FURUNO

OPERATOR'S MANUAL

HALF-CIRCLE COLOR SCANNING SONAR

FSV-75

Model **FSV-75-3D**

FURUNO ELECTRIC CO., LTD.

www.furuno.com

ECF

(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

FURUNO ELECTRIC CO., LTD.

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・FURUNO Authorized Distributor/Dealer

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0 0 0 1 9 5 8 6 7 1 4

IMPORTANT NOTICES

General
- This manual has been authored with simplified grammar, to meet the needs of international users.
- The operator of this equipment must read and follow the instructions in this manual.
  Wrong operation or maintenance can void the warranty or cause injury.
- Do not copy any part of this manual without written permission from FURUNO.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and the equipment specifications can change without notice.
- The example screens (or illustrations) shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by FURUNO will void the warranty.
- The following concern acts as our importer in Europe, as defined in DECISION No 768/2008/EC.
  - Name: FURUNO EUROPE B.V.
  - Address: Ridderhaven 19B, 2984 BT Ridderkerk, The Netherlands
- The following concern acts as our importer in UK, as defined in SI 2016/1025 as amended SI 2019/470.
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  - Address: West Building Penner Road Havant Hampshire PO9 1QY, U.K.
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How to discard this product
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (http://www.eiae.org/) for the correct method of disposal.

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

In the European Union
The crossed-out trash can symbol indicates that all types of batteries must not be discarded in standard trash, or at a trash site. Take the used batteries to a battery collection site according to your national legislation and the Batteries Directive 2006/66/EU.
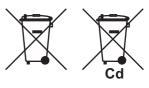
Cd
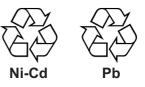
In the USA
The Mobius loop symbol (three chasing arrows) indicates that Ni-Cd and lead-acid rechargeable batteries must be recycled. Take the used batteries to a battery collection site according to local laws.

**Ni-Cd**   **Pb**

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.
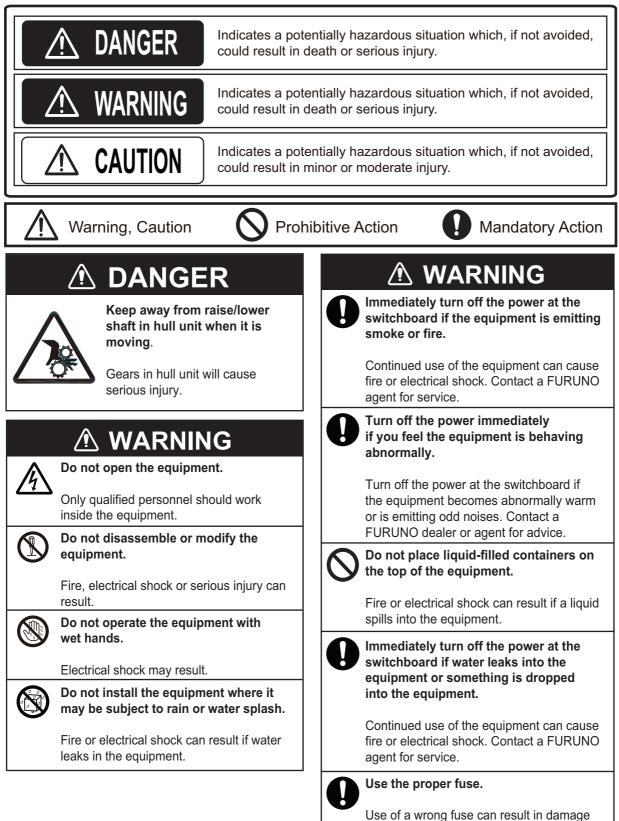
⚠ SAFETY INSTRUCTIONS

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

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

⚠ Warning, Caution	🚫 Prohibitive Action	❗ Mandatory Action

⚠ DANGER

Keep away from raise/lower shaft in hull unit when it is moving.

Gears in hull unit will cause serious injury.

⚠ WARNING

Do not open the equipment.

Only qualified personnel should work inside the equipment.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Do not operate the equipment with wet hands.

Electrical shock may result.

Do not install the equipment where it may be subject to rain or water splash.

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

⚠ WARNING

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.

Turn off the power immediately if you feel the equipment is behaving abnormally.

Turn off the power at the switchboard if the equipment becomes abnormally warm or is emitting odd noises. Contact a FURUNO dealer or agent for advice.

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

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

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

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

Use the proper fuse.

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

⚠ WARNING

Before raising or lowering the transducer manually, make sure the motor brake and drive shaft brake are engaged.

Handle the transducer carefully.
Do not swing the transducer or strike it against an object, to prevent damage to the transducer.

Do not transmit the transducer when it is out of water (for example, when dry-docked), to prevent damage to the transducer.

Do not remove the brake on the hull unit, to keep the shaft from falling.

When checking the brake on the hull unit, always take measures against static electricity.
Static electricity can cause the unit to move unexpectedly, which can result in personal injury to damage to the unit.

⚠ CAUTION

Maximum speed while the transducer is projected or being raised or lowered is as below, to prevent damage to the transducer.

Extended	Raising or lowering
18 kn	15 kn

Replace anti-corrosion zinc plates yearly.
Corrosion between the main shaft and transducer may result if not replaced, allowing water leakage and/or loss of transducer.

The LCD is made of glass. Do not apply force or shock to the LCD.

Broken LCD glass can cause injury.

WARNING LABELS
Warning labels are attached to the units of the system. Do not remove the labels.
If a label is missing or damaged, contact a FURUNO agent or dealer about replacement.

⚠ DANGER
Electrical shock hazard.
Do not remove cover.
No user-serviceable parts inside.
Turn off power before servicing.
And wait until charge lamp (green) goes off and then remove cover.

⚠ 危 険
感電の恐れあり。
サービスマン以外の方は、カバーを開けないでください。内部には高圧部品が数多くあり、万一さわると危険です。
サービスマンがカバーを開ける場合は、電源をOFFした後、CHARGEランプ（緑）が消灯していることを確認してから開けてください。

Name: Warning Label
Type: 10-079-6144
Code No.: 100-310-880-10

⚠ DANGER
Electrical shock hazard.
Do not remove cover.
No user-serviceable parts inside.
Turn off power before servicing.

⚠ 危 険
感電の恐れあり。
サービスマン以外の方はカバーを開けないで下さい。内部には高圧部分が数多くあり、万一さわると危険です。
サービスマンがサービスを行う前には、必ず電源をOFFにして下さい。

Name: Danger Label
Type: 10-089-7544-0
Code No.: 100-394-370-10

⚠ WARNING | ⚠ 警 告
Possibility of shaft coming down
To prevent the main shaft from coming down, do not remove the brake.
主軸降下の恐れあり
主軸が降下するため、ブレーキは取り外さないでください。

Name: Warning Label
Type: 10-089-5548-1
Code No.: 100-386-951-10

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

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

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

⚠ WARNING
Moving main shaft can pinch and cut.
Keep hands dear while operating.
Lockout power before servicing.

⚠ 警 告
上下動シャフト部分は手をはさむ恐れあり。
稼動中は手を近づけないこと。
サービスを行う前は電源を切ること。

Name: Finger Warning Label
Type: 06-021-4015
Code No.: 100-281-590-10

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EMERGENCY STOP BUTTON ON HULL UNIT

The **EMERGENCY STOP** button on the hull unit stops the raising or lowering of the transducer in case of an emergency. The transducer stops moving when the button is operated, a warning message appears and the transducer cannot be raised or lowered. The transducer is also stopped when the ratchet wrench in the hull unit, which is used to manually raise the transducer, is removed from its holder.

EMERGENCY STOP button
(default position)

To release the emergency stop condition, first confirm that no one is near the hull unit. Then do the following:

• To release the **EMERGENCY STOP** button, turn the button in the direction of the arrow on the button.
• Return the ratchet wrench to its holder.

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FOREWORD

A Word to the Owner of the FSV-75

Congratulations on your choice of the FURUNO FSV-75 Color Scanning Sonar. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

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

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

Thank you for considering and purchasing FURUNO equipment.

Features

- Increased detection range and the ability to scan a full half-circle in one sweep.
- Function keys for easy access to regularly used functions from the control panel.
- 32-color display to help you determine density and variation in fish schools.
- Auto-target-lock function to keep your targeted school in sight.
- Store up to 10 sets of settings to quickly change your setup for varying tasks.
- Save and replay echo images.
- Multiple marks and indications to help you identify fish finder data and voyage data at a glance.
- Robust diagnostics.
- 3D functions to estimate intuitively the positional relationship among own vessel and sonar echoes (bottom, school of fish, etc.).
  To unlock the 3D functions a software license key is required.

Interference suppression

When another ship asks you to suppress interference, the following measures can be taken. These measures should be performed based on the equipment priority listed below.

1) Broadband fish finder or sonar.
2) Multiple frequency fish finder or sonar.
3) Single frequency fish finder or sonar. (This equipment)

The FSV-75 is a single frequency sonar, therefore it has the lowest priority.

- Change the TX (transmission) frequency (see section 2.10.4).
- Lower the TX power (see section 2.9).
- Change the TX interval (see section 2.10.2).

Standards used in this manual

- Keys and controls on the control units are written in bold text; for example, the **MENU** key.

- Menu items, pop-up dialog box names and on-screen indications are enclosed with brackets; for example, [2 TD Position Mark].

- The following terms are used in this manual for brevity.

Term	Meaning
Select	Using the trackball on the control unit, move the cursor onto the item to be "selected".
Open the menu.	Press the **MENU/ESC** key.
Close the menu.	Press and hold the **MENU/ESC** key until the menu closes.

CE declaration

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

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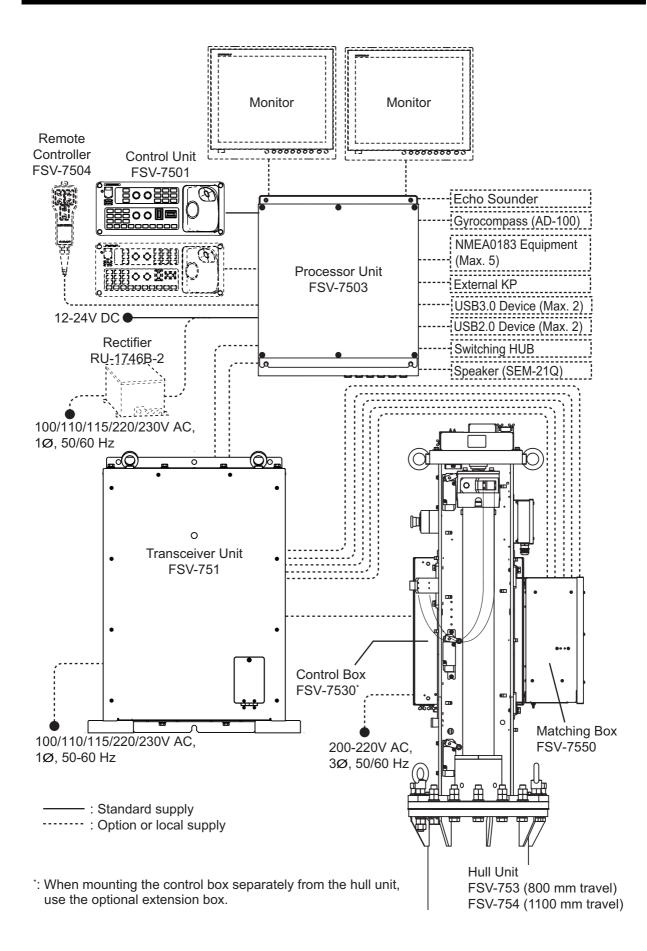
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SYSTEM CONFIGURATION

Monitor

Monitor

Remote
Controller
FSV-7504

Control Unit
FSV-7501

Echo Sounder

Gyrocompass (AD-100)

NMEA0183 Equipment
(Max. 5)

External KP

Processor Unit
FSV-7503

USB3.0 Device (Max. 2)

USB2.0 Device (Max. 2)

12-24V DC

Switching HUB

Speaker (SEM-21Q)

Rectifier
RU-1746B-2

100/110/115/220/230V AC,
1Ø, 50/60 Hz

Transceiver Unit
FSV-751

Control Box
FSV-7530*

Matching Box
FSV-7550

100/110/115/220/230V AC,
1Ø, 50-60 Hz

200-220V AC,
3Ø, 50/60 Hz

———— : Standard supply

- - - - - - : Option or local supply

Hull Unit
FSV-753 (800 mm travel)
FSV-754 (1100 mm travel)

*: When mounting the control box separately from the hull unit,
use the optional extension box.

Compatible equipment

This system is compatible with the following FURUNO equipment:

Name	Type/Model	Remarks
Display Unit	MU-190	Brilliance control is available with direct USB connection to the FSV-7503. The USB cable for brilliance control should be connected directly to the FSV-7503. Do not use a USB hub.
	MU-190HD	
Color Sounder (Fish Finder)	FCV-1200L[1]	
	FCV-1200LM	
	FCV-1500L[1]	-
Fish Finder	FCV-1900[2]	
Hi-Res Fish Finder	FCV-1900B[2]	
Fish Size Indicator	FCV-1900G[2]	
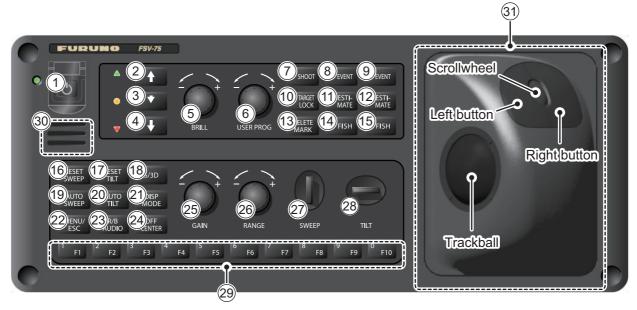
[1]: Requires EXIF assembly connection (available as an optional extra) at the fish finder.

[2]: Connect via the FCV-1903. If a telesounder is already connected to the FCV-1900/B/G, connection between the FSV-75 and the FCV-1900/B/G is not available.

1. OPERATIONAL OVERVIEW

1.1 Controls Overview

1.1.1 Control Unit

No.	Key/Control	Description
①	⏻	Press to turn the power on or off.
②	⬆	**If the mid protrusion key is programmed to [Fixed Position]:** Raises the transducer fully. **If the mid protrusion key is programmed to [Any Position]:** The transducer stops at desired position.
③	⬇	**If the mid protrusion key is programmed to [Fixed Position]:** Lowers the transducer to half protrusion. **If the mid protrusion key is programmed to [Any Position]:** The transducer stops at desired position.
④	⬇	**If the mid protrusion key is programmed to [Fixed Position]:** Raises the transducer. **If the mid protrusion key is programmed to [Any Position]:** The transducer stops at desired position.

No.	Key/Control	Description
⑤	BRILL	Adjusts the screen brilliance. **Note:** Monitor must be a compatible monitor (see page xvi) and must be connected via USB to the Control Unit.
⑥	USER PROG	Selects user-programmed (P1 to P10) settings.
⑦	SHOOT	Enters the net shooting mark or own ship mark.
⑧	EVENT	Enters an event mark or own ship mark (horizontal mode).
⑨	EVENT	
⑩	TARGET LOCK	Enters a target lock mark.
⑪	ESTI-MATE	Shows/hides the estimate mark.
⑫	ESTI-MATE	
⑬	DELETE MARK	**Short press:** Deletes the mark highlight with the cursor. **Long press:** Deletes both event marks and fish marks, when the cursor is on the slant or vertical slant display. If the cursor is on a different display, event and fish marks are not deleted.
⑭	FISH	Enters a fish mark.
⑮	FISH	
⑯	RESET SWEEP	Resets the sweep angle to 0°.
⑰	RESET TILT	Resets the tilt angle to 0°.
⑱	S/3D	Select the display (slant display or 3D display) to be controlled. The current operative display is highlighted with an orange frame.
⑲	AUTO SWEEP	Turns the Auto Sweep function on/off.
⑳	AUTO TILT	Turns the Auto Tilt function on/off.
㉑	DISP MODE	If [1 Mode Selection] (**section 9.3.3) is set to [Mode Key]**: Selects the display mode. **If [1 Mode Selection] is set to [Pull Down Menu]**: Opens the pull-down menu to select the display mode. Left-click an appropriate display mode from the pull-down menu.
㉒	MENU / ESC	**Short press:** Opens the menu; goes back one layer in the menu. **Long press:** Closes the menu.

No.	Key/Control	Description
㉓	R/B AUDIO	• Shows the range/bearing audio marker. • Opens the audio settings.
㉔	OFF CENTER	Off centers (moves) the own ship symbol to the cursor location.
㉕	GAIN	Adjusts the gain (sensitivity).
㉖	RANGE	Changes the display range.
㉗	SWEEP	Sets the sweep angle (based on bow direction).
㉘	TILT	Sets the tilt angle (based on sea surface).
㉙	1 F1 to 0 F10	• Perform assigned program/function. • Select the corresponding menu item (by number).
㉚	Speaker	Outputs audio for key operation, alerts and raise/lower completion.
㉛	Trackball	Trackball • Moves the cursor. • Highlights a menu item. Right button (short press)*1 • Opens the right-click pop-up menu. • Cancels the selected operation. • Goes back one layer in the menu. • Inserts an event mark (factory default settings)*3. Right button (long press) • Return the own ship mark to the center of the screen. Scrollwheel • **Spin:** Changes the value for settings. • **Spin:** Selects a menu item. • **Spin:** Adjusts tilt, range, gain and sweep. • **Spin:** Changes the selected User Program. • **Short press:** Confirms the selection; shows the circle cursor; changes the color reference (echo strength-based or depth-based) for the 3D display. • **Long press:** Opens the [Select Mark] window. Left button (short press)*1 • Confirms your selection. • Used with drag & drop feature*2. • Inserts a fish mark (factory default settings)*3. Left button (long press) • Moves the cursor to the own ship location.

*1. This manual abbreviates the operation of the **left/right buttons** as follows:
   "Press the **left button**" → "Left-click"; "Press the **right button**" → "Right-click".

*2. The operation of holding down the **left button** while moving the trackball is referred to as "drag & drop" in this manual

*3. The following marks can be assigned to the **left/right buttons** as a shortcut. To change the default settings and assign a mark to either button, see Mouse Button Setup in section 9.3.3.

   • Event marks   • Fish marks   • Estimate marks

1.1.2   Remote controller (Option)

The optional remote controller can be used for the following operations (default settings shown) when you are away from the control unit.

Note 1: Do not leave the remote controller in an area subject to water splash and spray. When the remote controller is not in use, return it to its designated hanging location.

Note 2: Each key on the remote controller can be re-assigned with a different function (see section 7.4).

No.	Function (default)	
①	Same function as the **SWEEP** control on the control unit.	
②	Same function as the **TILT** control on the control unit.	
③	Same function as the **RANGE** knob on the control unit.	

1.2   Breaker On/Off

The hull unit has a breaker. Turn the unit on from the switchboard or breaker.
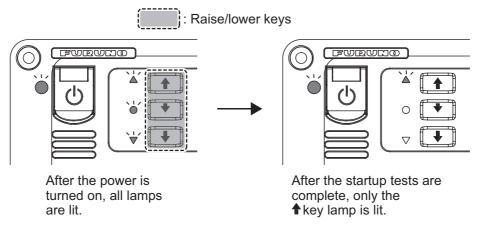
Note: If the breaker on the hull unit is turned on after the raise/lower keys (⬇ , ⬇ or ⬆) on the control unit are pressed, beware of the moving hull unit.

1.3   Turning the Power On/Off

Turning the power on

Press the power switch (⏻). The lamp to the left of the power switch lights up. A beep sounds, and the display changes in the following sequence: FURUNO display → model display → operation test display (see section 10.10.2). Then the lamp beside the switch changes as below. The last-used mode is activated in approximately 140 seconds after turning the power on.

Note: The transducer is not automatically retracted at start up. After applying the power, confirm that the transducer is retracted. If the transducer is retracted, the lamp to the left of the ⬆ key is on steadily. If the power goes off by power failure, etc., use the ⬆ key to retract the transducer and then operate the system.

After the power is turned on, all lamps are lit.

After the startup tests are complete, only the ⬆ key lamp is lit.

Turning the power off

1. First retract the transducer with the ⬆ key. The lamp to the left of the ⬆ key flashes while the transducer is being raised and lights steadily when it is fully raised.
   Note: While raising the transducer, the ship speed must be not exceed 15 knots, to prevent damage to the transducer and hull unit.

2. After the ⬆ key lights steadily, press the power switch (⏻). until the screen goes blank.

If the power switch (⏻). is pressed before retracting the transducer, the message "Raising ⬆" appears and the transducer is retracted. However, for safety purposes, make it a practice to retract the transducer before turning off the power.

1.4   Raising/Lowering the Transducer

⚠ **CAUTION**	⚠ **CAUTION**
Maximum speed while the transducer is projected and being raised or lowered is as below, to prevent damage to the transducer.	**The transducer is stopped whenever the emergency stop button on the hull is operated or the ratchet (for manual raising) is removed from its holder in the hull unit.**

Transducer stopped	Raising / Lowering
18 knots	15 knots

A message appears and the transducer cannot be raised or lowered. Re-set the emergency stop button or return the ratchet to its holder to release the emergency stop condition.

1.4.1   Lowering the transducer

With the boat at the fishing ground and the power on, press the ⬇ key to lower the transducer. The lamp to the left of the key flashes during lowering and the message "Lowering ⬇" appears at the bottom of the screen. When the transducer reaches the water, the message "TX Start" appears and transmission begins automatically. After the transducer is fully lowered the lamp the left of the key lights steadily. You can see the position of the transducer by watching the transducer mark at the top left corner on the screen. See section 1.4.3.

In normal use, fully lower the transducer. The time required to fully lower the transducer is indicated in the following table.

Stroke	Time (seconds)
800 mm	8
1100 mm	11

If the transducer becomes entangled in the net for some reason, partially raise the transducer with the ⬇ key. The function of the ⬇ key depends the menu setting (main menu → [9 Installation] → [4 Hull Unit Setting] → [2 Mid Key Setting].

[Fixed Position]: The transducer stops at the selected position. If the ⬇ key is operated while the transducer is being raised or lowered, the transducer stops at the fixed position. The fixed position can be set by clicking the transducer position marker. See the next page.
[Any Position]: The transducer starts lowering when the ⬇ key is operated. The lowering is stopped when the ⬇ key is operated. To raise or lower the transducer from the current position, use the ⬆ or ⬇ key. The ⬇ key does not control lowering or raising of the transducer.

You can see the approximate position of the transducer with the transducer position marker (see section 1.4.3). When the transducer is stopped before it reaches full protrusion, the lamp to the left of the ⬇ key lights steadily.
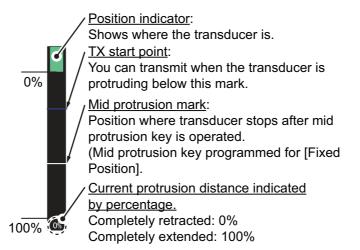
1.4.2 Raising the transducer

Press the ⬆ key to raise the transducer. The lamp to the left of the switch flashes and the message "Raising ⬆" flashes on the screen while the transducer is being raised. When retraction begins, the transmission is stopped and the message "TX STOPPED" appears on the screen. When the transducer is completely retracted, the message "RETRACTED" appears and the lamp to the left of the ⬆ key lights steadily.

Note: If the transducer is not raised within approx. 16 seconds (800 stroke) or 22 seconds (1100 mm stroke) the message "TRANSDUCER NOT RETRACTED" appears. If this occurs, see "How to raise the transducer manually" on page 10-22 for how to retract the transducer manually.

1.4.3 How to check transducer protrusion

The [Transducer Position Mark], which appears at the top left corner, lets you check how far the transducer is protruding. You can show or hide the marker by doing the following operation: Main menu → [0 Mark & Operation Support Tool] → [2 Mark Display] → [0 Next] → [2 TD Position Mark].

Position indicator:
Shows where the transducer is.

TX start point:
You can transmit when the transducer is protruding below this mark.

Mid protrusion mark:
Position where transducer stops after mid protrusion key is operated.
(Mid protrusion key programmed for [Fixed Position].

Current protrusion distance indicated by percentage.
Completely retracted: 0%
Completely extended: 100%

The color of the indicator changes according to transducer position and operation state.

- Green: The transducer is fully retracted.
- Brown-yellow: Transducer stopped at position other than "retracted".
- Red: The transducer is being raised or lowered.

Note: If the transducer position cannot be detected the transducer mark flashes. Further, the bar is not displayed, and the amount of protrusion is indicated as "**%".

How to set the mid protrusion mark

When [2 Middle Key Setting] (located in the [9 Installation Setting]
→ [4 Hull Unit Setting] menu) is set to [Fixed Position], you can
change the middle point for transducer projection.

1. Use the trackball to place the cursor on the Transducer Posi-
    tion Mark.

2. Left-click to show the settings pop-up window.

3. Left-click the ▲ or ▼ button to change the setting.
    The indication on the [Transducer Position Mark] also moves
    as you change the setting.

4. Left-click [Quit] to complete the setup and close the pop-up.

1.5 Screen Brilliance and Panel Dimmer

1.5.1 How to adjust the screen brilliance
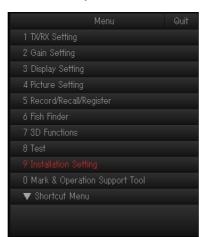
If your monitor is one of those listed as compatible on page xvi and the monitor is con-
nected to the control unit via USB, you can adjust the screen brilliance from the control
unit. Turn the **BRILL** knob clockwise to increase, or counter-clockwise to decrease,
the brilliance.

Note: If your monitor is not listed on page xvi, brilliance cannot be adjusted from the
control unit. Adjust the brilliance at the monitor.

1.5.2 How to adjust the panel dimmer

You can change the brightness of the panel and keys with the following procedure.

1. Press the **MENU/ESC** key to open the menu.
    This step is abbreviated to "Open the menu" in this manual.

Note: You can also open the menu from the right-click pop-up menu. See "Oper-
ation from the right-click pop-up menu" on page 1-16.

2. Select [9 Installation Setting], then left-click. A confirmation message appears.

> **Confirm**
> This menu is for installation settings regarding display, operation and initial settings. Do you want to adjust or change these settings?
>
> OK

3. Select [OK], then left-click. The [Installation Setting] menu appears.

> Menu   Quit
> < Installation Setting
> 1 Display Setting
> 2 Operation Setting
> 3 Motion Sensor
> 4 Hull Unit Setting
> 5 Interface Setting
> 6 External Data
> 7 Own Ship Data
> 8 Initialization

4. Select [2 Operation Setting], then left-click.

> Menu   Quit
> < Installation Setting
> << Operation Setting
> 1 Mode Selection   : Mode Key
> 2 Mouse Wheel Settings
> 3 Mouse Settings
> 4 Gain Control Steps   : 0.1
> 5 Event Key   : Event
> 6 Sweep/Tilt Settings
> F10 7 Dimmer   : 7
> 8 Key Beep Volume   : 5
> 9 Trackball Speed   : Normal
> 0 Next
> Open the next menu layer.

5. Select [7 Dimmer], then left-click.

> Quit
> Cancel
> ▲
> 7
> ▼
> (0～15)

6. Left-click the ▲ or ▼ button to change the setting.

7. Left-click [Quit] to complete the setup and close the pop-up.

8. Press and hold the **MENU/ESC** key until the menu closes.
   The process of closing the menu is abbreviated to "Close the menu." in the rest of this manual.

1.6 Display Modes
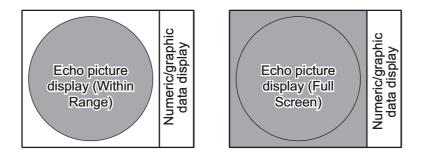
There are seven display modes; Slant (S), Vertical Slant (VCS), Slant + Fish Finder (S & FF)[*1], Vertical Slant + Fish Finder (VCS & FF)[*1], 3D[*2], 3D + Slant (3D & S)[*2], 3D + Fish Finder (3D & FF)[*1, *2, *3].

[*1]: Requires connection of a fish finder.

[*2]: To unlock the 3D functions a software license key is required.

[*3]: [5 Monitor Setting] on the [Display Setting] menu (see page 9-12) must be set to [Dual Display].

In the default setting, the slant (S) and vertical slant (VCS) modes are active. To use other display modes, register the display mode to use from the menu. For how to register display modes, see section 1.6.2.

Display format

The on-screen display area is comprised of a data display area and an echo display area. You can select one of two display formats, as indicated below. One shows the echoes with the outermost range ring as the boundary, the other shows echoes in a full-screen display. The full-screen format allows you to view echoes which would otherwise require a change in range. For more information about the data display area, see chapter 6.

1.6.1 How to select a display mode

To select a display mode, do the following procedure:

• If [1 Mode Selection] (see **section 9.3.3) is set to [Mode Key]**:
Press the **DISP MODE** key several times until the desired display appears.

• **If [1 Mode Selection] is set to [Pull Down Menu]**:
Press the **DISP MODE** key to open the pull-down menu. Left-click an appropriate display mode from the pull-down menu.

You can select the display modes that are registered to [1 Register Display Mode]. The default display modes are slant and vertical slant. For how to register display modes, see section 1.6.2.

1.6.2 How to register a display mode

To register a display mode, do the following procedure. The display modes that are registered here can be selected with the **DISP MODE** key.

1. Press the **MENU/ESC** key to open the main menu.

2. Select [5 Record/Recall/Register], then left-click. You can also open the [Record/Recall/Register] menu from the right-click pop-up menu. See "Operation from the right-click pop-up menu" on page 1-16.

3. Select [7 Register], then left-click.

4. Left-click [1 Register Display Mode].

Mode programmed to **DISP MODE** key has a check mark.
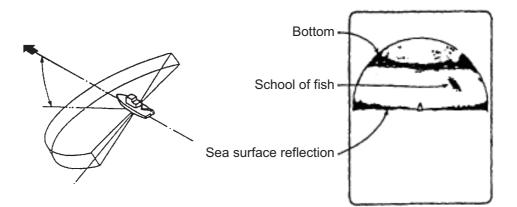
5. Select desired modes (you may select as many modes as you wish), then left-click [Quit].

6. Close the menu.

1.6.3   Display overview
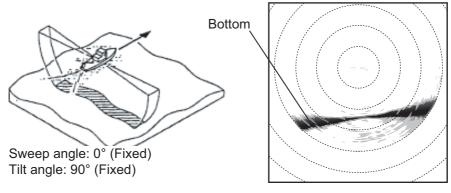
Slant display overview

The slant display shows a 180-degree cross section, using chosen tilt angle and train setting. For further details, see chapter 2.

Bottom

School of fish

Sea surface reflection

Vertical slant display overview
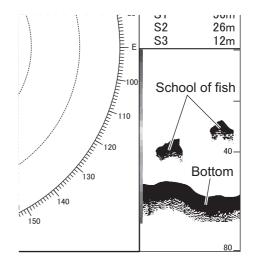
The vertical slant display shows a cross section right under the ship. The sweep angle is fixed to 0°, and the tilt angle is fixed to 90°. The echoes are vertically inverted on the slant display. For further details, see chapter 3.

Sweep angle: 0° (Fixed)
Tilt angle: 90° (Fixed)

Bottom

Fish finder display overview
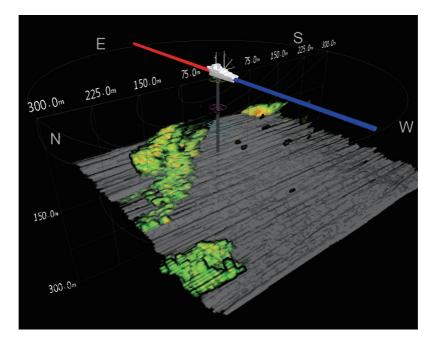
The FSV-75 can show the picture from the fish finder in combination with the sonar echoes. For further details, see chapter 4.

Note: Requires connection of a fish finder.

School of fish

Bottom

3D display overview
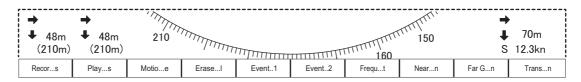
The 3D display can shows the sonar echoes in 3-dimensions. You can estimate intuitively the positional relationship among own vessel and sonar echoes (bottom, school of fish, etc). For further details, see chapter 5.

Note: To unlock the 3D functions a software license key is required.

1.7   Software Function Keys

The software function keys provide shortcuts to frequently used functions. You can see the current setting for each software function key. With all menus closed, place the cursor at the bottom of the screen for approx. two seconds to show the settings.

Shortcuts are display in numerical order. **1/F1** key's function appears at the left end and **0/F10** key's function appears at the right end.

Left click a function to get the corresponding action. See section 7.2.2 for how to change the function assigned to each key.
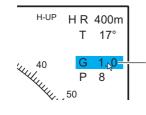
1.8 How to Adjust the Gain

The **GAIN** knob adjusts receiver gain (sensitivity). Adjust it so fish echoes are clearly displayed with minimal noise on the screen. Too high a gain setting not only displays excess noise and makes it difficult to discriminate wanted echoes but also causes bottom echoes to be painted in strong colors, resulting in echoes being masked by bottom reflections. Normally, set the control somewhere between positions 3 and 7.

Turn the **GAIN** knob to adjust the setting. Turn the control clockwise to increase the gain, counterclockwise to decrease the gain.

New gain setting is momentarily displayed in large characters at the top of each display. The setting value is always displayed next to "G", at the top-right corner of the screen.
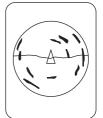
Note: The gain can also be adjusted from the gain indication. Select the gain indication to highlight it, then spin the scrollwheel.

Place the cursor on the gain setting, which is then highlighted. Spin the scrollwheel to change the setting.

Gain too low

Gain proper
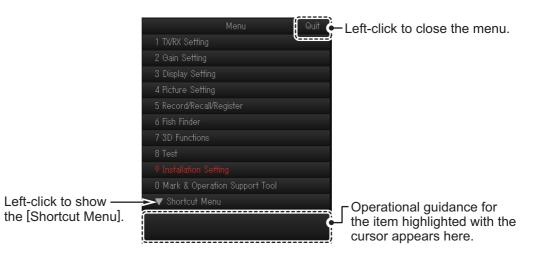
Gain too high

1.9 Menu Overview

Many operations can be carried out from the menu. This section provides information for basic menu operation.

1. Open the menu,
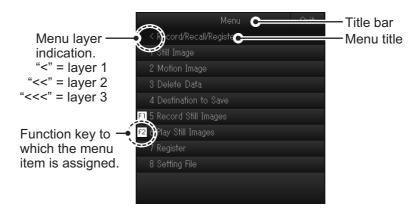
Left-click to show the [Shortcut Menu].

Left-click to close the menu.

Operational guidance for the item highlighted with the cursor appears here.

Note: You can also open the menu from the right-click pop-up menu. See "Operation from the right-click pop-up menu" on page 1-16.

2. Use the trackball to move the cursor ( ) over the menu item you want to view. The selected item is highlighted with a blue box.
   You can also spin the scrollwheel to select an item.
   The two methods of selection are abbreviated to "Select" in this manual.
   Note: You can select the menu item by pressing the corresponding numeric key (function key). For example, press the **0/F10** key to open the [Mark & Operation Support Tool] menu.

3. Press the **left button** (the process of pressing the **left button** is abbreviated to "left-click" in this manual). If you selected an item using the scrollwheel, push the scrollwheel. For example, if you selected [5 Record/Recall/Register], the following menu appears.

Menu layer indication.
"<" = layer 1
"<<" = layer 2
"<<<" = layer 3

Function key to which the menu item is assigned.

Title bar
Menu title

4. Select the item whose settings you want to change, then left-click. The settings window appears. The contents of each settings window depends on the item selected.

Selecting from a set range   Selecting from multiple options

5. Adjust the setting as required.

   • Set range: Left-click ▲ to move the selection cursor upwards, or left-click ▼ to move the cursor downwards. You can also spin the scrollwheel to select the desired setting.

   • Multiple options: Select the desired option, then left-click.

6. **To apply the change**, select [Quit] at the top of the settings window, then left-click.
   To cancel the change, select [Cancel] at the top of the settings window, then left-click.

7. Close the menu.

Note 1: You can move the menu window. Select the title bar, then drag and drop the window to the desired location. The menu is not move-able if a settings window is open.

Note 2: As a factory default, some menu items are displayed in red text. The contents of these menus are protected against unintentional or accidental change. When a locked menu is selected, a confirmation message appears. For example, the following confirmation message appears when you select [2 Assign User Program] (located at main menu → [5 Record/Recall/Register] → [7 Register]).

Select the appropriate option, then left-click. If you prefer not to receive confirmation messages, you can remove the lock for some of the locked menus. See section 9.3.9.

Note 3: If two menu items are functionally related, the setting of one menu item may cause restriction to another menu item. In this case, the equipment ignores both settings to use different ones or invalidates the setting of the item encountering restriction. The invalid setting value or menu item is shown in gray.
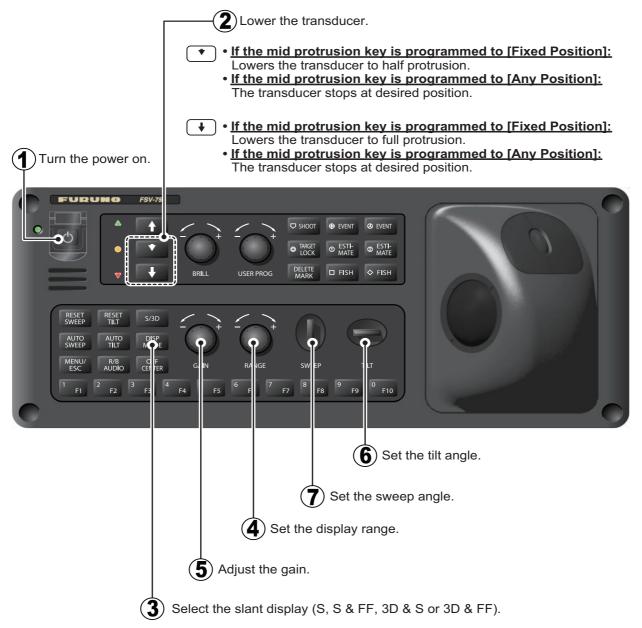
Operation from the right-click pop-up menu

Right-click the numeric/graphic data display to show the pop-up menu. These items can also be accessed from the main menu.
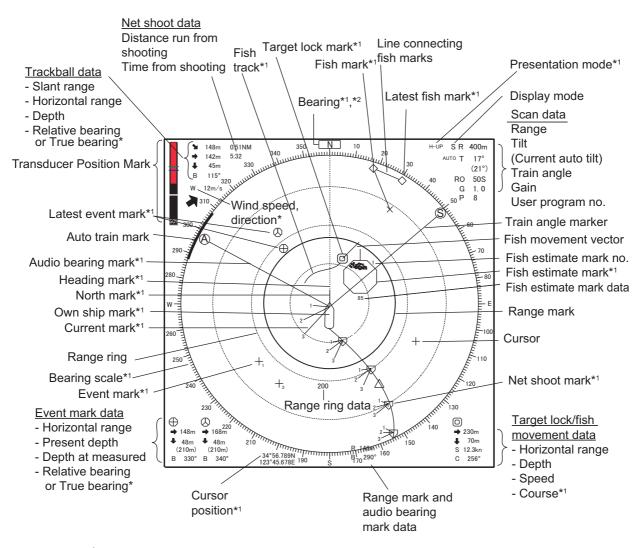
2. SLANT MODE

2.1 Basic Operating Procedure

(2) Lower the transducer.

[▼] • **If the mid protrusion key is programmed to [Fixed Position]:**
Lowers the transducer to half protrusion.
• **If the mid protrusion key is programmed to [Any Position]:**
The transducer stops at desired position.

[↓] • **If the mid protrusion key is programmed to [Fixed Position]:**
Lowers the transducer to full protrusion.
• **If the mid protrusion key is programmed to [Any Position]:**
The transducer stops at desired position.

(1) Turn the power on.

(6) Set the tilt angle.

(7) Set the sweep angle.

(4) Set the display range.

(5) Adjust the gain.

(3) Select the slant display (S, S & FF, 3D & S or 3D & FF).

Note: In the default setting, Slant (S) and Vertical Slant (VCS) modes are active. To use other display modes, register the display mode to use from the menu. For how to register display modes, see section 1.6.2.

2.2 Slant Display Overview

Net shoot data
Distance run from shooting
Time from shooting

Trackball data
- Slant range
- Horizontal range
- Depth
- Relative bearing
  or True bearing*

Transducer Position Mark

Fish track*¹

Target lock mark*¹

Fish mark*¹

Line connecting fish marks

Bearing*¹,*²

Latest fish mark*¹

Presentation mode*¹

Display mode

Scan data
Range
Tilt
(Current auto tilt)
Train angle
Gain
User program no.

Latest event mark*¹

Auto train mark

Audio bearing mark*¹

Heading mark*¹

North mark*¹

Own ship mark*¹

Current mark*¹

Range ring

Bearing scale*¹

Event mark*¹

Event mark data
- Horizontal range
- Present depth
- Depth at measured
- Relative bearing
  or True bearing*

Wind speed, direction*

Train angle marker

Fish movement vector

Fish estimate mark no.

Fish estimate mark*¹

Fish estimate mark data

Range mark

Cursor

Net shoot mark*¹

Target lock/fish movement data
- Horizontal range
- Depth
- Speed
- Course*¹

Cursor position*¹

Range mark and audio bearing mark data

Range ring data

Display values: 148m 0.51NM / 142m 5:32 / 45m / B 115° / W 12m/s

H-UP S R 400m / AUTO T 17° / (21°) / RO 50S / G 1.0 / P 8

34°56.789N 123°45.678E

148m / 48m (210m) / B 330°   168m / 48m (210m) / B 340°   230m / 70m / S 12.3kn / C 256°

*¹: This function/indication requires appropriate data input; see "DATA INPUT REQUIREMENTS" on page AP-12.

*²: Shown only with head-up mode.

Note: You can change the color of Event Marks, Fish Marks and Estimate Marks with [1 Mark Color] (located at [0 Mark & Operation Support] → [2 Mark Color & Size]).

2.3   Display Range

The **RANGE** knob selects the detection range and nine ranges are preset at the factory.

The following table shows the default settings for the display range (unit: m).

Surface

Range displayed on display

Bottom

Range No.	1	2	3	4	5	6	7	8	9
Detection range (m)	100	150	200	250	300	350	400	500	600

Note: Ranges can be preset at [5 Scan Range] (located at [5 Record/Recall/Register] → [7 Register]). See section 9.1.2.

Turn the **RANGE** knob to select a range. Turn clockwise to increase the range, counter-clockwise to decrease the range.

The range selected is momentarily displayed in large characters at the top of the screen. Range is always displayed next to "R" at the top right-hand corner of the screen.

Note 1: The range can also be adjusted from the range indication. Put the cursor on the range indication to highlight it in yellow then spin the scrollwheel.

Place the cursor on the range setting, which is then highlighted. Spin the scrollwheel to change the setting.

Note 2: In the target lock function, the range is automatically changed according to target position if [Tilt Interlock] ([Target Lock] menu) is selected to [Tilt & Range].
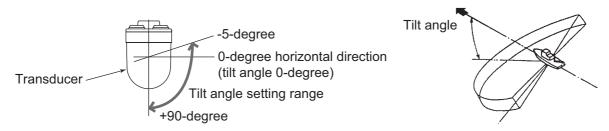
2.4   Tilt Angle
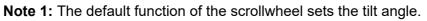
The tilt angle shows the direction to which the sound wave is emitted. When the sound wave is emitted horizontally, the tilt angle is said to be 0° and when vertically, 90°. The tilt angle can be set between -5° (upward) to 90° (downward), in increments of 1°.

2.4.1   How to set the tilt angle
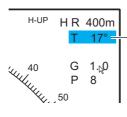
To manually set a tilt angle, operate the **TILT** control. The current tilt angle is momentarily displayed in large characters at the top of the screen. The tilt angle is always displayed next to "T" at the top right hand corner of the screen.

Select the tilt angle depending on target fish. For surface fish select a shallow angle (about 5°) and for bottom fish, a deep angle.

Note 1: The default function of the scrollwheel sets the tilt angle.

Note 2: The tilt angle can also be adjusted from the tilt angle indication. Put the cursor on the tilt angle indication to highlight it in blue then spin the scrollwheel.

Place the cursor on the tilt setting, which is then highlighted. Spin the scrollwheel to change the setting.

2.4.2 Automatic tilt
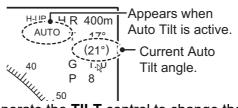
The **AUTO TILT** key automatically scans the tilt angle within the selected width. This is useful when you want to find the center depth of a school of fish. You can set the range for automatic tilt at [1 Auto Tilt Range] (located at [9 Installation Setting] → [2 Operation Setting] → [6 Sweep/Tilt Settings]). See section 9.3.3.

Note: Auto tilt is not available when the transducer is retracted, or when Target Lock is active.

1. Press the **AUTO TILT** key to turn the function on. Press the **AUTO TILT** key again to toggle between on and off. Each time the function is turned on or off, an indication appears momentarily on the screen.
   The auto tilt function adjusts the angle evenly to either side of the starting point. However, when the range is set to [±2~±10°], [±4~±16°] or [±6~±20°], the movement range of the auto tilt changes according to the range selected. See the table below for reference.
   Further, when auto tilt is active, the indication AUTO appears at the top right-hand corner of the screen, next to the tilt angle. The current auto tilt angle also appears (in parentheses) below the tilt indication.
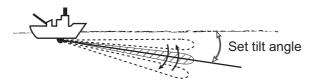
2. If necessary operate the **TILT** control to change the center of the tilt range.

3. To disable auto tilt, press the **AUTO TILT** key again.

Automatic tilt angles with __AUTO TILT__ key

Range (m)	Setting at [1 Auto Tilt Range]		
	[±2~±10°]	[±4~±16°]	[±6~±20°]
50 to 400	±10°	±16°	±20°
450 to 700	±8°	±16°	±20°
800	±6°	±12°	±16°
1000	±4°	±8°	±12°
1200 or more	±2°	±4°	±6°

For example, when the **RANGE**, **TILT** and [1 Auto Tilt Range] key are set to 800 m, 30° and [±4~±16°] respectively, the tilt angle changes at each transmission as follows: 30°→42°→30°→18°→30° (Based on the above table, 800m range has a 12° auto tilt range. Therefore, the tilt angle of 30° is the start point and that auto tilt moves ±12° to either side of the start point).

Note 1: The **AUTO TILT** key is inoperative when the target lock function is active or is made active. Auto tilt is resumed once target lock is disabled.

Note 2: If the **RESET TILT** key is pressed while auto tilt is active, the center (tilt angle) is moved to 0°.

2-5
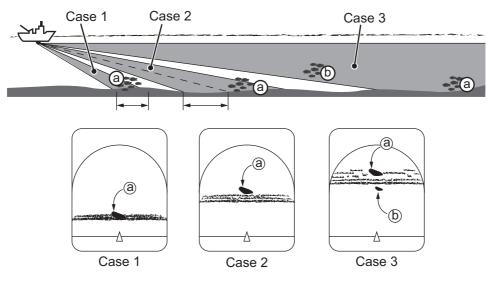
2.4.3   Relation between bottom echo and tilt angle

The figure below illustrates how two schools of fish "a" and "b" are displayed on the screen using three different tilt angles.

Case 1: Tilt angle 30° to 40°: This tilt angle will display the entire bottom since it is captured by the full width of the beam. The school of fish is obscured by the bottom.

Case 2: Tilt angle 10° to 20°: This tilt angle will only display half the bottom since it is captured by only the lower half of the beam. The school of fish is located above the bottom.

Case 3: Tilt angle 0° to 5°: This tilt angle may or may not capture the bottom since the returning bottom echo is weak. The school of fish is located close to the bottom.
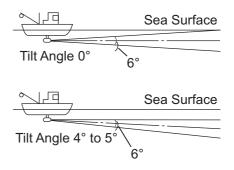
Points to consider

* Normally, a vertically distributed school of fish is a better sonar target than the bottom, because it reflects the transmitted pulse back toward the transducer.
* In case 3, both schools of fish "a" and "b" are presented. Generally speaking, however, midwater schools of fish tend to be larger than schools of fish on the bottom and they are often displayed near the bottom on the display.
* It is difficult to detect bottom fish when they are not distributed vertically.

2.4.4 Tilt angle for surface fish

Sound emitted from the sonar transducer forms an oval-shaped beam with a width of approximately 10° for 80kHz and 13° for 70kHz in the vertical direction (vertical beam width at -6dB). The tilt angle indicates the angle between the centerline of the beam and the horizontal plane. Then, if the tilt angle is set to 0°, the centerline is parallel with the sea surface and one half of the emitted sound goes upward, toward the sea surface.
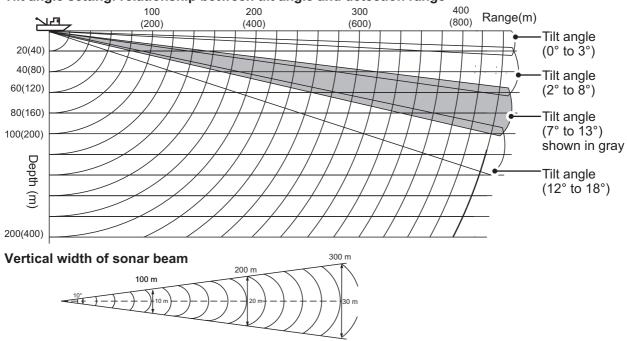
This causes one half of the emitted sound to be reflected toward the transducer and displayed on the screen as sea surface reflections. When the sea is calm, since the sound is reflected just like a light hitting a mirror at a low incident angle, it propagates away and the sea surface reflections become 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 for schools of fish on the surface effectively, the tilt angle is usually set between 4° and 5° so the upper portion of the beam becomes almost parallel with the sea surface. When the sea is rough, the tilt angle is slightly increased to lessen the affect of sea surface reflections.

2.4.5 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.
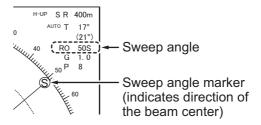
Tilt angle setting: relationship between tilt angle and detection range

Vertical width of sonar beam

2-7

2.5   Sweep Angle

The sweep angle is the center of the area (range) through which the sonar beam propagates sound waves. You can align the beam with the bow of your vessel when the sweep angle is set to 0°. Sweep angle can be adjusted either manually or automatically.

2.5.1   How to set the sweep angle

You can set a sweep angle manually by using the **SWEEP** control on the control unit. The available range is from -175° (portside) to +175° (starboard-side)*1, giving you a total of 350° of movement.

Sweep angle

Sweep angle marker (indicates direction of the beam center)

Push the **SWEEP** control to the right or left to change the angle. As the angle changes, the [RO] indication at the top-right of the screen also changes to show the current sweep angle. The sweep angle marker also moves according to the selected direction. When the **SWEEP** control is released, the selected angle appears on-screen in large text for five seconds.

The sweep angle is adjusted in 1° intervals (factory default*2). However, the **SWEEP** control is held for more than three seconds, the interval changes based on the setting selected at [4 Sweep Angle Interval] (located at main menu → [9 Installation Setting] → [2 Operation Setting] → [6 Sweep/Tilt Settings]).

[4 Sweep Angle Interval] setting	Actual interval when SWEEP control is held for more than three seconds
1°	3°
3°	5°
5°	7°
7°	10°
10°	10° (no change)

*1: The start and end angle of the available range is dependent on offsets set at installation. See the Installation Manual for details.

*2: You can change the interval at [4 Sweep Angle Interval] to suit your requirements. See section 9.3.3.

Note: The sweep angle can also be adjusted from the sweep angle indication. Put the cursor on the indication to highlight it in blue then spin the scrollwheel.

Place the cursor on the sweep indication. Spin the scrollwheel to change the setting after the setting is highlighted.

2.5.2 Auto sweep function
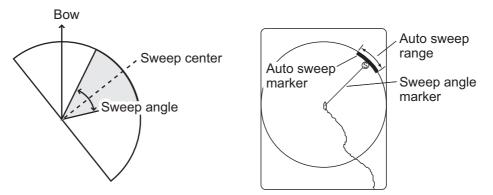
The auto sweep function provides automatic training of the sonar beam in left and right directions to enable search over a wide area. The auto sweep range (width) can be set from [2 Auto Sweep Range] (located at main menu → [9 Installation Setting] → [2 Operation Setting] → [6 Sweep/Tilt Settings]; see section 9.3.3).

Note: Auto sweep is not available when the transducer is retracted, or when Target Lock is active.

1. Press the **AUTO SWEEP** button while transmitting to toggle between activating/deactivating the function.
   Each time the function is activated or deactivated, an indication appears at the bottom of the screen for five seconds.
   When activated, the auto sweep function scans the preset range and the screen shows the auto sweep marker, indicating the center of the sweep range. The marker also moves accordingly when the center of the range is changed.

2. Push the **SWEEP** control to move the center of the sweep area as required.

3. Press the **AUTO SWEEP** button again to deactivate the function.

Note 1: If target lock is activated while auto sweep is active, auto sweep is automatically deactivated. In this case, auto sweep is reactivated when target lock is deactivated, however the center is moved based on the target lock direction at deactivation.

Note 2: You can adjust the auto sweep speed from [3 Auto Sweep Speed] (located at main menu → [9 Installation Setting] → [2 Operation Setting] → [6 Sweep/Tilt Settings]). See section 9.3.3.

Note 3: If the **RESET SWEEP** button is pressed while the auto sweep function is active, the center of the sweep range is moved to 0°.
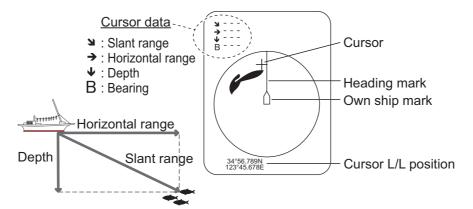
2.6 How to Measure Range and Bearing to a Target

You can measure the range and bearing to a school of fish, or other echo.
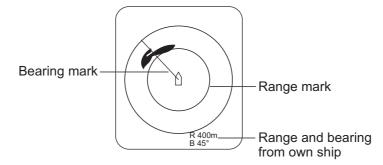
1. Operate the trackball to place the cursor on the target to which you want to measure the range and bearing. The range, bearing and depth to the target appear at the upper left corner of the screen.
   This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.
   Note: Cursor position may also be shown in latitude and longitude with [2 Cursor Position] (located at main menu → [0 Mark & Operation Support Tool] → [4 Mark & Data]). See section 9.2.5.

2. To measure the range and bearing to a different target, or mark the current target with its range and bearing, push the **R/B AUDIO** key. A range mark and bearing mark appear, intersecting the location selected at step 1. Further, the range and bearing to the target appear at the bottom of the screen.

Note 1: You can clear the range and bearing marks and the indications at the bottom of the screen. Place the cursor on, or near, the own ship symbol, then press the **R/B AUDIO** key.

Note 2: If [5 Audio] (located at main menu → [0 Mark & Operation Support Tool] → [9 Alarm & Audio]) is set to other than [OFF], the bearing mark is replaced with the audio bearing mark (see section 2.14.3).

Note 3: You can change how the data for cursor location and bearing marks are displayed with [4 Mark Display Style] (located at main menu → [0 Mark & Operation Support Tool] → [4 Mark & Data]). See section 9.2.5.

2.7 How to Eliminate Weak Echoes

Echoes from targets such as bottom and fish return to the transducer in order of distance to them, and when we compare their intensities at the transducer face, those from nearer targets are generally stronger due to little propagation attenuation and little absorption. If these echoes are displayed directly on the screen, the size of the displayed echo from the same school of fish may change with distance, making it difficult to judge the actual size of the school of fish. To overcome this inconvenience use the TVG curve function. TVG curve 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 the similar intensities irrespective of the ranges to them.

2.7.1 How to set the TVG curve

You can adjust the gain change for the TVG curve, do as follows.

1. Open the menu.

2. Select [2 Gain Setting], then left-click.

Menu	Quit
< Gain Setting	
1 TVG Curve	: 40Log
2 Near Gain	: 4.5
3 Near Gain Distance	: 400m
4 Far Gain	: 4.0
5 Far Gain Distance	: 1000m
6 AGC Near	: 4.0
7 AGC Far	: 4.0
8 AGC Distance	: 20m
9 Noise Suppression	: 5.0
0 Next	

3. Select [1 TVG Curve], then left-click.

Quit
Cancel
▲
40Log
▼
(0～40Log)

4. Left-click the ▲ or ▼ button to select the desired setting.
   The smaller the number, the gentler the gain change over distance.

5. Select [Quit], then left-click.

6. Close the menu.
   The TVG is also used to suppress unwanted echoes (sea surface reflections, cruising noise, etc.) on near ranges. If the selected curve does not provide satisfactory results, try to adjust [TVG-Near], [TVG-Medium] or [TVG-Far], as shown in section 2.7.2.

2.7.2 How to set near and far gain

You can set a different gain level for nearby echoes and far echoes with Near Gain and Far Gain functions.

1. Open the menu.

2. Select [2 Gain Setting], then left-click.

3. Select [3 Near Gain Distance] or [5 Far Gain Distance] as required, then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is 20 m to 1600 m, in 10 m steps.

5. Select [Quit], then left-click.

6. Select [2 Near Gain] or [4 Far Gain] as required, then left-click.

   • [2 Near Gain]: Adjust sensitivity in area closer than [3 Near Gain Distance].

   • [4 Far Gain]: Adjust sensitivity in area further than [5 Far Gain Distance].

7. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is [0.0] to [10.0]. The higher the setting value, the higher the gain, however at setting [5.0], no gain adjustment is applied.

8. Select [Quit], then left-click.

9. Close the menu.

Note: With factory default settings, you can use the shortcut keys **8/F8** (Near Gain) or **9/F9** (Far Gain) to switch between the gain settings.

When a school of fish is located a long distance away (about 800 meters) and is approaching own ship do as follows:

1) Adjust the tilt to keep the school of fish in the center of the sonar beam, namely, the school of fish is displayed in strongest colors possible.

2) Confirm that the fish echo is displayed in the same color as it approaches.

3) If the color suddenly changes to weaker colors as the fish gets closer, adjust [3 Near Gain Distance].

2.8 How to Adjust Strong and Weak Echoes

2.8.1 How to set AGC (Near, Far and Distance)

The AGC functions to automatically reduce the receiver gain only against strong echoes such as a large school of fish. Since weak echoes remain unaffected, a small school of fish becomes easier to detect. This equipment allows you to adjust near and far AGC based on distance. Do not set the AGC too high; weak echoes may be missed. This function does not affect echoes from the seabed (bottom). To adjust seabed echoes, see section 2.8.2.

1. Open the menu.
2. Select [2 Gain Setting], then left-click.
3. Select [8 AGC Distance], then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is 20 m to 2000 m, in 20 m steps.
5. Select [Quit], then left-click.
6. Select [6 Near AGC] or [7 Far AGC] as required, then left-click.

   • [6 AGC Near]: Suppress gain in area closer than the [3 Near Gain Distance].

   • [7 AGC Far]: Suppress gain in area that is beyond the [5 Far Gain Distance].

7. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is [0.0] to [10.0]. The higher the setting value, the higher the reduction. An excessively high AGC can hide weak echoes.
8. Select [Quit], then left-click.
9. Close the menu.

2.8.2 Seabed AGC

While it is ideal to suppress seabed (bottom) echoes with the AGC alone there are some fishing grounds where this is not possible. To suppress bottom echoes, use the Seabed AGC feature.

1. Open the menu.

2. Select [2 Gain Setting], then left-click.

3. Select [0 Next] to show the second page of the menu.

4. Select [1 Seabed AGC], then left-click.

5. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is [0.0] to [10.0]. The higher the setting value, the lower the gain for the bottom echoes.

6. Select [Quit], then left-click.

7. Close the menu.

2.8.3 How to adjust the pulse length

The pulse length determines the length of the transmission pulse emitted into the water. While a longer pulse is advantageous for long-range sounding, it has the disadvantage of being poor in discrimination of targets, that is, the ability to separate several closely located targets. When searching for bottom fish, therefore, it is useful to shorten the pulse length in order to separate fish echoes from bottom reflections. Decrease the pulse length setting to shorten the pulse length.

Note: For search of surface and midwater fish in which bottom reflections are not so strong, use the longest pulse length [9].

1. Open the menu.

2. Select [1 TX/RX Setting], then left-click.

3. Select [2 TX Pulse Length], then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.
   The setting range is [0] to [9]. The higher the setting, the longer the pulse length.
   Note: When reverberation is set to other than [0], pulse length is automatically set to [9].

5. Select [Quit], then left-click.

6. Close the menu.

2.8.4 Noise suppression

Removing or suppressing noise from weak echoes such as surface reflections, plankton and distant seabeds can help you clear the display. The noise suppression function adjusts the gain level for weak echoes only, leaving echoes schools of fish unadjusted.

1. Open the menu.
2. Select [2 Gain Setting], then left-click.
3. Select [9 Noise Suppression], then left-click.
4. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is [0.0] to [10.0]. The higher the setting value, the higher the reduction. Adjust this setting with caution so as not to hide smaller schools of fish.
5. Select [Quit], then left-click.
6. Close the menu.

2.9 How to Suppress Bottom and Sea Surface Reflections in Shallow Waters

In shallow fishing grounds with hard or rocky bottom, bottom reflections often interfere with wanted fish echoes and they can not be eliminated sufficiently with the aforementioned TVG and AGC functions. This function is especially true when the TILT is set to a larger angle in order to track schools of fish approaching within 400 m. In such cases try to reduce the output power by adjusting the Tx output instead of turning down the gain. The picture becomes clearer when output power is reduced rather than when the GAIN is decreased as illustrated below.

INCORRECT METHOD — Fish echo
TVG and AGC adjusted with TX POWER kept high → Fish echo weakened

CORRECT METHOD — Fish echo
Reduce TX POWER with TVG and AGC kept constant → Fish echo

How to reduce the TX power

1. Open the menu.
2. Select [1 TX/RX Setting], then left-click.
3. Select [3 Transmission Power], then left-click.
4. Left-click the ▲ or ▼ button to select the desired setting.
   The setting range is [0] to [9]. The higher the setting, the greater the TX power.
5. Select [Quit], then left-click.
6. Close the menu.

2.10   How to Reject Sonar Interference and Noise

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

2.10.1   How to identify the noise source
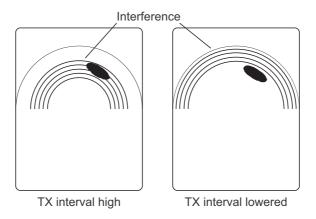
To eliminate noise effectively, you should first identify the noise source as follows:

1. Stop transmission; select [OFF] at main menu → [8 Test] → [9 Transmission]. Turn on the power of all on-board equipment one by one while observing the picture. If noise appears on the sonar display, that equipment is emitting noise. Check the offending equipment's grounding and installation.
2. Run the boat at various speeds to check if the noise is speed dependent.

If neither of the above two steps has effect on the picture, adjust one of the following:

2.10.2   Change the TX interval

When other sonars nearby are operating the same transmission interval as that of own ship's sonar, rings of interference appears on the display.

Interference

TX interval high   TX interval lowered

To remove the rings from the screen, do the following:

1. Open the menu.
2. Select [1 TX/RX Setting], then left-click.
3. Select [1 TX Interval], then left-click.
4. Left-click the ▲ or ▼ button to select the desired setting.
    *   [1] to [9]: the smaller the setting, the shorter the interval.
    *   [Random1] to [Random4]: changes the interval with each pulse, reducing the possibility of interference. A higher setting increases the available intervals used for the random change.
    *   [External Synch]: Matches the intervals with the signal input from an external source.
5. Select [Quit], then left-click.
6. Close the menu.

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2.10.3 Interference rejector

This control is similar to the interference rejector on echo sounders and radars. It is effective for rejecting random noise and sea surface reflections in rough sea conditions. Set it so that noise is just eliminated. Do not use an unnecessarily high setting since it may also reject small, wanted echoes.

1. Open the menu.

2. Select [4 Picture Setting], then left-click.

3. Select one of the following, depending on your requirements, then left-click.

   • [2 Interference Reject] / [7 Auto Sweep INT REJ]: Adjust [2 Interference Reject] for regular use; adjust [7 Auto Sweep INT REJ] for interference rejection while the auto sweep function is active. The setting for both items should be the same.

   • [3 INT Reject (FF)]: Rejects interference from echo sounders and other acoustic equipment.

Menu	Quit
< Picture Setting	
1 Echo Average	: 1
2 Interference Reject	: 2
3 INT Reject (FF)	: 0
4 Smooth Echo Range	: 1
5 Smooth Echo Circular	: 1
6 Auto Sweep Echo AVG	: 1
7 Auto Sweep INT REJ	: 2
8 Weak Echo Detection	: 1
9 2nd Echo Reject	: 0

4. Left-click the ▲ or ▼ button to select the desired setting.

   • [2 Interference Reject] / [7 Auto Sweep INT REJ]: the setting range is [0] to [3]. The degree of rejection in ascending strength is [2], [1], [3]. [0] disables the interference rejector.

   • [3 INT Reject (FF)]: the setting range is [0] to [6]. A higher setting increases the amount of interference rejected. [0] disables the interference rejector.

5. Select [Quit], then left-click.

6. Close the menu.

2.10.4 How to shift the TX frequency

If the interference can not be suppressed by the interference rejector or change in TX interval, shift the Tx frequency with the following procedure.

1. Open the menu.

2. Select [1 TX/RX Setting], then left-click.

3. Select [5 Frequency Shift], then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.
   The setting range is [-30] to [100].
   Note: Each step is equivalent to 0.1 kHz.

5. Select [Quit], then left-click.

6. Close the menu.

Note: With factory default settings, you can use the shortcut key **7/F7** to cycle through the frequency settings.

2.10.5 How to adjust the RX bandwidth (Auto Filter)

You can adjust the inbound (RX) bandwidth automatically or manually. When this function is enabled, the Auto Filter function automatically adjusts the inbound bandwidth to display echoes stably, even at high speeds (up to 18 knots). The Auto Filter also compensates for propeller noise and interference from other vessels.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

1. Open the menu.

2. Select [1 TX/RX Setting], then left-click.

3. Select [6 Bandwidth], then left-click.

4. Select the required setting, then left-click.

   • [OFF]: Disables the automatic adjustment, leaving the bandwidth at it widest. Noise may be shown on the screen with this setting.

   • [Wide]: Retains a wide bandwidth. Noise is reduced slightly.

   • [Middle]: Adjust the bandwidth to mid-range. This is the most commonly used setting, with average noise reduction.

   • [Narrow]: Narrows the beam. Noise reduction is large.

   Note: Selecting [Narrow] may cause fast moving fish, such as tuna, to be lost due to noise/gain adjustments.

5. Select [Quit], then left-click.

6. Close the menu.

2.10.6 Noise limiter

Weak, unwanted reflections, colored light-blue or green, are caused by dirty water, plankton layers, or ship's noise. The noise limiter can reduce the effects of these unwanted reflections. Raising the setting causes unwanted reflections to be displayed in colors of blue-to-background color.

1. Open the menu.

2. Select [3 Display Setting], then left-click.

3. Select [1 Noise Limiter], then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.
   The setting range is [0] to [10]. A higher value reduces more noise.

5. Select [Quit], then left-click.

6. Close the menu.

2.10.7 Reverberation

You can choose the length of reverberation for the echo signal, with [4 Reverberation] (located at main menu → [1 TX/RX Setting]. Adjusting the reverberation can compensate for echoes from plankton, surface reflections and seabed echoes. The settings available are [0] or [1]. The [0] setting is functional at ranges within 100 m. Setting [1] reduces reverberation to a greater degree. Select the appropriate setting for your needs.

2.10.8 Echo average

The echo average function adjusts echo afterglow - the amount of time an echo signal remains on the screen. This feature can be useful for watching echo movement.

You can adjust the echo average from either of the following menus, depending on your requirements: Main menu → [4 Picture Setting] → [1 Echo Average] or [6 Auto Sweep Echo AVG]. The setting range is [0] to [11].

Settings between [1] and [7]: Echoes are gradually displayed and afterglow remains on the screen longer as the setting is increased.

Settings between [8] and [11]: Echoes are quickly displayed and afterglow remains on the screen longer as the setting is increased.

Adjust [1 Echo Average] for regular use; adjust [6 Auto Sweep Echo AVG] for echo averaging while the auto sweep function is active. The setting for both items should be the same.

2.10.9 2nd echo rejection

A target that is farther than the repetition interval of transmission may appear as a virtual image on the screen one transmission later. This is called secondary echo. Reflections from tracks are so strong that secondary echoes appear easily. To remove secondary echoes, set [9 2nd Echo Reject] (located at main menu → [4 Picture Setting]) to other than "0" (OFF).

2.11 How to Adjust Beam Width

The width of the horizontal beam on the S-display can be adjusted from the [Beam Width] menu.
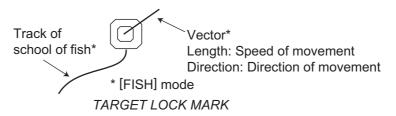
1. Open the menu.
2. Select [1 TX/RX Setting], then left-click.
3. Select [7 Beam Width], then left-click.
4. Left-click the ▲ or ▼ button to select the desired setting.
   The setting range is [0] to [4]. A higher setting gives a narrower beam.
5. Select [Quit], then left-click.
6. Close the menu.

2.12 How to Track a School of Fish

The target lock function automatically tracks a school of fish so you will not lose sight of it on the display. Two types of target lock are available: position tracking and tracking of school of fish. Select one from the menu as shown in the procedure that follows. The default setting is tracking of school of fish. Speed and bearing data are required. The FSV-75 cannot track a school of fish if the level of the echo is too weak.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

Only one target lock can be active at any time.

Track of school of fish*

Vector*
Length: Speed of movement
Direction: Direction of movement

* [FISH] mode

TARGET LOCK MARK

Note: The target lock function is unavailable when the display mode is 3D, 3D & S or 3D & FF.

2.12.1 How to select the target lock mode

Note: Target lock mode cannot be changed if a target lock is active.

1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [8 Target Lock], then left-click.
4. Select [1 Tacking Method], then left-click.
5. Select [Fish] or [Target Mark] as required. Modes are described in section 2.12.2 and section 2.12.3 respectively.
6. Select [Quit], then left-click.
7. Close the menu.
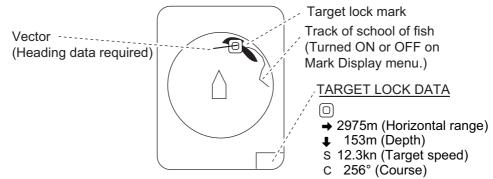
2.12.2   Fish mode

The automatic echo target lock function automatically tracks the operator-selected school of fish. When [2 Tilt Interlock] (located in the [8 Target Lock] menu (see previous page) is set to [Tilt & Range], and the tracked school of fish goes out of the zone in the range direction, the range and tilt are automatically controlled according to the position of the school of fish.

1. Select [Fish] in the procedure in section 2.12.1.

2. Select the school of fish to track.

3. Press the **TARGET LOCK** key.
   The target lock mark (red) is put on the school of fish selected at step 2. The color of the target lock mark (with vector) changes to white when the school of fish is captured by target lock. The vector shows the speed and direction of movement of the school of fish. The tip of the vector is the estimated position of the school of fish when the vector time elapses.
   If the target is lost, the target lock mark changes to red color and the tracking mode changes to position mode (see next section) at that position. When the sonar detects and tracks the target again, the Fish mode is restored.
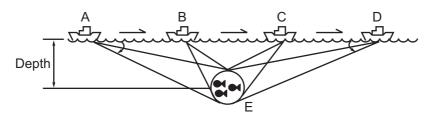
4. To disable the target lock, press the **TARGET LOCK** key.

2.12.3   Target mark mode

This mode tracks a stationary position (such as a reef) using position data fed from a navigator.

1. Select [Target Mark] in the procedure in section 2.12.1.

2. Select the location to track.

3. Press the **TARGET LOCK** key.
   Tilt, range and vertical bearing are automatically adjusted to track the location. Using the figure above as an example, the target lock mark is placed on location E. Then, the equipment remembers the location of E and automatically changes the tilt angle as the ship moves from position A through D. As long as the school of fish E is stationary its echo is kept displayed on the screen.

4. To disable the target lock, press the **TARGET LOCK** key.

2.12.4 Target lock menu description

Target lock functions not previously mentioned are described below.

Page 1	
[2 Tilt Interlock]	Provides automatic change of tilt angle and range or tilt angle in target lock. Setting range: [OFF] (no automatic change), [Tilt] (tilt angle), [Tilt & Range] (tilt angle and range)
[3 Mark Interlock]	Turns numeric/graphic data displays On/Off in target lock. [OFF] turns off both the estimate mark 1, 2 histogram and data display. [Estimate Mark] enables the estimate mark 1, 2 histogram. [Est & Fish Info] enables the both the estimate mark 1, 2 histogram and data display.
Page 2	
[1 Threshold]	Selects the minimum signal level to use in target lock tracking. The setting range is 1 to 30. Target lock tracks a target whose signal level is greater than set here.
[2 Bottom Threshold]	When a target is judged as a bottom echo, raise this setting to differentiate bottom from target. The setting range is 0 to 5.
[3 Target Speed Limit]	Sets maximum fish speed to track. The setting range is 1kn to 15kn.
[4 Smoothing]	Sets smoothing rate for fish speed data. The higher the figure, the smoother the position of the target lock target. Avoid over-smoothing, to prevent delay in tracking when own ship or target moves suddenly. The setting range is 0.0 to 1.0.
[5 Target Speed Update]	Sets the interval at which fish speed data is updated. The intervals are 15, 30, 45 and 60 seconds.
[6 Target Lock Window]	Selects the size of target lock detection area; normal, large, largest. (The area is not indicated on the screen.)
[7 Dimension Coefficient]	Sets dimension constant for calculation of weight (ton) of school of fish from the dimension of the school of fish.

2.13 Presentation Mode

2.13.1 Presentation mode description

This sonar has three presentation modes, head-up, north-up and course-up.

Presentation modes require appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

| Head-up | North-up | Course-up |
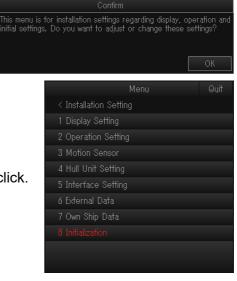
Head-up: The display is oriented toward ship's heading. The heading direction appears at the top of the display. Own ship position is fixed at the screen center. Echoes from fish and the bottom move on the screen relative to own ship's movement. This mode is useful for general use.

North-up: The display is oriented so North is at the top of the screen. Own ship position is fixed at the screen center and own ship mark pivots with ship's movement. Echoes from fish and the bottom move on the screen relative to own ship's movement.

Course-up: The display is oriented according to course. Own ship position is fixed at the screen center. Echoes from fish and the bottom move on the screen relative to own ship's movement. Targets are displayed at ship's bow.

2.13.2 How to select a presentation mode

1. Open the menu.
2. Select [9 Installation Setting], then left-click. A confirmation message appears.
3. Select [OK], then left-click. The Installation Setting menu appears.
4. Select [1 Display Setting], then left-click.
5. Select [1 Orientation Mode], then left-click.
6. Select the mode you want to use, then left-click.
7. Select [Quit], then left-click.
8. Close the menu.

2.14 How to Detect Schools of Fish Aurally

Sometimes you may 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 (optional supply).

2.14.1 How to turn the audio on/off

1. Open the menu.

2. Select [0 Mark & Operation Support Tool], then left-click.

3. Select [9 Alarm & Audio], then left-click.

4. Select [5 Audio], then left-click.

5. Select the appropriate item, then left-click.

   • [OFF]: Disables the audio feature.

   • [Audio1]: Enables the audio feature; sound is released for approaching fish and departing fish at the same volume.

   • [Audio2]: Enables the audio feature; sound released for approaching fish increases in volume. For departing fish the volume decreases.

6. Select [Quit], then left-click.

7. Close the menu.

Menu	Quit
< Mark & Operation Support Tool	
<< Alarm & Audio	
1 Fish Alarm	: OFF
2 Alarm Level	:
3 Alarm Zone	
4 Ship Speed Alarm	
5 Audio	: OFF
6 Audio Gain	: 5
7 Audio Sector	: OFF

When audio is active

With the appropriate data input (see "DATA INPUT REQUIREMENTS" on page AP-12) and the audio feature is active, the audio bearing marker appears on the screen. If the setting for [7 Audio Sector] (see section 2.14.2) is set to other than [OFF], the auto sweep is automatically activated. The sweep range is the center of the selected sector and the auto sweep marker appears on-screen. The bearing marker also moves according to any changes made to the settings. When the bearing marker sweeps over a school or bottom echoes, the speaker releases the selected audio.

R: indicates range from own ship to range marker.
B: indicates audio marker bearing.

When the audio is deactivated

When the audio feature is deactivated, the audio bearing marker is replaced with the bearing marker, regardless of whether the bearing marker was previously displayed. Further, the auto sweep marker is no longer displayed.

2.14.2 How to select the audio sector

Select the audio sector as follows. Note that the audio sector is not drawn on the display.

1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [9 Alarm & Audio], then left-click.
4. Select [7 Audio Sector], then left-click.

5. Left-click the ▲ or ▼ button to select the desired setting.
6. Select [Quit], then left-click.
7. Close the menu.

2.14.3 How to set the audio bearing

1. Place the cursor on the direction you want to monitor through the speaker.
2. Press the **R/B AUDIO** key.
    The audio bearing mark appears on the bearing selected and the center of the audio sector is located at the selected bearing.

Note: To erase the range mark and the data at the bottom of the screen, put the cursor near own ship mark and press the **R/B AUDIO** key. Note that the audio bearing is also erased when [Audio] on the [Alarm & Audio] menu is turned off.

2.14.4 Adjusting the audio volume

You can adjust the audio volume (gain) with the following procedure.
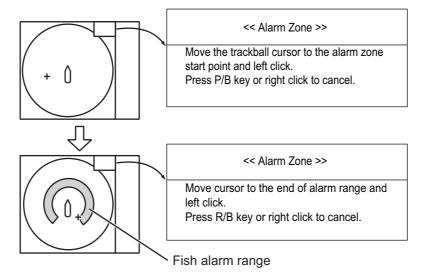
1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [9 Alarm & Audio], then left-click.
4. Select [6 Audio Gain], then left-click.
5. Left-click the ▲ or ▼ button to select the desired setting.
    [1] to [10] set the volume, [0] connects the volume control to the **GAIN** knob.
6. Select [Quit], then left-click.
7. Close the menu.

2.15 Fish Alarm

The fish alarm sounds the buzzer when a fish echo above a preset strength enters the operator-set alarm zone.

2.15.1 How to activate/deactivate the fish alarm

1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [9 Alarm & Audio], then left-click.
4. Select [1 Fish Alarm], then left-click.
5. Select [ON], then left-click.
6. Select [Quit], then left-click.
7. Select [3 Alarm Zone], then left-click.
8. Place the cursor on the starting point of the alarm zone, then left-click.
9. Select the ending point, then left-click. The display paints a fan-shaped alarm zone. The alarm range appears on the display as shown below.

<< Alarm Zone >>

Move the trackball cursor to the alarm zone start point and left click.
Press P/B key or right click to cancel.

<< Alarm Zone >>

Move cursor to the end of alarm range and left click.
Press R/B key or right click to cancel.

Fish alarm range

10. Push the left-click button.
11. Close the menu.
   When a fish echo enters the alarm area the buzzer sounds.

Note 1: There must be at least three degrees difference between the starting and ending points to get a fan-shaped alarm zone as shown in (a) and (b) below. Otherwise, the unit paints a 360-degree alarm zone as in (c) where there is less than 3 degrees between the starting and ending points.

More than 3°   Within 3°

(a)   (b)   (c)

Note 2: To disable the alarm, select [OFF] at step 5.

2.15.2   Alarm Level

The alarm level sets the minimum echo strength at which the fish alarm is activated. The echo strength is equivalent to echo color, as shown on-screen.
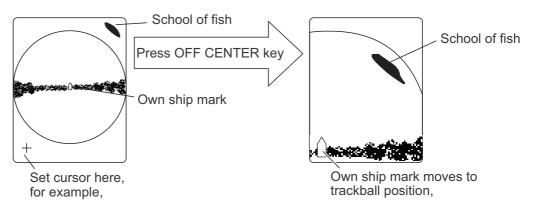
1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [9 Alarm & Audio], then left-click.
4. Select [2 Fish Alarm Level], then left-click.
5. Select the desired echo strength, then left-click.
6. Select [Quit], then left-click.
7. Close the menu.

2.16   How to Relocate a School of Fish

The off-center features functions to relocate a school of fish.

1. Place the cursor on the position where you want to relocate the own ship mark.
2. Press the **OFF CENTER** key.
3. To move the own ship mark back to the screen center, press the key again.

School of fish

Press OFF CENTER key

Own ship mark

Set cursor here, for example,

School of fish

Own ship mark moves to trackball position,

Note: You can also move the display by long-pressing the **left button**. To restore the normal display, long-press the **right button**.

2.17 How to Compare Concentration of School of Fish

2.17.1 How to compare with the fish estimate mark
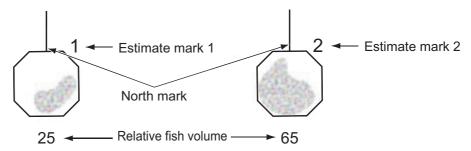
You can use the two **ESTIMATE** keys to get an estimate of the volume of two schools of fish.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

1. Place the cursor on a school of fish, then press the **ESTIMATE 1** key.
   The estimate mark appears on the school of fish. Relative volume is shown by a figure between 0 and 100, below the estimate mark. When the area inside the mark is filled in reddish brown, volume figure is said to be 100. When the estimate mark is entered, a graph is shown at the histogram on the numeric/graphic data display. For the histogram, see page 2-30.

2. Place the cursor on the second school of fish, and then press the **ESTIMATE 2** key.
   Compare estimate figures for each school of fish by observing estimate mark data and the fish histogram.

3. To turn off the estimate marks press their respective keys.
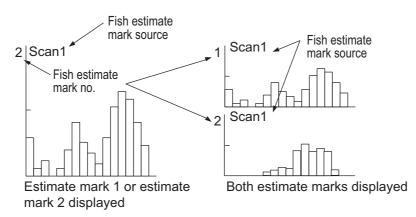
Note: The fish school mark and event mark 1 can be entered with the fish estimate mark. For details, contact your dealer.

Fish histogram

The fish histogram shows, in graph form, signal strength distribution for the school(s) of fish marked with an estimate mark on the horizontal displays. The histogram display for each of those displays will be different since the calculation method is different. This data appears only when an estimate mark is active. When two estimate marks are active, histograms are displayed one on top of the other as below.
The horizontal axis shows signal strength in 16 colors, and the vertical axis shows the concentration of a school of fish inside the fish estimate mark. For the fish estimate mark inscribed on the horizontal display the graph shows the average movement in five scans, to increase accuracy.

Estimate mark 1 or estimate mark 2 displayed   Both estimate marks displayed
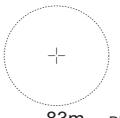
Note: The histogram display is redrawn five transmissions after a fish estimate mark is erased and another mark of the same number is entered soon after.

2.17.2 How to compare with the circle cursor

You can get an estimate of the volume of two schools of fish by measuring the diameter of the school of fish as follows:

1. Push the wheel to show the circle around the normal cursor.

2. Place the circle cursor on the school of fish.

3. Rotate the wheel to adjust the size of the circle cursor.
   Set the school of fish in the circle cursor to estimate correctly. The diameter of the circle cursor is displayed below the circle cursor.
   Note: If the diameter of the circle cursor is 100 m or more, diameter is rounded off to the nearest ten.

83m ← Diameter of the circle cursor

4. Place the circle cursor on another school of fish to estimate the volume.
   You can compare the volume of two schools of fish with the diameter of the school of fish.

5. Right-click to quit the measurement.
   The circle is removed and the normal cursor is restored.

Note: You can set the diameter of the circle cursor at [4 Circular Cursor Diameter] (Main menu → [9 Installation Setting] → [2 Operation Setting] → [2 Mouse Wheel Settings]). See section 9.3.3.

2.18 How to Measure the Speed of a School of Fish

To ensure a good haul, it is important to estimate the direction and speed of the school of fish before shooting the net. You can do this with the **FISH** keys. With tidal current data plus fish speed data, you can determine the timing of the net shooting more efficiently.
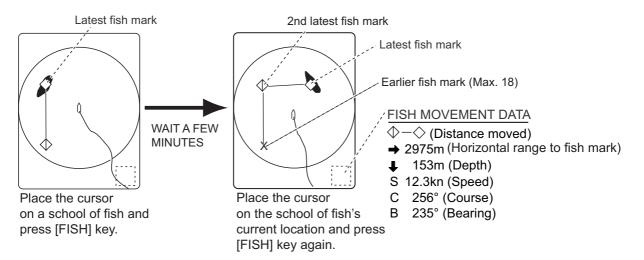
This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

There are two types fish marks available: FISH1 (□) and FISH2 (◇). Up to 20 marks can be entered.

2.18.1 How to measure the speed of a school of fish

1. Place the cursor on the center of a school of fish then press the **FISH** key or push the left-click button. The latest fish mark (□ or ◇) appears on the school of fish.

2. Wait until the target fish moves a reasonable distance from the latest fish mark.

3. Place the cursor on the same school of fish selected in step 1 then press the **FISH** key.
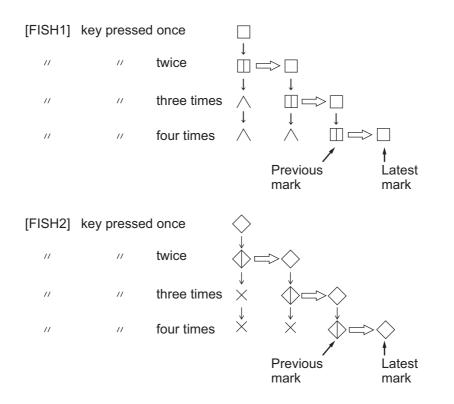
   The latest fish mark appears on the target, the 2nd latest fish mark (▢ or ◈) appears on the location selected at step 1 and any earlier fish marks are shown with an X. The distance between the two fish marks and the depth, speed, course, and bearing of the school of fish appear at the bottom right-hand corner of the horizontal display area.

Latest fish mark

2nd latest fish mark

Latest fish mark

Earlier fish mark (Max. 18)

FISH MOVEMENT DATA
◇－◇ (Distance moved)
➡ 2975m (Horizontal range to fish mark)
⬇ 153m (Depth)
S 12.3kn (Speed)
C 256° (Course)
B 235° (Bearing)

Place the cursor on a school of fish and press [FISH] key.

WAIT A FEW MINUTES

Place the cursor on the school of fish's current location and press [FISH] key again.

Note 1: The time and distance between each press of the **FISH** key should be as long as possible to increase accuracy of measurement. For best results, repeat the procedure two or three times.

Note 2: With factory default settings, you can use the **right button** to enter a fish mark.

Note 3: Each time the **FISH** key is pressed the latest fish mark and ship's speed mark change in the sequence shown in the following figure. When you enter more than 20, the earliest fish mark is erased.

[FISH1]   key pressed once

     //   //   twice

     //   //   three times

     //   //   four times

                                                    Previous   Latest
                                                    mark   mark

[FISH2]   key pressed once

     //   //   twice

     //   //   three times

     //   //   four times

                                                    Previous   Latest
                                                    mark   mark

2.18.2   How to delete fish marks

Fish marks can be deleted individually with the **DELETE MARK** key or from the menu.

With the DELETE MARK key

1. Place the cursor on the fish mark you want to erase.
   The color of the fish mark changes from white to red when the fish mark is correct-
   ly selected.

2. Press the **DELETE MARK** key to delete the fish mark.

From the menu

1. Right-click button the numeric/graphic data display to show the pop-up menu.

2. Select [2 Erase Marks], then left-click.

Right Click Pop up Menu	Quit
< Menu	
<< Mark & Operation Support Tool	
<<< Erase Marks	
1 Erase All	
F3 2 Event Mark1	
F4 3 Event Mark2	
F5 4 Fish Mark1	
F6 5 Fish Mark2	
6 Own Ship Position Mark	
F7 7 Ship's Track	
Open the next menu layer.	

3. Select [4 Fish Mark1] or [5 Fish Mark2] as required, then left-click. Each push of
   the left-button deletes fish marks in order from oldest to newest.

4. Close the menu.

2. SLANT MODE

2.19 Event Mark, Own Ship Position Mark

The event mark is useful for finding the horizontal range, depth and bearing to a location some distance from current position. There are two types of the event marks: event mark 1 (⊕) and event mark 2 (⊘). Up to 20 marks can be entered.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

Each time an event mark is entered the latest event mark appears at the cursor position and all other event marks are shown by marks ┼, ⅄ and numbered in sequential order. When the memory capacity for event marks is reached the earliest event mark is automatically erased to make room for the latest.

2.19.1 How to enter an event mark

1. Place the cursor where you want to enter an event mark.

2. Press an **EVENT** key. The appropriate mark appears and the horizontal range, depth and bearing to the event mark appear at the bottom left-hand corner of the horizontal display area.

➡ 234m: Horizontal range (m) from own ship mark
⬇ 19m: Present depth (m) to mark
(35m): Depth (m) of mark at moment EVENT key is pressed.
B 265°: Present bearing (degree)

Bottom left-hand corner of the screen

*Ex. Indications when the **EVENT** ⊕key is pressed*

With speed and heading data the mark follows own ship's movements. When the tilt angle is changed, the present depth to event mark changes. Note however that the mark's position does not change when automatic tilt is active; the tilt center angle is used to position the mark.

Plotting an event mark on the display is equivalent to dropping a buoy with an anchoring chain that extends from surface to bottom. The buoy is fixed at its geographical location, but the marker on the display moves to a point where the present beam plane intersects the anchoring chain of the buoy as the ship moves or the tilt angle is changed. This can be said about marks as well such as fish mark and cursor.

(35)

Stored when EVENT key is pressed.

You observe picture from direction of ⬇ mark.

B

A

Note: With factory default settings, you can use the **right button** to enter event mark1.

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2. SLANT MODE

2.19 Event Mark, Own Ship Position Mark

The event mark is useful for finding the horizontal range, depth and bearing to a location some distance from current position. There are two types of the event marks: event mark 1 (⊕) and event mark 2 (⊘). Up to 20 marks can be entered.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

Each time an event mark is entered the latest event mark appears at the cursor position and all other event marks are shown by marks ┼, ⅄ and numbered in sequential order. When the memory capacity for event marks is reached the earliest event mark is automatically erased to make room for the latest.

2.19.1 How to enter an event mark

1. Place the cursor where you want to enter an event mark.

2. Press an **EVENT** key. The appropriate mark appears and the horizontal range, depth and bearing to the event mark appear at the bottom left-hand corner of the horizontal display area.

➡ 234m: Horizontal range (m) from own ship mark
⬇ 19m: Present depth (m) to mark
(35m): Depth (m) of mark at moment EVENT key is pressed.
B 265°: Present bearing (degree)

Bottom left-hand corner of the screen

*Ex. Indications when the **EVENT** ⊕key is pressed*

With speed and heading data the mark follows own ship's movements. When the tilt angle is changed, the present depth to event mark changes. Note however that the mark's position does not change when automatic tilt is active; the tilt center angle is used to position the mark.

Plotting an event mark on the display is equivalent to dropping a buoy with an anchoring chain that extends from surface to bottom. The buoy is fixed at its geographical location, but the marker on the display moves to a point where the present beam plane intersects the anchoring chain of the buoy as the ship moves or the tilt angle is changed. This can be said about marks as well such as fish mark and cursor.

(35)

Stored when EVENT key is pressed.

You observe picture from direction of ⬇ mark.

B

A

Note: With factory default settings, you can use the **right button** to enter event mark1.

2.19.2 How to enter an own ship position mark

Place the cursor close to the center of the own ship mark (transducer position) and press the **EVENT** key. Up to ten own ship position marks (△) may be inscribed. When the capacity for own ship position marks is reached the earliest own ship position mark is automatically erased.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

Note: The **SHOOT** key can be set up enter the own ship position mark. Set [5 Event Key] to [Shoot] (Main menu → [9 Installation Setting] → [2 Operation Setting]).

2.19.3 How to erase an event mark, own ship position mark

Event marks and own ship position marks can be deleted individually with the **DE-LETE MARK** key or by earliest entry from the menu.

<u>With MARK DELETE key</u>

Place the cursor on the event mark or own ship position mark you want to erase. The color of the mark changes from white to red when the mark is correctly selected. Press the **DELETE MARK** key to delete the mark.

<u>From the menu</u>

1. Right-click the numeric/graphic data display to show the pop-up menu.
2. Select [2 Erase Marks], then left-click.
3. Select [2 Event Mark1], [3 Event Mark2] or [6 Own Ship Position Mark] as required, then left-click. Each push of the left-button deletes fish marks in order from oldest to newest.
4. Close the menu.
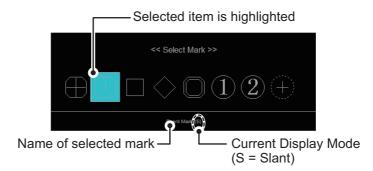
Note: With factory default settings, you can use the **5/F5** or **6/F6** keys to delete event mark1 or event mark2 respectively.

2.20   Select Mark Window

You can use the [Select Mark] window to enter event, fish, estimate and target lock marks. You can also use the window to switch back to the normal cursor.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

To open the [Mark Select] window, press and hold the scrollwheel for approximately two seconds. Select the mark you want to use, then press the **left button**. Move the cursor to the location you want to place the mark, then press the same button. The mark appears at the cursor location.

Selected item is highlighted

<< Select Mark >>

Name of selected mark — Current Display Mode (S = Slant)

2.21   Net Course Mark
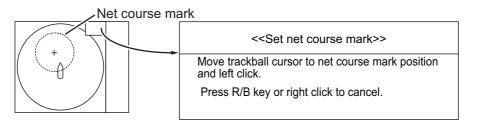
Before shooting the net, decide the shoot timing considering tide direction, distance to the school of fish and moving direction of the school of fish. Use the net course mark as a guide to decide the timing.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

How to enter the net course mark

1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [6 Net Course Mark], then left-click.
4. Select [1 Execute or Erase], then left-click. An instructional pop-up window appears with instructions.

Menu	Quit
< Mark & Operation Support Tool	
<< Net Course Mark	
F9 1 Execute or Erase	: Start/Stop
2 Net Shoot Setting	
3 Net Shoot Distance	: NM

Net course mark

<<Set net course mark>>

Move trackball cursor to net course mark position and left click.

Press R/B key or right click to cancel.

Note: You can cancel the net course mark operation by pressing the **R/B AUDIO** key or right-clicking the display. Note that the cancel operation is deactivated if the cursor is located on the fish finder display.

5. Select the desired echo strength, then left-click.

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6. Select [Quit], then left-click.

7. Close the menu.

Note: To delete the net course mark select [Delete] at step 4.
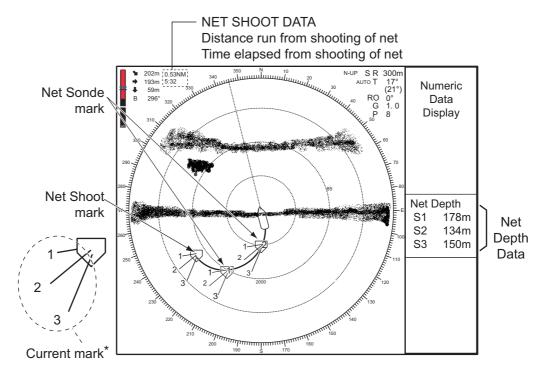
2.22 Net Data

With net sonde connection you can observe net data after the throwing of the net. This requires the net and sonde details to be set correctly at [7 Net Sonde Setting]. See section 9.2.8 for detailed instructions.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

Note: To enable this feature, Set [5 Event Key] to [Event] (Main menu → [9 Installation Setting] → [2 Operation Setting]).
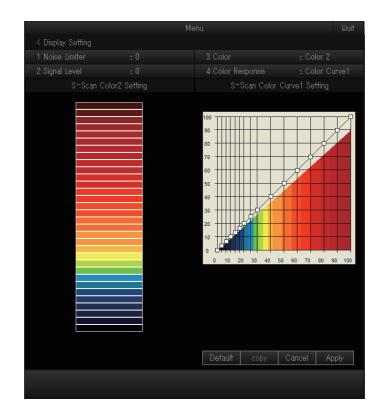
1. Press the **SHOOT** key at the location where you want to shoot your net. The following occurs:

   • The net shoot mark (⬗) appears at the own ship location.

   • Net shoot data appears at the top of the screen.

   • Net sonde marks (⬗¹,⬗²) appear.

   • Net depth data appears in the numeric data display

   • Depth and temperate data are no longer shown on the ship track.

2. To remove the sonde-related data from the screen, press the **SHOOT** key again.

*: The current mark can be shown/hidden from [4 On Net Shoot Mark] (located at main menu → [0 Mark & Operation Support Tool] → [6 Net Course Mark]). See section 9.2.6.

2.23 Menu Items Descriptions

This section presents menu items for the slant mode which have not been mentioned previously.

2.23.1 Display Setting menu
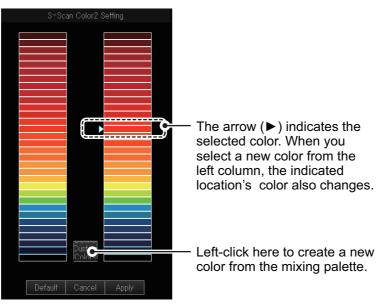
[2 Signal Level]: Contaminated water or reflections from plankton may be painted on the screen in green or light-blue. These echoes may be erased by strength. The setting range is [0] to [31]; [0] corresponds to the weakest color. Echoes weaker than the strength level set here are erased.

[3 Color]: Select the color arrangement to use. There are four colors to select from and a mix of colors that is easy to see is recommended.

[4 Color Response]: Select the color curve to use for echoes based on echo strength. There are four color curves available.

[S-Scan Color1 (2 to 4) Setting]: You can customize the echo colors from this menu item. See the procedure on the next page.

1. Select the color you want to customize, then left-click. The [Color Setting] window appears inside the menu.

The arrow (▶) indicates the selected color. When you select a new color from the left column, the indicated location's color also changes.

Left-click here to create a new color from the mixing palette.

2. Select one of the following methods as desired:

Select from the 32 preset colors

Select the new color from the left column, then left-click.

Create a new color

1) Select the [Create Custom Colors] button, then left-click. The mixing palette appears.

① Select the approximate color you want.

② Slide the slider bar, or enter the values you want for the new color.
[Hue]: Sets the hue.
[Sat]: Sets the saturation.
[Lum]: Set the brightness.
[Red]: Sets the level of red to use.
[Green]: Sets the level of green to use.
[Blue]: Sets the level of blue to use.

Preview window.

2) Create the color you want to use. The color currently being created also appears in the [Color Setting] window.
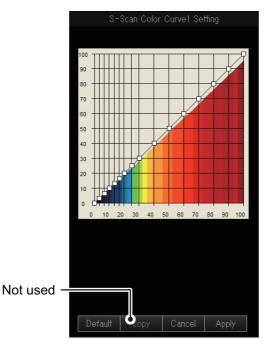
3) Select [Apply], then left-click to close the mixing palette.

3. To apply the color changes, select [Apply], then left-click.
The colors shown in the [Color Setting] window are updated to reflect your changes.

4. Repeat steps 1 to 3 for other colors as required.
   Note: You can also revert the settings to factory default colors. Select [Default] on any of the color windows, then left-click.

[S-Scan Color Curve Setting]: Adjusts reflected echo strength versus echo color level for currently selected color response number. To adjust the curve, place the trackball at the point desired then push the left-click button. On the horizontal axis, input level relative value is shown in the range from 0 to 100%. The setting range for input level is 0-100% in increments of 10% and output level is 0-100% in any value. Select [Apply] then push the left-click button.

Not used

Note: You can also revert the settings to factory default color curve settings. Select [Default], then left-click.

2.23.2 Picture Setting menu

[4 Smooth Echo RNG]: Selects echo smoothing level in the range direction. The setting range is [0] to [5]. The higher the setting, the greater the smoothing.

[5 Smooth Echo Circular]: Selects echo smoothing level in the circular direction. The setting range is [0] to [4]. The higher the setting, the greater the smoothing.
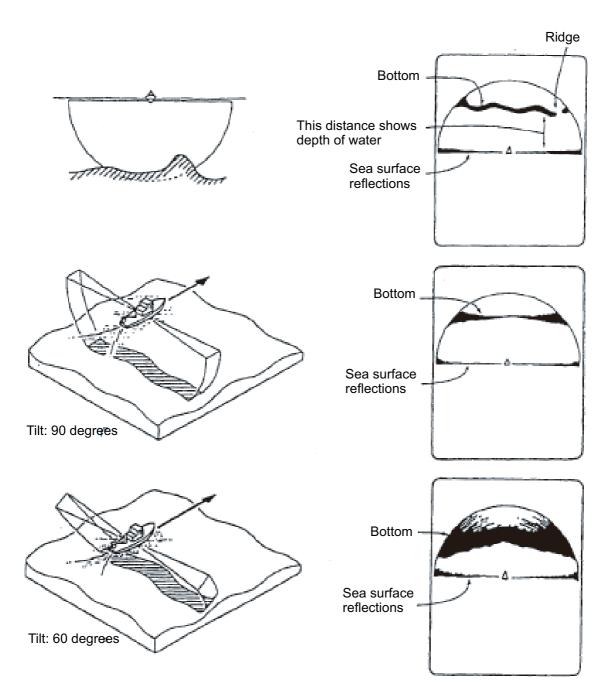
[8 Weak Echo Detection]: Emphasizes weak echoes. The setting range is [0] to [5]. A larger setting gives greater emphasis.

2.24 How to Interpret the Slant Display

2.24.1 Bottom echoes
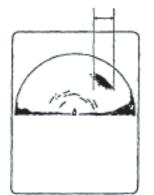
When the tilt angle is set at 90 degrees with the sector center faced dead ahead, the pictures illustrated below will appear on the screen. The bottom echo is represented on the screen as a thick line which realistically shows the bottom contour. When the tilt angle is decreased, the bottom trace becomes wider and weaker. By observing bottom condition on the screen, you may prevent the net from being damaged by a reef or a shipwreck.

Ridge

Bottom

This distance shows depth of water

Sea surface reflections

Tilt: 90 degrees

Bottom

Sea surface reflections

Tilt: 60 degrees

Bottom

Sea surface reflections

2.24.2   School of fish

A school of fish appears as a mass of echoes on the screen. The color of the mass shows the density of the fish and the size of the mass how they are distributed. In the following figures, the same school of fish is observed with two different tilt angles. From the left figure, the operator can know the horizontal distribution of the school of fish and from the right figure the vertical distribution.
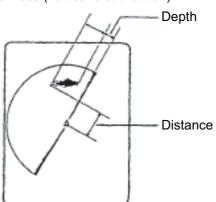
Width (Horizontal distribution Thickness (vertical distrtribution)
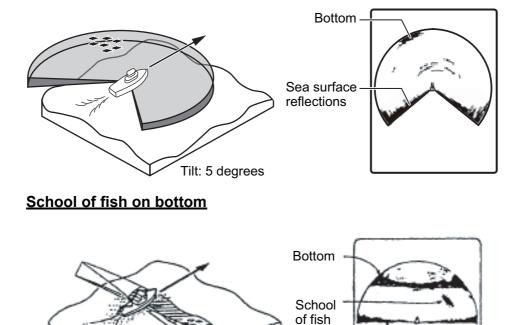
Tilt: 20 degrees
Sector Center : 0 degrees
Range: 400 m

Tilt: 90 degrees
Sector Center : 300 degrees
Range: 400 m

School of fish on surface

Tilt: 5 degrees

School of fish on bottom

Tilt: 40 degrees

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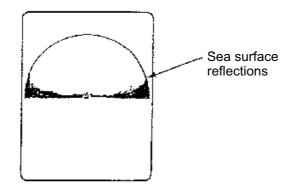
2.24.3 False echoes
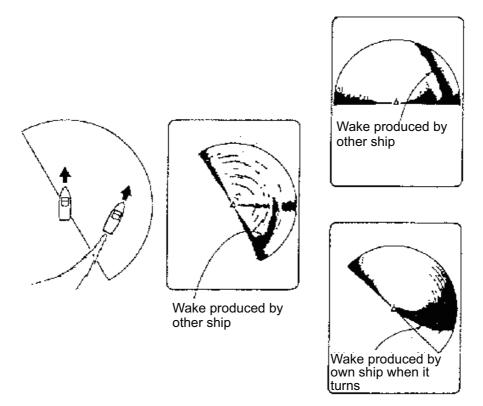
Sea surface reflections

In the half-circle display, sea surface reflections appear as a thick line extending across the own ship mark regardless of tilt angle. When the sonar is used with a narrow tilt angle, the sea surface reflections cover an extended area as illustrated below.

Sea surface reflections
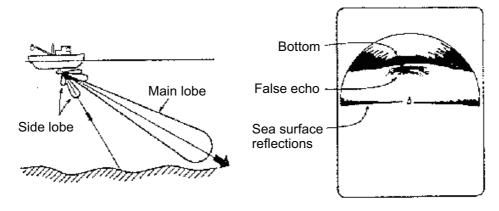
Wake

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.

Wake produced by other ship

Wake produced by other ship

Wake produced by own ship when it turns
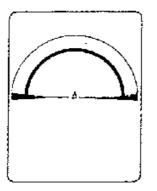
False echo by sidelobe

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.
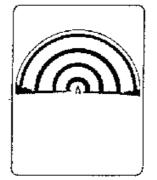
Noise and interference
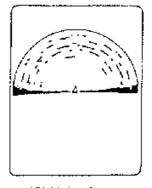
Interference from a sonar on another ship appears on the screen as shown in (A). (B) shows Interference from electrical equipment on board own ship. Noise from marine life appears on the display as shown in (C).

(A) Interference from other sonar (B) Electrical interference (C) Noise from marine life

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3. VERTICAL SLANT MODE

3.1 Basic Operating Procedure
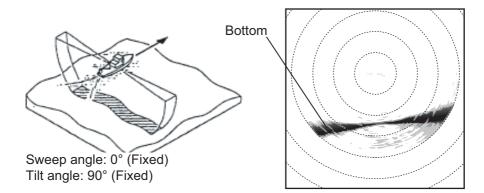
② Lower the transducer.

• **If the mid protrusion key is programmed to [Fixed Position]:**
Lowers the transducer to half protrusion.
• **If the mid protrusion key is programmed to [Any Position]:**
The transducer stops at desired position.

• **If the mid protrusion key is programmed to [Fixed Position]:**
Lowers the transducer to full protrusion.
• **If the mid protrusion key is programmed to [Any Position]:**
The transducer stops at desired position.

① Turn the power on.

④ Set the display range.

⑤ Adjust the gain.

③ Select the vertical slant display (VCS or VCS & FF).

Note: In the default setting, slant (S) and vertical Slant (VCS) modes are active. To use other display modes, register the display mode to use from the menu. For how to register display modes, see section 1.6.2.
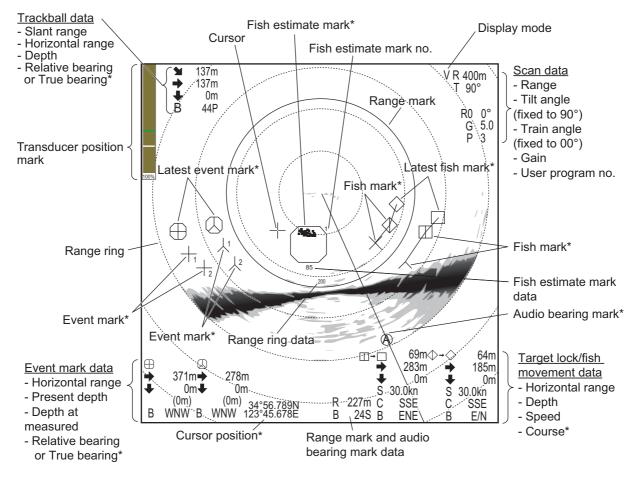
3.2 How the Vertical Slant Mode Works

3.2.1 Overview

The vertical slant display shows a cross section right under the own ship. The sweep angle is fixed to 0°, and the tilt angle is fixed to 90°. The echoes are vertically inverted the image of the slant display.
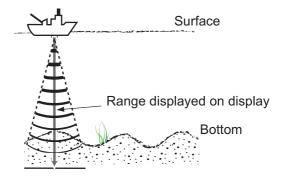
Sweep angle: 0° (Fixed)
Tilt angle: 90° (Fixed)

Bottom

3.2.2 Display overview

*: This function/indication requires appropriate data input; see "DATA INPUT REQUIREMENTS" on page AP-12.

Note 1: Event Marks, Fish Marks and Estimate Marks are based on horizontal distance from own ship. The vertical slant display shows a cross section right under the own ship. Therefore, the marks disappear from the display when the ship moves.

Note 2: You can change the color of Event Marks, Fish Marks and Estimate Marks from [1 Mark Color] (located at [0 Mark & Operation Support] → [2 Mark Color & Size]).

3.3 Display Range

The **RANGE** knob selects the detection range and nine ranges are preset at the factory.

Surface

Range displayed on display

Bottom

The following table shows the default settings for the display range (unit: m).

Range No.	1	2	3	4	5	6	7	8	9
Detection range (m)	100	150	200	250	300	350	400	500	600

Note: Ranges can be preset at [5 Scan Range] (located at [5 Record/Recall/Register] → [7 Register]). See section 9.1.2.

Turn the **RANGE** knob to select a range. Turn clockwise to increase the range, counter-clockwise to decrease the range.

The range selected is momentarily displayed in large characters at the top of the screen. Range is always displayed next to "R" at the top right-hand corner of the screen.

Note: The range can also be adjusted from the range indication. Put the cursor on the range indication to highlight it in yellow then spin the scrollwheel.

Place the cursor on the range setting, which is then highlighted. Spin the scrollwheel to change the setting.

3.4 How to Measure Range and Bearing to a Target

You can measure the range and bearing to a fish school, or other echo.
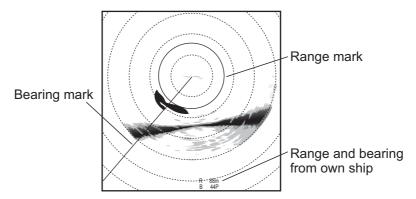
1. Operate the trackball to place the cursor on the target to which you want to measure the range and bearing. The range, bearing and depth to the target appear at the upper left corner of the screen.
    This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.
    Note: Cursor position may also be shown in latitude and longitude from [2 Cursor Position] (located at main menu → [0 Mark & Operation Support Tool] → [4 Mark & Data]). See section 9.2.5.

2. To measure the range and bearing to a different target, or mark the current target with its range and bearing, push the **R/B AUDIO** key. A range mark and bearing mark appear, intersecting the location selected at step 1. Further, the range and bearing to the target appear at the bottom of the screen.

Note 1: You can clear the range and bearing marks and the indications at the bottom of the screen. Place the cursor on, or near, the own ship symbol, then press the **R/B AUDIO** key.

Note 2: If [5 Audio] (located at main menu → [0 Mark & Operation Support Tool] → [9 Alarm & Audio]) is set to other than [OFF], the bearing mark is replaced with the audio bearing mark (see section 3.10.1).

Note 3: You can change how the data for cursor location and bearing marks are displayed from 4 Mark Display Style (located at main menu → [0 Mark & Operation Support Tool] → [4 Mark & Data]). See section 9.2.5.

3.5 How to Eliminate Weak Echoes

Echoes from targets such as bottom and fish return to the transducer in order of distance to them, and when we compare their intensities at the transducer face, those from nearer targets are generally stronger due to little propagation attenuation and little absorption. If these echoes are displayed directly on the screen, the size of the displayed echo from the same school of fish may change with distance, making it difficult to judge the actual size of the school of fish. To overcome this inconvenience use the TVG curve 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 the similar intensities irrespective of the ranges to them.

3.5.1 How to set the TVG curve

You can adjust the gain change for the TVG curve, do as follows.

1. Open the menu.
2. Select [2 Gain Setting], then left-click.

Menu	Quit
< Gain Setting	
1 TVG Curve	: 40Log
2 Near Gain	: 4.5
3 Near Gain Distance	: 400m
4 Far Gain	: 4.0
5 Far Gain Distance	: 1000m
6 AGC Near	: 4.0
7 AGC Far	: 4.0
8 AGC Distance	: 20m
9 Noise Suppression	: 5.0
0 Next	

3. Select [1 TVG Curve], then left-click.

Quit
Cancel
▲
40Log
▼
(0～40Log)

4. Left-click the ▲ or ▼ button to select the desired setting.
   The smaller the number, the gentler the gain change over distance.
5. Select [Quit], then left-click.
6. Close the menu.
   The TVG is also used to suppress unwanted echoes (sea surface reflections, cruising noise, etc.) on near ranges. If the selected curve does not provide satisfactory results, try to adjust [TVG-Near], [TVG-Medium] or [TVG-Far], as shown in section 3.5.2.

3-5

3.5.2 How to set near and far gain

You can set a different gain level for nearby echoes and far echoes with Near Gain and Far Gain functions.

1. Open the menu.

2. Select [2 Gain Setting], then left-click.

3. Select [3 Near Gain Distance] or [5 Far Gain Distance] as required, then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is 20 m to 1600 m, with 10 m steps.

5. Select [Quit], then left-click.

6. Select [2 Near Gain] or [4 Far Gain] as required, then left-click.

   • [2 Near Gain]: Adjust sensitivity in area closer than [3 Near Gain Distance].

   • [4 Far Gain]: Adjust sensitivity in area further than [5 Far Gain Distance].

7. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is [0.0] to [10.0]. The higher the setting value, the higher the gain, however at setting [5.0], no gain adjustment is applied.

8. Select [Quit], then left-click.

9. Close the menu.

Note: With factory default settings, you can use the shortcut keys **8/F8** (Near Gain) or **9/F9** (Far Gain) to switch between the gain settings.

When a school of fish is located on a long-range setting (about 800 meters) and is approaching own ship do as follows:

1) Adjust the tilt to keep the school of fish in the center of the sonar beam, namely, the school of fish is displayed in strongest colors possible.

2) Confirm that the fish echo is displayed in the same color as it approaches.

3) If the color suddenly changes to weaker colors as the fish gets closer, adjust [3 Near Gain Distance].

3.6 How to Adjust Strong and Weak Echoes

3.6.1 How to set AGC (Near, Far and Distance)

The AGC functions to automatically reduce the receiver gain only against strong echoes such as a large school of fish. Since weak echoes remain unaffected, a small school of fish becomes easier to detect. This equipment allows you to adjust near and far AGC based on distance. Do not set the AGC too high; weak echoes may be missed. This function does not affect echoes from the seabed (bottom). To adjust seabed echoes, see section 3.6.2.

1. Open the menu.
2. Select [2 Gain Setting], then left-click.
3. Select [8 AGC Distance], then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is 20 m to 2000 m, with 20 m steps.
5. Select [Quit], then left-click.
6. Select [6 Near AGC] or [7 Far AGC] as required, then left-click.

   • [6 AGC Near]: Suppress gain in area closer than the [3 Near Gain Distance].
   • [7 AGC Far]: Suppress gain in area that is beyond the [5 Far Gain Distance].

7. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is [0.0] to [10.0]. The higher the setting value, the higher the reduction. An excessively high AGC can hide weak echoes.
8. Select [Quit], then left-click.
9. Close the menu.

3.6.2 Seabed AGC

While it is ideal to suppress seabed (bottom) echoes with the AGC alone there are some fishing grounds where this is not possible. To suppress bottom echoes, use the Seabed AGC feature.

1. Open the menu.
2. Select [2 Gain Setting], then left-click.
3. Select [0 Next] to show the second page of the menu.

```
               Menu              Quit
< Gain Setting
1 Seabed AGC           : 5.0
0 Next
```

4. Select [1 Seabed AGC], then left-click.
5. Left-click the ▲ or ▼ button to select the desired setting.
   The available setting range is [0.0] to [10.0]. The higher the setting value, the higher the gain.
6. Select [Quit], then left-click.
7. Close the menu.

3.6.3 How to adjust the pulse length

The pulse length determines the length of the transmission pulse emitted into the water. While a longer pulse is advantageous for long-range sounding, it has the disadvantage of being poor in discrimination of targets, that is, the ability to separate several closely located targets. When searching for bottom fish, therefore, it is useful to shorten the pulse length in order to separate fish echoes from bottom reflections. Decrease the pulse length setting to shorten the pulse length.

Note: For search of surface and midwater fish in which bottom reflections are not so strong, use the longest pulse length [9].

1. Open the menu.
2. Select [1 TX/RX Setting], then left-click.
3. Select [2 TX Pulse Length], then left-click.
4. Left-click the ▲ or ▼ button to select the desired setting.
   The setting range is [0] to [9]. The higher the setting, the longer the pulse length.
   Note: When reverberation is set to other than [0], pulse length is automatically set to [9].
5. Select [Quit], then left-click.
6. Close the menu.

```
               Menu              Quit
< TX/RX Setting
1 Transmittion Interval    : 9
2 TX Pulse Length          : 9
3 Transmission Power       : 9
4 Reverberation            : 0
5 Frequency Shift          : 0
6 Band Width               : Middle
7 Beam Width               : 4
```
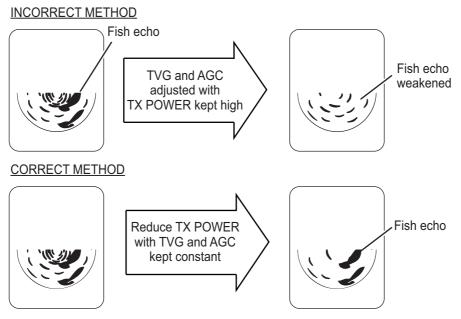
3.6.4 Noise suppression

Removing or suppressing noise from weak echoes such as surface reflections, plankton and distant seabeds can help you clear the display. The noise suppression function adjusts the gain level for weak echoes only, leaving echoes schools of fish unadjusted.

1. Open the menu.
2. Select [2 Gain Setting], then left-click.
3. Select [9 Noise Suppression], then left-click.
4. Left-click the ▲ or ▼ button to select the desired setting.
    The available setting range is [0.0] to [10.0]. The higher the setting value, the higher the reduction. Adjust this setting with caution to avoid smaller schools of fish being hidden.
5. Select [Quit], then left-click.
6. Close the menu.

3.7 How to Suppress Bottom and Sea Surface Reflections in Shallow Waters

In shallow fishing grounds with hard or rocky bottom, bottom reflections often interfere with wanted fish echoes and they can not be eliminated sufficiently with the aforementioned TVG and AGC functions, especially when the TILT is set to a larger angle in order to track schools of fish approaching within 400 m. In such cases try to reduce the output power by adjusting the Tx output instead of turning down the gain. The picture becomes clearer when output power is reduced rather than when the GAIN is decreased as illustrated below.

INCORRECT METHOD

CORRECT METHOD

How to reduce the TX power

1. Open the menu.
2. Select [1 TX/RX Setting], then left-click.
3. Select [3 Transmission Power], then left-click.

3-9

4. Left-click the ▲ or ▼ button to select the desired setting.
   The setting range is [0] to [9]. The higher the setting, the greater the TX power.

5. Select [Quit], then left-click.

6. Close the menu.

3.8 How to Reject Sonar Interference and Noise

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

3.8.1 How to identify the noise source
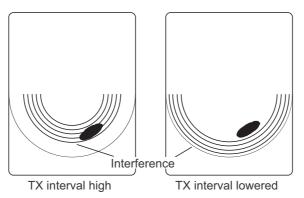
To eliminate noise effectively, you should first identify the noise source as follows:

1. Stop transmission; select [OFF] at main menu → [8 Test] → [9 Transmission]. Turn on the power of all on-board equipment one by one while observing the picture. If noise appears on the sonar display, that equipment is emitting noise. Check the offending equipment's grounding and installation.

2. Run the boat at various speeds to check if the noise is speed dependent.

If neither of the above two steps has effect on the picture, adjust one of the following:

3.8.2 Change the TX interval

When other sonars nearby are operating the same transmission interval as that of own ship's sonar, rings of interference appears on the display.

Interference

TX interval high   TX interval lowered

To remove the rings from the screen, do the following:

1. Open the menu.

2. Select [1 TX/RX Setting], then left-click.

3. Select [1 TX Interval], then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.
   - [1] to [9]: the smaller the setting, the shorter the interval.
   - [Random1] to [Random4]: changes the interval with each pulse, reducing the possibility of interference. A higher setting increases the available intervals used for the random change.
   - [External Synch]: Matches the intervals with the signal input from an external source.

5. Select [Quit], then left-click.

6. Close the menu.

3.8.3   Interference rejector

This control is similar to the interference rejector on echo sounders and radars. It is effective for rejecting random noise and sea surface reflections in rough sea conditions. Set it so that noise is just eliminated. Do not use an unnecessarily high setting since it may also reject small, wanted echoes.

1. Open the menu.

2. Select [4 Picture Setting], then left-click.

3. Select one of the following, depending on your requirements, then left-click.

    - [2 Interference Reject] / [7 Auto Sweep INT REJ]: Adjust [2 Interference Reject] for regular use; adjust [7 Auto Sweep INT REJ] for interference rejection while the auto sweep function is active. The setting for both items should be the same.

    - [3 INT Reject (FF)]: Rejects interference from echo sounders and other acoustic equipment.

Menu	Quit
< Picture Setting	
1 Echo Average	: 1
2 Interference Reject	: 2
3 INT Reject (FF)	: 0
4 Smooth Echo Range	: 1
5 Smooth Echo Circular	: 1
6 Auto Sweep Echo AVG	: 1
7 Auto Sweep INT REJ	: 2
8 Weak Echo Detection	: 1
9 2nd Echo Reject	: 0

4. Left-click the ▲ or ▼ button to select the desired setting.

    - [2 Interference Reject] / [7 Auto Sweep INT REJ]: the setting range is [0] to [3]. The degree of rejection in ascending strength is [2], [1], [3]. [0] disables the interference rejector.

    - [3 INT Reject (FF)]: the setting range is [0] to [6]. A higher setting increases the amount of interference rejected. [0] disables the interference rejector.

5. Select [Quit], then left-click.

6. Close the menu.

3.8.4   How to shift the TX frequency

If the interference can not be suppressed by the interference rejector or change in TX interval, shift the Tx frequency with the following procedure.

1. Open the menu.

2. Select [1 TX/RX Setting], then left-click.

3. Select [5 Frequency Shift], then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.
    The setting range is [-30] to [100].
    Note: When you change this setting, each step is equivalent to 0.1 kHz.

5. Select [Quit], then left-click.

6. Close the menu.

Note: With factory default settings, you can use the shortcut key **7/F7** to cycle through the frequency settings.

3.8.5 How to adjust the RX bandwidth (Auto Filter)

You can adjust the inbound (RX) bandwidth automatically or manually. When this function is enabled, the Auto Filter function automatically adjusts the inbound bandwidth to display echoes stably, even at high speeds (up to 18 knots). The Auto Filter also compensates for propeller noise and interference from other vessels.

This function requires appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.

1. Open the menu.
2. Select [1 TX/RX Setting], then left-click.
3. Select [6 Bandwidth], then left-click.
4. Select the required setting, then left-click.
   - [OFF]: disable the automatic adjustment, leaving the bandwidth at it widest. Noise may be shown on the screen with this setting.
   - [Wide]: Retains a wide bandwidth. Noise is reduced slightly.
   - [Middle]: Adjust the bandwidth to mid-range. This is the most commonly used setting, with average noise reduction.
   - [Narrow]: Narrows the beam. Noise reduction is large.

   Note: Selecting [Narrow] may cause fast moving fish, such as Tuna, to be lost due to noise/gain adjustments.

5. Select [Quit], then left-click.
6. Close the menu.

3.8.6 Noise limiter

Weak, unwanted reflections, colored light-blue or green, are caused by dirty water, plankton layers, or ship's noise. The noise limiter can reduce the effects of these unwanted reflections. Raising the setting causes unwanted reflections to be displayed in colors of blue to background color.

1. Open the menu.
2. Select [3 Display Setting], then left-click.

3. Select [1 Noise Limiter], then left-click.
4. Left-click the ▲ or ▼ button to select the desired setting.
   The setting range is [0] to [10]. A higher value reduces more noise.
5. Select [Quit], then left-click.
6. Close the menu.

3.8.7   Reverberation

You can choose the length of reverberation for the echo signal, with [4 Reverberation] (located at main menu → [1 TX/RX Setting]. Adjusting the reverberation can compensate for echoes from plankton, surface reflections and seabed echoes. The settings available are [0] or [1]. The [0] setting is functional at range within 100 m. If you select [1], the reduction in reverberation is larger. Select the appropriate setting for your needs.

3.8.8   Echo average

The echo average function adjusts echo afterglow - the amount of time an echo signal remains on the screen. This feature can be useful for watching echo movement

You can adjust the echo average from either of the following menus, depending on your requirements: Main menu → [4 Picture Setting] → [1 Echo Average] or [6 Auto Sweep Echo AVG]. The setting range is [0] to [11].

Settings between [1] and [7]: Echoes are gradually displayed and afterglow remains on the screen longer as the setting is increased.

Settings between [8] and [11]: Echoes are quickly displayed and afterglow remains on the screen longer as the setting is increased.

Adjust [1 Echo Average] for regular use; adjust [6 Auto Sweep Echo AVG] for echo averaging while the auto sweep function is active. The setting for both items should be the same.

3.8.9   2nd echo rejection

A target that is farther than the repetition interval of transmission may appear as a virtual image on the screen one time later. This is called secondary echo. Reflections from tracks are so strong that secondary echoes appear easily. To remove secondary echoes, set [9 2nd Echo Reject] (located at main menu → [4 Picture Setting]) to other than "0" (OFF).

3.9   How to Adjust Beam Width

The width of the horizontal beam on the S-display can be adjusted from the [Beam Width] menu.

1. Open the menu.
2. Select [1 TX/RX Setting], then left-click.
3. Select [7 Beam Width], then left-click.
4. Left-click the ▲ or ▼ button to select the desired setting.
   The setting range is [0] to [4]. A higher setting gives a narrower beam.
5. Select [Quit], then left-click.
6. Close the menu.

3.10   How to Detect Schools of Fish Aurally

Sometimes you may 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 (available as an optional extra).

3.10.1   How to turn the audio on/off

1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [9 Alarm & Audio], then left-click.
4. Select [5 Audio], then left-click.
5. Select the appropriate item, then left-click.
    • [OFF]: disables the audio feature.
    • [Audio1]: enables the audio feature; sound is released for approaching fish and departing fish at the same volume.
    • [Audio2]: enables the audio feature; sound re-leased for approaching fish increases in volume. For departing fish the volume decreases.
6. Select [Quit], then left-click.
7. Close the menu.

<u>**When audio is active**</u>

With the appropriate data input (see "DATA INPUT REQUIREMENTS" on page AP-12) and the audio feature is active, the audio bearing marker appears on the screen. If the setting for [7 Audio Sector] (see section 3.10.2) is set to other than [OFF], the auto sweep is automatically activated. The bearing marker moves according to any changes made to the settings. When the bearing marker sweeps over a school or bottom echoes, the speaker releases the selected audio.

R: indicates range from own ship to range marker.
B: indicates audio marker bearing.

Range marker

Audio bearing marker

<u>**When the audio is deactivated**</u>

When the audio feature is deactivated, the audio bearing marker is replaced with the bearing marker, regardless of whether the bearing marker was previously displayed. Further, the auto sweep marker is no longer displayed.

3.10.2 How to select the audio sector

Select the audio sector as follows. Note that you cannot watch this sequence on the display.

1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [9 Alarm & Audio], then left-click.
4. Select [7 Audio Sector], then left-click.

Quit
Cancel
OFF
30°
60°
90°
180°

5. Select the desired setting, then left-click.
6. Select [Quit], then left-click.
7. Close the menu.

3.10.3 How to set the audio bearing

1. Place the cursor on the direction you want to monitor through the speaker.
2. Press the **R/B AUDIO** key.
   The audio bearing mark appears on the bearing selected and the center of the audio sector is located at the selected bearing.

Note: To erase the range mark and the data at the bottom of the screen, put the cursor near own ship mark and press the **R/B AUDIO** key. Note that the audio bearing is also erased when [Audio] on the [Alarm & Audio] menu is turned off.

3.10.4 Adjusting the audio volume

You can adjust the audio volume (gain) with the following procedure.
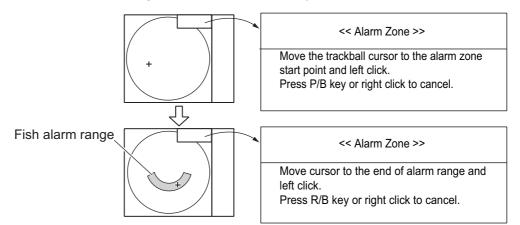
1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [9 Alarm & Audio], then left-click.
4. Select [6 Audio Gain], then left-click.
5. Left-click the ▲ or ▼ button to select the desired setting.
   [1] to [9] set the volume, [0] connects the volume control to the **GAIN** knob.
6. Select [Quit], then left-click.
7. Close the menu.

3.11 Fish Alarm

The fish alarm sounds the buzzer when a fish echo above a preset strength enters the operator-set alarm zone.

3.11.1 How to activate/deactivate the fish alarm
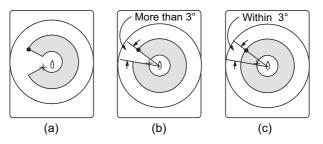
1. Open the menu.

2. Select [0 Mark & Operation Support Tool], then left-click.

3. Select [9 Alarm & Audio], then left-click.

4. Select [1 Fish Alarm], then left-click.

5. Select [ON], then left-click.

6. Select [Quit], then left-click.

7. Select [3 Alarm Zone], then left-click.

8. Place the cursor on the starting point of the alarm zone, then left-click.

9. Select the ending point, then left-click. The display paints a fan-shaped alarm zone. The alarm range appears on the display as shown below.

10. Push the left-click button.

11. Close the menu.
    When a fish echo enters the alarm area the buzzer sounds.

Note 1: There must be at least three degrees difference between the starting and ending points to get a fan-shaped alarm zone as shown in (a) and (b) below. Otherwise, the unit paints a 360-degree alarm zone as in (c) where there is less than 3 degrees between the starting and ending points.

Note 2: To disable the alarm, select [OFF] at step 5.

3.11.2 Alarm Level
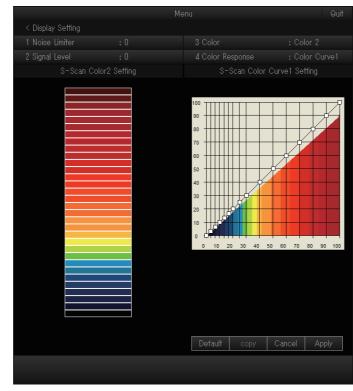
The alarm level sets the minimum echo strength at which the fish alarm is activated. The echo strength is displayed in color, as shown on-screen.

1. Open the menu.
2. Select [0 Mark & Operation Support Tool], then left-click.
3. Select [9 Alarm & Audio], then left-click.
4. Select [2 Fish Alarm Level], then left-click.
5. Select the desired echo strength, then left-click.
6. Select [Quit], then left-click.
7. Close the menu.

3.12 Menu Items Descriptions

This section presents menu items for the vertical slant mode which have been not mentioned previously.

3.12.1 Display Setting menu
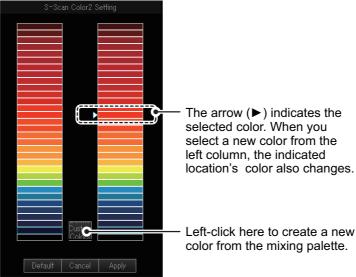
[2 Signal Level]: Contaminated water or reflections from plankton may be painted on the screen in green or light-blue. These echoes may be erased in order of strength. The setting range is [0] to [31]; [0] corresponds to the weakest color.

[3 Color]: Select the color arrangement to use. There are four colors to select from and a mix of colors that is easy to see is recommended.

[4 Color Response]: Select the color curve to use for echoes based on echo strength. There are four color curves available.

[S-Scan Color1 (2 to 4) Setting]: You can customize the echo colors from this menu item, with the following procedure.

1. Select the color you want to customize, then left-click. The [Color Setting] window appears inside the menu.

The arrow (►) indicates the selected color. When you select a new color from the left column, the indicated location's color also changes.

Left-click here to create a new color from the mixing palette.

2. Select one of the following methods as desired:

Select from the 32 preset colors

Select the new color from the left column, then left-click.

Create a new color

1) Select the [Create Custom Colors] button, then left-click. The mixing palette appears.

① Select the approximate color you want.

② Slide the slider bar, or enter the values you want for the new color.
[Hue]: Sets the hue.
[Sat]: Sets the saturation.
[Lum]: Set the brightness.
[Red]: Sets the level of red to use.
[Green]: Sets the level of green to use.
[Blue]: Sets the level of blue to use.

Preview window.

2) Create the color you want to use. The color currently being created also appears in the [Color Setting] window.

3) Select [Apply], then left-click. The mixing palette closes.

3. To apply the color changes, select [Apply], then left-click.
   The colors shown in the [Color Setting] window are updated to reflect your changes.

4. Repeat steps 1 to 3 for other colors as required.
   Note: You can also revert the settings to factory default colors. Select [Default] on any of the color windows, then left-click.

[S-Scan Color Curve Setting]: Adjusts reflected echo strength versus echo color level for currently selected color response number. To adjust the curve, place the trackball at the point desired then push the left-click button. On the horizontal axis, input level relative value is shown in the range from 0 to 100%. The setting range for input level is 0-100% in increments of 10% and output level is 0-100% in any value. Select [Apply] then push the left-click button.

Note: You can also revert the settings to factory default color curve settings. Select [Default], then left-click.

3.12.2　Picture Setting menu

[4 Smooth Echo RNG]: Selects echo smoothing level in the range direction. The setting range is [0] to [5]. The higher the setting, the greater the smoothing.

[5 Smooth Echo Circular]: Selects echo smoothing level in the circular direction. The setting range is [0] to [4]. The higher the setting, the greater the smoothing.

[8 Weak Echo Detection]: Emphasizes weak echoes. The setting range is [0] to [5]. A larger setting gives greater emphasis.

4. FISH FINDER MODE

This equipment can show the picture from the fish finder in combination with the sonar echoes.

Note: Requires connection of an fish finder.

4.1 Basic Operating Procedure

(2) Lower the transducer.

[▼] • **If the mid protrusion key is programmed to [Fixed Position]:** Lowers the transducer to half protrusion.
• **If the mid protrusion key is programmed to [Any Position]:** The transducer stops at desired position.

[↓] • **If the mid protrusion key is programmed to [Fixed Position]:** Lowers the transducer to full protrusion.
• **If the mid protrusion key is programmed to [Any Position]:** The transducer stops at desired position.

(1) Turn the power on.

(3) Select appropriate fish finder mode (S & FF, VCV & FF, 3D & FF).

(4) Adjust reange, gain and picture advanse speed on the menu.

Note: In the default setting, slant (S) and vertical Slant (VCS) modes are active. To use other display modes, register the display mode to use from the menu. For how to register display modes, see section 1.6.2.

4.2 Fish Finder Display Overview
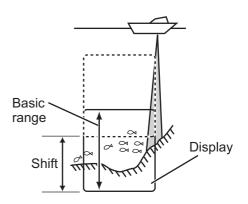
This display shows the picture from the fish finder in combination with the slant display (S & FF), vertical slant display (VCS & FF) or 3D display* (3D & FF).

*: [1 2nd Monitor Setting] on the [Monitor Setting] menu (see page 9-12) must be set to [Dual Display].

4.3 How to Select a Display Range

The basic range and range shifting functions together give you the means to select the depth you can see on the screen. The basic range can be thought of as providing a "window" into the water column and range shifting as moving the "window" to the desired depth.

1. Open the menu.
2. Select [6 Fish Finder], then left-click.

3. Select [2 Range], then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.

5. Select [Quit], then left-click.

6. Select [3 Shift], then left-click.

7. Left-click the ▲ or ▼ button to select the desired setting.

8. Select [Quit], then left-click.

9. Close the menu.

4.4 How to Adjust the Gain

You may adjust the display level of the fish finder picture as below.

1. Open the menu.

2. Select [6 Fish Finder], then left-click.

3. Select [1 Gain], then left-click.

4. Left-click the ▲ or ▼ button to select the desired setting.

5. Select [Quit], then left-click.

6. Close the menu.

4.5 How to Select Picture Advance Speed

The picture advance speed determines how quickly the vertical scan lines run across the screen. When selecting a picture advance speed, keep in mind that a fast advance speed will expand a school of fish horizontally and a slow advance speed will contract it.

1. Open the menu.
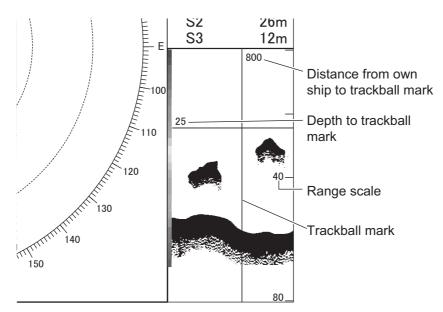
2. Select [6 Fish Finder], then left-click.

3. Select [7 Picture Advance], then left-click.

4. Select the desired setting, then left-click.
The fractions in the dialog box are one line produced per number of transmissions. For example, 1/2, displays one scan line per two transmissions.

5. Select [Quit], then left-click.

6. Close the menu.
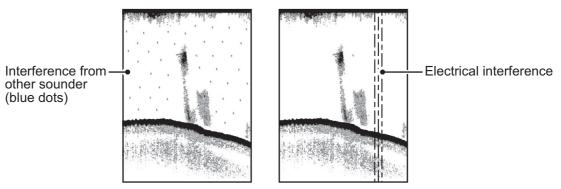
4.6 How to Measure Depth, Distance

You can measure depth and distance (picture advance set for [SPEED SYNC] from own ship to a location with the trackball mark. Use the trackball to place the trackball mark on the location. The trackball mark shows depth on its horizontal axis and distance on its vertical axis.

4.7 How to Reject Interference

Interference from other acoustic equipment operating nearby or other electronic equipment on your boat may show itself on the display as shown in the figure below. When this occurs use the interference rejector.

1. Open the menu.
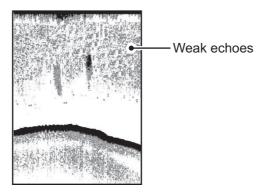
2. Select [6 Fish Finder], then left-click.

3. Select [6 Interference Reject], then left-click.

4. Select the desired setting, then left-click.
    [Strong] provides the greatest degree of suppression and [Weak] provides the weakest. [OFF] turns off thee interference rejector.
    Note: A high setting for interference rejection can also remove weak echoes (small targets).

5. Select [Quit], then left-click.

6. Close the menu.

4.8   How to Erase Weak Echoes

Sediment in the water or reflections from plankton may be painted on the display in low intensity tones, as shown in the illustration below. You can remove these unwanted-ed echoes with the color erase feature.

Weak echoes

1.   Open the menu.
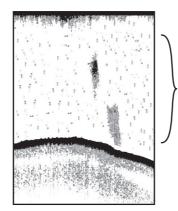
2.   Select [6 Fish Finder], then left-click.

3.   Select [5 Color Erase], then left-click.

4.   Left-click the ▲ or ▼ button to select the desired setting.
     As the setting increases, reflections are removed in order, from weakest to strongest.

5.   Select [Quit], then left-click.

6.   Close the menu.

4.9   How to Reject Low Level Noise (Clutter)

Low intensity "speckles" are referred to as clutter, and can appear over most of the screen. Clutter is often caused by sediment in the water or noise. These unwanted echoes can be rejected.

Low level noise (clutter) appears as "speckles" on the display.

1.   Open the menu.

2.   Select [6 Fish Finder], then left-click.

4-5
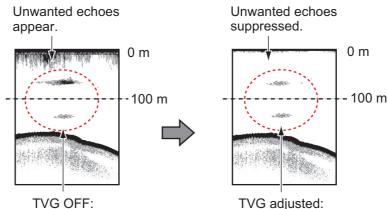
3.   Select [4 Clutter], then left-click.

```
              Menu          Quit
< Fish Finder
<< Clutter
1 Clutter Level        : 40%
2 Clutter Type         : Standard
```
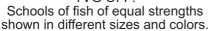
4.   Select [1 Clutter Level], then left-click.

5.   Left-click the ▲ or ▼ button to select the desired setting.
      The larger the setting, the greater the degree of clutter rejection.

6.   Select [Quit], then left-click.

```
   Quit
   Cancel
   ▲
   40%
   ▼
   (0~100%)
```

7.   Select [2 Clutter Type], then left-click.

8.   Select the desired setting, then left-click.

      • [Standard]: Strong color echoes are displayed as is and weak
        echoes are shown smaller, when the clutter level setting is raised.

```
   Quit
   Cancel
   Standard
   Liner
```

      • [Liner]: All echoes are displayed smaller, when the clutter level setting is raised.

9.   Select [Quit], then left-click.

10.   Close the menu.

4.10   How to Adjust TVG (Time Varied Gain)

A school of fish at a deep depth is displayed in weak colors even if it is equal in strength to one in shallow waters. This is due to propagation attenuation of the ultrasonic wave. To compensate for this difference, use TVG. TVG automatically adjusts the gain with depth so that echoes of the same strength and different depths are shown in the same colors regardless of their depths. The gain is increased with depth to display echoes of equal strengths in the same colors. In the following figure, for example, the TVG is set for 100 m and the TVG level is adjusted. Then, unwanted echoes at a distance less than 100 m are deleted and echoes at depths greater than 100 m are not affected.

Unwanted echoes appear.   Unwanted echoes suppressed.

0 m   0 m

100 m   100 m

TVG OFF: TVG adjusted:
Schools of fish of equal strengths   Schools of fish of equal strengths
shown in different sizes and colors.   shown in same sizes and colors.

1.   Open the menu.

2.   Select [6 Fish Finder], then left-click.

3.   Select [0 Next], then left-click.

4.   Select [1 TVG], then left-click.

Menu	Quit
< Fish Finder	
<< TVG	
1 TVG Level	: 3
2 TVG Distance	: 200

5.   Select [1 TVG Level], then left-click.

6.   Select the desired setting, then left-click.
     The higher the level the less the gain at near distance.
     Note: When the FCV-1200/1500 is connected, TVG level must be
     "0".

7.   Select [Quit], then left-click.

8.   Select [2 TVG Distance], then left-click.

9.   Left-click the ▲ or ▼ button to select the desired setting.

10. Select [Quit], then left-click.

11. Close the menu.

4.11   Smoothing

If echoes appear like "patchwork," turn this feature on to smooth them. This feature is
effective to reduce screen flickers at night.

1.   Open the menu.

2.   Select [6 Fish Finder], then left-click.

3.   Select [9 Smoothing], then left-click.

4.   Select the desired setting, then left-click.
     The more the setting value, the more this feature works.

5.   Select [Quit], then left-click.

6.   Close the menu.

4.12   How to Remove Unwanted Echoes near the Surface

The STC feature can remove unwanted echoes near the surface. Use this function
when you want to see fish near the surface clearly.

1.   Open the menu.

2.   Select [6 Fish Finder], then left-click.

3.   Select [0 Next], then left-click.

4. Select [2 STC Level], then left-click.

5. Left-click the ▲ or ▼ button to select the desired setting.
The larger the value the more surface echoes are erased. A setting of [0] disables the STC. In setting 10, STC deletes unwanted echoes from the surface to about 16 ft. Avoid setting the STC too high; fish echoes near the surface may be erased.

6. Select [Quit], then left-click.
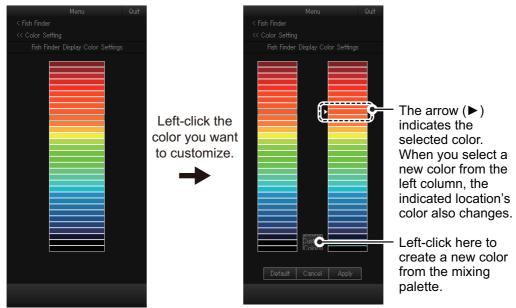
7. Close the menu.

4.13 How to Customize the Colors for Fish Finder Display

You can arrange the display color to your liking by changing the color arrangement on the color bar.

1. Open the menu.

2. Select [6 Fish Finder], then left-click.

3. Select [8 Color Setting], then left-click.

4. Select the color you want to customize, then left-click. The [Color Setting] window appears inside the menu.

Left-click the color you want to customize.

The arrow (▶) indicates the selected color. When you select a new color from the left column, the indicated location's color also changes.

Left-click here to create a new color from the mixing palette.

5. Select one of the following methods as desired:

Select from the 32 preset colors

Select the new color from the left column, then left-click.

Create a new color

1) Select the [Create Custom Colors] button, then left-click. The mixing palette appears.

① Select the approximate color you want.

Define Custom Colors9

② Slide the slider bar, or enter the values you want for the new color.
[Hue]: Sets the hue.
[Sat]: Sets the saturation.
[Lum]: Set the brightness.
[Red]: Sets the level of red to use.
[Green]: Sets the level of green to use.
[Blue]: Sets the level of blue to use.

Preview window.

2) Create the color you want to use. The color currently being created also appears in the [Color Setting] window.

3) Select [Apply], then left-click. The mixing palette closes.

6. To apply the color changes, select [Apply], then left-click.
The colors shown in the [Color Setting] window are updated to reflect your changes.

7. Repeat step 4 to step 6 for other colors as required.

8. Select [Quit], then left-click.

9. Close the menu.

Note: You can also revert the settings to factory default colors. Select [Default] on any of the color windows, then left-click.

4.14 How to Change the Depth Scale Position

Do as follows to change the depth scale position on the fish finder display:

1. Open the menu.

2. Select [6 Fish Finder], then left-click.

3. Select [0 Next], then left-click.

4. Select [5 Depth Scale], then left-click.

5. Select the desired setting, then left-click.

   • [Right]: The depth scale is shown on the right of the fish finder display.

   • [Left]: The depth scale is shown on the left of the fish finder display.

6. Select [Quit], then left-click.

7. Close the menu.

4.15   How to Select the Fish Finder Model

Do as follows to select the fish finder model connected with this equipment:

1.   Open the menu.
2.   Select [6 Fish Finder], then left-click.
3.   Select [0 Next], then left-click.
4.   Select [6 Fish Finder Model], then left-click.
5.   Select the desired setting, then left-click.
6.   Select [Quit], then left-click.
7.   Close the menu.

4.16   [Transducer Setting] Menu

The [Transducer Setting] menu includes the items relevant to the TX and RX settings.

4.16.1   How to open the [Transducer Setting] menu

1.   Open the menu.
2.   Select [6 Fish Finder], then left-click.
3.   Select [0 Next], then left-click.
4.   Select [3 Transducer Setting], then left-click.

4.16.2   Menu items on the [Transducer Setting] menu

Note: The settings on the [Transducer Setting] menu must be same as the settings of the fish finder. The settings on this equipment are not applied to the fish finder.

[1 TX/RX Mode]: Select the TX/RX mode same as the fish finder (Standard or ThruEcho CHIRP).

Note: If [6 Fish Finder Model] (see section 4.15) on the [Fish Finder] menu is set to [FCV-1200L/1500L], [1 TX/RX Mode] is fixed to [Standard].

[2 Transmission Pulse]: Select the pulse length same as fish finder.

[3 Pulse Length]: Operative when [Manual] is selected at [2 Transmission Pulse]. Enter the same value as the fish finder.

4.17 [Calibration] Menu

The [Calibration] menu lets you offsets to sound speed, draft and gain.

4.17.1 How to open the [Transducer Setting] menu

1. Open the menu.
2. Select [6 Fish Finder], then left-click.
3. Select [0 Next], then left-click.
4. Select [4 Calibration], then left-click.

```
                    Menu          Quit
< Fish Finder
<< Calibration
1 Sound Speed         : 1500.0
2 Draft               : 0.0
3 Gain Offset         : 0.0
```

4.17.2 Menu items on the [Calibration] menu

[1 Sound Speed]: Adjust the sound velocity if the depth indication is in correct, because of water temperature or salinity density.

[2 Draft]: The default depth display shows the distance from the transducer. If you would rather show the distance from the sea surface, set your ship's draft.
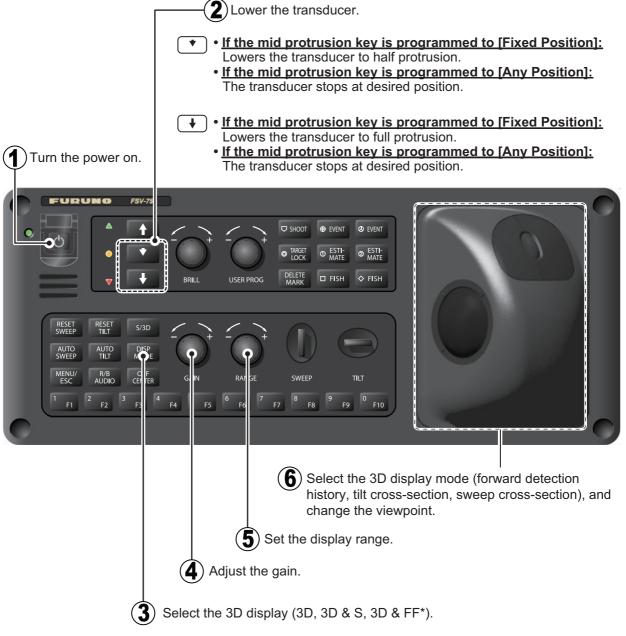
[3 Gain Offset]: If the gain is too high or too low, you can compensate it here.

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5. 3D MODE

Note: To unlock the 3D functions a software license key is required.

5.1 Basic Operating Procedure

②Lower the transducer.

[▼] • **If the mid protrusion key is programmed to [Fixed Position]:**
Lowers the transducer to half protrusion.
• **If the mid protrusion key is programmed to [Any Position]:**
The transducer stops at desired position.

[↓] • **If the mid protrusion key is programmed to [Fixed Position]:**
Lowers the transducer to full protrusion.
• **If the mid protrusion key is programmed to [Any Position]:**
The transducer stops at desired position.

①Turn the power on.

⑥Select the 3D display mode (forward detection history, tilt cross-section, sweep cross-section), and change the viewpoint.

⑤Set the display range.

④Adjust the gain.

③Select the 3D display (3D, 3D & S, 3D & FF*).

*: [1 2nd Monitor Setting] on the [Monitor Setting] menu (see page 9-12) must be set to [Dual Display].

Note: In the default setting, Slant (S) and Vertical Slant (VCS) modes are active. To use other display modes, register the display mode to use from the menu. For how to register display modes, see section 1.6.2.
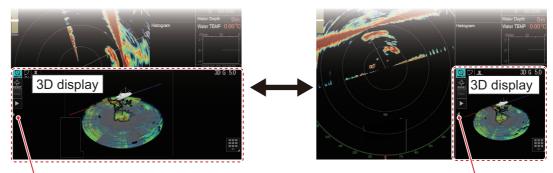
5.2 3D Display Overview

3D display mode button
(From left: Sweep cross-section, Tilt cross-section, FWD detection history)

Transducer position mark

Viewpoint reset button
Object ON/OFF button
Drawing start/stop button

Scan data
- Range
- Tilt angle
- Train angle
- Gain
- User program no.

Own ship mark

Bow line

Stern line

Detection beam area

Plumb line

Tool box

Mode indication
• Viewpoint operation mode
• Density calculation mode

Scrollwheel function

InstantAccess panel™ ON/OFF button

Scroll controller
Zoom in/out slider bar

Scale

InstantAccess panel™

Note 1: The display expand/retract button, which expands, retracts the display in the 3D & S mode, is not shown in the default configuration. To show the button, [1 2nd Monitor Setting] on the [Monitor Setting] menu (see page 9-12) must be set to [Sub Display] or [OFF]. The button appears below the drawing start/stop button.

Display expand/retract button

Display expand/retract button

Note 2: You can change the 3D echo color according to echo strength or depth. To change the color reference, short-push the scrollwheel.

5.3   Basic Operation

5.3.1   How to change the viewpoint angle

You can observe the 3D objects from various angles by changing the viewpoint. To change the viewpoint, do as follows:

1. Check that the viewpoint operation mode icon on tool box is highlighted.
    Note 1: If the tool box is hidden, click the [Show/ Hide Tool Box] button on the InstantAccess panel™.
    Note 2: If the viewpoint operation mode icon is not highlighted, click the [Density CALC ON/OFF] button to turn the density calculation function off.

Viewpoint operation mode icon

2. Hold down the **left button** while moving the trackball to change the viewpoint.

5.3.2   How to reset the viewpoint position

There are three methods to reset the viewpoint position.

Reset the viewpoint position using the viewpoint reset button at the top left of the display
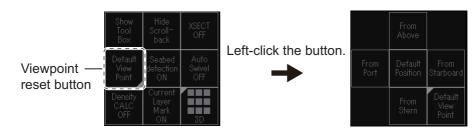
Left-click the viewpoint reset button at the top left of the display to reset the viewpoint position.

Note: The reset position is based on the setting of [1 Default View Point] on the [Camera Setting] menu. See section 5.15.2.

Reset the viewpoint position using the [Default View Point] button on the InstantAccess panel™

Left-click the [Default View Point] button on the InstantAccess panel™, then select the reset position.

Viewpoint reset button

Left-click the button.

- [From Above]: Viewpoint just above own ship
- [From Port]: Viewpoint from the center of the port side
- [From Starboard]: Viewpoint from the center of the starboard side
- [From Stern]: Viewpoint from the center of the stern side
- [Default Position]: User programmed default position. For how to customize the user programmed default position, see section 5.15.2.

Reset the viewpoint position from the menu

1. Open the menu.

2. Select [7 3D Functions], then left-click.

Menu	Quit
< 3D Functions	
1 Echoes	
2 Display Mode	
3 Playback - Current Data	
4 Playback - Saved Data	
5 Seabed detection	
6 Marks	
7 Density Calculations	
8 Camera Operations	
9 Camera Setting	
0 Next	

3. Select [8 Camera Operations], then left-click.

4. Select [3 Reset View Point], then left-click.
   Note: The reset position is based on the setting of [1 Default View Point] on the [Camera Setting] menu. See section 5.15.2.

5. Close the menu.

Menu	Quit
< 3D Functions	
<< Camera Operations	
1 Swivel Axis	: Single Axis
2 Auto Swivel	
3 Reset View Point	
4 School Cross-Section	

5.3.3 How to zoom in/out the display

There are two methods to zoom in/out the 3D display:

Adjust the zoom using the zoom in/out slider bar on the tool box

Drag the zoom in/out the slider bar on the tool box to zoom in/out the display.
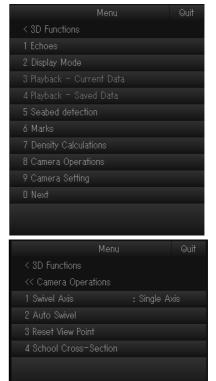
Note: If the tool box is hidden, click the [Show/Hide Tool Box] button on the InstantAccess panel™.

Zoom in/out slider bar
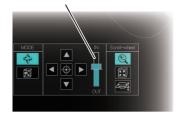
Adjust the zoom by spinning the scrollwheel

1. Check that the zoom mode icon on tool box is highlighted.
   Note 1: If the tool box is hidden, click the [Show/Hide Tool Box] button on the InstantAccess panel™.
   Note 2: If the zoom mode icon is not highlighted, change the following settings:
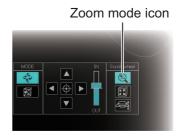
   • Left-click the [XSECT ON/OFF] button to disable the cross-section function.

   • Left-click the [Density CALC ON/OFF] button to disable the density calculation function.

Zoom mode icon

2. Spin the scrollwheel to zoom in/out the 3D display.

5.3.4 How to scroll the screen

You can scroll the screen by moving the viewpoint in an upward or downward direction, or in a leftward or rightward direction. There are two methods to scroll the screen.

Screen scroll using the display position controller on the tool box

Left-click the buttons on the display position controller to scroll the screen. To reset the scroll position and move the own ship mark to the center of the display, left-click the [Reset] button.

Note: If the tool box is hidden, click the [Show/Hide Tool Box] button on the InstantAccess panel™.

Screen scroll with the trackball operation

1. Check that the viewpoint operation mode icon on tool box is highlighted.
   Note 1: If the tool box is hidden, click the [Show/ Hide Tool Box] button on the InstantAccess panel™.
   Note 2: If the viewpoint operation mode icon is not highlighted, click the [Density CALC ON/OFF] button to turn the density calculation function off.

2. Hold down the **right button** while moving the trackball to scroll the screen.

Scroll controller
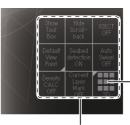
[Reset] button

Viewpoint operation mode icon

5.3.5 InstantAccess panel™
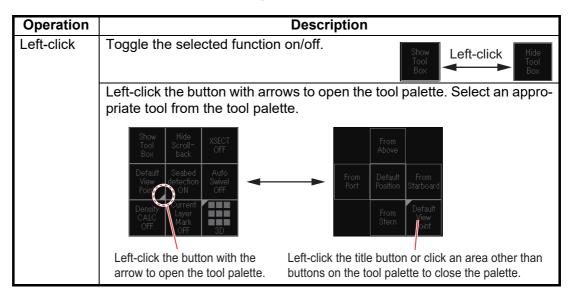
The InstantAccess panel™ is shown at the bottom-right corner of the 3D display. To show/hide the InstantAccess panel™, left-click the InstantAccess panel™ ON/OFF button.

InstantAccess panel™ ON/OFF button

InstantAccess panel™

How to control the InstantAccess panel™

Operation	Description
Left-click	Toggle the selected function on/off.
	Left-click the button with arrows to open the tool palette. Select an appropriate tool from the tool palette.

Left-click the button with the arrow to open the tool palette.

Left-click the title button or click an area other than buttons on the tool palette to close the palette.

Operation	Description
Right-click	Right-click the button to show the context menu. You can shortcut to the related menu from the context menu. The following buttons have the context menu. • [XSECT ON/OFF] button • [Default View Point] button • [Seabed detection ON/OFF] button • [Auto Swivel ON/OFF] button • [Density CALC ON/OFF] button • [Current Layer Mark ON/OFF] button Context menu

Function overview for buttons on the InstantAccess panel™

The following table shows an overview of the buttons on the InstantAccess panel™.

Name	Description
[Show/Hide Tool Box] button 	Show/hide the tool box at the bottom left of the 3D display. Tool box —
[Show/Hide Scroll-back] button 	Not used.
[XSECT ON/OFF] button 	Activate/deactivate the cross-section function. See section 5.10.
[Default View Point] button 	Left click this button to open the tool palette, then select the reset position. • [From Above]: Viewpoint just above own ship • [From Port]: Viewpoint from the center of the port side • [From Starboard]: Viewpoint from the center of the starboard side • [From Stern]: Viewpoint from the center of the stern side • [Default Position]: User programmed default position. For how to customize the user programmed default position, see section 5.15.2.
[Seabed detection ON/OFF] button 	Activate/deactivate the seabed detection. • [ON]: Activates the seabed detection. The seabed echo on the 3D display is displayed in gray. • [OFF]: Deactivated the seabed detection. The color of the seabed echo on the 3D display changes depending on the echo strength. You can change the setting from the menu. See section 5.14.

Name	Description
[Auto Swivel ON/OFF] button Auto Swivel ON / Auto Swivel OFF	Left-click the button to start the auto swivel function. Then, the 3D display makes one rotation. The rotation direction can be selected from the [Swivel Direction Forward/Reverse] button or menu. See section 5.15.1.
[Density CALC ON/OFF] button Density CALC ON / Density CALC OFF	Activate/deactivate the density calculation function. See section 5.11.
[Current Layer Mark ON/OFF] button Current Layer Mark ON / Current Layer Mark OFF	Show/hide the current layer mark, which can be shown or hidden from the menu. See section 5.13.8.

5.3.6 How to show/hide the 3D objects

Left-click the object ON/OFF button at the top left of the display to show/hide the objects listed below.

When the 3D objects are shown, the button reads Show .

When hidden, the button reads Hide .

Object ON/OFF button

• Event mark   • Fish mark   • Net course mark
• Range ring   • Scale   • Detection beam area
• Plumb line

5.3.7 How to start/stop the 3D picture drawing
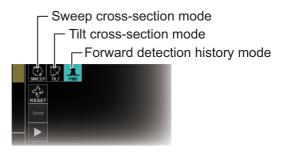
Left-click the drawing start/stop button at the top left of the display to start/stop the 3D picture drawing.

The label on the button reads ❚❚ while the 3D picture drawing is stopped. Left-click the button to start the drawing. The label on the button then reads ▶ .

Drawing start/stop button

5.4 3D Display Mode

There are three 3D display modes, sweep cross-section, tilt cross-section, and forward detection history. To change the 3D display mode, left-click an appropriate button for the 3D display mode. The button of the active mode is highlighted in blue.
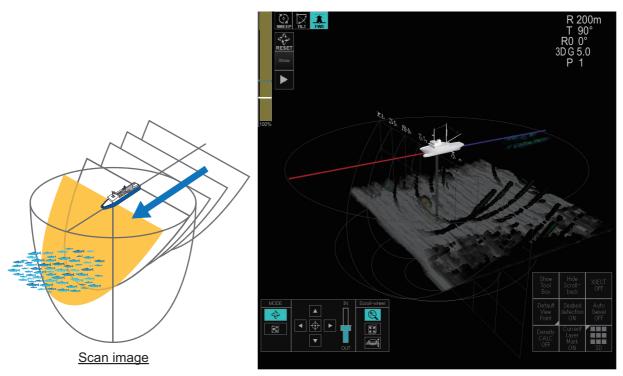
Sweep cross-section mode
Tilt cross-section mode
Forward detection history mode

5.4.1   Forward detection history mode

The forward detection history mode scans the forward area of own ship, and shows the sonar echoes in 3D format. This mode is useful for estimating the profile of the seabed.
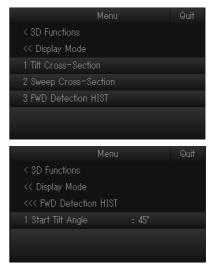
Note: The **AUTO SWEEP** and **AUTO TILT** keys are not used in the forward detection history mode.

Scan image

Start tilt angle for the forward detection history mode

You can change the starting tilt angle as follows.

1. Open the menu.
2. Select [7 3D Functions], then left-click.
3. Select [2 Display Mode], then left-click.

4. Select [3 FWD Detection HIST], then left-click.

5. Select [1 Start Tilt Angle], then left-click.

6. Left-click the ▲ or ▼ button to select the desired setting.
   When the forward detection history mode is active, the tilt angle is changed to the start angle set here and sweep angle is changed to "0°".

7. Select [Quit], then left-click.

8. Close the menu.

5.4.2 Tilt cross-section mode

The tilt cross-section mode scans the tilt angle within the selected width, and shows the underwater sonar echoes in the scanning area in 3D format. This mode is useful for seeing the shape of the fishing net in water.
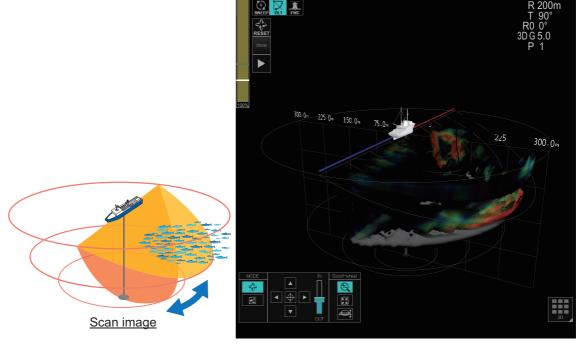
Note: The **AUTO SWEEP** and **AUTO TILT** keys are not used in the tilt cross-section mode.

Scan image

Scan area for the tilt cross-section mode

Do as follows to set the scan area for the tilt cross-section mode:

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [2 Display Mode], then left-click.

4. Select [1 Tilt Cross-Section], then left-click.

5. Select [1 Width], then left-click.

5-9

6. Left-click the ▲ or ▼ button to select the desired setting.
   [1 Width] sets the scanning area width in the tilt cross-section mode.
   The following figure shows the scanning area when the tilt angle
   (center of the tilt angle) is "50°" and [1 Width] is set to "60°".

0°

20°

Scanning area width
([1 Width] = 60°)

Center of the tilt angle
(Current tilt angle = 50°)   80°   90°

7. Select [Quit], then left-click.

8. Select [2 Tilt Speed], then left-click.

9. Select the desired setting, then left-click.
   Select the auto tilt speed in the tilt cross-section mode. The larger
   the setting number the faster the scanning speed.

10. Select [Quit], then left-click.

11. Close the menu.

Start tilt angle and sweep angle for the tilt cross-section mode

You can change the starting tilt and sweep angle as follows.

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [2 Display Mode], then left-click.

4. Select [1 Tilt Cross-Section], then left-click.

5. Select [3 Start Tilt Angle], then left-click.

6. Left-click the ▲ or ▼ button to select the desired setting.
   When the tilt cross-section mode is active, the tilt angle is changed
   to the start angle set here.

7. Select [Quit], then left-click.

8. Select [4 Start Sweep Angle], then left-click.

9. Left-click the ▲ or ▼ button to select the desired setting.
   When the tilt cross-section mode is active, the sweep angle is
   changed to the start angle set here.

10. Select [Quit], then left-click.

5.4.3 Sweep cross-section mode

The sweep cross-section mode rotates the detection beam in a sweep (revolution) di-
rection with the tilt angle fixed to "90°", and shows the underwater sonar echoes
around own ship in 3D format. This mode is useful for finding the position of a school
of fish.
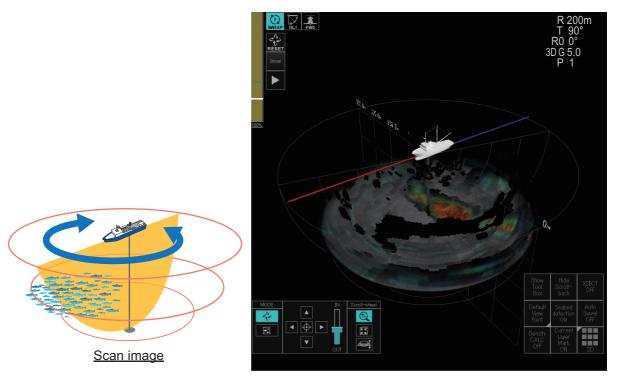
Note: The **RESET TILT**, **AUTO SWEEP** and **AUTO TILT** keys are not used in the
sweep cross-section mode.

Scan image

Scan area for the sweep cross-section mode

Do as follows to set the scan area for the sweep cross-section mode:

1. Open the menu.
2. Select [7 3D Functions], then left-click.
3. Select [2 Display Mode], then left-click.
4. Select [2 Sweep Cross-Section], then left-click.
5. Select [1 Width], then left-click.

6. Left-click the ▲ or ▼ button to select the desired setting.
   [1 Width] sets the scanning area width in the sweep cross-section mode. The center of the sweep angle is the current sweep angle.
7. Select [Quit], then left-click.
8. Select [2 Sweep Speed], then left-click.
9. Select the desired setting, then left-click.
   Select the auto sweep speed in the sweep cross-section mode. The larger the setting number the faster the scanning speed.
10. Select [Quit], then left-click.
11. Close the menu.
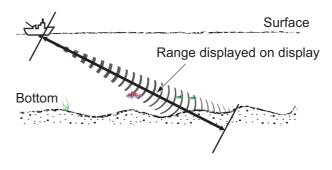
5.5　Display Range

The **RANGE** knob selects the de-
tection range and nine ranges are
preset at the factory.

The following table shows the de-
fault settings for the display range
(unit: m).

Surface

Range displayed on display

Bottom

Range No.	1	2	3	4	5	6	7	8	9
Detection range (m)	100	150	200	250	300	350	400	500	600

Note: Ranges can be preset at [5 Scan Range] (located at [5 Record/Recall/Register]
→ [7 Register]). See section 9.1.2.

Turn the **RANGE** knob to select a range. Turn clockwise to increase the range, count-
er-clockwise to decrease the range.

The range selected is momentarily displayed in large characters at the top of the
screen. Range is always displayed next to "R" at the top right-hand corner of the
screen.

Note: The range can also be adjusted from the range indication. Put the cursor on the
range indication to highlight it in yellow then spin the scrollwheel.

Place the cursor on the range
setting, which is then highlighted.
Spin the scrollwheel to change
the setting.

5.6　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 vertically, 90°. The
tilt angle can be set between -5° (upward) to 90° (downward), in increments of 1°.

To manually set a tilt angle, operate the **TILT** control. Watch the tilt angle indication
and tilt angle indicator is momentarily displayed in large characters at the top of the
screen. The tilt angle is always displayed next to "T" at the top right hand corner of the
screen.

Select the tilt angle depending on target fish. For surface fish select a shallow angle
(about 5°) and for bottom fish, a deep angle.
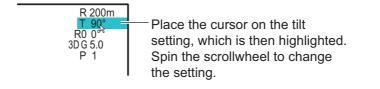
In the tilt cross-section mode, the current tilt angle is used for the center angle of the
auto tilt. Therefore, the center angle of the auto tilt for the tilt cross-section mode is
changed when you adjust the tilt angle.

Note 1: In the sweep cross-section mode, the tilt angle is fixed to "90°".

Note 2: The default function of the scrollwheel sets the tilt angle.

Note 3: The tilt angle can also be adjusted from the tilt angle indication. Put the cursor on the tilt angle indication to highlight it in blue then spin the scrollwheel.

Place the cursor on the tilt setting, which is then highlighted. Spin the scrollwheel to change the setting.

5.7 Sweep Angle

The sweep angle is the center of the area (range) through which the sonar beam propagates sound waves. You can align the beam with the bow of your vessel when the sweep angle is set to 0°.

You can set a sweep angle manually by using the **SWEEP** control on the control unit. The available range is from -175° (port-side) to +175° (starboard-side)[1], giving you a total of 350° of movement.

Push the **SWEEP** control to the right or left to change the angle. As the angle changes, the [RO] indication at the top-right of the screen also changes to show the current sweep angle. The sweep angle marker also moves according to the selected direction. When the **SWEEP** control is released, the selected angle appears on-screen in large text for five seconds.

The sweep angle is adjusted in 1° intervals (factory default[2]). However, the **SWEEP** control is held for more than three seconds, the interval changes based on the setting selected at [4 Sweep Angle Interval] (located at main menu → [9 Installation Setting] → [2 Operation Setting] → [6 Sweep/Tilt Settings]).

[4 Sweep Angle Interval] setting	Actual interval when SWEEP control is held for more than three seconds
1°	3°
3°	5°
5°	7°
7°	10°
10°	10° (no change)

In the sweep cross-section mode, the current sweep angle is used for the center angle of the auto sweep. Therefore, the center angle of the auto sweep for the sweep cross-section mode is changed when you adjust the sweep angle.

*1: The start and end angle of the available range is dependent on offsets set at instal-
lation. See the Installation Manual for details.

*2: You can change the interval at [4 Sweep Angle Interval] to suit your requirements.
See section 9.3.3.

Note: The sweep angle can also be adjusted from the sweep angle indication. Put the
cursor on the indication to highlight it in blue then spin the scrollwheel.

R 200m
T 90°
R0 0°
3D G 5.0
P 1

Place the cursor on the sweep indication.
Spin the scrollwheel to change the setting
after the setting is highlighted.

5.8 How to Erase Weak Echoes

Sediment in the water or reflections from plankton may be painted on the display in
low intensity tones, as shown in the illustration below. You can remove these unwant-
ed echoes with the color erase feature.

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [1 Echoes], then left-click.

Menu	Quit
< 3D Functions	
<< Echoes	
1 Color	
2 Signal Level	: 0
3 Surface Noise Reject	: 7

4. Select [2 Signal Level], then left-click.

5. Left-click the ▲ or ▼ button to select the desired setting.
   As the setting increases, reflections are removed in order, from
   weakest to strongest.

6. Select [Quit], then left-click.

7. Close the menu.

Quit
Cancel
▲
0
▼
(0~31)

5.9 How to Reject the Surface Noise

To reject the surface noise due to the sea surface reflections, etc., do as follows:

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [1 Echoes], then left-click.

4. Select [3 Surface Noise Reject], then left-click.

5. Left-click the ▲ or ▼ button to select the desired setting.
   The larger the setting, the greater the degree of surface noise re-
   jection.

6. Select [Quit], then left-click.

7. Close the menu.

Quit
Cancel
▲
7
▼
(0~15)

5.10 Cross-Section Function

The cross-section function shows the vertical or horizontal "slices" of 3D echoes.
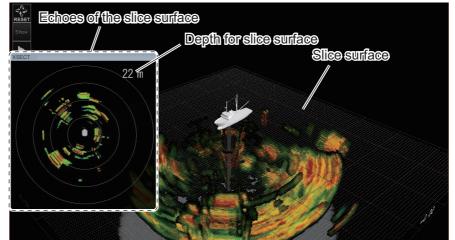
To use the cross-section function, do as follows:

Note: The cross-section and density calculation functions cannot be used simultaneously. One is automatically turned off when the other is activated.

1. Left-click the [XSECT ON/OFF] button to change the button label to "XSECT ON" to activate the cross-section function.
    The slice surface and the [XSECT] window appears. The [XSECT] window shows the echoes of the slice surface.
    The slice direction (vertical or horizontal) depends on the setting for [1 Cross-Section Movement] on the [School Cross-Section] menu. See section 5.15.1.
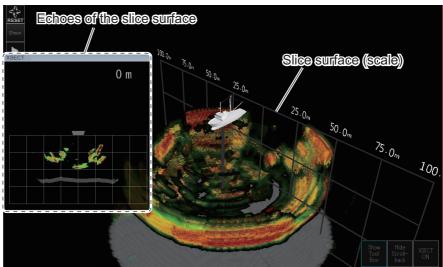
    • [1 Cross-Section Movement] = [Surface-Based]: Shows the slices that are horizontal with the sea surface.

    • [1 Cross-Section Movement] = [Scale-Based]: Shows the slices that are vertical to the sea surface.
    Note: The following figure shows the display example when [1 Scale Reference] on the [Depth Scale] menu is set to [VERT - Bow] or [OFF]. For details of [1 Scale Reference], see section 5.13.5.

2. Spin the scrollwheel to adjust the slice surface position.

3. To deactivate the cross-section function and close the [XSECT] window, left-click the [XSECT ON/OFF] button to change the button label to read "XSECT OFF".

5.11 Density Calculation Function

The density calculation function shows the fish volume and signal strength distribution for the school(s) in the specified calculation area.
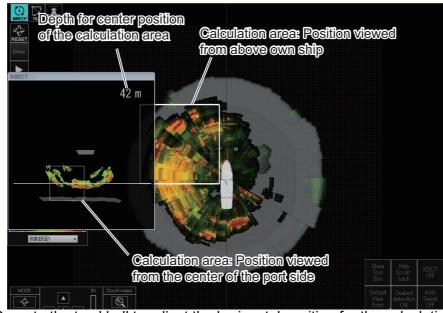
5.11.1 How to use the density calculation function

Do as follows to use the density calculation function:

Note 1: The cross-section and density calculation functions cannot be used simultaneously. One is automatically turned off when the other is activated.

Note 2: If you activate the density calculation function when the forward detection history mode is active, the drawing of 3D echoes stops.
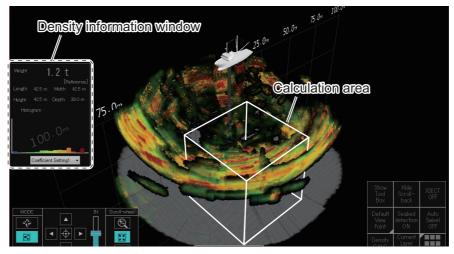
1. Left-click the [Density CALC ON/OFF] button to change the button label to "Density CALC ON" to activate the density calculation function.
   The position adjustment display for the calculation are appears.

2. Operate the trackball to adjust the horizontal position for the calculation area.

3. Spin the scrollwheel to adjust the vertical position (depth) for the calculation area.

4. After adjusting the calculation area position, left-click the display to fix the calculation area.
   The fish volume and signal strength distribution for the school(s) in the calculation area appear in the density information window.

Density information window

Total weight of fish in the calculation area

Size and depth of calculation area

Signal strength distribution

Coefficient setting drop-down list:
Select the coefficient setting for calculating the weight of the school. There are four coefficient settings. Change the coefficient setting according to the target fish. You can customize each coefficient setting from the menu.

Note: You can go back to the previous display (figure at step 1) and change the calculation area position by right-clicking the display.

5. Adjust the calculation area size as required.
   There are two methods for adjusting the calculation area size.
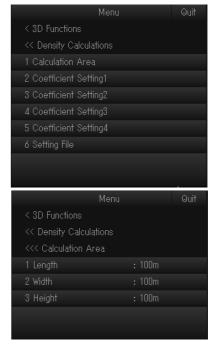
   • Scrollwheel operation: Spin the scrollwheel to increase/decrease the calculation area size.

   • Menu operation: You can adjust the length, width and height of the calculation area from the menu. See section 5.11.2.

6. To deactivate the density calculation function and close the density information window, left-click the [Density CALC ON/OFF] button to change the button label to read "Density CALC OFF".

5.11.2 How to adjust the calculation area size
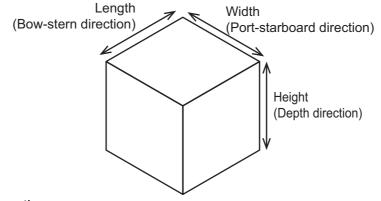
Do as follows to adjust the calculation area size for the density calculation function:

1. Open the menu.
2. Select [7 3D Functions], then left-click.
3. Select [7 Density Calculations], then left-click.

Menu	Quit
< 3D Functions	
<< Density Calculations	
1 Calculation Area	
2 Coefficient Setting1	
3 Coefficient Setting2	
4 Coefficient Setting3	
5 Coefficient Setting4	
6 Setting File	

4. Select [1 Calculation Area], then left-click.

Menu	Quit
< 3D Functions	
<< Density Calculations	
<<< Calculation Area	
1 Length	: 100m
2 Width	: 100m
3 Height	: 100m

5. Adjust the values for [1 Length], [2 Width] and [3 Height] to adjust the calculation area size.

Length
(Bow-stern direction)

Width
(Port-starboard direction)

Height
(Depth direction)

6. Close the menu.

5.11.3 How to customize coefficient setting

Do as follows to customize coefficient setting for the density calculation function:

1. Open the menu.
2. Select [7 3D Functions], then left-click.

3. Select [7 Density Calculations], then left-click.

4. Select the coefficient setting number ([2 Coefficient Setting1] to [5 Coefficient Setting4]), then left-click.
The pop-up window shown to the right appears. The X-axis indicates the echo strength (level) and the Y-axis indicates the coefficient setting. The information is used to estimate the volume of schools of fish from echo strength and is adjustable. This allows you to compensate the estimated volume of schools of fish versus actual volume. The value obtained by multiplying the value for each echo intensity specified in the graph by the value set in [Magnification] is the conversion factor (unit: $t/1,000,000m^3$).
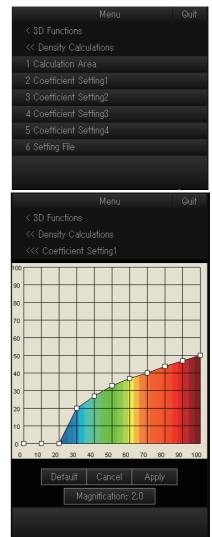
5. To adjust the curve, place the cursor at the point desired then left-click.

6. Select [Magnification], then left-click.

7. Left-click the ▲ or ▼ button to select the desired setting.

8. Select [Quit], then left-click.

9. Select [Apply], then left-click.
   Note: You can also revert the settings to factory default. Select [Default], then left-click.

10. Select [Quit], then left-click.

11. Close the menu.

5.11.4 How to save the coefficient setting data

The coefficient setting customized at section 5.11.3 can be saved and that data can be loaded into the equipment. Do as follows to save the coefficient settings:

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [7 Density Calculations], then left-click.

4. Select [6 Setting File], then left-click.

5. Select [1 Save], then left-click.
The file name, which appears in the [File Name] box, is automatically assigned as shown below.
Fish3DRatioFile_yyyy_mm_dd_hh_mm_ss.ini

Drop-down list of destinations

Progress bar
Fills in blue color, from left-to-right, indicating the save progress.

6. Select where to save the setting data, from the drop-down list of destinations.

7. Left-click the [Save] button. The progress bar advances as the saving progresses. After the saving is completed, the [Setting File] menu appears.

8. Close the menu.

Note: When there in not enough space on the drive to save the coefficient settings (a minimum of 500 MB is required), a warning message appears. Click the [Delete Data] function to show the [Delete Data] window (see section 8.8), then remove unnecessary files. Repeat the above procedure when the drive has sufficient free space to save motion images.

5.11.5 How to load the coefficient setting data

To load the coefficient setting data saved at section 5.11.4, do as follows:

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [7 Density Calculations], then left-click.

4. Select [6 Setting File], then left-click.

5. Select [2 Load], then left-click to open the [Load] window.

6. Select the file to load, from the destination list. The selected file appears in the [File Name] box.
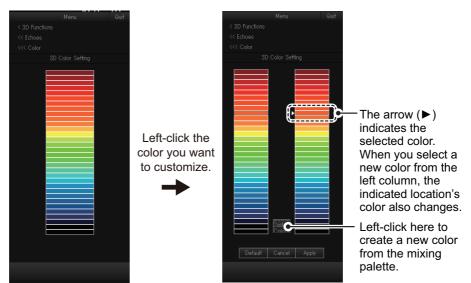
7. Left-click the [Load] button.
   The progress bar shows the loading progress. The [Setting File] menu appears when the loading is completed.

8. Close the menu.

5.12 How to Customize the Colors for 3D Display

You can arrange the display color to your liking by changing the color arrangement on the color bar.

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [1 Echoes], then left-click.

4. Select the color you want to customize, then left-click. The [Color Setting] window appears inside the menu.

5. Select one of the following methods as desired:

Select from the 32 preset colors

Select the new color from the left column, then left-click.

Create a new color

1) Select the [Create Custom Colors] button, then left-click. The mixing palette appears.

① Select the approximate color you want.

② Slide the slider bar, or enter the values you want for the new color.
[Hue]: Sets the hue.
[Sat]: Sets the saturation.
[Lum]: Set the brightness.
[Red]: Sets the level of red to use.
[Green]: Sets the level of green to use.
[Blue]: Sets the level of blue to use.

2) Create the color you want to use. The color currently being created also appears in the [Color Setting] window.

3) Select [Apply], then left-click. The mixing palette closes.

6. To apply the color changes, select [Apply], then left-click.
The colors shown in the [Color Setting] window are updated to reflect your changes.

7. Repeat step 4 to step 6 for other colors as required.

8. Select [Quit], then left-click.

9. Close the menu.

Note: You can also revert the settings to factory default colors. Select [Default] on any of the color windows, then left-click.

5.13 Mark Display Setting

5.13.1 How to show/hide the event mark

To show/hide the event marks on the 3D display, do as follows:

Latest event mark

Event mark

Event mark 1
⊕ Latest event mark
+₁ Event mark
Sequential order

Event mark 2
◇ Latest event mark
人₁ Event mark
Sequential order

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [6 Marks], then left-click.
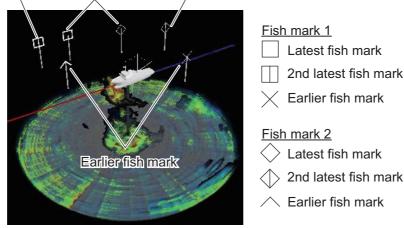
4. Select [1 Event Mark], then left-click.

5. Select [ON] or [OFF], then left-click.

6. Select [Quit], then left-click.

7. Close the menu.

5.13.2   How to show/hide the fish mark

To show/hide the fish marks on the 3D display, do as follows:
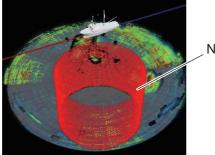
1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [6 Marks], then left-click.

4. Select [2 Fish Mark], then left-click.

5. Select [ON] or [OFF], then left-click.

6. Select [Quit], then left-click.

7. Close the menu.

5.13.3   How to show/hide the net course mark

To show/hide the net course mark on the 3D display, do as follows:
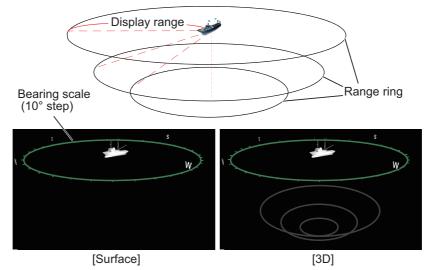
Net course mark

1.   Open the menu.

2.   Select [7 3D Functions], then left-click.

3.   Select [6 Marks], then left-click.

4.   Select [3 Net Course Mark], then left-click.

5.   Select [ON] or [OFF], then left-click.

6.   Select [Quit], then left-click.

7.   Close the menu.

5.13.4   How to set the range ring display

Do as follows to change the range ring display setting:

1.   Open the menu.

2.   Select [7 3D Functions], then left-click.

3.   Select [6 Marks], then left-click.

4.   Select [4 Range Rings], then left-click.

5.   Select the desired setting, then left-click.

- • [OFF]: Hide the range ring.

- • [Surface]: Show the range ring that is within the current display range. The range ring is only shown on the horizontal surface.

- • [3D]: Show the range ring(s) that is within the current display range. In the example below, four range rings are shown, in a basket-like appearance.

Display range

Range ring

Bearing scale
(10° step)

[Surface]   [3D]

6. Select [Quit], then left-click.

7. Close the menu.

5.13.5 How to set the depth scale display

Do as follows to change the depth scale display setting:
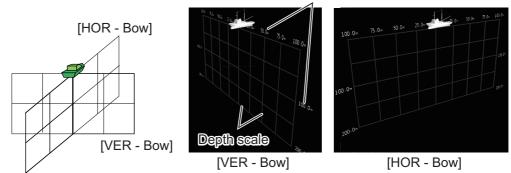
1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [6 Marks], then left-click.

4. Select [5 Depth Scale], then left-click.

5. Select [1 Scale Reference], then left-click.

6. Select the desired setting, then left-click.

   • [OFF]: Hide the depth scale.

   • [VERT - Bow]: The depth scale is vertical to the bow line.

   • [HOR - Bow]: The depth scale is horizontal with the bow line.

You can show/hide these scale indications from the menu.

[HOR - Bow]

[VER - Bow]

[VER - Bow]   [HOR - Bow]

7. Select [Quit], then left-click.

8. Select [2 Show Scale], then left-click.

9. Select [ON] or [OFF], then left-click.
   Select [ON] to show the scale indication on the depth scale.

10. Select [Quit], then left-click.

11. Close the menu.

5-25
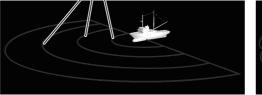
5.13.6 How to set the detection beam display

Do as follows to change the detection beam display setting:

1. Open the menu.
2. Select [7 3D Functions], then left-click.
3. Select [6 Marks], then left-click.
4. Select [6 Beam Display], then left-click.

5. Select [1 Beam Shape], then left-click.
6. Select the desired setting, then left-click.
    - [OFF]: Hide the detection beam
    - [Fan-Shaped]: Show the plane area of the detection beam. You can show the range rings on the detection beam concentrically.
    - [Detectable Area]: Show the stereoscopic area of the detection beam.

    You can show/hide these range rings from the menu.

    [Fan-Shaped]   [Detectable Area]

7. Select [Quit], then left-click.
8. If you selected [Fan-Shaped] at step 6, select [2 Range Rings], then left-click. For other settings, go to step 11.
9. Select [ON] or [OFF], then left-click.
   Select [ON] to show the range rings on the detection beam.
10. Select [Quit], then left-click.
11. Close the menu.

5.13.7 How to set the own ship mark display

Do as follows to change the own ship mark display setting:

1. Open the menu.
2. Select [7 3D Functions], then left-click.
3. Select [6 Marks], then left-click.
4. Select [7 Own Ship Mark], then left-click.

5. Set the menu items, referring the following table.

Menu item	Description
[1 Icon]	Select the shape of the own ship mark. [Type1]　　　　[Type2]
[2 Display Size]	Select the scaling method for the own ship mark. • [Scaled]: The size of the own ship mark changes according to the zoom in/out operation. • [Fixed]: The size of the own ship mark is fixed.
[3 Color]	Select the display color for the own ship mark.
[4 Bow Line]	Show/hide the bow line.
[5 Stern Line]	Show/hide the stern line.
[6 Bow/Stern Line Type]	Select the line type of the bow and stern lines. [Line]　　　　[Cylinder]
[7 Bow/Stern Line Color]	Select the line color for the bow and stern lines.

6. Close the menu.

5-27
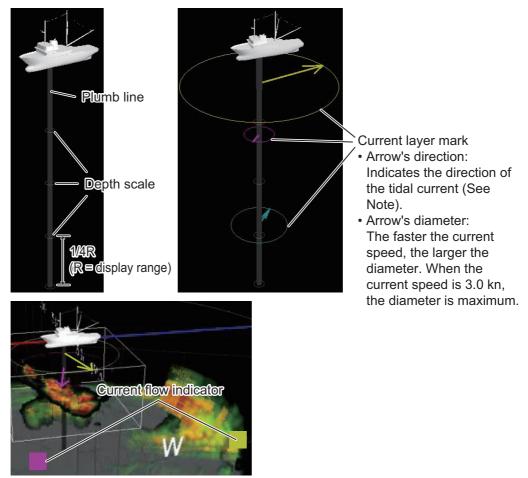
5.13.8 How to set the plumb line display

Do as follows to change the plumb line display setting:

1. Open the menu.
2. Select [7 3D Functions], then left-click.
3. Select [6 Marks], then left-click.
4. Select [7 Own Ship Mark], then left-click.

5. Set the menu items, referring the following table.

Note: Arrow's direction shows "from what direction the current is flowing" or "the direction the current is heading". [5 Current Flow Dir] on the [Current VEC & Wind]menu selects from what direction to display current data. See section 9.2.6.

Menu item	Description
[1 Show Plumb Line]	Show/hide the plumb line.
[2 Depth Scale]*	Show/hide the depth scale on the plumb line.
[3 Plumb Line Color]*	Select the display color for the plumb line.

Menu item	Description
[4 Current Layer Mark]	Show/hide the current layer mark. While the current layer mark is shown, the current flow indicator appears on the bearing ring. **Note 1:** A current indicator is necessary to show the current layer mark. **Note 2:** The setting is shared with the [Current Layer Mark ON/OFF] button on the InstantAccess panel™.

*: Operative when [1 Show Plumb Line] is set to [ON].

6.   Close the menu.

5.14   Seabed Detection Setting

Do as follows to adjust the settings relevant to the seabed detection:

1.   Open the menu.

2.   Select [7 3D Functions], then left-click.

3.   Select [5 Seabed detection], then left-click.

	Menu	Quit
< 3D Functions		
<< Seabed detection		
1 Seabed detection	: ON	
2 Detection threshold	: 12	
3 Seabed Echo Erasure	: 10	
4 Water Depth Limit	: 30	

4.   Set the menu items, referring the following table.

Menu item	Description
[1 Seabed detection]	Activate/deactivate the seabed detection. • [ON]: Activates the seabed detection. The seabed echo on the 3D display is displayed in gray. • [OFF]: Deactivated the seabed detection. The color of the seabed echo on the 3D display changes depending on the echo strength. **Note:** The setting is shared with the [Seabed detection ON/OFF] button on the InstantAccess panel™.
[2 Detection threshold]*	The higher the setting, the strong color echo (reddish brown, red) is recognized as the seabed.
[3 Seabed Echo Erasure]*	Adjust the level of the seabed echo rejector. The larger the setting, the greater the degree of seabed echo rejection.
[4 Water Depth Limit]*	Adjust the threshold for the seabed detection. The seabed detection is not conducted in the area that is shallower than the value set here.

*: Operative when [1 Seabed detection] is set to [ON].

5.   Close the menu.

5.15 Setting Menus for the Camera (Viewpoint)

5.15.1 [Camera Operation] menu

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [8 Camera Operations], then left-click.

4. Set the menu items, referring the following table.

Menu item	Description
[1 Swivel Axis]	Select the number of axes for the viewpoint operation. • [Single Axis]: The rotation direction (horizontal or vertical) depends on the cursor location during the viewpoint operation. • [Dual Axis]: The viewpoint rotates freely according to the track-ball movement.

[2 Auto Swivel]	
	• [1 Start/Stop]: Left-click to start the auto swivel function. When you start the function, the 3D display make one rotation. The rotation direction depends on [2 Swivel Direction].
	• [2 Swivel Direction]: Select the rotation direction for the auto swivel, between the clockwise (forward) and counterclockwise (reverse).
	  • [Forward]: The auto swivel direction is clockwise.
	  • [Reverse]: The auto swivel direction is counterclockwise.

[3 Reset View Point]	Left-click to reset the viewpoint position. **Note:** The reset position is based on the setting of [1 Default View Point] on the [Camera Setting] menu. See section 5.15.2.

[4 School Cross-Section]	
	• [1 Cross-Section Movement]: Select the slice direction for the cross-section function.
	  • [Scale-Based]: The slice surface is horizontal with the sea surface.
	  • [Surface-Based]: The slice surface is vertical to the sea surface.

5. Close the menu.

5.15.2 [Camera Setting] menu

1. Open the menu.
2. Select [7 3D Functions], then left-click.
3. Select [9 Camera Setting], then left-click.

4. Set the menu items, referring the following table.

Menu item	Description
[1 Default View Point]	Select the reset position when you click the viewpoint reset button at the top left of the screen or set [3 Reset View Point]. • [Custom]: User programmed default position. You can customize the user programmed default position on [2 Custom View Point]. • [Above]: Viewpoint just above own ship • [Port]: Viewpoint from the center of the port side • [Starboard]: Viewpoint from the center of the starboard side • [Stern]: Viewpoint from the center of the stern side
[2 Custom View Point]	• [1 View Point Selection]: Select the user programmed default position. • [Default]: Use the factory default viewpoint as the user programmed default position. The factory default is the viewpoint just above own ship. • [Saved]: The viewpoint saved at [2 Save View Point] is used for the user programmed default position. • [2 Save View Point]: Save the current viewpoint as the user custom viewpoint.
[3 Perspective]	Activate/deactivate the perspective of the 3D display. • [ON]: The 3D objects are drawn using perspective. The closer the distance from the viewpoint, the larger the 3D objects. • [OFF]: The 3D objects are drawn using projection. The size of the 3D object does not reflected with the distance from the viewpoint.

5. Close the menu.

5.16 How to Save 3D Setting Data

All menu items on the [3D Functions] menu can be saved and that data can be loaded into the equipment. Do as follows to save the 3D setting data:

1. Open the menu.

2. Select [7 3D Functions], then left-click.

3. Select [0 Next], then left-click.

4. Select [1 Setting File], then left-click.

5. Select [1 Save], then left-click.
   The file name, which appears in the [File Name] box, is automatically assigned as shown below.
   3DSettingFile_yyyy_mm_dd_hh_mm_ss.ini

Drop-down list of destinations

Progress bar
Fills in blue color, from left-to-right, indicating the save progress.

6. Select where to save the setting data, from the drop-down list of destinations.

7. Left-click the [Save] button. The progress bar advances as the saving progresses. After the saving is completed, the [Setting File] menu appears.

8. Close the menu.

Note: When there in not enough space on the drive to save the coefficient settings (a minimum of 500 MB is required), a warning message appears. Click the [Delete Data] function to show the [Delete Data] window (see section 8.8), then remove unnecessary files. Repeat the above procedure when the drive has sufficient free space to save motion images.

5.17 How to Load 3D Setting Data

To load the 3D setting data saved at section 5.16, do as follows:

1. Open the menu.
2. Select [7 3D Functions], then left-click.
3. Select [0 Next], then left-click.
4. Select [1 Setting File], then left-click.
5. Select [2 Load], then left-click to open the [Load] window.

6. Select the file to load, from the destination list. The selected file appears in the [File Name] box.
7. Left-click the [Load] button.
   The progress bar shows the loading progress. The [Setting File] menu appears when the loading is completed.
8. Close the menu.

Note: For the user custom view point (following menu item), the setting data is not applied after completing the loading. The setting is applied at the next time the 3D mode is activated.

• Main menu → [7 3D Functions] → [9 Camera Setting] → [2 Custom View Point] → [2 Save View Point]
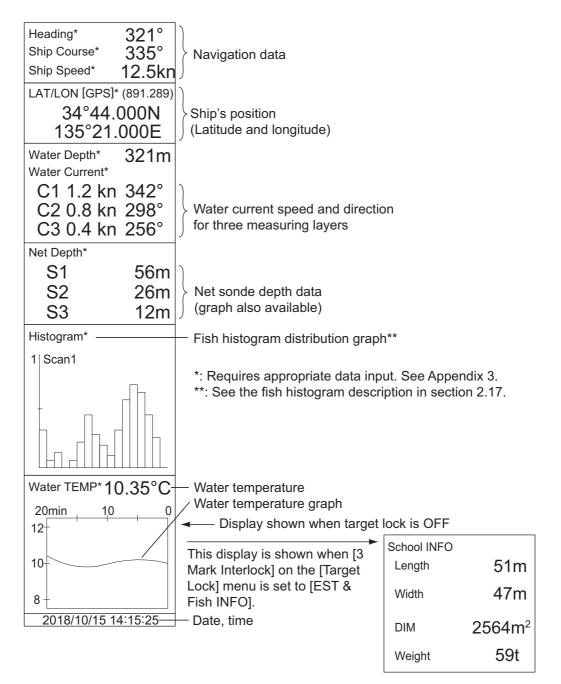
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6. NUMERIC/GRAPHIC DATA DIS-PLAY

6.1 Numeric/Graphic Data Display

Numeric/graphic data is shown in a window at the right side of the screen. To hide this display, do one of the following:

- Right click to show the pop-up menu→[4 Data Box Display]→[OFF]
- Main menu→[9 Installation Setting]→[1 Display Setting]→[OFF]→[7 Data Box Display]→[OFF]

Heading*	321°	} Navigation data
Ship Course*	335°	
Ship Speed*	12.5kn	

LAT/LON [GPS]* (891.289)
   34°44.000N
   135°21.000E — Ship's position (Latitude and longitude)

Water Depth*   321m
Water Current*

C1 1.2 kn 342°
C2 0.8 kn 298° — Water current speed and direction for three measuring layers
C3 0.4 kn 256°

Net Depth*

S1   56m
S2   26m — Net sonde depth data (graph also available)
S3   12m

Histogram* ——— Fish histogram distribution graph**

1 | Scan1

*: Requires appropriate data input. See Appendix 3.
**: See the fish histogram description in section 2.17.

Water TEMP* 10.35°C — Water temperature
— Water temperature graph
20min   10   0 ← Display shown when target lock is OFF
12
This display is shown when [3 Mark Interlock] on the [Target Lock] menu is set to [EST & Fish INFO].
10
8
2018/10/15 14:15:25 — Date, time

School INFO	
Length	51m
Width	47m
DIM	2564m²
Weight	59t

6.2 Numeric, Graphic Data Description

When a data is lost, its last value is shown in red. Data displays can be turned on or off from the [System] menu. Consult a FURUNO agent or dealer for details.

Numeric/ Graphic item	Description	Display range	Available formats	Where to change format
Heading	Shows heading input from heading sensor.	32 compass pts. 0° to 359° 0° to 359° 1° to 179° P/S, 0°, 180°	32 compass pts. 360° True 360° Relative 180° Relative	[Mark & Data] menu
Course	Shows ship course fed from numeric/graphic indication.			
Speed	Shows ship speed fed from a Numeric/graphic indication.	0.0 to 99.9 kn	Fixed at knots	
Position of the ship	Ship position in latitude and longitude. If position data is lost the last-entered position is shown in red.	Lat: 90°00.000S to 90°00.000N Lon: 179°59.999W to 179°59.999E, 180°00.00, 0°00.000	L/L	
Position sensor	The position sensor type is displayed in brackets ("[]"). When the position sensor is not connected, nothing appears between the brackets.	DGPS, KGPS, FGPS, GPS, DR	GPS DR AUTO	[System] menu
Depth	Shows depth from transducer to bottom.	0 to 9999 m	m	
Current	Shows tide speed and direction for three layers or tide and speed for two layers against a reference layer fed from a current indication.	Cur. Spd: 0 to 9.9 kn Direction: 0° to 359°	Direction shown as flow from or flow to	[Current VEC & Wind] menu
			32 compass pts. 360° True 360° Relative 180° Relative	[Mark & Data] menu
Net depth	Depth of net sonde transmitter. Shown only at shooting of net.	0 to 999 m	Depth of up to 3 pts. can be displayed.	[Net SONDE Setting] menu

Numeric/ Graphic item	Description	Display range	Available formats	Where to change format
Fish histogram	Shows signal strength concentration of fish estimate mark inscribed on slant display.	Two marks	ON or OFF from the [Mark Display] - [1 Histogram Display] menu	
Water temp.	Shows water temperature input from a temperature sensor.	-10.00°C to +40.00°C, 14.00°F to 104.00°F	°C, °F	[Mark & Data] menu
Water temp. graph	Shows water temperature over time. Horizontal axis: time, Vertical axis: °C(°F)	Horizontal axis: Time 20 min./1h/6h/12h/ 24h, Vertical axis: Temp. 4°C, 8°F, fixed width, auto shift)	°C, °F	[Mark & Data] menu
Info on school of fish	Shows information about school of fish captured by target lock.	**Length**: Distance to school of fish in range direction **Width**: Distance to school of fish in bearing direction **Dimensions**: Dimension of the school of fish **Weight**: Estimated tonnage of school of fish, calculated from the information above		
Date, time	Current date and time			ON or OFF from the [Display Setting] menu - [8 Date Display]

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7. HOW TO CUSTOMIZE THE SO-NAR

This chapter describes how to use the Shortcut menu, functions keys, user programs, and remote controller.

7.1 User Menu

Often-used menu items can be registered to the User menu, to enable quick access to those items. The default menu items are TX pulse length, TX power, display color, color response, and echo average.

7.1.1 How to register menu items to the user menu

This section show you how to register menu items to the User menu. As an example, the procedure below shows how to register [2 Interference Reject] ([Picture Setting] menu) to the User menu.

Note: Some menu items cannot be registered to the User menu. See the menu tree at the back of the manual for details.

1. Open the menu.
2. Left-click [4 Picture Setting] to show the [Picture Setting] menu.

3. Left-click [2 Interference Reject]. Hold down the left button (or scrollwheel) more than one second to show the following message.

4. Left-click [Register]. The selected item is registered, and shown at the bottom of the menu. The order of items in the User menu can be changed by drag and drop.
   Note: If 20 items are already registered to the User menu the following message appears. Delete unnecessary items from the User menu and then repeat the above procedure to register another item. Left-click the [Close] button to close this message.

5. Close the menu.

7.1.2   How to remove items from the user menu

You can remove unnecessary items from the User menu as shown below.

1. Open the menu.

2. Left-click [▼Shortcut Menu].

3. Left-click (or push the scrollwheel) the item to delete. Hold the button more than three seconds. The message window shown below appears.

```
              Delete Registration
Selected item will be removed from main menu. Are you sure?


                              Remove     Cancel
```

4. Click [Remove] to delete the selected item.

5. Close the menu.

7.2   Function Keys (F1 to F10)

The function keys provide one-touch display of desired menu item or entire menu. The default function key settings are as shown in the table below. Not all menu items and menus may be programmed to the function keys. See the menu tree at the back of this manual for items which may be programmed.

Function key	Default setting	Function
[1/F1]	Record Still Image	Save the still image.
[2/F2]	Play Still Image	Open the [Still Image] window.
[3/F3]	Motion Image	Open the playback window.
[4/F4]	Event All	Erase both event marks and fish marks.
[5/F5]	Event Mark 1	Erase event mark 1.
[6/F6]	Event Mark 2	Erase event mark 2.
[7/F7]	Frequency Shift	Set the transmission frequency.
[8/F8]	Near Gain	Change the near gain setting.
[9/F9]	Far Gain	Change the far gain setting.
[0/F10]	Transmission	Turn transmission on/off.

7.2.1   How to execute a program

1. Press desired function key ([1/F1] to [0/F10]) to show the applicable dialog box.

```
          <<Frequency Shift>>
                  0
```

When the [7/F7] key is pressed

2. Press the same function key again within five seconds to execute the function. The dialog box automatically disappears in five seconds. You can also close the dialog box manually by pressing any function key other than the one pressed at step 1.
    Note: You can change the location of dialog box that appears after pressing function key. Contact a FURUNO agent or dealer for details.

7.2.2 How to program the function keys

Sub menus, menu items and the timer function can be programmed to the function keys.

Note: Some menu items cannot be programmed to the function keys. See the menu tree at the back of this manual for the items which can be programmed to function keys.
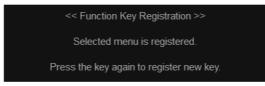
1. Place the cursor on the menu item to program to a function key (the item is framed with a light-blue rectangle). For the timer function, left-click the timer display (00:00:00) in the [Timer] window, and the indication is highlighted in light blue.
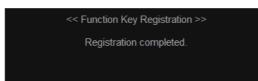
2. Press desired function key for more than one second.
   The message shown below appears for five seconds. If the message disappears, press the same function key again.

Note: If the menu selected at step 2 is already programmed to a function key, the following message appears for five seconds. To continue the programming, press the function key again within five seconds. The message shown at step 2 reappears.

3. Press the same function key again, and the message shown below appears. This completes the procedure for programming a function key.

After registration is completed, the number of the function key appears on the left of the menu item or timer indication.

7.2.3 How to check function key programs

You can check what functions you have programmed to the function keys, with the software function key display at the bottom of the screen (see section 1.7) and from the menu. To check from the menu, do the following.

1. Open the menu.
2. Left-click [5 Record/Recall/Register].
3. Left-click [7 Register] to show the following menu.

4. Left-click [3 F-Key List]. The items registered to the function keys appear.

5. Click [Confirm].
6. Close the menu.

7.2.4 How to erase programs

1. Open the menu.
2. Left-click [5 Record/Recall/Register].
3. Left-click [7 Register].
4. Left-click [4 Clear F-Key Setting]. A confirmation message appears.
5. Left-click [Changeable].
6. Click the function key for which you want to erase its program then push the left button. Repeat this step for other function keys.
7. Click [Quit] on the setting box to close the setting box.
8. Close the menu.

7.3 User Programs

The **USER PROG** control provides for instant setup of the equipment according to fishing ground or target fish. Ten programs may be set up.

At factory default, the presets are setup as shown in the following tables.

Preset No.	Settings	
	Slant/Vertical Slant/Fish Finder	3D
P1	CSH series sonar color scheme, suitable for a purse seining fishing vessel	The display color is normal multi-color. (The larger the user program number, the higher the gain for the 3D display.)
P2		
P3	FSV series sonar color scheme, suitable for a purse seining fishing vessel	
P4		
P5	FSV series sonar color scheme, suitable for a large-sized purse seining fishing vessel	
P6		The display color is special single-color.
P7	FSV series sonar color scheme, suitable for a squid fishing vessel	The display color is greenish single-color.
P8		The display color is bluish single-color.
P9	CSH series sonar color scheme, suitable for a whitebait fishing vessel	The display color is brownish single-color.
P10		The display color is grayish single-color.
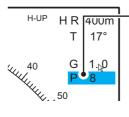
Setting defaults (factory default)

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
[TX/RX Setting] menu										
[1 Transmission Interval]	9	9	9	9	9	9	9	9	9	9
[2 TX Pulse Length]	9	9	9	9	9	9	9	9	9	9
[3 Transmission Power]	9	9	9	9	9	9	9	9	9	9
[4 Reverberation]	0	0	0	0	0	0	0	0	0	0
[5 Frequency Shift]	0	0	0	0	0	0	0	0	0	0
[6 Band Width]	N*	N*	N*	N*	N*	N*	N*	N*	N*	N*
[7 Beam Width]	3	3	3	3	3	3	3	3	3	3
*: Settings abbreviated as follows: "N" = Narrow										
[Gain Setting] menu										
[1 TVG Curve]	35	35	40	35	35	35	40	40	25	25
[2 Near Gain]	5.0	5.0	5.0	5.0	5.0	5.0	3.0	3.0	5.0	5.0
[3 Near Gain Distance]	100	100	100	100	100	100	100	100	100	100
[4 Far Gain]	7.9	9.0	8.2	9.0	7.0	9.0	10.0	10.0	9.0	9.0
[5 Far Gain Distance]	100	100	100	100	100	100	100	100	100	100
[6 AGC Near]	4.0	6.0	4.0	6.0	6.7	6.0	4.5	4.5	4.4	4.4
[7 AGC Far]	2.3	2.3	2.3	2.3	3.2	2.3	2.3	2.3	2.3	2.3
[8 AGC Distance]	200	200	200	200	200	200	200	200	100	100
[9 Noise Suppression]	3.0	3.5	3.0	3.5	4.5	4.0	5.0	5.0	2.0	3.5
[1 Seabed AGC]	2.9	2.5	2.9	2.5	1.7	1.7	2.5	2.5	2.5	2.5

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
[Display Setting] menu										
[1 Noise Limiter]	0	0	0	0	0	0	0	0	0	0
[2 Signal Level]	0	0	0	0	3	3	0	0	0	0
[3 Color]	4	4	4	4	4	4	4	4	4	4
[4 Color Response]	1	1	1	1	1	1	1	1	1	1
[Picture Setting] menu										
[1 Echo Average]	2	2	2	2	2	2	2	2	2	2
[2 Interference Reject]	2	2	2	2	2	2	2	2	2	2
[3 INT Reject (FF)]	3	3	3	3	6	6	6	6	6	6
[4 Smooth Echo Range]	1	1	1	1	0	0	1	1	1	1
[5 Smooth Echo Circular]	1	1	1	1	1	1	0	0	1	1
[6 Auto Sweep Echo AVG]	1	1	1	1	1	1	1	1	1	1
[7 Auto Sweep INT REJ]	2	2	2	2	2	2	2	2	2	2
[8 Weak Echo Detection]	1	1	1	1	1	1	1	1	1	1
[9 2nd Echo Reject]	30	30	30	30	30	30	30	30	30	30
[3D Function] - **[Echoes]** menu										
[2 Signal Level]	5	5	5	5	7	7	5	5	0	0
[3 Surface Noise Reject]	15	15	15	15	15	15	15	15	15	15
[3D Function] - **[Display Mode]** - **[Tilt Cross-Section]** menu										
[1 Width]	90°	90°	90°	90°	20°	20°	90°	90°	90°	90°
[2 Tilt Speed]	1	1	1	1	1	1	1	1	1	1
[3D Function] - **[Display Mode]** - **[Sweep Cross-Section]** menu										
[1 Width]	240°	240°	240°	240°	240°	240°	240°	240°	240°	240°
[2 Sweep Speed]	3	3	3	3	3	3	3	3	3	3

7.3.1   How to select a user program

Rotate the **USER PROG** control clockwise or counterclockwise to select the program no. desired. The program no. selected appears at the top right-hand corner of the screen to the right of "P". If the equipment is turned off with a user program active, it starts up with those settings at the next power on.

Place the cursor on the program number indication, which is then highlighted. Spin the scrollwheel to change the program.

Note: The user program no. can also be adjusted from the user program no. indication.

7.3.2 How to program the USER PROG control

1. Set the display appropriately, according to fishing ground, fishing objective, etc.

2. Open the menu.

3. Left-click [5 Record/Recall/Register].

4. Left-click [7 Register].

5. Left-click [2 Assign User Program]. A confirmation message appears.

6. Left-click [Yes]. The window shown to the right appears.

7. Left-click desired program no. A checkmark (✓) appears to the left of your selection. You can program 10 settings (P1 to P10).

8. Click [Quit] on the setting box to close the box.

9. Close the menu.

7.4 Remote Controller (option)

The keys of the remote controller can be reprogrammed with the functions of your choice.

1. Open the menu.

2. Left-click [5 Record/Recall/Register].

3. Left-click [7 Register].

4. Left-click [6 Remote Key Setting].

Note: The settings for [7 CH7] through [1 CH10] are only available when an external switch is connected to the TB1 port of the Processor Unit.

5. Left-click the item ([1 Ch1] to [6 Ch6]) corresponding to the key whose setting you want to change.

Quit			
Cancel			
Tilt Up	Full-Protrude	Auto Tilt	F6
Tilt Down	Event Mark1	Tilt Reset	F7
Range Up	Event Mark2	Display Mode	F8
Range Down	Fish Mark1	Off Center	F9
Gain Up	Fish Mark2	Range/Bearing	F10
Gain Down	Estimate Mark1	F1	Sweep Right
User Prog Up	Estimate Mark2	F2	Sweep Left
User Prog Down	Net Shoot Mark	F3	Auto Sweep
Retract	Target Lock	F4	Sweep Reset
Half-Protrude	Erase Marks	F5	S/3D

6. Left-click the function to register.

7. Left click [Quit] in the setting box.

8. Close the menu.
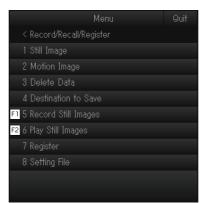
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8. DATA RECORD/RECALL

8.1 How to Specify Where to Save Still Images and Video Files

1. Open the menu.

2. Left-click [5 Record/Recall/Register]. This menu can also be shown by right-click-ing the screen to show the pop-up menu.

3. Left-click [4 Destination to Save] to show the Destination to Save window.

4. Left-click [Reference] on the Destination To Save window.

   Note: Disk capacity of the D drive is subject to change.

5. Specify the location where to save the still images and video files from the pull-down menu.

6. Left-click [OK].

7. Close the menu.

8.2   How to Save a Still Image

You can save the picture on the display as a still image. Each image requires an estimated memory space of 200kB as a minimum, however, this requirement changes with the image contents.

Note 1: The default function of the [1/F1] key is to save still images.

Note 2: A preview of the still image being saved appears on the display. The amount of time the preview appears can be changed. Contact a FURUNO agent or dealer for details.

Note 3: When there in not enough space on the drive to store more images (approx. 10% free space, or less), a warning message appears. Click the [Delete Data] function to show the [Delete Data] window (see section 8.8), then remove unnecessary files. Repeat the above procedure when the drive has sufficient free space to save still images.

8.2.1   How to save a still image from the menu

Note: For dual display configuration, select the monitor on which to capture the still image from the [Still Image] window. For how to open the [Still Image] window, see section 8.2.2.

1.   Open the menu.
2.   Left-click [5 Record/Recall/Register].
3.   Left-click [5 Record Still Image].
4.   To enter a comment, check [Add a Comment] on the [Still Image] window. A software keyboard appears. Enter your comment with the keyboard, then left-click [Enter].
     The picture at the moment the button is pushed is shown on the display for approx. four seconds. The still image data is saved at the location selected at section 8.1. Date and time are used for the name of the data automatically.

     • Still image: "yyyy_mm_dd_hh_mm_ss_comment*.jpg"
     • Setting data: "RECORD_yyyy_mm_dd_hh_mm_ss_comment*.dat"
     *: Shown if you entered the comment.

8.2.2   How to save a still image from the [Still Image] window

1.   Open the menu.
2.   Left-click [5 Record/Recall/Register].
3.   Left-click [1 Still Image] to show the [Still Image] window.

Drop-down list of monitors

Drop-down list of file names

The red button on the [Still Image] window functions to record a still image. Click the button to record.

4. Select the monitor on which to capture the still image from the monitor list.
    Note: The monitor list is operative when [1 2nd Monitor Setting] on the [Monitor Setting] menu (see page 9-12) is set to [Dual Display].
    1: main monitor, 2: sub monitor.

5. To add a comment to the still image, check [Add a Comment] checkbox.

6. Left-click the ⬤ button to save a still image.

7. If you checked [Add a Comment] at step 5, a software keyboard appears. Enter your comment with the keyboard, then left-click [Enter].
    The picture at the moment the button is pushed is shown on the display for approx. four seconds. The still image data is saved at the location selected at section 8.1. Date and time are used for the name of the data automatically.

    • Still image: "yyyy_mm_dd_hh_mm_ss_comment*.jpg"

    • Setting data: "RECORD_yyyy_mm_dd_hh_mm_ss_comment*.dat"

    *: Shown if you entered the comment.

8. Left-click [Quit] on the window to close the window.

8.3   How to Display a Saved Still Image

There are two ways to display saved still images.

• Display the latest still image
• Display a still image from the file name list

8.3.1   How to display the latest still image

1. Open the menu.
2. Left-click [5 Record/Recall/Register].
3. Left-click [6 Play Still Images].

Note: The window can be resized, and moved by drag and drop. Also, you can zoom in/out with the scrollwheel. Resize the window if the still image is not fully displayed.

4. Left-click [Quit] on the window to close the window.

Note: The default function of the [2/F2] key is to play the latest still image.

8.3.2 How to display a still image from the still image list

1. Open the menu.

2. Left-click [5 Record/Recall/Register].

3. Left-click [1 Still Image].

Drop-down list of monitors

Drop-down list of file names

4. Select a file from the list.

5. Click the [▶] button (green) in the window to display the selected still image. A maximum of eight still images can be displayed. When you display another image the oldest image is automatically erased.

6. Left-click [Quit] on the [Play Still Image] window to close the window.

7. Left-click [Quit] on the [Still Image] window to close the window.

8.4 How to Save Motion Images

An image shown on the display can be saved as a motion image.

Note: When saving motion images, it is recommended to save the images to an external hard drive, connected to the USB port on the Processor Unit.

1. Open the menu.

2. Left-click [5 Record/Recall/Register].

3. Left-click [2 Motion Image].

Drop-down list of monitors

Drop-down list of file names

4. If two monitors are used, select where to save the image.
   - 1: Main monitor
   - 2: Sub monitor

5. Left-click the [●] button (red) to start the saving.

6. To stop saving, click the [●] button (red) again. The file is saved to the location specified in section 8.1. The file name is automatically saved in the following format:
   yyyy_mm_dd_hh_mm_ss.avi
   Note: When the file size of the motion image is greater than 2GB, the image is saved in segments. Each segment is approx. 2GB in size. In this case the segment number appears after the "seconds" indication. For example, yyyy_mm_dd_hh_mm_ss_1.av; yyyy_mm_dd_hh_mm_ss_2.avi.

7. Left-click [Quit] on the [Motion Image] window to close the window.

Note 1: With factory default settings, the motion image window can be opened by pressing the **3/F3** key.

Note 2: When there in not enough space on the drive to store more images (approx. 10% free space, or less), a warning message appears. Click the [Delete Data] function to show the [Delete Data] window (see section 8.8), then remove unnecessary files. Repeat the above procedure when the drive has sufficient free space to save motion images.

8.5 How to Play Back Motion Images

You can play back motion images as follows:

1. Open the menu.
2. Left-click [5 Record/Recall/Register].
3. Left-click [2 Motion Image].

Drop-down list of monitors

Drop-down list of file names

4. Select the file to play back from the file list.
5. Left-click the [▶] button to start the playback.

Controls for stopping playback, fast forwarding and rewind are provided on the [Motion Image] window.

Stop playback

Fast forward

Rewind

6. Left-click [Quit] on the [Motion Image Playback] window to close the window.
7. Left-click [Quit] on the [Motion Image] window to close the window.

8.6   How to Save User Program Setting Data

Current setting data can be saved, and saved setting data (P1 to P10) can be loaded into the equipment. This allows you to use setting data that is useful for a specific task.

The setting data mentioned below is not saved if one or more of the settings for the **USER PROG** control is changed. See section 7.3.2 for how to program the **USER PROG** control.

1.   Open the menu.

2.   Left-click [5 Record/Recall/Register].

3.   Left-click [8 Setting File].

4.   Left-click [1 Save]. The file name, which appears in the [File Name] box, is automatically assigned as shown below.
     FSV75_yyyy_mm_dd_hh_mm_ss.ini

5.   Select where to save the setting data, from the drop-down list of destinations.

6.   Left-click the [Save] button. The progress bar advances as the saving progresses. After the saving is completed, the [Setting File] menu appears.

7.   Close the menu.

Note: When there in not enough space on the drive to store a settings file (approx. 500MB is required), a warning message appears. Click the [Delete Data] function to show the [Delete Data] window (see section 8.8), then remove unnecessary files. Repeat the above procedure when the drive has sufficient free space to save motion images.

8.7 How to Load User Program Data
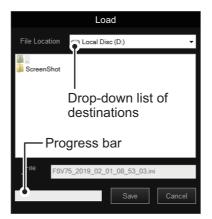
There are two methods you can use to load saved setting data:

1) Load the saved data for all settings (P1 to P10) at once
2) Load only the specified settings data

8.7.1 How to load data for all settings at once

This section shows you how to load all the setting information saved at section 8.6.

1. Open the menu.
2. Left-click [5 Record/Recall/Register].
3. Left-click [8 Setting File].
4. Left-click [2 Load] to show the [Load] window.

5. Select the file to load, from the destination list. The selected file appears in the [File Name] box.
6. Left-click the [Load] button.
   The progress bar shows the loading progress. The [Setting File] menu appears when the loading is completed.
7. Close the menu.

8.7.2 How to load data for settings individually

This section shows you how to load settings saved at section 8.6 individually. With this method, you can also copy one set of settings to a different setting (program) number.

1. Open the menu.
2. Left-click [5 Record/Recall/Register].
3. Left-click [8 Setting File].
4. Left-click [3 Load User PROG].

5. Select a file to load from the files list. The selected file's name appears in the [File Name] box.

When list is clicked

6.In the [Select User Program] section, left-click the [User Program to Load] list.

7.Left-click the setting number to load.

8.Left-click the [User Program to Set] list.

9.Left-click the setting number to load the settings.

10.Left-click the [Load] button.

The progress bar shows the loading progress. The [Setting File] menu appears when the loading is completed.

11. Close the menu.

8.8   How to Delete Files

You can delete unnecessary files (still images, motion images, setting data, etc.) as shown below.

1. Open the menu.

2. Left-click [5 Record/Recall/Register].

3. Left-click [3 Delete Data] to show the [Delete Data] window.

4. Select the file to delete. The selected file appears in the [File Name] box.

5. Left-click the [Delete] button. The message "Are you sure to delete?" appears.

6. Left-click the [OK] button.
    The file selected at step 4 is deleted.

7. Left-click the [Cancel] button to return to the [5 Record/Recall/Register] menu.

8. Close the menu.

8.9   How to Backup All Settings

You can backup all your menu settings (except language, IP address, date and time, oil replacement date, motor running time) with the following procedure.

1.   Open the menu.

2.   Left-click [5 Record/Recall/Register].

3.   Left-click [8 Setting File].

4.   Left-click [4 Save Ship's Original]. A confirmation message appears.

5.   Click [Yes] to show the [Save] window. The file name, which appears in the [File Name] box, is automatically assigned as shown below.
     FSV75_OriginalFile_yyyy_mm_dd_hh_mm_ss.ini

6.   Select where to save the setting data, from the drop-down list of destinations.

7.   Left-click the [Save] button. The progress bar advances as the saving progresses. After the saving is completed, the [Setting File] menu appears.
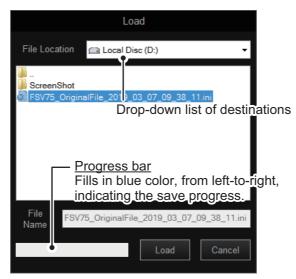
8.   Close the menu.

Note: The error message "Disk space insufficient. Delete unnecessary files." appears if the save destination does not have sufficient space (a minimum of 500MB is required). If this occurs, delete unnecessary files with the procedure outlined at section 8.8, then repeat the above procedure.

8.10 How to Load Backed-Up Settings

This section shows you how to load all the setting information saved at section 8.8.

1. Open the menu.
2. Left-click [5 Record/Recall/Register].
3. Left-click [8 Setting File].
4. Left-click [5 Load Ship's Original]. A confirmation message appears.
5. Click [Yes] to show the [Load] window.

6. Select the file to load, from the drop-down list of destinations. The selected file appears in the [File Name] box.
7. Left-click the [Load] button.
   The progress bar shows the loading progress.
8. When the backed-up data is loaded, a completion message appears. Restart the system to complete the procedure.

9. OTHER SETTINGS

This chapter describes the [Register], [Mark & Operation Support Tool], and [Installation Setting] menus.

9.1 [Register] Menu

The [Register] menu provides various programming functions.

9.1.1 How to open the [Register] menu

1. Press the **MENU/ESC** key to open the main menu.
2. Left-click [5 Record/Recall/Register].
3. Left-click [7 Register].

9.1.2 Menu description

[1 Register Display Mode]: Select the display mode to use. For details, see section 1.6.2.

[2 Assign User Program]: Program the **USER PROG** control according to fishing ground, fishing purpose, etc. See section 7.3.2.

[3 F-Key List]: Show the function assigned to each function key. See section 7.2.3.

[4 Clear F-Key Setting]: Erase programs assigned to the function keys. See section 7.2.4.

[5 Scan Range]: Presets the ranges to use with the **RANGE** control. The setting range is 50-2000 m. To set the ranges to use, left click [5 Scan Range] to display the window shown at the right. Click a detection range to show a checkmark (✓) to the left of the range. Only those detection ranges prefixed with a checkmark on this window are available with the **RANGE** control.
Note 1: A minimum of five ranges must be selected.
Note 2: The detection range currently in use is grayed out, and cannot be changed.

[6 Remote Key Setting]: Programs the keys of the optional remote controller. See section 7.4.

9.2 [Mark & Operation Support Tool] Menu

9.2.1 How to open the [Mark & Operation Support Tool] menu

1. Press the **MENU/ESC** key to open the main menu.
2. Left-click [0 Mark & Operation Support Tool].

For the [Target Lock] menu, see section 2.12.

9.2.2 [Erase Marks] menu

The [Erase Marks] menu erases event marks, fish marks, own ship position mark, and track.

Note: If [5 Monitor Setting] on the [Display Setting] menu (see page 9-12) is set to [Sub Display] or [OFF], all menu items on the [Erase Marks] menu are grayed out when the display mode is "3D".

1. On the [Mark & Operation Support Tool] menu, left-click [1 Erase Marks] to show the [Erase Marks] menu.

2. Left-click one of the following:
   • **[1 Erase All]**: Erases all event marks (1, 2), fish marks (1, 2). (These marks can also be erased by long-pressing the **DELETE MARK** key.)

- **[2 Event Mark 1]** - **[6 Own Ship Position Mark]**: Erases the oldest corresponding mark.

- **[7 Track]**: Erases approximately 10% of the oldest track.

3. For items other than [1 Erase All], left-click again to erase. Each click erases the oldest mark.

4. Close the menu.

Note: With factory default settings, function keys **5/F5** (event mark 1), **6/F6** (event mark 2) erase the oldest respective mark. Also, function key **4/F4** (erase all) erases all event and fish marks when pressed twice.
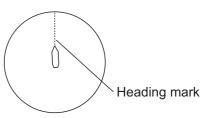
9.2.3 [Mark Display] menu

The [Mark Display] menu turns various marks on or off. To show this menu, open the [Mark & Operation Support Tool] menu, then select [2 Mark Display].
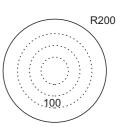
Heading mark, bearing scale, own ship tracks, data (temperature/depth) display on own ship track, net movement prediction (net move mark) and fish tracks require appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.
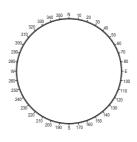
[1 Heading Mark]: The heading mark is a dashed line which indicates the heading in all presentation modes. It extends from own ship position to the outer edge of the display and appears at zero degrees in the head-up mode. Its orientation changes with ship's orientation in the north-up and course-up modes.

Heading mark

[2 Range Rings]: The range rings are the dotted line circles about own ship's on-screen position, and they provide an estimate of the range to a target. The number of range rings displayed depends on the menu setting for [3 Range Ring Interval] on page 2 of the [Mark Color & Size] menu. See section 9.2.4 for details.

9-3

[3 Bearing Scale]: The bearing scale is the concentric solid circle at the edge of the display, and provides an estimate of the bearing to a target. The scale can be turned OFF or ON and its degree of detail can be selected to [Coarse] or [Fine]. The [Coarse] setting provides a scale graduation every 10 degrees, with no numerical degree indication. The [Fine] setting provides a scale graduation every 1 degree, with numerical degree indication every 10 degrees.

[4 Plot Own Ship Track]: Traces ship's movement with a solid line. When the capacity of the track memory is exceeded, the earliest track is automatically erased to trace new track. Requires speed and course data.
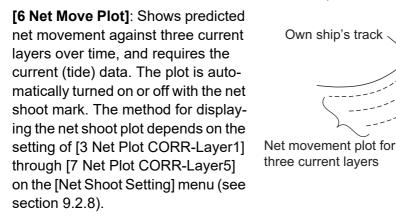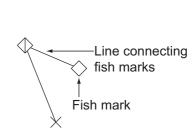
[5 Data On Track]: Shows depth or water temperature on the ship's track. Water temperature sensor required to show water temperature.

Track

120

124 ← Depth (or water temperature)

125

[6 Net Move Plot]: Shows predicted net movement against three current layers over time, and requires the current (tide) data. The plot is automatically turned on or off with the net shoot mark. The method for displaying the net shoot plot depends on the setting of [3 Net Plot CORR-Layer1] through [7 Net Plot CORR-Layer5] on the [Net Shoot Setting] menu (see section 9.2.8).

Own ship's track

Net movement plot for three current layers

[7 Fish Mark Connect]: You may connect fish marks with a line to show the order in which they were entered.

Line connecting fish marks

Fish mark

For Fish Mark 2

[8 Target Vector]: This is a line extending from the target lock mark, and it shows speed and direction of tracked school of fish. See the illustration at right for appearance.

Target movement vector

Target lock mark

Fish track mark

[9 Fish Track Plot]: Traces target movement when the target lock is active. Requires speed and course data.

[1 Histogram]: Shows signal strength distribution for the school(s) of fish marked with an estimate mark on the display.

[2 TD Position Mark]: The TD position mark indicates transducer position. The mark can be turned on or off. See section 1.4.3.

9.2.4   [Mark Color & Size] menu

The [Mark Color & Size] menu sets the color and size of marks. To show this menu, open the [Mark & Operation Support Tool] menu, then select [3 Mark Color & Size].

[1 Mark Color]: Select the color for the event mark, fish mark and fish estimate mark. The colors available are white, light blue, blue, yellow, purple, or green. Color cannot be assigned to individual categories of marks.

[2 Trackball Mark]: Sets the size of the trackball mark, normal or large.

[3 Target Lock Mark]: Sets the size of the target lock mark, normal, large, or small.

[4 Target Vector]: You may display the target vector in short, normal, or long lengths. Set "long" for slow moving target; "short" for faster moving target.

[5 Event Mark]: Sets the size of the event mark, normal, large, or small.

[6 Event Mark]: Sets the size of the fish mark, normal, large, or small.

[7 Own Ship Position Mark]: Sets the size of the own ship position mark, normal, large, or small.

[8 Own Ship Mark]: Sets the size of the own ship mark, normal, large, or actual. For actual size, the size of the own ship mark changes with the detection range.

[9 Net Shoot Mark]: Sets the size of the net shoot mark, normal, large, or small.

[1 Estimate on Scan]: Sets the size of the fish estimate mark on the display. The choices are normal or large.

[2 Current Vector]: Sets the length for the current vectors. The choices are normal, long, normal/thick, or long/thick.

[3 Range Ring Interval]: Sets the range ring interval, among 1/2R, 1/4R, and Auto.
- **[1/2R]**: Range ring is displayed at a distance of 1/2 of the detection range.
- **[1/4R]**: Range ring is displayed at a distance of 1/4 of the detection range.
- **[Auto]**: The number of range rings changes from three to five depending on the detection range. For example, when the detection range is 500 m, five range rings will appear with 100 m between each ring.

[4 Bearing Scale]: Sets the size of the bearing scale, normal or large.

[5 Own Ship's Track Plot]: Sets the amount of track to display, 5R, 10R, 20R, 40R (R = Range).

9.2.5   [Mark & Data] menu

The [Mark & Data] menu turns character information on or off. To show this menu, open the [Mark & Operation Support Tool] menu, then select [4 Mark & Data].

[1 Range/Bearing Display]: Turns the range and bearing data on or off.

[2 Cursor Position]: Turns the cursor position (latitude and longitude) display on or off. If position data is lost, the cursor position indication becomes red.

Note: [2 Cursor Position] and [5 LAT/LON] in the [Installation] menu ([9 Installation]→[6 External Data]→[5 LAT/LON]) must be turned on to show cursor position.

[3 Event Mark Display]: Selects how to display event mark data. The choices are [32 CMPS] (32 compass points), [360°True] (True bearing), [360°] (360° Relative), or [±180°] (180° Relative).

[4 Mark Display Style]: Selects how to display marks other than the event mark. The choices are [32 CMPS] (32 compass points), [360°True] (True bearing), [360°] (360° Relative), or [±180°] (180° Relative).

[5 Course Display]: Selects how to display course. The choices are [32 CMPS] (32 compass points), [360°True] (True bearing), [360°] (360° Relative), or [±180°] (180° Relative).

[6 Current Data Display]: Selects how to display tidal current data. The choices are [32 CMPS] (32 compass points), [360°True] (True bearing), [360°] (360° Relative), and [±180°] (180° Relative).

[7 Unit of Water TEMP]: Selects water temperature unit, °C (Celsius), or °F (Fahrenheit).

[8 Water TEMP Range]: Selects the time range to show water temperature, 20 Minute, 1 Hour, 6 Hours, 12 Hours, or 24 Hours.

[9 Fishing Area]: No use.

9.2.6 **[Current VEC & Wind] menu**

The [Current VEC & Wind] menu sets up how to display tidal current and wind data. To show this menu, open the [Mark & Operation Support Tool] menu, then select [5 Current VEC & Wind].

Current and wind data display require appropriate data input. For details, see "DATA INPUT REQUIREMENTS" on page AP-12.
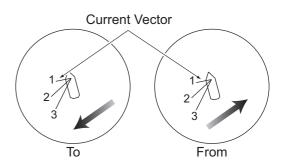
[1 Current Data]: Selects how to display current data, absolute or in relation to current layers (1, 2, 3, 4 or 5).

[2 On Own Ship Mark]: Shows or hides the current mark shown on the own ship mark.

[3 On Ship Position Mark]: Shows or hides the current mark on the own ship position mark.

[4 On Net Shoot Mark]: Shows or hides the current mark shown on the net shoot mark.

[5 Current Flow Dir]: Selects from what direction to display current data. [FROM] shows from what direction the current is flowing; [TO] shows the direction the current is heading. Requires connection of a current indicator.

9-7
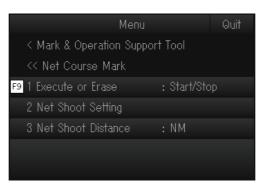
[6 Wind]: Selects wind display; [OFF], relative wind data or true wind data.

[7 Select Water Current]: Select the water current layer to display. To select the current layer to show, left click [7 Select Water Current]. The water current layer setting box appears. Select (checkmark) the layer(s) to show. You can display a maximum of three layers.

9.2.7   [Net Course Mark] menu

The [Net Course Mark] menu sets up net shoot parameters. To show this menu, open the [Mark & Operation Support Tool] menu, then select [6 Net Course Mark].

[1 Execute or Erase]: Sets the net shoot mark. See section 2.21.

[2 Net Shoot Setting]: Sets the net diameter, and net plotting correction values.

- **[1 Net Diameter]**: Sets net diameter in increments of 10 meters. Setting range is 200 m to 1000 m.
- **[2 Tilt Interlock]**: Turns on/off interlocking of diameter of net course mark with tilt angle.
- **[3 Net Plot CORR-Layer1]** - [**7 Net Plot CORR-Layer5**]: The movement of the net during net shooting is plotted using water current speed and direction fed from a current indicator. The current indicator feeds that data for three depths (layers), thus net movement will be different at each layer. Determine degree of difference among layers considering net, sea conditions, etc. If 50% is set, for example, the net movement plot mark moves at speed of 50% of water current speed.

[3 Net Shoot Distance]: Sets the unit of measurement for net shoot distance, nautical miles, meters, or feet.

9.2.8 [Net SONDE Setting] menu

The [Net SONDE Setting] menu sets up the net sonde. To show this menu, open the [Mark & Operation Support Tool] menu, then select [7 Net SONDE Setting].

The settings for [1 Number of XMTR], [2 XMTR Distance] and [3 Net Length] are inter-related and the number of sonde/distance between transmitters is restricted by the net length. For this reason it is recommended to use the following order when setting up your transmitters (sondes). Set [3 Net Length] → set [1 Number of XMTR] → [2 XMTR Distance]. If your net has more transmitters than available on the menu, reduce at least one of the settings at [2 XMTR Distance] to [0m], then set the correct number of transmitters at [1 Number of XMTR].

[1 Number of XMTR]: Sets the number of transmitter units used, from 0 to 10. When the total value of [2 XMTR Distance] is smaller than the setting value of [Net Length], max. 10 transmitter units can be used.

[2 XMTR Distance]: Sets the distance between transmitters. Select this item then push the left-click button to set the distances. The setting range is 0 to 1000 m (depending on the setting at [3 Net Length]). This setting cannot be changed while nets are out.

[3 Net Length]: Sets net length in increments of 100 m. Setting range is 1200 m to 3000 m.

[4 Depth Display]: Selects which sonde depth data to show. Select this item and push the left-click button to select net sondes. The check mark shows current selection (Max. 3).

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9.2.9 [Alarm & Audio] menu

The [Audio & Alarm] menu sets the fish alarm and the audio bearing mark sector. To show this menu, open the [Mark & Operation Support Tool] menu, then select [9 Audio & Alarm].

```
                Menu            Quit
  < Mark & Operation Support Tool
  << Alarm & Audio
  1 Fish Alarm            : OFF
  2 Alarm Level           :
  3 Alarm Zone
  4 Ship Speed Alarm
  5 Audio                 : OFF
  6 Audio Gain            : 5
  7 Audio Sector          : OFF
```

[1 Fish Alarm]: Turns the fish alarm function on or off. See section 2.15.1.

[2 Alarm Level]: Sets the minimum echo strength (echo color) which triggers the fish alarm. See section 2.15.2.

[3 Alarm Zone]:Sets fish alarm zone. See section 2.15.1.

[4 Ship Speed Alarm]: The default setting is [ON]. The alarm is released if ship's speed exceeds the following speeds:
• Transducer in lowered position: 18 kn
• Transducer in raised position: 15 kn

[5 Audio]: Turns the audio function on or off. See section 2.14.1.

[6 Audio Gain]: Adjusts the volume of the audio alarm. See section 2.14.4.

[7 Audio Sector]: Selects the audio sector width for use with audio function. See section 2.14.2.

9.3 [Installation Setting] Menu

9.3.1 How to open the [Installation Setting] menu

1. Press the **MENU/ESC** key to open the main menu.

2. Left-click [9 Installation Setting].

3. Left-click [OK].

9.3.2 [Display Setting] menu

The [Display Setting] menu sets various display-related items according to operator's preference. To display the menu, open the [Installation Setting] menu, then select [1 Display Setting].

*: For the service technician (no use)

[1 Orientation Mode]: Selects the orientation mode, among Head-up, North-up, Course-up.

[2 Echo Display Area]: Selects the echo display mode, [Within Range] or [Full Screen].

[3 Full Screen Area]: Used when [2 Echo Display Area] is set to [Full Screen]. Expands the detection range and shows echoes outside the normal display area. Options are [1.3R], [1.6R], [1.9R] (R = ratio of increase in relation to currently selected range).

[5 Monitor Setting]: Settings for the monitor. Left-click this item to show its menu.

Menu	Quit
< Installation Setting	
<< Display Setting	
<<< Monitor Setting	
1 2nd Monitor Setting	: Sub Display

[1 2nd Monitor Setting]: When two monitors are used, select what to show on the sub monitor. Restart the system after changing this setting.
[OFF]: Select for single monitor installation.
[Dual Display]: Main and sub monitors show different pictures.
[Sub Display]: The sub display shows the same picture as the main monitor.

Display mode	[Dual Display]		[Sub Display]	
	Main monitor	Sub monitor	Main monitor	Sub monitor
S	Slant	Slant	Slant	Slant
VCS	Vertical slant	Vertical slant	Vertical slant	Vertical slant
S & FF	Slant	Fish finder	Slant/Fish finder	Slant/Fish finder
VCS & FF	Vertical slant	Fish finder	Vertical slant/ Fish finder	Vertical slant/ Fish finder
3D	Slant	3D	3D/Slant (small)	3D/Slant (small)
3D & S	Slant	3D	Slant/3D	Slant/3D
3D & FF	Slant/Fish finder	3D	Not used.	

[6 Timer Display]: Shows or hides the timer display, which appears at the bottom left corner of the display. You can change the location of the timer display by drag and drop. To use the timer display, do the following.

1) Left-click the [▶] button on the timer window to start measuring time. The label on the button changes to [●] (stop).
2) To stop measuring time, left-click the [●] button. The label on the button changes to [▶].
3) To restart measurement from zero, left click the [◀] button (reset). The display shows "00:00:00".

How to operate the timer with a function key

Timer operation can also be controlled with a function key. For how to program a function key see section 7.2.2.

To control timer start and stop from the timer window, do as follows:
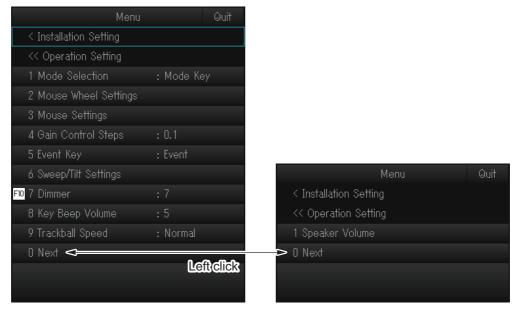
1) With the timer stopped, press the function key assigned to timer operation. Time measurement starts, and the label on the button changes to [●].
2) Press the same function key pressed at step 1. Time measurement stops, and the label on the button changes to [▶].
3) To restart measurement from the beginning, press the function key operated at step 1 twice within one second. The display shows "00:00:00".

[7 Data Box Display]: Shows or hides the Numeric/Graphic display. The display can also be shown or hidden by right-click the display area to show the pop-up menu. See section 6.1.

[8 Date Display]: Shows or hides the date display which appears at the bottom of the Numeric/Graphic display

9.3.3 [Operation Setting] menu

The [Operation Setting] menu sets various operation-related items according to operator's preference. To display the menu, open the [Installation Setting] menu, then select [2 Operation Setting].

[1 Mode Selection]: Determines how display modes are selected.

> [**Mode Key**]: Display modes selected with **DISP MODE** key.
> [**Pull Down Menu**]: Display modes selected with the pull-down menu.

[2 Wheel Setting]: Sets items related to scrollwheel operation. Left-click this item to show its setting menu.

- • [**1 Wheel**]: Sets setting value (detection range, gain, turn angle, user program number) increment direction.
  [**Normal**]: Upward scrolling decreases value; downward scrolling increases value.
  [**Reverse**]: Reverse results of [Normal].

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- [**2 S Mode**]: Sets the function to use when the scrollwheel is spun. Options are [Tilt Angle], [Range], [Gain], [Sweep].
- [**3 Circular Cursor**]: Adjusts the amount of variation of the circle cursor (1 - 9).
- [**4 Circular Cursor Diameter**]: Sets the default diameter of the circle cursor (10 - 2000 m).

[**3 Mouse Settings**]: Sets how to use the right and left buttons on the mouse. Left-click this item to show its setting menu.

- [**1 Right Click**]: Select to use the right button to enter marks (fish mark 1, fish mark 2, event mark 1, event mark 2, fish estimate mark 1, fish estimate mark 2).
- [**2 Left Click**]: Select to use the left button to enter marks (fish mark 1, fish mark 2, event mark 1, event mark 2, fish estimate mark 1, fish estimate mark 2).

[**4 Gain Control Steps**]: Sets the amount of change with each interval on the **GAIN** control.

- [**0.1**]: Value changes in increments of 0.1.
- [**0.2**]: Value changes in increments of 0.2.
- [**0.5**]: Value changes in increments of 0.5.

[**5 Event Key**]: Sets the key to use to enter an own ship position mark, [Event] or [Shoot].

[**6 Sweep Tilt Settings**]: Sets sector and tilt angle. Select this item to show its setting menu.

- [**1 Auto Tilt Range**]: Selects the auto tilt range, Variable ([±2° to 10°][1], [±4° to 16°][1], [±6° to 20°][1]) or Fixed ([±2°][2], [±4°][2], [±8°][2], [±16°][2]).

  [1]: Tilt changes according to range (see section 2.4.2).

  [2]: Tilt is fixed, regardless of range.
- [**2 Auto Sweep Range**]: Selects the auto sweep range, [±30°], [±60°], [±90°], [±120°]
- [**3 Auto Sweep Speed**]: Selects the auto sweep speed. The choices are [Setting1] to [Setting5]. The larger the setting number the faster the sweep speed.
- [**4 Sweep Angle Interval**]: Set the angle intervals for manual operation, [1°], [3°], [5°], [7°], [10°].

[7 Dimmer]: Adjust the illumination of the control unit operation panel, The setting range is 0-15.

[8 Key Beep Volume]: Sets the volume of the beep which sounds for key operation. The setting range is 0-7. "0" turns off the key beep.

[9 Trackball Speed]: Sets the tracking speed of the trackball, [Slow], [Normal], or [Fast].

[**1 Speaker Volume**]: Sets the volume of the internal speaker. Drag the volume bar up to increase, or down to decrease. To silence the audio, click the check-box at [Mute] to show a check-mark.

9.3.4 [Motion Sensor] menu

The [Motion Sensor] menu provides for correction of ship's pitching and rolling. To display the menu, open the [Installation Setting] menu, then select [3 Motion Sensor].

[**1 Pitch Angle Correction**]: Offsets the pitch angle at the motion sensor.

[**2 Roll Angle Correction**]: Offsets the roll angle at the motion sensor.

9.3.5 [Hull Unit Setting] menu

The [Hull Unit Setting] menu sets items related to the hull unit. To display the menu, open the [Installation Setting] menu, then select [4 Hull Unit Setting].

See the installation manual for details.

[**2 Middle Key Setting**]: Sets the operation function of the "mid-protrusion" key. [Fixed Position] stops the transducer at mid protrusion. [Any Position] stops the transducer when the key is released. See section 1.4.

9.3.6 [Interface Setting] menu

The [Interface Setting] menu sets the baud rate to use with the NMEA ports. To display the menu, open the [Installation Setting] menu, then select [5 Interface Setting].

Menu	Quit
< Installation Setting	
<< Interface Setting	
1 NMEA1 Baud Rate	: 4800bps
2 NMEA2 Baud Rate	: 4800bps
3 NMEA3 Baud Rate	: 4800bps
4 NMEA4 Baud Rate	: 4800bps
5 NMEA5 Baud Rate	: 4800bps

[**1 NMEA1 Baud Rate**] to [**5 NMEA5 Baud Rate**]: Set the baud rate for each NMEA port. The choices are [4800bps], [9600bps], [19200bps], [38400bps].

9.3.7 [External Data] menu

The [External Data] menu sets up the data received from external equipment. To display the menu, open the [Installation Setting] menu, then select [6 External Data].

Menu	Quit
< Installation Setting	
<< External Data	
1 Date & Time	: NMEA
2 Heading	: AD10
3 Speed & Course	: NMEA(SOG)
4 Speed Sensor	: GPS/DR
5 LAT/LON	: NMEA
6 Water Depth	: NMEA
7 Water Temperature	: NMEA
8 Water Current	: NMEA
9 Wind	: NMEA
0 Next	

Left click

Menu	Quit
< Installation Setting	
<< External Data	
1 Net Depth	: NMEA
0 Next	

[**1 Date & Time**]: Sets the input format for the date and time data, [Disable] or [NMEA].
[**2 Heading**]: Sets the input format for the heading data [Disable], [AD10], or [NMEA].
[**3 Speed & Course**]: Set the input format for the speed and course data, [Disable], [NMEA (SOG)], or [NMEA (STW)].
[**4 Speed Sensor**]: Sets the type of device to use as the speed and course data source, [Disable], [GPS/DR], or [DOPPLER/DR].
[**5 LAT/LON**]: Sets the input format for the position data, [Disable] or [NMEA].
[**6 Water Depth**]: Sets the input format for the water depth data, [Disable] or [NMEA].
[**7 Water TEMP**]: Sets the input format for the water temperature data, [Disable] or [NMEA].
[**8 Water Current**]: Sets the input format for the water current data, [Disable] or [NMEA].
[**9 Wind**]: Sets the input format for the wind data, [Disable] or [NMEA].
[**1 Net Depth**]: Sets the input format for the net depth data, [Disable] or [NMEA].

9.3.8   [Own Ship Data] menu

The [Own Ship Data] menu sets the dimensions of own ship and the transducer position. To display the menu, open the [Installation Setting] menu, then select [7 Own Ship Data]. For details regarding this menu and how to use it, see the installation manual.

9.3.9   [Initialization] menu

The [Initialization] menu provides the functions shown in the figure below. To display the menu, open the [Installation Setting] menu, then select [8 Initialization]. When [2 Item Attribution] (see below) is set to [Non-Changeable], a confirmation message appears. Left-click [OK] to access the menu.
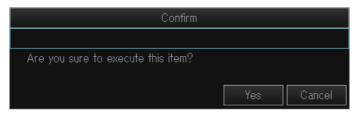
[**1 Language**]: Sets the language to use.

[**2 Item Attribution**]: When a protected menu item (in red) is clicked, you are asked if you want to display a confirmation message to enable settings changes. However, the menu items listed below show the confirmation message regardless of this setting.

- [Installation Setting] menu
- [4 Ship Speed Alarm] in the [Alarm & Audio] menu
- [3 Reset User Program] menu (in this menu)
- [4 Reset System] menu (in this menu)

[**3 Reset User Program**]: Restores all user programs to their default settings. When this item is clicked, the confirmation message shown below appears. Left-click the [Yes] button to restore the default settings.

[**4 Reset System**]: Restores all settings (except language, IP address, date and time, oil replacement date, motor running time) to default settings. When this item is clicked, the confirmation message shown below appears. Left-click the [Yes] button, the message "Press the power key to restart" appears. Restart the power to reset the system.

Note: When the system is reset, the default transducer position is restored, and the message "Register the transducer position?" appears. Enter the transducer position referring to the installation manual.

10. MAINTENANCE

This chapter provides maintenance and troubleshooting procedures for the operator.

⚠ WARNING	NOTICE
ELECTRICAL SHOCK HAZARD **Do not open the equipment.** This equipment uses high voltage that can cause electrical shock. Only qualified persons are allowed to work inside the equipment.	**Do not apply paint, anti-corrosive sealant or contact spray to plastic parts or equipment coating.** Those items contain products that can damage plastic parts and equipment coating.

10.1 Preventative Maintenance

Regular maintenance is important for keeping the equipment in good working order. Check the following points on a regular basis.

- Check the cables for wear-and-tear and damage.
- Check the connectors are all securely fastened and free of corrosion.
- Check the grounding terminal for corrosion and damage. Also check that the equipment is correctly grounded.
- Approximately once per year, have a qualified technician check that the hull unit brake is working (see section 10.11.3).

Cleaning the equipment cabinet

Dust or dirt can be removed from the equipment with a soft, dry cloth.

Do not use chemical cleaners to clean the equipment, they can remove paint and markings.

10.2 How to Replace Fuses

> ⚠ **WARNING**
>
> **Use the proper fuse.**
>
> Use of the wrong fuse can cause
> fire or damage the equipment.

The processor unit, transceiver unit and hull unit carry fuses that protect the system from overvoltage and equipment fault. If the power cannot be applied, check the following.

• Check the fuse in the processor unit.

• Check the circuit breaker in the transceiver unit. (The breaker is behind the lid at the front-right bottom corner of the unit.)

Find the cause before replacing a fuse. If the fuse blows again after replacement, contact your dealer for advice.

Unit	Type	Code No.	Remarks
Processor unit (Power cable)	FGBO-A 125V 15A PBF	000-155-827-10	For 12V DC × 1
	FGBO-A 125V 7A PBF	000-164-965-10	For 24V DC × 1
Transceiver unit (behind front lid)	FGBO-A 250V 5A PBF	000-155-840-10	For 100/110/115/ 220/230V AC × 1
Transceiver unit* (inside the unit)	FGMB-A 250V 4A PBF	000-157-569-10	For B voltage × 2
	FGMB-A 250V 5A PBF	000-157-570-10	For DC voltage × 2
	D52-8A:CULM	000-178-350-11	For B voltage × 1
Hull unit*	FGMB-A 250V 1A PBF	000-157-496-10	For brake output × 2
	FGMB-A 250V 2A PBF	000-157-497-10	For HCTL board 26V DC × 1
	FGMB-A 250V 5A PBF	000-157-570-10	For HCTL board 42V DC × 1

*: These fuses are located inside the equipment and may contain high voltage. Under no circumstances should these fuses be replaced by the user.

10.3 Battery on the Motherboard

The battery on the motherboard in the processor unit backs up data. When the voltage is too low, time and date may not display correctly. However, if the ZDA sentence (time and date data) is input from an external source, time and date are displayed according to the received data.

Name	Type	Code No.	Life
BATTERY KIT	BATTERY KIT-FJ	000-196-791-10	10 years

Note 1: When the voltage is 2.6V or less, the error code 322 appears. Have a qualified technician replace the battery.

Note 2: Dispose of the battery in accordance with local regulations. Tape the + and - terminals of the battery before disposal to prevent short circuit, which could cause a fire.

10.4 How to Change the Sonar Oil
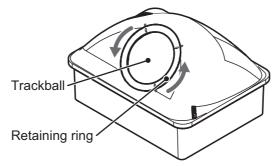
When the sonar oil is almost due for replacement, a reminder message appears on-screen after startup for approximately 10 seconds. If this message appears, contact your local dealer to arrange for oil replacement.

Name	Type	Code No.	Remarks
Gear Oil	SHC624	000-196-208-10	18.9 L
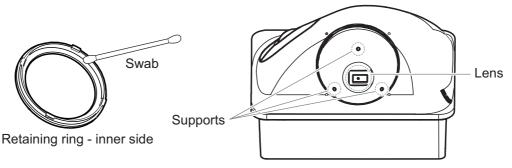
10.5 Trackball Maintenance

If the cursor moves abnormally, clean the trackball and inside the trackball housing (including the lens) as shown below:

1. Turn the retaining ring on the trackball module in the direction of the arrows (see figure below) to unlock it, then remove the retaining ring.

Trackball

Retaining ring

2. Use cellophane tape to remove the trackball from the trackball housing.
   Place the trackball and the retaining ring on a clean, soft cloth laid on a flat surface.

3. Clean the ball with a damp, soft cloth, then use a dry, lint-free cloth to carefully wipe the ball dry.

4. Use a swab, moistened with water, to carefully clean the inside of the retaining ring, the inside of the trackball housing, the supports and the lens. Change the swab regularly so that dirt and dust build-up is easily removed. Use a dry swab to wipe away moisture.

Swab

Retaining ring - inner side

Supports

Lens

Trackball housing

5. Re-set the ball and retaining ring. Be sure the retaining ring is not inserted reversely.

10.6   Troubleshooting
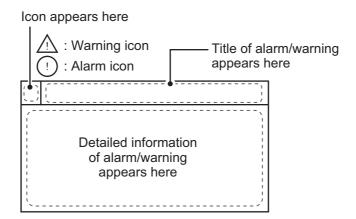
The table below provides common symptoms of equipment troubles and the means to rectify them. If the problem cannot be solved with the information supplied in this manual, consult your local dealer for service.

Troubleshooting

Symptom	Check, remedy
Cannot turn on power	• Check cables between transceiver unit, processor unit and monitor unit. • Check ship's mains. • Have a qualified technician check the fuses inside the transceiver unit.
Cannot turn off power	• Check cables between transceiver unit and processor unit. • Press and hold the power key for approximately seven seconds to force-shut-down the equipment.
Cannot operate the equipment	• Check connections between control unit and processor unit.
Strange noise from hull unit	• Gears may require re-greasing. See section 10.11.
Bottom echo becomes irregular	• Rough seas. Distance to the bottom changes due to rolling and pitching. • Long range selected. Transmission period is longer so ship's pitching and rolling are apt to affect detection of echo.
Weak echoes	• Output power set to minimum. Set power to maximum from main menu → [1 TX/RX Setting] → [3 Transmission Power]. • Adjust the gain with the **GAIN** knob. See section 1.8. • If either near echoes or far echoes only are weak, adjust the [Near Gain] or [Far Gain] as appropriate. See section 2.7.2.
Somewhat strange color	• Brilliance setting too low. Increase the monitor brightness.
Picture contains noise	• Equipment not grounded properly. Check equipment ground. • Power cable is too close to the signal cable. Relocate power cable or signal cable. • Debris may be on sea surface. Reject unwanted noise with the interference rejector on the [4 Picture Setting] menu or gain offset on the [3 Display Setting] menu.
Alarm releases no audio	• If settings at main menu → [9 Installation Setting] → [OK] → [1 Display Setting] → [2 Echo Display Area] are changed, on rare occasions the alarm is also silenced. Re-set the alarm parameters in this case.

10.7   Alarms and Warnings

When an alarm/warning condition occurs, the system release an audible alert (buzzer) and the alarm window appears (flashing). The alarm (or warning) icon appears in the window with a message and basic information. Warnings appear in red color, Alarms appear in yellow.

Icon appears here

⚠ : Warning icon

! : Alarm icon

Title of alarm/warning appears here

Detailed information of alarm/warning appears here

The table below shows the messages which may appear on the display, along with their level (alarm/warning), meaning, remedy and how the window behaves after the **R/B AUDIO** key is pressed.

All warning messages are accompanied by a buzzer, which you may silence with the **R/B AUDIO** key. The table below refers to this process as "Silence the buzzer."

Message	Level	Meaning, Remedy
Power supply		
<<OVERVOLTAGE!! >>	Warning	**Meaning:** The voltage supplied to the transceiver unit is excessive. Transmission is stopped if the equipment is transmitting, to protect the transducer and transmitter power section from damage. **Remedy:** Silence the buzzer. Retract the transducer and turn off the power. Consult your local dealer for service. **Behavior:** The window stops flashing but remains on-screen until the cause is removed or rectified.
Transceiver unit		
<<ELECTRIC CHARGE!! >>	Warning	**Meaning:** +B voltage of capacitors in the transceiver unit have not charged to predetermined voltage within the specified time. **Remedy:** Silence the buzzer. Consult your local dealer for service. **Behavior:** The window stops flashing but remains on-screen until the cause is removed or rectified.

Message	Level	Meaning, Remedy
<<NO RESPONSE FROM TRANSCEIVER UNIT!! >>	Warning	**Meaning:** There was no reply from the transceiver unit. **Remedy:** Silence the buzzer. Turn the power off, then on again, or turn the transceiver power off from the breaker. **Behavior:** The window stops flashing but remains on-screen until the cause is removed or rectified.
Hull unit, transceiver unit		
<<TD IS A HALT CONDITION!!>>	Warning	**Meaning:** The hull unit was stopped from the emergency stop button, or the ratchet was removed from the unit. The transducer is in emergency stop while this warning is active. **Remedy:** Silence the buzzer. Check the emergency stop button and ratchet. The cause must be rectified before you can move the transducer. **Behavior:** The window stops flashing but remains on-screen until the cause is removed or rectified.
<<TD RECOVERED THE HALT CONDITION>>	Warning	**Meaning:** There hull unit emergency stop is removed. **Remedy:** Silence the buzzer. **Behavior:** The window disappears.
<<TRANSDUCER NOT RETRACTED!! >>	Warning	**Meaning:** The transducer is not raised within 16 seconds (800 mm stroke) or 22 seconds (1100 mm stroke) after pressing the ↑ key. The LED keys next to the keys light up when this warning occurs. **Remedy:** Silence the buzzer. The cause may be tangled nets, bent shaft or a faulty raise unit. Consult your local dealer for service. **Behavior:** The window stops flashing but remains on-screen until the cause is removed or rectified.
<<OVER TEMPERATURE!! >>	Warning	**Meaning:** The transducer temperature is excessively high. **Remedy:** Silence the buzzer. Raise the transducer, then turn off the system power. **Behavior:** The window stops flashing but remains on-screen until the cause is removed or rectified.
<< TD WRONG POSITION ALARM!! >>	Alarm	**Meaning:** Transducer has stopped at an incorrect or unwanted position. **Remedy:** Press ↑ to return the transducer to normal position, then silence the buzzer. **Behavior:** The window stops flashing but remains on-screen until the cause is removed or rectified.
<< MOTOR CONTROL MALFUNCTION ALARM!! >>	Alarm	**Meaning:** The motor controller in the hull unit has malfunctioned. **Remedy:** Silence the buzzer. **Behavior:** The window disappears.

Message	Level	Meaning, Remedy
Processor unit		
<< SHIP SPD ALARM!! >>	Alarm	**Meaning:** Ship's speed exceeded the threshold speed (see section 9.2.9) when the transducer is extended. **Remedy:** Silence the buzzer. Lower the ship's speed. **Behavior:** The window disappears.
	Alarm	**Meaning:** Ship's speed exceeded the threshold speed (see section 9.2.9) when the transducer is being raised/lowered. **Remedy:** Silence the buzzer. Lower the ship's speed. **Behavior:** The window disappears.

Alarm and warning priorities

When multiple warnings occur at the same time, the warning with the highest priority is displayed. The order of priority is as follows:

Priority	Message	Remarks
1	<<TD IS A HALT CONDITION!!>>	Remains on-screen until the cause is removed or rectified.
2	<<TRANSDUCER NOT RETRACTED!! >>*	Remains on-screen until the cause is removed or rectified.
3	<<OVERVOLTAGE!! >>	
4	<<OVER TEMPERATURE!! >>	
5	<<ELECTRIC CHARGE!! >>*	Remains on-screen until the cause is removed or rectified.
6	<<NO RESPONSE FROM TRANSCEIVER UNIT!! >>	

*: These messages are not erased even if an alarm/warning of higher priority occurs.

10.8 Error Codes

The equipment displays a (blinking) three-digit error code at the bottom of the display in yellow color when it detects internal trouble. In case of multiple error, error codes appear in numerical order and the maximum number of error codes is five. For any error code, report error code number to your dealer.

10.9 Status Messages

Status messages appear at the screen center to alert the operator. These are as below.

Status message	Meaning
TX Off	Transmission turned off from the menu. (main menu → [8 Test] → [9 Transmission].
Unregistered	The transducer position is not registered and cannot be displayed on-screen. Referring to the installation manual, register the transducer position.
Raise/Lower Test*	Raise/lower command received from the control unit in normal operation, to manually test raise/lower switch in hull unit. Raise/lower keys on the control unit are inoperative during the hull unit test.
Manually Testing Scan	Scan/tilt command received from the control unit in normal operation, to manually test scan/tilt. **SCAN** and **TILT** controls on the control unit are inoperative during the hull unit test.

*Not displayed when TX is OFF.

10.10 Tests

A comprehensive diagnostic facility is provided for testing the equipment. If you feel the equipment is not working properly, conduct the test to find the cause.

If NG (No Good) appears in the test results for any test, contact your dealer for advice.

Note: Check that the system is correctly connected before doing any test.

10.10.1 How to Use the test menu

1. Open the menu.
2. Select [8 Test], then left-click.
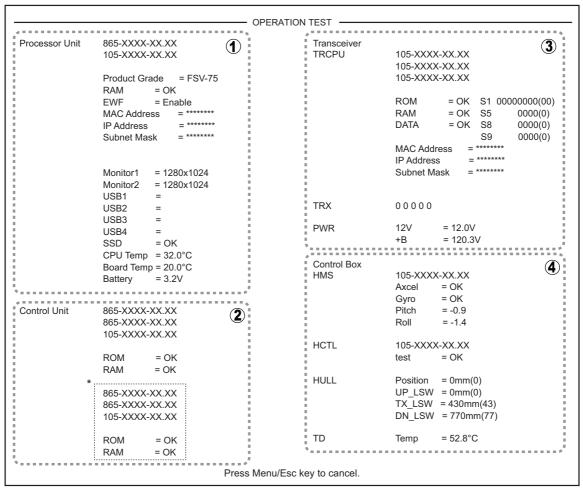
*: For qualified technicians only.

Note: If you are using [9 Transmission] to determine a noise source, be sure to set it back to [ON] after you have found the noise source. The menu items [ON(No Charge)] and [ON(No Alarm)] should not be selected by the operator.

10.10.2 Operation test

The operation test check the operational status of each unit in the system. To conduct this test, select [1 Operation Test] from the [Test] menu.

Press the **MENU/ESC** key to close the results.

```
──────────────────────── OPERATION TEST ────────────────────────

 Processor Unit    865-XXXX-XX.XX       ①    Transceiver                             ③
                   105-XXXX-XX.XX             TRCPU        105-XXXX-XX.XX
                                                           105-XXXX-XX.XX
                   Product Grade  = FSV-75                 105-XXXX-XX.XX
                   RAM        = OK
                   EWF        = Enable                     ROM     = OK   S1 00000000(00)
                   MAC Address   = ********               RAM     = OK   S5    0000(0)
                   IP Address    = ********               DATA    = OK   S8    0000(0)
                   Subnet Mask   = ********                               S9    0000(0)
                                                           MAC Address  = ********
                                                           IP Address   = ********
                   Monitor1   = 1280x1024                 Subnet Mask  = ********
                   Monitor2   = 1280x1024
                   USB1       =                TRX          0 0 0 0 0
                   USB2       =
                   USB3       =                PWR          12V     = 12.0V
                   USB4       =                             +B      = 120.3V
                   SSD        = OK
                   CPU Temp  = 32.0°C         Control Box                            ④
                   Board Temp = 20.0°C        HMS          105-XXXX-XX.XX
                   Battery    = 3.2V                        Axcel   = OK
                                                           Gyro    = OK
 Control Unit      865-XXXX-XX.XX       ②                  Pitch   = -0.9
                   865-XXXX-XX.XX                          Roll    = -1.4
                   105-XXXX-XX.XX
                                              HCTL         105-XXXX-XX.XX
                   ROM        = OK                         test    = OK
                   RAM        = OK
               *                              HULL         Position  = 0mm(0)
                   865-XXXX-XX.XX                          UP_LSW  = 0mm(0)
                   865-XXXX-XX.XX                          TX_LSW  = 430mm(43)
                   105-XXXX-XX.XX                          DN_LSW  = 770mm(77)

                   ROM        = OK            TD           Temp    = 52.8°C
                   RAM        = OK

                        Press Menu/Esc key to cancel.
```

OK: Status is normal; NG: Error detected
XX: Program number

For any NG, contact your dealer for advice.

How to read the test results

(1)	Processor unit information and status results. [Product Grade]: When the 3D function is unlock, "FSV-75-35" appears. For others, "FSV-75" appears. [RAM]: Indicates the RAM status; "OK" (white text) or "NG" (red text). [Battery]: Indicates the backup battery's charge. If the charge is 2.6V or less, consult your local dealer for battery replacement.
(2)	Control unit information and status results. [ROM]/[RAM]: Indicates the ROM and RAM status; "OK" (white text) or "NG" (red text). *: Appears only when a second control unit is connected.
(3)	Transceiver unit information and status results. [ROM]/[RAM]: Indicates the ROM and RAM status; "OK" (white text) or "NG" (red text). [+B] in [PWR] section: Indicates +B voltage.
(4)	Hull unit control box information and status results.

10.10.3 Board test

The board test checks all the circuit boards in the system. To conduct this test, select [2 Board Test] from the [Test] menu.

Press the **MENU/ESC** key to close the results.

```
─────────────────────────── BOARD TEST ───────────────────────────

TRCPU              ROM   = OK      S2T   = OK  ①      HCTL                      ②
 105-XXXX-XX.XX    RAM   = OK      RFP   = OK           105-XXXX-XX.XX
  Revision = 0     FRAM  = OK      FFP   = OK            Revision = 0
                                   S2R   = OK
                                   R2F   = OK


TRX1               ROM   = OK          TRX2               ROM   = OK
 105-XXXX-XX.XX    RAM   = OK           105-XXXX-XX.XX    RAM   = OK
  Revision = 0     TFP   = OK             Revision = 0    TFP   = OK
                   T2S   = OK                             T2S   = OK

TRX3               ROM   = OK          TRX4               ROM   = OK
 105-XXXX-XX.XX    RAM   = OK           105-XXXX-XX.XX    RAM   = NG
  Revision = 0     TFP   = OK             Revision = 0    TFP   = OK
                   T2S   = OK                             T2S   = OK

TRX5               ROM   = OK
 105-XXXX-XX.XX    RAM   = OK
  Revision = 0     TFP   = OK
                   T2S   = OK                                           ③

                         Press Menu/Esc key to cancel.
```

OK: Status is normal; NG: Error detected
XX: Program number

For any NG, contact your dealer for advice.

How to read the test results
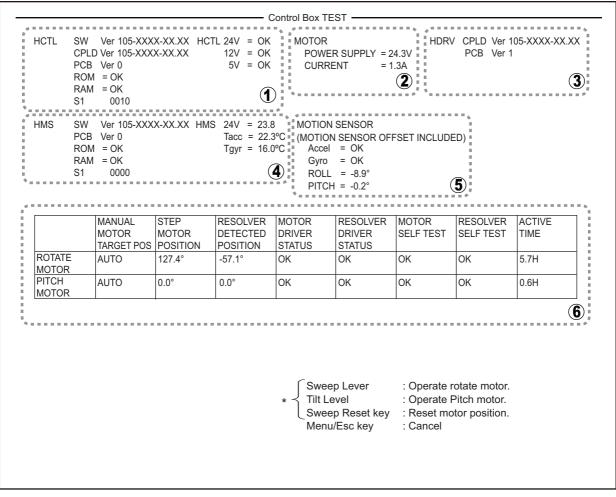
(1)	TRCPU board information and status results. Results appears as "OK" (white text) or "NG" (red text).
(2)	HCTL board information.
(3)	TRX board information and status results. Results appears as "OK" (white text) or "NG" (red text).

10.10.4 Hull unit control box test

The hull unit control box test displays detailed information for your control box. To conduct this test, select [4 Control Box Test] from the second page of the [Test] menu.

Press the **MENU/ESC** key to close the results.

```
──────────────── Control Box TEST ────────────────

HCTL    SW   Ver 105-XXXX-XX.XX  HCTL 24V  = OK    MOTOR                         HDRV  CPLD Ver 105-XXXX-XX.XX
        CPLD Ver 105-XXXX-XX.XX        12V  = OK      POWER SUPPLY = 24.3V             PCB  Ver 1
        PCB  Ver 0                      5V  = OK      CURRENT      = 1.3A
        ROM  = OK                                                          ②                              ③
        RAM  = OK
        S1     0010                              ①

HMS     SW   Ver 105-XXXX-XX.XX  HMS  24V  = 23.8   MOTION SENSOR
        PCB  Ver 0                     Tacc = 22.3ºC  (MOTION SENSOR OFFSET INCLUDED)
        ROM  = OK                      Tgyr = 16.0ºC   Accel  = OK
        RAM  = OK                                      Gyro   = OK
        S1     0000                              ④      ROLL   = -8.9°
                                                        PITCH  = -0.2°            ⑤
```

	MANUAL MOTOR TARGET POS	STEP MOTOR POSITION	RESOLVER DETECTED POSITION	MOTOR DRIVER STATUS	RESOLVER DRIVER STATUS	MOTOR SELF TEST	RESOLVER SELF TEST	ACTIVE TIME
ROTATE MOTOR	AUTO	127.4°	-57.1°	OK	OK	OK	OK	5.7H
PITCH MOTOR	AUTO	0.0°	0.0°	OK	OK	OK	OK	0.6H

⑥

```
      ⎧ Sweep Lever      : Operate rotate motor.
      ⎪ Tilt Level       : Operate Pitch motor.
  *  ⎨  Sweep Reset key  : Reset motor position.
      ⎩ Menu/Esc key     : Cancel
```

*: For qualified technicians
OK: Status is normal; NG: Error detected
XX: Program number

For any NG, contact your dealer for advice.

How to read the test results

(1)	HCTL board information and status results. Results appears as "OK" (white text) or "NG" (red text).
(2)	Motor information.
(3)	HDRV board information.
(4)	HMS board information and status results. Results appears as "OK" (white text) or "NG" (red text).
(5)	Motion sensor information and status results. Results appears as "OK" (white text) or "NG" (red text).
(6)	Motor test results.

10.10.5 Fan monitor test

The fan monitor test checks the fan RPM for the fans inside the control box, transceiver unit and processor unit. To conduct this test, select [8 Fan Monitor] from the [Test] menu.

Press the **MENU/ESC** key to close the results.

─────────────────── FAN MONITOR ───────────────────

Control Box
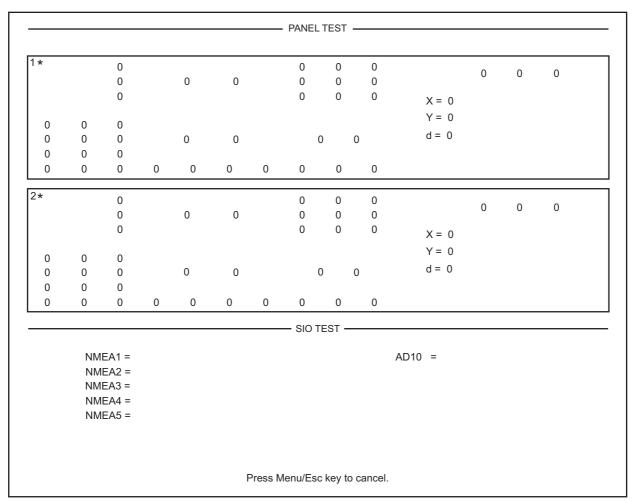
　　HCTL FAN0 Speed　　　= 8160rpm　　⌐‒‒ Control box fans

　　HCTL FAN1 Speed　　　= [Reserve]

Transceiver Unit

　　TRCPU FAN01 Speed　　= 4200rpm　　　　　TRCPU FAN05 Speed　　= 3840rpm

　　TRCPU FAN02 Speed　　= 4140rpm　　　　　TRCPU FAN06 Speed　　= 4080rpm

　　TRCPU FAN03 Speed　　= [Reserve]　　　　　TRCPU FAN07 Speed　　= [Reserve]

　　TRCPU FAN04 Speed　　= [Reserve]

Transceiver unit fans

Processor Unit

　　CPU BOARD_FAN1 Speed　　= 4000rpm　⌐‒‒ Processor unit fan

Press Menu/Esc key to cancel.

10.10.6 Panel test/SIO test

The panel test/SIO test checks the operational status of the control unit's keys, knobs and trackball. To conduct this test, select [1 Panel/SIO Test] from the second page of the [Test] menu.

Press the **MENU/ESC** key to close the results.

```
───────────────────────────── PANEL TEST ─────────────────────────────

  ┌─────────────────────────────────────────────────────────────────────┐
  │1 *        0                    0    0    0                           │
  │           0         0    0     0    0    0            0    0    0     │
  │           0                    0    0    0                           │
  │                                            X = 0                     │
  │   0    0    0                               Y = 0                    │
  │   0    0    0    0         0         0    0  d = 0                    │
  │   0    0    0                                                        │
  │   0    0    0    0    0    0    0    0    0    0                      │
  └─────────────────────────────────────────────────────────────────────┘
  ┌─────────────────────────────────────────────────────────────────────┐
  │2*         0                    0    0    0                           │
  │           0         0    0     0    0    0            0    0    0     │
  │           0                    0    0    0                           │
  │                                            X = 0                     │
  │   0    0    0                               Y = 0                    │
  │   0    0    0    0         0         0    0  d = 0                    │
  │   0    0    0                                                        │
  │   0    0    0    0    0    0    0    0    0    0                      │
  └─────────────────────────────────────────────────────────────────────┘

───────────────────────────── SIO TEST ─────────────────────────────

        NMEA1 =                              AD10  =
        NMEA2 =
        NMEA3 =
        NMEA4 =
        NMEA5 =




                        Press Menu/Esc key to cancel.
```

∗: When two control units are connected, "1" indicates control unit 1 and "2" indicates control unit 2.

Panel test section

Control to test	Method for check
Keys, Left button, Right button	Press, then release, each key (other than the power key (⏻) or **MENU/ESC** key). The corresponding location on the test screen shows a "1" (pressed) or "0" (released) if the key or button is functioning correctly.
Scrollwheel	1) Push, then release the scrollwheel. The indication shows a "1" (pressed) or "0" (released) if the scrollwheel is functioning correctly. 2) Spin the scrollwheel upwards, then downwards. The indication shows a "d" if the scrollwheel is functioning correctly.
Knobs	Turn each knob clockwise, then counter-clockwise. The corresponding location on the test screen shows a positive value (clockwise) or negative value (counter-clockwise) if the knob is functioning correctly.

Control to test	Method for check
Levers	Push each lever to the left, then right, then release the lever. The corresponding location on the test screen shows a "1" (pushed right/up), "2" (pushed left/down), or "0" (released) if the lever is functioning correctly.
Trackball	1) Move the trackball to the right; the indication shows a positive value. 2) Move the trackball to the left; the indication shows a negative value. 3) Move the trackball upwards; the indication shows a positive value. 4) Move the trackball downwards; the indication shows a negative value.

SIO test section
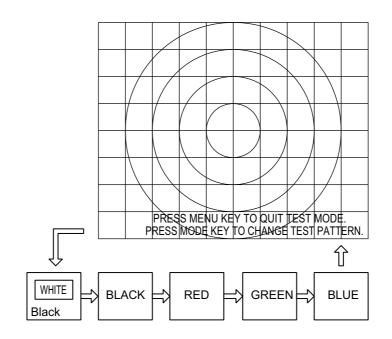
Shows the SIO test results. This test is normally conducted at the factory using a special connector.

10.10.7 Test pattern

The test pattern test checks for proper display of colors, brilliance and distortion. To conduct this test, select [2 Test Pattern] from the [Test] menu.

Press the **DISP MODE** key to change the test pattern.

Press the **MENU/ESC** key to close the results.

PRESS MENU KEY TO QUIT TEST MODE.
PRESS MODE KEY TO CHANGE TEST PATTERN.

WHITE / Black → BLACK → RED → GREEN → BLUE
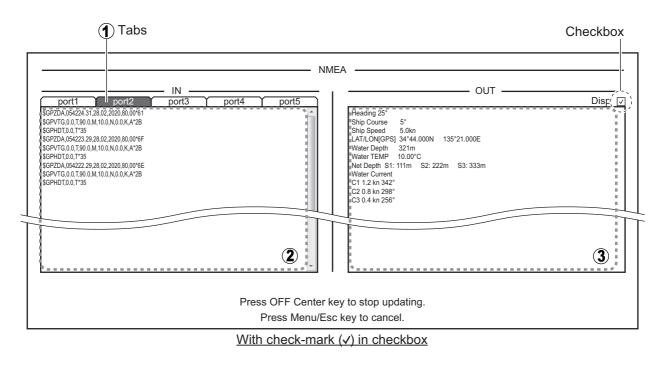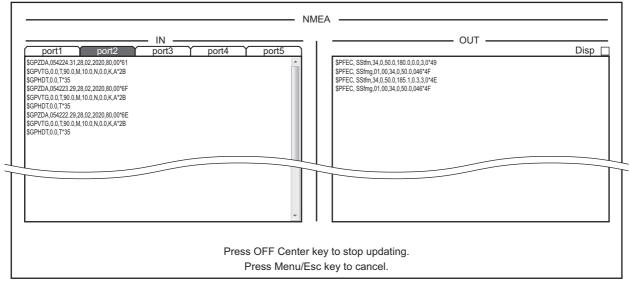
10.10.8 NMEA monitor

The NMEA monitor shows the NMEA sentences input to and output from the system. To conduct this test, select [7 NMEA Monitor] from the [Test] menu.

Press the **MENU/ESC** key to close the results.

With check-mark (✓) in checkbox

With checkbox un-checked (blank)

How to read the test results
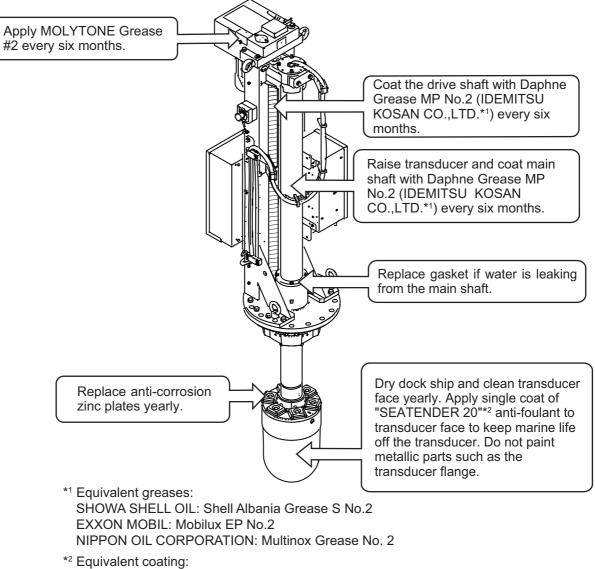
(1)	Port selection tabs. Left-click the port whose input/output you want to monitor.
(2)	Input results. Shows the incoming NMEA sentences.
(3)	Changes depending on checkbox status. **Checked (with ✓ mark)**: Shows the data output to the numerical/data display on the normal screen. **Un-checked (blank)**: Shows NMEA sentences output from the system.

10.11 Hull Unit (for Technicians Only)
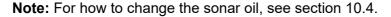
The following procedures (outlined in this section) should only be conducted by a qualified technician:

• Hull unit maintenance: section 10.11.1.

• Raising/lowering the transducer: section 10.11.2.

• Testing the brake in the hull unit: section 10.11.3.

10.11.1 Hull unit maintenance

Apply MOLYTONE Grease #2 every six months.

Coat the drive shaft with Daphne Grease MP No.2 (IDEMITSU KOSAN CO.,LTD.[1]) every six months.

Raise transducer and coat main shaft with Daphne Grease MP No.2 (IDEMITSU KOSAN CO.,LTD.[1]) every six months.

Replace gasket if water is leaking from the main shaft.

Replace anti-corrosion zinc plates yearly.

Dry dock ship and clean transducer face yearly. Apply single coat of "SEATENDER 20"[2] anti-foulant to transducer face to keep marine life off the transducer. Do not paint metallic parts such as the transducer flange.

[1] Equivalent greases:
SHOWA SHELL OIL: Shell Albania Grease S No.2
EXXON MOBIL: Mobilux EP No.2
NIPPON OIL CORPORATION: Multinox Grease No. 2

[2] Equivalent coating:
CHUGOKU MARINE PAINTS, Ltd.: SEA GRANDPRIX 660HS

Note: For how to change the sonar oil, see section 10.4.

How to grease the gear box
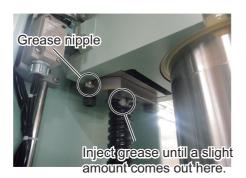
1. Unfasten the wing bolts from the gear box to remove the gear cover window.

2. While raising and lowering the transducer manually with the ratchet wrench (see section 10.11.2), apply Molytone No.2 Grease.

How to grease the gear shaft

Inject Daphne Grease MP No.2 to the grease nipple to grease the gear shaft.
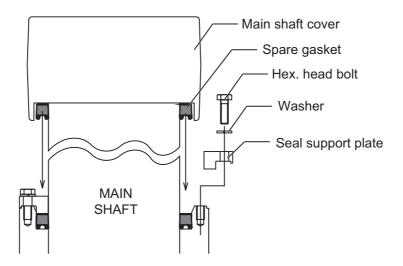
Operation image

How to replace the gasket

If water is leaking from the main shaft, replace the gasket. A spare gasket is provided on the cover of the main shaft.
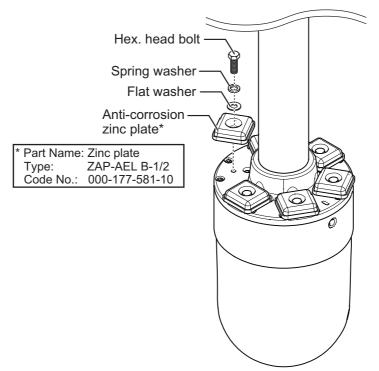
1. Unfasten four hex. head bolts to remove two seal support plates.

2. Cut and remove the gasket.

3. Take the spare gasket from the cover of the main shaft cover and set it to the main shaft.

4. Fasten the two seal support plates removed at step 1.

How to replace the anti-corrosion zinc plates

⚠ CAUTION

Replace the anti-corrosion zinc plates yearly.

Corrosion may result, allowing water leakage
and/or loss of transducer.
The clearance between the hull and the ground or
deck must be 650 mm or more.

---
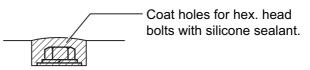
1. Remove the silicone sealant covering the hex. head bolts.

2. Unfasten the hex. head bolts and then remove the washers (2 pcs.) and anti-corrosion zinc plates (6 pcs.).

Hex. head bolt
Spring washer
Flat washer
Anti-corrosion zinc plate*

* Part Name: Zinc plate
   Type: ZAP-AEL B-1/2
   Code No.:   000-177-581-10

3. Set washers, new anti-corrosion zinc plates and hex. head bolts. Tighten the hex. head bolts.

4. Coat the holes for the hex. head bolts with silicone sealant.

Coat holes for hex. head
bolts with silicone sealant.

10.11.2 How to raise the transducer

> ⚠ **DANGER**
>
> **Keep away from raise/lower shaft in hull unit when it is moving.**
>
> Gears in hull unit will cause serious injury.

If the transducer cannot be raised with the switches on the control unit, because it is tangled in the net or its shaft is bent, try to raise it from the hull unit, automatically or manually, whichever works.
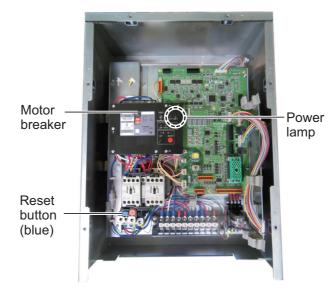
These procedures are intended for qualified technicians.

How to raise the transducer automatically

1. Check the LEDs on the hull unit.
    When the L.SW_LED on the raise/lower control box flashes, the raise/lower function may be abnormal. When you can not check the LEDs, continue to step 2.

2. Turn off the switchboard, transceiver unit and hull unit from the ship's mains breaker.
    To force a system shut-down, press and hold the POWER ON (I) switch for approximately seven seconds.

3. Check if the net or other object is caught in the transducer.

4. Look through the lid on the raise/lower control box in the hull unit to check if the motor breaker is OFF. If it is midway between ON and OFF, open the lid and turn it off and then on.

5. Unfasten six screws to remove the cover of the raise/lower control box.

Motor breaker

Power lamp

Reset button (blue)

6. Push the RESET button (blue) on the raise/lower control box.

Protection circuit activated → Push RESET button. → Protection circuit deactivated (normal)

RESET button

Green when protection circuit is deactivated.

7. Close the cover.

8. Turn on the breaker at the ship's mains.
   If you forced quit the system at step 1, go to the step 9.

9. Turn on the system from the control unit.

10. Press the ⬆ key on the control unit to raise the transducer.

How to raise the transducer manually

⚠ **WARNING**

Before operating the hull unit manually, check that the motor brake and shaft are working properly.
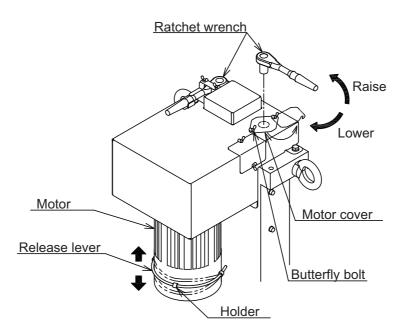
1. Open the lid on the raise/lower control box of the hull unit and turn off the motor breaker. Confirm that the power lamp is off. (See the illustration on the previous page for the location of those parts.)

2. Unscrew the butterfly bolts, then move the motor shaft cover.

3. Attach the ratchet wrench to the motor shaft.

4. While holding the ratchet wrench, pull the release lever toward you and upward to release the brake.
   Note: Hold the ratchet wrench when releasing the brake, to prevent the transducer from falling.

5. Turn the ratchet wrench counter-clockwise to raise the transducer.

6. After retracting the transducer into the tank, set the release lever to the holder.

7. Remove the ratchet wrench and return it to its holder. Restore the motor brake to its normal position.

Note: Be sure to return the ratchet wrench to its holder. Otherwise the hull unit will be stopped and the transducer cannot be raised or lowered.

Ratchet wrench

Raise

Lower

Motor

Motor cover

Release lever

Butterfly bolt

Holder

10.11.3 How to check the brake in the hull unit

The main shaft in the hull unit has two brakes, a motor brake and a drive shaft brake. Have a qualified technician check the motor brake yearly.

Before doing the check, make sure no one is near the hull unit and transducer.

Note: Record the check result in the brake check sheet in appendix 2.

How to check the brake in the raise/lower control box

1. Unfasten six screws to remove the cover from the raise/lower control box in the hull unit.

7-segment LEDs

Brake release push switch:
Releases the toggle switch selected brake while held down. The other brake is kept engaged.
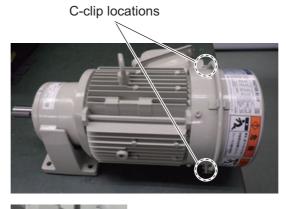
Toggle switch:
Select motor brake ([MBRAKE]).

Brake LED:
Checks toggle switch selected brake for proper operation.
The LED lights red if the brake is normal.

2. Set the toggle switch to the ([MBRAKE]) side.

3. Check that the Brake LED on the circuit board is lit. The LED does not light when the motor break control circuit is abnormal. If the LED is OFF, return the toggle switch to its original position and contact your dealer for advice.

4. Set the toggle switch to the [MBRAKE] position. Hold down the brake release push switch to release the motor brake. Check that the main shaft does not lower and the 7-segment LEDs on the circuit board does not change. If the main shaft lowers or the LED lighting pattern changes, release the brake release push switch. The drive shaft brake is abnormal; check the drive shaft brake.

How to measure the gap in the motor brake
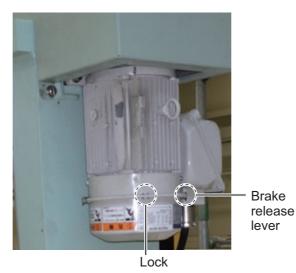
1. Use cir-clip pliers to release the two C-clips (one to either side of the brake).

C-clip locations

C-clips

2. Pull the brake release lever to unlock the brake.

Brake release lever

Lock

3. Remove the brake release level with a set of pliers.

4. Remove the brake release lever pin with a pair of pliers.

Brake release lever pin
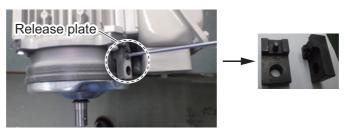
5. Unfasten three bolts to remove the brake cover.

Bolt

Remove brake cover
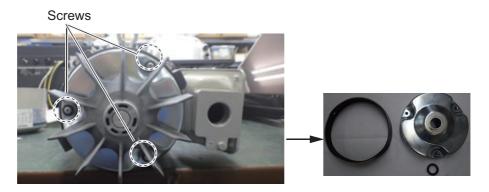
6. Unfasten the fan bolt, then remove the fan.

Fan bolt
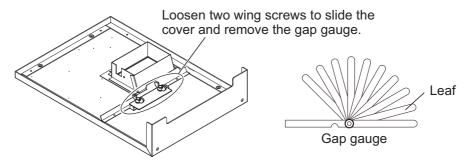
7. Unfasten both release plates (one on either side) with a hex wrench, then remove the plates.

Release plate
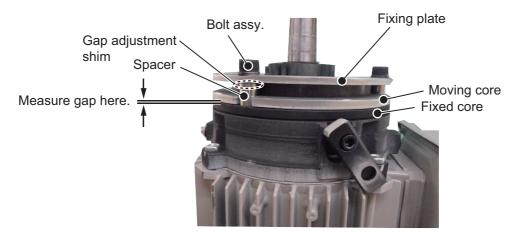
8. Referring to the following figure, unfasten the three screws, then remove the waterproofing cover and washer.

Screws

9. Use a gap gauge to measure the gap between the fixed core and the moving core.

Loosen two wing screws to slide the cover and remove the gap gauge.

Leaf

Gap gauge
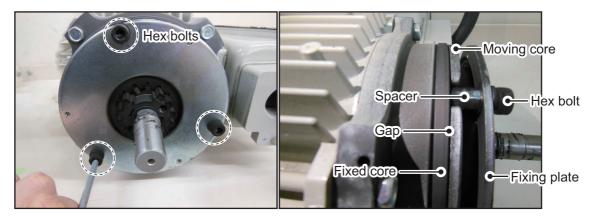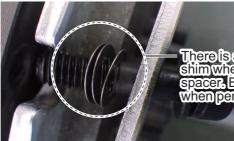
Insert the leaf of the gap gauge horizontally to the place of measurement. Take the measurement. Measure the gap at three places.

Bolt assy.

Fixing plate

Gap adjustment shim

Spacer

Measure gap here.

Moving core
Fixed core

10. If the gap measured at step 9 is approx. 0.6 mm, do the following to reduce the gap. (If you can insert the 0.6 mm leaf, do steps 1) to 3) below.)

1) Loosen three hex bolts to remove spacer, gap adjustment shim, bolt assembly, and fixing plate.
Note: Be careful not to drop the gap adjustment shim.

Hex bolts

Moving core

Spacer

Hex bolt

Gap

Fixed core

Fixing plate
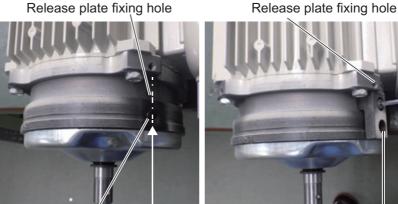
There is a chance to drop the shim when you remove the spacer. Be sure to catch the shim when performing this operation.

2) Reduce the amount of gap adjustment shims (thickness of shim: approx. 0.2 mm), then install the spacer, gap adjustment shim, bolt assembly and fixing plate.

3) Measure the gap. The gap must be between 0.3 and 0.4 mm. (Confirm that the 0.3 mm leaf can be inserted, but the 0.4 mm leaf cannot.)

11. Reassemble the motor brake.

Note 1: Coat the hex bolt for the fan with thread-locking fluid.

Note 2: Make sure that the holes on the release plates (removed at step 7) are aligned with the holes on the waterproofing washer and the release plate fixing holes. If the locking pins do not fit easily, the holes may be mis-aligned. Check the alignment and re-align as necessary.

Release plate fixing hole
Release plate fixing hole
Waterproofing washer hole
Align the holes when reassembling
Check that the holes are aligned
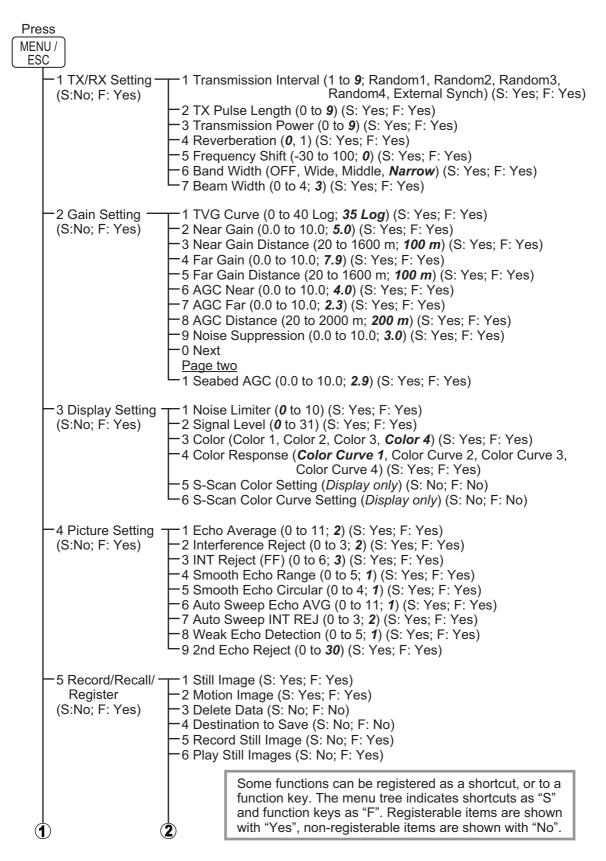
10-27
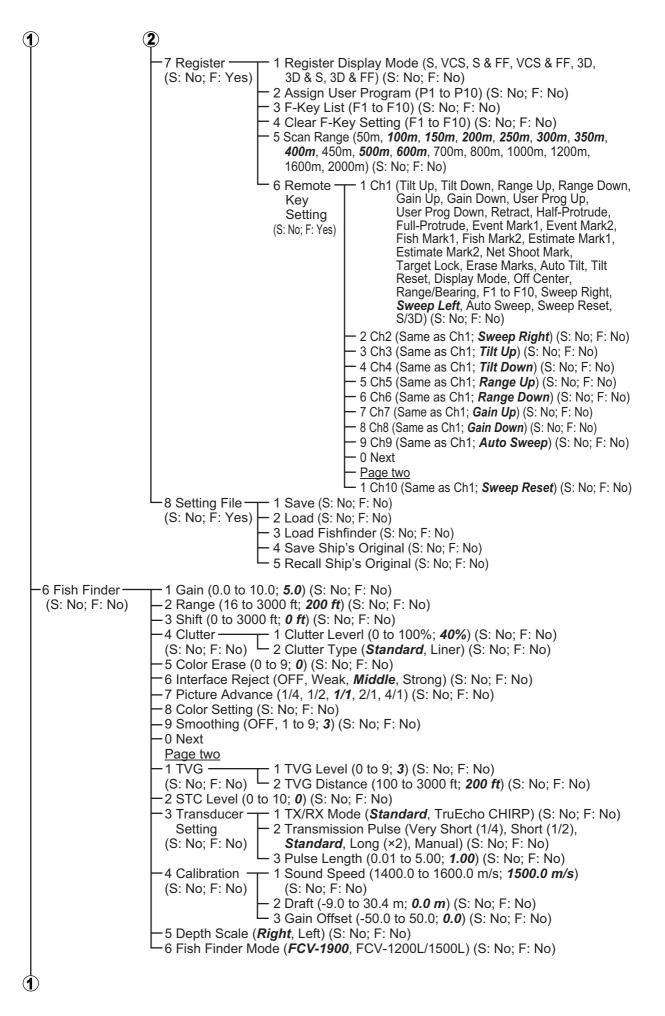
This page is intentionally left blank.
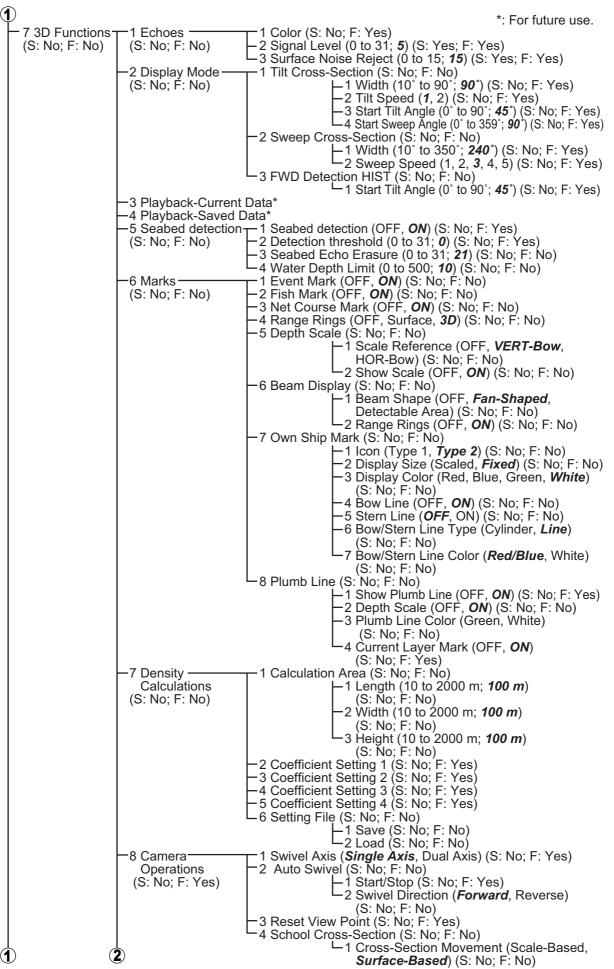
APPENDIX 1 MENU TREE
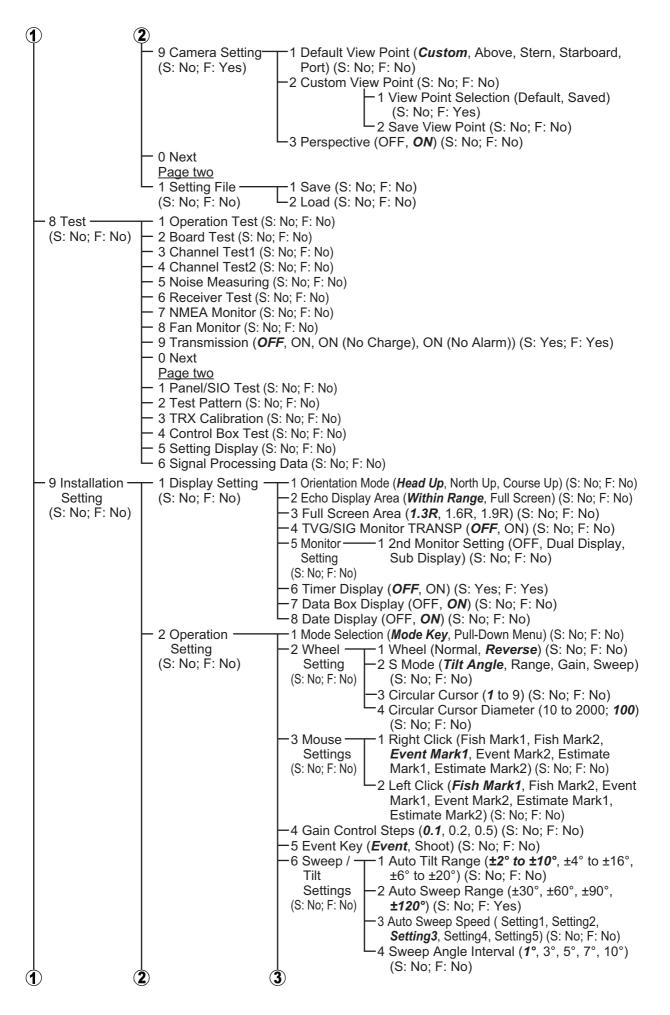
Default settings are shown in **_Bold Italic_** font. Several menu settings and their default values are dependent on the User Program selected at the time of use. The menu tree outlines the default settings for P1. For all other program settings, see section 7.3.

Press

MENU / ESC

1 TX/RX Setting (S:No; F: Yes)
- 1 Transmission Interval (1 to **_9_**; Random1, Random2, Random3, Random4, External Synch) (S: Yes; F: Yes)
- 2 TX Pulse Length (0 to **_9_**) (S: Yes; F: Yes)
- 3 Transmission Power (0 to **_9_**) (S: Yes; F: Yes)
- 4 Reverberation (**_0_**, 1) (S: Yes; F: Yes)
- 5 Frequency Shift (-30 to 100; **_0_**) (S: Yes; F: Yes)
- 6 Band Width (OFF, Wide, Middle, **_Narrow_**) (S: Yes; F: Yes)
- 7 Beam Width (0 to 4; **_3_**) (S: Yes; F: Yes)

2 Gain Setting (S:No; F: Yes)
- 1 TVG Curve (0 to 40 Log; **_35 Log_**) (S: Yes; F: Yes)
- 2 Near Gain (0.0 to 10.0; **_5.0_**) (S: Yes; F: Yes)
- 3 Near Gain Distance (20 to 1600 m; **_100 m_**) (S: Yes; F: Yes)
- 4 Far Gain (0.0 to 10.0; **_7.9_**) (S: Yes; F: Yes)
- 5 Far Gain Distance (20 to 1600 m; **_100 m_**) (S: Yes; F: Yes)
- 6 AGC Near (0.0 to 10.0; **_4.0_**) (S: Yes; F: Yes)
- 7 AGC Far (0.0 to 10.0; **_2.3_**) (S: Yes; F: Yes)
- 8 AGC Distance (20 to 2000 m; **_200 m_**) (S: Yes; F: Yes)
- 9 Noise Suppression (0.0 to 10.0; **_3.0_**) (S: Yes; F: Yes)
- 0 Next
  Page two
- 1 Seabed AGC (0.0 to 10.0; **_2.9_**) (S: Yes; F: Yes)

3 Display Setting (S:No; F: Yes)
- 1 Noise Limiter (**_0_** to 10) (S: Yes; F: Yes)
- 2 Signal Level (**_0_** to 31) (S: Yes; F: Yes)
- 3 Color (Color 1, Color 2, Color 3, **_Color 4_**) (S: Yes; F: Yes)
- 4 Color Response (**_Color Curve 1_**, Color Curve 2, Color Curve 3, Color Curve 4) (S: Yes; F: Yes)
- 5 S-Scan Color Setting (_Display only_) (S: No; F: No)
- 6 S-Scan Color Curve Setting (_Display only_) (S: No; F: No)

4 Picture Setting (S:No; F: Yes)
- 1 Echo Average (0 to 11; **_2_**) (S: Yes; F: Yes)
- 2 Interference Reject (0 to 3; **_2_**) (S: Yes; F: Yes)
- 3 INT Reject (FF) (0 to 6; **_3_**) (S: Yes; F: Yes)
- 4 Smooth Echo Range (0 to 5; **_1_**) (S: Yes; F: Yes)
- 5 Smooth Echo Circular (0 to 4; **_1_**) (S: Yes; F: Yes)
- 6 Auto Sweep Echo AVG (0 to 11; **_1_**) (S: Yes; F: Yes)
- 7 Auto Sweep INT REJ (0 to 3; **_2_**) (S: Yes; F: Yes)
- 8 Weak Echo Detection (0 to 5; **_1_**) (S: Yes; F: Yes)
- 9 2nd Echo Reject (0 to **_30_**) (S: Yes; F: Yes)

5 Record/Recall/Register (S:No; F: Yes)
- 1 Still Image (S: Yes; F: Yes)
- 2 Motion Image (S: Yes; F: Yes)
- 3 Delete Data (S: No; F: No)
- 4 Destination to Save (S: No; F: No)
- 5 Record Still Image (S: No; F: Yes)
- 6 Play Still Images (S: No; F: Yes)

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> Some functions can be registered as a shortcut, or to a function key. The menu tree indicates shortcuts as "S" and function keys as "F". Registerable items are shown with "Yes", non-registerable items are shown with "No".

AP-1

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7 Register ——— 1 Register Display Mode (S, VCS, S & FF, VCS & FF, 3D,
(S: No; F: Yes)　　　3D & S, 3D & FF) (S: No; F: No)
　　　　　　　— 2 Assign User Program (P1 to P10) (S: No; F: No)
　　　　　　　— 3 F-Key List (F1 to F10) (S: No; F: No)
　　　　　　　— 4 Clear F-Key Setting (F1 to F10) (S: No; F: No)
　　　　　　　— 5 Scan Range (50m, **100m**, **150m**, **200m**, **250m**, **300m**, **350m**,
　　　　　　　　　400m, 450m, **500m**, **600m**, 700m, 800m, 1000m, 1200m,
　　　　　　　　　1600m, 2000m) (S: No; F: No)

　　　　　　　— 6 Remote ——— 1 Ch1 (Tilt Up, Tilt Down, Range Up, Range Down,
　　　　　　　　Key　　　　　　Gain Up, Gain Down, User Prog Up,
　　　　　　　　Setting　　　　User Prog Down, Retract, Half-Protrude,
　　　　　　　(S: No; F: Yes)　Full-Protrude, Event Mark1, Event Mark2,
　　　　　　　　　　　　　　　Fish Mark1, Fish Mark2, Estimate Mark1,
　　　　　　　　　　　　　　　Estimate Mark2, Net Shoot Mark,
　　　　　　　　　　　　　　　Target Lock, Erase Marks, Auto Tilt, Tilt
　　　　　　　　　　　　　　　Reset, Display Mode, Off Center,
　　　　　　　　　　　　　　　Range/Bearing, F1 to F10, Sweep Right,
　　　　　　　　　　　　　　　Sweep Left, Auto Sweep, Sweep Reset,
　　　　　　　　　　　　　　　S/3D) (S: No; F: No)

　　　　　　　　　　　　　　— 2 Ch2 (Same as Ch1; **Sweep Right**) (S: No; F: No)
　　　　　　　　　　　　　　— 3 Ch3 (Same as Ch1; **Tilt Up**) (S: No; F: No)
　　　　　　　　　　　　　　— 4 Ch4 (Same as Ch1; **Tilt Down**) (S: No; F: No)
　　　　　　　　　　　　　　— 5 Ch5 (Same as Ch1; **Range Up**) (S: No; F: No)
　　　　　　　　　　　　　　— 6 Ch6 (Same as Ch1; **Range Down**) (S: No; F: No)
　　　　　　　　　　　　　　— 7 Ch7 (Same as Ch1; **Gain Up**) (S: No; F: No)
　　　　　　　　　　　　　　— 8 Ch8 (Same as Ch1; **Gain Down**) (S: No; F: No)
　　　　　　　　　　　　　　— 9 Ch9 (Same as Ch1; **Auto Sweep**) (S: No; F: No)
　　　　　　　　　　　　　　— 0 Next
　　　　　　　　　　　　　　— Page two
　　　　　　　　　　　　　　— 1 Ch10 (Same as Ch1; **Sweep Reset**) (S: No; F: No)

8 Setting File ——— 1 Save (S: No; F: No)
(S: No; F: Yes)　— 2 Load (S: No; F: No)
　　　　　　　　— 3 Load Fishfinder (S: No; F: No)
　　　　　　　　— 4 Save Ship's Original (S: No; F: No)
　　　　　　　　— 5 Recall Ship's Original (S: No; F: No)

6 Fish Finder ——— 1 Gain (0.0 to 10.0; **5.0**) (S: No; F: No)
(S: No; F: No)　— 2 Range (16 to 3000 ft; **200 ft**) (S: No; F: No)
　　　　　　　— 3 Shift (0 to 3000 ft; **0 ft**) (S: No; F: No)
　　　　　　　— 4 Clutter ——— 1 Clutter Leverl (0 to 100%; **40%**) (S: No; F: No)
　　　　　　　　(S: No; F: No)　— 2 Clutter Type (**Standard**, Liner) (S: No; F: No)
　　　　　　　— 5 Color Erase (0 to 9; **0**) (S: No; F: No)
　　　　　　　— 6 Interface Reject (OFF, Weak, **Middle**, Strong) (S: No; F: No)
　　　　　　　— 7 Picture Advance (1/4, 1/2, **1/1**, 2/1, 4/1) (S: No; F: No)
　　　　　　　— 8 Color Setting (S: No; F: No)
　　　　　　　— 9 Smoothing (OFF, 1 to 9; **3**) (S: No; F: No)
　　　　　　　— 0 Next
　　　　　　　　Page two
　　　　　　　— 1 TVG ——— 1 TVG Level (0 to 9; **3**) (S: No; F: No)
　　　　　　　　(S: No; F: No)　— 2 TVG Distance (100 to 3000 ft; **200 ft**) (S: No; F: No)
　　　　　　　— 2 STC Level (0 to 10; **0**) (S: No; F: No)
　　　　　　　— 3 Transducer ——— 1 TX/RX Mode (**Standard**, TruEcho CHIRP) (S: No; F: No)
　　　　　　　　Setting　　　　— 2 Transmission Pulse (Very Short (1/4), Short (1/2),
　　　　　　　　(S: No; F: No)　　**Standard**, Long (×2), Manual) (S: No; F: No)
　　　　　　　　　　　　　　— 3 Pulse Length (0.01 to 5.00; **1.00**) (S: No; F: No)
　　　　　　　— 4 Calibration ——— 1 Sound Speed (1400.0 to 1600.0 m/s; **1500.0 m/s**)
　　　　　　　　(S: No; F: No)　　(S: No; F: No)
　　　　　　　　　　　　　　— 2 Draft (-9.0 to 30.4 m; **0.0 m**) (S: No; F: No)
　　　　　　　　　　　　　　— 3 Gain Offset (-50.0 to 50.0; **0.0**) (S: No; F: No)
　　　　　　　— 5 Depth Scale (**Right**, Left) (S: No; F: No)
　　　　　　　— 6 Fish Finder Mode (**FCV-1900**, FCV-1200L/1500L) (S: No; F: No)

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*: For future use.

① 7 3D Functions (S: No; F: No)
├─ 1 Echoes (S: No; F: No)
│   ├─ 1 Color (S: No; F: Yes)
│   ├─ 2 Signal Level (0 to 31; *5*) (S: Yes; F: Yes)
│   └─ 3 Surface Noise Reject (0 to 15; *15*) (S: Yes; F: Yes)
├─ 2 Display Mode (S: No; F: No)
│   ├─ 1 Tilt Cross-Section (S: No; F: No)
│   │   ├─ 1 Width (10˚ to 90˚; *90˚*) (S: No; F: Yes)
│   │   ├─ 2 Tilt Speed (*1*, 2) (S: No; F: Yes)
│   │   ├─ 3 Start Tilt Angle (0˚ to 90˚; *45˚*) (S: No; F: Yes)
│   │   └─ 4 Start Sweep Angle (0˚ to 359˚; *90˚*) (S: No; F: Yes)
│   ├─ 2 Sweep Cross-Section (S: No; F: No)
│   │   ├─ 1 Width (10˚ to 350˚; *240˚*) (S: No; F: Yes)
│   │   └─ 2 Sweep Speed (1, 2, *3*, 4, 5) (S: No; F: Yes)
│   └─ 3 FWD Detection HIST (S: No; F: No)
│   └─ 1 Start Tilt Angle (0˚ to 90˚; *45˚*) (S: No; F: Yes)
├─ 3 Playback-Current Data*
├─ 4 Playback-Saved Data*
├─ 5 Seabed detection (S: No; F: No)
│   ├─ 1 Seabed detection (OFF, *ON*) (S: No; F: Yes)
│   ├─ 2 Detection threshold (0 to 31; *0*) (S: No; F: Yes)
│   ├─ 3 Seabed Echo Erasure (0 to 31; *21*) (S: No; F: No)
│   └─ 4 Water Depth Limit (0 to 500; *10*) (S: No; F: No)
├─ 6 Marks (S: No; F: No)
│   ├─ 1 Event Mark (OFF, *ON*) (S: No; F: No)
│   ├─ 2 Fish Mark (OFF, *ON*) (S: No; F: No)
│   ├─ 3 Net Course Mark (OFF, *ON*) (S: No; F: No)
│   ├─ 4 Range Rings (OFF, Surface, *3D*) (S: No; F: No)
│   ├─ 5 Depth Scale (S: No; F: No)
│   │   ├─ 1 Scale Reference (OFF, *VERT-Bow*, HOR-Bow) (S: No; F: No)
│   │   └─ 2 Show Scale (OFF, *ON*) (S: No; F: No)
│   ├─ 6 Beam Display (S: No; F: No)
│   │   ├─ 1 Beam Shape (OFF, *Fan-Shaped*, Detectable Area) (S: No; F: No)
│   │   └─ 2 Range Rings (OFF, *ON*) (S: No; F: No)
│   ├─ 7 Own Ship Mark (S: No; F: No)
│   │   ├─ 1 Icon (Type 1, *Type 2*) (S: No; F: No)
│   │   ├─ 2 Display Size (Scaled, *Fixed*) (S: No; F: No)
│   │   ├─ 3 Display Color (Red, Blue, Green, *White*) (S: No; F: No)
│   │   ├─ 4 Bow Line (OFF, *ON*) (S: No; F: No)
│   │   ├─ 5 Stern Line (*OFF*, ON) (S: No; F: No)
│   │   ├─ 6 Bow/Stern Line Type (Cylinder, *Line*) (S: No; F: No)
│   │   └─ 7 Bow/Stern Line Color (*Red/Blue*, White) (S: No; F: No)
│   └─ 8 Plumb Line (S: No; F: No)
│   ├─ 1 Show Plumb Line (OFF, *ON*) (S: No; F: Yes)
│   ├─ 2 Depth Scale (OFF, *ON*) (S: No; F: No)
│   ├─ 3 Plumb Line Color (Green, White) (S: No; F: No)
│   └─ 4 Current Layer Mark (OFF, *ON*) (S: No; F: Yes)
├─ 7 Density Calculations (S: No; F: No)
│   ├─ 1 Calculation Area (S: No; F: No)
│   │   ├─ 1 Length (10 to 2000 m; *100 m*) (S: No; F: No)
│   │   ├─ 2 Width (10 to 2000 m; *100 m*) (S: No; F: No)
│   │   └─ 3 Height (10 to 2000 m; *100 m*) (S: No; F: No)
│   ├─ 2 Coefficient Setting 1 (S: No; F: Yes)
│   ├─ 3 Coefficient Setting 2 (S: No; F: Yes)
│   ├─ 4 Coefficient Setting 3 (S: No; F: Yes)
│   ├─ 5 Coefficient Setting 4 (S: No; F: Yes)
│   └─ 6 Setting File (S: No; F: No)
│   ├─ 1 Save (S: No; F: No)
│   └─ 2 Load (S: No; F: No)
└─ 8 Camera Operations (S: No; F: Yes)
    ├─ 1 Swivel Axis (*Single Axis*, Dual Axis) (S: No; F: Yes)
    ├─ 2 Auto Swivel (S: No; F: No)
    │   ├─ 1 Start/Stop (S: No; F: Yes)
    │   └─ 2 Swivel Direction (*Forward*, Reverse) (S: No; F: No)
    ├─ 3 Reset View Point (S: No; F: Yes)
    └─ 4 School Cross-Section (S: No; F: No)
        └─ 1 Cross-Section Movement (Scale-Based, *Surface-Based*) (S: No; F: No)

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9 Camera Setting ── 1 Default View Point (**Custom**, Above, Stern, Starboard,
(S: No; F: Yes) Port) (S: No; F: No)
── 2 Custom View Point (S: No; F: No)
── 1 View Point Selection (Default, Saved)
(S: No; F: Yes)
── 2 Save View Point (S: No; F: No)
── 3 Perspective (OFF, **ON**) (S: No; F: No)

0 Next
Page two

1 Setting File ── 1 Save (S: No; F: No)
(S: No; F: No) ── 2 Load (S: No; F: No)

8 Test ── 1 Operation Test (S: No; F: No)
(S: No; F: No) ── 2 Board Test (S: No; F: No)
── 3 Channel Test1 (S: No; F: No)
── 4 Channel Test2 (S: No; F: No)
── 5 Noise Measuring (S: No; F: No)
── 6 Receiver Test (S: No; F: No)
── 7 NMEA Monitor (S: No; F: No)
── 8 Fan Monitor (S: No; F: No)
── 9 Transmission (**OFF**, ON, ON (No Charge), ON (No Alarm)) (S: Yes; F: Yes)
── 0 Next
Page two
── 1 Panel/SIO Test (S: No; F: No)
── 2 Test Pattern (S: No; F: No)
── 3 TRX Calibration (S: No; F: No)
── 4 Control Box Test (S: No; F: No)
── 5 Setting Display (S: No; F: No)
── 6 Signal Processing Data (S: No; F: No)

9 Installation ── 1 Display Setting ── 1 Orientation Mode (**Head Up**, North Up, Course Up) (S: No; F: No)
Setting (S: No; F: No) ── 2 Echo Display Area (**Within Range**, Full Screen) (S: No; F: No)
(S: No; F: No) ── 3 Full Screen Area (**1.3R**, 1.6R, 1.9R) (S: No; F: No)
── 4 TVG/SIG Monitor TRANSP (**OFF**, ON) (S: No; F: No)
── 5 Monitor ── 1 2nd Monitor Setting (OFF, Dual Display,
Setting Sub Display) (S: No; F: No)
(S: No; F: No)
── 6 Timer Display (**OFF**, ON) (S: Yes; F: Yes)
── 7 Data Box Display (OFF, **ON**) (S: No; F: No)
── 8 Date Display (OFF, **ON**) (S: No; F: No)

2 Operation ── 1 Mode Selection (**Mode Key**, Pull-Down Menu) (S: No; F: No)
Setting ── 2 Wheel ── 1 Wheel (Normal, **Reverse**) (S: No; F: No)
(S: No; F: No) Setting ── 2 S Mode (**Tilt Angle**, Range, Gain, Sweep)
(S: No; F: No) (S: No; F: No)
── 3 Circular Cursor (**1** to 9) (S: No; F: No)
── 4 Circular Cursor Diameter (10 to 2000; **100**)
(S: No; F: No)

── 3 Mouse ── 1 Right Click (Fish Mark1, Fish Mark2,
Settings **Event Mark1**, Event Mark2, Estimate
(S: No; F: No) Mark1, Estimate Mark2) (S: No; F: No)
── 2 Left Click (**Fish Mark1**, Fish Mark2, Event
Mark1, Event Mark2, Estimate Mark1,
Estimate Mark2) (S: No; F: No)

── 4 Gain Control Steps (**0.1**, 0.2, 0.5) (S: No; F: No)
── 5 Event Key (**Event**, Shoot) (S: No; F: No)
── 6 Sweep / ── 1 Auto Tilt Range (**±2° to ±10°**, ±4° to ±16°,
Tilt ±6° to ±20°) (S: No; F: No)
Settings ── 2 Auto Sweep Range (±30°, ±60°, ±90°,
(S: No; F: No) **±120°**) (S: No; F: Yes)
── 3 Auto Sweep Speed (Setting1, Setting2,
Setting3, Setting4, Setting5) (S: No; F: No)
── 4 Sweep Angle Interval (**1°**, 3°, 5°, 7°, 10°)
(S: No; F: No)

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— 7 Dimmer (0 to 15; *7*) (S: Yes; F: Yes)
— 8 Key Beep Volume (0 to 7; *5*) (S: No; F: No)
— 9 Trackball Speed (Slow, *Normal*, Fast) (S: No; F: No)
— 0 Next
   Page two
— 1 Speaker Volume (S: No; F: No)

— 3 Motion Sensor ——— 1 Pitch Angle Correction (-10.0 to +10.0) (S: No; F: No)
   (S: No; F: No) ——— 2 Roll Angle Correction (-10.0 to +10.0) (S: No; F: No)

— 4 Hull Unit ——— 1 REG TD Position (S: No; F: No)
   Setting ——— 2 Middle Key Setting (*Fixed Position*, Any Position) (S: No; F: No)
   (S: No; F: No) ——— 3 Heading Adjust1 (-180.0° to +179.9°; *0°*) (S: No; F: No)
   ——— 4 Heading Adjust2 (-180.0° to +179.9°; *0°*) (S: No; F: No)
   ——— 5 Hull Unit Stroke (*600/800 mm*, 1100 mm) (S: No; F: No)

— 5 Interface Setting ——— 1 NMEA1 Baud Rate (*4800bps*, 9600bps, 18200bps,
   (S: No; F: No)   38400bps) (S: No; F: No)
   ——— 2 NMEA2 Baud Rate (Same as NMEA1) (S: No; F: No)
   ——— 3 NMEA3 Baud Rate (Same as NMEA1) (S: No; F: No)
   ——— 4 NMEA4 Baud Rate (Same as NMEA1) (S: No; F: No)
   ——— 5 NMEA5 Baud Rate (Same as NMEA1) (S: No; F: No)

— 6 External Data ——— 1 Date & Time (Disable, *NMEA*) (S: No; F: No)
   (S: No; F: No) ——— 2 Heading (Disable, *AD10*, NMEA) (S: No; F: No)
   ——— 3 Speed & Course (Disable, *NMEA*) (S: No; F: No)
   ——— 4 Speed Sensor (Disable, *GPS/DR*, Doppler/DR) (S: No; F: No)
   ——— 5 LAT/LON (Disable, *NMEA*) (S: No; F: No)
   ——— 6 Water Depth (Disable, *NMEA*) (S: Yes; F: Yes)
   ——— 7 Water TEMP (Disable, *NMEA*) (S: No; F: No)
   ——— 8 Water Current (Disable, *NMEA*) (S: No; F: No)
   ——— 9 Wind (Disable, *NMEA*) (S: No; F: No)
   ——— 0 Next
      Page two
   ——— 1 Net Depth (Disable, *NMEA*) (S: No; F: No)

— 7 Own Ship ——— 1 Ship's Length (15 m to 150 m) (S: No; F: No)
   Data ——— 2 Ship's Width (5 m to 30 m) (S: No; F: No)
   (S: No; F: No) ——— 3 TD Position1 (5 m to 50 m) (S: No; F: No)
   ——— 4 TD Position2 (-10 m to 10 m) (S: No; F: No)

— 8 Initialization ——— 1 Language (日本語, English, Norsk, Dansk, Türk,
   (S: No; F: No)   한국어) (S: No; F: No)
   ——— 2 Item Attribution (*Non-Changeable*, Changeable) (S: No; F: No)
   ——— 3 Reset User Program (S: No; F: No)
   ——— 4 Reset System (S: No; F: No)

— 0 Mark & ——— 1 Erase Marks ——— 1 Erase All (S: Yes; F: Yes)
   Operation   (S: No; F: No) ——— 2 Event Mark1 (S: Yes; F: Yes)
   Support ——— 3 Event Mark2 (S: Yes; F: Yes)
   Tool ——— 4 Fish Mark1 (S: Yes; F: Yes)
   (S: No; F: No) ——— 5 Fish Mark2 (S: Yes; F: Yes)
   ——— 6 Own Ship Position Mark (S: Yes; F: Yes)
   ——— 7 Ship's Track (S: Yes; F: Yes)

— 2 Mark Display ——— 1 Heading Mark (OFF, *ON*) (S: No; F: No)
   (S: No; F: No) ——— 2 Range Rings (OFF, *ON*) (S: No; F: No)
   ——— 3 Bearing Scale (OFF, Coarse, *Fine*) (S: No; F: No)
   ——— 4 Plot Own Ship Track (OFF, *ON*) (S: No; F: No)
   ——— 5 Data on Track (*OFF*, Water TEMP, Water Depth) (S: No; F: No)
   ——— 6 Net Move Plot (OFF, *ON*) (S: No; F: No)
   ——— 7 Fish Mark Connect (OFF, *ON*) (S: No; F: No)
   ——— 8 Target Vector (OFF, *ON*) (S: No; F: No)
   ——— 9 Fish Track Plot (OFF, *ON*) (S: No; F: No)
   ——— 0 Next
      Page two
   ——— 1 Histogram Display (OFF, *ON*) (S: No; F: No)
   ——— 2 TD Position Mark (OFF, *ON*) (S: No; F: No)

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┬ 3 Mark Color & Size ─┬ 1 Mark Color (*White*, Light blue, Blue, Yellow, Purple,
│ (S: No; F: No)   │   Green) (S: No; F: No)
│   ├ 2 Trackball (*Normal*, Large) (S: No; F: No)
│   ├ 3 Target Lock Mark (*Normal*, Large, Small) (S: No; F: No)
│   ├ 4 Target Vector (Short, *Normal*, Long) (S: No; F: No)
│   ├ 5 Event Mark (Normal, *Large*, Small) (S: No; F: No)
│   ├ 6 Fish Mark (Normal, *Large*, Small) (S: No; F: No)
│   ├ 7 Own Ship Position Mark (Normal, *Large*, Small) (S: No; F: No)
│   ├ 8 Own Ship Mark (*Normal*, Large, Actual) (S: No; F: No)
│   ├ 9 Net Shoot Mark (*Normal*, Large, Small) (S: No; F: No)
│   ├ 0 Next
│   │   Page two
│   ├ 1 Estimate on Scan (Normal, *Large*) (S: No; F: No)
│   ├ 2 Current Vector (*Normal*, Long, Normal/Thick,
│   │   Long/Thick) (S: No; F: No)
│   ├ 3 Range Ring Interval (1/2R, *1/4R*, Auto) (S: No; F: No)
│   ├ 4 Bearing Scale (*Normal*, Large) (S: Yes; F: Yes)
│   └ 5 Own Ship's Track Plot (*5R*, 10R, 20R, 40R) (S: No; F: No)
│
├ 4 Mark & Data ──────┬ 1 Range/Bearing Display (OFF, *ON*) (S: No; F: No)
│ (S: No; F: No)   ├ 2 Cursor Position (*OFF*, ON) (S: No; F: No)
│   ├ 3 Event Mark Display (*32 CMPS*, 360°True, 360°, ±180°)
│   │   (S: No; F: No)
│   ├ 4 Mark Display Style (32 CMPS, 360°True, 360°, *±180°*)
│   │   (S: No; F: No)
│   ├ 5 Course Display (*32 CMPS*, 360°True, 360°, ±180°)
│   │   (S: No; F: No)
│   ├ 6 Current Data Display (32 CMPS, *360°True*, 360°, ±180°)
│   │   (S: No; F: No)
│   ├ 7 Unit or Water TEMP (*°C*, °F) (S: No; F: No)
│   ├ 8 Water TEMP Range (*20 Minutes*, 1 Hour, 6 Hours,
│   │   12 Hours, 24 Hours) (S: No; F: No)
│   └ 9 Fishing Area (*OFF*, ON) (S: No; F: No)
│
├ 5 Current VEC ──────┬ 1 Current Data (*Tidal Current*, REL to Layer1, REL to
│ & Wind   │   Layer 2, REL to Layer3, REL to Layer4, REL to Layer 5)
│ (S: No; F: No)   │   (S: No; F: No)
│   ├ 2 On Own Ship Mark (OFF, *ON*) (S: No; F: No)
│   ├ 3 On Ship Position Mark (OFF, *ON*) (S: No; F: No)
│   ├ 4 On Net Shoot Mark (OFF, *ON*) (S: No; F: No)
│   ├ 5 Current Flow Direction (*To*, From) (S: No; F: No)
│   ├ 6 Wind (*OFF*, Relative, Absolute) (S: No; F: No)
│   └ 7 Select Water Current (*Layer1*, *Layer2*, *Layer3*, Layer4,
│   Layer5) (S: No; F: No)
│
└ 6 Net Course ───────┬ 1 Execute or Erase (*Execute*, Erase) (S: No; F: Yes)
   Mark   ├ 2 Net ──────┬ 1 Net Diameter (200 m to 1000 m; *500 m*)
   (S: No; F: No)   │   Shoot   │   (S: No; F: No)
                      │   Setting   ├ 2 Tilt Interlock (OFF, *ON*) (S: No; F: Yes)
                      │ (S: No; F: No) ├ 3 Net Plot CORR-Layer1 (0% to 100%; 50%)
                      │   │   (S: No; F: No)
                      │   ├ 4 Net Plot CORR-Layer2 (0% to 100%; 50%)
                      │   │   (S: No; F: No)
                      │   ├ 5 Net Plot CORR-Layer3 (0% to 100%; 50%)
                      │   │   (S: No; F: No)
                      │   ├ 6 Net Plot CORR-Layer4 (0% to 100%; 50%)
                      │   │   (S: No; F: No)
                      │   └ 7 Net Plot CORR-Layer5 (0% to 100%; 50%)
                      │   (S: No; F: No)
                      └ 3 Net Shoot Distance (*NM*, Meter, Feet) (S: No; F: No)

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— 7 Net Sonde ——— 1 Number of XMTR (0 to 10*; **3**) (S: No; F: No)
    Setting ——————— 2 XMTR ————— 1 End of Net to S1 (0 m to 1000* m; **400 m**)
    (S: No; F: No)   Distance   (S: No; F: No)
                    (S: No; F: No) — 2 S1 to S2 (0 m to 1000* m; **400 m**)
                                 (S: No; F: No)
                               — 3 S2 to S3 (0 m to 1000* m; **400 m**)
                                   (S: No; F: No)
                               — 4 S3 to S4 (0 m to 1000* m; **400 m**)
                                   (S: No; F: No)

: Setting maximum depends   — 5 S4 to S5 (0 m to 1000 m; **400 m**)
    on setting at [3 Net Length].   (S: No; F: No)
                                   — 6 S5 to S6 (0 m to 1000* m; **400 m**)
                                   (S: No; F: No)
                                   — 7 S6 to S7 (0 m to 1000* m; **400 m**)
                                   (S: No; F: No)
                                   — 8 S7 to S8 (0 m to 1000* m; **400 m**)
                                   (S: No; F: No)
                                   — 9 S8 to S9 (0 m to 1000* m; **400 m**)
                                   (S: No; F: No)
                                   — 0 Next
                                      <u>Page two</u>
                                   — 1 S9 to S10 (0 m to 1000* m; **400 m**)
                                   (S: No; F: No)
                — 3 Net Length (1200 m to 3000 m; **1800 m**) (S: No; F: No)
                — 4 Depth Display (**S1**, **S2**, **S3**, S4, S5, S6, S7, S8, S9, S10)
                    (S: No; F: No)

— 8 Target Lock ——— 1 Tracking Method (Target Mark, **Fish**) (S: No; F: No)
    (S: No; F: No)   — 2 Tilt Interlock (OFF, Tilt, **Tilt & Range**) (S: No; F: No)
                     — 3 Mark Interlock (OFF, **Estimate Mark**, EST & Fish INFO)
                        (S: No; F: No)
                     — 4 Advanced ——— 1 Threshold (1 to 30; **16**) (S: No; F: No)
                        Settings   — 2 Bottom Threshold (1 to 30; **16**)
                        (S: No; F: No)   (S: No; F: No)
                                   — 3 Target Speed Limit (1 kn to 15 kn; **5 kn**)
                                   (S: No; F: No)
                                   — 4 Smoothing (0.0 to 1.0; **0.5**) (S: No; F: No)
                                   — 5 Target Speed Update (15s, 30s, 45s, **60s**)
                                   (S: No; F: No)
                                   — 6 Target Lock Window (Normal, Large, Largest)
                                   (S: No; F: No)
                                   — 7 Dimension Coefficient (0t/1000 m² to
                                         100t/1000 m²; **25t/1000 m²**) (S: No; F: No)

— 9 Alarm & ——————— 1 Fish Alarm (**OFF**, ON) (S: No; F: No)
    Audio   — 2 Alarm Level (S: No; F: No)
    (S: No; F: No)   — 3 Alarm Zone (S: No; F: No)
                     — 4 Ship Speed Alarm (**OFF**, ON) (S: No; F: No)
                     — 5 Audio (**OFF**, Audio1, Audio2) (S: No; F: No)
                     — 6 Audio Gain (0 to 10; **5**) (S: No; F: No)
                     — 7 Audio Sector (**OFF**, 30°, 60°, 90°, 180°) (S: No; F: No)

— ▼ Shortcut ——————— TX Pulse Length
    Menu   — Transmission Power
                     — Color
                     — Color Response
                     — Echo Average

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APPENDIX 2 ERROR CODE LIST

Error Code	Error Message	Description (as appears in error list)	Meaning and Remedy
Hull Unit			
100	Transducer Position Not Found	Multiple signals asserted for TXDR position.	More than one location is registered for the transducer. Move the transducer and re-set the system power.
101	Hull Unit Fan Error	Fan RPM has lowered.	Fan RPM is abnormally low. • Conduct the FAN monitor test (see section 10.10.5) and check that the value for each fan is not red. If any fan's RPM is shown in red color, consult your local dealer for service. • Reset the system power.
102	Rotary Encoder Error	Rotary encoder data is over normal range.	There is a problem with the hull unit. Move the transducer and reset the system power.
103	Motor Brake Malfunction	Malfunction of motor brake.	
104	Hull Unit Fall Error	Hull unit fall.	
105	Hull Unit Power Error	Hull unit power is over normal range.	There is a problem with the hull unit. Reset the system power.
111	Hull Unit Controller COMM Error	HCTL data communication error	There is a communication problem between the hull unit and the processor unit. Reset the system power.
112	Hull Unit Controller Data Error	HCTL data is over normal range	
113	Hull Unit Controller Malfunction	Hull Unit Controller error.	There is a problem in the control box. Reset the system power.
115	Motion Sensor Data COMM Error	Communication error in TX/RX data.	There is a problem in the motion sensor. Reset the system power.
116	Motion Sensor Data Error	Motion sensor data is over normal range.	
120	LSW Not Correctly Installed	LSW is not correctly installed.	The position signal from the transducer are not in order. Reset the system power.
130	3-Axis Motor OP Over-Time	3-Axis motor operated over limited time.	Contact your dealer to request service.
131	3-Axis Motor Electrical Fault	Overcurrent, low voltage occurred in 3-axis motor.	There is a problem in the 3-Axis motor. Reset the system power.
132	3-Axis Motor TEMP Fault	3-Axis motor temperature is over normal range.	

Error Code	Error Message	Description (as appears in error list)	Meaning and Remedy
133	Resolver Signal Malfunction	Error occurred in resolver signal.	There is a problem in the position sensor inside the transducer. • Conduct the control box test (see section 10.10.4) and check that the RESOLVER DRIVER STATUS item is not shown as "NG". • Reset the system power.
134	Resolver Signal DC (COS side)	Resolver Signal side COS disconnect.	There is a problem in the position sensor inside the transducer. • Conduct the control box test (see section 10.10.4) and check that the RESOLVER DRIVER STATUS item is not shown as "NG". • Reset the system power.
135	Resolver Signal DC (SIN side)	Resolver Signal side SIN disconnect.	
136	Resolver R/D Converter Fault	Resolver R/D Converter is fault.	
137	Resolver Internal TEMP Fault	Resolver internal temperature is fault.	
138	Motor Step-out	Motor Step-out occurred.	A step-out was detected in the hull unit motor. • Conduct the control box test (see section 10.10.4) and check that the MOTOR SELF TEST item is not shown as "NG". • Reset the system power.
139	Motor Sensor Calibration Data Error	Motor Sensor Calibration Data Error	There is a problem in the motion sensor. Reset the system power.
Transceiver Unit			
200	B Voltage Fault	B voltage is over normal range.	An abnormal voltage was detected. • Conduct the operation test (see section 10.10.2) and check the voltage for the +B item in the PWR section of the test results. • Reset the system power.
201	Transceiver Fan Error	Fan RPM has lowered.	Fan RPM is abnormally low. • Conduct the FAN monitor test (see section 10.10.5) and check that the value for each fan is not red. If any fan's RPM is shown in red color, consult your local dealer for service. • Reset the system power.
205	Motion Sensor Malfunction	Motion sensor status fail.	There is an error in the motion sensor. Reset the system power.

Error Code	Error Message	Description (as appears in error list)	Meaning and Remedy
206	TRX CALIB Verification Error	Error of calibration data.	There is a problem in the data on the TRX board. Reset the system power.
207	TRX CALIB Check Error	Error of lacking calibration.	
210	Processor Unit Input Error	Error occurred in input data from processor unit.	There is a communication problem with the processor unit. Reset the system power.
215	SoC PLL Error	Error of SoC PLL.	There is a problem with the transceiver board(s).
216	RXBMF_FPGA PLL Error	Error of RX_FPGA PLL.	• Conduct the board test (see section 10.10.3) and check that the results for all items do not appear in red.
217	FLT_FPGA PLL Error	Error of FLT_FPGA PLL.	
218	TRCPU FPGA MISC Error	Error of BMF PCB.	
220	TRX Board1 COMM Error	No data input from TRX Board1.	• Reset the system power.
221	TRX Board2 COMM Error	No data input from TRX Board2.	
222	TRX Board3 COMM Error	No data input from TRX Board3.	
223	TRX Board4 COMM Error	No data input from TRX Board4.	
224	TRX Board5 COMM Error	No data input from TRX Board5.	
243	RXBMF_FPGA Timeout	No data input from PRETRG.	
244	FLT_FPGA Timeout	No data input from PRETRG.	
245	12V voltage Malfunction	12V voltage is over normal range.	
248	PreLoader Error	PreLoader program error.	There is a problem with the program inside the transceiver. Reset the system power.
Processor Unit			
301	Processor Unit Fan Error	Fan RPM has lowered.	Fan RPM is abnormally low. • Conduct the FAN monitor test (see section 10.10.5) and check that the value for each fan is not red. If any fan's RPM is shown in red color, consult your local dealer for service. • Reset the system power.
304	Transceiver COMM Error	Error occurred in communication with transceiver.	There is a communication problem with the transceiver unit. Reset the system power.
305	Main Control COMM Error	Error occurred in communication with main control.	There is a problem communicating with the control unit. Reset the system power.
306	Sub Control COMM Error	Error occurred in communication with sub control.	

Error Code	Error Message	Description (as appears in error list)	Meaning and Remedy
310	Backup Memory Error	Backup memory write error.	An error occurred while saving the backup memory. Reset the system power.
311	Backup Data Error	A backup data faultily set to default.	An error occurred in the backup data; settings were reset to default. Reset the system power.
312	Backup Data Corrupt	A backup data corrupt.	The backup data is corrupt and cannot be loaded. Reset the system power.
320	Disk Space Error	No disk space.	Insufficient space to save data. Remove unnecessary files from main menu → [5 Record/Recall/Register] → [3 Delete Data] (see section 8.8).
321	Gain Adjust Value Fault	Fault of gain adjust value.	There is a problem with the gain values. Reset the system power.
322	Low Battery	Battery voltage is dropped.	The voltage of the battery inside the processor unit is low. Consult your local dealer for battery replacement.
323	NMEA Port Error	NMEA port recognition error.	There was a problem detecting the NMEA port. Reset the system power.
324	IP Address Conflict	IP address conflict	More than one connection has the same IP address. Have your local dealer check that the IP addresses are set as follows: • Processor Unit: 2 • Transceiver Unit: 1
325	DLL Error	DLL recognition error.	The DLL (Dynamic Link Library) file was not recognized or found. Reset the system power.
326	Grade authentication error 1.	Cannot decrypt authentication file.	Restart the system. If not rectified, contact your dealer to request service.
327	Grade authentication error 2.	MAC address mismatch.	
Others			
900	Motor Step-out	Motor Step-out occurred.	Remedy for this error is not required because the step-out is rectified automatically. If not rectified, error code "138" occurs.

APPENDIX 3 DATA INPUT REQUIRE- MENTS

The following table outline the data input requirements for the listed functions and/or displayed items.

Function/Item	See...	Required data
Bearing mark	page 2-10	Heading data
Own ship position mark	page 2-34	Speed/Course data
Own ship mark	page 2-2	Heading data, Speed/Course data
North mark	page 2-2	
Auto Filter	page 2-19	
Target Lock mark	page 2-21	
Presentation modes	page 2-24	
Audio bearing mark	page 2-25	
Estimate mark	page 2-29	
Fish mark	page 2-31	
Event mark	page 2-33	
Net Course mark	page 2-35	
Net Shoot mark	page 2-36	
Net Sonde mark	page 2-36	
Heading mark	page 9-3	
Bearing scale	page 9-4	
Tracks	page 9-4	
Fish tracks	page 9-4	
Net movement (Net move plot)	page 9-4	Heading data, Speed/Course data, Current data
Current mark	page 9-7	
Wind-related speed, barbs, etc	page 9-8	Heading data, Speed/Course data, Wind data
Cursor data (coordinates, etc)	page 2-10	Position data
Fishing area	page 9-7	
Depth on track	page 9-4	Depth data
Temperature graph	page 6-1	Temperature data
Temperature on track	page 9-4	
Net depth	page 2-36	Net depth data

APPENDIX 4 BRAKE TEST

Have a qualified technician check the motor brake yearly and record the results.

Brake Check Sheet for FSV-75 Hull Unit

Unit: ☐ FSV-753 ☐ FSV-754

Serial no.: _____

Note:
A. Follow the procedures for "How to Check the Brake in the Hull Unit" in Operator's Manual.
B. While the Hull Unit is running, check the brake with care not to be caught up in the gear.
C. Before doing the check, make sure no one is near the hull unit and transducer.

Check item	Method, standard	Date						
1. Checking the brake in the raise/lower control box								
1-1. Set the toggle switch to the [MBRAKE] side.	Check that the Brake LED on the circuit board is lit in red.	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG
1-2. Set the toggle switch to the [MBRAKE] position. Hold down the brake release push switch to release the motor brake.	Check that the main shaft does not lower and the 7-segment LEDs on the circuit board does not change.	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG
2. Measuring the gap in the motor brake								
2-1. Insert the 0.6 mm leaf of the gap gauge.	Check that the 0.6 mm leaf can be inserted at three places.	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG
2-2. If the check item 2-1 is NG, reduce the gap then check again.	Check that the 0.3 mm leaf can be inserted at three places.	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG
	Check that the 0.4 mm leaf can not be inserted at three places.	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG	OK/NG

SPECIFICATIONS OF HALF-CIRCLE COLOR SCANNING SONAR FSV-75, FSV-75-3D

1   GENERAL

1.1   Scanning method   Full digital beam forming

1.2   Frequency   180 kHz

1.3   Pulse length   0.5 to 40 ms

1.4   Range

Basic range (m)	Range (m)		Basic range (m)	Range (m)	
	Off-center 'OFF'	Off-center 'ON'		Off-center 'OFF'	Off-center 'ON'
50	0-50	0-90	800	0-800	0-1280
100	0-100	0-160	900	0-900	0-1440
150	0-150	0-240	1000	0-1000	0-1600
200	0-200	0-320	1100	0-1100	0-1760
300	0-300	0-480	1200	0-1200	0-1920
400	0-400	0-640	1400	0-1400	0-2000
500	0-500	0-800	1600	0-1600	0-2000
600	0-600	0-960	2000	0-2000	0-2000
700	0-700	0-1120			

1.5   Audio search   Frequency: 1 kHz, Output 10 W (optional speaker required)

2   PROCESSOR UNIT

2.1   Orientation   Head-up, North-up* and Course up* (*: sensor required)

2.2   Presentation mode

       Common   Slant, Vertical combination scan, Echo sounder combination,
                              Vertical and echo sounder combination

       FSV-75-3D only   3D single, 3D combination,
                              3D sounder combination (for dual-display)

2.3   Marks   Own ship, Bow line, Bearing/Distance, Event, Fish school, EBL,
                              Tracking, Current, Sonde

2.4   Information   Scan (Bearing/Distance), Cursor (Distance/Depth/Bearing), Event,
                              Fish school (Position/Bearing), Own ship's location, Speed/Bearing,
                              Water temperature, Wind speed/bearing

2.5   Features   Interference rejecter, Afterglow, Noise limiter, Delete color,
                              Automatic target tracking, Auto-retraction, Fish school alarm

2.6   Resolution   1280 x 1024 (SXGA)

2.7   Picture color   32 colors (sonar pictures), 6 colors (marks)

3   HULL UNIT

3.1   Transducer travel   800 mm or 1100 mm

3.2   Raise/lower time   8 s (800 mm travel), 11 s (1100 mm travel)

3.3   Tx beam width   Horizontal: 180°, Vertical: 6° (-3 dB at 180 kHz)

3.4   Rx beam width   Horizontal: 6°, Vertical: 6° (-3 dB at 180 kHz)

3.5   Scanning angle   -175° to +175°

3.6   Elevation angle   0° to 90° (downward)

3.7   Ship's speed allowance 18 kn (15 kn for raise/lower operation)

4   INTERFACE

4.1   Number of port

Video output	2 ch, HDMI, SXGA
NMEA0183	5 ch, V1.5/2.0/3.0/4.0/4.1
External KP	1 ch, current loop or contact closure (Input: 5-15 V, Output: 12 V)
Voice output	1 ch, 10 W, 4 ohms, monaural
Gyrocompass	1 ch, AD-10
Echo sounder input	1 ch, VI-1100A analog
Contact closure	1 ch, for external switch
USB	USB2.0: 2 ch, USB3.0: 2 ch
LAN	2 ch, Ethernet, 1000Base-T

4.2   Data sentences

Input   CUR, DBS, DBT, DPT, GGA, GLL, GNS, HDG, HDM, HDT, MDA, MTW, MWV, RMC, THS, VBW[1], VDR, VHW, VTG, VWR, VWT, ZDA

Output   TLL

*1: fore-aft/port-stbd speed data required

4.3   Output proprietary sentence

PFEC   evt, fkv, fmg, fvc, pidat, sht, tfm, tlm, tqm

5   POWER SUPPLY

5.1	Transceiver unit	100/110/115/220/230 VAC, 2.5 A max., 1 phase, 50-60 Hz
5.2	Processor unit	12-24 VDC: 4.0-2.0 A
5.3	Hull unit	200-220 VAC, 4 A max., 3 phase, 50/60 Hz
5.4	Rectifier (RU-1746B-2, option)	100/110/115/220/230 VAC, 1 phase, 50/60Hz

6   ENVIRONMENTAL CONDITIONS

6.1   Ambient temperature

Processor unit	-15°C to +55°C
Transducer	-5°C to +35°C
Transceiver unit	0°C to +50°C
Matching box	0°C to +50°C
Hull unit	0°C to +50°C
Control unit	-15°C to +55°C

6.2   Relative humidity   93% or less at +40°C

6.3   Degree of protection

Transducer	IPX8
Control unit	IP22 (panel), IP20 (chassis)
Processor unit	IP22
Transceiver unit	IP22
Matching box	IP22
Hull unit	IPX2

6.4   Vibration   IEC 60945 Ed.4

7   UNIT COLOR

7.1	Processor unit	N2.5
7.2	Transceiver unit	N2.5
7.3	Control unit	N2.5
7.4	Hull unit	2.5G7/2

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Publication No. DOCQA1308

EC Declaration of Conformity

$C\epsilon$

We   FURUNO ELECTRIC CO., LTD.

(Manufacturer)

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

(Address)

declare under our sole responsibility that the product

HALF-CIRCLE COLOR SCANNING SONAR

FSV-75 and FSV-75-3D

(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, 10.6, 10.7, 10.8, 10.9 and 11.2, incl. Corr. 1: 2008
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

• Test Report LIC 12-18-112 and LIC 12-18-113, December 21, 2018 prepared by 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.

Nishinomiya City, Japan
May 26, 2020

Yoshitaka Shogaki
Department General Manager
Quality Assurance Department

Y. Shogaki

(Place and date of issue)

(name and signature or equivalent marking of authorized person)