FURUNO

INSTALLATION MANUAL
HEADING SENSOR
C-2000

No. IM-E7233-0H
941130KS(9411,tata)

PRECAUTIONS

1. Connection with FURUNO Autopilot FAP-330/300

•The heading data is magnetic data. While operating FAP-330/300 in "NAV" mode, the bearing data of navigational equipment should be magnetic bearing.
•Compensate the C-2000 before operating FAP-330/300. Without compensation, FAP-330/300 can not control the boat.
•Select small damping value . Large damping causes the vessel (especially small boats) to meander after a turn. The default setting is "1".
•Electrical power is supplied from the processor unit. The power supply will be interlocked with FAP-330/300. Connect the power cable to connector J3 (HEADING SENSOR POWER).

2. Connection with FURUNO Current Indicator CI-60

•Do not connect C-2000 with CI-60G. Connect gyrocompass with CI-60G.
•Do not connect C-2000 with CI-60 equipped with optional "Doppler Sonar Current Indicator". Connect gyrocompass with doppler sonar current indicator.
•The bearing shown on the CI-60 is magnetic bearing.
•Compensate the C-2000 before operating CI-60.

3. Connection with radars

•Do not connect with ARPAs. Connect gyrocompass with ARPAs.
•Transmit heading data from the C-2000 in 25ms interval by AD-10 format. The functions "North Up" and "Course Up" need heading data in 25ms interval.
•Compensate the C-2000 before operating radars.

CHAPTER 1 INSTALLATION

1. Mounting Considerations

The C-2000 is designed for tabletop mountings. When selecting a mounting location keep the following points in mind.

•Align the arrow mark on the top side of the sensor parallel with the keel line.
•Face the keyboard side upward.
•Install the sensor close to the boat's center of the gravity.
•Install the sensor as far as possible from
Engine
Steel fuel tank
Steel water tank
Bilge pump
Anchor and anchor chain
Antenna cable for radio equipment
Power cable
Steel mast
Steel mast support
Steel keel
•Use the supplied power cable.
•Cover unused data output connector with cap (supplied).

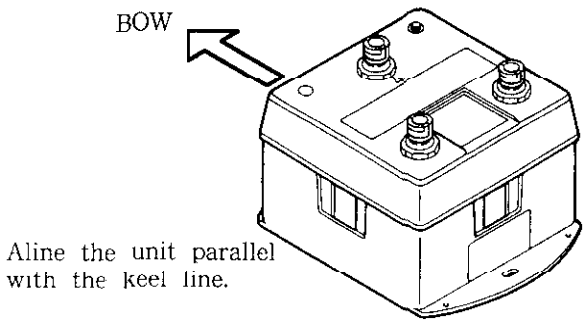


Fig-1 Installation direction of the C-2000

2. Mounting

1) Table top mounting

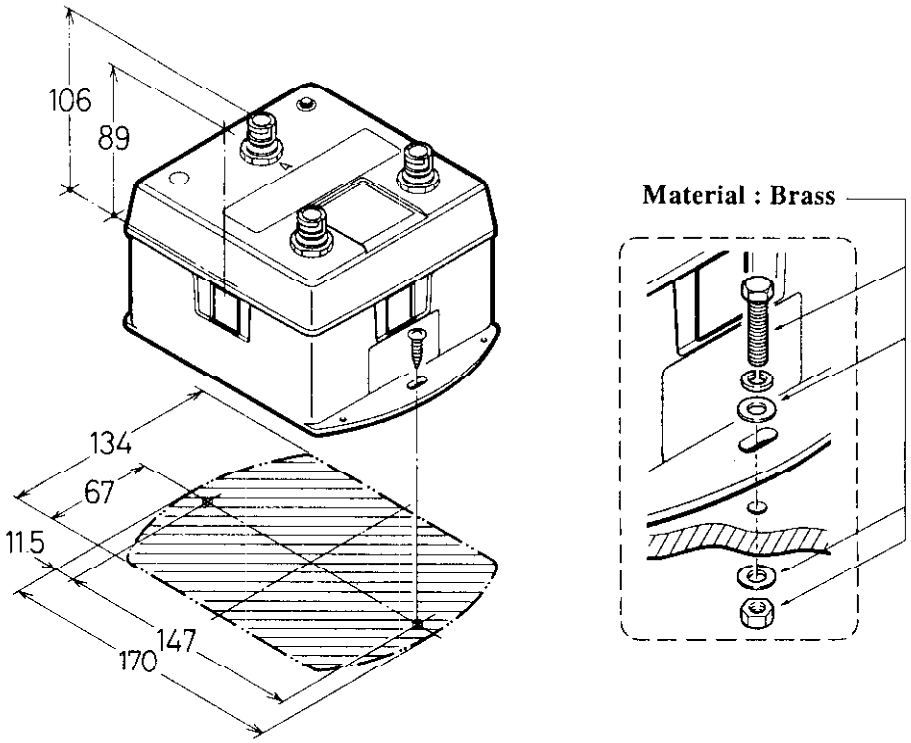


Fig-2 Mounting dimensions of the C-2000

All dimensions in millimeters.
For added support, use nuts, bolts and washers instead of woodscrews.
Secure sufficient space around the sensor for maintenance and checking.

2) Bulkhead mounting

Use optional bulkhead mounting base. See page D-2 for details.

3. Grounding

Ground the C-2000 only when it causes interference to other equipment. For example, a radiotelephone noise increases, video sounder picture contains noise. For grounding, use a cable about 1.25sq that does not contain steel. A cable larger than 1.25sq causes heading error.

If the C-2000 causes interference to a magnetic compass, change the location.

4. Installation of Voltage Transformer

The Voltage Transformer C-2001 is required for 16VDC to 40VDC ship's mains.

1) Mounting considerations

When selecting a mounting location keep the following points in mind.
•Avoid the following places.
•Locate the unit away from direct water splash or rain.
•Locate the unit away from an airconditioner.
•Select well-ventilated area.
•The temperature and humidity should be stable and moderate.

2) Mounting

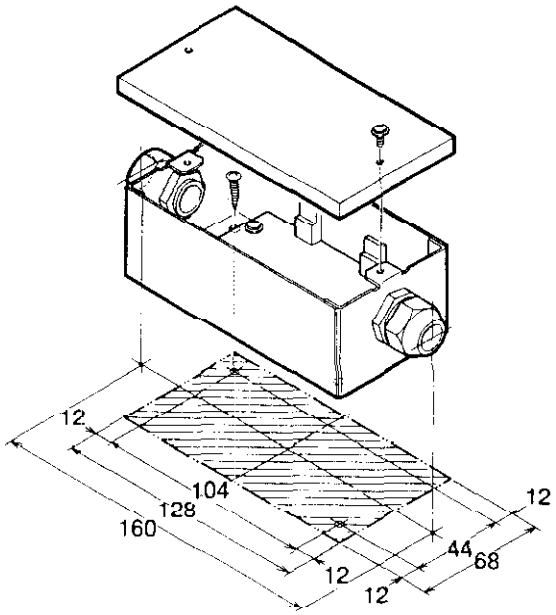


Fig-3 Mounting dimensions of the C-2001

All dimensions in millimeters.
For thin walls, use nuts, bolts and washers instead of woodscrews.
Secure sufficient space around the unit for maintenance and checking.

3) Cabling

Refer to fig-4 and fig-5 for connection inside the C-2001.

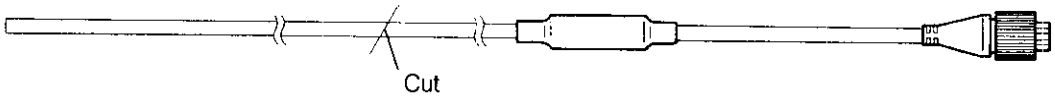


Fig-4 Processing the power cable

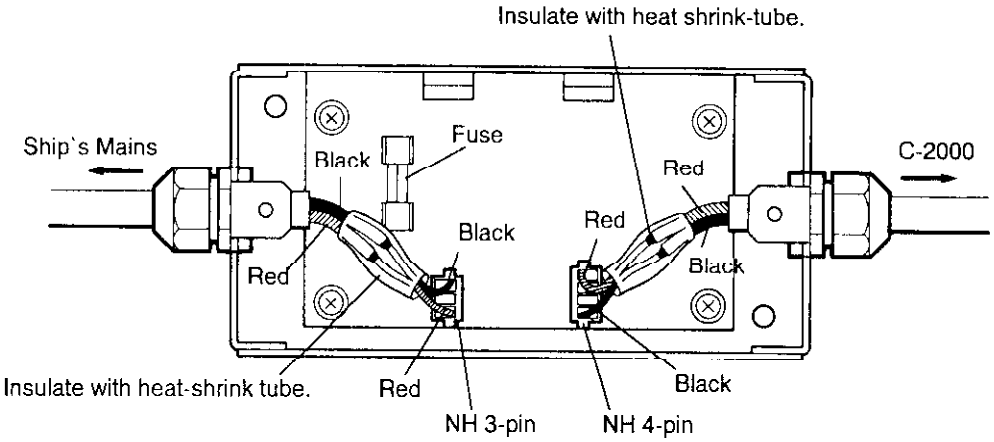


Fig-5 Connections inside the C-2001

CHAPTER 2 ADJUSTMENT

1. Applying the power

Self-test is done every time the power is applied as follows.

① Each LED turns on one by one and all LEDs blink twice for LED test.

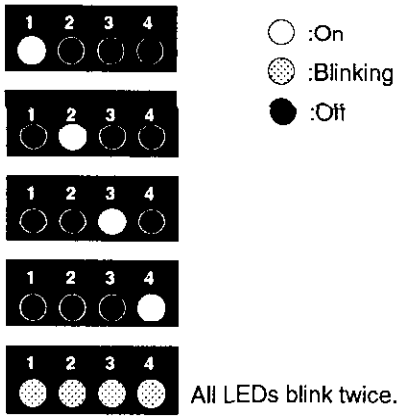


Fig-6 LED Status

② The program version is shown by the LEDs as follows during 0.5 recond.

Program Version	LED Status
0	1 2 3 4
1	1 2 3 4
2	1 2 3 4
3	1 2 3 4
4	1 2 3 4
5	1 2 3 4
6	1 2 3 4
7	1 2 3 4

:On
:Off

Program version
225-0122-10x

This number is shown by LEDs.

Fig-7 Program Version

③ For compensated data, all LEDs blink once.

Fig-8 Compensated Data Output

For raw output data, no LEDs light or blink.

④ The C-2000 becomes normal condition for no memory test error.

Fig-9 Memory test (no error)

If a memory error is detected.
a) LED 1 (red) and LED4 blink every second.

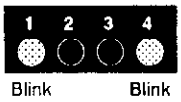


Fig-10 Memory test (Faulty EEPROM)

The EEPROM is faulty. Replace the unit.

b) LED 1 (red) and LEDs 3 and 4 blink every second.

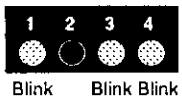


Fig-11 Memory test (Faulty compensation data)

The compensation data is destroyed. The sensor may not be used for navigation. Do the compensation again or clear the data.

c) LED 1 (red) blinks three times.

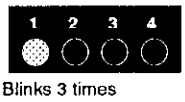


Fig-12 Memory test (Simple error)

For simple error the unit corrects itself. Do the self test again to confirm normal operation. If the unit shows error again, replace unit.

d) LED 1 (red) blinks every eight seconds.
The line between the sensor and the processing board is faulty. Check the line.

Blinks every eight seconds.

Fig-13 Memory test (Faulty circuit)

2. Compensation

The C-2000 contains a circuit which automatically compensate for magnetic field distortion aboard the boat, which causes heading data output error.

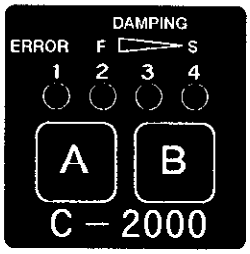


Fig-14 Keyboard

Procedure

① Find a calm and clear area without current, wind, swell or waves.

② Turn the boat clockwise or counterclockwise in a circle. Take about two minutes to complete the circle.

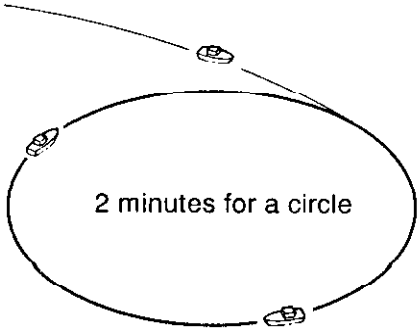


Fig-15 Turn through an accurate circle

③ While turning the boat, press the [A] and [B] buttons together. Release them when the #4 LED starts blinking.

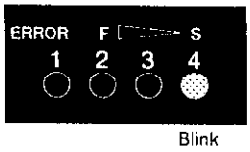


Fig-16 Led Status

④ Keep turning the boat in a circle until the #4 LED lights continuously. This should take between two and three "circles." If the #4 LED does not light, see Note 1 for procedure.

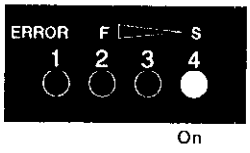


Fig-17 Led Status

After the #4 LED lights five seconds, the #2, #3 and #4 LEDs blink. This completes the compensation. If they do not blink, see Note 2 for procedure.

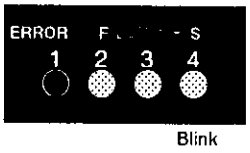


Fig-18 Led Status

⑤ Press the [B] button to return immediately to normal operation, or wait 30 seconds for the unit to return to normal operation automatically.

⑥ Check the compass reading against known heading reference for accuracy, before using the C-2000 for navigation. If the compass reading is in error, do "Heading Alignment" on next page.

Note 1: If the #4 LED continues to blink after more than three turns, continue turning and press the [A] button for two seconds to redo the compensation.

Note 2: If the #1 and #4 LEDs blinks, the compensation failed. Press the [A] button to redo the compensation.
If the #1, #3 and #4 LEDs blink, the compensation failed also. In this case the heading sensor is too close to a metallic object or device generating magnetic fields. For further information, see "Mounting Condition" on page 2.

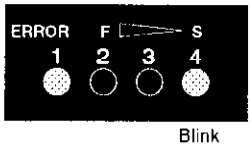


Fig-19 Led Status

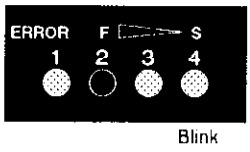


Fig-20 Led Status

3. Heading Alignment

Heading alignment is required when the heading output of the sensor does not match the ship's master compass reading.

Procedure

① Peel off the rubber seal covering the heading adjustment trimmer. Discard the rubber seal.

② Observing heading data on radar, GPS navigator or current indicator, adjust the trimmer with a screwdriver to set ship's heading on the C-2000.

③ Set new rubber seal (supplied) to trimmer. Be sure to use new rubber seal to prevent water leakage.

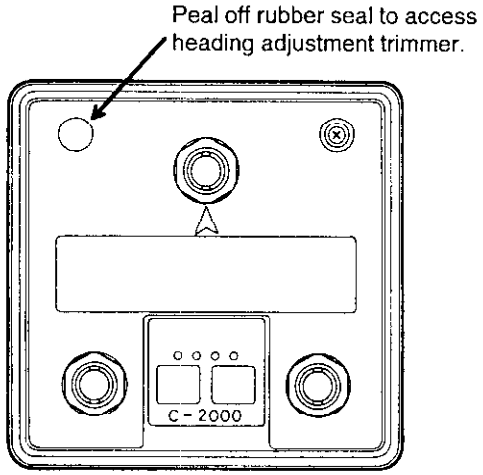


Fig-21 C-2000 Front panel

4. Damping Control

The damping control determines how sensitively the sensor responds to change of ship's heading. Use a small damping value for fast response.

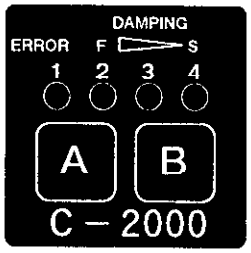


Fig-22 Keyboard

Procedure

① Default condition ..... LED status: 1 2 3 4 — Blinking

② Hold down [B] for more than 2 seconds.
Factory setting is "1". ..... LED status: 1 2 3 4 — On

③ Each pressing of [B] changes the setting.
Damping 0 ..... LED status: 1 2 3 4 — Off Off Off Off

Damping 1 ..... LED status: 1 2 3 4 — On

Damping 2 ..... LED status: 1 2 3 4 — On On

Damping 3 ..... LED status: 1 2 3 4 — On On On

④ Leave the desired setting for more than 2 seconds.
The sensor returns to the default condition. LED status: 1 2 3 4 — Blinking

Fig-23 LED Status

Note: Number above LEDs does not correspond to damping settings.

5. Data Output Format

The jumpers JP1, JP2, JP3 and JP4 provide the specifications tabulated below. The default setting for each jumper is underlined and in capital letters.

1) JP1

#1	#2	#3	#4	
on	– – – – – – – – – – – – – –			NMEA interval 200ms.
OFF	– – – – – – – – – – – – – –			NMEA interval 1 second.
	ON	– – – – – – – – – –		Not used.
		on	– – – – – –	Damping rate FAST.
		OFF	– – – – – –	Damping rate SLOW.
			ON – –	Not used.

2)Setting of JP-3 and JP-4 (DATA OUT 1)

Jumper / Item	JP-3					JP-4			
	#6	#7	#8	#9	#10	#1	#2	#3	#4
NMEA0183	ON	ON				ON	ON		
AD-10 Format interval 200ms			on	on				on	on
AD-10 Format interval 25ms				on	on			on	on

3)Setting of JP-2 (DATA OUT 2)

Jumper / Item	JP-2				
	#1	#2	#3	#4	#5
NMEA0183	on	on			
AD-10 Format Interval 200ms			ON	ON	
AD-10 Format interval 25ms				on	on

6. Clearing Compensation Data

Turn on the equipment while holding down [A].

CHAPTER 3 DISASSEMBLY/ASSEMBLY

1. Disassembly

① Inserting the cover release tools (two supplied) into any two cover catches. Insert fingers in other catches and pull to disengage cover.

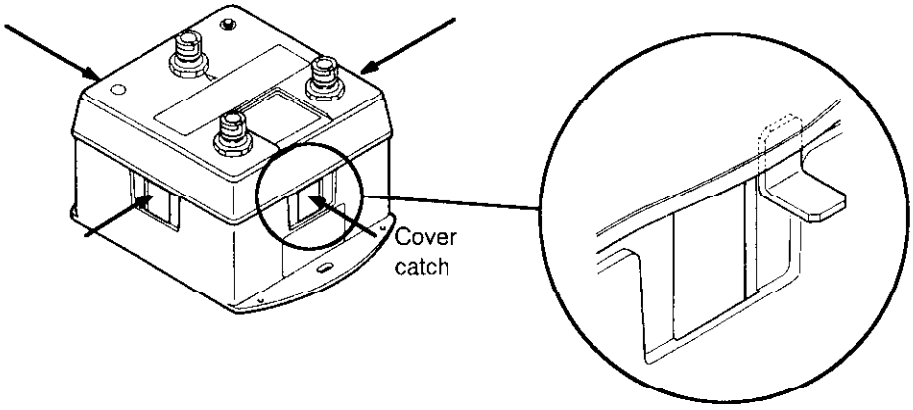


Fig-24 How to open the cover

② Dismount the cover.

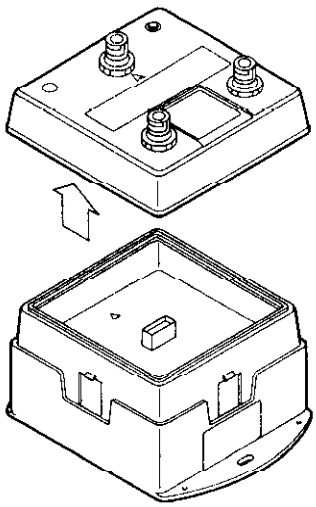


Fig-25 Removing the cover

③ Detach nuts on the connectors.

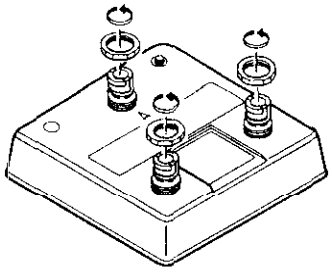


Fig-26 Loosening nuts on connectors

④ Loosen ground screw on the circuit board.

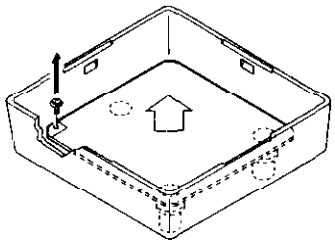


Fig-27 Location of ground screw

⑤ Dismount the circuit board. Be careful not to drop the O-rings of the connectors between the board and the upper case.

⑥ Dismount the sensor fixing plate.

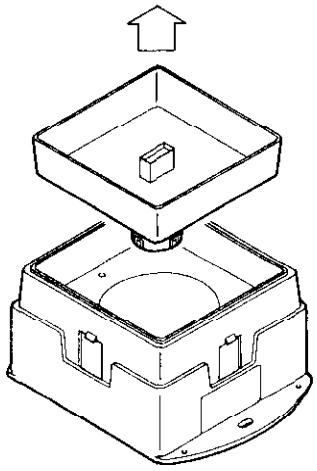


Fig-28 Dismounting the sensor fixing plate

2. Assembly

① Set the cover to the body with triangle marks facing same direction.

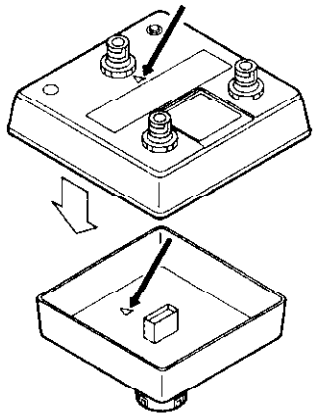


Fig-29 Attaching the cover

② Mate projection on sensor cover plate with hole on body.
Set the cover with triangle mark facing ship's bow.

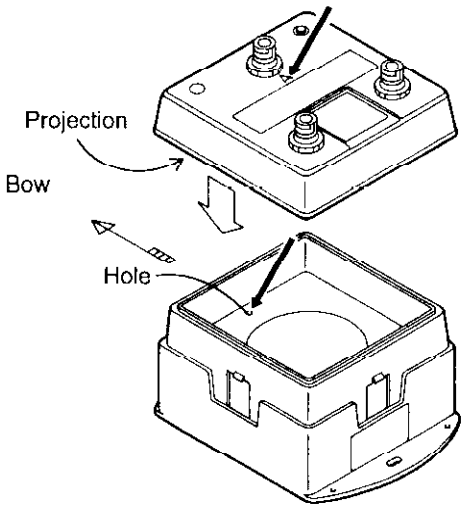


Fig-30 Attaching the cover

③ Press four places shown with arrows until you hear a click.

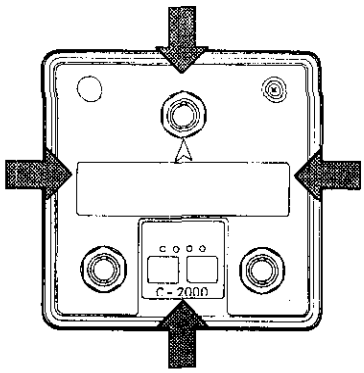


Fig-31 How to close cover

④ If not closed properly, the cover will protrude. Press cover again.

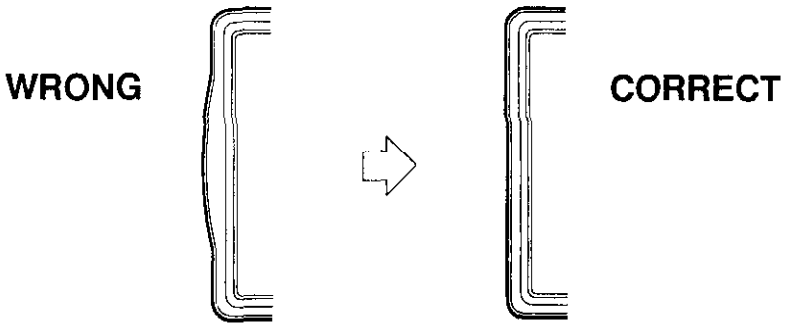


Fig-32 Wrong and correct placement of cover

⑤ Connect the cables.

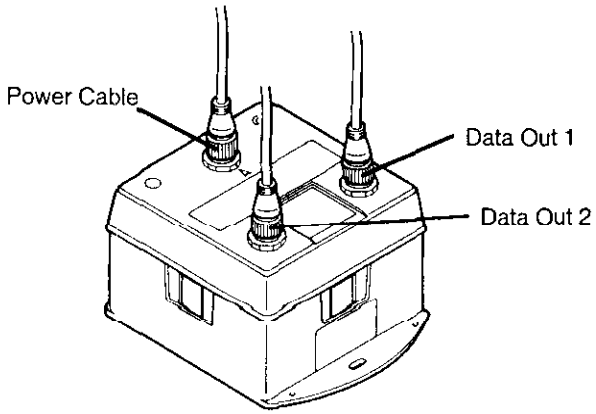


Fig-33 Connection of cables

CHAPTER 4 SPECIFICATIONS

1. SPECIFICATIONS

1) General

The FURUNO C-2000 Heading Sensor converts detected terrestrial magnetism into digital coded bearing data in AD-10 format. The digital bearing data may be output to equipment such as GPS navigator, autopilot and current indicator.

2) Specifications

Tracking Speed

Damping (sec)	0	1	2	3
Slow	0.8	1.5	2.8	5.0
Fast	0.2	0.6	1.2	2.1

Select damping rate FAST or SLOW by JP1. Default setting is SLOW.

Output Ports

2 ports — Switchable between AD-10 format and NMEA0183.

Data Output

AD-10 format
Photo-coupler driver type, 4 digit BCD code, MSB transmission order

NMEA0183
$HCHDG,xxx.x,,,,<CR><LF>
$HCHDM,xxx.x,M<CR><LF>

Data transmission

AD-10 format
Switchable between 25ms and 200ms.

NMEA0183
Switchable between 200ms and 1 sec.

Construction — Splashproof

Power Consumption — Less than 200mA

Power Supply — 10 to 16VDC.
16 to 40VDC with optional voltage transformer.

Dimensions — 134 (W) x 170 (D) x 89 (H)

Mass 420g

Color N1.0 Black

2. COMPLETE SET

No.	Name	Type	Code Number	Qty	Remarks
1	Sensor	C-2000-E	000-040-402	1	
2	Spare Parts	SP64-00800	000-040-403	1 set	
3	Installation Materials	CP64-01210	000-040-405	1 set	Select one. (See next page.)
		CP64-01230	000-040-407	1 set	
4	Accessories	SP64-00700	000-040-408	1 set	

3. OPTIONAL SUPPLY

No.	Name	Type	Code Number	Qty	Remarks
1	Voltage Transformer	C-2001	000-040-412	1	
2	Bullhead Mounting Base	OP64-9	000-040-413	1	
3	Signal Cable	MJ-A6SPF-0007-100	000-125-237	1	10m, Outer color:BLACK

4. SPARE PARTS

SP64-00800

No.	Name	Type	Code Number	Qty	Remarks
1	Fuse	FGMO-0.3A-125V	000-549-011	2	

5. INSTALLATION MATERIALS

(Select one from among CP64-01210 or CP64-01230)

CP64-01210

No.	Name	Type	Code Number	Qty	Remarks
1	Rubber Seal	22-018-1015	100-157-961	2	
2	Cover Removal Tool	22-018-1017	100-158-031	2	
3	Tapping Screw	5.1 × 20 C2700W	000-861-755	2	
4	Flat Washer	M5 C2600P	000-864-108	2	
5	Power Cable	MJ-A2SPF0011-100	000-125-234	1	Connector at one end. 22S0267, 10m
6	Signal Cable	MJ-A6SPF0007-100	000-125-237	1	Connector at both ends. 22S0270, 10m, Outer color: BLACK

CP64-01230

No.	Name	Type	Code Number	Qty	Remarks
1	Rubber Seal	22-018-1015	100-157-961	2	
2	Cover Removal Tool	22-018-1017	100-158-031	2	
3	Tapping Screw	5.1 × 20 C2700W	000-861-755	2	
4	Flat Washer	M5 C2600P	000-864-108	2	
5	Power Cable	MJ-A2SPF0012-100	000-125-235	1	Connector at both ends. 22S0268, 10m
6	Signal Cable	MJ-A6SPF0007-100	000-125-237	1	Connector at both ends. 22S0270, 10m, Outer color: BLACK

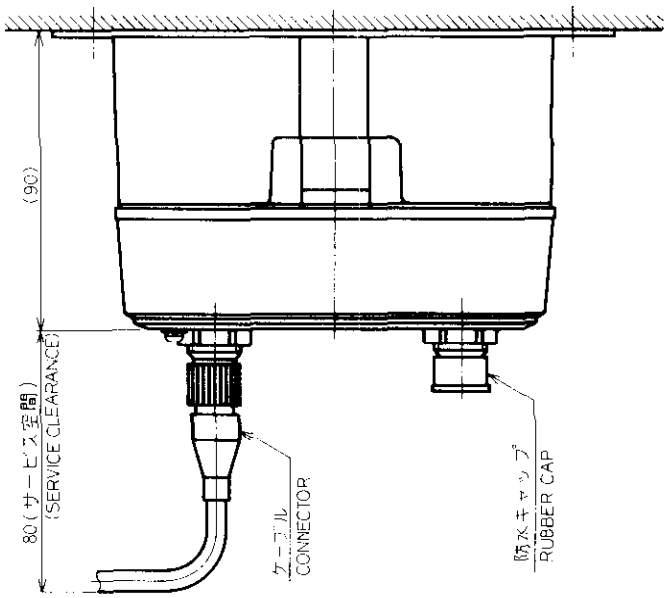
6. ACCESSORIES

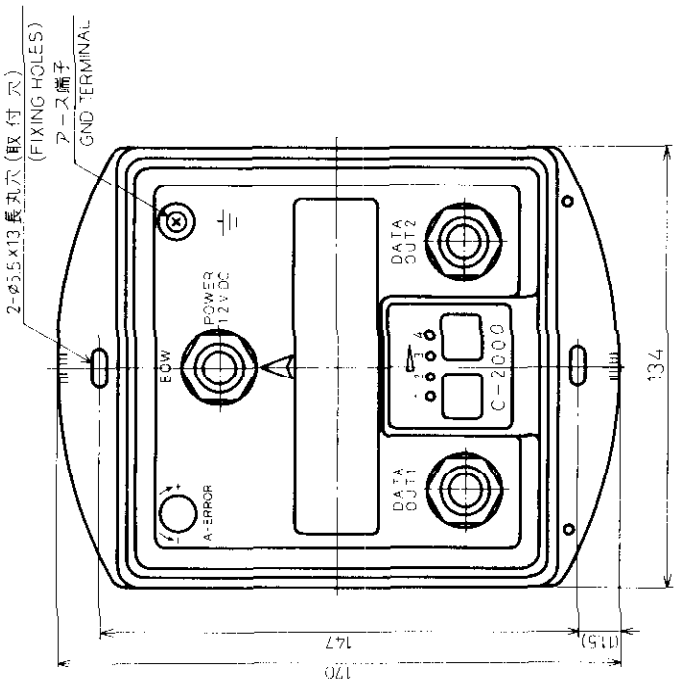
FP64-00700

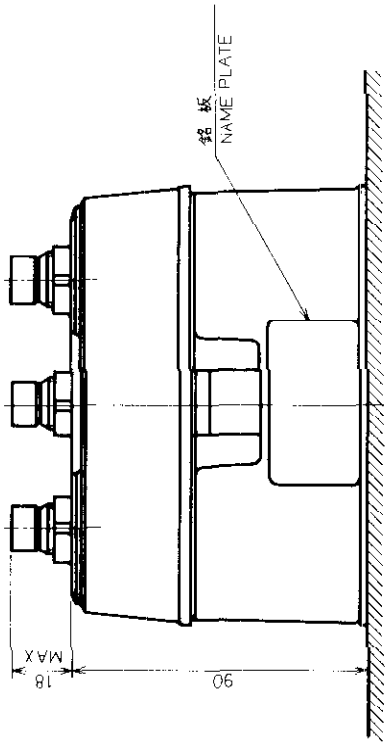
No.	Name	Type	Code Number	Qty	Remarks
1	Cap	22S0049	000-109-510	1	

FURUNO

D - 1







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

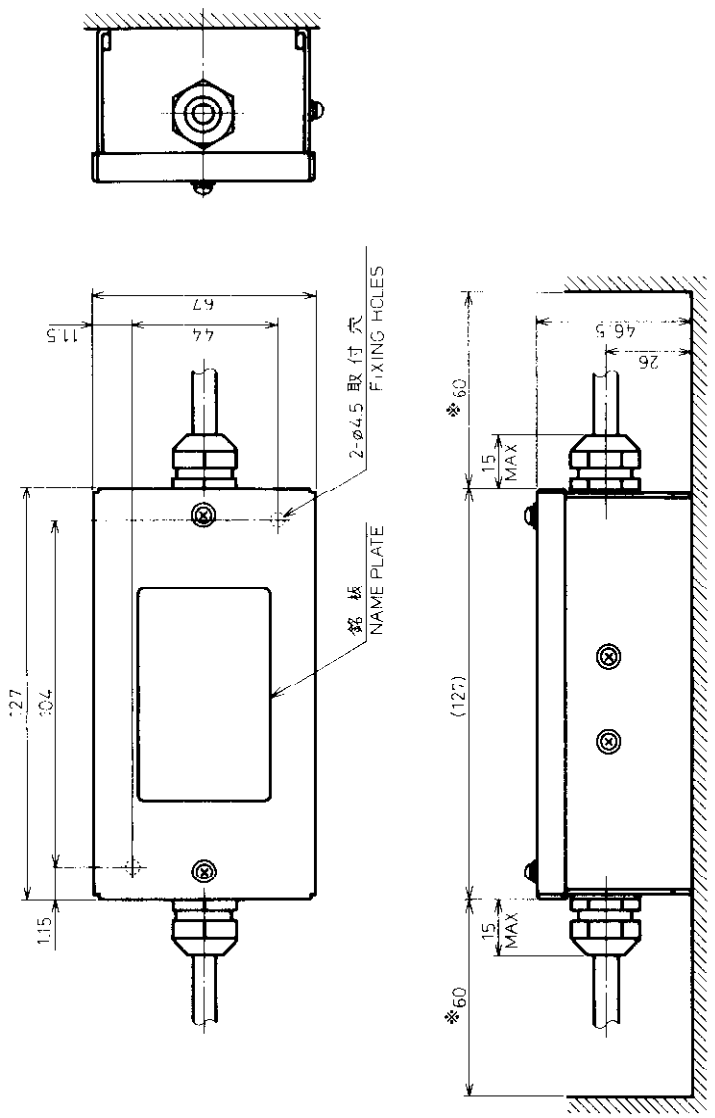
承認 APPROVED	MAR・6・'92 T. NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	ヘディングセンサ
検図 CHECKED	MAR・6・'92 T. NAKANO	尺度 SCALE	1/2	C-2000	HEADING SENSOR
製図 DRAWN	MAR・6・'92 S. NISHI	重量 WEIGHT	0.5 kg	図番 DWG.NO.	C7233-G01-A

FURUNO ELECTRIC CO., LTD.

FURUNO

D - 2

※:推奨サービス空間
RECOMMENDED SERVICE SPACE

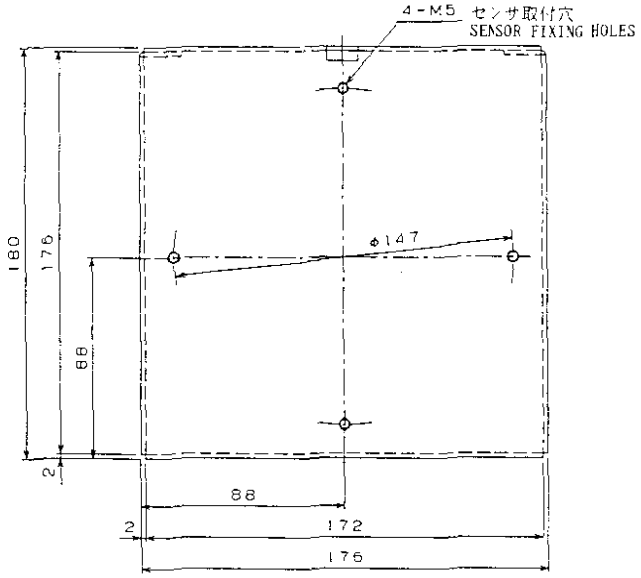


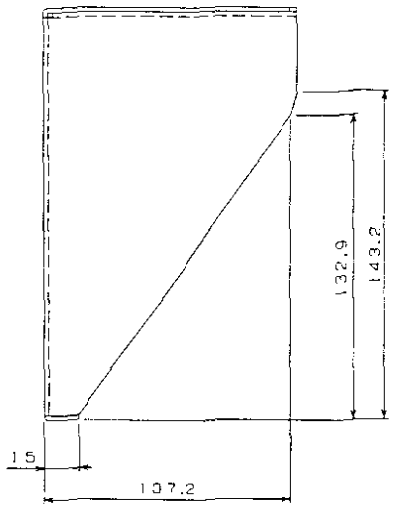
C-2000	品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

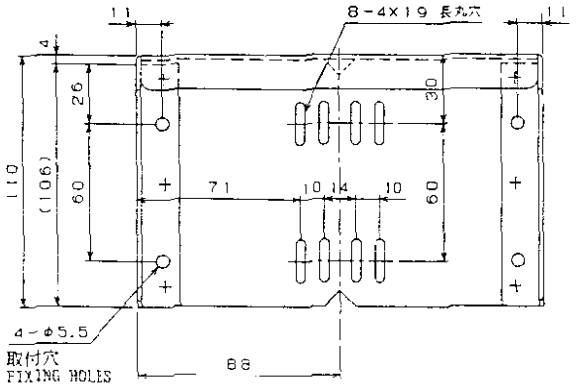
承認 APPROVED	MAR. 6 '92 TNAKAO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	変圧ボックス
検図 CHECKED	MAR. 6 '92 TNAKAO	尺度 SCALE	1/2	C-2001	VOLTAGE TRANSFORMER
製図 DRAWN	Mar. 6 '92 S.N.Li	重量 WEIGHT	0.3 kg	図番 DWG.NO	C7233-G02-A

FURUNO ELECTRIC CO., LTD.

FURUNO







DC-2000
C-2000

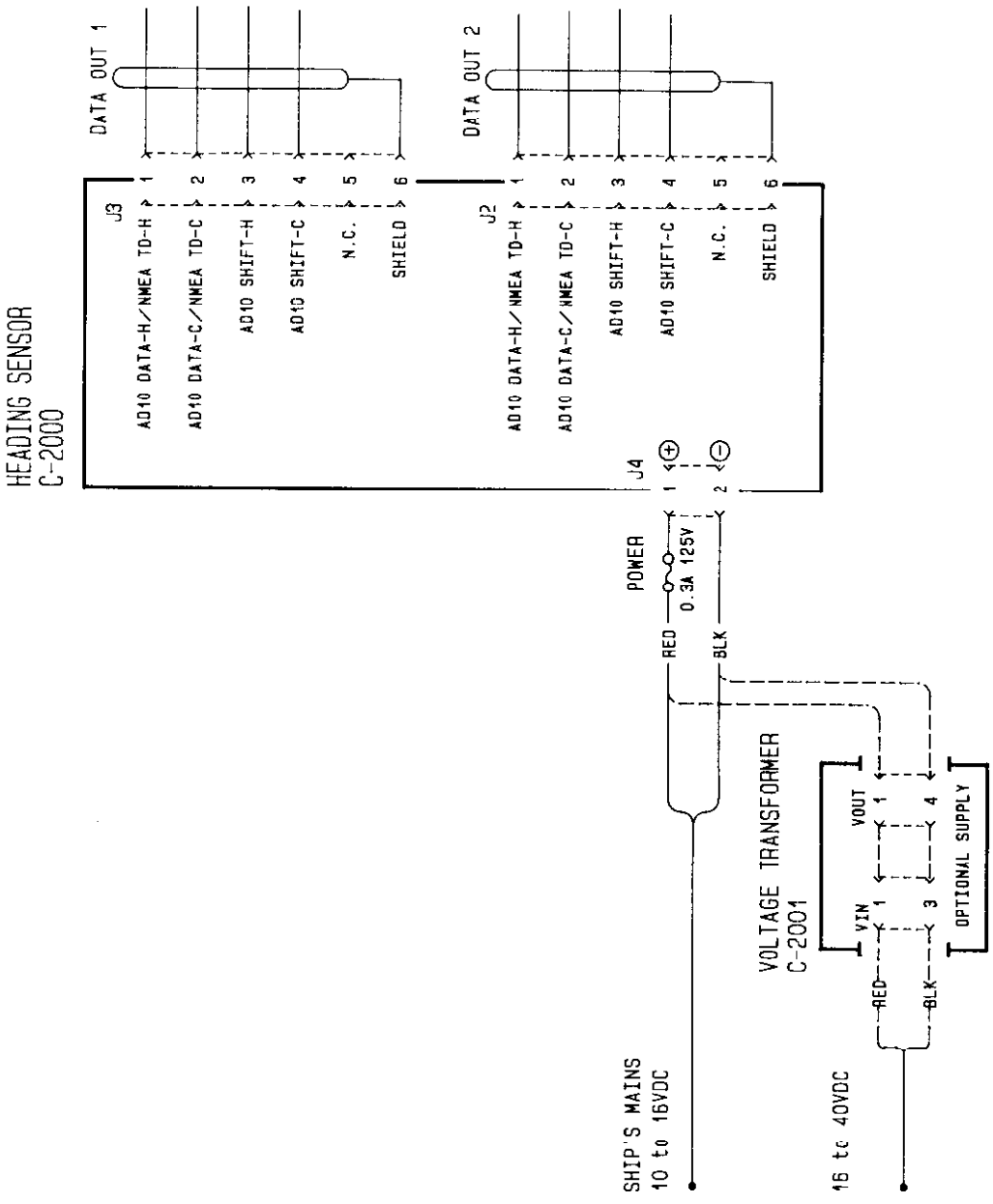
承認 APPROVED	Feb·22·'94 IKEDA	三角法 THIRD ANGLE	名称 TITLE	センサ壁掛け金具
検図 CHECKED	FEB·22·'94 TAKAHASHI	尺度 SCALE 1/2	OP649	BULKHEAD MOUNTING BASE
製図 DRAWN	FEB·22·'94 MIYOSHI	重量 WEIGHT kg	図番 DWG.NO	C7233-G03-A

FURUNO ELECTRIC CO., LTD.

D-3

FURUNO

S-1



承認 APPROVED	MAR・6・'92 T.NAKANO	名称 TITLE	
検図 CHECKED	MAR・6・'92 T.NAKANO	C-2000	HEADING SENSOR
製図 DRAWN	MAR・6・'92 S.NISHI	図番 DWG.NO.	E7233 – C01 – C

FURUNO ELECTRIC CO., LTD.