FURUNO

OPERATOR'S MANUAL

DOPPLER SONAR CURRENT INDICATOR

Model **CI-68**

FURUNO ELECTRIC CO., LTD.

www.furuno.com

FURUNO ELECTRIC CO., LTD.

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・FURUNO Authorized Distributor/Dealer

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IMPORTANT NOTICES

General

- This manual has been authored with simplified grammar, to meet the needs of international users.
- The operator of this equipment must read and follow the 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: Siriusstraat 86, 5015 BT, Tilburg, 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

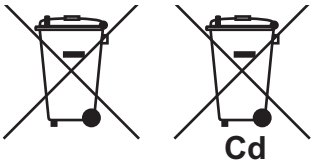
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (http://www.eiae.org/) for the correct method of disposal.

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.

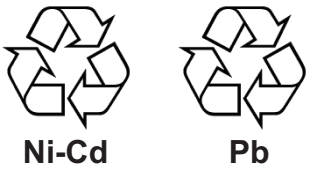
In the European Union

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



In the USA

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



In the other countries

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

SAFETY INSTRUCTIONS

Read these safety instructions before you operate the equipment.

WARNING	Indicates a condition that can cause death or serious injury if not avoided.
CAUTION	Indicates a condition that can cause minor or moderate injury if not avoided.

Warning, Caution Prohibitive Action Mandatory Action

WARNING

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

Only qualified personnel should work inside the equipment.

Immediately turn off the power at the switchboard if water leaks into the equipment or something is dropped in the equipment.

Continued use of the equipment can cause fire or electrical shock. Contact a FURUNO agent for service.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Do not place liquid-filled containers on the top of the equipment.

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

WARNING

Keep heater away from equipment.

A heater can melt the equipment's power cord, which can cause fire or electrical shock.

Use the proper fuse.

Use of a wrong fuse can damage the equipment.

Do not operate the equipment with wet hands.

Electrical shock can result.

Immediately turn off the power at the switchboard if the equipment is emitting smoke or fire.

Continued use of the equipment can cause fatal damage to the equipment. Contact a FURUNO agent for service.

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

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

⚠ CAUTION

Check the zinc plate (anticorrosion measure) regularly for corrosion and replace it when the ship is drydocked.

Corrosion may occur. As a result the transducer may fall out, allowing water to leak inside the vessel.

Do not use the equipment for other than its intended purpose.

Damage to the equipment or bodily injury may result if the equipment is misused.

Do not transmit with the transducer out of water, when drydocked, etc.

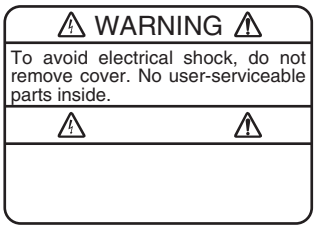
The transducer may become damaged.

Turn off the power at the switchboard immediately whenever you feel the equipment is abnormal.

Turn off the equipment at the switchboard if it becomes warm or is making strange noises. Contact your dealer at your earliest convenience.

WARNING LABEL

A warning label is attached to the transceiver and monitor units. Do not remove the labels. If a label is missing or damaged, contact a FURUNO agent or dealer about replacement.



Transceiver Unit
Name: Warning Label (1)
Type: 86-003-1011-1
Code No.: 100-236-231

Monitor Unit
Name: Warning Label (2)
Type: 03-129-1001-1
Code No.: 100-236-741

TFT LCD

The high quality TFT LCD displays 99.99% of its pixels. The remaining 0.01% of pixels may light or dropout, however this is not an indication of malfuction; it is a characteristic of the LCD.

TABLE OF CONTENTS

FOREWORD

A Word to the Owner of the CI-68

Congratulations on your choice of the FURUNO CI-68 Doppler Sonar Current Indicator. 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 current indicator 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.

Thank you for considering and purchasing FURUNO equipment.

Features

- With heading data from a gyrocompass, satellite compass, etc., the absolute movements of tide measuring layers is displayed, in colors.
- When ground (bottom) reference is not available acoustically; namely, ship is in deep water, this equipment provides absolute movements of measuring layers by receiving position (or speed) data from a GPS navigator and heading data from a gyrocompass or satellite compass.
- Single-mold transducer plus compact monitor unit, control unit, transceiver unit and junction box (option) permit installation on small vessels.
- Data is displayed on a bright, non-fading 10.4 inch TFT LCD. Background color is selectable from three colors.
- Commercially available monitor may be used in lieu of the LCD monitor.
- Six display modes to discern tide movement from a variety of angles.
- Logical keyboard layout and menu structure for intuitive operation. Function key provides shortcut menu operation.
- Triple-beam system for automatic error compensation against pitching and rolling.
- Echo level continuously displayed on the screen, for monitoring signal conditions on three sounding beams.
- Bottom echo can be found using external depth data. Further, the bottom echo can be acquired manually by monitoring the echo level display. This is useful when in deep seas, air bubbles block reception of the bottom echo, or a thick layer of plankton or a large fish school is mistakenly tracked as the bottom echo.
- Various alarms: tide, tide differential, speed, trip, etc. Audible and visual alerts are released if alarm condition is violated.
- Graph display shows past current data.
- Water temperature graph helps locate current rip. (Temperature sensor required.)

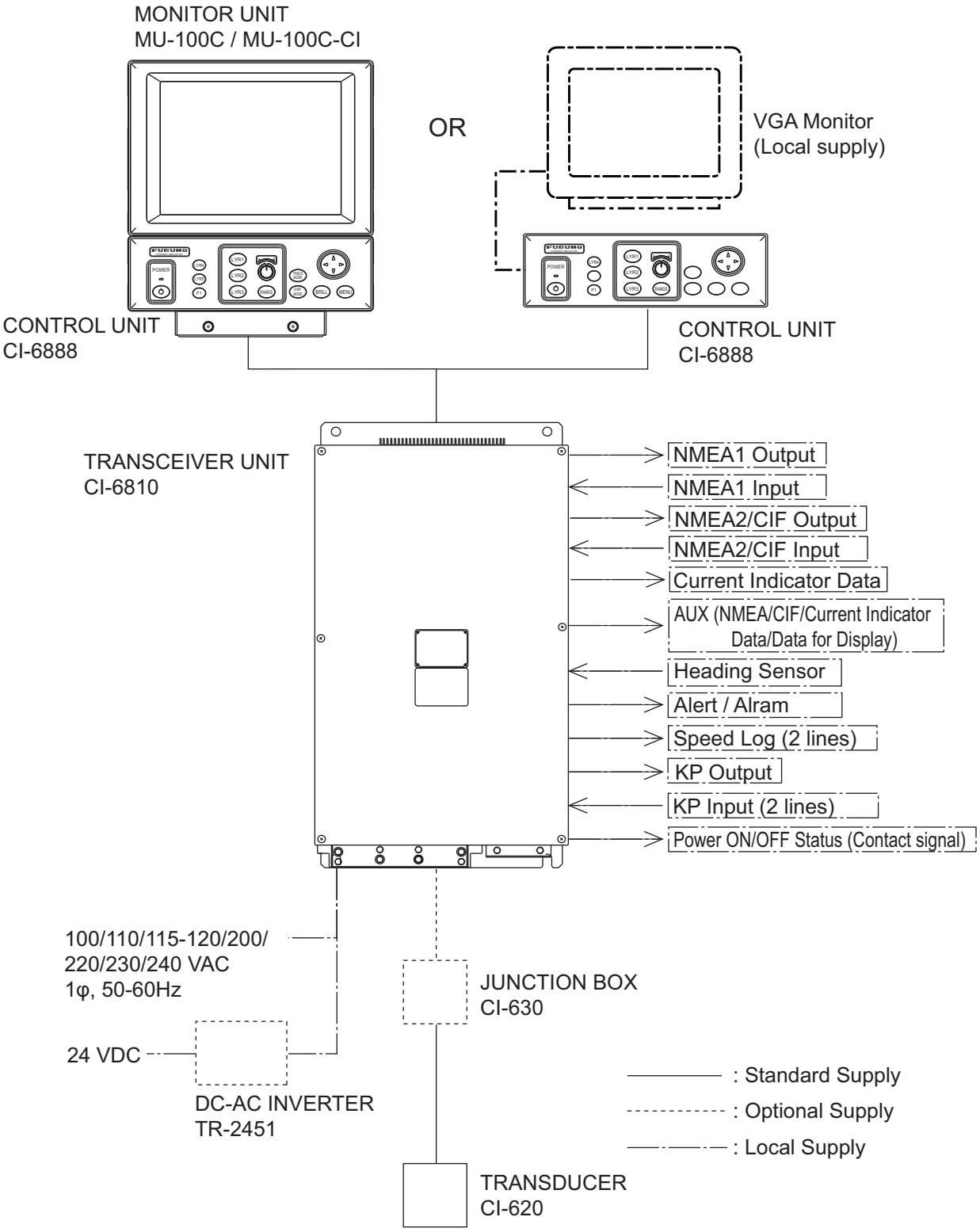
CE/UKCA declaration

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

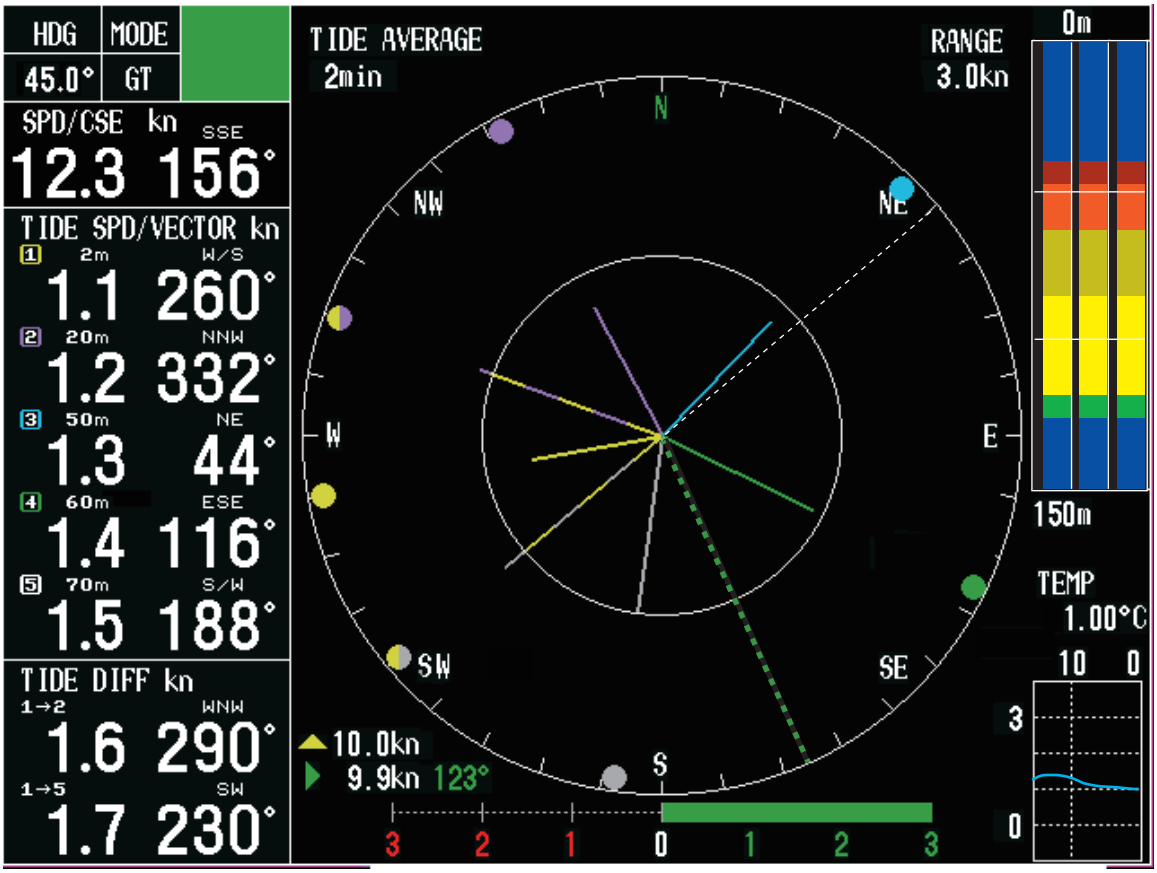
Disclosure of Information about China RoHS

With regards to China RoHS information for our products, please refer to our website (www.furuno.com).

SYSTEM CONFIGURATION



DISPLAY EXAMPLE



Tide vector display

Solid line: The speed and direction of the tide

- Tide vector for Layer 1 (LYR1) : Yellow
- Tide vector for Layer 2 (LYR2) : Purple
- Tide vector for Layer 3 (LYR3) : Blue
- Tide vector for Layer 4 (LYR4) : Green
- Tide vector for Layer 5 (LYR5) : Grey (Black when the setting for [BACKGROUND CLR] is white.)

Two-color line: The speed and direction of the differential tide

Dashed line (White or Black): Heading

Dashed line (Green): Ship’s speed and course

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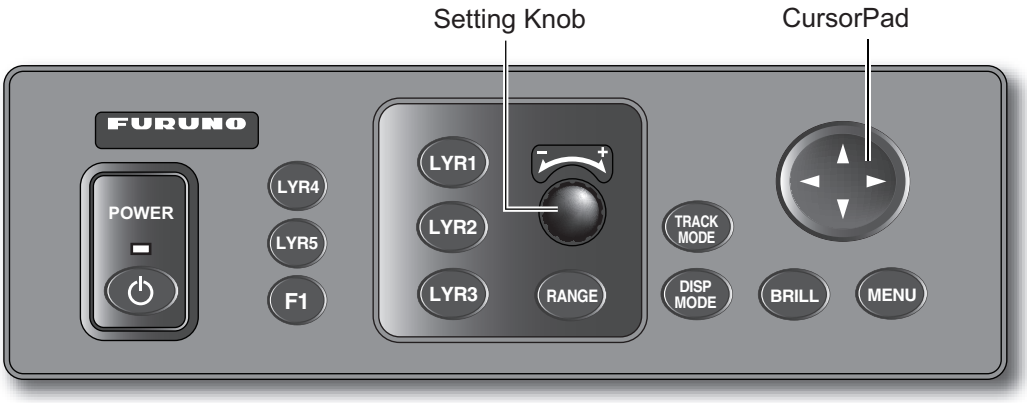
1. OPERATIONAL OVERVIEW

1.1 Controls



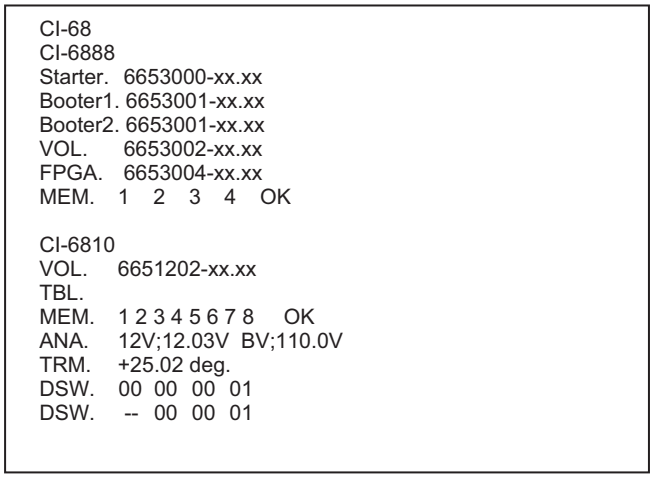
Control unit

Control	Function
POWER	Turns power on or off.
F1	Function key (menu shortcut keys)
LYR1 – LYR5	Set tide measuring depths for respective layers.
Setting Knob	Sets measuring depth and range.
RANGE	Sets range. The range which can be set depends on mode.
TRACK MODE	Chooses tracking mode among ground, water (or nav) and auto.
DISP MODE	Chooses a display mode.
BRILL	Adjusts brilliance of LCD.
MENU	Opens and closes the menu.
CursorPad	• Chooses menu items and options. • Increases or decreases numerical setting on menus and pop-up windows. • Silences audible alarm.

1.2 How to Turn the Power On/Off

Power ON

Press the **POWER** switch at the left hand side of the control unit to turn the power on. A beep sounds, the equipment turns on, and the lamp above the switch lights. The equipment conducts the diagnostic test to check for proper operation between the transceiver unit and the control unit and displays the results. After the diagnostic test is completed the last-used display appears.



XX: Program Version No.

Diagnostic test

Note: The example screens shown in this manual may not match the screens you see on your display. The screen you see depends on your system configuration and equipment settings.

Power Off

To turn the power off, press the **POWER** switch again.

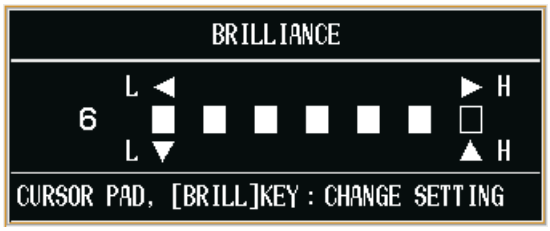
Note: The NAV mode measures tides in deep waters where ground tracking is not available. To use this function effectively, accurate heading data (from a gyrocompass, satellite compass) is necessary. For further details, see section 1.8.

1.3 How to adjust the LCD Brilliance and Panel Dimmer

LCD Brilliance

You can adjust the brilliance of the FURUNO-supplied monitor (MU-100C/MU-100C-CI) as below. When you adjust the brilliance of a commercial monitor, the **BRILL** key is not available.

1. Press the **BRILL** key to open the brilliance adjustment window.



   Note: Execute the next step within five seconds after displaying the brilliance adjustment window. Otherwise the window is erased.

2. Press ▶ or ▲ to raise the brilliance; ◀ or ▼ to lower it. The brilliance may also be adjusted by pressing the **BRILL** key. In this case, brilliance is adjusted cyclically (8 steps): 0 → 1 → … → 7 → 7 → 6 … 0 →.

Panel Dimmer

You can adjust the backlighting for the control panel with [PANEL DIMMER] on the [MENU 4] sub menu. See subsection 3.3.2.

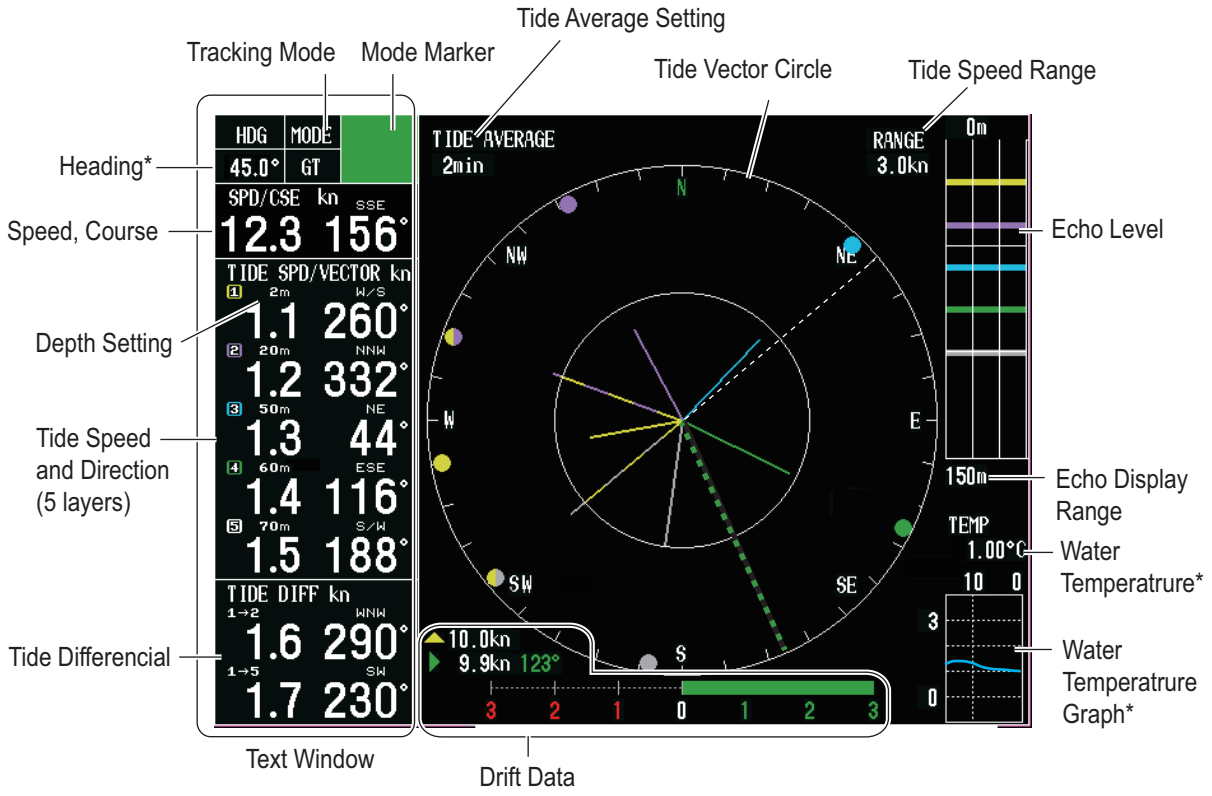
1.4 How to Choose a Display

This current indicator has six main displays: tide vector display, ship's speed display, course plot display, text display, echo level display and graph display. For the details for each display, see chapter 2.

You may choose a display by pressing the **DISP MODE** key. The display, which is selected [ON] on [MODE] sub menu, is shown on the screen. See subsection 3.4.1

1.4.1 Tide vector display

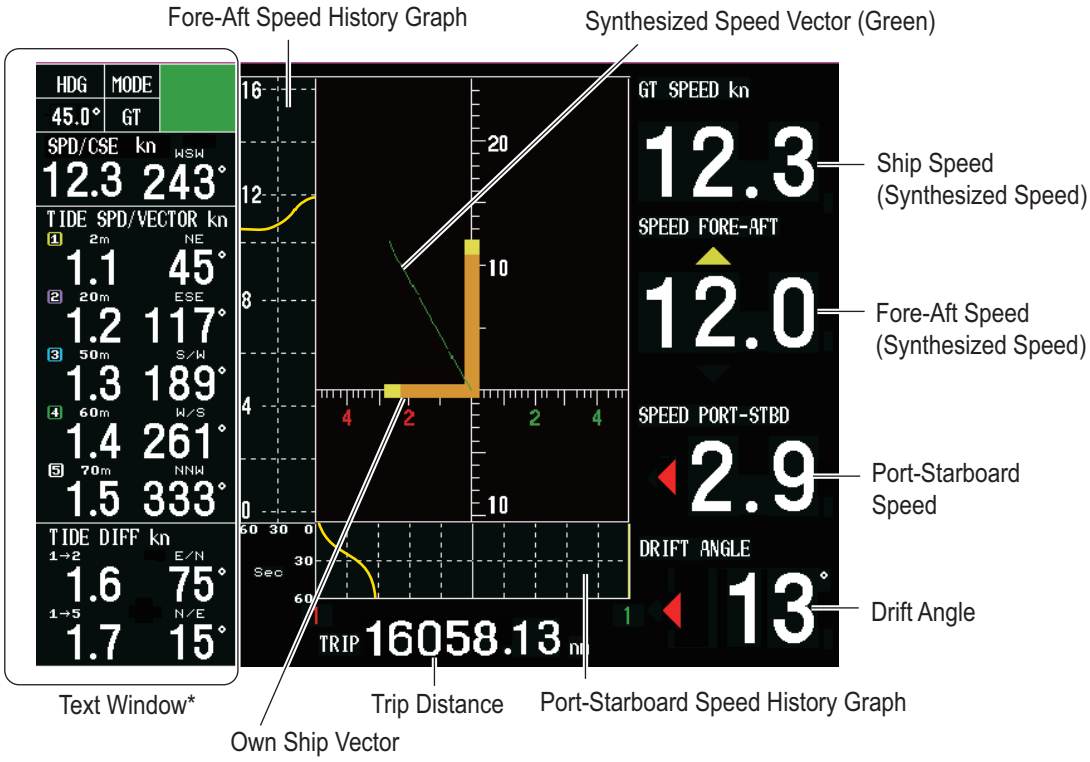
The tide vector display mainly shows tide speed and direction for five layers with a vector.



*: Sensor required.

1.4.2 Ship's speed display

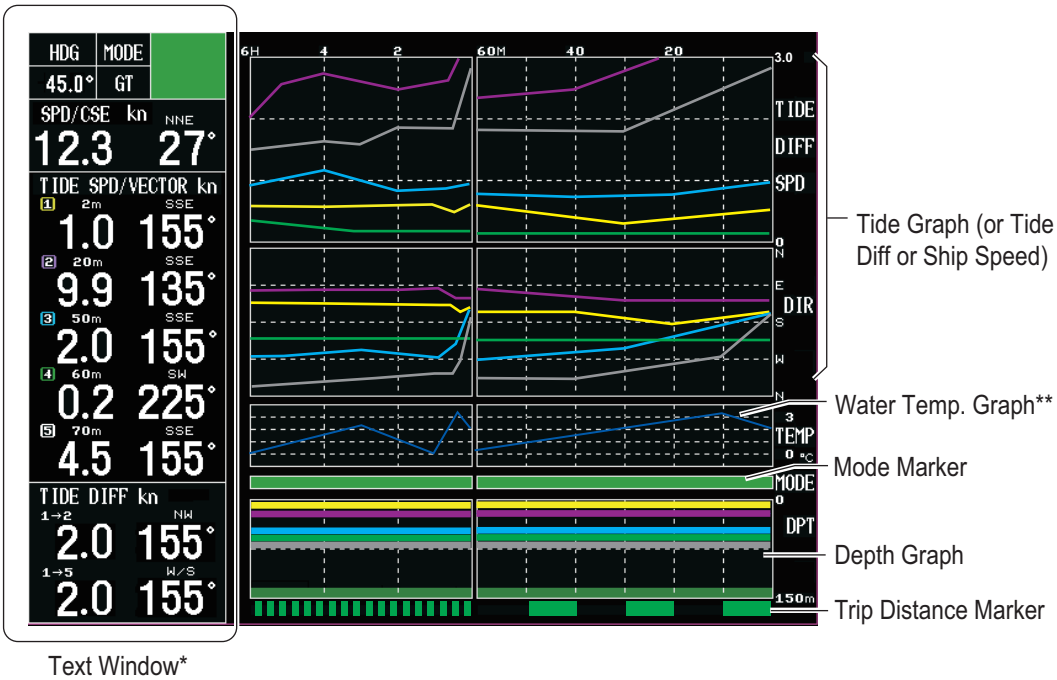
The ship's speed display shows ship's fore-aft and port-starboard speeds in analog and digital form.



*: See subsection 1.4.1

1.4.3 Graph display

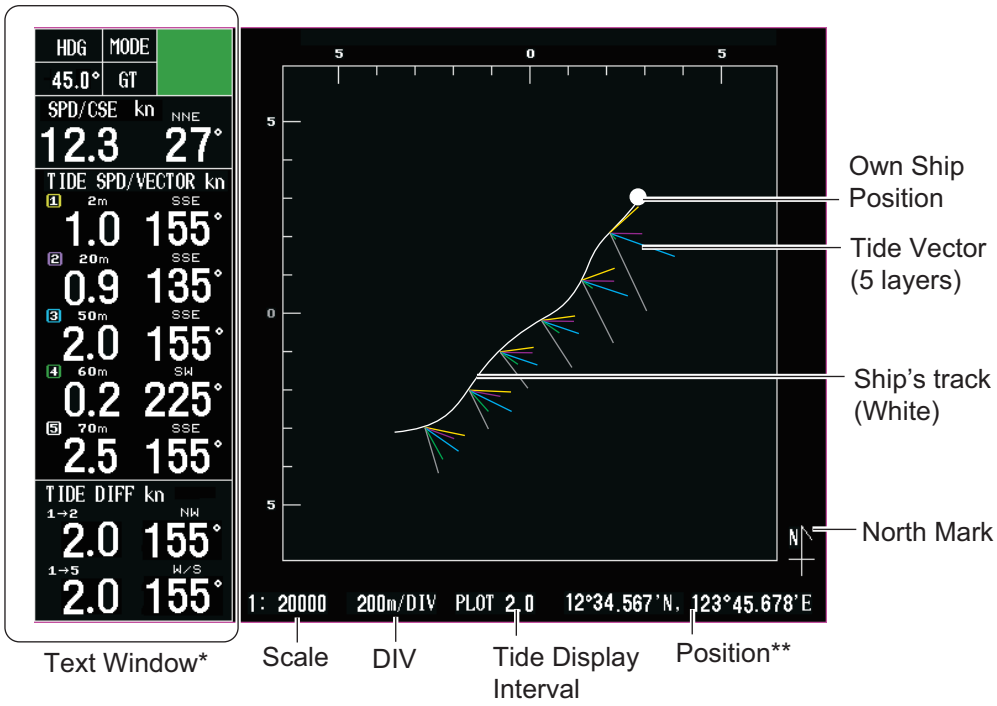
The graph display plots water temperature and depth data in graph form.



*: See subsection 1.4.1. **: Sensor required.

1.4.4 Course plot display

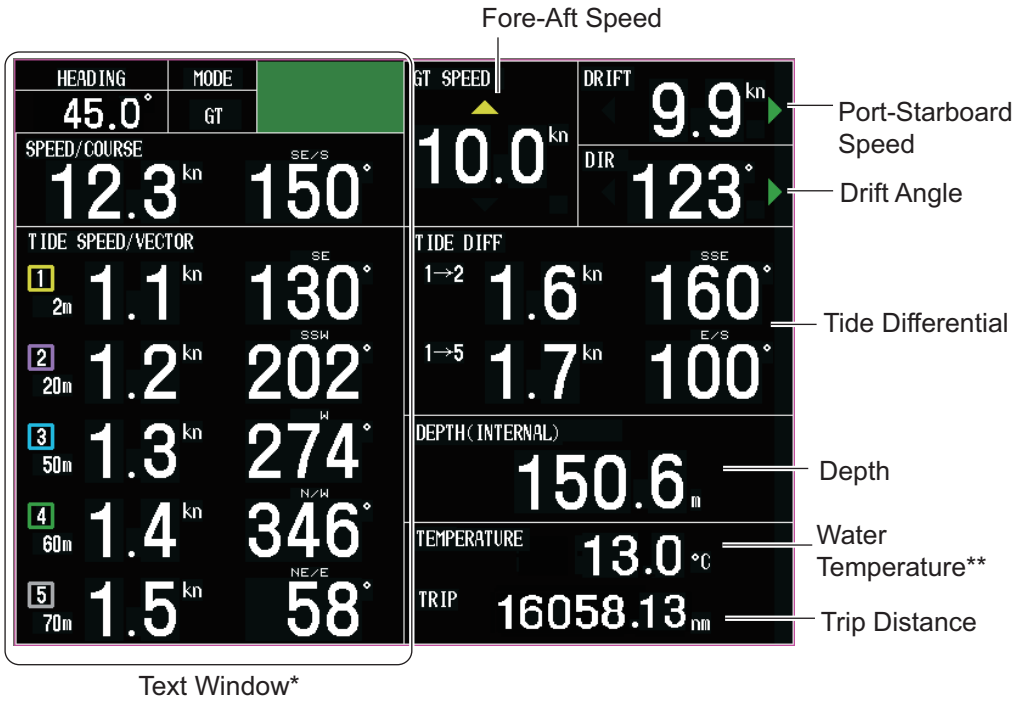
The course plot display plots ship's track along with tide vectors.



*: See subsection 1.4.1. **: Sensor required.

1.4.5 Text display

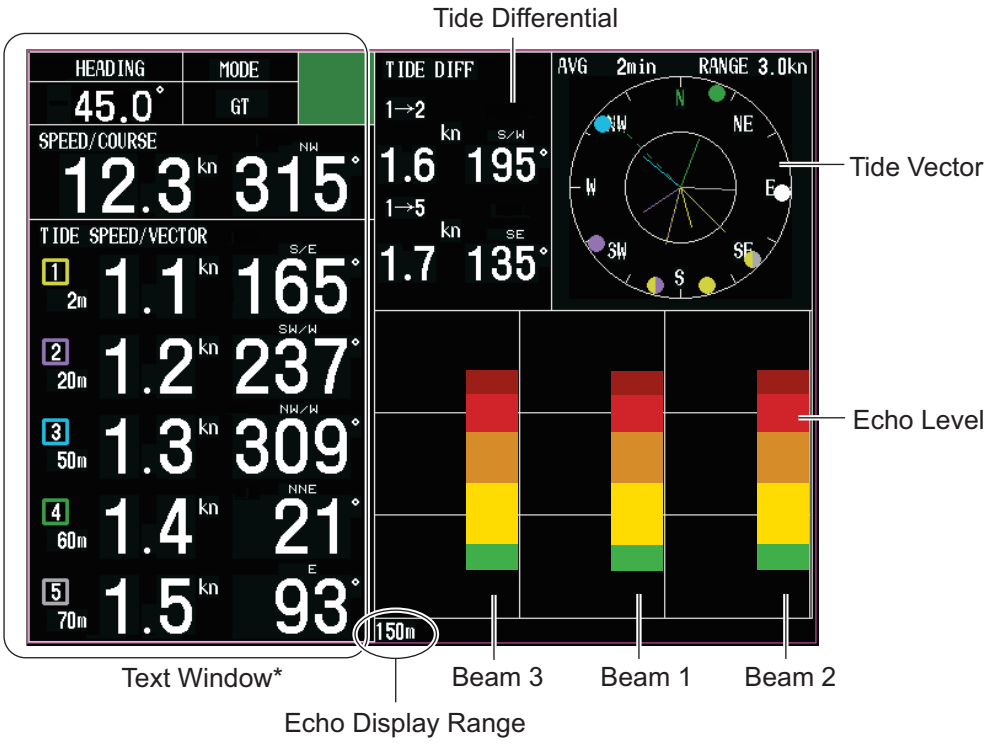
The text display provides various nav data in digital format.



*: See subsection 1.4.1. **: Sensor required.

1.4.6 Echo level display

The echo level display shows the strength of the echoes captured by three sounding beams. Note that [ECHO LEVEL] in the [MODE] sub menu must be set to [ON] to show the echo level display.



*: See subsection 1.4.1.

1.5 How to Set the Measuring Depth

Set the depths at which you wish to measure tide speed and direction as below.

Note: The layer 5 cannot be set when [BTM TIDE TRACK] in the [MENU 4] sub menu is set to [ON] (see subsection 3.3.2).

1. Press the **LYR1**, **LYR2**, **LYR3**, **LYR4**, or **LYR5** key as appropriate to show the depth setting window shown right.
   Note: This window disappears when there is no operation for five seconds.

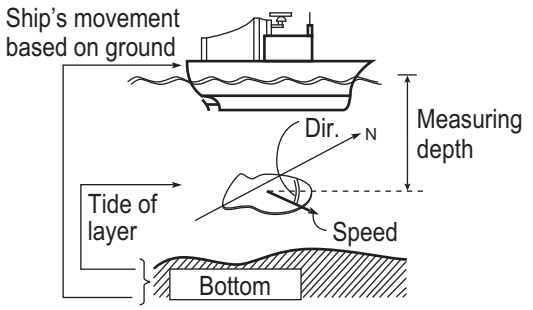
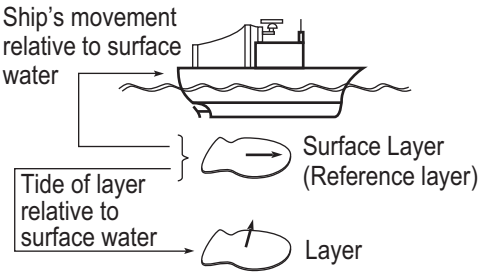
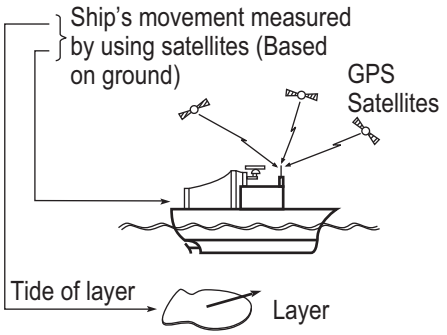
2. Operate the Setting Knob or the CursorPad to set depth of measurement. The setting range is 2-400 (meters).

Setting Knob:	Rotate clockwise to raise the range; counterclockwise to lower the range.
CursorPad:	Press ▶ or ▲ to raise the range; ◀ or ▼ to lower the range.

1.6 How to Choose Speed Tracking Mode

The tracking mode is available in ground tracking, water tracking, NAV and Auto/External.

Overview of Tracking Mode

Tracking mode	Contents	
GT (Ground tracking)	Absolute ship and tide movements based on ground and current (tide display (bottom echo must be present).	
WT (Water tracking)	Ship and tide movements relative to near-surface water and tide differential between tide layers. (The pulse length in this mode must be [NORMAL] and depth greater than 40 m, or LONG pulse length and depth greater than 70 m.)	
NAV	Ship's movement as measured by a navigation device and tide movements based on nav speed data. **Note:** The accuracy of tide measurement in the NAV mode depends heavily on gyrocompass accuracy.	
AUTO/EXT* (External)	Uses ground tracking mode when bottom echo is available and switches to water tracking mode (or [NAV] mode) when bottom echo is lost. The bottom echo is continuously sought, and if re-acquired the ground tracking mode is restored. *: [EXT] appears in the tracking mode window (top left corner) when [DEPTH SOURCE] in the [OTHER] sub menu. When set to [EXT], currents are shown based on the water depth entered. However, if no bottom echoes are detected, the currents will not be shown.	

To choose the tracking mode, press the **TRACK MODE** key. The tracking mode changes according to the setting ([OFF] or [ON]) of [NAV MODE] in the [MENU 4] sub menu. The current tracking mode appears at the top left-hand corner on the screen.

In case of [OFF] of [NAV MODE]
The tracking mode changes cyclically in the sequence of ground tracking, water tracking and auto (or external).

In case of [ON] of [NAV MODE]
The tracking mode changes cyclically in the sequence of ground tracking, nav and auto (or external).

1.7 How to choose the Range

You may choose the speed range by pressing the **RANGE** key. Also, you can change the range setting on the menu.

1. Press the **RANGE** key to show the range setting window. The window shown right appears (ex. range setting window for tide vector display).
   Note: This window disappears when there is no operation for five seconds.

2. Operate the Setting Knob or the CursorPad to set the range.

   Setting Knob: Rotate clockwise to raise the range; counterclockwise to lower the range.

   CursorPad: Press ▶ or ▲ to raise the range; ◀ or ▼ to lower the range.

Display and range to set

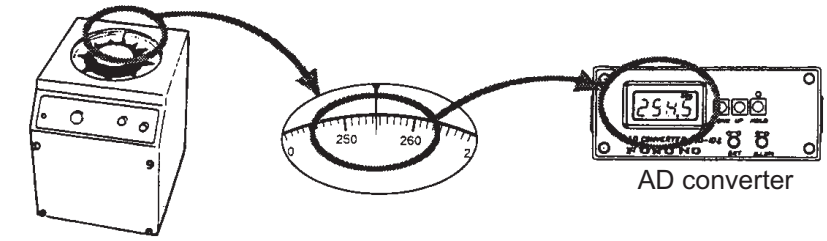
Display	Range	Menu operation
Tide vector	Tide speed range setting window appears. Set tide/tide differential range (radius of vector display ring) appropriately. Setting range: 0.5 kn, 1.0 kn, 1.5 kn, 2.0 kn, 3.0 kn, 5.0 kn, 10.0 kn	[TIDE RANGE] (subsection 3.4.1)
Ship's speed	The ship's speed range setting window shown depends on whether [SCALE SYNC] in the [DISP 2] sub menu is set to [ON] or [OFF]. [ON]: Port-starboard and fore-aft speeds are synchronized. The ship's speed range setting window appears. Set speed appropriately. [OFF]: The ship's speed range setting window appears. Set fore-aft speed appropriately. Setting range: 0.5 kn, 1.0 kn, 2.0 kn, 3.0 kn, 5.0 kn, 10.0 kn, 20.0 kn, 30.0 kn	[SCALE SYNC] [DRIFT SCALE] [SCALE] (subsection 3.4.3)
Graph	The speed range setting window shown depends on the setting of [MODE] in the [DISP 2] sub menu. See subsection 3.4.4. [TIDE], [TIDE DIF]: The tide speed range setting window appears. Set tide speed range (port-starboard of tide speed/tide differential graph) appropriately. Setting range: 0.5 kn, 1.0 kn, 1.5 kn, 2.0 kn, 3.0 kn, 5.0 kn, 10.0 kn [SHIP SPD]: The ship's speed range setting window appears. Set ship's speed range (fore-aft of ship's speed graph) appropriately. Setting range: 0.5 kn, 1.0 kn, 2.0 kn, 3.0 kn, 5.0 kn, 10.0 kn, 20.0 kn, 30.0 kn	[TIDE RANGE] (subsection 3.4.1)
Course plot	The display scale setting window appears. Set display scale as appropriate. Setting range: 1:10,000, 1:20,000, 1:50,000, 1:100,000	[SCALE] (subsection 3.4.3)
Echo level	Tide speed range setting window appears. Set tide and tide differential range (radius of vector display ring) appropriately. Setting range: 0.5 kn, 1.0 kn, 1.5 kn, 2.0 kn, 3.0 kn, 5.0 kn, 10.0 kn	[TIDE RANGE] (subsection 3.4.1)

Note: The **RANGE** key is not available on the Text display.

1.8 How to Set the Ship's Heading

The current indicator has a NAV mode which measures tides in deep waters where ground tracking is not available. To achieve reliable measurements, however, you must feed accurate heading (gyro) data and ship's position (or speed and course) data to the current indicator.

1. Confirm that the gyro has settled and all necessary compensations (latitude compensation, weather compensation, etc.) have been made correctly.
2. Adjust the AD Converter to show the same reading shown on the master gyrocompass. Do not make the adjustment while the ship is turning.

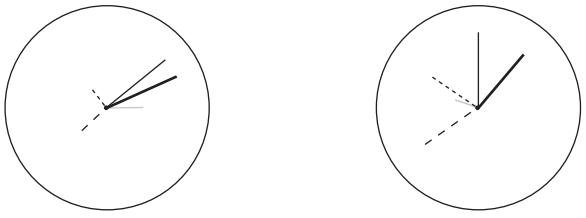


Master compass

AD converter

If the gyro reading is accurate, the current indicator will provide accurate tide information. If gyro data is wrong, the following symptoms will appear.

- The drift angle in the ground tracking mode is not the same as that in the nav mode or is shown in the direction reverse of the actual direction.
  Drift angle in ground tracking mode: Difference between ground speed and course and gyro heading.
  Drift angle in nav mode: Difference between nav course and gyro heading.
- Tide speed and direction in the ground mode is not the same as that in the nav mode. And the tide correlation (relative angle, size) between layers is different.

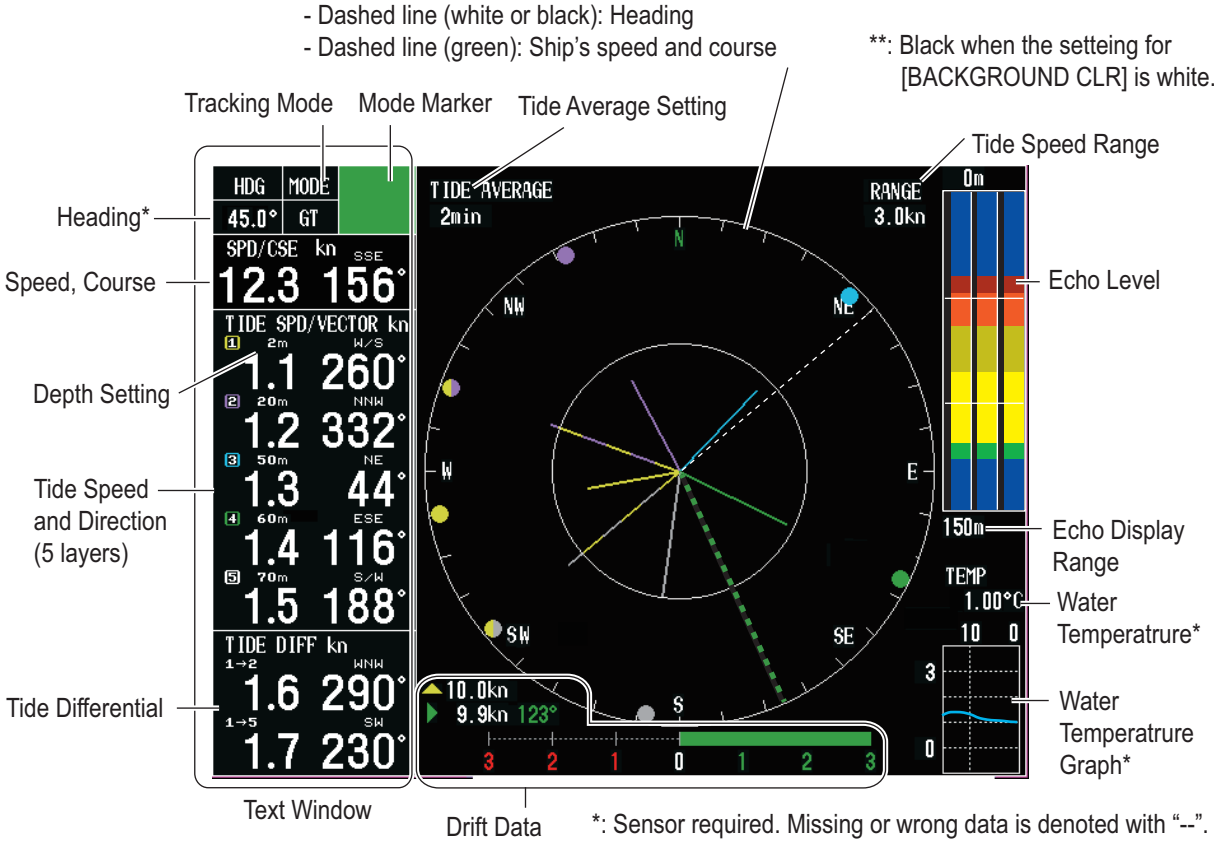


Ground Tracking Mode ⟷ Nav Mode

If you encounter such symptoms calibrate the current indicator as shown in the installation manual.

2. INTERPRETING THE DISPLAYS

2.1 Tide Vector Display



Heading

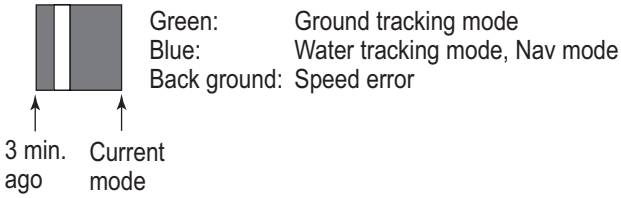
Ship's heading fed from a heading sensor.

Mode

Shows current tracking mode, as selected with the **TRACK MODE** key. See section 1.6.

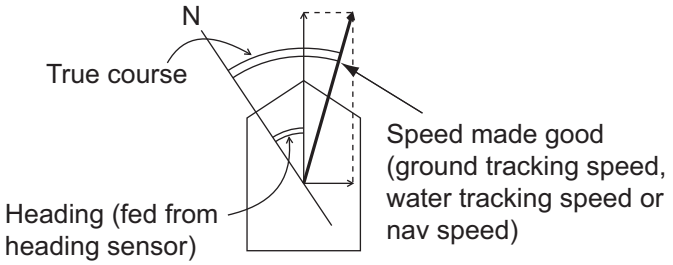
Mode marker

Shows tracking mode and echo availability for last three minutes, scrolling from right to left. The color represents tracking mode as shown right.



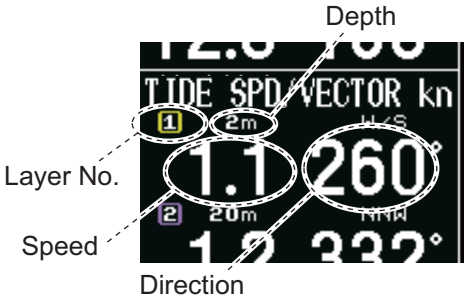
Speed/course

Speed made good and true course are shown. The displayable range is 0.0 to 40.0 kn for speed and 0° to 359° for course.



Tide speed and direction

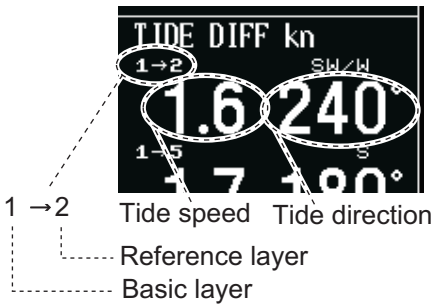
Tide speed and direction is shown for five layers (measuring depths). The displayable range is 0.0 to 9.9 kn for speed and 0° to 359° for course. The depth of each layer is shown at the right or lower-right of the layer number. The figure shown right is an example of the tide vector display. Data shown depends on the measuring mode as follows;



- **Ground tracking mode**: Speed and direction values of measuring layers represent movement of layer relative to ground.
- **Water tracking mode**: Speed and direction values of measuring layers represent movement of layer relative to near-surface water.
- **Nav mode**: Speed and direction values represent movement of measuring layers relative to pseudo ground. Required the ship's speed data from an external equipment.

Tide differential

Tide speed and direction differential are shown between basic layer and the reference layer. The displayable range is 0.0 to 9.9 kn for speed and 0° to 359° for course. The basic layer and the reference layer are selected with [REF TIDE DIFF] and [TIDE DIFF1 (2)] on the [MENU 3] sub menu. For example, if the basic layer is layer 1 and the reference ones are layer 4/layer 5, the tide differential between layer 1 and layer 4/layer 5 will be displayed.

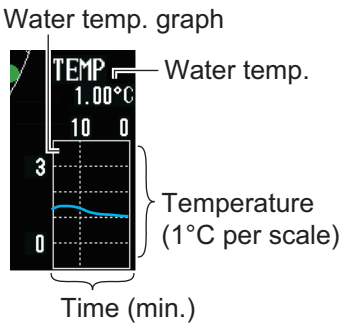


Water temperature

Water temperature is shown if a water temperature sensor is connected to the current indicator. The display range is -5.00 to 99.99 (°C).

Water temperature graph

Water temperature over the latest 15 minutes is displayed with a blue line, the data scrolling from right to left. The range of the temperature scale is 5°C and the range of the time scale is 15 minutes.



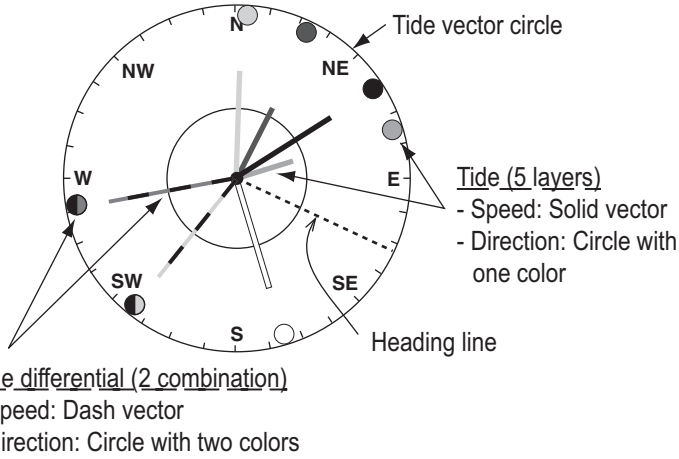
Heading line

The heading line is a dashed line (white) which shows ship's heading. It extends from ship's position (center of vector display) to the edge of the vector display. When the back color of the display is set "WHITE", the heading line is shown in black, see "BACKGROUND CLR" on page 3-5. You can hide the heading line, see "HEADING LINE" on page 3-6.

Note: If the heading line overlap on the ship's speed vector, ship's speed vector has higher priority so the heading line is hidden.

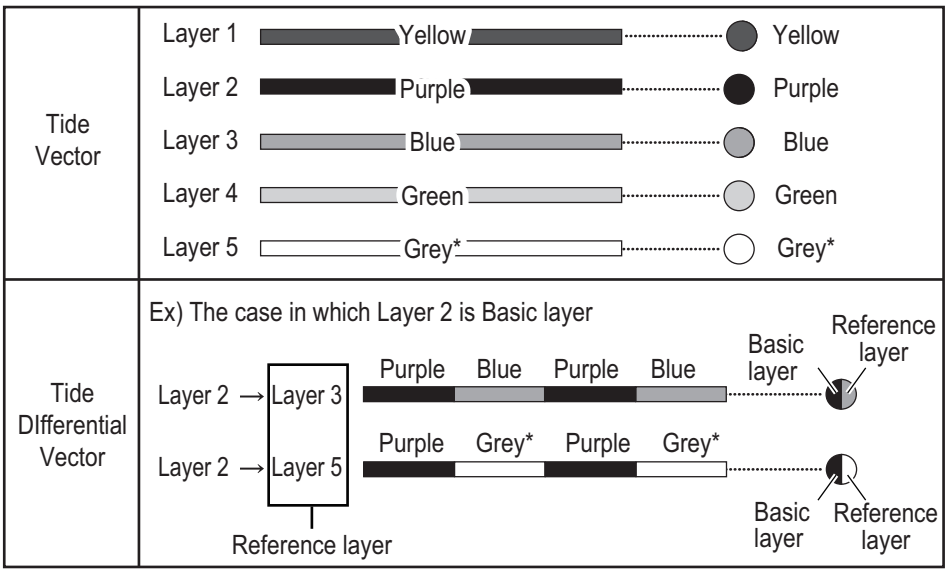
Tide/Tide differential vector

Tide speed and direction for five layers are shown in the tide vector circle. Also, the two tide differential are shown. You can hide their vector, see "TIDE VECTOR (LAYER 1 to LAYER 5)" on page 3-6.



Note 1: if vectors overlap, the vector of the highest layer is shown.

Note 2: The basic layer and reference layer are set on the [MENU 3] sub menu, see subsection 3.4.2.



*: Black when the setting for [BACKGROUND CLR] is white. See "BACKGROUND CLR" on page 3-5.

Ship's speed vector

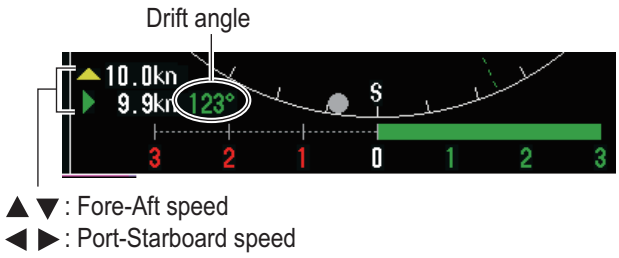
The ship's speed vector may be shown in green dashed line on the vector display. You can hide this vector, see "SHIP SPD VCTR" on page 3-6.

Range

The maximum range for the tide vector circle is shown. You may set with [TIDE RANGE] on the [DISP 1] sub menu, or **RANGE** key.

Drift data

The drift angle and the fore-aft/port-starboard speed are shown. The port-starboard speed is also shown as a graph. The unit for the port-starboard speed graph is kn (knot). The maximum speed which the speed graph can show is 3 kn. Speeds over 3 kn are displayed as a full-graph bar, fixed at 3 kn.



Tide average setting

The average time for measuring the tide speed and direction is shown. You can set this setting with [TIDE AVERAGE] on the [MENU 3] sub menu.

Echo level*

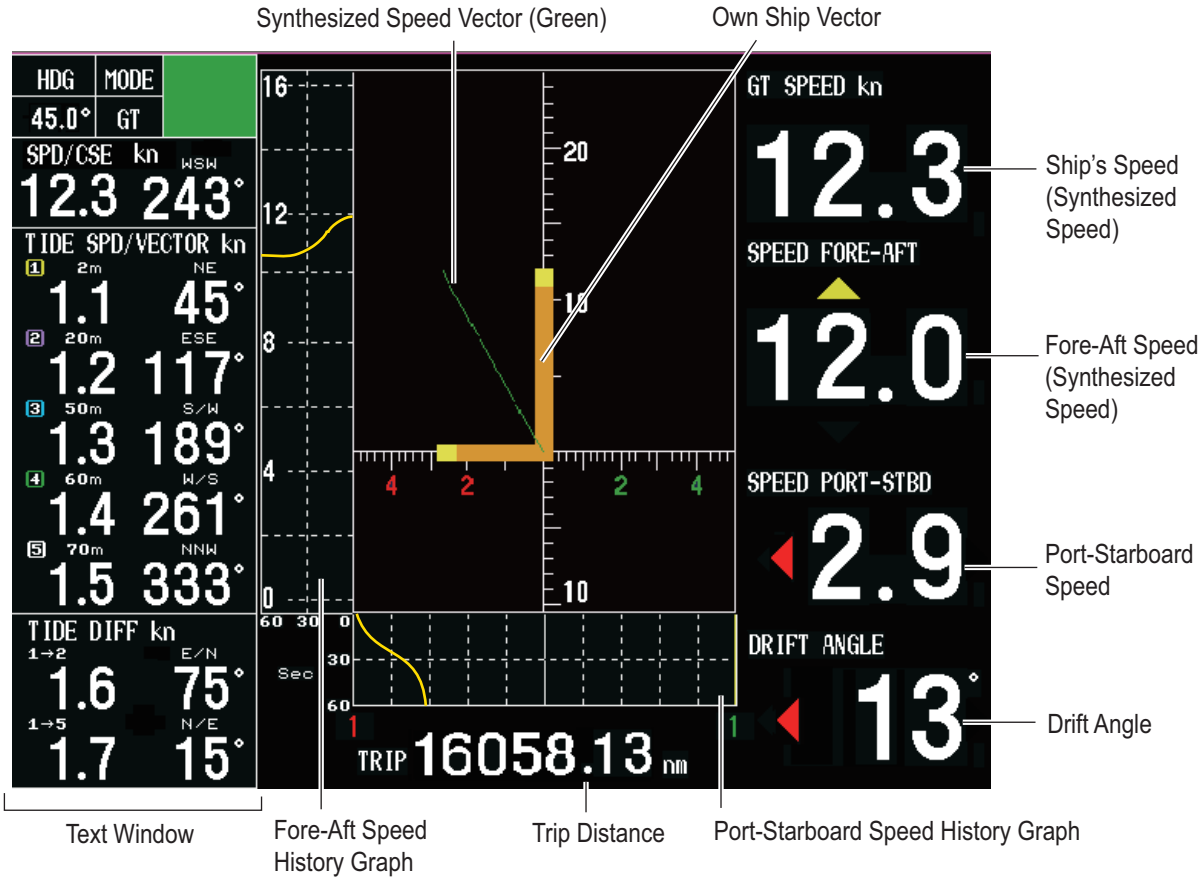
The echo level display shows echo level for the three sounding beams in colors or graph depending on the setting of [DISP MODE] in the [DISP 2] sub menu.

Echo display range*

The echo is shown in this setting value. You can set the value with [ECHO RANGE] on the [MENU 4] sub menu.

*: You can turn this display on or off with [ECHO LEVEL] on the [DISP 2] sub menu.

2.2 Ship's Speed Display



Text window

The contents are same as ones for the tide vector display, see section 2.1.

Ship's speed* (In GT, WT) or Water tracking speed (In NAV mode)

Port-starboard and fore-aft speeds are synchronized when [SCALE SYNC] in the [DISP 2] menu is set to [ON]. The available speed setting range is 0.0 to 40.0 kn.

Fore-aft speed*

Speed in the fore-aft direction. The speed setting range is 0.0 to 9.9 kn. Fore speed is denoted with a yellow "▲" above the speed readout and aft speed with a yellow "▼" below the speed readout.

Port-starboard speed*

Speed in the port-starboard direction. The speed setting range is 0.0 to 40.0 kn. Port speed is denoted with a red "◀" to the left of the speed readout and starboard speed with a green "▶" to the right of the speed readout.

Drift angle*

The angle measured in degrees between ship's heading and the actual movement. When drift angle is to port, a red "◀" appears and when it is to starboard a green "▶" appears. In the NAV mode, drift in water tracking speed is shown.

Trip

Shows trip distance. The distance is referenced to the setting of [LOG PULSE OUT] in the [I/O] sub menu. See the installation manual for the details.

Own ship vector*

The own ship vector shows port-starboard speed on the x-axis and fore-aft speed on the y-axis. The synthesized speed vector (green) appears when [SCALE SYNC] on the [DISP 2] sub menu is set to [ON].

Fore-aft speed history graph

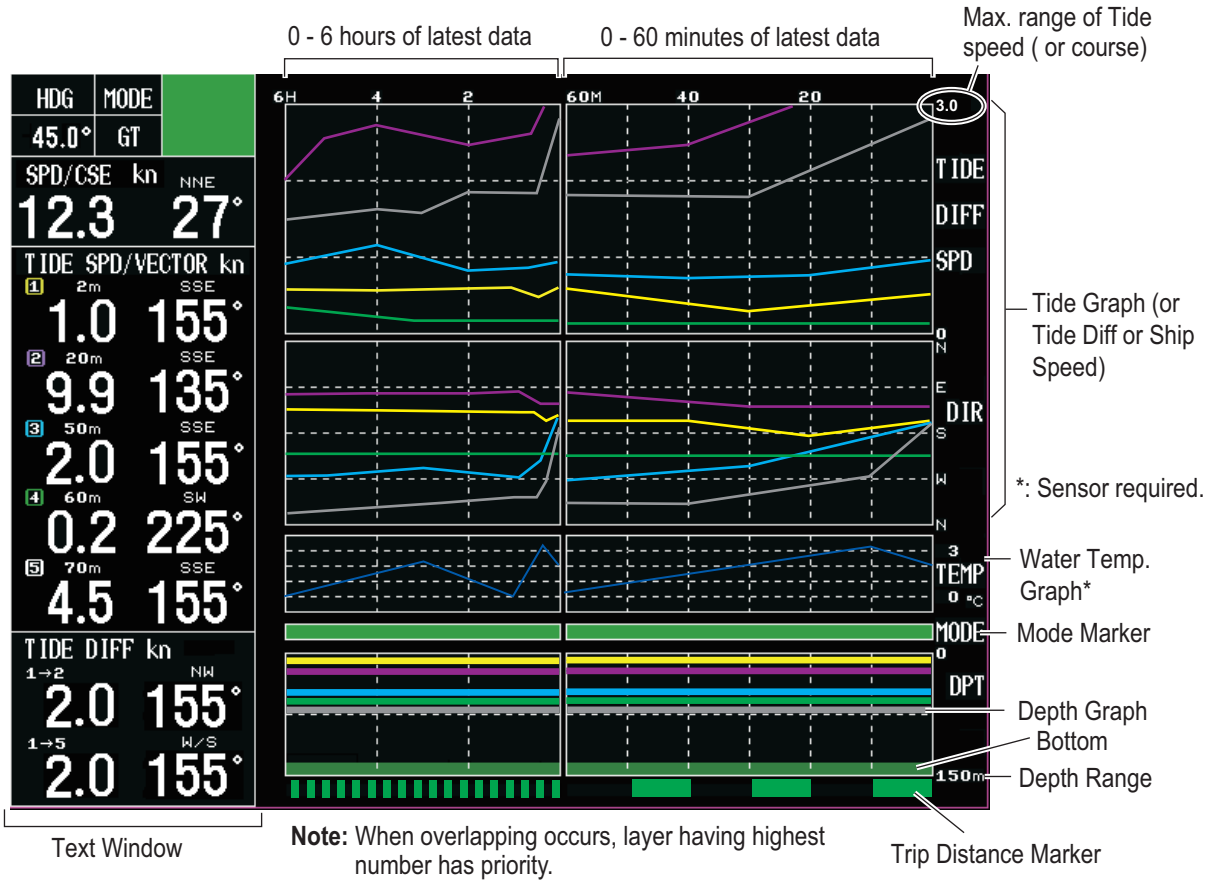
This graph shows fore-aft speed history over time, which is useful in trawling. [HISTORY] in the [DISP 2] sub menu sets the maximum range for the graph, and you can shift the range with [HISTORY SHIFT] in the [DISP 2] sub menu. The latest 60 seconds of fore-aft speed is shown, scrolling from right to left across the screen so the right edge of the graph displays the latest data.

Port-starboard history graph

This graph shows port-starboard speed history over time, which is useful in trawling. [DRIFT HISTORY] in the [DISP 2] sub menu sets the maximum range for the graph. The latest 60 seconds of port-starboard speed is shown, scrolling from top to bottom on the screen so the upper edge of the graph displays the latest data.

*: Speed used for calculation depends on setting of [SHIP SPD MODE] in the [DISP 1] sub menu. See "SHIP SPD MODE" on page 3-7.

2.3 Graph Display



Text window

The contents are same as ones for the tide vector display, see section 2.1. The text window may be turned on or off with [TEXT WINDOW] in the [DISP 2] sub menu. When the text window is turned off, 12 hours of graph data are shown.

Tide (or tide differential, speed) graph

The two graphs (speed and direction) are shown. You may choose the target data to display as graph among tide, tide differential and ship, see "MODE" on page 3-7.

For a tide graph, the five lines for each layer are shown in the each color; Layer1: Yellow, Layer 2: Purple, Layer 3: Blue, Layer 4: Green, Layer 5: Grey. For a tide differential graph, the two lines of the reference layers are shown. For example, when the reference layers are Layer 4 and Layer 5, the line colors are green and grey.

The maximum range for the speed (upper graph) is set with [TIDE RANGE] in the [DISP 1] sub menu. The display style for the direction (lower graph) is set with [TIDE GRAPH] in the [DISP 2] sub menu.

Note: The color for Layer is black when the setting for [BACKGROUND CLR] is white, See "BACKGROUND CLR" on page 3-5.

Water temperature graph

The scale of the water temperature graph is 5 °C width. You can hide this graph, see "TEMP GRAPH" on page 3-8.

Mode marker

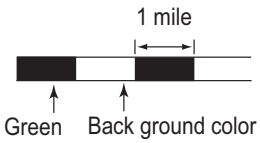
The mode marker shows by color which tracking mode is in use. This marker has longer history than the mode marker in the text window, see "Mode marker" on page 2-1.

Depth graph

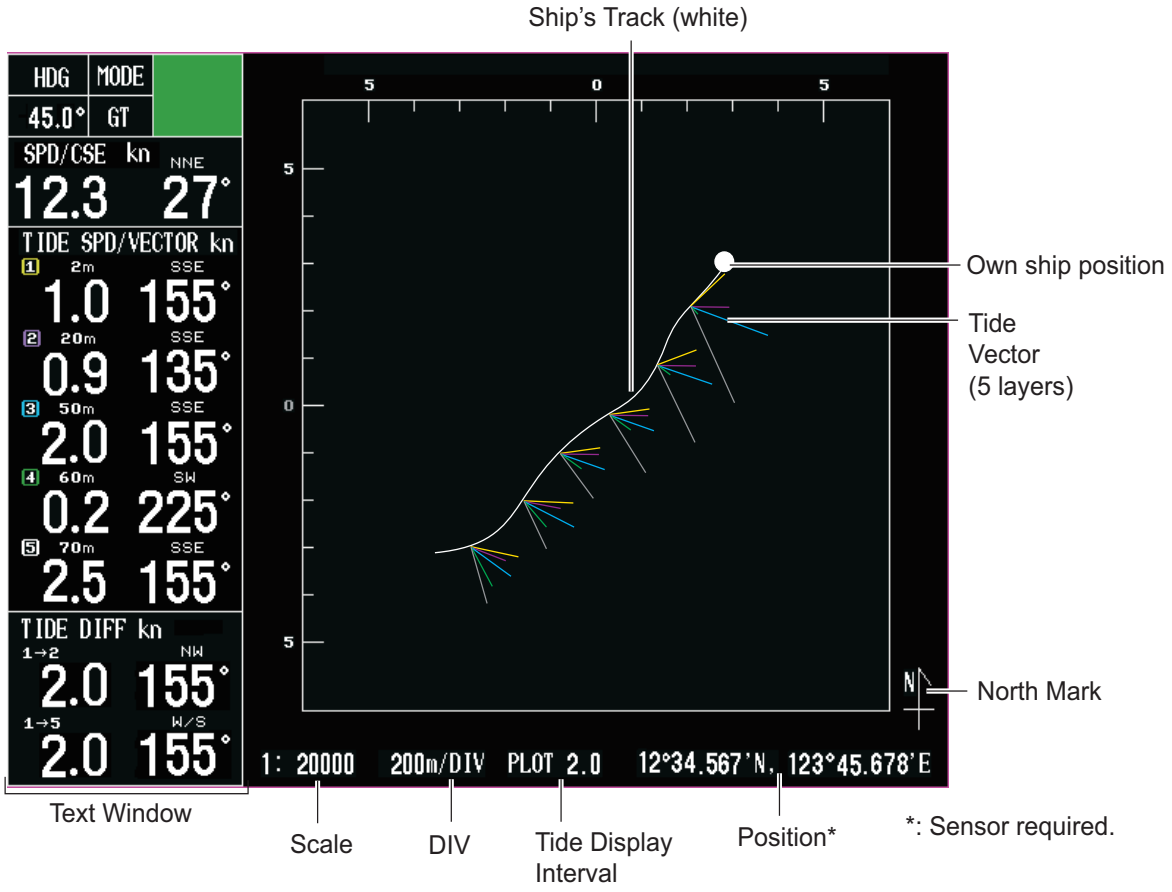
The depth graph displays depth data in graph form. If, in the water tracking mode, the depth is greater than the depth range no depth data is displayed. To graph depth from an external source, set [DEPTH SOURCE] in the [OTHER] sub menu (sub menu in the installation menu) to [EXTERNAL], see installation manual for details.

Trip distance marker

The trip distance marker shows trip distance in one-mile increments, in green and background color alternately as shown below.



2.4 Course Plot Display



Text window

The contents are same as ones for the tide vector display, see section 2.1. The text window may be turned on or off with [TEXT WINDOW] in the [DISP 3] sub menu. When the text window is turned off, the amount of track displayed is greater.

Ship’s track

Ship’s track is drawn with a white solid line. Ship’s track starts extending from the screen center and when own ship position reaches the edge of the screen it is brought back to the screen center. The ship’s track history is saved in three laps display width. You can hide this track, see "SHIP TRACK" on page 3-9.

Tide vector

The five vectors for each layer are shown in each color. The interval to display the vectors depends on the setting for the tide display interval described below. You can hide each vector, see "TIDE VECTOR (LAYER 1 to LAYER 5)" on page 3-6.

North mark

The north mark points upward on the course plot display.

Scale

You may choose the scale with [SCALE] in the [DISP 3] sub menu.

DIV

Shows range per scale division.

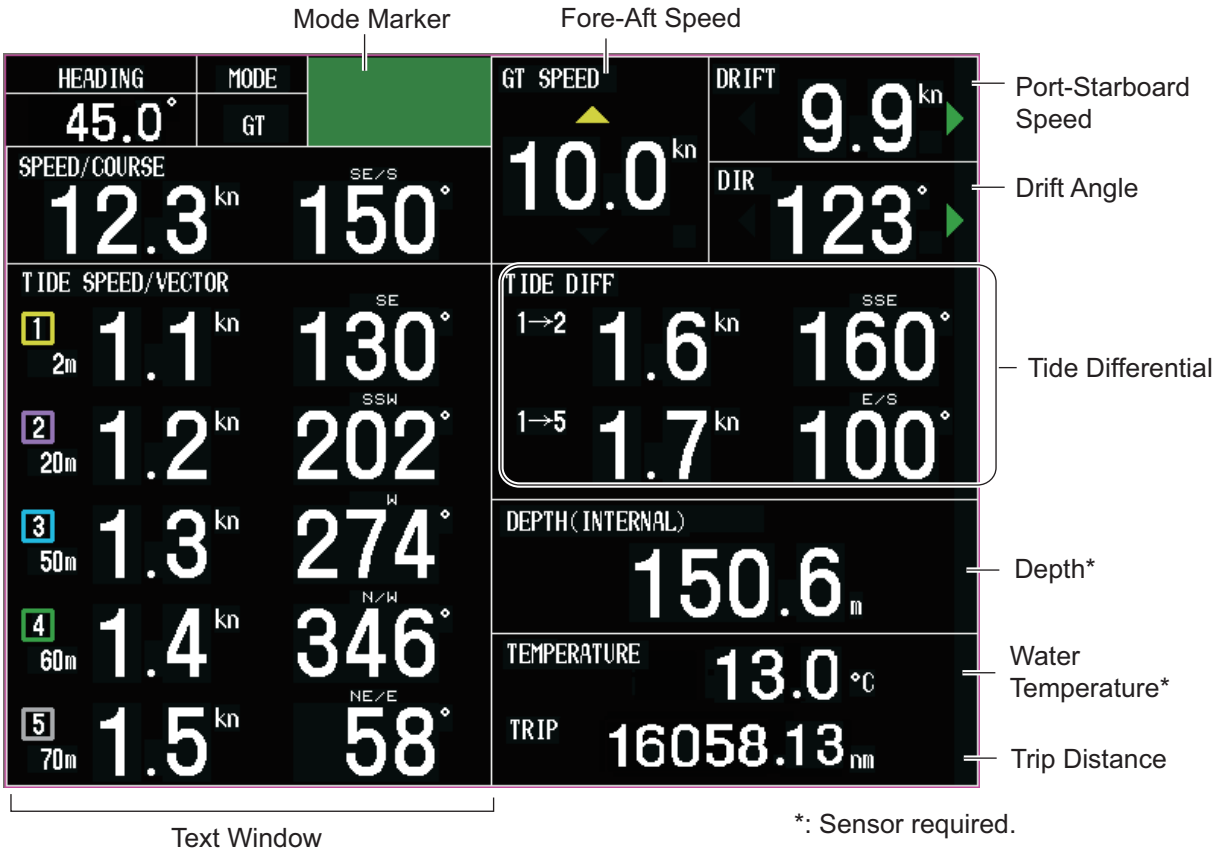
Tide display interval

You may change the interval to display the tide vectors in the plot display. For example, if the this value is 2.0, the tide vectors are shown each two scales. Accordingly you can see the actual distance between the tide vectors by the value of [DIV], see "INTERVAL" on page 3-9.

Position

Position which is input from the plotter is shown in latitude and longitude.

2.5 Text Display



Text window, Water Temperature

The contents are same as ones for the tide vector display, see section 2.1.

Note: Shows tracking mode and echo availability for last seven and half minutes, scrolling from right to left.

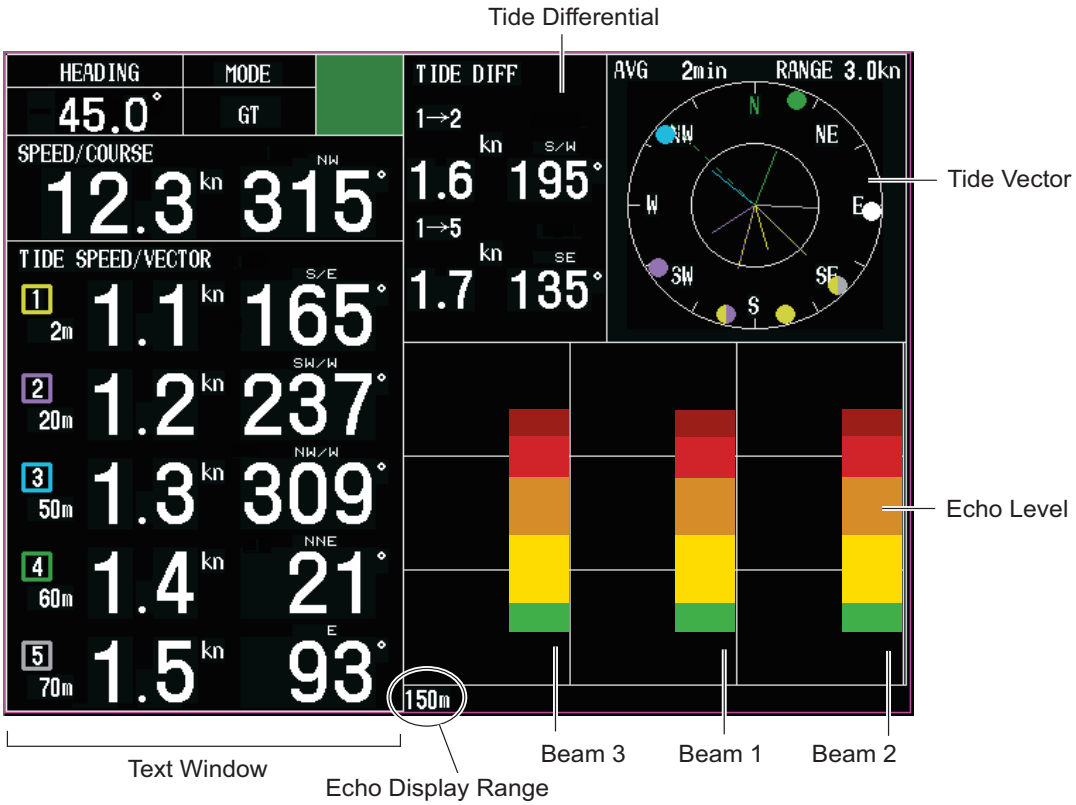
Fore-Aft Speed, Port-starboard speed, Drift Angle, Tide Differential and Trip Distance

The contents are same as ones for the tide vector display, see section 2.2.

Depth

The depth is different according to the setting of [DEPTH SOURCE] in the [DISP 3] sub menu, "DEPTH SOURCE" on page 3-9.
[DEPTH (INTERNAL)]: THe depth value calculated in the current indicator
[DEPTH (EXTERNAL)]: The depth value from the external equipment

2.6 Echo Level Display



Text Window, Tide Differential and Tide Vector

The contents are same as ones for the tide vector display, see section 2.1.

Echo Level

Echo status of beam 1 (fore), beam 2 (starboard) and beam 3 (port) is displayed in eight colors. The strongest echo is shown in reddish brown. For the setting of display color, see "TVG" and "GAIN" in subsection 3.3.2.

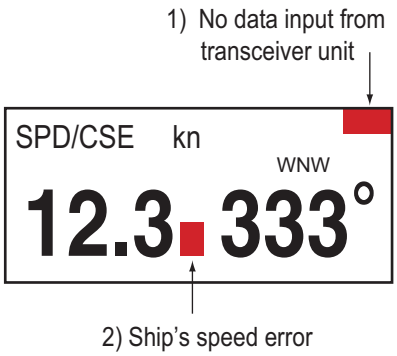
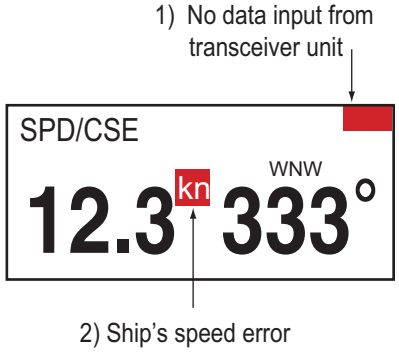
Echo Display Range

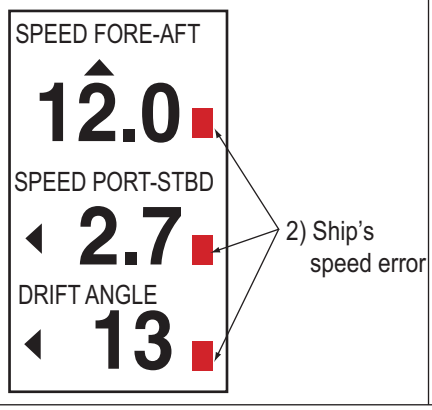
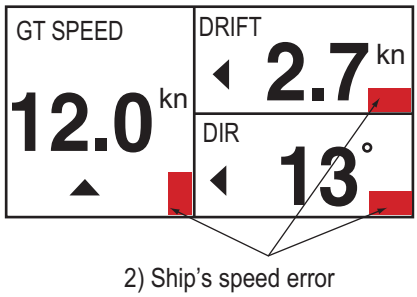
The echo is shown to a depth of this setting value. The echo display range can be set with [ECHO RANGE] in the [MENU 4] sub menu.

2.7 Error Display

An error display (small red square) is generated whenever display data or measured data is abnormal. When this occurs the corresponding data will be unreliable.

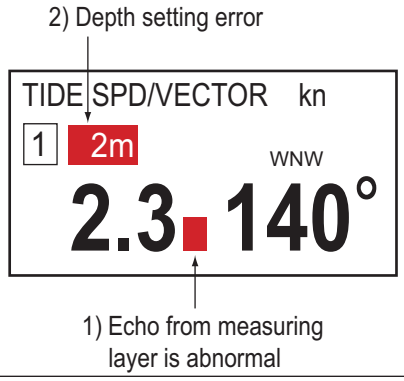
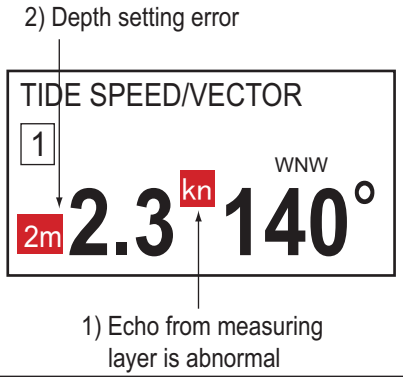
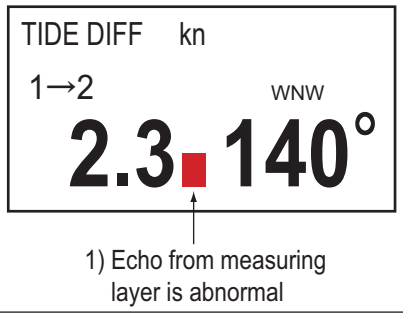
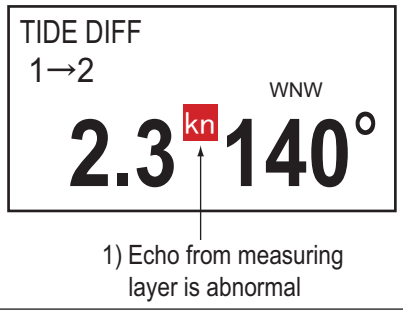
Speed and course (fore-aft, port-starboard, drift angle)

	For tide vector (Echo level is displayed), speed, graph and course plot displays	For tide vector (Echo level is not displayed), text and echo level displays
SPD/CSE		

	For Ship's speed display	For Text display
SPEED FORE-AFT SPEED PORT-STBD DRIFT ANGLE		

1) No data is being input from the transceiver unit to the display unit. If this occurs, call for a service.
2) This display appears when the ground tracking echo for ground tracking, reference layer for water tracking or GPS data from the GPS navigator is abnormal. In this case data is not reliable.

Tide for five layers/tide differential

	For tide vector (Echo level is displayed), speed, graph and course plot displays	For tide vector (Echo level is not displayed), text and echo level displays
TIDE SPD/ VECTOR		
TIDE DIFF		

1) Displayed when echo for a measuring layer is not present. The readout for the offending measuring layer is not reliable.
2) Displayed when the depth setting for a measuring layer is improper. The readout for the offending measuring layer is not reliable.
   Improper depth setting conditions
   - Depth in ground tracking mode is less than 10 m.
   - Depth setting is more than 75% of actual depth.
   - Echo cannot be obtained because of air bubbles, etc.
   - Echo for set depth cannot be found because depth has become deeper than set depth.

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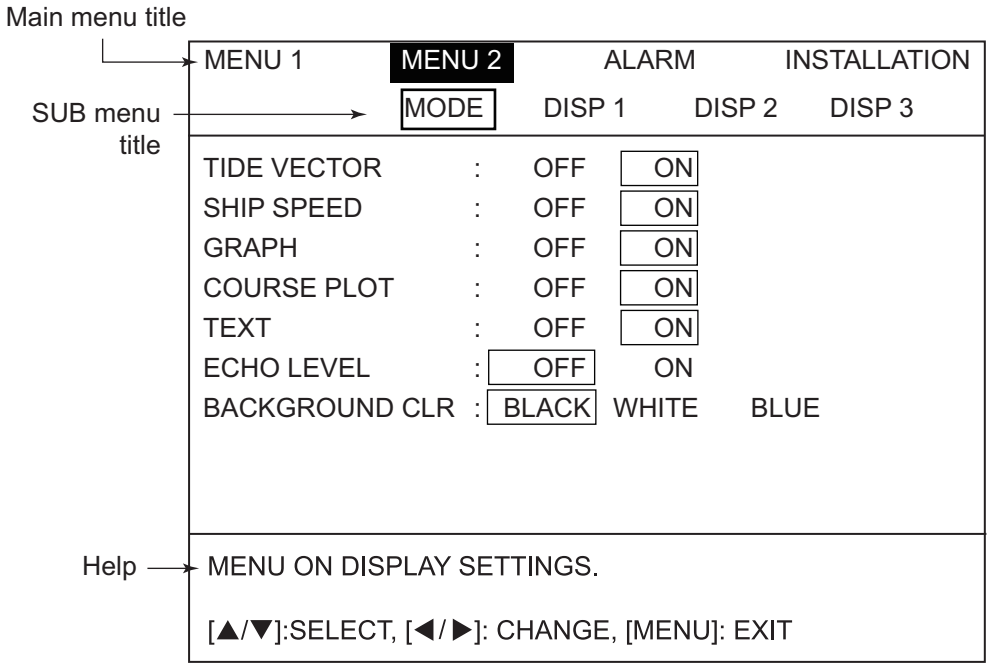
3. MENU OPERATION

There are four menus, [MENU 1], [MENU 2], [ALARM] and [INSTALLATION], in main menu. Each main menu has some sub menus. For [INSTALLATION], see the installation manual.

3.1 How to Operate Menu Window

Please refer to all menu items on "MENUTREE" on page AP-1.

1. Press the **MENU** key to open the menu. The last-used menu appears.



2. Press ▲ to place the cursor on the main menu title field.
3. Press ◀ or ▶ to choose the main menu desired. Then, the sub menus change according to the main menu. To choose a sub menu, press ▼ to choose the sub menu title field and then press ◀ or ▶ to choose the setting desired.
   Note: The [INSTALLATION] menu is locked to prevent unintentional adjustment of its settings. When you move the cursor from [ALARM] to [INSTALLATION], the following message appears. To open the [INSTALLATION] menu, press the [F1] key.

   PRESS FUNC KEY TO OPEN INSTALLATION MENU.
   PRESS [MENU] KEY TO OPEN ALARM MENU.

4. Press ▲ or ▼ to choose menu item desired. Selected item is displayed in reverse video and menu help appears in the box at the bottom of the menu.
5. Press ◀ or ▶ to choose menu option or change numerical value. To change numerical value, press ▶ to raise the value; ◀ to lower the value.
6. Press the [MENU] key to close the menu.

3.2 Function Key

The **F1** key provides menu shortcut operation. You may program the key as follows:

How to use the function key

To press the **F1** key displays the setting window programmed. This function key is not programmed at the factory. If it contains no program when pressed, the message "NO FUNCTION ASSIGNED TO [F1] KEY." appears on the display for about five seconds.

Note: When there is no operation for five seconds, the setting window disappears automatically.

How to program the function key

1. Press the **MENU** key to display the main menu.
2. Press ▲ to place the cursor on the main menu title field.
3. Press ◀ or ▶ to choose a main menu desired. If needed, press ▼ and then ◀ or ▶ to choose a desired sub menu.
4. Press ▲ or ▼ to choose a menu item programmed (or changed).
5. Press and hold down for more than three seconds the **F1** key until you hear three beeps and the message "PROGRAMMED SELECTED ITEM TO [F1] KEY" is displayed (about five seconds).
6. Press the **MENU** key to close the menu.

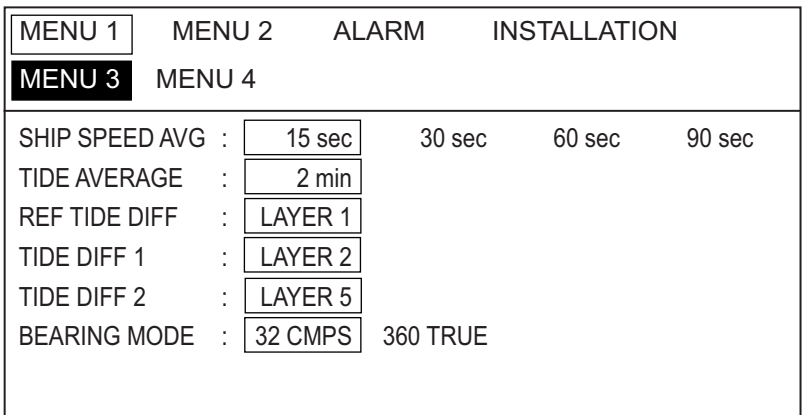
Note: The menus which you can not program to the **F1** key is shown below.

- [ALARM] menu
- [INSTALLATION] menu
- [BOTTOM SEARCH] menu ([MENU 4] sub menu)
- [RESET TRIP LOG] menu ([MENU 4] sub menu)
- [TEST] menu ([MENU 4] sub menu)

3.3 [MENU 1] menu

This menu mainly provides items for adjustment of tide parameters.

3.3.1 [MENU 3] sub menu



[MENU 3] sub menu

SHIP SPEED AVG

Choose the averaging time for the ship's speed display.

TIDE AVERAGE

Choose the averaging time for the tide display. If tide speed appears to be too slow, choose a higher setting.

REF TIDE DIFF

Choose the basic layer for tide differential measurements.

TIDE DIFF 1 (2)

Choose the reference layer for tide differential measurements. You can choose the same layers for [REF TIDE DIFF] and [TIDE DIFF 1 (2)]. If this case, the tide speed and directions are displayed "0".

BEARING MODE

You may show bearing in 32 compass points or 360 degrees.

32 CMPS

360 TRUE

3.3.2 [MENU 4] sub menu

MENU 1	MENU 2	ALARM	INSTALLATION
MENU 3	MENU 4		

NAV MODE	:	OFF	ON	
BOTTOM SEARCH	:	NO	YES	
BTM TIDE TRACK	:	OFF	ON	
ALM/KEY BEEP	:	OFF	ON	
WT SPD DEPTH	:	2 m	(2-400m)	
RESET TRIP LOG	:	NO	YES	
TEST	:	NO	GENERAL	PANEL PATTERN
ECHO RANGE	:	150 m		
TVG	:	OFF	ON	
GAIN	:	5	(1-40)	
PANEL DIMMER	:	5	(0-7)	

[MENU 4] sub menu

NAV MODE

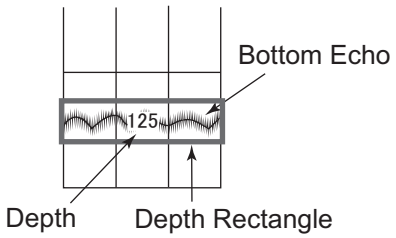
Choose [ON] to use NAV mode instead of the water tracking mode. For further details, see section 1.6.

BOTTOM SEARCH

BOTTOM SEARCH enables requisition of temporarily lost ground echo, in the water tracking mode (see section 1.6). When the bottom echo is lost for a short while due to

air bubbles, or the equipment tends to track on false bottom, acquire the bottom echo manually as follows.

1. Press ▶ to set [YES] for [BOTTOM SEARCH]. Then the message "PRESS FUNCTION KEY TO EXCUTE" appears.
2. Press the **F1** key. The menu window disappears and the depth rectangle (green) appears along with the echo level display.
3. Press ▲ or ▼ to set the depth rectangle on the bottom echo.
4. Press the **MENU** key to finish.



BTM TIDE TRACK

Set [ON] to measure depth of layer 5 changes automatically with the bottom depth to track on near-bottom tide in the ground tracking mode,. In this case the layer 5 indications shows "BTTM" instead of the tide measurement depth.

ALM/KEY BEEP

A key beeps to confirm correct key input, input error or error message. You may turn this beep on or off as desired. The beep sounds when an alarm setting is violated regardless of whether this item is turned on or off (see section 3.5).

WT SPD DEPTH

Set the reference depth at which to measure ship's speed in the water tracking mode. Set the depth for which you want to know the water tracking speed in reference to a specific depth. The setting range is 2-400 (m).

RESET TRIP LOG

Set the trip distance to zero (0). Choose [YES] and then you are prompted "PRESS FUNCTION KEY TO EXECUTE." Press the **F1** key to reset the trip log to zero.

TEST

Choose the diagnostic test to execute: General (program no. display, memory check, etc.), panel or pattern. For further details, see section 4.3.

ECHO RANGE

Choose the maximum depth to display echoes, from among 50, 100, 150, 200, 250, 300, 350, 400, 450, 500 (m).

TVG

Turn echo TVG on or off.

GAIN

Adjust echo level display color. The higher the digit the nearer to the strongest color (reddish brown). This menu does not adjust the gain of the received signal; speed and tide values are not affected by this adjustment. The setting range is 1-40.

PANEL DIMMER

Adjust the backlighting for the control panel, from 0-7. The higher the value, the brighter the backlighting.

3.4 [MENU 2] menu

You can set the screen setting on the [MENU 2] menu. There are four sub menus; [MODE], [DISP 1], [DISP 2] and [DISP 3].

3.4.1 [MODE] sub menu

Note: The display which you set [OFF] on this sub menu, does not appear with the **DISP MODE** key. Also, you do not set [OFF] for all displays.

MENU 1	MENU 2	ALARM	INSTALLATION
	MODE	DISP 1	DISP 2	DISP 3

TIDE VECTOR	:	OFF	ON	
SHIP SPEED	:	OFF	ON	
GRAPH	:	OFF	ON	
COURSE PLOT	:	OFF	ON	
TEXT	:	OFF	ON	
ECHO LEVEL	:	OFF	ON	
BACKGROUND CLR	:	BLACK	WHITE	BLUE

[MODE] sub menu

TIDE VECTOR

Enable or disable the tide vector display.

SHIP SPEED

Enable or disable the ship's speed display.

GRAPH

Enable or disable the tide graph display.

COURSE PLOT

Enable or disable the course plot display.

TEXT

Enable or disable the text display.

ECHO LEVEL

Enable or disable the echo level display.

BACKGROUND CLR

Choose the background color from among black, white and blue.

3.4.2 [DISP 1] sub menu

MENU 1	MENU 2	ALARM	INSTALLATION
	MODE	DISP 1	DISP 2	DISP 3

COMMON SETTINGS			
TIDE RANGE	:	3.0kn	
SHIP SPD VCTR	:	OFF	ON
HEADING LINE	:	OFF	ON
TIDE VECTOR			
LAYER 1	:	OFF	ON
LAYER 2	:	OFF	ON
LAYER 3	:	OFF	ON
LAYER 4	:	OFF	ON
LAYER 5	:	OFF	ON
TIDE DIFF	:	OFF	ON
DISPLAY MODE	:	HEAD UP	NORTH UP
SHIP SPD MODE	:	GT/WT	WT

[DISP 1] sub menu

TIDE RANGE

Set the tide range for the tide vector display, graph display and echo level display.

SHIP SPD VCTR

Turn the ship's speed vector on or off on the tide vector display and echo level display.

HEADING LINE

Turn the heading line on or off on the tide vector display and echo level display.

TIDE VECTOR (LAYER 1 to LAYER 5)

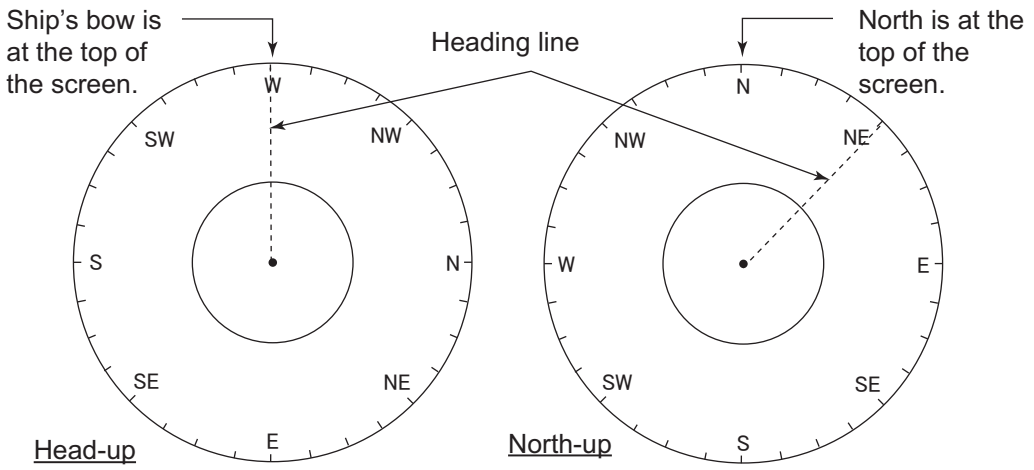
Turn the tide vector on or off for the respective layer on the tide vector display, course plot display and echo level display.

TIDE DIFF

Turn the tide vector on or off for the respective item on the tide vector display and echo level display.

DISPLAY MODE

Set display orientation for head-up or north-up. Heading device required for North-up.



SHIP SPD MODE

Choose the ship's speed to use to display drift angle, fore-aft speed and port-starboard speed on the ship's speed display and text display.

[GT/WT]: Displays the speed over ground in the ground tracking mode, the speed towards water in the water tracking mode.

[WT]: Displays the speed towards water regardless of the tracking mode.

3.4.3 [DISP 2] sub menu

MENU 1 | [MENU 2] | ALARM | INSTALLATION

MODE | DISP 1 | [DISP 2] | DISP 3

graph display settings	GRAPH				
	MODE	:	[TIDE]	TIDE DIF	SHIP SPD
	TIDE GRAPH	:	[NORTH]	SOUTH	
	TEMP GRAPH	:	OFF	[ON]	
	TEXT WINDOW	:	OFF	[ON]	
Tide vector display settings	TIDE VECTOR				
	ECHO LEVEL	:	OFF	[ON]	
	DISP MODE	:	[SOUNDER]	GRAPH	
Ship's speed display settings	SHIP SPEED				
	SCALE SYNC	:	OFF	[ON]	
	DRIFT SCALE	:	[1.0 kn]		
	SCALE	:	[10.0 kn]		
	DRIFT HISTORY	:	0.5 kn	[1 kn]	2 kn
	HISTORY	:	4 kn	8 kn	[16 kn] 32 kn
	HISTORY SHIFT	:	[0 kn]		

[DISP 2] sub menu

MODE

Choose the item to show on the graph display, among tide, tide differential and ship's speed.

TIDE GRAPH

Choose how to draw the tide on the graph display. The choices are [NORTH] (N, E, S, W) and [SOUTH] (S, W, N, E). Normally, use [NORTH]. When the graph becomes difficult to read switch to [SOUTH].

TEMP GRAPH

Turn the water temperature graph on the graph display on or off.

TEXT WINDOW

Turn the text window on the graph display on or off.

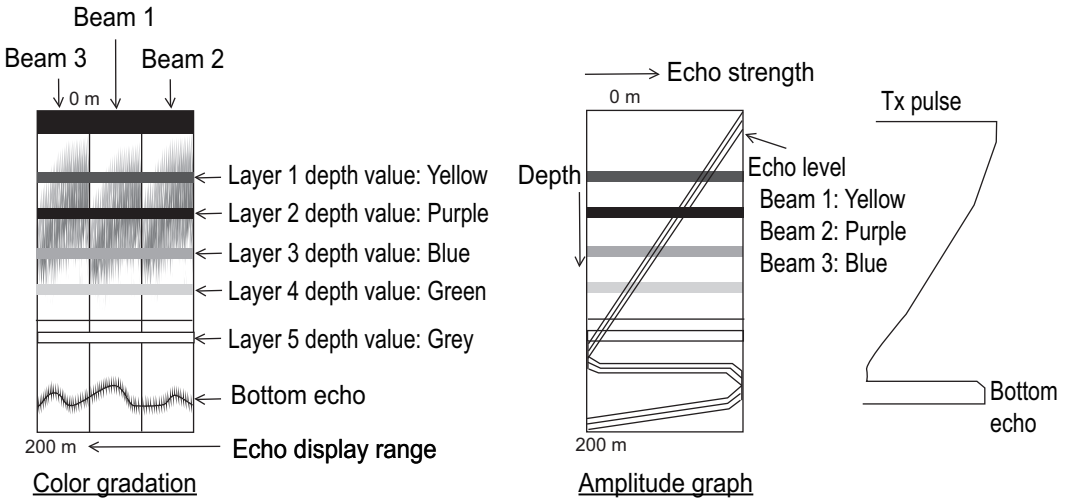
ECHO LEVEL

Turn the echo level display on or off on the tide vector display.

DISP MODE

This menu is available when you set [ON] in the [ECHO LEVEL].

[SOUNDER]: Echo strength shown in eight colors.
[GRAPH]: Echo strength shown by graph.



SCALE SYNC

Choose whether to interlock port-starboard speed range with fore-aft speed range or not.

DRIFT SCALE

Set the port-starboard speed range on the ship's speed display. This setting is available when you set [OFF] in the [SCALE SYNC].

SCALE

Set the fore-aft speed range on the ship's speed display. When you set [ON] in the [SCALE SYNC], this setting applies to the port-starboard speed range also.

DRIFT HISTORY

Set the range for the port-starboard speed history graph.

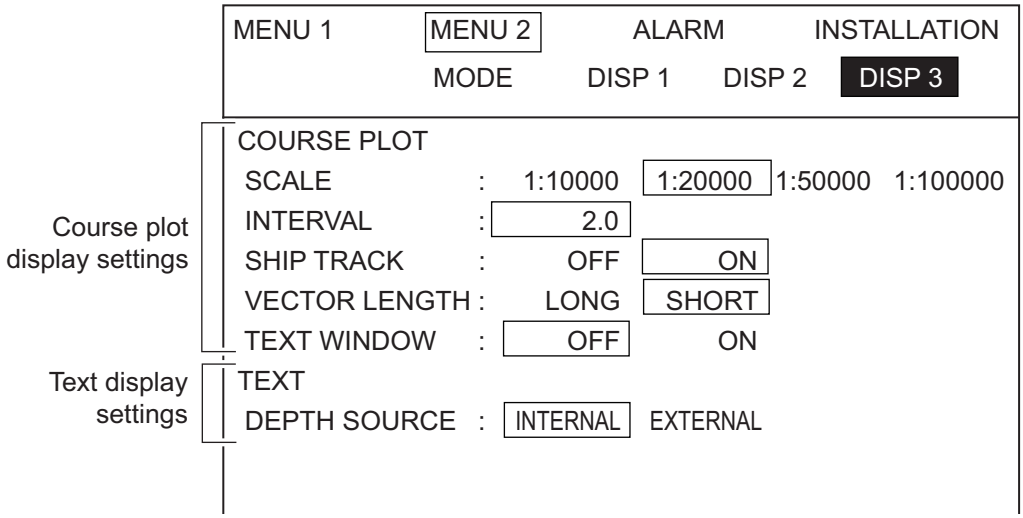
HISTORY

Set the range for the fore-aft speed history graph.

HISTORY SHIFT

Set the amount of shift for the fore-aft speed history graph.

3.4.4 [DISP 3] sub menu



[DISP 3] sub menu

SCALE

Choose the scale to use in the course plot display.

INTERVAL

Choose the display interval for the tide vector in the course plot display. The figures are scale on course plot display.

SHIP TRACK

Turn own ship's track display on or off.

VECTOR LENGTH

Choose the vector length from [LONG] or [SHORT]. For [LONG] 1 mm in length is equal to 0.1 kn.

TEXT WINDOW

Turn the text window in the course plot display on or off.

DEPTH SOURCE

Choose the depth to display.

[INTERNAL]: The depth which calculated in the current indicator is shown.
[EXTERNAL]: The depth which is input from the external device. The basic line for depth measurement is automatically set according to the input sentence (NMEA or CIF).

3.5 [ALARM] menu

The ALARM menu sets the parameters for tide, tide differential, ship's speed and trip distance alarm. When an alarm setting is violated, the audible alarm sounds and a warning message (flashing) appears at the bottom of the display. To silence the audible alarm, press the CursorPad (▲, ▼, ◀, or ▶). The alarm message remains on the screen until the cause for the corresponding alarm is eliminated or the alarm is disabled. When the alarm is again violated, the alarm message appears and the audible alarm is released. The audible alarm and alarm message may be enabled or disabled independently. Alarm messages appear in section 4.4.

The [ALARM] menu has two sub menus, [ALARM1] and [ALARM2].

Note: The [ALARM1] sub menu has priority to the [ALARM2] sub menu. In each sub menu, the menu shown in the higher position has the higher priority. When multiple alarms are violated, the audible and visual alarms are given to the alarm having the highest priority.

3.5.1 Alarm types

LAYER 1 to LAYER 5 (tide alarm)

You can set the alarms to activate Tide speed and direction alarms for respective tide layers.

SHALLOW T/D, DEEP T/D (tide differential alarm)

When the value becomes within the speed and direction you set for the tide differential alarm, the alarm function activates. There are two tide differentials so you can set each differential alarm. The shallower depth among two tide differential alarms is [SHALLOW T/D], the deeper one is [DEEP T/D]. For the selection of the basic/reference layer, see subsection 3.3.1.

Ex: Setting for tide differential alarms

[REF TIDE DIFF] (Basic layer)	[TIDE DIFF 1 (2)] (Reference layer)	Tide differential
LAYER 1	[TIDE DIFF 1]: LAYER 2 (depth: 20 m) [TIDE DIFF 2]: LAYER 4 (depth: 50 m)	[SHALLOW T/D]: tide differential between LAYER 1 and LAYER 2 [DEEP T/D]: tide differential between LAYER 1 and LAYER 4
LAYER 1	[TIDE DIFF 1]: LAYER 2 (depth: 50 m) [TIDE DIFF 2]: LAYER 4 (depth: 20 m)	[SHALLOW T/D]: tide differential between LAYER 1 and LAYER 4 [DEEP T/D]: tide differential between LAYER 1 and LAYER 2

SPD (Ship's speed)

Sets speed and course for speed alarm.

TRIP

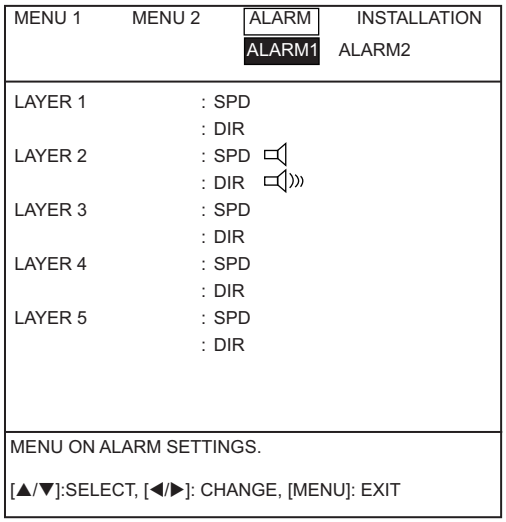
Sets distance and time for trip alarm.

3.5.2 How to set tide, tide differential and ship's speed alarms

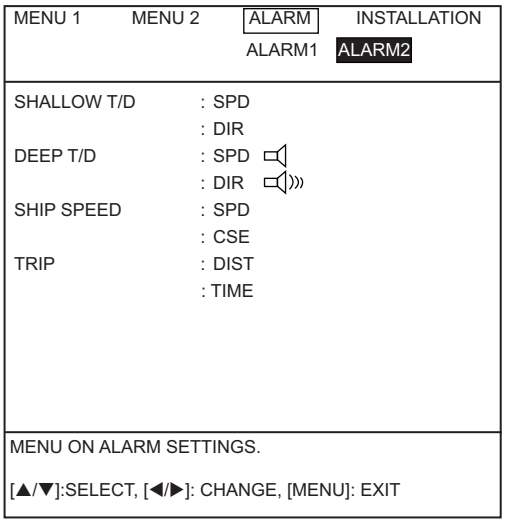
You can set the alarm items, [SPD] (speed), [DIR] (direction) and [CSE] (course), in the similar procedure.

As an example, for LAYER 1, set the tide speed alarm for 1-2 kn and tide direction alarm for 350° - 10°.

1. Press the **MENU** key to open the menu.
2. Press ▲ to place the cursor on the main menu title field.
3. Press ◀ or ▶ to choose [ALARM].
4. Press ▼ to place the cursor on the sub menu title field, and then press ◀ to choose [ALARM1]. The [ALARM1] sub menu appears. To set the tide differential alarm or ship's speed alarm, choose the [ALARM2] sub menu.



[ALARM1] sub menu



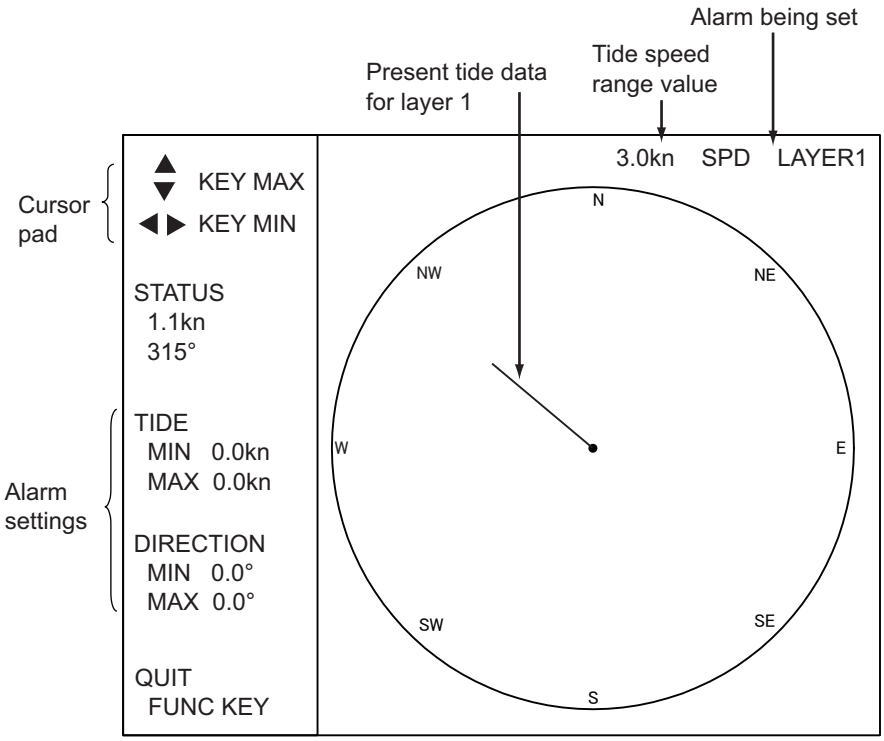
[ALARM2] sub menu

Alarm status is shown with the speaker icons.

Speaker icon	Contents
	Alarm ON (Audible alarm and alarm message: ON)
	Alarm OFF (Audible alarm: OFF, Alarm message: ON)

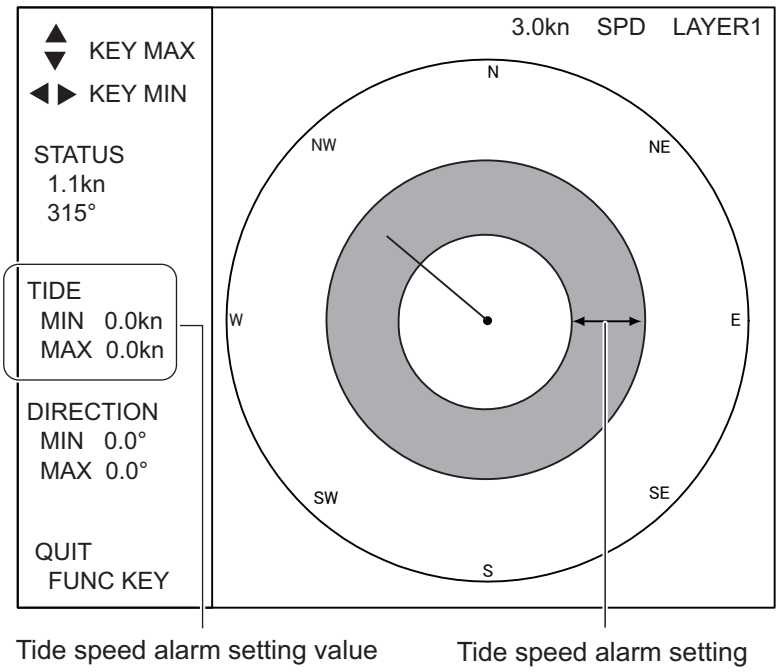
5. Press ▲ or ▼ to choose [LAYER1]-[SPD].

6. Press ▶ to open the alarm setting window.



Alarm setting screen (for LAYER 1)

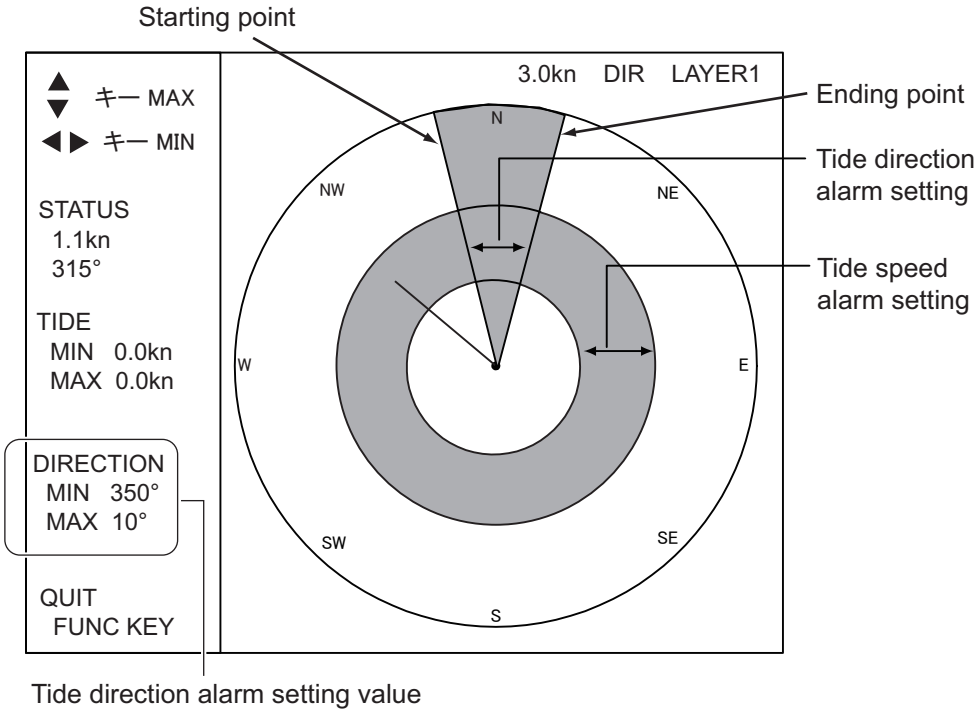
7. Press ◀ or ▶ to set minimum speed; ▲ or ▼ to set maximum speed (0 kn to tide speed range). As you operate an arrow (◀, ▶, ▲ or ▼) the radius of the inner or outer circle is increased or decreased accordingly. Your screen should now look something like the one shown below.



Alarm setting screen (tide speed set)

8. Press the F1 key to return to the [ALARM] menu. appears to the right of [SPD] at [LAYER 1].
9. Press ▼ to choose [DIR] at [LAYER 1].

10. Press ▶ to open the alarm setting window.
11. Use ◀ or ▶ to set starting point; ▲ or ▼ to set ending point. For example, set the starting point at 350° and the ending point at 10°. Then, the screen should look something like the one at the top of the next page.



Alarm setting screen (tide direction set)

12. Press the F1 key to return to the [ALARM] menu. The icon appears to the right of [DIR] at [LAYER 1].
13. Press the **MENU** key to close the menu.

3.5.3 How to set the trip alarm

Trip distance alarm

The trip distance alarm sounds when the vessel has traveled more than the preset distance.

1. Press the **MENU** key to open the menu.
2. Press ▲ to place the cursor on the main menu title field.
3. Press ◀ or ▶ to choose [ALARM].
4. Press ▼ to place the cursor on the sub menu title field, and then press ▶ to choose [ALARM2].
5. Press ▼ to choose [DIST] at [TRIP].
6. Press ▶ to show the trip distance setting screen.

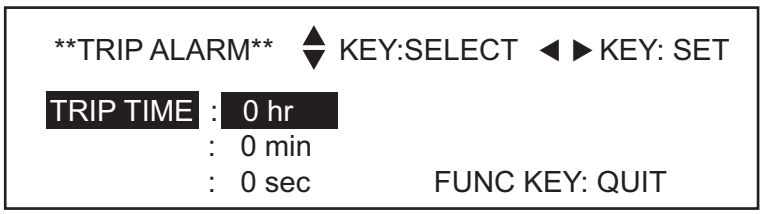
Trip distance alarm setting screen

7. Press ◀ or ▶ to set distance (0.0 nm to 30.0 nm).
8. Press the **F1** key to quit and return to the [ALARM] menu. The icon ◁))) appears to the right of [DIST] at [TRIP]. When the vessel has traveled more than the preset distance, the audible alarm sounds and an alarm message appears.
9. Press the **MENU** key to close the menu.

Trip time alarm

The trip alarm sounds when the preset trip time has elapsed.

1. Press the **MENU** key to open the menu.
2. Press ▲ to place the cursor on the main menu title field.
3. Press ◀ or ▶ to choose [ALARM].
4. Press ▼ to place the cursor on the sub menu title field, and then press ▶ to choose [ALARM2].
5. Press ▲ or ▼ to choose [TIME] at [TRIP].
6. Press ▶ to show the trip time setting screen.



Trip time alarm setting screen

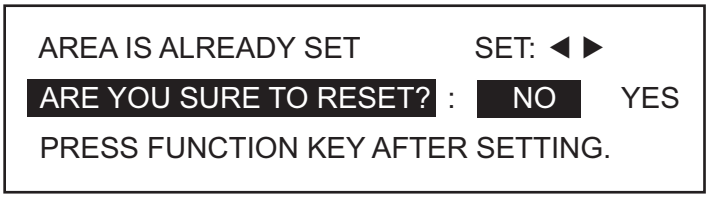
7. Press ▲ or ▼ to choose item to set.
8. Press ◀ or ▶ to set.
9. Press the **F1** key to quit and return to the [ALARM] menu. The icon ◁))) appears to the right of [TIME] at [TRIP]. When the alarm setting is violated the audible alarm sounds and an alarm message appears.
10. Press the **MENU** key to close the menu.

3.5.4 How to disable/enable the audible alarm

1. Press the **MENU** key to open the menu.
2. Press ▲ to place the cursor on the main menu title field.
3. Press ◀ or ▶ to choose [ALARM].
4. Press ▼ to place the cursor on the sub menu title field, and then press ◀ or ▶ to choose the sub menu required.
5. Press ▲ or ▼ to choose the alarm you want to process. An alarm where ◁ or ◁))) appears.
6. Press ◀ or ▶ to show ◁ or ◁))) as appropriate.
7. Press the **MENU** key to close the menu.

3.5.5 How to cancel an alarm

1. Press the **MENU** key to open the menu.
2. Press ▲ to place the cursor on the main menu title field.
3. Press ◀ or ▶ to choose [ALARM].
4. Press ▼ to place the cursor on the sub menu title field, and then press ◀ or ▶ to choose the sub menu required.
5. Press ▲ or ▼ to choose the alarm you want to disable.
6. Press the **F1** key, and the following window appears.



Alarm cancel confirmation message

7. Press ▶ to choose [YES].
8. Press the **F1** key to return to the [ALARM] menu. The speaker icon which you selected at step 5 is removed.
9. Press the **MENU** key to close the menu.

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4. MAINTENANCE & TROUBLE-SHOOTING

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

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

Only qualified personnel should work inside the quipment.

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.

4.1 Maintenance

Routine maintenance

Regular maintenance is important for good performance. Check the following on a regular basis to keep the equipment in good condition.

- Check that the connectors are tightly fastened.
- Check the ground wire and ground terminal for rust. Clean if necessary. Confirm that the ground wire is tightly fastened.
- Remove dust and dirt from the monitor unit with a dry, soft cloth. Do not use chemical cleaners to clean any part of the monitor unit. They can remove paint and markings.
- To remove dirt or salt deposits, use an LCD cleaner, wiping slowly with tissue paper so as to dissolve the dirt or salt. Change paper frequently so the salt or dirt will not scratch the LCD. Do not use solvents such as thinner, acetone or benzene for cleaning. Also, do not use degreaser or antifog solution, as they can strip the coating from the LCD.

Transducer

- Check the zinc plate attached to the transducer for corrosion regularly and replace it if it is corroded. It should be replaced when the ship is drydocked. If the plate is not replaced, corrosion may occur. This may allow the transducer to fall out from the hull, allowing water to leak inside the vessel.
- Do not paint the transducer face.
- When the vessel is drydocked, remove marine growth from the transducer. Marine life adhering to the transducer may cause a considerable drop in performance.

Fuse

The transceiver unit, monitor unit and control unit are equipped with a fuse which protects them from overvoltage and overcurrent. If a fuse blows, find the cause before replacing it. If it blows again after replacement, contact your dealer for advice. All fuses are located inside the units. Therefore, have a suitably qualified technician replace the fuses.

⚠ WARNING

Use the proper fuse.

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

Unit	Type	Code No.
Monitor Unit	FGMB 3A 125V	000-104-909
Control Unit	FGMB 2A 125V	000-103-165
Transceiver Unit (100 VAC spec.)	FGBO 3A AC250V	000-549-021
	FGBO 5A AC250V	000-549-022
Transceiver Unit (200 VAC spec.)	FGBO 3A AC250V	000-549-021

4.2 Troubleshooting

Below are simple troubleshooting procedures which the user may follow to try to restore normal operation. If normal operation cannot be restored, do not attempt to check inside any unit. Any repair work is best left to a qualified technician.

Case	Remedy
Nothing appears on the screen when the power switch is pressed.	• Check that the power cable is firmly connected. • The fuse may have blown. Request replacement of the fuse. • Adjust brilliance.
Ship's track is not displayed.	• Turn on [SHIP TRACK] in the [DISP 3] sub menu.
Bottom echo is not shown on the echo level display.	• Check if the setting of [ECHO RANGE] in the [MENU 4] sub menu is too low. • Bottom is deeper than measuring range. • Check setting of [GAIN] in the [MENU 4] sub menu.
Echo display is interrupted.	• Suspect poor measuring conditions. • Marine life may be adhering to the transducer. • Bottom is covered with sludge or the like.
Tide data is unstable.	• Adjust [TIDE AVERAGE] in the [MENU 3] sub menu.
Interference is present.	• Check ground for corrosion. • Check if the cables of other equipment are near the transducer cable.

4.3 Diagnostics

The current indicator is equipped with three test facilities to check it for proper operation. When you turn on the current indicator, the selftest starts automatically and then a normal operation. If you find the some error, do the following tests. When their result of the tests is NG, please contact the service technician.

4.3.1 General test

The general test mainly checks the ROM, RAM and voltages.

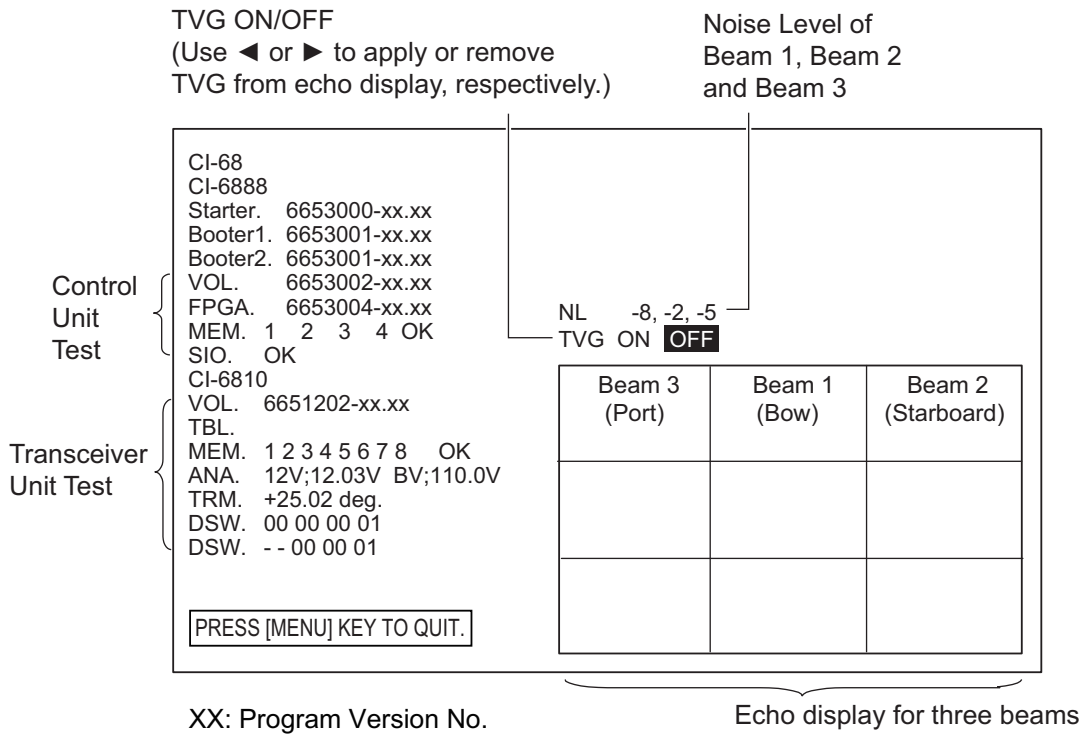
1. Press the **MENU** key to open the menu.
2. Press ▲ to place the cursor on the main menu title field.
3. Press ◀ to choose [MENU 1].
4. Press ▼ to place the cursor on the sub menu title field.
5. Press ▶ to choose [MENU 4].

MENU 1	MENU 2	ALARM	INSTALLATION	
MENU 3	MENU 4			
NAV MODE	:	OFF	ON	
BOTTOM SEARCH	:	NO	YES	
BTM TIDE TRACK	:	OFF	ON	
ALM/KEY BEEP	:	OFF	ON	
WT SPD DEPTH	:	2 m	(2-400m)	
RESET TRIP LOG	:	NO	YES	
TEST	:	NO	GENERAL	PANEL PATTERN
ECHO RANGE	:	150 m		
TVG	:	OFF	ON	
GAIN	:	5	(1-40)	
PANEL DIMMER	:	5	(0-7)	

[MENU 4] sub menu

6. Press ▲ or ▼ to choose [TEST].
7. Press ▶ to choose [GENERAL].

8. Press the **F1** key to start the test. The results of the test are shown on the screen.



General test results

Description of control unit test results

VOL:	Program version no. of the OCK Board (66P3982).
MEM:	Check of 1: ROM, 2: SRAM, 3: EEPROM and 4: DRAM.If all memories are functioning properly, "OK" appears. "NG" (No Good) appears when a memory is abnormal and an asterisk is placed to the right of the abnormal memory.
SIO:	Communication test with the transmission / reception calculation unitIf it is normal, “OK” will be displayed.If it is defective, “NG” will be displayed.

Description of transceiver unit test result

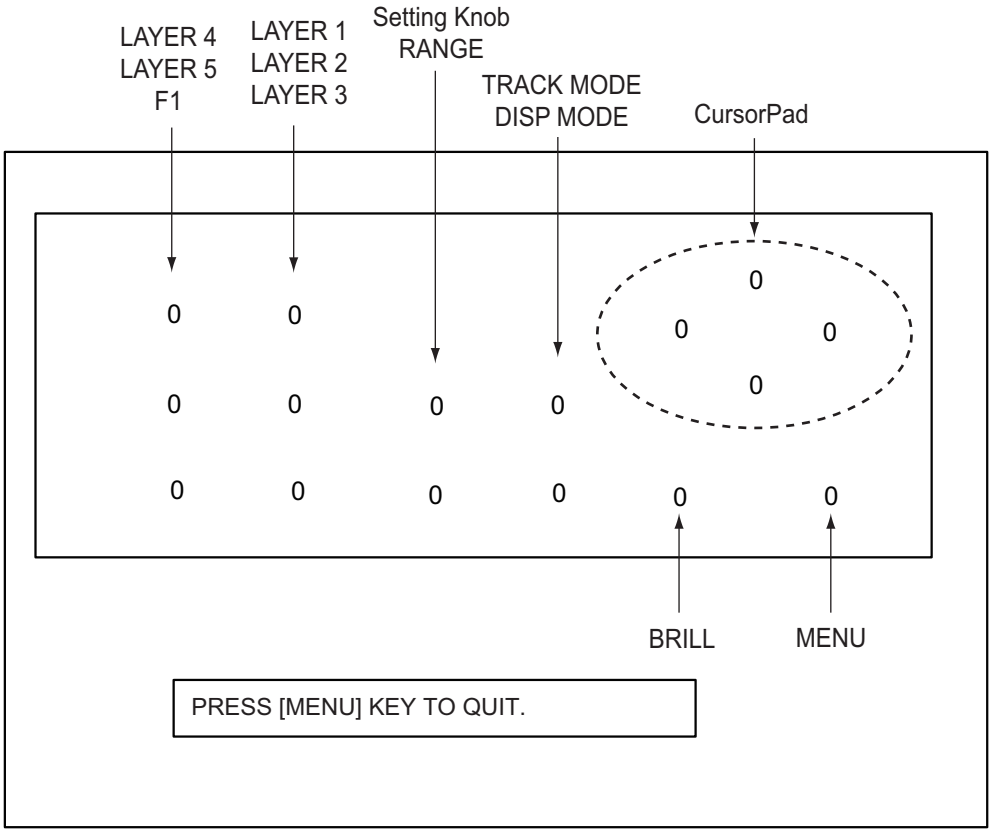
VOL:	OCK board (66P3982) ROM program number.
MEM:	Checks memory ICs on the PCP Board. If all memory ICs are functioning properly, "OK" appears. "NG" (No Good) appears when an IC is abnormal and an asterisk is placed to the right of the abnormal IC.
ANA:	Displays voltage of 12 V and +B lines.
TRM:	Displays temperature inside transducer.
DSW:	Displays PCP DIP switch settings.
DSW:	Displays PCN DIP switch settings.

9. To quit the test, press the **MENU** key to return to the [MENU 4] sub menu.
10. Press the **MENU** key again to close the menu.

4.3.2 Panel test

The panel test checks the keys and setting knob on the control unit for proper operation.

1. Open the [MENU 4] sub menu and choose [PANEL] at [TEST]. The message "PRESS FUNCTION KEY TO EXCUTE." appears.
2. Press the **F1** key to start the test. A screen for testing the control unit appears on the display.



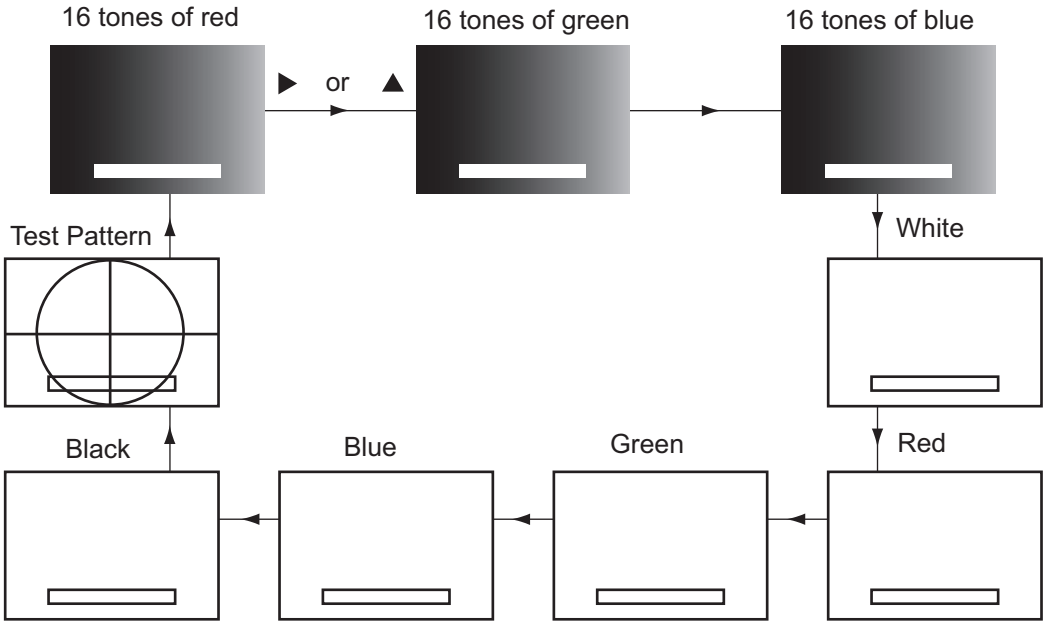
Panel test

3. Press each key (except **MENU** and **POWER**) one by one. A key's on-screen location should show "1" when the key is pressed and "0" when the key is released.
4. Operate the setting knob. The setting knob's on-screen indication should show appropriate setting value when the knob is operated.
5. To quit the test, press the **MENU** key to return to the [MENU 4] sub menu.
6. Press the **MENU** key again to close the menu.

4.3.3 Test pattern

The test pattern checks for proper display of colors.

1. Open the [MENU 4] sub menu and choose [PATTERN] at [TEST]. The message "PRESS FUNCTION KEY TO EXCEUTE." appears.
2. Press the **F1** key to start the test. The screen becomes the red gradation.
3. Press ▶ or ▲ to change the picture in the sequence shown above. You may reverse the order by pressing ◀ or ▼.



Note: When an external monitor is connected, it is 11 gradations instead of 16 gradations.

4. To quit the test, press the **MENU** key to return to the [MENU 4] sub menu.
5. Press the **MENU** key again to close the menu.

4.4 Error Messages and Alerts

The current indicator displays an error message and sounds the audible alarm when error is detected. To silence the alarm, press any arrow (◀, ▲, ▶, or ▼) on the CursorPad for transceiver-related alarm or turn off the alarm in the [ALARM] menu in case of control unit-related alarm. In case of multiple errors, the error or alert having the highest priority is displayed. The table below shows all the error messages and alerts which may appear, in order of priority, from highest to lowest.

Error messages and alerts

Error Message or Alert	Meaning
WARNING! OVERHEATED TRANSDUCER [001]	Overheated transducer
WARNING! ABNORMAL TX VOLTAGE [002]	Abnormal Tx voltage
WARNING! CHARGING ERROR (+B) [003]	Abnormal +B voltage
WARNING! ABNORMAL INPUT 12V [009]	Abnormal Input voltage (12 V)

Error Message or Alert	Meaning
WARNING! NO POSITION DATA [100]	External position data is missing
WARNING! NO SPEED DATA [101]	External speed data is missing
WARNING! NO DEPTH DATA [103]	External depth data is missing
WARNING! NO HEADING DATA [104]	Position data is missing
WARNING! ABNORMAL COURSE DATA [105]	Abnormal course error angle
WARNING! NO TEMPERATURE DATA [106]	Water temperature data is missing
WARNING! ABNORMAL TEMP INPUT [201]	Abnormal water temperature sensor
WARNING! LAYER 1 TIDE SPEED	Layer 1 speed alarm has been violated.
WARNING! LAYER 1 TIDE DIRECTION	Layer 1 tide direction alarm has been violated.
WARNING! LAYER 2 TIDE SPEED	Layer 2 speed alarm has been violated.
WARNING! LAYER 2 TIDE DIRECTION	Layer 2 tide direction alarm has been violated.
WARNING! LAYER 3 TIDE SPEED	Layer 3 speed alarm has been violated.
WARNING! LAYER 3 TIDE DIRECTION	Layer 3 tide direction alarm has been violated.
WARNING! LAYER 4 TIDE SPEED	Layer 4 speed alarm has been violated.
WARNING! LAYER 4 TIDE DIRECTION	Layer 4 tide direction alarm has been violated.
WARNING! LAYER 5 TIDE SPEED	Layer 5 speed alarm has been violated.
WARNING! LAYER 5 TIDE DIRECTION	Layer 5 tide direction alarm has been violated.
WARNING! SHALLOWER TIDE DIFF SPD	Shallow tide differential tide speed alarm has been violated.
WARNING! SHALLOWER TIDE DIFF DIR	Shallow tide differential tide direction alarm has been violated.
WARNING! DEEPER TIDE DIFF SPD	Deep tide differential tide speed alarm has been violated.
WARNING! DEEPER TIDE DIFF DIR	Deep tide differential tide direction alarm has been violated.
WARNING! SHIP SPEED	Speed alarm has been violated.
WARNING! SHIP COURSE	Course alarm has been violated.
WARNING! TRIP DISTANCE	Trip distance alarm has been violated.
WARNING! TRIP TIME	Trip time alarm has been violated.

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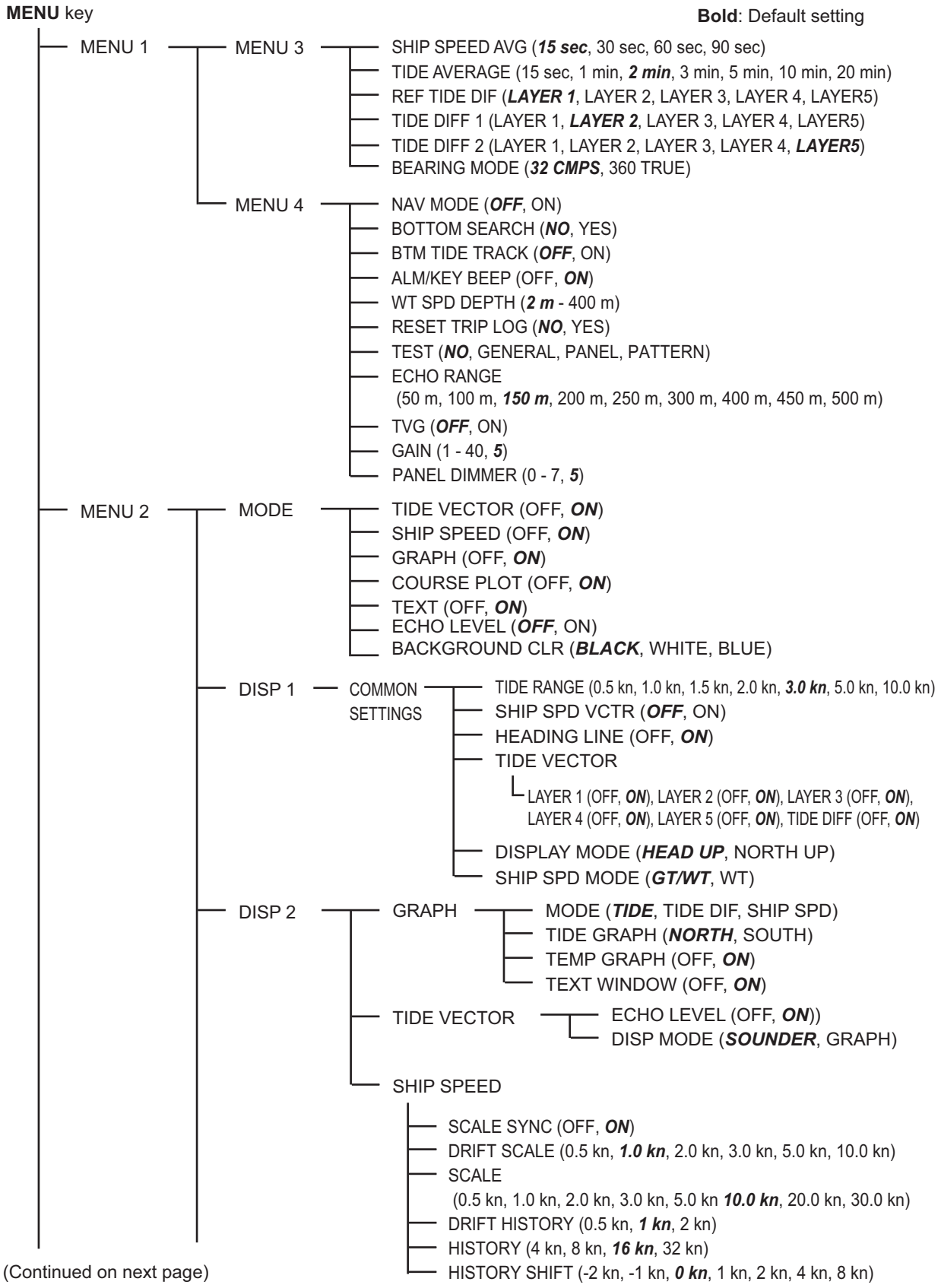
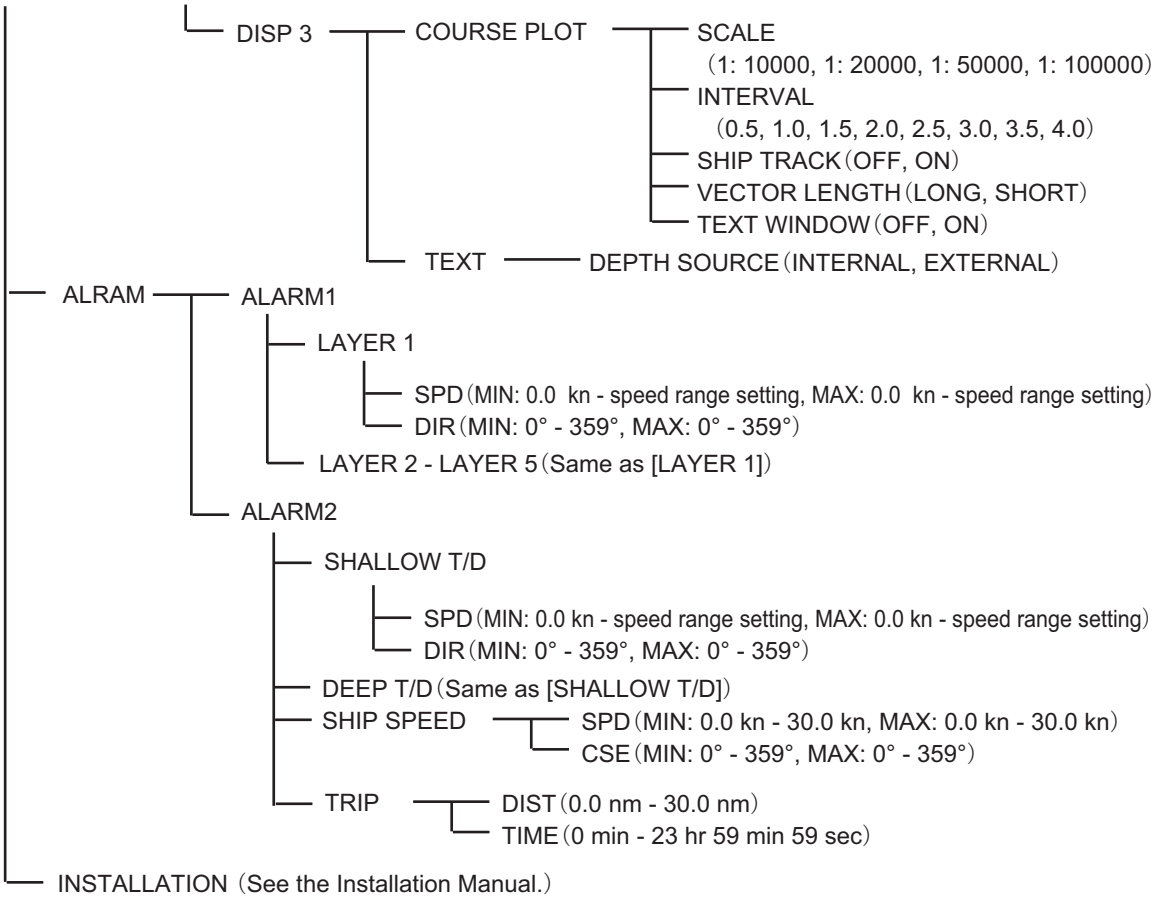
APPX. 1 MENUTREE



(Continued on next page)


DISP 3
COURSE PLOT
SCALE
(1: 10000, 1: 20000, 1: 50000, 1: 100000)
INTERVAL
(0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0)
SHIP TRACK(OFF, ON)
VECTOR LENGTH(LONG, SHORT)
TEXT WINDOW(OFF, ON)
TEXT
DEPTH SOURCE(INTERNAL, EXTERNAL)
ALRAM
ALARM1
LAYER 1
SPD(MIN: 0.0 kn - speed range setting, MAX: 0.0 kn - speed range setting)
DIR(MIN: 0° - 359°, MAX: 0° - 359°)
LAYER 2 - LAYER 5(Same as [LAYER 1])
ALARM2
SHALLOW T/D
SPD(MIN: 0.0 kn - speed range setting, MAX: 0.0 kn - speed range setting)
DIR(MIN: 0° - 359°, MAX: 0° - 359°)
DEEP T/D(Same as [SHALLOW T/D])
SHIP SPEED
SPD(MIN: 0.0 kn - 30.0 kn, MAX: 0.0 kn - 30.0 kn)
CSE(MIN: 0° - 359°, MAX: 0° - 359°)
TRIP
DIST(0.0 nm - 30.0 nm)
TIME(0 min - 23 hr 59 min 59 sec)
INSTALLATION(See the Installation Manual.)

SPECIFICATIONS OF CURRENT INDICATOR
CI-68

1 TRANSCEIVER

1.1	Frequency	244 kHz
1.2	Tracking mode	Ground tracking, Water tracking, Nav-aid, Automatic, External
1.3	Ship's speed	
	Measurement range	Fore-aft: -10.0 to 30 kn, Port-stbd: -9.9 to +9.9 kn
	Accuracy	Within ±1% or 0.1 kn, whichever is the greater
	Direction	All directions (360°) in one-degree steps
	Measurement depth	3-300 m (ground tracking mode), Actual depth depends on installation method and underwater conditions.
1.4	Tide	
	Speed	0.0-9.9 kn
	Accuracy	Within 0.2 kn
	Direction	All directions (360°) in one-degree steps
	Number of layers	5
	Measurement range	2-150 m Up to about 75% of depth. The depth must be greater than 22 m in the ground tracking mode and greater than 40 m in the water tracking mode using short pulse and greater than 70 m using long pulse. Actual range will vary depending on installation and underwater conditions.
1.5	Other functions	Bottom tide tracking, Alarm output, Interference rejecter, Demonstration mode
1.6	Adjustment	Ship's speed, Tide, Installation angle (bearing, trim, heel), Course error, Draft, External KP

2 DISPLAY UNIT

2.1	Display	VGA (640x480 dot)
2.2	Contents	Ship's speed, Course, Drift angle, Tide (5 layers), Tide differential (2 layers), Setting depth, Heading, Position, Echo level, Water temperature
2.3	Display mode	Tide vector, Graph, Course plot, Ship's speed, Text, Echo monitor

3 INTERFACE

3.1	IEC 61162, NMEA	IEC 61162-1 Ed. 2, IEC 61162-2, NMEA 0183 Ver-1.5/2/0/3.0
	Input sentences	DBT, DPT, GGA, GLL, HDT, HDM, HDG, MTW, RMA, RMC, VTG ZDA,
	Output sentences	CUR, VBW, VDR, VHW, VLW, VTG
3.2	CIF	4800 bps, 7 bits, 2 parity, FURUNO original format

	Input sentences	System time, Measuring position, Heading, Depth, Water temperature
	Output sentences	Tide data for 1st layer, tide-measured speed, depths for multi-layers
3.3	Current indicator data	RS-232C, 4800 bps, 7 bits, 2 parity Date and time, Position, Speed, Current indicator, Reverberation level, Speed calibration, Angle calibration, Alarm output, others

4 POWER SUPPLY

4.1	Transceiver unit	100/110/115-120/200/220/230/240VAC: 3-1.5A, 1 phase, 50/60 Hz
4.2	DC-AC inverter (TR-2451, option)	24VDC, 20A max.

5 ENVIRONMENTAL CONDITIONS

5.1	Ambient temperature	
	Transducer	-5°C to 35°C
	Other units	-15°C to 55°C
5.2	Relative humidity	95% or less (+40°C)
5.3	Degree of protection	
	Transceiver/Monitor unit	IPX0
	Control unit	IPX2 (panel), IPX0 (chassis)
	Junction box	IPX4
	Transducer	IPX8

6 COATING COLOR

6.1	Control/ Monitor unit	N3.0 (panel), 2.5GY5/1.5 (chassis)
6.2	Transceiver unit	2.5GY5/1.5

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www.furuno.com

Publication No. DOCQA1481

Declaration of Conformity

We FURUNO ELECTRIC CO., LTD.
(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan
(Address)

declare under our sole responsibility that the product

DOPPLER SONAR CURRENT INDICATOR CI-68
(Model name, type number)

to which this declaration relates conforms to the following standard(s) or other normative document(s)

EU	**UK**
EMC Directive 2014/30/EU	SI 2016 No.1091 EMC Regulations 2016 as amended
IEC 60945 Ed.4.0: 2002	EN 60945: 2002
For assessment, see • Test report Furuno Labotech International Co., Ltd. FLI 12-03-035, 22 Aug 2003	For assessment, see • Test report Furuno Labotech International Co., Ltd. FLI 12-03-035, 22 Aug 2003

(title and/or number and date of issue of the standard(s) or other normative document(s))

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
26 July 2021
(Place and date of issue)

Akihiko Kanechika
Department General Manager
Quality Assurance Department
(name and signature or equivalent marking of authorized person)

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Publication No. SOCQA0001

PSTI Statement of Compliance

We FURUNO ELECTRIC CO., LTD.
(Name of manufacturer of the product)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan
(Address of manufacturer of the product)

declare under our sole responsibility that the product

DOPPLER SONAR CURRENT INDICATOR,
CI-68, CI-88
(Product type, batch)

December / 31 / 2027
(Support period for the product)

https://www.furuno.co.jp/en/csr/sociality/customer/product_security.html
(Weblink for latest information and contact to report to the manufacturer security issues)

to which this declaration relates conforms to the following standard(s) or other normative document(s)

Product Security and Telecommunications Infrastructure Act 2022
Product Security and Telecommunications Infrastructure (Security Requirements for Relevant Connectable Products) Regulations 2023 Schedule 1

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
23 April 2024
(Place and date of issue)

Akihiko Kanechika
Department General Manager
Quality Assurance Department
(Signature, name and function of the signatory)