

FURUNO

INSTALLATION MANUAL

DOPPLER SONAR

MODEL DS-30



FURUNO ELECTRIC CO., LTD.

www.furuno.co.jp

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SAFETY INSTRUCTIONS

"**DANGER**", "**WARNING**" and "**CAUTION**" notices appear throughout this manual. It is the responsibility of the 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 a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or property damage.

**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 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.

Observe the following compass safe distances to prevent interference to a magnetic compass:

	Standard compass (m)	Steering compass (m)
Main display DS-300	0.75	0.50
Operation panel DS-301	0.2	0.2
Processor unit DS-310	1.3	1.0
Digital indicator DS-350	0.3	0.2
Digital indicator DS-351	0.4	0.3
Distribution unit DS-370	0.9	0.7
Analog indicator DS-381/382	0.7	0.6

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Complete Set

No.	Name	Type	Weight (kg)	Qty	Remarks
1	Main Display	DS-300	9.5	1	
2	Operation Panel	DS-301	1.5	1	
3	Processor Unit	DS-310	40	1	
4	Transceiver Unit	DS-320	14	1	
5	Transducer/Casing	DS-330/DS-331	82	1	Select one.
	Seachest with Gate Valve(incl. Transducer)	DS-335	450		
6	Installation Materials			1set	
7	Spare Parts			1set	

Option

No.	Name	Type	Weight (kg)	Remarks
1	Junction Box	DS-360	5.0	
2	Rate-of-turn Gyro	DS-340	5.5	
3	Distribution Unit	DS-370	19.0	
4	Digital Indicator	DS-350	7.0	
		DS-351	4.0	Flush mount
5	Remote Box	DS-359	0.7	For DS-351
6	Analog Indicator	DS-381	6.4	-10 to 40kt, ø200, Flush mount
		DS-382	6.0	-10 to 40kt, ø200, Bulkhead mount
		MF-22A-1	6.4	-10 to 30kt, ø200, Flush mount
		MF-22A-2	6.0	-10 to 30kt, ø200, Bulkhead mount
		MF-22A-3	1.3	-10 to 30kt, ø100, Flush mount
		MF-22A-4	4.4	-10 to 30kt, ø200, Flush mount (less brim)
		MF-22A-6	6.0	-10 to 30kt, ø200, Flush mount)
		MF-22A-7	6.0	-10 to 30kt, ø200, Bulkhead mount, (counterclockwise dial)
		MF-22A-8	6.0	-10 to 30kt, ø200, Bulkhead mount, (counterclockwise dial)
7	Range Switch Box	DS-389	0.7	Flush mount
8	Dimmer	MF-22L-1	1.2	Flush mount
		MF-22L-2	1.3	Bulkhead mount

No.	Name	Type	Weight (kg)	Remarks
9	Distance Indicator	MF-22T-1	6.0	Flush mount
		MF-22T-2	9.0	Bulkhead mount
		MF-22T-3	6.0	Tabletop mount
10	Alarm Unit	AU-12	0.6	

CHAPTER 1. GENERAL

The Furuno model DS-30 Doppler Sonar provides accurate measurement of the fore/aft and port/starboard speed of vessels. It mainly consists of display unit, processor unit, junction box, transceiver unit and transducer (hull unit).

NOTICE

Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

1.1. Selecting Mounting Location

1.1.1 Transducer (Hull Unit)

The performance of the DS-30 is directly related to the mounting location of the transducer. Especially air bubbles and turbulence caused by movement of the ship and interference from other acoustic equipment seriously degrade performance. The mounting location should, therefore, be determined carefully, keeping the following factors in mind.

1) Air Bubbles

Since the transducer of the DS-30 is installed flush with the ship's hull bottom, it is susceptible to air bubbles which flow below the hull bottom. Select a location where air bubbles created at ship's bow do not go down to the mounting location. When the ship has a bulbous bow, install the transducer in it or just behind it. However, when the ship makes a voyage in high latitude area breaking through ice flows, avoid the location where broken ice flows may strike the location. The DS-30 is used not only for ocean going navigation but also for docking to loading/unloading facilities, at which the bow and side thrusters are used. The transducer should be separated at least 4 or 5 meters from them.

NOTE: In extremely shallow harbors with soft bottom, whirls created by ship's movement cause air bubbles and also bottom materials to be stirred, which may make the use of DS-30 impossible.

2) Cavitation

Dents on ship's bottom cause whirls behind them and may sometimes cause cavitation which adversely affects the performance of the transducer, especially when the ship moves at a high speed.

The welded portion between the transducer casing and the ship's hull should therefore be finished as smooth as possible.

3) Variation of Draft Level

When the ship travels unloaded, the draft level goes low and air bubbles are apt to be pushed down to the transducer location. This occurs especially when the water level is lower than the center line of the bulbous bow. It is recommended to load a proper amount of ballast not only for the DS-30 but also for safety of navigation.

4) Interference of Other Ultrasonic Equipment

If integer multiple of the transmission frequency of other ultrasonic equipment is within 440 ± 8 kHz, interference may occur. Select a location at least 1 m away from the transducer of the ultrasonic equipment and change, if possible, the direction of its transmission beam so that the beam may not cross the beam of DS-30.

5) Installation in Dangerous Place

Do not install the transducer in the oil tank, oil room, LPG gas room and freezing room.

6) Maintenance Space

The transducer is detachable/replaceable in the water from outside the ship.

1.1.2 Other Indoor Units

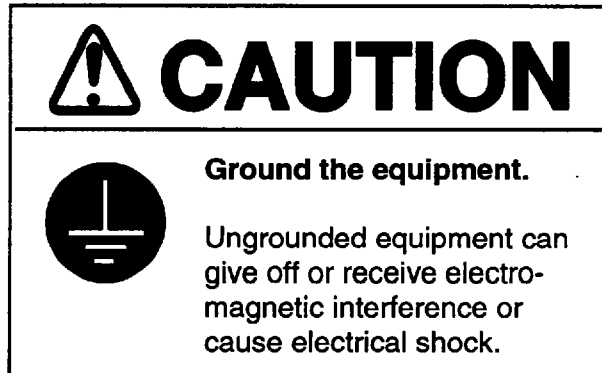
All units are designed and constructed to withstand humidity and corrosive atmosphere common to a vessel. However certain guidelines must be observed to ensure continued operation. When selecting a mounting location, keep the following points in mind.

- 1) Avoid place subject to high temperature/humidity. This includes heat emitting apparatuses and sunshine.
- 2) Avoid places subject to sea splash. Sea splashes most assuredly damage the sensitive components inside units.
- 3) Locate the units where they will not become soiled easily. Never locate it near exhaust pipes.
- 4) Select a place where vibration is minimal.
- 5) Select a place with sufficient ventilation.

1.2. Grounding

All units use pulse signals. Thus, insufficient grounding of the units may cause interference to other electronic equipment on board such as radio direction finder and radio receivers. To minimize unwanted radio radiation, perform the cabling and grounding works with due consideration of the following remarks.

- 1) Do not run cables near radio apparatuses. Do not also run them near or in contact with the cables of radio apparatuses.
- 2) Make cable run as short as possible, taking the shortest route.
- 3) Ground all units by using a copper strap.
- 4) To connect the copper strap to a copper plate, use silver solder or solder cream to ensure solid connection.



CHAPTER 2. MOUNTING

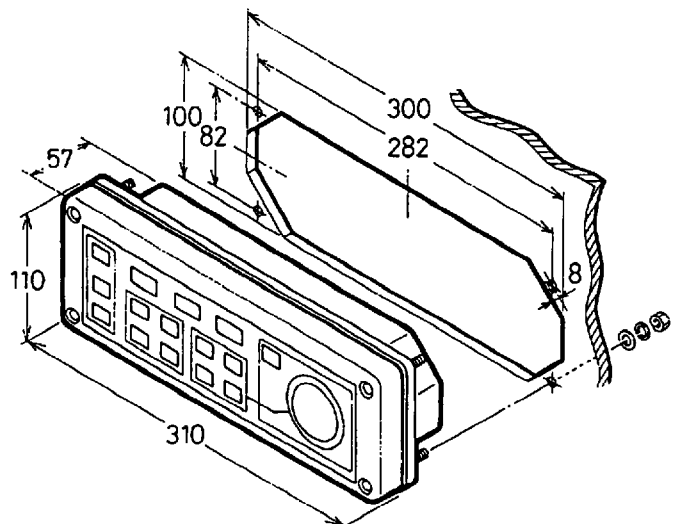
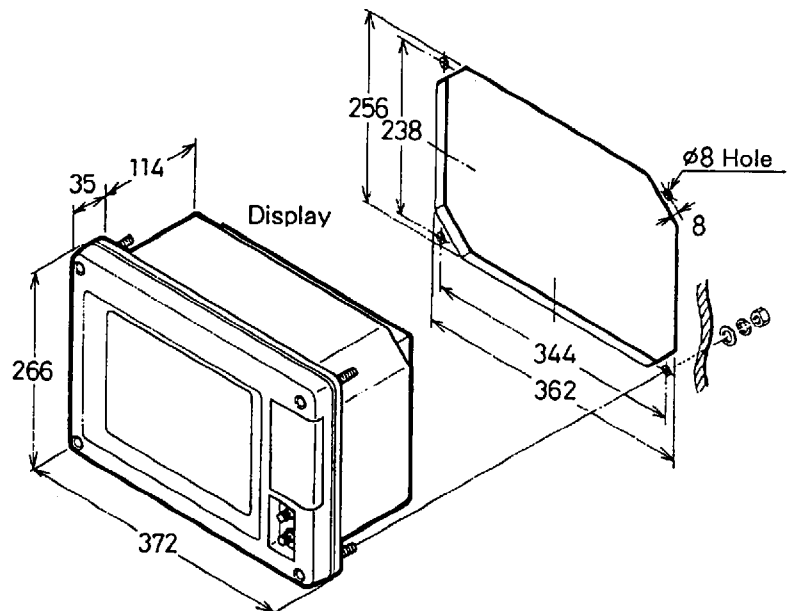
2.1. Main Display and Operation Panel

Select mounting locations taking the following points into account.

- 1) Select a place where operating personnel are able to control the units easily while observing the area surrounding the vessel.
- 2) Select a place not exposed to direct sunlight, water splashes and hot air.

2.1.1. Standard Mounting

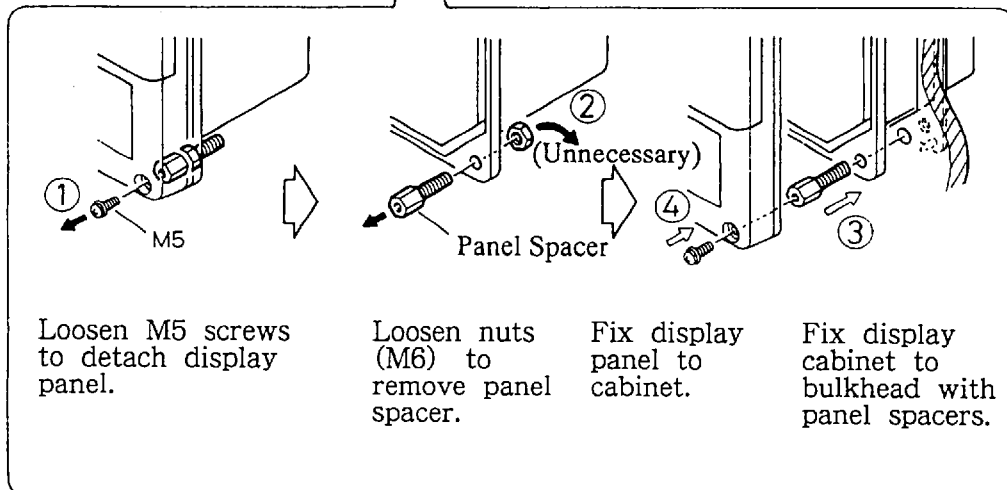
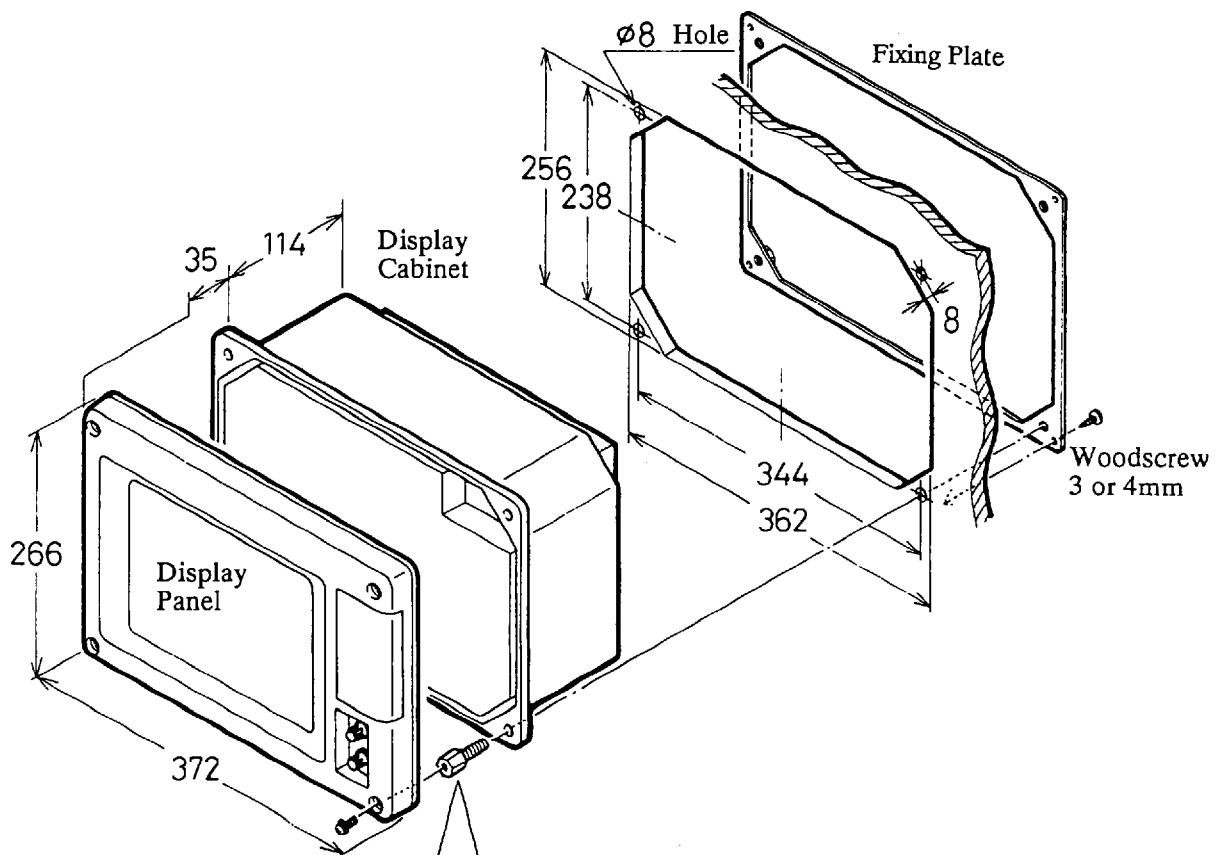
1. Cut out the bulkhead and drill fixing holes as shown at right. Reinforce if necessary the bulkhead since the display unit weighs 10 kg approximately.
2. Four mounting bolts (M6) are factory-fitted at the back of the front panel. Fit them into the fixing holes and push in the unit.
3. Fix the unit by tightening the bolts with nuts (M6) fitted from the back of the bulkhead.



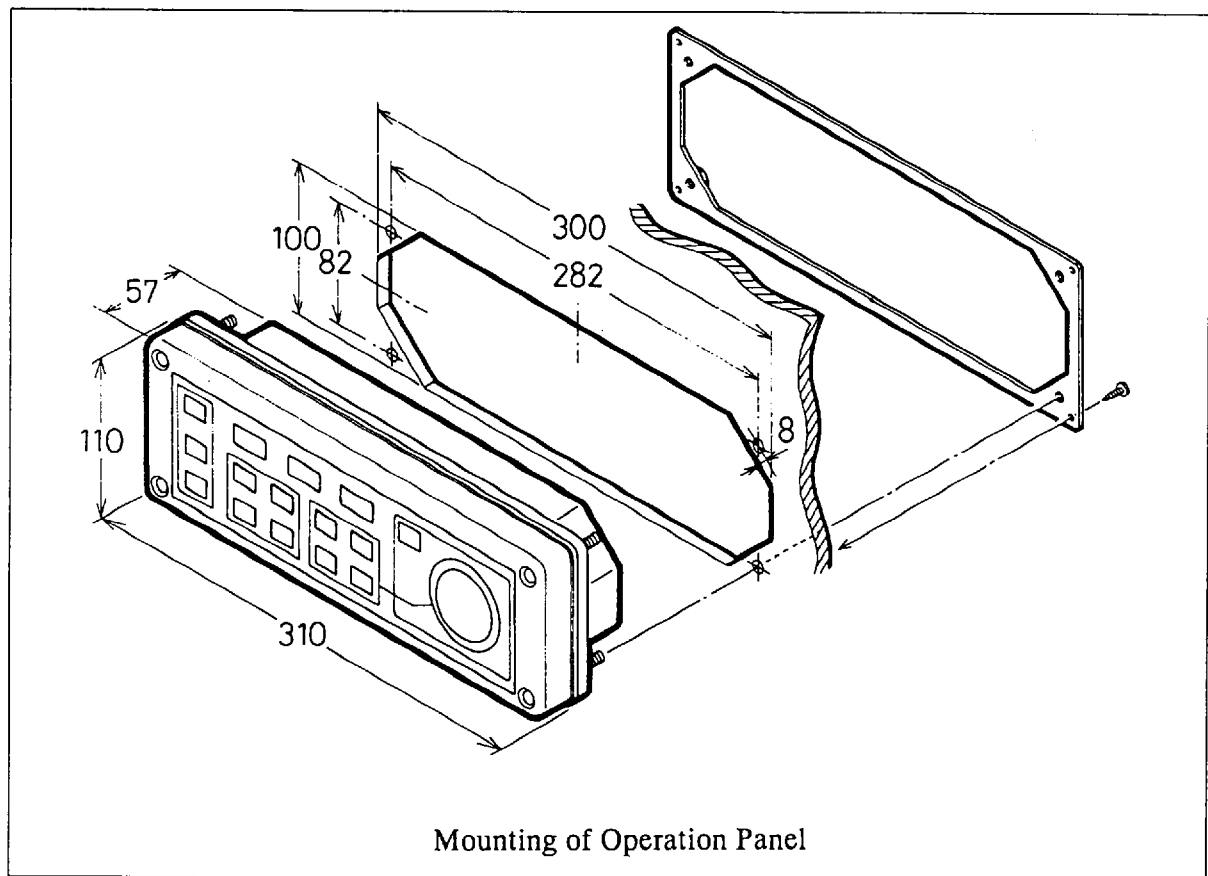
2.1.2. Mounting with Fixing Plate

When it is difficult to fit nuts from back of the bulkhead, use the fixing plate. The fixing plate is optional supply.

1. Cut out the bulkhead with dimensions shown in the figure below. (For those for the operation panel, refer to the next page.) Reinforce if necessary the bulkhead to withstand weight 10 kg of the display unit.
2. Detach the display panel from the cabinet by loosening screws (M5) at the four corners of the display panel. (① in the figure)
3. Remove nuts which fix the panel spacers at the four corners of the cabinet. The nuts removed are unnecessary. (② in the figure)



4. Attach the fixing plate to the back of the bulkhead by using woodscrews (3 or 4 mm).
When space is insufficient to use woodscrews and a screwdriver, use glue or vinyl tape to temporarily attach the fixing plate.
5. Fit the display unit to the cutout hole and insert the four panel spacers through the holes on display cabinet, bulkhead and mount plate. Then tighten the panel spacers securely to fix the cabinet.
6. Fix the display panel to the cabinet as before by using four screws (M5).



2.2. Processor Unit

Select a mounting location taking the following points into account.

- 1) Since the unit generates heat, select a well ventilated location with low humidity.
- 2) The unit can be bulkhead or floor mounted. When mounting on the bulkhead, reinforce the mounting location to withstand the unit weight of 40 kg.

2.2.1. Mounting Procedure

1. Fix four stud bolts on the selected location at intervals shown on the outline drawing. The bolt should stick out by 20 cm from the bulkhead (or floor).
2. Fit the mounting holes on the unit to the bolts and tighten the bolts by using nuts (M10).

2.3. Transceiver Unit

Select a mounting location, taking the following points into account.

- 1) Since the unit generates heat, select a well ventilated location with low humidity.
- 2) The unit can be bulkhead or floor mounted. When mounting on the bulkhead, reinforce the mounting location to withstand against the unit weight of 14 kg.

2.3.1 Mounting Procedure

1. Fix four mounting bolts on the selected location at intervals shown on the outline drawing so that bolt thread sticks out by 20 cm from the bulkhead (or floor).
2. Fit the mounting holes on the unit to the bolts and tighten the bolts by using nuts (M10).

2.4. Junction Box (Option)

The junction box can be floor or bulkhead mounted provided that the mounting location is strong enough to withstand the weight of 5 kg.

2.4.1. Mounting Procedure

1. Drill mounting holes on the mounting location, referring to the outline drawing.
2. Insert four bolts (M6x40) into mounting holes on the junction box and the mounting location.

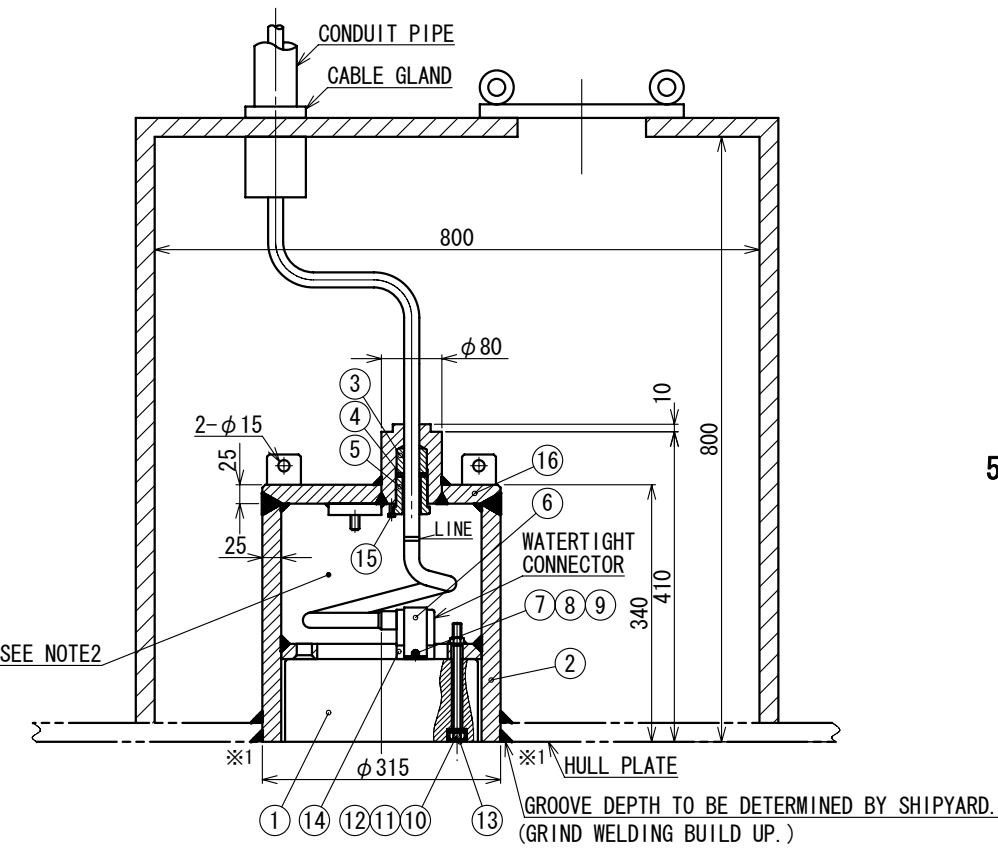
3. Fix the junction box by tightening the bolts with nuts placed from back of the installation location.

2.5. Transducer (Hull Unit)

For transducer /casing DS-330/311, refer to the installation instructions on page 2-5.

For gate value seachest DS-335, refer to the installation instructions on page D-9. Note that the spacer and upper plate should be oriented to the ship's bow.

HULL UNIT INSTALLATION



1) CHECKING MATERIAL AND THICKNESS OF TRANSDUCER CASING

Before starting the installation work, check that the transducer casing is of a material approved by ship classification society concerned and with a thickness not thinner than the hull plate. The standard tank supplied by FURUNO is of material KSTPG370 (KSTPG38, KST138), approved by ship Classification Society of Japan, with a thickness of 25 mm.

2) DETERMINING INSTALLATION SITE

Select the installation site referring to the recommended sites described in the installation instructions.
For ships prone to collect air bubbles under the hull bottom, consult your local FURUNO office or agent for advice.

3) CONSTRUCTING WATERPROOF COMPARTMENT FOR TRANSDUCER CASING

The compartment for the transducer casing is not compulsory required by law because the transducer casing is waterproof. However it is recommended to construct it for safety. Dimensions shown above are only for reference; shipyard may change as required. Since the transducer is detachable/replaceable in water from outside the ship, maintenance space is not required inside the compartment.

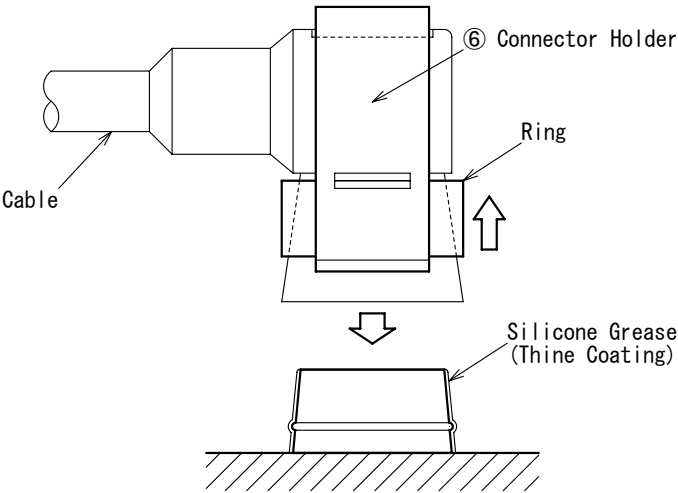
4) WELDING CASING

- a) Fore/aft marks are engroved on the casing. Align them with ship's fore-aft line.

- b) Orientation and leveling errors can be offset on the data offset menu in the display unit. Install the casing as follows.
Fore-aft orientation: Align the bow mark on the casing with ship's fore-aft line to an accuracy within 1 degree.
Leveling: Install the casing so that the top face of the casing is horizontal during navigation. Measure leveling accuracy with a level meter, after the ship is launched.
- c) Detach transducer (1), cable, cable gland (5) and gasket (3) before welding the casing.
- d) Welding method for casing and ship's hull should be determined by the shipyard. Weld reinforcement ribs to the casing if the shipyard considers them necessary.
- e) Remove welding build up between the casing and the ship's hull (part marked ※1 in the drawing) with a grinder, for a flat finish.

5) FIXING/CONNECTING TRANSDUCER CABLE

- a) Lead the transducer cable into the casing up to the white line mark on the cable and tighten the cable gland with the cable gland spanner supplied.
- b) Install locking bolt (15) after the cable gland is tightened.
- c) Remove dirt and apply silicone grease onto the side of receptacle on the transducer before plugging the watertight connector.
- d) To plug in the watertight connector, pull up the ring and insert the connector into the receptacle, and then fix the connector holder (6) with hex nut (7).



6) FIXING TRANSDUCER

Twisting the cable (namely, rotating the transducer by about one turn), align the bow mark on the transducer with ship's bow and fix the transducer by using hex bolt (10). After apply silicone sealant to bolt-head, put bolt cap (13) onto it.

7) CABLING

Lay the cable from the casing to the transceiver unit inside a conduit pipe and fill the conduit pipe with sand or other appropriate materials to prevent cable vibration.

8) PAINTING

Shop primer coating (Epcor Zinc Rich Primer B) has been applied to the casing. Paint both inner and outer surfaces on the casing with the paint used for top coating of the ship's hull bottom.

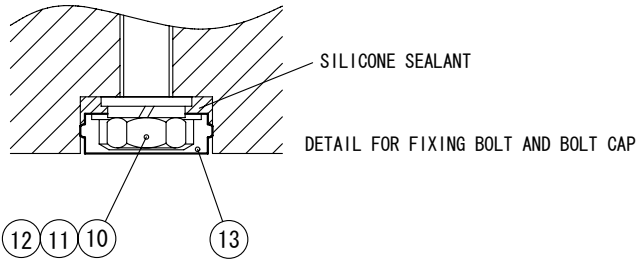
NOTE 1: The transducer surface is coated with anti-fouling paint Marine Star 20. Do not coat it by other type of paint.

9) TESTING AFTER INSTALLATION

Confirm the ohm value of terminals on the transducer. A digital ohmmeter is recommended. Do not use a megohmmeter.

TYPE OF SIGNAL	TEST POINT	STANDARD (Ω)
BEAM 1 (BLK)	TB #1 (RED) - #2 (BLK)	0.5~3.0
BEAM 2 (RED)	TB #4 (RED) - #5 (BLK)	0.5~3.0
BEAM 3 (GRN)	TB #7 (RED) - #8 (BLK)	0.5~3.0
TEMP SENSOR 1	TB #10 (YEL) - #11 (WHT)	450~550
TEMP SENSOR 2	TB #13 (BLU) - #14 (GRY)	450~550

NOTE 2: The inside of transducer tank (16) and bolt(10)-thru hole will be filled with water. It has no problem.



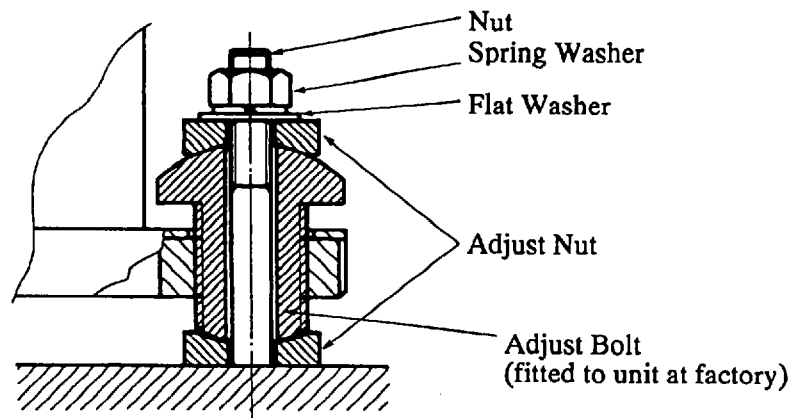
DRAWN	Jul. 26 '06 T. YAMASAKI		TITLE	DS-330/331
CHECKED	Jul. 26 '06 T. TAKENO		NAME	HULL UNIT
APPROVED	Jul. 27 '06 T. Matsuguchi	DS-30		INSTALLATION PROCEDURE
SCALE	MASS	kg	REMARKS	
DWG No.	E7236-Y10- J			

2.6. Rate-of-Turn Gyro Unit (Option)

The rate-of-turn gyro unit should be installed, in a location with minimal vibration, so that the sensor inside the unit is level to within $\pm 1^\circ$; error of up to $\pm 2^\circ$ can be corrected. There is no designation for orientation of the unit. Select the location considering that the cable for connection with the processor unit is 5m long.

2.6.1. Mounting Procedure

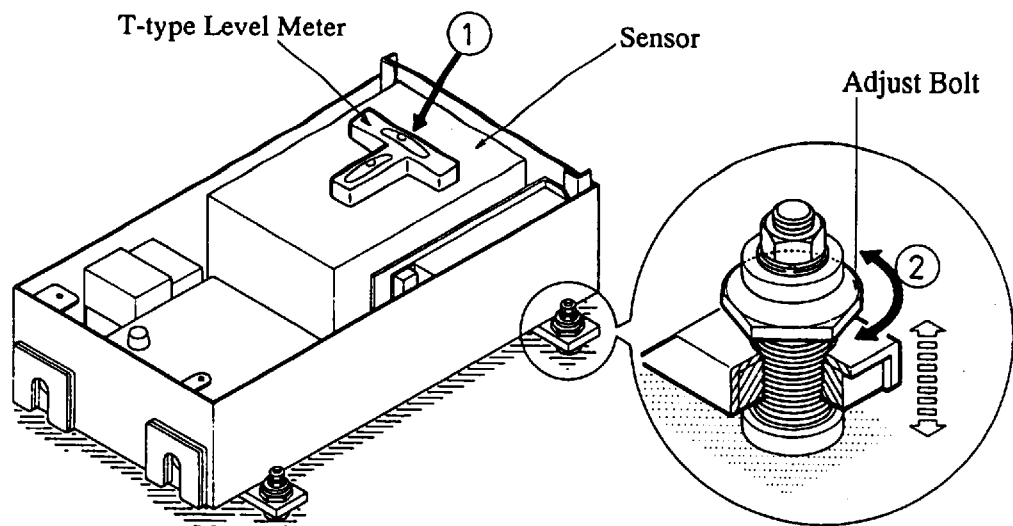
1. Fix four stud bolts on the selected location at intervals shown in the outline drawing.
2. Fix the unit by using adjust nuts, flat washers, spring washers and nuts supplied as installation materials as shown below.



2.6.2. Leveling Adjustment

This adjustment should be performed while the ship is in dry-dock where it has no heeling and trimming inclinations.

1. Place a T-type level meter on top of the sensor to measure longitudinal and transverse inclination.
2. For leveling the sensor, turn the adjust-bolts.



Error of Rate-of-Turn Gyro

The rate-of-turn gyro detects angular velocity of ship's motion, which sometimes contains the following errors.

Attitude Error

If the rate-of-turn gyro is not installed on the level or if the ship trims or heels, the angular velocity detected becomes $V_t \times \cos\theta$, where V_t is the true angular velocity and θ is the inclination angle of the rate-of-turn gyro from the horizontal plane.

Motion Error

If the static attitude of the rate-of-turn gyro is level, the ship's rolling and pitching cause no error. However, if the ship has a trim which causes static inclination of the rate-of-turn gyro, an error occurs by ship's rolling. The error is given by $V_r \times \sin \lambda$, where V_r is the angular velocity of rolling and " λ " is the trim angle.

Latitude Error

Error caused by earth's rotation depends on latitude.

If latitude is expressed by " α " and earth's rotation angular velocity by Ω , then error ω_E caused by earth's rotation is

$$\omega_E = \Omega \times \sin \alpha$$

Error by Vibration and Shock

Shock and vibration in longitudinal, transverse and vertical directions do not cause error in gyro output if it's intensity is within the gyro specifications. However, note that actual shock and vibration contain angular velocity components which cause error. When the unit is installed in the bridge, the error may be negligible.

Note: The life of the sensor in the Rate-of-Turn Gyro is approx. 17,000 hours. When the elapsed time shown on the hour meter in the Rate-of-Turn Gyro, exceeds 17,000 hours, replace the sensor.

CHAPTER 3. WIRING

3.1. Precautions for Cable Installation

3.1.1. Cable between hull unit (transducer) and transceiver

This cable carries very weak signals with amplitude of less than 0.1uV which are easily interfered by noise. **Dedicate conduit exclusively for this cable.** For the conduit which runs vertically, fill it with sand or other appropriate materials to prevent cable vibration.

3.1.2. Cable between transceiver unit and processor unit (via junction box)

These cables carry echo signals with amplitudes of greater than 0.1 mV which can be interfered by noise from high electric power cables. Do not run them in a conduit together with the following cables.

- 1) Cable carrying more than few kilowatts power to fluctuating loads.
- 2) Cable carrying switching waves generated by thyristor, etc.
- 3) Transmission antenna cable of radio equipment.

Also observe the guidelines for "Other cables of DS-30", described below.

3.1.3. Other cables of DS-30

Observe the following guidelines to prevent noise, interference problem.

- 1) When the cables run in parallel with power cables, separate them 40 cm at minimum.
- 2) When the cables run in non-metallic conduit or duct behind a bulkhead, use an armored cable without protective covering and ground it every 50 cm.

3.2. Cable Specification

When the cables shown in the interconnection diagrams are not available, use their equivalent referring to the table below.

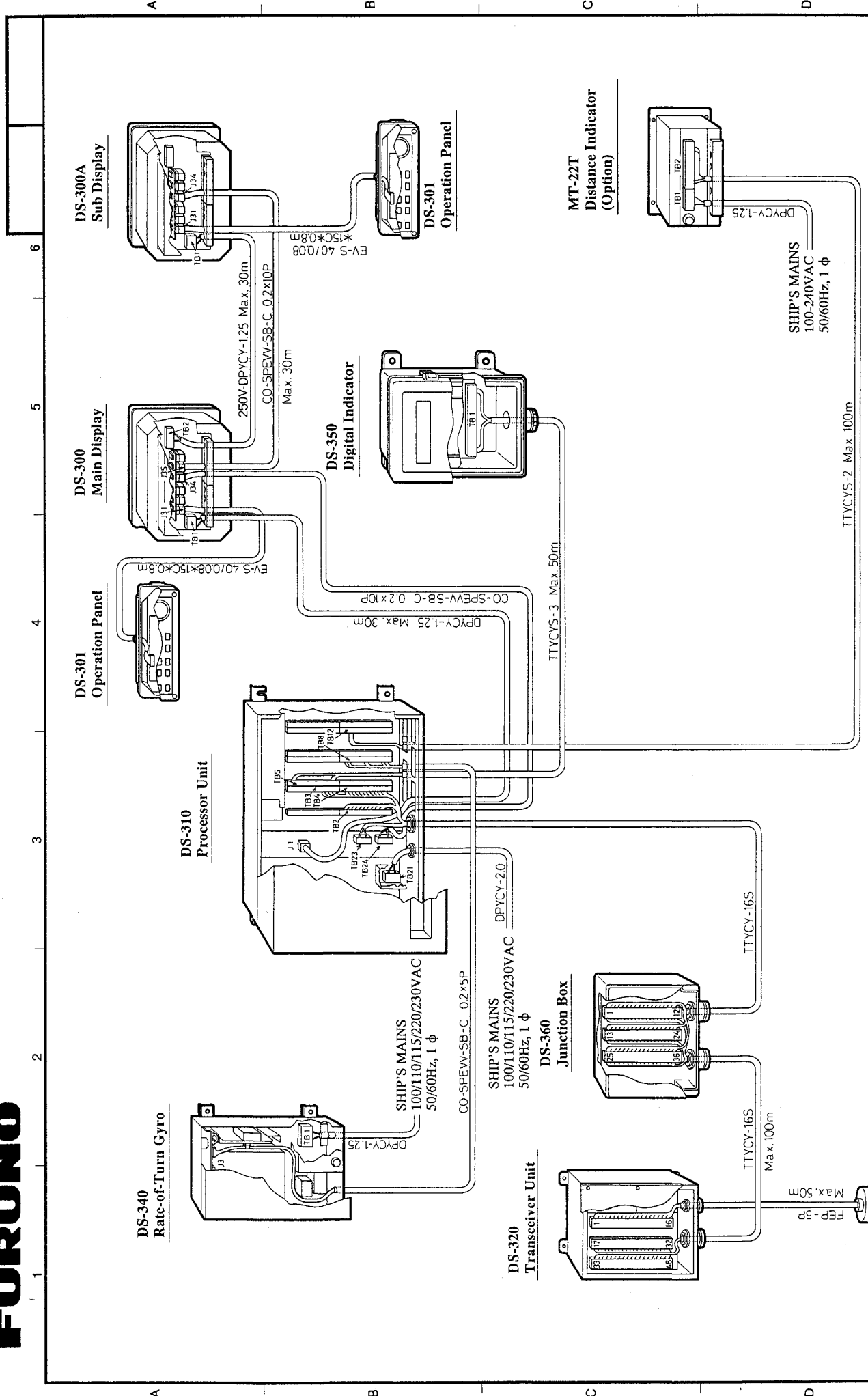
Cable Type	No. of Cores	Core size (mm)	Insulator Type	Shield Type	Aarmor	Outer Covering	Overall Diameter
CO-0.2x5P	5 pr	0.2	PVC	common	Yes	PVC	13.5
CO-0.2x10P	10pr	0.2	PVC	common	Yes	PVC	14.7
DPYCY-1.25	2	1.25	EP rubber	--	Yes	PVC	13.4
TTYCYS-1	1 pr	1.25	PVC	common	Yes	PVC	13.3
TTYCYS-2	2 pr	1.25	PVC	common	Yes	PVC	18.1
TTYCYS-3	3 pr	1.25	PVC	common	Yes	PVC	19.0
TTYCY-4S	4 pr	1.25	PVC	individual	Yes	PVC	22.8
TTYCY-16S	16 pr	1.25	PVC	individual	Yes	PVC	39.2



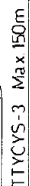
CAUTION

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.



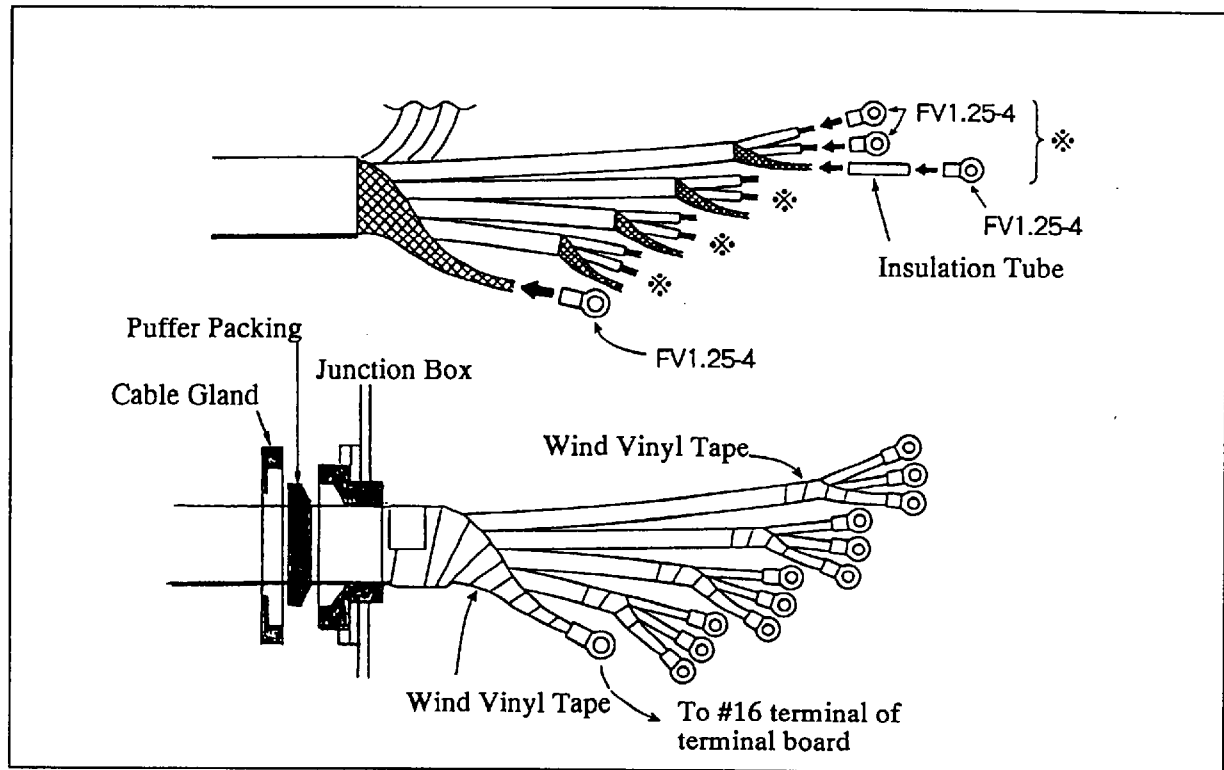
承認 APPROVED	名 称 TITLE	図 番 DWG.NO
検 査 CHECKED	DS-30 Connector/Terminal Board Location	E7236 -- Y08 -- A
製 図 DRAWN		



図番
DWG.NO
E7236 - Y13 - A

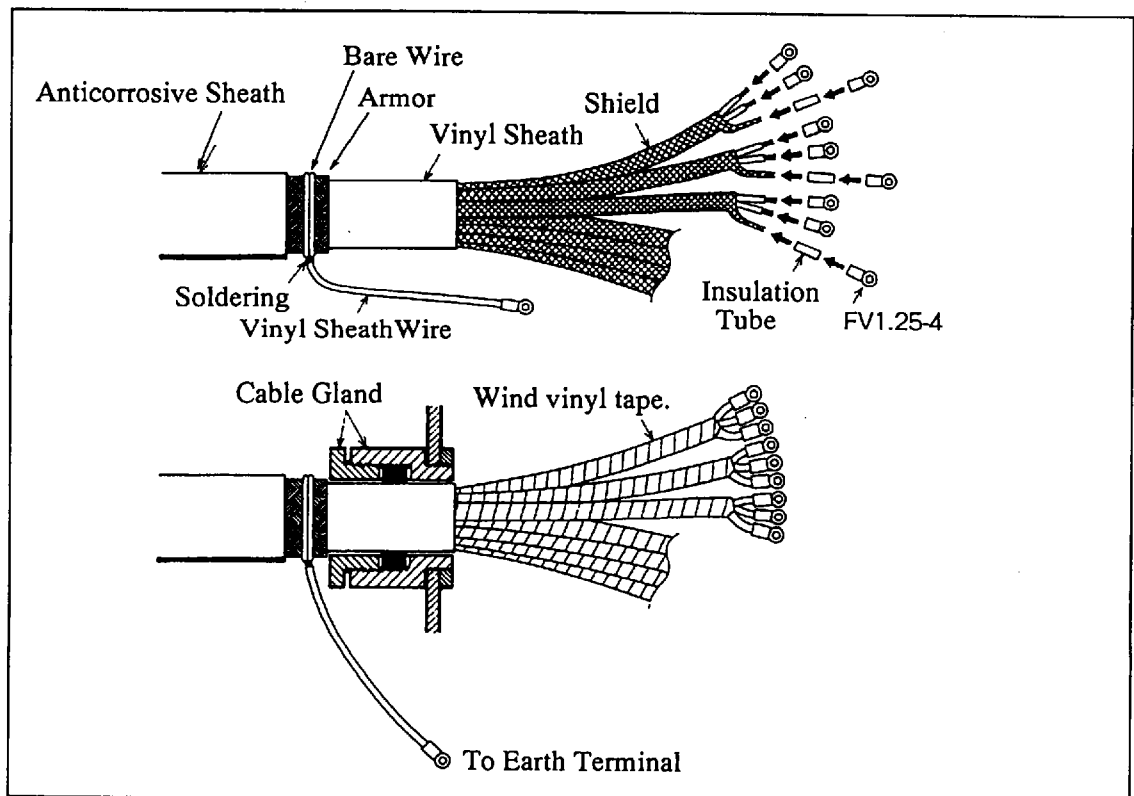
3.3. Cable Fabrication

3.3.1. Transducer Cable



3.3.2. Cables between Transceiver Unit/Junction Box/Processor Unit (TTYCY-16S)

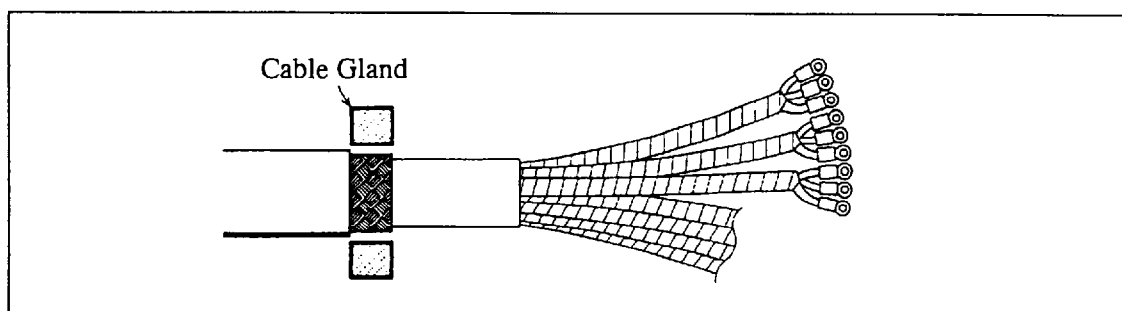
1) Transceiver Unit/Junction Box Side



Note: Do not undo the shield at the entrance into the unit. Noise induction through unshielded wires cause equipment malfunction.

2) Processor Unit Side

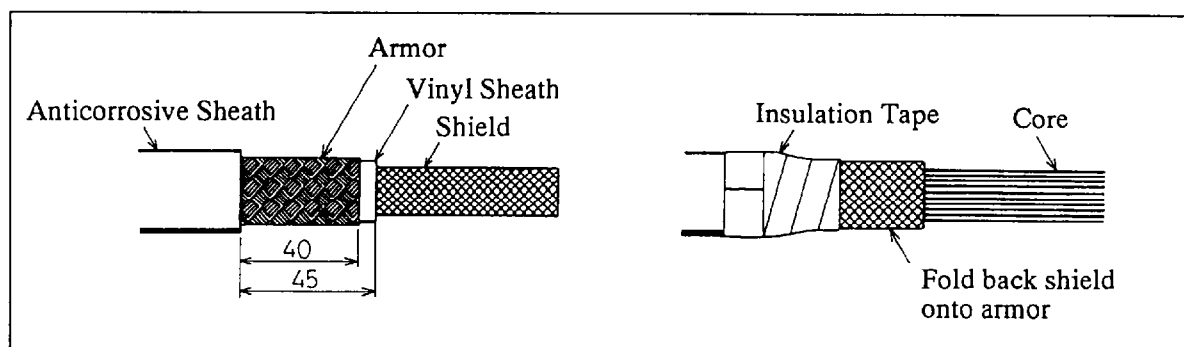
Fabricate the wires and shield in the same way as the transceiver unit/junction box sides. For the cable armor, remove paint and ground it through the cable clamp.



3.3.3. Cables between Processor Unit/Main Display Unit/Sub Display Unit (CO-SPEVV-SB-C 0.2x10P)

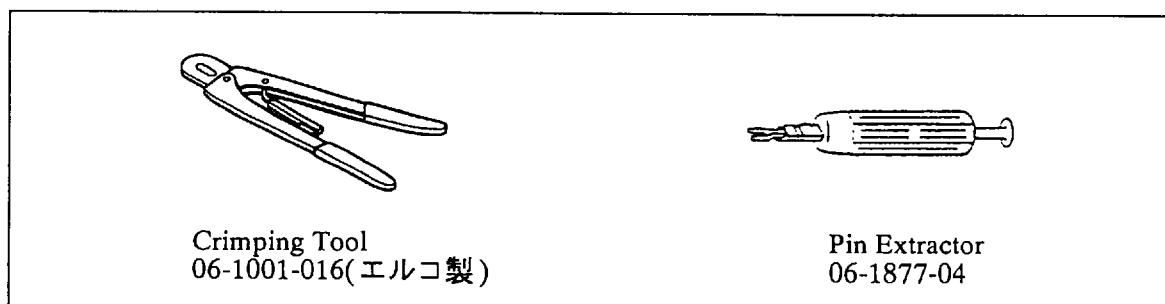
Connect the 20p connector as follows.

1) Cable Fabrication



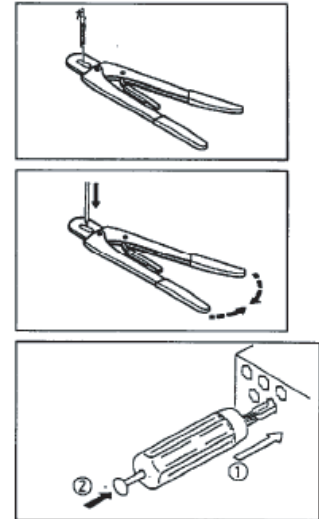
2) Crimping Tool and Crimping Method

A special crimping tool is necessary for connection of wires to the contact pins of 38P connector 00-8016-038-000-751. Also a pin extractor should be used to push out the contact pin from the connector body. The following describes how to crimp and extract the contact.



3) Wire Crimping Procedure

1. Strip the vinyl sheath of the wire to expose the core by 3mm to 4mm.
2. Hold the crimping tool horizontally and insert the contact pin with its slit faced downward into the crimp hole on the crimping tool.
3. Insert the wire onto the contact pin and squeeze the handle until the ratchet releases. Note that the wire should be inserted deep enough until its end comes in contact with the stopper plate of the crimping tool. After crimping, pull the wire to make sure that it is securely fixed.



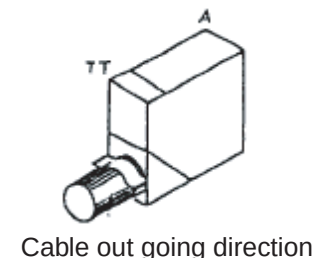
4) Inserting Contact Pin into Connector Housing

The connect pins fitted to wires should be inserted into the connector housing referring to the interconnection diagram.

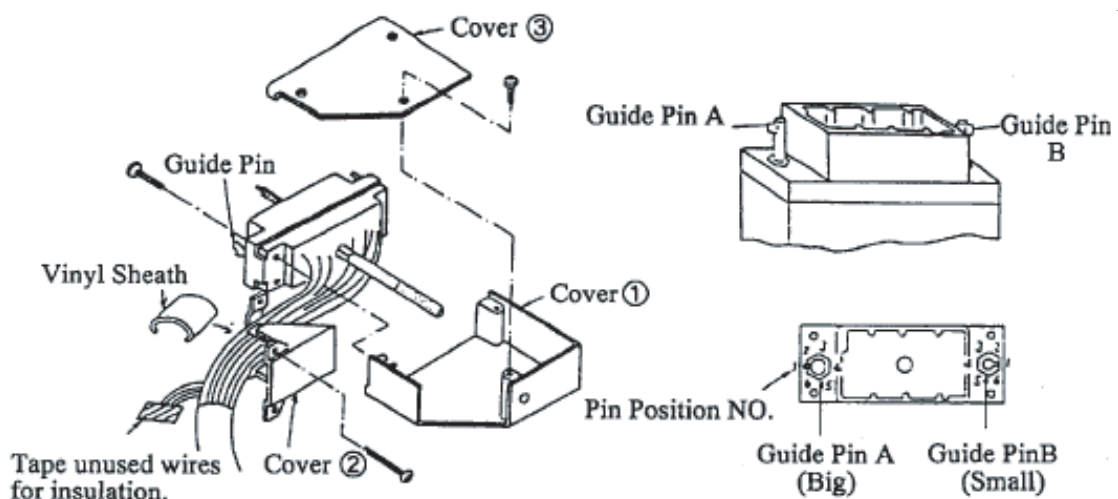
5) Procedure to Extract Contact Pin

When a contact pin is inserted into an incorrect hole on the connector body, take it out by using the pin extractor.

1. Push the pin extractor into the pin hole from the side opposite to the pin inserting side.
2. Push in the head of the pin extractor, and the contact pin is unlocked and pushed out.



6) Assembling Connector Housing

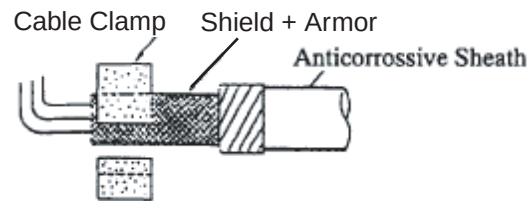


1. Fix the cover (1), paying attention to the cable outgoing direction.
2. Dress the wires and put covers (2) and (3) on.
3. Use a fragment of cable sheath to fix the wires with the connector clamp.
4. Cut the unused wires to proper length and wrap their ends with vinyl tape.

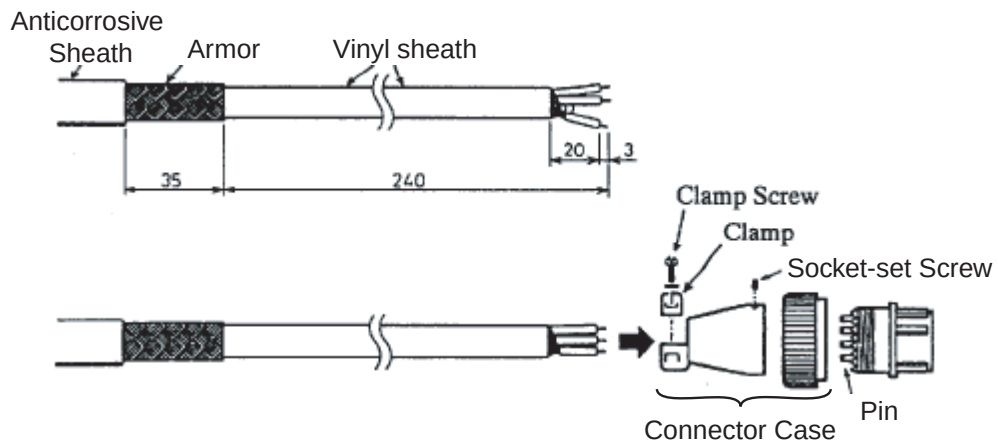
Note) Covers (1), (2) and (3) are not fitted on the connectors connected to the main and sub display units.

7) Clamping Cable

Clamp the shield and armor of the cable with cable clamp.



3.3.4 CIF/NMEA Data Signal Cable (CO-SPEVV-SB-C 0.2X5P)



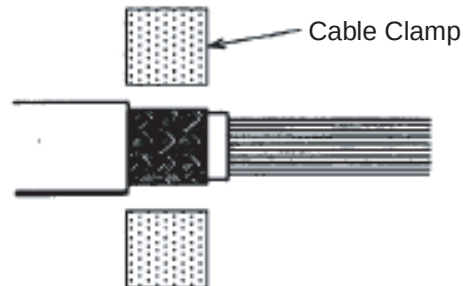
3.3.5 Other Cables

All other cables are connected to terminal boards. Fabricate their ends as follows.

1) Cable Armor

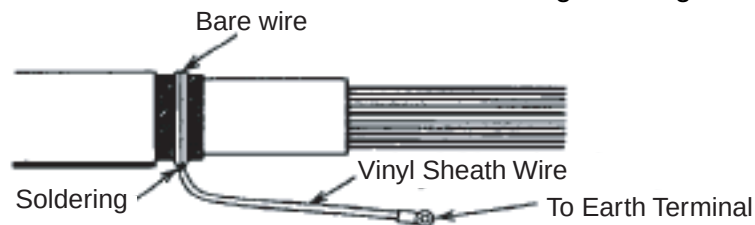
<For cables led in through cable clamp>

Expose the armor and clamp it with the cable clamp.



<For cables led in through cable gland>

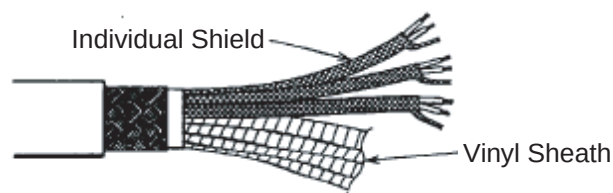
Solder a vinyl sheath wire to the armor and connect it to the grounding terminal.



2) Cable Shield

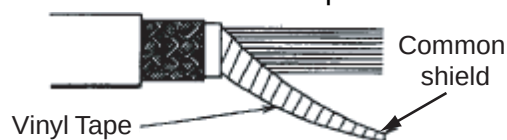
<For individual shield>

Undo individual shields only near at the terminal boards to which the wires are connected. Further, tape shields for insulation.



<For common shield>

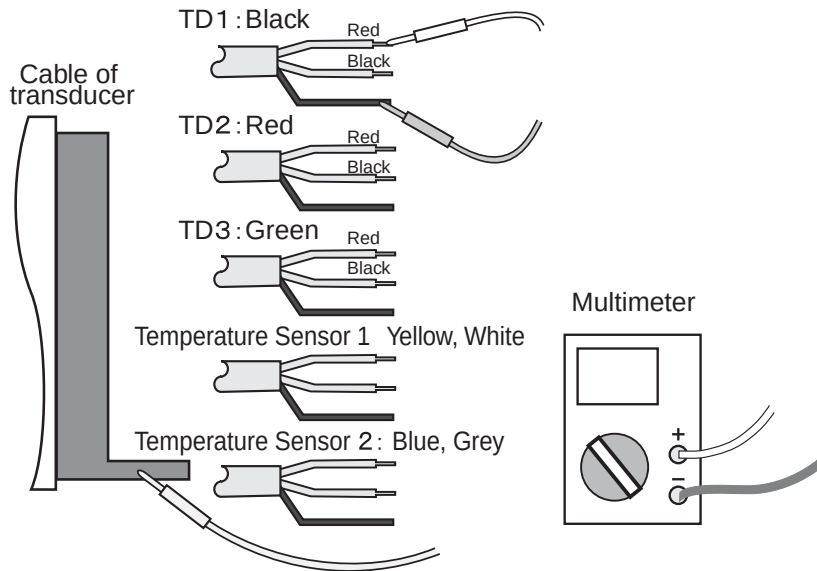
Undo common shield at entrance of the unit and tape it for insulation.



3.3.6 Insulation of cables for transducer

Insulation check

1. Remove all cores and shields of the transducer from the terminal board. All wires of the transducer are open.
2. Set the multimeter to the maximum resistance range and measure the resistance between each transducer line (TD1, TD2, TD3) and individual or common shield.



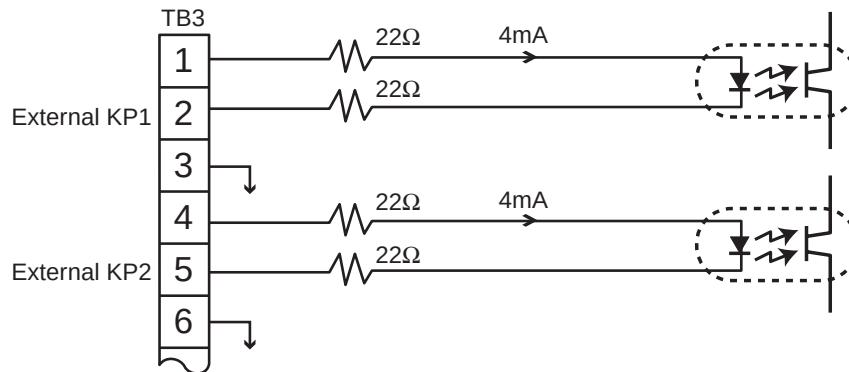
Measurement places		Insulation resistance value
- polarity lead	- polarity lead	
Red wire of black sheath	Shield in black sheath	Digital multimeter: More than 10MΩ Analog multimeter: Needle does not swing.
Red wire of black sheath	Common shield	
Red wire of red sheath	Shield in red sheath	
Red wire of red sheath	Common shield	
Red wire of green sheath	Shield in green sheath	
Red wire of green sheath	Common shield	

Note) If rating is not met a location, suspect faulty insulation. Replace a new one.

3.4 Remarks on Connection of Other Equipment

3.4.1 KP input Signal for Interference Rejection

When a TX trigger pulse (Keying Pulse) is connected from other acoustic equipment which gives interference to DS-30, note the following.



1) Interference Rejection Signal Input Circuit

Two input ports are provided in the processor unit for connection of KP for interference rejection. Use any one of them.

2) Current Requirement

Recommended current is 4 mA while the circuit operates normally at 2 mA to 20 mA. Adjust output resistance for the recommended current.

3.4.2 NMEA/CIF Signal I/O Circuit

The I/O circuit for NMEA or CIF format data has the configuration shown below, where CIF is Furuno standard data format.

Maximum allowable current in NMEA output is 25 mA and recommended current is 10 mA. When terminating the line by a photo-coupler for a current loop configuration, take suitable means at the signal receiving side to limit the current. If, for example, forward voltage drop in the photo-coupler is 2.2V:

$$[4.8 - 2.2 \text{ (V)}] / [10 \text{ (mA)}] - 227 \text{ (}\Omega\text{)} = 33 \text{ (}\Omega\text{)}$$

therefore, 33 ohm resistor should be inserted in series in the line.

3.4.3 Requirement of Wind Direction and Speed Signal

The wind meter that outputs following dc voltages can be connected.

- Wind direction: 0 to 1 Vdc for direction of 0° to 540°
- Wind speed: 0 to 1 Vdc for speed of 0 to 60 m/sec

3.4.4 Requirement in Engine Revolution Speed Signal

The engine tachometer that outputs following dc voltage can be connected.

- 0 to 1 Vdc for revolution speed of 0 to full scale.

3.4.5. Connection of Gyrocompass Signal (RS-232C/RS-422)

1) Specification of Gyrocompass Signal

DS-30 permits to connect the gyrocompass signal to AUX 1 port (J4) in the processor unit only when the digital gyro data conforms to the specifications shown below. In other cases, connect it to the port allocated exclusively to gyrocompass via the Furuno A/D Converter AD-100.

Communication Method: RS-232C/RS-422
 Data Transmission: Serial asynchronous form
 Baud Rate: 600/1200/2400/4800/9600 bauds
 Data Interval: 1 ms to 25 ms
 Data Format: Type (1), (2) or (3)

Type (1)			Type (2)		
Start bit: 1 bit Data bit: 8 bits Stop bit: 1 bit Parity bit: None			Start bit: 1 bit Data bit: 7 bits Stop bit: 2 bits Parity bit: None		
No.	Data	Description	No.	Data	Description
1	<CR>	Header	1	n	x100°
2	n	x100°	2	n	x10°
3	n	x10°	3	n	x1°
4	n	x1°	4	n	x1/6°
5	n	x0.1°	5	n	Do not care.
6	n	x0.01°	6	LF	Line feed

Type (3)					
Start bit: 1 bit Data bit: 8 bits Stop bit: 2 bits Parity bit: None					
No.	Data	Description	No.	Data	Description
1	<\$>		12	<,>	
2	<H>		13	SP/-	Polarity; Plus: space, Minus: -
3	<E>		14	n	x1°/sec
4	<H>		15	n	0.1°/sec Rate of turn
5	<R>	Do not care.	16	n	0.01°/sec
6	<C>	Line feed	17	<*>	Check sum delimiter
7	n	x100°	18	α	Checksum
8	n	x10°	19	β	Checksum
9	n	x1°	20	<CR>	Carriage return
10	n	x0.1°	21	<LF>	Line feed, Terminator
11	n	x0.01°			

NOTE: 1. Data should be in 7 bit ASCII code.

2. "n" shows a figure between 0 and 9.

3. The checksum is the 8 bit exclusive OR of all characters in the sentence but not including the "\$" and the "*" demiliters. The hexadecimal value of the most

significant and least significant 4 bits of the result are converted to two ASCII characters, which are transmitted as No. 18 and 19 data.

2) DIP Switch Setting

Set DIP switches on the MIF board in the processor unit as shown in the table.

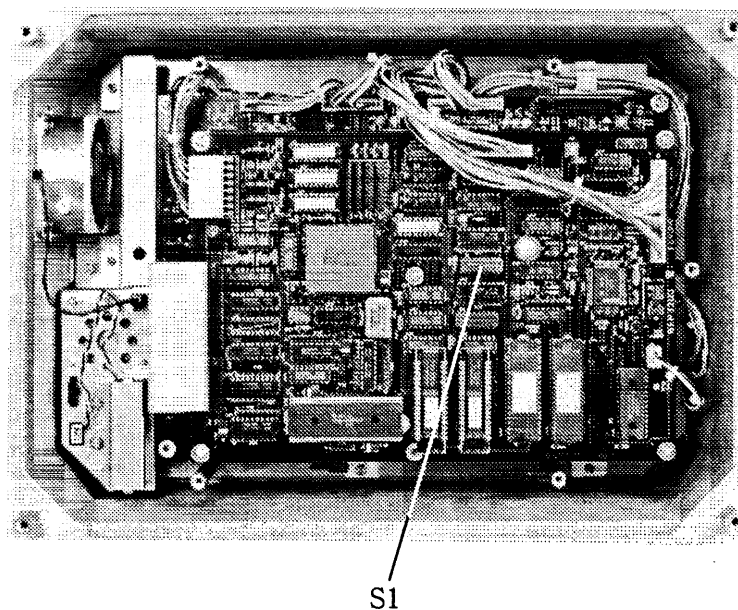
DIP Switch		Function	Setting															
S2	1 2	AUX 1 Port Baud Rate	Set baud rate of gyro signal. <table><tr><th>Baud Rate</th><th>1</th><th>2</th></tr><tr><td>9600</td><td>OFF</td><td>OFF</td></tr><tr><td>4800</td><td>OFF</td><td>ON</td></tr><tr><td>2400</td><td>ON</td><td>OFF</td></tr><tr><td>1200</td><td>ON</td><td>ON</td></tr></table>	Baud Rate	1	2	9600	OFF	OFF	4800	OFF	ON	2400	ON	OFF	1200	ON	ON
	Baud Rate	1	2															
9600	OFF	OFF																
4800	OFF	ON																
2400	ON	OFF																
1200	ON	ON																
	3 4	AUX 1 Port Input Format	Set data format of gyro signal. <table><tr><th>Data Format</th><th>3</th><th>4</th></tr><tr><td>Type (1)</td><td>OFF</td><td>OFF</td></tr><tr><td>Type (2)</td><td>OFF</td><td>ON</td></tr><tr><td>Type (3)</td><td>ON</td><td>-</td></tr></table>	Data Format	3	4	Type (1)	OFF	OFF	Type (2)	OFF	ON	Type (3)	ON	-			
Data Format	3	4																
Type (1)	OFF	OFF																
Type (2)	OFF	ON																
Type (3)	ON	-																
S3	1 2	Input Port Selection	Select input port of gyro signal. Select AUX1. <table><tr><th>Input Port</th><th>1</th><th>2</th></tr><tr><td>AD-100</td><td>OFF</td><td>OFF</td></tr><tr><td>AUX1</td><td>OFF</td><td>ON</td></tr><tr><td>CIF/NMEA</td><td>ON</td><td>ON</td></tr></table>	Input Port	1	2	AD-100	OFF	OFF	AUX1	OFF	ON	CIF/NMEA	ON	ON			
Input Port	1	2																
AD-100	OFF	OFF																
AUX1	OFF	ON																
CIF/NMEA	ON	ON																

CHAPTER 4. POST-INSTALLATION SETTING

4.1. DIP Switch Setting

Check and if necessary change the DIP switch settings depending on the external equipment connected.

4.1.1. Display Unit



Board	DIP SW		Function	Setting												
LCP Board 66P3300	S1	1	Main/Sub Selection	OFF: Main Display DS-300 ON: Sub Display DS-300A												
		2	Language Selection	<table><tr><td>Language</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Japanese</td><td>OFF</td><td>OFF</td><td>OFF</td></tr><tr><td>English</td><td>ON</td><td>ON</td><td>ON</td></tr></table>	Language	2	3	4	Japanese	OFF	OFF	OFF	English	ON	ON	ON
		Language		2	3	4										
		Japanese		OFF	OFF	OFF										
		English	ON	ON	ON											
3																
4																
		5	Indication of current direction	OFF: Coming direction ON: Going direction												
		6	Time indication	OFF: Legacy indication ON: UTC indication when input GPS Signal												

4.1.2. Processor Unit

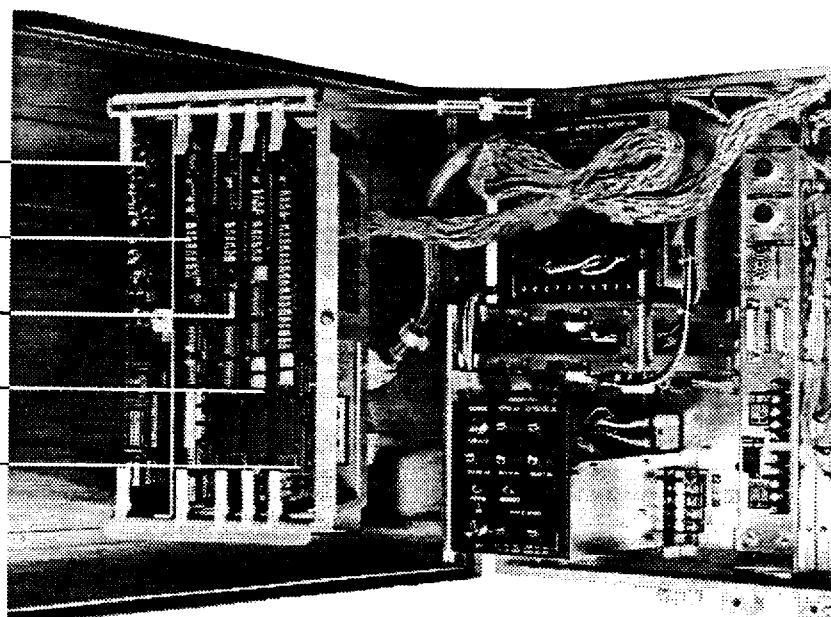
MLG Board 66P3319

MFT Board 66P3312

MKL Board 66P3313

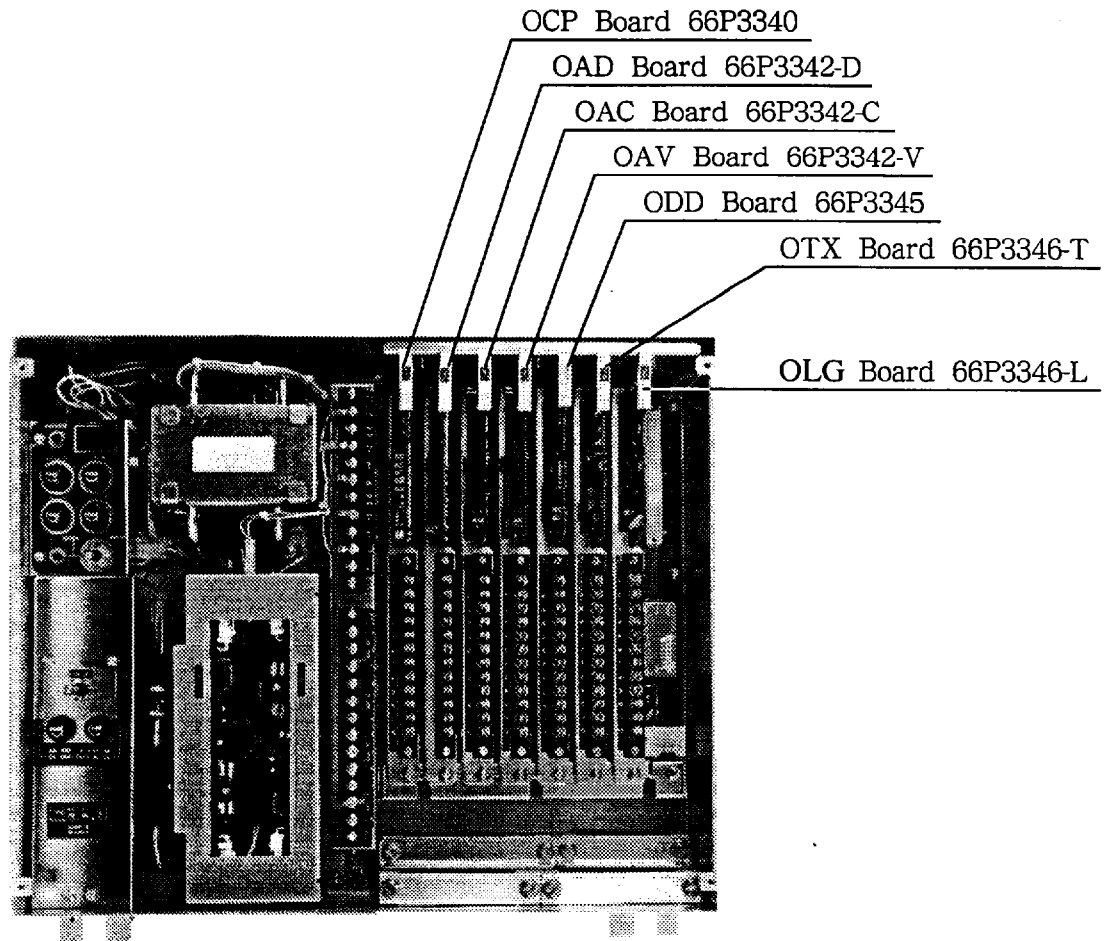
MCP Board 66P3310

MIF Board 66P3311



Board	DIP SW		Function	Setting												
MKL Board 66P3313	S1	1	Filter Parameter Setting	This determines the response speed of ship's speed reading against change of actual ship's speed. Normally it is set as shown in the table. Change the setting when the response seems slow. <table border="1"><tr><td>Ship Size</td><td>1</td><td>2</td></tr><tr><td>Large (300m or more)</td><td>OFF</td><td>OFF</td></tr><tr><td>Medium (200m or more)</td><td>OFF</td><td>ON</td></tr><tr><td>Small (100m or less)</td><td>ON</td><td>OFF</td></tr></table>	Ship Size	1	2	Large (300m or more)	OFF	OFF	Medium (200m or more)	OFF	ON	Small (100m or less)	ON	OFF
		Ship Size			1	2										
Large (300m or more)	OFF	OFF														
Medium (200m or more)	OFF	ON														
Small (100m or less)	ON	OFF														
MCP Board 66P3310	S3	7	Interference Rejector 1	Set to ON when KP signal from other acoustic equipment is connected to TB3-#1/#2 in processor unit for interference rejection. OFF: Interference rejector 1 on (Factory setting) ON: Interference rejector off												
		8	Interference Rejector 2	Set to ON when KP signal from other acoustic equipment is connected to TB3-#4/#5 in processor unit for interference rejection. OFF: Interference rejector 2 on (Factory setting) ON: Interference rejector off												
MIF Board 66P3311	S5	0 to F	Engine Revolution Speed Full Scale Setting	Set this item when the engine tachometer is connected. S5 is a DIP switch. Set it so that the full scale revolution (revolution for ±10V output) satisfies the following equation: Full scale revl. (rpm) = (S5 setting)x10 + 50 For example, if the full scale revolution is 70 rpm, set "2" and if 200 rpm, set "F".												

4.1.3. Distribution Unit



Quantity and type of boards to be incorporated change with equipment specifications.

Board	DIP SW	Function	Setting															
OAV Board 66P3342-V	S1	1 Ship's Speed 2 Voltage Output Selection	Select ship's speed versus voltage output characteristics according to specifications of external equipment connected to OAV board. <table><tr><th>Output</th><th>1</th><th>2</th></tr><tr><td>-10 to +40 kt = -2.50 to +10.0V</td><td>OFF</td><td>OFF</td></tr><tr><td>-10 to +30 kt = -3.33 to +10.0V</td><td>ON</td><td>OFF</td></tr><tr><td>-10 to +25 kt = -4.00 to +10.0V</td><td>OFF</td><td>ON</td></tr><tr><td>-10 to +20 kt = -5.00 to +10.0V</td><td>ON</td><td>ON</td></tr></table>	Output	1	2	-10 to +40 kt = -2.50 to +10.0V	OFF	OFF	-10 to +30 kt = -3.33 to +10.0V	ON	OFF	-10 to +25 kt = -4.00 to +10.0V	OFF	ON	-10 to +20 kt = -5.00 to +10.0V	ON	ON
		Output	1	2														
-10 to +40 kt = -2.50 to +10.0V	OFF	OFF																
-10 to +30 kt = -3.33 to +10.0V	ON	OFF																
-10 to +25 kt = -4.00 to +10.0V	OFF	ON																
-10 to +20 kt = -5.00 to +10.0V	ON	ON																
		3 Ship's Speed 4 Output Selection	Select type of ship's speed which is output from OAV board. <table><tr><th>Output</th><th>3</th><th>4</th></tr><tr><td>Fore-aft speed</td><td>OFF</td><td>OFF</td></tr><tr><td>Fore-aft speed in absolute value</td><td>ON</td><td>OFF</td></tr><tr><td>Vector speed</td><td>OFF</td><td>ON</td></tr></table>	Output	3	4	Fore-aft speed	OFF	OFF	Fore-aft speed in absolute value	ON	OFF	Vector speed	OFF	ON			
Output	3	4																
Fore-aft speed	OFF	OFF																
Fore-aft speed in absolute value	ON	OFF																
Vector speed	OFF	ON																

Board	DIP SW	Function	Setting															
OAC Board 66P3342 -C	S1	1 2 Ship's Speed Current Output Selection	Select ship's speed versus current output characteristics according to specifications of external equipment connected to OAC board. <table><tr><th>Output</th><th>1</th><th>2</th></tr><tr><td>-10 to +40 kt = 4.0 to 20.0 mA 0 kt = 7.2 mA</td><td>OFF</td><td>OFF</td></tr><tr><td>-10 to +30 kt = 4.0 to 20.0 mA 0 kt = 8.0 mA</td><td>ON</td><td>OFF</td></tr><tr><td>-10 to +25 kt = 4.0 to 20.0 mA 0 kt = 8.57 mA</td><td>OFF</td><td>ON</td></tr><tr><td>-10 to +20 kt = 4.0 to 20.0 mA 0 kt = 9.33 mA</td><td>ON</td><td>ON</td></tr></table>	Output	1	2	-10 to +40 kt = 4.0 to 20.0 mA 0 kt = 7.2 mA	OFF	OFF	-10 to +30 kt = 4.0 to 20.0 mA 0 kt = 8.0 mA	ON	OFF	-10 to +25 kt = 4.0 to 20.0 mA 0 kt = 8.57 mA	OFF	ON	-10 to +20 kt = 4.0 to 20.0 mA 0 kt = 9.33 mA	ON	ON
		Output	1	2														
-10 to +40 kt = 4.0 to 20.0 mA 0 kt = 7.2 mA	OFF	OFF																
-10 to +30 kt = 4.0 to 20.0 mA 0 kt = 8.0 mA	ON	OFF																
-10 to +25 kt = 4.0 to 20.0 mA 0 kt = 8.57 mA	OFF	ON																
-10 to +20 kt = 4.0 to 20.0 mA 0 kt = 9.33 mA	ON	ON																
		3 4 Ship's Speed Output Selection	Select type of ship's speed which is output from OAC board. <table><tr><th>Output</th><th>3</th><th>4</th></tr><tr><td>Fore-aft speed</td><td>OFF</td><td>OFF</td></tr><tr><td>Fore-aft speed in absolute value</td><td>ON</td><td>OFF</td></tr><tr><td>Vector speed</td><td>OFF</td><td>ON</td></tr></table>	Output	3	4	Fore-aft speed	OFF	OFF	Fore-aft speed in absolute value	ON	OFF	Vector speed	OFF	ON			
Output	3	4																
Fore-aft speed	OFF	OFF																
Fore-aft speed in absolute value	ON	OFF																
Vector speed	OFF	ON																
OAD Board 66P3342 -D	S1	1 Analog Indicator	Select analog indicator connected to OAD board. <table><tr><th>Analog Indicator</th><th>1</th></tr><tr><td>MF-22A, DS-761/762/763/771/ 772/773</td><td>ON</td></tr><tr><td>DS-381/382</td><td>OFF</td></tr></table> Note: Ship' speed current output to analog indicator is as follows: OFF: -10 to +40 kt = -2.50 to +10.0 mA ON: -10 to +30 kt = -3.33 to +10.0 mA	Analog Indicator	1	MF-22A, DS-761/762/763/771/ 772/773	ON	DS-381/382	OFF									
Analog Indicator	1																	
MF-22A, DS-761/762/763/771/ 772/773	ON																	
DS-381/382	OFF																	
ODD Board 66P3345	S1	1 2 Digital Indicator	Set as follows for the digital indicator connected to ODD board. <table><tr><th>Digital Indicator</th><th>1</th><th>2</th></tr><tr><td>MF-11D</td><td>OFF</td><td>OFF</td></tr><tr><td>MF-22D</td><td>ON</td><td>OFF</td></tr><tr><td>DS-720</td><td>OFF</td><td>ON</td></tr><tr><td>CI-370/377</td><td>ON</td><td>ON</td></tr></table>	Digital Indicator	1	2	MF-11D	OFF	OFF	MF-22D	ON	OFF	DS-720	OFF	ON	CI-370/377	ON	ON
Digital Indicator	1	2																
MF-11D	OFF	OFF																
MF-22D	ON	OFF																
DS-720	OFF	ON																
CI-370/377	ON	ON																

4.1.4. Digital Indicator DS-351 (option)

Refer to AP-7.

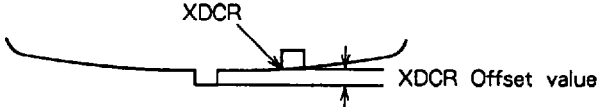
4.2. Setting Offset Data Menu

The offset data menu contains items for calibrating the DS-30 after it is installed on a ship. Unlock the menu and enter appropriate data.

OFFSET DATA		END
TRIM	:	+ 0.0°
HEEL	:	+ 0.0°
XDCR OFFSET	:	+ 0.0°
COMPASS CORR	:	+ 0.0°
R. O. T. ZERO	:	+ 0.0°/min
GND TRK SPD	:	+ 0.0 %
WTR TRK SPD	:	+ 0.0 %
UKC OFFSET	:	+ 0.0m
SPEED DIFF	:	EXECUTE ?

Factory setting in bold

Item	Description	Selection
Trim	Set ship's trim, that is, the relationship of the draft at bow and stern. Use "+" when the ship is down by the stern and "-" when it is down by the bow.	- 12.5 to + 12.5° 0.0°
Heel	Set ship's heel, that is, lateral inclination. Use "+" when the ship is up by the port and "-" when it is up by the starboard.	-12.5 to + 12.5° 0.0°
XDCR Offset	Set deviation angle of the transducer's fore-aft axis with reference to the ship's longitudinal axis. Use "+" when it is deviated to starboard side.	-12.5 to + 12.5° 0.0°
Compass Correction	Set a correction value to be applied to the heading sensor input to eliminate any constant deviation. Use "+" to add the correction value to the readout and "-" to subtract it from the readout. <i>NOTE: When the gyrocompass incorporates error correction function, do the correction at gyrocompass.</i>	-12.5 to + 12.5° 0.0°
R.O.T. (Rate Of Turn) Zero	Set a correction value if required for zero adjustment of the rate-of-turn gyro readout. Use "+" to add the correction value to the readout and "-" to subtract it. When the ship is at a perfect standstill and DS-30 has L/L data fed from nav-sensor, set a correction value which makes reading of ship's transverse speed zero. If DS-30 has no L/L data, the readout can not be corrected since the speed reading contains the latitude error (see page 2-7).	-12.5 to + 12.5°/min 0.0°/min

Item	Description	Selection
Ground Track Speed (GND TRK SPD)	Set a correction factor to be applied to the over-the-ground speed measured by DS-30. Use “+” to increase the readout and “-” to decrease it. Normally it is not necessary to set this item.	-12.5 to +12.5% 0.0%
Water Track Speed (WTR TRK SPD)	Set a correction factor to be applied to the through-the-water speed measured by DS-30. Use “+” to increase the readout and “-” to decrease it. Normally it is not necessary to set this item.	-12.5 to +12.5% 0.0%
UKC Offset	Set a correction value to be applied to the under-keel clearance (UKC) measured by DS-30. Use “+” to add the correction value to the readout and “-” to subtract it. A “-” correction value is usually used when the transducer is installed off the keel as shown below.  A “+” correction value is used to measure water depth instead of the under-keel-clearance. In this case, ship's draft is applied as the correction value. In addition to above, if there is a difference between the under-keel clearances measured by DS-30 and echo sounder and you are sure that the value measured by echo sounder is accurate, the difference can be used as a correction value.	-50.0 to +50.0m 0.0m
Speed Difference	Display the difference between the over-the-ground speed and heading measured by DS-30 and those derived from the external nav-sensor. The difference is displayed in parenthesis to the right of the correction values for the compass and the ground tracking speed. <i>It takes a few minutes until the difference is displayed.</i>	EXECUTE

4.3. Setting System Menu

The system menu contains display unit preset menu, ship data menu and external sensor menu.

4.3.1. Opening System Menu

Turn on the unit while holding down the MENU key until a beep sound stops.

4.3.2. Closing System Menu

Turn off and then on the POWER switch.

4.3.3. Setting Display Unit Preset Menu

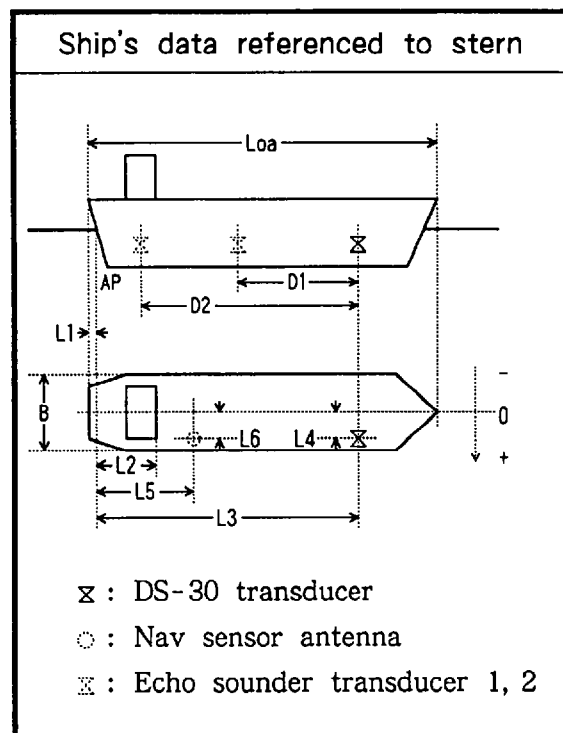
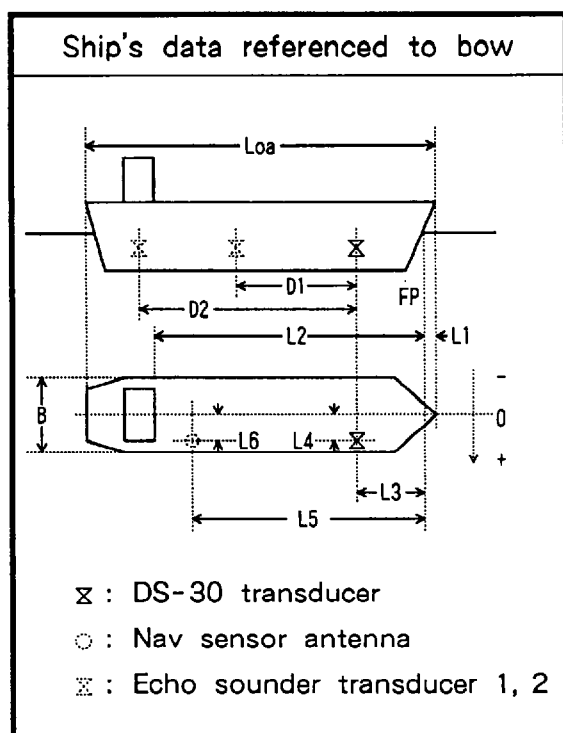
≡ DISPLAY PRESET ≡	END
CURSOR SPEED	: Medium
DEPTH UNIT	: m
DISTANCE RUN	: kt
CURR SPEED	: kt
WIND SPEED	: m/s
SCALE UNIT	: m
SPD RESLVL	: xx.xx
CURRENT DIRECTION	: Normal
WIND DIRECTION	: Normal
BTM HARDNESS	: OFF
BEEP SOUND	: 1
SYS DEFAULTS	: OFF

Item	Description	Selection
Cursor Speed	Choose the speed at which the cursor is moved by the trackball.	1. Slow 2. Medium 3. Fast
Depth Unit	Choose the unit of depth for the under-keel clearance display.	1. m 2. ft 3. fa
Distance Run	Choose the unit for the distance run readout.	1. n.m. 2. km

Curr. Speed	Choose the unit for the current speed readout.	1. kt 2. m/s
Wind Speed	Choose the unit for the wind speed readout.	1. kt 2. m/s
Scale Unit	Choose the distance scale unit for the X-axis of the berthing mode and under-keel clearance graphic display.	1. m 2. nm
Speed Resolution Level	Choose the resolution level for the ship's speed readout.	1. xx.xx 2. xx.x or xx.xx
Current Direction	Choose "Normal" so that the water current direction readout shows the direction toward which water moves.	1. Normal 2. Opposite
Wind Direction	Choose "Normal" so that the wind direction readout shows the direction from which the wind blows.	1. Normal 2. Opposite
Bottom Hardness	Choose whether to display bottom hardness level on the under-keel clearance graphic display.	1. Yes 2. No
Beep Sound	Choose tone/pattern of the audible alarm	1. Yes 2. No
System Default	Use this function to restore factory settings on all the system menus, erasing present settings.	

4.3.4. Setting Ship Data Menu

Set the ship's data measured on the ship drawing with either the bow or stern as a reference point of measurement..



Item	Description	Selection
Reference Point	Specify a reference point for measurement of the ship's data.	1. Bow 2. Stern
Loa	Set ship's length overall	50.0 to 400 m
B	Set ship's breadth.	5.0 to 100.0 m
L1	Set horizontal distance between bow (stern) and full load water line	0.0 to 30.0 m
L2	Set horizontal distance between full load water line and main radar antenna.	0.0 to (Loa - L1) m
L3	Set horizontal distance between full load water line and DS-30 transducer.	0.0 to (Loa - L1) m
L4	Set horizontal distance between keel and DS-30 transducer.	-B/2 to B/2 m
L5	Set horizontal distance between full load water line and nav-equipment antenna.	0.0 to (Loa - L1) m

L6	Set horizontal distance between keel and nav-equipment antenna.	-B/2 to B/2 m
D1	Set distance between DS-30 and #1 echo sounder transducers.	0.0 to (Loa-L1) m
D2	Set distance between DS-30 and #2 echo sounder transducers.	0.0 to (Loa-L1) m

4.3.5 Setting External Sensor Menu

≡ EXTERNAL SENSORS ≡	END
GYROCOMPASS : Yes R. O. T. GYRO : Yes NAV SENSOR : No WIND METER : No TACHOMETER : No CLINOMETER : No	

Item	Description	Selection
GYROCOMPASS	Choose YES if a gyrocompass is connected.	Yes/No
R.O.T GYRO	Choose YES if a laser rate of turn gyro is connected.	Yes/No
NAV SENSOR	Choose YES if a nav-sensor is connected.	Yes/No
WIND METER	Choose YES if a wind meter is connected.	Yes/No
TACHOMETER	Choose YES if main engine is tachometer is connected.	Yes/No
CLINOMETER	Choose YES if a clinometers is connected.	Yes/No

CHAPTER 5. POST-INSTALLATION CHECK

5.1. LED Status Check

5.1.1. Location of LEDs

The LEDs are located on the printed circuit boards shown in the table.

Unit	Board	LED
Processor Unit DS-310	MCP Board 66P3310	CR1 to CR11
	MFT Board 66P3312	CR1 to CR9
	MKL Board 66P3313	CR1 to CR7
	MIF Board 66P3311	CR3 to CR60
	MLG Board 66P3319	CR3 to CR5
Transceiver Unit DS-320	NCP Board 66P3330	CR10 to CR25
	NTX Board 66P3331	CR1 to CR20
	NPR Board 66P3333	CR1 to CR3
Rate-of Turn Gyro DS-430	RIF Board 66P3355	CR1, CR2
	Sensor	Above output connector
Digital Indicator DS-350/351	PCP Board 66P3355	CR1 to CR4
Distribution Box DS-370	OCP Board 66P3340	CR6 to CR12
	OAV Board 66P3342-V	CR2
	OAC Board 66P3342-C	CR2
	ODD Board 66P3345	CR1, CR2

- : Lit
- ◐ : Blinking
- : Not lit (OFF)

5.1.2. Processor Unit

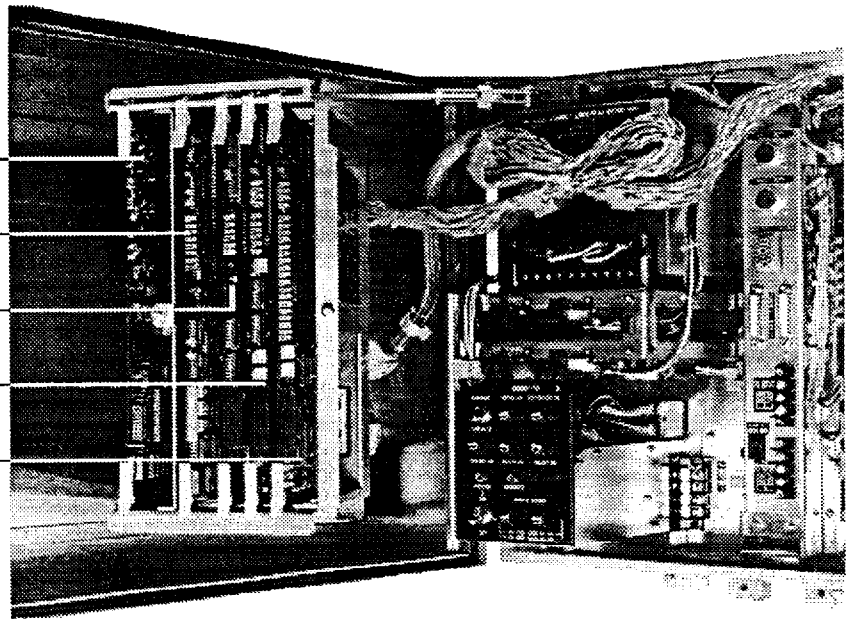
MLG Board 66P3319

MFT Board 66P3312

MKL Board 66P3313

MCP Board 66P3310

MIF Board 66P3311



66P3319	66P3312	66P3313	66P3310	66P3311
- CR3 +5V - CR4 +12V - CR5 -12V	- CR1 PASS - CR2 RUN - CR3 TASK1 - CR4 TASK2 - CR5 TASK3 - CR6 TASK4 - CR7 TASK5 - CR8 TASK6 - CR9 TASK7	- CR1 PASS - CR2 KLT - CR3 KLR - CR4 TTK - CR5 TRK - CR6 ATK - CR7 ATR	- CR1 PASS - CR2 EXKP - CR3 KP - CR4 EST - CR5 EG - CR6 DSPT - CR7 DSPR - CR8 TXT - CR9 TXR - CR10 AXT - CR11 AXR	- CR3 PASS - CR5 EST - CR6 EDA - CR7 ECK - CR8 LOG - CR10 CYRD - CR11 CYRC - CR12 RELD - CR13 RELC - CR14 CN1T - CR15 CN1H - CR16 CN2T - CR17 CN2R - CR18 RAT - CR19 RAR - CR22 AXIT - CR23 AXIR - CR24 AX2T - CR25 AX2R - CR26 MOT - CR27 MOR - CR46 N/C1 - CR47 N/C2 - CR28 LOGI - CR29 TEST - CR59 EKP1 - CR60 EKP2

1) MLG Board 66P3319

LED			Status	Remarks
No.	Signal	Color		
CR3	+5V	GRN	○	
CR4	+12V	GRN	○	
CR5	-12V	GRN	○	

2) MFT Board 66P3312

LED			Status	Remarks
No.	Signal	Color		
CR1	PASS	GRN	○	Check hardware on MFT board.
CR2	RUN	YEL	◐	CPU processing
CR3	TASK1	YEL	◐	Ditto
CR4	TASK2	YEL	◐	Ditto
CR5	TASK3	YEL	◐	Ditto
CR6	TASK4	YEL	◐	Ditto
CR7	TASK5	YEL	◐	Ditto
CR8	TASK6	YEL	◐	Ditto
CR9	TASK7	YEL	○	Carrier level

3) MKL Board 66P3313

LED			Status	Remarks
No.	Signal	Color		
CR1	PASS	GRN	○	Lights when self check of this board is OK.
CR2	KLT	YEL	◐	Internal data (MFP SIO out)
CR3	KLR	YEL	●	Internal data (MFP SIO in)
CR4	TTK	YEL	◐	Flickers or turns off depending on internal data or DIP switch setting (AUX1 out)
CR5	TRK	YEL	●	Internal data (AUX1 in)
CR6	ATK	YEL	●	Internal data (AUX2 out)
CR7	ATR	YEL	●	Internal data (AUX2 in)

4) MCP Board 66P3310

LED			Status	Remarks
No.	Signal	Color		
CR1	PASS	GRN	○	Lights when selfcheck of this board is OK.
CR2	EXKP	YEL	◐	Blinks with external KP input. Keeps off when external KP is not connected.
CR3	KP	YEL	◐	Blinks whenever DS-30 transmits.
CR4	Est	YEL	●	Unused
CR5	EG	YEL	◐	Echo reception gate
CR6	DSPT	YEL	◐	Serial data output to display unit DS-300

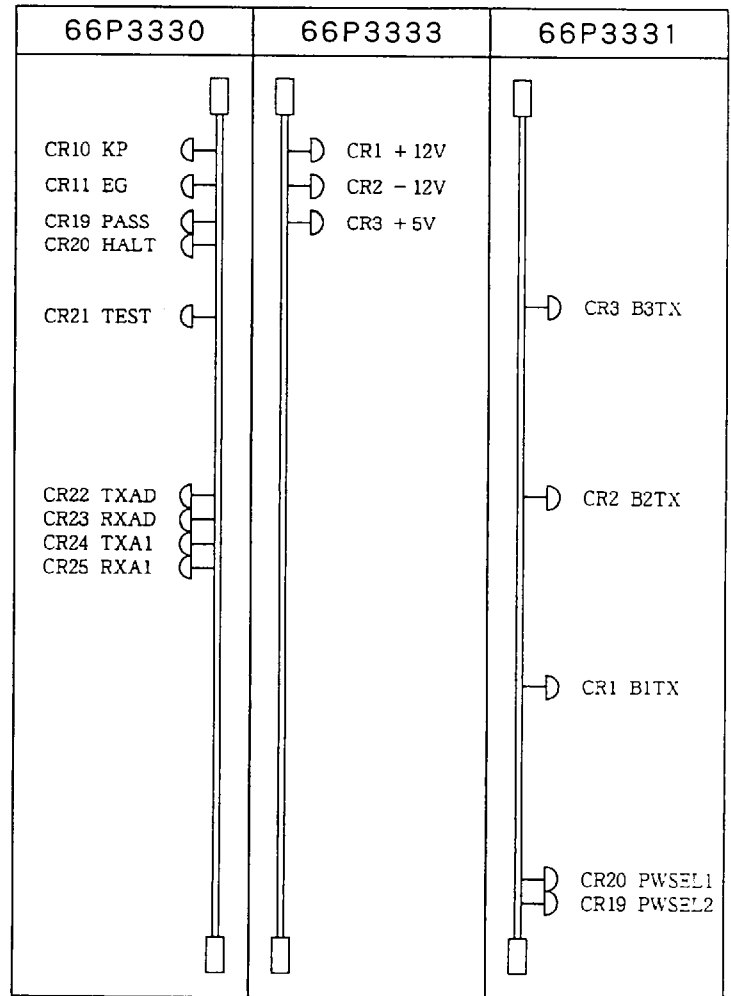
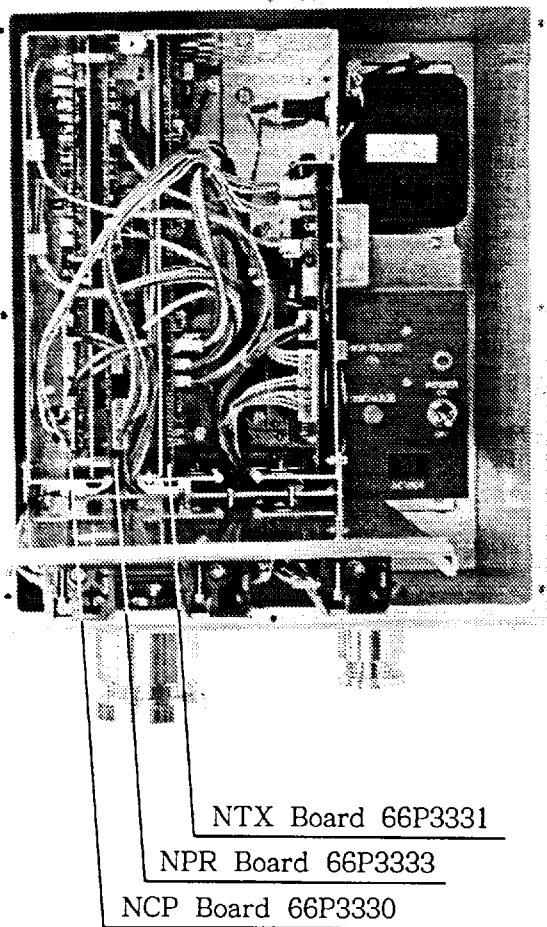
CR7	DSPR	YEL		Control data input from display unit DS-300
CR8	TXT	YEL		Control data output to transceiver unit DS-320
CR9	TXR	YEL		Serial data input from transceiver unit DS-320
CR10	AXT	YEL		Unused (auxiliary output port for data communication)
CR11	AXR	YEL		Unused (auxiliary input port for data communication)

5) MIF Board 66P3311

LED			Status	Remarks
No.	Signal	Color		
CR3	PASS	GRN		Lights when self check of this board is OK.
CR5	EST	YEL		Echo start pulse to display unit DS-300
CR6	EDA	YEL		Echo data pulse to display unit DS-300
CR7	ECK	YEL		Echo display shift pulse to display unit DS-300
CR8	LOG	YEL		Log pulse 200 pulses/nautical mile Flickering speed changes with ship's speed. Turns off when ship's speed is 0 kt.
CR10	GYRO	YEL		Flickers by serial data input from AD-100 When LSB bit of bearing data is an odd number, it lights.
CR11	GYRC	YEL		Flickers by serial clock input from AD-100.
CR12	RELB	YEL		True bearing data output Serial data pulse (AD-100 data format)
CR13	RELC	YEL		Clock for true bearing data Serial shift pulse (AD-100 format)
CR14	CN1T	YEL		CIF/NMEA port 1 data output
CR15	CN1R	YEL		CIF/NMEA port 1 data input Keeps off when CIF/NMEA data line is not connected to data source.
CR16	CN2T	YEL		CIF/NMEA port 2 data output
CR17	CN2R	YEL		CIF/NMEA port 2 data input Keeps off when CIF/NMEA data line is not connected to data source.
CR18	RAT	YEL		Control data output to rate of turn gyro DS-340 Keeps off when DS-340 is not connected.
CR19	RAR	YEL		Angular speed data input from rate of turn gyro DS-340 Keeps off when DS-340 is not connected.
CR22	AX1T	YEL		Internal data serial output
CR23	AX1R	YEL		External serial bearing data input Turns off when there is no data input (AUX1 in). See note 1.
CR24	AX2T	YEL		Nav reference serial data output (AUX2 out)
CR25	AX2R	YEL		Serial data input from external equipment Turns off when there is no data input (AUX 2 in). See note 2.
CR26	MOT	YEL		Unused (MIF D-SUB25P) See note 3.
CR27	MOR	YEL		Unused (MIF D-SUB25P) See note 3.
CR28	LOGI	YEL		Unused
CR29	TEST	YEL	 	MIF board self check indication LED Light: Self check working Off: Normal operation

CR46	N/C1	YEL		CIF/NMEA serial input/output port 1 Light: NMEA selected Off: CIF selected
CR47	N/C2	YEL		CIF/NMEA serial input/output port 2 Light: NMEA selected Off: CIF selected
CR59	EKP1	YEL		KP 1 input from external equipment
CR60	EKP2	YEL		KP2 input from external equipment
Note 1	Selection of serial bearing data input format 1: Type 1 2: Type 2 (Tokimekku) 3: Type 3 (Yokokawa Hokushin) Input data format is selected by DIP switch			
Note 2	Selection of serial data input format from external equipment 1: Wind meter I/F (SC-D232S) 2: Yokokawa NAV PET (MD1-1) Input data format is selected by DIP switch.			
Note 3	MIF monitor serial input/output port			

5.1.3 Transceiver Unit



1) NCP Board 66P3330

LED			Status	Remarks
No.	Signal	Color		
CR10	KP	YEL	●	Transmission pulse input/output monitor Normal transmission mode: input monitor Independent transmission mode 1, 2: output monitor
CR11	EG	YEL	●	Reception gate input/output monitor Normal transmission mode 1, 2: input monitor Independent transmission mode: output monitor
CR19	PASS	GRN	○	Lights when self check of this board is OK.
CR20	HALT	YEL	●	CPU monitor
CR21	TEST	YEL	○ ●	NCP board operation mode monitor Normal transmission mode: Off Independent transmission mode 1, 2: Lights
CR22	TXAD	YEL	●	Serial data output to processor unit DS-310
CR23	RXAD	YEL	●	Control data input from processor unit DS-310
CR24	TXA1	YEL	● ○	Auxiliary serial output port Normal transmission mode: Off Independent transmission mode: Flickers
CR25	RXA1	YEL	●	Auxiliary input port

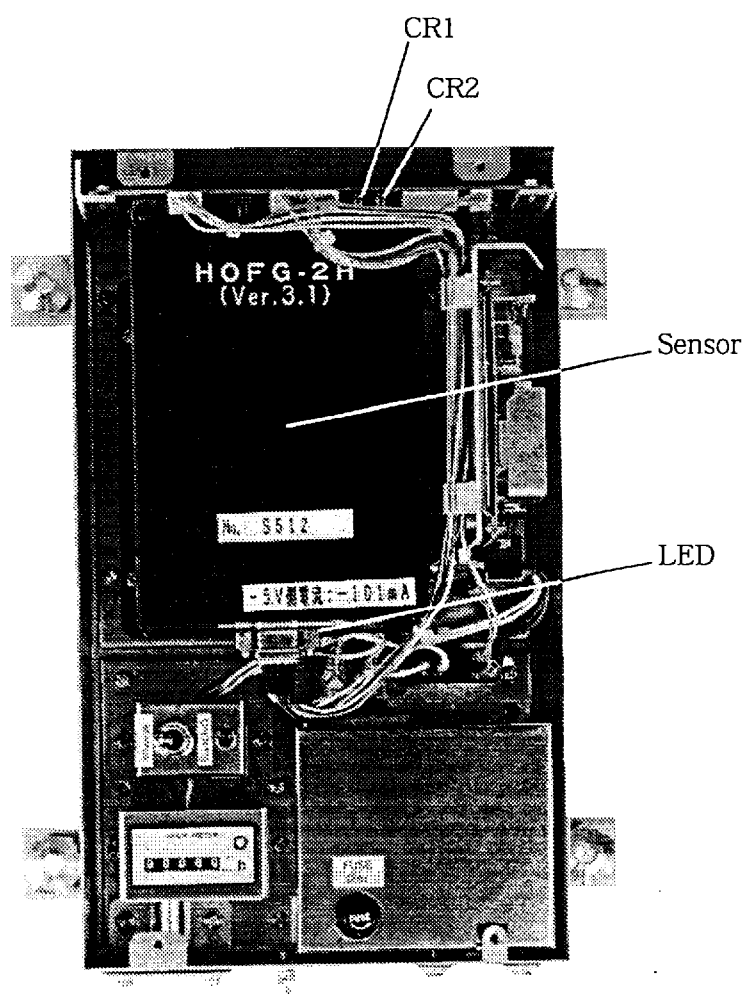
2) NTX Board 66P3331

LED			Status	Remarks
No.	Signal	Color		
CR1	B1TX	YEL		Beam 1 transmission monitor Blinks whenever DS-30 transmits.
CR2	B2TX	YEL		Beam 2 transmission monitor Blinks whenever DS-30 transmits.
CR3	B3TX	YEL		Beam 3 transmission monitor Blinks whenever DS-30 transmits.
CR19	PWSEL1	YEL		Power reduction bit 1 monitor
CR20	PWSEL2	YEL		Power reduction bit 2 monitor

3) NPR Board 66P3333

LED			Status	Remarks
No.	Signal	Color		
CR1	+12V	GRN		
CR2	-12V	GRN		
CR3	+5V	GRN		

5.1.4. Rate-of-Turn Gyro



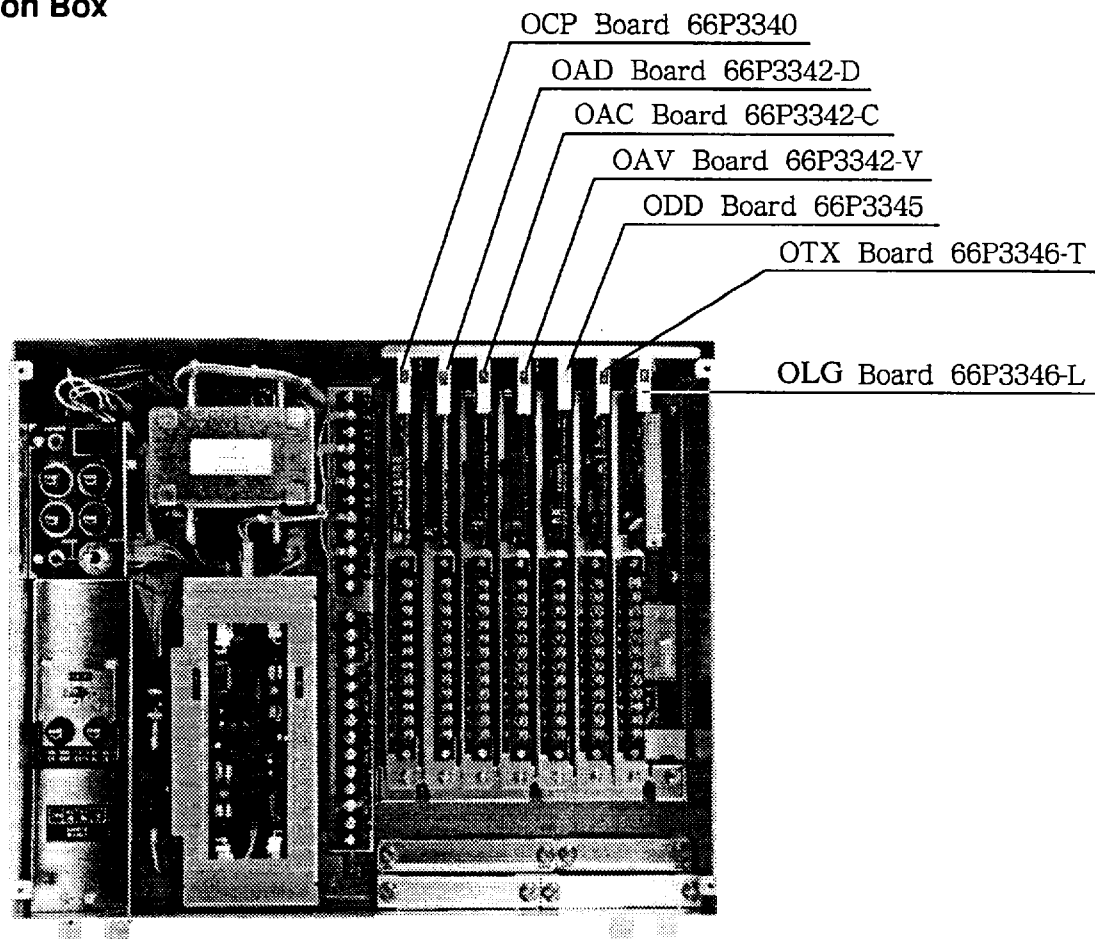
1) RIF Board 66P3350

LED			Status	Remarks
No.	Signal	Color		
CR1	TXD Monitor	YEL	●	
CR2	RXD Monitor	YEL	●	

2) Sensor Block

LED			Status	Remarks
No.	Signal	Color		
LED above connector		RED	●	Monitoring internal condition of sensor

5.1.5. Distribution Box



Quantity and type of boards to be incorporated change with equipment specifications.

66P3340	66P3342-V/C	66P3345
CR1 RXS CR2 CXS CR3 TXS CR4 RX2 CR5 TX2 CR6 RX1 CR7 TX1 CR8 SER CR9 LER CR10 400 CR11 PAS2 CR12 PAS1	CR2 FLAG	CR1 TXS CR2 CKS

1) OCP Board 66P3340

LED			Status	Remarks
No.	Signal	Color		
CR6	RX1	YEL		Serial data input from processor unit DS-310
CR7	TX1	YEL		Unused Serial output data to distance indicator DS-370
CR8	SER	YEL		Speed data output Output data valid: Off Output data invalid: Light
CR9	LER	YEL		Log pulse output Output data valid: Off Output data invalid: Light
CR10	400	YEL		Log pulse Turns off when speed is 0.0 kt.
CR11	PAS2	GRN		Lights when self check of work memory is OK.
CR12	PAS1	GRN		Lights when program ROM is OK.

2) OAV Board 66P3342-V

LED			Status	Remarks
No.	Signal	Color		
CR2	FLAG	YEL		Changes state with JP1 flag.

3) OAC Board 66P3342-C

LED			Status	Remarks
No.	Signal	Color		
CR2	FLAG	YEL		Changes state with JP1 flag.

4) ODD Board 66P3345

LED			Status	Remarks
No.	Signal	Color		
CR1	TXS	YEL		Data output to remote display
CR2	CKS	YEL		Shift pulse for data output to remote display

5.2. Self-check

The DS-30 has a self-check facility for general diagnosis of the major circuits. Execute the checks after all installation jobs are completed.

5.2.1. Procedure

1. Call up the main menu by pressing the MENU key.
2. Select the self-test item and press the MENU key. The sub-menu as shown below is displayed.

SELF-TEST		END
PANEL TEST	:	EXECUTE?
SYSTEM TEST	:	EXECUTE?
CONT. TEST	:	EXECUTE?
TX/RX TEST	:	OFF
SET TEST SPD	:	0.0kt'
SPD TEST ON	:	OFF

3. Select a self-test item to be executed and press the MENU key. As each self-test item is protected (locked), the following alert appears.

This item is locked.
Do you want to change setting?

4. Select "Yes" and press the MENU key twice, and the selected self-test is executed .

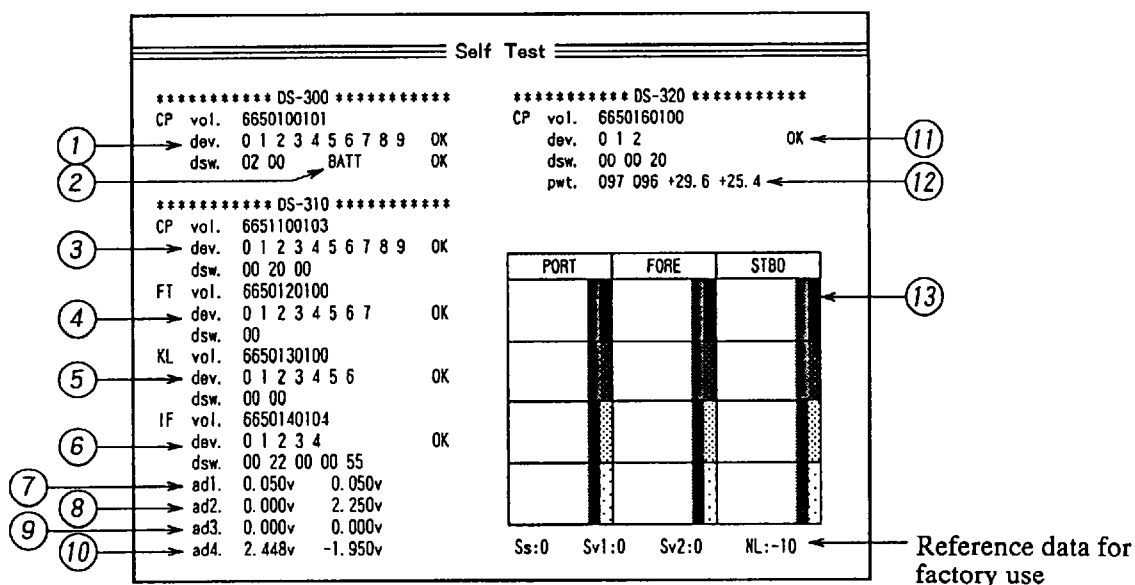
5.2.2. Panel Test

The panel test checks the operation panel keys for proper operation.

Panel Test										Press MENU key to exit									
TRACKING MODE		NAV DATA		SPEED		BERTHING		MENU											
kt/m/s		SPEED RANGE		VOYAGE RESET															
		DEPTH RANGE		ADVANCE		HU/NU		MARK											

To terminate the panel test press the MENU key.

The single test executes the system check for one cycle displaying the test result for each item checked.



No.	Self-check Item	Description
1	Display Unit (DS-300) LCP Board Memory IC	dev. 0 1 2 3 4 5 6 7 8 9 OK Memory ICs are checked. If all checked ICs are normal. "OK" is displayed. If a faulty IC is detected, "*" is displayed to the right of the number corresponding to the faulty IC. The numbers 0 to 9 represent the following ICs. 0: EPROM 1: SRAM (Lower byte) 2: VRAM (Upper byte)) 3: Dual Port RAM 4: VRAM (D0 to D3 bits) 5: VRAM (D4 to D7 bits) 6: VRAM (D8 to D11) 7: VRAM (D12 to D15) 8: Color Pallet 9: EEPROM
2	Display Unit (DS-300) LCP Board DIP Switch Setting Battery Voltage Back-up Data	dsw. xx.xx BATT OK ↑ ↑ DIP SW S1, S2 setting Battery voltage and back-up data The result of battery voltage and back-up data check is displayed by three types of message: OK: Both battery voltage and back-up data are normal. WR: Battery voltage is low but back-up data is normal. NG: Back-up data is abnormal or data is not guaranteed.

No.	Self-check Item	Description
3	Processor Unit (DS-310) MCP Board Memory IC	dev. 0 1 2 3 4 5 6 7 8 9 OK The following memory ICs are checked. 0: EPROM 1: PSRAM1 (Lower byte) 2: PSRAM2 (Upper byte) 3: PSRAM2 (Lower byte) 4: PSRAM2 (D0 to D3 bits) 5: SRAM (echo) 6: Dual Port RAM (MFT) 7: Dual Port RAM (MKL) 8: Color Pallet 9: EEPROM
4	Processor Unit (DS-310) MFT Board Memory IC	dev. 0 1 2 3 4 5 6 7 OK The following memory ICs are checked. The check result is displayed in the same way as item no 1. 0: EPROM 1: SRAM (D0 to D3) 2: SRAM (D4 to D7) 3: SRAM (D8 to D11) 4: SRAM (D12 to D15) 5: PSRAM (Lower byte) 6: PSRAM (Upper byte) 7: Dual Port RAM (MKL)
5	Processor Unit MKL Board Memory IC	dev. 0 1 2 3 4 5 6 OK The following memory ICs are checked. The check result is displayed in the same way as item no 1. 0: EPROM 1: SRAM 1 (D0 to D7) 2: SRAM 2 (D7 to D15) 3: SRAM 2 (D0 to D7) 4: SRAM 2 (D7 to D15) 5: Dual Port RAM 6: EEROM
6	Processor Unit (DS-310) MIF Board Memory IC	dev. 0 1 2 3 4 OK The following memory ICs are checked. The check result is displayed in the same way as item no 1. 0: EPROM 1: SRAM 2: Dual Port RAM 3: Gyro Interface 4: A/D Converter
7	Processor Unit (DS-310) MIF Board AD Conversion Voltage	ad1. $\pm x . x x x v$ $\pm x . x x x v$ ↑ ↑ Wind direction Wind speed Readout changes as follows depending on wind direction/speed: 0 to 4.9V for wind direction 0 to 540° 0 to 4.9V for wind speed 0 to 60m
8	Processor Unit (DS-310) MIF Board A/D Conversion Voltage	ad2. $\pm x . x x x v$ $\pm x . x x x v$ ↑ ↑ Unused Engine tachometer -4.9V to +4.9V depending on engine revolution speed.
9	Processor Unit (DS-310) MIF Board A/D Conversion Voltage	ad3. $\pm x . x x x v$ $\pm x . x x x v$ ↑ ↑ Unused Unused
10	Processor Unit (DS-310) MIF Board A/D Conversion Voltage	ad4. $\pm x . x x x v$ $\pm x . x x x v$ ↑ ↑ Ship's mains Internal reference voltage (2.54V) Ship's mains: 2.445 to 2.500V Internal reference voltage: -1.950 to -2.000V
11	Transceiver Unit (DS-320) NCP Board Memory IC	dev. 0 1 2 OK The following memory ICs are checked. The check result is displayed in the same way as item no 1. 0: EPROM 1: SRAM 2: A/D Converter

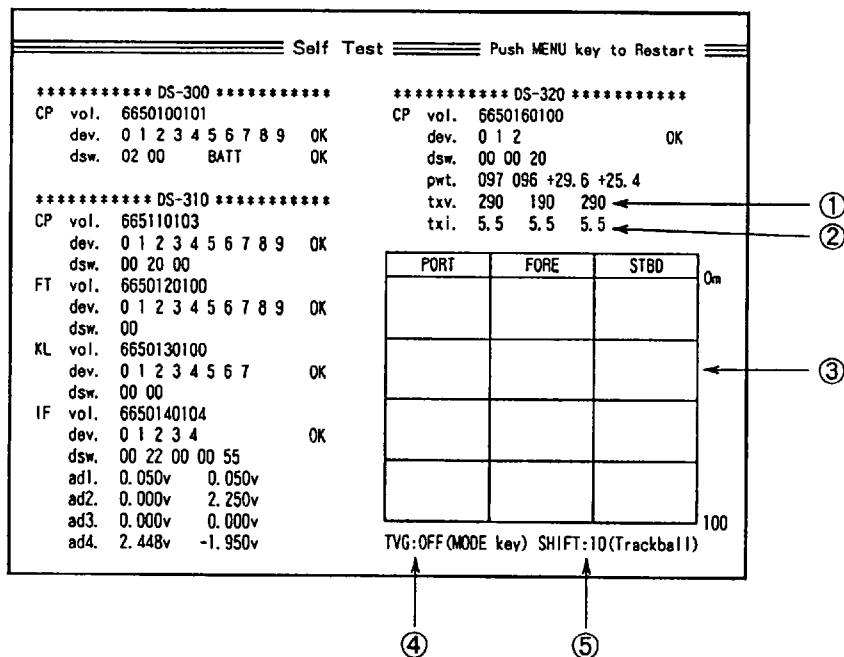
No.	Self-check Item	Description
12	Transceiver Unit (DS-320) NCP Board AD Conversion Value	pwt x x x x x x x x . x x x . x ↑ ↑ ↑ ↑ a b c d a) 100VAC: reading is 95 or 96 at 100VAC b) TX 100VDC: reading is 95 or 96 at 100VDC c) XDCR surface temp.: displays actual temperature d) XDCR mold material temp.: displays actual temperature
13	Color Pattern	Color test patterns are displayed. They are an orange bar and a 16-color bar which are alternately displayed, checking color generators in the display unit.

Note: 1 Number which follows "vol." is program number with least significant two digits showing version number.

2 Number which follows "dsw" is DIP switch setting.

5.2.4. Continuous Test

The continuous test executes the system check repeatedly. In addition to the check items of the single test, it displays the transmission voltage/current and received echoes for port, fore and starboard beams.



No.	Self-check Item	Description
1	TX Voltage	txv. x x x . x x x x . x x x x . x ↑ ↑ ↑ Fore Beam STBD Beam Port Beam TX voltage is normal if reading is more than 180 for all three beams. NOTE: Readings may fluctuate. Read a peak value.
2	TX Current	txi. x . x x x . x x x . x x ↑ ↑ ↑ Fore Beam STBD Beam Port Beam TX current is normal if reading is more than 3.0A for all three beams. NOTE: Readings may fluctuate. Read a peak value.
3	Received Echo	Displays received echoes for fore, starboard and port beams. When speed readings are abnormal, check that there is no interruption of echoes due to aeration. Use DEPTH RANGE key to change the depth scale.
4	TVG/ON/OFF	TRACKING MODE key turns on/off the TVG (Time Varied Gain) which is applied to received echoes displayed in item 3. When TVG is ON, propagation attenuation of sound in water is compensated so that echoes from targets with the same property are displayed in the same intensity irrespective of depth where targets are located.
5	SHIFT	Shows gain for echoes displayed in item 3. Use the TRACKBALL to change the gain.

5.2.5. TX/RX Test

The TX/RX test checks the transceiver circuit and the transducer for each beam.

When the speed readings measured by DS-30 are abnormal and echoes shown in the continuous test seem weak for a particular beam, the transceiver circuit or the transducer for that beam may be defective.

In beam FORE-AFT test, the ship's speed is measured by using the fore and starboard beams, without using the port beam. Likewise, in beam STBD-PORT test, the fore beam is not used, and in beam FORE-PORT test, the starboard beam.

If, for example, the speed readings are normal in beam FORE-STBD test but abnormal in beam STBD-PORT test and FORE-STBD tests, the transceiver or the transducer for the port beam is faulty.

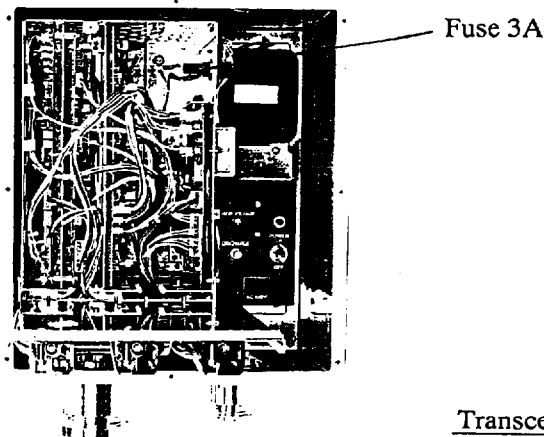
5.3. Checking External Noise and Interference

External noise level can be measured without transmission on the continuous check screen.

5.3.1. External Noise Check

1) Preparation

1. Remove 3A fuse in the transceiver unit..
2. Display the continuous check screen.
3. Set the TVG to OFF by operating the MODE key.
4. Set the depth range at maximum by operating the DEPTH RANGE key.



2) Check at Mooring

1. Adjust the SHIFT (echo gain) by operating the TRACKBALL and note the SHIFT reading when the color of noise in the echo data window changes from blue to the background color.
2. The reading is normally 7 or higher. If it is less than 7, noise is excessive.

3) Check at Cruising

1. With the SHIFT reading set at the value noted at “check at mooring”, run the ship at various speeds.
2. Observe the echo test window for the three beams. Noise is displayed in one of the 16 colors shown below depending on its intensity, where the color changes by one gradation whenever noise level is doubled.

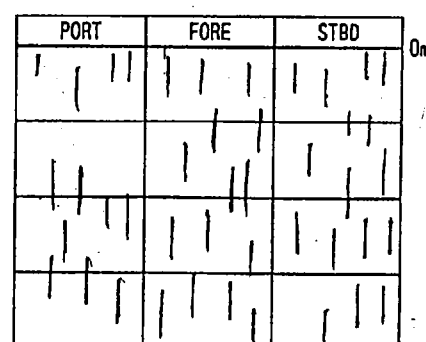
Black (lowest) → blue → light blue → cyan → light cyan → light green → green → yellow green → yellow-orange → orange → vermilion → red → reddish brown → brown → dark brown (highest)

3. Confirm that the noise level is almost even on all three beams and periodic pulse noise does not appear.
4. If the color changes more than 4 gradations compared to that at mooring, noise is excessive. In this case check the ground of each unit. (If the cruising noise is too heavy, you must consider transducer relocation.)

5.3.2. Interference Check

Perform this check at a location where the depth is greater than 50 meters (preferably about 100 meters) and no other ships are in the vicinity.

1. Set the SHIFT reading to the value noted at "Check at Mooring".
2. At a depth greater than 50 meters, operate other equipment one by one, observing the echo check window.
3. When there is interference, multiple strings are displayed as shown at right.
4. Put back the 3A fuse for normal operation.



Interference

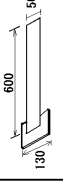
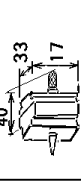
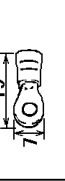
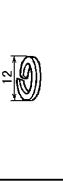
5. Turn off all ultrasonic wave generating equipment (echo sounder, etc.).
6. Operate the DS-30 in the ground tracking mode. Confirm that the ship's speed and direction readout is accurate.
7. Observing the display, turn on and operate the ultrasonic wave generating equipment one by one with their output power and pulselength set to the maximum.
8. If the ship's speed and direction readout changes abnormally when some equipment is turned on and operated, that equipment is interfering with the DS-30.
5. The interference can be removed by connecting the transmission trigger pulse (KP) of the interfering equipment to the processor unit. See page 3-10.

CODE NO.	66AM-X-9401 -2
TYPE	1/1

工事材料表				
INSTALLATION MATERIALS				
番号 NO.	名 称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY
1	10対ケーブル 10PAIR CABLE	 L=30M	COSPEWSBC 10PX0 2LF 00-SPEVW-SB-C 0.2X10P CODE NO. 000-560-424-10 000-560-424-00	1

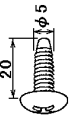
型式/コード番号が2段の場合、下段より上段に代わる通線製品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	1002-876-270-00
TYPE	CP66-00801

工事材料表				
INSTALLATION MATERIALS				
番号 NO.	名 称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY
1	7×3銅板 * 鉄付 * EARTH PLATE		0.4X50X600MM CODE NO. 000-170-971-10	1
2	34ヶ打 (8016) CONNECTOR		008016-020-000701VF+ CODE NO. 000-158-985-10	2
3	コンタクトピン (8017) CONTACT PIN (8017)		60-8017-0313-00339F+ CODE NO. 000-159-417-10	30
4	圧着端子 CRIMP-ON LUG		FV1.25-M4 (LF) CODE NO. 000-166-741-10	3
5	ハコばね金 SPRING WASHER		M6 SUS304 CODE NO. 000-158-855-10	4
6	ミカキ平座金 FLAT WASHER		M6 SUS304 CODE NO. 000-158-854-10	4
7	六角ナット 1/2 HEX. NUT		M6 SUS304 CODE NO. 000-158-856-10	8

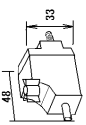
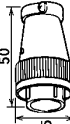
型式/コード番号が2段の場合、下段より上段に代わる通線製品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	002-876-280-00	66AM-X-9426 -3
TYPE	CP66-00802	1/1

工事材料表		INSTALLATION MATERIALS			用途／備考 REMARKS
番号 NO.	名称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	
1	セルフタッピングスクリュー 1/2		5X20 SUS304 CODE NO. 000-162-608-10	4	
2	フラットワッシャー 1/2		M6 SUS304 CODE NO. 000-158-854-10	4	
3	バネワッシャー 1/2		M6 SUS304 CODE NO. 000-158-855-10	4	
4	六角ナット 1種		M6 SUS304 CODE NO. 000-158-856-10	8	

型式/コード番号が2段の場合、下段より上段に代わる標準製品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

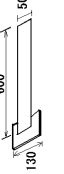
CODE NO.	002-876-330-00	66AM-X-9427 -4
TYPE	CP66-00803	1/1

工事材料表		INSTALLATION MATERIALS			用途／備考 REMARKS
番号 NO.	名称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	
1	7×3銅板 * 鉄付 * EARTH PLATE		0.4X50X600MM CODE NO. 000-170-971-10	1	
2	コネクタ (8016) CONNECTOR		008016-020-313704VF+ CODE NO. 000-159-002-10	1	
3	圧着端子 CRIMP-ON LUG		FW0.5-3 (LF) CODE NO. 000-166-729-10	12	
4	圧着端子 CRIMP-ON LUG		FW1.25-M3 (LF) CODE NO. 000-166-740-10	150	
5	圧着端子 CRIMP-ON LUG		FW2-M4 CODE NO. 000-157-229-10	10	
6	コネクタ (SRON) CONNECTOR (SRON)		SRON6A16-10P CODE NO. 000-160-728-10	2	

型式/コード番号が2段の場合、下段より上段に代わる標準製品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

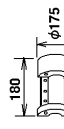
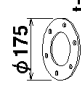
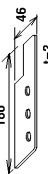
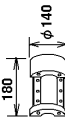
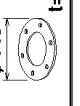
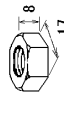
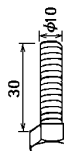
CODE NO.	002-876-350-00	66AM-X-9428 -2
	CP66-00804	

TYPE	CP66-00804	1/1
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工事材料表		INSTALLATION MATERIALS		略 図 OUTLINE		型名／規格 DESCRIPTIONS		数量 Q'TY		用途／備考 REMARKS	
番 号 NO.	名 称 NAME										
1	7-ス銅板＊鉄付＊ EARTH PLATE			0.4X50X600MM		CODE NO. 1000-170-971-10		1			
2	グラウンド ハﾟﾟキン GLAND PACKING			66-019-4201-0 ROHS		CODE NO. 100-176-510-10		1			
3	圧着端子 CRIMP-ON LUG			FV1.25-M4 (LF)		CODE NO. 1000-166-741-10		50			

型式/コード番号が2段の場合、下段より上段に代わる通線部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

TYPE	CP66-00805	1/2
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工事材料表		INSTALLATION MATERIALS		略 図 OUTLINE		型名／規格 DESCRIPTIONS		数量 Q'TY		用途／備考 REMARKS	
番 号 NO.	名 称 NAME										
1	フラジ FLANGE			66-019-4771-0 ROHS		CODE NO. 100-180-170-10		2			
2	ハﾟﾟキン PACKING			66-019-4772-0 ROHS		CODE NO. 100-180-180-10		2			
3	ハﾟﾟキン PACKING			66-019-4773-0 ROHS		CODE NO. 100-180-190-10		4			
4	フラジ FLANGE			66-019-4774-0 ROHS		CODE NO. 100-180-200-10		2			
5	ハﾟﾟキン PACKING			66-019-4775-0 ROHS		CODE NO. 100-180-210-10		2			
6	圧着端子 CRIMP-ON LUG			FV1.25-M4 (LF)		CODE NO. 100-166-741-10		50			
7	六角ナット HEX. NUT			M10 SUS304		CODE NO. 1000-166-475-10		12			
8	ハﾟﾟ座金 SPRING WASHER			M10 SUS304		CODE NO. 1000-167-233-10		12			
9	六角ボルト HEX. BOLT			M10X30 SUS304		CODE NO. 1000-162-782-10		12			
10	ハﾟﾟ座金 SPRING WASHER			M16 SUS304		CODE NO. 1000-167-400-10		8			

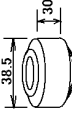
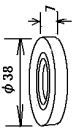
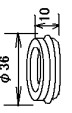
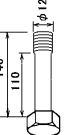
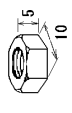
型式/コード番号が2段の場合、下段より上段に代わる通線部品であり、どちらかが入っています。なお、品質は変わりません。
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QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	002-876-450-00	66AM-X-9429 -6
TYPE	CP66-00805	2/2

工事材料表		INSTALLATION MATERIALS				
番号 NO.	名 称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS	
11	六角ボルト HEX. BOLT		M16X80 SUS304 CODE NO. 000-164-139-10	8		

型式/コード番号が2段の場合、下段より上段に代わる通称部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	002-876-310-00	66AM-X-9415 -9
TYPE	CP66-00840	1/2

工事材料表		INSTALLATION MATERIALS					
番号 NO.	名 称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS		
1	防水ゴム RUBBER PACKING		66-019-1202-0 ROHS CODE NO. 100-178-550-10	1			
2	座金 COUNTERSUNK WASHER		66-019-1203-1 ROHS CODE NO. 100-178-561-10	1			
3	ケーブルランド CABLE GLAND		66-019-1204-1 ROHS CODE NO. 100-178-571-10	1			
4	平座金 FLAT WASHER		66-019-1205-1 ROHS CODE NO. 100-176-531-10	3			
5	キャップ LID		66-019-1983-1 CODE NO. 100-176-521-00	3			
6	六角ボルト HEX BOLT		66-019-1984-3 ROHS CODE NO. 100-214-533-10	3			
7	バネ座金 SPRING WASHER		M12 SUS316L CODE NO. 000-167-396-10	6			
8	平座金 FLAT WASHER		M6 TP340 CODE NO. 000-168-314-10	2			
9	六角ナット 1/2 HEX NUT		M6 TW340 CODE NO. 000-168-315-10	2			
10	スプリングワッシャー SPRING WASHER		M6 ファン(TB340) CODE NO. 000-168-316-10	2			

型式/コード番号が2段の場合、下段より上段に代わる通称部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

2025

INSTALLATION MATERIALS

CODE NO.	002-876-310-00	66AM-X-9415 -9 2/2
TYPE	CP66-00840	

FURUNO ELECTRIC CO., LTD.

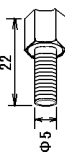
66AM-X-9415

図番 (1/1)
DWG. NO. C7236-M13-B

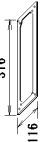
FURUNO ELECTRIC CO., LTD

CODE NO.		100-180-740-00		66AM-X-9419 -2	1/1
		TYPE			
TYPE		66-019-2194			
DOPPLER SONAR DOCKING SYSTEM					
DS-30				数量 Q'TY	用途／備考 REMARKS
明細書 DESCRIPTION		型名／規格 DESCRIPTIONS			
番 号 NO.	名 称 NAME	略 図 OUTLINE			
1	取付板 (1) MOUNTING PLATE				
		66-019-2194-0		1	
		CODE NO.		100-180-740-00	

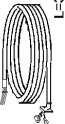
☆ (略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)
型式/コード 番号が2段の場合、下段より上段に代わる通達期品でどちらが入っています。 なお、品質は変わりませ
ん。
TOW TYPES AND CODES MAY BE LISTED. THE BOTTOM PRODUCT MAY BE SHIPPED IN PLACE OF THE TOP PRODUCT.
QUALITY THE SAME. FURUNO ELECTRIC CO.,LTD. 66AM-X-9419

CODE NO.		1002-876-370-00		66AM-X-9420 -2	1/1	
TYPE		0P66-2				
DOPPLER SONAR DOCKING SYSTEM						
DS-30						
明細書 DESCRIPTION		略 図 OUTLINE		型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
番 号 NO.	名 称 NAME					
1	パネルスペーサ (4) PANEL SPACER (4)			66-019-2591-1 ROHS	4	
				CODE NO.	100-178-841-10	

☆ (略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)
型式/コード 番号が2段の場合、下段より上段に代わる通達期品でどちらが入っています。 なお、品質は変わりませ
ん。
TOW TYPES AND CODES MAY BE LISTED. THE BOTTOM PRODUCT MAY BE SHIPPED IN PLACE OF THE TOP PRODUCT.
QUALITY THE SAME. FURUNO ELECTRIC CO.,LTD. 66AM-X-9420

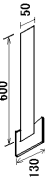
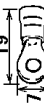
CODE NO.		100-180-860-00	66AM-X-9421 -2
TYPE		66-019-2593	1/1
DOPPLER SONAR DOCKING SYSTEM			
明細書 DESCRIPTION		DS-30	
番号 NO.	名称 NAME	略 図 OUTLINE	数量 Q'TY
1	取付板 (2) MOUNTING PLATE		
			1

☆ (略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)
型式/コード 番号が2段の場合、下段より上段に代わる通達期品でどちらが入っています。 なお、品質は変わりませ
ん。
TOW TYPES AND CODES MAY BE LISTED. THE BOTTOM PRODUCT MAY BE SHIPPED IN PLACE OF THE TOP PRODUCT.
QUALITY THE SAME. FURUNO ELECTRIC CO.,LTD. 66AM-X-9421

CODE NO.		000-028-862-00	66AM-X-9414 -2
TYPE		CP66-00900	1/1
OPERATION PANEL CABLE			
明細書 DESCRIPTION		DS-30	
番号 NO.	名称 NAME	略 図 OUTLINE	数量 Q'TY
1	コネクタ製品 CONNECTORS		
			1
2	信号ケーブル組品 SIGNAL CABLE ASSY.		
			1

☆ (略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)
型式/コード 番号が2段の場合、下段より上段に代わる通達期品でどちらが入っています。 なお、品質は変わりませ
ん。
TOW TYPES AND CODES MAY BE LISTED. THE BOTTOM PRODUCT MAY BE SHIPPED IN PLACE OF THE TOP PRODUCT.
QUALITY THE SAME. FURUNO ELECTRIC CO.,LTD. 66AM-X-9414

CODE NO.	002-876-550-00	66AM-X-9412 -2
TYPE	CP66-00811	1/1

工 事 材 料 表			INSTALLATION MATERIALS			用 途／備 考 REMARKS
番 号 NO.	名 称 NAME	略 図 OUTLINE	型 名／規 格 DESCRIPTIONS	数 量 Q'TY		
1	7-ス銅板＊鉄付＊ EARTH PLATE		0.4X50X600MM CODE NO. 000-170-971-10	1		
2	圧着端子 CRIMP-ON LUG		FV1.25-M3 (LF) CODE NO. 000-166-740-10	80		
3	圧着端子 CRIMP-ON LUG		FV1.25-M4 (LF) CODE NO. 000-166-741-10	15		

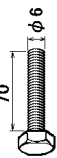
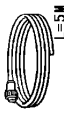
型式／コード番号が2段の場合、下段より上段に代わる通線部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	002-876-490-00	66AM-X-9411 -5
TYPE	CP66-00810	1/1

工 事 材 料 表		INSTALLATION MATERIALS				
番 号 NO.	名 称 NAME	略 図 OUTLINE	型 名 / 規 格 DESCRIPTIONS	数 量 Q'TY	用 途 / 備 考 REMARKS	
1	7-ス銅板 *鉄付 * EARTH PLATE		0.4X50X600MM CODE NO. 000-170-971-10	1		
2	グランド パッキン GLAND PACKING		66-019-4201-0 ROHS CODE NO. 100-176-510-10	2		
3	圧着端子 CRIMP-ON LUG		FV1.25-M4 (LF) CODE NO. 000-166-741-10	40		
4	ハコ 座金 SPRING WASHER		M6 SUS304 CODE NO. 000-158-855-10	4		
5	ミガキ 平座金 FLAT WASHER		M6 SUS304 CODE NO. 000-158-854-10	4		
6	六角ナット 1/4 HEX NUT		M6 SUS304 CODE NO. 000-158-856-10	8		
7	ハナコ 小ネジ PAN HEAD SCREW		M6X45 SUS304 CODE NO. 000-162-638-10	4		

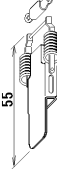
型式／コード番号が2段の場合、下段より上段に代わる通線部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	002-876-470-00	66AM-X-9407 -5
TYPE	CP66-00806	

工事材料表		INSTALLATION MATERIALS			
番号 NO.	名称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	調整ワシヤ ADJUSTING WASHER		66-019-6301-0 ROHS CODE NO. 100-176-550-10	8	
2	圧着端子 CRIMP-ON LUG		FV1. 25-M3 (LF) CODE NO. 000-166-740-10	3	
3	フラット座金 FLAT WASHER		M6 SUS304 CODE NO. 000-158-854-10	4	
4	スプリングワシヤ SPRING WASHER		M6 SUS304 CODE NO. 000-158-855-10	4	
5	六角ナット HEX NUT		M6 SUS304 CODE NO. 000-162-877-10	8	
6	六角ボルト HEX BOLT		M6X70 SUS304 CODE NO. 000-162-877-10	4	
7	信号ケーブル組品 SIGNAL CABLE ASSY.		S86-9-5 (7P) CODE NO. 002-884-530-00	1	
8	ビニル線 VINYL WIRE		VSF2 OSQ 7p *5M* CODE NO. 000-121-401-00	1	

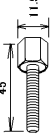
型式／コード番号が2段の場合、下段より上段に代わる通線部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	002-876-510-00	66AM-X-9408 -7
TYPE	CP66-00807	

工事材料表		INSTALLATION MATERIALS			
番号 NO.	名称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	シーアルワシヤ SEAL WASHER		03-001-3002-0 ROHS CODE NO. 300-130-020-10	4	
2	座金 WASHER		25 0X38. 0X2.0 A5052P CODE NO. 000-804-663-00	2	
3	ガスケット GASKET		66-019-5021-0 ROHS CODE NO. 100-176-560-10	1	
4	圧着端子 CRIMP-ON LUG		FV1. 25-M3 (LF) CODE NO. 000-166-740-10	12	
5	フラットヘッドネジ FLAT HEAD SCREW		M3X8 SUS304 CODE NO. 000-162-581-10	4	
6	シリコン SILICON RUBBER		S-8400W 7Pシリコン 50G CODE NO. 000-158-483-10	1	
7	ファスター FASTENER		TL-11J-1 CODE NO. 000-166-449-10	1	
8	ビニル線 VINYL WIRE		VSF2 OSQ 7p *5M* CODE NO. 000-121-401-00	1	

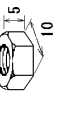
型式／コード番号が2段の場合、下段より上段に代わる通線部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	002-876-530-00	66AM-X-9409 -4
TYPE	CP66-00808	1/1

工事材料表		INSTALLATION MATERIALS			用途／備考 REMARKS
番号 NO.	名称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	
1	パネルスペーサ (2) PANEL SPACER (2)		FV1. 25-M3 (LF) CODE NO. 100-176-571-00	4	
2	圧着端子 CRIMP-ON LUG		FV1. 25-M3 (LF) CODE NO. 1000-166-740-10	12	
3	フラット座金 FLAT WASHER		M6 SUS304 CODE NO. 1000-158-854-10	4	
4	スプリングワッシャー SPRING WASHER		M6 SUS304 CODE NO. 1000-158-855-10	4	
5	六角ナット HEX NUT		M6 SUS304 CODE NO. 1000-158-856-10	8	
6	六角ナット3種 HEX NUT		M6 SUS304 CODE NO. 1000-167-502-10	4	
7	ビニール線 VINYL WIRE		VSF2 0.9mm 2芯 40mm CODE NO. 1000-121-401-00	1	

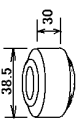
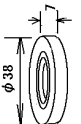
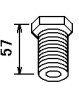
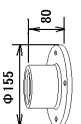
型式／コード番号が2段の場合、下段より上段に代わる通線部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CODE NO.	002-876-480-00	66AM-X-9410 -3
TYPE	CP66-00809	1/1

工事材料表		INSTALLATION MATERIALS			用途／備考 REMARKS
番号 NO.	名称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	
1	圧着端子 CRIMP-ON LUG		FV1. 25-M3 (LF) CODE NO. 1000-166-740-10	6	
2	フラット座金 FLAT WASHER		M6 SUS304 CODE NO. 1000-158-854-10	4	
3	スプリングワッシャー SPRING WASHER		M6 SUS304 CODE NO. 1000-158-855-10	4	
4	六角ナット 1種 HEX NUT		M6 SUS304 CODE NO. 1000-158-856-10	8	

型式／コード番号が2段の場合、下段より上段に代わる通線部品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

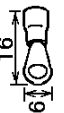
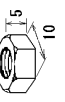
FURUNO

CODE NO.		002-876-360-00	66AM-X-9417 -3
TYPE		OP66-1	1/1
DOPPER SONAR DOCKING SYSTEM			
明細書 DESCRIPTION		DS-30	
番号 NO.	名 称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS
1	防水パッキン RUBBER PACKING		数量 Q'TY 1
			CODE NO. 66-019-1202-0 ROHS 100-178-550-10
2	座金 COUNTERSUNK WASHER		1
			CODE NO. 66-019-1203-1 ROHS 100-178-561-10
3	ケーブルグランド CABLE GLAND		1
			CODE NO. 66-019-1204-1 ROHS 100-178-571-10
4	フランジ FLANGE		1
			CODE NO. 66-019-1252-0 ROHS 100-178-440-10

☆ (略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)
型式/コード番号が2段の場合、下段より上段に代わる通達部品でどちらが入っています。 なお、品質は変わりません。
TOW TYPES AND CODES MAY BE LISTED. THE BOTTOM PRODUCT MAY BE SHIPPED IN PLACE OF THE TOP PRODUCT. QUALITY THE SAME.

FURUNO ELECTRIC CO.,LTD. 66AM-X-9417

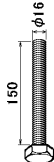
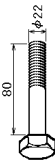
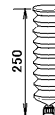
FURUNO

工事材料表					002-880-060-00		66AM-X-9422 -3	
					TYPE		CP66-01000	
INSTALLATION MATERIALS								
番号 NO.	名称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS			
1	圧着端子 CRIMP-ON LUG		FV1. 25-3(LF) CODE NO. 000-166-766-10	6				
2	ミガキ平座金 FLAT WASHER		M6 SUS304 CODE NO. 000-168-864-10	4				
3	バネ座金 SPRING WASHER		M6 SUS304 CODE NO. 000-168-865-10	4				
4	六角ナット 1 種 HEX NUT		M6 SUS304 CODE NO. 000-168-866-10	8				

型式/コード番号が2段の場合、下段より上段に代わる通達部品であり、どちらが入っています。 なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO.,LTD. 66AM-X-9422

FURUNO

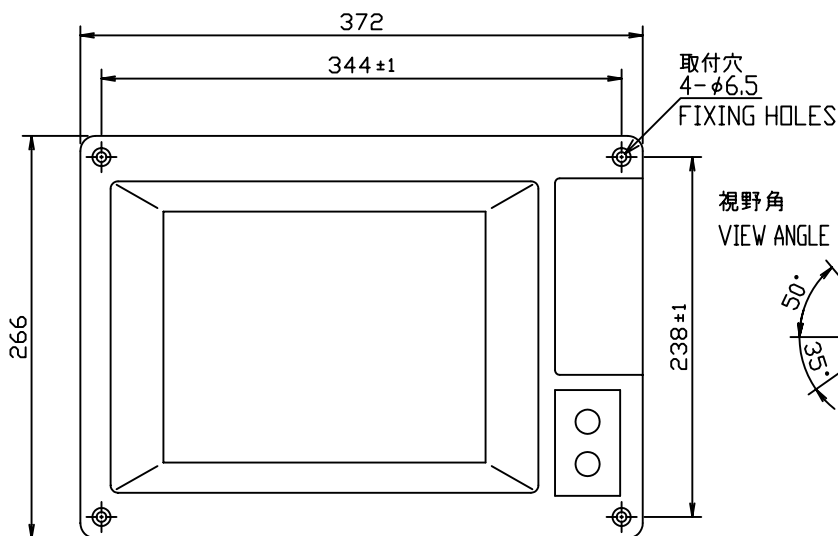
CODE NO.		002-880-320-00	66AM-X-9423 -9		
TYPE		CP6-01210	1/1		
工事材料表					
INSTALLATION MATERIALS					
番号 NO.	名 称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q T Y	用途／備考 REMARKS
1	ハ' ばね金 SPRING WASHER		M16 SUS316L CODE NO. 000-167-399-10	8	
2	六角ナット HEX NUT		M16 SUS316L CODE NO. 000-167-468-10	8	
3	六角ボルト 全長 HEX BOLT		M16X150 SUS316L CODE NO. 000-162-819-10	8	
4	ハ' ばね金 SPRING WASHER		M22 SUS316L CODE NO. 000-167-403-10	32	
5	六角ナット HEX NUT		M22 SUS316L CODE NO. 000-167-472-10	32	
6	六角ボルト HEX BOLT		M22X80LXS05 SUS316L CODE NO. 000-162-857-10	32	
7	グリス / リアス イヤワダ GREASE		No. 1 400ｼﾞ ｷﾐ ﾁｬｰｼﾞ CODE NO. 000-165-774-10	1	

型式・コード番号が2段の場合、下段より上段に代わる標準製品であり、どちらかが入っています。なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

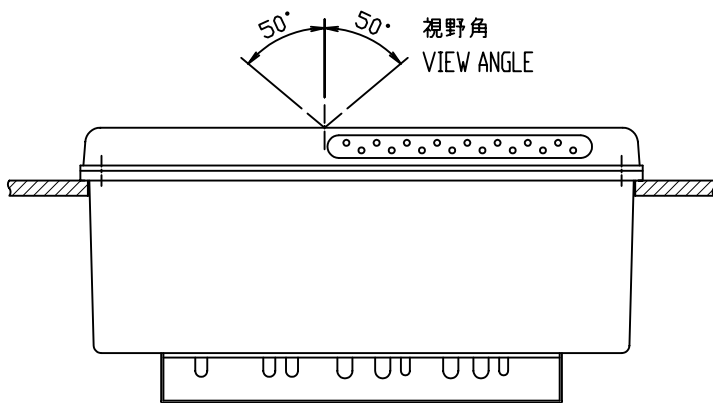
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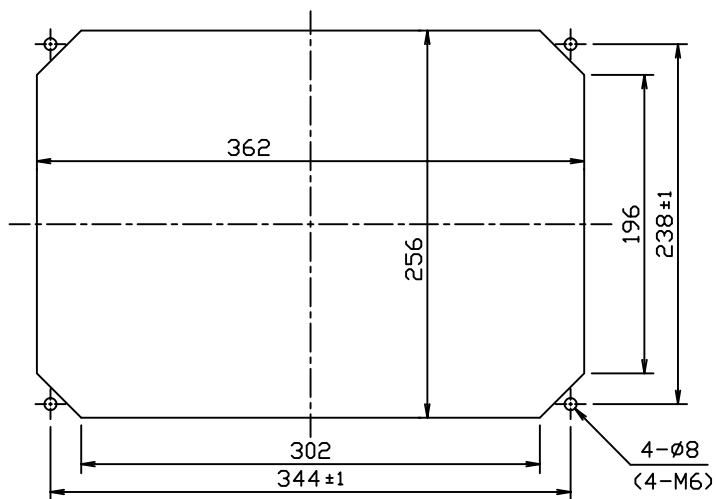
A



B



C



D

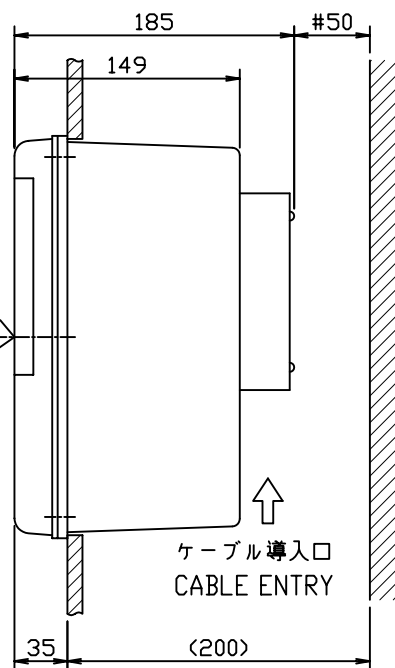


表 1 TABLE 1

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

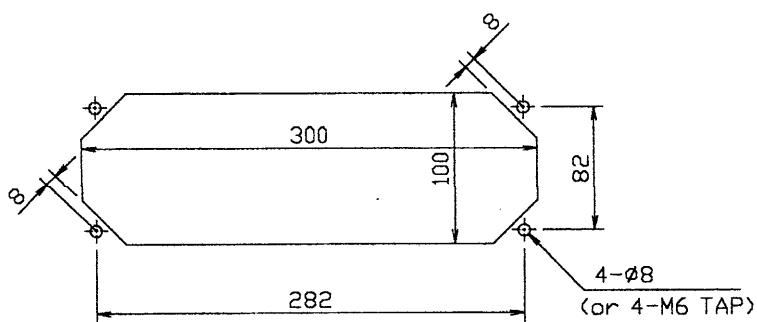
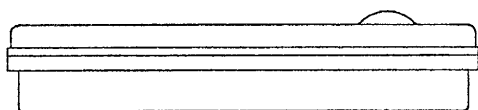
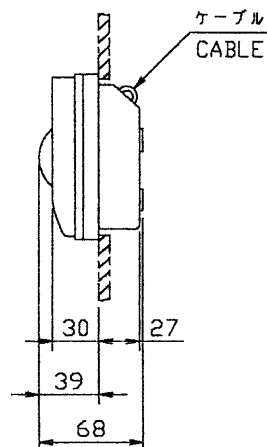
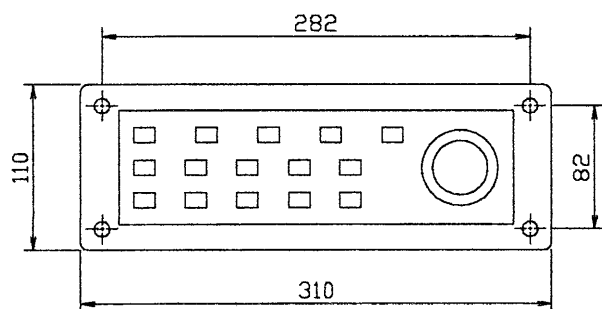
注記

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

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.

DRAWN	Sep. 6 '05	T.YAMASAKI	TITLE	DS-300
CHECKED	Sep. 6 '05	T.TAKENO	名称	主指示器（埋込装備）
APPROVED	Sep. 29 '05	T. Matsuyoshi		外寸図
SCALE	1/5	MASS ±10% 9.5 kg	NAME	MAIN DISPLAY (FLUSH MOUNT)
DWG.No.	C7236-G01- G			OUTLINE DRAWING



取付寸法
MOUNTING DIMENSION

DS-30

品番 ITEM	品名 NAME	材質 MATERIAL	数量 QTY	図番 DWG NO.	備考 REMARKS
DRAWN Jun. 27 '01 T.YAMASAKI				TITLE DS-301	
CHECKED Jun. 27 '01 Y.KIMURA				名称 指示部・操作箱	
APPROVED Jun. 27 '01 Y.KIMURA				外寸図	
SCALE 1/5	MASS 1.6 kg	±10%		NAME DISPLAY, OPERATION PANEL	
DWG.No. C7236-G02-D				OUTLINE DRAWING	

A

B

C

D

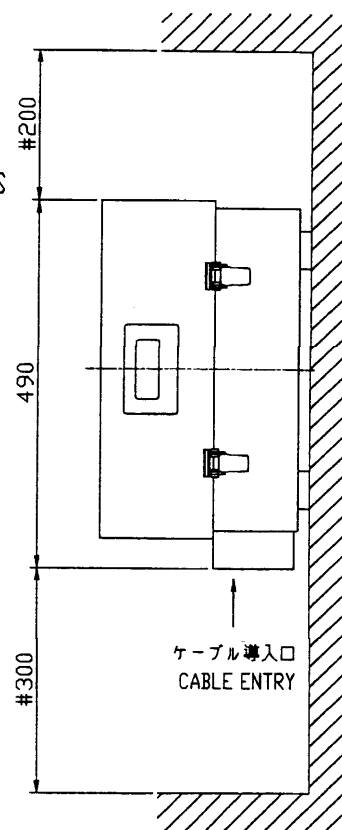
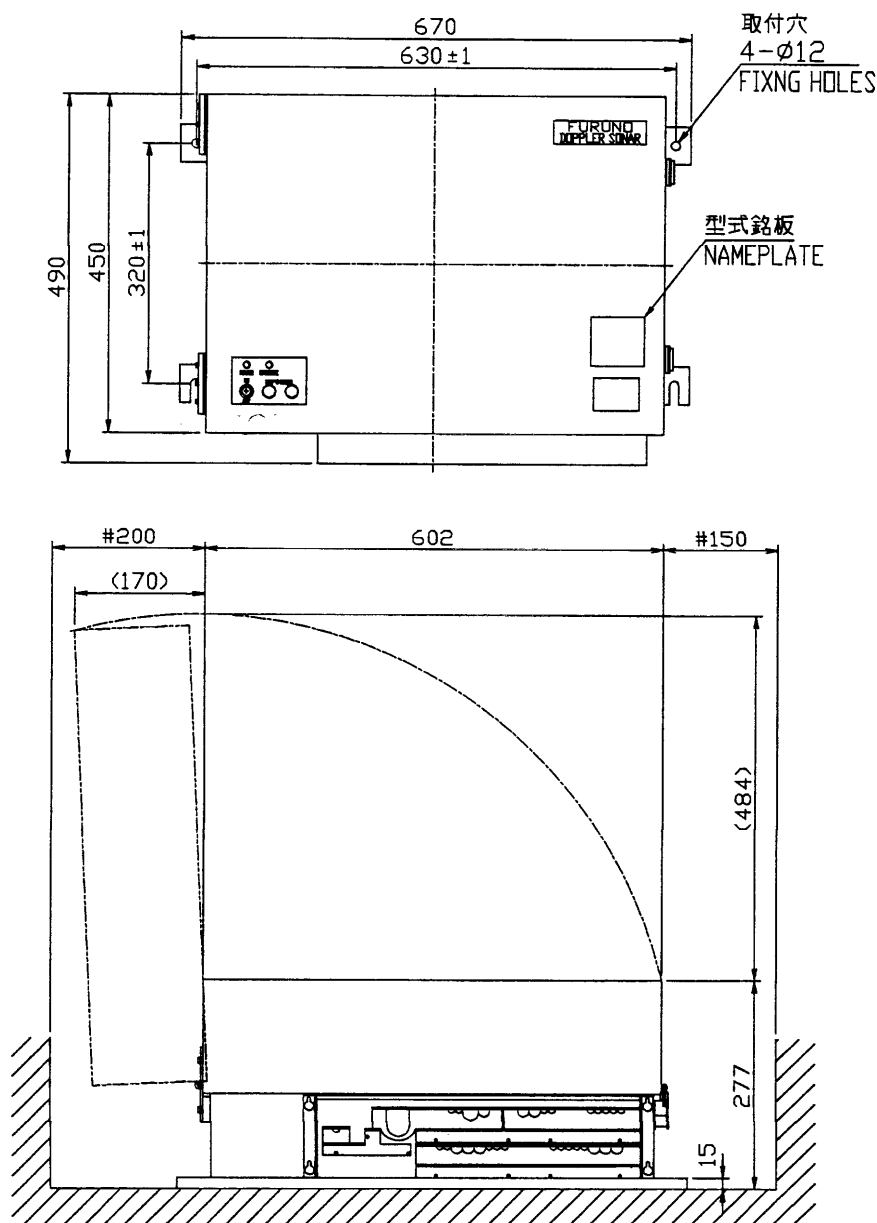


表1 TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 < L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3
500 < L ≤ 1000	±4

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.

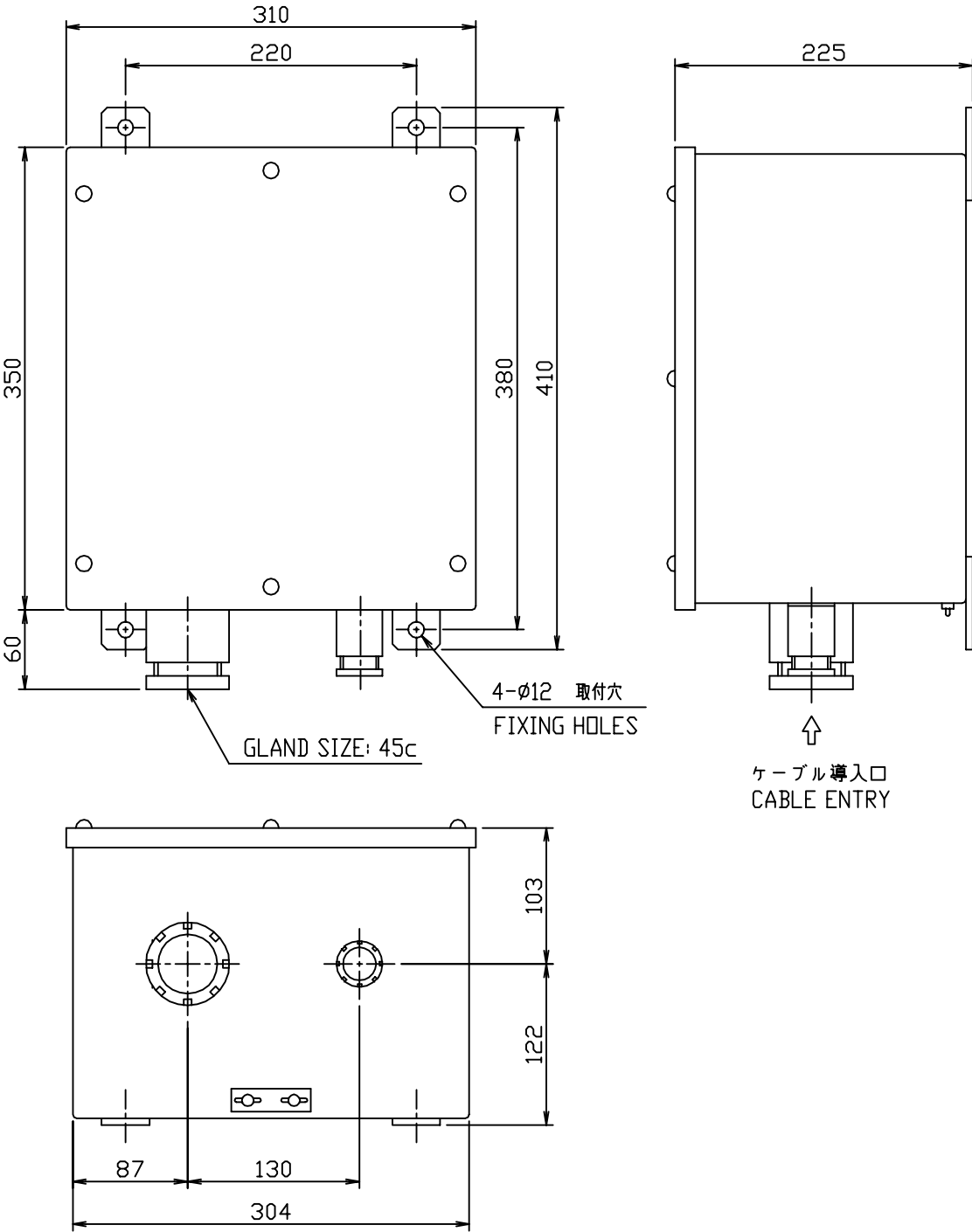
DRAWN Dec. 10 '01	T.YAMASAKI		TITLE DS-310
CHECKED Dec 11 '01 Y.K.			名称 演算制御部
APPROVED Dec 11 '01 Y.K.			外寸図
SCALE 1/10	WASS 40±6 kg		NAME PROCESSOR UNIT
DWG.No. C7236-G03-H			OUTLINE DRAWING

A

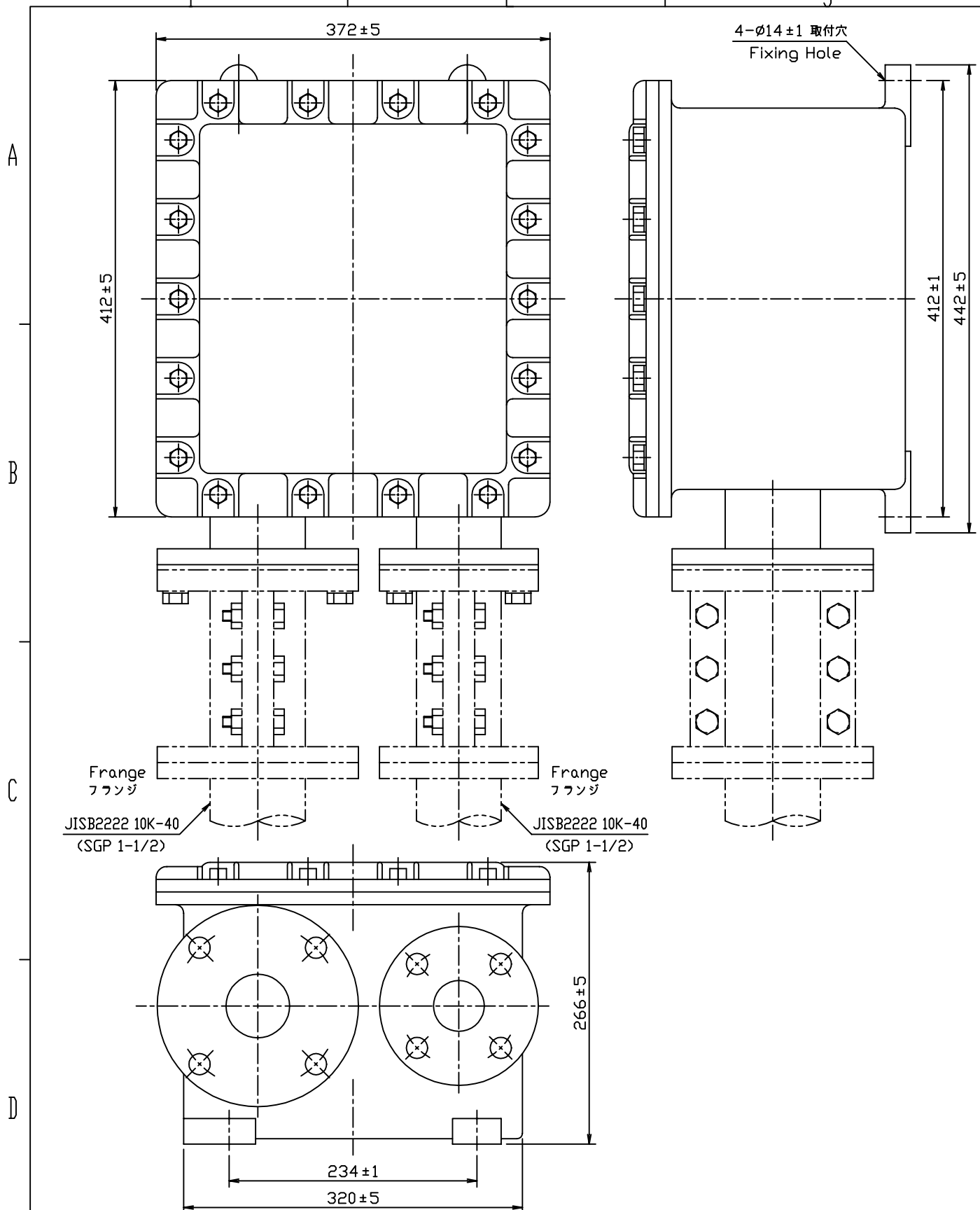
B

C

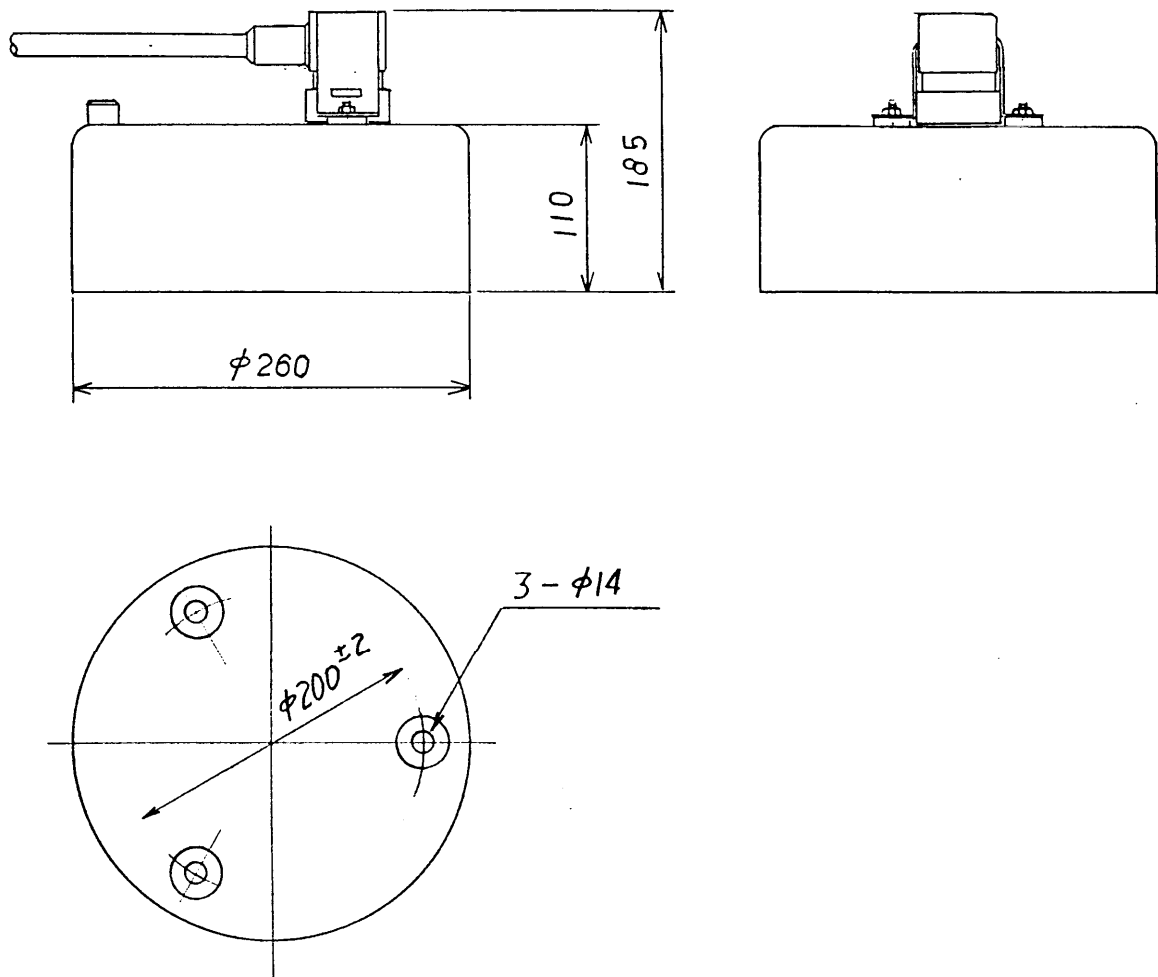
D



品番 ITEM		品名 NAME		材質 MATERIAL	数量 Q'TY	図番 DWGNO.	摘要 REMARKS
DRAWN Sep. 21, '04 E. MIYOSHI				TITLE DS-320			
CHECKED TAKAHASHI, T				名称 送受信器			
APPROVED Y. Hatai				外寸図			
SCALE 1/5		MASS 14 ±10% kg		NAME TRANSCEIVER UNIT			
DWG.No. C7236-G04-F				OUTLINE DRAWING			



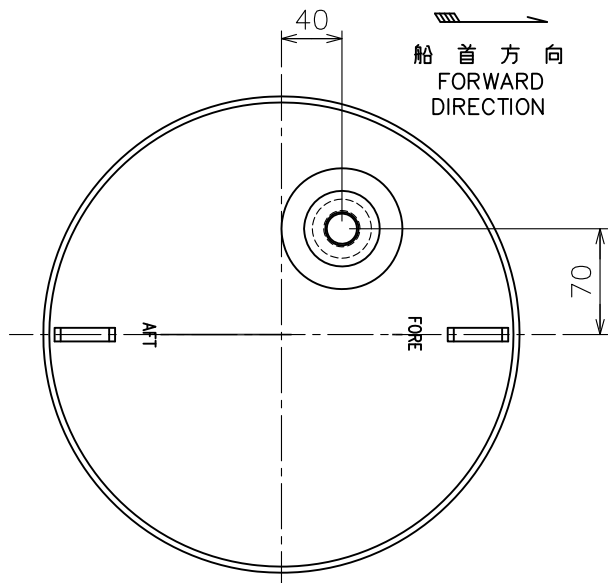
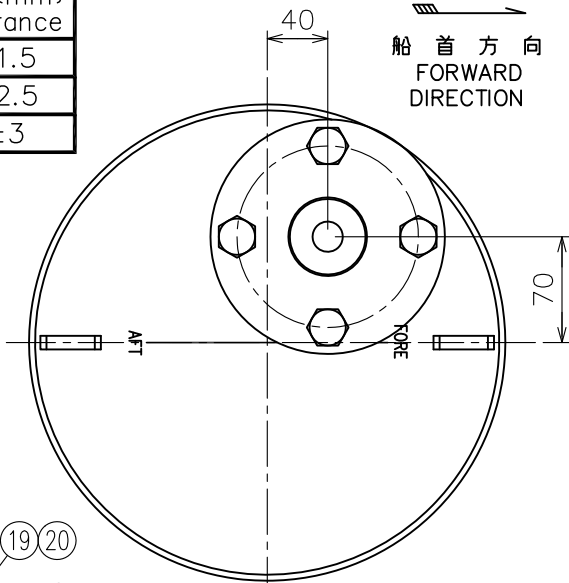
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS
DRAWN Jun. 27 '01 T.YAMASAKI		TITLE DS-325			
CHECKED Jun. 27 '01 Y.KIMURA		名称 耐压防爆式送受信器			
APPROVED Jun. 27 '01 Y.KIMURA		外寸図			
SCALE 1/5	MASS 48.5 ± 5 kg	NAME EXPLOSION-PROOF TYPE TRANSCIVER UNIT			
DWG.No. C7236-G13-C		OUTLINE DRAWING			



品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS
承認 APPROVED	APR. 8 '92 T. JAKA	三角法 THIRD ANGLE PROJECTION	名称 TITLE	DS-330 送受波器 TRANSDUCER	
検 CHECKED	APR. 8 '92 M. USUDA	尺度 SCALE	1/5		
製 DRAWN	APR. 8 '92 TOMITA	重量 WEIGHT	9 kg (5.7 6 金付)	図番 DWG.NO.	C 7 2 3 6 - G 1 4 - A

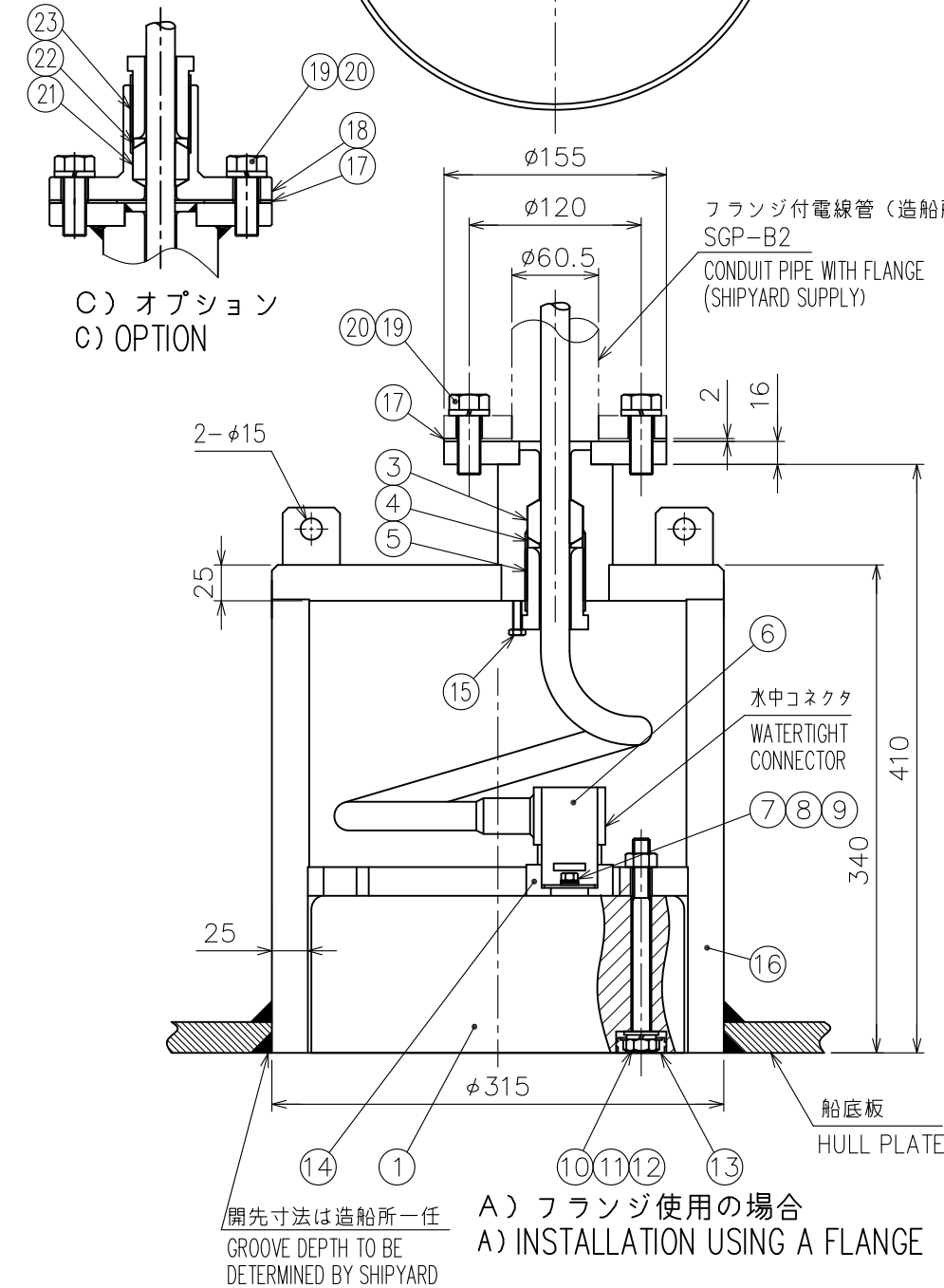
寸法区分 (mm) Dimension	公差 (mm) Tolerance
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3

表1 (Table1)

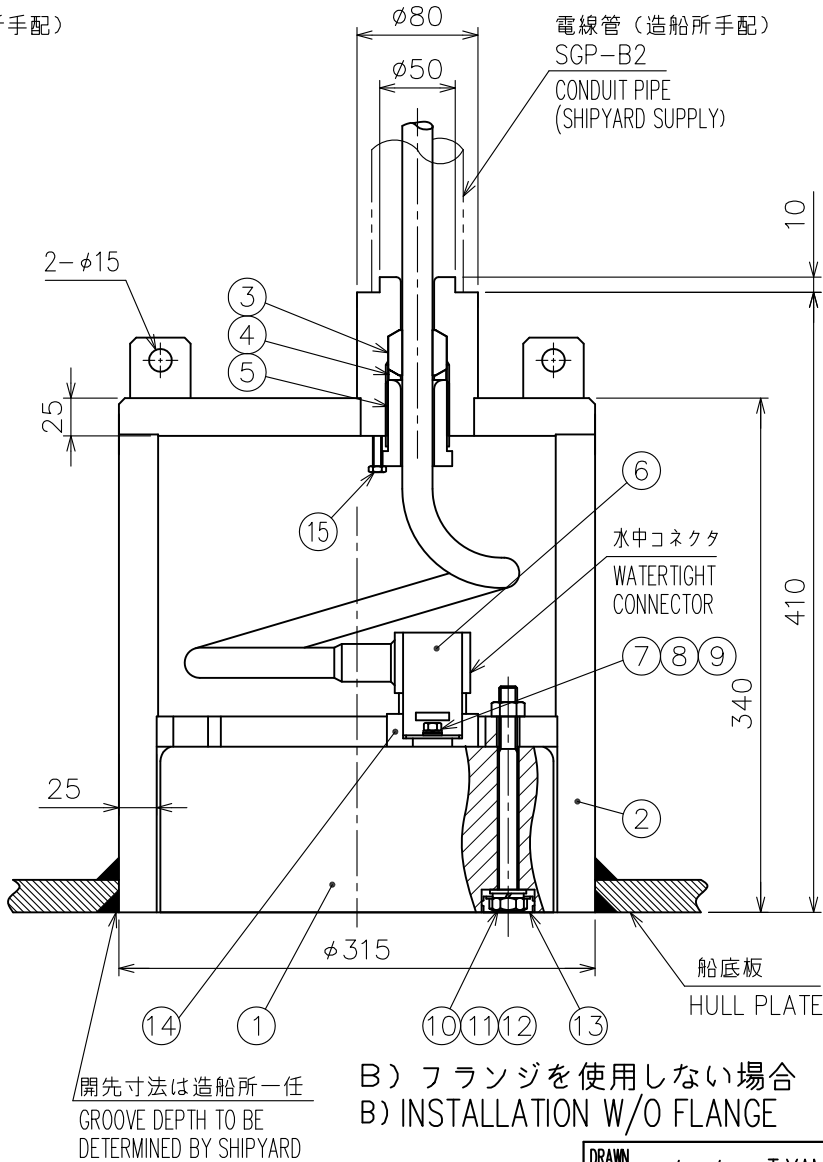


- 注 記
1. 船底タンクの板厚は標準25mmです。それ以上の厚さが必要な場合は別途打合せ願います。
 2. 船底タンクの材質はNK（日本海事協会）規格のKSTPG370およびKA材です。
 3. 船底タンクを船底に溶接する際、船首船尾の方向の据付の誤差は±1°以内としてください。
また水平方向の取付はタンクのフランジが吃水線と±1°以内の誤差で平行になるようにしてください。
 4. 指定外の寸法公差は表1の通りです。
 5. ⑤のケーブルグラッドは標準支給の予備品工具で締付けてください。

- NOTES
1. STANDARD THICKNESS OF THE CASING IS 25mm. CONSULT WITH FURUNO WHEN THICKER ONE IS REQUIRED.
 2. MATERIAL OF TANK MEETS NK (NIPPON KAIJI KYOUKAI) STANDARD KSTPG370 AND KA.
 3. ORIENT BOW MARK OF THE CASING IN PARALLEL WITH SHIP'S FORE-AFT LINE
AND THE TOP OF THE CASING IN PARALLEL WITH WATER-LINE TO AN ACCURACY OF 1 DEGREE OR BETTER.
 4. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
 5. CABLE GLAND ⑤ CAN BE TIGHTENED BY THE TOOL SUPPLIED.



A) フランジ使用の場合
A) INSTALLATION USING A FLANGE

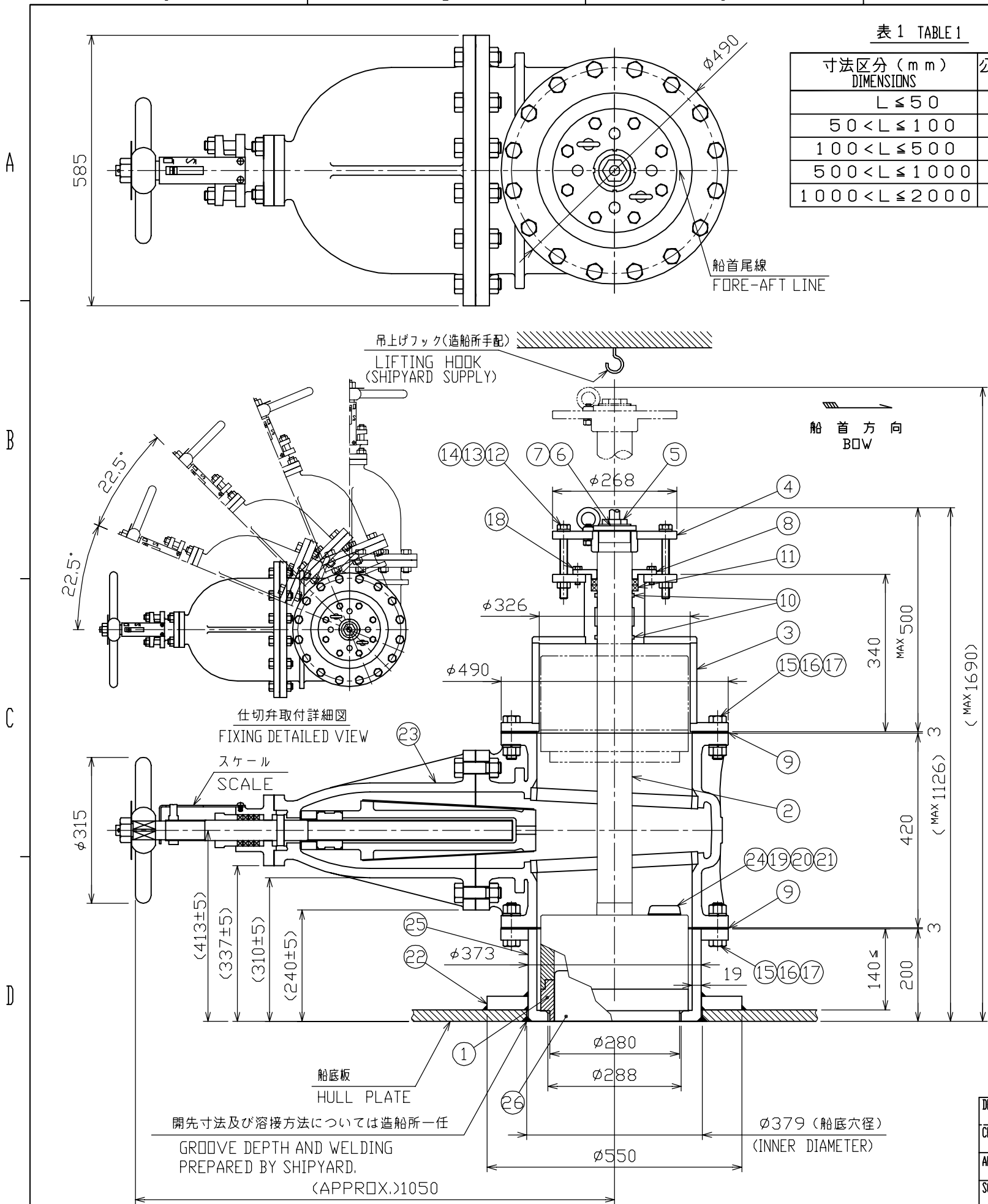


B) フランジを使用しない場合
B) INSTALLATION W/O FLANGE

23	ケーブルグラッド CABLE GLAND	SUS316L	(1)	66-019-1204	オプション OPTION
22	平座金 FLAT WASHER	SUS316L	(1)	66-019-1203	オプション OPTION
21	防水ゴム RUBBER GASKET	CR	(1)	66-019-1202	オプション OPTION
20	バネ座金 SPRING WASHER	SUS316L	(4)	M16	工材 (オプション) INSTALLATION MATERIALS (OPTION)
19	六角ボルト HEX BOLT	SUS316L	(4)	M16×45	工材 (オプション) INSTALLATION MATERIALS (OPTION)
18	フランジ ELECTROPLATED COATINGS OF ZINC ON IRON OR STEEL	SS400	(1)	66-019-1252	オプション OPTION
17	ガスケット GASKET	T No.1995	1	JIS 10K×50A	
16	タンク本体 CASING EPOXY ZINC RICH PRIMER	KSTPG370/KA	1	66-019-1211	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
15	六角ボルト HEX BOLT	SUS316L	1	M6×30	
14	CN押えリング CN-RING HOLDER	TB35C	1	66-019-1303	
13	キャップ BOLT CAP	PU	3	66-019-1983	
12	平座金 FLAT WASHER	SUS316L	3	66-019-1205	
11	バネ座金 SPRING WASHER	SUS316L	6	M12	
10	六角ボルト HEX BOLT	SUS316L	3	66-019-1984	
9	バネ座金 SPRING WASHER	TB340	2	M6	
8	平座金 FLAT WASHER	TB340	2	M6	
7	六角ナット HEX NUT	TB340	2	M6	
6	CN押え金具 CONNECTOR HOLDER	TP35C	1	66-019-1302	
5	ケーブルグラッド CABLE GLAND	SUS316L	1	66-019-1204	
4	平座金 FLAT WASHER	SUS316L	1	66-019-1203	
3	防水ゴム RUBBER GASKET	CR	1	66-019-1202	
2	タンク本体 CASING EPOXY ZINC RICH PRIMER	KSTPG370/KA	1	66-019-1208	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
1	送受波器 TRANSDUCER		1	DS-330	
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

DRAWN	3/Sep/08 T.YAMASAKI		TITLE	DS-330/331
CHECKED	3/Sep/08 T.TAKENO		名称	送受波器タンク
APPROVED	23/Oct/08 R.Esumi	DS-30		外寸図
SCALE	1/5	MASS 80 ±10% kg	NAME	TRANSDUCER TANK
DWG.No.	C7236-G05-Q	66-019-121G-0		OUTLINE DRAWING

質量 (①⑥⑦⑧⑨⑩⑪⑫⑬⑭⑰⑱⑲⑳㉑㉒㉓を除く)
(MASS WITHOUT ①⑥⑦⑧⑨⑩⑪⑫⑬⑭⑰⑱⑲⑳㉑㉒㉓)

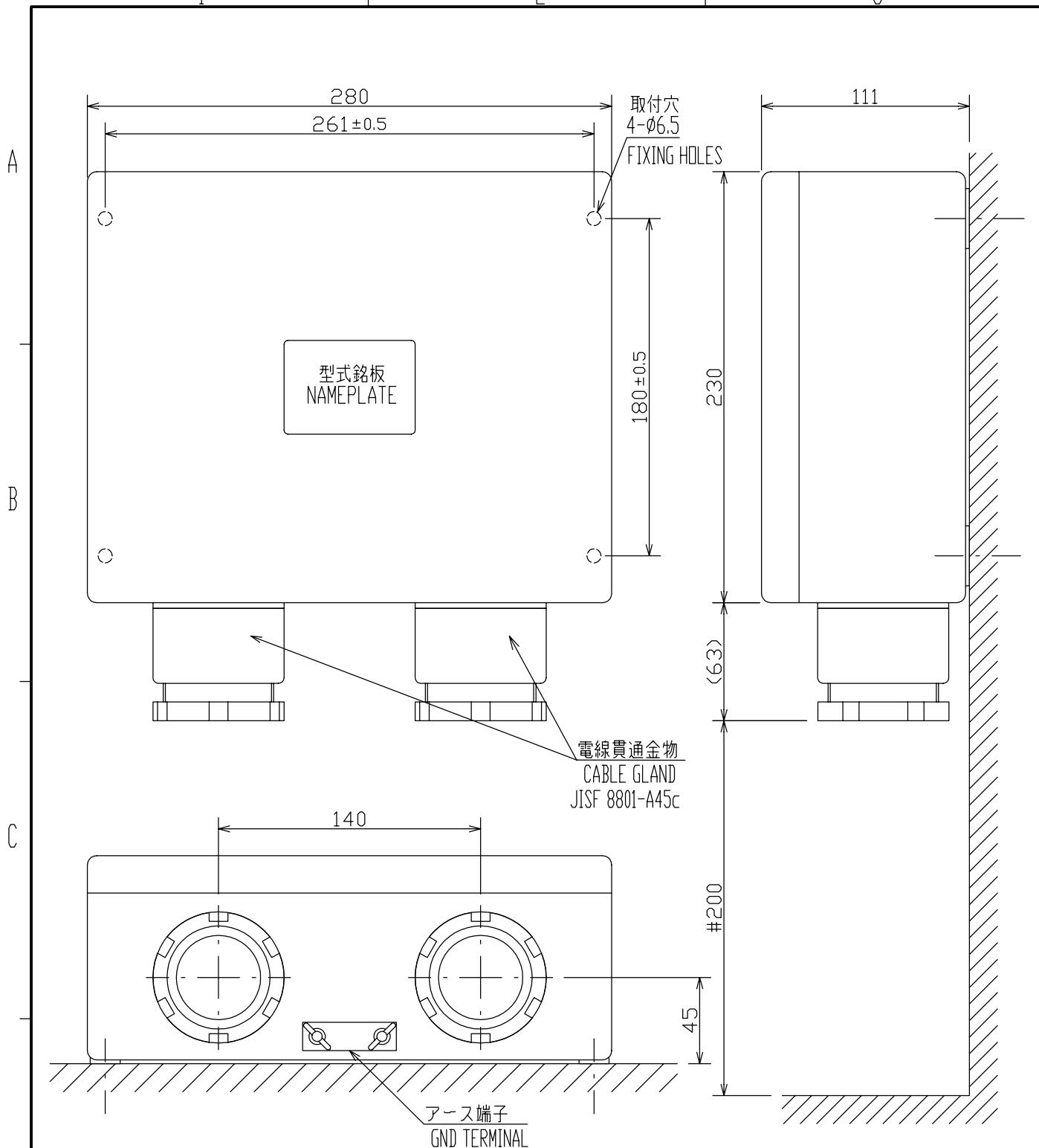


注記 1. 底上げタンク②⑤、送受波器②⑥の船首-船尾方向、水平方向の各取付誤差は±1度以内とする。
2. 仕切り弁②③を取付ける際はナット①⑦の回り止め対策として、ボルト①⑤及びナット①⑦を脱脂後、#271(日本ロックタイト)を塗布して完全に締めること。
3. 仕切り弁部以外の部分は $4.9 \times 10^5 \text{ Pa}$ の水圧試験がされています。
4. 仕切り弁②③は、 22.5° ピッチで任意の方向に取付け可能です。
5. 送受波器面にはマリンスター20を塗布しています。その他の船底塗料を塗布しないでください。
6. 指定外の寸法公差は表1の通り。
7. 装備時は、底上げタンク②⑤、シーチェストキャップ③および上部板④の船首マークを船首方向に合わせる。

NOTES 1. WELD SPACER ②⑤ TO HULL PLATE AND MOUNT TRANSDUCER ②⑥ WITHIN ± 1 DEGREE OF FORE-AFT LINE AND WITHIN ± 1 DEGREE IN HORIZONTAL DIRECTION.
2. BEFORE TIGHTENING NUTS ①⑦, CLEAN BOLTS ①⑤ AND NUTS ①⑦ WITH SOLVENT AND COAT PART OF THREADS WHICH CONTACT NUT WITH LOCTITE #271, TO PREVENT NUT FROM LOOSENING.
3. SEACHEST EXCEPT GATE VALVE IS TESTED UNDER $4.9 \times 10^5 \text{ Pa}$ WATER PRESSURE.
4. GATE VALVE ②③ CAN BE ATTACHED IN ANY DIRECTION IN 22.5° PITCH.
5. THE TRANSDUCER FACE IS COATED WITH MARINESTAR20, DO NOT APPLY OTHER TYPE OF PAINT.
6. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
7. ORIENT FORE LINES OF SPACER ②⑤ AND SEACHEST CAP ③ AND UPPER PLATE ④ TOWARD FORE DIRECTION TO INSTALL.

26	送受波器 TRANSDUCER		1	DS-330	質量には含まれない NOT INCLUDED IN MASS
25	底上げタンク SPACER LACQUER PRIMER	KA	1	66-019-1431	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
24	防蝕亜鉛 ANTI-CORROSIVE ZINC		3	ZAP B-1 1/2	
23	仕切り弁 GATE VALVE ALKYD RESIN PRIMER	SC480	1	66-019-1411	船級認定材 CLASSIFICATION SOCIETY APPROVED
22	底上げダブリング DOUBLING PLATE LACQUER PRIMER	KA	1	66-019-1432	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
21	平座金 FLAT WASHER	SUS316L	3	M12	
20	バネ座金 SPRING WASHER	SUS316L	3	M12	
19	六角ボルト HEX. BOLT	SUS316L	3	M12×20	
18	六角ボルト HEX. BOLT	SUS316L	4	M10×35	
17	六角ナット HEX. NUT	SUS316L	32	M22	
16	バネ座金 SPRING WASHER	SUS316L	32	M22	
15	六角ボルト HEX. BOLT	SUS316L	32	M22×80	
14	六角ナット HEX. NUT	SUS316L	8	M16	
13	バネ座金 SPRING WASHER	SUS316L	8	M16	
12	六角ボルト HEX. BOLT	SUS316L	8	M16×150	
11	BRINE SEAL		1SET	VALQUA No,7061	
10	リング O-RING	CR	2	JISB2401 1A P75	
9	ガスケット GASKET t=3mm	JOINT SHEET	2	66-019-1404	
8	取付板 FIXING PLATE	SUS316L	1	66-019-1407	
7	座金 WASHER	SUS316L	1	AW14	
6	六角ナット HEX. NUT	SUS316L	1	AN14	
5	締め付けグラウンド FIXING GRAND	SUS316L	1	66-019-1204	
4	上部板 UPPER PLATE LACQUER PRIMER	SM400A	1	66-019-1403	
3	シーチェストキャップ SEACHEST CAP LACQUER PRIMER	KSTPG370	1	66-019-1402	船級認定材 CLASSIFICATION SOCIETY APPROVED MATERIAL
2	シャフト SHAFT	SUS316L	1	66-019-1433	
1	上蓋 HEAD CAP	SUS316L	1	66-019-1434	
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.No.	備 考 REMARKS

DRAWN	MAY 16, '06	E. MIYOSHI	TITLE	DS-335
CHECKED		TAKAHASHI, T	名称	ゲートバルブ式送受波器タンク
APPROVED		Y. Hatai		船底装備図
SCALE	1/10	MASS 600 $\pm 10\%$ kg	NAME	SEACHEST WITH GATE VALVE
DWG No.	C7236-T06-H	REF No. 66-019-140G-7		HULL UNIT INSTALLATION



注記

- 1) 指定なき寸法公差は表 1 による。
- 2) #印寸法は最小サービス空間寸法とする。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.

表1 TABLE 1

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

DRAWN Feb. 9 '04 T.YAMASAKI		TITLE DS-360
CHECKED Feb. 9 '04 T.TAKENO		名称 接続箱
APPROVED Feb.12'04 H.HAYASHI		外寸図
SCALE 1/3	MASS 5.9 $\pm 10\%$ kg	NAME JUNCTION BOX
DWG.No. C7236-G06-F		OUTLINE DRAWING

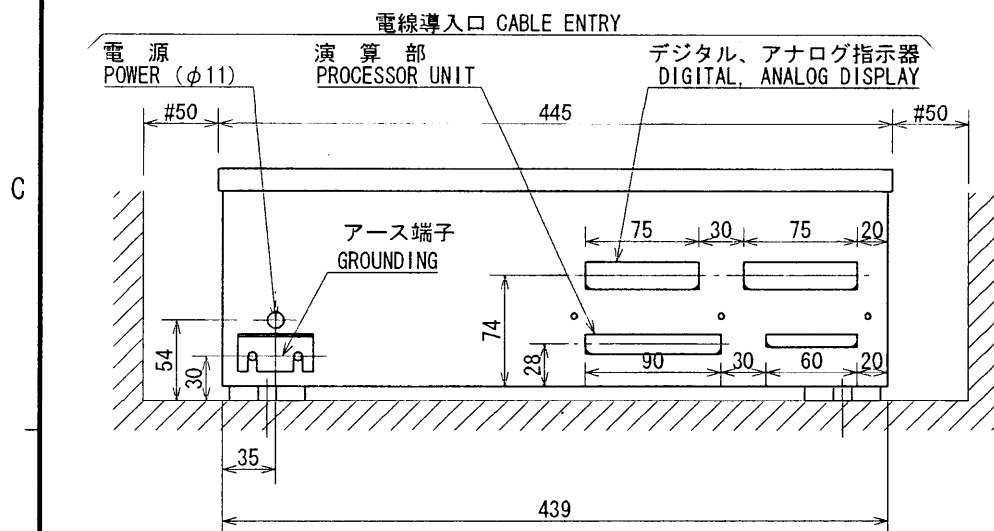
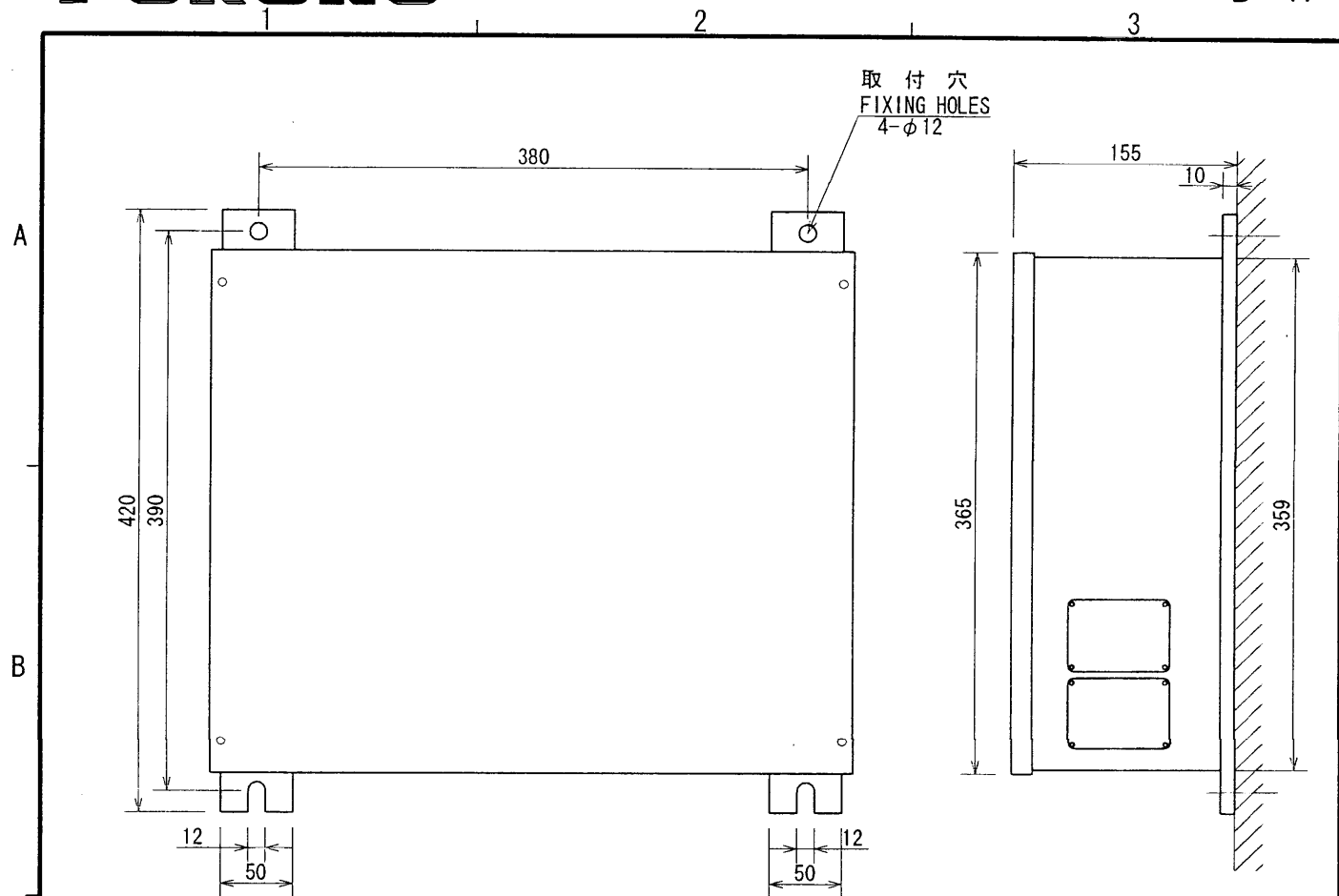


表 1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
0 < L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3
500 < L ≤ 1000	±4

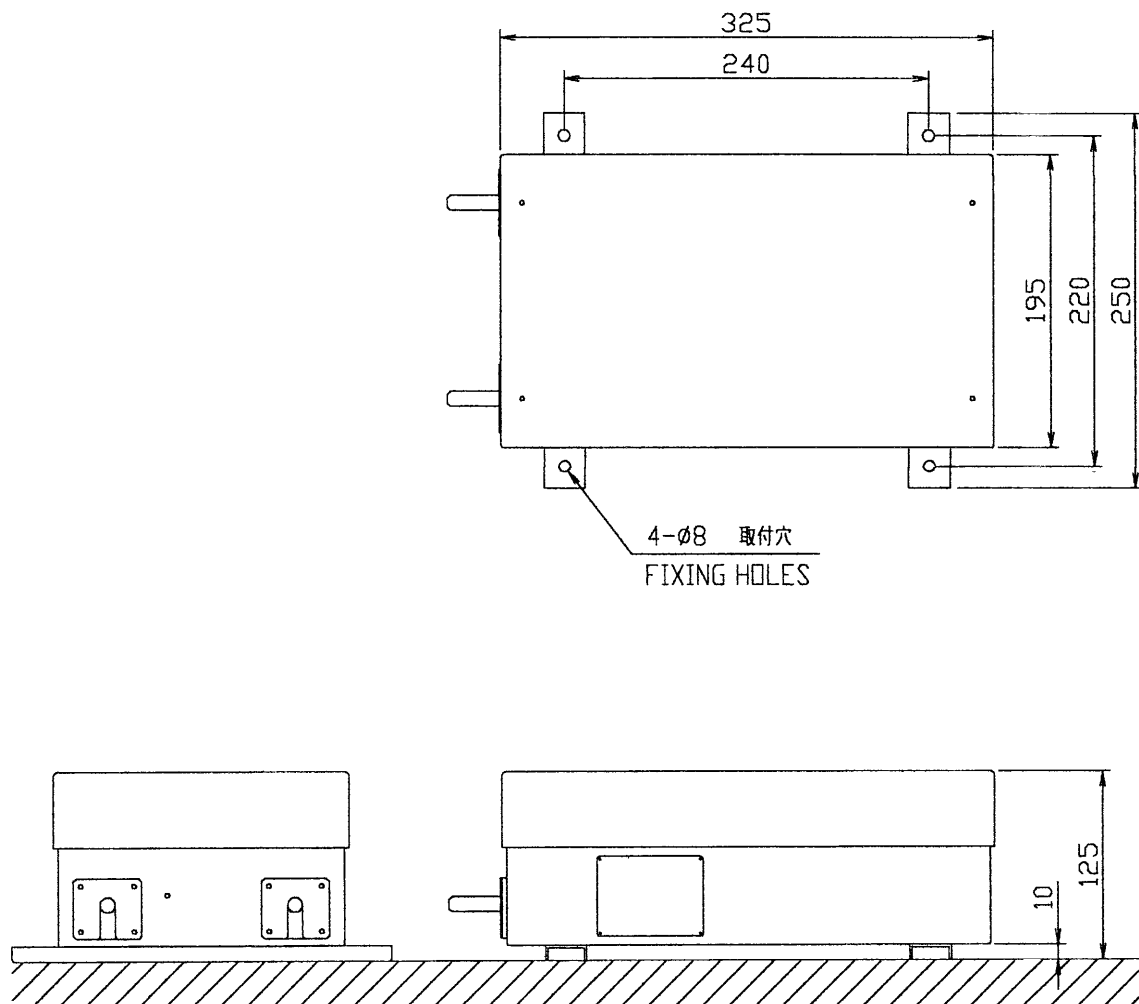
注記

- 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 DIMENSION.

DRAWN July 26 '00 T. YAMASAKI	TITLE DS-370
CHECKED July 27 '00 Y. K.	名称 分配器
APPROVED July 27 '00 Y. K.	外 寸 図
SCALE 1/5 MASS 19 kg	NAME DISTRIBUTION UNIT
DWG. No. C7236-G10-G	OUTLINE DRAWING



本装置は水平 ($\pm 1^\circ$) に設置する必要があります。

(水平装置の水平度調整範囲は $\pm 2^\circ$ 以下の場所を選んで下さい)

INSTALL UNIT LEVEL TO WITHIN $\pm 1^\circ$. ERROR ADJUSTABLE UP TO $\pm 2^\circ$.

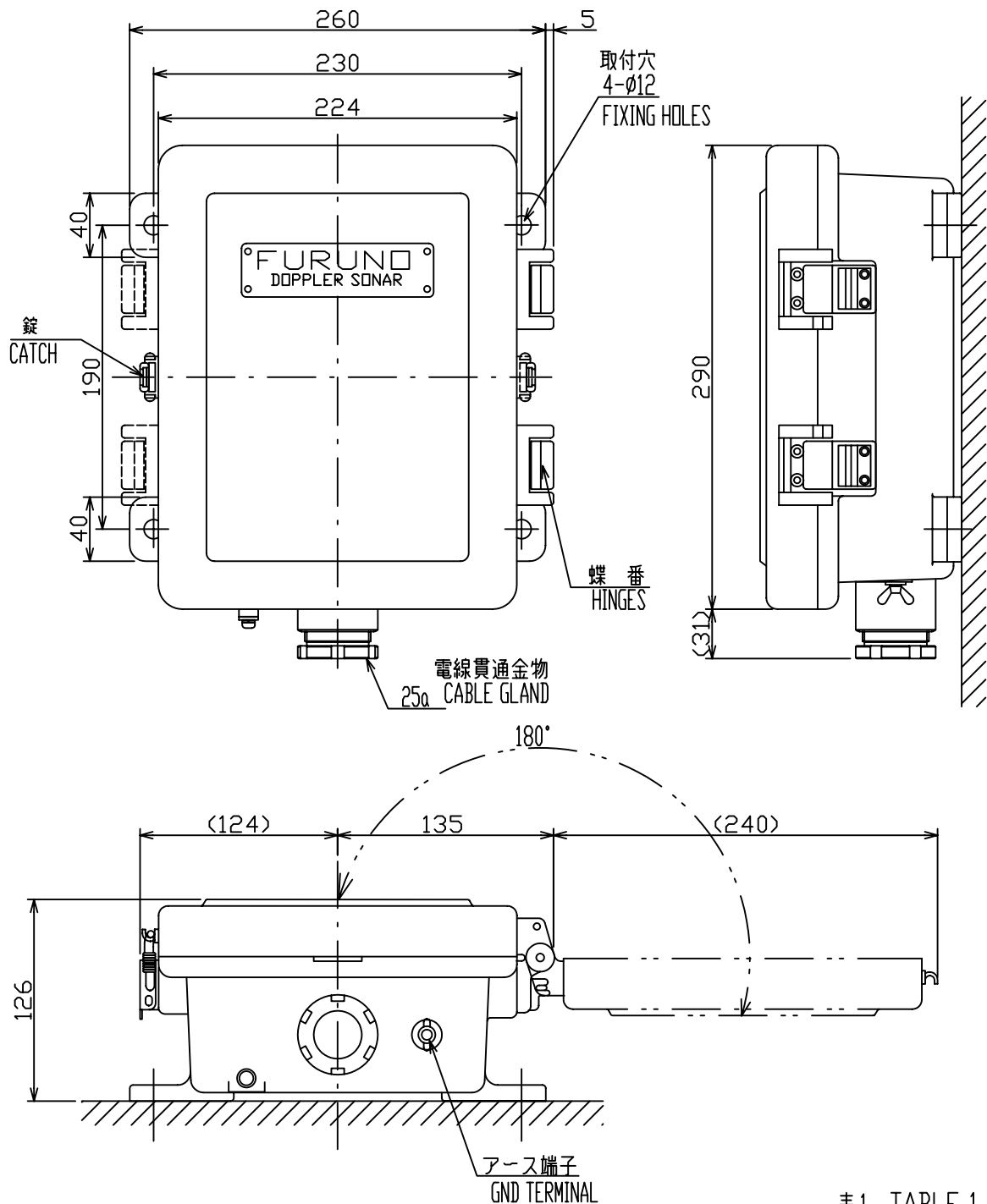
品番 ITEM		品名 NAME		材質 MATERIAL	数量 QTY	図番 DWGNO	備考 REMARKS
DRAWN Jun. 27 '01		T.YAMASAKI		TITLE DS-340			
CHECKED Jun. 27 '01		Y.KIMURA		名称 レートジャイロ変換器			
APPROVED Jun. 27 '01		Y.KIMURA		外寸図			
SCALE 1/5		MASS 6 $\pm 10\%$ kg		NAME RATE-OF-TURN GYRO			
DWG.No. C7236-G07-E				OUTLINE DRAWING			

A

B

C

D



注記

- 1) 指定なき寸法公差は表1による。
- 2) 錠と蝶番の取付位置を入れ替えることで、右開きの扉を左開きに変更できます。
また、蝶番を全て付属の錠に交換することで扉を取り外し型に変更可能。
- 3) ボルト固定部とアース端子接続部には防食対策(シーリング塗布)が必要。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. THE OPENING DIRECTION OF THE LID CAN BE CHANGED BY INTERCHANGING THE POSITION OF HINGES AND CATCH. TO MAKE THE LID DETACHABLE, REPLACE HINGES WITH CATCHES SUPPLIED.
3. APPLY SILICONE SEALANT AROUND FIXING BOLTS AND GROUNDING TERMINALS TO PREVENT RUSTING.

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

DRAWN	Feb. 9 '05	T.YAMASAKI		TITLE	DS-350
CHECKED	Feb. 9 '05	T.MATSUGUCHI		名称	デジタル指示器（壁掛型）
APPROVED	Feb. 22 '05	T.Matsuguchi	DS-30		外寸図
SCALE	1/4	MASS 7 kg		NAME	DIGITAL INDICATOR (BULKHEAD TYPE)
DWG.No.	C7236-G08- G				OUTLINE DRAWING

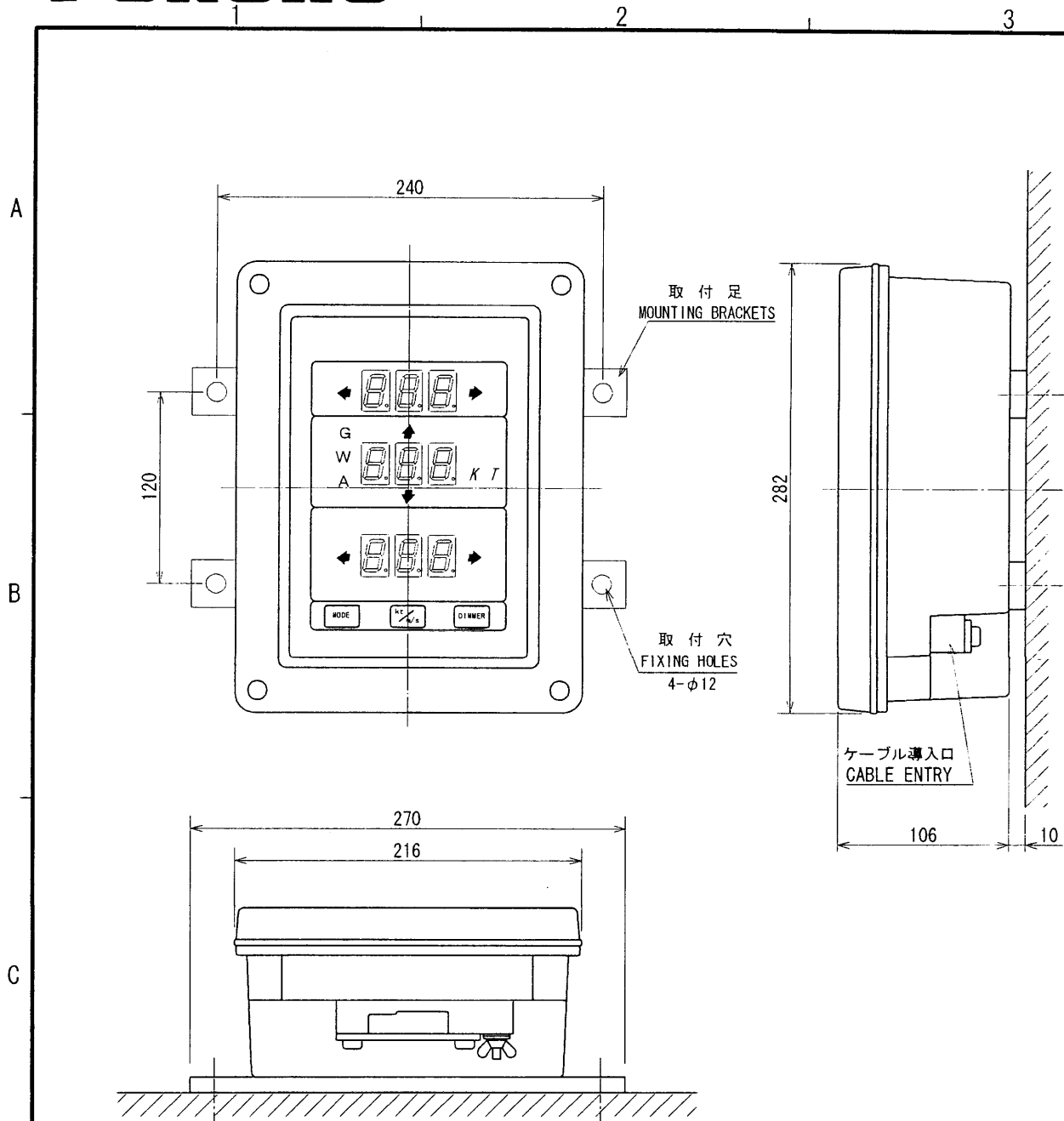


表 1 TABLE 1

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

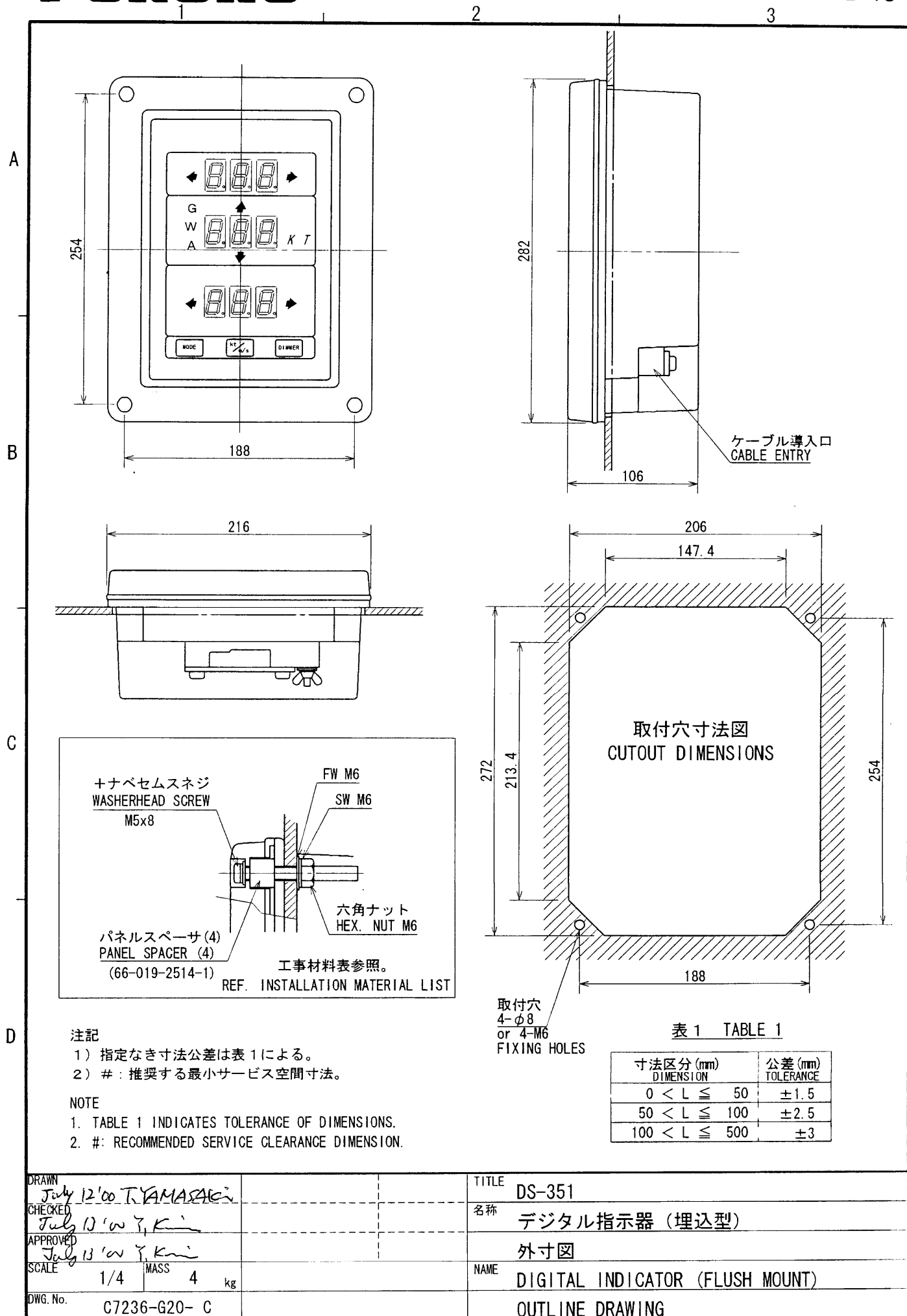
注記

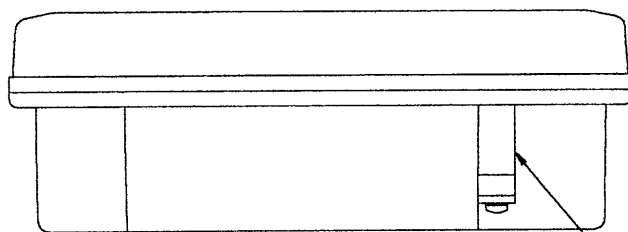
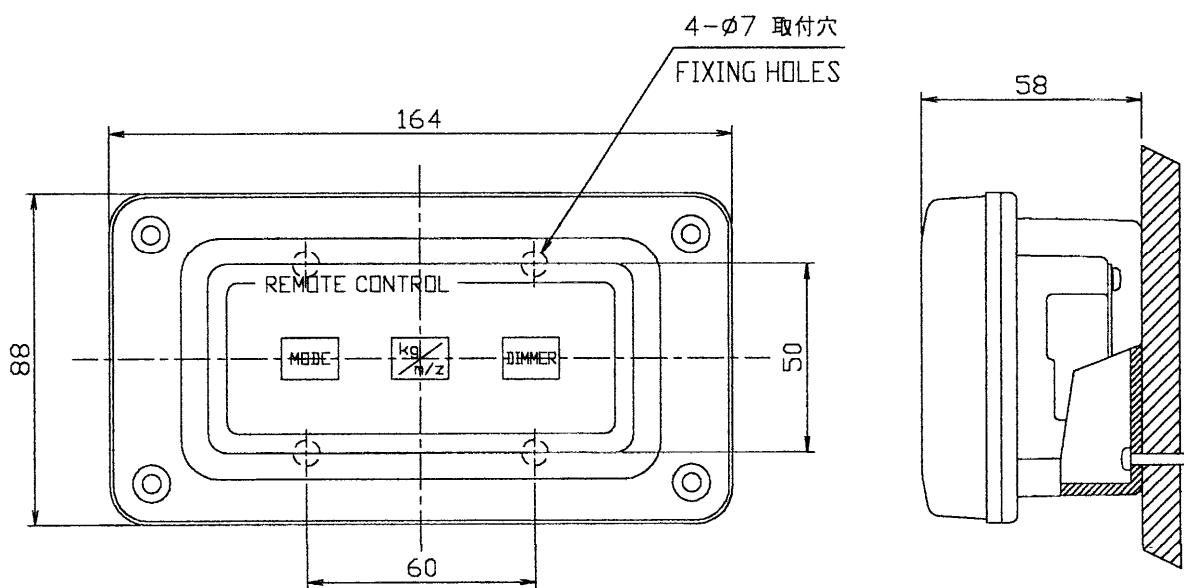
- 1) 指定なき寸法公差は表 1 による。
- 2) #: 推奨する最小サービス空間寸法。

NOTE

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

DRAWN July 7 '00 T. YAMASAKI	TITLE DS-351
CHECKED July 10 '00 T. Kuni	名称 デジタル指示器 (壁掛型)
APPROVED July 10 '00 T. Kuni	外寸図
SCALE 1/4	NAME DIGITAL INDICATOR (BULKHEAD TYPE)
MASS 4.4 kg	OUTLINE DRAWING
DWG. No. C7236-G17-C	



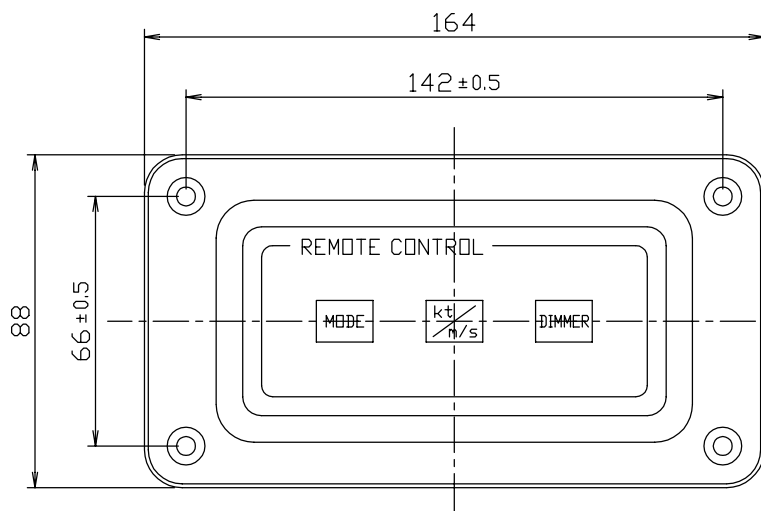
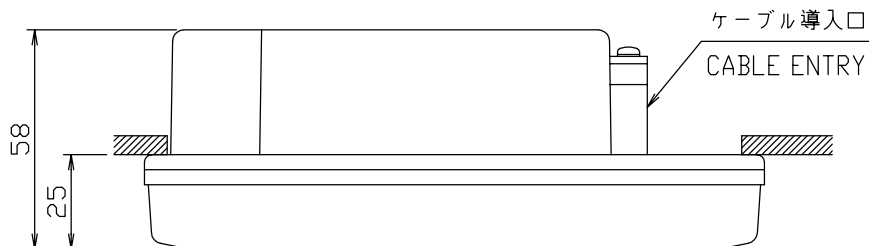


ケーブル導入口
CABLE ENTRY

品番 ITEM	品名 NAME	材質 MATERIAL	数量 QTY	図番 DWG.NO.	備考 REMARKS
DRAWN Jun. 27 '01 T.YAMASAKI		TITLE DS-359			
CHECKED Jun. 27 '01 Y.KIMURA		名称 リモート箱 (壁掛型)			
APPROVED Jun. 27 '01 Y.KIMURA		外寸図			
SCALE 1/2	MASS 0.7 ±10% kg	NAME REMOTE BOX (BULKHEAD MOUNT TYPE)			
DWG.No. C7236-G16-C		OUTLINE DRAWING			

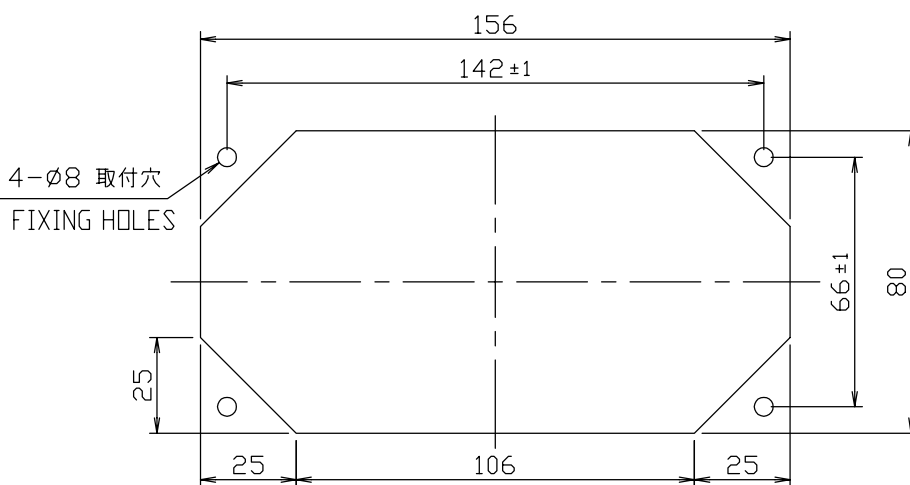
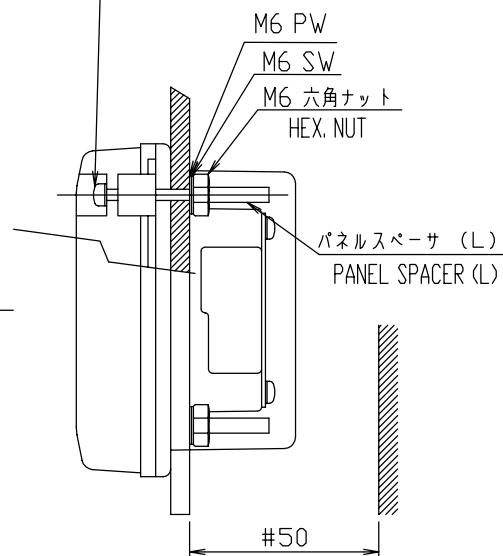
表1 TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
$L \leq 50$	± 1.5
$50 < L \leq 100$	± 2.5
$100 < L \leq 500$	± 3



WASHERHEAD SCREW
+ ナベセムスネジ M5 $\times$ 8

(ブラック処理) (BLACK)



取付穴寸法
CUTOUT DIMENSIONS

注記

- 1) 指定なき寸法公差は表1による。
- 2) #印寸法は最小サービス空間寸法を示す。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.

DRAWN	Feb. 9 '04 T. YAMASAKI		TITLE	DS-359
CHECKED	Feb. 9 '04 T. TAKENO		名称	リモート箱 (埋込装備)
APPROVED	Feb. 12 '04 H. HAYASHI	DS-30		外寸図
SCALE	1/2	MASS 0.7 $\pm$ 10% kg	NAME	REMOTE BOX (FLUSH MOUNT)
DWG. No.	C7236-G15- F			OUTLINE DRAWING

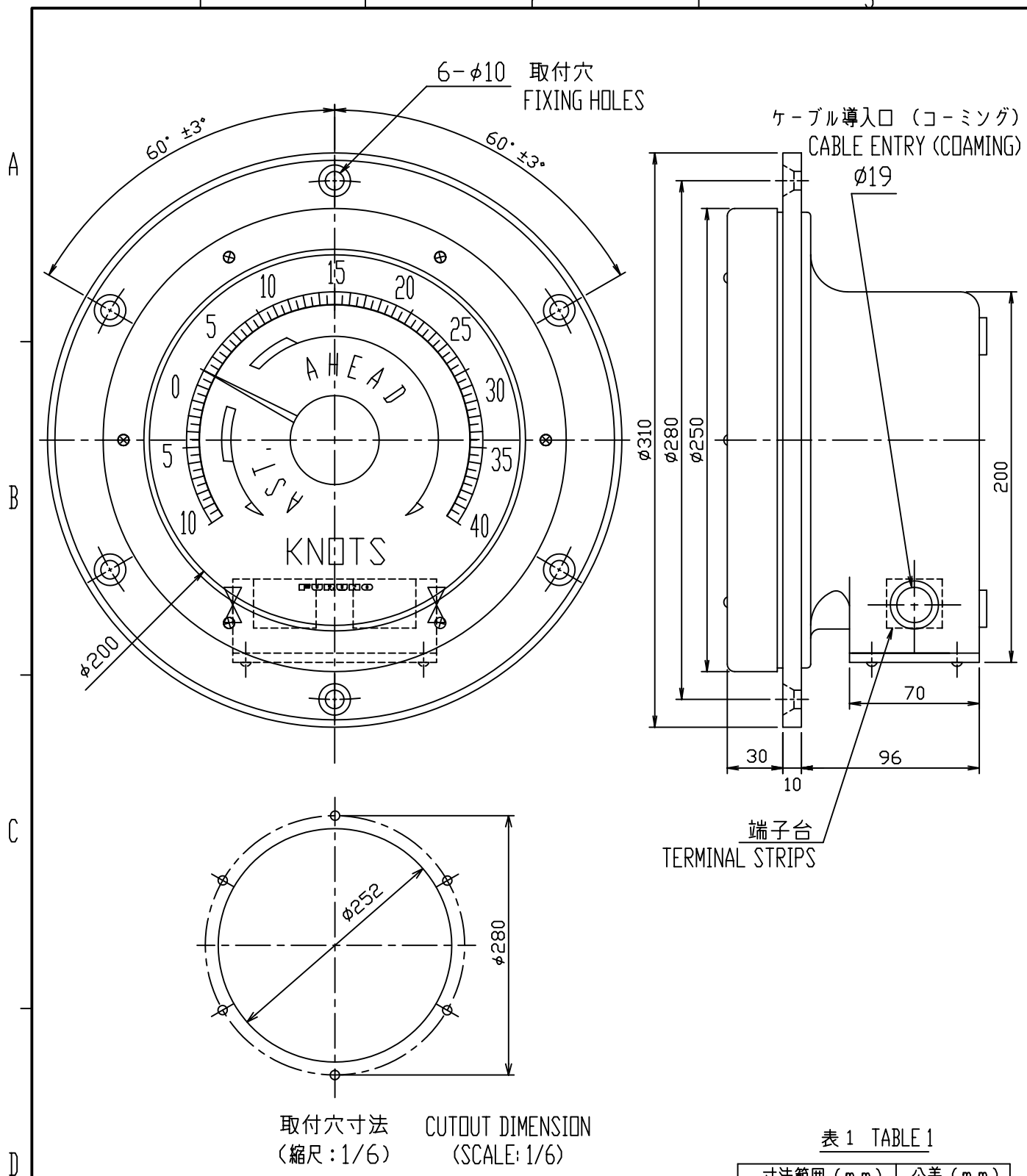


表 1 TABLE 1

寸法範囲 (mm) DIMENSION	公差 (mm) TOLERANCE
$L \leq 50$	± 1.5
$50 < L \leq 100$	± 2.5
$100 < L \leq 500$	± 3

注記

1) 指定なき寸法公差は表 1 による。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

DRAWN	Jan. 6 '06 T. YAMASAKI	TITLE	DS-381
CHECKED	Jan. 6 '06 T. TAKENO	名称	アナログ指示器 (埋込型)
APPROVED	Jan. 07 '06 T. Matsuyoshi		外寸図
SCALE	1/3	NAME	ANALOG INDICATOR (FLUSH MOUNT)
DWG.No.	C7236-G19-E		OUTLINE DRAWING

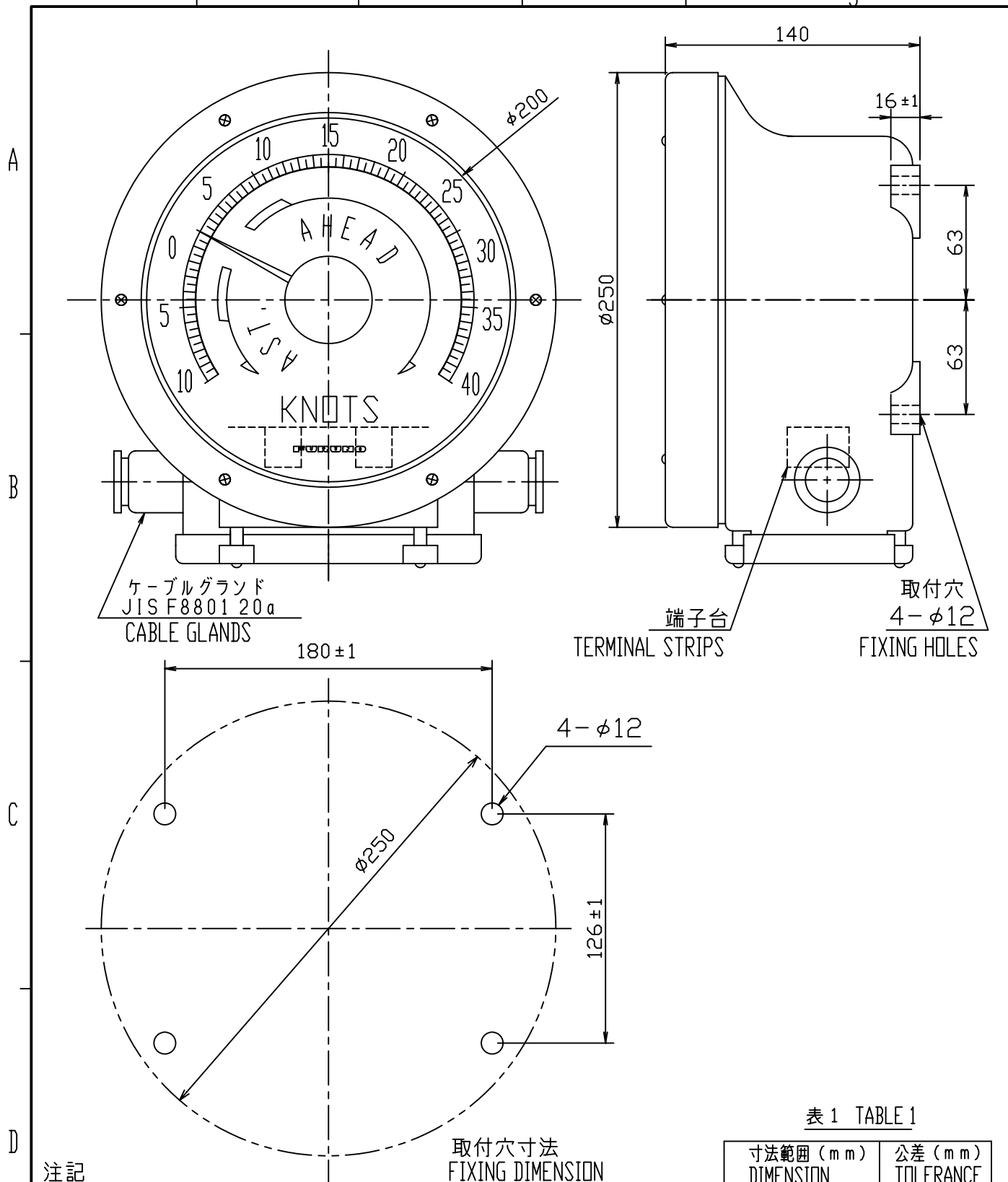


表 1 TABLE 1

寸法範囲 (mm) DIMENSION	公差 (mm) TOLERANCE
$L \leq 50$	± 1.5
$50 < L \leq 100$	± 2.5
$100 < L \leq 500$	± 3

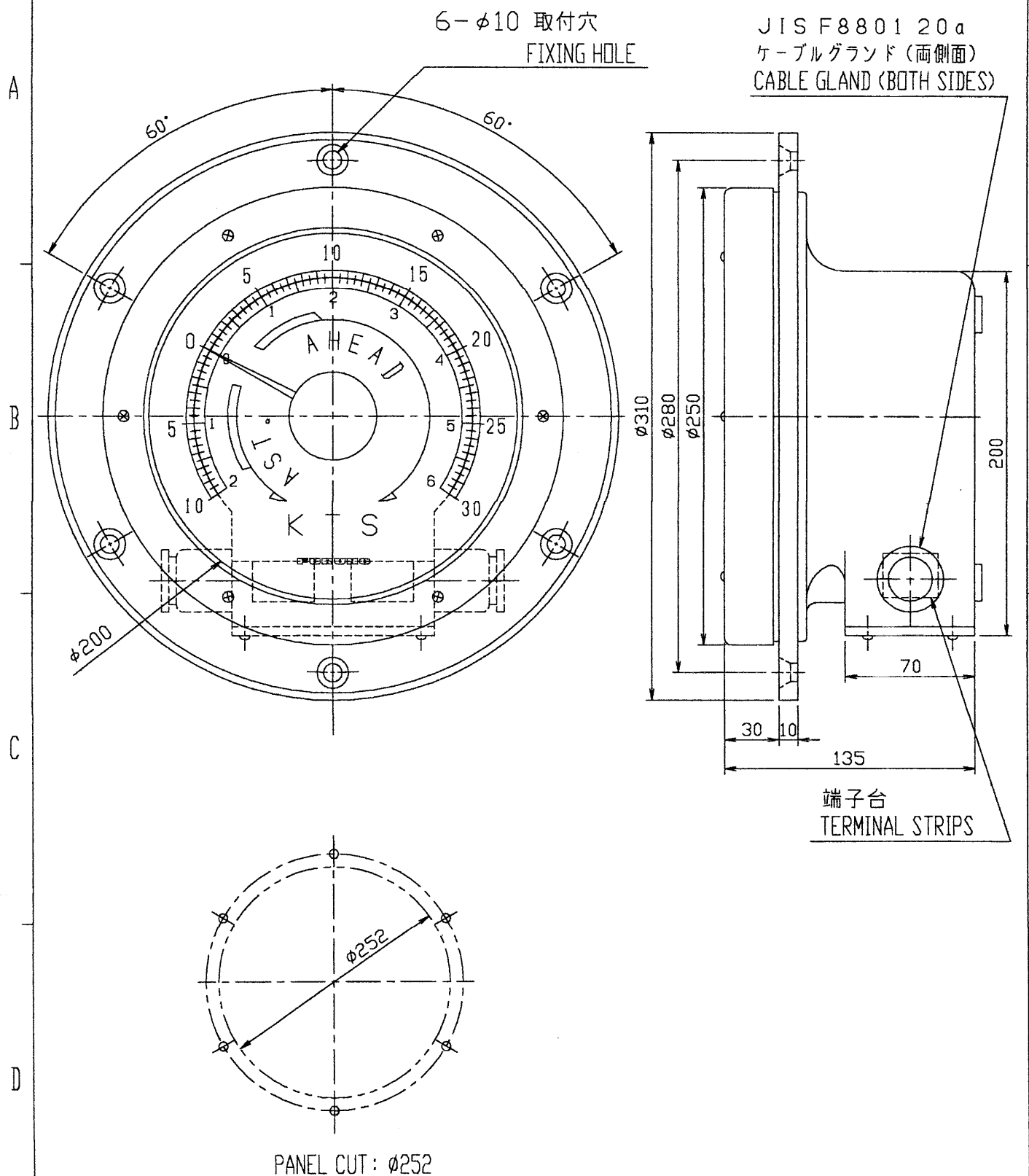
注記

1) 指定なき寸法公差は表 1 による。

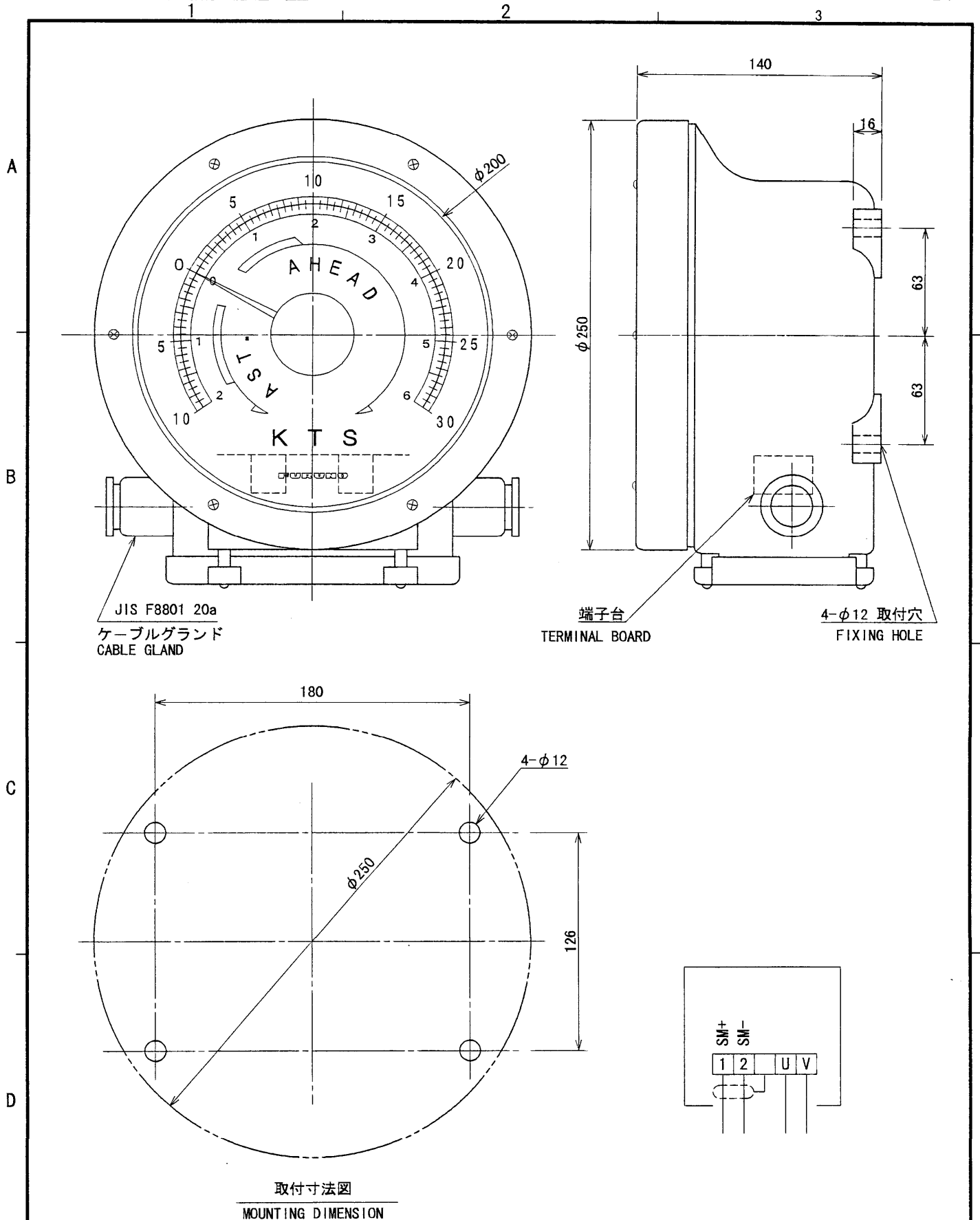
NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

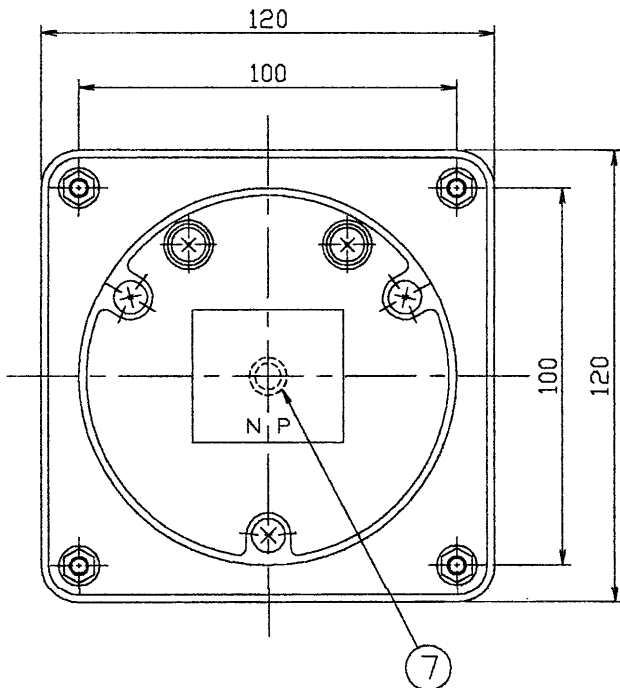
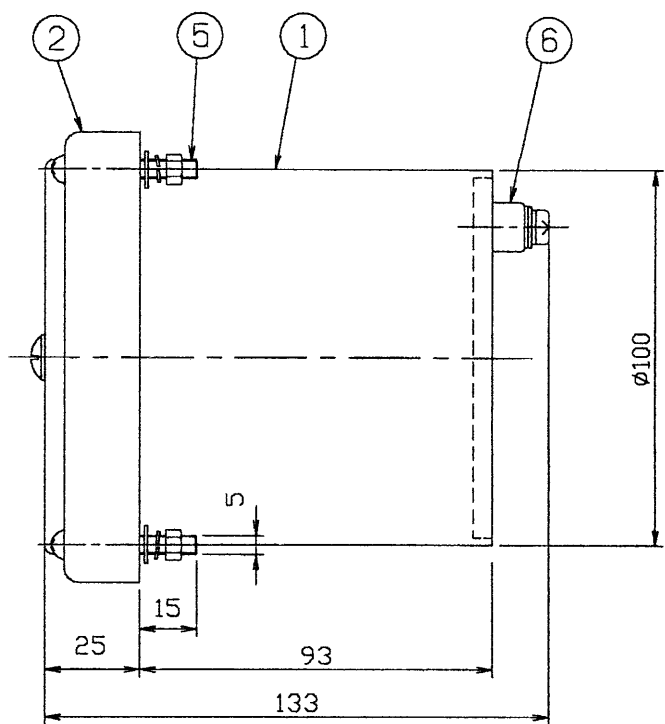
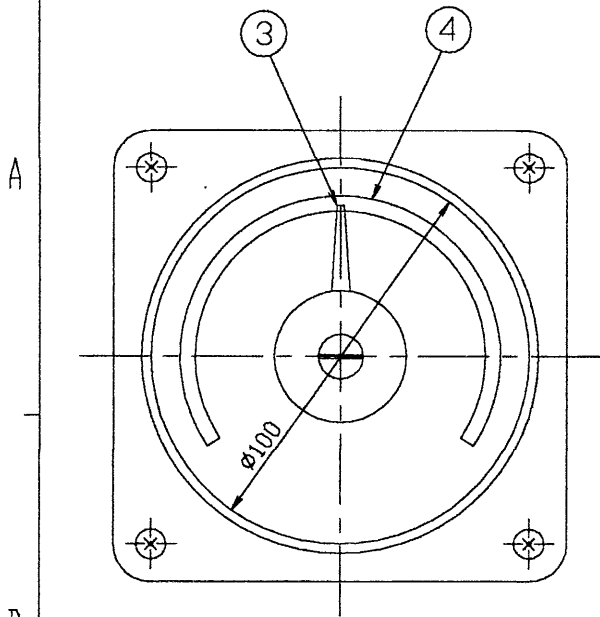
DRAWN Jan. 6 '06 T. YAMASAKI		TITLE DS-382
CHECKED Jan. 6 '06 T. TAKENO		名称 アナログ指示器 (壁掛型)
APPROVED Jan. 07 '06 T. Matsuyoshi		外寸図
SCALE 1/3 MASS 6.0 $\pm 10\%$ kg		NAME ANALOG INDICATOR (BULKHEAD MOUNT)
DWG.No. C7236-G18-D		OUTLINE DRAWING



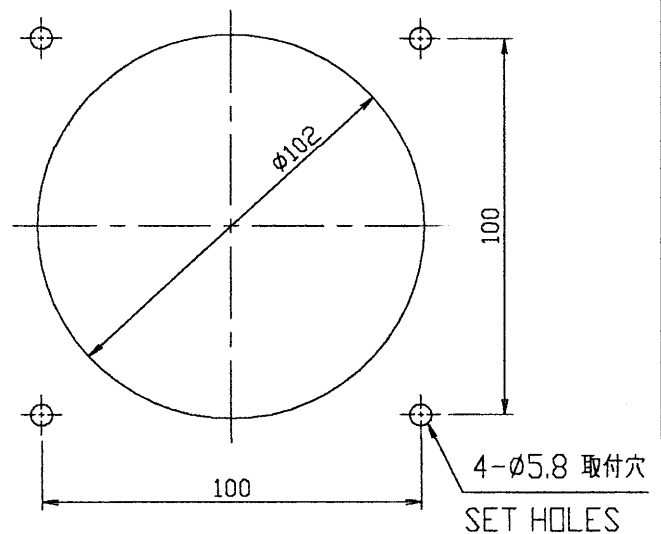
DRAWN Jun. 27' 01	T. YAMASAKI		TITLE MF-22A-1
CHECKED Jun. 27' 01	Y. KIMURA		名称 アナログ指示器(埋込型)
APPROVED Jun. 27' 01	Y. KIMURA		外寸図
SCALE 1/3	MASS 6.4 ±10% kg		NAME ANALOGUE DISPLAY UNIT (FLUSH MOUNT)
DWG.No. C7213-009-C			OUTLINE DRAWING



DRAWN Feb. 9 '01 T. YAMASAKI		TITLE MF-22A-2	
CHECKED Feb. 9 '01 Y. Kuni		名称 アナログ指示器 (壁掛型)	
APPROVED Feb. 9 '01 Y. Kuni		外寸図	
SCALE 1/3	MASS 6 $\pm 10\%$ kg	NAME ANALOGUE DISPLAY UNIT (BULKHEAD MOUNT)	
DWG. No. C7213-010- B		OUTLINE DRAWING	



パネル取付工事図
PANEL CUT



PARTICULARS (特性)	
TYPE (型式)	MOVING COIL (可動線巻型)
VOLTAGE (電圧)	1V
CURRENT (特性)	10mA

7	調整器 ADJUSTOR		1		
6	端子 TERMINAL		2		
5	取付ネジ SET SCREW	BSBW ₂ BRASS BAR	4		
4	目盛板 DIAL	合成樹脂 SHEET RESIN	1		
3	指針 POINTER	Al Pz ALUMINUM PLATE	1		
2	フタ COVER	合成樹脂 SHEET RESIN	1		
1	本体 BODY	合成樹脂 SHEET RESIN	1		
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	備考 REMARKS

DRAWN
Jun. 27 '01 T. YAMASAKI
CHECKED
Jun. 27 '01 Y. KIMURA
APPROVED
Jun. 27 '01 Y. KIMURA
SCALE
1/2 MASS ±10%
1.3 kg
DWG. No. C7213-079-E

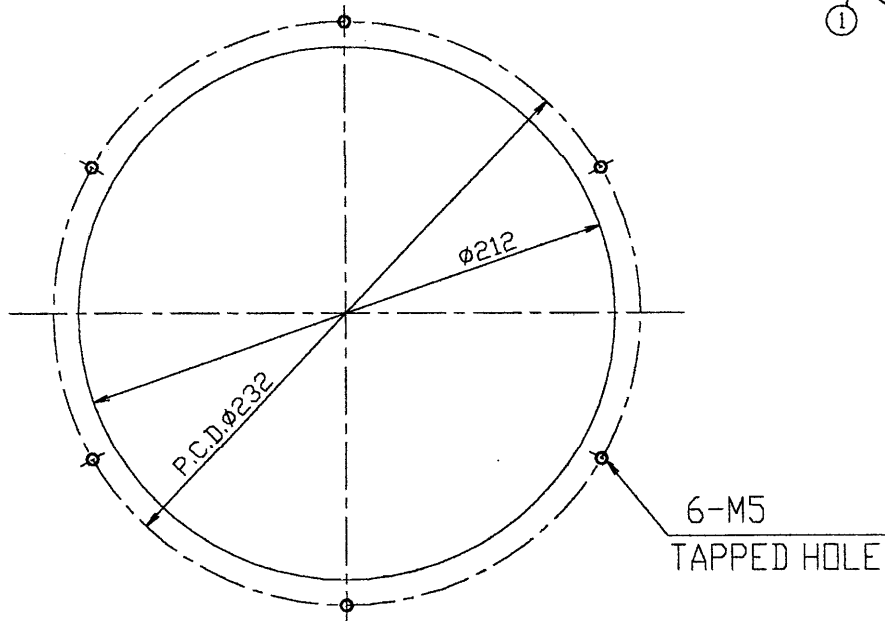
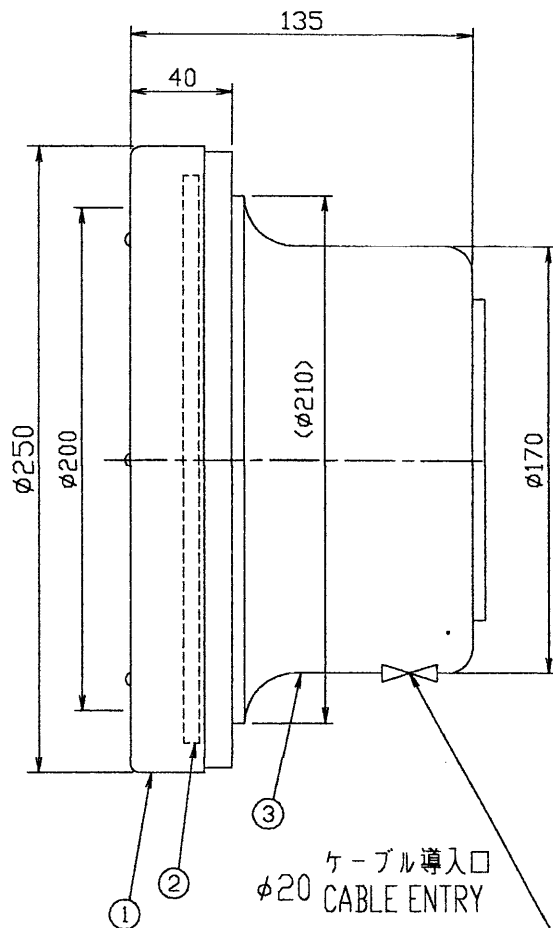
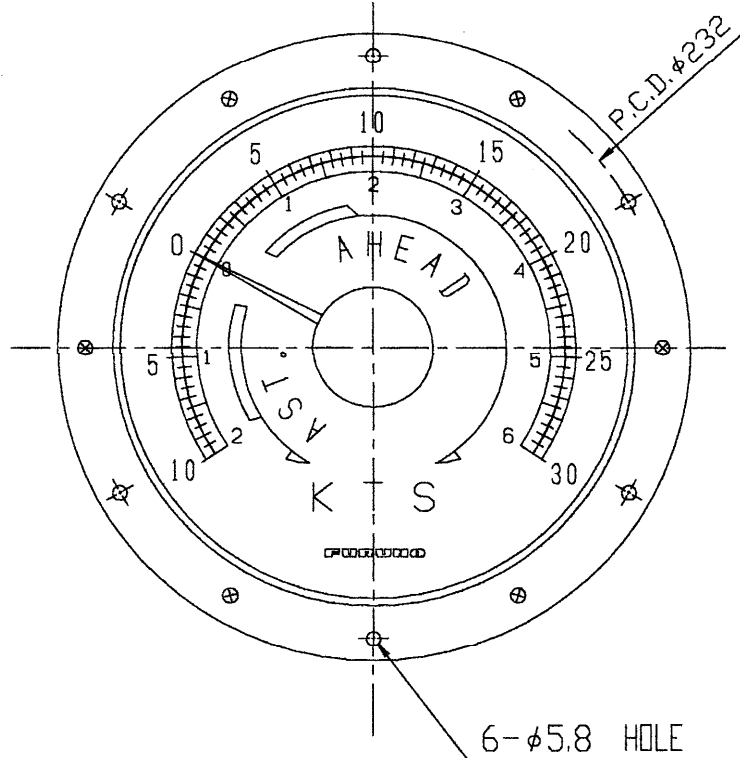
TITLE
MF-22A-3
名称
アナログ指示器 (パネル埋込型)
外寸図
NAME
ANALOGUE DISPLAY UNIT (FLUSH MOUNT)
OUTLINE DRAWING

A

B

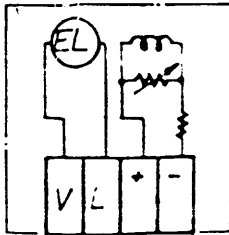
C

D

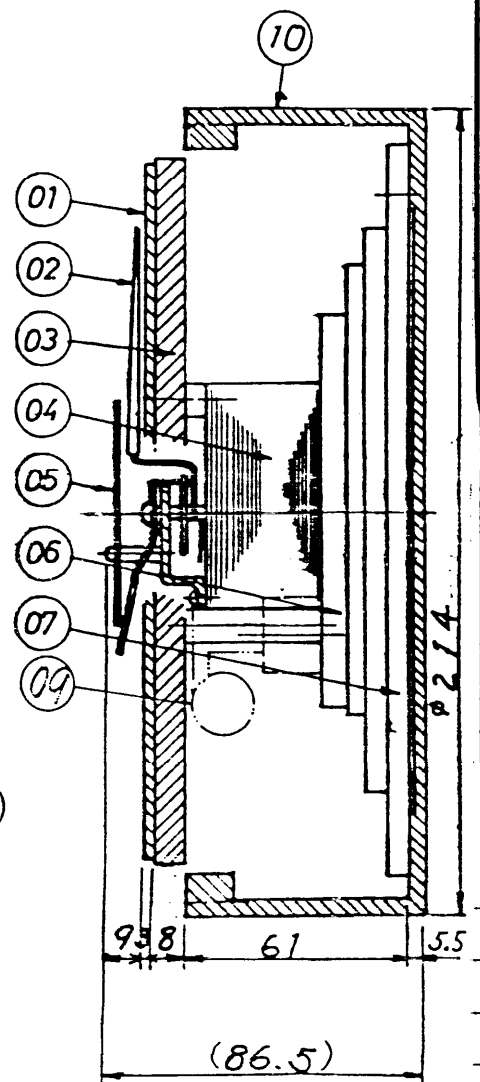
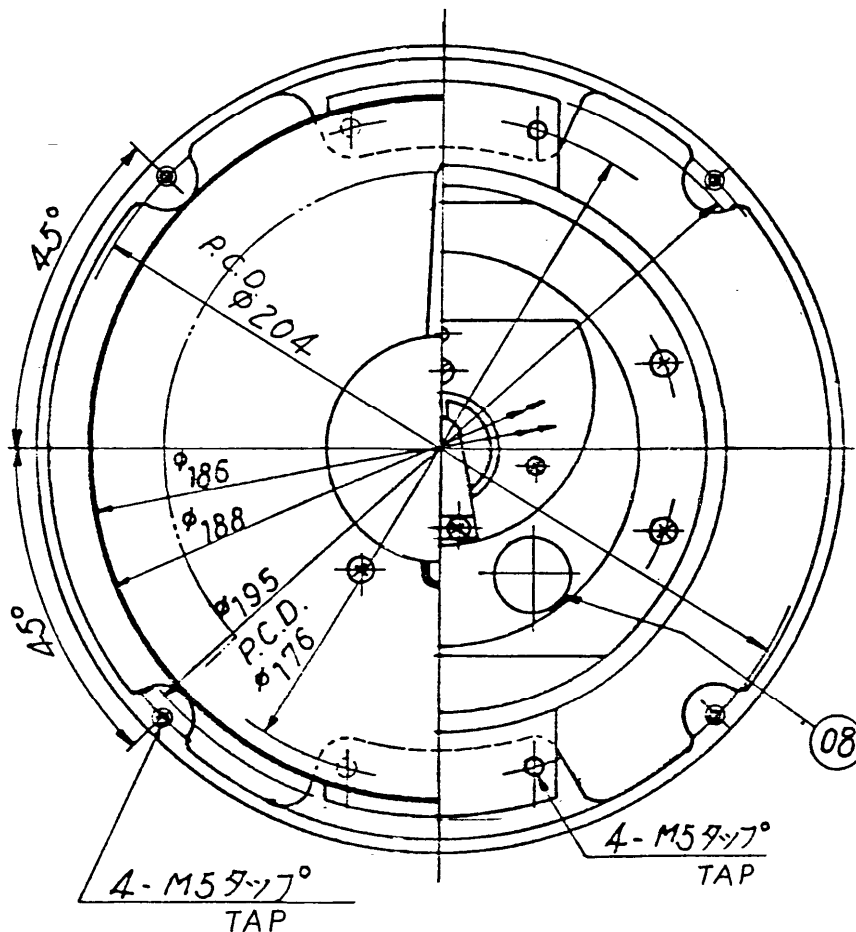


取付寸法図
FIXING DIMENSION

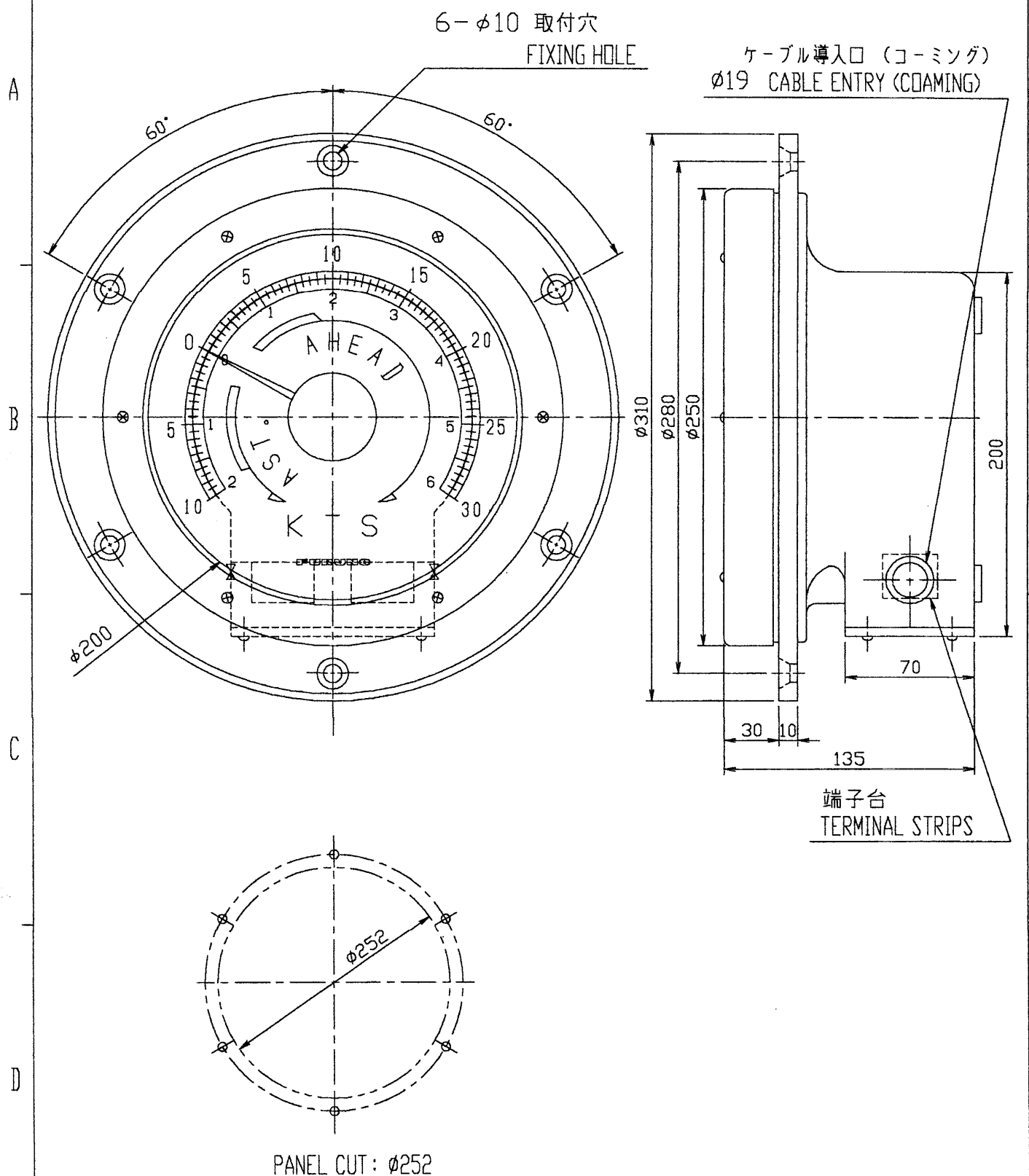
3	本体 BODY	AC7AF	1		
2	E.L.板 E.L. PLATE		1		
1	フタ COVER	AC7AF	1		
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	備考 REMARKS
DRAWN Jun. 27' 01	T. YAMASAKI	TITLE MF-22A-4			
CHECKED Jun. 27' 01	Y. KIMURA	名称 アナログ指示器 (埋込型)			
APPROVED Jun. 27' 01	Y. KIMURA	外寸図			
SCALE 1/3	MASS ±10% 4.4 kg	NAME ANALOGUE DISPLAY UNIT (FLUSH MOUNT)			
DWG.No.	C7213-096-D	OUTLINE DRAWING			



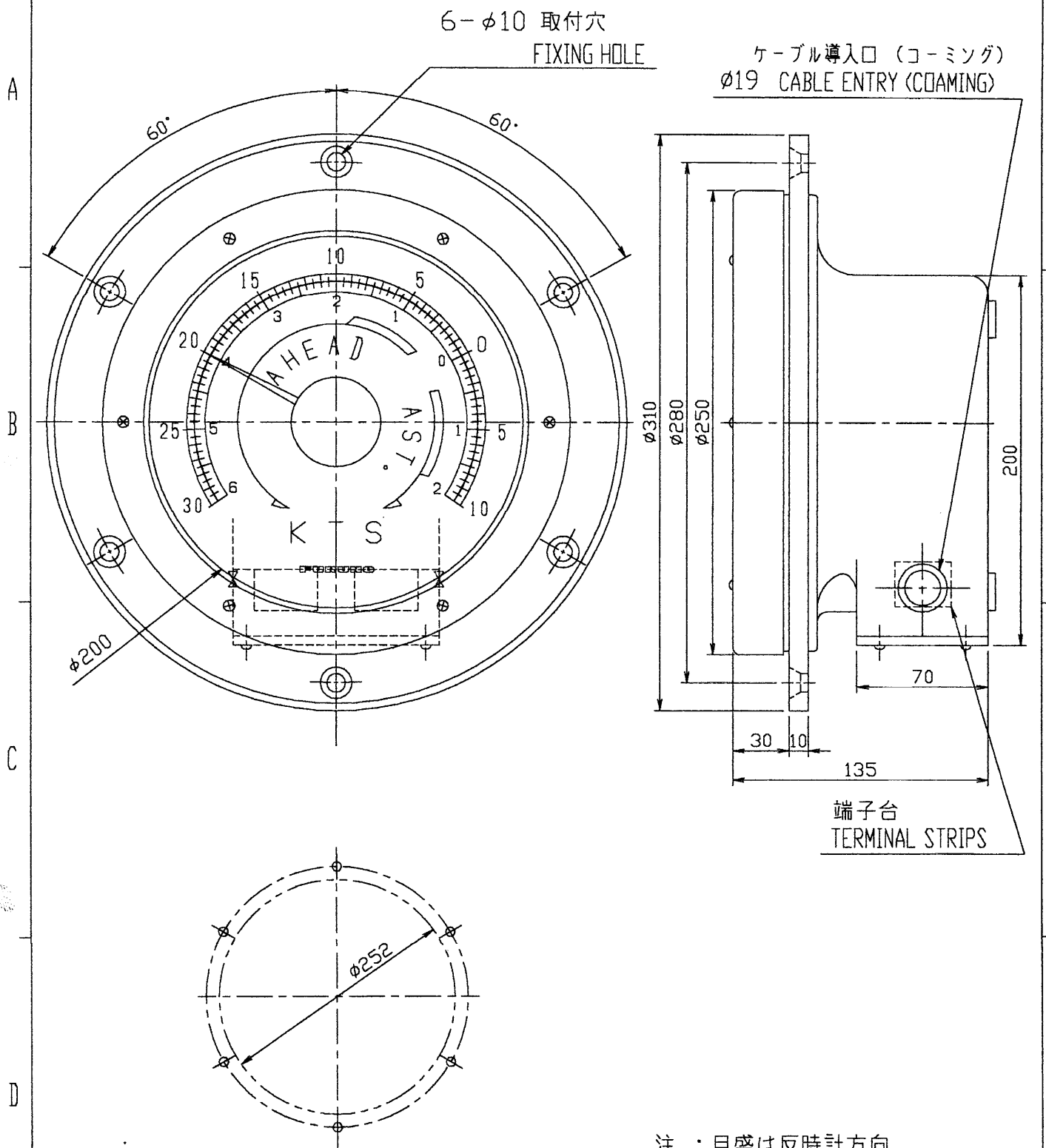
NO	NAME OF PARTS(名称)	NO. REQ.	MATERIAL(材質)	REMARKS(注記)
01	DIAL (目盛板)	1	SHEET RESIN	
02	POINTER (指針)	1	ALUMINUM PLATE A3P2	
03	EL PLATE (E.L.板)	1		
04	METER ELEMENT (メータ)	1		
05	BLIND COVER (盲フタ)	1	ALUMINUM PLATE A3P2	
06	BASE (ベース)	1	SHEET RESIN	
07	SET PLATE (取付板)	1	ALUMINUM ALLOY CASTING.	AC7AF
08	RESISTOR (補償線輪)	2		
09	— DO. — (—)	1		
10	COVER (カバー)	1	ALUMINUM ALLOY CASTING.	AC7AF



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 MF-22A-5	図番 C7213-036-E(4KI-20297-5)		
検図 CHECKED	尺度 SCALE 1/2	名称 アナログ指示器外觀図 ANALOG DISPLAY UNIT			
製図 DRAWN	重量 WEIGHT 2.8 kg	図番 DWG. NO.			



DRAWN Jun. 27' 01 T. YAMASAKI		TITLE MF-22A-6
CHECKED Jun. 27' 01 Y. KIMURA		名称 アナログ指示器 (埋込型)
APPROVED Jun. 27' 01 Y. KIMURA		外寸図
SCALE 1/3 MASS ±10% 6.0 kg		NAME ANALOGUE DISPLAY UNIT (FLUSH MOUNT)
DWG.No. C7213-111-C		OUTLINE DRAWING



注 : 目盛は反時計方向。
NOTE : DIRCTION OF SCALE IS CCW.

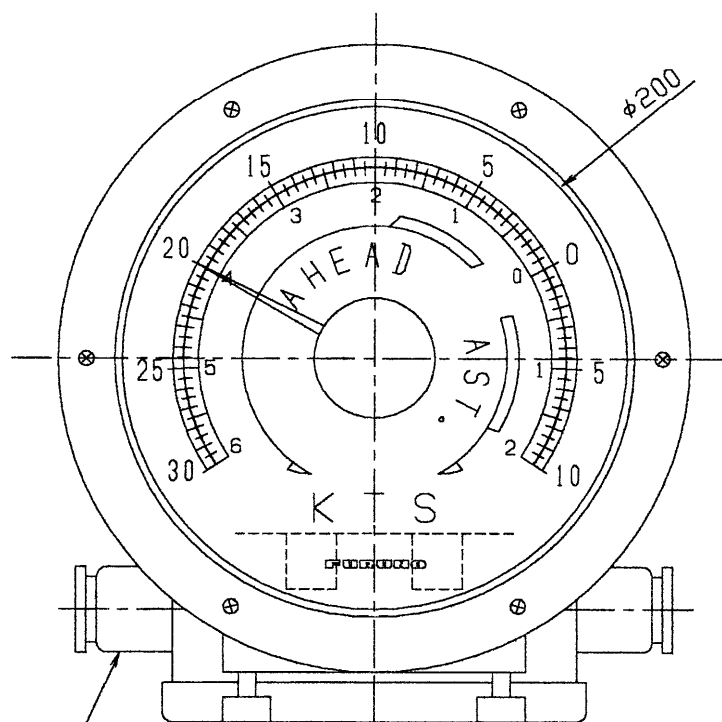
DRAWN Jun. 27' 01 T. YAMASAKI		TITLE MF-22A-7
CHECKED Jun. 27' 01 Y. KIMURA		名称 アナログ指示器 (埋込型)
APPROVED Jun. 27' 01 Y. KIMURA		外寸図
SCALE 1/3 MASS 6.0 ±10% kg		NAME ANALOGUE DISPLAY UNIT (FLUSH MOUNT)
DWG.No. C7213-120-E		OUTLINE DRAWING

A

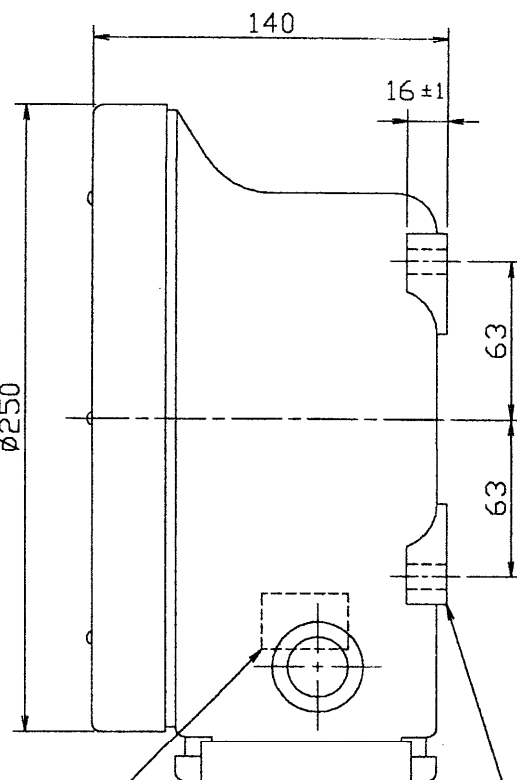
B

C

D

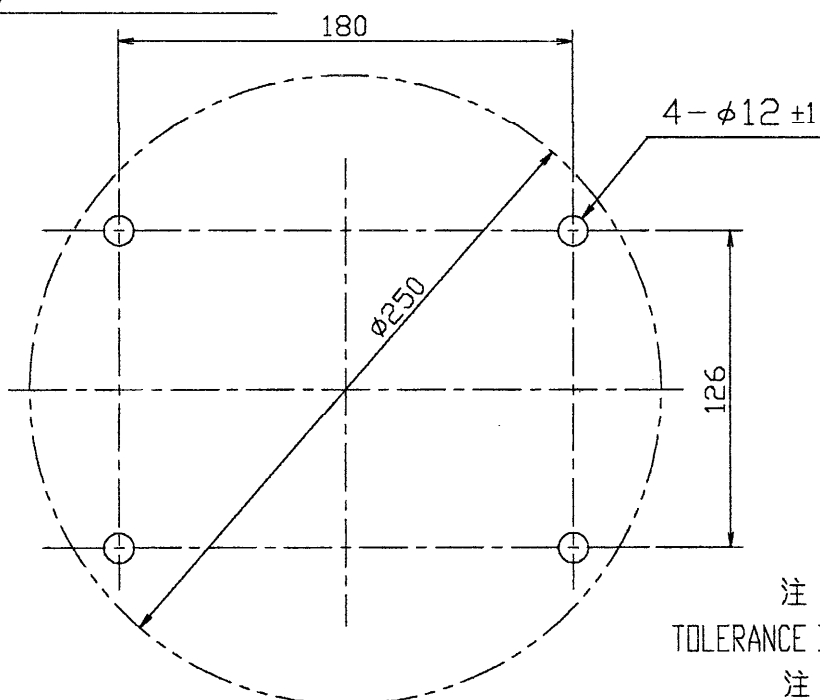


JIS F8801 20a
ケーブルグラウンド
CABLE GLAND



端子台
TERMINAL STRIPS

4- $\phi 12$ 取付穴
FIXING HOLE



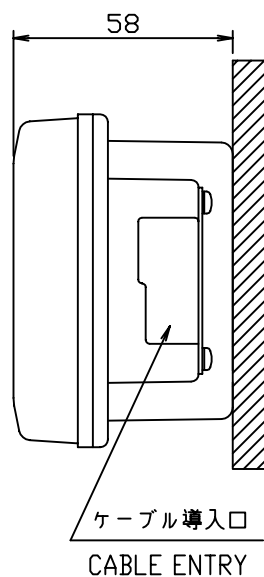
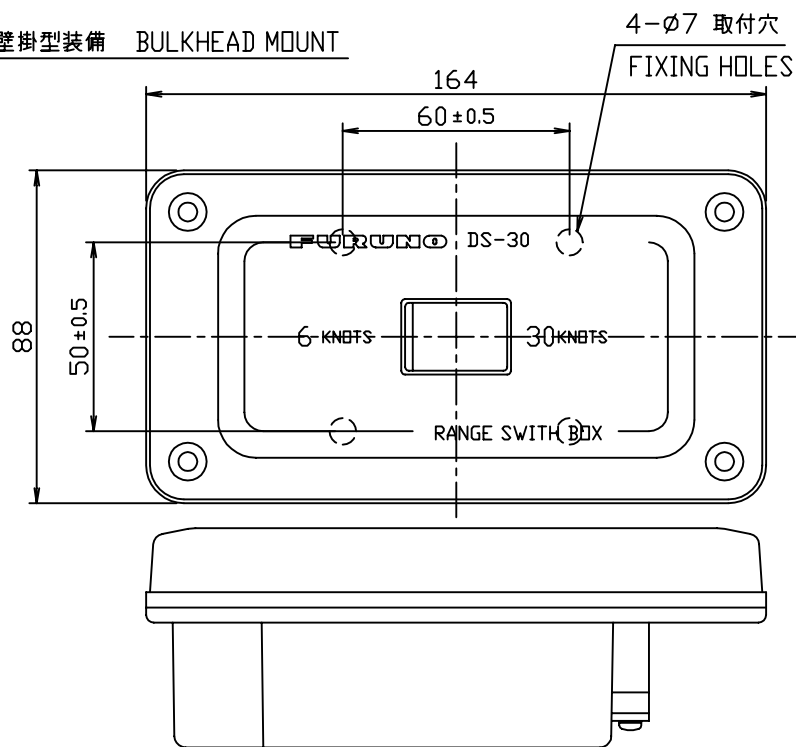
取付寸法図
FIXING DIMENSION

注 1 : 指定なき公差は 1.5 %
TOLERANCE IS 1.5% UNLESS OTHERWISE SPECIFIED.

注 2 : 目盛は反時計方向
NOTE 2 : DIRECTION OF SCALE IS CCW.

DRAWN Jun. 27' 01 T. YAMASAKI		TITLE MF-22A-8
CHECKED Jun. 27' 01 Y. KIMURA		名称 アナログ指示器 (壁掛型)
APPROVED Jun. 27' 01 Y. KIMURA		外寸図
SCALE 1/3 MASS $\pm 10\%$ 6.0 kg		NAME ANALOGUE DISPLAY UNIT (BULKHEAD MOUNT)
DWG.No. C7213-133-C		OUTLINE DRAWING

壁掛型装備 BULKHEAD MOUNT



埋込型装備 FLUSH MOUNT

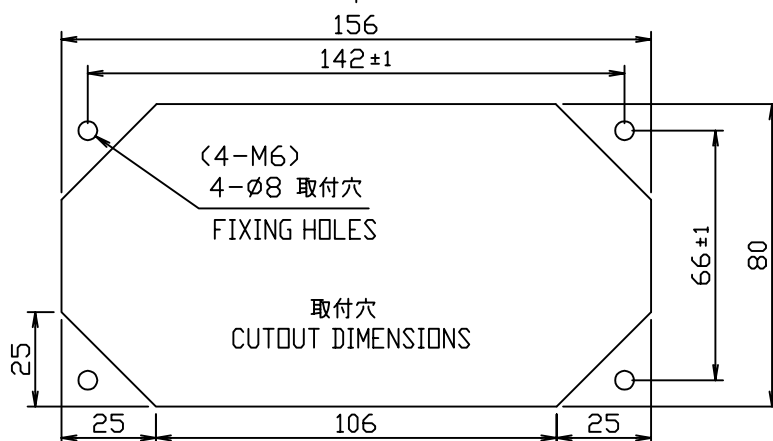
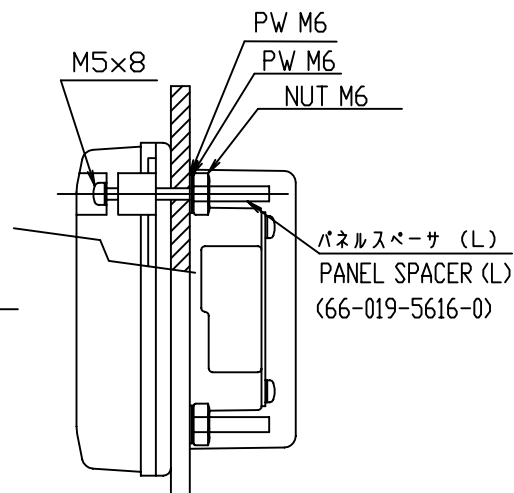
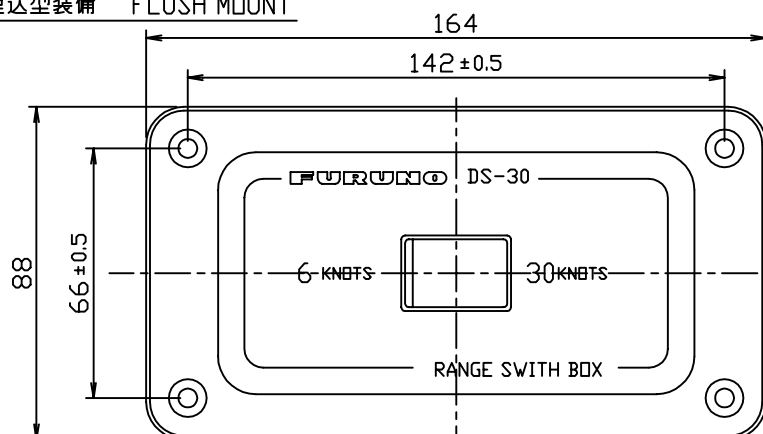


表 1 TABLE 1

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。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

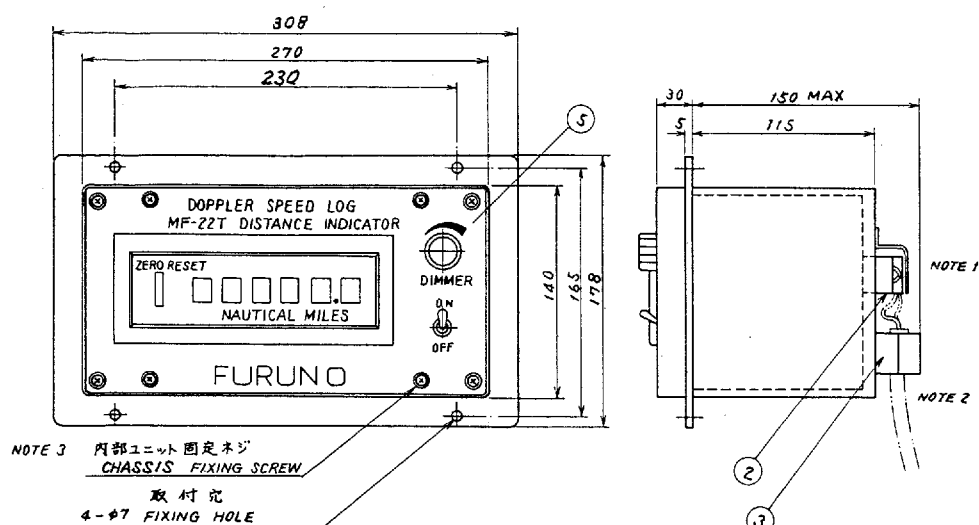
DRAWN May 20 '04 T.YAMASAKI		TITLE DS-389
CHECKED May 20 '04 T.TAKENO		名称 レンジ切換器
APPROVED May 20 '04 R. Matsuyuchi		外寸図
SCALE 1/2	MASS 0.7 ±10% kg	NAME RANGE SWITCH BOX
DWG.No. C7236-G22-D		OUTLINE DRAWING

FURUNO

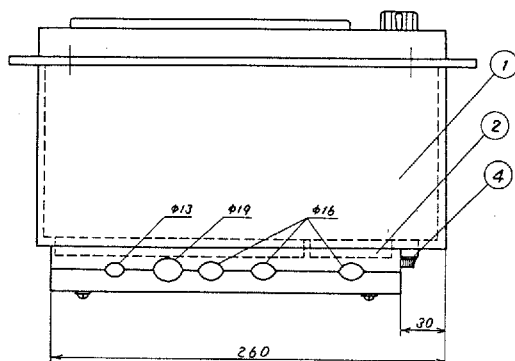
2

3

A



B



C

- NOTE 1. 固定金具から端子台までのケーブルには約 250mm の弛みを持たせる。
TO ENABLE THE CHASSIS TO BE DRAWN OUT, ALLOW WIRES OF APPROX. 250mm LONG BETWEEN CABLE CLAMP AND TERMINAL STRIP.
2. ケーブルの鎧装は塗装を取除いてクランプで締めつける。
CABLE ARMOR SHOULD BE CLAMPED TIGHTLY AFTER REMOVING THE PAINT.
3. 内部ユニット固定ネジ(黒色)をゆるめると内部のユニットのみ端子台ごと取出すことができます。
LOOSEN BLACK SCREWS TO DRAW OUT CHASSIS.

D

5	表示パネル DISPLAY PANEL	SPCC	1		
4	ヒューズホルダー FUSE HOLDER		1		
3	ケーブル固定金具 CABLE CLAMP	A5052B	1		
2	端子台 TERMINAL BOARD		2		TB1, TB2
1	ケース本体 HOUSING	SPCC	1		
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認
APPROVEDAPR. 29. '81
K. Kondo三角法
THIRD ANGLE PROJECTION名称
TITLE

航程計(埋込型)外觀図

検図
CHECKEDAPR. 29. '81
A. Kondo尺度
SCALE

1/5

MF-22T-1

OUTLINE OF DISTANCE INDICATOR
(FLUSH MOUNT)製図
DRAWNAPR. 28. '81
S. Kondo重量
WEIGHT

6.0 kg

図番
DWG.NO.

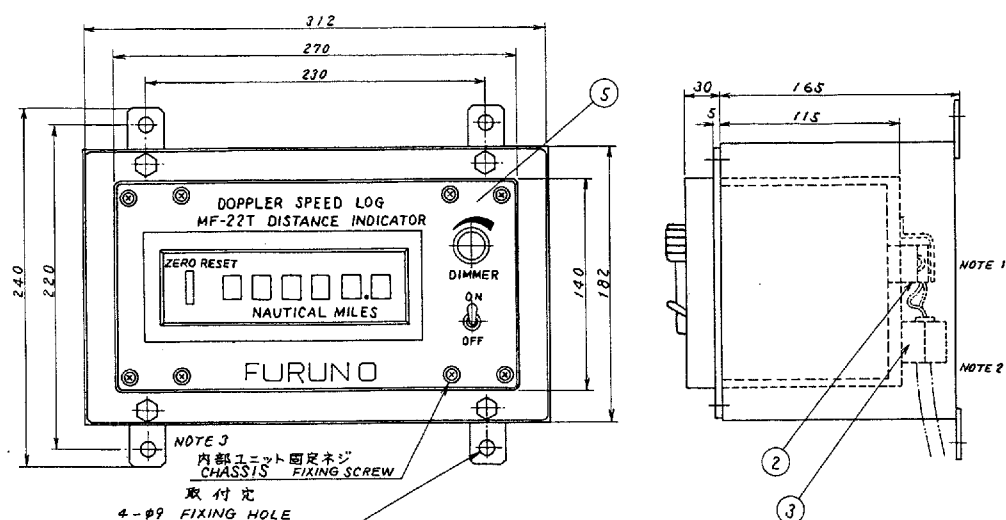
C7213-089-B

FURUNO

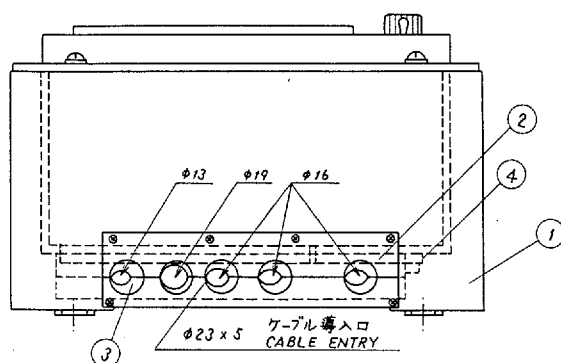
2

3

A



B



C

- NOTE 1. 固定金具から端子台までのケーブルには約 250mm の弛みを持たせる。
TO ENABLE THE CHASSIS TO BE DRAWN OUT, ALLOW WIRES OF APPROX. 250mm LONG BETWEEN CABLE CLAMP AND TERMINAL STRIP.
2. ケーブルの鎧装は塗装を取除いてクランプで締めつける。
CABLE ARMOR SHOULD BE CLAMPED TIGHTLY AFTER REMOVING THE PAINT.
3. 内部ユニット固定ネジ (黒色) をゆるめると内部のユニットのみ端子台ごと取出すことができます。
LOOSEN BLACK SCREWS TO DRAW OUT CHASSIS.

D

5	表示パネル DISPLAY PANEL	SPCC	1		
4	ヒューズホルダー FUSE HOLDER		1		
3	ケーブル固定金具 CABLE CLAMP	A5052B	1		
2	端子台 TERMINAL BOARD		2		TB1, TB2
1	ケース本体 HOUSING	SPCC	1		
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

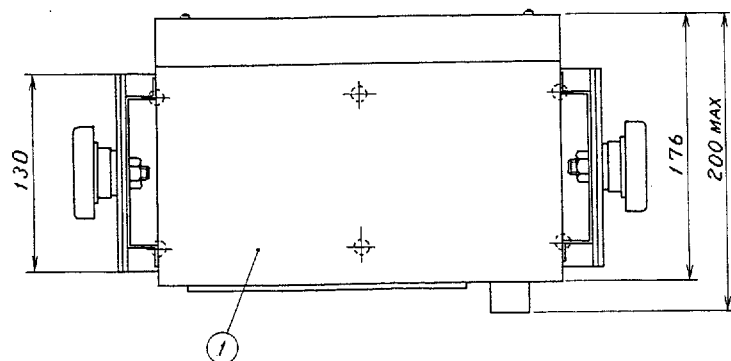
承認 APPROVED	APR. 29 '81 K. Kato	三角法 THIRD ANGLE PROJECTION	名称 TITLE	航程計(壁掛型)外觀図 OUTLINE OF DISTANCE INDICATOR	
検図 CHECKED	APR. 29 '81 A. A. A.	尺度 SCALE	MF-22T-2	(BULKHEAD MOUNT)	
製図 DRAWN	APR. 28 '81 S. Haganawa	重量 WEIGHT	9.0 kg	図番 DWG.NO.	C7213-092-A

FURUNO

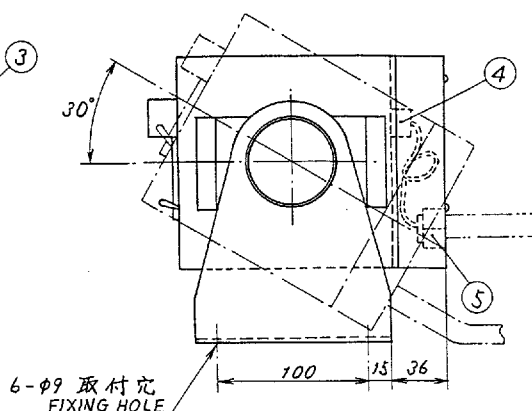
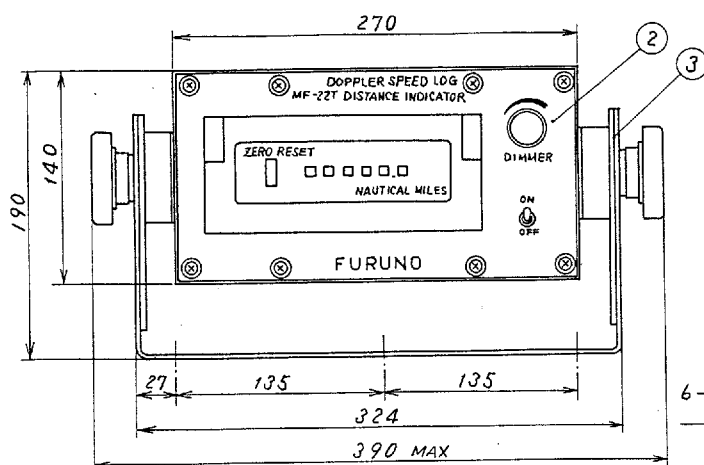
2

3

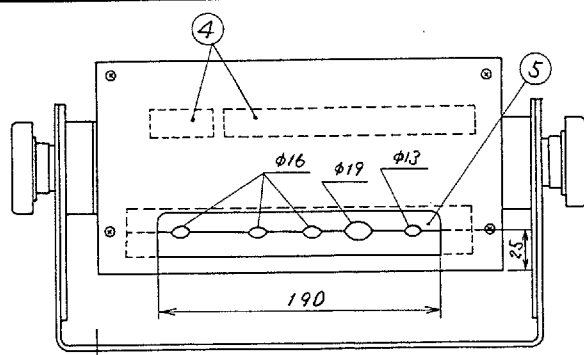
A



B



C



背面図
REAR VIEW

NOTE 1. 固定金具から端子台までのケーブルには約250 mmの弛みを持たせる。

TO ENABLE THE CHASSIS TO BE DRAWN OUT, ALLOW WIRES OF APPROX. 250mm LONG BETWEEN CABLE CLAMP AND TERMINAL STRIP.

2. ケーブルの鎧装は塗装を取り除いてクランプで締めつける。

CABLE ARMOR SHOULD BE CLAMPED TIGHTLY AFTER REMOVING THE PAINT.

D

5	ケーブル固定金具 CABLE CLAMP	A5052B	1		
4	端子台 TERMINAL STRIP		2		TB1, TB2
3	取付台 MOUNTING BRACKET	SPCC	1		
2	表示パネル DISPLAY PANEL	SPCC	1		
1	ケース本体 HOUSING	SPCC	1		
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認
APPROVEDJUL. 28. '81
K. Kato三角法
THIRD ANGLE PROJECTION名称
TITLE

MF-22T-3

航程計(卓上型)外觀図

OUTLINE OF DISTANCE INDICATOR
(TABLE TOP MOUNT)検
CHECKEDJuly. 28. '81
K. Kato尺 度
SCALE

1/5

製
DRAWNJuly. 28. '81
S. Hayawa重 量
WEIGHT

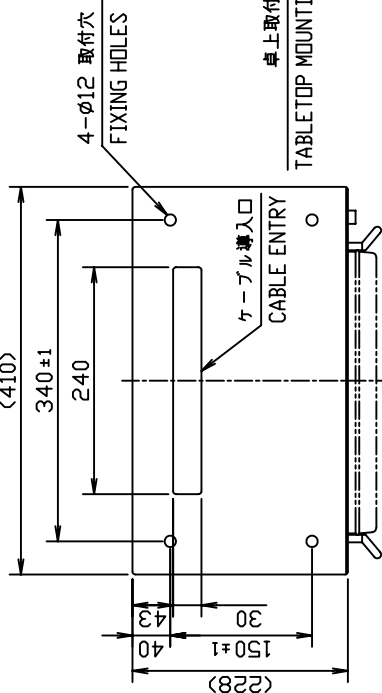
6.0 kg

図 番
DWG.NO.

C7213-113-B

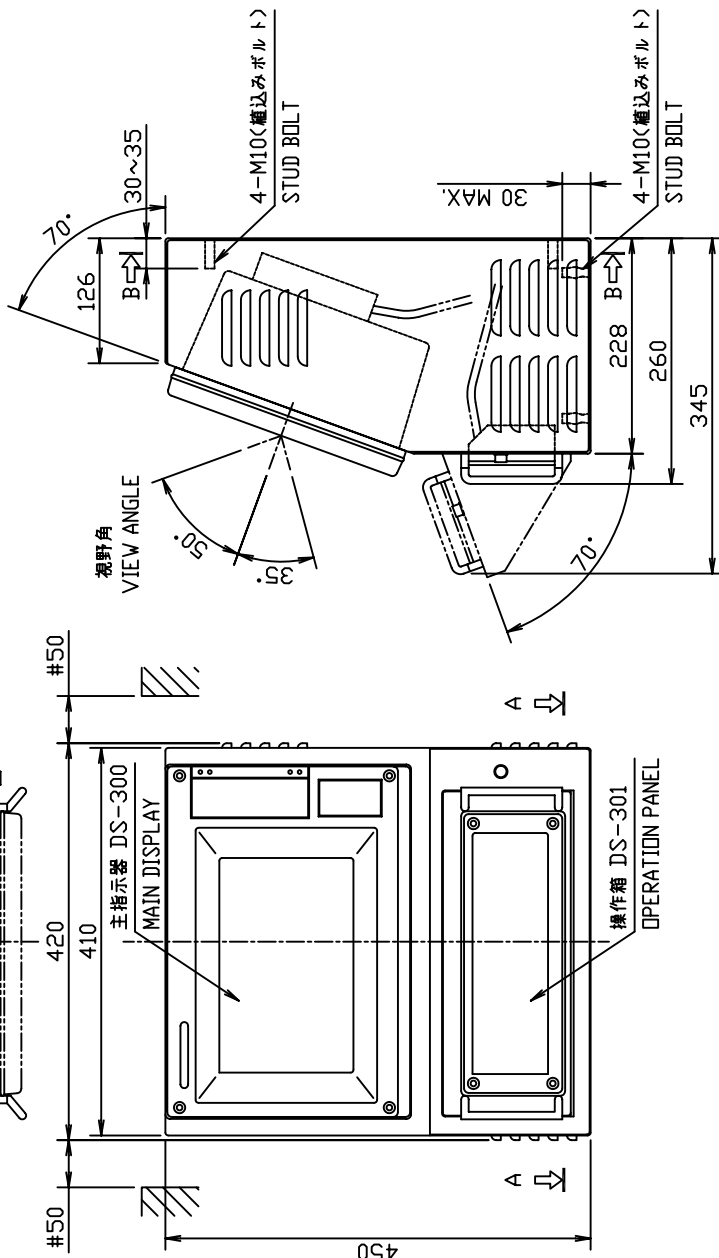
表 1 TABLE 1

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



卓上取付寸法図 (断面 A-A)

TABLETOP MOUNTING DIMENSIONS (SECTION A-A)



壁掛取付寸法図 (断面 B-B)

BULKHEAD MOUNTING DIMENSIONS (SECTION B-B)

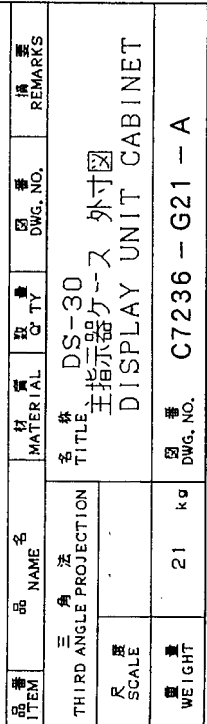
注記

- 1) 井：最小サービス空間寸法。
- 2) 指定な寸法公差は表 1 による。
- 3) 水平視視角は±50°。

NOTE

1. # MINIMUM SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3. HORIZONTAL VIEW ANGLE IS ±50°.

DRAWN	Sep. 6 '05	T. YAMASAKI	TITLE	DS-30
CHECKED	Sep. 6 '05	T. TAKENO	名称	主指示器ケース
APPROVED	Sep. 29 '05	M. Matsuyoshi	外寸図	
SCALE	1/8	MASS 21 ±10%	NAME	DISPLAY UNIT CABINET
DWG. No.	C7236-G23-C			OUTLINE DRAWING



2. 水平視野角は145°。
NOTE
1. ※: RECOMMENDED SERVICE SPACE.
2. HORIZONTAL VIEWING ANGLE IS 145°.

kg	図 番 DWG. NO.	C7236 - G21 - A
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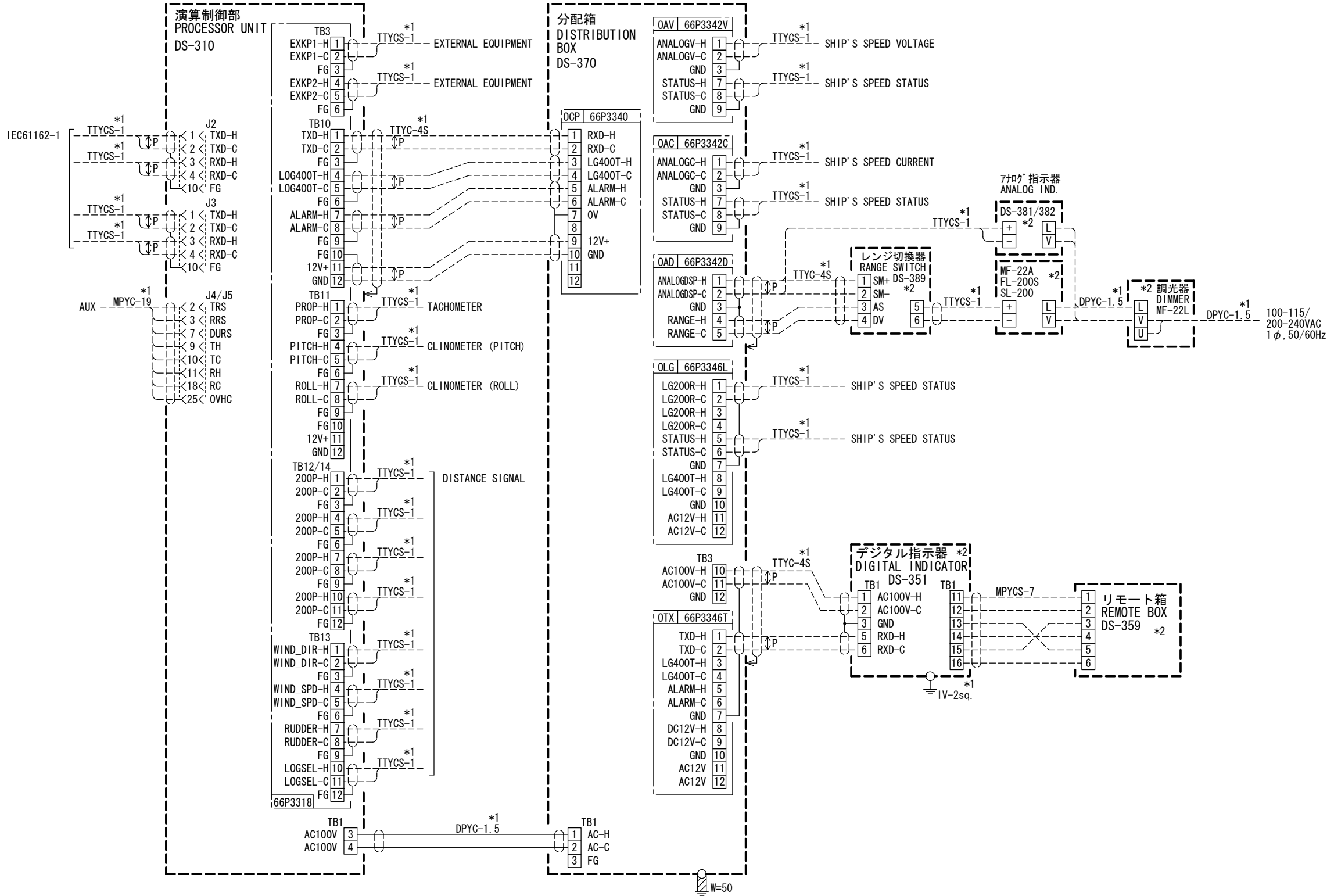
FURUNO ELECTRIC CO., LTD.

A

B

C

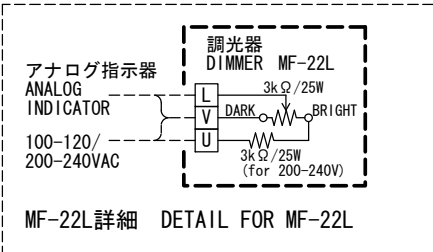
D



注記
* 1) 造船所手配。
* 2) オプション。
* 3) 分配箱には任意の組み合わせで最大 7 枚の基板を組み込み可能。
* 4) 2 台の分配箱を使用するときは、1 台は OTX 基板を利用すること。

NOTE
*1. SHIPYARD SUPPLY.
*2. OPTION.
*3. DISTRIBUTION BOX CAN INCORPORATE SEVEN BOARD IN ANY COMBINATION.
*4. WHEN TWO DISTRIBUTION BOXES ARE USED, CONNECT ONE DISTRIBUTION BOX TO "OTX" BOARD.

CO-0. 2x2P: CO-SPEVV-SB-C 0. 2x2P, φ 10.5
CO-0. 2x5P: CO-SPEVV-SB-C 0. 2x5P, φ 13.5
CO-0. 2x10P: CO-SPEVV-SB-C 0. 2x10P, φ 16



DRAWN	28/Apr/09 T. YAMASAKI	TITLE	DS-30 (DS-370)
CHECKED	28/Apr/09 T. TAKENO	名称	ドップラソナー (分配箱)
APPROVED	18/Jun/09 R. Esumi		相互結線図
SCALE	MASS kg	NAME	DOPLER SONAR (DISTRIBUTION BOX)
DWG No.	C7236-C02- K		INTERCONNECTION DIAGRAM

APPENDIX. LIST OF DIP SWITCH SETTING

DIP Switch Location

The DIP switches are located on the boards shown in the table below.

Unit	Board	DIP Switch
Display Unit DS-300	LCP Board	S1, S2
Processor Unit DS-310	MCP Board	S1, S2, S3, S4
	MFT Board	S1
	MKL Board	S1
	MIF Board	S1, S2, S3, S4, S5, S6
Transceiver Unit DS-320	NCP Board	S1, S2, S4, S5
Digital Indicator DS-351 (Option)	PCP Board	S1
Distribution Unit DS-370 (Option)	OCP Board	S1

Setting and Function of DIP Switch

⊙ : Do not change setting. ○ : Change setting as required.

1) Display Unit

Board	Switch Setting				Function	Factory setting
LCP Board	S1	#1		OFF	Mode selection: Main Display DS-300	
				ON	Ditto: Sub Display DS-300A	
		#2	#3	#4	Language selection	
		OFF	OFF	OFF	Japanese	
		ON	ON	ON	English	
		#5		OFF	Indication of current: Coming direction	
				ON	Indication of current: Going direction	
		#6		OFF	Time indication: Legacy	
				ON	Time indication: UTC when input GPS signal	
		#7, #8			Unused	
	S2	#8		OFF	High temperature alarm: Normal operation	○
				ON	Ditto: Test alarm	
		#1 to #7			Unused	

2) Processor Unit

Board	Switch Setting		Function	Factory Setting
MCP Board	S1	0	Monitor signal: Fore beam GEL	○
		1	Ditto : Fore beam EL	
		2	Ditto : Starboard beam GEL	
		3	Ditto : Starboard beam EL	
		4	Ditto : Port beam GEL	
		5	Ditto : Port beam EL	
		6	Ditto : TVG + external KP	
		7	Ditto : External KP	
		8 to F	Unused	
	GEL: Echo signal with TVG effected EL : Echo signal without TVG effected			
	S2	#1	#2 Bottom tracking beam selection	
		OFF	OFF Fore beam	○
		ON	OFF Starboard beam	
		ON	OFF Port beam	
		ON	ON All beams	
		#3	OFF TX pulselength in water tracking mode: Standard	⊙
			ON Ditto : Long	
		#4	OFF Automatic sound speed correction: On (Note 1)	⊙
			ON Ditto : Off	
		#5	OFF Angular speed latitude error correction: On (Note 2)	⊙
			ON Ditto : Off	
		#6	OFF Exponential smoothing: On (Note 3)	⊙
			ON Ditto : Off	
		#7	OFF Compass speed correction: On (Note 4)	⊙
			ON Ditto : Off	
		#8	OFF Ship's speed smoothing: Yes	⊙
			ON Ditto : No	
	NOTE 1. Sound speed is corrected by water temperature DS-30 transducer measures. 2. Angular speed measured by rate-of-turn gyro contains an error specific to latitude. For example, the error converted to ship's speed is 0.02kt in transverse speed at north latitude 35°. DS-30 corrects this error by latitude data fed by nav-sensor. 3. Smoothing applied to ship's speed data output 4. Gyrocompass reading contains an error which is given as a function of ship's speed and latitude. DS-30 corrects this error referring to correction table in memory. Gyrocompasses installed on vessels of 500 tons or more may correct the error by themselves. In that case, do not set this item to ON.			

Board	Switch Setting			Function	Factory Setting	
MCP Board	S3	#1	OFF	Speed data from nav-sensor: Position fix	⊙	
			ON	Ditto : Ship's speed		
		#2	OFF	GPS 0 kt: Unused for current reference calculation (When ship's speed measured by GPS is 0kt, current reference calculation is suspended, maintaining the previous result.)	⊙	
			ON	Ditto : Used for current reference calculation		
		#3	#4	Position fix time interval (Interval at which ship's speed is calculated from position fix data fed by nav-sensor.)		
				OFF	OFF	1 minute
		OFF	ON	2 minutes		
		ON	OFF	5 minutes		
		ON	ON	10 minutes		
		#5	#6	Transceiver unit baud rate		
				OFF	OFF	9600
		OFF	ON	4800	⊙	
		ON	OFF	2400		
		ON	ON	1200		
		#7	OFF	Interference rejector 1: Off	○	
			ON	Ditto : On		
		#8	OFF	Interference rejector 2: Off	○	
			ON	Ditto : On		
		S4	0		TVG curve selection: Auto (TVG curve is automatically adjusted based on water temperature measured by DS-30 transducer.)	⊙
	1		Ditto : Water temp 20°C or less			
	2		Ditto : Water temp 20°C to 25°C			
	3		Ditto : Water temp 25°C to 30°C			
	4 to F		Ditto : Water temp 30°C or above			
	MFT Board	S1	#8	OFF	Continuous self-test (for factory use): Off	○
				ON	Ditto : On	
			#1 to #7		Unused	
	MKL Board	S1	#1	#2	Filter parameter	
OFF			OFF	For large ship (ROM table 1)	○	
OFF			ON	For medium ship (ROM table 2)		
ON			OFF	For small ship (ROM table 3)		
ON			ON	For factory use		
3			OFF	Initializing E ² PROM: Yes	⊙	
			ON	Ditto : No		
#4			#5	Mode of output connector		
OFF			-	Normal	⊙	
ON			OFF	Raw data output		
ON			ON	Test data input (for factory use)		

Board	Switch Setting			Function					
MIF Board	S1	#1	OFF	NMEA Format, Baud rate: 4800bps	For Port1 J2				
			ON	CIF Format, Baud rate: 4800bps					
		#2	OFF	Data-through off *1		For Port2 J3			
			ON	Data-through on *1					
		#3	OFF	NMEA ver. 1.5					
			ON	NMEA ver. 2.0					
		#4	OFF	Logpulse out at forward and backward					
			ON	Logpulse out at forward only					
		#5	Same as #1						
		#6	Same as #2						
		#7	Same as #3						
		#8	Not used						

*1 Data-through : Data from external sensor are output from the same port together with the data of DS-30.

Board	Switch Setting		Function	Factory Setting	
MIF Board	S2	#1	#2	AUX port 1 baud rate	
		OFF	OFF	9800 bauds	
		OFF	ON	4800 bauds	☐
		ON	OFF	2400 bauds	
		ON	ON	1200 bauds	
		#3	#4	AUX port 1 input data format	
		OFF	OFF	Type 1	☐
		OFF	ON	Type 2	
		ON	-	Type 3	
		#5	#6	AUX port 2 baud rate	
		OFF	OFF	9600 (baud rate 1) or 600 bauds (baud rate 2)	
		OFF	ON	4800 (baud rate 1) or 300 bauds (baud rate 2)	☐
		ON	OFF	2400 (baud rate 1) or 300 bauds (baud rate 2)	
		ON	ON	1200 (baud rate 1) or 300 bauds (baud rate 2)	
		#7	#8	AUX port 2 input data format	
		OFF	OFF	Wind direction/speed interface SC-D232S	☐
		OFF	ON	NAV-PET (MDI-1)	
		ON	-	Wind direction/speed interface N-162LV-M	
		Note	Baud rate 1 or 2 of AUX 2 port is selected with S4-#6.		
	S3	#1	#2	Heading data input port selection	
		OFF	OFF	Gyro port	☐
		OFF	ON	AUX 1 port	
		ON	OFF	AUX 2 port	
		ON	ON	CIF/NMEA port 1/2	
		#3	#4	Rate-of-turn data input port selection	
		OFF	OFF	Rate-of-turn gyro (DS-340) port	☐
		OFF	ON	AUX 1 port	
		ON	-	AUX 2 port	
		#5	#6	Wind direction/speed data input port selection	
		OFF	OFF	Analog input port	☐
		OFF	ON	CIF/NMEA port 1/2	
		ON	-	AUX 2 port	
		#7	OFF	Engine speed data input port : Analog port	☐
			ON	Ditto : AUX 2 port	
		#8	OFF	Unused	☐
			ON		

Board	Switch Setting			Function	Factory setting
MIF Board	S4	#1	#2	Ship's speed for distance run pulse selection	
		OFF	OFF	Speed over-the-ground & through-water & speed fed from nav sensor	○
		OFF	ON	Speed over-the-ground & through-water	
		ON	-	Speed through-water	
		#3	OFF	Type of ship's speed for distance run pulse: Vector	○
			ON	Ditto : Fore-aft	
		#4	OFF	Bearing data output: True course	○
			ON	Ditto : Heading	
		#5	OFF	Bearing data output at low Ship's speed: True course	○
			ON	Ditto :Heading (Since ship's course data fluctuates by rolling and pitching when ship's speed is extremely low, heading data is output instead of course.)	
		#6	OFF	Distance signal alarm Contact: ON = No alarm	○
			ON	Fore-aft status Contact: ON = Aft (note 1)	
		#7	OFF	CIF/NMEA 1 option data: Off	◎
			ON	Ditto : On (Note 2.)	
		#8	OFF	CIF/NMEA 2 option data: Off	◎
			ON	Ditto : On (Note 2.)	
	S5	0 to F		Engine revolution full scale setting.	
	S6	0		Rate-of turn gyro data averaging time: 10 mses	
		1		Ditto : 20mses	
		2		Ditto : 40mses	
		3		Ditto : 80mses	
		4		Ditto : 160mses	
		5		Ditto : 230mses	◎
		6		Ditto : 640mses	
		7 to F		Ditto : 1280mses	

Note 1: Prior to setting #6 to “ON”, set #3 to “ON”.

Note 2: DRU (Dual Doppler Auxiliary Data) and VWT (True Wind Speed and Angle) are outputted.

3) Transceiver Unit

Board	Switch Setting		Function	Factory Setting	
NCP Board	S1/S2	S1	S2	Mode selection	
		OFF	-	Normal	○
		ON	OFF	Stand alone TX/RX (With the switches set as shown at left, turn on the transceiver unit, and the transceiver unit operates in stand-alone mode; output power and pulse length are adjusted with S5 and S4 respectively on NCP board.)	
		OFF	ON	Stand alone test	
	S4	0		Stand alone TX/RX mode TX range: 0 m	
		1		Ditto :0.5 m	
		2		Ditto :1.0 m	○
		3		Ditto :2.0 m	
		4		Ditto :5.0 m	
		5		Ditto :10.0 m	
		6		Ditto :20.0 m	
		7		Ditto :30.0 m	
NCP Board	S5	0		Stand alone TX/RX mode power control: 0 (max)	○
		1		Ditto : 1	
		2		Ditto : 2	
		3 to 7		Ditto : 3	

4) Digital Indicator

Set the DIP switch S1 on PCP board at installation.

Board	DIP SW		Function	Setting																		
PCP Board 66P3355	S1	1	Depth Unit Selection	<table><tr><td>Depth Unit</td><td>1</td><td>2</td></tr><tr><td>m</td><td>—</td><td>OFF</td></tr><tr><td>ft</td><td>OFF</td><td>ON</td></tr><tr><td>fm</td><td>ON</td><td>ON</td></tr></table>	Depth Unit	1	2	m	—	OFF	ft	OFF	ON	fm	ON	ON						
		Depth Unit		1	2																	
		m	—	OFF																		
		ft	OFF	ON																		
		fm	ON	ON																		
		2																				
				DS-350/351 only																		
		3	Display Mode Selection	OFF: Type A ON: Type B DS-350 only																		
4	Rate Gyro Connection	OFF:Yes ON: No DS-350/351 only																				
5	Gyrocompass Connection	OFF: Yes ON: No DS-351 only																				
6	Depth Selection	OFF: Internal Depth ON: External Depth DS-350/351 only																				
7	Model Selection		<table><tr><td>Model</td><td>7</td><td>8</td><td>Remarks</td></tr><tr><td>DS-30</td><td>OFF</td><td>OFF</td><td>DS-30/50 only</td></tr><tr><td rowspan="2">DS-351</td><td>OFF</td><td>ON</td><td>DS-30/50 only</td></tr><tr><td>ON</td><td>OFF</td><td>CI-60G/35 only</td></tr><tr><td>—</td><td>ON</td><td>ON</td><td>No use</td></tr></table>	Model	7	8	Remarks	DS-30	OFF	OFF	DS-30/50 only	DS-351	OFF	ON	DS-30/50 only	ON	OFF	CI-60G/35 only	—	ON	ON	No use
Model			7	8	Remarks																	
DS-30			OFF	OFF	DS-30/50 only																	
DS-351	OFF		ON	DS-30/50 only																		
	ON		OFF	CI-60G/35 only																		
—	ON	ON	No use																			
8																						

5) Distribution Unit

Board	Switch Setting			Function	Factory Setting
OCP Board	S1	#1	#2	#3	
		OFF	OFF	OFF	Normal
		OFF	OFF	ON	Dummy Test 1
		ON	OFF	ON	Dummy Test 2
		OFF	ON	ON	Dummy Test 3
		ON	ON	ON	Dummy Auto Adjustable
		#4 (Note1)	OFF		Not used
			ON		Not used
		#5 (Note1)	OFF		Not used
			ON		Not used
		#6	OFF		Only for water tracking, nav. ship's speed is displayed on optional indicator.
			ON		Nav. ship's speed is always displayed on optional indicator.
		#7	OFF		Combined ship's speed is displayed on optional indicator.
			ON		Nav. ship's speed is displayed on optional indicator. (Note 2)
		#8	OFF		Connection to DS-30
			ON		Connection to CI-60/60G

Note 1. Set S1#4 and #5 to "OFF".

Note 2. Only when ship's speed is inputted from navigation device.