

FURUNO

OPERATOR'S MANUAL

NET-SONDE

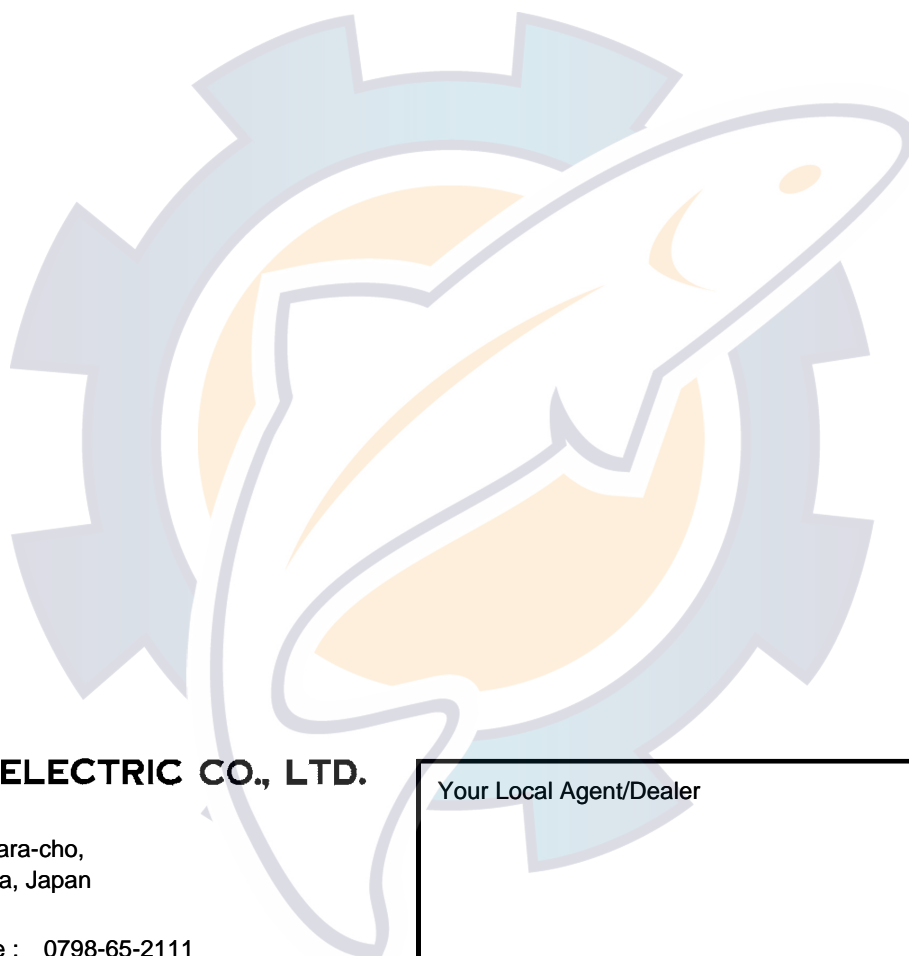
FNZ-18

MODEL

(For cylindrical type transmitter FNZ-1821)



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SAFETY INSTRUCTIONS



WARNING

The battery in the transmitter unit may leak or explode if mishandled, which can result in personal injury. Care for the battery as follows:

- Do not dispose of the battery in fire or store it in a hot place.
- Do not short battery terminals.
- Use only the specified charger to charge the Ni-cd battery.
- Do not disassemble or modify the battery or solder battery terminals.
- Do not use the battery in other equipment; it is strictly for use with the net-sonde.
- The alkaline electrolyte in the battery can cause loss of eyesight. If it gets in eyes, flush immediately with water and contact a physician.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Turn off the power immediately if water leaks into the equipment or the equipment is emitting smoke or fire.

Continued use of the equipment can cause fire or electrical shock.



WARNING

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 operate the equipment with wet hands.

Electrical shock can result.

Keep heater away from equipment.

Heat can alter equipment shape and melt the power cord, which can cause fire or electrical shock.



CAUTION

Use the proper fuse.

Use of a wrong fuse can result in fire or permanent equipment damage.

Turn off the equipment at the switch-board whenever you feel it is abnormal.

Continued use may damage the equipment.

Confirm that the power supply is compatible with the voltage rating of the equipment.

Connection to a wrong power supply can cause fire or equipment damage. Voltage rating appears on the label at the rear of the display unit.

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FEATURES

The FNZ-18 Net Sonde provides intuitive operation combined with easy maintenance and is immune to interference from other net-sonde transmitters operating at the same frequency.

The FNZ-18 displays the following:

- Net depth in both analog and digital displays
- Sinking and rising speed of net
- Water temperature
- Distance to the seabed (the distance between a transmitter and the seabed)

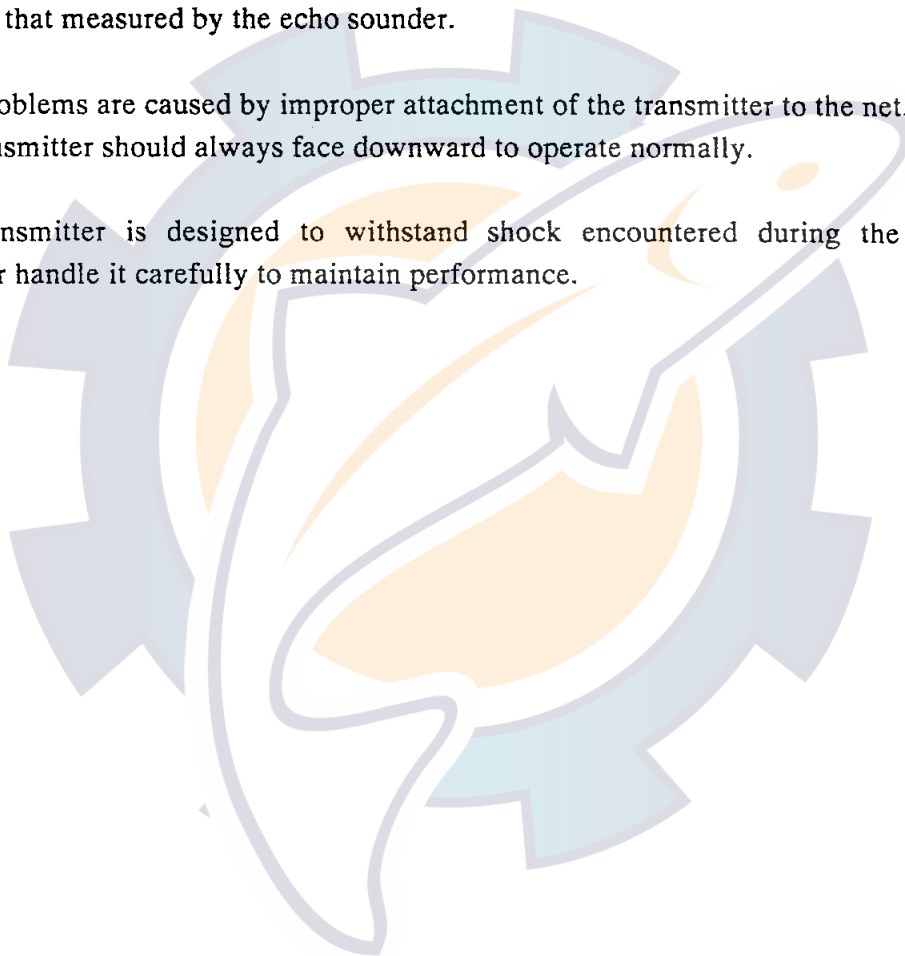
Thanks to a new technology a single drop-in receiver can receive the signals from up to seven transmitters.

Using a Ni-Cd battery eliminates the need for opening the transmitter to replace the battery, which sometimes causes water leakage. Up to three batteries (transmitter units) can be charged with the battery charger at one time.

The display is easily calibrated with the controls on the sub panel of the display unit.

REMARKS ON USAGE

- Charge the Ni-Cd battery where the temperature is 0 °C to 40 °C .
Charging the battery out of that range results in reduced discharge capacity.
- The Ni-Cd battery is not charged at the factory. Charge it before first use.
- The net-sonde measures depth based on water pressure; the echo sounder by propagation time of an ultrasonic signal. Thus, the depth measured by the net-sonde may not be the same as that measured by the echo sounder.
- Most problems are caused by improper attachment of the transmitter to the net.
The transmitter should always face downward to operate normally.
- The transmitter is designed to withstand shock encountered during the operation, however handle it carefully to maintain performance.



BASIC OPERATING PROCEDURE

The basic operating procedure is as below:

1

Charge the Ni-Cd battery.

2

Attach the transmitter(s) to the net and shoot the net.

3

Turn the power on. (Press the POW switch.)

4

Drop the receiver into the water. Allow it to submerge 10 to 15m beneath the surface.

5

Get necessary information from the display unit.

6

Before hauling the net, pull up the receiver.

7

Turn the power off.

8

If necessary, charge the Ni-Cd battery.

■ Complete Set

No.	Unit	Type	Qty	Remarks
1	Display Unit	FNZ-1810	1	
2	Transmitter	FNZ-1821	1	
3	Battery Charger	FNZ-1841	1	Three transmitters can be charged at once.
4	Drop-in Receiver with 25m cable	FNZ-1830	1	
5	Installation Materials	CP11-00200	1 set	
6	Spare Parts	SP11-00200	1 set	

■ Optional Supply

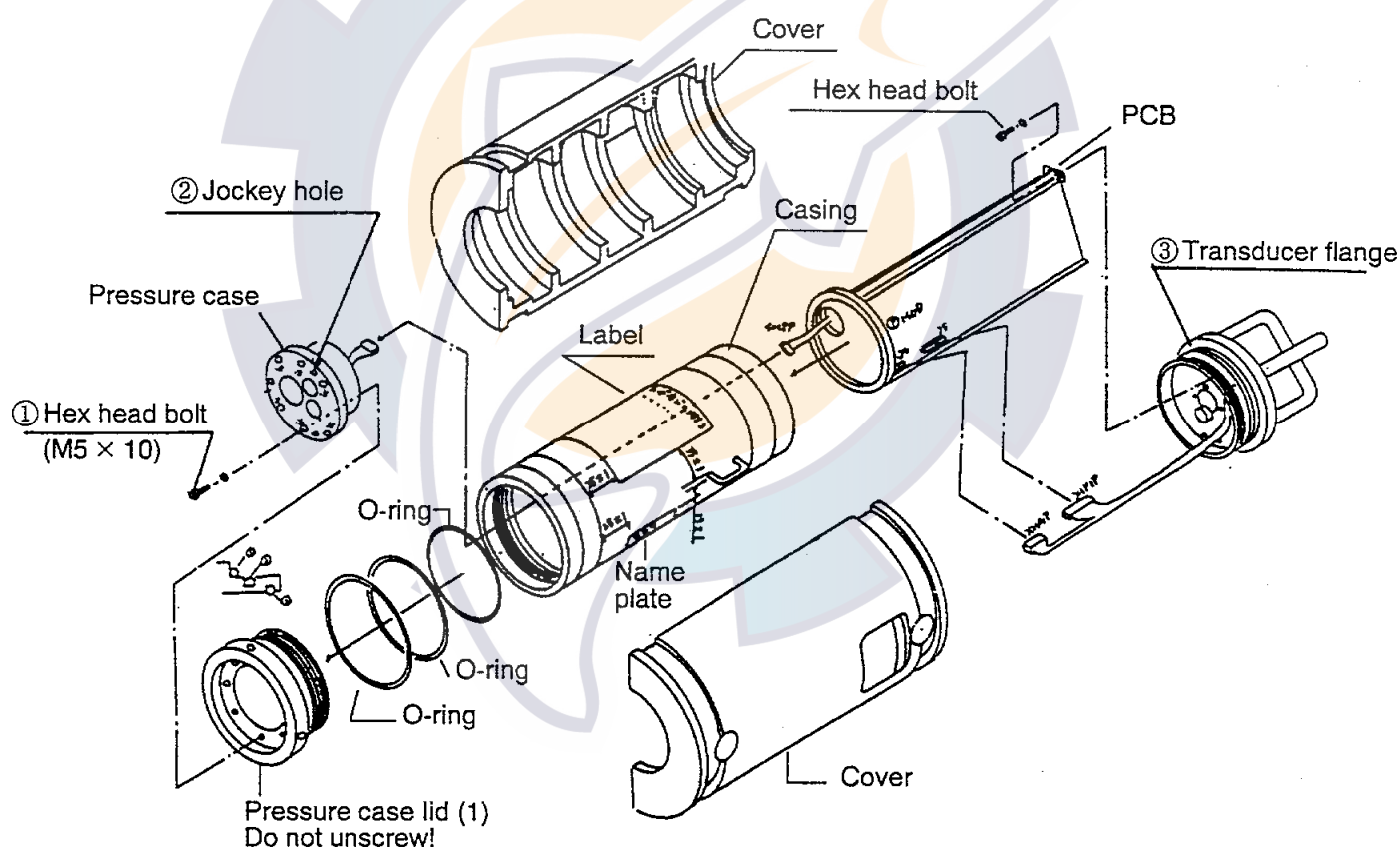
No.	Unit	Type	Qty	Remarks
1	Ni-Cd Battery	FNZ-1827-EU	1	Europe
		FNZ-1827-KOR	1	Korea
2	Hull Bottom Receiver	FNZ-1831	1	With 20m cable
3	Distribution Box	FNZ-1850	1	
4	Rectifier	PR-62	1	For one display unit
		RU-3423	1	For two or three display units

HOW TO DISASSEMBLE THE TRANSMITTER UNIT

The procedure below explains how to disassemble the transmitter unit, for replacement of battery or circuit board repair.

Note: Do not use a wrench to remove the pressure case lid (1).

1. Unfasten six bolts (M5 × 10).
2. Screw three bolts loosened in step 1 in jockey bolt holes to remove the pressure case.
3. Unplug all connectors.
4. Unscrew transducer flange to remove circuit board.



How to disassemble the FNZ-1821 (cylindrical type)

TRANSMITTER

Major parts

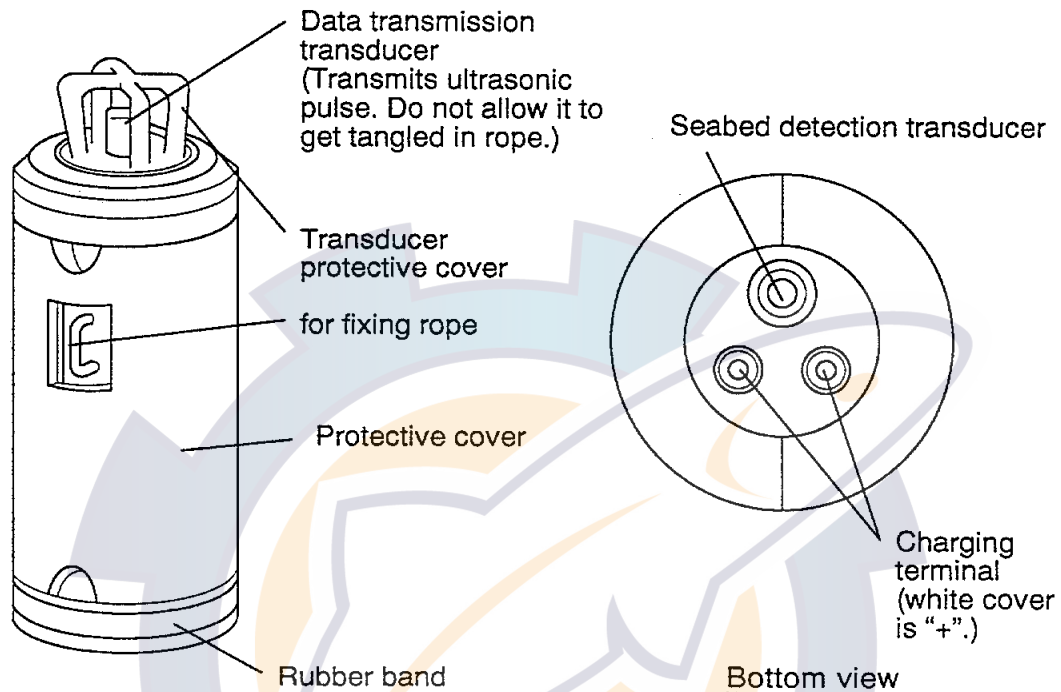


Fig. 1 Transmitter

How it the FNZ-18 works

The transmitter automatically turns on in water when it descends 10m from the sea surface. The data transmission transducer transmits depth, distance-to-seabed and temperature data omnidirectionally. See Fig. 2.

When it is time to charge the battery, the battery icon lights in red.

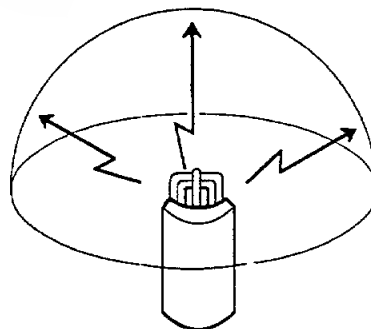


Fig. 2 How pulses are transmitted

■ **Identification mark**

Up to seven transmitters can be used on a single frequency, a different channel number for each transmitter. An identification mark (channel number) is painted on the body of the transmitter by the installer. Ask the installer for details about the mark. For the example in Fig. 3, the transmitters are marked with a number which shows the order they are to be installed on the net: 1, front end; 2, middle; 3, back end.

Note that a display unit should have the same channel number as its transmitter.

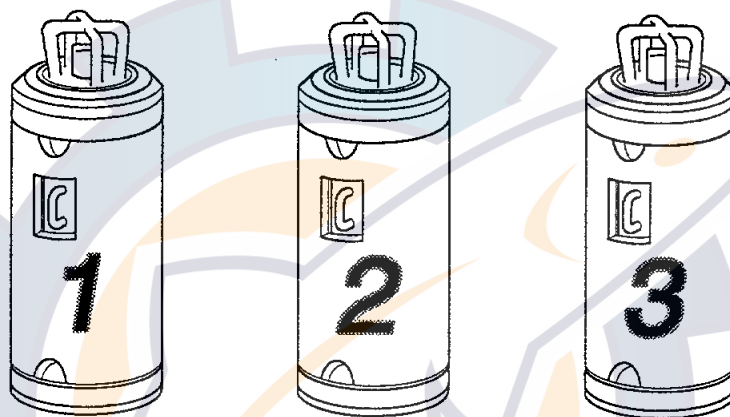


Fig. 3 Example of identification mark on the transmitter

■ Installation

The transmitter can be installed two ways. One method, method 2 in Fig. 4, is to attach the transmitter to a purse ring with a 1.5m to 2m long chain or rope and shackles. Make the connection in duplicate to prevent loss of the transmitter. The chain length should be so the transmitter does not get tangled with the purse line or the bridle rope of the seine.

The transmitter can also be attached to the lead line of the seine as shown in Method 1 in Fig. 4. However, this method may allow the purse line to reach the seabed before the transmitter.

The knot in the rope just above the data transmission transducer may block the ultrasonic pulse transmitted to the receiver if it is too large. Therefore, make the knot as small as possible.

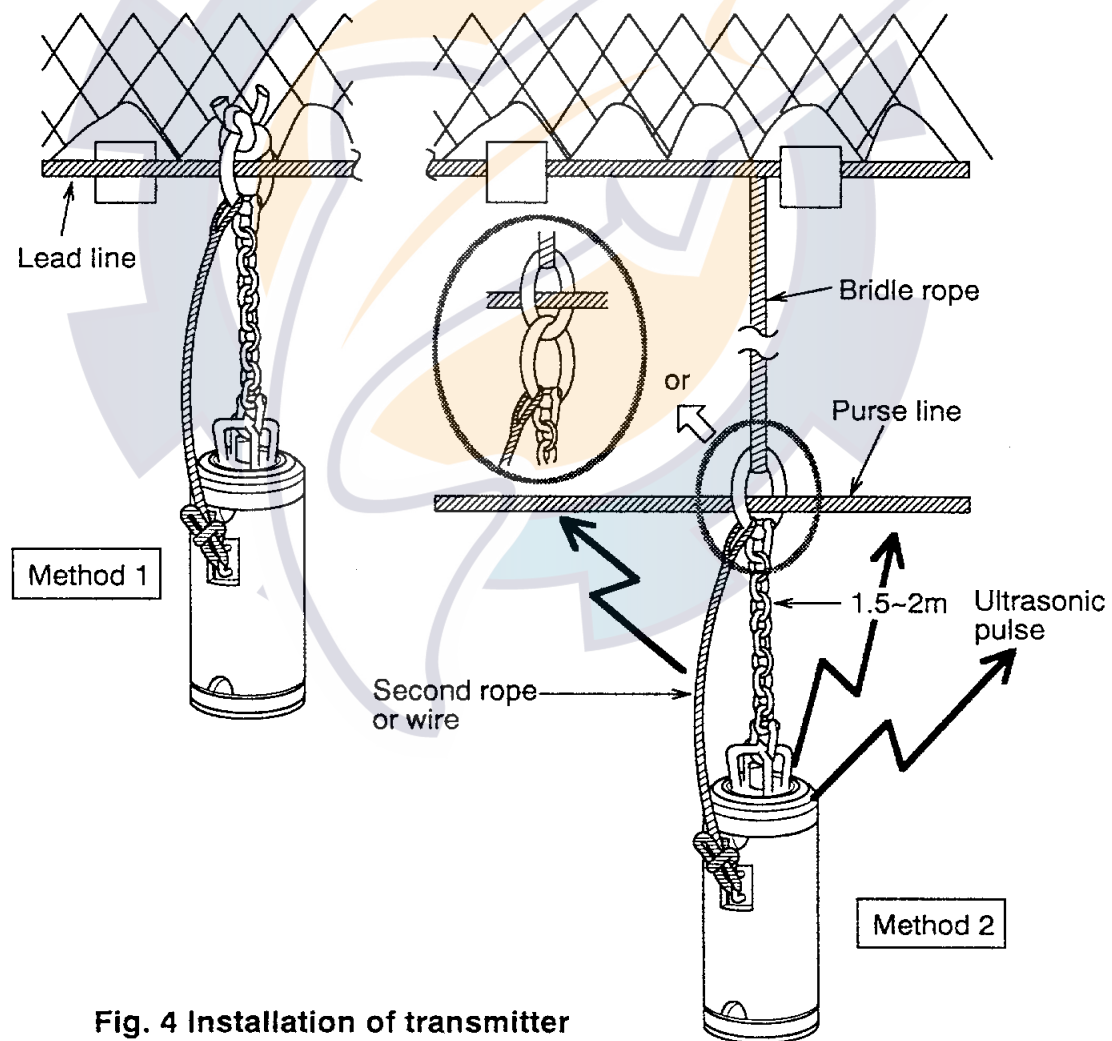
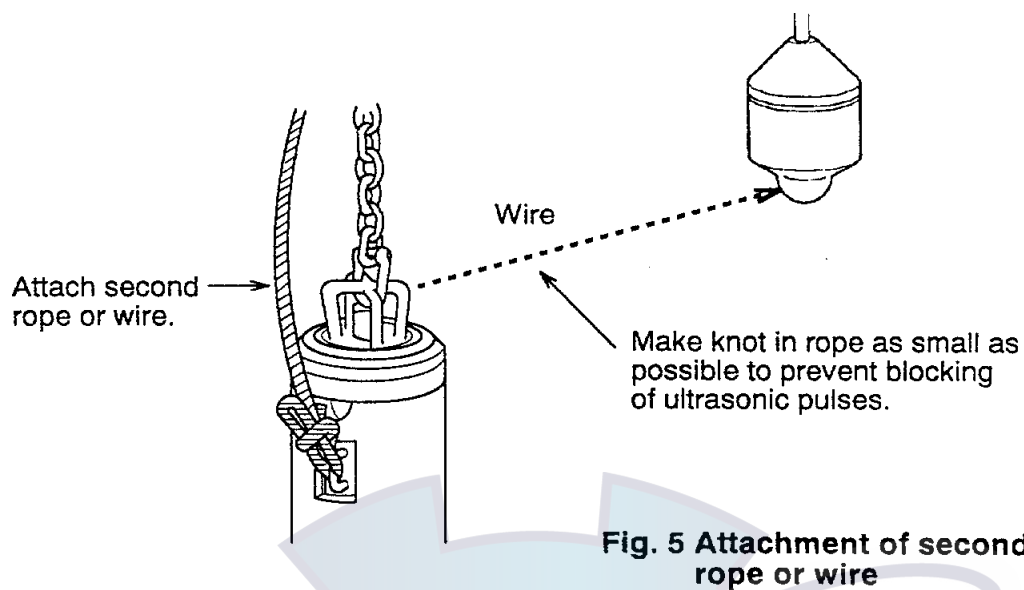


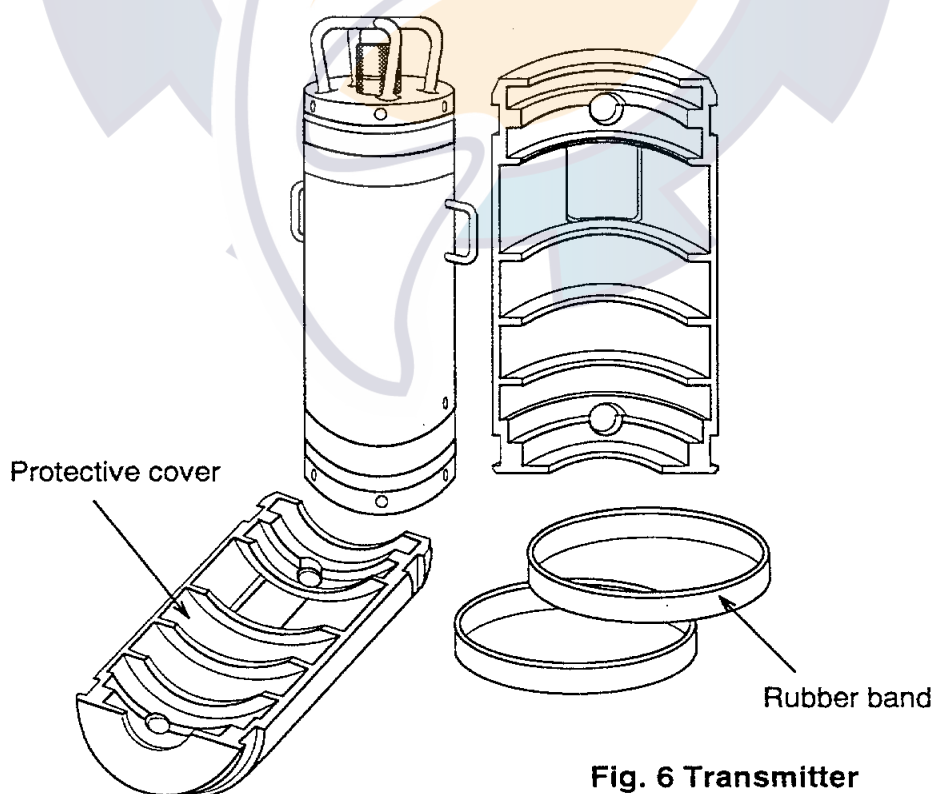
Fig. 4 Installation of transmitter



Generally, the transmitter is hung on the seine;

- 1) at the center of the lead line in a single display unit system
- 2) at the center and the both ends of the lead line in three display unit system

Note: Be sure to attach protective cover to the transmitter.



■ ***Charging Ni-Cd battery***

The Ni-Cd battery must be charged before first use. It should be also charged when the battery icon on the display unit lights in red.

Three batteries (transmitter units) can be charged at one time.

Batteries are charged one by one. The green lamp on the battery charger lights when a battery is fully charged. If the lamp does not light, try charging again. If the lamp still does not light, the battery and/or battery charger may be defective.

- Approximate operating time of a fully charged Ni-Cd battery is 4 hours.
- The Ni-Cd battery lasts about 200 cycles of charging and discharging.

Note 1: *Ambient temperature should be 0 °C - 40 °C . Charging in temperature out of that range may result in reduced discharge capacity.*

Note 2: *To lengthen battery life, do not charge the battery until the battery icon on the display unit lights in red. Unnecessary charging shortens battery life.*

How to charge Ni-Cd battery

1. Wipe off any foreign material and water from the electrical contacts of the battery charger plug.
2. Plug in the battery charger plug to the transmitter.
3. Turn on the battery charger.
4. The green lamp on the battery charger blinks while the battery is being charged. The lamp lights when the battery is charged fully.

- Lamp on the charger does not blink. → Check the connection.
- Lamp does not come on. → Is it a Ni-Cd battery
(should not be alkaline battery)?

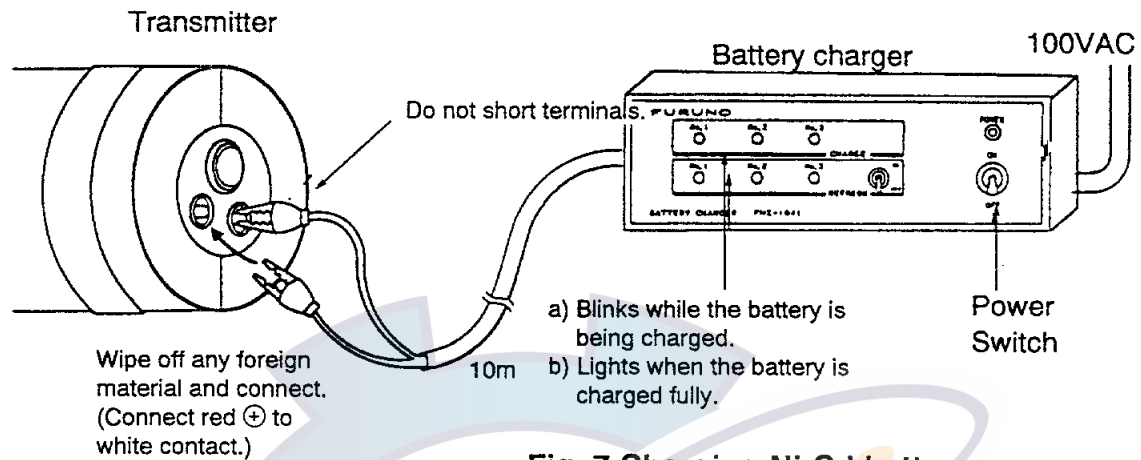


Fig. 7 Charging Ni-Cd battery

Replacement of Ni-cd battery

The Ni-cd battery lasts about 200 cycles of charging and discharging. When the battery begins to require frequent charging have a serviceman replace the battery. The replacement requires special tools which are not available on the market.

RECEIVER

There are two types of the receivers: drop-in type and hull bottom type. When both types of receivers are installed, the distribution box (option) is required to select either the receiver.

■ Use of drop-in receiver

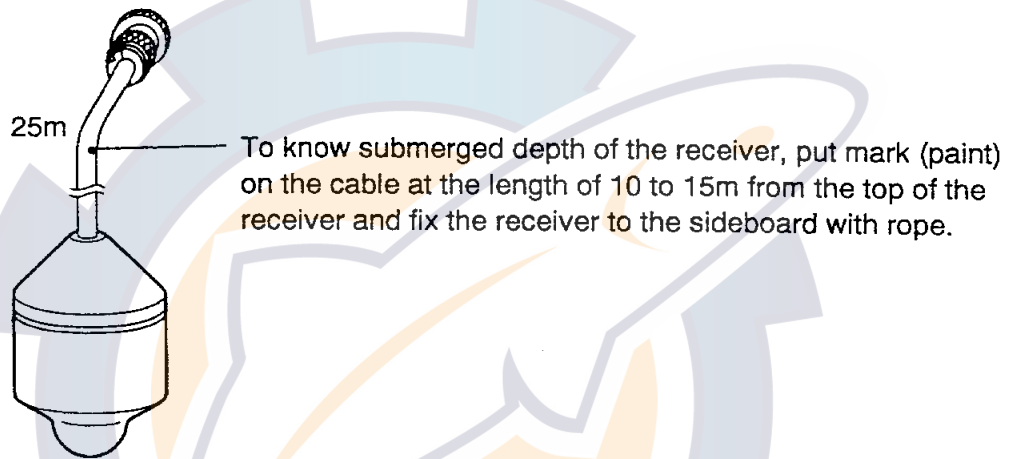


Fig. 8 Drop-in receiver

In multiple frequency system, receiver cables may be bound together to drop the receivers into the water together. However, the cables should not be bound near the receivers, as the receiver may not face downward, resulting that the signal from the transmitter may be missed.

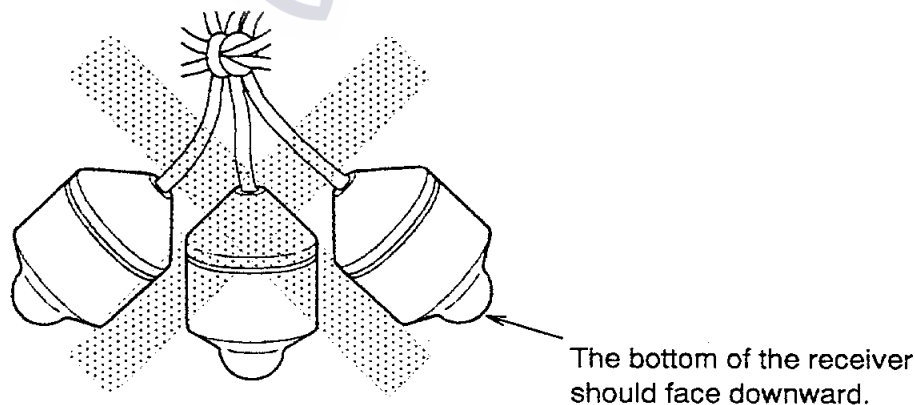
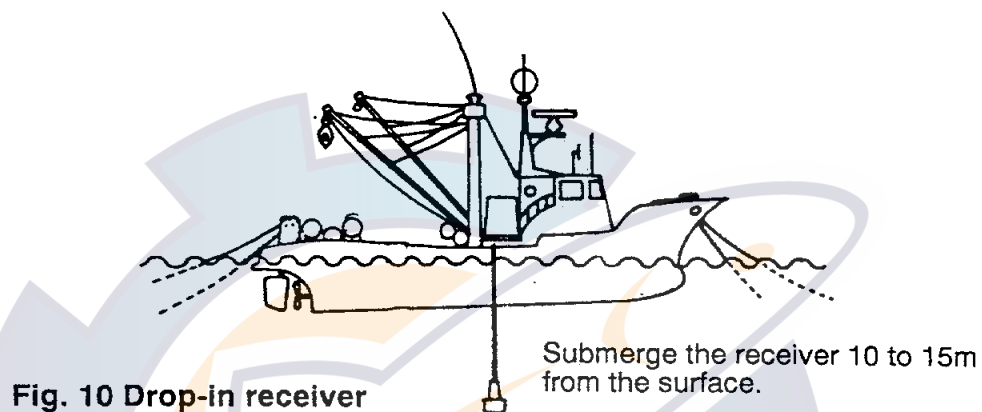


Fig. 9 How not to bind multiple receiver cables

After shooting the net, lower the receiver into the water from the sideboard. The receiver should be submerged 10 to 15m into the water to avoid contact with air bubbles around the boat, which may block the signal coming from the transmitter.

Do not slide the cable on the ship's sideboard. This will damage the cable.

Fix the cable to the hull so that the receiver stays at the depth of 10 to 15m. Before hauling the net, retrieve the receiver.



• Handling of receiver cable

- 1) Handle the receiver cable carefully. A nick on the outer sheath may result in poor electrical insulation.
- 2) Do not bend the cable to a radius of 20cm or less.
- 3) The white line along the cable acts as a guide for checking if the cable is twisted. The cable should not be twisted unduly during use.

■ Receiver selection

The switch on the distribution box selects a receiver, drop-in or hull bottom. "HULL BTM" selects the hull bottom receiver; "SIDEBOARD" the drop-in receiver.

DISPLAY UNIT

Front panel

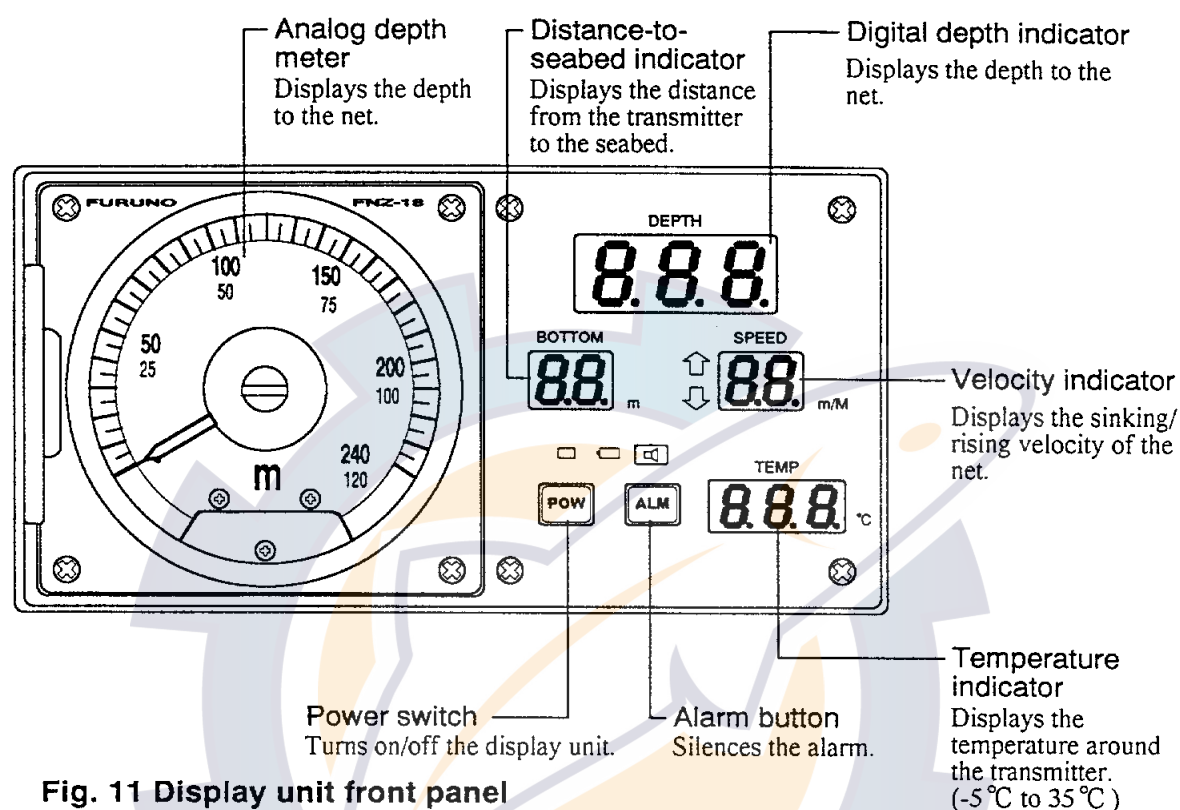


Fig. 11 Display unit front panel

Table 1 Icons

Mark	Name	Color	Status	Description
↑	Rising icon	GRN	ON	Lights when the net is rising.
↓	Sinking icon	GRN	ON	Lights when the net is sinking.
		RED	ON	Lights when the distance between the net and seabed is less than 0.5m.
🔊	Alarm icon	GRN	ON	Lights when alarm function is ON. No alarm is generated with this mark off.
		GRN/RED	Blinking	Blinks alternately in green and red with audio.
		RED	Blinking	Blinks during alarm violation without audio.
🔋	Battery icon	GRN	ON	Lights when the battery voltage is normal.
		RED	Blinking	Blinks when battery voltage is low. (Do not charge the battery until the lamp lights in red.)
		RED	ON	Lights when charging or replacement of the battery is required before next operation.

■ Sub panel

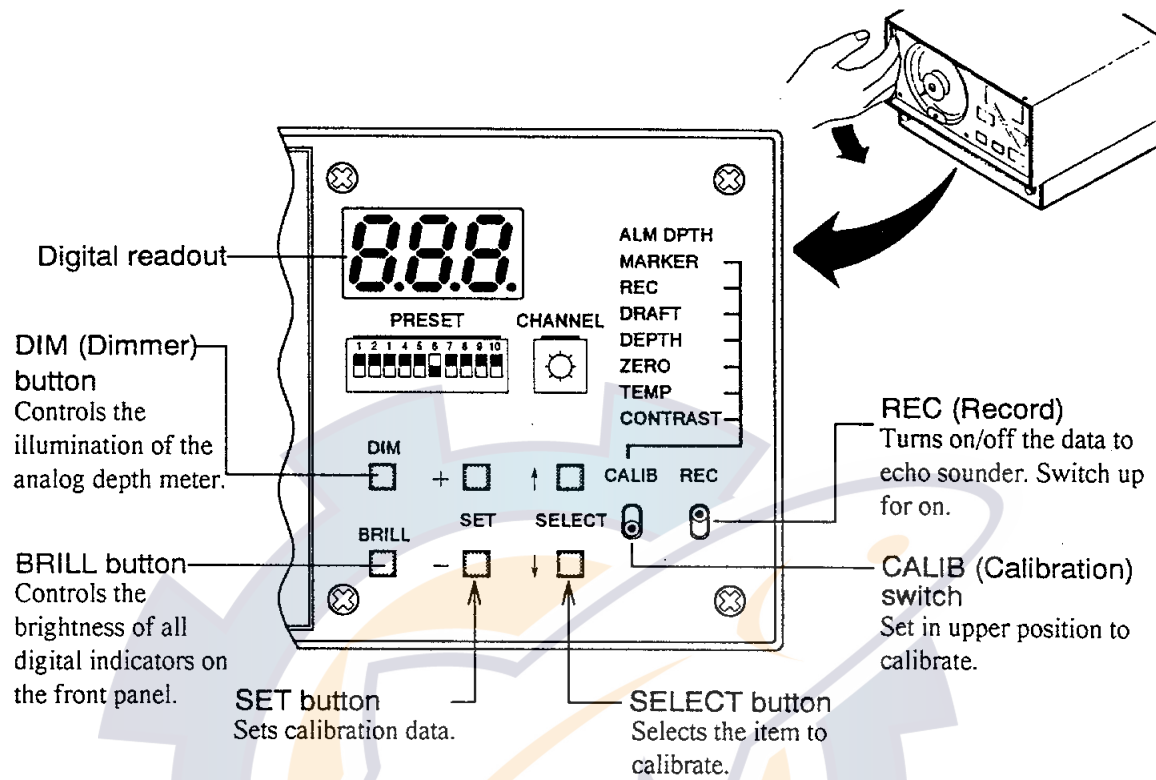
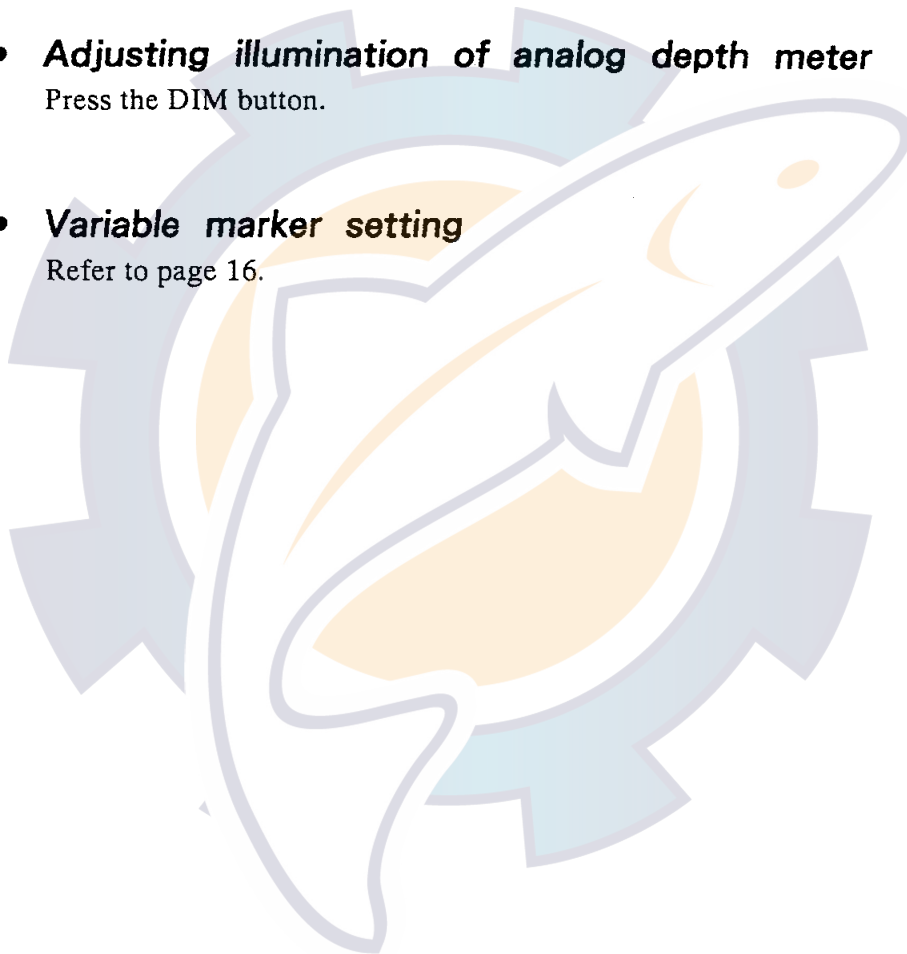


Fig. 12 Sub panel

■ **Basic operation**

- **Turning on/off the power**
Press the POW switch. The green LED above the switch comes on when the display unit is on.
- **Adjusting brightness of digital indicators**
Press the BRILL button on the sub panel.
- **Adjusting illumination of analog depth meter**
Press the DIM button.
- **Variable marker setting**
Refer to page 16.



DISPLAYING MARKERS ON ECHO SOUNDER

■ *Marker description*

With connection of an echo sounder, the following markers can be displayed on the echo sounder.

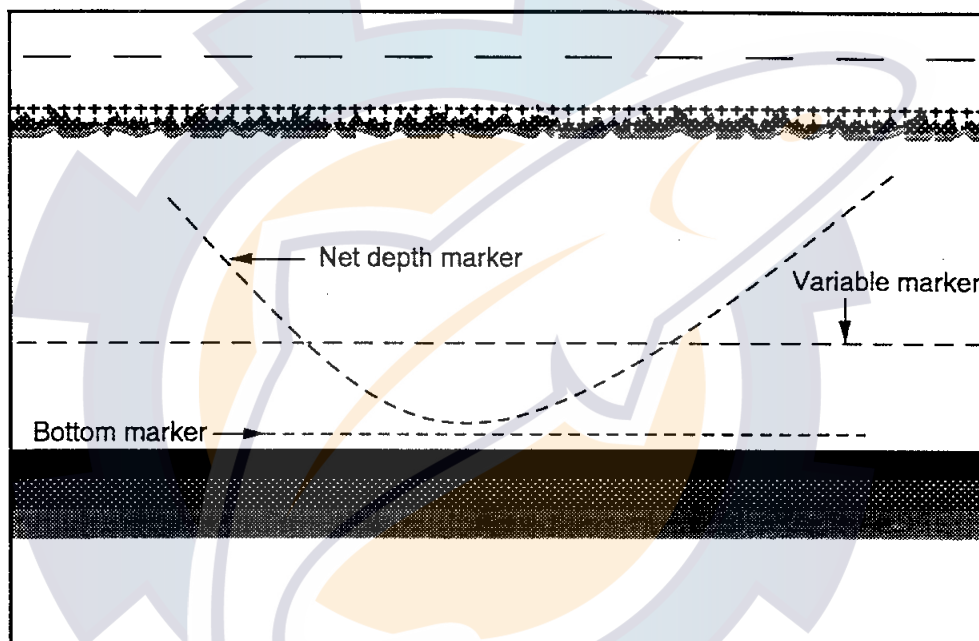


Fig. 13 Markers displayed on the echo sounder

Net depth marker: The depth of the net is depicted. This marker does not appear when the depth is less than 10m.

Variable marker: A horizontal line can be displayed on the echo sounder at the desired depth between 0 and 360m. This marker is turned off in the default setting.

Bottom marker: The bottom marker indicates the water depth at the net position; the echo sounder displays the water depth at own ship's position.
The distance to the seabed is added to the net depth to calculate the water depth at the net position. The bottom marker does not appear when the distance between the transmitter and the seabed is more than 100m.

■ ***Turning on/off the markers on the echo sounder***

Set the REC switch on the sub-panel to the upper position to output all markers from the display unit to the echo sounder. The lower position of the switch disables marker output.

Markers include depth marker, variable marker and bottom marker. Each marker can be turned on or off individually. (See page 20.)

■ ***Setting variable marker***

1. Press the SELECT buttons to select MARKER.
2. Press the SET buttons to set depth.

■ ***Selecting appearance of markers***

The appearance of the markers can be selected as below with DIP switch SW2 on the MAIN board in the display unit. It is a solid line in the default setting.

Table 2 DIP switch setting and marker appearance

MAIN Board(SW2)			Marker Appearance
#1	#2	#3	
OFF	OFF	OFF	_____
ON	OFF	OFF	____ _
OFF	ON	OFF	____ _
ON	ON	OFF	____ _
OFF	OFF	ON	____ _
ON	OFF	ON	____ _
OFF	ON	ON	____ _
ON	ON	ON	____ _

ALARMS

There are two types of alarms, depth alarm and seabed alarm. One may be turned on with the PRESET switch on the sub panel.

The depth alarm warns you when the net sinks to the preset depth. The seabed alarm warns you when the distance between the net and the seabed becomes equal or less than the alarm setting.

■ **Setting depth alarm**

To set the depth alarm at 150m, for example, do the following:

1. Turn off the display unit and open the front panel.
2. Set #8 of the PRESET switch on the sub panel to the lower position.
3. Turn on the power.
4. Press the SELECT button to select ALM DPTH.
5. Press SET buttons to set 150 on the digital depth readout.
6. Close the front panel.

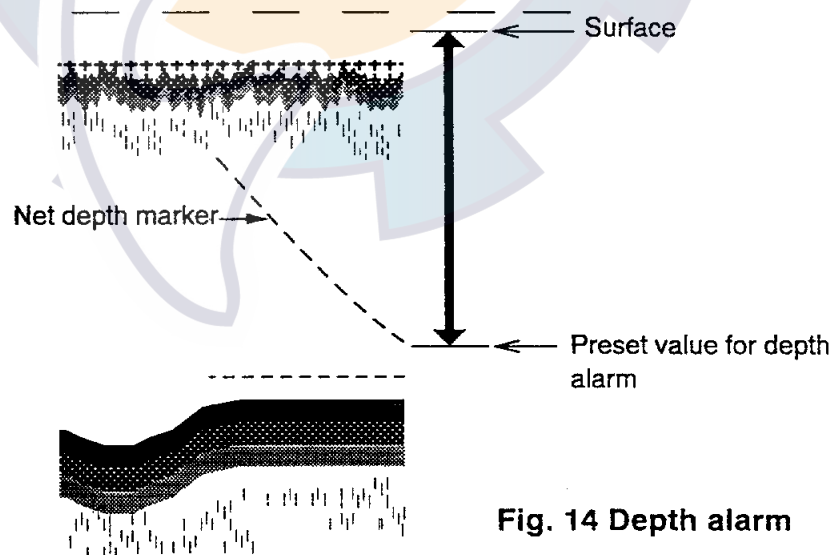


Fig. 14 Depth alarm

■ **Setting seabed alarm**

To set the seabed alarm, do the following:

1. Turn off the display unit and open the front panel.
2. Set #8 of the PRESET switch on the sub panel to upper position.
3. Turn on the power.
4. Press the SELECT button to select ALM DPTH.
5. Press the SET buttons to set alarm depth. Alarm range is 0 to 99.9m.
6. Close the front panel.

When the alarm is violated, the alarm icon lights in red and green alternately and the alarm sounds.

Press the ALM button to silence the alarm. The alarm icon remains lit in red until the distance between the net and the seabed is more than the preset value. When you do not need the alarm function, enter "0" (zero) as the alarm setting.

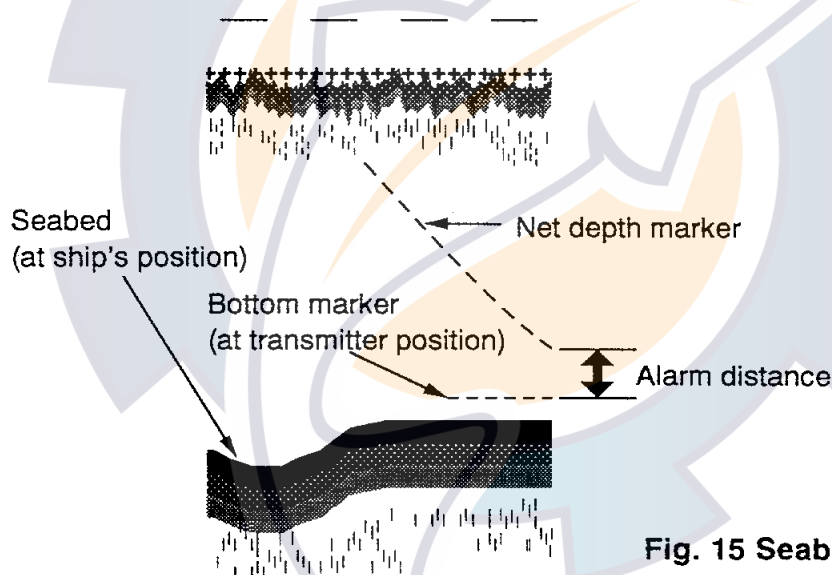


Fig. 15 Seabed alarm

ADVANCED OPERATION

■ *Individual brightness adjustment*

The brightness of the digital indicators can be adjusted individually as follows:

1. Open the front panel of the display unit.
2. Set the CALIB switch to the upper position.
3. Press the SELECT button to select CONTRAST. "555" appears on the display. This number corresponds to the digital depth indicator. Other numbers and their corresponding indicators are shown in table at right.
4. Press the SET buttons to adjust brightness.
5. Press the SELECT buttons to display "333" on the readout.
6. Adjust the brightness of the distance-to-seabed indicator with the SET buttons.
7. Do the same for the brightness of the other indicators.

Table 3 Number and indicator

Number	Indicator selected
555	Digital depth
333	Distance-to-seabed
222	Net Speed
111	Temperature
000	Marks

■ *Channel selection*

Seven sets of display units and transmitters of the same frequency can be installed, each having a different channel number, 0-6. A display unit should have the same number as its transmitter.

You may change the channel number (with the channel selector in the sub panel) when other ultrasonic equipment interferes with the net-sonde. Ask your dealer to change the channel.

■ *Changing alarm tone*

The alarm tone may be selected with a DIP switch inside the display unit. Eight tones are available. Consult with your dealer for details.

■ Changing analog depth meter scale

The analog meter scale is available in 120m or 240m. The desired meter scale may be selected with the preset switch on the sub panel. A 360m scale is available optionally.

360m analog meter (Type; DVF-11L 360M, Code number; 000-128-744)

Table 4 Preset SW setting and meter scale

Preset SW on the sub panel	Scale		
	120m	240m	360m
# 6	OFF	ON	OFF
# 7	ON	OFF	ON

ON : upper position, OFF : lower position

■ Selecting markers to display on echo sounder

Three markers can be output to the echo sounder. Each marker can be turned on/off individually as follows:

1. Open the front panel of the display unit.
2. Set the CALIB switch to the upper position.
3. Press the SELECT button to select REC.
4. Set #9 and #10 of the PRESET switch on the sub panel to the upper position. A three digit number appears on the digital readout. The left digit shows the output status of the depth marker, the middle the variable marker and the right the bottom marker. "1" is displayed when a marker is output, and "0" is displayed when the mark is not output.
5. Press the SET button (↓) to change digital readout status.

111 → 110 → 101 → 100 → 011 → 010 → 001 → 000 → 111

For example, to output the depth marker and bottom marker but not the variable marker, display "101" on the readout.

6. Set the CALIB switch to the lower position.

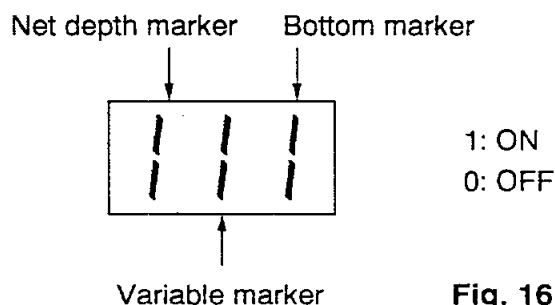


Fig. 16 Digital readout for marker output

CALIBRATIONS

This chapter explains how to calibrate various indications.



Set the CALIB switch to the lower position every time calibration data is entered on the readout.

■ ***Net depth marker on the echo sounder***

The net depth marker on the echo sounder can be adjusted in the range from -50 to +50m.

The procedure below shows how to adjust the depth marker displayed at 102m to correct depth of 100m.

1. Open the front panel of the display unit.
2. Set the CALIB switch at the upper position.
3. Set both #9 and #10 of the PRESET switch (sub panel) to the lower position.
4. Select MARKER with the SELECT button.
5. Press SET buttons to set "100" on the digital readout.
6. Select REC with the SELECT button.
7. Press the SET button ("-") to move the depth marker to the depth of 100m.
8. Set the CALIB switch to the lower position.

■ ***Depth indication***

If there is error at a depth, you may apply an offset to correct it. Five depths may be calibrated (+0.0 to 50 m). Note that the "net sinking" test cannot be conducted during the calibration.

For example, if the net sonde displays the depth of "104" when the actual depth is 100m, do the following:

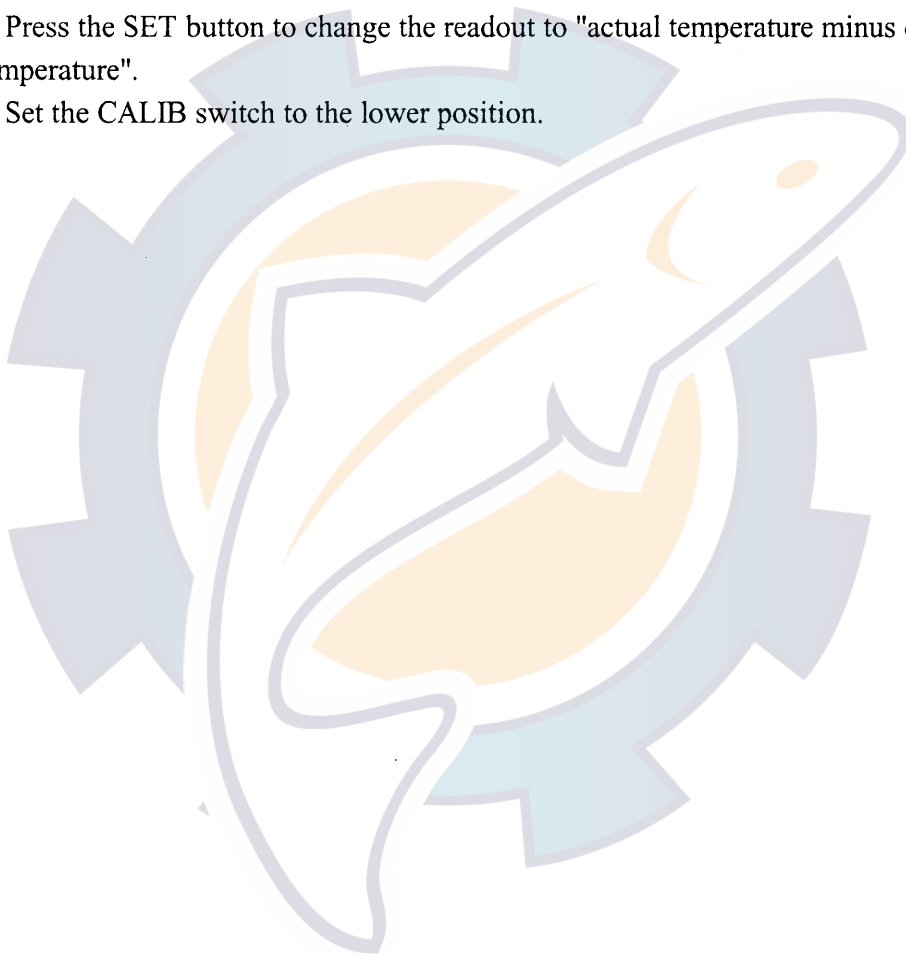
1. Open the front panel of the display unit.
2. Set the CALIB switch to the upper position.
3. Select DEPTH with the SELECT button. The "depth" is displayed on the readout. In this example, "104" is displayed.
4. Change the displayed data to actual depth by pressing the SET buttons. In this example, press "-" to change the readout from 104 to 100.
5. Set the CALIB switch to the lower position.

Note: If the calibration depth interval is too narrow or the same value is entered several times, depth indications deeper than the calibration value will be wrong. In this case, clear all data as shown on page 24 to reset all calibration values to zero.

■ ***Temperature indication***

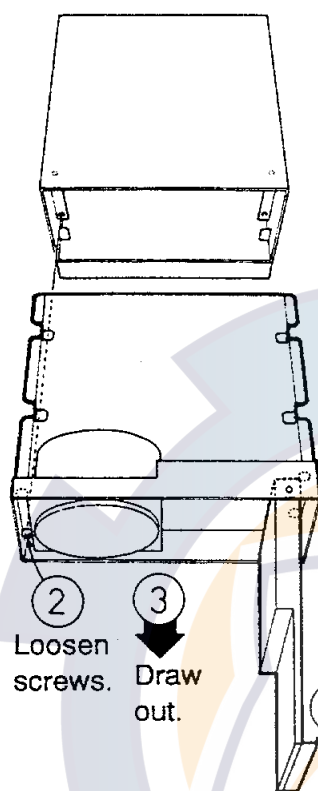
The temperature indication can be calibrated in the range from -9.9°C to $+9.9^{\circ}\text{C}$.

1. Open the front panel of the display unit.
2. Set the CALIB switch to the upper position.
3. Select TEMP with the SELECT button.
4. Press the SET button to change the readout to "actual temperature minus displayed temperature".
5. Set the CALIB switch to the lower position.



■ **Analog depth meter**

The analog depth meter can be calibrated as follows:



1. Turn off the power and open the front panel of the display unit.
2. Unfasten screw at each front corner of the display unit.
3. Draw out the indicator from its case.
4. Turn on the power.
5. Set the CALIB switch to the top position.
6. Select "MARKER" with the SELECT button.
7. Press the SET buttons to display "100" on the readout.
8. Turning the "FS" switch on the MAIN board, change the readout to "100."
9. Set the CALIB switch to the lower position.
10. Turn off the power.
11. Reassemble the display unit.

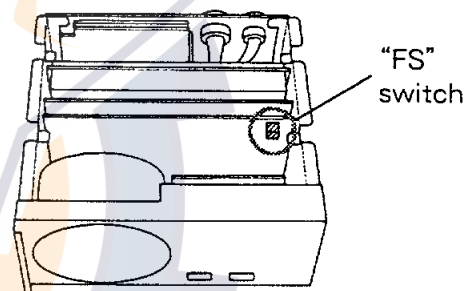


Fig. 17 Analog meter calibration

■ **Draft adjustment**

Adjust draft to prevent depth display error on the echo sounder.

1. Open the front panel of the display unit.
2. Set the CALIB switch to the upper position.
3. Select DRAFT with the SELECT button.
4. Press SET button ("+") to enter ship's draft.
5. Set the CALIB switch to the lower position.

■ ***Clearing all data***

1. If necessary, write down present calibration data.
2. Turn on the power.
3. Set the CALIB switch to the upper position.
4. Turn on the power while pressing and holding down the SELECT button [↓].
“Bup” appears on the display.
5. Set the CALIB switch to the lower position. “End” replaces “Bup.”
6. Turn off the power.



TESTING TRANSMITTER AND RECEIVER

■ Transmitter test

The system can be checked in a workshop since it is not necessary to drop the transmitter in water. The test should be performed as quickly as possible to conserve the battery.

1. If so equipped, set the switch on the distribution box to SIDEBBOARD.
2. Place the transmitter about 1 to 2m from the receiver.
3. With the test clip supplied, shortcircuit the charging terminals at the bottom of the transmitter.
4. Unscrew the pressure sensor cap.
5. Put a slight amount of grease into the pressure sensor cap hole.
6. Screw the dummy (optional) into the pressure sensor cap hole.

The transmitter starts operating and you should hear transmission sound from the seabed detection transducer.

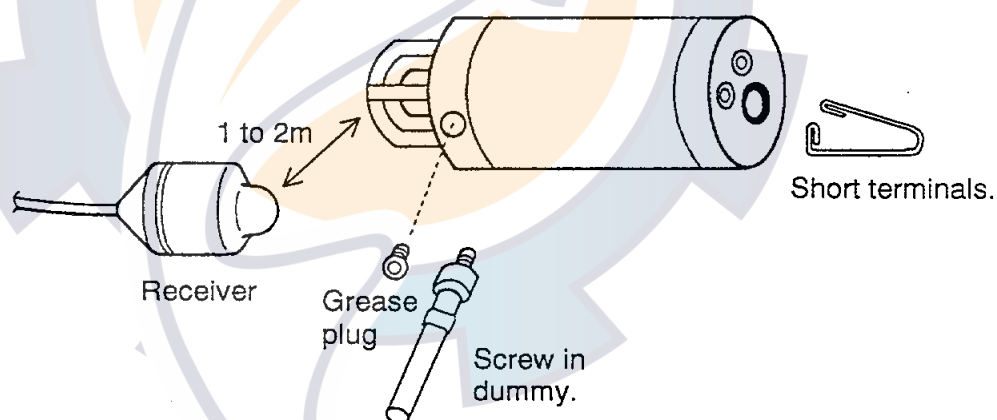


Fig. 18 Operation check of the transmitter

7. Turn on the display unit. Indications should be as shown in Table 5.

Table 5 Indications during transmitter test

Indicators	Indication	Remarks
Depth meter	10 to 20m	The tighter the dummy is screwed in, the higher the indication.
Digital depth		
Distance-to-seabed	0m	With the transmitter lying, the signal of "0" is transmitted.
Net speed	Within 0 to 2 meter/min.	
Temperature	Room temperature	
Battery icon	Lights in green.	

- Suspend the transmitter bottom side down about 0.5 to 1m from deck.
- Confirm that the distance-to-seabed indicator shows the distance to the deck multiplied by 4.3. (The sound velocity in water is about 4.3 times faster than that in the air.)
- Remove dummy. The distance-to-seabed indication should decrease and no value is displayed at a distance of less than 10m.
- Confirm that the small hole on the pressure sensor cap is clean.
- Screw in the pressure screw cap.

■ Receiver test

- Open the front panel of the display unit.
- Set #5 of the PRESET switch to the upper position.
- Rub the receiver bottom with your hand. If the depth meter swings, the receiver is normal.
- Set #5 of the PRESET switch to the lower position.

TROUBLESHOOTING

■ **Power lamp does not light.**

Check the fuse at the rear of the display unit.

■ **No depth indication (on either digital indicator or analog meter)**

Possible causes;

- 1) The transmitter is not submerged more than 10m.
- 2) The receiver is not deeper than the depth of the keel.
- 3) The signal from the transmitter is blocked by air bubbles.

■ **No distance-to-seabed indication**

Possible causes;

- 1) The distance to the seabed is more than 100m.
- 2) The transmitter inclines more than 45° in water. (The inclinometer incorporated in the transmitter disables bottom detection.)

■ **No markers on the echo sounder**

Possible causes;

- 1) The REC switch on the sub panel is turned off.
- 2) No connection between the net-sonde and the echo sounder.
- 3) Depth data is calibrated improperly.

■ **All digital indicators are blinking**

Possible causes;

- 1) The signal is blocked by air bubbles.
- 2) The receiver is not deep enough. (The receiver should be submerged more than 10m.)

■ Incorrect depth indication on echo sounder

Possible causes;

- 1) The output to the echo sounder may be calibrated improperly.

■ Incorrect depth indication

- 1) #7 and #8 of DIP switch SW1 on the MAIN board may be ON.
Turn them OFF.

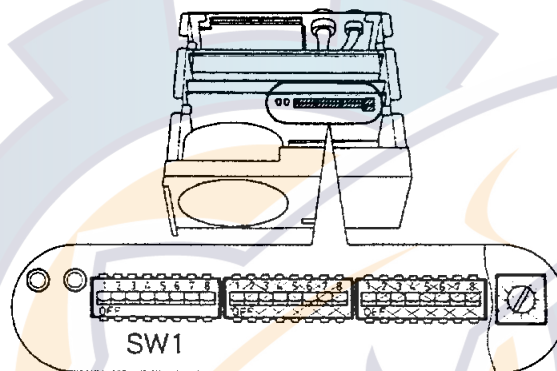


Fig. 19 SW1 on the MAIN board

DISPLAY UNIT SELF-TEST

To test the display unit, turn on the power while pressing the DIM or BRILL button. The sequence of the test is as below:

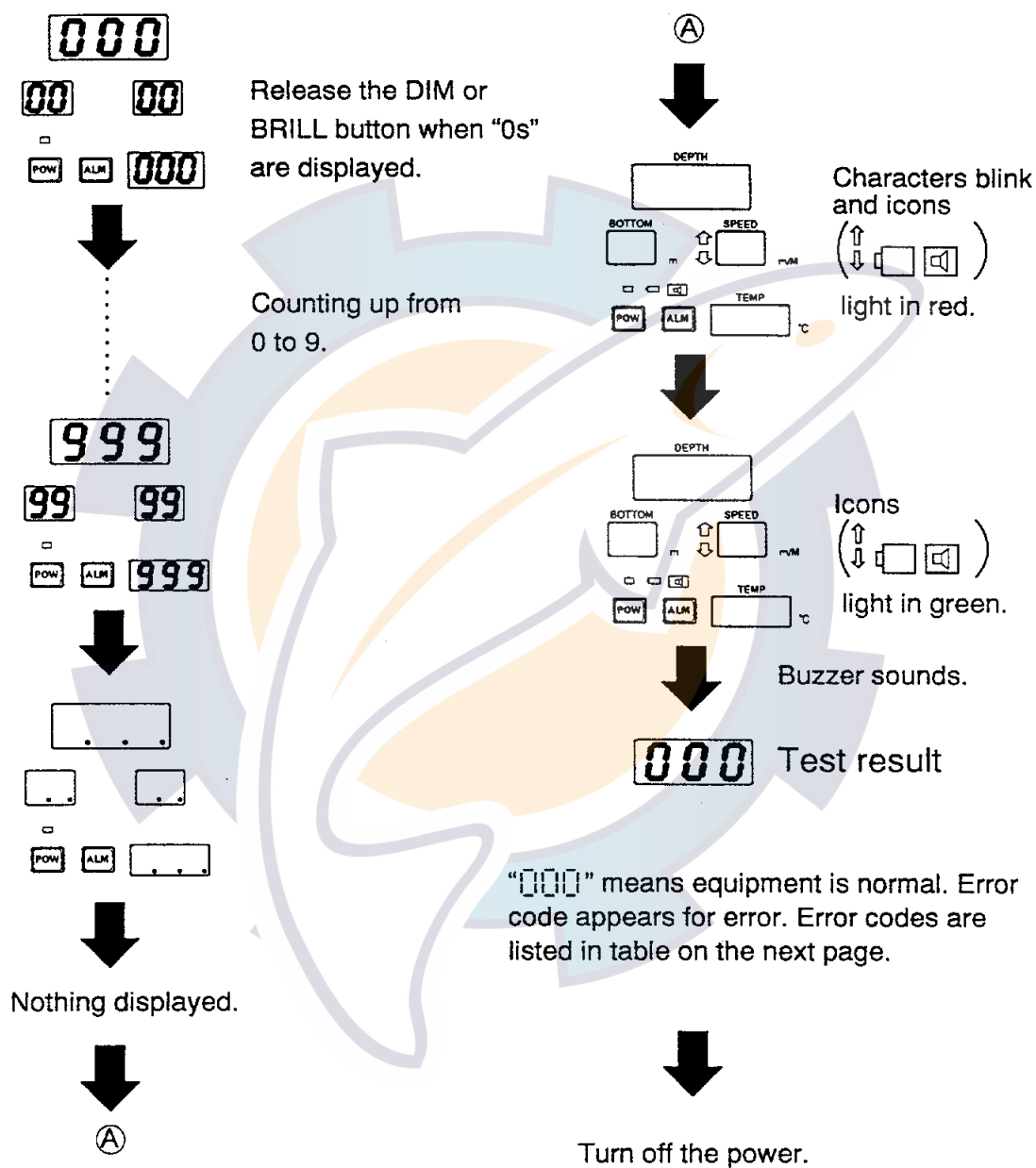


Fig. 20 Self-test sequence

Table 6 Error code list

Error code	Meaning	Error code	Meaning
000	No error	E _r A	ROM SUM error (SUB board)
E _r 1	I/O error (MAIN board)	E _r b	RAM1 error (SUB board)
E _r 2	I/O error (SUB board)	E _r c	RAM2 error (SUB board)
E _r 3	I/O error (MAIN or SUB board)	E _r d*	I/O center error (SUB board)
E _r 4	ROM SUM error (MAIN board)	E _r e*	I/O error (SUB board)
E _r 5	RAM error (MAIN board)	E _r f*	I/O "+" error (SUB board)

* Not an indication of malfunction. For use by service technician.

During the self-test net depth, bottom and temperature data are output to the echo sounder in the following sequence. The analog meter on the display unit shows the depth being output to the echo sounder.

- (1) Net depth: 1m → 100m → 1m (Changing at the rate of 1m/sec.)
- (2) Bottom: 100m
- (3) Temperature: +35°C → -5°C → 35°C (Changing at the rate of 0.4°C/sec.)

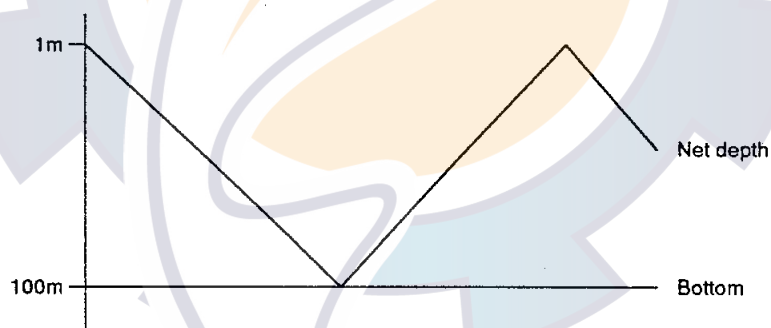


Fig. 21 Depth and distance-to-seabed data output

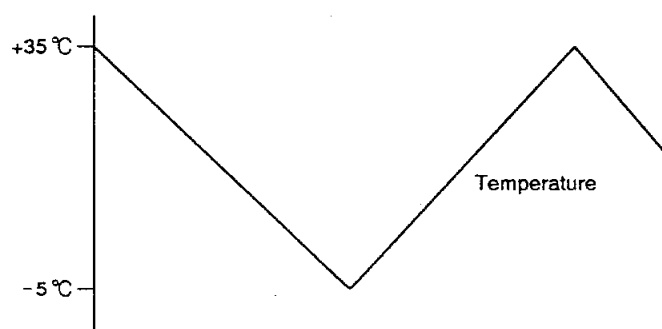


Fig. 22 Temperature output

SPECIFICATIONS

Display Unit

- 1) Frequency: 30, 40, 50, 60 or 70kHz
 2) Number of channels: 7 channels, DIP switch-selectable
 3) Indications:

Items	Range	Accuracy	Resolution
Net depth	0~360m	$\pm 1\%FS$	Less than 99.9m : 0.1m More than 100m : 1m
Sinking and rising speed of net	0~99m/min	$\pm 5\%$ (Sound velocity=1500m/s)	More than 9.9m/min: 0.1m/min Less than 10m/min : 1m/min
Distance to seabed	0~99m		Less than 9.9m : 0.1m More than : 1m
Temperature	-5 °C to +35 °C	$\pm 0.5^{\circ}C$	0.1 °C

- 4) Alarm: Depth alarm or seabed alarm
 5) Alarm tone: Selectable among 8 tones
 6) Variable marker: 0 to 360m
 7) Input/output data:
 a) Trigger pulse from echo sounder (E/S): 7 to 12V positive pulse
 b) Output signal to E/S: Depth marker, bottom marker, variable marker
 c) Output data in CIF format
 (Sonde number, net depth, distance-to-seabed, sinking and rising speed of net, temperature.)
 d) Analog temperature signal output: 100mV/°C
 e) Alarm signal to external speaker
 8) Calibrations: Meter adjustment, draft adjustment, depth adjustment, zero adjustment, temperature adjustment and brilliance adjustment
 9) Ambient conditions: Operating temperature: 0 °C to +50 °C
 Storage temperature: - 20 °C to +60 °C
 Relative humidity: Less than 90% (no condensation)
 10) Color: Front panel: N3.0 (dark gray)
 Cover: 2.5G7/2, Newtone No.5
 11) Power supply: 20 to 40VDC, power consumption less than 30W

Transmitter

- 1) Mode of signal transmission: Narrow band digital communication
- 2) Signal transmission range: 1000m (maximum)
- 3) Maximum depth: 500m
- 4) Measurements: Depth (10 to 360m), distance-to-seabed (0.5 to 99m) and Temperature (-5°C to $+35^{\circ}\text{C}$)
- 5) Data transmission to receiver: Frequency: 30, 40, 50, 60 or 70kHz
Beamwidth: Omnidirectional in upper hemisphere
Output power: 3W
- 6) Bottom detection: Frequency: 110kHz
Beamwidth: 90° (at -3dB)
Output power: 100W
Inclinometer incorporated
- 7) Ambient conditions: Operating temperature: -5°C to $+35^{\circ}\text{C}$
Storage temperature: -20°C to $+60^{\circ}\text{C}$
Storage humidity: Less than 95% (without condensation)
- 8) Power supply: Ni-cd battery, 14.4VDC
Continuous operation: more than 4 hours
The transmitter is automatically turned on/off at the depth of 10m.

Receiver

- 1) Directivity: Omnidirectional in lower hemisphere
- 2) Cable tensile strength: Approximately 1000kg

Battery charger

- 1) Battery connection: Plug-in type (with 10m cable), three batteries can be connected.
- 2) Charging time: Max. 1 hour/transmitter
- 3) Power supply: 100/110VAC, 1ϕ , 50/60Hz
- 4) Ambient conditions: Operating temperature: 0°C to $+40^{\circ}\text{C}$
Storage temperature: -20°C to $+60^{\circ}\text{C}$