FURUNO

OPERATOR'S MANUAL

Multi-Color LCD RADAR

FAR-1416

Model **FAR-1426**

(Product Name: MARINE RADAR)

TARGET ANALYZER **AUTO** **Target Tracking** **AIS** **CAN bus**

FURUNO ELECTRIC CO., LTD.

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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C3：JUL. 26, 2021

00019186212

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 instructions in this manual.
  Wrong operation or maintenance can void 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 the 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 void the warranty.
- The following concern acts as our importer in Europe, as defined in DECISION No 768/2008/EC.
  - Name: FURUNO EUROPE B.V.
  - Address: Ridderhaven 19B, 2984 BT Ridderkerk, The Netherlands
- The following concern acts as our importer in UK, as defined in SI 2016/1025 as amended SI 2019/470.
  - Name: FURUNO (UK) LTD.
  - Address: West Building Penner Road Havant Hampshire PO9 1QY, U.K.
- All brand, product names, trademarks, registered trademarks, and service marks belong to their respective holders.

**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. If a battery is used, tape the + and - terminals of the battery before disposal to prevent fire, heat generation caused by short circuit.

<u>In the European Union</u>
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.
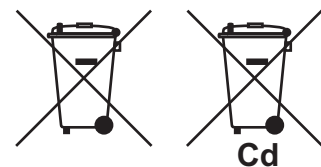
<u>In the USA</u>
The Mobius loop symbol (three chasing arrows) indicates that Ni-Cd and lead-acid rechargeable batteries must be recycled. Take the used batteries to a battery collection site according to local laws.
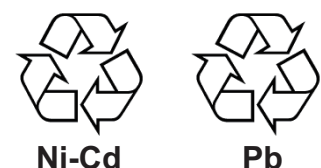
<u>In the other countries</u>
There are no international standards for the battery recycle symbol. The number of symbols can increase when the other countries make their own recycle symbols in the future.

⚠ SAFETY INSTRUCTIONS

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

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

ELECTRICAL SHOCK HAZARD. Do not open the equipment.

Only qualified personnel should work inside the equipment.

Turn off the radar power switch before servicing the antenna unit. Post a warning sign near the switch indicating it should not be turned on while the antenna unit is being serviced.

Prevent the potential risk of being struck by the rotating antenna and exposure to RF radiation hazard.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Immediately turn off the power at the ship's mains switchboard if water leaks into the equipment or the equipment is emitting smoke or fire.

Continued use can cause fatal damage to the equipment.

⚠ WARNING

Radio Frequency Radiation Hazard

The radar antenna emits electromagnetic radio frequency (RF) energy which can be harmful, particularly to your eyes. Never look directly into the antenna aperture from a close distance while the radar is in operation or expose yourself to the transmitting antenna at a close distance. Distances at which RF radiation level of 100 and 10 W/m^2 are given in the table below.

Note: If the antenna unit is installed at a close distance in front of the wheel house, your administration may require halt of transmission within a certain sector of antenna revolution. This is possible. Ask your FURUNO representative or dealer to provide this feature.

Model	Radiator	100W/m^2	10W/m^2
FAR-1416	XN12A	N/A	2.1 m
	XN13A	N/A	1.9 m
FAR-1426	XN12A	0.6 m	4.6 m
	XN13A	0.4 m	3.1 m

❗ **Use the proper fuse.**
Use of a wrong fuse can result in damage to the equipment or cause fire.

⚠ WARNING

🚫 **Keep heater away from equipment.**
Heat can alter equipment shape and melt the power cord, which can cause fire or electical shock.

🚫 **Do not place liquid-filled containers near the equipment.**

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

No one navigational aid should be relied upon for the safety of vessel and crew. The navigator has the responsibility to check all aids available to confirm position. Electronic aids are not a substitute for basic navigational principles and common sense.

- This TT automatically tracks automatically or manually acquired radar targets and calculates their courses and speeds, indicating them by vectors. Since the data generated by the auto plotter are based on what radar targets are selected, the radar must always be optimally tuned for use with the auto plotter, to ensure required targets will not be lost or unwanted targets such as sea returns and noise will not be acquired and tracked.

- A target does not always mean a land-mass, reef, ships or other surface vessels but can imply returns from sea surface and clutter. As the level of clutter changes with environment, the operator should properly adjust the A/C SEA, A/C RAIN and GAIN controls to be sure target echoes are not eliminated from the radar screen.

WARNING LABEL
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.

⚠ WARNING ⚠

To avoid electrical shock, do not remove cover. No user-serviceable parts inside.

⚠ 警 告 ⚠

感電の恐れあり。
サービスマン以外の方はカバーを開けないで下さい。内部には高電圧部分が数多くあり、万一さわると危険です。

⚠ DANGER

Electrical shock hazard. Do not toutch parts inside this cover.

⚠ 危 険

感電の恐れあり。
カバーの内部には、絶対に触れないで下さい。

DISPLAY UNIT
Name: Warning Label (1)
Type: 86-003-1011-3
Code No.: 100-236-233-10

ANTENNA UNIT
Name: Warning Label
Type: 14-055-4202-1
Code No.: 100-245-221-10

⚠ WARNING

🚫 **Do not place operate the equipment with wet hands.**
Electrical shock can result.

⚠ CAUTION

The plotting accuracy and response of this TT meets IMO standards. Tracking accuracy is affected by the following:

- 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 on the order of 15 - 30 seconds for high relative speed; 30 - 60 seconds for low relative speed.

- The target tracking and pertinent vector calculation accuracy is influenced by the following:
  - Echo intensity
  - The range measurement accuracy; characterized by both random and biased measurement errors.
  - The angular measurement accuracy; characterized by beam shape, target glint and bias errors.
  - Radar transmission pulsewidth
  - Gyrocompass heading error
  - Speed log error
  - Curent and wind (set & drift)
  - Course change (own ship and target)

The data generated by TT, AIS and video plotter are intended for reference only.

Refer to official nautical charts for detailed and up-to-date information.

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FOREWORD

A Word to the Owner of FAR-1416/FAR-1426

Congratulations on your choice of the FURUNO FAR-1416/FAR-1426 of radars. We are confident you will see why FURUNO 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.

Your radar 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 hearing from you, the end-user, about whether we are achieving our purposes.

Thank you for considering and purchasing FURUNO equipment.

Features

- Two methods of operation are available: RCU-029 (standard supply control unit) and RCU-030 (optional trackball control unit). The ergonomically designed palm rest on the RCU-030 makes it easy to use.
- Portrait or Landscape display modes available.
- Simple operation with "point-and-click" menu functionality.
- All functions can be accessed using only the trackball unit.
- TT and AIS are supplied as standard.
- CPA/TCPA alarms.
- Targets activate the user-set alarm zone when entering or exiting the zone.
- The target analyzer function helps to find targets in high noise areas (rain/snow) or where there is interference from surface reflections.
- The plotter functions are supplied as standard.

Signal processing functions

This radar has the signal processing functions listed in the table below.

Function	Description	Section
Interference rejector	Suppresses interference by other radars. Interference received simultaneously from multiple radars may be difficult to reduce.	section 1.21
Echo stretch	Enlarges target echoes, especially small echoes. Suppress interference, sea clutter and rain clutter before using echo stretch, to prevent enlargement of unwanted echoes.	section 1.22
Echo averaging	The radar samples echoes with each scan. Targets that show a large change with each scan are judged as clutter and are reduced to display only echoes from legitimate targets.	section 1.23
Automatic clutter elimination	Discriminates clutter from the radar echo, then reduces the clutter automatically.	section 1.24
Noise rejector	Reduces 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. Use this function with caution. Weak target echoes may disappear from the screen or the range resolution may worsen.	section 1.25

Program numbers

Unit	Software	Program No.	Remarks
Display unit	SPU	0359397-01.**	

** denotes minor modifications.

The programs used in the equipment

- Ubiquitous QuickBoot Copyright[©] 2015. Ubiquitous Corp. All right reserved.

- Portions of this software are copyright[©] 2016. The FreeType Project (www. freetype. org). All right reserved.

- This equipment includes GPL2.0, LGPL2.0, Apache, BSD, MIT or other licensed softwares. For further software information, please access the following URL: https://www.furuno.co.jp/en/contact/cnt_oss_e01.html

CE declaration

With regards to CE declarations, please refer to our website (www.furuno.com), for further information about RoHS conformity declarations.

SYSTEM CONFIGURATION

Antenna Unit

FAR-1416
XN12A-RSB0070-086A1
XN12A-RSB0073-086A1
XN13A-RSB0070-086A1
XN13A-RSB0073-086A1

FAR-1426
XN12A-RSB0070-087A1
XN12A-RSB0073-087A1
XN13A-RSB0070-087A1
XN13A-RSB0073-087A1

USB Device

Control Unit
RCU-029

External Monitor（DVI）

Remote Controller
RCU-019

External Monitor
(Analog RGB)/VDR

Trackball
Control Unit
RCU-030

CANbus Device

Navigation Device

Display Unit
RDP-155

GPS Receiver

AC100-230V,
1ø, 50/60Hz

Switching HUB
HUB-100

Gyro Compass*/
Heading Sensor/
Satellite Compass™

DC24V

External Buzzer
(For Alarm)

Rectifier
RU-1746B-2
RU-3424

AC100-115/
220-230V,
1ø, 50/60Hz

AC/DC Power
Supply Unit
PR-240
PR-850A
PR-241

Radar Sub Display

(Either one)

———— : Standard supply

-------- : Option or local supply

*: The gyrocompass must also have
an update rate that is adequate for
the ship's rate of turn. The update
rate must be better than 40 Hz (HSC)
or 20 Hz (conventional vessel).

Equipment category

Unit	Category
Antenna	Exposed to the weather
Other units	Protected from the weather

1. OPERATIONAL OVERVIEW

1.1 Control Unit

Control unit RCU-029
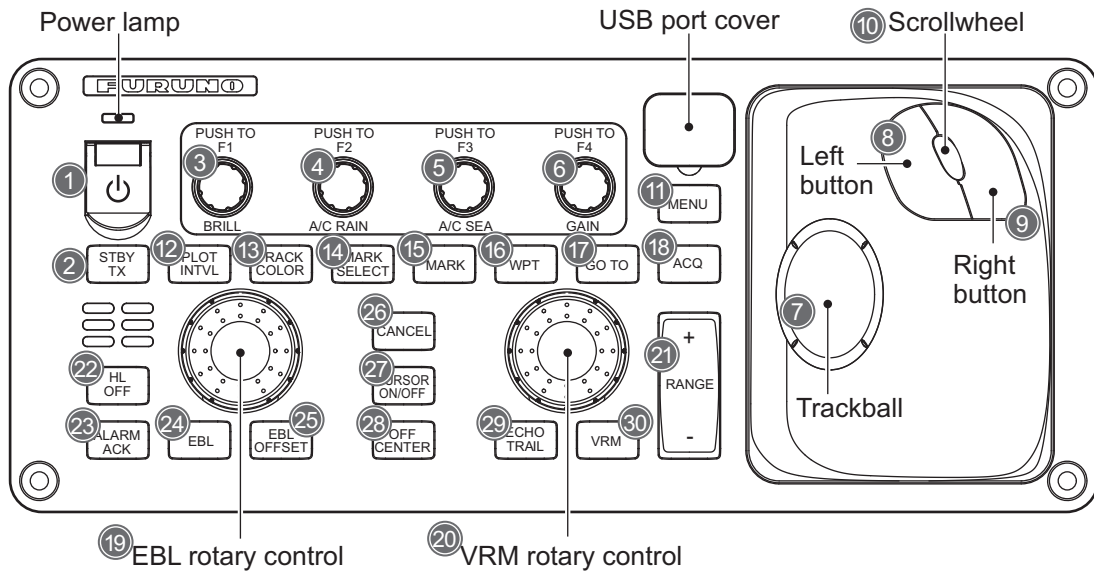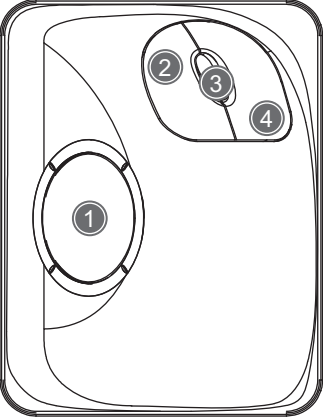
No.	Key/Control	Description
1	Power switch	Turns the power on or off. The power lamp lights up when the power is turned on.
2	STBY/TX	Press to switch between STBY (Stand-by) and TX (Transmit) modes.
3	BRILL/F1	Rotate: Adjusts the screen brilliance. Push: Activates the F1 function.
4	A/C RAIN/F2	Rotate: Adjusts rain clutter. Push: Activates the F2 function.
5	A/C SEA/F3	Rotate: Adjusts sea clutter. Push: Activates the F3 function.
6	GAIN/F4	Rotate: Adjusts gain. Push: Activates the F4 function.
7	Trackball	Moves the cursor and selects menu item.
8	Left button	Selects menu item. Change the setting.
9	Right button	Opens the cursor-selected context menu; closes open menus.
10	Scrollwheel	Rotate: Selects menu column. Press: Validate selection.
11	MENU	Opens/closes the main menu.
12	PLOT/INTVL	Sets the plot or interval.
13	TRACK/COLOR	Opens/closes the track line and color setting menu.
14	MARK SELECT	Opens/closes the mark patterns and colors setting menu.
15	MARK	Sets the mark on the screen.
16	WPT	Sets the waypoint on the screen.
17	GO TO	Sets the destination on the screen.
18	ACQ	• TT mode: Selects or acquires the cursor-highlighted echo as a target. • AIS mode: Selects or activates the cursor-highlighted target.
19	EBL rotary control	• Cursor 'On' mode: Sets the EBL value. • Cursor 'Off' mode: Moves the map to up/down.
20	VRM rotary control	• Cursor 'On' mode: Sets the VRM value. • Cursor 'Off'' mode: Moves the map to left/right.
21	Range +/-	Selects the display range.

No.	Key/Control	Description
22	HL OFF	Hides heading line when pressed and held.
23	ALARM ACK	• Acknowledges alerts. • Silences the alert buzzer.
24	EBL	Activates/deactivates the EBL cursor.
25	EBL OFFSET	Activates the EBL offset.
26	CANCEL	• TT mode: Deactivates tracking for the cursor-selected target. • AIS mode: Sleeps the selected target. • Long press: Sleeps/deactivates all TT targets.
27	CURSOR ON/OFF	Activates/deactivates the cross cursor.
28	OFF CENTER	Moves the radar display off center.
29	ECHO TRAIL	Activates/deactivates the echo trail.
30	VRM	Activates/deactivates the VRM cursor.
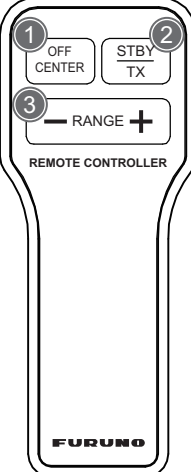
Trackball control unit RCU-030 (Option)

The optional trackball control unit RCU-030 can be used to control most features of this radar.

Parts location	No.	Name	Functions
	①	Trackball	Moves cursor. Selects a menu item.
	②	Left Button	Does the operation related to the selected object. Confirms the operation for the selected object.
	③	Scrollwheel	Rotate to select a menu item or to change the values in the menu box. Press to select the desired item.
	④	Right Button	Opens the box menu. Opens the main menu. Cancels current action.

Remote controller RCU-019 (Option)

The optional remote controller RCU-019 can be used to control the radar picture.

Parts location	No.	Key	Function
	①	Off-center	Moves the center of radar display (own ship's location).
	②	STBY/TX	Toggle between stand-by and transmission.
	③	RANGE	In TX mode: Select the radar range. In STBY mode: Select the plotter range.

Standards used in this manual

This manual uses the following standards:

Terminology standards	Meaning
Select	• Using the trackball, move the cursor over the item to be "selected". • Rotate the scroll wheel to highlight the item to be "selected".
Left-click	Press the left button on the RCU-029.
Right-click	Press the right button on the RCU-029.
Left button	Refers to the left button on the RCU-029.
Right button	Refers to the right button on the RCU-029.
Control unit	Refers to the control unit RCU-029.
Trackball control unit	Refers to the trackball control unit RCU-030.
Open the [MAIN MENU].	• Press the **MENU** key to open the main menu. • Select the [MENU] box, then left-click.
Close the menu.	• Press the **MENU** key to close the menu. (Closes all open menus.) • Select the operational display area, then right-click. • Select the [MENU] box, then right-click.

For the sake of brevity, the procedures in this manual use the terms "Open the [MAIN MENU]." and "Close the menu."

Most operations can be done with either the trackball control unit RCU-030 or the control unit RCU-029. Throughout this manual, procedures are outlined using the RCU-029 control unit, unless otherwise specified.

The display unit is available portrait type or landscape type. This manual is using the portrait type for explanations.

How to remove the hard cover

Press the middle of the hard cover with your thumbs and pull off the cover with other fingers toward you.
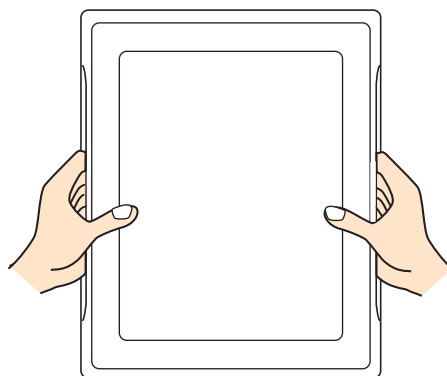
1.2 How to Turn the Radar On/Off

The **POWER** switch ⏻ is located at the top left corner of the control unit. Open the **POWER** switch cover and press the switch to turn the radar system on. To turn the system off, press and hold the **POWER** switch. The screen shows the bearing scale and digital timer for approximately 90 seconds (FAR-1416) or three minutes (FAR-

1426) after power is applied. The timer counts down three minutes of warm-up time. During this period, the magnetron (transmitter tube) is warmed for transmission. When the timer has reached 0:00, the indication "ST-BY" appears at the screen center, meaning the radar is now ready to transmit pulses.

XX: Program version
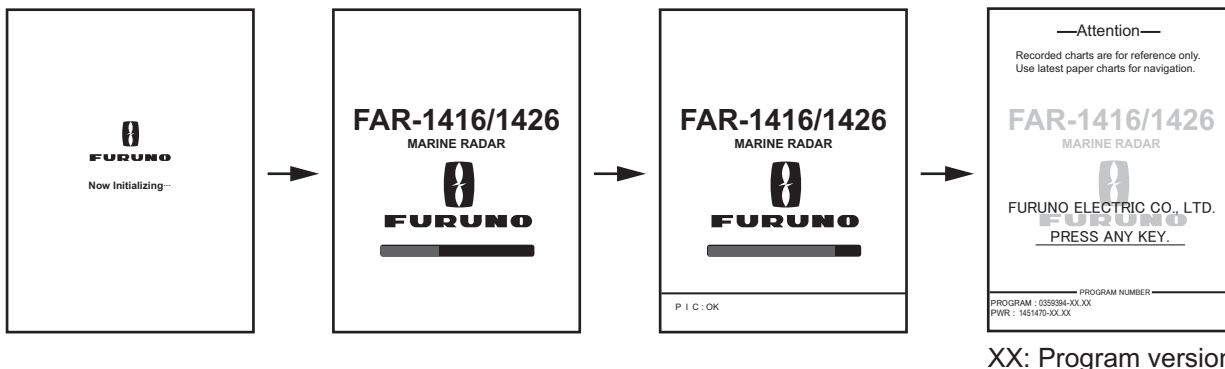
In the stand-by condition, rings and TT are not shown. In the warm-up and stand-by conditions, [ON TIME] and [TX TIME] are counted in hours and tenths of an hour, appearing at the screen center.

Password window

When the password is set from the password setting window, the confirmation window appears when the power is applied.
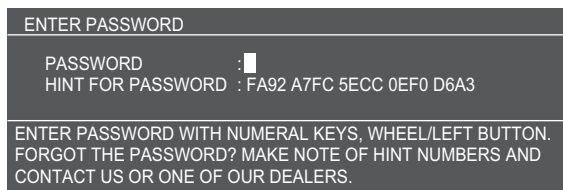
Rotate the **scrollwheel** and press the **left button** to enter the password. When the password entered matches the password registered, the confirmation window disappears and the standard display appears. Refer to section 1.49 to set the password.

Note 1: Do not turn on the power directly after it has been turned off. Wait several seconds before you reapply the power, to be sure the radar starts up properly.

Note 2: Parameters set on the menus are stored in a non-volatile memory (flash memory), and are preserved when the power is turned off.

Note 3: The screen refreshes slower in low ambient temperature.

1.3   How to Start/Stop Transmission

The radar is ready to transmit when the message "STBY" appears. Press the **STBY/TX** key to start transmission. The radar echoes are displayed on the screen with the previously used settings of range, brilliance, VRM, EBL and menu settings.

Press the **STBY/TX** key again to go into stand-by. The antenna radiator rotates when transmitting and is stopped in stand-by. The output of the magnetron shortens with transmission time. Keep the equipment in stand-by when its use is not required, to lengthen the life of the magnetron.

Start with the box on the screen

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.

2. Move the cursor onto the mark box at left-top on the screen, then press the **left button**.
    Each press of the button toggles between TX and STBY.
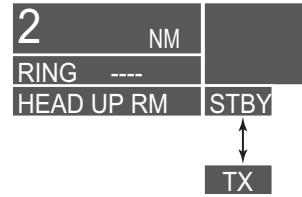
1.4 How to Tune the Receiver

1.4.1 How to select the tuning method

1. Select the [TUNE] box at the top right 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.

Tuning level indicator. Place arrow inside box to adjust tuning. (This disables automatic tuning.)

Tuning method (AUTO or MAN) ➝ TUNE MAN
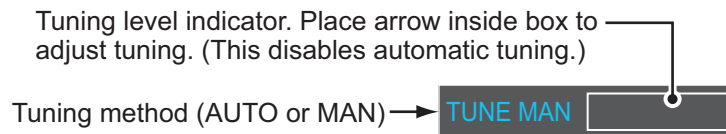
1.4.2 How to initialize tuning

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 **left button**.

3. Select [TUNE INITIALIZE], then press the **left button**.
    The indication "TUNE" color changed to yellow during the initialization.

4. Close the menu.

1.4.3 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 1.4.1.

3. Place the arrow on the tuning bar area in the [TUNE] box.

4. Rotate the **scrollwheel** to adjust tuning. The best tuning point is where the bar graph swings 80 percent approx. The tuning control position is indicated with a triangle, displayed inside the tuning bar.

TUNE MAN

Tuning control position.
Place cursor inside the box, then rotate the scrollwheel to adjust the tuning.
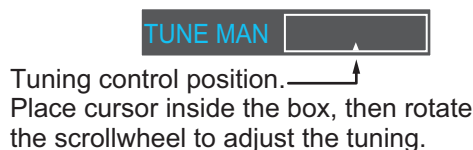
1.5   How to Adjust the Brilliance and Color tone

1.5.1   Adjust the brilliance with control panel

1. Use the **BRILL** knob to adjust the brilliance as appropriate. Turn clockwise to increase the brilliance, counter-clockwise to reduce the brilliance.

2. Push the **BRILL** knob to complete the procedure.

Note: External monitor brilliance is not adjustable from the radar. Refer to the external monitor's Operator's Manual for how to adjust brilliance.

1.5.2   Select the brilliance

The screen brilliance and color tone can be adjusted as shown below. The preset variations are following.

Color (Icon)	Brilliance (%)	Character color	Radar background color
Day	100	Green	Black
Dusk	40	White	Blue
Night	4	Red	Black

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.

2. Move the cursor onto the [BRILL] icon, then press the **left button**.

3. Press the **left button** to adjust the brilliance as appropriate. Each press of the **left button** cycles through the brilliance mode settings.

Note: You can adjust the mark and characters brilliance. Refer to section 1.42.

1.6   Display Indications

Portrait view
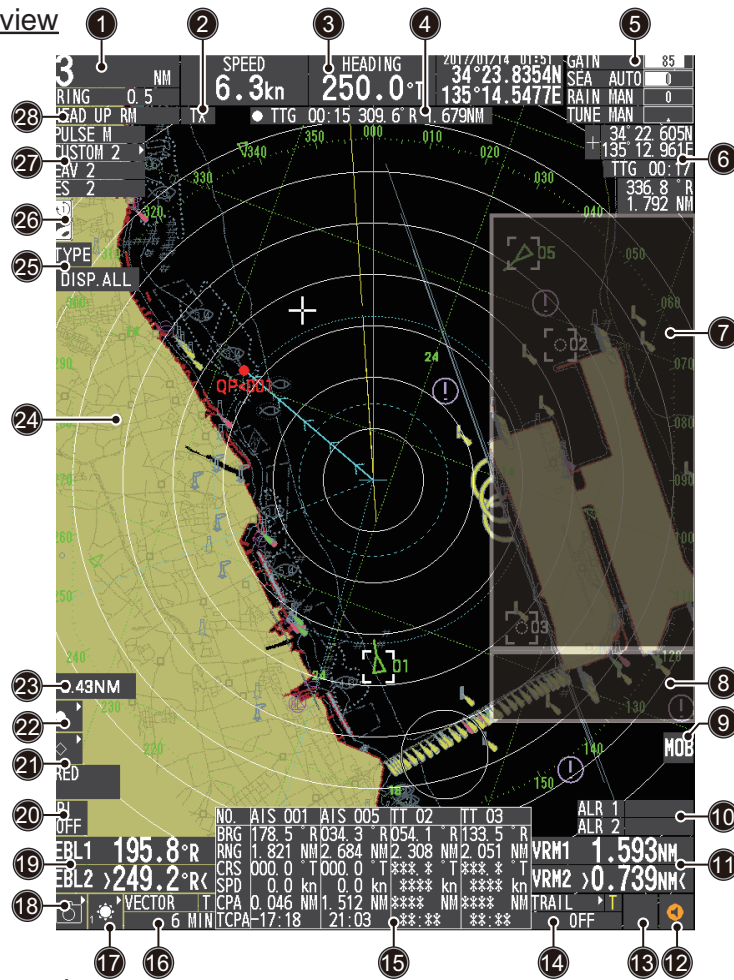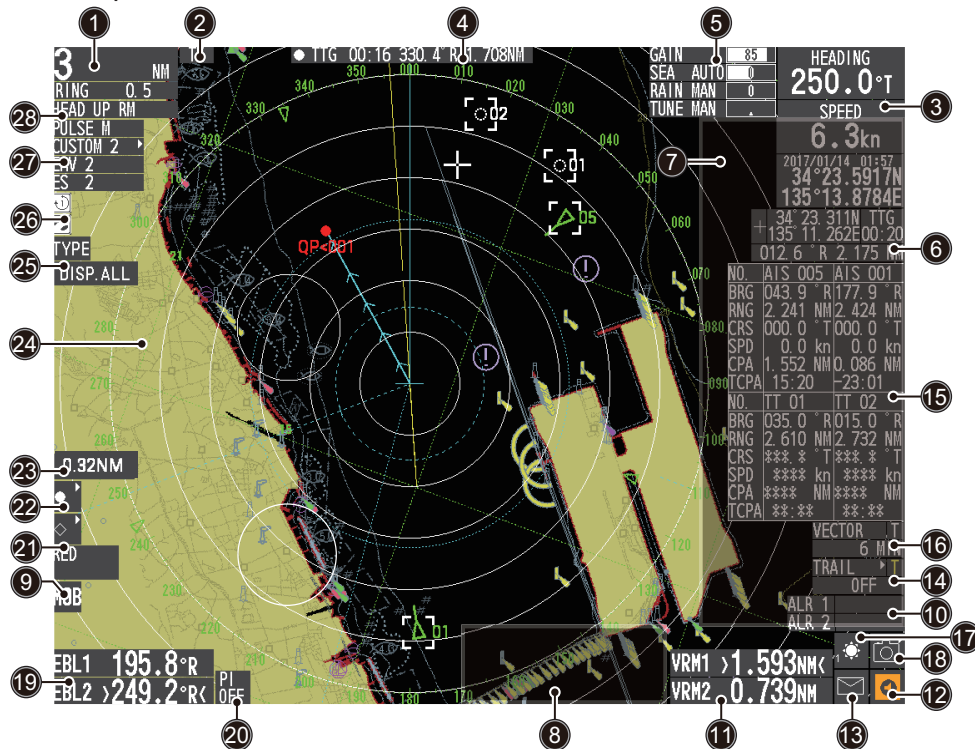
Landscape view

No.	Name	Description
1	Range/mode box	Changes the radar range and mode.
2	ST-BY/TX box	Changes the ST-BY mode and transmit mode.
3	Own ship information box	Shows various data regarding own ship. Contains speed*, heading and position context menus. *: Negative value speed: Vessel is using reverse thrust.
4	Waypoint information box	Displays the waypoint informations.
5	Indicator box	Adjusts the picture settings GAIN, A/C SEA, A/C RAIN and TUNE boxes.
6	Cursor data box	Displays the range, bearing and TTG to cursor position.
7	Menu information box	Displays currently setting menu.
8	Guidance box	Displays various information, such as received messages, TT/AIS target information and navigational data.
9	MOB box	Displays MOB mark data.
10	AZ box	Activates/deactivates the acquisition zone(s).
11	VRM box	Activates/deactivates the VRM.
12	Alert icon	Displays alert information.
13	AIS message icon	Displays AIS message arrival.
14	TRAIL box	Sets the target trail time and past position interval. Activates/deactivates target trail.
15	TGT List	Displays the target list; displays the [TARGET LIST] menu.
16	Vector box	Activates/deactivates vector indication.
17	BRILL icon	Adjusts screen brilliance; opens the [BRILL] menu.
18	Screenshot icon	Save a screenshot of the entire displayed image. Displays the screenshots list. **Note:** The screenshot data can be transfered to an USB flash memory.
19	EBL box	Activates/deactivates the EBL.
20	PI Line box	Activates/deactivates the PI lines.
21	MARK boxes	Selects mark icons; displays mark information.
22	Waypoint information box	Displays waypoint mark's shape and select menu.
23	Circle radius range box	Displays the radius range of circle line.
24	Radar effective area	Displays radar picture and map.
25	Mark filter box	Displays the mark filter information.
26	Plotter icons	Uses the plotter functions.
27	Radar control box	Sets the radar control and adjust the echo picture. This consists of PULSE, PICTURE, EAV and ES boxes.
28	Display mode box	Changes the display mode.

Display specifications

- Nominal viewing distance: 0.75 m
- Text height: 2.67 mm
- Text width: 2.08 mm

1.7 How to Use the Cursor

1.7.1 Cursor information box

Cursor data can be shown in latitude and longitude position or the cursor's X-Y co-ordinates.

Place cursor on the cursor data box at the right side of the display then press the **left button**. The data box shows the cursor information in the upper half and cursor location (latitude/longitude) is shown in the lower half.
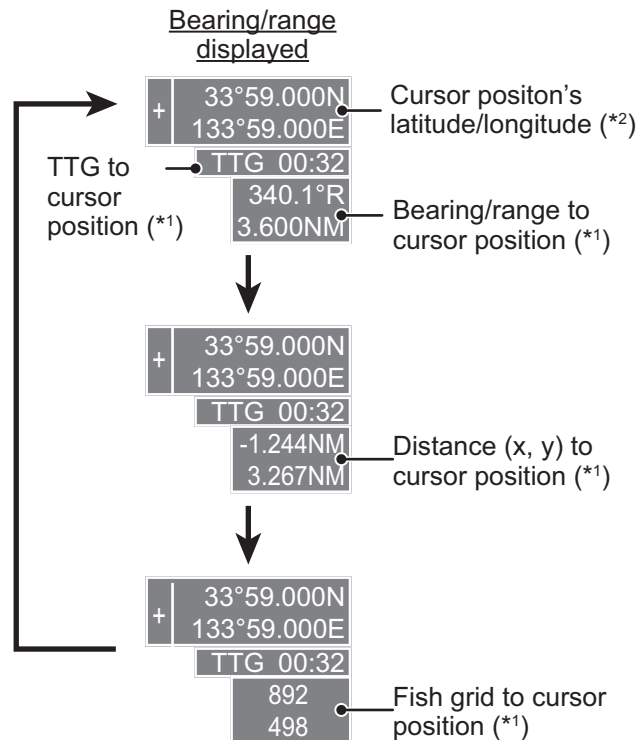
*[1]: Cursor position data shows "---" during st-by mode.
*[2]: Indication selectable from menu

Note 1: For the X-Y co-ordinates display, the Y-axis is the heading line, the upper half of the screen is "plus" and the lower part of the screen is "minus". The X-axis is the port/starboard direction, starboard is "plus", port is "minus".

Note 2: Cursor data reads "- - -.-" when the cursor is placed outside the operational display area.

1.7.2 How to select the cursor function

Functions that require the use of the cursor, such as EBL offset and zoom, can be activated directly from the guidance box, either method with the cursor inside the operational display area. Below is the procedure for choosing cursor-related functions from the [CURSOR] menu.

1. Press the **CURSOR ON/OFF** key when the cursor is not displayed.

2. Place the cursor on the radar effective area by operating the trackball, then rotate the **scrollwheel** to select a function required.
    The cursor control window appears and the cursor shape border shown in red.

> [L]: TARGET CANCEL
> [L]LONG: ALL TGT CANCEL
> TURNWHEEL: CURSOR SELECT

   Note: If there is no operation for 30 seconds, the cursor control window disappears and the function is reset.

3. Use the trackball to move the cursor to the location to use the function.

4. Press the **left button**.

5. To quit the selected function, press the **right button**.
    The cursor control window disappears and the cursor shape is reset.

Menu Item	Description
TARGET CANCEL	**TT:** Cancels tracking on selected tracked target. **AIS:** Sleeps selected AIS target.
TT TARGET DATA & ACQ	Acquires selected echo as tracked target.
EBL OFFSET	Offsets EBL to measure range and bearing between two targets.
OFF CENTER	Shifts screen center to selected location.
ZOOM SET	Zooms selected location.
MARK DELETE	Deletes selected mark (plotter mark, origin mark or waypoint mark).
DELETE OTHER TRACK	Deletes own ship's tracks.
CHART ALIGN	Aligns chart positions with the radar picture.
TRAIL ERASER SELECT	Erases trails.
SET CIRCLE LINE	Set the circle line.
MARK ATTRIBUTE CHANGE	Change the mark attributes.

1.8 Menu Operations

1.8.1 How to access the main menu

The main menu can be accessed from the control unit. The [MAIN MENU] appears in the text area on the right side of the screen.

Press the **MENU** key on the control panel or press the **right button**.

Note: To open the main menu with the **right button**, note the following.

- The cursor must not be on the control box.

- The cursor must not select a mark or symbol on the screen.

[MENU]	
1. [ECHO]	Echo processing functions
2. [ROUTES/WAYPOINTS]	Processes nav lines and waypoints.
3. [OTHER SHIPS' INFO.]	Sets TT and AIS functions.
4. [MARK]	Mainly turns markers on/off.
5. [TRACK]	Sets own ship's track on/off.
6. [MEMORY REC./PLAY.]	Upload/download the data files.
7. [ALERT SETTINGS]	Sets target alarm functions; outputs alert signal.
8. [CHART]	Sets chart information data.
9. [CURSOR/OWN SHIP MARK]	Selects cursor information.
10. [NAVDATA]	Navigation tools (PI lines/EBL/VRM)
11. [INITIAL SETTING]	Sets data display box items.

TURN WHEEL : SELECT
[L] : DECISION
[R]: GO BACK

Operation guide

To close the menu, press the **MENU** key or press the **right button** several times.

Note 1: The menu is closed automatically when it is not operated for 30 seconds.

Note 2: This manual uses the phrases "Open the [MAIN MENU]" and "Close the menu." for the sake of brevity.

Note 3: The guidance box can be hidden from the [OPERATION SETTING] menu. Refer to section 1.47.

1.8.2   How to operate the menus

1. Press the **MENU** key to open the [MAIN MENU].

2. Rotate the trackball or scrollwheel to select a layer one menu item, then left-click. The menu item currently selected is highlighted and shown in reverse video.
    Note: Press the **CURSOR ON/OFF** key to enable the cursor before using the trackball.

Layer one (MAIN MENU)   Layer two   Layer three

[MAIN MENU]
1. [ECHO]
2. [ROUTES/WAYPOINTS]
3. [OTHER SHIPS' INFO.]
4. [MARK]
5. [TRACK]
6. [MEMORY REC./PLAY.]
7. [ALERT SETTINGS]
8. [CHART]
9. [CURSOR/OWN SHIP MARK]
10. [NAVDATA]
11. [INITIAL SETTING]

Menu selection is highlighted and in reverse video.

[ECHO 1/2]
1. BACK
2. [CUSTOMIZE ECHO]
3. TUNE INITIALIZE
4. [TRAIL]
5. 2ND ECHO REJ
    OFF / ON
6. SART
    OFF / ON
7. WIPER
    OFF/1/2
8. ZOOM
    OFF /2TIMES/3TIMES
9. ZOOM DISPLAY
    STB GND/STB HDG/
    STB NORTH

0. NEXT

[CUSTOMIZE ECHO 1/2]
1. BACK
2. INT REJECT
    OFF/1/2/3
3. ECHO STRETCH
    OFF/1/2/3
4. ECHO AVERAGE
    ....

Select menu items with brackets "[ ]" to access the layer three menu items.

3. Rotate the trackball or scrollwheel to select the layer two menu item, then press the **left button**.
    When further settings are required, repeat this step to access the layer three menu. In the above example, [CUSTOMIZE ECHO] is selected, which opens the layer three [CUSTOMIZE ECHO 1/2] menu.

4. Rotate the trackball or scrollwheel to change the selected setting, then press the **left button**.

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

1.8.3   How to enter alphanumerics

Text input

Use the text box to enter the text. Press the **GO TO** key to toggle between upper- and lower-case letters.

Cursor for a charactor   Press [GO TO] key

COMMENT : _
ABCDE FGHIJ KLMNO   SELECTIONS:
PQRST UVWXYZ { }   1.
, . - ! ? / & = # _ 1 2 3 4 5   2.
6 7 8 9 0 ◀▶ Space Delete   3.
                            4.
                            5.
Enter
PRESS LEFT BUTTON: INPUT CHARS. PRESS RIGHT BUTTON: BACK
[GO TO] : SWITCH UPPER/LOWER CASE [DEL]: DELETE ALL
[PLOT INTVL]1~ [PLOT INTVL]5: ABBR. SELECTIONS

COMMENT : _
abcde fghij klmno   SELECTIONS:
pqrst uvwxyz { }   1.
, . - ! ? / & = # _ 1 2 3 4 5   2.
6 7 8 9 0 ◀▶ Space Delete   3.
                            4.
                            5.
Enter
PRESS LEFT BUTTON: INPUT CHARS. PRESS RIGHT BUTTON: BACK
[GO TO] : SWITCH UPPER/LOWER CASE [DEL]: DELETE ALL
[PLOT INTVL]1~ [PLOT INTVL]5: ABBR. SELECTIONS

1. Rotate the trackball or scrollwheel to select a character, then press the **left button**.

2. Repeat step 1 to enter the text desired.

Delete a specific character

Place the cursor on [▶] or [◀], then press the left button to select the character to erase. Select [Delete], then press the **left button**.

Delete all text

Press the **DEL** key.

Selections

Based on your past operations, the SELECTIONS column shows up to 5 of the most used words or characters. Press the following key to use the associated selection.

1) TRACK key: Select #1

2) COLOR key: Select #2

3) MARK SELECT key: Select #3

4) MARK Key: Select #4

5) WPT key: Select #5

3. Select [RUN], then press the **left button**.

Numeral input

Use the trackball to select the numeral, then press the **left button**.

1.9 How to Use the On-screen Box Menus

Some radar functions can be accessed using the on-screen box menus. A "▶" at the right side of an on-screen box which indicates that there is a box menu.

Use the trackball on RCU-029/030 to select the on-screen box, then right-click.

To operate the radar using the on-screen boxes, do the following:

1. Select the desired box.

   Note: The cursor changes shape according to its location. It is an arrow (↖) when placed outside the operational display area and when inside the operational display area, it is a cross (┼).

   For the purpose of this example, select the [PULSE] box, at the top left corner of the display.

Move the cursor here, the message appears on the right-hand of the screen.

PULSE --
CUSTOM1   ▸
EAV OFF
ES   OFF

[L]: PULSE SHORTER
[R]: PULSE LONGER
WHEEL: PULSE SELECT

When a box is correctly selected, its color changes (colors depending on selected color palette) and the guidance box at the bottom right corner shows operational

guidance. The operational guidance shows the function of the left button "[L]", right button "[R]" and the scrollwheel "WHEEL".
The [PULSE] box, for example, displays the operational guidance "PULSE SHORT / PULSE LONG/ SELECT PULSE". In this case you would **left-click** to select short pulse or **right-click** to select long pulse.

2. Press the **left button** to select the desired setting.

3. Rotate the **BRILL** knob to adjust the display brilliance.

4. Press the **MENU** key to open the main menu.

5. Select [INITIAL SETTING], then press the **left button** to display the [INITIAL SETING] menu.

6. Select [BRILL SETTING], then press the **left button**.

7. Select the desired menu item, then press the **left button**.

8. Select the appropriate option, then press the **left button**.
Further settings are required, select [NEXT], then press the **left button**.

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

```
[BRILL1 MENU 1/3]
1.  BACK
2.  INITIAL SETTING READ
    DAY/DUSK/NIGHT
    NO/YES
3.  ECHO COLOR
    YEL / GRN / WHT
    AMB/M-GRN/M-CHA
4.  CHAR COLOR
    GRN/WHT1/WHT2/ORG/RED
5.  RADAR BACKGROWND COLOR
    BLK/BLU1/BLU2
6.  CONTROL PANEL     [____]
7.  CHARACTER         [____]
8.  CURSOR            [____]
9.  ECHO              [____]

0.  NEXT
```
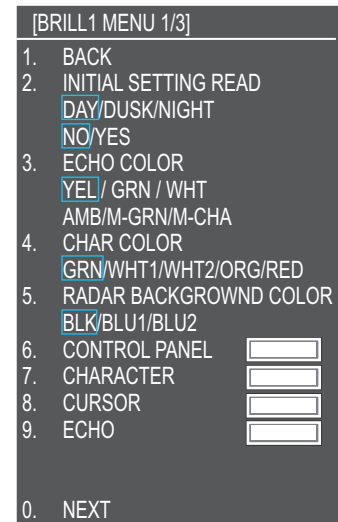
1.10 How to Select a Range Scale

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.

TX display

Press the +/- key on the RANGE button to select radar range scale.

[+]: raise the range, [-]: lower the range.

Press and hold the [+] or [-] key to change the range scale continuously.

ST-BY display

Press the +/- key on the RANGE button to select plotter range scale. The range scale indicates the distance of screen width.

[+]: expands the range scale on cursor (at cursor 'On') or own ship's position (at cursor 'Off').

[-]: reduces the range scale on cursor (at cursor 'On') or own ship's position (at cursor 'Off').

Press and hold the [+] or [-] key to change the range scale continuously.

Select range scale on the box menu

1. Press the **CURSOR ON/OFF** key when cursor is not shown.

2. Move the cursor onto the [RANGE] box at the top-left corner of the screen.

Range —⟋ 1.5 NM ⟋— Range Box

RING 0.5 ⟋— Range ring interval
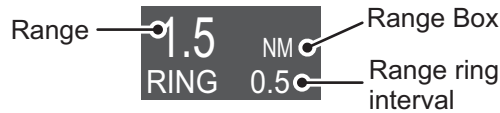
3. Press the **left button** to lower the range; the **right button** to raise the range. You can also select the range by rotating the **scrollwheel** then pressing the **left button** when the cursor is inside the range box.

1.11 How to Select a Pulselength

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

(PULSE) indication
S (short pulse)
M (medium pulse)
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 the procedure below.

1.11.1 How to change the pulselength

The pulselength can be changed 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 **scrollwheel** 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.
Scrollwheel (up)	Increases the pulselength.
Scrollwheel (down)	Decreases the pulselength.

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

Range	(PULSE) indication
1.5 NM	S, M
3 NM	M, L

1-15

1.12   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.
STERN UP	: The radar image is rotated 180°. Graphics and relative and true bearings are also rotated 180°.
COURSE UP	: Compass-stabilized relative to ship's orientation at the time of selecting COURSE UP.
GO TO UP	: The waypoint is shown in the top of the screen, while the waypoint is set as a destination. When the waypoint is no longer a destination, the presentation mode is reset to HEAD UP mode.
NORTH UP	: Compass-stabilized with reference to North.

True Motion (TM)

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

1.12.1   How to select a presentation mode

The presentation mode can be changed with using the display mode box.

1. Press the **CURSOR ON/OFF** key when cursor is not shown.

2. Move the cursor onto the display mode box.

3. Press the **left button** several times to change the presentation mode.
    The presentation mode changes in the following order with each press of the left button.
    HEAD UP, STAB HEAD UP, STERN UP, COURSE UP, GO TO UP, NORTH UP.
    Note 1: STERN UP is shown when [STERN UP RN] is set to [ON] in [OPERATION SETTING] of the [INITIAL SETTING] menu.
    Note 2: The bearing data at the top on the screen shows "***.*°" when the navigation data is lost. The north mark disappears, and presentation mode goes back to the head up mode and also TT/AIS targets disappear. When the navigation data is input again, presentation mode goes back the previous mode automatically.

1.12.2   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.

North marker   Heading line

Note 1: When off-centering is active, the heading line shows "000°".
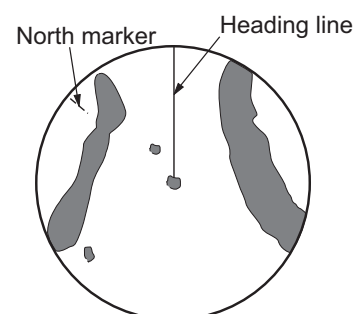
Note 2: When the range is set to other than 72 or 96 NM and [TRUE VIEW] in the [ECHO 2/2] menu is set to [ON], echoes are displayed smoothly with high-speed turns. However, the wiper and zoom functions are disabled.

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 HEAD UP mode.

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.

Heading line   North marker
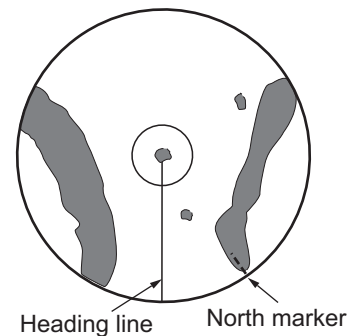
COURSE UP mode

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 picture is stable even with yawing or course changes.

North marker   Heading line
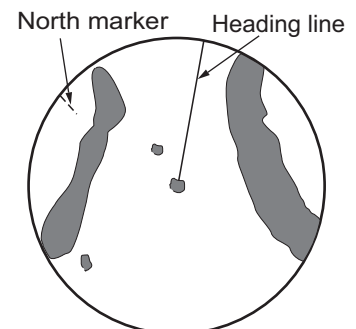
GO TO UP mode

When a waypoint is set as a destination, the waypoint appears at the top of the screen. When the waypoint is no longer a destination, the presentation mode is reset to HEAD UP mode.

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.

North marker   Heading line
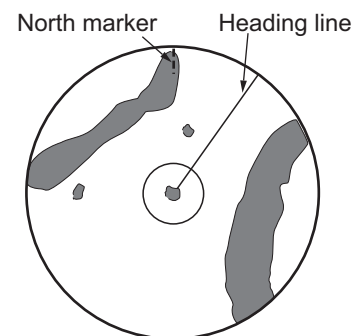
True motion mode

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 move the cursor onto the disp mode box at the top of the screen, then press and hold 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.
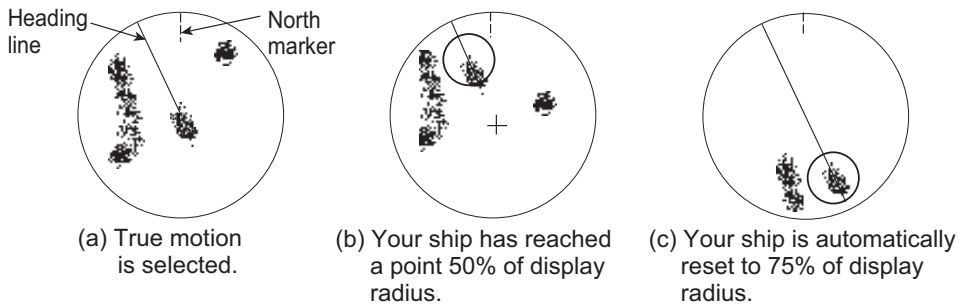
1.13 How to Set Up Function Keys

Some menu functions and menus can be assigned to a function key. This allows one-touch access to the assigned function or menu.

1.13.1 Set the function operation mode

There are two operation modes for function key settings.

- Single: registers one function to one of the keys.
- Multi: registers a maximum of eight functions to one of the keys.

The default setting is "single". Change the settings as follows.

1. Open the [MAIN MENU].
2. Select [INITIAL SETTING], then press the **left button**.
3. Select [FUNCTION KEY], then press the **left button**.
4. Select [FUNCTION OPERATION], then press the **left button**.
5. Select [SINGLE] or [MULTI], then press the **left button**.
6. Close the menu.

[FUNCTION KEY]
1. BACK
2. [F1]
3. [F2]
4. [F3]
5. [F4]
6. [MSU-003(A)]
7. [MCU-003(B)]
8. FUNCTION OPERATION SINGLE/MULTI

1.13.2 Operate the function keys

Single

Press a function key (F1/F2/F3/F4 key/knob) to execute the registered function. The function keys are preset as follows;

Function key number	Function
F1	Chart setting
F2	Orientation mode
F3	Custom menu
F4	TLL output

Multi

Press the F1 key (or F2/F3/F4 key) to select the registered functions. The function keys are preset as follows;

No.	Function key number			
	F1	**F2**	**F3**	**F4**
1	Chart display	Orientation mode	Custom menu	TLL output
2	Nav aids	Brill	EAV	MOB
3	Waypoint list	CU-TM reset	ES	ACE high sens.
4	Route list	TT list	Video cnt	-
5	Edit mark	AIS list	ACE	-
6	-	Consort list	Target analyzer	-
7	-	BPS buoy list	-	-
8	-	-	-	-

1. Press the **F1** (or F2/F3/F4) knob.
   The selecting menu appears.

2. Rotate the knob to select function desired.

3. Select a function with pressing the knob.
   Repeat pressing the knob changes the menu.

[F1 KEY EXECUTION]

1. CHART DISPLAY
2. NAV AID
3. WAYPOINT LIST
4. ROUTE LIST
5. EDIT MARK
6.
7.
8.

1.13.3 Change the function key setting

To activate an assigned function, press the corresponding function key (**F1**, **F2**, **F3** or **F4**).

You can change the function assigned to each key using the following procedure.

1. Open the [MAIN MENU].

2. Select [INITIAL SETTING], then press the **left button**.

3. Select [FUNCTION KEY], then press the **left button**.

4. Select [F1], [F2], [F3] or [F4] as appropriate, then press the **left button**.

5. Referring to the table of available functions below, select a function category, then left-click.

Function category	Available function
ECHO	PICTURE, RAIN/SEA/IR, ES, EAV, TARGET ANALIZER, HATCHING, NOISE REJ, VIDEO ADJ, PULSE LENGTH, NEAR STC CURVE, LOW LEVEL ECHO, ACE,TUNE SELECT, 2ND ECHO REJ, PM, SART, ECHO TRAIL, TRAIL T/R, WIPER, ACE, TUNE INITIALIZE, TRAIL, 2ND ECHO REJ, SART/WIPER, ECHO AREA, ZOOM, ZOOM AREA
TARGET (TT/AIS)	TT-LIST, AIS-LIST, CONSORT-LIST, GPS BUOY LIST, TARGET ACQ/SETTING, AIS PAST POSN, CONSORT DISPLAY, TT DISPLAY, GPS BOUY DISPLAY, OTHERTRACK CLEAR, OTHER TRACK INTERVAL, OTHER TRACK EDIT, CPA/TCPA, AZ1, AZ2, RESERVE MESSAGE
PLOTTER	WPT LIST, ROUTE LIST, WPT MARK, SIMPLE DESTINATION, CHART, WPT TIME, MARK SIZE, AUTO SHOT, MARK FILTER, MARK ALL DELETE, MARK INFO, ORIGIN MARK, CHART POS, MOB, OWN TRACK DISP, OWN TRACK ALL DELETE, TRACK EDIT, TRACK CHANGE ROUTE
OPERATION	MEMORY, ZOOM, ORIENTATION, VECTOR TIME, VECTOR MODE, TRAIL TIME, TRAIL MODE, ALARM1, ALARM2, ECHO COLOR, BRILL, TLL, DATA BOX 1, DATA BOX 2, DATA BOX 3, SCREENSHOT

Function category	Available function
PICTURE	CUSTOM1, CUSTOM2, CALM, RAIN, HEAVY RAIN, ABA, PICK, COAST, OCEAN, BOUY

6. Select the appropriate function to assign, then press the **left button**.

7. Close the menu.
   Repeat the procedure as necessary to set up other function keys.

1.14 How to Select the Interface for Heading Input

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

Heading input format can be selected as follows:

1. Place the cursor on the [HDG] box at the top-left of the screen, then press the **right button**. The [HDG] context menu appears.

2. Select [HDG SOURCE], then press the **left button**.

3. Select [AD-10] or [SERIAL] as appropriate, then press the **left button**.
   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.

1.15 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.

Note: Where the own ship speed exceeds 99.9kn, the displayed speed is "99.9kn".

1.15.1 Automatic speed input (log or GPS navigator)

1. Select the [NAV DATA] menu from the [MAIN MENU], then press the **left button**.
   The [NAV DATA 1/2] menu appears.

2. Select [SHIP SPEED SETTING], then press the **left button** to show the [SPEED SETTING] menu.

3. Select [SHIP SPEED], then press the **left button**.

```
[SHIP SPEED SETTING]

1.  BACK
2.  SHIP SPEED
    LOG(BT) / LOG(WT) /
    GPS
3.  SET DRIFT
    OFF/ON
    000.0°
    0.0kn
```
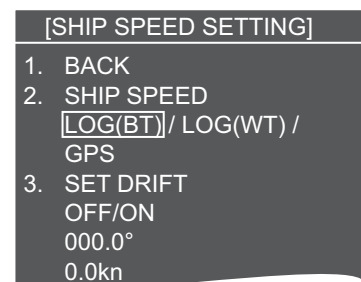
4. Select the appropriate source for automatic speed input, then press the **left button**.

Selection	Explanation	Stabilization Mode
[LOG (BT)]*	Log, speed over ground (SOG)	Ground stabilization
[COG (WT)]	Log, Speed thru water (STW)	Sea stabilization
[GPS]	Speed input by GPS navigator	Ground stabilization

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

1) From the [SHIP SPEED SETTING], select [SET DRIFT], then press the **left button**.
2) Select [ON], then press the **left button**.
3) Select the set angle, then press the **left button**.
4) Select the drift speed, then press the **left button**.

5. 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 leeway.

- 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)" appears and the alert buzzer sounds if no log signal is present for 30 s.
- A single-axis water log cannot measure speed when the wind is coming from the leeway direction.

1.16   How to Set the Navigational Data Box

You can select the information box for own ship. Three information boxes are prepared at top on the screen. The boxes show the following data: heading, own ship's speed, own ship's bearing, date and own ship's position, water temperature, water depth, wind direction/speed and current direction/speed.

Presetting of navigation data

- Box 1: Own ship's speed.
- Box 2: Own ship's heading.
- Box 3: Date and own ship's position.

How to change the navigation data

1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.

2. Move the cursor onto the information box desired.

3. Press the **left button** several times to select the information.
   You can also select the information by pressing the **left button**, then rotate the **scrollwheel**.

How to hide the navigation data box

1. Open the [MAIN MENU].

2. Select [NAV DATA], then press the **left button**.

3. Select [DATA BOX 1] (or DATA BOX 2/3), then press the **left button**.

4. Select [OFF], then press the **left button**.

5. Close the menu.

1.17 How to use MOB Mark

When a person falls overboard from the vessel, use the MOB (Man Overboard) function. This mark shows the range, bearing and estimated time to MOB position.

Note: Following operations are enable when [ROUTE SELECT] is set to [IN] in the [ROUTE/WAYPOINT] menu.

Enter the MOB mark

1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.

2. Move the cursor onto the MOB box at the bottom-right of the screen.

3. Press the **left button**.

   The MOB mark ((◎)) is entered on the location of own ship's position and the confirmation message box appears.
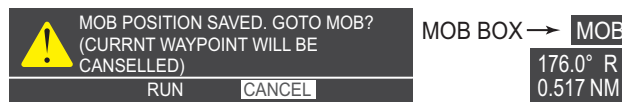
4. Select [RUN], then press the **left button**.
   The line between MOB location and own ship appears. The information box for waypoint at the top of the screen indicates the time to go to the waypoint.

Target information box

Note: Only one MOB mark can be entered any one time. When a new MOB mark is entered, the old mark is deleted.

Erase the MOB mark

1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.

2. Move the cursor onto the MOB box at bottom-right on the screen.

3. Press and hold the **left button**.
   The MOB mark disappears.
   Note: You can also erase the MOB mark by selecting the mark with the cursor and pressing **DEL** key.

1.18 How to Adjust the Gain

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.

1.18.1 How to select auto/manual gain control

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.

2. Move the cursor onto the [GAIN] box at the top-right of the screen.

Level bar
Select auto or manual
GAIN   75
Place cursor inside window to adjust gain.
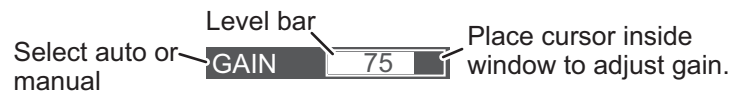
3. Press the **left button** to select [GAIN] (automatic adjustment) or [GAIN MAN] (manual adjustment).

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

1.18.2 How to adjust the gain manually

You can adjust the gain manually by following procedure.

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.

2. Move the cursor onto the range box at the top-left of the screen.

3. Rotate the **scrollwheel** to select 48 NM, then press the **left button**.

4. Select the manual adjustment refer to paragraph 1.18.1.

5. Move the cursor onto the level bar.

6. Rotate the **scrollwheel** upward to decrease the gain, or downward to increase the gain. The setting range is [0] to [100]. Adjust the gain to around 80.

How to adjust the GAIN from the control unit (RCU-029)

Rotate the **GAIN** knob (**F3**). Rotate anticlockwise to decrease the gain, or clockwise to increase the gain.

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 changed. For that reason adjust them carefully.

Note 2: The echo average (see "Echo Averaging" on page 1-28) 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. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.

2. Move the cursor onto the [SEA AUTO] or [SEA MAN] (whichever is shown) at the top of the display.

> A/C SEA adjustment method
> (SEA AUTO or SEA MAN)
>
> Place arrow inside window
> to adjust A/C SEA.
>
> SEA MAN   70
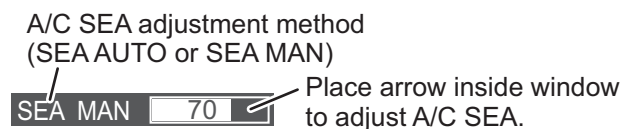
3. Press the **left button** to display [SEA (A)] or [SEA (M)] as appropriate.

1.19.2 How to fine-tune sea clutter reduction

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.

How to fine-tune sea clutter reduction from the control unit (RCU-029)

Rotate the **AC/SEA** knob (**F2**). Rotate anticlockwise to decrease the AC/SEA, or clockwise to increase the A/C SEA.

How to fine-tune sea clutter reduction from the on-screen box

1. Select [SEA AUTO], following the procedure in paragraph 1.19.1.

2. Place the arrow on level indicator inside the A/C SEA box at the top of the display.

3. While observing the A/C SEA level indicator, rotate the **scrollwheel** to increase/decrease the A/C SEA. 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.

Sea clutter at
screen center

A/C SEA control adjusted;
sea clutter reduced
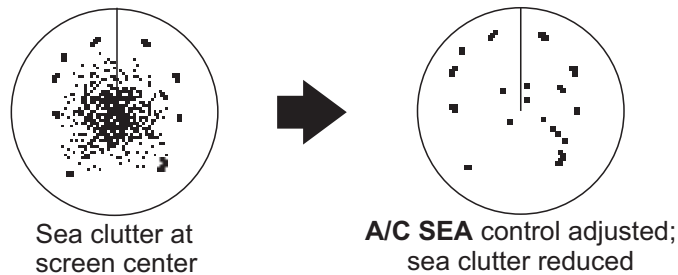
The proper setting of the A/C SEA should be such that the clutter is broken up into small dots, and small targets become distinguishable. If the setting is set too low, targets will be hidden in the clutter, while if the setting is too high, both sea clutter and targets will disappear from the display. 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.

How to reduce sea clutter manually from the control unit (RCU-029)

Rotate the **AC/SEA** knob (**F3**). Rotate anticlockwise to decrease the AC/SEA, or clockwise to increase the A/C SEA.

How to reduce sea clutter manually from the on-screen box

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 **scrollwheel** downward to increase the A/C SEA or upward 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 changed. For that reason adjust them carefully.

Note 2: The echo average (see "Echo Averaging" on page 1-28) 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 select the method of rain clutter reduction

Select the [RAIN] indication at the top-right of the screen, then press the **left button** to toggle [RAIN(A)] (automatic reduction) and [RAIN(M)] (manual reduction).

Left-click inside the box to change the A/C RAIN
adjustment method (RAIN AUTO or RAIN MAN)

RAIN MAN   70

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.

Rain clutter at screen center

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.
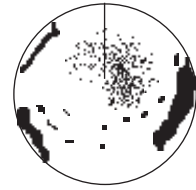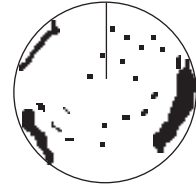
A/C RAIN control adjusted; rain clutter reduced

How to fine-tune sea clutter reduction from the control unit (RCU-029)

Rotate the **AC/RAIN** knob (**F2**). Rotate anticlockwise to decrease the AC/SEA, or clockwise to increase the A/C SEA.

How to fine-tune sea clutter reduction from the on-screen box

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

   A/C RAIN adjustment method
   (RAIN AUTO or RAIN MAN)

   Place arrow inside window to adjust A/C RAIN.

   RAIN MAN   70

2. While observing the A/C RAIN level indicator, rotate the **scrollwheel** downward to increase the A/C SEA or upward to decrease it. 100 levels (0 to 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
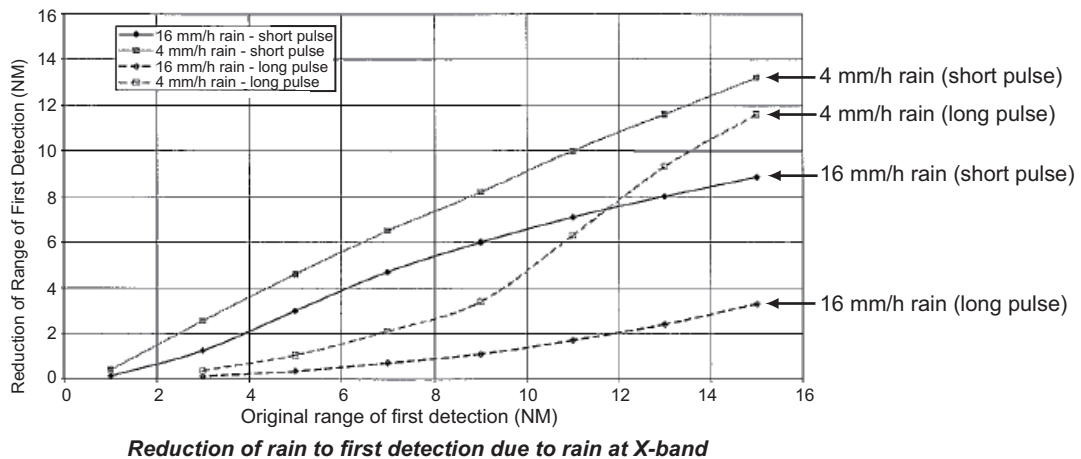
The author thanks the International Electrotechnical Commission (IEC) for permission to reproduce Information from its Interarntional Standard IEC 62388 ed.1.0 (2007). All such extracts are copyright of IEC, Geneva, Switzerland. All rights reserved. Further information on the IEC is available from www.iec.ch. IEC has no responsibility for the placement and context in which the extracts and contents are reproduced by the author, or is IC in any way responsible for the other content or accuracy therein.

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.
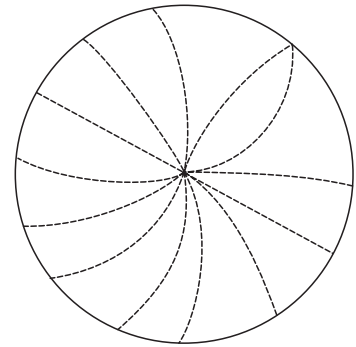
1. Open the [MAIN MENU].

2. Select [ECHO], then press the **left button**.

3. Select [CUSTOMIZE ECHO], then press the **left button**.

4. Select [INT REJECT], then press the **left button**.

5. Select the rejection level from [1], [2], [3] or [OFF], then press the **left button**.
   Level [3] provides the highest level of rejection.

6. Close the menu.

[CUSTOM ECHO MENU 1/2]

1. BACK
2. INT REJECT
   OFF/1/2/3
3. ECHO STRETCH
   OFF/1/2/3
4. ECHO AVERAGE
   OFF/1/2/3
5. ACE
   OFF/ON
6. TARGET ANALYZER
   OFF/ON
7. HATCHING
   OFF/ON
8. NOISE REJECT
   OFF/ON
9. [PULSE]

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]...

3	NM
RING	0.5
HEAD UP RM	
PULSE M	
CUSTOM 1▸	
EAV OFF	
ES 1	
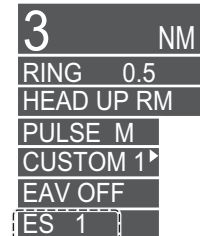
1.23 Echo Averaging

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:

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Move the cursor onto the EAV box, then press the **left button** several times 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 ACE threshold setting.

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

1.24.1 How to turn the 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.

GAIN	75
SEA MAN	70
RAIN MAN	70
TUNE MAN	

ACE not activated

GAIN ACE	75	— Place arrow inside window
SEA MAN	70	to adjust ACE.
RAIN MAN	70	
TUNE MAN		
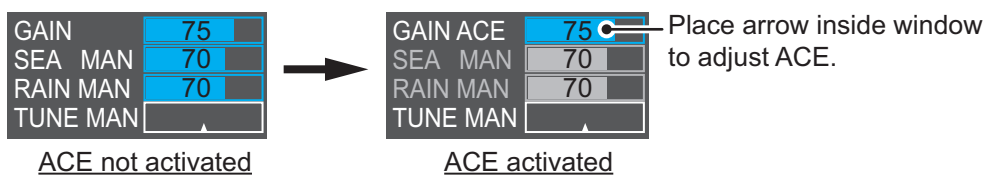
ACE activated

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

1.24.2 How to adjust the gain in 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 **scrollwheel**.

1.24.3 How to get high sensitivity

When Automatic Clutter Elimination (ACE) function is [ON], the high sensitivity mode operates while pressing the function key. Refer to paragraph 1.13.3 to set the function key. You can select the level for the high sensitivity mode as follows:

1. Open the [MAIN MENU].
2. Select [ECHO], then press the **left button**.
3. Select [NEXT], then press the **left button**.
4. Select [ACE], then press the **left button**.
5. Select [SIGNAL ENHANCEMENT], then press the **left button**.
6. Rotate the **scrollwheel** to select a level for high sensitivity among 1, 2 or 3, then press the **left button**.
7. Close the menu.

[ACE]
1. BACK
2. SIGNAL ENHANCEMENT
   1/2/3
3. SUPPRESS SECTOR
   START : 000
   ANGLE : 000
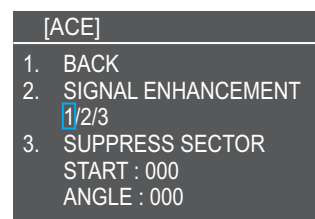
1.24.4 How to suppress false echoes

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 **left button**.
3. Select [NEXT], then press the **left button**.
4. Select [ACE], then press the **left button**.
5. Select [SUPPRESS SECTOR], then press the **left button**.
6. Rotate the **scrollwheel** to select the sector start angle and range, then press the **left button**.
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.

1. Open the [MAIN MENU].
2. Select [ECHO], then press the **left button**.
3. Select [CUSTOMIZE ECHO] then press the **left button**.
4. Select [NOISE REJECT], then press the **left button**.
5. Select [ON], then press the **left button**.
6. Close the menu.

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) (ACE set 'ON')	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.

Note: When the [TRUE VIEW] is set to [ON] of the [ECHO 2/2] menu, this feature is not used.

To activate the wiper feature, do the following:

1. Open the [MAIN MENU].

2. Select [ECHO], then press the **left button**.

3. Select [WIPER], then press the **left button**.

4. Rotate the **scrollwheel** to cycle through and select the desired setting. The options, in order, are: OFF → 1 → 2 → OFF...
With the desired setting selected, press the **left button**.

5. Close the menu.

```
[ECHO  1/2]
1.   BACK
2.   [CUSTOMIZE ECHO]
3.   TUNE INITIALIZE
4.   [TRAIL]
5.   2ND ECHO REJ
      OFF/ON
6.   SART
      OFF/ON
7.   WIPER
      OFF/1/2
8.   ZOOM
      OFF/2TIMES/3TIMES
9.   ZOOM DISPLAY
      STAB GND/STAB HDG/
      STAB NORTH
```

1.27 Zoom

The zoom function enlarges an area of interest as large as twice the normal viewing size, in the [INFORMATION BOX]. Zoom can be selected using the control unit or from a preset function key (see section 1.13 for how to assign functions to the function keys).

1.27.1 How to use the zoom functions

To enable/disable the zoom magnification, select the appropriate zoom setting ([2TIMES]: Enables magnification at 2×, or [3TIMES]: Enables magnification at 3×) from the [ZOOM] option in the [INFORMATION BOX] menu. (See section 1.9.)

Note: Zoom is not available when the [TRUE VIEW] setting for [ECHO 2/2] is [ON].

1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.

2. Rotate the **scrollwheel** to select [ZOOM SET], then press the **left button**.

3. Move the cursor inside the operational display area, then press the **left button**. The cursor is now displayed with a zoom box.

4. Move the cursor and zoom box at the location you wish to zoom, then press the **left button**.

5. Press the **right button** to complete the procedure. The selected area is displayed on the right-side of the screen and the cursor returns to normal shape.

Cursor with zoom box

Zoom box is placed at the location to be zoomed and the cursor returns to its normal shape.
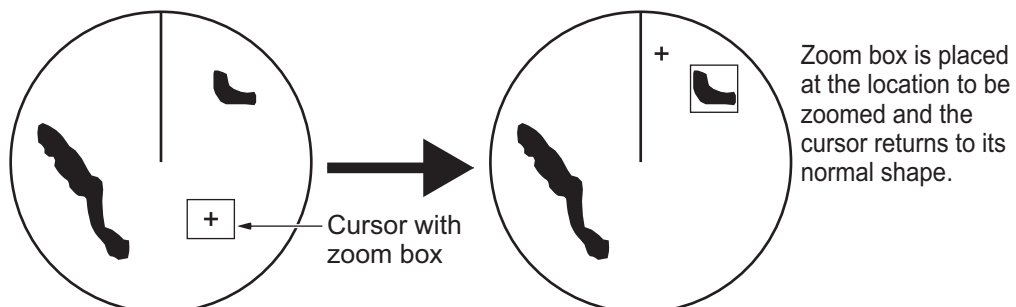
To disable the zoom function, repeat steps 1 to 3. At step 3, the zoom box is removed from the cursor.

1.27.2 Select zoom expansion

1. Open the [MAIN MENU].

2. Select [ECHO], then press the **left button**.

3. Select [ZOOM], then press the **left button**.

4. Select [2TIMES] or [3TIMES], then press the **left button**.

5. Select [ZOOM DISPLAY], then press the **left button**.

6. Select the method to expand, then press the **left button**.
   [STAB GND]: stab ground expansion [STAB HDG]: stab relative heading expansion [STAB NORTH]: stab true bearing expansion

7. Close the menu.

1.28 How to Off-Center the Display

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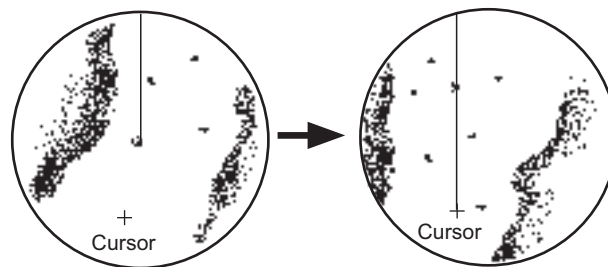
Put cursor where desired and do appropriate off-center procedure.

Off-centered display

This feature is not available on the 96 nm range or in the true motion mode.

If the conning position is outside the effective radar display, some parts of the bearing scale are not shown. For details, see.

How to off-center the display from the control unit

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Move the cursor at the position where you wish to move the sweep origin.

3. Press the **OFF CENTER** key. The sweep origin is now off-centered at the cursor position.

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

How to off-center using cursor function box

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Rotate the **scrollwheel** to select [OFFCENTER] from the cursor function box.

3. Move the cursor onto the location desired.

4. Press the **left button**.
   The sweep origin is off-centered.

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

• Own ship marker is large.

• Short-distance display range.

To cancel the off-center, select a larger range, then cancel the off-center.

1.29 Picture Presets

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 [ROUGH SEA], and is designed to be used in heavy rain.

Two user-programmable presets are also provided (labeled as [CUSTOM1/2]), so that you can have the radar automatically set to those conditions which are not covered by the provided setup options.

Below are the preset options provided with this radar.

Label	Description
CUSTOM1	User-defined custom settings.
CUSTOM2	User-defined custom settings.
CALM SEA	Optimum setting for calm sea.
RAIN	Optimum setting for normal rain.
ROUGH SEA	Optimum setting for rough weather or heavy rain.
NET FLOAT	Optimum setting for detection of floats on net (for purse seiner, etc.).*
BIRD	Optimum setting for detecting birds.
COAST	Optimum setting for short range detection using a range scale of 3 NM or less on calm seas.
OCEAN	Optimum setting for long range detection, on a range scale of 6 NM or larger.
BUOY	Optimum setting for detecting buoys.

* Set [ECHO AVERAGE] to [2] to see state of floats on net clearly. See section 1.23 for echo averaging.

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.

Changing 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.

The default settings for the custom presets are listed in the table below.

Default settings

Picture Name		CUSTOM1	CUSTOM2	CALM SEA	RAIN	ROUGH SEA	NET FLOAT	BIRD	COAST	OCEAN	BUOY
GAIN	MODE	MAN	MAN	MAN	MAN	MAN	MAN	MAN	MAN	MAN	MAN
	LEVEL	85	85	90	80	85	90	93	85	85	85
SEA	MODE	MAN	AUTO	MAN	MAN	MAN	MAN	MAN	MAN	MAN	MAN
	LEVEL	30	30	20	40	40	30	0	30	30	30
RAIN	MODE	MAN	MAN	MAN	MAN	MAN	MAN	MAN	MAN	MAN	MAN
	LEVEL	0	0	0	60	50	0	0	0	0	0
INT REJECT		1	1	1	1	2	1	1	1	1	1
ECHO STRETCH		1	2	1	OFF	OFF	OFF	3	1	3	1
ECHO AVERAGE		1	2	1	1	2	1	0	1	1	1
NOISE REJECT		OFF	ON	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
VIDEO CONTRAST TYPE		2-B	2-B	1-B	1-B	1-B	2-B	4-B	1-B	1-B	2-B
ACE		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
ACE GAIN		80	80	80	80	80	80	80	80	80	80
TARGET ANALYZER		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
HATCHING		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
PULSE	1.5NM	S	S	M	S	S	S	M	M	M	S
	3NM	M	M	M	M	M	M	M	M	M	M
	4NM	L	L	L	L	L	L	L	L	L	L
CONDITION	NEAR STC CURVE	3	3	3	3	3	3	3	3	3	3
	STC ANT HEIGHT (m)	Set at installation.									
	LOW LEVEL ECHO	0	0	0	0	0	0	0	0	0	0

1.29.1 How to select a customized echo

Pressing the **left button** after moving the cursor on the [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] → [CALM SEA] → [RAIN] → [ROUGH SEA] → [NET FLOAT] → [BIRD] → [COAST] → [OCEAN] → [BUOY].

Note 1: You can invalidate the option which is not required. Refer to paragraph 1.29.5.

Note 2: While the customize option is edited, the editing icon appears beside the box. Left click the editing icon to store the customized option to internal memory, or select other customize option, then the editing icon disappears.

1.29.2 How to edit a customized echo

1. Select a customize echo option to edit (see paragraph 1.29.1).

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.
    The editing icon appears when the settings are changed.

    • [INT REJECT]   : section 1.21   • [HATCHING]   : section 1.36
    • [ECHO STRETCH]   : section 1.22   • [NOISE REJECT] : section 1.25
    • [ECHO AVERAGE]   : section 1.23   • [PULSE]   : section 1.11
    • [TARGET ANALYZER] : section 1.36   • [ACE]   : section 1.24

4. Select [NEXT], then press the **left button** to open the [CUSTOM ECHO MENU 2/2]

```
[CUSTOM ECHO MENU 2/2]

1.   BACK
2.   VIDEO CONTRAST TYPE
     1/2/3/4
     A/B/C
3.   [CONDITION]
4.   DEFAULT
     NO/SAVE/USER/FACTORY
```

5. Select [VIDEO CONTRAST TYPE], then press the **left button**.
    The cursor moves to numeral.

6. 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.
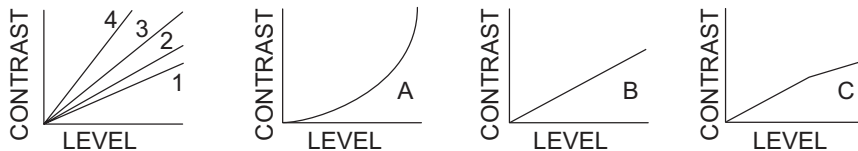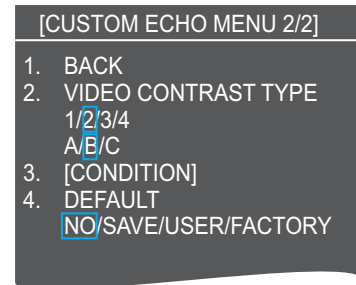
1-4: Control dynamic range. 1 provides the widest dynamic range; 4 is the narrowest dynamic range.
A: Low level echo brilliance is reduced and noise and clutter are also reduced.
B: Low and high level echoes are displayed evenly.
C: High level echoes' outer edge has gradation to indicate the echo level, with the higher level echo at the core.

7. Select [CONDITION], then press the **left button**.

8. Select [NEAR STC CURVE], then press the **left button**.

9. Select the appropriate setting for the current sea conditions, then press the **left button**. The available settings are: [2], [2.5], [3], [3.5], [4.2]. A higher setting is recommended for rough weather.

10. Select [STC ANT HEIGHT], then press the **left button**.

11. Select the radar antenna height (above the waterline), then press the **left button**.

12. If necessary, select [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.

13. To save custom settings, select [SAVE] from [DEFAULT], then press the **left button**.

14. Close the menu.

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

If you get lost in operation while changing the settings for a user customized echo, you can easily restore the settings for that user customized echo saved at paragraph 1.29.2.

1. Select the [CUSTOMIZE ECHO] box, then press the right button to display the [CUSTOMIZE ECHO] menu.
2. Select [NEXT], then press the **left button**.
3. Select [DEFAULT], then press the **left button**.
4. Select [USER], then press the **left button**.
5. Close the menu.

1.29.4 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 1-34).

1. Select the [CUSTOMIZE ECHO] box, then press the right button to display the [CUSTOMIZE ECHO] menu.
2. Select [NEXT], then press the **left button**.
3. Select [DEFAULT], then press the **left button**.
4. Select [FACTORY], then press the **left button**.
5. Close the menu.

1.29.5 How to invalidate the unused preset option

You can invalidate the unused picture preset option. The options which setting is [ON] are selectable.

Note: The using option cannot be set [OFF].

1. Open the [MAIN MENU].
2. Select [ECHO], then press the **left button**.
3. Select [NEXT], then press the **left button**.
4. Select [CUSTOM SELECT], then press the **left button**.
5. Select the option desired, then press the **left button**.
6. Select [OFF], then press the **left button**.
7. Close the menu.

```
[CUSTOM SELECT  2/2]
1.  BACK
2.  CUSTOM1
    OFF/ON
3.  CUSTOM2
    OFF/ON
4.  CALM SEA
    OFF/ON
5.  RAIN
    OFF/ON
6.  ROUGH SEA
    OFF/ON
7.  NET FLOAT
    OFF/ON
8.  BIRD
    OFF/ON
9.  COAST
    OFF/ON
0.  NEXT
```
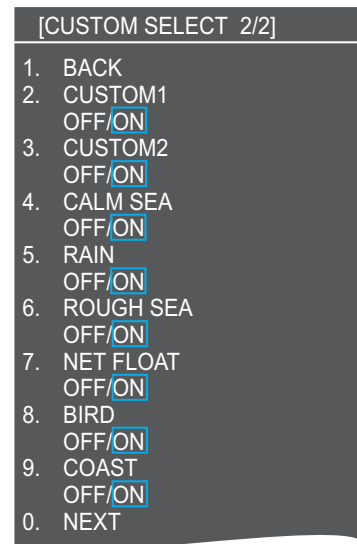
1.30 How to Reject Second-trace Echoes

In certain situations, echoes from very distant 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 the next radar pulse has been transmitted.
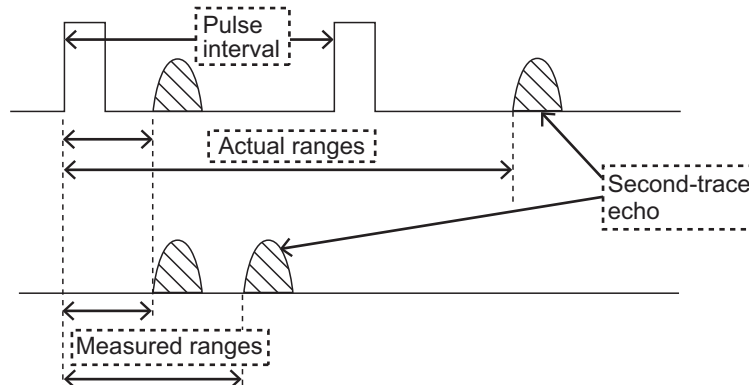
This equipment lengthens the pulse repetition period to reject false echoes.

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 **left button**.
3. Select [2ND ECHO REJ], then press the **left button**.
4. Select [ON], then press the **left button**. Select [OFF] to disable rejection.
5. Close the menu.

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 [CURSOR/OWN SHIP MARK], then press the **left button**.

3. Select [RANGE RING], then press the **left button**.

4. Rotate the **scrollwheel** to select [OFF], [STD.] or [MANUAL] as appropriate, then press the **left button**. Select prefer number of ring with the **scrollwheel** when you select the [MANUAL].

5. Close the menu.

```
[CURSOR/OWN SHIP MARK]
1.   BACK
2.   [CURSOR]
3.   [EBL/VRM]
4.   [PI LINE]
5.   [NET CORSOR]
6.   BEARING CURSOR
     360°/ 16 POINTS
7.   RANGE RING
     OFF/STD./MANUAL
     4
8.   [OWN SHIP MARK]
9.   [BARGE MARK]
```

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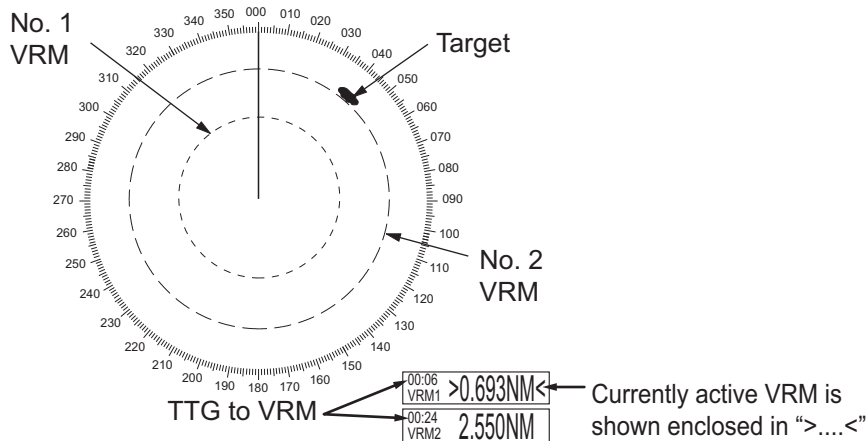
There are two methods for measuring range with the VRMs, using the **VRM** key and on-screen menu box operation.

Using the VRM key

1. Press the **VRM** key to display the VRM boxes. Press the **VRM** key again to switch between active VRMs. The currently active VRM marker is displayed as shown in the figure.

2. Rotate the **VRM control** knob to align the active VRM with the inner edge of the target, then read the distance at the lower right of the screen. 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.
   VRM range marker hides as marker indicated condition.

   • Both of VRM1 and VRM2 indicated and VRM1 (or 2) is activated: VRM2 (or 1)

   • VRM1 (or VRM2) only indicated: VRM1 (or 2)

Using the VRM control box

1. Press the **CURSOR ON/OFF** key, when the cursor is not shown.

2. Move the cursor onto the VRM box (VRM1 or VRM2), then press the **left button**.

3. Rotate the **scrollwheel** to move the cursor onto the inside edge of target, then press the **left button** and read the distance from own ship location to the target.

4. Move the cursor onto the VRM box, then press and hold the **left button** to erase the selected VRM.
   VRM range marker hides as marker indicated condition.

   • Both of VRM1 and VRM2 indicated and VRM1 (or 2) is activated: VRM2 (or 1)

   • VRM1 (or VRM2) only indicated: VRM1 (or 2)

1.31.3 How to set the VRM unit of measurement

VRMs can be displayed in the following units of measurement:

[EBL/VRM]
1. BACK
2. EBL 1
REL/TRUE
3. EBL 2
REL/TRUE
4. VRM 1
NM/km/SM
5. VRM 2
NM/km/SM
6. EBL OFFSET BASE
STAB GND/STAB HDG/
STAB NORTH
7. VRM TTG
OFF/1/2/1+2
8. VRM OFFSET
OFF/LINE EBL

• NM (Nautical Miles)   • KM (Kilometers)
• SM (Statute Miles)

To change the unit of measurement, do the following:

1. Open the [MAIN MENU].

2. Select [CURSOR OWN SHIP MARK], then press the **left button**.

3. Select [EBL/VRM], then press the **left button**.

4. Select [VRM1] or [VRM2] as appropriate, then press the **left button**.

5. Select the unit of measurement, then press the **left button**.

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 [CURSOR OWN SHIP MARK], then press the **left button**.

3. Select [EBL/VRM], then press the **left button**.

4. Select [VRM TTG], then press the **left button**.

5. Select [OFF], [1], [2] or [1&2] as appropriate, then press the **left button**.

   • [OFF]:   No TTG to VRM displayed.
   • [1]:   TTG to VRM1 displayed.
   • [2]:   TTG to VRM2 displayed.
   • [1and2]: 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 has an EBRL (Electronic Bearing Range Line, indicated as a short line, crossing the EBL at right angles). When VRM is not displayed and only EBL is displayed, the EBRL shows the range from the EBL origin.
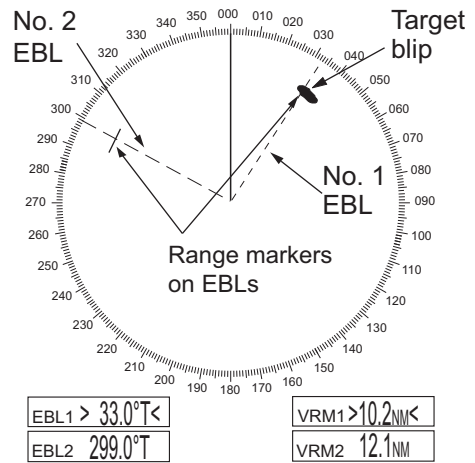
When VRMs are displayed with EBLs the VRM overlaps the EBRL. The value for EBRL and VRM is the same and is displayed in the VRM box at the bottom-right of the screen.

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 the EBL boxes. Press the key again to change between EBLs. The currently active EBL appears as shown in the figure below.

| EBL1 >189.5°T< | ← Currently active EBL is |
| EBL2   159.8°T | shown enclosed in ">...<" |
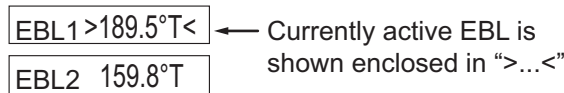
2. Rotate the **EBL** knob until the active EBL bisects the target of interest, and read its bearing at the lower-left corner of the screen.

3. Press and hold the EBL key to erase the active EBL.
   The inactive EBL indication disappears first. The active EBL indication disappears when EBL key is pressed and held more.

Using the EBL box

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.

2. Move the cursor onto the EBL (1 or 2) box, then press the **left button**.

3. Rotate the **trackball** to move the cursor onto the center of target, then read its bearing at the lower-left corner of the screen.

4. Press the **right button** 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 [CURSOR], then press the **left button**.

3. Select [EBL/VRM], then press the **left button**.

4. Select [EBL1] or [EBL2] as appropriate, then press the **left button**.

5. Select the [REL] or [TRUE] as appropriate, then press the **left button**.

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 Trackball to enable measurement of range and bearing between any two targets. This function is also useful for assessment of the potential risk of collision. It is possible to read CPA (Closest Point of Approach) by using a VRM as shown in (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.
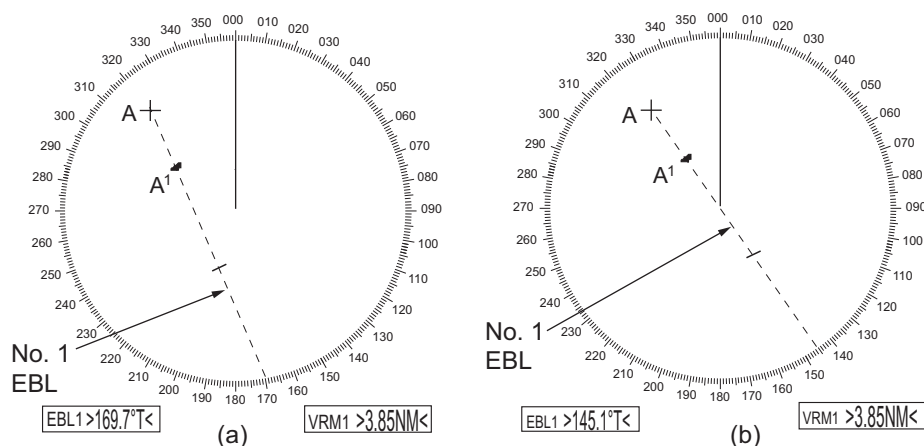
1.33.1   How to assess risk of collision using the offset EBL

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

Using the control unit (RCU-029)

Note: The [EBL OFFSET] function must be assigned to a function key (F1, F2 or F3) for this method. See section 1.13 for how to assign the function keys.

1. Press the EBL key to display or activate an 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** key and the origin of the active EBL shifts to the cursor position. Press the **EBL OFFSET** key again to anchor the EBL origin.

4. After waiting for a few minutes (at least 3 minutes), rotate the **scrollwheel** 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** key.

Using the on-screen box

1. Select the operational display area, then press the **right button**. The [CURSOR] context menu appears.

2. Select [EBL OFFSET], then press the **left button**.

3. Select the operational display area, then press the **left button**. The EBL line is attached to the cursor.

4. Place the offset EBL on the target appearing as threatening, then press the **left button**.

5. After waiting for a few minutes (at least 3 minutes), operate the EBL used in step 4 until it 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.

6. To return the EBL origin to the own ship's position, repeat steps 1 and 2, then press the **right button**.

7. Close the menu.

1.33.2 How to set the origin point reference for EBL OFFSET

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

1. Open the [MAIN MENU].

2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.

3. Select [EBL/VRM], then press the **left button**.

4. Select [EBL OFFSET BASE], then press the **left button**.

5. Rotate the **scrollwheel** to select [STAB GND], [STAB HDG] or [STAB NORTH] as appropriate, then press the **left button**.
    *   [STAB GND]:   Reference to latitude and longitude. Origin position is always fixed regardless of your ship's movement.
    *   [STAB HDG]:   Reference to heading. The relationship between origin position and own position is kept always.
    *   [STAB NORTH]:   Reference to North. The origin position changes with North position.

6. Close the menu.

1.34 How to Measure Range and Bearing Between Two Targets

Range and bearing between two targets can be measured using the EBL and VRM functions.
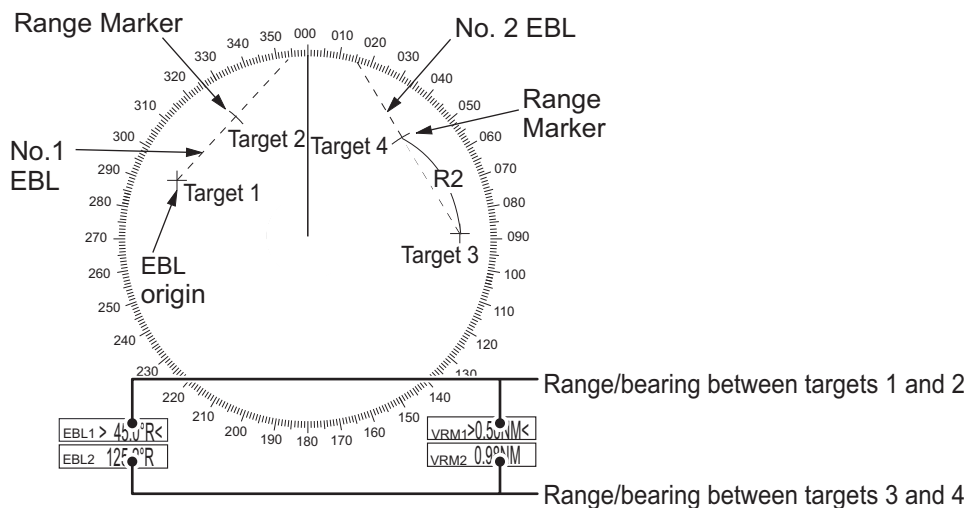
How to measure range and bearing

This procedure uses [EBL1] and [VRM1] as an example.

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.

2. Press the **EBL** key to activate EBL1.

3. Press the **EBL OFFSET** key to activate EBL offset function.

4. Move the cursor onto the target 1, then press the **EBL OFFSET** key. EBL1 moves to the cursor.

5. Rotate the **EBL** key until the EBL line passes through target 2.

6. Rotate the **VRM** key until the range marker on the inside edge of target 2. Read the EBL1 value and VRM1 value at the bottom on the screen.

7. You can repeat the same procedure on target 3 and target 4 of the above example by using the No. 2 EBL and the No. 2 VRM.

Bearing is shown relative to own ship with suffix "R" or as a true bearing with suffix "T" depending on EBL relative/true settings in the [EBL/VRM] menu.

How to link EBL and VRM OFFSET

You can link the EBL and VRM offset to show the VRM range ring with one target as the center-point. This may helpful if the range marker on the EBL is difficult to see.

1. Open the [MAIN MENU].
2. Select [CURSOR/OWN SHIP MARKS], then press the **left button**.
3. Select [EBL/VRM], then press the **left button**.
4. Select [VRM OFFSET], then press the **left button**.
5. Select [LINK EBL], then press the **left button**. The offset EBL is now displayed with the linked VRM range ring.
6. Close the menu.
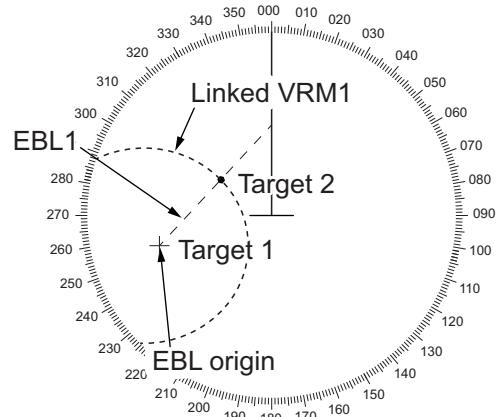
1.35   Target Trails

The trails of the radar echoes of targets can be displayed in the form of synthetic afterglow. Target trails are shown either relative or true and can be sea or ground stabilized. True motion trails require a compass signal, and position and speed data. When the range is changed, trails are continued for targets which were already displayed in the previous range. Newly detected targets have no trail when first detected.

1.35.1   Trail time

Trail time is the interval at which the trail is plotted on-screen. You can change the trail time as follows:

Trail time selecting

Trail length	Trail time
Normal	Off, 15 sec. 30 sec. 1/3/6/15/30 min., continuous
12 H	Off, 30 min. 1/3/6/12 hours, continuous
24 H	Off, 1/2/3/6/12/18/24 hours, continuous
48 H	Off, 2/4/8/16/24/36/48 hours, continuous

Using the control unit (RCU-029)

1. Place the cursor on the trail time setting inside the [TRAIL] box at the bottom-right corner of the screen, then press the **left button**. You can also press the **TGT TRAIL** key to cycle through and select the desired setting.

Trail menu → TRAIL ▶ R   Displayed as: "S", "G" or "R".
Trail time setting → 1 MIN   **S**: Sea stablized,
    G: Ground stabilized,
    R: Relative
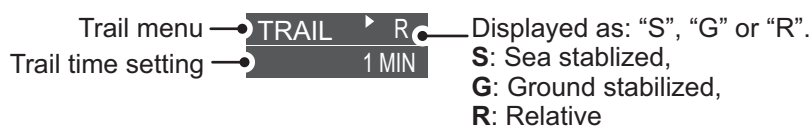
The options, in order, are: [OFF] → [15 sec] → [30 sec] → [1 min] → [3 min] → [6 min] → [15 min] → [30 min] → [CONT] → [OFF]...

Using the on-screen box

1. Place the cursor on the trail time setting inside the TRAIL box, at the bottom-right of the screen.

2. Rotate the **scrollwheel** to change the trail time. The time is changed in 30 second increments
    Note: When using the scrollwheel on the RCU-030 to change the trail time, the time is changed in 30 second increments also.

Note 1: The timer displays the elapsed time of the selected trail. Use caution when using this feature, as the displayed time is not the overall trail time. Also, when the trail timer is displayed, the trail accuracy of other ship's echoes may be lowered. When the trail time reaches the preset interval, the timer disappears.

Note 2: The [CONT] option sets the trail time plotting as continuous. When the plotting time reaches 29:59, the timer is hidden. The timer reappears when [TRAIL ALL CLEAR] is selected, or when the range is changed.

1.35.2 True or relative trails

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

Note 1: The [TRAIL MODE] box is shown in yellow under following conditions:

*   [TRAIL MODE] is set to [TRUE] and presentation mode is set to [HEAD UP RM].

*   [TRAIL MODE] is set to [TRUE] and presentation mode is set to [STERN UP].

The reference for the past position displays for AIS and TT is also switched whenever trail reference is switched.

Note 2: The [TRAIL MODE] box is shown in cyan under the following conditions:

*   [TRAIL MODE] is set to [TRUE] and presentation mode is set to [STAB HEAD UP RM].

*   [TRAIL MODE] is set to [TRUE] and presentation mode is set to [COURSE UP RM].

*   [TRAIL MODE] is set to [TRUE] and presentation mode is set to [NORTH UP RM].
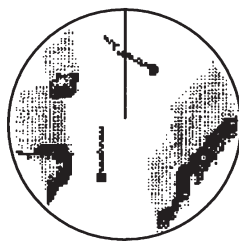
Relative target trails - Targets move relative to own ship, stationary targets are smeared.
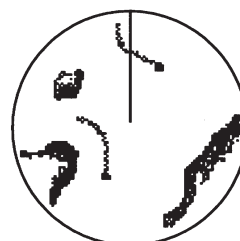
True target trails - Stationary targets are not smeared.

1. Select the [TRAIL] box at the bottom-right of the screen, then press the **right button**. The [TRAIL MENU] appears.

2. Select [TRAIL MODE], then press the **left button**.

3. Referring to the figure on the right, select the appropriate trail mode, then press the **left button**.

4. Close the menu.

1-45

1.35.3   Trail gradation

The trail afterglow can be displayed in a single tone or with gradual shading.
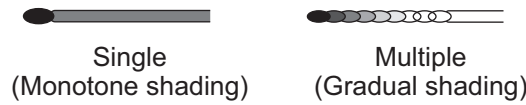
Single
(Monotone shading)

Multiple
(Gradual shading)

1. Select the [TRAIL] box at the bottom-right corner of the screen, then press the **right button** to display the [TRAIL MENU].

2. Select [TRAIL GRAD], then press the **left button**.

3. Select [Single] or [Multi] (Multiple) as appropriate, then press the **left button**.

4. Close the menu.

[TRAIL MENU 1/2]

1. BACK
2. TRAIL MODE
   REL/TRUE
3. TRAIL GRAD
   SINGLE/MULTI
4. TRAIL COLOR
   GRN/BLU/CYA/MAG/WHT/
   YEL
5. TRAIL LEVEL
   1/2/3/4
6. OS TRAIL
   OFF/1/2
7. NARROW TRAIL
   OFF/1/2
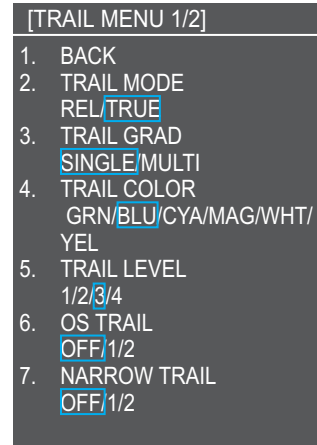
1.35.4   Trail color

The trail line color can be selected as below.

Using [NORMAL] of [TRAIL LENGTH]

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Select the [TRAIL] box at the bottom-right corner of the screen, then press the **right button** to display the [TRAIL MENU].

3. Select [TRAIL COLOR], then press the **left button**.

4. Select the appropriate setting, then press the **left button**.

5. Repeat the step 3 to select other colors.

6. Close the menu.

Using [12H/24H/48H] of [TRAIL LENGTH]

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Select the [TRAIL] box at the bottom-right corner of the screen, then press the **right button** to display the [TRAIL MENU].

3. Select [NEXT], then press the **left button**.

4. Select [LONG TIME TRAIL COL.], then press the **left button**.
   The long time trail color changing intervals are following;

   • 12H trail length: 1 hour

   • 24H trail length: 2 hours

   • 48H trail length: 4 hours

   When the [COLOR SHIFT] is set [ON] of the [LONG TIME TRAIL COL.] menu, trail line's color is changed by the setting time interval.

5. Select [LONG TIME TRAIL COL.], then press the **left button**.

6. Press the **left button** several times to select the color.

7. Rotate the **scrollwheel** to select the appropriate setting, then press the **left button**.

8. Repeat the step 6 and 7 to select other colors.

9. Close the menu.

1.35.5 Trail level

The level, or intensity, of the afterglow that extends from radar targets can be selected as below.

1. Select the [TRAIL] box at the bottom-right corner of the screen, then press the **right button** to display the [TRAIL MENU].

2. Select [TRAIL LEVEL], then press the **left button**.

3. Select the appropriate setting, then press the **left button**. The higher the number, the greater the intensity of the afterglow.

4. Close the menu.

1.35.6 Narrow trails

Target trails can be painted with thinner lines if desired. This can be useful when there are a lot of targets on the screen and it is hard to distinguish one from another.

1. Select the [TRAIL] box at the bottom-right corner of the screen, then press the **right button** to display the [TRAIL MENU].

2. Select [NARROW TRAIL], then press the **left button**.

3. Select the appropriate setting from [OFF], [1] or [2], then press the **left button**. [2] is thinner than [1].

4. Close the menu.

1.35.7 How to hide the trails temporarily

Following the procedure outlined in "Trail time" on page 1-44, set the trail time to [OFF]. The trails are hidden from view, but are continued. To show the trails again, repeat the procedure, setting the trail time to any interval other than [OFF].

1.35.8 How to erase/restart trails

Erase all trails

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

To erase trails, select the [TRAIL] box, then press and hold the **left button**. You can also press and hold **TGT TRAIL** key to erase trails.

Erase the part of trail

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Rotate the **scrollwheel** to select [TRAIL ERASER SELECT].

3. Press the **left button** to select the eraser size.

4. Erase the trail lines by following operations.

    • Erase the partial points: Move the cursor on the trail, then press and hold the **left button**. The points inside of the circle are deleted.

    • Erase the wide area points: Press and hold the **left button** and move the cursor with **trackball** on the trail. The circle overlapping points are deleted.

5. Press the **right button** to finish the operation.

1.35.9 How to prevent sea clutter in true trails

You can prevent the display of sea clutter in true trails about your ship to clear the radar picture. Your ship's trails can also be shown or hidden.

1. Select the [TRAIL] box at the bottom-right corner of the screen, then press the **right button** to display the [TRAIL MENU].

2. Select [OS TRAIL], then press the **left button**.

3. Select [OFF], [1] or [2] as appropriate, then press the **left button**.

Option	Show own ship's trail	Prevent sea clutter in true trails
[OFF]	No	No
[1]	Yes	Yes
[2]	No	Yes

4. Close the menu.

1.35.10 Select the Trail Length

You can select the trail length. The trail times differ from

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Move the cursor onto the [TRAL] box, then press the **right button** to open the [TRAIL MENU 1/2].

3. Select [NEXT], then press the **left button**.

4. Select [TRAIL LENGTH], then press the **left button**.

5. Select the tail length desired, then press the **left button**.
   You can select trail length among Normal, 12H, 24H or 48H.
   Note: When the trail length is changed, current trails are erased and trail box shows [OFF].

6. Close the menu.

1.35.11 How to hide the land trails

You can hide the land trails and clear the radar pictures.

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Move the cursor onto the [TRAIL] box, then press the **right button** to open the [TRAIL MENU 1/2].

3. Select [NEXT], then press the **left button**.

4. Select [HIDE LAND TRAILS(T)] or [HIDE LAND TRAILS(R)], then press the **left button**.

5. Select [OFF], [1] or [2] as appropriate, then press the **left button**.

Option	Still target trail		Moving target trail
	Large target	Small target	
[OFF]	Yes	Yes	No
[1]	No	Yes	Yes
[2]	No	No	Yes

6. Close the menu.

1.35.12 How to hold the trail

You can hold the trail while the time specified from setting [TRAIL LENGTH] to [12H/ 24H/48H] on the [TRAIL MENU 2/2] menu. The hold trail indicated with gray color.

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Move the cursor onto the [TRAIL] box, then press the **right button** to open the [TRAIL MENU 1/2].

3. Select [NEXT], then press the **left button**.

4. Select [TRAIL HIDE], then press the **left button**.

5. Rotate the **scrollwheel** to select start time and press the **left button**.

6. Rotate the **scrollwheel** to select end time and press the **left button**.

7. Close the menu.

Note: To cancel the setting, set the start/end time to [00:00].

1.35.13 Trail color shift

When there are many trails on the screen, especially when using long trails, it is difficult to distinguish past tracks from current tracks since they are the same color/ With the trail color shift feature, tracks are painted in a different color from the point when color shift is activated. For example, the current track color is 1: FUCHSIA. Then, at the moment the trail color shift is made active, trails from that point will be painted in 2: MAROON.
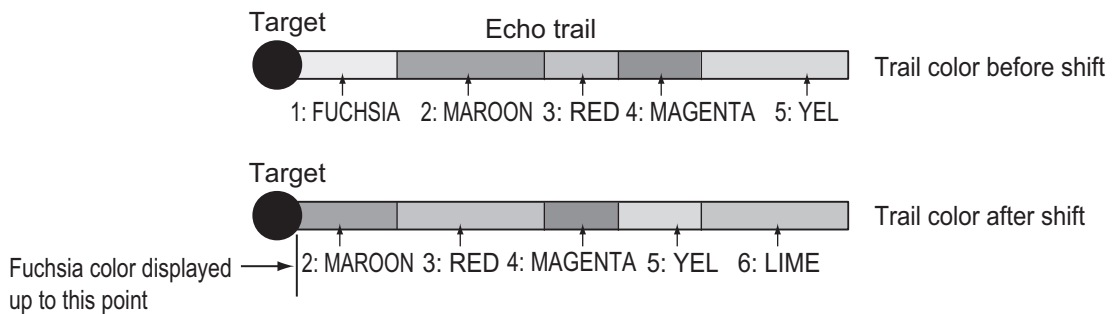
Note: At the moment the trail color shift is activated, the trail colors in effect after the time set in the TRAIL MODE box are erased. For example, the trail length is 12 HOURS and the time set in the TRAIL MODE box is 05:00. Then, using the illustration above as an example, 6: LIME will not be shown.

1. Press the **CURSOR ON/OFF** key when the cursor is not shown on the screen.

2. Move the cursor onto the [TRAIL] on the trail box, then press **right button**. [TRAIL MENU 1/2] menu appears.

3. Select [NEXT], then press the **left button**.

4. Select [LONG TIME TRAIL COLOR], then press the **left button**.

5. Select [COLOR SHIFT], then press the **left button**.

6. Select [ON], then press the **left button**.

7. Close the menu.

1.36 Target Analyzer

The target analyzer function analyzes echoes and assists the operator to determine dangerous targets. This function is particularly useful under heavy rain/snow or where there is surface reflection, which can cause interference and noise.

The target analyzer function can also place hatching over heavy rain areas, reducing the visible interference and allowing a clearer view of potential targets.

Echoes are displayed in five different colors to assist the operator in identifying targets. The colors and their respective echoes change depending on the echo color selected from the [BRILL] menu (see section 1.23) are shown in the table below.

Echo	Selected echo color					
	YEL	GRN	WHT	AMB	M-GRN	M-CYA
Surface reflection	Green	Green	Green	Green	Green	Green
Rain	Gray	Gray	Gray	Gray	Gray	Gray
Moving target	Red	Red	Red	Red	Pink	Pink
Approaching target	Pink	Pink	Pink	Pink	White	White
Other echoes	Yellow	Green	White	Amber	Red to green	Red to cyan

The following example figures show the manner in which this function affects displayed echoes.
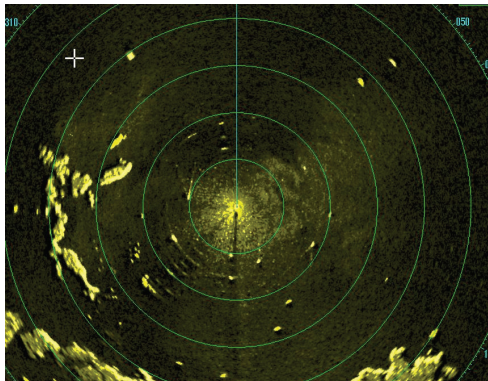
No echo adjustment
(Target analyzer off, EAV off, hatching off)
Rain, moving targets and surface reflections are all displayed with no filtering.
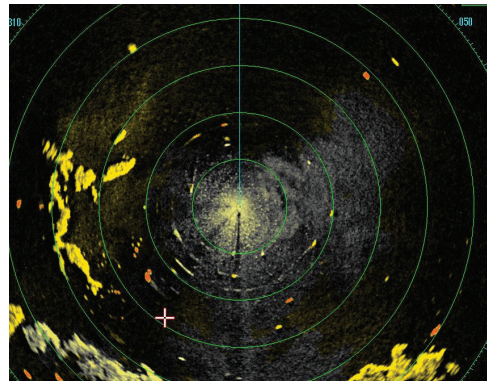
Minimal echo adjustment
(Target analyzer on, EAV off, hatching off)
Echoes are colored, surface reflections are filtered, rain is displayed.
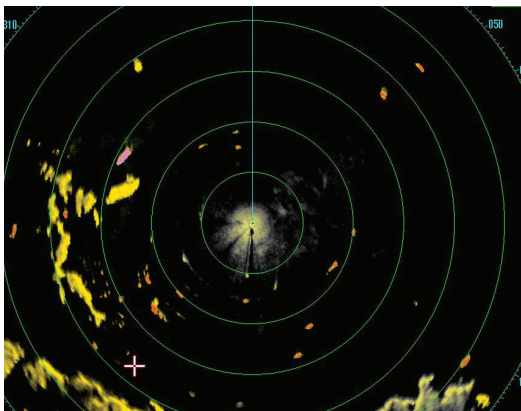
Moderate echo adjustment
(Target analyzer on, EAV on, hatching off)
Echoes are colored, surface reflections and rain are filtered.
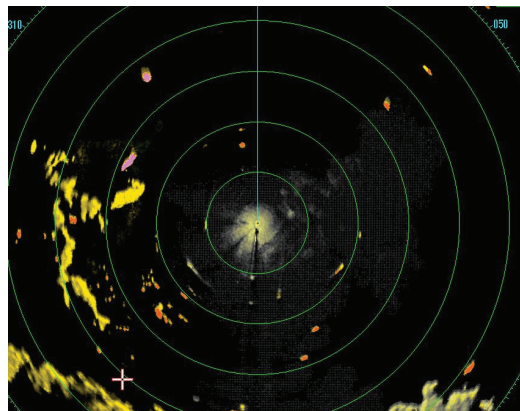
Maximum echo adjustment
(Target analyzer on, EAV on, hatching on)
Echoes are colored, surface reflections are filtered, rain is displayed in gray colored hatching.

Note 1: This function works best when the settings for [GAIN], [STC], [RAIN], [NOISE REJECT] and [VIDEO CONTRAST] are properly adjusted (surface reflections are displayed in green and rain is displayed in gray).

Note 2: This function recognizes moving targets as approaching targets. Buoys and other stationary objects are not recognized as approaching targets by this function.

Note 3: The target analyzer function requires a short period of time to analyze echoes and display them on-screen. If your antenna revolves at more than 40 rpm, moving targets may not be displayed correctly. For this reason, caution is advised when using the target analyzer function.

What is "hatching"?

Where echo averaging may hide light rain on the display, the hatching feature, when activated, places a gray "veil" over the areas where rain is detected. This allows the operator to see where the rain is without affecting the quality of the displayed echoes.

1.36.1 How to activate/deactivate the target analyzer

1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.
2. Select the [CUSTOMIZE ECHO] box, then press the **right button**.
3. Select [TARGET ANALYZER], then press the **left button**.
4. Select [OFF] to deactivate the function, or [ON] to activate the function, then press the **left button**.
5. Select [HATCHING], then press the **left button**.
6. Select [OFF] to deactivate the function, or [ON] to activate the function, then press the **left button**.
7. Close the menu.

1.37 Target Alert

The target alert serves to alert the navigator to targets (ships, landmasses, etc.) entering a specific area, with audiovisual alerts.

Note: The [ALR1] and [ALR2] boxes are not displayed when the setting for [AZ/ALR SELECT] in the [TT/AIS] menu is set to the default setting [AQUISITION ZONE]. To enable this function, set [AZ/ALR SELECT] in the [TT/AIS] menu to [TARGET ALARM ZONE].

⚠ **CAUTION**

- **The alarm should not be relied upon as the sole means for detecting possible collision situations.**

- **A/C SEA, A/C RAIN and GAIN controls should be properly adjusted to be sure the alarm system does not overlook target echoes.**

1.37.1 How to set a target alert

The procedure below shows how to set a target alarm using the figure below as an example.

1. Place the cursor in the [ALR1] or [ALR2] box as appropriate, then press the left button. The cursor jumps into the operational display area and the indication "SET" appears inside the target alarm box selected.
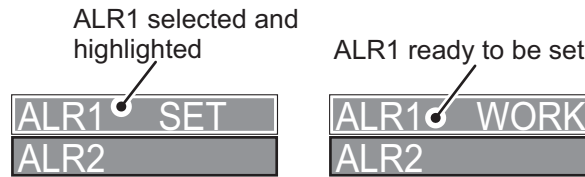
2. Using the Trackball, move the cursor to Point A, then press the **left button**.

3. Using the Trackball, move the cursor to Point B, then press the **left button**. "SET" is replaced with "WORK" in the [ALR1] box indication. The target alert zone's lines are shown as dashed lines.
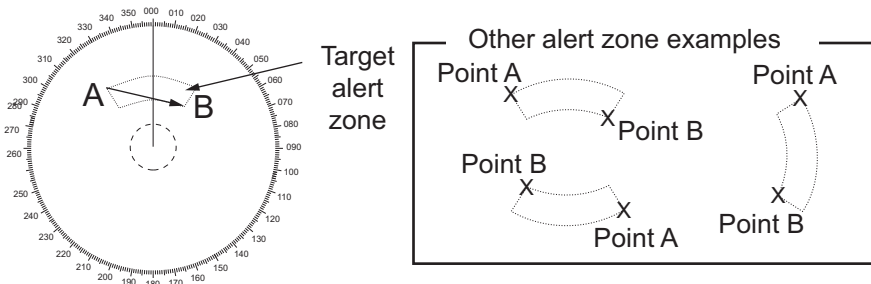
Note 1: To create a 360° alert zone, set Point B at the same location as Point A.

Note 2: Two alarm zones can be set simultaneously. The second alarm zone is only available when the first alert zone is active, however.

Note 3: When the target alarm zone is not within the range in use the indication "UP RNG" appears to the right of the target alarm box. In this case select a range that will display the target alarm zone.

1.37.2 How to mute the target alert

A target in the target alert zone produces both visual (flashing) and audible (beep) alarms. To silence the audio alarm select the appropriate target alert box then press the **left button** or the **ALARK ACK** key. (If the left button is used to mute the audio alarm, the indication in the target alert box changes to "ALR× MUTE".) This deactivates the audio alarm but does not stop the flashing of the offending target. You can also stop the alert by deactivating the target alert zone (see section 1.37.3).

To reactivate the audio alert, select the target alert box then press the **left button** until the target alert box shows "ALR× WORK".

1.37.3 How to deactivate a target alert

Select the target box to be deactivated, then press and hold the **left button**.

Note: When both [ALR1] and [ALR2] are active, [ALR2] must be deactivated before [ALR1] can be deactivated.
If [ALR1] and [ALR2] are active when you try to deactivate [ALR1], the system releases two audible beeps and shows the message "DELETE ALR2 FIRST".

1.37.4 How to change target alert attributes

You can select the echo strength level that triggers the alarm, the condition that generates the alarm and the volume of the audio alarm as follows:

1. Open the [MAIN MENU].

2. Select [ALERT], then press the **left button**.

3. Select [ALERT WATCH], then press the **left button**.

4. Select [ALR1 MODE] or [ALR2 MODE] as appropriate, then press the **left button**.

5. Select [IN] or [OUT] as appropriate, then press the **left button**.
   [IN]: Targets entering the alarm zone trigger the alarm.
   [OUT]: Targets leaving the alarm zone trigger the alarm.

6. Select [LEVEL], then press the **left button**.

7. Select the appropriate level of echo strength to trigger the alarm, then press the **left button**. [1] is the highest strength, [4] is the lowest strength.

8. Press the **right button** once to return to the [ALERT] menu.

9. Select [ALERT SOUND LEVEL], then press the **left button**.

10. Select [OFF], [LOW], [MID] or [HIGH] as appropriate, then press the **left button**.
    Note: This setting is applied to all alarms output from this radar system.

11. Close the menu.

1.38 PI (Parallel Index) Lines

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

Max. 1 PI line: Six sets of PI lines (PI1 to PI6)

Max. 2, 3 or 6 PI lines: Four sets of PI lines (PI1 to PI4)

You can control the presentation and interval of the PI lines from the [PI Line] box, which is at the lower-left corner of the screen.
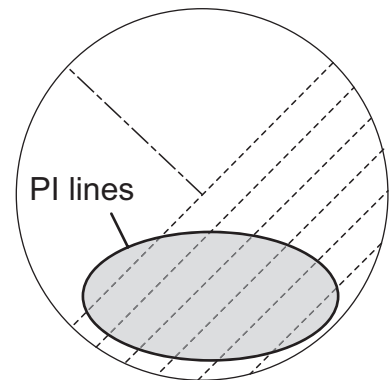
1.38.1 How to set the maximum number of lines to display

The maximum number of PI lines to display can be selected from [1], [2], [3] or [6] lines as below. The actual number of lines visible can be less depending on line interval.

1. Open the [MAIN MENU].

2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.

3. Select [PI LINE], then press the **left button**.

4. Select [PI LINE NUMBER], then press the **left button**.

5. Select the appropriate option, then press the **left button**.

6. Close the menu.

1.38.2   How to change PI line bearing and interval

1. If not already displayed, show a PI line, referring to paragraph 1.38.1.

2. Place the arrow on the PI line orientation in the [PI Line] box.

PI1   035.2° R ← PI line orientation
ON   10.00NM ← PI line interval
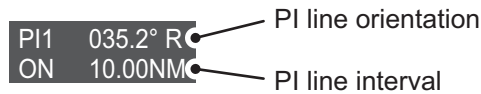
3. Rotate the **scrollwheel** to adjust the PI line bearing, between 000.0° to 359.9°. Enter a negative value to move the PI line to the opposite side of the PI line passing through the own ship position.

4. Place the cursor on the PI line interval.

5. Rotate the **scrollwheel** to change the PI line interval.

1.38.3   How to change the PI line bearing reference

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

1. Open the [MAIN MENU].

2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.

3. Select [PI LINE], then press the **left button**.

4. Select [PI LINE MODE], then press the **left button**.

5. Select [REL] or [TRUE] as appropriate, then press the **left button**.

6. Close the menu.

1.38.4   How to change the PI line orientation

PI lines orientation can be selected from parallel or perpendicular. This function is available when [SET ALL PI LINE] in the [PI LINE] menu is set for other than [1].

1. Open the [MAIN MENU].

2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.

3. Select [PI LINE], then press the **left button**.

4. Select [PI LINE MODE], then press the **left button**.

5. Select [HORI.], [VERT.] or [BOTH] as appropriate, then press the **left button**.

Horizontal   Vertical   Both side

- - - - : Base line
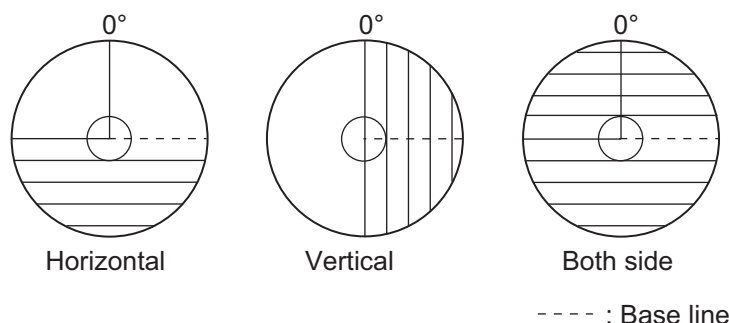
6. Close the menu.

1.38.5 How to reset the PI lines to default (ship's heading)

You can automatically return PI lines to default orientation (ship's heading), 0-degrees for parallel orientation, 90-degrees for perpendicular orientation. This is faster than doing it manually.

From the PI line box

Place the cursor inside the PI line box, then press and hold the **left button**.

From the menu

1. Open the [MAIN MENU].
2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.
3. Select [PI LINE], then press the **left button**.
4. Select [PI LINE RESET], then press the **left button**.
5. Close the menu.

1.39 How to Use the Net Cursor (Diamond Cursor)

The net cursor is used to depict your fishing net on the radar display. It is especially useful for bottom trawlers for knowing where the net is located. Enter the dimensions of your net in the menu to show the net in scale on the display.

EBL2

Net cursor
(Dimond cursor)
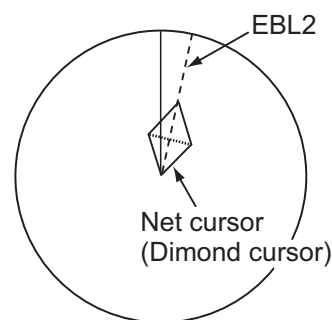
1.39.1 How to activate the net cursor

To activate the net cursor, do the following procedure.

1. Open the [MAIN MENU].
2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.
3. Select [NET CURSOR], then press the **left button**.
4. Select [NET CURSOR DISPLAY], then press the **left button**.
5. Select [ON], then press the **left button**.
   The net cursor appears on own ship's mark.
6. Close the menu.

[NET CURSOR]
1. BACK
2. NET CURSOR DISPLAY OFF/ON
3. FRONT HALF LENGTH
     0.0m
4. REAR HALF LENGTH
     0.0m
5. NET WIDTH
     0.0m
6. ROTATE STEP
     360°/ 32 POINTS

   WARP LENGTH
     0.0m

1.39.2 How to set the net cursor dimensions and orientation

1. Open the [MAIN MENU].
2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.
3. Select [NET CURSOR], then press the **left button**.

4. Select [FRONT HALF LENGTH], then press the **left button**.
    Rotate the **scrollwheel** and press the **left button** to set the front half length of net (max. 3000 m).

5. Select [REAR HALF LENGTH], then press the **left button**.
    Rotate the **scrollwheel** and press the **left button** to set the rear half length of net (max. 3000 m).

6. Select [NET WIDTH], then press the **left button**.
    Select [360°] or [32 POINTS], then press the **left button**.
    The net cursor moves as EBL2 moving. Select [360°] to move with 0.1° step, or select [32 POINTS] to move with 11.25° step.

7. Close the menu.

8. Stab the net cursor on the location of net casting with EBL offset function.

    1) Press the **EBL OFFSET** key.

    2) Move the cursor onto the casting point, then press the **left button**.

9. Rotate the **EBL** knob to adjust the orientation the net cursor until the cursor is in line with the tide flow direction (or against direction).
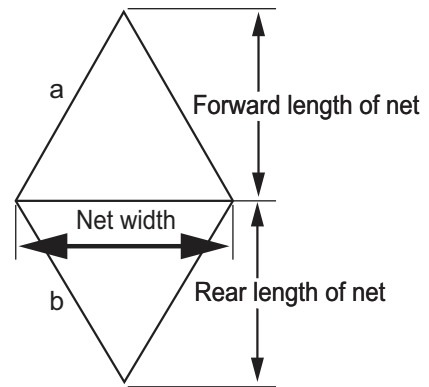
1.40   How to Use the Circle Line

You can use a circle line to measure the distance between two points.

1. Press the **CURSOR ON/OFF** key to appear the cursor when cursor is not shown.

2. Rotate the **scrollwheel** to select [SET CIRCLE LINE], then press the **left button**. A circle appears on the screen, and the circle radius range box appears at the left side of screen.
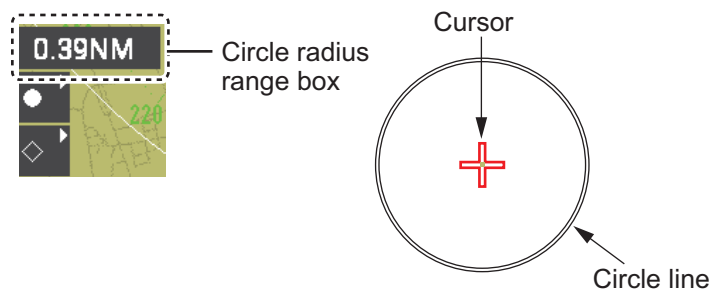
3. Move the cursor onto the start point to set the circle line.

4. Rotate the **scrollwheel** to adjust the radius range, then move the cursor onto the end point and press the **left button**.

5. Press the **right button** to close the menu.
    To erase the circle line, rotate the **scrollwheel** to select [SET CURSOR LINE], then press the **left button** and press the **right button** further.

1.41 How to Use Marks

1.41.1 Heading Line

The heading line is displayed in all display modes and shows your heading. The heading line appears above own ship in the head up mode and head up TB mode. The heading line appears under the own ship position in the stern up mode. In the north up, true motion and course up modes, the heading line moves according to the movement of the vessel.

Erase the heading line temporary

Press and hold the **HL OFF** key to hide the heading line. The heading line and markers on the radar screen are erased while the key is held.

1.41.2 Stern mark

The stern mark appears opposite to the heading line when the mark is active. To display or erase the stern mark, do the following:

1. Open the [MAIN MENU].
2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.
3. Select [OWN SHIP MARK], then press the **left button**.
4. Select [STERN MARK], then press the **left button**.
5. Select [ON] or [OFF], then press the **left button**.
6. Press the **MENU** key to close the menu.

[CURSOR/OWN SHIP MARK]

1. BACK
2. [CURSOR]
3. [EBL/VRM]
4. [PI LINE]
5. [NET CURSOR]
6. BEARING CURSOR
   360°/ 16 POINTS
7. RANGE RING
   OFF/STD./MANUAL
   4
8. [OWN SHIP MARK]
9. [BARGE MARK]

1.41.3 North mark

The north mark appears with short broken line inside of measure ring. The north mark moves while the head-up mode is activated.

1.41.4 Cursor bearing scale

The bearing scale is displayed in degrees or 16 compass points.

1. Open the [MAIN MENU].
2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.
3. Select [BEARING CURSOR], then press the **left button**.
4. Select [360°] or [16 POINTS], then press the **left button**.

360°   16 points
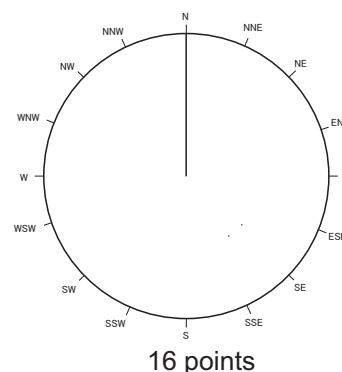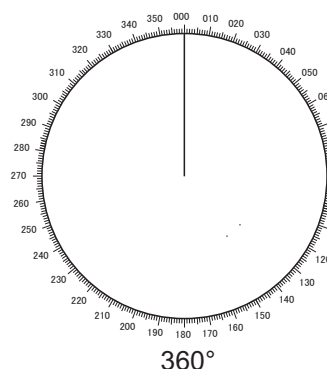
5. Close the menu.

1.41.5 How to set up the own ship symbol

The own ship symbol marks own position on the display. It can be turned on or off and its configuration selected from the [MARK] menu. Two configurations are available: minimized symbol and scaled symbol. The scaled symbol is scaled to indicate the length and beam of the vessel. Ship's dimensions should be entered at installation to use the scaled ship symbol.
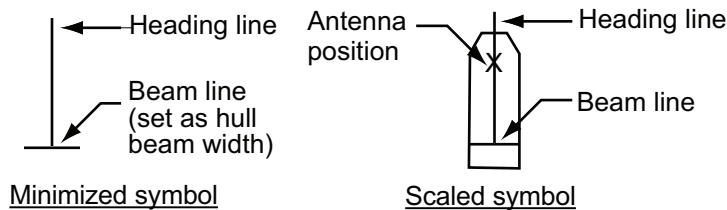
1. Open the [MAIN MENU].
2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.
3. Select [OWN SHIP MARK], then press the **left button**.
4. Select [OWN SHIP MARK DISPLAY], then press the **left button**.
5. Select [MIN] or [SCALED] as appropriate, then press the **left button**.
6. Close the menu.

Note: The own ship mark appears with white circle on the plotter screen. To erase the plotter own ship mark, set [PLOTTER OWN SHIP MARK] to [OFF] of the [OWN SHIP MARK] in [CURSOR/OWN SHIP MARK] menu.

1.41.6 Cursor setting

You can set the cursor properties. Do the following procedure.

1. Open the [MAIN MENU].
2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.
3. Select [CURSOR], then press the **left button**.
4. Select item to change the property, then press the **left button**.
    Select a property to change, then press the **left button**.
    -   Cursor bearing: sets the bearing relative/true.
    -   Cursor range: sets the unit of cursor range (NM/km/SM).
    -   Cursor size: sets the cursor size small/large.
    -   Cursor color: sets the cursor color among seven colors.
5. Close the menu.

[CURSOR]
1. BACK
2. CURSOR BEARING
   REL/TRUE
3. CURSOR RANGE
   NM/km/SM
4. CURSOR SIZE
   SMALL/LARGE
5. CURSOR COLOR
   RED/GRN/BLU/YEL/CYA/
   MAG/WHT

1.41.7 How to set the barge mark

You can mark the locations of barges on the display with icons. Set up barge information as follows:

1. Open the [MAIN MENU].

2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.

3. Select [BARGE MARK], then press the **left button**.

4. Select [BARGE MARK], then press the **left button**.

5. Select [ON] to display barge marks, [OFF] to hide barge marks, as appropriate, then press the **left button**.

6. Select [BARGE SIZE], then press the **left button**. Use the **scrollwheel** to enter the [LENGTH] and [WIDTH] of the barge.
   Rotate the **scrollwheel** to increase or decrease the value of the highlighted digit.
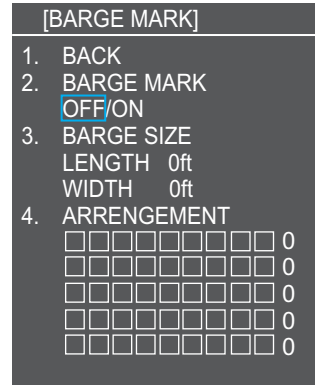
7. Select [ARRANGEMENT], then push the **left button**. This item lets you set a single barge or a barge chain. Select one of the five arrangements and rotate the **scrollwheel**. Select number of barges (max. 9) to display. As you rotate the **scrollwheel** the squares light or extinguish and the number of barges selected appears at the right side.

First row of barge [ARRANGEMENT] is displayed as the left side of the barge icon on-screen.

Own ship icon

8. Close the menu. The barge mark is now displayed as shown in the figure above.

1.42 How to Adjust Brilliance of On-screen Data

On-screen markers and alphanumeric readout brilliance can be adjusted using the following procedure:

1. Move the cursor onto the [BRILL] box at the bottom-left of the screen, then press the **right button**. The [BRILL] menu appears.

[BARGE MARK]

1. BACK
2. BARGE MARK
   OFF/ON
3. BARGE SIZE
   LENGTH   0ft
   WIDTH   0ft
4. ARRENGEMENT

[BRILL1 MENU 1/3]

1. BACK
2. INITIAL SETTING READ
   DAY/DUSK/NIGHT
   NO/YES
3. ECHO COLOR
   YEL / GRN / WHT
   AMB/M-GRN/M-CHA
4. CHAR COLOR
   GRN/WHT1/WHT2/ORG/RED
5. RADAR BACKGROWND COLOR
   BLK/BLU1/BLU2
6. CONTROL PANEL
7. CHARACTER
8. CURSOR
9. ECHO

0. NEXT

[BRILL1 MENU 2/3]

1. BACK
2. TRAIL
3. HEADING LINE
4. RING
5. BEARING CURSOR
6. EBL
7. VRM
8. PI LINE
9. TARGET

0. NEXT

[BRILL1 MENU 3/3]

1. BACK
2. L/L GRID
3. MARK
4. CHART
5. DEPTH LINE
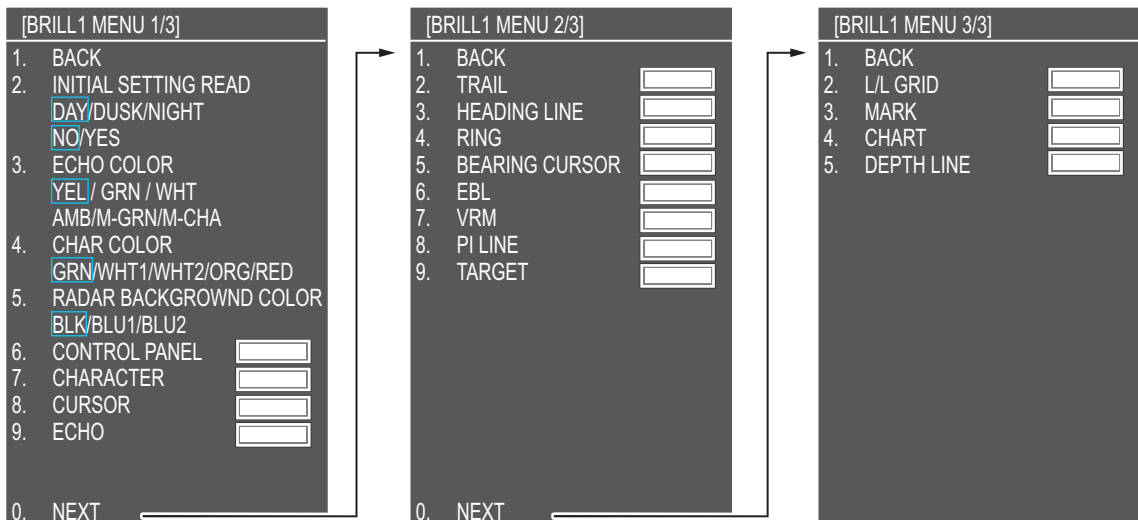
2. Select the appropriate item to adjust, then press the **left button**.

Menu item	Description
ECHO COLOR	Selects echo color.
CHARACTOR COLOR	Select box, menu and bearing ring colors.
RADAR BACKGROUND	Adjusts radar background brilliance.
CONTROL PANEL	Adjusts control panel key brilliance.
CHARACTER	Adjusts on-screen text brilliance.
CURSOR	Adjusts cursor brilliance.
ECHO	Adjusts the echo brilliance.
TRAIL	Adjusts echo trail brilliance.
HEADING LINE	Adjusts heading line brilliance.
RING	Adjusts range ring brilliance.
BEARING CURSOR	Adjusts bearing cursor brilliance.
EBL	Adjusts EBL line brilliance.
VRM	Adjusts VRM line brilliance.
PI LINE	Adjusts PI line brilliance.
TARGET	Adjusts target trail symbol brilliance.
L/L GRID	Adjusts latitude/longitude grid brilliance.
MARK	Adjusts marks brilliance (all marks).
CHART	Adjusts chart brilliance.
DEPTH LINE	Adjusts depth line brilliance.

3. Rotate the **scrollwheel** to select the appropriate brilliance setting, then press the **left button**.
    When the settings should be changed to the default settings, do follows:

    1) Select [INITIAL SETTING READ] on the [BRILL 1 menu 1/3], then press the **left button**.

    2) Select [DAY], [DUSK] or [NIGHT], then press the **left button**.

    3) Select [YES], then press the **left button**.

4. Close the menu.

Echo color

1. Select the [BRILL] box at the bottom-left of the screen, then press the **right button**. The [BRILL] menu appears.

2. Select [ECHO COLOR], then press the **left button**.

3. Select the appropriate color, then press the **left button**. The available options are listed in the table below.

Color	Description/remarks
YEL	Yellow echo (default setting)
GRN	Green echo
WHT	White echo
AMB	Amber echo
M-GRN	Red echo, gradually changes to green color as the echo weakens.
M-CYA	Red echo, gradually changes to cyan color as the echo weakens.

1.43   How to Select a Display Mode

- Standard display mode: The operational display area, box functions, data display, etc. are shown in a standard manner.

- Simple display: The display is echo-focused.

Note: The sea-through picture uses the alpha-blend method.

Follow the procedure below to change display modes.

1.   Open the [MAIN MENU].

2.   Select [ECHO], then press the **left button**. The [ECHO] menu appears.

3.   Select [NEXT], then press the **left button**. The [Echo 2/2] menu appears.

4.   Select [ECHO AREA], then press the **left button**.

5.   Select the appropriate setting, then press the **left button**.

CIRCLE   WIDE   ALL
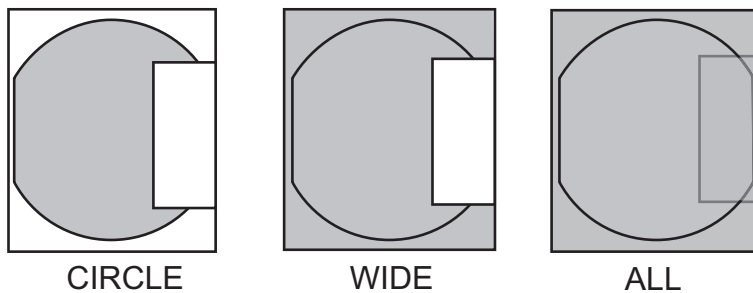
- [CIRCLE] mode: The echoes are displayed inside a circle on the screen.

- [WIDE] mode: The echoes are displayed in a square area, but are not displayed in the data display area.

- [ALL] mode: The echoes are displayed across the entire screen.

6.   Close the menu.

1.44   How to Display and Set Up Navigational Data

Wind, depth, ocean current, water temperature, date and time and waypoint data can be displayed on this radar, however appropriate sensors are required.

1.44.1   How to set up the navigational data

1.   Open the [MAIN MENU].

2.   Select [NAV DATA], then press the **left button**.

3. Select [NAV DATA SETTING], then press the **left button**.
   The [NAV DATA SETTING] menu appears.

```
[NAV DATA SETTING 1/2]          [MARK FILTERS 2/2]
1. BACK                         1. BACK
2. DEPTH UNIT                   2. DISP DATUM
   m/ft/fm/HIRO                    WGS-84/TOKYO
3. WIND UNIT                    3. DATE
   kn/m/s                          YYYY/MM/DD
4. WIND STAB MODE                  YYYY/MMM/DD
   REL/NORTH/TRUE                  MMM/DD/YYYY
5. BEARING UNIT                 4. TIME
   TRUE/MAGNETIC                   12 HOUR/24 HOUR
6. TEMPERATURE UNIT
   °C/°F
7. COORD DISPLAY
   LL/FISH GRID/LOLAN A/
   LORAN C/DECCA


0. NEXT
```
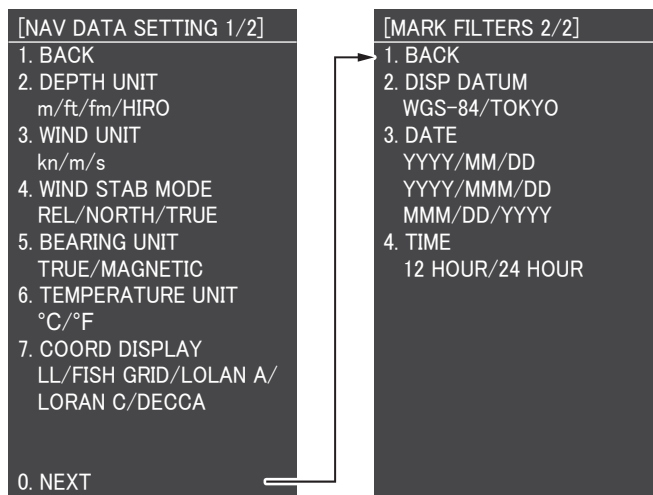
4. Referring to the table below, select the appropriate menu item, then press the **left button**.

Menu item	Available settings
DEPTH UNIT	m, ft, fa, HIRO
WIND UNIT	kn, m/s
WIND STAB	RELATIVE, NORTH, TRUE
BEARING UNIT	TRUE, MAGNETIC
TEMPERATURE	°C, °F
COODINATE	LL, FISH GRID, LORAN A, LORAN C, DECCA
DATUM	WSG84, TOKYO
DATE	YYYY/MM/DD, YYYY/MMM/DD, MMM/DD/YYYY
TIME	12HR, 24HR

5. Referring to the available options listed in the table above, select the appropriate setting, then press the **left button**.

6. Close the menu.

1.45 How to Set the Local Time

Set the local time by following procedure.

1. Open the [MAIN MENU].

2. Select [NAV DATA], then press the **left button**.

3. Select [LOCAL TIME SETTING], then press the **left button**.

4. Select [DATE-TIME], then press the **left button**.

5. Select [UTC] or [LOCAL], then press the **left button**.
   If you select [UTC], go to step 7.

6. Select [LOCAL TIME ADJUST], then press the **left button**.
   Rotate the **scrollwheel** to set the time difference from UTC, then press **left button**.

7. Close the menu.

1.46 How to Set the Loran/Decca

<u>**When using Loran A time offset**</u>

1. Open the [MAIN MENU].

2. Select [NAV DATA], then press the **left button**.

3. Select [NEXT], then press the **left button**.

4. Select [LORAN/DECCA SETTINGS], then press the **left button**.
   There are two pages for [LORAN DECCA SETTING] window. If the second page is appeared, press the **MARK SELECT** key to go back to the first page.

```
LORAN/DECCA SETTING                        SEL. PAGE _    1/2▶
LORAN A STA. COMB.      : 0 0 − 0 1
   TIME OFFSET 1        : + 0 0 0. 0µ s
   TIME OFFSET 2        : + 0 0 0. 0µ s
LORAN C STA. COMB.      : 0 0 : 1 1 − 2 9
   TIME OFFSET 1        : + 0 0 0. 0µ s
   TIME OFFSET 2        : + 0 0 0. 0µ s
CH CODE LIST
00 : 1L0   01 : 1L1   02 : 1L4   03 : 1L5   04 : 1L6   05 : 1L7   06 : 1S1
07 : 1S2   08 : 1S3   09 : 1S4   10 : 1S6   11 : 2H3   12 : 2H4   13 : 2H5
14 : 2H6   15 : 2S0   16 : 2S1   17 : 2S2   18 : 2S3   19 : 2S4   20 : 2S5
21 : 2S6   22 : 2S7

[MARK SELECT] : PREVIOUS PAGE      [MARK] : NEXT PAGE
TURN WHEEL : SELECT      PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```
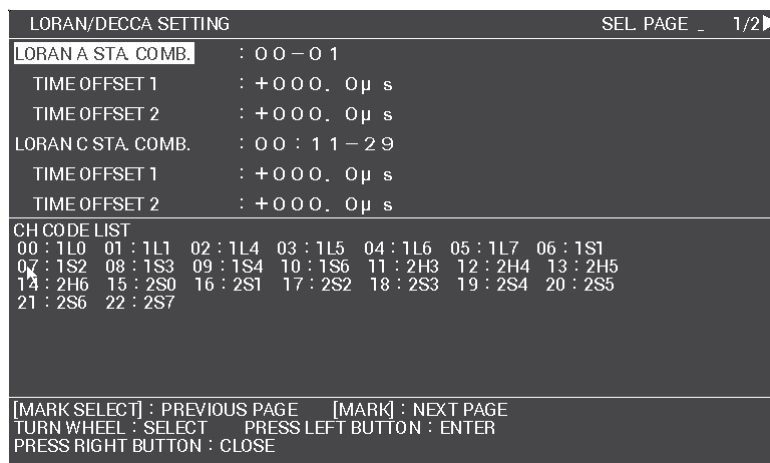
5. Select [LORAN A STA. COMB.], then press the **left button**.

6. Set the station combination refer to the [CH CODE LIST] lower side of the window.

7. Select [TIME OFFSET 1], then press the **left button**.

8. Rotate the **scrollwheel** and press the **left button** to set the time offset value.

9. Select [TIME OFFSET 2], then press the **left button**.

10. Rotate the **scrollwheel** and press the **left button** to set the time offset value.

11. Press the **MARK** key to go to second page.
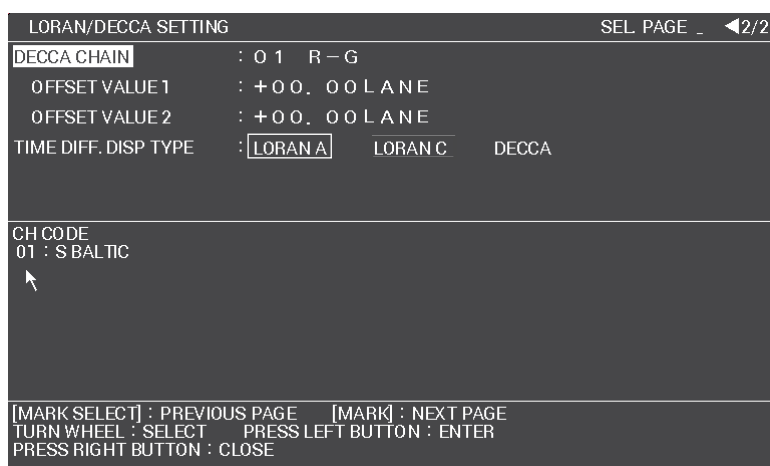
```
LORAN/DECCA SETTING                        SEL. PAGE _    ◀2/2
DECCA CHAIN            : 0 1   R − G
   OFFSET VALUE 1      : + 0 0. 0 0 L A N E
   OFFSET VALUE 2      : + 0 0. 0 0 L A N E
TIME DIFF. DISP TYPE   : LORAN A      LORAN C      DECCA

CH CODE
01 : S BALTIC



[MARK SELECT] : PREVIOUS PAGE      [MARK] : NEXT PAGE
TURN WHEEL : SELECT      PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```

12. Select [TIME DIFF. DISP TYPE], then press the **left button**.

13. Select [LORAN A], then press the **left button**.

14. Close the menu.

<u>**When using Loran C time offset**</u>

1. Open the [MAIN MENU].

2.   Select [NAV DATA], then press the **left button**.

3.   Select [NEXT], then press the **left button**.

4.   Select [LORAN/DECCA SETTING], then press the **left button**.
     There are two pages for [LORAN DECCA SETTING] window. If the second page is appeared, press the **MARK SELECT** key to go back to the first page.

5.   Select [LORAN C STA. COMB.], then press the **left button**.

6.   Set the station combination refer to the [GRI CODE LIST] lower side of the window. Set the main station and reference station channels.

7.   Select [TIME OFFSET 1], then press the **left button**.

8.   Rotate the **scrollwheel** and press the **left button** to set the time offset value.

9.   Select [TIME OFFSET 2], then press the **left button**.

10. Rotate the **scrollwheel** and press the **left button** to set the time offset value.

11. Press the **MARK** key to go to the second page.

12. Select [TIME DIFF. DISP TYPE], then press the **left button**.

13. Select [LORAN A], then press the **left button**.
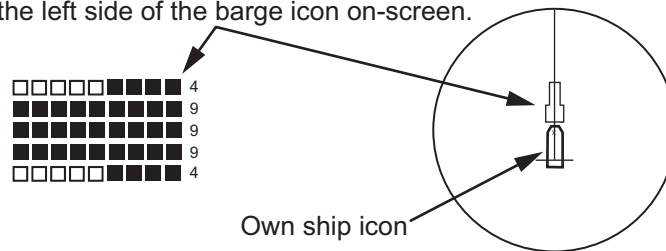
14. Close the menu.

When using Decca chain offset

1.   Open the [MAIN MENU].

2.   Select [NAV DATA], then press the **left button**.

3.   Select [NEXT], then press the **left button**.

4.   Select [LORAN/DECCA SETTING], then press the **left button**.
     There are two pages for [LORAN DECCA SETTING] window. If the first page is appeared, press the **MARK** key to go to the second page.

5.   Select [DECCA CHAIN], then press the **left button**.

6.   Set the Decca chain refer to the [CH CODE] lower side of the window.

7.   Select [OFFSET VALUE 1], then press the **left button**.

8.   Rotate the **scrollwheel** and press the **left button** to set the offset value.

9.   Select [OFFSET VALUE 2], then press the **left button**.

10. Rotate the **scrollwheel** and press the **left button** to set the offset value.

11. Select [TIME DIFF. DISP TYPE], then press the **left button**.

12. Select [DECCA], then press the **left button**.

13. Close the menu.

1.47 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 **left button**.

3. Select [OPERATION SETTING], then press the **left button**.

4. Referring to the table below, select the appropriate menu item to customize.

```
[OPERATION SETTING]
1.  BACK
2.  WHEEL DRIVE
    NORMAL/REVERSE
3.  KEY BEEP
    OFF/LOW/MID/HIGH
4.  STERN UP RM
    OFF/ON
5.  GUIDANCE
    OFF/ON
```

Menu items	Description	Available settings
WHEEL DRIVE	Sets the direction of the wheel drive (scrollwheel).	[NORMAL], [REVERSE]
KEY BEEP	Changes the key beep volume.	[OFF], [LOW], [MID], [HIGH]
STERN UP RM	HEAD UP RM display is reversed.	[ON], [OFF]
GUIDANCE	Turns operational guidance on/off.	[ON], [OFF]

5. Rotate the **scrollwheel** to select the appropriate setting, then press the **left button**.

6. Close the menu.

1.48 How to Interpret the ALERT message

When an alert condition is found, the applicable alert message appears in the [ALERT] box. A buzzer sounds for alarm and warning alerts. The [ALERT] box is shown as a icon.

Alert icon →
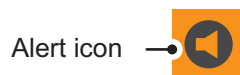
Silence the buzzer with the **ALERT ACK** key or select the [ALERT] box then press the **left button**. The buzzer and the flashing stop but the alert indication remains on the display until the reason for the alert is removed.

1.48.1 Alert descriptions

Alerts which can appear on this radar are listed in the table. The level of priority, from highest to lowest, is ALARM → WARNING → CAUTION. For detailed information regarding specific alarms and alarm codes, including possible remedies, see "ALERT LIST" on page AP-13.

Note: All active-unacknowledged warnings are repeated as warnings after 60 seconds (manufacturer's fixed time period).

1.48.2 Acknowledge the alert

When the alerts appear on the screen, acknowledge them following procedure.

• Press the **ALARM ACK** key.

- Move the cursor onto the alert icon, then press the **left button**.

- Select the alert message on the alert list, then press the **left button**.
  Refer to paragraph 1.48.3

1.48.3   Alert list

The alert list displays the names of violated alerts, including the time and date violated. Up to 100 alerts are stored in the internal memory. Unacknowledged alerts are displayed first in the list (in red text), in the order in which they appear in the [ALERT] box. Unacknowledged warnings are displayed in the list (in yellow-orange text), in the order in which they appear in the [ALERT] box.

Cautions are displayed in the list (in yellow text), in the order in which they appear in the [ALERT] box.

An unacknowledged alert can be acknowledged from the list by selecting it, the pressing the **left button**. To erase the data for the number selected, press the **left button** again. To erase all alert indications, select [REFRESH DATA], then press and hold the **left button**.

To display the alert list, place the cursor on the [ALERT] icon and press the **right button**.
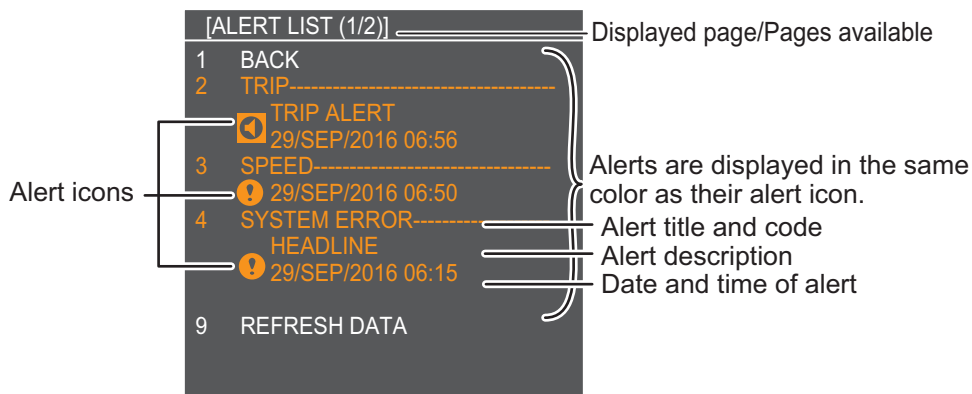
To change pages, select Next, then press the **left button**.

1.48.4   Alert icons and their meanings

Icon	Status	Visual indication	Audible alert
	Active - unacknowledged alarm	Red, flashing	3 short, audible alerts repeated every 7 seconds.
	Active - silenced alarm	Red, flashing	Silent
	Active - acknowledged alarm	Red	Silent
	Active - responsibility transferred alarm	Red	Silent
	Active - responsibility transferred alarm	Red	Silent
	Active - unacknowledged warning	Yellow-orange, flashing	2 short, audible alerts repeated every 60 seconds.
	Active - silenced warning	Yellow-orange, flashing	Silent
	Active - acknowledged warning	Yellow-orange	Silent
	Active - responsibility transferred warning	Yellow-orange	Silent
	Rectified - unacknowledged warning	Yellow-orange	Silent
	Caution	Yellow	Silent

1.49 Setting Password

1.49.1 How to set or change the password

You can set the password for security. If you forget the password, call your dealer.

1. Open the [MAIN MENU].

2. Select [INITIAL SETTING], then press the **left button**.

3. Select [SET PASSWORD], then press the **left button**.

4. Select [SET PASSWORD] once more, then press the **left button**.
   The message box appears.

```
[SET PASSWORD]
1.  BACK
2.  SET PASSWORD
3.  DISABLE PASSWORD
```

```
SET PASSWORD

          PASSWORD: ▮

SET A USER PASSWORD.
ENTER FOUR DIGITS WITH NUMERAL KEYS,
WHEEL/LEFT BUTTON.
```
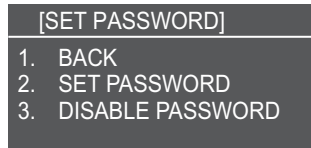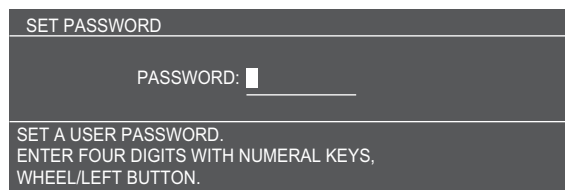
5. Enter the password as four numbers.

6. Enter the password once more to confirm.
   The message box appears.

```
PASSWORD IS DECIDED.
THE PASSWORD WILL BE EFFECTIVE
FROM NEXT TIME.
             CONFIRM
```
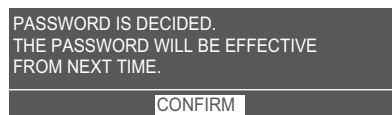
7. Press the **left button** to close the message box.

8. Press the **right button** to close the menu.

1.49.2 How to disable the password

1. Open the [MAIN MENU].

2. Select [INITIAL SETTING], then press the **left button**.

3. Select [SET PASSWORD], then press the **left button**.

4. Select [DISABLE PASSWORD], then press the **left button**.
   The message box appears.

```
⚠ DEACTIVATE PASSWORD.
   ARE YOU SURE?
     RUN      CANCEL
```
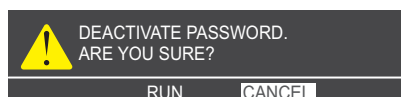
5. Select [RUN], then press the **left button**.
   Select [CANCEL], then press the **left button** to cancel the password changing.

6. Press the **right button** to close the menu.

2. RADAR OBSERVATION

2.1 General

2.1.1 Minimum and maximum ranges

Minimum range

The minimum range is defined by the shortest distance at which, using a scale of 1.5 or 0.75 nm, a target having an echoing area of 10 m^2 is still shown separate from the point representing the antenna position.

It is mainly dependent on the pulselength, antenna height, and signal processing such as main bang reduction and digital quantization. It is a good practice to use a shorter range scale as far as it gives favorable definition or clarity of picture.

The IMO Resolution MSC.192(79) requires the minimum range to be less than 40 m, respectively. This series of radars satisfy this requirement.

Maximum range

The maximum detecting range of the radar, Rmax, varies considerably depending on several factors such as the height of the antenna above the waterline, the height of the target above the sea, the size, shape and material of the target, and the atmospheric conditions.

Under normal atmospheric conditions, the maximum range is equal to the radar horizon or a little shorter. The radar horizon is longer than the optical one by about 6% because of the diffraction property of the radar signal. The Rmax is given in the following equation.
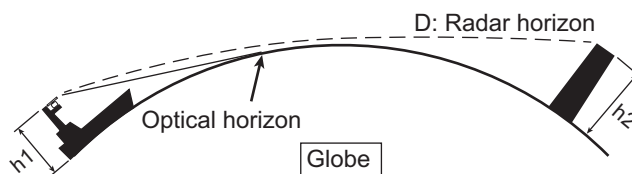
$$D = 2.2 \times (\sqrt{h1} + \sqrt{h2})$$
where D: radar horizon (nautical miles)
h1: antenna height (m)
h2: target height (m)

For example, if the height of the antenna above the waterline is 9 meters and the height of the target is 16 meters, the maximum radar range is;

$$D = 2.2 \times (\sqrt{9} + \sqrt{16}) = 2.2 \times (3 + 4) = 15.4 \text{ NM}$$

It should be noted that the detection range is reduced by precipitation (which absorbs the radar signal).

X-band and S-band

In fair weather, the equation on the previous page does not give a significant difference between X- and S-band radars. However, in heavy precipitation condition, an S-band radar would have better detection than an X-band radar.

Radar resolution

There are two important factors in radar resolution (discrimination): bearing resolution and range resolution.

- Range resolution is the ability to display as separate pips the echoes received from two targets that are on the same bearing and close to each other. This is determined by pulselength only. Practically, a 0.08 microsecond pulse offers the discrimination better than 40 m as do so with all FURUNO radars.
  Test targets for determining the range and bearing resolution are radar reflectors having an echoing area of 10 m^2.
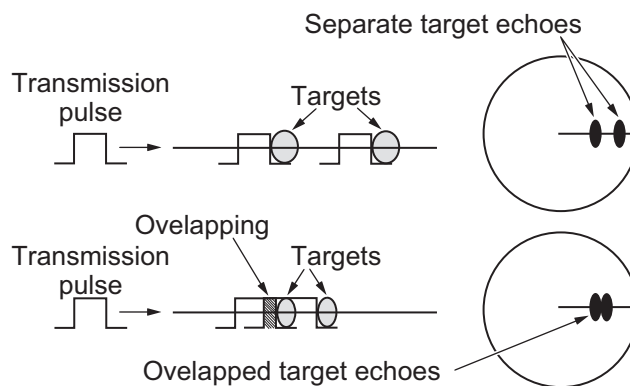
- Bearing resolution is the ability of the radar to display as separate pips the echoes received from two targets that are at the same range and close together. It is proportional to the antenna length and reciprocally proportional to the wavelength. The length of the antenna radiator should be selected for a bearing resolution better than 2.5° (IMO Resolution). This condition is normally satisfied with a radiator of 1.2 m (4 ft) or longer in the X-band. The S-band radar requires a radiator of about 12 feet (3.6 m) or longer.
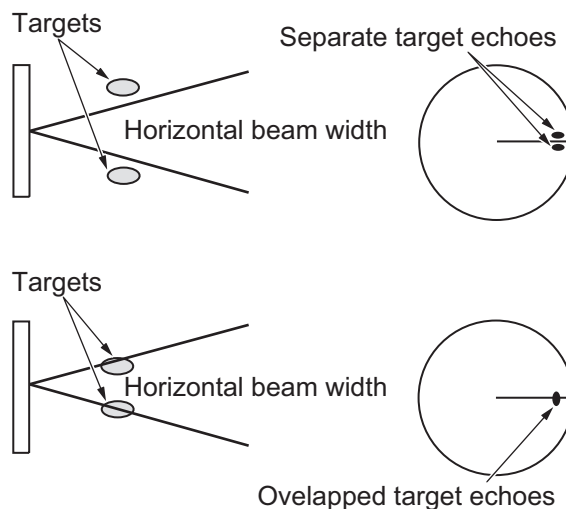
Bearing accuracy

One of the most important features of the radar is how accurately the bearing of a target can be measured. The accuracy of bearing measurement basically depends on the narrowness of the radar beam. However, the bearing is usually taken relative to the ship's heading, and thus, proper adjustment of the heading line at installation is an important factor in ensuring bearing accuracy. To minimize error when measuring the bearing of a target, put the target echo at the extreme position on the screen by selecting a suitable range.

Range measurement

Measurement of the range to a target is also a very important function of the radar. Generally, there are two means of measuring range: the fixed range rings and the variable range marker (VRM). The fixed range rings appear on the screen with a predetermined interval and provide a rough estimate of the range to a target. The variable range marker's diameter is increased or decreased so that the marker touches the inner edge of the target, allowing the operator to obtain more accurate range measurements.

2.2   False Echoes

Occasionally echo signals appear on the screen at positions where there is no target or disappear even if there are targets. They are, however, recognized if you understand the reason why they are displayed. Typical false echoes are shown below.

Multiple echoes

Multiple echoes occur when a transmitted pulse returns from a solid object like a large ship, bridge, or breakwater. A second, a third or more echoes may be observed on the display at double, triple or other multiples of the actual range of the target as shown below. Multiple reflection echoes can be reduced and often removed by decreasing the gain (sensitivity) or properly adjusting the A/C SEA control.
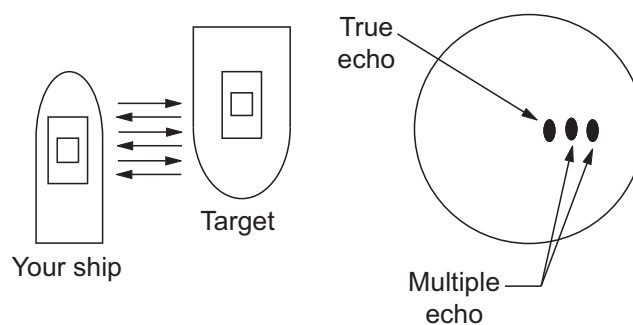
Sidelobe echoes

Every time the radar pulse is transmitted, some radiation escapes on each side of the beam, called "sidelobes". If a target exists where it can be detected by the side lobes as well as the main lobe, the side echoes may be represented on both sides of the true echo at the same range. Side lobes show usually only on short ranges and from strong targets. They can be reduced through careful reduction of the gain or proper adjustment of the A/C SEA control.

Mainlobe (beam)

Sidelobe   Sidelobe

Antenna

True target

False echoes by sidelobes
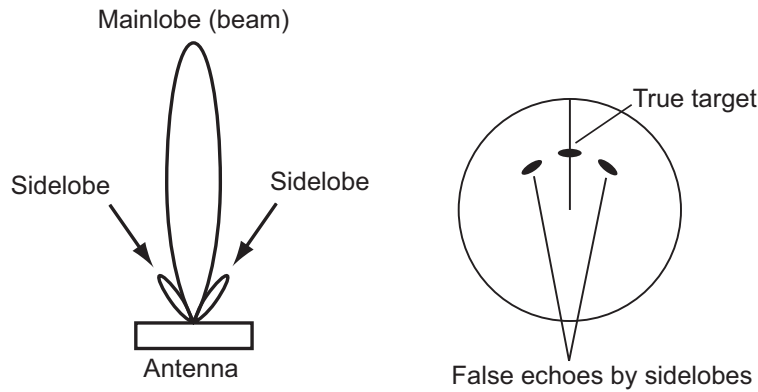
Virtual image

A relatively large target close to your ship may be represented at two positions on the screen. One of them is the true echo directly reflected by the target and the other is a false echo which is caused by the mirror effect of a large object on or close to your ship as shown in the figure below. If your ship comes close to a large metal bridge, for example, such a false echo may temporarily be seen on the screen.

Target ship   Route for direct reflection

Your ship

Bridge

True echo

Route for indirect reflection

Mirror image of target ship

False echo
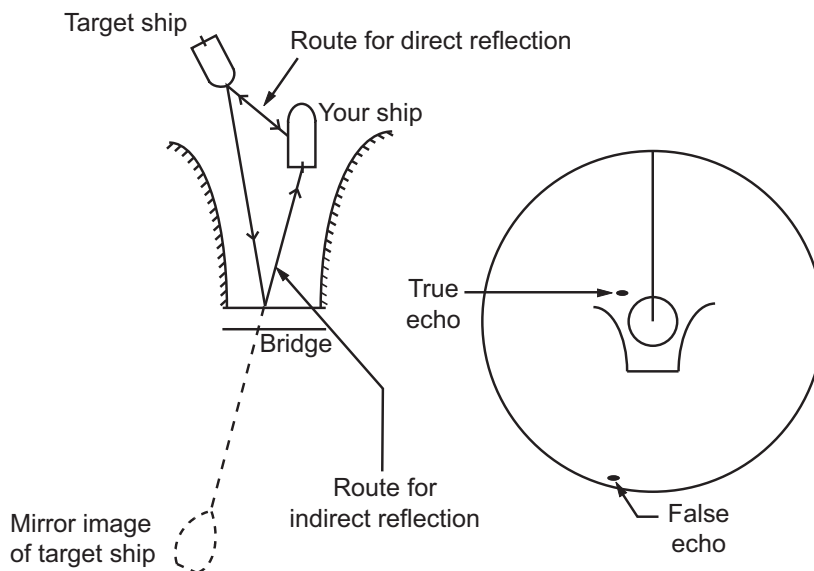
Shadow sectors

Funnels, stacks, masts, or derricks in the path of the antenna block the radar beam. If the angle subtended at the antenna is more than a few degrees, a non-detecting sector may be produced. Within this sector targets can not be detected.
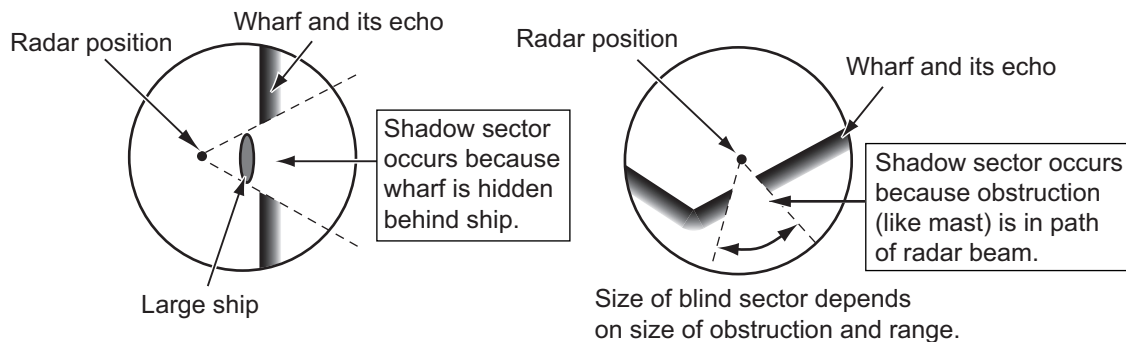
2.3 SART (Search and Rescue Transponder)

2.3.1 SART description

A Search and Rescue Transponder (SART) can be triggered by any X-Band (3 cm) radar within a range of approximately 8 nm. Each radar pulse received causes it to transmit a response which is swept repetitively across the complete radar frequency band. When interrogated, it first sweeps rapidly (0.4 μs) through the band before beginning a relatively slow sweep (7.5 μs) through the band back to the starting frequency. This process is repeated for a total of twelve complete cycles. At some point in each sweep, the SART frequency will match that of the interrogating radar and be within the pass band of the radar receiver. If the SART is within range, the frequency match during each of the 12 slow sweeps will produce a response on the radar display, thus a line of 12 dots equally spaced by about 0.64 nautical miles will be shown.

When the radar to the SART is reduced to about 1 nm, the radar display my show also the 12 responses generated during the fast sweeps. These additional dot responses, which also are equally spaced by 0.64 nautical miles, will be interspersed with the original line of 12 dots. They will appear slightly weaker and smaller than the original dots.

Screen A: When SART is distant

Screen B: When SART is close
Lines of 12 dots are displayed in concentric arcs.
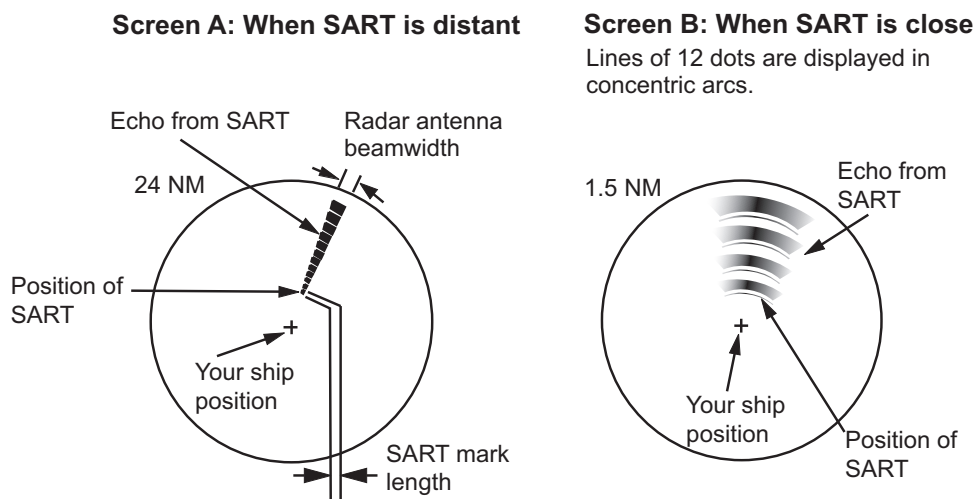
2.3.2 How to show SART marks on the radar display

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

1. Open the [MAIN MENU].
2. Select [ECHO], then press the **left button**.
3. Select [SART], then press the **left button**.
4. Select [ON] to show SART marks on the radar display, then press the **left button**. Select [OFF] to hide SART marks.
   When the SART function is active, the settings listed in the table on the following page are automatically made to radar functions:

Setting	Changed to
Range	12 NM
Pulselength	Long
Echo Stretch	Off
Noise Rejector	Off
Echo Averaging	Off
Interference Rejector	Off
Performance Monitor	Off
A/C RAIN	Off

5. Close the menu.

The indication "SART" appears at the bottom of the alert box, in yellow text, when this feature is active. Be sure to turn this feature off when SART detection is no longer your objective.

2.3.3 General remarks on receiving SARTs

SART range errors

When responses from only the 12 low frequency sweeps are visible (when the SART is at a range greater than about 1 nm), the position at which the first dot is displayed can be as much as 0.64 nm beyond the true position of the SART. When the range closes so that the fast sweep responses are seen also, the first of these will be no more than 150 meters beyond the true position.

Radar bandwidth

This is normally matched to the radar pulselength and is usually switched with the range scale and the associated pulselength. Narrow bandwidths of 3-5 MHz are used with long pulses on long range scales and wide bandwidths of 10-25 MHz with short pulses on short ranges.

A radar bandwidth of less than 5 MHz will attenuate the SART signal slightly, so it is preferable to use a medium bandwidth to ensure optimum detection of the SART.

Radar sidelobes

As the SART is approached, sidelobes from the radar antenna can show the SART responses as a series of arcs or concentric rings. These can be removed by the use of the anti-clutter sea control although it can be operationally useful to observe the side lobes as they may be easier to detect in clutter conditions and also they will confirm that the SART is near to own ship.

Note: SART information excerpted from IMO SN/Circ 197 OPERATION OF MARINE RADAR FOR SART DETECTION.

2.4 RACON

A RACON is a radar beacon that emits radar receivable signals in the radar frequency spectrum (X- or S-band). There are several signal formats; in general, the RACON signal appears on the radar screen as a rectangular echo originating at a point just beyond the position of the radar beacon. It has a Morse coded pattern. Note that the position on the radar display is not accurate.

Echoes on the radar screen
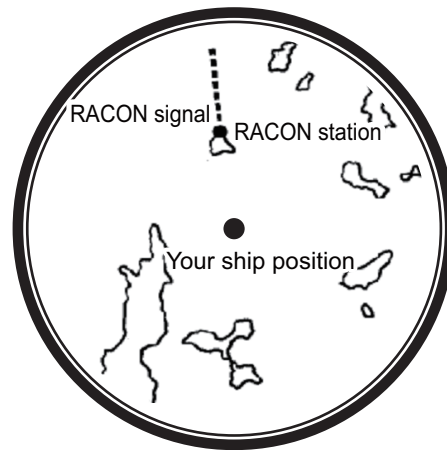
Echo description

2.5 Radar Target Enhancer (RTE)

An RTE is a radar transponder mounted on navigation buoys and masts of small crafts to significantly improve their detection by radar. Unlike a SART or RACON, which are passive, the RTE receives a radar signal, amplifies it and re-transmits it, with the intention of making the target's signal look larger on a radar display.

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3.   TARGET TRACKING (TT)

3.1   Precautions for Target Tracking Usage

⚠ WARNING

No one navigational aid should be relied upon for the safety of vessel and crew. The navigator has the responsibility to check all aids available to confirm position. Electronic aids are not a substitute for basic navigational principles and common sense.

- This TT automatically tracks automatically or manually acquired radar targets and calculates their courses and speeds, indicating them by vectors. Since the data generated by the auto plotter are based on what radar targets are selected, the radar must always be optimally tuned for use with the auto plotter, to ensure required targets will not be lost or unwanted targets such as sea returns and noise will not be acquired and tracked.

- A target does not always mean a land-mass, reef, ships or other surface vessels but can imply returns from sea surface and clutter. As the level of clutter changes with environment, the operator should properly adjust the [A/C SEA], [A/C RAIN] and [GAIN] controls to be sure target echoes are not eliminated from the radar screen.

⚠ CAUTION

The plotting accuracy and response of this TT meets IMO standards. Tracking accuracy is affected by the following:

- 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 on the order of 15 - 30 seconds for high relative speed; 30 - 60 seconds for low relative speed.

- The target tracking and pertinent vector calculation accuracy is influenced by the following:
  - Echo intensity
  - The range measurement accuracy; characterized by both random and biased measurement errors.
  - The angular measurement accuracy; characterized by beam shape, target glint and bias errors.
  - Radar transmission pulsewidth
  - Gyrocompass heading error
  - Speed log error
  - Curent and wind (set & drift)
  - Course change (own ship and target)

3.2 TT Symbols and Attributes

3.2.1 TT symbols

Item	Symbol	Status	Remarks
Automatically acquired target symbols shown. For manually acquired targets, the width of the line for "steady tracking" TT is thicker than that of the automatically acquired targets.		Initial stage	Broken circle around an echo to indicate that the target is under acquisition and initial stage of tracking, before steady-state tracking.
			Within one minute after acquisition (vector still inreliable).
		Steady tracking	Solid circle with vector indicating steady state tracking (within three minutes after acquisition.)
	(flashing)	CPA alarm	Plotting symbol (red) flashes to indicate the target is predicted to come into CPA or TCPA.
		CPA alarm acknowledge	Shown in red, and flashing stops after CPA/TCPA alarm is acknowledged.
	(flashing)	Lost target	A red "X" is crossed through the TT symbol to indicate that it is a lost target. Flashing stops after lost target is acknowledged.
Acquisition zone	(flashing)	On target passing through operator-set acquisition zone	Symbol is red and flashing.
Target selected for data readout		On selected target	Target data (range, bearing, course, speed, CPA, TCPA, BCR, BCT, etc.) displayed in information box.

3.2.2 How to display the TT symbols

1. Open the [MAIN MENU].

2. Select [OTHER SHIPS' INFO.], then press the **left button**.

3. Select [TT], then press the **left button**.

4. Select [TT SYMBOL DISPLAY], then press the **left button**.

5. Rotate the **scrollwheel** to select [ON], then press the **left button**.
   To hide the TT symbols, select [OFF].

6. Close the menu.

[TT]
1. BACK
2. TT SELECT
   MANUAL 50
   MANUAL 25•AUTO 25/
   AUTO 50
3. ALL CANCEL
   NO/YES
4. TT SYMBOL DISPLAY
   OFF/ON
5. TT SYMBOL COLOR
   RED/YEL/GRN/CYA/MAG/
   BLU/WHT
6. TT CUSTOM DISP SETTING
7. TT NUMBERING SETUP
   NUMERICAL ORDER/
   EARLIEST AVAILABLE

3.3 How to Select the TRAIL mode

3.3.1 How to select auto/manual trail mode

Target tracking is available in three modes: [MANUAL 50] (up to 50 targets, selected manually), [MANUAL 25•AUTO 25] (up to 50 targets, 25 selected automatically, 25 selected manually) and [AUTO 50] (up to 50 targets, selected automatically). To select a target tracking mode, do the following:

1. Open the [MAIN MENU].
2. Select the [OTHER SHIPS' INFO.], then press the **left button**.
3. Select [TT], then press the **left button**.
4. Select [TT SELECT], then press the **left button**.
5. Select the appropriate mode, then press the **left button**.
   MANUAL 50/ MANUAL 25•AUTO 25/ AUTO 50 selectable.
6. Close the menu.

3.3.2 How to manually acquire targets

1. Press the **CURSOR ON/OFF** key if the cursor is not shown.
2. Move the cursor onto the target to acquire, then press the **left button**.
   The plotting symbol is drawn by broken lines during the initial acquisition stage. A vector appears in about one minute after acquisition indicating the target's motion trend. If the target is consistently detected for three minutes, the plotting symbol changes to a solid circle. If acquisition fails, the target plotting symbol blinks and disappears shortly.

At acquisition   Within 1 min. after   Within 3 min. after
                      acquisition   acquisition
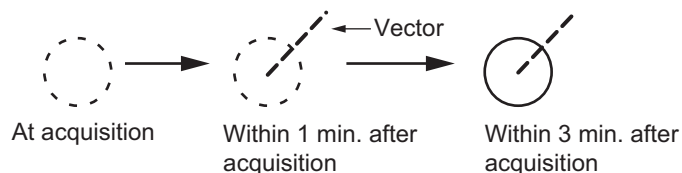
Cursor operation

1. Press the **CURSOR ON/OFF** key if the cursor is not shown.
2. Rotate the **scrollwheel** to select [TT TARGET DATA & ACK].
3. Move the cursor onto the target to acquire, then press the **left button**.
4. Press the **right button** to cancel the cursor operation.

Note 1: For successful acquisition, the target to be acquired should be within 0.1 to 24 nm (or 32 nm, depending on initial setting) from own ship and not obscured by sea or rain clutter.

Note 2: When the capacity for manual acquisition is reached, the message "TT TARGET FULL(MAN)" appears at the screen bottom. Cancel tracking of non-threatening targets if you wish to acquire additional targets manually.

Note 3: When a target being tracked nears another target being tracked, the targets may be "swapped". When two targets acquired either automatically or manually come close to each other, one of the two may become a Lost Target. Should this happen, manual re-acquisition of the Lost Target may be required after the two have separated.

3.3.3 How to automatically acquire targets

Targets are automatically acquired when the TT mode is set to either [MANUAL 25•AUTO 25] or [AUTO 50] and a target enters the acquisition zone (see section 3.10). The maximum tracking distance (24 NM or 32 NM) is set at installation.

Note: When the capacity for acquisition is reached full, the message "TT TGT FULL (AUTO)" appears and further acquisition does not work. To enable the acquisition, cancel some target trails which have no dangerous situation.

3.4 How to Cancel Target Tracking

When the number of tracked targets reaches maximum capacity, the alert box shows [TT TARGET FULL (MAN)] or [TT TARGET FULL (AUTO)], based on the selected TT mode. No new targets can be acquired until a tracked target is lost or tracking is canceled. When this occurs, cancel tracking for non-dangerous targets as required.

3.4.1 How to cancel tracking for individual TT targets

Cursor using

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.
2. Select the operational display area, then press the **right button**.
   The [CURSOR] menu appears.
3. Select [TARGET CANCEL], then press the **left button**.
4. Select the tracked target to cancel, then press the **left button**.

Cancel key using

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.
2. Move the cursor onto the tracking target symbol desired to cancel, then press the **CANCEL** key.

Note: When the TT list is shown, you can cancel the target tracking from the list. Move the cursor onto the column of tracking target desired, then press the **CANCEL** key.

3.4.2 How to cancel tracking for all TT targets

1. Open the [MAIN MENU].
2. Select [OTHER SHIP'S INFO.], then press the **left button**.
   The [OTHER SHIP'S INFO. 1/2] menu appears.
3. Select [TT], then press the **left button**.
4. Select [ALL CANCEL], then press the **left button**.
5. Select [YES], then press the **left button** to cancel tracking for all TT targets.
6. Close the menu.

3.5 Display Settings for Target Numbers

The mark shape, mark color and track color can be selected for tracked targets number 1 to 10. The table below shows the default shapes and colors.

No.	Mark Color	Shape	Track color	Target name
1	Red	○	Red	01
2	Yellow	◎	Yellow	02
3	Green	⊕	Green	03
4	Light-blue	◇	Light-blue	04
5	Purple	◈	Purple	05
6	Blue	⬙	Blue	06
7	White	⊠	White	07
8	White	▣	White	08
9	White	◬	White	09
10	White	◭	White	10

Confirm the settings

1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.

2. Move the cursor onto the TT symbol desired.

3. Rotate the **scrollwheel** to select a preset number (1 to 10). With wheel rotation, the preset number changes from 1 to 10. (The symbol appearance depends on tracking status, dashed lines for target under acquisition; solid lines for target being tracked.) Also, the TT vector color changes with symbol color.

How to set the TT symbol

1. Open the [MAIN MENU].

2. Select [OTHER SHIPS' INFO.], then press the **left button**.

3. Select [TT], then press the **left button**.

4. Select [TT CUSTOM DISP SETTING], then press the **left button**.
   TT CUSTOM SETTINGS window appears.

```
 TT CUSTOM SETTINGS

 PRESET NO.     1  2  3  4  5  6  7  8  9  10
 SMBL COLOR :   1.■ 2.■ 3.■ 4.■ 5.■ 6.■ 7.□
 SMBL SHAPE :   1.○ 2.◎ 3.⊕ 4.◇ 5.◈ 6.⬙ 7.⊠
                8.▣ 9.◭ 0.◬
 TRK COLOR  :   1.■ 2.■ 3.■ 4.■ 5.■ 6.■ 7.□
 TGT NAME   :   01

 TURN WHEEL : SELECT      PRESS LEFT BUTTON : ENTER
 PRESS RIGHT BUTTON : CLOSE
```
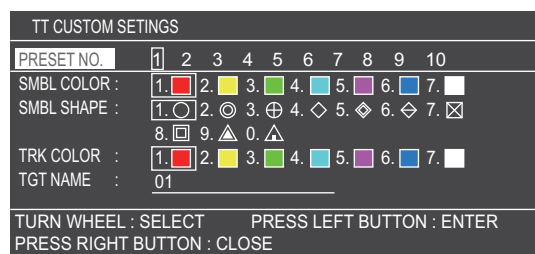
5. Select the symbol color, then press the **left button**.
   The options are red, green, blue, cyan, magenta, white and yellow. The color of TT symbols inside an acquisition zone cannot be changed.

6. Set the other options (symbol shape and track color), with same manner of step 5.

7. Select [TGT NAME], then press the **left button**.
Set the target name within 13 characters refer to paragraph 1.8.3.
The target number and target name are indicated at the side of target.

◯ 01_01
↑
Target number_Target name

8. Close the menu.

How to change the TT symbols

1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.

2. Move the cursor onto the [BRILL] box at bottom-left on the screen, then press the **right button**.
The color setting menu appears.

3. Select [NEXT], then press the **left button**.

4. Select [TARGET], then press the **left button**.

5. Rotate the **scrollwheel** to adjust brilliance, then press the **left button**.

6. Close the menu.

How to change the TT symbol size

1. Open the [MAIN MENU].

2. Select [OTHER SHIPS' INFO.], then press the **left button**.

3. Select [TARGET NO.], then press the **left button**.

4. Select [SMALL] or [LARGE], then press the **left button**.
If you select [OFF], no target number displayed.

5. Close the menu.

How to set target number assignment method

1. Open the [MAIN MENU].

2. Select [OTHER SHIP'S INFO.], then press the **left button**.

3. Select [TT], then press the **left button**.

4. Select [TT NUMBERING SETUP], then press the **left button**.

5. Select an option, referring to the descriptions below.

   • [NUMERICAL ORDER]: Targets are assigned a number from 01 to 50 in numerical order. (Unused numbers can not be used until more than 50 targets are acquired.)

   • [EARLIEST AVAILABLE]: Targets are assigned youngest unused target numbers.

6. Close the menu.

3.6 How to Display/Hide Target Data

The TT mode provides the full functionality of TT including display of range, bearing, course, speed, CPA and TCPA of all tracked targets.

The target bearing is shown in relative bearing in the HEAD UP mode and true bearing in the COURSE UP, NORTH UP and True Motion modes, with the suffix "R" (Relative) or "T" (True).

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

3.6.1 How to display target data

Basic information

Move the cursor onto a desired tracked target and press the **left button**. The target's shape changes to a square and the selected TT target's data box is shown in the data display area.

NO.	TT 03
BRG	050.6 °R
RNG	1.196 NM
CRS	303.6 °T
SPD	13.1 kn
CPA	1.699 NM
TCPA	05:43

○ 03 ← Target number

Frame
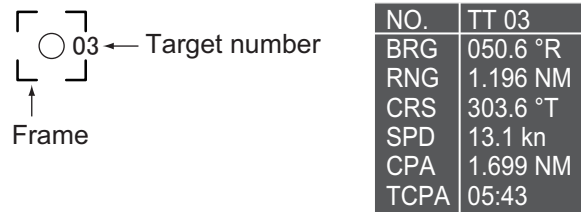
You can display the target data for two targets in one data box and the data for as many as six targets can be displayed.

Indication	Description
NO.	The method of target number assignment changes with the setting of [TT NUMBERING SETUP] on the [TT] menu.
BRG	Bearing from own ship to target in relative (R) or True (T) reference.
RNG	Range from own ship to target.
CRS	Relative (R) or True (T) Course Over Ground of target.
SPD	Relative (R) or True (T) Speed Over Ground of target.
CPA*	Closest Point of Approach of target to own ship.
TCPA*	Time to CPA of target to own ship.

*: To show the TT target's position data with the coordinates, set [DATABOX EXT DISPLAY] to [COORDINATE] on the [OTHER SHIPS' INFO. 2/2] menu.

You can display the target data to move the cursor onto a tracked target when the [TT SYMBOL DISPLAY] to [ON] at [TT] menu on [OTHER SHIPS' INFO 1/2].

TARGET NO.: 03
LAT: 34°24.7578' N
LON: 135°16.1181' E
DISTANCE 1.699 NM
DIR FM OS: 50.6° R

Note 1: You can hide the target data box temporary. Move the cursor onto the target data box, then press the **left button**. The target data box is hidden, then a [TGT DATA] icon appears. Move the cursor onto the icon and press the **left button** to open the target data box again.

Note 2: If you display the target data box while the zoom function is used, the zoom cursor is hidden temporary. The zoom cursor is recovered after the target data box is canceled.

Detailed information

1. Press the **CURSOR ON/OFF** key, when the cursor is not shown.

2. Move the cursor onto a desired target and press the **right button**.
   The target detail information appears at bottom on the screen.

```
 TT DETAIL INFO
 TARGET NO. : 03
 COURSE      : 87.7 °T      SOG         : 9.8kn
 TCPA        : 1m36s        CPA         : 1.010NM
 DISTANCE    : 1.042 NM     DIR FM OS   : 343.1° R
 POSITION    : 34°24.7578' N, 135°16.1181' E
 PRESS RIGHT BUTTON: CLOSE
```

3. Press the **right button** to hide the information.

3.6.2 How to display the target list

The target list provides a comprehensive data display of all TT (and AIS) targets being tracked.

How to display/hide the target list

1. Open the [MAIN MENU].

2. Select [OTHER SHIPS' INFO], then press the **left button**.

3. Select [TT LIST], then press the **left button**.
   The target list appears inside the information box.

```
 TARGET LIST
 TARGET NO.              DISTANCE DIR FM OS TCPA     CPA
 03                      2.607NM  0.0° R    1m30s    8.690NM




 [MARK SELECT] : PREVIOUS PAGE  [MARK] : NEXT PAGE
 [TRACK COLOR] : CHANGE COLOR  [PRESS RIGHT BOTTON] : CLOSE
 PRESS LEFT BUTTON : SELECT TARGET
 [PLOT INTVL] : RECORD START/STOP
```

4. Press the **right button** to hide the target list.

3.7   How to Display the Past Position

The past position display shows time-speed dots that mark the past positions of any tracked targets. To change the target tracking interval, see paragraph 5.1.4.

3.7.1   How to display the past position

1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [NEXT], then press the **left button**.

4. Select [OTHER TRACK SETTING], then press the **left button**.

5. Select [TT TRACK DISPLAY], then press the **left button**.

6. Select [ON], then press the **left button**.
   To hide the track, select [OFF].

7. Close the menu.

```
[OTHER TRACK SETTING]
1. BACK
2. AIS TRACK DISPLAY
   OFF/ON
3. DISPLAY TRACK DISPLAY
   OFF/ON
4. TT TRACK DISPLAY
   OFF/ON
5. GPS BUOY TRK DISPLAY
   OFF/ON
6. OTHER TRK REC INTVL
   TIME/RANGE
   TIME REC. : 00m 05s
   RANGE REC. : 0.10
7. OTHER CURR VCT DISP.
   OFF/ON
```

3.7.2   How to change TT track color/line

You can select the color and line type for TT tracks.

1. Press the **CURSOR ON/OFF** key, when the cursor is not shown.

2. Move the cursor onto a desired target and press the **TRACK COLOR** key.
   Track color window appears.

```
CHANGE TRACK COLOR
COLOR    : 1.■  2.■  3.■  4.■  5.■  6.■  7.□
            8.WATER TEMP   9.WATER DEPTH

LINE TYPE : 1.——    2.——    3.- - - -    4. - - -

TURN WHEEL : SELECT       PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```
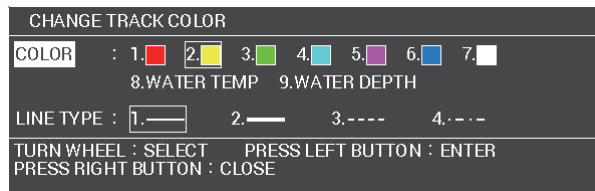
3. Select a color and a line from the menu.

4. Press the **right button** to close the window.

3.7.3   How to set TT track interval

You can set the TT track interval.

1. Press the **CURSOR ON/OFF** key, when the cursor is not shown.

2. Move the cursor onto a desired target and press the **PLOT INTVL** key.
   The selected target track is halted. The halted track is not recorded.

3. To reset the interval, move the cursor onto the halted target and press the **PLOT INTVL** key.

3.8   Vector

The vector on a tracked target is a line that represents the target's speed and course. The tip of vector is the predicted target position after the set vector time has passed. You can predict a possible collision with another target by extending the vector length (time).
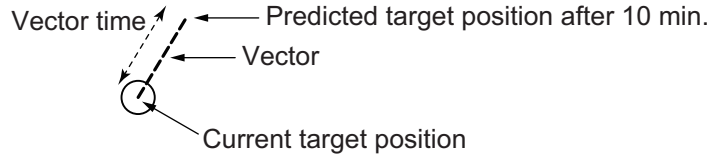
Vector time is set at [10 min].

To change the vector mode, move the cursor onto the vector reference indication in the VECTOR box, then press the **left button**. The vector reference cycles through True and Relative with each press the **left button**.

3.8.1   Types of vectors

True vector

True vector indicates the true movement of own ship and other ship relative to a land-mass. Use this mode to identify a distinguish target from a fixed target.

Relative vector

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

True vectors in ground stabilization

True vectors in sea stabilization

Relative vectors
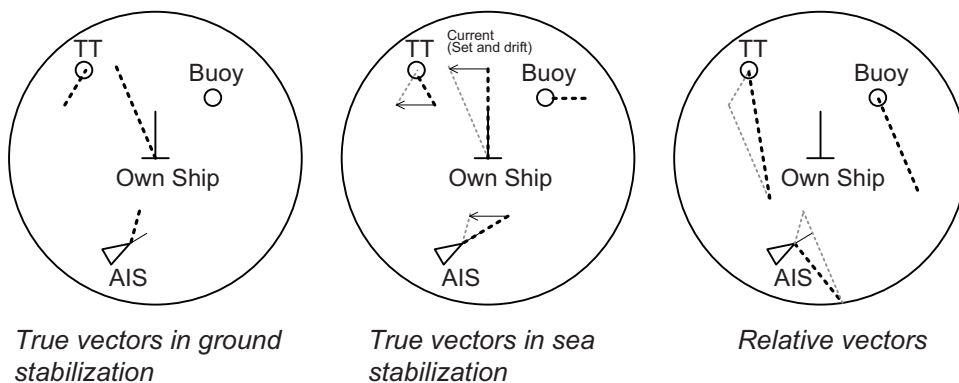
Ground stabilization/Water stabilization

The true vector mode display can be ground stabilized or sea stabilized. You can switch between ground stabilization and sea stabilization at [SHIP SPEED] in the [SHIP SPEED SETTING] menu. Select [LOG (BT)] for ground stabilization or [LOG (WT)] for sea stabilization. In the true vector mode, [T] is displayed in the vector mode box.

Sea stabilization is a display method using heading and speed through the water. Ground stabilization uses speed over the ground or current correction. When accuracy is low, current is corrected.

3.8.2 How to change the vector length (time)

The vector time provides an estimation of the target's vector and can be adjusted as follows:

Place the cursor on the vector time indication in the [Vector] box, then press the **left button**. The vector time cycles through the following settings with each press of the **left button**.

[6min] → [10min] → [20min] → [30min] → [45min] → [60min] → [30sec] → [1min] → [3min] → [5min] → [6min]...

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

3.9 Set Drift

Set, the direction in which a water current flows, can be manually entered in 0.1-degree steps. Drift, also known as "Rate", or the speed of the current, can also be entered manually in 0.1 kn steps.

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

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

To enter set and drift do the following:

1. Open the [MAIN MENU].
2. Select [NAV DATA], then press the **left button**.
3. Select [SPEED], then press the **left button**.
4. Select [SHIP SPEED SETTING], then press the **left button**.
5. Select [SET DRIFT], then press the **left button**.
6. Select [ON], then press the **left button**. The setting can now be adjusted.
7. Rotate the **scrollwheel** to select the appropriate setting (Setting range: 000.0° to 359.9°), then press the **left button**. The [DRIFT] setting is now selected.
8. Rotate the **scrollwheel** to select the appropriate setting (Setting range: 00.0kn to 19.9kn), then press the **left button**.
9. Close the menu.

Note 1: Set and drift are available when using manually input speed, speed through the water. The speed source is shown as "WTC" (Water Tracking Count).

Note 2: Set and drift should be checked periodically for correctness.

Note 3: When speed data input from the position sensor is valid, set and drift are not adjustable.

3.10   Alert

3.10.1   Lost target

Targets not detected in five consecutive scans become "lost targets". A lost target is shown in the display with a flashing red "X". Flashing stops after lost target alert is acknowledged.

If you are in an area where tracked targets are lost frequently, you may want to disable the lost target alert against tracked targets, by maximum range or minimum speed.

How to set the lost target filter

You can set the lost target alert to sound against lost targets that are within a specific range. To set the criteria, use the procedure below.

1. Open the [MAIN MENU].
2. Select [ALERT SETTINGS], then press the **left button**.
3. Select [TT/AIS ALERT], then press the **left button**.
4. Select [TT LOST ALERT], then press the **left button**.
5. Select [ON], then press the **left button**.
    The cursor moves to [ALERT RANGE].
6. Rotate the **scrollwheel** to adjust the setting as required, then press the **left button** to apply the setting.
7. Close the menu.

Note: Reference targets are not affected by this filter.

How to enable/disable the lost target alert

The [LOST TARGET ALERT] box at the bottom right corner enables and disables the lost target alert. Select the box with the cursor, then press the **left button** to select [OFF], [ALL] or [FILT] as appropriate.

*   [OFF]: Disable the alert.
*   [ALL]: Enable the alert for all lost targets, including filtered targets.
*   [FILT]: Enable the alert for all lost targets, excluding filtered targets.

3.10.2   Collision alert (CPA, TCPA)

This radar calculates CPA and TCPA by using own ship and relative target positions.

The TT continuously monitors the predicted range at the Closest Point of Approach (CPA) and predicted time to CPA (TCPA) of each TT. When the predicted CPA of any TT becomes smaller than a preset CPA range and its predicted TCPA less than a preset TCPA limit, the audio alarm sounds and TT COLLI-

> ⚠ **CAUTION**
>
> **CPA/TCPA Alarm**
>
> The CPA and TCPA alarm feature should never be relied upon as the sole means for detecting the risk of collision. The navigator is not relieved of the responsibility to keep visual lookout for avoiding collisions, whether or not the radar or other plotting aid is in use.

SION appears (in red) in the Alert Box. In addition, the symbol of the offending TT is red and flashes together with its vector.

This feature, when used correctly, helps prevent the risk of collision by alerting you to threatening targets. It is important that GAIN, A/C SEA, A/C RAIN and other radar controls are properly adjusted.

CPA and TCPA ranges must be set up properly taking into consideration the size, tonnage, speed, turning performance and other characteristics of own ship.

CPA and TCPA ranges can be adjusted from the antenna location.

The reference point for CPA and TCPA calculation can be selected from antenna position or conning position.

How to set the CPA and TCPA ranges

1. Open the [MAIN MENU].
2. Select [ALERT SETTINGS], then press the **left button**.
3. Select [TT/AIS ALERT], then press the **left button**.
4. Select [CPA/TCPA ALERT], then press the **left button**.
5. Rotate the **scrollwheel** to adjust the settings as required. The settings options are outlined in the table below.

Indication	Settings options
CPA	0.1-99.9 (NM) in 0.1 NM increments
TCPA	1-60 minutes, 1-minute increments

6. Close the menu.

How to acknowledge the TT collision alert

Place the cursor on the target, then press the **left button**, or select the [ALERT] icon with the trackball then press the **right button** to acknowledge the alarm and silence the buzzer. The alert "TT COLLISION" and the flashing of the plotting symbol and vector remain in the Alert Box until the dangerous situation is gone or you intentionally terminate tracking of the target.

Note that when the TT COLLISION alert is generated the AIS display is automatically turned on.

3.10.3 How to activate the acquisition zone

The acquisition zone functions both to alert you targets in a specific area and acts as an automatic acquisition area when automatic target acquisition is active. Any targets entering the zone will be automatically acquired.

How to activate the guard zone alert

When a target enters an acquisition zone, the buzzer sounds and the indication "TT NEW TARGET" (or "AIS NEW TARGET") appears (in yellow-orange) in the Alert Box. The symbol of the offending target is red and flashing. Further, the AIS display is automatically turned on if it is off.

1. Open the [MAIN MENU].
2. Select [OTHER SHIPS' INFO.], then press the **left button**.
3. Select [ACQUISITION ZONE], then press the **left button**.

4. Select [AZ/ALR SELECT], then press the **left button**.

5. Select [ACQUISITION ZONE], then press the **left button**.
    Select [TARGET ALARM ZONE] for using the target alarm.

6. Close the menu.

Note: The [AZ1] and [AZ2] boxes are not displayed when the setting for [AZ/ALR SE-LECT] in the [ACQUISITION ZONE] menu is set to [TARGET ALARM ZONE].

How to activate the first acquisition zone (AZ1)

There are two types of acquisition zones available, arc and polygon, however, AZ1 can only be set as an arc.

The No. 1 acquisition zone is available between 3 and 6 nm The TT/AIS acquisition zone's lines are white and dashed so as to distinguish them from the radar target alarm.

The procedure below shows how to set AZ1, using the example at the bottom of the page.

1. Place the cursor on the [AZ] indication at the bottom-right of the screen.

2. Press the **left button** to cycle through the settings and select [SET].

3. Place the cursor on the acquisition zone starting point ("A" in the figure below), then press the **left button**.

4. Place the cursor on the acquisition zone end point ("B" in the figure below), then press the **left button**.

5. Press the **right button** to complete the acquisition zone set up.

Target in acquision zone is red and flashing.
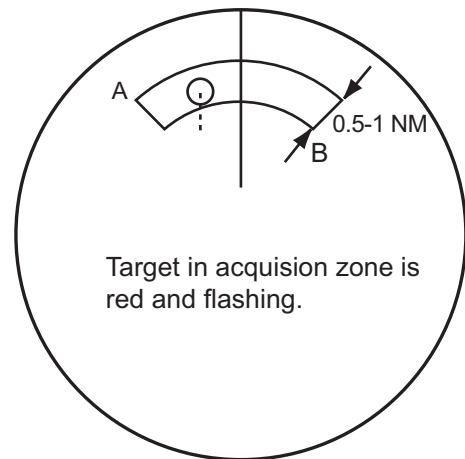
Notes on acquisition zones

•   If you wish to create an acquisition zone having a 360-degree coverage around own ship, set point B in almost the same direction (approx. ±3°) as point A, then press the left button.

•   The default acquisition zone is fan shaped. It can also be a polygon having 3-10 points.

•   If both acquisition zones are displayed, a maximum of four polygon points are shown.

•   TT and AIS are automatically set to TT=AUTO and AIS=DISP, respectively, when an AZ is activated in the following conditions:

    TT   : TT=OFF or TT=MANUAL 50
    AIS : AIS FUNC=OFF or AIS DISP=OFF

How to sleep/deactivate an acquisition zone

1. Select the appropriate [AZ] box.

2. Sleep, or deactivate, the acquisition zone, as explained below:

Sleeping the acquisition zone

Press the **left button** several times until the indication shows "SLEEP".

Deactivating the acquisition zone

Press and hold the **left button** until the AZ box becomes blank.

Note: When both [AZ1] and [AZ2] are active, [AZ2] must be deactivated before [AZ1] can be deactivated.
If [AZ1] and [AZ2] are active when you try to deactivate [AZ1], the system releases an audible alert and shows the message "DELETE AZ2 FIRST".

How to acknowledge the acquisition zone alert

Place the cursor on the acquisition zone, then press the **left button**, or select the [ALERT] box with the trackball then press the **left button** to acknowledge the alarm and silence the buzzer.

How to change the acquisition zone reference

The acquisition zone can be referenced to heading or North using the following procedure:

1. Open the [MAIN MENU].
2. Select [OTHER SHIPS' INFO.], then press the **left button**.
3. Select [ACQUISITION ZONE], then press the **left button**.
4. Select [AZ STAB], then press the **left button**.
5. Select [STAB HDG] to reference heading, or [STAB NORTH] to reference North.
6. Close the menu.

3.11   TT Simulation Mode

You can simulate the risk of a collision by using the TT simulation mode. The test can be terminated at any time by pressing the **STBY/TX** key.

1. Open the [MAIN MENU].
2. Select [INITIAL SETTING], then press the **left button**.
3. Select [OTHERS], then press the **left button**.
4. Select [DEMO ECHO], then press the **left button**.
5. Select [TT-TEST], then press the **left button**.

The normal operation is suspended then three simulated targets appear on the display.

The indication "S" appears at the bottom of the effective display area during the simulation mode. The simulation may be terminated any time by going to the STBY mode.

Three simulated targets move as the following table. The simulated target is automatically generated with the relative movement in the following table based on own ship's movement at the start of simulation mode.

Note: If own ship moves after the start of simulation mode, the movement of the simulated target is not matched with the values in the following table.

	Range (R)	Bearing (R)	Speed (R)	Course (R)	CPA	TCPA
Target 01	9.5 NM	270.0°	20.0 kn	90.0°	0.0 NM	28.5 min
Target 02	1.1 NM	333.0°	10.2 kn	90.2°	1.0 NM	2.9 min
Target 03	9.3 NM	45.0°	19.9 kn	225.1°	0.0 NM	28.0 min

Place the cursor on a target, then press the **left button** to display the target data.

Acquire the simulated targets after the TT simulation mode is performed. The tracking state changes from unstable to stable and the vector appears. You can simulate the movement of each function with changing true/relative vector, stabilization through the water/over the ground, range or length of vector.

Repeat the check for all targets.
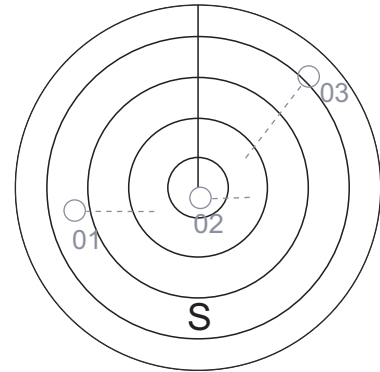
4. AIS OPERATION

With connection of the FURUNO AIS Transponder, this radar can display the names, positions and other navigational data up to 100 points of AIS transponder fitted ships.

Position data WGS-84 geodetic datum is required for AIS operation. Set the geodetic datum at the GPS navigator. When other datum is used, the AIS target position is not display correctly. Select the geodetic data WGS-84 certainly for ship's safety.

4.1 AIS Symbols and Their Meanings

How to show the AIS symbol

1. Open the [MAIN MENU].
2. Select [OTHER SHIPS' INFO], then press the **left button**.
3. Select [AIS], then press the **left button**.
4. Select [AIS SYMBOL DISPLAY], then press the **left button**.
5. Select [ON], then press **left button**.
6. Close the menu.

When the AIS is active, AIS targets are marked with the appropriate AIS symbol, as shown in the table below.

SYMBOL	STATUS	REMARKS
△	Sleeping target	Indicates the presence of a target equipped with AIS.
	Activated target	All AIS symbols shown with thick line. Bearing, speed and bector line indicated.
	ROT higher than preset ROT	Displayed for turning ship.
	Dangerous target	Displayed when CPA/TCPA is within CPA/TCPA limit. Red in color. Flashing until acknowledged.
	Lost target	"X" overlaid on a lost target. Red in color. Erased after acknowledged.
◇+	Physical AIS buoy	
◇+	Virtual AIS buoy	
	AIS aircraft	Lost time:10 minutes.
⊗	AIS-SART	

Note 1: The equipment continues to process AIS targets when the AIS feature is deactivated. When the AIS is activated again, symbols are immediately displayed.

Note 2: AIS symbols are momentarily erased and the screen is redrawn after the heading is changed in the HEAD UP mode.

Note 3: The CPA and TCPA of SAR aircraft data are not available and are shown as ***.

4.2 Activate AIS Targets

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

4.2.1 How to activate specific targets manually

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.

2. Move the cursor onto the target to activate, then press the **left button**. You can use the **ACK** key instead of the left button.

SOG (Speed Over Ground) and COG (Course Over Ground) vector [1]

Turning direction (ROT)

[1] Vector shows STW (Speed Thru Water) and CTW (Course Thru Water) when water tracking mode is selected at the radar.

Heading line [2]

[2] If there is no heading data available, the heading line is not displayed.
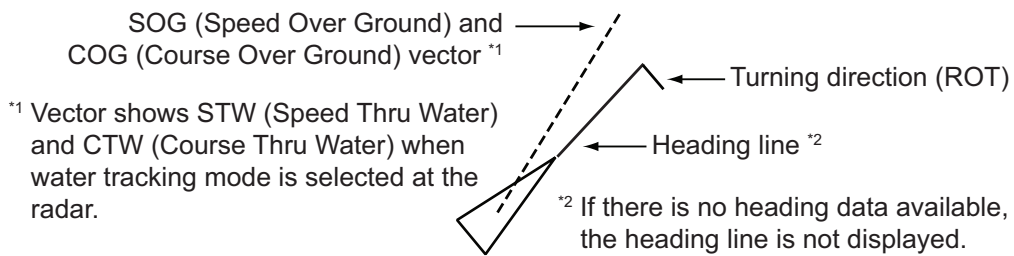
When you set [TARGET CURSOR INFO.] to [ON] in the [OTHER SHIP'S INFO. 2/2] menu, AIS information appears when placing the cursor onto the AIS target's symbol.

```
SHIP NAME : --
COURSE : 0.0°T     SPEED : 0.0kn
CPA : 5.138NM      TCPA : 12m59s
SHIP LENGTH : --m   SHIP WIDTH : --m
```

4.2.2   How to activate the AIS target within specified range

When an AIS target approach the area around own ship, the target symbol can be activated automatically.

1. Open the [MAIN MENU].
2. Select [ALERT SETTING], then press the **left button**.
3. Select [TT/AIS ALERT], then press the **left button**.
4. Select [AIS AUTO ACTIVATION], then press the **left button**.
5. Select [ON], then press the **left button**.
6. Rotate the **scrollwheel** to select the range required, then press the **left button**.
7. Close the menu.

```
[TT AIS ALERT 1/2]
1.  BACK
2.  TT LOST ALERT
    OFF/ON
    ALERT RANGE : 12NM
3.  AIS AUTO ACTIVATION
    OFF/ON
    ACTIVE RANGE : 01.5NM
4.  IGNORE MOORED SHIPS
    OFF/ON
    SPD FOR MOORED : 01.0kn
5.  AIS PROXIMITY ALERT
    OFF/ON
    ALERT RANGE : 01.0NM
6.  CPA/TCPA ALERT
    OFF/ON
    CPA  : 01.0NM
    TCPA: 00MIN30SEC
```

4.2.3   How to limit the AIS auto activate function

You can limit the function of the AIS auto activate function by ship's speed.

1. Open the [MAIN MENU].
2. Select [ALERT SETTINGS], then press the **left button**.
3. Select [TT/AIS ALERT], then press the **left button**.
4. Select [IGNORE MOORED SHIPS], then press the **left button**.
5. Select [ON], then press the **left button**.
    The cursor moves to [SPD FOR MOORED] line.
6. Rotate the **scrollwheel** to set the value, then press the **left button**.
7. Close the menu.

4.3   How to Sleep AIS Targets

If there are too many AIS targets on the screen you may wish to remove unnecessary ones. You can "sleep" an AIS target as below when the screen becomes filled with targets, which might prevent important radar and AIS displays from being identified.

Note: Targets that have been activated automatically and dangerous targets cannot be "slept".

1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.
2. Move the cursor onto the target to be slept, then press the **CANCEL** key.

4.4 How to Set the AIS Target Symbol

You can select AIS target color and brilliance as you desire.

How to set the color of AIS target mark

1. Open the [MAIN MENU].
2. Select [OTHER SHIPS' INFO.], then press the **left button**.
3. Select [AIS], then press the **left button**.
4. Select the mark color, then press the **left button**.
5. Close the menu.

How to set the brilliance of AIS target mark
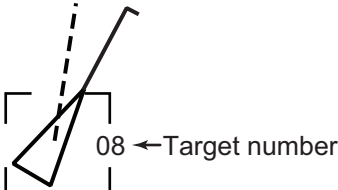
1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.
2. Move the cursor onto the [BRILL] box, then press the **right button**.
3. Select [NEXT], then press the **left button**.
4. Select [TARGET], then press the **left button**.
5. Rotate the **scrollwheel** to adjust the brilliance, then press the **left button**.
6. Close the menu.

4.5 AIS Target Data

You can display an AIS target's data by selecting it on the display.

4.5.1 How to display target data in the data display area

Place the cursor on a desired AIS target and press the **left button**. The target is highlighted with a square box and the selected AIS target's data is shown in AIS target data box in the data display area, at bottom of the screen.

AIS target data box

No.	AIS 007	AIS 010	AIS 008	Name of target ship
BRG	165.0 °R	345.9 °R	234.9 °R	Bearing to target
RNG	0.874 NM	0.874 NM	0.874 NM	Range to target
CRS	000.0 °T	000.0 °T	000.0 °T	Target's course
SPD	0.0 kn	0.0 kn	0.0 kn	Target's speed
CPA	0.655 NM	0.655 NM	0.765 NM	Target's CPA
TCPA	10:09	-10:09	-07:23	Target's TCPA

Maximum four AIS target data are shown at bottom on the screen.

Note 1: You can hide an active target to specify as a moored target.

- Move the cursor onto a active target symbol, then press the **CANCEL** key.
- Move the cursor onto a column on the list, then press the **CANSEL** key.

Note 2: You can hide an active target temporary by pressing the **left button** on the target data list. While the target is hidden, [DESTINATION DATA] box appears at bottom on the screen. Move the cursor onto the box and press **left button** to release the target.

Note 3: If the target data list is shown while the zoom function is activated, the zoom cursor is hidden. To show the zoom cursor, close the target data list.

4.5.2 How to remove target data from the display area

Place the cursor on a desired tracked target or target information box and press the **CANCEL** key. The select target's data is no longer displayed in the data display area.

Note 1: You can hide the target information temporarily by pressing the **left button** on the target data box at bottom in the screen. The information box will be retracted to a small icon. To show the information, press the **left bottom** on the icon.

Note 2: The zoom cursor is not shown while the zoom function is activated.When the information data box is hidden, the zoom cursor is shown.

Note 3: The target location date is available instead of CPA/TCPA. Select [DATABOX EXT DISPLAY] to [COODINATE] on [OTHER SHIPS' INFO. 2/2] menu.

4.5.3 How to show target information

1. Press the **CURSOR ON/OFF** key when cursor is not shown.

2. Move the cursor onto the AIS target, then press the **right button**.
   The information box for the AIS target appears.

```
AIS DETAIL INFO
SHIP NAME   : --
CALL SIGN   : --
MMSI NO.    : 000000001
COURSE      : 0.0°T        SOG          : 0.0 kn
TCPA        : 5m11s        CPA          : 1.60NM
DISTANCE    : 2.665NM      BRG          : 258.2°R
WAYPOINT    : --
SHIP TYPE:  --

SHIP COND   : Under way using engine
ELAPSED     : 1s
HEADING     : 144.0°T      ROT          : 0.0°/min
SHIP LEN    : --m          SHIP WIDTH  : --m
DANGER      : --
POSITION    : 34°11.0000°N, 134°48.0000°E
```

3. Press the **right button** to hide the information box.

4.5.4 How to show the AIS target list

1. Open the [MAIN MENU].

2. Select [OTHER SHIPS' INFO.], then press the **left button**.

3. Select [AIS LIST], then press the **left button**.
   The AIS target list appears at bottom on the screen.

```
AIS LIST                              SEL. PAGE  1/1
NAME OF SHIP          DISTANCE DIR FM OS TCPA      CPA
 000000001            2.320NM  317.2°R   16m10s    1.574NM
 000000005            2.352NM  53.52°R   13m11s    1.807NM




[MARK SELECT] : PREVIOUS PAGE    [MARK] : NEXT PAGE
[TRACK COLOR] : CHANGE COLOR     PRESS RIGHT BUTTON : CLOSE
PRESS LEFT BUTTON : SELECT TARGET
[PLOT INTVL] : RECORD START/STOP
```

- **MARK SELECT** key: moves to previous page.

- **MARK** key: moves to next page.
- **TRACK COLOR** key: shows the [CHANGE TRACK COLOR] window.
- **Left button**: indicates the selected AIS target data (refer to previous page).
- **PLOT INTVL** key: exchange the AIS target data recording start/stop.
- **Right button**: closes the list.

4.6 AIS Target's Track

You can display the AIS target's track. To set the track information, refer to section 5.1.

4.6.1 How to show the AIS target's track

1. Open the [MAIN MENU].
2. Select [TRACK], then press the **left button**.
3. Select [NEXT], then press the **left button**.
4. Select [OTHER TRACK SETTING], then press the **left button**.
5. Select [AIS TRACK DISPLAY], then press the **left button**.
6. Select [ON], then press the **left button**.
7. Close the menu.

4.6.2 How to set the AIS target's color and line

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.
2. Move the cursor onto an AIS symbol, then press the **TRACK COLOR** key. [CHANGE TRACK COLOR] window appears.
3. Select [COLOR], then press the **left button**.
4. Select a track color, then press the **left button**.
5. Select [LINE TYPE], then press the **left button**.
6. Select a line type, then press the **left button**.
7. Press the **right button** to close the menu.

4.6.3 How to hold/release the AIS track recording

1. Press the **CURSOR ON/OFF** key when cursor is not shown on the screen.
2. Move the cursor onto an AIS symbol, then press the **TRACK ON/OFF** key. The target track indication is held. The target track during the period is not recorded.
3. Move the cursor onto the AIS symbol which is held, then press the **TRACK ON/OFF** key to release the track recording.

4.7 Vector

The vector line on an activated AIS target indicates the speed and course of the AIS target. The top of the vector shows as estimated position of the target after the select-

ed vector time has ended. You can foresee a risk of collision with other AIS targets by extending the vector length (time).

How to select the vector mode and time

Vectors may be displayed in true (over ground/ over water) or relative reference. Vector time can be selected from 15/30/45 sec., 1 to 60 minutes. The settings are common with TT target.

1. Press the **CURSOR ON/OFF** key when the cursor is not shown on the screen.

2. Move the cursor onto the character R or T (relative or true) on vector box at left-bottom on the screen, then press the **left button**.
   Every press alternately changes [R] or [T].

3. Move the cursor onto the vector time box, then press the **left button** to select a vector time in ascending order (30 sec. and 1 min. to 60 min.) with interval. Use the **scrollwheel** to select 1 min. step.

Relative/ True mode

VECTOR   R
        6 MIN

Vector box

Vector time
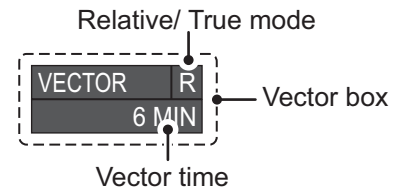
4.8   Alert Settings

4.8.1   How to set the AIS target alert

1. Open the [MAIN MENU].
2. Select [ALERT SETTINGS], then press the **left button**.
3. Select [TT/AIS ALERT], then press the **left button**.
4. Select [AIS PROXIMITY ALERT], then press the **left button**.
5. Select [ON], then press the **left button**. The settings can now be adjusted.
6. Rotate the **scrollwheel** to adjust the setting as required, then press the **left button** to apply the setting.
7. Close the menu.

When an alert occurred, audible alarm generated and alert message appears on the massage area. To cancel the AIS proximity alert, select [OFF] at the step 5.

4.8.2   How to set the lost target filter

If there are a lot of AIS targets in your area, the lost target alert can sound frequently. In this case you may wish to have the alert ignore lost targets whose range, speed, class or length are below the threshold value you specify.

1. Open the [MAIN MENU].
2. Select [ALERT SETTINGS], then press the **left button**.
3. Select [TT/AIS ALERT], then press the **left button**.
4. Select [NEXT], then press the **left button**.
5. Select [AIS LOST FILTER], then press the **left button**.
6. Select [ON], then press the **left button**. The settings can now be adjusted.
7. Rotate the **scrollwheel** to adjust the setting as required, then press the **left button** to apply the setting.

8. Close the menu.

4.8.3 How to set the collision alert (CPA/TCPA alert)

This radar calculates CPA and TCPA by using own ship and relative target positions. An AIS dangerous target is one whose CPA and TCPA are within the range of the CPA and TCPA limits set in the TT/AIS box. The AIS symbol of an AIS dangerous target is red and flashing, and is announced with the Alert 536 "AIS CPA/TCPA". After the alert is acknowledged the target symbol is displayed in red color.

⚠ **CAUTION**

CPA/TCPA Alarm

The CPA and TCPA alarm feature should never be relied upon as the sole means for detecting the risk of collision. The navigator is not relieved of the responsibility to keep visual lookout for avoiding collisions, whether or not the radar or other plotting aid is in use.

Collision alert setting

1. Open the [MAIN MENU].
2. Select [ALERT SETTINGS], then press the **left button**.
3. Select [TT/AIS ALERT], then press the **left button**.
4. Select [CPA/TCPA ALERT], then press the **left button**.
5. Select [ON], then press the **left button**. The settings can now be adjusted.
6. Rotate the **scrollwheel** to adjust the setting as required, then press the **left button** to apply the setting.
7. Close the menu.

Acknowledge the collision alert

Press the **ALERM ACK** key, or select an alert icon from the message box and press the **left button** to acknowledge the alert message.

The collision alert message blinks until the collision is not avoided.

4.9   AIS Messages

You can transmit and receive messages via the AIS. Messages can be registered twenty maximum. When the messages are overflowed, the earliest message erased automatically.

How to display the received messages

1. Press the **CURSOR ON/OFF** key, if the cursor is not shown.

2. Move the cursor onto the envelope icon $\boxtimes$ at bottom-right on the screen, then press the **left button**.

3. Select the message desired, then press the **left button**.

4. Press the **right button** to close the menu.

Note 1: You can open the mail message by selecting [RECEIVED MESSAGE] from [AIS] on [OTHER SHIPS' INFO.] menu.

Note 2: When the [AUTO MESSAGE DISPLAY] is [OFF] on [AIS] menu, the envelope icon to indicate the arrival of new mail is not shown.

Currently displayed page no. →
Close message list. When displayed as "BACK", goes back one page in the list. →
Message list →
Display next page. →
Name and Call Sign of selected message's sender. →
Message details →
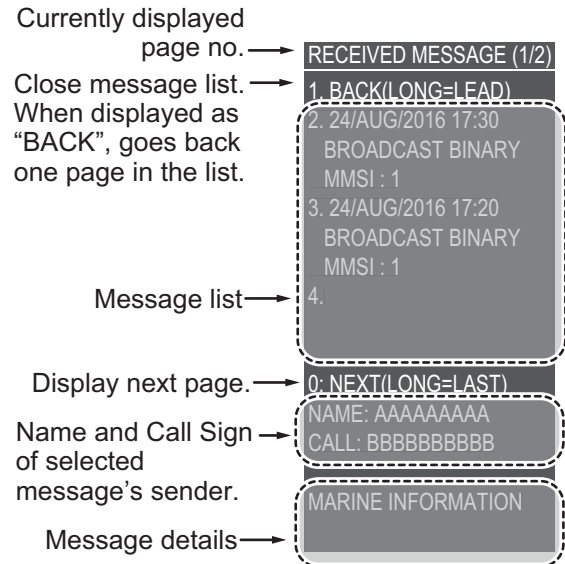
RECEIVED MESSAGE (1/2)
1. BACK(LONG=LEAD)
2. 24/AUG/2016 17:30
   BROADCAST BINARY
   MMSI : 1
3. 24/AUG/2016 17:20
   BROADCAST BINARY
   MMSI : 1
4.
0: NEXT(LONG=LAST)
NAME: AAAAAAAAA
CALL: BBBBBBBBBB
MARINE INFORMATION

This page is intentionally left blank.

5. VIDEO PLOTTER OPERATION

The video plotter has the following functions:

- Own ship and other ship's track plotting

- Enter waypoints and marks.

- Creates and displays routes.

- Able to save marks and tracks on removable USB memory.

Note: This section shows the operation under the ST-BY mode.

5.1 Track Display

The video plotter shows the own ship's track on the display. The other ship's tracks are able to display with AIS transponder connection.
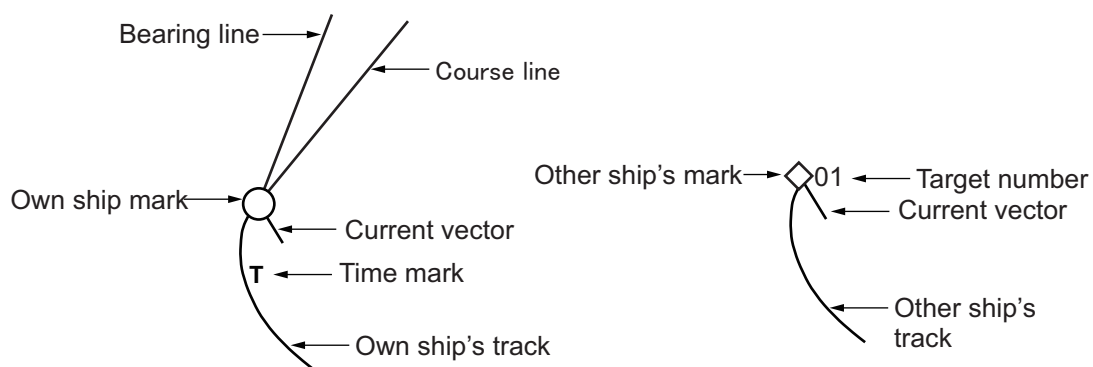
The own ship and other ship's track are available to record as routes (refer to paragraph 5.5.1). You can also change the own ship track color each time the system is turned on (refer to paragraph 5.1.5).

5.1.1 Symbol

Own ship mark

You can plot the own ship mark (○) on the location of your ship. The own ship mark shows present location of ship and following functions.

- Course line: White line from own ship mark to course direction.

- Bearing line: Cyan line from own ship mark to bearing direction.

- Current vector: Three layer current line enabled with specified colors (external current data required).

Note: The course line does not appear with the bearing line simultaneously.

Other ship mark

You can plot other ship marks (◇) on the location of another ship. The GPS buoy mark (□) available to plot on the screen.

5.1.2 How to show/hide the ship's mark

How to set the own ship mark

1. Open the [MAIN MENU].
2. Select [CURSOR/OWN SHIP MARK], then press the **left button**.
3. Select [OWN SHIP MARK], then press the **left button**.
4. Select [OWN SHIP VECTOR], then press the **left button**.
5. Select [HDG.] or [COURSE], then press the **left button**.
6. Select [OWN SHIP CURR VECTOR], then press the **left button**.
7. Select [ON], then press the **left button**.
8. Press the **right button** twice to return to the main menu.
9. Select [TRACK], then press the **left button**.
10. Select [NEXT], then press the **left button**.
11. Select [CURRENT VECTOR SETTING], then press the **left button**.
12. Select the first layer number with scrollwheel and then press the **left button**.
13. Select the second and third layer numbers same as step 12.
14. Press the **MENU** key to close the menu.

[OWN SHIP MARK]
1. BACK
2. OWN SHIP MARK DISPLAY
   OFF/MIN/SCALED
3. STERN MARK
   OFF/ON
4. OWN SHIP VECTOR
   OFF/HDG./COURSE
5. OWN SHIP CURR VECTOR
   OFF/ON
6. PLOTTER OWN SHIP MARK
   OFF/ON
7. PLOTTER HEADING LINE
   OFF/ON

How to set the other ship mark

To display the other ship mark, be aware of following:

• This function requires data from AIS transponder, DSB receiver or GPS buoy.
• The own ship's position data from a navigator is required.
• The appropriate settings are required for data input.
• Set the output setting correctly for a DSB receiver or a GPS buoy.
• Refer to other instructions for TT/AIS symbols.

1. Open the [MAIN MENU].
2. Select [OTHER SHIP'S INFO], then press the **left button**.
3. Select [NEXT], then press the **left button**. [OTHER SHIP'S INFO 2/2] menu appears.
4. Select [CONSORT DISPLAY] or [GPS BUOY DISPLAY], then press the **left button**.
5. Select [ON] to display the symbol, then press the **left button**.
   Select [OFF] to hide the symbol.
6. Press the **MENU** key to close the menu.

[OTHER SHIP'S INFO 2/2]
1. BACK
2. DATABOX EXT DISPLAY
   COORDINATE/CPA·TCPA
3. TARGET CURSOR INFO.
   OFF/ON
4. CONSORT DISPLAY
   OFF/ON
5. GPS VUOY DISPLAY
   OFF/ON
6. CONSORT MEG. DISPLAY
   OFF/ON

5.1.3   How to show/hide the tracks

Own ship's track setting

The own ship's track shown by default.

1.   Open the [MAIN MENU].

2.   Select [TRACK], then press the **left button**.

3.   Select [OWN TRACK SETTINGS], then press the **left button**.

4.   Select [OWN TRACK DISPLAY], then press the **left button**.

5.   Select [ON], then press the **left button** to show the own ship's track.
     Select [OFF] to hide the own ship's track.

6.   Select the number of points with the scroll-wheel then press the **left button**.

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

Note: The time mark setting is available for every hour. Set the [TIME MARK DISPLAY] to [ON] at the [OWN TRACK SETTINGS] menu.

```
[OWN TRACK SETTINGS]

1. BACK
2. OWN TRACK DISPLAY
   OFF/ON
   MAX POINTS : 30000
3. TRACK INTERVAL 1
   TIME/RANGE
   TIME REC. : 00m 30s
   RANGE REC. : 0.10
4. TRACK INTERVAL 2
   TIME/RANGE
   TIME REC. : 00m 30s
   RANGE REC. : 0.10
5. CURRENT VECTOR DISPLAY
   OFF/ON
6. [TRACK COLOR BY TEMP.]
7. [TRACK COLOR BY DEPTH]
8. TIME MARK DISPLAY
   OFF/ON
```

Other ship's track setting

The other ship's track is not shown by default.

1.   Open the [MAIN MENU].

2.   Select [TRACK], then press the **left button**.

3.   Select [NEXT], then press the **left button**.

4.   Select [OTHER TRACK SETTINGS], then press the **left button**.

5.   Select [AIS TRACK DISPLAY], [CNSRT TRACK DISPLAY], [TT TRACK DISPLAY] or [GPS BOUY TRK DISPLAY], then press the **left button**.

6.   Select [ON], then press the **left button** to show the other ship's track.
     Select [OFF] to hide the track.

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

Show/hide the current vector

1.   Open the [MAIN MENU].

2.   Select [TRACK], then press the **left button**.
     [TRACK 1/2] menu appears.

3.   Select [OWN TRACK SETTINGS], then press the **left button**.

4.   Select [CURRENT VECTOR DISPLAY], then press the **left button**.

5.   Select [ON], then press the **left button**.
     Select [OFF] when you hide the current vector.

6.   Press the **right button** to back to the [TRACK 1/2] menu.

7.   Select [NEXT], then press the **left button**.
     [TRACK 2/2] menu appears.

8.   Select [OTHER TRACK SETTINGS], then press the **left button**.

9. Select [OTHER CURR VCT DISP.], then press the **left button**.

10. Select [ON], then press the **left button** to show the other ship's current vector.
Select [OFF] to hide the current vector.

[TRACK 2/2]

1. BACK
2. [OTHER TRACK SETTING]
3. CURRENT VECTOR SETTING
   3 LAYER ◄ CURRENT #1
   4 LAYER ◄ CURRENT #2
   2 LAYER ◄ CURRENT #3

11. Press the **right button** to go back to [TRACK 2/2].

12. Select [CURRENT VECTOR SETTING], then press the **left button**.

13. Select the number of layers for current 1, between 1 and 5, then press the **left button**.
Select the number of layers for current 2 and 3 in the same manner.

14. Press the **MENU** key to close the menu.
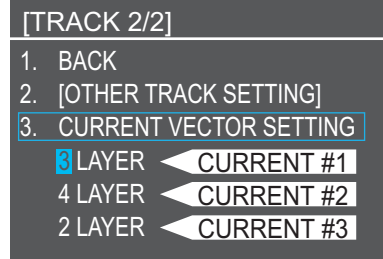
5.1.4 How to set the own ship's track recording

Hide own ship's track

You can hide the own ship track when it is not required. This can save memory.

1. Press **PLOT INTVL** key several times to select the (H) icon at the top-left of the screen.
To press the key to change the icon "Plot interval 1", "Plot interval 2" and "Halt".

2. Press **PLOT INTVL** key to cancel the halt.

Show/hide the own ship's track while recording is halted

You can show/hide the own ship's track while the track recording is halted.

1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [DISP. STOPPED TRACKS], then press the **left button**.

4. Select [OFF], then press the **left button** to hide the track.
To show the track, select [ON] and press the **left button**.

[TRACK 1/2]

1. BACK
2. EDIT TRACK
3. DELETE TRACK
4. AUTO COLOR CHANGE
   OFF/ON
5. DELETE OTHER TRACK
6. TRACK ROUTE CONVERSION
7. DISP. STOPPED TRACKS
   OFF/ON
8. PLOT STOPPED TRACKS
   NO TRACK/DRAW TRACK
9. [OWN TRACK SETTINGS]

0. NEXT

TURN WHEEL: SELECT
[L] : DECISION
[R] : GO BACK

Own track display is [ON] while track recording is halted.

Own ship

Halt

Track recording halt is released or expand/reduction

Own ship's track erased

Own ship

Release

Halt

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

Plotting a track while recording is halted

You can join a track, from the halt point to the release point.

1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [PLOT STOPPED TRACKS], then press the **left button**.

4. Select [DRAW TRACK], then press the **left button** to join the track with a line. To ignore the track between the halt and release points, select [NO TRACK] and press the **left button**.
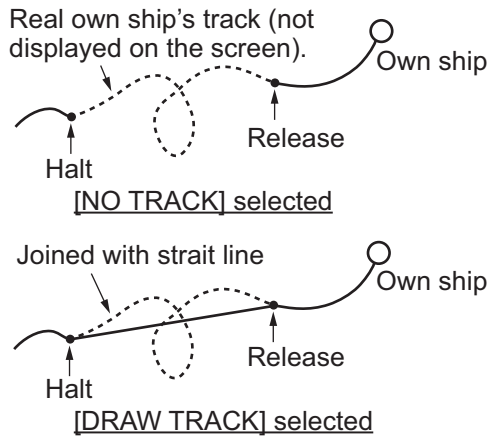
5. Press the **MENU** key to close the menu.

5.1.5 How to set the track color

You can select the track color from red, yellow, green, light-blue, purple, blue and white. To distinguish the track by voyage date, set a different color for the track of each day. The own ship's track color can also be changed according to water temperature or water depth automatically.

Set the track color

1. Press the **TRACK COLOR** key to open the color box.
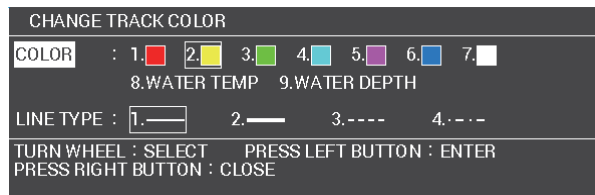
2. Select [COLOR], then press the **left button**.

3. Select a color, then press the **left button**.
When you select [WATER TEMP] or [WATER DEPTH], the color change according to the external temperature or depth data. External data is required to use the water temperature/depth settings.

4. Press the **right button** to close the menu.

Change the track color according to the water temperature

1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [OWN TRACK SETTINGS], then press the **left button**.

4. Select [TRACK COLOR BY TEMP.], then press the **left button**.

5. Select [TRACK COLOR BY TEMP.] once more, then press the **left button**.

6. Select [RANGE], then press the **left button**.

7. Set the color for the temperature range.
   For example, to show water temperatures above 18 degrees centigrade in red color, do the following:

   1) Select [RED], then press the **left button**.

   2) Rotate the **scrollwheel** to set "+18.0", then press the **left button**.

   3) Set the other colors in a similar manner.

   Note 1: The water temperature steps should be ascending order.

   Note 2: Temperatures below the [BLUE] setting appear in white color.

[TRACK COLOR BY TEMP.]
1. BACK
2. TRACK COLOR BY TEMP. RANGE/EV. 0.2/EV. 2.0
3. BLUE +05.0
4. MAGENTA +10.0
5. CYAN +12.5
6. GREEN +15.0
7. YELLOW +17.5
8. RED +20.0

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

When you select [EV.0.2] or [EV.2.0] at [TRACK COLOR BY TEMP.] on step 6, the color changes according to the interval selected. The color is shown in increments of 0.2 degree (or 2.0 degree).

Change the track color according to water depth

1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [OWN TRACK SETTINGS], then press the **left button**.

4. Select [TRACK COLOR BY DEPTH], then press the **left button**.

5. Select [TRACK COLOR BY DEPTH] once more, then press the **left button**.

6. Select [RANGE], then press the **left button**.

7. Set the color for the depth range.
   For example, to show depths beyond 500 meters in red, do the following:

   1) Select [RED], then press the **left button**.

   2) Rotate the **scrollwheel** to set "0500.0", then press the **left button**.

   3) Set the other colors same above.

   Note 1: The water depth steps should be ascending order.

   Note 2: Depth below the [BLUE] setting appear in white color.

[TRACK COLOR BY DEPTH]
1. BACK
2. TRACK COLOR BY DEPTH RANGE/EV. 2/EV. 20/ EV.200
3. BLUE 0010.0
4. MAGENTA 0050.0
5. CYAN 0100.0
6. GREEN 0200.0
7. YELLOW 0300.0
8. RED 0500.0

When you select [EV.2], [EV.20] OR [EV.200] at [TRACK COLOR BY DEPTH] on step 6, the color changes according to the interval selected. The color is shown in increments of the range.

Change the track color at power on

To change the own ship track color each time the system is turned on, use the automatic track color function. You can change your track color for each fishing day.

1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [AUTO COLOR CHANGE], then press the **left button**.

4. Select [ON], then press the **left button** to select the preferred color.
   The own ship's track color will change in the following order: red, yellow, green, light-blue, purple, blue and white.

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

Change the other ship's track color

1. Press the **CURSOR/DISP** key when the cursor is not shown.

2. Move the cursor onto the other ship target symbol.

3. While the target information is displayed, press the **TRACK COLOR** key.
   The [CHANGE TRACK COLOR] window appears.
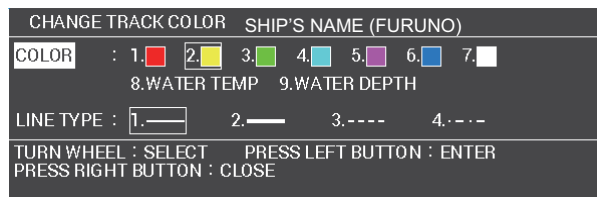
4. Select [COLOR], then press the **left button**.

5. Select the preferred color, then press the **left button**.

6. Press the **right button** to close the window.

5.1.6 How to set the track line

You can select the track line from solid line (thin/thick), broken line and long- and short-dashed line.

Change the own ship's track line

1. Press **TRACK COLOR** key to open the [CHANGE TRACK COLOR] window.
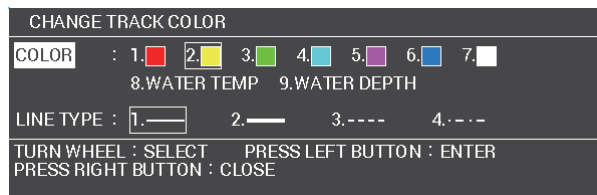
2. Select [LINE TYPE], then press the **left button**.

3. Select the preferred line type, then press the **left button**.

4. Press the **right button** to close the window.

Change the other ship's track line

1. Press the **CURSOR/DISP** key when the cursor is not shown.

2. Move the cursor onto the other ship target symbol.

3. While the target information is displayed, press the **TRACK COLOR** key. The [CHANGE TRACK COLOR] window appears.
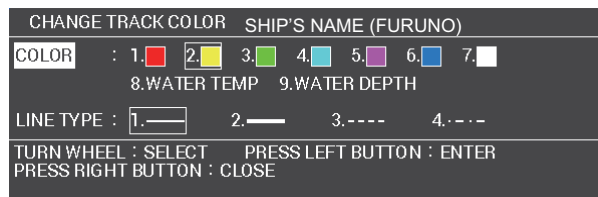
4. Select [LINE TYPE], then press the **left button**.

5. Select the preferred line type, then press the **left button**.

6. Press the **right button** to close the window.

5.1.7 How to set the track recording method and interval

You can record the track of your ship or an other ship. The data recording is by range interval or time interval.

Change the recording method for own ship's track

To change the recording method for own ship's track, press the **PLOT INTVL** key. The plotting method changes in the following order: [TRACK INTERVAL 1] → [TRACK IN-TERVAL 2] → [HALT] → [TRACK INTERVAL 1]…

To set the [TRACK INTERVAL 1/2], refer to following procedure.

Change the recording interval for own ship's track

1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [OWN TRACK SETTINGS], then press **left button**.

4. Select [TRACK INTERVAL 1] or [TRACK INTERVAL 2], then press the **left button**.

5. Select [TIME] or [RANGE], then press **left button**.

6. Rotate the **scrollwheel** to set the time interval or range interval, then press the **left button**.
   Setting ranges are as follows.Time interval: 0 seconds to 59 minutes 59 sec-onds.Range interval: 0 NM to 9.99 NM.

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

Change the recording interval for other ship's track

1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [NEXT], then press the **left button**.

4. Select [OTHER TRACK SETTINGS], then press **left button**.

5. Select [OTHER TRACK REC INTVL], then press the **left button**.

6. Select [TIME] or [RANGE], then press **left button**.

7. Rotate the **scrollwheel** to set the time interval or range interval, then press the **left button**.
Setting ranges are as follows.Time interval: 0 seconds to 59 minutes 59 seconds.Range interval: 0 NM to 9.99 NM.

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

5.1.8 How to delete the own ship's track

You can delete the color or line type of the own ship's track. The area to be deleted can be selected with one of the following five methods.

- Two points: deletes the track line between the points specified with the cursor.
- Set range: deletes the track lines by color or line type within the specified area.
- Within range: deletes the track lines displayed on the screen by color or line type.
- Out of range: deletes all track lines not displayed on the screen by color or line type.
- All: deletes all track lines by color or line type.

Note 1: Use this function with care. Erased tracks cannot be restored.

Note 2: Recorded tracks which are selected at [ADD] from [PLAY OWN TRK] in the [INT. MEMORY PLAYBACK] menu cannot be deleted.

Note 3: When tracks are recorded and colored according to temperature or depth, and the color in use immediately before selecting the method to delete tracks is the same color, all temperature and depth tracks of that color will also be deleted.
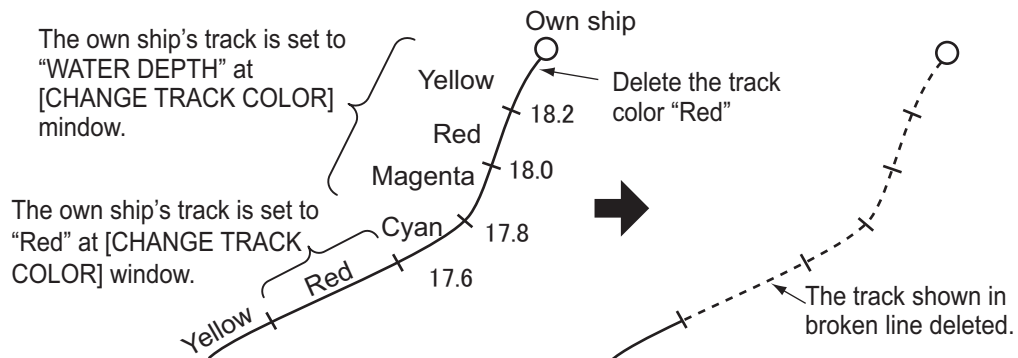
1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [DELETE TRACK], then press the **left button**.

4. Confirm [SEL. METH.] selected, then press the **left button**.

5. Select a method from five menus, then press the **left button**.

1) Between two points
Select start point and terminal point on the track with trackball. The track line between the two points will be deleted.
Note: Both current track and playback track cannot be erased at the same time.
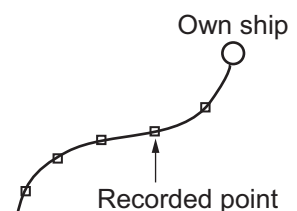
2) Set range
Select start point and terminal point of the area to erase. Select a color and a line type then select [RUN] and press the **left button**. The specified tracks within the selected area are deleted.

Start point

Terminal point (cursor)

White frame (effective area)
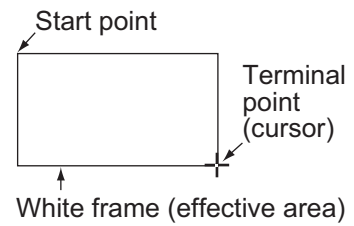
3) Within range
Select a color and a line type, then select [RUN] and press the **left button**. The specified tracks within the area displayed on the screen are deleted.

4) Out of range
Select a color and a line type, then select [RUN] and press the **left button**. The specified tracks outside of the area displayed on the screen are deleted.

5) All
Select a color and a line type, then select [RUN] and press the **left button**. All specified tracks are deleted.

6. Press the **right button** to close the menu.

5.1.9 How to edit the own ship's track

You can edit tracks after you reach port with one of the four methods listed below. Both current track and playback track cannot be edited at the same time.

• Two points: edits the track line between the points specified with the cursor.

• Set range: edits the track line by color or line type within the specified area.

• Within range: edits all track lines displayed on the screen by color or line type.

• Out of range: edits all track lines not displayed on the screen by color or line type.

Note 1: Recorded tracks which are selected at [ADD] from [PLAY OWN TRK] in the [INT. MEMORY PLAYBACK] menu cannot be deleted.

Note 2: When tracks are recorded and colored according to temperature or depth, and the color in use immediately before selecting the method to delete tracks is the same color, all temperature and depth tracks of that color will also be deleted.

1. Open the [MAIN MENU].

2. Select [TRACK], then press the **left button**.

3. Select [EDIT TRACK], then press the **left button**.
The [EDIT TRACK] window appears.

```
EDIT TRACK
SEL METH.    1. BTWN 2 PTS   2. SET RNG   3. WITHIN RNG
             4. OUT OF RNG
             NO. OF TRK PTS SEL.0

             ■  ■  ■  ■  ■  ■  □

             ─────   ─────   ─ ─ ─ ─   ·─·─·─

                        RUN
TURN WHEEL : SELECT      PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```
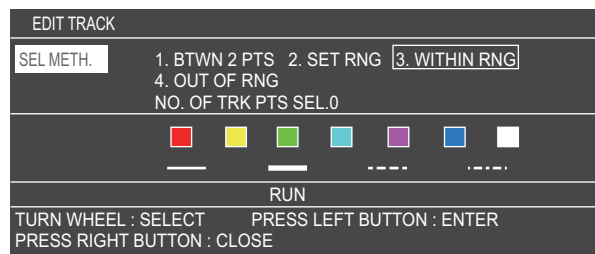
4. Confirm [SEL METH.] selected, then press the **left button**.

5. Select the desired option, then press the **left button**.

   1) Between two points: [BTWN 2PTS]
      Select the start point and the terminal point on the track. The track line between the two points will be edited. Specify the color and line type, then press the **left button** to change.

   2) Set range: [SET RNG]
      Select start point and terminal point of the area to edit. Select a color and a line type then select [RUN] and press the **left button**.

   3) Within range: [WITHIN RNG]
      Select a color and a line type, then select [RUN] and press the **left button**. All tracks displayed on the screen will be edited.

   4) Out of range: [OUT OF RNG]
      Select a color and a line type, then select [RUN] and press the **left button**. All tracks not displayed on the screen will be edited.

6. Press the **right button** to close the menu.

5.1.10 How to display other ship's information

You can display other ship's information on the screen.

Basic information

1. Press the **CURSOR DISP** key when the cursor is not shown.

2. Place the cursor on the target whose information you want to view.
   The information for the selected target appears. If there is no data, [- -] appears.


```
                              Target symbol
Cursor
                          01 ← Target number

              NAME：FURUNO
              LAT： 351° 8.3085' N
Other ship's  LON：135° 30.3529' E
information    DIST：1.075NM
              BRG：151.3°T
```
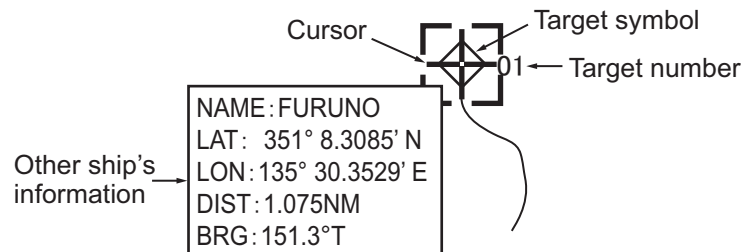
Note 1: If the target information is not shown, do the following procedure.

1) Open the [MAIN MENU].

2) Select [OTHER SHIP'S INFO.], then press the **left button**.

3) Select [NEXT], then press the **left button**.

4) Select [TARGET CURSOR INFO.], then press the **left button**.

5) Select [ON], then press the **left button**.

6) Press **MENU** key to close menu.

Detailed information

1. Press the **CURSOR DISP** key when the cursor is not shown.

2. Place the cursor on the target whose information you want to view, then press the **right button**.
   The target information box appears at the bottom of the screen.

```
CONSORT SHIP INFORMATIONS
NAME:      FURUNOMARU
LL:        34°35.3900' N, 13535.3900' E
DIST:      2.607NM   BRG: 0.0° R
TEMP:      10.0°C      DEP: 20.0m
CRT1:      1LAY 17.0kn 17.0° T
CRT2:      2LAY 20.0kn 40.0° T
CRT3:      3LAY 36.0kn 96.0° T
FISH L:    100cm
PRESS RIGHT BUTTON: GO BACK
```

3. Press the **right button** to close the information box.

Consort list

1. Open the [MAIN MENU].

2. Select [OTHER SHIP'S INFO.], then press **left button**.

3. Select [CONSORT LIST], then press the **left button**.
   The consort list appears at the bottom on the screen.

NAME OF SHIP	DISTANCE	DIR FM OS	TCPA	CPA
FURUNO	2.607NM	0.0° R	1m30s	8.690NM

CONSORT LIST

[MARK SELECT] : PREVIOUS PAGE [MARK] : NEXT PAGE
[TRACK COLOR] : CHANGE COLOR [PRESS RIGHT BOTTON] : CLOSE
PRESS LEFT BUTTON : SELECT TARGET
[PLOT INTVL] : RECORD START/STOP

- **MARK SELECT** key: moves to previous page.
- **MARK** key: moves to next page.
- **TRACK COLOR** key: shows the [CHANGE TRACK COLOR] window.
- **Left button**: shows the selected target data at the bottom of the screen.
- **PLOT INTVL** key: starts/stops track recording for the selected consort.
- **Right button**: closes the list.

GPS buoy

1. Open the [MAIN MENU].

2. Select [OTHER SHIP'S INFO.], then press **left button**.

3. Select [GPS BUOY LIST], then press the **left button**.
   The GPS buoy list appears.

GPS BUOY LIST			
ID	POSITION	DISTANCE	DIR FM OS
10	34°32.5000'N , 135°20.0000'E	2.476NM	90.0° R
99	34°32.5000'N , 135°14.0000'E	2.476NM	270.0° R
1	34°30.0000'N , 135°17.0000'E	2.504NM	180.0° R
50	34°35.0000'N , 135°17.0000'E	2.504NM	0.0° R

[MARK SELECT] : PREVIOUS PAGE [MARK] : NEXT PAGE
[TRACK COLOR] : CHANGE COLOR [PRESS RIGHT BOTTON] : CLOSE
PRESS LEFT BUTTON : SELECT TARGET
[PLOT INTVL] : RECORD START/STOP

- **MARK SELECT** key: moves to previous page.
- **MARK** key: moves to next page.
- **TRACK COLOR** key: shows the [CHANGE TRACK COLOR] window.
- **Left button**: shows the selected target data at the bottom of the screen.
- **PLOT INTVL** key: starts/stops recording tracks for the selected GPS buoy.
- **Right button**: closes the list.

5.1.11 How to delete other ship's track

1. Open the [MAIN MENU].
2. Select [TRACK], then press the **left button**.
3. Select [DELETE OTHER TRACK], then press the **left button**.
   The delete other ship's track box appears.

DELETE OTHER SHIPS' TRACK

SEL METH.   1. SPECIFY TARGET 2. ALL

NO. OF TRK PTS SEL.0

RUN
TURN WHEEL : SELECT   PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE

4. With [SEL METH.] selected, press the **left button**.
5. Rotate the **scrollwheel** to select the method to delete the track.
   [SPECIFY TARGET]: Only the selected target's tracks are deleted. Go to step 6.
   [ALL]: All recorded tracks with the same color or line type, selected at step 8 or step 10 respectively, are deleted. Go to step 8.
6. Move the cursor onto a target track desired, then press the **left button**.
7. Select [COLOR], then press the **left button**.
8. Select the track color to delete, then press **left button**.
   If [ALL] is selected, all colored tracks are selected.
9. Select the track line type, then press the **left button**.
10. Select a line type of target to delete, then press **left button**.
    If [ALL] is selected, all track lines of that type are selected. The total number of selected lines appears at [NO. OF TRK PTS SEL.].

11. Select [RUN], then press the **left button**.
    The selected tracks are deleted.

5.2 Mark

You can enter marks (a total of 30,000 marks) for fish school, shallow water, buoy, fishing point, etc. You can also connect marks with a line.

5.2.1 How to set marks

You can set the color, shape, line type, size and fish type to use as marks.

Mark color, shape and line type

You can set up to seven mark colors, 22 shapes and 4 line types.

1. Press the **MARK COLOR** key to open the [MARK COLOR/SHAPE] window. Confirm the color and shape with the mark box at left on the screen.
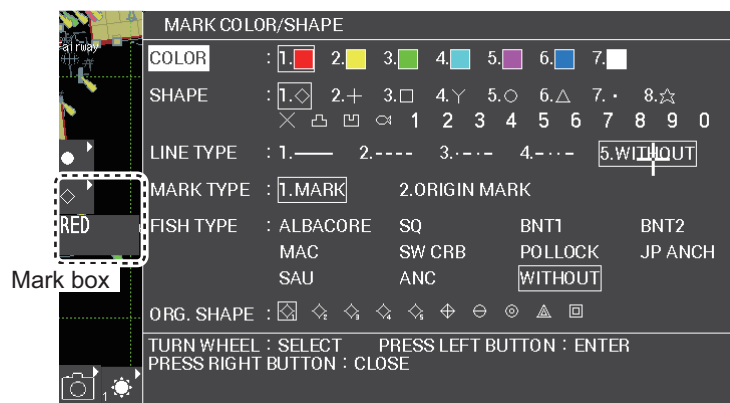
2. Select [COLOR], then press the **left button**.
3. Select a color, then press the **left button**.
4. Select [SHAPE], then press the **left button**.
5. Select a shape, then press the **left button**.
6. Select [LINE TYPE], then press the **left button**.
7. Select a line type, then press the **left button**.
8. Select [MARK TYPE], then press the **left button**.
9. Select [MARK], then press the **left button**.
10. Press the **right button** to close the window.

Mark size

You can set the mark sizes as [LARGE], [LARGE DOT] or [SMALL].

1. Open the [MAIN MENU].
2. Select [MARK], then press the **left button**.
3. Select [MARK SIZE], then press the **left button**.
4. Select the desired mark size, then press the **left button**.
5. Press the **MENU** key to close the menu.

5. VIDEO PLOTTER OPERATION

Set the fish type to a mark

You can assign a fish type to a mark and also hide the fish mark with the mark filter. For how to use the mark filter, see paragraph 5.2.6.

1. Press the **MARK COLOR** key to open the [MARK COLOR/SHAPE] window.

2. Select desired fish type, then press the **left button**.

3. Select the desired fish type, then press the **left button**.
   No fish type is assigned to the mark if [WITHOUT] is selected.
   Note: You can change the name of each fish type. Select the type you want to rename, then press the **GO TO** key. Enter up to 10 characters for the new name for the selected fish type. The new name is reflected on the other windows and menus.

4. Press the **right button** to close the window.

5.2.2 How to enter a mark/line

There are three methods to enter a mark. When a line type is selected, a specified line appears between marks.

- Enter a mark at the own ship's location.

- Enter a mark (line) at the cursor location.

- Enter a mark at a specified latitude/longitude.

Note: If marks are not displayed, check the mark box status, at the bottom-left of the screen. If the box shows "OFF", place the cursor on the box, then press the left button. You can also turn mark display on from the [MARK DISPLAY] in the [MARK] menu.

Enter a mark onto the own ship's location

1. Press the **CURSOR ON/OFF** key to hide the cursor when the cursor is shown.

2. Press the **MARK** key.
   The specified mark appears at the own ship location.

Enter a mark onto the cursor location

1. Press the **CURSOR ON/OFF** key to show the cursor when the cursor is not shown.

2. Press the **MARK** key.
   The specified mark appears at the cursor location.

Note: You can change the mark type with the mark box at bottom-left on the screen. Place the cursor onto the mark box, then rotate the **scrollwheel** to select the desired mark type.

How to enter a line between marks

You can enter marks with lines. Set the line type before entering the marks, refer to paragraph 5.2.1.

1. Move the cursor to a point to enter a mark.

2. Press the **MARK** key to enter the first mark.

3. Move the cursor to next point to enter a mark.

4. Press the **left button** or **MARK** key to enter the second mark.
    The relative distance and heading data appears near by cursor.
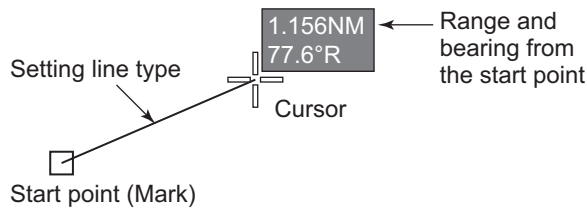
5. Repeat step 7 and 8 to enter the marks.
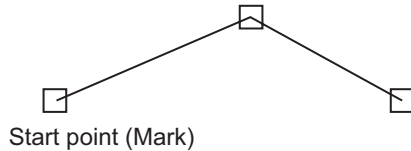
6. Press the **right button** to exit the mark function.

    Note 1: This function is invalid after ten seconds of no operation.

    Note 2: The cursor information display function is invalid while this relative location information is used. When the mark entering is finished, the cursor information display can be used.

Enter a mark onto the location at specified L/L

1. Open the [MAIN MENU].

2. Select [MARK], then press the **left button**.

3. Select [INPUT MARK], then press the **left button**.
    The mark input window appears.

4. Select [LATITUDE], then press the **left button**.

5. Rotate the **scrollwheel** to set the location by latitude, then press the **left button**.
    Rotate the **scrollwheel** to toggle between N (North) and S (South).

6. Select [LONGITUDE], then press the **left button**.

7. Rotate the **scrollwheel** to set the location by longitude, then press the **left button**.
    Rotate the **scrollwheel** to toggle between E (East) and W (West).

8. Select the mark color, shape, line type and fish type as outlined in paragraph 5.2.1.

9. Select [RUN], then press the **left button**.

10. Press the **right button** to close the window.

5.2.3   How to delete marks/lines

You can delete marks and lines from the menu or on the screen.

When you use the menu to delete marks, you can select the mark color, shape or fish type. There are five method to specify which marks to delete.

1) Cursor: deletes the mark/line selected by the cursor.

2) Set range: deletes all specified marks/lines in the selected area.

3) Within range: deletes all specified marks/lines displayed on the screen.

4) Out of range: deletes all specified marks/lines not displayed on the screen.

5) All: deletes all specified marks/lines, regardless of location.

Note: When [RECORD MARK/TRACK] is set to [YES] in the [INT. MEMORY PLAY-BACK] menu, the marks in the internal memory area cannot be deleted.

Delete mark/line selected by cursor on the screen

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Place the cursor onto the mark or line to delete.
    The mark selecting frame appears as follows.

3. Press the **CANCEL** key.

Delete marks/lines from menu

1. Open the [MAIN MENU].

2. Select [MARK], then press the **left button**.

3. Select [DELETE MARK], then press the **left button**.

4. Press the **left button** and select method to delete.

    1) Cursor: deletes the mark/line selected by the cursor.

    2) Set range: deletes all specified marks/lines in the selected area.

    3) Within range: deletes all specified marks/lines displayed on the screen.

    4) Out of range: deletes all specified marks/lines not displayed on the screen.

    5) All: deletes all specified marks/lines, regardless of location.

5. Select [RUN], then press the **left button**.

5.2.4   How to edit marks/lines

You can edit marks/lines which are already entered. There are four method to edit the marks/lines.

1) Cursor: edits the mark/line selected by the cursor.

2) Set range: edits the specified marks/lines in the selected area.

3) Within range: edits all specified marks/lines displayed on the screen.

4) Out of range: edits all specified marks/lines not displayed on the screen.

Note: Marks that are set to [ADD] at [PLAY MARK/TRACK] in the [INT. MEMORY PLAYBACK] menu cannot be edited.

1. Open the [MAIN MENU].
2. Select [MARK], then press the **left button**.
3. Select [EDIT MARK], then press the **left button**.

```
EDIT MARK
SEL METH.   : 1. CURSOR      2. SET RNG        3. WITHIN RNG
                4. OUT OF RNG
                NO. OF MRK SELECTED 0
COLOR       : 1.■  2.■  3.■  4.■  5.■  6.■  7.■  8. NO CHG.
SHAPE       : 1.◇  2.+  3.□  4.Y  5.○  6.△  7.·  8.☆
              ✕  ⌂  ⌄  ∝ 1  2  3  4  5  6  7  8  9  0  NO CHG.
LINE TYPE   : 1.——    2.- - - -   3.- · - ·   4.- · · -   5. NO CHG.
MARK TYPE   : 1.MARK        2.ORIGIN MARK
FISH TYPE   : ALBACORE  BNT1       BNT2       MAC
              SW CRB     POLLOCK   JP ANCH   SAU
              ANC        WITHOUT   NO CHG.
COMMENT   : _____   NO CHG.
                         RUN
TURN WHEEL : SELECT          PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```

4. Press the **right button** to select [SEL. METHOD].
5. Select the method to edit and press the **left button**.

   1) Cursor: edits the mark/line selected by the cursor.

   2) Set range: edits the specified marks/lines in the selected area.

   3) Within range: edits all specified marks/lines displayed on the screen.

   4) Out of range: edits all specified marks/lines not displayed on the screen.

   Select the color, shape, line type, fish type and comment with the **scrollwheel**.

6. Do the following operation if you select a method of [CURSOR] or [SET RNG].
   • [CURSOR]: Select a mark to edit.
   • [SET RNG]: Select an area to edit with start/end points.

7. Select [COLOR], then press the **left button**.
8. Rotate the **scrollwheel** to select a color, then press the **left button**.
   Select [NO CHG.] if you do not change the color.
9. Select mark shape, line type and fish type as same manner on step 7 and 8.
10. Select [COMMENT], then press the **left button**.
11. Change the comment refer to paragraph 1.8.3.
    Select [NO CHG.] if you do not change the comment.
12. Select [RUN], then press the **left button**.

5.2.5 How to show the mark information

Basic information

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.
2. Place the cursor on the mark whose information you want to view.
   The information shown is: location (Lat/Lon), water temperature, comment* and
   water depth. (Water temperature and depth requires external data.)
   * Comment appears when [MARK COMMENTS DISPLAY] (Main
   menu→[MARK]→[NEXT]→[MARK COMMENTS DISPLAY]) is set to other than
   [IN INFORMATION].

```
35°18.3085′N
135°30.3529′E
4.5°C    15.7m
```

Cursor

Mark

- No information: - -
- Temp./depth indication: shown only if the mark was entered at own ship location.

Note: When the mark information is not indicated, set the menu [MARK CURSOR INFO.] to [ON] in [MARK 2/2] menu.

Detailed information

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Place the cursor on the mark whose detailed information you want to view, then press the **right button**.
   The information box appears at the bottom of the screen.

```
MARK INFORMATION
POSITION       : 34° 03.6147′ N 134° 21.3473′ E
DATE           : 2016/10/01 04:25
COMMENT        : --
FISH TYP       : --
MOON AGE       : 13.9    ●
TIDE           : +0.8m
TEMP           : ---.- °C
DEPTH          : ----m
COMP           : --
DRIFT          : ----° ----.--kn
TIDAL CURRENT  : ----° ----.--kn
PRESS RIGHT BUTTON: CLOSE
```

3. Press the **right button** to close the box.

How to select mark comments display method

Set how to display mark comments,

1. Open the main menu.

2. Select [MARK], then press the **left button**.

3. Select [NEXT], then press the **left button**.

4. Select [MARK COMMENTS DISPLAY], then press the **left button**.

5. Select appropriate option, referring to the descriptions below.

   • [ON CHART]: Mark comment appears below mark and in basic and detailed mark information.

   • [IN POP UP INFO]: Mark comment appears in basic and detailed mark information.

   • [IN INFORMATION]: Mark comment only appears in detailed mark information.

6. Close the menu

5.2.6   How to use the mark filter

You can show/hide the marks according to the mark attributes.

Set the mark filter parameters

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Rotate the **scrollwheel** to select [MARK ATTRIBUTE CHANGE] and press the **left button**.
    The cursor function changes to mark attribute control.

3. Press the **left button** cycle through the filter settings.

Object to filter	Filter options	Meaning
-	Display all	No filter. All marks are shown.
Type	Disp. all, fish type set in the [MARK FILTER FISH TYPE SETTING] menu (up to 10 types)	The marks for the selected fish type are shown.
Color	Disp. all, Red, Yellow, Green, Syan, Magenta, Blue, White	The marks for the selected color are shown.
Shape	Disp. all, ◇ , +, □, Y, ○, •, ☆ , ×, 凸 , 凹 , ◁ , 1, 2, 3, 4, 5, 6, 7, 8, 9, 0	The marks for the selected shape are shown.
Date	Disp. all, The past week, The past month, The past year, This period, This time, AA/AA to BB/BB, AA to Current	The marks which has date within the selected period are shown.
Comp.	Disp. all, Mud, Sand, Gravel, Rock	The marks for the selected bottom hardness are shown.
Temp.	Disp. all, 0.0 °C to 30.0 °C, 0.1 °C step	The marks with temperature ±0.05 °C setting. When 0.0°C (minimum) is set, the marks with temperature below0.0°C are shown, and 30.0°C (maximum) is set, the marks with temperature above 30.0°C are shown.
Depth	Disp. all, 0.0 m to 200 m (5 m intervals below 100 m, 10 m intervals over 100 m)	When the mark has a depth information, 100 m or low depth marks are shown in ±2.5 m deviation, over 100 m marks are shown in ±5 m deviation, and minimum/maximum depth setting marks are shown
Moon age	Disp. all, 0 to 30 (1 step)	When the mark has a moon age, the specified number ±1 marks are shown.
Tide	Disp. all, Low tide, 30% up, 50% up, 70% up, High tide, 30% low, 50% low, 70% low	When the mark has a tide information, the specified tide level marks are shown.
C. direction	Disp. all, 0.0 °T (M) to 350.0 °T (M) 10° step	The marks with current direction within ±10° of the setting are shown.
C. speed	Disp. all, 0.0 kn to 5.0 kn (0.2 kn step)	Specified speed ±0.0 kn current. When the maximum speed is set, the beyond value current is shown.
Multi	Multi-display	All combined object filter

Note: Marks which are entered after the mark filter is set are not hidden.

How to show/hide the mark filters

1. Open the [MAIN MENU].

2. Select [MARK], then press the **left button**.

3. Select [MARK FILTERS], then press the **left button**.
    The [MARK FILTER 1/2] menu appears. To open the [MARK FILTER 2/2] menu, select [NEXT], then press the **left button**.

```
[MARK FILTERS 1/2]          [MARK FILTERS 2/2]
1. BACK                     1. BACK
2. FISH TYPE                2. TIDE LEVEL
   OFF/ON                      OFF/ON
3. COLOR                    3. CORRENT DIRECTION
   OFF/ON                      OFF/ON
4. SHAPE                    4. CURRENT SPEED
   OFF/ON                      OFF/ON
5. DATE                     5. MULTI
   OFF/ON                      OFF/ON
6. SEABED COMPOSITION
   OFF/ON
7. WATER TEMPERATURE
   OFF/ON
8. DEPTH
   OFF/ON
9. MOON AGE
   OFF/ON

0. NEXT
TURN WHEEL: SELECT          TURN WHEEL: SELECT
[L] : DECISION              [L] : DECISION
[R] : GO BACK               [R] : GO BACK
```
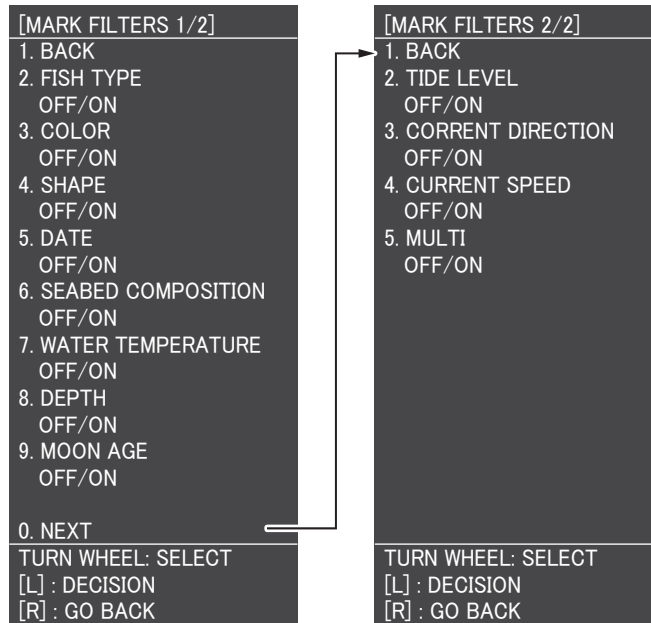
4. Select filtering option, then press the **left button**.

5. Select [OFF] or [ON], then press the **left button**.
    Only the filters set to [ON] here are shown on the screen as filter options.

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

Mark filters (fish) setting

You can show/hide the fish types available as filter options.

1. Open the [MAIN MENU].

2. Select [MARK], then press the **left button**.

3. Select [NEXT], then press the **left button**.

4.   Select [MARK FITERS(FISH)], then press the **left button**.
     The [MARK FILTERS(FISH) 1/2] menu appears. To open the [MARK FIL-
     TERS(FISH) 2/2] menu, select [NEXT], then press the **left button**.

```
[MARK FILTERS(FISH) 1/2]          [MARK FILTERS(FISH) 2/2]
1. BACK                           1. BACK
2. TYPE OF FISH 1                 2. TYPE OF FISH 9
   OFF/ON                            OFF/ON
3. TYPE OF FISH 2                 3. TYPE OF FISH 10
   OFF/ON                            OFF/ON
4. TYPE OF FISH 3
   OFF/ON
5. TYPE OF FISH 4
   OFF/ON
6. TYPE OF FISH 5
   OFF/ON
7. TYPE OF FISH 6
   OFF/ON
8. TYPE OF FISH 7
   OFF/ON
9. TYPE OF FISH 8
   OFF/ON

0. NEXT
TURN WHEEL: SELECT                TURN WHEEL: SELECT
[L] : DECISION                    [L] : DECISION
[R] : GO BACK                     [R] : GO BACK
```
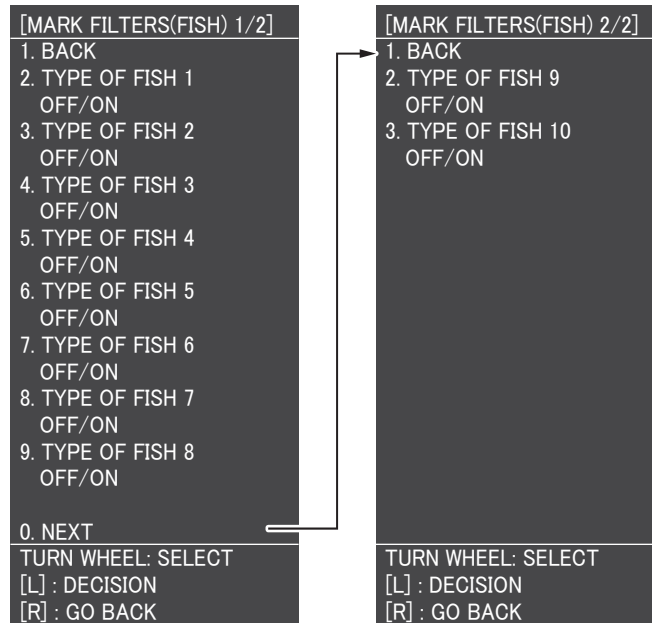
5.   Select the fish type, then press the **left button**.
     The following fish types are selectable.

No.	Fish type	No.	Fish type
1	Albacore	6	Pollock
2	BNT1	7	JP Anch
3	BNT2	8	SAU
4	MAC	9	ANC
5	SW CRB	10	Without

6.   Select [OFF] to hide the selected fish type from the filter options, or select [ON] to
     show the selected fish type in the filter options.

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

Mark filters (date) setting

You filter the displayed marks based on the date, time or a specified date range. Spin
the scrollwheel to change the date filter method, in the following order: [DISP. ALL] (all
marks) → [THE PAST WEEK] (marks entered within the last week) → [THE PAST
MONTH] (marks entered within the last month) → [THE PAST YEAR] (marks entered
within the last year) → [THIS PERIOD] (marks entered up to one month, before or after
the current date, regardless of year), [THIS TIME] (marks entered up to three hours,
before or after the current time, regardless of date), MM/DD to MM/DD (marks entered
during the specified period), MM/DD to CURR (marks entered between the specified
date and the current date).If you select a date range, set the date with the following
procedure:

1.   Open the [MAIN MENU].

2.   Select [MARK], then press the **left button**.

3.   Select [NEXT], then press the **left button**.

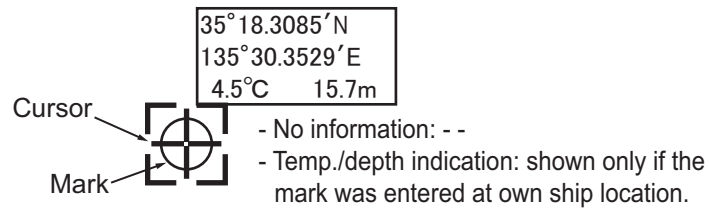4.   Select [MARK FILTERS(DATE)], then press the **left button**.

5. Select [START DATE], then press the **left button**.

6. Rotate the **scrollwheel** and press the **left button** to select a start date (AA/AA/AA).

7. Select [END DATE], then press the **left button**.

8. Rotate the **scrollwheel** and press the **left button** to select a end date (BB/BB/BB).

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

5.3 Origin Mark

You can enter up to 10 origin marks for dangers such as reefs. The heading and range to the last select/entered origin mark is shown in the mark box at the bottom-left of the screen. All origin marks are deleted when the power is turned off.

5.3.1 How to set the origin mark type

You can select the type of mark symbol for origin marks.

Type	Shape					Color
Numerical	◇1	◇2	◇3	◇4	◇5	Green
Symbol	◈	⊖	◎	△	▢	Light-blue

1. Press the **MARK SELECT** key to open the [MARK COLOR/SHAPE] window.

2. Select [MARK TYPE], then press the **left button**.
   The mark box indication changes according to the selection.

3. Select [ORIGIN MARK], then press the **left button**.
   The mark setting window appears.

Mark box
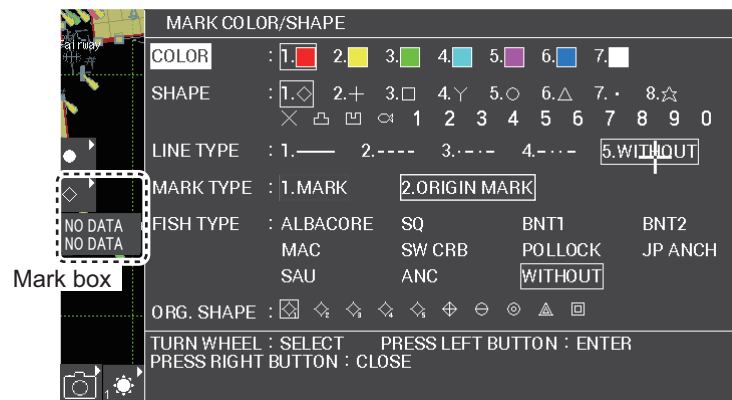
4. Rotate the **scrollwheel** to select an origin mark.
   The options available for selection are dependent on the type of origin mark selected. For numerical, five numbered origin marks are available; for symbol, five origin mark symbols are available.

5. Press the **right button** to close the window.

Origin mark stabilization

To change the stabilization for origin marks, do the following:

1. Open the [MAIN MENU].

2. Select [MARK], then press the **left button**.

3. Select [ORIGIN MARK], then press the **left button**.

4. Select [STAB GND.] or [STAB SEA], then press the **left button**.
   STAB GND.: the origin mark is stabilized based on a fixed geographical location.
   STAB SEA: the origin mark moves based on SOG data.

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

5.3.2 How to enter an origin mark

The origin mark requires heading and location data.

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Move the cursor onto the location to enter an origin mark.

3. Press the **MARK** key.
   The origin mark appears at the cursor location. The mark box shows range and heading to the origin mark.

Note 1: When the origin mark is not shown, confirm the mark box indication at left on the screen. If the mark box shows [OFF], place the cursor onto the mark box and press the **left button**. The mark function will be activated.

Note 2: You can select the origin mark shape from the mark box by rotating the scroll-wheel. When you select an origin mark here, the mark selected at paragraph 5.3.1 is replaced with this mark.

5.3.3 How to delete the origin mark

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Move the cursor onto the origin mark to delete.
   A frame appears on the origin mark.

3. Press the **CANCEL** key.
   The origin mark disappears and mark box indication changes to "NO DATA".

5.4 Waypoint

A particular location is known as a "waypoint", whether it be a starting point, a destination point or an intermediate point on a voyage. This radar system can store 100 waypoints. Waypoints 1 to 98 are user set waypoints, waypoint 99 is reserved for external input, waypoint 100 is reserved for MOB (Man Over Board). Waypoints can be entered with the cursor, or from the menu (manual input of latitude and longitude). Waypoints 1 to 98 can be edited from the menu.

5.4.1 How to enter waypoints

There are seven method to enter waypoints.

1) Enter a waypoint at the current own ship's location.

2) Enter a waypoint at the cursor location.

3) Enter a waypoint at the location specified lat/lon.

4) Enter a waypoint at the location specified bearing and distance.

5) Enter a waypoint from Loran-C time deviation.

6) Enter a waypoint from Loran-A time deviation.

7) Enter a waypoint from Decca phase difference.

Note 1: This function is only available if [ROUTE SELECT] is set to [IN] in the [ROUTE/WAYPOINT] menu.

Note 2: These plotted waypoints are hidden when [ROUTE SELECT] is set to [OUT] in the [ROUTE/WAYPOINT] menu.

Enter waypoint at own ship's location

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Place the cursor onto the MOB box, then press the **left click**.

   The MOB mark ( ) is entered at the current own ship's location. The information for the MOB mark (latitude, longitude and time entered) is saved to the waypoints list and the name "MOB" is assigned automatically.

   MOB POSITION SAVED. GOTO MOB?
   (CURRENT WAYPOINT WILL BE CANCELLED)
   RUN   CANCEL
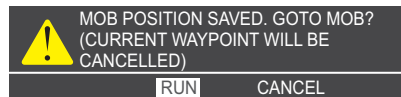
3. Select [RUN] and press the **left button** to enter the waypoint.
   When the cursor is not shown on the screen, pressing the **WPT** key enters a waypoint at the own ship location. For further information see the next section "How to enter waypoints with the cursor".

How to enter waypoints with the cursor

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.

2. Move the cursor onto the waypoint box, then rotate the **scroll wheel** to select the shape of waypoint mark.

3. Move the cursor onto the destination point, then press the **WPT** key.
   The [WAYPOINT ENTRY] window appears.

   WAYPOINT ENTRY

   NAME OF WPT   0 0 0 0 0 1

   PRESS LEFT BUTTON : ENTER   [CANCEL] : RESTORE DEFAULT
   [MARK SELECT][MARK] : CHANGE DIGIT ◄►
   PRESS RIGHT BUTTON : CLOSE   TURN WHEEL : NUM. ENTRY
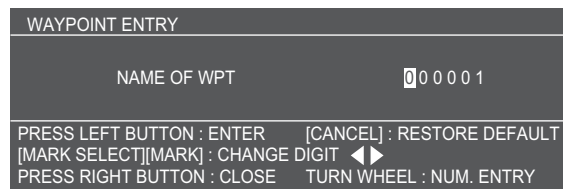
4. Rotate the **scrollwheel** to assign a number for the waypoint. The default number indicated is the lowest available waypoint number. If you do not want to change the default number, go to step 5. Up to 6 digits can be used to name each waypoint. Press the MARK key to move the input cursor to the right, press the MARK COLOR key to move the input cursor to the left. Press the **MARK** key to move the cursor to right and press the **MARK COLOR** key to move the cursor to left.

5. Press the **left button** to enter the waypoint.

Note 1: If the above procedure is done and the cursor was not shown, the waypoint is entered at the own ship location.

Note 2: If the number assigned to the new waypoint already exists, the following message appears.

> ⚠ WAYPOINT XXXXXX
> ALREADY EXISTS. OVERWRITE?
>
> RUN   CANCEL
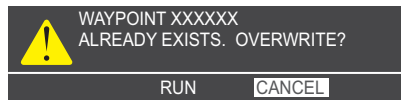
Select [RUN] and press the **left button** to overwrite. To cancel the waypoint name overwrite, select [CANCEL] and assign a new number to the waypoint.

How to enter waypoints by latitude/longitude

Note: Waypoints which are part of a route that is currently in use cannot be edited.

1. Open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [WAYPOINTS LIST], then press the **left button**.
    The [WAYPOINT LISTS] window appears.

```
WAYPOINTS LIST                          SEL. PAGE _  1/1
SET DEST. : NO DEST.
NAME    LATITUDE/LONGITUDE        INT. BAN  COMMENT
000001 ● 34° 33.0556'N 135° 04.5562'E  0.00NM  07:49 1501.01




SORT      : ALPHA. ORD    RNG ORDER   EST TIME OF ARR.
            MARK SHAPE    REG. ORDER      -- D -- : --

SPD FOR   : T. SHP SPD  : ---.-kn     TIME TO GO
TTG CALC    ENT VALUE : O O . O k n      ----HR --MIN

SEARCH    : _____
[MARK SELECT] : PREVIOUS PAGE      [MARK] : NEXT PAGE
[WPT] : NEW WAYPOINT      [GO TO] : SET DEST.
[CANCEL] : DELETE DEST.   PRESS RIGHT BUTTON : CLOSE
```

4. Select a waypoint to edit, or blank line for a new waypoint, then press the **left button**.
    The [EDIT WAYPOINT NAME] window appears.

```
EDIT WAYPOINT NAME
NAME OF WPT    : 000002____
LANE 1         : 1 C : 1 4 . 6 8
LANE 2         : 2 D : 3 8 . 7 1
     CHAIN       01 S BALTIC    R-G
MARK COLOR     : ■ ■ ■ ■ ■ ■ □
MARK SHAPE     : ● ■ ◆ 🐟 ...
                 ... ⚓ ...

MARK DISPLAY   : YES    NO
COORDINATE     : LAT./LON.     RNG./BRG.    TIME DIFF.
INT. BAN       : O . O O NM
COMMENT        : 15:13 1501.01_____

                        RUN

TURN WHEEL : SELECT     PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```

5. Select [COORDINATE], then press the **left button**.

6. Select [LAT/LON], then press the **left button**.

7. To edit or input a waypoint name, select [NAME OF WPT], then press the **left button**. The software keyboard appears. To skip naming the waypoint, go to step 8.

    1) Select a character, then press the **left button**. Repeat the process to name the waypoint. A total of 6 characters can be used when naming the waypoint.

    2) Select [ENTER] to complete naming the waypoint.

8. Select [LATITUDE], then press the **left button**.
    The settings can be adjusted.

9. Rotate the **scrollwheel** to select a digit, then press the **right button** to move to the next digit. Use this method to set the Latitude and Longitude.

10. Select [MARK COLOR], then press the **left button**.
    Rotete the **scrollwheel** to select a color.

11. Select [MARK SHAPE], then press the **left button**.
    Rotete the **scrollwheel** to select a mark shape.

12. Select [INT. BAN], then press the **left button**.
    The intrusion ban can be set by rotating the **scrollwheel**.
    Note: The intrusion ban should be set as a alert genaration area by specified range. If the range is set to other than 0.00 NM, the waypoint mark is set to the circle with a oblique line. To set the alert, refer to paragraph 5.7.1.

13. Select [COMMENT], then press the **left button**.
    Enter the comment with the scrollwheel and trackball on the comment box, then select [RUN] and press the **left button**.

14. Close the menu.

How to enter waypoint by bearing and distance

1. Open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [WAYPOINTS LIST], then press the **left button**.

4. Press the **WPT** key to open the [EDIT WAYPOINT NAME] window.

5. Select [COORDINATE], then press the **left button**.

6. Select [RNG./BRG.], then press the **left button**.

```
EDIT WAYPOINT NAME

NAME OF WPT     : 000002____

DISTANCE        : ∗∗∗.∗∗∗ NM
BEARING         : 0 6 6 . 3 °T


MARK COLOR      : ■ ■ ■ ■ ■ ■ ■

MARK SHAPE      : ● ■ ◆ ...

MARK DISPLAY    : YES    NO
COORDINATE      : LAT./LON.    RNG./BRG.    TIME DIFF.
INT. BAN         : 0 . 0 0 NM
COMMENT         : 15:13 1501.01_____

                    RUN

TURN WHEEL : SELECT    PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```

7. Select [DISTANCE], then press the **left button**.

8. Rotate the **scrollwheel** to set the distance between own ship and the waypoint.

9. Select [BEARING], then press the **left button**.

10. Rotate the **scrollwheel** to set the bearing from own ship to the waypoint.

11. Select the color, shape, display, intrusion ban and comment as required.

12. Press the **right button** to close the menu.

How to enter waypoint by Loran time offset

1. Open the [MAIN MENU].

2. Select [NAV DATA], then press the **left button**.

3. Select [NEXT], then press the **left button**.

4. Select [LORAN/DECCA SETTING], then press the **left button**.

```
LORAN/DECCA SETTING                      SEL. PAGE _   1/2▶
LORAN A STA. COMB.    : 0 0 − 0 1
  TIME OFFSET 1       : + 0 0 0 . 0μ s
  TIME OFFSET 2       : + 0 0 0 . 0μ s
LORAN C STA. COMB.    : 0 0 : 1 1 − 2 9
  TIME OFFSET 1       : + 0 0 0 . 0μ s
  TIME OFFSET 2       : + 0 0 0 . 0μ s
CH CODE LIST
00 : 1L0  01 : 1L1  02 : 1L4  03 : 1L5  04 : 1L6  05 : 1L7  06 : 1S1
07 : 1S2  08 : 1S3  09 : 1S4  10 : 1S6  11 : 2H3  12 : 2H4  13 : 2H5
14 : 2H6  15 : 2S0  16 : 2S1  17 : 2S2  18 : 2S3  19 : 2S4  20 : 2S5
21 : 2S6  22 : 2S7

[MARK SELECT] : PREVIOUS PAGE    [MARK] : NEXT PAGE
TURN WHEEL : SELECT    PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```

5. Press the **MARK** key to open the page 2/2.

```
LORAN/DECCA SETTING                          SEL. PAGE _  ◄2/2
DECCA CHAIN          : 0 1  R − G
  OFFSET VALUE 1     : + 0 0. 0 0 LANE
  OFFSET VALUE 2     : + 0 0. 0 0 LANE
TIME DIFF. DISP TYPE : LORAN A    LORAN C    DECCA



CH CODE
01 : S BALTIC
  ↖



[MARK SELECT] : PREVIOUS PAGE     [MARK] : NEXT PAGE
TURN WHEEL : SELECT     PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```

6. Select [TIME DIFF.DISP TYPE], then press the **left button**.

7. Select [LORAN C] or [LORAN A], then press the **left button**.

8. Press the **right button** to close the menu.

9. Press the **MENU** key to open the [MAIN MENU].

10. Select [ROUTES/WAYPOINTS], then press the **left button**.

11. Select [WAYPOINT LIST], then press the **left button**.

12. Press the **WPT** key to open the [EDIT WAYPOINT NAME] window.

13. Select [COORDINATE], then press the **left button**.

14. Select [TIME DIFF.], then press the **left button**.

```
EDIT WAYPOINT NAME
NAME OF WPT   : 000002
TIME OFFSET 1 : 1 9 5 3 6. 5
TIME OFFSET 2 : 2 9 6 7 6. 6


MARK COLOR    :
MARK SHAPE    :

MARK DISPLAY  : YES   NO
COORDINATE    : LAT./LON.     RNG./BRG.    TIME DIFF.
INT. BAN      : 0. 0 0 NM
COMMENT       : 15:13 1501.01

                    RUN
TURN WHEEL : SELECT     PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
```

15. Select [TIME OFFSET 1], then press the **left button**.

16. Rotate the **scrollwheel** to set the value of offset 1.

17. Select [TIME OFFSET 2], then press the **left button**.

18. Rotate the **scrollwheel** to set the value of offset 2.

19. Select the color, shape, display, int.ban and comment as required.

20. Press the **right button** to close the menu.

How to enter waypoint by Decca time offset

1. Open the [MAIN MENU].
2. Select [NAV DATA], then press the **left button**.
3. Select [NEXT], then press the **left button**.
4. Select [LORAN/DECCA SETTING], then press the **left button**.
5. Press the **MARK** key to go to page 2/2.
6. Select [TIME DIFF. DISP TYPE], then press the **left button**.
7. Select [DECCA], then press the **left button**.
8. Close the menu.
9. Open the [MAIN MENU].
10. Select [ROUTES/WAYPOINTS], then press the **left button**.
11. Select [WAYPOINT LIST], then press the **left button**.
12. Rotate the **scrollwheel** to select a waypoint, then press **WPT** key.
     [EDIT WAYPOINT NAME] window appears.
13. Select [COODINATE], then press the **left button**.
14. Select [TIME DEFF.], then press the **left button**.
15. Select [LANE 1], then enter the lane 1 values.
16. Select [LANE 2], then enter the lane 2 values.
17. Select mark color and shape refer to paragraph 5.4.1.
18. Close the menu.

5.4.2   How to edit the existing waypoints

You can edit an existing waypoint from the waypoints list.

Note: This function is enabled when [ROUTE SELECT] is set to [IN] in the [ROUTE/WAYPOINT] menu.

1. Open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [WAYPOINT LIST], then press the **left button**.
4. Select the waypoint to edit, then press the **left button**.
     The [EDIT WAYPOINT NAME] window appears.
     Note 1: Changes made to the mark color and shape are applied to all marks entered after this procedure is completed.
     Note 2: You cannot change the MOB mark details.
     Note 3: The waypoint with [INT. BAN] set to other than [0.00NM] cannot be edited.
     Note 4: You can sort the waypoints by alphabet, shape, range or time entered. Refer to paragraph 5.4.4.
5. Edit the details as required.
6. Select [RUN], then press the **left button**.
     The confirmation message appears. Select [RUN] and press the **left button** to overwrite. If you want to not overwrite the waypoint data, select [CANCEL].
7. Close the menu.

5.4.3   How to delete a waypoint

There are two method to delete waypoints.

- Delete waypoints on the map.
- Delete waypoints from the waypoints list.

Note: This function is enabled when [ROUTE SELECT] is set to [IN] in the [ROUTE/WAYPOINT] menu.

Delete waypoints on the map

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.
2. Put the cursor on a waypoint to delete.
3. Press the **CANCEL** key.
    The following confirmation message appears.
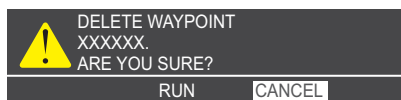
4. Select [RUN] and press the **left button** to delete the waypoint.

Delete waypoints from the waypoints list

1. Open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [WAYPOINTS LIST], then press the **left button**.
4. Select a waypoint from the list, then press the **CANCEL** key.
    The confirmation message appears.
5. Select [RUN] and press the **left button** to delete the waypoint.
6. Press the **right button** to close the waypoints list.

5.4.4   How to search for a waypoint

Sort the waypoints list

1. Open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [WAYPOINTS LIST], then press the **left button**.
4. Select [SORT], then press the **left button**.
5. Select a sort method among alphabet, range, mark shape and register order.
    1) ALPHA. ORD: sorts the waypoints in alphanumerical order.
    2) RNG ORDER: sorts the waypoints by range from own ship.
    3) MARK SHAPE: sorts the waypoints in the following priority order: MOB → INT.BAN → mark shape order shown in the [EDIT WAYPOINT NAME] window.
    4) REG. ORDER: sorts the waypoint according to the time and date witch they were entered.
6. Close the menu.

Enter a waypoint name

1. Open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [WAYPOINTS LIST], then press the **left button**.
4. Select [SEARCH], then press the **left button**.
5. Enter the first few characters of the you want to serch for, name of the waypoint with top several characters, then select [RUN] and press the **left button**.
   The waypoints which match your search appear at the top of the list. If a MOB mark exists, the search results appear immediately below the MOB mark.
6. Press the **right button** to close the waypoints list.

5.4.5 How to set the ship's speed to calculate the arriving time

The time to go (TTG) to a waypoint is calculated based on own ship speed and requires speed data input. You can set the speed automatically or manually.

1. Open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [WAYPOINTS LIST], then press the **left button**.
4. Select [SPD FOR TTG CALC], then press the **left button**.
5. Select [T.SHIP SPEED] to use the same data as used to calculate SOG, or [EXT VALUE] to manually input the ship speed. If you selected [T.SHIP SPEED], go to step 7.
6. Rotate the **scrollwheel** to select the value for ship's speed.
7. Select the waypoint you want to calculate the TTG for.
   The ETA and TTG to the selected waypoint appear at the right side of the window.
8. Close the menu.

5.4.6 How to show the waypoint name

The waypoint name is indicated by following method.

1. Press the **CURSOR ON/OFF** key when the cursor is not shown.
2. Put the cursor on a waypoint to show the name.
   The latitude, longitude and comments for the waypoint appear.
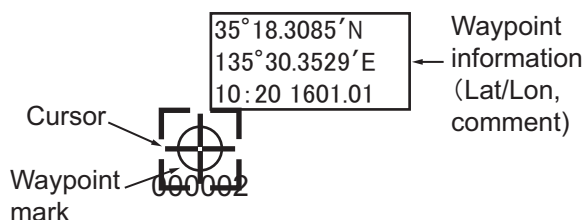
Note: When the cursor is overwritten on the waypoint mark and the information does not appear, set [WPT CURSOR INFORMATION] to [ON] in the [WAYPOINT SETTINGS] of the [ROUTES/WAYPOINTS] menu.

5.4.7 How to select the waypoint mark size

1. Open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [WAYPOINTS MARK], then press the **left button**.

4. Select [LARGE], [SMALL] or [OFF], then press the **left button**.

5. Close the menu.

5.4.8   How to display an external waypoint

A waypoint sent from a GPS navigator can be shown as an external waypoint on the radar display. The external waypoint can set as a destination also.

Note: The WPL or RTE sentence required.

1. Open the [MAIN MENU].

2. Select [ROUTE/WAYPOINT], then press the **left button**.

3. Select [ROUTE SELECT], then press the **left button**.

4. Select [OUT], then press **left button**.
    If [IN] is selected, the external waypoints are not shown. The color and shape of the external waypoints are indicated in the mark box.

    • Name: shows external waypoint name with the prefix "<<".

    • Shape: shows the shape selected in the [EDIT WAYPOINT NAME] window.

5. Close the menu.

5.5   Route

Often a trip from one place to another involves several course changes, requiring a series of route points (waypoints) which you navigate to, one after another. The sequence of waypoints leading to the ultimate destination is called a route. This section shows to create and edit routes.

5.5.1   How to create a route

There are three methods to create a route:

• With existing waypoints.

• From own ship position.

• With a selected track (own ship or other ship).

Note: This function is enabled when [ROUTE SELECT] is set to [IN] on [ROUTE/WAYPOINT] menu.

How to create a route with waypoints

1. Open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [ROUTES LIST], then press the **left button**.

```
ROUTES LIST                              SEL. PAGE _  1/1
NAME    COMMENT                TTL DIST    WPT QTY SET AS DEST.




BACK TRACK  : DIST.    TIME    NO      EST TIME OF ARR.
RNG LOG          : O O O．1 NM            -- D -- : --
TIME LOG         : O O H O 1 M
                                       TIME TO GO
SORT       : ALPHA. ORD   RNG ORDER       ----HR --MIN
             REG. ORDER
                                       DIREC : FWD
SPD FOR    : T. SHP SPD  : ---.-kn
TTG CALC     ENT VALUE : O O．O k n

SEARCH     : _____
PRESS LEFT BUTTON : EDIT ROUTE    [WPT] : NEW WAYPOINT
[TRACK COLOR] : REVERSE RTE       [GOTO] : SET DEST.
[CANCEL] : DELETE ROUTE           PRESS RIGHT BUTTON : CLOSE
[MARK SELECT] : PREVIOUS PAGE     [MARK] : NEXT PAGE
```

4. Press the **WPT** key to open the [ROUTE NAME/ENTER COMMENT] window.

```
ROUTE NAME/ENTER COMMENT
ROUTE NAME          : 0 0 0 0 0 1___

COMMNET             : _____
              RUN
```

5. Select [ROUTE NAME], then press the **left button**.

6. Enter the route name referring to paragraph 1.8.3.
    The route numbers are registered ascending order from 000001.

7. Select [COMMENT], then press the **left button**.

8. Select [RUN], then press the **left button**.
    The [ROUTE TURN POINTS LIST] appears.

9. Press the **left button** to move the cursor to the waypoints list.

10. Select the waypoints to register in the route, then press the **left button**.
    Press the **MARK COLOR** key or **MARK** key to change the page when there is more then six waypoints listed.
    The waypoints are displayed in the order set by [SORT].

11. Repeat the step 10 to complete the route.

12. Press the **right button** twice to go back to the [ROUTES LIST].
    To set this route as your destination, press the **GO TO** key. The direction indicator shows [FWD]. Press the **TRACK COLOR** key to reverse the route. The [REV] appears at the direction of the route.

```
 ROUTES LIST                              SEL PAGE _  1/1
 NAME     COMMENT          TTL DIST  WPT QTY SET AS DEST.
 000001                    5.81NM    3

 BACK TRACK  : DIST.   TIME   NO     EST TIME OF ARR.
 RNG LOG      : O O O.  1 NM              4 D 04:52
 TIME LOG     : O O H O 1 M
 SORT        : ALPHA. ORD  RNG ORDER  TIME TO GO
               REG. ORDER                4 HR  15MIN
 SPD FOR     : T.SHP SPD  : ---.-kn   DIREC : FWD
 TTG CALC      ENT VALUE : O O.  O k n
 SEARCH      : _____
 PRESS LEFT BUTTON : EDIT ROUTE   [WPT] : NEW WAYPOINT
 [TRACK COLOR] : REVERSE RTE      [GOTO] : SET DEST.
 [CANCEL] : DELETE ROUTE          PRESS RIGHT BUTTON : CLOSE
 [MARK SELECT] : PREVIOUS PAGE    [MARK] : NEXT PAGE
```

13. Press the **right button** to close the menu.

How to create a route from current own ship's location

You can make a route based on your ship's track while on the voyage. The route is created automatically or manually. You can register up to 100 waypoints (auto/manual combined) for routes. If you select the automatic route creation, the interval to record track should be set by range or time. The SAVE icon appears while the function works.

1. Open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [ROUTES LIST], then press the **left button**.
4. Select [RNG LOG] or [TIME LOG], then press the **left button**.
5. Rotate the **scrollwheel** to select the value.
6. Select [BACK TRACK], then press the **left button**.
7. Select [DIST.] or [TIME], then press the **left button**.
   The automatic route creation starts. The route name is registered automatically.
8. Press the **right button** to close the menu.

How to create a route from own ship's location manually

1. Press the **CURSOR ON/OFF** key to disappear the cursor.
2. Press the **WPT** key to register the current own ship's location.
   The [ROUTE XXXXXX REGISTERED WAYPOINT xxxxxx] message appears.
3. Press the **WPT** key to register a turn point as a waypoint.
   The same message as above appears.

How to stop the route creation

To stop the course creation, do the following procedure. When the route points reach 100 points, the route creation will be stop automatically.

1. Open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [ROUTES LIST], then press the **left button**.

4. Select [BACK TRACK], then press the **left button**.

5. Select [NO], then press the **left button**.

6. Press the **right button** to close the menu.

How to register the specified track as a route

1. Open the [MAIN MENU].

2. Select the [TRACK], then press the **left button**.

3. Select [TRACK ROUTE CONVERSION], then press the **left button**.
The [TRACK ROUTE CONVERSION] window appears. Waypoints on converted routes are shown as small squares.

```
TRACK ROUTE CONVERSION
SEL METH. :  BTWN 2PTS
FILTER SET



NO. OF DST TO CONV :0/100
PRESS CURSOR AT START OF TRACK CONVERSION.
PRESS LEFT BUTTON TO CONFIRM
```
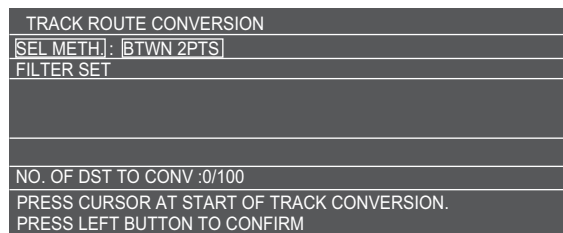
4. Select the square waypoint to use as the route start point, then press the **left button**.

5. Select the end waypoint in a similer manner, then press the **left button**.

6. Select [DIST.] on [FILTER SET], then press the **left button**.

7. Rotate the **scrollwheel** to set filter.

8. Select [BEARING] on [FILTER SET], then press the **left button**.

9. Select [CONVERSION], then press the **left button**.
The number of track points to be used in the route as waypoints appears.

```
TRACK ROUTE CONVERSION
SEL METH. :  BTWN 2PTS
FILTER SET



NO. OF DST TO CONV :3/100
[WPT]: CONVERTS TRACK POINT TO WAYPOINT.
[DELETE]: CANCEL CONVERTION  PRESS RIGHT BUTTON: GO BACK.
PRESS LEFT BUTTON TO CONFIRM
```

10. Press the **left button**.
The following confirmation message appears.

```
⚠  START CONVERSION.
   ARE YOU SURE?
        RUN      CANCEL
```
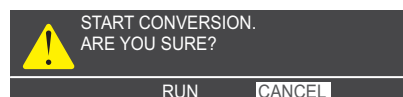
11. Select [RUN], then press the **left button**.

12. Close the menu.

5.5.2 How to edit created routes

How to add a waypoint into the route

You can add new waypoints to a registered route.

Note: This function is enabled when [ROUTE SELECT] is set to [IN] on [ROUTE/ WAYPOINT] menu.

1. Open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [ROUTE LIST], then press the **left button**.
4. Select a route to insert waypoints, then press the **left button**.
   The [ROUTE NAME/ENTER COMMENT] window appears.
5. Select [RUN], then press the **left button**.
   The [ROUTE TURN POINTS LIST] appears.
6. Select the location (waypoint) from the list, then press the **left button**.
   The cursor moves to [WAYPOINTS LIST]. A new waypoint will be inserted on previous row.
7. Select a waypoint from [WAYPOINTS LIST], then press the **left button**.
   The new waypoint is entered above (before) the selected waypoint.
   Note: If you make a wrong selection, press the **right button** to go back the [ROUTE TURN POINTS LIST] and select the waypoint to delete, then press the **CANCEL** key.
8. Close the menu.

How to delete a waypoint from the route

Note: This function is enabled when [ROUTE SELECT] is set to [IN] on [ROUTE/ WAYPOINT] menu.

1. Open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [ROUTE LIST], then press the **left button**.
4. Select a route to delete a waypoint, then press the **left button**.
   The [ROUTE NAME/ENTER COMMENT] window appears.
5. Select [RUN], then press the **left button**.
   The [ROUTE TURN POINTS LIST] window appears.
6. Select a waypoint to delete, then press the **CANCEL** key.
   The waypoint will be deleted.
7. Close the menu.

5.5.3 How to delete routes

Note: This function is enabled when [ROUTE SELECT] is set to [IN] on [ROUTE/ WAYPOINT] menu.

1. Open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [ROUTE LIST], then press the **left button**.

4. Select a route to delete, then press the **CANCEL** key.
   The following confirmation menu appears.

> ⚠ DELETE ROUTE NAME
> XXXXXX.
> ARE YOU SURE?
> RUN CANCEL
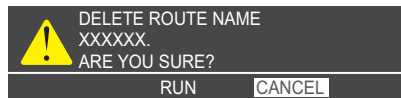
5. Select [RUN], then press the **left button**.
   The route will be deleted.

6. Close the menu.

5.5.4 How to search routes

To search the routes from the [ROUTE LIST], do the following procedures.

How to search from route sorting

1. Open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [ROUTE LIST], then press the **left button**.

4. Select [SORT], then press the **left button**.

5. Select the sort method from list, then press the **left button**.

   1) ALPHA. ORD: sorts the routes, in alphanumerical order.

   2) RNG ORDER: sorts the routes by range from own ship.

   3) REG. ORDER: sorts the routes according to the time and date at which they were entered.

6. Close the menu.

How to search from route name

1. Open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [ROUTE LIST], then press the **left button**.

4. Select [SEARCH], then press the **left button**.
   The character input window appears.

5. Enter the first few characters of the name you want to search for, then select [RUN] and press the **left button**.
   The route which match your search appear at the top of the list.

6. Close the menu.

5.5.5 How to set the ship's speed to calculate the arriving time

The time to go (TTG) to a waypoint calculated based on ship speed and requires speed data input. You can set the speed automatically or manually.

1. Open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [ROUTES LIST], then press the **left button**.

4. Select [SPD FOR TTG CALC], then press the **left button**.

5. Select [T.SHIP SPEED] to use the same data as used to calculate SOG, or [ENT VALUE] to manually input the ship speed. If you selected [T. SHIP SPEED], go to step 7.

6. Rotate the **scrollwheel** to select the value for ship's speed.

7. Select the route you want to calculate the TTG for.
   The ETA and TTG to the selected route appear at the right side of the window.

8. Close the menu.

5.5.6 How to create an external route

A route sent from a GPS navigator can be shown as an external route on the radar display. The external route can set as a destination also.

Note: The RTE sentence required.

1. Open the [MAIN MENU].

2. Select [ROUTE/WAYPOINT], then press the **left button**.

3. Select [ROUTE SELECT], then press the **left button**.

4. Select [OUT], then press the **left button**.
   The external route is shown. If [IN] is selected, the external routes is hidden.

5. Close the menu.

5.6 Destination Points

In navigation terminology, a destination point is a particular geographical location on a voyage whether it be a starting, intermediate or destination point. By setting a waypoint, information to get you to the waypoint with the shortest distance and time can be displayed.

5.6.1 Setting a quick point

Quick point is a temporarily set waypoint. There are quick point and quick route functions. Quick point ant quick route will remain after turning on/off the equipment, but older point and route will be deleted by inputting the new one.

How to select the setting method of quick points

There are two methods for setting a quick point, [ONE POINT] or [100 POINTS].

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.
    The [ROUTES/WAYPOINTS] menu appears.

3. Select [SET GOTO METHOD], then press the **left button**.

4. Select [ONE POINT] or [100 POINTS] as appropriate, then press the **left button**.
    [ONE POINT]: Set only one quick point as a destination.
    [100 POINTS]: Set 100 quick points as a route to the destination.

5. Close the menu.

```
[ROUTES/WAYPOINTS]

1.  BACK
2.  WAYPOINT LIST
3.  ROUTES LIST
4.  WAYPOINT MARK
    OFF/SMALL/LARGE
5.  WPT NAME DISPLAY
    OFF/SMALL/LARGE
6.  SET GOTO METHOD
    ONE POINT/100 POINTS
7.  [WAYPOINT SETTINGS]
8.  ROUTE SELECT
    IN/OUT
```

How to set the quick point

Note: The following procedures can be operated only when the setting of [ROUTE SELECT] is set as [IN].

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [SET GOTO METHOD], then press the **left button**.

4. Select [ONE POINT], then press the **left button**. (Refer to "How to select the setting method of quick points" on page 5-39).

5. Press the **CURSOR ON/OFF** key if the cursor is not shown.

6. Move the cursor to the location to input the quick point, then press **GO TO** key.

Time toward the target (TTG, variable from menu),
Bearing and distance from own ship to target.

Quick point

Shortest course from own ship to quick point (light blue)
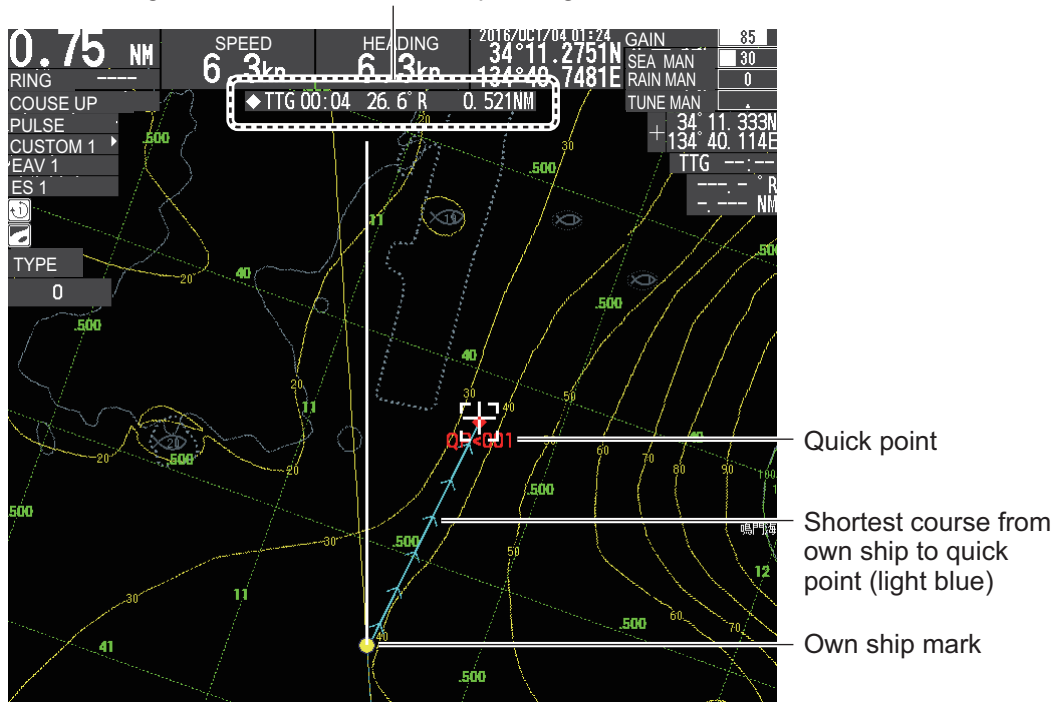
Own ship mark

Quick point is set. This quick point is named as "QP<001" and a light blue line will be drawn between own ship and quick point. This line shows the shortest course to the point and the arrow marks on the line shows the direction of own ship towards the point. The distance, bearing and TTG (factory default) will be displayed

on the upper area of the screen. The ship can reach the point with shortest distance and time by following the drawn line. The quick point "QP<001" is saved to the waypoint list.

Note 1: The older quick point will be deleted after a new one is registered.

Note 2: When this equipment receives the longitude and latitude information from connected navigational equipment, the information of QP<001 will be updated.

How to set the quick route

Note: The following procedures can be operated only when the setting of [ROUTE SELECT] is set as [IN].
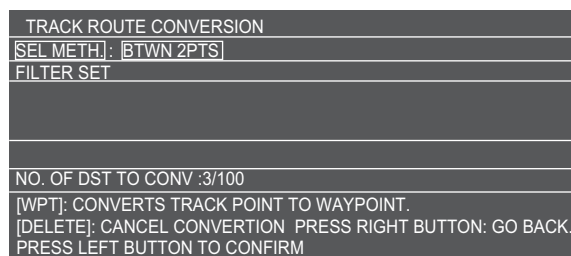
1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [SET GOTO METHOD], then press the **left button**.

4. Select [100 POINTS], then press the **left button**. (Refer to "How to select the setting method of quick points" on page 5-39).

5. Press the **CURSOR ON/OFF** key if the cursor is not shown.

6. Press the **GO TO** key.
   [CREATE QUICK ROUTE] window appears at the bottom side of display unit.

7. Move the cursor to the existing waypoint or new waypoint, then press the **left button** twice.

Time toward the target (TTG, variable from menu),
Bearing and distance from own ship to target.
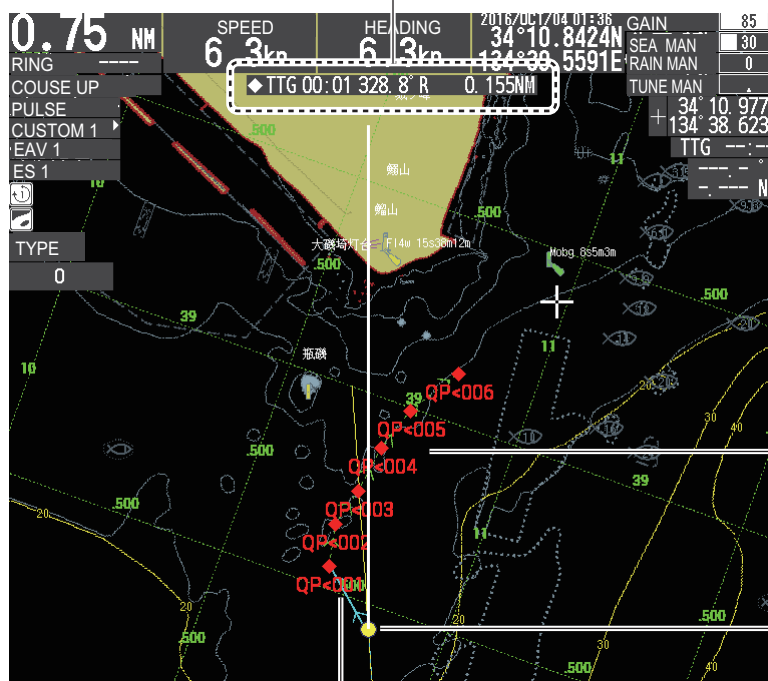
Quick route
(the route line after
first waypoint:
green broken line)

Own ship mark

The shortest course from own ship to the first
waypoint of the quick route: light blue line

   The name and symbol of selected waypoint will change to yellow. The point will be named as a quick point "QP<001".

8. Repeat the step 4 to complete the route.
   The selected waypoints will be connected with a yellow line. A maximum of 100 waypoints can be registered. Press **CANCEL** key to delete the most recently added waypoint.

9. To complete creating the route, press the **left button** twice at the destination point.
    A light blue line will be drawn between the own ship and the first waypoint and green line will be drawn for the rest of route. These lines show the shortest distance to each waypoint and arrow marks on the line show the direction of route. The distance, bearing and TTG (factory default) will be displayed on the upper area of the screen. The quick route is saved to the route list with a name of "Q<RTE".
    Note: The older quick route will be deleted after a new one is registered.
    "QP<001" will be deleted from the quick route when a new waypoint is set.

5.6.2 How to set the registered waypoint as a destination

There are four methods to set the registered waypoint as a destination.

*   Select the waypoint on the display
*   Select the waypoint from the [WAYPOINT LIST]
*   Select the waypoint by entering the waypoint name (for the numeral name only)
*   Select the waypoint from the log list.

Note: The following procedures can be operated only when the setting of [ROUTE SELECT] is set as [IN].

How to select the waypoint on the display

1. Press the **MENU** key to open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [SET GOTO METHOD], then press the **left button**.
4. Select [ONE POINT], then press the **left button**. (Refer to "How to select the setting method of quick points" on page 5-39).
5. Press the **CURSOR ON/OFF** key if the cursor is not shown.
6. Press the **GO TO** key.
    A light blue line will be drawn between own ship and a waypoint. The distance, bearing and TTG (factory default) will be displayed on the upper side of display unit.

How to select the waypoint from the waypoint list

1. Press the **MENU** key to open the [MAIN MENU].
2. Select [ROUTES/WAYPOINTS], then press the **left button**.
3. Select [WAYPOINT LIST], then press the **left button**.
4. Select the waypoint to set as a destination from the list, then press **GO TO** key.
    [GOTO: WAYPOINT xxxxx] will be displayed below the window title [WAYPOINTS LIST]. A light blue line will be drawn between own ship and a waypoint. The distance, bearing and TTG (factory default) will be displayed on the upper side of display unit.
5. Press the **right button** to close the menu.

How to select the waypoint by entering the waypoint name

1. Press the **CURSOR ON/OFF** key if the cursor is not shown.

2. Press **GO TO** key to open the [SELECT WPT] window.

```
SELECT WPT

ENTER WPT NO    [0] 0 0 0 0 0

WPT LOG

NAME    LATITUDE/LONGITUDE            INT. BAN  COMMENT
000007 ◆ 34' 21.3992' N  135'06.5654' E   0.00NM   20:42 1610.03



TO SET A DESTINATION : ENTER POINT NO. OR SEL HISTORY
PRESS LEFT BUTTON : ENTER      TURN WHEEL : SELECT
[MARK SELECT][MARK] : CHANGE DIGIT◀▶
[WPT]SELECTION SWITCHING       PRESS RIGHT BUTTON : CLOSE
```

3. Use the **scrollwheel**, **MARK COLOR** key or **MARK** key to enter the waypoint number to be set as a destination to the [ENTER WPT NO], then press the **left button**.
   A light blue line will be drawn between own ship and a waypoint. The distance, bearing and TTG (factory default) will be displayed.

How to select the waypoint from the log list

The waypoints (up to the latest 10 points) are registered to the log list. Follow the procedures below to select the waypoints from the listed points. When the number of registered waypoints exceed 10, the oldest waypoint will be deleted.

1. Press the **CURSOR ON/OFF** key if a cursor is not shown.

2. Press **GO TO** key to display the [WAYPOINTS LIST] window.

3. Press the **WPT** key.
   Data input cursor moves to the waypoint log.

```
SELECT WPT

ENTER WPT NO    [0] 0 0 0 0 0

WPT LOG

NAME    LATITUDE/LONGITUDE            INT. BAN  COMMENT
000007 ◆ 34' 21.3992' N  135'06.5654' E   0.00NM   20:42 1610.03
000006 ◆ 34' 21.3790' N  135'08.6011' E   0.00NM   20:42 1610.03



TO SET A DESTINATION : ENTER POINT NO. OR SEL HISTORY
PRESS LEFT BUTTON : ENTER      TURN WHEEL : SELECT
[MARK SELECT][MARK] : CHANGE DIGIT◀▶
[WPT]SELECTION SWITCHING       PRESS RIGHT BUTTON : CLOSE
```

4. Select the waypoint to set as a destination, then press the **left button**.
   A light blue line will be drawn between own ship and a waypoint. The distance, bearing and TTG (factory default) will be displayed on the upper side of display unit.

5.6.3 Set the registered route as a destination

Set the route as a destination

Note: The following procedures can be operated only when the [ROUTE SELECT] is set to [IN].

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [ROUTE LIST], then press the **left button**.

4. Select a route to set as a destination, then press **TRACK COLOR** key and set the direction of route.
   The direction of route will be changed from [DIREC: FWD] to [DIREC: REV] and vice versa.
   [DIREC: FWD]: Navigates to the waypoints in order that they are registered.
   [DIREC: REV]: Navigates to the waypoints in reverse order that they are registered.

5. Press the **GO TO** key.
   The selected route is set as a destination and [SET AS DEST.] will show [DIREC: FWD] or [DIREC: REV].

ROUTES LIST			SEL PAGE _ 1/1	
NAME	COMMENT	TTL DIST	WPT QTY	SET AS DEST.
000001		5.81NM	3	DIREC:FWD
Q<RTE		0.00NM	1	

Forward direction

ROUTES LIST			SEL PAGE _ 1/1	
NAME	COMMENT	TTL DIST	WPT QTY	SET AS DEST.
000001		5.81NM	3	DIREC:REV
Q<RTE		0.00NM	1	

Reverse direction

6. Close the menu.
   A light blue line will be drawn between own ship and a waypoint. The distance, bearing and TTG (factory default) will be displayed at upper side on the screen.

Skip the waypoint

You can temporarily disregard an unnecessary waypoint from a route. Such as skipping waypoint 4 and directly go to waypoint 3. Follow the procedures below to skip the selected waypoint and go to the next one.
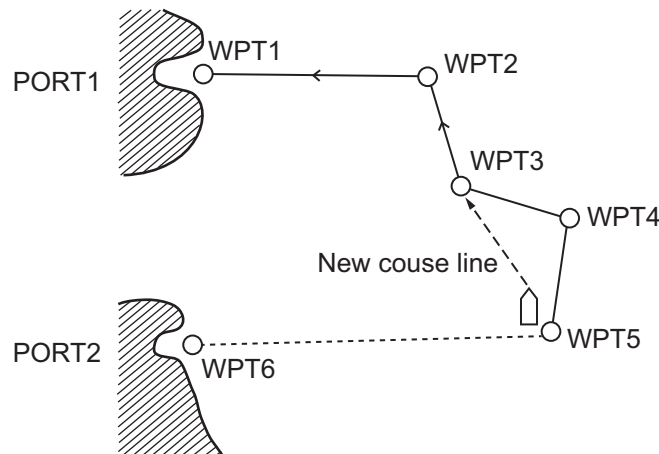
Note: The following procedures can be operated only when the setting of [ROUTE SE-LECT] is set as [IN].

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [ROUTE LIST], then press the **left button**.

4. Select a route to change, then press the **left button**.
   A confirmation message appears.

5. Select [RUN], then press the **left button**.
   [ROUTE NAME/ENTER COMMENT] window appears.

6. Select [RUN], then press the **left button**.
   [ROUTE TURN POINT LIST] window appears.

7. Select a waypoint to skip, then press **WPT** key.
   The name of selected waypoint, [---] will be displayed in [DISTANCE] and [TTG].
   Note: Press **WPT** key again to cancel skipping the waypoint and confirm that [---] is not displayed.

8. Close the menu.

How to set the refresh method for waypoints

When your vessel arrives at a waypoint, the waypoint is automatically switched to the next sequential waypoint. You can select the switching from two choices, [WPT ON VERTICAL LINE] and [ARRIVE ALERT RANGE].

[WPT ON VERTICAL LINE]: Automatically switches the waypoint to the next sequential waypoint when the vessel enters the arrival alarm area or the vessel passes an imaginary perpendicular line passing through the center of the destination waypoint. (Refer to section 5.7 about the arrival alert.)

[ARRIVE ALERT RANGE]: Automatically switches the waypoint to the next sequential waypoint when your vessel is within the arrival alarm area.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ROUTES/WAYPOINTS], then press the **left button**.

3. Select [WAYPOINT SETTINGS], then press the **left button**.

4. Select [WPT REFRESH SETTING], then press the **left button**.

5. Select [WPT ON VERTICAL LINE] or [ARRIVE ALERT RANGE], then press the **left button**.

6. Close the menu.

5.6.4 Cancel the waypoint

1. Press the **GO TO** key.
   A confirmation massage box appears.

   ⚠ XXXXXX
   SET AS A DESTINATION.
   CANCEL DESTINATION?
   RUN   CANCEL

2. Select [RUN], then press the **left button**.
   Waypoint is canceled.

5.6.5 Explanations on waypoint settings

The followings are about only the items which have not explained yet. [WAYPOINT SETTINGS] menu will appear from the [ROUTES/WAYPOINTS] → [WAYPOINT SETTINGS].

[BEARING TO WAYPOINT]: The bearing display can be selected from [RELATIVE] or [TRUE].

[RNG & BRG MODE]: When a destination is selected, the distance and bearing will be displayed on the upper side of display unit. [GREAT CIR.] or [MERCATOR] can be selected as a method of calculating the bearing and distance. The calculation method selected with this menu will be adopted to the calculation of total distance of route.

[GREAT CIR.]: This course line is the shortest course between two points on the surface of the earth, like stretching a piece of string between two points on earth. Frequent bearing changes are required to navigate by this method. For long-range navigation, divide the Great Circle route into several routes, and navigate each route by rhumb Line.

```
[WAYPOINT SETTINGS]

1.  BACK
2.  BEARING TO WAYPOINT
    REL/TRUE
3.  RNG & BRG MODE
    GREAT CIR./MERCATOR
4.  WPT ARRIVAL TIME
    TTG/ETA
5.  WPT REFRESH SETTING
    WPT ON VERTICAL LINE/
    ARRIVE ALERT RANGE
6.  WAYPOINT OVERWRITE
    CONFIRM/NO CONFIRM
7.  WPT NAME ZERO DISPLAY
    HIDE "0"/ALL "0"
8.  WPT CURSOR INFORMATION
    OFF/ON
```

[MERCATOR]: This method calculates the range and bearing between two points drawn on a nautical chart. Since the bearing is kept constant it is ideal for short-range navigation.

[WPT ARRIVAL TIME]: Select the information to display when setting the destination.

[TTG]: Time to go to the destination.

[ETA]: Estimated time of arrival.
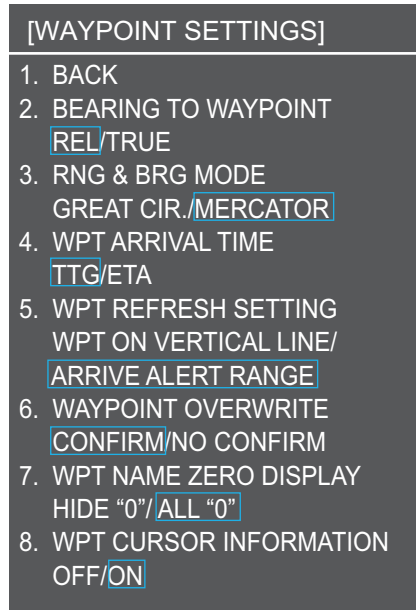
● TTG 00:33 149. 9° T   3. 559NM   ● ETA 10/13 00:49 149. 5° T   3. 562NM
          [TTG] selected   [ETA] selected

[WAYPOINT OVERWRITE]: Select to show the confirmation message or not when using the same name to the existing waypoint name.

[WPT NAME ZERO DISPLAY]: Select the way of displaying the waypoint ([HIDE "0"] or [ALL "0"]). If the waypoint name use only numerals, 0 will not be displayed when [HIDE "0"] is selected.

5.7 Alerts Regarding the Plotter

5.7.1 How to set the arrival, anchor watch alert

The arrival alert informs you that your vessel is approaching a destination waypoint The area that defines an arrival zone is that of a circle which you approach from the outside of the circle. The alert will be released if your vessel enters the circle. When the arrival alert is active, a red dashed circle marks the arrival alert range.
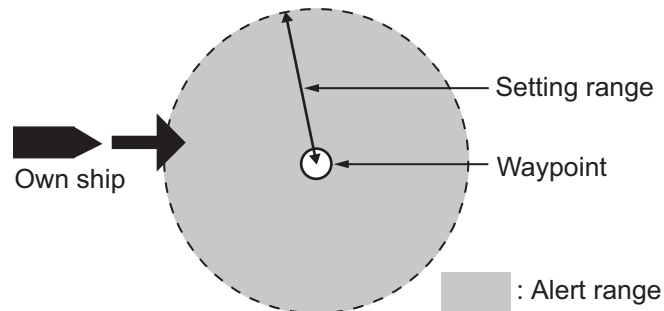
The anchor watch alarm informs you that your vessel is moving when it should be at rest. When the anchor watch is active, a orange dashed circle marks the anchor watch area.
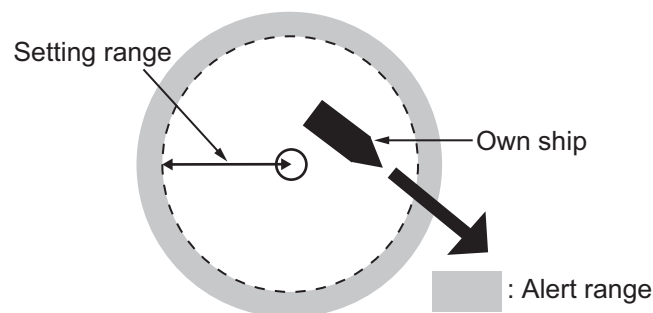
1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ALERT SETTINGS], then press the **left button**.

3. Select [ARRIVAL/ANCHOR ALERT], then press the **left button**.

4. Select [ARRIVAL ALERT] or [ANCHOR WATCH ALERT], then press the **left button**.

5. Select [ON], then press the **left button**. Cursor moves to the value of [ALERT RANGE] of [ARRIVAL ALERT] or [ANCHOR WATCH ALERT].

6. Rotate the **scrollwheel** to set the range, then press the **left button.**

7. Close the menu.

8. To set the anchor watch alert, move the cursor to the own ship or another ship near the own ship, then press **GO TO** key. The orange dashed circle showing the alert area appears. The alert sounds when your vessel goes out of this area.

```
[ARRIVAL/ ANCHOR ALERT]

1. BACK
2. ARRIVAL ALERT
   OFF/ON
   ALERT RANGE : 0.050NM
3. ANCHOR WATCH ALERT
   OFF/ON
   ALERT RANGE : 0.050NM
4. ROUTE  ALERT SETTING
   OFF/ON
5. XTE/BORDER ALERT
   OFF/OFF TRACK/XTE
   ALERT RANGE : 0.050NM
6. INTRUSION POINT ALERT
   OFF/ON
```

To deactivate an alarm, select [OFF] at step 5.

5.7.2 How to set the route alert

The route alert sets an anchor watch alert on each route point (waypoint) in the route in use. When your vessel goes out of the anchor watch alert range at a route point, the audio alert sounds. To use this alert, [ANCHOR ALERT] must be [ON]. (Refer to the paragraph 5.7.1.)

1. Press the **MENU** key to open the [MAIN MENU].
2. Select [ALERT SETTINGS], then press the **left button**.
3. Select [ARRIVAL/ANCHOR ALERT], then press the **left button**.
4. Select [ROUTE ALERT SETTING], then press the **left button**.
5. Select [ON], then press the **left button**.
   When your vessel goes out of the alarm range at a route point, the audio alarm sounds. If selecting [OFF], the anchor watch alarm alerts you when your vessel goes out of the alarm range at the last waypoint in the route. (i.e. [ANCHOR WATCH ALERT] is [ON].)
6. Close the menu.

To deactivate an alert, select [OFF] at step 5.

5.7.3 How to set XTE, border alert

The XTE (cross track error) alert warns you when your vessel is off its intended course. When the XTE alarm is active, two red dashed lines mark the XTE alarm area.
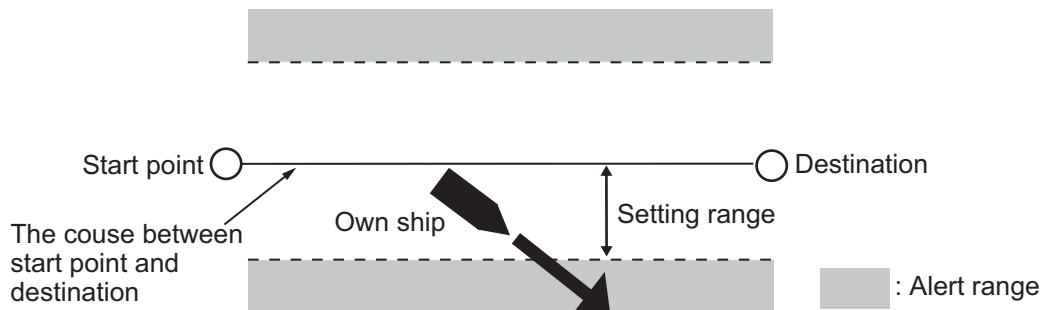
The border alert marks an area, defined by two waypoints, which you do not want to cross. The audible and visual alerts will be released when your vessel crosses the area defined by the two waypoints. When the border alert is active, the red dashed lines mark on either side of the setting line.
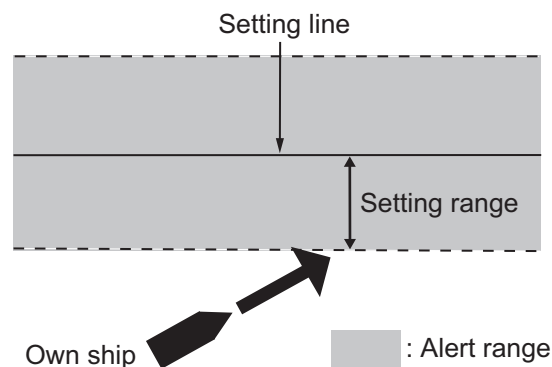
Note: The XTE and border alert cannot be turned on together.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ALERT SETTINGS], then press the **left button**.

3. Select [ARRIVAL/ANCHOR ALERT], then press the **left button**.

4. Select [XTE/BORDER ALERT], then press the **left button**.

5. Select [OFF TRACK] or [XTE], then press the **left button**.
   Cursor moves to the value of [ALERT RANGE] of [OFF TRACK] or [XTE].

6. Rotate the **scrollwheel** to set the range, then press the **left button.**

7. Close the menu.

To deactivate either alarm, select [OFF] at step 5.

5.7.4 How to set Intrusion point

The proximity alert shows you when your vessel nears a waypoint by the distance set for that waypoint on the waypoints list. The distance is called the proximity alert radius (see section 5.1.3). When the intrusion point alert is active, a red dashed circle marks the proximity alert radius.
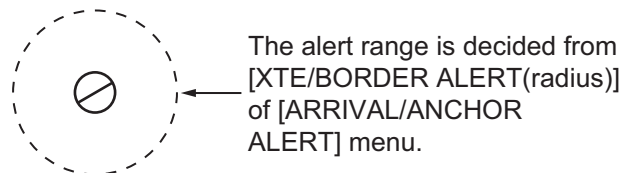
The alert range is decided from [XTE/BORDER ALERT(radius)] of [ARRIVAL/ANCHOR ALERT] menu.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ALERT SETTINGS], then press the **left button**.

3. Select [ARRIVAL/ANCHOR ALERT], then press the **left button**.

4. Select [INTRUSION POINT ALERT], then press the **left button**.

5. Select [ON], then press the **left button**.

6. Close the menu.

To deactivate either alarm, select [OFF] at step 5.

5.7.5 How to set ship speed alert

The ship speed alarm warns you when your boat's speed is within or over the speed range set.
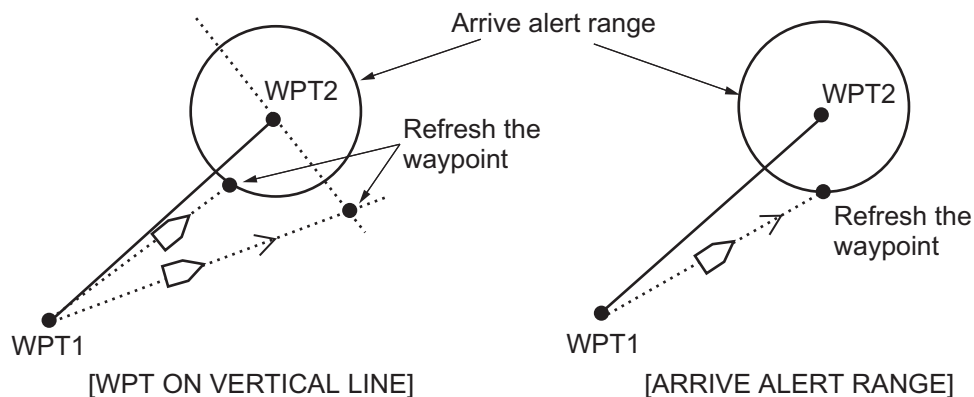
1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ALERT SETTINGS], then press the **left button**.

3. Select [SPEED/TRIP ALERT], then press the **left button**.

4. Select [SHIP SPEED ALERT], then press the **left button**.

```
[SPEED/TRIP ALERT]

1. BACK
2. SHIP SPEED ALERT
   OFF/INNER/OUTSIDE
   MINIMUM SPEED : 00.0kn
   MAXIMUM SPEED : 30.0kn
3. TRIP RANGE ALERT
   OFF/ON
   TRIP RANGE : 0000.1NM
4. TRIP RANGE RESET
```

5. Select [INNER] or [OUTSIDE], then press the **left button**.
    Cursor moves to the value of [MINIMUM SPEED].

6. Move the scrollwheel and set the minimum speed, then press the **left button.**
    Cursor moves to the value of [MAXIMUM SPEED].

7. Rotate the **scrollwheel** to set the maximum speed, then press the **left button**.

8. Close the menu.

To deactivate either alarm, select [OFF] at step 5.

5.7.6 How to set trip range alert

The trip range alert informs you when you have traveled a certain distance.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ALERT SETTINGS], then press the **left button**.

3. Select [ARRIVAL/ANCHOR ALERT], then press the **left button**.

4. Select [TRIP RANGE ALERT], then press the **left button**.

5. Select [ON], then press the **left button**.
    Cursor moves to the value of [TRIP RANGE].

6. Rotate the **scrollwheel** to set the range, then press the **left button.**

7. Close the menu.

To deactivate either alert, select [OFF] at step 5.

How to reset the trip range

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ALERT SETTINGS], then press the **left button**.

3. Select [ARRIVAL/ANCHOR ALERT], then press the **left button**.

4. Select [TRIP RANGE RESET], then press the **left button**.
    A confirmation box appears.
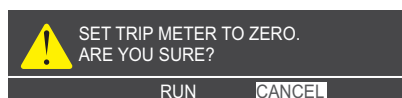
5. Select [RUN], then press the **left button**.
    Trip range resets.

5.7.7 How to set the water temperature alert

The water temperature alert is a function alerts you when the water temperature is higher or lower than the range set.

Note: The water temperature alert requires a water temperature sensor.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ALERT SETTINGS], then press the **left button**.

3. Select [W-TMP./TIDE/DEPTH], then press the **left button**.

4. Select [WATER TMP. ALERT], then press the **left button**.

5. Select [INNER] or [OUTSIDE], then press the **left button**.
Cursor moves to the value of [LOWEST TMP.].

6. Rotate the **scrollwheel** to set the lowest temperature, then press the **left button.**
Cursor moves to the value of [HIGHEST TMP.].

```
[W-TMP./TIDE/DEPTH]
1. BACK
2. WATER TMP. ALERT
   OFF/INNER/OUTSIDE
   LOWEST TMP. : +00.0°C
   HIGHEST TMP. : +30.0°C
3. TIDE ALERT
   OFF/ON
   VARIATION TMP. : 0.1°C
   DETECTION TIME: 010SEC
4. DEPTH ALERT
   OFF/ON
   START DEPTH : 0000.0m
   DEPTH WIDTH : 00.0m
```

7. Rotate the **scrollwheel** to set the highest temperature, then press the **left button**.

8. Close the menu.

To deactivate either alert, select [OFF] at step 5.

5.7.8 How to set the tide alert

The tide alert sounds when the water temperature goes higher or lower than the preset value within the interval time set.

Note: The tide alert requires a water temperature sensor.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ALERT SETTINGS], then press the **left button**.

3. Select [W-TMP./TIDE/DEPTH], then press the **left button**.

4. Select [TIDE ALERT], then press the **left button**.

5. Select [ON], then press the **left button**.
Cursor moves to the value of [VARIATION TMP.].

6. Move the scrollwheel and set the temperature variation, then press the **left button.**
Cursor moves to the value of [DETECTION TIME].

7. Move the scrollwheel and set the detection time, then press the **left button**.

8. Close the menu.

To deactivate either alert, select [OFF] at step 5.

5.7.9 How to set the depth alert

The depth alarm sounds when the bottom echo is within the alarm range set.

Note: The depth alarm requires a water depth data.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [ALERT SETTINGS], then press the **left button**.

3. Select [W-TMP./TIDE/DEPTH], then press the **left button**.

4. Select [DEPTH ALERT], then press the **left button**.

5. Select [ON], then press the **left button**.
   Cursor moves to the value of [START DEPTH].

6. Move the scrollwheel and set the temperature variation, then press the **left button.**
   Cursor moves to the value of [DEPTH WIDTH].

7. Move the scrollwheel and set the detection time, then press the **left button**.

8. Close the menu.

To deactivate either alarm, select [OFF] at step 5.

5.8 Chart

5.8.1 How to display or hide the chart

[CHART DISPLAY] menu is [ON] as a factory default.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [CHART], then press the **left button**.

3. Select [CHART DISPLAY], then press the **left button**.

4. Select [ON] to display chart (Select [OFF] to hide chart.), then press the **left button**.

5. Close the menu.

```
[CHART]
1.  BACK
2.  [CHART SETTING]
3.  DEPTH LINE SETTINGS
4.  BORDER LINE LEVEL
    OFF/1/2/3
5.  CHANGE CHARTS
    VECTOR/FISHING/
    C-MAP/NAVIONICS
6.  CHART DISPLAY
    OFF/ON
7.  LAT/LON. GRID
    OFF/RED/YEL/GRN/
    CYA/MAG/BLU/WHT
8.  DEPTH LINE FINE RANGE
```

Chart Icons

The chart icon at the bottom right of the screen depends on the state of the chart. See the table below.

Chart Icons	Meaning
	Suitable chart scale.
	Unsuitable chart scale. Press the ZOOM IN or ZOOM OUT key to adjust the chart scale.
	No chart file.

5.8.2 How to align the chart position

When the radar target and the chart are not overlaid correctly, align the chart position with the following procedure.

1. Press the **CURSOR ON/OFF** key if the cursor is not shown.

2. Select [CHART ALIGN] with the **scrollwheel**, then press the **left button**.
   [CHART ALIGN] function is set as a cursor function and a [icon] icon appears to show the status of chart alignment.

3. Use the trackball to move the chart, then press the **left button** on the radar target.

4. Press the **left button** to finish the procedures.
   To cancel the chart position alignment, use the scrollwheel to select [CHART ALIGN], then long-press the **left button**.

5.8.3 How to select the chart type

Four types of charts are available.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [CHART], then press the **left button**.

3. Select [CHANGE CHART], then press the **left button**.

4. Select either of the following charts, then press the **left button**.
   [VECTOR]: MapMedia chart (navigational chart).
   [FISHING]: MapMedia chart (for fishing).
   [C-MAP]: MapMedia chart based on C-MAP data.
   [NAVIONICS]: MapMedia chart based on Navionics chart data.

5. Close the menu.

Note: Depth contours for [FISHING] are drawn differently from navigational chart data (bathymetric chart data). Fishing chart does not have the latest shallow information, so select [VECTOR] when sailing into/out of port or sailing coast.

5.8.4 Chart settings menu

Below is the explanation about the each item of [CHART SETTINGS].

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [CHART], then press the **left button**.

3. Select [CHART SETTINGS], then press the **left button**.
   [CHART SETTINGS] menu has below four pages.

[CHART SETTINGS 1/4]	[CHART SETTINGS 2/4]	[CHART SETTINGS 3/4]	[CHART SETTINGS 3/4]
1. BACK	1. BACK	1. BACK	1. BACK
2. CONTOUR DISPLAY 17	2. BUOY OFF/ON	2. ALARM AREA OFF/ON	2. SMALL VESSEL SERVICE OFF/ON
3. TRIMMING BORDER LINE 9	3. DEPTH LINES/CURRENT OFF/ON	3. LIGHT SECTOR OFF/ON	3. MARINE FARM OFF/LINE/LINE+SYMBOL
4. BACKGROUND COLOR 1	4. LAND MARKS OFF/ON	4. MOUNTAINTOP OFF/ON	4. SOUNDINGS OFF/ON
5. CHAR(IMPORTANT) OFF/ON	5. OBSTACLES OFF/ON	5. LANDSCAPE OFF/ON	
6. CHAR(OTHER) OFF/ON	6. OBST IN SAFE AREA OFF/ON	6. FOG SIGNAL OFF/ON	
7. PLACE NAME OFF/ON	7. FISHING EQUIPMENT OFF/ON	7. SIGNALS OFF/ON	
8. NAV AIDS OFF/ON	8. COMP OFF/ON	8. SERVICE OFF/ON	
9. LIGHT BEACON OFF/ON	9. WATER QUALITY OFF/ON	9. HARBOR FACILITIES OFF/ON	
0. NEXT	0. NEXT	0. NEXT	

4. Select a menu item to change the settings, then press the **left button**.

5. Change the settings, then press the **left button**.

6. Close the menu after changing the settings.
The description for each item is shown as below.
[CONTOUR DISPLAY]: Selects color for land from 17 colors.
[TRIMMING BORDER LINE]: Selects color for edge from 17 colors.
[BACKGROUND COLOR]: Selects color for background from 17 colors. Change the background color when targets and chart lines are hard to see.
[CHART (IMPORTANT)]: Turns important text on or off.
[CHART (OTHER)]: Turns other text on or off.
[PLACE NAME]: Turns geographical name on or off.
[NAV AIDS]: Displays the navigation data set to [ON] from [LIGHT BEACON] (on page 1) to [SOUNDINGS] (on page 4) when selecting [ON]. Displays no navigation data regardless of each setting when selecting [OFF].
[LIGHT BEACON], [BUOY], [DEPTH LINES/CURRENT], [LANDMARKS], [OBSTACLES], [OBST IN SAFE AREA], [FISHING EQUIPMENT], [COMP], [WATER QUALITY], [ALARM AREA], [LIGHT SECTOR], [MOUNTAINTOP], [LANDSCAPE], [FOG SIGNAL], [SIGNALS], [SERVICE], [HARBOR FACILITIES], [SMALL VESSEL SERVICE], [SOUNDINGS]: Turns each mark on or off. See the table below. To display [MARINE FARM], select [LINE] or [LINE+SYMBOL].
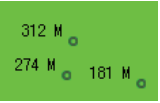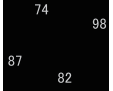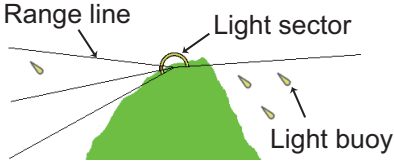
Mark name	Display example	Mark name	Display example	Mark name	Display example
LIGHT BEACON		BUOY		DEPTH LINES / CURRENT	
LANDMARKS		OBSTACLES		OBST IN SAFE AREA	
FISHING EQUIPMENT		COMP	Mud	WATER QUALITY	
ALARM AREA		MOUNTAINTOP	312 M 274 M 181 M	LANDSCAPE	
FOG SIGNAL		SIGNALS		SERVICE	
HARBOR FACILITIES		SMALL VESSEL SERVICE		MARINE FARM	
SOUNDINGS	74 98 87 82				

Note: If the text is displayed with a mark, the text is difficult to see depending on the background.

The mark display for light sector differs according to the setting of light beacon. For details, see the table below.

	[LIGHT SECTOR]: Set to [ON].	**[LIGHT SECTOR]: Set to [OFF].**
[LIGHT BEACON]: Set to [ON].	Light sector and range lines are displayed (lines for range are long). Range line — Light sector — Light buoy	Only light sector is displayed (lines for range are short).
[LIGHT BEACON]: Set to [OFF].	Light sector and range lines are displayed (range lines are long).	Light sector is not displayed.

5.8.5 How to set the depth line

You can turn the individual depth contour on or off and select color or line type apart from chart depth contour.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [CHART], then press the **left button**.

3. Select [DEPTH LINE SETTINGS], then press the **left button**.
   [DEPTH LINE SETTINGS] menu has three pages.

DEPTH LINES   SEL PAGE   1/3 ▶
WATER DEPTH	LINE TYPE	COLOR	DISP DEPTH LINE
1m	——	■	NO
2m		■	NO
3m	——		
4m	——		
5m	——		
6m	——		
7m	——		
8m	——		
9m	——		
10m	——		
20m	——		
30m	——		
40m	——		
50m	——		
60m	——		

[MARK SELECT] : PREVIOUS P
[WPT] : SHOW ALL   PRES
[GO TO] : HIDE ALL   PRES

Page 1

DEPTH LINES   SEL PAGE ◀2/3▶
WATER DEPTH	LINE TYPE	COLOR	DISP DEPTH LINE
70m	——	■	YES
80m	——	■	YES
90m	——		
100m	——		
110m	——		
120m	——		
130m	——		
140m	——		
150m	——		
160m	——		
170m	——		
180m	——		
190m	——		
200m	——		
300m	——		

[MARK SELECT] : PREVIOUS P
[WPT] : SHOW ALL   PRES
[GO TO] : HIDE ALL   PRES

Page 2

DEPTH LINES   SEL PAGE   ◀3/3
WATER DEPTH	LINE TYPE	COLOR	DISP DEPTH LINE
400m	——	■	YES
500m	——	■	YES
600m	——	■	YES
700m	——	■	YES
800m	——	■	YES
900m	——	■	YES
1000m	——	■	YES
1500m	——	■	YES
2000m	——	■	YES
2500m	——	■	YES
3000m	——	■	YES
3500m	——	■	YES
4000m	——	■	YES
4500m	——	■	YES
5000m	——	■	YES

[MARK SELECT] : PREVIOUS PAGE [MARK] : NEXT PAGE
[WPT] : SHOW ALL   PRESS LEFT BUTTON : SEL OBJ TO BE EDITED
[GO TO] : HIDE ALL   PRESS RIGHT BUTTON : CLOSE

Page 3

4. Select a depth line to change the settings, then press the **left button**. [EDIT DEPTH LINE] window appears.

```
DELETE OTHER SHIPS' TRACK
EDIT DEPTH LINE       :        YES      NO
SELECT LINE TYPE      :                      ----    -·-·
SELECT LINE COLOR     : ■ ■ ■ ■ ■ ■
                        RUN
TURN WHEEL : SELECT      PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : BACK TO DEPTH LINE SEL.
```
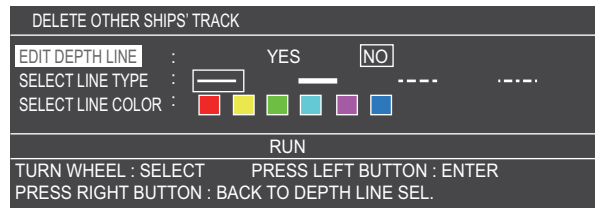
5. Select [DISP DEPTH LINE], then press the **left button**.

6. Select [YES] to display the depth line selected with step 4. Select [NO] not to display it.
    To display all the depth lines, press **WPT** key. To hide all the depth lines, press **GO TO** key.

7. Select [SELECT LINE TYPE], then press the **left button**.

8. Select a type of line from four types, then press the **left button**.

9. Select [SELECT LINE COLOR], then press the **left button**.

10. Select a color of line from six colors, then press the **left button**.

11. Select [RUN], then press the **left button**.

12. Repeat step 4 to 11 to change the settings of other depth lines.

13. Close the menu.

5.8.6 How to display the detailed depth line

The depth line can be displayed with a detailed range interval if the currently shown depth lines are too widely separated.

1. Press the **MENU** key to open the [MAIN MENU].

2. Select [CHART], then press the **left button**.

3. Select [DEPTH LINE FINE RANGE], then press the **left button**.

4. Select the range to display closely, then press the **left button**.
    Selected range will be displayed in a window as below.

```
3. 00NM
   ▲
  + O
   ▼
```

5. Set the level to display the detailed depth line, then press the **left button**.
    When bigger level is selected, the depth line will be displayed in details, but the chart drawing time will be longer.
    Note: The depth line display does not change at some range even if the detail level is changed.

6. Close the menu.

```
DEPTH LINE FINE RANGE
0. 025NM     :     + O
0. 050NM     :     + O
0. 075NM     :     + O
0. 100NM     :     + O
0. 125NM     :     + O
0. 250NM     :     + O
0. 500NM     :     + O
0. 750NM     :     + O
1. 00NM      :     + O
1. 50NM      :     + O
2. 00NM      :     + O
3. 00NM      :     + O
4. 00NM      :     + O
6. 00NM      :     + O
8. 00NM      :     + O
12. 00NM     :     + O
16. 00NM     :     + O
24. 00NM     :     + O
32. 00NM     :     + O
48. 00NM     :     + O
72. 00NM     :     + O
96. 00NM     :     + O
128. 0NM     :     + O
256. 0NM     :     + O
512. 0NM     :     + O
1024NM       :     + O
TURN WHEEL : SELECT
PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : BACK
```

5.8.7 Explanations on chart menu

Below is the explanation about the each item of [CHART] menu.

[BORDER LINE LEVEL]: Select to display the outline of landmass or not. To display the outline, the thickness of outline can be selected from three types. The larger the number the thicker the outline.

[LAT/LON. GRID]: Select to display the grid of latitude and longitude or not. When displaying, the color can be selected from seven colors.

[CHART]
1. BACK
2. [CHART SETTING]
3. DEPTH LINE SETTINGS
4. BORDER LINE LEVEL
   OFF/1/2/3
5. CHANGE CHARTS
   VECTOR/FISHING/
   C-MAP/NAVIONICS
6. CHART DISPLAY
   OFF/ON
7. LAT/LON. GRID
   OFF/RED/YEL/GRN/
   CYA/MAG/BLU/WHT
8. DEPTH LINE FINE RANGE

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6. DATA SAVE AND READ

This chapter covers how to save data to the internal memory or external (USB flash) memory.

6.1 Data Saving

The display unit has temporary memory that records data such as tracks, mark, routes, etc. The data may be erased if the temporary memory overflows. For this reason, important data should be recorded to either an external USB flash memory or to the internal memory. Data can be loaded and saved between both mediums.

*: Recording area: 10 block.
Every block has a capacity for following points;
Own ship's track: 30,000 pts
Other ship's track: 40,000 pts
Mark/line: 30,000 pts
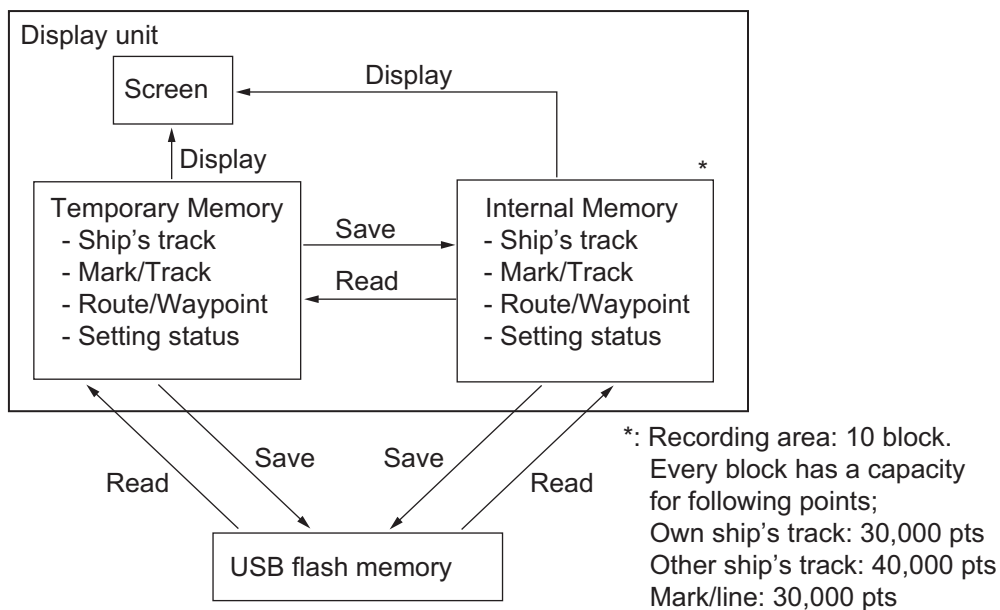
6.2 Internal Preserved Memory

There is an internal memory to save the current data. The data are saved and read between the temporary memory and the preserved memory.

6.2.1 How to save the data to internal memory

The data in current memory can be saved to the internal memory. Ten block recording areas are prepared in the internal memory. Each block has a capacity for own ship's track (30,000 pts), other ship's track (40,000 pts), mark/line (30,000 pts), waypoints (3,500 pts) and routes (200 pts).

1. Open the [MAIN MENU].

2. Select [MEMORY REC./PLAY.], then press the **left button** to open the menu.
   Note: The non-active menu indicated as gray characters.

```
[MEMORY REC./PLAY. 1/2]
1. BACK
2. USB MEMORY RECORDING
3. USB MEMORY PLAYBACK
4. INT. MEMORY RECORDING
5. INT. MEMORY PLAYBACK
6. TRF USB TO INT. MEMORY
7. DISPLAY INT. MEMORY
8. [AUTO BACKUP]
9. REMOVE USB MEMORY
```

3. Select [INT. MEMORY RECORDING], then press the **left button**.
   The internal memory recording menu appears.

```
INTERNAL MEMORY RECORDING
REC OWN TRK              : YES    NO
REC OTHER TRK           : YES    NO
RECORD MARK/TRACK       : YES    NO
RECORD ROUTE/WPT        : YES    NO
DOWNLOAD SETTINGS       : YES    NO
```

DATA SELECTION	OWN TRK	OTR TRK	MARK	WPT	ROUTE
DATA					
1: NO DATA					
2: NO DATA					
3: NO DATA					
4: NO DATA					
5: NO DATA					
6: NO DATA					
7: NO DATA					
8: NO DATA					
9: NO DATA					
0: NO DATA					

```
CURRENT USAGE  OWN TRK              : 164    /30000
               OTHER TRK (CONS)     : 0      /10000
               OTHER TRK (AIS)      : 0      /10000
               OTHER TRK (TT)       : 10     /10000
               OTHER TRK (GPS BUOY) : 0      /10000
               MARK/LINE            : 0      /30000


TURN WHEEL : SELECT  PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON :  CLOSE
SELECT THE FILE TO RECORD
```

4. Select the item required, then press the **left button**.

5. Select [YES], then press the **left button**.

6. Repeat the step 4 and 5 to save other data.

7. Select the block required to save the data.
   A character input window is displayed. The current date is displayed automatically. Go on the following step to change the comment.

8. Enter the comment to refer to page 1-16. (15 characters max.)

9. Select [YES] and press **left button**.

10. Close the menu

6.2.2 Display the internal memory data

To display the internal memory data, do following procedure.

1. Open the [MAIN MENU].

2. Select [MEMORY REC./PLAY.], then press the **left button**.

3. Select [DISPLAY INT. MEMORY], then press the **left button**.
   [DISPLAY INTERNAL MEMORY] window appears. Press the **MARK SELECT** key or the **MARK** key to select the page number from 1 to 3 pages.

```
 DISPLAY INTERNAL MEMORY              SEL PAGE      1/3 ▶
 INTERNAL MEMORY 1
    ADD OWN TRACK DISP        : YES      NO      0/30000
    ADD OTHER TRCK DISP       : YES      NO      0/40000
    ADD MARK/LINE DISP        : YES      NO      3/30000

 INTERNAL MEMORY 2
    ADD OWN TRACK DISP        : YES      NO      0/30000
    ADD OTHER TRCK DISP       : YES      NO      0/40000
    ADD MARK/LINE DISP        : YES      NO      3/30000

 INTERNAL MEMORY 3
    ADD OWN TRACK DISP        : YES      NO      0/30000
    ADD OTHER TRCK DISP       : YES      NO      0/40000
    ADD MARK/LINE DISP        : YES      NO      3/30000

 INTERNAL MEMORY 4
    ADD OWN TRACK DISP        : YES      NO      0/30000
    ADD OTHER TRCK DISP       : YES      NO      0/40000
    ADD MARK/LINE DISP        : YES      NO      3/30000

 TTL ADD DISP    OWN TRK              : 0      /30000
                 OTHER TRK (CONS)     : 0      /10000
                          (AIS)       : 0      /10000
                          (TT)        : 0      /10000
                          (GPS BUOY)  : 0      /10000
                 MARK/LINE            : 0      /30000

 [MARK SELECT] : PREVIOUS PAGE    [MARK] : NEXT PAGE
 TURN WHEEL : SELECT       PRESS LEFT BUTTON : ENTER
 PRESS RIGHT BUTTON :  CLOSE
```

4. Select [YES], then press the **left button**.
   The current data is displayed on the screen. To cancel the display, select [NO] and press the **left button**.

5. Repeat the step 4 and 5 for other data indication.

6. Close the menu.
   To erase the indication, select [NO] at step 5.

6.2.3 How to playback the internal memory data

You can playback the internal memory data. However, this playback operation deletes the present data on active memory. If you need the present registered data, backup the active memory data to internal memory.

1. Press the **STBY/TX** key to change to st-by mode.
   The following procedures are enable at TX mode.

2. Open the [MAIN MENU].

3. Select [MEMORY REC./PLAY.], then press the **left button**.

4. Select [INT MEMORY PLAYBACK], then press the **left button**.

```
INTERNAL MEMORY PLAYBACK
PLAY OWN TRK          : ADD         NO
PLAY OTHER TRK        : ADD         NO
PLAY MARK/TRACK       : OVERWRITE   ADD    NO
PLAY ROUTE/WPT        : OVERWRITE   NO
UPLOAD SETTING        : OVERWRITE   NO
```

DATA SELECTION			SEL PAGE_		
DATA	OWN TRK	OTR TRK	MARK	WPT	ROUTE
20170112230515	1037	0	0	0	0

```
CURRENT USAGE  OWN TRK                : 1037    /30000
               OTHER TRK (CONS)       : 0       /10000
               OTHER TRK (AIS)        : 32      /10000
               OTHER TRK (TT)         : 16      /10000
               OTHER TRK (GPS BUOY)   : 0       /10000
               MARK/LINE              : 6       /30000


TURN WHEEL : SELECT  PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON :  CLOSE
SELECT THE FILE TO RECORD
```

5. Select an item to playback, then press the **left button**.

6. Select [ADD] or [OVERWRITE], then press the **left button**.
   [ADD]: adds data onto present data.
   [OVERWRITE]: overwrites data onto present data.
   Note: The addition of track has a limit of 30,000 points. If the number of track reaches the limit, the earliest track data is overwritten.

7. Select other items and playback data as same manner on step 5 and 6.

8. Select data number from [DATA SELECTION] list, then press the **left button**.
   The confirmation message appears.

9. Select [RUN], then press the **left button**.
   The progress massage appears.

10. Confirm the message, then press the **left button**.

11. Close the menu.

6.2.4 How to delete the internal memory data

To delete the internal memory data, do the following:

1. Open the [MAIN MENU].

2. Select [MEMORY REC./PLAY.], then press the **left button**.

3. Select [NEXT], then press the **left button**.
   [MEMORY REC/PLAY 2/2] appears.

```
[MEMORY REC./PLAY.  2/2]

1.  BACK
2.  [SAVE BACKUP DATA]
3.  [READING BACKUP DATA]
4.  MANAGEMENT SCREENSHOT
5.  [DELETE INTRNL MEMORY]
6.  [RELAY DATA]
```

4. Select [DELETE INTRNL MEMORY], then press the **left button**.
   [DELETE INTRNL MEMORY] menu appears.

```
[DELETE INTRNL MEMORY]
1.  BACK
2.  DEL. 1 INTRNL MEMORY
3.  DEL. 2 INTRNL MEMORY
4.  DEL. 3 INTRNL MEMORY
5.  DEL. 4 INTRNL MEMORY
6.  DEL. 5 INTRNL MEMORY
7.  DEL. 6 INTRNL MEMORY
8.  DEL. 7 INTRNL MEMORY
9.  DEL. 8 INTRNL MEMORY
10. DEL. 9 INTRNL MEMORY
11. DEL.10 INTRNL MEMORY
```
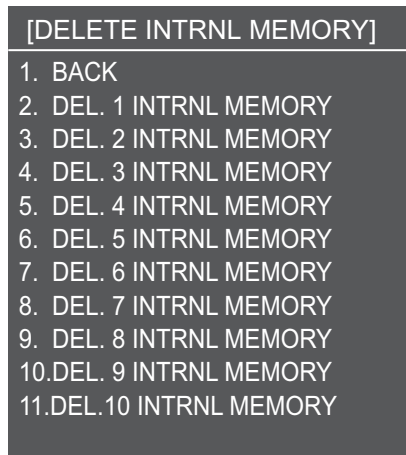
5. Select memory number to delete, then press the **left button**.
   The confirmation message appears.

```
⚠  SELECTED INTERNAL
   MEMORY 1 WILL BE DELETED.
   ARE YOU SURE?
        RUN    CANCEL
```
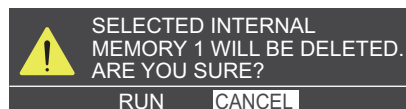
6. Select [RUN], then press the **left button**.
   The progress message appears.

7. Close the menu.

6.3 USB Flash Memory

An USB flash memory allows the backup of your data. Use the USB port on the control unit to save the data.

Note 1: USB 2.0 available.

Note 2: The waterproof rating is reduced while the USB port is used. Do not spray the liquid on the port while the USB flash memory is connected. After operation, remount the waterproofing cap onto the port securely.

6.3.1 How to insert the USB flash memory

1. Remove the cover from the USB port.

USB connector
cover
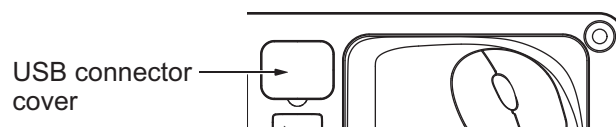
2. Insert the USB flash memory to the USB port.

6.3.2 How to remove the USB flash memory

> ⚠ **CAUTION**
>
> **To remove the USB flash memory, do the following procedure.**
>
> Wrong operation may cause to damage the USB flash memory.

1. Open the [MAIN MENU].
2. Select [MEMORY REC./PLAY.], then press the **left button**.
3. Select [REMOVE USB MEMORY], then press the **left button**.
   The message shows to remove the USB flash memory.
4. Confirm the message, then press the **left button**.
5. Remove the USB flash memory.
6. Remount the cap to the USB port securely.
7. Close the menu.

6.3.3 How to save the data to USB flash memory

The following data is available to save to USB flash memory.

- Current data (own ship's track, other ship's track, mark/track, route/destination, setting status)
- internal memory data (same as above)

1. Insert the USB flash memory to the USB port.
2. Open the [MAIN MENU].
3. Select [MEMORY REC./PLAY.], then press the **left button**.

4. Select [USB MEMORY RECORDING], then press the **left button**.

USB MEMORY RECORDING					
REC OWN TRK	: YES	NO			
REC OTHER TRK	: YES	NO			
RECORD MARK/TRACK	: YES	ADD	NO		
RECORD ROUTE/WPT	: YES	NO			
SEL DATUM	: WGS-84	TOKYO			
DOWNLOAD SETTING	: YES	NO			

DATA SELECTION

DATA	OWN TRK	OTR TRK	MARK	WPT	ROUTE
RUN DATA	2965	154	7	20	4

CURRENT USAGE	OWN TRK	: 2965	/30000
	OTHER TRK (CONS)	: 0	/10000
	OTHER TRK (AIS)	: 89	/10000
	OTHER TRK (TT)	: 65	/10000
	OTHER TRK (GPS BUOY)	: 0	/10000
	MARK/LINE	: 7	/30000

TURN WHEEL : SELECT PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
SELECT THE FILE TO RECORD

5. Select the item to save, then press the **left button**.

6. Select [YES], then press the **left button**.

7. Repeat the step 5 and 6 for other data saving.

8. Select [SEL DATUM], then press the **left button**.

9. Select [WGS-84] or [TOKYO], then press the **left button**.
   In generally, default setting WGS-84 is available.

10. Select the data to save from following;
    [CURRENT DATA]: current memory data.
    [1:XXXXXX] to [0:XXXXXX]: internal memory data.
    (XXXXXX: filename)
    The window to enter the filename appears. The current date is indicated as a file-name.

11. Enter the comment to refer to paragraph 1.8.3. (15 characters max.)
    The following message appears.

    ```
    ⚠  SAVE RUN DATA
       TO USB MEMORY.  OK?

          RUN      CANCEL
    ```

12. Select [RUN], then press the **left button**.
    A message informing you that the save is in progress is displayed, followed by a confirmation that the save process is complete. The save process takes approximately one minute. Larger screenshots may take more time to save.
    Note: Track data is saved in UTC time format.

6.3.4 Reload the data from USB flash memory

To reload the data from USB flash memory to internal memory, do the following procedure.

1. Insert the USB flash memory to the USB port.

2. Press **STBY/TX** key to change to st-by mode.
   Following procedures are not enabled at TX mode.

3. Open the [MAIN MENU].

4. Select [MEMORY REC./PLAY.], then press the **left button**.

5. Select [USB MEMORY PLAYBACK], then press the **left button**.

```
 USB MEMORY PLAYBACK
PLAY OWN TRK        : ADD        NO
PLAY OTHER TRK      : ADD        NO
PLAY MARK/TRACK     : OVERWRITE  ADD      NO
PLAY ROUTE/WPT      : OVERWRITE  NO
SEL DATUM           : WGS-84     TOKYO
UPLOAD SETTING      : OVERWRITE  NO
DATA SELECTION                  SEL PAGE
FILE NAME      OWN TRK  OTR TRK  MARK  WPT  ROUTE
201607231746   5370     0        0     0    0








CURRENT USAGE  OWN TRK              : 1037    /30000
               OTHER TRK (CONS)     : 0       /10000
               OTHER TRK (AIS)      : 32      /10000
               OTHER TRK (TT)       : 16      /10000
               OTHER TRK (GPS BUOY) : 0       /10000
               MARK/LINE            : 6       /30000


TURN WHEEL : SELECT  PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON :  CLOSE
SELECT THE FILE TO RECORD
```

6. Select the item to save, then press the **left button**.

7. Select [ADD] or [OVERWRITE], then press the **left button**.
   [ADD]: adds data onto present data.
   [OVERWRITE]: overwrites ontopresent data.
   Note: The addition of mark/track has a limit of 30,000 points. If the number of mark reaches the limit, the earliest mark data is overwritten.

8. Repeat the step 5 and 6 for other data loading.

9. Select [SEL DATUM], then press the **left button**.

10. Select [WGS-84] or [TOKYO], then press the **left button**.
    In generally, default setting WGS-84 is available.

11. Select the file to load from the data selection list.
    The confirmation message "LOAD FILE. ARE YOU SURE?" appears.

12. Select [RUN], then press the **left button**.
    A message informing you that the load is in progress is displayed, followed by a confirmation that the load process is complete. However the screenshot data is large, it takes more time for storage.

13. Confirm the message, then press the **left button**.

14. Close the menu.

6.3.5 Transfer the data from USB flash memory

The data in USB memory are transfered to internal memory with following procedure.

1. Insert the USB flash memory to the USB port.

2. Open the [MAIN MENU].

3. Select [MEMORY REC./PLAY.], then press the **left button**.

4. Select [TRF USB TO INT. MEMORY], then press the **left button**.

TRF USB TO INTERNAL MEMORY					
REC OWN TRK	: YES		NO		
REC OTHER TRK	: YES		NO		
REC MARK/TRACK	: YES		NO		
REC ROUTE/WPT	: YES		NO		
SEL DATUM	: WGS-84		TOKYO		
DOWNLOAD SETTING	: YES		NO		
DATA SELECTION			SEL PAGE_		
FILE NAME	OWN TRK	OTR TRK	MARK	WPT	ROUTE
201607231746.csv	5370	0	0	0	0

CURRENT USAGE	OWN TRK	: 1037	/30000
	OTHER TRK (CONS)	: 0	/10000
	OTHER TRK (AIS)	: 32	/10000
	OTHER TRK (TT)	: 16	/10000
	OTHER TRK (GPS BUOY)	: 0	/10000
	MARK/LINE	: 6	/30000

TURN WHEEL : SELECT   PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON : CLOSE
SELECT THE FILE TO RECORD

5. Select the item to transfer, then press the **left button**.

6. Select [Yes], then press the **left button**.

7. Repeat the step 4 and 5 for other data transferring.

8. Select [SEL DATUM], then press the **left button**.

9. Select [WGS-84] or [TOKYO], then press the **left button**.
In generally, default setting WGS-84 is available.

10. Select the file to transfer from the data selection list.

11. Enter the comment to refer to page 1-16.
"TRANSFER [XXXXXX.csv] TO INTERNAL MEMORY. ARE YOU SURE?" is appeared. (XXXXXX: filename entered)

12. Select [RUN], then press the **left button**.
A message informing you that the transfer is in progress is displayed, followed by a confirmation that the transfer process is complete.

13. Confirm the message, then press the **left button**.

14. Close the menu.

6.4 Data Backup

This section provides the method for data backup.

6.4.1 Data backup automatically

You can backup the data (own ship's track, other ships' track, mark/line, route/way-points, setting status) automatically when the power is turned on. There are two methods for auto-backup.

• USB flash memory

• Internal memory

Note: The auto-backup function causes the startup procedure to take longer than normal.

How to backup the data periodically

To save the data into the USB flash memory automatically, insert the USB flash memory to the data port before the power is turned on.

1. Open the [MAIN MENU].
2. Select [MEMORY REC./PLAY.], then press the **left button**.
3. Select [AUTO BACKUP], then press the **left button**.
4. Select [USB MEMORY], then press the **left button**.
5. Select [ON], then press the **left button**.
6. Close the menu.
   The data will be registered to USB flash memory when you turn the power is on.

Note: The backup data will be transfered after the instruction message at power on is disappears. The transferring message appears while the backup is in progress.

How to backup the data to internal memory periodically

To save the data into the internal memory when you turn the power on.

1. Open the [MAIN MENU].
2. Select [MEMORY REC./PLAY.], then press the **left button**.
3. Select [AUTO BACKUP], then press the **left button**.
4. Select [INTERNAL MEMORY], then press the **left button**.
5. Select [ON], then press the **left button**.
6. Close the menu.

6.4.2 Data backup manually

There are two methods to manually save the data backup.

• USB flash memory

• Internal memory

How to backup the data to USB memory

1. Insert the USB flash memory to the USB port.

2. Open the [MAIN MENU].

3. Select [MEMORY REC./PLAY.], then press the **left button**.

4. Select [NEXT], then press the **left button**.

5. Select [SAVE BACKUP DATA], then press the **left button**.

6. Select [SAVE TO USB MEMORY], then press the **left button**.

7. Select [RUN], then press the **left button**.

8. Close the menu.

How to backup the data to internal memory

1. Open the [MAIN MENU].

2. Select [MEMORY REC./PLAY.], then press the **left button**.

3. Select [NEXT], then press the **left button**.

4. Select [SAVE BACKUP DATA], then press the **left button**.

5. Select [SAVE TO INT. MEMORY], then press the **left button**.

6. Select [RUN], then press the **left button**.

7. Close the menu.

6.4.3   Load the backup data

There are two methods to read the backup data.

- USB flash memory
- Internal memory

How to load the data from USB flash memory

1. Insert the USB flash memory to the USB port.

2. Press [ST-BY/TX] key to turn the stand-by mode.
   The following procedure is not available in TX mode.

3. Open the [MAIN MENU].

4. Select [MEMORY REC./PLAY.], then press the **left button**.

5. Select [NEXT], then press the **left button**.

6. Select [READING BACKUP DATA], then press the **left button**.

7. Select [READ FROM USB MEMORY], then press the **left button**.

8. Select [RUN], then press the **left button**.
   The confirmation message appears, then the system will be restarted.

How to load the data from internal memory

1. Open the [MAIN MENU].

2. Select [MEMORY REC./PLAY.], then press the **left button**.

3. Select [NEXT], then press the **left button**.

4. Select [READING BACKUP DATA], then press the **left button**.

5. Select [READ FROM INTERNAL MEMORY], then press the **left button**.

6. Select [RUN], then press the **left button**.
   A message appears, then the system restarts.

6.5 Data Reloading

You can load data from other equipment to internal memory in this equipment.

Note: The data transfer should be done by a technician. Contact your local dealer to do this procedure.

1. Insert the USB memory which has the required data to the USB port on control unit.

2. Open the main menu.

3. Select [MEMORY REC./PLAY.], then press the **left button**.

4. Select [NEXT], then press the **left button**.

5. Select [RELAY DATA], then press the **left button**.
   GD-X80 includes GD-280 (BB), GD-380 and GD-680.
   Note: [GD-X80(FLOPPY)] and [GD-188(FLOPPY)] and are unusable.

```
[RELAY DATA]
 1. BACK
 2. GD-X80(CARD)
 3. GD-X80(FLOPPY)
 4. GP-3500
 5. GP-3000 SERIES
 6. GD-500
 7. GD-188(CARD)
 8. GD-188(FLOPPY)
 9. FAR-21x7
```

6. Select the model, then press the **left button**.
   Following figure shows an example for [GD-X80(CARD)].
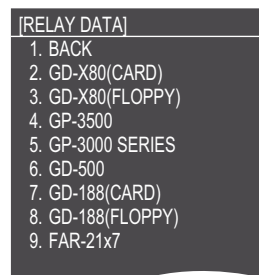
```
GD-X80 (CARD)
REC OWN TRK          : YES      NO
REC OTHER TRK        : YES      NO
REC MARK/TRACK       : YES      NO
REC ROUTE/WPT        : YES      NO
SEL DATUM            : WGS-84   TOKYO
DATA SELECTION                  SEL PAGE
FILE NAME    OWN TRK  OTR TRK  MARK  WPT  ROUTE




CURRENT USAGE  OWN TRK               : 1037    /30000
               OTHER TRK (CONS)      : 0       /10000
               OTHER TRK (AIS)       : 32      /10000
               OTHER TRK (TT)        : 16      /10000
               OTHER TRK (GPS BUOY)  : 0       /10000
               MARK/LINE             : 6       /30000

TURN WHEEL : SELECT  PRESS LEFT BUTTON : ENTER
PRESS RIGHT BUTTON :  CLOSE
SELECT THE FILE TO RECORD
```

7. Select the item preferred, then press the **left button**.

8. Select [YES], then press the **left button**.

9. Repeat step 7 and 8 to load other data.

10. Select [SEL DATUM], then press the **left button**.

11. Select [WGS-84] or [TOKYO], then press the **left button**.

12. Select the file to load, then press the **left button**.

13. Select [RUN], then press the **left button**.
    The confirmation message appears.

14. Close the menu.

6.6   Screenshot

This system has a screen capture function. The screenshot data is saved in the internal memory (100 pictures max.). The captured data should be transfered to an USB flash memory to browse as follows:

1. Press the **CURSOR ON/OFF** key if a cursor is not shown.

2. Move the cursor onto the screenshot icon (📷).

    The screenshot function is activated and the operation guide appears.
    Note: While another function menu is activated, the screenshot is disable. Set up the screenshot function to a function key, then you can use the screenshot while the other function is used. Refer to section 1.13.

3. Press the **left button** to save the screenshot to internal memory.
    The message "SAVED SCREENSHOT" appears.
    Note: Do not operate the keys before the message disappears.

4. Connect a USB flash memory in the USB drive.

5. Move the cursor onto the screenshot icon.

6. Press the **right button** to show the operation menu.

```
SCREENSHOT                          NO.OF SCREENSHOTS  3/100
SELECT FILE                                  SEL PAGE    1/1
2017-10-12_005010009.png
2017-10-12_005006018.png
2017-10-11_005006015.png




TURN WHEEL : SELECT  PRESS RIGHT BUTTON : CLOSE
PRESS LEFT BUTTON :  COPY TO USB MEMORY  [CANSEL]: DELETE
[MARK SELECT]: PREVIOUS PAGE   [MARK]: NEXT PAGE
```

7. Press the **left button** to save the data onto the USB flash memory.
    The message box appears. Select [RUN] to transfer the data to memory.

```
⚠  OVERWRITE CURRENT SCREENSHOT
   DATA TO USB MEMORY.
   ARE YOU SURE?
        RUN    CANCEL
```
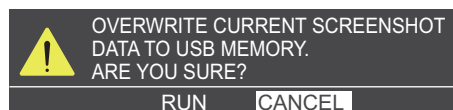
    All data are stored to the folder 'FAR-14x6\screenshot\User' in the USB flash memory.

8. Press the **right button** to close the menu.

9. Remove the USB flash memory.
    Note: Refer to paragraph 6.3.2.

Note: To erase the screenshot data from internal memory, select the files on the list of screenshots and press the **CANCEL** key.

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7. MAINTENANCE, TROUBLE-SHOOTING

Periodic checks and maintenance are important for proper operation of any electronic system. This chapter contains maintenance and troubleshooting instructions to be followed to obtain optimum performance and the longest possible life of the equipment. Before attempting any maintenance or troubleshooting procedure please review the safety information below.

⚠ WARNING

Do not open the equipment.

Hazardous voltage which can cause electrical shock exists inside the equipment. Only qualified personnel should work inside the equipment.

Turn off the radar power switch before servicing the antenna unit. Post a warning sign near the switch indicating it should not be turned on while the antenna unit is being serviced.

Prevent the potential risk of being struck by the rotating antenna.

A transmitting radar antenna emits electromagnetic waves, which can be harmful, particularly to the eyes.

Never look directly into the antenna aperture from a close distance while the radar is in operation, or expose yourself to the transmitting radar at a close distance.

Wear a safety belt and hard hat when working on the antenna unit.

Serious injury or death can result if someone falls from the radar antenna mast.

NOTICE

Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

7.1 Periodic Maintenance Schedule

Regular maintenance is essential to good performance. A regular maintenance program should be established and should at least include the items shown in the table below.

Interval	Check Point	Checks and measures	Remarks
As required	The LCD will in time accumulate a layer of dust which tends to dim the picture	Wipe the LCD carefully to prevent scratching, using tissue paper and an LCD cleaner. To remove stubborn dirt, use an LCD cleaner, wiping slowly with tissue paper so as to dissolve the dirt. Change paper frequently so the dirt will not scratch the LCD.	Do not use chemical-based cleaners to clean the LCD. They can damage the LCD coating.
	Display unit cleanliness	Dust and dirt may be removed with a soft cloth.	Do not use chemical-based cleaners to clean the display unit. They can remove paint and markings.
3 to 6 months	Exposed nuts and bolts and sealant compound on cable gland of antenna unit	- Check for corroded or loosened nuts and bolts. If necessary, clean and repaint them thickly. Replace them if heavily corroded. - Check for cracks and peeling in sealing compound on cable gland.	- Sealing compound can be used instead of paint. Apply a small amount of grease between nuts and bolts for easy removal in future. - Apply sealing compound to minor crack or peeling. If the problem is severe, completely remove sealant then reapply.
	Antenna radiator	Check for dirt and cracks on radiator surface. Thick dirt should be wiped off with soft cloth dampened with fresh water. If a crack is found, apply a slight amount of sealing compound as a temporary remedy, then call for repair.	Do not use chemical-based cleaners for cleaning. They can remove paint and markings. If you need to remove ice from the antenna unit, use a wooden hammer or plastic head hammer. Cracks on the unit may cause water ingress, causing serious damages to internal circuits.
	Terminal strips and plugs in antenna unit (TECHNICIANS only)	Open antenna cover to check terminal strip and plug connections inside. Also check the rubber gasket of antenna covers for deterioration.	When closing antenna covers in position, be careful not to catch loose wires between covers and unit.
6 months to one year	Terminal strips, sockets, earth terminal on display unit (TECHNICIANS only)	Check for loose connections. Check contacts and plugs for proper seating, etc.	The technician should repair the failure.
One year	Antenna scanner Radiator: Do not paint. Scanner unit	Check the scanner unit for rust, corrosion and chipped paint. If the scanner unit has rusted or the paint has chipped, paint the affected area.	Do not paint the antenna radiator. Apply paint only the scanner unit.

7.2   How to Replace the Fuse

A fuse is located on the interface board of the display unit. The fuse protects the equipment from reverse polarity of the ship's mains and equipment fault. If a fuse blows, find the cause before replacing it. Use the correct fuse. Using the wrong fuse will damage the equipment and void the warranty.

⚠ **WARNING**

Use the proper fuse.

Use of the wrong fuse can cause fire or electrical shock.
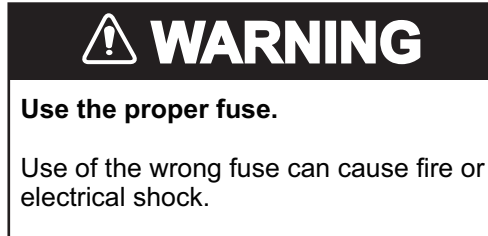
Power	Type	Code No.
24 VDC	FGMB-S 125V 10A PBF	000-157-470-10

7.3   Life Expectancy of Major Parts

This radar has consumable parts, and the table that follows shows the estimated life expectancy for the consumable parts. Life expectancy estimates are based on use under normal conditions. Request a FURUNO agent or dealer to replace the consumable parts, to get the best performance and longest possible life from the equipment.

Part	Type	Use	Life expectancy	Remarks
Antenna motor	RM-8025	for 24 rpm	10,000 hours	
	RM-8711	for 48 rpm		
Magnetron	MAF1565N	for 12 kW	5,000 hours	Check no. of hours used at TX time. Reset time after replacement.
	M1458F	for 25 kW		

Note: The magnetron is a consumable item. The effectiveness of your magnetron will decrease over time, causing lower-than-normal signal strength and loss of echoes. Magnetron should be changed regularly. The table above shows the typical life-span of a magnetron used under normal conditions.

7.4   Trackball Maintenance

If the cursor skips or moves abnormally, clean the trackball using the procedure below.

1. Turn the retaining ring counterclockwise 45° to unlock it.
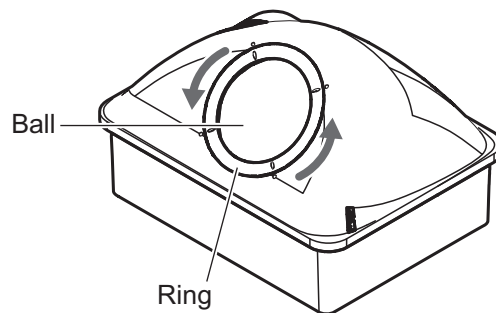
Ball

Ring

2. Remove the retaining ring and ball.

3. Clean the ball with a soft, lint-free cloth, then blow carefully into the ball-cage to dislodge dust and lint.

4. Look for a build-up of dirt on the metal rollers. If dirty, clean the rollers using a cotton swab moistened lightly with isopropyl rubbing alcohol.

5. Make sure that fluff from the swab is not left on the rollers.

Cotton swab

Inner ring unit

Ball bearing

Lens

Inside of ring case
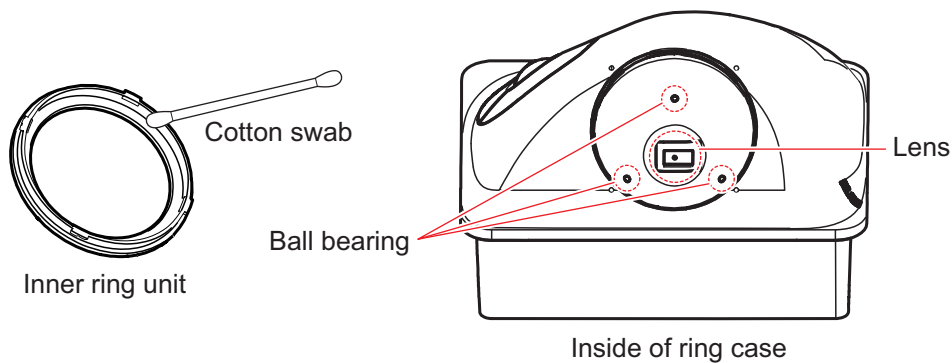
6. Replace the ball and retaining ring. Be sure the retaining ring is not inserted reversely.

7.5   Easy Troubleshooting

This section provides troubleshooting procedures that the user can follow to restore normal operation. If you cannot restore normal operation, do not attempt to check inside any unit. Any repair work is best left to a qualified technician.

Problem	Possible cause	Remedy
Power does not turn on.	The fuse is blown. The power cable is damaged. The battery does not work. The control cable damaged or disconnect.	Replace the fuse. Check the power cable and connection. Check the voltage for source and normalize the cable connection and current. Check the control cable and connection.
Control keys do not work.	Control cable is disconnected.	Confirm the connection of control unit and check the cable for damage. Press the power switch for ten seconds, then press the power switch to reboot the system.
Key beep inaudible.	Key beep turned off.	Adjust key beep level in the [ALERT] menu, referring to section 1.47.
Picture is not updated or freeze. 30 seconds after the picture freezes, the buzzer sounds and alarm signal is output.	Video freeze.	Turn the power off and on again to restore normal operation.
Power is ON but nothing appears on monitor.	Brilliance is too low.	Adjust the brilliance with BRILL knob, referring to section 1.5.
Marks, indications and noise appear but no echo.	Tx high voltage protection circuit has activated.	Reset the power to restore normal operation.
Range changed but radar picture does not change.	Defective range key or video freeze up.	Adjust the range with the control unit, or the [RANGE] box several times. If that does not work try to turn the power off and on again to see if the problem might be video freeze up. If unsuccessful, replacement of control unit may be required.
Only two PI lines when six lines are wanted	Incorrect setting of PI line interval	Adjust PI line interval, referring to paragraph 1.38.2. Also, the setting for number of PI lines to display may be inappropriate. Check the menu setting for number of PI lines, referring to paragraph 1.38.1.
Range rings are not displayed	Range rings are turned off	Try turning on the range rings with [RING RANGE] in the [CURSOR] menu. If they do not appear, their brilliance may be too low. Adjust their brilliance in the [BRILL] menu.
Tracked target not tracked correctly	Poor definition of targets in sea clutter	Adjust A/C SEA and A/C RAIN referring to section 1.19 and section 1.20.
Tuning adjusted but poor sensitivity	Second trace echo rejector on or dirt on radiator face	• Disable the second trace echo rejector, referring to section 1.30. • Clean the radiator face.
Own ship's track does not appear.	The track menu is not set.	Set [OWN TRACK DFISPLAY] to [ON] in the [OWN TRACK SETTINGS] menu. Set [DISP. STOPPED TRACKS] to [ON] in the [TRACK] menu.

Problem	Possible cause	Remedy
The waypoint and route registered are not displayed.	The route menu is not set.	Set [ROUTE SELECT] to [IN] in the [ROUTE/WAYPOINT] menu.
Bearing is not stabilized	Magnetic correction is required.	Set the [MAGNETIC CORRECTION] value of [HEADING SETTING] in the [NAV DATA] menu.
CAN bus data is not received.	Response error	Turn the network equipment on first, and reset the power to recover.

7.6 Advanced-level Troubleshooting

This section describes how to cure hardware and software troubles that should be carried out by qualified service personnel.

Note 1: This radar equipment contains complex modules in which fault diagnosis and repair down to component level are not practicable by users.

Note 2: When replacement of the SPU board is necessary, the previous settings can be transferred to new SPU board as follows:

• Save your settings to a USB memory, referring to paragraph 6.3.3.

• After replacing the SPU board, load the entire contents of the USB memory to the radar, referring to paragraph 6.3.4 for the procedure.

Problem	Possible cause	Remedy
Cannot turn power on.	1) Blown fuse. 2) Mains voltage/polarity. 3) Power supply board. 4) Control unit is disconnected.	1) Replace blown fuse. 2) Correct wiring and input voltage. 3) Replace power supply board. 4) Confirm the control unit connection and control cable.
Brilliance adjusted but no picture.	SPU board	Replace SPU board.
Antenna not rotating.	1) Antenna drive mechanism 2) Defective antenna drive motor relay	1) Replace antenna drive mechanism. 2) Press relay reset button.
Data and marks not displayed in transmit status	SPU board	Replace SPU board.
Adjust GAIN with A/C SEA set at minimum. Marks and indications appear but no noise or echo.	1) IF amplifier 2) Signal cable between antenna and display unit 3) Video amplifier board	1) Replace IF amplifier. 2) Check continuity and isolation of coaxial cable. **Note:** Disconnect the plug and lugs at both ends of coaxial cable before checking it by ohmmeter. 3) Check video coax line for secure connection. If connection is good, replace SPU board.
Marks, indications and noise appear but no echo (transmission leak representing own ship position is absent)	1) TX high voltage protection circuit has activated. 2) Magnetron 3) Modulator board 4) SPU board	1) Reset power to restore normal operation. 2) Check magnetron current. Replace magnetron. 3) Replace modulator board. 4) Replace SPU board.

Problem	Possible cause	Remedy
Picture not updated or picture freeze-up	1) Bearing signal generator board (in antenna unit) 2) SPU board 3) Video freeze-up	1) Check the connection of signal cables. 2) Replace SPU board. 3) Turn the radar off, then on.
Incorrect orientation of picture	1) Terminal board: RFTB/RTB (inside transceiver unit) or FRP_TB board (inside display unit) 2) SPU board	If the message "HEADLINE" appears in orange letters inside the alert box, the heading signal is lost or interrupted. Check the heading line signal cable and terminal board connections. If there is no problem with cables or connections, replace the SPU board.
Cannot operate radar from on-screen boxes	SPU board	Replace SPU board.
Radar is properly tuned but poor sensitivity	1) Deteriorated magnetron 2) Detuned MIC 3) Dirt on radiator face 4) Second trace echo rejection is ON	1) With the radar transmitting on 48 nm range, check magnetron current. If current is below normal, magnetron may be defective. Replace it. 2) Check MIC detecting current. If it is below normal value, MIC may have become detuned. MIC must be tuned. 3) Clean the radiator surface. 4) Disable the second-trace echo rejector referring to section 1.30.
Range changed but radar picture not changing	1) Defective range key 2) SPU board 3) Video freeze up	1) Adjust the range with the control unit, or the [RANGE] box several times. If unsuccessful, replacement of control unit may be required. 2) Replace SPU board. 3) Turn off and on radar.
Interference rejector is inoperative (IR level is not displayed)	SPU board	Replace SPU board.
Echo stretch is ineffective (neither ES1, ES2 nor ES3 is displayed)	SPU board	Replace SPU board.
Range rings are not displayed	1) Adjust the brilliance of range rings on the BRILL menu to see if intensity is increased 2) SPU board	1) Replace associated circuit board if unsuccessful. 2) Replace SPU board.
Poor discrimination in range	Sea clutter control not functioning properly	Improper setting of A/C SEA. If A/C SEA is seen only at very close range, suspect inaccurate frequency of reference oscillator.
True motion orientation not working correctly	1) Incorrect menu setting 2) Speed entry incorrect 3) TM display inaccurate	1) Referring to section 1.12, select TM orientation mode. 2) Enter correct own ship speed referring to section 1.15. 3) Make sure that speed and compass inputs are accurate.
Target not tracked correctly	Poor definition of targets in sea clutter	Adjust A/C SEA and A/C RAIN referring to section 1.19 and section 1.20.
Trackball control unit is not responded	Trackball control unit	Replace trackball control unit.

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Problem	Possible cause	Remedy
Picture is not updated with each sweep.	1) Slots in rotating disc in antenna unit 2) Motor brushes	1) Remove foreign material (carbon, grease, etc.) from slots. 2) Replace motor brushes if they are shorter than 6 - 7 mm.

7.7 Diagnostics

A diagnostic test program is provided to test major circuit boards in the display unit. Note that the normal radar picture is lost during this test.

7.7.1 Radar function test

Proceed as follows to execute the diagnostic test:

1. Open the [MAIN MENU].

2. Select [INITIAL SETTING], then press the **left button**.

3. Select [TEST], then press the **left button**.

4. Select [SELF TEST (RADAR)], then press the **left button**.
   In a few moments the results of the test are displayed. If "NG" (No Good) appears, corresponding components may be defective. Consult your dealer.

XX.XX: Program version number

To stop the test at any time, press the **F1** key several times.

5. Check the keys, knobs and trackball to operate.
   The correct behavior shows the correspondence indicator for controls with cyan color.

6. Press the **F1** key three times to stop the diagnostic test.
   The NMEA1 sentences appears.

7. Press the **F1** key to advance the next port test.

8. Press the **F1** key to stop the test.
   Note: To stop the test, press the **F1** key three times.

7.7.2 Plotter function test

The plotter function test should be done with following procedure.

1. Open the [MAIN MENU].

2. Select [INITIAL SETTING], then press the **left button**.

3. Select [TEST], then press the **left button**.

4. Select [SELF TEST (PLOTTER)], then press the **left button**.
   The test result appears. When the result of NG is shown, contact your local dealer to arrange for service and repair.
   Note: When no device is connected to the external ports, the result is shown as "NG". Further, USB ports are 2.0 format; if a USB 3.0 format device is connected, the results is shown as "NG".

```
SELF TEST (PLOTTER)
Start Time : 2017/--/--  00:00     Total Count : 10
Main                                  Key
 Application          0359394-xx.xx    Bootloader Ver.    0359260-xx.xx
 First Booter         0359391-xx.xx    Apprication Ver.   0359252-xx.xx
 Second Booter        0359392-xx.xx    SELF TEST RESULT   OK (NG : 0)
 Operating System     0359393-xx.xx
 CPU temperature      42.000          Power
 LAN (WIRED)          OK (NG : 0)      Bootloader Ver.    1451469-xx.xx
 CAN                  NG (1)           Apprication Ver.   1451470-xx.xx
 USB1 (RCU)           NG (1)           SELF TEST RESULT   OK (NG : 0)
 USB2                 NG (1)           POWER SOURCE VOL   23.9volt
 USB3                 NG (1)
 INTERNAL MEMORY
 TOTAL LCD RUN HOURS  11h--m--s
 MIPI                 OK (NG : 0)
 MAC                  00:40:9D:8A:FC:30
 CAN ID               C078C800E7E0000
 RUNNING HOURS        0h--m--s
 TRIP DISTANCE        600.00000NM
PRESS RIGHT BUTTON : END TEST AND GO BACK
```

5. Press the **right button** to stop the function test.

7.8 CANbus Monitor

You can check the CANbus data from the CANbus monitor. These data can be saved in the USB flash memory.

1. Open the [MAIN MENU].

2. Select [INITIAL SETTING], then press the **left button**.

3. Select [TEST], then press the **left button**.

4. Select [CANbus MONITOR], then press the **left button**.
   The sentences for NMEA2000 appear.

```
CANbus MONITOR
                    PLAYING            NO USB
RX
20 20 20 20 20 20 20 20 31 FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF 01 01 00 6C 88 00 00 0A 00 FC FF FF
FF E5 13 FF 3C 86 01 00 6C 88 00 00 0A 00 FC 00 00 00 01 C0 01 00
31 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 31 FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF 01 01 6C 88 00 00


TX
00 00 E8 00 00 EA 00 00 EA 00 00 EF 00 00 ED 01 00 EF 01 11 14 F0
01 06 FF 01 07 FF 01 01 00 E8 00 00 EA 00 00 EF 00 00 EF 00 EF 01
F0 01 14 F0 01 12 F1 01 1A F1 01 03 F5 01 01 F8 01 02 F8 01 05 F8
F8 01 08 F9 01 02 FD 01 06 FD 01 06 FD 01 08 FD 01 11 FE 01 12 00
00 E8 00 00 EA 00 00 EE 00 00 EF 00 00 EA 00 00 ED 01 00 00 EF 01




PRESS LEFT BUTTON : RECORD START/STOP
PRESS RIGHT BUTTON : CLOSE
[GO TO] : SWITCH DISPLAY STATE
[WPT] : CANbus CONNECTION DEVICE DISPLAY
```

Go to step 9 when you do not save the log.

5. Insert the USB flash memory to the USB port.
   The indicator changed from "NO USB" to "SAVING st-by".

6. Press the **left button** to start saving the log.
   The indicator changes to "SAVING".

7. Press the **left button** to stop the saving process.

8. Remove the USB flash memory from the port.

9. Press the **GO TO** key to display CANbus connected device informations.
   To change the page, press **MARK SELECT** or **MARK** key.

```
CANbus CONNECTION DEVICE DISPLAY          PAGE _ 1/1
SA  SET  USE  Model ID        Serial Code       LEN
1             SC-60           12345-67890       3
2             SC-30           96765-43210       5




LEN (ALL) : 8
[MARK SELECT] : PREVIOUS PAGE  [MARK] : NEXT PAGE
PRESS LEFT BUTTON : SHOW DETAILS
[GO TO] : SET AS MAIN HEADING SENSOR
```

10. Select a device, then press the **left button**.
    The details for the device selected are shown.

11. To set a device as the main heading sensor, select the device, then press the GO TO key. A ◇ mark appears in the [SET] column for the main sensor. Other sensors which are also used show a ◇ mark in the [USE] column.

12. Press the **right button** to close the menu.

7.9 Operation/ Alert Log

You can check the operation and alert log from the log monitor

1. Open the [MAIN MENU].

2. Select [INITIAL SETTING], then press the **left button**.

3. Select [MAINTENANCE], then press the **left button**.

4. Select [OPERATION/ALERT LOG], then press the **left button**.
   Press [MARK SELECT] or [MARK] button to change the pages.

```
OPERATION/ALERT LOG                   SEL PAGE _ 1/1
NAME      TIME            DETAILS
REC.01    01/01 07:20:49  STARTED SYSTEM
REC.02    01/01 07:23:06  SHUTTING DOWN SYSTEM
REC.01    01/01 02:00:13  STARTED SYSTEM
REC.02    01/01 02:01:02  SHUTTING DOWN SYSTEM
REC.01    01/01 02:00:13  STARTED SYSTEM
REC.02    01/01 02:05:04  SHUTTING DOWN SYSTEM
REC.01    01/01 00:00:00  STARTED SYSTEM




[MARK SELECT] : PREVIOUS PAGE     [MARK] : NEXT PAGE
PRESS RIGHT BUTTON : CLOSE
```

5. Press the **right button** to close the menu.

APPENDIX 1 MENU TREE

MAIN MENU
- **1 ECHO**
- **2 ROUTES/WAYPOINTS**
- **3 OTHER SHIP'S INFO.**
- **4 MARK**
- **5 TRACK**
- **6 MEMORY REC./PLAY. (*1)**
- **7 ALERT SETTINGS**
- **8 CHART**
- **9 CURSOR/OWN SHIP MARK**
- **10 NAV DATA**
- **11 INITIAL SETTING**

Default settings are displayed in **_BOLD ITALIC_** .

*1: This menu item is available when a USB memory is inserted.
When there is no USB memory inserted, this item is not selectable.

1 ECHO
- 1 BACK
- 2 CUSTOMIZE ECHO
  - 1 BACK
  - 2 INT REJECT (OFF, 1, **2**, 3)
  - 3 ECHO STRETCH (**_OFF_**, 1, 2, 3)
  - 4 ECHO AVERAGE (**_OFF_**, 1, 2, 3)
  - 5 ACE (**_OFF_**, ON)
  - 6 TARGET ANALYZER (**_OFF_**, ON)
  - 7 HATCHING (**_OFF_**, ON)
  - 8 NOISE REJECT (**_OFF_**, ON)
  - 9 PULSE
    - 1 BACK
    - 2 1.5NM (**_SHORT_**, MIDDLE)
    - 3 3NM (**_MIDDLE_**, LONG)
    - 4 4NM (MIDDLE, **_LONG_**)
  - 0 NEXT
    - 1 BACK
    - 2 VIDEO CONTRAST TYPE (**_1_**, **_2_**, 3, 4, A, **_B_**, C)
    - 3 CONDITION
      - 1 BACK
      - 2 NEAR STC CURVE (2 to 4.2, **_3_**)
      - 3 STC ANT HEIGHT (5 to 50, **_25_**)
      - 4 LOW LEVEL ECHO (0 to 8, **_0_**)
    - 3 DEFAULT (**_NO_**, SAVE, USER, FACTORY)
- 3 TUNE INITIALIZE
- 4 TRAIL
  - 1 BACK
  - 2 TRAIL MODE (**_REL_**, TRUE)
  - 3 TRAIL GRAD (**_SINGLE_**, MULTI)
  - 4 TRAIL COLOR (GRN, **_BLU_**, CYA, MAG, WHT, YEL)
  - 5 TRAIL LEVEL (1, 2, **_3_**, 4)
  - 6 OS TRAIL (**_OFF_**, 1, 2)
  - 7 NARROW TRAIL (**_OFF_**, 1, 2)
  - 0 NEXT
    - 1 BACK
    - 2 HIDE LAND TRAILS(T) (**_OFF_**, 1, 2)
    - 3 HIDE LAND TRAILS(R) (**_OFF_**, 1, 2)
    - 4 TRAIL LENGTH (**_NORMAL_**, 12H, 24H, 48H)
- 5 2ND ECHO REJ (**_OFF_**, ON)
- 6 SART (**_OFF_**, ON)
- 7 WIPER (**_OFF_**, 1, 2)
- 8 ZOOM (**_OFF_**, 2TIMES, 3TIMES)
- 9 ZOOM DISPLAY (STAB GND, **_STAB HDG_**, STAB NORTH)
- 0 NEXT
  - 1 BACK
  - 2 TRUE VIEW (**_OFF_**, ON)
  - 3 ECHO AREA (**_CIRCLE_**, WIDE, ALL)
  - 4 ACE
    - 1 BACK
    - 2 SIGNAL ENHANCEMENT (1, **_2_**, 3)
    - 3 SUPPRESS SECTOR (START, ANGLE, **_000_**)

(Continued on next page)

(Continued from previous page)
└ 5 CUSTOM SELECT
   ├ 1 BACK
   ├ 2 CUSTOM1 (*OFF*, ON)
   ├ 3 CUSTOM2 (*OFF*, ON)
   ├ 4 CALM SEA (*OFF*, ON)
   ├ 5 RAIN (*OFF*, ON)
   ├ 6 ROUGH SEA (*OFF*, ON)
   ├ 7 NET FLOAT (*OFF*, ON)
   ├ 8 BIRD (*OFF*, ON)
   ├ 9 COAST (*OFF*, ON)
   └ 0 NEXT
      ├ 1 BACK
      ├ 2 OCEAN (*OFF*, ON)
      └ 3 BUOY (*OFF*, ON)

2 ROUTES/WAYPOINTS
├ 1 BACK
├ 2 WAYPOINTS LIST
├ 3 ROUTES LIST
├ 4 WAYPOINT MARK (OFF, *SMALL*, LARGE)
├ 5 WPT NAME DISPLAY (OFF, *SMALL*, LARGE)
├ 6 SET GOTO METHOD (ONE POINT/ *100 POINTS*)
├ 7 WAYPOINT SETTINGS
│   ├ 1 BACK
│   ├ 2 BEARING TO WAYPOINT (*REL*, TRUE)
│   ├ 3 RNG & BRG MODE (GREAT CIR., *MERCATOR*)
│   ├ 4 WPT ARRIVAL TIME (TTG, *ETA*)
│   ├ 5 WPT REFRESH SETTING (WPT ON VERTICAL LINE, *ARRIVE ALERT RANGE*)
│   ├ 6 WAYPOINT OVERWRITE (*CONFIRM*, NO CONFIRM)
│   ├ 7 WPT NAME ZERO DISPLAY (HIDE "0", *ALL "0"*)
│   └ 8 WPT CURSOR INFORMATION (OFF, *ON*)
└ 8 ROUTE SELECT (*IN*, OUT)

3 OTHER SHIP'S INFO.
├ 1 BACK
├ 2 TT LIST
├ 3 AIS LIST
├ 4 CONSORT LIST
├ 5 GPS BUOY LIST
├ 6 TARGET NO (OFF, *SMALL*, LARGE)
├ 7 TT
│   ├ 1 BACK
│   ├ 2 TT SELECT (*MANUAL 50*, MANUAL 25・AUTO 25, AUTO 50)
│   ├ 3 ALL CANCEL (*NO*, YES)
│   ├ 4 TT SYMBOL DISPLAY (OFF, *ON*)
│   ├ 5 TT SYMBOL COLOR (RED, YEL, GRN, CYA, MAG, BLU, *WHT*)
│   ├ 6 TT CUSTOM DISP SETTING
│   └ 7 TT NUMBERING SETUP (*NUMERICAL ORDER*, EARLIEST AVAILABLE)
├ 8 AIS
│   ├ 1 BACK
│   ├ 2 AUTO MESSAGE DISPLAY (OFF, *ON*)
│   ├ 3 RECEIVED MESSAGES
│   ├ 4 AIS SYMBOL DISPLAY (OFF, *ON*)
│   └ 5 AIS SYMBOL COLOR (RED, YEL, *GRN*, SYA, MAG, BLU, WHT)
├ 9 ACQUISITION ZONE
│   ├ 1 BACK
│   ├ 2 AZ STAB (*STAB HDG*, STAB NORTH)
│   └ 3 AZ/ALR SELECT (ACQUISITION ZONE, *TARGET ALARM ZONE*)
└ 0 NEXT
     ├ 1 BACK
     ├ 2 DATABOX EXT DISPLAY (COODINATE, *CPA・TCPA*)
     ├ 3 TARGET CURSOR INFO. (OFF, *ON*)
     ├ 4 CONSORT DISPLAY (OFF, *ON*)
     ├ 5 GPS BUOY DISPLAY (*OFF*, ON)
     └ 6 CONSRT MEG. DISPLAY (*OFF*, ON)

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4 MARK
 ├ 1 BACK
 ├ 2 EDIT MARK
 ├ 3 DELETE MARK
 ├ 4 INPUT MARK
 ├ 5 MARK SIZE (LARGE, ***LARGE DOT***, SMALL)
 ├ 7 ORIGIN MARK (STAB GND., ***STAB SEA***)
 ├ 8 MARK DISPLAY (OFF, ***ON***)
 ├ 9 MARK FILTERS
 │ ├ 1 BACK
 │ ├ 2 FISH TYPE (OFF, ***ON***)
 │ ├ 3 COLOR (OFF, ***ON***)
 │ ├ 4 SHAPE (OFF, ***ON***)
 │ ├ 5 DATE (OFF, ***ON***)
 │ ├ 6 SEABED COMPOSITION(OFF, ***ON***)
 │ ├ 7 WATER TEMPERATURE (OFF, ***ON***)
 │ ├ 8 DEPTH (OFF, ***ON***)
 │ ├ 9 MOON AGE (OFF, ***ON***)
 │ └ 0 NEXT
 │   ├ 1 BACK
 │   ├ 2 TIDE LEVEL (OFF, ***ON***)
 │   ├ 3 CURRENT DIRECTION (OFF, ***ON***)
 │   ├ 4 CURRENT SPEED (OFF, ***ON***)
 │   └ 5 MULTI (OFF, ***ON***)
 └ 0 NEXT
   ├ 1 BACK
   ├ 2 MARK FILTERS (FISH)
   │ ├ 1 BACK
   │ ├ 2 TYPE OF FISH 1 (OFF, ***ON***)
   │ ├ 3 TYPE OF FISH 2 (OFF, ***ON***)
   │ ├ 4 TYPE OF FISH 3 (OFF, ***ON***)
   │ ├ 5 TYPE OF FISH 4 (OFF, ***ON***)
   │ ├ 6 TYPE OF FISH 5 (OFF, ***ON***)
   │ ├ 7 TYPE OF FISH 6 (OFF, ***ON***)
   │ ├ 8 TYPE OF FISH 7 (OFF, ***ON***)
   │ ├ 9 TYPE OF FISH 8 (OFF, ***ON***)
   │ └ 0 NEXT
   │   ├ 1 BACK
   │   ├ 2 TYPE OF FISH 9 (OFF, ***ON***)
   │   └ 3 TYPE OF FISH 10 (OFF, ***ON***)
   ├ 3 MARK FILTERS (DATE)
   │ ├ 1 BACK
   │ ├ 2 START DATE
   │ └ 3 END DATE
   ├ 4 MARK CURSOR INFO (OFF, ***ON***)
   └ 5 MARK COMMENTS DISPLAY (ON CHART, IN POP UP INFO, ***IN INFORMATION***)

APPENDIX 1 MENU TREE

5 TRACK
├ 1 BACK
├ 2 EDIT TRACK
├ 3 DELETE TRACK
├ 4 AUTO COLOR CHANGE (OFF, *ON*)
├ 5 DELETE OTHER TRACK
├ 6 TRACK ROUTE CONVERSION
├ 7 DISP. STOPPED TRACKS (OFF, *ON*)
├ 8 PLOT STOPPED TRACKS (NO TRACK, *DRAW TRACK*)
├ 9 OWN TRACK SETTINGS
│   ├ 1 BACK
│   ├ 2 OWN TRACK DISPLAY (OFF, *ON*)
│   ├ 3 TRACK INTERVAL1 (*TIME* , RANGE)
│   ├ 4 TRACK INTERVAL2 (*TIME* , RANGE)
│   ├ 5 CURRENT VECTOR DISPLAY (*OFF* , ON)
│   ├ 6 TRACK COLOR BY TEMP.
│   │   ├ 1 BACK
│   │   ├ 2 TRACK COLOR BY TEMP.(*RANGE* , EV. 0.2, EV 2.0)
│   │   ├ 3 BLUE (-99.9 to +99.9, *+05.0*)
│   │   ├ 4 MAGENTA (-99.9 to +99.9, *+10.0*)
│   │   ├ 5 CYAN (-99.9 to +99.9, *+12.5*)
│   │   ├ 6 GREEN (-99.9 to +99.9, *+15.0*)
│   │   ├ 7 YELLOW (-99.9 to +99.9, *+17.5*)
│   │   └ 8 RED (-99.9 to +99.9, *+20.0*)
│   ├ 7 TRACK COLOR BY DEPTH
│   │   ├ 1 BACK
│   │   ├ 2 TRACK COLOR BY DEPTH (*RANGE* , EV. 2, EV. 20, EV. 200)
│   │   ├ 3 BLUE (0000.0 to 9999.9, *0010*)
│   │   ├ 4 MAGENTA (0000.0 to 9999.9, *0050*)
│   │   ├ 5 CYAN (0000.0 to 9999.9, *0100*)
│   │   ├ 6 GREEN (0000.0 to 9999.9, *0200*)
│   │   ├ 7 YELLOW (0000.0 to 9999.9, *0300*)
│   │   └ 8 RED (0000.0 to 9999.9, *0400*)
│   └ 8 TIME MARK DISPLAY (OFF, *ON*)
└ 0 NEXT
    ├ 1 BACK
    ├ 2 OTHER TRACK SETTING
    │   ├ 1 BACK
    │   ├ 2 AIS TRACK DISPLAY (*OFF* , ON)
    │   ├ 3 CNSRT TRACK DISPLAY (*OFF* , ON)
    │   ├ 4 TT TRACK DISPLAY (*OFF* , ON)
    │   ├ 5 GPS BOUY TRK DISPLAY (*OFF* , ON)
    │   ├ 6 OTHER TRK REC INTVL. (TIME, *RANGE* , 0010sec, 0.10)
    │   └ 7 OTHER CURR VCT DISP. (*OFF* , ON)
    └ 3 CURRENT VECTOR SETTINGS (1 to 5, 1/2/3 LAYER)

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6 MEMORY REC./PLAY. *

| ├ 1 BACK
| ├ 2 USB MEMORY RECORDING
| │   ├ REC OWN TRK (YES, *NO*)
| │   ├ REC OTHER TRK (YES, *NO*)
| │   ├ RECORD MARK/TRACK (YES, NO)
| │   ├ RECORD ROUTE/WPT (YES, *NO*)
| │   ├ SEL DATUM (*WGS-84* , TOKYO)
| │   └ DOWNLOAD SETTING (YES, *NO*)
| ├ 3 USB MEMORY PLAYBACK
| │   ├ PLAY OWN TRK (ADD, *NO*)
| │   ├ PLAY OTHER TRK (ADD, *NO*)
| │   ├ PLAY MARK/TRACK (OVERWRITE, ADD, NO)
| │   ├ PLAY ROUTE/WPT (OVERWRITE, *NO*)
| │   ├ SEL DATUM (*WGS-84* , TOKYO)
| │   └ OVERWRITE SETTING (OVERWRITE, *NO*)
| ├ 4 INT. MEMORY RECORDING
| │   ├ REC OWN TRK (YES, *NO*)
| │   ├ REC OTHER TRK (YES, *NO*)
| │   ├ RECORD MARK/TRACK (YES, NO)
| │   ├ RECORD ROUTE/WPT (YES, *NO*)
| │   └ DOWNLOAD SETTING (YES, *NO*)
| ├ 5 INT. MEMORY PLAYBACK
| │   ├ PLAY OWN TRK (ADD, *NO*)
| │   ├ PLAY OTHER TRK (ADD, *NO*)
| │   ├ PLAY MARK/TRACK (OVERWRITE, ADD, NO)
| │   ├ PLAY ROUTE/WPT (OVERWRITE, *NO*)
| │   └ OVERWRITE SETTING (OVERWRITE, *NO*)
| ├ 6 TRF USB TO INT. MEMORY
| │   ├ REC OWN TRK (YES, *NO*)
| │   ├ REC OTHER TRK (YES, *NO*)
| │   ├ RECORD MARK/TRACK (YES, NO)
| │   ├ RECORD ROUTE/WPT (YES, *NO*)
| │   ├ SEL DATUM (*WGS-84* , TOKYO)
| │   └ DOWNLOAD SETTING (YES, *NO*)
| ├ 7 DISPLAY INT. MEMORY (INTERNAL MEMORY 1 to 10)
| │   ├ ADD OWN TRACK DISP (YES, *NO*)
| │   ├ ADD OTHER TRK DISP (ADD, *NO*)
| │   └ ADD MARK/LINE DISP (YES, *NO*)
| ├ 8 AUTO BACKUP
| │   ├ 1 BACK
| │   ├ 2 USB MEMORY (*OFF* , ON)
| │   └ 3 INTERNAL MEMORY (*OFF* , ON)
| ├ 9 REMOVE USB MEMORY
| └ 0 NEXT
| ├ 1 BACK
| ├ 2 SAVE BACKUP DATA
| │   ├ 1 BACK
| │   ├ 2 SAVE TO USB MEMORY
| │   └ 3 SAVE TO INT. MEMORY
| ├ 3 READING BACKUP DATA
| │   ├ 1 BACK
| │   ├ 2 READ FROM USB MEMORY
| │   └ 3 READ FROM INT. MEMORY
| ├ 4 MANAGEMENT SCREENSHOT
| ├ 5 DELETE INTNL MEMORY
| │   ├ 1 BACK
| │   └ 2 to 11 DEL. 1(to 10) INTRNL MEMORY
| └ 6 RELAY DATA
| ├ 1 BACK
| ├ 2 GD-X80(CARD)
| ├ 3 GD-X80(FLOPPY)
| ├ 4 GP-3500
| ├ 5 GP-3500 SERIES
| ├ 6 GD-500
| ├ 7 GD-188(CARD)
| ├ 8 GD-1888FLOPPY)
| └ 9 FAR-21x7

> ***:** This menu item is available when a USB memory is inserted.
> When there is no memory inserted, this item is not selectable.

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7 ALERT SETTINGS
  ├ 1 BACK
  ├ 2 ALERT SOUND LEVEL (OFF, *LOW*, MID, HIGH)
  ├ 3 TARGET ALERT
  │   ├ 1 BACK
  │   ├ 2 ALR1 MODE (*IN*, OUT)
  │   ├ 3 ALR2 MODE (*IN*, OUT)
  │   └ 4 ALR LEVEL (1, *2*, 3, 4)
  ├ 4 ARRIVAL/ANCHOR ALERT
  │   ├ 1 BACK
  │   ├ 2 ARRIVAL ALERT(*OFF*, ON)
  │   ├ 3 ANCHOR WATCH ALERT (*OFF*, ON)
  │   ├ 4 ROUTE ALERT SETTING (*OFF*, ON)
  │   ├ 5 XTE/BORDER ALERT (*OFF*, OFF TRACK, XTE)
  │   └ 6 INTRUSION POINT ALERT (OFF, *ON*)
  ├ 5 SPEED/TRIP ALERT
  │   ├ 1 BACK
  │   ├ 2 SHIP SPEED ALERT (OFF, INNER, *OUTSIDE*)
  │   ├ 3 TRIP RANGE ALERT (*OFF*, ON)
  │   └ 4 TRIP RANGE RESET
  ├ 6 TT/AIS ALERT
  │   ├ 1 BACK
  │   ├ 2 TT LOST ALERT (*OFF*, ON)
  │   ├ 3 AIS AUTO ACTIVATION (*OFF*, ON)
  │   ├ 4 IGNORE MOORED SHIPS (*OFF*, ON)
  │   ├ 5 AIS PROXIMITY ALERT (*OFF*, ON)
  │   ├ 6 CPA/TCPA ALERT (*OFF*, ON)
  │   └ 0 NEXT
  │   ├ 1 BACK
  │   └ 2 AIS LOST ALERT (*OFF*, ON)
  └ 7 W-TEMP./TIDE/DEPTH
           ├ 1 BACK
           ├ 2 WATER TEMP. ALERT (*OFF*, INNER, OUTSIDE)
           ├ 3 TIDE ALERT (*OFF*, ON)
           └ 4 DEPTH ALERT (*OFF*, ON)

8 CHART
```
├ 1 BACK
├ 2 CHART SETTING
│       ├ 1 BACK
│       ├ 2 CONTOUR DISPLAY (1 to 17, 17 )
│       ├ 3 TRIMMING BORDER LINE (1 to 17, 8 )
│       ├ 4 BACKGROUND COLOR (1 to 17, 1 )
│       ├ 5 CHAR(IMPORTANT) (OFF, ON )
│       ├ 6 CHAR(OTHER) (OFF, ON )
│       ├ 7 PLACE NAME (OFF, ON )
│       ├ 8 NAV AIDS (OFF, ON )
│       ├ 9 LIGHT BEACON (OFF, ON )
│       └ 0 NEXT
│               ├ 1 BACK
│               ├ 2 BUOY (OFF, ON )
│               ├ 3 DEPTH LINES/CURRENT (OFF, ON )
│               ├ 4 LAND MARKS (OFF, ON )
│               ├ 5 OBSTACLES (OFF, ON )
│               ├ 6 OBST IN SAFE AREA (OFF, ON )
│               ├ 7 FISHING EQUIPMENT (OFF, ON )
│               ├ 8 COMP (OFF, ON )
│               ├ 9 WATER QUALITY (OFF, ON )
│               └ 0 NEXT
│                       ├ 1 BACK
│                       ├ 2 ALARM AREA (OFF, ON )
│                       ├ 3 LIGHT SECTOR (OFF, ON )
│                       ├ 4 MOUNTAINTOP (OFF, ON )
│                       ├ 5 LANDSCAPE (OFF, ON )
│                       ├ 6 FOG SIGNAL (OFF, ON )
│                       ├ 7 SIGNALS (OFF, ON )
│                       ├ 8 SERVICE (OFF, ON )
│                       ├ 9 HARBOR FACILITIES (OFF, ON )
│                       └ 0 NEXT
│                               ├ 1 BACK
│                               ├ 2 SMALL VESSEL SERVICE (OFF, ON )
│                               ├ 3 MARINE FARM (OFF, ON )
│                               └ 4 SOUNDINGS (OFF, ON)
├ 4 BORDER LINE LEVEL (OFF, 1, 2, 3)
├ 5 CHANGE CHARTS (VECTOR, FISHING, C-MAP, NAVIONICS)
├ 6 CHART DISPLAY (OFF, ON )
├ 7 LAT./LON. GRID (OFF, RED, YEL, GRN, SYA, MAG, BLU, WHT)
└ 8 DEPTH LINE FINE RANGE
```

9 CURSOR/OWN SHIP MARK
├ 1 BACK
├ 2 CURSOR
│   ├ 1 BACK
│   ├ 2 CURSOR BEARING (***REL*** , TRUE)
│   ├ 3 CURSOR RANGE (***NM*** , km, SM)
│   ├ 4 CURSOR SIZE (***SMALL*** , LARGE)
│   └ 5 CURSOR COLOR (RED, GRN, BLU, YEL, CYA, MAG, ***WHT***)
├ 3 EBL/VRM
│   ├ 1 BACK
│   ├ 2 EBL1 (***REL*** , TRUE)
│   ├ 3 EBL2 (***REL*** , TRUE)
│   ├ 4 VRM1 (***NM*** , km, SM)
│   ├ 5 VRM2 (***NM*** , km, SM)
│   ├ 6 EBL OFFSET BASE (***STAB GND*** , STAB HDG, STAB NORTH)
│   ├ 7 VRM TTG (***OFF***, 1, 2, 1+2)
│   └ 8 VRM OFFSET (OFF, ***LINK EBL***)
├ 4 PI LINE
│   ├ 1 BACK
│   ├ 2 PI LINE NUMBER (1, 2, 3, 6)
│   ├ 3 PI LINE MODE (***HORI***., VERT., BOTH)
│   └ 4 PI LINE RESET
├ 5 NET CURSOR
│   ├ 1 BACK
│   ├ 2 NET CURSOR DISPLAY (***OFF***, ON)
│   ├ 3 FRONT HALF LENGTH (0.0 to 3000.0m, ***0m***)
│   ├ 4 REAR HALF LENGTH (0.0 to 3000.0m, ***0m***)
│   ├ 5 NET WIDTH (0.0 to 3000.0m, ***0m***)
│   └ 6 ROTATE STEP (360 deg, 32 POINTS)
├ 6 BEARING CURSOR (360°, 16 POINTS)
├ 7 RANGE RING (OFF, STD., ***MANUAL***)
├ 8 OWN MARK
│   ├ 1 BACK
│   ├ 2 OWN SHIP MARK DISPLAY (OFF, ***MIN*** , SCALED)
│   ├ 3 STERN MARK (***OFF*** , ON)
│   ├ 4 OWN SHIP VECTOR (OFF, ***HDG.*** , COURSE)
│   ├ 5 OWN SHIP CURR VECTOR (OFF, ***ON***)
│   ├ 6 PLOTTER OWN SHIP MARK (OFF, ***ON***)
│   └ 7 PLOTTER HEADING LINE (OFF, ***ON***)
└ 9 BARGE MARK
    ├ 1 BACK
    ├ 2 BARGE MARK (***OFF*** , ON)
    ├ 3 BARGE SIZE (LENGTH, WIDTH)
    └ 4 ARRANGEMENT

10 NAV DATA
```
├ 1 BACK
├ 2 DATA BOX 1 (OFF, ON )
├ 3 DATA BOX 2 (OFF, ON )
├ 4 DATA BAX 3 (OFF, ON )
├ 5 NAV DATA SETTING
│        ├ 1 BACK
│        ├ 2 DEPTH UNIT (m , ft, fa, HIRO)
│        ├ 3 WIND UNIT (kn , m, s)
│        ├ 4 WIND STAB MODE (REL , NORTH, TRUE)
│        ├ 5 BEARING UNIT (TRUE , MAGNETIC)
│        ├ 6 TEMPERATURE UNIT (°C , °F)
│        ├ 7 COORD DISPLAY (LL , FISH GRID, LORAN A/ LORAN C/ DECCA)
│        └ 0 NEXT
│                 ├ 1 BACK
│                 ├ 2 DISP DATUM (WGS-84 , TOKYO)
│                 ├ 3 DATE (YYYY/MM/DD , YYYY/MMM/DD, MMM/DD/YYYY)
│                 └ 4 TIME (12 HOUR, 24 HOUR )
├ 6 HEADING SETTINGS
│        ├ 1 BACK
│        ├ 2 HEADING SOURCE (AD-10, SERIAL )
│        └ 3 MAGNETIC CORRECTION (AUTO , MANUAL)
├ 7 SHIP SPEED SETTING
│        ├ 1 BACK
│        ├ 2 SHIP SPEED (LOG(BT), LOG(WT), GPS )
│        └ 3 SET DRIFT (OFF , ON)
├ 8 LOCAL TIME SETTING
│        ├ 1 BACK
│        ├ 2 DATE-TIME (UTC, LOCAL )
│        └ 3 LOCAL TIME ADJUST (-12:00 to +14:00, 0:00 )
├ 9 HIRO SETTING
│        ├ 1 BACK
│        └ 2 HIRO SETTING
└ 0 NEXT
         ├ 1 BACK
         └ 2 LORAN/DECCA SETTINGS
```

11 INITIAL SETTING
```
├ 1 BACK
├ 2 BRILL SETTING
│        ├ 1 BACK
│        ├ 2 INITIAL SETTING READ (DAY , DUSK, NIGHT)
│        ├ 3 ECHO COLOR (YEL , GRN, WHT, AMB, M-GRN, M-CYA)
│        ├ 4 CHARACTOR COLOR (GRN, WHT1 , WHT2, ORG, RED)
│        ├ 5 RADAR BACKGROUND COLOR (BLK , BLU1, BLU2)
│        ├ 6 CONTROL PANEL
│        ├ 7 CHARACTER
│        ├ 8 CURSOR
│        ├ 9 ECHO
│        └ 0.NEXT
│                 ├ 1 BACK
│                 ├ 2 TRAIL
│                 ├ 3 HEADING LINE
│                 ├ 4 RING
│                 ├ 5 BEARING CURSOR
│                 ├ 6 EBL
│                 ├ 7 VRM
│                 ├ 8 PI LINE
│                 ├ 9 TARGET
│                 └ 0 NEXT
│                          ├ 1 BACK
│                          ├ 2 L/L GRID
│                          ├ 3 MARK
│                          ├ 4 CHART
│                          └ 5 DEPTH LINE
```

(Continued from previous page)
```
├ 3 OPERATION SETTING
│       ├ 1 BACK
│       ├ 2 WHEEL DRIVE (NORMAL, REVERSE)
│       ├ 3 KEY BEEP (OFF, LOW, MID, HIGH)
│       ├ 4 STERN UP RM (OFF, ON)
│       └ 5 GUIDANCE (OFF, ON)
├ 4 FUNCTION KEY
│       ├ 1 BACK
│       ├ 2 [F1]
│       │       ├ 1 BACK
│       │       ├ 2 ECHO
│       │       │     CUSTOM-MENU, AUTO-RAIN, AUTO-SEA, IR/ES, EAV, TARGET ANALYSER
│       │       │     HATCHING, NOISE REJ, VIDEO CNT, PULSE, NEAR STC CURVE,
│       │       │     LOW LEVEL ECHO/ACE, ACE HIGH SENSITIVITY, TUNE INITIALIZE
│       │       │     2ND ECHO REJ, SART, WIPER, ZOOM
│       │       ├ 3 TARGET
│       │       │     TT LIST, AIS LIST, CONSORT LIST, GPS BUOY LIST, AIS TRACK DISPLAY,
│       │       │     CONSORT TRACK DISP, TT TRACK DISPLAY, GPS BUOY TRACK DISPLAY,
│       │       │     TARGET TRACK DELETE, RECEIVED MESSAGES
│       │       ├ 4 PLOTTER
│       │       │     WAYPOINT LIST, ROUTES LIST, WAYPOINT MARK, SET GOTO METHOD,
│       │       │     CHART DISPLAY, WPT ARRIVAL TIME, MARK SIZE, EDIT MARK, CHART ALIGN
│       │       │     MOB, OWN TRACK DISPLAY, DELETE,TRACK, EDIT TRACK,
│       │       │     TRK ROUTE CONVERSION, TLL, NAV AIDS
│       │       ├ 5 OPERATION
│       │       │     USB MEOMORY REC./PLAY, ORIENTATION MODE, VECTOR MODE, TRAIL TIME
│       │       │     TRAIL MODE, ALERM1, ALERM2, ECHO COLOR, BRILL, CU-TM RESET,
│       │       │     DATA BOX1/2/3, SCREENSHOT
│       │       └ 6 CUSTOM SELECT
│       │             CUSTOM1/2, CALM SEA, RAIN, ROUGH SEA, NET FLOAT, BIRD, COAST,
│       │             OCEAN, BUOY
│       ├ 3 [F2] (Same as F1)
│       ├ 4 [F3] (Same as F1)
│       ├ 5 [F4] (Same as F1)
│       ├ 6 [MCU-003(A)] This unit is not used. The memu lists for detail are omitted.
│       │       ├ 1 BACK
│       │       ├ 2 ECHO
│       │       ├ 3 TARGET
│       │       ├ 4 PLOTTER
│       │       ├ 5 OPERATION
│       │       ├ 6 CUSTOM SELECT
│       │       └ 7 STD KEY
│       ├ 7 [MCU-003(B)] (Same as MCU-003(A))
│       └ 8 FUNCTION OPERATION (SINGLE, MULTI)
├ 5 TEST
│       ├ 1 BACK
│       ├ 2 SELF TEST (RADAR)
│       ├ 3 SELFTEST (PLOTTER)
│       ├ 4 CANbus MONITOR
│       └ 5 TT SIMULATION MODE
├ 7 PASSWORD
│       ├ 1 BACK
│       ├ 2 SET PASSWORD
│       └ 3 DISABLE PASSWORD
└ 8 MAINTENANCE
        ├ 1 BACK
        ├ 2 UPDATE SOFTWARE
        │       ├ 1 BACK
        │       ├ 2 RADAR
        │       ├ 3 PLOTTER
        │       ├ 4 CHART SYMBOLS
        │       └ 5 POWER SUPPLY UNIT
        ├ 3 UPDATE CHART
        └ 4 OPERATION/ALERT LOG
```

BOX MENU

CUSTOM ECHO MENU   (Refer to page AP-1)
└ Same as [2 CUSTOMIZE ECHO] selection in the [ECHO 1/2] menu.

WAYPOINT MENU   (Refer to page AP-2)
└ Same as [ROUTE/WAYPOINT] selection in the Main menu.

MARK MENU   (Refer to page AP-3)
└ Same as [MARK] selection in the Main menu.

SCREENSHOT MENU   (Refer to page AP-5)
└ Same as [SCREENSHOT] selection in the [MEMORY REC./PLY.] menu.

BRILL MENU   (Refer to page AP-9)
└ Same as [2 BRILL SETTING] selection in the [INITIAL SETTING] menu.

TRAIL MENU   (Refer to page AP-1)
└ Same as [4 TRAIL] selection in the [ECHO 1/2] menu.

APPENDIX 2 LONGITUDE ERROR

The longitude lines concentrate on the north pole and south pole, namely, 1 NM is equivalent to 1 minute at 0 degree latitude, 2 minutes at 60 degrees latitude, 3 minutes at 70 degrees latitude and so on. For this reason, a longitude error occurs on the radar display.

For example, when own ship is at 60°N and 135°E, even if the cursor indication is 62°N and 139°E, the real cursor position is deviated to the left (west) side. The table below shows the longitude error, represented from 0° to 90° at 96 NM from the radar center (own ship).

(NM)
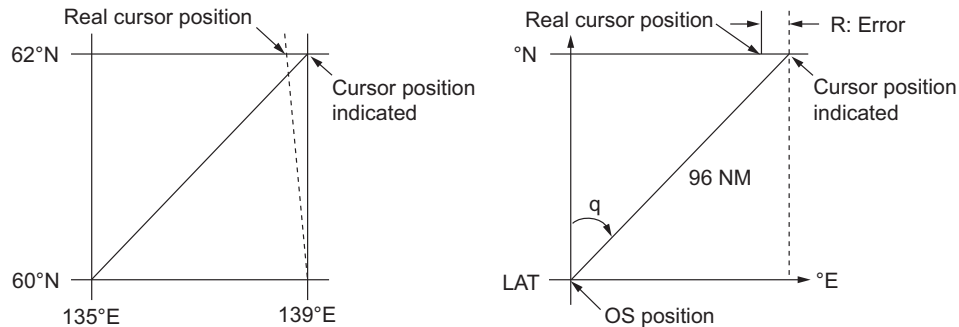
q / LAT	5°	10°	15°	20°	25°	30°	35°	40°	45°
75°	0.2256	0.4444	0.6496	0.8350	0.9950	1.1248	1.2202	1.2786	1.2980
70°	0.21980213	0.43290201	0.632803	0.8134132	0.96923215	1.09551918	1.1884382	1.24517456	1.26402037
65°	0.21229339	0.41810678	0.61115946	0.78556318	0.93600295	1.05790007	1.14755221	1.20224625	1.22034042
60°	0.20316898	0.40012949	0.58486463	0.75173456	0.89565021	1.0122297	1.09793265	1.15016811	1.16737294
55°	0.19249832	0.37910698	0.55411863	0.71218478	0.84848102	0.95885565	1.03998717	1.08933651	1.10552105
50°	0.18036264	0.35519924	0.51915545	0.66721485	0.79485438	0.89818413	0.97406698	1.02021439	1.03525547
45°	0.16685429	0.32858822	0.48024119	0.61716701	0.73517843	0.83067689	0.90076355	0.94332783	0.95711098
40°	0.15207608	0.29947644	0.437672	0.56242216	0.66990732	0.7568477	0.82060477	0.85926197	0.87168229
35°	0.13614047	0.26808546	0.39177186	0.53339693	0.59953781	0.67725844	0.73420069	0.76865661	0.77961957
30°	0.11916876	0.2346542	0.3428901	0.44054055	0.52460545	0.59251483	0.6422089	0.67220131	0.68162348
25°	0.10129001	0.19943707	0.29139874	0.37433139	0.44568053	0.50326182	0.54532952	0.57063015	0.57843983
20°	0.08264056	0.16270211	0.23768966	0.30527334	0.36336372	0.41017869	0.44429984	0.46471615	0.47085389
15°	0.06336208	0.12472888	0.18217162	0.23389198	0.27828148	0.31397386	0.33988878	0.35526538	0.35968447
10°	0.04360137	0.0858064	0.12526714	0.16073056	0.19108136	0.21537949	0.23289096	0.24311083	0.24577764
5°	0.02350833	0.04623087	0.0674093	0.08634588	0.10242699	0.11514595	0.1241207	0.12910605	0.13000029
0°	0.00323737	0.0063035	0.00903844	0.01130406	0.01299309	0.01403609	0.0144058	0.0141187	0.01323356

(NM)

q / LAT	50°	55°	60°	65°	70°	75°	80°	85°	90°
75°	1.2780	1.2192	1.1233	0.9933	0.8332	0.6479	0.4431	0.2249	0
70°	1.24442563	1.18701379	1.09356117	0.96694117	0.81103484	0.3061092	0.43117887	0.21881975	0
65°	1.20131324	1.14577786	1.05546143	0.93315023	0.78260251	0.60843159	0.41596331	0.21107193	0
60°	1.14905813	1.09582188	1.00932899	0.89225746	0.74821409	0.58162173	0.397582	0.20171772	0
55°	1.08805799	1.03752602	0.95551494	0.84457408	0.70813132	0.55038538	0.37617487	0.19082831	0
50°	1.0187708	0.97133397	0.89442885	0.79046297	0.66265924	0.51496026	0.35190481	0.17848659	0
45°	0.94174265	0.89774948	0.82653562	0.73033596	0.61214392	0.47561599	0.32495654	0.16478648	0
40°	0.85754099	0.81733258	0.75235195	0.66465066	0.55696981	0.43265198	0.29553516	0.14983224	0
35°	0.76681293	0.73069528	0.63744242	0.59390696	0.49755683	0.38639524	0.26386458	0.13373769	0
30°	0.67024897	0.63849695	0.58741521	0.51864327	0.43435714	0.33719779	0.23018583	0.11662531	0
25°	0.568584	0.54143927	0.49791741	0.43943239	0.36785173	0.28543407	0.19475522	0.09862535	0
20°	0.46259176	0.44026091	0.40463016	0.35687717	0.29854675	0.23149802	0.15784242	0.07987479	0
15°	0.35307892	0.3357319	0.30826343	0.2716059	0.22696965	0.17580013	0.11972833	0.06051633	0
10°	0.2487894	0.22864776	0.20955062	0.18426754	0.15366517	0.1187643	0.08070304	0.0406973	0
5°	0.12684572	0.11982348	0.10624302	0.09552679	0.0791912	0.04106355	0.04106355	0.02056855	0
0°	0.01184713	0.01008727	0.008104	0.00605903	0.00411455	0.00111154	0.00111154	0.00028325	0

APPENDIX 3 ALERT LIST

This radar can output alerts in following format.

Alert mode	Alert message	Priority & Category	Explanation
SYSTEM ERROR	TRIGGER	Warning Cat: B	Output trigger interrupted/lost. Confirm the signal input.
SYSTEM ERROR	VIDEO	Warning Cat: B	Video signal interrupted/lost. Confirm the signal input.
SYSTEM ERROR	AZIMUTH	Warning Cat: B	Azimuth signal is interrupted/lost. Confirm the Gyrocompass connection.
SYSTEM ERROR	HEADLINE	Warning Cat: B	Heading signal interrupted/lost. Confirm the Gyrocompass connection.
SYSTEM ERROR	GYRO	Warning Cat: B	No heading information received from gyro-compass for five seconds.
SYSTEM ERROR	LOG(WT)	Warning Cat: B	No speed data received for five seconds when [LOG(WT)] is set as speed reference. Confirm the network with SDME.
SYSTEM ERROR	LOG(BT)	Warning Cat: B	No speed data received for thirty seconds when [LOG(BT)] is set as speed reference. Confirm the network with SDME.
SYSTEM ERROR	EPFS	Warning Cat: B	EPFS Error. No speed or position data received from EPFS device for thirty seconds. Confirm the network with GPS.
SYSTEM ERROR	CHART MEMORY ERROR	Warning Cat B	Chart card is not inserted correctry. Reboot the system.
NEW TARGET	TT NEW TARGET	Warning Cat: A	A new TT target has entered the Acquisition Zone.
LOST TARGET	TT LOST	Warning Cat: A	TT target is lost. Confirm the lost target.
LOST TARGET	AIS LOST	Warning Cat: A	AIS target is lost.
TARGET Capacity	TT TGT FULL(AUTO)	Warning Cat: A	Automatically acquired target capacity has reached 100%. Release some low priority targets.
TARGET Capacity	TT TGT FULL(MAN)	Warning Cat: A	Manually acquired target capacity has reached 100%. Release some low priority targets.
TARGET Capacity	TT TGT 95%(AUTO)	Caution Cat: A	Automatically acquired target capacity has reached 95%. Release some low priority targets.
TARGET Capacity	TT TGT 95% (MAN)	Caution Cat: A	Manually acquired target capacity has reached 95%. Release some low priority targets.
AIS Alert	AIS MESSAGE RECEIVE	-	AIS data received.
AIS Alert	AIS ACCESS	Warning Cat: B	A new AIS target has entered the Acquisition Zone. Avoid collision. Set the AIS access alert, if required.
ARRIVAL	DESTINATION ARRIVAL	Warning Cat: B	Ship has entered the destination arrival alert zone.

Alert mode	Alert message	Priority & Category	Explanation
LEAVE	DESTINATION LEAVE	Warning Cat. B	Ship has left the leaving alert zone. Steer to go back the zone.
XTE	CROSS TRACK ERROR	Warning Cat: B	Cross-track error, ship is off-course. Keep the own ship's course.
Intrusion	INTRUSION BAN	Warning Cat. B	Ship has approached a target ban. Confirm the target.
SPEED	SPEED ALERT	Warning Cat. B	Ship's speed has exceed/fall short of the set threshold. Adjust ship's speed if required.
TRIP	TRIP ALERT	Warning Cat. B	Trip distance has exceed the setting range. Change the setting range if required.
CPA/ TCPA	COLLISION	Alarm Cat: A	TT or AIS target is within CPA/TCPA threshold, danger of collision. Avoid collision. Adjust CPA/TCPA if required.
Temperature	WATER TEMPERATURE	Alarm Cat: B	Ship has entered within (or left outside of) water temperature setting area.
Current	CURRENT RIP	Warning Cat. B	Water temperature has changed over the setting time/range.
DEPTH	DEPTH ALERT	Warning Cat: B	Depth has shortened of set threshold. Prevent to run aground.

APPENDIX 4 ABBREVIATIONS

A:

Abbreviation	Word	Abbreviation	Word
ACK	Acknowledge	ACQ	Acquire
Act	Activate	ACE	Automatic Clutter Elimination
ANT	Antenna	AIS	Automatic Identification System
AP	Autopilot	ATON	Aids to Navigation
AUTO	Automatic	A/C RAIN	Anti Clutter Rain
A/C SEA	Anti Clutter Sea	AID	Aid
ALF	ALF sentence	ALR	Alarm
AMB	Amber	AMS	Alert Management System
APR	April	AUG	August

B:

Abbreviation	Word	Abbreviation	Word
BLU	Blue	BCR	Bow Crossing Range
BCT	Bow Crossing Time	BRG	Bearing
BRILL	Brilliance	BT	Bottom Tracking

C:

Abbreviation	Word	Abbreviation	Word
CALC	Calculated	CALIB	Calibrate
Ch	Channel	CHG	Change
CCRP	Consistent Common Reference Point	CCRS	Consistent Common Reference System
CPA	Closest Point of Approach	CONT	Continue
CDROM	Compact Disc Read Only Memory	CORR	Corrected/Correction
CRS	Course	CTW	Course Through the Water
COG	Course Over Ground	CU	Course Up
CURS	Cursor	CYA	Cyan

D:

Abbreviation	Word	Abbreviation	Word
DTM	Datum	DEC	December
deg	degree(s)	DEST	Destination
DGPS	Differential GPS	Diff	Differential
DIST	Distance	DISP	Display
DR	Dead Reckoning		

E:

Abbreviation	Word	Abbreviation	Word
E	East	EAV	Echo Averaging
EBL	Electronic Bearing Line	ECDIS	Electronic Chart Display and Information System
ENC	Electronic Navigational Chart	EP	Estimated Position
EQUIP	Equipment	ERR	Error
ES	Echo Stretch	ES	Echo Stretch
ETD	Estimated Time of Departure	EXT	External

F:

Abbreviation	Word	Abbreviation	Word
FEB	February	FILT	Filter/Filtered
FUNC	Function		

G:

Abbreviation	Word	Abbreviation	Word
GAP	Gap	GC	Great Circle
GND	Ground	GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System	GRAD	Gradation
GRN	Green	GRY	Gray
GT	Gross Tonnage		

H:

Abbreviation	Word	Abbreviation	Word
HD	Heading	HDG	Heading
HL	Heading Line	HSC	High Speed Craft

I:

Abbreviation	Word	Abbreviation	Word
IBS	Integrated Bridge System	ID	Identification
IMO	International Maritime Organization	INFO	Information
INS	Integrated Navigation System	IP ADDRESS	Internet Protocol Address
IR	Interference Rejection		

J:

Abbreviation	Word	Abbreviation	Word
JAN	January	JUN	June
JUL	July		

L:

Abbreviation	Word	Abbreviation	Word
L	Long pulse	LAT	Latitude
LAN	Local Area Network	LCD	Liquid Crystal Display
LIM	Limit	L/L	Latitude/Longitude
LOG	Log	LON	Longitude
LOP	Line Of Position		

M:

Abbreviation	Word	Abbreviation	Word
MAG	Magnetic	MAG	Magenta
MAN	Manual	MAR	March
MAX	Maximum	MAY	May
MBS	Main Bang Suppression	M-CYA	Multi Cyan
MFDF	Medium Frequency Direction Finder	MENU	Menu
M-GRN	Multi Green	MIC	Monolithic Integrated Circuit
MID	Middle	M1/M2/M3	Medium pulse 1/2/3
MOB	Man Over Board	MON	Monday
Msgs	Messages	MSC	Maritime Safety Committee

N:

Abbreviation	Word	Abbreviation	Word
N	North	NAV	Navigation
NLT	Not Less Than	NMT	Not More Than
NOV	November	NR	Noise Rejector

O:

Abbreviation	Word	Abbreviation	Word
OS	Own Ship	OCT	October

P:

Abbreviation	Word	Abbreviation	Word
PAST POSN	Past Positions	PC	Personal Computer
PI	Parallel Index Line	PM	Performance Monitor
PNK	Pink	POSN	Position
PPI	Plan Position Indicator		

R:

Abbreviation	Word	Abbreviation	Word
RACON	Radar beacon	RAD	Radius
RAM	Random Access Memory	RAIN	Anti Clutter Rain
RD	Read	RED	Red
REF	Reference/Echo Reference	R, REL	Relative
REJ	Rejection	RENC	Regional ENC Co-ordinating Centre
RFC board	RF Control board	RL	Rhumb Line
RM	Relative Motion	RNG	Range
ROM	Read Only Memory	ROT	Rate Of Turn
RTE	Route	RTGT	Reference Target
RX	Receive		

S:

Abbreviation	Word	Abbreviation	Word
S	South	S1/S2	Short pulse1/2
SAR	Search and Rescue	SART	Search and Rescue Transponder
SD	Secure Digital	SEA	Anti Clutter Sea
SEL	Select	SENC	System ENC
SEP	September	SIO	Serial Input Output
SOG	Speed Over Ground	SOLAS	Safety of Life at Sea
SPD	Speed	SPU	Signal Processing Unit board
STAB	Stabilized	STBD	Starboard
STBY	Standby	STC	Sensitivity time control
Std	Standard	STW	Speed Through Water
SW	Switch	SYM	Symbol (s)

T:

Abbreviation	Word	Abbreviation	Word
T	True	TAG	Tag
TCPA	Time to CPA	TGT	Target
TM	True Motion	TPL	Transferred Line Of Position
True-G	True ground stabilized	True-S	True sea stabilized
TT	Target Tracking/Tracked Target	TTG	Time To Go
TX	Transmit		

U:

Abbreviation	Word	Abbreviation	Word
UNCAL	Uncalibrated	UTC	Coordinated Universal Time

V:

Abbreviation	Word	Abbreviation	Word
VECT	Vector	VRM	Variable Range Marker

W:

Abbreviation	Word	Abbreviation	Word
W	West	WAT	Water
WGS	World Geodetic System	WHT	White
W/O	Without	WOP	Wheel Over Point
WP	Waypoint	WPT	Waypoint
WR	Write	WT	Water Tracking
WTC	Water Tracking Current		

X:

Abbreviation	Word
XTE	Cross Track Error

Y:

Abbreviation	Word
YEL	Yellow

AP-18

Units of measurement

Abbreviation	Word	Abbreviation	Word
deg	Degree(s)	ft	Foot/feet
H	Hour(s)	km	Kilometer(s)
KM	Kilometer(s)	kn	Knot(s)
KYD	Kiloyard(s)	min	Minute(s)
m	Meter(s)	MHz	Megahertz
NM	Nautical miles	sec	Second(s)
SM	Statute mile(s)	°	Degree(s)

APPENDIX 5 SYMBOLS/ ICONS

The pages following list the symbols or icons which can be displayed on your radar.

General radar symbols

Symbol/ Icon	Meaning
● ◎	Own Ship Marker
◇ ☐	Other Ship's Symbol Left: Friend Ship, Right: Buoy
◎	MOB Mark
◢ ◿ ◿	Chart Status Left: Chart scale displayed correctly, Center: Chart scale displayed incorrectly, Right: There is no chart file
H	Own ship's track plotting suspended.
↺1 ↺2	Trip intreval
L/L	Position adjustment
SA/VE	Route recording
💾	Editing icon: appears while custum setting is edited.

SPECIFICATIONS OF MARINE RADAR
FAR-1416/1426

1 ANTENNA UNIT

1.1	Antenna type	Slotted waveguide array
1.2	Radiator length	4 ft (XN12A), 6 ft (XN13A)
1.3	Horizontal beamwidth	1.9° (XN12A), 1.35° (XN13A)
1.4	Vertical beamwidth	22°
1.5	Sidelobe attenuation	
	XN12A	-24 dB (within ±10° of main-lobe)
	XN13A	-28 dB (within ±10° of main-lobe)
1.6	Polarization	Horizontal
1.7	Rotation	24 rpm (RSB-0070), 48 rpm (RSB-0073)

2 RF TRANSCEIVER

2.1	Frequency	9410 MHz ±30 MHz, P0N
2.2	Output power	
	FAR-1416	12 kW
	FAR-1426	25 kW
2.3	Minimum range	25 m
2.4	Maximum range	FAR-1416: 72 NM, FAR-1426: 96 NM
2.5	Range discrimination	25 m
2.6	Range accuracy	1 % of range in use or 10 m whichever is the greater
2.7	Bearing accuracy	Within ±1°

2.8 Range, Pulselength and Pulse Repetition Rate

PRR (Hz approx.)	Range scale (NM)																	
	0.125	0.25	0.5	0.75	1	1.5	2	3	4	6	8	12	16	24	32	48	72	96
2100			S															
1200							M											
600*												L						

*: 500 Hz on 96 NM range

2.9	IF frequency	60 MHz

3 DISPLAY UNIT

3.1	Screen size	15-inch color LCD, 304 x 228 mm, 1024 x 768 dots (XGA) Portrait/ landscape mode available
3.2	Brightness	400 cd/m^2 typical
3.3	Contrast	600:1
3.4	View angle	160° typical
3.5	Radar effective diameter	213 mm
3.6	Range scales and ring interval	

Scale (NM)	0.125	0.25	0.5	0.75	1	1.5	2	3	4	6	8	12	16	24	32	48	72	96
RI (NM)	0.025	0.05	0.1	0.25	0.25	0.25	0.5	0.5	1	1	2	2	4	4	8	8	12	16
Number of rings	5	5	5	3	4	6	4	6	4	6	4	6	4	6	4	6	6	6

3.7	Echo tones	32 levels
3.8	Warm-up time	90 s approx. (FAR-1416), 3 minutes approx. (FAR-1426)

3.9	Orientation mode	Head-up, STAB Head-up, North-up, Course-up, Stern-up, Destination-up, True-motion
3.10	Marks	Cursor, Radar ring, Heading mark, North mark, Bearing line, Vector, Map mark, Zoom, VRM, EBL, Acquisition zone
3.11	Target tracking (TT)	Auto or manual acquisition: 50 targets in 0.2-32 NM Time of vector: 30 s to 60 minutes
3.12	Target analyzer	Distinguish target type and display with different colors
3.13	AIS	Display capacity: 100 targets Time of vector: 30 s to 60 minutes
3.14	Echo trail	True/Relative, Trail length: 0, 15/30 sec, 1 to 30 minutes or continue

4   PLOTTER FUNCTIONS

4.1	Projection	Mercator
4.2	Usable area	85° latitude or below
4.3	Geoids	WGA84, Tokyo
4.4	Effective Projection area	0.125 NM to 1,024 NM (at equatorial area)
4.5	Memory capacity	
	Own ship's track	30,000 pts
	Other ship's track	TT: 10,000 pts /50 ships, AIS: 1,000 pts/100 ships, Consort ship: 10,000 pts/40 ships, GPS buoy: 10,000 pts/100 sets
	Mark/line	30,000 pts
	Waypoint	3,500 pts
	Route	200 routes with 100 waypoint each
4.6	External memory	Waypoint: 100 pts, 1 route
4.7	Electronic chart	Mapmedia
4.8	Own ship's tracking	7 colors

5   INTERFACE

5.1   Number of ports on display unit

Heading input	1 port: AD-10 format or IEC61162-1
Serial I/O	3 ports: IEC61162-1
Contact closure	3 ch: Alert output (Normal open: 2 ch, Normal close: 1 ch)
Remote display	2 ports (Signal: HD, BP, Trigger and Video)
LAN	1 port, Ethernet 100Base-TX
CANbus	1 port, NMEA2000, contact pin connector
USB	2 ports, USB 2.0, for data backup or control
DVI	1 port, DVI-D connector
RGB	1 port, RGB monitor or VDR

5.2   Data sentences

Input	ABK, ALR, BLV, CUR, DBK, DBS, DBT, DPT, GGA, GLL, GNS, HDG, HDM, HDT, MTW, MWV, RMB, RMC, RTE, THS, TLL, TTM, VBW, VDM, VDO, VDR, VHW, VTG,VWR, VWT, WPL, ZDA
Output	
Serial port	TLL, TTM

	LAN port	BWC, BWR, CUR, DBK, DBS, DBT, DPT, DTM, GGA, GLL, GNS, HDG, HDM, HDT, MTW, MWV, RMC, THS, VBW, VTG, VWR, VWT, ZDA

5.3   Output proprietary sentences

       PFEC   pireq, pidat

5.4   CANbus PGN

	Input	059392/904, 060928, 061184, 126208/720/992/996, 127250/258/259, 128259/267, 129025/026/029/033/291, 130306/310/311/312/316/577/578
	Output	059392/904, 060928, 061184, 126208/464/720/993/996, 130822/823

6   POWER SUPPLY

6.1   Display unit

	FAR-1416	24 VDC (21.6-31.2 V): 5.0 A max.
	FAR-1426	24 VDC (21.6-31.2 V): 5.6 A max.

6.2   Rectifier/ Power supply unit (option)

	RU-1746B-2/RU-3424	100-115/220-230 VAC, 1 phase, 50/60 Hz
	PR-850A	100/110/120/200/240 VAC, 1 phase, 50/60 Hz
	PR-240	100-115/200-230 VAC, 1 phase, 50/60 Hz
	PR-241	100-230 VAC, 1 phase, 50-60 Hz

7   ENVIRONMENTAL CONDITIONS

7.1   Ambient temperature

	Antenna unit	-25°C to +55°C (storage: -25°C to +70°C)
	Display unit	-15°C to +55°C
	Remote controller	-20°C to +60°C

7.2   Relative humidity   93% or less at +40°C

7.3   Degree of protection

	Antenna unit	IP26
	Display/control unit	IP22
	Remote controller	IP56

7.4   Vibration   IEC 60945 Ed.4

8   UNIT COLOR

8.1   Antenna unit   N9.5 (fixed)

8.2   Display/control unit   N2.5 (fixed)

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Declaration of Conformity
[FAR-1416/FAR-1426]

Bulgarian (BG)	С настоящото Furuno Electric Co., Ltd. декларира, че гореспоменат тип радиосъоръжение е в съответствие с Директива 2014/53/ЕС, SI 2017/1206. Цялостният текст на ЕC/UK декларацията за съответствие може да се намери на следния интернет адрес:
Spanish (ES)	Por la presente, Furuno Electric Co., Ltd. declara que el tipo de equipo radioeléctrico arriba mencionado es conforme con la Directiva 2014/53/UE, SI 2017/1206. El texto completo de la declaración de conformidad de la EU/UK está disponible en la siguiente dirección Internet:
Czech (CS)	Tímto Furuno Electric Co., Ltd. prohlašuje, že výše zmíněné typ rádiového zařízení je v souladu se směrnicí 2014/53/EU, SI 2017/1206. Úplné znění EU/SK prohlášení o shodě je k dispozici na této internetové adrese:
Danish (DA)	Hermed erklærer Furuno Electric Co., Ltd., at ovennævnte radioudstyr er i overensstemmelse med direktiv 2014/53/EU, SI 2017/1206. EU/UK-overensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse:
German (DE)	Hiermit erklärt die Furuno Electric Co., Ltd., dass der oben genannte Funkanlagentyp der Richtlinie 2014/53/EU, SI 2017/1206 entspricht. Der vollständige Text der EU/UK-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar:
Estonian (ET)	Käesolevaga deklareerib Furuno Electric Co., Ltd., et ülalmainitud raadioseadme tüüp vastab direktiivi 2014/53/EL, SI 2017/1206 nõuetele. EL/GB vastavusdeklaratsiooni täielik tekst on kättesaadav järgmisel internetiaadressil:
Greek (EL)	Με την παρούσα η Furuno Electric Co., Ltd., δηλώνει ότι ο προαναφερθέντας ραδιοεξοπλισμός πληροί την οδηγία 2014/53/ΕΕ, SI 2017/1206. Το πλήρες κείμενο της δήλωσης συμμόρφωσης ΕΕ/UK διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο:
English (EN)	Hereby, Furuno Electric Co., Ltd. declares that the above-mentioned radio equipment type is in compliance with Directive 2014/53/EU, SI 2017/1206. The full text of the EU/UK declaration of conformity is available at the following internet address:
French (FR)	Le soussigné, Furuno Electric Co., Ltd., déclare que l'équipement radioélectrique du type mentionné ci-dessus est conforme à la directive 2014/53/UE, SI 2017/1206. Le texte complet de la déclaration UE/RU de conformité est disponible à l'adresse internet suivante:
Croatian (HR)	Furuno Electric Co., Ltd. ovime izjavljuje da je gore rečeno radijska oprema tipa u skladu s Direktivom 2014/53/EU, SI 2017/1206. Cjeloviti tekst EU/UK izjave o sukladnosti dostupan je na sljedećoj internetskoj adresi:
Italian (IT)	Il fabbricante, Furuno Electric Co., Ltd., dichiara che il tipo di apparecchiatura radio menzionato sopra è conforme alla direttiva 2014/53/UE, SI 2017/1206. Il testo completo della dichiarazione di conformità UE/RU è disponibile al seguente indirizzo Internet:
Latvian (LV)	Ar šo Furuno Electric Co., Ltd. deklarē, ka augstāk minēts radioiekārta atbilst Direktīvai 2014/53/ES, SI 2017/1206. Pilns ES/AK atbilstības deklarācijas teksts ir pieejams šādā interneta vietnē:

Lithuanian (LT)	Aš, Furuno Electric Co., Ltd., patvirtinu, kad pirmiau minėta radijo įrenginių tipas atitinka Direktyvą 2014/53/ES, SI 2017/1206. Visas ES/JK atitikties deklaracijos tekstas prieinamas šiuo interneto adresu:
Hungarian (HU)	Furuno Electric Co., Ltd. igazolja, hogy fent említett típusú rádióberendezés megfelel a 2014/53/EU, SI 2017/1206 irányelvnek. Az EU/EK-megfelelőségi nyilatkozat teljes szövege elérhető a következő internetes címen:
Maltese (MT)	B'dan, Furuno Electric Co., Ltd., niddikjara li msemmija hawn fuq-tip ta' tagħmir tar-radju huwa konformi mad-Direttiva 2014/53/UE, SI 2017/1206. It-test kollu tad-dikjarazzjoni ta' konformità tal-UE/RU huwa disponibbli f'dan l-indirizz tal-Internet li ġej:
Dutch (NL)	Hierbij verklaar ik, Furuno Electric Co., Ltd., dat het hierboven genoemde type radioapparatuur conform is met Richtlijn 2014/53/EU, SI 2017/1206. De volledige tekst van de EU/VK-conformiteitsverklaring kan worden geraadpleegd op het volgende internetadres:
Polish (PL)	Furuno Electric Co., Ltd. niniejszym oświadcza, że wyżej wymieniony typ urządzenia radiowego jest zgodny z dyrektywą 2014/53/UE, SI 2017/1206. Pełny tekst deklaracji zgodności UE/UK jest dostępny pod następującym adresem internetowym:
Portuguese (PT)	O(a) abaixo assinado(a) Furuno Electric Co., Ltd. declara que o mencionado acima tipo de equipamento de rádio está em conformidade com a Diretiva 2014/53/UE, SI 2017/1206. O texto integral da declaração de conformidade da EU/UK está disponível no seguinte endereço de Internet:
Romanian (RO)	Prin prezenta, Furuno Electric Co., Ltd. declară că echipamentul radio menționat mai sus este în conformitate cu Directiva 2014/53/UE, SI 2017/1206. Textul integral al declarației de conformitate UE/RU este disponibil la următoarea adresă internet:
Slovak (SK)	Furuno Electric Co., Ltd. týmto vyhlasuje, že vyššie spomínané rádiové zariadenie typu je v súlade so smernicou 2014/53/EÚ, SI 2017/1206. Úplné EÚ/SK vyhlásenie o zhode je k dispozícii na tejto internetovej adrese:
Slovenian (SL)	Furuno Electric Co., Ltd. potrjuje, da je zgoraj omenjeno tip radijske opreme skladen z Direktivo 2014/53/EU, SI 2017/1206. Celotno besedilo izjave EU/ZK o skladnosti je na voljo na naslednjem spletnem naslovu:
Finnish (FI)	Furuno Electric Co., Ltd. vakuuttaa, että yllä mainittu radiolaitetyyppi on direktiivin 2014/53/EU, SI 2017/1206 mukainen. EU/UK-vaatimustenmukaisuusvakuutuksen täysimittainen teksti on saatavilla seuraavassa internetosoitteessa:
Swedish (SV)	Härmed försäkrar Furuno Electric Co., Ltd. att ovan nämnda typ av radioutrustning överensstämmer med direktiv 2014/53/EU, SI 2017/1206. Den fullständiga texten till EU/Storbritannien-försäkran om överensstämmelse finns på följande webbadress:

Online Resource

http://www.furuno.com/en/support/red_doc

<u>Notice for radiated immunity</u>

The test for the radiated immunity is performed up to 2.7 GHz only without the special condition of spot frequency being applied. There is a chance that this equipment may interfere with allocated services in the frequency range of 2.7 GHz to 6 GHz, particularly in harbors, rivers, lake banks, etc.