

FURUNO

OPERATOR'S MANUAL

COLOR GPS/PLOTTER/SOUNDER

MODEL GP-3500F



FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

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SAFETY INSTRUCTIONS

WARNING



ELECTRICAL SHOCK HAZARD
Do not open the equipment.

Only qualified personnel should work inside the equipment.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury 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 fire or electrical shock. 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.

Do not operate the unit with wet hands.

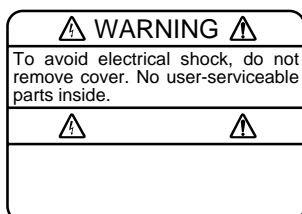
Erectlic shock can result.

Do not maneuver the vessel based on the depth indication alone.

Grounding may result.

WARNING LABEL

A warning label is attached to the equipment. Do not remove the label. If the 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

CAUTION

Use the proper gain setting.

Incorrect gain may produce wrong depth indication, possibly resulting in a dangerous situation.

The picture is not refreshed when picture advancement is stopped.

Maneuvering the vessel in this condition may result in a dangerous situation.

Do not turn on the equipment with the transducer out of water.

The transducer may be damaged.

No single navigation aid should even be relied upon as the exclusive means for navigating your vessel.

The navigator is responsible for checking all aids (including nautical charts) available to confirm his position. Electronic aids are intended to assist, not replace, the navigator.

No one navigation device should ever be solely relied upon for the navigation of a vessel.

Always confirm position against all available aids to navigation, for safety of vessel and crew.

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

About the TFT LCD

The TFT LCD is constructed using the latest LCD techniques, and displays 99.99% of its pixels. The remaining 0.01% of the pixels may drop out or blink, however this is not an indication of malfunction.

FOREWORD

Congratulation on your choice of the FURUNO COLOR GPS/PLOTTER/SOUNDER GP-3500F. For over 50 years 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.

The 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.

Feature

The GP-3500F is a totally integrated GPS receiver, color video plotter and color video sounder consisting of a display unit, antenna unit and transducer.

The GPS receiver tracks up to 13 satellites (GPS: 12, WAAS: 1) simultaneously, and an 8-state Kalman filter ensures optimum accuracy in determination of vessel position, course and speed.

Main features of the GP-3500F

- Bright 10.4-inch color TFT LCD with temperature compensated tone and brilliance control
- Simplified operation using individual keys, ENTER knob and trackball
- Three lines (main and sub of own ship's track, other ship's track) can be displayed simultaneously.
- Accepts FURUNO and NavCharts (NAVIONICS) charts, or C-MAP NT/NT+ charts (C-MAP), depending on specification. All names mentioned are registered trademarks of their respective companies.
- Fast chart redraw
- Built-in backup memory stores 80,000 points total of own ship's tracks and marks
- Stores 3500 waypoints and 200 routes with up to 35 waypoints
- Man overboard feature records latitude and longitude coordinates at time of man overboard.
- Alarms: Arrival, Anchor Watch, Cross-track Error, Proximity, Speed, Trip, Temperature, Current, Depth and Fish.
- User programmable PROG key
- Own ship and cursor positions may be shown in latitude and longitude, Loran A, Loran C or Decca LOPs.
- Data storage on memory cards.
- Improved position accuracy with optional DGPS beacon receiver.
- 50 and 200 kHz dual frequency transducer available
- Automatic function permits unattended adjustment of range, gain and clutter.
- Past sounder display can be shown.

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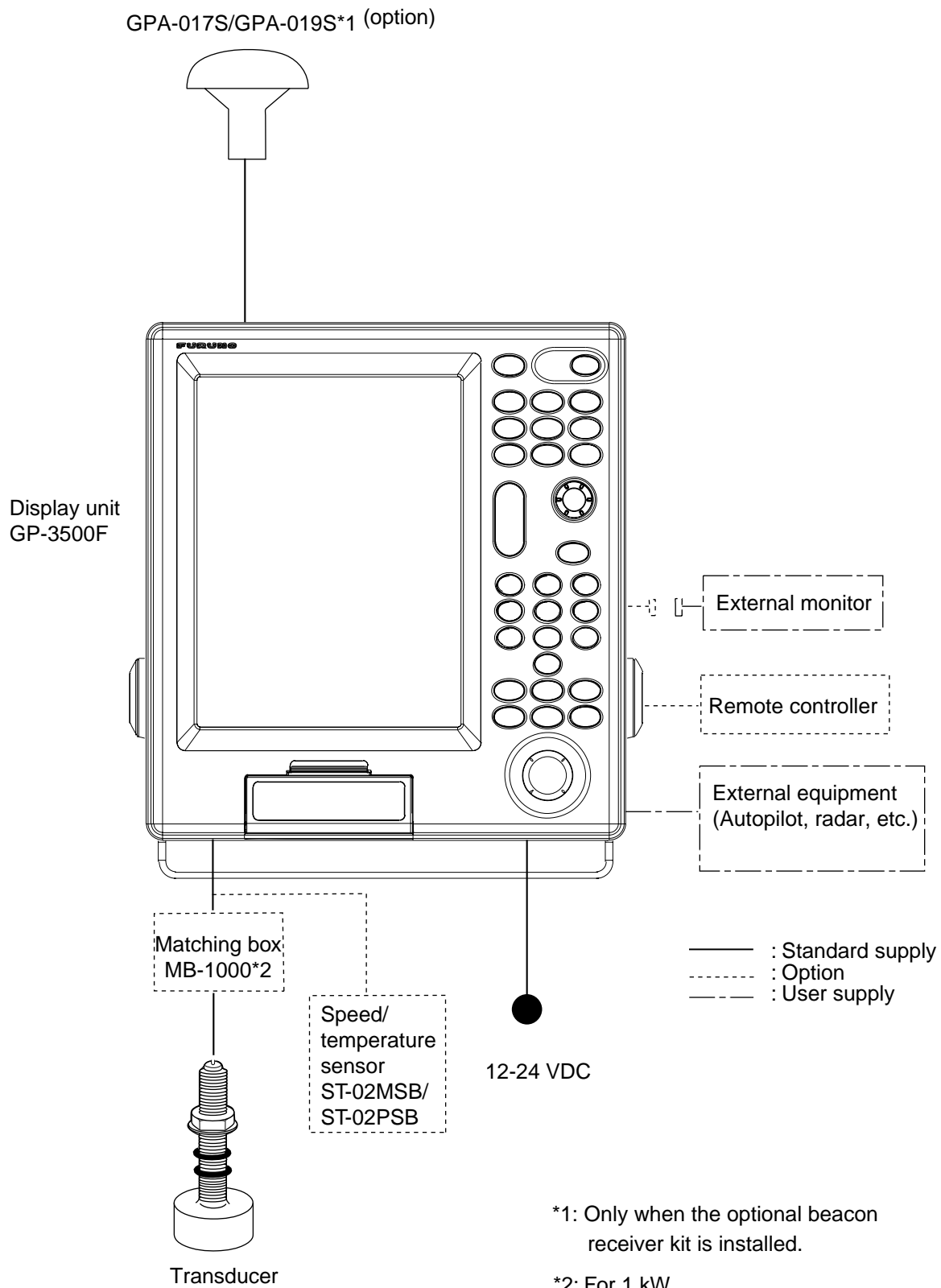
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SYSTEM CONFIGURATION

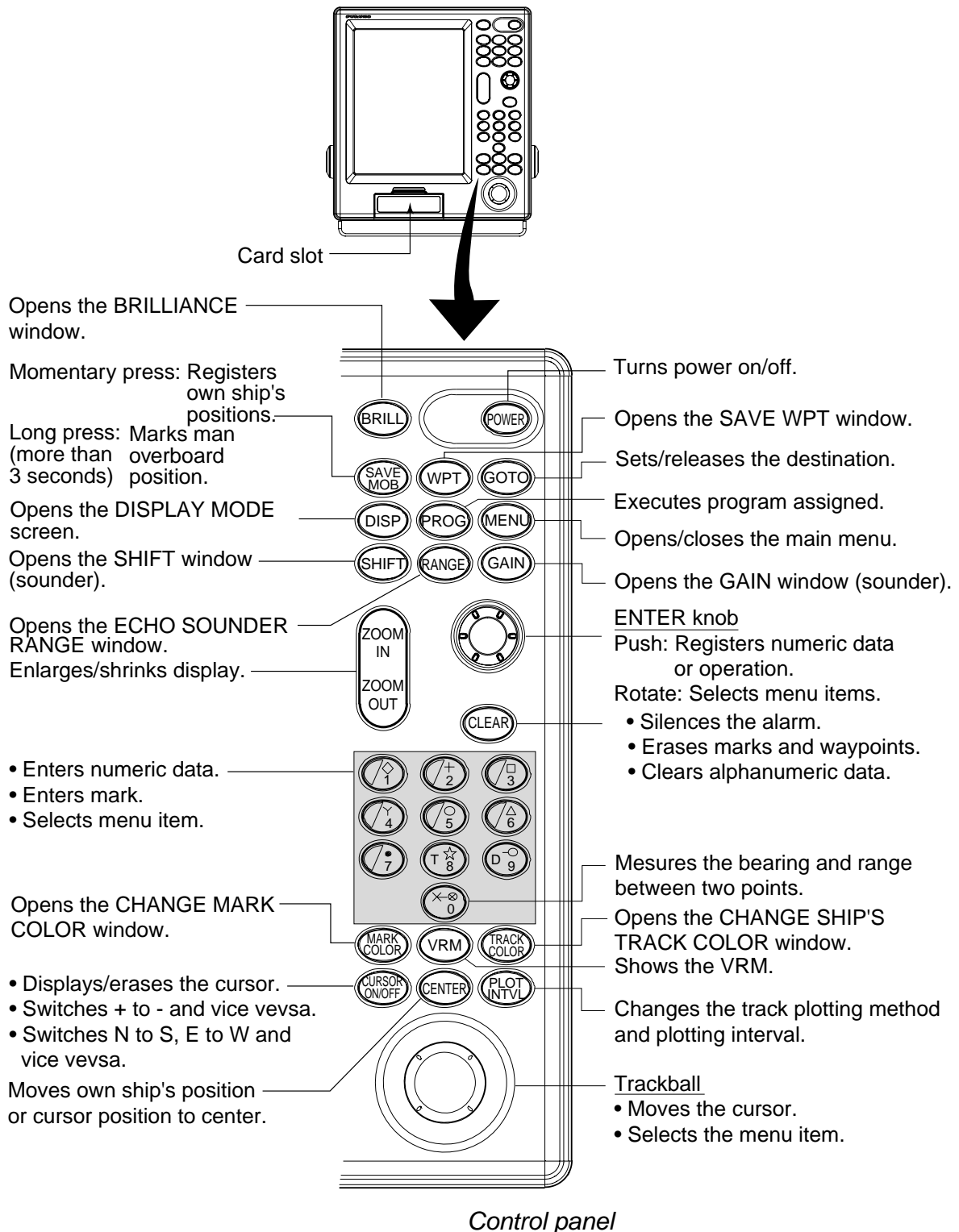


1. BASIC OPERATION

1.1 Controls Description

1.1.1 Display unit

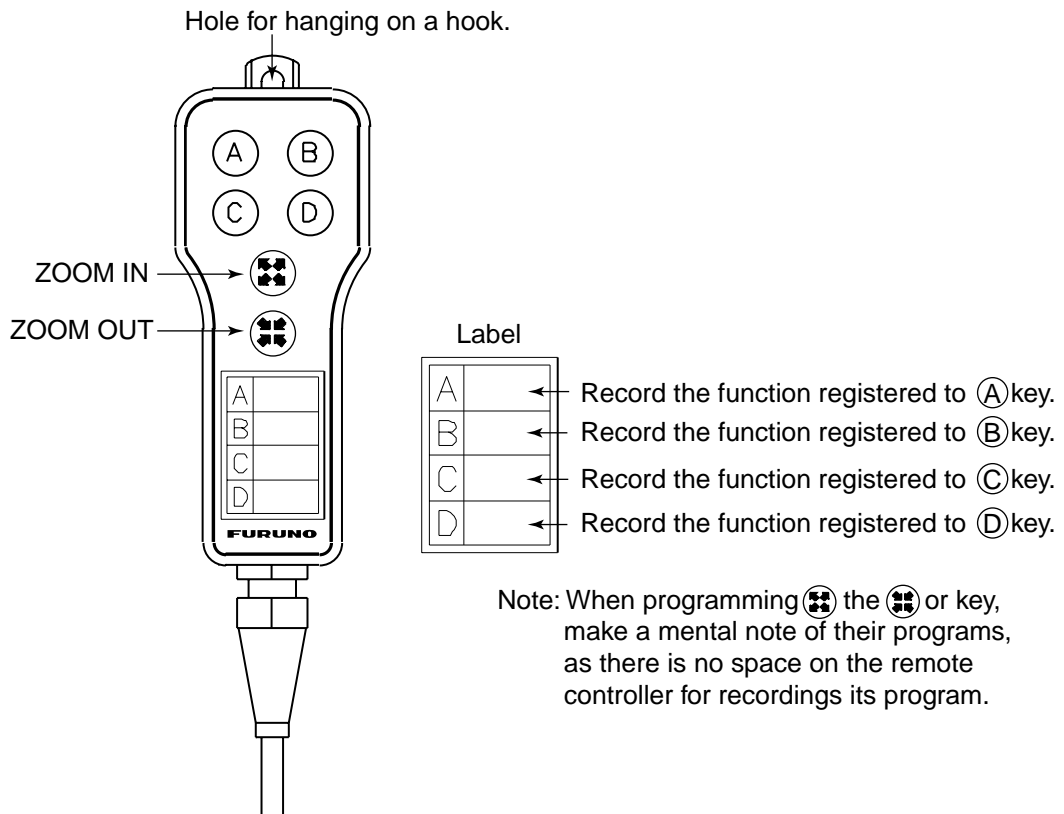
When you correctly execute an operation, the unit generates a beep. Invalid operation causes the unit to emit three beeps.



Control panel

1.1.2 Remote controller

The remote controller provides for armchair control of the display unit. It has six keys, all of which may be programmed by the user.



Remote controller

The default key functions are as below.

Key	Function
A	Enter a waypoint with the next consecutive waypoint number at the own ship (or cursor) position.
B	Same as pressing the [ENTER] knob on the control panel.
C	Same as [CLEAR] key function.
D	Same as [1] key function.
(ZOOM IN)	Same as [ZOOM IN] key function.
(ZOOM OUT)	Same as [ZOOM OUT] key function.

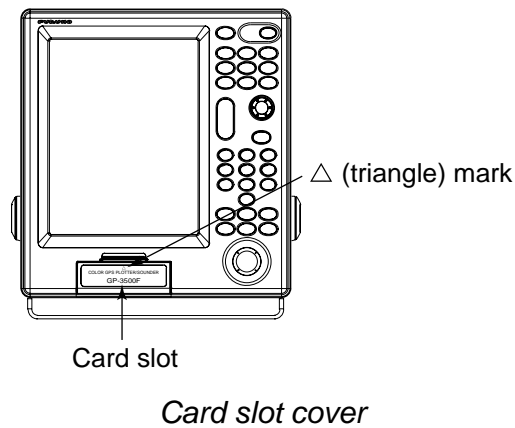
For how to program the remote controller, see paragraph 9.5.2. You can program other function to each key. (See paragraph 9.5.2.) Record the function name on the label on the remote controller, using an oil-based felt-tip pen.

1.2 Loading a Mini Chart Card

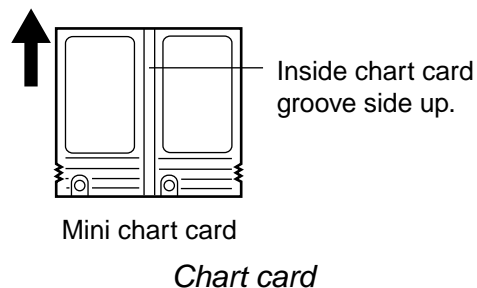
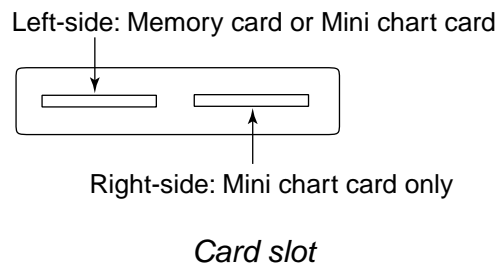
Your unit reads FURUNO and NavCharts (NAVIONICS) chart cards, or C-MAP (available in near future) chart cards, depending on the type of display unit you have. Insert the appropriate chart card for your area before turning the power on to show chart data automatically.

Note: Static electricity can be passed through your fingers to a card and destroy the contents of the card. To prevent this, always touch a metallic object, such as a steel desk, before handling a memory card.

1. Push down the lid catch to open the mini chart card slot cover.



2. Insert appropriate mini chart card groove side up in the right side slot.



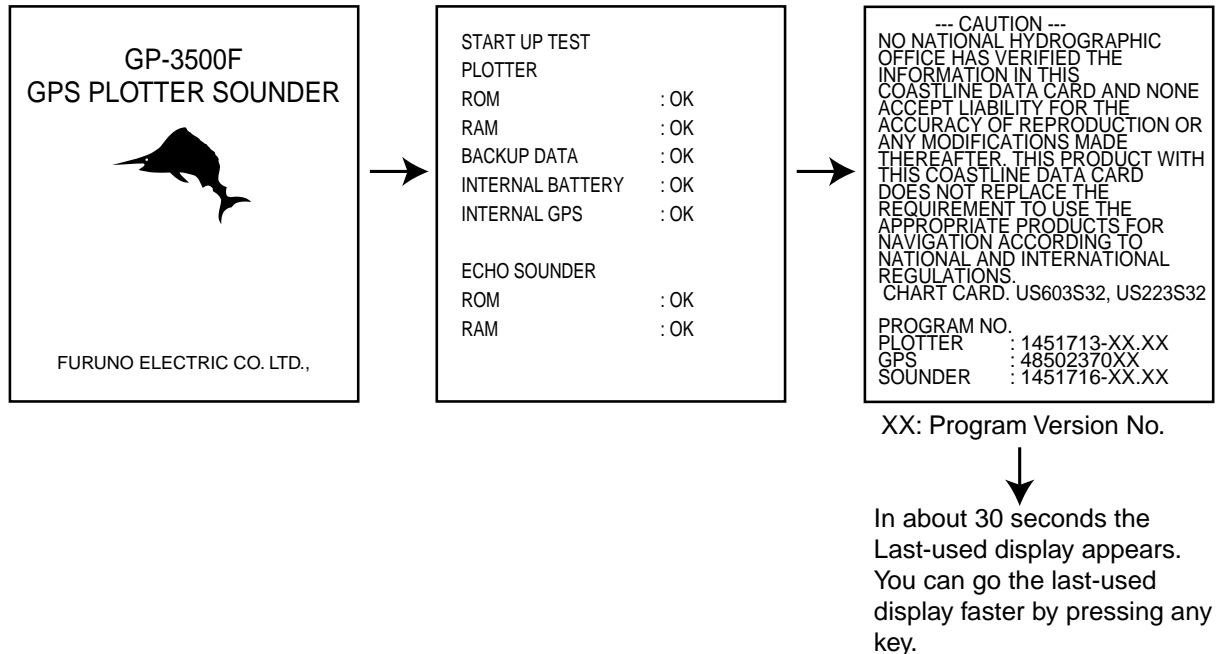
3. Close the slot cover to protect the chart drive. (Keep the slot cover closed at all times.)
Press the center of the lid catch to close it.

1.3 Turning the Power On/Off

Turning the power on

- Press the [POWER] key.

When the unit is turned on, it proceeds in the sequence shown in the figure below.



Start-up sequence

Note 1: 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.

Note 2: If the message "SYSTEM HAS FAILED START UP TEST. PLEASE CONTACT A LOCAL FURUNO REPRESENTATIVE FOR REPAIR. PRESS ANY KEY TO CONTINUE." appears, contact your dealer for advice.

This equipment takes about 90 seconds to find its position when turned on for the very first time. Thereafter it takes about 12 seconds to find position each time the power is turned on. The message "NO FIX", which means the equipment is now findings its position, appears at the bottom of the Plotter (or Pilot) display immediately after turning the power on. When the GPS receiver finds its position, "NO FIX" changes to "2D" or "3D" to show that position data is now accurate.

Position-fixing indications and their meanings

Indication	Meaning	Indication	Meaning
2D	2D (dimension) GPS position fix	D2D*	2D (dimension) DGPS position fix
3D	3D (dimension) GPS position fix	D3D*	3D (dimension) DGPS position fix
W2D	2D (dimension) WAAS position fix	DEMO	Simulation mode
W3D	3D (dimension) WAAS position fix		

*: The internal beacon receiver board (option) is necessary.

Note: If the password window appears, follow the procedure in paragraph 9.8.1.

Turning the power off

- Press the [POWER] key.
After the turning power off, attach the LCD cover to prevent it.

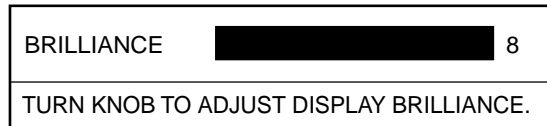
1.4 Adjusting Brilliance and Hue

You can adjust display brilliance, panel dimmer and hue as shown below.

1.4.1 Adjusting display brilliance

1. Press the [BRILL] key.

The brilliance adjustment window appears.



Brilliance adjustment window

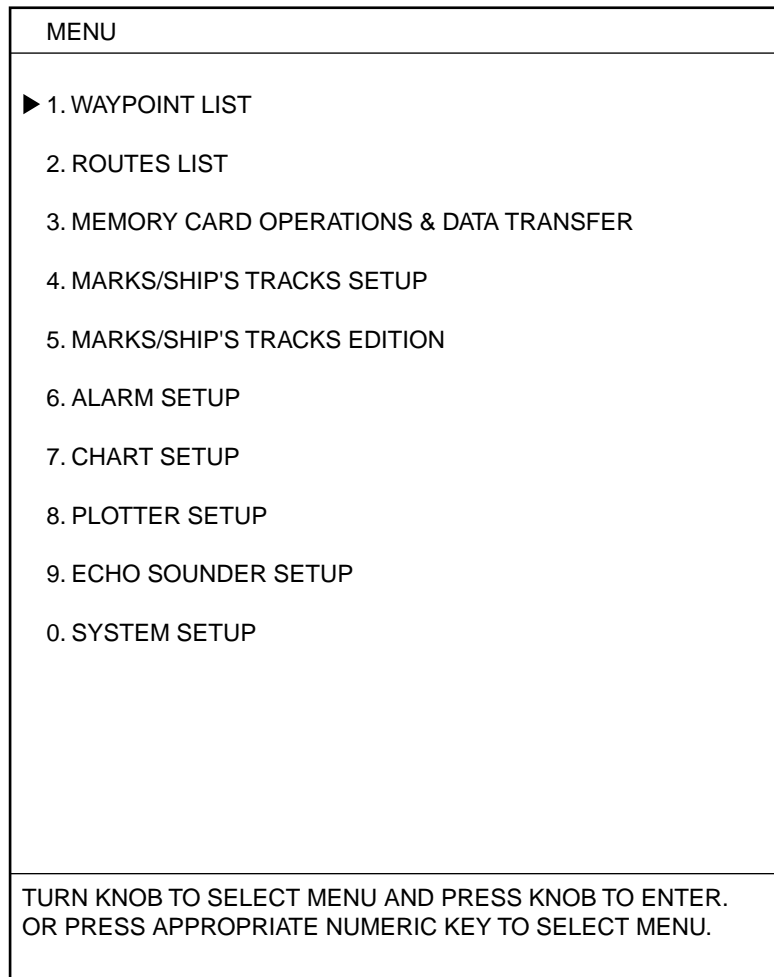
Note: The adjustment window disappears when there is no operation for three seconds.

2. Rotate the [ENTER] knob to adjust the brilliance, in eight levels
Rotate the knob clockwise to raise the setting or counterclockwise to decrease it. Also you can adjust brilliance by pressing the [BRILL] key. In this case brilliance is changed cyclically 1→2...→8→7→ ...1→2....
3. Press the [ENTER] knob to manually close the adjustment window, or wait three seconds to let the equipment close it automatically.

Note: The brilliance of an external monitor cannot be adjusted from the display unit. Adjust it at the external monitor.

1.4.2 Adjusting control panel dimmer

1. Press the [MENU] key to open the main menu.



Main menu

2. Press the [8] key to display the PLOTTER SETUP menu.

1. BASIC OPERATION

8. PLOTTER SETUP	
▶ LORAN-A GRI	00-01
CORRECTION 1	+000.0 μ s
CORRECTION 2	+000.0 μ s
LORAN-C GRI	00:11-29
CORRECTION 1	+000.0 μ s
CORRECTION 2	+000.0 μ s
DECCA CHAIN	01 R-G
CORRECTION 1	+00.00 LANE
CORRECTION 2	+00.00 LANE
TD DISPLAY	1. LORAN-A 2. LORAN-C 3. DECCA
RESET TRIP LOG	1. YES 2. NO
PLOTTER RANGE SETUP	1. YES 2. NO
PANEL DIMMER	1 2 3 4 5 6 7 8
HUE	1. DAY 2. NIGHT 3. TWILI 4. MANUAL

00:1L0	01:1L1	02:1L4	03:1L5	04:1L6
05:1L7	06:1S1	07:1S2	08:1S3	09:1S4
10:1S6	11:2H3	12:2H4	13:2H5	14:2H6
15:2S0	16:2S1	17:2S2	18:2S3	19:2S4
20:2S5	21:2S6	22:2S7		

TURN KNOB TO SELECT MENU.
SELECT THE ITEM OF EACH MENU BY TRACKBALL.

Plotter setup menu

3. Rotate the [ENTER] knob to choose PANEL DIMMER.
4. Roll the trackball in the right-left direction to choose the illumination desired.
You may also choose the setting by pressing the appropriate numeric key.
The larger the number the greater the illumination.
5. Press the [MENU] key several times to close the menu.

1.4.3 Selecting hue

1. Press the [MENU] key to display the main menu.
2. Press the [8] key to display the PLOTTER SETUP menu.
3. Rotate the [ENTER] knob to choose HUE.
4. Roll the trackball in the right-left direction to choose the hue desired.
You may also choose the hue by pressing the appropriate numeric key.
Refer to the table shown below to choose appropriate hue settings.

Hue setting and item color

	Day	Night	Twilight	Manual
Landmass	Yellow	Yellow	Yellow	Depending on the setting of CHART SETUP menu
Land edge	Black	Yellow	Black	
Background	White	Black	Gray	
Menu background	White	Black	Gray	White
Character	Black	White	Black	Black

5. Press the [MENU] key several times to close the menu.

1.5 Selecting a Display

Five full-screen displays are available: Plotter, Pilot, Navigation, Compass and Sounder. In addition to the full-screen display, you can divide the screen into half-screen combination displays. See Chapter 2 for Plotter, Pilot, Navigation and Compass displays, Chapter 11 for Sounder display.

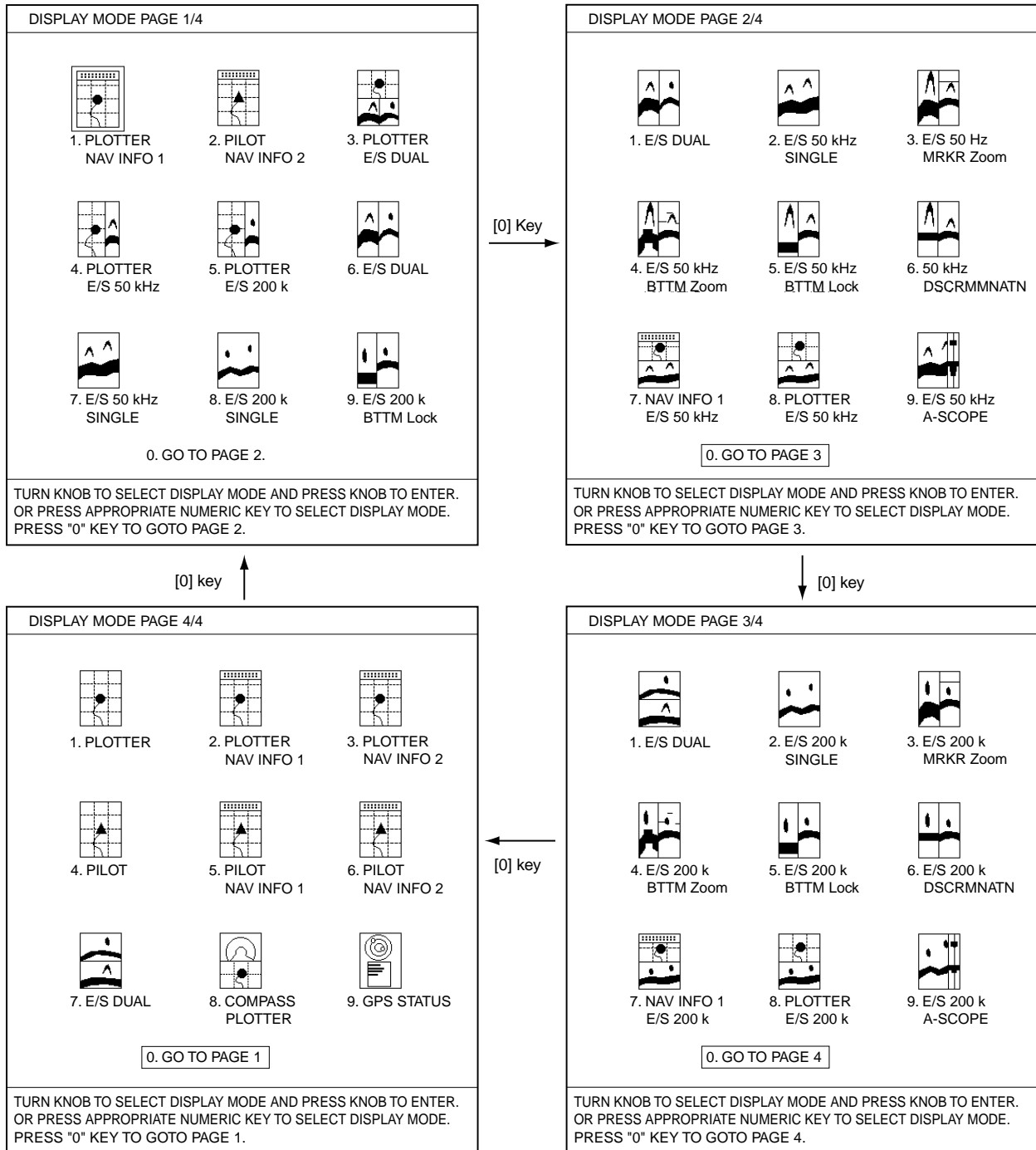
1. Press the [DISP] key.

A DISPLAY MODE screen appears. There are four pages of DISPLAY MODE screens.

2. Press the [0] key several times to show the page desired.

You may also choose a page by using the [ENTER] knob as below.

- a) Rotate the [ENTER] knob to select "0. GOTO PAGE X" at the bottom of the screen.
- b) Press the [ENTER] knob to choose page.



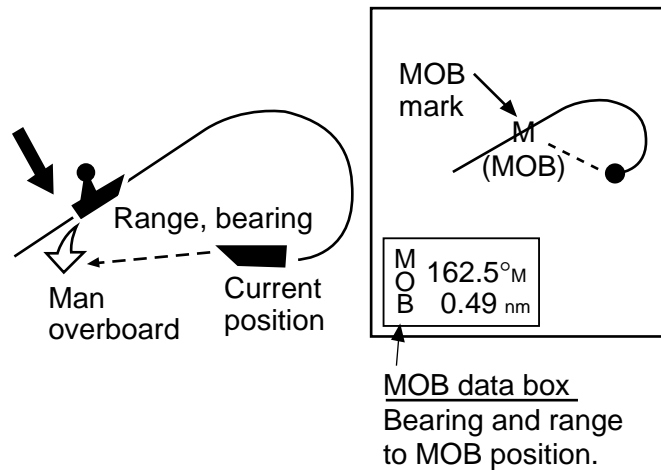
DISPLAY MODE screen

- Press appropriate numeric key to choose a display.
Selected display replaces display mode page.

Note: The DISPLAY MODE screens can store a total of 36 displays, nine on each of four pages. You may program the DISPLAY MODE screens as desired. For further details, see paragraph 9.6.1 for plotter displays and paragraph 11.17 for sounder displays.

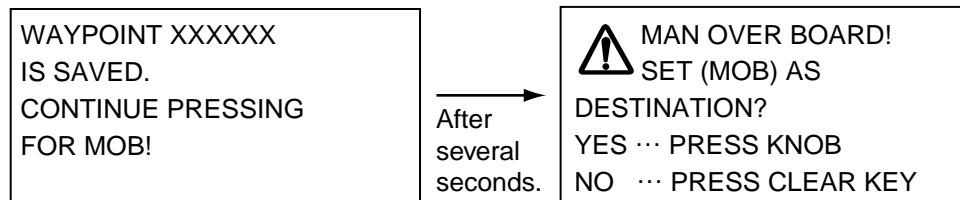
1.6 MOB Mark

The MOB (Man Overboard) mark functions to mark man overboard position. You can inscribe this mark from any mode, except while playing back data, recording data or conducting a diagnostic test.



1. Press and hold down the [SAVE/MOB] key immediately for about three seconds when someone falls onboard.

The display shows the waypoint number being saved (youngest empty waypoint number) under the MOB position followed by the MOB confirmation window.



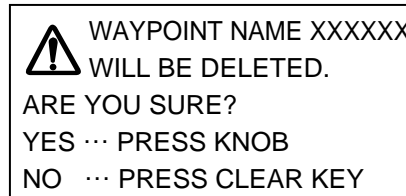
MOB mark messages

2. Push the [ENTER] knob to select the MOB position as the destination, or press the [CLEAR] key to only mark current ship's position as a waypoint. If you select the MOB position as the destination;
 - a) A full-screen PLOTTER NAV INFO 1 display replaces the display in use.
 - b) The MOB mark "M" appears at the MOB position and a dashed line runs between it and current position. This line shows the shortest course to the MOB position.
 - c) Range and bearing to the MOB position are shown in the MOB data box.

Note: The MOB mark can be deleted as follows.

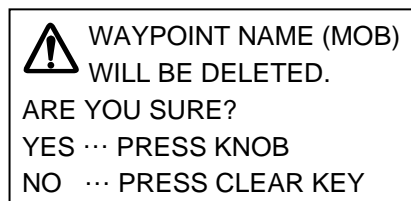
- a) Press the [CURSOR ON/OFF] key to show the cursor.
- b) Operate the trackball to place the cursor on the MOB mark.
- c) Press the [CLEAR] key.

The following message appears on the screen:

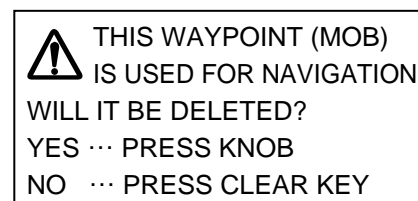


Confirmation message

- d) Press the [ENTER] knob.
Then, the waypoint entered at step 1 on the previous page is erased.
- e) Operate the trackball to place the cursor on the MOB mark.
- f) Press the [CLEAR] key.
- g) A new message appears on the screen:



When MOB is not set as destination



When MOB is set as destination

Confirmation message

- h) Press the [ENTER] knob to erase the MOB mark.

1.7 Using PROG Key

Less-often used functions are provided in the menu. To avoid opening menus to access a particular function, the [PROG] key may be assigned any of the function in the menu. Note that the function for [SHIFT], [RANGE], [GAIN] and [VRM] keys can also be programmed. The default program of the [PROG] key is as shown in the table below.

Key	Functions
PROG	Displays the WAYPOINT LIST.

•**Note 1:** To program plotter functions to the [PROG] key ([SHIFT], [RANGE], [GAIN] or [VRM] keys), see paragraph 9.5.1. For echo sounder functions, see paragraph 11.16.

Note 2: If the [PROG] key is programmed for a sounder function it may only be used on the sounder display or a menu entered from the sounder display only.

1.8 Simulation Mode

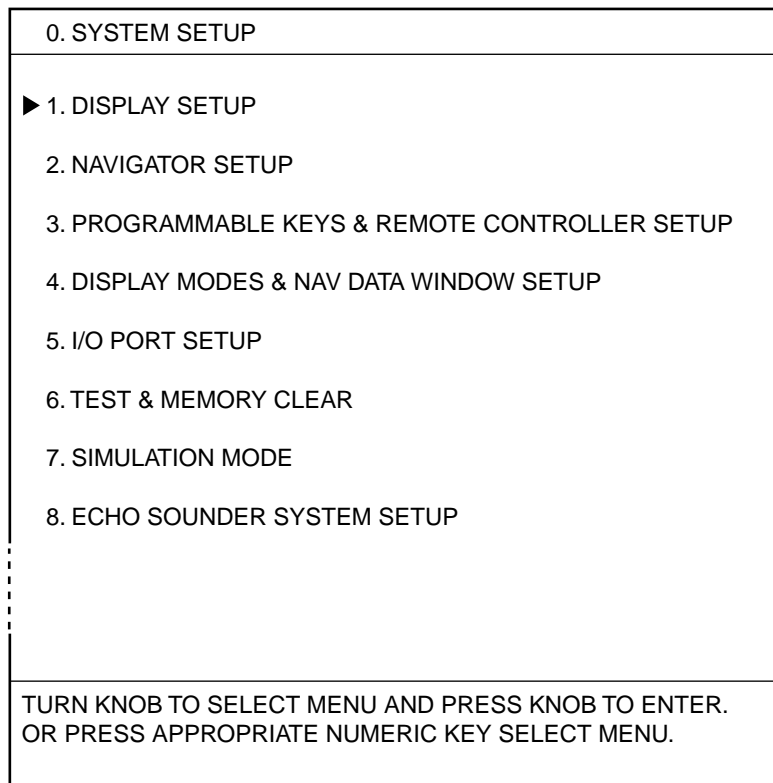
The simulation mode provides simulated plotter and sounder operation of this unit. All controls are operative.

“DEMO” appears at the bottom of the plotter (pilot) display (top of the sounder display) when any simulation mode is active.

Plotter

Own ship's mark tracks from the default position at the course and speed set.

1. Press the [MENU] key to display main menu.
2. Press the [0] key to display the SYSTEM SETUP menu.



System setup menu

3. Press the [7] key to display the SIMULATION MODE menu.

0-7. SIMULATION MODE SETUP		
▶ PLOTTER	<input type="text" value="1. SIM"/>	2. LIVE
SPEED	09.9 kt	
COURSE	1. DIRECTION	<input type="text" value="2. 8 FIGURE"/>
DIRECTION	000.0°	
LATITUDE	45°35.000'N	
LONGITUDE	125°00.000'W	
DATE & TIME	03.01.01 00:00	
ECHO SOUNDER	<input type="text" value="1. SIM"/>	2. LIVE
TURN KNOB TO SELECT MENU. SETUP SIMULATION MODE BY TRACKBALL.		

Simulation mode setup menu

4. Rotate the [ENTER] knob to choose PLOTTER.
5. Press the [1] key to choose "1. SIM."
6. Rotate the [ENTER] knob to choose SPEED.
7. Enter speed (setting range: 0.0 to 99.9 kt) with the numeric keys, then press the [ENTER] knob.
8. Rotate the [ENTER] knob to choose COURSE.
9. Press the [1] or [2] key to choose "1. DIRECTION" or "2. 8 FIGURE."
 DIRECTION: Track is traced according to course set. Go to step 10.
 8 FIGURE: Track is traced in a figure-eight course. Go to step 12.
10. Rotate the [ENTER] knob to choose DIRECTION.
11. Enter course (setting range: 0.0 to 359.9) with the numeric keys, then press the [ENTER] knob.
12. Rotate the [ENTER] knob to choose LATITUDE.
13. Enter latitude with the numeric keys, and press the [ENTER] knob.
 Press the [CURSOR ON/OFF] key to switch from north to south and vice versa.
14. Rotate the [ENTER] knob to choose LONGITUDE.
15. Enter longitude with the numeric keys, and then press the [ENTER] knob.
 Press the [CURSOR ON/OFF] key to switch from east to west and vice versa.
16. Rotate the [ENTER] knob to choose DATE & TIME.

1. BASIC OPERATION

17. Enter start date and time with the numeric keys, in 24-hour notation and then press the [ENTER] knob.
18. Press the [MENU] key several times to close the menu.

Note: To terminate the simulation mode, select "2. LIVE" at step 5.

Echo sounder

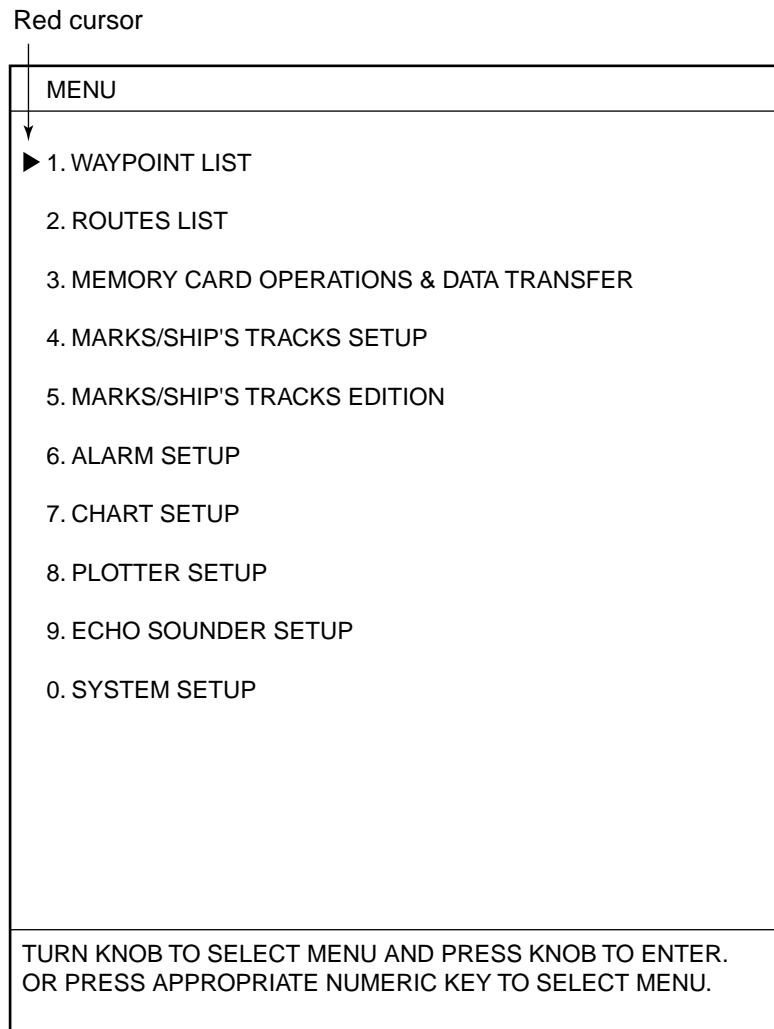
1. Press the [MENU] key to display the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [7] key to display the SIMULATION MODE menu.
4. Rotate the [ENTER] knob to choose ECHO SOUNDER.
5. Press the [1] key to choose "1. SIM."
6. Press the [MENU] key several times to close the menu.

Note: To terminate the simulation mode, select "2. LIVE" at step 5.

1.9 Menu Overview

Secondary operations are carried out through the menu. This section provides basic menu operating information.

1. Press the [MENU] key to display the main menu.



Main menu

2. Select a menu item.

There are three ways to select a menu item. This manual uses method a).

- a) Press the appropriate numeric key.
- b) Rotate the [ENTER] knob to select the menu item desired, and then press the [ENTER] knob.

The red cursor appears at left side of the item selected. Rotate the [ENTER] knob clockwise to move the red cursor upward; counterclockwise for downward.

- c) Roll the trackball in up-down direction to select item, and then press the [ENTER] knob.

1. BASIC OPERATION

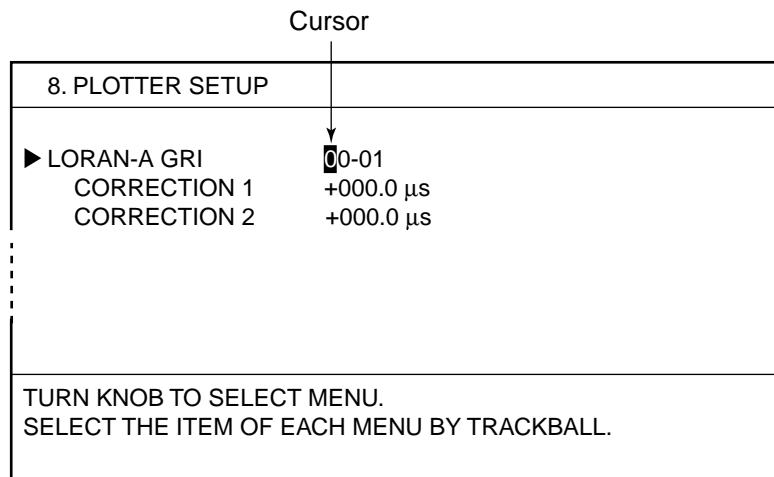
For example, press the [8] key to display the PLOTTER SETUP menu.

Cursor (red rectangle)

8. PLOTTER SETUP	
LORAN-A GRI	00-01
CORRECTION 1	+000.0 μ s
CORRECTION 2	+000.0 μ s
LORAN-C GRI	00:11-29
CORRECTION 1	+000.0 μ s
CORRECTION 2	+000.0 μ s
DECCA CHAIN	01 R-G
CORRECTION 1	+00.00 LANE
CORRECTION 2	+00.00 LANE
▶ TD DISPLAY	1. LORAN-A 2. LORAN-C 3. DECCA
RESET TRIP LOG	1. YES 2. NO
PLOTTER RANGE SETUP	1. YES 2. NO
PANEL-DIMMER	1 2 3 4 5 6 7 8
HUE	1. DAY 2. NIGHT 3. TWILI 4. MANUAL
00:1L0 01:1L1 02:1L4 03:1L5 04:1L6 05:1L7 06:1S1 07:1S2 08:1S3 09:1S4 10:1S6 11:2H3 12:2H4 13:2H5 14:2H6 15:2S0 16:2S1 17:2S2 18:2S3 19:2S4 20:2S5 21:2S6 22:2S7	
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.	

Plotter setup menu

3. Rotate the [ENTER] knob to select item which you want to change the setting.
You can also select item by rolling the trackball in up-down direction.
4. Roll the trackball in left-right direction to select option (with the red rectangle).
When the option is prefixed with numeral, you can select it by pressing the appropriate numeric key. In this manual selection by numeric key is used when both selection methods are available.
5. Press the [MENU] key several times to close the menu.

Entering numeric data*Plotter setup menu*

1. Press the appropriate numeric key.
2. Press the [ENTER] knob.

You may also enter a value rotating the [ENTER] knob.

Note: If you enter a wrong value, move the cursor to the that position and then re-enter the proper value. The cursor for entering value is moved by rolling the trackball in left-right direction.
 To clear a line of data, place the red cursor on the line and press the [CLEAR] key.

1. BASIC OPERATION

Entering character

PASSWORD ENT AGAIN ■				
[END]				
ABCDE	FGHIJ	KLMNO	PQRST	UVWXY
Z, - ! ?	/ & ^ = #	1 2 3 4 5	6 7 8 9 0	_____
a b c d e	f g h i j	k l m n o	p q r s t	u v w x y
z _____	_____	_____	_____	_____ ◀▶
SELECT ALPHANUMERIC CHARACTER BY TRACKBALL AND PRESS KNOB TO ENTER. OR PRESS NUMERIC KEY TO NAME WAYPOINT. MOVE THE CURSOR TO "END" ONCE THE EDITION IS FINISHED.				

Ex. Set password, entering characters

1. Roll the trackball in up-down direction to select the first alphanumeric character with the cursor (red square).
Numeric may also be entered by pressing numeric key.
2. Press the [ENTER] knob.

Note: If you enter a wrong character, move the cursor to that location and then re-enter the proper character. To move the digit cursor, select ◀ and then press the [ENTER] knob for left direction, or select ▶ and then press the [ENTER] knob for right direction.
Press the [CLEAR] key to erase the all characters.

3. Repeat steps 1 and 2 to complete the naming.
4. Finally, select "END" and then press the [ENTER] knob.

2. PLOTTER AND PILOT DISPLAY DESCRIPTION

2.1 Plotter and Pilot Displays

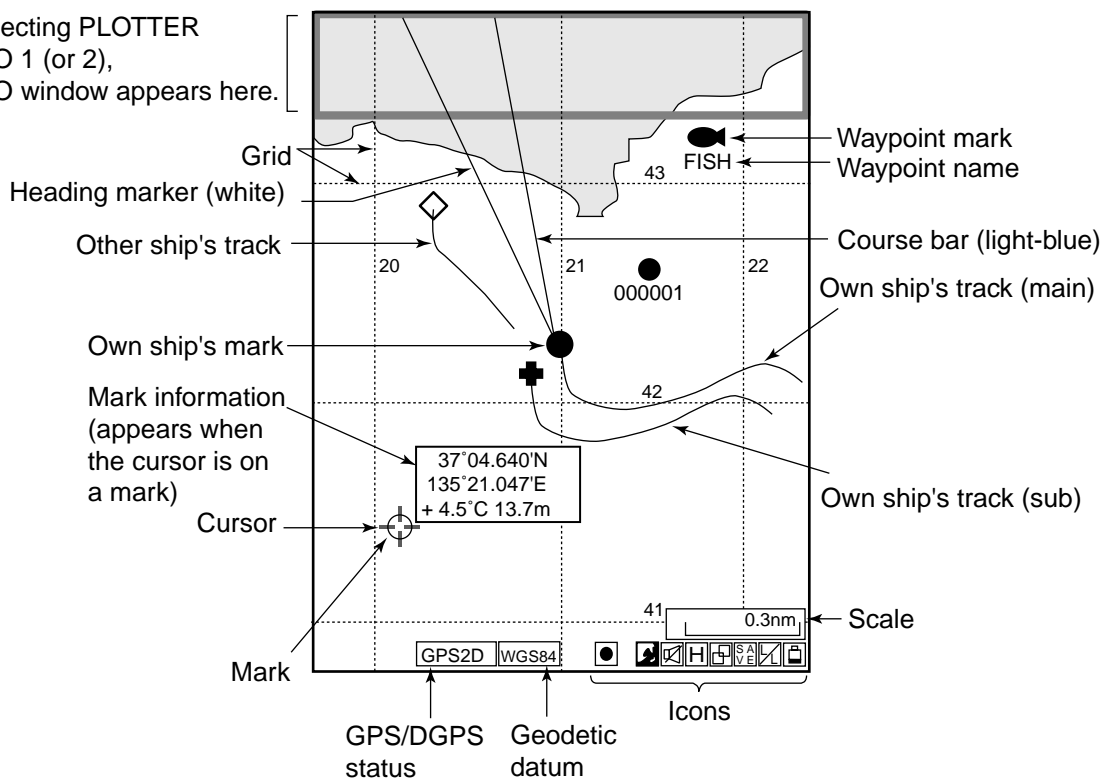
The plotter and pilot displays can be shown with full-screen or in a half screen combined with the nav information window, compass or echo sounder display.

To choose a plotter or pilot display, press the [DISP] key, and then press the [0] key several times to show the DISPLAY MODE PAGE 4/4 screen. Press the appropriate numeric key to show the display desired.

2.1.1 Plotter display

The plotter display shows chart data, tracks, waypoints and marks on the display. The plotter display orientation is always north-up. North (zero degree) is at the top of the display and own ship (filled circle) is at the center of the screen.

When selecting PLOTTER NAV INFO 1 (or 2), NAV INFO window appears here.



PLOTTER display

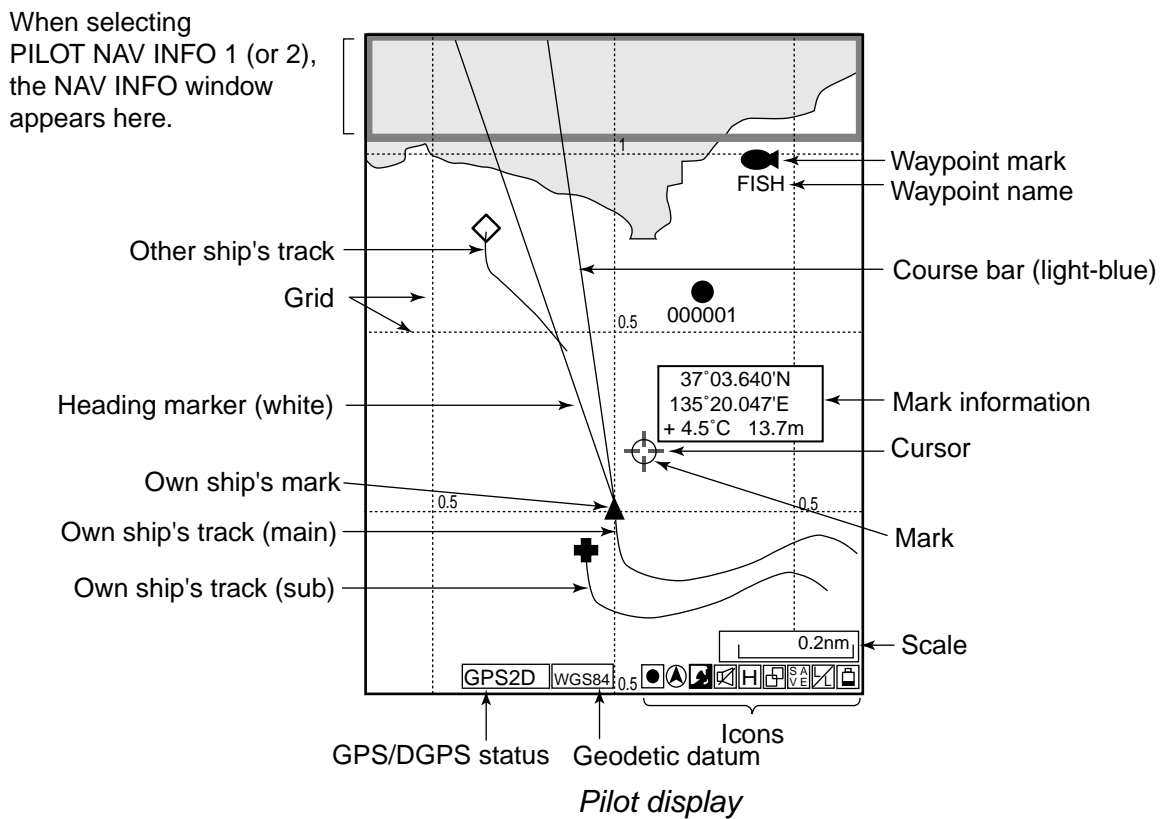
2. PLOTTER AND PILOT DISPLAY DESCRIPTION

2.1.2 Pilot display

The pilot display is similar to the plotter display, with the following differences.

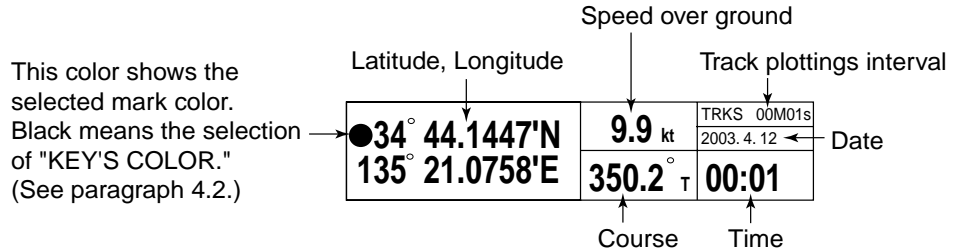
- 1) The pilot display orientation is always auto course-up. The course is at the top of screen at the moment the pilot display is selected. A filled triangle marks own ship's position. When own ship is off its intended course by 22.5° or more, it is automatically brought back to perpendicular.
- 2) The north mark (▲) appears at the bottom of the screen and points to north.
- 3) The grid lines denote the distance from own ship, not longitude/latitude.

Note: When north is not at the top of screen, the distance error may be larger than on the plotter display since the Mercator projection is used.

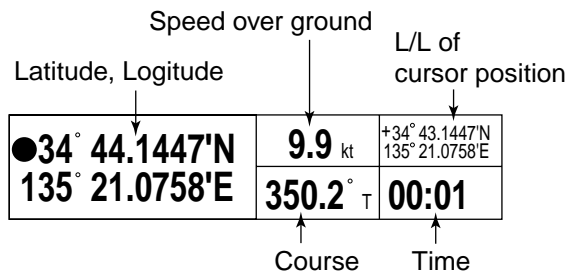


2.1.3 NAV INFO 1 display

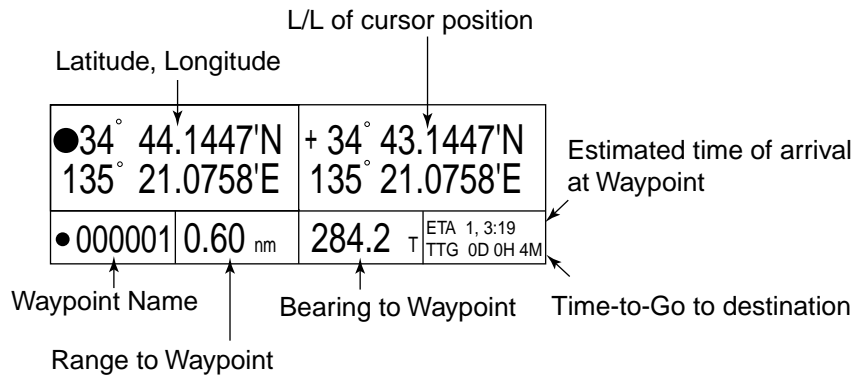
Select "PLOTTER (or PILOT) NAV INFO 1 (or 2)" from the DISPLAY MODE screen to show the NAV INFO 1(or 2) window at the top of the screen. When setting a destination, the NAV INFO 1 (2) window changes to the WPT INFO 1 (2) window.



NAV INFO 1 window (Default data)

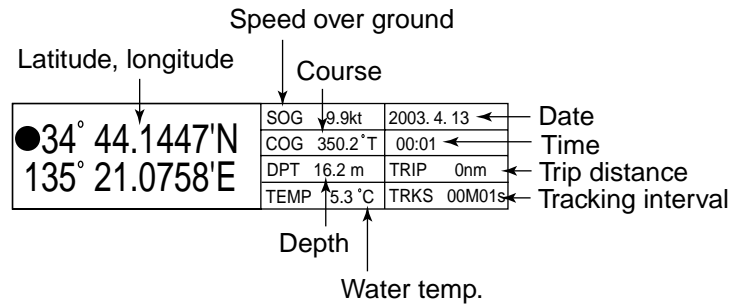


NAV INFO 2 window (Default setting)



NAV INFO 1 window on setting a destination (default data)

2. PLOTTER AND PILOT DISPLAY DESCRIPTION

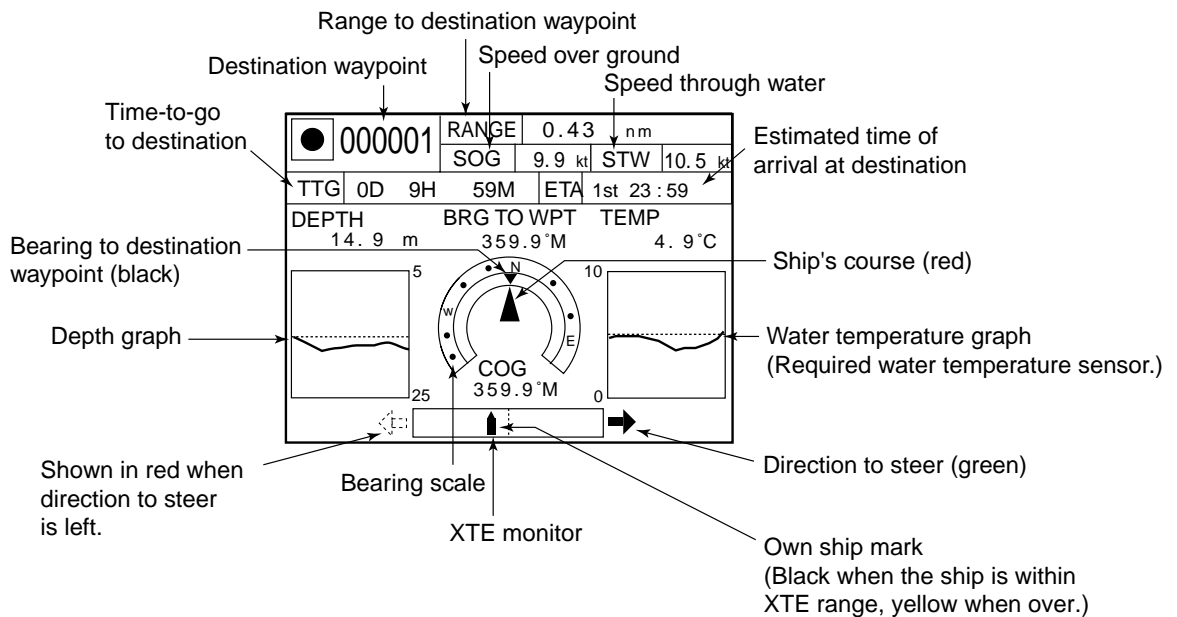


NAV INFO 2 window on setting a destination (default data)

Note: You can choose the data to display in the NAV. INFO windows. For further details, see paragraph 9.6.2.

2.1.4 Compass plotter (or pilot) display

The compass display, displayed at the top of the screen in a combination display, provides steering information.



Compass display

Compass indicator

The black inverted triangle shows the bearing to the destination waypoint, and the red triangle shows own ship's course.

Note: The course means the direction of own ship's movement, it is not the direction of heading. The cursor includes the affect of current and wind.

Depth and water temperature graphs

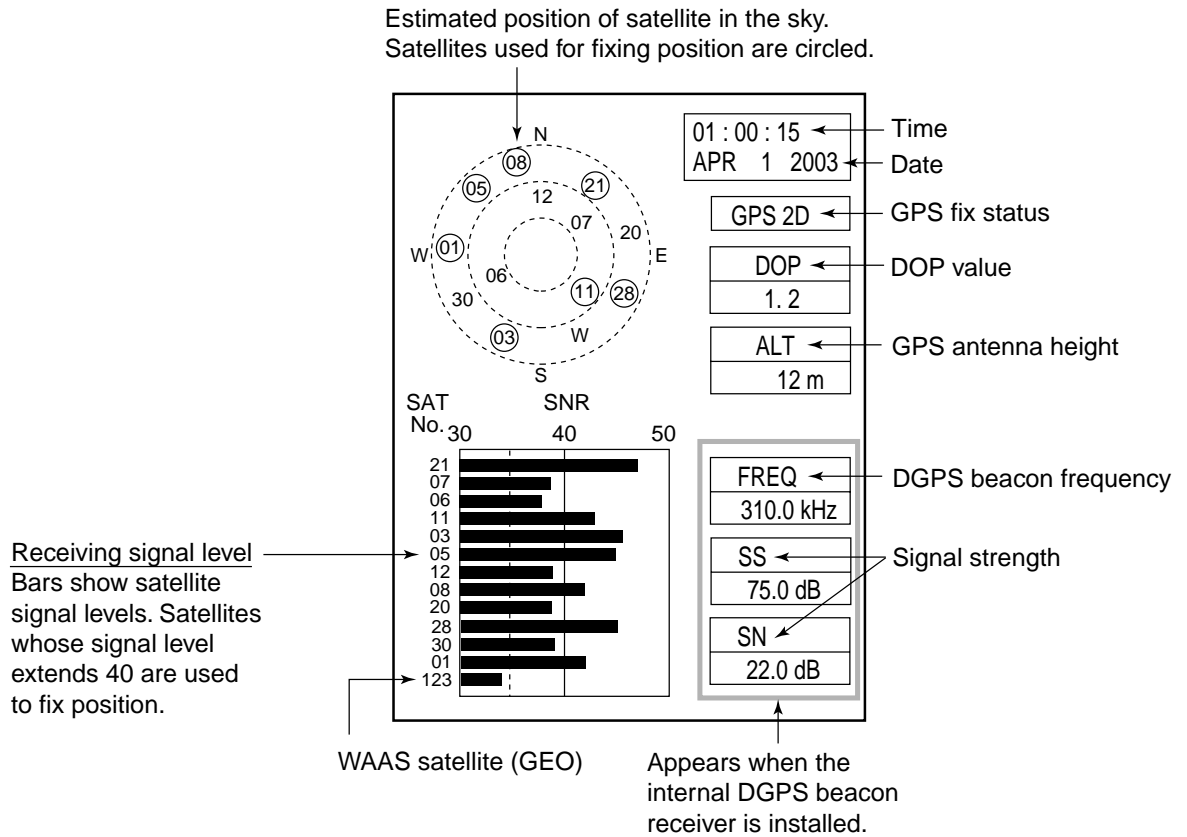
The depth and water temperature graphs, which require appropriate sensors, show the latest 10 minutes of depth and water temperature data. The range of the depth graph is 50 feet and it is automatically adjusted with depth.

XTE (cross-track error) monitor

The black boat-shaped (own ship mark) mark shows ship's cross-track from the intended course and direction, and amount to steer to return to course. It is shown in black when the amount of cross-track error is within the XTE monitor range and yellow when it is over. An arrow appears at the right or left side of the XTE monitor and it shows the direction to steer to return to the intended course. The arrow is shown in red when you should steer left, and green when you should steer right. In the example on the previous page you would steer right to return to course set. To maintain course, steer the vessel so the own ship marker stays at the center of the XTE monitor.

2.1.5 GPS status display

The GPS status display provides data about the GPS satellites and GEO satellite (for WAAS).



GPS status display

DOP value: DOP stands for Dilution of Precision and is an indication of the quality of the satellite constellation. The smaller value means the higher accuracy. (For your reference, the positioning accuracy is approx. 10 m when the value is less than “4”.)

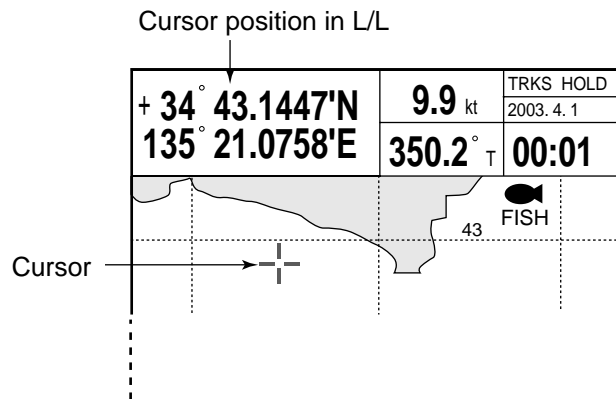
SS: SS (Signal Strength) displays a numeric representation of electrical field strength of the received signal on the selected frequency. The higher the number the stronger the received signal, and a figure above 60 is normal.

SN: SN (Signal-to-Noise) ratio displays the ratio between the desired signal and unwanted noise on the selected frequency. The higher the SN ratio the better the quality of the signal, and a figure above 21 is normal.

2.2 Operating the Cursor

1. Press the [CURSOR ON/OFF] key.

The cursor is turned on, and the cursor appears at the own ship's position. To hide the cursor, press the [CURSOR ON/OFF] key again.



PLOTTER NAV INFO 1 display (appearing the cursor)

2. Operate the trackball.

The cursor moves in the direction the trackball is operated and the cursor position is indicated at the top of the screen.

Note: The chart display moves in the opposite direction when it reaches an edge of the screen.

To return the cursor to the screen center

- Press the [CENTER] key to return the cursor to the screen center.

2.3 Shifting the Display

The display can be shifted on the plotter display and pilot display.

1. If the cursor is turned on, press the [CURSOR ON/OFF] key to turn it off.
2. Operate the trackball.

The display shifts in the direction which the trackball is rolled.

3. Press the [CENTER] key to return the own ship position to the screen center. (On the pilot display, the own ship's mark is positioned slightly below the center of the screen.)

Note: When own ship reaches an edge of the screen, it is returned to the center of the screen automatically.

2.4 Changing Chart Scale

It is useful to change chart scale to

- Show destination on the display
- Find how close you are to your destination
- View ship's tracks around a fishing ground

When cursor is off

Own ship is at the screen center. The display is enlarge or shrunk from the screen center.

When cursor is on

The range scale is enlarged or shrunk with the cursor position as center.

- Press the [ZOOM IN] key to enlarge the scale, or [ZOOM OUT] key to shrink. After pressing the [ZOOM IN] or [ZOOM OUT] key, the current range appears at the center of the screen for a second. The range value shows the distance between the left-side and right-side edges of the screen.

Ranges (default setting)

0.125	0.25	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00
8.00	12.0	16.0	24.0	32.0	48.0	72.0	96.0	128	256
512	1024								

(The larger value may be different from the above depending on latitude of own ship.)

Note 1: When the display is expanded or shrunk beyond the range of the chart card in use warning icon appears, along with the appropriate chart icon. See paragraph 2.7.

Note 2: You can choose the ranges to use. See paragraph 9.2.3.

Note 3: The width of the screen can be shown with scales instead of the distance. See paragraph 9.3.

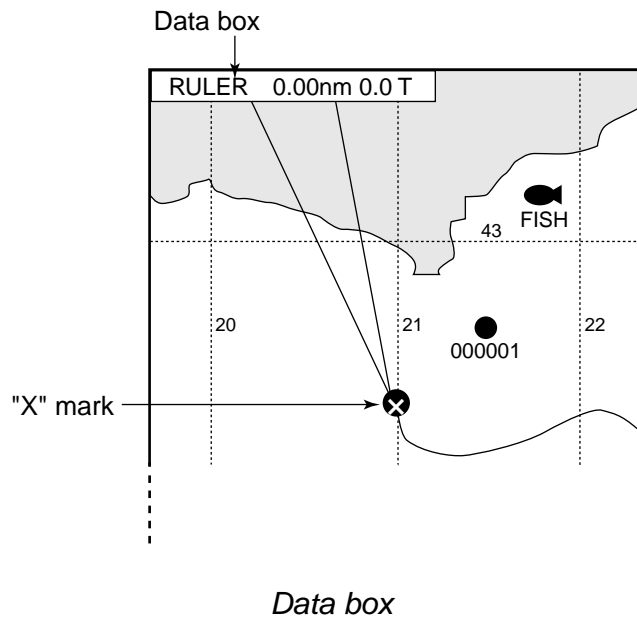
2.5 Measuring Range and Bearing Between two Points

You can measure the range and bearing between two points as follows.

1. If the cursor is turned on, press the [CURSOR ON/OFF] key to turn it off.

2. Press the [0] key.

The "X" mark is entered at the own ship's position at the moment the [0] key is pressed, and a data box appears at the top of the display.



3. Use the trackball to place the cursor on the starting point.

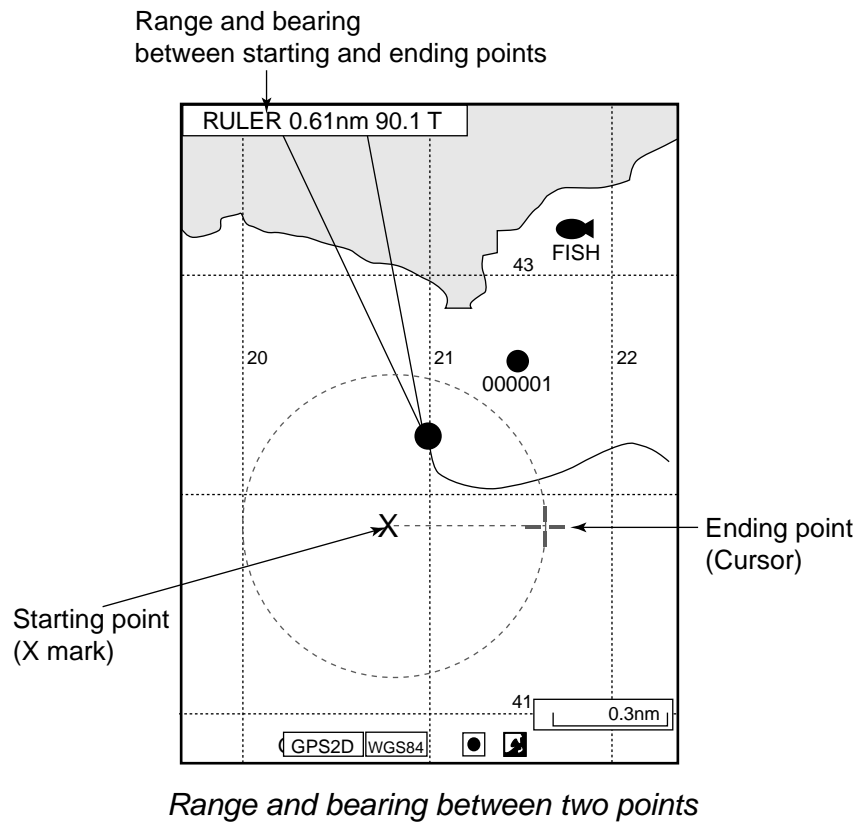
When the cursor is moved, a dashed circle appears, with the "X" mark at its center and a dashed line extending from the "X" mark to the cursor.

4. Press the [ENTER] knob, and the "+" mark moves to the cursor position.

5. Use the trackball to place the cursor on the ending point.

The data box shows range and bearing between the starting and ending points.

2. PLOTTER AND PILOT DISPLAY DESCRIPTION



6. Press the [0] key to terminate the measurement and erase the dashed circle and line, and data.

2.6 Using the VRM (Variable Range Marker)

The VRM function to measure the distance between two points, like using dividers to measure distance on a nautical chart.

1. Press the [VRM] key to show the VRM.

Each pressing this key makes the sequence shown below.

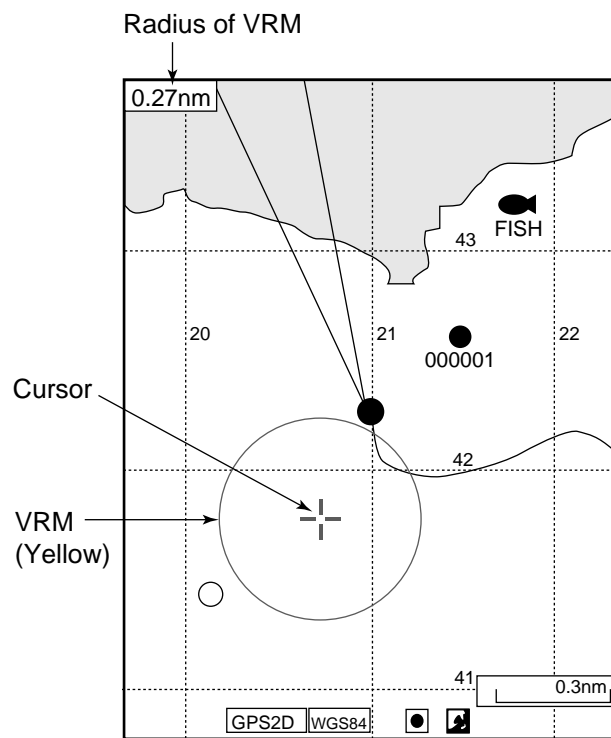
VRM off → VRM (floating VRM) → VRM (fixed VRM) → VRM off ...

VRM off: VRM is turned off.

VRM (floating VRM): You can adjust its position and radius.

VRM (fixed VRM): VRM is fixed at position selected with floating VRM. Its radius is also fixed.

When cursor is turned on, VRM appears around it. When cursor is turned off, VRM appears around own ship's position. Also, a data box appears at the top of the display to show the radius of VRM.



VRM

2. Use the trackball to place the VRM where desired.
3. Rotate the [ENTER] knob to adjust the radius of VRM.
Clockwise rotation: Increase radius.
Counterclockwise rotation: Decrease radius.

2. PLOTTER AND PILOT DISPLAY DESCRIPTION




4. When it is not necessary to change the VRM's location and size, simply press the [ENTER] knob.
VRM is fixed at the selected position.
5. To turn off the VRM, press the [VRM] key to hide VRM.
The data box disappears immediately.

Note: The [VRM] key's default function is to turn the VRM on and off. Its function can be changed as desired. For details, see paragraph 9.5.1.

2.7 Mini Chart Cards

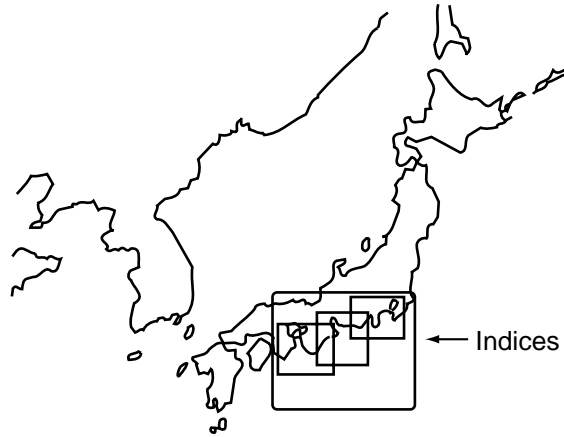
This equipment uses both FURUNO and NAVIONICS chart cards or C-MAP NT mini chart cards depending on its specifications. When you insert a suitable chart card in the right side slot and turn on the power, a chart appears. If a wrong card is inserted or a wrong chart scale is selected, landmasses will be hollow. Insert the proper card and select a suitable chart scale. Chart icons appear at the bottom of the plotter (or pilot) display to help you select a suitable chart size. The table below shows the chart icons and their meanings.

Chart icons and their meanings

Icon	Meaning
	Proper card is not inserted or chart scale is too small. Operate the [ZOOM IN] key to adjust chart scale.
	Chart scale is too large. Operate the [ZOOM OUT] key to adjust chart scale.
	Suitable chart scale is selected.

Indices and chart enlargement

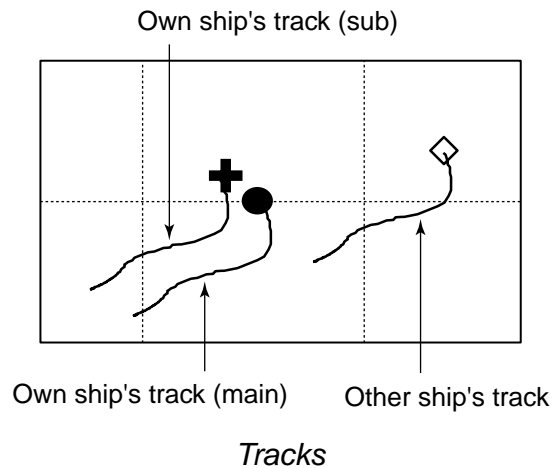
When the [ZOOM OUT] key is used, you will see several frames appear on the chart. These frames are called indices and they show you what parts of the chart can be zoomed. The areas circumscribed with smaller frames can show more detailed information.



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3. TRACK

Your ship's track (main and sub tracks) is plotted on the screen using navigation data fed from the built-in GPS navigator. When connecting with an ARPA-equipped radar, other ship's track can also be plotted. This chapter shows you how to turn track on or off, and change its color and plotting interval. Own ship's track is displayed in red in the default setting.



3.1 Displaying Track

3.1.1 Own ship's track

Own ship's track can be turned on or off as follows.

1. Press the [MENU] key to display the main menu.
2. Press the [4] key to open the 4. MARKS/SHIP'S TRACKS SETUP menu.
This menu has two pages. If PAGE 2/2 appears, rotate the [ENTER] knob clockwise to select "PREVIOUS PAGE."
3. Rotate the [ENTER] knob to choose "SHIP'S TRACKS DISP."

3. TRACKS

4. MARKS/SHIP'S TRACKS SETUP		PAGE 1/2	
NEXT PAGE			
MARKS SIZE	<input type="text" value="1.L"/>	2.L+	3.S
LINES STYLE	<input type="text" value="1.——"/> <input type="text" value="2.-----"/>	3.-----	4.-----
TRACK INTERVAL 1	<input type="text" value="TIME (00M10s)"/>	DIST (0.10nm)	
TRACK INTERVAL 2	<input type="text" value="TIME (00M10s)"/>	<input type="text" value="DIST (0.10nm)"/>	
▶ SHIP'S TRACKS DISP	<input type="text" value="1.ON"/>	2.OFF	
DISP TRACKS (HOLD)	<input type="text" value="1.ON"/>	2.OFF	
PLOT TRACKS (HOLD)	<input type="text" value="1.ON"/>	<input type="text" value="2.OFF"/>	
TRACKS COLOR	<input type="text" value="1.——"/>	2.——	3.----- 4.-----
TRACKS BY TEMP	<input type="text" value="RANGE"/>	GRDNT (0.2°F 2.0°F)	
	WHITE:	005.0°F BELOW	
	BLUE:	005.0°F ~	
	PURPLE	010.0°F ~	
	LIGHT BLUE:	012.5°F ~	
	GREEN:	015.0°F ~	
	YELLOW:	017.5°F ~	
	RED:	020.0°F ABOVE	
TRACKS BY DEPTH	<input type="text" value="RANGE"/>	GRDNT (2ft 20ft 200ft)	
	WHITE:	0032.8 ft SHALLOWER	
	BLUE:	0032.8 ft ~	
	PURPLE	0164.0 ft ~	
	GREEN:	0656.2 ft ~	
	YELLOW:	0984.3 ft ~	
	RED:	1312.3 ft DEEPER	
SHIP'S TRACKS	12,000		
MARKS	04,000/16,000		
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.			

Marks/ship's tracks setup menu (page 1)

4. Press the [1] key to choose ON or the [2] key to choose OFF as appropriate.
5. Press the [MENU] key several times to close the menu.

Note: The number of track points used appears at the bottom of the MARKS/SHIP'S TRACKS EDITION menu. (See page 3-16.)

3.1.2 Sub track

A second track of own ship's track, called sub track, may be shown, using data from a second navigator.

Note that the sub track is not stored in the memory; it is erased when it goes off the screen or when the power is turned off.

1. Press the [MENU] key to display the main menu.
2. Press the [4] key to show the MARKS/SHIPS TRACKS SETUP menu.
3. If PAGE 1/1 appears, rotate the [ENTER] knob clockwise to select "NEXT PAGE to show page 2/2."
4. Rotate the [ENTER] knob to choose "DISP SUB TRACKS."

4. MARKS/SHIP'S TRACKS SETUP		PAGE 2/2
PREVIOUS PAGE		
DISP TARGET TRACKS	1. ON	2. OFF
TARGET TRACK COLOR	1. <input type="checkbox"/>	2. <input type="checkbox"/> 3. <input type="checkbox"/> 4. <input type="checkbox"/> 5. <input type="checkbox"/> 6. <input type="checkbox"/> 7. <input type="checkbox"/>
TARGET TRACK STYLE	1. <input type="checkbox"/>	2. <input type="checkbox"/> 3. <input type="checkbox"/> 4. <input type="checkbox"/>
▶ DISP SUB TRACKS	1. ON	2. OFF
SUB TRACK COLOR	1. <input type="checkbox"/>	2. <input type="checkbox"/> 3. <input type="checkbox"/> 4. <input type="checkbox"/> 5. <input type="checkbox"/> 6. <input type="checkbox"/> 7. <input type="checkbox"/>
SUB TRACK STYLE	1. <input type="checkbox"/>	2. <input type="checkbox"/> 3. <input type="checkbox"/> 4. <input type="checkbox"/>
SUB TRACK TALKER	1. GP	2. II 3. IN 4. SN 5. TR 6. LA 7. LC 8. DE 9. EC
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.		

Marks/ship's tracks setup menu (page 2)

5. Press the [1] key to choose ON or the [2] key to choose OFF as appropriate.
6. Press the [MENU] key several times to close the menu.

Note: The position data used to trace the sub track may be chosen with "SUB TRACK TALKER" on page 2 of the MARKS/SHIP'S TRACKS SETUP menu. For further details, refer to the installation manual.

3. TRACKS

3.1.3 Other ship's track

You may show the tracks of ARPA targets tracked in auto tracking. Note that this track is not stored in the memory; it is erased when it goes off the screen a when the power is trued off

1. Press the [MENU] key to display the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 1/1 appears, rotate the [ENTER] knob clockwise to select "NEXT PAGE."
4. Rotate the [ENTER] knob to choose "DISP TARGET TRACKS."
5. Press the [1] to choose ON or the [2] key to choose OFF as appropriate.
6. Press the [MENU] key several times to close the menu.

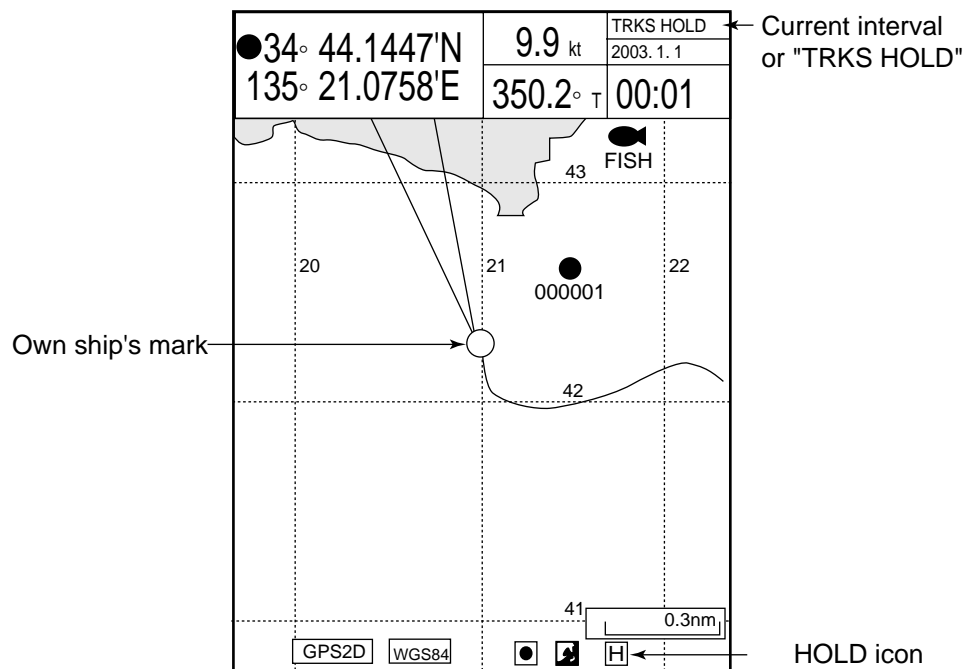
3.2 Stopping, Restarting Plotting of Own Ship Track

When your boat is at anchor or returning to port, you probably won't need to record its track. You can stop recording the track, to conserve the track memory, as follows.

1. Press the [PLOT INTVL] key several times to show the "H" (Hold) icon (at the bottom of the screen). Each time the key is pressed the track function available changes in the sequence shown below.

TRACK INTERVAL 1 -> TRACK INTERVAL 2 -> HOLD -> TRACK INTERVAL 1

Track plotting interval or "HOLD" appears at the top right corner of the NAV INFO 1 (or 2) display. When plotting is stopped, own ship's mark changes from a solid circle to a hollow one and track is not stored in the memory.



Stopping plotting track (ex. PLOTTER NAV INFO 1 display)

Note: If the track plotting interval is not shown in the NAV INFO window, see paragraph 9.6.2.

2. To restart plotting, press the [PLOT INTVL] key.

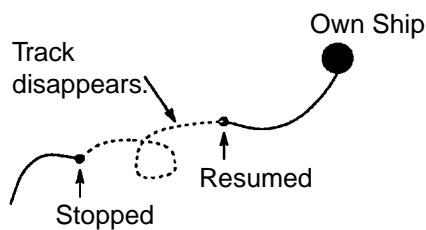
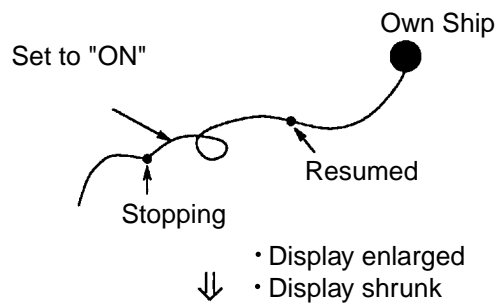
Note: Plotting can also be stopped or restarted from the full screen echo sounder display.

3.2.1 Displaying own ship's track while track plotting is stopped

You can show or hide own ship's track on the PLOTTER (or PILOT) display while track plotting is stopped.

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 2/2 appears, rotate the [ENTER] knob clockwise to select "PREVIOUS PAGE."
4. Rotate the [ENTER] knob to choose "DISP TRACKS (HOLD)."
5. Press the [1] key to choose ON or the [2] key to choose OFF as appropriate
ON: Own ship's track is displayed while recording is stopped. In this case own ship's track is not recorded; it is erased when it goes off screen or when the power is turned off.

OFF: Own ship's track is not displayed while recording is stopped.



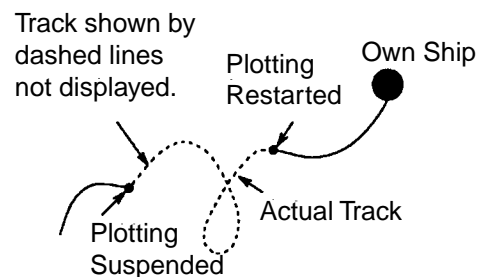
*Display while stopping recording of track
(When "ON" is selected at step 5 above)*

5. Press the [MENU] key several times to close the menu.

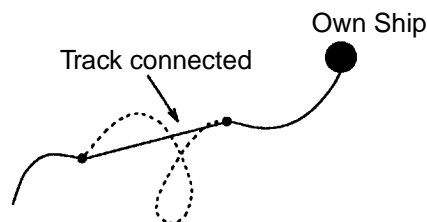
3.2.2 Connecting own ship's track when resuming plotting

When you resume plotting of own ship's track, the point where plotting was stopped and restarted can be connected with a straight line.

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to display the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 2/2 appears, rotate the [ENTER] knob clockwise to select "PREVIOUS PAGE."
4. Rotate the [ENTER] knob to choose the "PLOT TRACKS (HOLD)."
5. Press the [1] key to choose ON or the [2] key to choose OFF as appropriate
 ON: Stopping and resuming points are connected with a straight line.
 OFF: Stopping and resuming points are not connected.



Track points where plotting was suspended and restarted are not connected.



Track points where track plotting was stopped and restarted are connected with a straight line.

Display after stopping

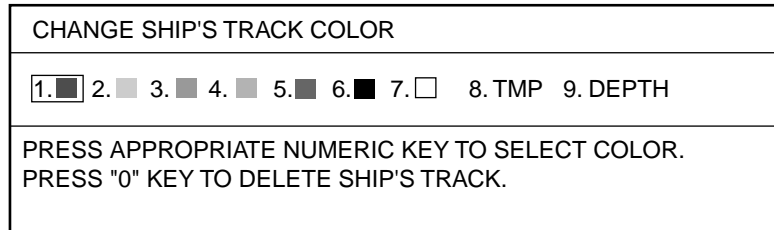
5. Press the [MENU] key several times to close the menu.

3.3 Changing Track Color

Track can be displayed in red, yellow, green, light-blue, purple, blue or white. It can be useful to change track color on a regular basis to discriminate between previous day's track, etc. For own ship's track, track color can be changed automatically according to water temperature or depth.

3.3.1 Changing own ship's track color

1. Press the [TRACK COLOR] key to show the CHANGE SHIP'S TRACK COLOR window.



Change ship's track color window

Note: This window disappears if there is no operation in ten seconds.

2. Press the appropriate numeric key to choose color.
1 through 7 keys: Own ship's track is colored accordingly.
8: Own ship's track color changes with water temperature. (Requires water temperature sensor.)
9: Own ship's track color changes with depth.
Own ship's track color changes from the moment.

3.3.2 Changing sub track color

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 1/2 appears, rotate the [ENTER] knob to select NEXT PAGE.
4. Rotate the [ENTER] knob to select SUB TRACKS COLOR.
5. Press the appropriate numeric key to choose color.
6. Press the [MENU] key several times to close the menu.

3.3.3 Changing target track color

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 1/2 appears, rotate the [ENTER] knob to select NEXT PAGE.
4. Rotate the [ENTER] knob to select TARGET TRACK COLOR.
5. Press the appropriate numeric key to choose color.
6. Press the [MENU] key several times to close the menu.

3.3.4 Automatically changing own ship's track color by water temperature

There are two methods by which own ship's track color may be changed according to water temperature: by preset temperature range or temperature variation.

Changing own ship's track color by preset temperature range

This method changes the color of track when the water temperature is within a preset range. For example, you can set up to paint the track yellow when the water temperature is between 17 and 20°C.

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 2/2 appears, rotate the [ENTER] knob to select PREVIOUS PAGE.

4. MARKS/SHIP'S TRACKS SETUP		PAGE 1/2	
NEXT PAGE			
MARKS SIZE	1. L	2. L+	3. S
LINES STYLE	1. —	2. ----	3. .---- 4. ----
TRACK INTERVAL 1	TIME (00M10s)	DIST (0.10nm)	
TRACK INTERVAL 2	TIME (00M10s)	DIST (0.10nm)	
▶ SHIP'S TRACKS DISP	1. ON	2. OFF	
DISP TRACKS (HOLD)	1. ON	2. OFF	
PLOT TRACKS (HOLD)	1. ON	2. OFF	
TRACKS COLOR	1. —	2. —	3. ---- 4. ----
TRACKS BY TEMP	RANGE	GRDNT (0.2°F 2.0°F)	
	WHITE:	005.0°F BELOW	
	BLUE:	005.0°F ~	
	PURPLE	010.0°F ~	
	LIGHT BLUE:	012.5°F ~	
	GREEN:	015.0°F ~	
	YELLOW:	017.5°F ~	
	RED:	020.0°F ABOVE	
TRACKS BY DEPTH	RANGE	GRDNT (2ft 20ft 200ft)	
	WHITE:	0032.8 ft SHALLOWER	
	BLUE:	0032.8 ft ~	
	PURPLE	0164.0 ft ~	
	GREEN:	0656.2 ft ~	
	YELLOW:	0984.3 ft ~	
	RED:	1312.3 ft DEEPER	
SHIP'S TRACKS	12,000		
MARKS	04,000/16,000		
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.			

Marks/ship's tracks setup menu (Page 1/1)

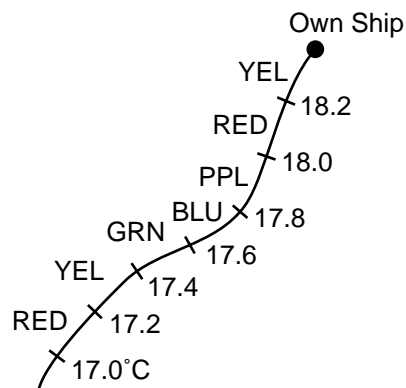
3. TRACKS

4. Rotate the [ENTER] knob to select TRACKS BY TEMP.
5. Roll the trackball leftward to select "RANGE."
6. Set the temperature range desired for each color. For example, if you want to paint the track red when the water temperature is higher than 18°C, do the following:
 - a) Rotate the [ENTER] knob to select "RED: xxx.x°C ABOVE."
 - b) Press the [0], [1], [8], [0] in that order, and then press the [ENTER] knob.

Note: To erase, press the [CLEAR] key.
 - c) Set ranges for other colors similarly. You cannot enter the range for WHITE. It becomes the same range as BLUE automatically.
7. Press the [MENU] key several times to close the menu.

Changing own ship's track color according to temperature variation

This setting paints the track in up to five colors according to temperature variation. When you select "0.2°F", for example, the track is painted red when the water temperature is between 17.0 and 17.2 degrees; yellow when the water temperature is between 17.2 and 17.3 degrees. Thus, the track color changes green, blue and purple in 0.2 degree steps. When the water temperature becomes 18.0 degrees, the track color returns to red.



Example, presetting unit 0.2°

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 2/2 appears, rotate the [ENTER] knob to select PREVIOUS PAGE.
4. Rotate the [ENTER] knob to select TRACKS BY TEMP.
5. Roll the trackball rightward to select 0.2°F or 2.0°F of "GRDNT."
6. Press the [ENTER] knob.
7. Press the [MENU] key several times to close the menu.

3.3.5 Changing own ship's track color according to depth

The color of the own ship's track can be changed according to depth range or depth variation.

Changing track color by preset depth range

This method changes the color of track when the depth is within a preset range. For example, you can set up to paint the track yellow when the depth is between 200 and 300 feet.

1. Press the [MENU] key to show the main menu.
2. Press [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If the PAGE 2/2 appears, rotate the [ENTER] knob to select PREVIOUS PAGE.

4. MARKS/SHIP'S TRACKS SETUP		PAGE 1/2	
NEXT PAGE			
MARKS SIZE	1. L	2. L+	3. S
LINES STYLE	1. —	2. ----	3. ---- 4. ----
TRACK INTERVAL 1	TIME (00M10s)	DIST (0.10nm)	
TRACK INTERVAL 2	TIME (00M10s)	DIST (0.10nm)	
▶ SHIP'S TRACKS DISP	1. ON	2. OFF	
DISP TRACKS (HOLD)	1. ON	2. OFF	
PLOT TRACKS (HOLD)	1. ON	2. OFF	
TRACKS COLOR	1. —	2. —	3. ---- 4. ----
TRACKS BY TEMP	RANGE	GRDNT (0.2°F 2.0°F)	
	WHITE:	005.0°F BELOW	
	BLUE:	005.0°F ~	
	PURPLE	010.0°F ~	
	LIGHT BLUE:	012.5°F ~	
	GREEN:	015.0°F ~	
	YELLOW:	017.5°F ~	
	RED:	020.0°F ABOVE	
TRACKS BY DEPTH	RANGE	GRDNT (2ft 20ft 200ft)	
	WHITE:	0032.8 ft SHALLOWER	
	BLUE:	0032.8 ft ~	
	PURPLE	0164.0 ft ~	
	GREEN:	0656.2 ft ~	
	YELLOW:	0984.3 ft ~	
	RED:	1312.3 ft DEEPER	
SHIP'S TRACKS	12,000		
MARKS	04,000/16,000		
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.			

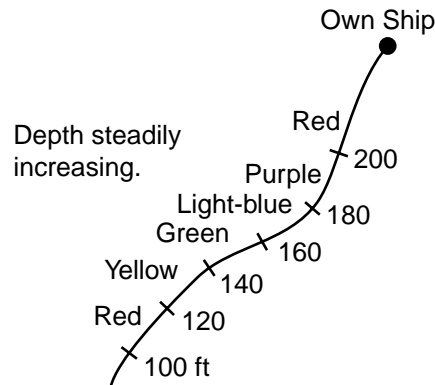
Marks/ship's tracks setup menu (Page 1/2)

3. TRACKS

4. Rotate the [ENTER] knob to select "TRACKS BY DEPTH".
 5. Roll the trackball leftward to select "RANGE."
 6. Set the depths as desired. For example, to change track color to red when the depth is more than 500 feet;
 - a) Rotate the [ENTER] knob to select "RED xxxx.xx ft DEEPER."
 - b) Press the [0], [5], [0], [0], [0], [0] keys in that order, and then press the [ENTER] knob.
- Note:** To erase, press the [CLEAR] key.
- c) Set depths for other colors similarly. You cannot enter the depth for WHITE: it is automatically set for the same depth as BLUE.
7. Press the [MENU] key several times to close the menu.

Changing own ship's track color by depth variation

This setting paints the track in up to seven colors according to depth variation selected. For example, you could set up to change the track color for every 20 feet of depth change.



Example, track color changes with every 20 ft of depth change

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 2/2 appears, rotate the [ENTER] knob to select PREVIOUS PAGE.
4. Rotate the [ENTER] knob to select TRACKS BY DEPTH.
5. Roll the trackball rightward to select 2 ft, 20 ft or 200 ft of "GRDNT."
6. Press the [MENU] key several times to close the menu.

3.4 Changing Track Line Type

Tracks may be traced on the display with a solid line, dashed line, dotted line or dot-dash line. Choose line type desired as follows:

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. To set own ship's track line, select LINE STYLE on PAGE 1/2.

For the sub track or target track lines, select the appropriate item on the PAGE 2/2.

4. Press appropriate numeric key to select the line type desired.
5. Press the [MENU] key several times to close the menu.

3.5 Track Plotting Method, Interval

In drawing the track, the ship's position is stored into the unit's memory at an interval of time or distance. A shorter interval provides better reconstruction of the track, but the storage time of the track is reduced. When the track memory becomes full, the oldest track is erased to make room for the latest.

3.5.1 Track plotting method

- Press the [PLOT INTVL] key to select the track plotting method. Each time the key is pressed the plotting method changes in the sequence shown below.

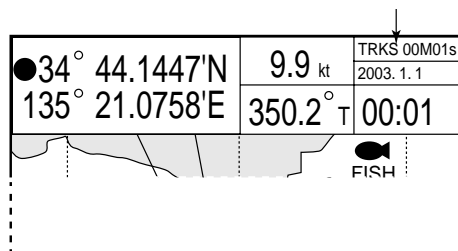
Track interval 1 → Track interval 2 → Hold → Track interval 1 ...

The PLOTTER (or PILOT) NAV INFO 1 display shows the current plotting method.

Distance is useful for conserving track memory, since no track is recorded when the boat is stationary.

To change the track plotting method (for time and distance) and interval, see the next paragraph.

"00M10s" → "0.10nm" → "TRKS HOLD" → "00M10s" → ...



Plotter display showing location of track plotting interval indication

Note: If the plotting method does not appear, see paragraph 9.6.2.

3.5.2 Track plotting interval

The track plotting interval can be changed as you like.

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 2/2 appears, rotate the [ENTER] knob to select PREVIOUS PAGE.
4. Rotate the [ENTER] knob to select "TRACK INTERVAL 1" or "TRACK INTERVAL 2".
5. Roll the trackball in left-right direction to select "TIME" or "DIST (distance)" as appropriate.
6. Press the numeric keys to enter value.

Setting range is 00M00S to 99M59S (Time), 0.00 nm to 9.99 nm (Distance).

Note 1: To clear data, press the [CLEAR] key.

Note 2: You may remove a plotting interval from the [PLOT INTVL] key's selection sequence by entering all zeroes as the plotting interval. For example, if TRACK INTERVAL 2 is set as 00M00S (or 0.00 nm), the sequence [PLOT INTVL] key's sequence is as shown below.
TRACK INTERVAL 1 → Hold → TRACK INTERVAL 1 → Hold

7. Press the [ENTER] knob.
8. Press the [MENU] key several times to close the menu.

3.6 Erasing Tracks

There are two methods to erase tracks: by color and by line type. Be absolutely sure you want to erase track; erased track cannot be restored.

Note 1: Files set to “YES” on the DISPLAY DATA FROM MEMORY CARD menu cannot be erased. (See paragraph 10.2.3.)

Also, files set to “YES” on the DISPLAY DATA FROM INTERNAL MEMORY menu cannot be erased. (See paragraph 10.4.2.)








Note 2: Tracks set to change according to water temperature or depth cannot be erased. (See paragraph 3.3.1.)

3.6.1 Erasing tracks by color

You may erase tracks according to color, within an area or all same color track.


Erasing all track

1. Press the [TRACK COLOR] key to show the CHANGE SHIP'S TRACK COLOR window.
2. Press the [0] key within 10 seconds to show the DELETE SHIP'S TRACK window.

DELETE SHIP'S TRACK													
1.		2.		3.		4.		5.		6.		7.	
PRESS APPROPRIATE NUMERIC KEY TO DELETE SHIP'S TRACK.													

Delete ship's track window

3. Press the appropriate numeric key to choose the color to erase. The following message appears.

	DELETE ALL SHIP'S TRKS
	IN XXXX (type of color).
	ARE YOU SURE?
	YES ... PRESS KNOB NO ... PRESS CLEAR KEY

4. Press the [ENTER] knob to clear all tracks of the color chosen.

3. TRACKS

Erasing tracks by area

You can erase tracks within an area you specify.

1. Press the [MENU] key to show the main menu.
2. Press the [5] key to show the MARKS/SHIP'S TRACKS EDITION menu.

5. MARKS/SHIP'S TRACKS EDITION	
▶ 1. EDIT MARKS	
2. DELETE MARKS	
3. ENTER MARKS	
4. EDIT SHIP'S TRACKS	
5. DELETE SHIP'S TRACKS	
NUMBER OF TRACKS	6,886/12,000
NUMBER OF MARKS	3/4,000
	Used points
	Points available
TURN KNOB TO SELECT MENU AND PRESS KNOB TO ENTER. OR PRESS APPROPRIATE NUMERIC KEY TO SELECT MENU.	

Marks/ship's track edition menu

3. Press the [5] key to show the DELETE SHIP'S TRACKS window.

5-5. DELETE SHIP'S TRACKS	
ENTER	
SELECT	1. 2PTS 2. AREA 3. INSIDE 4. OUTSIDE 5. ALL
COLOR	1. ■ 2. ■ 3. ■ 4. ■ 5. ■ 6. ■ 7. □ 8. ALL
STYLE	1. — 2. — 3. - - - - 4. - - - - 5. ALL
SET "SELECT", "COLOR" AND "STYLE". PLACE CURSOR ON "ENTER".	

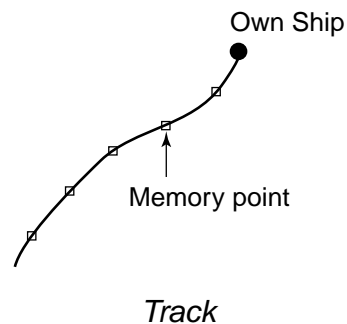
Delete ship's tracks window

4. Rotate the [ENTER] knob to select COLOR.
5. Roll the trackball in left-right direction to select the color to erase.
6. Rotate the [ENTER] knob to choose SELECT.
7. Roll the trackball in left-right direction to select a method.
 - 2 PTS: All tracks between two points entered on the plotter screen are erased.
 - AREA: All tracks within an area you set are erased.
 - INSIDE: All tracks currently displayed are erased.
 - OUTSIDE: All tracks other than currently displayed ones are erased.
 - ALL: All tracks in the memory are erased.
8. Rotate the [ENTER] knob to select ENTER.

9. Do the follows depending on selection made at step 7.

2 PTS

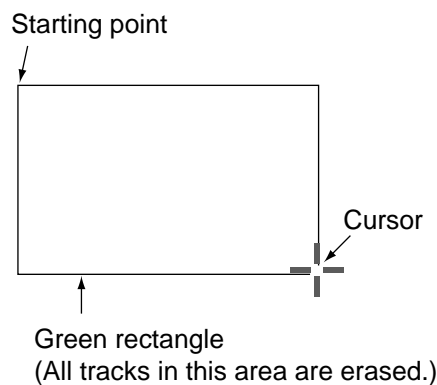
Squares (memory points) appear on the track.



- Operate the trackball to place the cursor on the starting memory point to erase.
- Press the [ENTER] knob. A green dot appears on the starting point.
- Operate the trackball to place the square on the ending memory point to erase.
- Press the [ENTER] knob twice.
- Press the [MENU] key several times to close the menu.

AREA

- Operate the trackball to move the cursor to the starting point of the area to erase.
- Press the [ENTER] knob.
- Operate the trackball to move the cursor to the ending point of the area to erase. A green rectangle appears.



Erasing area

- Press the [ENTER] knob to change the color of rectangle from green to white.
- Press the [ENTER] knob again.
- Press the [ENTER] knob several times to close the menu.

INSIDE, OUTSIDE or ALL

- Press the [ENTER] knob.
- Press the [MENU] key several times to close the menu.

3.6.2 Erasing tracks by line type

You can erase tracks by line type as follows:

1. Press the [MENU] key to show the main menu.
2. Press the [5] key to show the MARKS/SHIP'S TRACKS EDITION menu.
3. Press the [5] key to show the DELETE SHIP'S TRACKS window.

5-5. DELETE SHIP'S TRACKS				
ENTER				
▶ SELECT	1. 2PTS	2. AREA	3. INSIDE	4. OUTSIDE 5. ALL
COLOR	1. ■	2. ■	3. ■	4. ■ 5. ■ 6. ■ 7. □ 8. ALL
STYLE	1. —	2. —	3. - - - -	4. - - - - 5. ALL
SET "SELECT", "COLOR" AND "STYLE". PLACE CURSOR ON "ENTER".				

Delete ship's tracks window

4. Rotate the [ENTER] knob to select STYLE.
5. Press appropriate number key to chose line type to erase ALL erases all track.
6. Rotate the [ENTER] knob to choose SELECT.
7. Press appropriate numeric key to select a method.
 - 2 PTS: All tracks between two points entered on the plotter screen are erased.
 - AREA: All tracks within an area you set are erased.
 - INSIDE: All tracks currently displayed are erased.
 - OUTSIDE: All tracks other than those currently displayed are erased.
 - ALL: All tracks in the memory are erased.
8. Rotate the [ENTER] knob to select ENTER.
9. Follow step 9 in paragraph 3.6.1.

3.7 Editing Tracks

The color and style of tracks may be edited as desired.

Note 1: Files set to “YES” on the DISPLAY DATA FROM MEMORY CARD menu cannot be edited. (See paragraph 10.2.3.)

Also, files set to “YES” on the DISPLAY DATA FROM INTERNAL MEMORY menu cannot be edited. (See paragraph 10.4.2.)

Note 2: Tracks set to change according to water temperature or depth cannot be erased. (See paragraph 3.3.1.)

1. Press the [MENU] key to show the main menu.
2. Press the [5] key to show the MARKS/SHIP'S TRACKS EDITION menu.
3. Press the [4] key to show the EDIT SHIP'S TRACKS window.

5-4. EDIT SHIP'S TRACKS								
ENTER								
▶ SELECT	1. PTS	2. AREA	3. INSIDE	4. OUTSIDE				
COLOR	1. ■	2. ■	3. ■	4. ■	5. ■	6. ■	7. □	8. NONE
STYLE	1. —	2. —	3. - - - -	4. - - - -	5. NONE			
SET "SELECT", "COLOR" AND "SHAPE". PLACE CURSOR ON "ENTER".								

Edit ship's tracks window

4. Rotate the [ENTER] knob to choose SELECT.
5. Press appropriate numeric key to select the method.
6. Rotate the [ENTER] knob to select COLOR.
7. Press appropriate numeric key to select the color to be changed.
8. Rotate the [ENTER] knob to select STYLE.
9. Press appropriate numeric key to select the line type.
10. Rotate the [ENTER] knob to select ENTER.
11. Do the follows depending on your selection at step 5. For details, see paragraph 3.6.2.

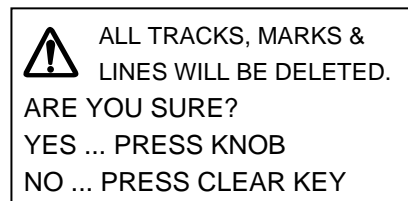
3.8 Changing Track Memory Capacity

The equipment stores a total of 16,000 points of track and marks, and the default setting allocates 12,000 points for track and 4,000 points for marks and lines. If you require a different apportion you may change it as shown in the procedure below. Note that when the track memory capacity is changed, all tracks and marks in the memory are erased. Save them to a memory card (See paragraph 10.2.2) or internal memory (See paragraph 10.4.1) if necessary. The internal memory which has five memory brocks can store maximum 80,000 points of track and marks.

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If the PAGE 2/2 appears, rotate the [ENTER] knob to select PREVIOUS PAGE.
4. Rotate the [ENTER] knob to select SHIP'S TRACKS.
5. Press the numeric keys to enter the track memory points.

Note: To clear entry, press the [CLEAR] key.

6. Press the [ENTER] knob, and the following window appears.



Note: If the number more than 16,000 or “_” is entered at step 5, an error beep sounds and the [ENTER] knob is inoperative.

7. Press the [ENTER] knob.
At this time all tracks, marks and lines in the memory are erased.
Note: To cancel, press the [CLEAR] key.
8. Press the [MENU] key several times to close the menu.

4. MARKS & LINES

Marks are useful for denoting important points such as a good fishing spot. The default setting allows you to enter 4,000 marks and line points. Marks can be inscribed in 11 shapes and seven colors of red, yellow, green, light-blue, purple, blue and white.

4.1 Entering Marks





You can enter marks three ways:

- Enter a mark at own ship position
- Enter a mark at the cursor position
- Enter mark by latitude and longitude position

Note: The number of marks and lines used appears at the bottom of the MARKS/SHIP'S TRACKS EDITION menu. (See page 4-2.)

Entering a mark at own ship position

1. Press the [CURSOR ON/OFF] key to turn off the cursor.
2. Press the numeric key corresponding to the mark you wish to enter.

[1] key:  [2] key:  [3] key:  [4] key: Y
[5] key:  [6] key:  [7] key:  [8] key: 

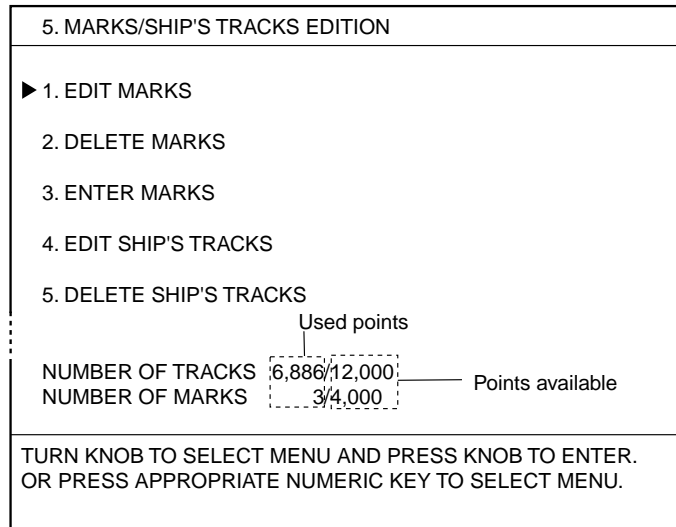
The water temperature and depth at the mark position are memorized automatically when the appropriate sensors are connected.

Entering a mark at the cursor position

1. Press the [CURSOR ON/OFF] key to show the cursor.
2. Operate the trackball to place the cursor at the location where you want to enter a mark.
3. Press the numeric key corresponding to the mark you wish to enter.

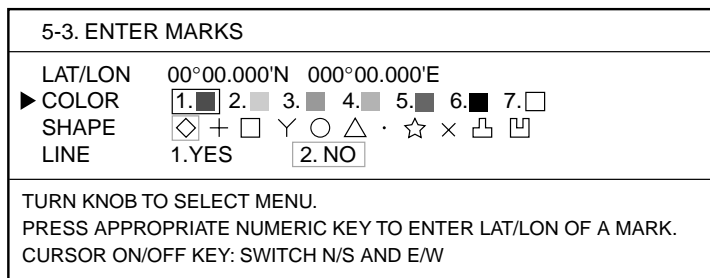
Entering a mark by manual input of latitude and longitude position

1. Press the MENU key to display main menu.
2. Press the [5] key to display the MARKS/SHIP'S TRACKS EDITION menu.



Marks/ship's tracks edition menu

3. Press the [3] key to choose "ENTER MARKS."



Enter marks menu

4. Rotate the [ENTER] knob to choose "COLOR."
5. Press appropriate numeric key to choose a color.
6. Rotate the [ENTER] knob to choose SHAPE.
7. Roll the trackball in the right-left direction to choose the shape desired.
8. Rotate the [ENTER] knob to choose LINE.
9. Press the [1] key to connect marks with lines; [2] key to inscribe marks without interconnection lines.
10. Rotate the [ENTER] knob to choose "LAT/LON."
11. Press the numeric keys to enter latitude of mark position.
To enter 34° 38.838 latitude, for example, press [3], [4], [3], [8], [8], [3], [8] keys in that order. You can switch co-ordinates (N <-> S) by pressing the [CURSOR ON/OFF] key before entering latitude.
12. Press the numeric key to enter longitude of mark position.
To enter 135° 34.638 longitude, for example, press [1], [3], [5], [3], [4], [6], [3], [8] keys in that order. You can switch co-ordinates (E <-> W) by pressing the [CURSOR ON/OFF] key before entering longitude.
13. Press the [ENTER] knob to inscribe the mark at the location entered.
14. Press the [MENU] key several times to close the menu.

4.2 Changing Mark Color

Mark can be displayed in red, yellow, green, light-blue, purple, blue, or white.

1. Press the [MARK COLOR] key to show the CHANGE MARK COLOR window.

CHANGE MARK COLOR							
1. ■	2. ■	3. ■	4. ■	5. ■	6. ■	7. □	8. KEY'S COLOR
PRESS APPROPRIATE NUMERIC KEY TO SELECT COLOR.							

Change mark color window

2. Press the appropriate numeric key to choose a color.
 - [1] through [7]: The mark or line is entered at own ship's position (or cursor position) in the color selected.
 - [8]: The mark is entered at own ship's position (or cursor position) in the color and shape shown on the label of the numeric key.

You may show marks in one color or the colors shown on the numeric key.

4.3 Changing Mark Size

You may choose mark size as follows:

1. Press the [MENU] key to display main menu.
2. Press the [4] key to display the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 2/2 appears, rotate the [ENTER] knob clockwise to select "PREVIOUS PAGE."

4. MARKS/SHIP'S TRACKS SETUP		PAGE 1/2
NEXT PAGE		
MARKS SIZE	1. L	2. L+ 3. S
LINES STYLE	1. —	2. ---- 3. ---- 4. ----
TRACK INTERVAL 1	TIME (00M10s)	DIST (0.10nm)
TRACK INTERVAL 2	TIME (00M10s)	DIST (0.10nm)
▶ SHIP'S TRACKS DISP	1. ON	2. OFF
DISP TRACKS (HOLD)	1. ON	2. OFF
PLOT TRACKS (HOLD)	1. ON	2. OFF
TRACKS COLOR	1. —	2. — 3. ---- 4. ----
TRACKS BY TEMP	RANGE	GRDNT (0.2°F 2.0°F)
	WHITE:	041.0°F BELOW
	BLUE:	041.0°F ~
	PURPLE	050.0°F ~
	LIGHT BLUE:	054.5°F ~
	GREEN:	059.0°F ~
	YELLOW:	063.5°F ~
	RED:	068.3°F ABOVE
TRACKS BY DEPTH	RANGE	GRDNT (2 ft 20 ft 200 ft)
	WHITE:	0032.8 ft SHALLOWER
	BLUE:	0032.8 ft ~
	PURPLE	0164.0 ft ~
	GREEN:	0656.2 ft ~
	YELLOW:	0984.3 ft ~
	RED:	1312.3 ft DEEPER
SHIP'S TRACKS	15,000	
MARKS	1,000/16,000	
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.		

Marks/ship's tracks setup menu (page 1)

4. Rotate the [ENTER] knob to choose "MARKS SIZE."
5. Press appropriate numeric key to choose size.
 1. L: Large
 2. L+: Large with dot at center of mark
 3. S: Small
6. Press the [MENU] key several times to close the menu.

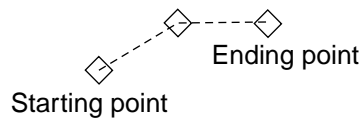
4.4 Entering Lines

Lines can be drawn on the screen to depict important locations such as fishing spots and danger areas.

1. Press the [CURSOR ON/OFF] key to show the cursor.
2. Operate the trackball to move the cursor to the starting point of the line.
3. Press appropriate numeric key (1 to 8) to choose the mark you wish to show between line points.

[1] key:	◇	[2] key:	+	[3] key:	□	[4] key:	Y
[5] key:	○	[6] key:	△	[7] key:	•	[8] key:	☆

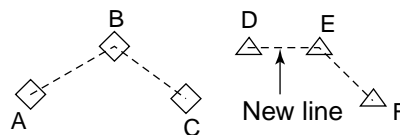
4. Operate the trackball to move the cursor to the next point for the line.
5. Press the [9] key.
6. Repeat steps 4 and 5 to complete the line.



Line

Starting a new line

To start a new line, press appropriate numeric key (1 to 8) at the start point. For example, press one of numeric keys (1 to 8) at point D and the [9] key for points E and F.



Two lines

4.5 Selecting Line Type

Lines are available in four styles: solid, dashed, dash-dot and dash-double dot line.

1. Press the [MENU] key to show the main menu.
2. Press the [4] key to show the MARKS/SHIP'S TRACKS SETUP menu.
3. If PAGE 2/2 appears, rotate the [ENTER] knob to select PREVIOUS PAGE.
4. Rotate the [ENTER] knob to select LINE STYLE.
5. Press appropriate numeric key to choose line style.
6. Press the [MENU] key several times to close the menu.

4.6 Erasing Marks, Lines

Marks and lines can be erased individually, by color and by type. Note that the erased marks and lines cannot be returned.

Note : Files set to "YES" on the DISPLAY DATA FROM MEMORY CARD menu cannot be erased. (See paragraph 10.2.3.)
Also, files set to "YES" on the DISPLAY DATA FROM INTERNAL MEMORY menu cannot be erased. (See paragraph 10.4.2.)

Erasing marks and lines individually

1. Press the [CURSOR ON/OFF] key to show the cursor.
2. Operate the trackball to place the cursor on the mark (or line) to erase.
The flashing diamond appears. When erasing lines, place the cursor on the mark of line.
3. Press the [CLEAR] key.
If the selected mark or line is not erased, press the [CLEAR] key several times; multiple marks may occupy the same location.

Erasing marks and lines by color

1. Press the [MENU] key to show the main menu.
2. Press the [5] key to show the MARKS/SHIP'S TRACKS EDITION menu.
3. Press the [2] key to show the DELETE MARKS window.

5-2. DELETE MARKS	
ENTER	
▶ SELECT	1. CURSOR 2. AREA 3. INSIDE 4. OUTSIDE 5. ALL
COLOR	1. ■ 2. ■ 3. ■ 4. ■ 5. ■ 6. ■ 7. □ 8. ALL
SHAPE	◇ + □ √ ○ △ · ☆ × □ ▢ ALL
SET "SELECT", "CURSOR" AND "SHAPE". PLACE CURSOR ON "ENTER".	

Delete marks window

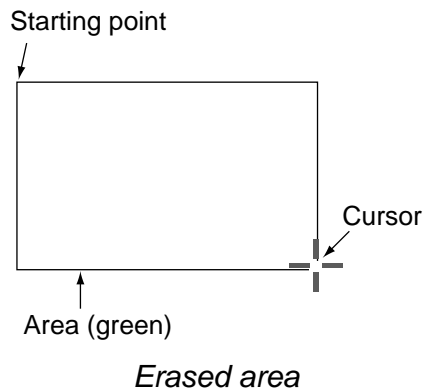
4. Rotate the [ENTER] knob to select COLOR.
5. Roll the trackball in left-right direction to select the color to erase.
6. Rotate the [ENTER] knob to choose SELECT.
7. Press the appropriate numeric key to choose how to erase.
CURSOR: The mark selected by the cursor is erased.
AREA: Marks and lines in the area you set are erased.
INSIDE: All marks and lines currently displayed are erased.
OUTSIDE: All marks and lines which are not currently displayed are erased.
ALL: All marks and lines stored in the memory are erased.
8. Rotate the [ENTER] knob to select ENTER.
9. Do one of the following depending on the selection you made at step 7.

CURSOR

- a) Operate the trackball to place the cursor on the mark you want to erase.
- b) Press the [ENTER] knob.
- c) Press the [MENU] key several times to close the menu.

AREA

- a) Operate the trackball to move the cursor to the starting point of the area.
- b) Press the [ENTER] knob.
- c) Operate the trackball to move the cursor to the ending point of the area.
A green rectangle appears.



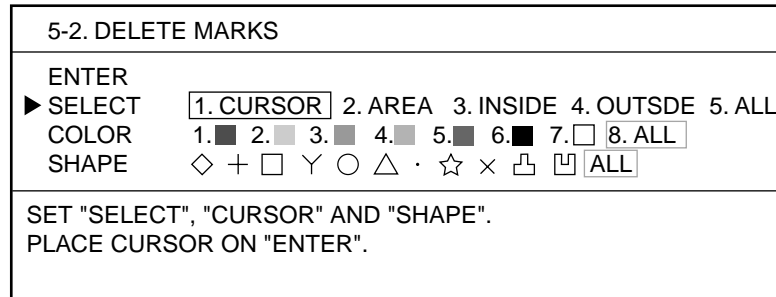
- d) Press the [ENTER] knob. The color of the rectangle changes from green to white.
- e) Press the [ENTER] knob again.
- f) Press the [MENU] key several times to close the menu.

INSIDE, OUTSIDE and ALL

- a) Press the [ENTER] knob.
- b) Press the [MENU] key several times to close the menu.

Erasing marks and lines by shape

1. Press the [MENU] key to show the main menu.
2. Press the [5] key to show the MARKS/SHIP'S TRACKS EDITION menu.
3. Press the [2] key to show the DELETE MARKS window.



Delete marks menu

4. Rotate the [ENTER] knob to select SHAPE.
5. Roll the trackball in left-right direction to select the shape.
6. Rotate the [ENTER] knob to choose SELECT.
7. Press the appropriate numeric key to select the method.
8. Rotate the [ENTER] knob to select ENTER.
9. Do step 9 in the "Erasing marks and lines by color" on page 4-6.

4.7 Editing Marks, Lines

You can edit the shape and color of marks and lines.

Note: Files set to “YES” on the DISPLAY DATA FROM MEMORY CARD menu cannot be erased. (See paragraph 10.2.3.)

Also, files set to “YES” on the DISPLAY DATA FROM INTERNAL MEMORY menu cannot be erased. (See paragraph 10.4.2.)

1. Press the [MENU] key to show the main menu.
2. Press the [5] key to show the MRKS/SHIP'S TRACKS EDITION menu.
3. Press the [1] key to show the EDIT MARKS window.

5-1 EDIT MARKS	
ENTER	
▶ SELECT	1. CURSOR 2. AREA 3. INSIDE 4. OUTSIDE
COLOR	1. ■ 2. ■ 3. ■ 4. ■ 5. ■ 6. ■ 7. □ 8. ALL
SHAPE	◇ + □ Y ○ △ · ☆ × ▽ □ NONE
SET "SELECT", "COLOR" AND "SHAPE" PLACE CURSOR ON "ENTER".	

Edit marks window

4. Rotate the [ENTER] knob to choose SELECT.
5. Press the appropriate numeric key to select the method.
 - CURSOR: Use the cursor to choose mark to edit.
 - AREA: Edit marks and lines in the area you set.
 - INSIDE: Edit marks and lines currently displayed.
 - OUTSIDE: Edit marks and lines which are not currently displayed.
6. Rotate the [ENTER] knob to select COLOR.
7. Press the appropriate numeric key to select the color to be changed.
8. Rotate the [ENTER] knob to select SHAPE.
9. Roll the trackball in left-right direction to select the shape to edit.
10. Rotate the [ENTER] knob to select ENTER.
11. Refer to page 4-7 to edit.

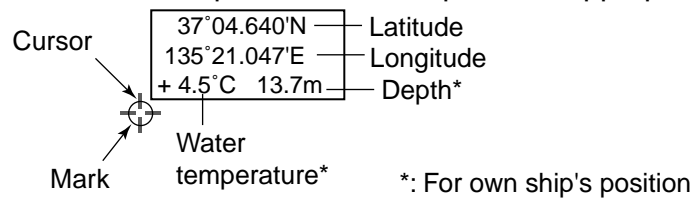
4.8 Displaying Mark Data

You can display mark data as follows;

Note: Files set to “YES” on the DISPLAY DATA FROM MEMORY CARD menu cannot be displayed. (See paragraph 10.2.3.)

Also, files set to “YES” on the DISPLAY DATA FROM INTERNAL MEMORY menu cannot be displayed. (See paragraph 10.4.2.)

1. Press the [CURSOR ON/OFF] key to show the cursor.
2. Operate the trackball to place the cursor on the mark for which you want to display its data. Water temperature data requires an appropriate sensor.



Mark data

Note: If mark data does not appear, press [MENU], [0], [1] in that order, and then turn on MARK STATUS on PAGE 2/2 of the DISPLAY SETUP menu.

4.9 Target Mark (TLL)

Target position data can be output from certain radars and shown on your plotter with the TLL mark (x). For details, see the Operator's Manual for your radar.

5. WAYPOINT

In navigation terminology, a waypoint is a particular location on a voyage whether it be a starting, intermediate or destination point. A waypoint is the simplest piece of information your equipment requires to get you a destination, in the shortest distance possible.

5.1 Entering Waypoints

This unit has 3500 waypoints into which you can enter position information. There are seven methods by which you can enter a waypoint: at own ship's position, by cursor, by latitude and longitude, by range and bearing, by Loran-C LOP, by Loran-A LOP and by Decca LOP.

5.1.1 Entering waypoints at own ship's position

- Press the [SAVE/MOB] key momentarily.

The message "WAYPOINT XXXXXX IS SAVED! CONTINUE PRESSING FOR MOB!" appears for three seconds to let you know that ship's position is saved as a waypoint. The default waypoint mark is a yellow solid circle. You can know the shape and color of the selected waypoint by the icon (●) at the bottom of the plotter (or pilot) display. This new waypoint will automatically be saved in the waypoint list under the next consecutive waypoint number.

Note: If the waypoint icon does not appear at the bottom of the plotter (or pilot) display, do the following.

- a) Press the [MENU], [0], [1] in that order to show the DISPLAY SETUP menu.
- b) Select "1. ON" at "WAYPOINT STATUS" from page 2/2.

5.1.2 Entering waypoints by the cursor

1. If the cursor is off, press the [CURSOR ON/OFF] key to display the cursor.
2. Operate the trackball to position the cursor where desired.
3. Press the [WPT] key.

The SAVE WAYPOINT window appears.

Cursor	
SAVE WAYPOINT	↓
▶ WAYPOINT NAME 0 0 0 0 0 1	
PRESS NUMERIC KEY TO ENTER WAYPOINT NAME. PRESS KNOB TO SAVE WAYPOINT.	

Save waypoint window

Note: The SAVE WAYPOINT WINDOW will be erased automatically if there is no operation within 10 seconds.

4. If desired, press the numeric keys to change the waypoint number (max. six digits).

The waypoint is named automatically under the next consecutive waypoint number. If you do not need to change the waypoint name, go to step 5.

To reset the waypoint name to 000000, press the [CLEAR] key.

Each time a number key is pressed the cursor jumps one place leftward.

5. Press the [ENTER] knob.

The message "WAYPOINT XXXXXX IS SAVED!" appears on the screen for three seconds. The waypoint icon (▣ default setting) at the bottom of the plotter (or pilot) display shows current waypoint shape and color.

Note 1: If the waypoint icon does not appear at the bottom of the plotter (or pilot) display, do the following.

- a) Press the [MENU], [0], [1] in that order to show the DISPLAY SETUP menu.
- b) Select "1. ON" at "WAYPOINT STATUS" on page 2/2.

Note 2: If the above operation is done when the cursor is off, the waypoint is entered at own ship's position.

Note 3: If the waypoint name entered at step 4 already exists, the message "WAYPOINT XXXXXX ALREADY EXISTS. ENTER ANOTHER NAME." appears. Enter another name for it after returning to the SAVE WAYPOINT window.

5.1.3 Entering waypoints by latitude and longitude position

1. Press the [MENU] key to show the main menu.
2. Press the [1] key to show the WAYPOINTS LIST.

The screenshot shows the '1. WAYPOINTS LIST' screen. At the top left, 'Red cursor' points to the first row. At the top right, 'Current page' points to '1' and 'No. of pages' points to '1/1'. The list contains 20 rows of waypoints, each with a red cursor on the first row. The columns are labeled: NAME, LATITUDE, LONGITUDE, PRXMTY, and COMMENT. Below the list, there are sorting options: 'SORT' with '1.ALPHA' selected, '2. DIST', and '3. MARK'. Below that, 'SPD TO CALC TTG' with '1.ACTUAL' selected, and 'SPD SIM SPD 00.0kt'. Below that, 'SEARCH'. Below that, 'ETA: --D--:-- TTG: ----H--M'. Below that, instructions: 'TURN KNOB TO SELECT WAYPOINT.', 'KNOB: EDIT WPT WPT: ADD WPT GOTO: SET WPT TO NAVIGATE', 'ZOOM IN: PREVIOUS PAGE ZOOM OUT: NEXT PAGE CLEAR: DEL'. At the bottom, a line points to 'ETA and TTG for the waypoint selected with the red cursor'.

Waypoints list

The number of pages in the WAYPOINTS LIST depends on the number of waypoints entered. The current and total number of pages are shown at the top of the list. When the total is more than two pages, press the [ZOOM OUT] key to go to the next page. To go to the previous page, press the [ZOOM IN] key.

5. WAYPOINT

- Press the [WPT] key to show the waypoint edit window.

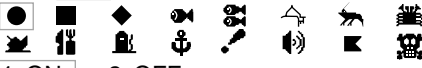
Character cursor

WAYPOINT NAME 000001

▶ LATITUDE 3 **4** 43.483'N

LONGITUDE 135 24.759'E

MARK COLOR 1. ■ 2. ■ 3. ■ 4. ■ 5. ■ 6. ■ 7. □

MARK SHAPE 

MARK DISPLAY 1. ON 2. OFF

COORDINATE 1. LAT/LON 2. RNG/BRG 3. TD

PRXMTY RADIUS 0.00 nm

COMMENT -----

END

A B C D E F G H I J K L M N O P Q R S T U V W X Y

Z , - ! ? / & = # _ 1 2 3 4 5 6 7 8 9 0 -----

a b c d e f g h i j k l m n o p q r s t u v w x y

z ----- ◀ ▶

TURN KNOB TO SELECT MENU.
SELECT THE ITEM OF EACH MENU BY TRACKBALL.

Waypoint edit list

- Rotate the [ENTER] knob to select COORDINATE.
- Press the [1] key to select "1. LAT/LON".
- Rotate the [ENTER] knob to select LATITUDE.
- Use the numeric keys to enter the latitude of the waypoint.
To switch from North to South and vice versa, press the [CURSOR ON/OFF] key.
- Rotate the [ENTER] knob to select LONGITUDE.
- Use the numeric keys to enter the longitude of the waypoint.
To switch from East to West and vice versa, press the [CURSOR ON/OFF] key.
To change waypoint name, mark color, mark display, mark shape, proximity radius and comment, go to step 10. If you do not need to change those items go to step 23.


10. Rotate the [ENTER] knob to select WAYPOINT NAME.
11. Operate the trackball to enter the waypoint name. (Max. six characters)
 - a) Operate the trackball to select the first character. You can enter numeric data with the numeric keys.
 - b) Press the [ENTER] knob.

Note: If you enter a wrong character, re-enter the correct character after placing the character cursor on the wrong character. To move the character cursor, select ◀ or ▶ and then press the [ENTER] knob. To erase all characters, press the [CLEAR] key.
 - c) Repeat steps a) and b) to complete the waypoint name.
12. Select "END" by operating the trackball, and then press the [ENTER] knob.
13. Rotate the [ENTER] knob to select MARK COLOR.
14. Press the appropriate numeric key to choose color.

Note: Waypoint mark color and shape cannot be selected when PRXMTY RADIUS is other than 0.00.

15. Rotate the [ENTER] knob to select MARK SHAPE.
16. Roll the trackball in left-right direction to select a shape.
17. Rotate the [ENTER] knob to select MARK DISPLAY.
18. Press appropriate numeric key to select "1. ON" or "2. OFF."

Press the [1] key to show waypoints on the plotter (or pilot) display; [2] key to hide waypoints. (For "2. OFF," waypoint mark is gray in the WAYPOINT LIST.)
19. Rotate the [ENTER] knob to select PRXMTY RADIUS.
20. Use the numeric keys to enter the proximity radius.

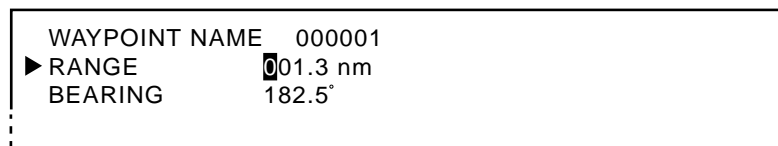
This is the alarm range that will be used for this waypoint when the proximity alarm is active. When the proximity radius is other than 0.00, the waypoint mark becomes  automatically. For how to set the proximity alarm, see paragraph 8.4.
21. Rotate the [ENTER] knob to select COMMENT.
22. Operate the trackball to enter the comment (max. 13 characters).
23. Select "END," and then press the [ENTER] knob to finish.
24. Press the [ENTER] knob again.

The waypoint edit window disappears, and the waypoint is registered in the WAYPOINTS LIST.
25. To enter another waypoint, repeat steps 3 through 24.
26. Press the [MENU] key several times to close the menu.

5.1.4 Entering waypoints by range and bearing

This method is useful when you want to enter a waypoint by using range and bearing to a target found on a radar.

1. Press the [MENU] key to show the main menu.
2. Press the [1] key to show the WAYPOINTS LIST.
3. Press the [WPT] key to show the waypoint edit window.
4. Rotate the [ENTER] knob to select COORDINATE.
5. Press the [2] key to select "2. RNG/BRG".
6. Rotate the [ENTER] knob to select "RANGE."



Waypoint edit window (Range/Bearing)

7. Use the numeric keys to enter the range from own ship to the waypoint.
8. Rotate the [ENTER] knob to select "BEARING."
9. Use the numeric keys to enter the bearing from own ship to the waypoint.
10. Follow from step 10 in "5.1.3 Entering waypoints by longitude and latitude position."

5.1.5 Entering waypoints by Loran A or Loran C LOPs

1. Press the [MENU] key to show the main menu.
2. Press the [8] key to show the PLOTTER SETUP menu.
3. Rotate the [ENTER] knob to select TD DISPLAY.

8. PLOTTER SETUP	
LORAN-A GRI	81-01
CORRECTION 1	+000.0µs
CORRECTION 2	+000.0µs
LORAN-C GRI	00:19-29
CORRECTION 1	+000.0µs
CORRECTION 2	+000.0µs
DECCA CHAIN	01 R-G
CORRECTION 1	+00.00 LANE
CORRECTION 2	+00.00 LANE
▶ TD DISPLAY	1. LORAN-A 2. LORAN-C 3. DECCA
RESET TRP LOG	1. YES 2. NO
PLOTTER RANGE SETUP	1. YES 2. NO
PANEL DIMMER	1 2 3 4 5 6 7 8
HUE	1. DAY 2. NIGHT 3. TWILI 4. MANUAL

TURN KNOB TO SELECT MENU.
SELECT THE ITEM OF EACH MENU BY TRACKBALL.

Plotter setup menu

4. Press the [1] or [2] key as appropriate to select "1. LORAN-A" or "2. LORAN-C."
5. Press the [MENU] key to return to the main menu.
6. Press the [1] key to show the WAYPOINTS LIST.
7. Press the [WPT] key to show the waypoint edit window.
8. Rotate the [ENTER] knob to select "COORDINATE."
9. Press the [3] key to select "3. TD."
10. Rotate the [ENTER] knob to select TD1 LORAN-C (or A).

WAYPOINT NAME	000001
▶ TD1 LORAN-C	14512.3
TD2 LORAN-C	29348.1
GRI	9970 11-30

Waypoint edit window (Loran-C TD)

WAYPOINT NAME	000001
▶ TD1 LORAN-A	1825.3
TD2 LORAN-A	3631.5
STATION	2S3-2S4

Waypoint edit window (Loran-A TD)

5. WAYPOINT

11. Use the numeric keys to enter the TD1 LORAN-C (or A).
12. Rotate the [ENTER] knob to select TD2 LORAN-C (or A).
13. Use the numeric keys to enter the TD2 LORAN-C (or A).
14. Follow from step 10 in of “5.1.3 Entering waypoints by longitude and latitude position.”

5.1.6 Entering waypoints by Decca LOPs

1. Press the [MENU] key to show the main menu.
2. Press the [8] key to show the PLOTTER SETUP menu.
3. Rotate the [ENTER] knob to select “TD DISPLAY.”
4. Press the [3] key to select “3. DECCA.”
5. Press the [MENU] key to return to the main menu.
6. Press the [1] key to show the WAYPOINTS LIST.
7. Press the [WPT] key to show the waypoint edit window.
8. Rotate the [ENTER] knob to select “COORDINATE”.
9. Press the [3] key to select “3. TD.”

```
WAYPOINT NAME      000001
▶ LANE1            1A:06.68
LANE2              2A:41.90
      CHAIN        01 S BALTIC      R-G
```

Waypoint edit window (DECCA)

10. Rotate the [ENTER] knob to select “LANE 1”.
11. Use the numeric keys to enter the LANE 1 value.
Enter the alphabet of the lane by pressing the appropriate numeric key referring to the table below.

Numeric key	Alphabet	Numeric key	Alphabet
[1] key	A	[6] key	F
[2] key	B	[7] key	G
[3] key	C	[8] key	H
[4] key	D	[9] key	I
[5] key	E	[0] key	J

To enter “1F22.01”, for example, press [1], [6] (F), [2], [2], [0], [1] in that order.

12. Rotate the [ENTER] knob to select LANE 2.
13. Use the numeric keys to enter the LANE 2 value.
14. Follow from step 10 in “5.1.3 Entering waypoints by longitude and latitude position.”

5.2 Editing Waypoint Data

You can edit waypoint data through the WAYPOINTS LIST.

1. Press the [MENU] key to show the main menu.
2. Press the [1] key to show the WAYPOINTS LIST.
3. Rotate the [ENTER] knob to select the waypoint you want to edit.
4. Press the [ENTER] knob.
5. Edit the waypoint data on the waypoint edit window as appropriate.

Note 1: The color and shape of a waypoint whose PRXMTY RADIUS is other than 0.00 cannot be changed.

Note 2: After changing the color and shape of waypoint, these settings are used for waypoint entered at own ship's position.

6. Press the [ENTER] knob. The waypoint edit window disappears, and the waypoint data is changed.
7. Press the [MENU] key to close the menu.

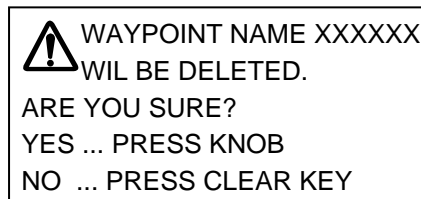
5.3 Erasing Individual Waypoints

Individual waypoints can be erased by the cursor or through the WAYPOINTS LIST.

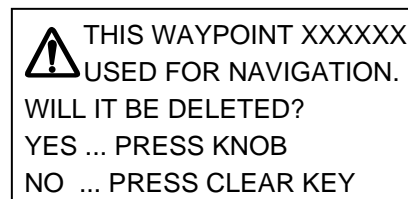
Erasing waypoints by the cursor

1. Press the [CURSOR ON/OFF] key to show the cursor.
2. Operate the trackball to place the cursor on the waypoint you want to erase.
A flashing diamond mark appears over the waypoint when it is correctly selected.
3. Press the [CLEAR] key.

You are asked if you are sure to erase the waypoint.



Normal waypoint



Destination waypoint

Erasing message

4. Press the [ENTER] knob.
The waypoint is erased from both the plotter screen and the WAYPOINTS LIST.

Erasing waypoints through the WAYPOINTS LIST

1. Press the [MENU] key to show the main menu.
2. Press the [1] key to show the WAYPOINTS LIST.
3. Rotate the [ENTER] knob to select the waypoint you want to erase.
You can sort waypoints in alphabetical or distance order, or by mark shape. (See paragraph 5.4.)
4. Press the [CLEAR] key.
5. Press the [ENTER] knob.
The waypoint is erased from both the WAYPOINTS LIST and the plotter screen.
6. Press the [MENU] key several times to close the menu.

5.4 Searching Waypoints

You can search for a waypoint through the WAYPOINTS LIST.

Searching by sorting

1. Press the [MENU] key to show the main menu.
2. Press the [1] key to show the WAYPOINTS LIST.
3. Rotate the [ENTER] knob to select "SORT".
4. Press the appropriate key among 1, 2 and 3 to select the sorting method.
 1. ALPHA: Sorting waypoints and MOB in alphanumeric order.
 2. DIST: Sorting waypoints in order of decreasing distance to own ship.
 3. MARK: Sorting waypoints in order of MOB mark, PROXIMITY RADIUS mark and other mark shapes.
5. Press the [MENU] key several times to close the menu.

Searching by waypoint name

1. Press the [MENU] key to show the main menu.
2. Press the [1] key to show the WAYPOINTS LIST.
3. Rotate the [ENTER] knob to select SORT.
4. Press the [1] key to select "1. ALPHA."
5. Rotate the [ENTER] knob to select SEARCH to show the character window.
6. Operate the trackball to enter the first 1 to 3 characters.
7. Operate the trackball to select "END", and then press the [ENTER] knob.
Matching waypoint name appears at the top of the list.
8. Press the [MENU] key several times to close the menu.

5.5 Setting Ship's Speed for TTG

Calculation of TTG is based on ship's speed data. This data can be set manually or automatically.

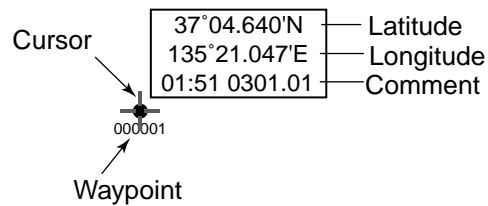
1. Press the [MENU] key to show the main menu.
2. Press the [1] key to show the WAYPOINTS LIST.
3. Rotate the [ENTER] knob to select "SPD TO CALC TTG".
4. Roll the trackball in left-right direction to select "ACTUAL SPD" or "SIM SPD."
For ACTUAL SPD, go step 6. For SIM SPEED, go to step 5.
ACTUAL SPD: Calculating with the actual ship's speed.
SIM SPD: Calculating with a simulated value.
5. Press the numeric keys to enter a ship's speed value.
TTG for the waypoint selected with the red cursor is calculated by using the speed value entered.
6. Press the [MENU] key several times to close the menu.

5.6 Displaying Waypoint Data

You can show waypoint data on the plotter screen as follows:

1. Press the [CURSOR ON/OFF] key to show the cursor.
2. Operate the trackball to place the cursor on the waypoint for which you want to know its data.

The data (L/L and comment) window for the selected waypoint appears next to the waypoint mark.



Waypoint data window

Note: If the data window does not appear, do the following.

- a) Press the [MENU], [0], [1] key in that order.
- b) Rotate the [ENTER] knob to select WAYPOINT INFO on page 2/2 of DISPLAY SETUP menu.
- c) Press the [1] key to select "1. ON, " and then press the [MENU] key several times to close the menu.

5.7 Changing Waypoint Mark Size

You may change the size of all waypoint marks to small or large, or turn them off.

1. Press the [MENU] key to show the main menu.
2. Press the [7] key to show the CHART SETUP menu.
If the CHART SETUP menu does not appear, rotate the [ENTER] knob clockwise.
3. Rotate the [ENTER] knob to select "WAYPOINTS."

7. CHART SETUP	
GOTO CONTOUR LINES SETUP	
OFFSET CHART POS	1. YES <input type="checkbox"/> 2. NO <input type="checkbox"/>
LAT/LON GRID	0. OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
TEXT INFORMATION	1. YES <input type="checkbox"/> 2. NO <input type="checkbox"/>
▶ WAYPOINTS	1. LARGE <input type="checkbox"/> 2. SMALL <input type="checkbox"/> 3. SMALL <input type="checkbox"/>
WAYPOINT NAME	1. YES <input type="checkbox"/> 2. NO <input type="checkbox"/>
CHART BORDER LINE	1. YES <input type="checkbox"/> 2. NO <input type="checkbox"/>
LANDMASS	0. OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
TRIMMING BORDER LINE	0. OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
BACKGROUND	0. OFF <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.	

Chart setup menu

4. Press the appropriate numeric key to select "1. LARGE", "2. SMALL" or "3. OFF."
 LARGE: Waypoints are shown in actual mark shape.
 SMALL: Waypoints are displayed with an "x" regardless of mark shape selected.
 OFF: All waypoints are off except the waypoint destination and route.
5. Press the [MENU] key several times to close the menu.

6. ROUTE

Often a trip from one place to another involves several course changes, requiring a series of route points (waypoints) which you navigate to, one after another. The sequence of waypoints leading to the ultimate destination is called a route.

6.1 Entering Routes

You can store up to 200 routes and a route may consist of 35 points. There are two methods to enter a route:

- Using existing waypoints
- Track based route using own ship positions recorded at preset intervals

6.1.1 Entering routes using existing waypoints

1. Press the [MENU] key to show the main menu.
2. Press the [2] key to show the ROUTES LIST.

Red cursor Current page No. of pages

2. ROUTES LIST	DIR: FOLLOW	1/1
ROUTE NAME	COMMENT	GO TO (FOLLOW)
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
-----	-----	-----
BACK TRACK	1. YES 2. NO	
RECORD TYPE	DISTANCE 00.1nm TIME 00H01M	
SPD TO CALC TTG	ACTUAL SPD SIM SPD 00.0kt	
(TOTAL DIST	0.00nm	
(ETA: 1D 0: 1	TTG: 0H 1M	
PRESS KNOB: EDIT ROUTE WPT: ADD ROUTE		
GOTO: SET RTE TO NAVI CLEAR: DEL COURSE: SWITCH		
FLLW/RVRS		

└─ Total distance, ETA and TTG for the route selected with the red cursor

Routes list

The current page no. and total number of pages are shown at the top of the list. When the list has more than two pages, press the [ZOOM OUT] key to go to the next page, [ZOOM IN] key to return to the previous page.

- 3. Press the [WPT] key to show the route name entry window.
 - 4. Operate the trackball to enter the route name. (Max. 6 characters)
 - 5. Operate the trackball to select "END", and then press the [ENTER] knob.
 - 6. Operate the trackball to enter a comment. (Max. 13 characters)
 - 7. Operate the trackball to select "END, " and then press the [ENTER] knob.
- The waypoints window appears.

Route name

000002		ROUTE LIST		PAGE 1/2	
NO.	WPT NAME	LATITUDE	LONGITUDE	DISTANCE	TTG
▶ 1	-----	--°--'N	---°--'E	---.---nm	-----H
2	-----	--°--'N	---°--'E	---.---nm	-----H
3	-----	--°--'N	---°--'E	---.---nm	-----H
4	-----	--°--'N	---°--'E	---.---nm	-----H
5	-----	--°--'N	---°--'E	---.---nm	-----H
6	-----	--°--'N	---°--'E	---.---nm	-----H
7	-----	--°--'N	---°--'E	---.---nm	-----H
8	-----	--°--'N	---°--'E	---.---nm	-----H
9	-----	--°--'N	---°--'E	---.---nm	-----H
10	-----	--°--'N	---°--'E	---.---nm	-----H
11	-----	--°--'N	---°--'E	---.---nm	-----H
12	-----	--°--'N	---°--'E	---.---nm	-----H
13	-----	--°--'N	---°--'E	---.---nm	-----H
14	-----	--°--'N	---°--'E	---.---nm	-----H
15	-----	--°--'N	---°--'E	---.---nm	-----H
16	-----	--°--'N	---°--'E	---.---nm	-----H
17	-----	--°--'N	---°--'E	---.---nm	-----H
18	-----	--°--'N	---°--'E	---.---nm	-----H
RNG=---		BRG=---		°	
WPT NAME	LATITUDE	LONGITUDE	COMMENT		
▶ 000001 ●	34°44.041'N	135°21.255'E	00:29 0301.01		
000002 ●	34°44.237'N	135°20.936'E	POINT A		
000003 ●	33°43.878'N	134°20.049'E	00:20 0301.02		
000004 ●	32°33.678'N	133°21.029'E	03:29 0301.02		
000005 ●	33°40.591'N	134°20.628'E	POINT B		
PRESS KNOB: ADD WPT CLEAR KEY: DELETE WPT					
CURSOR ON/OFF KEY: SKIP			MENU KEY: RETURN		
ZOOM IN: PREVIOUS PAGE			ZOOM OUT: NEXT PAGE		

Waypoints in the route


Distance and bearing between the waypoint selected with the red cursor and preceding waypoint. When the first waypoint is selected, distance and bearing between own ship's position and it are shown.

Waypoints window

Waypoints window

8. Roll the trackball in up-down direction to select the starting waypoint.
When more than five waypoints are entered, press the [ZOOM IN] or [ZOOM OUT] key to change the page.
9. Press the [ENTER] knob. The selected waypoint is entered in the route as starting point.
10. Repeat steps 8 and 9 to complete the route.
11. Press the [WPT] or [MENU] key.
The ROUTE LIST shows total distance, ETA and TTG of the route.
12. Press the [MENU] key several times to close the menu.

6.1.2 Creating track-based routes

You can create routes based on your ship's track by entering waypoints at own ship's position up to 35 points, manually or automatically. For automatic entry, you will need to set interval of time or distance. This feature is useful when you wish to retrace a track. The SAVE icon () appears at the bottom of the screen when creating a track based route.

1. Press the [MENU] key to show the main menu.
2. Press the [2] key to show the ROUTES LIST.
3. Rotate the [ENTER] knob to select RECORD TYPE.
4. Roll the trackball in left-right direction to select "DISTANCE" or "TIME."
5. Press the numeric keys to enter value for distance (or time).

Note: If you enter a wrong value, press the [CLEAR] key, and then re-enter the correct value.

6. Press the [ENTER] knob.
7. Rotate the [ENTER] knob to select BACK TRACK.
8. Press the [1] key to select "1. YES."
The route creation starts, and it is named automatically.
9. Press the [MENU] key several times to close the menu.
10. To create a track-based route manually, follow the steps shown below.
 - a) Press the [SAVE/MOB] momentarily to enter a waypoint at own ship's position.
 - b) Repeat step a) whenever you change course.

Stopping the creating track-based routes

To manually stop creating a track-based route, follow the procedure below. When 35 waypoints have been entered, creation is stopped automatically.

1. Press the [MENU] key to show the main menu.
2. Press the [2] key to show the ROUTES LIST.
3. Rotate the [ENTER] knob to select BACK TRACK.
4. Press the [2] key to select "2. NO."
5. Press the [MENU] key several times to close the menu.

6.2 Editing Routes

6.2.1 Inserting waypoints

Waypoints can be inserted in routes as follows:

1. Press the [MENU] key to show the main menu.
2. Press the [2] key to show the ROUTES LIST.
3. Rotate the [ENTER] knob to select the route in which you want to insert a waypoint.
4. Press the [ENTER] knob three times to show the waypoints window.
5. Rotate the [ENTER] knob to place the red cursor at the waypoint which will follow the waypoint you wish to insert.
6. Roll the trackball in up-down direction to select the waypoint you want to insert.
7. Press the [ENTER] knob.

Note: If a wrong waypoint is inserted, press the [CLEAR] key to delete.

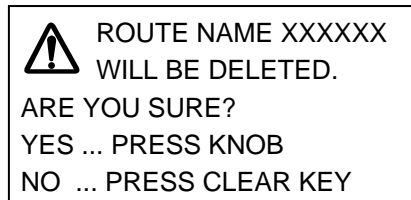
8. Press the [MENU] key several times to close the menu.

6.2.2 Removing waypoints from routes

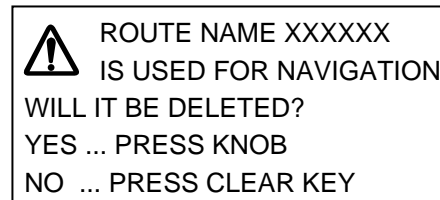
1. Press the [MENU] key to show the main menu.
2. Press the [2] key to show the ROUTES LIST.
3. Rotate the [ENTER] knob to select the route in which you want to remove a waypoint.
4. Press the [ENTER] knob three times to show the waypoints window.
5. Rotate the [ENTER] knob to select the waypoint you want to remove.
6. Press the [CLEAR] key to remove the waypoint.
7. Press the [MENU] key several times to close the menu.

6.3 Erasing Routes

1. Press the [MENU] key to show the main menu.
2. Press the [2] key to show the ROUTES LIST.
3. Rotate the [ENTER] knob to select the route you want to erase.
4. Press the [CLEAR] key to show the following message.



Normal route



Destination route

Erasing message

5. Press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

6.4 Setting Ship's Speed for TTG

Calculation of TTG is based on ship's speed data. This data can be set manually or automatically.

1. Press the [MENU] key to show the main menu.
2. Press the [2] key to show the ROUTES LIST.
3. Rotate the [ENTER] knob to select SPD TO CALC TTG.
4. Roll the trackball in left-right direction to select "ACTUAL SPD" or SIM SPD." For ACTUAL SPD, go step 6. For SIM SPEED, go to step 5.
ACTUAL SPD: The actual ship's speed is used.
SIM SPD: The simulated speed is used.
5. Press the numeric keys to enter the speed value, and then press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

7. NAVIGATION

This section shows you how to get to a desired destination by using “quick points,” waypoints, port services and routes.

7.1 Navigating to Quick Points

The quick point feature allows you to navigate to point(s) without retaining the date indefinitely in your unit’s memory. Each time a quick point is entered, previous quick points having the same numbers as newly entered ones are written over.

Selecting quick point entry method

You need to tell your unit how to set the quick point: 1 POINT or 35 POINTS (up to 35 points), NEAR SERVICE or PORT SERVICE. (For NEAR SERVICE and PORT SERVICE, see page 7-5.)

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [1] key to show the DISPLAY SETUP menu.
4. If page 2/2 appears, rotate the [ENTER] knob to select PREVIOUS PAGE to show page 1/2.

5. Rotate the [ENTER] knob to select SET GOTO METHOD.

0-1 DISPLAY SETUP		1/2
NEXT PAGE		
LANGUAGE	1. ENGLISH	
KEY BEEP	1. ON 2. OFF	
SPEED SOURCE	1. INT GPS 2. NMEA SOG 3. NMEA STW 4. INTERNAL E/S	
NMEA SPEED CALIB	+00%	(-50 ~ +50%)
TEMPERATURE SOURCE	1. NMEA	2. INTERNAL E/S
NMEA TEMP CALIB	+00.0°F	(-40 ~ +40°F)
DEPTH SOURTH	1. NMEA	2. INTERNAL E/S
NMEA DEPTH CALIB	+000.0 ft	(-15 ~ +100ft)
LAT/LON DISPLAY	1. DD°MM.MM'	2. DD°MM.MMM'
	3. DD°MM.MMMM'	4. DD°MM'SS.S
RANGE & SPEED UNITS	1. nm, kt	2. km, km/h 3. sm, mph
DEPTH UNIT	1. m 2. ft	3. fa 4. pb
TEMPERATURE UNIT	1. °C	2. °F
TIME DISPLAY	1. 12 HOURS	2. 24 HOURS
BEARING READOUT	1. TRUE	2. MAGNETIC
MAGNETIC VARIATION	1. AUTO	2. MANUAL 07.0°W
HEADING MARKER	1. ON	2. OFF
COURSE VECTOR	1. LINE	2. VECTOR 3. OFF
WAYPOINT SWITCHING	1. PERPENDICULAR	2. ARRIVAL CIRCLE
RNG & BRG MODE	1. RHUMB LINE	2. GREAT CIRCLE
▶ SET GOTO METHOD	1. 1 POINT	2. 35 POINTS
	3. NEAR SERVICE	4. PORT SERVICE
RANGE/SCALE	1. RANGE	2. SCALE
SCALE DISPLAY	1. ON	2. OFF
GPS STATUS	1. ON	2. OFF
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.		

Display setup menu

6. Press the appropriate numeric key to select the method to use:
- 1 POINT: Setting a single quick point as waypoint.
 - 35 POINTS: Setting multiple quick points (up to 35) as a route.
 - NEAR SERVICE, PORT SERVICE: See page 7-5.
7. Press the [MENU] key several times to close the menu.

Navigating to a single quick waypoint

1. Referring to page 7-1 for the procedure, set GO TO METHOD to "1. 1POINT".
2. Press the [DISP] key, and then select the PLOTTER NAV INFO 1 or PILOT NAV INFO 1 display.
3. Press the [DISP] key to close the DISP MODE display.
If the cursor is not displayed, press the [CURSOR ON/OFF] key to display it.
4. Operate the trackball to place the cursor on the location where you want to enter the quick point.
5. Press the [GOTO] key.

A light-blue line connects between own ship and destination, marked "QP<01>," and it shows the shortest course to the destination.

Arrows on the line show the direction to follow to get to the quick point. Range and bearing from own ship to the destination appear at the top of screen. This location is saved to the WAYPOINT LIST as waypoint "QP01."

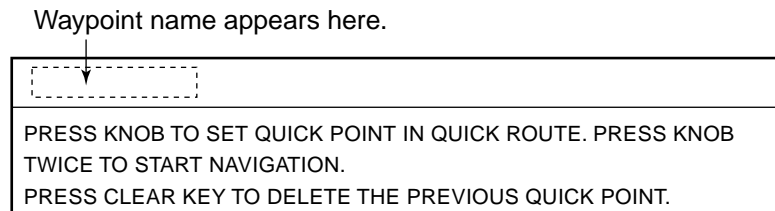
Note 1: Each time a quick point is entered previous quick points having the same numbers as newly entered ones are written over.

Note 2: If range and bearing from own ship to the destination do not appear on the screen, refer to paragraph 9.6.2.

Note 3: When waypoint data (L/L) is received from an external navigator, the quick waypoint is erased and the waypoint data becomes the new destination.

Navigating a quick route

1. Referring to page 7-1 for the procedure, set SET GO TO METHOD to “2. 35 POINT.”
2. Press the [DISP] key, and then select the PLOTTER NAV INFO 1 or PILOT NAV INFO 1 display.
3. Press the [DISP] key. If the cursor is not displayed, press the [CURSOR ON/OFF] key to display it.
4. Press the [GOTO] key to show the following window.

*Operation guidance*

5. Operate the trackball to place the cursor on an existing waypoint or a new location.
6. Press the [ENTER] knob.
When selecting a new location, “QP<01>” appears at the cursor position.
7. Repeat steps 5 and 6 to complete the route.
Maximum 35 points can be entered. To erase last-entered waypoint, press the [CLEAR] key.
8. After entering all waypoints, press the [ENTER] knob twice.
A light-blue line connects between own ship and the first quick point of the route, and green lines connect between other quick points. The line shows the shortest course to destination. Arrows on the line show the direction to follow the route. Range and bearing from own ship to the first destination appear at the top of screen. The unit saves the points as a route, under the name “Q<RTE (Quick Route).”

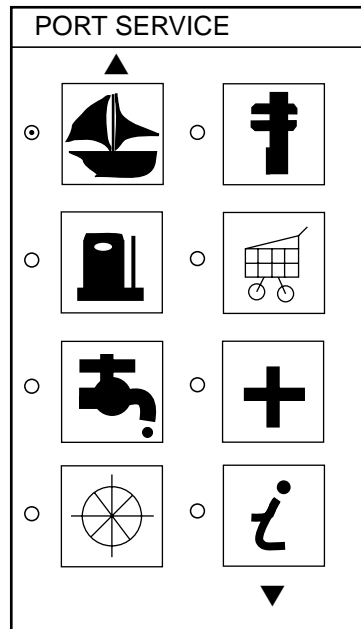
Note 1: Each time a quick route is entered, previous quick route is written over. When entering a new quick waypoint, QP<01> is removed from the Q<RTE.

Note 2: If range and bearing from own ship to the first destination do not appear on the screen, refer to paragraph 9.6.2.

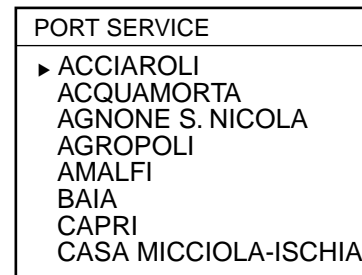
Navigating to ports, port service

Some Nav-Chart™ chart cards have a port service list which shows services available at ports or harbors. You can use the list to set destination as follows.

1. Referring to page 7-1 for the procedure, set SET TO GOTO METHOD to “3. NEAR SERVICE” or “4. PORT SERVICE.”
NEAR SERVICE displays the port service list.
PORT shows a list of ports in your area.
2. Press the [DISP] key, and then select PLOTTER NAV INFO 1 or PILOT NAV INFO 1 display.
3. Press the [DISP] key. If the cursor disappears, press the [CURSOR ON/OFF] key.
4. Press the [GOTO] key.
A list of ports or port services appear depending on what you selected at step 1.



Near service list (NavChart™)



Port service list
(NavChart™, Italy)

Port service lists

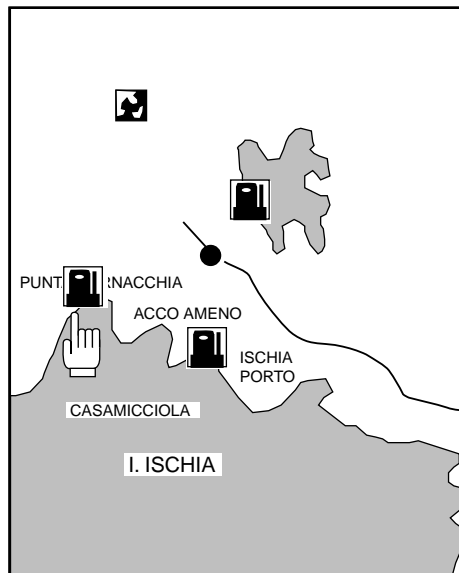
5. Do one of the following depending on selection made at step 1.

PORT SERVICE

Rotate the [ENTER] knob to select port and then press the [ENTER] knob. Make a route using the trackball and [ENTER] key. (If you want to go directly to that port, simply press the [ENTER] knob twice.

NEAR SERVICE

Select service mark desired with the [ENTER] knob, and then press the [ENTER] knob. Then, the display shows the locations of those services nearest you. (The figure below shows the location of a filling station in an area in southern Italy.) Use the cursor pad to place the “hand cursor” on the port service icon desired and press the [ENTER] knob. Make a route using the trackball and [ENTER] knob. (If you want to go directly to location desired, simply press the [ENTER] knob twice.)



Sample fitting station locations (southern Italy)

7.2 Navigating to a Waypoint

Existing waypoints can be set as destination using the following four methods:

- Selecting a waypoint on the PLOTTER (or PILOT) NAV INFO 1 display
- Selecting a waypoint from the WAYPOINT LIST
- Selecting a waypoint from the history list
- Entering the waypoint name (only the waypoint having a numeric name)

Selecting waypoint on PLOTTER (PILOT) NAV INFO 1 display

1. Referring to page 7-1 for the procedure, set SET GOTO METHOD to "1. 1 POINT."
2. Press the [DISP] key, and then select the PLOTTER NAV INFO 1 or PILOT NAV INFO 1 display.
3. Press the [DISP] key. If the cursor is not displayed, press the [CURSOR ON/OFF] key to display it.
4. Operate the trackball to place the cursor on a waypoint.
5. Press the [GOTO] key.

A light-blue line runs between destination selected and own ship's position. Arrows on the line show the direction to follow. Range and bearing from own ship's position to destination appear at the top of the screen.

Selecting waypoint from WAYPOINT LIST

1. Press the [MENU] key to show the main menu.
2. Press the [1] key to show the WAYPOINTS LIST.
3. Rotate the [ENTER] knob to select a waypoint

Waypoints can be sorted alphanumerically, by distance or mark type. (Refer to paragraph 5.4.)

4. Press the [GOTO] key.

The message "NAVIGATING: XXXXXX (XXXXXX = waypoint name)" appears at the top of the waypoints list.

Selected wapoint as destination
↓

1. WAYPOINTS LIST		NAVIGATING: 000000			
NAME	LATITUDE	LONGITUDE	PRXMTY	COMMENT	
▶ 000001	● 34°44.041'N	135°21.255'E	0.00nm	00:29	0301.01
000002	● 34°44.237'N	135°20.936'E	0.00nm	POINT A	
000003	● 33°43.878'N	134°20.049'E	0.00nm	00:20	0301.02

Waypoints list (upper)

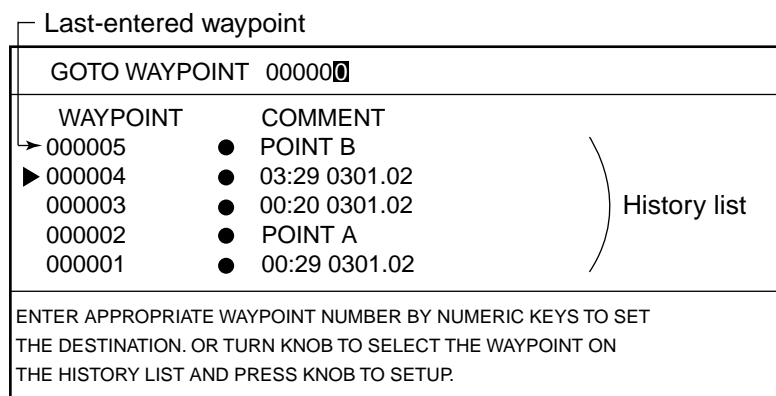
5. Press the [MENU] key several times to close the menu.

A light-blue line runs between destination selected and own ship's position. Arrows on the line show the direction to follow. Range and bearing from own ship's position to destination appear at the top of the screen.

Selecting waypoint from the history list

The latest five waypoints entered are saved to the history list. You may choose a waypoint from this list to set it as destination. If five waypoints have been saved, the oldest one is erased automatically and a new one is saved.

1. Press the [CURSOR ON/OFF] key to turn off the cursor.
2. Press the [GOTO] key to show the following window.



Destination window

Note: This window will disappear automatically if there is no key operation within 10 seconds.

3. Rotate the [ENTER] knob to select a waypoint.
4. Press the [ENTER] knob.

A light-blue line runs between destination selected and own ship's position. Arrows on the line show the direction to follow. Range and bearing from own ship's position to destination appear at the top of the screen.

Entering waypoint name

This method is available only for waypoints having numeric names.

1. Press the [CURSOR ON/OFF] key to turn off the cursor.
2. Press the [GOTO] key to show the following window.

Last-entered waypoint

GOTO WAYPOINT 000000	
WAYPOINT	COMMENT
→ 000005	● POINT B
▶ 000004	● 03:29 0301.02
000003	● 00:20 0301.02
000002	● POINT A
000001	● 00:29 0301.02

) History list

ENTER APPROPRIATE WAYPOINT NUMBER BY NUMERIC KEYS TO SET THE DESTINATION. OR TURN KNOB TO SELECT THE WAYPOINT ON THE HISTORY LIST AND PRESS KNOB TO SETUP.

Destination window

Note: This window will disappear automatically if there is no key operation within 10 seconds.

3. Press the numeric keys to enter a waypoint name at the GOTO WAYPOINT line.
Each press of the numeric key changes the cursor position to the left digit.

Note: Press the [CLEAR] key to change the waypoint name to “000000.”

4. Press the [ENTER] knob.
A light-blue line runs between destination selected and own ship's position. Arrows on the line show the direction to follow. Range and bearing from own ship's position to destination appear at the top of the screen.

7.3 Following a Route

Setting a route as destination

1. Press the [MENU] key to show the main menu.
2. Press the [2] key to show the ROUTES LIST.
3. Rotate the [ENTER] knob to select a route.
4. Press the [CURSOR ON/OFF] key to switch the direction to follow if necessary.

FOLLOW: Follow a route in normal order.

REVERSE: Follow a route in reverse order.

Each press of the [CURSOR ON/OFF] key switches "FOLLOW" and "REVERSE" at the top of the list.

5. Press the [GOTO] key.

The selected route is set as destination, and "FOLLOW" or "REVERSE" appears in the far right-hand column.

Use the [CURSOR ON/OFF] key
to choose direction to follow route,
REVERSE and FOLLOW.

ROUTE NAME	COMMENT	GOTO
2. ROUTE LIST	DIR: REVERSE	1/1
▶ 000001	-----	←
-----	-----	
-----	-----	

Destination route

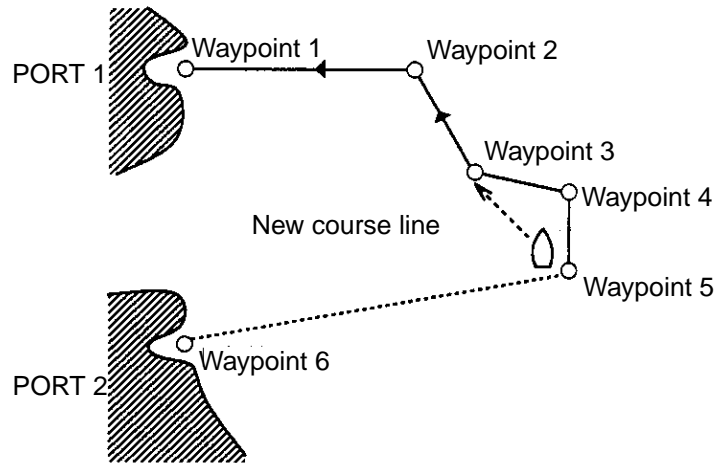
Route list

6. Press the [MENU] key several times to close the menu.

A light-blue line runs between the first waypoint and own ship's position, and green lines connect other route waypoints. Arrows on the line show the direction to follow. Range and bearing from own ship's position to destination appear at the top of the screen.

Skipping route waypoints

In some instances you may want to “skip” waypoints while following a route. In the figure below, for example, the vessel has decided to navigate from waypoint 05 to 03, skipping waypoint 04.



1. Press the [MENU] key to show the main menu.
2. Press the [2] key to show the ROUTES LIST.
3. Rotate the [ENTER] knob to select a route.
4. Press the [ENTER] knob three times to show the waypoints list.
5. Rotate the [ENTER] knob to select the waypoint you want to skip.
6. Press the [CURSOR ON/OFF] key to show “-“ next to the waypoint selected at step 5.

000002		ROUTE LIST		PAGE 1/2	
NO.	WPT	LATITUDE	LONGITUDE	DISTANCE	TTG
1	000001	34°44.041'N	135°21.255'E	0.00nm	0.0H
▶ 2	-000002	34°44.237'N	135°20.936'E	----nm	-----H
3	000003	33°43.878'N	134°20.049'E	1.00nm	0.1H
4	-----	--'---'N	---'---'E	----nm	-----H

Skipped waypoint

Waypoints window

Note: To restore the waypoint, press the [CURSOR ON/OFF] key again to erase the “-“.

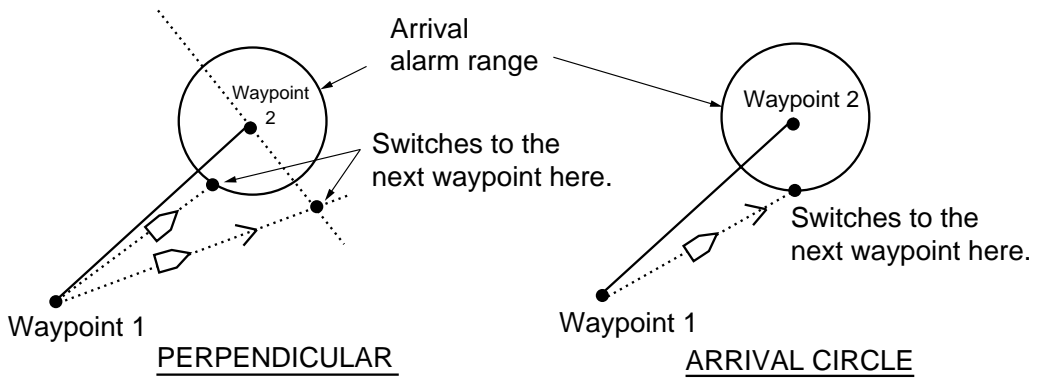
7. Press the [MENU] key several times to close the menu.

Switching waypoint

When you arrive to a waypoint on a route, you can switch to the next waypoint two ways: PERPENDICULAR or ARRIVAL CIRCLE.

PERPENDICULAR: Automatically switches the TO waypoint when the boat enters the arrival alarm range or the boat passes an imaginary perpendicular line passing through the center of the destination waypoint.

ARRIVAL ALARM: Automatically switches the TO waypoint when your boat is within the arrival alarm area. For how to set the arrival alarm area, see chapter 8.



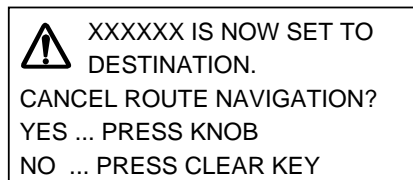
Switching waypoint

To select waypoint switching method, do the following.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [1] key to show the DISPLAY SETUP menu.
4. If page 2/2 appears, rotate the [ENTER] knob to select "PREVIOUS PAGE."
5. Rotate the [ENTER] knob to select "WAYPOINT SWITCHING."
6. Press the [1] or [2] key to select "1. PERPENDICULAR" or "2. ARRIVAL CIRCLE" as appropriate.
7. Press the [MENU] key several times to close the menu.

7.4 Canceling Navigation

1. Press the [GOTO] key to show the following message.



Cancel message

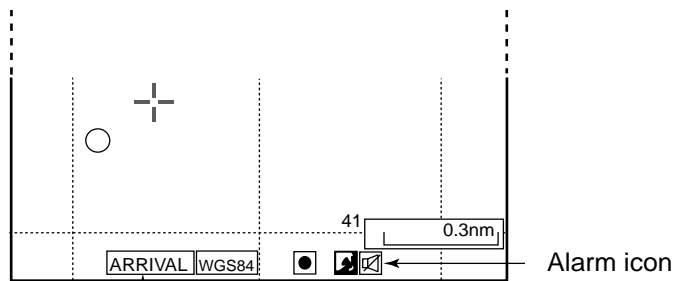
2. Press the [ENTER] knob to cancel destinations or the [CLEAR] key to escape.

8. ALARMS

There are 12 alarms which generate both audible and visual alarms: Arrival Alarm, Anchor Watch Alarm, XTE Alarm, Border Alarm, Proximity Alarm, Speed Alarm, Trip Log Alarm, Temperature Alarm, Shear Alarm, Bottom Alarm, Fish Alarm and Fish Alarm (B/L).

When an alarm setting is violated again, the buzzer sounds and the speaker icon (🔊) and type of alarm appear. You may silence the buzzer by pressing the [CLEAR] key. The icon remains on the screen until the cause of the alarm is removed or the alarm is deactivated. When an alarm setting is occurred again, the buzzer sounds and the speaker icon appears.

For fish alarms, see paragraph 11.15.



Status abbreviation and alarm type appears alternately.

- ARRIVAL: Arrival alarm
- ANCHOR: Anchor watch alarm
- XTE: XTE alarm
- BORDER: Border alarm
- PRXMTY: Proximity alarm
- SPEED: Speed alarm
- TRIP: Trip log alarm
- TMP: Temperature alarm
- SHEAR: Shear alarm
- BOTTOM: Bottom alarm

Plotter display, showing location of violated alarm indication

Note: When multiple alarms are violated, the last-violated alarm is shown at the bottom of the screen.

8.1 Audio Alarm On/Off

The audio alarm sounds whenever an alarm setting is violated. You can enable or disable the audio alarm as follows:

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.

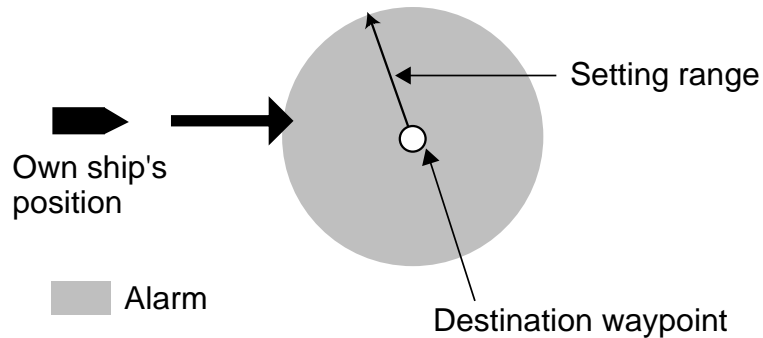
6. ALARMS SETUP			
▶ AUDIO ALARM	1. SHORT	2. LONG	3. CONT 4. OFF
ARRIVAL/ANCHOR WATCH	1. ARRIVAL	2. ANCHOR	3. OFF
RANGE TO MONITOR	0.001 nm		
XTE/BORDER ALARM	1. XTE	2. BORD	3. OFF
RANGE TO MONITOR	0.050nm		
PROXIMITY ALARM	1. ON	2. OFF	
SPEED ALARM	1. INSIDE	2. OUT	3. OFF
MINIMUM SPEED	000.0kt		
MAXIMUM SPEED	030.0kt		
TRIP LOG ALARM	1. ON	2. OFF	
DIST TO MONITOR	0000.1nm		
TEMPERATURE ALARM		1. INSIDE	2. OUT 3. OFF
MINIMUM TEMPERATURE		+00.0°C	
MAXIMUM TEMPERATURE		+30.0°C	
SHEAR ALARM	1. ON	2. OFF	
GRADIENT OF TEMP	00.1°C	0.1~10.0	
INTERVAL	010 s	10~120 s	
BOTTOM ALARM	1. ON	2. OFF	
DEPTH	0000.0ft		
RANGE	00.0ft		
FISH ALARM	1. ON	2. OFF	
DEPTH	0000.0ft		
RANGE	00.0ft		
FISH ALARM (B/L)	1. ON	2. OFF	
DEPTH	0000.0ft		
RANGE	00.0ft		
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.			

Alarm setup menu

3. Rotate the [ENTER] knob to select AUDIO ALARM.
4. Roll the trackball in left-right direction to select beep type.
 SHORT: Short beeps sound.
 LONG: Long beeps sound.
 CONT: Continuous beep sounds.
 OFF: Audio alarm off.
5. Press the [MENU] key several times to close the menu.

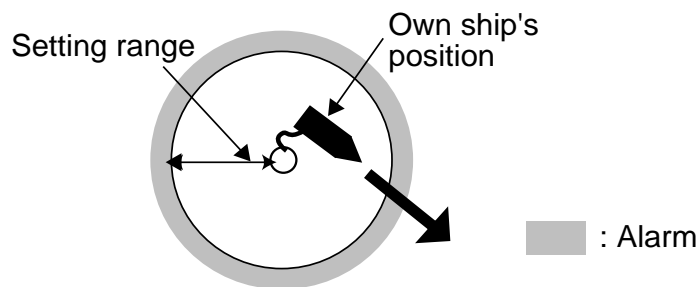
8.2 Arrival Alarm/Anchor Watch Alarm

The arrival alarm informs you that your boat is approaching a destination waypoint. The area that defines an arrival zone is that of a circle which you approach from the outside of the circle. The alarm will be released if your boat enters the circle. When the arrival alarm is active, a red dashed circle marks the arrival alarm area.



How the arrival alarm works

The anchor watch alarm informs you that your boat is moving when it should be at rest. When the anchor watch is active, a red dashed circle marks the anchor watch area.



How the anchor watch alarm works

Note: The arrival and anchor watch alarms cannot be turned on together.

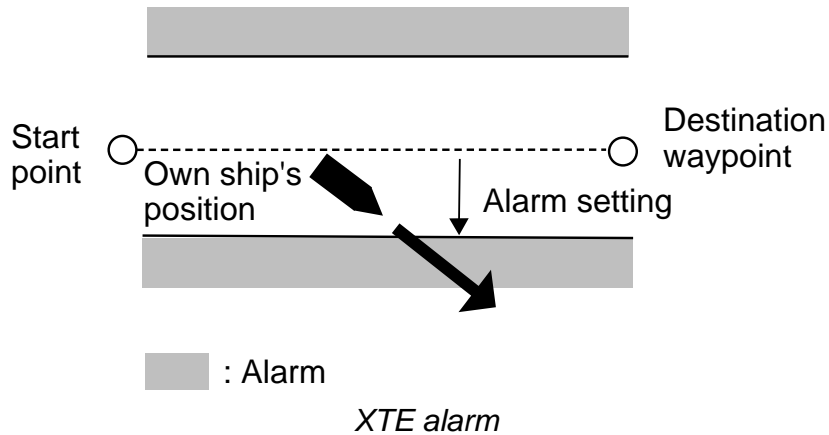
1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select ARRIVAL/ANCHOR WATCH.
4. Press the [1] or [2] key to select "1. ARRIVAL" or "2. ANCHR" as appropriate.
5. Rotate the [ENTER] knob to select RANGE TO MONITOR below ARRIVAL/ANCHOR WATCH.
6. Press the numeric keys to enter the range value. (Setting range: 0.001 to 9.999 nm)
7. Press the [ENTER] knob.
8. Press the [MENU] key several times to close the menu.
9. For the anchor watch alarm, place the cursor on own ship's position and then press the [GOTO] key.

The anchor watch alarm range is shown with a red dashed circle, its center at own ship's position at the moment you completed step 9. If own ship goes out of this range, the audible and visual alarms are released.

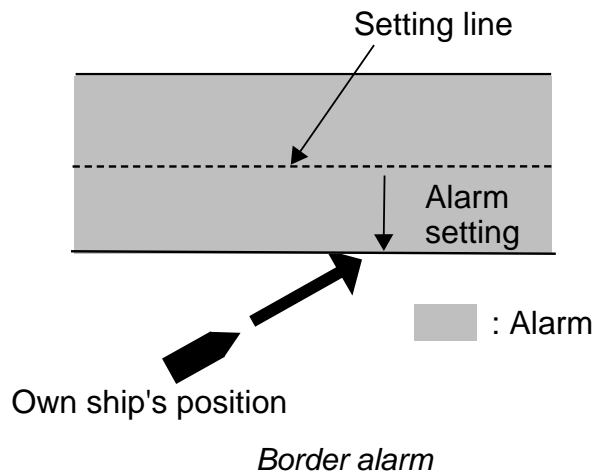
Note : To deactivate the alarm, select "3. OFF" at step 4.

8.3 XTE (Cross Track Error) Alarm/Border Alarm

The XTE alarm warns you when your boat is off its intended course. When the XTE alarm is active, two red dashed lines mark the XTE alarm area.



The border alarm marks an area, defined by two waypoints, which you do not want to cross. The audible and visual alarms will be released when your ship crosses the area defined by the two waypoints.



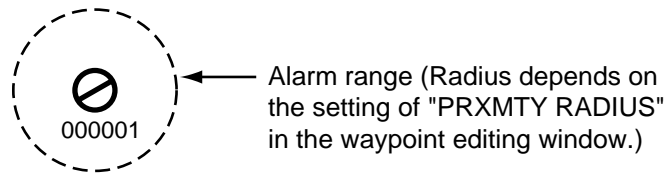
Note: The XTE and border alarms cannot be turned on together.

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select XTE/BORDER ALARM.
4. Press the [1] or [2] key to select "1. XTE" or "2. BORD" as appropriate.
5. Rotate the [ENTER] knob to select RANGE TO MONITOR below XTE/BORDER ALARM.
6. Press the numeric key to enter the range value. (Setting range: 0.001 to 9.999 nm)
7. Press the [ENTER] knob.
8. Press the [MENU] key several times to close the menu.

Note: To deactivate the alarm, select "3. OFF" at step 4.

8.4 Proximity Alarm

The proximity alarm alerts you when your vessel nears a waypoint by the distance set for that waypoint on the waypoints list. The distance is called the proximity alarm radius. You can globally activate or deactivate the proximity alarm here.



Proximity alarm

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select PROXIMITY ALARM.
4. Press the [1] key to select "1. ON."
5. Press the [MENU] key several times to close the menu.

Note: To deactivate the alarm, select "2. OFF" at step 4.

8.5 Speed Alarm

The speed alarm warns you when your boat's speed is within or over the speed range set.

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select SPEED ALARM.
4. Press the [1] or [2] key to select "1. INSIDE" or "2. OUT" as appropriate.
5. Rotate the [ENTER] knob to select MINIMUM SPEED.
6. Press the numeric keys to enter the minimum speed value, and then press the [ENTER] knob.
7. Rotate the [ENTER] knob to select MAXIMUM SPEED.
8. Press the numeric keys to enter the maximum speed value, and then press the [ENTER] knob.
9. Press the [MENU] key several times to close the menu.

Note: To deactivate the alarm, select "3. OFF" at step 4.

8.6 Trip Log Alarm

The trip log alarm informs you when you have traveled a certain distance.

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to select ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select TRIP LOG ALARM.
4. Press the [1] key to select "1. ON."
5. Press the numeric keys to enter the trip log value, and then press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

Note: To deactivate the alarm, select "2. OFF" at step 4.

8.7 Temperature Alarm

Note: This alarm requires water temperature data.

There are two types of water temperature alarms: INSIDE and OUT. The INSIDE alarms sounds when the water temperature is within the range set, and the OUT alarm sounds when the water temperature is higher or lower than the range set.

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select TEMPERATURE ALARM.
4. Press the [1] or [2] key to select “1. INSIDE” or “2. OUT” as appropriate.
5. Rotate the [ENTER] knob to select MINIMUM TEMPERATURE.
6. Press the numeric keys to enter the minimum temperature value, and then press the [ENTER] knob.
To switch “+” and “-”, press the [CURSOR ON/OFF] key.
7. Rotate the [ENTER] knob to select MAXIMUM TEMPERATURE.
8. Press the numeric keys to enter the maximum temperature value, and then press the [ENTER] knob.
9. Press the [MENU] key several times to close the menu.

Note: To deactivate the alarm, select “3. OFF” at step 4.

8.8 Shear Alarm

Note: This alarm requires water temperature data.

The shear alarm sounds when the water temperature changes more or less than the preset value within the interval time set.

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select SHEAR ALARM.
4. Press the [1] key to select “1. ON.”
5. Rotate the [ENTER] knob to select GRADIENT OF TEMP.
6. Press the numeric keys to enter the gradient of temp value, and then press the [ENTER] knob. (Setting range: 0.1 to 10.0°C)
7. Rotate the [ENTER] knob to select INTERVAL.
8. Press the numeric keys to enter the interval value, and then press the [ENTER] knob. (Setting range: 10 to 12 seconds)
9. Press the [MENU] key several times to close the menu.

Note: To deactivate the alarm, select “2. OFF” at step 4.

8.9 Bottom Alarm

The bottom alarm sounds when the bottom echo is within the alarm range set. To activate the bottom alarm the depth must be displayed.

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select BOTTOM ALARM.
4. Press the [1] key to select "1. ON."
5. Rotate the [ENTER] knob to select DEPTH.
6. Press numeric keys to enter the starting point of the alarm range.
7. Rotate the [ENTER] knob to select RANGE.
8. Press numeric key to set the alarm range, and then press the [ENTER] knob.
9. Press the [MENU] key several times to close the menu.

Note: To deactivate the alarm, select "2. OFF" at step 4.

9. CUSTOMIZING YOUR UNIT

This chapter describes the various options which allow you to set up your unit to suit your needs.

9.1 CHART SETUP Menu

The CHART SETUP menu provides for chart offset, track controls and chart details.

9.1.1 Offsetting the chart

In some instances position may be off by a few minutes. For example, the position of the ship is shown to be at sea while it is in fact moored at a pier. You can compensate for the error by offsetting chart position as follows:

1. Press the [MENU] key to show the main menu.
2. Press the [7] key to show the CHART SETUP menu.

If the CHART SETUP menu does not appear, rotate the [ENTER] knob clockwise to show it.

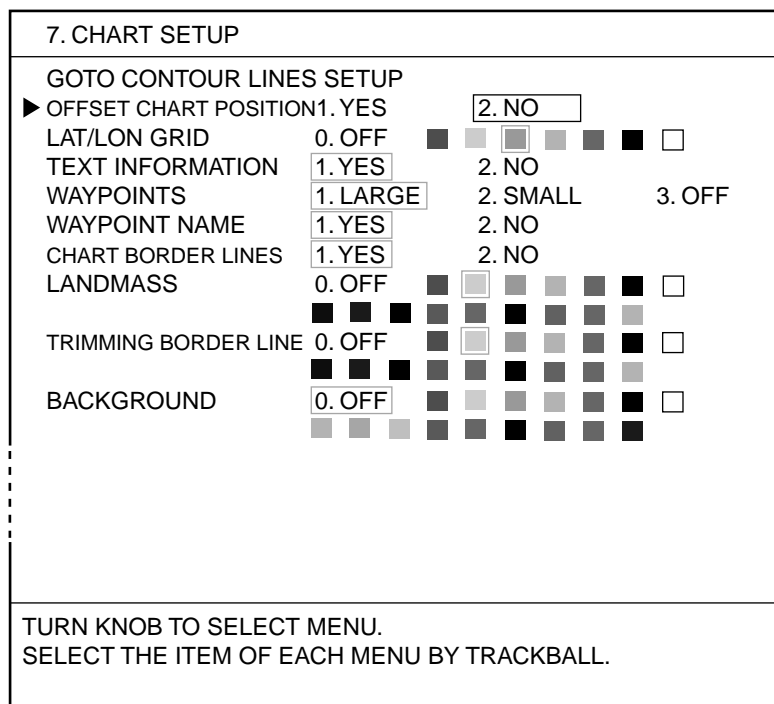


Chart setup menu

3. Rotate the [ENTER] knob to select OFFSET CHART POSITION.

9. CUSTOMIZING YOUR UNIT

4. Press the [1] key to select "1. YES."

The plotter screen appears with the following window.

OFFSET METHOD 1. CURSOR 2. LAT/LON 3. DELTA L/L 4. CANCEL
TURN KNOB TO SELECT OFFSET METHOD. PRESS KNOB TO CANCEL CHART POSITION OFFSET.

Position offset window

5. Press the [1], [2] or [3] key to select "1. CURSOR", "2. LAT/LON" or "3. DELTA L/L" as appropriate.
6. Do one of the following depending on the option selected at step 5.

1. CURSOR

The position offset window changes as below.

OFFSET METHOD 1. CURSOR 2. LAT/LON 3. DELTA L/L 4. CANCEL
TURN KNOB TO SELECT OFFSET METHOD. PLACE CURSOR ON CORRECT LAT/LON POSITION AND PRESS KNOB TO ENTER.

Position offset window (1. Cursor)

- a) Operate the trackball to place the cursor where to offset chart position.
- b) Press the [ENTER] knob to return to the CHART SETUP menu.

2. LAT/LON

The position offset window changes as below.

OFFSET METHOD 1. CURSOR 2. LAT/LON 3. DELTA L/L 4. CANCEL
LATITUDE 00°00.000' N
LONGITUDE 000°00.000' E
TURN KNOB TO SELECT OFFSET METHOD. ENTER CORRECT LAT/LON POSITION AND PRESS KNOB TO ENTER. CURSOR ON/OFF: SWITCH NOUTH/SOUTH & EAST/WEST

Position offset window (2. LAT/LON)

- a) Press the numeric keys to enter the latitude for own ship's position on the chart.
- b) Press the [CURSOR ON/OFF] key to switch from North to South and vice versa.
- c) Roll the trackball to downward to place the cursor on the LONGITUDE line.
- d) Press the numeric keys to enter the longitude.
- e) Press the [CURSOR ON/OFF] key to switch from East to West and vice versa.
- f) Press the [ENTER] knob to return to the CHART SETUP menu.


3. DELTA L/L

For this method, pre-calculate the error on a nautical chart.

The position offset window changes as below.

OFFSET METHOD	1. CURSOR	2. LAT/LON	3. DELTA L/L	4. CANCEL
LATITUDE			00°00.000' N	
LONGITUDE			000°00.000' E	
TURN KNOB TO SELECT OFFSET METHOD.				
ENTER CORRECT LAT/LON POSITION AND PRESS KNOB TO ENTER.				
CURSOR ON/OFF: SWITCH NOUTH/SOUTH & EAST/WEST				

Position offset window (3. Delta L/L)

- a) Use the numeric keys to enter the correction value for latitude.
 - b) Press the [CURSOR ON/OFF] key to switch from North to South and vice versa.
 - c) Roll the trackball downward to place the cursor on the LONGITUDE line.
 - d) Press the numeric keys to enter the correction value for longitude.
 - e) Press the [CURSOR ON/OFF] key to switch from East to West and vice versa.
 - f) Press the [ENTER] knob to return to the CHART SETUP menu.
7. Press the [MENU] key several times to close the menu.
The offset icon () appears at the bottom of the PLOTTER (or PILOT) NAV INFO 1 display.

Note: To cancel chart offset, select "4. CANCEL" at step 5.

9.1.2 CHART SETUP menu items description

The CHART SETUP menu lets you turn chart features on or off and choose colors. In this paragraph, the operating procedure for NavCharts is described.

1. Press the [MENU] key to show the main menu.
2. Press the [7] key to show the CHART SETUP menu.

If the CHART SETUP menu does not appear, rotate the [ENTER] knob clockwise to show it.

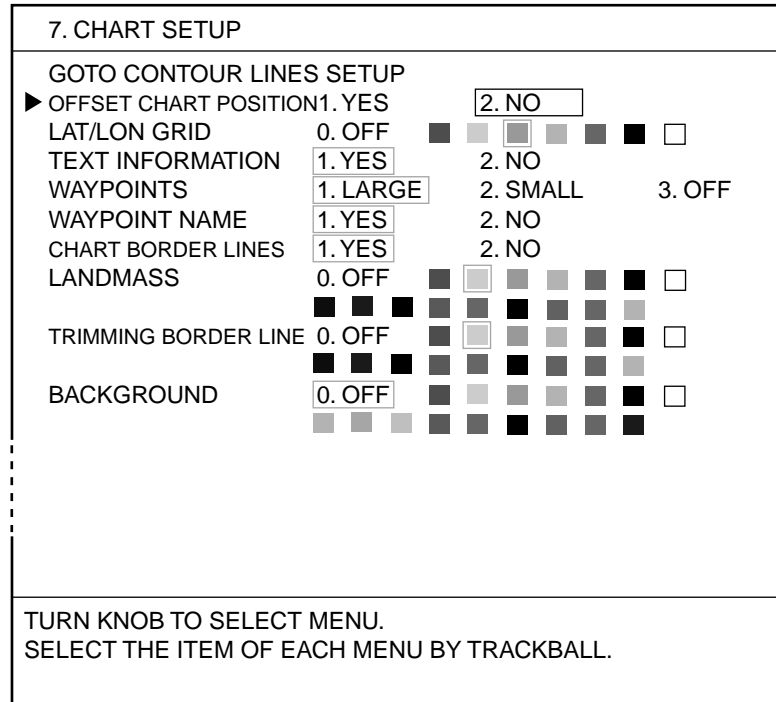


Chart setup menu

3. Rotate the [ENTER] knob to select the desired item.
4. Roll the trackball in left-right direction to select option.
For color selection of red, yellow, green, light-blue, purple, blue and white, you can select one of them by pressing the appropriate numeric key.
[1] key: red, [2] key: yellow, [3] key: green, [4] key: light-blue, [5] key: purple, [6] key: blue, [7] key: white
5. Press the [MENU] key several times to close the menu.

OFFSET CHART POSITION

See paragraph 9.1.

LAT/LON GRID

Turns lat/lon grid on/off and changes its color.
This can be selected from among seven colors.

TEXT INFORMATION

Turns geographic name display on/off.

WAYPOINTS

Turns waypoint on or off and selects size to large or small. For details, see section 5.7.

WAYPOINT NAME

Turns waypoint name on/off on the PLOTTER (or PILOT) NAV INFO 1 display.

CHART BORDER LINES

Turns chart indices on/off.

LANDMASS

Turns landmass on or off and selects a color for land from among 16 colors.

TRIMMING BORDER LINE

Turns edge of landmass on or off and selects a color for edge from among 16 colors.

BACKGROUND

Turns background on or off and selects a color for background from among 16 colors.

NAV AIDS

Turns navigation data on NavChart™, lighthouse data on FURUNO charts on or off.

LIGHTHOUSES

Turns lighthouse viewing sector on or off.

OTHER SYMBOLS

Turns other map symbols on or off.

9.1.3 CONTOUR LINES SETUP menu

You can select the color of contour lines which are lines colored according to depth. In this paragraph, the operating procedure for NavCharts is described.

1. Press the [MENU] key to show the main menu.
2. Press the [7] key.
3. If the CHART SETUP menu appears, rotate the [ENTER] knob clockwise to show the CONTOUR LINES SETUP menu.

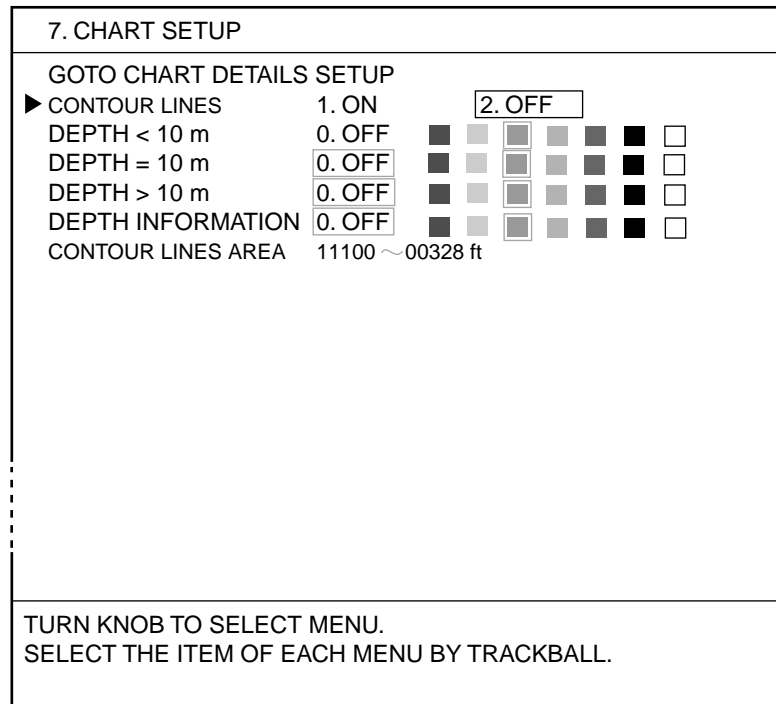


Chart setup menu

4. Rotate the [ENTER] knob to select CONTOUR LINES, and then press the [1] key to select "1. ON."
5. Rotate the [ENTER] knob to select DEPTH<10 m, and then press an appropriate numeric key to select a color.
6. Set the colors for DEPTH=10 m and DEPTH>10 m also.
7. Rotate the [ENTER] knob to select DEPTH INFORMATION, and then press an appropriate numeric key to select a color for depth information.
8. Rotate the [ENTER] knob to select CONTOUR LINES AREA, and then use the numeric keys to enter the depth area for which you want to show contour lines.
9. Press the [MENU] key several times to close the menu.

9.2 PLOTTER SETUP Menu

The PLOTTER SETUP menu mainly sets up the Loran (Decca) TD display. (For panel dimmer and hue, see section 1.4.)

9.2.1 Setting TD display

To display own ship's position in TDs in the data window, follow the procedure below. For how to set the data window, see paragraph 9.6.2.

Displaying position in Loran A

1. Press the [MENU] key to show the main menu.
2. Press the [8] key to show the PLOTTER SETUP menu.

8. PLOTTER SETUP	
▶ LORAN-A GRI	■-00
CORRECTION 1	+000.0 ms
CORRECTION 1	+000.0 ms
LORAN-C GRI	00-00
CORRECTION 1	+000.0 ms
CORRECTION 1	+000.0 ms
DECCA CHAIN	00 R-G
CORRECTION 1	+000.0 ms
CORRECTION 1	+000.0 ms
TD DISPLAY	1. LORAN-A 2. LORAN-C 3. DECCA
RESET TRIP LOG	1. YES 2. NO
PLOTTER RANGE SETUP	1. YES 2. NO
PANEL DIMMER	1 2 3 4 5 6 7 8
HUE	1. DAY 2. NIGHT 3. TWILI 4. MANUAL
00:1L0 01:1L1 02:1L4 03:1L5 04:1L6 05:1L7 06:1S1 07:1S2 08:1S3 09:1S4 10:1S6 11:2H3 12:2H4 13:2H5 14:2H6 15:2S0 16:2S1 17:2S2 18:2S3 19:2S4 20:2S5 21:2S6 22:2S7	
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.	

Plotter setup menu

3. Rotate the [ENTER] knob to select LORAN-A GRI to show the station codes in the menu.
4. Use the numeric keys to enter GRI code.

9. CUSTOMIZING YOUR UNIT

5. If necessary, rotate the [ENTER] knob to select CORRECTION 1 to enter offset.
Use the numeric keys to enter position offset, and then press the [ENTER] knob.
Use the [CURSOR ON/OFF] key to switch from “+” to “-” and vice versa.
6. If necessary, enter an offset at CORRECTION 2.
7. Rotate the [ENTER] knob to select TD DISPLAY.
8. Press the [1] key to select “1. LORAN-A”.
9. Press the [MENU] key several times to close the menu.

Displaying position in Loran C

1. Press the [MENU] key to show the main menu.
2. Press the [8] key to show the PLOTTER SETUP menu.
3. Rotate the [ENTER] knob to select LORAN-C GRI to show the GRI code in the menu.
4. Use the numeric keys to enter GRI code.
For GRI9970, for example, press the [1] and [0] keys to show the chain list.
5. Use the numeric keys to enter station pair, and then press the [ENTER] knob.
6. If necessary, rotate the [ENTER] knob to select CORRECTION 1 below LORAN-C GRI to enter offset.
Use the numeric keys to enter position offset, and then press the [ENTER] knob.
Use the [CURSOR ON/OFF] key to switch from “+” to “-” and vice versa.
7. If necessary, enter an offset at CORRECTION 2.
8. Rotate the [ENTER] knob to select TD DISPLAY.
9. Press the [2] key to select “2. LORAN-C”.
10. Press the [MENU] key several times to close the menu.

Displaying position in DECCA TDs

1. Press the [MENU] key to show the main menu.
2. Press the [8] key to show the PLOTTER SETUP menu.
3. Rotate the [ENTER] knob to select DECCA CHAIN.
4. Use the numeric keys to enter Decca chain number (01 to 48). Available lanes appear.
5. Use the numeric keys to enter lane pair, and then press the [ENTER] knob.
6. If necessary, rotate the [ENTER] knob to select CORRECTION 1 below DECCA CHAIN.
7. Use the numeric keys to enter position offset and then press the [ENTER] knob.
Use the [CURSOR ON/OFF] key to switch from “+” to “-” and vice versa.
8. If necessary, enter an offset at CORRECTION 2.
9. Rotate the [ENTER] knob to select TD DISPLAY.
10. Press the [3] key to select “3. DECCA.”
11. Press the [MENU] key several times to close the menu.

9.2.2 Resetting trip distance

You can reset trip distance to “0.” The trip distance is shown in the NAV INFO window. (See paragraph 9.6.2.)

1. Press the [MENU] key to show the main menu.
2. Press the [8] key to show the PLOTTER SETUP menu.
3. Rotate the [ENTER] knob to select RESET TRIP LOG.
4. Press the [1] key to select “1. YES” to reset trip distance to “0.”
5. Press the [MENU] key several times to close the menu.

9.2.3 Selecting range of PLOTTER (PILOT) display

You may choose the PLOTTER (or PILOT) display ranges you wish to use. After choosing the ranges desired, change the range with the [ZOOM IN] or [ZOOM OUT] keys to activate range settings.

Note: At least two ranges must be turned on.

1. Press the [MENU] key to show the main menu.
2. Press the [8] key to show the PLOTTER SETUP menu.
3. Rotate the [ENTER] knob to select “PLOTTER RANGE SETUP.”
4. Press the [1] key to select “1. YES.”

The PLOTTER RANGE SETUP menu appears.

9. CUSTOMIZING YOUR UNIT

PLOTTER RANGE SETUP		
▶ 0.125	1. ON	2. OFF
0.25	1. ON	2. OFF
0.50	1. ON	2. OFF
0.75	1. ON	2. OFF
1.00	1. ON	2. OFF
1.50	1. ON	2. OFF
2.00	1. ON	2. OFF
3.00	1. ON	2. OFF
4.00	1. ON	2. OFF
6.00	1. ON	2. OFF
8.00	1. ON	2. OFF
12.0	1. ON	2. OFF
16.0	1. ON	2. OFF
24.0	1. ON	2. OFF
32.0	1. ON	2. OFF
48.0	1. ON	2. OFF
72.0	1. ON	2. OFF
96.0	1. ON	2. OFF
128	1. ON	2. OFF
256	1. ON	2. OFF
512	1. ON	2. OFF
1024	1. ON	2. OFF

TURN KNOB TO SELECT MENU.
SELECT THE ITEM OF EACH MENU BY TRACKBALL.

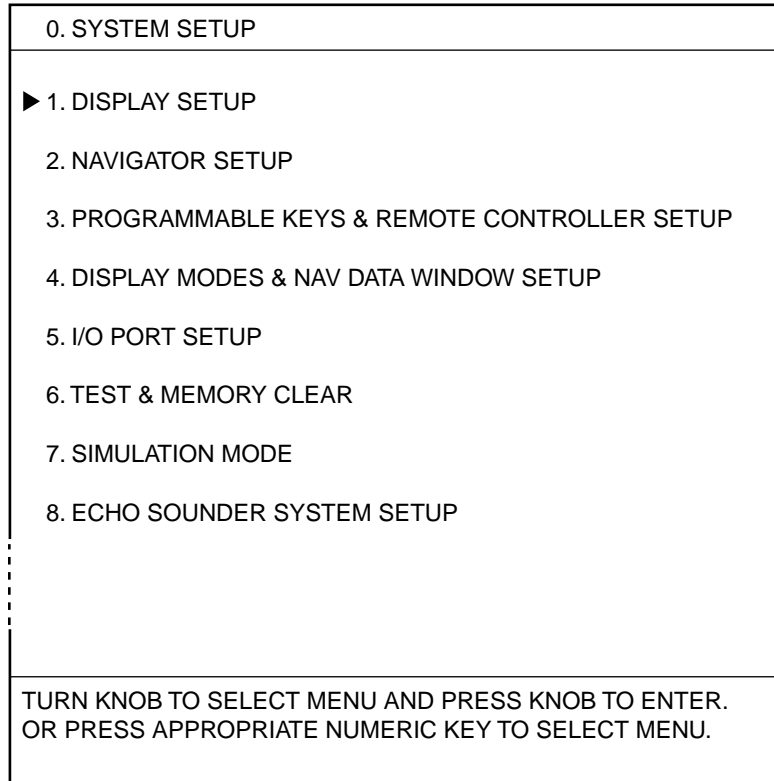
Plotter range setup menu

5. Rotate the [ENTER] knob to select the range which you want to turn on or off.
6. Press the [1] or [2] key to select "1. ON" or "2. OFF" as appropriate.
7. Press the [MENU] key several times to close the menu.

9.3 DISPLAY SETUP Menu

The DISPLAY SETUP menu contains items for setting up the display.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.



System setup menu

3. Press the [1] key to show the DISPLAY SETUP menu.
The DISPLAY SETUP menu has two pages, the last-used page appears.
4. If page 2/2 appears, rotate the [ENTER] knob clockwise to select PREVIOUS PAGE.

0-1. DISPLAY SETUP		1/2
NEXT PAGE		
▶ LANGUAGE	ENGLISH	
KEY BEEP	1. ON 2. OFF	
SPEED SOURCE	1. INT GPS 2. NMEA SOG 3. NMEA STW 4. INTERNAL E/S	
NMEA SPEED CALIB	+00% (-50 +50%)	
TEMPERATURE SOURCE	1. NMEA 2. INTERNAL E/S	
NMEA SETUP CALIB	+000.00 ft (-15 +100 ft)	
DEPTH SOURCE	1. NMEA 2. INTERNAL E/S	
NMEA DEPTH CALIB	+000.0 ft (-15 +100 ft)	
LAT/LON DISPLAY	1. DD°MM.MM' 2. DD°MM.MMM' 3. DD°MM.MMMM' 4. DD°MM'SS.S	
RANGE & SPEED UNITS	1. nm,kt 2. km,km/h 3. sm,mph	
DEPTH UNIT	1. m 2. ft 3. fa 4. pb	
TEMPERATURE UNIT	1. °C 2. °F	
TIME DISPLAY	1. 12 HOURS 2. 24 HOURS	
BEARING READOUT	1. TRUE 2. MAGNETIC	
MAGNETIC VARIATION	1. AUTO 2. MANUAL 07.0°W	
HEADING MARKER	1. ON 2. OFF	
COURSE VECTOR	1. LINE 2. VECTOR 3. OFF	
WAYPOINT SWITCHING	1. PERPENDICULAR 2. ARRIVAL CIRCLE	
RNG & BRG MODE	1. RHUMB LINE 2. GREAT CIRCLE	
SET GOTO METHOD	1. 1 POINT 2. 35 POINTS 3. NEAR SERVICE 4. PORT SERVICE	
RANGE/SCALE	1. RANGE 2. SCALE	
SCALE DISPLAY	1. ON 2. OFF	
GPS STATUS	1. ON 2. OFF	
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.		

Display setup menu (page 1)

Page 1

LANGUAGE

English only.

KEY BEEP

Turns key beep on/off.

SPEED SOURCE

Selects source of speed data from among INT GPS (internal GPS), NMEA SOG, NMEA STW and INTERNAL E/S. For details, see the installation manual.

NMEA SPEED CALIB

An offset may be applied to NMEA speed data (NMEA SOG or NMEA STW at SPEED SOURCE). For details, see the installation manual.

TEMPERATURE SOURCE

Selects the source of temperature data from NMEA or INTERNAL E/S. For details, see the installation manual.

NMEA TEMP CALIB

You may apply an offset to NMEA water temperature data. For details, see the installation manual.

DEPTH SOURCE

Selects source of depth from NMEA or INTERNAL E/S. For details, see the installation manual.

NMEA DEPTH CALIB

You can apply an offset to NMEA depth data. For details, see the installation manual.

LAT/LON DISPLAY

Chooses how many digits (or seconds) to display after the decimal point in latitude and longitude position. The choices are DD°MM.MM', DD°MM.MMM' and DD°MM.MMMM' DD°MM'SS.S.

RANGE & SPEED UNITS

Chooses unit of range and speed measurement from among nm, kt; km, km/h and sm, mph)

DEPTH UNIT

Chooses unit of depth measurement from among m, ft, fa and pb.

TEMPERATURE UNIT

Chooses unit of water temperature measurement from °C and °F.

TIME DISPLAY

Chooses time notation; 12 hours or 24 hours.

BEARING READOUT

Chooses how to calculate range and bearing, TRUE or MAGNETIC.

True bearing is a bearing measured using true North as the reference direction, and it is calculated by the formula True Bearing =Magnetic Bearing +Magnetic Variation. Magnetic bearings are measured with magnetic north as the reference direction.

Select MAGNETIC when using a magnetic compass, TRUE for using the gyrocompass.

MAGNETIC VARIATION

The location of the magnetic north pole is different from the geographical north pole. This causes a difference between the true and magnetic north location. This difference is called magnetic variation, and varies with respect to the observation point on earth. Your unit is preprogrammed with all the earth's magnetic variations. However, you may wish to enter variation manually to refine accuracy.

1. Rotate the [ENTER] knob to select MAGNETIC VARIATION.
2. Press the [2] key to select "2. MANUAL."
3. Key in the magnetic variation referring to a nautical chart.
4. Press the [CURSOR ON/OFF] key to switch from East to West and vice versa.
5. Press the [ENTER] knob.

HEADING MARKER

You may extend a line from the own ship position to show ship's heading. (Heading data is required.) The length of line depends on the setting of COURSE VECTOR below.

COURSE VECTOR

The course display, which may be a vector or bar, may be turned on or off as appropriate.

Vector: Length varies with speed. (The length is not affected by display scale.)

Bar: Shows course.

WAYPOINT SWITCHING

Chooses waypoint switching method, PERPENDICULAR or ARRIVAL CIRCLE. (See page 7-10.)

RNG & BRG MODE

When you set a destination, the equipment displays the range, bearing and course to that destination. Range and bearing are calculated by the Great Circle or Rhumb Line method. Route total distance is also calculated. Cross-track error is only calculated in the Great Circle method.

Rhumb line: This method calculates the range and bearing between two points drawn on a nautical chart. Since the bearing is kept constant it is ideal for short-range navigation.

Great circle: This course line is the shortest course between two points on the surface of the earth, like stretching a piece of string between two points on earth. Because frequent course changes are required it is most suitable for long-range navigation.

SET GOTO METHOD

Selects the method by which to navigate to a quick point from among 1 POINT, 35 POINTS, NEAR SERVICE and PORT SERVICE. (See paragraph 7.1.)

RANGE/SCALE

Selects the method how to show the display width, RANGE or SCALE.

SCALE DISPLAY

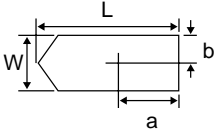
Turns the scale on or off in the PLOTTER (or PILOT) display.

GPS STATUS

Turns GPS status abbreviations on or off in the PLOTTER (or PILOT) display.


Page 2

- On page 1 of the DISPLAY SETUP menu, rotate the [ENTER] knob to select NEXT PAGE to show page 2 of the DISPLAY SETUP menu.

0-1. DISPLAY SETUP		2/2
PREVIOUS PAGE		
▶ WAYPOINT STATUS	<input type="checkbox"/> 1. ON	<input type="checkbox"/> 2. OFF
WAYPOINT INFO	<input type="checkbox"/> 1. ON	<input type="checkbox"/> 2. OFF
MARK STATUS	<input type="checkbox"/> 1. ON	<input type="checkbox"/> 2. OFF
OWN SHIP'S MARK	<input type="checkbox"/> 1. LARGE	<input type="checkbox"/> 2. SMALL <input type="checkbox"/> 3. SHIP
SHIP'S LENGTH	10.0 m (0.1 99.9 m)	
SHIP'S WIDTH	02.0 m (0.1 99.9 m)	
ANTENNA POSITION Va	05.0 m (0.1 99.9 m)	
ANTENNA POSITION Hb	01.0 m (0.1 99.9 m)	
		
TURN KNOB TO SELECT MENU. SELECT ITEM OF EACH MENU BY TRACKBALL.		

Display setup menu (Page 2)

WAYPOINT STATUS

Turns the waypoint status icon () on or off on the PLOTTER (or PILOT) display.

This icon shows the current shape and color of waypoints.

WAYPOINT INFO

Turns the waypoint data on or off. When ON is selected, place the cursor on a waypoint to show the waypoint data box.

MARK STATUS

Turns the mark data on or off. When ON is selected, place the cursor on a mark to show the mark data box.

OWN SHIP'S MARK

Selects own ship's mark size from among LARGE, SMALL or SHIP. "SHIP" is selected to indicate the length and width of your vessel, with SHIP'S LENGTH, SHIP'S WIDTH, ANTENNA POSITION Va and ANTENNA POSITION Hb below.

SHIP'S LENGTH, SHIP'S WIDTH

Sets the ship's length and width. (See the installation manual.)

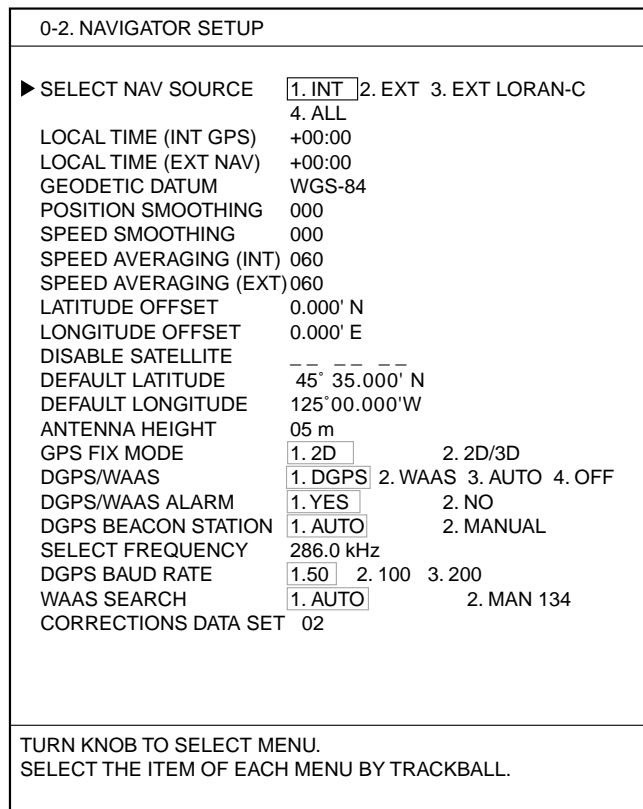
ANTENNA POSITION Va, ANTENNA POSITION Hb

Sets the antenna unit position. (See the installation manual.)

9.4 NAVIGATOR SETUP Menu

The NAVIGATOR SETUP menu chooses the source of navigation data and sets up the built-in GPS receiver.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [2] key to show the NAVIGATOR SETUP menu.



Navigator setup menu

SELECT NAV SOURCE

Selects the source of position data from among INT (internal), EXT (external), EXT (external) LORAN-C and ALL. For details, see the installation manual. When selecting EXT, EXT LORAN-C or ALL, "EXT" appears at the bottom of the PLOTTER (PILOT) display.

LOCAL TIME (INT GPS)

GPS uses UTC time. If you would rather use local time, key in the time difference between it and UTC time. Use the [CURSOR ON/OFF] key to switch from "+" to "-" and vice versa. The setting range is -13:30 to +13:30.

LOCAL TIME (EXT NAV)

If the NMEA time data fed from external equipment is wrong and cannot be corrected at the external equipment, enter an offset here to correct it. Use the [CURSOR ON/OFF] key to switch from "+" to "-" and vice versa.

GEODETTIC DATUM

Your unit is preprogrammed with most of the major chart systems of the world. Although the WGS-84 system, the GPS standard, is now widely used other categories of charts still exist. Select the chart system used, not the area where your boat is sailing.

1. Rotate the [ENTER] knob to select GEODETTIC DATUM.
2. Roll the trackball in left-right direction to select the chart system you are using.

The geodetic datum system selected appears at the bottom of the PLOTTER (or PILOT) display.

WGS84: WGS-84 is selected.

TOKYO: TOKYO-MN is selected.

LOCAL: Other chart system is selected.

POSITION SMOOTHING

When the DOP or receiving condition is unfavorable, the GPS fix may change, even if the vessel is dead in water. This change can be reduced by smoothing the raw GPS fixes. A setting between 000 to 999 is available. The higher the setting, the more smoothed the raw data, however too high a setting slows response time to change in latitude and longitude. This is especially noticeable at high ship's speeds. 000 is the normal setting; increase the setting if the GPS fix changes.

SPEED SMOOTHING

During position fixing, ship's velocity (speed) is directly measured by receiving GPS satellite signals. The raw velocity data may change randomly depending on receiving conditions and other factors. You can reduce this random variation by increasing the smoothing. Like with latitude and longitude smoothing, the higher the speed smoothing the more smoothed the raw data. If the setting is too high, however, the response to speed and course change slows. For no smoothing, enter all zeroes.

SPEED AVERAGING (INT)

Calculation of ETA and TTG is based on average ship's speed over a given period. If the period is too long or too short, calculation error will result. Change the setting accordingly if calculation error occurs.


SPEED AVERAGING (EXT)

Speed averaging for the ship's speed data received from external equipment in NMEA format.

LATITUDE OFFSET, LONGITUDE OFFSET

GPS-generated position may be off by some seconds because of various factors. In this case, you can apply an offset to GPS position to refine position accuracy. Calculate the error on a nautical chart.

1. Rotate the [ENTER] knob to select LATITUDE OFFSET or LONGITUDE OFFSET.
2. Press the numeric keys to enter the error value.
3. To switch North and South (East and West), press the [CURSOR ON/OFF] key.
4. Press the [ENTER] knob.

The L/L offset icon () appears at the bottom of the PLOTTER (or PILOT) display.

DISABLE SATELLITE

Every GPS satellite is broadcasting abnormal satellite number(s) in its Almanac, which contains general orbital data about all GPS satellites, including those which are malfunctioning. Using this information, the GPS receiver automatically eliminates any malfunctioning satellite from the GPS satellite schedule. However, the Almanac sometimes may not contain this information. If you hear about a malfunctioning satellite from another source, you can disable it manually. Enter satellite number (max. 3 satellites) in two digits.

DEFAULT LATITUDE, DEFAULT LONGITUDE

The default latitude and longitude position is Seattle, U.S.A. (45°35.000'N, 125°00.000'W). When the unit is turned on for the first time it begins searching for its actual position. To lessen the time required to find position, you may enter your position manually. Use the [CURSOR ON/OFF] key to switch co-ordinate.

ANTENNA HEIGHT

Enter the height of the antenna unit above sea surface. For further details, refer to the installation manual.

GPS FIX MODE

You can choose the position-fixing mode from 2D or 2D/3D. When selecting 2D/3D, 2D or 3D is automatically chosen depending on the number of available satellites. (3D requires four or more satellites.)

DGPS/WAAS

Choose the position-fixing method among DGPS, WAAS and AUTO. DGPS requires the optional DGPS receiver board. For WAAS, see the "WAAS Facility" at the back of this manual.

AUTO fixes position by WAAS when DGPS correction data is not available. For normal GPS positioning, select "OFF."

DGPS/WAAS ALARM

This alarm alerts you (by audible and visual alarms) when the WAAS or DGPS signal is lost.

YES: Alarm sounds when the position fixing method is switched from WAAS to DGPS or vice versa.

NO: Alarm sounds once when WAAS or DGPS signal is lost.

DGPS BEACON STATION

DGPS reference station can be searched automatically or manually. For manual search, select MANUAL here, and set frequency of DGPS reference station.

1. Rotate the [ENTER] knob to select DGPS BEACON STATION.
2. Press the [2] key to select "2. MANUAL."
3. Rotate the [ENTER] knob to choose SELECT FREQUENCY.
4. Roll the trackball in left-right direction to set the station of DGPS reference station which is the nearest to own ship.

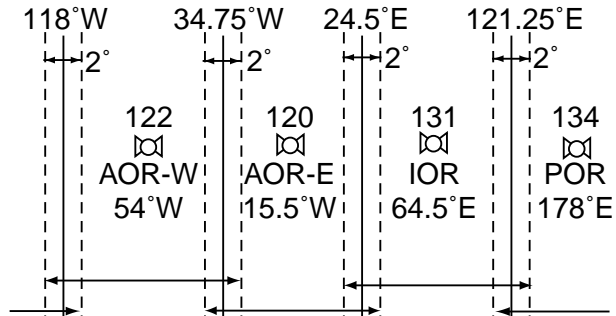
DGPS BAUD RATE

Selects the transmission rate of the DGPS reference station nearest you, among 50, 100 or 200 (bps). This setting is only effective when DGPS BEACON STATION is "MANUAL."

WAAS SEARCH

Choose AUTO for automatic search or MANUAL for manual search. For MANUAL, enter appropriate WAAS satellite number, referring to the illustration below.

AUTO mode and GEO satellite



Longitude Range	Satellite
120.25°E to 117°W	134
119°W to 33.75°W	122
35.75°W to 25.5°E	120
23.5°E to 122.25°E	131

CORRECTIONS DATA SET

Determines how to use the WAAS signal, which is currently in the test mode. Use "02" (default setting) until the WAAS system changes from its current "Testing Status" to "Operational Status." Then, switch to setting "0."

9.5 PROGRAMMABLE KEYS & REMOTE CONTROLLER SETUP Menu

This paragraph shows how to program keys and the remote controller (option).

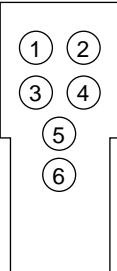
9.5.1 Programmable key setup

The [PROG] key provides one-touch execution of desired function. Further, the [SHIFT], [RANGE], [GAIN] and [VRM] keys can also be programmed for other functions. The default programs for those keys are as shown in the table below.

Key label	Functions
PROG	Shows the WAYPOINTS LIST.
SHIFT	Shows E/S SHIFT window.
RANGE	Shows E/S RANGE window.
GAIN	Shows E/S GAIN window.
VRM	Use the VRM function. (When the menu is turned off.)

If the above settings are not to your liking, you may change them as below.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [3] key to show the PROGRAMMABLE KEYS & REMOTE CONTROLLER SETUP menu.

0-3. PROGRAMMABLE KEYS & REMOTE CONTROLLER SETUP	
▶ PROGRAMMABLE KEYS SETUP	
WAYPOINTS LIST	
SHIFT KEY SETUP	
E/S SHIFT	
RANGE KEY SETUP	
E/S RANGE	
GAIN KEY SETUP	
E/S GAIN	
VRM KEY SETUP	
VRM	
REMOTE CONTROLLER KEY SETUP	
SAVE/MOB KEY	
REMOTE CONTROLLER KEY 2 SETUP	
PRES KNOB TO ENTER	
REMOTE CONTROLLER KEY 3 SETUP	
CLEAR KEY	
REMOTE CONTROLLER KEY 4 SETUP	
MARK 1	
REMOTE CONTROLLER KEY 5 SETUP	
RANGE - ZOOM IN	
REMOTE CONTROLLER KEY 6 SETUP	
RANGE - ZOOM OUT	
	
	REMOTE CONTROLLER
TURN KNOB TO SELECT MENU AND PRESS KNOB TO ENTER.	

Programmable key & remote controller setup menu

4. Rotate the [ENTER] knob to select the item (key) you want to change, and then press the [ENTER] knob.
 When changing the function of the [PROG] key, for example, select PROGRAMMABLE KEYS SETUP.
 The PROGRAMMABLE FUNCTION LIST appears (shown on the next page). This list has two pages, page 1 for plotter functions and page 2 for echo sounder functions. For echo sounder functions, see paragraph 11.16.
5. If page 2 appears, rotate the [ENTER] knob to select PREVIOUS PAGE.
 You can change pages by pressing the [ZOOM IN] key (page 1) and [ZOOM OUT] key (page 2).
6. Rotate the [ENTER] knob to choose a function and press the [ENTER] knob.
 The selected function appears in the menu.
7. Press the [MENU] key several times to close the menu.

The next page shows the menu items and functions.

Function keys

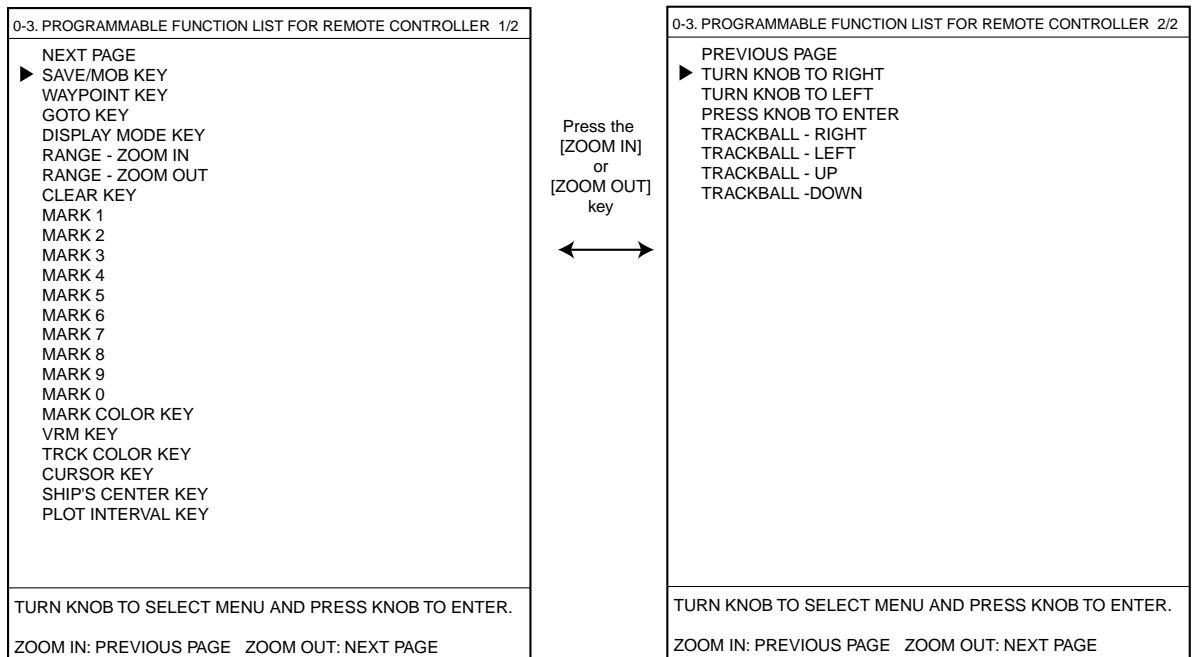
Menu item	Function
WAYPOINTS LIST	Shows the WAYPOINTS LIST.
ROUTES LIST	Shows the ROUTES LIST.
DISP MEMORY CARD	Shows the DISPLAY DATA FROM MEMORY CARD menu appears.
DISP INT MEMORY	Shows the DISPLAY DATA FROM INTERNAL MEMORY menu.
INT MEM OPERATION	Shows the OPERATE INTERNAL MEMORY menu.
MARKS/LINES	Each press of the key changes the line type in the sequence below. Solid line → Dotted line → Alternate long and short dashed lines → Double-dashed line
DISP TARGET TRACKS	Turns the target tracks on or off.
DISP SUB TRACKS	Turns the sub tracks on or off.
EDIT MARKS	Shows the EDIT MARKS window.
DELETE MARKS	Shows the DELETE MARKS window
SAVE MARKS	Shows the SAVE MARKS window
EDIT TRACKS	Shows the EDIT SHIP'S TRACKS window.
DELETE TRACKS	Shows the DELETE SHIP'S TRACKS window.
DELETE ALL TRACKS	Deletes own ship's track wholly. (This function is not available when a menu is displayed.)
ALARM SETUP	Shows the ALARM SETUP menu.
DISP ALL SYMBOLS	Turns all navigation symbols on or off.
CONTOUR LINE SETUP	Turns the contour lines on or off. (This function is not available when a menu is displayed.)
RESET TRIP LOG	Resets the trip log to "0."
PANEL DIMMER	Change the panel dimmer in the sequence of 1→2→3→...→8→7...
HUE	Each press of the [PROG] key changes DAY→NIGHT→TWILI (twilight) →MANUAL→DAY in that order. (This function is not available when a menu is displayed.)
VRM	Enables the VRM function. (This function is not available when a menu is displayed.)

9.5.2 Remote controller (option) setup

The keys of the optional remote controller can be programmed as below.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [3] key to show the PROGRAMMABLE KEYS & REMOTE CONTROLLER SETUP menu.
4. Rotate the [ENTER] knob to select a key No. of the remote controller.
For key location, refer to the figure in the menu.

The PROGRAMMABLE FUNCTIONS LIST FOR REMOTE CONTROLLER menu appears.



Programmable functions list for remote controller menu

5. Rotate the [ENTER] knob to select a function, and then press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.
7. Write the selected function name on the label supplied with the remote controller.
8. Attach the label to the remote controller.

Function keys for remote controller

Menu items	Functions
SAVE/MOB KEY	Same as [SAVE/MOB] key on the display unit
WAYPOINT KEY	Enters waypoint under the youngest empty waypoint number not used.
GOTO KEY	Same as [GOTO] key on the display unit.
DISPLAY MODE KEY	Same as [DISP] key on the display unit.
RANGE-ZOOM IN	Same as [ZOOM IN] key on the display unit.
RANGE-ZOOM OUT	Same as [ZOOM OUT] key on the display unit.
CLEAR KEY	Same as [CLEAR] key on the display unit.
MARK 1 to 0	Same as [1] to [0] keys on the display unit.
MARK COLOR KEY	Same as [MARK COLOR] key on the display unit.
VRM KEY	Same as [VRM] key on the display unit.
TRACK COLOR KEY	Same as [TRACK COLOR] key on the display unit.
CURSOR KEY	Same as [CURSOR ON/OFF] key on the display unit.
SHIP'S CENTER key	Same as [CENTER] key on the display unit.
PLOT INTERVAL KEY	Same as [PLOT INTVL] key on the display unit.
TURN KNOB TO RIGHT (TO LEFT)	Same as rotating the [ENTER] knob on the display unit clockwise (counterclockwise).
PRESS KNOB TO ENTER	Same as pressing the [ENTER] knob.
TRACKBALL-RIGHT (LEFT, UP, DOWN)	Same as rolling the trackball to right (left, upward, downward) direction.

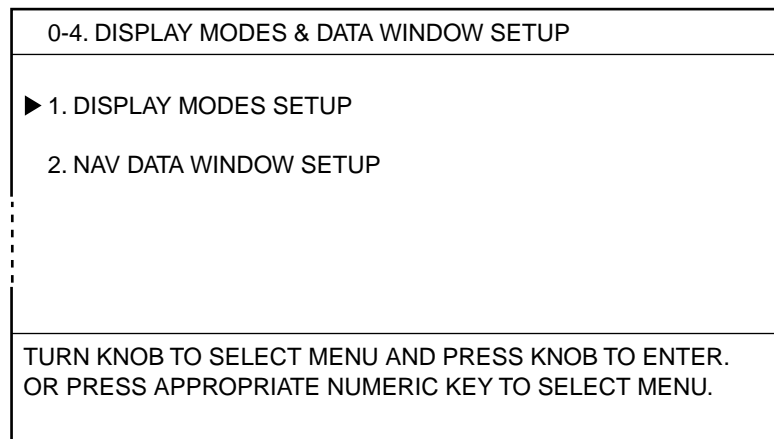
9.6 DISPLAY MODES & NAV DATA WINDOW SETUP Menu

This menu sets up the DISPLAY MODE and NAVIGATION DATA screens.

9.6.1 Setting the DISPLAY MODE screen

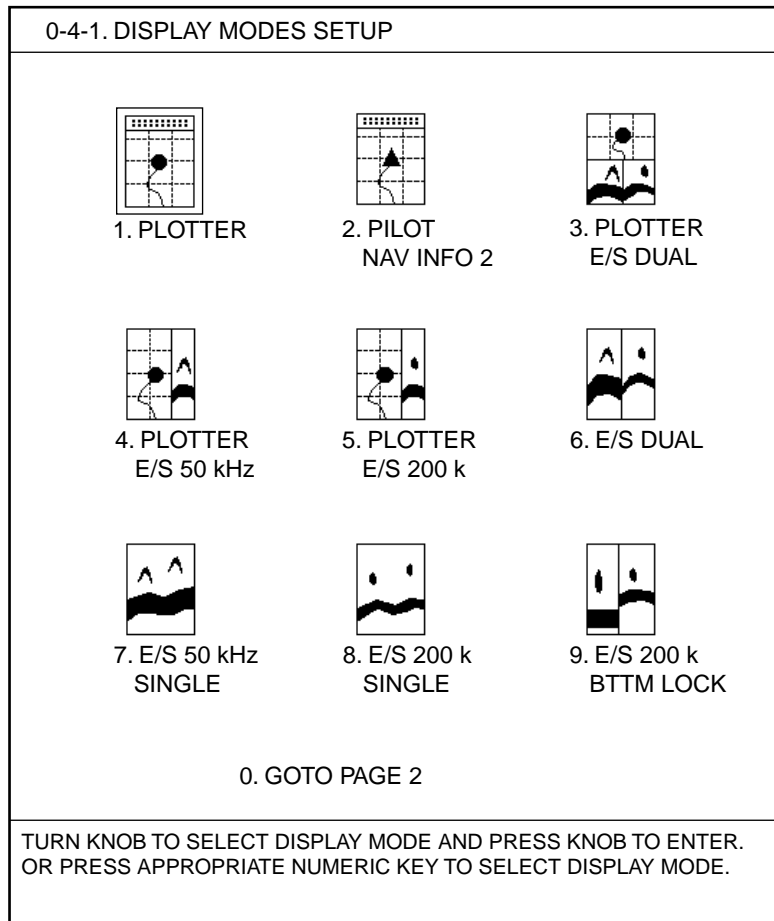
The DISPLAY MODE screen appears when pressing the [DISP] key and it is used to choose a display mode. You may choose and arrange the display mode icons as desired.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [4] key to show the DISPLAY MODES & NAV DATA WINDOW SETUP menu.



Display modes & nav data window setup menu

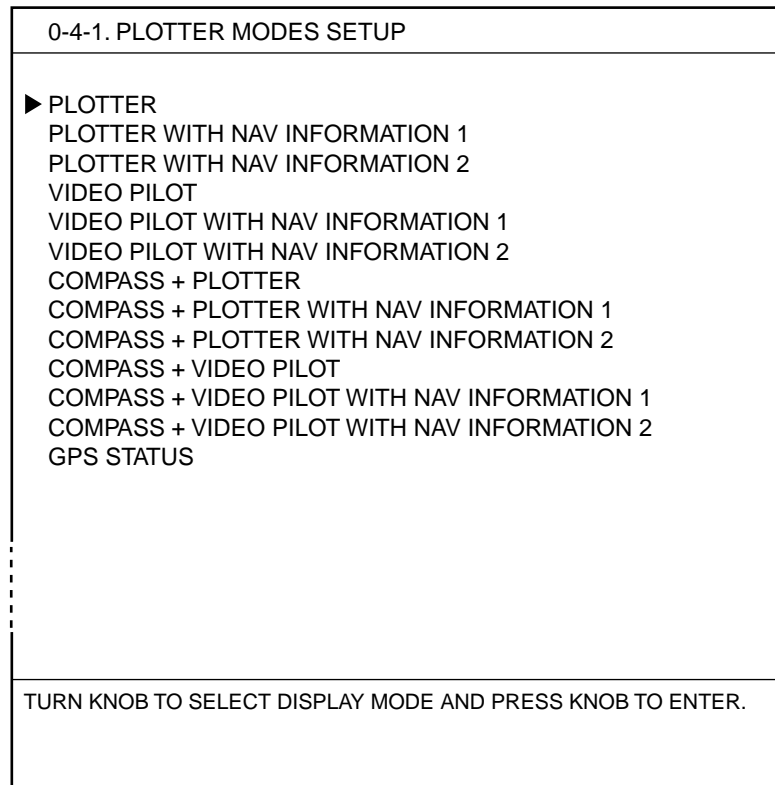
4. Press the [1] key to show the DISPLAY MODES SETUP menu.



Display modes setup menu

5. Press the [0] key several times to show the page you want to change.
6. Press the appropriate numeric key to select the display you want to change.
The setup menu appears. This menu has six pages, PLOTTER, ECHO SOUNDER 50/200 kHz, ECHO SOUNDER 50 kHz (2 pages) and ECHO SOUNDER 200 kHz (2 pages). For echo sounder menus, see paragraph 11.17.
7. Press the [ZOOM IN] or [ZOOM OUT] key to show the PLOTTER MODES SETUP menu.

9. CUSTOMIZING YOUR UNIT



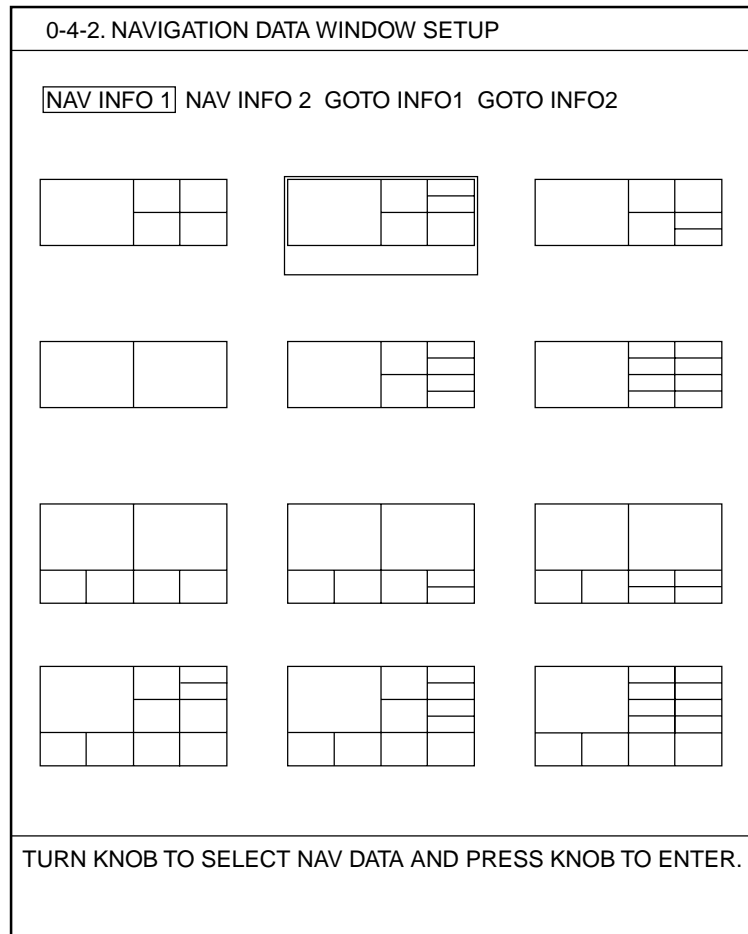
Plotter mode setup menu

8. Rotate the [ENTER] knob to select a display type, and then press the [ENTER] knob.
The DISPLAY MODES SETUP menu appears.
9. Press the [MENU] key to close the menu.

9.6.2 Setting the navigation data window

The navigation data window appears at the top of the PLOTTER (or PILOT) NAV INFO 1 display and PLOTTER (or PILOT) NV INFO 2 display. You may select the data to display and where to display it as follows:

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [4] key to show the DISPLAY MODES & NAV DATA WINDOW SETUP menu.
4. Press the [2] key to show the NAVIGATION DATA WINDOW SETUP menu.



Navigation data setup menu

5. Roll the trackball in left-right direction to select a display title.
 - NAV INFO1: Window shown on NAV INFO1 display.
 - NAV INFO2: Window shown on NAV INFO2 display.
 - GOTO INFO1: Window shown when a destination is set at NAV INFO1 display.
 - GOTO INFO2: Window shown when a destination is set at NAV INFO2 display.
6. Rotate the [ENTER] knob to select a display pattern, and then press the [ENTER] knob.

0-4-2. NAVIGATION DATA WINDOW SETUP

NEXT PAGE

- ▶ OWN SHIP POSITION LAT/LON
- OWN SHIP POSITION TD LORAN-A
- OWN SHIP POSITION TD LORAN-C
- OWN SHIP POSITION TD DECCA
- CURSOR POSITION LAT/LON
- CURSOR POSITION TD LORAN-A
- CURSOR POSITION TD LORAN-C
- CURSOR POSITION TD DECCA
- OWN SHIP/CURSOR POSITION LAT/LON
- OWN SHIP/CURSOR POSITION TD LORAN-A
- OWN SHIP/CURSOR POSITION TD LORAN-C
- OWN SHIP/CURSOR POSITION TD DECCA
- WAYPOINT POSITION LAT/LON
- WAYPOINT POSITION TD LORAN-A
- WAYPOINT POSITION TD LORAN-C
- WAYPOINT POSITION TD DECCA
- WAYPOINT POSITION ETA & TTG
- WAYPOINT POSITION ETA & TTG

Press the [ZOOM IN] or [ZOOM OUT] key to change the page.

SHIP/CURSOR POSITION LAT/LON	SOG	PLOT INTERVAL
		DATE
	COG DEGREE	TIME

Large column Middle column Small column

SELECT THE POSITION TO BE DISPLAYED BY TRACKBALL.
TURN KNOB TO SELECT NAV DATA AND PRESS KNOB TO ENTER.
ZOOM IN: PREVIOUS PAGE ZOOM OUT: NEXT PAGE

Navigation data window setup menu

7. Operate the trackball to select a location.
The selected column becomes red.
8. Rotate the [ENTER] knob to select the data to display.
The navigation data window setup menu has three pages, changed by pressing the [ZOOM IN] or [ZOOM OUT] keys. Depending on the column size, the available data may be changed. (See the table on the next page.)
9. Press the [ENTER] knob.
The data selected at step 8 appears at the location selected at step 7.
10. Press the [MENU] key several times to close the menu.

Available data

Data	Large column	Middle column	Small column
OWN SHIP POSIITON	YES	YES	NO
OWN SHIP POSITION TD LORAN-A	YES	YES	NO
OWN SHIP POSITION LORAN-C	YES	YES	NO
OWN SHIPOSITION TD DECCA	YES	YES	NO
CURSOR POSIITON LAT/LON	YES	YES	NO
CURSOR POSIITON TD LORAN-A	YES	YES	NO
CURSOR POSIITON TD LORAN-C	YES	YES	NO
CURSOR POSIITON TD DECCA	YES	YES	NO
OWN SHIP/CURSOR POSIITON LAT/LON	YES	YES	NO
OWN SHIP/CURSOR POSIITON TD LORAN-A*	YES	YES	NO
OWN SHIP/CURSOR TD LORAN-C*	YES	YES	NO
OWN SHIP/CURSOR POSIITON TD DECCA*	YES	YES	NO
WAYPOINT POSITION LAT/LON	YES	YES	NO
WAYPOINT POSITION TD LORAN-A	YES	YES	NO
WAYPOINT POSITION TD LORAN-C	YES	YES	NO
WAYPOINT POSITION TD DECCA	YES	YES	NO
WAYPOINT POSITION ETA & TTG	YES	YES	NO
CURSOR POSITION ETA & TTG	YES	NO	NO
DISTANCE TO CURSOR POSITION	NO	YES	YES
BEARING TO CURSOR (DEGREE)	NO	YES	YES
BEARING TO CURSOR (NORTH-SOUTH-EAST-WEST)	NO	YES	YES
TTG TO CURSOR POSITIONJ	NO	YES	YES
ETA TO CURSOR POSITION	NO	YES	YES
WAYPOINT NAME	NO	YES	YES
DISTANCE TO WAYPOINT	NO	YES	YES
BEARING TO WAYPOINT (DEGREE)	NO	YES	YES
BEARING TO WAYPOINT (NORTH-SOUTH-EAST-WEST)	NO	YES	YES
TTG TO WAYPOINT	NO	YES	YES
ETA TO WAYPOINT	NO	YES	YES
COG (DEGREE)	NO	YES	YES
COG (NORTH-SOUTH-EAST-WEST)	NO	YES	YES
HEADING (DEGREE)	NO	YES	YES
HEADING (NORTH-SOUTH-EAST-WEST)	NO	YES	YES
SOG	NO	YES	YES

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STW	NO	YES	YES
TRIP LOG	NO	YES	YES
ODOMETER	NO	YES	YES
DEPTH	NO	YES	YES
TEMPERATURE	NO	YES	YES
DATE	NO	YES	YES
TIME	NO	YES	YES
OWN SHIP POSITION (FOR JAPANESE)	Not used.		
CURSOR POSITION (FOR JAPANESE)	Not used.		
OWN SHIP/CURSOR POSITION (FOR JAPANESE)	Not used.		
SHIP'S TRACK PLOTTING INTERVAL	NO	YES	YES
SCALE	NO	YES	YES
GPS STATUS	NO	YES	YES
DOP	NO	YES	YES
ALARM	NO	YES	YES

*: When turning the cursor on, the data for cursor is shown. (If turned off, the data for own ship's position appears.)

9.7 I/O PORT SETUP Menu

This menu sets up the I/O ports, and should be done at the installation. Note that the data transfer between this unit and external equipment may be wrong after changing this menu settings. Be sure the ports are correctly set. Improper setting may prevent proper transfer of data.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [5] key to show the I/O PORT SETUP menu.

0-5. I/O PORT SETUP			
▶ NMEA I/O PORT 1			
NMEA FORMAT	1. NMEA0183 Ver 1.5	2. Ver 2.0	
TLL OUTPUT	1. ON 2. OFF		
L/L FORMAT	1. DD°MM.MM' 2. DD°MM.MMM'		
	3. DD°MM.MMMM'		
OUTPUT DESTINATION	1. ON 2. OFF		
SELECT OUTPUT SENTENCE	1. ON 2. OFF		
NMEA I/O PORT 1			
NMEA FORMAT	1. NMEA0183 Ver 1.5 2. Ver 2.0		
TLL OUTPUT	1. ON 2. OFF		
L/L FORMAT	1. DD°MM.MM' 2. DD°MM.MMM'		
	3. DD°MM.MMMM'		
OUTPUT DESTINATION	1. ON 2. OFF		
SELECT OUTPUT SENTENCE	1. ON 2. OFF		
RS232C FORMAT			
BAUD RATE	1. 4800 2. 9600 3. 19200 4. 38400		
CHARACTER LENGTH	1. 7 BIT 2. 8 BIT		
STOP BIT	1. 1 BIT 2. 2 BITS		
PARITY	1. EVEN 2. ODD 3. OFF		
NMEA FORMAT	1. NMEA0183 Ver 1.5 2. Ver 2.0		
L/L FORMAT	1. DD°MM.MM' 2. DD°MM.MMM'		
	3. DD°MM.MMMM'		
OUTPUT DESTINATION	1. ON 2. OFF		
SELECT OUTPUT SENTENCE	1. ON 2. OFF		
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.			

I/O port setup menu

NMEA FORMAT

Select NMEA0183 version 1.5 or 2.0 depending on the navigator connected.

TLL OUTPUT

Select ON to output L/L data to the navigator connected at the moment a mark is entered.

L/L FORMAT

Selects the number of minute places to shown in latitude and longitude position, from hundredth, thousandth or ten thousandth.

OUTPUT DESTINATION

Select ON to output the WPT sentence to the navigator connected when setting a route as destination.

SELECT OUTPUT SENTENCE

Selects sentences to output.

1. Rotate the [ENTER] knob to select SELECT OUTPUT SENTENCE.
2. Press the [1] key to select "1. ON" to show the NMEA SENTENCES LIST.
3. Rotate the [ENTER] knob to select a sentence.
4. Press the [ENTER] knob to display ON or OFF as appropriate.
5. Repeat step 3 and 4 for other sentences.
6. Press [MENU] key to return to I/O PORT SETUP menu.

AAM: Arrival alarm
 APB: Autopilot sentence (XTE, XTE direction, arrival radius, bearing and destination from origin to destination)
 BOD: Bearing origin to destination
 BWR: Bearing and distance to waypoint (rhumb line)
 BWC: Bearing and distance to waypoint (great circle)
 DPT: Depth (only for Version 2.0)
 DBT: Depth below transducer (only for Version 1.5)
 GGA: GPS fix data (UTC of position, L/L, receiving status, number of satellite in use, DOP)
 GLL: Longitude and latitude
 GTD: TD Loran-C
 MTW: Water temperature
 RMA: Recommended minimum specific Loran-C data
 RMB: Recommended minimum navigation information (XTE, direction to steer, destination waypoint ID, origin waypoint L/L, destination waypoint L/L, range and bearing between waypoints, range and bearing to destination, destination closing velocity, arrival alarm)
 RMC: Recommended minimum specific GPS/TRANSIT data
 VHW: Water speed and heading
 VTG: Course over ground and ground speed
 WPL: Waypoint location
 XTE: Cross-track error, measured
 ZDA: Time and date
 HDT: Heading true
 HDG: Heading, deviation and variation
 MWV: Wind speed and angle
 TTM: Tracked target message

BAUD RATE

Selects data baud rate among 4800, 9600, 19200 and 38400.

CHARACTER LENGTH

Selects data character length 7 bit or 8 bit.

STOP BIT

Selects stop bit, 1 bit or 2 bit.

PARITY

Selects parity among EVEN, ODD or OFF.

9.8 TEST & MEMORY CLEAR Menu

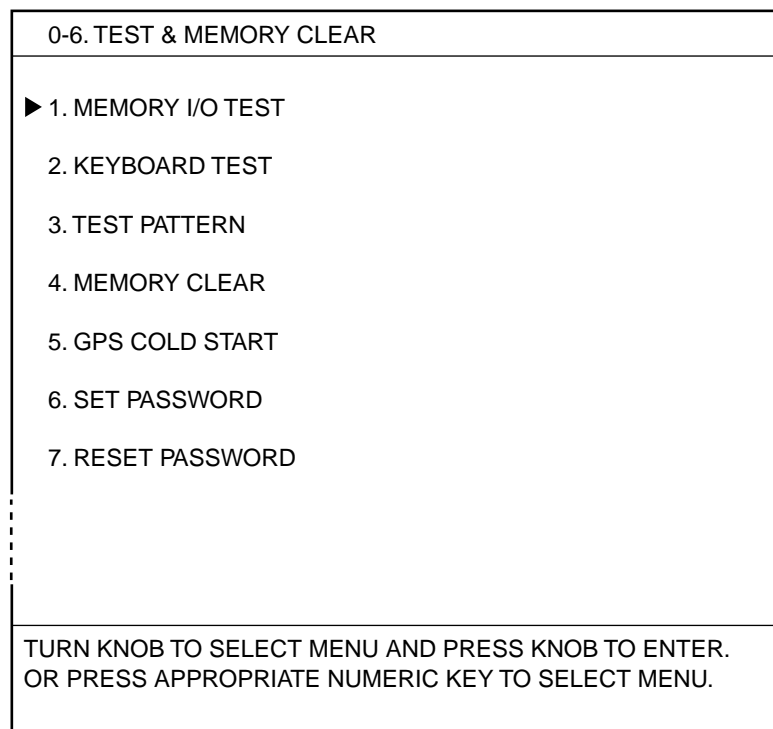
This menu provides the diagnostic test, memory clearing, GPS cold start and setting the password.

In this section, only the password function is described. For other items, see Chapter 12.

9.8.1 Setting the password

You may use a password to prevent unauthorized operation of the equipment. The equipment cannot be operated unless the correct password is entered, at the power is on of the equipment. Do not forget the password. If you forget the password, contact a FURUNO agent or dealer for advice. (The serviceman will restore default settings, all waypoints and marks are erased.)

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [6] key to show the TEST & MEMORY CLEAR menu.



Test & memory clear menu

4. Press the [6] key to show the password window.

										END														
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
Z	,	-	!	?	/	&	=	#	_	1	2	3	4	5	6	7	8	9	0	---	---	---	---	---
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y
z	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
										◀▶														
TURN KNOB TO SELECT MENU.																								
SELECT THE ITEM OF EACH MENU BY TRACKBALL.																								

Password window

5. Operate the trackball and [ENTER] knob to enter a password.
The entered character is shown with asterisk.
6. Operate the trackball to select "END", and then press the [ENTER] knob.
7. Enter the password set at step 5.
8. Select "END", and then press the [ENTER] knob to return to the TEST & MEMORY CLEAR menu.

Note 1: If the passwords entered at step 5 and 7 are different, an error message appears. Enter the correct password again.

Note 2: When the [MENU] key is pressed before "END" is selected, the TEST & MEMORY CLEAR menu appears. Enter password.

9. Press the [MENU] key several times to close the menu.

Note: At the next power-up, you will be prompted to enter the password.
Enter it as follows:

- a) Enter your password. The characters are shown with an asterisk mark.
- b) Select "END", and then press the [ENTER] knob.

When your password is correct, the password window disappears after appearance of the message "PASSWORD IS ENTERED". If you enter an wrong password, the message "THE PASSWORD WAS INVALID. ENTER PASSWORD AGAIN." appears. Reenter your password.

9.8.2 Removing the password

To remove the password, do the following:

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [6] key to show the TEST & MEMORY CLEAR menu.
4. Press the [7] key to select RESET PASSWORD.
5. Press the [ENTER] knob to remove the password, or the [CLEAR] key to escape.
6. Press the [MENU] key several times to close the menu.

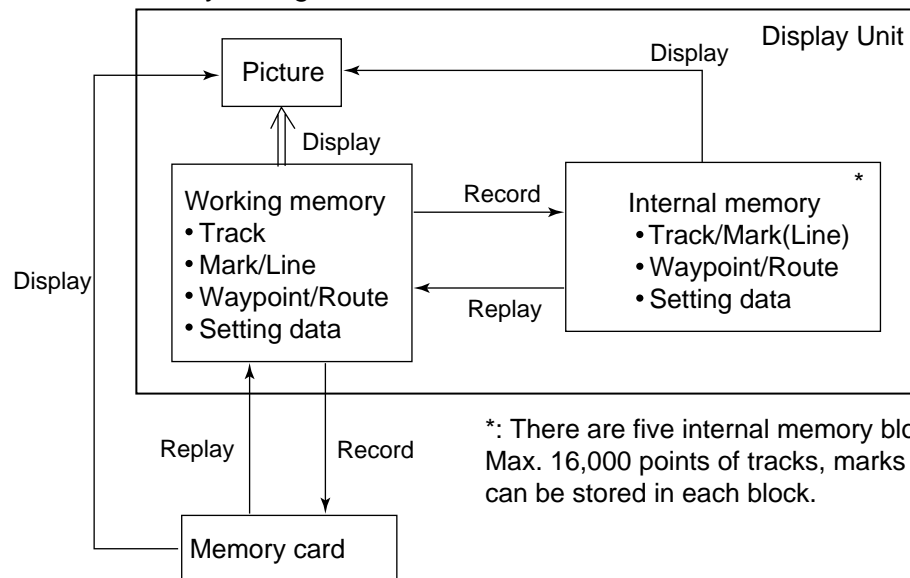
10. RECORDING & PLAYING BACK DATA

This chapter provides information necessary for recording and playing back data, and uploading and downloading data to (from) a PC.

10.1 Recording Data

Data can be recorded in the “working memory.” The working memory stores data such as position, marks, lines, waypoints. When it is full, earliest data are erased one by one to make room for new data. Thus it is good idea to save important data to a memory card or the internal memory.

This unit’s memory configuration is as shown below.



Memory configuration

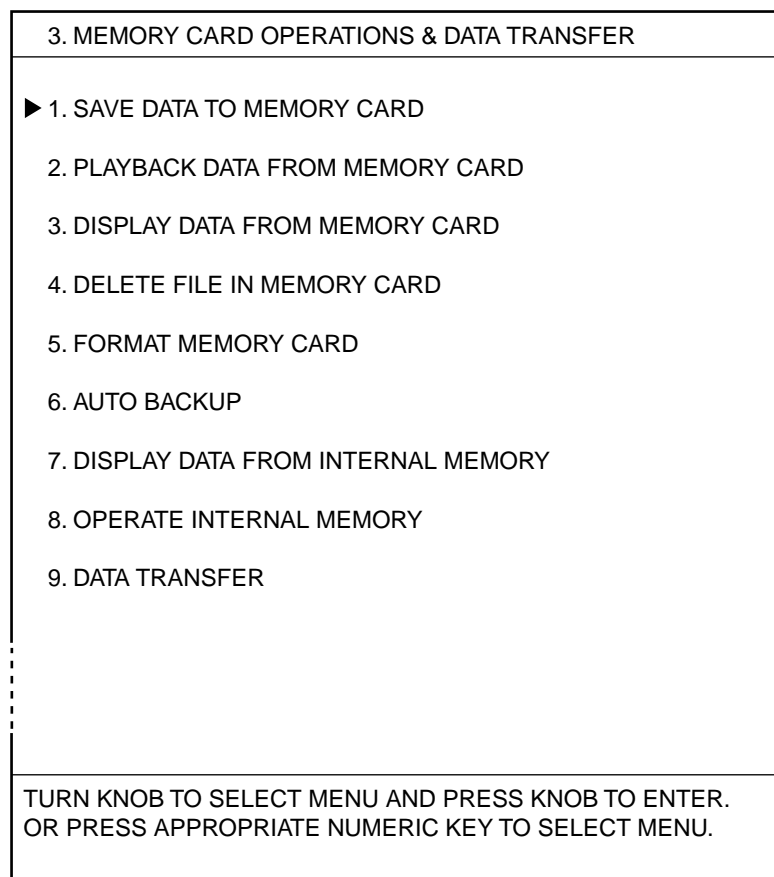
10.2 Memory Card Operation

10.2.1 Formatting memory cards

Before you can use a memory card, it must be formatted. Formatting prepares the card for use with the system. To format a card, follow the procedure below.

Note: Formatting a memory card erases all data from the card.

1. Open the slot cover at the front of the display unit.
2. Insert a blank memory card in to the left-hand card slot, with groove side up.
3. Close the slot cover.
4. Press the [MENU] key to show the main menu.
5. Press the [3] key to show the MEMORY CARD OPERATION & DATA TRANSFER menu.



Memory card operation & data transfer menu


6. Press the [5] key to show the FORMAT MEMORY CARD menu.

3-5. FORMAT MEMORY CARD	
▶ FORMAT MEMORY CARD	1. YES <input type="checkbox"/> 2. NO
SELECT "YES" BY TRACKBALL TO START THE FORMAT.	

Format memory card menu

7. Press the [1] key to select "1. YES."

The following message appears.

	START FORMATTING MEMORY CARD. ARE YOU SURE? YES ... PRESS KNOB NO ... PRESS CLEAR KEY
---	---

8. Press the [ENTER] knob.

The message "NOW FORMATTING MEMORY CARD" appears. When the formatting is completed, the message "FORMAT COMPLETED. PRESS KNOB TO CONTINUE." appears.

9. Press the [ENTER] knob.

Note: If you insert a mini chart card in the left slot, an error message appears. After pressing the [ENTER] knob, remove the chart card, insert a memory card and then retry the formatting.

10. Press the [MENU] key several times to close the menu.

10.2.2 Saving data to a memory card

You can save the data in the working memory (tracks, marks/lines, waypoints/routes data) to a memory card.

There are two methods to save data: save data to a new file or save it to an existing file in which the previous data is written over.

Creating a new file

1. Insert a formatted memory card into the left slot.
2. Press the [MENU] key to show the main menu.
3. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
4. Press the [1] key to show the SAVING DATA TO MEMORY CARD menu.

3-1. SAVING DATA TO MEMORY CARD		
▶ SHIP'S TRACKS	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
MARKS & LINES	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
WAYPOINTS & ROUTES	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
SETTING DATA	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
CREATE NEW FILE		
<div style="border-left: 1px solid black; border-top: 1px solid black; border-bottom: 1px solid black; height: 40px; width: 100%;"></div>	Name of files in the memory card	
<small>TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL. MOVE THE CURSOR ON THE FILE NAME AND PRESS KNOB TO SAVE DATA.</small>		

Saving data to memory card menu

5. Rotate the [ENTER] knob to select item to save.
SETTING DATA means user settings.
6. Press the [1] key to select "YES."
7. Repeat steps 5 and 6 to choose other items to save.
8. Rotate the [ENTER] knob to select CREATE NEW FILE, and then press the [ENTER] knob.
The character window appears.
9. Operate the trackball and [ENTER] knob to enter the file name. (max. 16 characters)
Enter the simple name, i.e., contents on purpose to use, to search it easily.

10. Operate the trackball to select "END", and then press the [ENTER] knob.

The message "NOW SAVING DATA TO MEMORY CARD. DO NOT TURN OFF DISPLAY UNIT UNTIL COMPLETED." appears.

When saving is completed, "COMPLETED SAVING DATA. PUSH ENTER KNOB TO CONTINUE." appears.

Note 1: When the file name entered at step 9 has been already exists, an error message appears. Press the [ENTER] knob to overwrite, or [CLEAR] key to cancel the saving.

Note 2: If data could not be saved, the message "SAVING IS FAILED. PUSH THE KNOB TO CONTINUE." appears. Press the [ENTER] knob to clear from the message.

Note 3: Various memory card messages appear to alert you to memory card-related error. These are shown below.

Memory card is not inserted.

"MEMORY CARD IS NOT INSERTED. PLEASE INSERT MEMORY CARD. PUSH KNOB TO CONTINUE."

Unformatted memory card

"MEMORY CARD IS NOT FORMATTED. PUSH KNOB TO CONTINUE."

Chart card inserted instead of memory card.

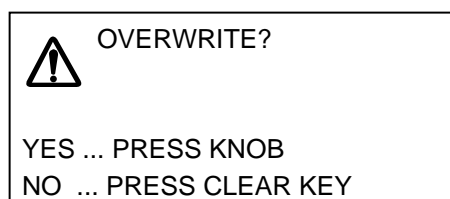
"WRONG CARD IS INSERTED. PLEASE INSERT CORRECT MEMORY CARD. PUSH KNOB TO CONTINUE."

11. Press the [ENTER] knob to show the new file name.

12. Press the [ENTER] knob several times to close the menu.

Saving to an existing file

1. Insert the memory card to be saved into the left slot.
2. Press the [MENU] key to show the main menu.
3. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
4. Press the [1] key to show the SAVING DATA TO MEMORY CARD menu.
5. Rotate the [ENTER] knob to select item to save.
6. Press the [1] key to select "YES."
7. Repeat steps 5 and 6 to choose other items to save.
8. Rotate the [ENTER] knob to select the file under which to save the data.
9. Press the [MENU] key to show the following window.



10. RECORDING & PLAYING BACK DATA

10. Press the [ENTER] knob.

The overwriting starts.

The message "NOW SAVING DATA TO MEMORY CARD. DO NOT TURN OFF DISPLAY UNIT UNTIL COMPLETED." appears. When the overwriting is finished, the message "COMPLETED SAVING DATA. PRESS KNOB TO CONTINUE." appears.

11. After the "completed" message appears, press the [ENTER] knob.

12. Press the [MENU] key several times to close the menu.

10.2.3 Displaying data from a memory card

Tracks and marks in a memory card can be displayed on the screen as follows.

1. Insert a memory card into the left slot.
2. Press the [MENU] key to show the main menu.
3. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
4. Press the [3] key to show the DISPLAY DATA FROM MEMORY CARD menu.

3-3. DISPLAY DATA FROM MEMORY CARD			
FILE NAME	TRACKS	MARKS	DISPLAY
▶ FILE 1	120	20	NO
FILE 2	916	0	NO

TURN KNOB TO SELECT FILE.
PRESS KNOB TO DISPLAY DATA.

Display data from memory card

Note: If an empty memory card is inserted, a beep sounds at step 4 operation.

5. Rotate the [ENTER] knob to select a file to load.
6. Press the [ENTER] knob to show "YES" at the DISPLAY column.
7. Repeat steps 5 and 6 to load other files.

Note: To escape, press the [ENTER] knob to select "NO."

8. Press the [MENU] key several times to close the menu.

Tracks and marks are displayed on the screen. These data can not be edited or erased.

10.2.4 Playing back data from a memory card


Files stored on a memory card can be loaded to the working memory and displayed on the screen. This is useful for analyzing data. However, waypoints/routes and setting data will be replaced with played back ones. For that reason, you may want to record the current display before replaying data.

1. Insert a memory card into the left slot.
2. Press the [MENU] key to show the main menu.
3. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
4. Press the [2] key to show the PLAYBACK DATA FROM MEMORY CARD menu.

3-2. PLAYBACK DATA FROM MEMORY CARD		
▶ SHIP'S TRACKS	1. YES	2. NO
MARKS & LINES	1. YES	2. NO
WAYPOINTS & ROUTES	1. YES	2. NO
SETTING DATA	1. YES	2. NO
FILE NAME	TRACKS	MARKS
SELECT THE MENU TO PLAYBACK BY TRACKBALL. TURN KNOB OT SELECT THE FILE TO PLAYBACK AND PRESS KNOB TO START.		

Playback data from memory card menu

5. Rotate the [ENTER] knob to select an item to load.
 6. Press the [1] key to select "YES."
 7. Repeat steps 5 and 6 to load other items.
 8. Rotate the [ENTER] knob to select a file, and then press the [ENTER] knob.
- The following window appears.

	PLAY BACK FILE. ARE YOU SURE?
YES ... PRESS KNOB NO ... PRESS CLEAR KEY	

9. Press the [ENTER] knob.

The message "NOW LOADING DATA FROM MEMORY CARD." appears. When the loading is finished, the message "COMPLETED LOADING DATA. PRESS KNOB TO CONTINUE." appears.

Note 1: To escape, press the [CLEAR] key instead of the [ENTER] knob.

Note 2: Loaded and current data are processed as follows:

Tracks: Since loaded track data is added to internal track, oldest track will be erased when the track memory capacity is exceeded.

Waypoints & routes: The loaded data replaces data previously stored.

Marks and lines: The loaded data is added to internal data. When the mark/line memory becomes full no marks may be entered.

Setting data: The loaded data replaces current configuration settings. If the memory card is ejected while loading or data could not be loaded, push the [ENTER] knob to restart. Note that track memory allocation is not saved or loaded.

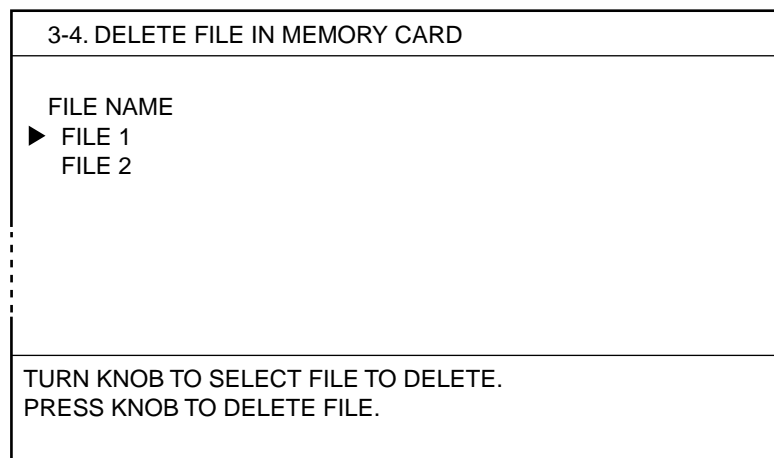
10. Press the [ENTER] knob.

When loading SETTING DATA, the unit restarts automatically.

11. Press the [MENU] key several times to close the menu.

10.2.5 Deleting files

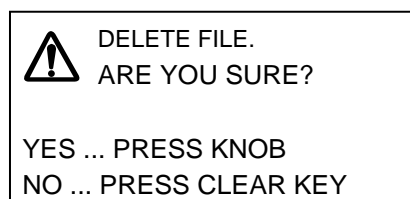
1. Insert a memory card into the left slot.
2. Press the [MENU] key to show the main menu.
3. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
4. Press the [4] key to select DELETE FILE IN MEMORY CARD menu.



Delete file in memory card menu

Note: When the memory card has no data, a beep sounds at step4.

5. Rotate the [ENTER] knob to select the file to delete, and then press the [ENTER] knob.



6. Press the [ENTER] knob to delete file, or press the [CLEAR] key to escape.
7. Press the [MENU] key several times to close the menu.

10.3 Automatic Backup Function

Your unit can backup data (tracks, marks/lines, waypoints/route and setting data) automatically when turning the power on.

There are two backup methods: backup by a memory card and backup by the internal memory. Note that the start-up sequence (until the normal display appears) may take longer when this function is active.

10.3.1 Backup to a memory card

After activating this method, insert a memory card into the left slot.


1. Press the [MENU] key to show the main menu.
2. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
3. Press the [6] key to show the AUTO BACKUP menu.

3-6. AUTO BACKUP			
▶ AUTO BACKUP TO MEMORY CARD FILE NAME	1. YES	<input type="text" value="2. NO"/>	
BACKUP			
AUTO BACKUP TO INT. MEMORY	<input type="text" value="1. YES"/>	2. NO	
SELECT BLOCK OF INT. MEMORY	<input type="text" value="1. BLK1"/>	2. BLK2	
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF OF EACH MENU BY TRACKBALL.			

Auto backup menu

4. Rotate the [ENTER] knob to select AUTO BACKUP TO MEMORY CARD.
5. Press the [1] key to select "1. YES."
6. Press the [MENU] key several times to close the menu.

Then, whenever you turn on the power, data is automatically saved to the "BACKUP" file in the memory card. The message "NOW DOING AUTO BACKUP. WAIT FOR A WHILE." appears while the backup. If the memory card is not inserted into the slot though "1. YES" is selected at step5, the following window appears.

	MEM CARD NOT INSERTED TO DO BACKUP.
CONTINUE?	
YES ... PRESS KNOB	
NO ... PRESS CLEAR KEY	

To continue, insert a memory card into the left slot, and then press the [ENTER] knob. If you cancel, press the [CLEAR] key.

10.3.2 Backup to internal memory

1. Press the [MENU] key to show the main menu.
2. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
3. Press the [6] key to show the AUTO BACKUP menu.
4. Rotate the [ENTER] knob to select AUTO BACKUP TO INT. MEMORY.
5. Press the [1] key to select "1. YES."
6. Rotate the [ENTER] knob to choose SELECT BLOCK OF INT. MEMORY.
7. Press the [1] or [2] key to select the memory block where to save backup data.
8. Press the [MENU] key several times to close the menu.

Whenever turning the power on, data is automatically stored in the block selected at step 7.

Note: When this setting is done, the backup starts automatically after the caution screen at the power on. The message "NOW DOING AUTO BACKUP. WAIT FOR A WHILE." appears while the backup.

10.4 Internal Memory

Your unit has five internal memories in which to store data. Data are saved and replayed between the working memory and internal memory.

10.4.1 Saving data to internal memory

Data in the working memory can be saved to the internal memories. The total number of points for tracks, marks and lines is 16,000.

1. Press the [MENU] key to show the main menu.
2. Press the [3] key to show the MEMEMORY CARD IOERATIONS & DATA TRANSFER menu.
3. Press the [8] key to show the OPERATE INTERNAL MEMORY.

3-8. OPERATE INTERNAL MEMORY		
▶ SHIP'S TRACKS & MARKS	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
WAYPOINTS & ROUTES	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
SETTING DATA	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
SAVE TO INTERNAL MEMORY		
BLOCK-1	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
BLOCK-2	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
BLOCK-3	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
BLOCK-4	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
BLOCK-5	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
PLAYBACK FROM INTERNAL MEMORY		
BLOCK-1	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
BLOCK-2	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
BLOCK-3	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
BLOCK-4	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
BLOCK-5	<input type="checkbox"/> 1. YES	<input type="checkbox"/> 2. NO
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL. NOTE: TRACKS & MARKS ONLY CAN BE SAVED IN THE BLOCK 3-5. WAYPOINTS & ROUTES CAN BE SAVED IN THE BLOCK.		

Operate internal memory

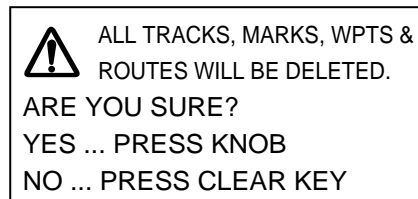
4. Rotate the [ENTER] knob to select item to save.
5. Press the [1] key to select "1. YES."
6. Repeat steps 4 and 5 to save other items.
7. Rotate the [ENTER] knob to select BLOCK 1, 2, 3, 4 or 5 from SAVE TO INTERNAL MEMORY as appropriate.
 - BLOCK-1, 2: For track, mark, waypoint, route and setting data
 - BLOCK 3, 4, 5: For track and mark only

Note: If BLOCK-1 or 2 is used for backup (see paragraph 10.3.2), it cannot be selected here.

10. RECORDING & PLAYING BACK DATA

8. Press the [1] key to select "1. YES."

When there are data in a memory block selected, the following window appears. Press the [ENTER] knob to continue.



The message "NOW SAVING DATA TO INTERNAL MEMORY. DO NOT TURN OFF DISPLAY UNIT UNTIL COMPLETED." appears.

When the saving is finished, the message "COMPLETED SAVING DATA TO INTERNAL MEMORY. PRESS KNOB TO CONTINUE." appears.

Note: When you select the block set for the backup (paragraph 10.3.2), the message "THIS BLOCK IS ALREADY SET FOR AUTO BACKUP. SELECT ANOTHER BLOCK" appears. Re-select another block.

9. Press the [ENTER] knob.
10. Press the [MENU] key to close the menu.

10.4.2 Displaying tracks and marks stored in the internal memory

Tracks and marks stored in the internal memory can be displayed on the screen.

1. Press the [MENU] key to show the main menu.
2. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
3. Press the [7] key to show the DISPLAY DATA FROM INTERVAL MEMORY menu.

3-7. DISPLAY DATA FROM INTERNAL MEMORY			
BLOCK	ITEM	NUMBER	DISPLAY
▶ BLOCK-1	TRACKS	3,246	NO
	MARKS	3	NO
BLOCK-2	TRACKS	36	NO
	MARKS	0	NO
BLOCK-3	TRACKS	0	NO
	MARKS	0	NO
BLOCK-4	TRACKS	0	NO
	MARKS	0	NO
BLOCK-5	TRACKS	0	NO
	MARKS	0	NO
TURN KNOB TO SELECT MENU AND PRESS KNOB TO DISPLAY DATA.			

Display data from internal memory menu

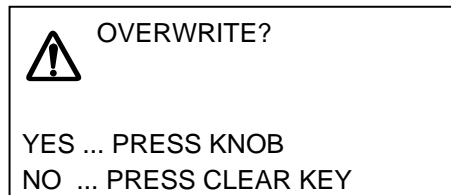
4. Rotate the [ENTER] knob to select TRACKS or MARKS from a block number you wish to load.
5. Press the [ENTER] knob to show "YES" at the right side of screen.
To escape, press the [ENTER] knob to select "NO."
6. Repeat steps 4 and 5 to load data from other blocks.
7. Press the [MENU] key several times to close the menu.
Selected marks (or tracks) appear on the screen. Note that these cannot be erased or edited.

10.4.3 Playing back data from the internal memory

Data in the internal memory can be loaded to the working memory and played back on the screen. However, loaded waypoint/route and setting data will replace current data. For that reason, you may want to record the current display before replaying data.

1. Press the [MENU] key to show the main menu.
2. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
3. Press the [8] key to show the OPERATE INTERNAL MEMORY menu.
4. Rotate the [ENTER] knob to select item to replay.
5. Press the [1] key to select "1. YES."
6. Repeat steps 4 and 5 for other items to replay.
7. Rotate the [ENTER] knob to select BLOCK 1, 2, 3, 4 or 5 from PLAYBACK FROM INTERNAL MEMORY.
8. Press the [1] key to select "1. YES. "

The following message window appears.



9. Press the [ENTER] knob.
10. After the "completed" message appears, press the [ENTER] knob.
The unit restarts automatically when selecting SETTING DATA.
11. Press the [MENU] key several times to close the menu.

10.5 Uploading, Downloading Data

You can upload/download mark, line, waypoint (in alphabetical order) and route (in numerical order) from/to a PC to the working memory, through the PC/NMEA IN port at the rear of the display unit. To upload/download, use the “Hyper Terminal (supplied with Windows)”, “Tera Term (free software)” or equivalent.

Note 1: Route data contains comment data for routes.

Note 2: DGPS facility is not available while uploading/downloading data.

Note 3: The DATA TRANSFER FROM/TO PC menu provides a wiring diagram for connection of a PC. Refer to it to connect a PC.

10.5.1 Downloading data

You may download data in the working memory to a PC as follows:

1. Connect the PC to the equipment.
2. Press the [MENU] key to show the main menu.
3. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
4. Press the [9] key to show the DATA TRANSFER FROM/TO PC menu.

3-9. DATA TRANSFER FROM/TO PC			
▶ TRANSFER FROM PC	1. YES	<input type="checkbox"/> 2. NO	
MARKS & LINES	1. YES	<input type="checkbox"/> 2. NO	
WAYPOINTS & ROUTES	1. YES	<input type="checkbox"/> 2. NO	
TRANSFER TO PC			
	1. YES	<input type="checkbox"/> 2. NO	
MARKS & LINES	1. YES	<input type="checkbox"/> 2. NO	
WAYPOINTS & ROUTES	1. YES	<input type="checkbox"/> 2. NO	
BAUD RATE	1. 4800	2. 9600	3. 19200 <input type="checkbox"/> 4. 38400
CHARACTER LENGTH	1. 7 BITS	<input type="checkbox"/> 2. 8 BITS	
STOP BIT	<input type="checkbox"/> 1. 1 BIT		2. 2 BITS
PARITY	1. EVEN	2. ODD	<input type="checkbox"/> 3. NONE
X CONTROL			
PC/NMEA IN			
PC_TD >1>	--- WHITE		
PC_RD >2>	--- BLUE		
RD3_H >3>	--- YELLOW		
RD3_C >4>	--- GREEN		
+12V >5>	--- RED		
GROUND >6>	--- BLACK		
SHIELD >7>	--- SHIELD		
CABLE TYPE: MJ-A7SPF0007-050			
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.			

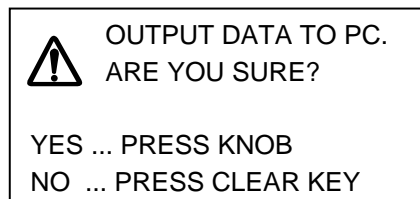
Note: Use 1, 2 and 6 pins are only for connection with PC.

Data transfer from/to PC menu

10. RECORDING & PLAYING BACK DATA

5. **To download mark/line data**, rotate the [ENTER] knob to select MARKS & LINES of TRANSFER TO PC.
6. Press the [1] key to select "1. YES."
7. **To download waypoint/route data**, rotate the [ENTER] knob to select WAYPOINTS & ROUTES of TRANSFER TO PC>.
8. Press the [1] key to select "1. YES."
9. Set RS-232C as follows.
 - a) Rotate the [ENTER] knob to select BAUD RATE.
 - b) Roll the trackball in left-right direction to select the baud rate among 4800, 9600, 19200 and 38400.
 - c) Rotate the [ENTER] knob to select CHARACTER LENGTH.
 - d) Roll the trackball in left-right direction to select the character length: 7 BITS or 8 BITS.
 - e) Rotate the [ENTER] knob to select STOP BIT.
 - f) Roll the trackball in left-right direction to select the stop bit: 1 BIT or 2 BITS.
 - g) Rotate the [ENTER] knob to select PARITY.
 - h) Roll the trackball in left-right direction to select the parity from among EVEN, ODD and NONE.
10. Rotate the [ENTER] knob to select TRANSFER TO PC.
11. Press the [1] key to select "1. YES."

The following message appears.



12. Press the [ENTER] knob.
13. When the downloading is completed, press the [ENTER] knob.
14. Press the [MENU] key several times to close the menu.

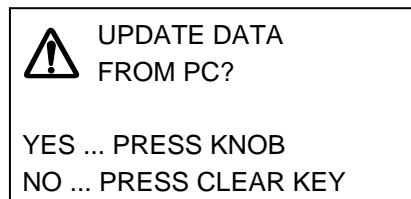
10.5.2 Uploading data

Data in the PC can be uploaded to the working memory.

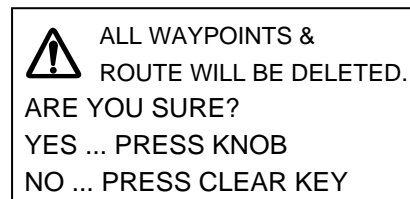
Note: When waypoint or route data are uploaded, all data in the internal memory will be replaced with the uploaded data.

1. Connect the PC to the equipment.
2. Press the [MENU] key to show the main menu.
3. Press the [3] key to show the MEMORY CARD OPERATIONS & DATA TRANSFER menu.
4. Press the [9] key to show the DATA TRANSFER menu.
5. **To upload mark/line**, rotate the [ENTER] knob to select MARKS & LINES of TRANSFER FROM PC.
6. Press the [1] key to select "1.YES."
7. **To upload waypoint/route**, rotate the [ENTER] knob to select WAYPOINT & ROUTE of TRANSFER FROM PC.
8. Press the [1] key to select "1. YES."
9. Set RS-232C referring to paragraph 10.5.1.
10. Rotate the [ENTER] knob to select TRANSFER FROM PC.
11. Press the [1] key to select "1. YES."

One of the following messages appears.



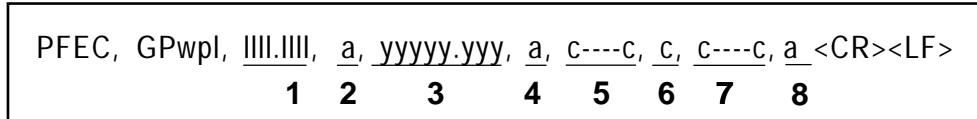
Mark/line



Waypoint/Route

12. Press the [ENTER] knob to upload data.
The message "UPDATING FROM PC NOW" appears. When the updating is finished, the message "UPDATE IS COMPLETED. PRESS ENTER KNOB." appears.
13. When the uploading is completed, press the [ENTER] knob.
14. Press the [MENU] key several times to close the menu.

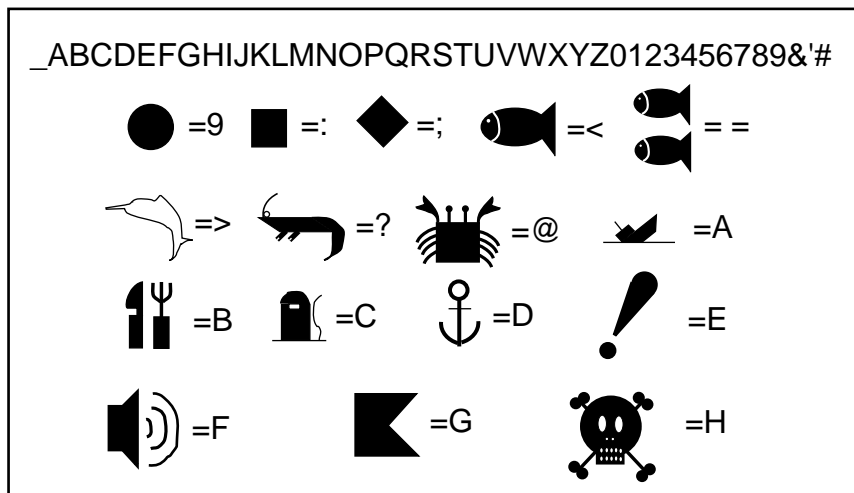
Waypoint data format



Waypoint data format

- 1: Waypoint latitude
- 2: N/S
- 3: Waypoint longitude
- 4: E/W
- 5: Waypoint name (Number of characters is fixed 6 and space code is placed when the number of characters are less than 6.)
- 6: Waypoint color
- 7: Waypoint comment (1 byte for mark code +13 characters of comment.)
 1st byte of mark code: Fixed to “@”.
 2nd byte of mark code: Internal mark code. See Note 1.
8. Information of marking waypoint. Always set to “A”.
 “A”: Displayed
 “V”: Not displayed.

Note 1: The following characters can be used for comments:



Characters available for comment

Route data menu

$\$GPRTE, \underline{x}, \underline{x}, \underline{a}, \underline{ccc}, \underline{c----c}, \underline{c----c}, \dots, \underline{c----c} <CR><LF>$ <div style="display: flex; justify-content: space-around; margin-top: 5px;"> 1 2 3 4 5 6 12 </div>
--

Route comment format

- 1: Number of sentences required for one complete route data (1 to 4). See Note 2.
- 2: Number of sentences currently used (1 to 4)
- 3: Message mode (Always set to C)
- 4: Route No. (001 to 300, 3 digits required)
- 5 through 12: Waypoint name (Max. 8 names, length of each waypoint name is fixed to 7 byte)

Note 2: A route can may contain 35 waypoints, and the GPRTE sentence for one route data may exceed 80 byte limitation. In this case, route data is divided into several GPRTE sentences (Max. 4 sentences). This value shows the number of sentences the route data has been divided.

Route comment data format

$\$PFEC, GPrtc, \underline{xx}, \underline{c----c} <CR><LF>$ <div style="display: flex; justify-content: space-around; margin-top: 5px;"> 1 2 </div>

Route comment format

1. Route No. (01 to 200, 3 digits required)
2. Route comment (Max. 16 characters, variable length)
3. The same characters of the comment for waypoint comment can be used.

End of sentence

$\$PFEC, GPxfr, CTL, E <CR><LF>$

End of sentence

10. RECORDING & PLAYING BACK DATA

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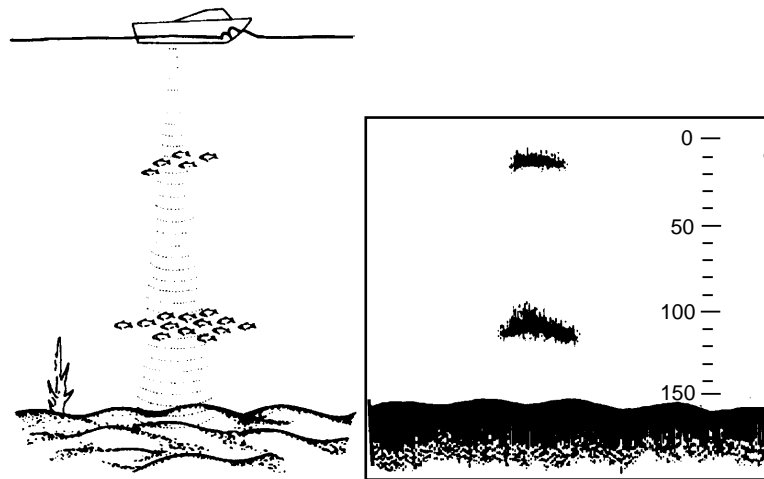
11. VIDEO SOUNDER OPERATION

11.1 Principle of Operation

The video sounder determines the distance between its transducer and underwater objects such as fish, lake bottom or seabed and displays the results on screen. It does this by utilizing the fact that an ultrasonic wave transmitted through water travels at a nearly constant speed of 4800 feet (1500 meters) per second. When a sound wave strikes an underwater object such as fish or sea bottom, part of the sound wave is reflected back toward the source (transducer). Thus by calculating the time difference between the transmission of a sound wave and the reception of the reflected sound wave, the depth to the object can be determined.

The entire process begins in the display unit. Transmitter power is sent to the transducer as a short pulse of electrical energy. The electrical signal produced by the transmitter is converted into an ultrasonic signal by the transducer and transmitted into the water. Any returning signals from intervening objects (such as a fish school) are received by the transducer and converted into an electrical signal. The signals are then amplified in the amplifier section, and finally, displayed on screen.

The picture displayed is made up of a series of vertical scan lines, one for each transmission. Each line represents a snapshots are accumulated side by side across the screen, and the resulting contours of the bottom and fish between the bottom and surface are displayed.



Underwater conditions and video sounder display

Note: The procedure in this chapter assume that the echo sounder mode is active.

11.2 Sounder Displays

There are nine display modes from which to choose: single frequency, dual-frequency, marker zoom, bottom zoom, bottom lock, bottom discrimination, A-scope, Mix display and plotter/sounder display. For Mix display, see paragraph 11.2.8.

You may select a display as follows.

1. Press the [DISP] key to show the DISPLAY MODE screen.
2. Press the [0] key several times until the desired display appears.
3. Press the appropriate numeric key to select a display.

To show the Mix display, you must set a DISPLAY MODE screen for the mix display. For further details, see paragraph 11.17.

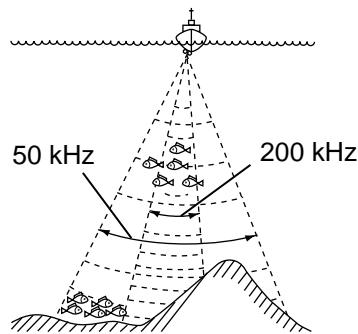
11.2.1 Single frequency display (50 kHz or 200 kHz)

50 kHz

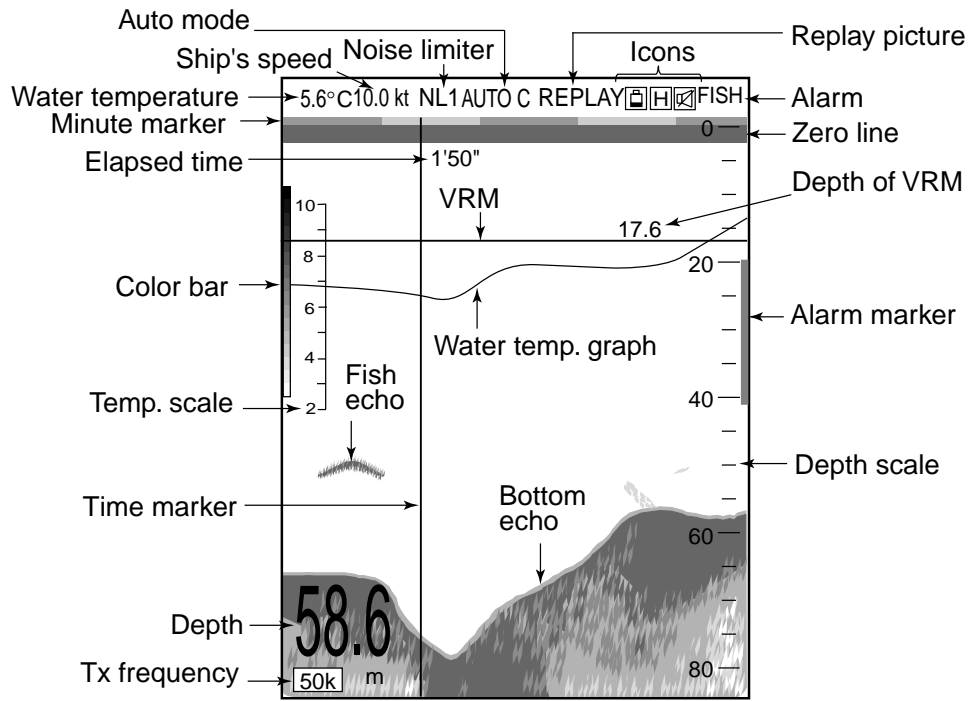
The sounder uses ultrasonic pulses to detect bottom conditions. The lower the frequency of the pulse, the wider the detection area. Therefore, the low frequency is useful for general detection and judging bottom condition.

200 kHz

The higher the frequency of the ultrasonic pulse the better the resolution. Therefore, the high frequency is ideal for detailed observation of fish school.



Sounding area and transmission frequency



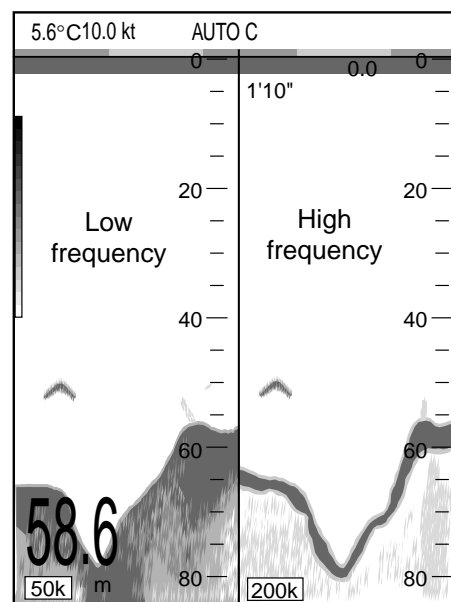
Single display

Note: The water temperature display requires a water temperature sensor. The water temperature graph can be turned on or off with TEMPERATURE GRAPH on the ECHO SOUNDER SYSTEM SETUP menu. For further details, see paragraph 11.18.

11.2.2 Dual-frequency display

The dual-frequency display provides both 50 kHz and 200 kHz pictures. This display is useful for comparing the same picture with two different sounding frequencies.

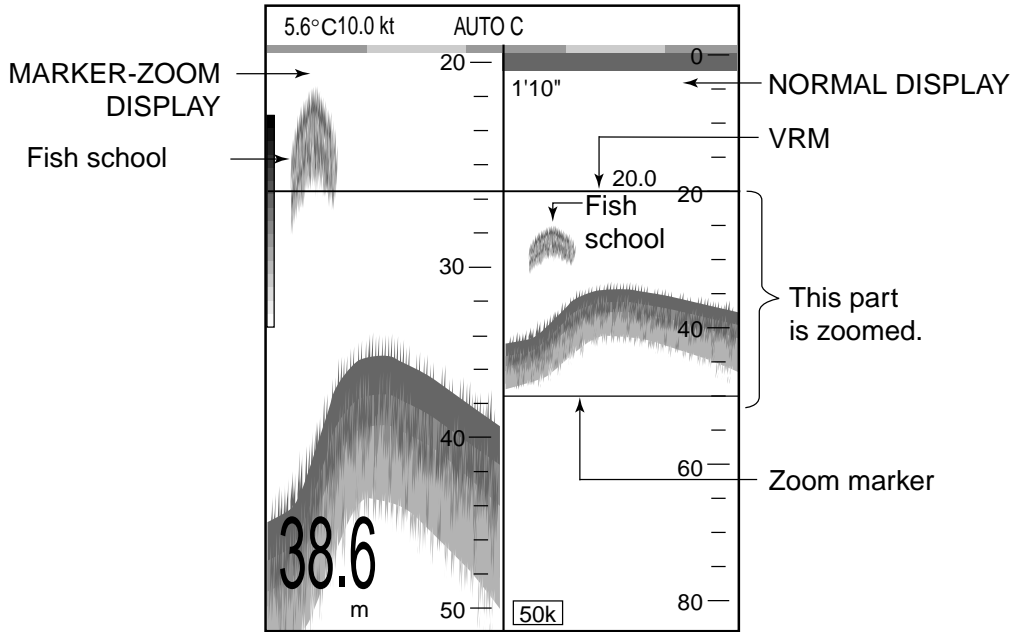
Freq.	Beam width	Trail
Low	Wide	Long
High	Narrow	Short



Dual-frequency display

11.2.3 Marker-zoom display (50 kHz or 200 kHz)

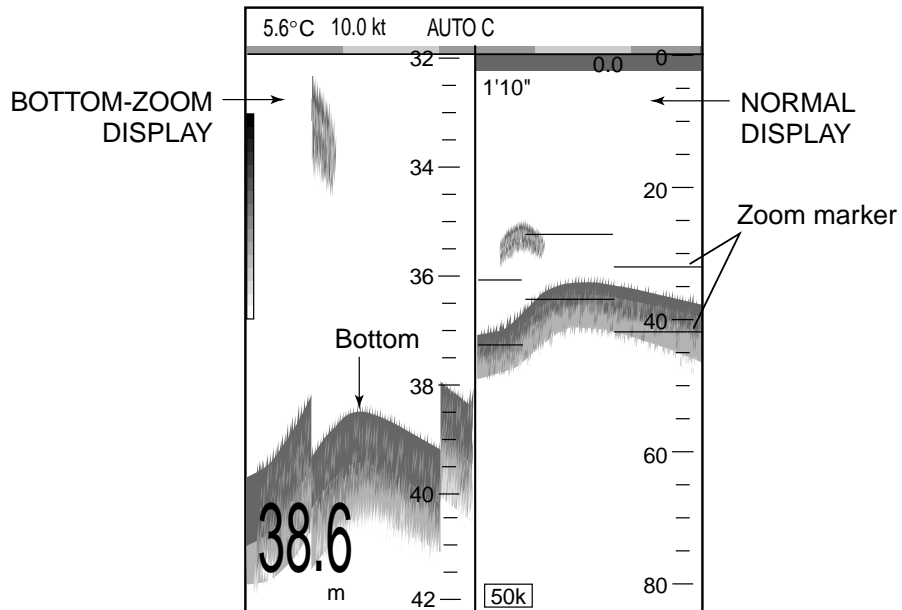
The marker-zoom display expands a selected area of the normal sounder picture to full vertical size of the screen on the left-half window. You may specify the portion to expand by operating the VRM (Variable Range Marker). The area between the VRM and zoom marker is expanded. (You may choose the zoom range. For further details, see paragraph 11.19.)



Marker-zoom display

11.2.4 Bottom-zoom display (50 kHz or 200 kHz)

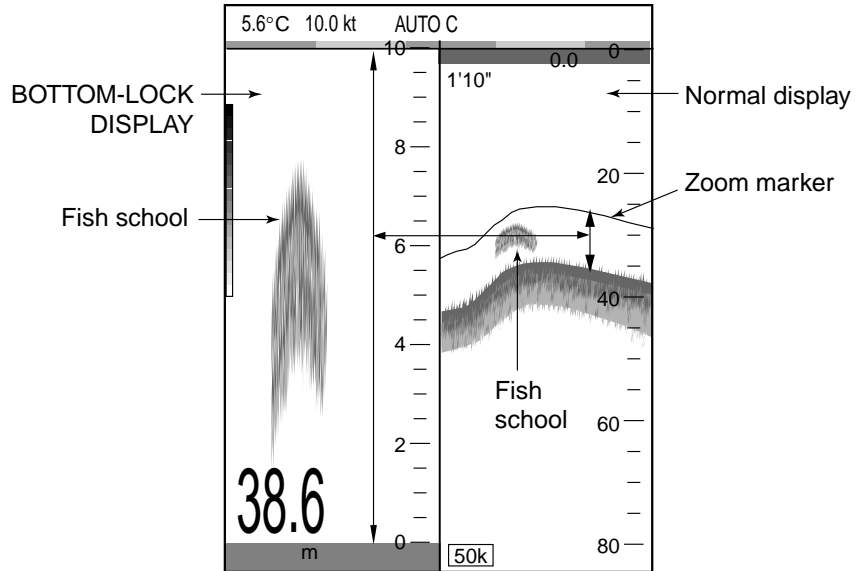
The bottom-zoom display expands bottom and bottom fish echoes by the zoom range selected on the menu. The bottom between the zoom markers is expanded automatically.



Bottom-zoom display plus normal sounder display

11.2.5 Bottom-lock display (50 kHz or 200 kHz)

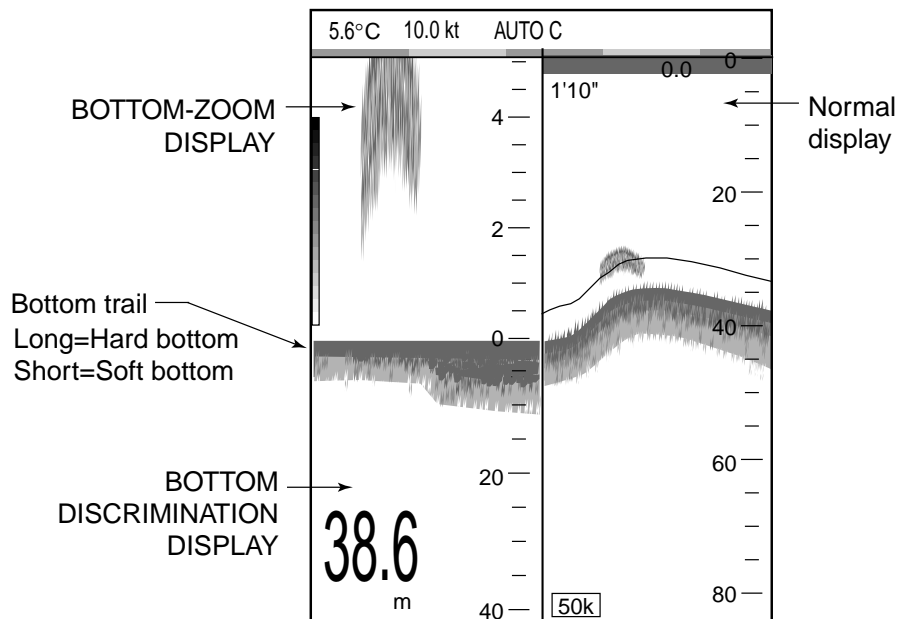
The bottom-lock display provides a compressed normal picture on the right half of the screen and a 3 or 6 meters (10 or 20 feet) wide layer in contact with the bottom is expanded onto the left half of the screen. This mode is useful for discriminating bottom fish from the bottom echo. You may select the bottom lock range. Refer to paragraph 11.19.



Bottom-lock display plus normal sounder display

11.2.6 Bottom discrimination display (50 kHz or 200 kHz)

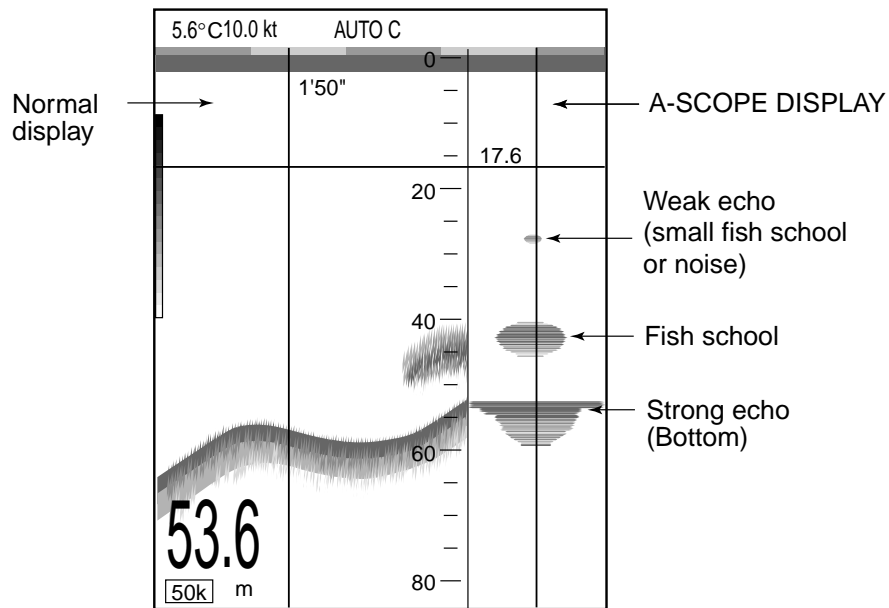
The bottom discrimination display shows the normal display as the right half, the left half of the display is split in half horizontally with the bottom zoom display on the upper half and the bottom discrimination display on the lower half. A bottom displayed with a short echo tail usually means it is a soft, sandy bottom. A long echo tail means a hard bottom.



Bottom discrimination display

11.2.7 A-scope display (Single display only)

The A-scope display, available in all modes, shows echoes at each transmission with amplitudes and tones proportional to their intensities, on the right 1/3 of the screen. It is useful for estimating fish species and seabed composition.



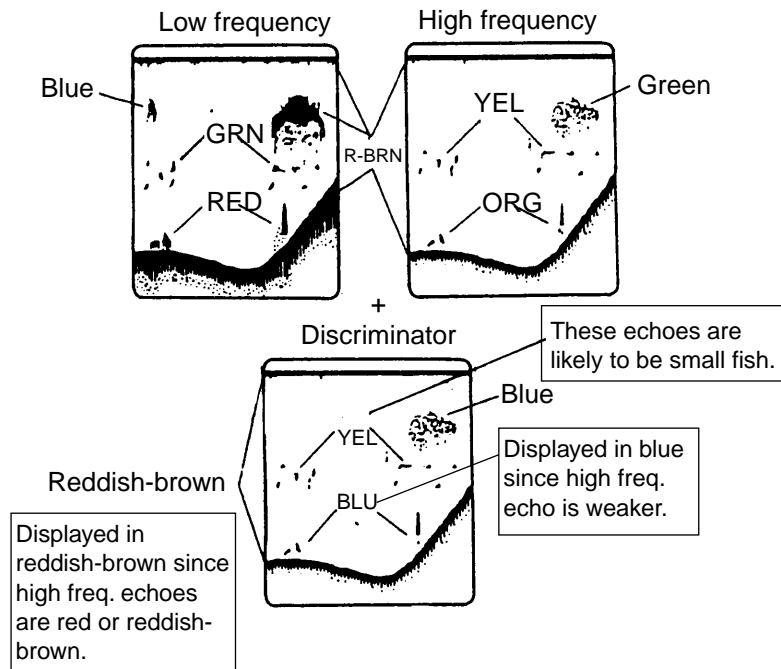
A-scope display

11.2.8 Mix display

This mode compares echo intensity between low and high frequencies, and displays echoes from tiny fish in discriminative colors. This is done by utilizing the fact that tiny fish return a stronger echo against a high frequency rather than a low frequency. This is done as below.

1. If a high frequency echo is stronger than the corresponding echo on the low frequency, the high frequency echo is displayed.
2. If the low frequency echo is stronger than or equal to the high frequency echo, it is less likely to be a tiny fish and therefore is displayed in blue.
3. If the echoes on both frequencies have the intensity corresponding to reddish brown or red, they are displayed in reddish brown or red: this is necessary to display the zero line and bottom in reddish brown or red.

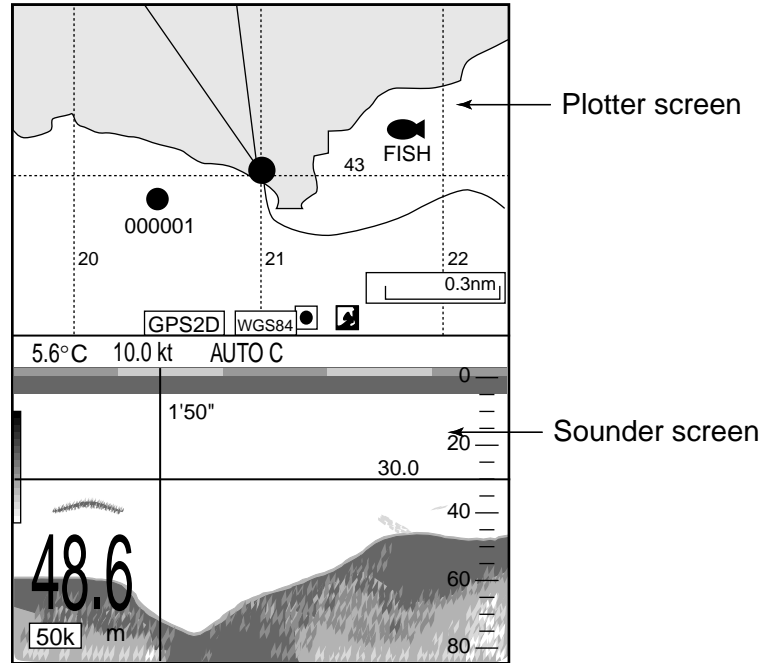
In other words, the echoes displayed in orange thru light-blue may be considered to be tiny fish such as whitebait.



How the mix display works

11.2.9 Plotter (or Pilot)/sounder display

This display provides the plotter display on the upper half of the screen and the normal sounder display on the bottom half (or 2/3 of screen: plotter, 1/3: sounder). It is useful for searching fish schools at cruising speed. Note that vertical division is also available.



Plotter/sounder display (vertically)

11.3 Automatic Sounder Operation

Automatic sounder operation is useful when you are preoccupied with other tasks and do not have the time to adjust the display.

The automatic sounder function automatically selects the proper gain, range scale and clutter suppression level according to depth. It works as follows:

- Range changes automatically to locate the bottom on the lower half of screen. The range jumps to one step shallower range when bottom echoes reach a half way point of the full scale from top and to one step deeper range when they come to the lower edge of the scale.
- The gain is automatically adjusted to display the bottom echo in reddish brown (default color arrangement).
- Clutter, which suppresses low level noise, is automatically adjusted.

Two types of automatic sounder modes are available: CRUISING and FISHING. CRUISING is for tracking the bottom, and FISHING is for searching fish schools. CRUISING uses a higher clutter rejection setting the FISHING therefore it is not recommended for fish detection – weak fish echoes may be erased by the clutter suppression circuit.

How to enable automatic sounder operation

1. Press the [MENU] key to show the main menu.
2. Press the [9] key to show the ECHO SOUNDER SETUP menu.

9. ECHO SOUNDER SETUP	
▶ 1. AUTO MODE	OFF
2. NOISE LIMITER	OFF
3. CLUTTER	4
4. WHITE MARKER	OFF
5. HUE	1
6. USER COLOR SETUP	
7. SIGNAL LEVEL	OFF
8. PICTURE ADVANCE	1/1
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.	

Echo sounder setup menu

3. Press the [1] key to show the AUTO MODE window.

AUTO MODE
1. CRUISING
▶ 2. FISHING
3. OFF

Auto mode window

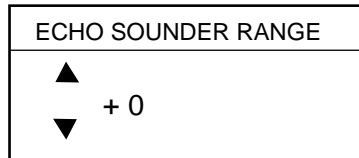
4. Press the [1] or [2] key to select “1. CRUISING” or “2. FISHING.”
“AUTO-C” or “AUTO-F” appears at the top of the sounder screen, depending on your selection. (AUTO-C: CRUISING, AUTO-F: FISHING)
5. Press the [ENTER] knob to return to the ECHO SOUNDER SETUP menu.
6. Press the [MENU] key several times to close the menu.

Note: Manual SHIFT and CLUTTER functions are inoperative in the auto mode.

Offsetting the basic range

The basic range in the AUTO mode can be offset. This is useful for watching the bottom in detail.

1. Press the [RANGE] key to show the ECHO SOUNDER RANGE window.



Echo sounder range window

2. Rotate the [ENTER] knob to set offset value. (-100 to +300 ft)

Note 1: This setting must be done within 10 seconds after pressing the [RANGE] key, otherwise the window will be erased.

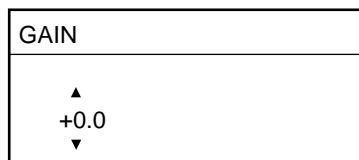
Note 2: When the basic range is changed, the offset value returns to zero.

Note 3: The [RANGE] key can be programmed for other function. For details, see paragraph 11.16.

Offsetting the gain

You can adjust gain in AUTO mode.

1. Press the [GAIN] key to show the GAIN window.



Gain window

2. Rotate the [ENTER] knob to select offset value. (-5.0 to + 5.0)

Note 1: This setting must be done within 10 seconds after pressing the [GAIN] key, otherwise the window will be erased.

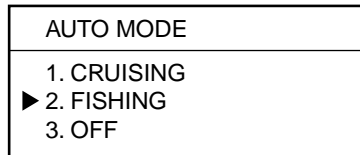
Note 2: The [GAIN] key can be programmed for other function. For details, see paragraph 11.16.

11.4 Manual Sounder Operation

Manual operation is useful for observing fish schools and bottom using fixed gain setting.

11.4.1 Selecting the manual mode

1. Press the [MENU] key to show the main menu.
2. Press the [9] key to show the ECHO SOUNDER menu.
3. Press the [1] key to show the AUTO MODE window.



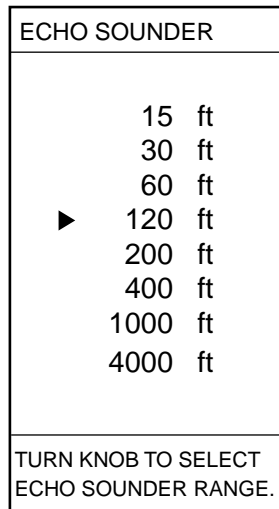
Auto mode window

4. Press the [3] key to select "3. OFF."
5. Press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

11.4.2 Selecting display range

The basic range may be selected with the [RANGE] key, from the eight ranges shown in the illustration below. (These eight ranges may be programmed as desired. For details, see paragraph 11.15.)

1. Press the [RANGE] key to show the ECHO SOUNDER RANGE window.



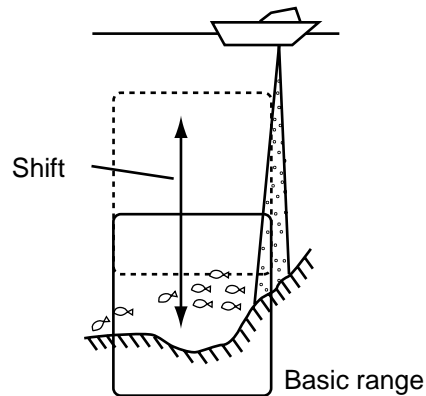
Echo sounder range window

2. Rotate the [ENTER] knob to select a range.

Note: This setting must be done within 10 seconds after pressing the [RANGE] key, otherwise the window will be erased.

11.4.3 Shifting the basic range

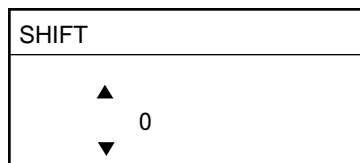
The shift function determines the start depth of the picture. Start depth (shift) is shown at the top of the screen.



Principle of shift

Note: This function is not available when the AUTO mode is on.

1. Press the [SHIFT] key to show the SHIFT window.



Shift window

2. Rotate the [ENTER] knob to set shift value.

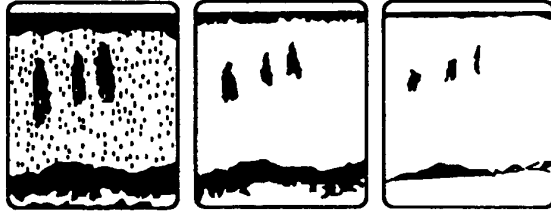
Note 1: This setting must be done within 10 seconds after pressing the [SHIFT] key, otherwise the window will be erased.

Note 2: If the shift value is larger than the distance to the bottom, nothing appears on the display.

Note 3: The [SHIFT] key can be programmed for other function. See paragraph 11.16.

11.4.4 Adjusting gain

Adjust the sensitivity of the receiver so excessive noise just disappears from the screen.



Gain too high

Gain proper

Gain too low

Example of proper and improper gain levels

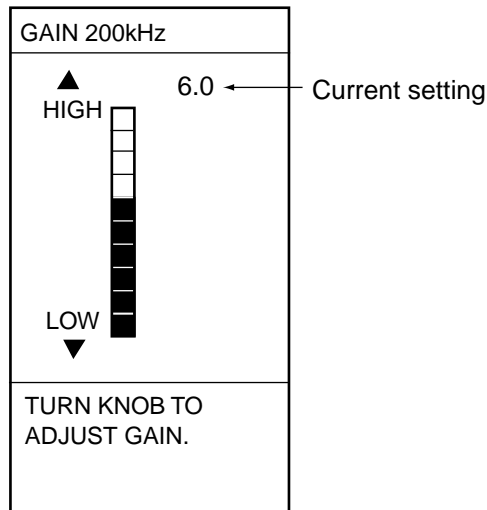


CAUTION

Use the proper gain setting.

Incorrect gain may produce wrong depth indication, possibly resulting in a dangerous situation.

1. Press the [GAIN] key to show the GAIN window. For dual-frequency display, press the key again if necessary to select the frequency.



Gain window (ex. 200 kHz)

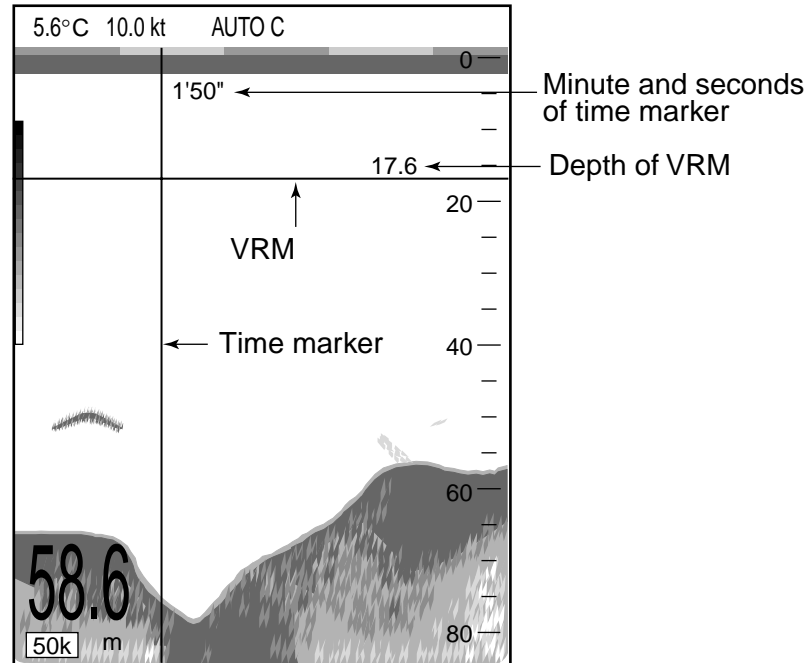
2. Rotate the [ENTER] knob to set gain. (0.0 to 10.0).

Note: This setting must be done within 10 seconds after pressing the [GAIN] key, otherwise the window will be erased.

11.5 Measuring Depth, Time

The VRM measures the depth, and the time marker measures time.

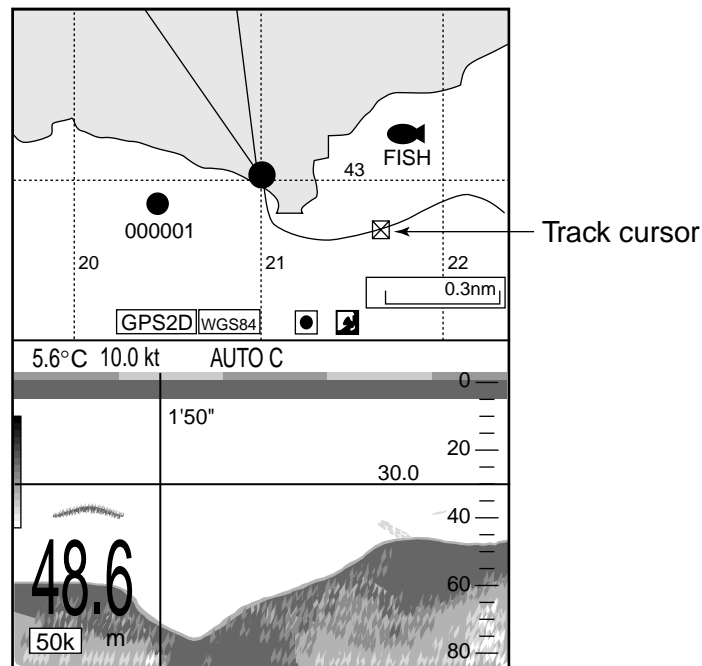
- For measuring depth, roll the trackball in upward-downward direction to shift the VRM.
- For measuring time, roll the trackball in left-right direction to move the time marker to measure the elapsed time.



How to use the VRM, time cursor

To measure depth or time in the plotter (pilot)/sounder display, follow the procedure below. Further, you may mark the geographical location of a fish school on the plotter display.

- Press the [CURSOR ON/OFF] key more than three seconds to enable trackball operation on the sounder display. At this time the track cursor appears on the ship's track line and it denotes the approximate geographical position of the time marker on the sounder screen.



Track cursor OFF:

Trackball is available on plotter screen.

Track cursor ON:

Trackball is available on sounder screen.

Track cursor

- b) Operate the trackball to place the time marker on the fish school desired, and then press the appropriate numeric key among 1-7 to mark the location of the fish school on the plotter display. Also, a vertical line is entered at the time marker position. The color of the line is the second color from the top of the color bar in the 16 color display, the top color of the color bar in the 8 color display. Waypoint can be entered at track cursor position similarly.
- c) Press the [CURSOR ON/OFF] key to erase the track cursor. The trackball operation is available on the plotter screen.

11.6 Entering Mark on the Display

You can mark on the plotter (or pilot) display through the sounder display.

- Press appropriate numeric key among 1 through 7 at the moment a fish school, etc. appears on the sounder screen.

The sequence is as below depending on the display in use.

Sounder display

A vertical bar is entered at the right edge of the echo sounder screen. The color of this bar depends on the number of display colors used. It is the second color from the top of color bar in the 16-color display, or the top color in the 8-color display.

On the plotter display, the selected mark is entered at ship's position the moment the key is pressed.

Plotter (or pilot)/sounder display

A vertical bar is entered at the right edge of the echo sounder screen. The mark is entered on the plotter (or pilot) display as below.

When the cursor is turned on: at the cursor position

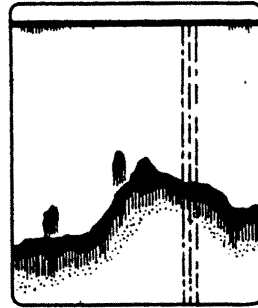
When the cursor is turned off: at own ship's position

11.7 Reducing Interference

Interference from other acoustic equipment operating nearby or other electronic equipment on your boat may show itself on the display as shown below.



Interference from
other sounder



Electrical interference

Types of interference

To reduce interference, do the following:

1. Press the [MENU] key to show the main menu.
2. Press the [9] key to show the ECHO SOUNDER SETUP menu.
3. Press the [2] key to show the NOISE LIMITER window.

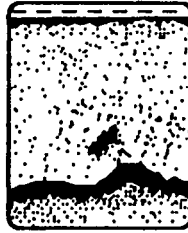
NOISE LIMITER	
1.	OFF
▶ 2.	NL1
3.	NL2
4.	NL3

Noise limiter window

4. Rotate the [ENTER] knob to select degree of suppression (NL1, NL2, NL3) or turn the noise limiter off.
NL3 provides the greatest degree of suppression.
5. Press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

11.8 Reducing Low-Level Noise

Dots (light-blue) may appear over most of the screen. This is mainly due to sediment in the water or noise. This noise can be suppressed.



Appearance of low-level noise

Note: Clutter cannot be adjusted in the AUTO mode.

1. Press the [MENU] key to show the main menu.
2. Press the [9] key to show the ECHO SOUNDER SETUP menu.
3. Press the [3] key to show the CLUTTER window.



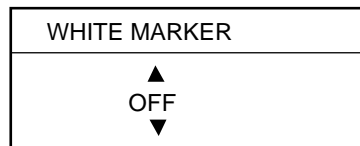
Clutter window

4. Rotate the [ENTER] knob to set clutter rejection level desired (0 to 7).
The higher the number the higher the degree of suppression. Note that the clutter suppressor may erase weak echoes. Therefore, select "0" when its use is not required.
5. Press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

11.9 White Marker

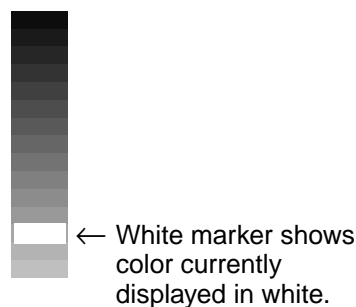
The white marker functions to display a particular echo in white. For example, you may want to display the bottom echo in white to discriminate fish echoes near the bottom.

1. Press the [MENU] key to show the main menu.
2. Press the [9] key to show the ECHO SOUNDER SETUP menu.
3. Press the [4] key to show the WHITE MARKER window.



White marker window

4. Rotate the [ENTER] knob to select color to display in white.
As you rotate the [ENTER] knob, the number (corresponds to echo number) in the marker window changes, the white marker on the echo strength bar shifts and selected echo color is displayed in white.



Echo strength bar (16 color) when white marker function is active

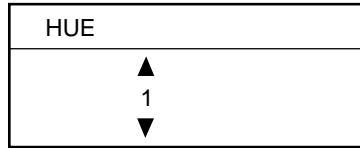
5. Press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

Note: To turn the white marker function off, select OFF at step 4.

11.10 Display Colors

You can select the number of colors and background color to use as follows:

1. Press the [MENU] key to show the main menu.
2. Press the [9] key to show the ECHO SOUNDER SETUP menu.
3. Press the [5] key to show the HUE window.



Hue window

4. Rotate the [ENTER] knob to select hue number, referring to the table below. (You can see the result of your selection on the display.)

Hue no. and background and echo colors

Hue No.	Echo color	Background color
0	USER COLOR on the USER COLOR SETUP menu (See paragraph 11.11.)	
1	16	Blue
2	8	Blue
3	16	Blue
4	8	Dark blue
5	16	White
6	8	White
7	16	Black
8	8	Black
9	Monochrome, 8 colors	

5. Press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

11.11 Customizing Colors

In addition to the standard and factory programmed color sets, the user may set and store nine sets of display colors and recall them from the HUE window.

1. Press the [MENU] key to show the main menu.
2. Press the [9] key to show the ECHO SOUNDER SETUP menu.
3. Press the [6] key to show the USER COLOR SETUP menu.

USER COLOR SETUP											
▶ USER COLOR		1		2	3	4	5	6	7	8	9
DEFAULT SET		1.YES		2.NO							
		NEW COLOR				ORIGINAL COLOR					
		R	G	B		R	G	B			
1		00	00	15	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
2		00	04	15	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
3		00	08	15	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
4		00	12	15	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
5		00	15	15	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
6		00	12	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
7		00	15	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
8		08	15	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
9		12	15	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
10		15	15	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
11		15	08	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
12		15	04	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
13		15	00	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
14		12	00	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
15		10	00	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
16		08	00	00	<input type="checkbox"/>	00	00	15	<input type="checkbox"/>		
					↑						
					Color bar						
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.											

User color setup menu

4. Rotate the [ENTER] knob to select USER COLOR.
5. Press appropriate numeric key to select a user color number.
6. Rotate the [ENTER] knob to select the color number (1 through 16) to change.
7. Roll the trackball in left-right direction to select "R (red)", "G (green)" or "B (blue)" as appropriate.
8. Use the numeric keys to enter the color brightness.
The larger the number, the brighter the color.
9. Repeat step 8 for "R", "G" or "B."

11. VIDEO SOUNDER OPERATION

10. Press the [ENTER] knob.

The color changed at steps 8 and 9 is entered to the color bar.

11. Repeat steps 6 through 10 to change other color.

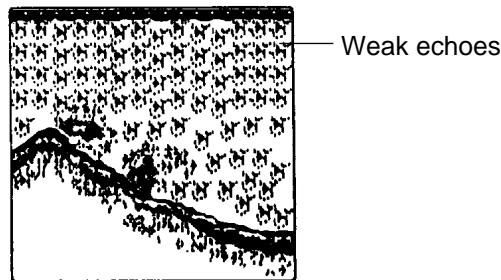
12. Press the [MENU] key several times to close the menu.

Note: To restore the colors to the default setting:

- a) Open the USER COLOR SETUP menu.
- b) Rotate the [ENTER] knob to select USER COLOR.
- c) Select the number for the color to restore.
- d) Rotate the [ENTER] knob to select DEFAULT SET.
- e) Press the [1] key to select "1. YES."
- f) Press the [MENU] key several times to close the menu.

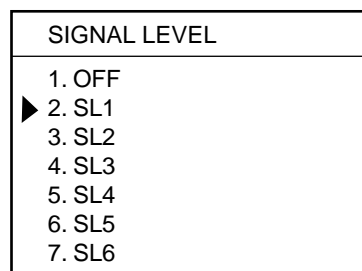
11.12 Erasing Weak Echoes

Sediment in the water or reflections from plankton may be painted on the display in green or light blue. These weak echoes may be erased as below.

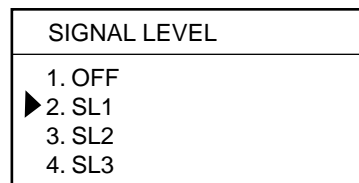


Appearance of weak echoes

1. Press the [MENU] key to show the main menu.
2. Press the [9] key to show the ECHO SOUNDER SETUP menu.
3. Press the [7] key to show the SIGNAL LEVEL window.



16 colors



8 colors

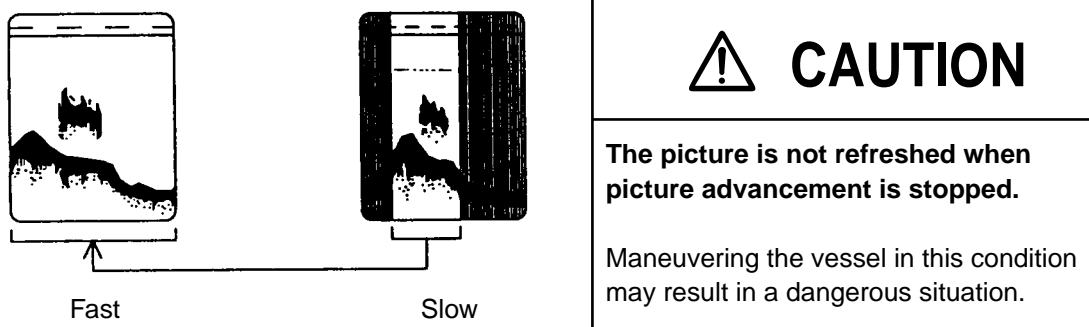
Signal level window

4. Rotate the [ENTER] knob to select level of erasure or OFF appropriate. The higher the number the stronger the echo that will be erased.
5. Press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

11.13 Picture Advance Speed

The picture advance speed determines how quickly the vertical scan lines run across the screen. When selecting a picture advance speed, keep in mind that a fast advance speed will expand the size of the fish school horizontally on the screen and a slow advance speed will contract it.

The advancement speed may be set independent of or synchronized with ship's speed.



Picture advance speed

1. Press the [MENU] key to show the main menu.
2. Press the [9] key to show the ECHO SOUNDER SETUP menu.
3. Press the [8] key to show the PICTURE ADVANCE window.

PICTURE ADVANCE	
1.	2/1
▶ 2.	1/1
3.	1/2
4.	1/4
5.	1/8
6.	1/16
7.	STOP

Picture advance window

The fractions in the window denote the number of scan lines produced per transmission. For example, 1/8 means one scan line is produced every eight transmissions. STOP freezes the display and it is convenient for photographing the display.

4. Rotate the [ENTER] knob to select speed desired.
5. Press the [ENTER] knob.
6. Press the [MENU] key several times to close the menu.

11.14 Reviewing Past Picture

One past picture can be reviewed.

Setting up to display past picture

In the factory setting, the past picture cannot be displayed. To display, do the following.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [8] key to show the ECHO SOUNDER SYSTEM SETUP menu.

0-8. ECHO SOUNDER SYSTEM SETUP			
GOTO ECHO SOUNDER RABGE SETUP			
FISH ALARM LEVEL	1. HIGH	<input type="checkbox"/> 2. MED	3. LOW
TRANSMISSION	<input type="checkbox"/> 1. ON	2. STOP	
TRANSMISSION POWER	<input type="checkbox"/> 1. HIGH	2. LOW	
TVG 200 kHz	1. YES	<input type="checkbox"/> 2. NO	3
TVG 50 kHz	1. YES	<input type="checkbox"/> 2. NO	3
ECHO OFFSET 200 kHz	1. YES	<input type="checkbox"/> 2. NO	+00
ECHO OFFSET 50 kHz	1. YES	<input type="checkbox"/> 2. NO	+00
BOTTOM LEVEL 200 kHz	1. YES	<input type="checkbox"/> 2. NO	+000
BOTTOM LEVEL 50 kHz	1. YES	<input type="checkbox"/> 2. NO	+000
SMOOTHING	<input type="checkbox"/> 1. OFF	2. SM1	3. SM2 4. SM3 5. SM4
DEPTH INFORMATION	1. L	<input type="checkbox"/> 2. S	3. OFF
TEMPERATURE GRAPH	<input type="checkbox"/> 1. ON	2. OFF	
ZOOM MARKER	<input type="checkbox"/> 1. ON	2. OFF	
▶ PLAYBACK SNDR IMAGE	1. PLAY	2. S-DOWN	<input type="checkbox"/> 3. OFF
SPEED CALIBRATION:	+00%	(-50~+50%)	
TEMP CALIBRATION:	+00.0°F	(-20~+20°F)	
DEPTH CALIBRATION:	+000.0 ft	(-15~+100 ft)	
ACSTC SPD CALIB :	+000 m/s		
SPEED (STW)	: - . - kt		
TEMPERATURE	: + 4.9°F		
DEPTH	: 81.6 ft		
ACOUSTIC SPEED	: 1500 m/s		
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.			

Echo sounder setup menu

4. If the ECHO SOUNDER RANGE SETUP menu appears, rotate the [ENTER] knob clockwise to show the ECHO SOUNDER SYSTEM menu.
5. Rotate the [ENTER] knob to select PLAYBACK SNDR IMAGE.
6. Press the [1] or [2] key to select "1. PLAY" or "2. S-DOWN" as appropriate.
PLAY: The past picture is played back reversely, like rewinding a video tape.
S-DOWN: The past picture is compressed to show it in its entirety.
7. Press the [MENU] key several times to close the menu.

Reviewing the past picture

This feature is only available with the single frequency display.

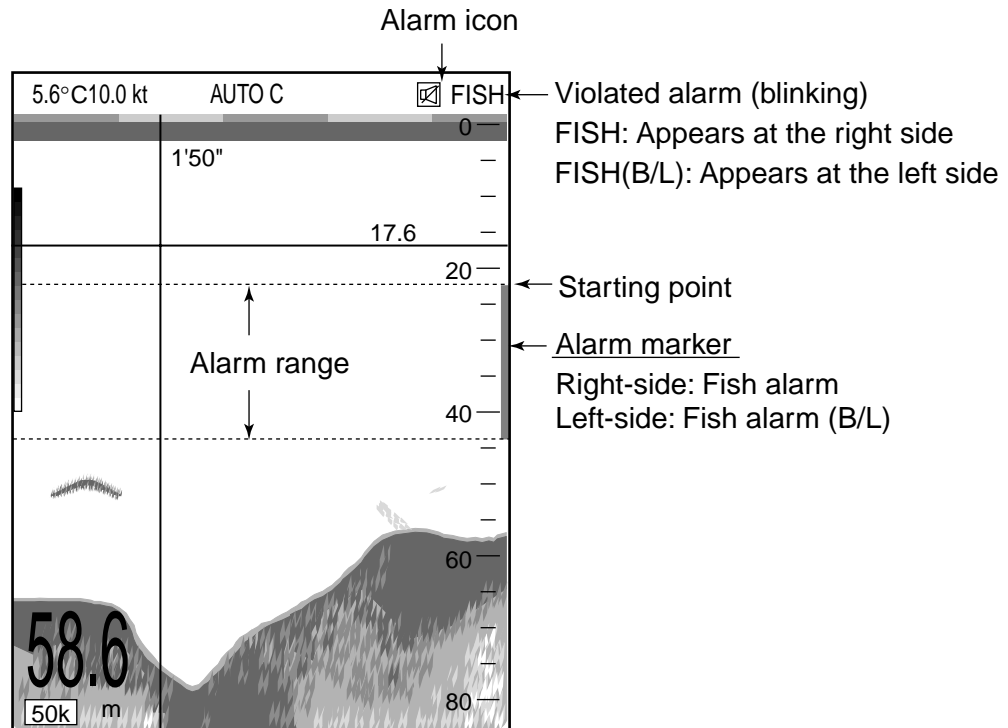
1. Press the [ENTER] knob.
 The picture freezes, and "REPLAY" appears at the top of the screen.
 Depending on your selection on menu, the picture is shown as below.
 PLAY: Rotate the [ENTER] knob counterclockwise to scroll the past picture.
 S-DOWN: The entire past picture appears.
2. Press the [ENTER] knob to return to the normal operation.

Note1: You may escape from the REPLAY mode by pressing the [SHIFT], [RANGE], [GAIN] or [PROG] key.

Note2: When pressing a numeric key, an appropriate mark is entered at the position of time marker on ship's track on the plotter display. At the same time, a horizontal line is entered at time markers position. (16 colors: the second color from the top, 8 colors: the top of the color bar) For the [WAYPOINT] key, the waypoint is entered to the position of time marker on own ship's track. For time marker, see Chapter 11.5.

11.15 Alarms

The sounder section has two conditions which generate visual and audible alarms: fish alarm (normal) and fish alarm (bottom lock). The alarm icon appears and the audible alarm sounds when an alarm setting is violated. You can silence the audible alarm by pressing the [CLEAR] key, but the alarm icon stays on the screen until the cause of the alarm is cleared or the alarm is deactivated.



Single frequency display, fish alarm is violated

Note: When multiple alarms occur, the audible alarm sounds for the last alarm.

11.15.1 Audio alarm on/off

The audio alarm sounds whenever an alarm setting is violated. You can enable or disable the audio alarm.

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.

6. ALARM SETUP			
▶AUDIO ALARM	[1. SHORT]	2. LONG	3. CONT 4. OFF
ARRIVAL/ANCHOR WATCH	1. ARRIVAL	2. ANCHOR	[3. OFF]
RANGE TO MONITOR	0.050 nm		
XTE/BOADER ALARM	1. XTE	2. BOAD	[3. OFF]
RANGE TO MONITOR	0.050 nm		
PROXIMITY ALARM	1. ON	[2. OFF]	
SPEED ALARM	1. INSIDE	2. OUT	[3. OFF]
MINIMUM SPEED	000.0 kt		
MAXIMUM SPEED	030.0 kt		
TRIP LOG ALARM	1. ON	[2. OFF]	
DIST TO MONITOR	0000.1 nm		
TEMPERATURE ALARM	1. INSIDE	2. OUT	[3. OFF]
MINIMUM TEMPERATURE	+00.0 C		
MAXIMUM TEMPERATURE	+30.0 C		
SHEAR ALARM	1. ON	[2. OFF]	
GRADIENT OF TEMP	00.1 C	0.1	10.0
INTERVAL	010 MIN	10	120 MIN
BOTTOM ALARM	1. ON	[2. OFF]	
DEPTH	0000.0 ft		
RANGE	00.0 ft		
FISH ALARM	1. ON	[2. OFF]	
DEPTH	0000.0 ft		
RANGE	00.0 ft		
FISH ALARM (B/L)	1. ON	[2. OFF]	
DEPTH	0000.0 ft		
RANGE	00.0 ft		

TURN KNOB TO SELECT MENU.
SELECT THE ITEM OF EACH MENU BY TRACKBALL.

Alarms setup menu

3. Rotate the [ENTER] knob to select AUDIO ALARM.
4. Press the appropriate numeric key to select audio alarm type or turn the audio alarm off.
 - SHORT: Short beeps
 - LONG: Long beeps
 - CONT: Continuous beep
 - OFF: No beep
5. Press the [MENU] key several times to close the menu.

11.15.2 Fish alarm

The fish alarm sounds when a fish echo is within the preset alarm range. The depth at which fish live depends on species season and time of the day. The fish alarm can alert you when fish echoes are within a certain depth. Note that the sensitivity of the fish alarm can be set on the ECHO SOUNDER SYSTEM SETUP menu. For further details, see paragraph 11.18.

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select FISH ALARM.
4. Press the [1] key to select "1. ON."
5. Rotate the [ENTER] knob to select DEPTH of FISH ALARM.
6. Press the numeric keys to enter the starting point, and then press the [ENTER] knob.

The starting point is the depth from the transducer. (See the figure shown on page 11-27.)

7. Rotate the [ENTER] knob to select RANGE of FISH ALARM.
8. Press the numeric keys to enter alarm range, and then press the [ENTER] knob.
9. Press the [MENU] key several times to close the menu.

At the right of the screen, the (white) alarm marker appears.

Note: To turn this alarm off, select "2. OFF" at step 4.

11.15.3 Fish alarm (B/L)

The bottom-lock fish alarm sounds when a fish echo is within a predetermined distance from the bottom. This alarm is available for the bottom-lock and bottom discrimination displays. This alarm is useful to detect bottom fishes. Note that the sensitivity of the fish alarm can be set on the ECHO SOUNDER SYSTEM SETUP menu. For further details, see paragraph 11.18.

1. Press the [MENU] key to show the main menu.
2. Press the [6] key to show the ALARMS SETUP menu.
3. Rotate the [ENTER] knob to select FISH ALARM (B/L).
4. Press the [1] key to select "1. ON."
5. Rotate the [ENTER] knob to select DEPTH of FISH ALARM (B/L).
6. Press the numeric keys to enter the starting point, and then press the [ENTER] knob.

The starting point is range from bottom.

7. Rotate the [ENTER] knob to select RANGE of FISH ALARM (B/L).
8. Press the numeric keys to enter the alarm range from the ending point, and then press the [ENTER] knob.
9. Press the [MENU] key to close the menu.

The white alarm marker appears at the left of the Bottom-lock and Bottom discrimination displays.

Note: To turn this alarm off, select "2. OFF" at step 4.

11.16 Programmable Key Setup

The programmable key ([PROG] key) provides one-touch execution of desired function. Also, the [SHIFT], [RANGE], [GAIN] and [VRM] keys can be programmed for other functions. The default programs for these keys settings are as shown in the table below.

Key label	Functions
PROG	Shows the WAYPOINTS LIST.
SHIFT	Shows E/S SHIFT window.
RANGE	Shows E/S RANGE window.
GAIN	Shows E/S GAIN window.
VRM	Use the VRM function. (only when the menu is not shown.)

If the above settings are not to your liking, you may change them as below.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [3] key to show the PROGRAMMABLE KEYS & REMOTE CONTROLLER SETUP menu.
4. Rotate the [ENTER] knob to select the key name you want to change the function, and then press the [ENTER] knob.

If you want to change the function of the [PROG] key, for example, select "PROGRAMMABLE KEYS SETUP." The PROGRAMMABLE FUNCTIONS LIST appears.

0-3. PROGRAMMABLE FUNCTIONS LIST	2/2
PREVIOUS PAGE ► E/S SHIFT E/S RANGE E/S GAIN E/S AUTO MODE E/S NOISE LIMITER E/S CLUTTER E/S WHITE MARKER E/S HUE E/S SIGNAL LEVEL E/SPICTURE ADV	
TURN KNOB TO SELECT MENU AND PRESS KNOB TO ENTER.	
ZOOM IN: PREVIOUS PAGE	ZOOM OUT: NEXT PAGE

Programmable functions list

5. If page 1/2 appears, rotate the [ENTER] knob clockwise to select NEXT PAGE.

11. VIDEO SOUNDER OPERATION

6. Rotate the [ENTER] knob to select the function, and then press the [ENTER] knob.

Note that the function of "E/S GAIN" is available for the [GAIN] key only.

7. Press the [MENU] key several times to close the menu.

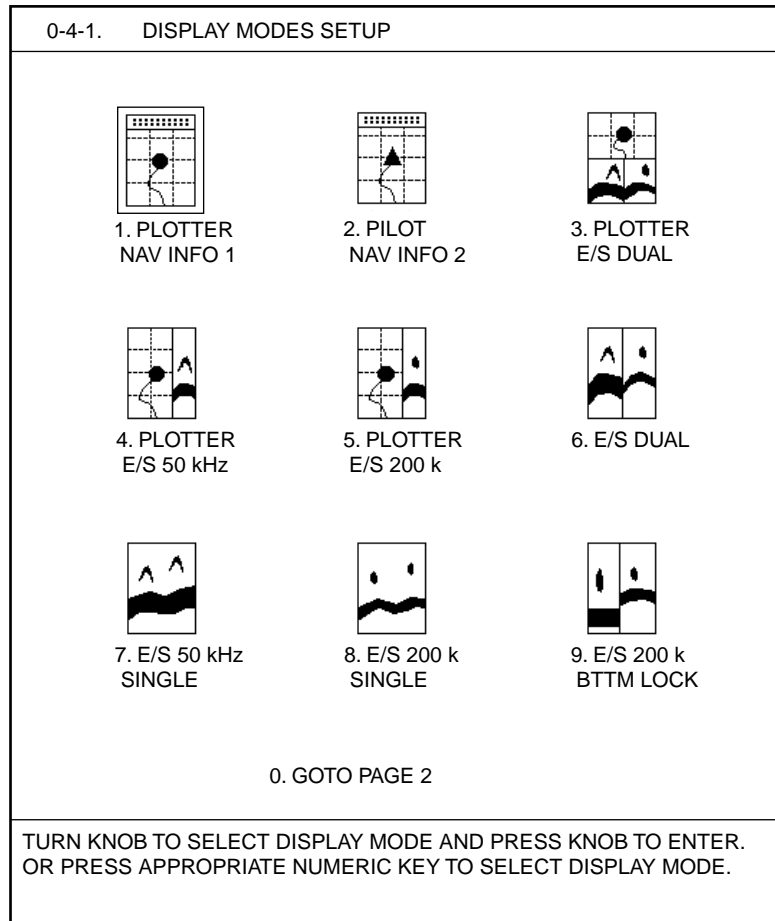
Function keys

Menu item	Function
E/S SHIFT	Shows the SHIFT window.
E/S RANGE	Shows the ECHO SOUNDER RANGE window.
E/S GAIN	Shows the GAIN window.
E/S AUTO MODE	Shows the AUTO MODE window.
E/S NOISE LIMITER	Shows the NOISE LIMITER window.
E/S CLUTTER	Shows the CLUTTER window.
E/S WHITE MARKER	Shows the WHITE MARKER window.
E/S HUE	Shows the HUE window.
E/S SIGNAL LEVEL	Shows the SIGNAL LEVEL window.
E/S PICTURE ADV	Shows the PICTURE ADVANCE window.

11.17 Setting the DISPLAY MODE Screen

The DISPLAY MODE screen appears when pressing the [DISP] key. Display type and order can be arranged as below.

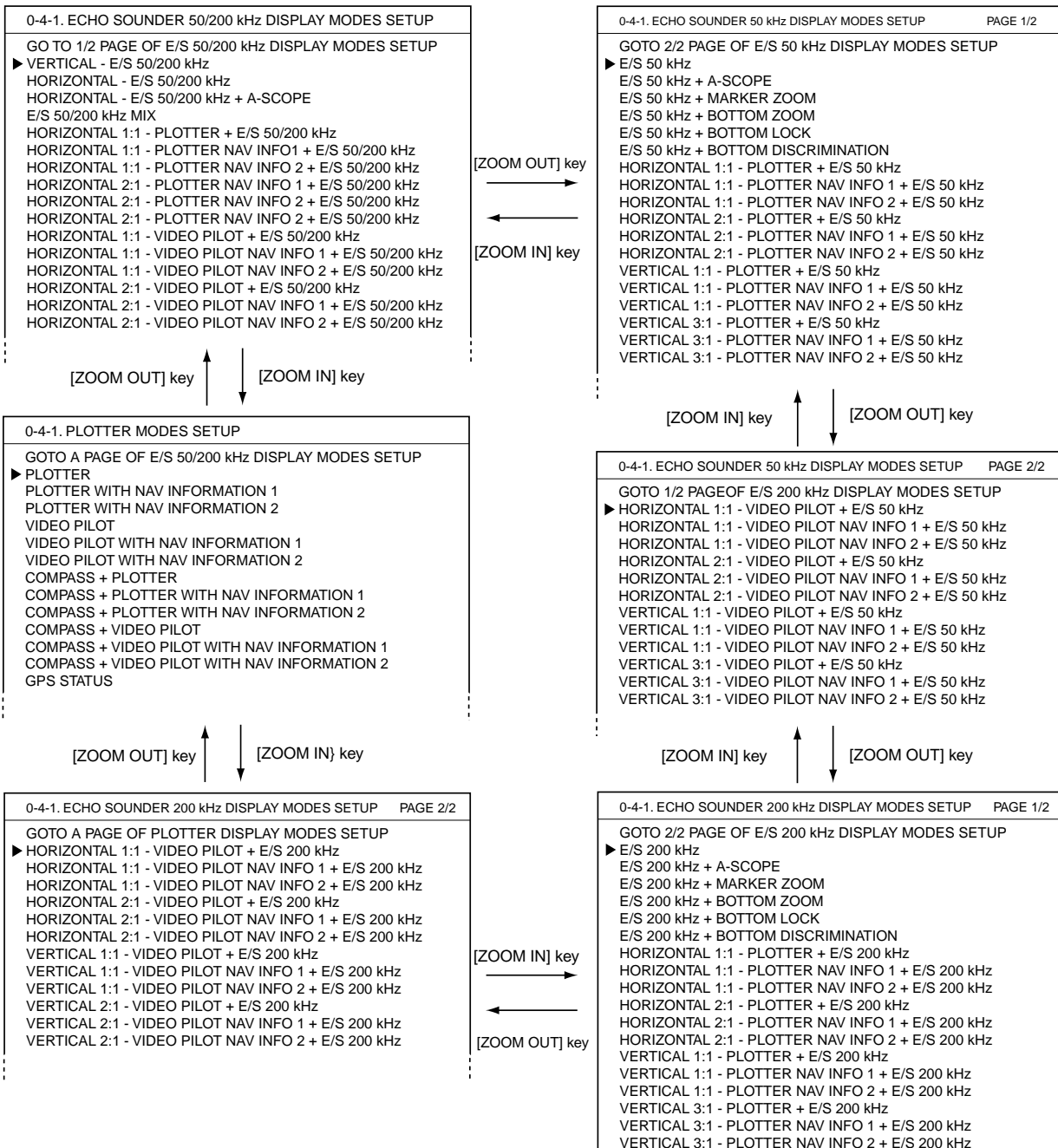
1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [4] key to show the DISPLAY MODES & NAV DATA WINDOW SETUP menu.
4. Press the [1] key to show the DISPLAY MODES SETUP menu.



Display modes setup menu

5. Press the [0] key several times to choose the page desired.
6. Press the numeric key corresponding to the desired display.
A display modes setup menu appears. Each display has six pages; plotter, 50/200 kHz Sounder, 50 kHz Sounder (page 1, 2), 200 kHz Sounder (page1, 2). For the plotter display without sounder, see paragraph 9.6.1.
7. Press the [ZOOM IN] or [ZOOM OUT] key to show the setup menu desired.

11. VIDEO SOUNDER OPERATION



Sequence of Display setup menu

8. Rotate the [ENTER] knob to select the display.
The DISPLAY MODES SETUP menu appears. The display icon selected at step 6 changes to the new selection of step 8.
9. Press the [MENU] key several times to close the menu.

11.18 ECHO SOUNDER SYSTEM SETUP Menu

The ECHO SOUNDER SYSTEM SETUP menu sets up the sounder section.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [8] key to show the ECHO SOUNDER SYSTEM SETUP menu.
4. If the ECHO SOUNDER RANGE SETUP menu appears, rotate the [ENTER] knob to select GOTO ECHO SOUNDER RANGE SETUP menu.

0-8. ECHO SOUNDER SYSTEM SETUP			
GOTO ECHO SOUNDER RABGE SETUP			
FISH ALARM LEVEL	1. HIGH	2. MED	3. LOW
TRANSMISSION	1. ON	2. STOP	
TRANSMISSION POWER	1. HIGH	2. LOW	
TVG 200 kHz	1. YES	2. NO	3
TVG 50 kHz	1. YES	2. NO	3
ECHO OFFSET 200 kHz	1. YES	2. NO	+00
ECHO OFFSET 50 kHz	1. YES	2. NO	+00
BOTTOM LEVEL 200 kHz	1. YES	2. NO	+000
BOTTOM LEVEL 50 kHz	1. YES	2. NO	+000
SMOOTHING	1. OFF	2. SM1	3. SM2 4. SM3 5. SM4
DEPTH INFORMATION	1. L	2. S	3. OFF
TEMPERATURE GRAPH	1. ON	2. OFF	
ZOOM MARKER	1. ON	2. OFF	
▶ PLAYBACK SNDR IMAGE	1. PLAY	2. S-DOWN	3. OFF
SPEED CALIBRATION:	+00%	(-50~+50%)	
TEMP CALIBRATION:	+00.0°F	(-20~+20°F)	
DEPTH CALIBRATION:	+000.0 ft	(-15~+100 ft)	
ACSTC SPD CALIB :	+000 m/s		
SPEED (STW)	: - . - kt		
TEMPERATURE	: + 4.9°F		
DEPTH	: 81.6 ft		
ACOUSTIC SPEED	: 1500 m/s		
TURN KNOB TO SELECT MENU. SELECT THE ITEM OF EACH MENU BY TRACKBALL.			

Echo sounder system setup menu

FISH ALARM LEVEL

Sets the alarm sensitivity, that is, the minimum echo strength which will trigger the fish alarms.

HIGH: Red and stronger echoes trigger the alarm.

MED: Yellow and stronger echoes trigger the alarm.

LOW: Blue and stronger echoes trigger the alarm.

TRANSMISSION

Turns TX power on/off.

Normally, "1" should be selected. To stop the transmission, select "2". When turning the power off and on it again, "1" is selected automatically.

TRANSMISSION POWER

Sets transmission power to HIGH or LOW.

Normally, select "1". When the gain becomes too high at the shallower, select "2".

TVG (200 kHz, 50 kHz)

TVG (Time Varied Gain) compensates for propagation attenuation of the ultrasonic waves. It does this by equalizing echo presentation so that fish schools of the same size appear in the same density in both shallow and deep waters. In addition, it reduces surface noise. Note that if the TVG level is set too high short range echoes may not be displayed.

ECHO OFFSET (200 kHz, 50kHz)

If the on-screen echo level appears to be too weak or too strong and the level cannot be adjusted satisfactorily with the gain control on the display unit, adjust echo offset to compensate for too weak or too strong echoes.

BOTTOM LEVEL (200 kHz, 50 kHz)

If the depth indication is unstable in automatic operation or the bottom echo cannot be displayed in reddish-brown by adjusting the gain control in manual operation, you may adjust the bottom echo level detection circuit, for both 50 kHz and 200 kHz, to stabilize the indication.

NOTE

If the BOTTOM LEVEL is set too low, weak echoes may be recognized as the sea bottom, and the depth indication may be unstable. Reversely, if the setting is too high, the depth indication will not be displayed.

SMOOTHING

Smooths echoes to present stable display. The higher the setting the greater the smoothing.

DEPTH INFORMATION

Selects the size of the depth indication, L (large), S (small) or OFF.

TEMPERATURE GRAPH

Turns the temperature graph on or off.

Note: This graph is not available on the HORIZONTAL 2:1 and VERTICAL 3:1 displays.

ZOOM MARKER

Turns the zoom marker on or off on the single frequency display for the bottom-lock or bottom discrimination display.

PLAYBACK SNDR IMAGE

Reviews the past picture. For further details, see paragraph 11.14.

SPEED CALIBRATION, TEMP CALIBRATION,

DEPTH CALIBRATION, ASTC SPD CALIBRATION

See the installation manual.

11.19 ECHO SOUNDER RANGE SETUP Menu

This section shows you how to set custom ranges for basic range, zoom range (marker and bottom zoom) and bottom lock range.

Note: All default basis ranges are restored whenever the unit of depth measurement is changed. Therefore, change the depth unit before changing the basic range.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [8] key to show the ECHO SOUNDER SYSTEM SETUP menu.
4. If the ECHO SOUNDER SYSTEM SETUP menu appears, rotate the [ENTER] knob to select ECHO SOUNDER RANGE SETUP menu.

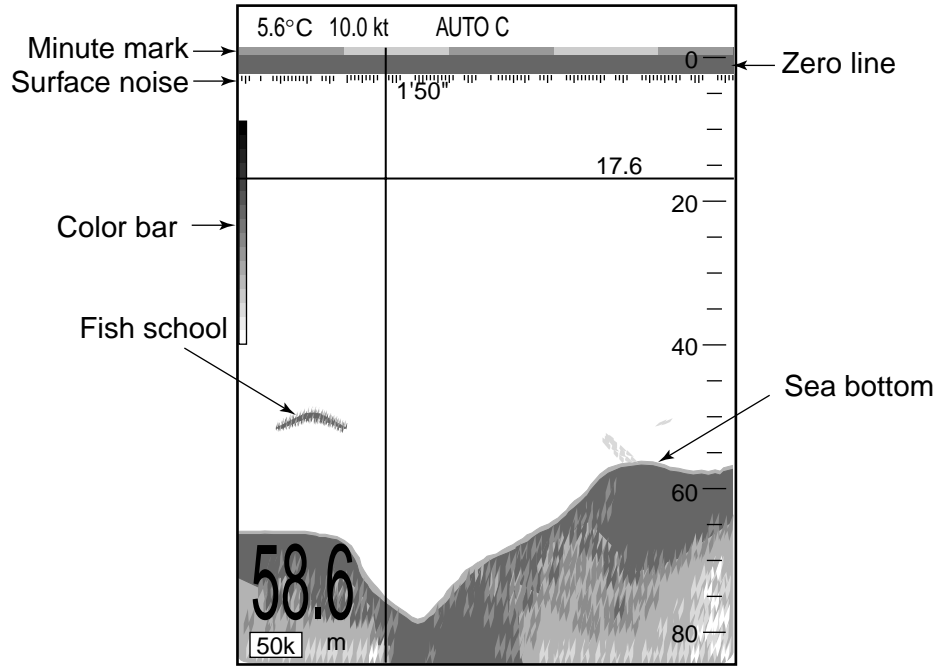
0-8. ECHO SOUNDER RANGE SETUP		
GOTO ECHO SOUNDER SYSTEM SETUP		
▶ RANGE 1	15 ft	
RANGE 2	30 ft	
RANGE 3	60 ft	
RANGE 4	120 ft	
RANGE 5	200 ft	
RANGE 6	400 ft	
RANGE 7	1000 ft	
RANGE 8	4000 ft	
ZOOM RANGE	10 ft	
BOTTOM LOCK RANGE	15 ft	<input type="text" value="30 ft"/>
TURN KNOB TO SELECT MENU. SET RANGE BY TRACKBALL. SELECT THE ITEM OF EACH MENU BY TRACKBALL.		

Echo sounder range setup menu

5. Rotate the [ENTER] knob to select the range to change.
 - RANGE 1 through 8: Set the ranges of the ECHO SOUNDER RANGE window which is shown by pressing the [RANGE] key. (Setting range: 15 to 4000 ft)
 - ZOOM RANGE: Set the zoomed range for Marker-zoom and Bottom-zoom displays. (Setting range: 15 to 400 ft)
 - BOTTOM LOCK RANGE: Set the zoomed range for Bottom-lock and Bottom discrimination displays. (Setting range: 15 or 30 ft)
6. Roll the trackball in left-right direction to set range.
 - For basic range, set depth from lowest to highest. A range cannot be higher than its succeeding neighbor.
7. Press the [MENU] key for several times to close the menu.

11.20 Interpreting the Sounder Display

This section provides, using typical examples, the information necessary for interpreting the sounder display.

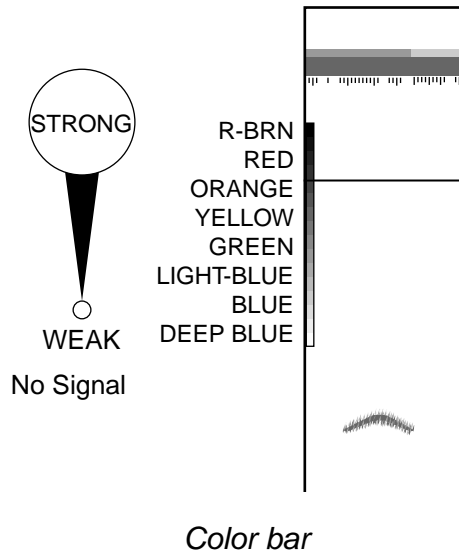


Typical single frequency display

11. VIDEO SOUNDER OPERATION

Color bar

The color bar shows the relation between echo intensity and echo color on the screen. The top color (reddish-brown) is the strongest color and the lower colors the weakest. The bar can be used as a reference to estimate density of a fish school, fish species and hardness of the bottom. The background color can be selected on the menu screen.

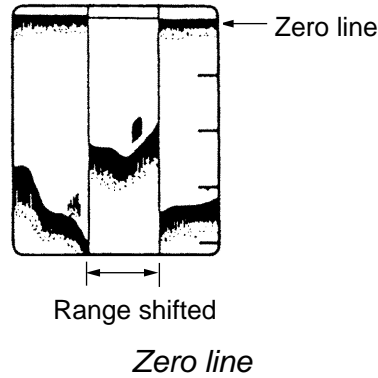


Minute marker

The minute marker displays a minute worth of time with two colored bars, each bar 30 seconds in time. It is useful for estimating elapsed time.

Zero line

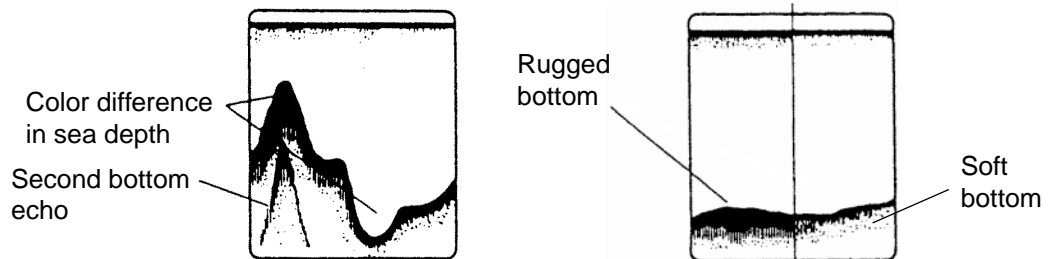
The zero line represents the transducer's position. It moves off the screen when a shifted range is used, or is shown at draft depth when ship's draft is entered.



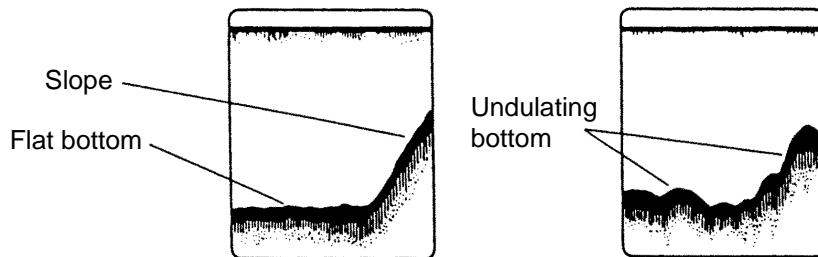
Bottom echoes

Bottom echoes are normally strongest and displayed in reddish-brown or red, but colors and width will vary with bottom material, depth, sea condition, installation, frequency, pulselength and sensitivity.

A hard and rough bottom appears with a longer tail because it reflects more of the ultrasonic pulse. Because of their stronger return, shallow echoes appear wider than deep ones even when all bottom conditions are equal. Also, a longer bottom tail appears on slopes because of the difference in traveling time at both edges of the beam angle. In the rugged bottom, echoes are reflected on many different planes, overlapping to present a 3D effect.



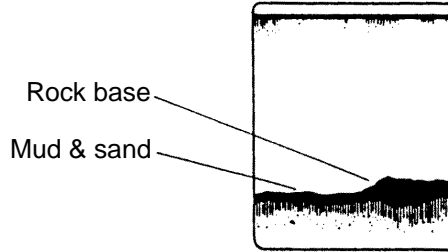
Bottom material and bottom profile



Bottom shapes

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The nature of the bottom is known from the intensity and length of the bottom tail. Generally, when observing the bottom nature, the lower sounding frequency is used, the pulselength is set to long, and the gain setting is not disturbed. In the hard and craggy bottom, the bottom appears more reddish and with a long tail. However, the bottom with sediment may give a short tail if a low frequency sounding is used.

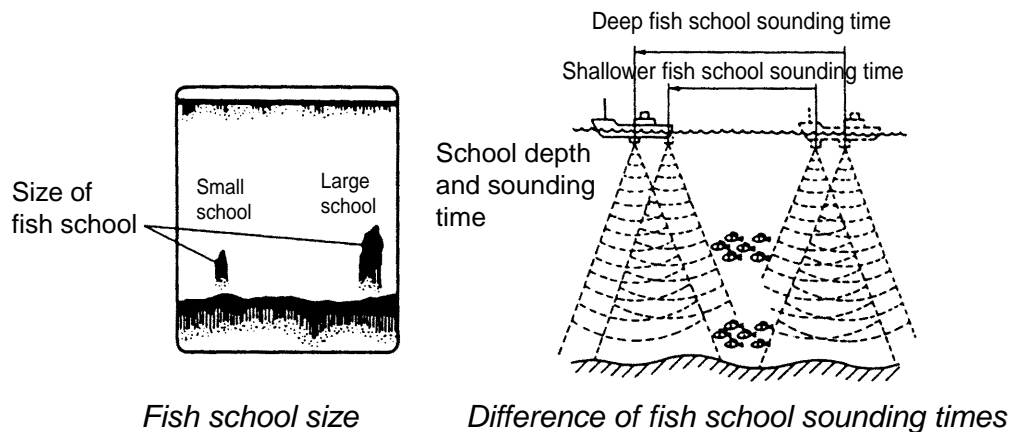


Bottom nature

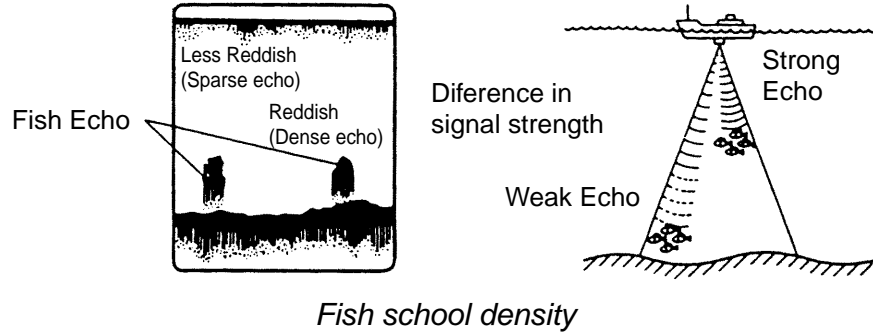
Fish school echoes

Fish quantity can be estimated to a certain extent from fish echoes on the screen if fish school size and fish school density are kept in mind.

Usually the size of fish echoes on the screen is proportional to the actual size of the fish school. However, if two fish echoes appear at different depths with the same size, the fish school at shallower depth is smaller because the ultrasonic beam widens as it propagates and a fish school in deep water is displayed larger.

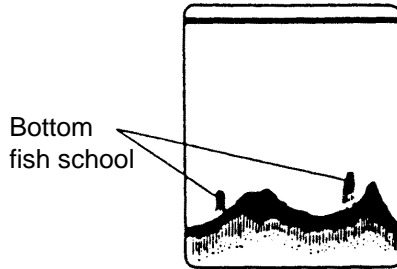


If two fish schools appear with the same color at different depths, the one in deeper water is denser because the ultrasonic wave attenuates as it propagates and the fish school in deep water tends to be displayed in a weaker color.



Fish schools at bottom

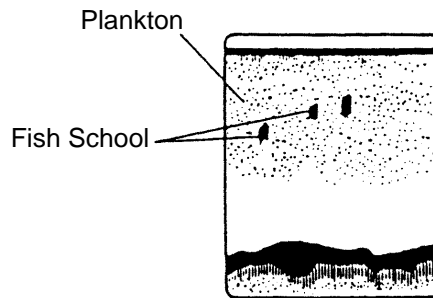
Because bottom echoes are stronger than fish school echoes, it is possible to distinguish them by echo color. When the gain is properly set, bottom echoes are displayed in reddish-brown or red, and fish school echoes in weaker colors.



Other

Plankton

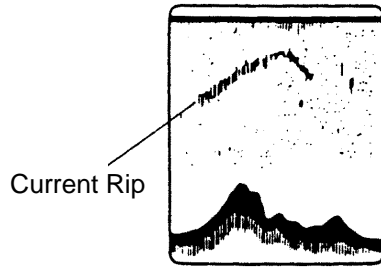
A plankton lager, a likely place to find fish, is displayed in green or blue dots.



Plankton

Current rip

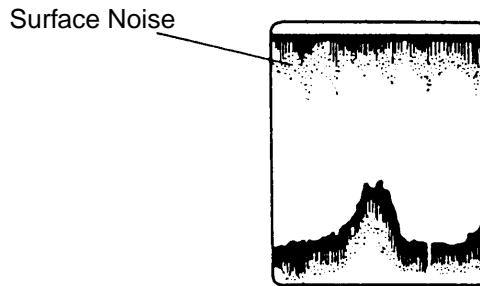
A current rip develops when two ocean currents of different speeds, directions and water temperatures meet. Its on-screen appearance is as shown below.



Current rip

Surface noise

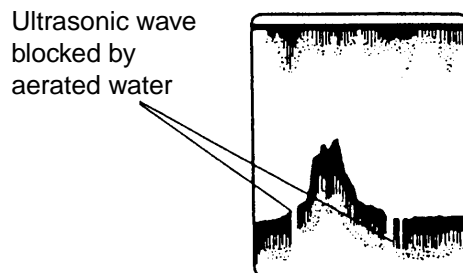
When the sea is rough or the ship passes over a wake, surface noise may appear at the top of the screen. It can be suppressed with the CLUTTER FUNCTION.



Surface noise

Aerated water

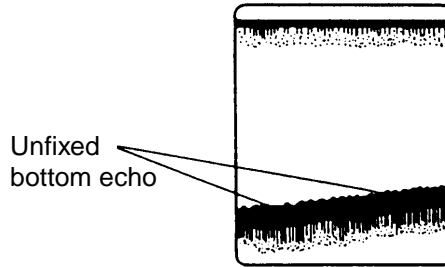
When the sea is rough or the ship makes a quick turn, gaps in the bottom echo on the screen may appear. This is caused by air bubbles which block propagation of the sound wave. Generally low frequency ultrasonic waves are interrupted more easily than high ones.



Aerated water

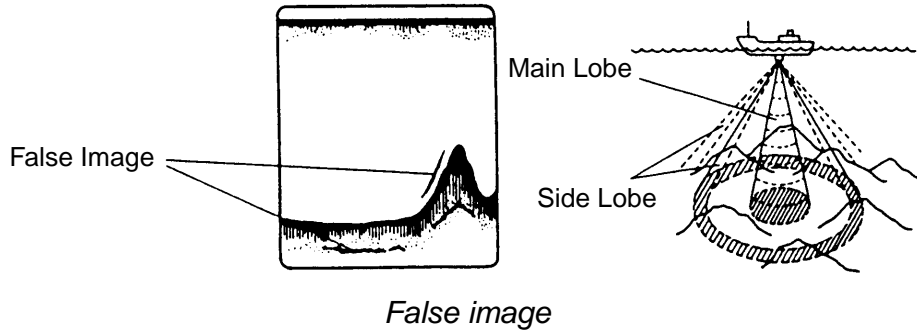
Unstable bottom echo

The sea bottom echo may be displayed jagged like a saw. This results from that the beam direction and distance to the bottom changes by the ship's rolling and pitching in stormy weather.



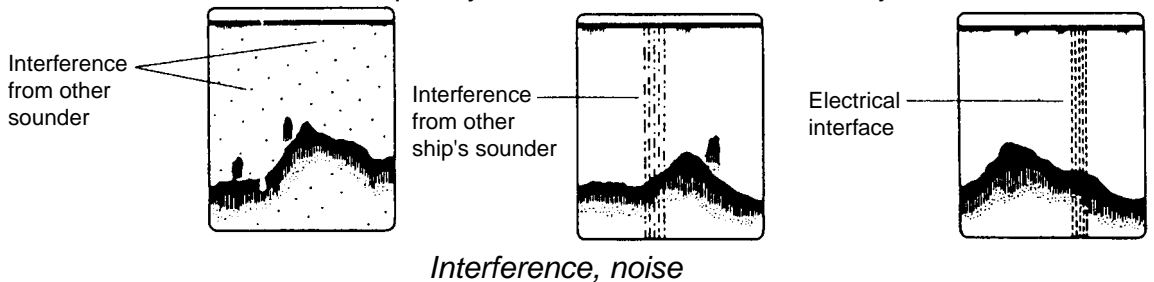
False image

Every time the ultrasonic pulse is transmitted, some radiation escapes on each side of the beam, called "side lobes." Echoes from side lobes show on the display as false images as below.



Interference, noise

As shown in the figure below, unwanted signals are displayed cyclically or at random. The source of these unwanted signals may be induction from electrical machinery, ship's vibration, engine noise, interference from other sounders being operated nearby, etc. As a general rule, echoes from interference usually appear below the bottom echo. If TVG is ON, echoes and interference will become stronger as the depth becomes deeper. Further, if "TRANSMISSION POWER" on the ECHO SOUNDER SYSTEM SETUP menu is set to "2. LOW", echoes will be displayed in weaker colors, but the color of interference remains the same so you can easily distinguish interference from echoes. If interference is present on the screen, lower the TX frequency or turn on the interference rejector.




11. VIDEO SOUNDER OPERATION

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12. MAINTENANCE & TROUBLESHOOTING

12.1 Maintenance

Regular maintenance is important for continued performance. Important points to be checked from time to time are shown below.


WARNING


Do not open the equipment.



Hazardous voltage which can cause electrical shock exists inside the equipment. Only qualified personnel should work inside the equipment.

Location	Check point	Remedy
Antenna unit	Check for loosened and corroded bolts.	Tighten loosened bolts. Replace heavily corroded bolts.
Antenna cable	Check connection point for watertightness.	Replace damaged parts.
	Check connector for tightness and corrosion.	
	Check cables for damage.	
Display unit connectors	Check for tight connection.	Tighten loosened connectors.
Ground terminal	Check for tight connection and corrosion.	Clean or replace as necessary.
Display unit	Dust and foreign material on the display unit.	Dust or dirt may be removed from the cabinet with soft cloth. Water-diluted mild detergent may be used if desired. DO NOT use chemical cleaners to clean the display unit; they may remove paint and markings. Wipe the LCD carefully to prevent scratching, using tissue paper and an LCD cleaner. 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.
Transducer	Check the transducer face for marine life, which can reduce sensitivity.	Remove marine life from the transducer when drydocking the boat. Use a piece of wood to remove any marine life.


12.2 Replacement of Fuse

 CAUTION
<p>Use the correct fuse.</p> <p>Use of a wrong fuse can cause fire or damage the equipment.</p>

The fuse on the power cable protects the system from reverse polarity of the ship's mains and equipment fault. If the fuse blows, find the cause before replacing it. Use only a 3 A fuse. Using the wrong fuse will damage the unit and void the warranty.

Name	Type	Code No.
Fuse	FGBO-A 3A AC125V	000-549-063

12.3 Replacement of Battery

A battery installed on the circuit board inside display unit preserves data when the power is turned off. The life of the battery is about three years. When the battery voltage is low the battery icon () appears on the display. When this happens, contact your dealer to request replacement of the battery.

Name	Type	Code No.
BATT (L1)	CR2450-F2ST2L	000-144-941

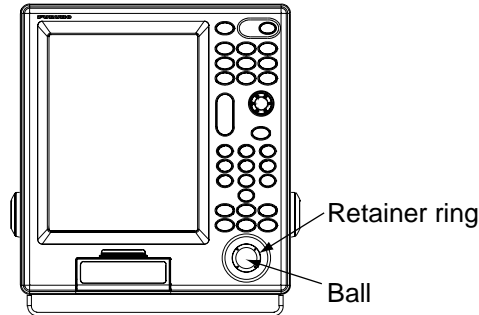
Note: Save data into the memory card or internal memory before replacing the battery.

 WARNING	
	<p>Replace teh battery with correct polarity.</p> <p>Wrong polarity may cause an explosion.</p>

12.4 Trackball Maintenance

If the cursor skips or moves abnormally, you may need to clean the trackball.

1. Turn the retainer ring counterclockwise 45° to unlock it.



Display unit

2. Remove the retainer ring and ball.
3. Clean the ball with a soft lint-free cloth, and then blow carefully into the ball-cage to dislodge dust and lint.
4. Look for a build-up of dirt on the metal rollers. If dirty, clean the rollers using a cotton swab moistened lightly with isopropyl-rubbing alcohol.
5. Make sure that fluff from the swab is not left on the rollers.
6. Replace the ball and retainer ring.

Note: Trackball maintenance parts are available as below.

Part	Type	Code No.
Retainer ring and ball	MU3721	000-144-645

12.5 Simple Troubleshooting

This section provides simple troubleshooting procedures which the user can follow to restore normal operation. If you cannot restore normal operation do not attempt to check inside the unit. Any trouble should be referred to a qualified technician.

General troubleshooting

If...	Then...
you cannot turn on the power	<ul style="list-style-type: none"> ● check for blown fuse.
	<ul style="list-style-type: none"> ● check that the power connector is firmly fastened.
	<ul style="list-style-type: none"> ● check for damaged power cable.
	<ul style="list-style-type: none"> ● check battery for proper voltage output.
no picture appears	<ul style="list-style-type: none"> ● press the [BRILL] key for several times.
there is no response when a key is pressed	<ul style="list-style-type: none"> ● turn off and on the power.

Plotter troubleshooting

If...	Then...
position is not fixed within 90 seconds	<ul style="list-style-type: none"> ● check that antenna connector is firmly fastened.
	<ul style="list-style-type: none"> ● check number of satellites received, on the GPS STATUS display.
position is wrong	<ul style="list-style-type: none"> ● check that the correct geodetic chart system is selected on the NAVIGATOR SETUP menu.
	<ul style="list-style-type: none"> ● enter position offset, on the NAVIGATOR SETUP menu.
the track is not plotted	<ul style="list-style-type: none"> ● check that "1. ON" is selected at DISP TRACKS (HOLD) in the MARKS/SHIP'S TRACKS SETUP menu.
	<ul style="list-style-type: none"> ● check that "1. ON" is selected at SHIP'S TRACKS DISP in the MARKS/SHIP'S TRACKS SETUP menu.
Loran C (or Decca) TDs are wrong	<ul style="list-style-type: none"> ● enter TD offset on the PLOTTER SETUP menu.
Bearing is wrong	<ul style="list-style-type: none"> ● check the MAGNETIC VARIATION in the DISPLAY SETUP menu.
The ship's speed indication is not zero after the ship is stopped	<ul style="list-style-type: none"> ● try to decrease speed/course smoothing.

Sounder troubleshooting

If...	Then...
picture does not move though marks and characters appear	<ul style="list-style-type: none"> ● check that “7. STOP” is not selected of the PICTURE ADVANCE on the ECHO SOUNDER SETUP menu.
	<ul style="list-style-type: none"> ● check for loosened transducer connector.
zero line does not appear though the picture appears	<ul style="list-style-type: none"> ● the picture is shifted. Confirm shift setting.
picture sensitivity is too low	<ul style="list-style-type: none"> ● check gain setting, if using manual operation.
	<ul style="list-style-type: none"> ● marine life or air bubbles may be clinging to transducer face.
	<ul style="list-style-type: none"> ● bottom may be too soft to return a suitable echo.
the depth indication is not displayed	<ul style="list-style-type: none"> ● adjust gain and range to display the bottom echo in reddish brown, if you are using the manual operation.
noise or interference shows on the display	<ul style="list-style-type: none"> ● If no noise appears after turning the engine off, the engine interference is suspected. Call your dealer.
	<ul style="list-style-type: none"> ● check the ground.
	<ul style="list-style-type: none"> ● other video sounder of the same frequency as yours may be operating near you.
data is wrong though the water temperature graph appears.	<ul style="list-style-type: none"> ● check that sensor cable is tightly fastened.

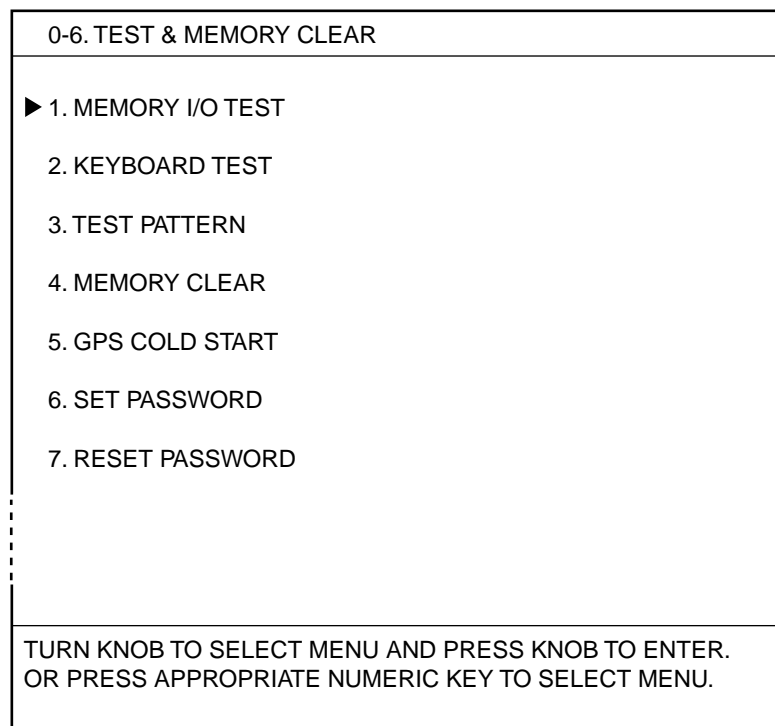
12.6 Diagnostics

This section provides the procedures for testing the equipment for proper operation. Three tests are provided: MEMORY I/O TEST, KEYBOARD TEST and TEST PATTERN.

12.6.1 Memory I/O test

The memory I/O test checks each memory circuits and signal I/O circuit, displaying program number. Results for device checks are shown as OK or NG (No Good). For any “NG”, request service.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [6] key to show the TEST & MEMORY CLEAR menu.



Test & memory clear menu

4. Press the [1] key to start the MEMORY I/O TEST.

0-6. MEMORY I/O TEST	
PLOTTER	
ROM	:OK
RAM	:OK
NMEA IN/OUT 1	:--
NMEA IN/OUT 2	:--
NMEA IN	:--
RS232C	:--
BACKUP DATA	:OK
INTERNAL BATTERY	:OK
INTERNAL GPS	:OK
INTERNAL BEACON	:OK
ECHO SOUNDER	
ROM	:OK
RAM	:OK
PROGRAM NUMBER	
PLOTTER	: 1451713-XX.XX
GPS RECEIVER	: 48502370XX
BEACON RECEIVER	: 08501820XX
ECHO SOUNDER	: 1451716-XX.XX
PRESS MENU KEY TO FINISH THE TEST.	

XX: Program version No.

Only when equipped with optional DGPS receiver board.

"NMEA IN/OUT 1", "NMEA IN/OUT 2", "NMEA IN" and "PC" are for factory use.
Normally, "--" appears at those locations.

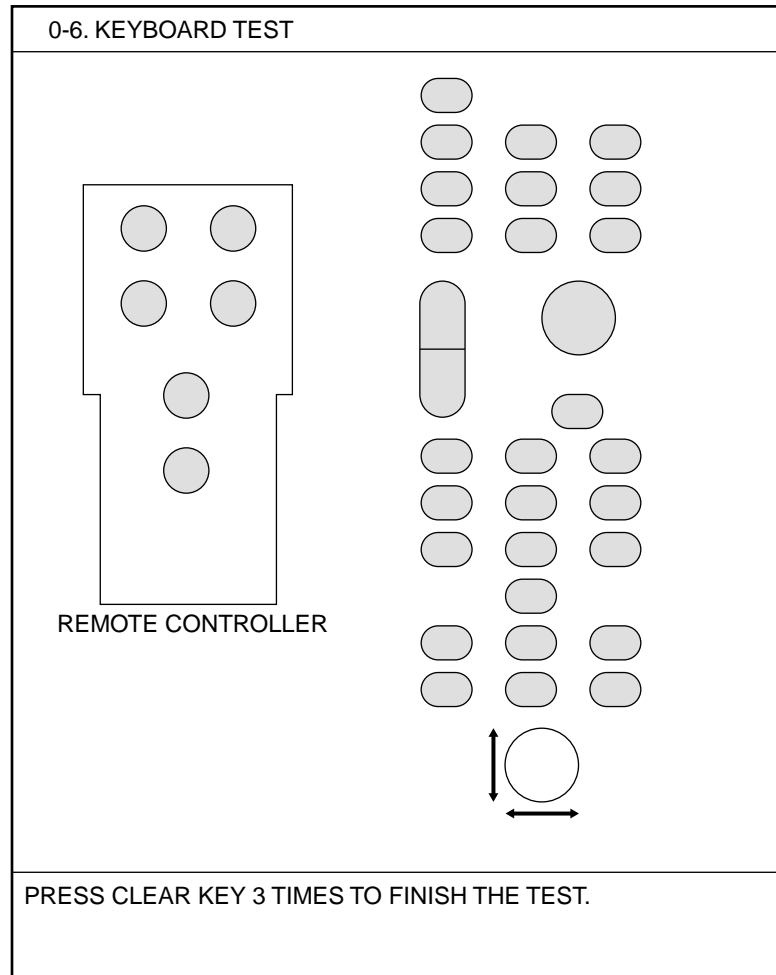
Memory I/O test

5. Confirm that all check items are "OK."
6. Press the [MENU] key to finish the memory I/O test.
7. Press the [MENU] key for several times to close the menu.

12.6.2 Keyboard test

The keyboard test checks the controls on the display unit and remote controller for proper operation.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [6] key to show the TEST & MEMORY CLEAR menu.
4. Press the [2] key to show the KEYBOARD TEST.



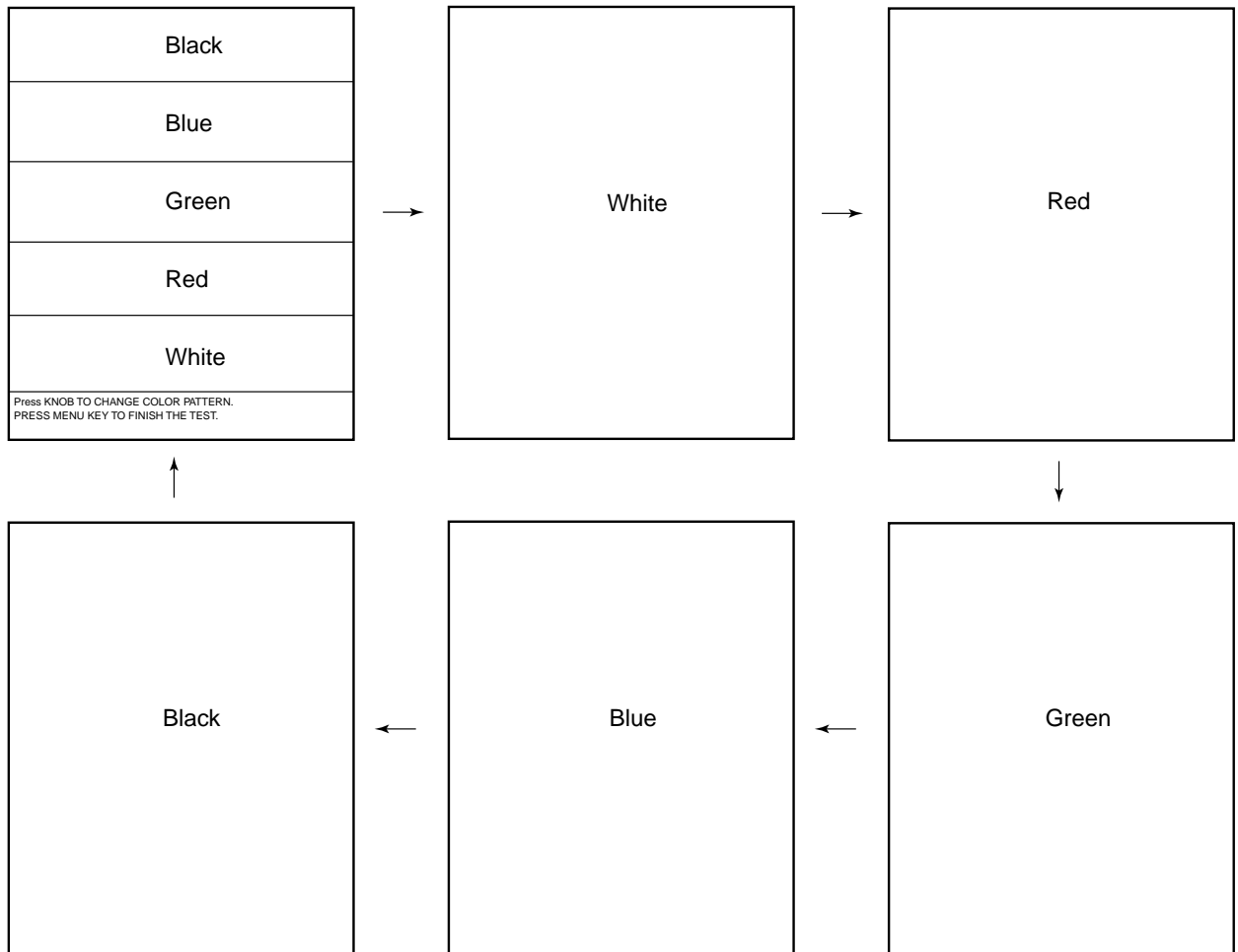
Keyboard test

5. Operate each control on the display unit and remote controller one by one. A key is functioning properly if its on-screen location "fills" in black when the key is pressed. For the [ENTER] knob and trackball, rotate them to show their X-Y positions digitally, and push the [ENTER] knob to confirm its function. Note that the [POWER] key cannot be tested.
6. Press the [CLEAR] key three times to finish the test.
7. Press the [MENU] key for several times to close the menu.

12.6.3 Test pattern

The test pattern test checks the display for proper display of colors.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [6] key to show the TEST & MEMORY CLEAR menu.
4. Press the [3] key to show the test pattern screen (five-color display).
5. Rotate the [ENTER] knob to change the pattern in the sequence shown below.



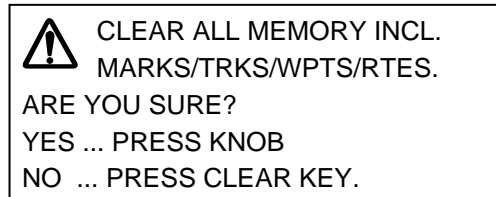
Test pattern

6. Press the [MENU] key to finish the test.
7. Press the [MENU] key for several times to close the menu.

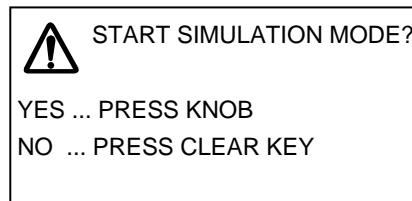
12.7 Clearing the Working Memory

The working memory can be cleared to restart operation with default settings. All tracks, marks, waypoints and routes are deleted. Note that the cleared memory cannot be restored.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [6] key to show the TEST & MEMORY CLEAR menu.
4. Press the [4] key to show the following window.



5. Press the [ENTER] knob to clear the memory.
The equipment restarts automatically, and then the following window appears.



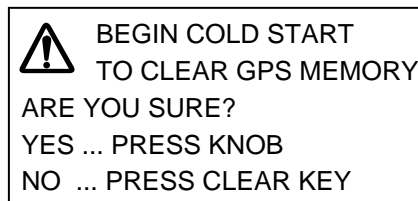
Note: Press the [CLEAR] key to escape.

6. To start the simulation mode, press the [ENTER] knob. (For normal operation, press the [CLEAR] key.)
Soon after the memory is cleared, “BACK DATA: NG” and the message “SYSTEM HAS FAILED START UP TEST. PLEASE CONTACT A LOCAL FURUNO REPRESENTATIVE FOR REPAIR. PRESS ANY KEY TO CONTINUE” appears on the startup test screen. This is normal; it is not a sign of malfunctions.
7. Press any key twice to finish.

12.8 Cold Start

Cold start is automatically executed at initial power application or when the GPS memory is cleared. This is done to acquire the Almanac to receive a GPS satellite. You can also do the cold start manually when the Almanac is too old to acquire a satellite; for example, when the equipment has not been used for one year or more. Manually cold starting the receiver erases the existing Almanac to receive the current one.

1. Press the [MENU] key to show the main menu.
2. Press the [0] key to show the SYSTEM SETUP menu.
3. Press the [6] key to show the TEST & MEMORY CLEAR menu.
4. Press the [5] key to show the following window.



5. Press the [ENTER] knob to begin the cold start or the [CLEAR] key to escape. Cold start takes about 90 seconds to complete.
6. Press the [MENU] key several times to close the menu.

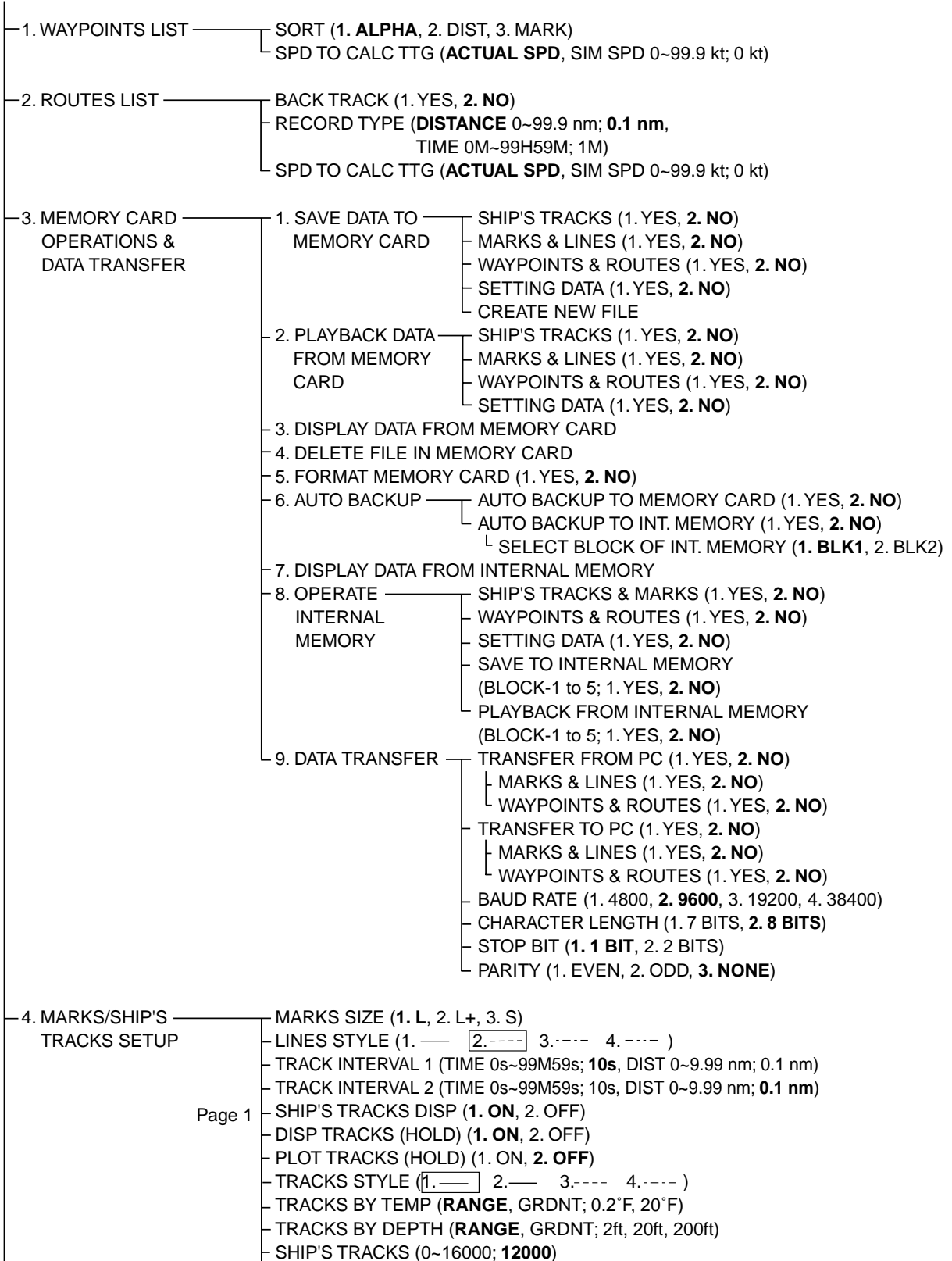
The Almanac description is shown on the next page.

Almanac

Every GPS satellite is broadcasting general orbital data (called Almanac) about all other satellites. The GPS receiver decodes the Almanac to calculate when and at what angle the GPS satellite is to appear. If there is no Almanac in the receiver the estimated arrival time of the GPS satellite cannot be found and thus GPS position fix cannot be calculated. The GPS receiver is shipped with no Almanac in its memory. When the power is first turned on after installation the receiver starts receiving the Almanac. This is called "cold start." Each time the GPS receiver receives orbital data the Almanac is replaced with the latest one.

MENU TREE

[MENU] key

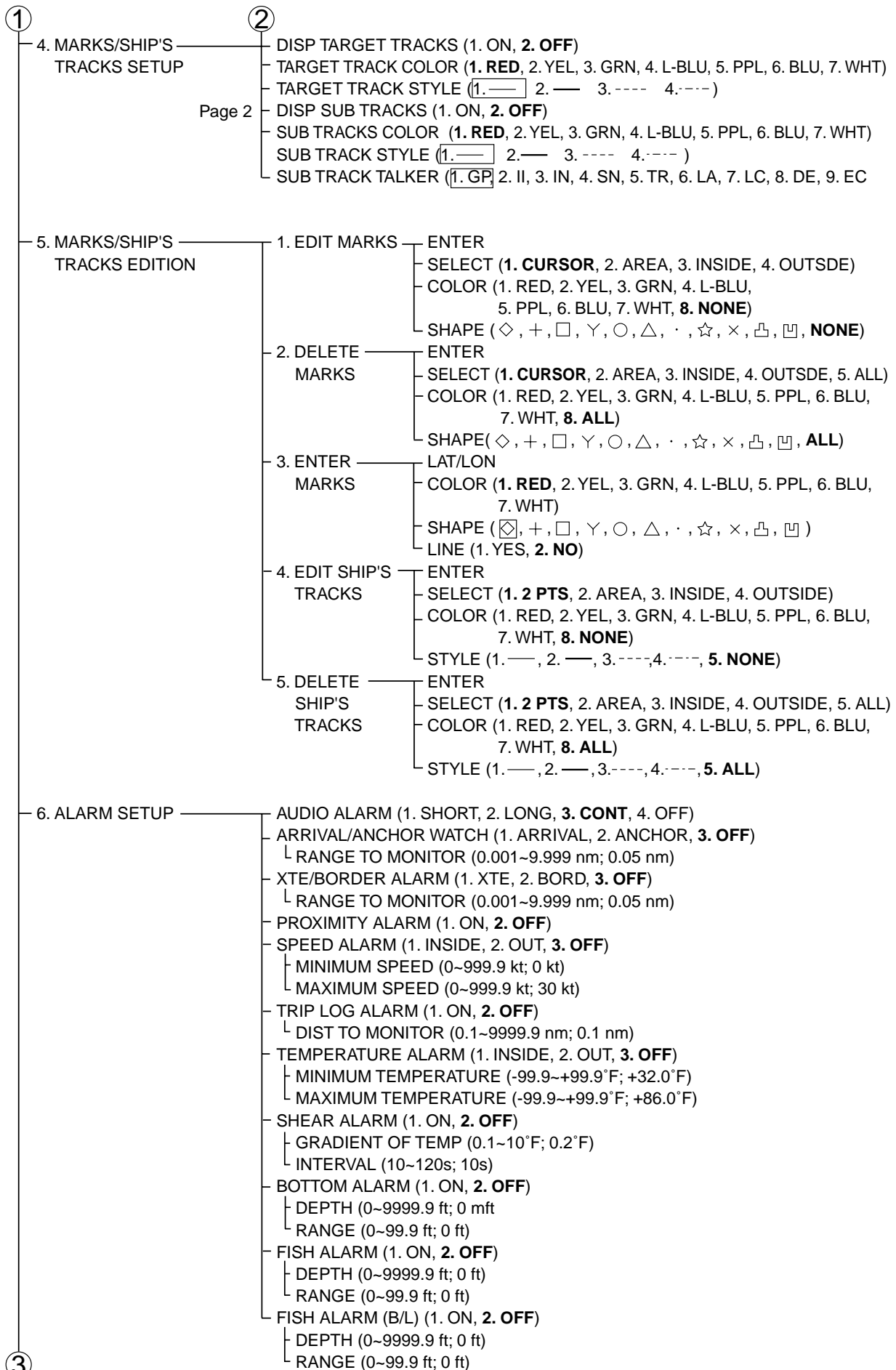


①

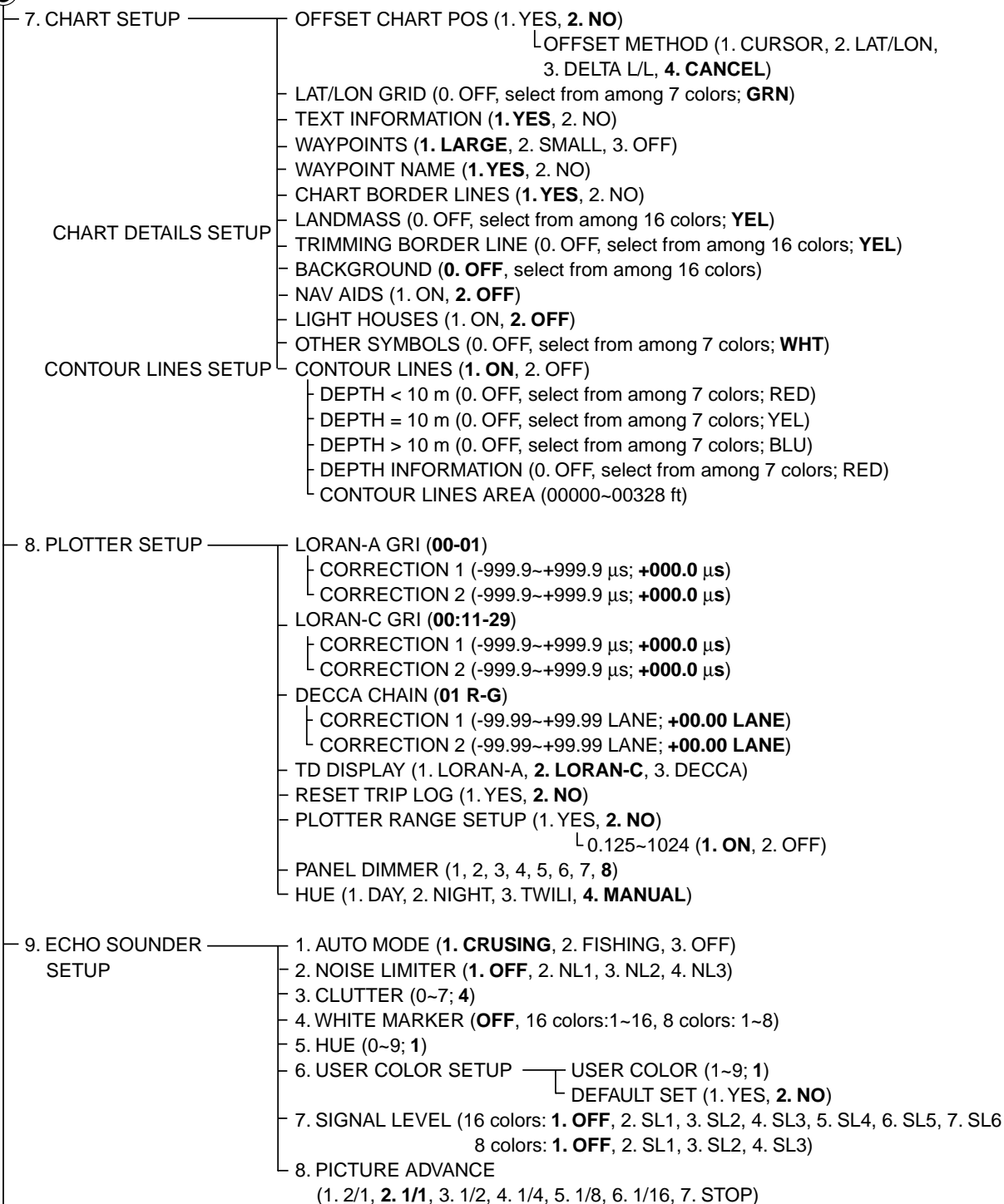
②

Page 1

MENU TREE

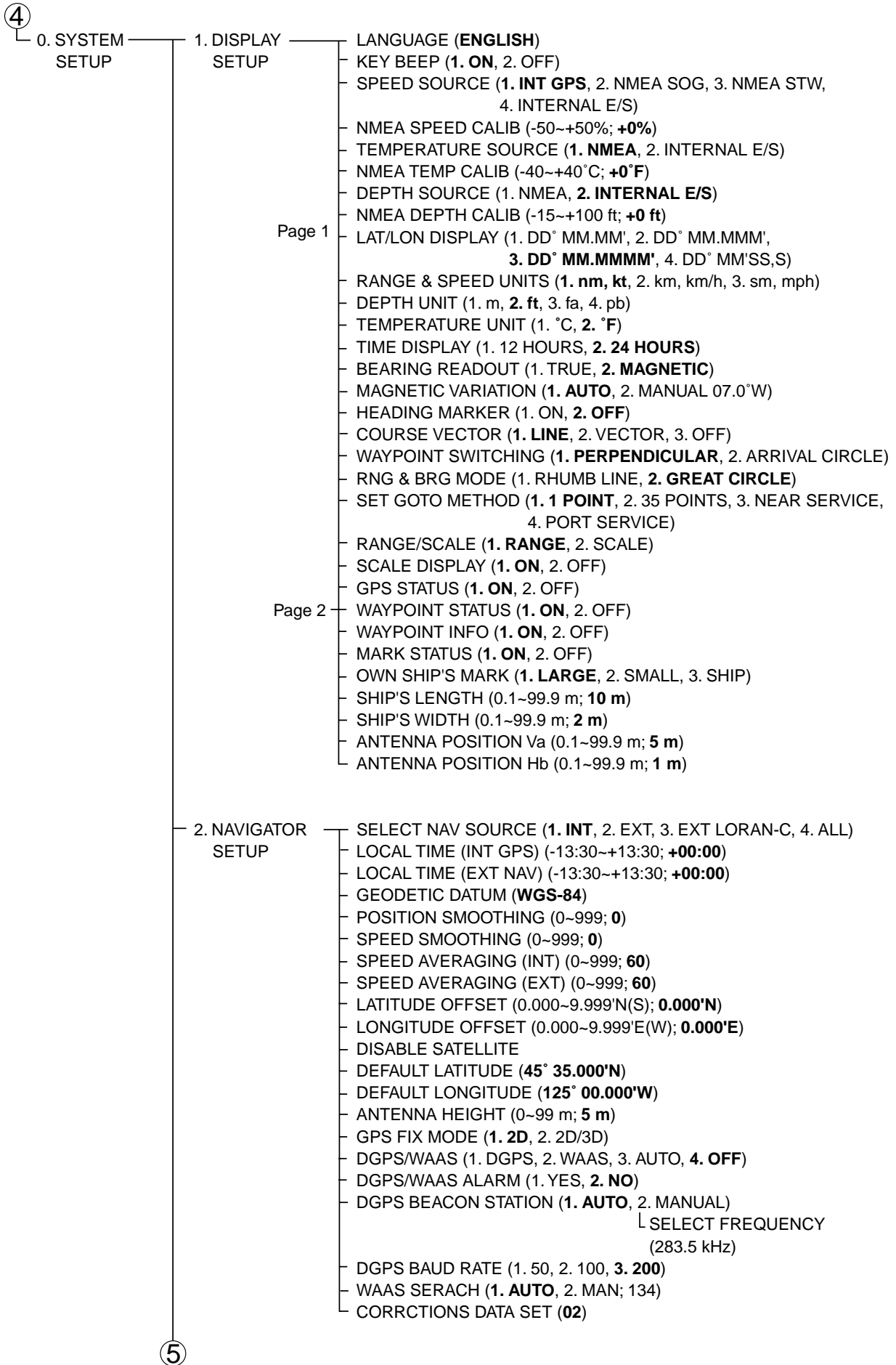


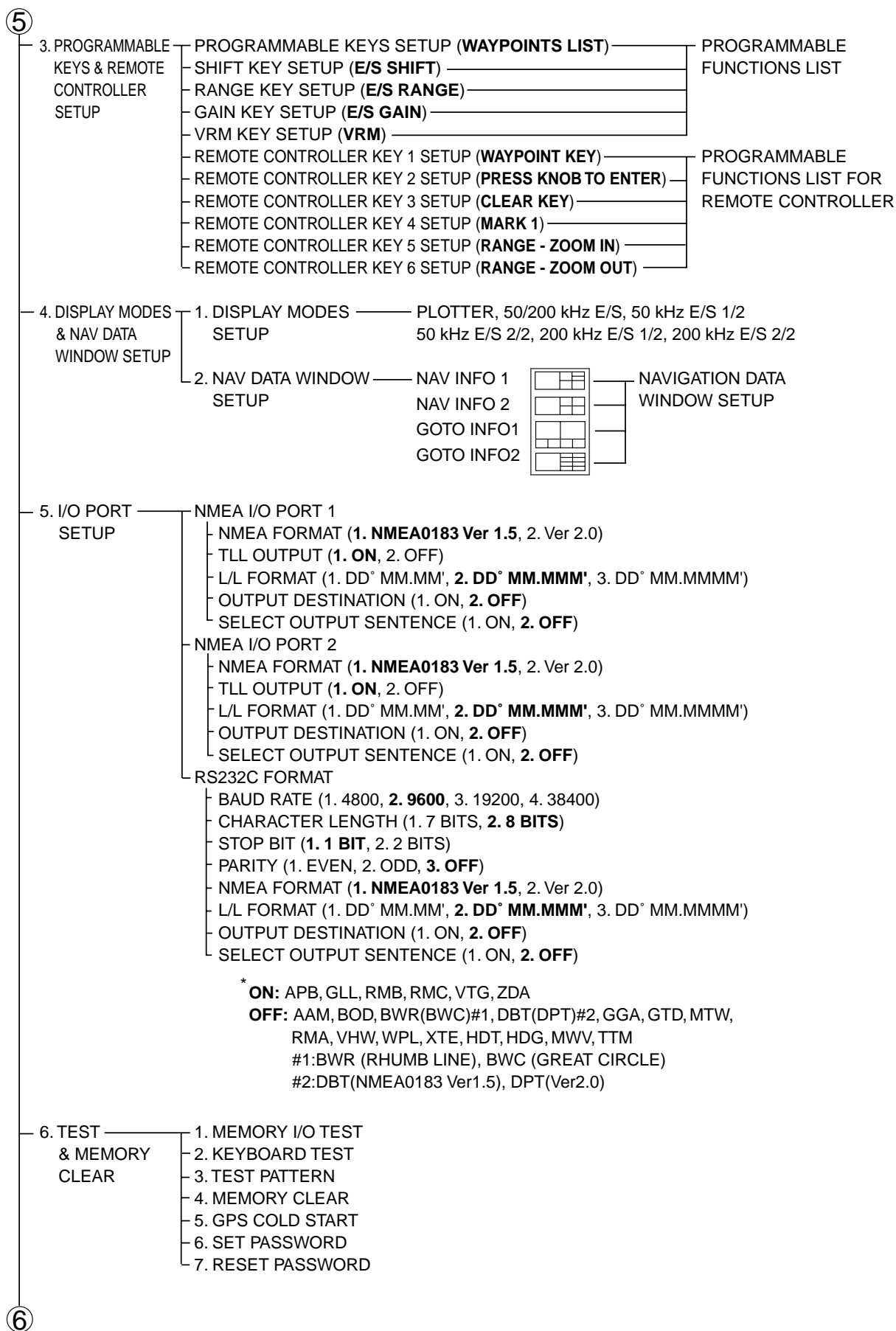
③



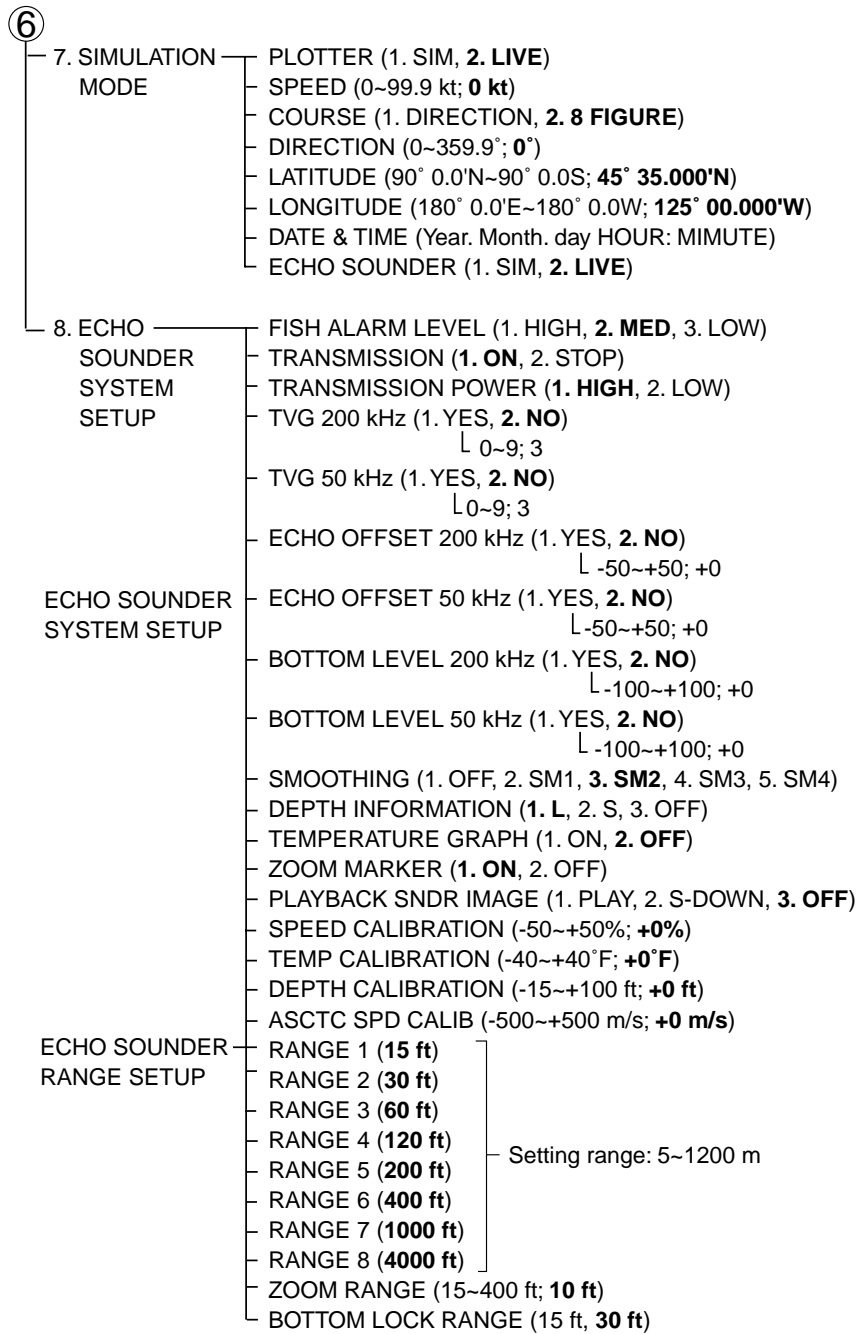
④

MENU TREE

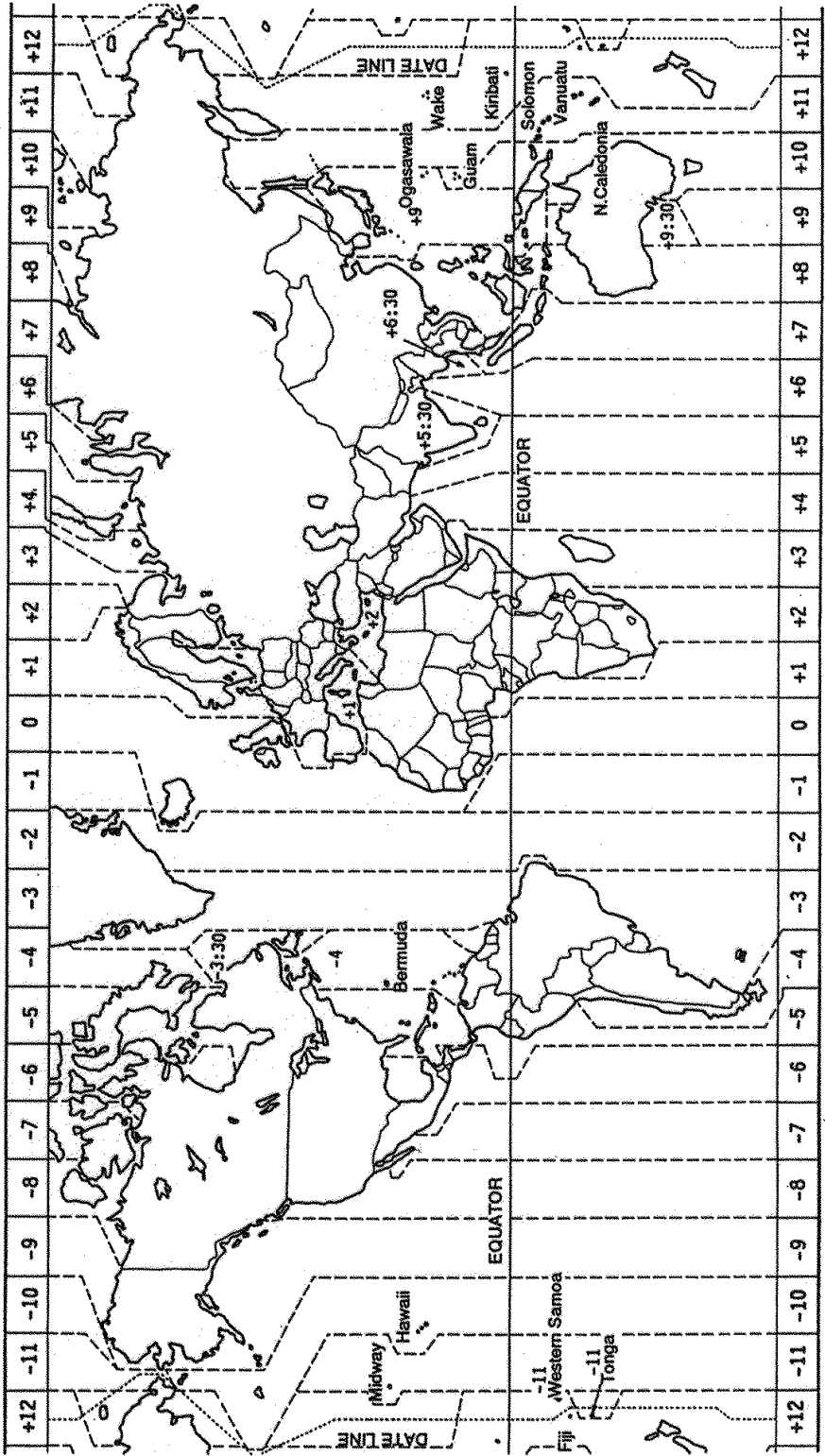




MENU TREE



WORLD TIME CHART

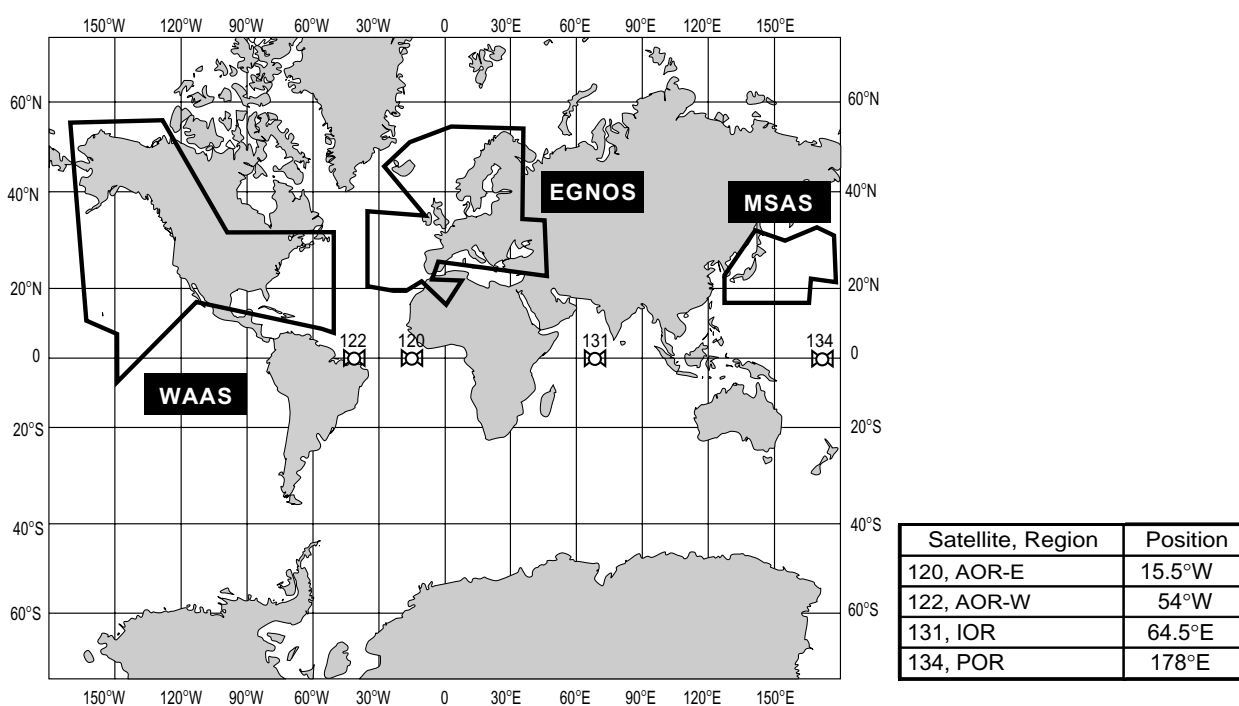


GEODETIC CHART LIST

001 : WGS84			
002 : WGS72			
003 : TOKYO			
004 : NORTH AMERICAN 1927	: Mean Vallue (Japan, Korea, and Okinawa)		
005 : EUROPEAN 1950	: Mean Vallue (CONUS)		
006 : AUSTRALIAN GEODETIC 1984	: Mean Vallue		
007 : ADINDAN	: Australia and Tasmania Island		
008 :	: Mean Value(Ethiopia and Sudan)		
009 :	: Ethiopia		
010 :	: Mall		
011 :	: Senegal		
012 : AFG	: Sudan		
013 : AIN EL ABD 1970	: Somalla		
014 : ANNA 1 ASTRO 1965	: Bahrain Island		
015 : ARC 1950	: Cocos Island		
016 :	: Mean Value		
017 :	: Bostswana		
018 :	: Lesotho		
019 :	: Malawi		
020 :	: Swaziland		
021 :	: Zaire		
022 :	: Zambila		
023 : ARC 1960	: Zimbabwe		
024 :	: Mean Value (Kanya, Tanzania)		
025 :	: Kenya		
026 : ASCENSION ISLAND 1958	: Tanzania		
027 : ASTRO BEACON "E"	: Ascension Island		
028 : ASTRO B4 SOR. ATOLL	: Iwo Jima Island		
029 : ASTRO POS 71/4	: Tem Island		
030 : ASTRONOMIC STATION 1952	: St. Helena Island		
031 : AUSTRALIAN GEODETIC 1966	: Marcus Island		
032 : BELLEVUE (IGN)	: Australia and Tasmania Island		
033 : BERMUDA 1957	: Efate and Erromango Islands		
034 : BOGOTA OBSERVATORY	: Bermuda Islands		
035 : CAMPO INCHAUSPE	: Colombia		
036 : CANTON ISLAND 1966	: Argentina		
037 : CAPE	: Phoenix Islands		
038 : CAPE CANAVERAL	: South Africa		
039 : CARTHAGE	: Mean Value (Florida and Bahama Islands)		
040 : CHATHAM 1971	: Tunisia		
041 : CHUA ASTRO	: Chatham Island (New Zealand)		
042 : CORREGO ALEGRE	: Paraguay		
043 : DJAKARTA (BATAVIA)	: Brazil		
044 : DOS 1968	: Sumatra Island (Indonesia)		
045 : EASTER ISLAND 1967	: Gizo Island (New Georgia Island)		
046 : EUROPEAN 1950 (Cont'd)	: Easter Island		
047 :	: Westem Europe		
048 :	: Cypus		
049 :	: Egypt		
050 :	: England, Scotland, Channel, and Shetland Islands		
051 :	: England,Ireland, Scotland, and Shetland Islands		
052 :	: Greece		
053 :	: Iran		
054 :	: Italy •• Sardinia		
055 :	: Italy •• Sicily		
056 :	: Norway and Finland		
057 : EUROPEAN 1979	: Portugal and Spain		
058 : GANDAJIKA BASE	: Mean Value		
059 : GEODETIC DATUM 1949	: Republic of Maldives		
060 : GUAM 1963	: New Zealand		
061 : GUX 1 ASTRO	: Guam Island		
062 : HJORSEY 1955	: Guadalcanal Island		
063 : HONG KONG 1963	: Iceland		
064 : INDIAN	: Hong kong		
065 :	: Thailand and Vletnam		
066 : IRELAND 1956	: Bangladesh, India, and Nepal		
067 : ISTS 073 ASTRO 1969	: Ireland		
068 : JHONSTON ISLAND 1961	: Diego Garcia		
069 : KANDAWALA	: Jhonston Island		
070 : KERGUELEN ISLAND	: Sri Lanka		
071 : KERTAU 1948	: Kerguelen Island		
072 : LA REUNION	: West Malaysia and Singapore		
073 : L.C. 5 ASTRO	: Mascarene Island		
074 : LIBERIA 1964	: Cayman Brac Island		
075 : LUZON	: Liberia		
076 :	: Philippines (Exciuding Mindanao Island)		
077 : MAHE 1971	: Mindanao Island		
078 : MARCO ASTRO	: Mahe Island		
079 : MASSAWA	: Salvage Islands		
080 : MERCHICH	: Eritrea (Ethiopia)		
081 : MIDWAY ASTRO 1961	: Morocco		
082 : MINNA	: Midway Island		
083 : NAHRWAN	: Nigeria		
084 :	: Masirah Island(Oman)		
085 :	: United Arab Emirates		
086 : NAMIBIA	: Saudi Arabia		
087 : MAPARIMA, BWI	: Namibla		
	: Trinidad and Tobago		
088 : NORTH AMERICAN 1927		: Western United States	
089 :		: Eastern United States	
090 :		: Alaska	
091 :		: Bahamas (Excluding San Saivador Island)	
092 :		: Bahamas •• San Saivador Island	
093 :		: Canada (Including Newfoundland Island)	
094 :		: Alberta and British Columbla	
095 :		: East Canada	
096 :		: Manitoba and Ontario	
097 :		: Nothwest Territories and Saskatchewan	
098 :		: Yukon	
099 :		: Canal Zone	
100 :		: Caribbean	
101 :		: Central America	
102 :		: Cuba	
103 :		: Greenland	
104 :		: Mexico	
105 : NORTH AMERICAN 1983		: Alaska	
106 :		: Canada	
107 :		: CONUS	
108 :		: Mexico, Central America	
109 : OBSERVATORIO 1966		: Corvo and Flores Islands (Azores)	
110 : OLD EGYPTIAN 1930		: Egypt	
111 : OLD HAWAIIAN		: Mean Value	
112 :		: Hawaii	
113 :		: Kaula	
114 :		: Maui	
115 :		: Oahu	
116 : OMAN		: Oman	
117 : ORDNANCE SURVEY OF GREAT BRITAIN 1936	: Mean Value		
118 :		: England	
119 :		: England, Isie of Man, and Wales	
120 :		: Scotland and Shetland Islands	
121 :		: Wales	
122 : PICO DE LAS NIVIES		: Canary Islands	
123 : PITCAIRN ASTRO 1967		: Pitcaim Island	
124 : PROVISIONAL SOUTH CHILEAN 1963		: South Chile (near 53° s)	
125 : PROVISIONAL SOUTH AMERICAN 1956		: Mean Value	
126 :		: Bolivia	
127 :		: Chile •• Northem Chie (near 19° s)	
128 :		: Chile •• Southem Chile (near 43° s)	
129 :		: Colombia	
130 :		: Ecuador	
131 :		: Guyana	
132 :		: Peru	
133 :		: Venezuela	
134 : PUERTO RICO		: Puerto Rico and Virgin Islands	
135 : QATAR NATIONAL		: Qatar	
136 : QORNOQ		: South Greenland	
137 : ROME 1940		: Sardinia Islands	
138 : SANTNA BRAZ		: Sao Maguel, Santa Maria Islands (Azores)	
139 : SANTO (DOS)		: Espirito Santo Island	
140 : SAPPER HILL 1943		: East Faikland Island	
141 : SOUTH AMERICAN 1969		: Mean Value	
142 :		: Argentina	
143 :		: Bolivia	
144 :		: Brazil	
145 :		: Chile	
146 :		: Colombia	
147 :		: Ecuador	
148 :		: Guyana	
149 :		: Paraguay	
150 :		: Peru	
151 :		: Trinidad and Tobago	
152 :		: Venezuela	
153 : SOUTH ASIA		: Singapore	
154 : SOUTHEAST BASE		: Porto Santo and Medeira Islands	
155 : SOUTHWEST BASE		: Falal, Graclosa,Pico, Sao Jorge, and Terceira Islands	
156 : TIMBALAI 1948		: Brunel and East Malaysia (Sarawak and Sadah)	
157 : TOKYO		: Japan	
158 :		: Korea	
159 :		: Okinawa	
160 : TRISTAN ASTRO 1968		: Tristan da Cunha	
161 : VITI LEVU 1916		: Viti Levu Island (Fiji Islands)	
162 : WAKE-ENIWETOK 1960		: Marshall Islands	
163 : ZANDERIJ		: Suriname	
164 : BUKIT RIMPAH		: Bangka and Belltung Islands (Indonesia)	
165 : CAMP AREA ASTRO		: Camp Mcmurdo Area, Antarctica	
166 : G. SEGARA		: Kalimantan Islands(Indonesia)	
167 : HERAT NORTH		: Afghanistan	
168 : HU-TZU-SHAN		: Taiwan	
169 : TANANARIVE OBSERVATORY 1925		: Madagascar	
170 : YACARE		: Uruguay	
171 : RT-90		: Sweden	
172 : PULKOVO 1942		: Russia	
173 : FINNISH KJK		: Finland	

WHAT IS WAAS?

WAAS, available in North America, is a provider in the worldwide SBAS (Satellite Based Augmentation System) navigation system. SBAS provides GPS signal corrections to SBAS users, for even better position accuracy, typically better than three meters. Two more SBAS providers are also currently under development, MSAS (Multi-Functional Satellite Augmentation System) for Japan and EGNOS (Euro Geostationary Navigation Overlay Service) for Europe. All providers will be compatible with one another, thus providing "seamless" position fixes to SBAS users. The illustration below shows the coverage area. (Accuracy may be affected when using a GEO satellite not within your current location.)



At the time of this software release, SBAS is still under development (Providers are expected to have initial operations capability from the times shown above.) During this developmental period, which may last for several years, there is no guarantee of the accuracy, integrity, continuity, or availability of the SBAS signal. Furuno will accept no responsibility for the use of the signal for other than the above stated purpose. It is the user's responsibility to exercise common prudence and navigational judgment while using the SBAS signal. Users are reminded that the SBAS has not been commissioned for use in safety of life applications (SOLAS) and must be turned to the "OFF" position on any SOLAS vessels.

SPECIFICATIONS OF COLOR GPS PLOTTER/SOUNDER GP-3500F

1 DISPLAY

- | | | |
|-----|---------------------|---|
| 1.1 | Display System | 10.4-inch TFT color LCD |
| 1.2 | Effective area | 158.4 (W) x 211.2 (H) mm |
| 1.3 | Display pixels | 480 (H) x 640 (V) dots |
| 1.4 | Position Indication | Latitude/longitude or Loran C or A LOPS |
| 1.5 | Projection | Mercator |
| 1.6 | Usable Area | 85° latitude or below |
| 1.7 | Display Mode | Plotter, Video pilot, NAV data |

2 GPS RECEIVER

- | | | |
|-----|--------------------------|---|
| 2.1 | Receiving Channels | GPS: 12 channels, 12 satellite, parallel tracking
WAAS: 1 channel |
| 2.2 | Rx Frequency | 1575.42 MHz |
| 2.3 | Rx Code | C/A code, WAAS |
| 2.4 | Position Fixing System | All in view, 8-state Kalman filter |
| 2.5 | Position Accuracy | GPS: 10 m approx., 95% of the time, 2 drms, HDOP 4
WAAS: 3m approx., 95% of the time, 2 drms |
| 2.6 | Tracking Velocity | 999 kt |
| 2.7 | Position-fixing Time | Warm start: 12 s, Cold start: 90 s |
| 2.8 | Position Update Interval | 1 s |

3 PLOTTER

- | | | |
|-----|---------------------------|---|
| 3.1 | Effective Projection Area | 0.125 nm to 6,144 nm (at equatorial area) |
| 3.2 | Track Display | Plot interval: by time (1s to 99m 59s) or distance (0.01 to 9.99 nm) |
| 3.3 | Memory Capacity | Track and mark point: 16,000 points
Waypoint: 3,500 points with comment (QP 35 points)
Route: 200 routes and 1 simple route with 35 waypoints each |
| 3.4 | Alarms | Arrival and Anchor watch alarms
Cross track error and border alarms
Ship's speed in and out alarms |
| 3.5 | Electronic Chart Card | FURUNO chart card or NAVIONICS chart card available |
| 3.6 | Information Display | Ship's L/L position (Loran C/A or Decca TDs also available)
Date and Time, Ship's speed, Chart scale, Waypoint L/L position,
Range and bearing to destination waypoint
Cursor intersection L/L position,
Range and bearing to cursor intersection
Water temperature and water depth (sensor data required) |

4 SOUNDER

- 4.1 Transmit Frequency 50/200 kHz
- 4.2 Transmission 600 or 1k Wrms
- 4.3 Display range 5/10/20/40/80/150/300/500 m, shift; 0-1200 m
- 4.4 Extension Mode Marker zoom, Bottom zoom, Bottom rock, Bottom distinction
- 4.5 Auto Mode Cruising/Fishing selected
- 4.6 Picture advance 6 steps

5 INTERFACE

- 5.1 Number of ports Input: 3 ports, Output: 2 ports
- 5.2 Input data IEC 61162-1, NMEA0183 Ver1.5/2.0
Sentences GLL, GGA, GNS, VTG, RMA, RMB, RMC, BWC, BWR, ZDA, RTE, HDT, HDG, HDM, VHW, TLL, TTM, DPT, DBT, DBK, DBS, MTW, GLC, GTD
- 5.3 Output data IEC 61162-1, NMEA0183 Ver1.5/2.0
Sentences AAM, APB, BOD, BWC or BWR, DPT or DBT, GGA, GLL, GNS, GTD, HDG, HDT, MTW, MWV, RMA, RMB, RMC, ZDA, RTE, TTM, VHW, VTG, WPL, XTE
- 5.4 I/O data RS-232C for PC

6 SOURCE

- 6.1 Display Unit
600 Wrms 12-24 VDC: 1.9-1.0 A
1k Wrms 12-24 VDC: 2.2-1.3 A

7 ENVIRONMENTAL CONDITIONS

- 7.1 Ambient Temperature Antenna unit: -25 to + 70
Display unit: -15 to + 55
- 7.2 Relative Humidity 95% (40)
- 7.3 Waterproof Antenna unit: IPX6
(IEC60529) Display unit: IPX2 (external monitor attached: IPX0)
- 7.4 Vibration IEC60945

8 COATING COLOR

- 8.1 Display Unit chassis: Munsell 2.5GY5/1.5, Panel: N3.0
- 8.2 Antenna Unit N9.5 (white)

9 COMPASS SAFE DISTANCE

- 9.1 Display Unit Standard: 0.6 m Steering: 0.4 m

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Pub NO. DOC-595

Declaration of ConformityWe **FURUNO ELECTRIC CO., LTD.**

(Manufacturer)

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

(Address)

declare under our sole responsibility that the product

Color GPS plotter/sounder Models GP-3500 and GP-3500F consisting of display unit GP-3500 or GP-3500F, Antenna unit GPA-017S or GPA-019S, Remote controller RMC-3500, Transducer 520-5PSD and Temperature sensor T-02MSB

(Model name, serial number)

are in conformity with the essential requirements as described in the Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment (R&TTE Directive) and satisfies all the technical regulations applicable to the product within this Directive

EN 60945: 1997-01 (IEC 60945 Third edition: 1996-11)

EN 60945: 2002-11 (IEC 60945 Fourth edition: 2002-08)

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

For assessment, see

- Statement of Opinion N° 03214192/AA/00 of 1 July 2003 issued by Telefication, The Netherlands
- EMC Test Report FLI 12-03-023 of 23 May 2003 and Safety Test Report FLI 12-03-024 of 30 May 2003 prepared by Furuno Labotech International Co., Ltd.

On behalf of Furuno Electric Co., Ltd.

Hiroaki Komatsu
Manager,
International Rules and Regulations

Nishinomiya City, Japan
July 14, 2003

(Place and date of issue)

(name and signature or equivalent marking of authorized person)