FURUNO

OPERATOR'S MANUAL

COLOR SECTOR SCANNING SONAR

Model **CH-37BB**

FURUNO ELECTRIC CO., LTD.

www.furuno.com

ECF
(Elemental Chlorine Free)
The paper used in this manual
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・FURUNO Authorized Distributor/Dealer

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IMPORTANT NOTICES

General

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

How to discard this product

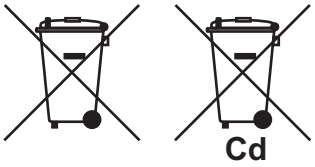
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (http://www.eiae.org/) for the correct method of disposal.

How to discard a used battery

Some FURUNO products have a battery(ies). To see if your product has a battery, see the chapter on Maintenance. Follow the instructions below if a battery is used. Tape the + and - terminals of battery before disposal to prevent fire, heat generation caused by short circuit.

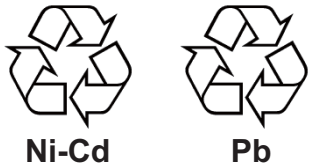
In the European Union

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



In the USA

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



In the other countries

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

SAFETY INSTRUCTIONS

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

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

Warning, Caution Prohibitive Action Mandatory Action

WARNING

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

Only qualified personel should work inside the equipment.

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

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

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.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

WARNING

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

Fire, electrical shock or serious injury can result.

Do not operate the equipment with wet hands.

Electrical shock can result.

Keep heater away from the equipment.

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

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

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

Use the proper fuse.

Fuse rating is shown on the equipment. Use of a wrong fuse can result in damage to the equipment.

⚠ CAUTION

Ground the equipment to prevent electrical shock and mutual interference.

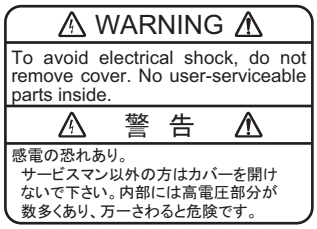
Do not exceed 18 knots when operating the equipment and do not exceed 15 knots when lowering or raising the transducer.

The transducer may become damaged.

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

Use of the equipment as a stepping stool, for example, may result in personal injury or equipment damage.

A warning label is attached to the equipment. Do not remove the label. If the label is worn or illegible, contact a FURUNO agent or dealer.



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

Name: Warning label
Type: 16-021-3517-0
Code No.: 100-350-230-10

⚠ CAUTION

WORKING WITH THE SONAR OIL

Precautions

- Keep oil away from eyes. Wear protective gloves when working with the oil. The oil can cause inflammation of the eyes.
- Do not touch the oil. Waer protective gloves when working with the oil. The oil can cause inframmation of the skin.
- Do not ingest the oil. Diarrhea or vomiting can result.
- Keep the oil out of reach of children.

Emergency

- If the oil enters eyes, flush with clean water about 15 minutes. Consult with a physician.
- If the oil contacts skin, wash with soap and water.
- If the oil is ingested, see a physician immediately.

Disposal of oil and its container

Dispose of oil and its container in accordance with local regulations. For further details, contact place of purchase.

Storage

Seal container to keep out foreign material. Store in dark place.

TABLE OF CONTENTS

FOREWORD ..... **vi**
SYSTEM CONFIGURATION ..... **vii**

1. OPERATIONAL OVERVIEW **1-1**
1.1 Control Description 1-1
1.2 Remote Controller 1-3
1.3 Turning the Power On/Off 1-3
1.4 Lowering the Transducer 1-4
1.5 Backlight of Panel 1-4
1.6 Presentation Mode 1-4
1.7 Adjusting Gain 1-6
1.8 Menu Operation 1-6

2. SONAR MODE **2-1**
2.1 Select Sonar Mode 2-1
2.1.1 Standard sonar display 2-1
2.1.2 Expanded sonar display 2-2
2.2 Basic Operation 2-2
2.3 Selecting Range 2-3
2.4 Selecting Sector 2-3
2.5 Setting the Tilt Angle 2-4
2.5.1 Tilt angle for surface fish 2-4
2.5.2 How to discriminate fish echoes from the bottom 2-4
2.5.3 Suitable tilt angle 2-5
2.6 R/B and Event Markers (trackball operation) 2-6
2.7 Detecting Schools of Fish Effectively 2-7
2.7.1 Relocating a school of fish for easy observation 2-7
2.7.2 Suppressing bottom and sea surface reflections 2-7
2.7.3 Suppressing bottom tail 2-7
2.7.4 Displaying surface fish clearly (TVG adjustment) 2-7
2.7.5 Detecting schools of fish aurally 2-8
2.8 Rejecting Sonar Interference and Noise 2-9
2.9 Interpreting the Display 2-10
2.9.1 How the picture is painted 2-10
2.9.2 Bottom echoes 2-10
2.9.3 Schools of fish echo 2-11
2.9.4 Sea surface reflections 2-11
2.9.5 Wake 2-12
2.9.6 False echo by sidelobe 2-12
2.9.7 Noise and interference 2-12

3. VERTICAL FAN MODE **3-1**
3.1 Selecting Vertical Fan Mode 3-1
3.2 Basic Operation 3-2
3.3 Selecting Range 3-2
3.4 Selecting Bearing for the Vertical Fan 3-3
3.5 Selecting the Display Sector 3-4
3.6 Selecting the Sector Center 3-4
3.7 Trackball Marker 3-5
3.8 Event Marker 3-6
3.9 Horizontal/Vertical Marker 3-6
3.10 Applying Proper TVG 3-7

3.11 Rejecting Interference and Noise 3-7
3.12 Net Mouth Marker 3-8
3.12.1 How to move the net mouth marker 3-9
3.13 Interpreting the Display 3-10
3.13.1 How the picture is painted 3-10
3.13.2 Port-stbd picture 3-10
3.13.3 When ship passes over schools of fish 3-11
3.13.4 Display of net hauling 3-11
3.13.5 False echo 3-11

4. 3D MODE 4-1
4.1 Selecting 3D Display 4-1
4.2 Turning Vertical Echoes On/Off 4-1
4.3 Changing 3D View Scale Mode and Selection 4-2
4.4 Other Operations 4-3

5. PRESENTATION MODE 5-1
5.1 Display Combination View 5-1
5.2 Dual Menu 5-2
5.3 Description of DUAL Menu 5-2
5.4 E/S Menu 5-3

6. CUSTOM MODE KEYS 6-1
6.1 Customizing the Keys 6-1
6.2 Using Custom Mode 6-1
6.3 Custom Mode Registration 6-2
6.4 Custom Mode Key Labels 6-3

7. SYSTEM MENU 7-1
7.1 How to Display the System Menu 7-1
7.2 System Setting Menu 7-2
7.3 Setting Range of Sonar Mode 7-3
7.4 Setting Range of Vertical Fan Mode 7-3
7.5 Setting Screen Colors 7-4
7.6 Setting Language 7-5
7.7 Restoring Default Settings 7-5

8. MAINTENANCE 8-1
8.1 General Maintenance 8-1
8.2 Maintenance of Transceiver Unit 8-1
8.3 Fuse Replacement 8-1
8.4 Maintenance of Hull Unit 8-2
8.5 Processor Unit Test 8-2
8.6 Train/Tilt Test 8-4
8.7 Test Pattern 8-4
8.8 Error Messages 8-5
8.8.1 Raise lower error message 8-5
8.8.2 Transceiver unit error message 8-5
8.8.3 Speed warning 8-5
8.8.4 Train error message 8-5
8.8.5 Tilt error message 8-5
8.9 Troubleshooting 8-6

APPENDIX 1 MENU TREE AP-1
SPECIFICATIONS SP-1
INDEX IN-1

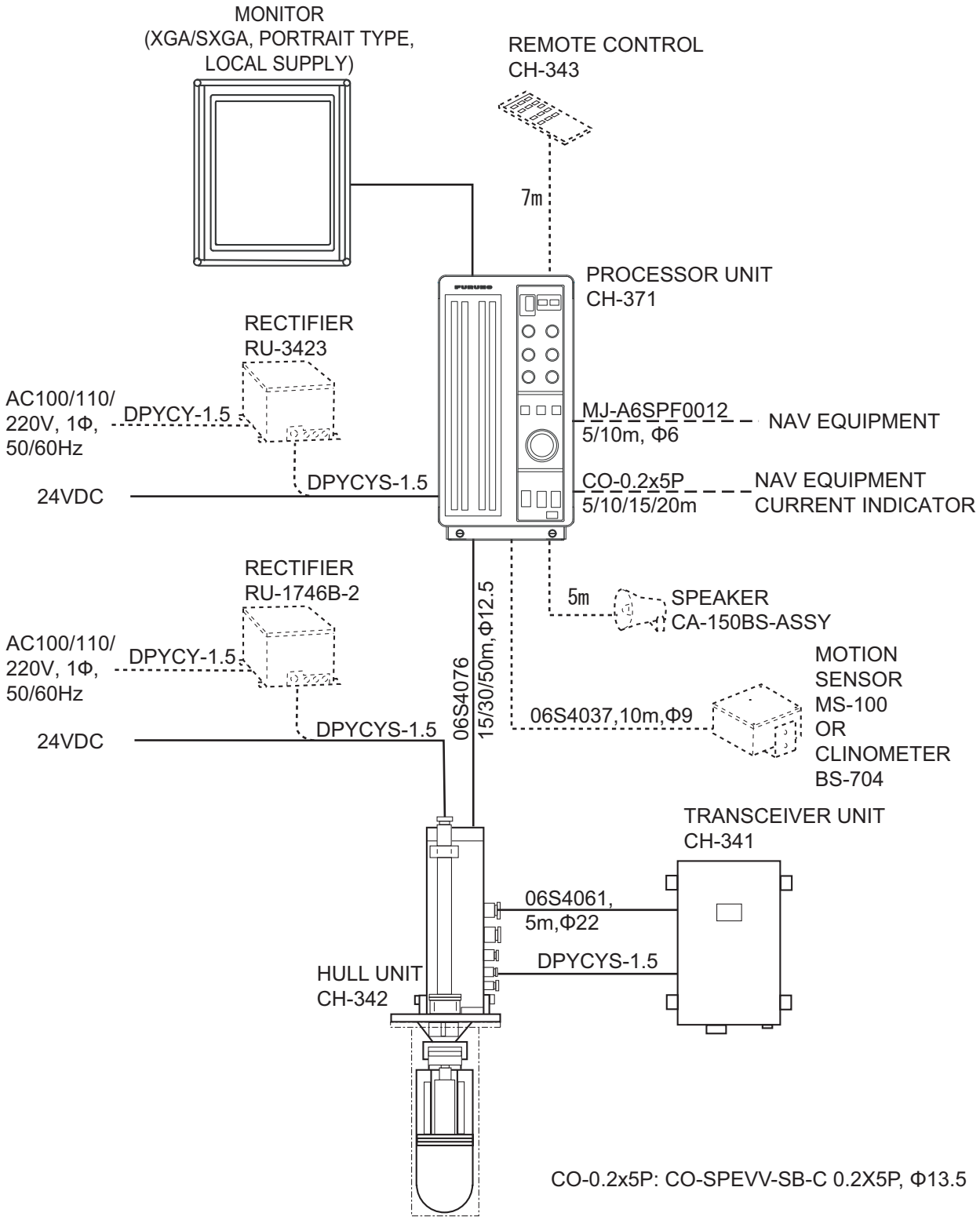
FOREWORD

Congratulations on your choice of the FURUNO CH-37BB Color Sector Scanning Sonar! We are confident that you will enjoy many years of trouble-free operation with this fine piece of equipment.Since 1948, FURUNO Electric Company has enjoyed an enviable reputation for quality and reliability throughout the world. This dedication to excellence is furthered by our extensive global network of agents and dealers.The CH-37BB is the newest addition to FURUNO's CH family of sonars. This new sonar is especially designed to provide faster detection capability by sector scanning method and improved operation by rotary controls and trackball. The sonar picture is presented in 16 or 8 colors on a high resolution CRT. The excellent signal processing technique and improved receiver bring you a clear and high-quality picture on the monitor of your choice.We would appreciate feedback from you, the end-user, about whether we are achieving our purpose. Thank you for considering and purchasing FURUNO equipment.

Features

- Multi sector scanning provides quick coverage of full 360° area in just 8 transmissions.
- PPI operation can be selected for superior detection range and bottom fish sounding.
- Custom mode keys provide desired sonar settings by one key stroke.
- Selectable background color lessens eye fatigue in both daytime and nighttime operations.
- Selection of frequencies - 60, 113, 162 kHz.
- Trackball offers easy-to-use operation for marker settings.
- Quick training and quick raise/lower operation.
- Vertical mode presents a vertical section of underwater conditions.
- 3D mode shows vertical echoes like a graphic track plotter.

SYSTEM CONFIGURATION



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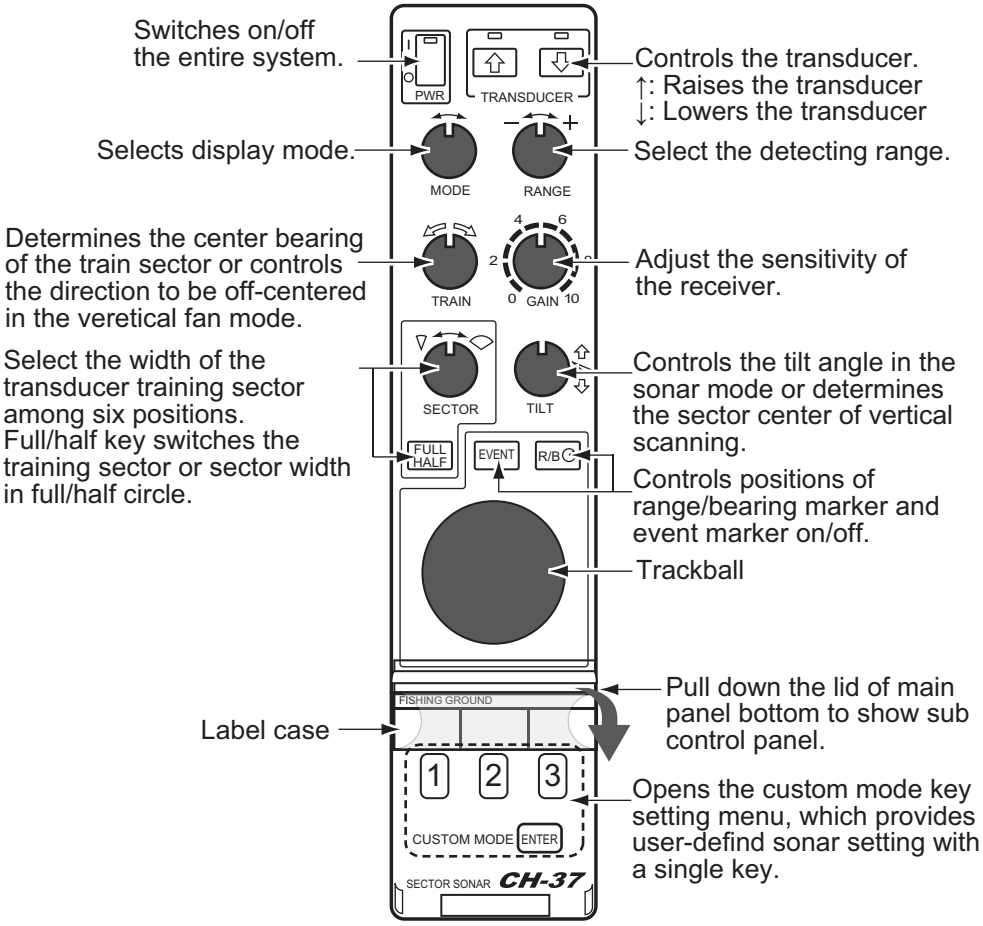
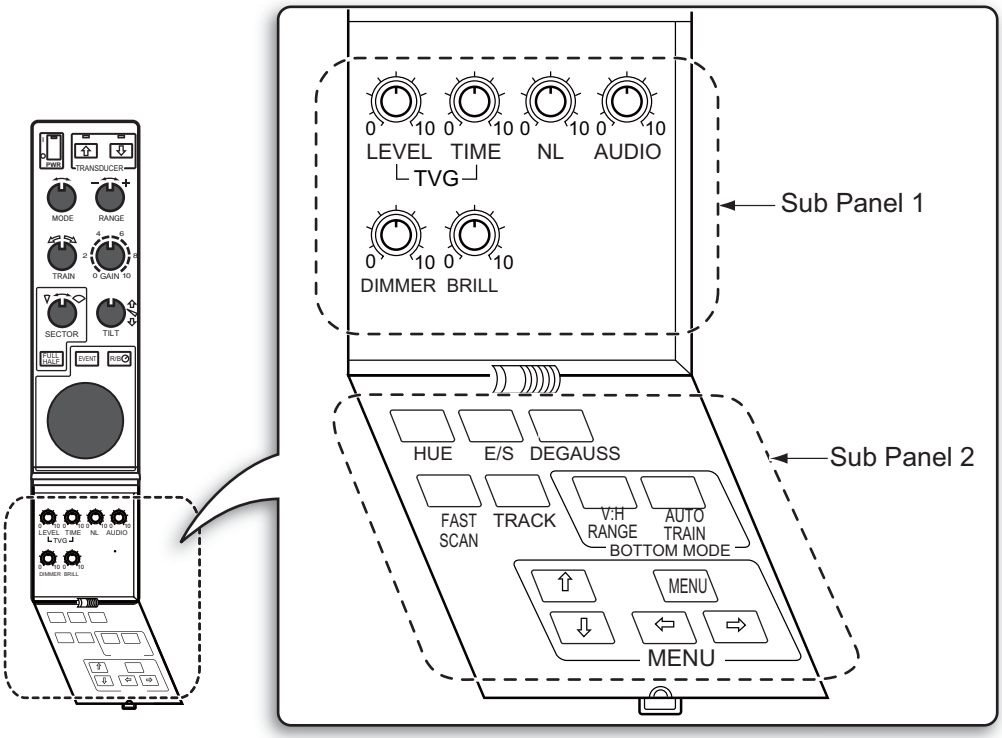
1. OPERATIONAL OVERVIEW

1.1 Control Description

Main panel



Sub panel



Sub panel 1

Control	Description	Remark
TVG	LEVEL controls the receiver sensitivity to eliminate surface noise, which may mask shallow targets. TIME determines the TVG effective range.	2.7.4
NL	Reject noise which appears on the screen in light blue or blue. A setting between 2 and 4 will suffice in most cases.	2.8
AUDIO	Adjust the volume of the external loudspeaker, which monitors target echoes.	2.7.5
DIMMER	Adjust panel backlighting.	1.5
BRILL	Not used	

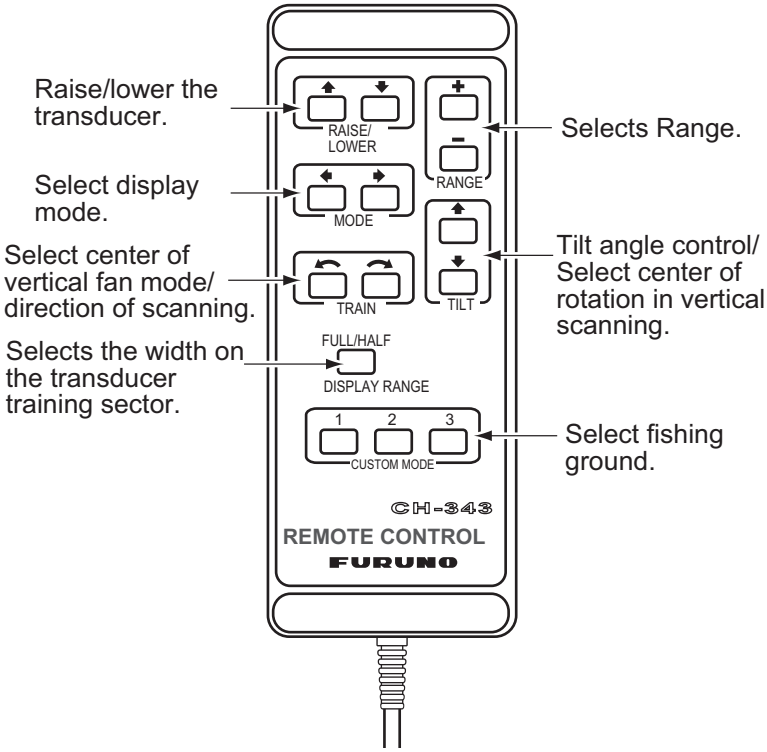
Sub panel 2

Key	Description	Remark
HUE	Change the background color of the display in the sequence of deep blue, blue, black.	7.5
E/S	Turn the E/S combination display on/off. (Optional devices required.)	5.1
DEGAUSS	Not used	
FAST SCAN	Change the sector steps (45°/6° in sonar mode and 6°/3° in vertical fan mode).	2.4 3.5
TRACK	Turn the course line plotting on/off. (Navigation equipment required.)	

Key	Description	Remark
V:H RANGE	Changes the horizontal range scale in the vertical fan mode.	3.3
AUTO TRAIN	Changes the auto and manual train in the vertical fan mode.	3.4
MENU	Displays the menu screen of the mode in use.	

1.2 Remote Controller

The Remote Controller CH-343 enables control of the processor unit from a remote location.



1.3 Turning the Power On/Off

Power on

Press the [PWR] switch on the main panel. The lamp above the switch lights to show that power is turned on.

Power off

With the ship speed under 15 knots, retract the transducer with the [↑] key on the main panel. The lamp above the key lights while the transducer is being raised and goes off when the transducer fully raised. Then press the [PWR] switch.

Note: The transducer is automatically retracted into the tank even if the [PWR] switch is pressed before retracting the transducer. However, for safety purpose, make it a habit to retract the transducer before turning off the power.

1.4 Lowering the Transducer

Press the [↓] key on the main panel to lower the transducer. The lamp above the key blinks while the transducer is being lowered and lights when the transducer is fully lowered.

⚠ CAUTION

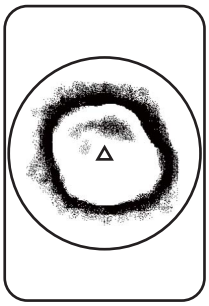
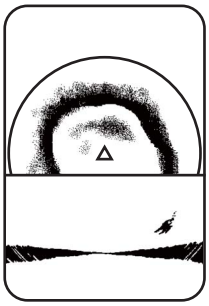
Observe maximum allowable ship's speed of 18 knots during operation and 15 knots while raising/lowering transducer, to prevent damage to the transducer.

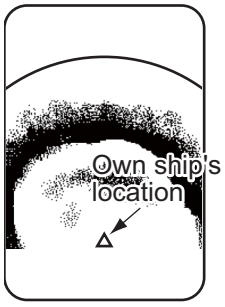
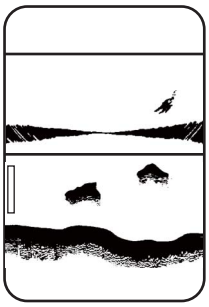
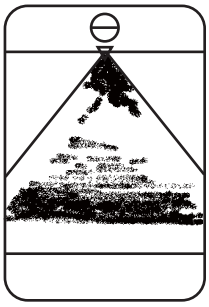
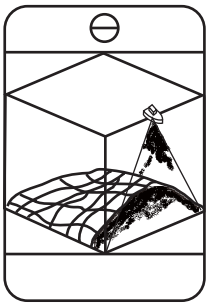
1.5 Backlight of Panel

The main and sub panel 1's backlight can be changed with the dimmer control volume. Turn clockwise to increase the brightness.

1.6 Presentation Mode

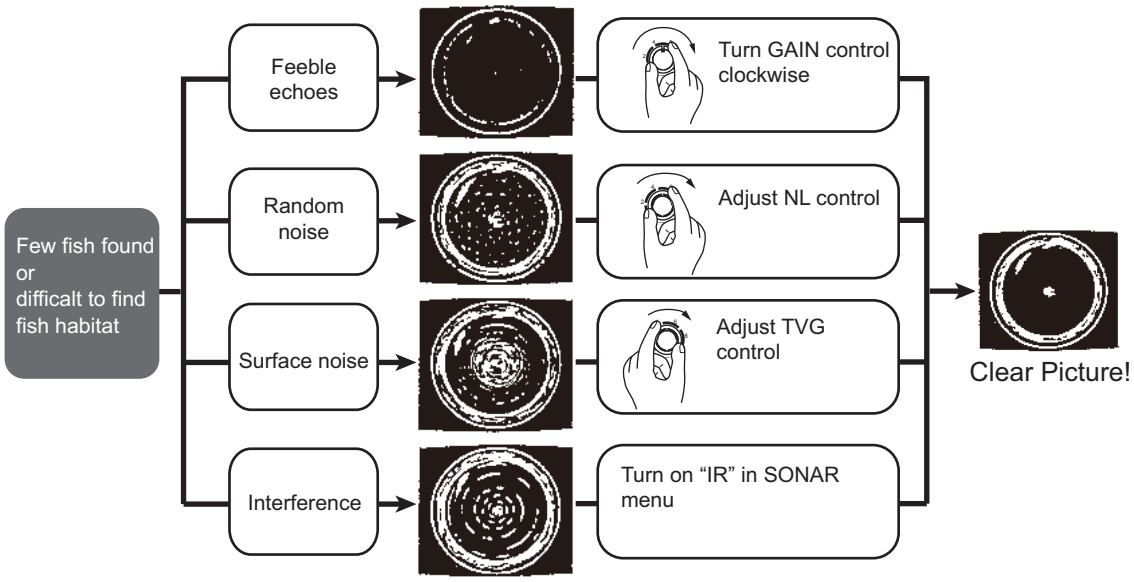
Five presentation modes are available with the MODE control: Normal sonar, Normal sonar + combination, Expanded sonar, Vertical fan mode or Vertical fan mode + combination and 3D display mode (front and slant perspective views).

Mode	Presentation
●	 **Normal sonar mode** Normal full circle picture appears on the entire screen.
	 **Normal sonar, vertical fan of sonar** Normal full circle picture appears at the upper 2/3 of the screen; vertical fan or sonar on the lower 1/3. To select the picture to display in the lower 1/3, see chapter 5.1.

Mode	Presentation
	 **Expanded sonar mode** Zoomed picture appears on the entire screen. Echoes are expanded 1.5 times.
	Vertical fan mode A vertical section of underwater conditions (half-circle area) appears on the entire screen.  **Vertical fan mode + sonar** A vertical section of underwater conditions (half-circle area) appears on the upper 2/3 and sonar picture on the lower 1/3. To select the picture to display in the lower 1/3, see chapter 5.1.
	 **3D display (front perspective view)** The vertical contour line appears historically (time or distance). Only the latest echo is painted, like the vertical mode presentation. This mode may be turned on in the SYSTEM menu.
	 **3D display (slant perspective view)** Display contents are same as front perspective mode except the perspective is different. This mode may be turned on in the SYSTEM menu.

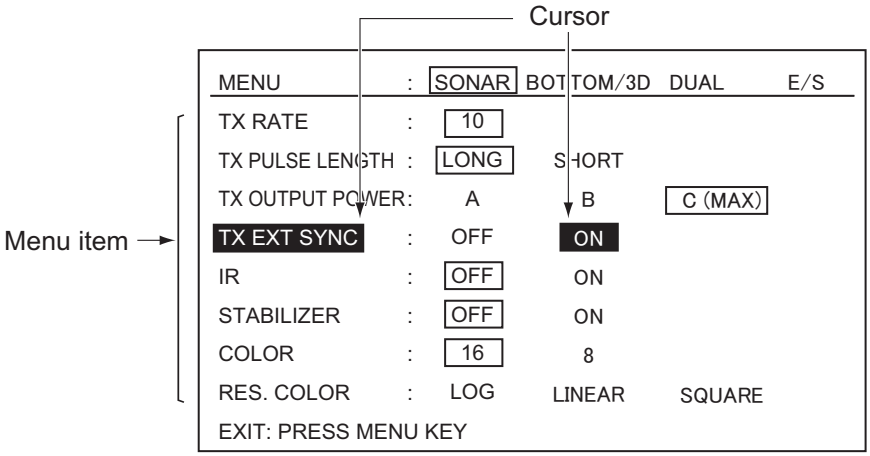
1.7 Adjusting Gain

Most equipment malfunctioning claims result from improper setting of switches and controls. For example, fish, fish habitat or outcrop can not be readily detected by merely increasing the gain. Initially set the gain between 3 and 5 with the GAIN control. Then, fine tune depending on the fishing ground, frequency used, etc.



1.8 Menu Operation

1. Press the [MENU] key on the sub panel 2. The MENU window appears.



2. Move the cursor to the top column with [↑] key.
3. Select the menu required with [→] or [←] key. The menu items change according to the menu selected.
4. Select item with [↑] or [↓] keys. The selected item is highlighted and the current setting is circumscribed.
5. Select value with [→] or [←] keys.
6. Press the [MENU] key again to turn off the menu.

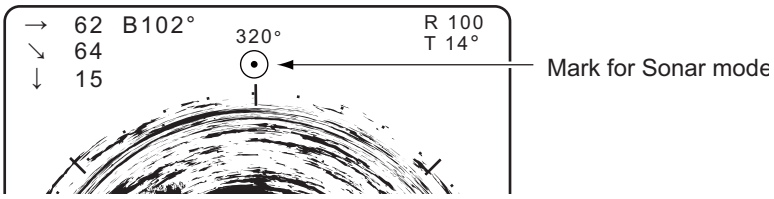
Note: The TX rate is available in 10 levels, 1 to 10. Select “10“ for normal use.

2. SONAR MODE

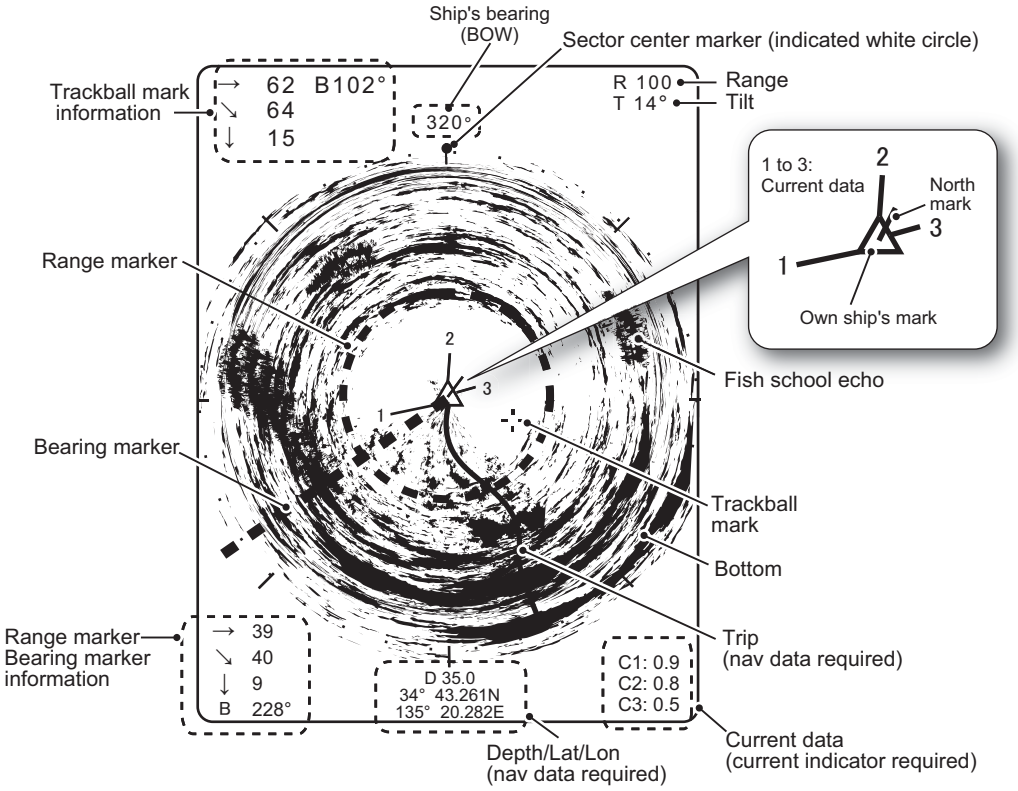
2.1 Select Sonar Mode

Select sonar mode with the MODE switch. The Mode Mark will be a [Full-circle scanning] or [Dome] (half-circle scanning).

Turn the MODE control clockwise/counterclockwise to set the SONAR mode. The sonar mode mark appears momentarily.

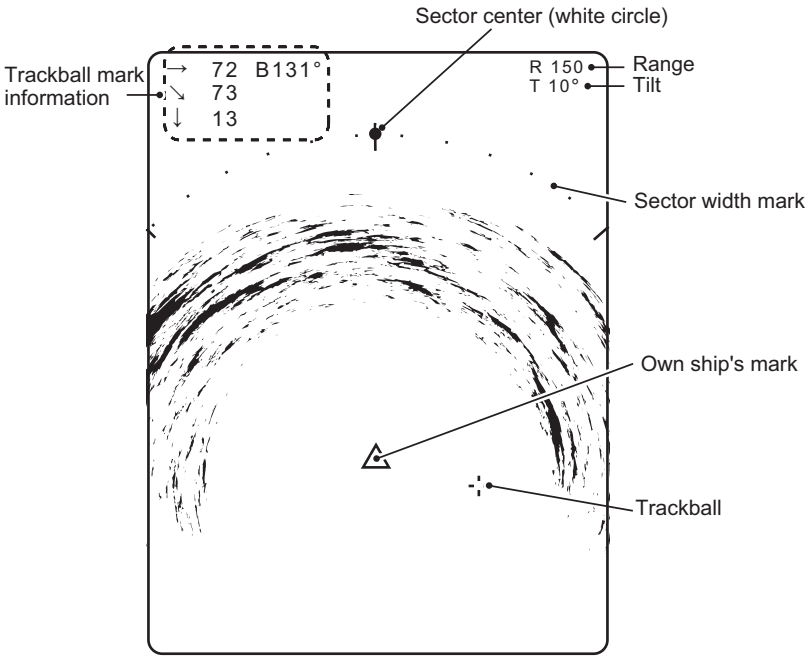


2.1.1 Standard sonar display

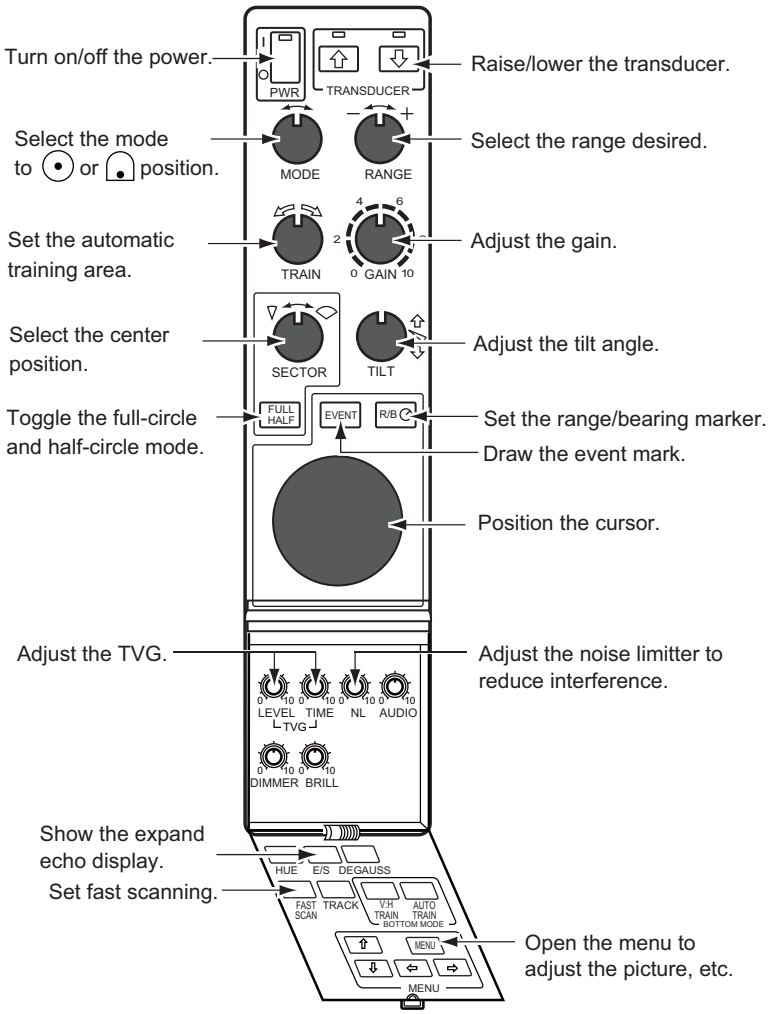


Note: Heading and north mark require current indicator and gyrocompass or log.

2.1.2 Expanded sonar display

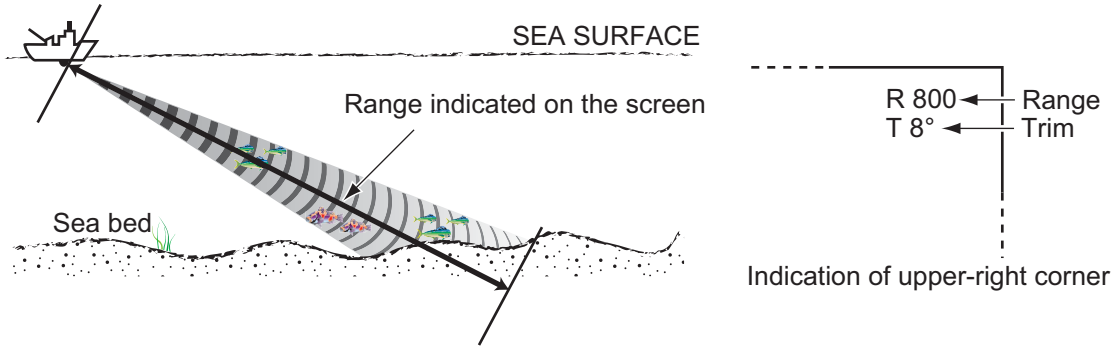


2.2 Basic Operation



2.3 Selecting Range

The RANGE control selects the detection range. Select the range according to either the fish species being searched or the depth desired. Normally it is set so that the bottom is traced at the lower part of the screen (like an echo sounder).



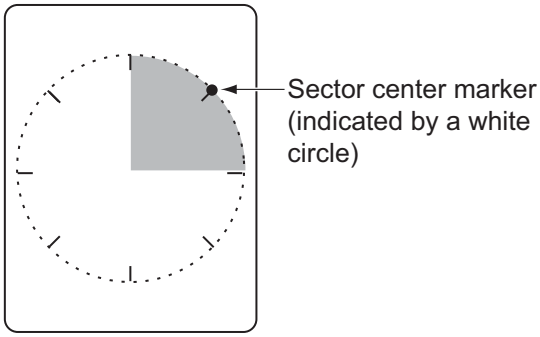
	Freq.	- ←←Range (m) →→+
Range	60 kHz	50 100 150 ------- 600 800 1200 1600
	113 kHz	50 100 150 ------- 500 600 800 1000
	162 kHz	50 100 150 ------- 450 500 600 800

Note: Unit of range measurement may be changed through the SYSTEM menu. For details see section 7.1.

2.4 Selecting Sector

Sector width

Sector means the width of the transducer training. The SECTOR control selects the training (display) area among six positions. In the full circle mode (360°) the direction of training is clockwise only.



Mode	Transducer Training Sector (display area)
Sonar mode	45°, 90°, 135°, 180°, 225°*, and 360°*

*: Selected by FULL/HALF key

Sector step

The FAST SCAN key in the sub panel 2 selects sector step in 45° or 6°.

2.5 Setting the Tilt Angle

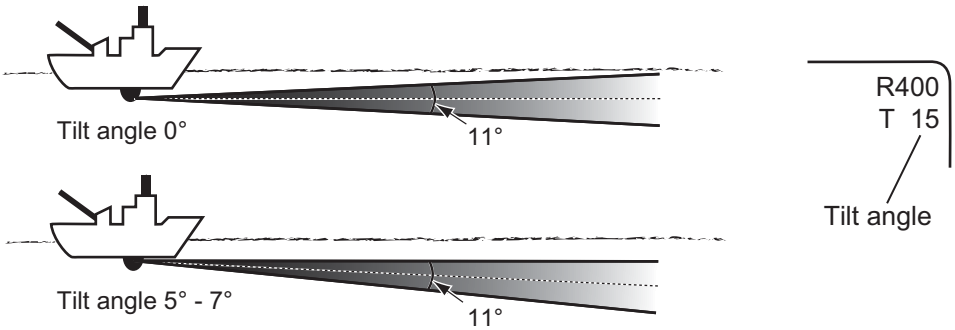
The tilt angle shows the direction to which the sound wave is emitted. When the sound wave is emitted horizontally, the tilt angle is said to be 0° and when emitted vertically, 90°. To set a tilt angle, operate the TILT control. Watch the tilt angle indication at the top right corner of the screen. The tilt angle can be set in one-degree steps from +5° (upward) to 90° (downward).

2.5.1 Tilt angle for surface fish

Sound emitted from the sonar transducer forms an oval-shaped beam with a width of approximately 11° (for 113 kHz transducer) in the vertical direction (vertical beam width). The tilt angle is indicated by the angle between the center line of the beam and the horizontal plane. Then, if the tilt angle is set to 0°, the center line is parallel with the sea surface and one half of the emitted sound goes upward, toward the sea surface.

This causes one half of the emitted sound to be reflected toward the transducer and displayed on the screen as sea surface reflections. When the sea is calm, since the sound is reflected just like a light hitting a mirror at a narrow incident angle, it propagates away and the sea surface reflections become negligible

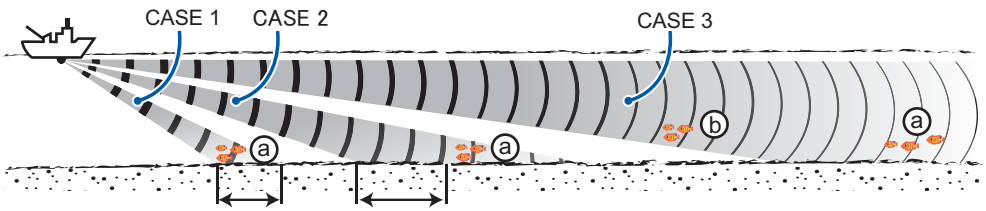
However if the sea is not calm enough, they will become dominant and interfere with observation of wanted echoes. To minimize these sea surface reflections and to search surface schools of fish effectively, the tilt angle is usually set between 5° and 7° so the upper portion of the beam becomes almost parallel with the sea surface. When the sea is rough, it is often set to a little larger angle.

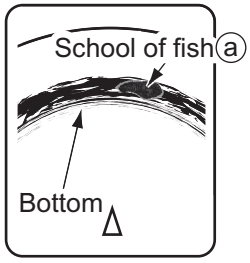
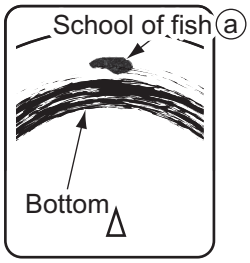
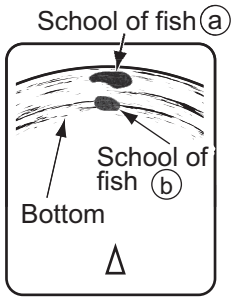


2.5.2 How to discriminate fish echoes from the bottom

Finding a proper tilt angle is important when searching for fish.

Following figure illustrates how schools of fish are displayed on the screen using three different tilt angles.



Case	1	2	3
Tilt angle	30° to 40°	10° to 20°	0° to 5°
Screen			
Discrimination fish echoes	School of fish is obscured by the bottom	School of fish is located above the bottom (midwater)	School of fish is located close to the bottom

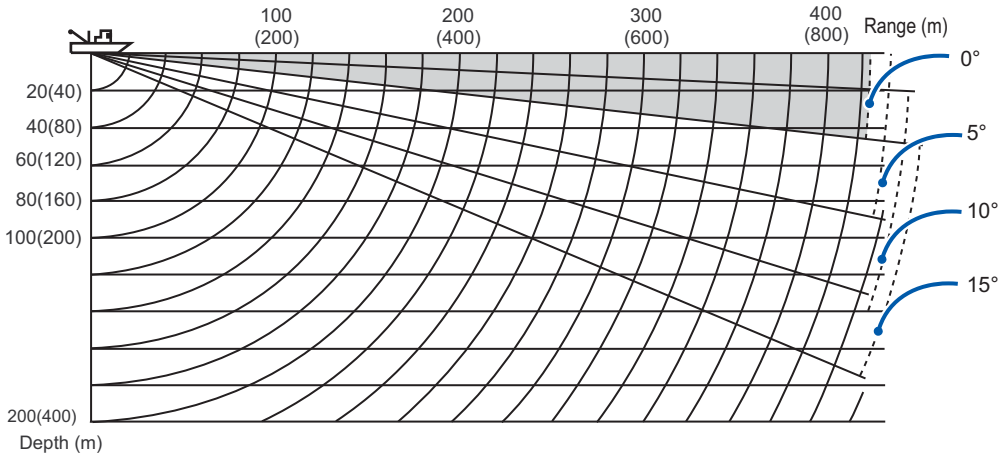
Point to consider

- Normally, a vertically distributed schools of fish are better sonar target than the bottom, because it reflect the transmitted pulse back toward the transducer.
- In case of 3, both schools of fish (a) and (b) are presented. However midwater schools of fish tend to be larger than bottom schools of fish and they are often displayed near the bottom on the display.
- It is difficult to detect bottom fish when they are not distributed vertically.

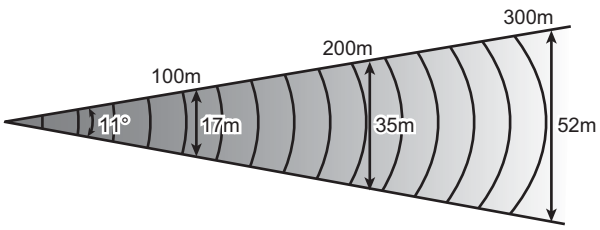
2.5.3 Suitable tilt angle

The figure below illustrates the relationship among tilt angle, depth and detection range. Refer to it to find out the suitable tilt angle for a given depth/detection range.

Tilt angle and beam coverage (frequency: 113 kHz, vertical beamwidth: 11°

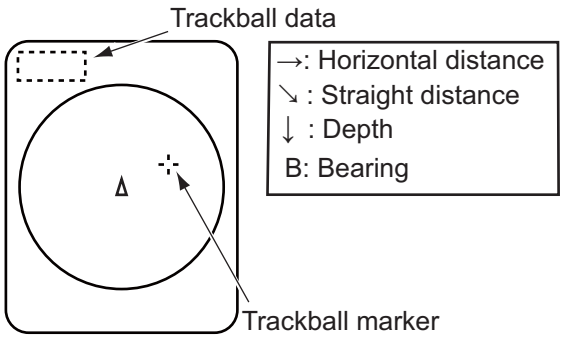
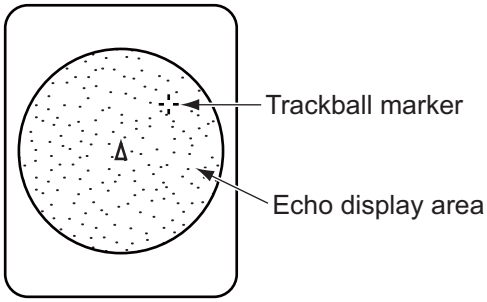
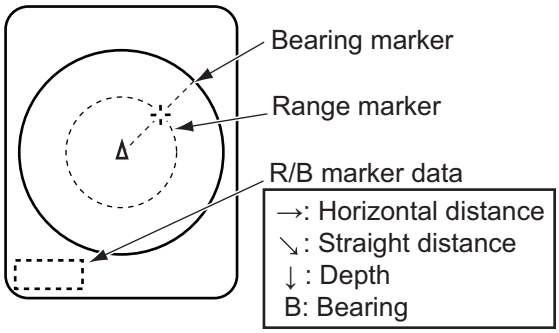
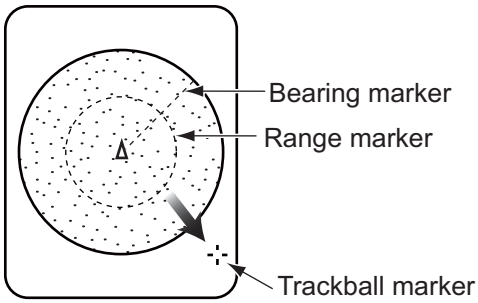


Vertical width of sonar beam



2.6 R/B and Event Markers (trackball operation)

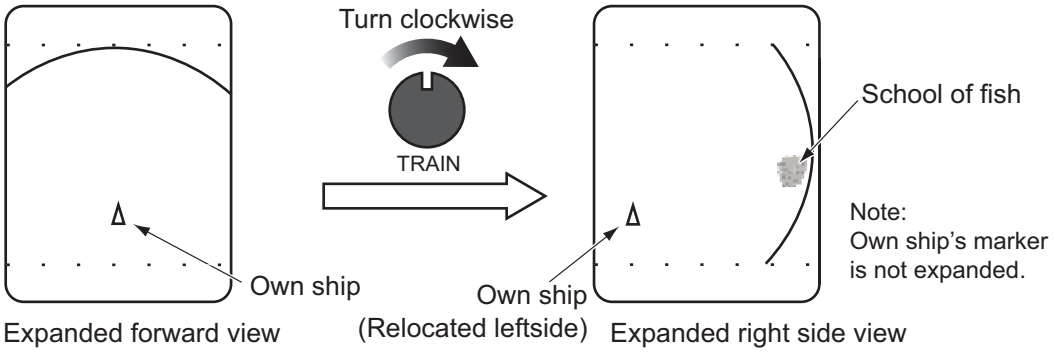
The trackball functions to obtain the data (slant & horizontal range, depth and bearing) from own ship to the specified position on the screen and, combined with the R/B and EVENT keys, it switches the R/B and event markers on/off. With navigation data input, the event marker moves with ship's movement.

Function	Procedure/Purpose	
Trackball data		1) Position the trackball marker on the location desired. 2) Read the trackball data displayed at the upper left corner of the screen.
Event marker		1) Position the trackball marker on the location desired. 2) Press the EVENT key to inscribe the event marker.
R/B marker		1) Position the trackball marker on the location desire. 2) Press the R/B key. The range appears at the bottom left corner of the screen.
Erase marker		1) Place the marker outside the echo display area. 2) Press the EVENT or R/B key.

2.7 Detecting Schools of Fish Effectively

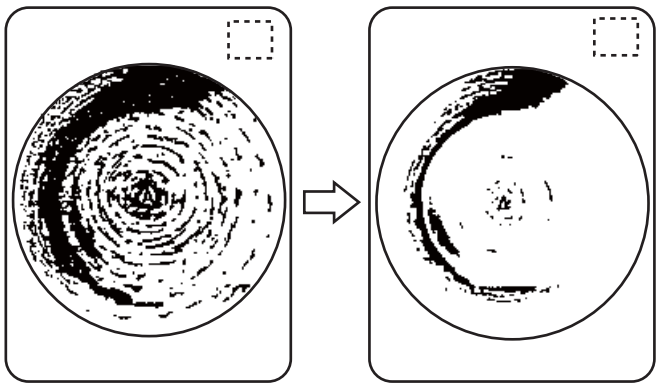
2.7.1 Relocating a school of fish for easy observation

When a school of fish is near the edge of the screen and inconvenient for observation, use the expanded sonar mode and adjust the TRAIN control (off-center function) to relocate the school of fish close to the screen center.



2.7.2 Suppressing bottom and sea surface reflections

In shallow fishing grounds, excessive sea surface and bottom reflections often interfere with wanted fish echoes and they cannot be eliminated sufficiently with the aforementioned TVG controls. In such cases, try to reduce the output power from C to B or A on the SONAR menu, without turning down the gain. The picture becomes clearer when output power is reduced rather than when the gain is decreased, as illustrated below.



TX OUTPUT POWER: HIGH TX OUTPUT POWER: LOW

2.7.3 Suppressing bottom tail

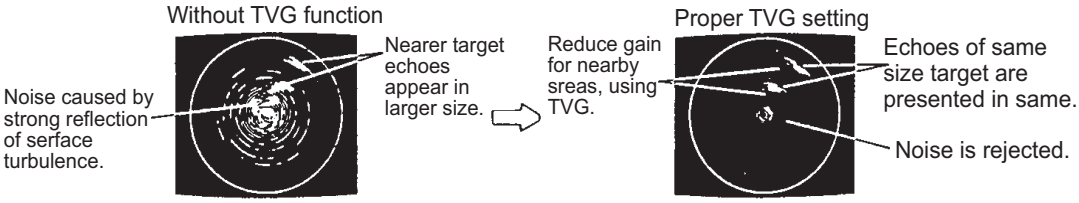
As described earlier, schools of fish near the bottom are sometimes difficult to detect because you have to discriminate fish echoes from the bottom reflections. To discriminate fish echoes near the bottom, select the short Tx pulse length on the SONAR menu to decrease the tail of bottom reflection.

2.7.4 Displaying surface fish clearly (TVG adjustment)

Echoes from targets (such as the bottom or a fish) return to the transducer in order of the distance to them, and when their intensities are compared at the transducer face, those from nearer targets are generally stronger when their reflecting properties are

nearly equal. The sonar operator will be quite inconvenienced if these echoes are directly displayed on the screen, since he won't be able to judge the actual size of the target from the size of echoes displayed on the screen. To overcome this inconvenience, use the TVG function. It compensates for propagation loss of sound in water: amplification of echoes on short range is suppressed and gradually increased as range increases so that similar targets are displayed in similar intensities irrespective of the ranges to them.

The TVG LEVEL and TIME controls compensate for propagation loss. The effective distance is up to 1000 m approximately.

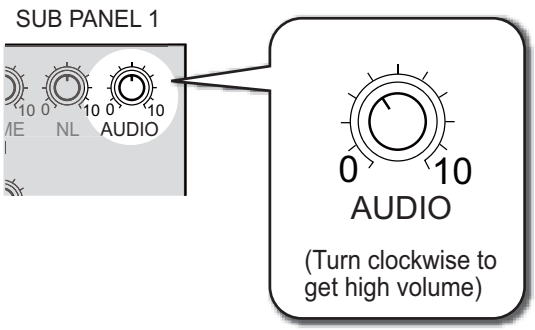


The TVG also functions to suppress unwanted echoes and noise which appear in a certain range area on the screen as shown in the figure above.

1) Set TVG time between 3 and 5. (130 to 300 m approx.) This is the standard setting and you can maintain it in most cases.
2) When sea surface reflections or plankton layers disturb the picture, set the TVG level control around 5 to eliminate them.
3) Locate a school of fish on a long range setting which is approaching your vessel. Adjust the tilt to keep the school of fish in the center of the sonar beam. Check that the fish echo appears in the same color while it approaches. If the color changes suddenly to weaker colors as the fish echo nears, the TVG is improperly set. Adjust the TVG level to correct it. If sea surface reflections and noise remain, try to remove them with the interference rejector ("IR" on the SONAR menu) and NL control as described on section 2-8.

2.7.5 Detecting schools of fish aurally

Occasionally you will be preoccupied with other tasks and unable to concentrate on watching the sonar picture. In such cases it would be a good choice to use the audio function. This function enables you to monitor echoes from schools of fish and bottom through the external speaker (option), of which the volume can be adjusted with the AUDIO control on the sub panel 1.



After you become accustomed to utilizing the audio function, you should be able to detect a school of fish from a range longer than you can detect it on the screen. In addition you may judge whether the schools of fish is approaching or going away; the tone becomes higher when the fish is approaching and lower when going away.

2.8 Rejecting Sonar Interference and Noise

While observing the sonar picture, you may encounter occasional or intermittent noise and interference as shown below. These are mostly caused by onboard electronic equipment, engine, propeller noise, or electrical noise from other sonars being operated nearby.

Identifying noise source

To eliminate noise effectively, you should first identify the source of noise as follows:

- Operate all onboard equipment one by one while observing the picture.
- Run the boat at various speeds to check if the noise is speed dependent.

If neither of the above affects the picture, turn on “IR“ in the SONAR menu or adjust NL control as below.

Rejecting noise with the interference rejector

This control is effective in rejecting random noise and sea surface reflections in rough sea conditions. Pull the GAIN control and adjust it to eliminate only noise. Reject the noise with “IR” in the SONAR menu. Do not use an unnecessarily high setting since it many also reject small wanted echoes.

Rejecting noise with NL control

Weak, unwanted reflections, colored light blue or green, appear when water is contaminated, or plankton layers or noise exist. These echoes gradually become bluish as the NL control is turned clockwise. Usually a setting from 3 to 4 provides sufficient reduction.

Rejecting interference with Tx rate

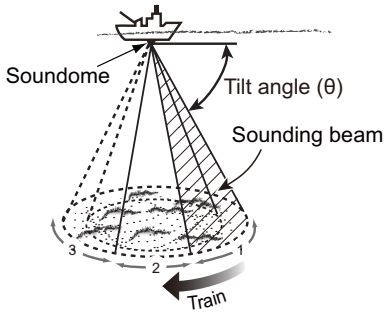
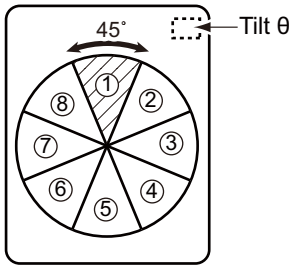
When other sonars are operating nearby at the same transmission interval as that of own ship’s sonar, interference caused by other sonars appears. To reduce the interference, reduce the Tx rate setting on the SONAR menu.

Note: When the sonar is used in shallow water with the range set between 100 m and 200 m and the Tx rate at 10, bottom reflections caused by the transmission which is the last but one appear on near on screen. Reduce the Tx rate to 7 or 8 to reject them.

2.9 Interpreting the Display

2.9.1 How the picture is painted

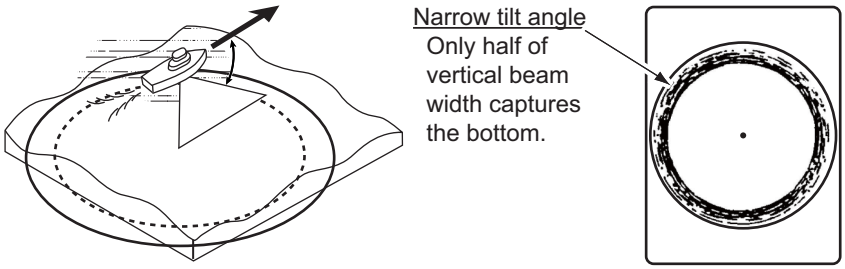
The wide sounding beam is emitted from the soundome at a certain tilt angle (see hatched area in the figure below). The information (target echoes) obtained by this beam is displayed in 45° sector of the screen. Thus, all directions around the boat are sounded in 8 times of transmissions.

Sounding beam	Screen display
	

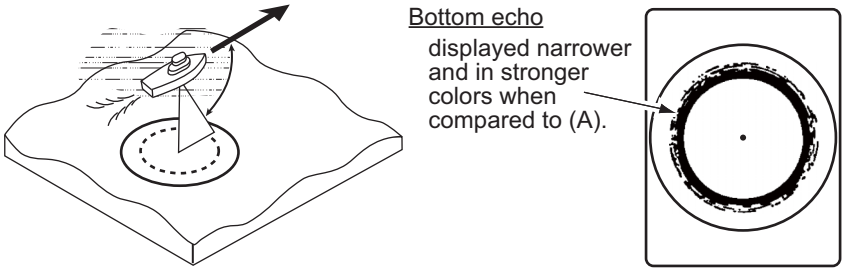
2.9.2 Bottom echoes

When the tilt angle is widened, the bottom echo illustrated below will appear on the display. When the tilt is narrowed, the bottom trace becomes wider and weaker. By observing the bottom condition on the display, the skipper can prevent net damage.

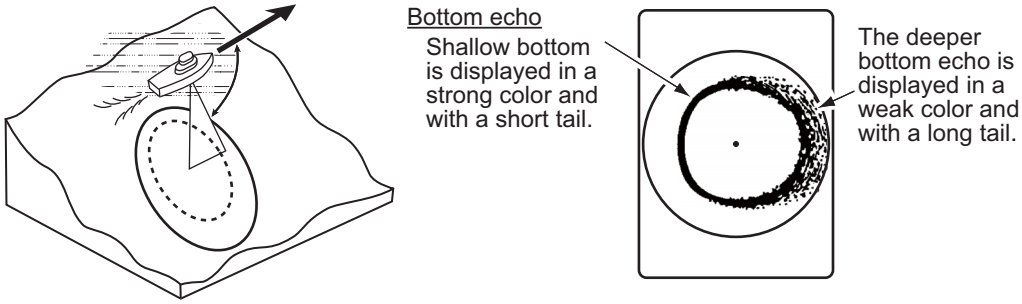
1) Flat bottom (Tilt angle 10° to 15°)



2) Flat bottom (Tilt angle 20° or more)



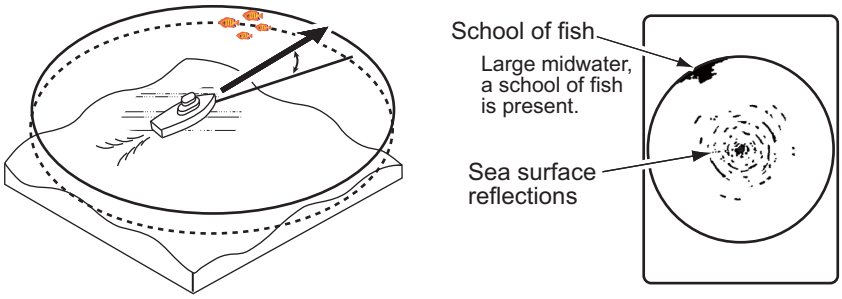
3) Sloping bottom (Tilt angle 20° or more)



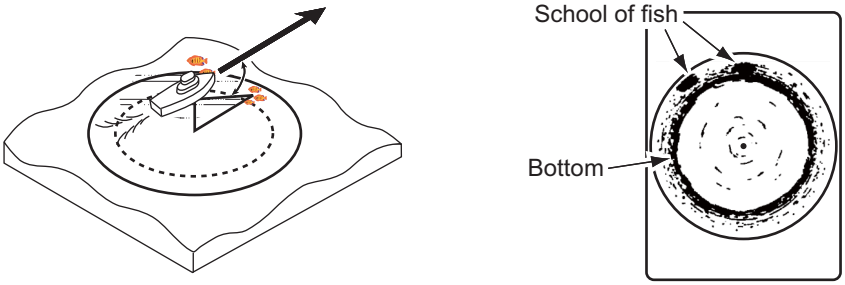
2.9.3 Schools of fish echo

A school of fish appears as a mass of echoes on the screen. The color of the mass shows the density of schools of fish on the sonar beam. To find distribution and center point of a school of fish, try several different tilt angles.

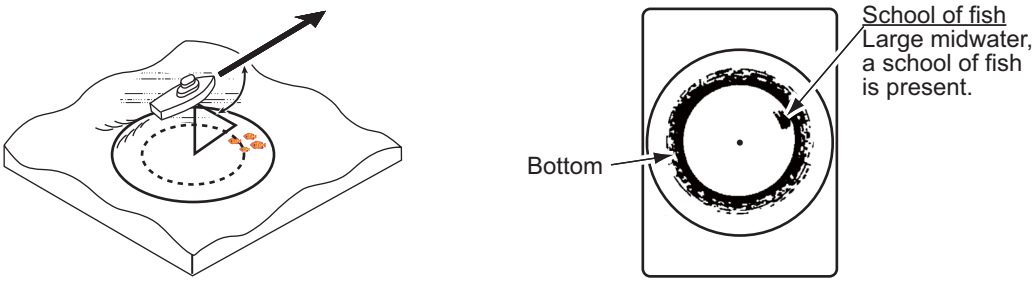
1) Sea surface fish (Tilt angle 0° to 10°)



2) Midwater, bottom fish (Tilt angle 0° to 20°)

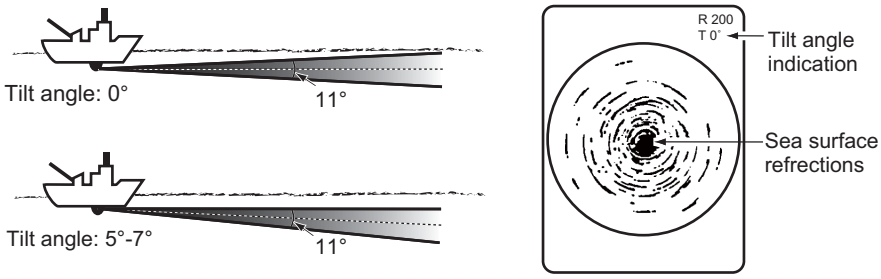


3) Midwater, bottom fish (Tilt angle 30° or more)



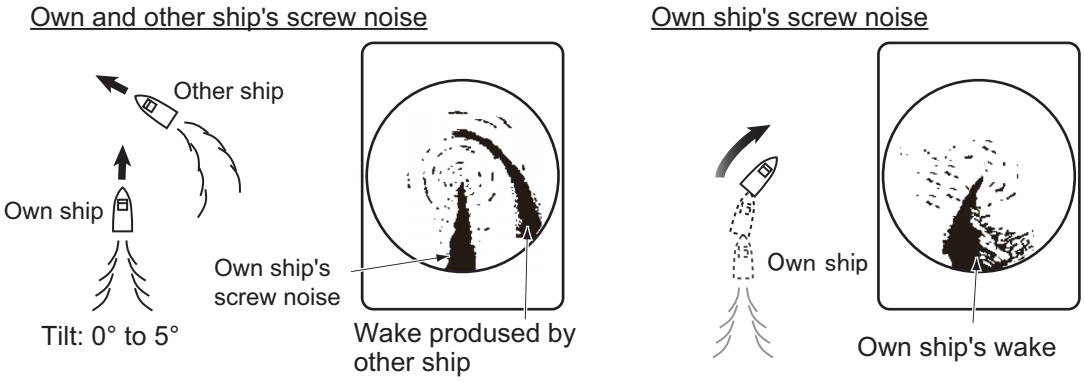
2.9.4 Sea surface reflections

To reduce sea surface reflections, set the tilt angle to 5 or higher, so the upper edge of the sonar beam does not hit the sea surface, or adjust TVG. When a narrow tilt angle is used, sea surface reflections cover a large area as illustrated below.



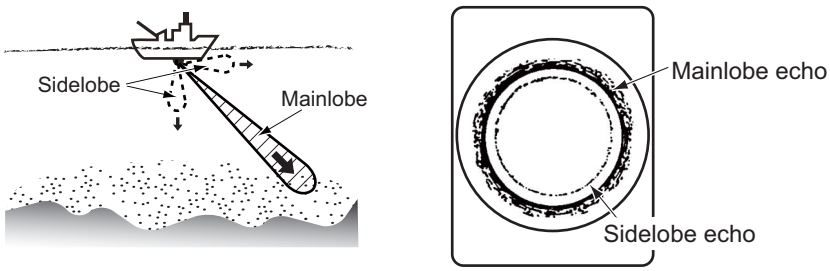
2.9.5 Wake

A wake produced by own ship or another ship can be a strong reflecting object when a narrow tilt angle is used. As the wake appears as a thick continuous line, it can be easily distinguished from a school of fish. A wake contains many air bubbles which attenuate ultrasonic energy, making it difficult to sound beyond the wake.



2.9.6 False echo by sidelobe

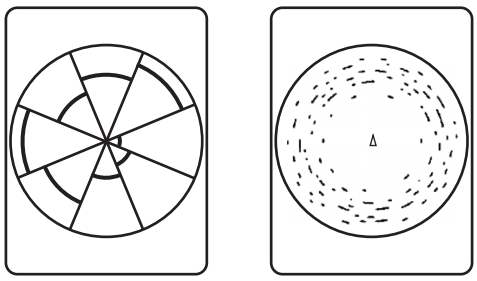
An ultrasonic wave is emitted only in the direction set by the TILT control, however there are some emissions outside the main beam. These are called sidelobes. The energy of the sidelobe is fairly weak but when the water is comparatively shallow and the bottom is rocky and hard, strong signals are detected by the sidelobe. These are represented on the display as a false echo as shown below.



The bottom echo detected by sidelobe appears at a certain tilt angle when the sidelobe points vertically. Also, poor soundome projection may result in a similar false echo.

2.9.7 Noise and interference

When the fishing ground is crowded with many fishing boats, the sonar is subject to interference from ultrasonic equipment (echo sounder or sonar) on other boats as well as those on own ship. For instance, interference from the sonar operated on other boats will show itself on the display as in (a).



a) Interference from other sonars

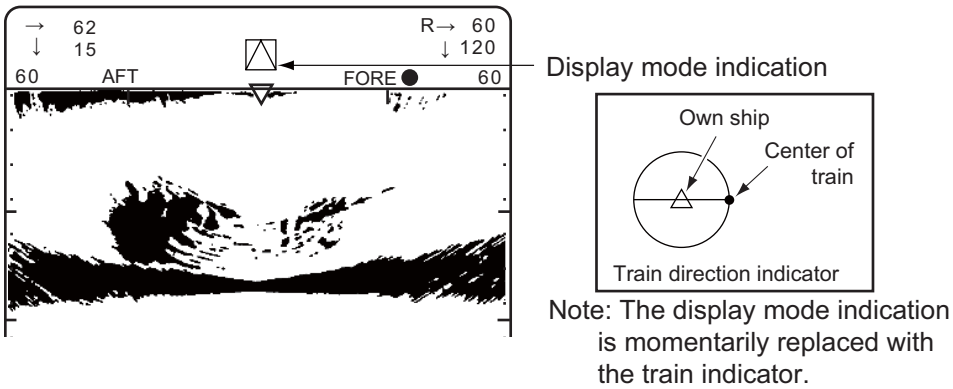
b) Interference from marine life

This interference can be suppressed by changing the Tx rate on the SONAR menu. Noise from marine life shows itself on the displays as in (b). This type of noise can be suppressed with “IR” in the SONAR menu.

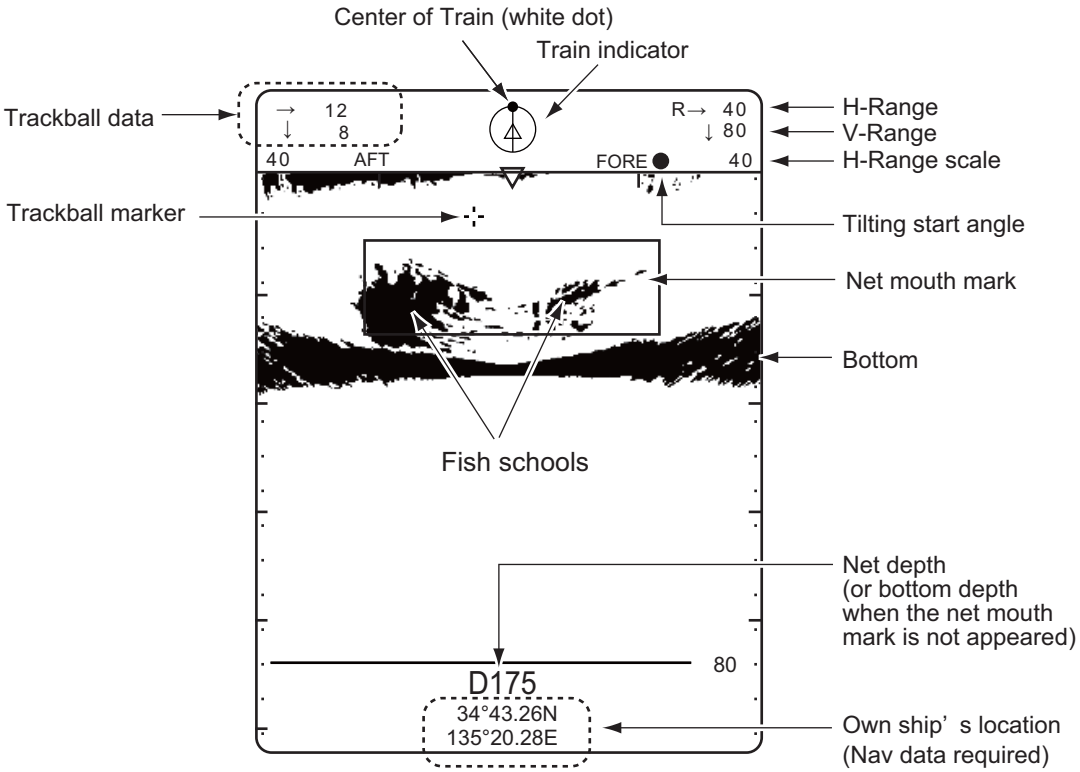
3. VERTICAL FAN MODE

3.1 Selecting Vertical Fan Mode

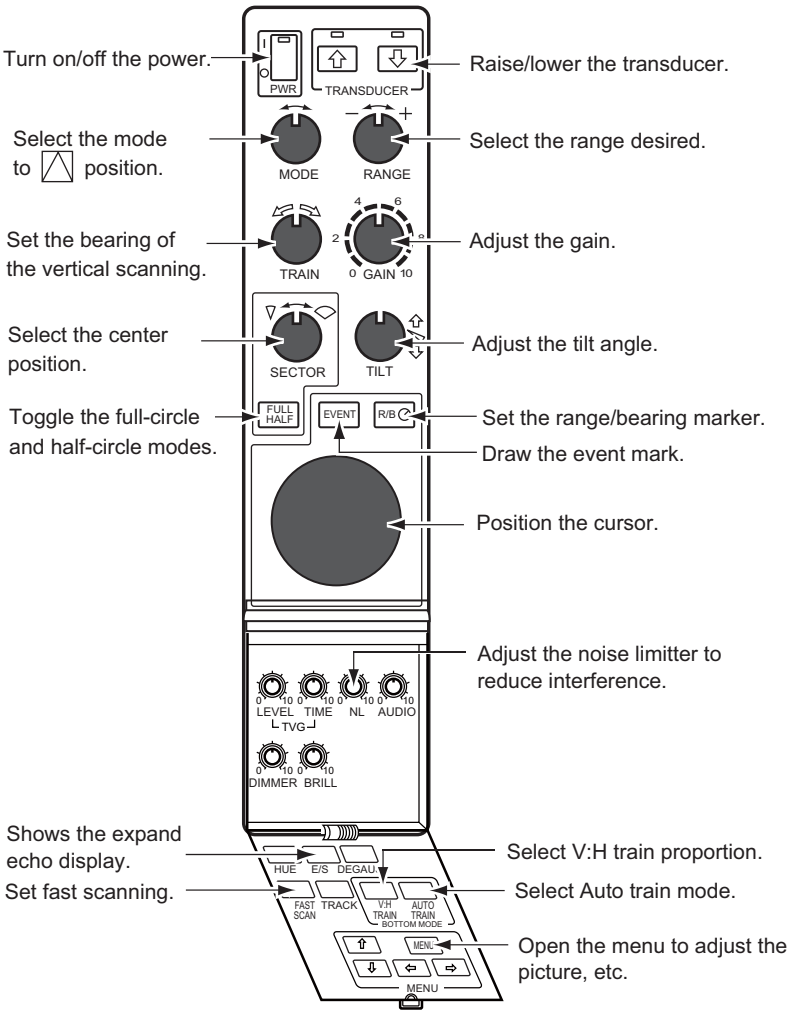
Turn the [MODE] control clockwise/counterclockwise to select vertical fan mode. The display mode mark appears momentarily.



Vertical fan mode indications

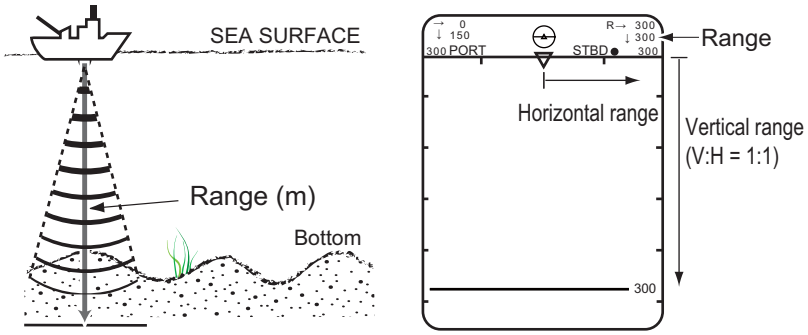


3.2 Basic Operation



3.3 Selecting Range

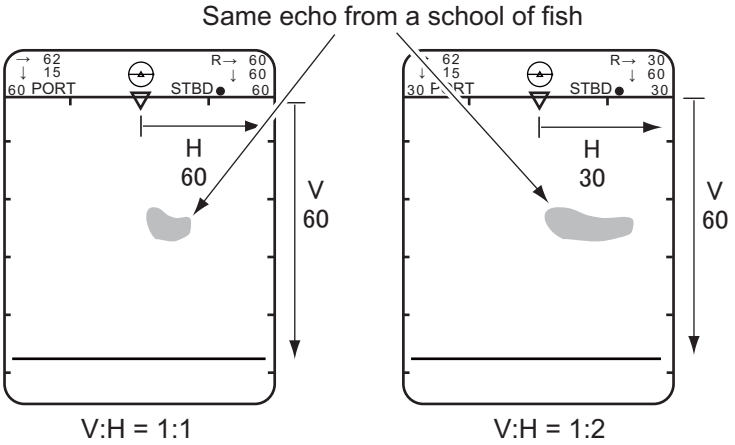
The RANGE control selects the detection (display) range. Select the range according to either the fish species being searched or the depth desired. Normally it is set so that the bottom is traced at the lower part of the screen (like an echo sounder). The current range is displayed on screen after the "↓" indication, as shown in the figure below. After setting a range, the newly set range appears enlarged on screen for several seconds.



Mode	- ← Range (m) → +
Vertical Fan mode	20 40 60 ---------- 280 320 400

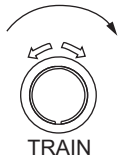
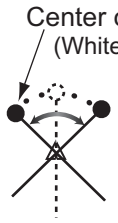
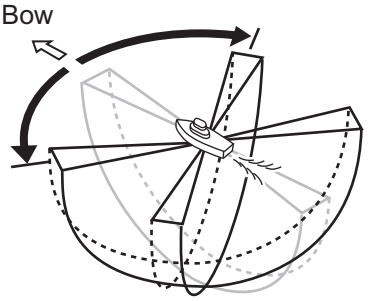
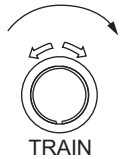
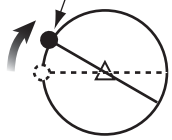
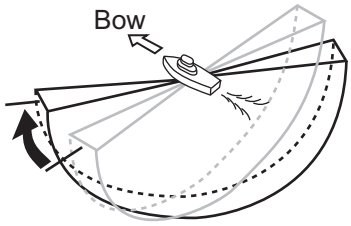
V:H RANGE key

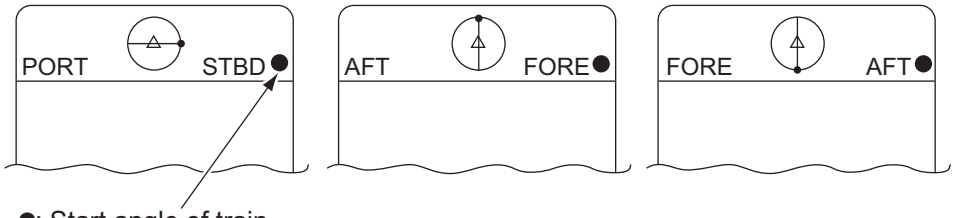
The V:H RANGE key changes the horizontal range scale in two steps.



3.4 Selecting Bearing for the Vertical Fan

The TRAIN control determines the bearing of the vertical fan beam. To which bearing the beam positions is known by the train indicator mark.

Operation	Train Indicator	Training of Vertical Fan Beam
Auto train (90°) 		
Manual train 		



●: Start angle of train
(It is shown to start from STBD side)

The training of the fan beam depends on the status of the AUTO TRAIN key in the sub panel 2.

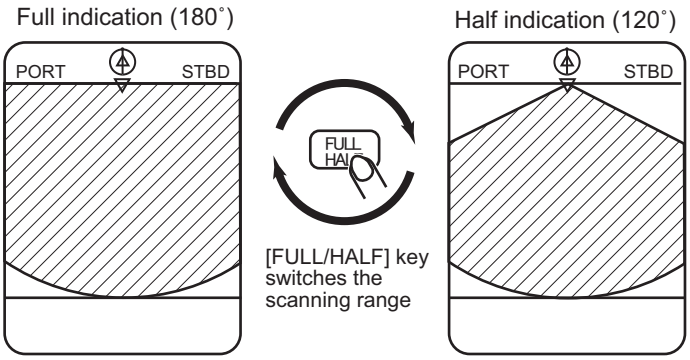
Operation	Train Indicator	Training of Vertical Fan Beam
Auto train [on] LED lights AUTO TRAIN	Break line shows train angle Auto train sector: 90˚	The beam trains automatically within the selected range centered at the bearing set by the TRAIN control.
Auto train [off] LED goes off AUTO TRAIN	Center of train Solid line shows train circulation	The train control can rotate the fan beam to any bearing desire. See V-MODE MANUAL TRAIN on chapter 7.

3.5 Selecting the Display Sector

The SECTOR controls determine the display area (sector width).

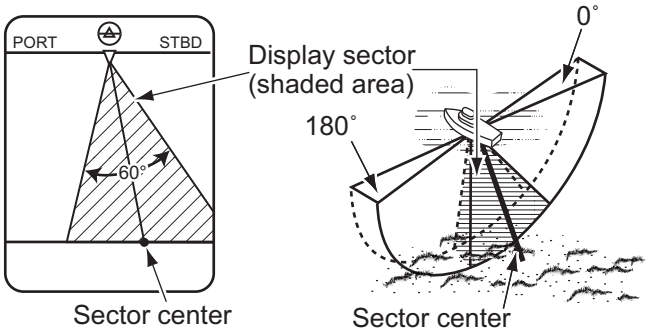
Mode	Display Sector (transducer tilting sector)
Vertical Fan mode	36° 60° 96° 120°* 156° or 180°*

*: Selected by FULL/HALF key



3.6 Selecting the Sector Center

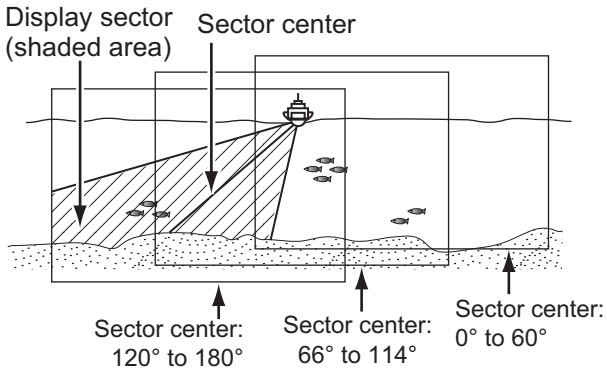
The TILT controls determine the display center (sector center) respectively.

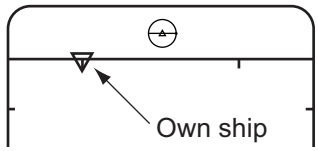
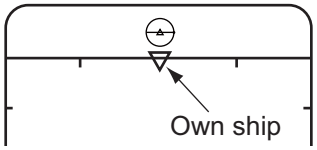
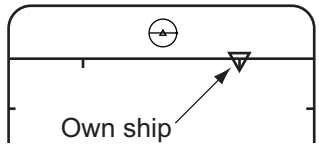


Automatic shifting of own ship position

Own ship position on the screen is shifted automatically either rightward or leftward according to the direction of the sector center and the display sector width.

The figure below shows the own ship position has been shifted rightward on the screen to provide the wider view at the port side.



Sector center	Own ship's location
0° to 60°	 Own ship marker relocated left side of the display.
66° to 114°	 Own ship marker relocated center of the display.
120° to 180°	 Own ship mark relocated right side of the display.

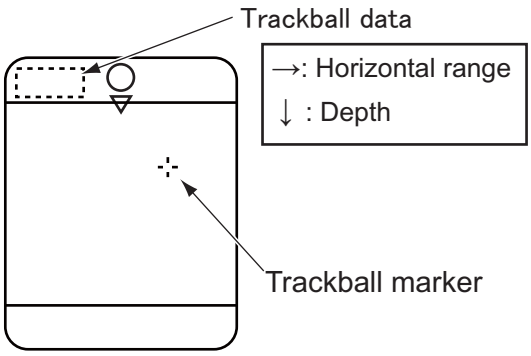
Sector step

The FAST SCAN key in the sub panel 2 selects sector step in 6° (Fast) or 3° (Normal).

3.7 Trackball Marker

The trackball functions to obtain the data (horizontal range and depth) from own ship to the specified position on the screen.

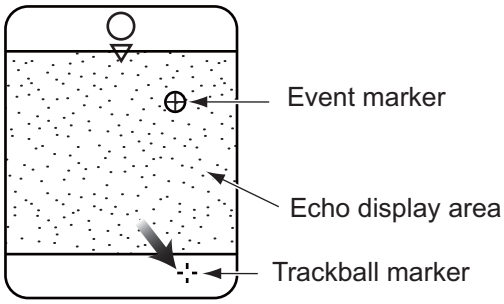
To confirm the trackball marker information on the desired location, read the trackball data displayed at the upper-left corner of the screen.



3.8 Event Marker

The event marker keeps desired location. It is able to registered one point only. When a new event marker is registered, forward point data will be deleted.

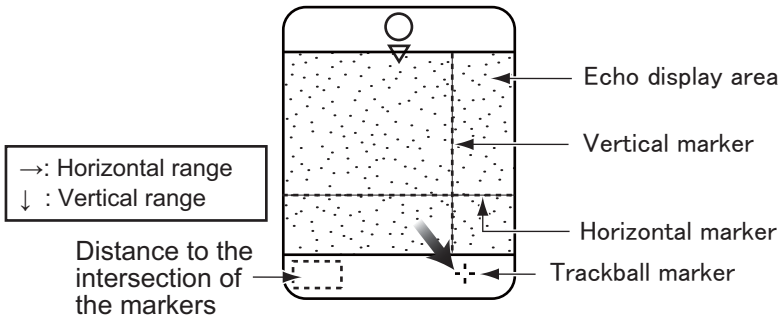
1) Position the trackball marker on the desired location.
2) Press the EVENT key.
3) To erase the marker, place the trackball marker outside the echo display and press the EVENT key.



3.9 Horizontal/Vertical Marker

Horizontal/Vertical marker shows the horizontal range and depth from own ship to the desired location.

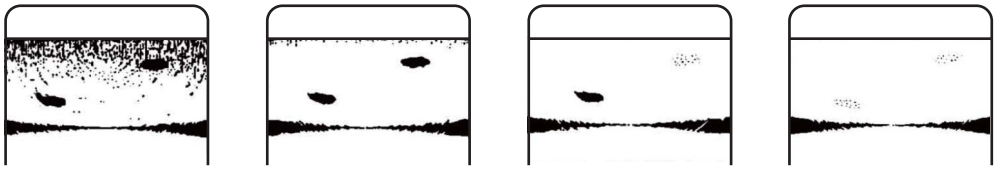
1) Position the trackball marker on the desired location.
2) Press the R/B key. The horizontal and vertical markers appear and the distance to the intersection of the markers is indicated at the bottom-left of the screen.
3) To erase the marker, place the trackball marker outside of the echo display area and press the R/B key.



3.10 Applying Proper TVG

The TVG function is the same as the one explained in the sonar mode. For best results, set both TVG level and time a little lower than the ones in the sonar mode. The setting is mode on the BOTTOM/3D menu screen and the usual setting for both time and level is 3.

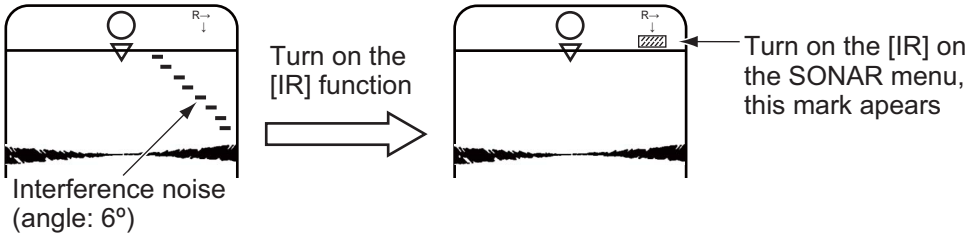
TVG level rejects surface noise, which may mask shallow targets and TVG time adjust the effective depth.



Level too low | Proper | Level too high | Time too high

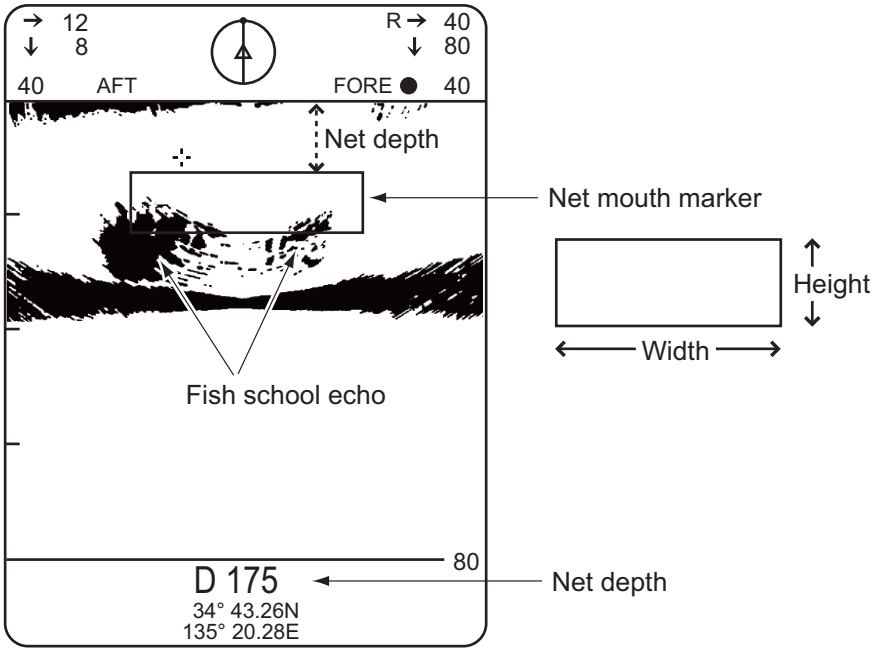
3.11 Rejecting Interference and Noise

While observing the picture, you may encounter occasional or intermittent noise and interference as shown below. This is mostly caused by onboard electronic equipment, engine, propeller noise, or electrical noise from other sonars being operated nearby. Turn on the interference rejector (IR) in the SONAR menu to reduce or eliminate the interference.



3.12 Net Mouth Marker

The net mouth marker is a tool use to help determine the best timing to raise the nets. This can be achieved by displaying the net mouth marker with the fish echoes. The net mouth marker is displayed as shown below.



How to display the net mouth marker

1. On sub-panel 2, press the **MENU** key to display the menu.
2. Using the ↑ or ↓ key, move the cursor to the top-most line of the menu.
3. Using the ← or → key, select [DUAL] to display the [DUAL] menu.

MENU	:	SONAR	BOTTOM/3D	DUAL	E/S
DUAL MODE	:	E/S	BOTTOM	SONAR	
NET MOUTH SHIFT	:	0			
NET MOUTH WIDTH	:	100			
NET MOUTH HEIGHT	:	30			
NET DEPTH	:	AUTO	MANUAL	OFF	
HOR SCAN RATE	:	1			
VERT SCAN RATE	:	1			
EXIT: PRESS MENU KEY					

4. Using the ↑ or ↓ key, select [NET DEPTH].
5. Using the ← or → key, select [AUTO] or [MANUAL], as appropriate.
   - **[AUTO]:** The net mouth marker depth is determined using NMEA depth input (DBS).
   - **[MANUAL]:** Use the NET MOUTH WIDTH and NET MOUTH HEIGHT settings to input the net dimensions. See paragraph 3.12.1 for how to move the marker.
   - **[OFF]:** Hide the net mouth marker
6. Press the **MENU** key to close the menu.

How to change the net mouth marker size

The net mouth marker size can be adjusted manually.

1. Select [NET MOUTH WIDTH] or [NET MOUTH HEIGHT] from the [DUAL] menu.
2. On sub-panel 2, press the ← or → key to adjust the width or height.

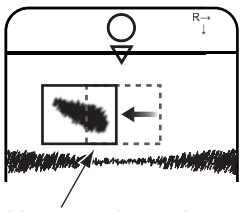
3.12.1 How to move the net mouth marker

The net mouth marker can be moved left or right and the depth can be adjusted. There are two methods for moving the net mouth marker, from the menu or with no menu displayed. Using the menu method will display the current location of the net mouth.

Position the net mouth marker in the desired position using the following procedures.

How to move the net mouth marker left or right

1. With the net mouth marker displayed, select [NET MOUTH SHIFT] from the [DUAL] menu.
2. Press the ← or → key to adjust the net mouth marker location as appropriate. The location range is -999 to 999, the location at the screen centre is 0.



Net mouth marker shifted to the left

To move the net mouth marker without using the menu, follow step 2 in the above procedure with the net mouth marker displayed and the menu closed.

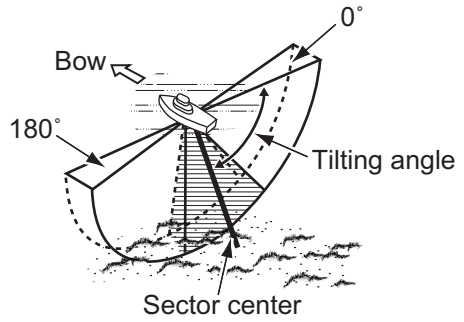
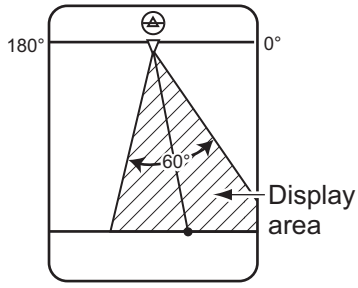
How to adjust the net mouth marker depth

To adjust the net depth, press the ↑ or ↓ key to adjust the depth as appropriate with the net mouth marker displayed and the menu closed.

3.13 Interpreting the Display

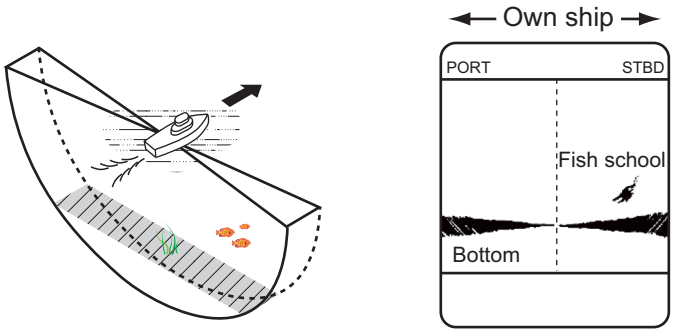
3.13.1 How the picture is painted

The sounding beam is emitted and the information (target echoes) obtained by the beam appears in the corresponding sector as it appears on the sonar mode. The difference is that the training is performed only in vertical direction. It forms a sounding area of a half-circle (like a slice of watermelon) to observe a vertical section of underwater conditions.

Mode	Sounding beam	Screen display
Vertical fan mode	Select the bearing of the sounding beam by TRAIN control, the sounding sector center by the TILT control and the display area by the SECTOR control. 	Example for sector angle 60° 

3.13.2 Port-stbd picture

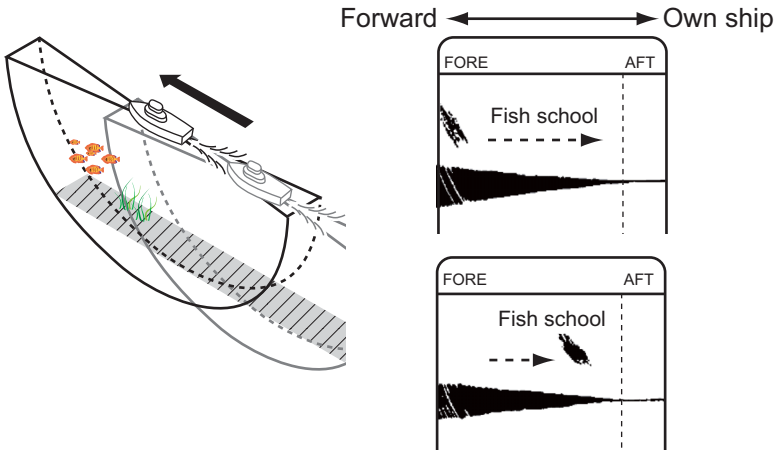
You can see fish echoes at the center-right of the CRT. The bottom is displayed wider as the distance from the ship's position increases. Therefore, it may be difficult to discriminate bottom fish.



3.13.3 When ship passes over schools of fish

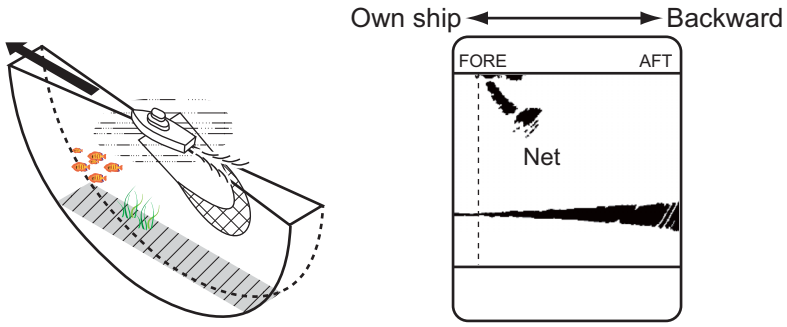
The sounding beam is directed fore-aft and the display is offcentered* to present a wider view of the area forward of the ship. You can clearly see the schools of fish approaching from the bow of the ship.

*: Automatically shifted according to the operation control settings.



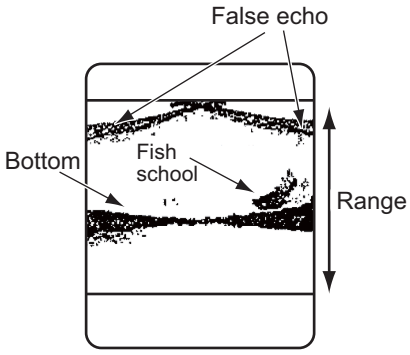
3.13.4 Display of net hauling

The net hauling display is useful for raising the net at the right time.



3.13.5 False echo

In shallow water (less than 100 m), unwanted echoes may appear. This phenomenon is caused by the false echo from the previous transmission. Reducing the Tx rate on the BOTTOM/3D menu may lessen this effect.



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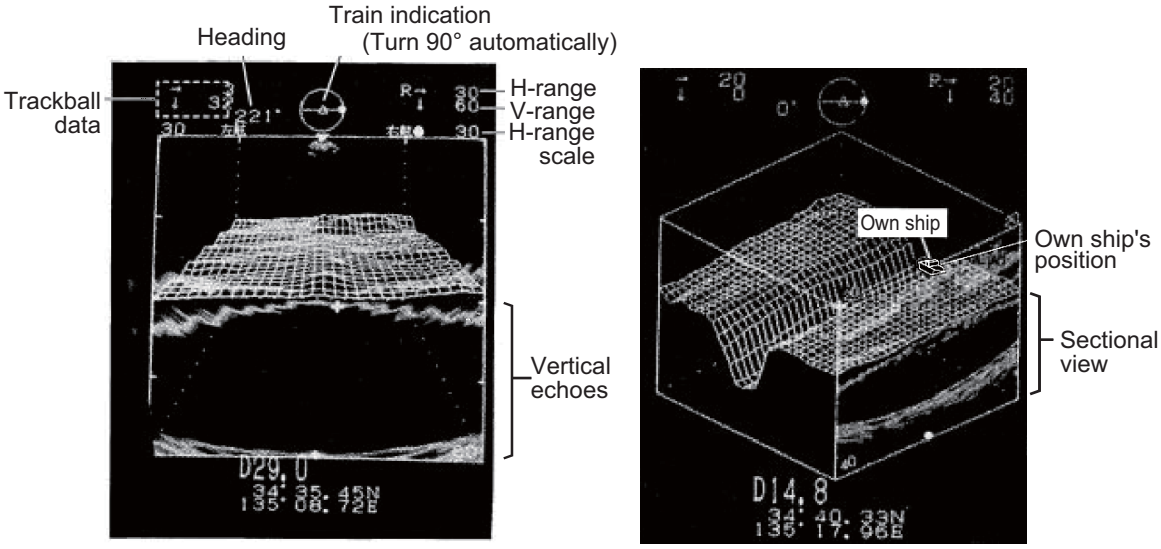
4. 3D MODE

The 3D mode shows vertical echoes (real time echoes) and a frontal or oblique image of the bottom just passed, like a graphic track plotter. This mode is useful for locating a wreck, a shoal or a fishing reef. Vertical echoes can be turned on/off through the BOTTOM/3D menu.

4.1 Selecting 3D Display

Either of two displays may be selected with the MODE control: the frontal image at [FRONT] position, or the oblique image at [OBLIQUE]. Example displays of both images are shown below.



Frontal image

Oblique image

4.2 Turning Vertical Echoes On/Off

Vertical echoes, namely, real time echoes, can be turned on or off on the VERT. ECHO OVERLAY field of the BOTTOM/3D menu.

1. Press the [MENU] key on the sub panel 2. The menu window appears.

MENU	: SONAR	BOTTOM/3D	DUAL	E/S
TVG (LEVEL)	: 4.0			
TVG (TIME)	: 4.0			
BEAM WIDTH	: NAR	WIDE		
AUTO TRAIN SECTOR	: 90	180	360	
VERT. ECHO OVERLAY	: OFF	ON		
3D VIEW SCALE	: TIME	DIST		
TIME SCALE	: 1/1	1/2	1/4	
(or DISTANCE SCALE	: 500	1000)		
EXIT: PRESS MENU KEY				

2. Select BOTTOM/3D with the [→] or [←] keys.
3. Select item with [↑] or [↓] keys. The selected item is highlighted and the current setting is circumscribed.
4. Select value with [→] or [←] keys.
5. Press the MENU key to return to the BOTTOM/3D menu.

BOTTOM/3D menu description

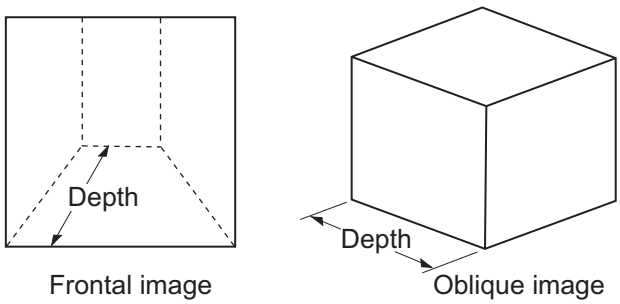
Menu	Description
TVG (LEVEL)	Controls the receiver sensitivity in short to medium ranges to eliminate surface noise, which may mask shallow targets.
TVG (TIME)	Determines the TVG effective depth.
BEAM WIDTH	Sets the vertical beam width is useful for searching a wide area vertically but fish detection range is shortened since the transmitted power attenuates.
AUTO TRAIN SECTOR	Sets the train sector, 90°, 180°, 360°. Use a wide sector to conduct a general search, narrowing it once a school of fish is detected.
VERT. ECHO OVERLAY	Turns on/off the vertical echoes.
3D VIEW SCALE	Determines the depth item, time or distance for 3D display mode. (Requires optional equipment)
TIME (DIST) SCALE	Selects z-axis scale of 3D picture.

4.3 Changing 3D View Scale Mode and Selection

The depth (z-axis) of the graph is displayed in either “TIMe” or “DISTance” scale mode. The depth can be set to 500 or 1000 meters in the distance scale mode, or 1/1, 1/2 or 1/4 in the time scale mode. The fraction means graph update/number of transmission. “1/4” for example, means the graph is updated every four transmissions.

These selections are made on the 3D VIEW SCALE and TIME SCALE (or DISTANCE SCALE) lines of the BOTTOM/3D menu.

The time mode should be selected when speed data is not being fed to the unit from navaids or speed log.



4.4 Other Operations

The following operations are the same as those in the Vertical Fan Mode.

- Range selection
- Trackball marker information display
- Rejecting sonar interference and noise
- Horizontal/Vertical and Event markers
- TVG adjustment
- Beam width selection

The selection of the bearing of the vertical fan beam and auto train function are disabled, as the bearing of the vertical fan beam is automatically selected to 90° in this mode.

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5. PRESENTATION MODE

Five presentation modes are available with the MODE control: Normal sonar, Normal sonar + combination, Expanded sonar, Vertical fan mode and Vertical fan mode + combination and 3D display mode (front and slant perspective views).

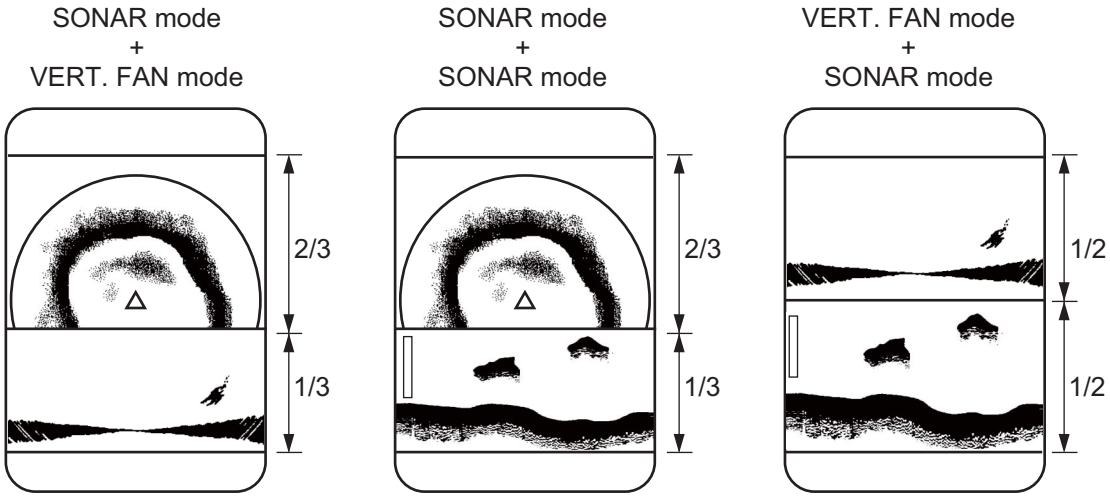
5.1 Display Combination View

Press the E/S key to select combination view. The combination presentation mode is selected as follows;

Mode	Combination
Sonar mode	Sonar mode + Vertical fan mode Sonar mode + Sonar mode (split-screen display)
Vertical fan mode	Vertical fan mode + Sonar mode (split-screen display)

Note 1: Sonar mode (expanded view) and 3D mode (Frontage/Oblique) are disabled in order to use the combination view.

Note 2: The screen is split as follows:
Sonar mode: upper 2/3, lower 1/3
Vertical fan mode: upper 1/2, lower 1/2



5.2 Dual Menu

1) Press the [MENU] key in the sub panel 2.
2) Move the cursor with [↓] or [↑] keys and select “DUAL“ at top column with [→] or [←] keys.

```
MENU                  : SONAR   BOTTOM/3D DUAL   E/S
DUAL MODE             :  E/S    [BOTTOM]         SONAR
NET MOUTH SHIFT       : [ 0 ]
NET MOUTH WIDTH       : [100]
NET MOUTH HEIGHT:     [ 30 ]
NET DEPTH             : [AUTO]    MANUAL         OFF
HOR SCAN RATE         : [ 1 ]
VERT SCAN RATE        : [ 1 ]

EXIT:  PRESS MENU KEY
```

3) Select an item with [↓] or [↑] keys and select value with [→] or [←] keys.
4) Press [MENU] key to close the menu.

5.3 Description of DUAL Menu

Mode	Description
Dual mode	Choose the display to show on the lower 1/3 of the combination display. BOTTOM (vertical fun), SONAR (sonar picture) is displayed like an echo sounder picture. [SOUNDER] menu in [DUAL] is invalid.
Net mouth shift	Set the left/right position of the net mouth mark. The setting range is -999 m to +999 m and the default setting is 0 m. (setting range and default setting change with unit of measurement.)
Net mouth width	Set the left/right width of the net mouth mark. The setting range is 1 m to 999 m and the default setting is 100 m. (Setting range and default setting change with unit of measurement.)
Net mouth height	Set the up/down width of the net mouth mark. The setting range is 1 m to 999 m and the default setting is 30 m. (Setting range and default setting change with unit of measurement.)
Net depth	Choose the net mouth mark depth setting method. The default setting is MANUAL. AUTO mode uses the IEC/NMEA depth data sentences DBS. MANUAL mode requires the depth setting with the [↑] or [↓] key on the sub panel.
HOR Scan Rate	Set the horizontal scan rate for the combination mode. The number of horizontal scans produced per line drawn in the combination display. The setting range is 1 to 10 and the default setting is 1.
VERT Scan Rate	Set the vertical scan rate for the combination mode. The number of vertical scans produced per line drawn in the combination display. The setting range is 1 to 10 and the default setting is 1.

5.4 E/S Menu

This procedure is available only when [SONAR MODE] is firstly selected.

1) Press the [MENU] key.
2) Select E/S at the top of the screen.
3) Select an item with [↑] or [↓] keys and select value with [→] or [←] keys.
4) Press the [MENU] key to close the menu.

Note: Select [BOTTOM/3D] menu by turning the MODE knob for changing the setting for changing the setting for [BOTTOM/3D].

Item	Description
RANGE	Select echo sounder range: 40, 80, 160, 240 or 320 (m).
SHIFT	Enter display starting depth.
GAIN	Adjusts gain.
N.L.	Suppresses noise which covers the whole screen. Normally, set to 1 or 2.
IR	Suppresses interference from sonar or other ship or noise from electrical machinery onboard own ship.
ADVANCED SPEED	Select picture advance speed. The fractions the number of scan lines produced per transmission.
RES. COLOR	Select “LOG” or “LINEAR” according to amplifier of echo sounder. LINEAR: FCV-382/782/271, LOG: FCV-291/292/1000

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6. CUSTOM MODE KEYS

Like the re-dial feature on a telephone, the custom mode keys record control settings and play them back in a single key stroke. This feature is useful when you need to quickly set up the sonar according to fishing ground or fish species being searched. You can program three sets of settings for the MODE, RANGE, SECTOR, TRAIN and TILT controls.

6.1 Customizing the Keys

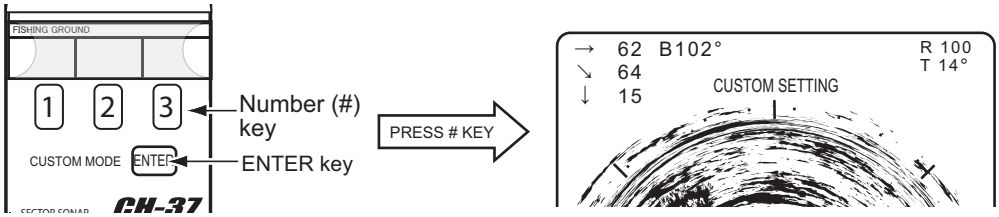
1) Tune the sonar as you normally would.
2) Press the [ENTER] key to display the CUSTOM MODE menu.

Present setting ↓ — Remaining setting

ITEM	SETTING	CUSTOM1	CUSTOM2	CUSTOM3
MODE	⊙	FAST	⊙ FAST	FAST
RANGE	800	250	250	120
SECTOR	75°	0°	75°	90°
TRAIN	225°	225°	360°	180°
TILT	30°	30°	30°	90°

Customize : Press the number key to register
Cancel : Press the ENTER key to exit

3) Press one of [1], [2] or [3] key (contents shown in second column from the left in figure below).



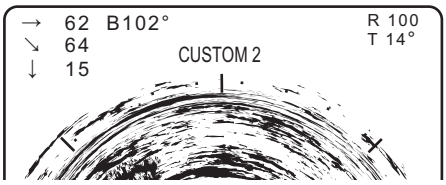
MAIN PANEL — SCREEN (UPPER PART)

4) Repeat step 2 for remaining custom mode keys.

Note: Custom mode key labels are provided in section 6.3. Cut them out and insert them in the label cases on the front panel as shown.

6.2 Using Custom Mode

1) Press the desired custom mode key among 1, 2 and 3. The custom number appears upper-center on the screen momentarily appears.

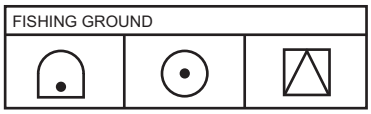


2) To escape from the custom mode settings, Adjust any control.

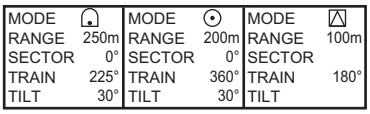
6.3 Custom Mode Registration

1. Enter the mode name desired on the custom mode key label on the next page.

FRONT (example)

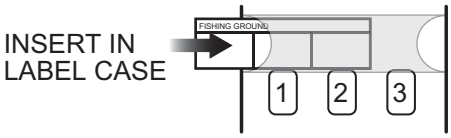


BACK (example)



2. Cut out the label.
3. Fold the label in half at the center line of the label.

4. Insert the label in the label case.



6.4 Custom Mode Key Labels

(FRONT)

FISHING GROUND		

(BACK)

MODE RANGE 250m SECTOR 0° TRAIN 225° TILT 30°	MODE RANGE 200m SECTOR 0° TRAIN 360° TILT 30°	MODE RANGE 100m SECTOR TRAIN 180° TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

FISHING GROUND		
MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT	MODE RANGE SECTOR TRAIN TILT

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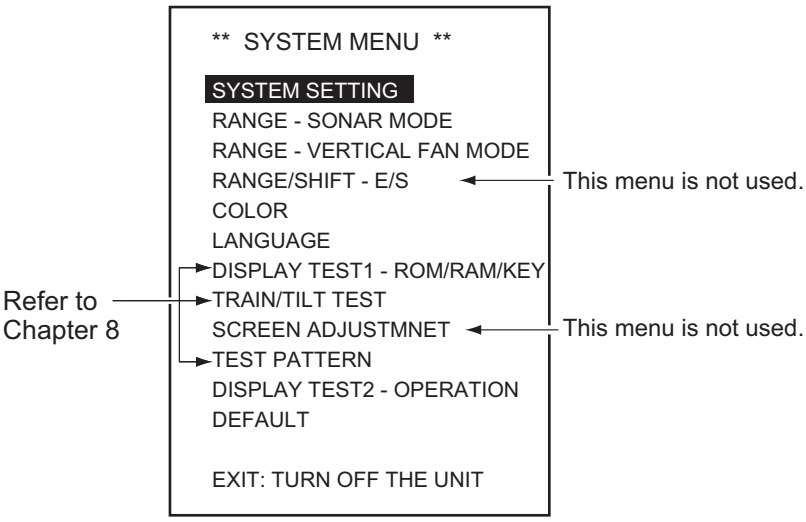
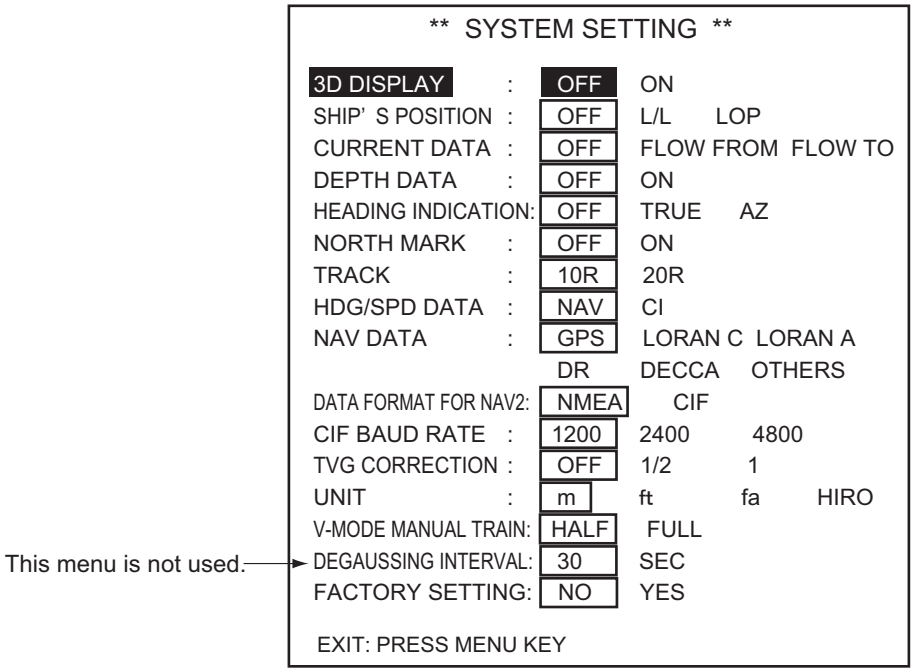
7. SYSTEM MENU

7.1 How to Display the System Menu

1. Turn on the [PWR] key while pressing the [MENU] key. Release the keys when you hear a beep. The SYSTEM menu appears.



2. Select SYSTEM SETTING and press the [MENU] key.



3. Select items with [↑] or [↓] keys.
4. Select an option with [→] or [←] keys.
5. Press the [MENU] key. The system setting menu is closed and return to the system menu.
6. Press the [PWR] key and return to normal operation.

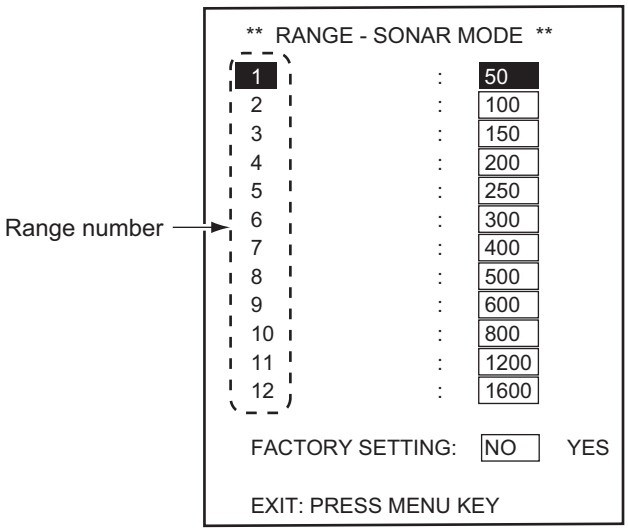
Note: Be sure to return to the system menu before turning off the power, to properly register settings.

7.2 System Setting Menu

Item	Description
3D DISPLAY	Turn 3D display on/off.
SHIP'S POSITION	Turn position indication on/off and selects position format; latitude and longitude or Loran LOP.
CURRENT DATA	Turn current (tide) data display method; flow from, flow to or off.
HEADING DISPLAY	Turn heading indication on/off and select its format; true or azimuth.
NORTH MARK	Turn north mark on/off.
TRACK	Select length of course line plotting; 10R (ten times the range in use) or 20R (twenty times the range in use).
HDG/SPD DATA	Select source of data to be used to plot course line; NAV (navigator), CI (Current Indicator).
NAV DATA	Select source of position data; GPS, LORAN C/A, DR, DECCA, others.
DATA FORMAT FOR NAV2	Select data format for nav data; CIF (FURUNO) or NMEA.
CIF BAUD RATE	Select baud rate of CIF data; 1200, 2400 and 4800 bps.
TVG CORRECTION	Change TVG curve to compensate for absorption of ultra-sonic wave in water; OFF, Standard TVG curve, 1/2, 1/2 of theoretical absorption value added to TVG curve, 1, Full theoretical absorption value added to TVG curve.
UNIT	Select unit of depth measurement; m: meters, ft: feet, fm: fathoms, HR: Hiro.
V-MODE MANUAL TRAIN	Select manual training sector width for the Vertical Fan Mode. Half: half circle, Full: full circle.
DEAUSSING INTERVAL	Not used.
FACTORY SETTING	Yes restores default system menu settings.

7.3 Setting Range of Sonar Mode

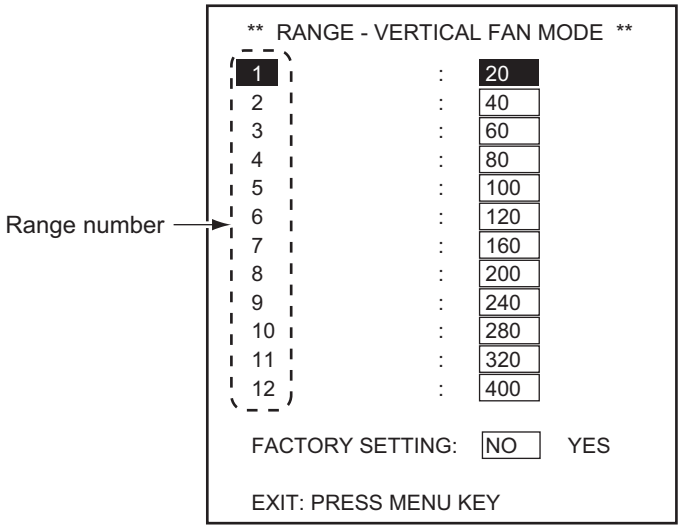
1. Select RANGE-SONAR MODE from the SYSTEM menu.
2. Press the [MENU] key to show the RANGE - SONAR MODE menu.



3. Select range with [↓] or [↑] keys.
4. Select value with [→] or [←] keys.
5. Press the [MENU] key to return to the SYSTEM menu.
6. Press the [PWR] key to quit the setting operation.

7.4 Setting Range of Vertical Fan Mode

1. Select RANGE-VERTICAL FAN MODE from the SYSTEM menu.
2. Press the [MENU] key to show the RANGE- VERTICAL FAN MODE menu.

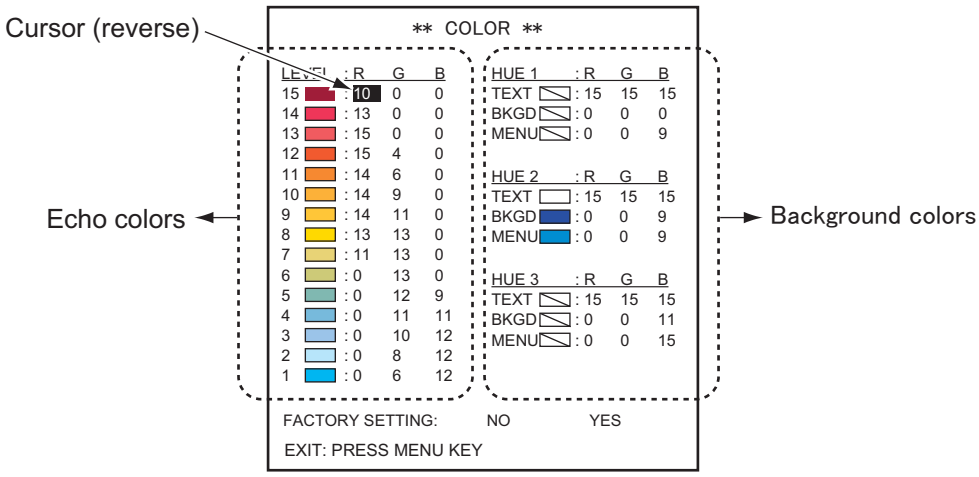


3. Select range with [↑] or [↓] keys.
4. Select value with [→] or [←] keys.
5. Press the [MENU] key to return to the SYSTEM menu.
6. Press the [PWR] key to quit the setting operation.

7.5 Setting Screen Colors

The color setting screen allows you to adjust display colors.

1. Select COLOR from the SYSTEM menu.
2. Press the [MENU] key to show the COLOR menu.



3. Select item with [↑] or [↓] keys.
4. Select color with [→] or [←] keys.
5. Press the [MENU] key to return to the SYSTEM menu.
6. Press the [PWR] key to quit the setting operation.

Echo color

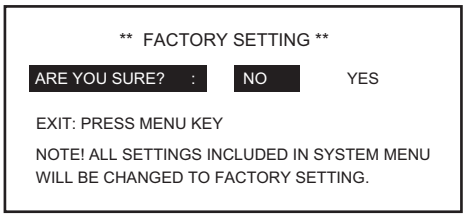
Echo signal level is indicated (1 to 15). The larger number is the stronger signal.

Hue color

Hue color settings are available in three patterns. They includes the text, background and menu frame colors.

Restoring default setting colors

1. Select FACTORY SETTING from the COLOR menu.
2. Select “YES“ with [→] key and press the [MENU] key. The message window appears.



3. Select “YES“ with [→] key and press the MENU key to return to the COLOR menu.
4. Press the [MENU] key to return to the SYSTEM menu.
5. Press the [PWR] key to quit the setting operation.

7.6 Setting Language

1. Select LANGUAGE from the SYSTEM menu.
2. Press the [MENU] key to show the LANGUAGE menu.

```
** LANGUAGE **

LANGUAGE      :  JAPANESE  ENGLISH

EXIT: PRESS MENU KEY
```

3. Select language with [→] or [←] key.
4. Press the [MENU] key to return to the SYSTEM menu.
5. Press the [PWR] key to quit the setting operation.

7.7 Restoring Default Settings

1. Select DEFAULT from the SYSTEM menu.
2. Press the [MENU] key to show the DEFAULT menu.

```
** DEFAULT **

ARE YOU SURE?  :  NO      YES

EXIT: PRESS MENU KEY
NOTE! ALL SETTINGS INCLUDED IN SYSTEM MENU
WILL BE CHANGED TO FACTORY SETTING.
```

3. Select “YES” and press the [MENU] key to restore default settings.
4. Press the [PWR] key to quit the setting operation.

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8. MAINTENANCE

Good performance depends on regular maintenance. Following the recommended procedures in this chapter will keep the equipment operating in top condition for years to come.

⚠ WARNING

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

This equipment uses high voltage that can cause electrical shock. Only qualified personnel should work inside the equipment.

NOTICE

Do not apply paint, anti-corrosive sealant or contact spray to plastic part or equipment coating.

Those items contain products that can damage plastic parts and equipment coating.

8.1 General Maintenance

- Handle with care. Corrosion may start even from a scratch.
- Allow space around the unit for ventilation.
- Keep the equipment away from magnets (such as a speaker, large capacity transformer) and also magnetic sensitive units like a gyrocompass.
- Clean the filter and screen with a wet or dry soft cloth. Do not use commercial cleaners or solvents to clean the unit. They may remove paint and markings.

8.2 Maintenance of Transceiver Unit

Keep the unit clean, especially the cable entrance. Wipe off dust or oil with a cloth dampened in water-diluted mild detergent.

8.3 Fuse Replacement

⚠ WARNING

Use the proper fuse.

Fuse rating is shown on the equipment. Use of a wrong fuse can result in equipment damage.

The fuses in the processor and transceiver units protect them from overvoltage, equipment fault and reverse polarity of the ship's mains. If the power cannot be applied, first check the fuse for the processor unit. The fuse for the transceiver unit is inside the unit; have a qualified technician check the fuse. If a fuse blows after replacement, or the power cannot be turned in spite of normal fuse, contact your dealer for advice.

Unit	Type	Code No.	Remarks
Processor unit	FGBO 125V 3A PBF	000-155-830-10	24VDC, 3A

8.4 Maintenance of Hull Unit

Lubrication

Grease the raise/lower screw shaft once a year. Also, grease the raise/lower main shaft (upper part of the grease cotton retainer) twice a year. These parts can accessed by removing the raise/lower drive assembly cover.

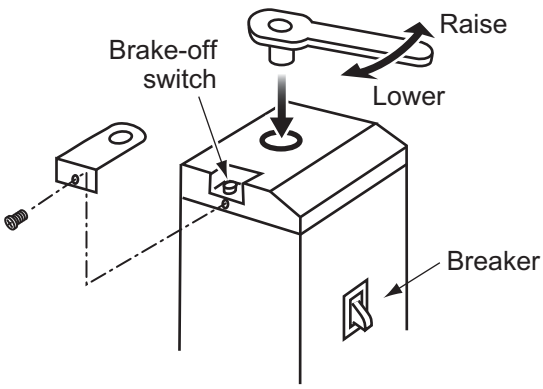
Manual raise/lower of transducer with hand crank

⚠ CAUTION

Turn off the hull unit before using the hand crank.

Bodily injury may result if the power is not turned off.

Ship's mains should be supplied to the hull unit to do this check. Also be sure to press and hold down the brake-off switch while manually raising/lowering the transducer. Failure to press the switch may damage the raise/lower motor.



1. Turn off the breaker on the hull unit.
2. Remove the break-off switch cover.
3. Set 19 mm socket wrench and turn it while pressing the break-off switch.
4. Check that the transducer can be raised/lowered smoothly with a constant force from the upper to the lower limit positions. If not, centers of the main body flange and the retraction tank are not aligned. Adjust the hull unit mounting position.

8.5 Processor Unit Test

This test checks the ROM, RAM and keyboard for proper operation.

1. Turn on the power while pressing the [MENU] key. Release the keys when you hear a beep. The SYSTEM menu appears.
2. Select DISPLAY TEST 1 - ROM/RAM/KEY with the [↑] or [↓] keys on the sub panel 2.
3. Press the [MENU] key to start the test. The program number, TX frequency and pitch/roll angles are displayed. ROM, RAM and serial I/O are checked.

4. Operate each key and control on the main panel, sub panel and remote control box. A pressed key's on-screen indication changes to 1 when the key is pressed; 0 when it is released.
5. Press the [MENU] key to return to the SYSTEM menu.
6. Press the [PWR] key to quit the operation.

ROM program version number is displayed. ROM/RAM and serial ports are checked for proper operation, and TX frequency, roll/pitch angle are displayed.

Remote control box check.
Switch is normal if value changes when switch is operated.

```
                    ** DISPLAY TEST **

PROGRAM NO.  0650101-XXX ——— MAIN PANEL ———
ROM                  OK      *      *      *
SRAM                 OK     12            12
VRAM                 OK      0           255
SIO1                        12             0
SIO2                         0      0      0
TX FREQUENCY  60 KHZ       X: 0          Y: 0
ROLL                0.0      0      0      0
PITCH               0.0                    0
                                   ————————————
— REMOTE CONTROL —      ——— SUB PANEL ———
   0      0      0      255    255    255    *
   0      0      0      *      *
   0      0      0      0      0      0
      0           0      0      0      0      0
   0      0      0             0            EXIT
                                0      0      0
                                   ————————————
EXIT :   PRESS MENU KEY
```

Main panel check.
Switch is normal if value changes when switch is operated.

Sub panel check.
Switch is normal if value changes when switch is operated.

8.6 Train/Tilt Test

This test checks the transducer training and tilting functions for proper operation.

1. Select TRAIN/TILT TEST with [↑] or [↓] key from the SYSTEM menu.
2. Press the [MENU] key to start the test.
3. Press the [MENU] key to return the SYSTEM menu again.
4. Press the [PWR] key to quit the operation.

```
** TRAIN/TILT TEST **

– PHOTO SENSOR CHECK –
   TRAIN                TILT
   0°     OK            +10°    OK
 180°     OK            180°    OK
                        190°    OK

– TRAIN CHECK –
                        PULSES   NG
   0 → 180° (  CW)      1428      0
 180 →   0° (  CW)      1449      0
   0 → 180° ( CCW)      1427      0
 180 →   0° ( CCW)      1451      0

– TILT CHECK –
                        PULSES   NG
 +10 →  90°             1206      0
  90 → 190°              939      0
 190 →  90°              919      0
  90 → +10°             1225      0

              TEST COUNT =  8

EXIT :  PRESS MENU KEY
```

Note: The number of pulses are reference only.

This check the photo sensors which detect the referense angles for training and tilting operations.

This checks the transducer training operation. The four digit figures used to train the transducer by 180°. If training is abnormal, NG count increases by one.

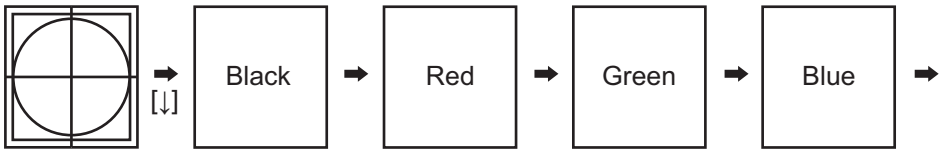
This checks the transducer tilting operation. If the number of pulses used to tilt the transducer is abnormal, NG count increases by one.

This increases by one when above test has done.

8.7 Test Pattern

This test checks display position and colors.

1. Select TEST PATTERN with [↑] or [↓] keys from the SYSTEM menu.
2. Press the [MENU] key to start the test.



Position check

3. Press the [MENU] key to return the SYSTEM menu again.
4. Press the [PWR] key to quit the operation.

8.8 Error Messages

8.8.1 Raise lower error message

If the power is not applied to the hull unit, the error message appears on the screen and the buzzer sounds.

If this occurs, turn the power off and check the breaker and fuse the screen suggests.

HULL UNIT
POWER OFF
(CHECK BREAKER AND FUSE)

PRESS R/B KEY TO SILENCE ALARM

8.8.2 Transceiver unit error message

If the power is not supplied to the transceiver unit, the error message appears on the screen and the buzzer sounds.

If this occurs, turn the power off and check the fuse as the screen suggests.

TRANSCEIVER
UNIT
POWER OFF
(CHECK FUSE ON TRANSCEIVER UNIT)

PRESS R/B KEY TO SILENCE ALARM

8.8.3 Speed warning

Because the transducer may be damaged if it is kept lowered when ship's speed exceeds 15 knots (based on the speed relative to ground fed from nav sensor), the following message appears and the buzzer sounds.Press the R/B key to silence the buzzer and return to the normal sonar picture. Raise the transducer.

TRANSDUCER
REMAINS
LOWERED

(REDUCE SHIP' S SPEED AND PRESS ↑ KEY)

PRESS R/B KEY TO SILENCE ALARM

8.8.4 Train error message

If something is wrong with the train control circuit, the following message appears and the unit stops operating. Turn the PWR switch off and contact your service agent at your earliest convenience.

TRAIN NG

8.8.5 Tilt error message

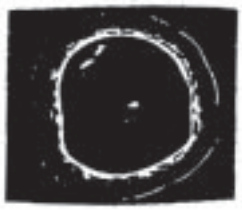
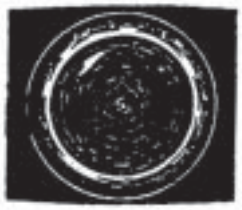
If something is wrong with the tilt control circuit, the following message appears and the unit stops operating. Turn the PWR switch off and contact your service agent at your earliest convenience.

TILT NG

8.9 Troubleshooting

The table below provides common symptoms of equipment troubles and the means to rectify them. If normal operation cannot be restored, do not check inside the system. Any repair work is best left to a qualified technician.

Symptom	Check
No picture	Power supply. Check ship's mains voltage at the power plug connected to the power unit. Fuse. If blown, replace with 3A fuse. Call service technician if it blows again. NEVER use a fuse of a higher rating.
Bottom echo becomes irregular	Rough seas. Distance to sea bottom changes due to rolling and pitching. Long range selected. Since transmission period is a little longer, ship's rolling and pitching are apt to effect detection of echo.
Weak echo	TX OUTPUT POWER set to other than "C". Check the TX output power setting on the sonar menu, and set it to "C" for max. output power. TVG effect is excessive. Excessive TVG results in elimination of useful echoes. Note: Readjustment of TVG is required whenever the GAIN control is suggested.
Somewhat strange color	BRILL control set too low. Increase the brightness.
Color partially irregular	Magnet is near the screen. This symptom occurs if equipment which contains a magnet (loudspeaker, etc.) is placed near the screen. Separate the magnetic equipment from the unit. Note: If the symptom continues, consult with electronics technician.

Symptom	Check
Picture distorted 	Equipment generating strong magnetic field is near display unit. Locate magnetic field generating equipment (rectifier, etc.) well away from the display unit.
Picture contains noise 	Equipment not grounded properly. Carefully check the ground. Power cable is run alongside the signal cable. Signal cable may pickup noise emitted from power cable of other equipment; therefore, separate them from each other. Debris may be on sea surface. Reject unwanted echoes with the interference rejector on the SONAR menu, TVG control or NL control.
Trail speed is low	Confirm if the “IR“ is ON in the SONAR menu. If the “IR“ function is ON, trail is lower than usual cause the reflection signal is compared with latest. Use the function ’off’ in usual.

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APPENDIX 1 MENU TREE

- MENU
  [MENU] key
  - SONAR
    - TX RATE (1 to 10)
    - TX PULSE LENGTH (LONG, SHORT)
    - TX OUTPUT POWER (A, B, C)
    - TX EXT SYNC (OFF, ON)
    - IR (OFF, ON)
    - STABILIZER (OFF, ON)
    - COLOR (16, 8)
    - RES. COLOR (LOG, LINEAR, SQUAER)
  - BOTTOM/3D
    - TVG (LEVEL) (0.0 to 10.0)
    - TVG (TIME) (0.0 to 10.0)
    - BEAM WIDTH (NARROW, WIDE)
    - AUTO TRAIN SECTOR (90,180,360)
    - VERT. ECHO OVERLAY (OFF, ON)
    - 3D VIEW SCALE (TIME, DISTANCE)
    - TIME (DIST.) SCALE (1/1, 1/2, 1/4), (500,1000)
  - DUAL
    - DUAL MODE (E/S, BOTTOM, SONAR)
    - NET MOUTH SHIFT (-999 to 999)
    - NET MOUTH WIDTH (1 to 999)
    - NET MOUTH HEIGHT (1 to 999)
    - NET DEPTH (AUTO, MANUAL, OFF)
    - HOR SCAN RATE (1 to 10)
    - VERT SCAN RATE (1 to 10)
  - E/S
    - RANGE (40,80,160,240,320)
    - SHIFT (0 to 1000)
    - GAIN (0.0 to 10.0)
    - N.L. (0 to 10)
    - IR (OFF, ON)
    - ADVANCE SPEED (1/1, 1/2, 1/4)
    - RES. COLOR (LOG, LINEAR)

SYSTEM MENU

- [PWR] key + [MENU] key
  - SYSTEM SETTING
    - 3D DISPLAY (OFF, ON)
    - SHIP' S POSITION (OFF, L/L, LOP)
    - CURRENT DATA (OFF, FLOW FROM, FLOW TO)
    - DEPTH DATA (OFF, ON)
    - HEADING INDICATION (OFF, TRUE, AZ)
    - NORTH MARK (OFF, ON)
    - TRACK (10R, 20R)
    - HDG/SPD DATA (NAV, IC)
    - NAV DATA (GPS, LORAN C, LORAN A, DR, DECCA, OTHES)
    - DATA FORMAT FOR NAV2 (NMEA, CIF)
    - CIF BAUD RATE (1200, 2400, 4800)
    - TVG CORRECTION (OFF, 1/2, 1)
    - UNIT (m, ft, fm, HR)
    - V-MODEL MANUAL TRAIN (HALF, FULL)
    - DEGAUSSING INTERVAL (Not used)
    - FACTORY SETTING (OFF, ON)
  - RANGE SONAR MODE
  - RANGE VERTICAL FAN MODE
  - RANGE/SHIFT E/S (Not used)
  - COLOR
  - LANGUAGE
  - DISPLAY TEST1 (ROM/RAM/KEY)
  - TRAIN/TILT TEST
  - SCREEN ADJUSTMENT
  - TEST PATTERN
  - DISPLAY TEST2 (operation)
  - DEFAULT

SPECIFICATIONS OF COLOR SECTOR SCANNING SONAR CH-37BB

1 GENERAL

1.1	Display system	15-inch color monitor (XGA/SXGA) or more recommended
1.2	Transmitting frequency	60/113/162 kHz selected
1.3	Output power	0.8 kW (60 kHz), 1.3 kW (113 kHz), 1.5 kW (162 kHz)
1.4	Pulse length	0.2 to 10.6 ms, varied according to the range in use

1.5 Range

Range	Detection range (m)			Train speed (sec) at 113 kHz
	60 kHz	113 kHz	162 kHz	
1	0-50	0-50	0-50	3.8
2	0-100	0-100	0-100	4.3
3	1-150	1-150	1-150	4.8
4	0-200	0-200	0-200	5.4
5	0-250	0-250	0-250	6.0
6	0-300	0-300	0-300	6.7
7	0-400	0-350	0-350	7.0
8	0-500	0-400	0-400	7.6
9	0-600	0-500	0-450	8.6
10	0-800	0-600	0-500	10.0
11	0-1200	0-800	0-600	12.0
12	0-1600	0-1000	0-800	14.0

2 PROCESSOR UNIT

2.1	Picture output	1024 x 764 pixels, 16 or 8 colors selectable
2.2	Color hue control	LOG, linear, square
2.3	Display mode	Vertical (normal, expanded), Slice combination, Sonar combination
2.4	Sensitivity	Variable continuity
2.5	Unit indication	m, ft, fa, HR
2.6	Horizontal range	12 steps during 30 m to 1600 m
2.7	Vertical range	12 steps during 10 m to 1600 m
2.8	Display sector width	
	Horizontal mode	45°, 90°, 135°, 180°, 225° and 360°
	Vertical mode	36°, 60°, 96°, 120°, 150° and 180°
2.9	Off-center	4 point at expand mode, according to the train setting 2 point at slice mode, according to the tilt setting
2.10	TVG	Level (100 dB max.), Range (1000 m max.)
2.11	Clutter	Variable, Hue control
2.12	Elimination interference	Correlation with before data
2.13	Audio monitor	2 W, 8 ohms using external speaker (option)

3 HULL UNIT

3.1	Train step	45° step by fast scan mode or 6° step by normal mode
3.2	Tilting	
	Horizontal mode	15° step on automatic mode or 6° step on manual mode
	Vertical fan mode	6° (fast scan) or 3° step (normal)
3.3	Transducer travel	400 mm
3.4	Raise/lower time	10 sec approx.
3.5	Allowable ship's speed	18 knots or less (15 knots during raise/lower operation)

4 INTERFACE

4.1	NAV data input	NMEA0183 Ver2.0 or CIF
4.2	External KP I/O	TTL for synchronization
4.3	RGB Video signal output	XGA (VESA DDC), for external monitor

5 POWER SUPPLY

5.1	Processor unit	24 VDC: 0.5 A max.
5.2	Transceiver unit	24 VDC: 3.5 A
5.3	Hull unit	24 VDC: 3.5 A max. (6.5 A while traveling)
5.4	Total	24 VDC: 13.0 A max. (16.0 A while traveling)
5.5	Rectifier (option)	
	RU-3423, RU-1746B-2	100-115/220-240 VAC, 1 phase, 50/60Hz

6 ENVIRONMENTAL CONDITION

6.1	Ambient temperature	0°C to +50°C
6.2	Relative humidity	95% or less at 40°C
6.3	Degree of protection	
	Processor unit	IPX0
	Transceiver unit	IPX2
	Hull unit	IPX4
	Transducer	IPX8

7 COATING COLOR

7.1	Processor unit	N3.0
7.2	Hull unit	2.5GY5/1.5
7.3	Transceiver unit	2.5G7/2

INDEX

Numerics
3D mode 4-1
3D view scale 4-2

A
AUDIO control 1-2, 2-8
AUTO TRAIN key 1-3

B
Backlight 1-4
Bottom tail 2-7
BRILL control 1-2

C
Color
echo color.....7-4
hue color 7-4
screen colors.....7-4
Combination view.....5-1
Custom mode.....6-1
key labels 6-3

D
Default settings 7-5
DEGAUSS key.....1-2
DIMMER control.....1-2
Dual menu.....5-2

E
E/S key.....1-2
E/S menu 5-3
Error message 8-5
Event marker
sonar mode 2-6
vertical fan mode.....3-6

F
FAST SCAN key 1-2

G
Gain
adjusting.....1-6

H
Horizontal marker.....3-6
HUE key.....1-2

I
Interference.....2-9, 2-12, 3-7

L
Language 7-5

M
Main panel 1-1
Maintenance 8-1
Menu
operation 1-6
MENU key.....1-3
Menu tree.....AP-1
MODE control
vertical fan mode.....3-1

N
Net mouth marker 3-8
How to display the marker.....3-8
How to move the marker 3-9
How to resize the marker 3-9
NL control.....1-2
Noise.....2-9, 2-12, 3-7

P
Power switch.....1-3
Presentation mode.....1-4

R
R/B marker.....2-6
Range
sonar mode 7-3
vertical fan mode.....7-3
RANGE control
sonar mode 2-3
vertical fan mode.....3-2
Remote controller.....1-3

S
School of fish
detecting.....2-7
Sea surface reflection 2-7
SECTOR control
sonar mode 2-3
vertical fan mode.....3-4
Speed warning 8-5
Sub panel.....1-2
System menu 7-1
SYSTEM SETTING menu.....7-1

T
Test
processor unit.....8-2
train/tilt.....8-4
Test pattern.....8-4
Tilt angle 2-4, 2-5
TILT control
vertical fan mode.....3-4
Tilt error message 8-5
TRACK key 1-2
Trackball data 2-6
Trackball marker
vertical fan mode.....3-5
Train error message.....8-5
Troubleshooting 8-6
TVG control.....1-2

V
Vertical marker.....3-6
V-H RANGE key.....1-3
vertical fan mode.....3-3

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EC Declaration of Conformity

We FURUNO ELECTRIC CO., LTD.

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

(Address)

declare under our sole responsibility that the product

COLOR SECTOR SCANNING SONAR CH-37BB

(Model name, type number)

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

IEC 60945 Ed.4.0: 2002, clauses 9.2, 9.3, 10.3, 10.4, 10.5, 10.8 and 10.9
IEC 60945 Ed.3.0: 1996, clauses 10.2 and 10.3

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

For assessment, see

- EMC Test Report FLI 12-11-118, December 15, 2011 prepared by Furuno Labotech International Co., Ltd.

This declaration is issued according to the Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

On behalf of Furuno Electric Co., Ltd.

Y. Shogaki

Nishinomiya City, Japan
April 20, 2016

(Place and date of issue)

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