



# KODEN

## OPERATION MANUAL

---

### COLOR Sonar

# ESR-160

This product is specifically designed to be installed on boats and other means of maritime transport. If your country forms part to the EU, please contact your dealer for advice before attempting to install elsewhere.



## **Declaration of Conformity**

(As required by Article 7 (1) of Directive 89/336/EEC)

**Declares under his sole responsibility that the produced Color Sonar manufactured by**

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**Identified by the type number ESR-160 to which this declaration refers conforms to the requirements of Directive 89/336/EEC amended by 92/31/EEC and 93/68/EEC and is in conformity with the EMC, Health and Safety standards of**

**EN60945**

**Signed** .....  
**Saburo Suzuki,**

**Dated** ..... 20.03.2003 .....  
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**N.B. As this product is for Maritime use compliance with Directive 72/23/EEC is not required.**

## AMENDMENT HISTORY

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No.	Document No & Rev No.	Date	Amendments
0	93132852-00	03/07/07	First issue
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2	93132852-02	05/03/01	Page 84 DISPLAY UNIT (SONAR MOD)
3	0093132852-03	06/01/26	Cover
4	0093132852-04	07/09/28	Cover
5	0093132852-05	11/02/08	Page 11_TRUNK/JOINT PIPE LENGTH detail Addition
6			
7			
8			
9			
10			

### Amendment policy

When any change is applied in the document, the document number of the cover sheet is modified. The document number is shown in the footer area, right bottom of cover sheet.

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NOTES TO USERS

Thank you for purchasing the ESR-160.

Before operating this unit, please read this manual thoroughly to ensure correct and safe operation in accordance with the warning instructions and operation procedures.

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# INTRODUCTION

## SYMBOLS

- ◎ The following symbols are used in this manual. Please read this manual carefully and take note of these symbols.



: indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



: indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



: indicates a potentially hazardous situation which, if not avoided, may result in minor injury.

NOTE !

: indicates the contents for the user's reference.



: pages for your reference.


## INSTRUCTIONS FOR THIS OPERATION MANUAL

- ◎ This manual should be kept on hand to provide your quick reference whenever you need it. When you give this unit, ESR-160, to someone else, make sure to give this manual, too.
- ◎ Any use other than that mentioned in this manual is not guaranteed.
- ◎ The contents in this manual are subject to change without notice or obligation.


## **INTRODUCTION**

---

### **TURNING ON THE POWER**

- ◎ When the power switch (  ) is turned clockwise with a click sound,  
the power is turned on and automatically the transducer dome starts to go down.

### **TURNING OFF THE POWER**

- ◎ When the power switch (  ) is turned counterclockwise with a click sound,  
the power is turned off and automatically the transducer dome starts to go up.

### **KEY OPERATION**

- ◎ One short beep will show that you pressed the correct key.  
Three short beeps will advise you that a wrong key is pressed.

# FOR YOUR SAFETY

## INSTALLATION SITE REQUIREMENTS

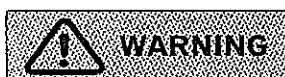


- ⦿ Do not let flammable gas get in the unit, as this will lead to fires.



- ⦿ For long term trouble-free service, the proposed site for installation should be:
  - 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 vibrations.
  - Away as much as possible from areas of high temperatures or areas where the unit is likely to be exposed to direct sunlight.
- ⦿ To avoid magnetic interference to the display, please keep the unit separated from magnetic equipments.
  - Also equipments effected by magnetism, compass and tapes etc, should be kept separately from the Display Cabinet.

## MOUNTING CONDITIONS



- ⦿ Do not install the ESR-160 on unstable or unlevel surfaces. Failure to observe this condition may result in the unit falling or toppling over, resulting in injury.
- ⦿ Bring wiring to the following attention to avoid getting hurt or causing fire or damage.
  - 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 thing 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 electric shock, or fire.



# INTRODUCTION

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## POWER SUPPLY



- Please use with the indicated voltage.  
Otherwise, it will lead to fires or electric shock.

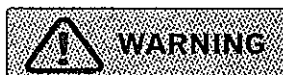


- Make sure to turn off the power by turning the power switch on the unit. Do not turn off the power on the switchboard side. The transducer stops in the protruding status, thereby causing a serious problem or wrong operation.
- When starting the vessel engine, make sure the power of this unit is turned off, otherwise it may cause a serious problem or wrong operation.

## HANDLING



- Do not open the case cover. There is a risk of electric shock if you touch the high voltage conductors.  
Electrical installations should be carried out by the qualified staff
- When installing the transducer through an opening in the hull bottom, pay attention to the intensity and waterproofing. If not, it may cause wrecks.

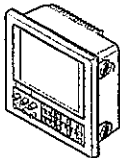
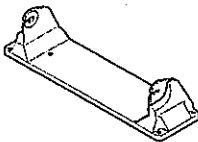


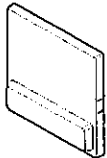


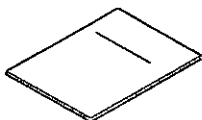
- Please use specified fuse.  
If not, it could result in serious trouble or fire.
- Please use the specified power supply cables.  
If not, it could result in fire.
- The Hoist Gears and Flange Unit require regular lubrication with grease.
- Make sure the voltage between the Flange and the Battery's negative terminal not to exceed 0.65V.  
Otherwise due to the electric corrosion the Transducer may be damaged.

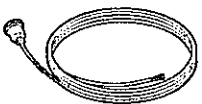
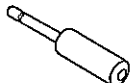
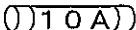
# SUPPLIED COMPONENTS

## SUPPLIED COMPONENTS

### LCD DISPLAY UNIT


CODE					
PART	DISPLAY UNIT	PEDESTAL	WASHER	KNOB BOLT	COVER
					
P. No.	ESR-1601	E42MB11161	A30MB10330	A30MB103901	A30MB10250
QTY	1	1	2	2	1

CODE	* * VA120				
PART	OPERATION MANUAL				
					
P. No.	-				
QTY	1				

CODE	* * VA010				
PART	POWER SUPPLY CABLE	AUDIO PLUG	FUSE		
	 2.2m with a fuse holder				
P. No.	CW-253	P110	F-7161		
QTY	1	1	3		

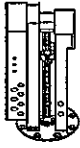
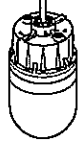
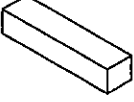

NOTE: the code No. is shown on the packages. However, two \*\* indicates the lot management No.






### PIPE

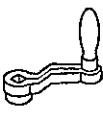

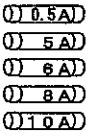
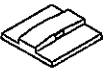
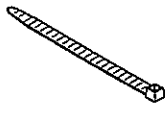
CODE					
PART	PIPE				
					
P. No.	ESR-1504				
QTY	1				

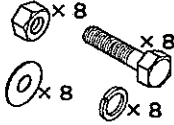
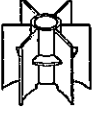
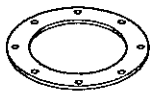
# SUPPLIED COMPONENT

## HOIST/LOWER UNIT

CODE	* * HZ170				
PART	HOIST		TRANSDUCER DOME	SEALING AGENT	HEX ROD WRENCH
					 3 mm 5 mm
P. No.	ESR-1602		ESR-1603	50 g	—
QTY	1		1	1	EACH ONE

CODE	* * HZ140				
PART	DUMPER	FIXING COLOR for upper/lower	PIPE CAP	CAP BOLT	HEX ROD WRENCH
					 2 mm 3 mm
P. No.	—	—	—	M4 X 10	—
QTY	1	EACH ONE	1 SET	4	EACH ONE

CODE	* * HZ010		* * HZ001	* * HZ002	
PART	CRANK HANDLE	GREASE	FUSE	ANP BASE	CABLE BINDER
			 (1) 0.5A) (1) 5A) (1) 6A) (1) 8A) (1) 10A)		
P. No.	OB-63	100 g	F-7161	ANP-1	AB-100-1000
QTY	1	1	EACH 3	2	2

CODE	* * HZ110			* * HZ120	
PART	HEX BOLT SET		TANK GUIDE	GUM PACKING for FLANGE	
	 x 8 x 8 x 8				
P. No.	M16X55U		ESR-1510	ESR-1512	
QTY	1		3	1	

NOTE: the code No. is shown on the packages. However, two \*\* indicates the lot management No.

# INSTALLATION

This chapter explains the installation for sonar Display unit and Hoist-lower unit.

## INSTALLATION

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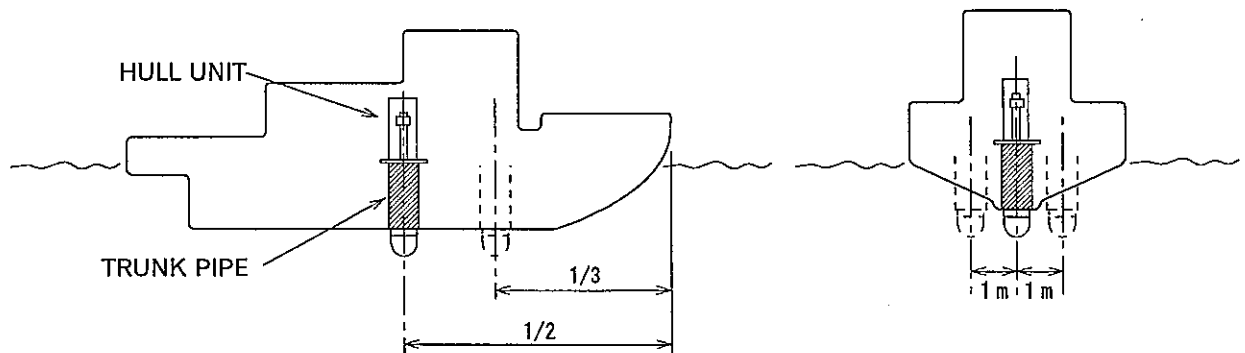
# INSTALLATION

Satisfy the following conditions and also instructions of operation manual in deciding the Tank mounting site.

Fully discuss about the strength with the shipyard and the installer before determining on the position and the method of installation and necessary materials.

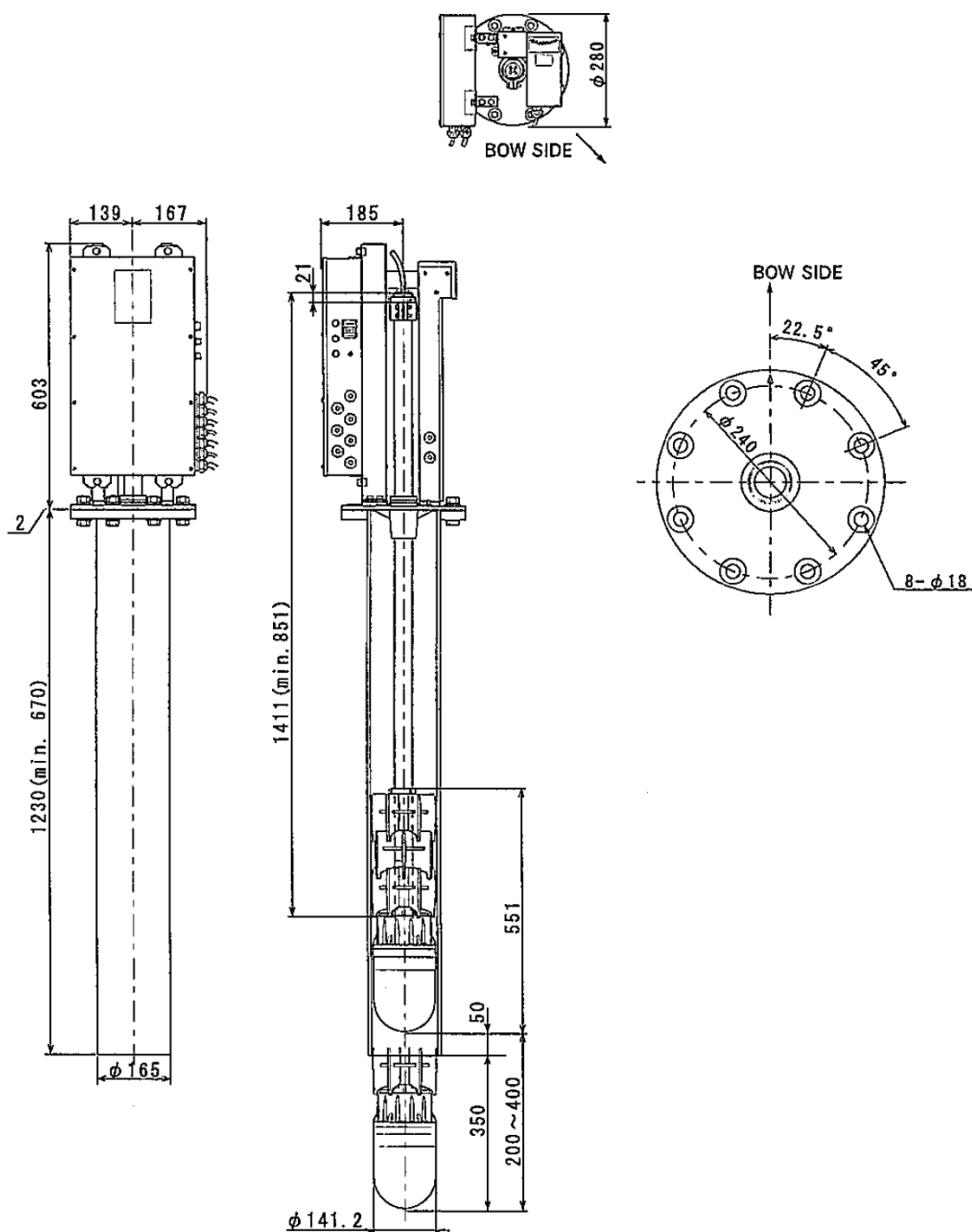
## INSTALLATION POSITION

- ◎ Select a position the least influenced from air bubbles, interference or noise.
- It is most advisable to select a position along the keel and within  $1/3$  to  $1/2$  of the overall length. If this is not possible, install the unit so that the center of the tank comes within 1m from the keel.



- ◎ Be sure there are no obstacles to interfere the ultrasonic beam when the transducer is lowered.
- ◎ Provide sufficient clearance around the tank to make maintenance and inspection work.
- ◎ The Bow mark (△) on the flange should be installed facing the bow of the vessel. However, if this hinders maintenance and inspection and when there is no solution, direct the mark to the opposite (180 degrees) direction toward the stern.

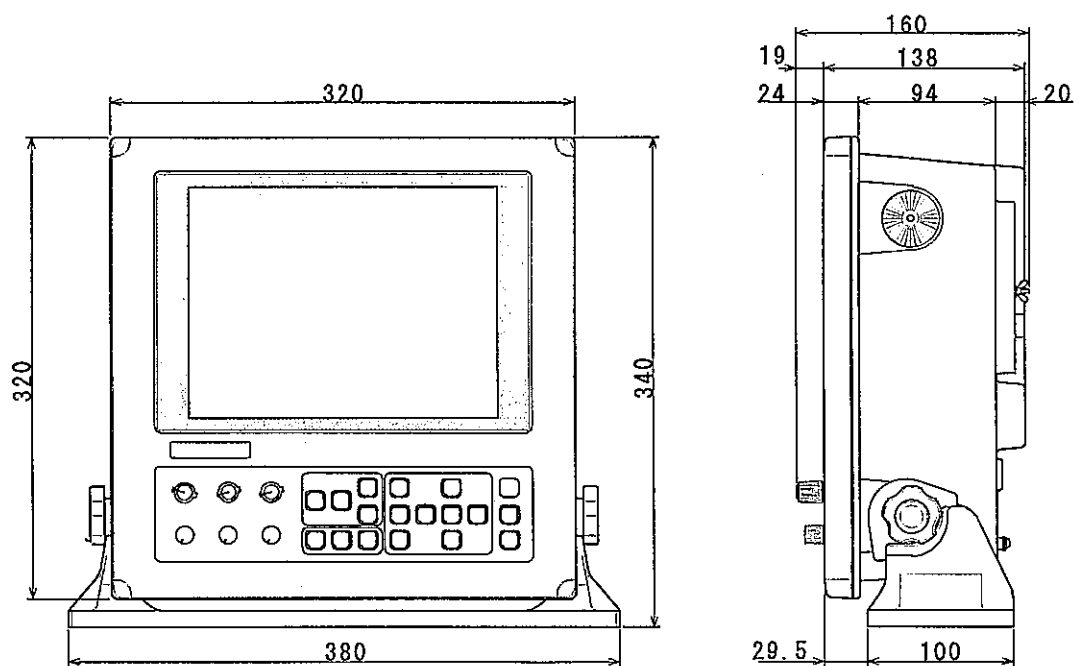
## OUTLINE and DIMENSIONS (Hoist/lower unit)



PIPE	TYPE	STANDARD	OPTION
JOINT PIPE LENGTH		1411 (mm)	1681 (mm)
TRUNK PIPE LENGTH		1230 (mm)	1500 (mm)

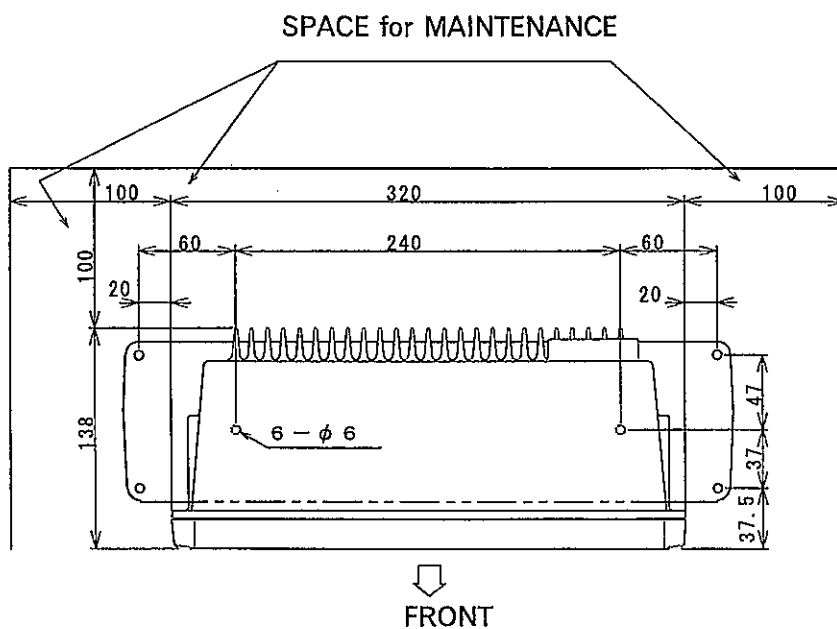
# INSTALLATION

## OUTLINE and DIMENSIONS (DISPLAY UNIT)



WEIGHT : 7.0 kg

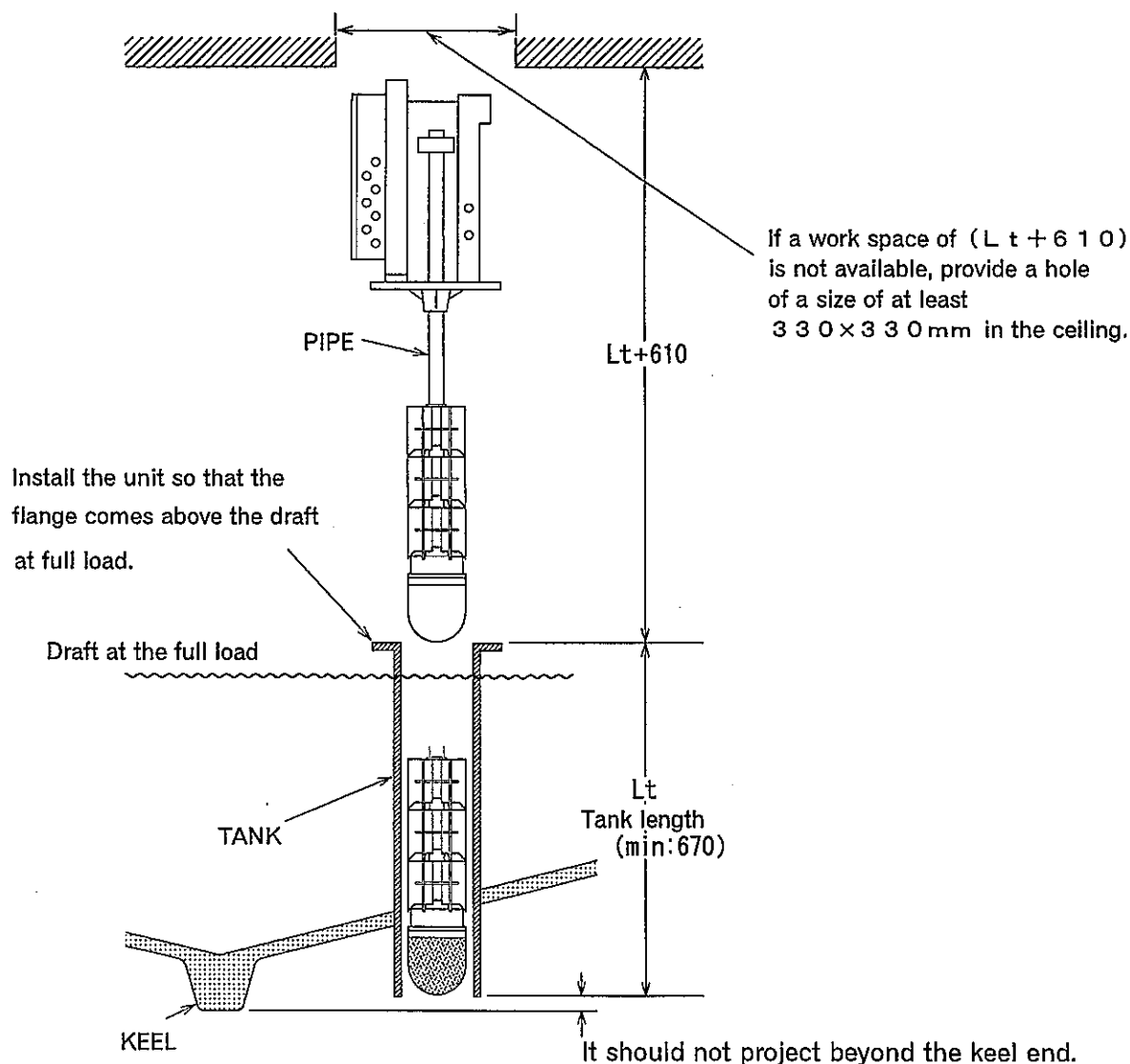
## TEMPLATE for INSTRUCTIONS



## TANK INSTALLATION

### 1-1 MAINTENANCE SPACE

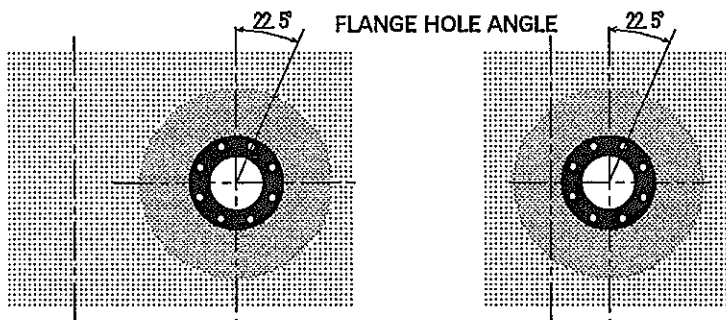
- ◎ When installing the Tank, pay full attention to the safety (strength, water-tightness, etc.) and, at the same time, secure a space for maintenance and inspections.
- ◎ Since the hoist-lower unit is not of waterproof structure, keep it away from water drops and splashes.
- ◎ The ESR-160 is shipped from the factory with a standard, 1,411 mm pipe and without Tank (options are available) .
- ◎ **The Pipe should be at least 181 mm longer than the Tank.**





## 2 INSTALLATION CONDITIONS

© The Trunk Pipe should be installed satisfying the following conditions.



- The position for installation should be within  $\frac{1}{3}$  to  $\frac{1}{2}$  of the overall length from the bow.

- It also should come on the keel or within 1m for the keel.

- There should be no obstacles right below the flange of the Tank which may interrupt bolt clamping of the flange.

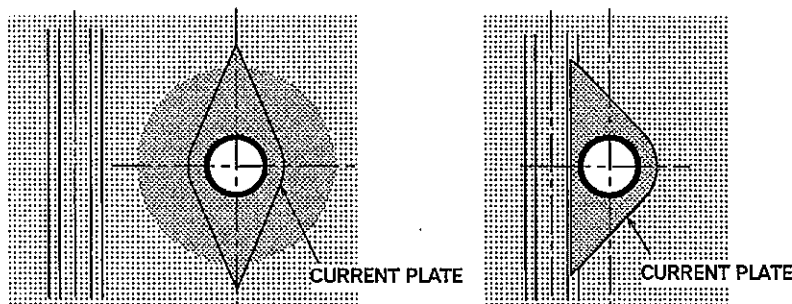
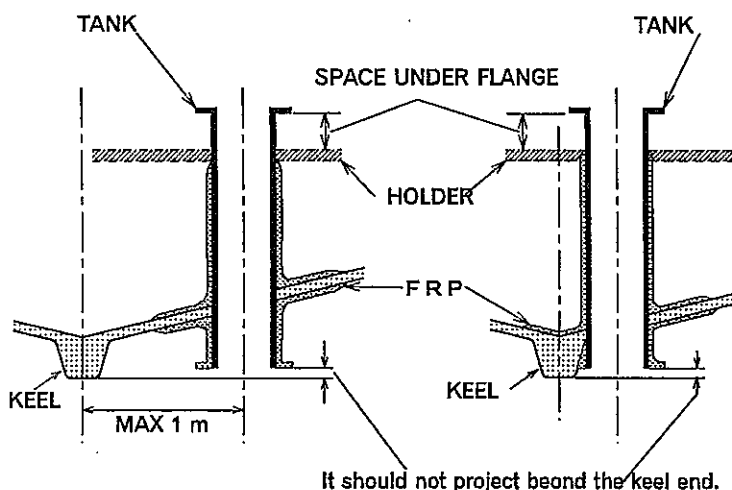
- The top end of the pipe should not project below the keel end.

- The flange surface of the Tank should stay level during standard cruise.

- Apply FRP sufficiently to all the necessary sections to prevent leakage of water.

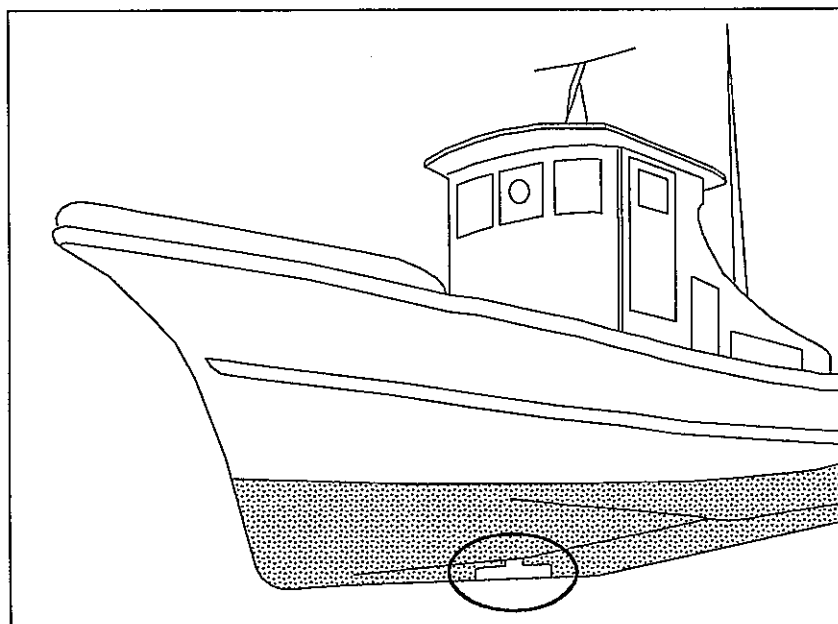
- Make the surrounding of the pipe projecting out from the bottom in a streamline shape and provide a current plate to suppress water resistance and generation of air bubbles to the minimum.

- When necessary, install a holder to stop shaking. When doing this, make sure the holder does not interfere bolt clamping of the flange.

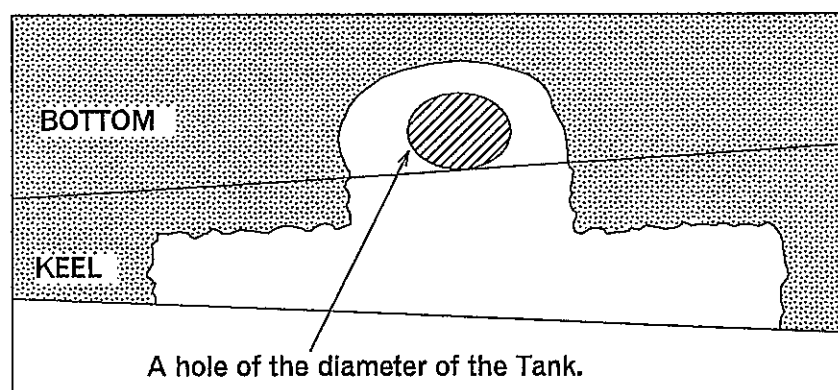


© Fully discuss about the strength and water tightness with the ship owner, persons in charge in the shipyard and the installer before determining on the position and the method of installation and necessary materials.

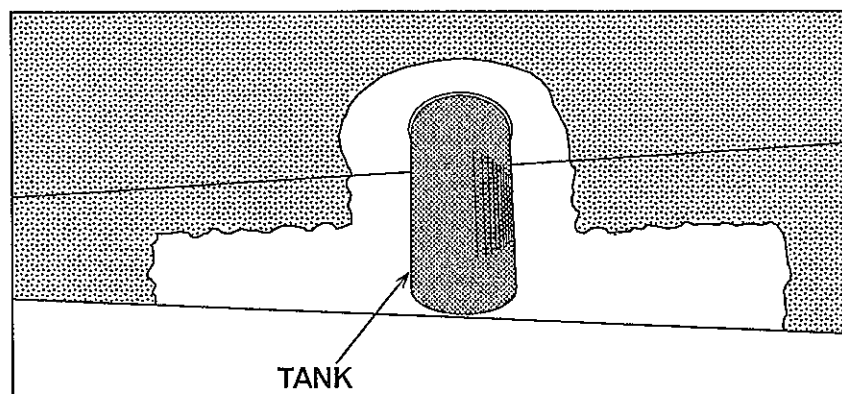
## 3 EXAMPLES OF INSTALLATION OF THE TANK



- The position to install the Tank.  
cf page 10



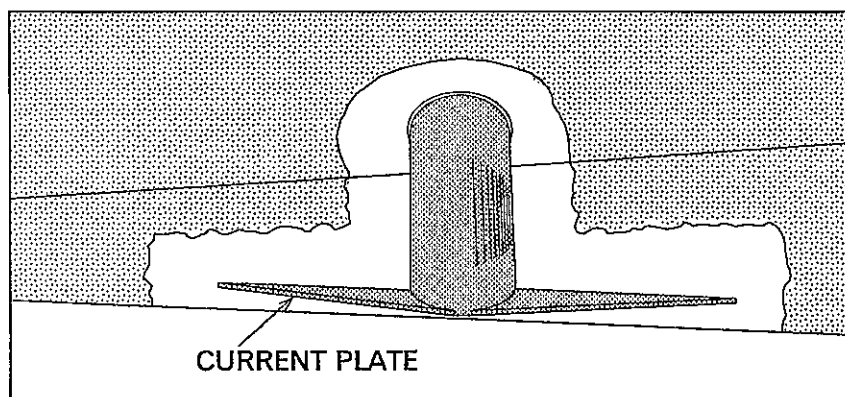
- Open a hole of the same diameter as of the Tank along the keel in the bottom.



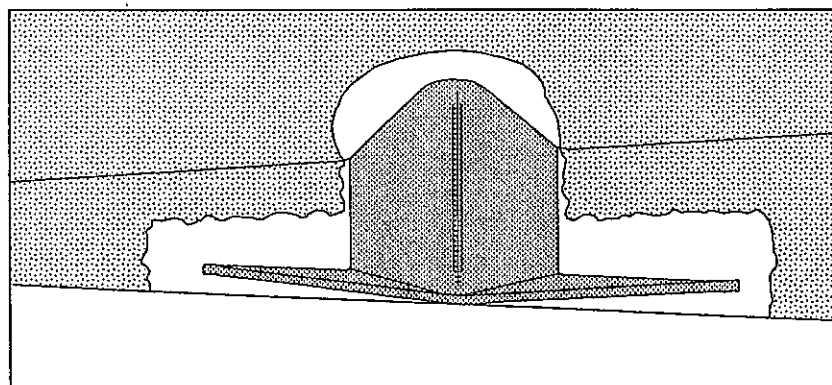
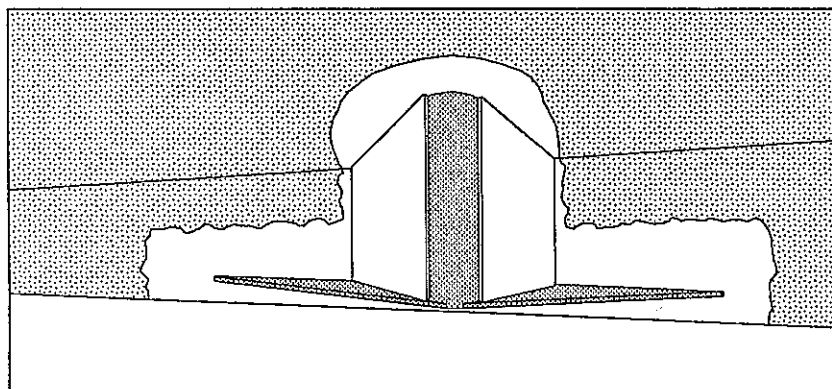
- Install the Tank into the hole.  
The flange surface of the Tank should stay level during standard cruise.

<to be continued>

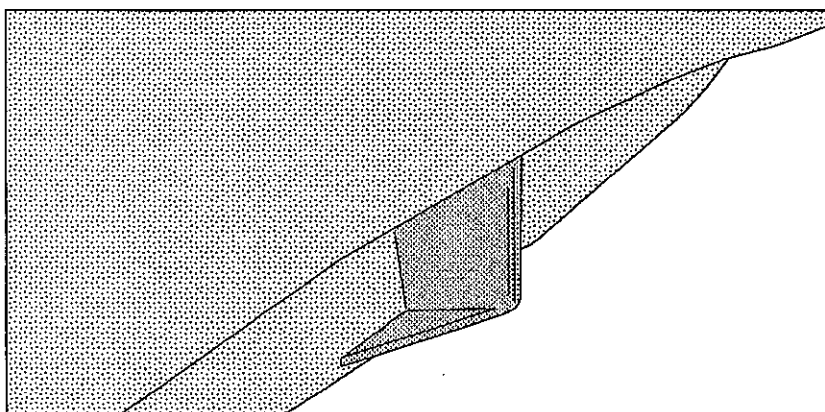
## INSTALLATION



- Make the surrounding of the Tank projecting out from the bottom in a streamline shape and provide a current plate to suppress water resistance and generation of air bubbles to the minimum.



- Apply FRP sufficiently to all the necessary sections to prevent leakage of water.

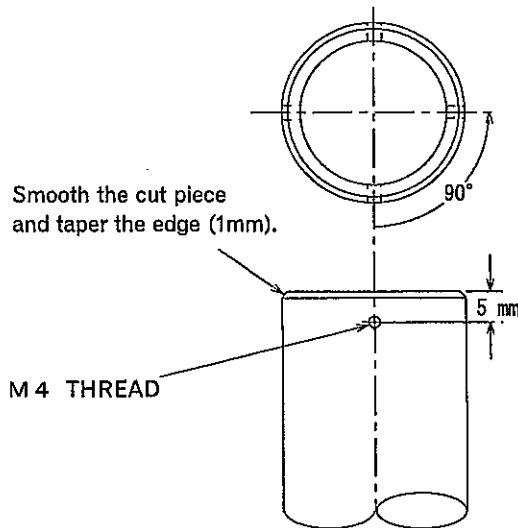


# ASSEMBLY of HOIST-LOWER UNIT, TRANSDUCER and PIPE.

## 1 PIPE LENGTH

$$\text{STANDARD PIPE LENGTH} = \text{TANK LENGTH} + 181\text{mm}$$

## 2 PIPE ADJUSTMENT



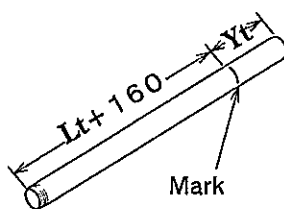
◎ If the Pipe length is standard, that is, Tank + 181mm, adjustment is unnecessary.

① Cut the Pipe to the required length.

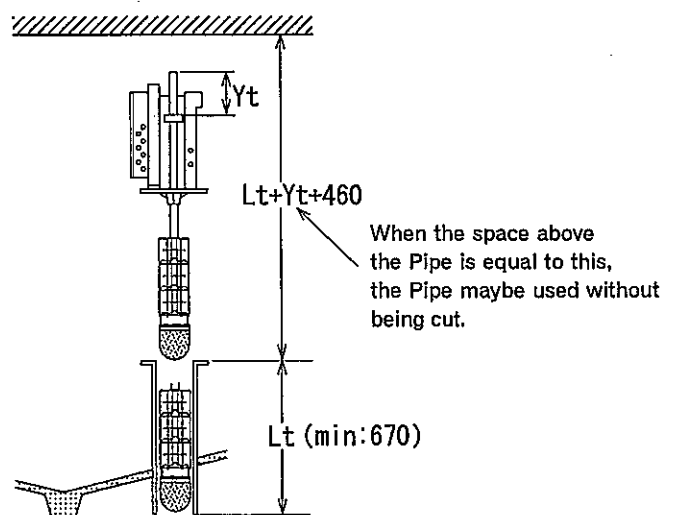
② Smooth the cut piece and taper the edge as shown.

③ 5 mm from the end of the pipe and at an angle of 90° drill four  $\phi$  3.4 holes and tap with a M4 thread.

◎ When using a short Tank the Pipe may be cut in the method explained above.



A mark is attached to the place of  $Lt + 160$ . This mark is united and bound tight at the upper end of Joint arm.

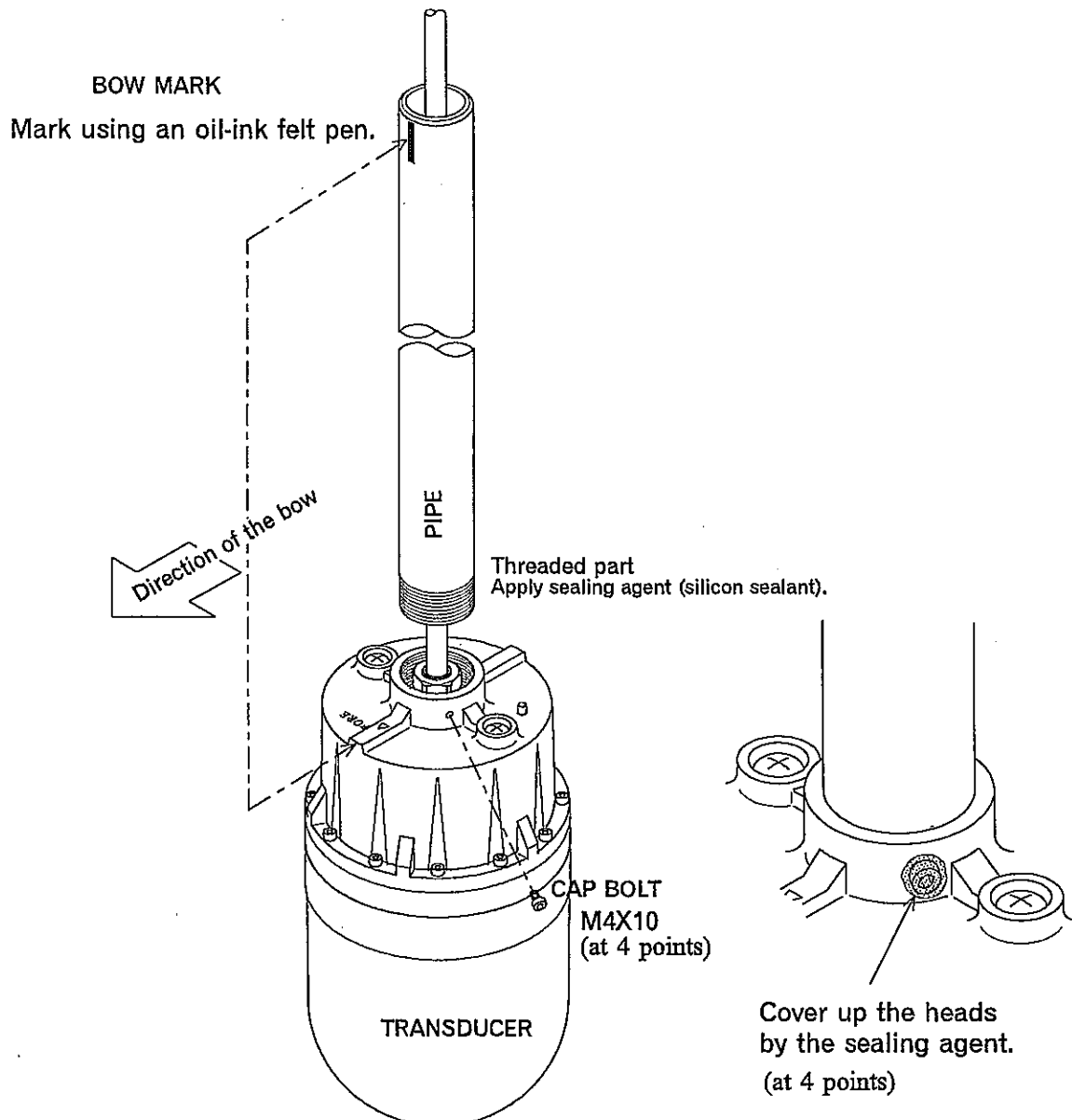


### 3 MOUNTING THE PIPE TO THE TRANSDUCER

#### ① Mounting the Pipe to the Transducer

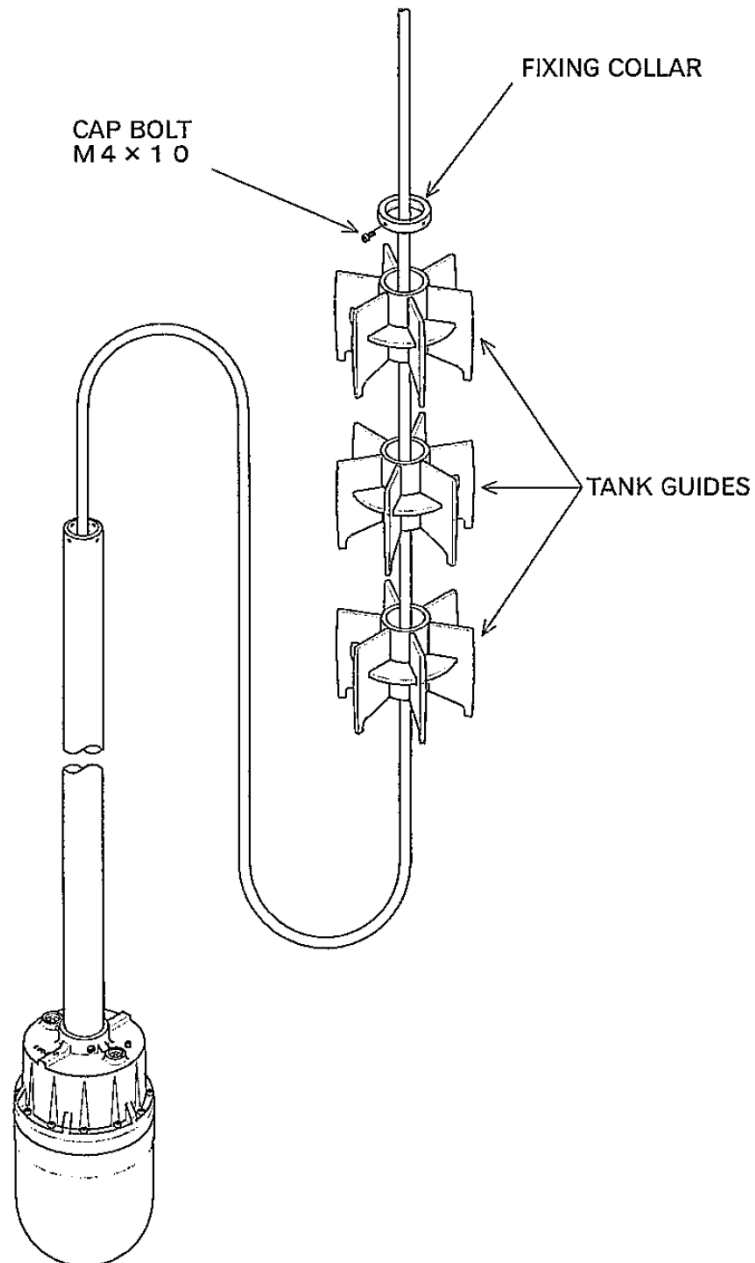
When attaching the Pipe to the Transducer, be sure not to damage the Pipe thread or twist the transducer cable.

- Totally wipe dirt and grease off from the threaded parts of the Transducer and the Pipe and apply sealing agent.
- Clamp the Pipe into the Transducer as tight as possible and lock the clamp using M4x10 Cap bolts (4 units.) and cover up the Cap bolts by the sealing agent.
- Apply the bow mark at the top end of the Pipe.



**② Installing the Tank guide**

- Thread the three Tank guides onto the Pipe in the direction shown below.
- Thread the fixing collar and tighten the attached cap bolts (2 pcs) .
- Thread the Fixing collar and tighten it using the attached cap bolts (2 pcs) so that the guides can not move.



<To be continued>

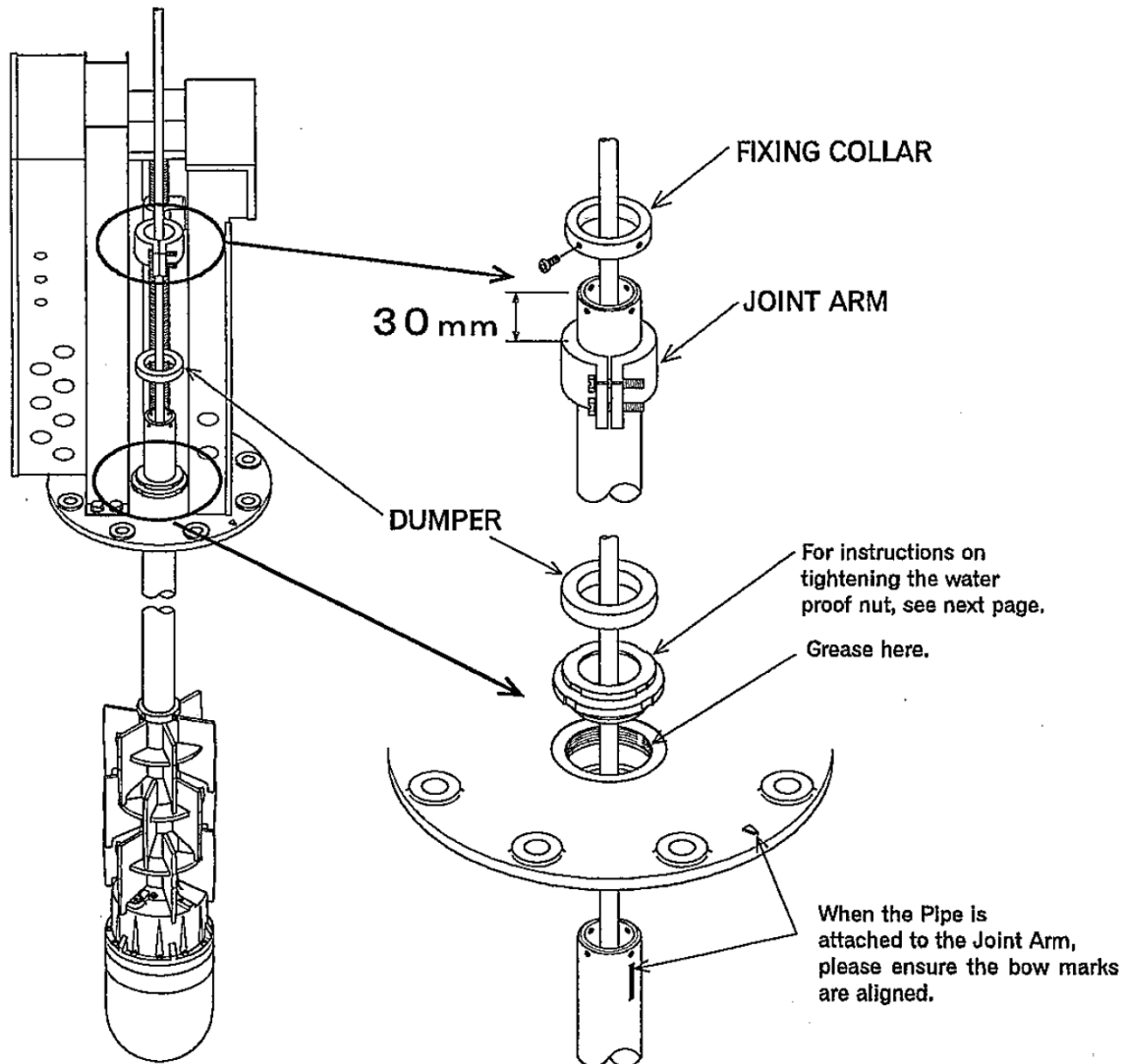
## INSTALLATION

### ③ Installing the Transducer to the Hoist

- Apply grease to the bearing of the Flange.
- Loosen the water proof nut and thread the Pipe through the Flange bearing and thread the dumper. Mount them to the Joint arm matching the bow direction.
- Ensure that the Pipe end projects 30mm from the Joint arm surface.

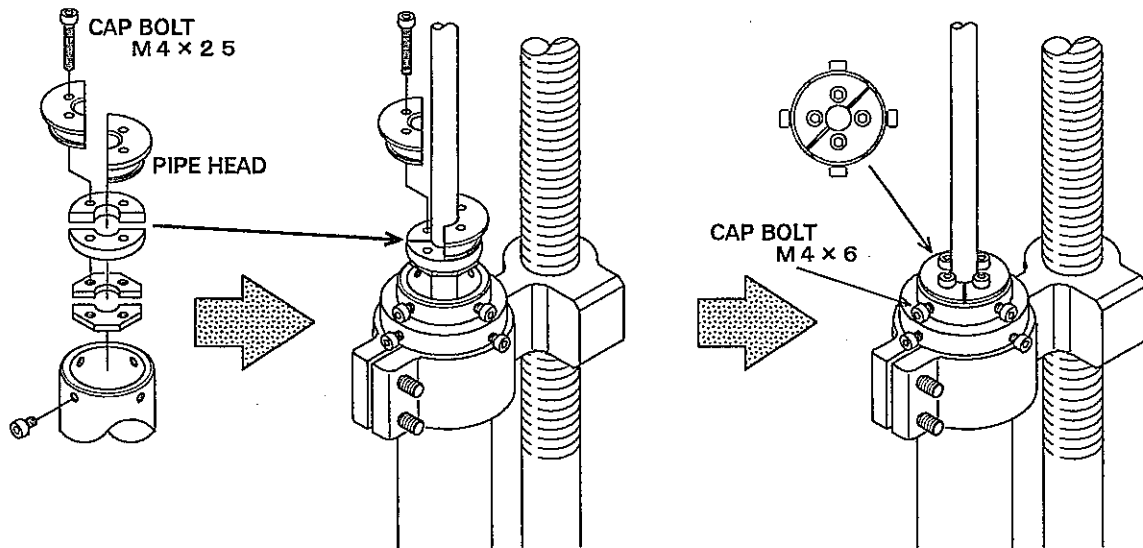
In case of the length of the Tank other than 1230mm long, ensure the lowest part of the Transducer is at least 50mm above the lowest part of the Tank.

- To prevent slip-out of the Pipe, fasten the attached Fixing collar using cap bolts (2 pcs).



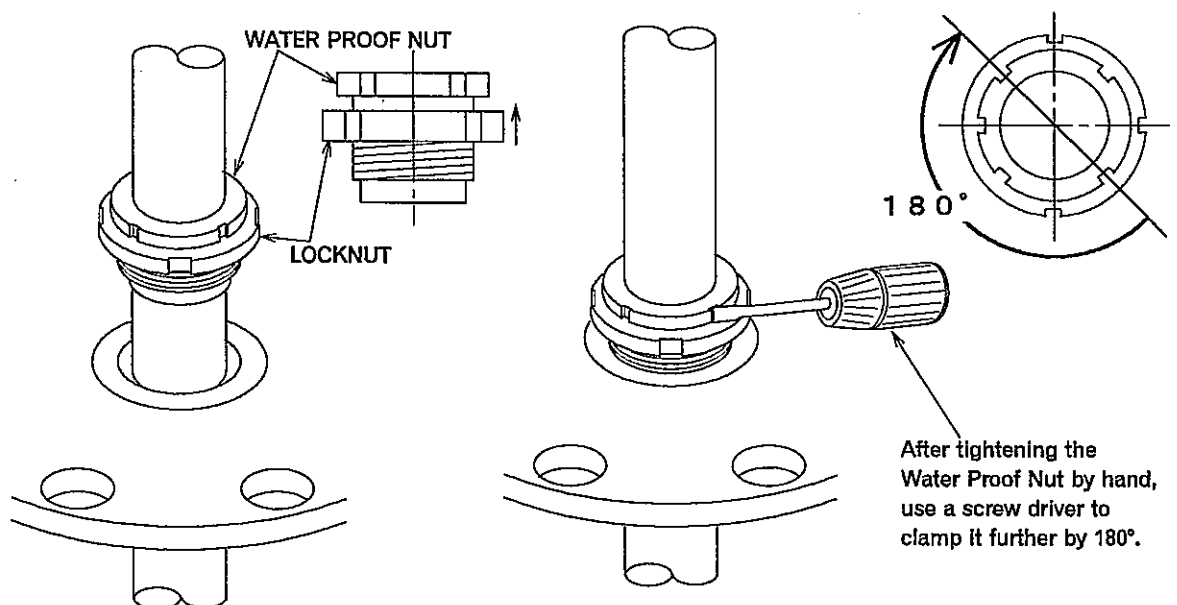
## ④ Attaching the Pipe Head to the end of the Pipe

- Insert the Pipe Head into the end of the Pipe as per the diagram below and tighten the attached cap bolts.
- To prevent slip-out of the pipe cap tighten the cap bolts, 4 pcs included as the accessories, (M4x10).



## ⑤ How to tighten Water Proof Nut and Locknut

- Lift up the Locknut as shown in the diagram below.  
Tighten the Water Proof Nut firmly by hand into the Flange opening.  
Turn the nut 180° with screwdriver and the hammer. Not to over tighten this nut.
- The Locknut is used to prevent slip-out of the Water Proof Nut.



After tightening the Water Proof Nut by hand, use a screw driver to clamp it further by 180°.

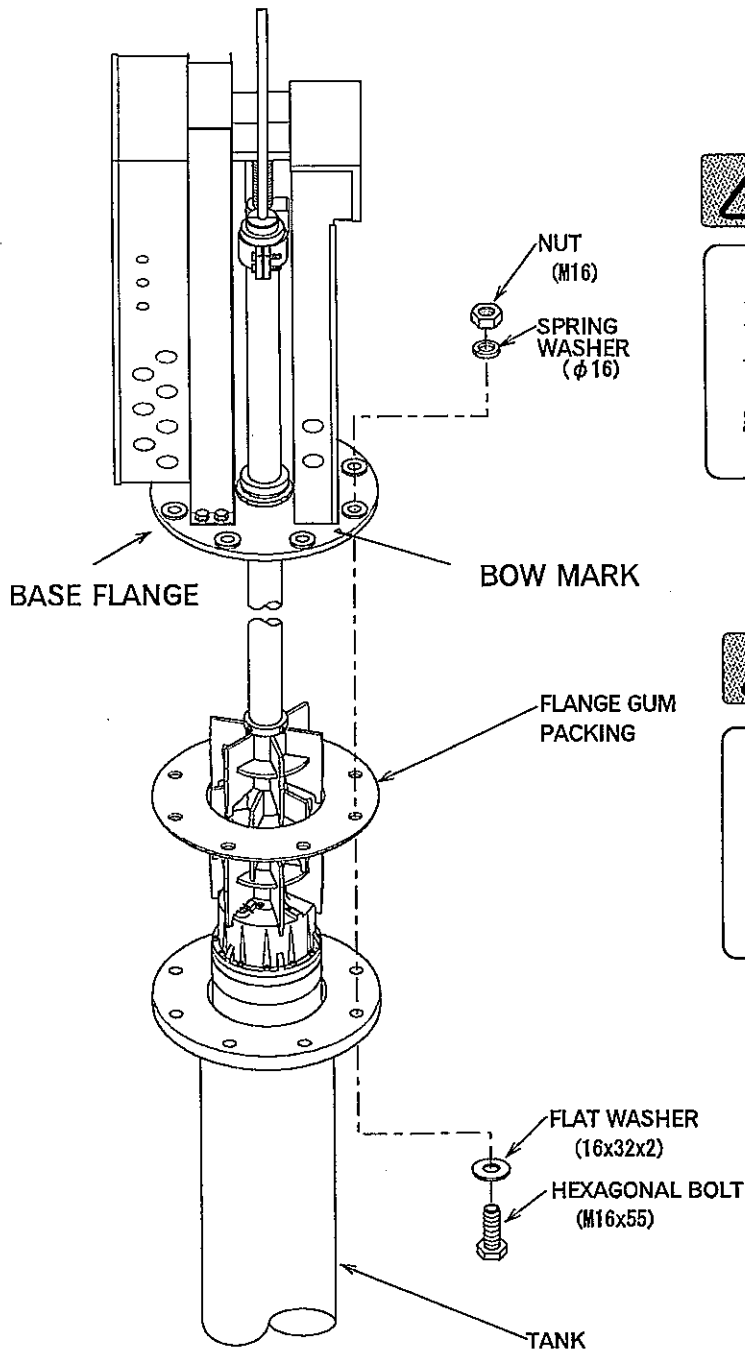
<to be continued>



## INSTALLATION

### ⑥ Mounting the Base flange to the Tank

- Use the 8 attached hexagonal bolts (M16 x 55) to fit the Base flange to the Tank.  
When clamping bolts for fitting the Base flange to the Tank, make tentative clamp and try to move the Transducer up and down for several times to confirm the alignment when making the final clamping evenly.



Please apply grease regularly to the Flange opening and Hoist gears.

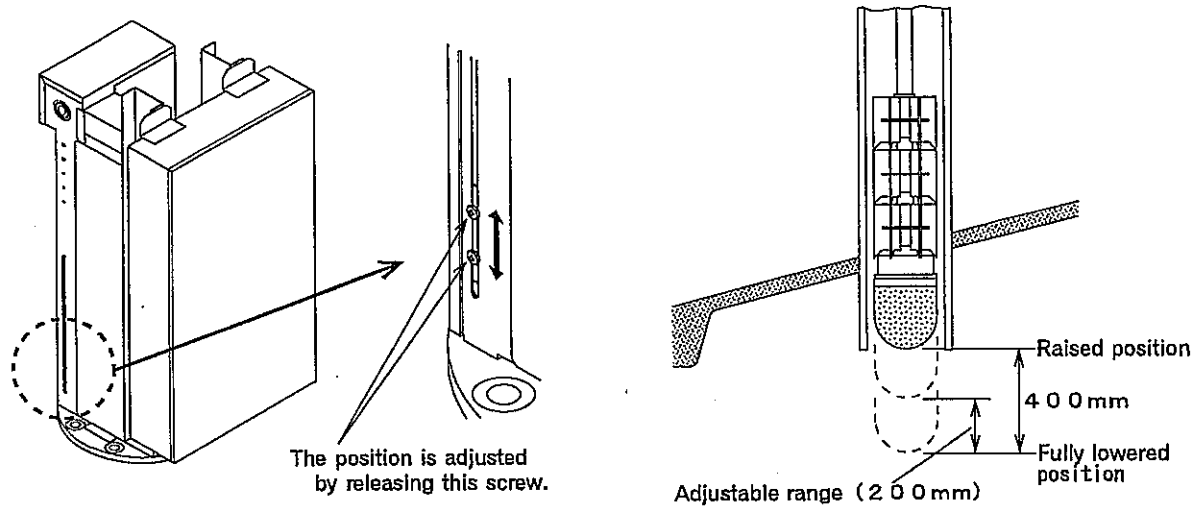


Do not apply adhesive, etc. on the Gum packing of the Flange but use it direct as it is.

## 4 ADJUSTMENT of the PROJECTION of the TRANSDUCER

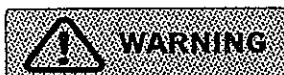
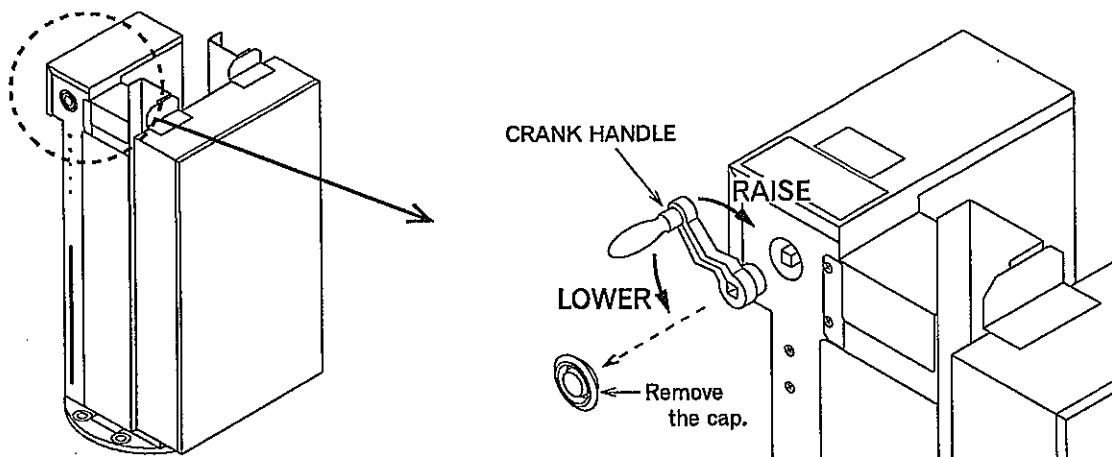
- ◎ The projection from the Tank of the Transducer can be adjusted within the range of 200 to 400 mm. Adjustment of such projection can be made by adjusting the lower limit switch of the hoist-lower unit.

If the limit switch is raised, please use the ANP base and cable binder provided ensuring the limit switch wiring does not touch the Hoist gears.



## 5 MANUAL OPERATION OF THE HOIST

- ◎ In the case the Hoist is unable to raise the Transducer, it can operate the Hoist manually as shown in the below drawings.

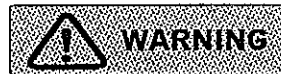
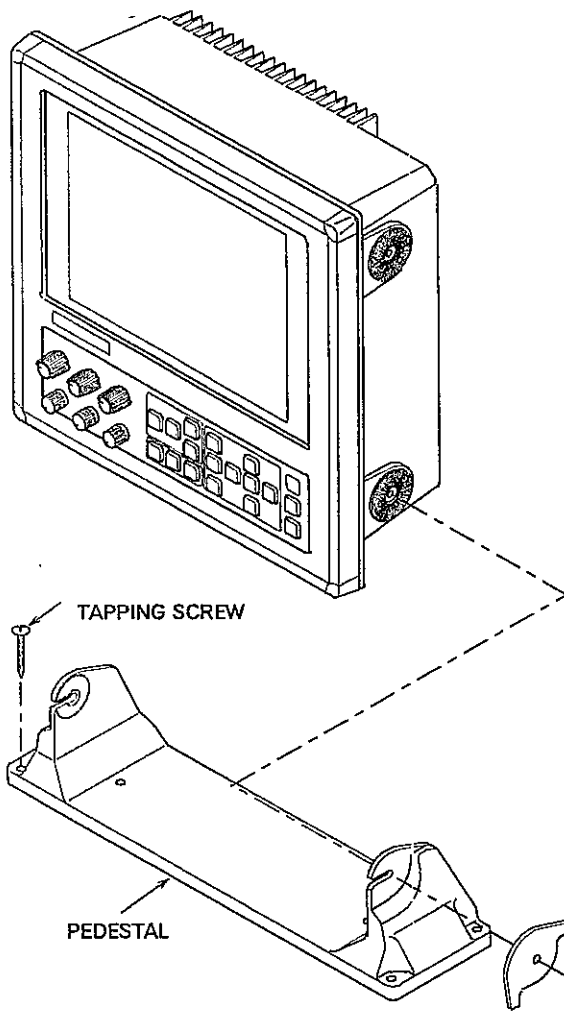


Confirm the voltage between the Flange and battery minus terminal does not exceed 0.65 volts after the assembly. The damage to the Transducer due to the corrosion may result, if the voltage exceeds it.

## INSTALLATION

### HOW TO INSTALL DISPLAY UNIT

- ◎ The Pedestal is assembled into the Display unit when shipping.
- ① Remove the Display unit and 2 washers from the Pedestal by loosening the knob bolts securing the Display unit.
- ② Install the Pedestal to the position to install the Display unit, using attached screws (6 pcs standard installation accessory).
- ③ Assemble the Display unit and the Pedestal. Tighten the knob bolts after having a comfortable viewing angle.

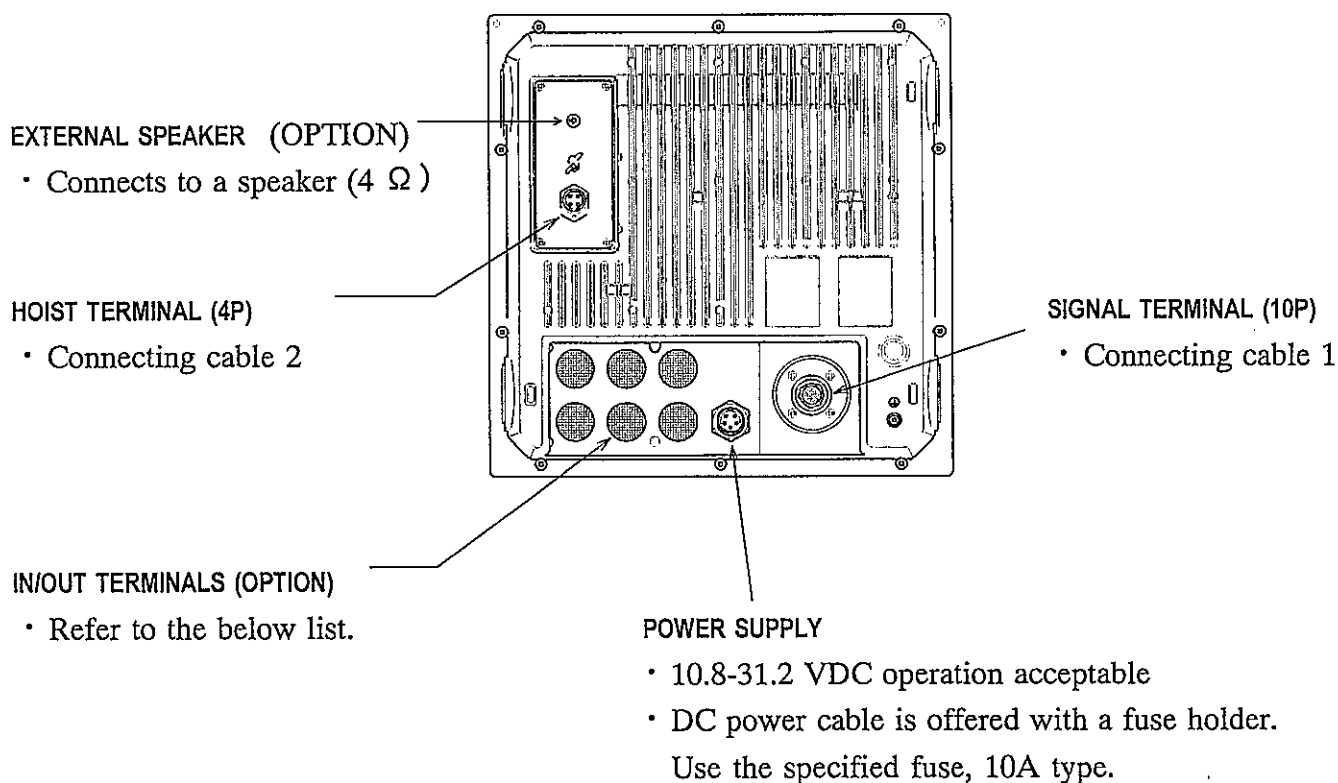


- ◎ The unit should be installed on a flat surface. Do not use the unit while tentatively installed, otherwise it may cause trouble.



- ◎ Make sure the unit is not close to any inverters, converters, or transformers that interfere with the sonar performance.
- ◎ Choose a position not exposed to direct water splashes.
- ◎ Avoid location under a high temperature or high humidity.
- ◎ Do not put magnetic substances close to the unit.
- ◎ Select the best position so that the unit may be used even under fishing operation.

## CABLE CONNECTIONS - ESR-1601 REAR PANEL



### © AVAILABLE OPTIONAL CABLE KITS

	ARTICLE	NOTES
OP-1607	REMOTE CONTROLLER	• Connects to a remote controller
OP-1605	NAV-IN TERMINAL	• Connects to an external navigator or reads NMEA-0183 sentences
OP-1602	TRIGGER TERMINAL	• To synchronize with an external sounder
OP-1606	NMEA OUT	• Transmits the depth, the water temp. data and present target position, LAT/LON when GPS navigator connected.

The details of the optional kits in the above list are shown on page 81 and 82.

# INSTALLATION

## CABLE CONNECTION - HOIST LOWER UNIT

### FUSE 1 • 2 • 3

Please use fuses in accordance with the chart below.

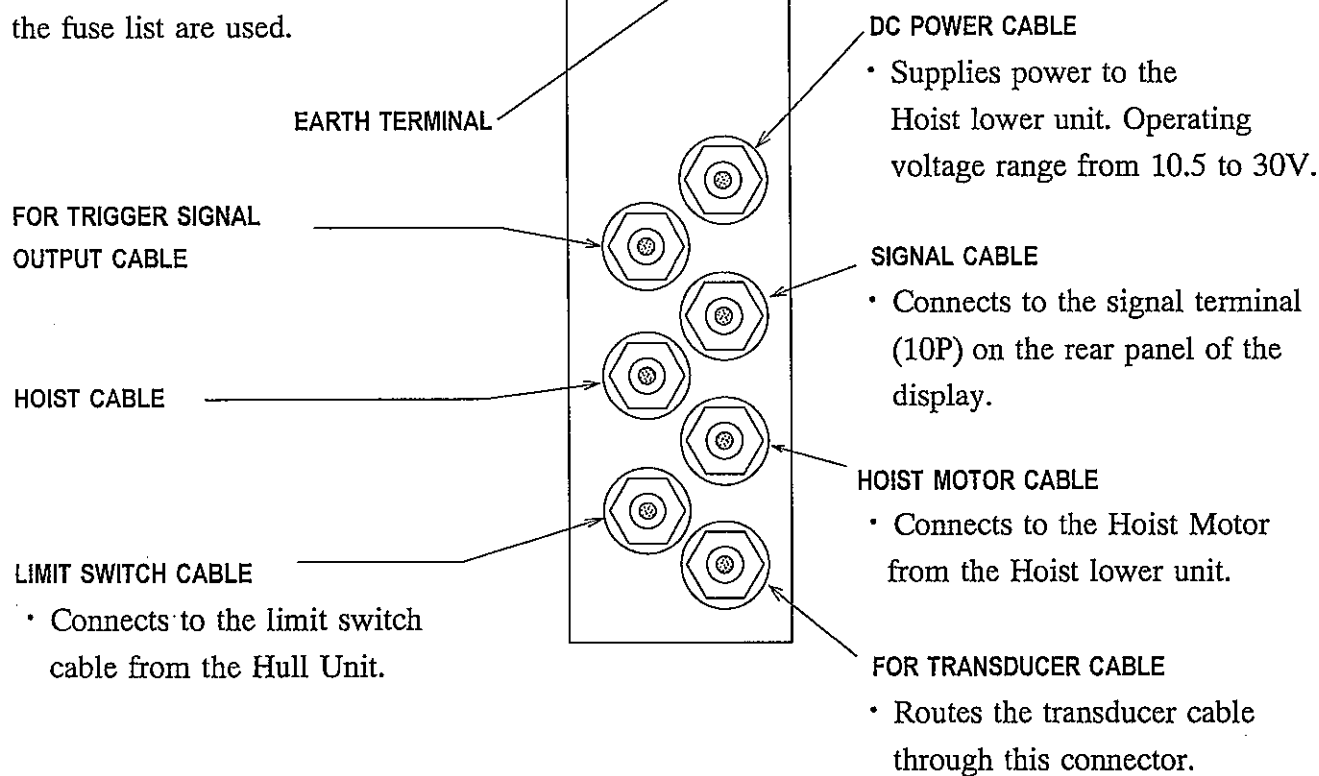
FUSE 1	For Hoist lower unit
FUSE 2	For Hoist Motor
FUSE 3	For Limit Switch Circuit

When changing the fuses, please ensure the correct fuses shown in the fuse list are used.

### FUSE SEAL

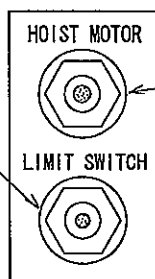
This shows the correct amperage.

VOLTAGE	12 V	24 V
FUSE 1	10 AMP	6 AMP
FUSE 2	5 AMP	8 AMP
FUSE 3	0.5 AMP	



### LIMIT SWITCH CABLE.

- Connects to the main board.



### HOIST MOTOR CABLE

- Connects to the main board.

## CONNECTIONS

- ◎ Prior to the connections between the Display unit and the Hoist lower unit, read the following warning carefully to ensure its correct operation.

- ◎ All ESR-160 operate a universal power supply of the following voltages.

DISPLAY UNIT	: 10.8 ~ 31.2 V
HOIST LOWER UNIT	: 10.5 ~ 30 V

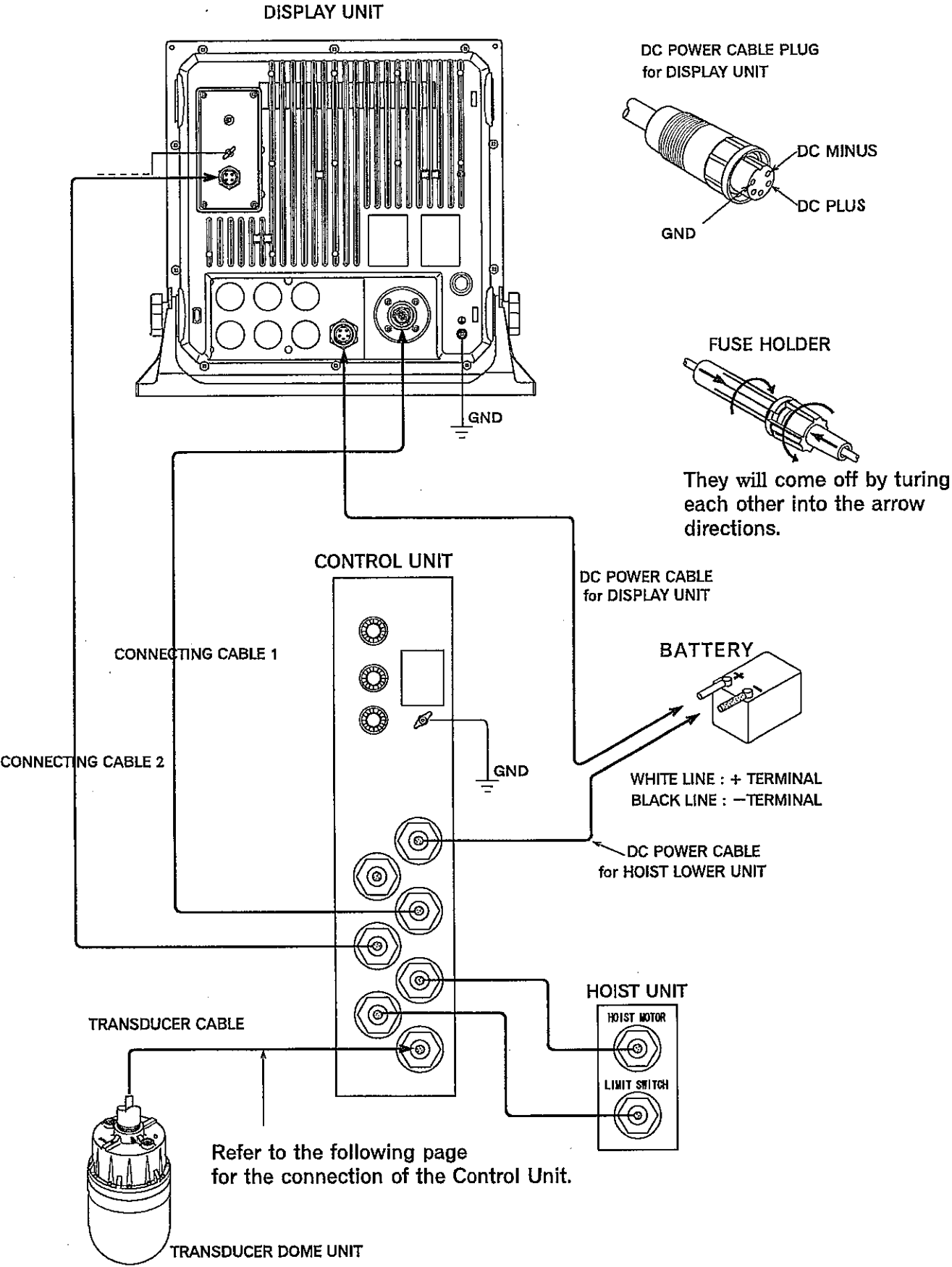
Incorrect voltage may cause units damage.

Note that the power supply connection for ESR-160 should be accomplished via Operation unit.

- ◎ Please use the specified power supply cables.  
If not, it may cause fire or any damage.
- ◎ Please check if the power from the flange to the battery (negative terminal) should stay within 0.65V. In case the higher voltage, connect with the thick cable and stay within 0.65V. Otherwise it may cause Transducer damage.
- ◎ When connecting the cables, do not bent it to an acute angle, twist it, or impart excessive force because this sometimes causes cracks or damage.

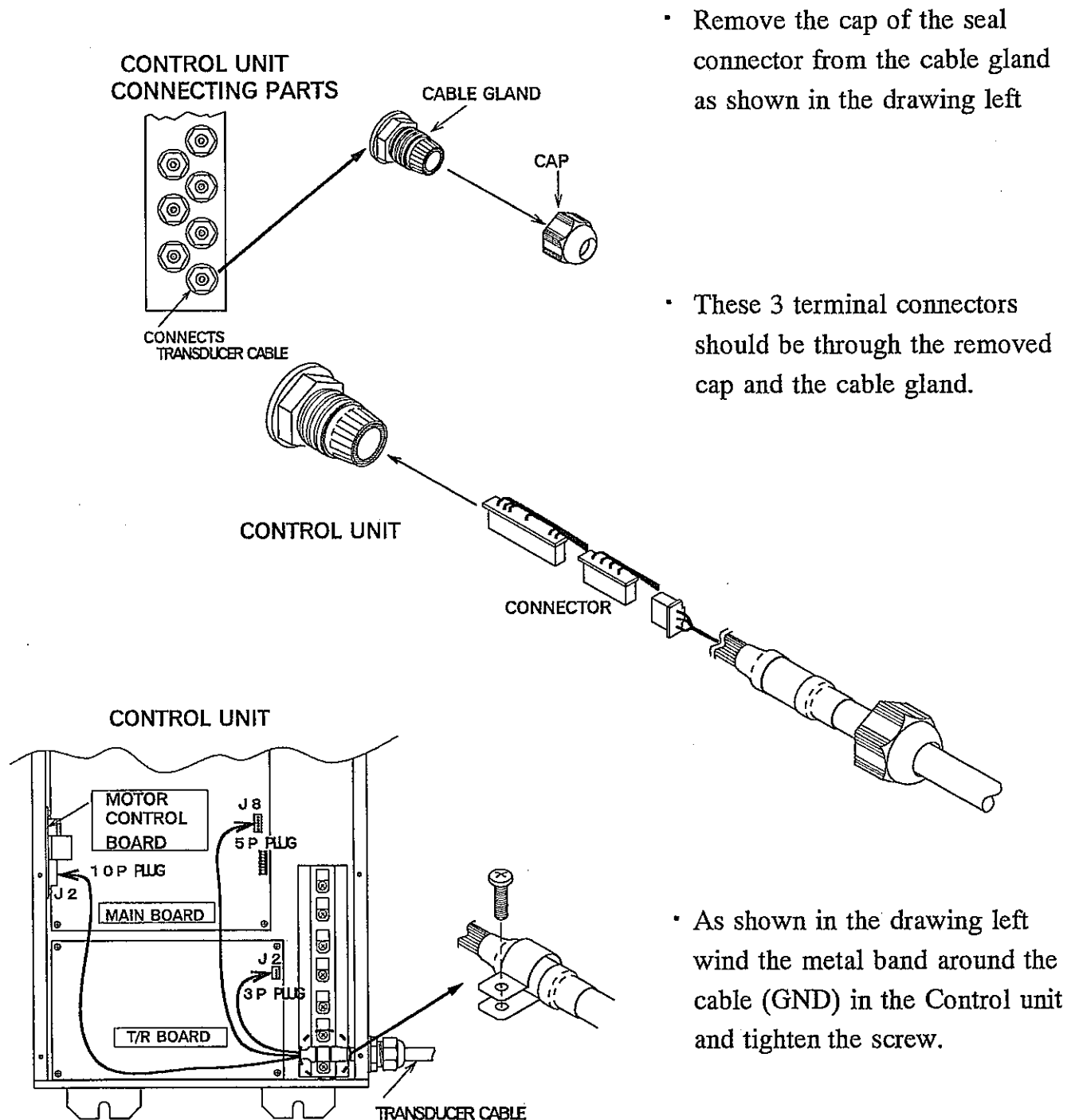
**INSTALLATION**

**INTERNAL CONNECTIONS**



## CONNECTIONS - TRANSDUCER CABLE

- Remove the cover of the Control unit and connects in accordance with the following notes and drawings.



- Remove the cap of the seal connector from the cable gland as shown in the drawing left
- These 3 terminal connectors should be through the removed cap and the cable gland.
- As shown in the drawing left wind the metal band around the cable (GND) in the Control unit and tighten the screw.

- Connect the 3P plug to J2 on the T/R board, 5P plug to J8 on the Main board and 10P plug to J2 on the Motor Control board.
- Put the cover back to the unit after the connections are completed.



FUNDAMENTALS

This chapter explains the fundamentals of ESR-160 systems.

FUNDAMENTALS

OPERATION PANEL .....	31
SCREEN DISPLAY .....	32
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SONAR MODE OPERATION .....	34
BOTTOM SCAN MODE DISPLAY .....	36
BOTTOM SCAN MODE DISPLAY OPERATION ---	37
SOUNDER MODE DISPLAY .....	38
SOUNDER MODE OPERATION .....	39

## OPERATION PANEL

HOIST/LOWER DISPLAY LIGHT **CF** PAGE 72

- When the Light is on, it indicates that the transducer is in the down position.

CURSOR SHIFT KEYS:

**CF** PAGE 75

- Moves the cursor or selects to display Marker or Cursor.

TARGET LOCK KEY: **CF** PAGE 77

- Turns on or off the target lock mode.

TILT KEY: **CF** PAGE 74

- Moves the tilt angle upwards or downwards.

SECTOR ROTATION KEY: **CF** PAGE 73

- Rotates scanning sector counterclockwise or clockwise.

RANGE DIAL: **CF** PAGE 69

- Selects a shallower or deeper range scale.

SECTOR DIAL: **CF** PAGE 70

- Widens or narrows the scanning sector angle.

MODE DIAL: **CF** PAGE 69

- Changes Display Mode.

HOIST/LOWER KEYS: **CF** PAGE 72

- Uploads and downloads the transducer.

CURSOR SELECTION KEY:

**CF** PAGE 75

- Selects the Ring Marker or Cross Marker.

CURSOR SHIFT KEYS: **CF** PAGE 75

MARK KEY: **CF** PAGE 78

THRESHOLD KEY: **CF** PAGE 78

- Reduces the unnecessary weak echoes accordingly.

OPERATION MODE KEYS: **CF** PAGE 79

- Calls up the user-defined setting or changes the settings.

TVG CONTROL DIAL: **CF** PAGE 71

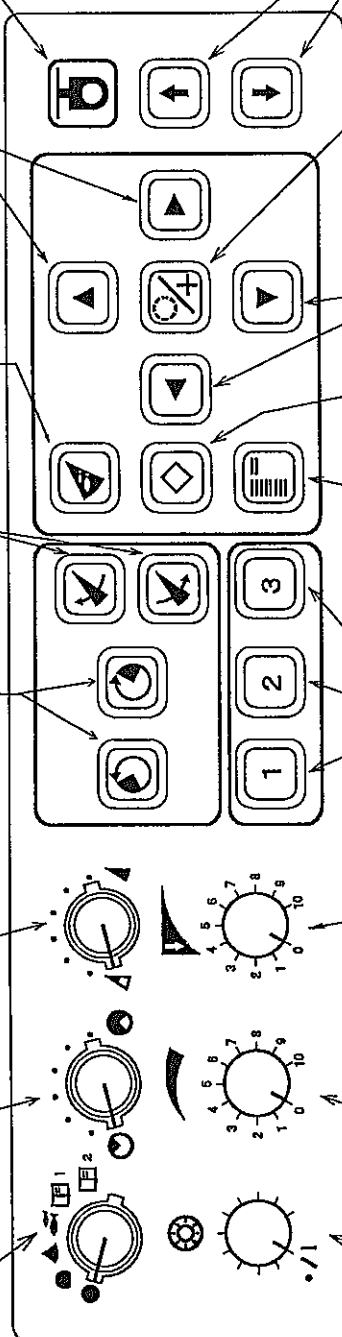
- Adjusts the receiver sensitivity especially in the distance.

GAIN CONTROL DIAL: **CF** PAGE 71

- Adjusts the receiver sensitivity.

POWER SWITCH DIAL: **CF** PAGE 71

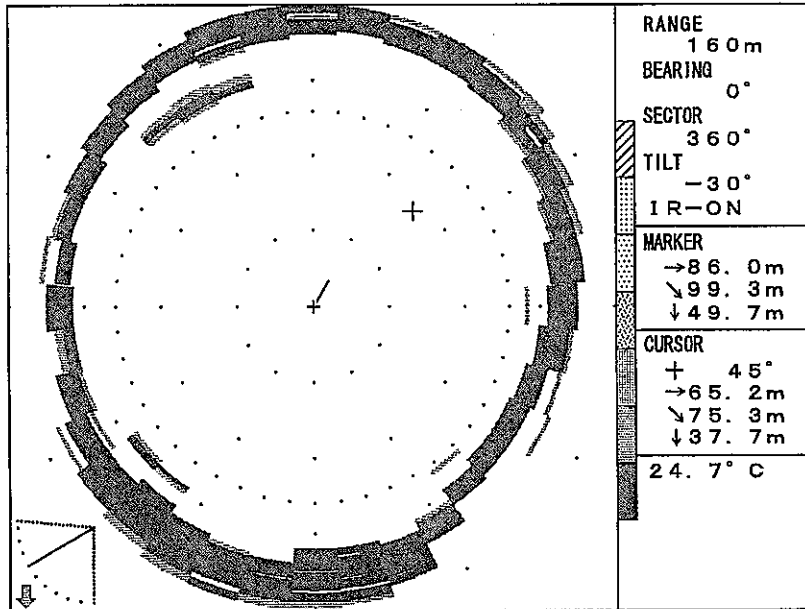
- Turns on or off the power and adjusts the screen brightness.



## SCREEN DISPLAY

◎ The screen data presentation system is as follows.

- The ESR-160 offers a variety of display modes in split screen by combination of Mode dials and Menu.



### SPLIT SCREEN LEFT

- Sonar Mode
- Sonar Off-center Mode
- Bottom-Scan Mode
- Sounder Mode

Use Mode Dial to select displayed Mode.

### SPLIT SCREEN RIGHT

- MENU 1 & Self check function
- MENU 2 & Self check function
- INFORMATION - Data display
- SUB-DISPLAY - various displays in split screen

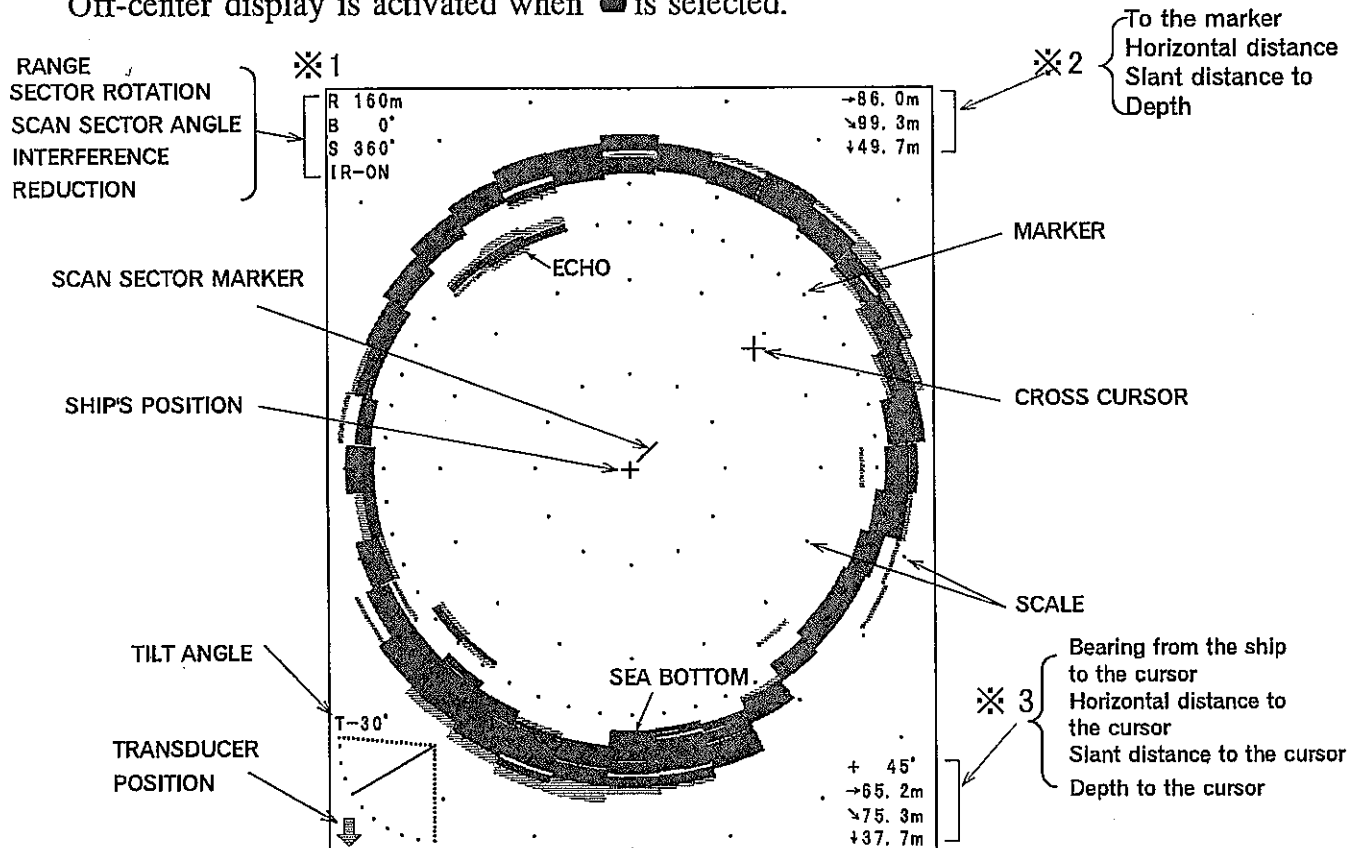
Use Mode Dial to select MENU 1 or 2 .  
Information - Data display and Sub-display can be applied in MENU 2.

- Range Dial provides 8 kinds of optimized user-defined ranges set in MENU 1 (☐<sup>1</sup>).
- Fundamental appropriate menu settings can be applied in MENU 2 (☐<sup>2</sup>).
- Displays of HISTORICAL, +PRESS, +A-SCOPE, WAKE and EXT.F.F.(external fish finder) as well as INFORMATION - Data display can be applied and set in MENU 2.

# SONAR MODE DISPLAY

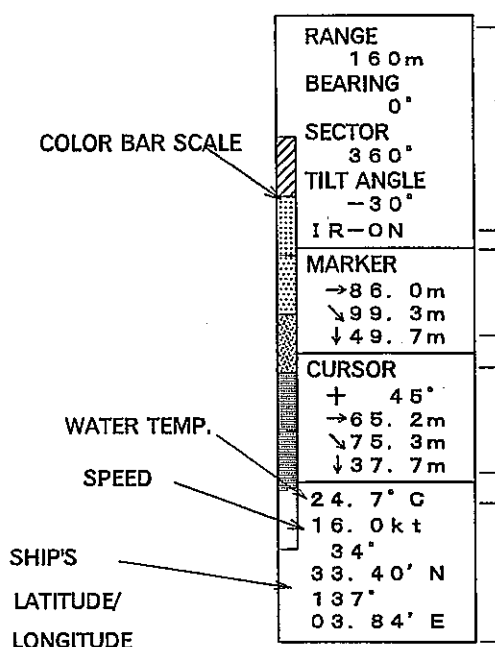
☉ To select Mode Dial ● or ● to display the following sample.

Off-center display is activated when ● is selected.



In SONAR MODE + INFORMATION displays on the split screen the above mentioned \*1 to \*3 and tilt angle are not displayed.

## INFORMATION - Data display



The info will be displayed as the below-mentioned, selecting the item other than SUB-DISPLAY, INFORMATION.

\*1 on Sonar mode screen, top left.

indicates the info left except Tilt angle.

Tilt angle is displayed down left.

"IR" will not be displayed when INTERFERENCE RED. function "OFF" is selected.

\*2 on Sonar mode screen, top right.

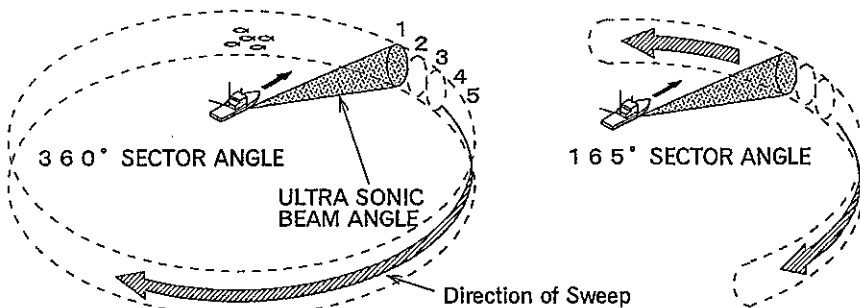
\*3 on Sonar mode screen, down right

displayed on Sub-Display down.

\* To present this info will require the ESR-160 is connected to an external navigator.

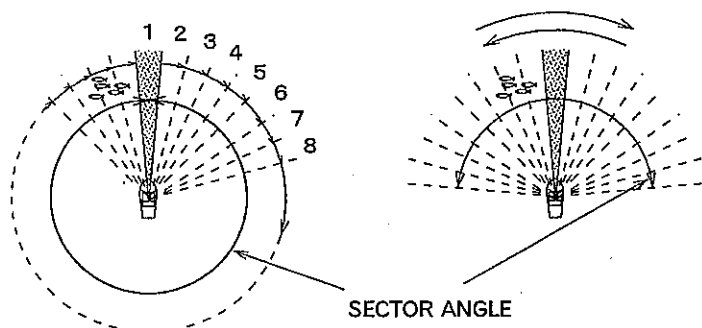
## SONAR MODE OPERATIONS

- ◎ The transducer sends out a beam of ultra sonic sound which sweeps in the specified sector and bearing.
  - The echoes of reflected sound waves are picked up by the transducer and displayed like a radar in their respective range and direction on the Display Unit screen.
  - By adjusting the Tilt and Sector the Sonar beam may be trained from the surface to the bottom.

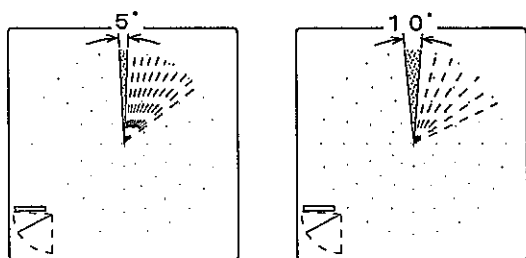


- Changing the sector angle makes it possible to detect in various ranges.

**CF** page 70



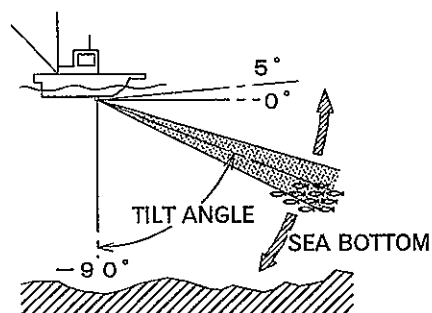
- The echoes received from the sound beam (1 → 2 → 3 ~) are displayed on the screen in that order.



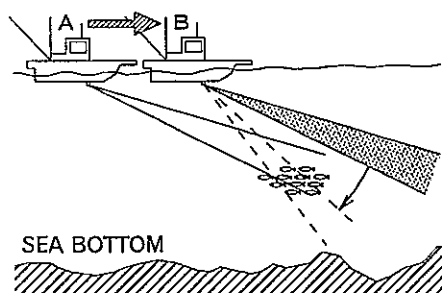
180/80 kHz

- The sector is covered by the Sonar beam in the selected step angle.
  - The reflected echo is displayed in order in the angle specified.
  - The step angle can be selected in Menu 2 - STEP (SONAR) .
- CF** page 56.
- A narrow step gives a more detailed image on the screen, however more sweep time is requested than a wide step.

© The Tilt angle can be changed from  $5^\circ$  above horizontal to  $-90^\circ$  vertical in a  $1^\circ$  step.



- With this range all directions from extremely shallow waters to deep areas may be searched.
- When adjusting the tilt angle please consider the conditions such as boat speed and water depth.

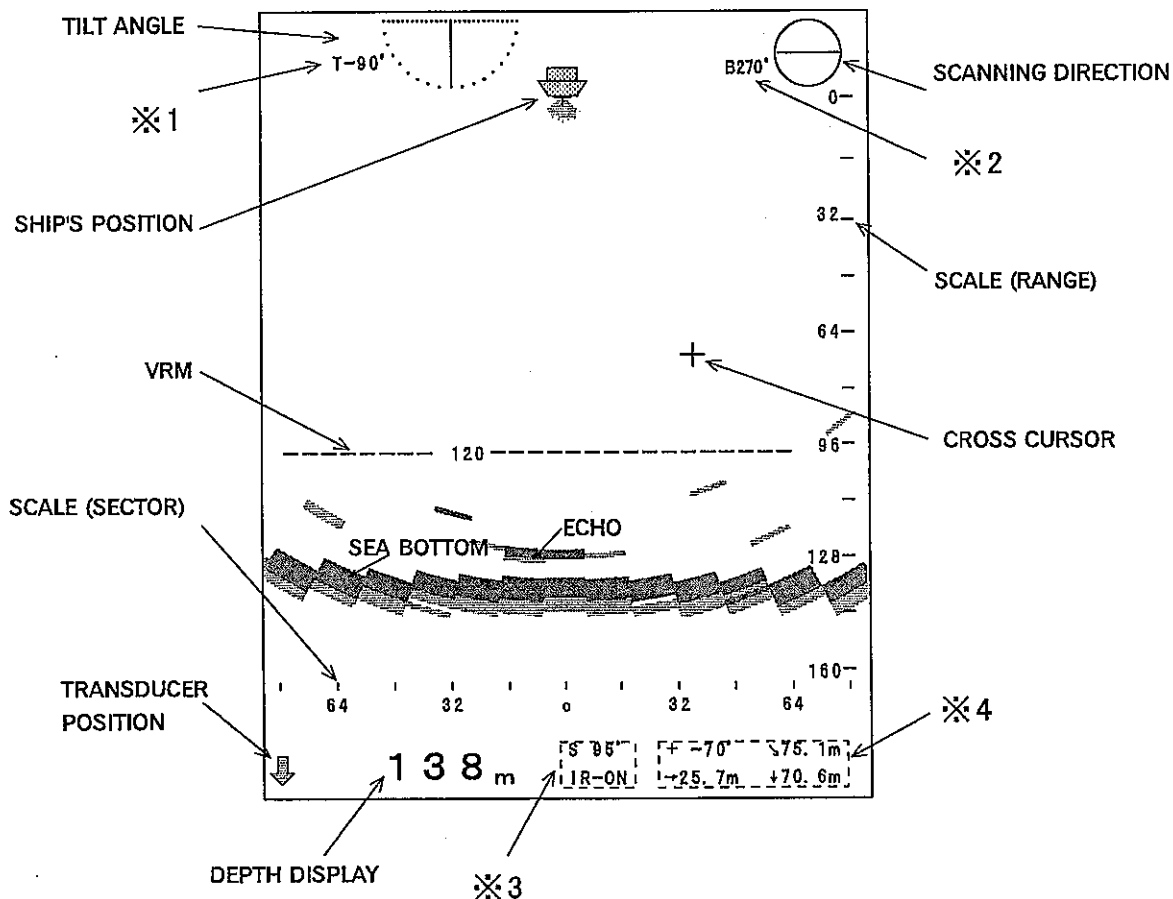


- If the vessel should proceed with the Sonar beam at the same angle at point A. the fish school echo will be displayed but when the vessel reaches point B. The beam will pass above the fish school and no echo will be displayed.
- In order to display the fish school at point B. adjust the Tilt angle so that the Sonar beam strikes the target.

The Tilt angle of the sonar sound beam can only be changed when the sound beam is in Sonar Mode, Bottom Scan Mode and Sounder Mode. **CF** page 74

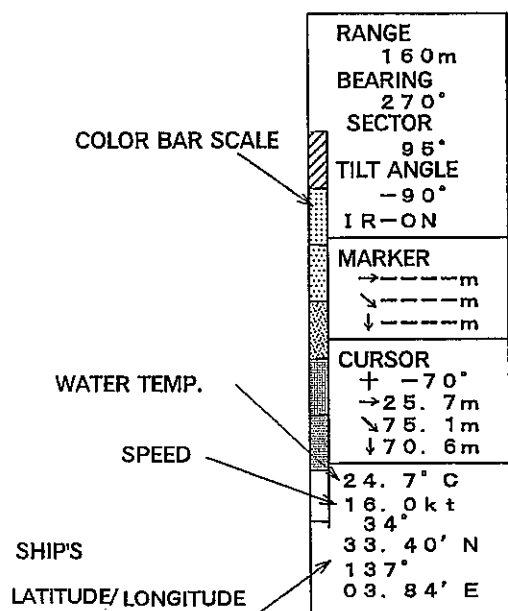
## BOTTOM SCAN MODE DISPLAY

© To select Mode dial ▲ to display the following sample.



In BOTTOM SCAN MODE + INFORMATION displays on the split screen the above mentioned ※ 1 to ※ 4 are not displayed.

### INFORMATION - Data display



The info will be displayed as the below-mentioned, selecting the item other than SUB-DISPLAY, INFORMATION.

※ 1, ※ 2 and ※ 3 on Sonar mode screen indicate the info left.

"IR" will not be displayed when INTERFERENCE RED. function "OFF" is selected.

VRM on Bottom Scan mode screen.

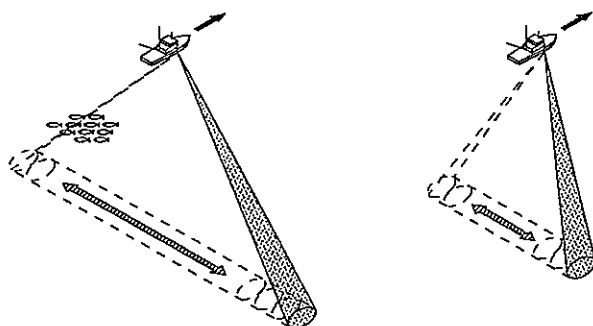
※ 4 on Sonar mode screen.

displayed on Sub-Display down.

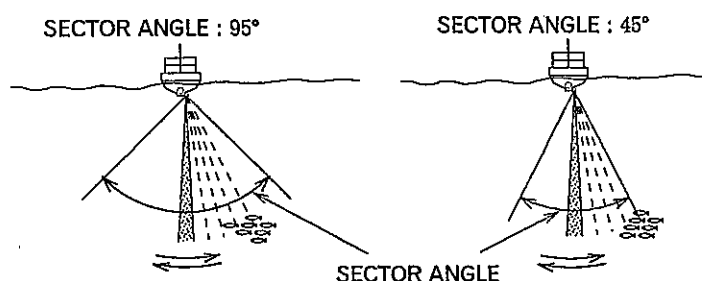
\* To present this will require the ESR-160 is connected an external navigator.

## BOTTOM SCAN MODE OPERATIONS

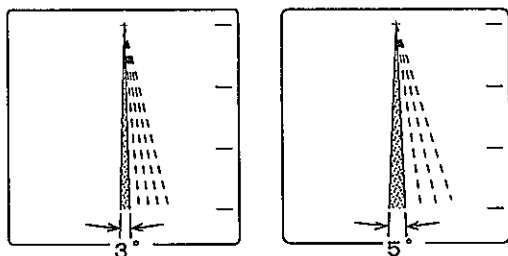
- ◎ The Sonar beam sweeps from side to side underneath the vessel.  
The screen will clearly display echoes from the middle depth and the sea-bottom contour.



- The ultra sonic sound beams out as the beam sweeps from side to side.



- Choose the size of the area to be scanned by changing Sector angle.  
**CF** page 70
- The specified Sector angle is centered on the bearing line.  
**CF** page 74




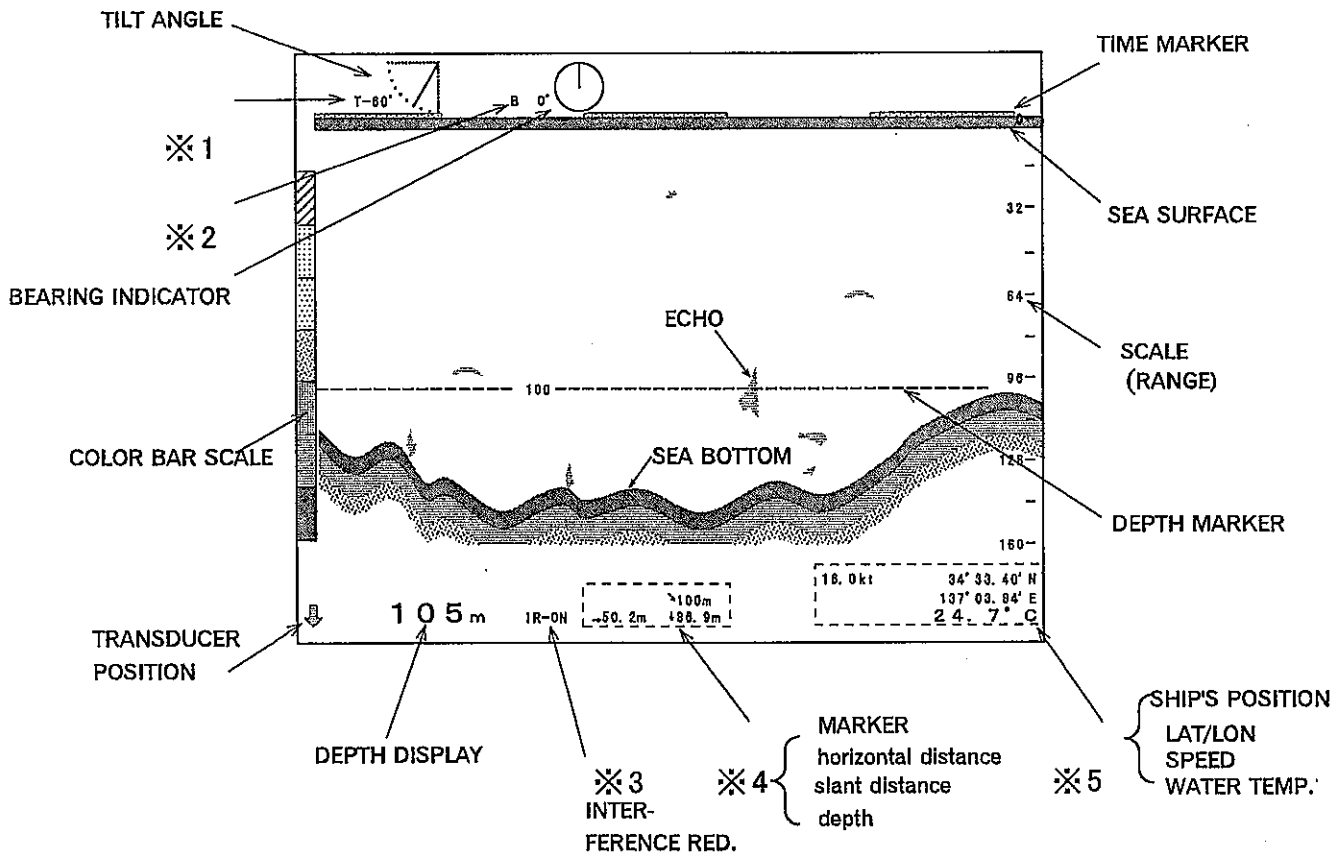
- The sector is covered by the Sonar beam in steps of the specified angle.
- The reflected echo is displayed in order in the angle specified.
- The step angle may be selected in the Menu 2 - STEP (BOTTOM SCAN).

**CF** page 56



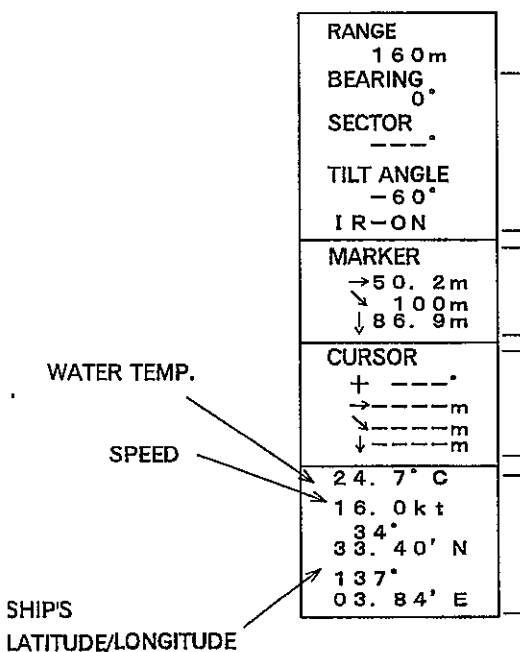
## SOUNDER MODE DISPLAY

© To select Mode dial  to display the following sample.



In SOUNDER MODE + INFORMATION in the split screen the above mentioned \*1 to \*5 are not displayed.

### INFORMATION SCREEN



The info will be displayed as the below-mentioned, selecting the item other than SUB-DISPLAY, INFORMATION.

\*1, \*2 and \*3 on Sounder mode screen indicate the info left. "IR" will not be displayed when INTERFERENCE RED. function "OFF" is selected.


VRM on Sounder mode screen and \*4 on Sounder mode screen indicates its Data.

not displayed on Sounder mode screen

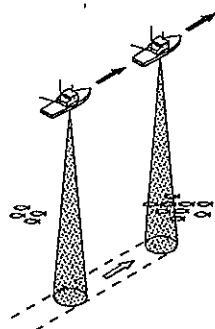
displayed on Sounder mode screen or on \*5 on Sub-Display screen

\* To present this will require the ESR-160 is connected an external navigator.

## SOUNDER MODE OPERATION

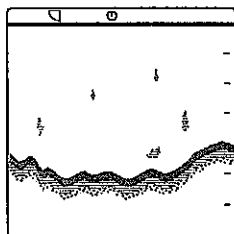
- ◎ The Sonar beam sweeps underneath the vessel and the ESR-160 can be used as echo sounder mode by selecting Mode dial .

The screen will clearly display echo sounder images from the middle depth and the sea-bottom contour.



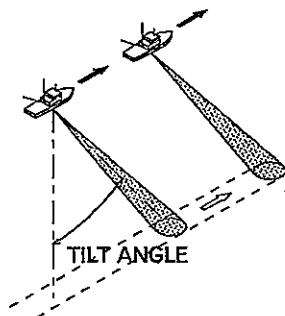
detects underneath the vessel.

SOUNDER MODE



- When operating in the SOUNDER MODE, the transducer tilt  $90^\circ$  and stops rotating and the sounder image is displayed on the screen.
- The beam width is relative to the frequency.

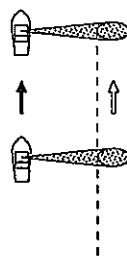
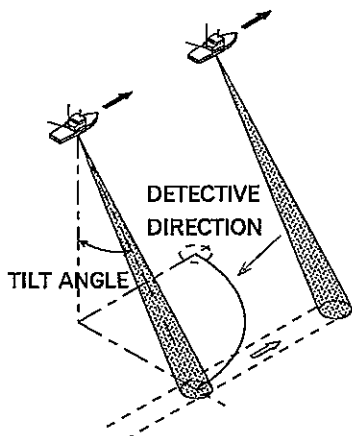
detects fore by changing Tilt angel.



- The sounder image other than that of underneath the vessel can be displayed by changing Tilt angle and detective direction.

**CF** page73/74/75

detects fore by changing Tilt angel and Bearing .



# Chapter 4

## FUNCTION SETTINGS

This chapter provides you the main functions of the ESR-160 Sonar and describes the primary controls. It also suggests settings to use for initial start up.

### INITIAL SETTINGS

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### REMOTE CONTROL SET 67

# INITIAL SETTINGS

## FACTORY SETTINGS





- ◎ The ESR-160 is shipped from the factory with the functions under the settings listed below. Before using it, please enter the functions to the desired setup.

FUNCTIONS	FACTORY SETTINGS (in the item <input type="checkbox"/> )	SETTING MENU
<b>FUNCTION SET</b> <b>GAIN UP</b> <b>TVG CURVE</b> <b>DYNAMIC RANGE</b> <b>PULSE WIDTH</b> <b>TX POWER</b>	<input type="checkbox"/> OFF · +10dB · +20dB · +30dB · +40dB OFF · 10LOG · 20LOG · <input type="checkbox"/> 30LOG · 40LOG 1 dB · 2 dB · <input type="checkbox"/> 3 dB <input checked="" type="checkbox"/> 1 · × 1.5 · × 2 A · B · C · <input type="checkbox"/> D	Change at Menu 2  <input type="checkbox"/> CF (pages 45)
<b>REDUCTION</b> <b>INTERFERENCE RED.</b>	<input type="checkbox"/> OFF · ON	
<b>DISP ITEM SEL.</b> <b>SUB-DISPLAY</b>  <b>STEP (SONAR)</b> <b>STEP (BOTTOM-SCAN)</b> <b>OFF-CENTER POS.</b> <b>SCALE DOTS</b> <b>COMPASS DISP.</b> <b>WAKE DISP.</b> <b>WAKE SUB RANGE</b> <b>WAKE MEM. INTERVAL</b> <b>PRESS RATE</b>	<input type="checkbox"/> INFORMATION · HISTORICAL · +PRESS · + A-SCOPE · WAKE · EXT. F. F. 5° · <input type="checkbox"/> 10° 3° · <input type="checkbox"/> 5° <input type="checkbox"/> FORE · BACK · RIGHT · LEFT OFF · <input type="checkbox"/> ON <input type="checkbox"/> OFF · ON <input type="checkbox"/> OFF · ON <input type="checkbox"/> 50m (10~500m) <input type="checkbox"/> 5 SEC. · 10 SEC. · 30 SEC. · 60 SEC. 1/2 · <input type="checkbox"/> 1/4 · 1/8 · 1/16	
<b>OTHERS</b> <b>AUDIO LEVEL</b> <b>TARGET LOCK</b> <b>TRIGGER SIGNAL</b> <b>DEPTH UNIT</b> <b>TEMP. UNIT</b> <b>TEMP. ADJUST</b> <b>SPEED UNIT</b> <b>HOIST AUTO UP</b> <b>TRAIN CORRECT</b> <b>PANEL BRIGHTNESS</b> <b>COLOR</b>	<input type="checkbox"/> 0 (0~39) <input type="checkbox"/> MODE0 · MODE1 · MODE2 · MODE3 <input type="checkbox"/> INTERNAL · EXTERNAL <input type="checkbox"/> m · br · fm · ft <input type="checkbox"/> C · °F <input type="checkbox"/> +0.0°C (-9.9°~+9.9°) <input type="checkbox"/> kt · km/h <input type="checkbox"/> OFF · 10kt <input type="checkbox"/> 0° (0°~355°) <input type="checkbox"/> BRIGHT · DARK <input type="checkbox"/> A-1 · A-2 · B-1 · B-2 · C-1 · C-2	
<b>RANGE SET MENU</b> <b>SONAR/OFF-CENTER RANGE</b> <b>BOTTOM-SCAN/ F.F. RANGE</b>	SELECTABLE 8 RANGES	Change at Menu 1 <input type="checkbox"/> CF (pages 43)
<b>OPERATION MODE 1, 2, 3</b> <b>USER'S SETTINGS</b>	NO SETTINGS NO SETTINGS	

## INITIAL SETTING

---



### RETURN TO FACTORY SETTINGS

- ◎ First turn the power off, then turn on the power while pressing both   keys at the same time.  
Keep pressing the   keys until the beep sound stops.
- Activating this operation will erase all settings excluding "Train Correct" at Menu 2, and restore the basic settings from the factory.



### USER SETTINGS

- ◎ Separate to the Factory Setting function, Settings may be entered by the user and memorized. This function is called "User Settings". By entering "User Settings" the ESR-160 to suit individual needs can be done. This not only simplifies operation of the ESR-160, but adds considerably to its reliability.
- All user implemented data in the ESR-160 can be erased by making a reset of the unit and thus return to "User settings". Please ensure the "User settings " are memorized on the first operation.

#### 1. MEMORIZE USER SETTINGS

- First ensure the functions are at the desired settings by MENU 2.
- After disconnecting the power supply once, then turn the power supply back on, while pressing the  key at the same time.  
Keep pressing the  and until the beep sound stops.
- After completing this operation all functions and their units will be memorized as set by the user.

#### 2. RETURN TO USER SETTINGS

- In case, for some reason, the ESR-160 become inoperable, the unit can be reset by disconnecting the power supply and then turn the power supply back on, while pressing the  at the same time. Keep pressing the  key until the beep sound stops.
- This operation can return to User Settings.

#### 3. CHANGING USER SETTINGS

- To change the functions in User Settings first activate "Return to Factory Settings" and then memorize "User Settings" again as described in the previous item 1

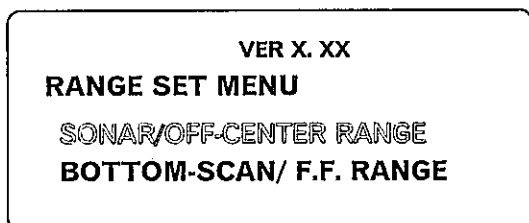
#### NOTE !

~~~~~  
Releasing the keys before the beep sounds stops may not complete the job.  
Performing "Return to Factory Settings" will return all settings to Factory Settings and erase all User Settings.  
~~~~~

## MENU 1 (RANGE SET MENU)

◎ One of eight ranges can be quickly selected using this function and each of these ranges can be set by the user to meet his own requirements using RANGE dial.

- The following will be displayed by selecting MODE dial - 1.



- Use the cursor shift key or to highlight the item you wish to change.  
By pressing the cursor shift key or the following is displayed.

- Refer to the next page for 8 available ranges.

SONAR/OFF-CENTER RANGE ( BOTTOM-SCAN/ F.F. RANGE )	
1	4 0 m
2	8 0 m
3	1 2 0 m
4	1 6 0 m
5	2 0 0 m
6	2 4 0 m
7	2 8 0 m
8	3 2 0 m

- Use the cursor shift key or to highlight the number you wish to change.
- Each press of or key change the range related to the basic ranges listed in the next page.

cursor shift key

- : makes the range value smaller.
- : makes the range value larger.

- (1) ~ (8) indicates RANGE DIAL numbers .

The initial set values of SONAR/OFF-CENTER RANGE differ from those of BOTTOM-SCAN/ F.F. RANGE. Depth units can be selected from MENU 2 → OTHERS → DEPTH UNIT. Each range value of both SONAR/OFF-CENTER RANGE and BOTTOM-SCAN/ F.F. RANGE should be entered.

The range values can be selected from the list shown in the next page by pressing the keys, however the values of OFF-CENTER can be displayed automatically when OFF-CENTER MODE is activated.


<To be continued>

## BASIC RANGE (BASIC DEPTH)

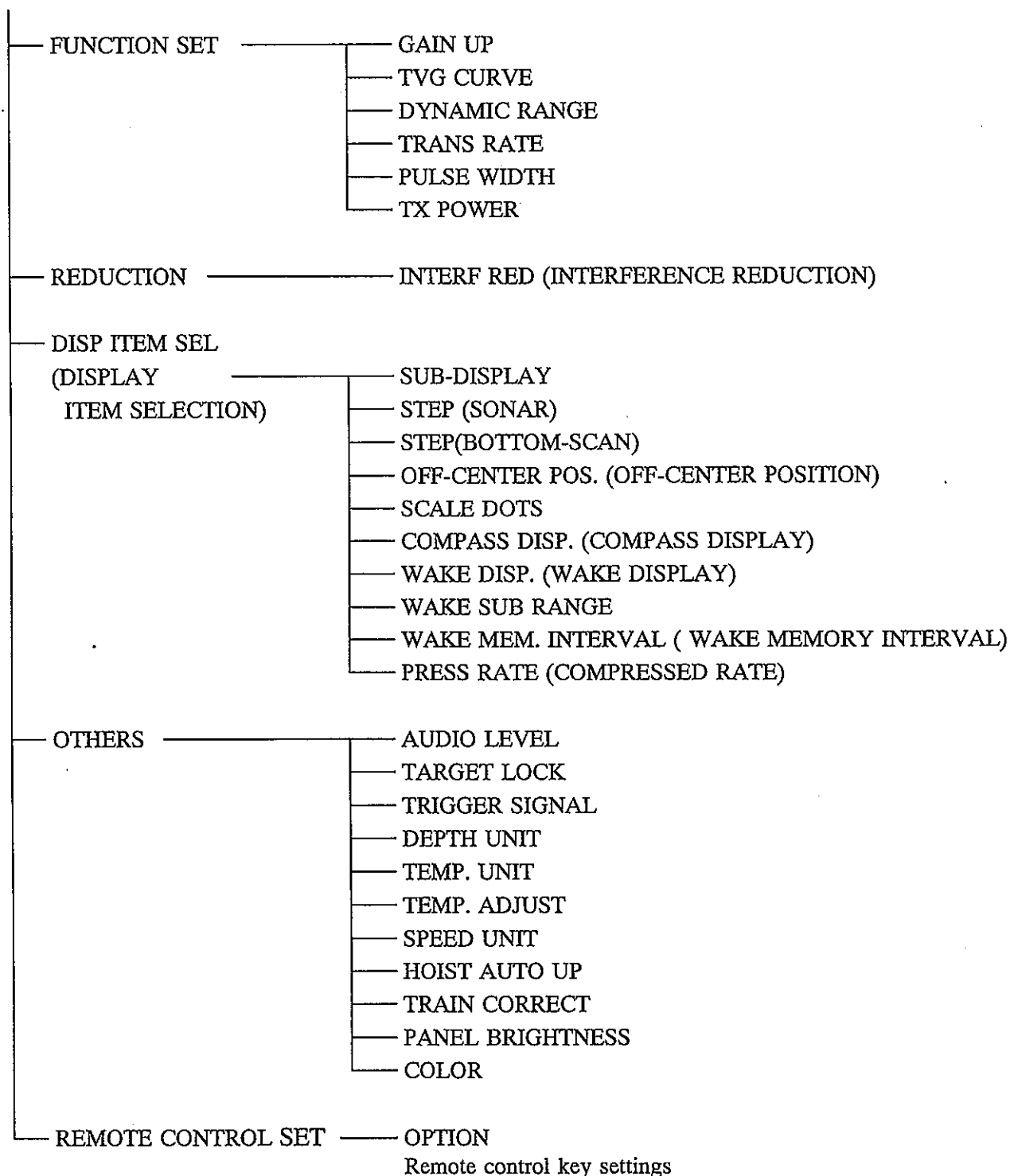
initial values

RANGE	m			br·fm			ft		
	NORMAL	OFF-CENTER	BOTTOM-SCAN	NORMAL	OFF-CENTER	BOTTOM-SCAN	NORMAL	OFF-CENTER	BOTTOM-SCAN
1	—	—	10	—	—	6	—	—	40
2	—	—	15	—	—	9	—	—	60
3	20	30	20	12	18	12	80	120	80
4	40	60	40	20	30	20	100	150	100
5	60	90	60	30	45	30	120	180	120
6	80	120	80	40	60	40	160	240	160
7	100	150	100	50	75	50	200	300	200
8	120	180	120	60	90	60	240	360	240
9	140	210	140	80	120	80	280	420	280
10	160	240	160	100	150	100	320	480	320
11	180	270	180	120	180	120	360	540	360
12	200	300	200	160	240	160	400	600	400
13	240	360	240	200	300	200	500	750	500
14	280	420	280	240	360	240	600	900	600
15	320	480	320	280	420	280	700	1050	700
16	360	540	360	320	480	320	800	1200	800
17	400	600	400	360	540	360	900	1350	900
18	500	750	500	400	600	400	1000	1500	1000
19	600	900	600	500	750	500	1200	1800	1200
20	700	1050	700	600	900	600	1600	2400	1600
21	800	1200	800	700	1050	700	2000	3000	2000
22	900	1350	900	800	1200	800	2400	3600	2400
23	1000	1500	1000	900	1350	900	3200	4800	3200
24	1200	1800	1200	1000	1500	1000	4000	6000	4000
25	1600	2400	1600	1200	1800	1200	5000	7500	5000
26	2000	3000	2000	1600	2400	1600	6000	9000	6000

## MENU 2 (FUNCTION SET MENU)

- ◎ Basic functions may be briefly described in the following.
  - Before first using the ESR-160, customizing the functions to suit individual needs.
  - Turn the mode selection dial to "  2 " to display the menu below.

### MAIN MENU








\* For more detailed explanation, refer to the following pages.



# FUNCTION SETTINGS

## MAIN MENU

- Turn the mode selection dial to "  2 " to display the menu below.
- Use the cursor shift key  or  to highlight the item you wish to change.
- By pressing the cursor shift key  or  the following is displayed.

MAIN MENU

FUNCTION SET

REDUCTION

DISP ITEM SEL.

OTHERS

REMOTE CONTROL SET

VER 0.00E

SELF CHECK

DATA-TX OK

DATA-RX OK

DATA OK





HOIST OK

TILT OK

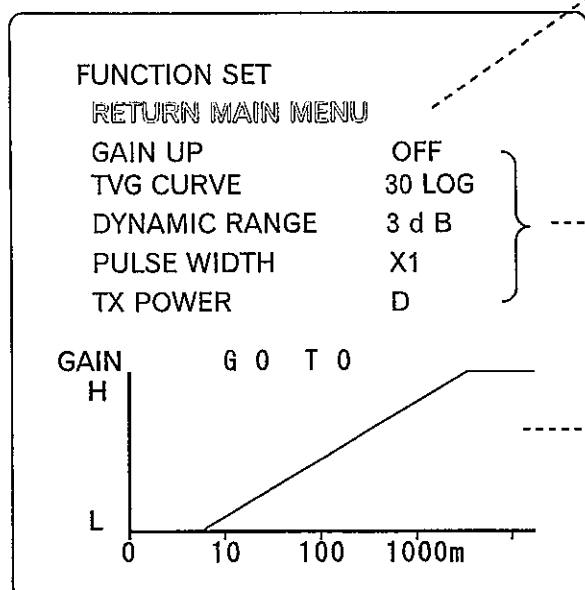
TRAIN OK







ROM-VER OK

OTHERS OK

- Version No. of EPROM
- Use the cursor shift key  or  to highlight the item you wish to change.
- The setup display is accessed by pressing the cursor shift key  or .
- SELF CHECK function  
The test result NG in red is displayed in case of some troubles.





## SETTING FUNCTIONS



- Use the cursor shift key  or  to return to MAIN MENU.
- Use the cursor shift key  or  to highlight the item you wish to change.
- Press  or  key to select the desired setting.
- Graph for Gain Characteristics displays the changed gains such as TVG curve, Gain Up, Gain dial and Far Gain dial etc.

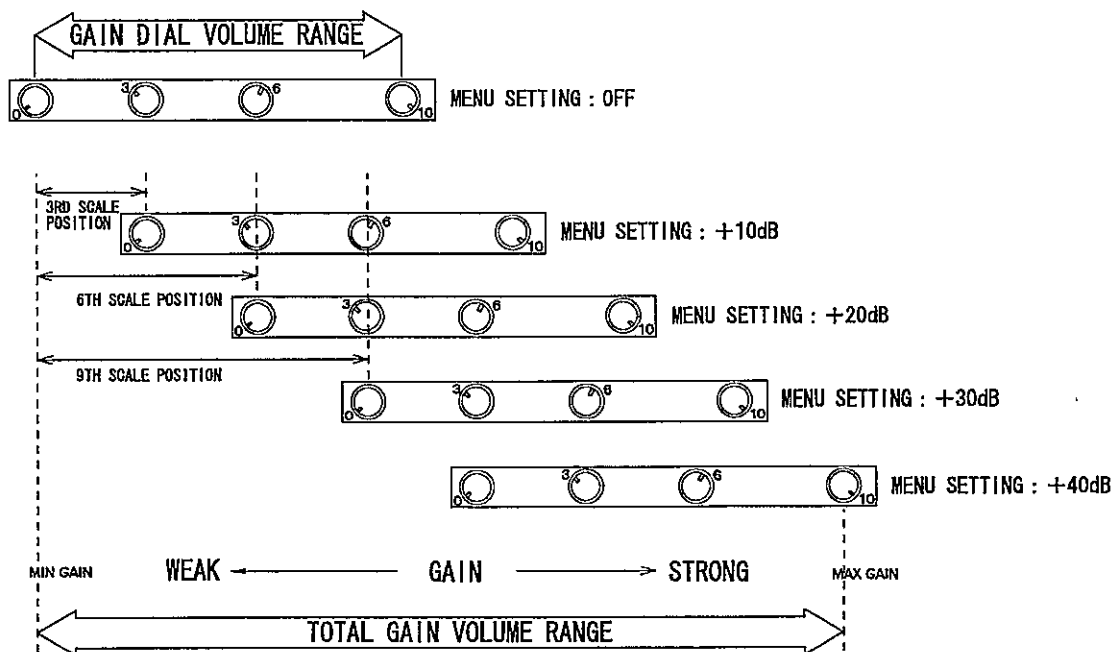
# 1. GAIN UP

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

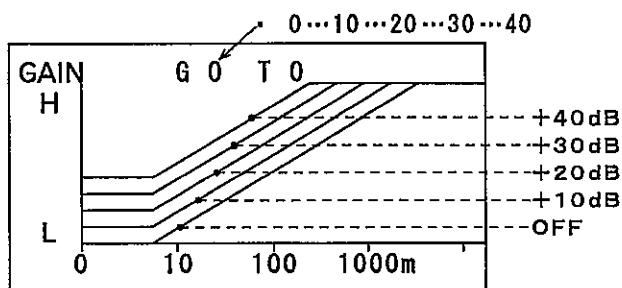
- Highlight the "GAIN UP" function by means of   keys and select the desired values by   keys.



- Each press of  or  key changes the settings "OFF → + 10dB → + 20dB → + 30dB → + 40dB".



- When the menu gain adjust setting is changed from OFF to + 10dB, the gain dial volume increases 3 points on the scale.
- When the menu gain adjust setting is OFF and the front panel dial is on 3, it has the same result as when the menu gain adjust setting is on + 10dB and the gain dial is on 0.







- Selected GAIN UP, Gain Characteristics Diagram shifted accordingly shows left under the following conditions.

Gain dial : 0  
Far Gain dial : 0  
TVG Curve : 30LOG

### 2. TVG CURVE

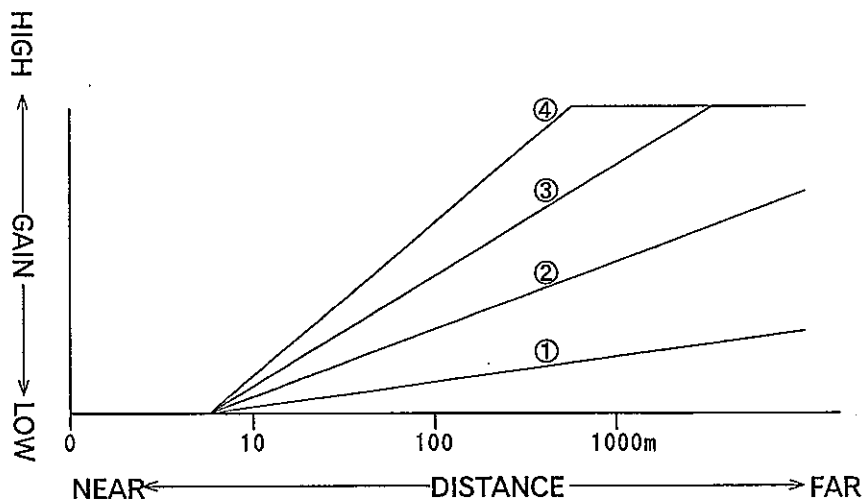
- ⊙ TVG offsets the effects of propagation loss of sound as it passes through the water. Propagation loss of sound is the sum of spreading and attenuation losses. The TVG curve is adjusted to counter the loss.

- Highlight the "TVG CURVE" function by means of   keys and select the desired values by   keys.

TVG CURVE      30LOG

- Each press of  or  key changes the settings "OFF → 10LOG → 20LOG → 30LOG → 40LOG"

- OFF : the TVG is inactive.
- 10LOG : Curve ① in the below drawing.
- 20LOG : Curve ② in the below drawing.
- 30LOG : Curve ③ in the below drawing.
- 40LOG : Curve ④ in the below drawing.







- In accordance with the distance the gain increases automatically even if the gain volume is unchanged as seen in the above drawing.

### NOTE !



- ⊙ Please note that the TVG settings and gain control by Gain dials have its affect mutually.

### 3. DYNAMIC RANGE

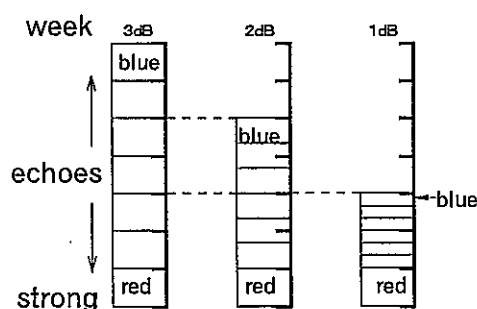
- By shifting the dynamic range, the display to reflect the received echo more precisely or the display to discriminate their density is selected.

- Highlight the "DYNAMIC RANGE" function by means of   keys and select the desired values by   keys.



- Each press of  or  key changes the settings "OFF → 1dB → 2dB → 3dB .....".





#### COLOR BAR SCALE

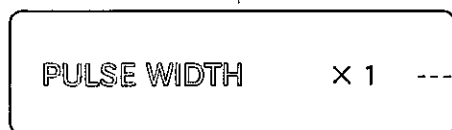




The diagram shows the comparative signal threshold levels for the dynamic ranges.

### 4. PULSE WIDTH

- The transmitted pulse width can be set.

- Highlight the "PULSE WIDTH" function by means of   keys and select the desired values by   keys.



- Each press of  or  key changes the settings "x 1 ...x 1.5 ...x 2 .....".

x 1 : automatically changes the transmit pulse width according to the range (normal) listed below.

x 1.5 : automatically the normal transmit pulse width x 1.5

x 2 : automatically the normal transmit pulse width x 2

A longer pulse width provides greater detective range.





RANGE (m)	PULSE WIDTH(msec)
0 ~ 59	0.25
60 ~ 79	0.40
80 ~ 99	0.75
100 ~ 119	0.90
120 ~ 159	1.00

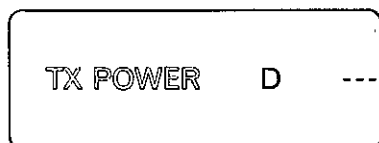
RANGE (m)	PULTH WIDTH (msec)
160 ~ 199	1.25
200 ~ 239	2.00
240 ~ 399	2.50
400 ~	3.75

### NOTE !

- ~~~~~
- ◎ In actual practice, the short pulse width gives better resolution, and less noise in shallow water or surface scanning. The longer pulse width is selected, the lower resolution is given.
- ~~~~~

## 5. TX POWER

- ◎ The output power of the ultrasonic sound wave may be selected.
- In crowded fishing areas, this function may be used to reduce power and avoid interference to other Fishing boat's Sonars and Echo Sounders.
  - Highlight the "TX POWER" function by means of   keys and select the desired level of the transmitting power by   keys.
  - "D" indicates the maximum power and then gradually reduced by moving from "D" → "C" → "B" → "A" that is the minimum power.









Each press of   keys changes the setting "D - C - B - A" .

## REDUCTION

REDUCTION

RETURN MAIN MENU

INTERFERENCE RED OFF


- Use the cursor shift key  or  to return to MAIN MENU.
- Use the cursor shift key  or  to highlight the item you wish to change.
- Press  or  key to select the desired setting.

### 1. INTERFERENCE REDUCTION

◎ This function may be used to eliminate noise from other boats..

- Highlight the "INTERFERENCE RED" by means of   keys and select the function "ON" or "OFF" by   keys.

INTERFERENCE RED OFF

- Each press of  or  key changes the settings "ON → OFF".

- ON : Interference reduction is functioning.
- OFF : Interference reduction is not functioning.

## DISPLAY ITEM SELECTION

### DISP ITEM SEL.

RETURN MAIN MENU

SUB-DISPLAY

STEP (SONAR)

STEP (BOTTOM-SCAN)

OFF-CENTER POS.

SCALE DOTS

COMPASS DISP.

WAKE DISP.

WAKE SUB RANGE

WAKE MEM. INTERVAL

PRESS RATE

INFORMATION

1 0°

5°

FORE

ON



OFF



OFF

50m

5 SEC.

1 / 4





• Use the cursor shift key  or  to return to MAIN MENU.

• Use the cursor shift key  or  to highlight the item you wish to change.



• Press  or  key to select the desired setting.

## 1. SUB-DISPLAY

◎ This function may be used to select the mode displayed on the right split screen.

- Highlight the "SUB-DISPLAY" by means of   keys and select the desired setting by   keys.

SUB-DISPLAY INFORMATION

- Each press of  or  key changes the settings, "INFORMATION → HISTORICAL → +PRESS → + A -SCOPE → WAKE → EXT.F.F."

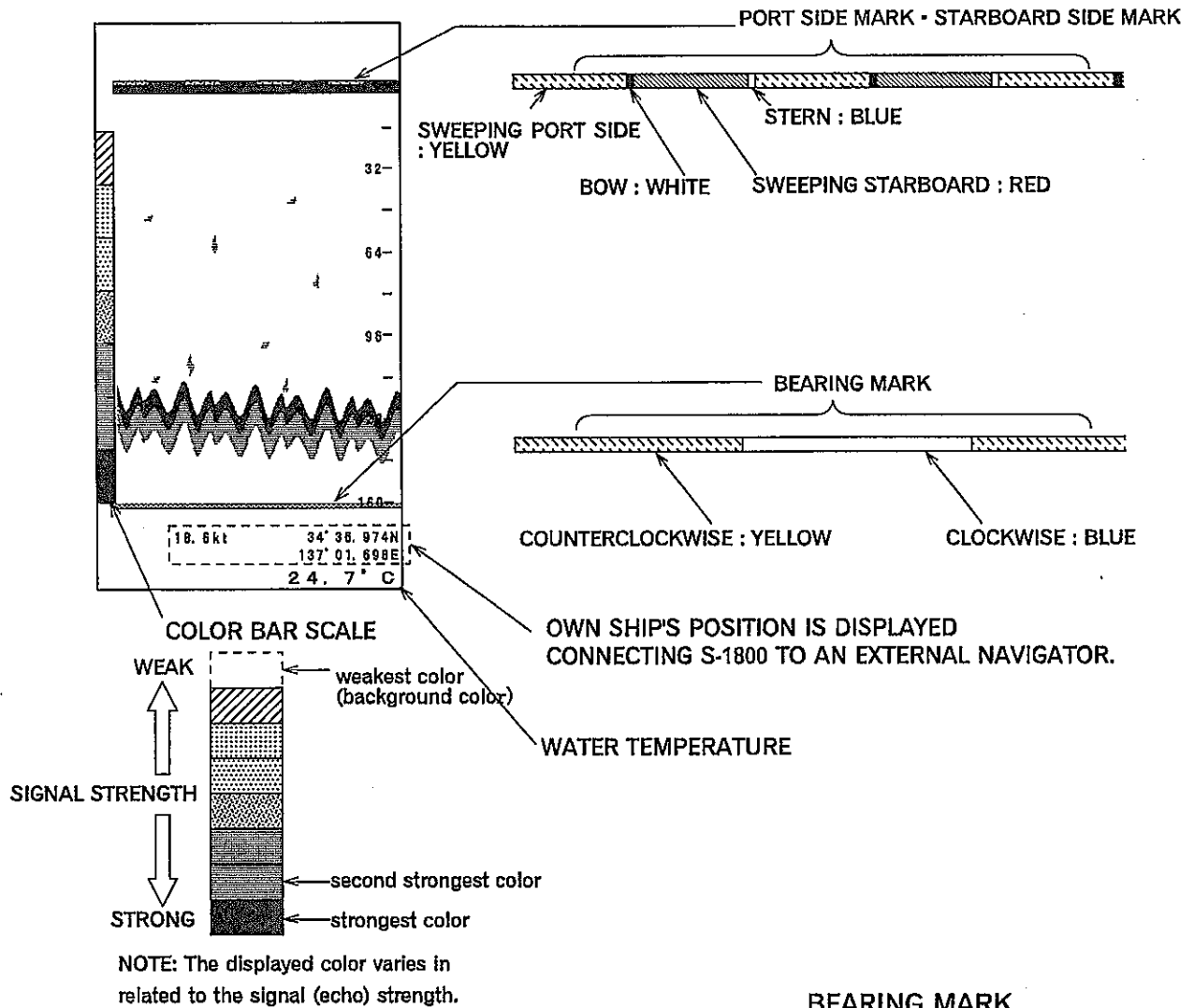
## ① INFORMATION

◎ This can be activated by selecting the MODE dial    .

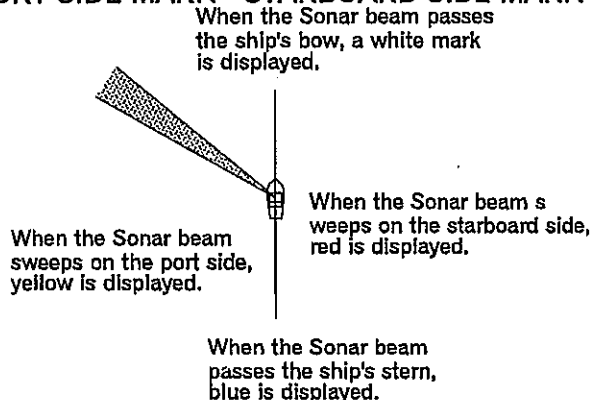
RANGE 160m	←	displays the selected range.
BEARING 0°	←	displays the bearing angle set by the Bearing keys
SECTOR 360°	←	displays the sector angle set by the Sector dial.
TILT ANGLE -30°	←	displays the tilt angle set by the Tilt keys
IR-ON	←	displays only when the INTERFERENCE RED - ON is selected.
MARKER →86.0m ↘99.3m ↓49.7m	←	displays horizontal distance, slant distance and depth to the marker. not displayed in BOTTOM SCAN MODE.
CURSOR + 45° →65.2m ↘75.3m ↓37.7m	←	displays horizontal distance, slant distance and depth to the cursor. not displayed in SOUNDER MODE.
24.7°C	←	displays the water temperature.
16.0kt 34° 33.40' N 137° 03.84' E	←	displays the ship's speed and latitude/longitude. * To present this info will require the ESR-160 is connected to an external navigator.

## ② HISTORICAL DISPLAY

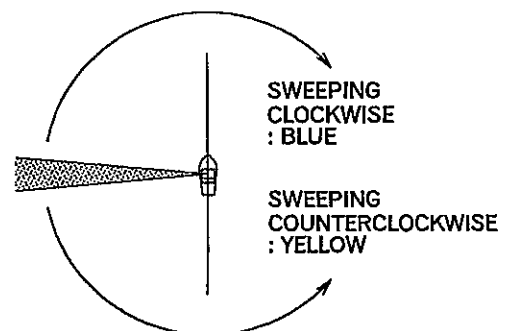
- ◎ This vertical writing display appears on the right split screen by HISTORICAL in SUB-DISPLAY under SONAR MODE (●●) and BOTTOM SCAN MODE (▲). However, on selecting SOUNDER MODE (⚡) the vertical sounding picture is full up on the screen.



### PORT SIDE MARK • STARBOARD SIDE MARK



### BEARING MARK



The mark color is displayed as shown in the color bar scale being related to the Sonar beam bearing direction.

The mark color is displayed as shown in the color bar scale being related to the Sonar beam direction (position).

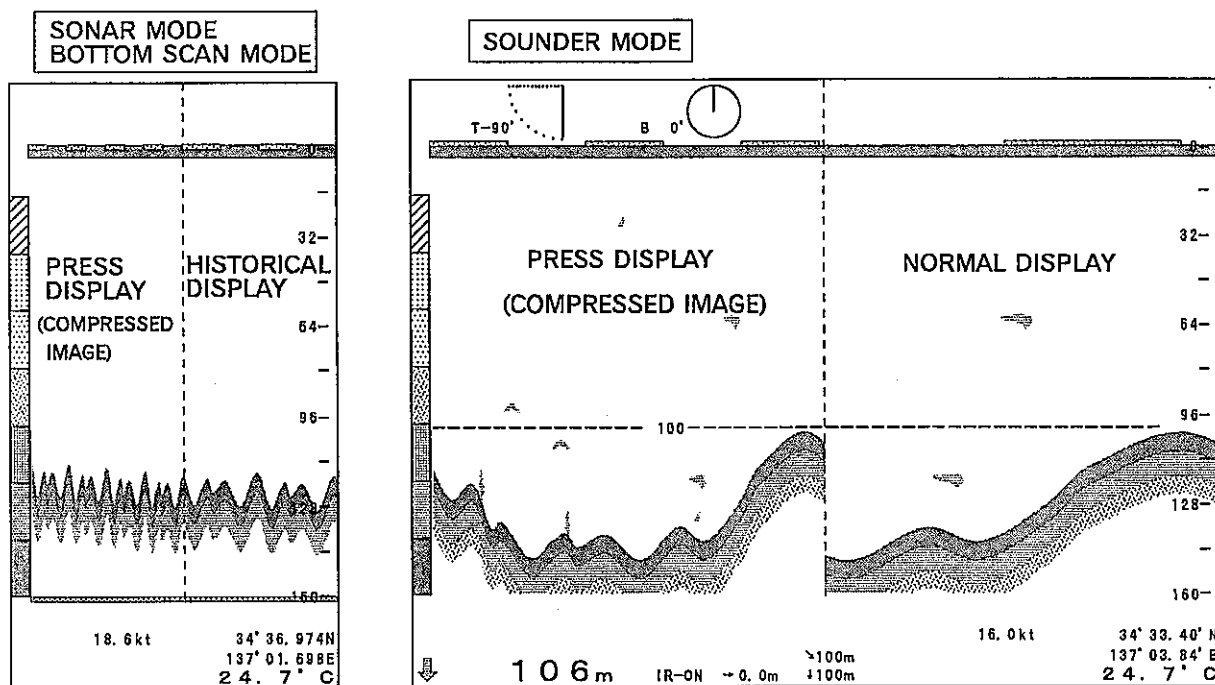


## FUNCTION SETTINGS

### ③ + PRESS (COMPRESSED VERTICAL WRITING DISPLAY)

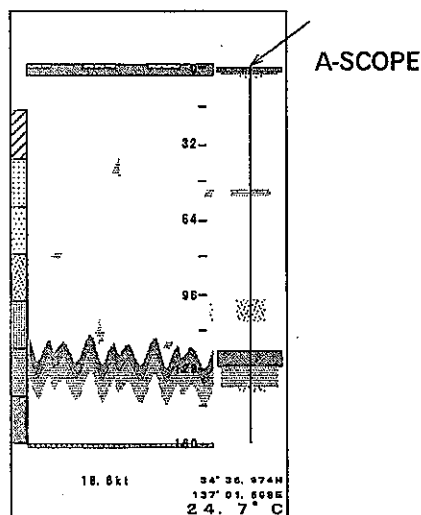
- ⊙ The vertical writing display and its compressed writing display appears on the right split screen by + PRESS in SUB-DISPLAY under SONAR MODE (● ●) and BOTTOM SCAN MODE (▲).

However, on selecting SOUNDER MODE (⚓) the normal vertical sounding picture and its compressed picture appear in the right and left split screen..



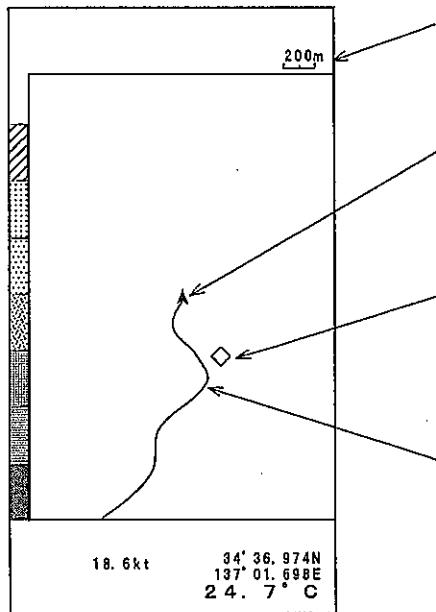
### ④ + A-SCOPE

- ⊙ A-SCOPE appears at the right side of the vertical writing display on the right split screen.
- The drawing below shows an example in SONAR MODE and BOTTOM SCAN MODE. A-Scope function is also available in SOUNDER MODE.



## ⑤ WAKE

- ◎ By connecting the ESR-160 to an external navigator own ship's position can be shown on the screen.



• **SCREEN WIDTH**

displays the screen width selected by "WAKE SUB RANGE".

• **OWN SHIP**

displays own ship's position in latitude/longitude and speed at the bottom of the split screen..

• **MARK**

displays marks placed by the cross cursor in SONAR MODE screen.

• **WAKE (TRACK)**





The wake (track) is initially saved into memory every 2 seconds. The previous wake saving periods can be selected via the procedure of "WAKE MEM. INTERVAL".

※ No color bar scale appears on Sounder Mode screen.



## FUNCTION SETTINGS

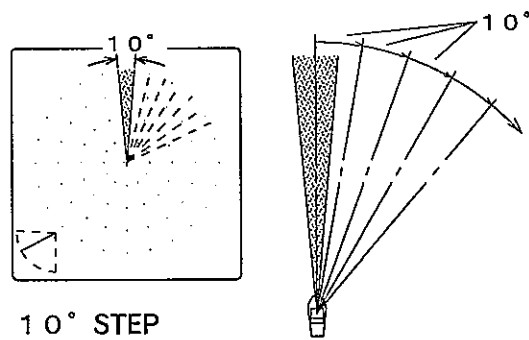
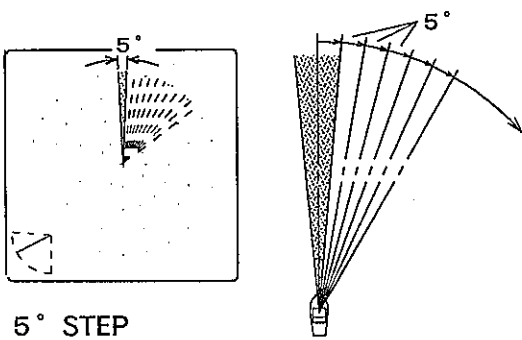
### 2. STEP (SONAR)

◎ The step angle (scanning angle) in the Sonar mode may be selected.

- Highlight the "STEP (SONAR)" function by means of   keys and select the desired step angle by   keys.



STEP (SONAR) 10°

• Each press of  or  key changes the angles "5° → 10°.....".



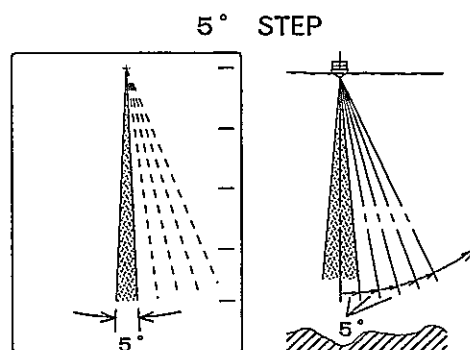
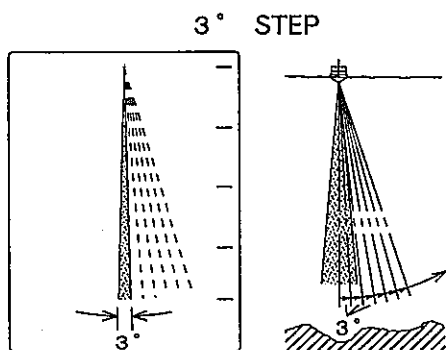
### 3. STEP (BOTTOM-SCAN)

◎ The step angle (scanning angle) in the Bottom Scan mode may be selected.

- Highlight the "STEP (BOTTOM-SCAN)" function by means of   keys and select the desired step angle by   keys.





STEP (SONAR) 5°



• Each press of   keys changes the angles "3° → 5°.....".

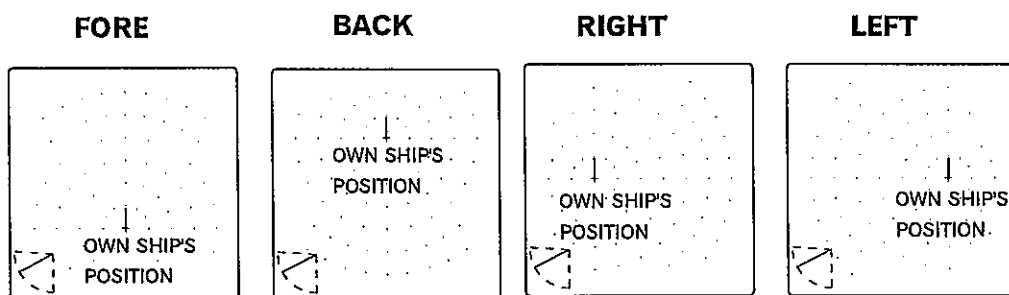


## 4. OFF-CENTER POSITION

◎ The ship's position on the screen may be selected in the OFF-CENTER mode.





- Highlight the "OFF-CENTER POS." function by means of   keys and select the desired center position by   keys.



OFF-CENTER POS.    FORE ----- • Each press of  or  key changes the setting "FORE - BACK - RIGHT - LEFT"

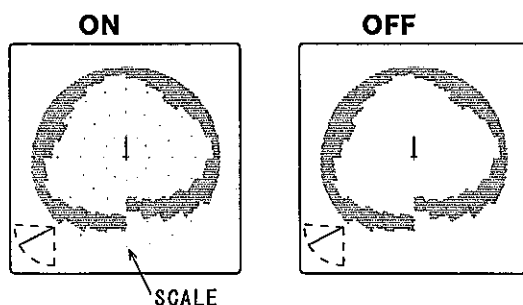


## 5. SCALE DISPLAY

◎ The scale dots display under SONAR mode can be turned on/off.

- Highlight the "SCALE DOTS" function by means of   keys and select ON or OFF by   keys.

SCALE DOTS    ON ----- • Each press of  or  key changes the setting, "OFF - ON".







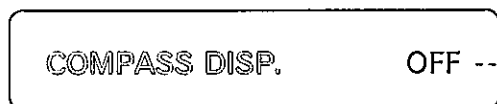
- ON : displays scale (dots).
- OFF : displays no scale.



- When the scale dots display OFF is selected, no scale appears on the screen in SONAR/OFF-CENTER modes. However the scale appears on the screen in BOTTOM SCAN/SOUNDER modes.

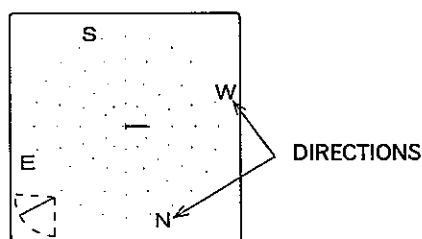
### 6. COMPASS DISPLAY

- ◎ The points of the compass can be shown on the screen in the Sonar mode by connecting the ESR-160 to an external navigator.

- Highlight the "COMPASS DISP." function by means of   keys and select the compass display function ON or OFF by   keys.







- Each press of  or  key changes the Compass display, "ON - OFF".

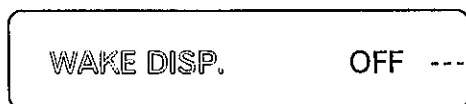


- ON : displays the points of the compass.
- OFF : displays no points of the compass.

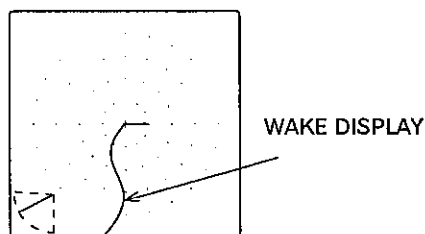
### 7. WAKE DISPLAY

- ◎ The track line can be shown on the screen in the Sonar mode by connecting the ESR-160 to an external navigator.

- Highlight the "WAKE DISP." function by means of   keys and select the wake display function ON or OFF by   keys.







- Each press of   keys changes the wake display "ON - OFF".







- ON : displays the wake (trackline).
- OFF : displays no wake (trackline).

## 8. WAKE SUB RANGE

⊙ The screen width scaling for a navigational display can be selected. **CF** page 55





- Highlight the "WAKE SUB RANGE" function by means of   keys and select the screen width by   keys.



WAKE SUB RANGE 50m ----- • Each press of  or  key changes the values.  
"10 - 20 - 30 .....500".

-  : increases the values.
-  : decreases the values.

## 9. WAKE MEMORY INTERVAL





⊙ The track is saved into memory and its interval can be selected.



- Highlight the "WAKE MEM. INTERVAL" function by means of   keys and select the interval by   keys.

WAKE MEM. INTERVAL 5 SEC. ---- • Each press of  or  keys changes the values.  
"5 SEC. - 10 SEC. - 30 SEC. - 60 SEC".

## 10. PRESS RATE (COMPRESSED RATE)

⊙ The rate of the compressed picture can be selected. **CF** page 54







- Highlight the "PRESS RATE" function by means of   keys and select the setting by   keys.

PRESS RATE 1 / 4 ----- • Each press of  or  key changes the values.  
"1 / 2 - 1 / 4 - 1 / 8. - 1 / 16"..

- Compress rate 1/2 shows one line for 2 sound beams and 1/4 for 4 sound beams.





## OTHERS

OTHERS	
RETURN MAIN MENU -----	
AUDIO LEVEL	0
TARGET LOCK	MODE 1
TRIGGER SIGNAL	INTERNAL
DEPTH UNIT	m
TEMP. UNIT	°C
SPEED UNIT	K t
HOIST AUTO UP	OFF
TRAIN CORRECT	0°
PANEL BRIGHTNESS	BRIGHT
COLOR SELECTION	A-1



- Use the cursor shift key  or  to return to MAIN MENU.
- Use the cursor shift key  or  to highlight the item you wish to change.
- Press  or  key to select the desired setting.  
The values of TRAIN CORRCET can not be changed here.  
**CF** page 65

## 1. AUDIO LEVEL

◎ The sound level of an external speaker can be adjusted.

- Highlight the "AUDIO LEVEL" function by means of   keys and select the desired level by   keys.

AUDIO LEVEL	0
-------------	---

- Each press of  or  key changes the level from 0 to 39.



key : decreases the volume




key : increases the volume





### NOTE !

◎ The connection of the optional external speaker (4 Ω ) is required. **CF** page 25

## 2. TARGET LOCK

◎ This function changes the rotary direction or tracks the target automatically.

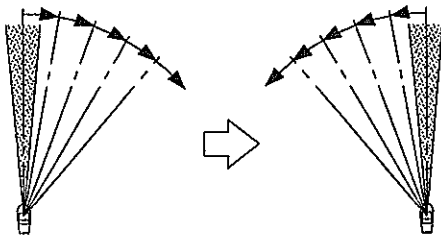
- To select the desired Target Lock function when  key is pressed during the Searchlight operation in the Sonar mode.


- Highlight the "TARGET LOCK" function by means of   keys and select the desired TARGET LOCK function by   keys.

TARGET LOCK MODE0

- Each press of  or  key changes the setting "MODE0 - MODE1 - MODE2 - MODE3"

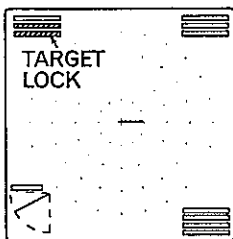
### ① MODE 0




- When MODE 0 is selected as a target lock mode, the sector rotary direction is reversed by pressing  key.

- Not tracking the echo automatically.

### ② MODE 1



- When MODE 1 is selected as a target lock mode, by pressing  key the Sonar beam will track the echo automatically left and right and "TARGET LOCK" will be displayed at the top left of the screen. If the beam should have lost the echo and not picked it up again after a 60° sweep, the Target Lock function will be released.

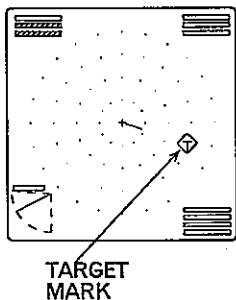
### ③ MODE 2


- When MODE 2 is selected as a target lock mode, the Sonar beam will track the echo automatically up and down (one time of up and down track after three times of left and right track) in addition to the Mode 1 functions.

<To be continued>



### ④ MODE 3



- When the ESR-160 is connected to a navigator, the Target Mark is displayed and tracked automatically by pressing the Target Lock key .





The Target Mark follows after the ship automatically and moves on the screen. This Target Mark also displayed on the Sub-Display in the split screen.

### NOTE !

- ECHO CONFIRMATION: Under Target Lock the Sonar beam will track the strongest echo from 1/4 of the scale (in Off Center mode 1/6 of the scale) or when the strongest echo of the Historical Display is 3 dots or more.
- During Target Lock operation Tilt, Sector rotation and Sector keys will not be operated, and if the Menu or Range keys are pressed or the Display mode is changed Target Lock will be released.
- When Target Lock ceases Sector rotation and Sector angles will return to their original positions, Tilt angle will remain in Target Lock position.
- Target Lock function is not available in the Bottom Scan Mode.

## 3. TRIGGER SIGNAL

- ◎ To select where the trigger signal is taken from either INTERNAL or EXTERNAL.

- Highlight the "TRIGGER SIGNAL" function by means of   keys and select the desired trigger signal by   keys.

TRIGGER SIGNAL   INTERNAL

- Each press of  or  key changes the setting "INTERNAL - EXTERNAL"

- INTERNAL : selects the signal of the ESR-160.
- EXTERNAL : selects the signal from an external unit.





### NOTE !




- ◎ To synchronize the external equipment, the optional kit is required.

In case of "INTERNAL" selection the receptacle for the trigger signal output is on the control unit panel of the ESR-160. **CF** page 26

## 4. DEPTH UNIT

- ◎ The user may select the displayed depth unit to be one of the following:  
meters (m), braccia (br), fathoms (fm) or feet (ft).





- Highlight the "DEPTH UNIT" function by means of   keys and select the desired depth unit by   keys.

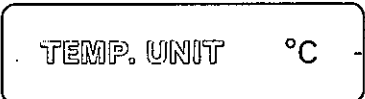


 • Each press of  or  key changes the Depth unit.  
" m - br - fm - ft "

( mt : Displays the unit meters. br : Displays the unit braccia. 1BR : 1.65m  
fm : Displays the unit fathoms. 1FM : 1.8288m ft : Displays the unit feet. 1FT : 0.3048m

## 5. TEMPERATURE UNIT

- ◎ Temperature unit can be set to °C or °F.





- Highlight the "TEMP. UNIT" function by means of   keys and select the desired temperature unit by   keys.

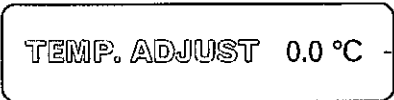


 • Each press of  or  key changes the temperature unit "°C - °F "

( °C : centigrade  
°F : Fahrenheit



## 6. TEMPERATURE ADJUSTMENT

- ◎ To adjust the water temperature displayed on the screen.

- Highlight the "TEMP. ADJUST" function by means of   keys and select the range to display an adjusted temperature by   keys.





 • Each press of  or  key changes the range in 0.1 interval from - 9.9 to + 9.9.

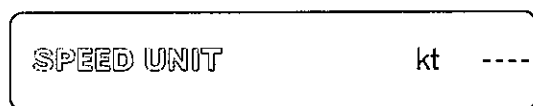
( + 9.9 ° : maximized the value of the adjustment  
+ 0.0 ° : no adjustment  
- 9.9 ° : minimized the value of the adjustment



(  increases the value  
 decreases the value

## 7. SPEED UNIT

◎ It can be shown in knots (kt) or kilometers/hour (km/h).

- Highlight the "SPEED UNIT" function by means of   keys and select the speed unit by   keys.







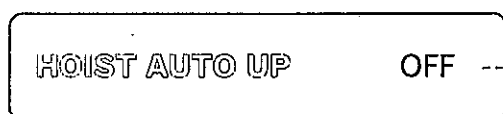
- Each press of  or  key changes the speed unit, " kt - km/h ".



- kt : measured in knot.
- km/h : measured in kilometers.



## 8. HOIST AUTO UP



◎ The transducer can be retracted automatically when the ship speed is over a specified speed by connecting to an external equipment.




- Highlight the "HOIST AUTO UP" function by means of   keys and select the value by   keys.

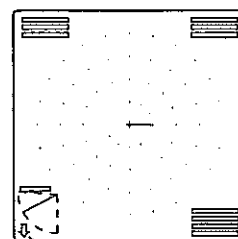


- Each press of  or  key changes the item, "OFF or 10 kt (18 km/h).

- Use the Tilt Key  or  to change the speed after selecting the initial value 10 kt (18 km/h). Selectable values : "1 kt ~ 15 kt" or "1 km/h ~ 27 km/h)





- Tilt Key  : increases the value
- Tilt Key  : decreases the value



- The transducer position mark shows the down direction () on the left bottom of the screen while the transducer is lowering. When Hoist Auto UP function is activated, the mark changes into (). The Hoist Lower Display Light  goes off when the transducer is retracted automatically.

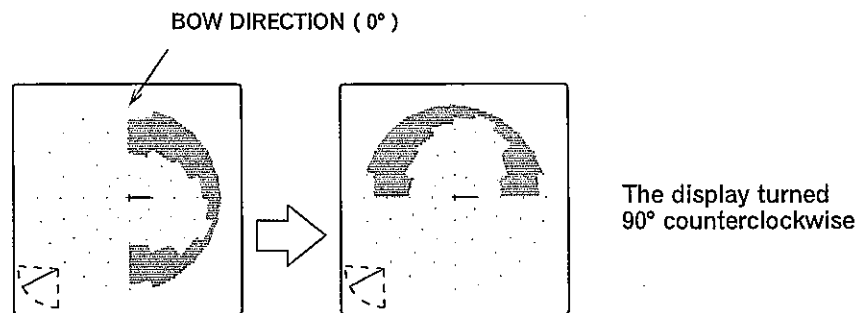


SHOWS THE TRANSDUCER POSITION, LOWERING/RAISING.

## 9. TRAIN CORRECT

- ◎ To adjust the deviation of the bow direction ( $0^\circ$ ) which was caused by fitting of the transducer.
- In the Sonar mode use  or  key to set the Sector rotation toward the Bow direction.
- Select MENU 2/OTHERS and highlight the "TRAIN CORRECT" function by means of   keys.





**TRAIN CORRECT** 90 ° ----- • Each press of  or  key changes the degree of Train Correct.





- When releasing this function, set the current Sector rotation at  $0^\circ$  and follow the above procedure "TRAIN CORRECT" again.





## 10. PANEL BRIGHTNESS

- ◎ To adjust the intensity of the sonar display (backlight) .  
"DARK" is recommended for the night time view.



- Highlight the "PANEL BRIGHTNESS" function by means of   keys and select "BRIGHT" or "DARK" by   keys.

**PANEL BRIGHTNESS** BRIGHT ---- • Each press of  or  key changes the item "BRIGHT" or "DARK" .

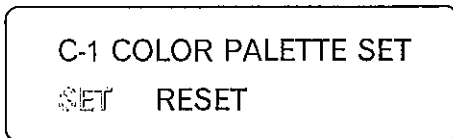
## 11. COLOR SELECTION







- ◎ The display background color may be selected from four set options A-1, A-2, B-1, B-2 or the tone range may be specified freely on C-1, C-2 in Color Palette function.
- C-1 and C-2 can be customized to suit individual needs and wishes.
- The initial settings for C-1, C-2 are C-1=A-1, C-2=B-1.
- Highlight the "COLOR" function by means of   keys and select the desired tone by   keys.








- Each press of  or  key changes the tone, " A-1, A-2, B-1, B-2, C-1, C-2 ".

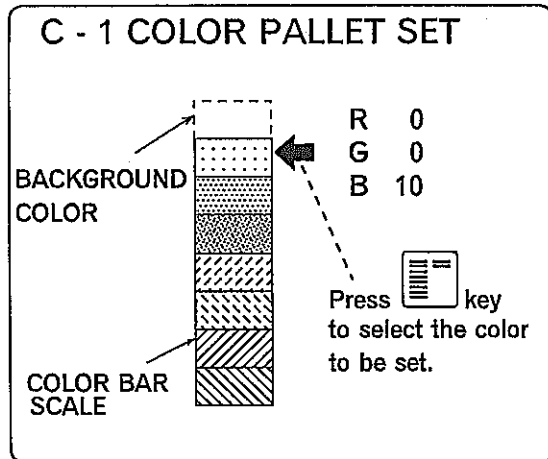
### \* GUIDES TO THE COLOR PALETTE








- Use   keys to select C-1 or C-2.
- Press  key to display the menu on the left.
- Highlight the "RESET" function by means of   keys and press  key to return to the initial setting and the Pallete Setting Menu terminates.

<To be continued>

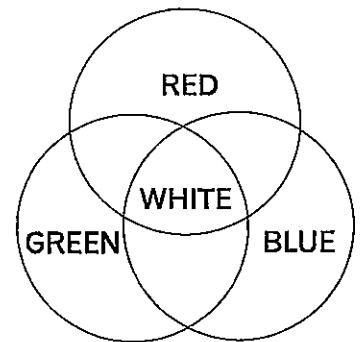
- Highlight the "SET" function by means of   keys and press  key to activate the following menu.
- Press  key to select the desired color.
- By using  key to move the arrow to the desired frame, the menu to set the color tone selected in step 3 (red • green • blue) is displayed.



- Highlight a color to be set by means of   keys and select the level of the color (0 ~ 15) by   keys.
- The number 15 is the strongest color and its tone decreases in accordance with the smaller number
- Press  key to memorize the desired color selection into "C - 1" or "C - 2" .

## COLOR PALLET

- By using Color Palette function by changing the ratio of red, green, blue of the colors on the display sample various tones may be selected.
- By using Color Palette function the strength of each of the three colors (red, green, blue) may be set in 15 steps freely.
- The Color Palette function may be used to set the tones according to the target fish species so as to produce the most visible display.



## REMOTE CONTROL SET

- Select the "REMOTE CONTROL SET" function at Menu 2.
- Refer to Chapter 6 Option, "REMOTE CONTROL SET" on page 83.

## Chapter 5

# SONAR OPERATION

This chapter provides you the description of operation dials and keys for the ESR-160 Sonar.

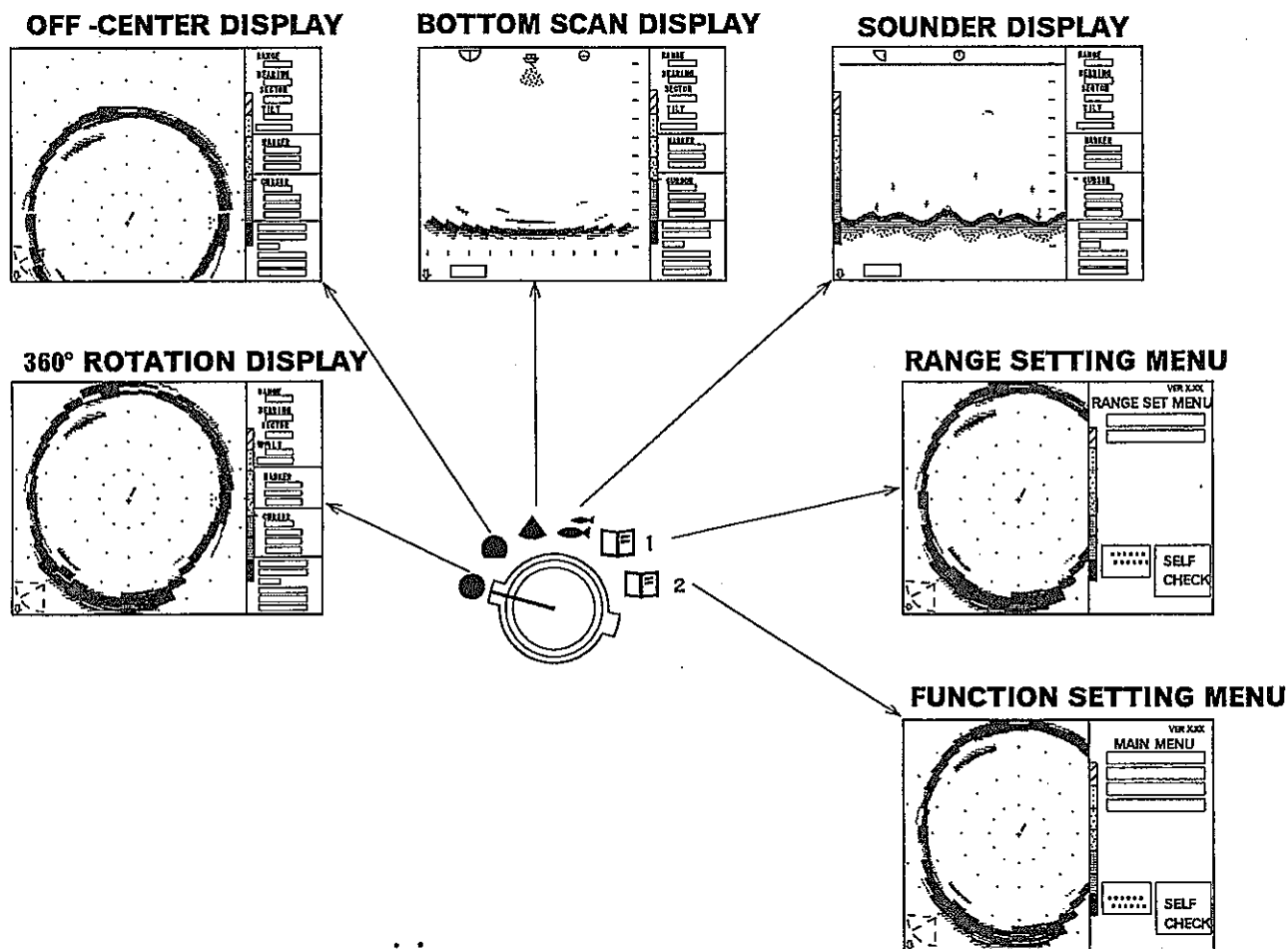
OPERATION DIAL	MODE DIAL .....	69
	RANGE DIAL .....	69
	SECTOR DIAL .....	70
	POWER SWITCH .....	71
	GAIN DIAL .....	71
	TVG CONTROL DIAL .....	71
OPERATION KEY	HOIST/LOWER DISPLAY LIGHT .....	72
	HOIST/LOWER KEYS .....	72
	SECTOR ROTATION KEYS .....	73
	TILT KEYS .....	74
	CURSOR KEYS .....	75
	TARGET LOCK KEY .....	77
	MARK KEY .....	78
	THRESHOLD KEY .....	78
	OPERATION MODE KEYS .....	79

# OPERATION DIALS

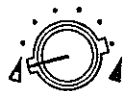
## MODE DIAL

⊙ Selects the Displayed Mode.

- All operational functions displayed in the right split screen ( **CF** page 52 ) and own ship's position on OFF-CENTER screen ( **CF** page 57) are accessed by using "MENU 2".



## RANGE DIALS

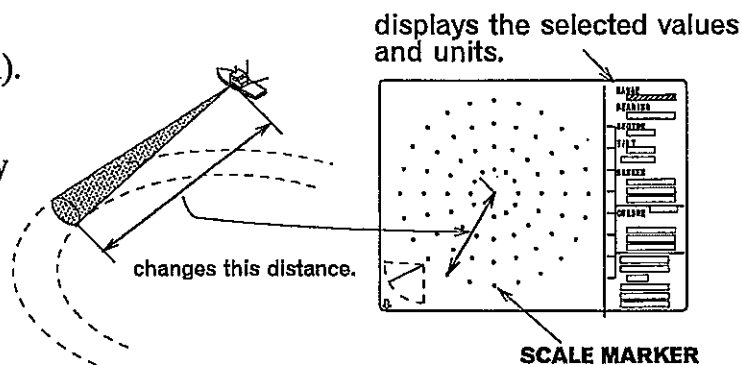


⊙ Changes the basic range (basic depth).

- The setting for 8 ranges is accessed by using "MENU 1". **CF** page 43
- The setting for the depth units is accessed by using "MENU 2".

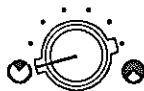
**CF** page 63

- Scale marker (dot) can appear or disappear by "MENU 2". **CF** page 57

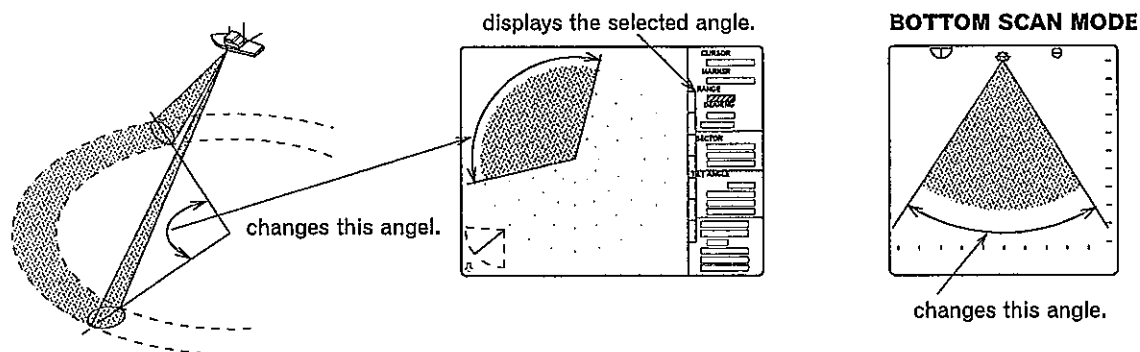




## SECTOR DIAL



- ⊙ Changes the scanning historical angle (sector angle) in the Sonar Mode.
- ⊙ Changes the scanning secotr angel (vertical angle) in the Botom Scan Mode.

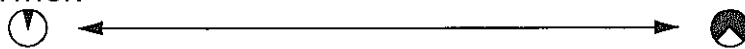


- Clockwise rotation ( $\rightarrow \odot$ ) widens the sector angle and counterclockwise rotation ( $\rightarrow \ominus$ ) narrows the sector angle.

The setting for the step is accessed by using "MENU 2". **CF** page 56

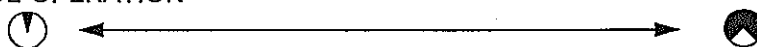
### ※ SELECTABLE SECTOR ANGLE

#### SONAR MODE OPERATION



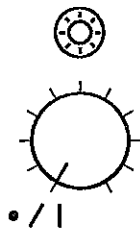
5 ° STEP	5°	25°	45°	85°	125°	165°	205°	360°
1 0 ° STEP	10°	30°	50°	90°	130°	170°	210°	360°

#### BOTTOM SCAN MODE OPERATION





3 ° STEP	3°	27°	45°	63°	93°	117°	147°	177°
5 ° STEP	5°	25°	45°	65°	95°	115°	145°	175°

## POWER SWITCH (POWER/BRILLIANCE CONTROL)

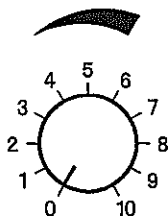


- ◎ When the Power switch is turned clockwise, the power is turned on with a click and the screen brightness increases.
- The brightness of the control panel can not be adjusted here. It can be adjusted by "MENU 2". **CF** page 65

- ◎ When turning on the power, the transducer dome is automatically hoisted and lowered. During hoisting operation, the arrow mark ↓ appears on the screen. At this time, the message "WAITING" is displayed on the display screen and the Hoist/Lower display light  blinks. When a protruding status is provided after completion of lowering, the scanning is started.

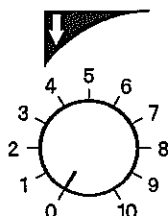
- ◎ When the Power switch is turned counterclockwise until a click can be heard, the power is turned off. As soon as the power is turned off, the transducer unit automatically starts to go up. When an uploading state is provided after completion of hoisting, the Hoist/Lower light  goes out completely. Do not turn off the power until the Hoist/Lower light goes out.

## GAIN CONTROL DIAL



- ◎ As the Gain control dial is turned clockwise, the sensitivity increases.
- Gain controls can be adjusted by "GAIN UP" function in "MENU 2". **CF** page 47

## TVG CONTROL DIAL



- ◎ The intensity of the receiving signal decreases gradually with the increase in distance.

TVG circuit suppresses the receiving sensitivity at transmission by correcting the sensitivity of the receiving circuit based on the time, and gradually increases the receiving sensitivity thereafter with the lapse of time.

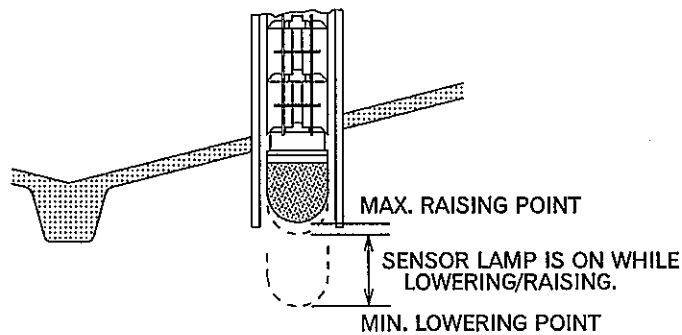
**CF** page 48

# OPERATION KEYS

## HOIST/LOWER DISPLAY LIGHT



- ◎ The transducer dome is lowering while the Hoist/Lower display light blinks.





Not turn off the power of the hoist while it blinks.



## HOIST KEYS

- ◎ To temporarily upload the transducer dome to move the scanning position, press the

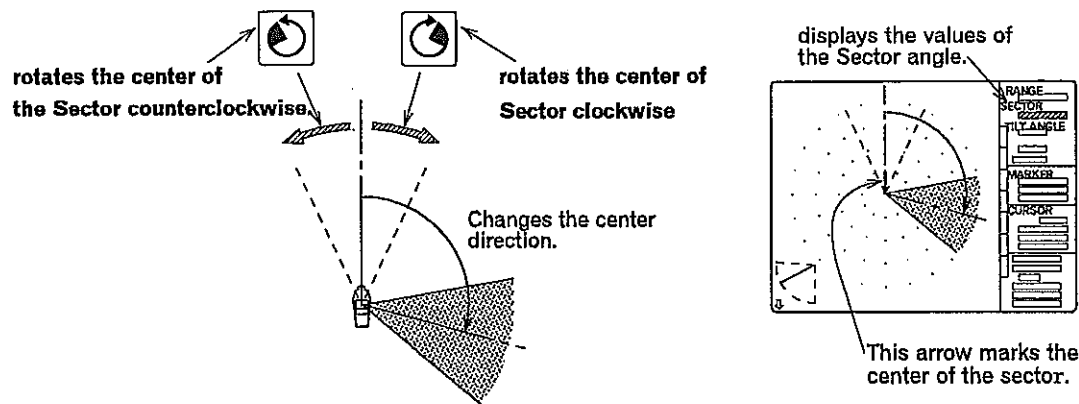
 key or  key. During operation it can be hoisted and lowered manually.

-  (upper arrow mark ) appears on the screen, when hoisting the transducer dome. When an uploading state is provided after completion of hoisting, the Hoist/Lower Display light  goes out completely.
-  (down arrow mark ) appears on the screen, when lowering the transducer dome.
- Slow down the ship's speed before pressing  key in case of lowering the transducer again after the uploading it automatically.

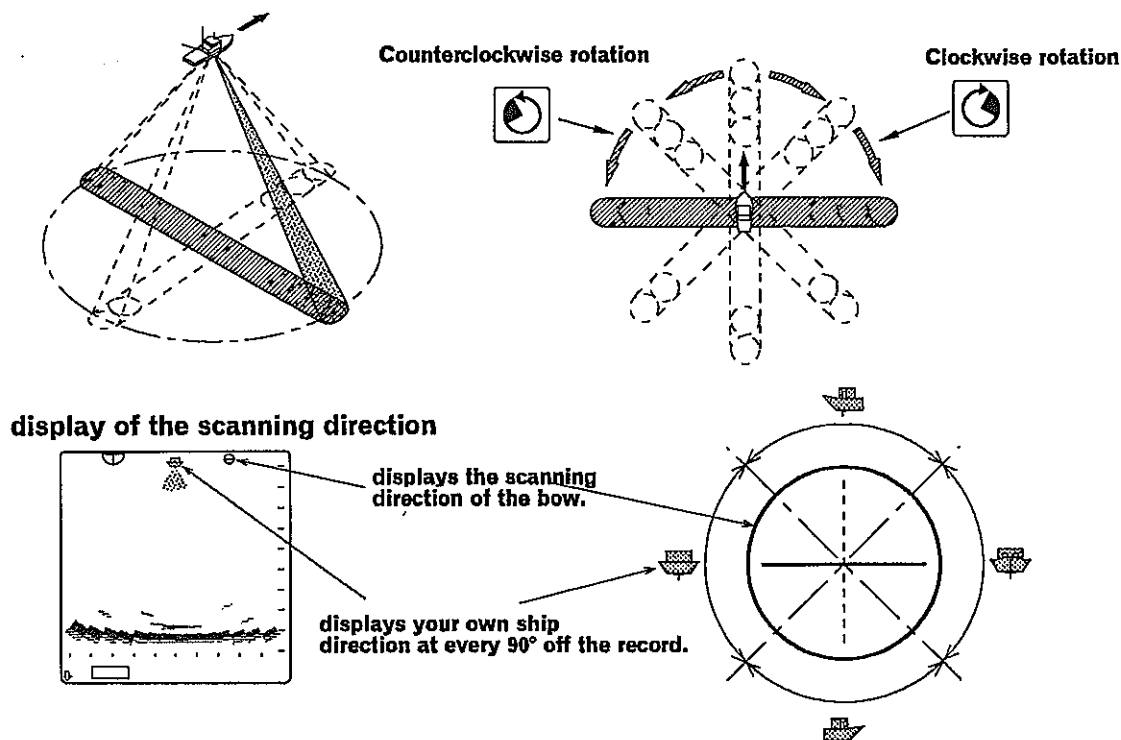
## SECTOR ROTATION KEYS

◎ Press one of the scan sector keys to set a central sector of rotation.

- The central sector of rotation can be set in  $5^\circ$  steps.



◎ Use these keys to define the center of current scanning sector in  $5^\circ$  steps in Bottom Scan Mode.



◎ In case of Sounder Mode "TILT KEYS" explained in the next page is collaborated with the Sector rotation keys. The shifted angles are the same as those of Bottom Scan Mode.

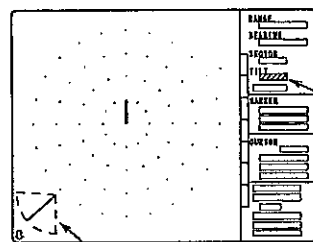
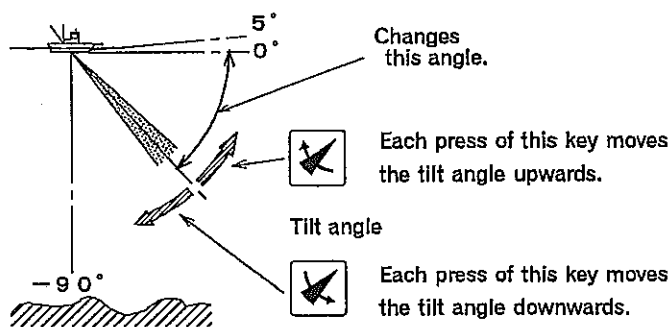
**CF** page 75

# OPERATION KEYS

## TILT KEYS



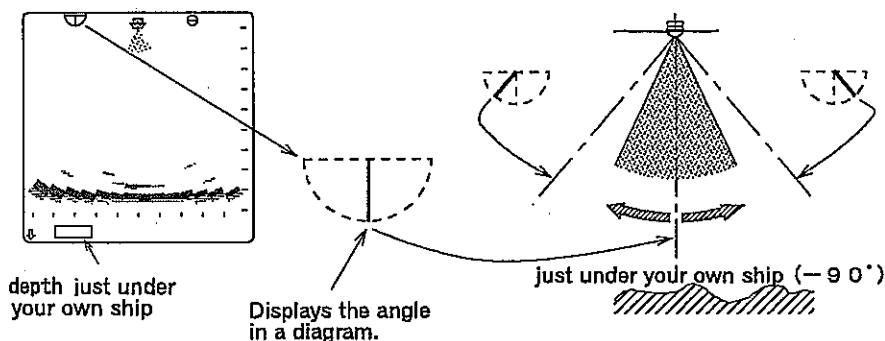
◎ Use these keys to control the tilt angle in the Sonar Mode.



Displays the values of the tilt angle.

VARIABLE TILT ANGLE :  $5^{\circ} \sim 0^{\circ} \sim -90^{\circ}$  ( every  $1^{\circ}$  )

◎ Use these keys to control the tilt angle in the Bottom Scan Mode.



This key changes the tilt angle and the center direction.



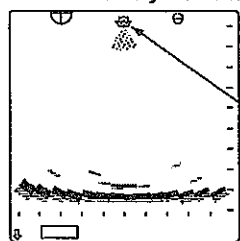
Each press of this key moves the tilt angle clockwise.

Tilt angle



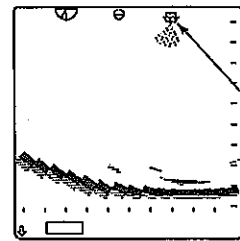
Each press of this key moves the tilt angle counterclockwise.

The angle center is just under your own ship.



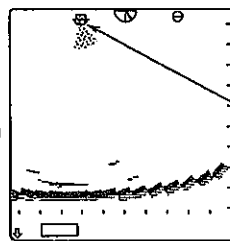
Your own ship position (center)

The center is set in the range shown by an arrow.



Your own ship position (right)

The center is set in the range shown by an arrow.



Your own ship position (left)

VARIABLE TILT ANGLE

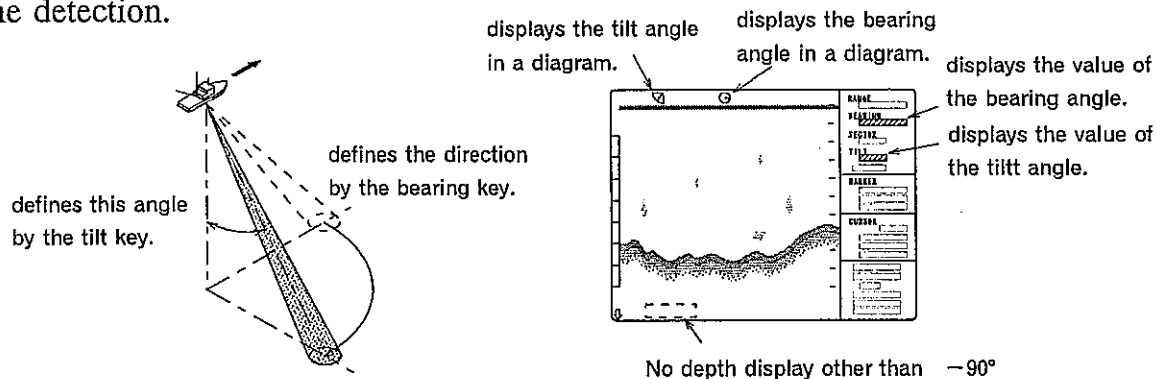
:  $3^{\circ}$  step .....  $-3^{\circ} \sim -90^{\circ}$  ( every  $3^{\circ}$  )

:  $5^{\circ}$  step .....  $-5^{\circ} \sim -90^{\circ}$  ( every  $5^{\circ}$  )

※ Refer to the page 56 for steps.

<To be continued>

- ◎ Use the Tilt keys and the Sector rotation keys to define the direction of the detection.








VARIABLE TILT ANGLE :  $5^{\circ} \sim 0^{\circ} \sim -90^{\circ}$  ( every  $1^{\circ}$  )


- Marker indicates the depth other than just below the ship ( $-90^{\circ}$  ).  
Refer to the following "CURSOR KEYS" for Maker.


## CURSOR KEYS





- ◎ Use these keys to know the depth and horizontal/slant distance to a user selected target.

-  key selects the cursor and     key move cursor in any direction on the screen.

 key : activates either Ring Marker or Cross Cursor in Sonar Mode.  
: activates either VRM or Cross Cursor in Bottom Scan Mode.  
: displays VRM only in Sounder Mode.

 key : expands the Ring Marker, shifts the Cross Cursor upward or shifts VRM to the shallow.




 key : contracts the Ring Marker, shifts the Cross Cursor downward or shifts VRM to the deeper area.

 key : shifts the Cross Cursor left

 key : shifts the Cross Cursor right.

## OPERATION KEYS

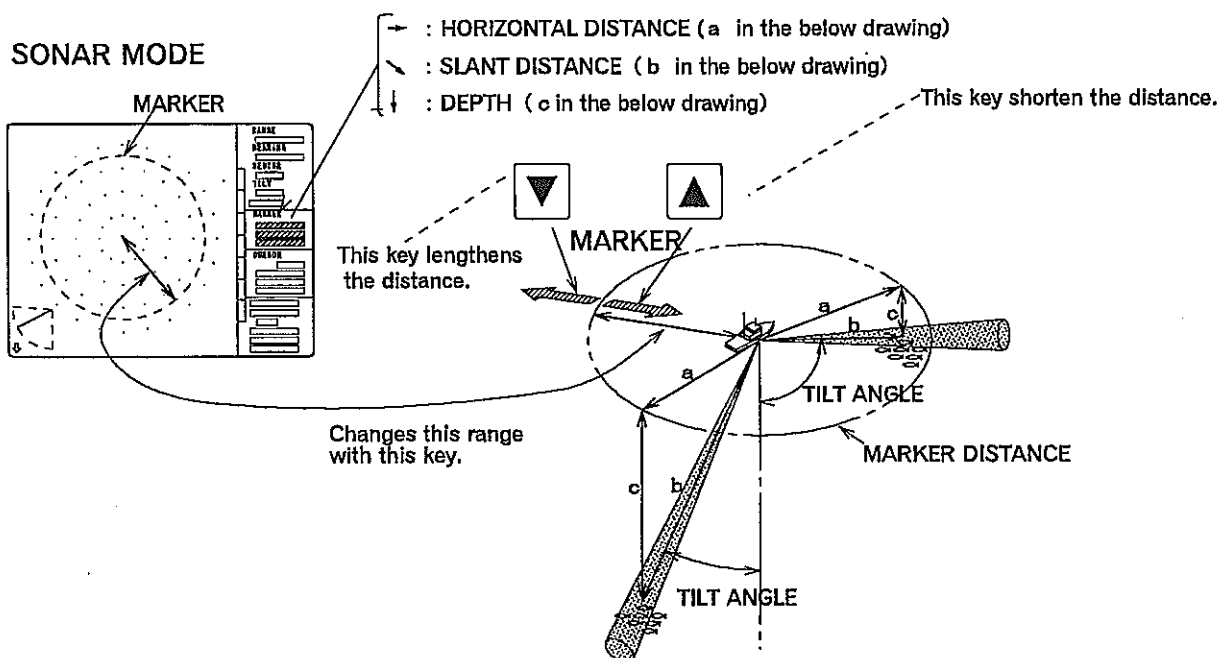
- ◎ After the first installing the ESR-160 the Ring Marker or the Cross Cursor neither appears nor operates on the screen even if turning on the power or after returning to factory settings.

- First the marker appears by pressing either  or  key and then select the Ring Marker or the Cross Cursor by  key.

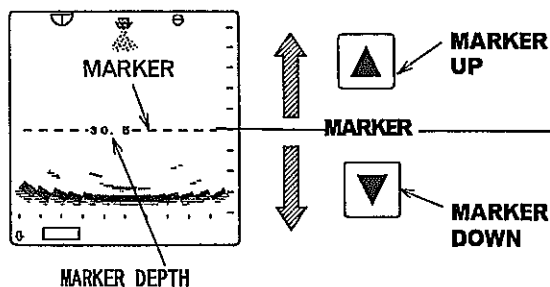
The Ring Marker is not available in Sounder Mode.

The inactive function is displayed in red and stored even the power is turned off.

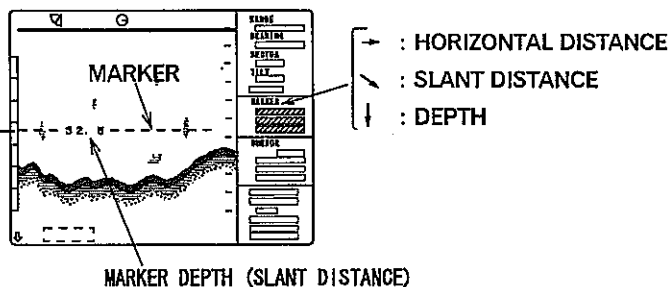
- ◎ When the Ring Marker is selected, (the Cross Cursor is in red or not displayed)



### BOTTOM SCAN MODE







### SOUNDER MODE







- ※ VRM appears and Marker data is not presented right in Bottom Scan Mode.

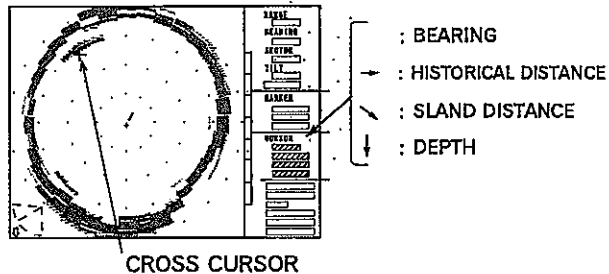
- ※ In Sounder Mode it presents the slant distance in the MARKER box.

- Press  and  key at the time to turn the Marker off.

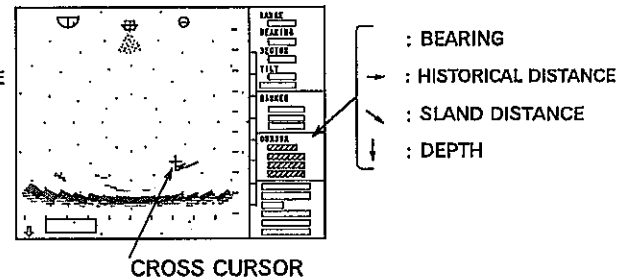
Again pressing  or  key returns Marker to previous position.

- ⊙ When the Cross Cursor is selected, (the Ring Marker is in red or not displayed) however it is not available in Sounder Mode.
- Set the Cross Cursor on a target by using     key and the depth and horizontal/slant distance to the target are displayed in the CURSOR box.

## SONAR MODE






## BOTTOM SCAN MODE




- The Cross Cursor is used for placing the marks (**CF** page 78) and also the target marks for Target Lock (**CF** page 62).

## TARGET LOCK KEY

- ⊙ When pressing  (the Target Lock key) in Sonar Mode, the direction of sweep of the Sonar beam is reversed. (when MENU 2 / TARGET LOCK / MODE 0 is selected.)
- ⊙ When pressing  (the Target Lock key) in Sonar Mode, the Sonar beam track the echo automatically. (when MENU 2 / TARGET LOCK / MODE 1 or MODE 2 is selected.)
- ⊙ By pressing  (the Target Lock key) on the target in Sonar Mode the target mark is displayed and tracked automatically. (when MENU 2 / TARGET LOCK / MODE 3 is selected.)
- Make reference to Target Lock function on page 61.

## NOTE !

- ⊙  Target Lock key is disabled in Bottom Scan Mode and Sounder Mode.




## OPERATION KEYS

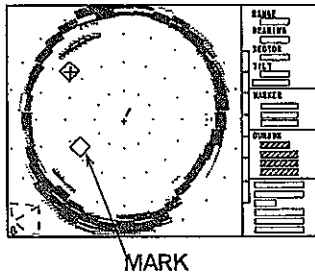
### MARK KEY



- ◎ The mark can be placed on the screen in Sonar Mode.


By placing the Cross Cursor on a marked target and pressing  key is displayed the mark (◇) on the screen.

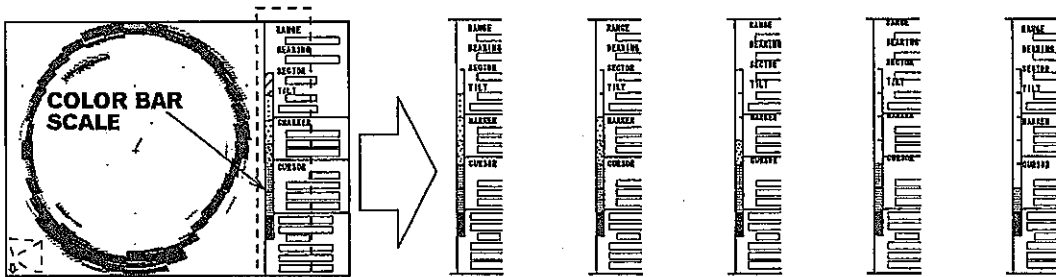
- The mark moves on the screen being accompanied by the ship's movement.
- Wake Display on (DISP ITEM SEL./WAKE DISP./ON) is selected in the split screen, the mark is also displayed there.



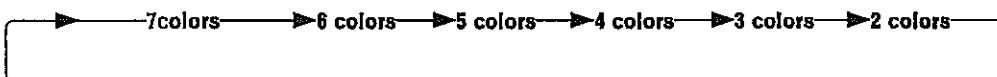
### THRESHOLD KEY



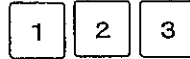
- ◎ The weak echoes disappear by pressing this key accordingly.
- Only strong wanted targets appear on the screen by pressing this key to erase unwanted returns such as plankton or noise.
- Each press of  key clears the weakest color sample.



Each press of this key changes the color sample as shown right.



## OPERATION MODE KEYS



◎ Use these keys to select one of the 3 kinds of operation mode you have created.

By pressing one of these keys the desired operation mode can be set immediately.

- "OPERATION SET MENU" is accessed by selecting MENU 2 and then pressing ( ) key.
- Highlight the item to be changed by means of keys and set the desired values by keys.
- To return back to the previous operation mode, use MODE dial.

OPERATION MODE 1 (2,3)	
STEP (SONAR)	10°
STEP (BOTTOM-SCAN)	5°
BEARING (SONAR)	0°
BEARING (BOTTOM-SCAN)	270°
TILT (SONAR)	0°
TILT (BOTTOM-SCAN)	— 90°
GAIN UP	OFF
TVG CURVE	30LOG

- Press key to set the desired values.

- By pressing one of the operation mode ( ) keys the desired "Operation Mode" appears on the screen instantly.
- The settings of Operation modes would not be changed, even if other settings are selected on the control panel or MENU 2. During the operation by one of the operation modes the settings can be changed and activate the changed settings, however pressing one of the operation keys ( ) again returns to the previous operation mode.

### NOTE !

◎ It is possible to memorize the present settings in the operation modes without displaying "Operation Mode".

- Hold the ( ) key for three seconds after the first buzzer.  
By the second buzzer the present settings are memorized in the Operation Mode.
- Note that it may not be memorized when the key is released before the second buzzer.

# Chapter 6

## OPTION

This chapter provides you the explanation related to the optional terminal kits.

OPTION	OPTIONAL CONNECTIONS -----	81
	INTERFACE CONNECTIONS -----	82
	REMOTE CONTROL SET -----	83
SPECIFICATIONS	-----	84

## OPTIONAL CONNECTIONS

- ◎ The ESR-160 is designed to interface with various types of external equipment that output or accept data signals in the NMEA sentences or the remote controller.

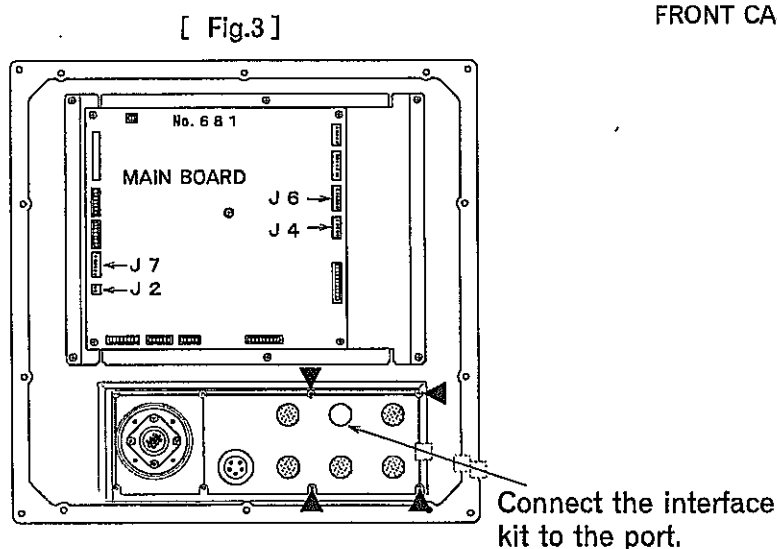
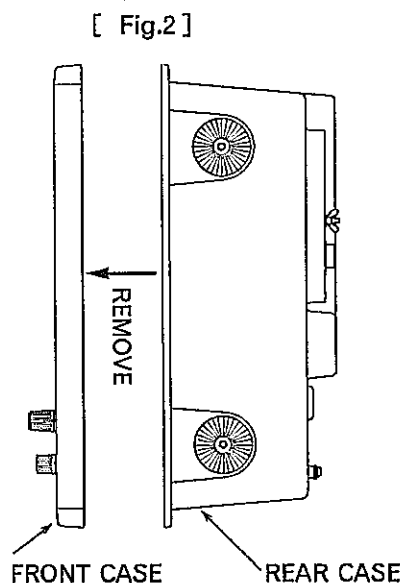
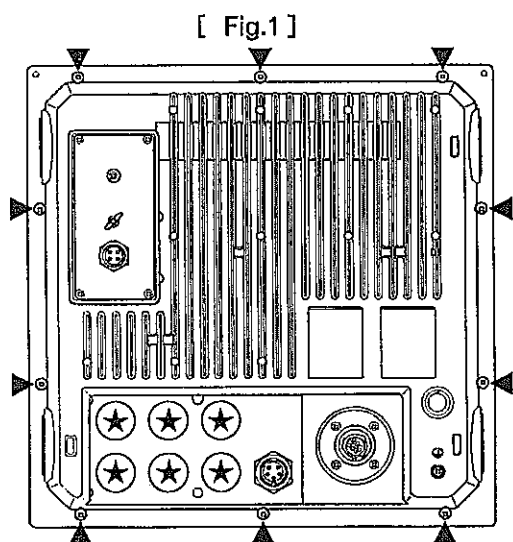
The connection cables between the main unit and others are not included.

P.No.	NAME	TERMINAL CONNECTIONS
OP-1607	REMOTE CONTROLLER	
OP-1605	N A V — I N TERMINAL	No 1:Signal Input +      No 3: Shield      No 4:Signal Output + No 2:Signal Input —      No 5:Signal Output —
OP-1602	TRIGGERINPUT TERMINAL (INTERFACE KIT FOR EXTERNAL TRIGGER)	No 1:Trigger Input No 2:GND
OP-1606	N M E A OUTPUT TERMINAL (INTERFACE KIT FOR NMEA-OUT)	No 1:NC      No 3: Shield      No 5:Signal Output — No 2:NC      No 4: Signal Output +      No 6: N C

※ NC.....Nothing to be connected.

## INTERFACE CONNECTIONS

- ◎ Before connecting optional kits, remove all cables on the main unit.
- ① Remove the total 10 screws (▲ Fig. 1) on the rear panel.  
Peel the sheet (★ Fig. 1) on the port where the optionnal kit would be connected
- ② Remove the front case (Fig. 2) so that Main board in the rear case can be seen. ( Fig. 3)  
Care must be taken to the connections between the front case and the rear case.

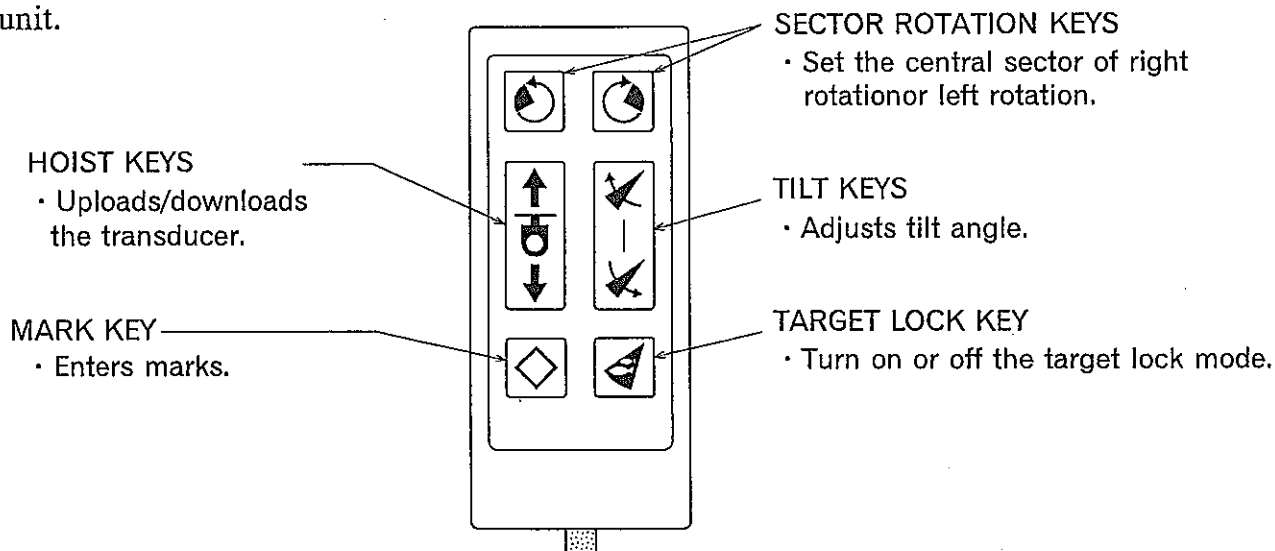


◎ Do not open the case cover.  
There is a risk of electric shock  
if you touch the high voltage  
conductors.  
Electrical installation should be  
carried out by the qualified staff.

- ③ Connect the interface kit on the port and tighten the lug terminal (GND) in the hole ( ▲ Fig. 3) using the screws M3.  
Insert the connectors into the specified terminals on the main board.
  - NAV-IN terminal → J4
  - Trigger Input terminal → J2
  - NMEA Ouput terminal → J6
  - Remote Controller connection → J7
- ④ Fasten the screws to fix the case cover.

## REMOTE CONTROL SET

- ◎ Remote controller connection is made to the terminal on the rear of the display unit.



- ① After connecting the remote controller to the terminal on the rear of the Display unit, this function is available by selecting "MAIN MENU- REMOTE CONTROL SET" at Menu 2 of Mode dial.
- ② Use the cursor shift key or to highlight "REMOTE CONTROL SET" and by pressing the cursor shift key or the following appears on the screen.

REMOTE CONTROL SET	
1 SECTOR LEFT	1 2
2 SECTOR RIGHT	3 4
3 HOIST UPLOAD	5 6
4 TILT UP	7 8
5 HOIST DOWNLOAD	
6 TILT DOWN	
7 MARK	
8 TARGET	

- Use or key to select the desired item.

Highlighting the item to be changed and pressing the cursor shift key or , the key operation will change as follows.

OPERATION MODE 1 ... OPERATION MODE 2 ... OPERATION MODE 3 ... TARGET...  
 MARK...THRESHOLD...CURSOR SELECTION...HOIST DOWNLOAD... HOIST UPLOAD  
 ...CURSOR SHIFT LEFT ...CURSOR SHIFT RIGHT...CURSOR SHIFT UP ...CURSOR SHIFT DOWN  
 ...TILT UP...TILT DOWN...SECTOR RIGHT...SECTOR LEFT...OPERATION MODE 1

The above box shows the initial settings of the remote control keys.

## SPECIFICATIONS

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### ◎ DISPLAY UNIT

Display	10.4 " LCD (TFT) color
Power Supply	10.8 ~ 30.2 VDC
Weight	7 kg
Sonar Type	Searchlight Sonar
Display Range	Selectable 8 positions shown in the following page.
Scanning sector (SONAR MODE)	( 5 ° step) 5 ° · 25 ° · 45 ° · 85 ° · 125 ° · 165 ° · 205 ° · 360 ° (10 ° step) 10 ° · 30 ° · 50 ° · 90 ° · 130 ° · 170 ° · 210 ° · 360 °
(BOTTOM SCAN MODE)	( 3 ° step) 3 ° · 27 ° · 45 ° · 63 ° · 93 ° · 117 ° · 147 ° · 177 ° ( 5 ° step) 5 ° · 25 ° · 45 ° · 65 ° · 95 ° · 115 ° · 145 ° · 175 °
Sector Center	selectable in step of 5 °
Tilt Angle	5 ° ~ 0 ° ~ - 90 ° (1° step)
Display Modes	Sonar Mode · Off-center Mode · Bottom Scan Mode · Sounder Mode
Data Display	Range · Range Scale · Tilt Angle · Tilt Angle Diagram · Sector Angle Display · Sector Angle · Interference Reduction Ring Marker (Historical distance, Slant distance, depth) Cross Cursor (Bearing, Historical distance, Slant distance, Depth) Compass display* · Wake Display* · Ship Speed* · LAT/LON Gain Up · TVG Graph · Color Bar Scale · Temperature Scan Image Display (2 types) · Own Ship Position · VRM Depth (on detecting just below the ship)
Other Functions	Operation Modes (3 types) · Off Center, Mark · Mark · Train Correct Target Lock (in Searchlight Mode) · Temperature Adjustment Pulse Width · Color Palett · Gain Control · TVG Control · Dynamic Range Threshold Control · Output Power Reduction · External Trigger Sync. Trigger Signal Output · Hoist/Lower light · Hoist Auto Up · Audio Output
Input Data*	NMEA-0183 · Trigger Signal · Remote Controller
Output Data*	LAT/LON for the target · Trigger Signal

\* Optional interface required.

### ◎ HOIST/LOWER UNIT

Frequency	180kHz OR 80kHz
Sonar Type	Searchlight Sonar
Hoist Stroke	200 ~ 400 m m
Hoist Time	10 seconds (400 m m stroke, 24V power supply) Lowering or Raising automatically
External Output	Trigger Signal
Power Supply	10.5 ~ 30 VDC 110W
Weight	44kg ( tank exclusive)

**RANGE POSITIONS**

RANGE	m			br·fm			ft		
	NORMAL	OFF-CENTER	BOTTOM-SCAN	NORMAL	OFF-CENTER	BOTTOM-SCAN	NORMAL	OFF-CENTER	BOTTOM-SCAN
1	—	—	10	—	—	6	—	—	40
2	—	—	15	—	—	9	—	—	60
3	20	30	20	12	18	12	80	120	80
4	40	60	40	20	30	20	100	150	100
5	60	90	60	30	45	30	120	180	120
6	80	120	80	40	60	40	160	240	160
7	100	150	100	50	75	50	200	300	200
8	120	180	120	60	90	60	240	360	240
9	140	210	140	80	120	80	280	420	280
10	160	240	160	100	150	100	320	480	320
11	180	270	180	120	180	120	360	540	360
12	200	300	200	160	240	160	400	600	400
13	240	360	240	200	300	200	500	750	500
14	280	420	280	240	360	240	600	900	600
15	320	480	320	280	420	280	700	1050	700
16	360	540	360	320	480	320	800	1200	800
17	400	600	400	360	540	360	900	1350	900
18	500	750	500	400	600	400	1000	1500	1000
19	600	900	600	500	750	500	1200	1800	1200
20	700	1050	700	600	900	600	1600	2400	1600
21	800	1200	800	700	1050	700	2000	3000	2000
22	900	1350	900	800	1200	800	2400	3600	2400
23	1000	1500	1000	900	1350	900	3200	4800	3200
24	1200	1800	1200	1000	1500	1000	4000	6000	4000
25	1600	2400	1600	1200	1800	1200	5000	7500	5000
26	2000	3000	2000	1600	2400	1600	6000	9000	6000





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