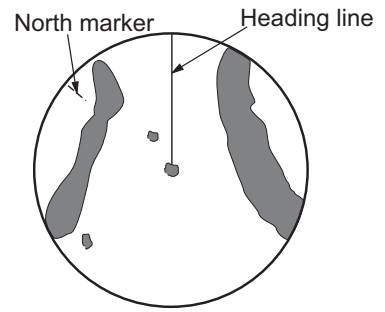
4. Use ▲ or ▼ to select a display mode and press the **ENTER** key.
5. Press the **MENU** key to close the menu.

**Note:** All modes except head up require a heading signal in AD-10 format or NMEA format. If the heading signal is lost, the mode is changed to head up and the north marker disappears. The display for heading is XXX.X and the alarm sounds. The message "GYRO" (AD-10 format data) or "NMEA\_HDG" (NMEA format data) appears in the alarm message display. To stop the audio alarm, press any key. When the heading signal is restored, check the heading. To check the heading, press the **F3** key. When the heading signal is restored, the current heading is displayed at the heading indication.

## 1.7.2 Description of display modes

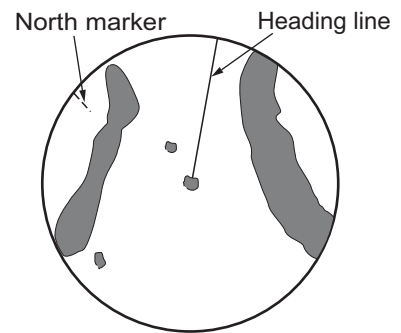
### Head up mode

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.



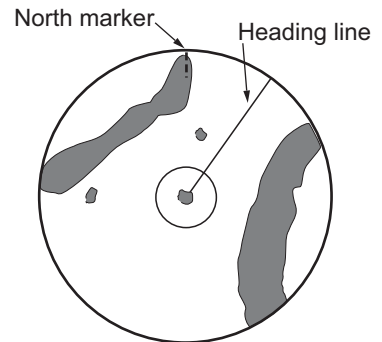
### Course up mode

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.



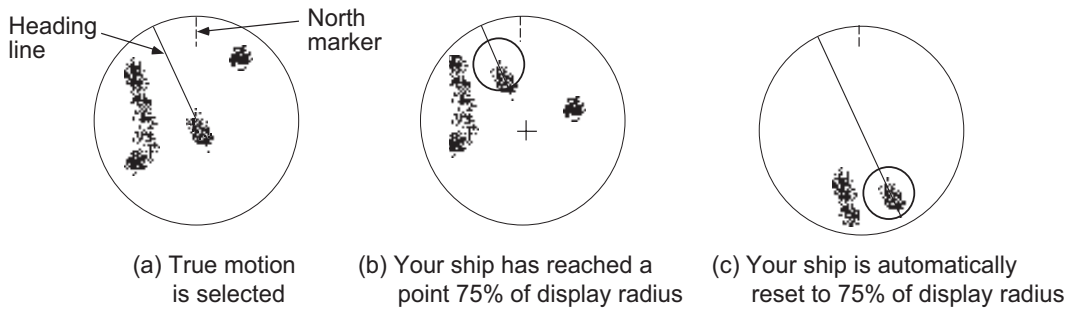
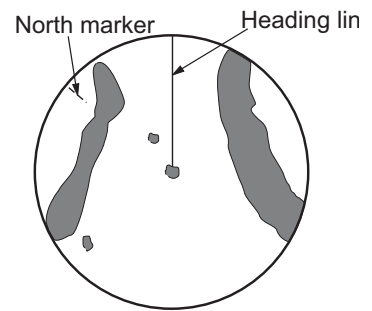
### North up mode

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.



**True motion mode**

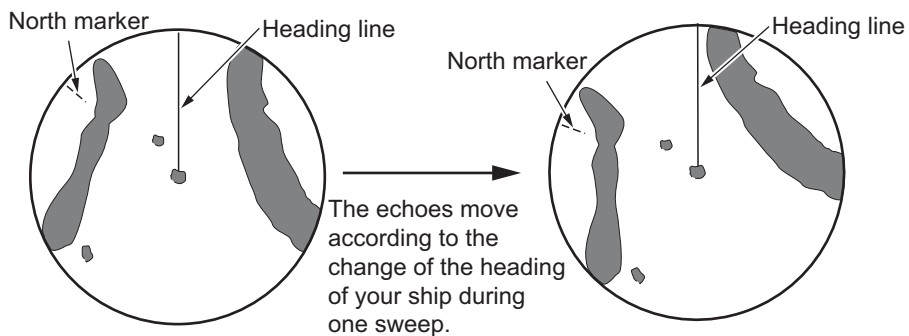
Your ship and other objects in motion move with their true courses and speed. All fixed targets, like landmasses, appear as fixed echoes in ground stabilized TM. When your ship reaches a point that is 75% of the radius of the display, the position is reset. The ship appears at 75% radius opposite to the extension of the heading line on the display center. You can manually reset your ship symbol if you press the **OFF CENTER** key.



*Example: Automatic reset of your ship marker in true motion mode*

**True view mode**

The echoes move in real time according to the change of the heading of your ship. The heading line is at the top of the screen. When the heading signal is lost, this function is not available and the display mode automatically changes to the head up mode. The [Wiper] is not available in this mode (see section 1.31).



## 1.8 How to Select a Range Scale

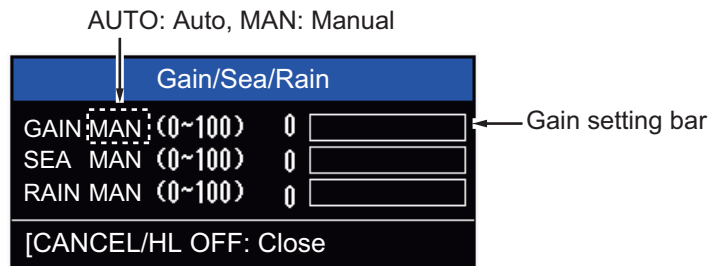
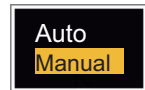
The selected range scale, range ring interval and pulselength are shown at the upper left corner on the screen. When an object target comes closer, reduce the range scale so that the target appears in 50-90% of the display radius.

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

## 1.9 How to Adjust the Gain (sensitivity)

The gain functions to adjust the sensitivity of the receiver for the best reception. The gain is adjusted automatically or manually.

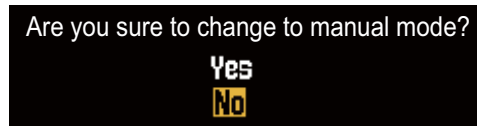
1. Press the **MENU** key to open the menu.
2. Use ▲ or ▼ and select [Echo] and press the **ENTER** key.
3. Use ▲ or ▼ to select [Gain Mode] and press the **ENTER** key.
4. Use ▲ or ▼ to select [Auto] or [Manual] and press the **ENTER** key. the window for Gain/Sea/Rain indicator shown below appears. This window closes automatically in the [River] or [Sea] mode when there is no menu operation for ten seconds. [Auto] is for adjusting the gain automatically. For [Manual] go to "Manual mode" below.



*Gain/Sea/Rain indicator*

5. Press the **CANCEL/HL OFF** key to close the window.
6. Press the **MENU** key to close the menu.

**Note:** To adjust the gain finely in [Auto] mode, rotate the **GAIN** knob. The confirmation message appears. If you select [Yes] the mode changes to [Manual] mode. Rotate the **Gain** knob to adjust the gain.



### Manual mode

1. Rotate the **GAIN** knob to adjust the gain so that weak noise appears on all of the screen. If the gain is too low, weak echoes are erased. If the gain is too high, the background noise hides weak targets.
2. Press the **CANCEL/HL OFF** key to close the window.

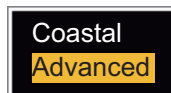


## 1.10 How to Reduce the Sea Clutter

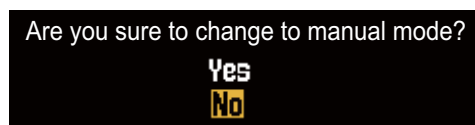
The reflected echoes from the waves appear around your ship and have the name "sea clutter". The sea clutter extends according to the height of waves and antenna above the water. When the sea clutter hides the targets, use the **A/C SEA** control to reduce the clutter, either manually or automatically.

### Auto mode

1. Press the **Menu** key to open the menu.
2. Use ▲ or ▼ to select [Echo] and press the **ENTER** key.
3. Use ▲ or ▼ to select [Sea Mode] and press the **ENTER** key.
4. Use ▲ or ▼ to select [Auto] or [Manual] and press the **ENTER** key. The window for Gain/Sea/Rain indicator appears. (Refer to the illustration of step 4 in section 1.9). If you selected [Auto], go to step 5. For [Manual], go to "Manual mode" below.
5. Press the **CANCEL/HL OFF** key to close the window. [Auto] is used to reduce the sea clutter automatically. If the sea clutter is strong while cruising along a coastline in the [Auto] mode, go to step 6. If not, go to step 9.
6. Use ▲ or ▼ to select [Auto Sea] and press the **ENTER** key.



7. Use ▲ or ▼ to select [Coastal] or [Advanced] then press the **ENTER** key. The window for Gain/Sea/Rain indicator appears for confirmation.  
**[Coastal]:** Suppress both land and sea clutter. For cruising along a coastline.  
**[Advanced]:** Automatically identify land echoes from sea reflections to suppress only sea reflections. Use this mode for general use.
8. Press the **CANCEL/HL OFF** key to close the menu.
9. Press the **MENU** key to close the menu,  
**Note:** When you want to adjust the sea clutter finely in [Auto] mode, rotate the **A/C SEA** knob. The confirmation window appears. If you select [Yes], the mode changes to [Manual] mode. Rotate the **A/C SEA** knob to adjust the sea clutter.



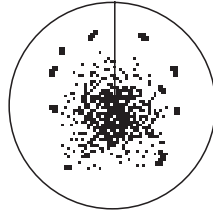
*Confirmation message*

### Manual mode

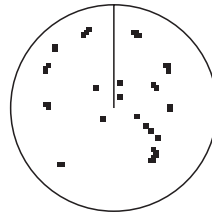
- 1) Rotate the **A/C SEA** knob to reduce the sea clutter.  
**Note:** When the setting of the **A/C SEA** control is correct, the clutter is broken into small dots, and small targets become identified. If the setting is not enough, targets are hidden in the clutter. If the setting is higher than necessary, both sea clutter and targets disappear from the display. Normally adjust the control until the clutter has disappeared to leeward, but a small amount of the clutter is visible windward.

## 1. OPERATION

- 2) Press the **CANCEL/HL OFF** key to close the window.



Sea clutter at screen center



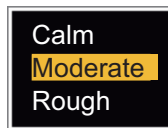
A/C SEA control adjusted;  
sea clutter reduced

### 1.11 How to Reduce the Rain Clutter

The reflections from the rain or snow appear on the screen. These reflections have the name "rain clutter". When the rain clutter is strong, targets in the rain clutter are hidden in the clutter. Reflections from the rain clutter are easily identified from true targets by their wool-like appearance. The **A/C RAIN** control, like the **A/C SEA** control, adjusts the receiver sensitivity, but in longer range. If the setting is high, the rain clutter is more reduced. The rain control breaks the continuous display of rain or snow reflections into a random pattern. When the rain clutter hides the targets, adjust the rain control (automatic or manual) to reduce the clutter.

#### Auto mode

1. Press the **MENU** key to open the menu.
2. Use ▲ or ▼ to select [Echo] and press the **ENTER** key.
3. Use ▲ or ▼ to select [Rain Mode] and press the **ENTER** key.
4. Use ▲ or ▼ to select [Auto] or [Manual] then press the **ENTER** key. The window for Gain/Sea/Rain indicator appears (refer to the illustration of step 4 at section 1.9). If you selected [Auto], go to step 5. For [Manual], go to "Manual mode" below.
5. Press the **CANCEL/HL OFF** key to close the window.
6. Use ▲ or ▼ to select [Auto Rain] and press the **ENTER** key.

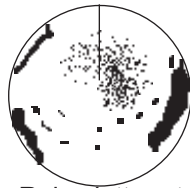


7. Use ▲ or ▼ to select [Calm], [Moderate] or [Rough] then press the **ENTER** key. The window for Gain/Sea/Rain indicator appears for confirmation.  
**[Calm]**: For light rain  
**[Moderate]**: When you cannot reduce the rain clutter with [Calm] mode  
**[Rough]**: For heavy rain
8. Press the **CANCEL/HL OFF** key to close the window.
9. Press the **MENU** key to close the menu.

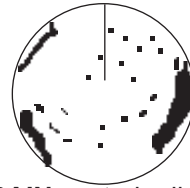
**Note:** When you want to adjust the rain clutter finely in [Auto] mode, rotate the **A/C RAIN** knob. The confirmation message appears. If you select [Yes], the mode changes to [Manual] mode. Rotate the **A/C RAIN** knob to adjust the rain clutter.

**Manual mode**

1. Rotate the **A/C RAIN** knob to reduce the rain clutter.
2. Press the **CANCEL/HL OFF** key to close the window.



Rain clutter at screen center

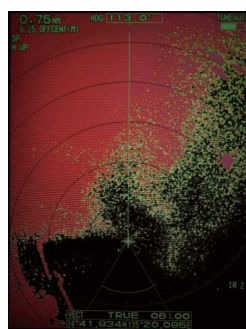
**A/C RAIN** control adjusted;  
rain clutter reduced**1.12 Automatic Adjustments of Sea and Rain Clutters**

When you can not correctly reduce the sea clutter or rain clutter with the related control, turn on the automatic anti-clutter feature. When this feature is turned on, "A/C AUTO" appears at the lower-right corner.

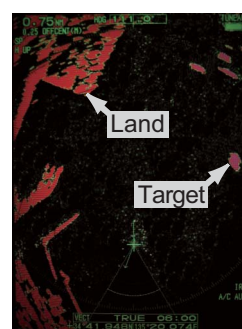
1. Press the **MENU** key to open the menu.
2. Use **▲** or **▼** to select [Echo] and press the **ENTER** key.
3. Use **▲** or **▼** to select [A/C Auto] and press the **ENTER** key.
4. Use **▲** or **▼** to select [Off] or [On] then press the **ENTER** key.
5. Press the **MENU** key to close the menu.

**Caution on use**

- Echoes that cover wide areas (like land and islands) can become smaller when the [A/C Auto] is used.
- When [A/C Auto] is active, the strength of a target in sea clutter or rain clutter can be lower than actual strength. In this case change to manual **A/C SEA** and manual **A/C RAIN** and adjust the picture.



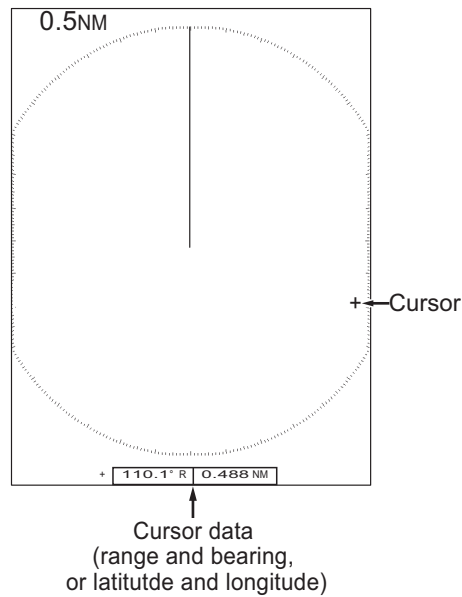
A/C Auto: Off



A/C Auto: On

## 1.13 Cursor

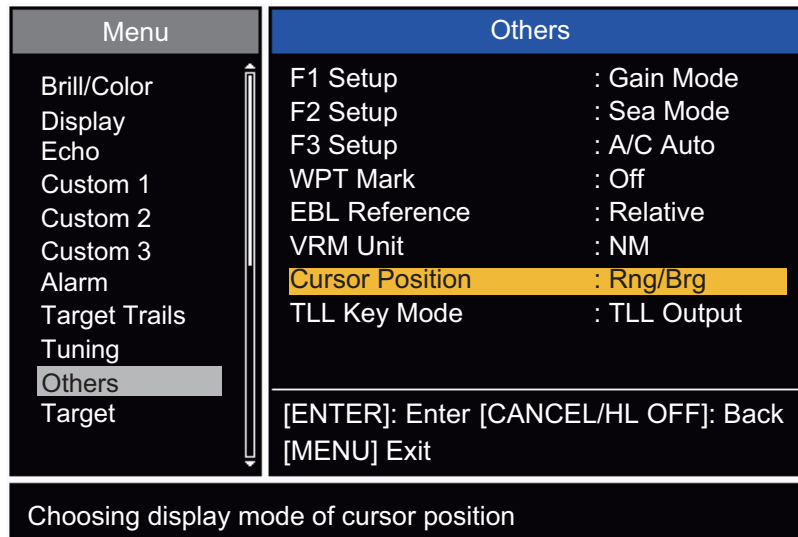
The cursor functions to find the range and bearing (default function) to a target or the latitude and longitude position of a target. Use the **CursorPad** to move the cursor into position and read the cursor data at the screen bottom.



### Cursor data

You can show the cursor data as range and bearing (from your ship to the cursor) or latitude and longitude. Position and heading signal are required.

1. Press the **MENU** key to open the menu.
2. Use ▲ or ▼ to select [Others] and press the **ENTER** key.



*Others menu*

- Use ▲ or ▼ to select [Cursor Position] and press the **ENTER** key.

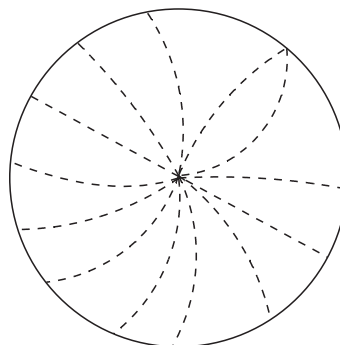


#### *Cursor Position options*

- Use ▲ or ▼ to select [Rng/Brg] (Range/Bearing) or [Lat/Lon] (Latitude/Longitude) then press the **ENTER** key. (When the navigation data box display is set to [Nav] or [All] in the [Display] menu, cursor latitude and longitude position cannot be displayed in the cursor data box.)
- Press the **MENU** key to close the menu.

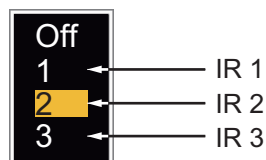
## 1.14 Interference Rejector

The radar interference can occur when your ship is near the radar of another ship that operates on the same frequency band with your radar. The interference shows on the screen as many bright dots. The dots can be random or in the shape of dotted lines that run from the center to the edge of the display. You can identify the interference from the normal echoes, because the interference does not appear in the same location at the next antenna rotation. When this feature is turned on, "IR 1", "IR 2" or "IR 3" appears at the lower-right corner.



*Interference*

- Press the **MENU** key to open the menu.
- Use ▲ or ▼ to select [Echo] and press the **ENTER** key.
- Use ▲ or ▼ to select [Int Rejector] and press the **ENTER** key.



#### *Indication at the lower-right corner of the display*

- Use ▲ or ▼ to select [Off], [1], [2] or [3] then press the **ENTER** key. [3] removes the interference the most.
- Press the **MENU** key to close the menu.

**Note:** When there is no interference, turn off the interference rejector so you do not miss the small targets.

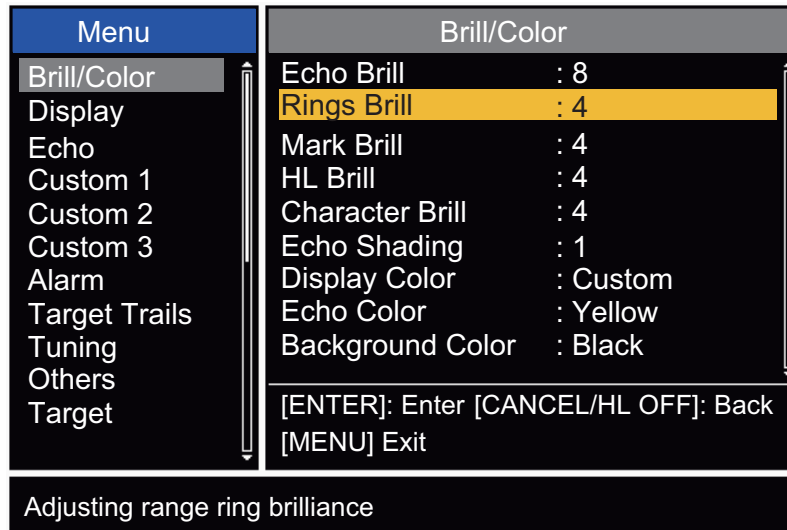
## 1.15 How to Measure the Range to a Target

You can measure the range to a target in three methods. You can use the fixed range rings, the cursor (if set to measure range and bearing) and the VRM (Variable Range Marker).

Use the fixed range rings to get a rough estimate of the range to a target. The fixed range rings are the concentric solid circles about your ship. The number of rings changes with the selected range scale. The interval of the range ring is displayed at the upper-left corner of the screen. Count the number of rings between the center of the display and the target. Check the range ring interval and measure the distance of the echo from the nearest ring.

### 1.15.1 How to adjust range ring brilliance

1. Press the **MENU** key to open the menu.
2. Use ▲ or ▼ to select [Brill/Color] and press the **ENTER** key.
3. Use ▲ or ▼ to select [Rings Brill] and press the **ENTER** key.



*Brill/Color menu*

4. Use ▲ or ▼ to select an option and press the **ENTER** key. [4] is the brightest. [Off] turns off the range rings.



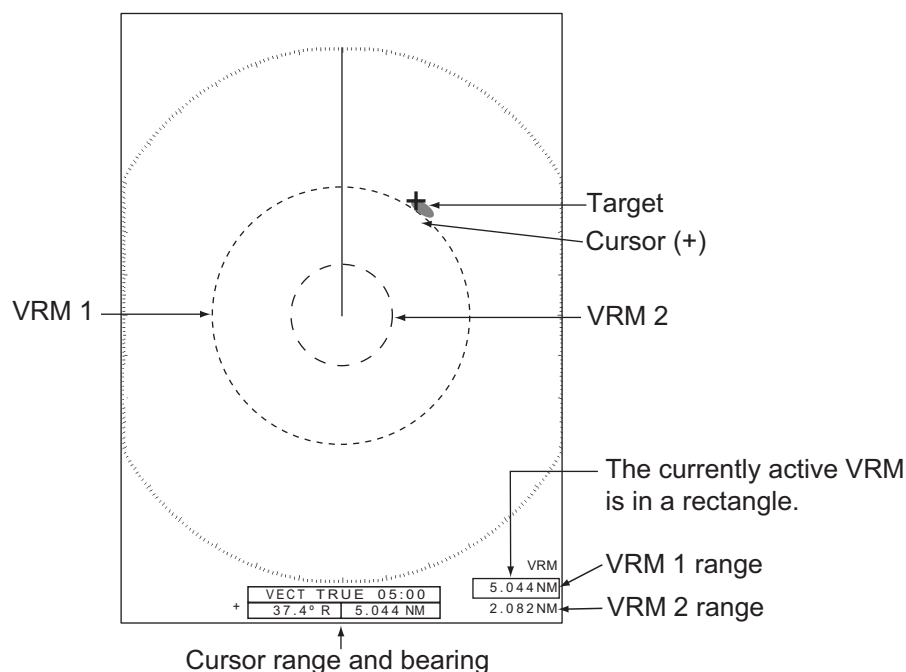
*Rings/Brill options*

5. Press the **MENU** key to close the menu.

### 1.15.2 How to measure the range with a VRM

There are two VRMs, No. 1 and No. 2. The VRMs are dashed rings so that you can identify the rings from the fixed range rings. You can identify VRM 1 from VRM 2 by different lengths of dashes. The dashes of the No. 1 VRM are shorter than those of the No. 2 VRM.

1. Press the **VRM** key to display either of the VRMs. Press the **VRM** key to change the active VRM between No. 1 and No. 2. The indication of the currently active VRM is in a rectangle.
2. Use the CursorPad to align the Variable Range Marker with the inner edge of the target. Read the distance at the lower-right corner of the screen. Each VRM remains at the same geographical distance when you operate the **RANGE** key. The size of the VRM ring changes in proportion to the selected range scale.
3. Press the **ENTER** key to anchor the VRM.
4. To erase a VRM, press the **VRM** key to activate the VRM and press the **CANCEL/HL OFF** key.



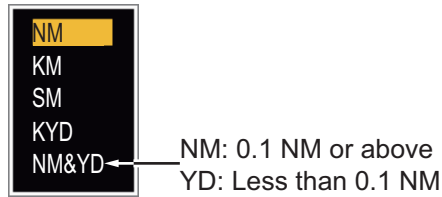
### 1.15.3 How to select VRM unit

You can select the unit of measurement used by the VRM. The selections are nautical miles (NM), kilometers (KM), statute miles (SM), kiloyard (KYD) or nautical miles and yards (NM&YD). The cursor range unit is also changed when the VRM unit is changed.

1. Press the **MENU** key to open the menu.
2. Use **▲** or **▼** to select [Others] and press the **ENTER** key.

## 1. OPERATION

- Use ▲ or ▼ to select [VRM Unit] and press the **ENTER** key.



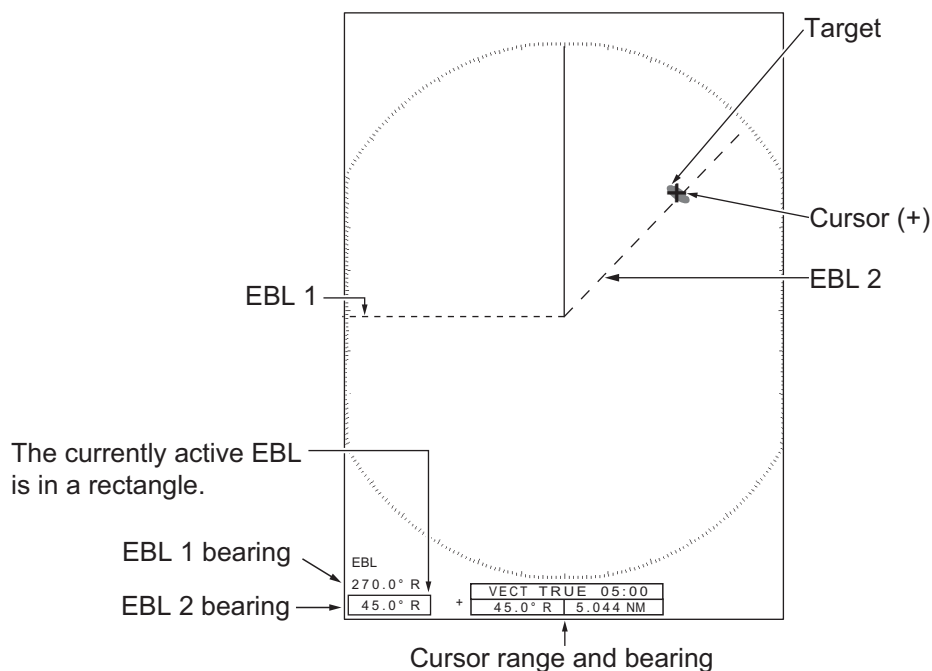
- Use ▲ or ▼ to select the unit and press the **ENTER** key.
- Press the **MENU** key to close the menu.

## 1.16 How to Measure the Bearing to a Target

Use the Electronic Bearing Line (EBL) to take a bearing of a target. There are two EBLs, No. 1 and No. 2. Each EBL is a straight dashed line from the center of the screen to the edge. The dashes of the No. 1 EBL are shorter than those of the No. 2 EBL.

### 1.16.1 How to measure the bearing with an EBL

- Press the **EBL** key to display either of the EBLs. Press the **EBL** key to change the active EBL between No. 1 and No. 2. The indication of the currently active EBL is in a rectangle.
- Use the **CursorPad** to put the EBL on the center of the target. Read the bearing at the lower-left corner of the screen.
- Press the **ENTER** key to anchor the EBL.
- To erase an EBL, press the **EBL** key to activate the EBL and press the **CANCEL/HL OFF** key.



*How to measure the bearing with the EBL*



## 1.16.2 EBL reference

"R" (relative) follows the EBL indication if the bearing is relative to the heading of your ship. "T" (true) follows the EBL indication if the bearing is in reference to the north. You can select relative or true in the head up and true view modes. The bearing indication is true in all other modes. True bearing requires a heading sensor.

1. Press the **MENU** key to open the menu.
2. Use ▲ or ▼ to select [Others] and press the **ENTER** key.
3. Use ▲ or ▼ to select [EBL Reference] and press the **ENTER** key.



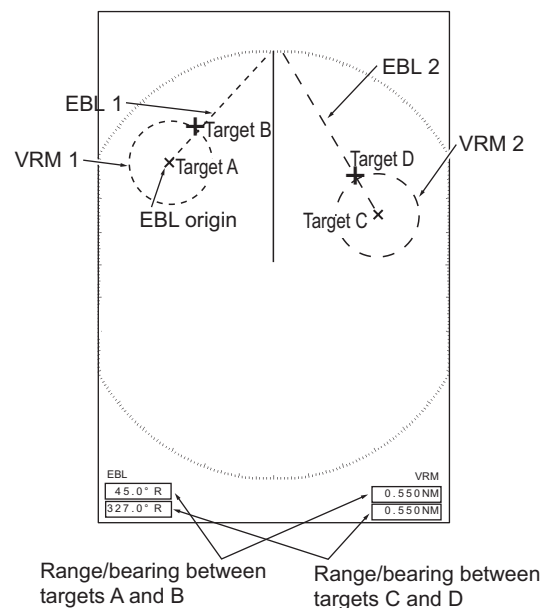
4. Use ▲ or ▼ to select [Relative] or [True] then press the **ENTER** key.
5. Press the **MENU** key to close the menu.

## 1.17 How to Measure the Range and Bearing Between Two Targets

You can move the origin of the EBL to measure the range and bearing between two targets.

1. Press the **EBL** key to select the bearing indication of EBL 1 or EBL 2. The indication of the currently active EBL is in a rectangle.
2. Use the **CursorPad** to put the cursor on the center of the target A.
3. Press the **OFF CENTER** key to move the origin of the EBL to the location selected at step 2.
4. Use the **CursorPad** to put the cursor on the center of the target B.
5. Press the **VRM** key to display the VRM having the same number as the EBL activated at step 1. The indication of the currently active VRM is in a rectangle.
6. Use the **CursorPad** to set the VRM on the inner edge of the target B.
7. Read the bearing and range indications at the bottom of the screen.

**Note:** When you press the **OFF CENTER** key in EBL operation, the origin of an EBL moves between the screen center and cursor location. To return the origin of an EBL to the screen center, press the **ENTER** key when the origin of an EBL is on the screen center.

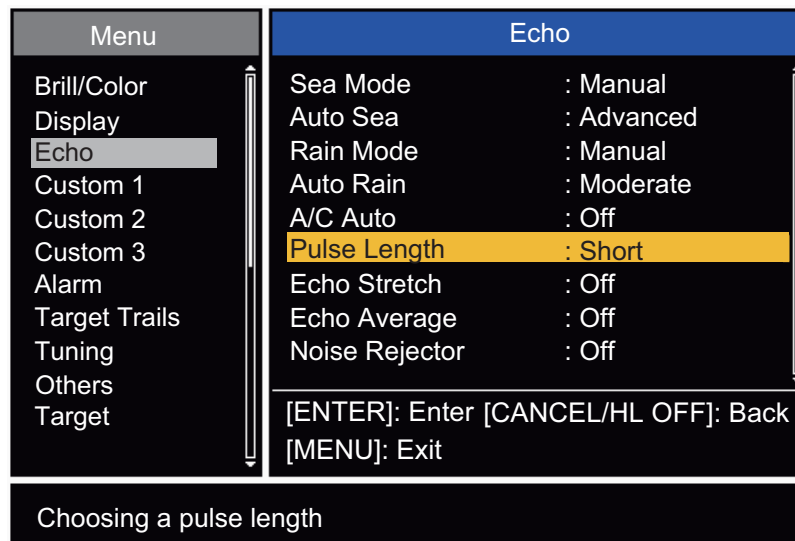


## 1.18 How to Select a Pulselength

The pulselength in use appears at the upper-left position on the screen. The pulse-lengths are set to each range scale and custom setup. You can change the pulse-length on the 1.5 nm, 1.6 nm, 3 nm or 3.2 nm range with the following procedure. Pulselength cannot be changed on other ranges. (You can change the pulselength on the 2 nm or 4 nm range in the [Russian-River] mode.) Use a longer pulse when your purpose is long range detection. Use a shorter pulse when the resolution is important.

**Note:** Press the **CUSTOM** key several times to activate the [Echo] menu until the [CS 1] (2, 3) indication (custom setting) disappears from the screen. See the illustration in section 1.3.

1. Press the **MENU** key to open the menu.
2. Use ▲ or ▼ to select [Echo] and press the **ENTER** key.



*Echo menu*

3. Use ▲ or ▼ to select [Pulse Length] and press the **ENTER** key



*Pulse Length options*

4. Use ▲ or ▼ to select [Short] or [Long] then press the **ENTER** key. The pulse-length indication at the upper-left corner changes according to your selection as shown below.
  - 1.5 nm or 1.6 nm (or 2 nm in the [Russian-River] mode): "SP" for [Short] pulse, "MP" for [Long] pulse
  - 3 nm or 3.2 nm (or 4 nm in the [Russian-River] mode): "MP" for [Short] pulse, "LP" for [Long] pulse
5. Press the **MENU** key to close the menu.