

FURUNO

OPERATOR'S MANUAL

RIVER RADAR

Model

FR-1908V-BB



(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

FURUNO ELECTRIC CO., LTD.

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• FURUNO Authorized Distributor/Dealer

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(MISU) FR-1908V-BB



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IMPORTANT NOTICES

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.
- SD, SDHC Logos are trademarks of SD-3C, LLC.

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

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.

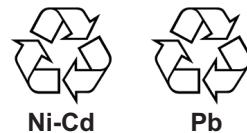
In the European Union

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

The operator must read the safety instructions before attempting to operate the equipment.



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



Warning, Caution



Prohibitive Action



Mandatory Action

WARNING



Do not open the equipment.

The equipment uses high voltage that can cause electrical shock. Refer any repair work to a qualified technician.



Before turning on the radar, be sure no one is near the antenna.

Prevent the potential risk of being struck by the rotating antenna, which can result in serious injury or death.



If water leaks into the equipment or something is dropped into the equipment, immediately turn off the power at the switchboard.

Fire or electrical shock can result.



If the equipment is giving off smoke or fire, immediately turn off the power at the switchboard.

Fire or electrical shock can result.



If you feel the equipment is acting abnormally or giving off strange noises, immediately turn off the power at the switchboard and contact a service technician.



Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.



Make sure no rain or water splash leaks into the equipment.

Fire or electrical shock can result if water leaks into the equipment.



Do not place liquid-filled containers on or near the equipment.

Fire or electrical shock can result if a liquid spills into the equipment.

WARNING



Do not operate the equipment with wet hands.

Electrical shock can result.



Keep objects away from the antenna unit, so as not to impede rotation of the antenna.

Fire, electrical shock or serious injury can result.



Use the proper fuse.

Use of the wrong fuse can cause fire or electrical shock.



Do not depend on one navigation device for the navigation of the ship. The navigator must check all aids available to confirm position.

- The TT (Target Tracking) automatically tracks an automatically or manually acquired radar target and calculates its course and speed, indicating them with a vector. Since the data generated by the TT depends on the selected radar targets, the radar must be optimally tuned for use with the TT, 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 sea and rain clutter controls and the gain control so that the target echoes do not disappear from the radar screen.

CAUTION

The data from AIS are intended for reference purposes only.

Check all available navigation aids to determine target movement.

 CAUTION
<p>The TT tracks and plots the movement of up to 100 radar targets and fully complies with IMO standards for TT.</p> <p>Tracking accuracy is affected by the following:</p> <ul style="list-style-type: none">• Tracking accuracy is affected by course change. One to two minutes is required to restore vectors to full accuracy after an abrupt 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 approx. 15-30 seconds for the higher relative speed; approx. 30-60 seconds for the lower relative speed. The following factors can affect accuracy:<ul style="list-style-type: none">- Echo intensity- Radar transmission pulse width- Radar bearing error- Gyrocompass error- Course change (own ship and target)
<p>The data generated by TT and AIS are intended for reference only.</p> <p>Refer to official nautical charts for detailed and up-to-date information.</p>

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FOREWORD

A Word to the Owner of the FR-1908V-BB Radar

Congratulations on your choice of the FR-1908V-BB Radar.

Please carefully read the safety information and operating instructions set forth in this manual before attempting to operate the equipment and conduct any maintenance. Your radar set will perform to the utmost of its ability only if it is operated and maintained in accordance with the correct procedures.

Features

The FR-1908V-BB consists of an antenna unit, processor unit, and control unit and is designed to meet the requirements of navigation radar used on inland waterways. Radar targets are displayed on a 19-inch high resolution display, in a single color or gradations of green or cyan according to echo strength. Following are the main features.

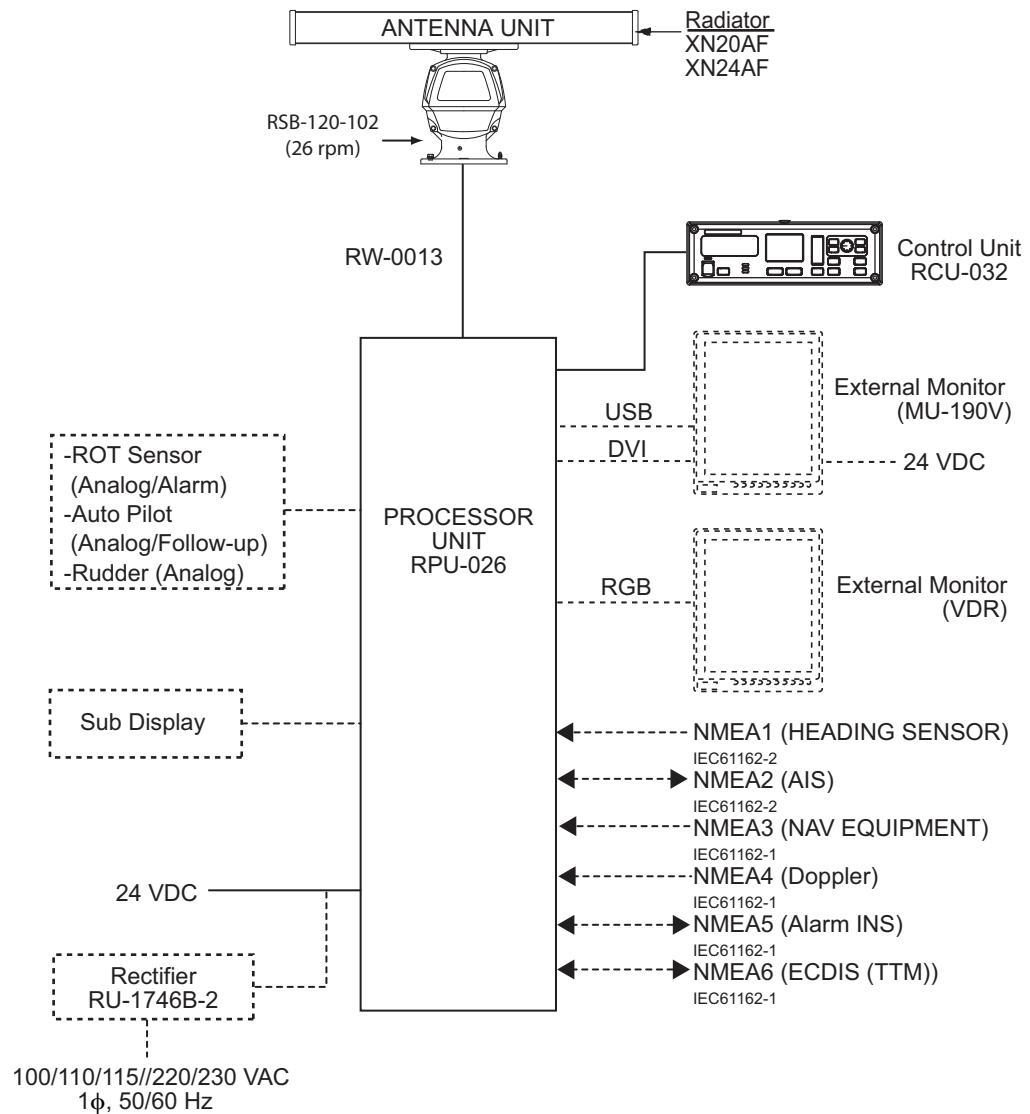
- Displays inland AIS targets
- Easy switching between River and Sea modes
- Automatic capture of the radar display
- Alarm history with Alarm log
- Graph displays: ROT, Rudder and AutoPilot
- TT (Track target) function to watch other ships' movement
- Large capacity memory - Mark/Line: max. 5,000 points, TT: 100 targets, AIS: 300 targets

Program No.

0359451-01.**

** denotes minor modifications.

SYSTEM CONFIGURATION



Category of Units

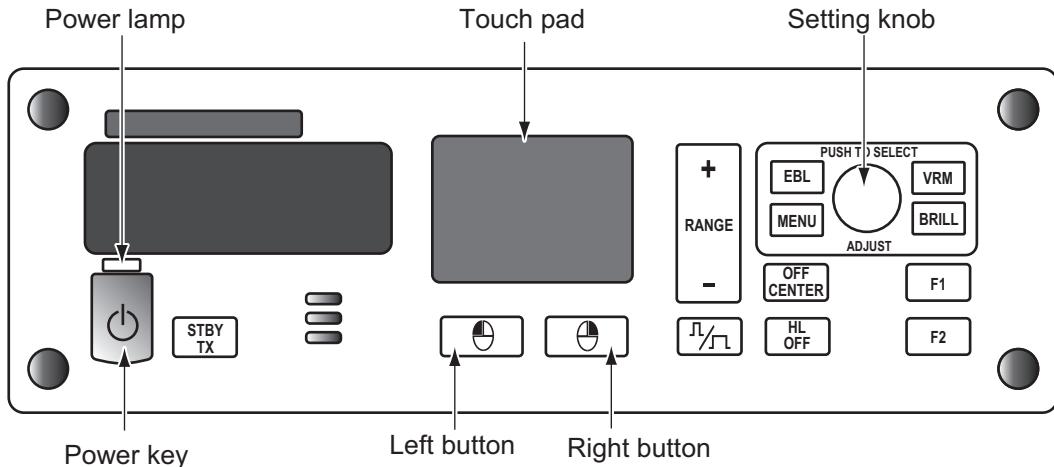
Antenna Unit: Exposed to the weather
All other units: Protected from the weather

SYSTEM CONFIGURATION

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1. OPERATION

1.1 Controls



Control	Function
Power key	Turn On/Off power. Power lamp lights when the power is turned on.
STBY/TX	Switch between stand-by and transmission.
Touch pad	Move the selection or the cursor.
Left-click	
Right-click	
RANGE	Select display range.
HL	Select the pulse width.
EBL	Display/Hide EBL (Electronic bearing line).
VRM	Display/Hide VRM (Variable range marker).
MENU	Display/Hide Menu window.
BRILL	Move the cursor on the [BRL] (brill) icon.
OFF CENTER	Off-center own ship position.
HL OFF	Hide the heading line temporarily.
F1, F2	Execute menu short cut assigned.
Setting knob	Operate EBL, VRM, Brilliance. Select the menu item.

1.2 How to Turn the Radar On/Off

1. Open the cover at the bottom left section on the control unit. Press the **Power** key to turn the radar on.
2. Press the **Power** key on the control unit to turn off the power.

1.3 How to Transmit

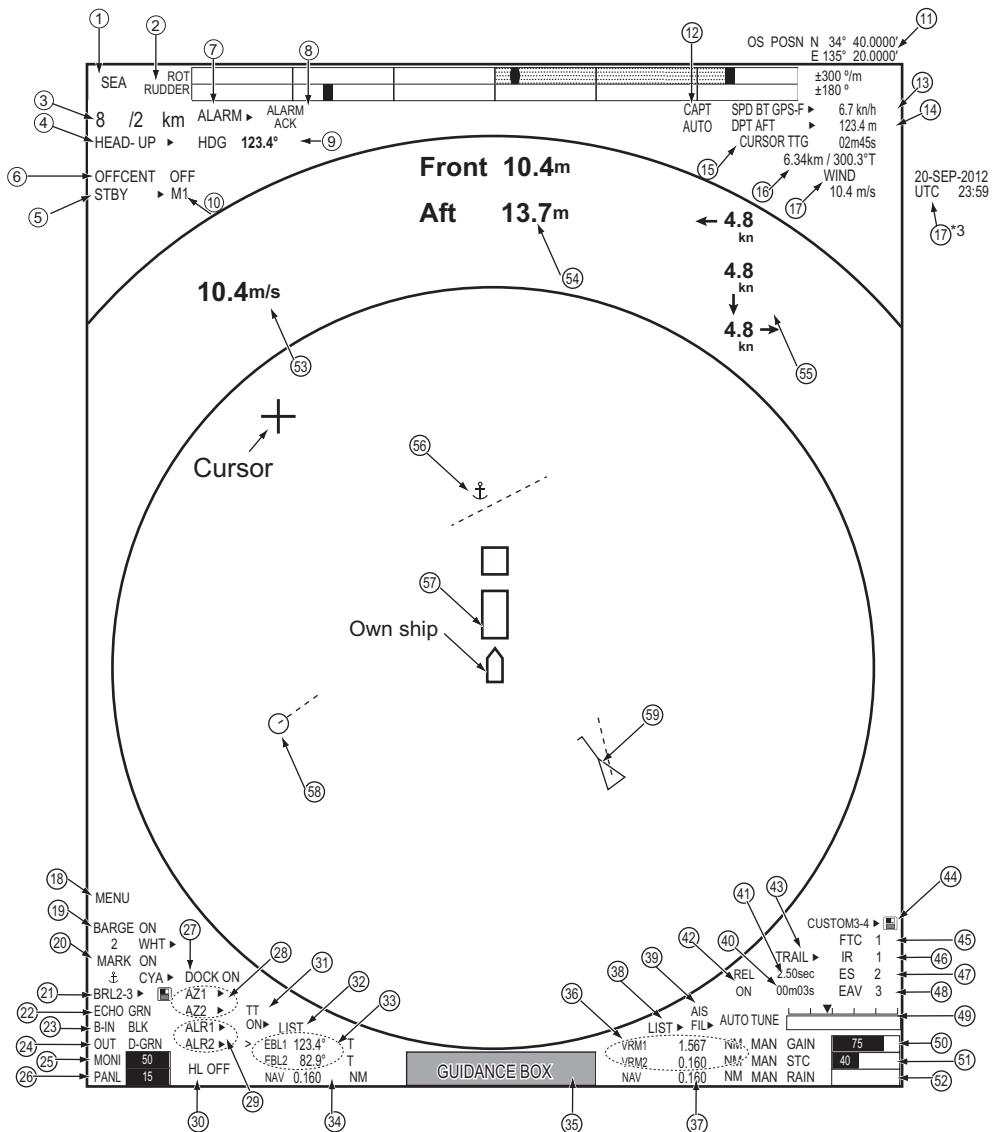
To transmit, press the **STBY/TX** key while [STBY] is displayed. Radar echoes are displayed on the screen with the previously used settings of range.

Each press of the **STBY/TX** key switches between stand-by and transmit (You can also switch between stand-by and transmission by clicking the [STBY/TX] indication.). The antenna is stopped in stand-by, and rotates in transmission.

The magnetron in the antenna unit generates the radar pulses and decays over time. To extend the life of the magnetron, keep the radar in stand-by when its use is not required.

1.4 Radar Display Indications

The illustration below shows all the icons and symbols (both in the [RIVER] and [SEA] modes) that may appear on the display. Some icons or symbols may not be shown depending on the display mode.



Radar display example

No.	Icon/Symbol	No.	Icon/Symbol
1	Operation mode	2	ROT/Rudder graph
3	Range/Range ring interval	4	Orientation mode
5	Standby/Transmit	6	Off-center
7	Generated alarm	8	Alarm acknowledge
9	Heading	10	Pulse width
11* ³	Own ship position (Lat/Lon)	12	Capture
13	Ship speed	14	Depth
15	Time to go to cursor position	16	Cursor position
17	Wind speed or Date/Time* ³	18	Menu
19* ¹	Barge Mark	20* ¹	Mark
21	Brilliance set	22	Echo color
23	Background color (effective display area)	24	Background color (outside effective display area)
25	Monitor brill	26	Panel dimmer
27	Docking mode	28* ²	Acquisition zone 1, 2
29* ²	Target alarm 1, 2	30	Heading line Off
31* ²	Target tracking	32* ²	TT (Target tracking) list
33	EBL 1, 2	34	Nav line (port)
35	Guidance box	36	VRM 1, 2
37	Nav line (starboard)	38	AIS list
39	AIS	40	Trail elapsed time
41	Trail time	42	Trail mode (Relative or True)
43	Trail	44	Custom setting name
45	FTC	46	Interference rejection
47	Echo stretch	48	Echo average
49	Tuning	50	Gain
51	STC	52	Rain
53	Wind speed	54	Dual depth
55	Ship's speed and movement at fore, midpoint and aft	56	Mark, Line
57* ¹	Barge	58* ¹	TT symbol
59* ²	AIS symbol		

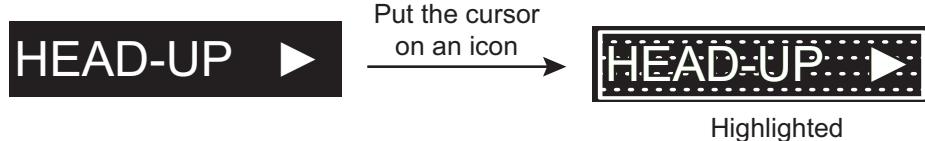
*¹: River mode only*²: Sea mode only*³: Off by default

1.5 Menu Operation

1.5.1 How to operate the radar from the icons

How to select the menu icon on the screen

Use the touch pad to select an icon. The icon is highlighted when correctly selected.

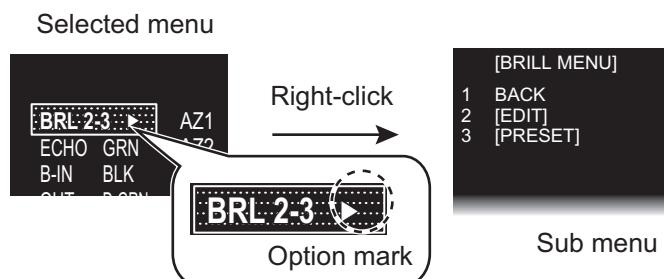


Operations available with the left button

- Open the main menu when the [MENU] icon is selected (see paragraph 1.5.2).
- Select options related to the selected icon cyclically.

Operations available with the right button

Opens the sub menu window for the menu icon with the option mark (triangle).

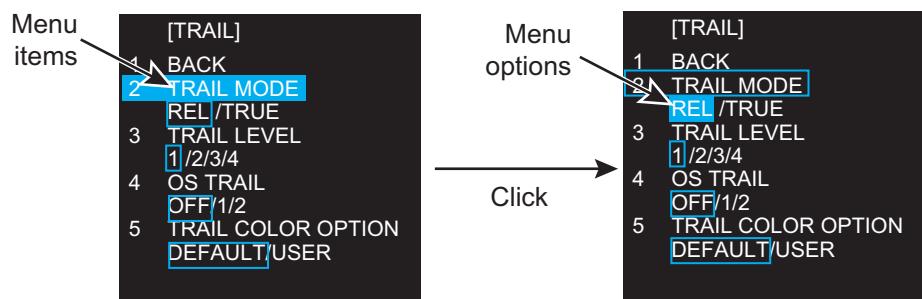


Operation available with the setting knob

- Rotation: Change the setting value on the setting box (clockwise to decrease the value, counterclockwise to increase the value).
- Press: Move the cursor on the setting box respectively among [GAIN], [STC] and [RAIN].

How to select the menu items on the menu window

1. Use the touch pad to select the menu item. The selected menu item is enclosed with a rectangle.
2. Use the touch pad to select an option. The selected option is enclosed with a rectangle.



Click outside the menu window to close the menu window.

Mouse operation

A mouse can be connected to the processor unit to control radar functions. The table below compares operation with the control unit and mouse.

Note: Connect the USB mouse to the processor unit directly. Do not use a USB hub when connecting the USB mouse to the processor unit.

Control unit	Mouse
Cursor movement by touch pad	Cursor movement by mouse operation
Left button press	Left-click
Right button press	Right-click
Setting knob rotation	<ul style="list-style-type: none"> • Wheel rotation • Cursor movement when selecting menus
Setting knob press	Wheel press

1.5.2 Menu window

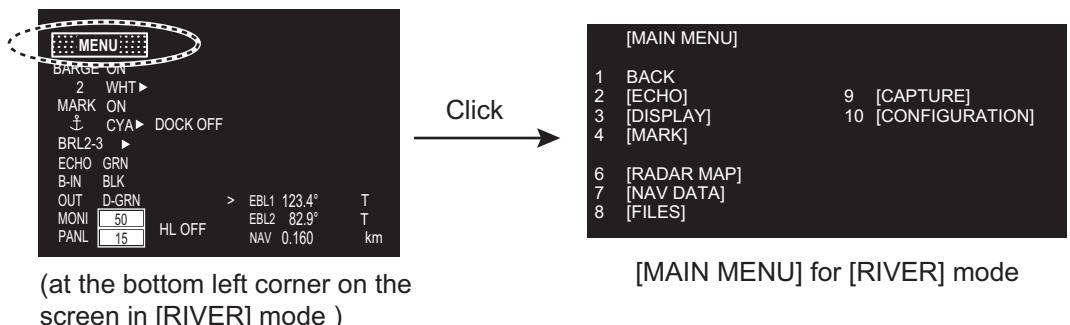
Main menu

To open the main menu, put the cursor on the [MENU] icon.

Note: Hereafter, placement of the cursor and operation of the left button are omitted in procedures done with icons. For example, the above sentence would be written as "Click the [MENU] icon."

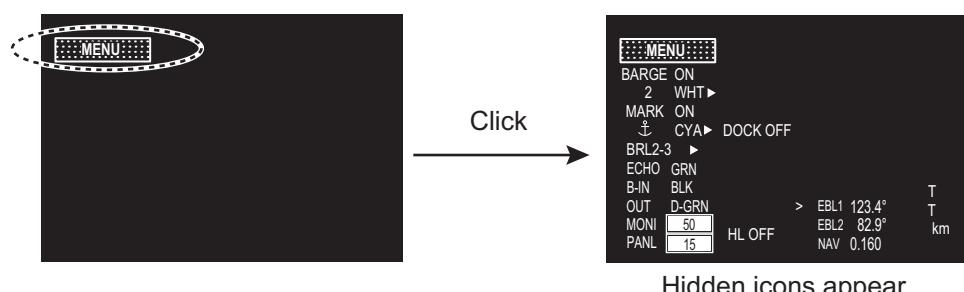
To close the main menu, left-click or right-click outside the menu window. Also, if no operation for specified duration*, the main menu is closed automatically.

*: Sets the duration on the [AUTO-CLOSING TIME] menu.



1.5.3 How to show the hidden icons

If the radar can be set to hide some icons after a specified interval, click the [MENU] icon to display the hidden icons.



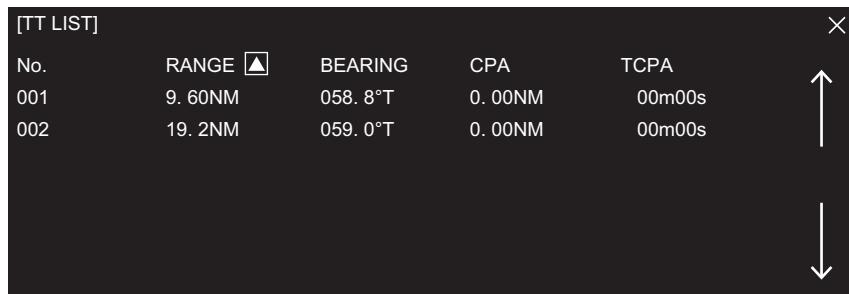
1. OPERATION

1.5.4 List windows

There are three list windows (TT, AIS and Alarm) and they provide information about tracking targets, AIS targets and generated alarms.

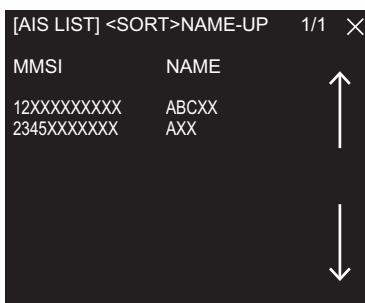
- TT list: Click the [LIST] icon for TT at the bottom of the display to show the TT list.

[TT LIST]				
No.	RANGE	BEARING	CPA	TCPA
001	9. 60NM	058. 8°T	0. 00NM	00m00s
002	19. 2NM	059. 0°T	0. 00NM	00m00s



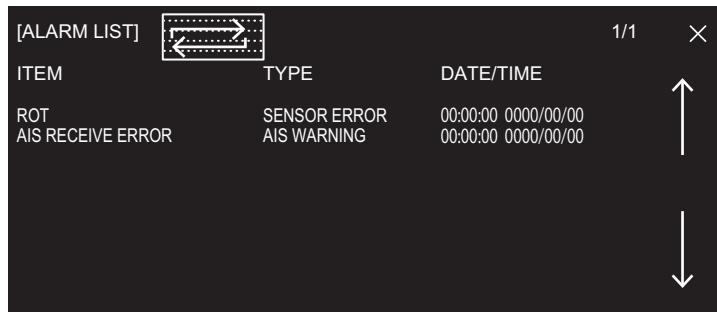
- AIS list: Click the [LIST] icon for AIS at the bottom of the display to show the AIS list.

[AIS LIST] <SORT>NAME-UP 1/1 X	
MMSI	NAME
12XXXXXXXXXX	ABCXX
2345XXXXXXXX	AXX



- Alarm list: Right-click the [ALARM] icon at the top left corner then click [3 ALARM LIST/HISTORY] to show the Alarm list.

[ALARM LIST]		
ITEM	TYPE	DATE/TIME
ROT	SENSOR ERROR	00:00:00 0000/00/00
AIS RECEIVE ERROR	AIS WARNING	00:00:00 0000/00/00



How to close a list window

Click the close button (x) at the top right corner of the list window. Alternately, right-click or left-click outside the window.

1.6 How to Adjust Display Brilliance, Panel Dimmer

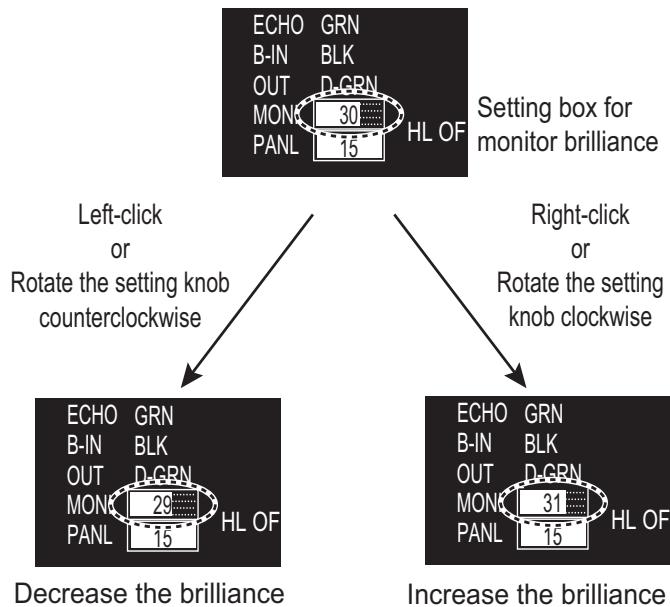
1.6.1 Display brilliance

You can adjust the display brilliance (setting range: 0 to 50) with the [MONI] icon. The connection between the processor unit and the monitor unit MU-190RH with the USB cable (supplied) is required. See the Operator's manual of MU-190RH.

Note: This function is available when the following menus of MU-190RH are set as below:

- [AUTO DIMMER]: [OFF]
- [EXT BRILL CTRL]: [ON]

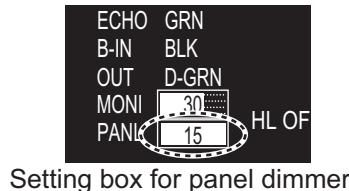
1. Click the setting box for display brilliance at the bottom left corner of the screen.
2. Press the left button to decrease the brilliance; the right button to increase the brilliance. With mouse connection, rotate the wheel or click the right or left button to adjust the brilliance.



1.6.2 Panel dimmer

The backlighting for the keys on the control unit can be adjusted as follows:

1. Click the setting box for panel dimmer at the bottom left corner on the screen.

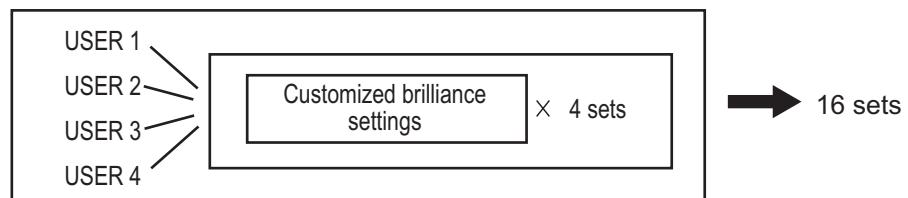


2. Press the left button to decrease the dimmer; the right button to increase the dimmer. With mouse connection, rotate the wheel or click the right or left button to adjust the panel dimmer.

1.6.3 Brilliance Sets

This radar provides customized sets of brilliance to match any ambient lighting condition. Four sets of customized brilliance settings are available for four users each, for a total of 16 sets.

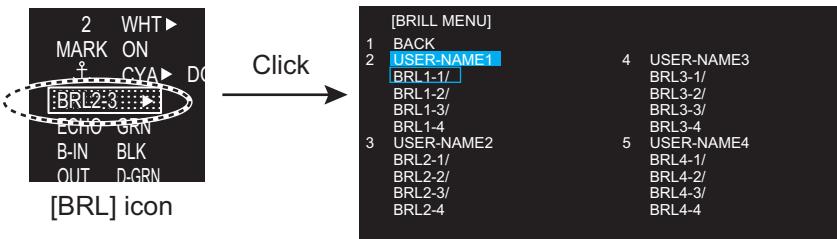
When the radar is powered on, the display is shown with the maximum brilliance setting. Select the appropriate brilliance, depending on the environment.



1. OPERATION

How to select a customized brilliance set

1. Click the [BRL] icon at the bottom left corner on the screen to show the [BRILL MENU] window.



2. Click the user name and the required brilliance set.
3. Click outside the menu window to close the menu.

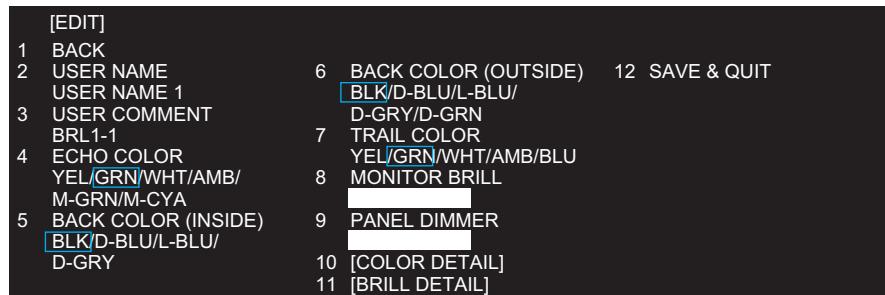
How to edit [BRILL MENU]

You can edit the menu contents for each brilliance set.

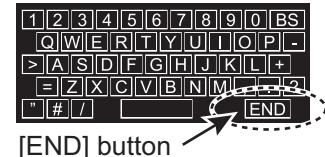
1. Right-click the [BRL] icon at the bottom left corner on the screen to show the [BRILL MENU] window.

Note: The [BRL1-1] setting is fixed as a default setting. You can edit the setting, but when the system is turned off, the default setting is restored. To save a custom brilliance set, select a setting other than [BRL1-1].

2. Click [EDIT].

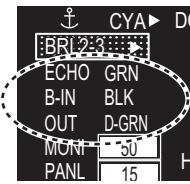


3. Click [USER NAME].
4. To edit the name, click the name column then enter the name with the software keyboard. Click the [END] button to finish.
 - Change the digit: Rotate scrollwheel.
 - Delete a character: Use the [BS] button on the software keyboard.
5. Click [USER COMMENT] to edit. The editing procedure is the same as that for [USER NAME]. Refer to step 4.
6. To edit the comment, click the respective BRL column then enter the comment with the software keyboard. Click the [END] button to finish.
7. Click the menu item, [4 ECHO COLOR] to [11 BRILL DETAIL], to edit.
8. Set the option for each menu item as appropriate.
9. Click [SAVE & QUIT] to save the settings.



1.7 Color Scheme

You can select the color for echo and background color (inside/outside) with the display icons.



Click the icon to change the color.

Available colors

Available options (Each color is selectable respectively)						
[ECHO COLOR]	YEL (yellow)	GRN (green)	WHT (white)	AMB (amber)	M-GRN*	M-CYA*
[BACK COLOR (INSIDE)]	BLK (black)	D-BLU (dark blue)	L-BLU (light blue)	D-GRY (dark gray)	—	—
[BACK COLOR (OUTSIDE)]	BLK (black)	D-BLU (dark blue)	L-BLU (light blue)	D-GRY (dark gray)	D-GRN (dark green)	—

You can set the customized color for the following items on [COLOR DETAIL].

- Echo color
- Back color (effective display area)
- Fixed range ring color
- Back color (outside effective display area)
- Gyro scale color
- Trail color
- Alarm indication
- Character color
- Cursor color

1. Right-click the [BRL] icon at the bottom left corner on the screen to show the [BRILL MENU] window.
2. Click [EDIT].
3. Click [COLOR DETAIL].



4. Set the option for each menu item as appropriate.
5. Click [SAVE & QUIT] to save the settings.

1. OPERATION

Default settings for [USER 1] to [USER 4]

		Available options (Each color is selectable)					
		[USER 1]	[USER 2]	[USER 3]	[USER 4]		
[ECHO COLOR]		GRN (green)		WHT (white)			
[BACK COLOR (INSIDE)]		BLK (black)					
[BACK COLOR (OUTSIDE)]		BLK (black)	D-BLU (dark blue)	D-GRY (dark gray)	D-GRN (dark green)		
[TRAIL COLOR]		GRN (green)	WHT (white)	GRN (green)	GRN (green)		
[COLOR DETAIL]	[CHARACTER]	WHT (white)					
	[FIXED RING]	WHT (white)					
	[GYRO RING]	GRN (green)		WHT (white)			
	[EBL/VRM/NAV LINE]	GRN (green)					
	[ALARM]	RED					
	[CURSOR]	GRN (green)					

Available colors

		Available options (Each color is selectable)					
[ECHO COLOR]	YEL (yellow)	GRN (green)	WHT (white)	AMB (amber)	M-GRN*	M-CYA*	
[BACK COLOR (INSIDE)]	BLK (black)	D-BLU (dark blue)	L-BLU (light blue)	D-GRY (dark gray)	—	—	
[BACK COLOR (OUTSIDE)]	BLK (black)	D-BLU (dark blue)	L-BLU (light blue)	D-GRY (dark gray)	D-GRN (dark green)	—	
[TRAIL COLOR]	YEL (yellow)	GRN (green)	WHT (white)	AMB (amber)	BLU (Blue)	—	
[COLOR DETAIL]	[CHARACTER]	GRN (green)	RED	WHT (white)	—	—	—
	[FIXED RING]	GRN (green)	WHT (white)	—	—	—	—
	[GYRO RING]	L-BLU (light blue)	RED	GRN (green)	WHT (white)	—	—
	[EBL/VRM/NAV LINE]	L-BLU (light blue)	GRN (green)	WHT (white)	—	—	—
	[ALARM]	RED	WHT (white)	—	—	—	—
	[CURSOR]	GRN (green)	WHT (white)	—	—	—	—

*: [M-GRN]: Multi-green (green gradation), for [SEA] mode only

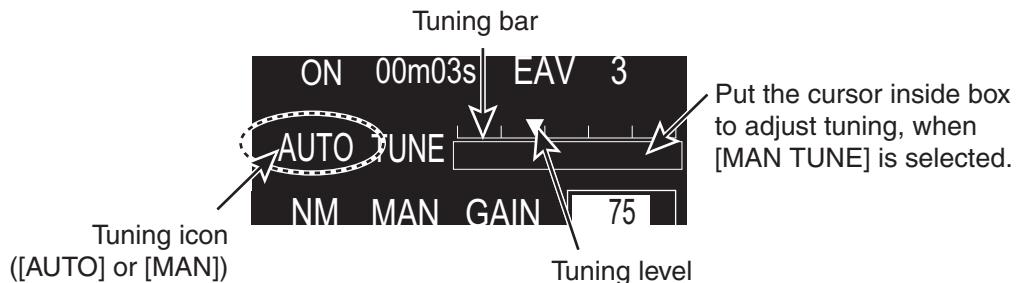
[M-CYA]: Multi-cyan (cyan gradation), for [SEA] mode only

1.8 Tuning

1.8.1 How to select the tuning method

The tuning method, auto tuning or manual tuning, can be selected with the tuning icon as follows.

Click the tuning icon ([AUTO] or [MAN]) at the bottom right corner on the screen to switch between [AUTO] and [MAN].



1.8.2 Automatic tuning

Click the tuning icon to select [AUTO] referring to paragraph 1.8.1.

1.8.3 Manual tuning

1. Click the tuning icon to select [MAN] referring to paragraph 1.8.1.
2. Put the cursor on the tuning bar.
3. Rotate the setting knob to adjust the tuning. The best tuning point is where the bar swings maximum. The triangle in the bar graph shows tuning level; not the tuning condition.

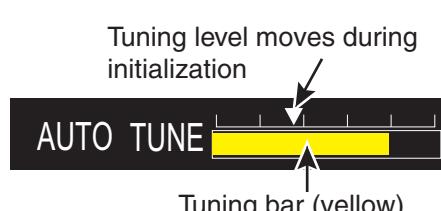
1.8.4 How to initialize tuning

Automatic tuning is initialized during the installation.

However, if you feel that automatic tuning is not working properly try re-initializing the tuning. Open [MAIN MENU] then click [ECHO] to open [ECHO] menu. Then click [TUNE INITIALIZE] to start the initialization.



The tuning bar turns yellow and moves during the initialization.



Note 1: The display may appear incorrect during initialization, caused by changes in pulse or tuning levels.

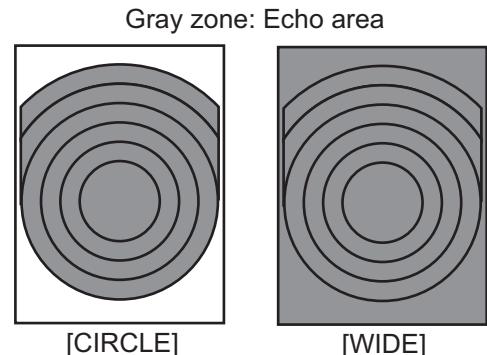
Note 2: The following operations cancel the initialization process.

- Change of range
- Go [STBY] mode
- Change of pulse width

1.9 Echo Area

The echo display area can be selected for [CIRCLE] or [WIDE], in the [SEA] mode.

1. Open [MAIN MENU], click [DISPLAY].
2. Click [ECHO AREA] then select the option.
 [CIRCLE]: Echoes in the radar circle.
 [WIDE]: Echoes in the whole of the display
3. Click outside the menu window to close the menu.



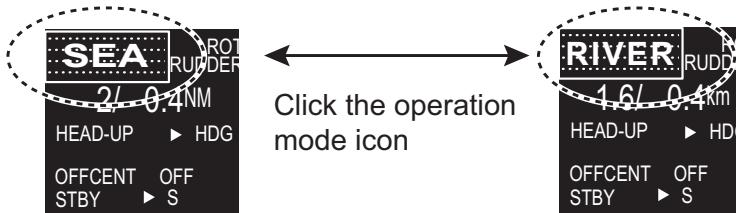
1.10 Operation Modes

This radar has two operating modes: river mode and sea mode.

- The river mode provides the radar display used at river.
- The sea mode provides the traditional radar display.

1.10.1 How to select an operation mode

Click the operation mode icon at the top left corner of the screen to select [RIVER] or [SEA].



Note 1: To enable switching of the operation mode, the [OPERATION TYPE] setting, in the [SERVICE MENU], must be set to [RIVER-SEA]. See your dealer.

Note 2: To change the operation mode ([RIVER] or [SEA]), go to [STBY] once to select the operation mode then go to [TX] mode.

The following items are set according to the operation mode.

- Orientation mode
- Range
- Units
- Screen size (River mode: circle* only, Sea mode: circle* and wide*)

*: See section 1.9.

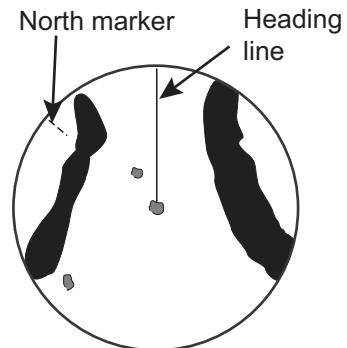
1.10.2 Orientation mode

Relative motion (RM)

In relative motion, own ship position is stationary on the screen to observe relative motion of surrounding targets.

- **HEAD UP**

The head-up mode is a display in which the line connecting own ship and the top of the display indicates own ship's heading. The target pips are painted at their measured distances and in their directions relative to own ship's heading. The short line on the bearing scale is the north marker, which indicates heading sensor north.



- **HEAD UP (TB)**

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 rotates in accordance with the heading sensor signal, enabling you to know own ship's heading at a glance.

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

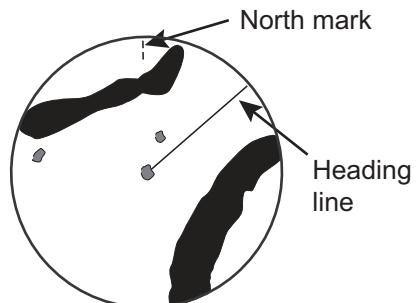
- **STERN UP**

A display without azimuth stabilization in which the line that connects the center with the top of the display indicates your stern.

- **NORTH UP**

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

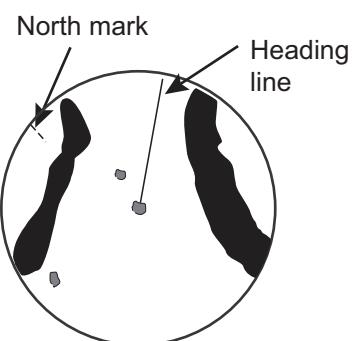
If the compass fails, the orientation mode changes to head-up and the north marker disappears.



- **COURSE UP**

The course-up mode is an azimuth stabilized display in which a line connecting the center with the top of the display indicates own ship's intended course (namely, own ship's previous heading just before this mode has been selected). Target pips are painted at their measured distances and in their directions relative to the intended course, which is maintained at the 0-degree position.

The heading line moves in accordance with ship's yawing and course change.



1. OPERATION

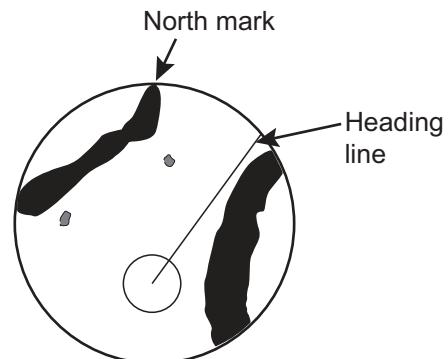
True motion (TM)

- **NORTH UP**

Ground (or water mass) is stabilized with compass and speed inputs. Your ship and other objects in motion move with their true courses and speed.

- **COURSE UP**

Own ship and other moving objects move in accordance with their true courses and speed. In ground stabilized TM, all fixed targets, such as landmasses, appear as stationary echoes. In the sea stabilized TM without set and drift inputs, the landmass can move on the screen.



Mode availability

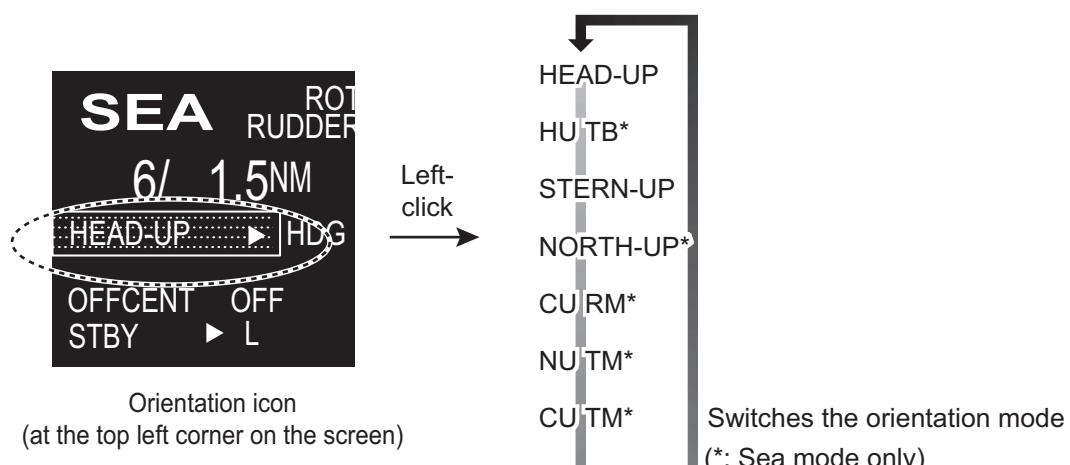
Orientation mode	Data		Availability	
	Heading	L/L	[RIVER] mode	[SEA] mode
Head up RM			Yes	Yes
Head up RM (TB)	✓		No	Yes
Stern up RM			Yes	Yes
North up RM	✓		No	Yes
Course up RM	✓		No	Yes
North up TM	✓	✓	No	Yes
Course up TM	✓	✓	No	Yes

✓: The necessary data to enable the operation mode.

1.10.3 How to select an orientation mode

Select the orientation mode icon then press the left button to select an orientation mode.

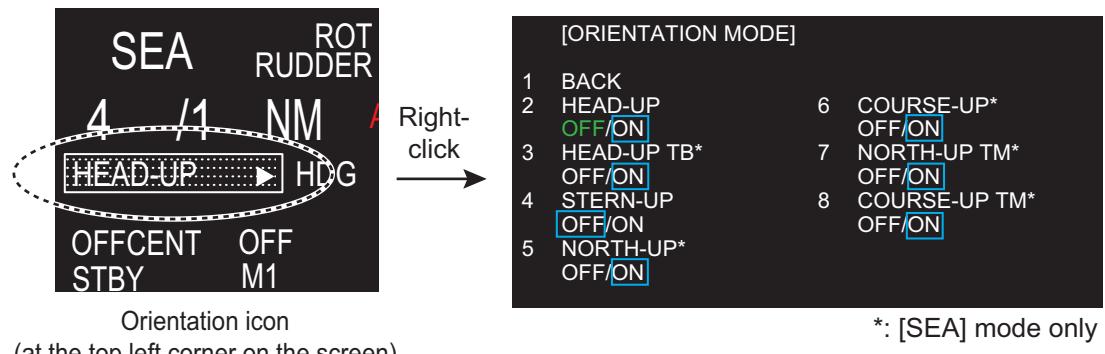
Note: You can not set [HEAD-UP] to [OFF].



1.10.4 How to change orientation mode presets

Seven orientation modes are available in the [SEA] mode, two orientation modes in the [RIVER] mode. You can remove unnecessary modes from the Orientation icon as follows.

1. Right-click the orientation icon to show the [ORIENTATION MODE] window.

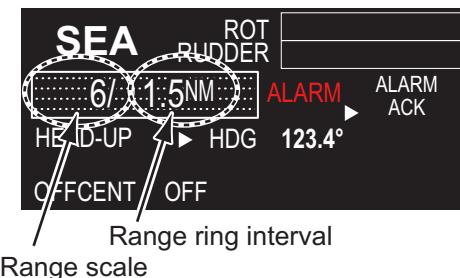


2. Click the mode to set.
3. Click [ON] or [OFF]. Any mode set to [OFF] is removed from the Orientation icon.
Note: You can not set [HEAD-UP] to [OFF].
4. Click outside the menu window to close the menu.

1.11 How to Select the Range Scale

The selected range scale, range ring interval and pulse width are shown at the top 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.

The available units for range are NM, KM, SM, and KYD. You can change the unit when installed.



Left-click the range scale icon to decrease the range: right-click to increase the range.



1. OPERATION

Range for River mode

In River mode, the default unit is SM.

Range (SM)	Range ring interval (SM)
0.125	0.025
0.25	0.05
0.5	0.1
0.8	0.2
1.2	0.2
1.6	0.4
2	0.4
4	1
8	2
16	4
32	8
64	16

Range for Sea mode

In Sea mode, the default unit is NM.

Range (NM)	Range ring interval (NM)
0.125	0.025
0.25	0.05
0.5	0.1
0.75	0.25
1	0.25
1.5	0.25
2	0.4
3	0.5
4	1
6	1
8	2
12	2
16	4
24	4
32	8
48	8
64	16

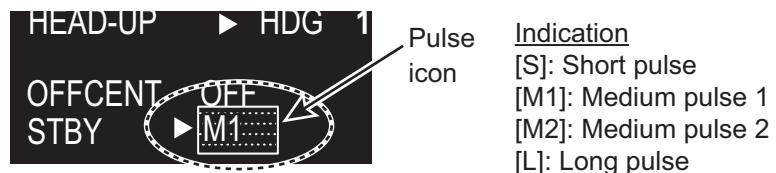
1.12 Pulse width

The pulse width in use is displayed at the top left corner on the screen. The pulse widths are set to each range scale and custom setup. Use a longer pulse width when your purpose is long range detection. Use a shorter pulse width when the resolution is important.

1.12.1 How to change a pulse width

The pulse width in use is displayed at the top left corner of the screen using the indications shown in the table below.

Left-click the pulse icon to shorten the pulse width or right-click to lengthen the pulse width.



Appropriate pulse widths are preset to individual range scales. If you are not satisfied with the current pulse width settings, you may change them referring to paragraph 1.12.2.

Pulse width for [RIVER] mode

Range (SM)	Available pulse width
0.125/ 0.25/ 0.5/ 0.8/ 1.2	S
1.6/2	S/M1
4	M1/M2
8/16	M2/L
32/64	L

Pulse width for [SEA] mode

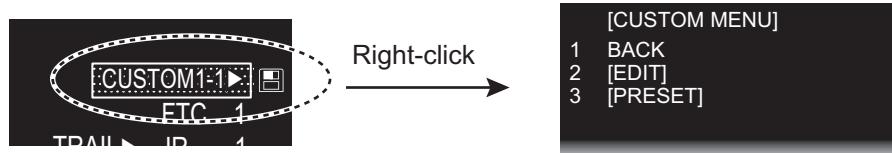
Range (NM, SM)	Available pulse width
0.125/ 0.25/ 0.5/ 0.75/ 1	S
1.5/ 2	S/M1
3/ 4	M1/M2
6/ 8/ 12/ 16	M2/L
24/ 32/ 48/ 64	L

Range (km, kyd)	Available pulse width
0.125/ 0.25/ 0.5/ 0.75/ 1/ 1.5/ 2	S
3/ 4	S/M1
6/ 8	M1/M2
12/ 16/ 24/ 32	M2/L
48/ 64	L

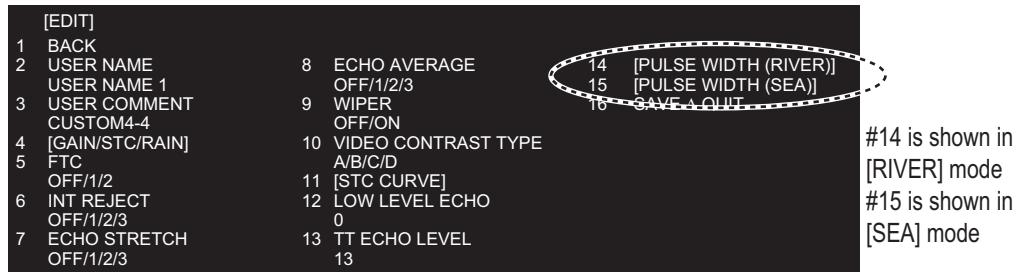
1. OPERATION

1.12.2 How to select a pulse width

1. Right-click [CUSTOM] icon at the bottom right corner on the screen to show [CUSTOM MENU].

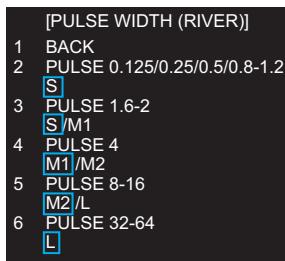


2. Click [EDIT].

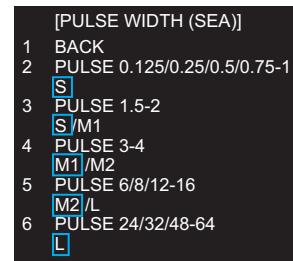


3. Click [PULSE WIDTH].

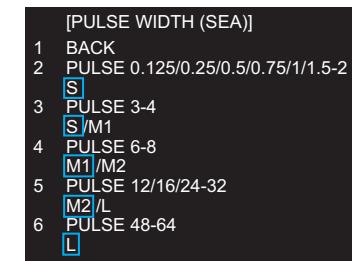
For [RIVER] mode



For [SEA] mode



Range unit: NM, SM



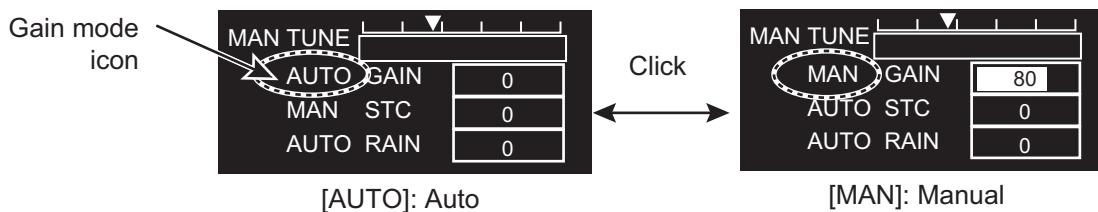
Range unit: km, kyd

4. Click the range in use.
5. Click the desired pulse width.
6. Click outside the menu window to close the menu.

1.13 How to Adjust the Gain (sensitivity)

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

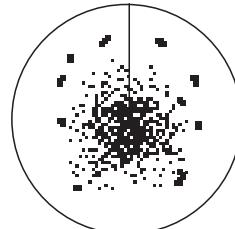
1. Click the gain mode icon at the bottom right corner on the screen to show [MAN] or [AUTO] as appropriate.



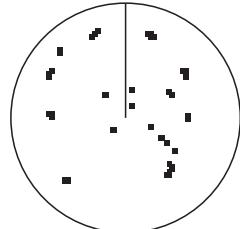
2. For manual adjustment, rotate the setting knob to adjust the gain so that weak noise appears on all of the screen. If the gain is too low, weak echoes are erased. If the gain is too high, the background noise hides weak targets. For auto mode, the setting range is -50 to 50. For manual mode, 0 to 100.

1.14 How to Reduce the Sea Clutter

The reflected echoes from the waves appear around your ship and are called "sea clutter". The sea clutter extends according to the height of waves and antenna above the water. When the sea clutter hides the targets, reduce the clutter, either manually or automatically.

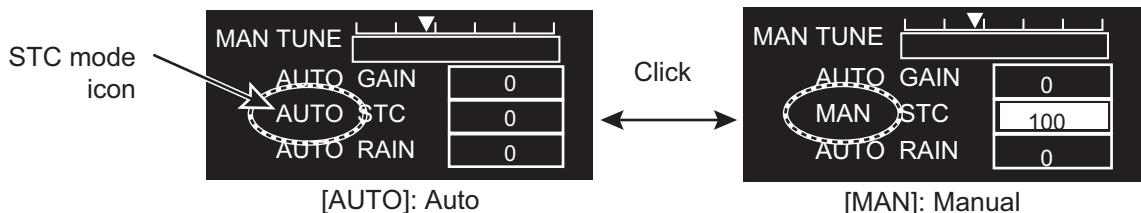


Sea clutter at screen center



STC adjusted; sea clutter suppressed

1. Click the STC mode icon at the bottom right corner on the screen to show [MAN] or [AUTO] as appropriate.

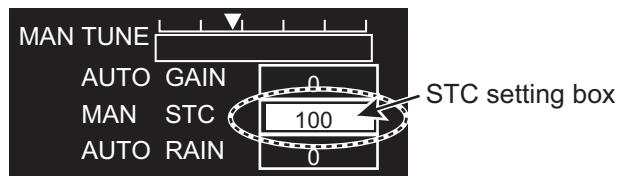


2. For manual adjustment, rotate the setting knob to adjust the sea clutter so that the clutter is broken into small dots, and small targets become identified. If the setting is too low, targets are hidden in the clutter. If the setting is too high, both sea clutter and targets disappear from the display. Normally adjust the control until the clutter has disappeared to leeward, but a small amount of the clutter is visible windward. For auto mode, the setting range is -50 to 50. For manual mode, 0 to 100.

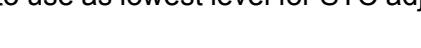
STC PRESET

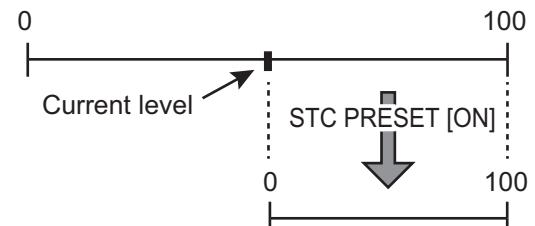
You can tune STC properly with the [STC PRESET] function.

1. Click the STC mode icon to set [MAN] (Manual mode).
2. Put the cursor on the STC setting box at the bottom right corner on the screen.



3. Rotate the setting knob to set the level to use as lowest level for STC adjustment.
4. Open [MAIN MENU], click [ECHO].
5. Click [STC PRESET].
6. Click [ON] to activate the [STC PRESET] function. The STC bar is re-scaled to set the STC level to zero.





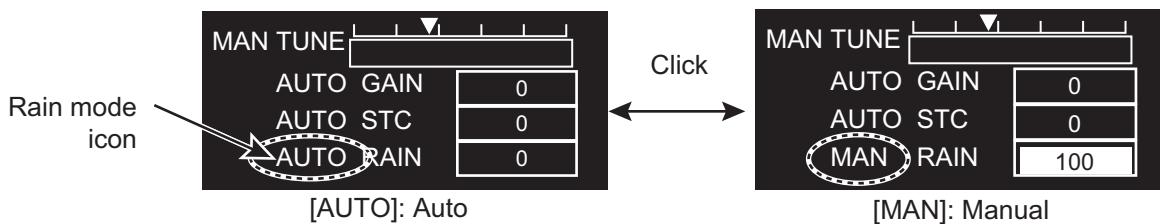
Change of the STC scale bar

1.15 How to Reduce the Rain Clutter

The reflections from the rain or snow appear on the screen. These reflected echoes are called “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 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.

1. Click the rain mode icon at the bottom right corner on the screen to show [MAN] or [AUTO] as appropriate.



2. For manual adjustment, rotate the setting knob to reduce the rain clutter.
For auto mode, the setting range is -50 to 50. For manual mode, 0 to 100.

1.16 Cursor

Within the radar display, the cursor is shown by a plus sign (+). When the cursor is outside the radar display it comes to an arrow (↖).

Cursor menu

Functions that require the use of the cursor, such as EBL offset, may be activated directly from [CURSOR MENU]. This menu is available when the cursor is inside the effective display area.

1. Put the cursor anywhere within the radar display.
2. Press the right button to show [CURSOR MENU].



3. Use the touch pad to select the desired menu.
[ACQUIRE]*: Acquires a target (TT or AIS).
[REF MARK]*: Acquire a target to use to gauge own ship's speed.
[OFFCENTER]: Off-center your position.
[EBL OFFSET]: Shift the origin of an EBL.

*: This function is available for [SEA] mode only.