

# FURUNO

## OPERATOR'S MANUAL

A - D CONVERTER

MODEL AD - 100



**FURUNO ELECTRIC CO., LTD.**  
NISHINOMIYA, JAPAN



# SAFETY INFORMATION

"NOTIICE", "CAUTION" and "WARNING" 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.



## WARNING

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



## CAUTION

This notice indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or property damage.

## NOTICE

This notice indicates an unsafe practice which, if not avoided, could result in property damage or equipment malfunction.



# 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.**

Ungrounded equipment can give off or receive electromagnetic 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.

## **NOTICE**

**The mounting location must satisfy the following condition:**

- Away from rain and water splash
- Out of direct sunlight
- Away from air conditioner vents
- Away from magnets and magnetic fields
- Moderate and stable in temperature and humidity
- Observe the following compass safe distances to prevent interference to a magnetic compass:
  - Standard compass: 1.10 m
  - Steering compass: 0.80 m



# 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 disassemble 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.

*(Continued on next page)*

# NOTICE

**Do not use the equipment for other than its intended purpose.**

Use of the equipment as a chair or a shelf, for example, can cause equipment damage.

**Immediately turn off the power whenever you feel the equipment is abnormal.**

Continued use can cause equipment damage.

**Keep magnets and magnetic fields (speaker, transformer, etc.) away from the equipment.**

Magnets and magnetic fields can cause equipment malfunction.

**Handle the equipment carefully.**

Rough handling can cause corrosion.

**Do not use chemical cleaners to clean the equipment.**

Chemical cleaners can remove paint and markings.

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Declaration of conformity to type

## SPECIFICATIONS OF AD-100 A-D CONVERTER

### General

The AD-100 A-D converter converts the gyro compass reading into digital coded bearing data and display it on a 4 digit LED display.

The digital bearing output may be sent to navigation equipment such as radar, GPS navigator and autopilot.

### Specifications

- |                      |  |
|----------------------|--|
| 1. Input Signal      | Gyro repeater signal (AC Synchro, DC Synchro or Step-by-Step) DIP switch provided to select input signal.  |
| 2. Input Voltage     | AC Synchro Type --- 20VAC to 135VAC (Rotor)<br>20VAC to 135VAC (Stator)<br>50/60Hz, 400Hz or 500Hz<br>DC Synchro Type -- 20VDC to 100VDC (Rotor)<br>20VAC to 100VAC (Stator)<br>Step-by-Step ----- 20VDC to 100VDC   |
| 3. Power Consumption | Less than 5W   |
| 4. Tracking Speed    | 30°/sec  |
| 5. Bearing Display   | 4 digit LED display  |
| 6. Data Output       | AD-10S format ----- Photo-coupler driver type, 4 digit BCD code, MSB transmission order.<br>IEC61162-1 ----- HDT, VHW<br>or NMEA0183 RS-485 level<br>Ver. 1.5/2.0/3.0 Baud rate 4800 and 38,400 bps  |
| 7. Output Ports      | AD-10S format ----- 6 ports<br>IEC61162-1 ----- 1 port<br>or NMEA0183<br>Ver. 1.5/2.0/3.0  |
| 8. Data Transmission | AD-10S format ----- Switchable between 25ms and 200ms.<br>Use 25ms for radar only.<br>IEC61162-1 ----- Selectable among 25ms, 100ms, 200ms and 1s.<br>or NMEA0183 Note: For 25ms, 100ms or 200ms, only HDT is output.<br>Ver. 1.5/2.0/3.0 The 25ms setting sets baud rate to 38,400 bps. |
| 9. Color             | Cabinet ----- 2.5GY 5/1.5 Newtone No.5<br>Front Panel ----- N3.0   |

### Program Number

Program No.	Version No.
645-1410	05

## EQUIPMENT LIST

### COMPLETE SET

No.	Name	Type	Code NO.	Qty	Remarks
1	Main Unit	AD-100	000-040-104	1	
2	Accessories	FP64-00400	000-040-107	1	
3	Installation Materials	CP64-00500	000-040-106	1	
4	Spare Parts	SP64-00400	000-040-105	1	

### ACCESSORIES

No.	Name	Type	Code NO.	Qty	Remarks
1	Tapping Screw	5x20 SUS304	000-802-081	4	
2	Knob Bolt	KT-B M6x10	000-861-924	2	
3	Flat Washer	M5 SUS304	000-864-128	4	
4	Flat Washer	M6 SUS304	000-864-129	2	
5	Hanger Bracket	RUA-1003	380-010-030	1	

### INSTALLATION MATERIALS

No.	Name	Type	Code NO.	Qty	Remarks
1	NH Connector Assembly	64-45 (5P)	004-441-960	6	
2	NH Connector Assembly	64-107 (4P)	004-412-000	1	
3	VH Connector Assembly	64-47 (5P)	004-411-980	1	
4	VH Connector Assembly	64-48 (3P)	004-411-990	1	
5	Heat-shrink Tube	5x0.25 0.1m	000-117-772	2	Black
6	Heat-shrink Tube	3x0.25 1m	000-568-172	1	Black

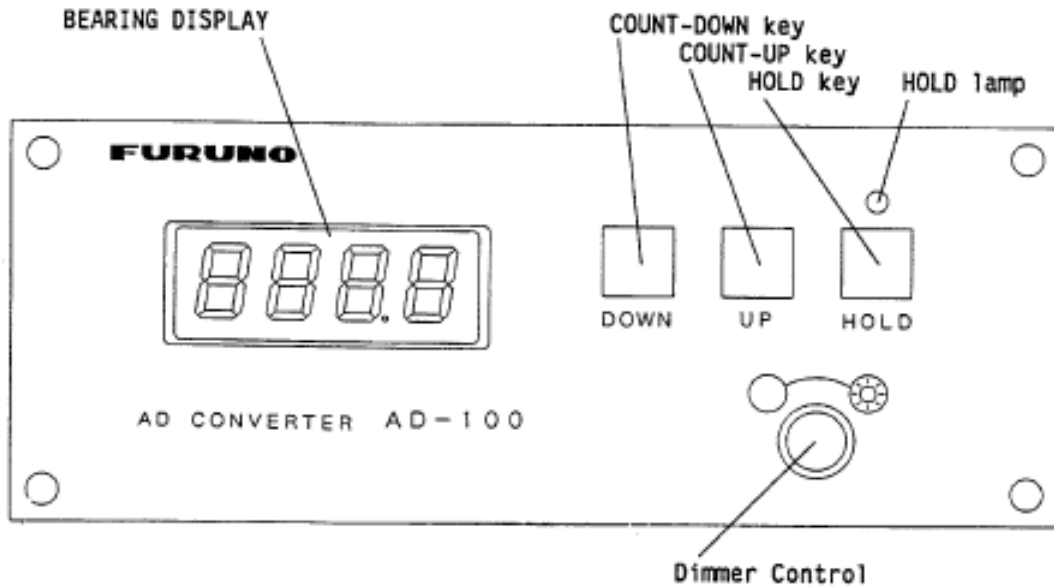
### SPARE PARTS

No.	Name	Type	Code NO.	Qty	Remarks
1	Glass Tube Fuse	FGMB 2A 250V	000-122-000	4	



## CHAPTER 1 OPERATION

### 1. FRONT PANEL



FRONT PANEL

### 2. OPERATION

- (1) When you turn on the power of a gyrocompass, the AD-100 is powered on simultaneously.
- (2) Adjust the brightness of the Bearing Display and the backlighting of the keys with the Dimmer Control.
- (3) The Bearing Display is blinking, which means the data is not yet sending out from AD-100.
- (4) Once you press HOLD key, the data is sent out changing the Bearing Display from blink to light. In this state, the Hold lamp does not light yet. Prior to press of the HOLD key, adjust the Display with the UP or DOWN keys to get the same reading to the gyrocompass. Each pressing of the key changes the display by 0.1 degrees. For faster change, press and hold down the key to change the display in 1.0 degree steps.
- (5) If Power fail detection is preset to OFF (See page 3-10), switching on the gyrocompass makes the data of AD-100 output immediately. Therefore, it is necessary to ensure that the reading between the gyrocompass and the Display is same after the gyrocompass reading stabilizes.
- (6) To freeze the display, press the HOLD key. In this case the HOLD lamp lights. To restart the display press the HOLD key. Since the computing circuit is disengaged from the gyrocompass during HOLD, readjust the Display to get the same reading to the gyrocompass.

## CHAPTER 2 MAINTENANCE

### 1. FUSE REPLACEMENT

To protect the unit from serious damage, four 2A fuses are provided on a P.C. board. The fuses protect against overvoltage or internal fault of the equipment. If a fuse blows, find the cause of the problem before replacing it.

#### CAUTION

Do not use a fuse rated more than 2A, since it may cause more serious damage to the equipment.

### 2. MINOR TROUBLESHOOTING

Operating problems are most likely caused by loose connectors or wrong setting of DIP switches. The table below provides simple troubleshooting which can be done by the operator.

Symptom	Possible Cause	Remedy
No display	<ul style="list-style-type: none"> <li>*Dimmer control turned fully CCW.</li> <li>*Gyrocompass not on.</li> <li>*External power supply is turned off.</li> <li>*Flat cable between the two P.C. Board is loose.</li> <li>*Blown fuse.</li> <li>*No power because of wrong jumper setting.</li> <li>*Gyrocompass not connected.</li> </ul>	<ul style="list-style-type: none"> <li>*Turn the control clockwise.</li> <li>*Turn on the power..</li> <li>*Turn on the power.</li> <li>*Reconnect.</li> <li>*Check supply voltage. Replace fuse.</li> <li>*Correct JP1, JP4 and JP5 to the right setting.</li> <li>*Connect gyrocompass.</li> </ul>
Display is fixed on "000.0".	<ul style="list-style-type: none"> <li>*DIP switch SW1 is set wrong.</li> </ul>	<ul style="list-style-type: none"> <li>*Correct the setting.</li> </ul>
No data output	<ul style="list-style-type: none"> <li>*Loose data output connector.</li> <li>*JP6 and/or JP7 not connected.</li> </ul>	<ul style="list-style-type: none"> <li>*Tighten the connector.</li> <li>*Connect JP6 and JP7.</li> </ul>
Bearing display is frozen.	<ul style="list-style-type: none"> <li>*Hold function is turned on.</li> </ul>	<ul style="list-style-type: none"> <li>*Press HOLD key to release the HOLD function.</li> </ul>
A value between "000.0" and "359.9" flashes.	<ul style="list-style-type: none"> <li>*Power fail detection or Stator signal breaking detection is activated.</li> </ul>	<ul style="list-style-type: none"> <li>*Check the connection with the Gyrocompass.</li> <li>*Press COUNT-UP or COUNT-DOWN key to match the AD-100 indication with the Gyrocompass indication, and then press HOLD key.</li> </ul>
"999.9" flashes	<ul style="list-style-type: none"> <li>*Stator signal breaking detection is activated.</li> </ul>	<ul style="list-style-type: none"> <li>*Check the connection with the Gyrocompass.</li> </ul>

Symptom	Possible Cause	Remedy
The bearing display deviates often.	*Jumpers and DIP switches are set wrong.	*Correct the setting.
Key input not accepted	*Defective keyboard	*Call for service.

The status of the LEDs on the Processor Board show equipment condition.

CR21	CR22	
OFF	OFF	No power
OFF	ON	Power supply less than 5V, or Stator signal breaking detection/ Power fail detection activates.
BLINK	OFF	Defective CR22
BLINK	ON	Power supply and CPU are normal.

### 3. SELF TEST

The AD-100 employs Self tests to check it for proper operation. These are as follows.

- \*Display LED test
- \*Analog Data Input Test
- \*DIP SW Setting Display
- \*Program Version Display
- \*Key Input Test

#### 1) Sequence

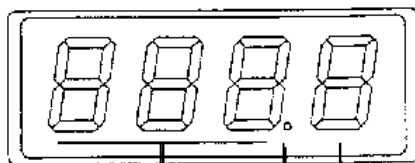
##### DISPLAY LED TEST

- \*The HOLD lamp and all the segments on the display lights for 1 sec.
- \*The display changes from "0000", "1111" – "8888" "9999". every 1 sec.

##### ANALOG DATA INPUT TEST

- \*The input data of S1, S2, S3, R1, R2 alternately appears on the LED for 1 sec. (This test is for factory use only.)

LED Display



- 1 to 5 (1=S1, 2=S2, 3=S3, 4=R1, 5=R2)
- Decimal point
- 0 to 255 (Input analog data)

- continued -

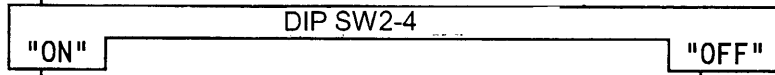
DIP SW1, 2 Setting Display

DIP SW2, 3 Setting Display

\*The value shown in the table on the next page appears for 1 sec.  
\*Refer to "2) LED status according to DIP SW setting"

Program Version Display

\*Version number appears for 1 sec.



Continuous

One Cycle

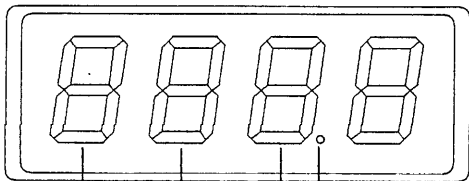
\*Continuous test

\*Normal operation is restored upon completion of the test.

### Key Input Test

The key input test may be done at any time during the Self test. Press the COUNT-UP key, COUNT-DOWN key or HOLD key to enable the key input test.

### LED Display



Decimal point

Each pressing of the HOLD key displays "0" or "1".

Each pressing of the COUNT-UP key displays "0" or "1".

Each pressing of the COUNT-DOWN key displays "0" or "1".

To exit from the key input test and return to self test:

Press COUNT-UP and COUNT-DOWN keys together.

2) LED status according to DIP switch setting

LED for 100 degree place	SW1-1	SW1-2	SW1-3	REMARKS
0	OFF	OFF	OFF	360x
1	ON	OFF	OFF	180x
2	OFF	ON	OFF	90x
3	ON	ON	OFF	36x
4	OFF	OFF	ON	Not used
5	ON	OFF	ON	Not used
6	OFF	ON	ON	Not used
7	ON	ON	ON	Not used

LED for 10 degree place	SW1-4	SW1-5	SW1-6	REMARKS
0	OFF	OFF	OFF	AC/DC Synchro
1	ON	OFF	OFF	DC Step
2	OFF	ON	OFF	Full Wave Pulsating Current
3	ON	ON	OFF	Half Wave Pulsating Current
4	OFF	OFF	ON	Not used
5	ON	OFF	ON	Not used
6	OFF	ON	ON	Not used
7	ON	ON	ON	Not used

LED for 1 degree place	SW1-7	SW1-8	REMARKS
0	OFF	OFF	50/60Hz
1	OFF	ON	400HZ
2	ON	OFF	500HZ
3	ON	ON	DC

LED for 0.1 degree place	SW2-1	SW2-2	SW2-3	REMARKS
0	OFF	OFF	OFF	The setting of these three DIP switches is decided according to stator voltage and rotor voltage.
1	ON	OFF	OFF	
2	OFF	ON	OFF	
3	ON	ON	OFF	
4	OFF	OFF	ON	
5	ON	OFF	ON	
6	OFF	ON	ON	

LED for 100 degree place	SW2-4	Remarks
0	OFF	Refer to "4)-(2) DIP switch SW2, 3" on page 3-10.
1	ON	

LED for 10 degree place	SW2-5	SW2-6	Remarks
0	OFF	OFF	Refer to "4)-(2) DIP switch SW2, 3" on page 3-10.
1	ON	OFF	
2	OFF	ON	
3	ON	ON	

LED for 1 degree place	SW2-7	Remarks
0	OFF	Refer to "4)-(2) DIP switch SW2, 3" on page 3-10.
1	ON	

LED for 0.1 degree place	SW3-1	SW3-2	SW3-3	Remarks
0	OFF	OFF	OFF	Refer to "4)-(2) DIP switch SW2, 3" on page 3-10.
1	ON	OFF	OFF	
2	OFF	ON	OFF	
3	ON	ON	OFF	
4	OFF	OFF	ON	
5	ON	OFF	ON	
6	OFF	ON	ON	
7	ON	ON	ON	

## CHAPTER 3 INSTALLATION

### 1. INSTALLATION

#### 1) General notes on installation

This equipment provides its intended function only when it is installed properly. The installation site is important for proper operation and continued performance. Select it keeping the following points in mind.

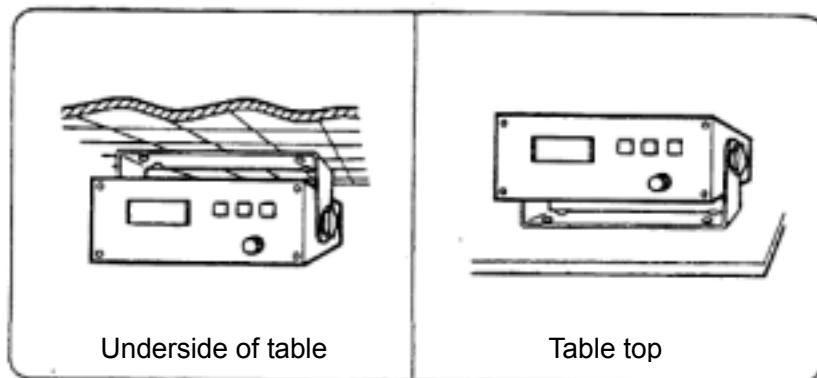
- (1) Select a place where the unit can be observed and operated directly.
- (2) Keep away from water spray.
- (3) Select a clean and cool place.
- (4) Select a place where shock, vibration and noise are minimal.
- (5) Observe the following compass safe distance to prevent interference to a magnetic compass:
  - Standard compass: 1.10 m
  - Steering compass: 0.80 m

#### NOTE

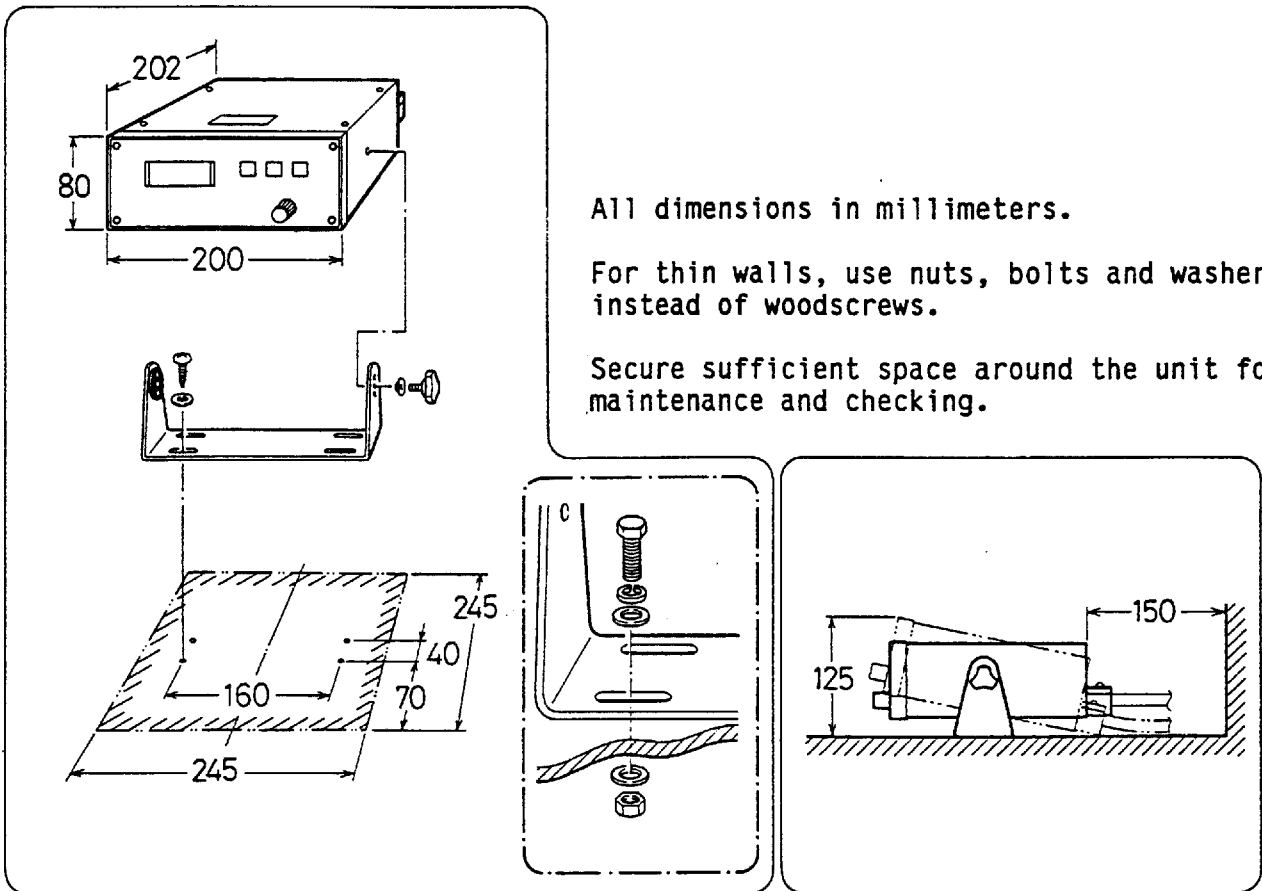
FURUNO will not assume responsibility for damage caused by water spray.

#### 2) Mounting the unit

The equipment can be mounted on the underside of table or a table top. Ensure the mounting location is strong enough to support the unit under the condition of shock and vibration normally encountered onboard the vessel. If necessary, reinforce the mounting location with a lining block or doubling plate.



### 3) Mounting dimensions



### 4) Mounting procedure

- (1) Drill pilot holes for the hanger.
- (2) Fix the hanger with tapping screws (supplied).  
For thin walls, use bolts and nuts instead of the tapping screws.
- (3) Set the equipment to the hanger. Orient the unit for optimum viewing angle and tighten the knob screws.



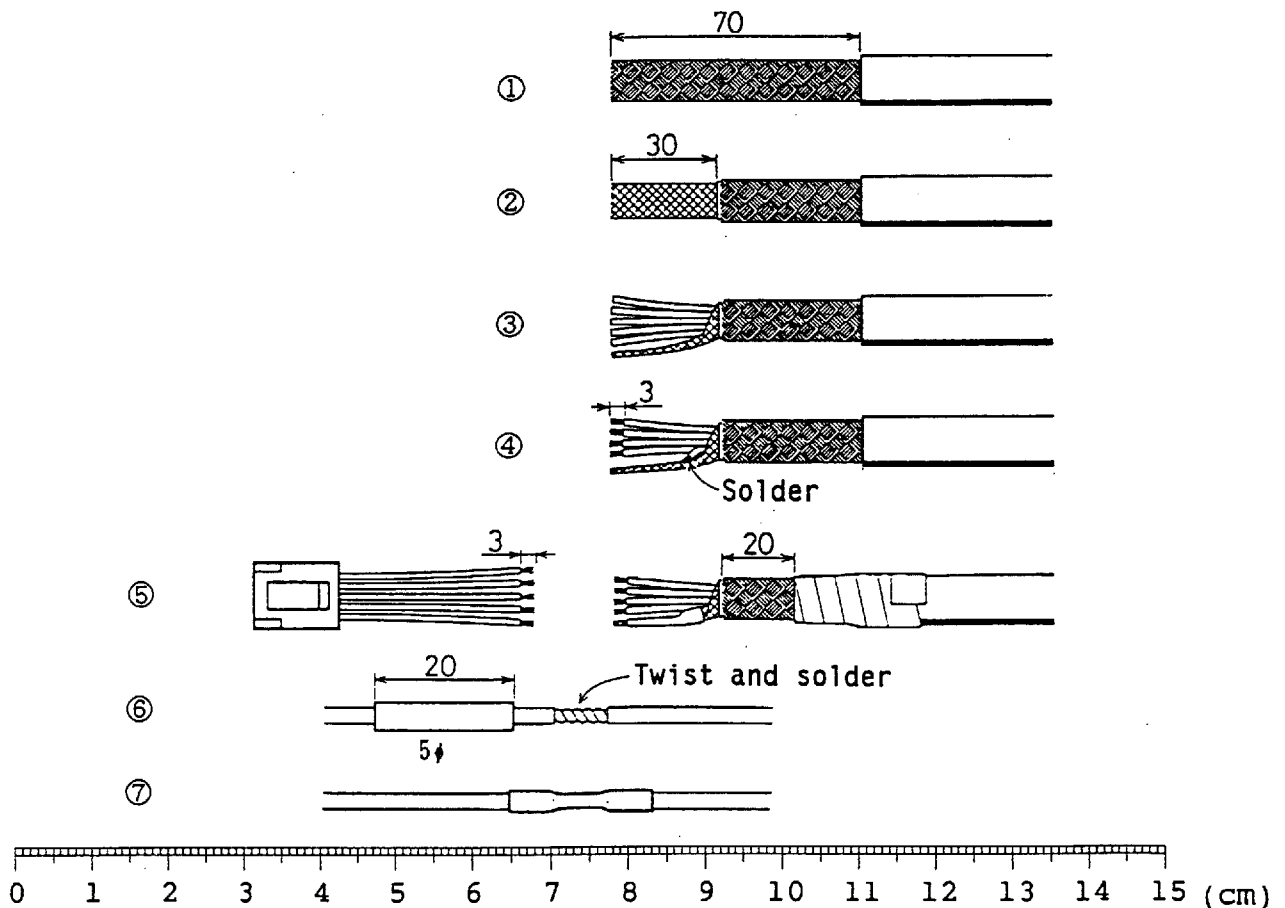
## 2. CABLE CONNECTION

The connection between the A-D converter and a gyrocompass requires a 5C cable (250V-MPYCS-5 or equivalent). For the connection between the A-D converter and radar, satellite navigator, GPS receiver, doppler sonar, current indicator, etc., 5P cable (CO-SPEVV-SB-C 0.2sq) is required.

### 1) Fabrication of 5C cable

- (1) Remove the outer sheath by 70mm.
- (2) Remove the armor and sheath by 30mm.
- (3) Separate the cores from the braided shield.
- (4) Expose the core for 3mm. Cut and solder unused cores to the shield.
- (5) Dress the shield with vinyl tape leaving 3mm of the it exposed.
- (6) Dress the end of armor with vinyl tape leaving 20mm of the it exposed.
- (7) Remove the cable of VH connector (supplied) by 3mm.
- (8) Pass the cable through heat shrink tube. Solder cable and core.
- (9) Heat the heat shrink tube.

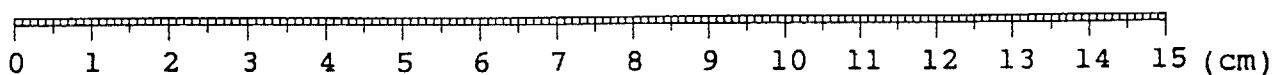
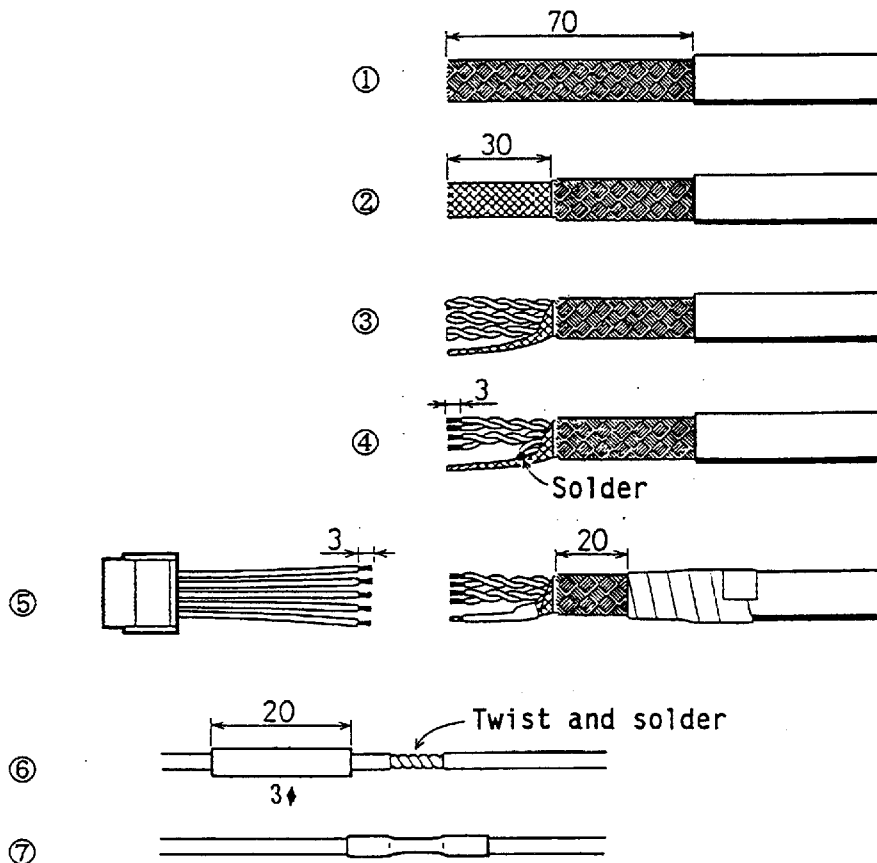
Note : Ground the armor through the cable clamp.



## 2) Fabrication of 5 pair cable

- (1) Remove the outer sheath by 70mm.
- (2) Remove the armor and sheath by 30mm.
- (3) Separate the cores from the braided shield.
- (4) Expose the cables for 3mm. Cut and solder unused cores to the shield.
- (5) Dress the shield with vinyl tape leaving 3mm of the it exposed.
- (6) Dress the end of armor with vinyl tape leaving 20mm of the it exposed.
- (7) Remove the cable of NH connector (supplied) by 3mm.
- (8) Pass the cable through heat shrink tube. Solder cable and core.
- (9) Heat the heat shrink tube.

Note : Ground the armor through the cable clamp.



### 3. EXTERNAL POWER SUPPLY

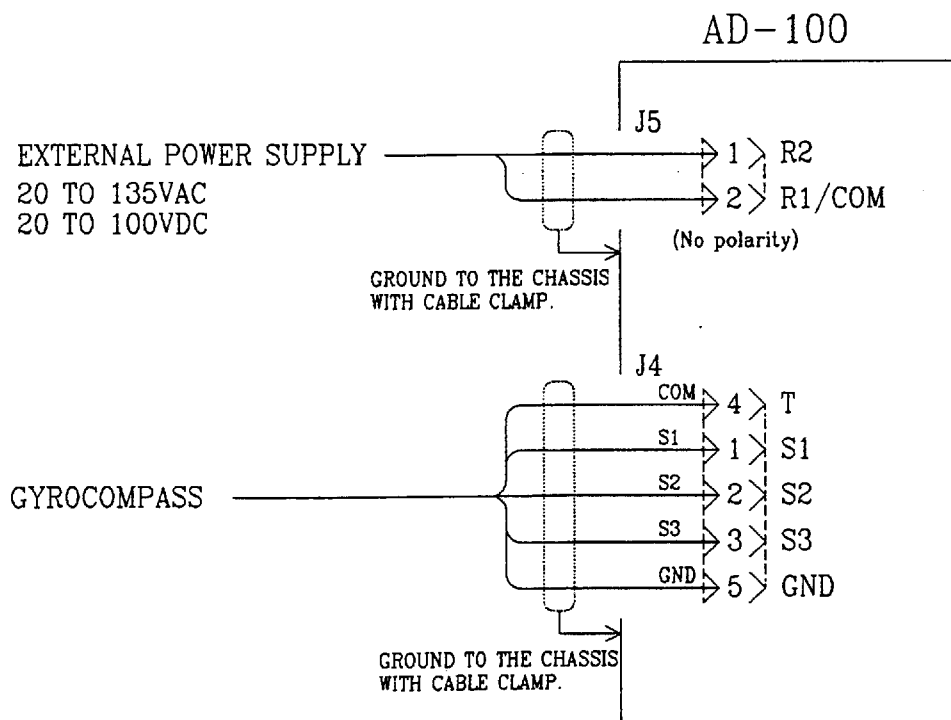
An external power supply is required when a DC Step-by-step gyrocompass is used since it cannot supply 5W or 20V.

#### 1) Jumper wire

If an external power supply is used, remove jumper wire JP1.

#### 2) Cable connection

Connect cables as shown below.



#### 4. SETTING THE DIP SWITCHES AND JUMPER WIRES

The AD-100 can accommodate various brands and specifications of gyrocompasses by means of DIP switches and jumper wires. Below are the specifications of the gyrocompass it can accommodate and the next page shows DIP switch and jumper settings for various brands of gyrocompasses.

##### •AC synchro

\*Frequency : 50/60Hz      400Hz      500Hz  
 \*Rotor Voltage : \_\_\_\_\_ VAC  
 \*Stator Voltage : \_\_\_\_\_ VAC  
 \*Gear Ratio : 360x      180x      90x      36x

##### •DC synchro

\*Frequency : 50/60Hz      400Hz      500Hz  
 \*Rotor Voltage : \_\_\_\_\_ VDC  
 \*Stator Voltage : \_\_\_\_\_ VDC  
 \*Gear Ratio : 360x      180x      90x      36x

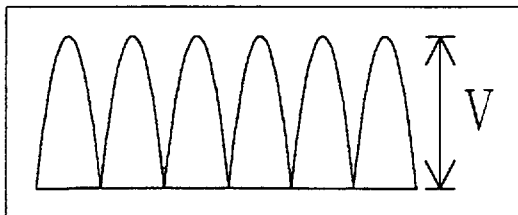
##### •DC step-by-step

\*Supplied Power : \_\_\_\_\_ VDC  
 \*Gear Ratio : 360x      180x      90x      36x

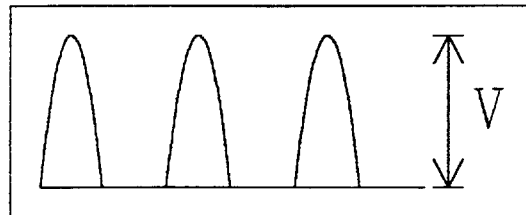
##### •Full/Half wave pulsating current

\*Frequency : 50/60Hz      400Hz      500Hz  
 \*Supplied Power : \_\_\_\_\_ VDC  
 \*Gear Ratio : 360x      180x      90x      36x

Full wave pulsating current



Half wave pulsating current



# 1) DIP switch and jumper wire setting

Revised at Apr. 9. 2001

Maker	Models	Specification	SW 1-1	SW 1-2	SW 1-3	SW 1-4	SW 1-5	SW 1-6	SW 1-7	SW 1-8	SW 2-1	SW 2-2	SW 2-3	JP1	JP2	JP3	JP4	JP5	
FURUNO	GY-700	DC step 100V 180x 5-wire, open collector	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1	
Anschutz	Standard 2,3	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 22V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	#1, #2,#3	#2	#2	#1	#1	
	Standard 4,6	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 90V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#2	#1	#1	#1	
	Standard 20	DC step 35V 180x COM(-), 3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2	
Yokogawa Navtec (Plaith type)	C-1/1A/2/3 A-55, B-55	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 22V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	#1, #2,#3	#2	#2	#1	#1	
	CMZ-700	DC step 24V 180x COM(+), 3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	Remove	#2	-	*	*	
	CMZ-250X/ 300X/500	DC synchronous 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	-	ON	OFF	Remove	#2	-	*	*
		DC step 35V 180x COM(+),3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2
	CMZ-100/200/ 300 C-1Jr,D-1Z/1/3 IPS-2/3	AC synchronous 50/60Hz Rotor voltage: 100V Stator voltage: 90V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
CMZ-50 Note 2	step 35V 180x COM(+),3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	-	ON	OFF	Remove	#2	-	*	*	
Plaith	NAV GAT II/III	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 68V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#2	#2	#1	#1	
Tokimec (Sperry type)	ES-1/2/11 GLT-101/102/ 103/106K/107	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 90V 36x	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1	
	ES-11A/110 TG-200 PR222R/2000 PR237L/H GM 21	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 22V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1	
	MK-14 MOD-1/2/T NK-EN,NK-EI	DC step 70V 180x COM(-), 3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1	
	SR-130/140	DC step 70V 180x 5-wire, open collector	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1	
	TG-100/5000 PR-357/130/ 140, ES-17 GLT-201/202 /203	DC step 70V 180x COM(+), 3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1	
	TG-6000	DC step 24V 180x	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2	
	GM-11	AC synchronous 50/60Hz Rotor voltage: 100V Stator voltage: 90V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1	
	SR-120,ES-16 MK-10/20/30	DC step 35V 180x	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2	
Kawasaki	GX-81	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 90V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1	
Armabrown	MK-10,MKL-1 SERIES1351, MOD-4	DC step 50V 180x COM(+), 3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1	
Robertson	SKR-80	DC step 35V 180x COM(-), 3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	-	#2	#2	

Note1) \*: Set JP4 and JP5 according to the voltage of the external power supply.

Note2) If CMZ-50 has 35VDC, set JP1 to #4, #5, #6.

2) Default setting

This unit is set at the factory for connection with the gyrocompass specifications tabulated below.

- 1) Type : AC synchro
- 2) Frequency : 50/60Hz
- 3) Rotor Voltage : Between 60VAC and 135VAC
- 4) Stator Voltage : Between 60VAC and 135VAC
- 5) Gear Ratio : 360X
- 6) Supplied Power : Between 30VAC and 135VAC

3) Setting procedure

(1) Type of gyrocompass

Type	SW1-4	SW1-5	SW1-6	JP1
AC Synchro	OFF	OFF	OFF	#1, #2, #3
DC Synchro	OFF	OFF	OFF	#2, #3, #4
DC step-by-step	ON	OFF	OFF	#4, #5, #6
Full wave pulsating current	OFF	ON	OFF	#4, #5, #6
Half wave pulsating current	ON	ON	OFF	#4, #5, #6

(2) Frequency

Frequency	SW1-7	SW1-8
50/60Hz	OFF	OFF
400Hz	ON	OFF
500Hz	OFF	ON
DC	ON	ON

(3) Rotor voltage

This is for AC synchro type gyrocompass only. For the rotor voltage of the DC synchro type will be at step 6.

Rotor Voltage	SW2-1	JP3
20 to 45VAC	ON	#2
30 to 70VAC	OFF	#2
40 to 90VAC	ON	#1
60 to 135VAC	OFF	#1

(4) Stator voltage

Stator Voltage	SW2-2	SW2-3	JP2
20 to 45VAC	ON	OFF	#2
30 to 70VAC	OFF	OFF	#2
40 to 90VAC	ON	OFF	#1
60 to 135VAC	OFF	OFF	#1
20 to 60VDC	ON	OFF	#2
40 to 100VDC	OFF	OFF	#2

- Continued -

(5) Gear ratio

Gear Ratio	SW1-1	SW1-2	SW1-3
X360	OFF	OFF	OFF
X180	ON	OFF	OFF
X90	OFF	ON	OFF
X36	ON	ON	OFF

(6) Power supply voltage

Voltage	JP4	JP5
20 to 45VAC	#2	#2
30 to 135VAC	#1	#1
20 to 60VDC	#2	#2
40 to 135VDC	#1	#1

(7) Output data transmitting interval and output sentence, version no. and baud rate.

Tx interval	SW2-5	SW2-6	Output sentence	Version no.	SW3-1	Baud rate	SW3-2
1s	OFF	OFF	HDT + VHW	NMEA0183 Ver 1.5	OFF	4860 bps	OFF
200ms	ON	OFF	HDT	IEC61162-1 or	ON	38400 bps	ON
100ms	OFF	ON	HDT	NMEA0183			
25ms	ON	ON	HDT	Ver 2.0/3.0			

(8) Data transmitting interval of AD-10S format

Select data transmitting interval for each port by changing the proper jumper wire on JP6 or JP7.

**NOTE:** Use the interval 25ms. for radar only.

END

4) Function of DIP switches and jumper wires

The function of each DIP switch and jumper wire is as listed below. Set them according to the specifications of the gyrocompass connected. After setting, reset CPU or turn the power off and then on again to write setting into the CPU (  : default setting).

(1) DIP Switch SW1 (1/2)

Segment	Function	Setting
SW1-1, -2, -3	Gear Ratio	SW1-1    SW1-2    SW1-3
	<input type="checkbox"/> X360	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	X180	ON    OFF    OFF
	X90	OFF    ON    OFF
	X36	ON    ON    OFF
SW1-4, -5, -6	Type of Gyrocompass	SW1-4    SW1-5    SW1-6
	<input type="checkbox"/> AC Synchro	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	DC Synchro	OFF    OFF    OFF
	DC Step	ON    OFF    OFF
	Full Wave Pulsating Current	OFF    ON    OFF
	Half Wave Pulsating Current	ON    ON    OFF

Segment	Function	Setting
SW1-7, -8	Frequency 50/60Hz 400Hz 500Hz DC	SW1-7 SW1-8 OFF OFF ON OFF OFF ON ON ON

(2) DIP Switch SW2, SW3

Segment	Function	Setting
SW2-1	Rotor Voltage 20 to 90VAC 30 to 135VAC	SW2-1 ON OFF
SW2-2, SW2-3	Stator Voltage 20 to 90VAC or 20 to 60VAC 30 to 135VAC or 40 to 100VDC	SW2-2 SW2-3 ON OFF OFF OFF
SW2-4	Selftest	SW2-4 ON Continuous OFF One cycle
SW2-5 SW2-6	Output interval of the output data	SW2-5 SW2-6 OFF OFF 1s ON OFF 200ms OFF ON 100ms ON ON 25ms
SW2-7	Stator signal breaking detection	SW2-7 ON Disable OFF Enable
SW2-8	Reset CPU	Normally off Turn ON and OFF to reset CPU
SW3-1	Selection of the output data	SW3-1 ON IEC61162-1 or NMEA0183 Ver 2.0/3.0 OFF NMEA0183 Ver 1.5
SW3-2	Baud rate of the output data	SW3-2 ON 38,400bps OFF 4,800bps
SW3-3	Power fail detection	SW3-3 OFF Disable ON Enable
SW3-4	Not used	

Jumper JP1

Segment	Function	Setting
#1, #2, #3	Type of Gyrocompass AC Synchro DC Synchro DC Step Full Wave Pulsating Current Half Wave Pulsating Current	#1, #2, #3 #2, #3, #4 #4, #5, #6 #4, #5, #6 #4, #5, #6



Jumper JP2

Segment	Function	Setting
	Stator Voltage 20 to 70VAC or 20 to 100VDC 40 to 135VAC	#2 #1

Jumper JP3

Segment	Function	Setting
	Rotor Voltage 20 to 70VAC 40 to 135VAC	#2 #1

Jumper JP4

Segment	Function	Setting
	Power Supply 20 to 45VAC or 20 to 60VDC 30 to 135VAC or 40 to 100VDC	#2 #1

Jumper JP5

Segment	Function	Setting
	Power Supply 20 to 45VAC or 20 to 60VDC 30 to 135VAC or 40 to 100VDC	#2 #1

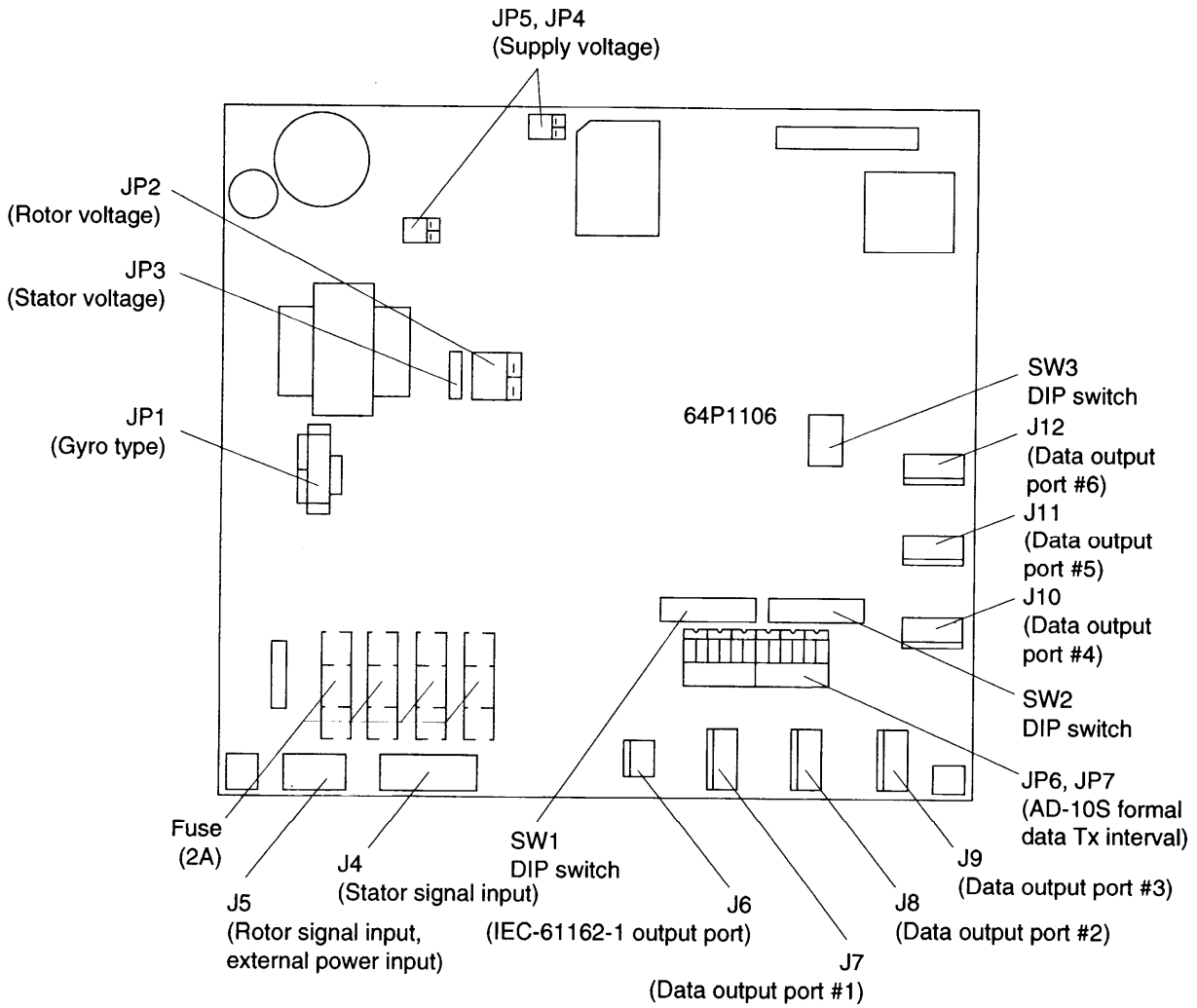
Jumper JP6

Segment	Function	Setting
#1, #2, #3	Output Interval of The AD-10S format. port1, port2, port3	#25 25ms #200 200ms

Jumper JP7

Segment	Function	Setting
#4, #5, #6	Output Interval of The AD-10S format. port4, port5, port6	#25 25ms #200 200ms

CHAPTER 4 PARTS LOCATION



PROCESSOR BOARD 64P1106

## CHAPTER 5 DIGITAL INTERFACE

### Output sentences

HDT, VHW

### Transmission interval

Selectable among 25ms, 100ms, 200ms, and 1s.

Note: For 25ms, 100ms or 200ms. only HDT is output.

The 25ms setting sets baud rate to 38,400 bps.

### Data transmission

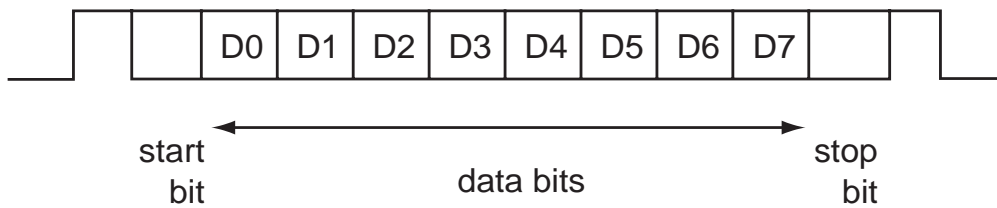
Data is transmitted in serial asynchronous form in accordance with the standard referenced in 2.1 of IEC 61162-1. The first bit is a start bit and is followed by data bits, least-significant-bit as illustrated below.

The following parameters are used:

Baud rate: 4800 or 38400 bps

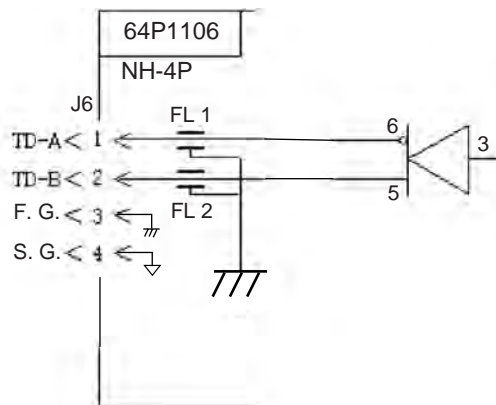
data bits: 8 (D7 = 0), parity none

stop bits: 1



### Schematic diagrams

IEC-61162-1 output port

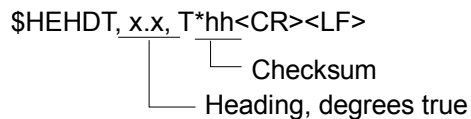


Output drive capability

Max. 10 mA

**HDT - Heading - true**

Actual vessel heading in degrees true produced by any device or system producing true heading.

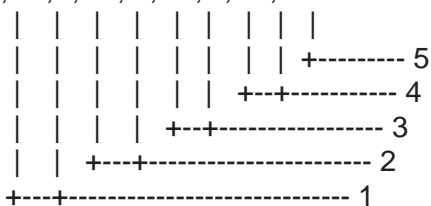


Note: For NMEA0183 Ver.1.5 setting (SW3-1: OFF),  
checksum is null field.

**VHW - Water speed and heading**

The compass heading to which the vessel points and the speed of the vessel relative to the water.

\$HEVHW,x.x,T,x.x,M,x.x,N,x.x,K\*hh<CR><LF>



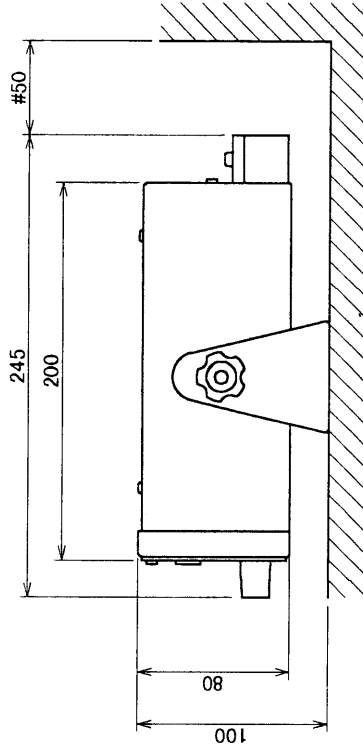
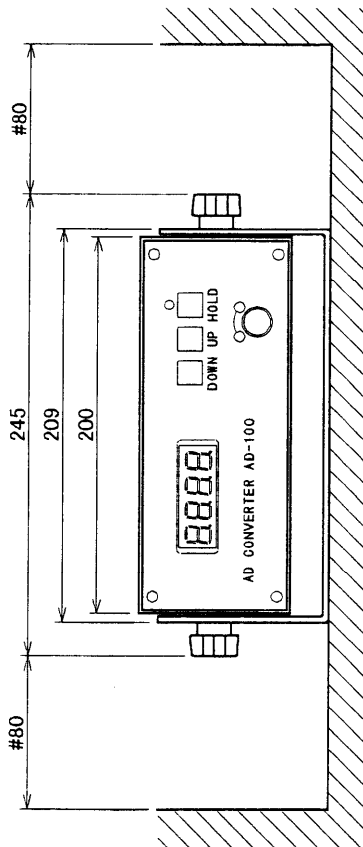
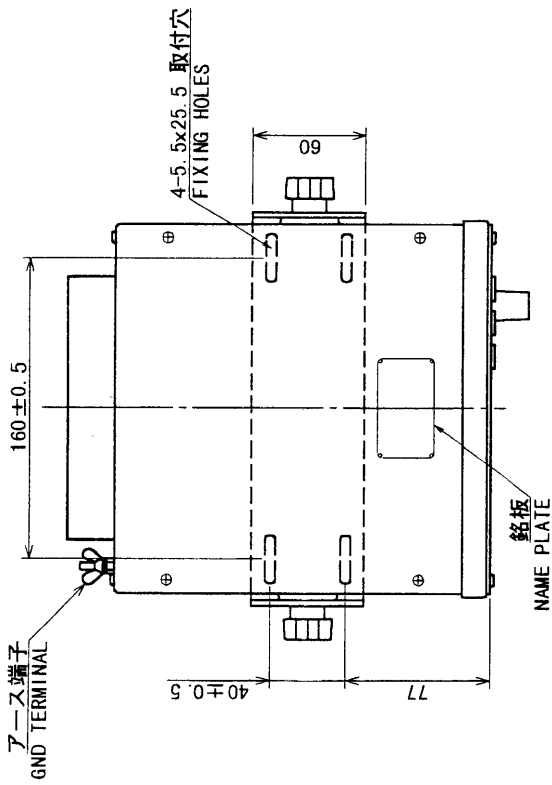
- 1. Heading, degrees true
- 2. Heading, degrees magnetic
- 3. Speed, knots
- 4. Speed, km/h
- 5. Checksum

Note1: No.2, 3, and 4 are null fields.

Note2: For NMEA0183 Ver.1.5 setting (SW3-1: OFF),  
checksum is null field.

表 1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
0 < L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3



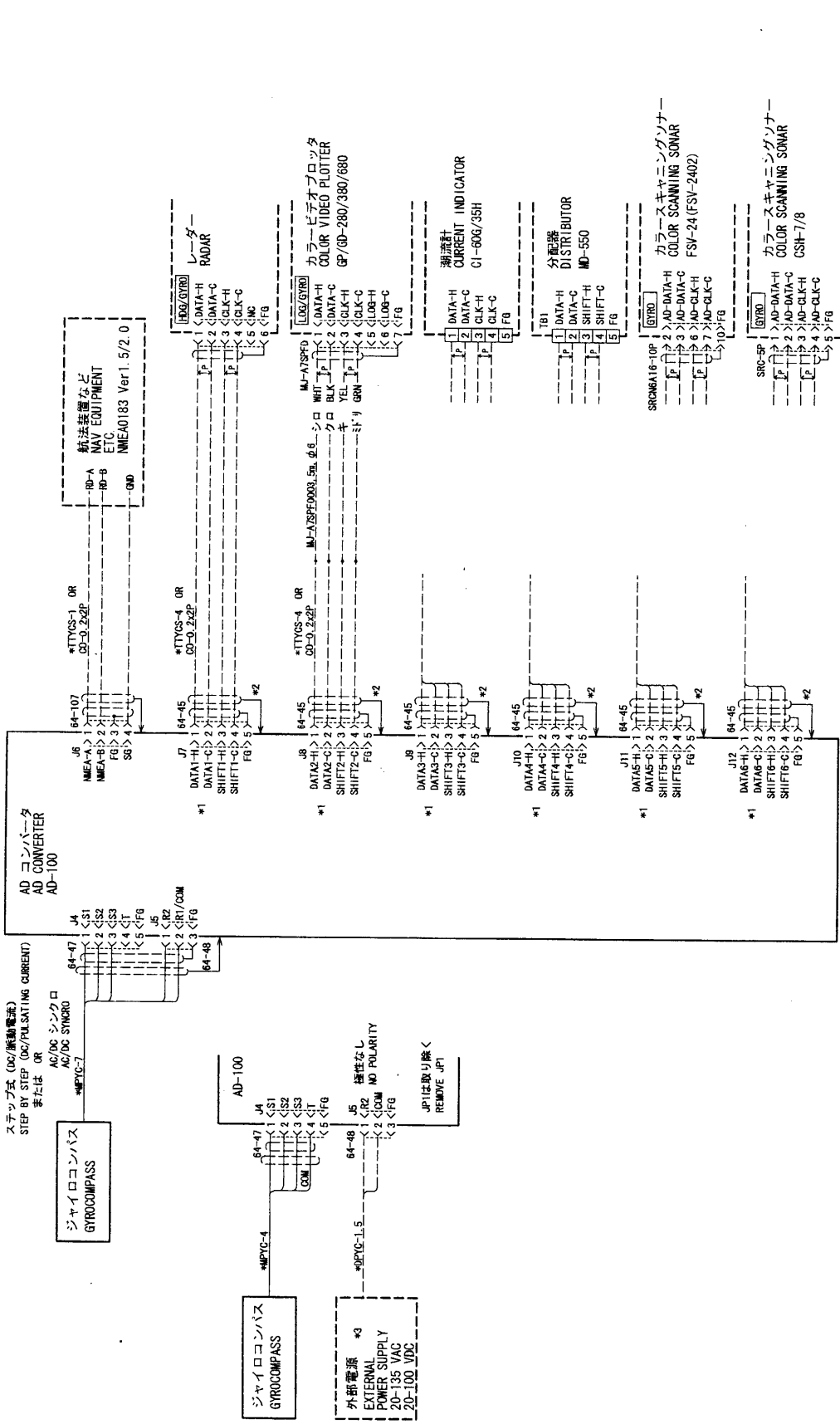
注記

- 1) 指定なき寸法公差は表 1 による。
- 2) #: 推奨する最小サービス空間寸法。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. #: RECOMMENDED SERVICE CLEARANCE.

DRAWN Apr 17 '60 T. YAMASAKI	TITLE AD-100
CHECKED OAKI '60 Y. Kusun	名称 A-Dコンバータ
APPROVED APR 17 '60 Y. Kusun	外寸図
SCALE 1/4	NAME A-D CONVERTER
MASS 2.0 kg	OUTLINE DRAWING
DWG. No. C4340-G01-E	



注記

- \* 1) データ送信間隔は25msまたは200msから選択。ただしレーダーは25msを使用のこと。
- \* 2) シールドおよび使用しないワイヤはFGピンでアースに落とす。
- \* 3) DCステップ電圧が5W以下るとき、または電圧が20V以下るときは外部電源を使用する。

NOTE

- \* 1) SELECT DATA TRANSMISSION INTERVAL BETWEEN 25 ms AND 200 ms. RADAR REQUIRES 25 ms INTERVAL.
- \* 2) GROUND SHIELD AND UNUSED WIRES THRU FG PIN.
- \* 3) USE THE EXTERNAL POWER SUPPLY WHEN DC STEP CANNOT SUPPLY 5W OR 20V.

OD-0, 2x2P: OD-SPEW-SB-C 0, 2x2P, φ 10, 5

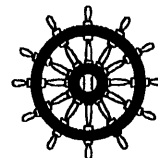
DRAWN	May 23 '03	I. YAMASAKI	TITLE	AD-100
CHECKED	May 23 '03	I. TAKENO	名称	ADコンバータ
APPROVED	May 23 '03	Masaguchi	相互結線図	
SCALE		MASS	NAME	AD CONVERTER
DWG No.	CA340-C01-G			INTERCONNECTION DIAGRAM

# FURUNO®

**FURUNO ELECTRIC CO., LTD.**9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan  
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Pub NO. DOC-255

## 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

**Compass interface model AD-100**

(Model names, type numbers)

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

StandardTest standard

IMO Resolution A.477 (XII)

IEC 60936

IMO Resolution A.694 (17)

IEC 60945

IMO Resolution MSC.64(67) Annex 4

(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. 050558/99 of 01 October 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 RegulationsNishinomiya City, Japan  
December 14, 1999

(Place and date of issue)

(name and signature or equivalent marking of authorized person)



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