

FURUNO

OPERATOR'S MANUAL

SURVEILLANCE RADAR

Model **FAR-3220Z**



FURUNO ELECTRIC CO., LTD.

www.furuno.com



(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

FURUNO ELECTRIC CO., LTD.

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• FURUNO Authorized Distributor/Dealer

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IMPORTANT NOTICES

General

General

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

How to discard this product

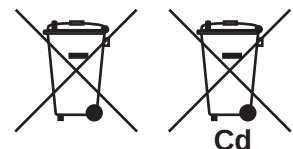
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (<http://www.eiae.org/>) for the correct method of disposal.

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. Follow the instructions below if a battery is used. Tape the + and - terminals of battery before disposal to prevent fire, heat generation caused by short circuit.

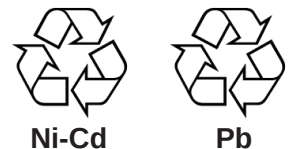
In the European Union

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



In the USA

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



In the other countries

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



SAFETY INSTRUCTIONS

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



WARNING

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



CAUTION

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



Warning, Caution



Prohibitive Action



Mandatory Action

WARNING



Do not open the equipment.

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



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

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



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

Fire or electrical shock can result.



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

Fire or electrical shock can result.



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



Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.



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

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



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

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

WARNING



Do not operate the equipment with wet hands.

Electrical shock can result.



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

Fire, electrical shock or serious injury can result.



Use the proper fuse.

Use of the wrong fuse can cause fire or damage the equipment.



The TT function is a valuable aid to navigation. However, the navigator must check all aids available to avoid collision.

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

⚠ CAUTION

The 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 approx. 15-30 seconds for the higher relative speed; approx. 30-60 seconds for the lower relative speed. The following factors can affect accuracy:
 - Echo intensity
 - Radar transmission pulse length
 - Radar bearing error
 - Gyrocompass error
 - Course change (own ship and targets)



Handle the LCD monitor carefully.

The LCD is made of glass, which can cause injury if broken.



The data presented by this equipment is intended as a source of navigation information.

The prudent navigator never relies exclusively on any one source of navigation information, for safety of vessel and crew.

Warning Label(s)

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



Name: Warning Label 1

Type: 86-003-1011-1

Code No.: 100-236-231



Name: Warning Sticker

Type: 03-142-3201-0

Code No.: 100-266-890

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FOREWORD

Congratulations on your choice of the FURUNO FAR-3220Z Surveillance Radar. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

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

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

Features

This radar meets the requirements of IEC 62388 (Marine navigation and radio-communication equipment and systems - Shipborne radar - Performance requirements, method of testing and required test results) and IMO MSC.192(79), IMO Resolution A.817(19), and IEC 61174. This radar displays radar targets, electronic charts, nav lines, Tracked Target (TT) data, AIS targets and other navigation data on a display.

This radar system is comprised of an antenna unit, transceiver unit, processor unit, power supply unit, and a trackball control unit (RCU-025 or RCU-026).

The main features of this series are

- New HMI (Human Machine Interface) gives improved operability.
- Accepts SXGA, UXGA video inputs.
- Radar, chart and chart radar modes. (The chart radar mode does not meet the criteria for navigation aid for Japanese flag vessels as defined by Japanese law.)
- Many warning features to support safer and more efficient navigation.
- Grounding warnings, safe depth contours.
- Chart database loaded and updated using CD-ROMs.
- Tracked Target (TT) data and AIS data to aid in collision avoidance.
- AIS messaging.
- Route created in chart mode can be displayed on the radar.
- Route planning and route monitoring facilities in the chart mode.

Signal Processing Functions

This radar has the signal processing functions described in the table below. All signal processing functions are set with the picture preset feature.

Signal processing function	Description	Section
Interference rejector	Suppress interference transmitted by other radars. Interference received simultaneously from many radars can be difficult to reduce.	2.7
Echo stretch	Enlarge target echoes, especially small echoes. Suppress interference, sea clutter and rain clutter before using echo stretch, to prevent the enlargement of unwanted echoes.	2.8

Signal processing function	Description	Section
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.	2.9
Automatic clutter elimination	Discriminate the clutter from the radar echo then reduce the clutter automatically.	2.10
Noise rejector	Reduce 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. Use this function with caution. Weak target echoes may disappear from the screen or the range resolution may worsen.	2.11

Standards Used in this Manual

- Two types of Control Units are available: Radar Control Unit RCU-025 (radar controls with trackball module), and Trackball Control Unit RCU-026 (trackball module only). The descriptions in this manual use the Trackball Control Unit.
- Unless noted otherwise, "click" means to push the left button on a trackball module.
- The keys and controls of the Radar Control Unit are shown in bold face; for example, the **ENTER** key.
- The buttons on the InstantAccess bar™, Status bar and menu items are shown in brackets; for example, the [ES] button.
- Context-sensitive menus are available with many buttons, and boxes and objects. Right-click an item to display the related context-sensitive menu.
- The display colors mentioned in this manual are those with the color palette setting "Day-Gray".
- InstantAccess bar™ is a trademark of FURUNO Electric Co., Ltd.

Program Number

System	Program no.	Version no.	Remarks
Antenna unit			
SPU	0359407	01.xx	
RF-Converter	0359414	01.xx	
Processor unit (EC-3000)			
Main	0359266	02.xx	

xx: Minor change

The latest IHO standard can be found at <http://www.iho.int>

Virus Prevention

This equipment is not equipped with a virus checker. This equipment operates in real time; therefore, having a virus checker that periodically checks the equipment for viruses would increase the processing load, which can affect operation. However, you can avoid viruses by following the instructions in this section.

When you update a chart

The PC and medium (USB flash memory, etc.) used to download and store an update for an existing chart or a new chart may be infected with a virus. Check the PC and the medium for viruses with a commercial virus checker - BEFORE you connect them to the ECDIS. Be sure the virus checker contains the latest virus definition files.

Network connection

The ECDIS receives and displays information from various navigation equipment and radar via a LAN. A PC and other equipment connected to a network can carry viruses. To prevent the introduction of a virus to the LAN, DO NOT connect the ECDIS or HUB to an external network, including other shipboard LAN.

Do not install 3rd party programs in the ECDIS

Programs installed via an external network can carry viruses that can cause the ECDIS to malfunction. Do not install any Windows® software.

Open Source Software

This product includes software to be licensed under the GNU General Public License (GPL), GNU Lesser General Public License (LGPL), BSD, Apache, MIT and others. The program(s) is/are free software(s), and you can copy it and/or redistribute it and/or modify it under the terms of the GPL or LGPL as published by the Free Software Foundation. Please access to the following URL if you need source codes: https://www.furuno.co.jp/en/contact/cnt_oss_e01.html

This product uses the software module that was developed by the Independent JPEG Group.

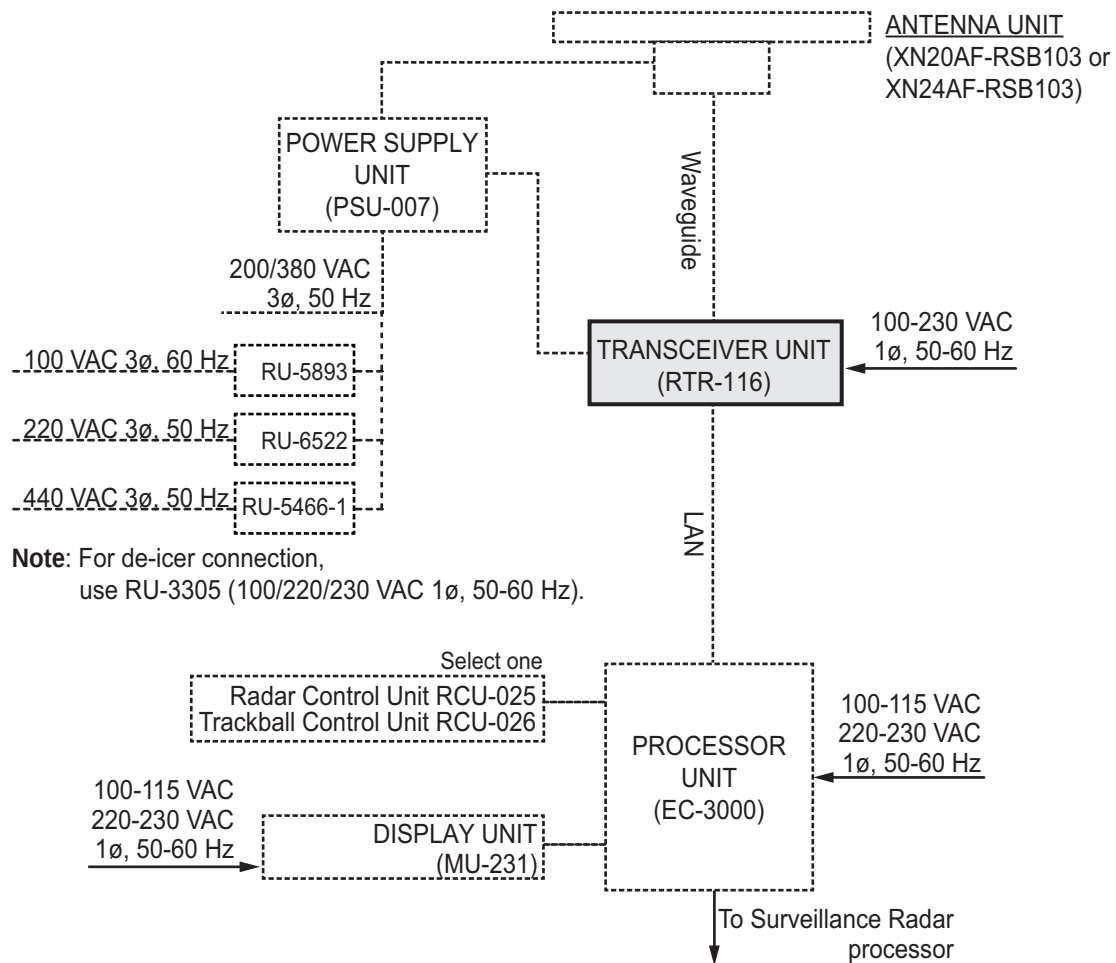
Reverse engineering

Reverse engineering (reverse assemble, reverse compiler) of the software of this equipment is prohibited.

CE declaration

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

SYSTEM CONFIGURATION



- Basic configuration is shown with solid line.
- Equipment shown with dotted lines are local supply.

Category of units

Antenna units: Exposed to the weather

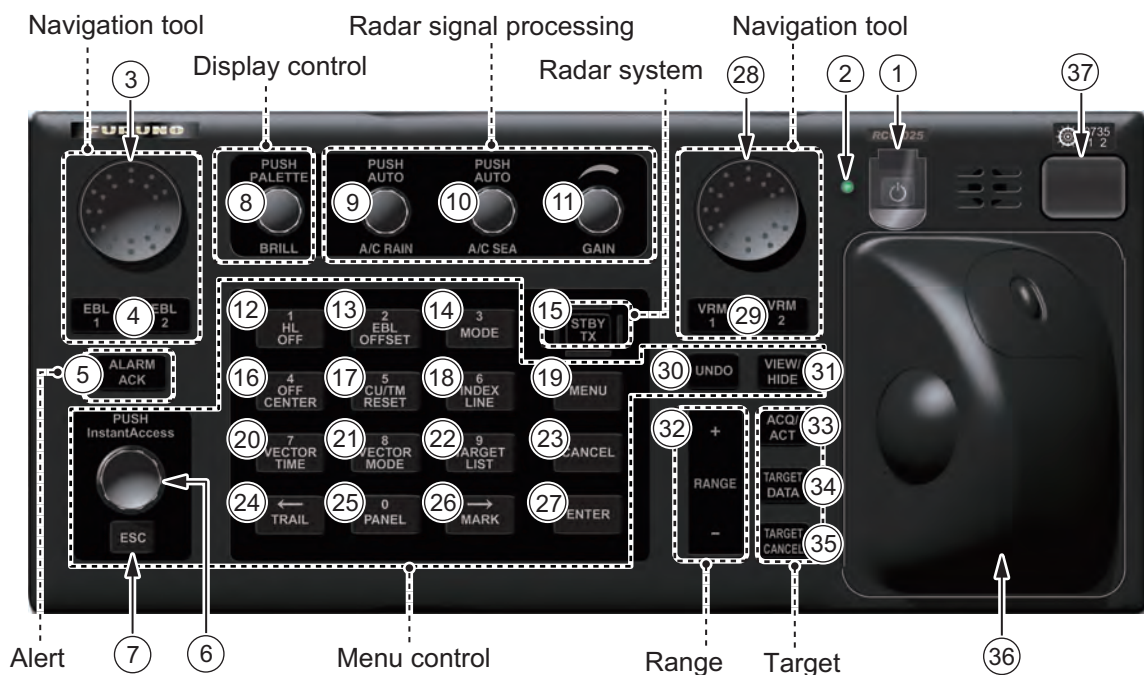
Other units: Protected from the weather

1. OPERATIONAL OVERVIEW

1.1 Radar Control Unit RCU-025

1.1.1 Control description

The Radar Control Unit RCU-025 consists of various controls and a trackball module (trackball, scrollwheel and left and right buttons). The trackball module functions like a PC mouse. The user rolls the trackball and operates the left and right buttons and the scrollwheel to do various functions.



When you press the correct key, a single beep sounds to alert you to correct operation. For wrong operation, several beeps sound. You can select the loudness of the beep or deactivate the beep on the [Customize] menu.

No.	Control	Description
1		Turns the system on or off. (For configurations using a FURUNO monitor with the slide switch ON, this key also turns the monitor unit on or off.)
2	Status LED	The color and state of the LED change according to system or alert status. Green, lighting: Normal operation status; no alerts generated. Green, flashing: The heater on the CPU board is on, because ambient temperature is not at least 0°C. The heater takes about two minutes to warm the processor unit. The LED lights green after the heater goes off. Red, lighting: Acknowledged alert or SYSTEM FAIL. SYSTEM FAIL occurs when there is trouble in the Processor Unit or communication failure between the Processor Unit and a Control Unit. Each Control Unit detects trouble and its lamp flashes in red and the buzzer sounds. If this condition occurs at the No. 1 Control Unit, the SYSTEM FAIL signal is output. Red, flashing: Unacknowledged alert or SYSTEM FAIL.
3	Rotary control, EBL1, EBL2	Rotary control: Adjusts the active EBL. EBL1, EBL2: Activates or deactivates the respective EBL.

1. OPERATIONAL OVERVIEW

No.	Control	Description
5	ALARM ACK	- Acknowledges unacknowledged alert. - Silences the audio alarm.
6	InstantAccess knob	Selects the buttons on the InstantAccess bar™.
7	ESC	Goes back one step in current operating sequence on the InstantAccess bar™.
8	BRILL	Rotate: Adjusts the brilliance of the display. Push: Selects a color palette.
9	A/C RAIN	Rotate: Suppresses rain clutter. Push: Toggles between manual and automatic rain clutter adjustment.
10	A/C SEA	Rotate: Suppresses sea clutter. Push: Toggles between manual and automatic sea clutter adjustment.
11	GAIN	Adjusts the sensitivity of the radar receiver.
12	HL OFF	- Temporarily erases everything except radar echoes when pressed and held down. - Enters the numeric 1. - Selects like-numbered menu item.
13	EBL OFFSET	- Activates or deactivates the offset EBL. - Enters the numeric 2. - Selects like-numbered menu item.
14	MODE	- Selects a presentation mode. - Enters the numeric 3. - Selects like-numbered menu item.
15	STBY TX	Toggles the radar between standby and TX.
16	OFF CENTER	- Puts sweep origin at the cursor location. - Enters the numeric 4. - Selects like-numbered menu item.
17	CU/TM RESET	Course-up: Resets heading line to 000°. True motion: Moves own ship position 75% of the radius in stern direction. - Enters the numeric 5. - Selects like-numbered menu item.
18	INDEX LINE	- Selects an index line (in the PI line box). - Long-press to activate or deactivate selected index line. - Enters the numeric 6. - Selects like-numbered menu item.
19	MENU	Opens, closes the menu.
20	VECTOR TIME	- Sets the vector time (length) for TT and AIS targets. - Enters the numeric 7. - Selects like-numbered menu item.
21	VECTOR MODE	- Sets the vector mode (relative, true) for TT and AIS targets. - Enters the numeric 8. - Selects like-numbered menu item.
22	TARGET LIST	- Displays AIS, TT data in the target list. - Enters the numeric 9. - Selects like-numbered menu item.
23	CANCEL	Cancels the changes made on the currently selected menu.
24	TRAIL	- Goes back one page in the menu. - Moves cursor leftward in text box. - Turns the echo trail display on or off. - Long-press to reset all trails.

No.	Control	Description
25	PANEL	- Adjusts the backlighting of the keys. - Enters the numeric 0. - Selects like-numbered menu item.
26	MARK	- Goes forward one page in the menu. - Moves cursor rightward in text box. - Inputs selected mark on the radar screen, at the position selected.
27	ENTER	Confirms selection on menu.
28	Rotary control, VRM1, VRM2	Rotary control: Adjusts the diameter of the active VRM.
29		VRM1, VRM2: Activates or deactivates the respective VRM.
30	UNDO	Undoes edit or text input when creating a radar map, route, user chart.
31	VIEW/HIDE	Radar mode, chart radar mode: Shows or hides the AZ box, Drop mark boxes, Mark box, PI line box, Trial box. Chart mode: Shows or hides the EBLs, InstantAccess bar™, [Overlay/NAV Tools] box, [Route information] box, VRMs.
32	RANGE	Selects radar range (radar and chart radar modes), chart scale (chart mode).
33	ACQ/ACT	TT: Acquires cursor-selected target, for target tracking. AIS: Activates cursor-selected sleeping AIS target.
34	TARGET DATA	Displays the detailed data for selected TT, AIS target, in the TT/AIS information box.
35	TARGET CANCEL	TT: Stops tracking cursor-selected tracked target. AIS: Sleeps cursor-selected activated AIS target. - Long-press to erase all displayed TT target data.
36	Trackball module	The trackball module is the same as that used in the Trackball Control Unit RCU-026. See the description in the next section.
37	USB port	For connection of USB flash memory (FAT16 or FAT32 format). Do not connect a USB HDD or PC keyboard. The DVD drive (Maker: TEAC, Type: PU-DRV10) is for chart updates.

1.1.2 Operator fitness

The system outputs the operator fitness signal when a key or button is pressed, the trackball is moved or a rotary control is rotated.

1.2 Trackball Control Unit RCU-026

1.2.1 Control description

The Trackball Control Unit RCU-026 has a power switch, a trackball module (trackball, scrollwheel and left and right mouse buttons), a status LED, and a USB port. The trackball module functions like a PC mouse; the user rolls the trackball and operates the left and right buttons and the scrollwheel to do various functions.



No.	Control	Description
1	Power switch	Turns the system on or off. (For configurations using a FURUNO monitor with the slide switch ON, this key also turns the monitor unit on or off.)
2	Status LED	The color and state of the LED change according to system or alert status. See the Status LED description on page 1-1.
3	Left button	- Does the operation related to the object selected. - Confirms the operation done for the object selected.
4	Scrollwheel	- Selects menu options. - Selects chart scale. - Sets numeric data. (The scrollwheel does not have a "push" function.)
5	Right button	- Displays context-sensitive menu when the cursor is put in the display area. - Cancels operation done on the object selected.
6	Trackball	- Moves the cursor. - Selects an object.
7	USB port	For connection of USB flash memory (FAT16 or FAT32 format). Do not connect a USB HDD or PC keyboard.

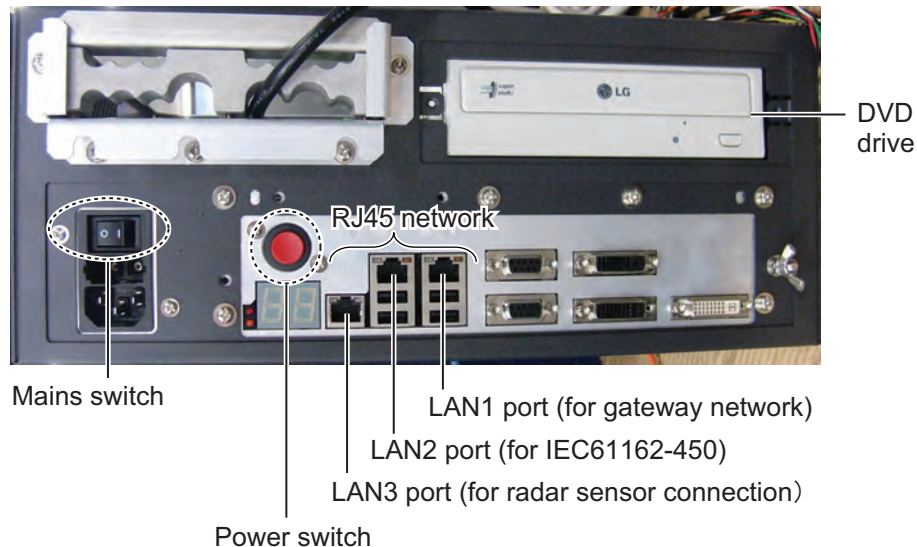
1.2.2 Operator fitness

The system outputs the operator fitness signal when a key or button is pressed, the trackball is moved or a rotary control is rotated.

1.3 Processor Unit EC-3000

The Processor Unit is the heart of the system, and is mainly responsible for the chart management, route planning and route navigation.

The Processor Unit has two power switches on its rear panel. The Mains switch controls the power from the switchboard, and the Power switch controls the power to the system.



Note 1: Do not operate the radar with a DVD or CD inserted in the DVD drive, to prevent damage to the drive and media. Remove media from the drive after usage. Insert media only to update charts. After completion of an update, remove the media from its drive and store it in its case. Store media out of direct sunlight, in a place where temperature and humidity are moderate and stable.

Note 2: To keep the system stable, restart the unit at least once every two weeks.

Note 3: Close the lid of the DVD drive when the drive is not in use.

1.4 How to Turn the System On/Off

Normally, leave the power switches of the Processor Unit on and control the power with the power switch on a Control Unit (RCU-025, RCU-026). The monitor unit is powered independently.

How to power the system

Push the mains switch on the Processor Unit for the "I" position. Turn on the power switch on the Processor Unit or a Control Unit. The start-up display appears on the monitor.

After the power is applied, the program starts up and about one minute later the bearing scale appears. A short time later the indication "ST-BY" appears at the screen center. The radar is now ready to transmit radar pulses. In the stand-by condition, no radar pulses are transmitted and TT nor AIS is active.

The settings on the menus are stored in a non-volatile memory (hard disk) and are preserved when the power is turned off.

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Note: If the ambient temperature is less than 0°C (32°F) when the power is applied, nothing appears on the display and the Status LED on the Control Unit flashes. This is because the heater is warming the unit. The display appears in approx. two minutes.

How to power off the system

Press the power switch on the Processor Unit or a Control Unit. Push the Mains switch for the "O" position.

Note: If the Power switch was turned off by mistake or the like and you wish to restart the radar promptly, turn on the Power switch not later than 10 seconds after power-off.

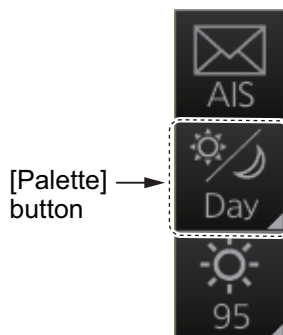
1.5 How to Select a Color Palette

This radar provides three sets of color and brilliance sets (palette), day, dusk and night, to match any ambient lighting condition. The default specifications of each palette are as shown in the table below. The panel dimmer setting is automatically changed, and the number of steps depends on the color palette selected.

Palette	Brilliance		Panel dimmer (step)	Text color	Background color
	19" display unit	23"/27" display unit			
Day-gray	110cd/m ²	120cd/m ²	9	White	Gray
Day-blue	110cd/m ²	120cd/m ²	9	White	Blue
Dusk-gray	50cd/m ²	50cd/m ²	8	Light gray	Dark gray
Dusk-blue	50cd/m ²	50cd/m ²	8	Light gray	Dark blue
Night-gray	5cd/m ²	5cd/m ²	5	Orange	Dark gray
Night-blue	5cd/m ²	5cd/m ²	5	Light gray	Dark blue

To select a palette, do the following:

1. Click the [Palette] button on the InstantAccess bar™.



- Click [Day], [Dusk] or [Night] as appropriate. For example, select [Day] to show its options.



- Click the palette (gray, blue) desired.

Note: A palette can also be selected by pushing the **BRILL** control on the Control Unit.

1.6 Control Unit Backlighting

How to adjust the brilliance manually with the control unit (RCU-025)

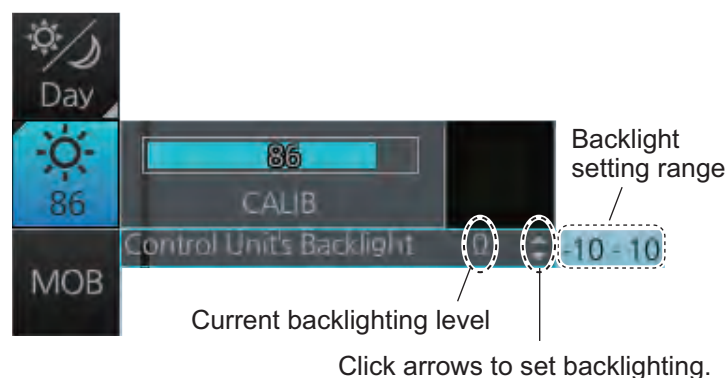
Push the **PANEL** key to adjust backlighting of the control unit.

How to adjust the brilliance manually on the menu (For Radar mode and chart radar mode)

- Right-click the **BRILL** button on the InstantAccess bar™ then select [Brill Menu].
- Adjust the backlighting on the [1 CONTROL PANEL] menu.

How to adjust the brilliance manually with the InstantAccess knob (For chart mode)

- Push the **InstantAccess** knob.
- Rotate the knob to select the [BRILL] button then push the knob to show the brilliance adjustment window.
- Put the cursor on the backlighting setting, and up and down arrows appear. Click the arrows to adjust the backlighting.



1.7 Display Modes

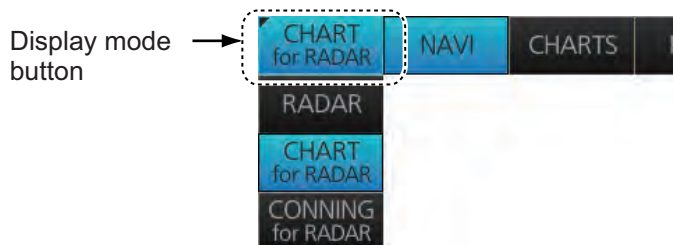
This radar has the following display modes:

- [RADAR]: - The **radar mode** provides the traditional radar display.
- The **chart radar mode** overlays the electronic chart on the radar image.
- [CHART for RADAR]: The **chart mode** shows the electronic charts.
- [CONNING for RADAR]: The **conning mode** provides a comprehensive navigation data display.

1.7.1 How to select a display mode

Click the Display mode button to select desired mode.

- [RADAR]: Radar or chart radar mode (see paragraph 1.8.2)
- [CHART for RADAR]: Chart mode
- [CONNING for RADAR]: Conning mode (see section 24.1)



1.7.2 Limitations when using the chart radar mode

The presentation mode for the chart radar mode can be course-up RM, north-up RM, or north-up TM. The presentation mode is automatically switched to north-up RM if the mode is head-up at the time the chart radar mode is selected.

1.8 Display Screens

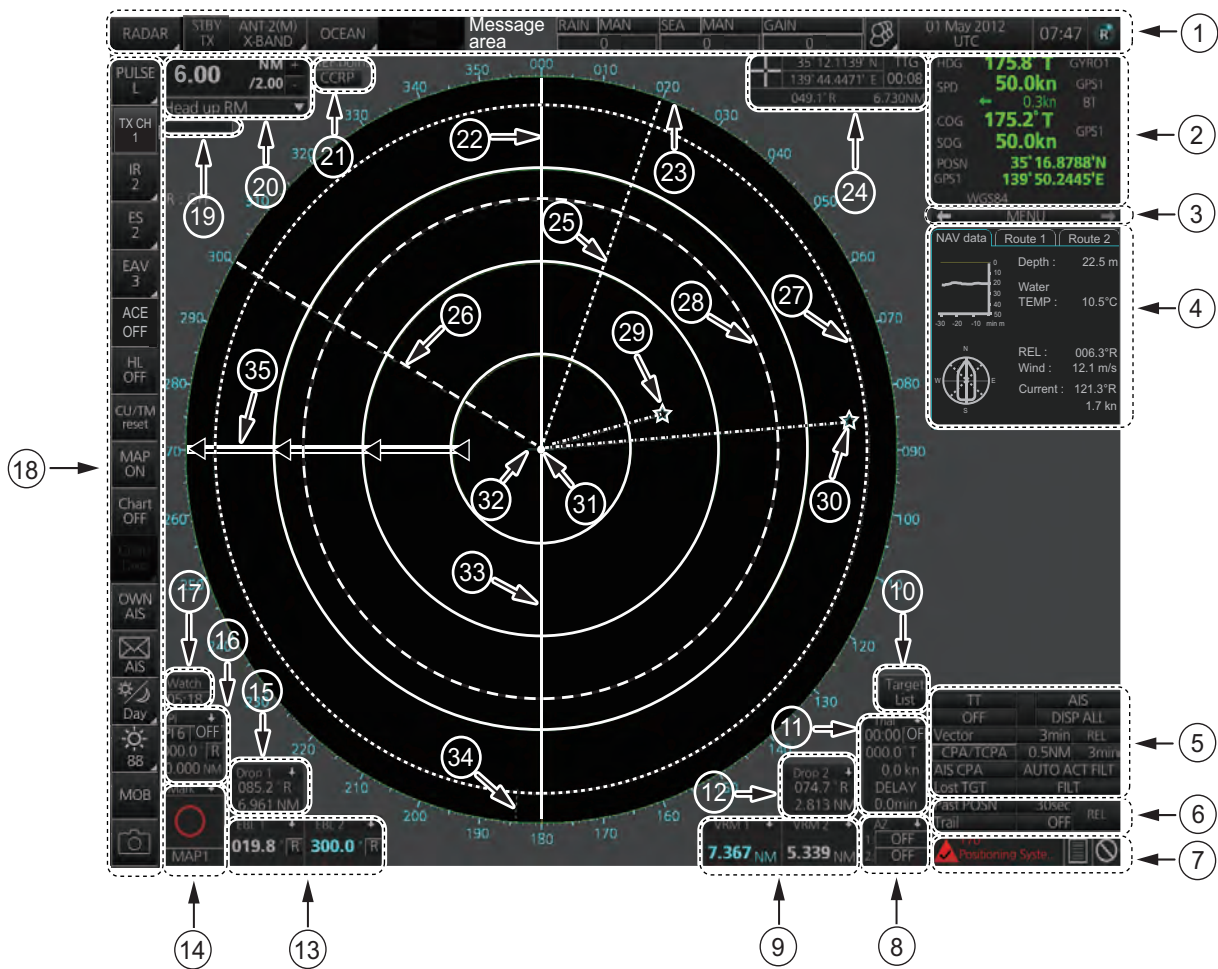
All display screens have operational buttons, boxes and indications, and display markers. Click a button or indication to execute the related operation. Context-sensitive menus are available with several boxes and objects. Right-click the appropriate box or object to show the related context-sensitive menu.

Monitor viewing distance

The optimal viewing distance for the FURUNO-supplied monitors is 1020 mm.

1.8.1 Radar display

The illustration below shows the markers, data, etc. as they appear on a FURUNO 19-inch monitor unit. The layout for the 23-inch and 27-inch monitor unit is partially different - the  button appears on the bottom of the InstantAccess bar™.



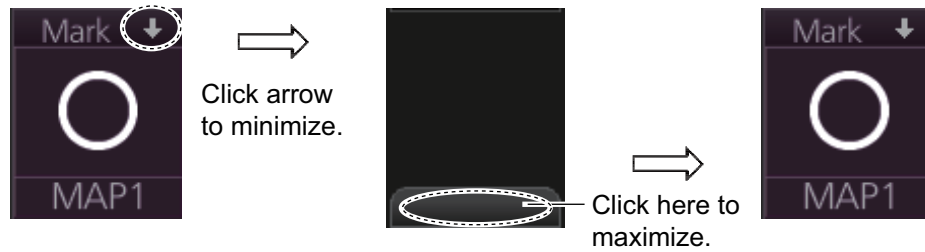
No.	Name	Description
1	Status bar	• Selects an antenna. • Selects the mode. • Adjusts the radar picture. • Displays radar operational messages.

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No.	Name	Description
2	Sensor information, datum box	Shows your ship's heading, heading source, ship's speed, water tracking speed, speed source, course over the ground, speed over the ground, course and speed source, ship's position, position source, chart datum. Note: Position source shall meet the requirements of IMO MSC.112(73).
3	Menu	Drop-down menu with various radar and chart functions.
4	Information box	Provides various navigation data and route information.
5	TT/AIS setting box	Sets the parameters for TT and AIS targets.
6	Trail box	Sets the parameters for the target trails.
7	Alert box	Shows alert messages by alert name and alert number. - Unacknowledged or regenerated alerts flash in red (alarm) or yellow-orange (warning). - Acknowledged alerts are shown in normal video.
8	Acquisition zone box	Sets an acquisition zone for TT, AIS.
9	VRM boxes	Shows the range and TTG to the VRM1, VRM2.
10	Target list button	Displays the TT and AIS target list.
11	Trial maneuver box	Sets the parameters for the trial maneuver.
12	Drop mark 2 box	Shows the bearing and range to the drop mark 2.
13	EBL boxes	Shows the bearing to the EBL1, EBL2.
14	Mark box	Selects the mark to inscribe on the radar display.
15	Drop mark1 box	Shows the bearing and range to the drop mark 1.
16	PI line box	- Adjusts the direction and width of the parallel index lines. - Activates or deactivates the parallel index lines.
17	Watch box	Counts down the time remaining until the buzzer sounds to alert the operator to view the radar picture.
18	InstantAccess bar™	Quick access to often-used radar, chart radar and chart functions. For radar and chart radar functions, see section 1.10. For chart functions, see paragraph 6.1.3.
19	Tuning bar	No use.
20	Range/Presentation mode box	- Selects the radar range. - Selects the presentation mode.
21	REF point box	Selects the reference point (antenna or CCRP) for measurements (range, bearing, etc.) and markers (position, etc.)
22	Heading line	Indicates ship's heading.
23	Bearing scale	The bearing scale provides an estimate of the bearing to a target.
24	Cursor position box	This box shows - Latitude and longitude of the cursor position. - Range and bearing to the cursor position. - TTG to the cursor position.
25	EBL1	Measures the bearing to a target.
26	EBL2	
27	VRM1	Measures the range to a target.
28	VRM2	
29	Drop mark 1	Finds the range and bearing to drop mark position.
30	Drop mark 2	
31	Antenna marker	A cross marks antenna position.
32	Own ship marker	An inverted "T" marks your ship's position.
33	Stern marker	Marks location of stern.
34	North marker	Marks North.
35	Range rings	Provide an estimate of the range to a target.

How to minimize, maximize the boxes at the bottom of the screen

The boxes at the bottom of the screen that contain an arrow can be minimized. Click the arrow to minimize the box. To restore maximum size, click the minimized box.



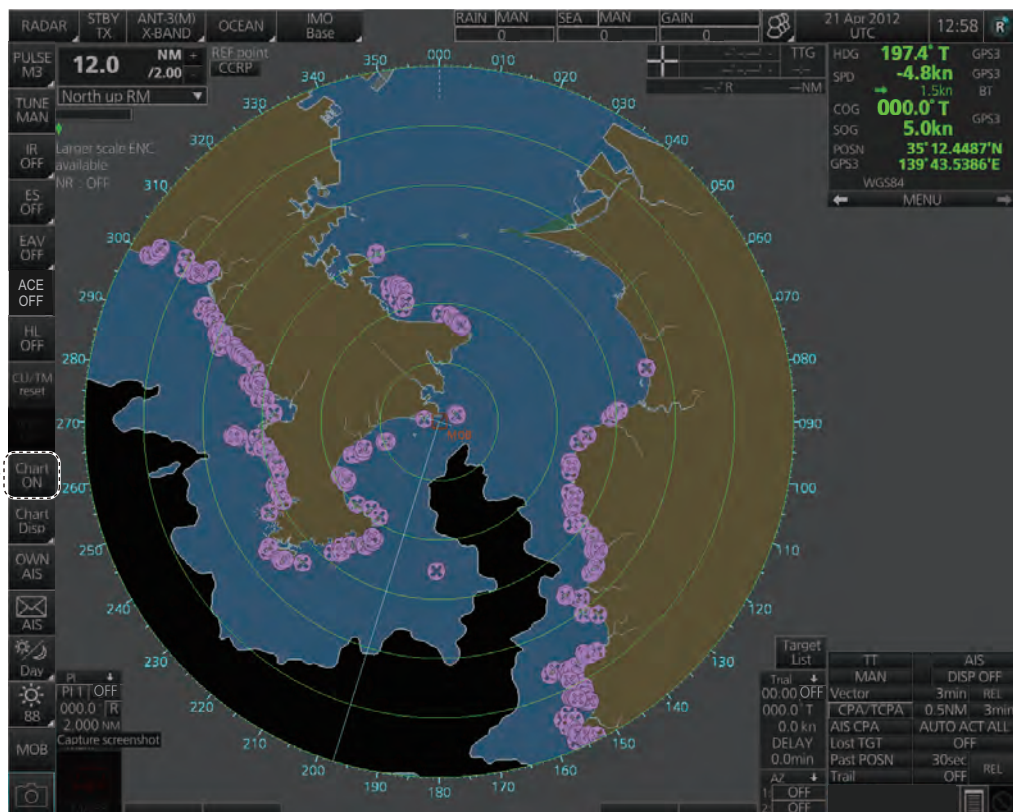
Example: Mark box

Note: The respective VRM or EBL is erased from the screen when the corresponding VRM or EBL box is minimized.

1.8.2 Chart radar display

The chart radar display overlays an electronic chart on the radar picture. To switch between the radar and chart radar displays, click the [Chart ON/OFF] button on the InstantAccess bar™.

Click to hide, show chart.

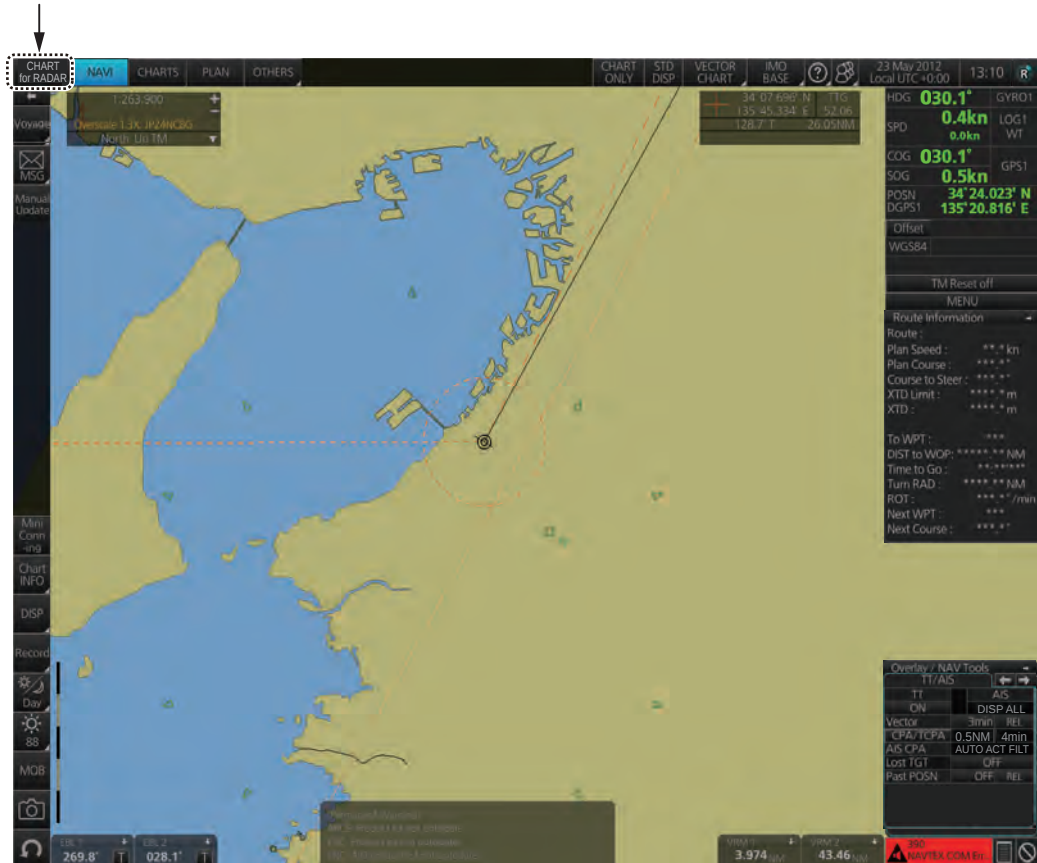


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1.8.3 Chart display

The chart display shows only the electronic chart. Click the Display mode button to select [CHART for RADAR] to activate this display. See chapter 6 for a description of the chart display.

Select [CHART for RADAR].

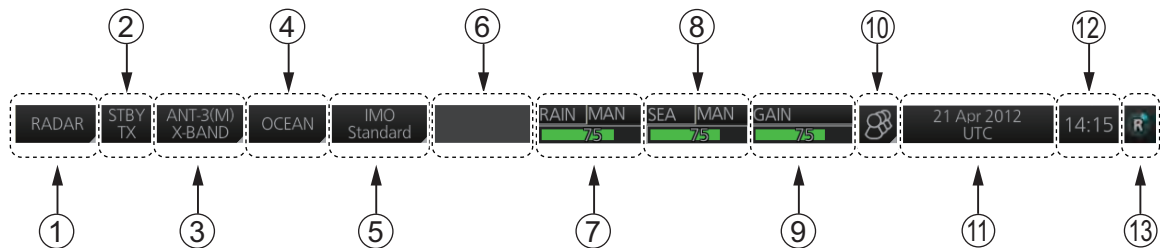


1.9 Status Bar

The Status bar is displayed at the top of screen in all modes. This bar provides, in the radar and chart radar modes, buttons for selection of the mode, antenna and chart database, and adjustment of the radar picture.

For a description of the Status bar used in the chart radar mode, see paragraph 6.1.2.
For a description of the Status bar used in the conning mode, see section 24.1.

1.9.1 Status bar for radar, chart radar mode

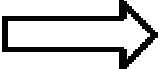


No.	Button name	Description
1	Display Mode	Selects the display mode: [RADAR], [CHART for RADAR], [CONNING for RADAR] or [AMS for RADAR].
2	STBY TX	Toggles the radar between stand-by and transmit.
3	Antenna	Selects an antenna.
4	Customize Echo	Presets the radar controls for specific navigation purpose; for example, congested waters.
5	Chart database	Selects the chart database (IMO Base, IMO Primary, IMO Standard, IMO All or PERSONAL).
6	Message area	Displays the message or icon.
7	RAIN*	Reduces rain clutter.
8	SEA*	Reduces sea clutter.
9	GAIN	Adjusts the gain of the radar receiver.
10	Settings 	Manages user profiles; opens the Settings menu.
11	Date	- Displays the date. - Selects the time to use, local or UTC. - Sets the time difference between local and UTC (to use local time).
12	Time	Displays the time, local or UTC.
13	Working Indicator 	- Rotates clockwise if the system is working properly. If it is not spinning the system is not working. Shortly after the working indicator stops spinning the buzzer sounds and the status LED turns red. Reset the power to restore normal operation. - If the primary display mode is specified during installation, the first letter of the primary mode name appears at the center of the working indicator as follows: C: Conning, E: ECDIS, R: Radar. The letter can be clicked to return to the primary display mode.

*: The indication is grayed out when the Automatic Clutter Elimination (ACE) function is [ON].

1.9.2 How to operate the buttons, slider bars on the Status bar

The Status bar has three types of controls: toggle button, drop-down list button and slider bar. You operate the buttons and bars with the trackball module.

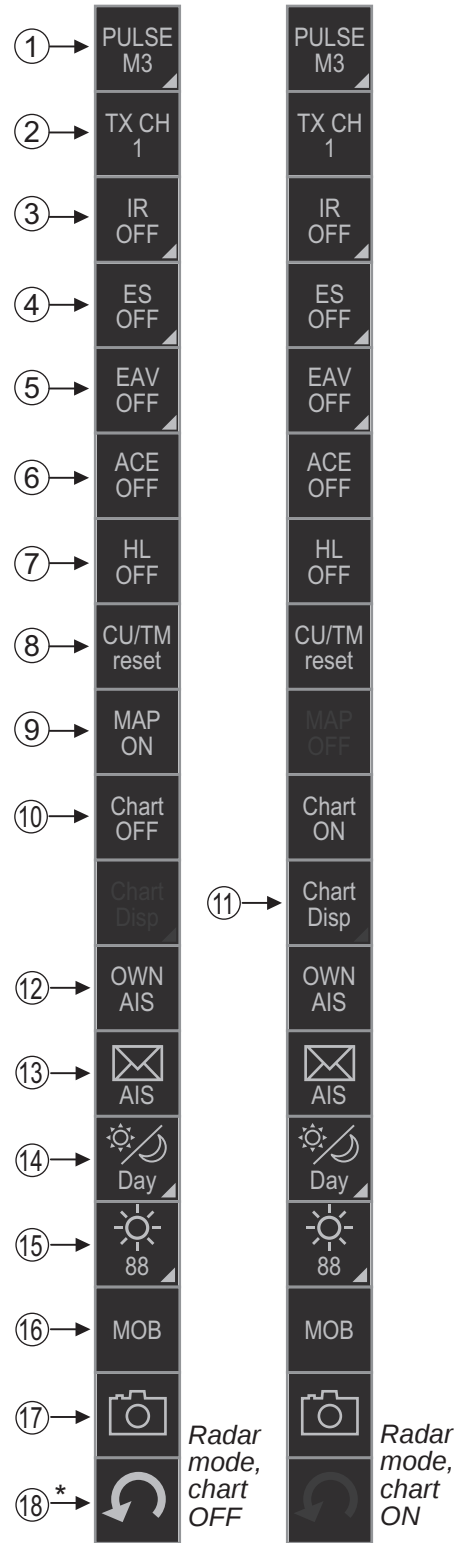
Control type	Example of control
Toggle button	
A toggle button alternately selects one of two functions assigned to the button. For example, the [STBY TX] button toggles the radar between stand-by and TX. The background color of the [STBY TX] button momentarily changes to light-blue when switching from standby to TX.	
Drop-down list button	
A drop-down list button provides a list from which to select an option related to the label on the button. A drop-down list button is identified by a triangle on the button's bottom-right corner. The [Chart database] button, shown in the right figure, is an example of a drop-down list button.	  Click button to show drop-down list. 
Slider bar	
The slider bars provide for adjustment of the radar picture. [RAIN], [SEA] and [GAIN] are slider bar buttons. To adjust the bar coarsely, put the cursor at any location within the slider bar area then push the left button. For fine adjustment, put the cursor at the end of the slider bar and roll the trackball while holding down the left button. Release the button to finish.	

1.10 InstantAccess Bar™

The InstantAccess bar™ runs vertically along the left edge of the screen and is displayed always. This bar provides, in the radar and chart radar modes, buttons for adjustment of the radar picture and chart, AIS operations, display brilliance control, MOB, screenshot, etc.

For a description of the InstantAccess bar™ used in the chart mode, see paragraph 6.1.3.

*: This button is not displayed on a 19-inch monitor unit.

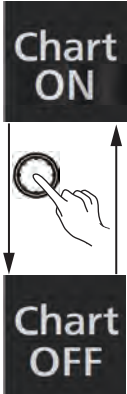
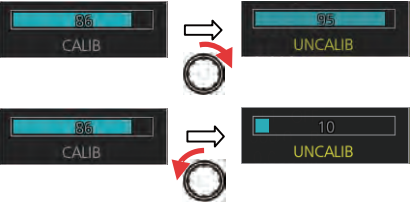


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No.	Button name	Description
1	PULSE	Selects the radar pulse length.
2	TX CH 1(2)	Selects the transmit frequency from [TX CH 1] or [TX CH 2].
3	IR	Activates or deactivates the interference rejector.
4	ES	Activates or deactivates the echo stretch.
5	EAV	Activates or deactivates the echo averaging when Automatic Clutter Elimination (ACE) function is off.
6	ACE	Activates or deactivates the Automatic Clutter Elimination (ACE) function. Automatic Clutter Elimination (ACE) automatically sets the gain, rain and sea clutter controls according to the sea and rain clutter states.
7	HL OFF	Temporarily erases everything but radar echoes.
8	CU/TM reset	• Puts the ship's heading at the top of the screen in course-up mode the moment this button is pressed. • Resets the ship's position to a point of 75% radius opposite to the extension of the heading line passing through the display center in true motion modes.
9	MAP ON/OFF	Shows or hides the radar map marks on the radar display, in the radar mode.
10	CHART ON/OFF	Shows or hides the electronic chart.
11	Chart Disp	Shows or hides various chart objects. Shown in the chart radar mode. See paragraph 2.38.2.
12	OWN AIS	Shows the [VOYAGE DATA] menu, to set your ship's AIS data.
13	 AIS message	Displays screen for "received AIS messages".
14	 Palette	Selects a color palette.
15	 BRILL	• Adjusts the backlighting for the control unit, in the chart mode.
16	MOB	Enters a MOB mark at the current position.
17	 Capture	Takes a screenshot.
18	 UNDO	Restores previous condition in radar map and text input.

1.10.1 How to operate the buttons, slider bars on the InstantAccess bar™

The InstantAccess bar™ has three types of controls: toggle button, drop-down list button and slider bar. (The MOB and Capture buttons are special buttons.) You operate the buttons and bars with the trackball module or the **InstantAccess** knob. This section shows you how to use the **InstantAccess** knob.

Toggle button	Drop-down list button	Slider bar
	A drop-down list button provides a list from which to select an option related to the label on the button. A drop-down list button is identified by a triangle on the button's bottom-right corner. [Palette] button  <i>Palette list</i>	

1. Push the **InstantAccess** knob to enable its use with the InstantAccess bar™.
2. Rotate the **InstantAccess** knob to select a button. The background color of the button selected is light-blue.
3. Do one of the following depending on button type.
 - 1) **Toggle button**: Push the knob to select setting.
 - 2) **Drop-down list button** or **slider bar**: Push the knob then rotate the knob to select an item or adjust the slider bar. Push the knob to confirm your selection.

Note: You can use the **ESC** key to go back one step in the current operating sequence.

1.11 Sensor Information, Datum Box

Sensor information, datum box displays the sensor data and the name of the datum in use. If the selected sensor's signal is interrupted or lost, the system automatically switches to a usable sensor. The sensor indications and names are colored according to sensor state. See the table below.

- **HDG**: Heading and its source.
- **SPD**: Longitudinal speed and its source. The direction of transverse speed is indicated with arrows, ➡, Starboard, ⬅, Port.
- **COG**: Course over ground and its source.
- **SOG**: Speed over ground and its source.
- **POSN**: Latitude and longitude position of own ship and its source.
- **Datum**: Chart datum (WGS84, WGS72, etc.) in use. No datum appears when there is no datum sentence.



Note: The position source shall meet the requirements of IMO MSC.112(73).

Color of nav data indications and sensor name

The color of the nav data indications and sensor names changes according to the state of the sensor data. The table shown below provides basic indication and color meanings. For detailed information, see Appendix 3. When no sensor data is received, the sensor source indication is blank and the related indication shows asterisks.

Nav data indication	Color of nav data indication	Color of sensor name	State
	Green	White	Sensor is normal.
	Yellow	White	Validity of data is low or offset is applied.
	Yellowish-orange	Yellowish-orange	Integrity check failed
	Green, data shown with asterisks (***)	No display	Data is not being received.
	Yellow	White	Data is input manually (manual heading, gyro correction, manual speed, dead reckoning).

Note: Depending on settings selected at installation, the integrity check (see section 16.7) result colors can be changed. In this case, nav data color changes according to status as follows:

- [Passed]: Green
- [Doubtful]: Yellow
- [Failed], [Not Available] or [Excluded]: Bright Yellow

1.12 Menu Overview

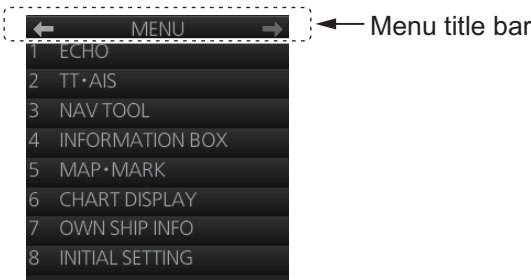
The menu consists of eight main menus and several sub menus. You can operate the menu with the Radar Control Unit or trackball module. The system closes open menus whenever there is no menu operation for 30 seconds.

1.12.1 Basic menu operation

1. Open the main menu.

Control Unit: Press the **MENU** key.

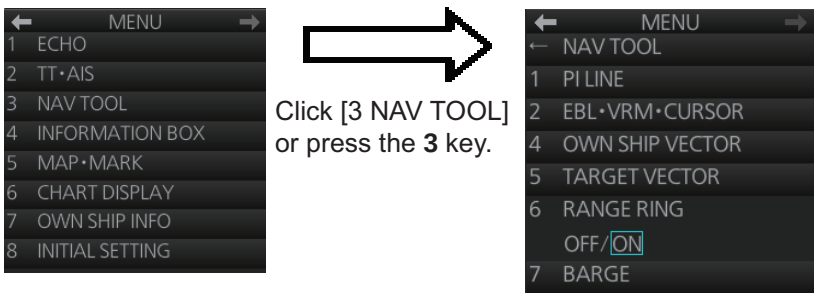
Trackball module: Click the menu title bar at the right side of the display.



2. Select a menu.

Control Unit: Press the corresponding numeric key. For example, press the **3** key to show the [NAV TOOL] menu.

Trackball module: Click the menu desired. The current selection is highlighted in blue.



3. Select a menu item.

Control Unit: Press the corresponding numeric key.

Trackball module: Click the menu item desired. The current selection is highlighted in blue.

4. Select a menu option.

Control Unit: Press the corresponding numeric key. The current selection is highlighted in orange.

Trackball module: Spin the scrollwheel. The current selection is highlighted in orange.

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5. Confirm your selection.

Control Unit: Press the **ENTER** key.

Trackball module: Push the left button.

Note: Hereafter, "select" in a menu operating procedure means to press the applicable numeric key on the Control Unit or push the left button on the trackball module.

Keys, buttons to use in menus

Control Unit

MENU key: Open main menu, or close menu.

CANCEL key: Go back one layer in menu, or close menu when main menu is displayed.

←key: Return to main menu, in no. 2 layer or higher.

Trackball module

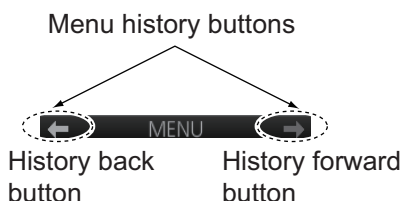
Right button: Go back one layer, or close menu when main menu is displayed.

Left button: (1) Click menu title bar to go back one layer, or close menu when main menu is displayed, (2) Click the left arrow on the menu title bar to return to the main menu, in no.2 layer or higher.

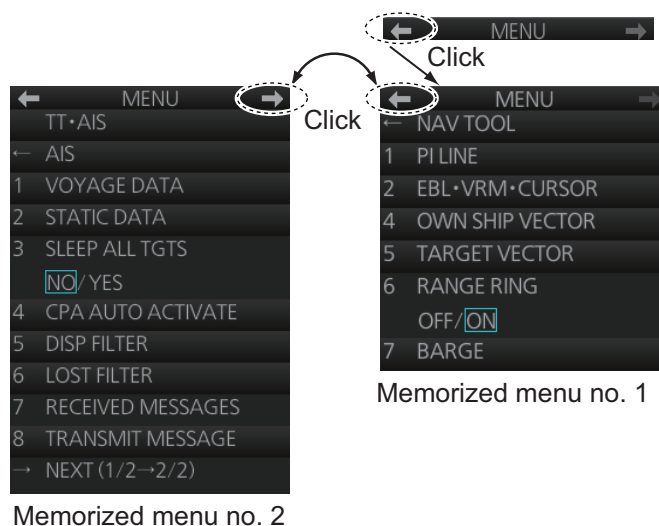
1.12.2 Menu history feature

This chart radar remembers the 10 last-used menus to help you go to recently used menus quickly. The memorized menus are cleared when the power is turned off. Installation- and service-related menus and menus where no operation occurred are not memorized. Menus accessed multiple times are counted as one menu.

Click the memory history buttons on the menu title bar to navigate through the last-used menus.



For example, the last two used menus are [NAV TOOL] and [AIS].



1.12.3 How to enter numeric data

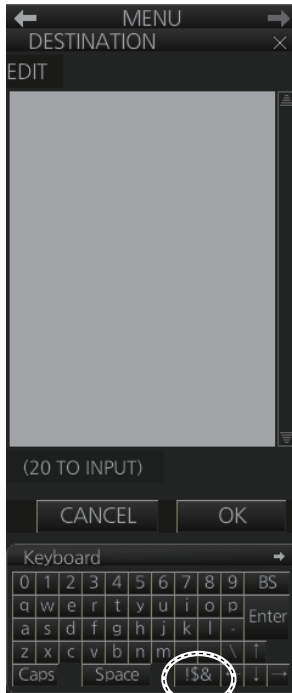
Select the numeric data, then do one of the following:

Control Unit: Use the ten keys to enter data.

Trackball module: Spin the scrollwheel to set data then push the left button.

1.12.4 How to enter alphanumeric character data

Some operations display a software keyboard to enter alphanumeric character data.



Click to switch between letters and symbols.

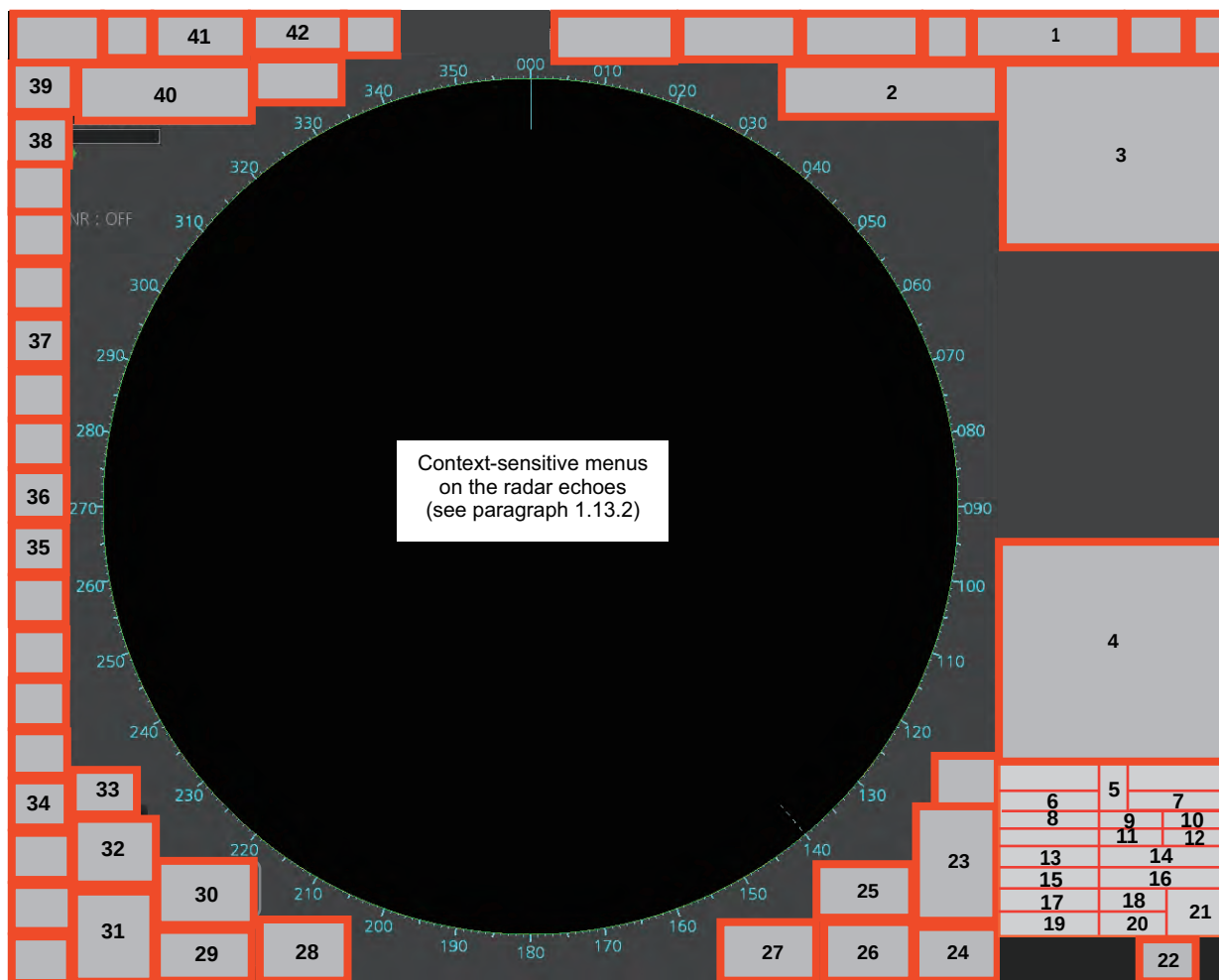
To enter characters, click applicable characters on the software keyboard. You can switch between letter input and symbol input by clicking the key circled in the illustration above.

1.13 Context-Sensitive Menus in the Radar Mode

Context-sensitive menus are available with many of the boxes and buttons surrounding the display area and objects within the display area. Right-click the boxes and buttons marked with numerals in the illustration below to show the related context-sensitive menus. If a menu is not operated within 30 seconds, it is automatically closed.

For context-sensitive menus in the chart mode, see the chapter on chart overview.

1.13.1 Context-sensitive menus available with buttons and boxes



No.	Box name	Menu	No.	Box name	Menu
1	Adjust Local Time	Adjust Local Time	2	Cursor Position	Range-Bearing Position, X-Y Position, Cursor Menu
3	Sensor Information, Datum Box	Select Sensor, OS Info Menu	4	AIS Info	Expanded AIS Data, AIS Message
5	Association	Association OFF/TT/AIS, Association Menu	6	TT	OFF / MAN / AUTO / MAN/AUTO, TT Menu, Symbol Menu
7	AIS	DISP OFF / FILT / ALL, AIS Menu, Symbol Menu	8	Vector	OS Vector Menu, Target Vector Menu

No.	Box name	Menu	No.	Box name	Menu
9	Vector Time	Vector Time (30 s - 60 min), OS Vector Menu, Target Vector Menu	10	Vector Reference	True-G(S), REL, OS Vector Menu, Target Vector Menu
11	CPA Range	CPA Range (0.5 - 20 NM)	12	CPA time	CPA Time (1 - 60 min)
13	AIS CPA	Auto Activate Menu	14	Auto Activate	OFF, AUTO ACT FILT, AUTO ACT ALL, Auto Activate Menu
15	Lost TGT	TT Lost Filter Menu, AIS Lost Filter Menu	16	Lost TGT Filter	OFF, FILT, ALL, TT Lost Filter Menu, AIS Lost Filter Menu
17	Past POSN	Past POSN Menu	18	Past POSN display interval	Past POSN display interval (OFF, 30 s - 6 min), Past POSN Menu
19	Trail	Trail All Clear, Trail Menu	20	Trail Time	Trail Time (OFF, 15 s - 30 min, CONT), Trail Menu
21	Trail/Past POSN Reference	True-G(S), REL, Past POSN Menu, Trail Menu	22	Alert List	Alert List/Log Window
23	Trial	Trial Mode, Trial Maneuver Menu	24	AZ	Acquisition Zone Menu
25	Drop Mark 2	Drop2 Off	26	VRM 2	VRM2 Off, EBL•VRM Menu
27	VRM 1	VRM1 Off, EBL•VRM Menu	28	EBL 2	EBL2 Off, EBL•VRM Menu
29	EBL 1	EBL1 Off, EBL•VRM Menu	30	Drop Mark 1	Drop1 Off
31	Mark	Mark Color (B-type only), Mark Position, MAP File, Edit Map Comment, Map•Mark Menu	32	PI Line	Number of PI Line, Reset PI Line, PI Menu
33	Watch	Watch Time (OFF, 6 - 20 min)	34	Brill Menu	Brill Menu
35	Chart ON/OFF	Chart Display Menu	36	MAP ON/OFF	Radar Map Menu, Route Menu, Event Menu, User Chart Menu
37	ACE	Automatic Clutter Elimination (ACE) Menu	38	PULSE	Pulse Menu
39	RANGE	Range Scales 0.125 to 96.0 NM	40	Antenna Selection	Dual Radar, ANT Select Menu
41	Customize Echo	Customize Echo Menu			

1.13.2 Context-sensitive menus in the display area in the radar and chart radar modes

Right-click anywhere in the display area in the radar and chart radar modes to show the context-sensitive menu.



[Target Data/ACQ/ACT]: For cursor-selected TT or AIS target, display target data, acquire target for TT, or activate sleeping AIS target.

[Target Cancel]: Cancel tracking on selected tracked target (erase target), sleep activated AIS target.

[Off Center]: Off center the display.

[EBL Offset]: Offset EBL1, EBL2 (to measure range and bearing between two targets).

[Zoom Set]: Select zoom area.

[Area Select]: Specify the area where to delete, copy marks.

[Mark Delete]: Delete cursor-selected mark. Grayed out when radar map is off.

[Mark Copy]: Copy cursor-selected mark. Grayed out when radar map is off.

[Own Ship Offset]: Apply an offset to own ship position.

[REF Mark]: Make cursor-selected target a reference target (for use in TT). Grayed out unless TT is active.

[Cursor Size]: Select cursor size, large or small.

[Notes Detail]: Show details about cursor-selected Notes.

[MOB Delete]: Delete selected MOB mark.

Area selected

[Area Target Cancel]: Cancel tracking on targets within the area selected. The targets to cancel tracking can be selected as follows;

- [Any]: Cancel tracking of TT or AIS target; delete REF mark.
- [TT Only]: Cancel tracking of TT; delete REF mark.
- [AIS Only]: Cancel tracking of AIS target.

[Area Mark Delete]: Delete all marks within the area selected.

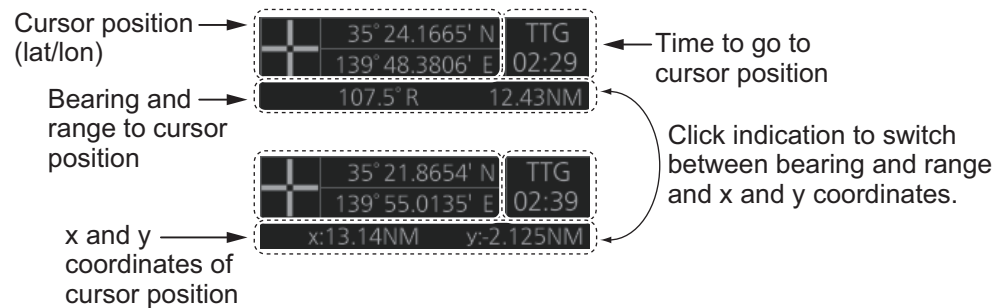
[Area Mark Copy]: Copy all marks within the area selected.

[Area Cancel]: Cancel the area created.

1.14 Cursor Position

Cursor data appears in the cursor position box at the top-right position on the display. The appearance of the box is slightly different between different size monitors, although the content is the same.

For the cursor position box that appears in the chart mode, see section 6.6.



The indication below the cursor position can show the range and bearing to the cursor or x-y coordinates of the cursor position. Click that indication and select [Range-Bearing Position] or [X-Y Position] as appropriate. For the x-y coordinate display, the y-axis is the heading line, right/top is "plus" and left/lower is "minus".

Note 1: The cursor bearing can be selected to true or relative with [1 CURSOR BEARING] in the [CURSOR] menu. Right-click the indication and select [Cursor Menu] to open the [CURSOR] menu.

Note 2: The cursor position is shown as "---.-" when the cursor is not within the effective display area.

1.15 How to Select Sensor Settings

This radar system accepts navigation data input two ways: System or Local. System shares sensor data among multiple radars in a network. Sensor priority is also commonly shared among the radars. Local selects a sensor outside the network.

- 1. Right-click anywhere in the Sensor information, datum box to show the context-sensitive menu.
- 2. Click [Select Sensor].

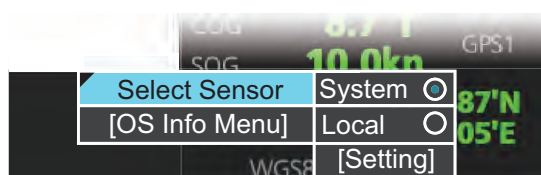


- 3. Click [System] or [Local].
- Note:** The sensor system can also be selected in the chart mode through this procedure and through the menu. Open the menu then select [7 OWN SHIP INFO] followed by [1 SENSOR].

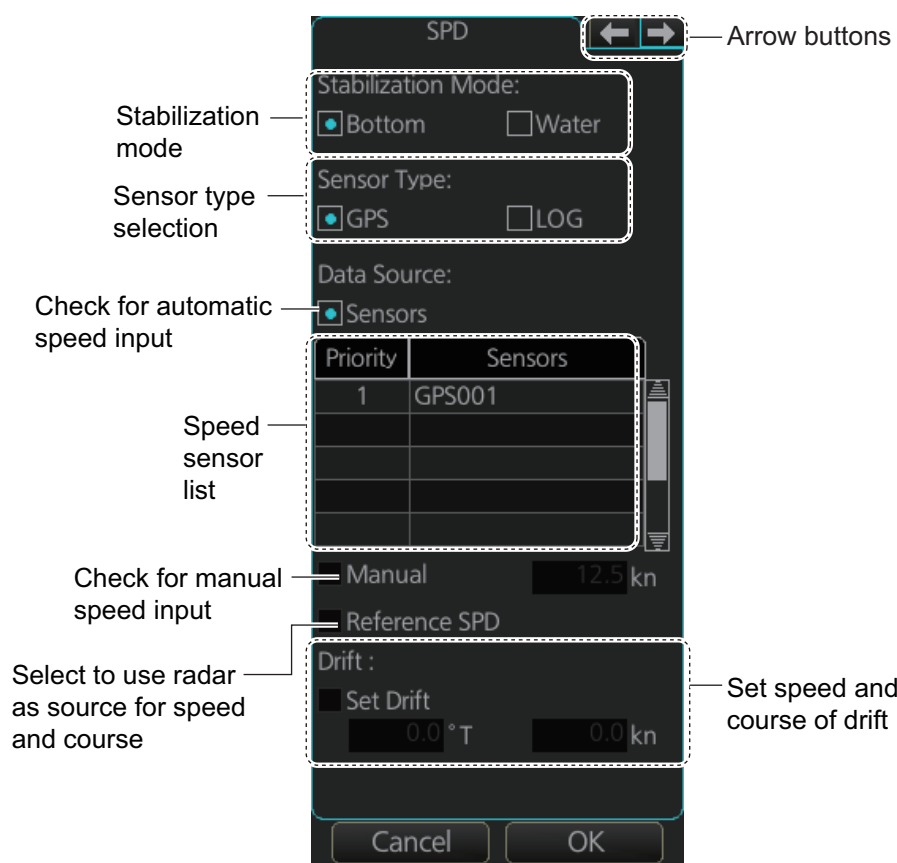
1.16 How to Enter Ship Speed

The TT and azimuth stabilized presentation modes require own ship speed input and compass signal. The speed can be entered automatically from a speed log (STW, SOG) or GPS (SOG), or manually on the menu. Note that the FURUNO GPS Navigator GP-150 provides COG and SOG.

1. Right-click anywhere in the Sensor information, datum box to show the context-sensitive menu.
2. Click [Select Sensor] then click [Setting].



3. Use the arrow buttons to select the [SPD] page.



4. **For automatic input**, follow the procedure below. **For manual input**, go to step 5.
 - 1) Check [Sensors].
 - 2) Set the priority for the speed sensors in case of Local sensor. Click the triangle on any line then select the sensor to set as the primary source of speed. All other sensors are then set as secondary source. Only one sensor can be primary while the others can be secondary. If a speed sensor is changed from secondary to primary state and another speed sensor was selected as primary, then that sensor previously selected to primary state is then automatically selected to secondary state.

- 3) Select [Bottom] or [Water] at [Stabilization Mode] to set the stabilization method. Select [Bottom] for GPS or [Water] for a speed log.
- 4) Check [GPS] or [LOG] at [Sensor Type] to select the source of speed data.
- 5) Go to step 6.
5. **For manual input**, set the stabilization mode for [Water] and check [Manual]. Click the manual box to show the up and down arrows. Click the arrows to set speed.
Note: For [Set Drift], see section 3.11.
6. Click the [OK] button to save the settings then click the [MENU] bar to close the menu.

Notes on speed input

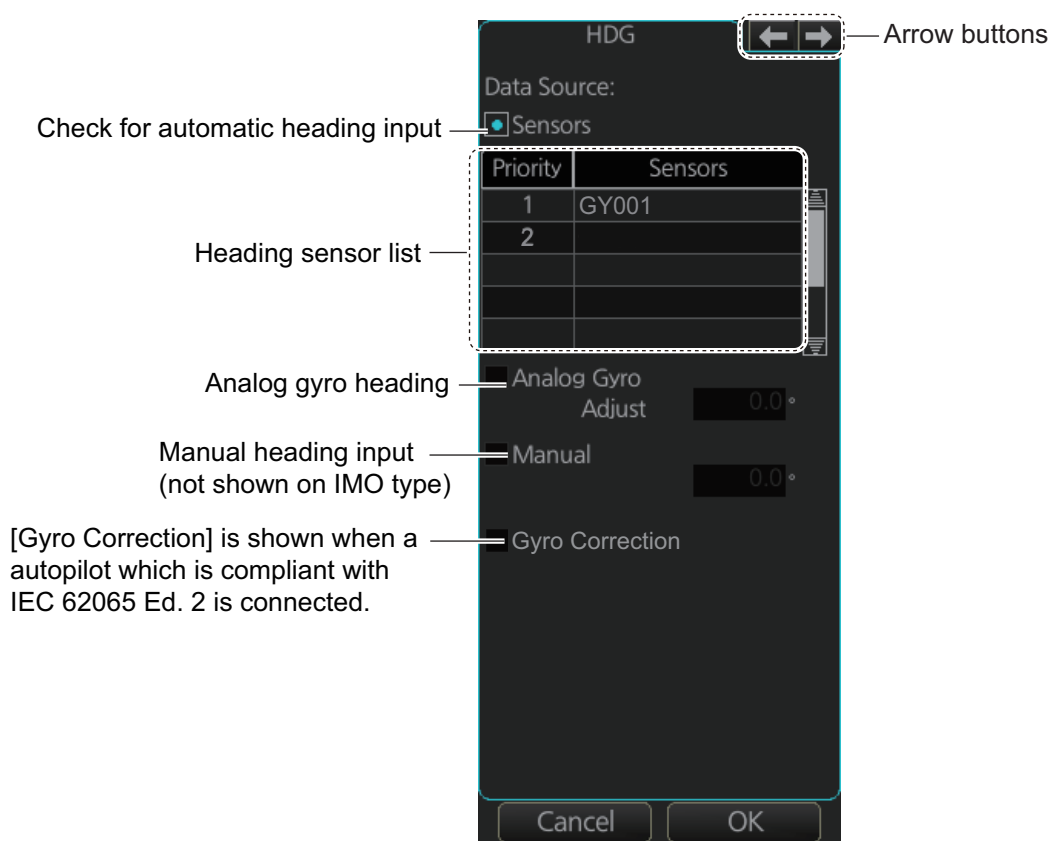
- IMO Resolution A.823(19) for TT requires that a speed log to be interfaced with a TT should be capable of providing through-the-water speed (forward speed).
- A single-axis water log cannot measure speed when the wind is coming from the leeway direction.
- When AIS is active, [Manual], [Reference SPD] and [Set Drift] are shown in gray to indicate that they are not available for selection.

1.17 How to Enter Heading

Heading can be entered manually or automatically.

Note: When the vessel is in high latitudes (over 85°), data from the gyrocompass is not used. The internal filter data is used for heading calculation. In this case, the heading source in the sensor information box appears as "FILT". However, high altitudes are not supported in RADAR mode.

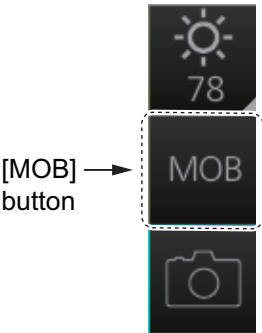
1. Right-click anywhere in the Sensor information, datum box to show the context-sensitive menu.
2. Click [Select Sensor] then click [Setting].
3. Use the arrow buttons to select the [HDG] page.



4. **For automatic input**, follow the procedure below. **For manual input**, go to step 5.
 - 1) Check [Sensors].
 - 2) Set the priority for the heading sensors. Click the triangle on any line then select the sensor to set as the primary source of heading. All other sensors are then set as secondary source. Only one sensor can be primary while the others can be secondary. If a heading sensor is changed from secondary to primary state and another heading sensor was selected as primary, then that sensor previously selected to primary state is then automatically selected to secondary state.
 - 3) Go to step 6.
5. **For manual input**, check the [Manual] box. Click the heading input box to show the up and down arrows. Click the arrows to set heading.
6. Click the [OK] button to save the settings then click the [MENU] bar to close the menu.

1.18 How to Mark MOB Position

Use the MOB (man overboard) feature to mark the position of man overboard on the display screen. Click the [MOB] button (in any mode) on the InstantAccess bar™.



The MOB mark instantly appears at the geographical position of your ship when the button is clicked.



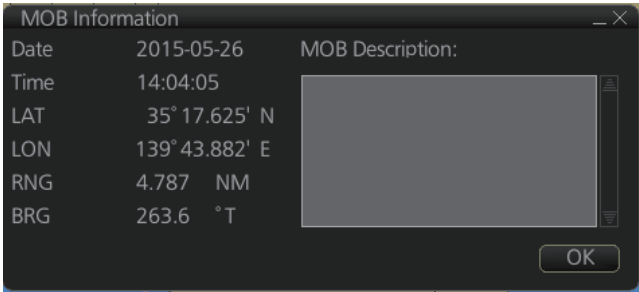
Up to 100 MOB marks can be saved. When the capacity for MOB marks is reached, the oldest mark is automatically erased to make room for the latest.

To hide an MOB mark, get into the Navigation voyage mode ([NAVI]) or Voyage planning mode ([PLAN]), right-click the mark to show the context-sensitive menu then select [Hide MOB].

Exercise caution when using this feature in strong tide or current. The person will not be at the MOB position for a very long time.

How to find MOB information

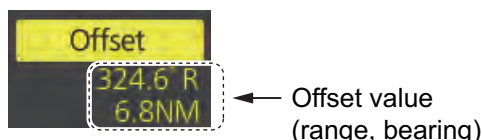
In Navigation voyage mode or Voyage planning mode, put the cursor on a MOB mark and click. Text can be entered in the [MOB Description] window. Click the [OK] button to save the text and close the window.



1.19 How to Offset Position

The position shown in the Sensor information, datum box (section 1.11) may be different from the actual position. This error affects the positioning accuracy of radar echoes, radar map and TT and AIS symbols. If there is a difference, apply an offset to position as shown below to compensate for the error.

1. Right-click the display area to show the context-sensitive menu.
2. Select [Own Ship Offset] and push the left button. The color of the cursor becomes blue.
3. Roll the trackball until the cursor is at the "correct position".
4. Push the left button to confirm.

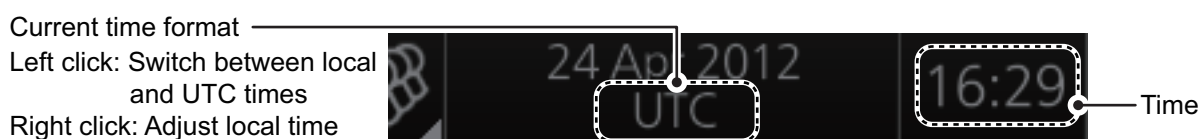


To cancel the offset, show the context-sensitive menu then select [Reset Own Ship Offset]. The indication [Offset] and the offset values are then erased from the display.

1.20 How to Select Time Format, Set Local Time

The time indication on the Status bar shows either UTC time and date, or on-board time and date, and cannot be adjusted. On-board time display requires synchronization with the on-board clock. For further details, consult your local dealer.

You can switch between the local time and the UTC time by left-clicking the Current time format indication (requires synchronization with local time, consult your local dealer for details).



Note: If the ZDA sentence is not input to this system, the date and time indications on the status bar appear in yellow color.

To use the local time, enter the time difference between the local time and the UTC time as shown below.

Note: Where the on-board time is synchronized, the local time setting is not available.

1. Right-click the Current time format indication to show the context-sensitive menu.
2. Click [Adjust Local Time] to display the [Local Time Adjust] dialog box.
3. Enter the time difference between the local time and the UTC time, in hours and minutes. Use the button on the left to select the time offset direction. Select "+" if the local time is ahead of the UTC time, or "-" if it is behind the UTC time.
4. When input is complete, click [OK] to apply the changes.

