FURUNO

Installation Manual
CHART RADAR
Model FAR-3210(-BB)/3220(-BB)/3310/3320/ FAR-3220-NXT(-BB)/3320-NXT

(Product Name: Marine Radar)

FURUNO ELECTRIC CO., LTD.

www.furuno.com

(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

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⚠ SAFETY INSTRUCTIONS

The installer of the equipment must read the applicable safety instructions before attempting to install the equipment.

⚠ DANGER	Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.

⚠ Warning, Caution Prohibitive Action Mandatory Action

⚠ DANGER

Wear a safety belt and hard hat when working on the antenna unit.

Serious injury or death can result if someone falls from the radar antenna mast.

⚠ WARNING

Radio Frequency Radiation Hazard

The radar antenna emits electromagnetic radio frequency (RF) energy which can be harmful, particularly to your eyes. Never look directly into the antenna aperture from a close distance while the radar is in operation or expose yourself to the transmitting antenna at a close distance. Distances at which RF radiation level of 100, 50 and 10 W/m^2 are given in the table below.

If the antenna unit is installed at a close distance in front of the wheel house, your administration may require halt of transmission within a certain sector of antenna revolution. See the installation manual for how to manage blind sectors.

Model	Transceiver	Antenna*	100 W/m^2	50 W/m^2	10 W/m^2
FAR-3210(-BB) FAR-3310	RTR-105 (12 kW)	XN12CF	0.6 m	1.4 m	4.4 m
		XN20CF	0.4 m	0.9 m	3.0 m
		XN24CF	0.3 m	0.6 m	2.5 m
FAR-3220(-BB) FAR-3320	RTR-106 (25 kW)	XN12CF	1.3 m	2.7 m	9.5 m
		XN20CF	1.0 m	1.7 m	6.8 m
		XN24CF	0.7 m	1.3 m	5.5 m
FAR-3220-NXT(-BB) FAR-3320-NXT	RTR-123 (600 W)	XN12CF	0.3 m	0.7 m	3.3 m
		XN20CF	0.24 m	0.32 m	1.9 m
		XN24CF	0.19 m	0.29 m	1.6 m

* XN12CF: 4 ft, XN20CF: 6.5 ft, XN24CF: 8 ft

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Do not open the equipment unless totally familiar with electrical circuits and service manual.

Only qualified personnel are allowed to work inside the equipment.

Construct a suitable service platform from which to install the antenna unit.
Serious injury or death can result if someone falls from the radar antenna mast.

Turn off the power at the mains switchboard before beginning the installation.
Fire, electrical shock or serious injury can result if the power is left on or is applied while the equipment is being installed.

Be sure that the power supply is compatible with the voltage rating of the equipment.
Connection of an incorrect power supply can cause fire or damage the equipment.

Use only the specified power cable.
Fire or damage to the equipment can result if a different cable is used.

Do not install the monitor unit, processor unit, power supply unit or control unit in a dusty environment, or one where the units may get wet from rain or water splash.
Dust or water in the units can result in fire, electrical shock, or damage to the equipment.

Attach protective earth securely to the ship's body.
The protective earth (grounding) is required for the AC power supply to prevent electrical shock.

⚠ CAUTION

Observe the following compass safe distances to prevent deviation of a magnetic compass:

	Standard compass	Steering compass
Antenna Unit (Magnetron radar, 12 kW)	2.15 m	1.40 m
Antenna Unit (Magnetron radar, 25 kW)	2.45 m	1.60 m
Antenna Unit (Solid state radar)	1.15 m	0.70 m
Processor Unit (EC-3000)	2.40 m	1.55 m
Monitor Unit (MU-190)	1.65 m	1.05 m
Monitor Unit (MU-231)	0.85 m	0.55 m
Monitor Unit (MU-270W)	0.90 m	0.55 m
Radar Control Unit (RCU-025)	0.30 m	0.30 m
Trackball Control Unit (RCU-026)	0.30 m	0.30 m
Intelligent HUB (HUB-3000)	1.20 m	0.75 m
Sensor Adapter (MC-3000S)	2.05 m	1.35 m
Sensor Adapter (MC-3010A)	0.75 m	0.50 m
Sensor Adapter (MC-3020D)	1.05 m	0.70 m
Sensor Adapter (MC-3030D)	0.90 m	0.60 m
Switching HUB (HUB-100)	1.00 m	0.60 m
Power Supply Unit (PSU-014)	2.20 m	1.40 m
Junction Box (RJB-001)	1.10 m	0.70 m

Note: For more information, please refer to IMO SN/Circ.271 “Guidelines for the installation of shipborne radar equipment.”

SYSTEM CONFIGURATION

NOTICE

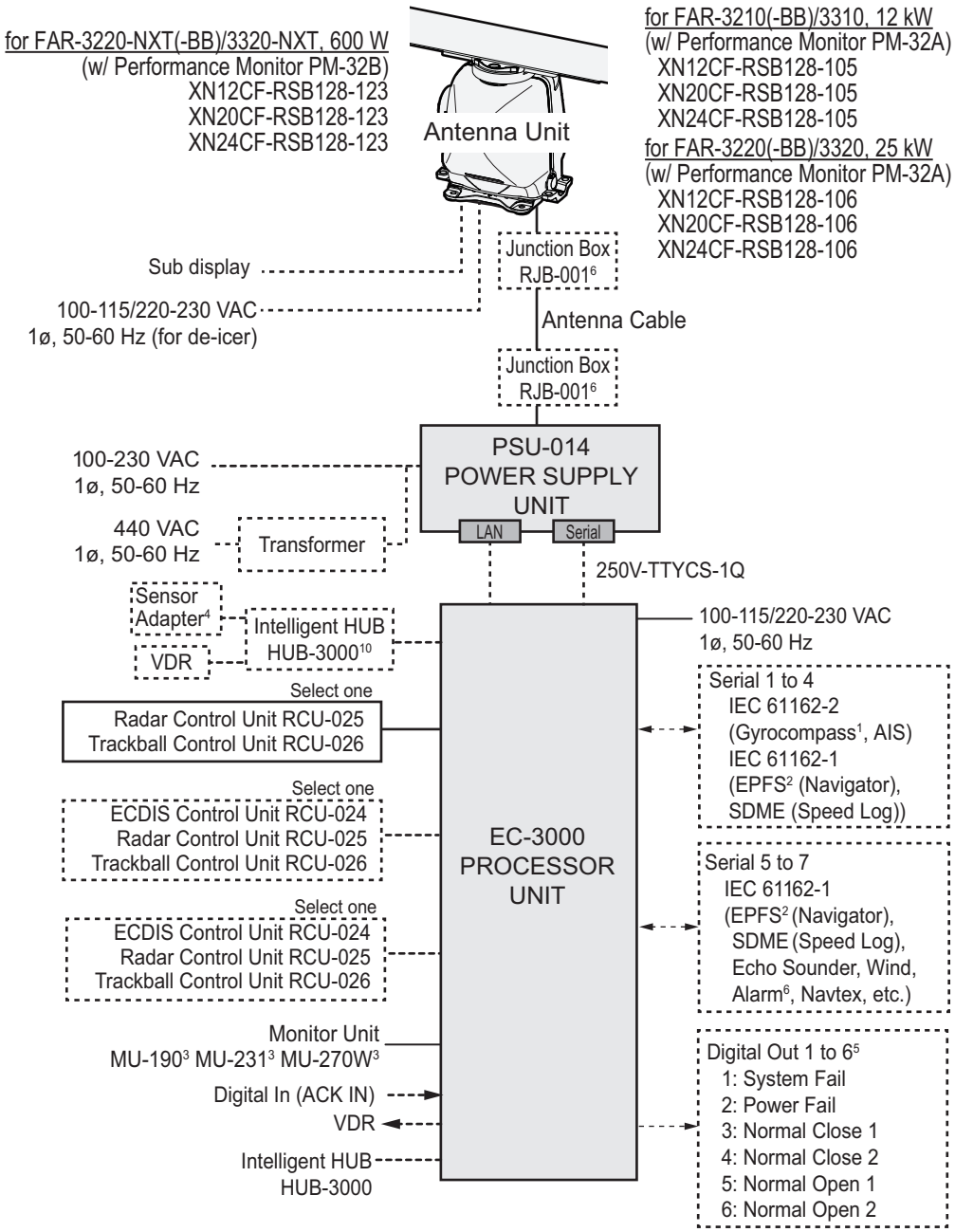
The radar(s) must be interconnected to the following type approved sensors:

- **EPFS meeting the requirements of the IMO resolution MSC.112(73).**
- **Gyrocompass meeting the requirements of the IMO resolution A.424(XI).**
- **SDME meeting the requirements of IMO resolution MSC.96(72).**

The radar may be interconnected via HUB-3000 to other FURUNO processing units having approved LAN ports.

Standard connection

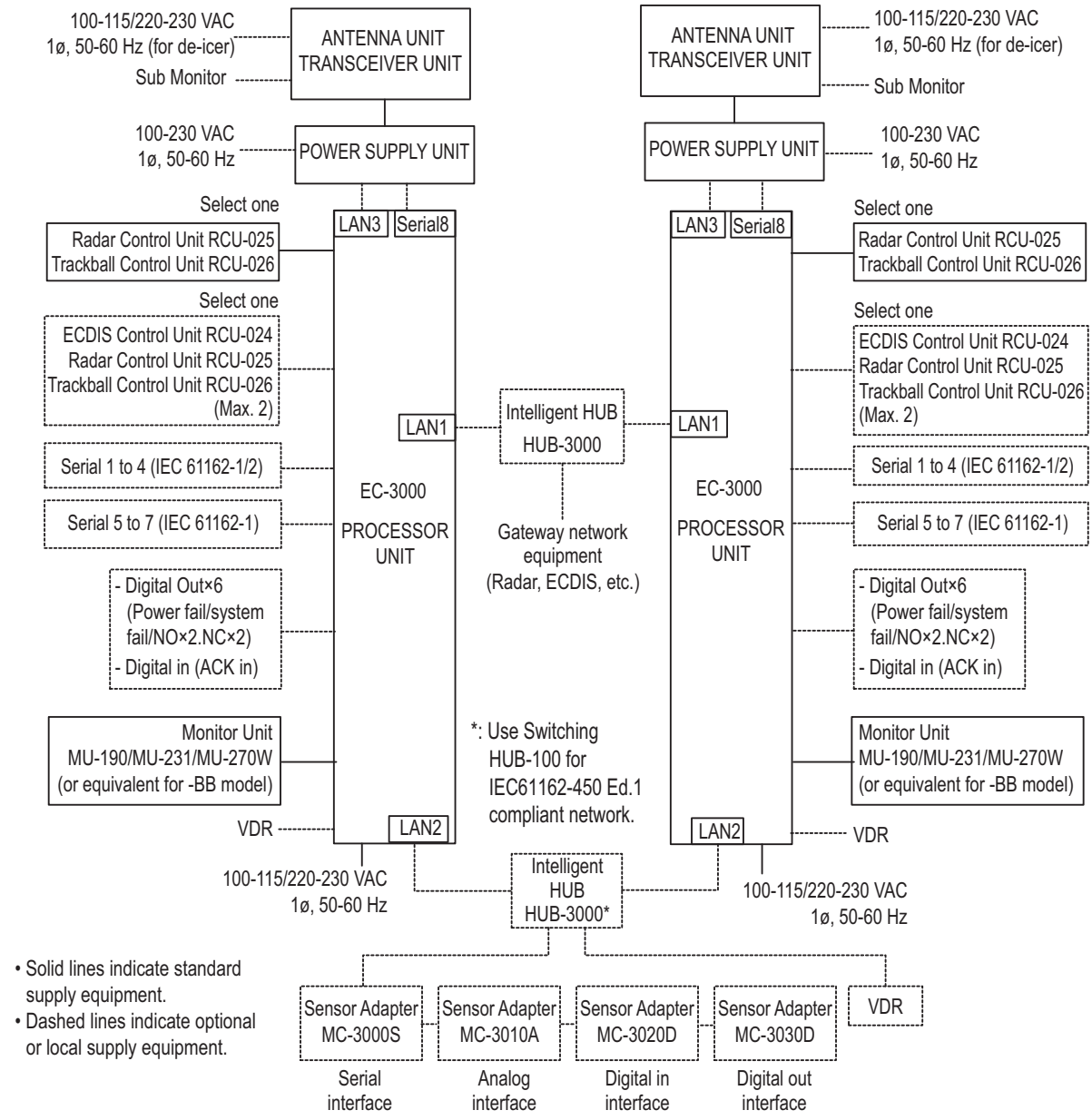
Basic configuration is shown with solid line.



See the next page for foootnotes.

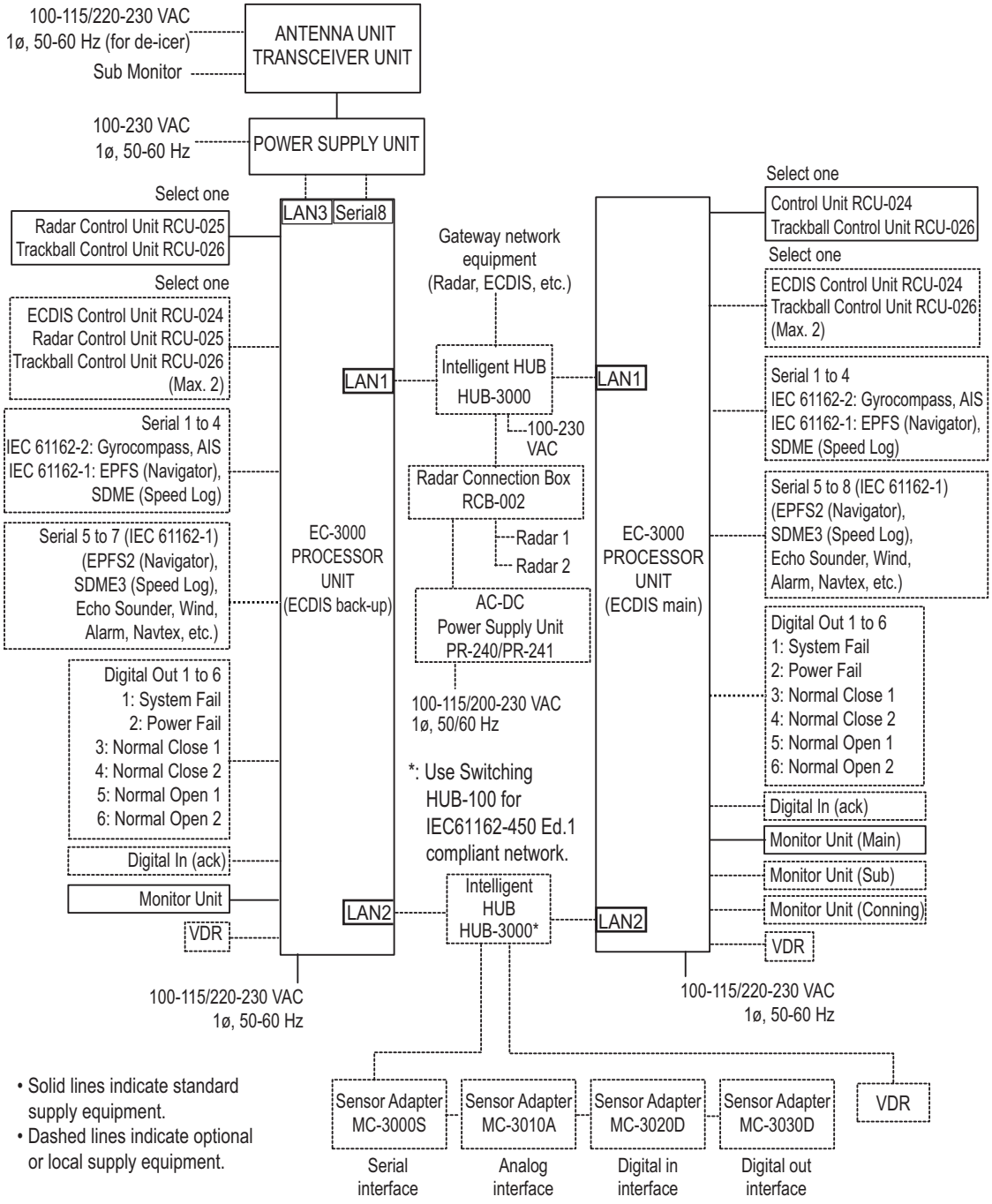
Interswitch connection

When multiple radars are used, connect the units as shown in the figure below. This configuration lets each radar as a standalone radar in case of HUB malfunction.



Back-up ECDIS connection

When setting up the radar as a ECDIS back-up, connect the radar and main ECDIS unit as shown in the figure below.



Category of units

Antenna units: Exposed to the weather
Other units: Protected from the weather

Radar Component Combinations

RADAR MODEL	ANTENNA UNIT	TRANSCEIVER UNIT	POWER SUPPLY UNIT
FAR-3x10 FAR-3x20	XN12CF-RSB-128 XN20CF-RSB-128 XN24CF-RSB-128	RTR-105	PSU-014
		RTR-106	
FAR-3x20-NXT		RTR-123	
FAR-3x20W	XN20CF-RSB-130 XN24CF-RSB-130	RTR-108	
FAR-3x30S	SN24CF-RSB-129 SN30CF-RSB-129 SN36CF-RSB-129	RTR-107	PSU-014 PSU-015
FAR-3x30SW	SN36CF-RSB-131	RTR-109	
FAR-3x30S-SSD	SN24CF-RSB-133 SN30CF-RSB-133 SN36CF-RSB-133	RTR-111	PSU-016 PSU-018

Notes

1) The gyrocompass must be type approved for compliance with IMO resolution A.424(XI) (and/or resolution A.821(19) for installation on HSC). The gyrocompass must also have an update rate that is adequate for the ship's rate of turn. The update rate must be better than 40 Hz (HSC) or 20 Hz (conventional vessel).
2) The EPFS must be type approved for compliance with IMO resolution MSC.96(72).
3) The monitors listed in the following table have been approved by the IMO.
   If a different monitor is to be used on IMO vessels, its effective diameter must meet the applicable Category requirements.
   - CAT 1C and CAT 1HC: effective diameter of 320 mm or higher
   - CAT 2C and CAT 2HC: effective diameter of 250 mm or higher

Category	Maker	Model	Viewing distance
CAT 1C and CAT 1HC	FURUNO	MU-231	1.02 m
		MU-231CE	1.02 m
		MU-270W	1.02 m
	Hatteland Technology	JH23T12FUD*	1.02 m
		JH23T14FUD	1.02 m
		HD26T22 FUD	0.99 m
		HD26T21 MMD	0.99 m
		HD27T22 FUD	1.07 m
		HD32T22 FUD	1.15 m
		HD55T22 FUD	1.95 m
	North Invent	WA270-01.MON.01	1.07 m
		WA460-01.MON.01	1.64 m
CAT 2C and CAT 2HC	FURUNO	MU-190	1.02 m
		MU-201CE	1.08 m
	Hatteland Technology	JH19T14FUD	1.02 m
		JH20T17FUD	0.88 m
		HD19T22FUD	1.01 m
		HD24T22FUD	0.86 m

For installation and operation of other monitors, see the respective manuals.
For BB types, a monitor unit is prepared by the user.
*: For use with radar only; do not use for Back-up ECDIS.

4) The sensor adapters are Control Serial MC-3000S, Analog IN MC-3010A, Digital IN MC-3020D and Digital OUT MC-3030D.
5) Characteristics of contact output for Alarm:
   - (Load current) 250 mA
   - (Polarity) Normally Open: 2 ports, Normally Close: 2 ports
   - Serial I/O for alarm is also possible, which complies with IEC 61162-1.
6) Junction boxes are required for antenna cable length greater than 100 m. Max. cable length is 400 m.
7) The ALR format is not BAM-compliant and shall not be used for new installation. It may be used for retrofitting on ships-in-operation only.
8) When using this unit as a Back-up ECDIS, the setup of the Back-up ECDIS must be completed by a FURUNO approved service engineer.
9) When setting up Operator Fitness and connecting this unit to the BNWAS, ensure the Monitor Unit and Control Unit are installed on the bridge where proper look-out can be carried out.
10) Use Switching HUB-100 for IEC61162-450 Ed.1 compliant network.

EQUIPMENT LISTS

Standard supply: FAR-3210(-BB)/3220(-BB)/3310/3320, Magnetron radar

Name	Type	Code No.	Qty	Remarks
Antenna Unit	XN12CF-RSB128-105	-	Select one	4 ft
	XN12CF-RSB128-106	-		
	XN20CF-RSB128-105	-		6.5 ft
	XN20CF-RSB128-106	-		
	XN24CF-RSB128-105	-		8 ft
	XN24CF-RSB128-106	-		
Processor Unit	EC-3000	-	1	
Monitor Unit	MU-190	-	Select one	For FAR-32x0
	MU-231	-		For FAR-33x0
	MU-270W	-		
Control Unit	RCU-025	-	Select one	Standard type
	RCU-026	-		Trackball type
Power Supply Unit	PSU-014	-	1	
Installation Materials	CP03-35201	001-249-860	1	For radiator
	CP03-35401	001-507-920	Select one	For RSB, no deicer
	CP03-35403	001-507-930		For RSB, w/deicer
	CP03-35500 [15M]	000-024-096	Select one	For antenna unit, 15 m
	CP03-35510 [30M]	000-024-097		For antenna unit, 30 m
	CP03-35520 [40M]	000-024-098		For antenna unit, 40 m
	CP03-35530 [50M]	000-024-099		For antenna unit, 50 m
	CP03-35301	001-249-770	1	For PSU-014
	CP24-02120	000-024-925	1	For EC-3000
	CP24-02200	000-027-668	1	For RCU-025
	CP24-02300	000-027-673	1	For RCU-026
Accessories	FP24-00603	001-285-760	1	For EC-3000
	FP24-00701	001-418-340	1	For RCU-025
	FP24-00801	001-418-410	1	For RCU-026
Spare Parts	SP24-00601	001-170-660	1	For EC-3000 Fuse: FGMB-S 125V 10A PBF (000-157-470-10, 3 pcs.)
	SP24-00602	001-170-670	1	For EC-3000 Fuse: FGMB-A 250V 5A PBF (000-157-570-10, 3 pcs.)
	SP03-17641	001-249-740	1	For PSU-014 Fuse: FGBO-A 250V 7A PBF (000-178-084-10, 2 pcs.)
	SP03-19701	001-531-630	1	For Antenna unit w/de-icer Fuse: FGBO-A 250V 3A PBF (000-155-841-10, 4 pcs.)

Standard supply: FAR-3220-NXT(-BB)/3320-NXT, Solid state radar

Name	Type	Code No.	Qty	Remarks
Antenna Unit	XN12CF-RSB128-123	-	Select one	4 ft
	XN20CF-RSB128-123	-		6.5 ft
	XN24CF-RSB128-123	-		8 ft
Processor Unit	EC-3000	-	1	
Monitor Unit	MU-190	-	Select one	For FAR-3220-NXT(-BB)
	MU-231	-		For FAR-3320-NXT
	MU-270W	-		
Control Unit	RCU-025	-	Select one	Standard type
	RCU-026	-		Trackball type
Power Supply Unit	PSU-014	-	1	
Installation Materials	CP03-35201	001-249-860	1	For radiator
	CP03-35401	001-507-920	Select one	For RSB, no deicer
	CP03-35403	001-507-930		For RSB, w/deicer
	CP03-35500 [15M]	000-024-096	Select one	For antenna unit, 15 m
	CP03-35510 [30M]	000-024-097		For antenna unit, 30 m
	CP03-35520 [40M]	000-024-098		For antenna unit, 40 m
	CP03-35530 [50M]	000-024-099		For antenna unit, 50 m
	CP03-35301	001-249-770	1	For PSU-014
	CP24-02120	000-024-925	1	For EC-3000
	CP24-02200	000-027-668	1	For RCU-025
	CP24-02300	000-027-673	1	For RCU-026
Accessories	FP24-00603	001-285-760	1	For EC-3000
	FP24-00701	001-418-340	1	For RCU-025
	FP24-00801	001-418-410	1	For RCU-026
Spare Parts	SP24-00601	001-170-660	1	For EC-3000 Fuse: FGMB-S 125V 10A PBF (000-157-470-10, 3 pcs.)
	SP24-00602	001-170-670	1	For EC-3000 Fuse: FGMB-A 250V 5A PBF (000-157-570-10, 3 pcs.)
	SP03-17641	001-249-740	1	For PSU-014 Fuse: FGBO-A 250V 7A PBF (000-178-084-10, 2 pcs.)
	SP03-19701	001-531-630	1	For Antenna unit w/de-icer Fuse: FGBO-A 250V 3A PBF (000-155-841-10, 4 pcs.)

Console type

Name	Type	Code No.	Remarks
Display Unit	RCN-303	-	For 23.1/27-inch monitor
	RCN-304	-	For 19-inch monitor

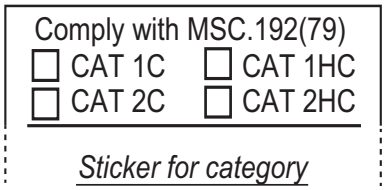
Optional supply

Name	Type	Code No.	Remarks
Sensor Adapter	MC-3000S	-	Serial type
	MC-3010A	-	Analog IN
	MC-3020D	-	Digital IN
	MC-3030D	-	Digital OUT
LAN Signal Conv.	OP03-223-3	001-254-380	For magnetron radar
	OP03-223-4	001-569-010	For solid state radar
Cable Extension Kit	OP03-224-3	001-254-410	For magnetron radar, with Junction Box RJB-001, LAN Signal Converter
	OP03-224-4	001-569-040	For solid state radar, with Junction Box RJB-001, LAN Signal Converter
Program Install Software	OP03-230	001-285-780	DVD-R
Deicer Kit	OP03-226	001-254-320	
Switching HUB	HUB-100	-	
Intelligent HUB	HUB-3000	-	
Control Unit	RCU-026	-	Trackball type
	RCU-024	-	ECDIS standard type
Monitor Unit	MU-190	-	For FAR-32x0
	MU-231	-	For FAR-33x0
	MU-270W	-	
Bracket Assembly	OP26-5	000-016-270	For MU-190
	OP26-15	001-116-730	For MU-231
	OP26-30	001-439-060	For MU-270W
Hood Assembly	OP26-6	001-080-930	For MU-190
	OP26-16	001-116-740-01	For MU-231
Hood Assembly (Rear)	OP26-33	001-439-110	For MU-270W
Flush Mount Kit	OP26-12	001-116-280	For MU-190
	OP26-17	001-116-750	For MU-231
Flush Mount Assembly (Rear)	OP26-31	001-439-070	For MU-270W
Connection Stand (27)	OP26-34	001-462-860	For MU-270W
Cable Assembly	OP24-32	001-188-300	USB cable between processor unit and control unit
Terminal Opener	OP24-33	001-188-850	
Transformer Unit	RU-1803	-	
	RU-3305-0	-	
	RU-5693	-	
	RU-6522	-	
	RU-5466-1	-	
Rectifier	RU-3424	-	AC220V
	RU-1746B-2	-	
Junction Box	RJB-001	000-083-355	
LAN Cable Assy.	MOD-Z072-050+	001-167-890-10	

Name	Type	Code No.	Remarks
AC/DC Power Supply Unit	PR-240	-	
	PR-241	-	
Ferrite Core	OP86-11	001-594-450	For PR-241
Installation Materials	CP03-28900(10M)	000-082-658	LAN cable for sensor adapter
	CP03-28910(20M)	000-082-659	
	CP03-28920(30M)	000-082-660	
Installation Materials	CP24-02900(10M)	001-208-050	LAN cable for HUB-3000
	CP24-02910(20M)	001-208-060	LAN cable for HUB-3000
	CP24-02920(30M)	001-208-040	LAN cable for HUB-3000
Connector	CP03-28901	008-542-460	
Crimping Tool	CRIMPFOX 10S	001-206-920	For sensor adapters
Cable Assy.	DVI-D/D S-LINK 5M	001-132-960-10	Between processor unit and monitor unit, 5 m
	DVI-D/D S-LINK 10M	001-133-980-10	Between processor unit and monitor unit MU-190, 10 m
Cable Assy.	DSUB9P-X2-L5M	001-188-260	For monitor unit, 5 m
	DSUB9P-X2-L10M	001-188-270	For monitor unit, 10 m
Cable Assy.	DSUB9P-X2-L5M-WP	001-207-890	For monitor unit, 5 m, waterproof type
	DSUB9P-X2-L10M-WP	001-207-900	For monitor unit, 10 m, water-proof type
Cable Assy.	DSUB9P-X2-A-L5M	001-252-580	Brightness control cable for monitor unit, 5 m
	DSUB9P-X2-A-L10M	001-252-590	Brightness control cable for monitor unit, 10 m
Cable Assy.	TET-16-045A-2(L5M)	000-194-754-10	For RCU-025, 5 m
	TET-16-045A-3(L10M)	000-194-755-10	For RCU-025, 10 m
	TET-16-045A-4(L20M)	000-194-756-10	For RCU-025, 20 m
	TET-16-045A-5(L30M)	000-194-757-10	For RCU-025, 30 m
	6TPSH-XH12X2-L5.0SP2	001-186-310-10	For RCU-026, 5 m
	6TPSH-XH12X2-L10SP2	001-186-320-10	For RCU-026, 10 m
	6TPSH-XH12X2-L20SP2	001-186-330-10	For RCU-026, 20 m
	6TPSH-XH12X2-L30SP2	001-186-340-10	For RCU-026, 30 m
Cable	MC1.5-W-L600	001-187-470-10	Between sensor adapters, 0.6 m
	MC1.5-W-L1000	001-187-480-10	Between sensor adapters, 1 m
	MC1.5-W-L2000	001-187-490-10	Between sensor adapters, 2 m
	MC1.5-W-L3000	001-187-500-10	Between sensor adapters, 3 m
Signal Cable Assy.	S03-92-15(8P)	001-259-890	For sub monitor, RW-00136, 15 m
	S03-92-30(8P)	001-259-900	For sub monitor, RW-00136, 30 m
	S03-92-40(8P)	001-259-910	For sub monitor, RW-00136, 40 m
	S03-92-50(8P)	001-259-920	For sub monitor, RW-00136, 50 m
Spare Parts	SP24-00801	001-235-520	For HUB-3000

Name	Type	Code No.	Remarks
Antenna Reinforcement Kit	OP03-257	001-507-730	
Wave Analyzer Software	WV-100	001-562-500	
	WV-100ST	001-562-510	With SEA-TRIAL mode.
SSD Replacement Kit	OP03-264	001-576-910	
PM Modification Kit	OP03-265	001-585-810	
Operator's Manual	OME-36160-*	-	Hard copy manual, English
	OMJ-36160-*	-	Hard copy manual Japanese
	OMC-36181-*	-	Wave Analyzer Software manual, English/Japanese
Magnetron Replacement Instruction Manual	E32-01306-*	-	Hard copy manual, English
	J32-01306-*	-	Hard copy manual, Japanese

About the category sticker



This radar meets the requirements in IEC62388 (Marine navigation and radiocommunication equipment and systems-Shipborne radar-Performance requirements, method of testing and required test results). Check the appropriate box on the sticker which is pre-attached to the processor unit, according to your radar's specification. Refer to the table shown below to confirm your category.

Category	Radar type	ANT. rotation speed
CAT 1C	FAR/3310/3320	24 rpm
CAT 1HC	Same models as above	42 rpm
CAT 2C	FAR/3210(-BB)/3220(-BB)	24 rpm
CAT 2HC	Same models as above	42 rpm

1. INSTALLATION

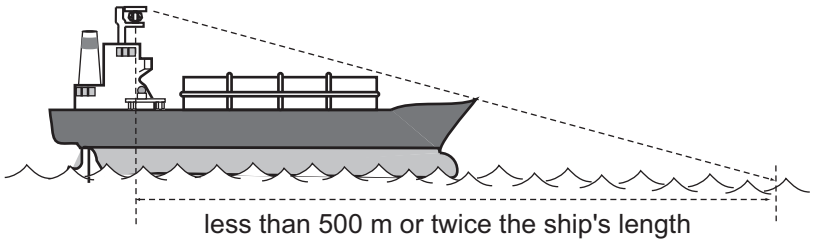
NOTICE

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 Antenna Unit

1.1.1 Installation considerations

- The antenna unit is generally installed either on top of the wheelhouse or on the radar mast, on a suitable platform. Locate the antenna unit in an elevated position to permit maximum target visibility.
- A line of sight from the antenna unit to the bow of the ship must hit the surface of the sea in not more than 500 m or twice the ship's length, depending whichever value is smaller, for all load and trim conditions.



- BS/CS broadcast equipment may be subject to interference from radar waves. For BS/CS antenna installation, adjust the height and installation position of the BS/CS antenna to avoid interference from radars.
- Install the antenna unit so that any blind sectors caused by objects (mast, etc.) are kept to a minimum. A blind sector must not exist in arc of the horizon from right ahead to 22.5° aft of the beam to either side (see the figure below). Also, individual blind sectors of more than 5°, or the total arc of both blind sectors of more than 20°, must not occur in the remaining arc (Figure 2). Note that any two blind sectors separated by 3° or less are regarded as one sector.

Figure 1

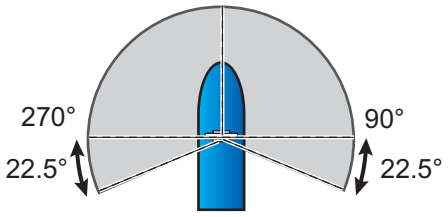
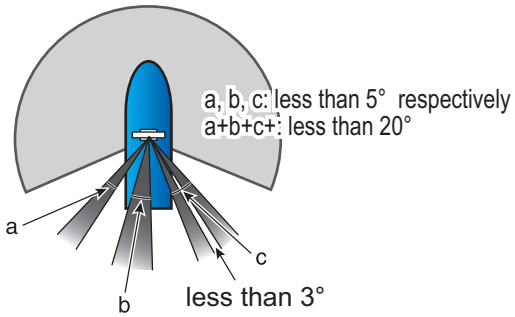
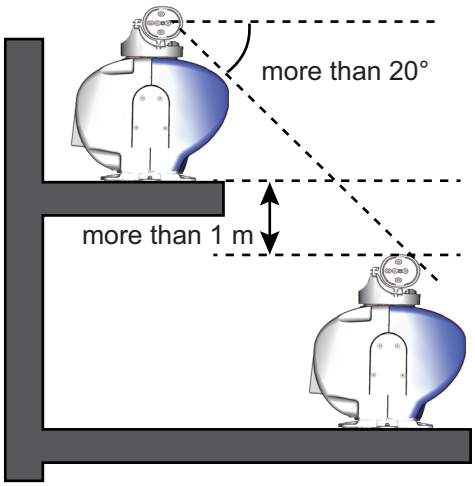


Figure 2

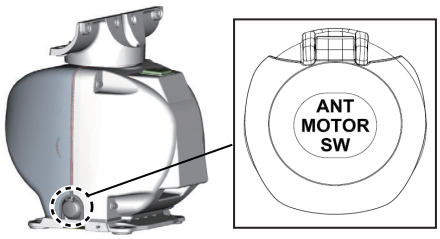


- Do not install the antenna where extreme winds may strike the port and starboard sides of the antenna.

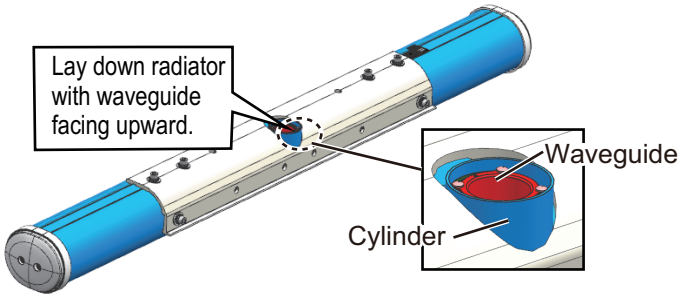
- Install the antenna unit away from interfering high-power energy sources and TX radio antennas.
- Keep the lower edge of the antenna unit above the safety rail by at least 500 mm.
- Install two antenna units as shown in the right figure.
- No funnel, mast or derrick shall be within the vertical beamwidth of the antenna unit in the bow direction, especially zero degree ±5°, to prevent blind sectors and false echoes on the radar picture.



- It is rarely possible to place the antenna unit where a completely clear view in all directions is available. Therefore, determine the angular width and relative bearing of any shadow sectors for their influence on the radar at the first opportunity after fitting.
- Locate the antenna of an EPFS clear of the radar antenna to prevent interference to the EPFS. A separation of more than two meters is recommended.
- A magnetic compass will be affected if the antenna unit is placed too close to the compass. Observe the compass safe distances on page ii to prevent interference to a magnetic compass.
- Do not paint the radiator aperture, to ensure proper emission of the radar waves.
- Ground the unit with the ground wire (supplied).
- An antenna switch is provided on the chassis to stop the antenna. Make sure the mounting location provides easy access to the switch.



- Deposits and fumes from a funnel or other exhaust vent can affect the aerial performance and hot gases may distort the radiator portion. Do not install the antenna unit where the temperature is more than 55 °C.
- Leave sufficient space around the unit for maintenance and servicing. See the antenna unit outline drawing for recommended maintenance space.
- If it is necessary to lay down the radiator before you fasten it to the antenna unit, lay it down with the waveguide up, to prevent damage to the cylinder that surrounds the waveguide.



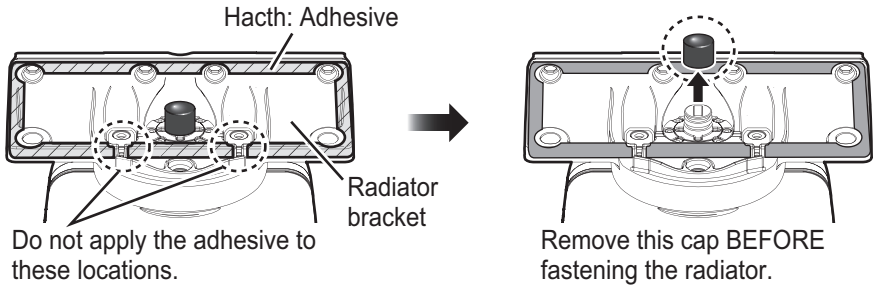
- If the de-icer is installed, a two-pole breaker (supplied locally) must also be installed.

Note: For more information, please refer to IMO SN/Circ.271 "Guidelines for the installation of shipborne radar equipment.

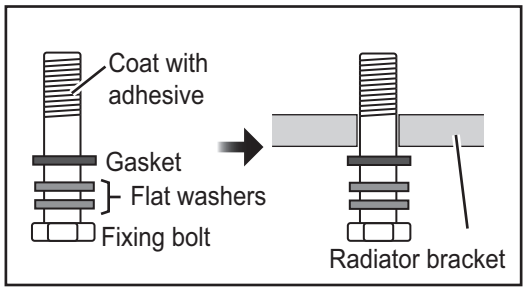
1.1.2 How to assemble the antenna unit

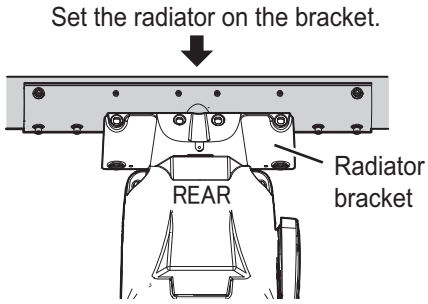
The Antenna Unit consists of the antenna radiator and the Antenna Unit chassis, and they are packed separately. Fasten the antenna radiator to the Antenna Unit chassis as follows:

1. Coat the hatched area shown in the figure in step 2 with the supplied adhesive.
2. Remove the protective waveguide cap from the waveguide on the radiator bracket.

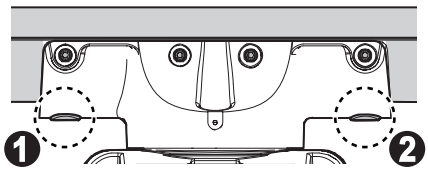


3. Pass the supplied gaskets to six sets of the Antenna M8×50 fixing bolts w/two flat washers, and then coat the threads of the Antenna fixing bolts with the supplied adhesive. Set the radiator on the radiator bracket.

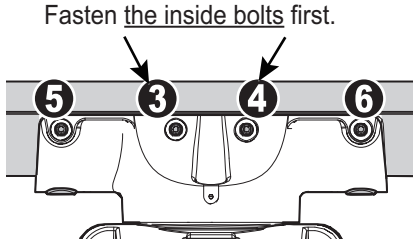




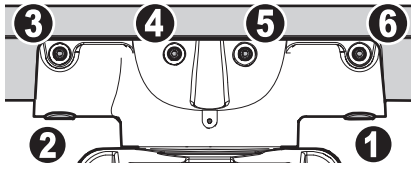
4. Fasten the antenna radiator with the two bolts from the bottom (1 and 2 in the right figure). The torque must be 15.0 N•m.



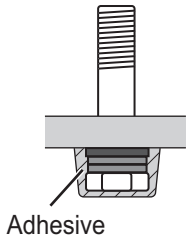
5. Fasten loosely the four bolts from the side (3 to 6 in the right figure). Then fasten first the inside bolts (3 and 4 in the right figure), and fasten the outside bolts (5 and 6 in the right figure). The torque must be 15.0 N•m.



6. **Retighten the six bolts in the order shown in the figure to the right** to fix the antenna radiator. Make sure that the torque for each is 15.0 N•m.



7. Coat the Antenna fixing bolts fixed at step 6 with the supplied adhesive as shown in the right figure.



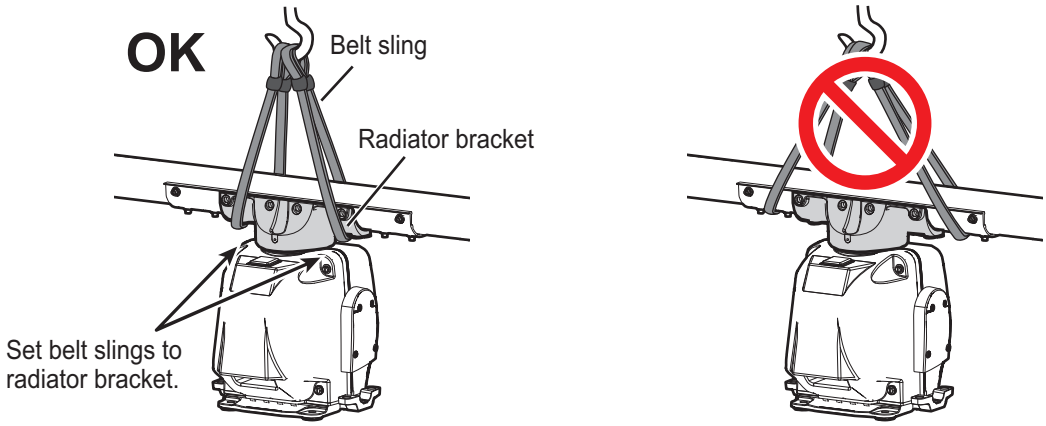
1.1.3 How to hoist the Antenna Unit

The Antenna Unit may be assembled before hoisting it to the mounting platform. Attach lifting belt slings to the "Radiator Bracket", NOT the antenna radiator, as shown in the figure below.

Also, hoist the Antenna Unit slowly. Hoisting swiftly may cause a damage to the antenna radiator or damage the radiator chassis.

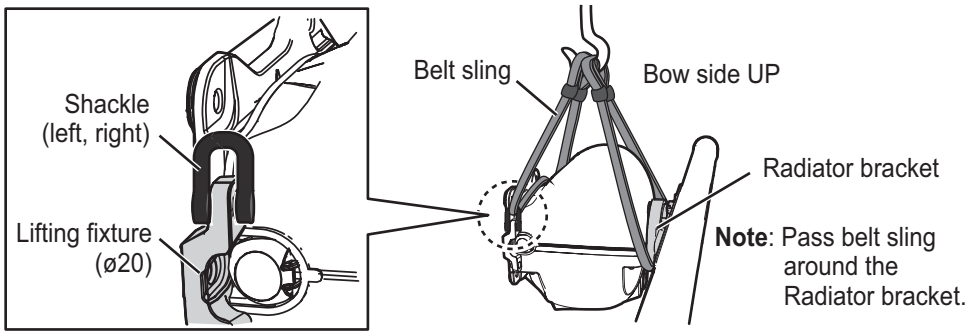
There are two methods to hoist the Antenna Unit.

- **Upright hoisting**



- **Sideways hoisting**

  Fasten belt sling to a shackle, pass belt sling around radiator bracket and fasten other end of belt sling to other shackle.



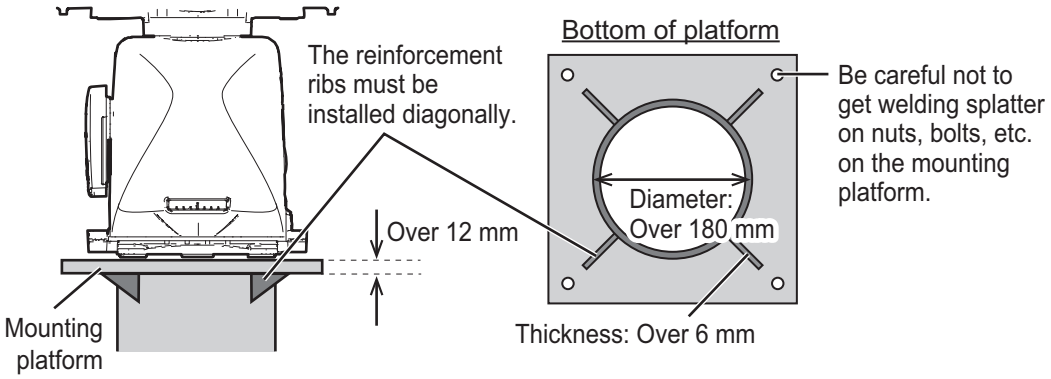
1.1.4 How to fasten the Antenna Unit to the mounting platform

1. Construct a suitable mounting platform referring to the outline drawing at the end of this manual.

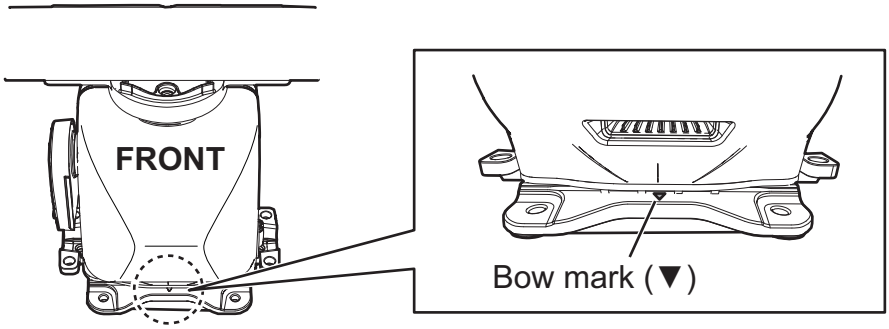
   Note: The mounting platform must be flat, level and firmly secured.

   - The diameter of the mast for fixing the Antenna Unit platform must be over 180 mm.
   - The thickness of the Antenna Unit platform must be over 12 mm.

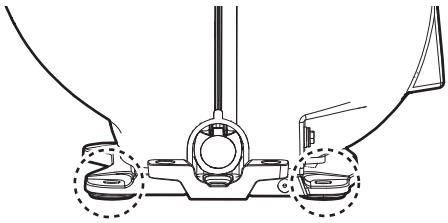
- The reinforcement rib must be installed diagonally.



2. Referring to the outline drawing at the back of this manual, drill four mounting holes (ϕ15 mm) in the mounting platform.
3. Place the Antenna Unit on the platform, then orient the unit so the bow mark on its base is facing the ship's bow.
   Note: When the Antenna Unit is placed on the platform, make sure that the platform is not inclined.



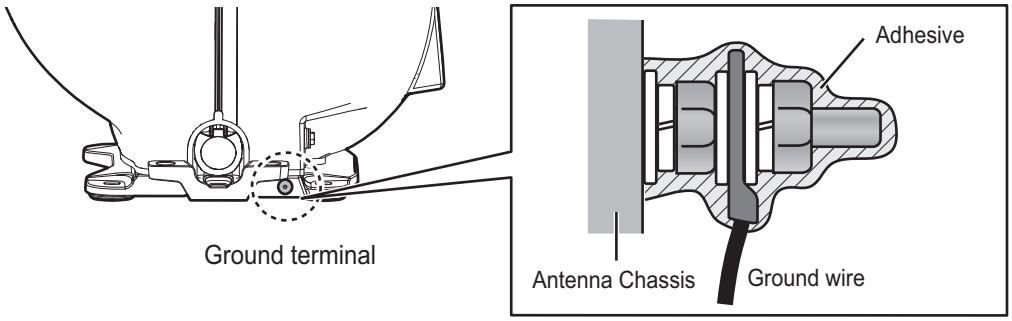
4. Insert four sets of hex bolts (M12×70) attached the seal washers to the mounting holes of the antenna chassis, referring to the installation guide (C3900Y01) at the back of this manual. Lift the antenna chassis slightly then insert the bolts attached the insulation sheets.



   Note: DO NOT insert the bolts from the underside of the platform. The cover cannot be opened.
5. Adjust the direction of the Antenna Unit so the bow mark on its base is facing the ship's bow.
6. Fasten the Antenna Unit to the mounting platform with four sets of hex bolts (M12×70), nuts, flat washers and seal washers. Insert the bolts from the topside of the platform.
7. Using a hex bolt (M6×25), nut (M6) and flat washer (M6), establish the ground system on the mounting platform. The location must be within 340 mm of the ground terminal on the Antenna Unit. Connect the ground wire (RW-4747, 340 mm, sup-

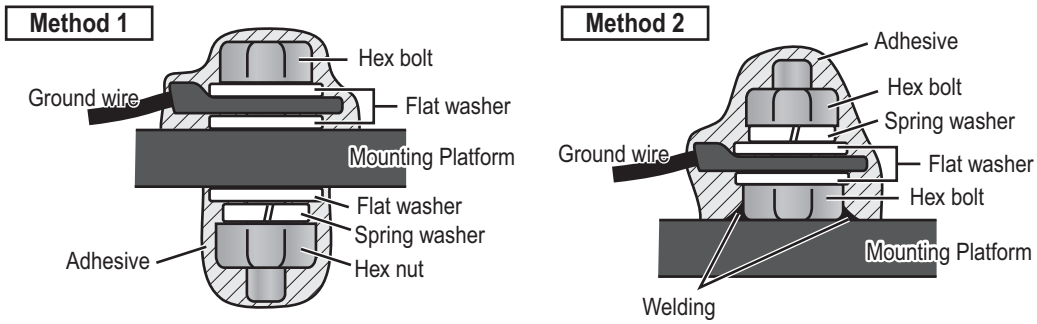
plied) between the grounding point and ground terminal on the Antenna Unit. Coat the hardware of the ground system with the supplied adhesive.

Antenna chassis side



Mounting platform side

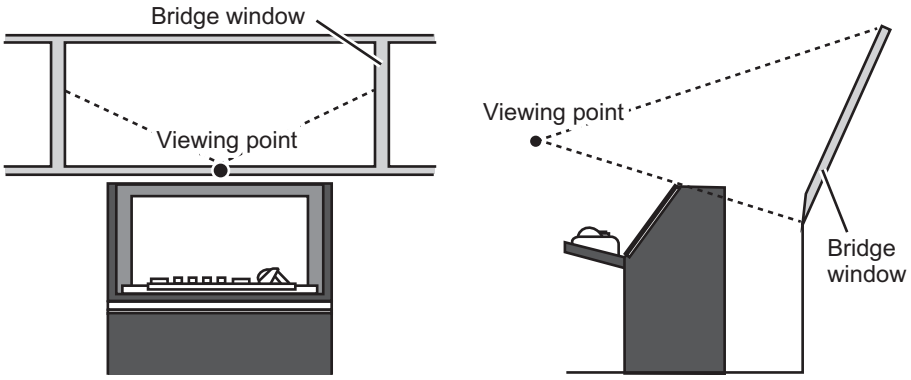
Arrange a ground terminal as close as possible to Antenna Unit. There are two methods to connect the ground wire for mounting platform side.



1.2 Monitor Unit

See the operator's manual for MU-190 (OMC-44670), MU-231 (OMC-44690) or MU-270W (OMC-44930) for the installation procedure. Keep in mind the following points when selecting a location.

- Locate the monitor unit where no framing is installed immediately in front of the monitor.
- Locate the monitor where the display is easily visible in all ambient lighting conditions.



1.3 Radar Control Unit, Trackball Control Unit

The control units can be installed on a desktop or flush mounted in a console. For the desktop installation the unit can laid flat or tilted.

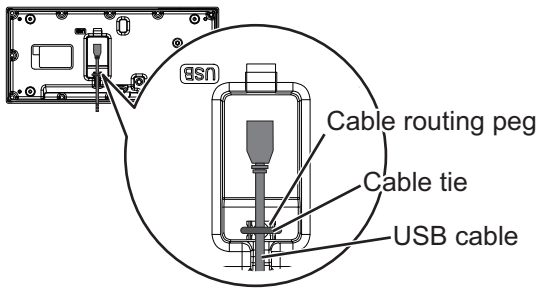
Installation considerations

Keep in mind the following points when selecting a location.

- Select a location where the control unit can be operated easily.
- Locate the unit away from heat sources because of heat that can build up inside the cabinet.
- Locate the equipment away from places subject to water splash and rain.
- Leave sufficient space for maintenance and service, referring to the outline drawings at the back of this manual.
  Note: The outline drawing number for RCU-024 and RCU-025 is different depending on the serial number, as shown below:
  For RCU-024:
  - "199999" or earlier: See "C4473-G02" to "C4473-G04".
  - "200001" or later: See "C4473-G18" to "C4473-G20".

  For RCU-025:
  - "199999" or earlier: See "C3607-G01" to "C3607-G03".
  - "200001" or later: See "C3607-G05" to "C3607-G07".
- Determine the location considering the length of the signal cable between the control unit and the processor unit.
- A magnetic compass will be affected if the control unit is placed too close to the magnetic compass. Observe the compass safe distances in the SAFETY INSTRUCTIONS to prevent interference to the compass.
- Be sure to connect the ground wire (between the earth terminal on the chassis and the ship's earth).
- Fasten the USB cable with the cable tie.

Ex. RADAR control unit, bottom view

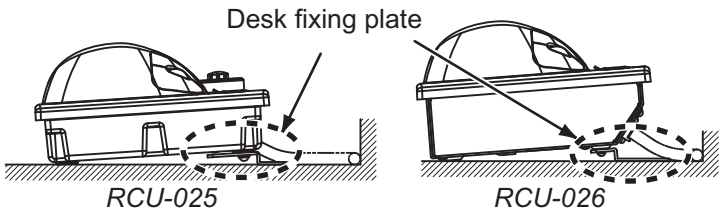


1.3.1 Desktop installation

How to mount the unit tilted

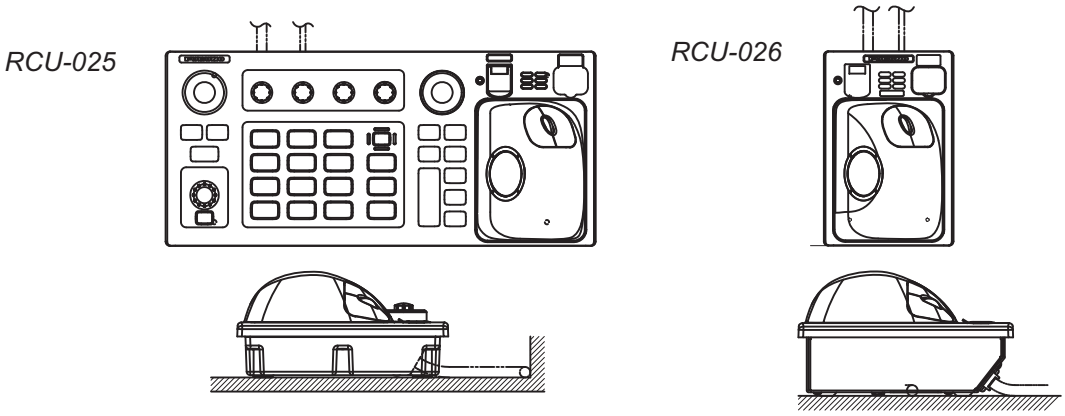
Use the desk fixing plate to mount the unit tilted.

1. Fix the desk fixing plate to the bottom of the control unit.
2. Fix the control unit with self-tapping screws ($\phi 5 \times 20$, local supply).



How to mount the unit flush with mounting surface

1. Drill four mounting holes of 5 mm diameter referring to the outline drawing at the back of this manual.
2. Fix the control unit with four screws (M4, local supply) from the underside of the desktop.



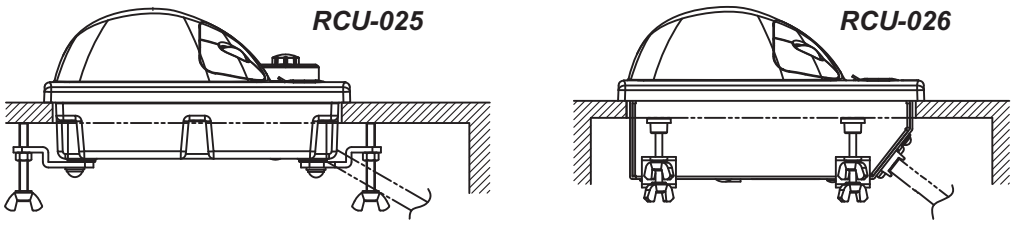
1.3.2 Flush mounting

Use the applicable optional flush mount kit to install the control unit in a console.

Flush mount kit

Control Unit	Type	Code
RCU-025	OP24-24	001-171-790
RCU-026	OP24-27	001-171-820

1. Prepare a cutout in the location referring to the outline drawing at the back of this manual.
2. Set the control unit to the cutout.
3. Attach the mounting plate to the control unit with four screws from the rear side.
4. Screw the wing screw to each mounting plate and then insert hex. bolt to each wing screw.
5. Fasten each wing screw and then fasten the hex. nuts as shown in figure below.

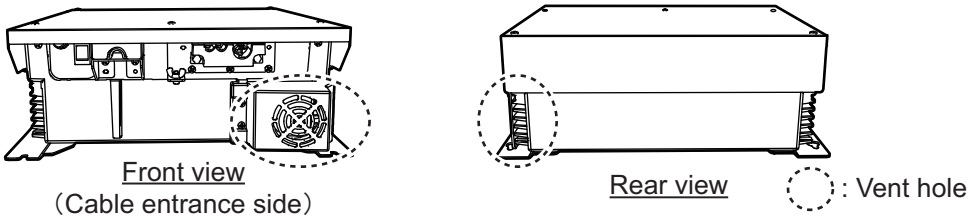


1.4 Power Supply Unit

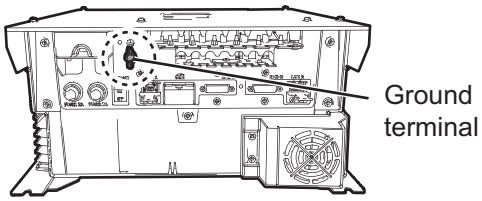
1.4.1 Installation considerations

The Power Supply Unit can be mounted on a bulkhead or deck. Keep in mind the following points when selecting a location.

- Locate the unit away from heat sources because of heat that can build up inside the cabinet.
- Select a location where the vibration is minimal.
- Locate the equipment away from places subject to water splash and rain.
- Make the service clearance of 100 mm in front of the vent hole (front and rear sides).



- Leave sufficient space at the sides and rear of the unit to facilitate maintenance.
- Connect the ground wire between the earth terminal on the chassis and the ship's earth.

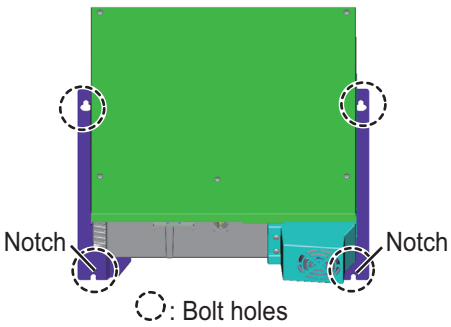


- A magnetic compass will be affected if the unit is placed too close to the magnetic compass. Observe the compass safe distances on page ii to prevent disturbance to the compass.

1.4.2 How to install the power supply unit

Use four bolts (M6, local supply) to fix the power supply unit.

Note: For bulkhead mounting, the open notches on the unit must face the deck.



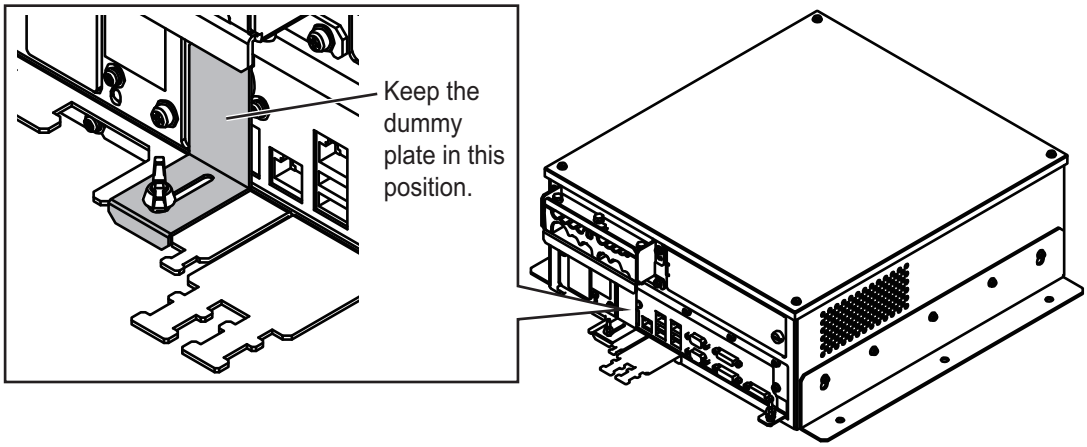
1.5 Processor Unit

1.5.1 Installation considerations

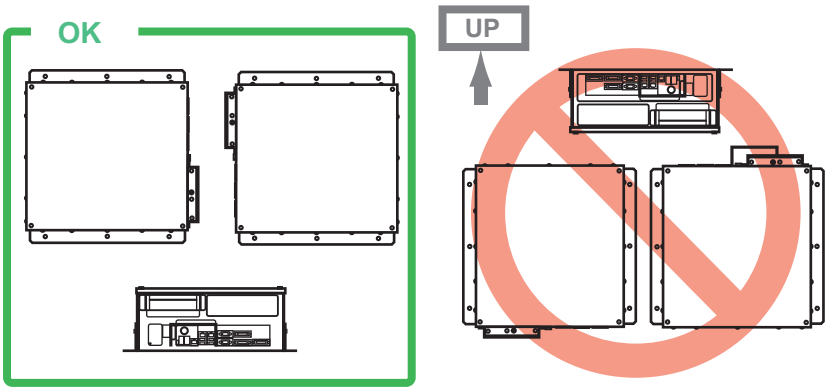
Keep in mind the following points when selecting a location.

- Locate the processor unit away from heat sources because of heat that can build up inside the cabinet.

- Select a location where the vibration is minimal.
- Locate the equipment away from places subject to water splash and rain.
- Make the service clearance of 100 mm in front of the vent hole (left side).
- Leave sufficient space at the sides and rear of the unit to facilitate maintenance.
- Be sure to connect the ground wire (between the earth terminal on the chassis and the ship's earth).
- A magnetic compass will be affected if the processor unit is placed too close to the magnetic compass. Observe the compass safe distances in the SAFETY INSTRUCTIONS to prevent interference to a magnetic compass.
- Leave the dummy plate fastened, to prevent the wrong operation of the power switch. The items behind the plate are for use by the serviceman.

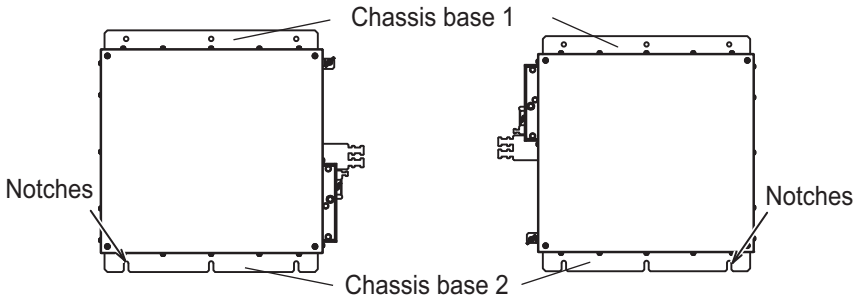


- Install the processor unit on the floor, or on a bulkhead with the following direction (horizontal), because of the DVD drive unit.

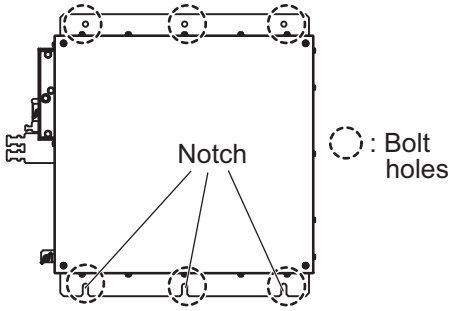


1.5.2 How to install the processor unit

1. Use 10 binding head screws (M4×8, supplied) to attach the chassis bases 1 and 2 to the processor unit.
   Note: For bulkhead mounting, attach the chassis base 2 so that the notches on it are facing the deck.



2. Use six bolts (M6, local supply) to fasten the processor unit.
   For bulkhead mounting, fasten three bolts for the lower bolt holes, leaving 5 mm of thread exposed from the bolt head. Set the notches of the processor unit on the three bolts, then fasten three bolts for the upper bolt holes. Then secure the processor unit in place with all six bolts fastened tightly.



1.6 Sensor Adapters (option)

Installation considerations

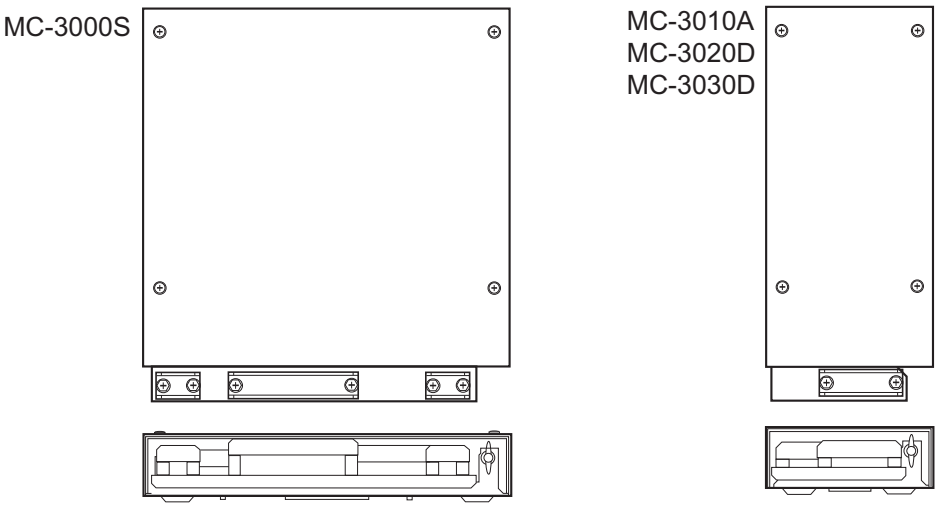
When you select a mounting location, keep in mind the following points:

- Locate the adapter away from heat sources because of heat that can build up inside the cabinet.
- Select a location where the vibration is minimal.
- Locate the equipment away from places subject to water splash and rain.
- Be sure to connect the ground wire (between the earth terminal on chassis and the ship's earth).
- Leave sufficient space at the sides and rear of the unit to facilitate maintenance.
- A magnetic compass will be affected if the adapter is placed too close to the magnetic compass. Observe the compass safe distances in the SAFETY INSTRUCTIONS to prevent interference to a magnetic compass.
- Select the location considering the number of sensor adapters connected.
  A maximum of eight MC-3000S can be connected to a sensor network.
  A maximum of 10 sensor adapters (MC-3010A/3020D/3030D) can be connected to a MC-3000S. However, note that five MC-3010A can be connected.
- For the MC-3000S, use a Cat5 cable.
- Select the location so that the length of the cables among the sensor adapters (MC-3000S, 3010A, 3020D and 3030D) is less than 6 m. If the length is more than 6 m, the adapters may not work properly.

How to install the sensor adapter

1. Unfasten four pan head screws to remove the cover from the sensor adapter.
2. Fasten four self-tapping screws ($\phi 4 \times 20$, supplied) to fix the sensor adapter.

3. Reattach the cover.



1.7 Intelligent HUB (option)

Use the optional Intelligent HUB (HUB-3000) to connect gateway network or sensor network. Do not connect this network to the shipborne LAN network. Further, do not connect a PC to this network, other than for maintenance.

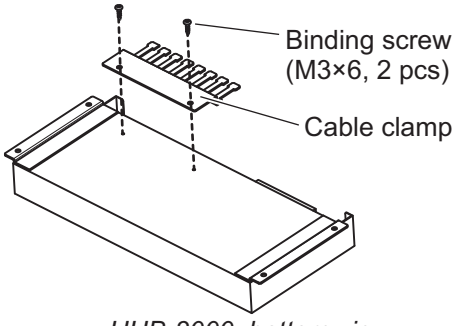
Installation considerations

Keep in mind the following considerations when selecting a location.

- Locate the hub away from heat sources because of heat that can build up inside the cabinet.
- Select a location where the vibration is minimal.
- Locate the hub away from places subject to water splash and rain.
- Be sure to connect a ground (between the earth terminal on the hub and the ship's earth).
- Leave sufficient space at the sides and rear of the unit to facilitate maintenance.
- A magnetic compass will be affected if the hub is placed too close to the magnetic compass. Observe the compass safe distances in the SAFETY INSTRUCTIONS to prevent interference to a magnetic compass.

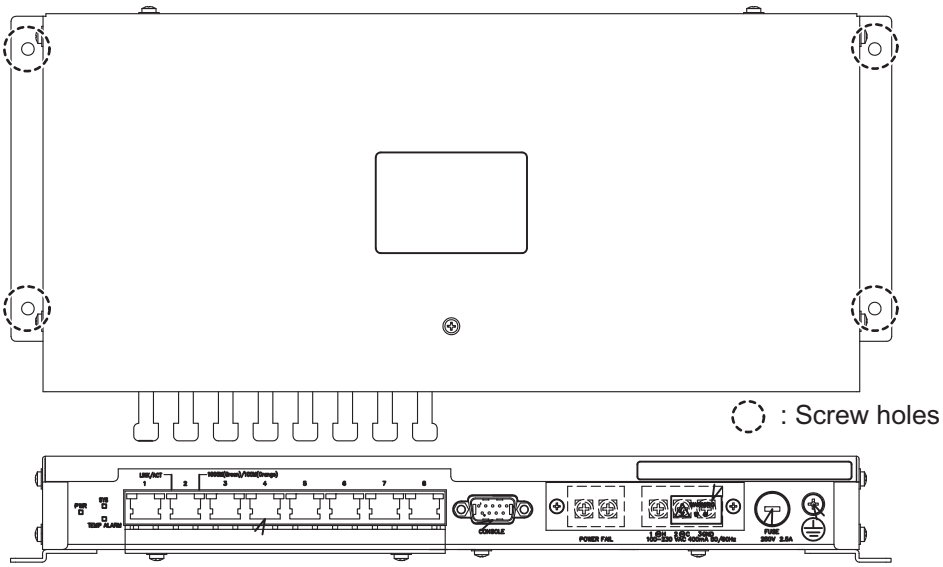
How to install the HUB-3000

1. Use two binding screws (M3×6, supplied) to attach the cable clamp (supplied) to the bottom of the HUB-3000.



HUB-3000, bottom view

2. Fasten four self-tapping screws (ϕ4×20, supplied) to fix the unit.



1.8 Switching Hub (option)

Use the optional Switching HUB (HUB-100) to connect sensor network that complies with IEC 61162-450 Ed.1. Do not use the HUB to connect a network other than ship-board LAN sensor network. Note that a commercial PC cannot be connected in this network, other than for the maintenance.

For the installation procedures, see the operator's manual for HUB-100 (Pub. No.OMC-35191).

Installation considerations

Keep in mind the following points when selecting a location.

- Locate the hub away from heat sources because of heat that can build up inside the cabinet.
- Select a location where the vibration is minimal.
- Locate the equipment away from places subject to water splash and rain.
- Make sure that the ground wire is connected between the earth terminal on the hub and the ship's earth.
- Leave sufficient space at the sides and rear of the unit to facilitate maintenance.
- A magnetic compass will be affected if the hub is placed too close to the compass. Observe the compass safe distances in the SAFETY INSTRUCTIONS to prevent compass malfunction.

1.9 Junction Box (option)

If the length of the antenna cable is more than 100 m, junction boxes are required. Install the boxes in a location protected from the weather, because their waterproofing standard is IPX3.

Fasten the junction boxes to the mounting location with four sets of M8 bolts and nuts. See the outline drawing for mounting dimensions.

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2. WIRING

2.1 Overview

Cabling considerations

To lessen the chance of picking up electrical interference, avoid where possible routing the antenna cable (power and LAN lines) near other onboard electrical equipment (radars, TX radio antennas, etc.). Also avoid running the cable in parallel with power cables. When crossing with other cable, the angle must be 90° to minimize the magnetic field coupling.

The antenna cable between the antenna and processor units is available in lengths of 15 m, 30 m, 40 m, and 50 m. Whatever length is used, it must be unbroken; namely, no splicing allowed. Use the antenna cable as short as possible to minimize attenuation of the signal.

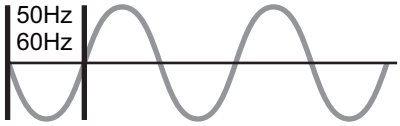
The radar must be connected to an emergency power source, as required by SOLAS II-1.

About network construction

- Use HUB-3000 for IEC 61162-450 Ed.2 compliant network. HUB-100 can also be used to connect IEC 61162-450 Ed.1 compliant network.
- Do not connect the ship's LAN network to the optional HUBs. Also, commercial PCs cannot be connected to the gateway network, other than for maintenance.
- To connect the FEA-2xx7, FMD-32xx, FAR-2xx7, FCR-2xx9 via LAN network, use the INS network.
- This unit does not support IGMP snooping or CGMP enabled switch.
- This unit does not have a router or repeater hub function.
- The Switching HUB (HUB-100) does not support IGMP snooping or CGMP enabled switch.
- When you use IEC61162-450 compatible sensors, set [Transmission Group] on the [Common Installation Settings] menu. See the Instruction Manual (E32-01305-*) for details.
- When connecting two or more FAR-2xx7 series radars, via the HUB-3000, to a FAR-3000 series radar, the HUB-3000 IGMP querier function must also be setup. See the Instruction Manual for the HUB-3000 IGMP querier.
- To ensure the security of the FURUNO network, be sure to connect with non-FURUNO networks via the service gateway (tBOX810-83A-FL).

About wiring

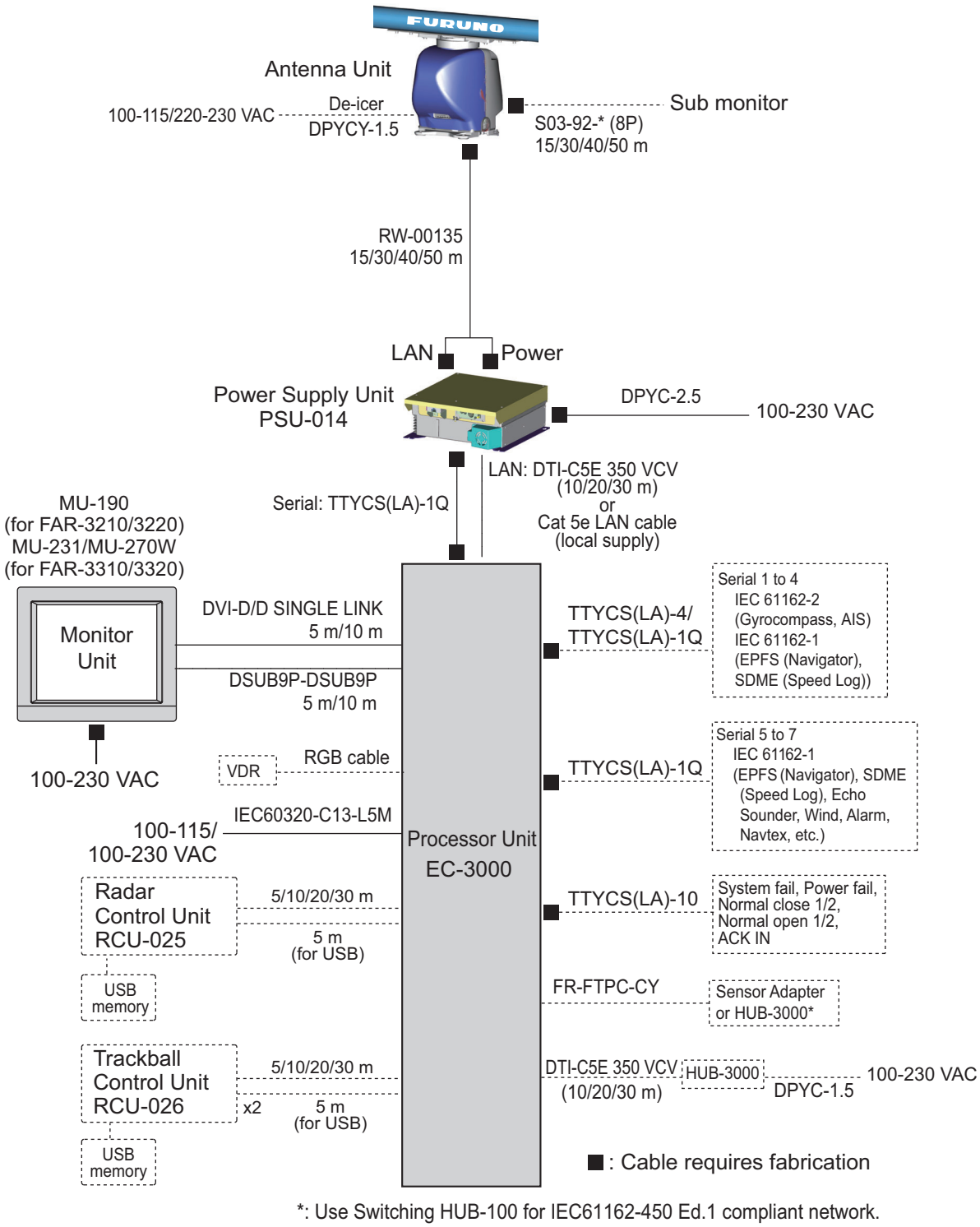
- To use the USB port on the control unit, connect the control unit to the processor unit, using the USB cable supplied with the control unit or optional USB cable.
- The length of the USB cable must be within 5 m to prevent equipment trouble.
- The length of LAN cables must be within 50 m.
- Use the Cat5e or Cat6 LAN cable for the network if available locally.
- If LAN cables are not available locally, use the optional LAN cables (FR-FTPC-CY for sensor network, DTI-C5E350 VCV for gateway network).
- If extension or division of the DVI or RGB cables is necessary, use the dividers shown below.
  - DVI cable divider: DVI-12A (maker: IMAGENICS)
  - RGB divider: CIF-12H, DD-106 or WBD-14F (maker: IMAGENICS)
- Make sure that the ground wires are connected between the ground terminals on each equipment and the ship's earth.
- Pass the cables through the specified clamp or the locking wire saddle.
- If a UPS (user supply) is connected to this equipment, be sure that the grounding lamp does not light.
- The output from the UPS must be a sine wave, as in the right figure.



Standard wiring

A Cat 5e LAN cable (RW-00135) connects between the antenna unit and the PSU. The maximum length of the cabling between the Processor Unit and the antenna unit is 80 m.

Retrofit (using antenna cable RW-9600) or foremast installation is also possible, with the installation of a pair of LAN Signal Converters, one in the antenna unit, the other in the PSU. See section 2.7.



*: Use Switching HUB-100 for IEC61162-450 Ed.1 compliant network.

2.2 Antenna Unit

Three cables are connected to the antenna unit: antenna cable, cable for the sub monitor (option) and power cable for the deicer (option). The procedure shows how to connect all cables. Disregard the descriptions for the optional equipment if not applicable.

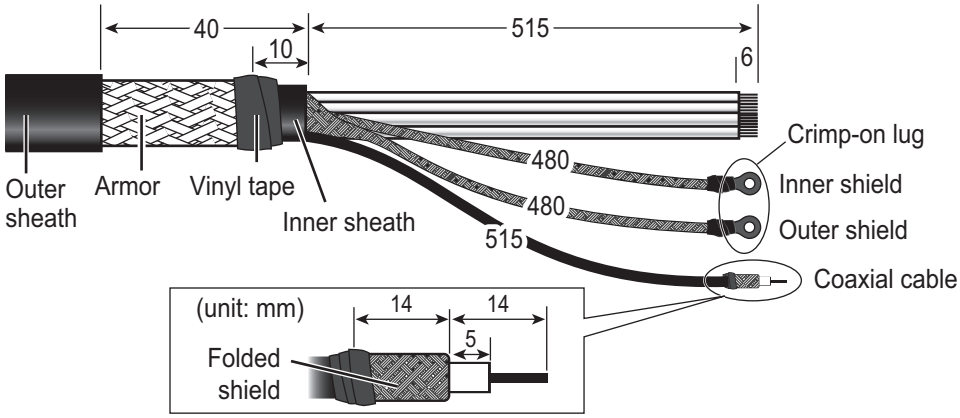
2.2.1 How to fabricate the cables

Antenna cable RW-00135

The end of the antenna cable RW-00135 which connects to the antenna unit is prefabricated.

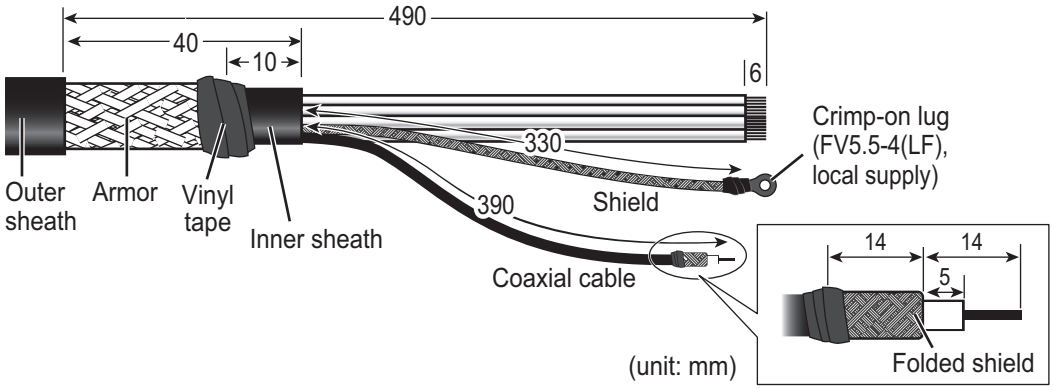
Antenna cable RW-9600 (for retrofit or foremast installation)

The white, red, and green wires are not used. Attach a single crimp-on lug (FV5.5-S4(LF), yellow, supplied locally) to the wires. (These wires will be connected together with the shield of the power line, in the next section.)



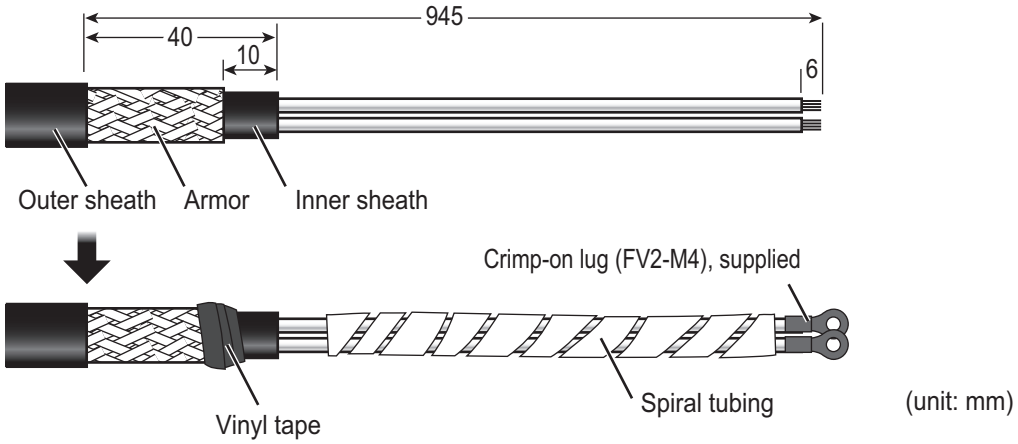
Cable RW-00136 (for a sub monitor)

Note: The maximum cable length is 50 m.



Cable DPYCY-1.5 (for the optional deicer)

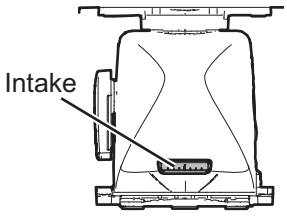
- Before beginning any work on the antenna unit, turn off the breaker for the de-icer at the mains switchboard. (Turning off the display unit has no effect.)
- The de-icer activates when the temperature becomes 0 °C, and shuts down when the temperature reaches 5 °C.



2.2.2 How to connect the cables

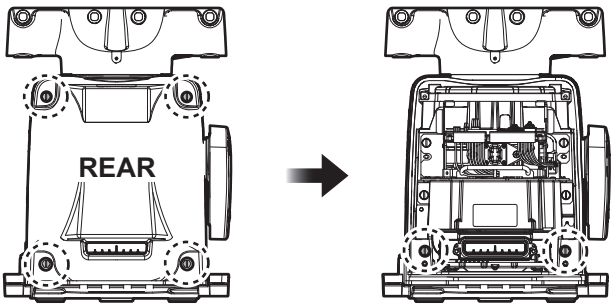
NOTICE

If there is a chance of inclement weather when the RF unit is removed, cover the intakes on both covers with packing tape for waterproofing. Be sure to remove the tape after completing the installation.



Some parts or wiring have been omitted from the illustrations for clarity. Also, in the procedure, mainly figures of magnetron radar are shown.

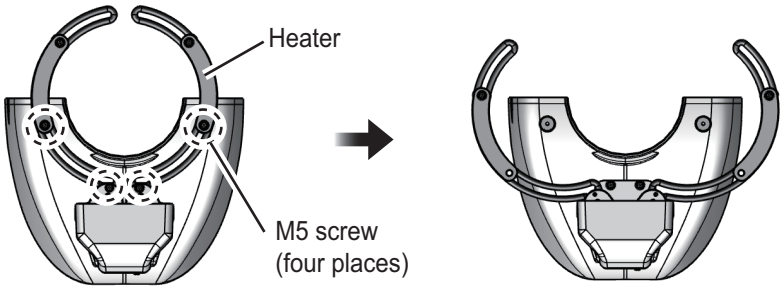
1. Loosen four bolts from the rear cover to remove the rear cover. If the de-icer is already installed, loosen two bolts inside the antenna to remove the front cover.



For de-icer installation

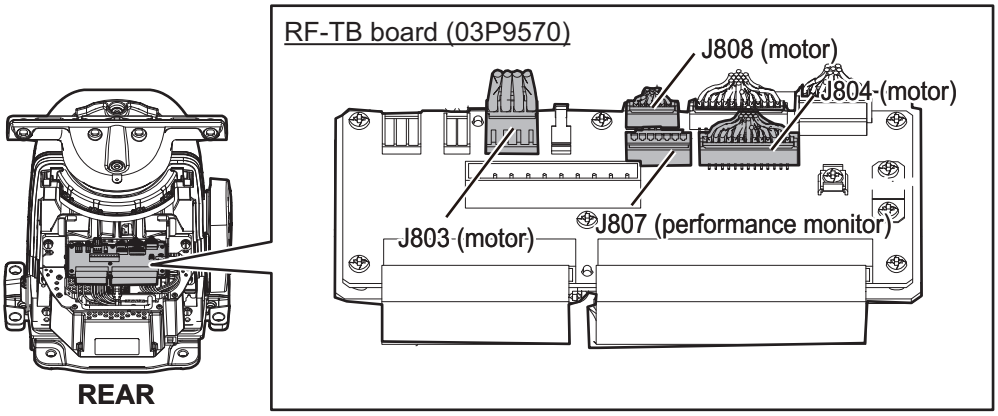
Note 1: The cable for the performance monitor is connected between the rear cover and the RF-TB Board in the Antenna Unit. Open the cover slowly to prevent damage to the cable and connector.

Note 2: If the de-icer is to be installed, remove four M5 screws and spread open the right and left heater elements on the cover, then remove the front cover, being careful not to hit the elements on the radiator or chassis.

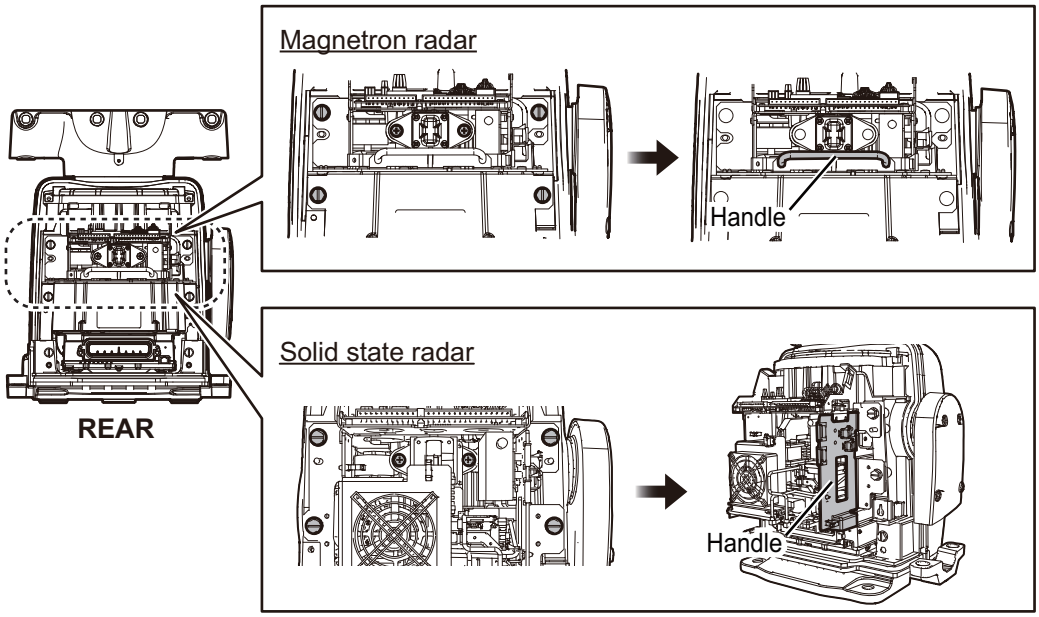


Note 3: If this a retrofit or foremast installation, a LAN Signal Converter is required, in both the Antenna Unit and the Processor Unit. See section 2.7.

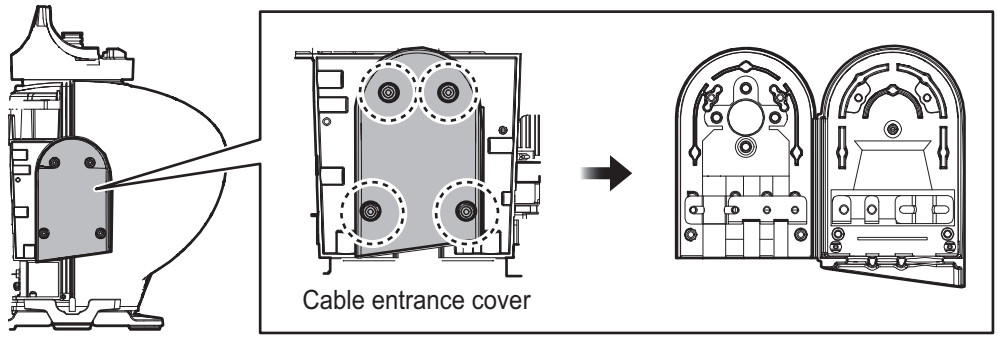
2. Disconnect the performance monitor connector (J807) and the motor drive connectors (J803, J804 and J808) from the RF-TB Board.



3. Unfasten the six bolts in the figure below to enable removal of the transceiver unit.Then, pull the handle on the transceiver unit to remove the unit. **For magnetron radar, lay the unit on its side or on top of non-ferrous material, to prevent demagnetization of the magnetron.**

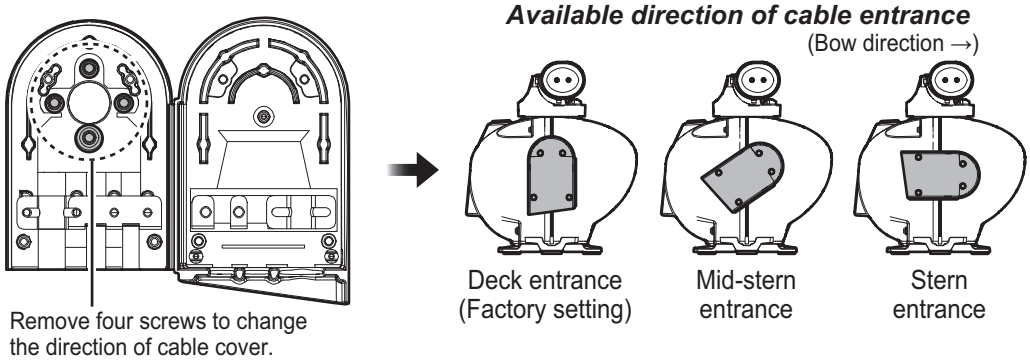


4. Unfasten four screws to open the cable entrance cover.

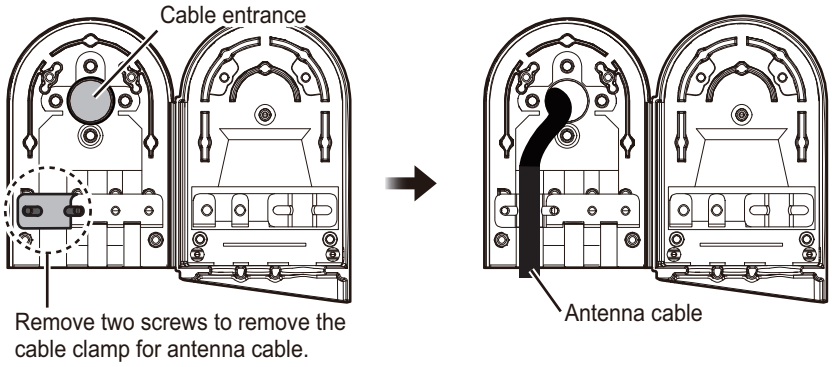


How to change the orientation

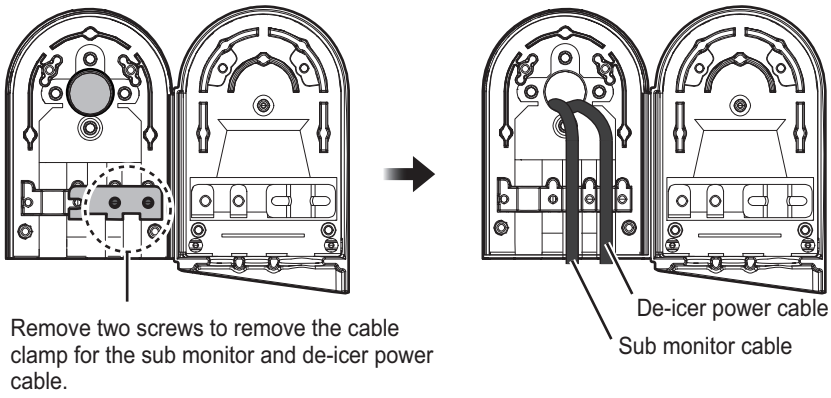
The orientation of the cable entrance can be changed, in one of the three orientations shown in the following figure. **No other orientation is allowed, to maintain watertight integrity.** The default orientation is "deck". To change the entrance, unfasten the four screws circled in the following figure, then orient the cable entrance in the required direction. Refasten the screws.



5. Unfasten the two screws fixing the cable clamp for antenna cable, then pass the antenna cable through the cable entrance.

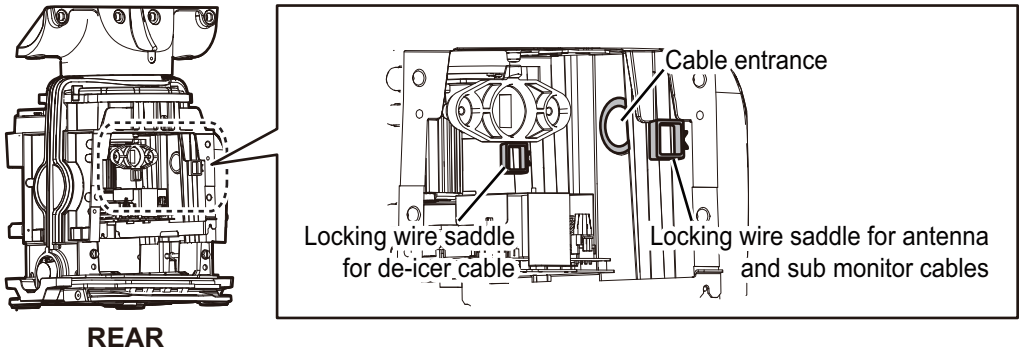


If applicable, unfasten the two screws fixing the cable clamp for the sub monitor and de-icer power cable, then pass the cables through the cable entrance.

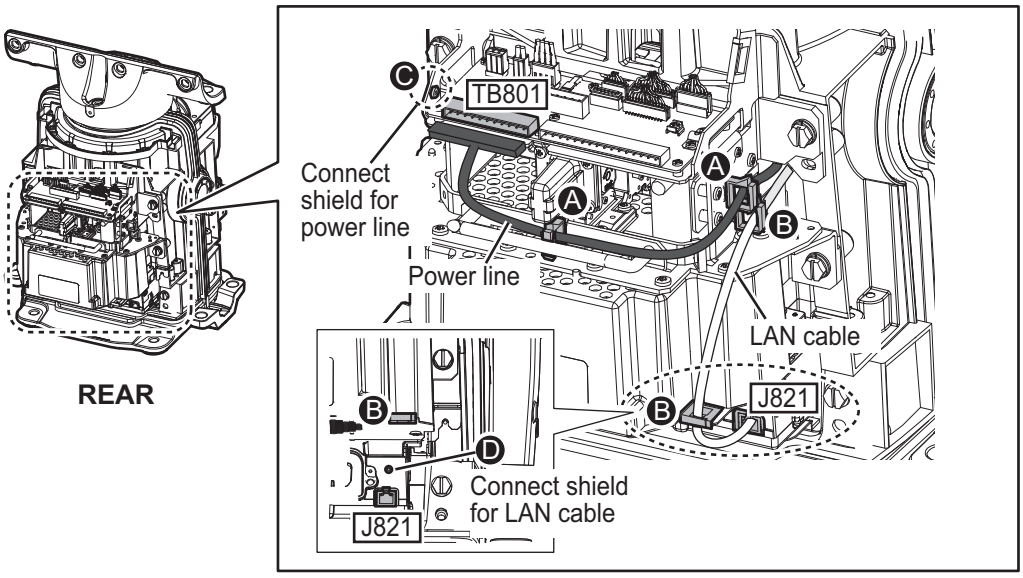


Note: Dummy plugs are provided to insert into unused cable slots for waterproofing.

6. Pass the cables through their respective locking wire saddles in the chassis from the cable entrance.
   Note: Make sure to pass the cable through the specified locking wire saddle.

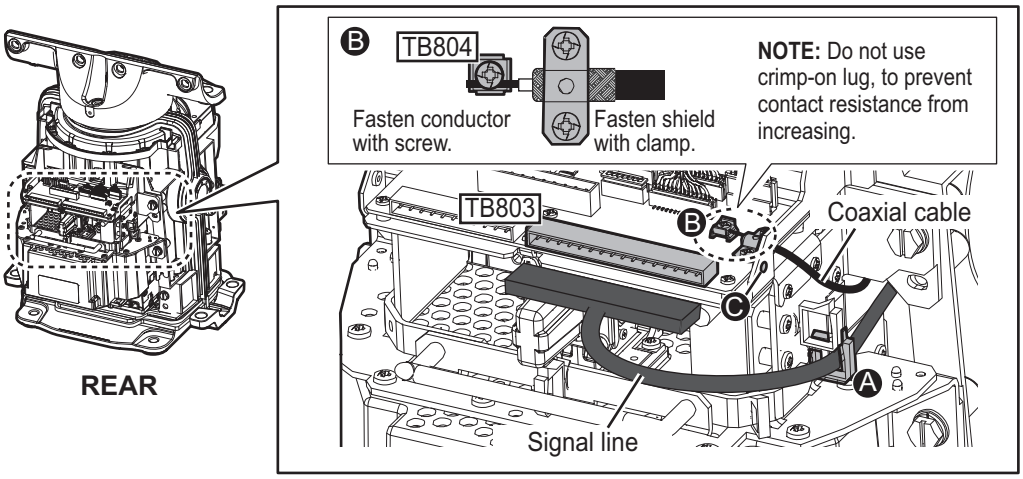


7. Re-mount the transceiver unit then reconnect the connectors for the motor (J803, J804 and J808).
8. Attach the appropriate WAGO connectors (pre-attached) to the appropriate cables, and then connect the antenna and sub monitor cables to the RF-TB Board as shown in the following figure. For how to connect the WAGO connector. For pin arrangement, see the interconnection diagram at the back of this manual.
   Note 1: Make sure to pass the cable through the specified locking wire saddle.
   Note 2: A terminal opener is provided on the RF-TB Board.
   - Destination of antenna cable
     Power line: TB801 through the locking wire saddles (A, two places).
     LAN cable: J821 through the locking wire saddles (B, two places).
     Shield of power line: Screw on fixing plate (C)
     Shield of LAN cable: Screw (D)

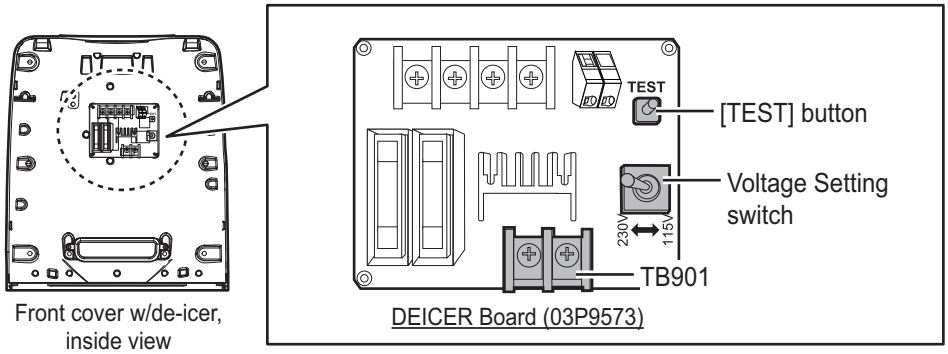


Note: For the antenna cable RW-9600, connect the crimp-on lug (that binds unused wires) together with the shield of the power line.

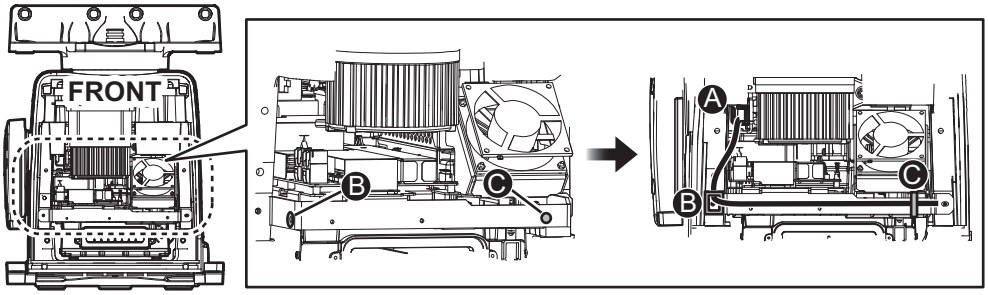
- Destination of sub monitor cable
  Signal line: TB803 through the locking wire saddle (A).
  Coaxial cable: TB804 (B)
  Shield of signal cable: Screw on fixing plate (C)



9. **For DE-ICER INSTALLATION**, connect the de-icer power cable the de-icer board 03P9573 attached on the front cover. If the de-icer is not provided, go to step 10.

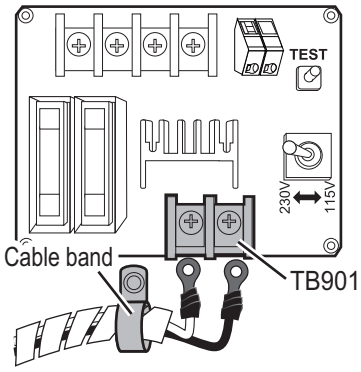


1) Set a locking wire saddle (supplied) at locations (B) and (C) shown in the following figure. Pass the de-icer power cable from cable entrance through the locking wire saddles (A), (B) and (C) and pull it to the front side.



2) Pass the de-icer power cable through the cable band. Connect the cable to TB901 on the DE-ICER board (03P9573), using the supplied crimp-on lugs.

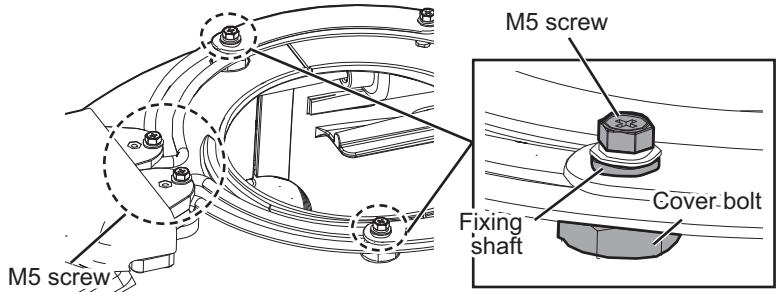
3) Set the Voltage Setting switch according to the power source for the de-icer; 115 V or 230 V. The default setting is 230 V.



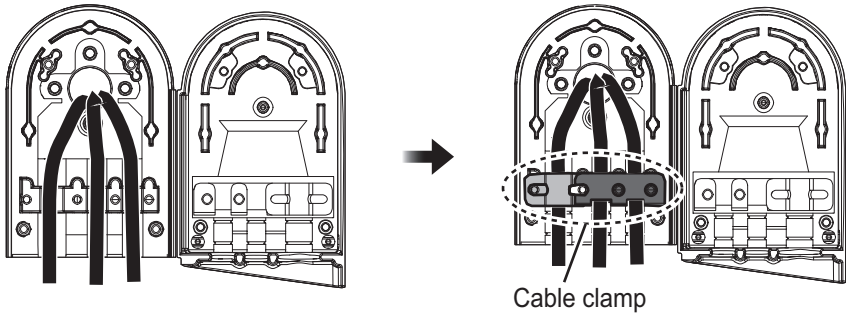
4) Apply power to the de-icer then press and hold the **TEST** button for about ten seconds. Check that the heater gets hot and then release the **TEST** button.

5) Set the front cover to the Antenna Unit. Close the open heater and return to its original position.Take care not to hit the heater elements on the chassis or radiator.

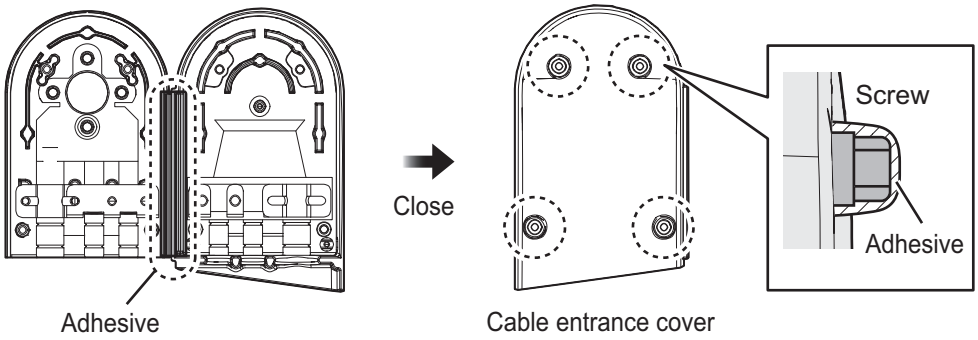
6) Fasten the base of the heater with two M5 screws and apply the adhesive the screw heads. Also, fasten the fixing shafts for the cover bolts with two M5 screws.



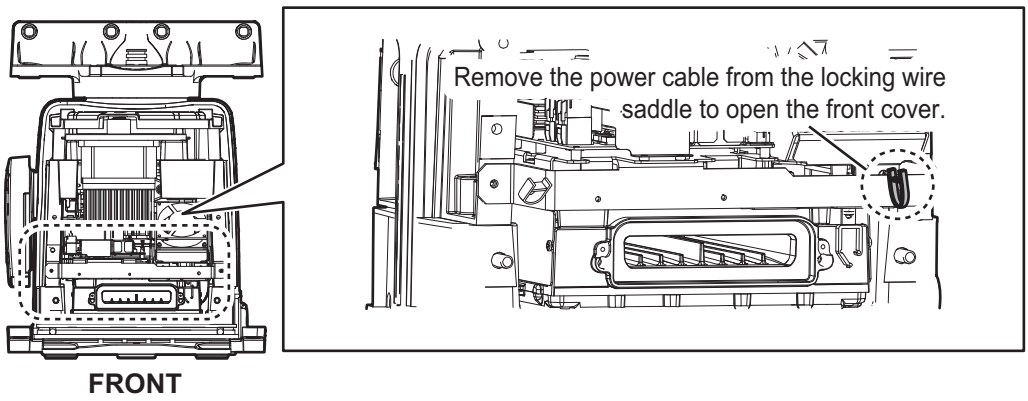
10. Position the cables so their armors lie beneath their respective cable clamps in the cable entrance. Fasten the cable clamps.



11. Coat the hinge with the supplied adhesive for hinge waterproof then close the cable entrance cover. Fix the cable cover with four screws, then coat the screws with the supplied adhesive.



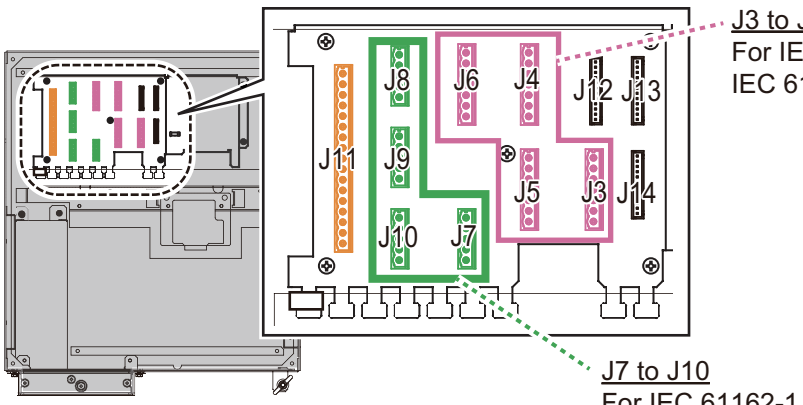
12. Reconnect the performance monitor connector (J807) to the rear cover.
13. **Check that the gasket on the front and rear covers is seated properly**, then close the covers. The torque for the fixing bolts is 10.0 N•m.
    Note 1: If it is necessary to open the front cover after installing the de-icer kit, remove the power cable from the locking wire saddle shown in the right figure then detach the cover slowly to prevent damage to the heater element.



Note 2: Take care not to hit the heater elements on the chassis or radiator. If the heater hits something, unfasten the fixing screws for the heater to adjust the position of the heater. Then fix the heater again.

2.3 Processor Unit

Note: The interface ports approved for interconnecting navigation equipment are shown in the figure below. For details, see section 2.3.3 "How to select the serial input/output format".



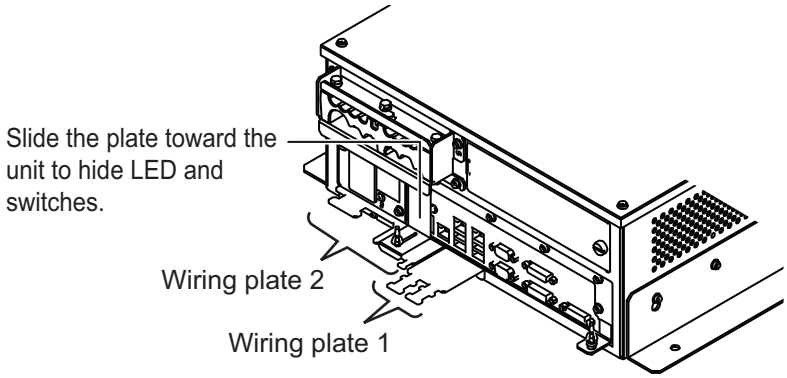
Top view of EC-3000

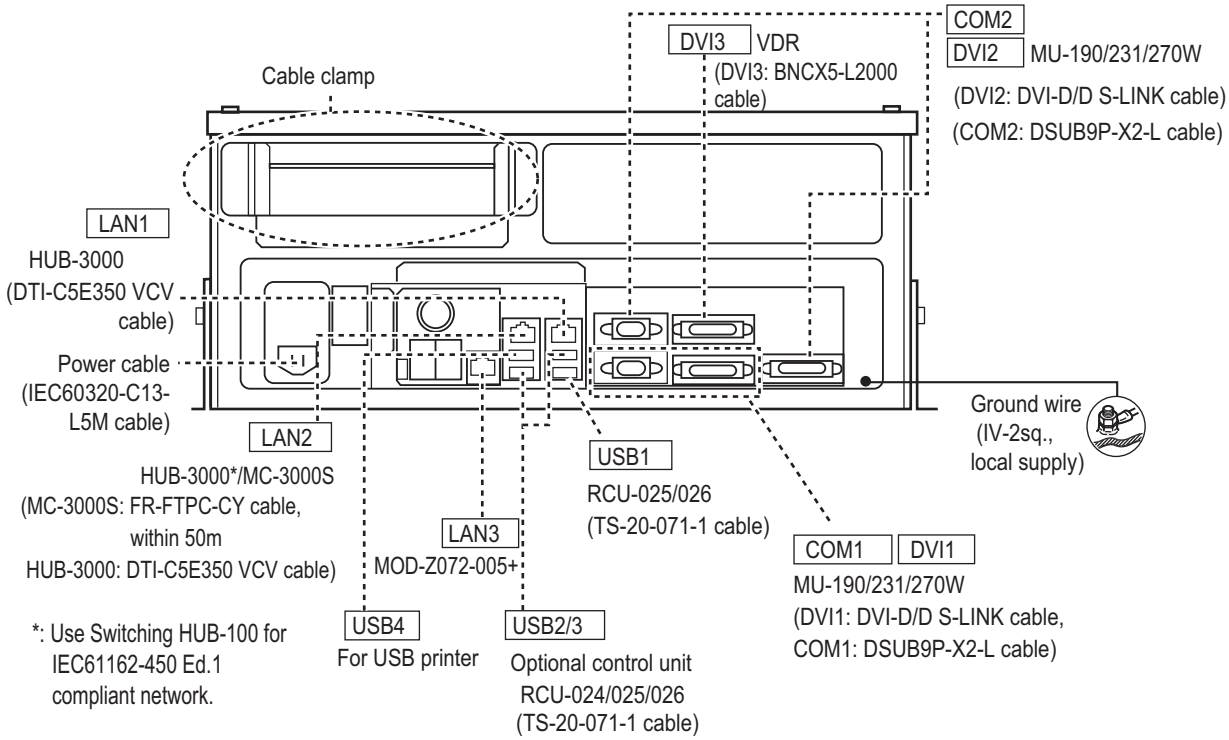
2.3.1 How to connect cables to terminals in the processor unit

Use screws (M3×6, supplied) to attach the wiring plate 1 and wiring plate 2 to the processor unit. Connect the cables shown below to the connectors at the front of the processor unit. Bind cables to the appropriate fixing metal with the cable ties (supplied).

For the cables from the monitor unit (type: DVI-D/D SLINK5M/10M (MU-190 only), DSUB9P-X2-L5/10M) and ground wire, connect them to the processor unit directly (without fixing to a wiring plate). Tighten the fixing screws on these connectors to prevent disconnection from the processor unit.

Note: Connect the cables so that they do not interfere with the opening or closing of the DVD tray.





Cables connected at the wiring plate 1

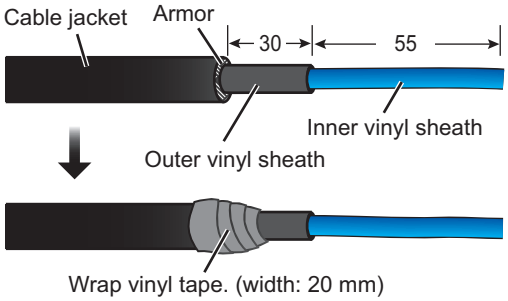
- USB cables from the control units
- Printer cable
- LAN cable (type: DTI-C5E350 VCV) from the HUB-3000
- LAN cable (type: FR-FTPC-CY) from the HUB-100/MC-3000S

Cables connected at the wiring plate 2

- Power cable (Type: IEC60320-C13-L5M)
- LAN cable to the LAN3 port

How to fabricate the LAN cable

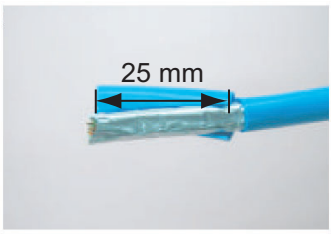
Fabricate the LAN cable (FR-FTPC-CY, DTI-C5E350 VCV), as shown below. (Wrap both edges of the armor with vinyl tape.) Make sure the shield of the cable contacts the shell of the modular plug.
Note: For a locally supplied LAN cable, expose the armor and clamp the armor with the cable clamp.



1

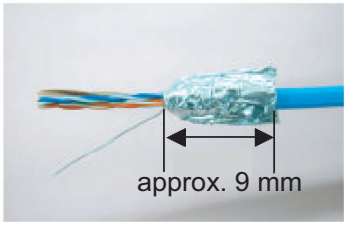
Expose inner vinyl sheath.

2



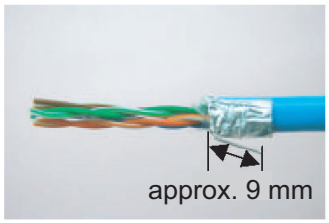
Remove the outer sheath by approx 25 mm. Be careful not to damage inner shield and cores.

3



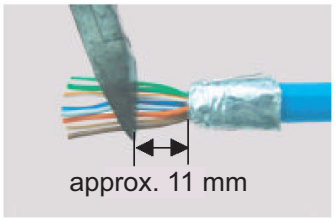
Fold back the shield, wrap it onto the outer sheath and cut it, leaving 9 mm.

4



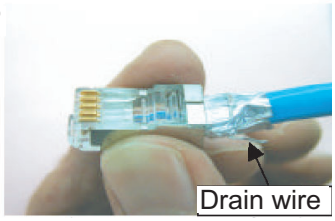
Fold back drain wire and cut it, leaving 9 mm.

5



Straighten and flatten the core in order and cut them, leaving 11 mm.

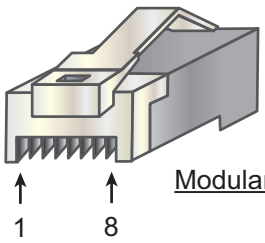
6



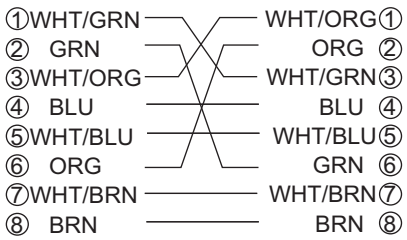
Insert the cable into the modular plug so that the folded part of the shield enters into the plug housing. The drain wire should be located on the tab side of the jack.

7

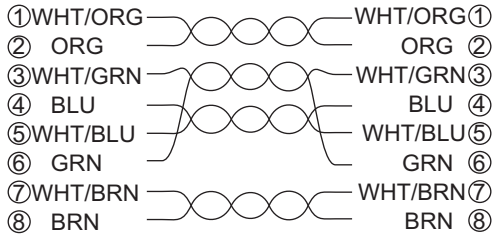
Using special crimping tool MPT5-8AS (PANDUIT CORP.), crimp the modular plug.
Finally check the plug visually.



[Crossover cable]



[Straight cable]



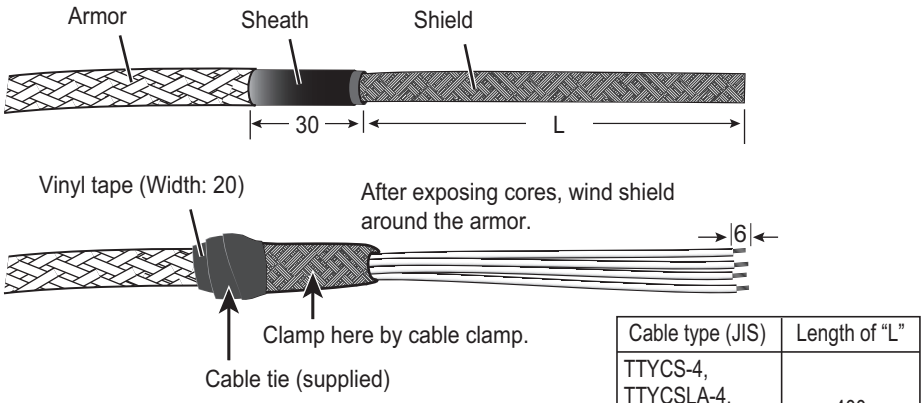
2.3.2 How to connect cables inside the processor unit

How to fabricate the cables

Fabricate the JIS cables (see the Appendix for equivalent cables if not available locally) as shown below. Connect the cables to the WAGO connectors on the I/O Board (24P0124) inside the processor unit.

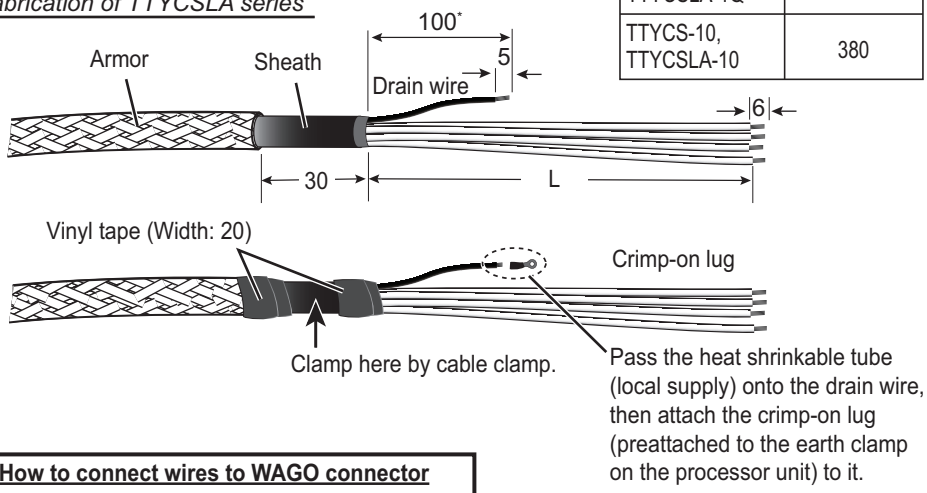
For locations of cables and cores, see the sticker on the reverse side of the top cover. (All dimensions in millimeters)

Fabrication of TTYCS series

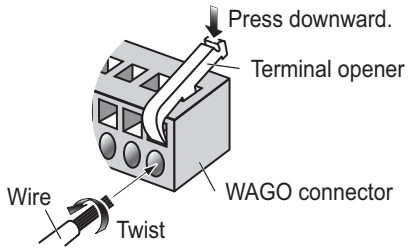


Cable type (JIS)	Length of "L"
TTYCS-4, TTYCSLA-4, TTYCS-1Q, TTYCSLA-1Q	400
TTYCS-10, TTYCSLA-10	380

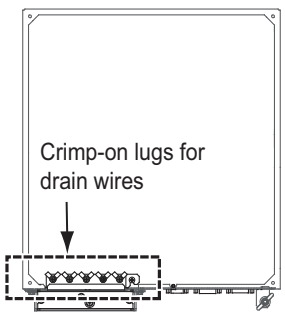
Fabrication of TTYCSLA series



How to connect wires to WAGO connector



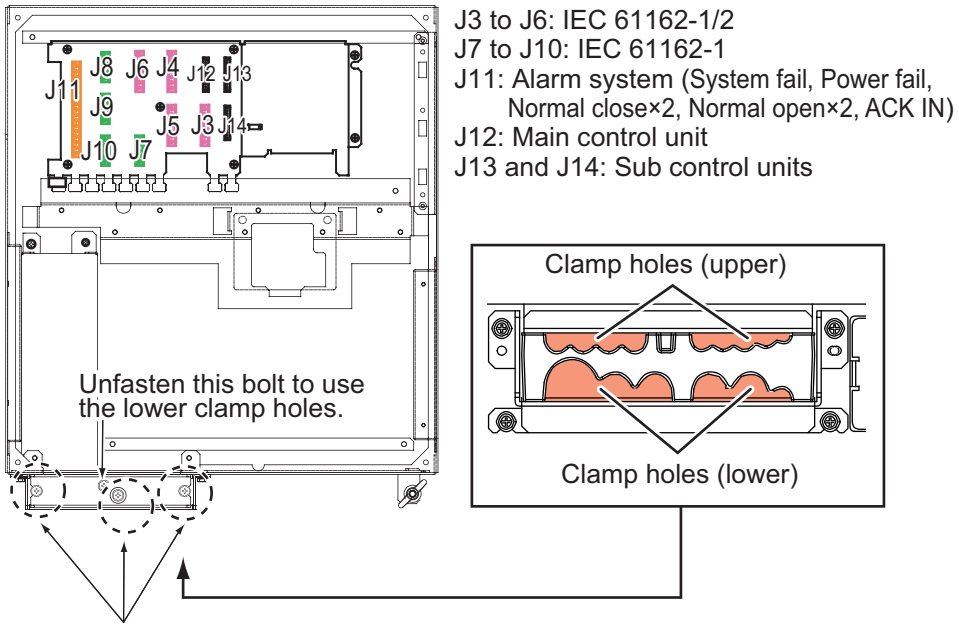
<Procedure>
1. Twist the cores.
2. Press the terminal opener downward.
3. Insert the wire to hole.
4. Remove the terminal opener.
5. Pull the wire to confirm that it is secure.



Processor unit, cover removed

How to connect the cables

1. Unfasten four screws (M4×8) to remove the top cover from the processor unit.
2. Unfasten the three bolts circled below to remove the upper plate of the cable clamp.



J3 to J6: IEC 61162-1/2
J7 to J10: IEC 61162-1
J11: Alarm system (System fail, Power fail, Normal close×2, Normal open×2, ACK IN)
J12: Main control unit
J13 and J14: Sub control units

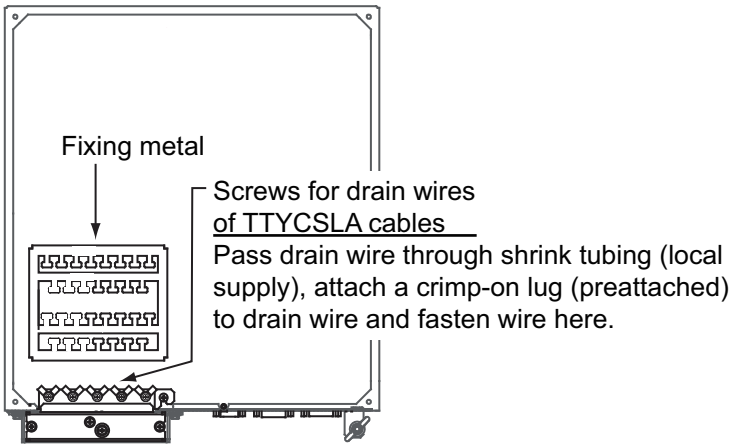
Processor unit, top view

3. Pass the cables through the clamp holes, then fasten the bolts removed at step 2 to fix the cables.

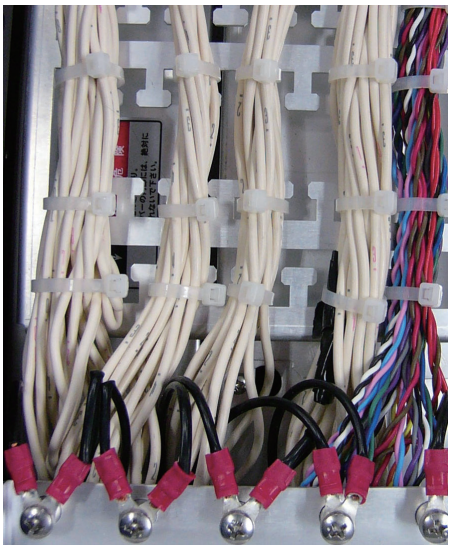
Lay shields of cables under this clamp then tighten the clamp.

4. Connect the WAGO connectors to the I/O Board, referring to the interconnection diagram.

5. Bind the cables to the fixing metal in the processor unit with the cable ties (supplied).



6. For the drain wire of the TTYCSLA series cable, attach shrink tubing (local supply) to drain wire, fasten a crimp-on lug (pre-attached at location shown below) to drain wire then fasten the wire with a screw.



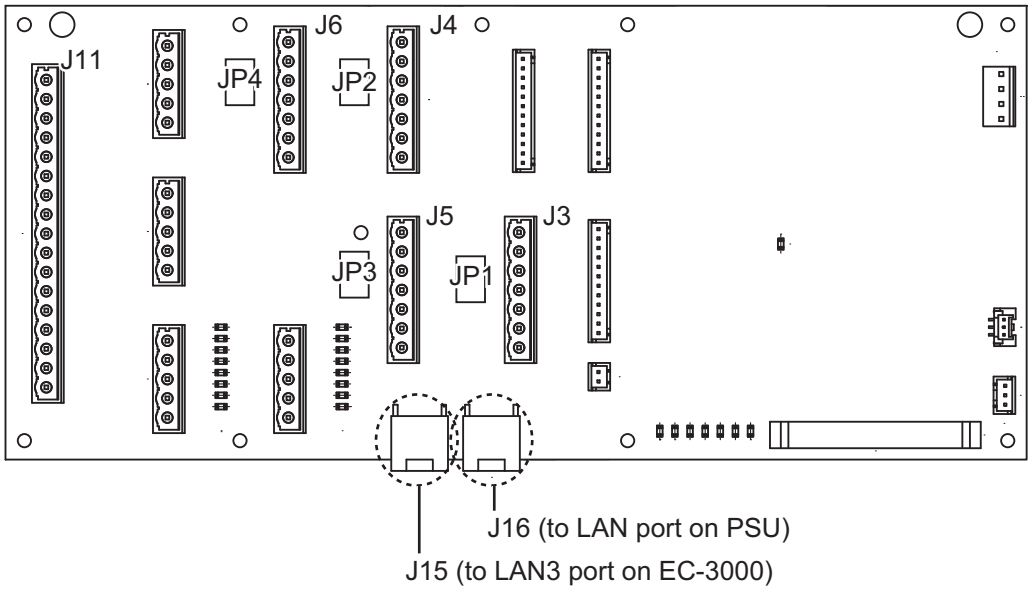
Example of wiring inside the processor unit

2.3.3 How to select the serial input/output format

How to set the termination resistors

Use the jumper blocks JP1 to JP4 on the I/O Board (24P0124) to set the termination resistors for J3 to J6 ON or OFF. The default setting is ON.

- When setting the starting/ending terminal for the multipoint connection, or multipoint is not connected (CH1 to CH4): termination resistor ON
- When not setting the starting/ending terminal for the multipoint connection (CH1 to CH4): termination resistor OFF



Processor unit, I/O Board (24P0124)

Jumper block JP1		Connector J3
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination connector: OFF
2-3	SHORT	

Jumper block JP2		Connector J4
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination connector: OFF
2-3	SHORT	

Jumper block JP3		Connector J5
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination connector: OFF
2-3	SHORT	

Jumper block JP4		Connector J6
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination connector: OFF
2-3	SHORT	

How to select the serial input/output format

Use the connectors J3 to J6 to set the input/output format for serial CH1 to CH4, from IEC 61162-1 or IEC 61162-2. For connectors J7 to J10, use TTYCS-1Q or TTYCSLA-1Q cable for a connector.

Connector J3

Pin #	Signal	In/Out	Description	IEC 61162-2	IEC 61162-1
1	TD1-A	Out	Serial CH1, output IEC 61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD1-B	Out	Serial CH1, output IEC 61162-1/2		
3	RD1-A	In	Serial CH1, input IEC 61162-2		No connection
4	RD1-B	In	Serial CH1, input IEC 61162-2		
5	ISOGND1	-	Isolation GND (CH1)		
6	RD1-H	In	Serial CH1, input IEC 61162-1	No connection	TTYCS(LA)-4
7	RD1-C	In	Serial CH1, input IEC 61162-1		

Connector J4

Pin #	Signal	In/Out	Description	IEC 61162-2	IEC 61162-1
1	TD2-A	Out	Serial CH2, output IEC 61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD2-B	Out	Serial CH2, output IEC 61162-1/2		
3	RD2-A	In	Serial CH2, input IEC 61162-2		No connection
4	RD2-B	In	Serial CH2, input IEC 61162-2		
5	ISOGND2	-	Isolation GND (CH2)		
6	RD2-H	In	Serial CH2, input IEC 61162-1	No connection	TTYCS(LA)-4
7	RD2-C	In	Serial CH2, input IEC 61162-1		

Connector J5

Pin #	Signal	In/Out	Description	IEC 61162-2	IEC 61162-1
1	TD3-A	Out	Serial CH3, output IEC 61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD3-B	Out	Serial CH3, output IEC 61162-1/2		
3	RD3-A	In	Serial CH3, input IEC 61162-2		No connection
4	RD3-B	In	Serial CH3, input IEC 61162-2		
5	ISOGND3	-	Isolation GND (CH3)		
6	RD3-H	In	Serial CH3, input IEC 61162-1	No connection	TTYCS(LA)-4
7	RD3-C	In	Serial CH3, input IEC 61162-1		

Connector J6

Pin #	Signal	In/Out	Description	IEC 61162-2	IEC 61162-1
1	TD4-A	Out	Serial CH4, output IEC 61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD4-B	Out	Serial CH4, output IEC 61162-1/2		
3	RD4-A	In	Serial CH4, input IEC 61162-2		No connection
4	RD4-B	In	Serial CH4, input IEC 61162-2		
5	ISOGND4	-	Isolation GND (CH4)		
6	RD4-H	In	Serial CH4, input IEC 61162-1	No connection	TTYCS(LA)-4
7	RD4-C	In	Serial CH4, input IEC 61162-1		

Connector J7

Pin#	Signal	In/Out	Description	Remarks
1	TD5-A	Out	Serial CH5, output IEC 61162-1	Use TTYCS(LA)-1Q, IEC 61162-1 only
2	TD5-B	Out	Serial CH5, output IEC 61162-1	
3	RD5-H	In	Serial CH5, input IEC 61162-1	
4	RD5-C	In	Serial CH5, input IEC 61162-1	
5	GND	-	GND	

Connector J8

Pin#	Signal	In/Out	Description	Remarks
1	TD6-A	Out	Serial CH6, output IEC 61162-1	Use TTYCS(LA)-1Q, IEC 61162-1 only
2	TD6-B	Out	Serial CH6, output IEC 61162-1	
3	RD6-H	In	Serial CH6, input IEC 61162-1	
4	RD6-C	In	Serial CH6, input IEC 61162-1	
5	GND	-	GND	

Connector J9

Pin#	Signal	In/Out	Description	Remarks
1	TD7-A	Out	Serial CH7, output IEC 61162-1	Use TTYCS(LA)-1Q, IEC 61162-1 only
2	TD7-B	Out	Serial CH7, output IEC 61162-1	
3	RD7-H	In	Serial CH7, input IEC 61162-1	
4	RD7-C	In	Serial CH7, input IEC 61162-1	
5	GND	-	GND	

Connector J10

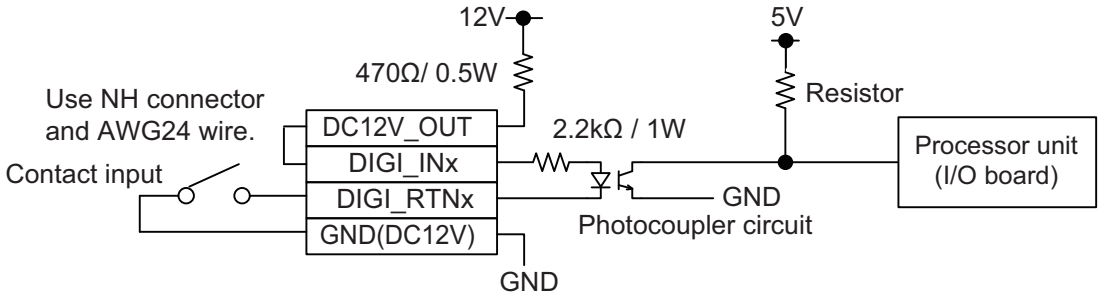
Pin#	Signal	In/Out	Description	Remarks
1	TD8-A	Out	Serial CH8, output IEC 61162-1	Use TTYCS(LA)-1Q, IEC 61162-1 only For PSU
2	TD8-B	Out	Serial CH8, output IEC 61162-1	
3	RD8-H	In	Serial CH8, input IEC 61162-1	
4	RD8-C	In	Serial CH8, input IEC 61162-1	
5	GND	-	GND	

How to set contact input/output

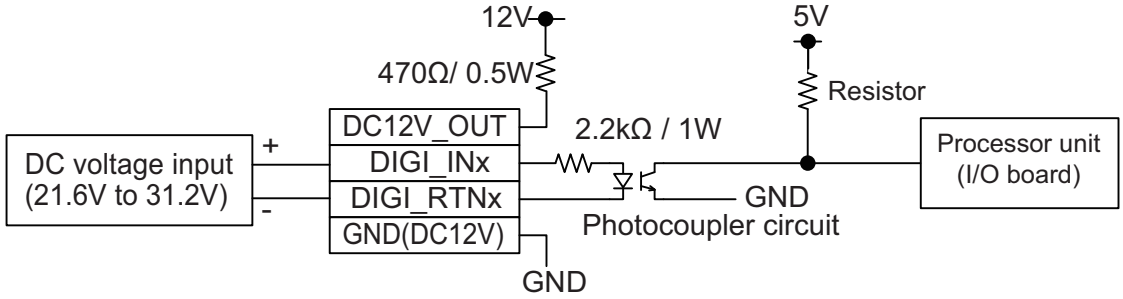
The connector J11 can be used for the connection of contact input or voltage input. Refer to the figures shown below to make the wiring which complies with the input specification.

Note: The input must not exceed the range of the input voltage, to prevent malfunction.
-Setting for voltage input: 21.6V to 31.2V
-Setting for contact input: Voltage cannot be input (contact signal only).

• (Setting for contact input)



• (Setting for voltage input)



Connector J11

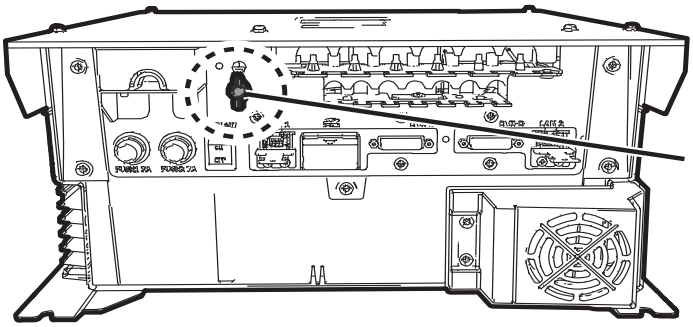
Pin #	Signal name	In/Out	Description	Contact input	Voltage input
1	SYS_FAIL-A	Out	System fail output (NC)	TTYCS(LA)-10	TTYCS(LA)-10
2	SYS_FAIL-B	Out	System fail output (NC)		
3	PWR_FAIL-A	Out	Power fail output (NC)		
4	PWR_FAIL-B	Out	Power fail output (NC)		
5	NC1-A	Out	Alarm output (NC1)		
6	NC1-B	Out	Alarm output (NC1)		
7	NC2-A	Out	Alarm output (NC2)		
8	NC2-B	Out	Alarm output (NC2)		
9	NO1-A	Out	Alarm output (NO1)		
10	NO1-B	Out	Alarm output (NO1)		
11	NO2-A	Out	Alarm output (NO2)		
12	NO2-B	Out	Alarm output (NO2)		
13	DC12V_OUT	Out	ACK input	#13-#14: short	No connection
14	DIGI_IN1	In	ACK input		TTYCS(LA)-10
15	DIGI_RTN1	Out	ACK input	TTYCS(LA)-10	
16	GND (DC12V)	In	ACK input		No connection
17	GND	-	GND	NO connection	

Note: NC1/2 and NO1/2 are output with a fixed value.

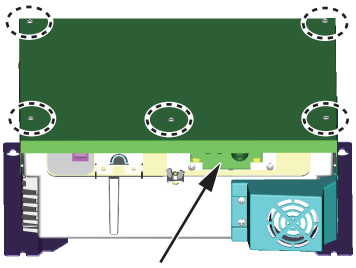
2.4 Power Supply Unit

This procedure shows how to wire the power supply. For details see the interconnection diagram.

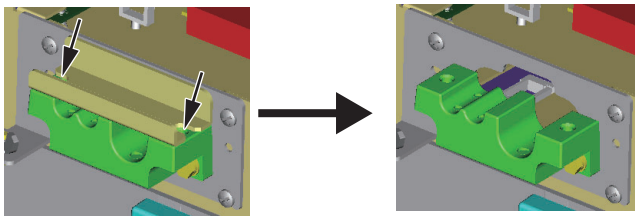
1. Connect the ground wire between the ground terminal on the chassis and the ship's earth.
   Note: Electrical shock can result if the ground wire is not connected properly.



2. Unfasten five screws to open the cover of the power supply unit.

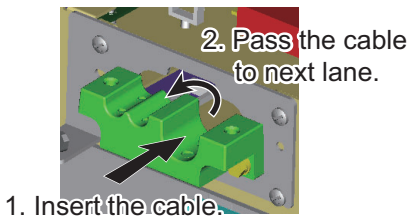


3. Unfasten two screws from the cable clamp to separate the cable clamp assembly.

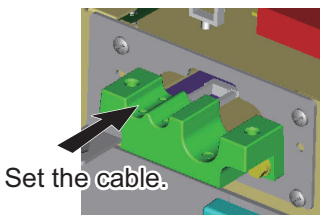


Cable clamp

4. Pass the LAN and serial cables through the cable clamp.

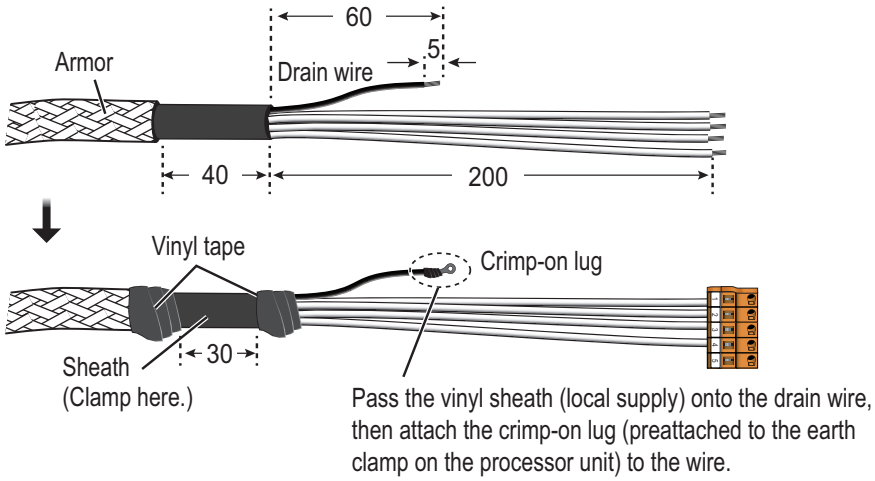


LAN cable

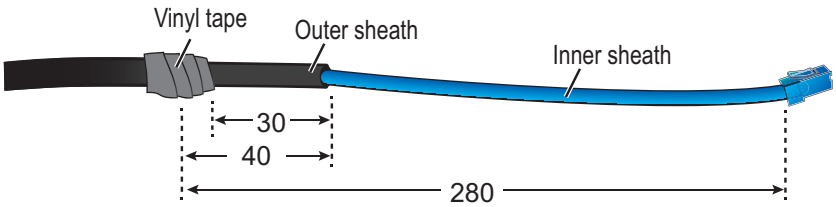


Serial cable

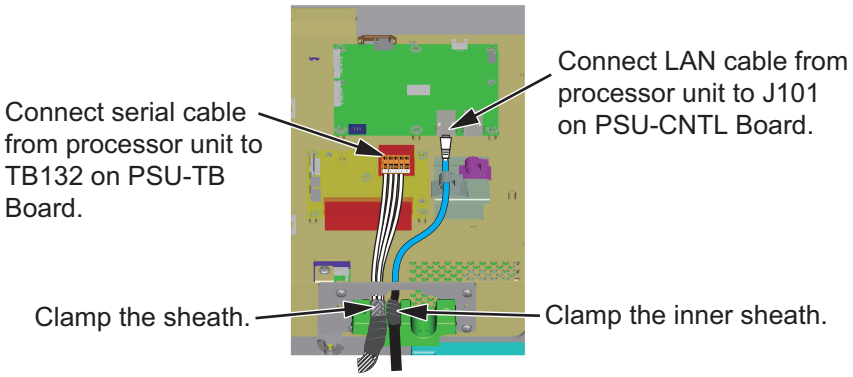
5. As shown below, fabricate the cables. For retrofit, the optional LAN Signal Converter kit. See section 2.7 for wiring.
   TTYCS(LA)-1Q



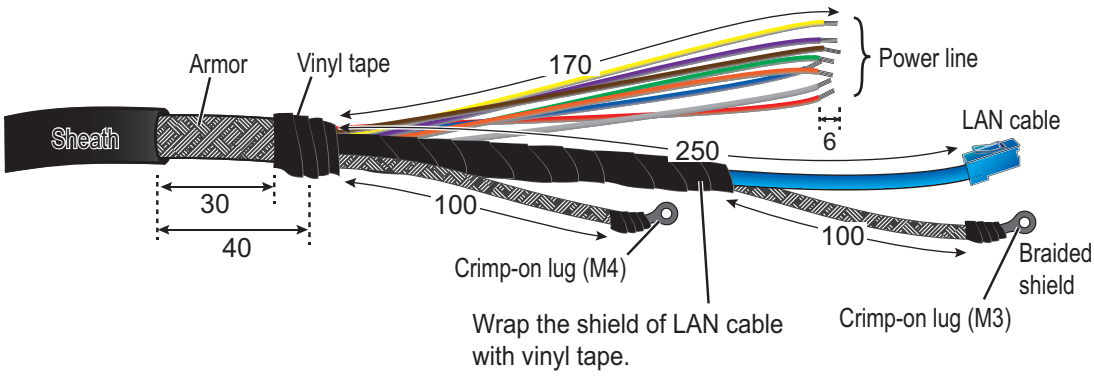
   LAN cable
   See "How to fabricate the LAN cable" on page 2-14 for how to attach the LAN cable connector.



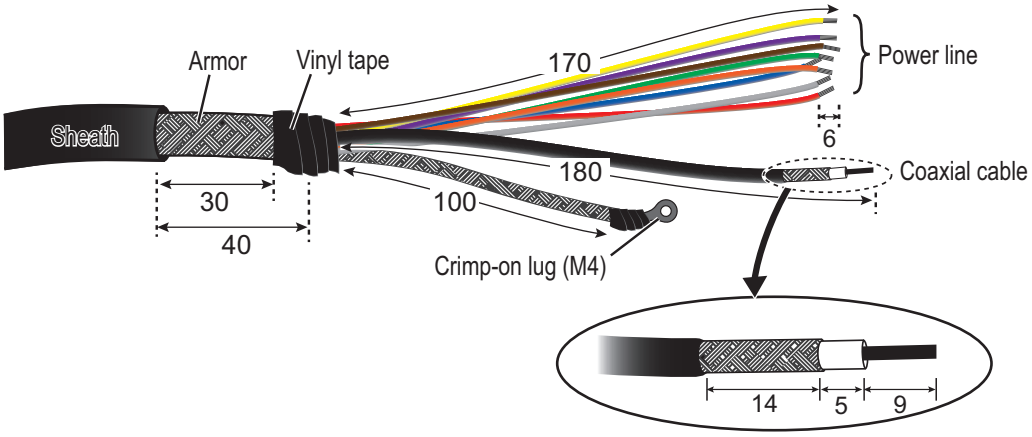
6. Connect the cables fabricated at step 4 as shown below.



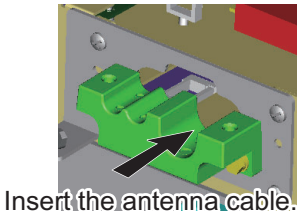
7. Fabricate the antenna cable as shown below.
   RW-00135
   See "How to fabricate the LAN cable" on page 2-14 for how to attach the LAN cable connector.



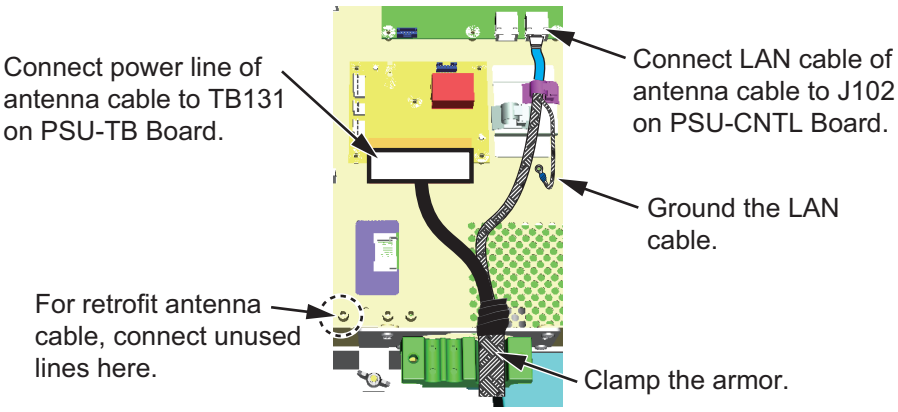
RW-9600



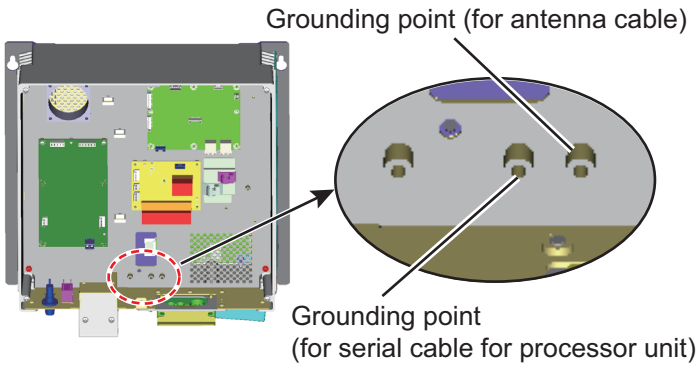
8. Pass the antenna cable through the cable clamp.



9. Connect the power line of the antenna cable to the 13-pin WAGO connector, referring to the interconnection diagram at the back of this manual.
10. Connect the power line and the LAN cable of the antenna cable as shown below.

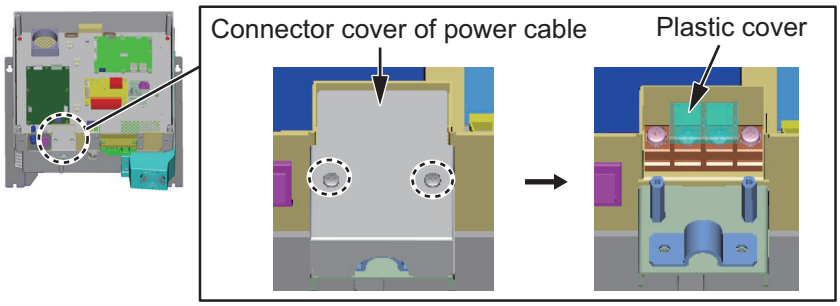


11. Connect the shield wires of the antenna cable and serial cable for the processor unit.

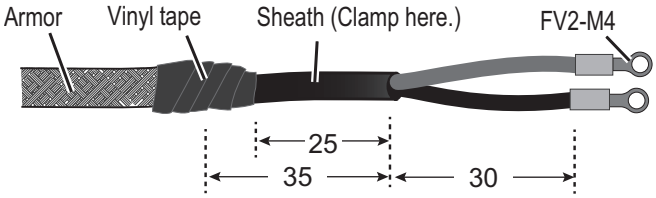


12. Reattach the cable clamp assembly.

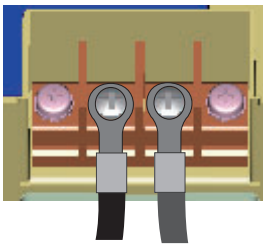
13. Remove the connector cover for the power cable (2 places).



14. Fabricate the power cable (DPYC-2.5) as shown below.



15. Pull up the plastic cover and connect the power cable.



16. Remount the connector cover for the power cable.
17. Reattach the cover of the power supply unit.

2.5 Monitor Unit

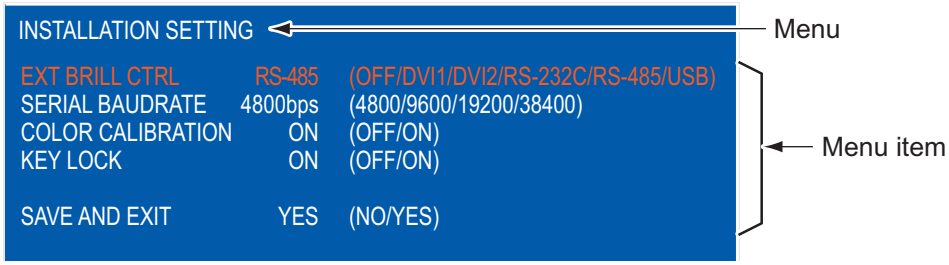
For the wiring of the monitor unit, see the operator's manual supplied with the monitor unit. Also, for resolution and image data output settings, see the Instruction Manual (E32-01305-*).

Mounting considerations

- Connect the radar main monitor to the DVI1 and COM1 ports.
- Connect the sub radar monitor to the DVI2 and COM2 ports.

Menu Setting

The [INSTALLATION SETTING] menu appears only when the power is turned on for the first time after installation of the monitor unit.



Adjust the settings referring to the following table.

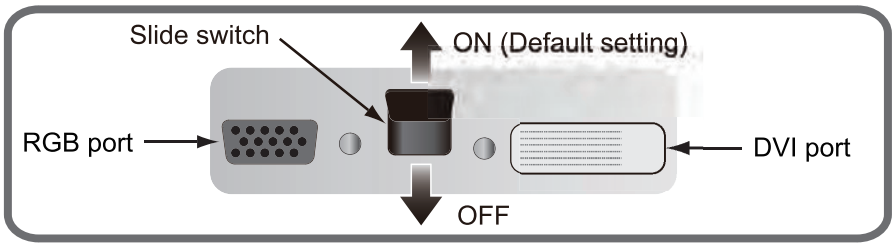
EXT BRILL CTRL	SERIAL BAUD RATE	COLOR CALIBRATION	KEY LOCK	DVI PWR SYNC*
RS-485	4800bps	ON	ON	ON

*: [DVI PWR SYNC] is the slide switch at the bottom rear of the monitor unit. Confirm that this switch is set to [ON] (default setting). See Slide switch below for details.

Slide switch

Set the slide switch to "ON" (default setting). This setting automatically powers the monitor unit on or off according to the DVI signal input. The power switch of the monitor unit is inoperative.

Note: The OFF position provides control of the monitor unit power with the power switch of the monitor unit.



How to open the [INSTALLATION SETTING] menu

Turn off the monitor unit. While you hold the **DISP** key, press the **BRILL** key to turn on the monitor unit. Keep the **DISP** key pressed until the [INSTALLATION SETTING] menu appears.

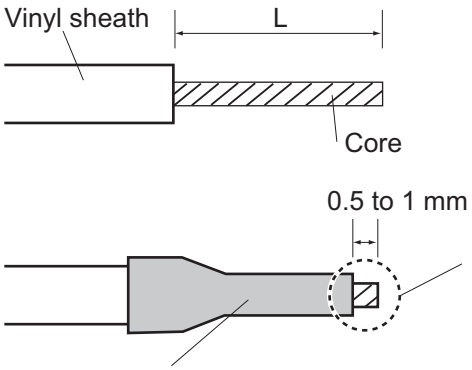
Note: When the [DVI PWR SYNC] slide switch is ON, turn on the connected external equipment while you press the **DISP** key to turn on the monitor unit.

2.6 Sensor Adapters (option)

A maximum of eight MC-3000S can be connected to a sensor network (for the redundant connection: 16). The MC-3000S (serial input/output, IEC61162-2/1, 4ch) can connect a maximum of 10 sensor adapters, using the MC1.5-W cables. The maximum number of MC-3010A units is five.

When fabricating the MC1.5-W cables, use the lot terminal (ferrule type, supplied) to maintain performance. Use the ferrule-type terminals (supplied) to connect the cables to the terminals in the sensor adapters. This connection requires a crimping tool (CRIMPFOX10S, option). For the relations between the connectors and rod terminals, see page AP-2. Also, the stickers attached on the reverse side of the covers show the detailed connections.

How to attach ferrule-type terminal



Ferrule-type terminal	Length of "L"
AI 1.5-6 BK (BLK)	6 mm
AI 0.34-6 TQ (BLU)	
AI 0.75-6 GY (GREY)	
AI 1-6 RD (RED)	
AI 0.14-8 GY(GREY)	8 mm

Attach the cables to the applicable pins.

Pin no.	Cable color	Signal
1	Red	24V_OUT or 24V_IN
2	Black	24V_GND
3	White	MODBUS-A
4	Blue	MODBUS-B
5	Gray	GND

Note 1: Use the MC1.5-W cable between the sensor adapters.

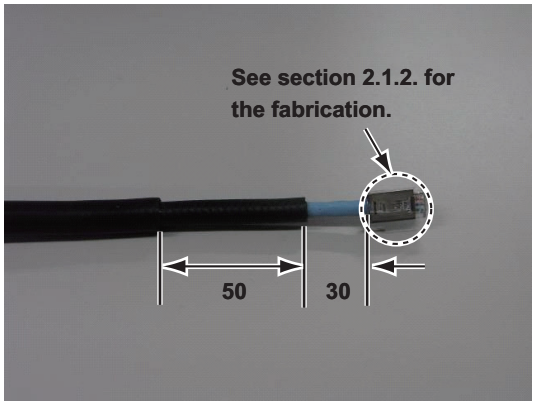
Note 2: The total length of the MC1.5-W cables must be less than 6 m to prevent malfunction.

2.6.1 MC-3000S

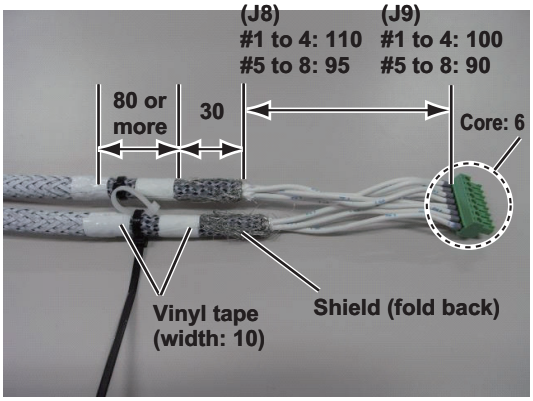
Use the LAN cable FR-FTPC-CY cable to connect the MC-3000S and the processor unit. With HUB-3000 or HUB-100, a maximum of eight MC-3000S can be connected.

Fabrications

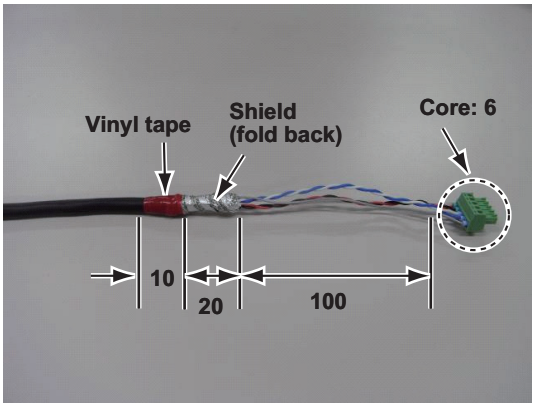
LAN cable (FR-FTPC-CY)



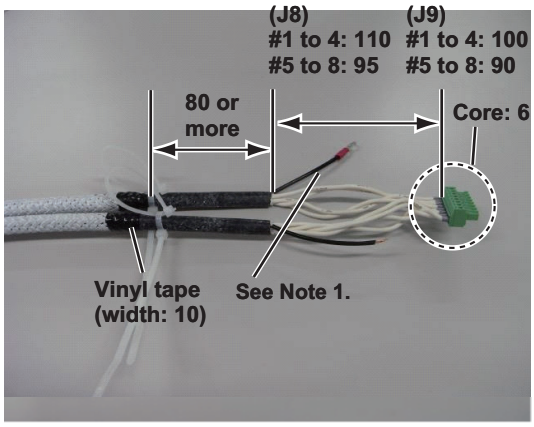
TTYCS-1Q cable



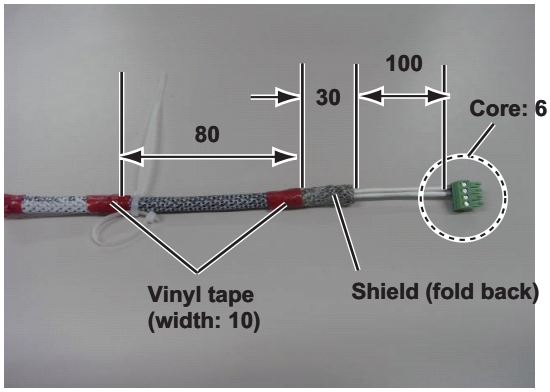
MC1.5-W-L600/1000/2000/3000 cable



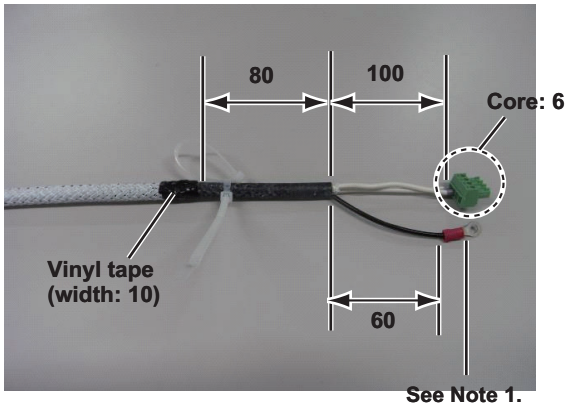
TTYCSLA-1Q cable



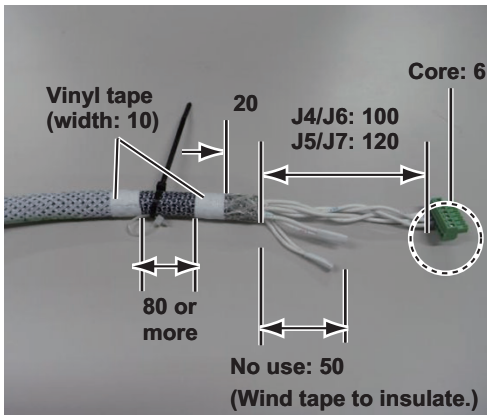
TTYCS-1 cable



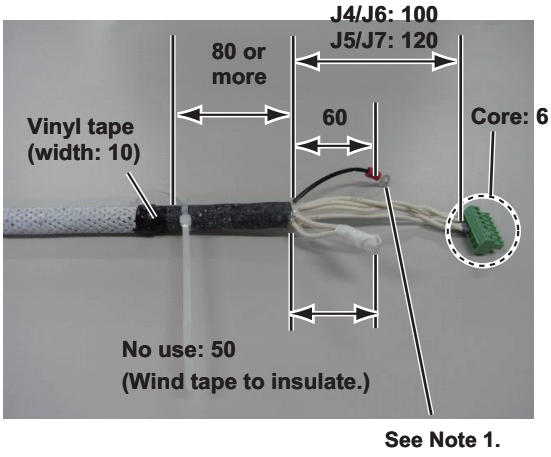
TTYCSLA-1 cable



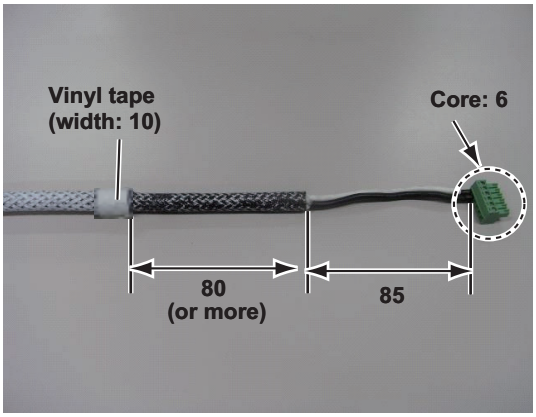
TTYCS-4 cable



TTYCSLA-4 cable



DPYC-1.5 cable

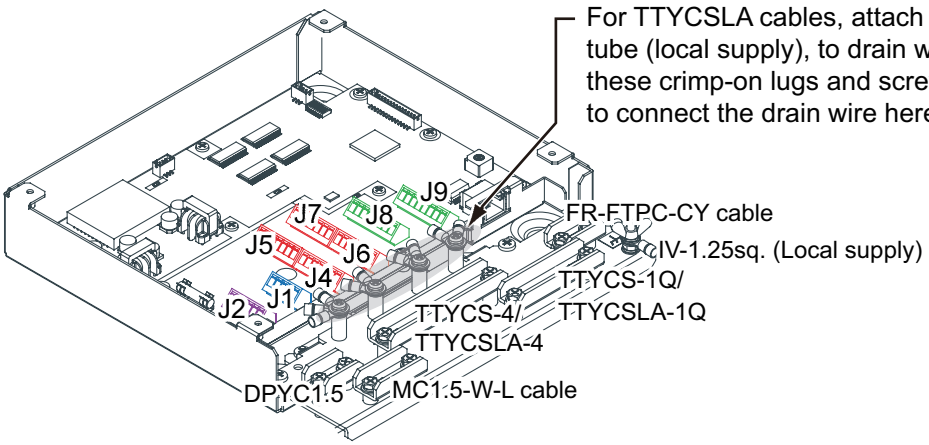


Note 1: Pass drain wire through shrink tubing (local supply), then attach crimp-on lug (pre-attached in unit).

Note 2: See "How to fabricate the LAN cable" on page 2-14 for how to fabricate the LAN cable.

Connections

Unfasten four screws to remove the cover. Pass the cables through the clamps and attach the cables to respective connectors. The shield (or drain wire) must lie in (connected to) the clamp.



Note: Be sure each cable shield lies in the cable clamp.

How to set NC/NO output (J2)

The POWER FAIL signal on the connector J2 can be set to NC (normal close) output or NO (normal open) output as shown in the table below.

Connector J2

Pin #	Signal name	In/Out	Remarks	NO	NC
1	24V_IN	-	24 VDC	DPYC-1.5	
2	24V_GND	-	GND (24 VDC)		
3	PWR_FAIL_A	Out	Power fail output	TTYCS(LA)-1	No connection
4	PWR_FAIL_COM	Out	Power fail output		TTYCS(LA)-1
5	PWR_FAIL_B	Out	Power fail output	No connection	

How to set input specification (J4 to J9)

For connectors J4 to J7, the connections are different depending on the input specifications as shown below.

Connector J4

Pin #	Signal name	In/ Out	Remarks	IEC 61162-2	IEC 61162-1
1	TD1-A	Out	Serial CH1, output IEC 61162-1/2/modbus	TTYCS(LA)-4	TTYCS(LA)-4
2	TD1-B	Out	Serial CH1, output IEC 61162-1/2/modbus		
3	RD1-A	In	Serial CH1, output IEC 61162-2/modbus		No connection
4	RD1-B	In	Serial CH1, output IEC 61162-2/modbus		
5	ISOGND1	-	Isolation, GND (CH1)		
6	RD1-H	In	Serial CH1, output IEC 61162-1	No connection	TTYCS(LA)-4
7	RD1-C	In	Serial CH1, output IEC 61162-1		

Connector J5

Pin #	Signal name	In/ Out	Remarks	IEC 61162-2	IEC 61162-1
1	TD2-A	Out	Serial CH2, output IEC 61162-1/2/modbus	TTYCS(LA)-4	TTYCS(LA)-4
2	TD2-B	Out	Serial CH2, output IEC 61162-1/2/modbus		
3	RD2-A	In	Serial CH2, output IEC 61162-2/modbus		No connection
4	RD2-B	In	Serial CH2, output IEC 61162-2/modbus		
5	ISOGND2	-	Isolation, GND (CH2)		
6	RD2-H	In	Serial CH2, output IEC 61162-1	No connection	TTYCS(LA)-4
7	RD2-C	In	Serial CH2, output IEC 61162-1		

Connector J6

Pin #	Signal name	In/ Out	Remarks	IEC 61162-2	IEC 61162-1
1	TD3-A	Out	Serial CH3, output IEC 61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD3-B	Out	Serial CH3, output IEC 61162-1/2		
3	RD3-A	In	Serial CH3, output IEC 61162-2		No connection
4	RD3-B	In	Serial CH3, output IEC 61162-2		
5	ISOGND3	-	Isolation, GND (CH3)		
6	RD3-H	In	Serial CH3, output IEC 61162-1	No connection	TTYCS(LA)-4
7	RD3-C	In	Serial CH3, output IEC 61162-1		

Connector J7

Pin #	Signal name	In/ Out	Remarks	IEC 61162-2	IEC 61162-1
1	TD4-A	Out	Serial CH4, output IEC 61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD4-B	Out	Serial CH4, output IEC 61162-1/2		
3	RD4-A	In	Serial CH4, output IEC 61162-2		No connection
4	RD4-B	In	Serial CH4, output IEC 61162-2		
5	ISOGND4	-	Isolation, GND (CH4)		
6	RD4-H	In	Serial CH4, output IEC 61162-1	No connection	TTYCS(LA)-4
7	RD4-C	In	Serial CH4, output IEC 61162-1		

Connector J8

Pin #	Signal name	In/ Out	Description	Used cable
1	TD5-A	Out	Serial CH5, output IEC 61162-1	TTYCS-1Q or TTYCSLA-1Q
2	TD5-B	Out	Serial CH5, output IEC 61162-1	
3	RD5-H	In	Serial CH5, input IEC 61162-1	
4	RD5-C	In	Serial CH5, input IEC 61162-1	
5	TD6-A	Out	Serial CH6, output IEC 61162-1	
6	TD6-B	Out	Serial CH6, output IEC 61162-1	
7	RD6-H	In	Serial CH6, input IEC 61162-1	
8	RD6-C	In	Serial CH6, input IEC 61162-1	

Connector J9

Pin#	Signal name	In/Out	Description	Used cable
1	TD7-A	Out	Serial CH7, output IEC 61162-1	TTYCS-1Q or TTYCSLA-1Q
2	TD7-B	Out	Serial CH7, output IEC 61162-1	
3	RD7-H	In	Serial CH7, input IEC 61162-1	
4	RD7-C	In	Serial CH7, input IEC 61162-1	
5	TD8-A	Out	Serial CH8, output IEC 61162-1	
6	TD8-B	Out	Serial CH8, output IEC 61162-1	
7	RD8-H	In	Serial CH8, input IEC 61162-1	
8	RD8-C	In	Serial CH8, input IEC 61162-1	

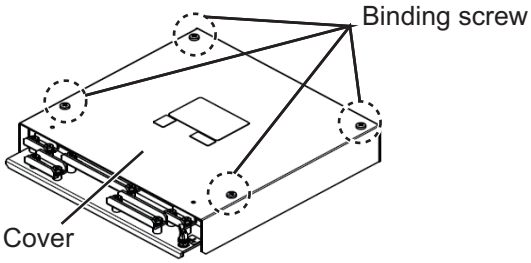
Case gasket OP24-28

The optional kit OP24-28 protects the connectors on the MC-3000S to waterproofing standard IPX2.

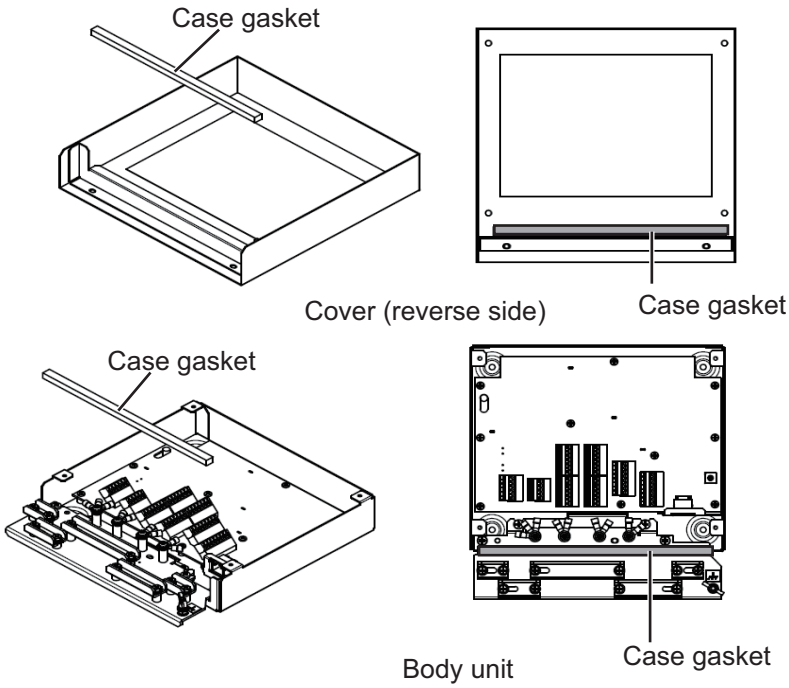
Case gasket (type: OP24-28, code no.: 001-169-970)

Name	Type	Code No.	Qty	Remarks
Case gasket (serial)	24-014-2051	100-367-880-10	2	For MC-3000S

1. Unfasten four binding screws to remove the cover from the adapter.



2. Peel the paper from the case gasket, then attach the case gasket to the reverse side of the cover and the body unit as shown below.



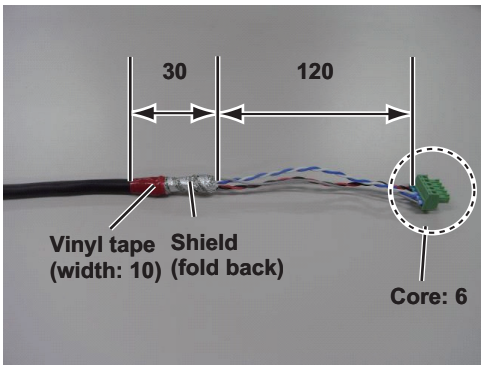
3. Attach the cover to the MC-3000S body unit.

2.6.2 MC-3010A/3020D/3030D

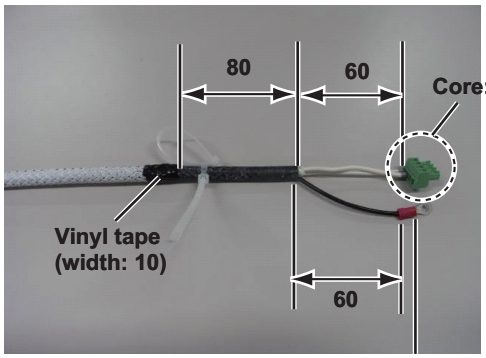
- MC-3010A: Inputs analog signal. To use MC-3010A as current input, connect short pins to each terminals.
- MC-3020D: Inputs digital signal (8ch contact input). Contact or voltage input is selectable (contact input requires short pins).
- MC-3030D: Outputs digital signal (8ch, normal open/close).

Fabrications

MC1.5-W-L600/1000/2000/3000 cable (Input)

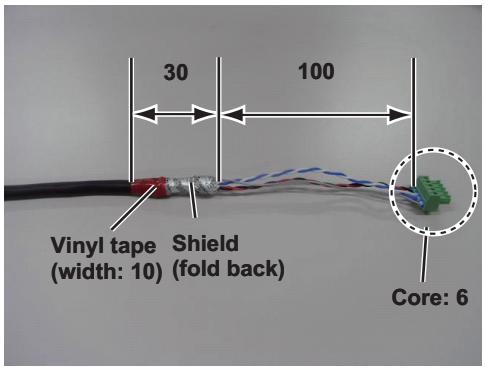


TTYCSLA-1 (MC-3010A)

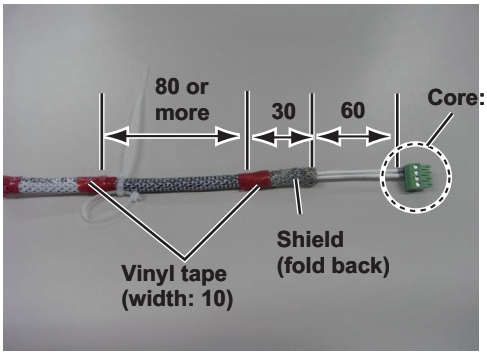


Pass drain wire through shrink tubing (local supply), then attach crimp-on lug (pre-attached in unit).

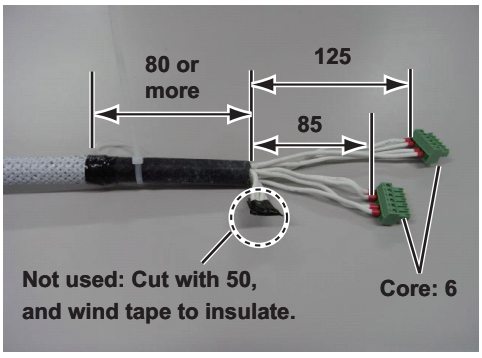
MC1.5-W-L600/1000/2000/3000 cable (Output)



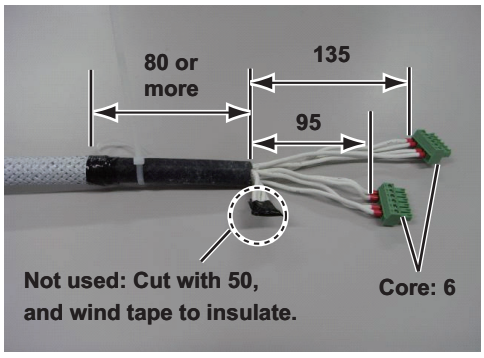
TTYCS-1 (MC-3010A)



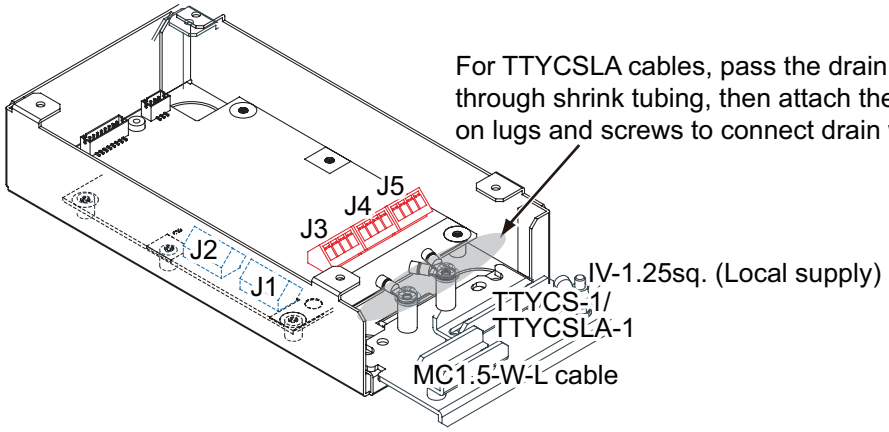
MPYC-12 cable (MC-3030D)



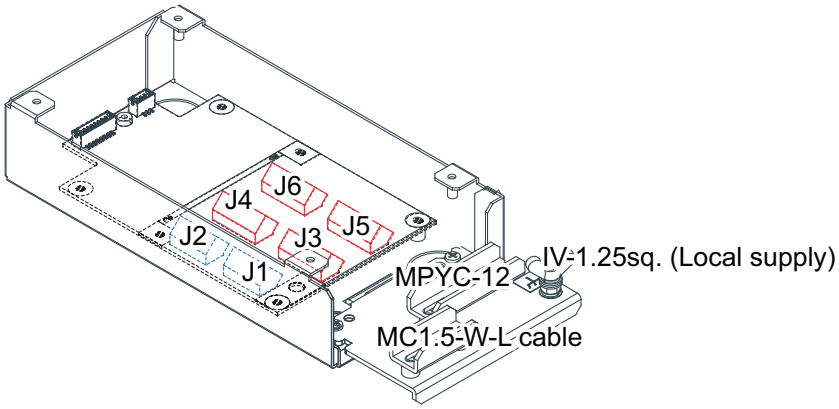
MPYC-12 cable (MC-3020D)



Connection



MC-3010A



Note: The cable shield must lie in the cable clamp.

MC-3020D/3030D

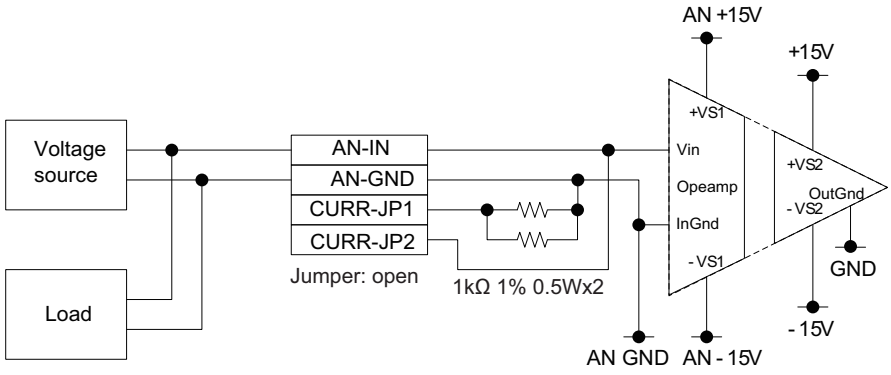
Input method (MC-3010A only)

Select the method of the analog data input, power voltage or power current.

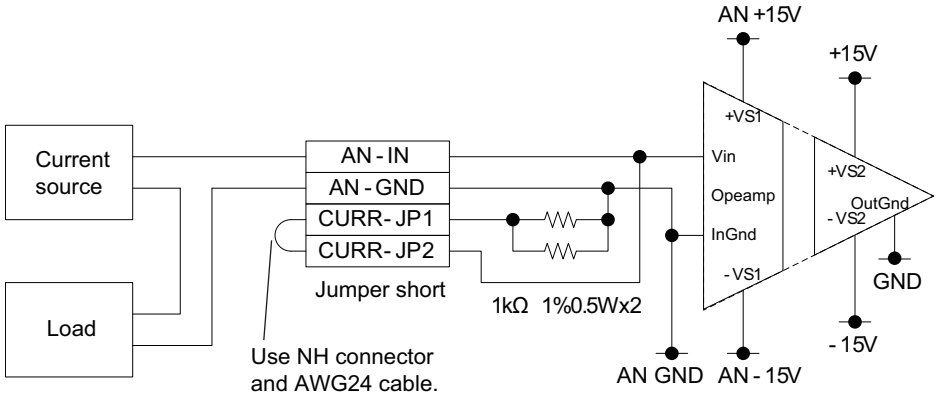
Note 1: The input must not exceed the range of the input voltage, to prevent malfunction.
-Setting for voltage input: -10V to +10V or 0 to 10V (depending on the setting)
-Setting for contact input: Voltage 4mA to 20mA

Note 2: When changing the input method, turn off the MC-3010A and on again to put change in effect.

- Power voltage: Input the amount of power voltage change to the operational amplifier.



- Power current: Pass the power current to the shunt resistor, 1kΩ/parallel (combined resistance: 500Ω) to input the amount of voltage change at the both ends of the resistor to the operational amplifier.



Connector J3

Pin #	Signal name	In/Out	Description	Power voltage	Power current
1	AN1_IN	In	Analog 1 input	TTYCS(LA)-1	
2	AN1_GND	-	Analog 1 GND		
3	CURR1_JP1	-	Analog 1 input, power current/ voltage setting jumper 1	Pin #3-#4: open	Pin #3-#4: short
4	CURR1_JP2	-	Analog 2 input, power current/ voltage setting jumper 1		

Connector J4

Pin #	Signal name	In/Out	Description	Power voltage	Power current
1	AN2_IN	In	Analog 2 input	TTYCS(LA)-1	
2	AN2_GND	-	Analog 2 GND		
3	CURR2_JP1	-	Analog 2 input, power current/ voltage setting jumper 1	Pin #3-#4: open	Pin #3-#4: short
4	CURR2_JP2	-	Analog 2 input, power current/ voltage setting jumper 1		

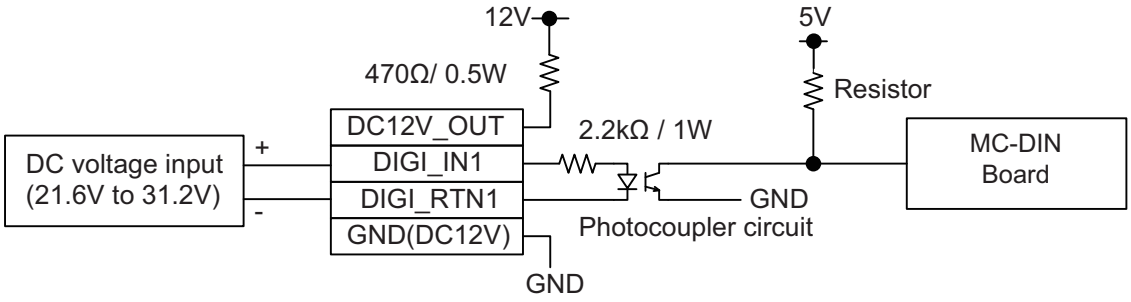
Connector J5

Pin #	Signal name	In/Out	Description	Power voltage	Power current
1	AN3_IN	In	Analog 3 input	TTYCS(LA)-1	
2	AN3_GND	-	Analog 3 GND		
3	CURR3_JP1	-	Analog 3 input, power current/ voltage setting jumper 1	Pin #3-#4: open	Pin #3-#4: short
4	CURR3_JP2	-	Analog 3 input, power current/ voltage setting jumper 1		

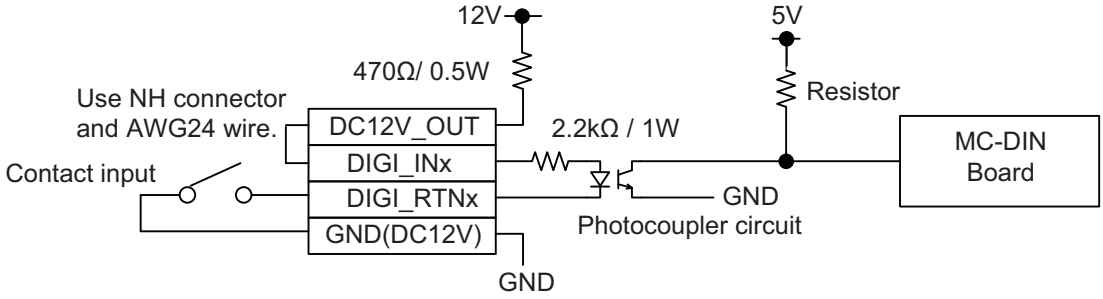
How to set ACK input (MC-3020D)

Use the connectors J3 to J6 to set the ACK input for ACK1 to ACK8 as shown below.

- Input circuit for voltage input



- Input circuit for contact input



Note 1: The input must not exceed the range of the input voltage, to prevent malfunction.

- Setting for voltage input: 21.6V to 31.2V
- Setting for contact input: Voltage cannot be input (contact signal only).

Note 2: For analog input, see page 2-34.

Connector J3

<table>
<tr><th>Pin #</th><th>Signal name</th><th>In/ Out</th><th>Remarks</th><th>ACK1 contact</th><th>ACK1 voltage</th><th>ACK2 contact</th><th>ACK2 voltage</th></tr>
<tr><td>1</td><td>DC12V_OUT</td><td>Out</td><td rowspan="4">ACK1 In</td><td rowspan="2">Pin #1-#2: short</td><td>No connection</td><td colspan="2" rowspan="3">According to ACK1 input</td></tr>
<tr><td>2</td><td>DIGI_IN1</td><td>In</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>3</td><td>DIGI_RTN1</td><td>Out</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>4</td><td>GND (DC12V)</td><td>In</td><td>No connection</td></tr>
<tr><td>5</td><td>DC12V_OUT</td><td>Out</td><td rowspan="4">ACK2 In</td><td colspan="3" rowspan="4">According to ACK2 input</td><td>Pin #5-#6: short</td><td>No connection</td></tr>
<tr><td>6</td><td>DIGI_IN2</td><td>In</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>7</td><td>DIGI_RTN2</td><td>Out</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>8</td><td>GND (DC12V)</td><td>In</td><td>No connection</td></tr>
</table>

Connector J4

<table>
<tr><th>Pin #</th><th>Signal name</th><th>In/ Out</th><th>Remarks</th><th>ACK3 contact</th><th>ACK3 voltage</th><th>ACK4 contact</th><th>ACK4 voltage</th></tr>
<tr><td>1</td><td>DC12V_OUT</td><td>Out</td><td rowspan="4">ACK3 In</td><td rowspan="2">Pin #1-#2: short</td><td>No connection</td><td colspan="2" rowspan="3">According to ACK3 input</td></tr>
<tr><td>2</td><td>DIGI_IN3</td><td>In</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>3</td><td>DIGI_RTN3</td><td>Out</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>4</td><td>GND (DC12V)</td><td>In</td><td>No connection</td></tr>
<tr><td>5</td><td>DC12V_OUT</td><td>Out</td><td rowspan="4">ACK4 In</td><td colspan="2" rowspan="4">According to ACK4 input</td><td rowspan="2">Pin #5-#6: short</td><td>No connection</td></tr>
<tr><td>6</td><td>DIGI_IN4</td><td>In</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>7</td><td>DIGI_RTN4</td><td>Out</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>8</td><td>GND (DC12V)</td><td>In</td><td>No connection</td></tr>
</table>

Connector J5

<table>
<tr><th>Pin #</th><th>Signal name</th><th>In/ Out</th><th>Remarks</th><th>ACK5 contact</th><th>ACK5 voltage</th><th>ACK6 contact</th><th>ACK6 voltage</th></tr>
<tr><td>1</td><td>DC12V_OUT</td><td>Out</td><td rowspan="4">ACK5 In</td><td rowspan="2">Pin #1-#2: short</td><td>No connection</td><td colspan="2" rowspan="3">According to ACK5 input</td></tr>
<tr><td>2</td><td>DIGI_IN5</td><td>In</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>3</td><td>DIGI_RTN5</td><td>Out</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>4</td><td>GND (DC12V)</td><td>In</td><td>No connection</td></tr>
<tr><td>5</td><td>DC12V_OUT</td><td>Out</td><td rowspan="4">ACK6 In</td><td colspan="2" rowspan="4">According to ACK6 input</td><td rowspan="2">Pin #5-#6: short</td><td>No connection</td></tr>
<tr><td>6</td><td>DIGI_IN6</td><td>In</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>7</td><td>DIGI_RTN6</td><td>Out</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>8</td><td>GND (DC12V)</td><td>In</td><td>No connection</td></tr>
</table>

Connector J6

<table>
<tr><th>Pin #</th><th>Signal name</th><th>In/ Out</th><th>Remarks</th><th>ACK7 contact</th><th>ACK7 voltage</th><th>ACK8 contact</th><th>ACK8 voltage</th></tr>
<tr><td>1</td><td>DC12V_OUT</td><td>Out</td><td rowspan="4">ACK1 In</td><td rowspan="2">Pin #1-#2: short</td><td>No connection</td><td colspan="2" rowspan="3">According to ACK7 input</td></tr>
<tr><td>2</td><td>DIGI_IN7</td><td>In</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>3</td><td>DIGI_RTN7</td><td>Out</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>4</td><td>GND (DC12V)</td><td>In</td><td>No connection</td></tr>
<tr><td>5</td><td>DC12V_OUT</td><td>Out</td><td rowspan="4">ACK2 In</td><td colspan="2" rowspan="4">According to ACK8 input</td><td rowspan="2">Pin #5-#6: short</td><td>No connection</td></tr>
<tr><td>6</td><td>DIGI_IN8</td><td>In</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>7</td><td>DIGI_RTN8</td><td>Out</td><td rowspan="2">MPYC-12</td></tr>
<tr><td>8</td><td>GND (DC12V)</td><td>In</td><td>No connection</td></tr>
</table>

How to set alarm output (MC-3030D)

Use the connector J3 to J6 on the MC_OUT Board (24P0117) to select NC (normal close) or NO (normal open) for alarm output 1 to 8.

Connector J3

Pin #	Signal name	In/ Out	Remarks	Alarm1 NO Out	Alarm1 NC Out	Alarm2 NO Out	Alarm2 NC Out
1	A1	Out	Alarm1 Out	MPYC-12	No connection	-	
2	COM1				MPYC-12		
3	B1			No connection			
4	A2		Alarm2 Out	-		MPYC-12	No connection
5	COM2						MPYC-12
6	B2					No connection	

Connector J4

Pin #	Signal name	In/ Out	Remarks	Alarm3 NO Out	Alarm3 NC Out	Alarm4 NO Out	Alarm4 NC Out
1	A3	Out	Alarm3 Out	MPYC-12	No connection	-	
2	COM3				MPYC-12		
3	B3			No connection			
4	A4		Alarm4 Out	-		MPYC-12	No connection
5	COM4						MPYC-12
6	B4					No connection	

Connector J5

Pin #	Signal name	In/ Out	Remarks	Alarm5 NO Out	Alarm5 NC Out	Alarm6 NO Out	Alarm6 NC Out
1	A5	Out	Alarm5 Out	MPYC-12	No connection	-	
2	COM5				MPYC-12		
3	B5			No connection			
4	A6		Alarm5 Out	-		MPYC-12	No connection
5	COM6						MPYC-12
6	B6					No connection	

Connector J6

Pin #	Signal name	In/ Out	Remarks	Alarm7 NO Out	Alarm7 NC Out	Alarm8 NO Out	Alarm8 NC Out
1	A7	Out	Alarm7 Out	MPYC-12	No connection	-	
2	COM7				MPYC-12		
3	B7			No connection			
4	A8		Alarm8 Out	-		MPYC-12	No connection
5	COM8						MPYC-12
6	B8					No connection	

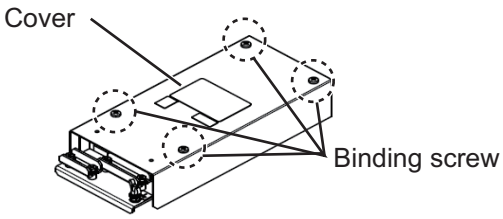
Case gasket OP24-29

The optional kit OP24-29 protects the connectors on the MC-3010A/3020D/3030D to waterproofing standard IPX2.

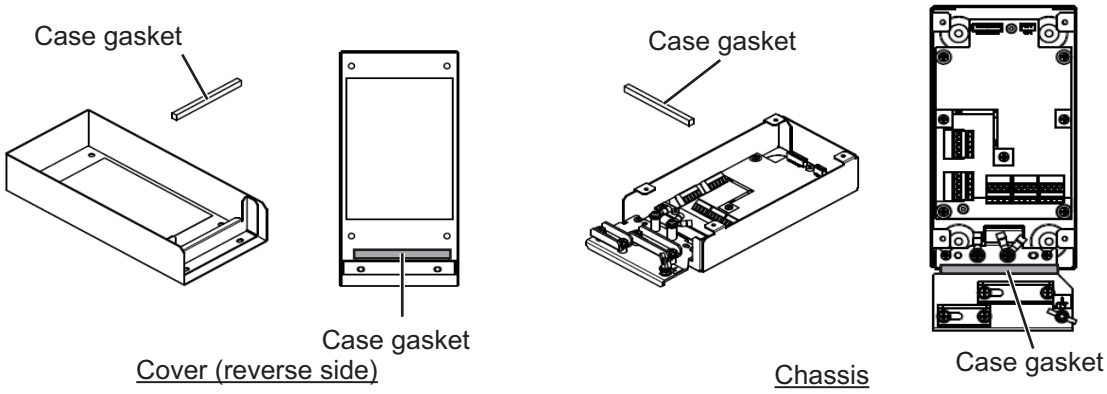
Case gasket (type: OP24-29, code no.: 001-169-960)

Name	Type	Code No.	Qty	Remarks
Case gasket (analog)	24-014-2052-1	100-367-961-10	2	MC-3010A/3020D/3030D

1. Unfasten four binding screws to remove the cover from the adapter.



2. Peel the paper from the case gasket, then attach the case gasket to the reverse side of the cover and the body unit as shown below.

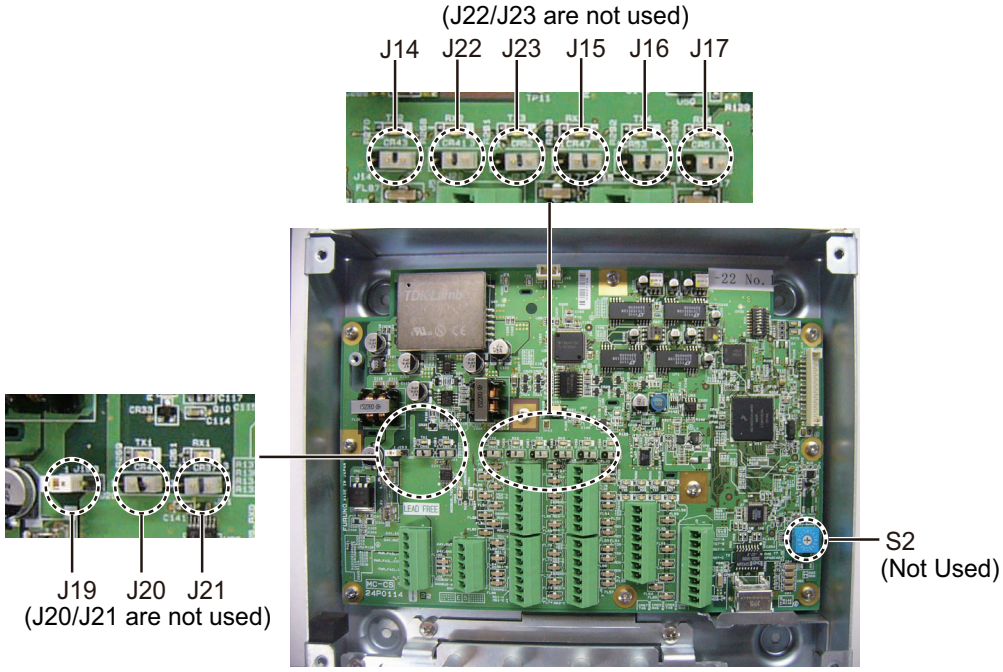


3. Attach the cover to the MC-3010A/3020D/3030D chassis.

2.6.3 How to set jumper blocks in the sensor adapters

MC-3000S

Set the jumper blocks on the MC-CS Board (24P0114) referring to the tables that follow.



MC-CS Board (24P0114)

Jumper block: Use the jumper block J19 to set the termination resistor on/off for the MODBUS communication on the connector J1. For the first and last sensor adapter in a series, their termination resistors must be set to ON. Use the MC-CS Board with the default setting because it becomes the "first" adapter in a series.

Jumper block J19		Connector J1
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Set the jumper blocks J14 through J17 to turn the termination resistors on connectors J4 through J7, respectively.

(Termination resistor ON)

- When setting the starting/ending terminal for the multipoint, or the multipoint is not connected (CH1 to 4).

(Terminal resistor OFF)

- When setting the terminal other than starting/ending for the multipoint (CH1 to 4).

Jumper block J14		Connector J4 (CH1)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

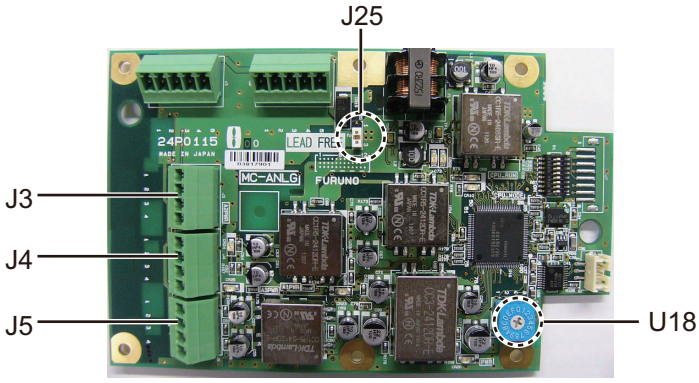
Jumper block J15		Connector J5 (CH2)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Jumper block J16		Connector J6 (CH3)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

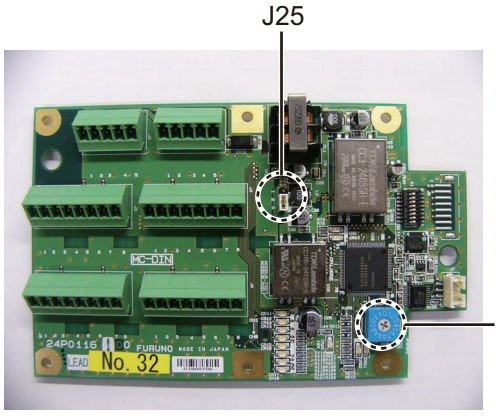
Jumper block J17		Connector J7 (CH4)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

MC-3010A/3020D/3030D

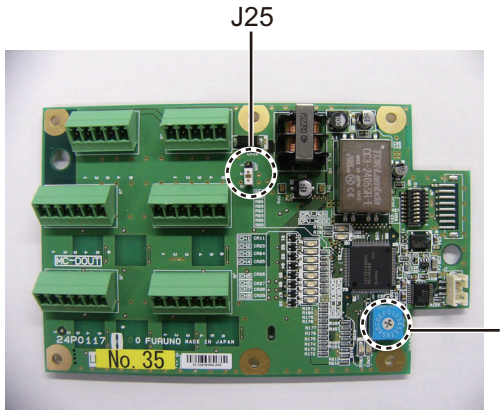
This paragraph shows how to set the MC-ANLG Board (24P0115, for MC-3010A), MC-DIN Board (24P0116, for MC-3020D) and MC-DOUT Board (24P0117, for MC-3030D).



MC-ANLG Board (24P0115)



MC-DIN Board (24P0116)



MC-DOUT Board (24P0117)

Rotary switch: Use the rotary switch (U18) to set the MODBUS address with a digit of number from "0". When multiple sensor adapters are connected to the MC-3000S, the same number cannot be used among them. (It is allowed to use the same number between the MC-3000S and a sensor adapter.)

Jumper block: Use the jumper block J25 to set the termination resistor on/off for the MODBUS communication on the connector J1. For the first and last sensor adapter in a series, their termination resistors must e set to ON. If not, communication between sensor adapters is not possible.

Jumper block J25		Connector J1
1-2	OPEN	Termination resistor: OFF (default setting)
2-3	SHORT	
1-2	SHORT	Termination resistor: ON
2-3	OPEN	

2.7 LAN Signal Converter Kit (option)

The LAN Signal Converter allows the use of existing antenna cable RW-9600 for TR-UP radar.

If the LAN Signal Converter is not attached in the antenna and power supply units, the LAN Signal Converter Kit (optional supply) is required.

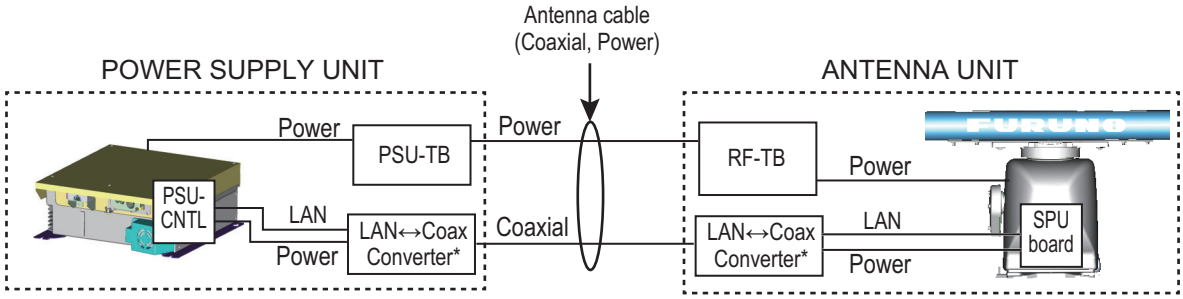
LAN Signal Converter Kit

Radar	Type	Code No.
Magnetron radar	OP03-223-3	001-254-380
Solid state radar	OP03-223-4	001-569-010

2.7.1 Application overview

The LAN Signal Converter has two applications.

Application 1: Use with existing antenna cable (retrofit)

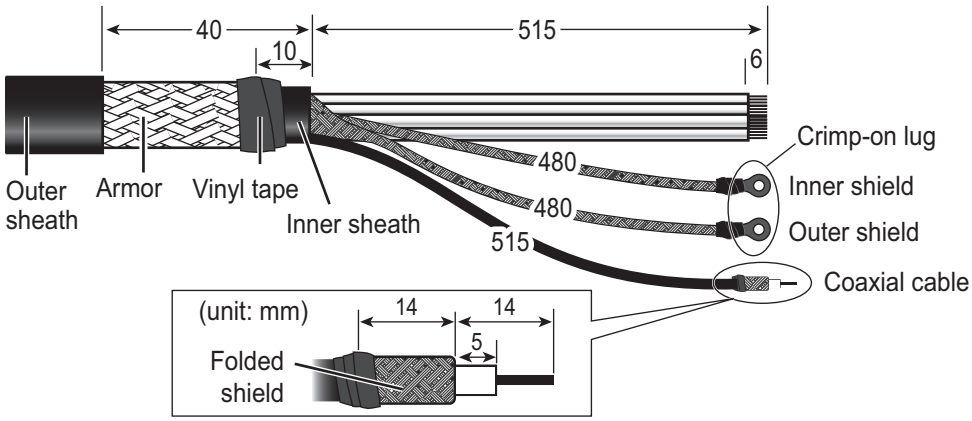


** Installed inside respective unit.*

Method 1: Using existing antenna cable (RW-9600)

Use with existing antenna cable (RW-9600) in case of retrofit. The maximum length of the antenna cable is 100 m.

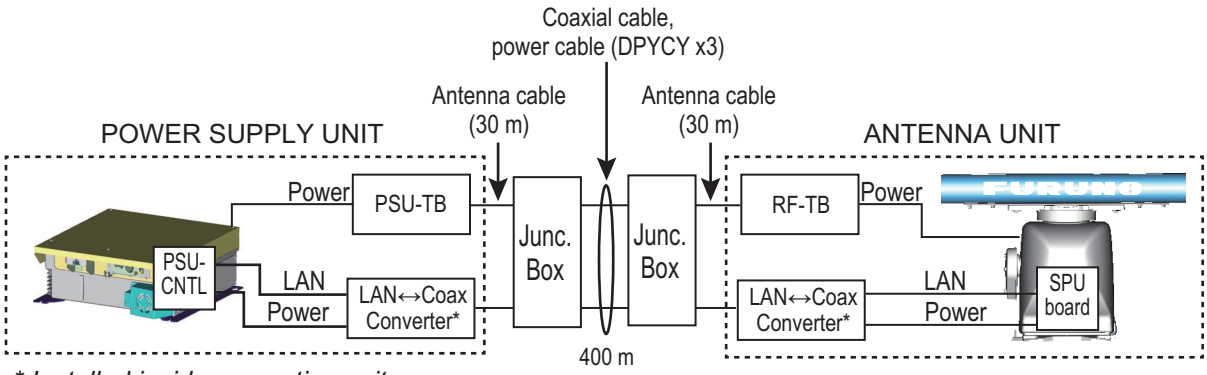
The white, red, and green wires are not used. Attach a single crimp-on lug (FV5.5-S4(LF), yellow) locally to the wires. (These wires will be connected together with the shield of the power line, in the next section.)



Application 2: Foremast installation

Foremast installation, where the distance between the antenna unit and the power supply unit is more than 100 m (max. 460 m). See section 2.8 and the interconnection diagram for connections in the junction box.

The Cable Extension Kit (Type: OP03-224-3, Code No.: 001-254-410), comprised of two junctions boxes, two LAN Signal Converters and necessary hardware, is optionally available.



** Installed inside respective unit.*

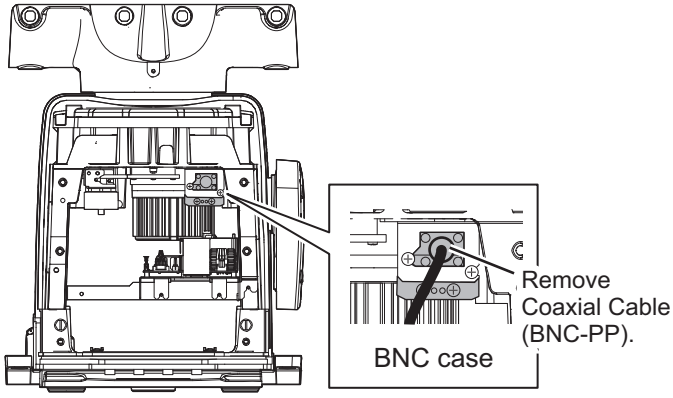
Method 2: Using antenna cable RW-9600 (new)

2.7.2 Installation in the antenna unit

Note: If the Antenna Unit does not included the LAN Signal Converter, the converter kit (available as an optional extra) is required. See "LAN Signal Converter Kit" on page 2-42.

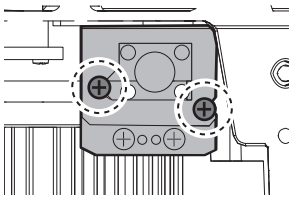
Dismount the transceiver unit in the Antenna Unit. See section 2.2.2, for details. Also, in the procedure, mainly figures of magnetron radar are shown.

1. Unfasten the coaxial cable from the converter in the Antenna Unit.

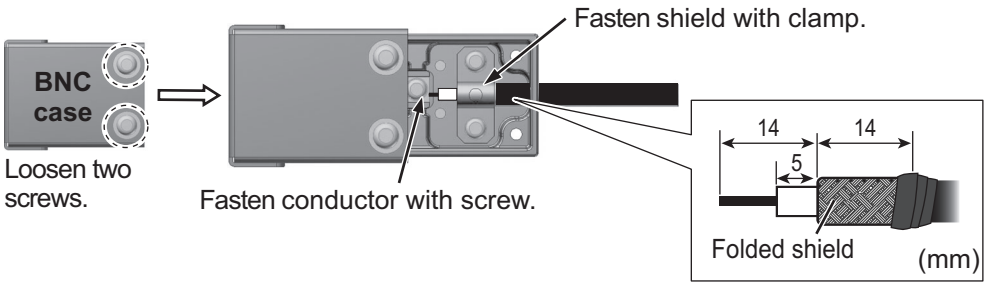


Rear view

2. Unfasten two screws to detach the BNC case from the Antenna Unit.



3. Loosen two screws on the BNC case. Attach the coaxial cable from the Antenna Unit then close the case.

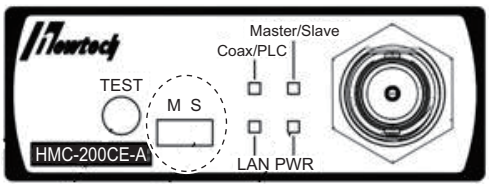


4. Fasten the BNC case to the original position in the Antenna Unit with original two screws, referring to step 2.
5. Mount the transceiver unit to the Antenna Unit.
6. Re-connect the coaxial cable (disconnected at step 1).

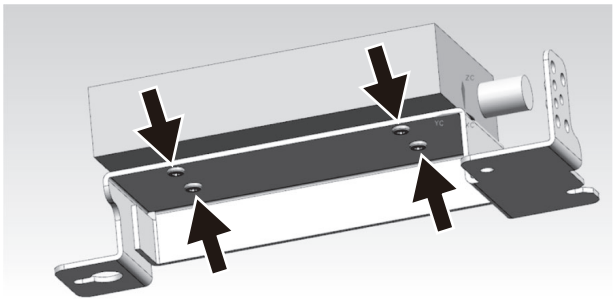
2.7.3 Installation in the power supply unit

Some parts or wiring may have been omitted from the illustrations of the power supply unit for clarity.

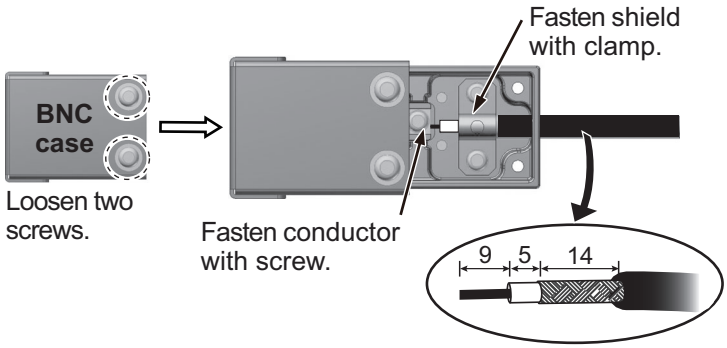
1. Set the M_S switch on the converter to the M (Master) position.



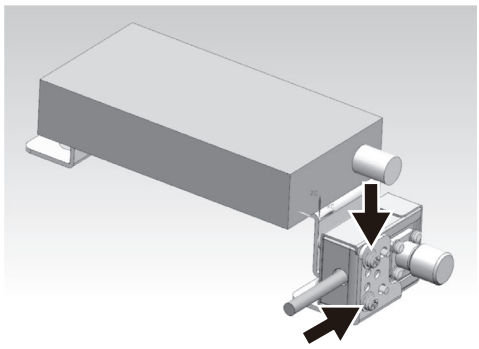
2. Fasten the converter to its mounting bracket with four screws.



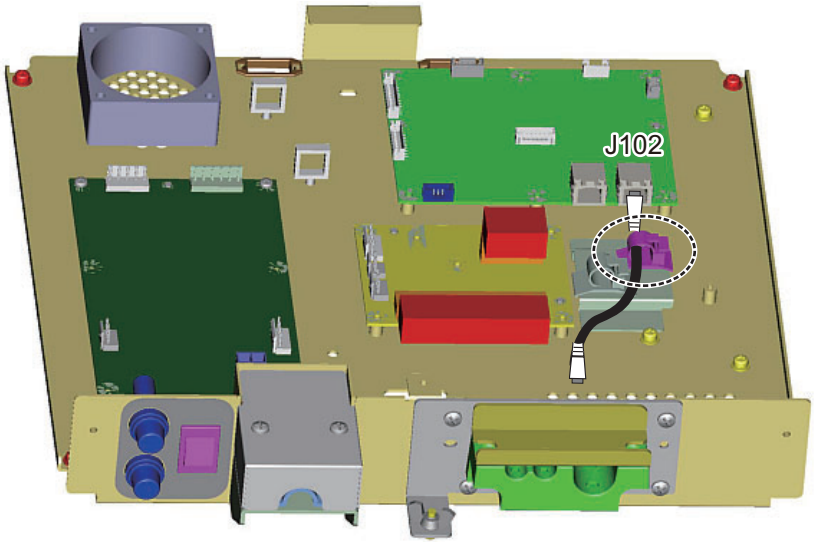
3. Loosen two screws on the BNC case. Attach the coaxial cable from the antenna cable then close the case.



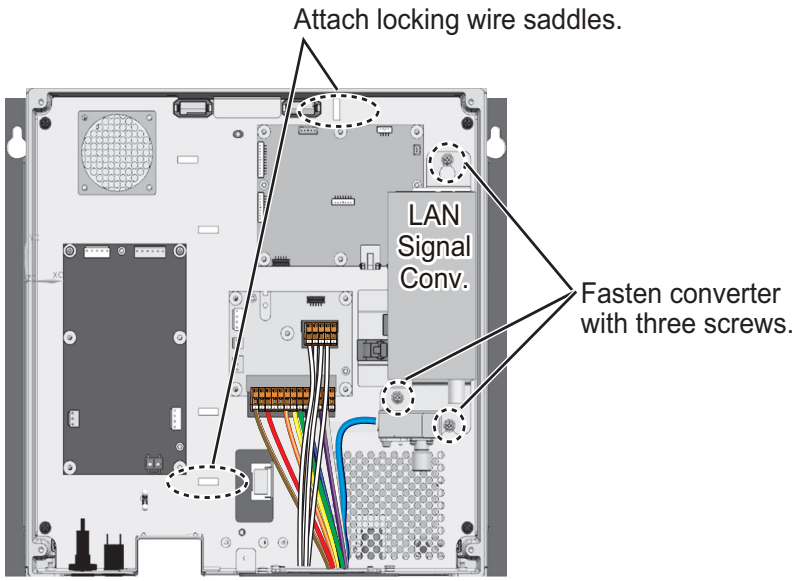
4. Fasten the BNC case to the mounting bracket with two screws.



5. Pass the LAN cable thru the clamp circled below then connect it to J102 on the PSU-CNTL board. (The cable will be connected to the converter after the converter is installed.)

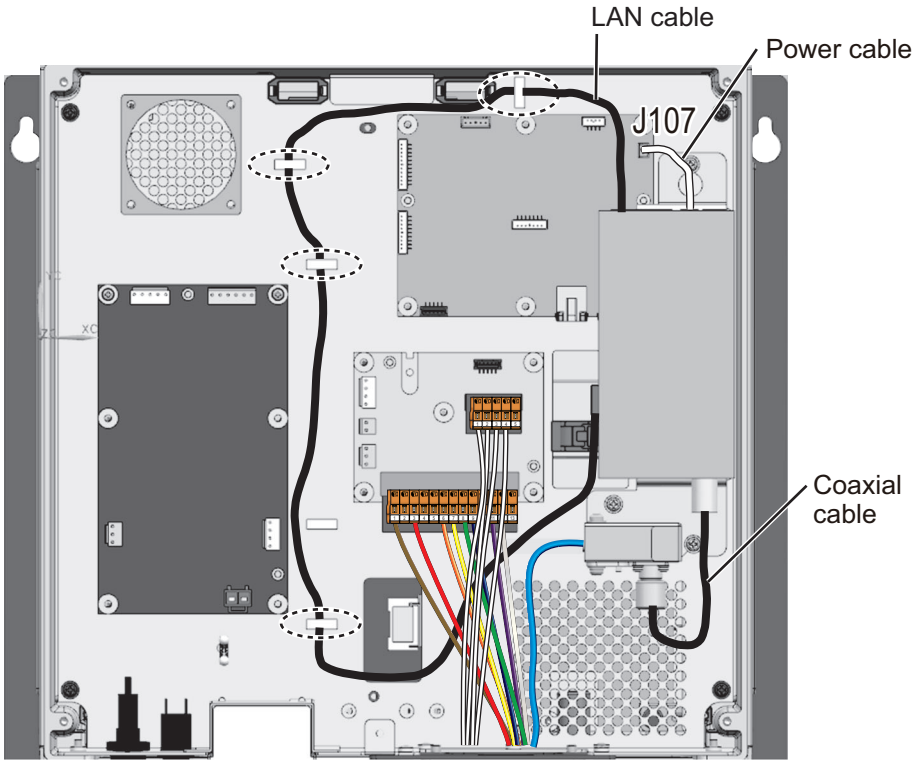


6. Fasten the converter with three screws at the locations shown circled below. Attach the two supplied locking wire saddles to the locations circled below.



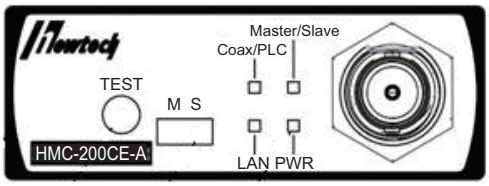
7. Connect the LAN, power and coaxial cables as shown below.

- Pass the LAN cable through the four locking wire saddles circled in the figure on the next page then connect it to the LAN port on the converter.
- Connect the power cable (supplied) between the converter and J107 on the PSU-CNTL Board.
- Connect the coaxial cable between the converter and the BNC case.



2.7.4 How to check the installation

Observe the LEDs on the converter to check for proper operation, troubleshoot.



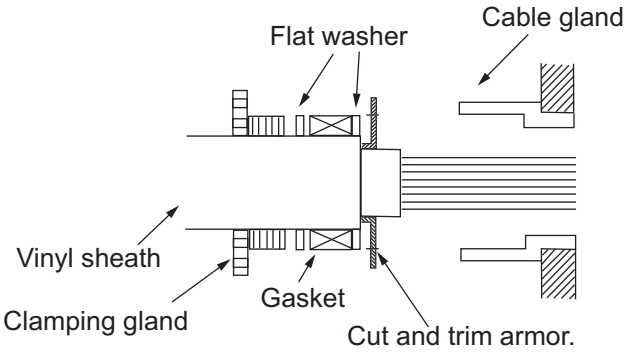
LED	State	Meaning
PWR	OFF	Power OFF
	Lighting green	Power ON
	Flashing orange	Test mode
LAN	OFF	Link down
	Lighting green	100 M link up
	Flashing green	100 M active
	Lighting orange	10 M link up
	Flashing orange	10 M active
Coax/PLC	OFF	Link down
	Lighting green	Link up
Master/Slave	Lighting green	Master mode
	Lighting orange	Slave mode

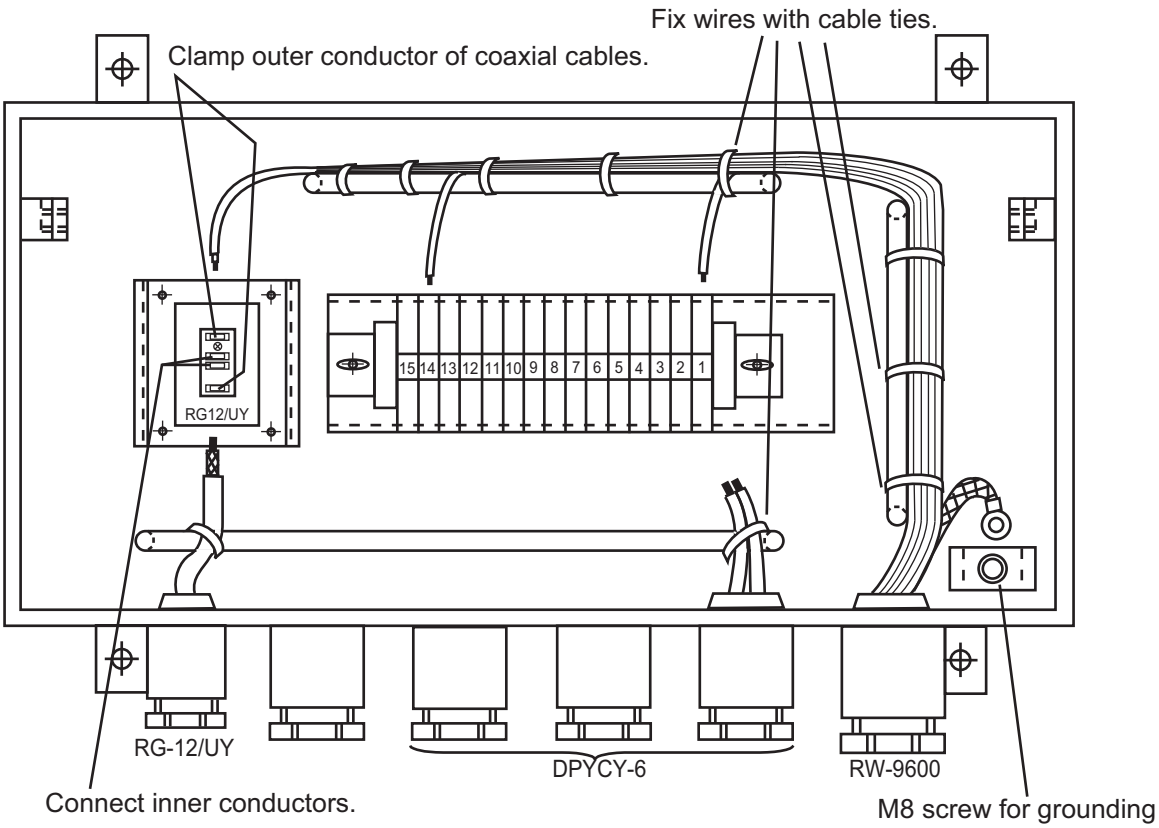
Note: The TEST button is for factory use. Do not operate the button.

2.8 Junction Box (option)

Junction boxes are required when the distance between the antenna unit and power supply unit is greater than 100 meters (max. 460 meters); for example, the antenna unit is installed on the foremast. Use signal cable RW-9600(x2), power cable DPYCY-6(x3), and coaxial cable RG-12/UY(x3).

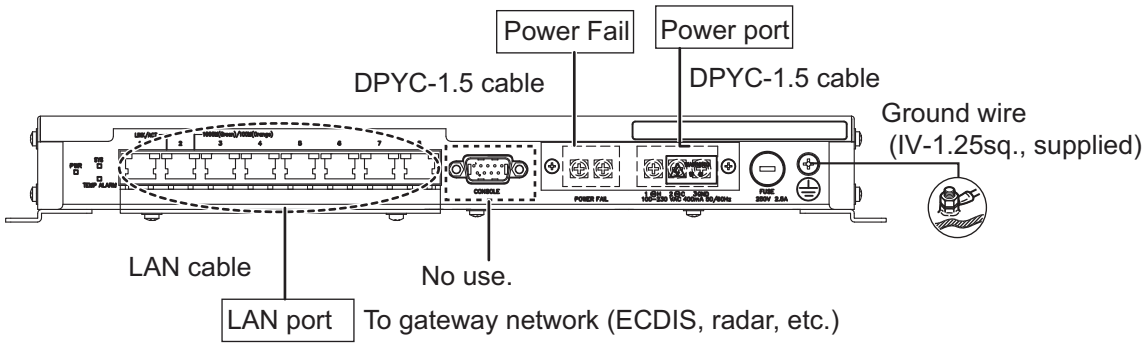
Pass each cable through its cable gland as shown below.



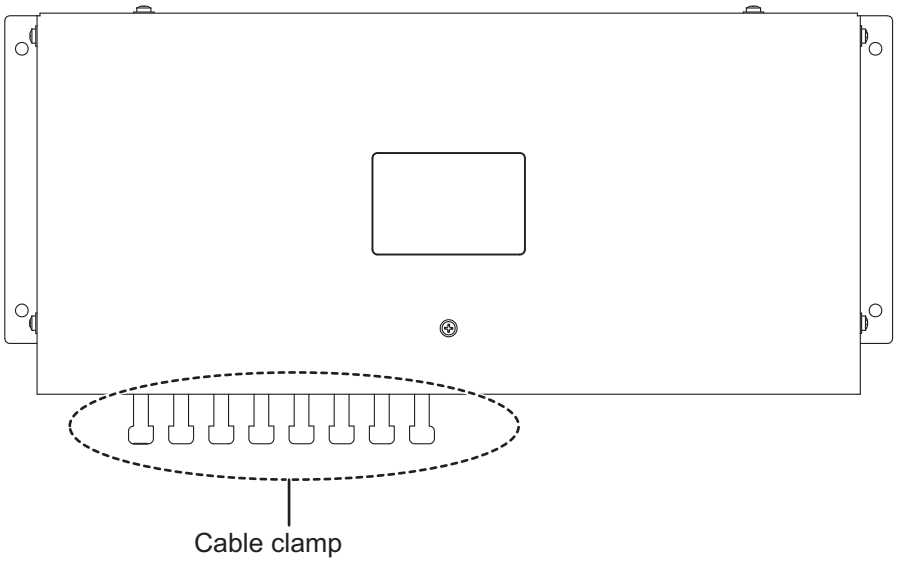


2.9 Intelligent HUB (option)

Fix the LAN cables to the cable clamp with the cable ties (supplied).



Attach the LAN cap (supplied) to the unused connector holes to comply with waterproofing standard IPX2.



2.10 How to Extend the Control Unit Cable (option)

To extend the length of the cable between the control unit and the processor unit, use the appropriate cable assembly for the control unit, as listed below.

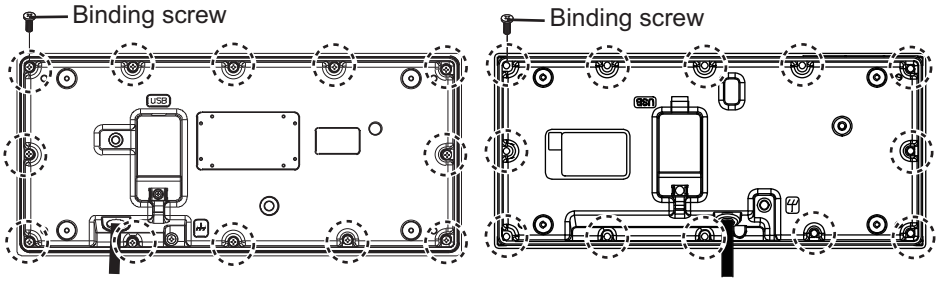
- RCU-025: TET-16-045A (5/10/20/30 m)
- RCU-026: 6TPSH-XH12X2-LxxSP2 (5/10/20/30 m)

Note: When the control unit cable is 10 m or longer, the USB cable (TS-20-071-1, 5 m) that is supplied with the control unit cannot be used. Even if the USB cable is not used, you can operate the control unit properly, but the USB port on the control unit is deactivated.

2.10.1 Radar control unit (RCU-025)

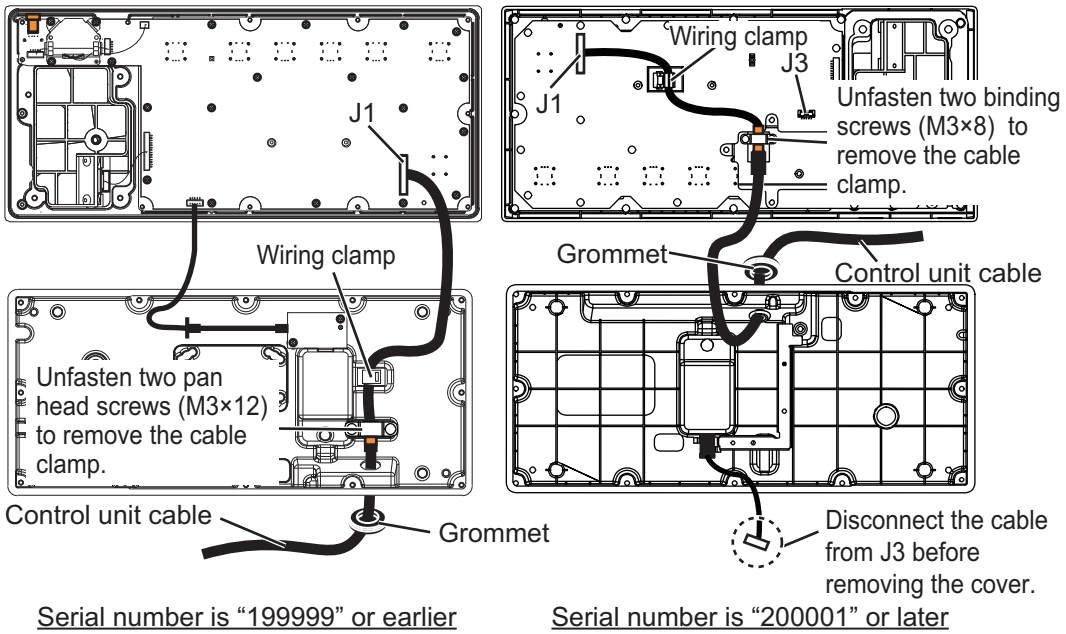
Wiring for the control unit

1. Unfasten 12 binding screws (M3x8) from the bottom of the control unit to remove the cover.
   Note: Do not add stress to the cables connected to the control unit board when removing the cover. When the serial number of the control unit is "200001" or later, disconnect the cable from the J3 (see the figure on step 3) before removing the cover.



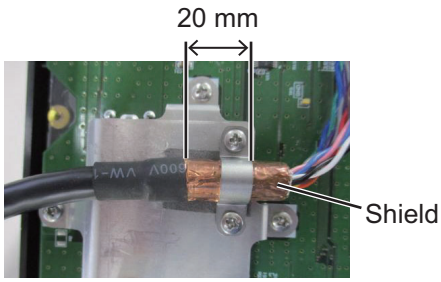
Serial number is "199999" or earlier　　Serial number is "200001" or later

2. Unfasten two screws to remove the cable clamp.
3. Release the control unit cable from the wiring clamp, then disconnect the cable from the J1.



Serial number is "199999" or earlier　　Serial number is "200001" or later

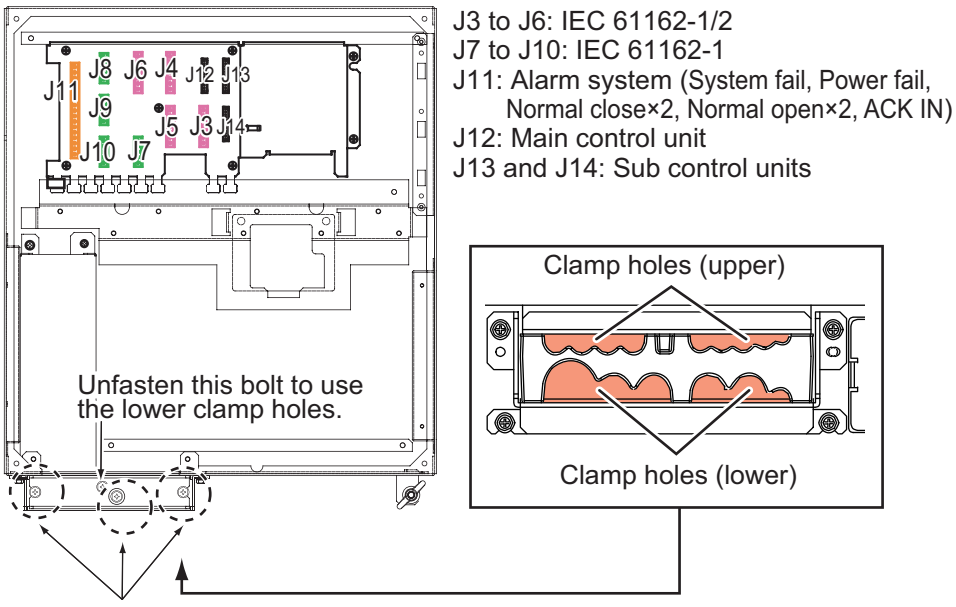
4. Pull out the control unit cable from the cover.
5. Pass the optional cable assy (TET-16-045A) through the grommet and cable entrance on the control unit.
6. Fasten the shield of the cable with the cable clamp (removed at step 2).
   Note: When the serial number is “200001” or later, fasten the shield as shown in the figure to the right.



7. Connect the cable to the J1, then secure the cable with the wiring clamp.
8. Reattach the control unit cover.

Wiring for the processor unit

1. Unfasten four screws (M4×8) to remove the processor unit cover.
2. Unfasten the three bolts circled in the figure below to remove the cable clamp (upper).



3. Disconnect the control unit cable from the processor unit, then connect the cable assy (TET-16-045A).
4. Set the shield part of cables under the cable clamp then tighten the cable clamp.

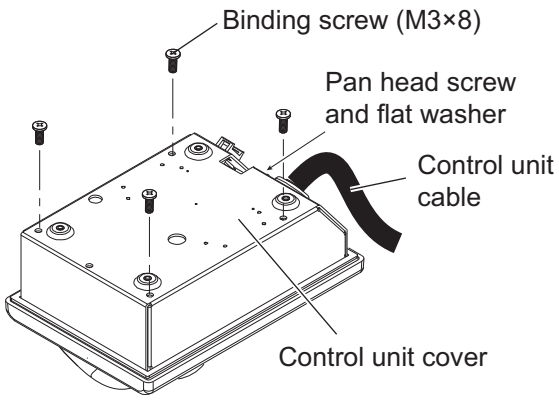
5. Attach the processor unit cover.

2.10.2 Trackball control unit (RCU-026)

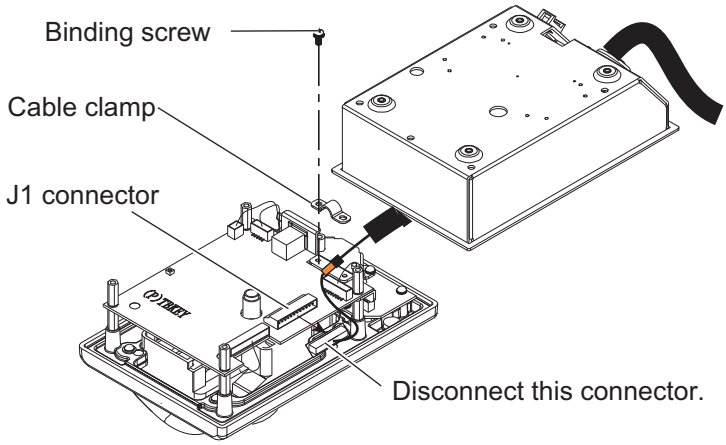
Wiring for the trackball control unit

1. Unfasten four binding screws (M3×8) from the bottom of the control unit, and a pan head screw (M3×8) and flat washer from the back of the control unit to remove the cover.

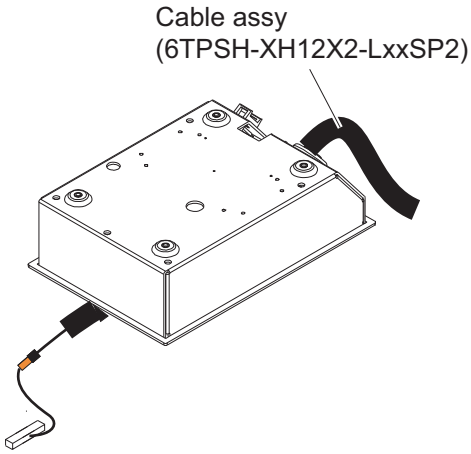
   Note: Remove the cover slowly to prevent damage to the cables connected to the circuit board in the control unit.



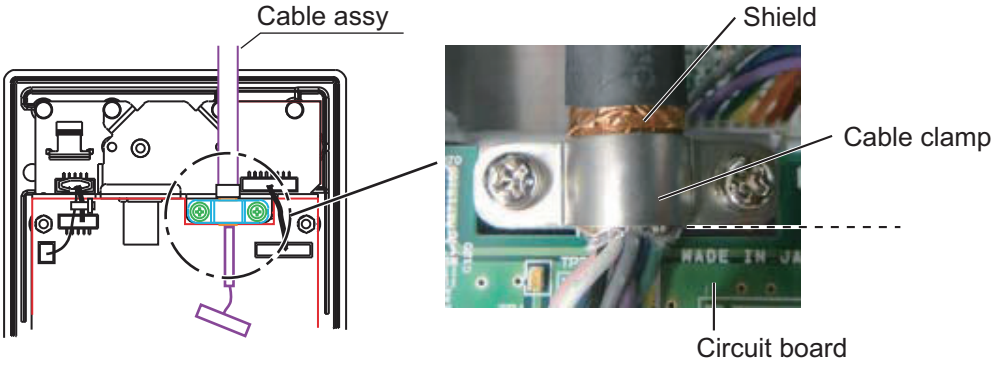
2. Remove the cable clamp from the control unit, then disconnect the control unit cable from the J1 connector.



3. Pull out the control unit cable from the cover.
4. Pass the optional cable assy (6TPSH-XH12X2-LxxSP2) through the cable hole on the cover.



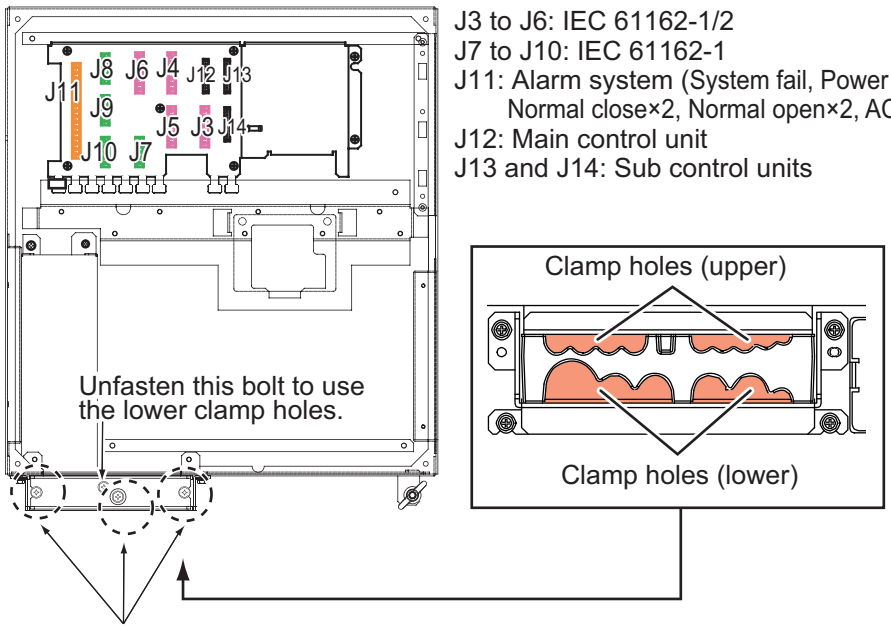
5. Fasten the shield of the cable assy with the cable clamp (removed at step 2), then connect the connector at the end of the cable assy to the J1 on the circuit board.
   Note: The shield of the cable must not touch the circuit board.



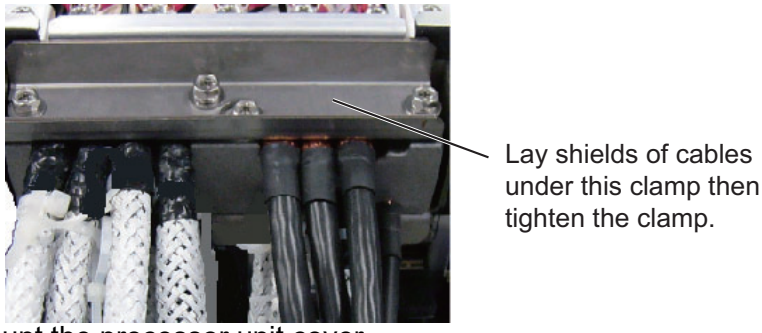
6. Reattach the control unit cover.

Wiring for the processor unit

1. Unfasten four screws (M4×8) to remove the processor unit cover.
2. Unfasten the three bolts circled below to remove the cable clamp (upper) as shown below.



3. Disconnect the control unit cable from the processor unit, then connect the cable assy (6TPSH-XH12X2-LxxSP2).
4. Set the shields of cables under the cable clamp then tighten the cable clamp.



5. Remount the processor unit cover.

2.11 VDR Connection

You can connect a VDR to this radar in one of two manners: DVI-I (Analog RGB) or LAN.

2.11.1 DVI-I (Analog RGB) connection

- Use the RGB cable (DVI-BNCX5-L2000) to connect the VDR.
- The DVI-D port and DVI-I port each have their own circuits. This prevents the interruption of the radar picture shown on the main monitor (connected to the DVI-D port), if a fault occurs at the DVI-I port.
- The processor unit continuously outputs video signals from its DVI-D and DVI-I ports. These signals cannot be stopped by the operator.

2.11.2 LAN connection

- Connect the VDR to the LAN2 port of the EC-3000.
  The VDR must comply with IEC 61160-450 standards.
- To set up the VDR, refer to the Instruction Manual supplied with the VDR, as well as the Settings and Adjustments Instruction Manual supplied with this radar.
- The image output from the LAN2 port is the same resolution as the image output from the DVI-D port.

3. SETTINGS AND ADJUSTMENTS

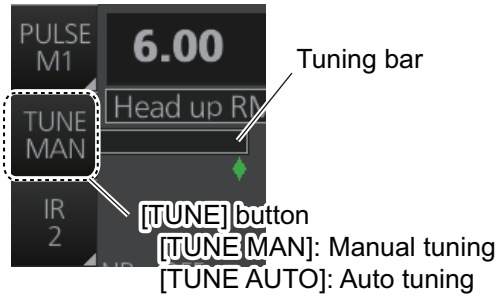
Note: After completing the settings and adjustments, copy the setting data to a USB flash memory, referring to section 23.2 in the Operator's Manual. This will allow easy restoration of setting data after the SPU Board is replaced, etc.

3.1 How to Access the Radar Installation Menu

The [RADAR INSTALLATION] menu has various items for adjustment of the radar. To show this menu, press the **MENU** key five times while pressing and holding the **1 HL OFF** key.

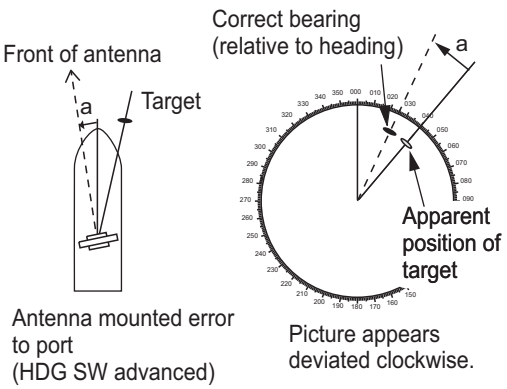
Tuning initialization

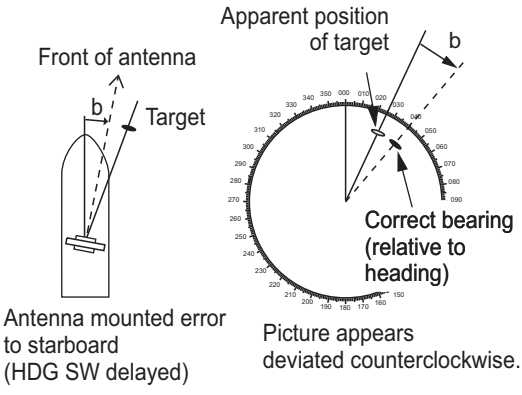
Right click the [TUNE] button on the InstantAccess bar™ then select [Tune Initialize] to start initialization. "TUNE IN" appears during the initialization.



3.2 How to Align the Heading

You have mounted the antenna unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually must appear on the heading line (zero degrees).





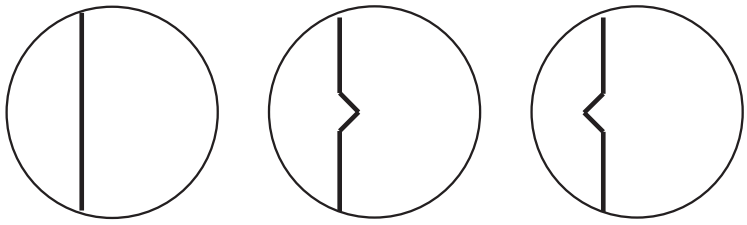
In practice, you will probably observe some small bearing error on the display because of the difficulty in achieving accurate initial positioning of the antenna unit. The following adjustment will compensate for this error.

1. Select a stationary target echo at a range between 0.125 and 0.25 NM, preferably near the heading line.
2. Operate the EBL control to bisect the target echo.
3. Read the target bearing.
4. Measure the bearing of the stationary target on a navigation chart and calculate the difference between the actual bearing and apparent bearing on the radar screen.
5. Show the [RADAR INSTALLATION] menu.
6. Select [1 ECHO ADJ] followed by [2 HD ALIGN].
7. Key in the bearing difference. The setting range is 0° to 359.9°.
8. Confirm that the target echo is displayed at the correct bearing on the screen.

3.3 How to Adjust the Sweep Timing

Sweep timing differs with respect to the length of the signal cable between the antenna unit and the processor unit. Adjust sweep timing at installation to prevent the following symptoms:

- The echo of a "straight" target (for example, pier), on the 0.25 NM range, appears on the display as being pulled inward or pushed outward. See the figure below.



(1) Correct (2) Target pushed inward (3) Target pushed outward

- The range of target echoes is also be incorrectly shown.

1. Transmit on the 0.25 NM range.
2. Adjust the radar picture controls to display the picture properly.
3. Select a target echo which should be displayed straightly.
4. Show the [RADAR INSTALLATION] menu, then select [1 ECHO ADJ] followed by [3 TIMING ADJ].
5. Set a value which displays the target straightly. The setting range is 0 to 4095. The default settings for each radar are shown below:
   - Default for magnetron radar: [325]
   - Default for solid state radar: [43]

3.4 How to Suppress Main Bang

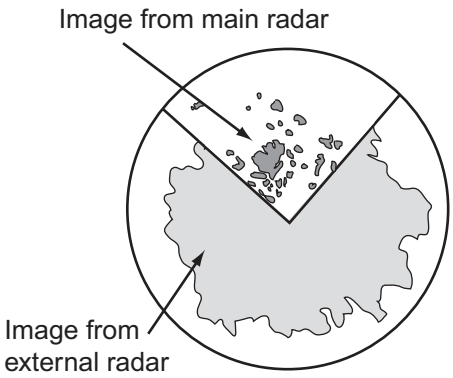
Main bang is the clutter at the center of the screen that you typically see on the radar display, and it may mask close-in targets. If main bang appears at the screen center, suppress it as follows.

1. Transmit the radar on a long range and then wait ten minutes.
2. Adjust the gain to show a slight amount of noise on the display.
3. Select the 0.25 NM range, and turn off the **A/C SEA** control.
4. Show the [RADAR INSTALLATION] menu, then select [1 ECHO ADJ] followed by [4 MBS].
5. Set a value that causes the main bang to just disappear. The setting range is 0 to 255.

3.5 Dual Radar Display

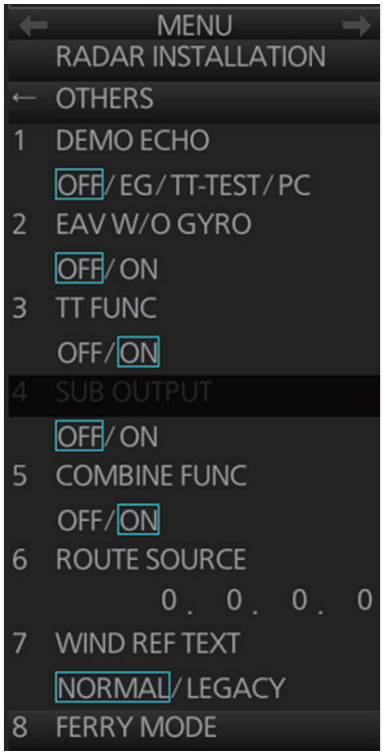
The dual radar display shows radar images from two radar sources on one radar display. Any combination of X- and S-band radars is possible.

Note: The [RADAR INSTALLATION] menu is inoperative (grayed out on the installation menu) when the dual radar display is active.



3.5.1 How to enable, disable the dual radar display

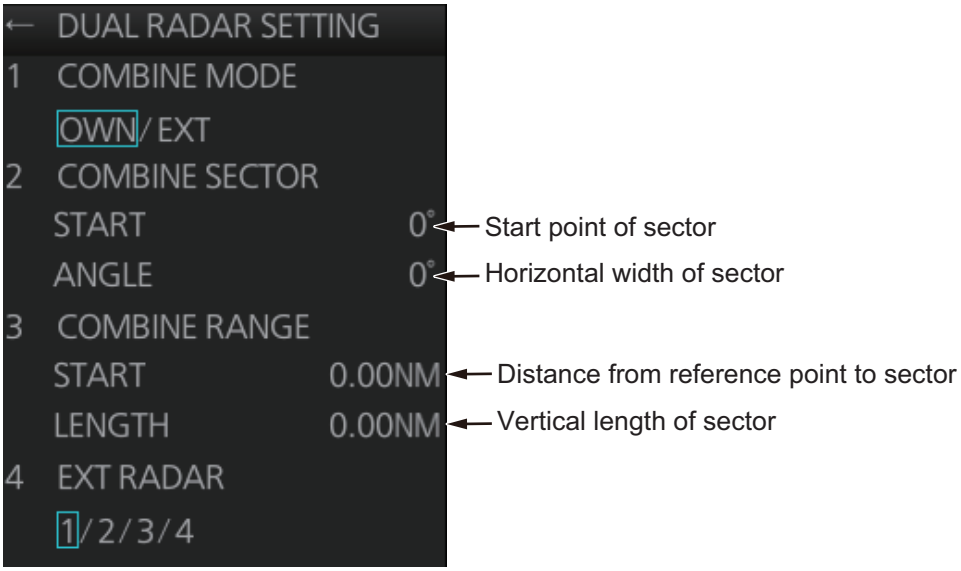
1. Open the [RADAR INSTALLATION] menu, then select [OTHERS] menu.
2. Select [5 COMBINE FUNC].
3. Select [OFF] or [ON] as appropriate.



3.5.2 How to set the width and length for the picture from the external radar

If two FAR-3xx0 series radars are to be used for the dual radar display, set the same display area on each radar to ensure proper performance.

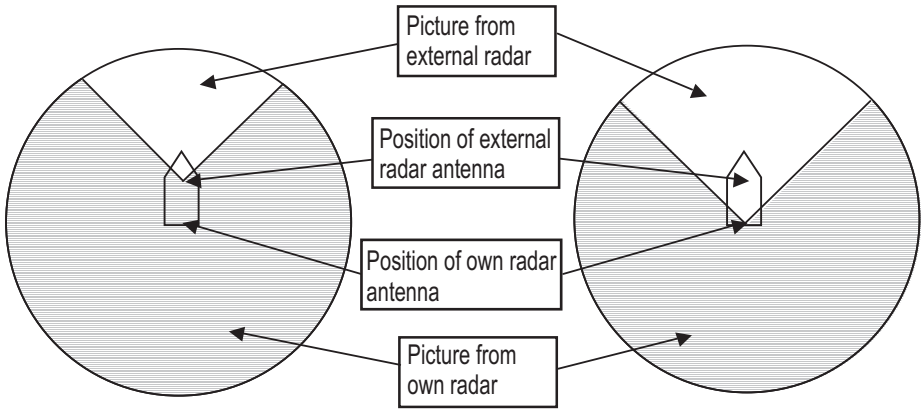
1. Open the [RADAR INSTALLATION] menu, then select [2 SCANNER], [6 DUAL RADAR SETTING] to show the [DUAL RADAR SETTING] menu.



2. Select [1 COMBINE MODE] to select which radar to set as reference point.
3. Select [OWN] or [EXT] as appropriate.
   [OWN]: Set own radar's antenna as the reference point and set display area of own radar. The area outside that set here is where the image from the external radar is displayed.
   [EXT]: Set the external radar's antenna as the reference point and set the display area of the external radar. The area outside that set here is where the image from own radar is displayed.

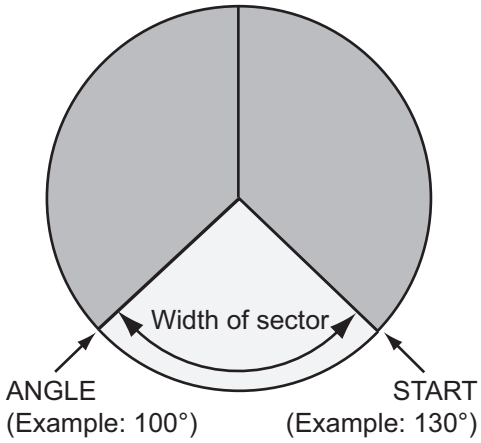
Radar selected for COMBINE MODE: External	
START:	315°
ANGLE:	90°
START:	00.00 nm
LENGTH:	99.99 nm

Radar selected for COMBINE MODE: Own	
START:	45°
ANGLE:	270°
START:	00.00 nm
LENGTH:	99.99 nm

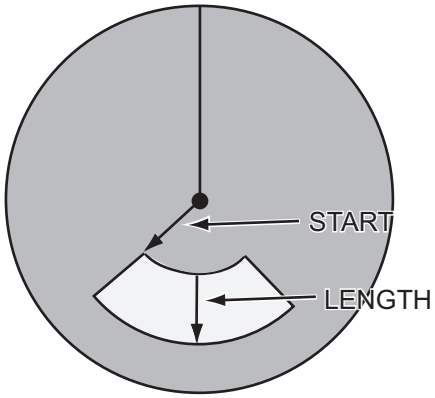


4. Select [2 COMBINE SECTOR] to set the width of the sector.

5. Use the scrollwheel to set [START] and [ANGLE], referring to the example below. Spin the scrollwheel to set and push it to confirm.
   A solid green line marks the dual radar display area.
   - **[START]**: Start point of the sector (in degrees, 000-359).
   - **[ANGLE]**: Horizontal width of the sector (in degrees, 000-359).



6. Select [3 COMBINE RANGE] to set the vertical width of the sector.
7. Use the scrollwheel to set [START] and [LENGTH], referring to the example below. Spin the scrollwheel to set and push it to confirm.
   - **[START]**: Distance from reference point to sector
   - **[LENGTH]**: Vertical length of sector



<Example> START: 01.00 nm
LENGTH: 02.00 nm

3.5.3 How to select the external radar (image source) to use

The dual radar display works best with two FAR-3xx0 radars. Other makes or models can be used, however performance may vary.

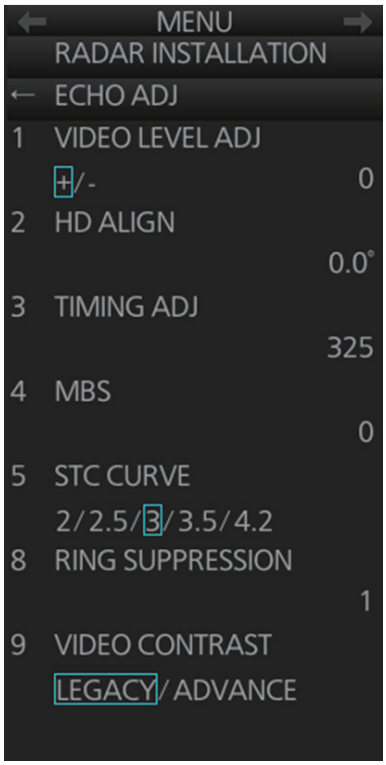
1. From the [RADAR INSTALLATION] menu, select [2 SCANNER], [6 DUAL RADAR SETTING].
2. Select [4 EXT RADAR].
3. Select required radar no. (Only the numbers of radar set on the [RADAR INSTALLATION] menu are valid.)
   Note 1: The dual radar will not function if a radar incompatible to the dual radar function is selected.
   Note 2: The dual radar display is designed to be used with two FAR-3xx0 series radars. Other makes or models can be used, however performance may vary.
4. Press the **MENU** key to close the menu.

3.6 Other Settings

This section describes the menu items not previously described.

3.6.1 [ECHO ADJ] menu

Open the main menu then select [9 RADAR INSTALLATION]→ [1 ECHO ADJ] to open the [ECHO ADJ] menu.



[1 VIDEO LEVEL ADJ]

Adjust the video level manually. Set the radar as follows:

- Interference Rejector (IR): 2
- Echo Stretch (ES): OFF
- Echo Averaging (EAV): OFF
- Gain: 80
- Range: 24 NM
- Pulse Length: Long

Select [+] or [-]. Rotate the scrollwheel so that noise just disappears from the screen. The setting range is 0 to 32. After completion of the adjustment the radar goes into standby. If the noise does not disappear, switch to [-]([+]) and try again.

[5 STC CURVE]

Use the default setting. Change the setting according to sea condition. The larger the number the greater the STC effect.

[8 RING SUPPRESSION]

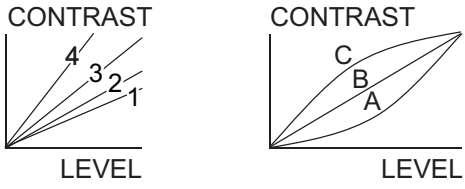
Remove “ring” noise which appears with the waveguide-type radar. Adjust so the rings disappear at the range of 0.125 NM. The setting range is 0 to 255.

[9 VIDEO CONTRAST]

Select [LEGACY] for FAR-3xx0 series radar only.

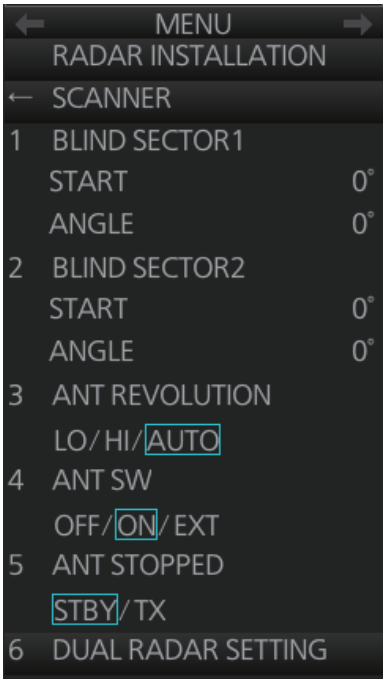
Note: The [ADVANCE] setting is not available at this time.

[VIDEO CONTRAST] set to [LEGACY] at installation:



3.6.2 [SCANNER] menu

Open the main menu then select [9 RADAR INSTALLATION]→ [2 SCANNER] to open the [SCANNER] menu.



[1 BLIND SECTOR1], [2 BLIND SECTOR2]

Set area(s) where to prevent transmission. Heading must be properly aligned (see section 3.2) before setting any blind sector. For example, set the area where an interfering object at the rear of the antenna would produce a dead sector (area where no echoes appear) on the display. To enter an area, enter start bearing relative to the heading and dead sector angle. To erase the area, enter 0 for both the [START] and [ANGLE] sections. The setting range of [START] is 0° to 359° and [ANGLE] is 0° to 180°.

Note: Turn off a stern blind sector when adjusting the PM gain, to display the echo from the performance monitor properly.

[3 ANT REVOLUTION]

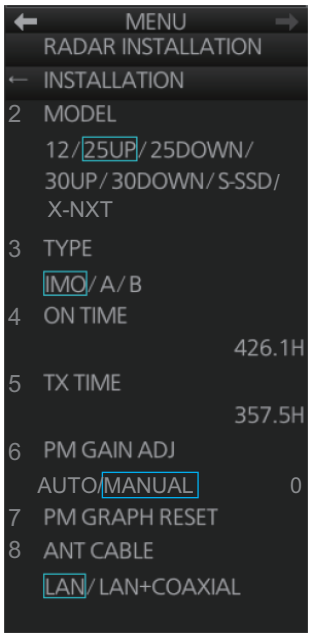
For HSC only. Select [LO] for 36 rpm, [HI] for 42 rpm. [AUTO] sets the normal rotation speed to 36 rpm and switches the rotation speed to 42 rpm when the short pulse is selected.

Note: Select [OFF] at [ANT SW] to prevent antenna rotation. [ANT STOPPED] prevents transmission while the antenna is stopped in STBY.

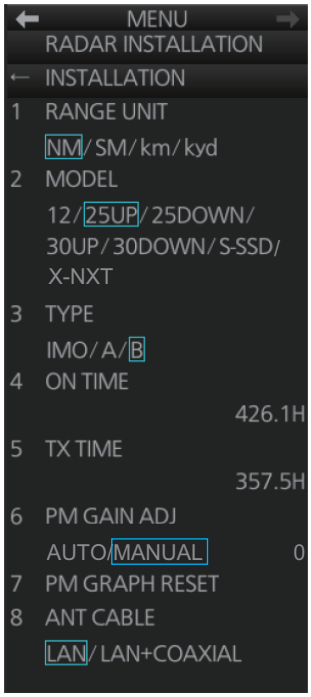
3.6.3 [INSTALLATION] menu

Open the main menu then select [9 RADAR INSTALLATION]→ [3 INSTALLATION] to open the [INSTALLATION] menu.

IMO-/A-type radars



B-type radar



[1 RANGE UNIT]

For the B-type radar, select the range unit, NM, SM, KM or kyd then push the left button.

[2 MODEL]

Confirm the model of your radar. If this setting is different from your model, the radar will not function properly. The number before a diagonal (12, 25, 30) is the output power (in kW). [UP], [DOWN] indicates the location of the transceiver unit. [UP] is in the antenna unit, and [DOWN] means separate transceiver unit. [S-SSD] means S-band solid state device. [X-NXT] means X-band solid state device.

[3 TYPE]

Select the type of radar: [IMO], [A] or [B].
[IMO]: IMO specifications
[A]: Near-IMO specifications
[B]: Non-Japanese fishing vessel specifications

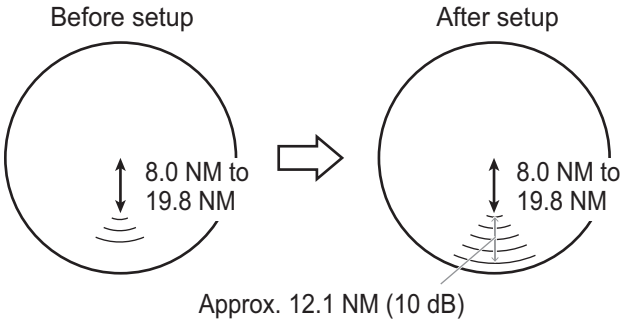
Note: Reboot the processor unit when this setting is changed.

[4 ON TIME], [5 TX TIME]

These items show the number of hours the radar has been turned on and transmitted, respectively. Value can be changed; for example, after replacing the magnetron. [TX TIME] can be reset to 0.

[6 PM GAIN ADJ]

Adjust the performance monitor, automatically or manually, whenever the magnetron is replaced. For automatic adjustment, no further operation is required; close the menu at the completion of the adjustment. For manual do as follows to adjust the performance monitor gain.



Ex: When [ARC] is set to [5]
(The location of arcs changes with the setting of [ARC] in [PERFORMANCE MON] in the [ECHO] menu.)

1. Adjust the **GAIN** control so that a slight amount of white noise appears on the screen. Arcs for the performance monitor appear on the screen.
2. Select [PM GAIN ADJ] then spin the scrollwheel so that the outer arc faintly appears. The setting range is 0 to 255. Wait at least eight scans then right click to set.
   Note: Turn off a stern blind sector before adjusting the PM gain, to display the echo from the performance monitor properly.
   - Range: 24 NM
   - Pulse Length: Long
   - A/C SEA: OFF (turn off manually)
   - A/C RAIN: OFF (turn off manually)
   - Echo Averaging (EAV): OFF
   - Video Contrast: 2-B

[7 PM GRAPH RESET]

Select this item to reset all PM graphs, after replacing the magnetron. The message shown to the right appears. Click the [OK] button to reset the PM graphs.

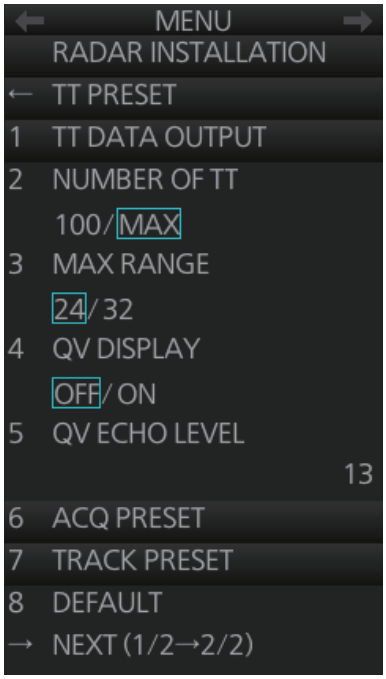
Note: After the PM graphs are reset, perform PM gain adjustment, as previously outlined in "[6 PM GAIN ADJ]" on page 9

[8 ANT CABLE]

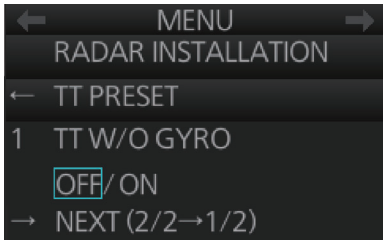
Select the method of connection between the radar sensor and the processor unit. [LAN] (LAN cable only) or [LAN+COAXIAL] (LAN and coaxial cables). Select [LAN+COAXIAL] when the optional LAN Signal Converter is installed.

3.6.4 [TT PRESET] menu

Open the main menu then select [9 RADAR INSTALLATION]→ [4 TT PRESET] to open the [TT PRESET] menu.



Page 1

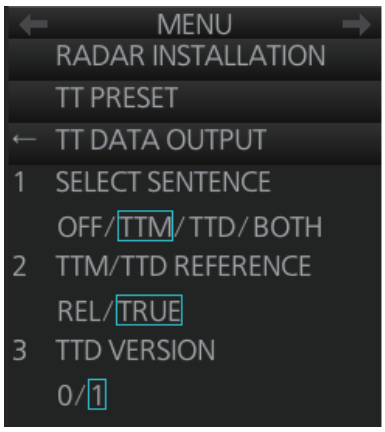


Page 2

[1 TT DATA OUTPUT]

Show the [TT DATA OUTPUT] menu.

Note: Confirm the data input configuration for the equipment which will receive the TT (target tracking) sentence BEFORE setting this menu.



- [SELECT SENTENCE]: Select the sentence that is output the TT target data.
  [OFF]: For no output of the TT data.
  [TTM]: For connected equipment which can receive the TTM sentence.
  [TTD]: For connected equipment which can receive the TTD sentence.
  [BOTH]: For connected equipment which can receive both TTM and TTD sentences.
  Note: This setting is valid for LAN connection only. For serial connection, the output sentence is determined on the [Common Installation Setting] menu, this setting is invalid. See WEB SETTING MANUAL (E32-01305) for details. For both LAN and serial connections, set the baudrate to 38,400 bps.
- [TTM/TTD REFERENCE]: Set the output format for tracked target's bearing. [REL] (Target bearing from own ship, degree relative, target course, degree relative), or [TRUE] (Target bearing, degree true, target course, degree true).
- [TTD VERSION]: For TTD sentence, select the required protocol version for the connected equipment for TTD output ([0]: ver. 0 only, [1]: ver. 0 and ver. 1).
  Note: If the connected equipment is FMD-3x00, select [1].

[2 NUMBER OF TT]

Set the number of targets that can be acquired, [100] or [MAX] (200). For FAR-2xx7 radar, select [100].

[3 MAX RANGE]

Select the maximum target tracking range, 24 or 32 nm.

[4 QV DISPLAY]

[OFF]: Normal picture,
[ON]: Quantized video. The normal picture is in effect whenever the power is turned on regardless of this setting.

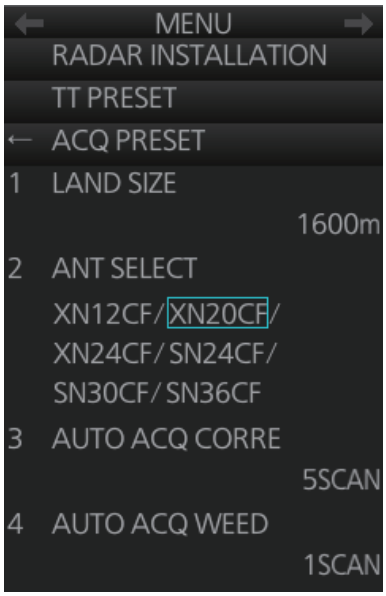
[5 QV ECHO LEVEL]

Set the detection level of echoes. The setting range is 1 to 31.

[6 ACQ PRESET]

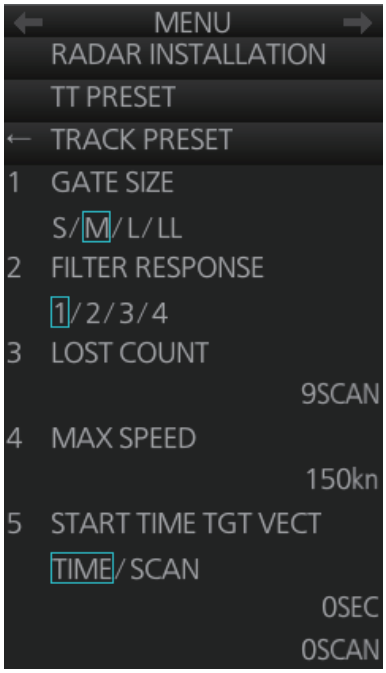
Show the [ACQ PRESET] menu.

- [LAND SIZE]: Set the land size in units of 100 m. The setting range is 100 to 3000 m. A target whose length is equal to or greater than the length set here is judged as a land target.
- [ANT SELECT]: Set the antenna radiator type of your radar. The size of the echo changes with radiator size. Select the correct radiator type to ensure proper performance.
- [AUTO ACQ CORRE]: Set the correlation count of automatic acquisition. The setting range is 3 to 10.
- [AUTO ACQ WEED]: Set the cancel count of automatic acquisition. The setting range is 1 to 5.



[7 TRACK PRESET]

- **[GATE SIZE]**: Set the gate size among [S], [M], [L] or [LL].
- **[FILTER RESPONSE]**: Set the filter response function. The setting range is 1 to 4.
  1: Filter response is improved.
  4: Filter stability is improved.
- **[LOST COUNT]**: Set the number of scans to allow before a target is declared a lost target. The setting range is 1 to 20.
- **[MAX SPEED]**: No use.
- **[START TIME TGT VECT]**: Set the number of seconds or number of scans to wait before showing the vector for a newly acquired target. Select [TIME] or [SCAN] then enter value.



[8 DEFAULT]

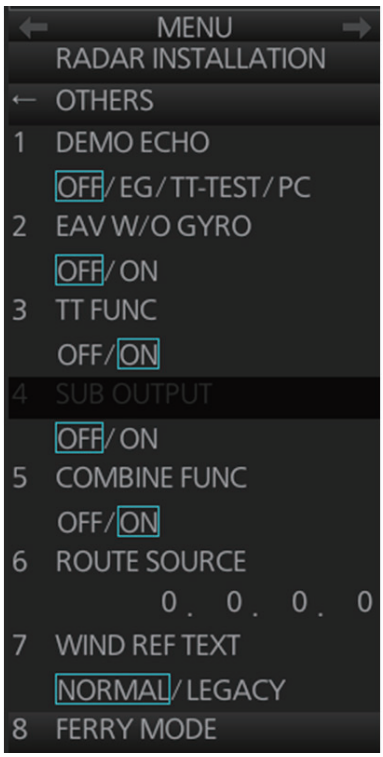
Restore the default settings for the [RADAR INSTALLATION] menu settings.

[1 TT W/O GYRO] (page 2)

TT can be used without a gyro. Select [ON] to use TT without a gyro.

3.6.5 [OTHERS] menu

Open the main menu then select [9 RADAR INSTALLATION]→ [5 OTHERS] to open the [OTHERS] menu.



[1 DEMO ECHO]

Select the type of demonstration echo to use. [EG] (Echo Generator), [TT-TEST] or [PC]. Select [OFF] to deactivate the demonstration echo feature.

[2 EAV W/O GYRO]

The each averaging feature can be used without a gyrocompass. Select [ON] to use the feature without a gyrocompass.

[3 TT FUNC]

Activate or deactivate the TT function.

[4 SUB OUTPUT]

No use.

[5 COMBINE FUNC]

Enables, disables the dual radar display. Select [ON] to enable the dual radar display.

[6 ROUTE SOURCE]

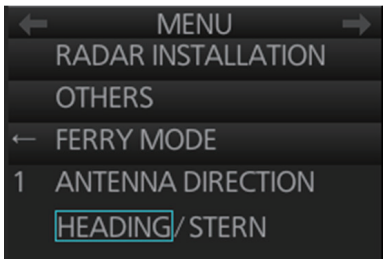
Set the IP address when receiving route information from a route source other than FMD-3200/3300.

[7 WIND REF TEXT]

Select the format of the wind information on the [NAV data] box. For the wind reference, set on the [WIND STB] (Main menu→[4 INFORMATION BOX]→[2 SET NAV DATA]→[6 WIND STB]) menu.

[8 FERRY MODE]

Select the direction in which the antenna was installed (oriented) at [ANTENNA DIRECTION].



3.7 Network Transmission Setting Between ECDIS and Radar

Connect the ECDIS and FAR-3xx0 series radar with the LAN cable to show the radar echo and TT symbols on the ECDIS chart display, and show the ECDIS route and user chart symbols on the radar display.

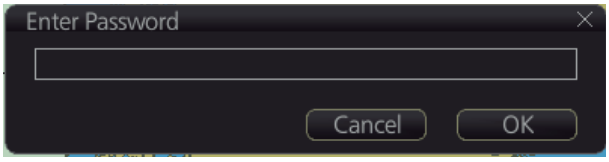
1. Press the **MENU** key five times while holding down the [1 HL OFF] key.
2. Select [9 RADAR INSTALLATION]→[4 TT PRESET]→[1 TTM/TTD PREFERENCE] and then select [TRUE].
3. On the ECDIS, open the [Common Installation Setting] menu.
4. Open the [Own Ship Setting] menu on the ECDIS to select [Radar Antenna] on the menu bar.
5. For one antenna unit, check [RAS001]. For two antenna units, check[RAS001] and [RAS002].

3.8 How to Set the Forwarding Distance

Set the forwarding distance* as follows. The configuration can be copied to other units connected to the network after saving the configuration.

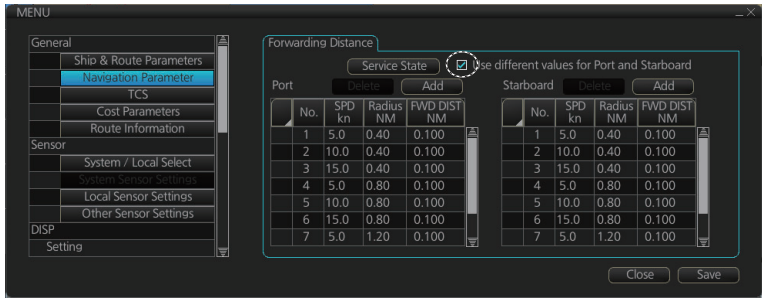
*: The distance the ship travels straight after the steering control.

1. In the chart mode, press **Ctrl**, **Shift** and **t** keys simultaneously on the control unit or keyboard. A dialog box for password input appears.



2. Enter the password and click the [OK] button.
   Note: The edit mode remains enabled until you press **Ctrl**, **Shift** and **t** keys simultaneously or reboot the unit.
3. Click [MENU] in the chart mode to open the menu.
4. Click [Navigation Parameter] to show the [Navigation Parameter] setting window.

5. Enter [SPD kn] (ship speed), [Radius NM] (turning radius) and [FWD DIST NM] (forwarding distance*).
6. When [FWD DIST NM] is different between port and starboard sides, check the checkbox of [Use different values for Port and Starboard] and then enter each setting value.



7. Click the [Save] button to save the configuration.

3.9 Synchronization With Ship's Clock

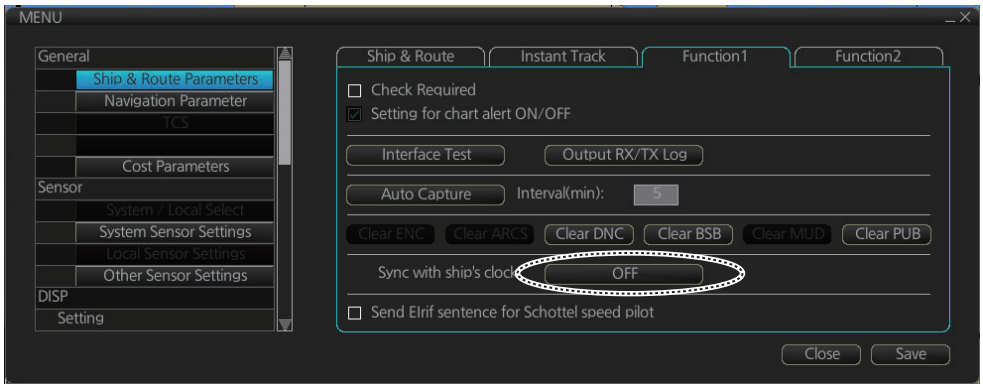
The time (UTC) received from the GPS is shown. If the ZDA sentence is input from the ship's clock, the time synchronized with the ship's clock can be shown.

Do as follows to activate the synchronization with the ship's clock.

Note: The local time setting is not available when the synchronization with ship's clock is active.

1. In the chart mode, press **Ctrl**, **Shift** and **t** keys simultaneously on the control unit or keyboard. A dialog box for entry of password appears.
2. Enter the password and click the [OK] button.
   Note: The edit mode remains enabled until you press **Ctrl**, **Shift** and **t** keys simultaneously or reboot the unit.
3. Click [MENU] to open the menu.

4. Click [Ship & Route Parameters], then click the [Function1] tab.

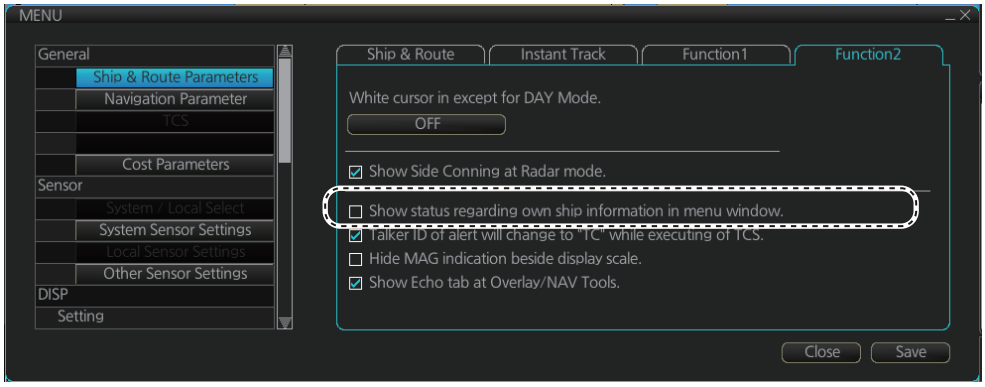


5. Click the [OFF] button of [Sync with ship's clock] to set "ON".
6. Click the [Save] button to save the configuration.

3.10 How to Change the Display Color for Sensor Data Based on Integrity

The following procedure shows how to change the color of the data in the sensor information box based on the results of the Integrity Check. For the Integrity Check, see the Operator's Manual for the Chart Radar.

1. In the chart mode, press **Ctrl**, **Shift** and **t** keys simultaneously on the control unit or keyboard. A dialog box for entry of password appears.
2. Enter the password and click the [OK] button.
   Note: The edit mode remains enabled until you press **Ctrl**, **Shift** and **t** keys simultaneously or reboot the unit.
3. Click [MENU] to open the menu.
4. Click [Ship & Route Parameters], then click the [Function2] tab.



5. Check the checkbox of [Show status regarding own ship information in menu window.].
6. Click the [Save] button to save the configuration.

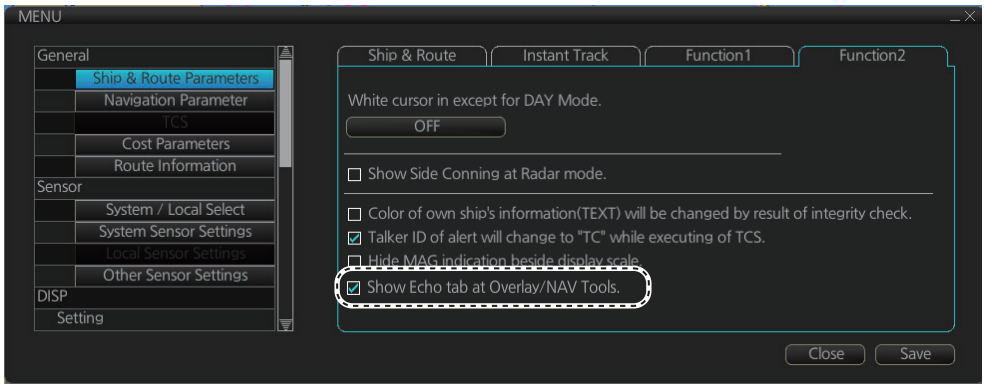
3.11 How to display the [Echo] page

To overlay the radar image on the chart mode, display the [Echo] page in the [Overlay/NAV Tools] box. For details, see the Operator's Manual for the Chart Radar.

Note 1: For B-type radar, the [Echo] page is not available regardless of this setting.

Note 2: In radar mode, set the radar to transmit to show the radar image on the chart mode.

1. In the chart mode, press **Ctrl**, **Shift** and **t** keys simultaneously on the control unit or keyboard. A dialog box for entry of password appears.
2. Enter the password and click the [OK] button.
   Note: The edit mode remains enabled until you press **Ctrl**, **Shift** and **t** keys simultaneously or reboot the unit.
3. Click [MENU] to open the menu.
4. Click [Ship & Route Parameters], then click the [Function2] tab.



5. Check the checkbox of [Show Echo tab at Overlay/NAV Tools].
6. Click the [Save] button to save the configuration.

3.12 Web Setting Menu

The setup of the Back-up ECDIS must be completed by a FURUNO approved service engineer. For details, see the Instruction Manual (E32-01305).

3.13 How to Set Up the Back-up ECDIS

The set up of the back-up ECDIS must be completed by a FURUNO approved service engineer. For details, see the Instruction Manual (E32-01305).

When Back-up ECDIS mode is active, the following changes occur:

- Own Ship Look-ahead Area function is fixed to ON and cannot be disabled.
- The talker for some route-related sentences and alerts changes to "EI".
- Display Mode button changes to show "Back-up ECDIS".
- Some information sent to a VDR (ECDIS display source information and LAN images) is sent with the prefix "EI" instead of "RA" and the equipment number changes as outlined in section 1.2.1 of the Instruction Manual.

4. INPUT/OUTPUT DATA

NOTICE

The radar(s) must be interconnected to the following type approved sensors:
- **EPFS meeting the requirements of the IMO resolution MSC.112(73).**
- **Gyrocompass meeting the requirements of the IMO resolution A.424(XI).**
- **SDME meeting the requirements of IMO resolution MSC.96(72).**

The radar may be interconnected via HUB-3000 to other FURUNO processing units having approved LAN ports.

4.1 Processor Unit

Input and output data are shown in the table below.

Input

Data	Specification	Contents	Remarks
Heading signal	IEC 61162-2*		
Speed signal	IEC 61162-1 Ed.5		
Navaid data	IEC 61162-1 Ed.5	Position, time and date, datum, course, speed, wind, current, depth, temperature, Navtex, etc.	
AIS signal	IEC 61162-2		
Alarm handling signal	Contact closure		Input from alarm system
	IEC 61162-1 Ed.5		Input from alarm system

*: Data input cycle must be more than 40 Hz (high speed craft) or 20 Hz (conventional ships).

Output

Data	Specification	Contents	Remarks
Radar system data	IEC 61162-1 Ed.5	RSD, OSD	
TT data**	IEC 61162-1 Ed.5	TTD, TTM, TLB	
Alarm signal	IEC 61162-1 Ed.5		4 systems, output contents are selected by menu.
	Contact closure		

**: The output sentence and baud rate can be set at the PC (See the Instruction Manual). The mode can be set at the [TT PRESET] menu (See section 3.6.4).

Alert Interface

The alert interface for this equipment are shown as follows:

- IEC 61162-1/2 (combination): 4 ports
- IEC 61162-1: 3 ports
- IEC 61162-450: 1 port

4.2 IEC 61162 Sentences

Input Data	Sentence priority
AIS addressed and binary broadcast acknowledgment	ABK
Alert command	ACN (ACM)
Cyclic alert list	ALC
Alert sentence	ALF
Set alarm state	ALR
Alert command refused	ARC
Set and drift	CUR>VDR
Display dimming control	DDC
Depths	DPT>DBT
Datum	DTM
Position	GNS>GGA>RMC>GLL
Heartbeat supervision report	HBT
Heading correction report	HCR
Water temperature	MTW
Wind direction and speed	MWD
Wind speed and angle (relative)	MWV (R)
Wind speed and angle (true)	MWV (T)
NAVTEX receiver mask	NRM
NAVTEX received message	NRX
Navigation status report	NSR
Route transfer report	RRT
System function ID	SRP
Heading (true)	THS>HDT
Speed (SOG)	VBW
Speed (STW)	VBW>VHW
UAIS VHF data-link message	VDM
UAIS VHF data-link own-vessel report	VDO
Dual ground/water distance	VLW
AIS voyage static data	VSD
Speed (position)	VTG>RMC
Time and date	ZDA

Output Data	Sentence
Addressed binary and safety related message	ABM
Cyclic alert list	ALC
Alert sentence	ALF
Set alarm state	ALR
Alert command refused	ARC
AIS broadcast binary message	BBM
Monitor setting	DDC
General event message	EVE
Heartbeat supervision report	HBT
Own ship data	OSD
Route transfer report	RRT
Radar system data	RSD
Routes	RTE

Output Data	Sentence
System function ID	SRP
TT target data	TLB, TTD, TTM
Voyage static data	VSD
Waypoint location	WPL

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APPX. 1 JIS CABLE GUIDE

Cables listed in the manual are usually shown as Japanese Industrial Standard (JIS). Use the following guide to locate an equivalent cable locally.

JIS cable names may have up to 6 alphabetical characters, followed by a dash and a numerical value (example: DPYC-2.5).
For core types D and T, the numerical designation indicates the *cross-sectional Area (mm^2)* of the core wire(s) in the cable.
For core types M and TT, the numerical designation indicates the *number of core wires* in the cable.

1. Core Type

D: Double core power line
T: Triple core power line
M: Multi core
TT: Twisted pair communications (1Q=quad cable)

2. Insulation Type

P: Ethylene Propylene Rubber

3. Sheath Type

Y: PVC (Vinyl)

4. Armor Type

C: Steel

5. Sheath Type

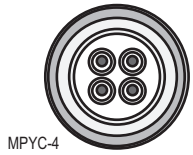
Y: Anticorrosive vinyl sheath

6. Shielding Type

SLA: All cores in one shield, plastic tape w/aluminum tape
-SLA: Individually shielded cores, plastic tape w/aluminum tape


DPYCY


TPYCY


MPYC-4


TTYCSLA-4

1 3 4 5 6
EX: TTYCYSLA - 4
Designation type — # of twisted pairs

1 2 3 4
MPYC - 4
Designation type — # of cores

The following reference table lists gives the measurements of JIS cables commonly used with Furuno products:

Type	Core Area	Core Diameter	Cable Diameter	Type	Core Area	Core Diameter	Cable Diameter
DPYC-1.5	1.5mm²	1.56mm	11.7mm	TTYCSLA-1	0.75mm²	1.11mm	9.4mm
DPYC-2.5	2.5mm²	2.01mm	12.8mm	TTYCSLA-1T	0.75mm²	1.11mm	10.1mm
DPYC-4	4.0mm²	2.55mm	13.9mm	TTYCSLA-1Q	0.75mm²	1.11mm	10.8mm
DPYC-6	6.0mm²	3.12mm	15.2mm	TTYCSLA-4	0.75mm²	1.11mm	15.7mm
DPYC-10	10.0mm²	4.05mm	17.1mm	TTYCY-1	0.75mm²	1.11mm	11.0mm
DPYCY-1.5	1.5mm²	1.56mm	13.7mm	TTYCY-1T	0.75mm²	1.11mm	11.7mm
DPYCY-2.5	2.5mm²	2.01mm	14.8mm	TTYCY-1Q	0.75mm²	1.11mm	12.6mm
DPYCY-4	4.0mm²	2.55mm	15.9mm	TTYCY-4	0.75mm²	1.11mm	17.7mm
MPYC-2	1.0mm²	1.29mm	10.0mm	TTYCY-4SLA	0.75mm²	1.11mm	19.5mm
MPYC-4	1.0mm²	1.29mm	11.2mm	TTYCYSLA-1	0.75mm²	1.11mm	11.2mm
MPYC-7	1.0mm²	1.29mm	13.2mm	TTYCYSLA-4	0.75mm²	1.11mm	17.9mm
MPYC-12	1.0mm²	1.29mm	16.8mm	TTPYCSLA-1	0.75mm²	1.11mm	9.2mm
TPYC-1.5	1.5mm²	1.56mm	12.5mm	TTPYCSLA-1T	0.75mm²	1.11mm	9.8mm
TPYC-2.5	2.5mm²	2.01mm	13.5mm	TTPYCSLA-1Q	0.75mm²	1.11mm	10.5mm
TPYC-4	4.0mm²	2.55mm	14.7mm	TTPYCSLA-4	0.75mm²	1.11mm	15.3mm
TPYCY-1.5	1.5mm²	1.56mm	14.5mm				
TPYCY-2.5	2.5mm²	2.01mm	15.5mm				
TPYCY-4	4.0mm²	2.55mm	16.9mm				

APPX. 2 ROD TERMINALS

MC-3000S, MC-CS Board (24P0114)

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J1	1	24V_VOUT	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		
J2	1	24V_IN	AI 1.5-6 BK (black)	DPYC-1.5
	2	24V_GND		
	3	PWR_FAIL-A	AI 0.75-6 GY (Gray)	TTYCS-4 TTYCSLA-4
	4	PWR_FAIL-COM		
	5	PWR_FAIL-B		
	6	NC	-	-
J4	1	TD1-A	AI 0.75-6 GY (Gray)	TTYCS-4 TTYCSLA-4
	2	TD1-B		
	3	RD1-A		
	4	RD1-B		
	5	ISOGND1		
	6	RD1-H		
	7	RD1-C		
J5	1	TD2-A	AI 0.75-6 GY (gray)	TTYCS-4 TTYCSLA-4
	2	TD2-B		
	3	RD2-A		
	4	RD2-B		
	5	ISOGND2		
	6	RD2-H		
	7	RD2-C		
J6	1	TD3-A	AI 0.75-6 GY (gray)	TTYCS-4 TTYCSLA-4
	2	TD3-B		
	3	RD3-A		
	4	RD3-B		
	5	ISOGND3		
	6	RD3-H		
	7	RD3-C		
J7	1	TD4-A	AI 0.75-6 GY (gray)	TTYCS-4 TTYCSLA-4
	2	TD4-B		
	3	RD4-A		
	4	RD4-B		
	5	ISOGND4		
	6	RD4-H		
	7	RD4-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J8	1	TD5-A	AI 0.75-6 GY (gray)	TTYCS-1Q TTYCSLA-1Q
	2	TD5-B		
	3	RD5-H		
	4	RD5-C		
	5	TD6-A		TTYCS-1Q TTYCSLA-1Q
	6	TD6-B		
	7	RD6-H		
	8	RD6-C		
J9	1	TD7-A	AI 0.75-6 GY (gray)	TTYCS-1Q TTYCSLA-1Q
	2	TD7-B		
	3	RD7-H		
	4	RD7-C		
	5	TD8-A		TTYCS-1Q TTYCSLA-1Q
	6	TD8-B		
	7	RD8-H		
	8	RD8-C		

MC-3010A MC-ANLG Board (24P0115)

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J1	1	24V_IN	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		
J2	1	24V_OUT	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		
J3*	1	AN1_IN	AI 0.75-6 GY (gray)	TTYCS-1 TTYCSLA-1
	2	AN1_GND		
	3	CURR1_JP1		
	4	CURR1_JP2		
J4*	1	AN2_IN	AI 0.75-6 GY (gray)	TTYCS-1 TTYCSLA-1
	2	AN2_GND		
	3	CURR2_JP1		
	4	CURR2_JP2		
J5*	1	AN3_IN	AI 0.75-6 GY (gray)	TTYCS-1 TTYCSLA-1
	2	AN3_GND		
	3	CURR3_JP1		
	4	CURR3_JP2		

*: For pin #3 and 4, no cable is connected. However the jumper connection is necessary depending on the input specification.

MC-3020D, MC-DIN Board (24P0116)

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J1	1	24V_IN	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		
J2	1	24V_OUT	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		
J3*	1	DV12V_OUT1	AI 1-6 RD (red)	MPYC-12
	2	DIGI_IN1		
	3	DIGI_RTN1		
	4	GND		
	5	DC12V_OUT2		
	6	DIGI_IN2		
	7	DIGI_RTN2		
	8	GND		
J4*	1	DV12V_OUT3	AI 1-6 RD (red)	MPYC-12
	2	DIGI_IN3		
	3	DIGI_RTN3		
	4	GND		
	5	DC12V_OUT4		
	6	DIGI_IN4		
	7	DIGI_RTN4		
	8	GND		
J5*	1	DV12V_OUT5	AI 1-6 RD (red)	MPYC-12
	2	DIGI_IN5		
	3	DIGI_RTN5		
	4	GND		
	5	DC12V_OUT6		
	6	DIGI_IN6		
	7	DIGI_RTN6		
	8	GND		
J6*	1	DV12V_OUT7	AI 1-6 RD (red)	MPYC-12
	2	DIGI_IN7		
	3	DIGI_RTN7		
	4	GND		
	5	DC12V_OUT8		
	6	DIGI_IN8		
	7	DIGI_RTN8		
	8	GND		

*: Pin #1 and 5: no cable connection. However the jumper connection is necessary between #1 and 2 and #5 and 6 depending on the input specification.

MC-3030D, MC-DOUT Board (24P0117)

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J1	1	24V_IN	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		
J2	1	24V_OUT	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		
J3	1	A1	AI 1-6 RD (red)	MPYC-12
	2	COM1		
	3	B1		
	4	A2		
	5	COM2		
	6	B2		
J4	1	A3	AI 1-6 RD (red)	MPYC-12
	2	COM3		
	3	B3		
	4	A4		
	5	COM4		
	6	B4		
J5	1	A5	AI 1-6 RD (red)	MPYC-12
	2	COM5		
	3	B5		
	4	A6		
	5	COM6		
	6	B6		
J6	1	A7	AI 1-6 RD (red)	MPYC-12
	2	COM7		
	3	B7		
	4	A8		
	5	COM8		
	6	B8		

APPX. 3 DIGITAL INTERFACE

Digital Interface

<Input sentences>

ABK, ACN (ACM), ALC, ALF, ALR, ARC, CUR, DBT, DDC, DPT, DTM, GGA, GLL, GNS, HBT, HCR, HDT, MTW, MWD, MWV, NRM, NRX, NSR, RMC, RRT, SRP, THS, VBW, VDM, VDO, VDR, VHW, VLW, VSD, VTG, ZDA

<Output sentences>

ABM, ALC, ALF, ALR, ARC, BBM, DDC, EVE, HBT, OSD, RRT, RSD, RTE, SRP, TLB, TTD, TTM, VSD, WPL

Note: When this radar system has Back-up ECDIS enabled and Back-up ECDIS mode is active, the talker for some route-related sentences and alerts changes to "EI".

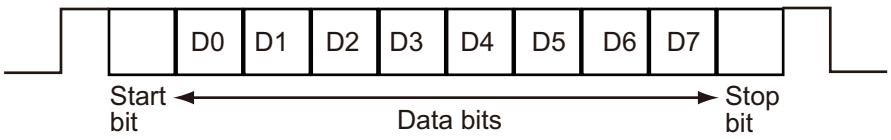
<Transmission interval>

25 s for HBT

<Data reception>

Data is received in serial asynchronous form in accordance with the standard referenced in IEC 61162-2 or IEC 61162-1 Ed.5.

The following parameters are used:
Baud rate: 38,400 bps (HDT, THS, !AIVDM, !AIVDO, !AIABK, $AIALR). The baud rate of all other sentences is 4800 bps
Data bits: 8 (D7 = 0), Parity: none, Stop bits: 1



Data Sentences

<Input sentences>

ABK - UAIS Addressed and binary broadcast acknowledgment

$--ABK,xxxxxxxxx,x,x.x,x,x,*hh<CR><LF>
1 2 3 4 5

1. MMSI of the addressed AIS unit (9 digits)
2. AIS channel of reception (No use)
3. Message ID (6, 8, 12, 14)
4. Message sequence number (0 to 9)
5. Type of acknowledgement (See below)
   0 = Message (6 or 12) successfully received by the addressed AIS unit
   1 = Message (6 or 12) was broadcast, but not ACK by addressed AIS unit
   2 = message could not be broadcast (quantity of encapsulated data exceeds five slots)
   3 = requested broadcast of message (8, 14 or 15) has been successfully completed
   4 = late reception of message (7 or 13) ACK that was addressed to this AIS unit (own ship and referenced a valid transaction)
   5 = message has been read and acknowledged on a display unit.

ACN (ACM) - Alert command

$--ACN,hhmmss.ss,aaa,x.x,x.x,ca,a*hh<CR><LF>
$--ACM,hhmmss.ss,aaa,x.x,x.x,ca,a*hh<CR><LF>
1 2 3 4 5 6

1. Time (No use)
2. Manufacturer mnemonic code (3 digit alphanumeric code, null)
3. Alert identifier (0, 1 to 999 or 10000 to 9999999)
4. Alert instance (0 to 999999, null)
5. Alert command (A=ACK from ext. equipment, Q=Request from ext. equipment, O=Responsibility transfer, S=Silence from ext. equipment)
6. Sentence status flag (C should not be null field. Sentence without C is not a command.)

Information about the use of ACN vs ACM
The alert command sentence formatter ACM is defined in IEC 61924-2 Ed. 1. After Ed. 1 was released, the ACM is used by other criteria and the IEC technical corrigendum adopted the sentence formatter ACN to replace the ACM. However, equipment released before the adoption of the ACN may use ACM. This equipment uses both ACN and ACM.

ALC - Cyclic alert list

$--ALC,xx,xx,xx,x.x, aaa,x.x,x.x,x.x,’’’’’’’’,*hh<CR><LF>
1 2 3 4 5 6 7 8 9

1. Total number of sentences for this message (01 to 99)
2. Sentence number (01 to 99)
3. Sequential message identifier (00 to 99)
4. Number of alert entries (0 to 3)
5. Manufacturer mnemonic code (FEC, null)
6. Alert identifier (1 to 999 or 10000 to 9999999)
7. Alert instance (1 to 999999, null)
8. Revision counter (1 to 99)
9. Additional alert entries (see Note)

Alert entry 1
See Note

Note: Alert entry 0 to n: Each alert entry consists of
- Manufacturer Identifier (see ALF Manufactuer)
- Alert Identifier (see ALF Alert identifier)
- Alert instance (see ALF instance)
- Revision counter (see ALF revision counter)

Each entry identifies a certain alert with a certain state.
It is not allowed that an alert entry is split between two ALC sentences.

ALF - Alert sentence

$--ALF,x,x,x,hhmmss.ss,a,a,a,aaa,x.x,x.x,x.x,x,c--c,*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13

1. Total number of ALF sentences for this message (1, 2)
2. Sentence number (1, 2)
3. Sequential message identifier (0 to 9)
4. Time of last change (hh=00 to 23, mm=00 to 59, ss.ss=00.00 to 59.99)
5. Alert category (A=Alert category A, B=Alert category B, C=Alert category C, null)
6. Alert priority (A=Alarm, W=Warning, C=Caution, null when #2 is 2)
7. Alert state (V=Not ACKed, S=Silence, A=ACked, O/U=Resolved, Not ACKed, N=Normal state, null when #2 is 2)
8. Manufacturer mnemonic code (FEC, null)
9. Alert identifier (1 to 999 or 10000 to 9999999)
10. Alert instance (1 to 999999, null)
11. Revision counter (1 to 99)
12. Escalation counter (0 to 2)
13. Alert text (max. 18 characters)

ALR - Set alarm state

$--ALR,hhmmss.ss,xxx,A,A,c—c,*hh<CR><LF>
1 2 3 4 5

1. Time of alarm condition change, UTC (000000.00 to 235959.99)
2. Unique alarm number (identifier) at alarm source (000 to 999, null)
3. Alarm condition (A=threshold exceeded, V=not exceeded)
4. Alarm acknowledge state (A=acknowledged, V=not acknowledged)
5. Alarm description text (alphanumeric characters, max. 32)

ARC - Alert command refused

$--ARC,hhmmss.ss,aaa,x.x,x.x,c*hh<CR><LF>
1 2 3 4 5

1. Release time of the alert command refused (000000.00 to 235959.99)
2. Used for proprietary alerts, defined by the manufacturer (FEC, null)
3. The alert identifier (1 to 999 or 10000 to 9999999)
4. The alert instance (1 to 999999, null)
5. Refused alert command (A=acknowledge, Q=request/repeat information, O=responsibility transfer, S=silence)

CUR - Current

$--CUR,A,x,x.x,x.x,x.x,a,x.x,x.x,x.x,a,a,*hh<CR><LF>
1 2 3 4 5 6 7 8 9 1011

1. Validity of data (A=valid, V=not valid)
2. Data set number (0 to 9)
3. Layer number (0.0 to 3.0)
4. Current depth in meters (0.00 to 99.99)
5. Current direction in degrees (0.00 to 360.00)
6. Direction reference in use (true or relative)
7. Current speed in knots (0.00 to 99.99)
8. Reference layer depth in meters (No use)
9. Heading (0 to 360.00)
10. Heading reference in use (true or magnetic)
11. Speed reference (B=Bottom track W=Water track P=Positioning system)

DBT - Depth below transducer

$--DBT,xxxx.x,f,xxxx.x,M,xxxx.x,F,*hh<CR><LF>
1 2 3 4 5 6

1. Water depth (0.00 to 99999.99)
2. feet
3. Water depth (0.00 to 99999.99)
4. Meters
5. Water depth (0.00 to 99999.99)
6. Fathoms

DDC - Display dimming control

$--DDC,a,xx,a,a*hh<CR><LF>
1 2 3 4

1. Display dimming preset (D=Daytime, K=Dusk, N=Nightime, null)
2. Brightness percentage (00 to 99, null)
3. Color palette (No use)
4. Sentences status flag (C)

DPT - Depth

$--DPT,x.x,x.x,x.x,*hh<CR><LF>
1 2 3

1. Water depth relative to the transducer, meters (0.00 to 99999.99)
2. Offset from transducer, meters (No use)
3. Maximum range scale in use (No use)

DTM - Datum reference

$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc,*hh<CR><LF>
1 2 3 4 5 6 7 8

1. Local datum (W84=WGS84, W72=WGS72, S85=SGS85, P90=PE90, 999=User defined null)
2. Local datum subdivision code (No use)
3. Lat offset, min (No use)
4. N/S (No use)
5. Lon offset, min (No use)
6. E/W (No use)
7. Altitude offset, meters (No use)
8. Reference datum (No use)

GGA - Global positioning system fix data

$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx,*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14

1. UTC of position (no use)
2. Latitude (0000.00000 to 9000.00000)
3. N/S
4. Longitude (0000.00000 to 18000.00000)
5. E/W
6. GPS quality indicator (1 to 8)
7. Number of satellite in use (No use)
8. Horizontal dilution of precision (0.0 to 999.9)
9. Antenna altitude above/below mean sealevel (No use)
10. Unit, m (No use)
11. Geoidal separation (No use)
12. Unit, m (No use)
13. Age of differential GPS data (0.0 to 999.99)
14. Differential reference station ID (No use)

GLL - Geographic position, latitude/longitude

$--GLL,llll.ll,a,yyyyy.yy,a,hhmmss.ss,a,x,*hh<CR><LF>
1 2 3 4 5 6 7

1. Latitude (0000.00000 to 9000.00000)
2. N/S
3. Longitude (0000.00000 to 18000.00000)
4. E/W
5. UTC of position (No use)
6. Status (A=data valid V=data invalid)
7. Mode indicator (A=Autonomous D=Differential E=Estimated M=Manual input S=Simulator)

GNS - GNSS fix data

$--GNS,hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c,xx,x.x,x.x,x.x,x.x,x.x,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 1213

1. UTC of position (no use)
2. Latitude (0000.00000 to 9000.00000)
3. N/S
4. Longitude (0000.00000 to 18000.00000)
5. E/W
6. Mode indicator (A=Autonomous, D=Differential, E=Estimated Mode, F=Float RTK, M=Manual Input Mode, N=No fix, P=Precise, R=Real Time Kinematic, S=Simulator Mode)
7. Total number of satellites in use (No use)
8. HDOP (0.00 to 999.99)
9. Antenna altitude, meters (No use)
10. Geoidal separation (No use)
11. Age of differential data (0.00 to 99.99)
12. Differential reference station ID (No use)
13. Navigational status indicator (S=Safe, C=Caution, U=Unsafe, V=Not valid)

HBT - Heartbeat supervision sentence

$--HBT,x.x,A,x*hh<CR><LF>
1 2 3

1. Configured repeat interval (0 to 999, null)
2. Equipment status (A=Normal V=System fail)
3. Sequential sequence identifier (0 to 9)

HCR- Heading correction report

$--HCR,x.x,a,a,x.x*hh<CR><LF>
1 2 3 4

1. Heading, degrees true (0.00 to 360.00)
2. Mode indicator (A=Autonomous, E=Estimated(dead reckoning), M=Manual input, S=Simulator mode, V=Data not valid (including standby)
3. Correction state (A=Both Speed/latitude and dynamic correction included in heading, D=Dynamic correction included in heading, S=Speed/latitude correction included in heading, N=No correction included in heading, V=Not available, reporting device does not know about correction state)
4. Correction value (-180.0 to 180.0, null)

HDT - Heading, true

$--HDT,xxx.x,T*hh<CR><LF>
1 2

1. Heading, degrees (0.00 to 360.00)
2. True (T)

MTW - Water temperature

$--MTW,x.x,C*hh<CR><LF>
1

1. Water temperature, degrees C (-100.000 to 100.000)

MWD - Wind direction and speed

$--MWD,x.x,T,x.x,M,x.x,N,x.x,M*hh<CR><LF>
1 2 3 4

1. Wind direction, 0 to 359 degrees True
2. Wind direction, 0 to 359 degrees Magnetic
3. Wind speed, knots
4. Wind speed, meters/second

MWV - Wind speed and angle

$--MWV,x.x,a,x.x,a,A*hh<CR><LF>
1 2 3 4 5

1. Wind angle, degrees (0.00 to 360.00)
2. Reference (R/T)
3. Wind speed (0.00 to 9999.99)
4. Wind speed units (K=km/h M=m/s N=knots S=mph)
5. Status (A=data valid V=data invalid)

NRM - NAVTEX receiver mask

$--NRM,x,x,hhhhhhhh,hhhhhhhh,a*hh<CR><LF>
1 2 3 4 5

1. Function code (0 to 3)
2. Frequency table index (1 to 3)
3. Transmitter coverage area mask (00000000 to 02FFFFFF)
4. Message type mask (00000000 to 02FFFFFF)
5. Sentence status flag (R=Status report of current settings, C=Configuration command to change settings)

NRX - NAVTEX received message

$--NRX,xxx,xxx,xx,aaxx,x,hhmmss.ss,xx,xx,xxxx,xxxx,xxxx,A,c--c,*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13

1. Number of sentences (001 to 999)
2. Sentence number (001 to 999)
3. Sequential message ID (00 to 99)
4. Navtex message code (aaxx aa:AA to ZZ xx:00 to 99, null)
5. Frequency table index (0 = not received over air, 1 = 490 kHz, 2 = 518 kHz, 3 = 4209.5 kHz, 4 to 9 = reserved, null)
6. UTC of receipt of message (no use)
7. Day (01 to 31, null)
8. Month (01 to 12, null)
9. Year (0000 to 9999, null)
10. Total number of characters in this series of NRX sentences (1 to 8000, null)
11. Total number of bad characters (1 to 8000, null)
12. Status indication (A/V, null)
13. Message body (English alphanumeric characters)

NSR - Navigation Status Report

$--NSR, a, A, a, A, a, A, a, A, a, A, a, A *hh<CR><LF>
1 2 3 4 5 6 7 8 9 10111213

1. Integrity of heading (P, F, D, N)
2. Plausibility of heading (A, V, N)
3. Integrity of position (P, F, D, N)
4. Plausibility of position (A, V, N)
5. Integrity of STW (P, F, D, N)
6. Plausibility of STW (A, V, N)
7. Integrity of SOG and COG (P, F, D, N)
8. Plausibility of SOG and COG (A, V, N)
9. Integrity of depth (P, F, D, N)
10. Plausibility of depth (A, V, N)
11. Mode of STW (W, E, M, N)
12. Integrity of time (P, F, D, N)
13. Plausibility of time (A, V, N)

RMC - Recommended minimum specific GPS/TRANSIT data

$GPRMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,ddmmyy,x.x,a,a,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 111213

1. UTC of position fix (No use)
2. Status (A=data valid, V=navigation receiver warning)
3. Latitude (0000.00000 to 9000.00000)
4. N/S
5. Longitude (00000.00000 to 18000.00000)
6. E/W
7. Speed over ground, knots (0.00 to 99.94)
8. Course over ground, degrees true (0.0 to 360.0)
9. Date (No use)
10. Magnetic variation, degrees (No use)
11. E/W (No use)
12. Mode indicator (A= Autonomous mode, D= Differential mode, S= Simulator, F=Float RTK P=Precise, R=Real time kinematic E=Estimated (DR) M=Manual
13. Navigational status indication (S=Safe C=Caution U=Unsafe V=Navigational status not valid)

RRT - Report Route Transfer

$--RRT, a, c-c, c-c, c-c, a, a *hh <CR><LF>
1 2 3 4 5 6

1. Reported transfer type.
   (M=Monitored route, A=Alternative route for editing, Q=Query for transmitting any monitored or alternative route for editing)
2. Name of transferred route. (Max. 30 characters, null)
3. Version of transferred route. (Max. 20 characters, null)
4. ID of current waypoint for monitored route. (Max. 10 characters, null)
5. File transfer statues of transferred route.
   (A=Successful reception of the route file transfer, E=Error in reception of the route file transfer)
6. Status of the intended application of the transferred route.
   (A=Content of the received route accepted and valid, V=Content of received route rejected, P=Pending, application level has not yet evaluated the received route, N=Not applicable).

SRP - System function ID

$--SRP,x,hhhhhhhhhhhh,c--c*hh<CR><LF>
1 2 3

1. Instance number for interface redundancy (i.e. number of physical port for identical SFI), null if interface redundancy not in use. The instance numbers shall be ordinal with no skipping (1, 2, 3,…).
2. Reported MAC address used by SFI, 48bit hexadecimal number, for example 32613C4EB605
3. Reported IP address used by SFI as text string, for example 239.192.0.1

THS - True heading and status

$--THS,xxx.x,a*hh<CR><LF>
1 2

1. Heading, degrees True (0.00 to 360.00)
2. Mode indicator (A=Autonomous E=Estimated M=Manual input S=Simulator V=Data not valid)

VBW - Dual ground/water speed

$--VBW,x.x,x.x,x,x.x,x.x,x,x.x,x.x,x.x,x,*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10

1. Longitudinal water speed, knots (-99.949 to 99.949)
2. Transverse water speed, knots (-99.949 to 99.949, null)
3. Status: water speed, A=data valid V=data invalid
4. Longitudinal ground speed, knots (-99.949 to 99.949)
5. Transverse ground speed, knots (-99.949 to 99.949, null)
6. Status: ground speed, A=data valid V=data invalid
7. Stern transverse water speed, knots (-99.949 to 99.949)
8. Status: stern water speed, A=data valid V=data invalid
9. Stern transverse ground speed, knots (-99.949 to 99.949)
10. Status: stern ground speed, A=data valid V=data invalid

VDM - UAIS VHF data-link message

!AIVDM,x,x,x,x,s--s,x,*hh<CR><LF>
1 2 3 4 5 6

1. Total number of sentences needed to transfer the message (1 to 9)
2. Message sentence number (1 to 9)
3. Sequential message identifier (0 to 9, null)
4. AIS channel Number (A, B, null)
5. Encapsulated ITU-R M.1371 radio message (1 to 62 bytes)
6. Number of fill-bits (0 to 5)

VDO - UAIS VHF data-link own vessel report

!AIVDO,x,x,x,x,s--s,x,*hh<CR><LF>
1 2 3 4 5 6

1. Total number of sentences needed to transfer the message (1 to 9)
2. Message sentence number (1 to 9)
3. Sequential message identifier (0 to 9, null)
4. AIS channel Number (A, B, C, D, null)
5. Encapsulated ITU-R M.1371 radio message (1 to 62 bytes)
6. Number of fill-bits (0 to 5)

VDR - Set and drift

$--VDR,x.x,T,x.x,M,x.x,N,*hh <CR><LF>
1 2 3 4 5 6

1. Direction, degrees (0.00 to 360.00)
2. T=True (fixed)
3. Direction, degrees (0.00 to 360.00, null)
4. M=Magnetic (fixed)
5. Current speed (0 to 99.99)
6. N=Knots (fixed)

VHW - Water speed and headings

$--VHW,x.x,T,x.x,M,x.x,N,x.x,K,*hh <CR><LF>
1 2 3 4 5 6 7 8

1. Heading, degrees (No use)
2. T=True (No use)
3. Heading, degrees (No use)
4. M=Magnetic (No use)
5. Speed (-99.94 to 99.94)
6. N=Knots (fixed)
7. Speed (-99.94 to 99.94)
8. K=km/h (fixed)

VLW - Dual ground/water distance

$--VLW,x.x,N,x.x,N,x.x,N,x.x,N*hh<CR><LF>
1 2 3 4 5 6 7 8

1. Total cumulative water distance (0.0 to 999999.999)
2. N=Nautical miles
3. Water distance since reset (0.000 to 999999.999)
4. N=Nautical miles
5. Total cumulative ground distance (no use)
6. N=Nautical miles (no use)
7. Ground distance since reset (no use)
8. N=Nautical miles (no use)

VSD- AIS voyage static data

$--VSD,x.x,x.x,x.x,c--c,hhmmss.ss,xx,xx,x.x,x.x*hh<CR><LF>
1 2 3 4 5 6 7 8 9

1. Type of ship and cargo category (0 to 255, null)
2. Maximum present static draught (0 to 25.5 meters, null)
3. Persons on-board (0 to 8191, null)
4. Destination (1 to 20 characters, null)
5. Estimated UTC of arrival at destination (000000.00 to 235959.99, null, 246000.00)
6. Estimated day of arrival at destination (00 to 31 (UTC), null)
7. Estimated month of arrival at destination (00 to 12 (UTC), null)
8. Navigational status (0 to 15, null)
9. Regional application flags (null)

VTG - Course over ground and ground speed

$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a,*hh <CR><LF>
1 2 3 4 5 6 7 8 9

1. Course over ground, degrees (0.00 to 360.00)
2. T=True (fixed)
3. Course over ground, degrees (No use)
4. M=Magnetic (No Use)
5. Speed over ground, knots (0.00 to 99.94)
6. N=Knots (fixed)
7. Speed over ground, km/h (0.00 to 99.94)
8. K=km/h (fixed)
9. Mode indicator (A=Autonomous, D=Differential, E=Estimated (dead reckoning), M=Manual input, S=Simulator, P=Precision)

ZDA - Time and date

$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>
1 2 3 4 5 6

1. UTC (000000.00 to 235960.99)
2. Day (01 to 31)
3. Month (01 to 12)
4. Year (UTC, 1970 to 2037)
5. Local zone, hours (No use)

<Output sentences>

ABM - UAIS Addressed binary and safety related message

!--ABM,x,x,x,xxxxxxxxx,x,xx,s--s,x,*hh<CR><LF>
1 2 3 4 5 6 7 8

1. Total number of sentences needed to transfer the message (1 to 9)
2. Message sentence number (1 to 9)
3. Message sequence identifier (0 to 3)
4. The MMSI of destination AIS unit for the ITU-R M.1371 message (9 digits)
5. AIS channel for broadcast of the radio message (0 to 3)
6. VDL message number (6 or 12), see ITU-R M.1371
7. Encapsulated data (1 to 60 bytes)
8. Number of fill-bits (0 to 5)

ALC - Cyclic alert list

$--ALC,xx,xx,xx,x.x, aaa,x.x,x.x,x.x,’’’’’’’’,*hh<CR><LF>
1 2 3 4 5 6 7 8 9

1. Total number of sentences for this message (01 to 99)
2. Sentence number (01 to 99)
3. Sequential message identifier (00 to 99)
4. Number of alert entries (0 to 3)
5. Manufacturer mnemonic code (FEC, null)
6. Alert identifier (1 to 999 or 10000 to 9999999)
7. Alert instance (1 to 999999, null)
8. Revision counter (1 to 99)
9. Additional alert entries (see Note)

Alert entry 1
See Note

Note: Alert entry 0 to n: Each alert entry consists of
- Manufacturer Identifier (see ALF Manufactuer)
- Alert Identifier (see ALF Alert identifier)
- Alert instance (see ALF instance)
- Revision counter (see ALF revision counter)

Each entry identifies a certain alert with a certain state.
It is not allowed that an alert entry is split between two ALC sentences.

ALF - Alert sentence

$--ALF,x,x,x,hhmmss.ss,a,a,a,aaa,x.x,x.x,x.x,x,c--c,*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13

1. Total number of ALF sentences for this message (1, 2)
2. Sentence number (1, 2)
3. Sequential message identifier (0 to 9)
4. Time of last change (hh=00 to 23, mm=00 to 59, ss.ss=00.00 to 59.99)
5. Alert category (A=Alert category A, B=Alert category B, C=Alert category C, null)
6. Alert priority (A=Alarm, W=Warning, C=Caution, null when #2 is 2)
7. Alert state (V=Not ACKed, S=Silence, A=ACked, O/U=Resolved, Not ACKed, N=Normal state, null when #2 is 2)
8. Manufacturer mnemonic code (FEC, null)
9. Alert identifier (1 to 999 or 10000 to 9999999)
10. Alert instance (1 to 999999, null)
11. Revision counter (1 to 99)
12. Escalation counter (0 to 2)
13. Alert text (max. 18 characters)

ALR - (See input sentence on page AP-7.)

ARC - Alert command refused

$--ARC,hhmmss.ss,aaa,x.x,x.x,c*hh<CR><LF>
1 2 3 4 5

1. Release time of the alert command refused (000000.00 to 235959.99)
2. Used for proprietary alerts, defined by the manufacturer (FEC, null)
3. The alert identifier (1 to 999 or 10000 to 9999999)
4. The alert instance (1 to 999999, null)
5. Refused alert command (A=acknowledge, Q=request/repeat information, O=responsibility transfer, S=silence)

BBM - UAIS broadcast binary message

!--BBM,x,x,x,x,xx,s--s,x,*hh<CR><LF>
1 2 3 4 5 6 7

1. Total number of sentences needed to transfer the message (1 to 9)
2. Sentence number (1 to 9)
3. Sequential Message identifier (0 to 9)
4. AIS channel for broadcast of the radio message (0 to 3)
5. ITU-R M.1371 message ID (8 or 14)
6. Encapsulated data (1 to 60 bytes)
7. Number of fill-bits, 0 to 5

DDC - Display dimming control

$--DDC,a,xx,a,aa*hh<CR><LF>
1 2 3 4

1. Display dimming preset (null)
2. Brightness percentage (00 to 99)
3. Color palette preset (null)
4. Sentences status flag (R=report of current settings, C=configuration command)

EVE - General event message

$--EVE,hhmmss.ss,c--c,c--c*hh<CR><LF>
1 2 3

1. Event time (000000.00 to 235959.99)
2. Tag code used for identification of source of event (RA0001 to RA0010, EI0001 to EI0016, IN0001 to IN0016, II0001 to II0016)
3. Event description (OPERATION)

Note: This sentence is output after input has been detected from either the trackball or the keyboard.

HBT - (See input sentence on page AP-9.)

OSD- Own ship data

$--OSD,53.21,A,57.89,R,12.52,R,45.67,6.78,N*hh<CR><LF>
1 2 3 4 5 6 7 8 9

1. Heading, degrees true (0.00 to 359.99, null)
2. Heading status (A=data valid, V=data invalid)
3. Vessel course, degrees true (0.00 to 359.99, null)
4. Course reference (B=Bottom tracking log, M=Manually entered, W=Water referenced, R=Radar tracking (of fixed target), P=Positioning system ground reference, null)
5. Vessel speed (0.00 to 999.99, null)
6. Speed reference (B/M/W/R/P, null)
7. Vessel set, degrees true, manually entered (0.00 to 359.99, null)
8. Vessel drift (speed), manually entered (0.00 to 99.99, null)
9. Speed units (N=Knots)

RRT - (See input sentence on page AP-11.)

RSD - Radar system data

$RARSD,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,N,H*hh <CR><LF>
1 2 3 4 5 6 7 8 9 10 11 1213

1. Origin 1 range, from own ship (0.000 to 999) (see note 2)
2. Origin 1 bearing, degrees from 0 (0.0 to 359.9) (see note 2)
3. Variable range marker 1(VRM1), range (0.000 to 999)
4. Bearing line 1(EBL1), degrees from 0 (0.0 to 359.9)
5. Origin 2 range (0.000 to 999.9) (see note 2)
6. Origin 2 bearing (0.0 to 359.9)(see note 2)
7. VRM2,.9 range (0.000 to 999)
8. EBL2, degrees (0.0 to 360.0)
9. Cursor range, from own ship (0.000 to 999)
10. Cursor bearing, degrees clockwise from 0 (0.0 to 359.9)
11. Range scale in use (0.0625 to 120)
12. Range units (K/N/S)
13. Display rotation (see note 1)

Note:

1 Display rotation:
C=Course-up, course-over-ground up, degrees true
H=Head-up, ship's heading(center-line) 0 up
N=North-up, true north is 0 up

2 Origin 1 and origin 2 are located at the stated range and bearing from own ship and provide for two independent sets of variable range markers (VRM) and electronic bearing lines (EBL) originating away from own ship position.

RTE - Routes

$--RTE,x.x,x.x,a,c--c,c--c,• •,c--c*hh <CR><LF>
1 2 3 4 5 • • 6

1. Total number of sentences being transmitted (1 to n/null)
2. Sentence number (1 to n/null)
3. Message mode (c/w/null)
4. Route identifier/null
5. Waypoint identifier/null • • Additional waypoint indentifiers
6. Waypoint “n” identifier (alphabet or null)

SRP - (See input sentence on page AP-11.)

TLB - Target label

$--TLB,x.x,c--c,x.x,c--c,…,x.x,c--c*hh<CR><LF>
1 2 3 3

1. Target number “n” reported by the device (1 to 1023)
2. Label assigned to target “n” (TT=000 - 999, AIS=000000000 - 999999999)
3. Additional label pairs

TTD - Tracked Target Data

!RATTD,xx,xx,x,s--s,x*hh<CR><LF>
1 2 3 4 5

1. Total hex number of sentences need to transfer the message (01)
2. Hex sentence number (01)
3. Sequential message identifier (0)
4. Encapsulated trancked target data (6 bit binary-converted data)
5. Number of fill bits (0 to 5)

TTM - Tracked target message

$RATTM,05,12.34,23.4,R,45.67,123.4,T,1.23,8.23,N,c--c,T,R,hhmmss.ss,M*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 1213 14 15

1. Target number (00 to 999)
2. Target distance from own ship (0.000 to 99.999)
3. Bearing from own ship,degrees (0.0 to 359.9)
4. True or Relative (T)
5. Target speed (0.00 to 999.99, null)
6. Target course, degrees (0.0 to 359.9, null)
7. True or Relative
8. Distance of closet point of approach (0.00 to 99.99, null)
9. Time to CPA, min., "-" increasing (-99.99 to 99.99, null)
10. Speed/distance units (N=NM)
11. Target name (null)
12. Target status (L=Lost Q=Acquiring T=Tracking)
13. Reference target (R, null otherwise)
14. UTC of data (null)
15. Type of acquisition (A=Automatic M=Manual)

VSD - UAIS Voyage static data

$--VSD,x.x,x.x,x.x,c--c,hhmmss.ss,xx,xx,x.x,x.x*hh<CR><LF>
1 2 3 4 5 6 7 8 9

1. Type of ship and cargo category (0 to 255, null)
2. Maximum present static draught (0 to 25.5 meters, null)
3. Persons on-board (0 to 8191, null)
4. Destination (1 to 20 characters, null)
5. Estimated UTC of arrival at destination (000000.00 to 235959.99, null, 246000.00)
6. Estimated day of arrival at destination (00 to 31 (UTC), null)
7. Estimated month of arrival at destination (00 to 12 (UTC), null)
8. Navigational status (0 to 15, null)
9. Regional application flags (null)

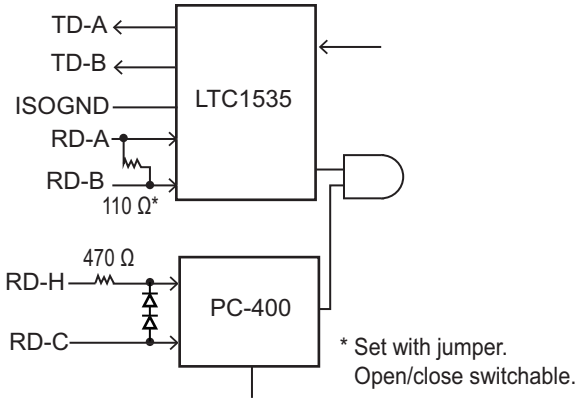
WPL - Waypoint location

$--WPL,llll.ll,a,yyyyy.yy,a,c--c*hh<CR><LF>
1 2 3 4 5

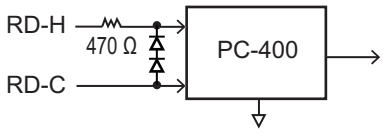
1. Waypoint latitude (0000.00000 to 9000.00000)
2. N/S
3. Waypoint longitude (00000.00000 to 18000.00000)
4. E/W
5. Waypoint identifier (No use)

Serial Interface

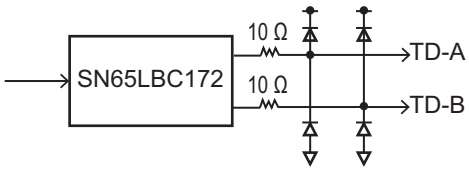
Processor Unit: IEC 61162-2/1 input/output
Sensor Adapter: IEC 61162-2/1 input/output



Processor Unit: IEC 61162-1 input
Sensor Adapter: IEC 61162-1 input



Processor Unit: IEC 61162-1 output
Sensor Adapter: IEC 61162-1 output



APPX. 4 ALERT LIST

This radar provides aggregated header alerts for presentation of an aggregation on the AMS (Alert Management System). The following table shows the aggregate header alerts along with the corresponding ALF alert number.

Aggregated Alert Name	ALF No.*	Aggregated Alert Name	ALF No.*
Critical Point	3038, ×	New Target	3048, ×
Target Capacity	3042, ×	Lost Target	3052, ×
	3043, ×		

*: "×" indicates instance number.

Alerts which are not acknowledge within the set time limit are repeated as warning level, with the exception of the Alert "Anchor Watch". The Alert "Anchor Watch" is escalated from waring level to alarm level if the alert is not acknowledged within the set time. The default escalation time is as follows. If you require to change the escalation time, see the Operator's Manual.

- IEC62923-2 standard alert: 270 s (fixed)
- Other than IEC62923-2 standard alert: 60 s (adjustable)
- "Anchor Watch": 120 s (fixed)
  The escalation time for "Anchor Watch" is based on IEC61174 and time limit cannot be changed.

The table below lists the possible alerts for this radar. Each alert is listed with priority and category. This radar can output alerts in ALF or ALR format. The alert number for each depends on the output format and may differ.

Note 1: The ALR format is not BAM-compliant and shall not be used for new installations. It may be used for retrofitting on ships-in-operation only.

Note 2: You can change the priority for some alerts to [Warning] from the [Chart Alerts] page (see the Operator's Manual).

Note 3: When this unit is assigned as a backup ECDIS, the following ALF alerts are output with the EI talker. (3015, 3024, 3031, 3032, 3035, 3038, 10645, 10703, 10801, 13035)

Note 4: None of the alerts support responsibility transfer.

Priority: Alarm, Warning, Caution

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3042, 1	523	TT TGT Full (Auto)	Cancel non-dangerous TT manually	Warning Cat: A
		Meaning: 100% of capacity for automatically acquired TT is used. **Remedy**: The number of acquired TT target became 100% of its limit. Stop tracking unnecessary TT targets.		
3042, 2	525	TT TGT Full (MAN)	Cancel non-dangerous TT manually	Warning Cat: A
		Meaning: 100% of capacity for manually acquired TT is used. **Remedy**: The number of acquired TT target became 100% of its limit. Stop tracking unnecessary TT targets.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3042, 3	531	AIS Display Full	Adjust [AIS DISP FILTER] settings	Warning Cat: A
		Meaning: 100% of maximum number of target which can be displayed is used. **Remedy**: The number of AIS target became 100% of that can be displayed. Change the display number using filter function.		
3042, 4	533	AIS CPTY Full	Adjust [AIS DISP FILTER] settings	Warning Cat: A
		Meaning: 100% of memory capacity for AIS targets is filled. **Remedy**: Memory for AIS targets is filled 100%. Cancel unnecessary targets.		
3042, 5	535	Active AIS Full	Sleep non-dangerous AIS manually	Warning Cat: A
		Meaning: 100% of capacity for active AIS is used. **Remedy**: The number of active AIS target became 100% of its limit. Change the unnecessary targets to sleep mode.		
3043, 1	522	TT TGT 95% (Auto)	Cancel non-dangerous TT manually	Caution Cat: B
		Meaning: Appears when capacity for automatically tracked targets is full. **Remedy**: Remove TT symbol manually because the capacity for TT is 95%.		
3043, 2	524	TT TGT 95% (MAN)	Cancel non-dangerous TT manually	Caution Cat: B
		Meaning: Appears when capacity for manually tracked targets is full. **Remedy**: Remove TT symbol manually because the capacity for TT is 95%.		
3043, 3	530	AIS Display 95%	Adjust [AIS DISP FILTER] settings	Caution Cat: B
		Meaning: 95% of maximum number of target which can be displayed is used. **Remedy**: The number of AIS target became 95% of that can be displayed. Change the display number using filter function.		
3043, 4	532	AIS Capacity 95%	Adjust [AIS DISP FILTER] settings	Caution Cat: B
		Meaning: 95% of memory capacity for AIS targets is filled. **Remedy**: Memory for AIS targets is filled 95%. Cancel unnecessary targets.		
3043, 5	534	Active AIS 95%	Sleep non-dangerous AIS manually	Caution Cat: B
		Meaning: 95% of capacity for active AIS is used. **Remedy**: The number of active AIS target became 95% of its limit. Change the unnecessary targets to sleep mode.		
3044, -	519	CPA/TCPA	Take evasive action if necessary	Alarm Cat: A
		Meaning: Target is within CPA/TCPA threshold, danger of collision. **Remedy**: Take evasive action if necessary. Adjust CPA/TCPA settings.		
3048, 1	521	TT New Target	Confirm TT new targets	Warning Cat: A
		Meaning: The system detected a new TT target. **Remedy**: Check the target details and take appropriate action.		
3048, 2	529	AIS New Target	Confirm AIS new targets	Warning Cat: A
		Meaning: The system detected a new AIS target. **Remedy**: Check the target details and take appropriate action.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3052, 1	527	TT Target Lost	Check lost TGT. ACQ TGT if necessary	Warning Cat: A
		Meaning: The system lost a TT target. **Remedy**: Confirm that the target is lost, then acknowledge the alert. If the target was used as a speed reference, acquire a new reference target.		
3052, 2	528	REF Target Lost	Check lost TGT. ACQ TGT if necessary	Warning Cat: A
		Meaning: The system lost a reference target. **Remedy**: Confirm that the target is lost, then acknowledge the alert. If the target was used as a speed reference, acquire a new reference target.		
3052, 3	537	AIS Target Lost	Confirm AIS lost targets	Warning Cat: A
		Meaning: The system lost an AIS target. **Remedy**: Confirm that the target is lost, then acknowledge the alert. If the target was used as a speed reference, acquire a new reference target.		
3003, 1	541	AIS MSG Send ERR	Check AIS transponder or network	Caution Cat: B
		Meaning: AIS message transmission failed. **Remedy**: Check the connection with AIS.		
3006, -	760	Datum Mismatch	Check the GPS sensor status	Caution Cat: B
		Meaning: Datum mismatch between EPFS and chart. **Remedy**: Match the datum.		
3008, 2	729	LOST ISW FUNC	Use radar as standalone	Warning Cat: B
		Meaning: Interswitch function had to be stopped. (Only displayed when Inter-switch is active.) **Remedy**: Use the radar as a standalone.		
3008, 3	910	LOST WAVE FUNC	Check wave analysis PC or network	Warning Cat: B
		Meaning: Wave analysis function has a problem. **Remedy**: Check connection with wave analysis PC, or disable WAVE mode.		
3008, 100	691	Route Failure	Route monitoring stops	Warning Cat: B
		Meaning: Route monitoring is stopped because distance from route is more than set value of Max XTD. **Remedy**: Start route monitoring after approaching the monitoring route.		
3015, 1	720	Lost Headline	Execute the self test	Warning Cat: B
		Meaning: There is a problem with the heading signal from the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		
3015, 2	721	Lost Azimuth SIG	Execute the self test	Warning Cat: B
		Meaning: There is a problem with the azimuth signal from the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3015, 3	722	Lost Trigger SIG	Execute the self test	Warning Cat: B
		Meaning: There is a problem with the trigger signal from the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		
3015, 4	723	Lost Video SIG	Execute the self test	Warning Cat: B
		Meaning: There is a problem with the video signal from the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		
3015, 5	724	Lost RPU Gyro	Check RPU gyro sensors or network	Warning Cat: B
		Meaning: There is a problem with the gyro signal from the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		
3015, 6	725	Lost Echo SIG	Execute the self test	Warning Cat: B
		Meaning: There is a problem with the echo signal from the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		
3015, 8	727	Lost Radar ANT	Check connection with radar antenna	Warning Cat: B
		Meaning: There is a problem communicating with the SPU board in the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		
3015, 9	770	Lost SPU	Execute the self test	Warning Cat: B
		Meaning: There is a problem with the SPU board in the radar antenna. **Remedy**: For detailed information, conduct a [Self Test].		
3015, 10	771	Lost MTR-DRV	Execute the self test	Warning Cat: B
		Meaning: There is a problem communicating with the MTR-DRV board in the radar antenna. **Remedy**: For detailed information, conduct a [Self Test].		
3015, 11	773	Lost RF-CONV	Execute the self test	Warning Cat: B
		Meaning: There is a problem with the RF-Converter board in the radar antenna. **Remedy**: For detailed information, conduct a [Self Test].		
3015, 12	774	Lost PSU	Execute the self test	Warning Cat: B
		Meaning: There is a problem with the PSU-Control board in the power supply unit. **Remedy**: For detailed information, conduct a [Self Test].		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3015, 13	775	Lost HPA	Execute the self test	Warning Cat: B
		Meaning: There is a problem with the HPA board in the radar antenna. **Remedy**: For detailed information, conduct a [Self Test].		
3015, 14	781	Lost MTR-DRV COM	Execute the self test	Warning Cat: B
		Meaning: There is a problem communicating with the SPU board in the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		
3015, 15	783	Lost RF-CONV COM	Execute the self test	Warning Cat: B
		Meaning: There is a problem communicating with the RF-Converter board in the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		
3015, 16	784	Lost PSU COM	Check connection with PSU-Control	Warning Cat: B
		Meaning: There is a problem communicating with PSU-Control board in the power supply unit. **Remedy**: For detailed information, conduct a [Self Test].		
3015, 21	170	Lost Position	Check position sensor status	Warning Cat: B
		Meaning: All position data has been lost for more than 30 seconds. **Remedy**: Check the connection with GPS sensors and sensor status.		
3015, 22	272	Lost UTC Signal	Check position sensor status	Warning Cat: B
		Meaning: Time data of all available GPS sensor has been not available for more than 3 seconds. **Remedy**: Check the connection with GPS sensors and sensor status.		
3015, 23	277	Lost Wind Signal	Check wind sensor or sensor status	Warning Cat: B
		Meaning: Wind speed/direction data of all available WIND sensors has been not available for more than 3 seconds. **Remedy**: Check the connection with wind sensors and sensor status.		
3015, 24	279	Lost COG/SOG SIG	Check position sensor status	Warning Cat: B
		Meaning: COG/SOG data of all available GPS sensor has been not available for more than 3 seconds. **Remedy**: Check the connection with GPS sensors and sensor status.		
3015, 25	284	Lost LOG(BT) SIG	Check speed sensor or sensor status	Warning Cat: B
		Meaning: SOG data of all available LOG (ground speed) sensors has been not available for more than 3 seconds. **Remedy**: Check the connection with LOG sensors and sensor status.		
3015, 26	450	Lost Heading SIG	Check heading sensor or sensor status	Warning Cat: B
		Meaning: Heading data of all available heading sensor has been not available for more than 2 seconds. **Remedy**: Check the connection with heading sensors and sensor status.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3015, 27	453	Lost SDME Signal	Check speed sensor or sensor status	Warning Cat: B
		Meaning: Speed data from all available SDME has been not available for more than 3 seconds. **Remedy**: Check the connection with SDME and sensor status.		
3015, 28	278	Lost LOG(WT) SIG	Check speed sensor or sensor status	Warning Cat: B
		Meaning: STW data of all available LOG (water speed) sensors has been not available for more than 3 seconds. **Remedy**: Check the connection with LOG sensors and sensor status.		
3015, 30	380	Lost AIS COM	Check connection with AIS	Warring Cat: B
		Meaning: Data from AIS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. AIS is turned off, or there is a problem with network. **Remedy**: Check the connection with AIS and network.		
3016, 19	801	Lost PM	Execute the self test	Caution Cat: B
		Meaning: There is a problem communicating with the PM board in the radar antenna. **Remedy**: For detailed information, conduct a [Self Test].		
3016, 20	805	Lost PM BOARD	Execute the self test	Caution Cat: B
		Meaning: There is a problem communicating with the MTR-DRV board in the radar antenna. **Remedy**: Check connections between the radar antenna and the processor unit. If the problem appears to be caused by the radar antenna, contact your local dealer for service.		
3016, 24	382	Lost COG/SOG SIG	Check position sensor status	Caution Cat: B
		Meaning: COG/SOG data of all available GPS sensor has been not available for more than 3 seconds. **Remedy**: Check the connection with all GPS.		
3016, 25	383	Lost LOG (BT) SIG	Check speed sensor or sensor status	Caution Cat: B
		Meaning: SOG data of all available LOG (ground speed) sensors has been not available for more than 3 seconds. **Remedy**: Check that the sensor is powered.		
3016, 28	384	Lost LOG(WT) SIG	Check speed sensor or sensor status	Caution Cat: B
		Meaning: STW data of all available LOG (water speed) sensors has been not available for more than 3 seconds. **Remedy**: Check the connection with all LOG sensors.		
3016, 30	381	Lost AIS COM	Check connection with AIS	Caution Cat: B
		Meaning: Data from AIS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. AIS is turned off, or there is a problem with network. **Remedy**: Check the connection with AIS and network.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3024, 1	172	Off Track Alarm	Make XTD smaller	Alarm Cat: A
		Meaning: Deviation is big between planning course and current heading. While monitoring route, ship position deviates XTD Limit. **Remedy**: Reconfirm XTD Limit or keep own ship inside of channel limit.		
3031, 1	171	Safety Contour	Crossing safety contour. Take helm	Alarm Cat: A
		Meaning: When a check area is set, the vessel entered a shallower area than the threshold set in [Safety Contour]. **Remedy**: Reconfirm Safety Contour setting or change the course.		
3031, 2	496	Anchor Watch	Dragging anchor. Be careful it	Alarm Cat: A
		Meaning: While anchor watch alert function is enabled, ship's position has been outside of alarm area centering certain position for more than 3 seconds. **Remedy**: Be careful of dragging anchor.		
3032, 2	495	Anchor Watch	Dragging anchor. Be careful it	Warning Cat: A
		Meaning: While anchor watch alert function is enabled, ship's position has been outside of alarm area centering certain position for more than 3 seconds. **Remedy**: Be careful of dragging anchor.		
3035, 1	620	USR CHT Danger	Watch crossing user chart danger	Warning Cat: A
		Meaning: A User Chart Danger Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 2	621	Separation Zone	Crossing traffic separation zone	Warning Cat: A
		Meaning: A Traffic Separation Zone that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 3	622	ITZ	Watch crossing inshore traffic zone	Warning Cat: A
		Meaning: An Inshore Traffic Zone that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 4	623	Restricted Area	Watch crossing restricted area	Warning Cat: A
		Meaning: A Restricted Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 5	624	Caution Area	Watch crossing caution area	Warning Cat: A
		Meaning: A Caution Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 6	625	OFS PROD Area	Crossing offshore production area	Warning Cat: A
		Meaning: An Offshore Production Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3035, 7	626	MIL PRAC Area	Watch crossing military practice area	Warning Cat: A
		Meaning: A Military Protection Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 8	627	SPL Landing Area	Watch crossing seaplane landing area	Warning Cat: A
		Meaning: A Seaplane Landing Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 9	628	SM Transit Lane	Watch crossing submarine transit lane	Warning Cat: A
		Meaning: A Submarine Transit Lane that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 10	629	Anchorage Area	Watch crossing anchorage area	Warning Cat: A
		Meaning: An Anchorage Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 11	630	Marine Farm	Crossing marine farm/aquaculture	Warning Cat: A
		Meaning: A Marine Farm/Aquaculture that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3035, 12	631	PSSA Area	Watch crossing PSSA Area	Warning Cat: A
		Meaning: A PSSA Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 13	632	ATBA	Watch crossing areas to be avoided	Warning Cat: A
		Meaning: An Areas to be Avoided that is set to Alarm in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned, on ship's direction.		
3035, 14	645	NAV Hazard	Watch crossing navigational hazard	Warning Cat: A
		Meaning: One or more navigational hazards detected by the Look-ahead function. **Remedy**: Adjust course as necessary.		
3036, 1	594	USR CHT Danger	Watch crossing user chart danger	Caution Cat: B
		Meaning: A User Chart Danger Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 2	595	Separation Zone	Crossing traffic separation zone	Caution Cat: B
		Meaning: A Traffic Separation Zone that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3036, 3	596	ITZ	Watch crossing inshore traffic zone	Caution Cat: B
		Meaning: An Inshore Traffic Zone that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 4	597	Restricted Area	Watch crossing restricted area	Caution Cat: B
		Meaning: A Restricted Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 5	598	Caution Area	Watch crossing caution area	Caution Cat: B
		Meaning: A Caution Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 6	599	OFS PROD Area	Crossing offshore production area	Caution Cat: B
		Meaning: A Military Protection Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 7	600	MIL PRAC Area	Watch crossing military practice area	Caution Cat: B
		Meaning: A Seaplane Landing Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 8	601	SPL Landing Area	Watch crossing seaplane landing area	Caution Cat: B
		Meaning: A Seaplane Landing Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 9	602	SM Transit Lane	Watch crossing submarine transit lane	Caution Cat: B
		Meaning: A Submarine Transit Lane that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 10	603	Anchorage Area	Watch crossing anchorage area	Caution Cat: B
		Meaning: An Anchorage Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 11	604	Marine Farm	Crossing marine farm/aquaculture	Caution Cat: B
		Meaning: A Marine Farm/Aquaculture that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 12	605	PSSA Area	Watch crossing PSSA Area	Caution Cat: B
		Meaning: A PSSA Area that is set to Warning/Caution in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
3036, 13	606	ATBA	Watch crossing areas to be avoided	Caution Cat: B
		Meaning: An Areas to be Avoided that is set to Alarm in chart alert is detected inside the check area. **Remedy**: Be careful of the object mentioned here, on ship's direction.		
3036, 14	607	NAV Hazard	Watch crossing navigational hazard	Caution Cat: B
		Meaning: One or more navigational hazards detected by the Look-ahead function. **Remedy**: Adjust course as necessary.		
3038, 1 to 3038, 199	-	WPT xx Approach (xx: waypoint number)	Take helm if needed	Warning Cat: A
		Meaning: The wheel over point is soon being approached. **Remedy**: Be careful that WPT is approaching. Take helm if needed.		
3038, 10000	-	Critical Area	Confirm description of notes	Warning Cat: A
		Meaning: The critical area is soon being approached. **Remedy**: Be careful that critical area is approaching. Confirm description of notes.		
10303, 1	030	Lost SA1 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.1 sensor adapter and network.		
10303, 2	031	Lost SA2 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.2 sensor adapter and network.		
10303, 3	032	Lost SA3 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.3 sensor adapter and network.		
10303, 4	033	Lost SA4 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.4 sensor adapter and network.		
10303, 5	034	Lost SA5 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.5 sensor adapter and network.		
10303, 6	035	Lost SA6 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.6 sensor adapter and network.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10303, 7	036	Lost SA7 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.7 sensor adapter and network.		
10303, 8	037	Lost SA8 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.8 sensor adapter and network.		
10303, 9	038	Lost SA9 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.9 sensor adapter and network.		
10303, 10	039	Lost SA10 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with this sensor adapter is detected. 30 seconds timeout. This sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.10 sensor adapter and network.		
10303, 11	094	Lost SA11 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with No.11 sensor adapter is detected. 30 seconds timeout. No.11 sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.11 sensor adapter and network.		
10303, 12	095	Lost SA12 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with No.12 sensor adapter is detected. 30 seconds timeout. No.12 sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.12 sensor adapter and network.		
10303, 13	096	Lost SA13 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with No.13 sensor adapter is detected. 30 seconds timeout. No.13 sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.13 sensor adapter and network.		
10303, 14	097	Lost SA14 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with No.14 sensor adapter is detected. 30 seconds timeout. No.14 sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.14 sensor adapter and network.		
10303, 15	098	Lost SA15 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with No.15 sensor adapter is detected. 30 seconds timeout. No.15 sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.15 sensor adapter and network.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10303, 16	099	Lost SA16 COM	Check sensor adapter or network	Caution Cat: B
		Meaning: Communication error with No.16 sensor adapter is detected. 30 seconds timeout. No.16 sensor adapter is turned off, or there is a problem with network. **Remedy**: Check the connection with No.16 sensor adapter and network.		
10332, -	331	Lost SEL Gyro	Selected Gyro status missing	Warning Cat: B
		Meaning: When connected with Double Gyro System, instrument produced by YDK Technologies, “Double Gyro” status cannot be acquired. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.		
10403, 1	255	Lost Gyro 1 COM	Check the gyro status	Caution Cat: B
		Meaning: Data from this gyro has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This gyro is turned off, or there is a problem with network. **Remedy**: Check the connection with this gyro and network.		
10403, 2	256	Lost Gyro 2 COM	Check the gyro status	Caution Cat: B
		Meaning: Data from this gyro has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This gyro is turned off, or there is a problem with network. **Remedy**: Check the connection with this gyro and network.		
10403, 3	257	Lost Gyro 3 COM	Check the gyro status	Caution Cat: B
		Meaning: Data from this gyro has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This gyro is turned off, or there is a problem with network. **Remedy**: Check the connection with this gyro and network.		
10403, 4	258	Lost Gyro 4 COM	Check the gyro status	Caution Cat: B
		Meaning: Data from this gyro has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This gyro is turned off, or there is a problem with network. **Remedy**: Check the connection with this gyro and network.		
10403, 5	259	Lost Gyro 5 COM	Check the gyro status	Caution Cat: B
		Meaning: Data from this gyro has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This gyro is turned off, or there is a problem with network. **Remedy**: Check the connection with this gyro and network.		
10403, 11	391	Lost ROT Gyro1	Check the ROT gyro status	Caution Cat: B
		Meaning: Data from this ROT gyro has been discontinued for more than set time. (Set at installation) Default: 60 seconds. **Remedy**: Check the connection with this ROT gyro.		
10403, 12	392	Lost ROT Gyro2	Check the ROT gyro status	Caution Cat: B
		Meaning: Data from this ROT gyro has been discontinued for more than set time. (Set at installation) Default: 60 seconds. **Remedy**: Check the connection with this ROT gyro.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10403, 13	393	Lost ROT Gyro3	Check the ROT gyro status	Caution Cat: B
		Meaning: Data from this ROT gyro has been discontinued for more than set time. (Set at installation) Default: 60 seconds. **Remedy**: Check the connection with this ROT gyro.		
10403, 21	290	Lost GPS1 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		
10403, 22	291	Lost GPS2 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		
10403, 23	292	Lost GPS3 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		
10403, 24	293	Lost GPS4 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		
10403, 25	294	Lost GPS5 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		
10403, 26	295	Lost GPS6 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		
10403, 27	296	Lost GPS7 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		
10403, 28	297	Lost GPS8 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10403, 29	298	Lost GPS9 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		
10403, 30	299	Lost GPS10 COM	Check the GPS status	Caution Cat: B
		Meaning: Ship position data from this GPS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This GPS is turned off, or there is a problem with network. **Remedy**: Check the connection with this GPS and network.		
10403, 41	280	Lost SDME1 COM	Check the SDME status	Caution Cat: B
		Meaning: Speed data from this SDME sensor has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This SDME sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with this SDME sensor and network.		
10403, 42	281	Lost SDME2 COM	Check the SDME status	Caution Cat: B
		Meaning: Speed data from this SDME sensor has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This SDME sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with this SDME sensor and network.		
10403, 43	282	Lost SDME3 COM	Check the SDME status	Caution Cat: B
		Meaning: Speed data from this SDME sensor has been discontinued for more than set time. (Set at installation) Default: 60 seconds.This SDME sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with this SDME sensor and network.		
10403, 51	235	Lost Depth1 COM	Check the echo sounder status	Caution Cat: B
		Meaning: Input of depth data from this echo sounder has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This echo sounder is turned off, or there is a problem with network. **Remedy**: Check the connection with this echo sounder and network.		
10403, 52	236	Lost Depth2 COM	Check the echo sounder status	Caution Cat: B
		Meaning: Input of depth data from this echo sounder has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This echo sounder is turned off, or there is a problem with network. **Remedy**: Check the connection with this echo sounder and network.		
10403, 53	237	Lost Depth3 COM	Check the echo sounder status	Caution Cat: B
		Meaning: Input of depth data from this echo sounder has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This echo sounder is turned off, or there is a problem with network. **Remedy**: Check the connection with this echo sounder and network.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10403, 61	300	Lost Rudder1 COM	Check the rudder status	Caution Cat: B
		Meaning: Rudder data from this rudder sensor has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This rudder sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with this rudder sensor and network.		
10403, 62	301	Lost Rudder2 COM	Check the rudder status	Caution Cat: B
		Meaning: Rudder data from this rudder sensor has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This rudder sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with this rudder sensor and network.		
10403, 63	302	Lost Rudder3 COM	Check the rudder status	Caution Cat: B
		Meaning: Rudder data from this rudder sensor has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This rudder sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with this rudder sensor and network.		
10403, 71	303	Lost HCS1 COM	Check the autopilot status	Caution Cat: B
		Meaning: Data from this HCS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This HCS is turned off, or there is a problem with network. **Remedy**: Check the connection with this HCS and network.		
10403, 72	304	Lost HCS2 COM	Check the autopilot status	Caution Cat: B
		Meaning: Data from this HCS has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This HCS is turned off, or there is a problem with network. **Remedy**: Check the connection with this HCS and network.		
10403, 81	305	Lost VDR COM	Check the VDR status	Caution Cat: B
		Meaning: Sentence from VDR has been discontinued for more than set time. (Set at installation) Default: 180 seconds VDR is turned off, or there is a problem with network. **Remedy**: Check the connection with VDR and network.		
10403, 91	306	Lost BNWAS1 COM	Check the BNWAS status	Caution Cat: B
		Meaning: Caution Sentence from BNWAS1 has been discontinued for more than set time. (Set at installation) Default: 180 seconds BNWAS is turned off, or there is a problem with network. **Remedy**: Check the connection with BNWAS1 and network.		
10403, 92	307	Lost BNWAS2 COM	Check the BNWAS status	Caution Cat: B
		Meaning: Caution Sentence from BNWAS2 has been discontinued for more than set time. (Set at installation) Default: 180 seconds BNWAS is turned off, or there is a problem with network. **Remedy**: Check the connection with BNWAS2 and network.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10403, 93	308	Lost BNWAS3 COM	Check the BNWAS status	Caution Cat: B
		Meaning: Caution Sentence from BNWAS3 has been discontinued for more than set time. (Set at installation) Default: 180 seconds BNWAS is turned off, or there is a problem with network. **Remedy**: Check the connection with BNWAS3 and network.		
10403, 101	360	Lost WIND1 COM	Check the wind sensor status	Caution Cat: B
		Meaning: Data from this wind sensor has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This wind sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with this wind sensor.		
10403, 102	361	Lost WIND2 COM	Check the wind sensor status	Caution Cat: B
		Meaning: Data from this wind sensor has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This wind sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with this wind sensor.		
10403, 103	362	Lost WIND3 COM	Check the wind sensor status	Caution Cat: B
		Meaning: Data from this wind sensor has been discontinued for more than set time. (Set at installation) Default: 60 seconds. This wind sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with this wind sensor.		
10403, 111	370	Lost CURRENT COM	Check the water current sensor status	Caution Cat: B
		Meaning: Data from water current has been discontinued for more than set time. (Set at installation) Default: 60 seconds. Water current sensor is turned off, or there is a problem with network. Check the connection with water current and network. **Remedy**: Check the connection with water current sensor and network.		
10403, 121	371	Lost TEMP COM	Check water temperature sensor status	Caution Cat: B
		Meaning: Data from water temp. has been discontinued for more than set time. (Set at installation) Default: 60 seconds. Water temp sensor is turned off, or there is a problem with network. **Remedy**: Check the connection with water temp sensor and network.		
10403, 141	390	Lost NAVTEX COM	Check the NAVTEX status	Caution Cat: B
		Meaning: Data from NAVTEX has been discontinued for more than set time. (Set at installation) Default: 180 seconds. NAVTEX is turned off, or there is a problem with network **Remedy**: Check the connection with NAVTEX and network.		
10432, -	431	HUB-3000 Error	Check HUB-3000 connections	Warning Cat: B
		Meaning: A network error has occurred between the HUB-3000 and one or more connected units. **Remedy**: Check network connections between the EC-3000 and networked units.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10452, -	330	Conflict Gyro	Double Gyro Status Conflict	Warning Cat: B
		Meaning: When connected with Double Gyro System, instrument produced by YDK Technologies, two gyro has been displayed “Selected” status for 3 seconds. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.		
10492, -	500	Watch Alert	Reset timer or turn off the function	Warning Cat: B
		Meaning: Watch alert interval reached. **Remedy**: ACK the alert, check the radar display.		
10503, 1	851	GPS1 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 2	852	GPS2 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 3	853	GPS3 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 4	854	GPS4 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 5	855	GPS5 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 6	856	GPS6 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10503, 7	857	GPS7 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 8	858	GPS8 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 9	859	GPS9 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 10	860	GPS10 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship position data from this GPS is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 11	871	Gyro1 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Heading data from this Gyro is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 12	872	Gyro2 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Heading data from this Gyro is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 13	873	Gyro3 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Heading data from this Gyro is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10503, 14	874	Gyro4 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Heading data from this Gyro is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 15	875	Gyro5 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Heading data from this Gyro is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 21	861	SDME1 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship speed data from this SDME is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 22	862	SDME2 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship speed data from this SDME is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 23	863	SDME3 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Own ship speed data from this SDME is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 31	881	ROT Gyro1 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Heading data from this ROT Gyro is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10503, 32	882	ROT Gyro2 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Heading data from this ROT Gyro is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10503, 33	883	ROT Gyro3 Banned	Reset filter or check sensor status	Caution Cat: B
		Meaning: Heading data from this ROT Gyro is determined abnormal by integrity check. **Remedy**: Reset the filter to confirm that it isn't a temporal error value. If the data is normal, it is reusable. However, if it's continually removed, there is a possibility that correct data is not received from sensor. In this case, contact FURUNO.		
10512, 1	900	No POSN for FILT	Reset filter or check sensor status	Warning Cat: B
		Meaning: No valid position sensor is available for filter. (Banned or connection error) **Remedy**: Check the connection with all GPS.		
10512, 2	901	No SOG for FILT	Reset filter or check sensor status	Warning Cat: B
		Meaning: No valid COG/SOG sensor is available for filter. (Banned or connection error) **Remedy**: Check the connection with all GPS.		
10512, 3	902	No STW for FILT	Reset filter or check sensor status	Warning Cat: B
		Meaning: No valid CTW/STW sensor is available for filter. (Banned or connection error) **Remedy**: Check the connection with all GPS.		
10512, 4	903	No HDG for FILT	Reset filter or check sensor status	Warning Cat: B
		Meaning: No valid heading sensor is available for filter. (Banned or connection error) **Remedy**: Check the connection with all heading sensors.		
10543, -	539	AIS MSG Received	AIS message is received. Check it	Caution Cat: B
		Meaning: AIS message is received. **Remedy**: Check the AIS message.		
10603, 1	273	Lost Bow Depth	Check the depth sensor status	Caution Cat: B
		Meaning: Depth data of all available depth sensors (Bow) has been not available for more than 3 seconds. **Remedy**: Check the connection with all echo sounders.		
10603, 2	274	Lost MID Depth	Check the depth sensor status	Caution Cat: B
		Meaning: Depth data of all available depth sensors (Midship) has been not available for more than 3 seconds. **Remedy**: Check the connection with all echo sounders.		
10603, 3	275	Lost Stern Depth	Check the depth sensor status	Caution Cat: B
		Meaning: Depth data of all available depth sensors (Stern) has been not available for more than 3 seconds. **Remedy**: Check the connection with all echo sounders.		
10603, 5	285	Lost HDG MAG	Check the magnetic compass status	Caution Cat: B
		Meaning: Heading data of all available magnetic gyro has been not available for more than 3 seconds. **Remedy**: Check the connection with all magnetic gyro.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
10645, -	644	Actual UKC Limit	Watch and avoid grounding	Warning Cat: A
		Meaning: Actual depth is outside the preset UKC limit. **Remedy**: Check depth, adjust heading accordingly.		
10703, -	700	RT version > 1	RT is rejected. Check connected units	Caution Cat: B
		Meaning: Received route transfer sentence (RTZ) is a higher version than this system. **Remedy**: Check route details. Some route details may not be displayed correctly.		
10712, -	728	ANT VER Mis-match	Consult local dealer for SW update	Warning Cat: B
		Meaning: Software version not correct. **Remedy**: Update the radar software. If the problem persists, consult your dealer.		
10752, 3	755	Select SART Mode	Signal detected. Select SART mode	Warning Cat: B
		Meaning: A SART signal was detected. This alert appears only for FAR-3220-NXT(-BB) and FAR-3320-NXT. **Remedy**: Show the SART marks on the radar display. **Note:** Keep in mind the following points: • This alert can occur when this equipment receives interference simultaneously from multiple radars. • This alert may not occur under the bad weather conditions such as at rain.		
10801, -	485	Depth Limit	Watch and avoid grounding	Alarm Cat: A
		Meaning: Actual depth is outside the echo alarm limit. **Remedy**: Check depth, adjust heading accordingly.		
13035, 1	634	UKC Limit	Watch and avoid grounding	Warning Cat: A
		Meaning: Measured depth from echo sounder is less than set UKC limit value. **Remedy**: Be careful that measured depth is less than UKC limit.		
13035, 2	635	Non-official ENC	Install official ENC charts	Warning Cat: A
		Meaning: When Non-official ENC is set to Warning/Caution in chart alert, the non-official chart area is detected inside the check area. **Remedy**: Install official ENC charts.		
13035, 3	636	No Vector Chart	Install vector charts	Warning Cat: A
		Meaning: When No Vector Chart is set to Warning/Caution in chart alert, the No Vector Chart area is detected inside the check area. **Remedy**: Install vector charts.		
13035, 4	637	Not Up-to-date	Install latest charts	Warning Cat: A
		Meaning: When Not Up to Date is set to Warning/Caution in chart alert, a chart area that is not up-to date is detected inside the check area. **Remedy**: Install the latest charts.		
13035, 5	638	Permit Expired	Update chart permits	Warning Cat: A
		Meaning: When Permit Expired is set to Warning/Caution in chart alert, a chart area that has an expired permit is detected inside the check area. **Remedy**: Update chart permits.		

Alert ID		Alert title	Alert Message	Priority & Category
ALF	ALR			
13035, 6	646	Sounding UKC LIM	Watch and avoid grounding	Warning Cat: A
		Meaning: Chart depth for one or more legs is outside of UKC threshold. **Remedy**: Adjust course accordingly.		
13035, 7	647	Too Many Dangers	Change route geometry	Warning Cat: A
		Meaning: Selected route has too many dangerous objects in one or more legs. **Remedy**: Shorten the route or the look-ahead area.		
13036, 1	608	UKC Limit	Watch and avoid grounding	Caution Cat: B
		Meaning: Measured depth from echo sounder is less than set UKC limit value. **Remedy**: Be careful that measured depth is less than UKC limit.		
13036, 2	609	Non-official ENC	Install official ENC charts	Caution Cat: B
		Meaning: When Non-official ENC is set to Warning/Caution in chart alert, the non-official chart area is detected inside the check area. **Remedy**: Install official ENC charts.		
13036, 3	611	No Vector Chart	Install vector charts	Caution Cat: B
		Meaning: When No Vector Chart is set to Warning/Caution in chart alert, the No Vector Chart area is detected inside the check area. **Remedy**: Install vector charts.		
13036, 4	612	Not Up-to-date	Install latest charts	Caution Cat: B
		Meaning: When Not Up to Date is set to Warning/Caution in chart alert, a chart area that is not up-to date is detected inside the check area. **Remedy**: Install the latest charts.		
13036, 5	613	Permit Expired	Update chart permits	Caution Cat: B
		Meaning: When Permit Expired is set to Warning/Caution in chart alert, a chart area that has an expired permit is detected inside the check area. **Remedy**: Update chart permits.		
13036, 6	614	Sounding UKC LIM	Watch and avoid grounding	Caution Cat: B
		Meaning: Chart depth for one or more legs is outside of UKC threshold. **Remedy**: Adjust course accordingly.		
13036, 7	615	Too Many Dangers	Change route geometry	Caution Cat: B
		Meaning: Selected route has too many dangerous objects in one or more legs. **Remedy**: Shorten the route or the look-ahead area.		

Priority: Indication

All indications are in category “B”. The indications are not subject to responsibility transfer and are not output as ALF sentences.

Note: Indications also appear in the [Alert] box on the screen and on the [Alert List].

Alert ID		Alert title	Alert Message
ALF	ALR		
10001, 1	001	Main Monitor Fan1 Rotation Speed Lowering	There is a problem with No.1 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM1 (Main Monitor). Fan1 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 2	002	Main Monitor Fan2 Rotation Speed Lowering	There is a problem with No.2 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM1 (Main Monitor). Fan2 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 3	003	Main Monitor Fan3 Rotation Speed Lowering	There is a problem with No.3 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM1 (Main Monitor). Fan3 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 4	004	Main Monitor Fan4 Rotation Speed Lowering	There is a problem with No.4 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM1 (Main Monitor). Fan4 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 5	014	Sub Monitor Fan1 Rotation Speed Lowering	There is a problem with No.1 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM2 (Sub Monitor). Fan1 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 6	015	Sub Monitor Fan2 Rotation Speed Lowering	There is a problem with No.2 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM2 (Sub Monitor). Fan2 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 7	016	Sub Monitor Fan3 Rotation Speed Lowering	There is a problem with No.3 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM2 (Sub Monitor). Fan3 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	

Alert ID		Alert title	Alert Message
ALF	ALR		
10001, 8	017	Sub Monitor Fan4 Rotation Speed Lowering	There is a problem with No.4 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM2 (Sub Monitor). Fan4 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 9	011	Main Monitor RS485 Communication Timeout	There is a problem with brightness control cable. Please exchange it
		Meaning: For Main monitor: Connected to COM1. There has been no communication from processor unit through RS485 for 180 seconds. (No communication implies in completed sentence or checksum error.) **Remedy**: Check the connection of brightness control cable.	
10001, 10	024	Sub Monitor RS485 Communication Timeout	There is a problem with brightness control cable. Please exchange it
		Meaning: For Sub monitor: Connected to COM2. There has been no communication from processor unit through RS485 for 180 seconds. (No communication implies in completed sentence or checksum error.) **Remedy**: Check the connection of brightness control cable.	
10001, 11	012	Main Monitor No Signal	There is a problem with video cable. Please exchange it
		Meaning: For Main monitor: Connected to COM1. There has been no signal continuously for 60 seconds. **Remedy**: Check the connection of video cable.	
10001, 12	025	Sub Monitor No Signal	There is a problem with video cable. Please exchange it
		Meaning: For Sub monitor: Connected to COM2. There has been no signal continuously for 60 seconds. **Remedy**: Check the connection of video cable.	
10001, 13	013	Main Monitor Sentence Syntax Error	There is a problem with brightness control cable. Please exchange it
		Meaning: For Main monitor, connected to COM1, value of externally input sentence is out of range that defined by sentence. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 14	026	Sub Monitor Sentence Syntax Error	There is a problem with brightness control cable. Please exchange it
		Meaning: For Main monitor, connected to COM2, value of externally input sentence is out of range that defined by sentence. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 15	027	Main Monitor COM Timeout	There is a problem with brightness control cable. Please exchange it
		Meaning: Communication with MU is interrupted. 60 seconds timeout. **Remedy**: Check the connection with the monitor.	
10001, 16	028	Sub Monitor COM Timeout	There is a problem with brightness control cable. Please exchange it
		Meaning: Communication with MU is interrupted. 60 seconds timeout. **Remedy**: Check the connection with the monitor.	

Alert ID		Alert title	Alert Message
ALF	ALR		
10001, 17	073	Processor Unit CPU Temp High	CPU board temperature is high in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: CPU temperature in processor unit exceeds threshold. **Remedy**: Turn off Processor Unit. If same error occurs after a few minutes, contact FURUNO.	
10001, 18	074	Processor Unit GPU Temp High	CPU board temperature is high in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: GPU temperature in processor unit exceeds threshold. **Remedy**: Turn off Processor Unit. If same error occurs after a few minutes, contact FURUNO.	
10001, 19	075	Processor Unit CPU Board Temp High	CPU board temperature is high in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: CPU temperature in processor unit exceeds threshold. **Remedy**: Turn off Processor Unit. If same error occurs after a few minutes, contact FURUNO.	
10001, 20	076	Processor Unit Remote 1 Temp High	CPU board temperature is high in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: CPU temperature in this processor remote control unit exceeds threshold. **Remedy**: Turn off Processor Unit. If same error occurs after a few minutes, contact FURUNO.	
10001, 21	077	Processor Unit Remote 2 Temp High	CPU board temperature is high in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: CPU temperature in this processor remote control unit exceeds threshold. **Remedy**: Turn off Processor Unit. If same error occurs after a few minutes, contact FURUNO.	
10001, 22	078	Processor Unit CPU Fan Rotation Speed Lowering	There is a problem with a CPU Fan in Processor Unit. Please exchange it
		Meaning: Rotation speed of CPU fan in processor unit is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 23	079	Processor Unit Fan1 Rotation Speed Lowering	There is a problem with No.1 Fan in Processor Unit. Please exchange it
		Meaning: Rotation speed of CPU fan1 in processor unit is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	

Alert ID		Alert title	Alert Message
ALF	ALR		
10001, 24	080	Processor Unit Fan2 Rotation Speed Lowering	There is a problem with No.2 Fan in Processor Unit. Please exchange it
		Meaning: Rotation speed of CPU fan2 in processor unit is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 25	081	Processor Unit Fan3 Rotation Speed Lowering	There is a problem with No.3 Fan in Processor Unit. Please exchange it
		Meaning: Rotation speed of CPU fan3 in processor unit is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10001, 26	089	Processor Unit CPU board Battery Power Error	CPU board power voltage is abnormal in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: CPU board battery voltage in processor unit is out of threshold. **Remedy**: Turn off Processor Unit. If same error occurs after a few minutes, contact FURUNO.	
10001, 27	090	Processor Unit CPU board Core Power Error	CPU board power voltage is abnormal in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: CPU board battery voltage in processor unit is out of threshold. **Remedy**: Turn off Processor Unit. If same error occurs after a few minutes, contact FURUNO.	
10001, 28	070	RCU 1 COM Timeout	A communication error is detected with No.1 Remote Control Unit. Please check connection with No.1 Remote Control Unit
		Meaning: Communication error with this remote control unit is detected. 40 seconds timeout. **Remedy**: Check the connection with this remote control unit.	
10001, 29	071	RCU 2 COM Timeout	A communication error is detected with No.2 Remote Control Unit. Please check connection with No.2 Remote Control Unit
		Meaning: Communication error with this remote control unit is detected. 40 seconds timeout. **Remedy**: Check the connection with this remote control unit.	
10001, 30	072	RCU 3 COM Timeout	A communication error is detected with No.3 Remote Control Unit. Please check connection with No.3 Remote Control Unit
		Meaning: Communication error with this remote control unit is detected. 40 seconds timeout. **Remedy**: Check the connection with this remote control unit.	
10001, 31	400	Network Printer Not Available	Network printer is not available. Please check the printer status and connection
		Meaning: When executing printout, network printer is not recognized, network printer connection is interrupted, or printer error such as paper shortage, paper jam and run out of ink occurs. **Remedy**: Check that the printer is connected to network, or printer errors such as paper shortage, paper jam and run out of ink does not occur.	

Alert ID		Alert title	Alert Message
ALF	ALR		
10001, 32	401	Local Printer Not Available	Local printer is not available. Please check the printer status and connection
		Meaning: When executing printout, local printer is not recognized, network printer connection is interrupted, or printer error such as paper shortage, paper jam and run out of ink occurs. **Remedy**: Check that the printer is connected, or printer errors such as paper shortage, paper jam and run out of ink does not occur.	
10002, 3	006	Main Monitor High Temperature Inside Monitor	FURUNO Monitor internal temperature is high. Please turn off monitor
		Meaning: Internal temperature exceeds threshold. Monitor: Connected to COM1 (Main Monitor). **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 4	019	Sub Monitor High Temperature Inside Monitor	FURUNO Monitor internal temperature is high. Please turn off monitor
		Meaning: Internal temperature exceeds threshold. Monitor: Connected to COM2 (Sub Monitor). **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 5	007	Main Monitor Fan1 No Rotation	There is a problem with No.1 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM1 (Main Monitor). Fan1 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 6	008	Main Monitor Fan2 No Rotation	There is a problem with No.2 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM1 (Main Monitor). Fan2 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 7	009	Main Monitor Fan3 No Rotation	There is a problem with No.3 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM1 (Main Monitor). Fan3 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 8	010	Main Monitor Fan4 No Rotation	There is a problem with No.4 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM1 (Main Monitor). Fan4 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 9	020	Sub Monitor Fan1 No Rotation	There is a problem with No.1 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM2 (Sub Monitor). Fan1 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	

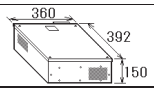
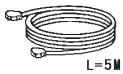
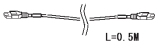
Alert ID		Alert title	Alert Message
ALF	ALR		
10002, 10	021	Sub Monitor Fan2 No Rotation	There is a problem with No.2 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: COM2 (Sub Monitor). Fan2 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 11	022	Sub Monitor Fan3 No Rotation	There is a problem with No.3 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: COM2 (Sub Monitor). Fan3 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 12	023	Sub Monitor Fan4 No Rotation	There is a problem with No.4 Fan of FURUNO Monitor. Please exchange it
		Meaning: For FURUNO monitor: Connected to COM2 (Sub Monitor). Fan4 rotation speed is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 13	082	Processor Unit CPU Fan No Rotation	There is a problem with a CPU Fan in Processor Unit. Please exchange it
		Meaning: Rotation speed of fan in processor unit is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 14	083	Processor Unit Fan1 Fan No Rotation	There is a problem with No.1 Fan in Processor Unit. Please exchange it
		Meaning: Rotation speed of fan1 in processor unit is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 15	084	Processor Unit Fan2 Fan No Rotation	There is a problem with No.2 Fan in Processor Unit. Please exchange it
		Meaning: Rotation speed of fan2 in processor unit is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 16	085	Processor Unit Fan3 Fan No Rotation	There is a problem with No.3 Fan in Processor Unit. Please exchange it
		Meaning: Rotation speed of fan3 in processor unit is below threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 17	086	Processor Unit CPU board 5v Power Error	CPU board power voltage is abnormal in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: 5 V power voltage of CPU board in processor unit is out of threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10002, 18	087	Processor Unit CPU board 3.3V Power Error	CPU board power voltage is abnormal in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: 3.3 V power voltage of CPU board in processor unit is out of threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	

Alert ID		Alert title	Alert Message
ALF	ALR		
10002, 19	088	Processor Unit CPU board 12V Power Error	CPU board power voltage is abnormal in Processor Unit. Please turn off Processor Unit. If same error is occurred after a few minutes, please contact to service department of Furuno
		Meaning: 12 V power voltage of CPU board in processor unit is out of threshold. **Remedy**: If the error frequently occurs, contact FURUNO and inform frequency of occurrence.	
10050, 1	320	Lost CH1 COM	Check the serial port status
		Meaning: Input from EC-3000 serial ch.1 has been discontinued for more than certain time (Set at installation). Default: No timeout **Remedy**: Check the status of the serial port.	
10050, 2	321	Lost CH2 COM	Check the serial port status
		Meaning: Input from EC-3000 serial ch.2 has been discontinued for more than certain time (Set at installation). Default: No timeout **Remedy**: Check the status of the serial port.	
10050, 3	322	Lost CH3 COM	Check the serial port status
		Meaning: Input from EC-3000 serial ch.3 has been discontinued for more than certain time (Set at installation). Default: No timeout **Remedy**: Check the status of the serial port.	
10050, 4	323	Lost CH4 COM	Check the serial port status
		Meaning: Input from EC-3000 serial ch.4 has been discontinued for more than certain time (Set at installation). Default: No timeout **Remedy**: Check the status of the serial port.	
10050, 5	324	Lost CH5 COM	Check the serial port status
		Meaning: Input from EC-3000 serial ch.5 has been discontinued for more than certain time (Set at installation). Default: No timeout **Remedy**: Check the status of the serial port.	
10050, 6	325	Lost CH6 COM	Check the serial port status
		Meaning: Input from EC-3000 serial ch.6 has been discontinued for more than certain time (Set at installation). Default: No timeout **Remedy**: Check the status of the serial port.	
10050, 7	326	Lost CH7 COM	Check the serial port status
		Meaning: Input from EC-3000 serial ch.7 has been discontinued for more than certain time (Set at installation). Default: No timeout **Remedy**: Check the status of the serial port.	
10050, 8	327	Lost CH8 COM	Check the serial port status
		Meaning: Input from EC-3000 serial ch.8 has been discontinued for more than certain time (Set at installation). Default: No timeout **Remedy**: Check the status of the serial port.	
10312, -	510	Lost MODBUS COM	Check MODBUS status and connection
		Meaning: Connection to the IAS (MODBUS) is lost or interrupted. **Remedy**: Check connection.	
10740, 1	730	ISW: STBY	Selected radar entered standby mode. Set selected radar to TX mode
		Meaning: The antenna unit selected with the Interswitch is in stand-by **Remedy**: Set the antenna unit to transmit state.	
10740, 2	740	ISW: NO SIGNAL	Selected radar has problem. Use radar as stand-alone
		Meaning: No video signal from the antenna unit selected with the Interswitch. **Remedy**: Check the antenna unit. Use radar as standalone.	

Alert ID		Alert title	Alert Message
ALF	ALR		
10740, 3	750	ISW: NO RADAR	Communication with selected radar has interrupted/ lost. Use radar as standalone
		Meaning: No communication from the antenna unit selected with the Inter-switch. **Remedy**: Check that both the antenna unit and the processor unit are powered. Also check the wiring between the antenna unit and the processor unit. Use radar as standalone.	
10807, -	820	NAVTEX Message Received	NAVTEX Message is received. Please check it
		Meaning: NAVTEX message is received. **Remedy**: Check the NAVTEX message.	
10910, 1	911	LOST WV UTC SIG	Check that data input to Wave Analyzer is correct
		Meaning: An input error has occurred for time/date data. **Remedy**: Check data input to the Wave Analysis software.	
10910, 2	912	LOST WV COG/SOG	Check that data input to Wave Analyzer is correct
		Meaning: An input error has occurred for speed/course data. **Remedy**: Check data input to the Wave Analysis software.	
10910, 3	913	LOST WV WIND SIG	Check that data input to Wave Analyzer is correct
		Meaning: An input error has occurred for wind data. **Remedy**: Check data input to the Wave Analysis software.	
10910, 4	914	LOST WV RADAR ANT	Check that data input to Wave Analyzer is correct
		Meaning: An input error has occurred for radar data. **Remedy**: Check data input to the Wave Analysis software.	
10910, 5	915	LOST WV GYRO SIG	Check that data input to Wave Analyzer is correct
		Meaning: An input error has occurred for gyrocompass data. **Remedy**: Check data input to the Wave Analysis software.	

PACKING LIST

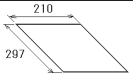
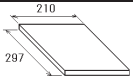
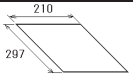
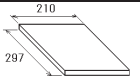
EC-3000
R3210X*/R3220X*/R3310X*/R3320X/R32XBB/R2710*/2720*/R*NXT*

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
制御部 PROCESSOR UNIT		EC-3000-* 000-020-737-00 **	1
予備品 SPARE PARTS			
予備品 SPARE PARTS		SP24-00601 001-170-660-00	1 (*1)
予備品 SPARE PARTS		SP24-00602 001-170-670-00	1 (*1)
付属品 ACCESSORIES			
付属品 ACCESSORIES		FP24-00603 001-285-760-00	1
工事材料 INSTALLATION MATERIALS			
ｹｰﾌﾞﾙ(ｸﾐﾋﾓ) CABLE ASSEMBLY		DSUB9P-X2-L5M 000-176-663-11	1
ｹｰﾌﾞﾙ組品LAN LAN CABLE ASSEMBLY		MOD-Z072-005+ 001-588-900-00	1
工事材料 INSTALLATION MATERIALS		CP24-02101 001-170-630-00	1

1.ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
1.CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

2.(*1)は、それぞれ仕様選択品を表します。
2.(*1)INDICATE SPECIFICATION SELECTIVE ITEM.

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
電源ｹｰﾌﾞﾙ AC CABLE		IEC60320-C13-L5M 000-176-423-11	1
図書 DOCUMENT			
ﾄﾞﾝｸﾞﾙｲﾝﾌｫﾒｰｼｮﾝｼｰﾄ DONGLE INFORMATION SHEET		 999-999-085-0*	1 (*)
取扱説明CD OPERATOR'S MANUAL CD		FAR3XXX O/M *CD-ROM* 000-197-278-1*	1
操作要領書 OPERATOR'S GUIDE		OS*-36160-* 000-178-028-1* **	1
装備設定要領書 INSTRUCTION MANUAL		*32-01305-* 000-178-045-1* **	1
装備要領書 INSTALLATION MANUAL		IM*-36160-* 000-198-071-1* **	1

3.(*)は、ﾀﾞﾐｰｺｰﾄﾞに付き、注文できません。
3.(*) THIS CODE CANNOT BE ORDERED.

C3616-Z06-J

PACKING LIST

XN12CF/-HK

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ｱﾝﾃﾅ ANTENNA RADIATOR ASSEMBLY		XN12CF* 001-252-640-00 **	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP03-35201 001-249-860-00	1

ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3616-Z01-B

PACKING LIST

XN20CF/-HK

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ｱﾝﾃﾅ ANTENNA RADIATOR ASSEMBLY		XN20CF 001-252-650-00 **	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP03-35201 001-249-860-00	1

ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

型式/ｺｰﾄﾞ番号が2段の場合、下段より上段に代わる過渡期品であり、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.)

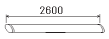
C3616-Z02-A

PACKING LIST

03HL-X-9853 -0 1/1

XN24CF/-HK

A-4

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ｱﾝﾃﾅ ANTENNA RADIATOR ASSEMBLY		XN24CF 001-252-660-00 **	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP03-35201 001-249-860-00	1

ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

型式/ｺｰﾄﾞ番号が2段の場合、下段より上段に代わる過渡期品であり、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.）

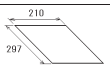
C3616-Z03-A

PACKING LIST

03HL-X-9867 -5 1/1

RSB-128-105N*/-105N*HK , RSB-128-106N*/-106N*HK/-106N*MSA, RSB-128-123N*/-123N*HK

A-5

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
空中線本体部 SCANNER UNIT		RSB-128*N* 000-024-105-00 **	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP03-35401 001-507-920-00	1
図書 DOCUMENT			
吊下締付要領 HOIST X-BAND,TIGHTEN BOLSTS		C32-01302-* 000-178-042-1*	1

ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

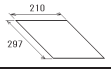
C3616-Z08-F

PACKING LIST

03HL-X-9855 -6 1/1

RSB-128-105I*, RSB-128-105I*HK, SB-128-106I* ,RSB-128-106I*HK, RSB-128-123I*, RSB-128-123I*HK

A-6

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
空中線本体部 SCANNER UNIT		RSB-128*I* 000-024-106-00 **	1
予備品 SPARE PARTS			
予備品 SPARE PARTS		SP03-19701 001-531-630-00	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP03-35403 001-507-930-00	1
図書 DOCUMENT			
吊下締付要領 HOIST X-BAND,TIGHTEN BOLSTS		C32-01302-* 000-178-042-1*	1

ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

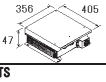
C3616-Z04-G

PACKING LIST

03HL-X-9857 -2 1/1

PSU-014/014L/014HK/014LHK

A-7

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
空中線電源部 POWER SUPPLY UNIT		PSU-014/HK 000-023-893-00 **	1
予備品 SPARE PARTS			
予備品 SPARE PARTS		SP03-17641 001-249-740-00	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP03-35301 001-249-770-00	1

ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

型式/ｺｰﾄﾞ番号が2段の場合、下段より上段に代わる過渡期品であり、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.）

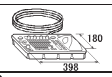
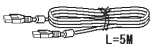
C3616-Z05-C

PACKING LIST

24AL-X-9879 -2 1/1

RCU-024B ,RCU-024B-HK

A-8

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ECDIS操作部 ECDIS CONTROL UNIT		RCU-024B* 000-037-640-00 **	1
付属品 ACCESSORIES			
付属品 ACCESSORIES		FP24-00701 001-418-340-00	1
工事材料 INSTALLATION MATERIALS			
ｹｰﾌﾞﾙ(ｸﾐﾐﾝ)USB CABLE ASSEMBLY		TS-20-071-1 L=5000 000-176-700-11	1
工事材料 INSTALLATION MATERIALS		CP24-02201 001-418-330-00	1

ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CN

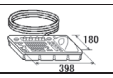
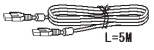
C4473-Z31-C

PACKING LIST

24AL-X-9880 -3 1/1

RCU-025A/-HK

A-9

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ﾚｰﾀﾞｰ操作部 RADAR CONTROL UNIT		RCU-025A/-HK 000-037-642-00 **	1
付属品 ACCESSORIES			
付属品 ACCESSORIES		FP24-00701 001-418-340-00	1
工事材料 INSTALLATION MATERIALS			
ｹｰﾌﾞﾙ(ｸﾐﾐﾝ)USB CABLE ASSEMBLY		TS-20-071-1 L=5000 000-176-700-11	1
工事材料 INSTALLATION MATERIALS		CP24-02201 001-418-330-00	1

ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
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CN

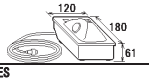
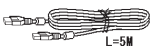
C4473-Z32-D

PACKING LIST

24AL-X-9881 -0 1/1

RCU-026/-HK

A-10

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ﾄﾗｯｸﾎﾞｰﾙ操作部 TRACKBALL CONTROL UNIT		RCU-026/-HK 000-027-666-00 **	1
付属品 ACCESSORIES			
付属品 ACCESSORIES		FP24-00801 001-418-410-00	1
工事材料 INSTALLATION MATERIALS			
ｹｰﾌﾞﾙ(ｸﾐﾐﾝ)USB CABLE ASSEMBLY		TS-20-071-1 L=5000 000-176-700-11	1
工事材料 INSTALLATION MATERIALS		CP24-02301 001-418-400-00	1

ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

型式/ｺｰﾄﾞ番号が2段の場合、下段より上段に代わる過渡期品であり、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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(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

CN

C4473-Z33-A

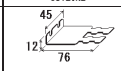
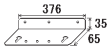
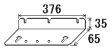
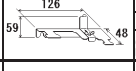
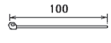
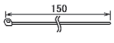
A-11

FURUNO

CODE NO.	001-170-630-00	24AL-X-9401 -3
TYPE	CP24-02101	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	配線板1 WIRING PLATE 1		24-014-0104-2 CODE NO. 100-366-812-10	1	
2	筐体足1 CHASSIS BASE 1		24-014-0121-1 CODE NO. 100-367-721-10	1	
3	筐体足2 CHASSIS BASE 2		24-014-0122-1 CODE NO. 100-372-171-10	1	
4	配線板2組立品 WIRING PLATE 2 ASSY		CP24-02102 CODE NO. 001-186-200-00	1	
5	ｺﾝﾍﾞｯｸｽ CABLE TIE		CV-100N CODE NO. 000-162-167-10	10	
6	ｺﾝﾍﾞｯｸｽ CABLE TIE		CV-150N CODE NO. 000-162-186-10	30	
7	圧着端子 CRIMP-ON LUG		FV1.25-4(LF) RED K CODE NO. 000-166-666-11	9	
8	ﾅﾍﾞｲﾝﾄﾞｺﾈｼﾞ BINDING HEAD SCREW		M3X6 SUS304 CODE NO. 000-162-664-10	5	
9	ﾅﾍﾞｲﾝﾄﾞｺﾈｼﾞ BINDING HEAD SCREW		M4X8 SUS304 CODE NO. 000-162-669-10	10	

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

C4473-M01-D

FURUNO

CODE NO.	001-249-860-00	03HL-X-9401 -3
TYPE	CP03-35201	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	ﾎﾞﾙﾄ用ﾊﾟｯｷﾝ GASKET FOR BOLT	φ15	03-182-3186-0 CODE NO. 100-386-270-10	6	
2	ｱﾝﾃﾅ取付ﾎﾞﾙﾄ ANTENNA FIXING BOLT	50 φ8	03-182-4188-3 CODE NO. 100-383-603-10	6	
3	接着剤袋詰 ADHESIVE	164 35 28	TB5211 50G CODE NO. 001-477-870-00	1	

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

C3616-M04-B

FURUNO

CODE NO.	001-507-920-00	03HL-X-9403 -1
TYPE	CP03-35401	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	ｼｰﾙﾜｯｼｬｰ SEAL WASHER	φ30	03-001-3002-0 ROHS CODE NO. 300-130-020-10	4	
2	絶縁ｼｰﾄ1 INSULATION SHEET 1	Φ48	03-182-3117-2 CODE NO. 100-387-752-10	4	
3	六角ﾅｯﾄ 1ｼｭ HEXAGONAL NUT	10 19	M12 SUS304 CODE NO. 000-167-491-10	8	
4	ﾐｶﾞｷﾏﾙ平座金 FLAT WASHER	φ24	M12 SUS304 CODE NO. 000-167-446-10	4	
5	六角ﾎﾞﾙﾄ 全ﾈｼﾞ HEXAGON HEAD SCREW	70 φ12	M12X70 SUS304 CODE NO. 000-162-814-10	4	
6	六角ﾅｯﾄ 1ｼｭ HEXAGONAL NUT	5 10	M6 SUS304 CODE NO. 000-158-856-10	1	
7	ﾊﾞﾈ座金 SPRING WASHER	12	M6 SUS304 CODE NO. 000-158-855-10	1	
8	ﾐｶﾞｷ平座金 FLAT WASHER	φ13	M6 SUS304 CODE NO. 000-158-854-10	3	
9	六角ﾎﾞﾙﾄ HEXAGONAL HEAD BOLT	25 φ6	M6X25 SUS304 CODE NO. 000-162-871-10	1	
10	ｹｰﾌﾞﾙ組品 CABLE ASSY.	340	RW-4747 CODE NO. 000-566-000-12	1	

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

C3616-M02-B

FURUNO

CODE NO.	001-507-930-00	03HL-X-9408 -6
TYPE	CP03-35403	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	ｼｰﾙﾜｯｼｬｰ SEAL WASHER	φ30	03-001-3002-0 ROHS CODE NO. 300-130-020-10	4	
2	絶縁ｼｰﾄ1 INSULATION SHEET 1	Φ48	03-182-3117-2 CODE NO. 100-387-752-10	4	
3	圧着端子 CRIMP-ON LUG	19 7	FV2-M4 K CODE NO. 000-157-229-11	2	
4	ﾛｯｷﾝｸﾞﾜｲﾔｰｻﾄﾞﾙ LOCKING WIRE SADDLE	20 43	LWS-1211Z CODE NO. 000-167-788-11	2	
5	六角ﾅｯﾄ 1ｼｭ HEXAGONAL NUT	10 19	M12 SUS304 CODE NO. 000-167-491-10	8	
6	ﾐｶﾞｷﾏﾙ平座金 FLAT WASHER	φ24	M12 SUS304 CODE NO. 000-167-446-10	4	
7	六角ﾎﾞﾙﾄ 全ﾈｼﾞ HEXAGON HEAD SCREW	70 φ12	M12X70 SUS304 CODE NO. 000-162-814-10	4	
8	六角ﾅｯﾄ 1ｼｭ HEXAGONAL NUT	5 10	M6 SUS304 CODE NO. 000-158-856-10	1	
9	ﾊﾞﾈ座金 SPRING WASHER	12	M6 SUS304 CODE NO. 000-158-855-10	1	
10	ﾐｶﾞｷ平座金 FLAT WASHER	φ13	M6 SUS304 CODE NO. 000-158-854-10	3	

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

C3616-M01-G(1)

FURUNO

CODE NO.	001-507-930-00	03HL-X-9408 -6
TYPE	CP03-35403	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	六角ﾎﾞﾙﾄ HEXAGONAL HEAD BOLT	25 φ6	M6X25 SUS304 CODE NO. 000-162-871-10	1	
12	ｹｰﾌﾞﾙ組品 CABLE ASSY.	340	RW-4747 CODE NO. 000-566-000-12	1	
13	ｽﾊﾟｲﾗﾙﾁｭｰﾌﾞ VO SPIRAL TUBE VO	L=0.9M	SPN-08L-VO +900MM+ CODE NO. 000-198-786-10	1	

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

C3616-M01-G(2)

FURUNO

CODE NO.	001-249-770-00	03HL-X-9405 -2
TYPE	CP03-35301	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	圧着端子 CRIMP-ON LUG		FV1.25-4(LF) RED K CODE NO. 000-166-666-11	1	
2	圧着端子 CRIMP-ON LUG		FV2-4 BLU K CODE NO. 000-157-247-11	3	
3	圧着端子 CRIMP-ON LUG		FV2-M3 BLU K CODE NO. 000-157-250-11	1	
4	ｺﾈｸﾀ(ﾓｼﾞｭﾗｰ) MODULAR CONNCTOR		MPS588-C CODE NO. 000-166-044-10	3	

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

C3618-M04-C

FURUNO

CODE NO.		03HL-X-9406 -0
TYPE		1/1

工事材料表

INSTALLATION MATERIALS

FAR-3210/3210-BB/3310/3220/3220-BB/3320/3230S/
3230S-BB/3230S-SSD/3230S-SSD-BB/3330S/3330S-SSD

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ｹｰﾌﾞﾙ(組品) CABLE ASSEMBLY		RW-00135-L15M CODE NO. 001-259-830-00	1	選択 TO BE SELECT
2	ｹｰﾌﾞﾙ(組品) CABLE ASSEMBLY		RW-00135-L30M CODE NO. 001-259-860-00	1	選択 TO BE SELECT
3	ｹｰﾌﾞﾙ(組品) CABLE ASSEMBLY		RW-00135-L40M CODE NO. 001-259-870-00	1	選択 TO BE SELECT
4	ｹｰﾌﾞﾙ(組品) CABLE ASSEMBLY		RW-00135-L50M CODE NO. 001-259-880-00	1	選択 TO BE SELECT

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、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 ELECTRIC CO ., LTD.

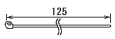
C3618-M05-A

FURUNO

CODE NO.	001-418-330-00	24AL-X-9408 -0
TYPE	CP24-02201	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	+ﾄﾗｽﾀｯﾋﾟﾝﾈｼﾞ 1ｼｭ SELF-TAPPING SCREW		5X20 SUS304 CODE NO. 000-162-608-10	2	
2	ｺﾝﾍﾞｯｸｽ CABLE TIE		CV-125N CODE NO. 000-172-164-10	2	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、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 ELECTRIC CO ., LTD. CN

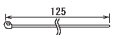
C4473-M08-A

FURUNO

CODE NO.	001-418-400-00	24AL-X-9409 -0
TYPE	CP24-02301	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	+ﾄﾗｽﾀｯﾋﾟﾝﾈｼﾞ 1ｼｭ SELF-TAPPING SCREW		5X20 SUS304 CODE NO. 000-162-608-10	2	
2	ｺﾝﾍﾞｯｸｽ CABLE TIE		CV-125N CODE NO. 000-172-164-10	2	
3	+ﾅﾍﾞｾﾙXB WASHER HEAD SCREW *B*		M3X12 SUS304 CODE NO. 000-162-648-10	4	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、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 ELECTRIC CO ., LTD. CN

C4473-M09-A

FURUNO

CODE NO.	001-418-340-00	24AL-X-9511 -0
TYPE	FP24-00701	1/1

付属品表

ACCESSORIES

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	卓上取付板 DESK FIXING PLATE		24-014-1401-0 CODE NO. 100-367-460-10	1	
2	USBｼｰﾄ USB SHEET		24-014-1411-0 CODE NO. 100-372-000-10	1	
3	+ﾅﾍﾞｾﾙｽB WASHER HEAD SCREW *B*		M4X12 C2700W MBN12 CODE NO. 000-163-192-10	4	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、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.	001-418-410-00	24AL-X-9512 -0
TYPE	FP24-00801	1/1

付属品表

ACCESSORIES

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	卓上取付板 DESKTOP FIXING PLATE		14-078-2311-0 CODE NO. 100-364-730-10	1	
2	USBｼｰﾄ USB SHEET		24-014-1411-0 CODE NO. 100-372-000-10	1	
3	+ﾅﾍﾞｾﾙｽB WASHER HEAD SCREW *B*		M3X8 SUS304 CODE NO. 000-162-649-10	2	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、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

表１ TABLE 1

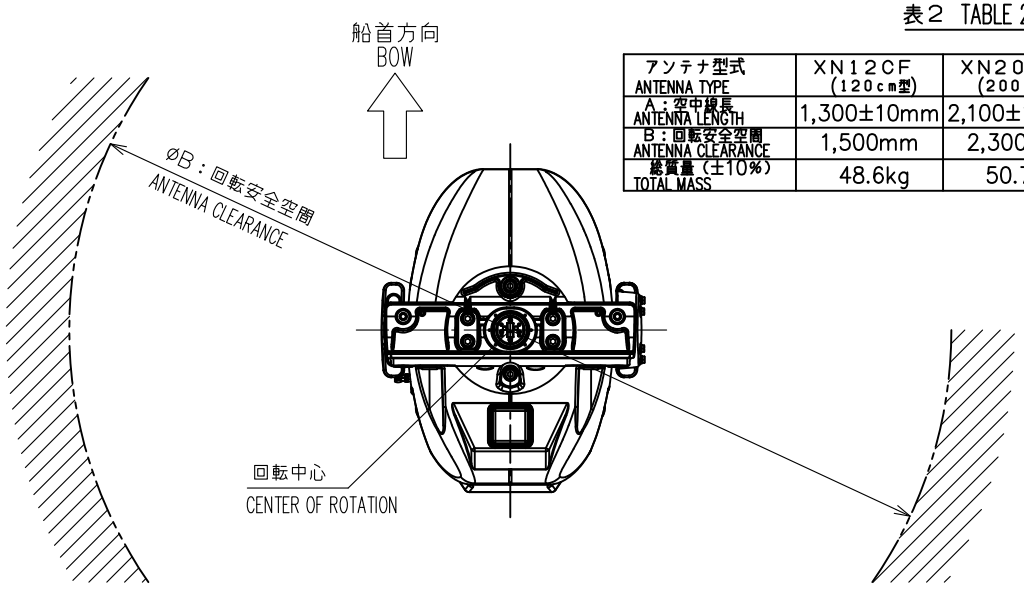
寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4
1000<L≦2000	±5
2000<L≦4000	±7

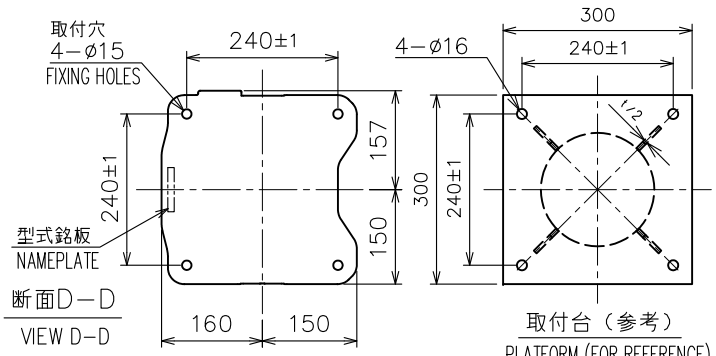
表２ TABLE 2

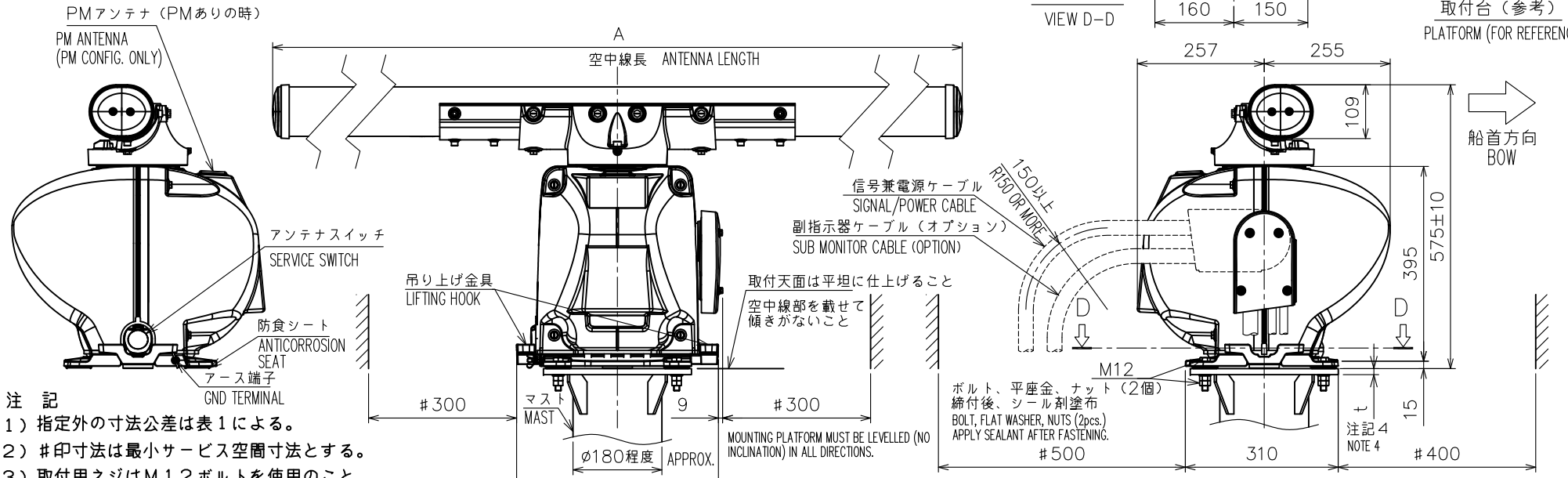
アンテナ型式 ANTENNA TYPE	XN12CF (120cm型)	XN20CF (200cm型)	XN24CF (240cm型)
A：空中線長 ANTENNA LENGTH	1,300±10mm	2,100±10mm	2,600±10mm
B：回転安全空間 ANTENNA CLEARANCE	1,500mm	2,300mm	2,800mm
総質量（±10%） TOTAL MASS	48.6kg	50.7kg	51.9kg

補強リブの板厚は取付台の半分程度。
溶接は、取付用ボルト・平座金の座面にかからぬこと。
補強リブはマスト支柱中心と取付穴の中心を結ぶ方向に取り付けること。

THICKNESS OF RIB: t/2 (HALF OF PLATFORM PLATE)
AVOID BOLT & WASHER LOCATIONS ON THE PLATFORM WHEN WELDING THE RIBS.
THE RIBS SHOULD BE WELDED IN THE LINE WITH THE STANCHION CENTER AND FIXING HOLES CENTER.







注　記
1）指定外の寸法公差は表１による。
2）＃印寸法は最小サービス空間寸法とする。
3）取付用ネジはＭ１２ボルトを使用のこと。
4）取付台は厚さ（ｔ）１２ｍｍ以上の鋼・鉄板を使用のこと。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M12 BOLTS FOR FIXING THE UNIT.
4. THICKNESS OF PLATFORM (t): 12 mm OR MORE STEEL PLATE.

DRAWN 6/Nov/2017 T.YAMASAKI		TITLE	RSB-128
CHECKED 6/Nov/2017 H.MAKI		名称	空中線部（PMあり／なし、氷結防止なし）
APPROVED 6/Nov/2017 H.MAKI	FAR-2xx8ser. FAR-3210ser.		外寸図
SCALE 1/12 MASS 表2参照 SEE TABLE 2		NAME	ANTENNA UNIT (PM Y/N, NO DE-ICER)
DWG.No. C3616-G02- G	REF.No. 03-182-310G-8		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

D-1

FURUNO

表１ TABLE 1

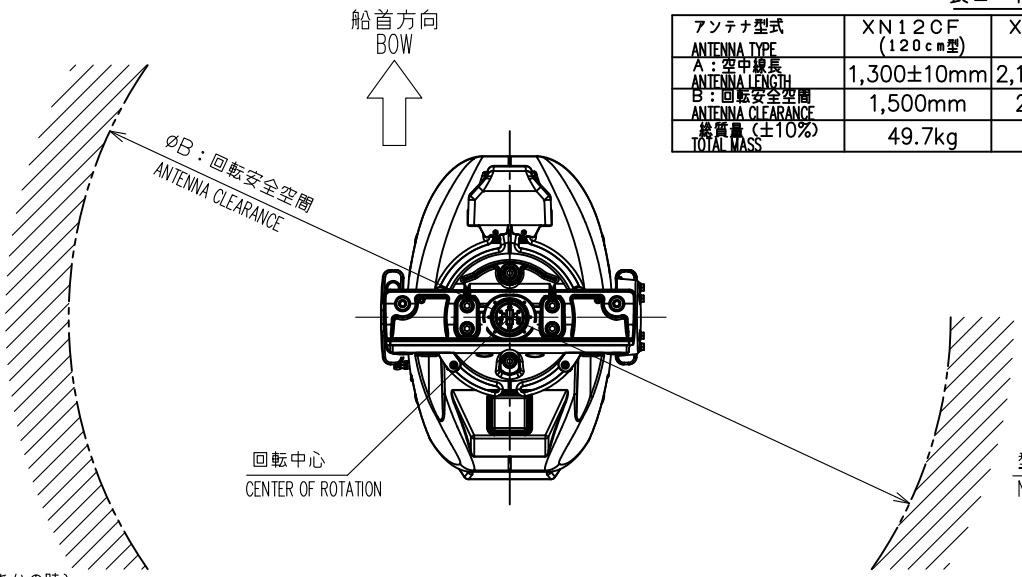
寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4
1000<L≦2000	±5
2000<L≦4000	±7

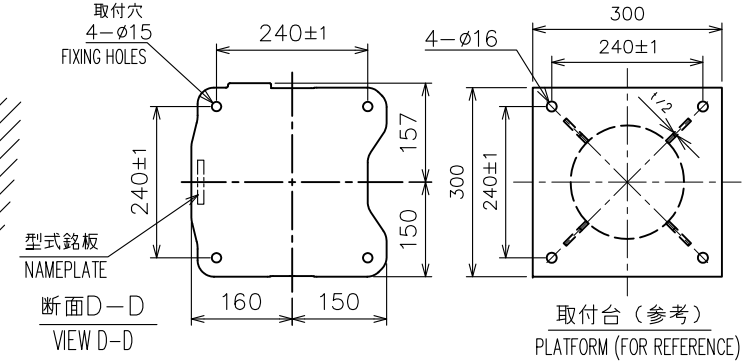
表２ TABLE 2

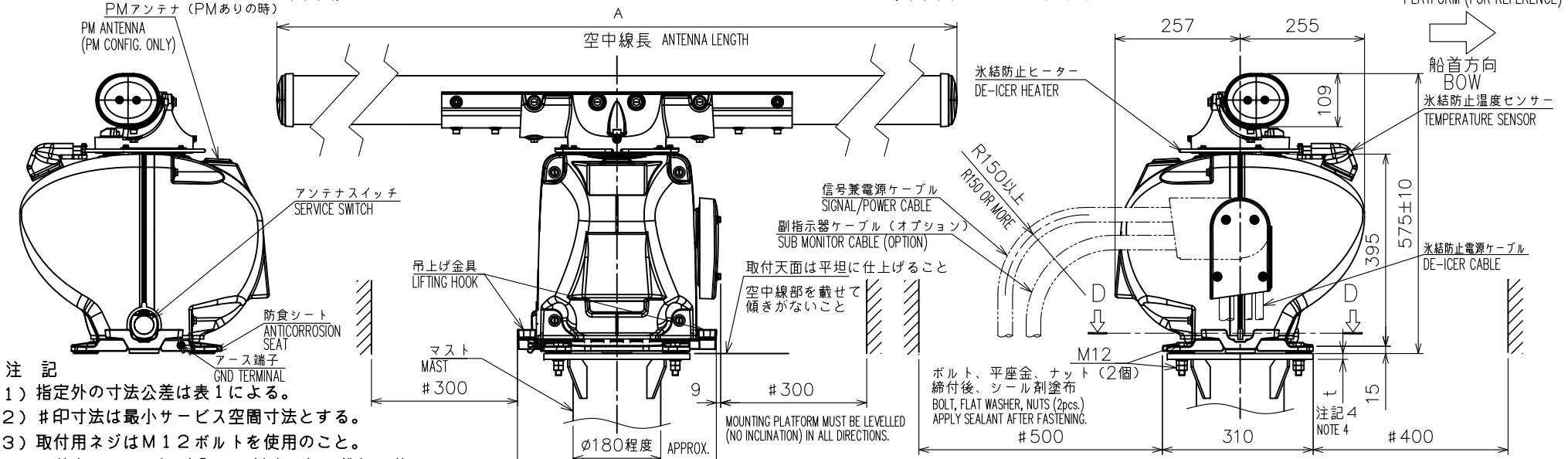
アンテナ型式 ANTENNA TYPE	XN12CF (120cm型)	XN20CF (200cm型)	XN24CF (240cm型)
A：空中線長 ANTENNA LENGTH	1,300±10mm	2,100±10mm	2,600±10mm
B：回転安全空間 ANTENNA CLEARANCE	1,500mm	2,300mm	2,800mm
総質量（±10%） TOTAL MASS	49.7kg	51.8kg	53.0kg

補強リブの板厚は取付台の半分程度。
溶接は、取付用ボルト・平座金の座面にかからぬこと。
補強リブはマスト支柱中心と取付穴の中心を結ぶ方向に取り付けること。

THICKNESS OF RIB: t/2 (HALF OF PLATFORM PLATE)
AVOID BOLT & WASHER LOCATIONS ON THE PLATFORM WHEN WELDING THE RIBS.
THE RIBS SHOULD BE WELDED IN THE LINE WITH THE STANCHION CENTER AND FIXING HOLES CENTER.







注　記
1）指定外の寸法公差は表１による。
2）＃印寸法は最小サービス空間寸法とする。
3）取付用ネジはＭ１２ボルトを使用のこと。
4）取付台は厚さ（t）12mm以上の鋼・鉄板を使用のこと。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M12 BOLTS FOR FIXING THE UNIT.
4. THICKNESS OF PLATFORM (t): 12 mm OR MORE STEEL PLATE.

DRAWN 6/Nov/2017 T.YAMASAKI		TITLE	RSB-128
CHECKED 6/Nov/2017 H.MAKI		名称	空中線部（PMあり／なし、氷結防止付）
APPROVED 7/Nov/2017 H.MAKI	FAR-2xx8ser. FAR-3210ser.		外寸図
SCALE 1/12 MASS 表2参照 SEE TABLE 2		NAME	ANTENNA UNIT (PM Y/N, W/ DE-ICER)
DWG.No. C3616-G03- F	REF.No. 03-182-311G-7		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

表１ TABLE 1

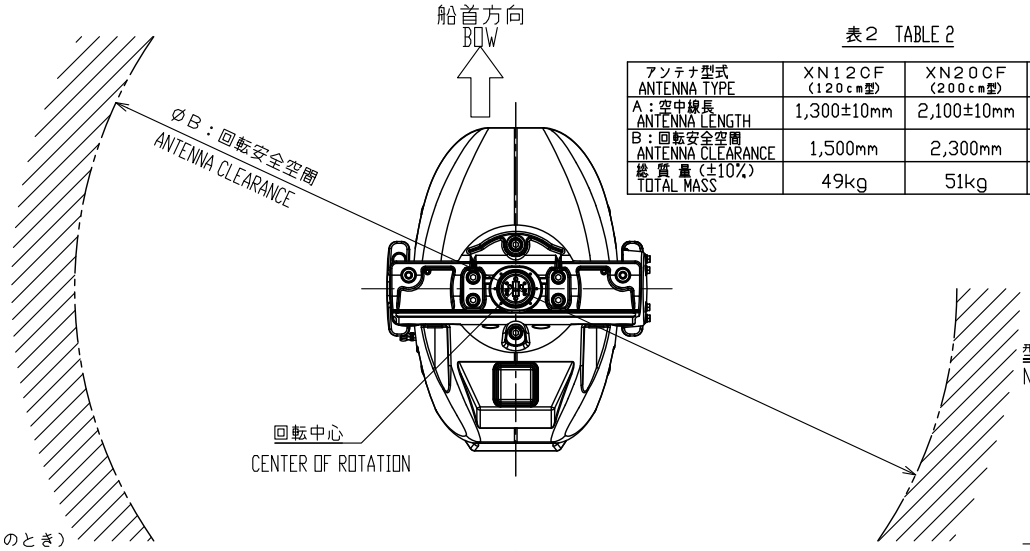
寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4
1000<L≦2000	±5
2000<L≦4000	±7

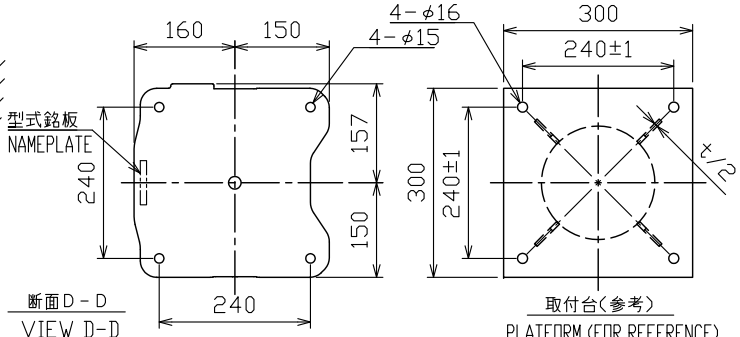
表２ TABLE 2

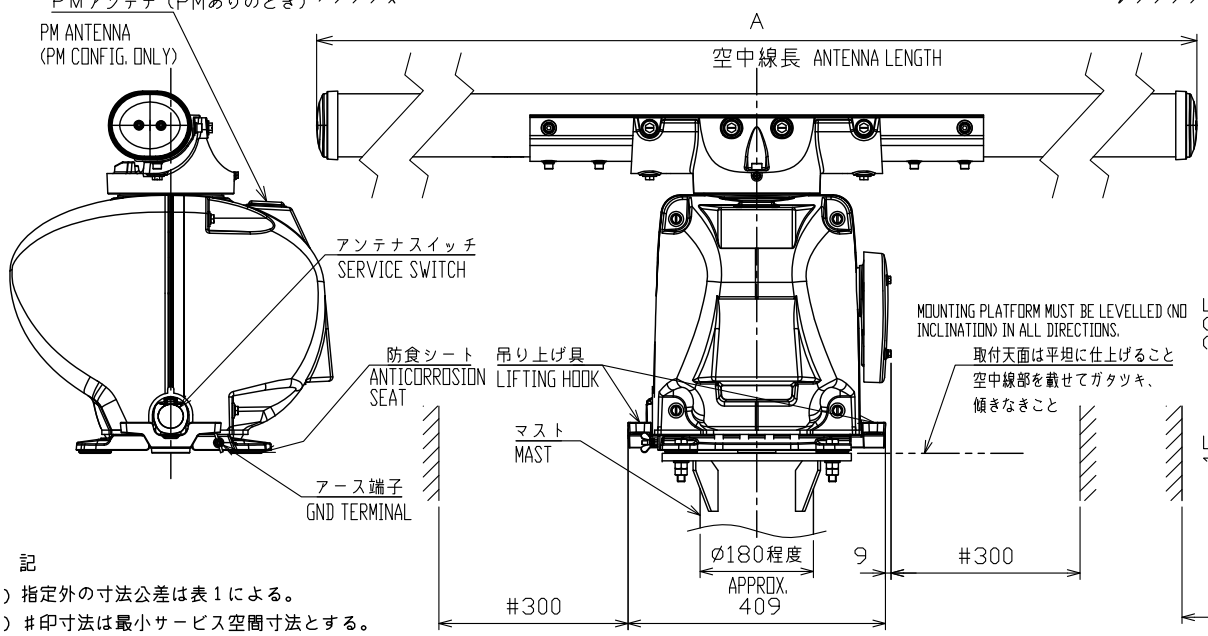
アンテナ型式 ANTENNA TYPE	XN12CF (120cm型)	XN20CF (200cm型)	XN24CF (240cm型)
A：空中線長 ANTENNA LENGTH	1,300±10mm	2,100±10mm	2,600±10mm
B：回転安全空間 ANTENNA CLEARANCE	1,500mm	2,300mm	2,800mm
総 質 量（±10%） TOTAL MASS	49kg	51kg	52kg

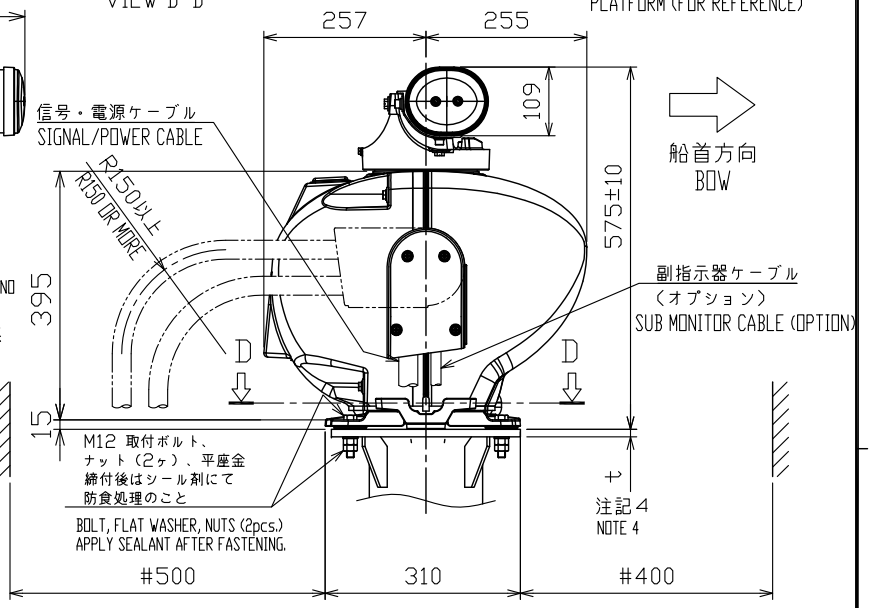
補強リブの板厚は取付台の半分程度。
溶接は、取付用ボルト・平座金の座面にかからぬこと。
補強リブはマスト支柱中心と取付穴の中心を結ぶ方向に取り付けること。

THICKNESS OF RIB: t/2 (HALF OF PLATFORM PLATE)
AVOID BOLT & WASHER LOCATIONS ON THE PLATFORM WHEN WELDING THE RIBS.
THE RIBS SHOULD BE WELDED IN THE LINE WITH THE STANCHION CENTER AND FIXING HOLES CENTER.









注　記

１）指定外の寸法公差は表１による。
２）＃印寸法は最小サービス空間寸法とする。
３）取付用ネジはＭ１２ボルトを使用のこと。
４）取付台には厚さ（ｔ）１２ｍｍ以上の鋼・鉄板を使用のこと。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M12 BOLTS FOR FIXING THE UNIT.
4. THICKNESS OF PLATFORM (t): 12 mm OR MORE STEEL PLATE.

DRAWN 15/Oct/2019 T.YAMASAKI		TITLE	RSB-128
CHECKED 15/Oct/2019 H.MAKI		名称	空中線部（PMあり／なし、氷結防止なし）
APPROVED 17/Oct/2019 H.MAKI	FAR-2xx8-NXT		外寸図
SCALE 1/12	MASS 表2参照 SEE TABLE 2	NAME	ANTENNA UNIT (PM Y/N, NO DE-ICER)
DWG.No. C3679-G01- A	REF.No. 03-199-310G-2		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

表１ TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4
1000<L≦2000	±5
2000<L≦4000	±7

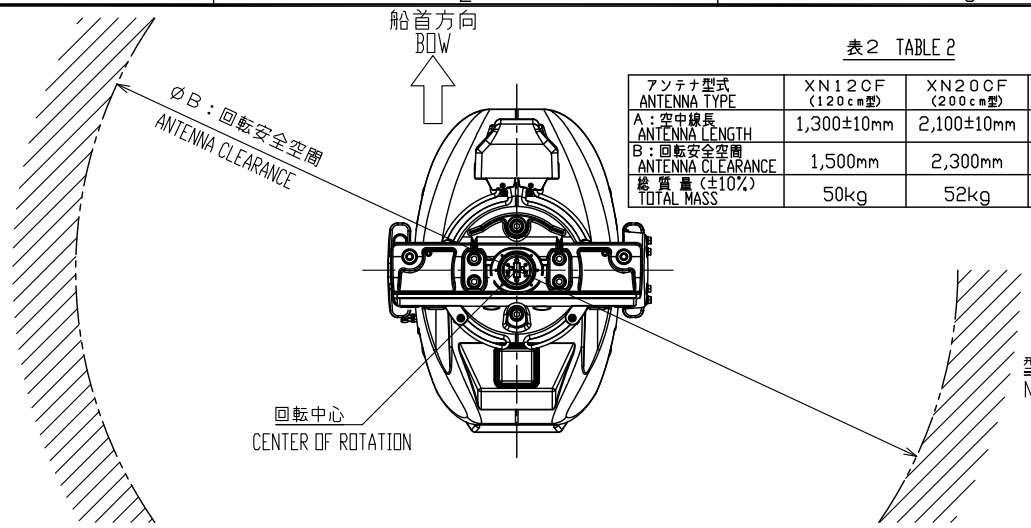
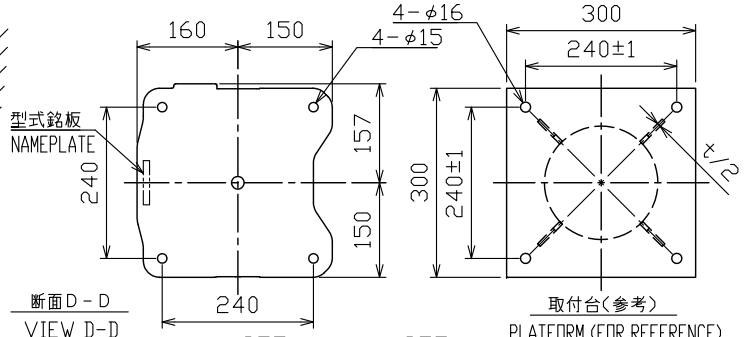
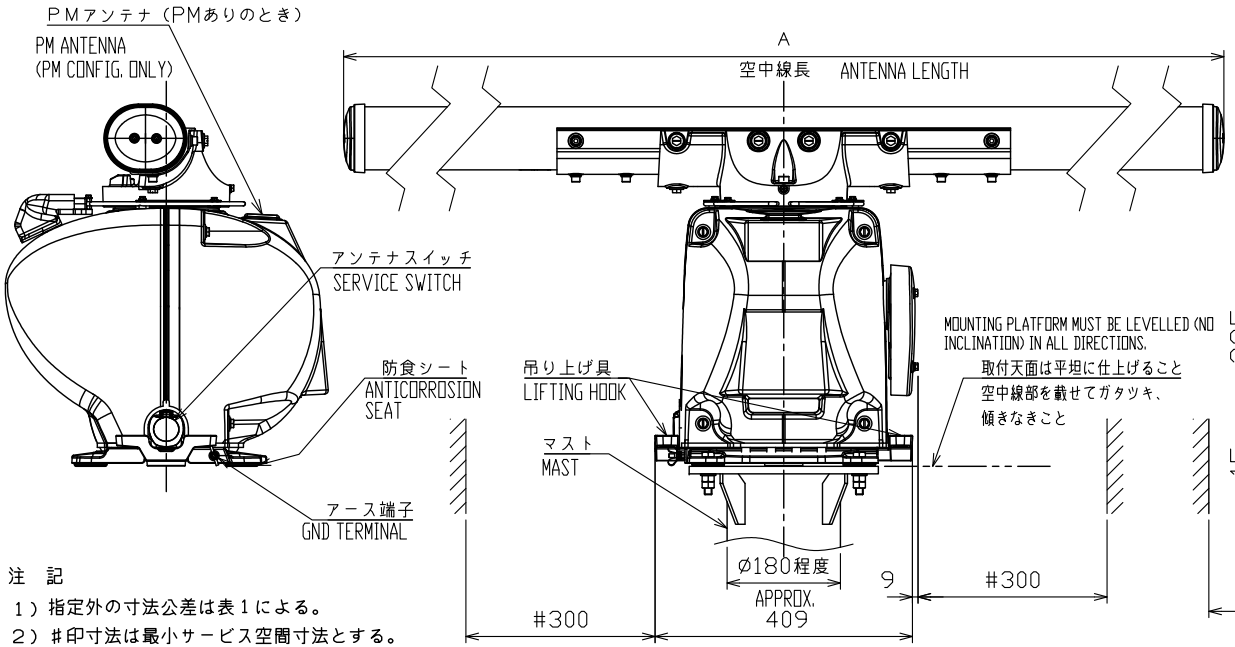


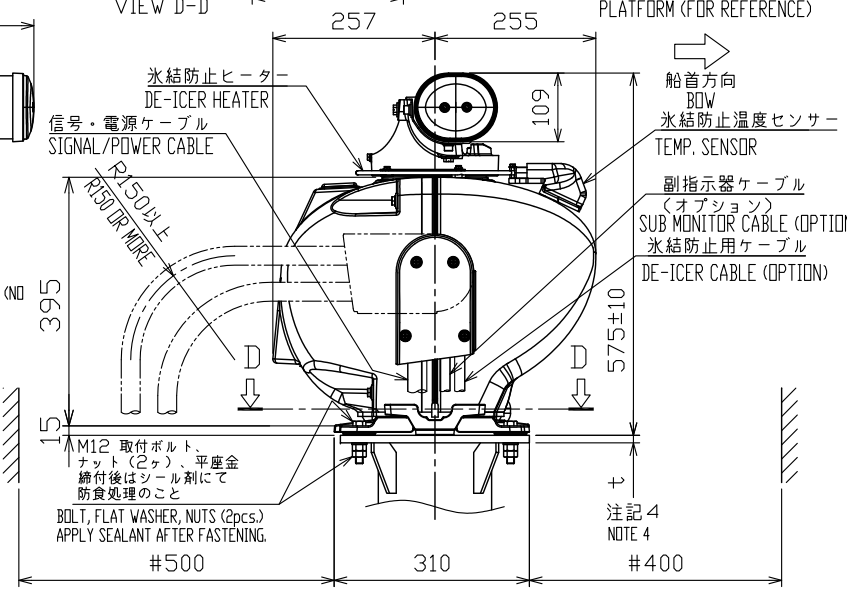
表２ TABLE 2

アンテナ型式 ANTENNA TYPE	XN12CF（120cm型）	XN20CF（200cm型）	XN24CF（240cm型）
A：空中線長 ANTENNA LENGTH	1,300±10mm	2,100±10mm	2,600±10mm
B：回転安全空間 ANTENNA CLEARANCE	1,500mm	2,300mm	2,800mm
総 質 量（±10%） TOTAL MASS	50kg	52kg	53kg

補強リブの板厚は取付台の半分程度。
溶接は、取付用ボルト・平座金の座面にかからぬこと。
補強リブはマスト支柱中心と取付穴の中心を結ぶ方向に取り付けること。
THICKNESS OF RIB: t/2 (HALF OF PLATFORM PLATE)
AVOID BOLT & WASHER LOCATIONS ON THE PLATFORM WHEN WELDING THE RIBS.
THE RIBS SHOULD BE WELDED IN THE LINE WITH THE STANCHION CENTER AND FIXING HOLES CENTER.







注　記

１）指定外の寸法公差は表１による。
２）＃印寸法は最小サービス空間寸法とする。
３）取付用ネジはＭ１２ボルトを使用のこと。
４）取付台には厚さ（ｔ）１２ｍｍ以上の鋼・鉄板を使用のこと。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M12 BOLTS FOR FIXING THE UNIT.
4. THICKNESS OF PLATFORM (t): 12 mm OR MORE STEEL PLATE.

DRAWN 16/Oct/2019 T.YAMASAKI		TITLE	RSB-128
CHECKED 16/Oct/2019 H.MAKI		名称	空中線部（PMあり／なし、氷結防止あり）
APPROVED 17/Oct/2019 H.MAKI	FAR-2xx8-NXT		外寸図
SCALE 1/12	MASS 表2参照 SEE TABLE 2	NAME	ANTENNA UNIT (PM Y/N, W/ DE-ICER)
DWG.No. C3679-G02- A	REF.No. 03-199-311G-2		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

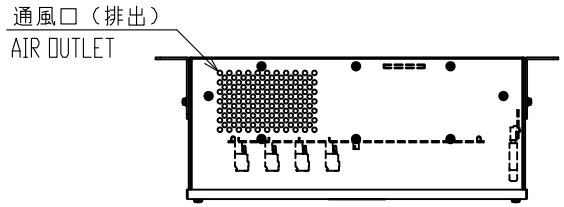
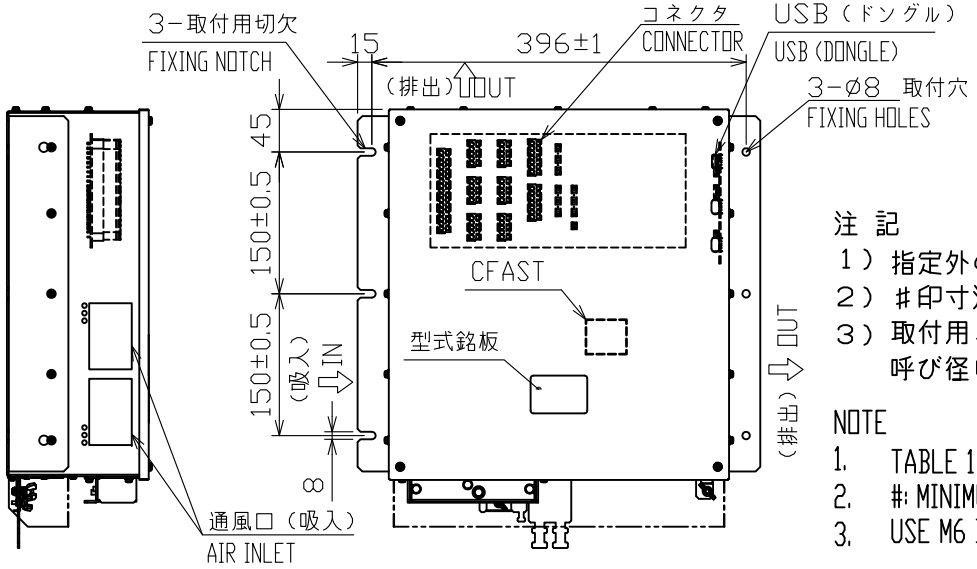


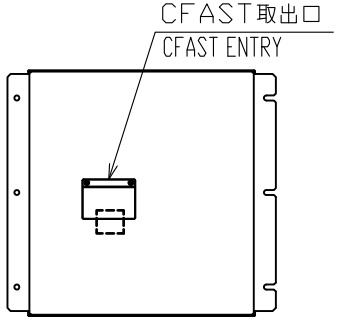
表 1 TABLE 1

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

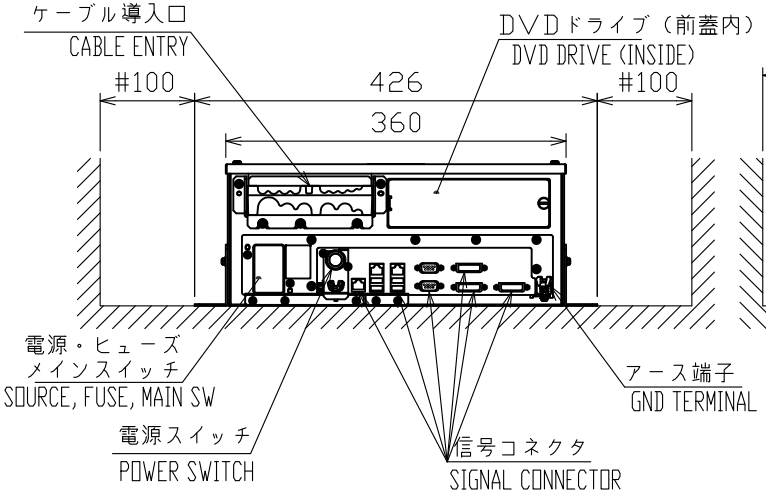


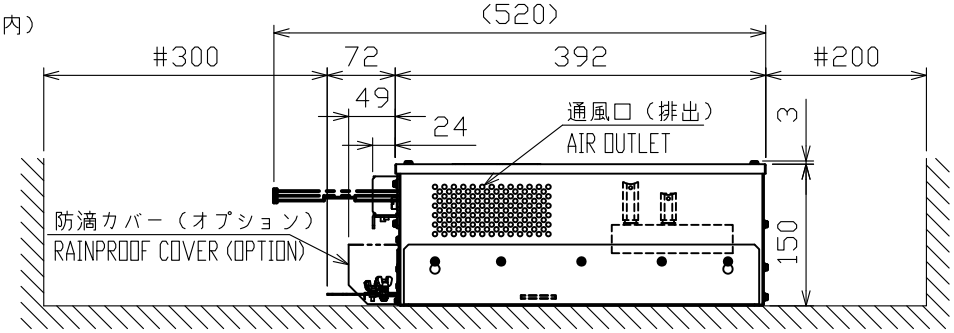
注 記
1）指定外の寸法公差は表 1 による。
2）＃印寸法は最小サービス空間寸法とする。
3）取付用ネジはＭ６ボルトまたはコーチボルト
呼び径６を使用のこと。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M6 BOLTS OR COACH SCREWS ø6 FOR FIXING THE UNIT.



背面（尺度:1/12）
REAR VIEW (SCALE: 1/12)

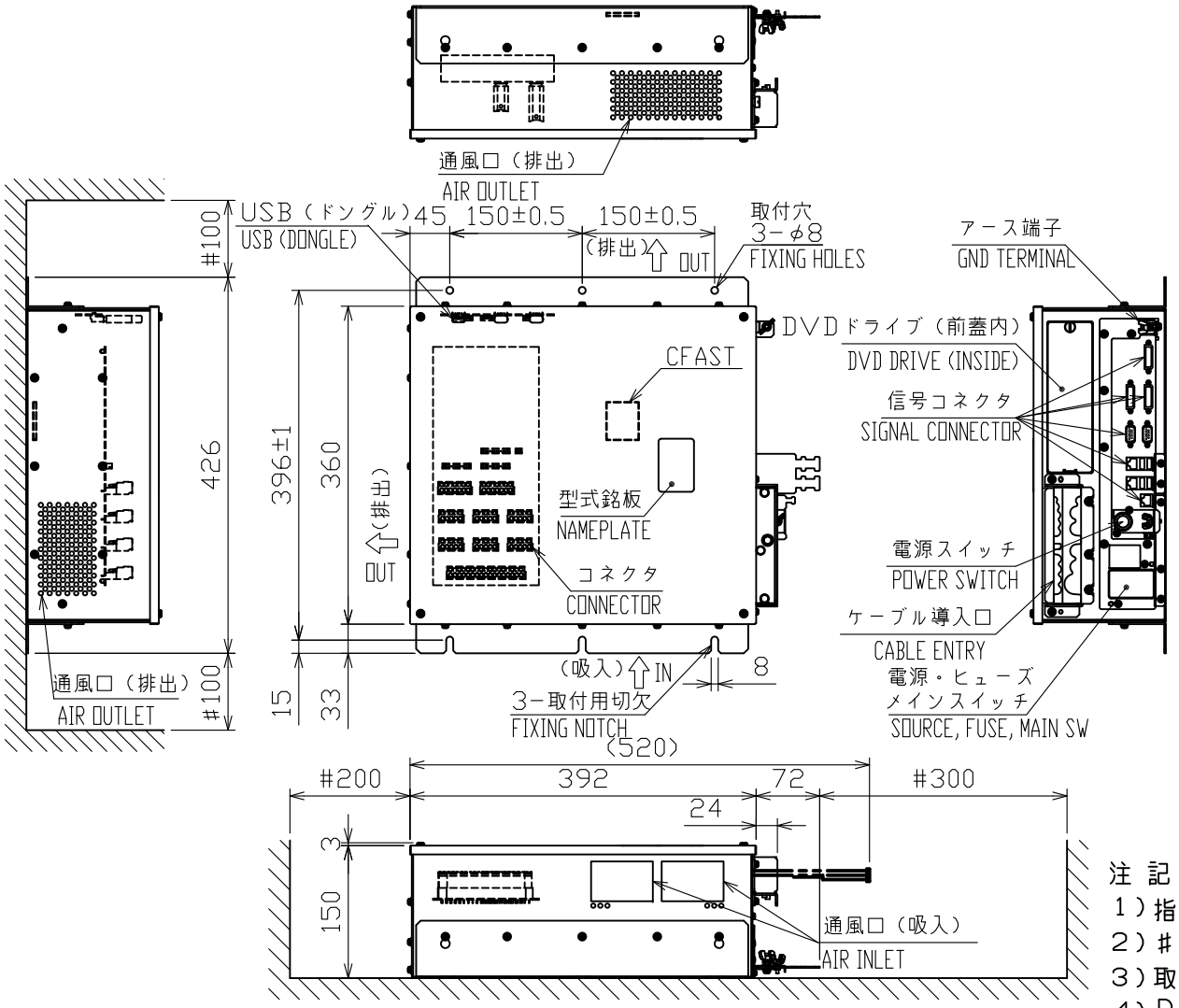


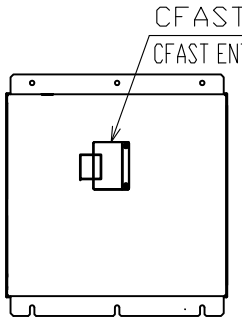


DRAWN 29/Nov/2017 T.YAMASAKI		TITLE	EC-3000
CHECKED 29/Nov/2017 H.MAKI	CD-3200/3300	名称	制御部（卓上装備）
APPROVED 29/Nov/2017 H.MAKI	FCR-2819ser. FMD-3200/3300		外寸図
SCALE 1/8 MASS 14 ±10% kg		NAME	PROCESSOR UNIT (TABLETOP MOUNT)
DWG.No. C4473-G14- B	REF.No. 24-014-010G-4		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO



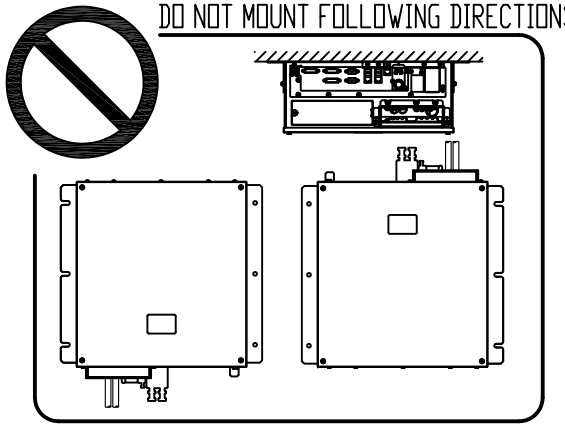


背面（尺度： 1／12）
REAR VIEW (SCALE: 1/12)

表 1 TABLE 1

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

下図の向きでは取付けできません
DO NOT MOUNT FOLLOWING DIRECTIONS



注 記
1）指定外の寸法公差は表１による。
2）＃印寸法は最小サービス空間寸法とする。
3）取付用ネジはM6ボルトまたはコーチネジ呼び径６を使用のこと。
4）ＤＶＤドライブの向きは左右いずれかとする。切欠きが下向きとなるよう取付金具（工材）を本体に取り付ける。

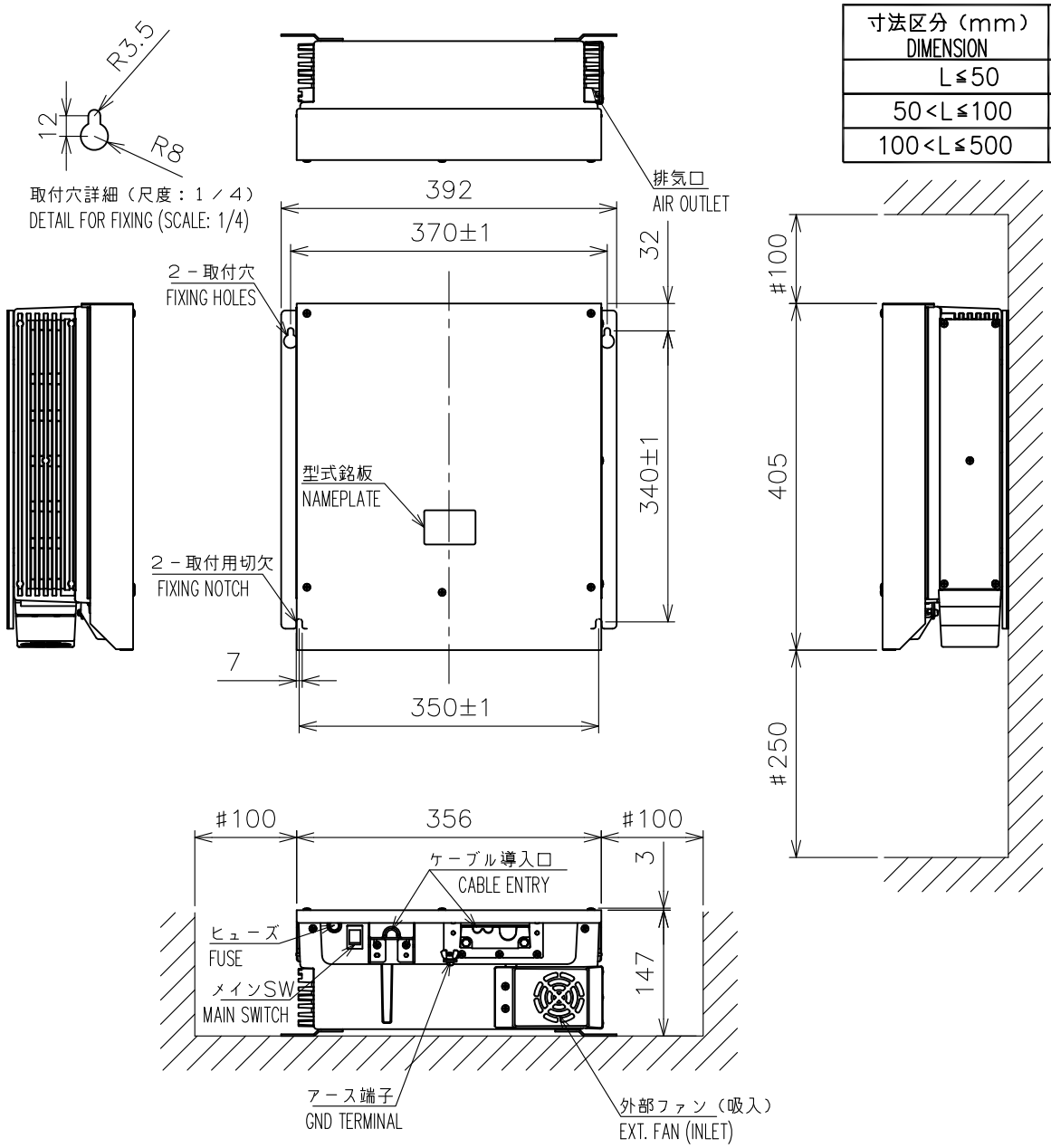
NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M6 BOLTS OR COACH SCREWS ø6 FOR FIXING THE UNIT.
4. FACE THE DVD DRIVE TO RIGHT OR LEFT SIDE EITHER. MOUNT THE FIXING PLATES (SUPPLIED) TO THE CHASSIS AS THE FIXING NOTCH FACES TO BOTTOM.

DRAWN 29/Nov/2017 T.YAMASAKI		TITLE	EC-3000
CHECKED 29/Nov/2017 H.MAKI	CD-3200/3300	名称	制御部（壁掛装備）
APPROVED 29/Nov/2017 H.MAKI	FCR-2819ser. FMD-3200/3300		外寸図
SCALE 1/8 MASS 14 ±10% kg		NAME	PROCESSOR UNIT (BULKHEAD MOUNT)
DWG.No. C4473-G01- D	REF.No. 24-014-011G-3		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

表1 TABLE 1

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



注記
1）指定外の寸法公差は表1による。
2）＃印寸法は最小サービス空間寸法とする。
3）取付用ネジはＭ６ボルトまたはコーチボルト呼び径６を使用のこと。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M6 BOLTS OR COACH SCREWS ø6 FOR FIXING THE UNIT.

DRAWN 20/Mar/2014 T.YAMASAKI		TITLE	PSU-014/016
CHECKED 20/Mar/2014 H.MAKI		名称	空中線電源部
APPROVED 24/Mar/2014 H.MAKI	FAR-3210/3220 ser.		外寸図
SCALE 1/8 MASS 8.5 ±10% kg		NAME	POWER SUPPLY UNIT
DWG. No. C3616-G01- B	REF. No. 03-182-910G-3		OUTLINE DRAWING

FURUNO

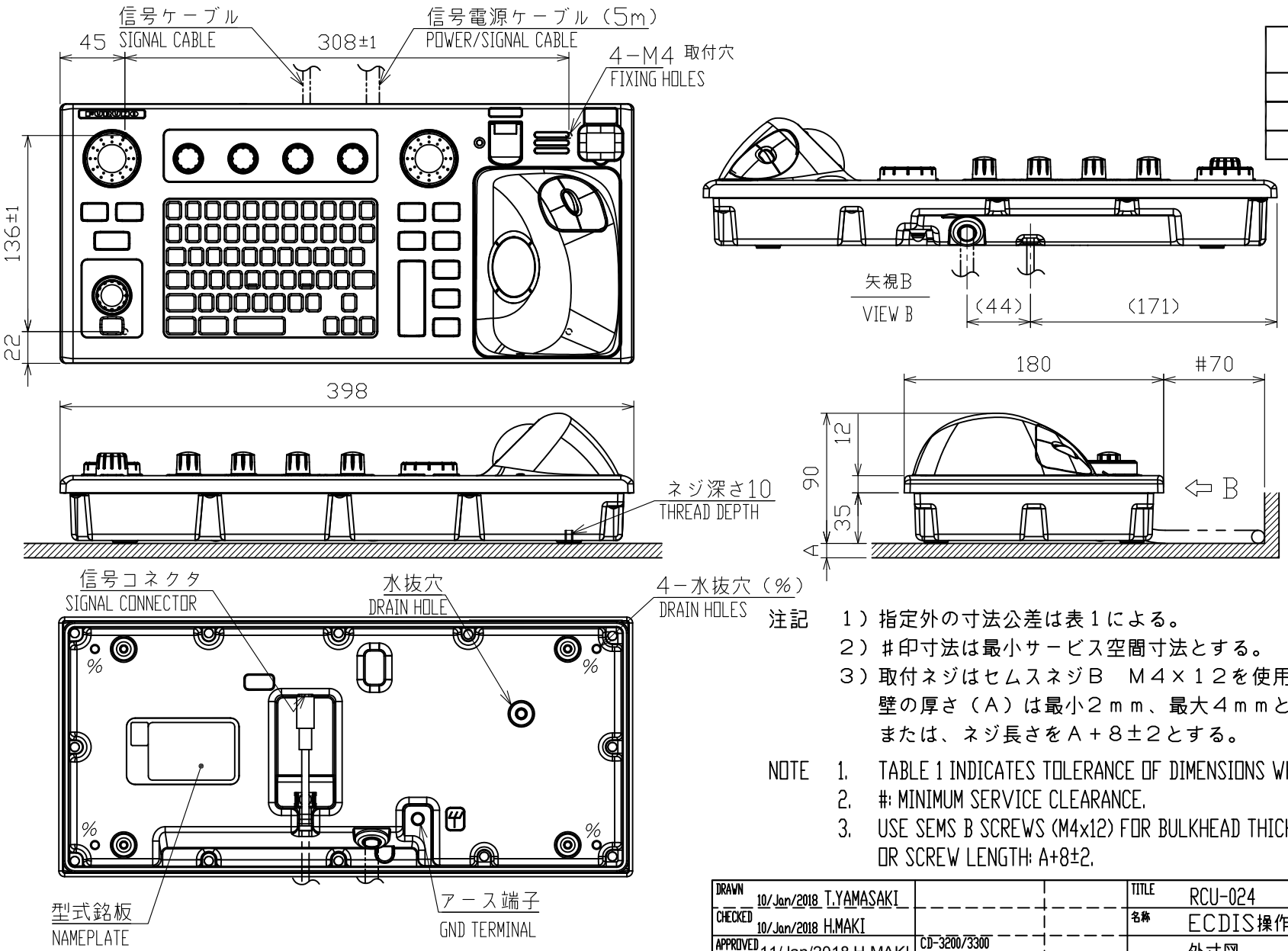


表1 TABLE 1

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

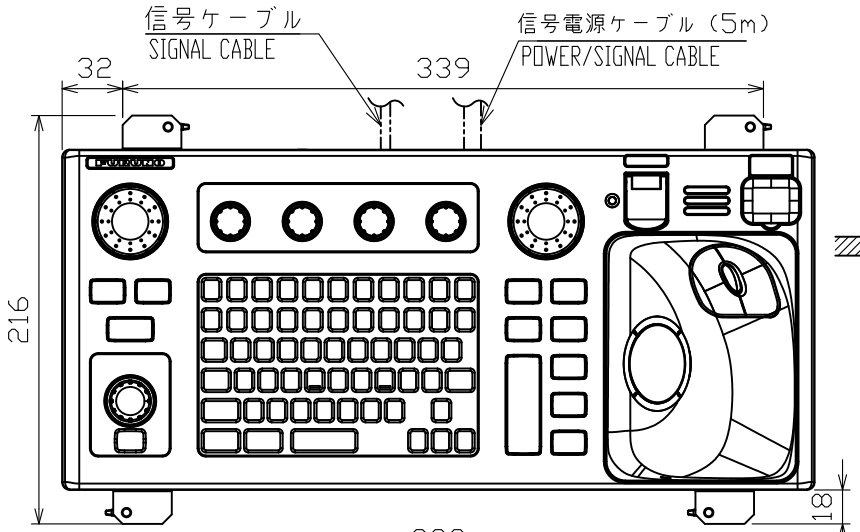
注記
1）指定外の寸法公差は表１による。
2）＃印寸法は最小サービス空間寸法とする。
3）取付ネジはセムスネジＢ　Ｍ４×１２を使用のこと。
壁の厚さ（Ａ）は最小２ｍｍ、最大４ｍｍとする。
または、ネジ長さをＡ＋８±２とする。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE SEMS B SCREWS (M4x12) FOR BULKHEAD THICKNESS(A):2≦A≦4 OR SCREW LENGTH: A+8±2.

DRAWN 10/Jan/2018 T.YAMASAKI		TITLE	RCU-024
CHECKED 10/Jan/2018 H.MAKI		名称	ECDIS操作部（卓上装備）
APPROVED 11/Jan/2018 H.MAKI	CD-3200/3300 FMD-3200/3300		外寸図
SCALE 1/4 MASS 2.1 ±10% kg	質量は5mケーブルを含む。 MASS INCLUDES 5m CABLE.	NAME	ECDIS CONTROL UNIT (TABLETOP MOUNT)
DWG.No. C4473-G19- A	REF.No. 24-014-510G-1		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO



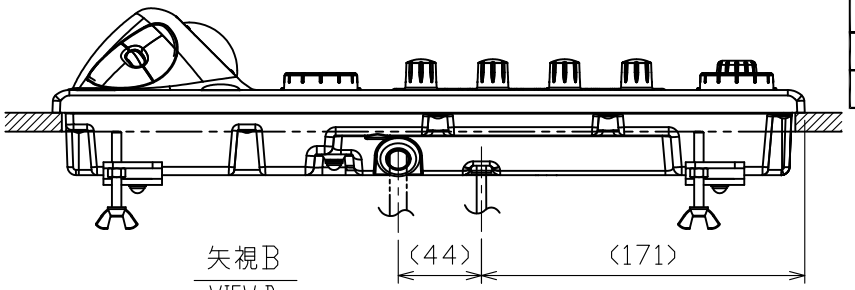
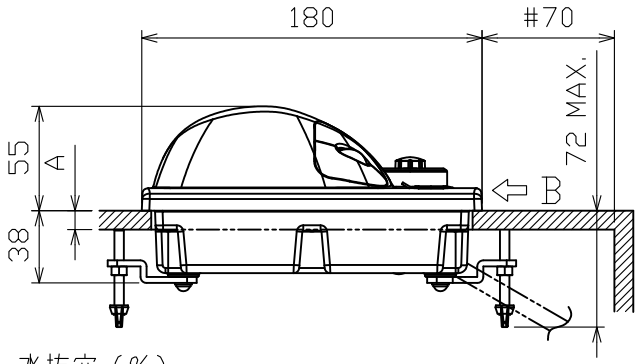
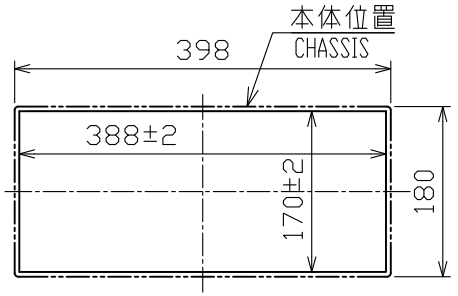


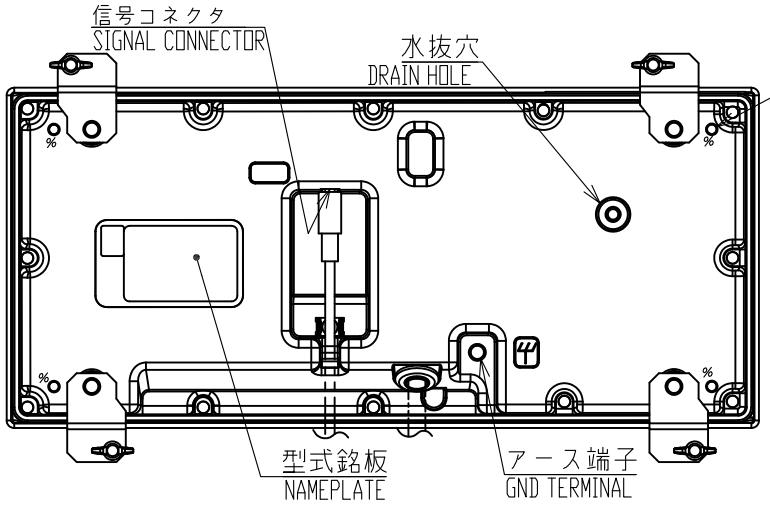
表1 TABLE 1

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





取付穴寸法（尺度：1/8）
CUTOUT DIMENSIONS (SCALE: 1/8)



注記　1）指定外の寸法公差は表1による。
2）＃印寸法は最小サービス空間寸法とする。
3）壁の厚さ（A）は最小10mm、最大20mmとする。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. BULKHEAD THICKNESS(A): 10≦A≦20.

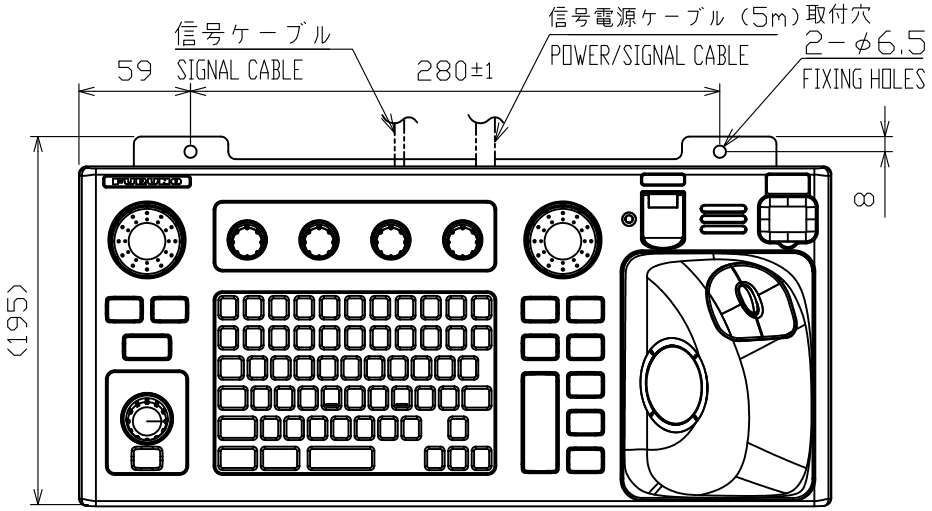
DRAWN 10/Jan/2018 T.YAMASAKI		TITLE	RCU-024
CHECKED 10/Jan/2018 H.MAKI		名称	ECDIS操作部（埋込装備）
APPROVED 11/Jan/2018 H.MAKI	CD-3200/3300 FMD-3200/3300		外寸図
SCALE 1/4 MASS 2.3 ±10% kg	質量は5mケーブルを含む。 MASS INCLUDES 5m CABLE.	NAME	ECDIS CONTROL UNIT (FLUSH MOUNT)
DWG.No. C4473-G18- A	REF.No. 24-014-500G-1		OUTLINE DRAWING

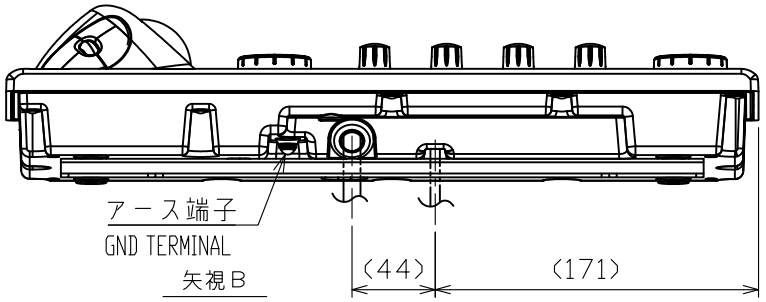
FURUNO ELECTRIC CO., LTD.

FURUNO

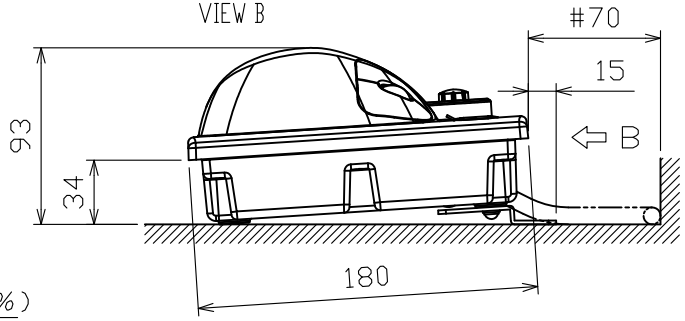
表1 TABLE 1

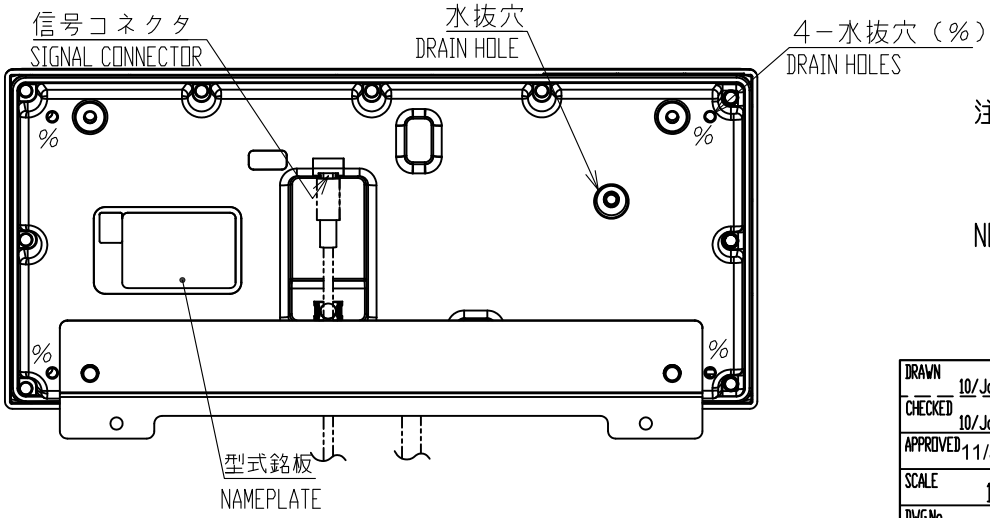
寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3





矢視B
VIEW B





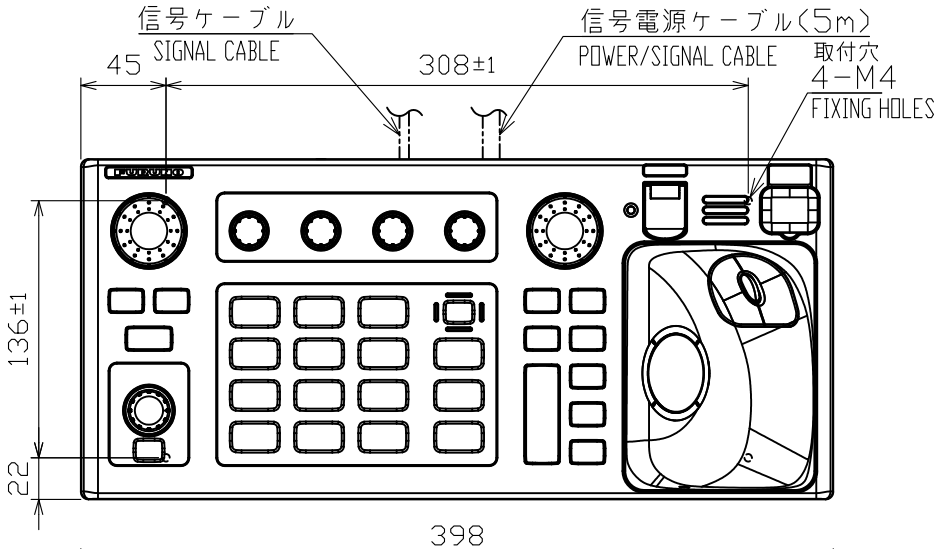
注記　1）指定外の寸法公差は表1による。
　　2）#印寸法は最小サービス空間寸法とする。
　　3）壁の厚さ（A）は最小10mm、最大20mmとする。

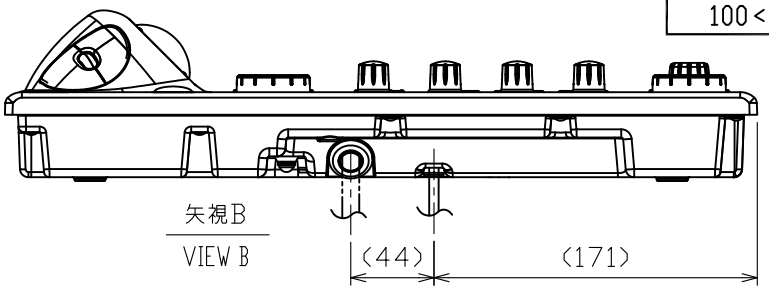
NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. BULKHEAD THICKNESS(A): 10≦A≦20.

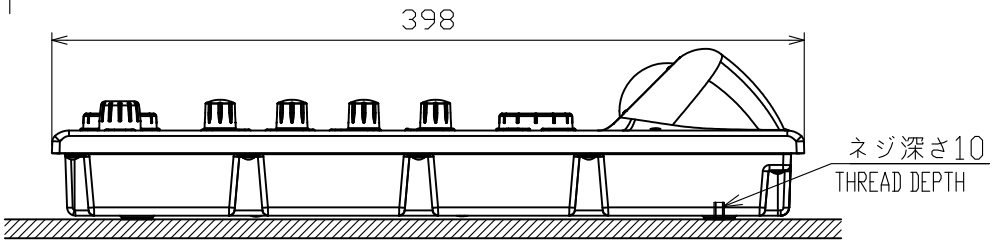
DRAWN 10/Jan/2018 T.YAMASAKI		TITLE	RCU-024
CHECKED 10/Jan/2018 H.MAKI		名称	ECDIS操作部（取付金具）
APPROVED 11/Jan/2018 H.MAKI	CD-3200/3300 FMD-3200/3300		外寸図
SCALE 1/4 MASS 2.4 ±10% kg	質量は5mケーブルを含む。 MASS INCLUDES 5m CABLE.	NAME	ECDIS CONTROL UNIT (FIXTURE MOUNT)
DWG.No. C4473-G20- A	REF.No. 24-014-520G-1		OUTLINE DRAWING

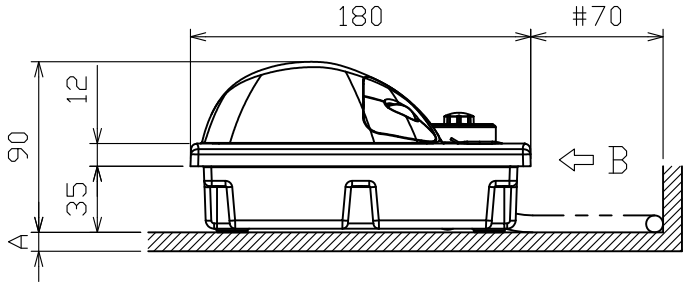
FURUNO ELECTRIC CO., LTD.

FURUNO









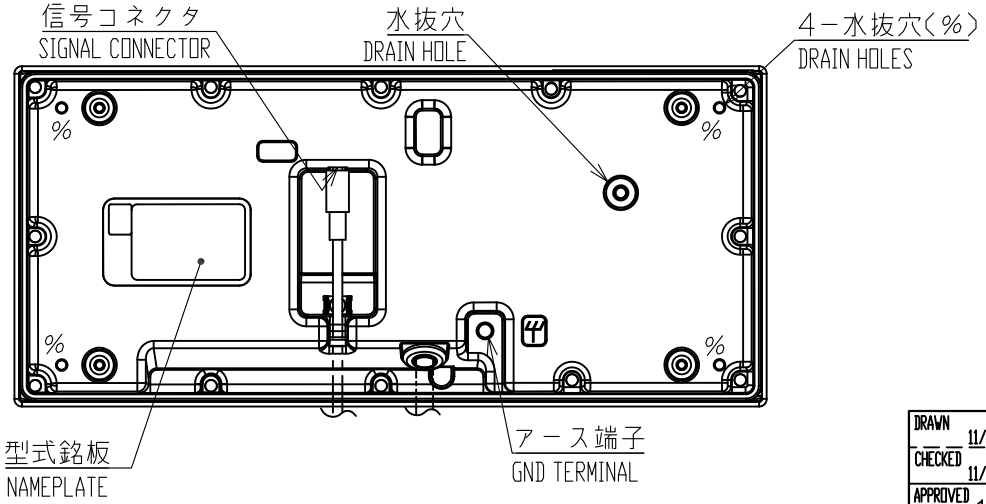


表1 TABLE 1

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

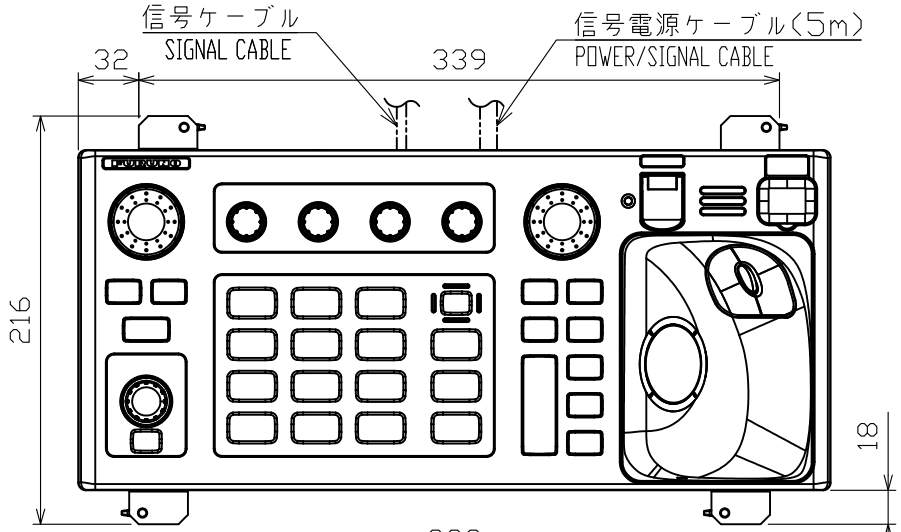
注 記 1） 指定外の寸法公差は表１による。
2） ＃印寸法は最小サービス空間寸法とする。
3） 取付ネジはセムスネジＢ Ｍ４×１２を使用のこと。
壁の厚さ（Ａ）は最小２、最大４とする。
または、ねじ長さを（Ａ＋８±２）とする。

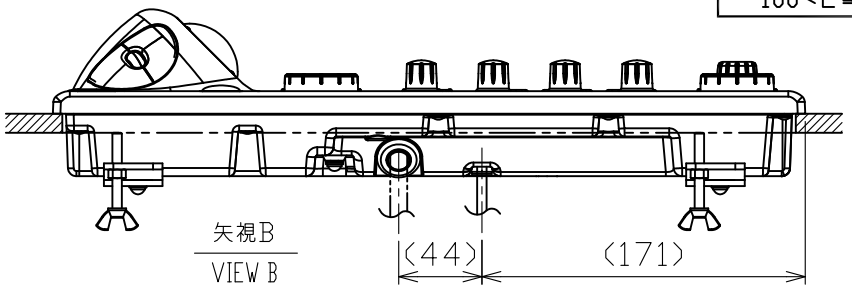
NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE SEMS B SCREWS M4×12 FOR FIXING THE UNIT.
BULKHEAD THICKNESS (A): 2≦A≦4 OR SCREW LENGTH: A+8±2.

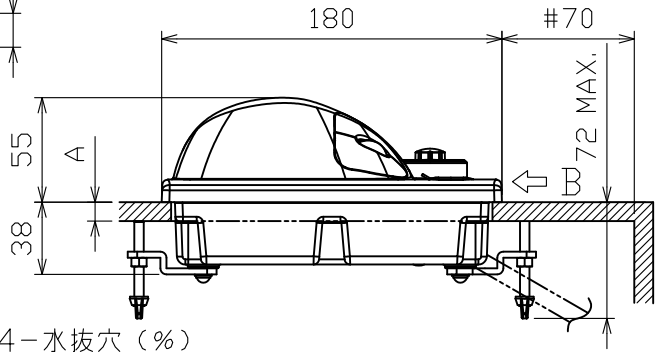
DRAWN 11/Jan/2018 T.YAMASAKI		TITLE	RCU-025
CHECKED 11/Jan/2018 H.MAKI		名称	レーダー操作部（卓上装備）
APPROVED 11/Jan/2018 H.MAKI	FAR-32x0/33x0 FCR-21x9/28x9		外寸図
SCALE 1/4 MASS 2.1 ±10% kg	質量は5mケーブルを含む。 MASS INCLUDES 5m CABLE.	NAME	RADAR CONTROL UNIT (TABLETOP MOUNT)
DWG.No. C3607-G05- A	REF.No. 03-179-200G-0		OUTLINE DRAWING

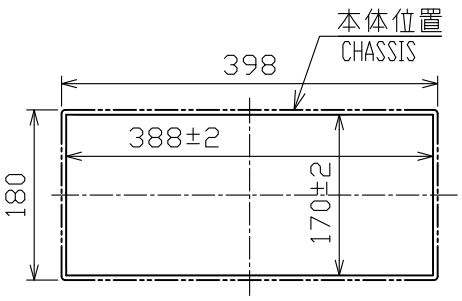
FURUNO ELECTRIC CO., LTD.

FURUNO









取付穴寸法（尺度：1／8）
CUTOUT DIMENSIONS (SCALE: 1/8)

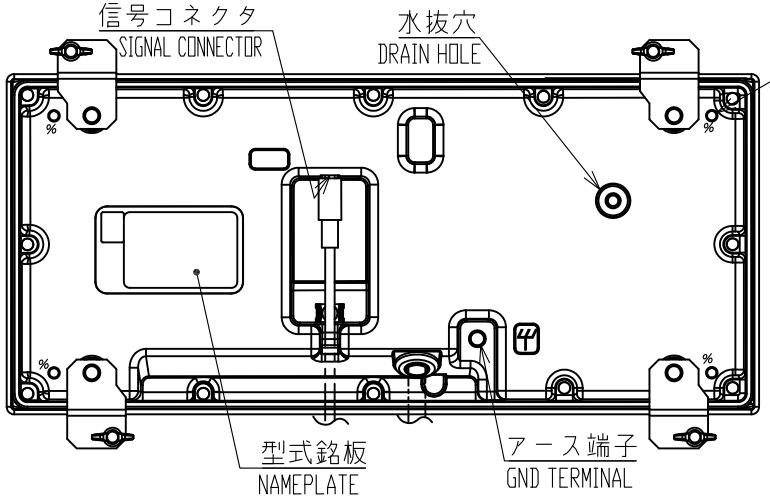


表1 TABLE 1

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

注記　1）指定外の寸法公差は表1による。
2）＃印寸法は最小サービス空間寸法とする。
3）壁の厚さ（A）は最小10mm、最大20mmとする。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. BULKHEAD THICKNESS(A): 10≦A≦20.

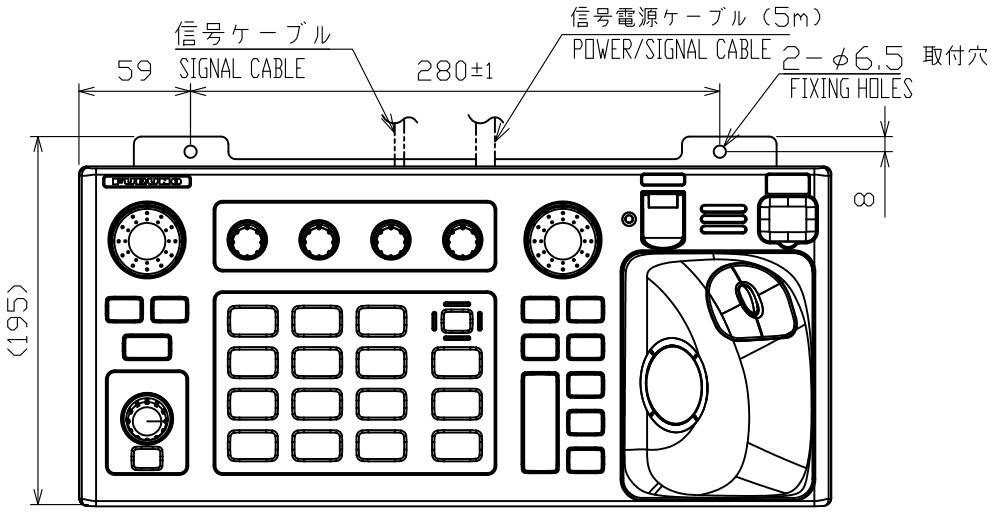
DRAWN 11/Jan/2018 T.YAMASAKI		TITLE	RCU-025
CHECKED 11/Jan/2018 H.MAKI		名称	レーダー操作部（埋込装備）
APPROVED 11/Jan/2018 H.MAKI	FAR-32x0/33x0 FCR-21x9/28x9		外寸図
SCALE 1/4 MASS 2.3 ±10% kg	質量は5mケーブルを含む。 MASS INCLUDES 5m CABLE.	NAME	RADAR CONTROL UNIT (FLUSH MOUNT)
DWG.No. C3607-G06-A	REF.No. 03-179-210G-0		OUTLINE DRAWING

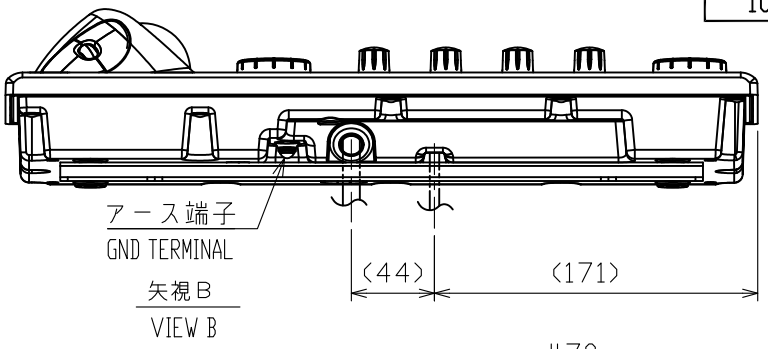
FURUNO ELECTRIC CO., LTD.

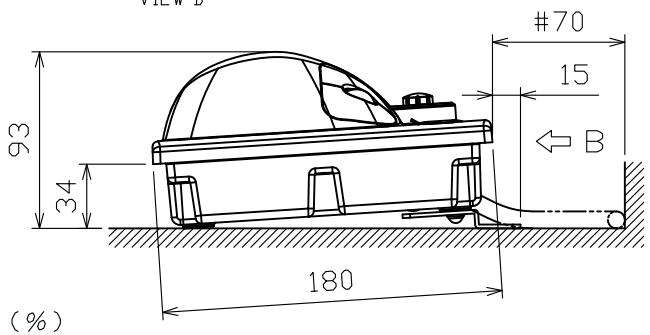
FURUNO

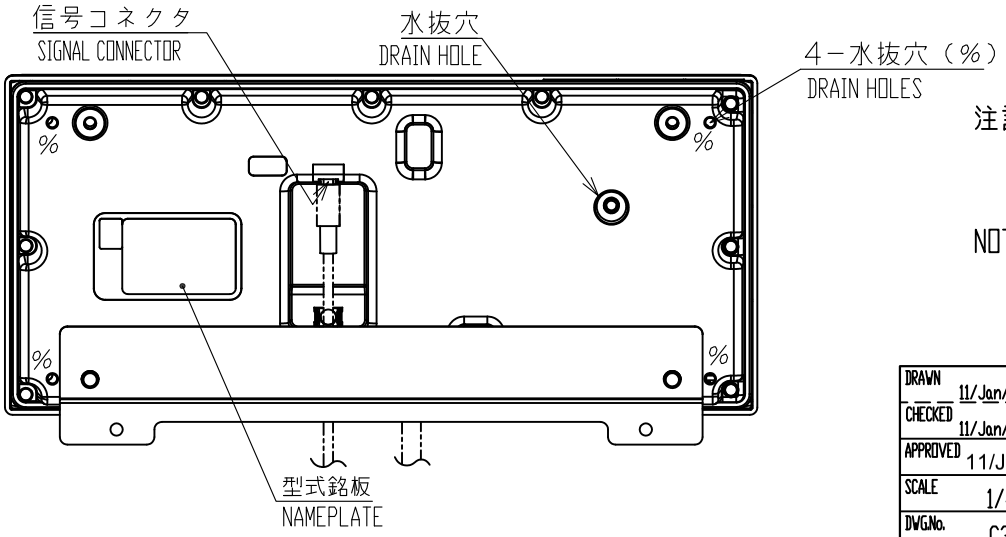
表1 TABLE 1

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









注記 1）指定外の寸法公差は表1による。
2）＃印寸法は最小サービス空間寸法とする。
3）壁の厚さ（A）は最小10mm、最大20mmとする。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. BULKHEAD THICKNESS(A): 10≦A≦20.

DRAWN 11/Jan/2018 T.YAMASAKI		TITLE	RCU-025
CHECKED 11/Jan/2018 H.MAKI		名称	レーダー操作部（取付金具）
APPROVED 11/Jan/2018 H.MAKI	FAR-32x0/33x0 FCR-21x9/28x9		外寸図
SCALE 1/4 MASS 2.4 ±10% kg	質量は5mケーブルを含む。 MASS INCLUDES 5m CABLE.	NAME	RADAR CONTROL UNIT (FIXTURE MOUNT)
DWG.No. C3607-G07-A	REF.No. 03-179-220G-0		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

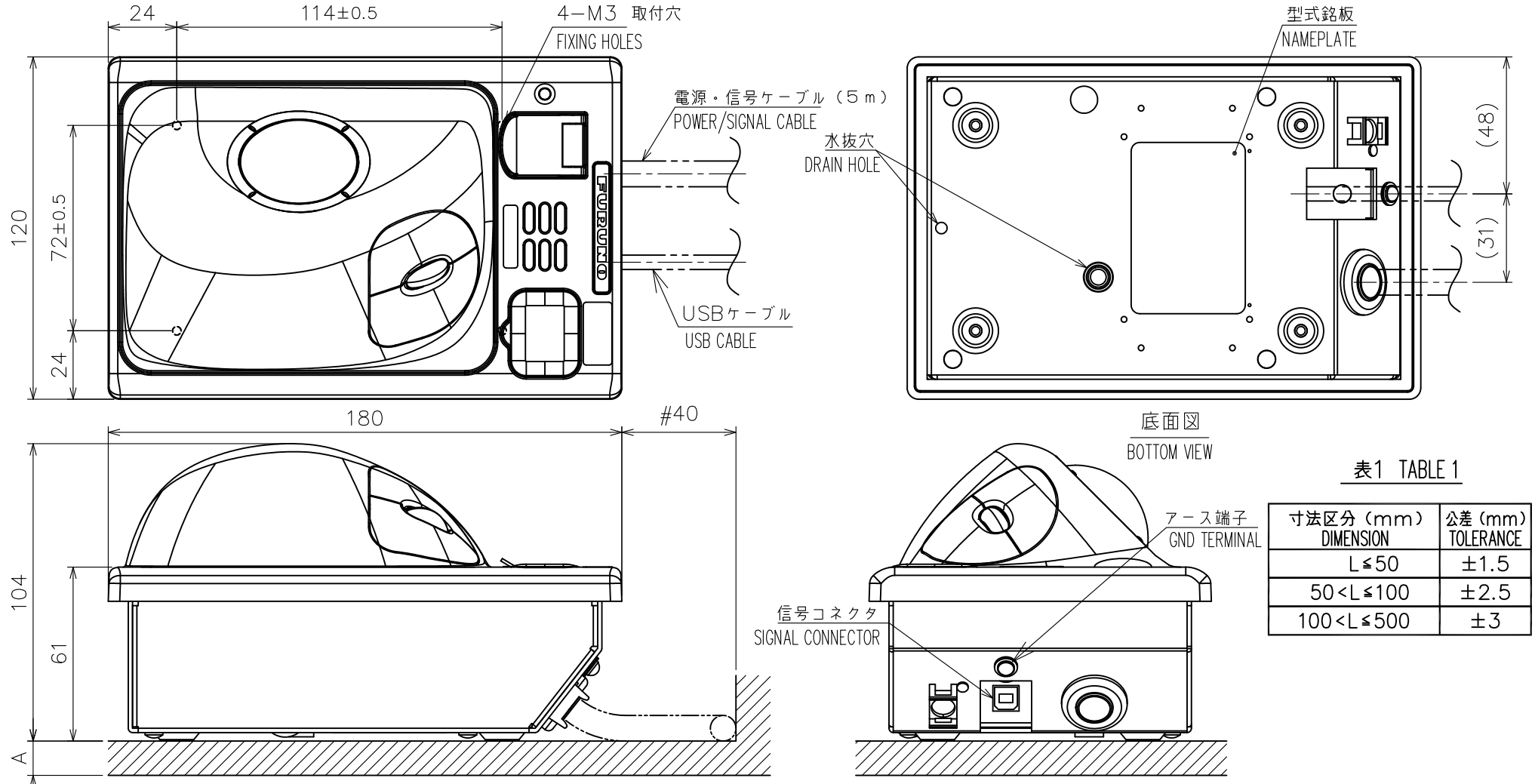


表1 TABLE 1

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

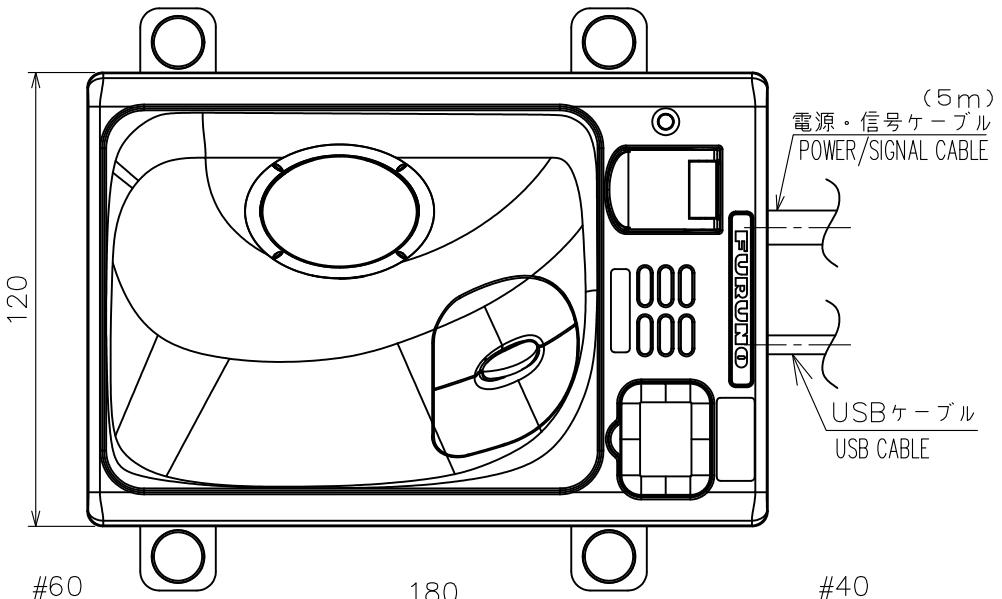
注 記 １）指定外の寸法公差は表１による。
２）＃印寸法は最小サービス空間寸法とする。
３）取付ネジはセムスネジＢ Ｍ３×１２を使用のこと。壁の厚さ（Ａ）は最小２、最大４とする。それ以外はねじ長さをＡ＋８±２とする。

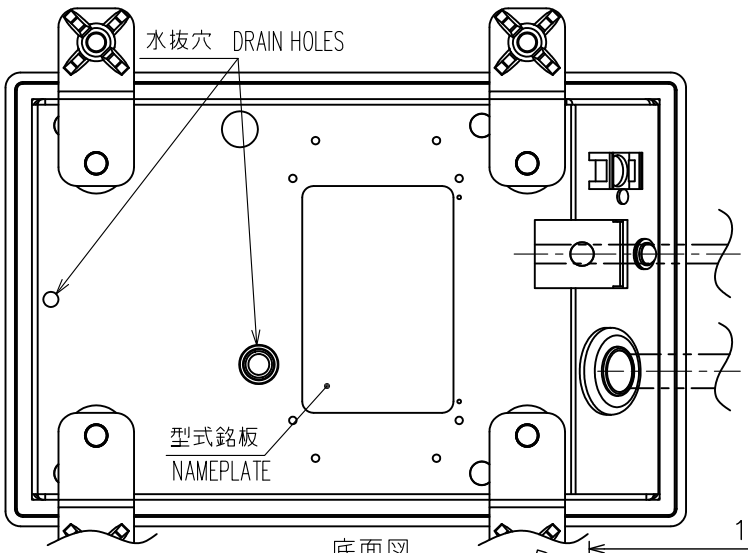
NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE SEMS B SCREWS M3x12 FOR BULKHEAD THICKNESS (A): 2≦A≦4.
OR SCREW LENGTH: A+8±2.

DRAWN 14/Jun/2018 T.YAMASAKI		TITLE	RCU-026
CHECKED 14/Jun/2018 H.MAKI		名称	トラックボール操作部（卓上装備）
APPROVED 14/Jun/2018 H.MAKI	FMD-3200		外寸図
SCALE 1/2 MASS 1.4 ±10% kg	質量は5mケーブルを含む。 MASS INCLUDES 5m CABLE.	NAME	TRACKBALL CONTROL UNIT (TABLETOP MOUNT)
DWG.No. C4473-G05- C	REF.No. 24-014-150G-2		OUTLINE DRAWING

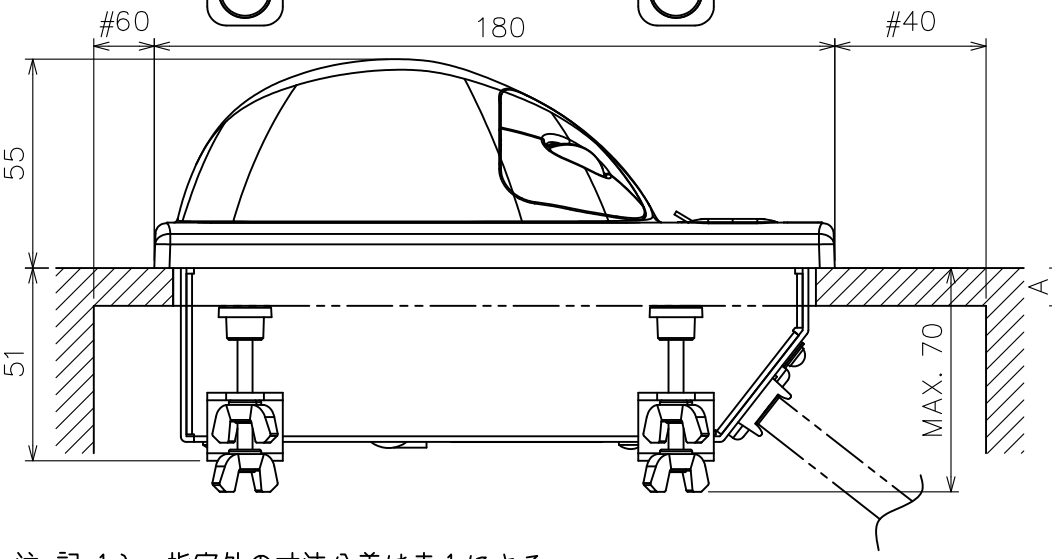
FURUNO ELECTRIC CO., LTD.

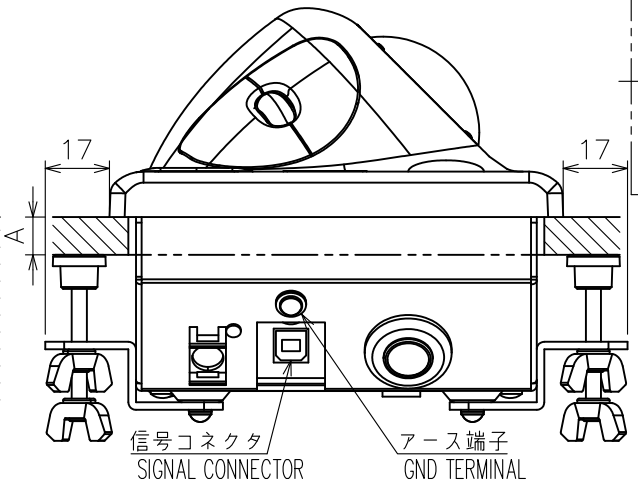
FURUNO

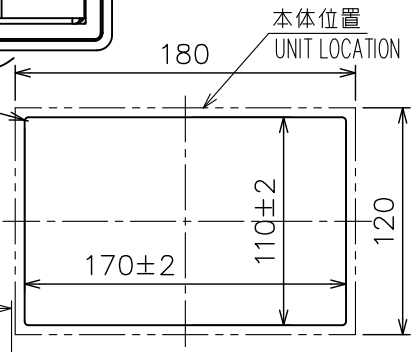




底面図
BOTTOM VIEW







取付穴寸法（尺度：1／4）
CUTOUT DIMENSIONS (SCALE: 1/4)

表1 TABLE 1

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

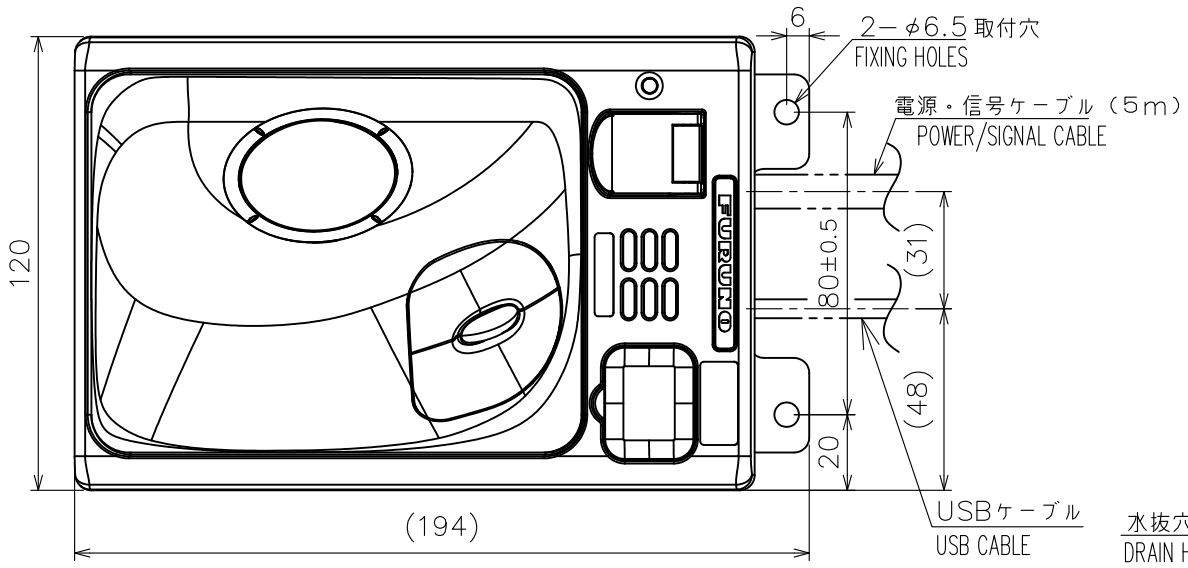
注 記 1） 指定外の寸法公差は表１による。
2） ＃印寸法は最小サービス空間寸法とする。
3） 壁の厚さ（Ａ）は最小１０ｍｍ、最大２０ｍｍとする。

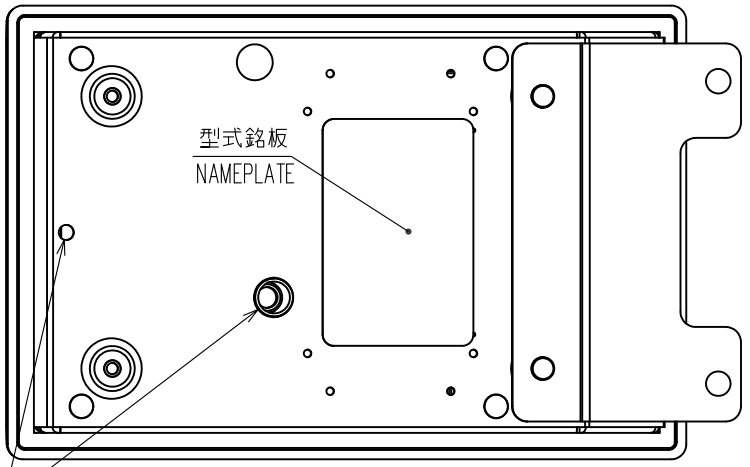
NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. BULKHEAD THICKNESS (A): 10≦A≦20.

DRAWN 14/Jun/2018 T.YAMASAKI		TITLE	RCU-026
CHECKED 14/Jun/2018 H.MAKI		名称	トラックボール操作部（埋込装備）
APPROVED 14/Jun/2018 H.MAKI	FMD-3200		外寸図
SCALE 1/2 MASS 1.5 ±10% kg	質量は5mケーブルを含む。 MASS INCLUDES 5m CABLE.	NAME	TRACKBALL CONTROL UNIT (FLUSH MOUNT)
DWG.No. C4473-G06- C	REF.No. 24-014-160G-2		OUTLINE DRAWING

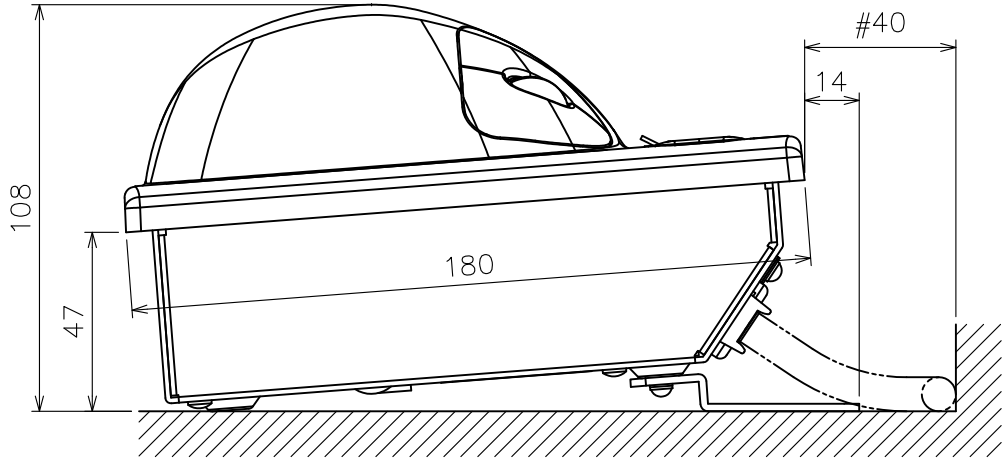
FURUNO ELECTRIC CO., LTD.

FURUNO





底面図
BOTTOM VIEW



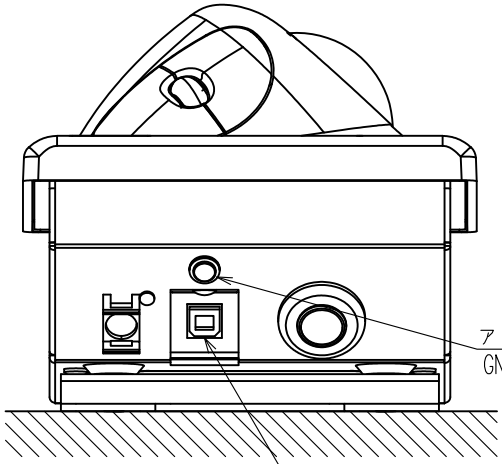


表1 TABLE 1

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

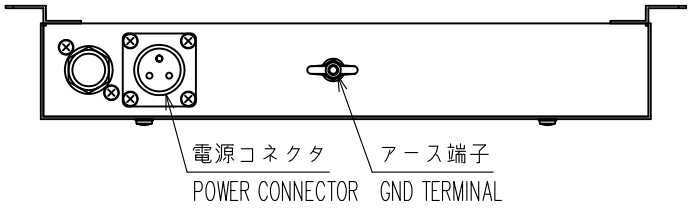
注　記　1）　指定外の寸法公差は表１による。
　　2）　＃印寸法は最小サービス空間寸法とする。
　　3）　取付ネジはトラスタッピンネジ呼び径５Ｘ２０を使用のこと。

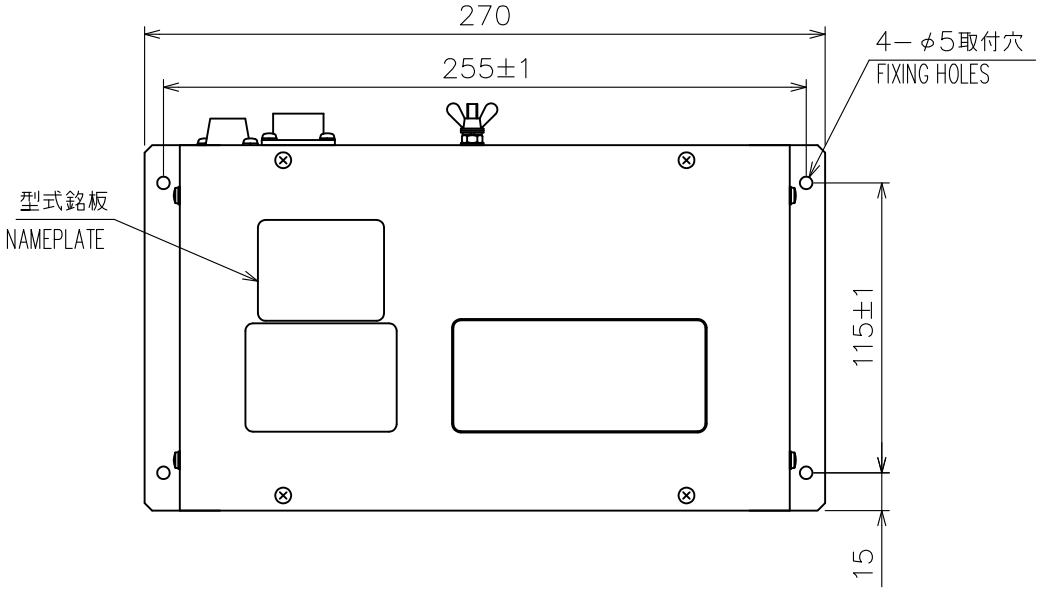
NOTE　1.　TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
　　2.　#: MINIMUM SERVICE CLEARANCE.
　　3.　USE TAPPING SCREWS ø5x20 FOR FIXING THE UNIT.

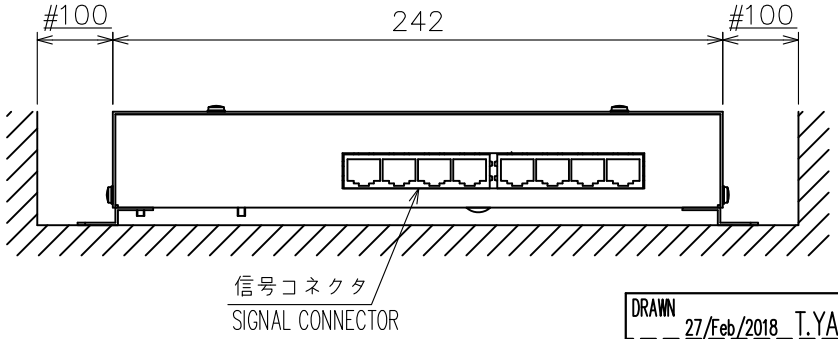
DRAWN 14/Jun/2018 T.YAMASAKI		TITLE	RCU-026
CHECKED 14/Jun/2018 H.MAKI		名称	トラックボール操作部（取付金具）
APPROVED 14/Jun/2018 H.MAKI	FMD-3200		外寸図
SCALE 1/2 MASS 1.5 ±10% kg	質量は5mケーブルを含む。 MASS INCLUDES 5m CABLE.	NAME	TRACKBALL CONTROL UNIT (FIXTURE MOUNT)
DWG.No. C4473-G07- C	REF.No. 24-014-170G-2		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO







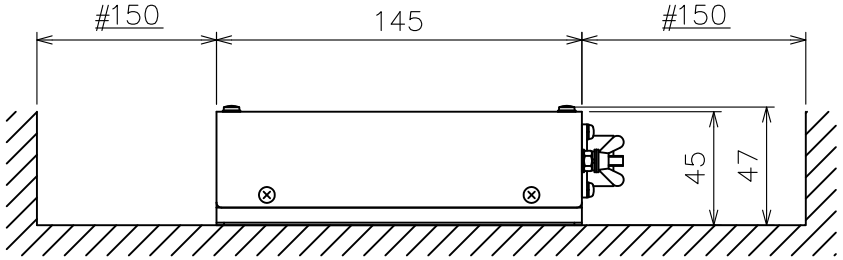


表１　TABLE 1

寸法区分（ｍｍ） DIMENSIONS	公差（ｍｍ） TOLERANCE
Ｌ≦５０	±１．５
５０<Ｌ≦１００	±２．５
１００<Ｌ≦５００	±３

注　記

１）　指定外寸法公差は表１による
２）　＃印寸法は最小サービス空間寸法とする
３）　取付用ネジはトラスタッピンネジ呼び径４×１６を使用のこと

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4x16 FOR FIXING THE UNIT.

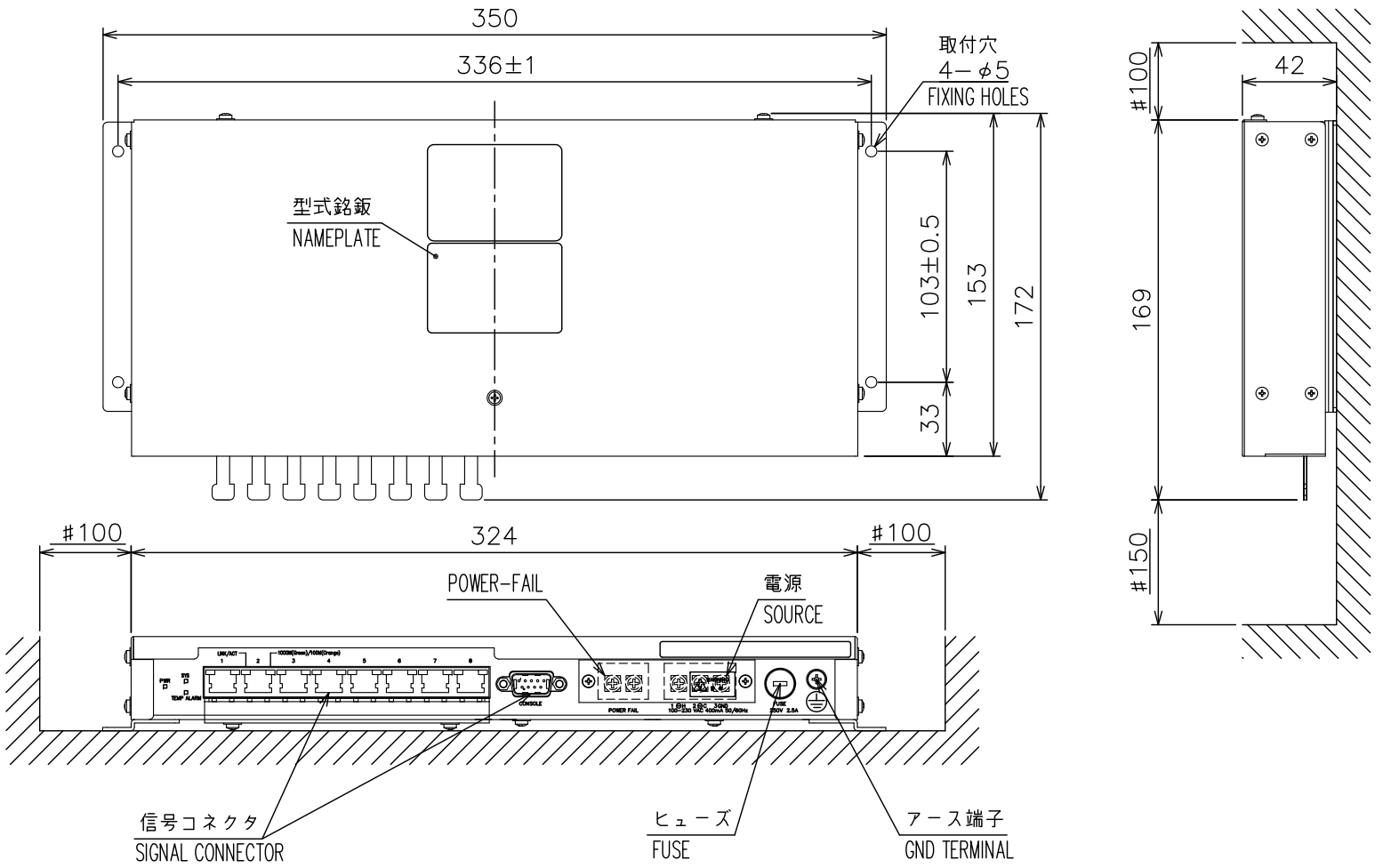
DRAWN 27/Feb/2018 T.YAMASAKI		TITLE	HUB-100
CHECKED 27/Feb/2018 H.MAKI		名称	イーサネットスイッチングハブ
APPROVED 28/Feb/2018 H.MAKI			外寸図
SCALE 1/3	MASS 1.5 ±10% kg	NAME	SWITCHING HUB
DWG. No. C3519-G18- C	REF. No. 03-163-960G-4		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

表1 TABLE 1

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



注 記 1） 指定外の寸法公差は表１による。
2） ＃印寸法は最小サービス空間寸法とする。
3） 取付用ネジはトラスタッピンネジ呼び径４×２０を使用のこと。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4x20 FOR FIXING THE UNIT.

DRAWN 8/Jun/2018 T.YAMASAKI		TITLE	HUB-3000
CHECKED 8/Jun/2018 H.MAKI		名称	インテリジェントハブ
APPROVED 8/Jun/2018 H.MAKI	FMD-3200		外寸図
SCALE 1/3 MASS 1.5 ±10% kg	質量はケーブルを含まず。 MASS DOES NOT INCLUDE CABLE.	NAME	INTELLIGENT HUB
DWG. No. C4473-G12- C	REF. No. 24-014-350G-2		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

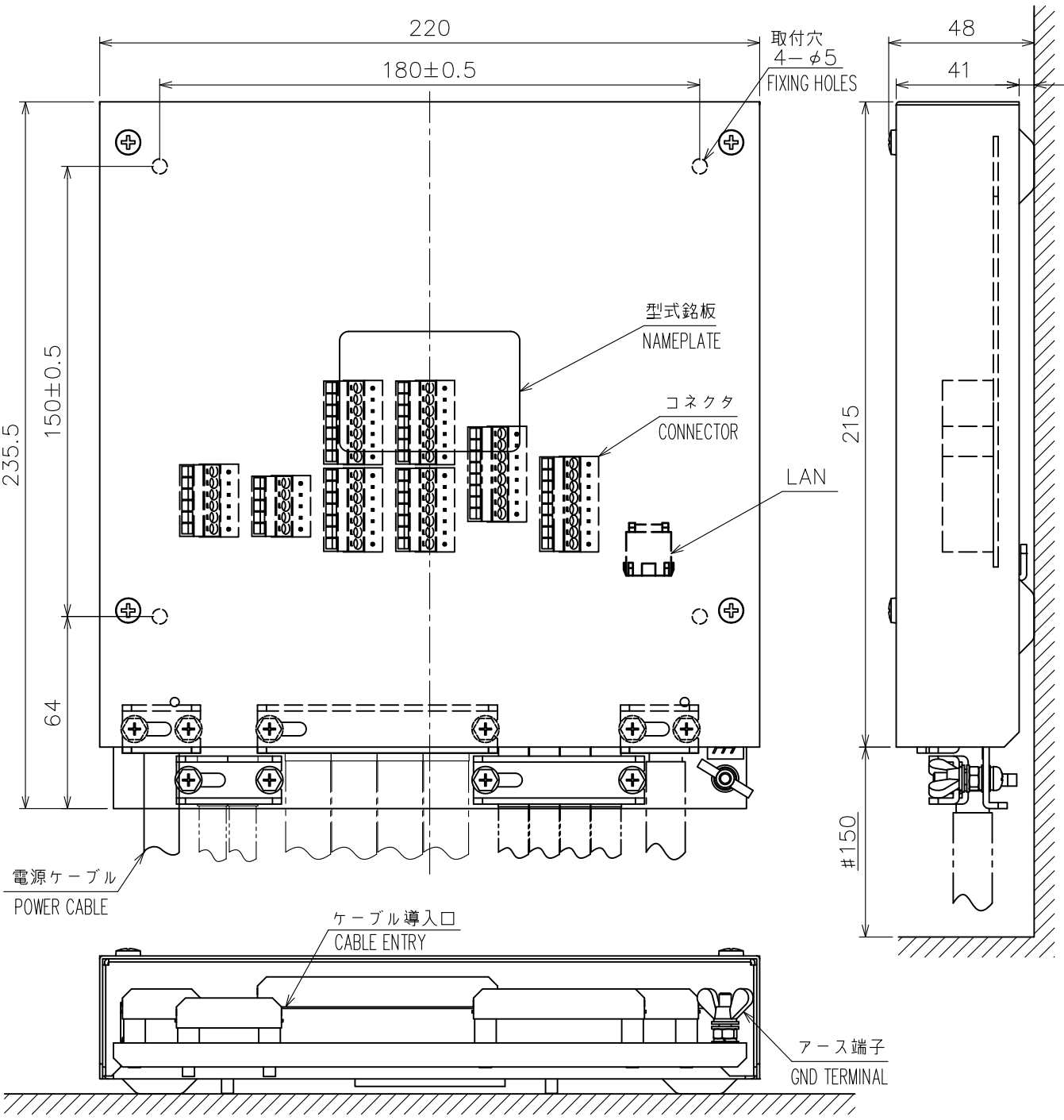


表1 TABLE 1

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

注 記 1） 指定外の寸法公差は表１による。
2） ＃印寸法は最小サービス空間寸法とする。
3） 取付用ネジはトラスタッピンネジ呼び径４×２０を使用のこと。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4x20 FOR FIXING THE UNIT.

DRAWN 11/Jan/2012 T.YAMASAKI		TITLE	MC-3000S
CHECKED 11/Jan/2012 H.MAKI		名称	センサーアダプター（シリアル）
APPROVED 13/Jan/2012 Y.NISHIYAMA	FMD-3200		外寸図
SCALE 1/2 MASS 1.5 ±10% kg	質量はケーブルを含まず。 MASS DOES NOT INCLUDE CABLE.	NAME	SENSOR ADAPTER (SERIAL)
DWG. No. C4473-G08- A	REF. No. 24-014-200G-1		OUTLINE DRAWING

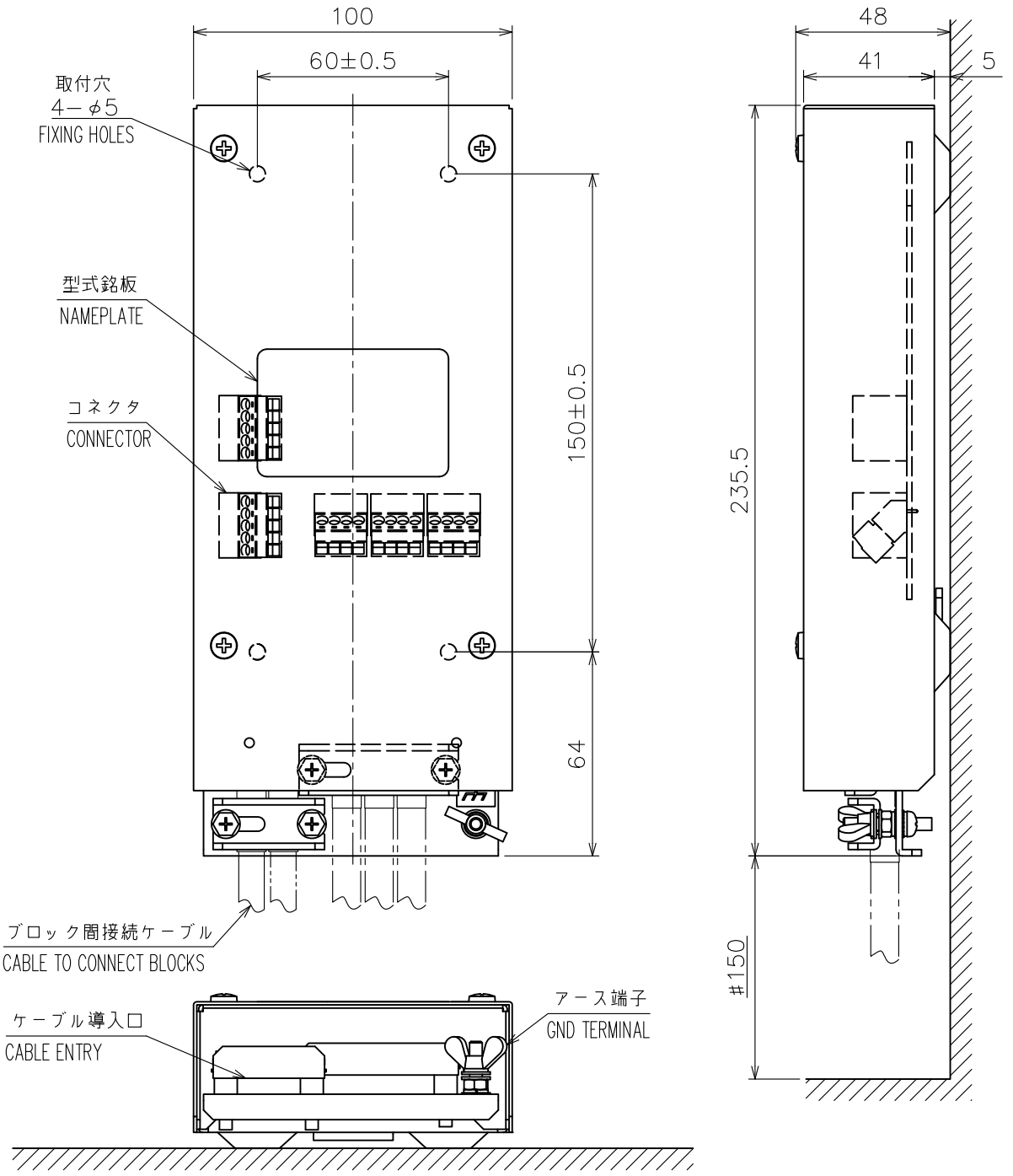


表1 TABLE 1

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

注 記 1） 指定外の寸法公差は表１による。
2） ＃印寸法は最小サービス空間寸法とする。
3） 取付用ネジはトラスタッピンネジ呼び径４×２０を使用のこと。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4x20 FOR FIXING THE UNIT.

DRAWN 11/Jan/2012 T.YAMASAKI		TITLE	MC-3010A
CHECKED 11/Jan/2012 H.MAKI		名称	センサーアダプター（アナログ）
APPROVED 13/Jan/2012 Y.NISHIYAMA	FMD-3200		外寸図
SCALE 1/2 MASS 0.8 ±10% kg	質量はケーブルを含まず。 MASS DOES NOT INCLUDE CABLE.	NAME	SENSOR ADAPTER (ANALOG)
DWG. No. C4473-G09- A	REF. No. 24-014-210G-1		OUTLINE DRAWING

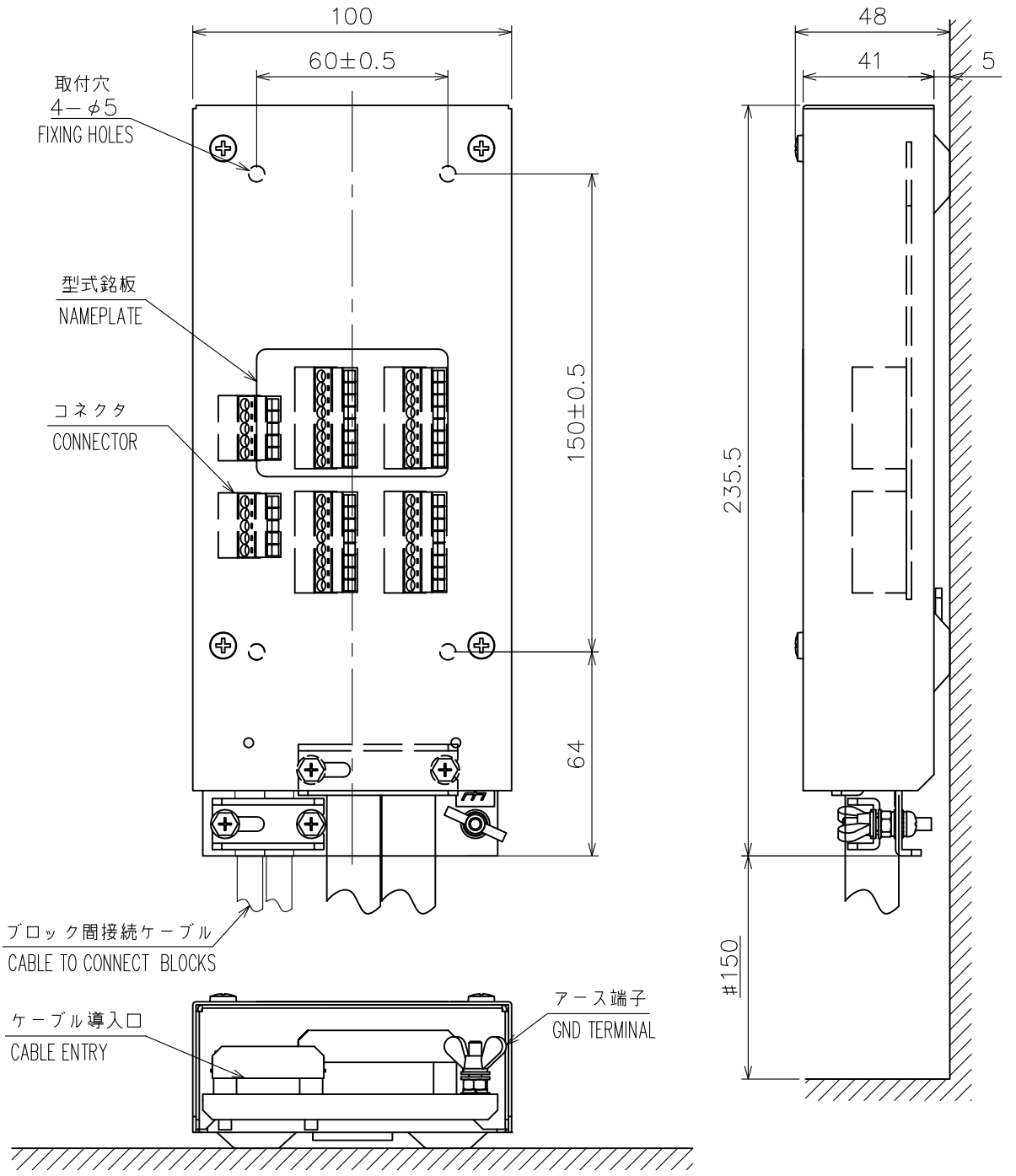


表1 TABLE 1

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

注 記 1） 指定外の寸法公差は表１による。
2） ＃印寸法は最小サービス空間寸法とする。
3） 取付用ネジはトラスタッピンネジ呼び径４×２０を使用のこと。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4x20 FOR FIXING THE UNIT.

DRAWN 11/Jan/2012 T.YAMASAKI		TITLE	MC-3020D
CHECKED 11/Jan/2012 H.MAKI		名称	センサーアダプター（デジタルイン）
APPROVED 13/Jan/2012 Y.NISHIYAMA	FMD-3200		外寸図
SCALE 1/2 MASS 0.8 ±10% kg	質量はケーブルを含まず。 MASS DOES NOT INCLUDE CABLE.	NAME	SENSOR ADAPTER (DIGITAL IN)
DWG. No. C4473-G10- A	REF. No. 24-014-220G-1		OUTLINE DRAWING

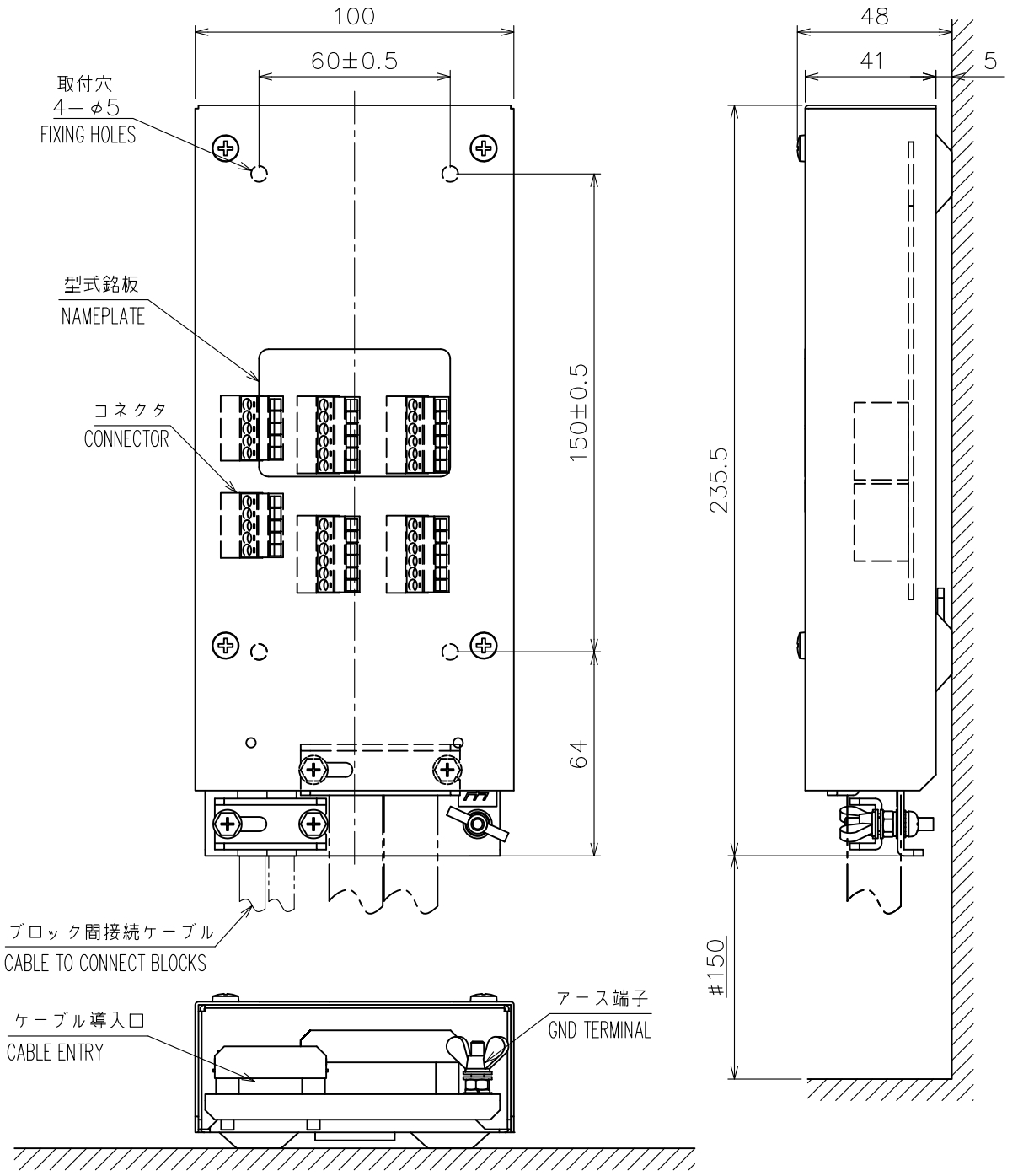


表1 TABLE 1

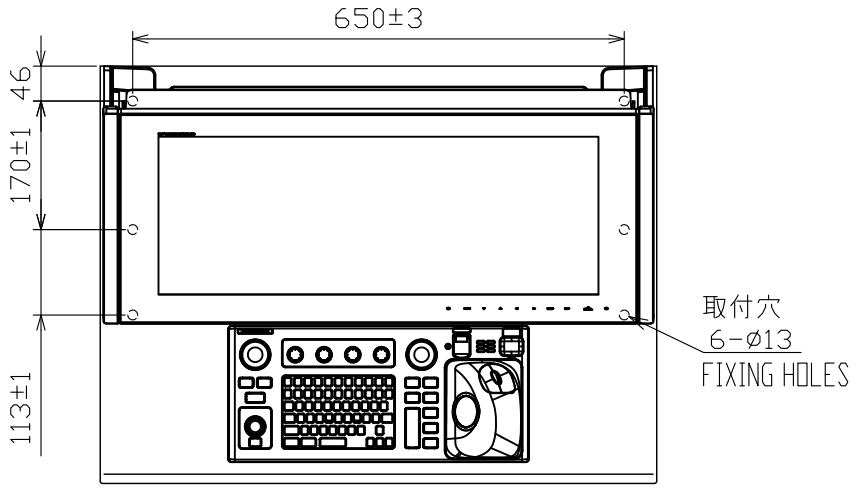
寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

注 記 1） 指定外の寸法公差は表１による。
2） ＃印寸法は最小サービス空間寸法とする。
3） 取付用ネジはトラスタッピンネジ呼び径４×２０を使用のこと。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4x20 FOR FIXING THE UNIT.

DRAWN 11/Jan/2012 T.YAMASAKI		TITLE	MC-3030D
CHECKED 11/Jan/2012 H.MAKI		名称	センサーアダプター（デジタルアウト）
APPROVED 13/Jan/2012 Y.NISHIYAMA	FMD-3200		外寸図
SCALE 1/2 MASS 0.8 ±10% kg	質量はケーブルを含まず。 MASS DOES NOT INCLUDE CABLE.	NAME	SENSOR ADAPTER (DIGITAL OUT)
DWG. No. C4473-G11- A	REF. No. 24-014-230G-1		OUTLINE DRAWING

FURUNO



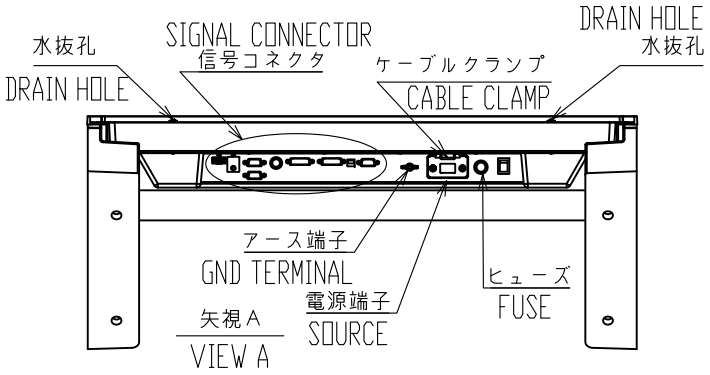
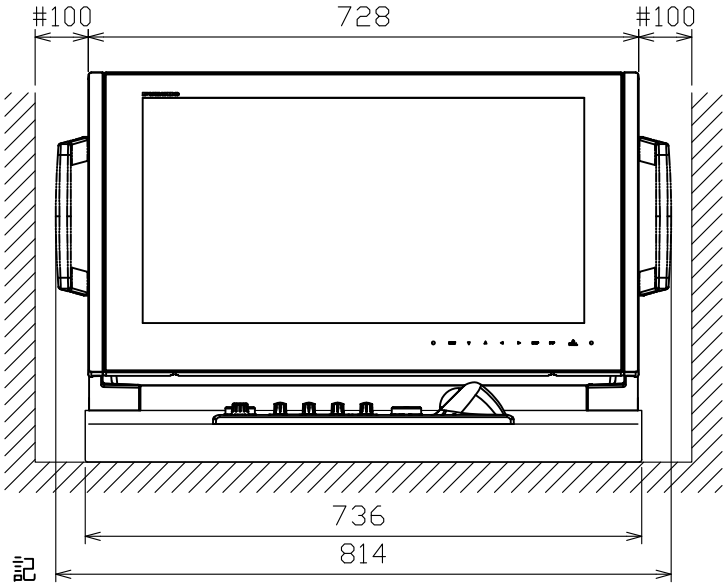
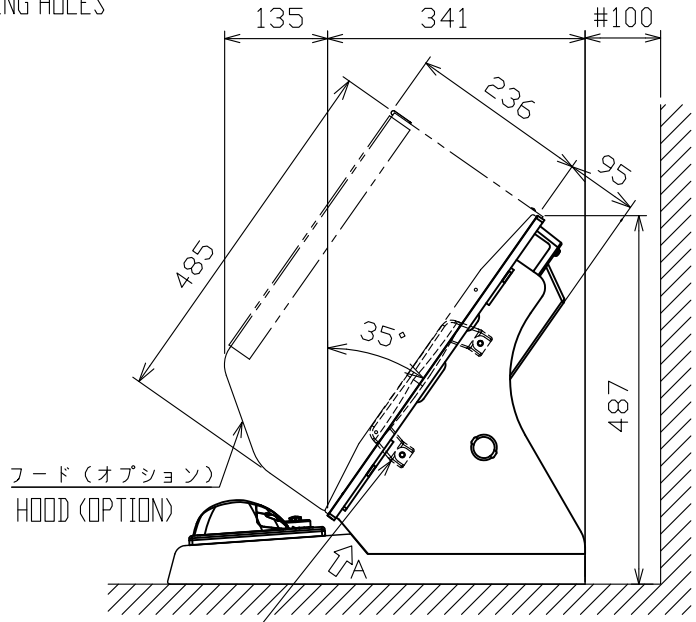
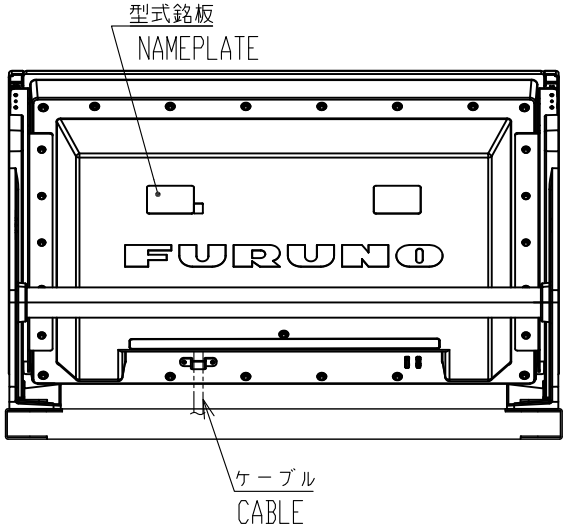


表1 TABLE 1

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







注 記

1） 指定外の寸法公差は表１による。
2） #印寸法は最小サービス空間寸法とする。
3） 取付用ネジはＭ１０ボルトまたはコーチボルト呼び径９を使用のこと。

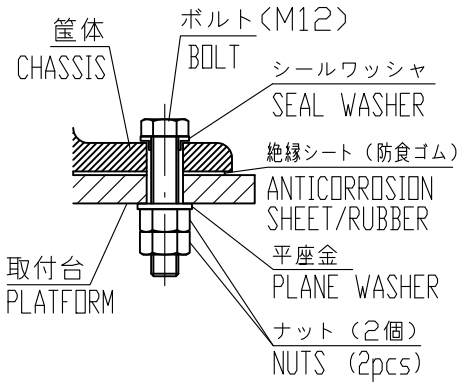
NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M10 BOLTS OR COARCH SCREWS ø9 FOR FIXING THE UNIT.

DRAWN 3/Feb/2020 T.YAMASAKI		TITLE	MU-270W
CHECKED 3/Feb/2020 H.MAKI		名称	表示部（連結台タイプ）
APPROVED 6/Feb/2020 H.MAKI			外寸図
SCALE 1/10 MASS 32 ±10% kg	質量はケーブル・オプションを含まず。 MASS DOES NOT INCLUDE CABLE/OPTION.	NAME	MONITOR UNIT (CONNECTION STAND TYPE)
DWG.No. C4493-G04- B	REF.No. 26-009-130G-1		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

（1） 取付ボルトのダブルナット締付手順
PROCEDURE OF DOUBLE NUTS FASTENING TO A BOLT



締付方法 FASTENING METHOD

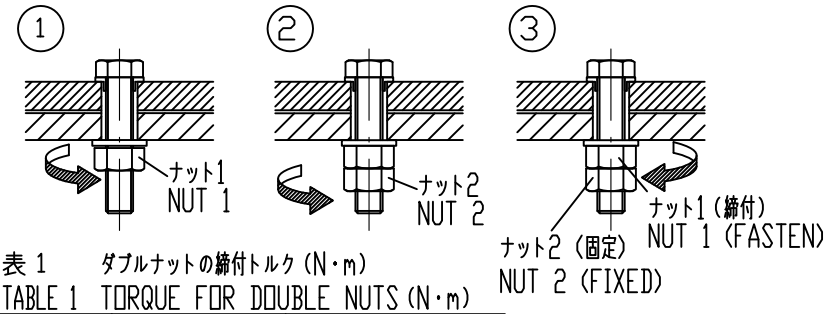
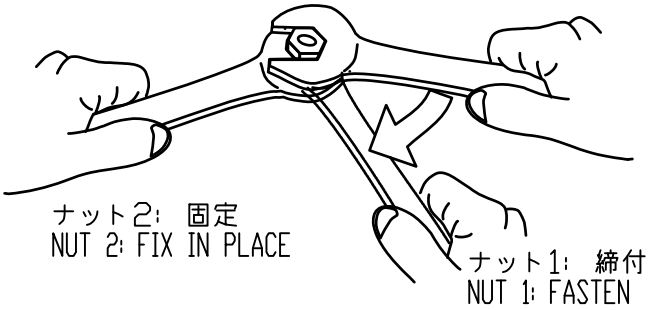


表 1 ダブルナットの締付トルク（N・m）
TABLE 1 TORQUE FOR DOUBLE NUTS (N・m)

空中線部 ANT. UNIT		標準 STANDARD	RSB-098/099/100/101/102/132/144
ナット NUT	1	57	74
	2	49	63.5

ナット1とナット2は、右図の通り同時に締め付けます。このとき、どちらのナットにも200mm程度のスパナを使用してください。

FASTEN THE DOUBLE NUTS AS SHOWN IN THE FIGURE TO THE RIGHT. USE SPANNERS WITH A LENGTH OF APPROX. 200 mm.

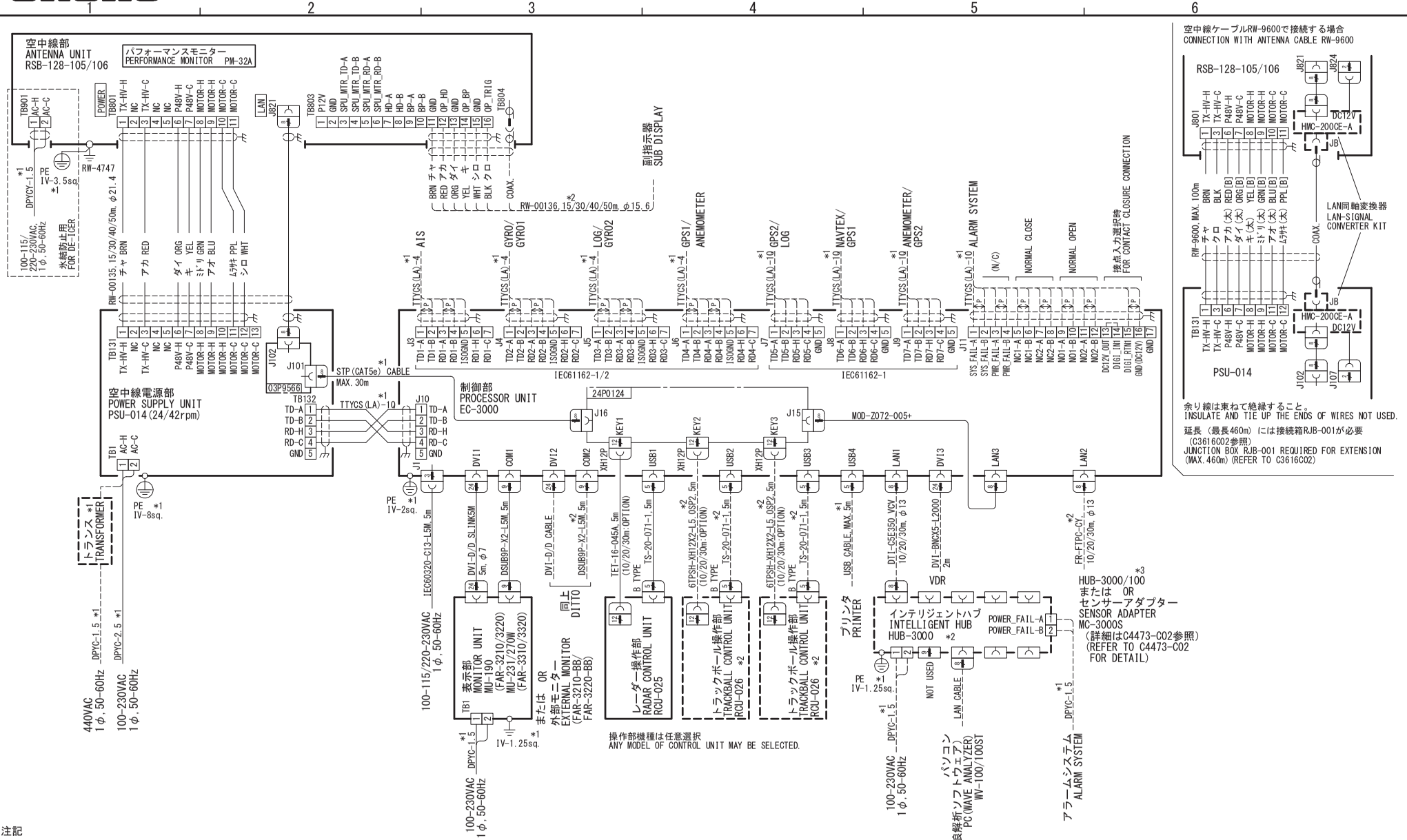


（2） 防水シールの例
EXAMPLE FOR SEALING BOLTS/NUTS

注記
1） 取付ボルト、ナットには、図示（2）のようにシール剤を塗布すること。
2） 空中線部本体は、底面に外部との圧力調整機能がありますので、装備面の周囲にはシリコンを塗布しないでください。

NOTE
1. APPLY SILICONE SEALANT ONTO FIXING BOLT/NUT AS FIGURE (2).
2. DO NOT APPLY SILICONE SEALANT AROUND THE ANTENNA BASE BECAUSE IT HAS A FUNCTION FOR PRESSURE BALANCE WITH OUTER ENVIRONMENT.

DRAWN 25/Mar/2021 T.YAMASAKI		TITLE	RADAR OPEN ANTENNA
CHECKED 25/Mar/2021 H.MAKI		名称	レーダーオープンアンテナ（締付トルク）
APPROVED 25/Mar/2021 H.MAKI			装備要領図
SCALE – MASS – ±10% kg		NAME	TORQUE FOR FASTENING
DWG. No. C3900-Y01- A	REF. No.		INSTALLATION PROCEDURE

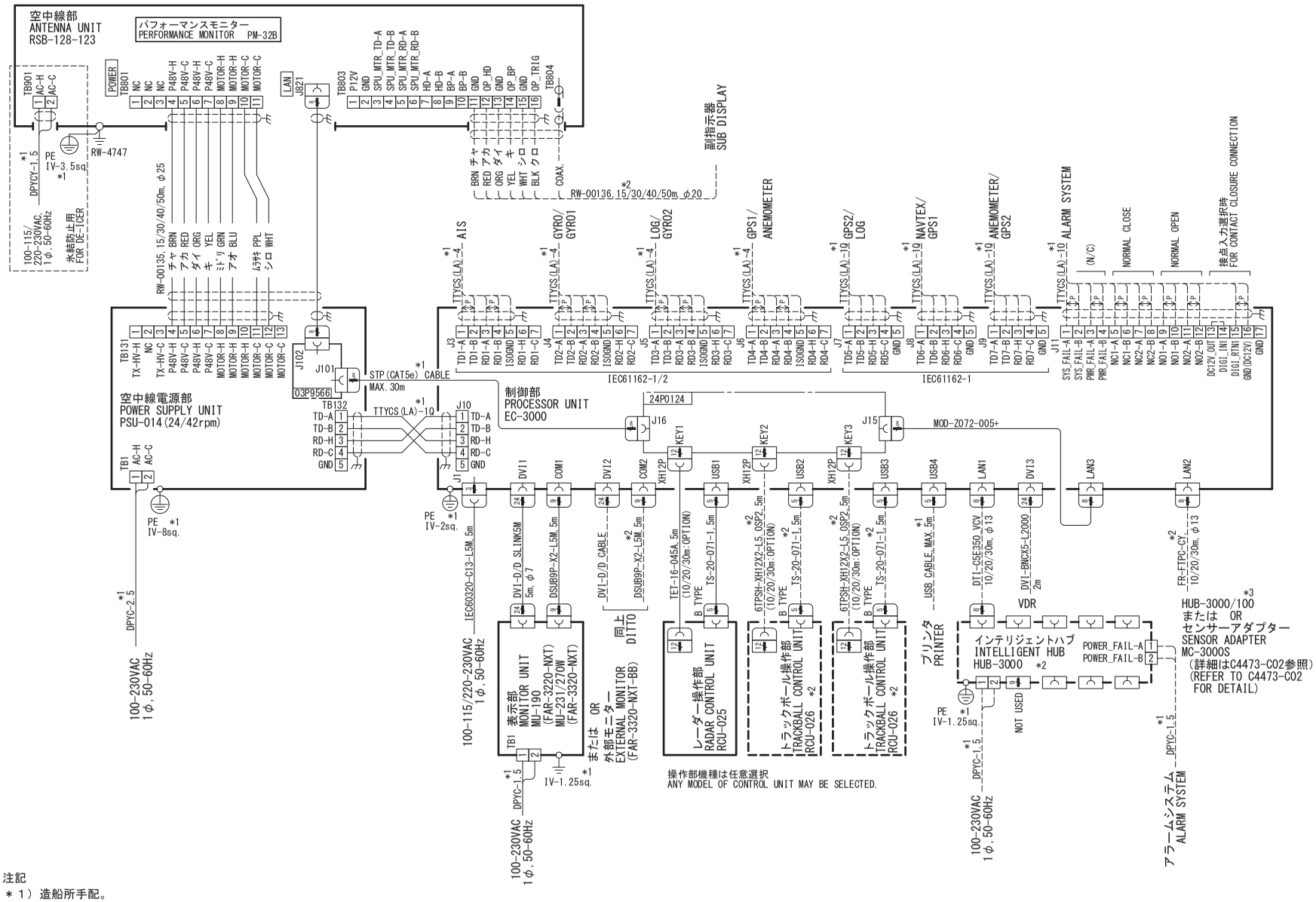


注記
＊1）造船所手配。
＊2）オプション。
＊3）IEC61162-450 Ed.2を構成する際はHUB-3000を使用のこと。
IEC61162-450 Ed.1の場合はHUB-100でもよい。

NOTE
*1: SHIPYARD SUPPLY
*2: OPTION
*3: USE HUB-3000 FOR IEC61162-450 Ed.2.
HUB-100 IS AVAILABLE FOR IEC61162-450 Ed.1.

DRAWN 2/Jul/2021 T.YAMASAKI		TYPE	FAR-3210/3220(-BB), FAR-3310/3320
CHECKED 2/Jul/2021 H.MAKI		名称	航海用レーダー
APPROVED 4/Aug/2021 H.MAKI			相互結線図
SCALE	MASS kg	NAME	MARINE RADAR
DWG.No. C3616-C01- M	REF.No. 03-183-6002-1		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

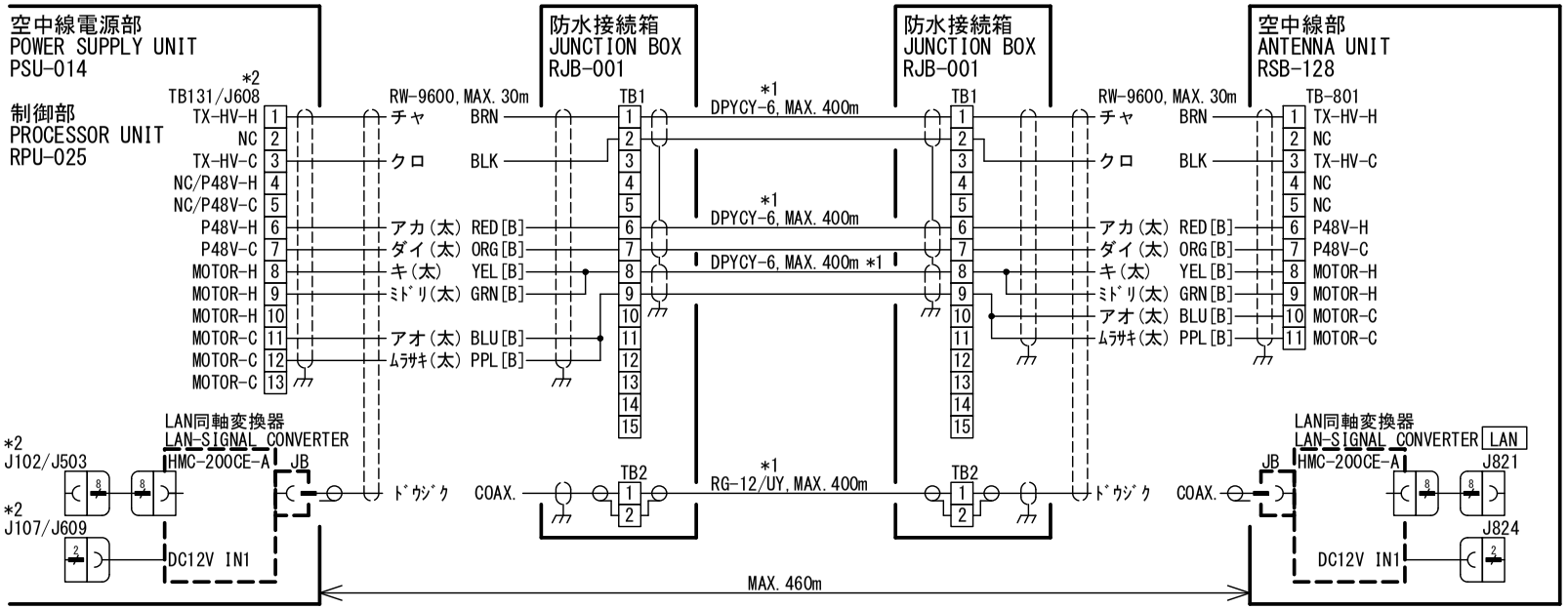


注記
＊1）造船所手配。
＊2）オプション。
＊3）IEC61162-450 Ed.2を構成する際はHUB-3000を使用のこと。
IEC61162-450 Ed.1の場合はHUB-100でもよい。

NOTE
*1: SHIPYARD SUPPLY
*2: OPTION
*3: USE HUB-3000 FOR IEC61162-450 Ed.2.
HUB-100 IS AVAILABLE FOR IEC61162-450 Ed.1.

DRAWN 2/Jul/2021 T.YAMASAKI		TYPE	FAR-3220-NXT(-BB)/3320-NXT
CHECKED 2/Jul/2021 H.MAKI		名称	航海用レーダー
APPROVED 4/Aug/2021 H.MAKI			相互結線図
SCALE / MASS kg		NAME	MARINE RADAR
DWG.No. C3681-C01- C	REF.No.		INTERCONNECTION DIAGRAM

FURUNO



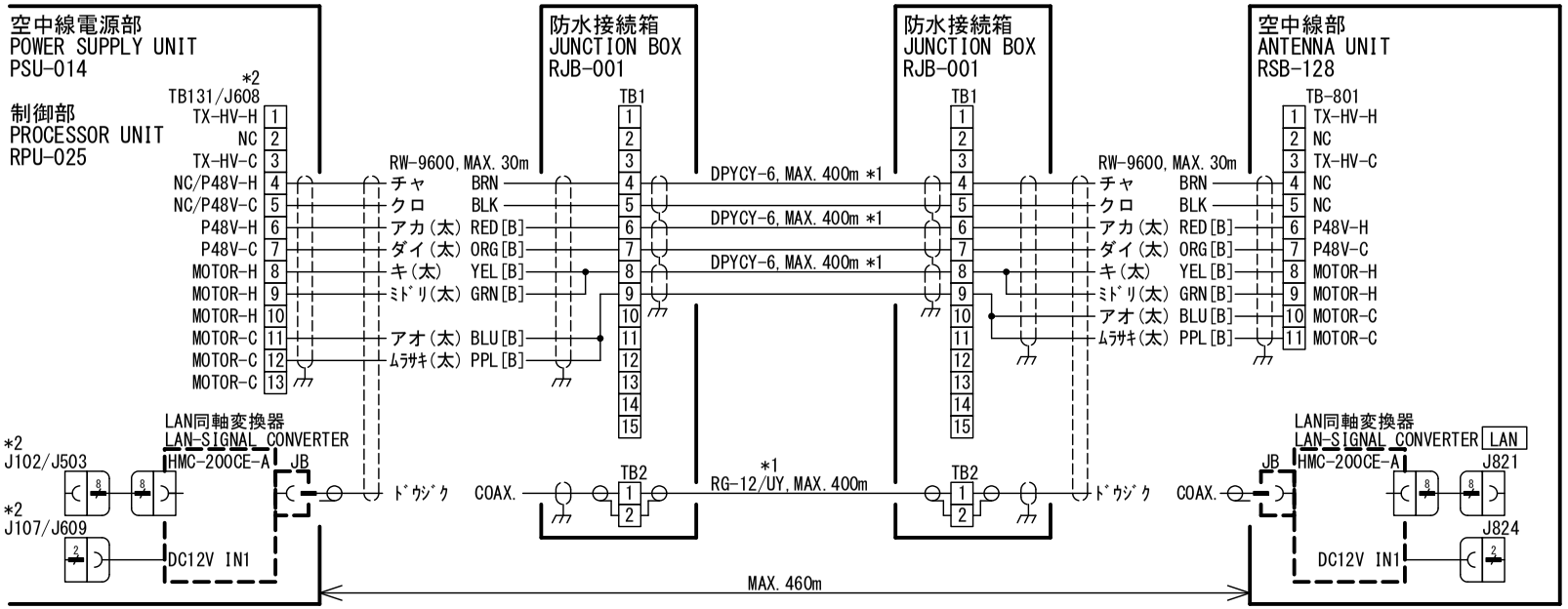
注記
＊１）造船所手配。
＊２）併記された番号は、PSU-014/RPU-025の順。

NOTE
*1: SHIPYARD SUPPLY.
*2: THE CONNECTOR NUMBERS ARE SHOWN AS PSU-014/RPU-025 ORDER.

DRAWN 15/Sep/2017 T. YAMASAKI			TITLE RJB-001
CHECKED 15/Sep/2017 H. MAKI			名 称 防水接続箱（空中線ケーブル延長）
APPROVED 15/Sep/2017 H.MAKI	FAR-2218 ser. FAR-3210 ser.		相互結線図
			NAME JUNCTION BOX (ANTENNA CABLE EXTENSION)
DWG. No. C3616-C02- G	REF. No.		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

FURUNO



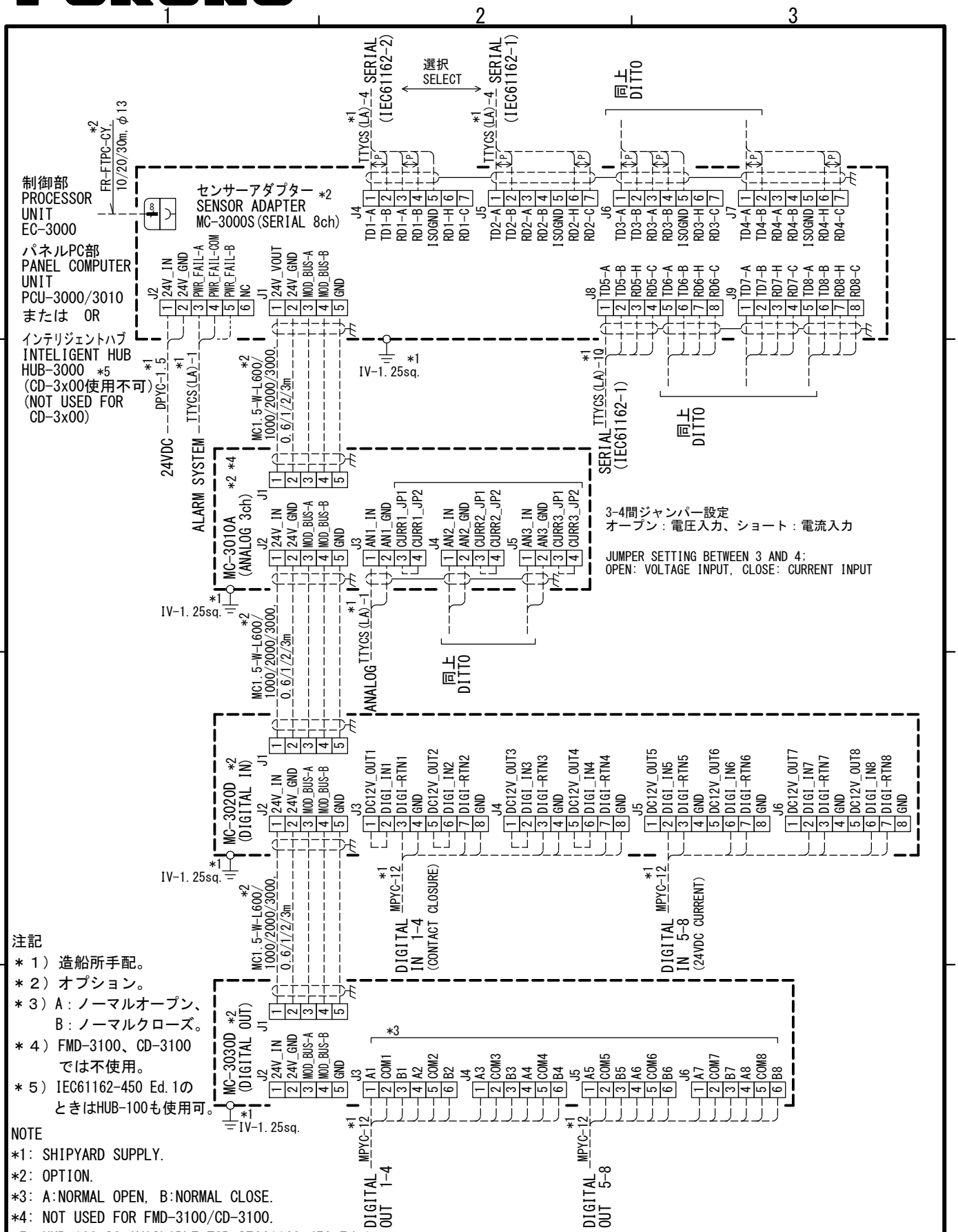
注記
＊１）造船所手配。
＊２）併記された番号は、PSU-014/RPU-025の順。

NOTE
*1: SHIPYARD SUPPLY.
*2: THE CONNECTOR NUMBERS ARE SHOWN AS PSU-014/RPU-025 ORDER.

DRAWN 1/Nov/2019 T. YAMASAKI		TITLE RJB-001
CHECKED 1/Nov/2019 H. MAKI	FAR-3320-NXT FAR-3220-NXT(-BB)	名 称 防水接続箱（空中線ケーブル延長/固体化）
APPROVED 7/Nov/2019 H.MAKI	FAR-2328-NXT FAR-2228-NXT(-BB)	相互結線図
		NAME JUNCTION BOX (CABLE EXTENSION/SOLID)
DWG. No. C3679-C03- A	REF. No.	INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

FURUNO



注記
＊１）造船所手配。
＊２）オプション。
＊３）A：ノーマルオープン、
　　B：ノーマルクローズ。
＊４）FMD-3100、CD-3100
　　では不使用。
＊５）IEC61162-450 Ed.1の
　　ときはHUB-100も使用可。

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: A:NORMAL OPEN, B:NORMAL CLOSE.
*4: NOT USED FOR FMD-3100/CD-3100.
*5: HUB-100 IS AVAILABLE FOR IEC61162-450 Ed.1.

DRAWN 7/Jul/2021 T.YAMASAKI			TITLE MC-3000S/3010A/3020D/3030D
CHECKED 7/Jul/2021 H.MAKI		CD-3100/3200/3300	名称 センサーアダプター
APPROVED 28/Jul/2021 H.MAKI		FCR-2819 SER. FMD-3100/3200/3300	相互結線図
SCALE	MASS kg		NAME SENSOR ADAPTER
DWG.No. C4473-C02- G		REF.No. 24-014-6003-2	INTERCONNECTION DIAGRAM