FURUNO

OPERATOR'S MANUAL

NAVIGATIONAL ECHO SOUNDER

MODEL FE-680

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

9-52, Ashihara-cho,
Nishinomiya, Japan

Telephone: 0798-65-2111
Telefax: 0798-65-4200

·Your Local Agent/Dealer

FIRST EDITION : APR 1985
G : OCT. 18, 1999

PUB. No. OME-22800
(YOSH) FE-680

0008066720 0

⚠ SAFETY INSTRUCTIONS

"**DANGER**", "**WARNING**" and "**CAUTION**" notices appear throughout this manual. It is the responsibility of the operator and installer 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.

SAFETY INFORMATION FOR THE OPERATOR

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.

SAFETY INFORMATION FOR THE INSTALLER

WARNING

Only qualified personnel should work inside the equipment.

This equipment uses high voltage electricity which can shock, burn, or cause death.

Turn off the power at the ship's mains switchboard before beginning the installation. Post a warning sign near the switchboard to ensure that the power will not be applied while the equipment is being installed.

Serious injury or death can result if the power is not turned off, or is applied while the equipment is being installed.

CAUTION

Ground the equipment to prevent electrical shock and mutual interference.

Ungrounded equipment can give off or receive electro-magnetic interference or cause electrical shock.

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

Connection to the wrong power supply can cause fire or equipment damage. The voltage rating appears on the label at the rear of the equipment.

CAUTION ON DOCKING

This echo sounder measures the depth to the seabottom by means of an ultrasonic pulse emitted from the transducer fitted on the ship's hull plate and returned from the seabottom. Because the transducer is easily damaged if subjected to strong mechanical shock, you are requested to take the following safety measures to avoid damaging it when the ship is put on wood blocks during docking.

1. Lay the woood blocks under the ship's hull according to the docking plan, which shows the layout of the ship's hull structures including the transducer.

2. Have a diver check that the transducer does not touch any blocks prior to pumping out water from the dock.

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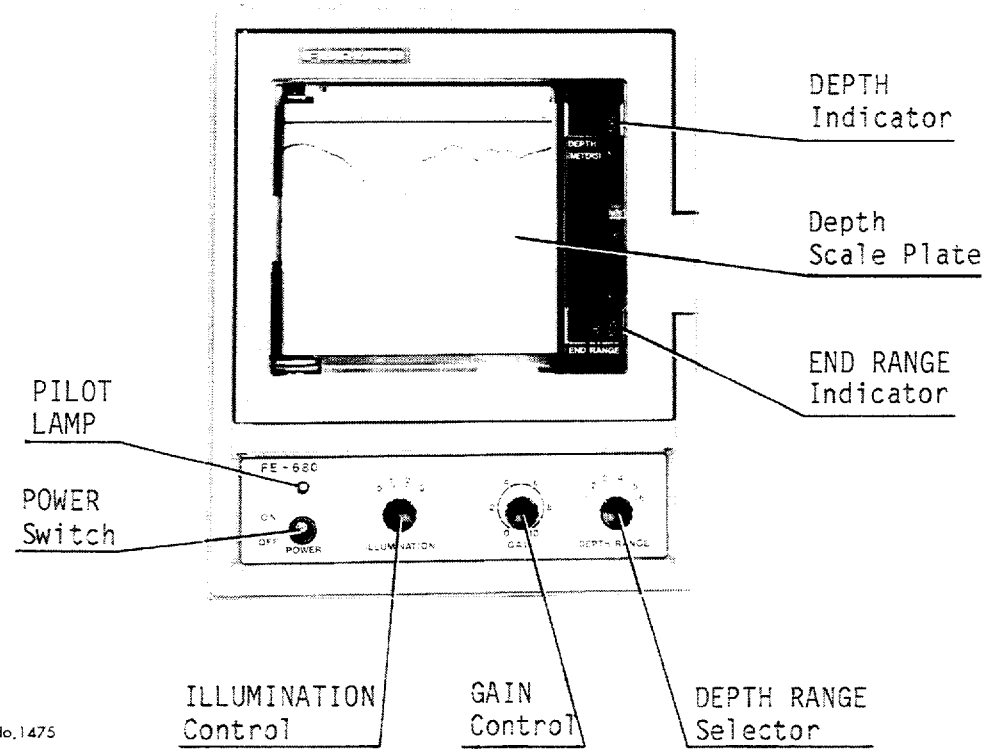
Chapter 1. OPERATION

1-1. OPERATING CONTROLS



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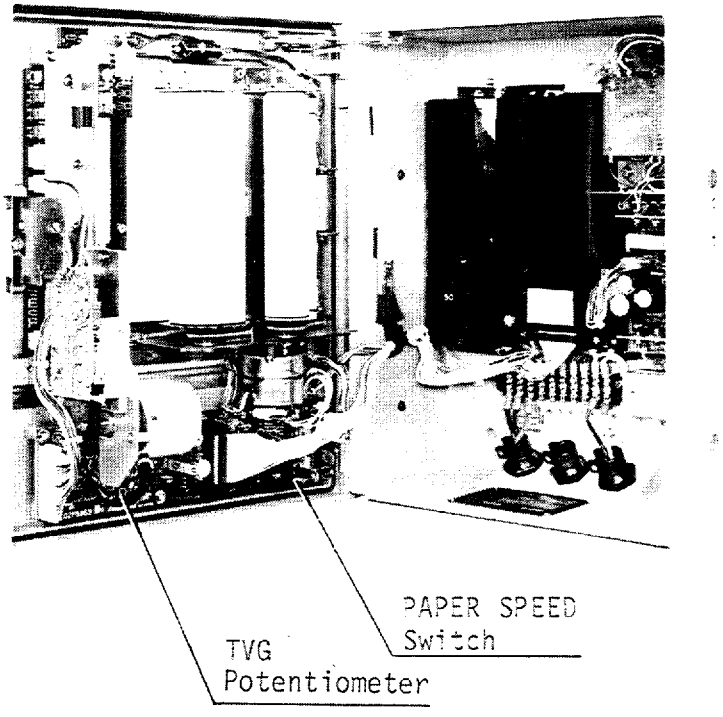

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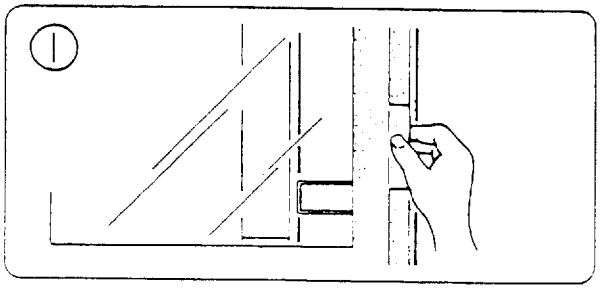
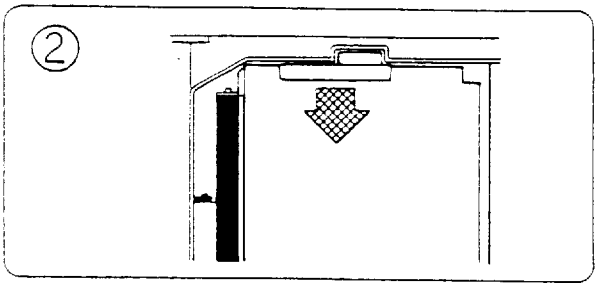
1-2. HOW TO LOAD RECORDING PAPER

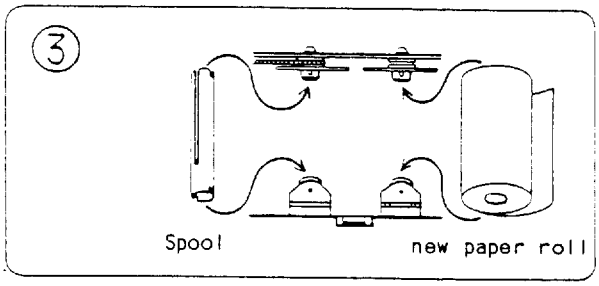


Open cabinet door.

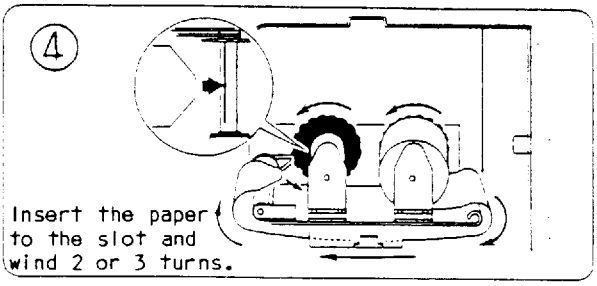


Pull recording plate forward.

Making sure that the recording stylus positions at the back of the recorder cabinet, pull the handle on the recording plate toward you.

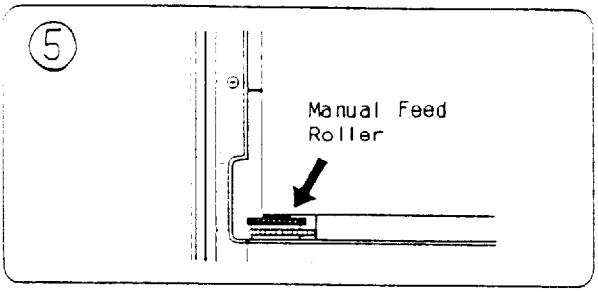


Set a new roll of paper and spool.



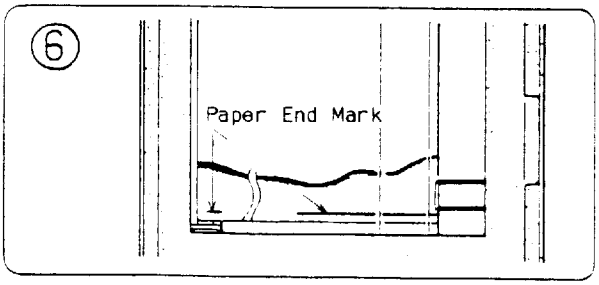
Load paper into recorder cabinet.

Insert the paper end to the slot of spool and close the recording plate.



Check paper for proper tension and positioning.

Thighten paper, if slackened, by turning the manual feed roller leftwards. Check that the paper is not one-sided.

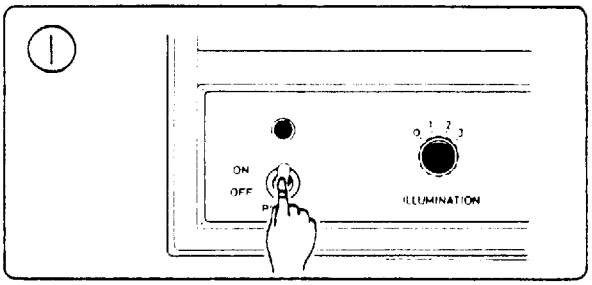


The paper end mark appears.

An end mark dash will appear when the paper remaining becomes approximately 10% of the total length of the roll, i.e. at about 2m from the end. When a continuous line appears, the remaining paper length is less than 1m.

Note: Terms marked with "*" are explained in "Glossary" on page 5.

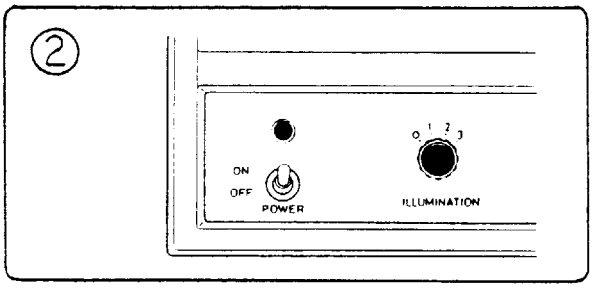
1-3. OPERATING PROCEDURE



Turn POWER switch on.

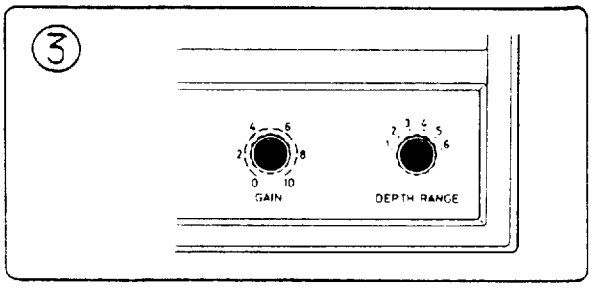
The PILOT LAMP lights up.

Note: Make sure that the recording paper is in position. Operation without the paper will impair the paper feeding roller.



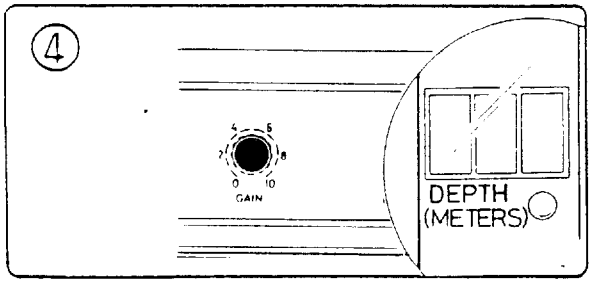
Turn ILLUMINATION to 1, 2 or 3 as necessary.

The switch adjusts the illumination for control panel and the recording paper.



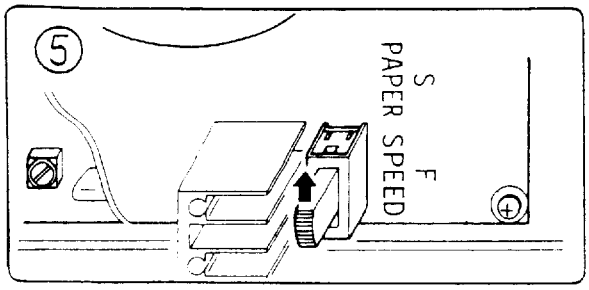
Select recording range.

The recording range starts from 0m. The recording end depth is digitally indicated on the lower indicator.



Adjust Gain*.

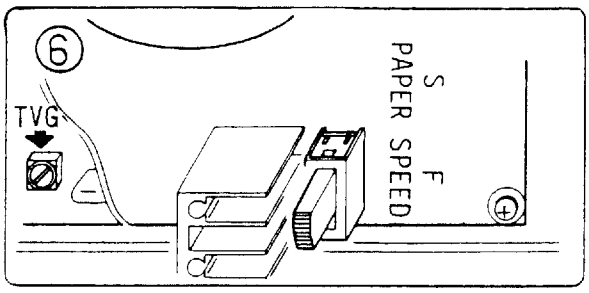
Clockwise rotation of the control increases the sensitivity. When the gain is properly set and seabed echo is sufficiently strong, sea depth is digitally indicated on the upper indicator.



Change PAPER SPEED switch if necessary.

The paper speed changes in two steps as listed below.

DEPTH RANGE	PAPER SPEED (mm/min)	
	F	S
1	8	4
2	8	4
3	8	4
4	8	4
5	4	2
6	2	1



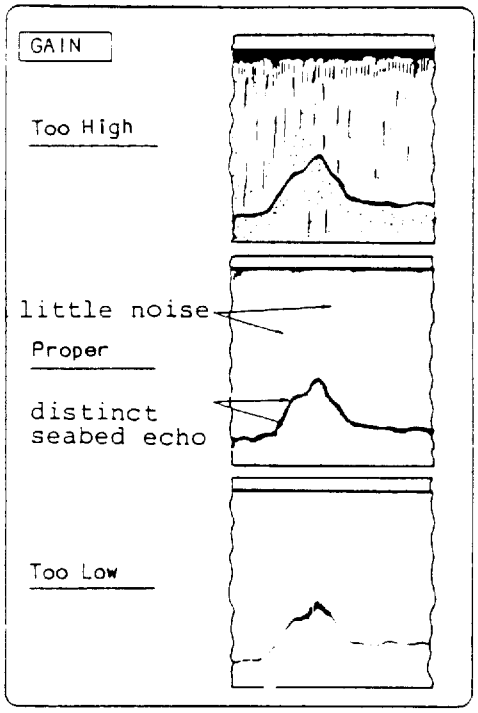
Adjust TVG* potentiometer.

Clockwise rotation of the potentiometer suppresses surface noise.

UTMOST CARE SHOULD BE TAKEN TO HIGH VOLTAGE WHEN GAINING ACCESS TO INTERNAL CONTROLS OR SWITCHES.

1-4. GLOSSARY

GAIN

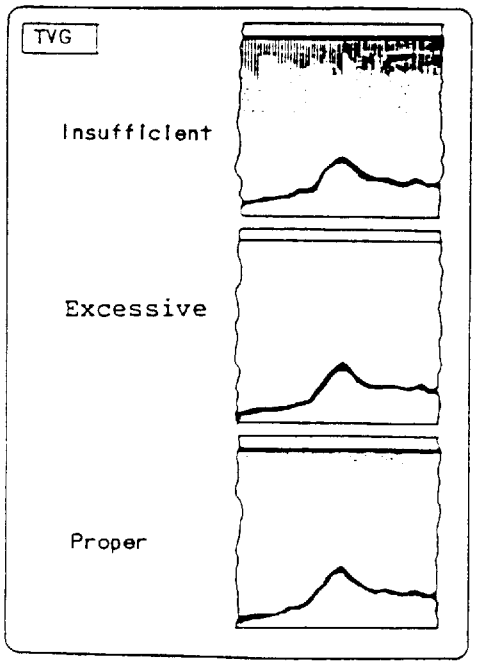


In short, the gain determines the minimum echo level which is received and recorded on the echo sounder. Clockwise rotation of the GAIN control increases the receiver sensitivity and enables reception of weaker echoes.
However the setting should be determined considering the followings.

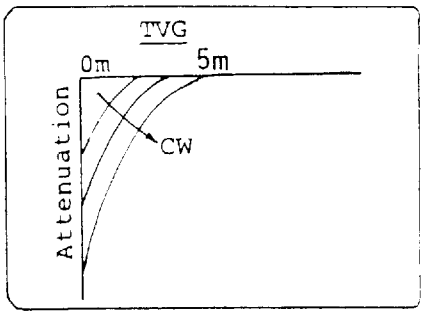
Gain Too High
Unwanted noise is excessively marked and wanted terget echoes are obscured.

Gain Too Low
The seabed is not positively recorded.

TVG



The function of TVG is to suppress the sensitivity of the receiver for the echoes coming back earlier and gradually restores it with time for those coming back later. Changing the sensitivity in this manner helps reduce surface noise and provides clear and uniform recording.



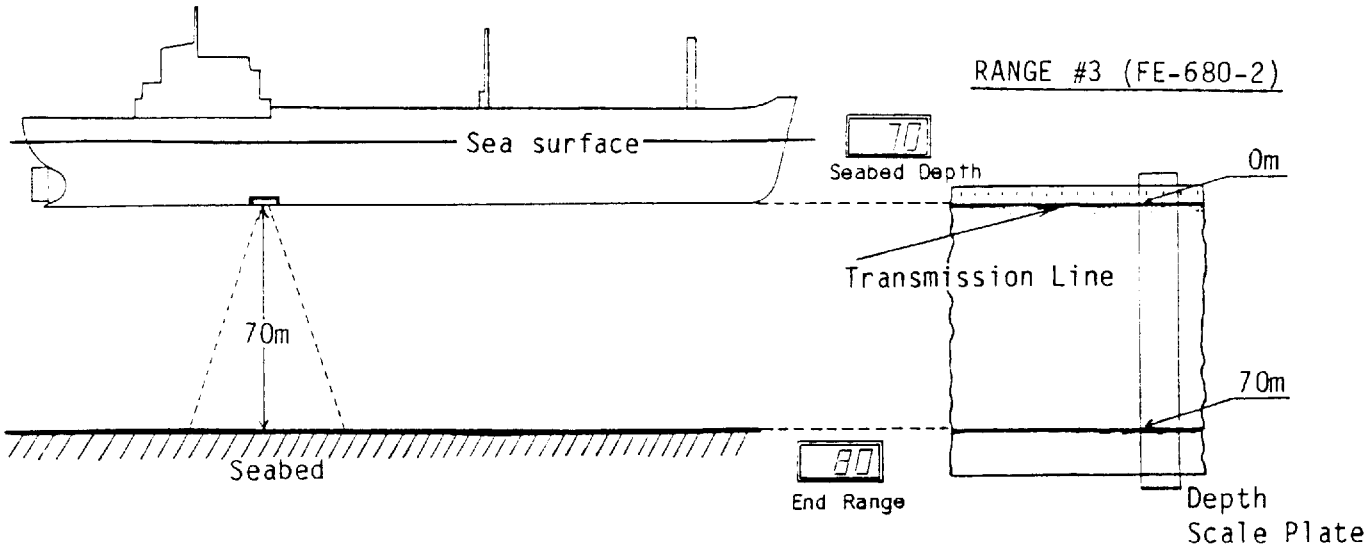
1-5. NOTES ON READING WATER DEPTH BY DIGITAL INDICATOR

Stability of digital depth indication depends on how distinctly seabed echo is recorded. The following points should be taken into account for safe navigation when reading the water depth on the DEPTH indicator:

(1) The depth below the transducer (bottom clearance) should be more than 2m. If it is less than 2m, the readout is locked at 2m.

(2) The seabed echo should be strong enough or not interrupted by air bubbles.
If the recorded echo is unreliable, the digital readout flickers to alert the operator.

(3) The seabed should be represented on the recording paper to obtain correct digital depth readout. The DEPTH RANGE must be changed according to the sea depth.
Shown below is the relation between the digital depth readout and the seabed is recorded on the recording paper.

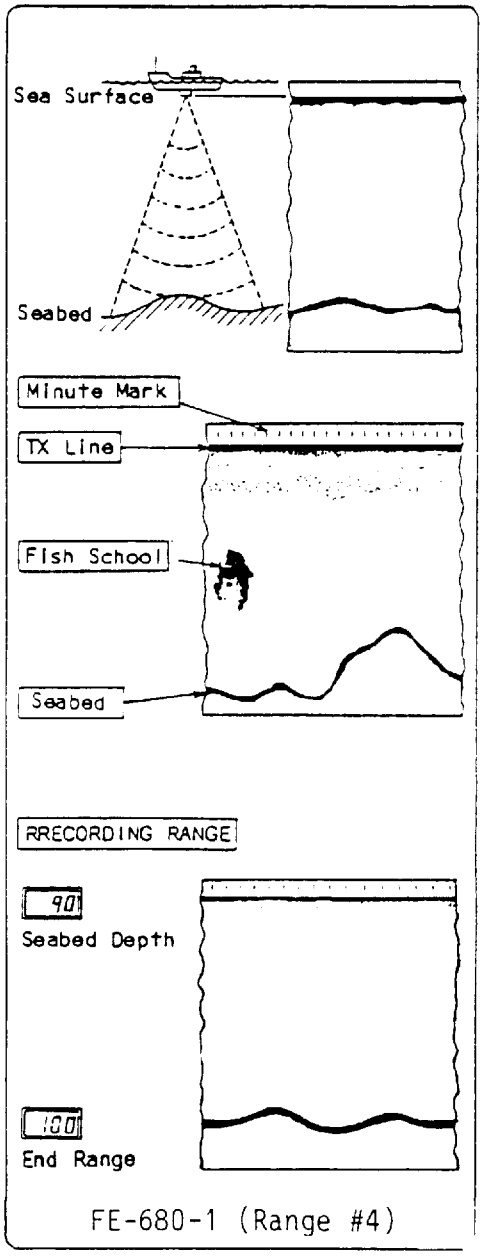


1-6. HOW TO INTERPRET ECHOGRAM

What is provided on echogram.

Transmission Line(zero line)

The transmission line is a trace of acoustical signal emitted into the water. It indicates the position of the ship's hull bottom where the transducer is installed.
This means the recordings show clearance between ship's hull and sea bottom.
To know the water depth below the sea surface, ship's draft should be added to the measured depth.



FE-680-1 (Range #4)

Seabed

The seabed is recorded as comparatively dark trace with some width. Its intensity and width vary with the nature of the seabed and characteristics of the echo sounder (frequency, pulselength and receiver characteristics).

Fish School

Fish school may sometimes be recorded between the transmission line and seabed. If the fish schools disturb correct digital depth indication or tracking of the seabed, try to reduce the gain.

Minute Mark

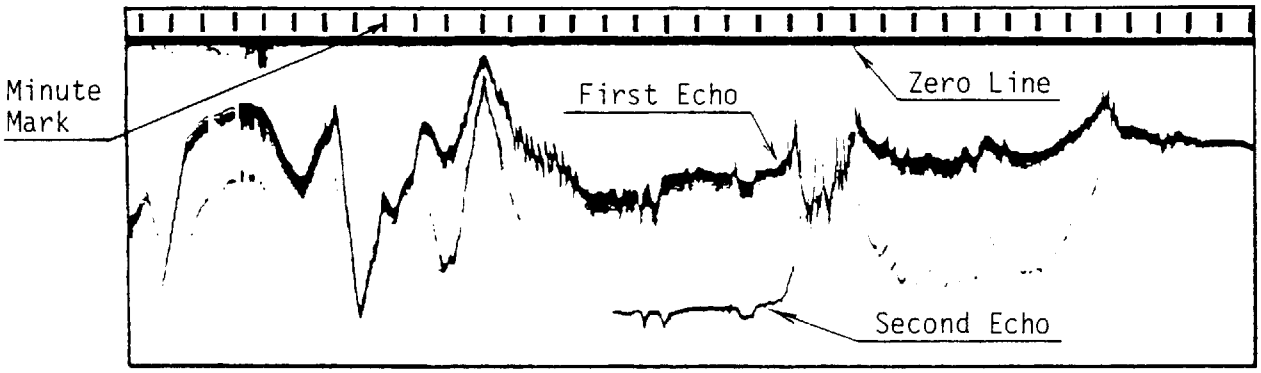
Minute marks are plotted every minute but their spacings will vary with the range setting and paper speed.

Recording Range

The recording range (end range) selected with the DEPTH RANGE switch is indicated on the lower digital display.

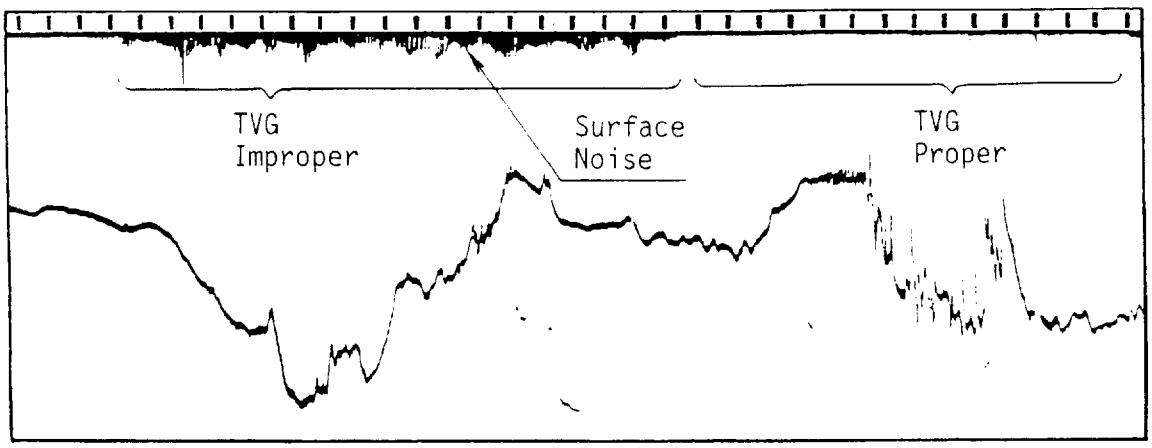
Multiple Reflection

The echo sounder plots zero line, first echo, second echo, etc. as shown below. To read the sea depth, an interval between the first echo trace (seabed) and zero line should be referred to. The second or third echo appears at the same interval and is able to be identified easily. In a comparatively shallow water or over the hard seabed, multiple reflections may occur if the gain control setting is too high. This is because the sounding pulse is reflected at the seabed and sea surface (or ship's hull) repeatedly. Therefore, ignore the second and third echo traces, etc. for depth measurement.



Sea Surface Noise

Sea surface noise is mainly caused by the air bubble created by ship's cruising, rough sea conditions, rain, wake, etc.
If this noise spoils seabed echo trace, readjustment of the TVG potentiometer behind the front panel is required for clear echo trace.
See page 4.

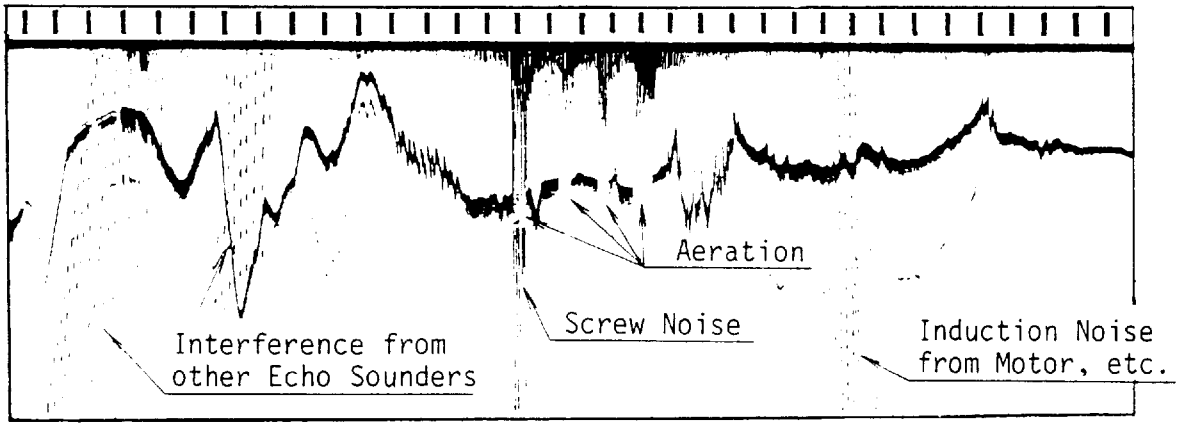


Interference and Induction Noise

Various types of interference and noise may arise.
Turning the gain control counterclockwise will moderate the noise for easy observation of seabed echo trace.
Interference from other echo sounders will be plotted with parallel inclining broken lines. Electric induction noise from a motor or generator will be plotted with dots appearing at random.

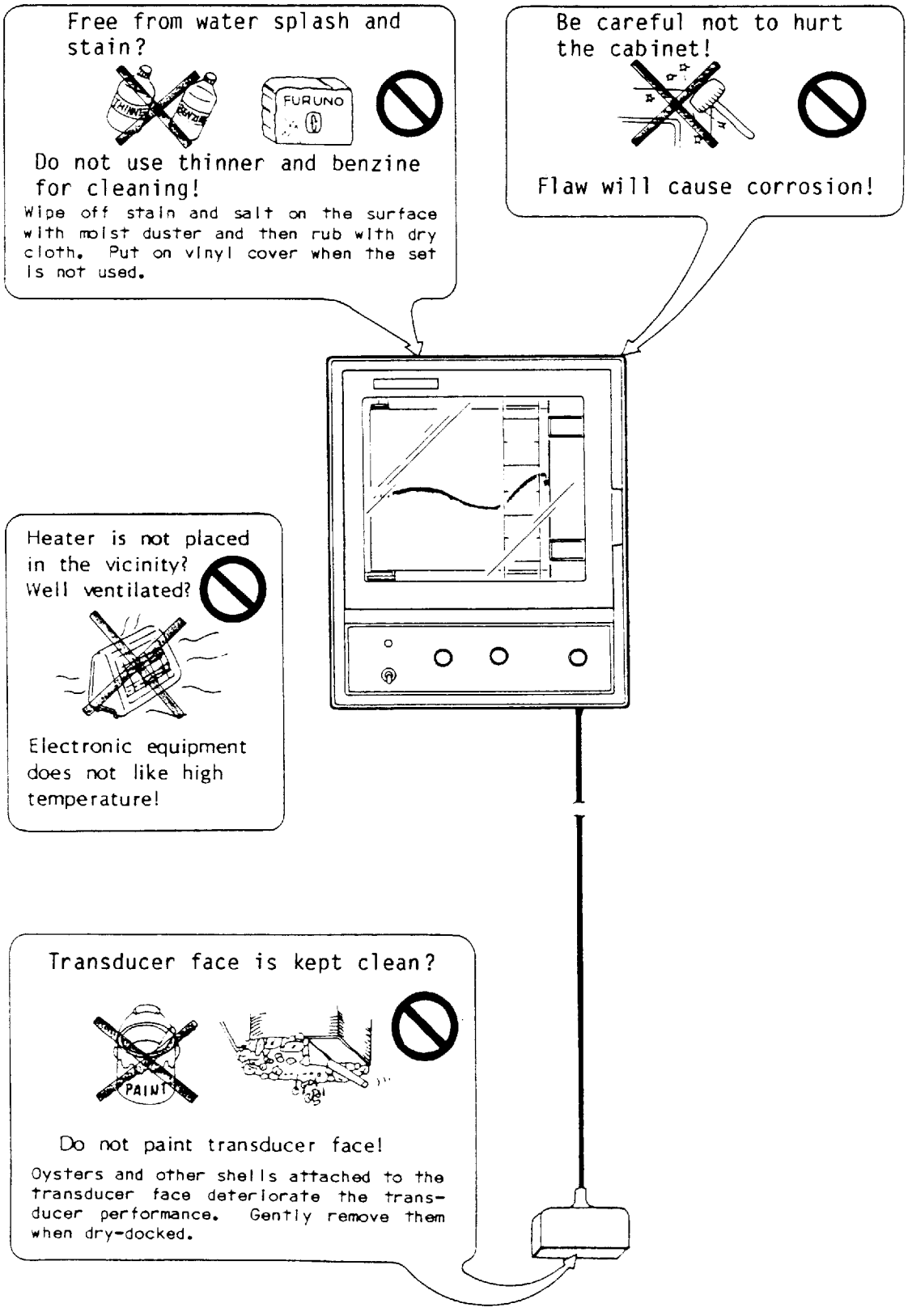
Blocking by Aeration

When making a turn or going astern, the propeller screw causes a lot of bubbles, which interrupt normal sounding. Blocking by aerated water also takes place in a rough weather. This is an incurable problem in the equipment using acoustical signals.

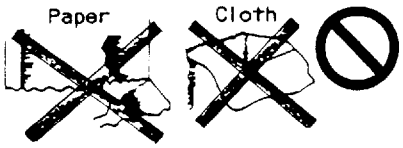


Chapter 2. **MAINTENANCE**

2-1. GENERAL CAUTIONS



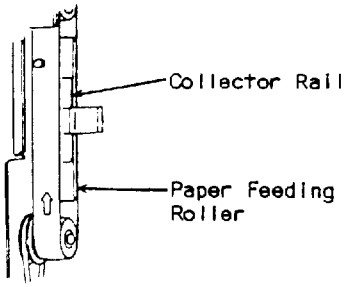
No abnormal noise from mechanical part?



Do not jam rubbish in the gears.

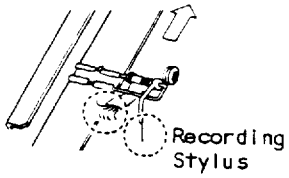
Be careful not to jam paper, thread or rubbish in the gears when replacing recording paper or cleaning inside.

No stain on collector rail or paper feeding roller?



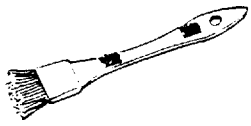
Stain on collector rail and flaw of paper feeding roller deteriorate quality of echogram.

Recording stylus is worn away?

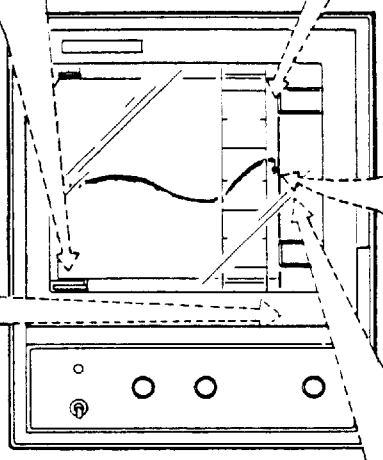


Worn stylus obscures echogram!

No carbon chips accumulated inside?

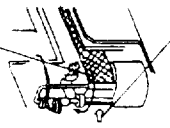


Carbon accumulates with time. Clean the inside with the brush supplied.

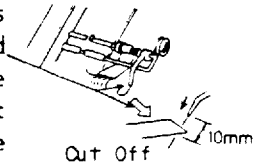


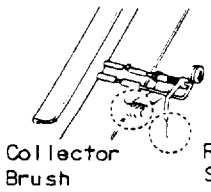
2-2. HOW TO REPLACE RECORDING STYLUS

① Turn belt by hand along arrow until recording stylus comes out.

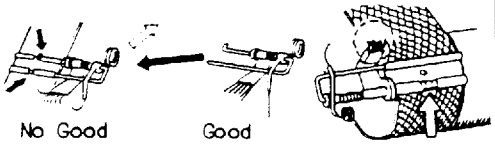


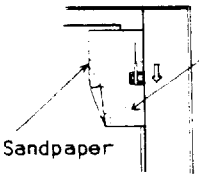
② When only the stylus nib is worn, pull out the nib and cut off the worn part. The proper length of nib is about 10mm. If it is too long, the recording becomes weak.





③ When the collector brush is worn, take out the whole stylus assembly by pushing it along arrow (⬆) and replace it with new one.





④ Making sure the recording paper is in position, put sandpaper as shown and turn the belt about 20 times to round the stylus nib.

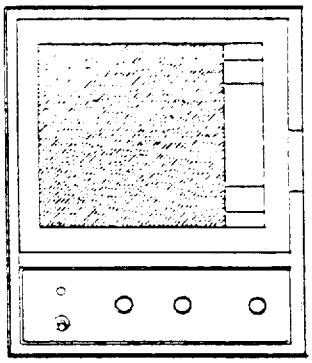
BEFORE OPENING CABINET DOOR
TURN OFF POWER SWITCH FIRST!

2-3. FUNCTIONAL CHECK

*Please perform following check before making a service call.

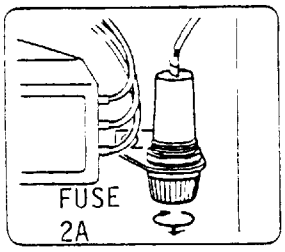
When the set is found faulty, do not attempt further troubleshooting but call your local service agent for repair.
Careless check of internal circuitry may lead more serious trouble.

No recording (Belt not rotating)



Nothing at all with power on.
Fuse is OK?

If the fuse is blown, replace it with new one. In case it blows again, call for repair.

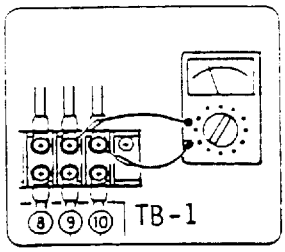


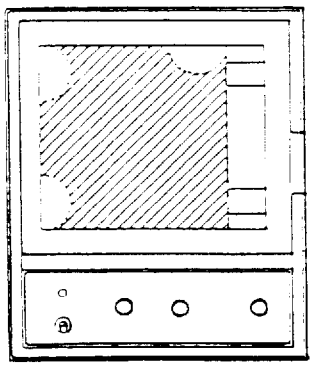
The fuse is located at the lower right bottom inside the recorder cabinet.

Supply voltage is normal?

Check the supply voltage at TB-1.

Ship's Mains	Ratings
100VAC	90 - 110VAC
110VAC 115VAC	99 - 127VAC
220VAC	198 - 242VAC
230VAC	207 - 253VAC



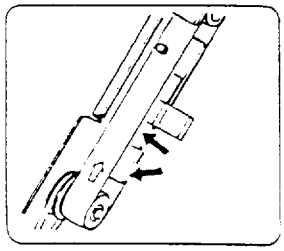


Illumination lamps light darkly but belt does not rotate.

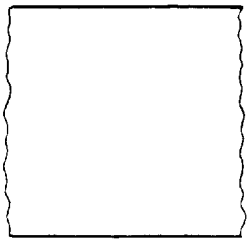
Check that the rated voltage listed above is present between #9 and #10 of power supply terminal TB-1.

Fuse blows shortly after power on.
Belt is jammed?

Check the belt for strange materials (scrap of paper, rubbish) which will overload the motor, leading a fuse to blow.

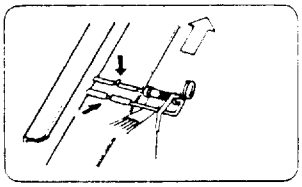


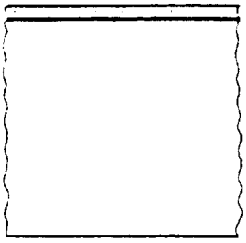
Abnormal Recording



Belt rotates but no recording.
Recording stylus is set in position?

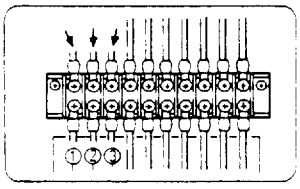
⇨ Refer to "How to replace recording stylus" on page 11.

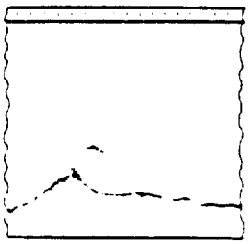




Transmission line plotted but no echo trace.
No loose connection in the transducer terminals?

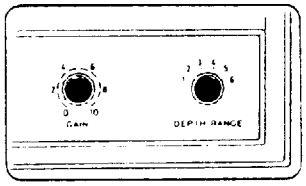
⇨ When the connection is loose, tighten it firmly to avoid further loosening.





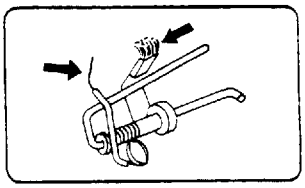
Faint seabed trace.
Sea is not rough?

⇨ The recording condition may become poor at the rough sea. Turn GAIN control a little clockwise.



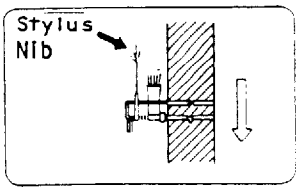
Weak recording over the paper.
Recording stylus is worn away?

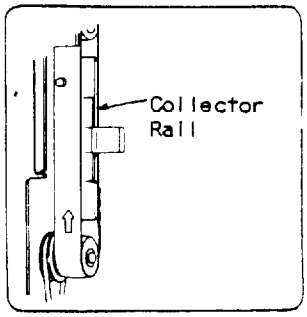
⇨ Refer to "How to replace recording stylus" on page 11.



Uneven recording.
No strange material on the stylus nib?
No stain on the collector rail?

⇨ The recording stylus, collector rail and paper feeding roller should be kept clean all the time.

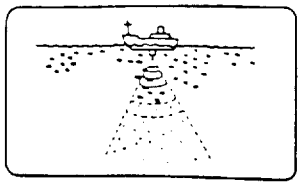




⇨

Intermittent recording.
Sea is not rough?
Ship is not under way of quick turning.

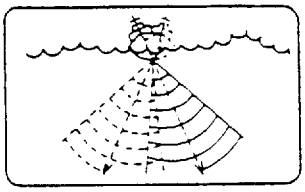
In addition to above, the intermittent recording will result when the ship is going astern or crossing over a wake of other boat. Alteration of transducer installation site may be required if the recording is intermittent all the time.



⇨

Bottom contour recorded zig-zag.
Sea is not rough?

It is an effect of pitching and rolling. This is only remarkable with a narrow beam transducer.

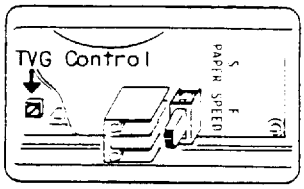


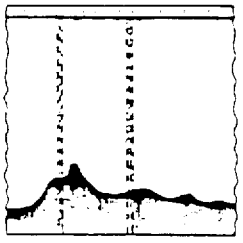
Narrow Beam

⇨

Excessive surface noise.
TVG is adjusted properly?

Amount of surface noise depends on sea condition (rough or calm). TVG should be kept adjusted in accordance with existing sea condition.

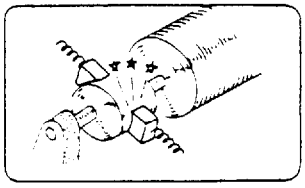


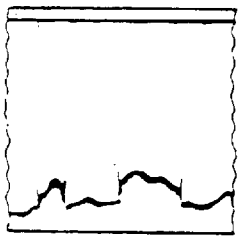


⇨

Irregular noise appears at times.
It comes from other electric equipment.

Turn off suspected electric equipment one by one, especially the ones with brush such as rotary inverter and generator, to locate noise generating source. Keep the echo sounder and its wiring off the noise source.

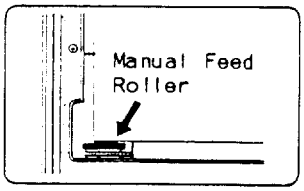




⇨

Minute mark interval irregular.
Recording paper is set in position?

Correct setting of the recording paper, referring to "how to load recording paper" on page 2 and check paper feeding condition by turning manual feed roller.



Chapter 3. INSTALLATION

3-1. RECORDER UNIT

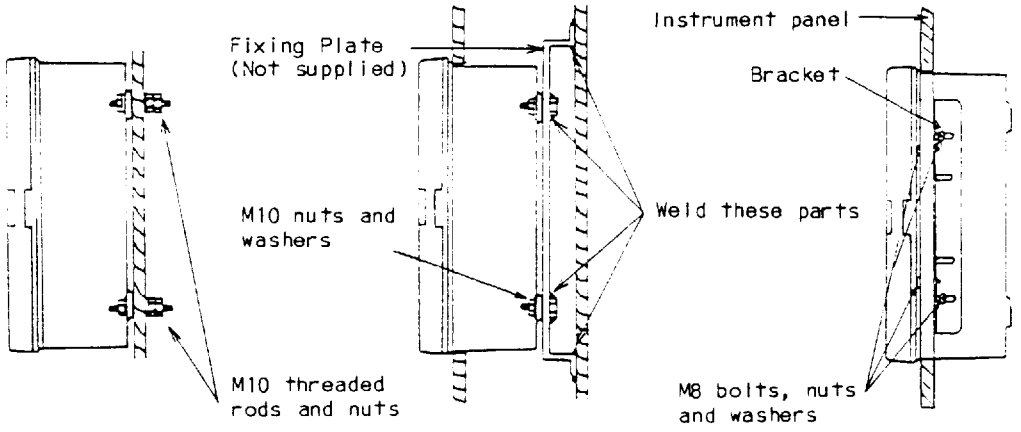
The recorder unit can be installed on the bulkhead or built in the bulkhead or instrument panel.

BULKHEAD MOUNT

Refer to the outline drawing C2280-020-A on page 24.
Make three fixing holes (3-Ø12), and then fix the unit with M10 threaded rods and nuts.

FLUSH MOUNT

Cut out the planking by a dimension of 280mm wide by 340mm high and then weld the fixing plate with bolts to the inner bulkhead. After this, put the unit into the hole and fix it with four M10 nuts and washers. The fixing plate should be arranged locally.



BULKHEAD MOUNT FLUSH MOUNT PANEL MOUNT

PANEL MOUNT

Refer to the outline drawing C2280-021-A on page 25.
Cut out the mounting panel by a dimension of 280mm wide by 340mm high and then fix the unit by using the mounting brackets on the both sides of the recorder cabinet.
The mounting brackets can be supplied optionally.

3-2. CABLING

Cabling to the recorder unit includes the connection of the power and transducer cables on the terminal board.
Refer to the cabling diagram C2280-001-C on page 23.
As for the optional equipment such as Digital Depth Indicator ED-202, refer to the installation diagram in each operator's manual.

3-3. TRANSDUCER

The installation of the transducer and the tank should be accomplished by a dockyard referring to the installation drawings on pages 28 and 29.
An example of transducer installation method is also shown on page 18.

Note: Discussions should take place and agreement reached with the dockyard for sufficient reinforcement and watertightness of the hull to comply with the regulations concerned.

To decide the location of the transducer, the following points should be taken into account.

(1). The most important matter is where the transducer is installed. The position should be free from aeration possibly occurring beneath the hull and also not affected by engine and propeller noise.

(2). It is known that air bubble stream starts approximately from a quarter length from the stem, and spreads over the hull bottom approximately to three quarters.
Air bubble stream varies in form and intensity according to ship's speed, draught, trim, shape of bow and hull, as well as a sea state.

(3). In a laden ship, a position somewhere near a quarter of the ship's length from the stem often gives satisfactory results. As for vessels such as oil tankers whose fore draught is especially shallow, an after position about three quaters of ship's length from the stem is often suitable.

(4). It is recommended to install the transducer on the keel line or between 600mm and 900mm from the keel to minimize the effect of aerated water.

(5). Siting near obstructions such as the forward propeller, bow thruster, water intake pipes and speed log sensor should be avoided.

(6). Select a place giving minimum mechanical vibration.

(7). Do not lay the transducer cable near or in parallel with other electric cables.

(8). To extend the transducer cable, a junction box and an optional shielded 2C cable (ex. 660V DPYCS-2.0) are required.

(9). **When the transducer cable length exceeds 100m on system frequency of 50KHz (FE-680-2) or 15m on 200KHz (FE-680-1), a matching box is required. Make the following change on main p. c. board (02P5949) when the matching box is used.**

(1) Turn the power off.

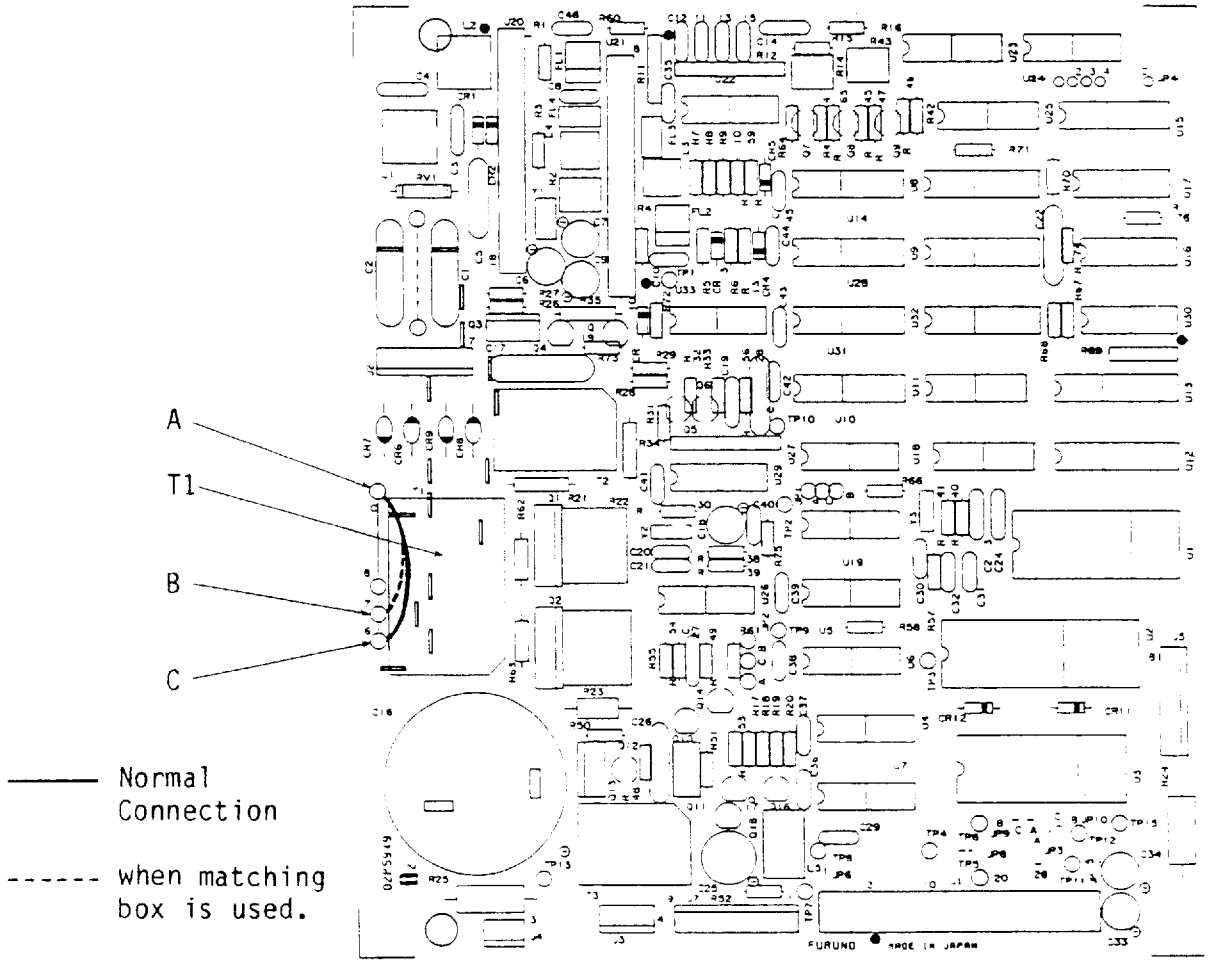
(2) Open the front door.

(3) Remove three screws retaining the dust cover, then unplug the six connectors and disconnect a crimp-on lug connected to the main p. c. board 02P5949.

(4) Remove four screws to take out the main p. c. board.

(5) Change a jumper connection from A-C to A-B on the soldering side of p. c. board.

(6) Fit the p. c. board for normal operation.



02P5949 MAIN PRINTED CIRCUIT BOARD

EXAMPLE OF TRANSDUCER INSTALLATION (TTF-5600)

(1). Never fail to remove the transducer and rubber gasket prior to welding the transducer tank to the hull.

(2). Install the transducer tank on the hull. The tank bottom should be flush with the hull bottom. Feed the transducer cable through the cable gland.

(3). Apply seal tape to the threads of the gland nut for watertightness.

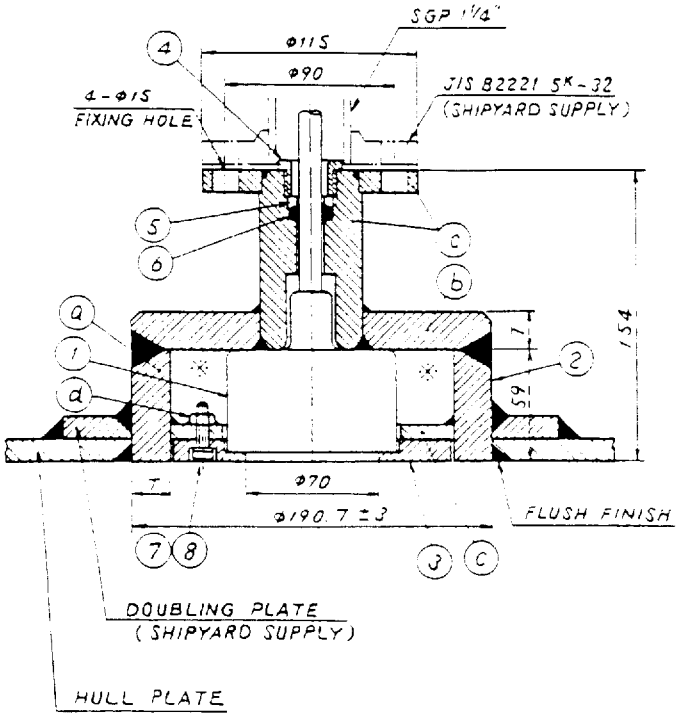
(4). Pass the cable thru the gasket, washer and gland nut.

(5). Fix the transducer to the tank with the transducer fixing flange.

(6). Apply a coat of grease to the gasket and washer and settle the gland nut.
Note: Use silicone grease to prevent the rubber gasket from deterioration.

(7). Screw up the gland nut tightly.

(8). It is recommended to enclose the transducer cable in a conduit pipe for waterproofness and electrical shielding as well as for protecting the cable from mechanical damage.
The conduit pipe should be fixed with the flange on the transducer tank. The pipe should be of such a length to clear the water level when the ship is fully loaded. The pipe end should be finished with filling compound. It is recommended to fill sand in the pipe between the transducer and the junction box (or matching box). This will prevent the transducer from vibration and eventual damage.



1	Transduser (50B-6B)
2	Transducer Tank
3	Fixing Flange
4	Gland Nut
5	Washer
6	Rubber Gasket
7	Hex. Bolt (M6x25)
8	Spring Washer (For M6)

※ Sea water comes into the area marked with " ※ " inside the tank.

Transducer Tank for 50B-6B Transducer

SPECIFICATIONS OF FE-680-1/2
NAVIGATIONAL ECHO SOUNDER

1. DEPTH RANGE, SOUNDING RATE, PAPER SPEED, PULSE LENGTH, FREQUENCY:

MODEL	DEPTH RANGE (m)	SOUNDING RATE (*)	PAPER SPEED (mm/min)		PULSE LENGTH (msec)	FREQUENCY (kHz)
			F	S		
FE-680-1	0 - 10	336	8	4	0.5	200
	0 - 20	336	8	4	0.5	
	0 - 40	168	8	4	0.5	
	0 - 100	84	8	4	1.0	
	0 - 200	42	4	2	2.0	
	0 - 400	42	2	1	2.0	
FE-680-2	0 - 20	336	8	4	0.5	50
	0 - 40	336	8	4	0.5	
	0 - 80	168	8	4	0.5	
	0 - 200	84	8	4	1.0	
	0 - 400	42	4	2	2.0	
	0 - 800	21	2	1	2.0	

* Pulse repetition rate per minute

2. RECORDING SYSTEM

Belt straight line recording system

3. RECORDING PAPER

Dry electrosensitive paper
Type; PD-1520NW (150mm X 20m; 5.9" X 66'), Effective width (130mm; 5.1")

4. DIGITAL READOUT

a) Depth  : Seabed Depth (1m step)

b) Range  : Depth Range

5. OUTPUT POWER

300W

6. TRANSDUCER & TANK

FREQUENCY	TRANSDUCER	BEAM WIDTH (-3dB)	TANK	REMARKS
200kHz	200B-8B	5.4°	TTF-2000 TTS-2000-2 TTD-2000	Standard Option Option
50kHz	50B-6B	28°	TTF-5600 TTS-5600-2 TTD-5600	Standard Option Option

7. POWER SUPPLY

100/110/115/220/230VAC ±10%, 50/60Hz ±5%, 1Ø, 50VA Approx.

8. COATING COLOR

Front Door N5.0 Leather Tone
Cabinet N6.0 New Tone No.5

9. EQUIPMENT LIST

Standard Supply

No.	NAME	TYPE	Q'TY	WEIGHT (kg)	DIMENSION (mm) W H D	REMARKS
1	Recorder Unit	FE-680 -1/2	1	10 11	292 x 350 x 152 350 x 350 x 152	Bulkhead Mount Panel Mount
2	Transducer	200B-8B 50B-6B	1	3.6 4	110 x 65 x 110 90 x 90 x 90	with 15m cable "
3	Transducer Tank	TTF-2000 TTF-5600	1	19 17	216 x 154 x 216 190 x 154 x 190	20mm thick "
4	Installation Materials		1 set			
5	Spare Parts		1 set			

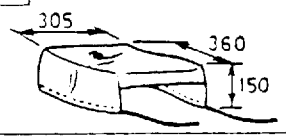
Optional Supply

No.	NAME	TYPE	WEIGHT (kg)	DIMENSION (mm) W H D	REMARKS
1	Matching Box	MB-504 MB-502	2.6	120 x 111 x 252 120 x 111 x 252	for FE-680-1 for FE-680-2
2	Transducer Switch Box	EX-8	2.7 3	174 x 150 x 85 224 x 200 x 80	Bulkhead Mount Flush Mount
3	Digital Depth Indicator	ED-202	11 " " "	400 x 210 x 245 400 x 210 x 245 400 x 210 x 245 380 x 210 x 245	Table-Top Mount Bulkhead Mount Overhead Mount Flush Mount
4	Watertight Junction Box	JIS F8821-1	1.6	Ø105 x 60	
5	Transducer Tank	TTS-2000-2 TTD-2000-3 TTS-5600-2 TTD-5600-3	28 26 	260 x 294 x 260 300 x 342 x 300 260 x 294 x 260 300 x 342 x 300	for FE-680-1 " for FE-680-2 "

Accessories

No.	NAME	TYPE	CODE No.	Q'TY	OUTLINE	REMARKS
1	Vinyl Cover	FP02-00300	000-800-076	1	1	Bulkhead Mount

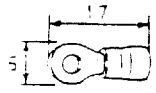
1



Installation Materials

No.	NAME	TYPE	CODE No.	Q'TY	OUTLINE	REMARKS
1	Crimp-On Lug	FV2-S3.3 Blue	000-538-117	10	1	Bulkhead Mount
2	Copper Strap	WEA-1004-0	500-310-040	1	2	"
3	Plastic Rivet	#1150	000-515-881	3	3	Panel Mount
4	Hex. Bolt (Slotted Head)	M8x20 SUS304	000-862-147	4	4	"
5	Hex. Nut	Mx8 SUS304	000-863-110	4	5	"
6	Flat Washer	Mx8 SUS304	000-864-130	4	6	"
7	Spring Washer	Mx8 SUS304	000-864-262	4	7	"
8	Crimp-On Lug	FV2-S3.3 Blue	000-538-117	10	1	"
9	Copper Strap	WEA-1004-0	500-310-040	1	2	"
10	BRACKET	02-046-0006 DFZCR6	100-043-320	1	8	"

1



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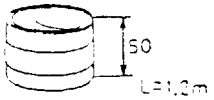

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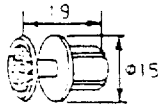

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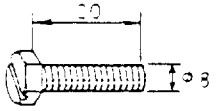

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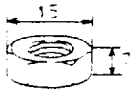

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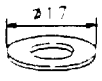

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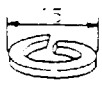

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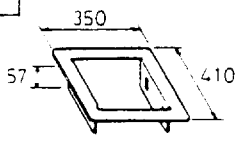
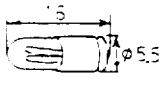


Spare Parts

No.	NAME	DWG. No. TYPE No.	CODE No.	Q'TY	OUTLINE	REMARKS
1	Lamp	T-5.5MG 8V, 60mA	000-101-424	3	1	
2	Pilot Lamp	T3.8 C 8V, 60mA	000-540-180	2	2	
3	Fuse	FGBO-A 2A 125VAC	000-549-062	2	3	
4	Recording Paper	PD-1520NW	000-878-455	2	4	
5	Recording Stylus	02-015-2190-2	201-521-902	2	5	
6	Sandpaper	#240	000-835-666	1	6	
7	Spare Parts Box	F710	000-831-610	1	7	

1



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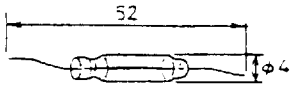

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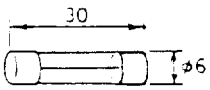

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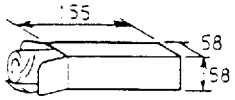

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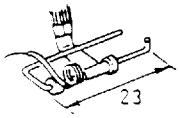

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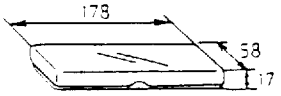
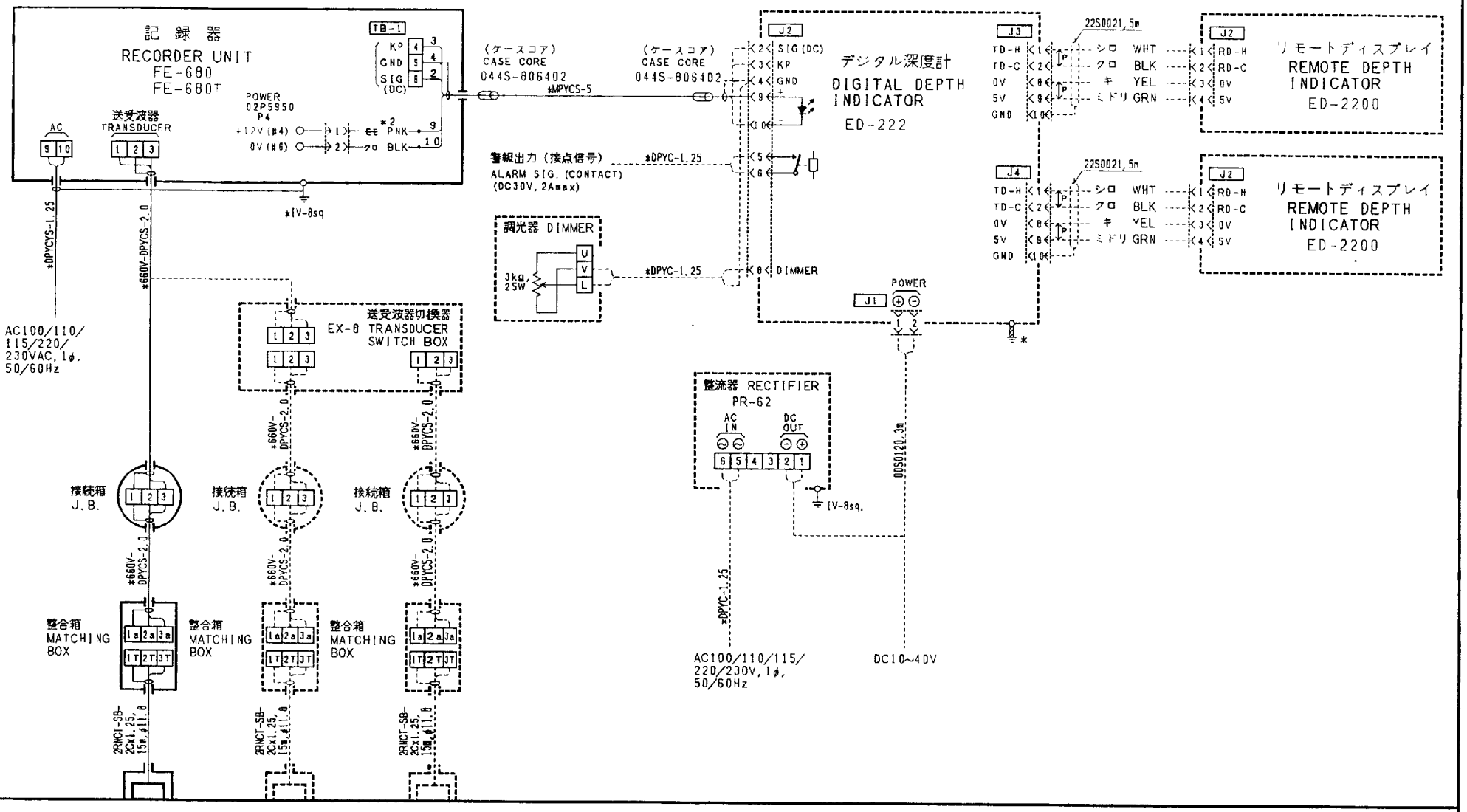
7





NOTE 1:

- ⊀99⊁: コネクタ CONNECTOR
- 99: 端子台 TERMINAL BOARD
- ⏚: IV-8sq. 或いは同等品にて接地 GROUNDING WIRE IV-8sq.
- ----: オプション支給 OPTIONAL SUPPLY
- *: 造船所殿手配 SHIPYARD SUPPLY

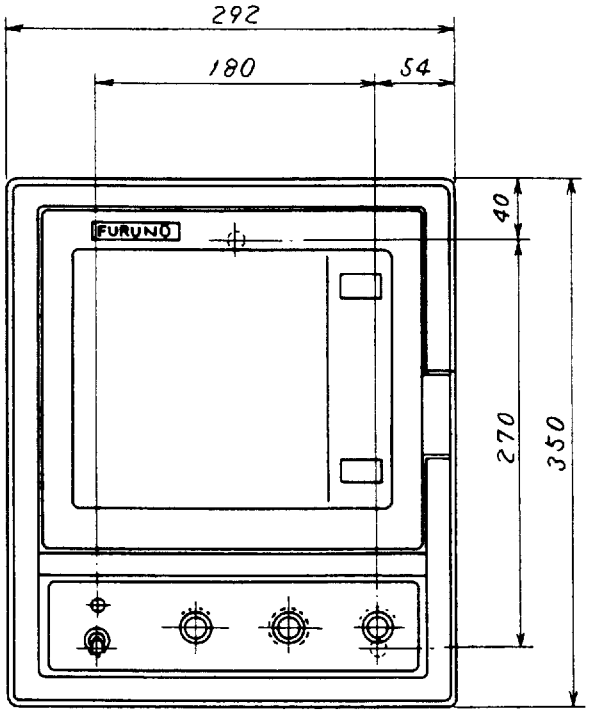
NOTE 2:

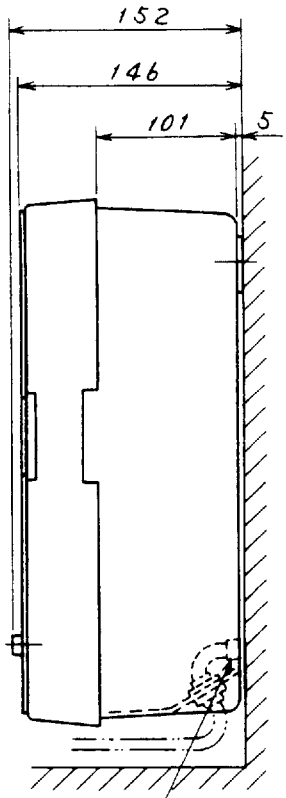
送受波器ケーブルが次の長さを超えるときには整合箱を使用すること。

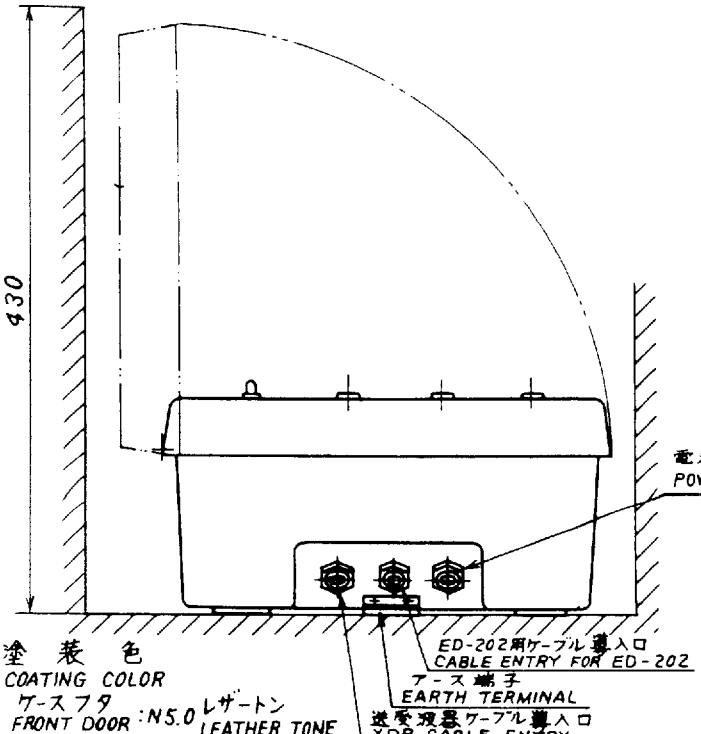
MACHING BOX IS REQUIRED WHEN TRANSDUCER CABLE EXCEEDS THE LENGTH BELOW.

FREQUENCY	LENGTH
50kHz	100m
200kHz	15m

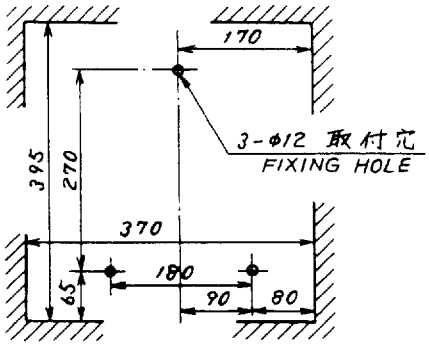
承認 APPROVED	Sept 9 '96 K. Ono	名称 TITLE	音響測深機
検図 CHECKED	Aug 21.'96 K. Kuwaki	FE-680 FE-680T	NAVIGATIONAL ECHO SOUNDER
製図 DRAWN	July 22 '96 YEBISU	図番 DWG. NO.	C2280-C03-F



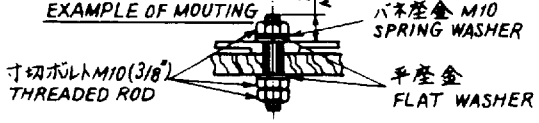




取 付 寸 法
MOUNTING DIMENSION



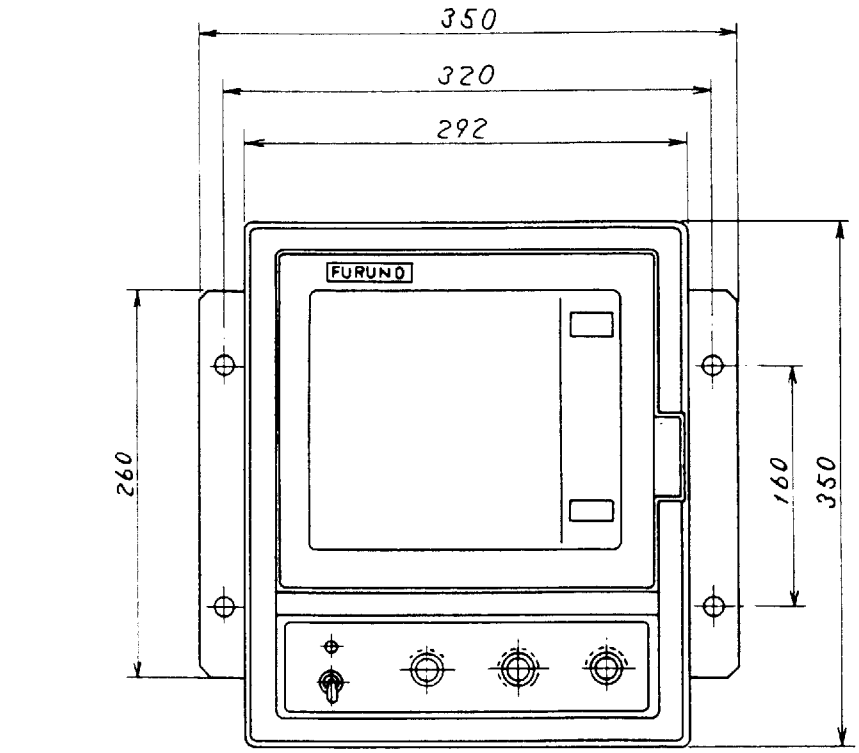
取 付 例
EXAMPLE OF MOUTING

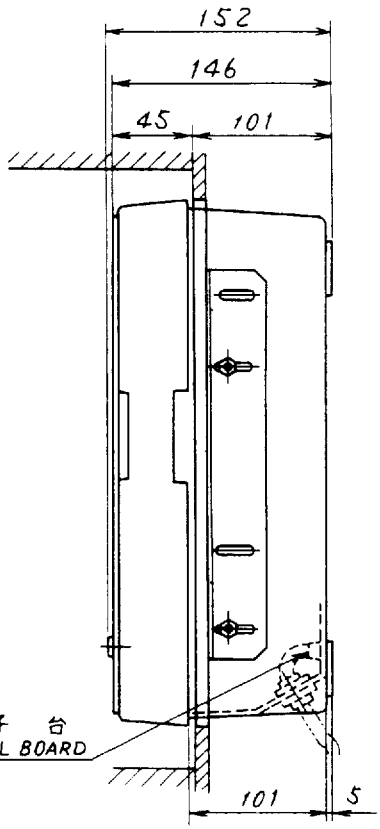


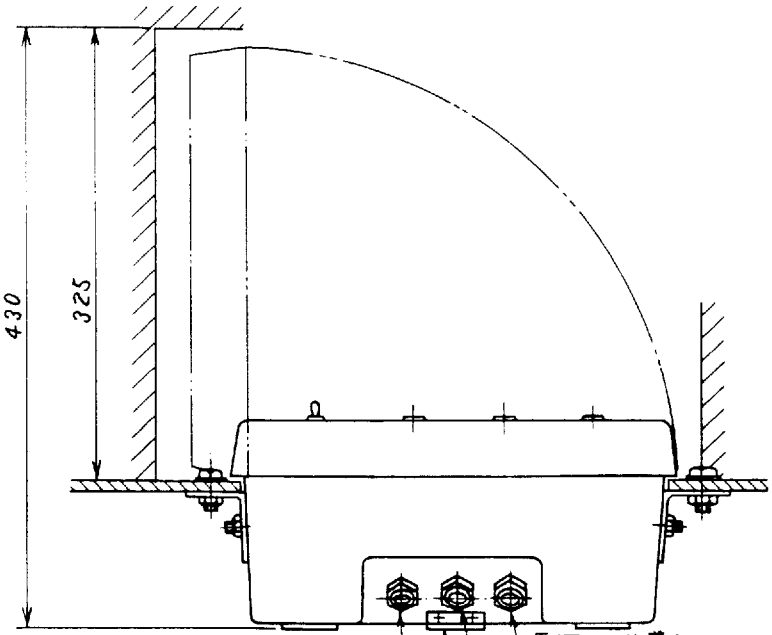
塗 装 色
COATING COLOR
ケースフタ FRONT DOOR :N5.0 レザートン LEATHER TONE
ケース CABINET :N6.0 ニュートン NO.5 NEW TONE NO.5

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

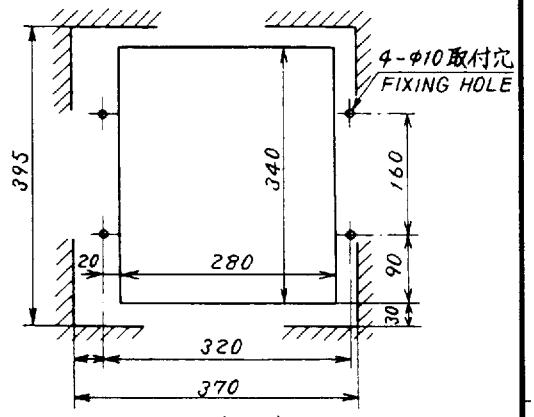
承認 APPROVED	OCT. 30. '84	三角法 THIRD ANGLE PROJECTION		名称 TITLE	記録器 (壁掛型)
検図 CHECKED	Oct. 17. '84	尺度 SCALE	1/5	FE-680	RECORDER (BULKHEAD MOUNT)
製図 DRAWN	Oct. 16. '84 Hashino	重量 WEIGHT	10 kg	図番 DWG. NO.	C2280-020-A



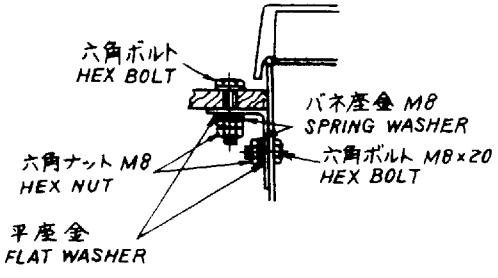




取付寸法
MOUNTING DIMENSION



取付例
EXAMPLE OF MOUNTING



塗装色
COATING COLOR

ケースフタ FRONT DOOR	: N5.0	レザートン LEATHER TONE	
ケース CABINET	: N6.0	ニュートン NO.5 NEW TONE NO.5	

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	Oct. 20. '84	三角法 THIRD ANGLE PROJECTION		名称 TITLE	記録器（埋込型）
検図 CHECKED	Oct. 17. '84	尺度 SCALE	1/5	FE-680	RECORDER (FLUSH MOUNT)
製図 DRAWN	Oct. 16. '84 Hashino	重量 WEIGHT	11 kg	図番 DWG.NO.	C2280-021-A

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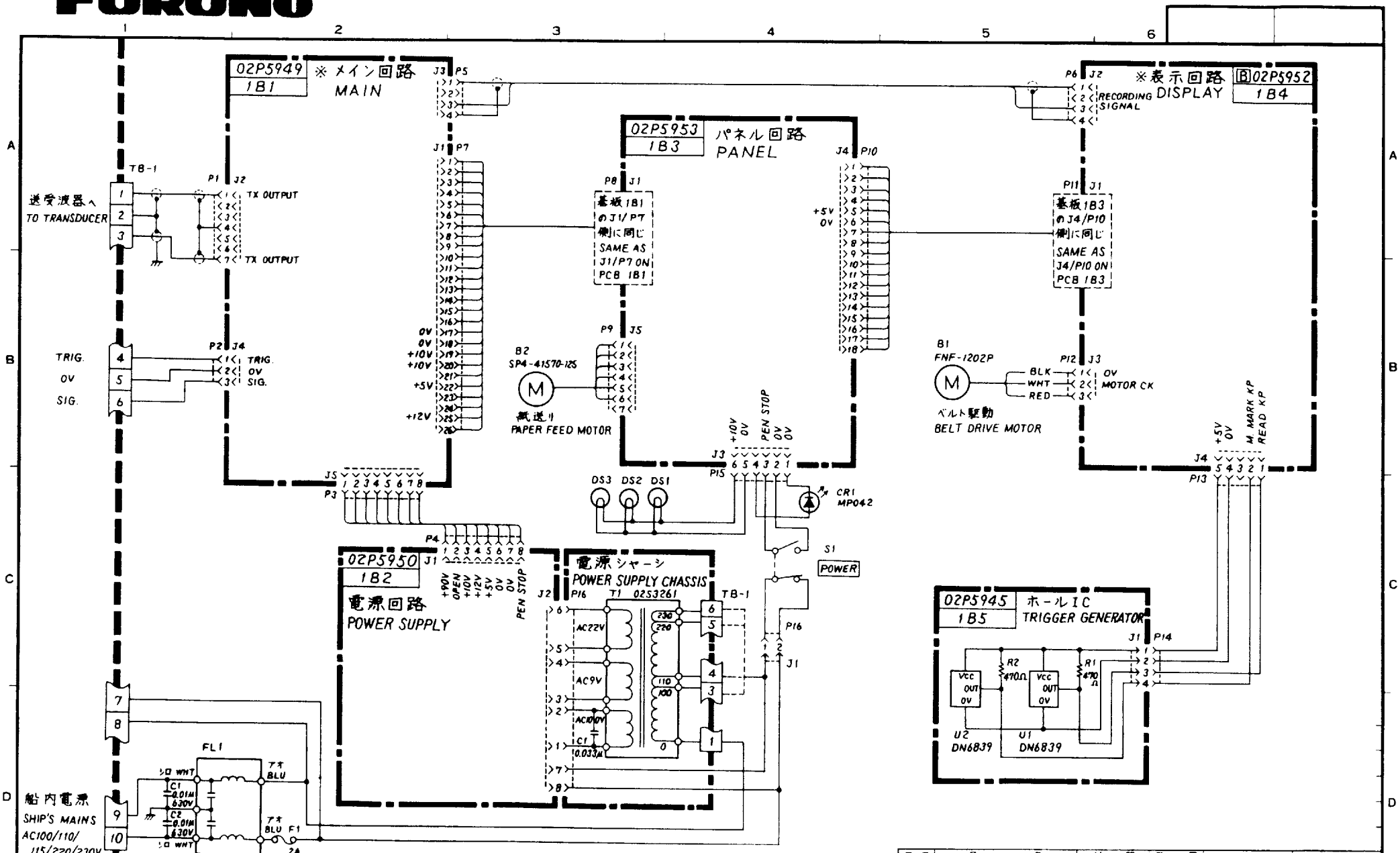

	1B1	1B4
FE-680-1	02P5949 200kHz	B 02P5952
FE-680-2	02P5949 50kHz	A 02P5952

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED		三角法 THIRD ANGLE PROJECTION	名称 TITLE: 総合回路図 SCHEMATIC DIAGRAM
検図 CHECKED		尺度 SCALE	FE-680
製図 DRAWN	Mar. 7. '95 Takeda	重量 WEIGHT kg	図番 DWG.NO. C2280-018-A

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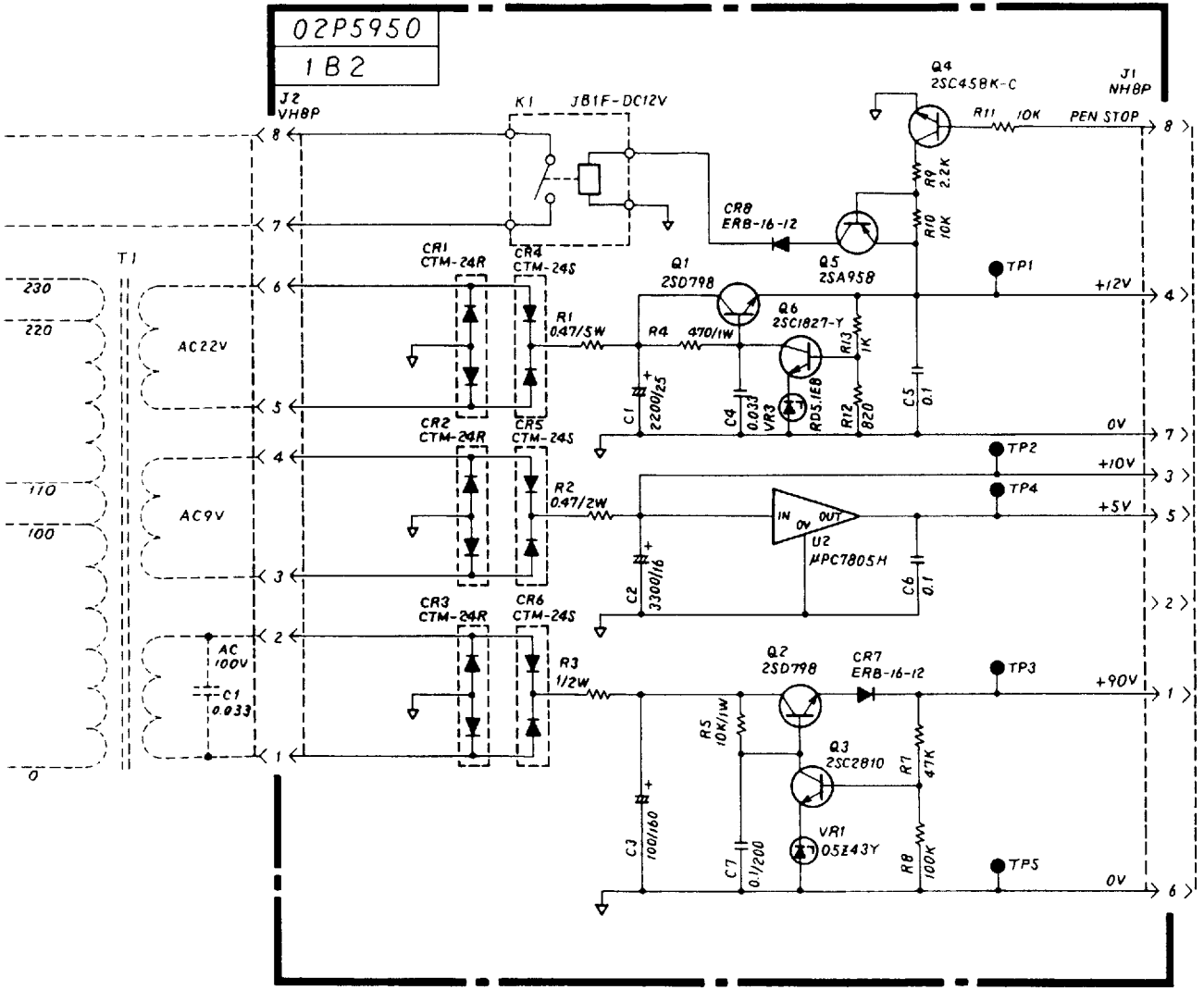

NOTE 1. 特記なき抵抗の値はΩ(1/4W), コンデンサの容量はμF.
ALL RESISTANCE IN OHMS (1/4W) AND CAPACITANCE IN MICROFARADS UNLESS NOTED OTHERWISE.

ITEM	NAME	MATERIAL	Q'TY	DWG NO	REMARKS

APPROVED		THIRD ANGLE PROJECTION	TITLE: FE-680 電源回路 / FE-680T POWER SUPPLY
CHECKED		SCALE	
DRAWN	Mar. 5 '95 T. Sakata	WEIGHT kg	DWG. NO. C2280-012-A

FURUNO

FURUNO ELECTRIC CO., LTD.
9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan
Tel: +81 798-65-2111 Fax: +81 798-65-4200

Pub NO. DOC-243

Declaration of conformity to type

We FURUNO ELECTRIC CO., LTD.

(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address)

hereby declare under our sole responsibility that the product

Navigational echo sounder modes FE-680 consisting of Recorder unit FE-680, Transducer unit 50B-6B and Digital depth indicator ED-222

(Model names, type numbers)

to which this declaration relates conforms to the following standard(s) or normative document(s)

Standard	Test standard
IMO Resolution A.224 (VII)	EN 9875
IMO Resolution A.694 (17)	EN 60945
IMO Resolution A.813 (19)	IEC 61162-1

(title and/or number and date of issue of the standard(s) or other normative document(s))

For assessment, see EC – type approval certificate no. 6296/007/99 – S4230 of 29 July 1999 issued by Federal Maritime and Hydrographic Agency, the Federal Republic of Germany

This declaration is issued according to the provisions of European Council Directive 96/98/EC on marine equipment modified by Commission Directive 98/85/EC.

On behalf of Furuno Electric Co., Ltd.

Hiroaki Komatsu
Manager,
International Rules and Regulations

Nishinomiya City, Japan
August 17, 1999

(Place and date of issue)

(name and signature or equivalent marking of authorized person)