

**SUZUKI**

15 INCH COLOR LCD TFT  
ECHO SOUNDER

---

**ES-8600**

**OPERATION MANUAL**

**SUZUKI FISH FINDER CO., LTD.**

12-1 MAMIZUKA, TOYOHASHI  
AICHI 441-8007, JAPAN

PHONE: (81) 532-32-7511 FAX: (81) 532-32-7500

<http://www.suzukiff.co.jp/> [sales@suzukiff.co.jp](mailto:sales@suzukiff.co.jp)



# INTRODUCTION

*Thank you for purchasing the SUZUKI ES-8600 ECHO SOUNDER.  
We are confident you will enjoy using your unit for many years to come.*

Before attempting to operate this equipment, read this instruction manual thoroughly to ensure correct and safe operation in accordance with the warning instructions and operation procedures.

You are strongly recommended to store this instruction manual carefully for future reference. In the event that you have an operational problem or malfunction, this manual will provide useful instructions.

# CONTENTS

INTRODUCTION	1
CONTENTS	2
SAFETY INSTRUCTIONS	5
FOR YOUR SAFETY	6
SUPPLIED COMPONENTS	8
DIMENSIONS	9
INSTALLATION	11
CONNECTIONS	12
WIRING	14
DISPLAY	15
DISPLAY MODES	16
KEYBOARD	17
DIAL OPERATION	18
Frequency Selection Dial	18
Mode Selection Dial	19
1. Normal Mode	20
2. Bottom Expansion Mode	20
3. Partial Expansion Mode	21
4. Navigation Display Mode	22
5. Range Set	22
6. Main Menu	22
Brightness Dial	23
VR1, VR2 Dial (Gain Dial)	23
VR3, VR4 Dial (Far Gain Dial)	24
KEY OPERATION	25
Range Keys	25
Phased Range Keys	25
Auto Range Function	26
Auto Shift Function	26
Picture Speed Key	27
EXR / VRM Keys	28
1. Expansion Start Point	28
2. VRM (Variable Range Marker)	28
Expansion Range Keys	29
Mark Key	29
1. Mark	29
2. Timer	30
3. Squid	30
Memory Save / Load Keys	31
High / Low Frequency Keys	32
Threshold Key	32
Operation Mode Keys	33
RANGE SET	34
1. Main Range	34
2. Expansion Range	35




MAIN MENU	36
FUNCTION SET	37
1. Main Frequency	37
2. Gain Up	38
3. TVG	39
4. D Range (Dynamic Range)	40
5. Clutter	40
6. TX Power	41
7. Pulse Width	42
8. IF Filter	42
9. Image Filter 1	42
REDUCTION	43
1. Interference Reduction	43
2. Jamming Reduction	44
3. Noise Reduction	45
4. White Line	45
5. Image Filter 2	46
SCREEN DIVISION	47
1. Bottom Expansion	47
2. Screen Division	48
3. Dual Frequency Display Location	49
4. High Frequency	49
DISPLAY ITEM SELECTION	50
1. Depth Display Font Size	50
2. Depth Scale Position	51
3. EXP/VRM (Expansion/Variable Range Marker)	51
4. Temperature Display Font Size	52
5. Temperature Graph	52
6. Color Scale	53
7. Latitude/Longitude of Own Ship	53
8. Speed Display	54
9. Course Display	54
10. Voltage Display	55
11. Mark	55
12. Display Position for Depth and Water Temperature	56
13. Depth Grid Size	56
14. Picture Feed	57
15. Scale Font	57
16. Picture Speed	58
17. A-Scope	58
UNIT ADJUSTMENT	59
1. Depth Unit	59
2. Temperature Unit	60
3. Speed Unit	60
4. Temperature Adjustment	60
5. Draft	61
6. Sonic Control	61
OTHERS	62

1. Full-Screen Gain	62
2. Outer Depth	63
3. Prior Depth Measuring Frequency for Digital Display	63
4. Trigger Signal	63
5. Output Data	64
6. Transmit Interval Addition Rate	64
7. Transmit Rate (Pulse Repetition Rate)	65
8. Frequency of Power Supply Source	65
9. Panel Brightness	65
10. Operation Mode	66
11. Shift Average - Scale increment	66
12. Water Temperature Sensor	66
13. Auto Shift Limit	67
14. Bottom Detection Limit	67
15. Trigger Synchronization	67
16. Range Set	68
COLOR PALETTE	69
1. Color Selection	69
2. Display Colors	69
3. How to Edit the Color Palette	70
ALARMS	71
1. Shallow Alarm	71
2. Deep Alarm	72
3. Fish Alarm	73
4. Temperature Maximum Alarm	73
5. Temperature Minimum Alarm	74
6. Temperature Range Alarm	74
7. Fish Alarm (Selection of Frequency on Sounding Alarm)	74
T/R BOARD SET	75
1. Main Frequency	75
2. Transducer	76
3. Frequency	76
4. TX Frequency	77
5. RX Frequency	77
6. RX Bandwidth	77
7. Carrier	78
8. Power Voltage	78
9. TX Duty	78
MAINTENANCE	79
1. Language	79
2. Elapsed Time	79
3. Update	79
4. Settings (User Settings / Return to Factory Settings)	80
5. Gain or Far Gain	81
6. About This Equipment	81
OPTION	82
DISPOSAL	83
SPECIFICATIONS	84

## SYMBOLS

The following symbols are used in this manual.

Please read this manual carefully and take note of these symbols.

 <b>DANGER</b>	: indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	: indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	: indicates a potentially hazardous situation which, if not avoided, may result in minor injury.

## NOTICE

This manual should be kept on hand to provide your quick reference whenever you need it.

Any use other than that mentioned in this manual is not guaranteed.

The contents of this manual and equipment specifications are subject to change without notice.

No part of this manual may be copied or reproduced without written permission.

## TFT LCD

The high quality TFT (Thin Film Transistor) LCD displays 99.99% of its picture elements. The remaining 0.01% may drop out or light, however this is an inherent property of the LCD; it is not a sign of malfunction.

## INSTALLATION SITE REQUIREMENTS



Keep the unit away from the flammable gas.  
Otherwise it causes a fire.



Follow the below proposed conditions for the installation.  
Otherwise it causes a fire, serious injury, and an electrical shock.

Away as much as possible from areas where the unit is likely to be exposed to direct water spray and free as much as possible from shocks and engine vibration.

Away as much as possible from areas of high temperatures or areas where the unit is likely to be exposed to direct sunlight.

## MOUNTING CONDITIONS



Do not install the unit on unstable or uneven surfaces.  
Installing the unit tentatively may result in dropping, toppling over or injury.

Follow the below conditions for wirings. Otherwise it causes heat, a fire, and injury.

Run the cables not to touch the rotary obstacles or disturb the operation.

Do not use the cables bent, twisted or stretched by force.

Do not put heavy objects on the cables.



Always turn off the power before connecting or disconnecting the unit.  
Pulling the cables may damage the cables themselves and result in fire or an electrical shock.

## POWER SUPPLY



Operating voltage: 20 to 30 volts DC.  
Use the proper voltage. Otherwise it will result in fire and electrical shock.



Turn on/off the power by ON/OFF keys on the control panel.  
Turning on/off the power by the switchboard may damage the unit.

Turn off the power when starting the vessel engine.  
Otherwise it could result in serious trouble and damage the unit.

## HANDLING



Do not operate the unit while steering.  
Otherwise it will cause wrecks and injury.

Do not open the case cover.  
There is a risk of electrical shock if you touch the high voltage conductors.  
Only qualified personnel should work inside the unit.

Care for sufficient reinforcement and being watertight should be taken when installing the transducer.  
If not, serious leaks may result.



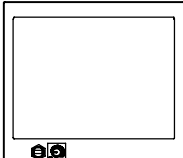
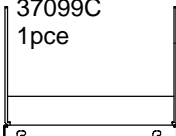


Use the proper fuse when changed.  
Otherwise it could result in serious trouble and fire.





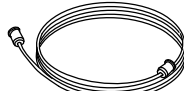
Use the specified power supply cables.  
Otherwise it could result in serious trouble and fire.



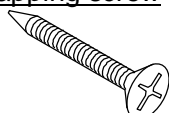
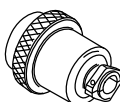
Insert new batteries, when replacing them.  
Be sure that the batteries polarity is correct.  
Never subject batteries to very hot or cold temperatures, or disassemble or dump into fire/water.  
Do not use batteries with fluid leaking out.

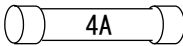
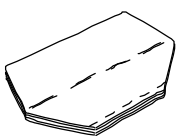
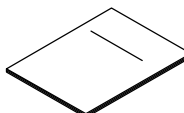
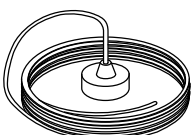
SUPPLIED COMPONENTS

**SUPPLIED COMPONENTS**

CODE				**OF111	
ITEM	<u>Monitor</u> 	<u>Bracket</u> 37099C 1pce 	 Knob bolt KG-B2 4pcs	<u>Base</u> 	
PARTS#	-			37100C	
QTY	1			1	

CODE			**OF110		**OF141
ITEM	<u>Keyboard</u> 	 Knob bolt KG-B2 2pcs	<u>Keyboard bracket</u> 	<u>Truss tapping screw</u> 	<u>Signal cable 1</u>  2.5m
PARTS#	-		37076C	M4x12	35503D
QTY	1		1	4	1

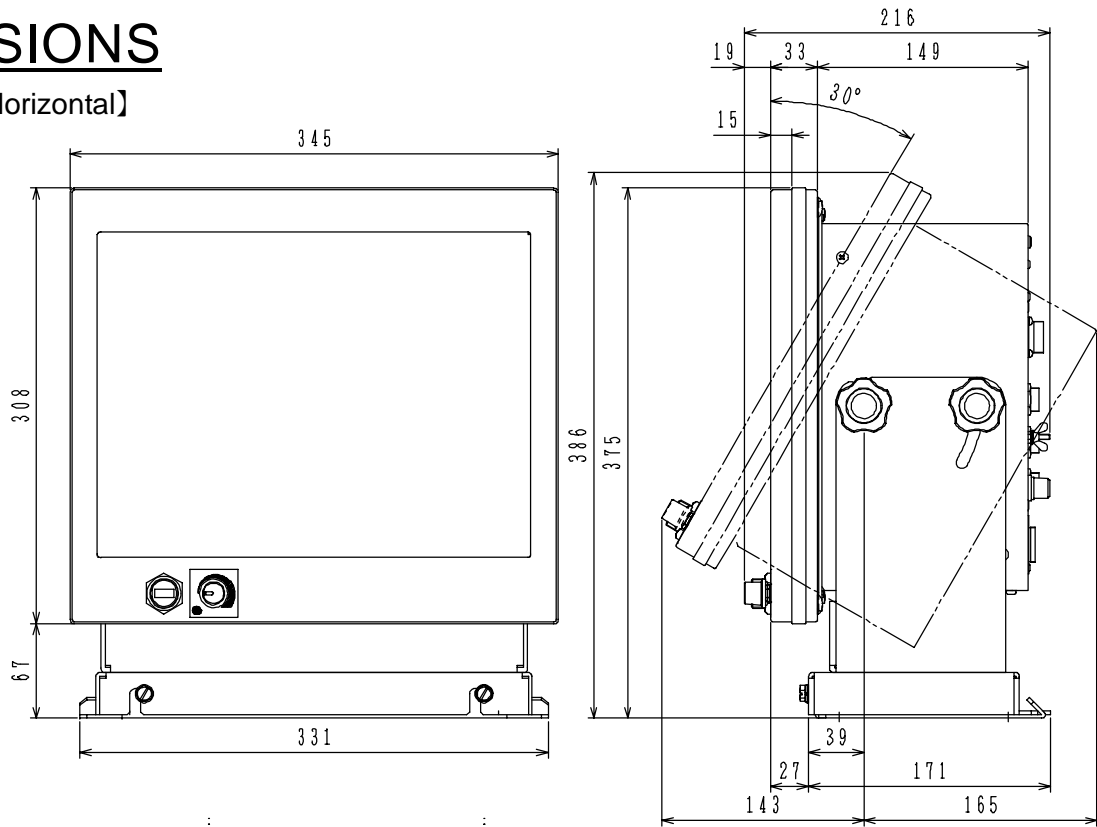
CODE	**OF010				
ITEM	<u>Power supply cable</u>  2m	<u>Hex. bolt</u> 	<u>Flat head tapping screw</u> 	<u>TD plug</u> 	
PARTS#	31524D	M6x20-Assy	M5x30	HS21P-3	
QTY	1	2	4	2	

CODE	**OF120				
ITEM	<u>Fuse</u>  4A	<u>Cover</u> 	<u>Manual</u> 		<u>Transducer</u> 
PARTS#	-	-	ES-8600-EM		When required.
QTY	3	1	1		

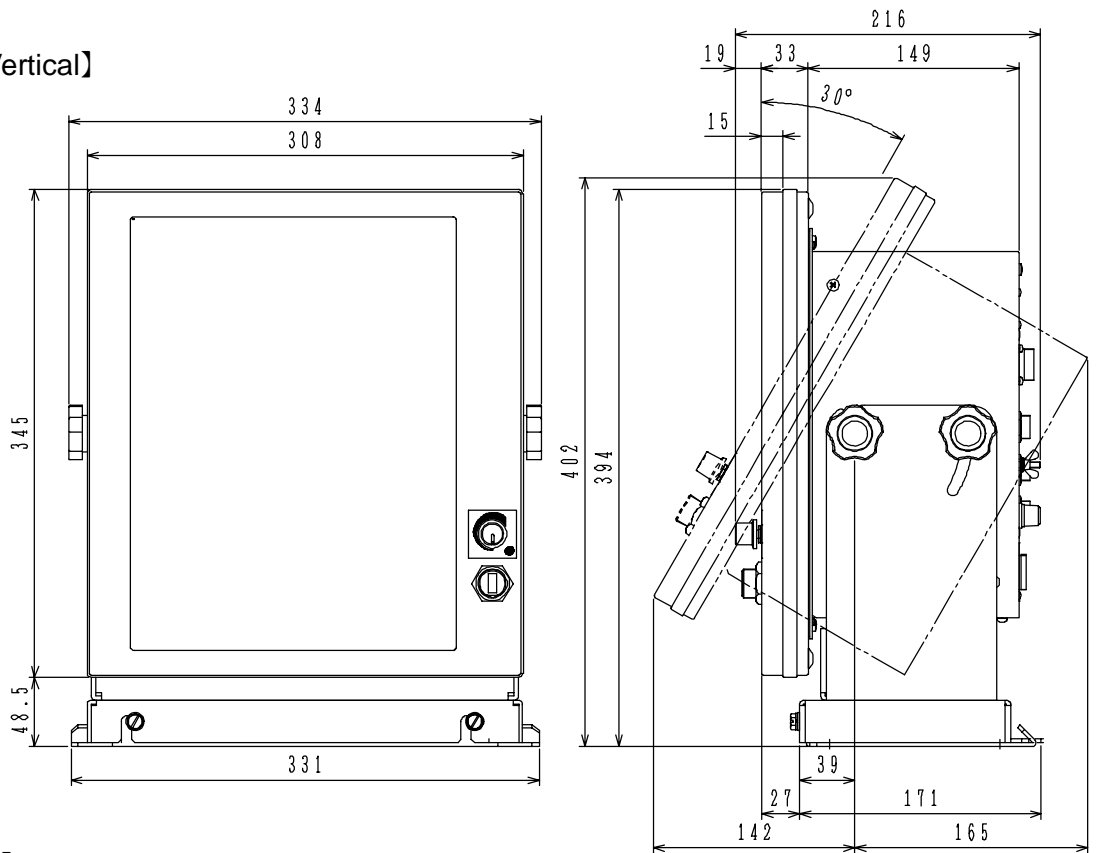
NOTE: The code number is shown on the package.  
However, \*\*shows the lot management number.

# DIMENSIONS

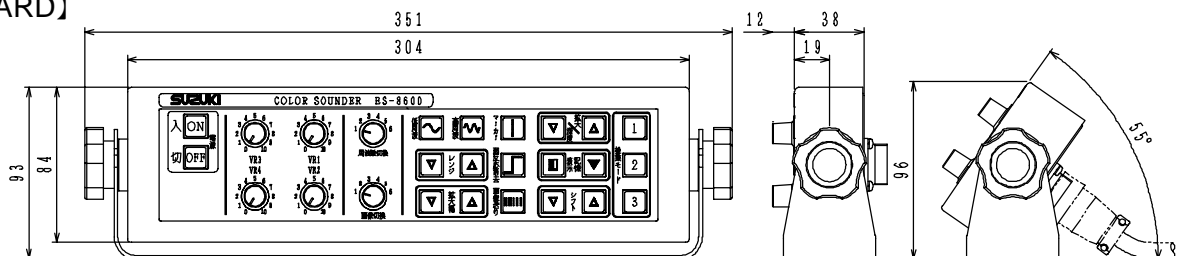
【MONITOR Horizontal】



【MONITOR Vertical】

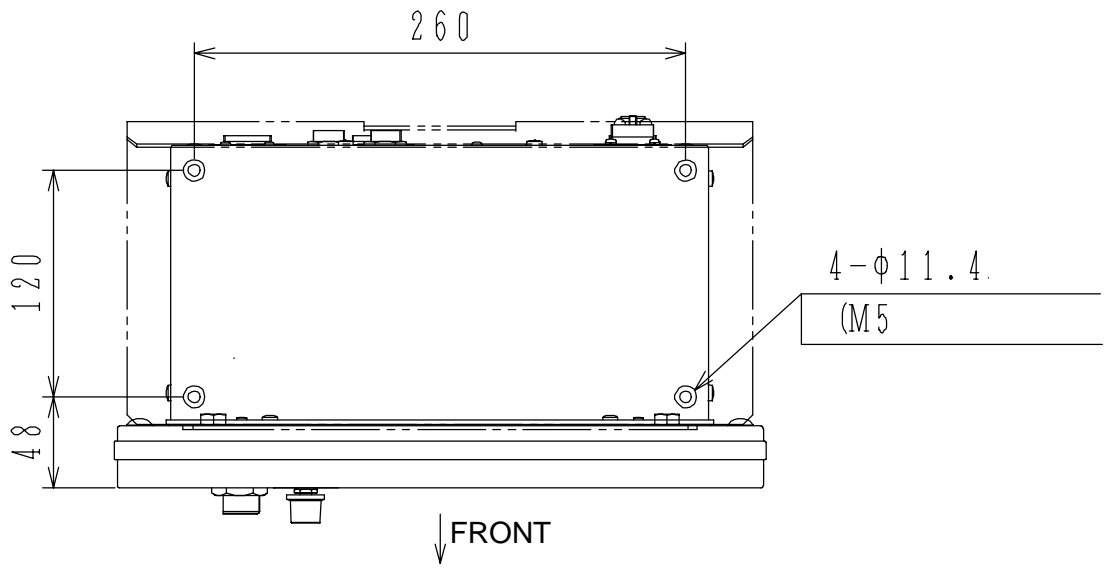


【KEYBOARD】

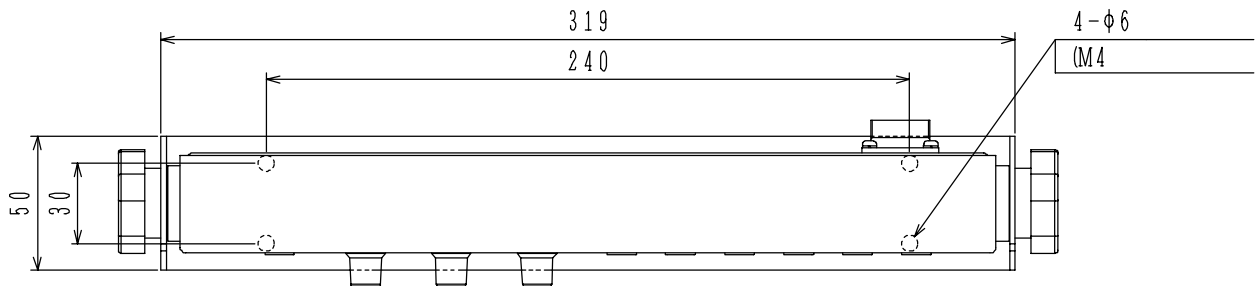


# DIMENSIONS

## 【MONITOR】

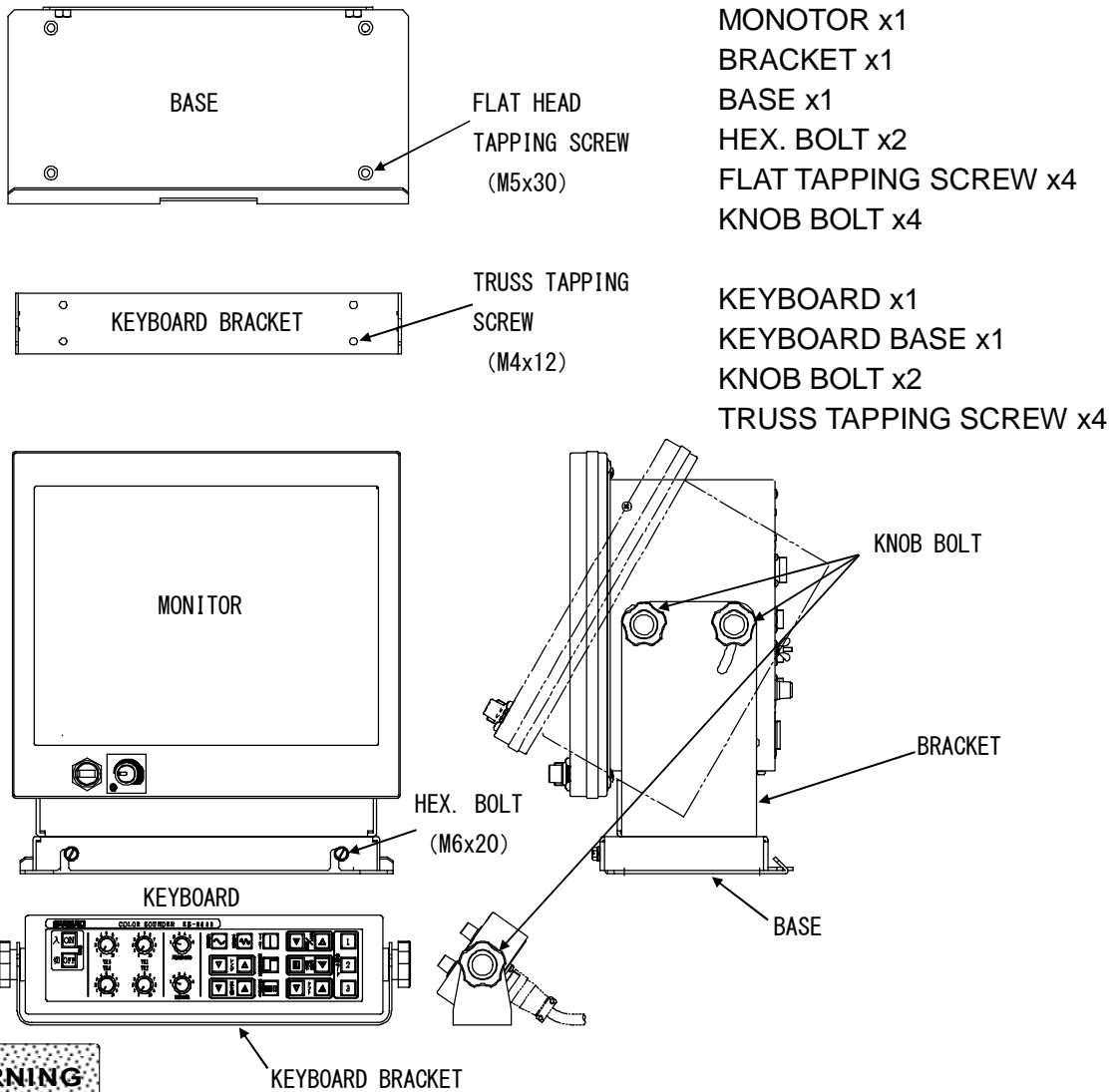


## 【KEYBOARD】



# INSTALLATION

1. Fasten the base to the mounting location with 4 flat head tapping screws.
2. Assemble the Monitor unit into the bracket. Tighten the knob bolts after selecting a comfortable viewing angle of the monitor.
3. Insert the Monitor unit with bracket into the base. Pull the bracket to the left and tighten the hex. bolt.
4. Insert the keyboard into the keyboard bracket and fasten it with the knob bolts adjusting the comfortable viewing angle.

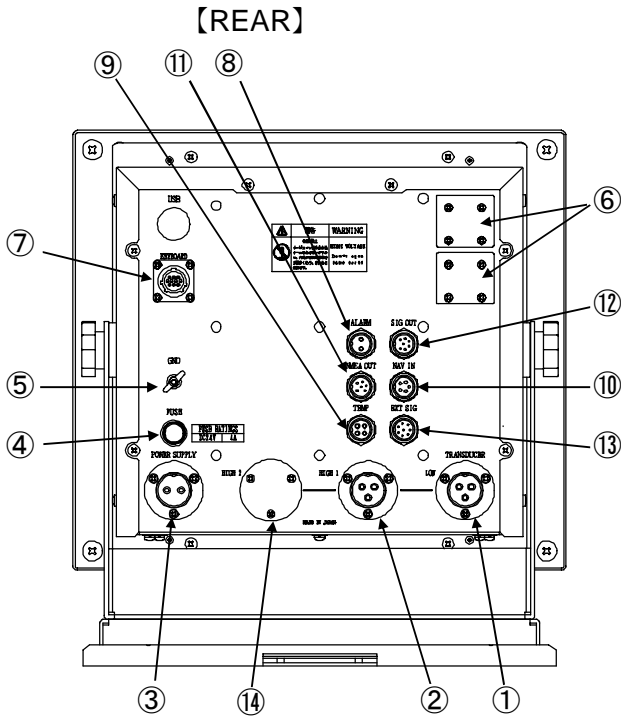


The unit should be installed on a flat surface.  
Do not use the unit while tentatively installed to avoid some trouble.

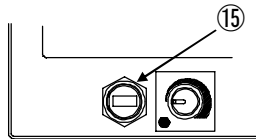


Make sure the unit is not close to any inverters, converters, or transformers that Interfere with the sounder performance.  
Avoid the mounting location where gets rain or spray.  
Keep the unit out of direct sunlight, heat sources

# CONNECTIONS



[FRONT]



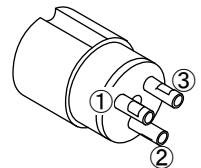
- ① Connects Low Frequency Transducer
- ② Connects High Frequency Transducer

- ③ Connects Power Supply  
DC20~30V

- ④ Fuse Holder  
Use the specified fuses.  
DC24V:4A

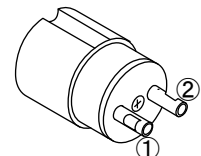
Pin No.	CONNECT
No.1	White
No.2	Shield
No.3	Black

3 P PLUG



Pin No.	CONNECT
No.1	White(+)
No.2	Black(-)

2 P PLUG



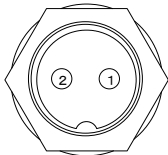
⑤ GND

Connects to ship's earth

⑥ Option (for external monitor)

⑦ Connects Keyboard

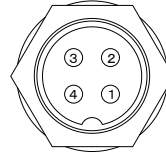
⑧ External Alarm



Pin No.	SIGNAL
No.1	Relay contact
No.2	Relay connect

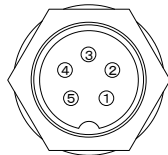
Relay Contact Capacity.  
DC30V2A/AC125V0.4A

⑨ Connects Water Temperature sensor



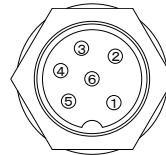
Pin No.	CONNECT
No.1	White
No.2	Shield
No.3	N.C.
No.4	Black

⑩ NMEA IN



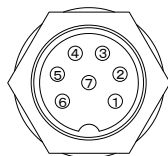
Pin No.	SIGNAL
No.1	Signal input+
No.2	Signal input-
No.3	Shield
No.4	N.C.
No.5	N.C.

⑪ NMEA OUT



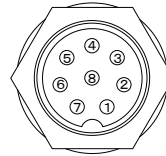
Pin No.	SIGNAL
No.1	N.C.
No.2	N.C.
No.3	Shield
No.4	Signal output+
No.5	Signal output-
No.6	N.C.

⑫ SIGNAL OUT



Pin No.	SIGNAL
No.1	Signal input+
No.2	Signal input-
No.3	Shield
No.4	Signal output+
No.5	Signal output-
No.6	+12V output
No.7	GND

⑬ Connects External Sounder

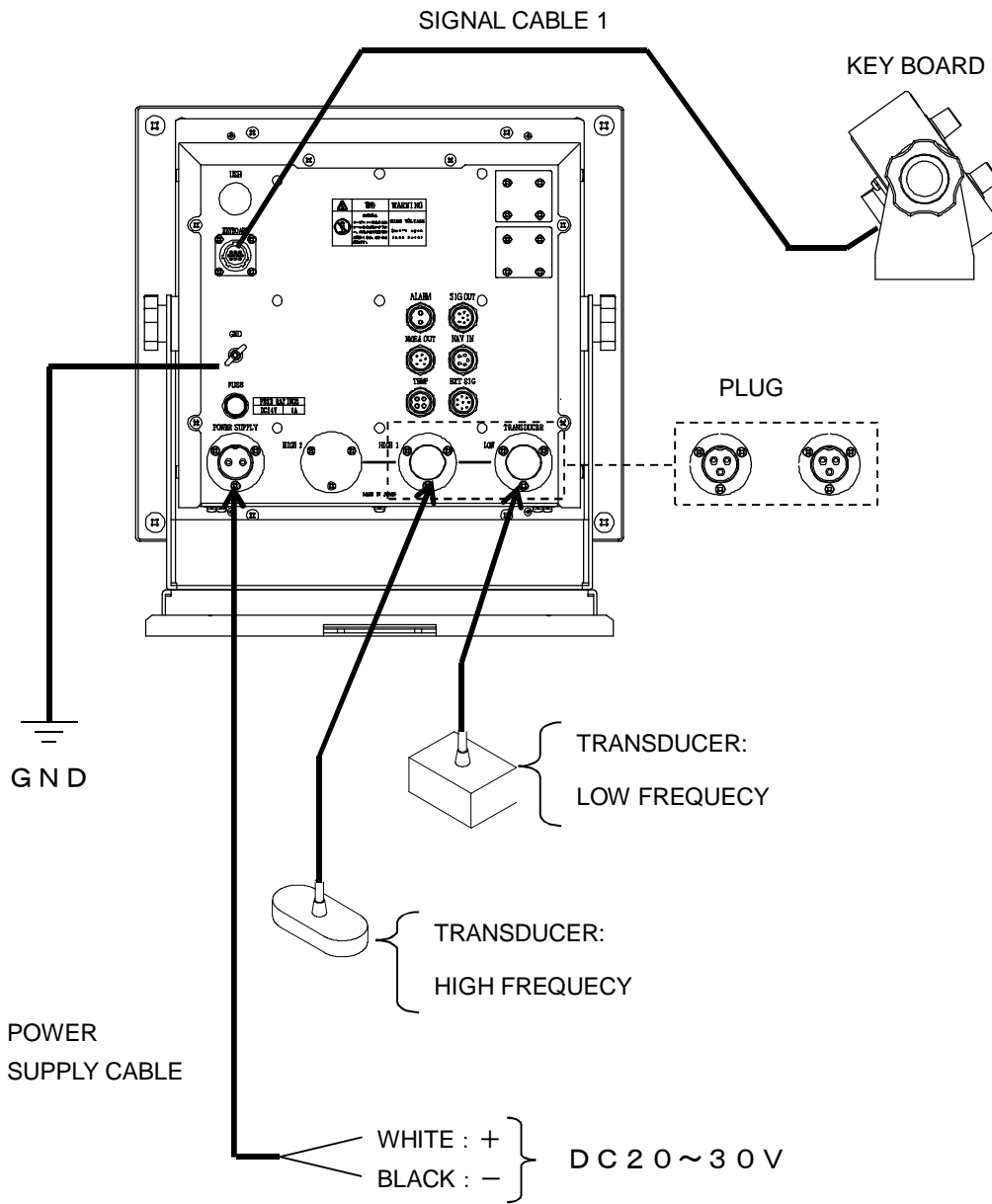


Pin No.	SIGNAL
No.1	Trigger input
No.2	Trigger output
No.3	N.C.
No.4	N.C.
No.5	GND
No.6	N.C.
No.7	N.C.
No.8	Shield

⑭ Not usable

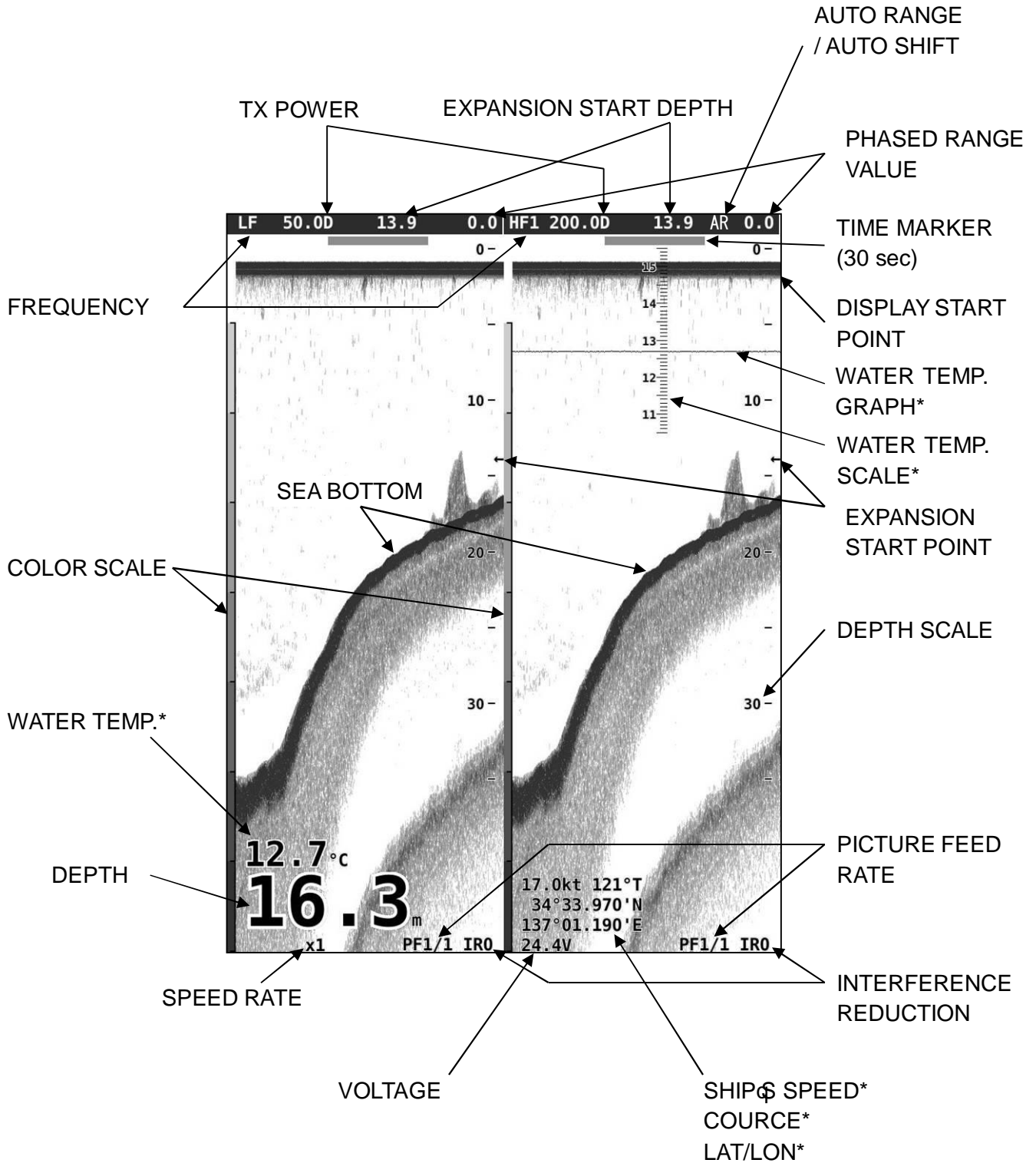
⑮ Connects the USB flash memory stick

# WIRING



# DISPLAY

The below shows an example for Normal mode.



NOTE: \*Optional equipment is required.

# DISPLAY MODES

## DISPLAY MODES

The following display modes are available.

MODE		FREQ. SCREEN				
SINGLE	HORIZ	---				
		---				
DUAL	HORIZONTAL	L/H				
		H/L				
DUAL	VERTICAL	L/H				
		H/L				

- L: LOW FREQUENCY
- H: HIGH FREQUENCY
- PART: PARTIAL EXPANSION DISPLAY
- BOTTOM: BOTTOM EXPANSION DISPLAY
- NAV: NAVIGATION DISPLAY

# KEYBOARD

## OPERATION MODE KEY:

- Call up the user-defined setting.

## EXP/VRM KEY:

- Selects the upper expansion start point for partial expansion mode.

## MARK KEY:

- Enters a vertical mark on the display.

## HIGH FREQUENCY KEY:

- Adjusts and changes the functions for high frequency.

## LOW FREQUENCY KEY:

- Adjusts and changes the functions for low frequency.

## FREQUENCY SELECTION DIAL:

- Selects the frequency.

## VR1 DIAL:

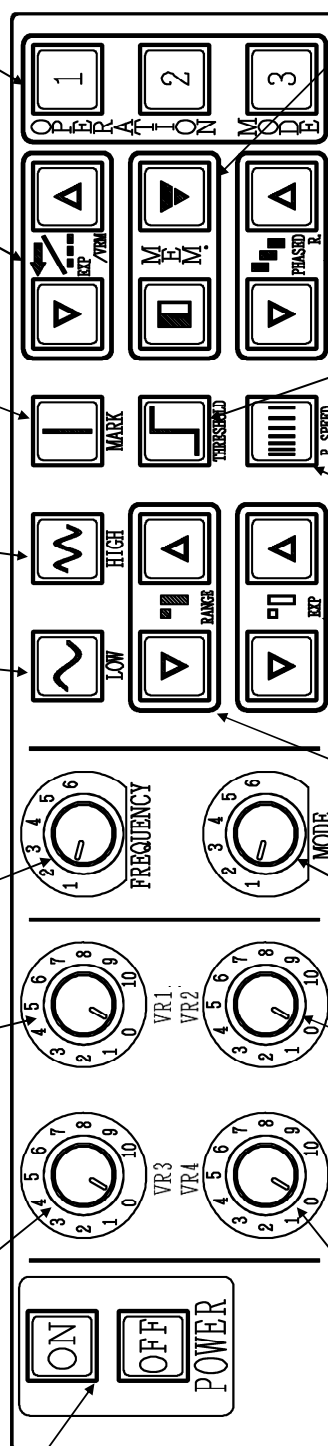
- Adjusts presentation of received echo.
- Factory default setting: GAIN (HIGH)  
Refer to page 81.

## VR3 DIAL:

- Adjusts presentation of received echo.
- Factory default setting: FAR GAIN (HIGH)  
Refer to page 81.

## POWER SUPPLY KEY:

- Turns power ON/OFF.



## MEMORY SAVE/LOAD KEY:

- Saves/displays data on the screen.
- LOAD KEY is also used as ENTER KEY.

## PHASED RANGE KEYS:

- Adjust the scale/range of depth.

## THRESHOLD KEY:

- Displays and erases colors from the color threshold.

## PICTURE SPEED KEY:

- Selects the rate of picture movement.

## EXPANSION RANGE KEYS:

- Select the expansion ranges for partial and bottom expansion

## RANGE KEYS:

- Select the basic range.

## MODE SELECTION DIAL:

- Selects the display mode.

## VR2 DIAL:

- Adjusts presentation of received echo.
- Factory default setting: GAIN (LOW)  
Refer to page 81.

## VR4 DIAL:

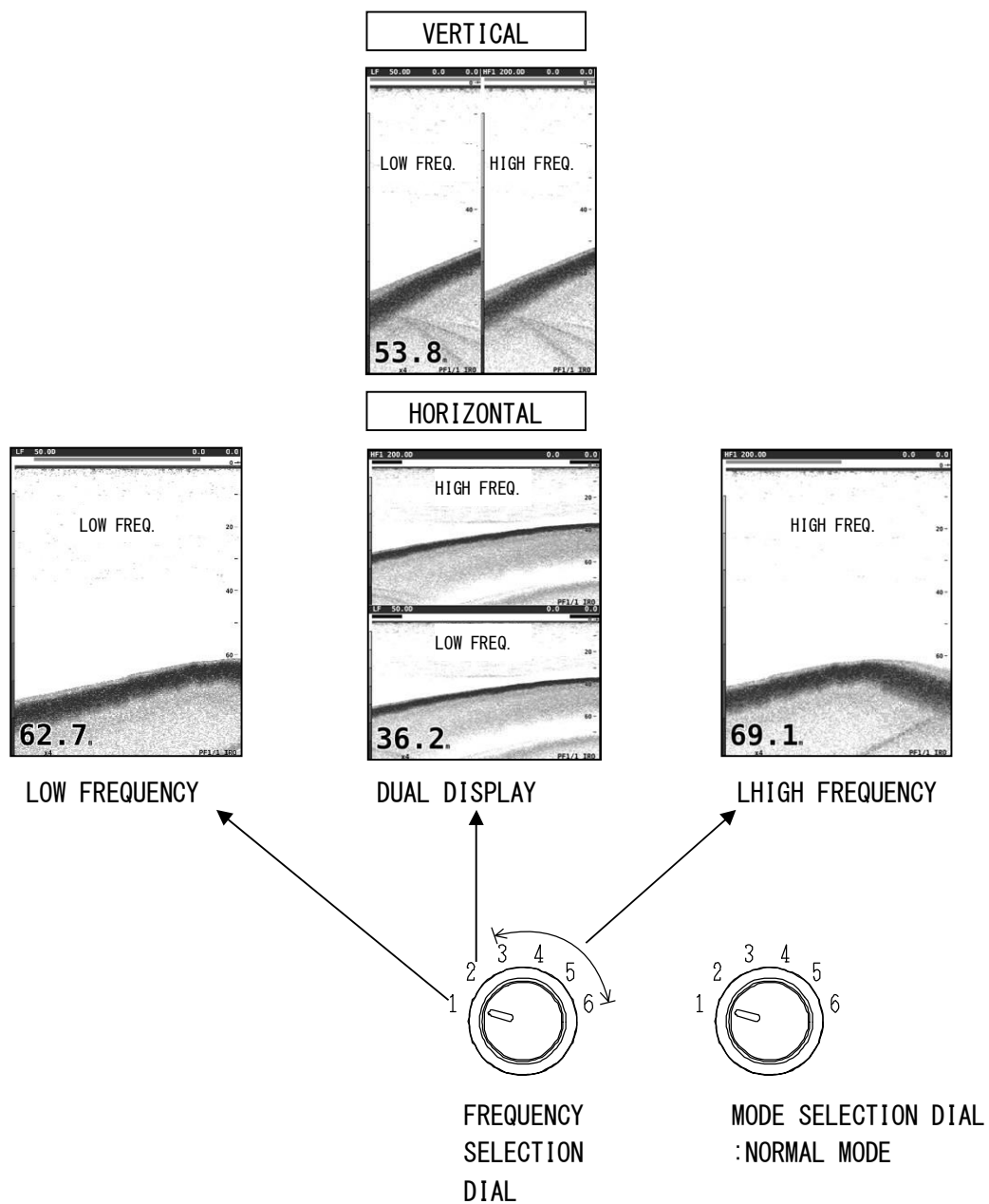
- Adjusts presentation of received echo.
- Factory default setting: FAR GAIN (LOW)  
Refer to page 81.

# DIAL OPERATION

## Frequency Selection Dial

Depending on your requirements you can select one of the following combination screen using Frequency selection dial.

The following drawings show some description of each of the modes available and the actual displays are relevant to the settings of the menu system and Mode selection dial.

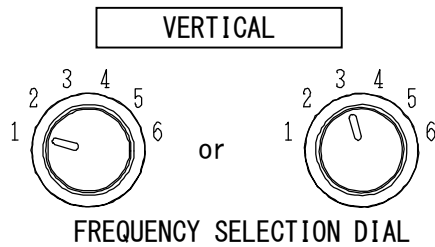


Refer to the Display Modes for details.

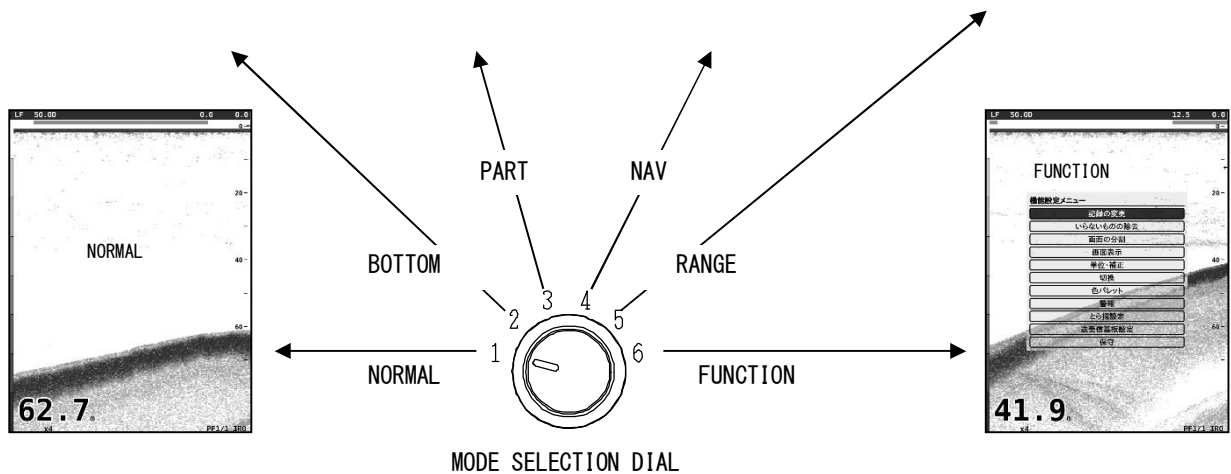
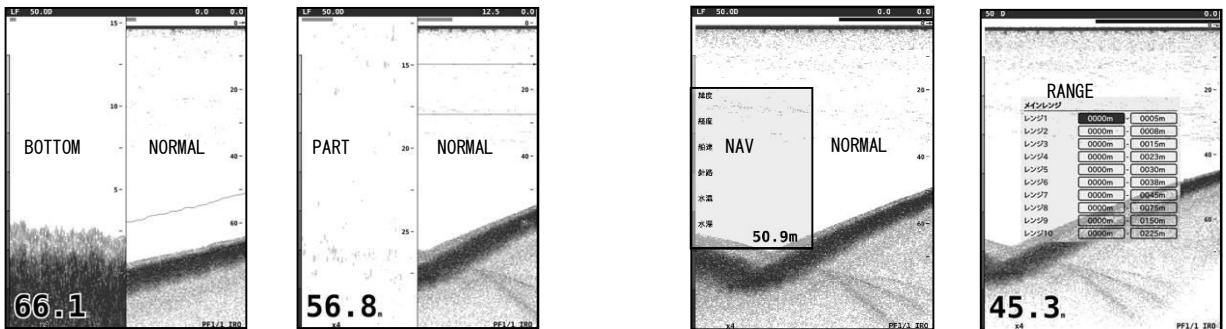
## Mode Selection Dial

Depending on your requirements you can select one of the following combination screen using Mode selection dial.

The following drawings show some description of each of the modes available and the actual displays are relevant to the settings of the menu system and Frequency selection dial.



The followings are displayed when Low Frequency or High Frequency selected.

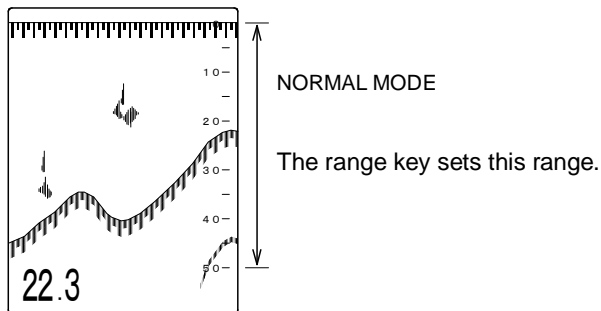


- NORMAL: NORMAL DISPLAY
- PART: PARTIAL EXPANSION DISPLAY
- BOTTOM: BOTTOM EXPANSION DISPLAY
- NAV: NAVIGATION DISPLAY
- RANGE: RANGE SET MENU
- FUNCTION: FUNCTION SET MENU

Refer to the Display Modes in page 16 for details.

## 1. Normal Mode

Normal Mode is displayed on the full screen.



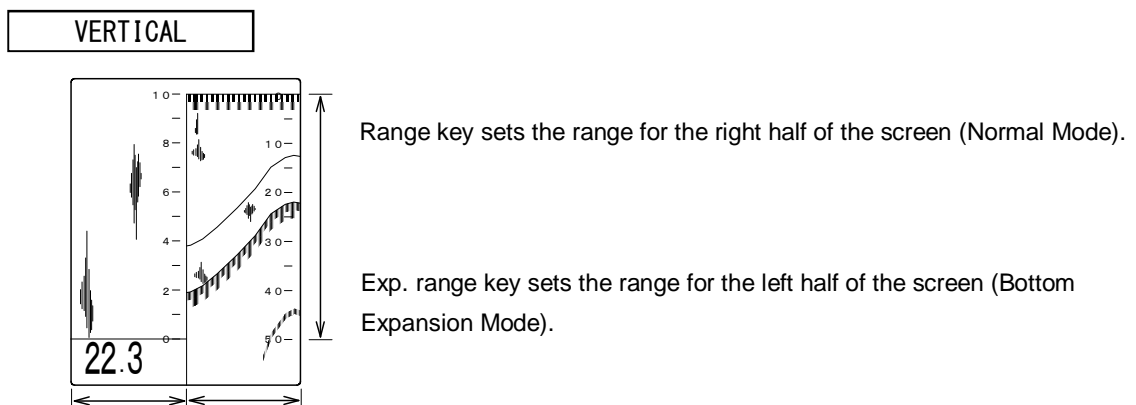
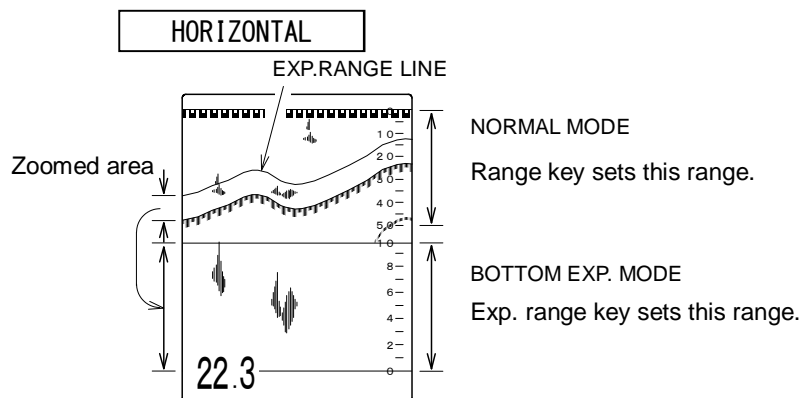
## 2. Bottom Expansion Mode

Normal Mode is displayed on the upper half of the screen, and Bottom Expansion Mode is displayed on the lower half.

When SCREEN DIVISION . VERTICAL is selected, you will see Normal Mode on the right half of the screen and Bottom Expansion Mode on the left half of the screen.

The range of the expansion display is indicated on the Normal Display by a line.

The expansion range can be set with the Expansion Range key.



### 3. Partial Expansion Mode

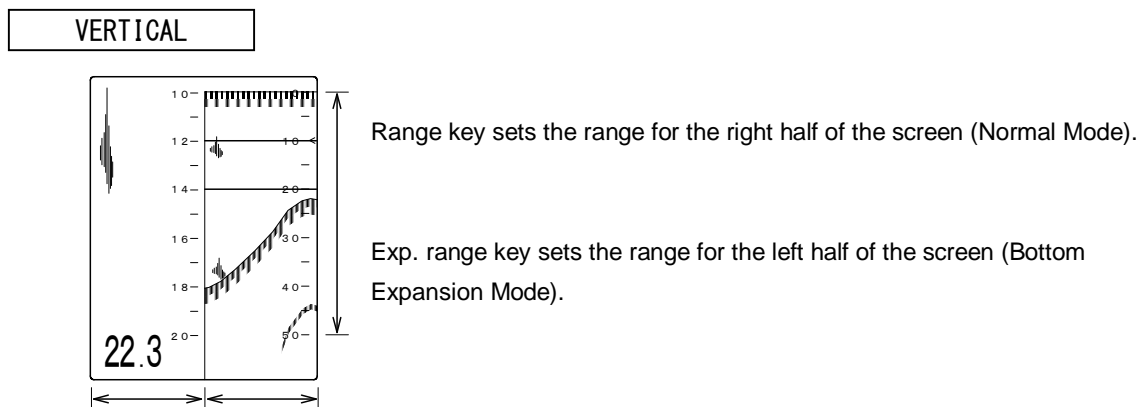
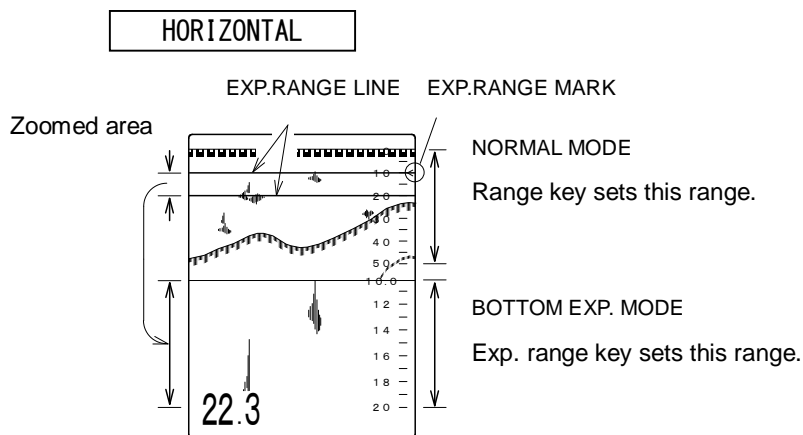
Normal Mode is displayed on the upper half of the screen, and Partial Expansion Mode is displayed on the lower half.

When SCREEN DIVISION . VERTICAL is selected, you will see Normal Mode on the right half of the screen and Partial Expansion Mode on the left half of the screen.

The range of the expansion display is indicated on the Normal Display by 2 lines indicating the upper and lower limits.

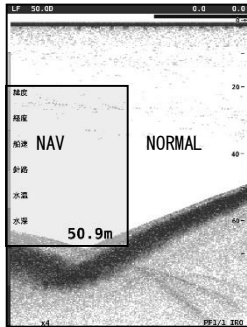
The upper limit can be adjusted with the Expansion start mark.

The lower limit can be adjusted with the Expansion range key.



## 4. Navigation Display Mode

Navigation data is displayed on the left half of the screen.



### NOTE !

---

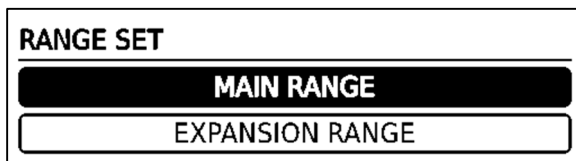
Navigation data is only available when optional equipment is connected.

Water temperature data is only available when optional water temperature sensor is connected.

---

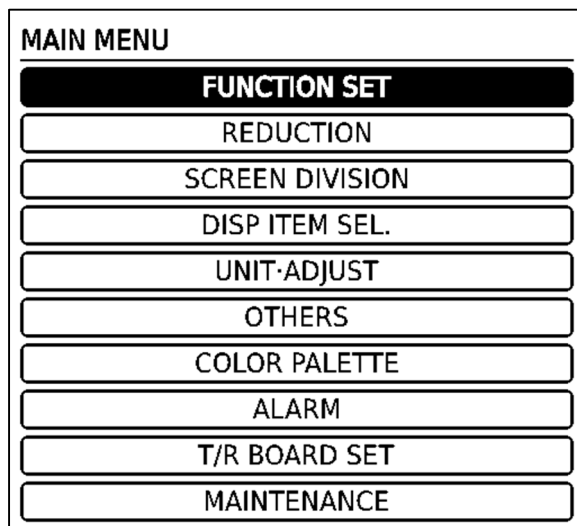
## 5. Range Set

The Dial No.5 displays the Range Set Menu.



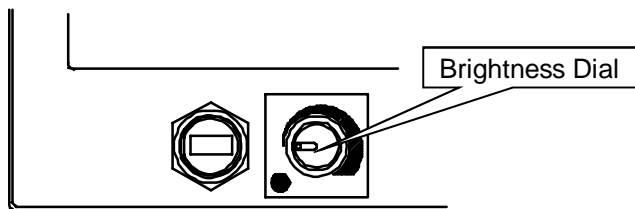
## 6. Main Menu

The Dial No.6 displays the Main Menu.



## Brightness Dial

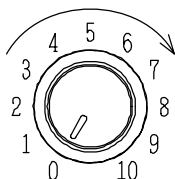
The brightness can be changed with the dial at the left corner of the monitor.  
Further Turning in a clockwise direction increases screen brightness.



## VR1, VR2 Dial (Gain Dial)

\*Factory default setting is GAIN. FAR GAIN can be set to VR1 and VR2 dial. Refer to page 81 for details.

This dial adjusts the sensitivity of the received echo.  
Turning the Dial clockwise increases the gain setting.  
Keep turning the dial until the sea bottom is shown in red.



The strongest echoes are displayed in red and as the received echoes get weaker they are indicated as follows; red orange yellow green light green blue light blue.

When the target is the sea bottom, the gain level setting can be low because the echo from the sea bottom is very strong. However, when the target is fish, the level of gain must be increased to pick up the weaker echo.

Increasing the gain too much will display unwanted echoes from bubbles and plankton etc.

If the sea bottom echo is weak due to seaweed, mud etc. adjust the gain level to pick up the weaker echo.

When passing over the transducer face, bubbles reflect the sound wave appear as echoes on the screen. In this case, no echoes (fish school) may be displayed even though at a maximum gain level.

### **NOTE !**

Use Gain Up on the Function Set Menu to control the variable gain ranges.

## DIAL OPERATION

---

### VR3, VR4 Dial (Far Gain Dial)

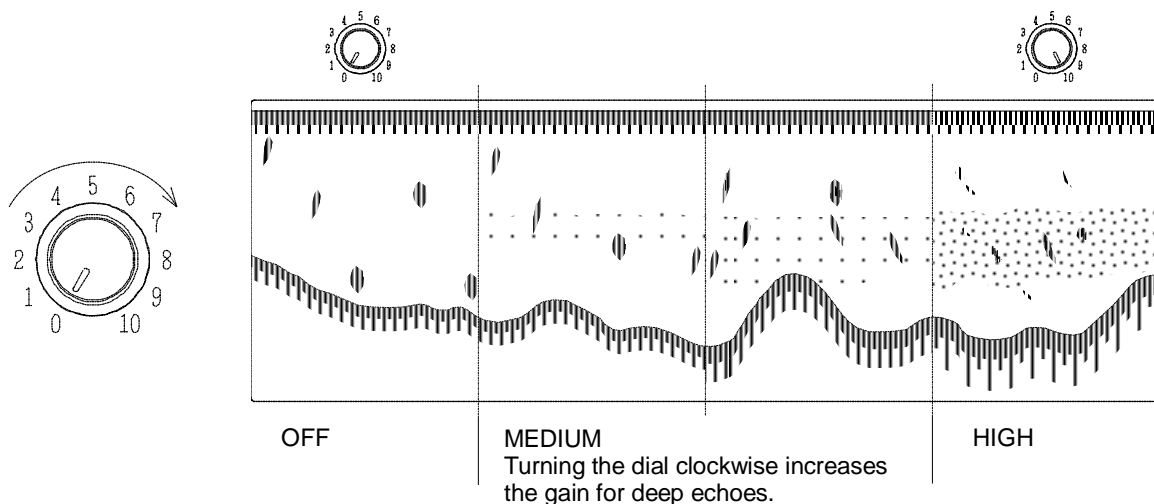
\* Factory default setting is FAR GAIN. GAIN can be set to VR3 and VR4 dial. Refer to page 81 for details.

The level of the sensitivity of the received deep echo signal can be controlled with this dial.

Turning the dial clockwise does not increase the gain level close to the transducer but increases the gain level as the depth increases.

For further true display, it corrects the display differences between the shallow echo and the deep echo.

The sensitivity achieved using this dial influences the sensitivity achieved using the Dial and TVG Curve function on Function Set Menu.



### What is "Far Gain"?

---

The power of the sound wave is absorbed at a certain rate when traveling through the water. The higher the frequency is the higher the rate of absorption.

For example after traveling 1 kilometer the power of a 50kHz sound wave will decrease to 1/8 of its original strength.

The power of a 200kHz sound wave will decrease to 1/300 of its original strength.

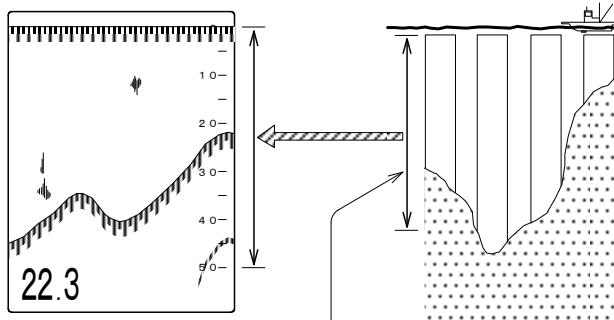
Use this FAR GAIN+function to counteract the absorption effect by increasing received echo signal of deep echoes.

---

# KEY OPERATION

## Range Keys

These 10 ranges can be programmed as desired with these keys.



This range can be changed with these keys.

Shallower Range



Deeper Range

## Phased Range Keys

The Depth Start Point at the top of the screen can be changed with these keys.

The increment can be changed with the Phased R. keys via OTHERS-SHIFT AR+ (See page 66)

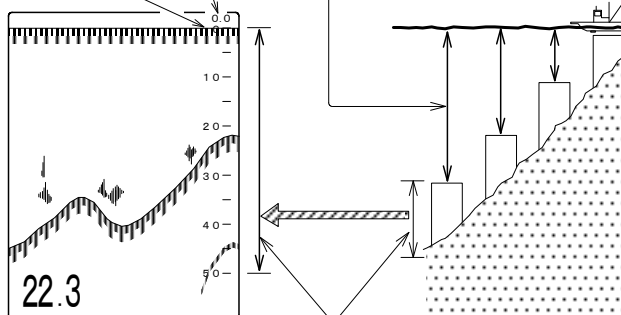
This function may be useful to show the desired area expanded on the screen.

The display of Start Depth becomes shallower with this key.



The display of Start Depth becomes deeper with this key.

This value changes  
The Depth value changed.



This range is set with Range keys.

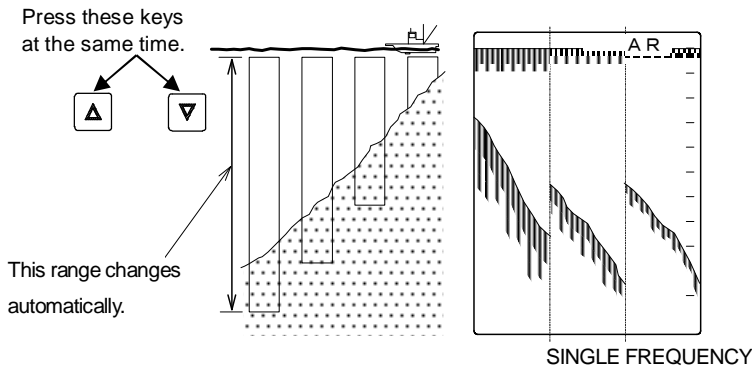
## Auto Range Function

The range will change automatically to always show the full depth from transducer face to sea bottom regardless of changes in depth.

Press both Range Keys at the same time to start the Auto Range function.

%R+ appears on the right top screen while this function is activated.

Press both keys at the same time to release this function.



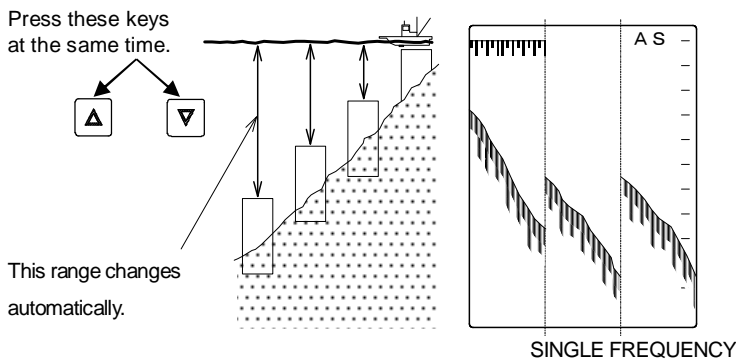
## Auto Shift Function

Press both Phased R. Keys (Phased Range keys) at the same time to start the Auto Shift Range function.

If the depth is over the limit, the scale display will fluctuate.

%S+ appears on the right top screen while this function is activated.

Press both keys at the same time to release this function.



### NOTE!

---

For Auto Range and Auto Shift functions to work successfully the sea bottom echo must be in red or orange which are the strongest scale colors.

Even when the sea bottom echo is in red or orange, if there is some interference due to bubbles etc., the function may not be able to track the bottom. In this case, if the bottom is not located after 16 transmissions, the depth scale will return to 0 and start searching again. If the function is unable to locate the bottom, the scale will continue to fluctuate.

---

# Picture Speed Key

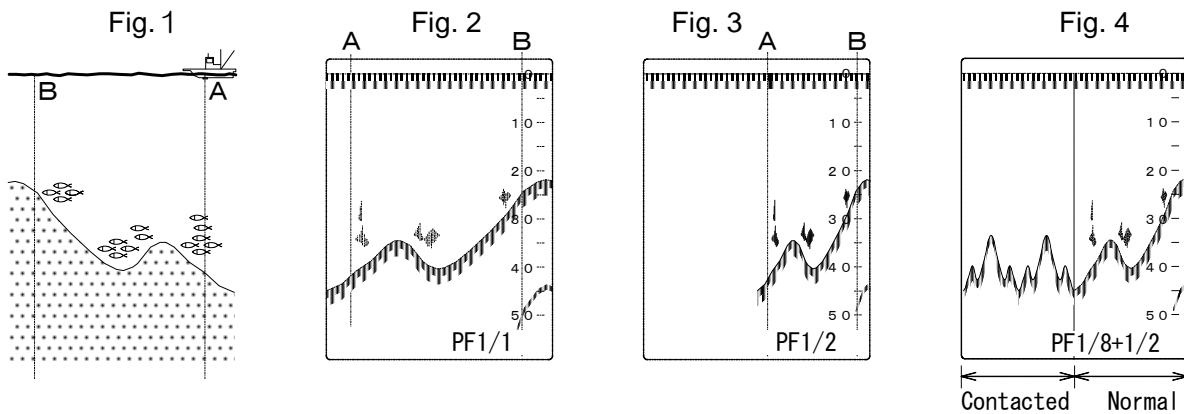
The picture speed rate may be selected from the following.

Each press of this key changes the setting.

PF1/1, PF1/2, PF1/4, PF1/8, PF1/4+1/1, PF1/8+1/2, PF1/16+1/4, PF1/32+1/8, PF0 STOP

Full display screen  
(Fig.1~3)

Normal Picture on the right half of the screen and contracted picture on the left half of the screen.  
(Fig.4)



When the ship travels from point A to B, Fig.2 in case of PF1/1 and Fig.3 in case of PF1/2 are displayed each.

When the normal picture on the right half of the screen and the contracted picture on the left half of the screen like the Fig.4, it is useful for the long time display.  
(PF1/4+1/1, PF1/8+1/2, PF1/16+1/4, PF1/32+1/8+should be selected.)

## What is Picture Speed?

Picture Speed rate refers to the speed that the picture travels from right to left on the screen. 1/1 refers to 1 vertical line of picture per 1 sound transmission, and 1/2 refers to 1 vertical line of picture per 2 sound-transmission. There is no relation to ship speed.

# KEY OPERATION

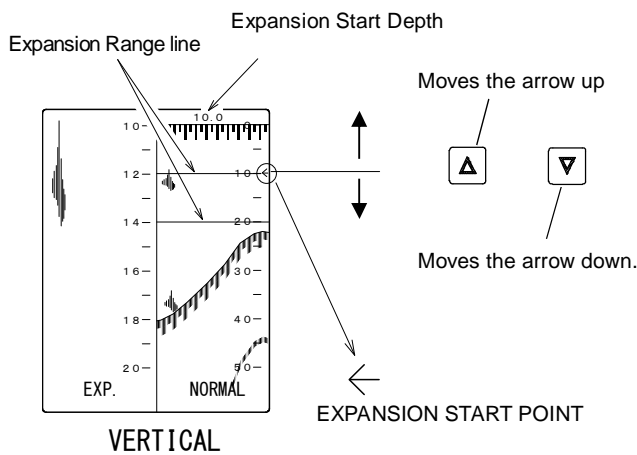
## EXP / VRM Keys

Use these keys to set the Expansion Start Point and VRM to measure depth.

### 1. Expansion Start Point

The expansion Start Point for Partial Expansion Mode can be set with these keys.

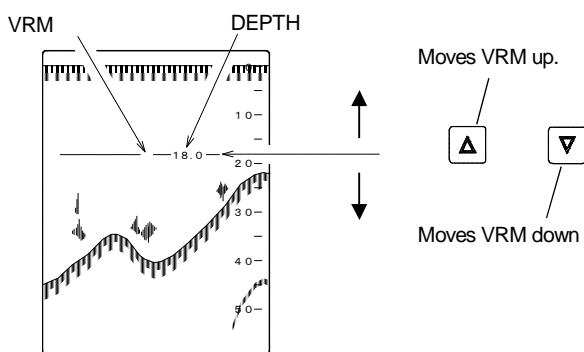
An arrow shows the start point of Expansion Display.  
The depth of this point is displayed on the top right of the screen.  
Expansion line can be set with Expansion Range keys.



### 2. VRM (Variable Range Marker)

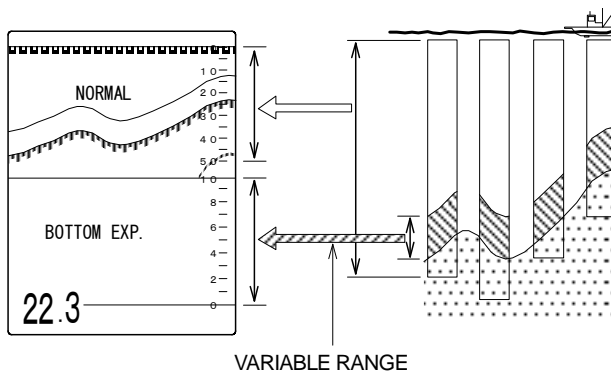
The user can measure the range to targets shown on the display screen by use of the VRM. Refer to a dotted line and the digitally displayed depth to the VRM shown on the display.

Press both keys at the same time to activate/inactivate the VRM.



## Expansion Range Keys

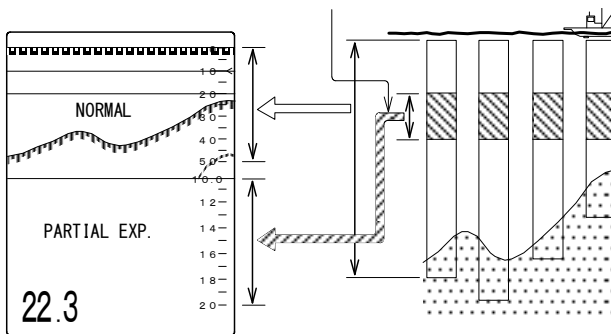
The Expansion range for Partial or Bottom Expansion Modes can be set with these keys.



Narrows the Expansion Range



Widens the Expansion Range

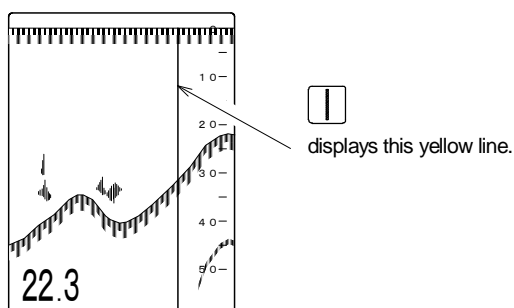


## Mark Key

Pressing this key will set a vertical marker on the screen.

### 1. Mark

This key inscribes a vertical yellow line on the screen when pressed. It may be used to denote a fish school or other important echo.



# KEY OPERATION

---

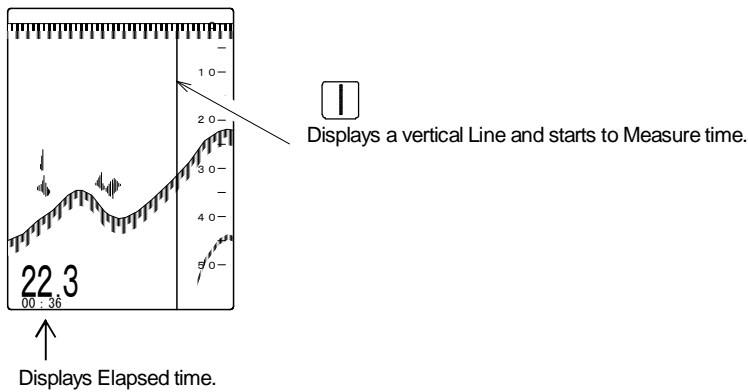
## 2. Timer

Elapsed time can be displayed on the screen.

The first press of this key displays a line on the screen and starts to measure time.

The second press of this key displays a line again and displays elapsed time.

The third press of this key displays a line again and this elapsed time disappears.



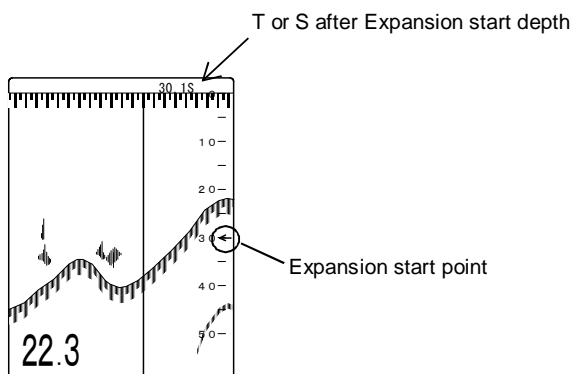
## 3. Squid

When the output data is set to "183T" or "600S", the NMEA output can be switched to the depth or the expansion start depth.

Pressing this key displays a line on the screen and switches the output.





"T" is displayed after expansion start depth when "183T" and expansion start depth are selected.

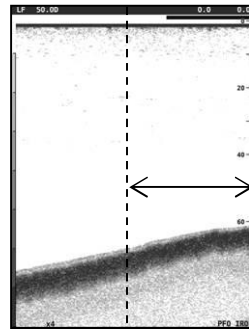
"S" is displayed after expansion start depth when "600S" and expansion start depth are selected.



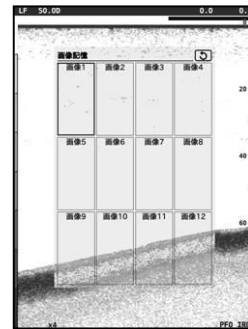
## Memory Save / Load Keys





The picture on the right half of the screen can be save and load with Memory Save / Load Key.

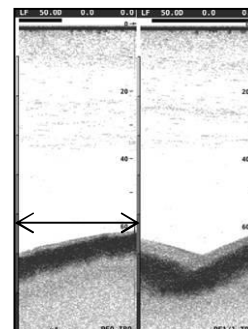
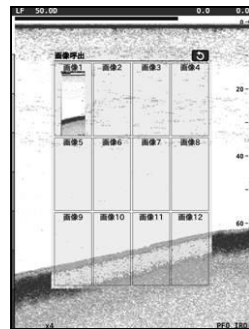
1. Press this key  to memorize the right half of the picture on the screen.  
%SAVE THE IMAGE+box (No.1 - No.12) is appears on the screen.
2. Use the EXP/VRM   keys to select the number which you want to save the image.
3. Press this key  to save the image.



Memorizes this half of the picture on the screen.



4. Press this key  to display %LOAD THE IMAGE+box (No.1 - No.12).
5. Use the EXP/VRM   keys to select the number which you want to load the image.
6. Press this key  to display the image on the left half of the screen.



The image displays on the left half.


Up to 12 images can be saved.


New image can be overwritten on %SAVE THE IMAGE+box (No.1 - No.12)

The saved image is stored even if off the power is turned on or off.

## High / Low Frequency Keys

The settings for adjusting the presentation of the high or low frequency echo picture are accessed by these keys individually. Select %MAIN MENU . OTHERS . RANGE SET . SINGLE+ (See page 68)

Pressing this key  enables the settings for high frequency presentation to change and %HIGH+ on the top screen appears.

Pressing this key  enables the settings for low frequency presentation to change and %LOW+ on the top screen appears.

When neither %HIGH+ nor %LOW+ is highlighted, %MAIN MENU . OTHERS . RANGE SET . LINKED+ is set. (See page 68)

## Threshold Key

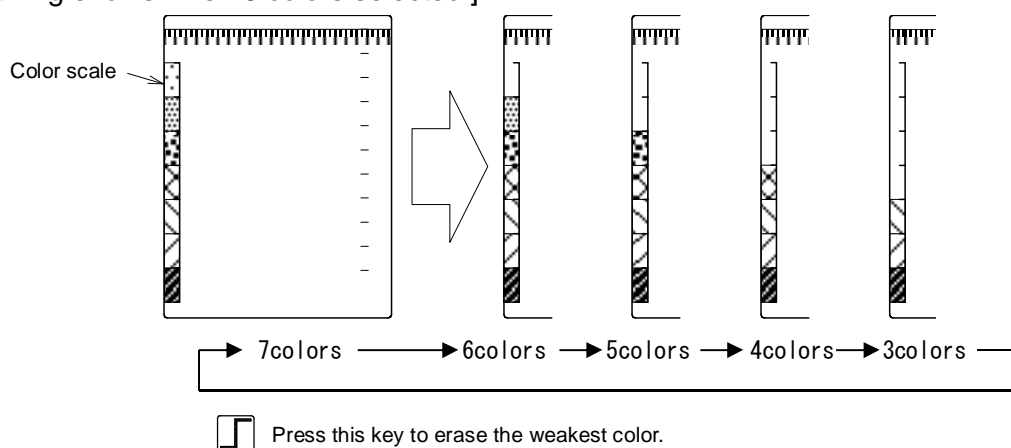
The color threshold function allows the weaker targets and noise that may be shown on the display screen to be eliminated from the display with this key.

Doing this leaves only the stronger targets on the display screen.

Each press of this key erases the weakest color and the last remaining colors are as follows.

- 3 colors of the strongest colors are left when 8 colors display selected.
- 6 colors of the strongest colors are left when 16 colors display selected.
- 10 colors of the strongest colors are left when 32 colors display selected.

[The below drawing shows when 8 colors selected.]



## What is “Threshold”?

---

The unit will pick up and display unwanted echoes from small objects in the water. With the threshold function it is possible to eliminate these unwanted echoes from the screen.

---

## Operation Mode Keys

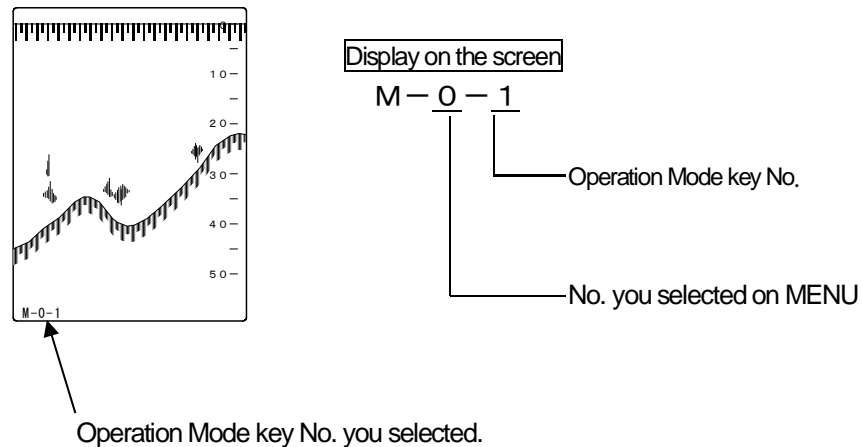
By pressing one of these keys ( 1 2 3 ) the desired operation mode can be set immediately, if the settings are previously stored.

By utilizing the %MAIN MENU . OTHERS . OPE.MODE+in total 6 kinds of Operation Mode are available. (See page 66)

The time when holding one of these 3 keys for two seconds until a beep sounds, the current setting menu will be stored in the memory. It will not be stored if the key is released before a beep sounds.

Press one of the keys to activate this function, however, it will not be accessed and 3 beeps will sound if the pressed key has no storage.




During the operation this setting can be changed through the menu or keys, however it will not be stored and return to the previous operation mode by pressing one of these 3 keys.



# RANGE SET





Turning the Mode selection Dial to %**+** displays the Range Set Menu.




Use the EXP/VRM   keys to highlight the Main range or Expansion range. Press the ENTER  key.


## 1. Main Range

The user can preset 10 main setting ranges.

Use the EXP/VRM   keys to highlight the item to change. Use the PHASED R.   keys to select the desired value.

PHASED R.  key: Increases the value.

PHASED R.  key: Decreases the value.





MAIN RANGE		
RANGE1	<input type="text" value="0000m"/> - <input type="text" value="0025m"/>	
RANGE2	<input type="text" value="0000m"/> - <input type="text" value="0050m"/>	
RANGE3	<input type="text" value="0000m"/> - <input type="text" value="0100m"/>	
RANGE4	<input type="text" value="0000m"/> - <input type="text" value="0150m"/>	
RANGE5	<input type="text" value="0000m"/> - <input type="text" value="0200m"/>	
RANGE6	<input type="text" value="0000m"/> - <input type="text" value="0300m"/>	
RANGE7	<input type="text" value="0000m"/> - <input type="text" value="0500m"/>	
RANGE8	<input type="text" value="0000m"/> - <input type="text" value="1000m"/>	
RANGE9	<input type="text" value="0000m"/> - <input type="text" value="1500m"/>	
RANGE10	<input type="text" value="0000m"/> - <input type="text" value="2000m"/>	



Variable ranges : up to 3000m (6000feet)


When  is highlighted, pressing the ENTER  key will access to the Range Set Menu.

## 2. Expansion Range

The user can preset 8 ranges for Expansion.

Use the EXP/VRM   keys to highlight the item to change.  
Use the PHASED R.   keys to select the desired value.




PHASED R.  key: Increases the value.  
PHASED R.  key: Decreases the value.

EXPANSION RANGE 	
RANGE1	0001m
RANGE2	0002m
RANGE3	0005m
RANGE4	0010m
RANGE5	0020m
RANGE6	0030m
RANGE7	0040m
RANGE8	0050m

Variable ranges : up to 1000m (3000feet)


When  is highlighted, pressing the ENTER  key will access to the Range Set Menu.

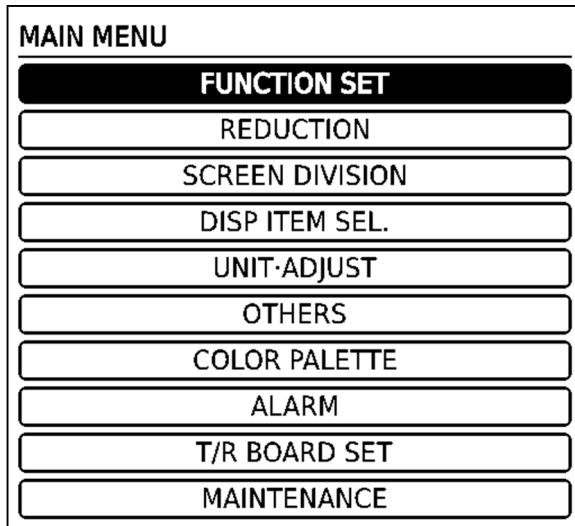
## MAIN MENU

The user can preset basic function settings with the EXP/VRM   keys and the ENTER  key.

Turn the Mode Selection Dial to %6+ to display the Main Menu.

Use the EXP/VRM   keys to highlight the item to change.

Use the ENTER  key to select the desired item.

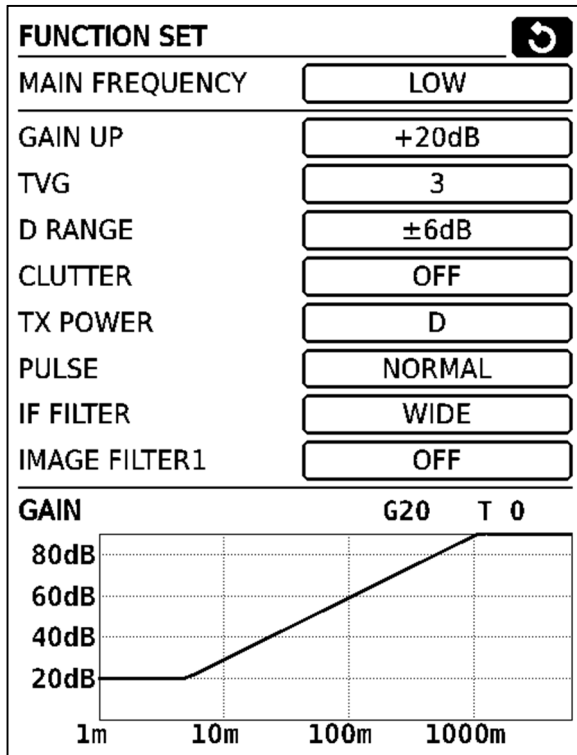


The user settings may be recommended to be memorized as %USER SETTING.+ (See page 80)

MAIN MENU MAINTENANCE SETTINGS SAVING

# FUNCTION SET

Use the EXP/VRM  $\Delta$   $\nabla$  keys to highlight the item to change.  
Use the PHASED R.  $\Delta$   $\nabla$  keys to select the desired setting.



When  is highlighted, pressing the ENTER  $\blacksquare$  key will access to the Main Menu.

## 1. Main Frequency

Selecting the desired frequency you want to change with the PHASED R.  $\Delta$   $\nabla$  keys.

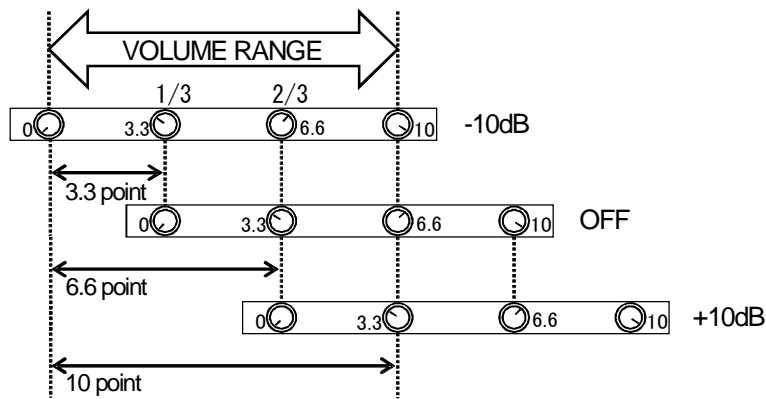
**SETTING:** LOW, HIGH1, HIGH2

## 2. Gain Up

This function makes it possible to display a clearer picture of the full range and control sensitivity at various depth.

Use the PHASED R.   keys to select the desired value.

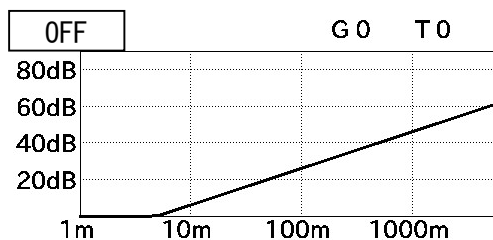
**SETTING:** -10dB, OFF, +10dB, +20dB, +30dB, +40dB, +50dB, +60dB



When the menu gain adjust setting is changed from OFF to +10dB, the gain dial volume increases 3.3 point on the scale.

When the menu gain adjust setting is OFF and the gain dial is on 3.3, it has the same result as when the menu gain adjust setting is +10db and the gain dial is on 0.

When the menu gain adjust setting is changed, the diagram changes as shown below.



Turning the Gain dial clockwise increases the above shown value between 0 and 30.

Turning the Far Gain dial clockwise increases the above shown value between 0 and 50.

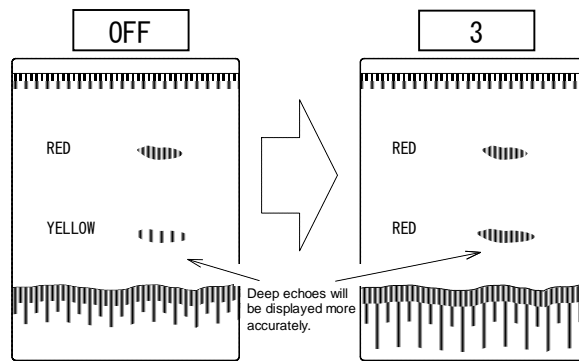
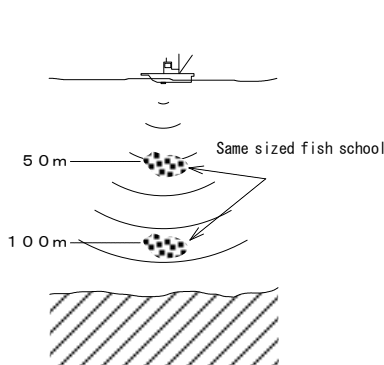
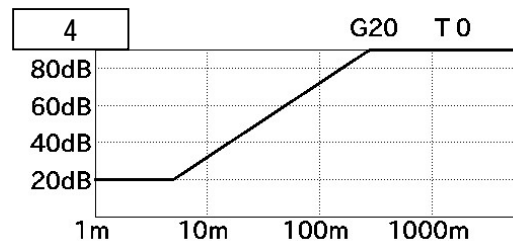
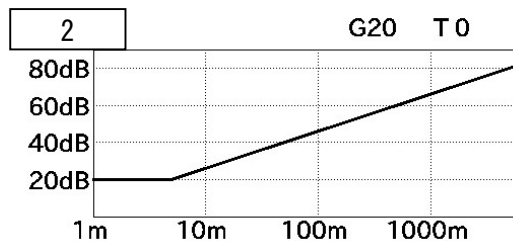
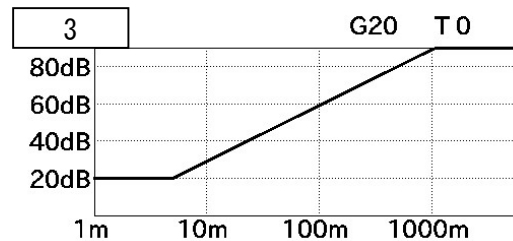
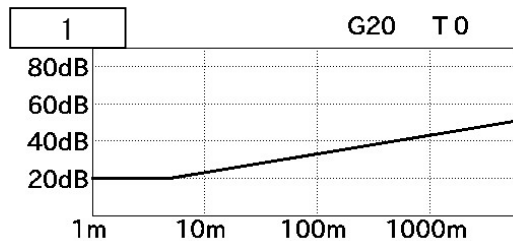
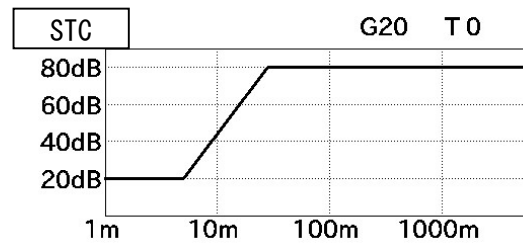
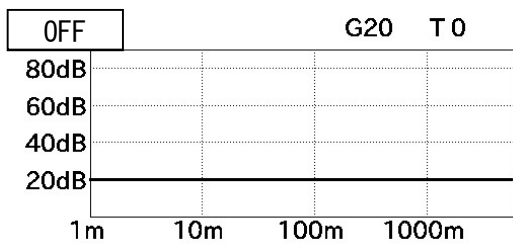
### 3. TVG

The TVG function may be adjusted according to the strength of the target echo.

As the echoes returning from the bottom and from fish targets get weaker as the depth increases. It is advantageous to have a Time Variable Gain that automatically compensates for the loss in signal strength.

Use the PHASED R.   keys to select the desired level.

**SETTING:** OFF, STC, 1, 2, 3, 4



Echoes from fish school in deep will be weaker than from one in shallow in case the size of fish school is the same.

By selecting TVG 3 will show deep echoes at a more accurate size and density. (Dynamic Range Level:±6dB)

**NOTE !**

The TVG function setting will be affected mutually by the far gain and the gain adjust functions.

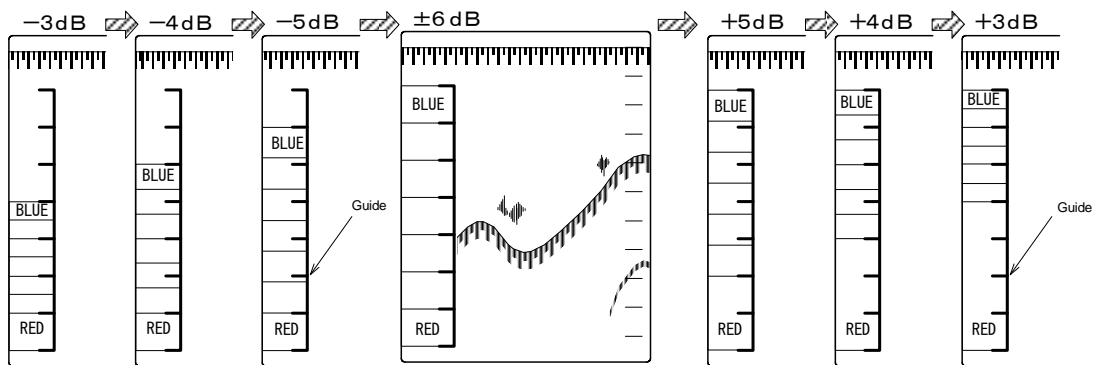
## 4. D Range (Dynamic Range)

By shifting the dynamic range, the operator is able to discriminate more precisely the size, depth and density of the fish school.

Experimenting with this function will give you the best setting for fishing operations.

Use the PHASED R.   keys to select the desired value.

**SETTING:** -3dB, -4dB, -5dB,  $\pm 6$ dB, +5dB, +4dB, +3dB



The diagram shows the comparative signal levels to the standard  $\pm 6$ dB for dynamic ranges. When the dynamic range is changed from  $\pm 3$ dB to  $\pm 5$ dB, this range will be displayed in 7 colors.

## 5. Clutter

By using this function the unwanted weak noise can be get rid of. The selection of too high level may suppress the weak echo being wanted.

Use the PHASED R.   keys to select the desired level.

**SETTING:** OFF, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

## 6. TX Power

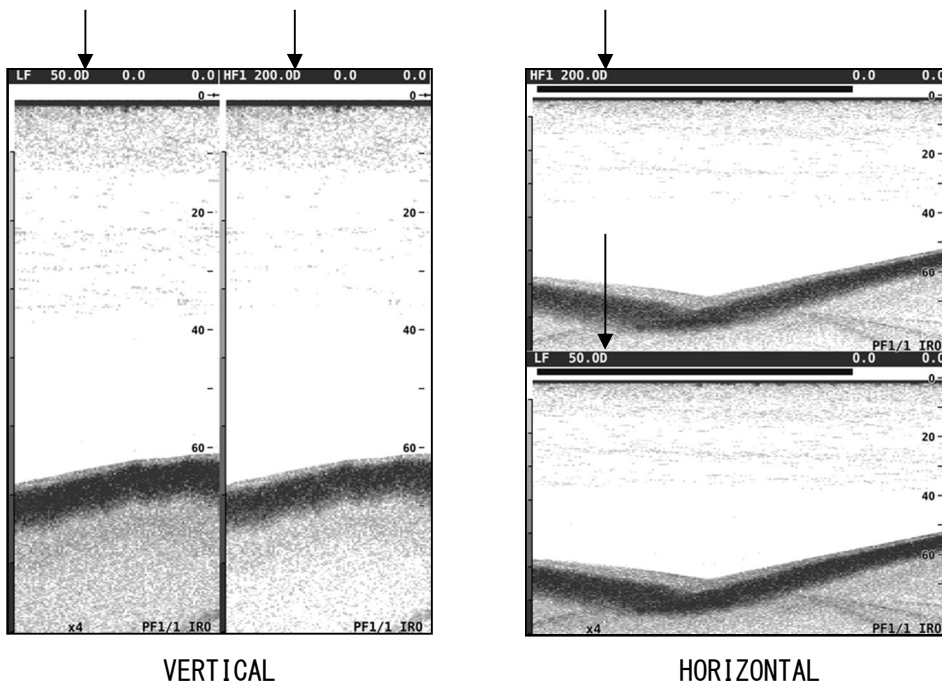
The output power of the ultrasonic sound wave may be selected.

In crowded fishing areas, this function may be useful to avoid interference from other fishing boats' sonars and echo sounders.

Use the PHASED R.   keys to select the desired level.

**SETTING:** D, C, B, A

The present level of TX power appears next to frequency as shown below.



 indicates maximum power and then gradually reduced to the minimum power .

### 7. Pulse Width

The transmitted pulse width can be selected.

The transmitted pulse width can be set to one of 3 kinds of auto width (NARROW, NORMAL or WIDE) or a specific pulse width (0.3) that can be set manually.

Use the PHASED R.   keys to select the desired value.

**SETTING:** NARROW, NORMAL, WIDE, FIX

≠NARROW≠ A half of Normal pulse width

≠NORMAL≠ NORMAL changes the pulse width automatically according to the range.

≠WIDE≠ Four-thirds of Normal pulse width

≠FIX≠ The pulse width is independently of the range in use.

#### NOTE !

---

In actual practice the short pulse width gives better resolution and less noise in shallow water. A long pulse will reach deeper but gives less resolution.

Select NORMAL when moving from the shallow water to deeper water to avoid the less gain.

---

### 8. IF Filter

The IF filter of receiving circuit can be selected.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** NARROW, WIDE

≠NARROW≠ filter is low noise priority circuit (Low noise / Low resolution)

≠WIDE≠ filter is a resolution priority circuit (High noise / High resolution)

### 9. Image Filter 1





The data of image on the echo sounder can be enhanced by this function.


Use the PHASED R.   keys to select the desired value.

**SETTING:** OFF, 1 to 99

OFF indicates no filter function and the higher level it is set, the more filter affected on the data of image.

# REDUCTION

Use the EXP/VRM   keys to highlight the item to change.  
Use the PHASED R.   keys to select the desired setting.

REDUCTION 	
INTERF RED	OFF
JAMING RED	OFF
NOISE RED	OFF
WHITE LINE	OFF
IMAGE FILTER2	OFF

When  is highlighted, pressing the ENTER  key will access to the Main Menu.

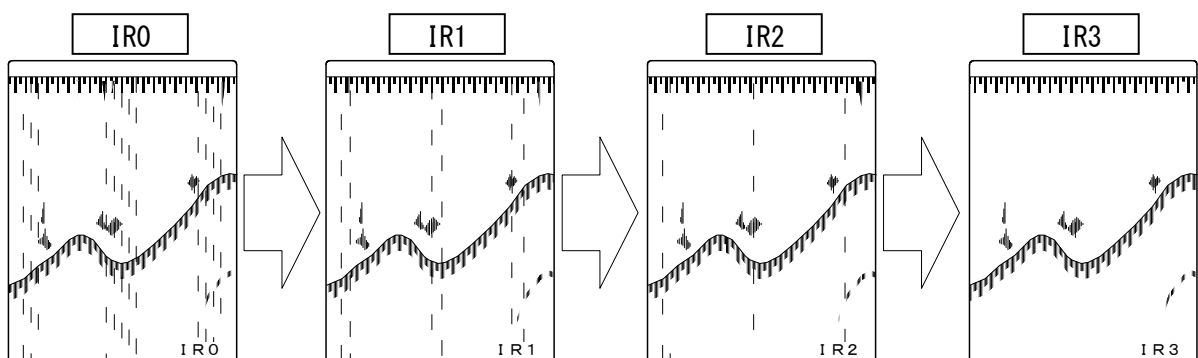
## 1. Interference Reduction

Interference from other equipment operating nearby or nearby fishing boats may be suppressed.

Use the PHASED R.   keys to select the desired level.

**SETTING:** OFF, LOW, MIDDLE, HIGH (Display on the screen: IR0, IR1, IR2, IR3)

As the level of the setting closes to HIGH, higher level of Interference Reduction is set.



Some types of interference may not be suppressed.  
Do not select excessive level than the level to be needed, since the weak echoes are erased.

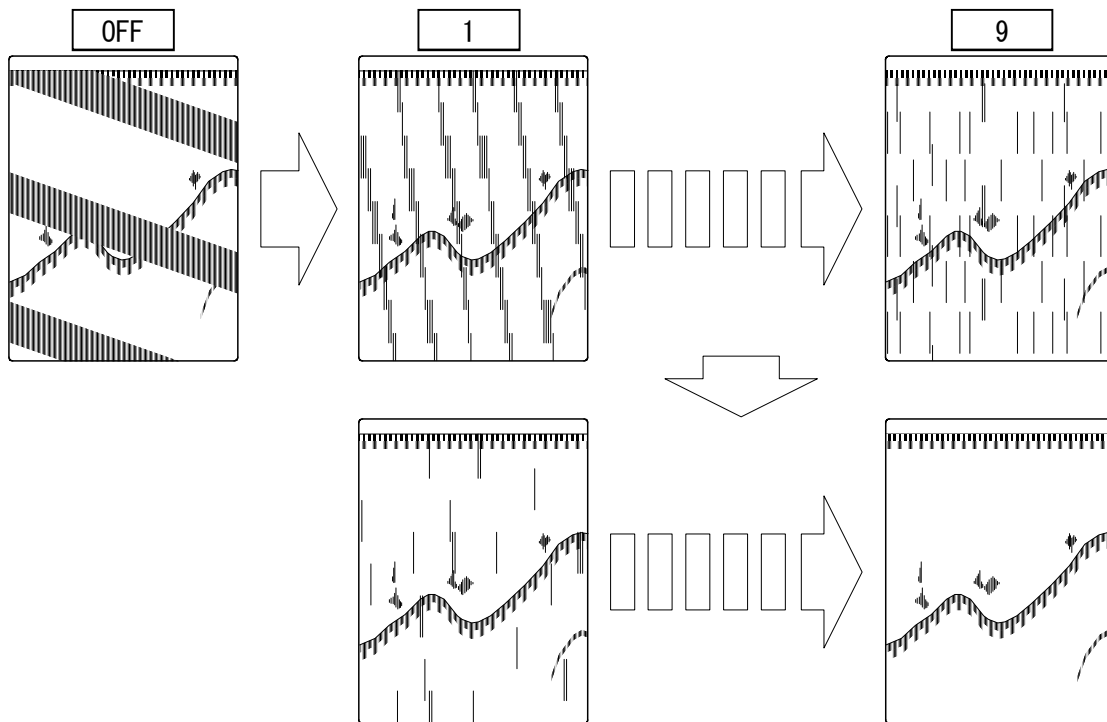
## 2. Jamming Reduction

This function will reduce the Jamming noise by changing the regular noise irregularly.

Use the PHASED R.   keys to select the desired level.

**SETTING:** OFF, 1, 2, 3, 4, 5, 6, 7, 8, 9

OFF indicates no reducing function and the higher level it is set, the more irregular data appears like below.



After the irregular data is set, reduce noise by combining of interference reduction and jamming reduction.



Do not use INTERFERENCE RED combined with excessive level of JAMING RED, otherwise the weak echoes being wanted will be erased.

### What is “Jamming”?

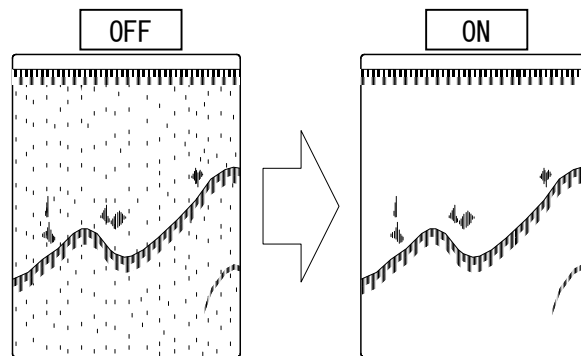
By receiving sound waves of the same or similar frequency from nearby boats they affect each other and appear with seeing doubled, or up and down on the screen.

### 3. Noise Reduction

The noise cluttering on the entire screen is reduced.

Use the PHASED R.   keys to select the desired setting.


**SETTING:** OFF, ON



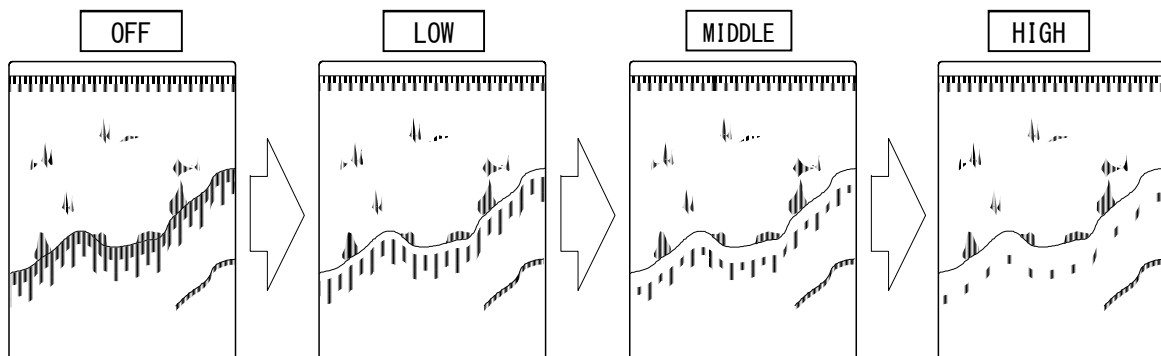
Some types of noise reflections may not be suppressed.

### 4. White Line

This function is a control that places a line at the displayed sea floor and blanks out just below the line. The purpose of this is to help the user detect targets, such as fish, which are very close to the sea floor and whose echoes tend to merge with those of the sea floor itself.

Use the PHASED R.   keys to select the desired level.

**SETTING:** OFF, LOW, MIDDLE, HIGH



## 5. Image Filter 2

The image displayed on the echo sounder can be enhanced by this function.

Use the PHASED R.   keys to select the desired level.

**SETTING:** OFF, 1x3, 1x5, 3x3, 5x5

OFF indicates no filter function and the higher level it is set, the more filter affected on the image.

**NOTE !**

---

Image Filter 1 and Image Filter 2

	High resolution/Rough image	Low resolution/Smooth image
Image Filter 1	OFF+, 1x3, 1x5, 3x3, 5x5	OFF+, 1x3, 1x5, 3x3, 5x5
Image Filter 2	OFF+, 1x3, 1x5, 3x3, 5x5	OFF+, 1x3, 1x5, 3x3, 5x5

When applying Image Filter 1 or Image Filter 2, the relationship of the resolution and the smoothness of the image are shown in the table above.

Please change the level of the filter depending on whether you are focusing on resolution or smoothness of the image.

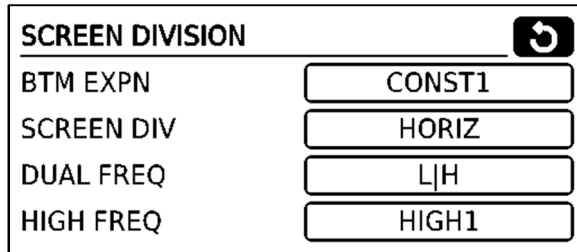
Image Filter 1 filters each receiving data.

Image Filter 2 filters data using a block of receiving data. For example, "1x3" will be filtered by using 1x3 block of receiving data. "5x5" will be filtered 5x5 block of receiving data.

---

# SCREEN DIVISION

Use the EXP/VRM  $\Delta$   $\nabla$  keys to highlight the item to change.  
 Use the PHASED R.  $\Delta$   $\nabla$  keys to select the desired setting.



When  is highlighted, pressing the ENTER  key will access to the Main Menu.

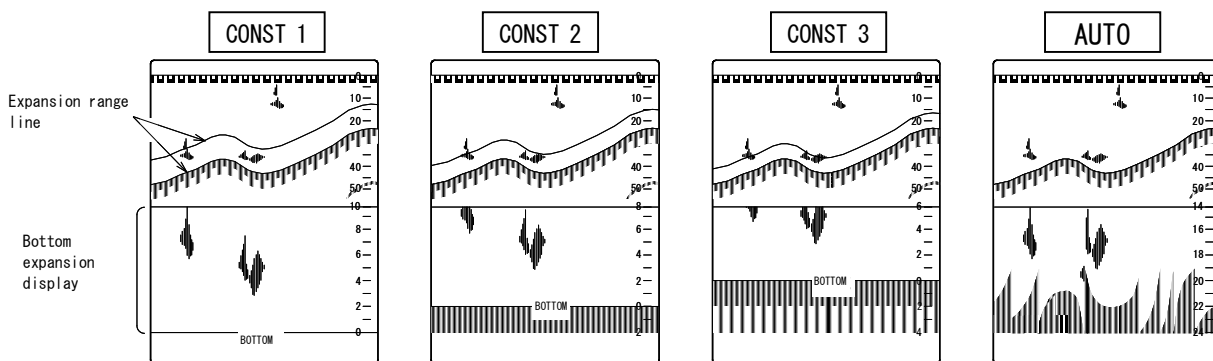
## 1. Bottom Expansion

The bottom contour can be selected by the following shifts and displayed across the screen for close observation of the echoes of interest on or near of the bottom.

Use the PHASED R.  $\Delta$   $\nabla$  keys to select the desired setting.

**SETTING:** CONST 1, CONST 2, CONST 3, AUTO

- +CONST 1+ The upper part of the bottom is displayed with the expansion range.
- +CONST 2+ The zoomed bottom is shifted deeper than CONST 1.
- +CONST 3+ The zoomed bottom is shifted deeper than CONST 2.
- +AUTO+ The zoomed bottom is automatically tracked.



# SCREEN DIVISION

---

## 2. Screen Division

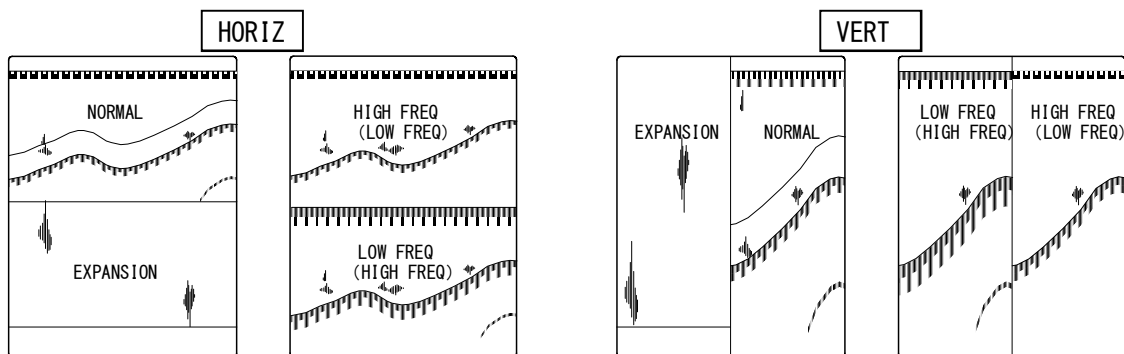
The screen division can be selected either VERTICAL or HORIZONTAL.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** HORIZ, VERT

+HORIZ+ displays the picture divided horizontally.

+VERT+ displays the picture divided vertically.



### 3. Dual Frequency Display Location

Dual frequency display location is selected as shown in the below drawings when Frequency Selection Dial  $\frac{2}{6}$  is activated.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** L | H, H | L

#### SCREEN DIVISION: VERTICAL

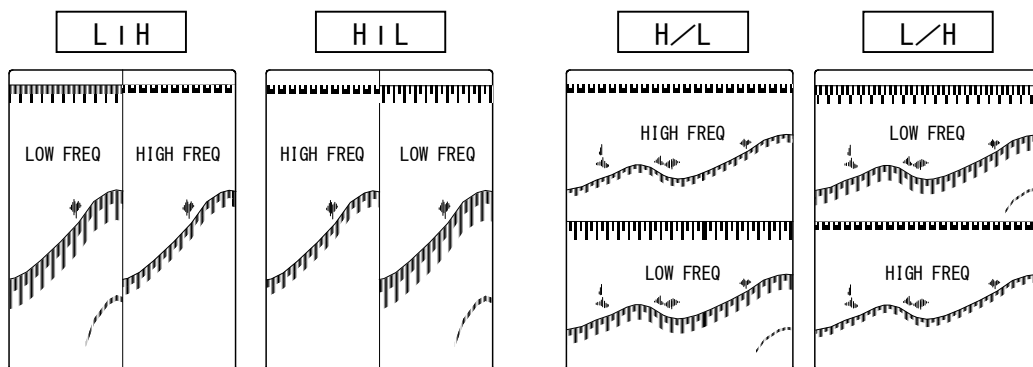
$\frac{L}{H}$  | H: Low frequency display on the left half and High frequency display on the right half

$\frac{H}{L}$  | L: High frequency display on the left half and Low frequency display on the right half

#### SCREEN DIVISION: HORIZONTAL

$\frac{H}{L}$  / L: High frequency display on the upper half and Low frequency display on the lower half

$\frac{L}{H}$  / H: Low frequency display on the upper half and High frequency display on the lower half



### 4. High Frequency

This function is available when the TR boards for 3 frequencies (option) mounted.

HIGH 2 will not function when the TR boards for 3 frequencies not mounted.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** HIGH 1, HIGH 2

# DISPLAY ITEM SELECTION

Use the EXP/VRM   keys to highlight the item to change.  
Use the PHASED R.   keys to select the desired setting.

DISP ITEM SEL. <input type="button" value="↺"/>	
DEPTH DISP	MEDIUM
SCALE	RIGHT
EXP/VRM	EXP
TEMP DISP	OFF
TEMP GRAPH	OFF
COL. SCALE	ON
LAT.LONG.	OFF
SPEED DISP	OFF
COURSE	OFF
VOLT DISP	OFF
MARK	MARK
DISP.POS	LOWER
DEPTH GRID	AUTO
PICTURE FEED	AUTO
SCALE FONT	SMALL
PIC. SPEED	x1
A-SCOPE	OFF

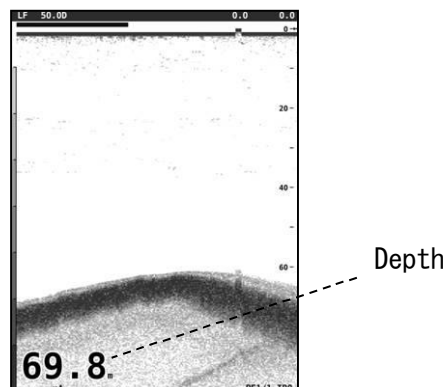
When  is highlighted, pressing the ENTER  key will access to the Main Menu.

## 1. Depth Display Font Size

The appropriate size of the depth indication can be selected.

Use the PHASED R.   keys to select the desired size.

**SETTING:** OFF, SMALL, MEDIUM, LARGE, EX. LARGE

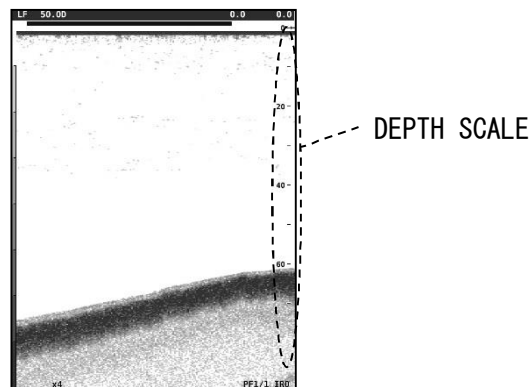


## 2. Depth Scale Position

The location of the depth scale indication can be selected.

Use the PHASED R.   keys to select the desired location.

**SETTING:** RIGHT, CENTER, OFF



## 3. EXP/VRM (Expansion/Variable Range Marker)

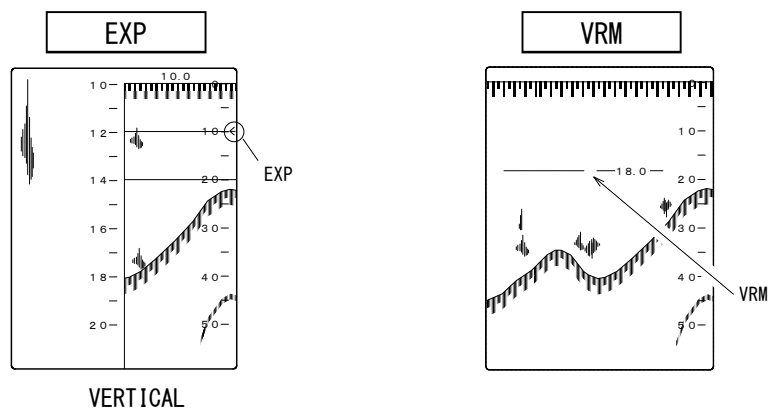
EXP or VRM function can be selected.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** EXP, VRM

**EXP:** activates the Expansion start point.

**VRM:** activates the dotted line for digitally displayed depth.

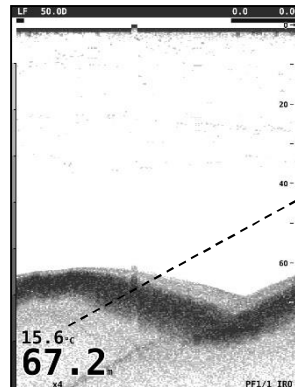


## 4. Temperature Display Font Size

The appropriate size of the temperature indication can be selected.

Use the PHASED R.   keys to select the desired size.

**SETTING:** OFF, SMALL, LARGE



Water temperature

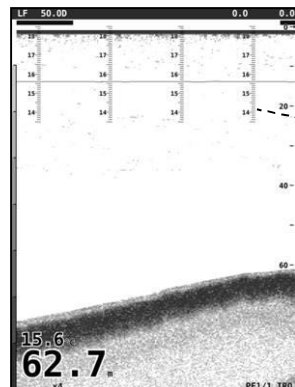
\*Optional equipment is required.

## 5. Temperature Graph

The temperature Graph can be activated or inactivated.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** OFF, ON



Temperature graph

\*Optional equipment is required.



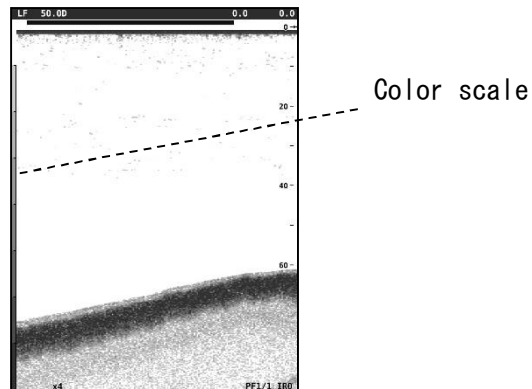
Water temperature, Temperature graph and Scale can be active only when optional equipment is connected. Select OFF while disconnecting the temperature sensor.

## 6. Color Scale

Color Scale can be activated or inactivated.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** ON, OFF

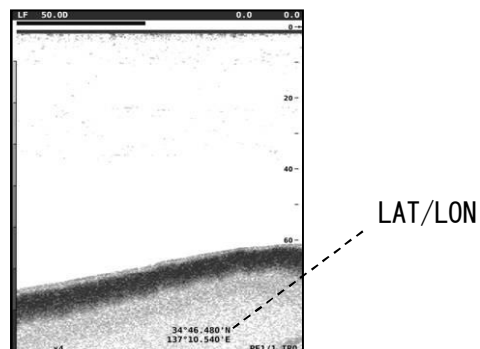


## 7. Latitude/Longitude of Own Ship

Ship's location can be displayed in Latitude/Longitude on the screen or be inactive.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** OFF, ON



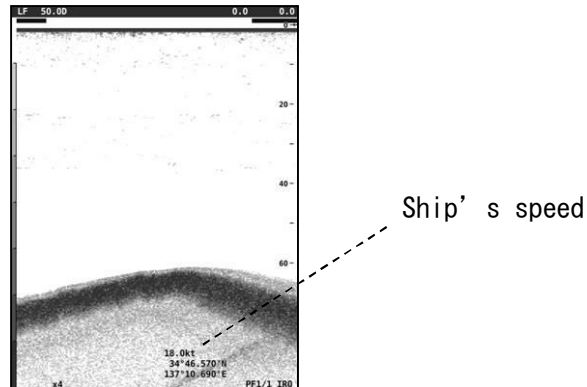
\*Optional equipment is required.

## 8. Speed Display

Ship's speed can be displayed on the screen or be inactive.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** OFF, ON



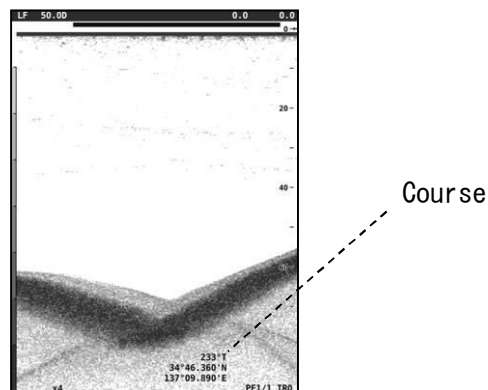
\*Optional equipment is required.

## 9. Course Display

Course can be displayed on the screen or be inactive.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** OFF, ON



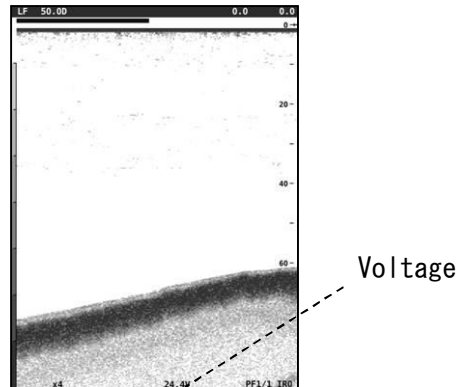
\*Optional equipment is required.

## 10. Voltage Display

Voltage can be displayed on the screen or be inactive.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** OFF, ON



## 11. Mark

One of the Mark key functions can be selected.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** MARK, TIMER, SQUID

**MARK:** The Mark key inscribes a vertical mark line on the screen when pressed.

**TIMER:** Elapsed time from the moment the Mark key is pressed may be displayed.

The first press of this key displays a line on the screen and starts to measure time.

The second press of this key displays a line again and displays elapsed time.

The third press of this key displays a line again and this elapsed time disappears.

The maximum measurable time is 60 minutes and it will start measuring from one second after measuring 60 minutes.

**SQUID:** The depth set by the EXP key is output to the MNEA output (option).

When the output data is set to "183T" or "600S", the NMEA output can be switched to the depth or the expansion start depth.

Pressing this key displays a line on the screen and switches the output.

"T" is displayed after expansion start depth when "183T" and expansion start depth are selected.

"S" is displayed after expansion start depth when "600S" and expansion start depth are selected.

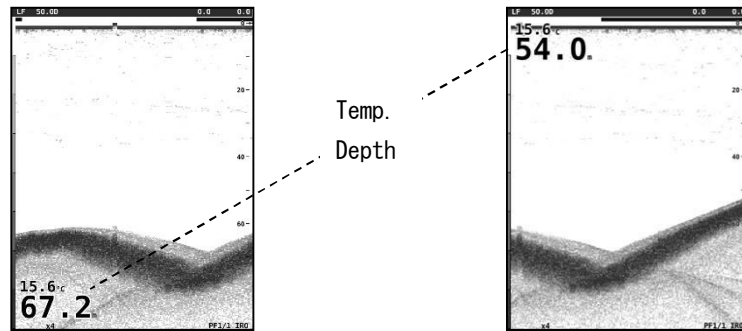
## DISPLAY ITEM SELECTION

### 12. Display Position for Depth and Water Temperature

The display location of the depth and water temperature can be selected.

Use the PHASED R.   keys to select the desired location.

**SETTING:** LOWER, UPPER

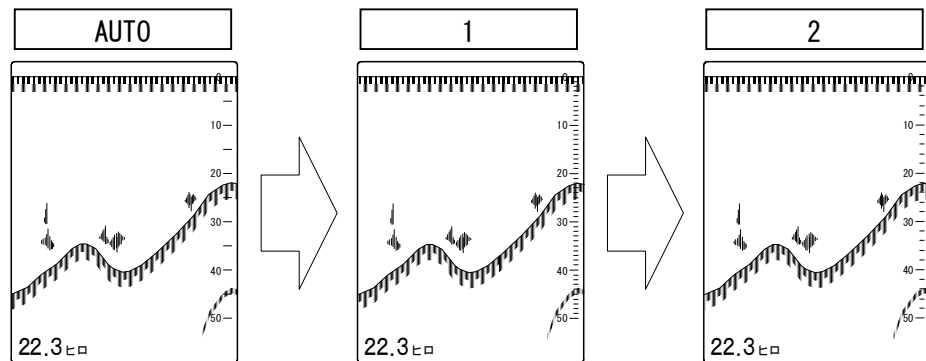


### 13. Depth Grid Size

The display size of Depth Grid can be selected.

Use the PHASED R.   keys to select the desired size.

**SETTING:** AUTO, 1, 2, 5, 10, 20, 50, 100




## 14. Picture Feed

Picture Feed control can be selected either AUTO or FIXED.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** AUTO, FIXED

**AUTO:** picture moves to the left by the speed rate changes dependently of the range in use.

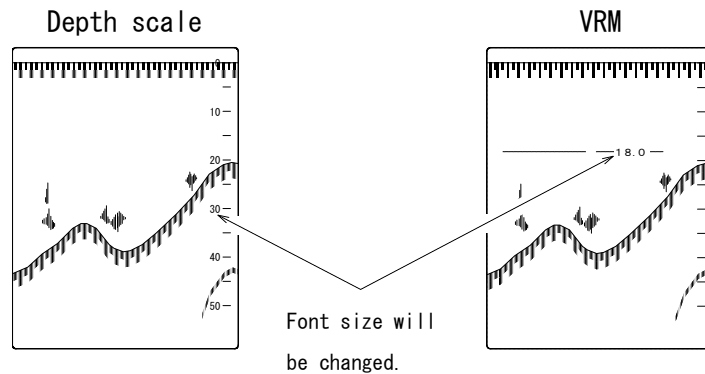
**FIXED:** picture moves to the left by the speed rate changes independently of the range in use. The rate value can be entered with Picture Speed  key.

## 15. Scale Font

Scale Font and VRM digitally displayed on the screen can be selected.

Use the PHASED R.   keys to select the desired size.

**SETTING:** SMALL, LARGE



### 16. Picture Speed

The Picture Advance Speed determines how quickly the vertical scan lines run across the screen.

Use the PHASED R.   keys to select the desired speed.

**SETTING:** x 1, x 2, x 3, x 4

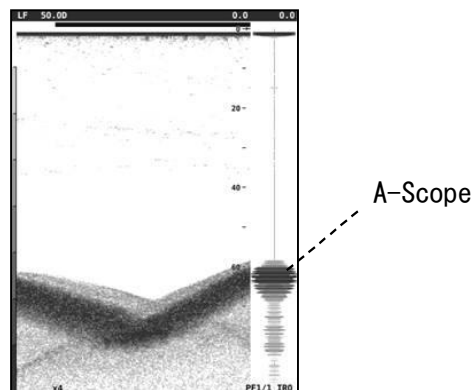
When choosing a faster speed, keep in mind that a fast advance speed will show a rougher picture.

### 17. A-Scope





A-Scope, a method of displaying the echo sounder information can be active or inactive.


Use the PHASED R.   keys to select the desired setting.

**SETTING:** ON, OFF



# UNIT ADJUSTMENT

Use the EXP/VRM   keys to highlight the item to change.  
Use the PHASED R.   keys to select the desired setting.

UNIT-ADJUST 	
DEPTH UNIT	m
TEMP UNIT	°C
SPEED UNIT	kt
TEMP ADJ	+0.0°C
DRAFT	00.0m
SONIC CONTROL	1500m/sec

When  is highlighted, pressing the ENTER  key will access to the Main Menu.

## 1. Depth Unit

Depth can be set to a desired unit.

Use the PHASED R.   keys to select the desired unit.

**SETTING:** m, fm, br, ft

m (meters), fm (fathoms), br (braccia), ft (feet)

1fm=1.8288m

1br=1.65m

1ft=0.3048m

## UNIT ADJUSTMENT

---

### 2. Temperature Unit

Temperature and temperature graph can be shown in Celsius or Fahrenheit.

Use the PHASED R.   keys to select the desired unit.

**SETTING:** ° C, ° F

\*Optional equipment is required.

### 3. Speed Unit

Speed can be shown in knots or kilometers/hour.

Use the PHASED R.   keys to select the desired unit.

**SETTING:** kt (knots), km/h (kilometers/hour)

1kt=1.852km/h

### 4. Temperature Adjustment

This function offsets water temperature indication to improve accuracy.

Use the PHASED R.   keys to select the desired value.

**SETTING:** +9.9 to -9.9

\*Optional equipment is required.

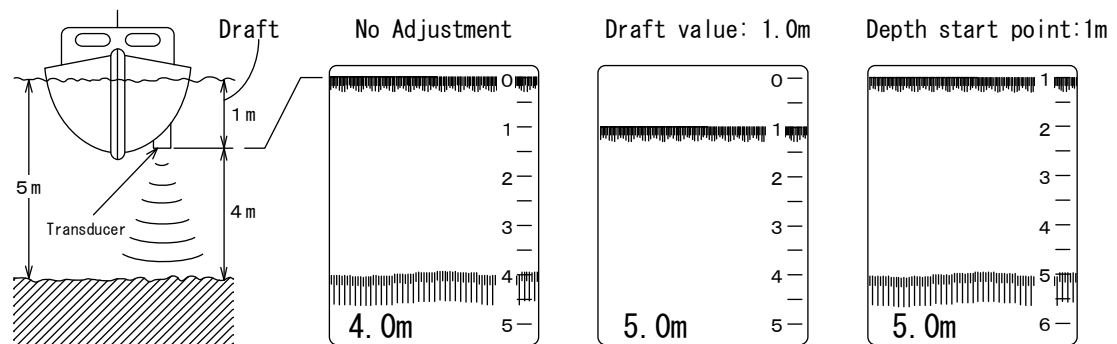
## 5. Draft

This function sets draft value, when depth below the surface is required.

Use the PHASED R.   keys to select the desired value.

**SETTING:** 0.00 to 99.9

When your ship's draft height is 1 meter and the actual depth from sea level is 5 meters, the display of depth readout is normally 4 meters. If necessary, you can change the difference by the following adjust.



After entering the setting draft value, adjust the depth start point with the PHASED R.   keys

## 6. Sonic Control

This function can adjust the speed of sound which changes with sea water concentration, water temperature, etc.





Use the PHASED R.   keys to select the desired value.


**SETTING:** 1400m/sec to 1600m/sec

### NOTE !

-----  
 The speed at which sound waves are transmitted in sea water is 1500 meters per second.  
 -----

# OTHERS

Use the EXP/VRM   keys to highlight the item to change.  
 Use the PHASED R.   keys to select the desired setting.

OTHERS 	
FULL-SCREEN GAIN	<input type="text" value="ON"/>
OUTER DPTH	<input type="text" value="OFF"/>
MJR FREQ	<input type="text" value="LOW"/>
TRIGGER	<input type="text" value="INTERNAL"/>
OUTPUT	<input type="text" value="OFF"/>
T.INTVAL ADD	<input type="text" value="0"/>
TRANS RATE	<input type="text" value="2000"/>
POW FREQ	<input type="text" value="120.4kHz"/>
PANEL BRIGHT	<input type="text" value="15"/>
OPE.MODE	<input type="text" value="0"/>
SHIFT AR	<input type="text" value="1"/>
TEMP SENSOR	<input type="text" value="OP-102"/>
ASHIFT LIMIT	<input type="text" value="1999m"/>
BOTTOM LIMIT	<input type="text" value="0000m"/> <input type="text" value="9999m"/>
TRIG SYNC	<input type="text" value="ON"/>
RANGE SET	<input type="text" value="LINKED"/>

When  is highlighted, pressing the ENTER  key will access to the Main Menu.

## 1. Full-Screen Gain

Selecting the screen display method when the gain is changed with the gain dial.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** ON, OFF

---

## 2. Outer Depth

The bottom depth that is out of the set range can be displayed in digits or not.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** ON, OFF

When ON is selected, measuring the depth has priority over the transmit pulse of which rate will be decreased.

## 3. Prior Depth Measuring Frequency for Digital Display

The main frequency to measure the depth can be selected.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** LOW, HIGH

## 4. Trigger Signal

The Trigger Signal source can be selected Internal or External.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** INTERNAL, EXTERNAL

Select **%INTERNAL+** when this unit alone is operated.

Select **%EXTERNAL+** when connecting this unit to another unit synchronized.

## 5. Output Data

The NMEA output data format can be selected.

Use the PHASED R.   keys to select the desired format.

**SETTING:** OFF, 183N, 183T, 600S

**OFF** outputs nothing

**183N** outputs NMEA-0183 format, DBT, TLL or MTW every 1 second

**183T** outputs NMEA-0183 format, **DBT+** every 1 second

**600S** outputs the depth data at the transmission speed, 600bps.

### NOTE !

---

**DBT** Depth below the transducer

**TLL** Pressing the Mark key outputs the data of Latitude/Longitude when a navigator is connected.

**MTW** Data for Water temperature is output when a temperature sensor is connected.

**Data Transmission Speed** Speed of the data transmitted.

---

## 6. Transmit Interval Addition Rate

The transmit interval rate can be added to eliminate some double echoes.

Use the PHASED R.   keys to select the desired value.

**SETTING:** 000 to 999

The larger values selected, the less double echoes appears on the screen.

---

## 7. Transmit Rate (Pulse Repetition Rate)

The transmit rate of the sound waves from the transducer can be selected.

Use the PHASED R.   keys to select the desired rate.

**SETTING:** 500, 1000, 1500, 2000, 2500, 3000

## 8. Frequency of Power Supply Source

Noise generated from the power supply source in this unit may appear on the screen depending on the frequency of the power supply board.

The appropriate frequency to avoid noise caused by the power supply source can be selected.

Use the PHASED R.   keys to select the desired frequency.

**SETTING:** 100.0kHz to 140.0kHz

## 9. Panel Brightness

The bright level of backlight can be selected.

Use the PHASED R.   keys to select the desired level.

**SETTING:** 0 to 15

### 10. Operation Mode

The memory page for Operation Mode can be selected.

Use the PHASED R.   keys to select the desired mode.

**SETTING:** 0, 1

Each of the setting 0 and 1 can store 3 kinds of operation mode, so in total 6 kinds of operation mode can be stored in the memory.

### 11. Shift Average . Scale Increment

A different shift activated with the Phased R. keys can be set.

Use the PHASED R.   keys to select the desired value.

**SETTING:** 1, 5, 10, 50, 100

For example in the SHIFT AVERAGE 1, the depth on the screen moves by 1 depth unit and in the SHIFT AVERAGE 5 does by 5 depth units.

### 12. Water Temperature Sensor

The interfacing connection for temperature sensor can be selected.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** OP-102, OP-41-1, NMEA-0183

Connect OP-102 (OP-41-1) to the TEMP terminal.  
Connect NMEA-0183 to the NAV IN terminal.

## 13. Auto Shift Limit

The limit of the depth value for automatic bottom tracking can be selected.

Use the PHASED R.   keys to select the desired value.

**SETTING:** 10 to 1999

## 14. Bottom Detection Limit

A limit for the bottom detection range can be selected.

Use the PHASED R.   keys to select the desired value.

**SETTING:** 0000 to 9999

## 15. Trigger Synchronization

The timing to transmit the sound waves of high and low frequencies can be selected.

Use the PHASED R.   keys to select ON or OFF.

**SETTING:** ON, OFF

**ON:** transmits the high and low frequency sound waves at the same time and synchronizes the transmit cycle for deeper range.

**OFF:** transmits the high and low frequency sound waves separately. In this case it transmits at the same speed with a single frequency use that sometimes generates interference itself and degrades the performance.

## 16. Range Set

The settings for both frequencies can be activated linked or separately.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** LINKED, SINGLE

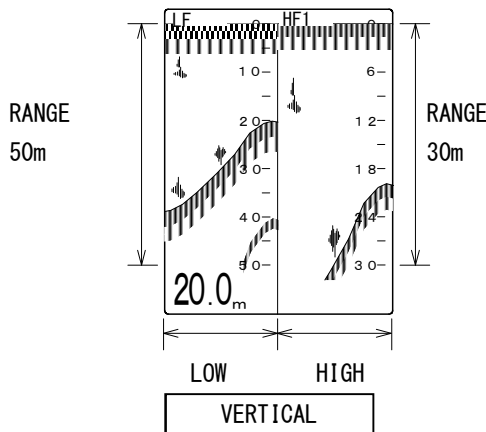
In case LINKED selected the following function settings will be functioned under the same settings.

RANGE (NORMAL MODE), SUB RANGE (EXPANSION MODE), SHIFT (UPPER DEPTH), AUTO RANGE, AUTO SHIFT, PICTURE SPEED, INTERFERENCE REDUCTION, JAMMING REDUCTION, NOISE REDUCTION

In case SINGLE selected the above function settings will be functioned in both frequency use separately and the indication for selected frequency on the screen will be highlighted. Both indications for frequency will not be highlighted when LINKED selected.





In case one single frequency highlighted the high frequency  key enables the settings for high frequency presentation to change.

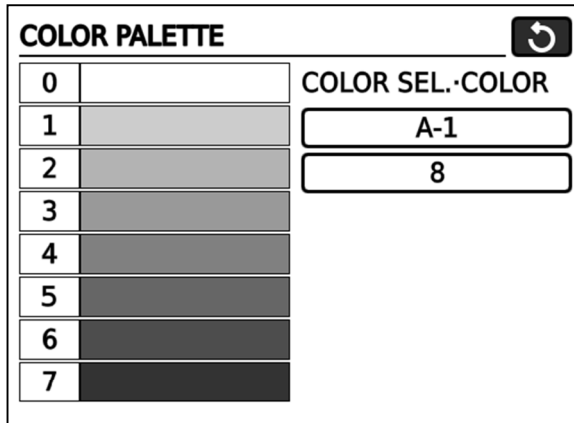
In case one single frequency highlighted the low frequency  key enables the settings for low frequency presentation to change.



As shown above the different range in each frequency is functioned simultaneously.

# COLOR PALETTE

Use the EXP/VRM   keys to highlight the item to change.  
 Use the PHASED R.   keys to select the desired setting.



When  is highlighted, pressing the ENTER  key will access to the Main Menu.

## 1. Color Selection

10 basic color settings are available.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** A-1, A-2, B-1, B-2, C-1, C-2, D-1, D-2, E-1, E-2

$\%1+$ ,  $\%2+$  By using Color Palette colors can be set freely.  
 As initial settings E-1 is the same with A-1 and E-2 is the same with B-1.

## 2. Display Colors

The number of colors can be selected.

Use the PHASED R.   keys to select 8 or 16 colors.

**SETTING:** 8, 16

## 3. How to Edit the Color Palette

To freely set the colors for E-1 and E-2, first specify E-1 or E-2 with the PHASED R.   keys, and press the ENTER  key to display the color palette below.

COLOR PALETTE		<input type="checkbox"/>
0		COLOR SEL. COLOR
1		<b>E-1</b>
2		8
3		RESET
4		EDIT
5		
6		
7		

Use the EXP/VRM   keys to highlight %SET+ and press the ENTER  key to display the menu below.

COLOR PALETTE		<input type="checkbox"/>
<b>0</b>		COLOR SEL. COLOR
1		E-1
2		8
3		RESET
4		COLOR # <b>0</b>
5		R <input type="checkbox"/> 4
6		G <input type="checkbox"/> 4
7		B <input type="checkbox"/> 10

Use the EXP/VRM   keys to highlight %COLOR #+ and select the color number to set with the PHASED R.   keys. (Color number 0 is background color)

Use the EXP/VRM   keys to select %R+, %G+, or %B+ for ratio change.

Use the PHASED R.   keys to change the ratio value (0 to 15)

Highlight %COLOR #+ after the RGB setting. Press the ENTER  key to close this menu and the desired setting is memorized in E-1 or E-2.

(Select %RESET+ and press the ENTER  key to reset the color palette you edited.)

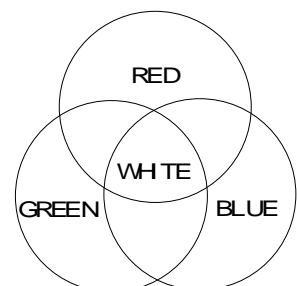
### What is "Color Palette"?

---

The ratio of the primary colors (red, green and blue) can create various colors.


This function (Color Palette) can change 15 different level of color intensity on the primary colors each so that the user can set the desired colors.

This function can be used as a reference to estimate density of a fish school, fish species and hardness of the bottom.



# ALARMS

Use the EXP/VRM  $\Delta$   $\nabla$  keys to highlight the item to change.  
Use the PHASED R.  $\Delta$   $\nabla$  keys to select the desired setting.

ALARM 	
SHALLOW	OFF
DEEP	OFF
FISH	OFF
TEMP MAX.	OFF
TEMP MIN.	OFF
TEMP RANGE	OFF
FISH ALARM	LOW

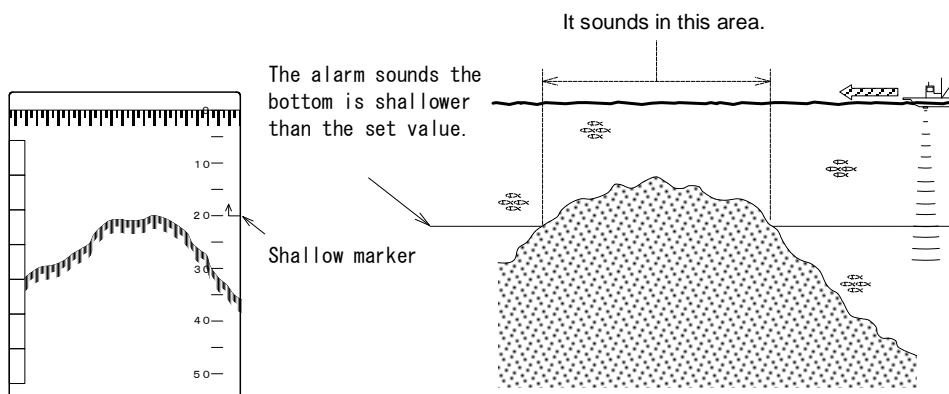
When  is highlighted, pressing the ENTER  key will access to the Main Menu.

## 1. Shallow Alarm

This function can be set to sound the alarm when the unit detects the sea bottom at the shallower area than the set alarm depth.

Use the PHASED R.  $\Delta$   $\nabla$  keys to select the desired value.

**SETTING:** OFF, 0000 to 3999



Select  $\text{OFF}+$  when releasing this function or this function may not be utilized.

### “How to stop sounding the alarm”

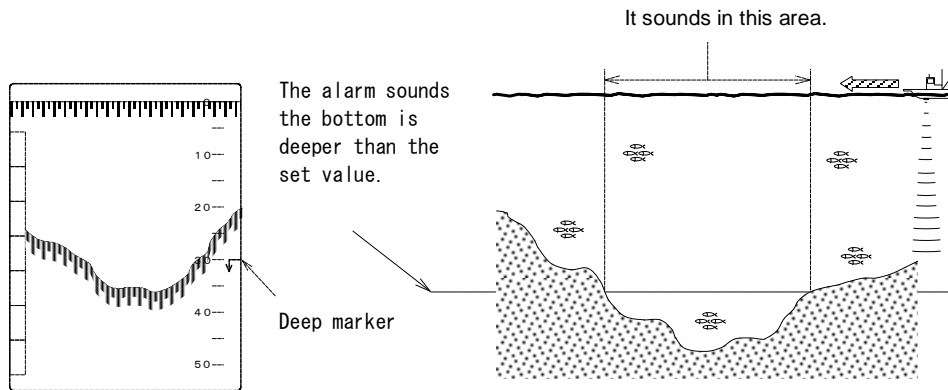
Once the alarm starts sounding, press any key to disable the alarm. Pressing any key will stop sounding. All keys will not be usable while sounding the alarm.

## 2. Deep Alarm

This function can be set to sound the alarm when the unit detects the sea bottom at the deeper area than the set alarm depth.

Use the PHASED R.   keys to select the desired value.

**SETTING:** OFF, 0000 to 3999



Select **OFF+** when releasing this function or this function may not be utilized.

### **“How to stop sounding the alarm”**

---

Once the alarm starts sounding, press any key to disable the alarm. Pressing any key will stop sounding. All keys will not be usable while sounding the alarm.

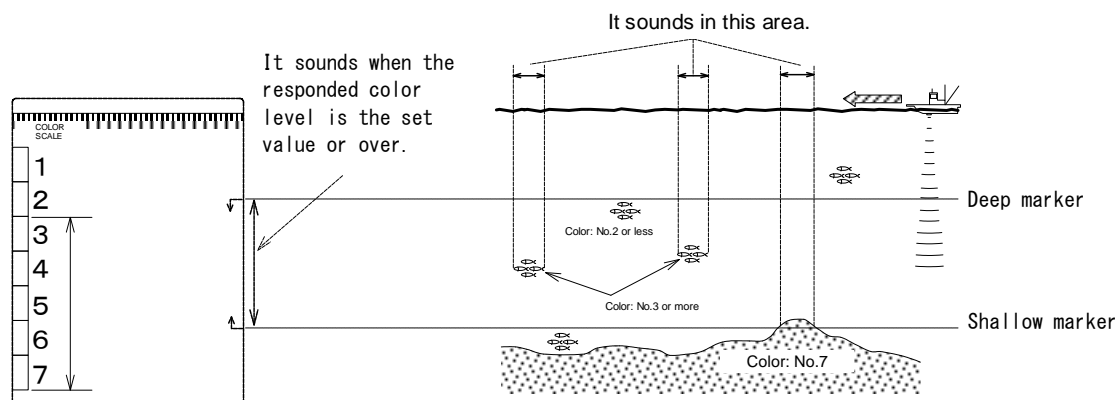
---

### 3. Fish Alarm

This function can be set to sound the alarm when the unit detects any object between the two set points (Deep alarm and Shallow alarm).

Use the PHASED R.   keys to select the desired level.

**SETTING:** OFF, 1 to 7 (8 color display) or 1 to 15 (16 color display)



Select the settings for %SHALLOW+ and %DEEP+, OFF to activate Fish Alarm after setting the values for %SHALLOW+ and %DEEP+.

Select %OFF+ when releasing this function or this function may not be utilized.

### 4. Temperature Maximum Alarm

This function can be set to sound the alarm when the water temperature goes above the set value, which is available only when an optional water temperature sensor is connected.

Use the PHASED R.   keys to select the desired value.

**SETTING:** OFF, 00.0° C to 35.0° C

Select %OFF+ when releasing this function or this function may not be utilized.

#### “How to stop sounding the alarm”

---

Once the alarm starts sounding, press any key to disable the alarm. Pressing any key will stop sounding. All keys will not be usable while sounding the alarm.

---

## 5. Temperature Minimum Alarm

This function can be set to sound the alarm when the water temperature goes below the set value, which is available only when an optional water temperature sensor is connected.

Use the PHASED R.   keys to select the desired value.

**SETTING:** OFF, 00.0° C to 35.0° C

Select %OFF+ when releasing this function or this function may not be utilized.

## 6. Temperature Range Alarm

This function can be set to sound the alarm when the water temperature goes above the set value, that is, the changed value in the past one-minute is over the set value, which is available only when an optional water temperature sensor is connected.

Use the PHASED R.   keys to select the desired value.

**SETTING:** OFF, 00.0° C to 09.8° C

Select %OFF+ when releasing this function or this function may not be utilized.

## 7. Fish Alarm (Selection of Frequency on Sounding Alarm)

The frequency on sounding the fish alarm can be selected.

Use the PHASED R.   keys to select the desired setting.

**SETTING:** LOW, HIGH





### “How to stop sounding the alarm”


---

Once the alarm starts sounding, press any key to disable the alarm. Pressing any key will stop sounding. All keys will not be usable while sounding the alarm.

---

## T/R BOARD SET

Use the EXP/VRM   keys to highlight the item to change.  
Use the PHASED R.   keys to select the desired setting.

T/R BOARD SET 	
MAIN FREQUENCY	LOW
TRANSDUCER	OTHER
FREQUENCY	50.0kHz
TX FREQUENCY	50.0kHz
RX FREQUENCY	50.0kHz
RX BANDWIDTH	OFF
CARRIER	UPPER
POW.VOLT	0V
TX DUTY	32

When  is highlighted, pressing the ENTER  key will access to the Main Menu.



**CAUTION**

If this setting is made wrong, not only this machine won't work properly, but also there is a possibility of damage to the transducer.

### 1. Main Frequency

Selecting the frequency to set the T/R board.

Use the PHASED R.   keys to select the frequency.

**SETTING:** LOW, HIGH1、HIGH2

## T/R BOARD SET


---

### 2. Transducer

Selecting the transducer to connect the unit.

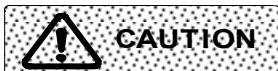
Use the PHASED R.   keys to select the transducer.

**SETTING:** OTHER, 20kHz6/2, 20kHz6/4, 50kHz60 1, NGM-100-200

T/R BOARD SET 	
MAIN FREQUENCY	LOW
TRANSDUCER	OTHER
FREQUENCY	50.0kHz
TX FREQUENCY	50.0kHz
RX FREQUENCY	50.0kHz
RX BANDWIDTH	OFF
CARRIER	UPPER
POW.VOLT	0V
TX DUTY	32

When "OTHER" is selected, you can change "FREQUENCY" "TRANSMITTER FREQUENCY" "RECEIVER FREQUENCY" "BANDWIDTH" "CARRIER" "POWER VOLTAGE" "TX DUTY".

When the registered transducer is selected, you can change "TRANSMITTER FREQUENCY" "RECEIVER FREQUENCY" "BANDWIDTH".



#### CAUTION

When T/R board setting menu is displayed, transmitting and receiving sounds are stopped to protect the transducer and the T/R board.

### 3. Frequency (When "OTHER" is selected)

Selecting the frequency of the transducer connected to the unit when "OTHER" is selected for "TRANSDUCER".

Use the PHASED R.   keys to select the desired frequency.

**SETTING:** 10.0kHz to 400.0kHz

## 4. TX Frequency

The TX frequency for the transducer is adjusted by this setting.

Use the PHASED R.   keys to select the desired frequency.

**SETTING:** -10.0kHz to (Selected frequency) to +10.0kHz

You can select the TX frequency so that the sensitivity is best.  
Change the TX frequency to avoid the interference, if required.

This setting is cleared by changing the setting with "TRANSDUCER" or "FREQUENCY".

## 5. RX Frequency

The RX frequency for the transducer is adjusted by this setting.

Use the PHASED R.   keys to select the desired frequency.

**SETTING:** -10.0kHz to (Selected frequency) to +10.0kHz

You can select the RX frequency so that the sensitivity is best.  
Change the RX frequency to avoid the interference, if required.

This setting is cleared by changing the setting with "TRANSDUCER" or "FREQUENCY".

## 6. RX Bandwidth

Bandwidth of Receiver's frequency can be set.

Use the PHASED R.   keys to select the desired frequency.

**SETTING:** OFF, 1kHz, 1.5kHz, 2kHz, 3kHz, 5kHz, 7kHz, 10kHz, 12kHz, 15kHz, 15kHz\_W

When narrower band is chosen, the noise suppression is greater. However, resolution in shallow water is lower. For increased resolution, select wider band.

## 7. Carrier (When "OTHER" is selected)

Carrier for the TR board can be set when "OTHER" is selected for "TRANSDUCER".

Use the PHASED R.   keys to select the desired carrier.

**SETTING:** LOWER, UPPER

%OWER± non use

## 8. Power Voltage (When "OTHER" is selected)

Power voltage of transmitting can be set when "OTHER" is selected for "TRANSDUCER".

Use the PHASED R.   keys to select the desired value.

**SETTING:** 0V to 100V



Do not raise the power supply voltage more than necessary  
If the power supply voltage is raised more than necessary, the transducer may be damaged.  
Damaged transducers may result in expensive repairs.





## 9. TX Duty (When "OTHER" is selected)




The TX duty of transmitting can be set when "OTHER" is selected for "TRANSDUCER".

Use the PHASED R.   keys to select the desired value.

**SETTING:** 1 to 63

# MAINTENANCE



Use the EXP/VRM   keys to highlight the item to change.  
Use the PHASED R.   keys to select the desired setting.

<b>MAINTENANCE</b> 	
LANGUAGE	English(en) 
ELAPSED TIME	0H 
UPDATE	
SETTINGS	
GAIN OR FAR GAIN	
ABOUT THIS EQUIPMENT	

When  is highlighted, pressing the ENTER  key will access to the Main Menu.

## 1. Language

Main language can be set.


Use the PHASED R.   keys to select the desired language.

**SETTING:** Japanese(ja), English(en)

Press the ENTER  key after the language is selected.

## 2. Elapsed Time

It indicates the total time that elapses while the unit operating.




Press the ENTER  key to reset the elapsed time.

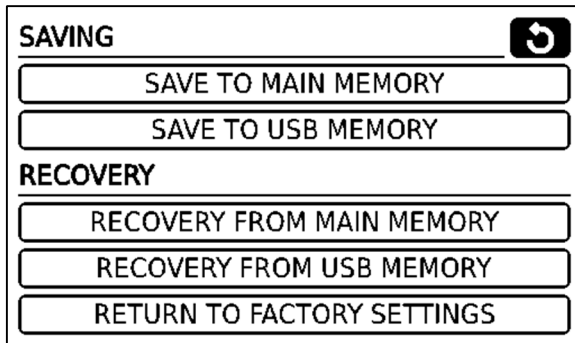
## 3. Update

Update the version of program with the USB flash memory stick if necessary.

## 4. Settings (User Settings / Return to Factory Settings)

This is the way to save and load the settings

Use the EXP/VRM   keys to highlight the item to change.  
Press the ENTER  key to select the desired item.



When  is highlighted, pressing the ENTER  key will access to the Maintenance menu.

%SAVE TO MAIN MEMORY%: to back up the setting to the internal memory

%SAVE TO USB MEMORY%: to back up the setting to the USB flash memory stick

%RECOVER FROM MAIN MEMORY%: to load the setting from the internal memory

%RECOVER FROM USB MEMORY%: to load the setting from the USB flash memory stick

%RETURN TO FACTORY SETTINGS%: to reset the setting.

### NOTE !

---

User Settings are the settings set up by the user previously.

With this function the user may return to the desired function settings if the unit should become inoperable due to mistaken use of the controls. Be sure to store the user settings before the first operation.

---



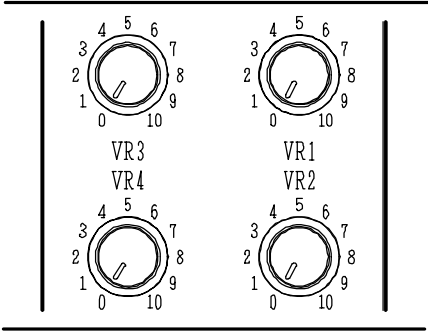
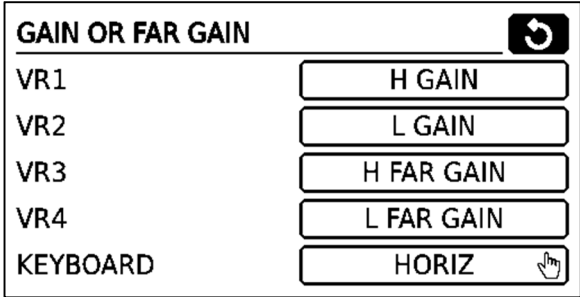
Be sure to turn off the power of the unit before inserting the USB flash memory stick.

Please do not remove the USB flash memory stick from the unit while saving or loading. The data may be destroyed.

Be sure to turn off the power of the unit before removing the USB flash memory stick.

# 5. Gain or Far Gain

Apply Gain or Far Gain to the VR1, VR2, VR3, and VR4 dials.



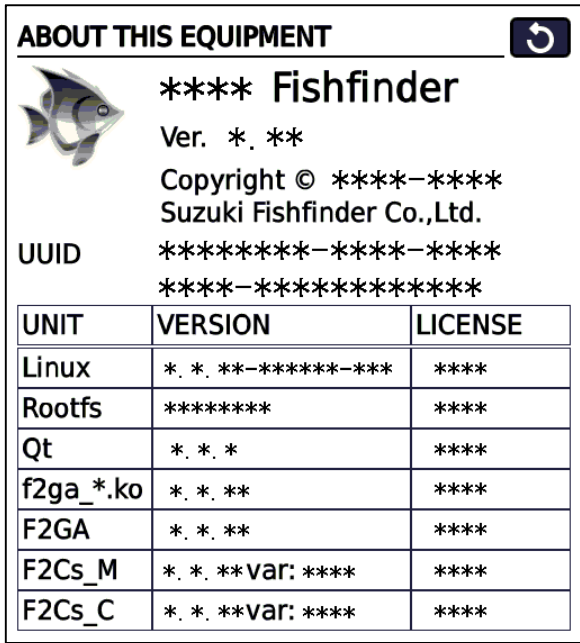
Use the EXP/VRM keys to highlight the item to change. Use the PHASED R. keys to select the desired setting.

**SETTING:** LOW GAIN, HIGH GAIN, LOW FAR GAIN, HIGH FAR GAIN

(KEYBOARD: Select HORIZ. DO NOT CHANGE)

# 6. About This Equipment

The program version and license are displayed.



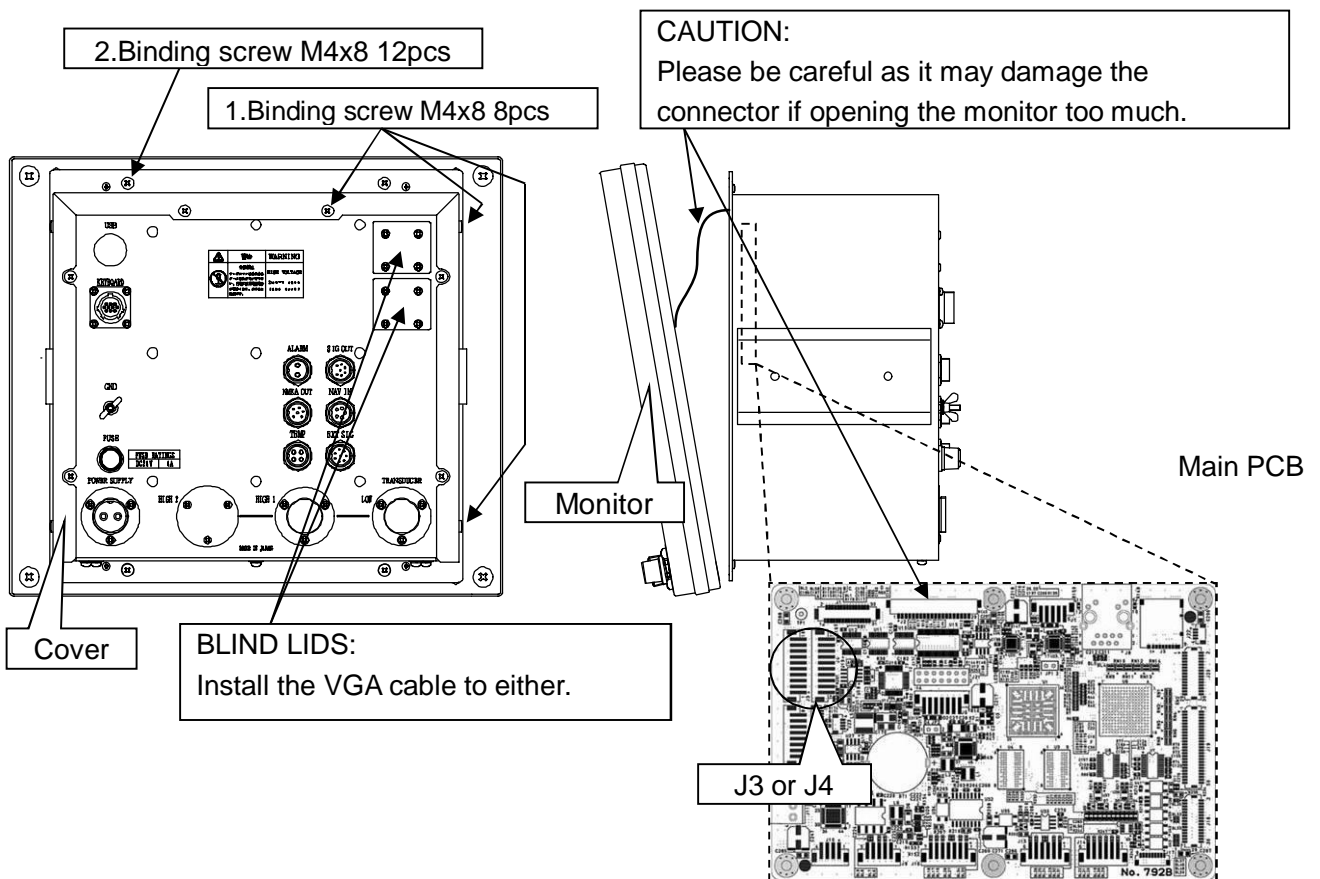
Press the ENTER key will access to the Maintenance menu.

# OPTION

P/no.	Name	Description
OP-102	Water temp. sensor	For the bottom of a ship
OP-41-1	Water temp. sensor	For the side of a ship
OP-370	VGA cable Assy	For connecting external monitor
	USB flash memory stick (2GB/4GB)	For back up the setting

## Installation of OP-370 VGA Cable Assy

Remove all cables connected to the unit before mounting the kit.



1. Remove 8 pcs of 1.Binding screws, and remove the cover.
2. Remove the Blind lid and inset the VGA cable.
3. Attach the VGA cable with the screw holding the Blind lid.
4. Remove 12 pcs of 2.Binding screws, and open the monitor as the drawing above.
5. Connect VGA cable connector to J3 or J4 of Main PCB.
6. Put the cover and monitor back to its original place after finished.

---

## DISPOSAL

### Disposal of Equipment

Dispose of this equipment in accordance with local regulations.

### Disposal of Lithium Battery

Before disposing of the lithium battery, place a piece of adhesive tape across the plus and minus terminals as non-combustible garbage. Dispose of the lithium battery in accordance with local regulations.



This equipment contains the lithium battery of high-density energy.  
Careless disposal of the lithium battery causes electric shorts, impact, heat, electrical shock, explosion, injury, fire and so on.

## SPECIFICATIONS

# SPECIFICATIONS

Basic Ranges	Free Range (10 kinds of range settings up to 3000m, br, fm or 6000ft)
Shift	Up to 1999m, br. fm. or 2999ft
Part Expansion	Free Range (8 kinds of range settings up to 1000m, br, fm or 3000ft)
Frequencies	Dual-frequency (20, 24, 28, 38, 40, 45, 50, 60, 68, 75, 80, 150, 200kHz, TRI-TR Boards Can Be Mounted)
Display Mode	<ol style="list-style-type: none"> <li>1. Single Low Frequency</li> <li>2. Single High Frequency</li> <li>3. Dual Frequency (Vertical or Horizontal)</li> <li>4. Bottom Expansion/Sounder</li> <li>5. Partial Expansion/Sounder</li> <li>6. Navigation Mode/Sounder</li> <li>7. Range set Menu</li> <li>8. Functions set Menu</li> <li>9. Color Palette Set Menu</li> <li>10. A-Scope/Sounder</li> </ol>
Digital Display	<ol style="list-style-type: none"> <li>1. Depth</li> <li>2. Depth Scale</li> <li>3. Shift</li> <li>4. Expansion Start/VRM</li> <li>5. Timer</li> <li>6. Water Temperature, Graph*</li> <li>7. Lat / Lon*</li> <li>8. Speed*</li> <li>9. Course*</li> <li>10. Voltage</li> </ol>
Other Functions	Operation Mode, Frequency Selection, Far Gain Control, Gain Control, TVG Curve, D-Range, Transmit. Interval Change, Pulse Width Change (Auto/Manual), Color Selection, Interference Reduction, Jamming Reduction, Noise Reduction, Clutter Control, Water Temp. Adjustment, White Line, Picture Filter, Screenshot, Outer Range Display, Draft Adjustment, Output Power Reduction, Stopwatch, Various Alarms, Scale Change, Brightness Control, Picture Speed (Auto/Fix), Sonic Control, Full-screen Gain Control
External Input	Water Temperature Sensor (OP-102, OP-41, NMEA-0183 <MTW>), Navigational Data (NMEA-0183) , External Sounder, Compass (NMEA-0183)
External Output	Depth Data (NMEA-0183), Water Temperature Data (NMEA-0183), Marker (TLL), External Sounder, Analog RGB Output*, External Buzzer
Others	USB Memory
Screen	15inch TFT Color LCD Monitor 1024x768 Pixels Display Resolution (XGA), 8/16 colors
Power Requirement	DC 20 . 30V, Power Consumption 60W

\*Optional equipment is required.