FURUNO

OPERATOR'S MANUAL

COLOR SEARCHLIGHT SONAR

MODEL   CH – 18

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

•Your Local Agent/Dealer

00080659500

⚠ SAFETY INSTRUCTIONS

"DANGER", "WARNING" and "CAUTION" notices appear throughout this manual. It is the responsibility of the operator of the equipment to read, understand and follow these notices. If you have any questions regarding these safety instructions, please contact a FURUNO agent or dealer.

⚠ **DANGER**	This notice indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.

⚠ **WARNING**	This notice indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **CAUTION**	This notice indicates apotentially hazardous situation which, if not avoided, could result in minor or moderate injury, or property damage.

⚠ WARNING

Do not open the cover of the equipment. This equipment uses high voltage electricity which can shock, burn, or cause death. Only qualified personnel should work inside the equipment.
Do not dissasemble or modify the equipment. Fire, electrical shock or serious injury can result.
Immediately turn off the power at the ship's mains switchboard if water or foreign object falls into the equipment or the equipment is emitting smoke or fire. Continued use of the equipment can cause fire, electrical shock or serious injury.

⚠ CAUTION

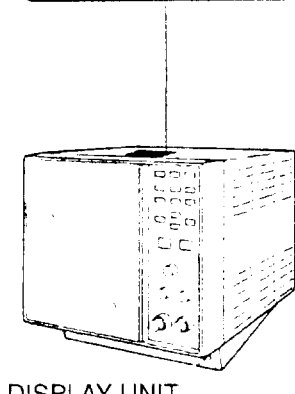| |
|---|
| **Do not place liquid-filled containers on the top of the equipment.**

Fire or electrical shock can result if a liquid spills into the equipment. |
| **Do not place heater near the equipment.**

Heat can melt the power cord, which can result in fire or electrical shock. |
| **Do not operate the unit with wet hands.**

Electrical shock can result. |
| **Use the correct fuse.**

Use of the wrong fuse can cause fire or equipment damage. |
| **Do not exceed speed 15 knots when operating the equipment or during lowering or raising of the transducer.**

The transducer m_y become damaged. |
| **The zinc block attached near the transducer must be replaced yearly.**

The junction between the transducer and main shaft may corrode, which can result in loss of the tansducer or water leakage inside the ship. |

WARNING Label attached

⚠ **WARNING** ⚠
To avoid electrical shock. do not remove cover. No user-serviceable parts inside.
⚠ ▬ ▬ ⚠
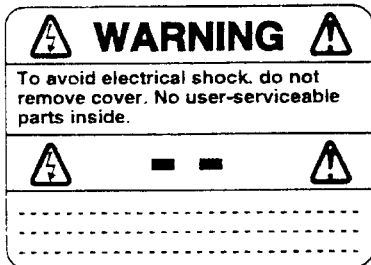
Name :   Warning Label (1)
Type :   86-003-1011-0
Code No. : 100-236-230

DISPLAY UNIT

TRANSCEIVER UNIT

A WORD TO FURUNO CH-18 OWNERS

Congratulations on your choice of FURUNO CH-18 Color Searchlight Sonar! We are confident that you will enjoy many years of operation with this fine piece of equipment.

For over 40 years Furuno Electric Company has enjoyed an enviable reputation for quality and reliability throughout the world. This dedication to excellence is furthered by our extensive global network of agents and dealers.

The CH-18 Color Searchlight Sonar is a microcomputer-controlled up-to-date sonar for small fishing boats developed with our many years of experience and state-of-art technology in the design and manufacture of large sonars. Although the CH-18 is compact and light-weight, it incorporates many useful functions which usually can not be found in this class of sonar and will contribute to modernization and high efficiency of your fishing operation. The excellence of signal processing technique combined with well-suspended sidelobes brings you a high quality 8-color picture on an 8-inch screen.

We would appreciate feedback from you, the end-user, about whether we are achieving our purpose.

Thank you for considering and purchasing Furuno equipment.
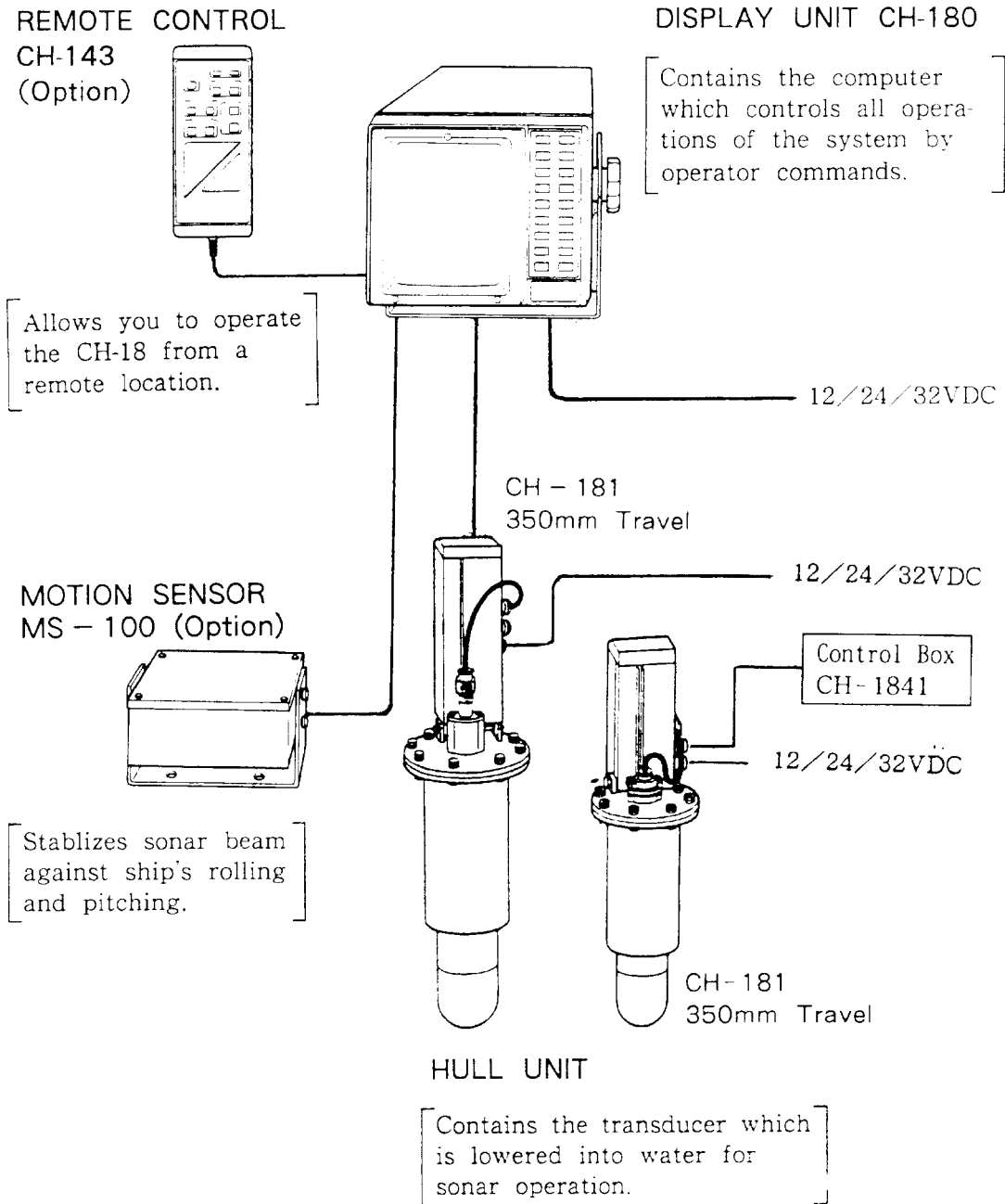
CONTENTS

✳ ✳ ✳ ✳ ✳ ✳ ✳ ✳

1. SYSTEM CONFIGURATION

The CH-18 consists of the following units.

REMOTE CONTROL
CH-143
(Option)

DISPLAY UNIT CH-180

Contains the computer
which controls all opera-
tions of the system by
operator commands.

Allows you to operate
the CH-18 from a
remote location.

12/24/32VDC

CH − 181
350mm Travel

12/24/32VDC

MOTION SENSOR
MS − 100 (Option)

Control Box
CH-1841

12/24/32VDC

Stablizes sonar beam
against ship's rolling
and pitching.

CH-181
350mm Travel

HULL UNIT

Contains the transducer which
is lowered into water for
sonar operation.

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2. OPERATIONAL CONTROLS

The front part of the display unit is separated into two sections : controls on the right-hand side, and the CRT on the left-hand side. Changing a touchpad setting will cause a corresponding change on the screen as well as a change in the appearance of the echoes being viewed.
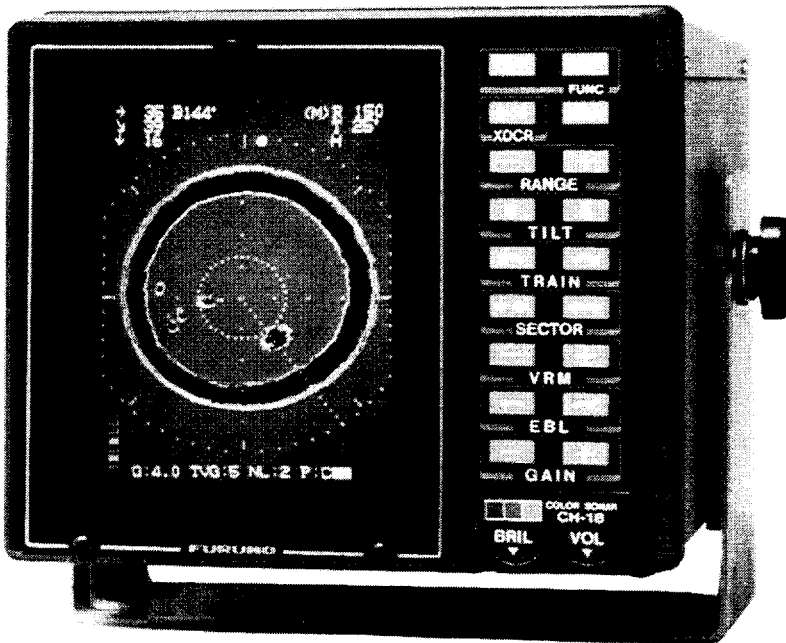
OPERATING CONTROL／KEY

PWR	POWER Key	↰ ↱	TRAIN Key
OFF	OFF (FUNC) Key	⇥⇤ ⇤⇥	SECTOR Key
↑/↓	XDCR (Transducer) Key	− +	VRM Key
MENU	MENU Key	↱ ↰	EBL Key
− +	RANGE Key	− +	GAIN Key
↑ ↓	TILT Key	BRIL	BRILliance Control
		VOL	VOLume Control

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3. BASIC OPERATION

POWER ON/OFF

"ON"   "OFF"

Press PWR key.   Press both PWR and OFF keys simultaneously.

TRANSDUCER RAISE/LOWER
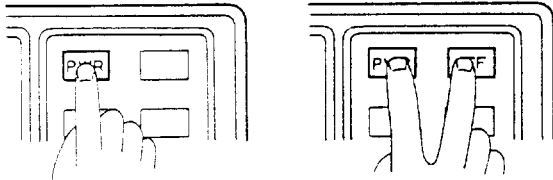
> ⚠ **CAUTION**
>
> **Do not exceed speed 15 knots when operating the equipment or during lowering or raising of the transducer.**
>
> The transducer may become damaged.
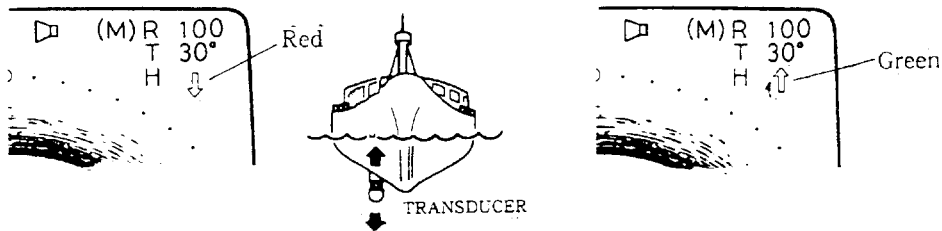
Lower the transducer to use the sonar and retract it into the tank after use.

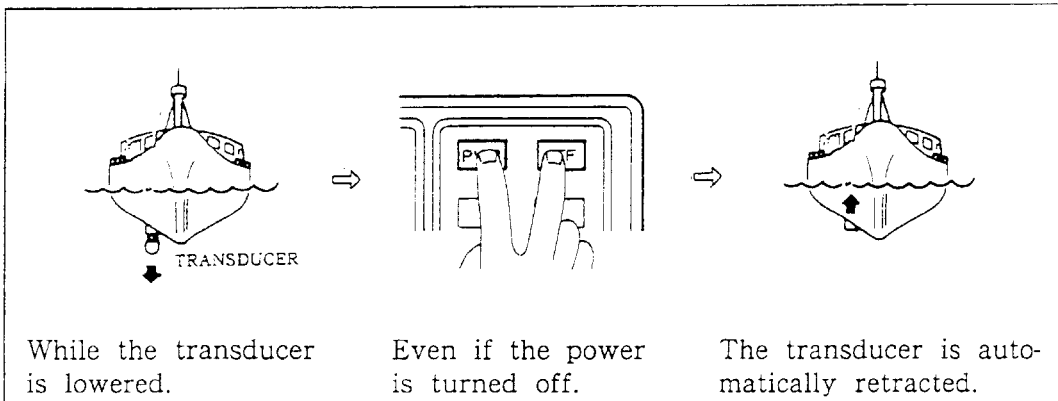"LOWER"   "RAISE"

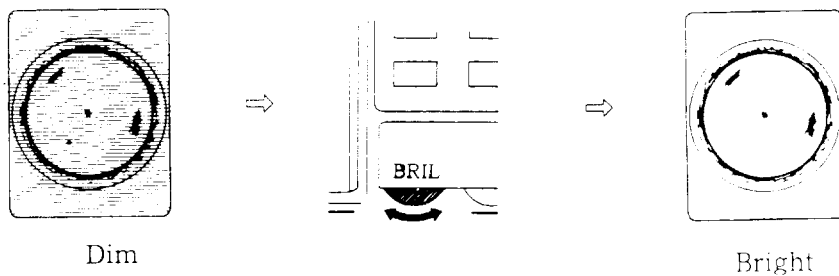Press ↑/↓ (XDCR) key.   Press ↑/↓ (XDCR) key again.

The "↓" indication flickers while lowering the transducer and lights in red when completed.

The "⇑" indication flickers while raising the transducer and lights in green when completed.
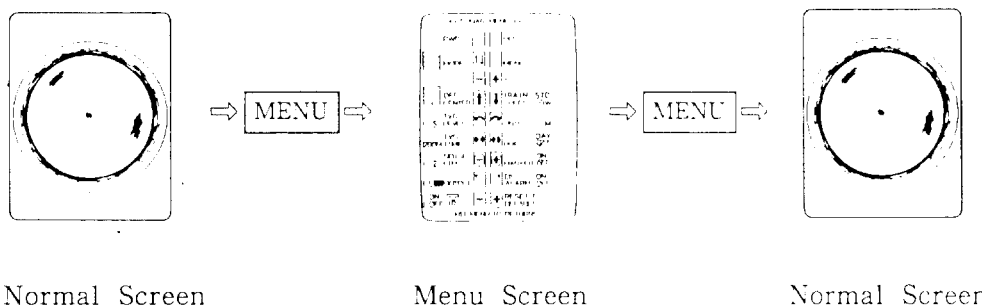
| While the transducer is lowered. | Even if the power is turned off. | The transducer is automatically retracted. |

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BRILLIANCE ADJUSTMENT

The screen brightness is adjustable with the BRIL control.

Dim   Bright

NORMAL/MENU SCREEN SELECTION

Every pressing of the MENU key changes the screen selection between normal and menu.

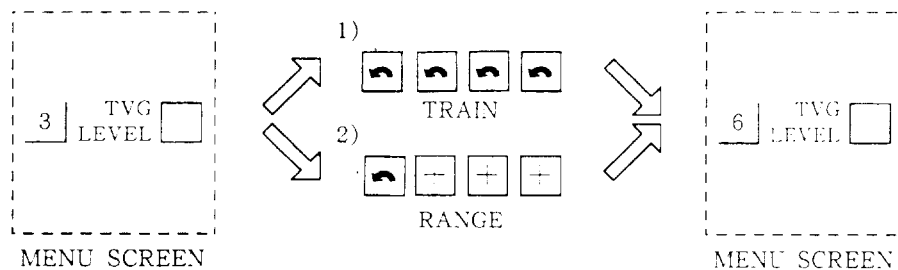Normal Screen   Menu Screen   Normal Screen

KEY OPERATION ON MENU SCREEN

The settings on the menu screen can be changed either by
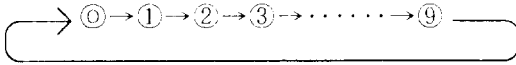1) pressing the corresponding control key repeatedly.
2) pressing the corresponding control key once and then the RANGE $\boxed{-}$
   $\boxed{-}$ keys.

(EXAMPLE) To change TVG LEVEL.

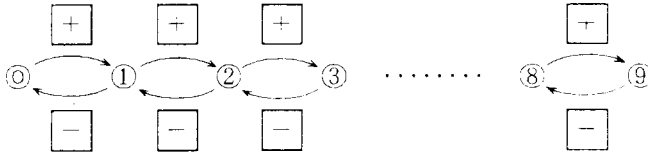MENU SCREEN   MENU SCREEN

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○ Difference Between The Two Methods

1) When only a control key is used, the settings can be changed in one direction.

⓪→①→②→③→‥‥‥‥→⑨

2) When the RANGE [+] and [−] keys are used. the settings can be changed in both directions.

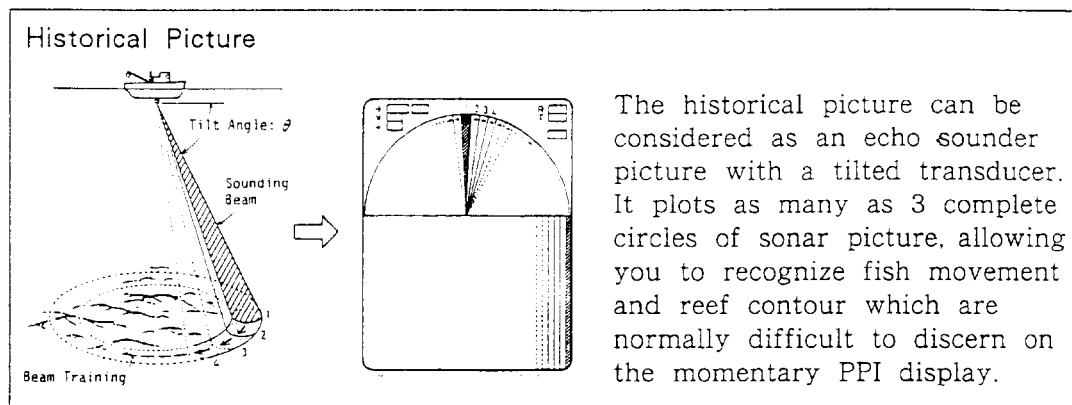| [+] | [+] | [+] | | [+] |
| ⓪ | ① | ② | ③ ‥‥‥‥‥ | ⑧ | ⑨ |
| [−] | [−] | [−] | | [−] |

PICTURE SELECTION

In addition to the normal PPI sonar picture, the following three pictures are available as secondary pictures and one of them which has been pre-selected on the menu screen can be displayed by pressing the OFF (FUNC) key at any time.

S O N A R M O D E	Expanded PPI		Picture is expanded by 50%.
	PPI + Historical		Historical picture is plotted on lower half of the screen.
V / S M O D E	Vertical Sounding		The transducer is tilted 90° and the CH-18 works as vertical sounding echo sounder.

Every pressing of the [OFF] (FUNC) key alternates the normal PPI and the preselected secondary picture.

| Expanded PPI |
| or |
| PPI+Historical |
| or |
| Vert. Sounding |

Historical Picture

The historical picture can be considered as an echo sounder picture with a tilted transducer. It plots as many as 3 complete circles of sonar picture, allowing you to recognize fish movement and reef contour which are normally difficult to discern on the momentary PPI display.
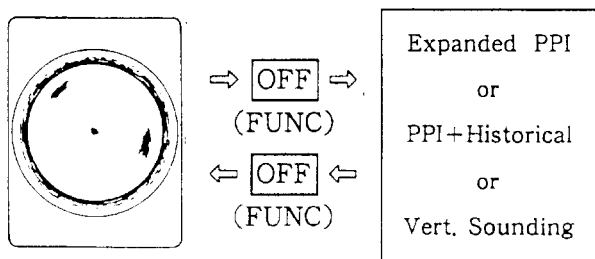
PRE-SETTING OF SECONDARY PICTURE

The secondary picture which is displayed with the [OFF] (FUNC) key can be preset as follows on the menu screen.

Menu Screen
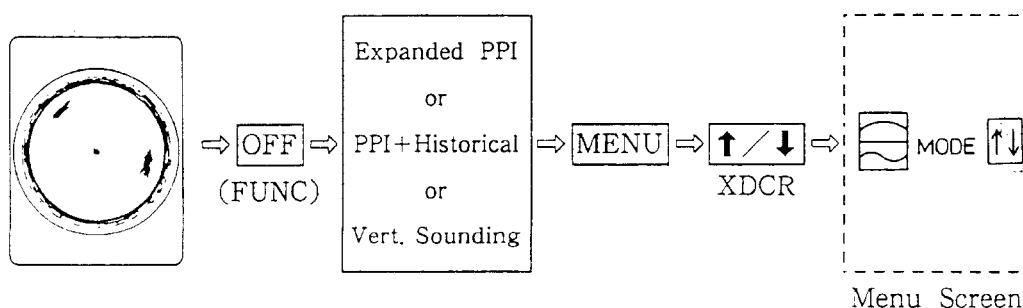
NOTE :   To preset a secondary picture, the [MENU] key should be pressed when a picture other than the normal PPI is being displayed.

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4. SONAR MODE OPERATION

(NORMAL PPI, EXPANDED PPI, PPI + HISTORICAL)

PICTURE RANGE SELECTION

The picture range may be selected with the RANGE ⌈+⌉⌈−⌉ keys from the
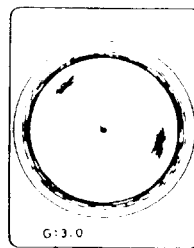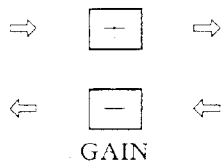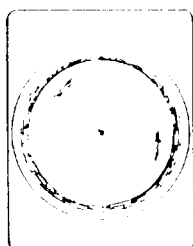11 ranges listed below.
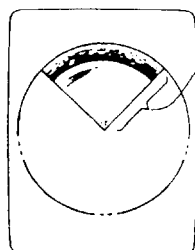
Picture Range

	1	2	3	4	5	6	7	8	9	10	11
Meter	10	20	40	60	100	150	200	250	300	400	600
Foot	30	60	100	200	300	400	600	800	1000	1200	2000
Fathom	5	10	20	40	60	80	100	120	150	200	300

GAIN ADJUSTMENT

The picture (receiver) sensitivity is adjustable with the GAIN ⌈+⌉⌈−⌉ keys
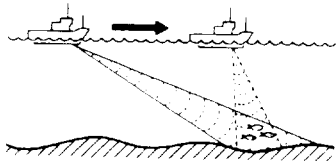from "0" to "10" in steps of 0.5. Normally it is used at "5" position.

GAIN

Gain Setting

TILT ADJUSTMENT

The sounding direction (tilt angle of the transducer) may be set with
the ⌈↑⌉⌈↓⌉ keys : 0° for horizontal and 90° for vertical directions. It is
normally set so that the seabed echoes appear near the screen edge.

Own Ship
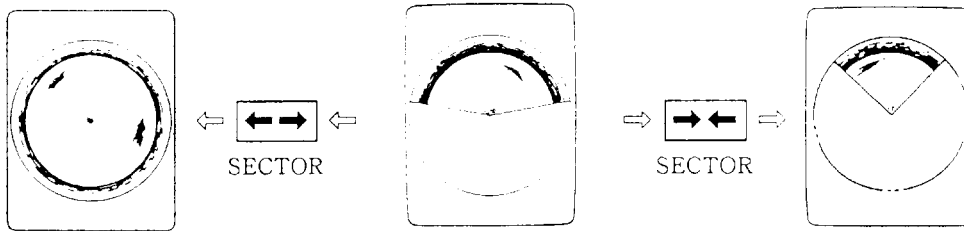
Seabed

Tilt Angle

Fish School

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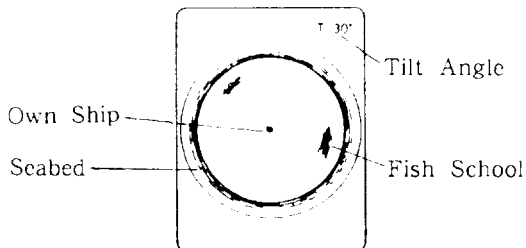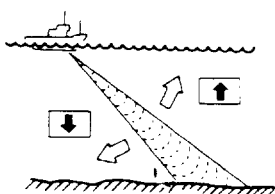
Tilt angle should be kept adjusted

The tilt angle should be continually adjusted after a fish school is detected so as not to miss it as the ship moves.

SEARCH AREA SETTING

The search area can be set with the SECTOR ⟵→ →⟵ keys from 6° to 360° in 8 steps.

⟸ SECTOR ⟸ ⟹ SECTOR ⟹

Selecting Appropriate Search Area

The search time depends on the width of the search area. Select an appropriate width to serve the desired purpose.
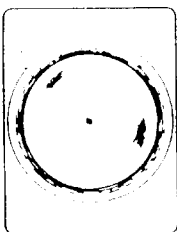
Full circle search until a fish school is detected.
Time required to search 360° is 27 secs on 300m range.
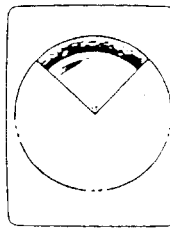
Narrow search area for tracking fish school and seeking reefs.
Time required to search 96° is 7 secs on 300m range.

SEARCH DIRECTION SETTING

When the detected fish school moves out of the present search area, change the direction of the search area with the TRAIN keys. The center direction of the area is displayed with the "○" mark.

Searching Center

⟸ ⟸ ⟹ ⟹
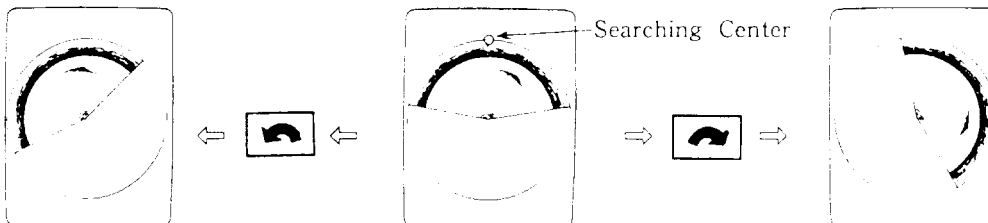
OFF-CENTERING EXPANDED PPI PICTURE

The expanded PPI picture may be off-centered in 45° steps to 8 directions on the menu screen.

⇒ MENU ⇒ ↑ ⇒
TILT

OFF-CENTER

MENU SCREEN

The MENU key should be pressed when the expanded PPI picture is being displayed.

MEASURING RANGE AND BEARING TO FISH SCHOOL

To measure range and bearing to a fish school (target), move the VRM (Variable Range Marker) and EBL (Electronic Bearing Line) markers onto the fish school with the ⊕ and ⊖ keys of the VRM switch and ⬤ ⬤ keys of the EBL switches.

Display Data

EBL Marker

VRM Marker

→ Horizontal distance to fish school.

↘ Slant range.

↓ Depth of fish school.

B Bearing of bearing marker.
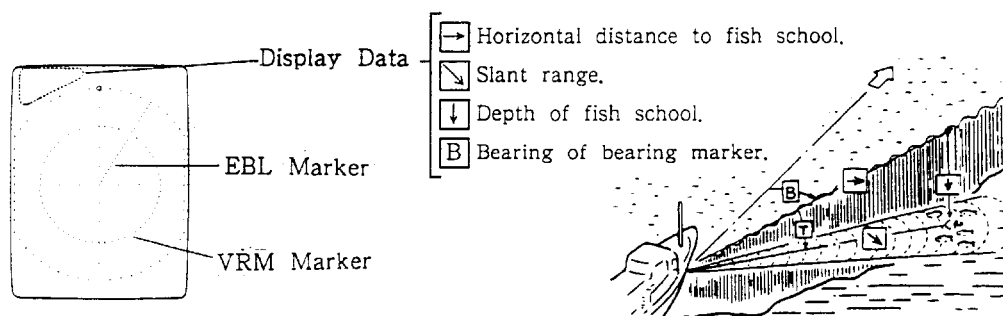
DETECTING A FISH SCHOOL WITH ALARM FUNCTION
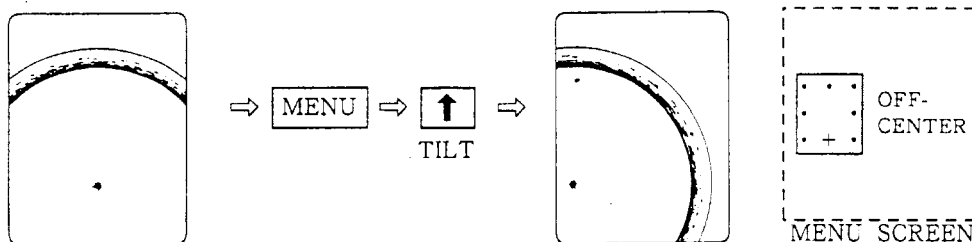
When you are occupied with other tasks and unable to concentrate on watching the picture, use the alarm function. The alarm function enables you to aurally detect a fish school appearing in a predetermined zone through the loudspeaker. The alarm zone is set with the VRM marker as shown below.

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MENU SCREEN

MENU ⇒ [🐟] ⇒ | ▷   ON | ⇒ MENU ⇒ [⊕] [⊖]
              | ALARM OFF | VRM

Alarm Zone

VRM marker
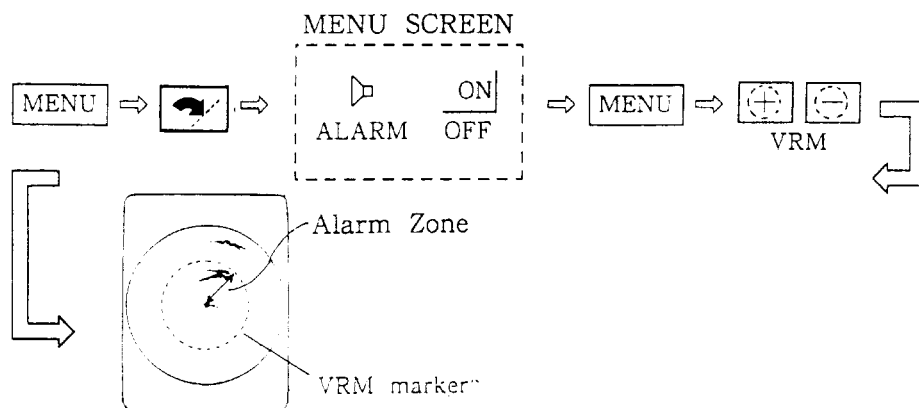
The audio alarm is triggered by echoes displayed in red and reddish brown regardless whether they are from a fish school or seabed.

UTILIZING AUDIO FOR FISH DETECTION

In addition to the alarm function mentioned above, the audio from the external loud speaker can be used for fish detection. Since echoes from fish school generally sound in a different tone, it would become possible to detect a fish school from a range longer than that detected on the display when you are accustomed t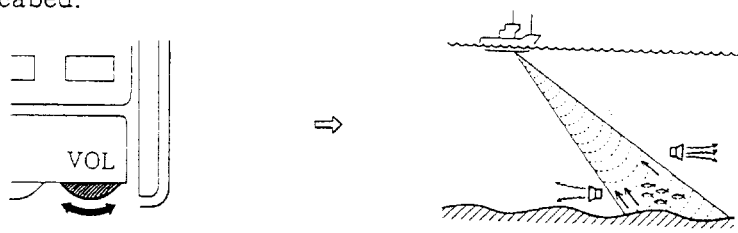o using this audio function. Note that in case of the alarm function, the tone is the same for both fish school and seabed.

VOL   ⇒

ELIMINATING LOW LEVEL NOISE

When low level noise appears over an extended area of the screen, mainly due to contaminated water, use the NOISE LIMiter function to eliminate it.

⇒ MENU ⇒ [⊖] ⇒
             VRM

| 2 NOISE LIM

MENU SCREEN
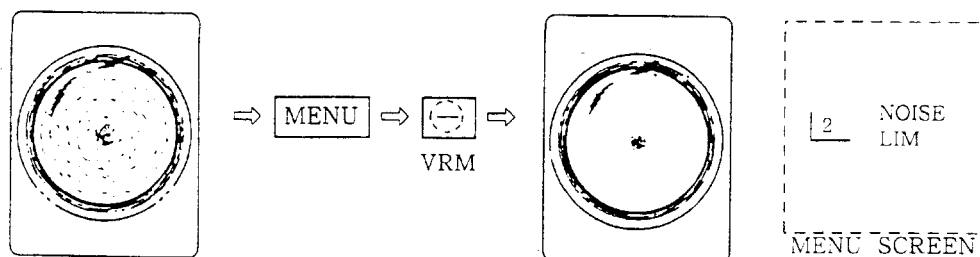
Usually set it to "2" or "3". Too high a setting causes weak echoes (displayed in green or light blue) to go undetected.

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ELIMINATING INTERFERENCE

When interference from other acoustic equipment operating nearby or other electric equipment can be seen on the screen. use the IR (Interference Rejection) function.

⇒ MENU ⇒ | — | ⇒
GAIN

```
+-----------------+
| ON     [///]    |
| OFF     IR      |
+-----------------+
  MENU  SCREEN
```
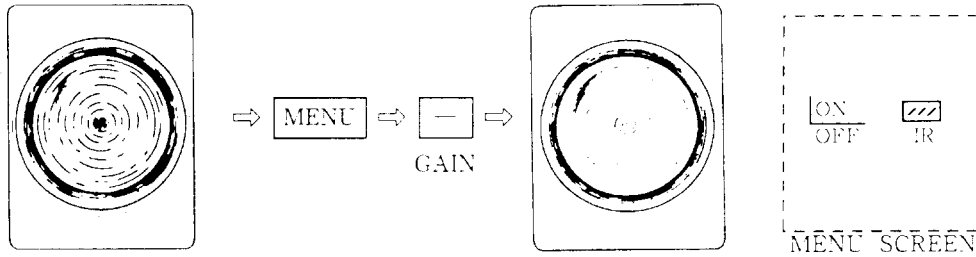
CHANGING TVG SETTING

The TVG setting can be changed on the menu screen.

Changing TVG Level ⇒ MENU ⇒ [🔄]
TRAIN

Changing TVG Range ⇒ MENU ⇒ [→ ←]
SECTOR

```
+-----------------+
| [ 5 ]    TVG    |
|          LEVEL  |
| [200M]   TVG    |
|          RANGE  |
+-----------------+
  MENU  SCREEN
```
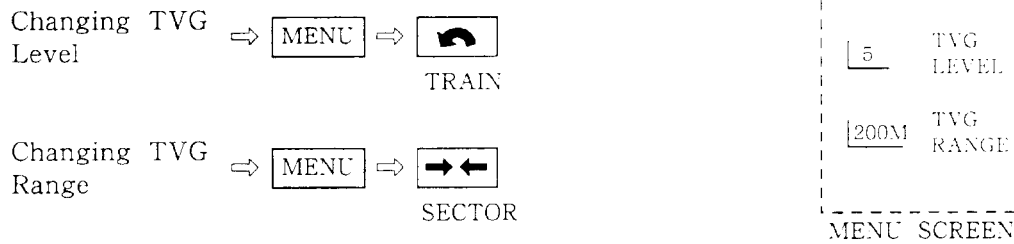
The standard setting is "5" for TVG level and "200m" for TVG range.

HOW TVG WORKS

The TVG compensates for receiver gain in accordance with distance in order to suppress noise caused by sea surface reflections and to display the echoes of equal size targets in the same color.

Without TVG function

Proper TVG setting

Noise caused by strong reflection of surface turbulence

Nearer target echoes appear in bigger size.

Echoes of equal size targets are presented in the same color and size.
Noise is rejected.
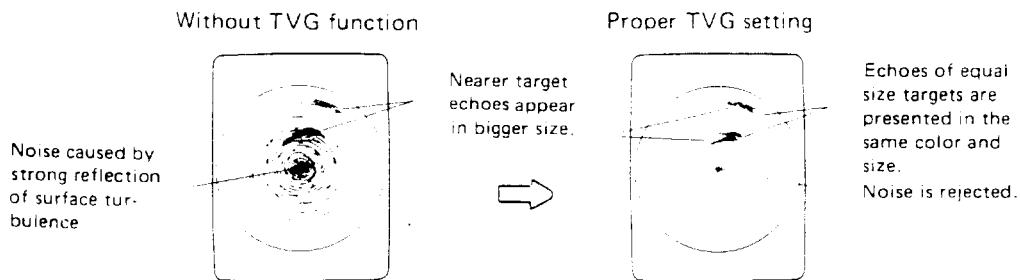
The TVG range and level may be adjusted as follows.

Adjust TVG range.

Adjust TVG Level.
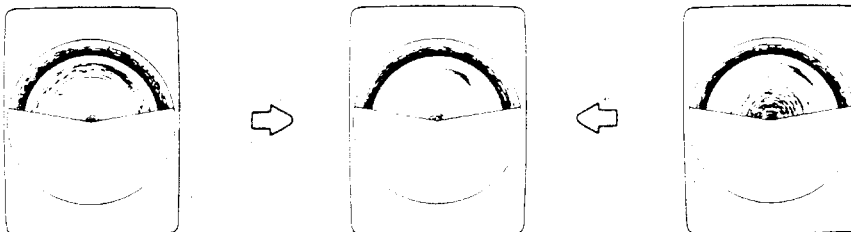
CHANGING TRAIN SPEED

Two train speeds (rotation speed of transducer) are available and either of them can be selected on the menu screen.

MENU ⇒ ↓ ⇒

TRAIN SPEED   STD / LOW

MENU SCREEN
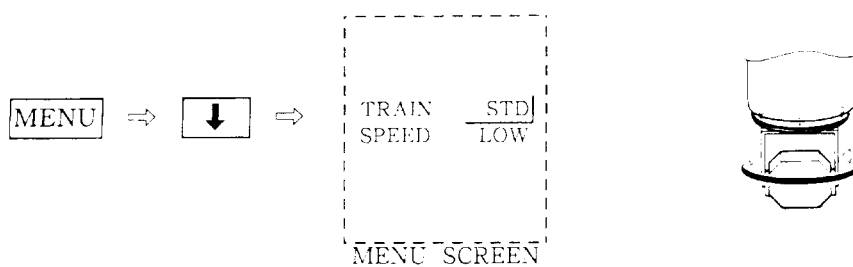
The standard speed is recommended for quick searching of a wide area and to track fish schools which swim fast. In the low speed setting, higher sensitivity can be expected.

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REDUCING OUTPUT POWER

When many ships are operating nearby and operating echo sounders or sonars at the same frequency as the CH-18, it is recommended that the output power be reduced to avoid mutual interference.
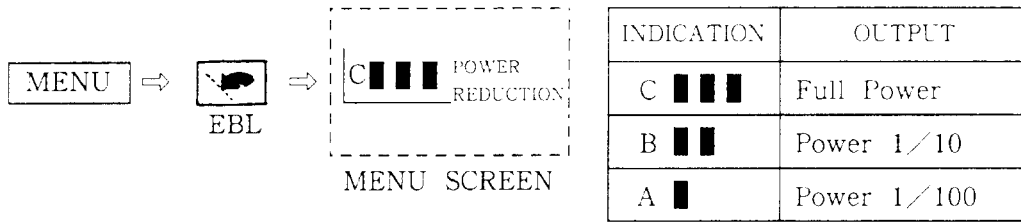
MENU ⇨ [EBL] ⇨ C■■■ POWER REDUCTION

MENU SCREEN

INDICATION	OUTPUT
C ■■■	Full Power
B ■■	Power 1/10
A ■	Power 1/100

HOW TO OBTAIN QUALITY PICTURE

Most of poor detecting range complaints result from improper settings of keys. For example, fish, fish habitat can not be readily detected by merely increasing the gain. Adjust appropriate settings by carefully studying the picture.

Weak Echoes   Adjust

⇨ Gain
Page. 7

Difficult to detect fish or fish habitat ⇨

Random Noise

⇨ NOISE LIM
Page. 10

Surface Noise

⇨ TVG
Page. 11

Interference

⇨ IR
Page. 11

13
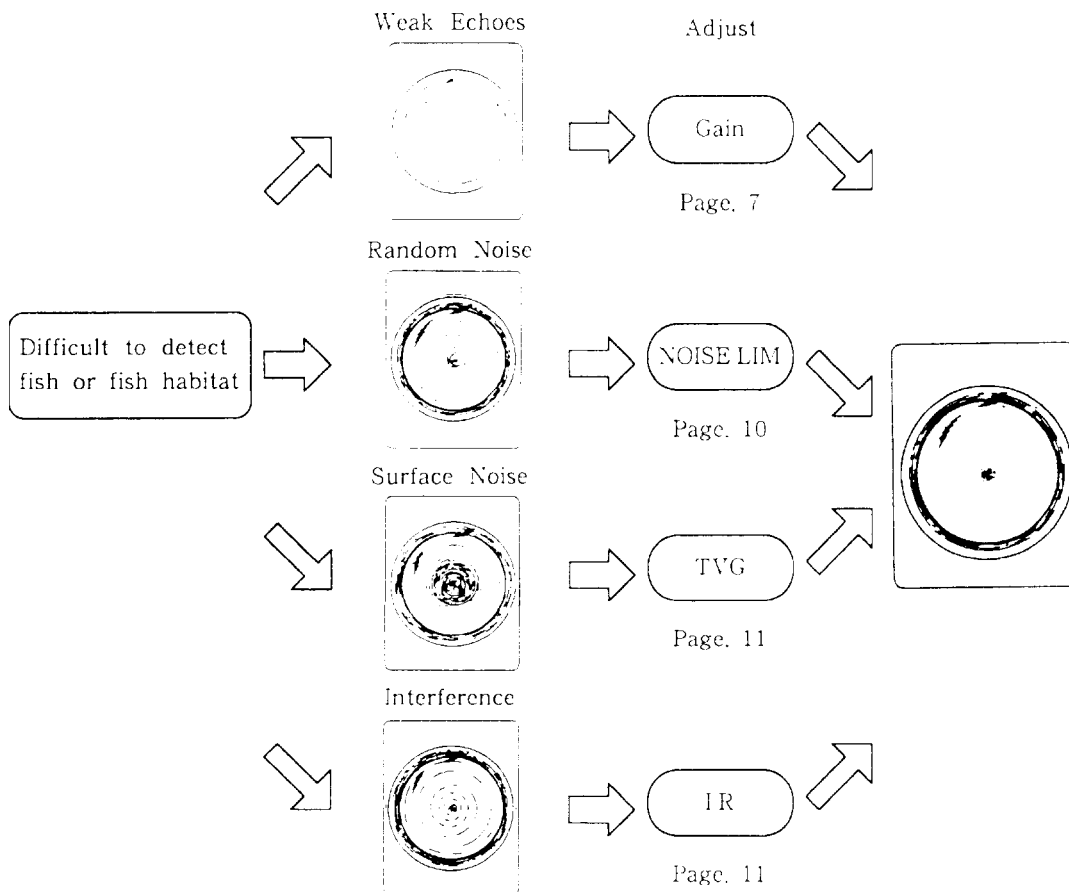
5. VERTICAL SOUNDING (V/S) MODE OPERATION

● This mode can be used even while the transducer is retracted into tank.

PICTURE RANGE SELECTION

The picture range may be selected with the RANGE ⊞⊟ keys from the 11 ranges listed below.

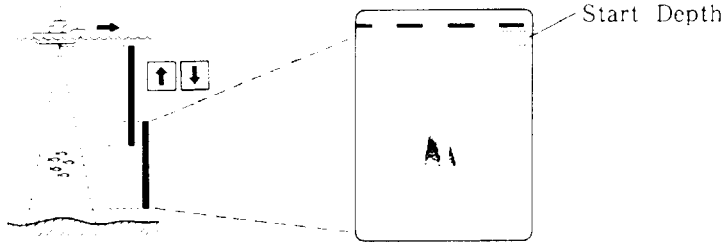Picture Range

	1	2	3	4	5	6	7	8	9	10	11
Meter	10	20	40	60	100	150	200	250	300	400	600
Foot	30	60	100	200	300	400	600	800	1000	1200	2000
Fathom	5	10	20	40	60	80	100	120	150	200	300

RANGE PHASING

The range phasing is to shift the start depth of the picture displayed on the screen. It can be shifted in steps of 1/5 of the picture range with the TILT ⬆⬇ keys.
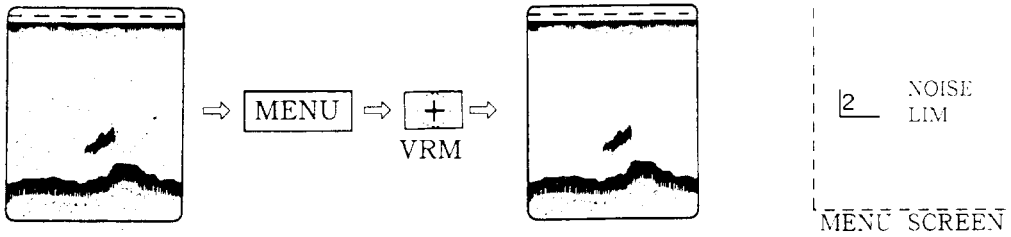
Start Depth

GAIN ADJUSTMENT

The receiver sensitivity is adjustable with the GAIN ⊞⊟ keys. Set it to the point just below where excessive noise appears on the screen. Normally it is set around "5".

⇐ ⊞ ⇐ GAIN   ⇒ ⊟ ⇒ GAIN

ELIMINATING LOW LEVEL NOISE

When blue dots appear on the whole screen, mainly due to contaminated water, use the NOISE LIMiter function.


Normal setting is "2" or "3". Too high a setting causes weak fish echoes to be eliminated.

ELIMINATING INTERFERENCE

When interference from other acoustic equipment operating nearby or other electric equipment can be seen on the screen, use the IR (Interference Rejection) function.

Interference from other
electric devices.

Interference from nearby
echo sounders.

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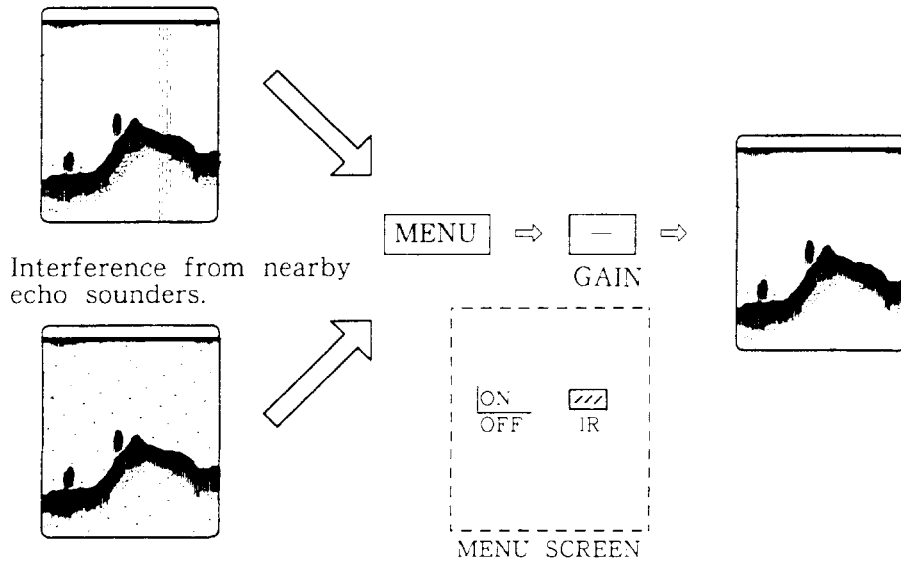
ELIMINATING SURFACE NOISE

When surface noise masks a shallow target, adjust the TVG settings on the menu screen. In addition to suppressing surface noise, the TVG works to compensate for propagation loss of sound so that the echoes from the same size fish schools are displayed in the same color.

TRAIN

⇒ MENU ⇒ or ⇒

SECTOR

TVG
5 LEVEL

200M TVG
RANGE

MENU SCREEN
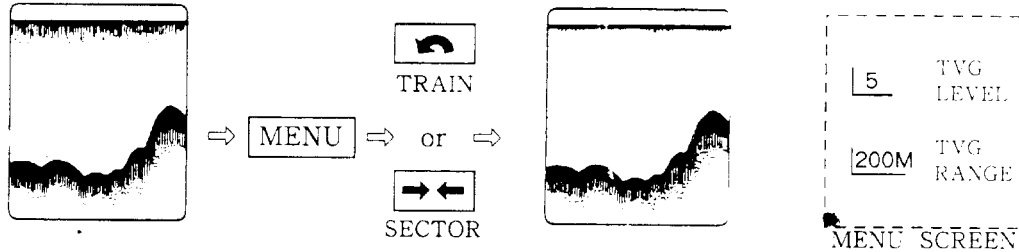
MEASURING DEPTH OF A FISH SCHOOL

To measure the depth of a fish school accurately, use the VRM marker.

VRM   or   VRM   ⇒

Depth
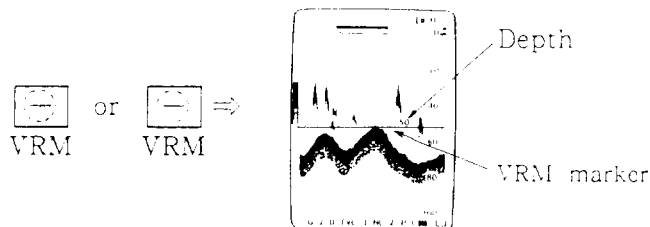
VRM marker

DETECTING A FISH SCHOOL AURALLY

The alarm function enables you to aurally detect a fish school appearing in a predetermined zone through the loudspeaker. The alarm zone may be set with the VRM marker.

MENU ⇒ EBL ⇒

ALARM   ON
         OFF

MENU SCREEN

⇒ MENU ⇒ VRM or VRM

ALARM ZONE

VRM MARKER

⇒

VOL

⇒
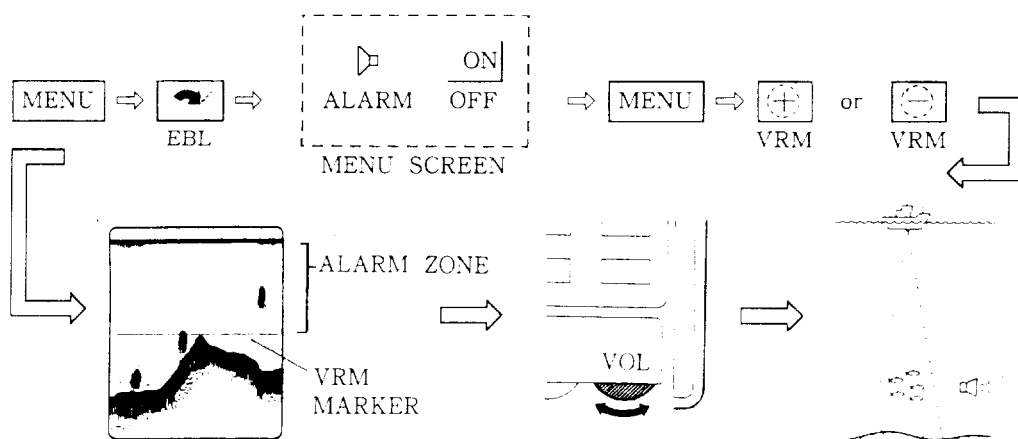
The audio alarm is triggered with echoes displayed in red or reddish brown regardless whether they are from a fish school or seabed.

REDUCING OUTPUT POWER

When many ships are operating nearby and operating echo sounders or sonars at the same frequency as the CH-18, it is recommended that the

MENU SCREEN

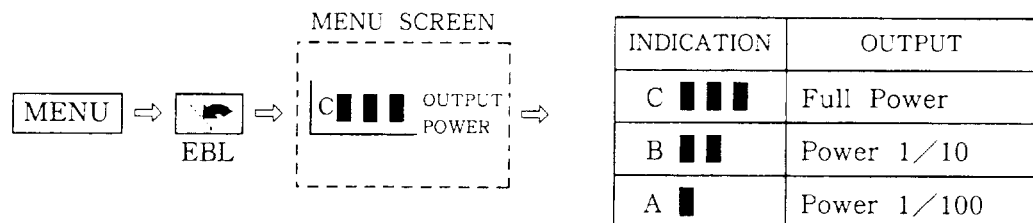$\boxed{\text{MENU}} \Rightarrow \boxed{\text{\Large ☛}} \Rightarrow$ C ■ ■ ■ OUTPUT POWER $\Rightarrow$
                    EBL

| INDICATION	OUTPUT
C ■ ■ ■	Full Power
B ■ ■	Power 1/10
A ■	Power 1/100

output power be reduced to avoid mutual interference.

6. OPERATIONS COMMON TO SONAR AND VERTICAL SOUNDING MODES

● The following settings are common to both sonar and vertical sounding modes and can be changed on either menu screens.
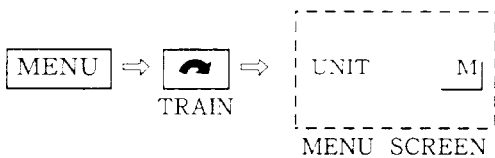
BACKGROUND COLOR SELECTION

The background color can be changed for day and nighttime operations ; blue for day and black for night.

MENU ⇒ [→ ←] ⇒ | HUE   DAY
         SECTOR   NGT |
              MENU SCREEN
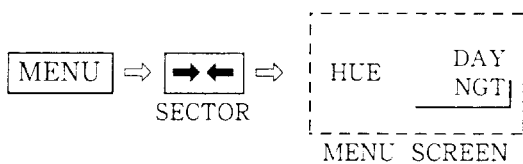
UNIT SELECTION

The unit of range and depth display can be selected among meter (M), foot (FT) and fathom (FA).

MENU ⇒ [⌢] ⇒ | UNIT   M |
         TRAIN
              MENU SCREEN

ON/OFF OF VRM AND EBL MARKERS

The VRM and EBL markers can be turned on/off on the menu screen with the VRM [⊕] key.

MENU ⇒ [⊕] ⇒ | MARKER ON/OFF |
         VRM
              MENU SCREEN

MENU ⇒ [⌐] | ▷ ALARM ON/OFF |
         EBL

18
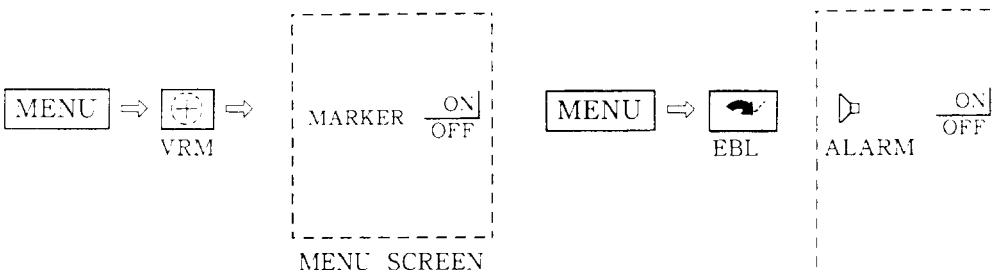
7. USEFUL FUNCTION

RESTORING TO STANDARD SETTING

When you are lost in operation and unable to restore the desired picture, try to press |MENU| and GAIN | + | and then |MENU| keys, and all settings on the menu screen are returned to the standard settings.
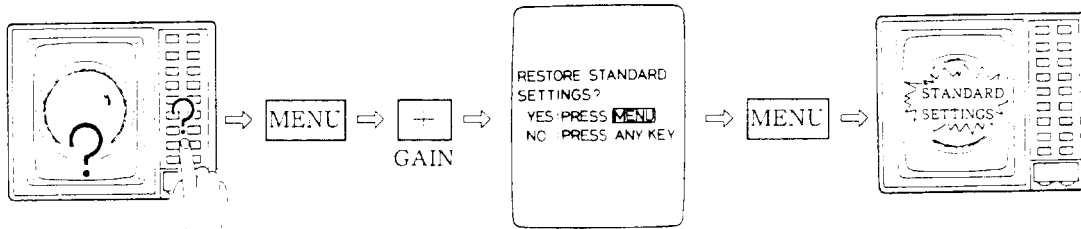
Note that only the settings on the displayed menu screen are reset.

SETTING MENU SCREEN WHILE OBSERVING PICTURE

When the TVG, NOISE LIM, IR or OUTPUT item is selected on the menu screen, the sonar picture is automatically superimposed and the settings can be adjusted while observing it.
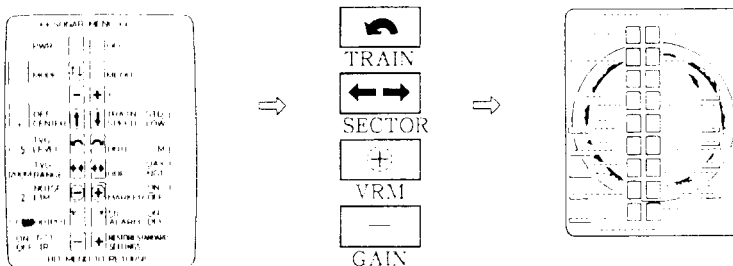
In the menu screen of the vertical sounding mode, the picutre is always displayed at the left 15% of the screen.

SONAR MODE SETTINGS ARE INDEPENDENT OF VERTICAL SOUNDING MODE SETTINGS

The settings are mutually independent on the sonar and vertical sounding modes and therefore even if the gain is, for example, adjusted on the sonar mode, the gain of the vertical sounding picture is unaffected.

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SWITCH SETTINGS ARE REMEMBERED

Since most of the switch settings are remembered in the memory while the power is off, your CH-18 operates in the same settings when used in the next time.

OFF and ON   Angle not changed
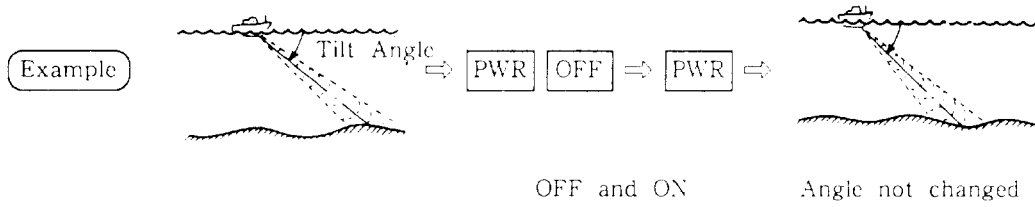
8. INTERPRETING THE PICTURE

SONAR MODE

PPI+Historical Display

```
→  46  B330°        ⊅   (M)R 100
↘  53                    T  30°
↓  26         ·   ○  ·        H  ⟨⟩
```

```
G:3.0  TVG:5  NL:2  P:C▮▮▮  ▱
```
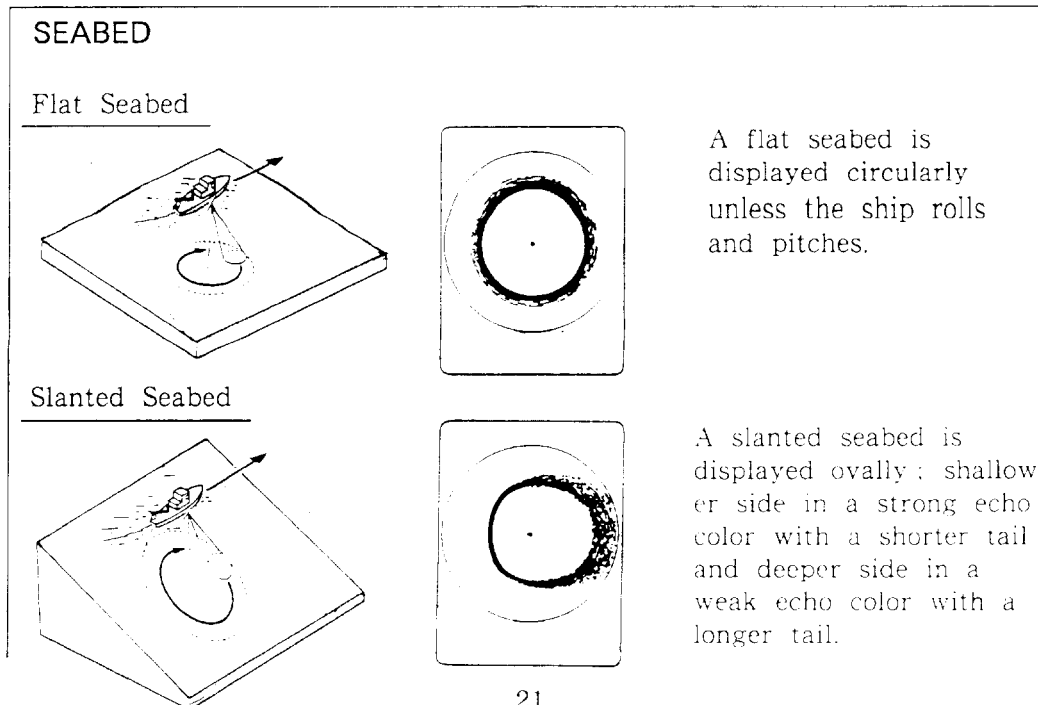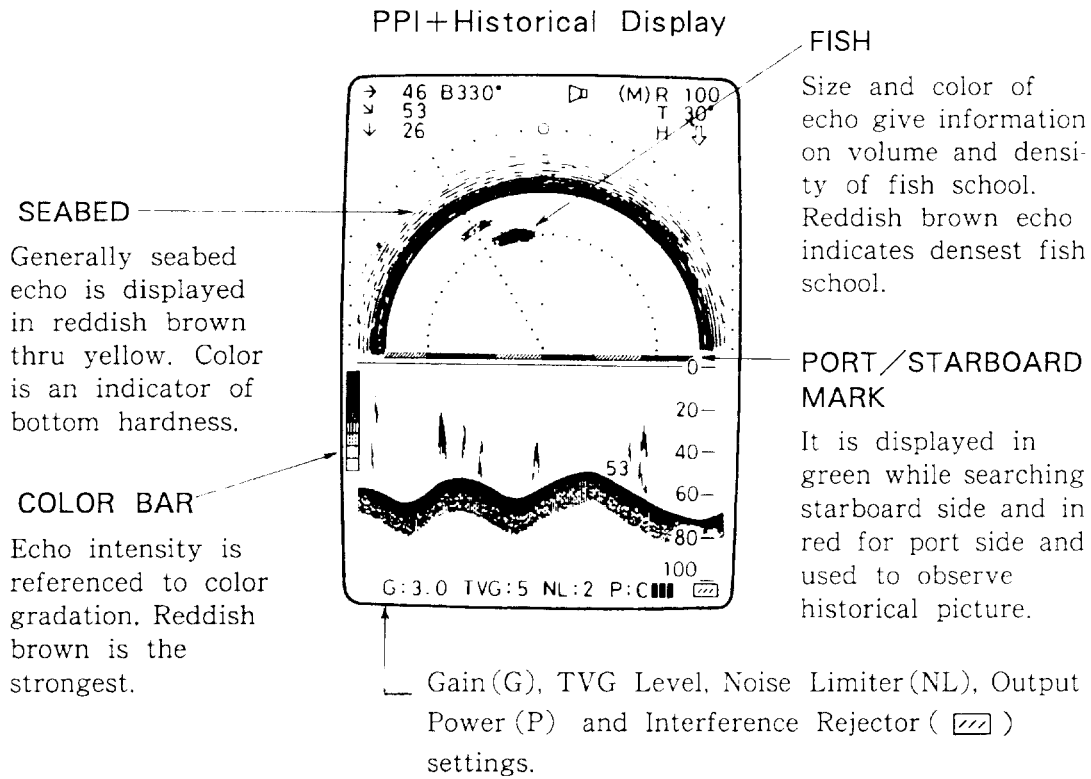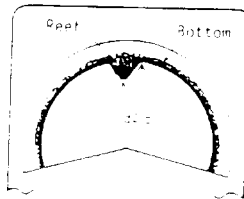
```
        0
     20 —
     40 —
  53
     60 —
     80 —
    100
```

FISH

Size and color of echo give information on volume and density of fish school. Reddish brown echo indicates densest fish school.

SEABED

Generally seabed echo is displayed in reddish brown thru yellow. Color is an indicator of bottom hardness.

COLOR BAR

Echo intensity is referenced to color gradation. Reddish brown is the strongest.

PORT/STARBOARD MARK

It is displayed in green while searching starboard side and in red for port side and used to observe historical picture.

⌐ Gain(G), TVG Level, Noise Limiter(NL), Output Power (P) and Interference Rejector (▱) settings.

SEABED

Flat Seabed

A flat seabed is displayed circularly unless the ship rolls and pitches.

Slanted Seabed

A slanted seabed is displayed ovally ; shallower side in a strong echo color with a shorter tail and deeper side in a weak echo color with a longer tail.
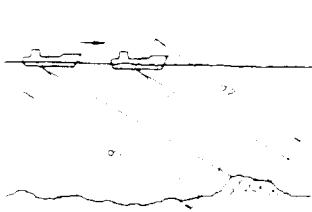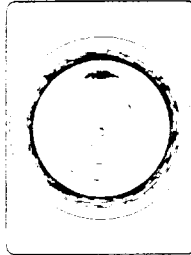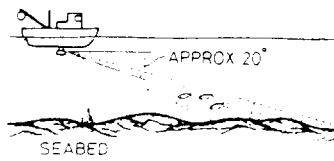
21

Reef or Wreck

A reef or wreck is displayed in red or reddish brown as a part of the seabed protruded inward, when detected at the lower part of the beam.
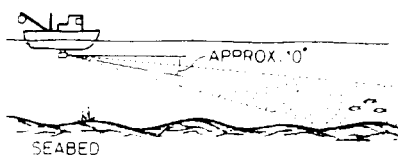
FISH

Deep Tilt Angle

APPROX 20°

SEABED

Since the seabed is displayed in strong echo colors, only the fish appearing before the seabed echo can be detected.

Shallow Tilt Angle

APPROX. '0'

SEABED

The seabed is displayed in weak echo colors and fish echoes among seabed echoes become discernable, longer range detection becoming possible.

When Beam Hits Side of Fish
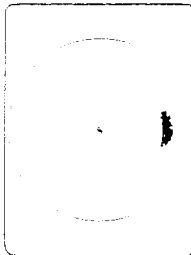
Since fish return strong echoes, they are displayed in strong echo colors. A long detection range can be expected.

When Beam Hits Head/Tail of Fish

Fish return weak echoes and therefore detecting range is limited.

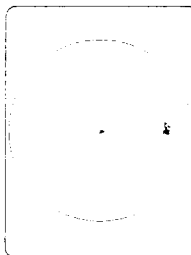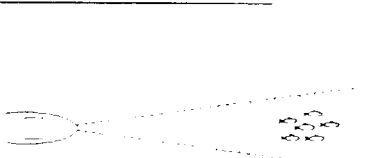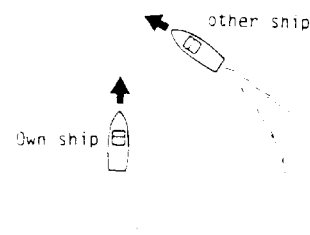## UNWANTED ECHOES

Wake

other ship

Own ship

As the wake appears as a thick continuous line, it can be easily distinguished from a fish school. However, sounding beyond the wake becomes often difficult because of air bubbles in the wake.

Propeller Noise

other ship

Own ship
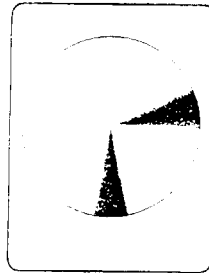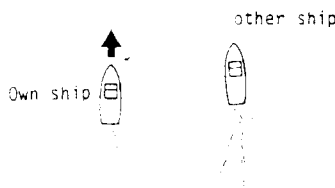
When other ship is nearby, noise caused by revolution of propeller may appear as a thick line spreading radially.

VERTICAL SOUNDING MODE

ALARM MARK

It is displayed when the alarm function is turned on.

MINUTE MARK

Minute mark is displayed 30 seconds every minute.

TRANSDUCER

Color changes to red when the transducer is lowered and green when it is retracted.

SEABED

Generally it is displayed in reddish brown or red.

TRANSMISSION LINE

It shows the transducer position i.e., ship's hull bottom.

DEPTH

Seabed depth is displayed.

67M

G:2.0 TVG:3 NL:2 P:C

FISH SCHOOL

Size and color of echo give information on volume and density of fish school.

9. MAINTENANCE AND PERIODICAL CHECK

● Observing the following points will help to keep your CH-18 in top condition for many years.

Keep screen and filter clean ! Put on cover after operation.

Do not use thinner or benzine for cleaning. Use a damp and soft cloth.

Keep heater away ! Allow room for ventilation.
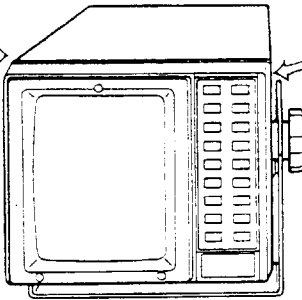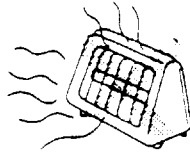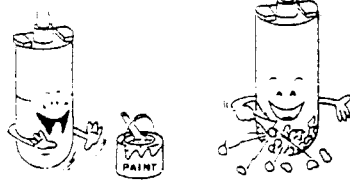
⚠ WARNING

Do not open the cover of the equipment.
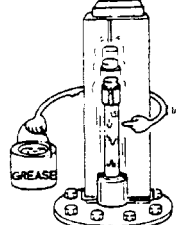
This equipment uses high voltage electricity which can shock, burn, or cause death. Only qualified personnel should work inside the equipment.

Apply grease to hull unit shaft periodically !

Keep soundome clean !

● Don't paint soundome.

● Carefully scrape off marine growth at dry-docking.

Tighten grease cotton retainer if water leaks thru main shaft.
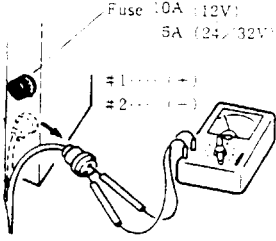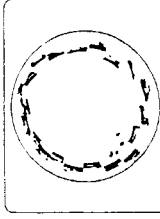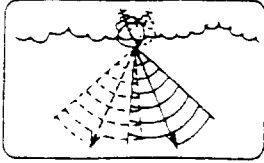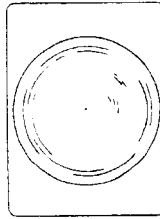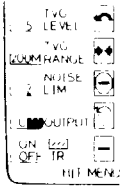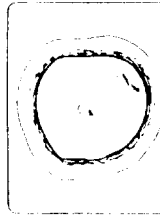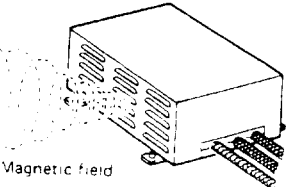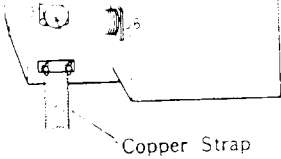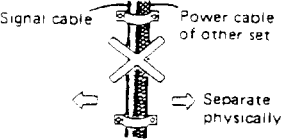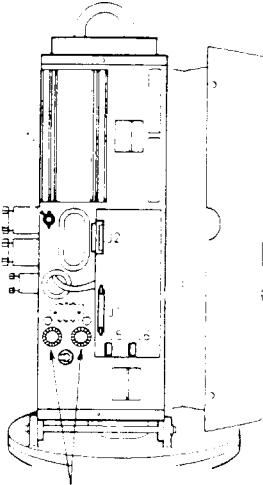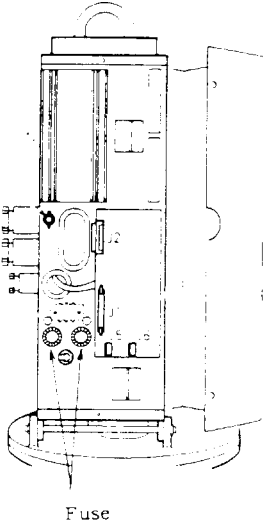
M8x25
- F.W

Do not tighten excessively.
(7 to 9mm)

Grease Cotton Retainer

Grease Cotton

Main Body Flange

O-ring

⚠ CAUTION

The zinc block attached near the transducer must be replaced yearly.

The junction between the transducer and main shaft may corrode, which can result in loss of the tansducer or water leakage inside the ship.

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10. TROUBLESHOOTING

If your CH-18 seems faulty, look over the following check list. If proper operation cannot be restored, call for service, informing service personnel of the symptom and the result of the self check shown on page 25.

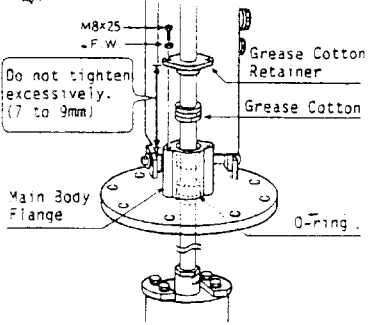| Symptom	Check
No picture	● **Power supply is OK?** Check ship's mains voltage at the power plug connected to the display unit. ● **Fuse is OK?** Replace the fuse if blown. Call service personnel if it blows again after replacement.
Bottom echo becomes irregular	● **Sea is rough?** Distance to seabed changes due to rolling and pitching. ● **Long range is selected?** Since receiving time is longer, ship's rolling and pitching are apt to effect detection of echo.
Feable echo	● **Output power is set to "C"?** Check the setting on the menu screen and set it to "C" (maximum output power) if not set so. ● **TVG effect is excessive?** An excessive setting of TVG results in disappearance of useful echoes.
distorted Picture	● **Equipment generating strong magnetic field is sited nearby?** Make sure that magnetic field generating equipment such as a rectifier is separated sufficiently from the display unit.

Symptom	Check
          Noisy picture	● Equipment is grounded firmly ? Carefully check the ground. ● Other cable is run along with signal cable ? The signal cable may pick up noise emitted from the power cable of other equipment if they are too close to each other. Separate them if necessary. ● Seawater is dirty with floating debris ? Reject unwanted echoes with the interference rejector, TVG or noise limiter function. Copper Strap Signal cable Power cable of other set Separate physically
    TRAIN NG "TRAIN NG" appears	● No bearing signal comes from the hull unit. Message "TRAIN NG" means that the transducer is not rotating properly. Check the fuses in hull unit. If not blown, raise transducer, turn off power and call for service.
    TILT NG "TILT NG" appears	● No tilt signal comes from the hull unit. Message "TILT NG" means that the transducer is not tilting properly. Check the fuses in hull unit. If not blown, raise transducer, turn off power and call for service. Fuse

DIAGNOSTIC SELF-CHECK

The major circuits of the set can be checked with the self-check facility. If you suspect something is wrong with your set, turn off the set and turn it on again by pressing the PWR and GAIN + keys simultaneously, and the following self-check page is displayed. If any abnormality is found, call for service and report the check results to the service personnel.

```
  PWR        +
         ⇩  GAIN
```

```
         ** SELF TEST **

  —MAIN CPU—              —PANEL—
   0650026-00                *    0
   ROM       OK
   RAM       OK             0    0

  —SUB-CPU—                 0    0
   0650027-00               0    0
   ROM       OK
   RAM       OK             0    0

  —VIDEO RAM—               0    0
   ECHO D0:OK D1:OK D2:OK
   CHR       OK             0    0

  —CLINOMETER—              0    0
   ROLL     -12°
   PITCH    -05°  —DIP SWITCH—   01

  —TRAIN/TILT MOTOR TEST— COUNT 6

   TRAIN       NG    TILT          NG
   0>180  529   0    +8>30  313     0
   180>0  541   0    30>93  454     0
   180<0  531   0    30<93  449     0
   0<180  539   0    -8<30  319     0
```

● MAIN CPU/SUB CPU Check

Test of the memory chips that the built-in computers use. If faulty, "NG" (No Good) is displayed instead of "OK".

● PANEL Check

The numeral should change to "1" each time a key is pressed and held for one or two seconds..

● TILT MOTOR Check

Number of "NG" increases when the number of pulses used to tilt the transducer is incorrect. When it increases frequently, the set is faulty.

● TRAIN MOTOR Check

Number of "NG" increases whenever the number of pulses used to train the transducer is incorrect. When the NG number increases frequently, the set is faulty.

● CLINOMETER Check

Check of optionally supplied motion sensor. It is normal if the value changes with ship's rolling and pitching.

● VIDEO RAM Check

Test of memory chips that store video data to be displayed on the screen. If faulty, "NG" is displayed instead of "OK".

11. APPENDIX

LIST OF FUNCTION OF CONTROL KEY

KEY	SETTING		BACKUP	INITIAL SETTING
	RANGE	STEP		
XDCR			No	UP
MENU			No	Normal PPI
RANGE	10m~600m		Yes	
TILT	+5°~90°	1°	Yes	
TRAIN	0°~360°	6°	Yes	
SECTOR	6°~360°	6°, 36°, 60°, 96°, 120°, 156°, 180°, 360°	Yes	
VRM	Within range scale in use.	Sonar Mode / Range/120	Yes	
		Vertical Sounding Mode / Range/200	Yes	
EBL	0°~360°	6°	Yes	
GAIN	0~10	0.5	Yes	

LIST OF MENU SCREEN SETTING

MENU	SETTING RANGE	STANDARD SETTINGS		BACK-UP	REMARKS
		SONAR	V/S		
TVG LEVEL	0~10	5	3	Yes	
TVG RANGE	25m, 50m, 100m, 200m, 400m	200m	50m	Yes	
NOISE LIMITER	0~10	2	2	Yes	
POWER REDUCTION	A, B, C	C	C	Yes	A : 8W B : 80W C : 800W
I R	ON, OFF	OFF	OFF	Yes	
OFF-CENTER			×	Yes	
UNIT	FA, FT, M, ヒロ	M		Yes	Common to Sonar and V/S modes.
HUE	DAY, NIGHT	NIGHT		Yes	〃
MARKER	ON, OFF	ON		Yes	〃
TRAIN SPEED		STD	×	Yes	
ALARM	ON, OFF	OFF		Yes	

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** SONAR MENU **

PWR [ ] [ ]OFF

MODE [↑↓] [ ]MENU

– [–] [+] +

OFF CENTER [↑] [↓] TRAIN SPEED — STD / LOW

TVG 5 LEVEL [↶] [↷] UNIT — M

TVG 200M RANGE [◀▶] [◀▶] HUE — DAY / NGT

NOISE 2 LIM [⊖] [⊕] MARKER — ON / OFF

C OUTPUT [↺] [↻] ⊡ ALARM — ON / OFF

ON / OFF IR [⁄⁄⁄] [–] [+] RESTORE STANDARD SETTINGS

HIT MENU TO RETURN!

** VERTICAL SOUNDING MENU **

PWR [ ] [ ]OFF

MODE [↑↓] [ ]MENU

– [–] [+] +

[↑] [↓] TRAIN SPEED — STD / LOW

TVG 5 LEVEL [↶] [↷] UNIT — M

TVG 200M RANGE [◀▶] [◀▶] HUE — DAY / NGT

NOISE 2 LIM [⊖] [⊕] MARKER — ON / OFF

C OUTPUT [↺] [↻] ⊡ ALARM — ON / OFF

ON / OFF IR [⁄⁄⁄] [–] [+] RESTORE STANDARD SETTINGS

HIT MENU TO RETURN!

※ NOT DISPLAYED WHEN MENU IS PRESSED WHILE NORMAL PPI PICTURE IS DISPLAYED.

※※ DISPLAYED ONLY WHEN EXPANDED PPI PICTURE IS SELECTED.

DIFFERENCE BETWEEN STANDARD AND LOW TRAIN SPEED

RANGE		10	20	40	60	100	150	200	250	300	400	600
TRAIN SPEED	STD (sec)	11	11	11	11	11	14	18	23	27	36	53
	Low (sec)	11	11	11	12	15	20	24	29	33	42	60

SPECIFICATIONS

1. Display System :   PPI and vertical display on 8-inch color CRT

2. Picture Color :   8 colors depending on signal strength

3. Display Mode :   ● Sonar mode
   PPI, expanded PPI, PPI + historical displays are available.
   ● Vertical sounding (V/S) mode

4. Range, Pulselength (P/L), Train Speed, TX Interval

MODE	Range (m)	10	20	40	60	100	150	200	250	300	400	600
SONAR	Pulselength (ms)	0.2	0.2	0.4	0.6	1.1	1.6	2.2	2.7	3.3	4.4	6.6
SONAR	Train Speed (S)	11	11	11	11	11	14	18	23	27	36	53
V/S	Pulselength (ms)	0.2	0.2	0.3	0.4	0.7	1.0	1.3	1.6	1.8	2.2	2.6
V/S	TX Interval (ms)	100	100	200	200	400	400	500	500	600	700	830

Note   1. Unit for range scale can be selected among "meter"
   "feet" and "fathom".
   2. Train speed can be changed to slower speed.
   3. TX interval in sonar mode is every 6° transducer
   training.

5. Range Phasing :   In steps of 1/5 of range for V/S mode.

6. Audio :   2W, 1.0kHz with external loudspeaker

7. Transceiver :   Frequency   : 180kHz
   Output Power : 800Wrms
   Beamwidth   : 6.5° (−3dB point)

8. Training :

Train Sector	6° (Stop), 36°, 60°, 96°, 120°, 156°, 180°, 360°
Train Center	Can be set in any direction in 6° steps.
Train System	Continuous training or step-by-step training selectable

9. Tilt :   −5° (above horizontal) to 90° (vertical) · 10 seconds

10. Transducer :   CH − 181 (350mm travel) ··· Raise/lower time, 30sec. approx.
   Raise/Lower   CH − 184 (250mm travel) ··· Raise/lower time, 4sec. approx.

11. Allowable Ship's Speed :   15 knots