FURUNO

Installation Manual
CLASS A AIS
Model FA-170

(U-AIS TRANSPONDER)

SAFETY INSTRUCTIONS i
SYSTEM CONFIGURATION ii
EQUIPMENT LISTS iii

1. MOUNTING 1-1
1.1 How to Install the Antenna Unit(s) 1-1
1.2 How to Install the FA-1702 Monitor Unit 1-10
1.3 How to Install the FA-1701 Transponder Unit 1-15
1.4 How to Install the FA-1703 Pilot Plug Unit (option) 1-16
1.5 How to Install the PR-241/PR-240 Power Supply (option) 1-17

2. WIRING 2-1
2.1 Connection Overview 2-1
2.2 How to Fabricate the Cables 2-2
2.3 Unit Interconnection 2-4
2.4 How to Terminate COM Ports (For IEC 61162-1/2 signal) 2-8
2.5 Connection of Ship's Main and AC-DC Power Supply 2-9

3. SETTINGS AND ADJUSTMENTS 3-1
3.1 How to Set MMSI, IMO No., Name and Call Sign 3-2
3.2 Inland AIS Specific Settings 3-3
3.3 How to Set GNSS Antenna Position 3-5
3.4 How to Enable or Disable Alerts 3-6
3.5 How to Set Up the I/O Ports 3-7
3.6 Network Set Up 3-8
3.7 How to Set the LR Interface 3-11
3.8 SERVICE Menu Operations 3-11

APPX. 1 JIS CABLE GUIDE AP-1
APPX. 2 DIGITAL INTERFACE AP-2
APPX. 3 NETWORK AND SECURITY CONFIGURATIONS SETTINGS AP-17

PACKING LIST(S) A-1
OUTLINE DRAWING(S) D-1
INTERCONNECTION DIAGRAM(S) S-1

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SAFETY INSTRUCTIONS

Follow the safety instructions listed below and throughout this manual to prevent damage to your equipment or vessel and to prevent harm to the operator or other personnel on-board. The results of failing to follow the instructions and guidelines outlined herein are listed below.

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 Prohibitive Action

WARNING

ELECTRICAL SHOCK HAZARD
Do not open the equipment unless totally familiar with electrical circuits and service manual.
Only qualified personnel should work inside the equipment.

Turn off the power at the switchboard before beginning the installation.
Fire or electrical shock can result if the power is left on.

Do not approach the antenna closer than listed below when it is transmitting.
The antenna emits radio waves that can be harmful to the human body.

RF power density on antenna aperture	Distance
100 W/m^2	N/A
10 W/m^2	0.04 m
2 W/m^2	0.09 m

Do not install the equipment where it may get wet from rain or water splash.
Water in the equipment can result in fire, electrical shock or damage the equipment.

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. The voltage rating of the equipment appears on the label above the power connector.

CAUTION

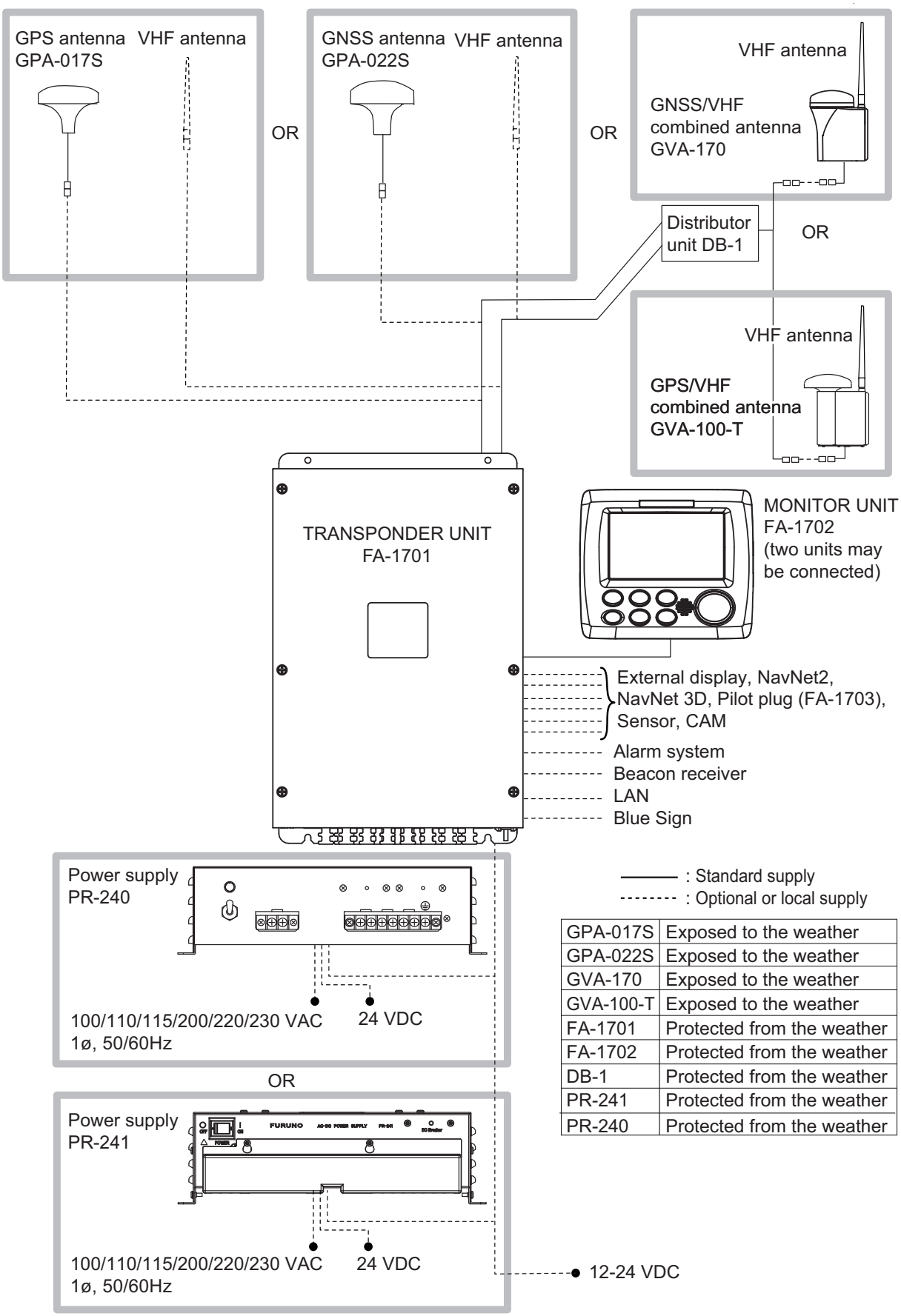
Observe the following compass safe distances to prevent interference to a magnetic compass:

Equipment	Standard compass	Steering compass
FA-1701 Transponder unit	1.70 m	1.10 m
FA-1702 Monitor unit	0.65 m	0.40 m
FA-1703 Pilot Plug unit	0.35 m	0.30 m

Equipment	Standard compass	Steering compass
GVA-100-T	0.40 m	0.30 m
GVA-170	0.35 m	0.30 m
DB-1	0.30 m	0.30 m
PR-241	0.85 m	0.55 m
PR-240	0.90 m	0.60 m

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

SYSTEM CONFIGURATION



GPA-017S	Exposed to the weather
GPA-022S	Exposed to the weather
GVA-170	Exposed to the weather
GVA-100-T	Exposed to the weather
FA-1701	Protected from the weather
FA-1702	Protected from the weather
DB-1	Protected from the weather
PR-241	Protected from the weather
PR-240	Protected from the weather

EQUIPMENT LISTS

Standard supply

Name	Type	Code no.	Qty	Remarks
Transponder Unit	FA-1701	—	1	
Monitor Unit	FA-1702	—	1	
GPS Antenna	GPA-017S	—	1	Select one.
GNSS Antenna	GPA-022S	—	1	
GPS/VHF Combined Antenna	GVA-100-T	—	1	
GNSS/VHF Combined Antenna	GVA-170	—	1	
Distributor Unit	DB-1	—	1	For GVA-170/GVA-100-T
Installation Materials	CP05-13600	000-029-284	1	For DB-1 (GVA-170/GVA-100-T) See table below for contents.
	CP05-13610	000-029-285	1	For DB-1 (GVA-170/GVA-100-T, Deep Sea) and GPA-017S See table below for contents.
	CP05-13620	000-029-286	1	For DB-1 (GVA-170/GVA-100-T) See table below for contents.
	CP24-00141	001-176-030	1	For GVA-170/GVA-100-T
	CP05-13630	000-029-287	1	For GPA-017S/GPA-022S See table below for contents.
	CP05-13640	000-029-288	1	For GPA-017S/GPA-022S See table below for contents.
	CP05-13701	001-426-520	1	For FA-1702
Spare Parts	SP05-06501	001-426-300	1	For FA-1701 (Type: FGMB 125V 8A PBF, 2 pcs. Code: 000-191-004-10)

Installation materials

Installation materials	Contains			
	CP05-13601	CP24-00101	Z-AWG25X4P-SB L050	TNC-PS/PS-3D-L15M-R
CP05-13600	Y	Y	N	N
CP05-13610		N	N	N
CP05-13620		Y	Y	N
CP05-13630		N	Y	N
CP05-13640		N	Y	Y

Optional supply

Name	Type	Code no.	Qty	Remarks
Pilot Plug Unit	FA-1703	—	1	
Monitor Unit	FA-1702	—	1	
Power Supply Unit	PR-241	—	1	
	PR-240	—	1	
Ferrite Core	OP86-11	001-594-450	1	For PR-241
Distributor Unit	DB-1	—	1	For GVA-170/GVA-100-T
GNSS Antenna	GPA-022S	—	1	
Antenna Cable Assembly	CP20-02700 (30M)	004-381-160	1	For GPA-017S/GPA-022S (30 m)
	CP20-02720 (40M)	001-207-990	1	For GPA-017S/GPA-022S (40 m)
	CP20-02710 (50M)	004-381-170	1	For GPA-017S/GPA-022S (50 m)
Antenna Cable Set	CP24-00300	000-041-938	1	For GVA-170/GVA-100-T (30 m)
	CP24-00310	000-041-939	1	For GVA-170/GVA-100-T (50 m)
	CP24-00320	000-022-637	1	For GVA-170/GVA-100-T (40 m)
Mast Mounting Kit	CP20-01111	004-365-780	1	For GPA-017S/GPA-022S
Antenna Fixing Bracket	N173F/FEC	001-474-350-00	1	For CX4-3/FEC (ϕ49-90)
	N174F/FEC	001-494-890-00	1	For CX4-3/FEC (ϕ30-61)
AD Converter	AD-100-E	000-040-110	1	
Mast Mounting Kit	OP24-5	005-954-510	1	For GVA-170/GVA-100-T
Front Fixing Panel	OP24-35	001-247-240	1	For FA-1702
F Mount Cushion Kit	OP05-141	001-436-880	1	
Installation Materials	CP03-28900 (10M)	000-082-658	1	LAN cable (10 m)
	CP03-28910 (20M)	000-082-659	1	LAN cable (20 m)
	CP03-28920 (30M)	000-082-660	1	LAN cable (30 m)
	CP03-28930 (50M)	000-084-368	1	LAN cable (50 m)
	CP03-28940 (100M)	000-090-429	1	LAN cable (100 m)
Antenna	CX4-3/FEC	001-474-340-00	1	
Cable Assembly	TNC-PS/PS-3D-L15M-R	001-173-110-10	1	For connection to GPA-017S/GPA-022S
	OP05-146-1	001-542-230	1	For connection between FA-1701 and FA-1702. Contains Z-AWG25X4P-SB L050 (5 m) and OP05-147.
	OP05-146-2	001-542-240	1	For connection between FA-1701 and FA-1702. Contains Z-AWG25X4P-SB L100 (10 m) and OP05-147.
Water Proof Kit	OP05-139	001-426-500	1	For FA-1702

Name	Type	Code no.	Qty	Remarks
Cable Protection Kit	OP05-147	001-542-590	1	For FA-1702, Cable packing for the cable assembly Z-AWG25X4P-SB L050 (5 m) or Z-AWG25X4P-SB L100 (10 m).
Replacement Kit	OP05-140	001-426-510	1	For FA-1702
EAIS Handbook	E42-01503-*	000-191-095-*	1	For EAIS users
Attaching the WSV label	E42-01604-*	000-192-102-*	1	For Inland AIS users

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1. MOUNTING

NOTICE

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

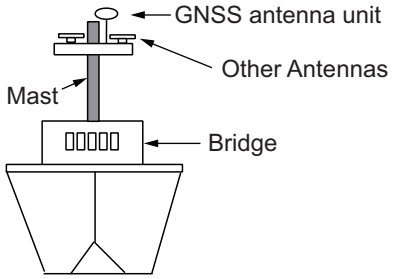
Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

1.1 How to Install the Antenna Unit(s)

1.1.1 GPS antenna unit (GPA-017S), GNSS antenna unit (GPA-022S)

Install the GNSS antenna unit referring to the outline drawing at the back of this manual.

When selecting a mounting location for the antenna, keep in mind the following points.

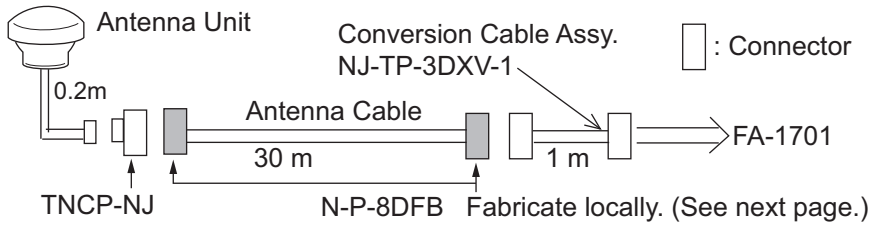


- Select a location out of the radar beam. The radar beam will obstruct or prevent reception of the GNSS satellite signal.
- There should be no interfering object within the line-of-sight to the satellites. Objects within line-of-sight to a satellite, for example, a mast, may block reception or prolong acquisition time.
- Mount the antenna unit as high as possible to keep it free of interfering objects and water spray, which can interrupt reception of GNSS satellite signal if the water freezes.
- Referring to the drawing at the back if this manual, leave sufficient space between all antennas to avoid mutual interference.

How to extend the antenna cable

Three types of antenna cable extensions are optionally available.

a) Antenna cable set CP20-02700

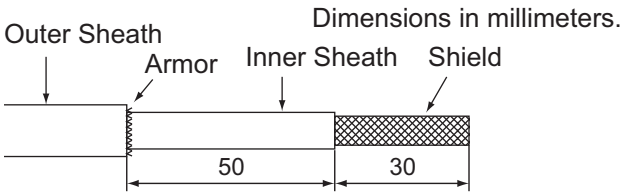


- Securing and waterproofing the connector
  Referring to the figures in section 2.2.1 secure and waterproof the connections.

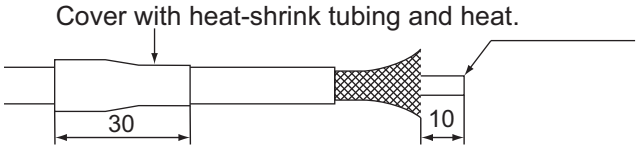
b) Antenna cable set CP20-02720 (8D-FB-CV, 40m)/CP20-02710 (8D-FB-CV, 50m)
Connect the cable the same as a) above.

c) Cable type RG-10/UY (shipyard supply)
Note: The length of this cable should be less than 20 m to prevent signal loss. The coax. coupling cable assy. (type: NJ-TP-3DXV-1, code no. 000-123-809-10), coaxial connector (N-P-8DFB; supplied), vulcanizing tape and vinyl tape are required. Fabricate both ends of the cable as shown in the figure on the next page.

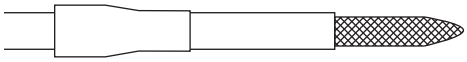
How to attach the connector N-P-8DFB for cable 8D-FB-CV



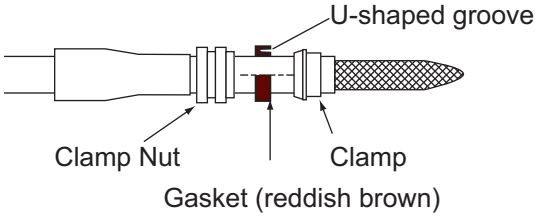
Remove outer sheath and armor by the dimensions shown left.
Expose inner sheath and shield by the dimensions shown left.



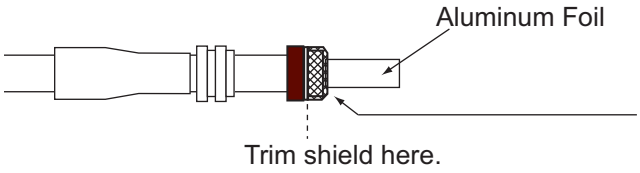
Remove insulator and core by 10 mm.



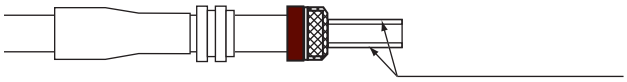
Twist shield end.



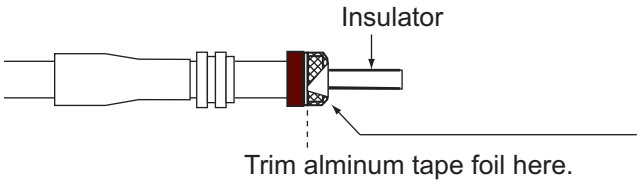
Slip on clamp nut, gasket and clamp as shown left.



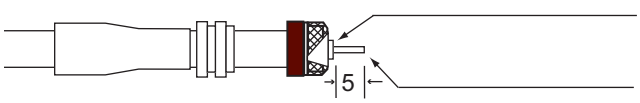
Fold back shield over clamp and trim.



Cut alminum foil at four places, 90° from one another.

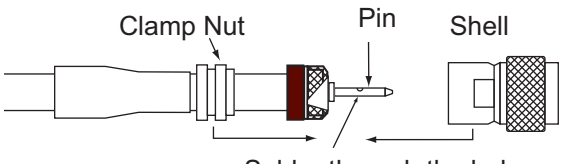


Fold back alminum tape foil onto shield and trim.



Expose the insulator by 1 mm.

Expose the core by 5 mm.



Slip the pin onto the conductor. Solder them together through the hole on the pin.

Insert the pin into the shell. Screw the clamp nut into the shell.
(Tighten by turning the clamp nut. Do not tighten by turning the shell.)

1.1.2 VHF antenna

Requirements for the antenna

Select a good quality antenna that meets the requirement listed below:

- Frequency range: 155 to 162 MHz
- Impedance: 50 ohms
- Polarization: Vertical
- Handling power: 30W
- VSWR: Less than 2:1
- Quality: Able to withstand the marine environment

Installation location

The location of the mandatory AIS VHF-antenna should be carefully considered. Digital communication is more sensitive than analog/voice communication to interference created by reflections in obstructions like masts and booms. It may be necessary to relocate the VHF radiotelephone antenna to minimize interference effects.

To minimize interference effects, the following guidelines apply:

- The AIS VHF antenna should be placed in an elevated position that is as free as possible with a minimum of 0.5 meters in the horizontal direction from constructions made of conductive materials. The antenna should not be installed close to any large vertical obstruction. The objective for the AIS VHF antenna is to see the horizon freely through 360 degrees.
- The AIS VHF antenna should be installed safely away from interfering high-power energy sources like radar and other transmitting radio antennas, preferably at least 3 meters away from and out of the transmitting beam.
- There should not be more than one antenna on the same plane. The AIS VHF antenna should be mounted directly above or below the ship's primary VHF radiotelephone antenna, with no horizontal separation and with a minimum of 2.8 meters vertical separation. If it is located on the same plane as other antennas, the distance apart should be at least 10 meters.

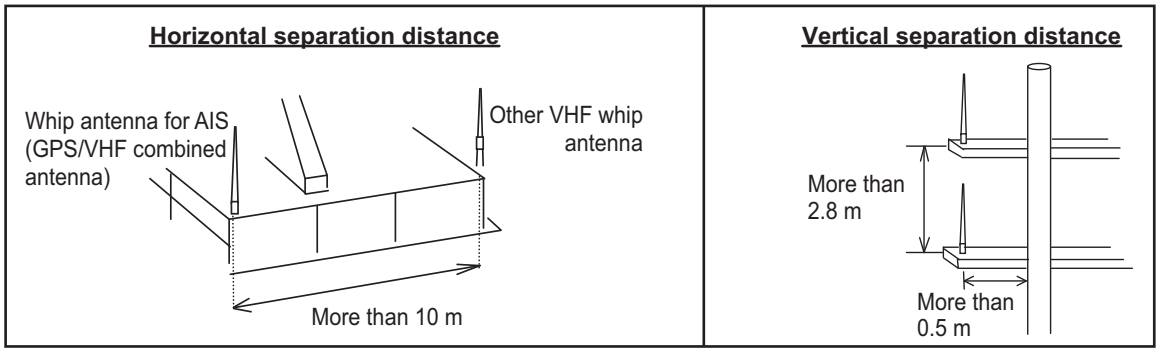
Note: Keep the device away from other antennas, LED lighting*, and other equipment that may cause interference.

*: LED lighting installed on compass decks, etc., generates electromagnetic noise due to the operation of the built-in switching circuit. If AIS or VHF antennas are installed near LED lighting, the electromagnetic noise generated by the LED lighting may cause serious problems such as reduced reception sensitivity.

Cabling

- The cable should be kept as short as possible to minimize signal attenuation. Coaxial cables equal to or better than RG10U/Y are recommended.
- All outdoor-installed connectors on coaxial cables should be fitted with preventive isolation such as vulcanizing tape to protect against water penetration into the antenna cable. Also, apply marine sealant at the antenna base to prevent water intrusion from the screw part of antenna base.
- Coaxial cables should be installed in separate signal cable channels/tubes and at least 10 cm away from power supply cables. Crossing of cables should be done at right angles (90°). The minimum bend radius of the coaxial cable should be 5 times the cable's outer diameter.

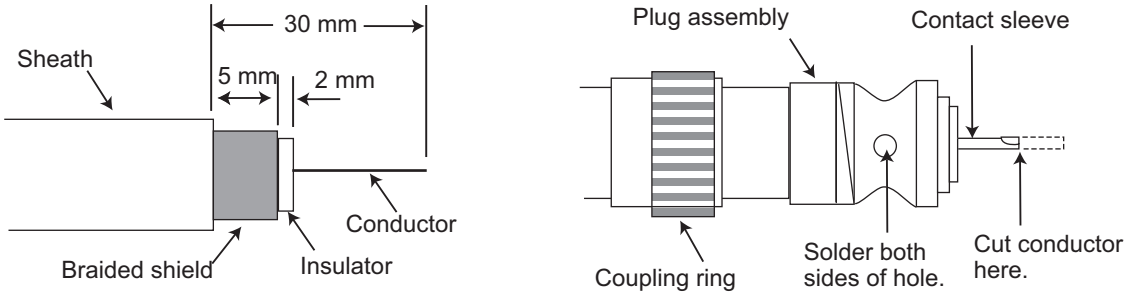
- Install the VHF whip antenna referring to the outline drawing at the back of this manual. Separate this antenna from other VHF radiotelephone antennas as shown below to prevent interference to the FA-170.



When coaxial cable RG-10/UY (shipyard supply) is used, attach the coaxial plug M-P-7 (dockyard supply) as shown on the following page.

How to attach the plug M-P-7

Lay the coaxial cable and attach an M-type plug (if necessary) to the cable as follows.



1. Remove the sheath by 30 mm.
2. Bare 23 mm of the center conductor. Trim braided shield by 5 mm and tin.
3. Slide coupling ring onto cable.
4. Screw the plug assembly on the cable.
5. Solder plug assembly to braided shield through solder holes. Solder contact sleeve to conductor.
6. Screw coupling ring into plug assembly.

1.1.3 GNSS/VHF combined antenna (GVA-170), GPS/VHF combined antenna (GVA-100-T)

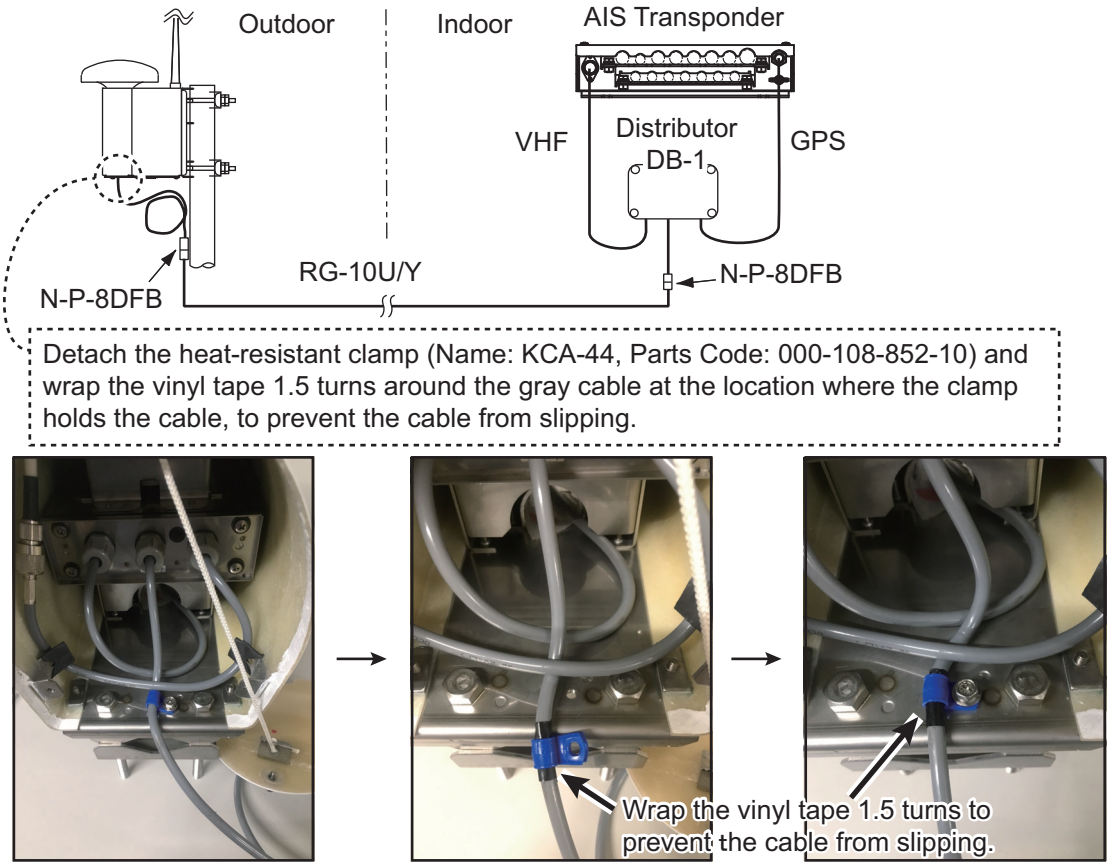
Install the combined antenna unit referring to the outline drawing. When selecting a mounting location for the antenna, keep in mind the following points.

- Select a location out of the radar beam. The radar beam will obstruct or prevent reception of the GNSS satellite signal.
- There should be no interfering object within the line-of-sight to the satellites. Objects within line-of-sight to a satellite, for example, a mast, may block reception or prolong acquisition time.
- Mount the antenna unit as high as possible. Mounting it this way keeps it free of interfering objects and water spray, which can interrupt reception of GNSS satellite signal if the water freezes.

Note: Keep the device away from other antennas, LED lighting*, and other equipment that may cause interference.

*: LED lighting installed on compass decks, etc., generates electromagnetic noise due to the operation of the built-in switching circuit. If AIS or VHF antennas are installed near LED lighting, the electromagnetic noise generated by the LED lighting may cause serious problems such as reduced reception sensitivity.

- Also, refer to the antenna installation guidelines on page 1-3.



Installation overview of GNSS/VHF combined antenna

Note: Where the mast on which the antenna is installed has a diameter of 60 mm to 80 mm, the optional mast installation kit is required (Model: OP24-5, Code: 005-954-510).

Installing the VHF antenna CX4-3/FEC to the combined antenna GVA-170/GVA-100-T

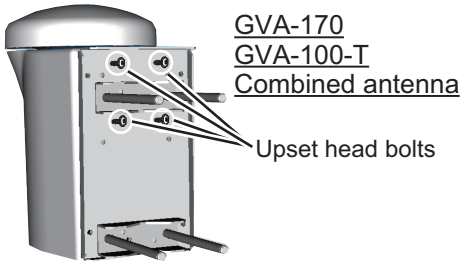
The compatibility of VHF antenna (CX4-3/FEC) with the GVA-100-T differs with GVA-100-T's serial number.

Compatibility of CX4-3/FEC and GVA-100-T

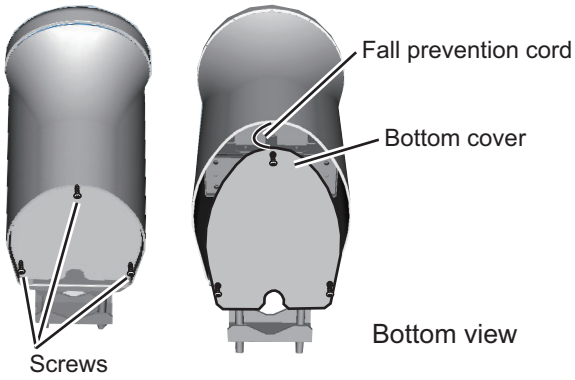
Serial No.	CX4-3/FEC
000101 to 019999	NG
020000 and after	OK

To install the VHF antenna CX4-3/FEC to the combined antenna GVA-170/GVA-100-T (with serial number 020000 and after), follow the below procedures.

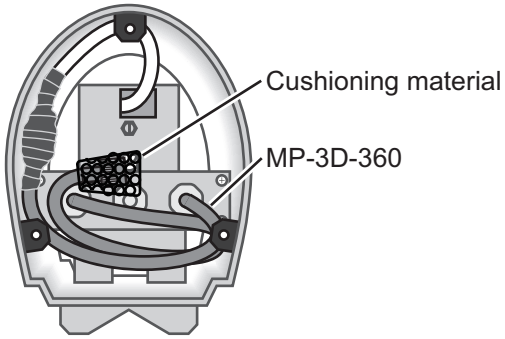
1. Unfasten the upset head bolts (M5, 4pcs.) at the back side of the GVA-170/GVA-100-T.



2. Turn the GVA-170/GVA-100-T upside-down, then unfasten three screws with captive washers (M4, 3pcs.) on the bottom cover to detach it.

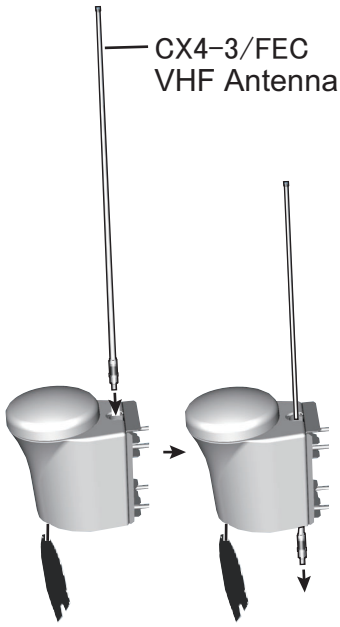


3. Remove the cushioning material from the connector of the cable (MP-3D-360) to connect with VHF antenna.

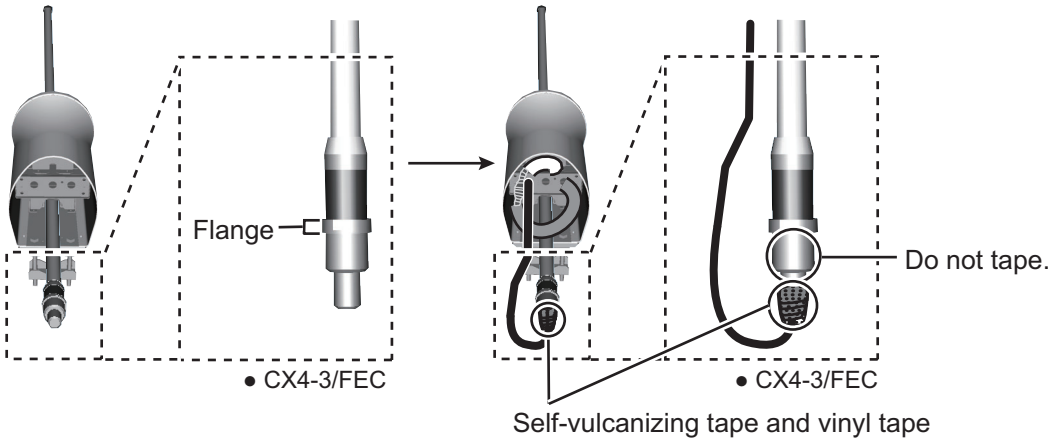


Bottom view after opening the bottom cover.

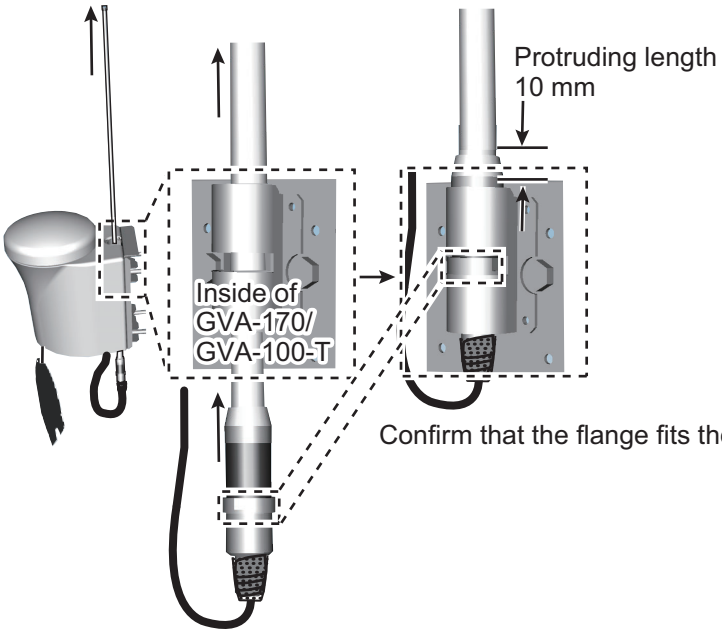
4. Insert the CX4-3/FEC to the GVA-170/GVA-100-T from the connector side.

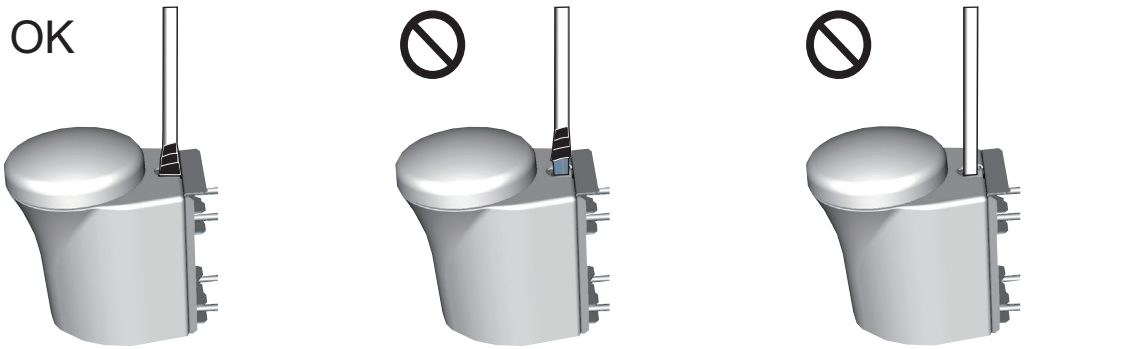


5. Connect the MP-3D-360 connector to the VHF antenna and wrap the junction of the connectors with self-vulcanizing tape and vinyl tape.



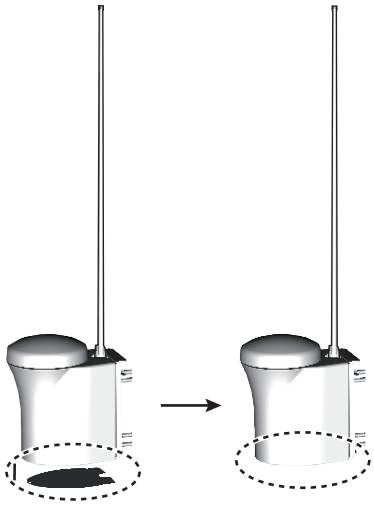
6. Raise the CX4-3/FEC upward, confirm that the flange fits the caulking and tighten with the upset head bolts unfastened with step 1.





Correct installation | NG: PVC pipe can be seen. | NG: Taped part can not be seen.

7. Fasten the bottom cover to the GVA-170/GVA-100-T.

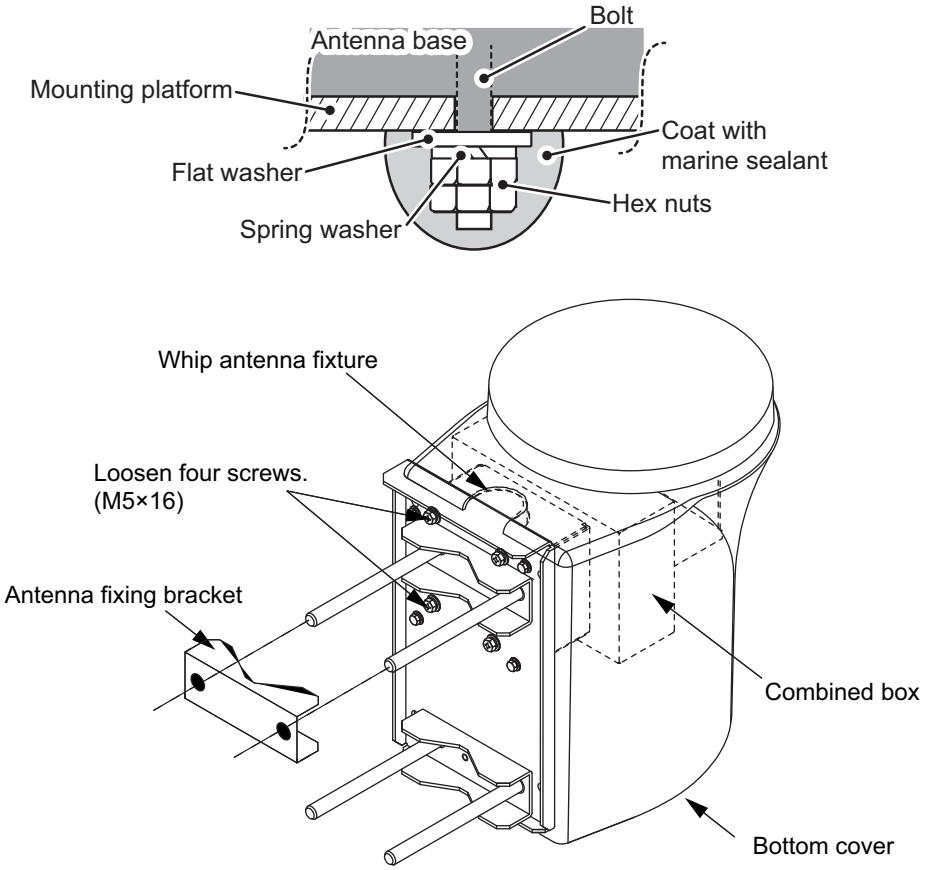


Mounting procedure

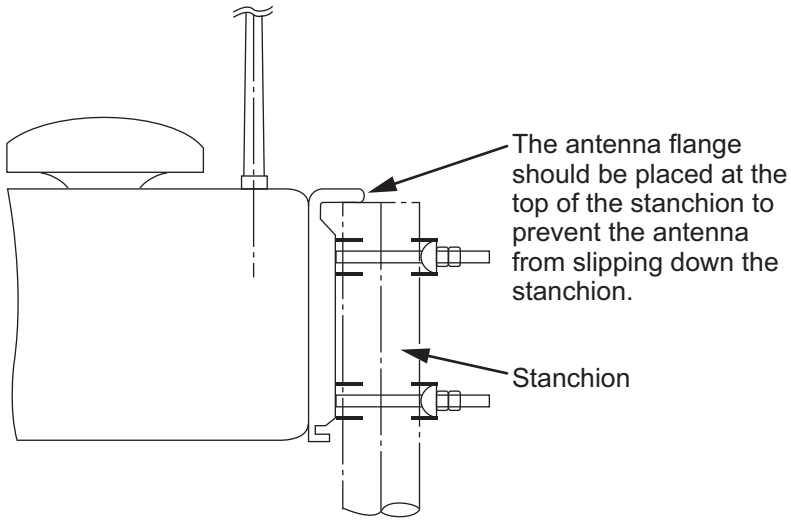
1. Dismount the bottom cover, cut the cable-tie inside the unit and take out the co-axial connector attached to the combined box.

2. Loosen four screws to loosen whip antenna fixture and pull out the coaxial connector coming from the combined box through the hole in the whip antenna fixture.
3. Connect the coaxial connector to the whip antenna base and wrap the junction part of the whip antenna with vulcanizing tape and then vinyl tape for waterproofing.
4. Insert the whip antenna from the top of the combined antenna.
5. Secure the whip antenna with whip antenna fixture.
6. Using a new cable tie (supplied), secure the cables and coaxial connector inside the antenna case.
7. Mount the bottom cover.
8. Fix the GNSS/VHF combined antenna to the ship's stanchion (40 to 50 mm diameter) with antenna fixing brackets, flat washers and hex nuts.

Note: Coat the exposed parts of bolts and nuts with marine sealant (local supply).

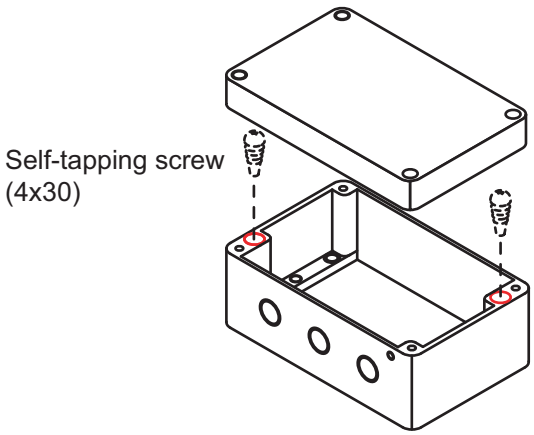


GNSS/VHF Combined antenna, GPS/VHF Combined antenna



How to install distributor unit DB-1

The length of the cable between the distributor unit and transponder unit is 1 m so locate the distributor unit within 1 m from the transponder unit. Fix the distributor unit on the bulkhead, facing the cable entrance downward. Remove the lid of the distributor unit and secure the unit with two self-tapping screws.



Note: Be sure no foreign material or water enters the distributor unit.

1.2 How to Install the FA-1702 Monitor Unit

The monitor unit can be installed on a desktop, overhead (bulkhead) or flush mounted in a panel. Install it on the chart table or near the steering place, referring to the outline drawing.

When selecting a mounting location for the monitor unit, keep the following in mind:

- Keep the unit out of direct sunlight.
- The temperature and humidity should be moderate and stable. (Operating temperature range: -15°C to +55°C)
- Locate the unit away from exhaust pipes and vents.
- The mounting location should be well ventilated.
- Mount the unit where shock and vibration are minimal.

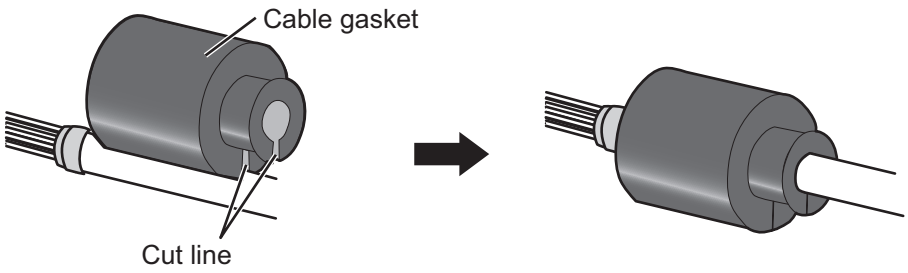
- Keep the unit away from electromagnetic field generating equipment such as motor, generator.
- For maintenance and checking purposes, leave sufficient space at the sides and rear of the unit and leave slack in cables. Refer to the outline drawing.
- A magnetic compass will be affected if the unit is placed too close to it. Observe the following compass safe distances to prevent disturbance to the magnetic compass:
  Standard compass: 0.65 meters
  Steering compass: 0.40 meters
- For flush mount installation, make sure the mounting location is flat.
- To avoid damage to the cabling when mounting the FA-1702, make sure the cabling is not excessively bent.

Note: The cabling to the FA-170 should be completed before mounting the unit. See "How to connect the FA-1702 monitor unit" on page 2-5.

1.2.1 How to fit the cable gasket (When using the OP05-146-1 or OP05-146-2)

When using the cable assembly OP05-146-1 or OP05-146-2, its waterproofing capability can be increased by attaching the cable gasket attached to the cable assembly.

The cable gasket needs to be attached to the cable as shown below. The cut line must face downward to prevent the water intrusion to the unit.



Regarding how to fit the cable gasket to the cable clamp, refer to the illustration on the next page, step 2.

Regarding how to connect the cabling to the FA-1702, referring to section 2.3.1.

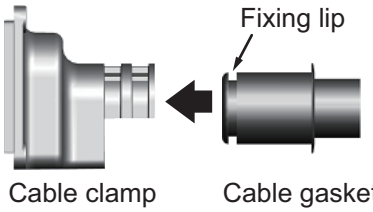
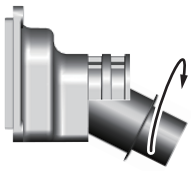
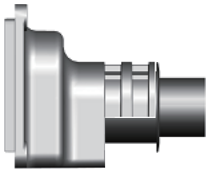
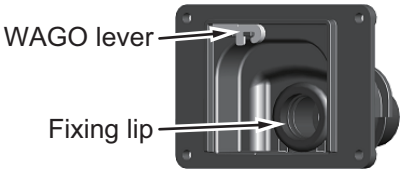
1.2.2 How to fit the optional waterproofing kit (OP05-139)

The optional waterproofing kit (OP05-139) must be fitted at the same time as the cabling is connected to the FA-1702.

The waterproofing kit (OP05-139) contains the following items:

- Cover gasket (Code:100-403-800-10) ×1
- Cable gasket (Code:100-403-791-10) ×1

1. Unfasten the four screws on the rear cable clamp, then remove the cable clamp to reveal the WAGO connector.
2. Fit the cable gasket to the cable clamp, referring to the figure below.

<table>
<tr>
<td>1. Fit the cable gasket to the cable clamp, passing the fixing lip partially through the cable clamp.

</td>
<td>2. To pass the fixing lip completely through the cable gasket, twist the cable gasket gently.
</td>
</tr>
<tr>
<td>3. Check that the cable gasket is flush against the cable clamp, as shown below.
</td>
<td>4. Check that the cable gasket’s fixing lip is flush against the inside of the cable clamp.

</td>
</tr>
</table>

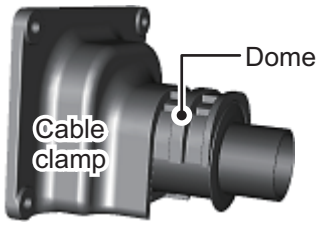
3. Pass the cabling through the cable gasket and cable clamp.
   Note: To maintain the IPx5 waterproof rating, the cable must be TTYCSLA-4 (or equivalent) with a diameter of ϕ14.4±0.4 mm.
4. Fit the cover gasket to the rear of the FA-1702. Make sure the cover gasket is placed inside the groove indicated in the figure below.



5. Connect the cabling to the FA-1702, referring to section 2.3.1.

6. Slide the cable clamp along the cable until the clamp is flush against the rear of the FA-1702.

   Note: The cable clamp must be oriented with the dome-side up, to prevent water intrusion.

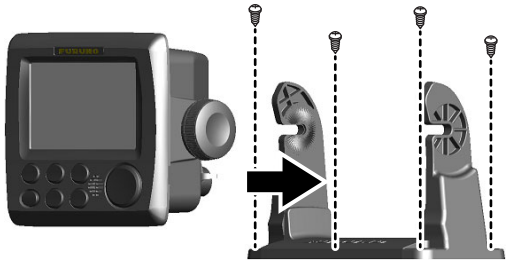


7. Fasten the four screws removed at step 1.
8. Secure the cabling to the cable clamp with cable ties (included) referring to the figure in section 2.3.1.

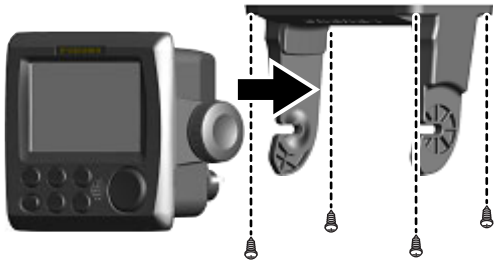
1.2.3 How to install the FA-1702 on a desktop or overhead

The monitor unit is shipped with the hanger. For correct installation, the monitor unit and the hanger need to be separated during the installation.

1. Place the monitor unit on a firm, flat surface, then unfasten the two knobs on either side of the monitor unit to separate the monitor unit and a hanger.
2. Drill four holes for the self-tapping screws (ϕ5×20) at the installation location.
3. Secure the hanger to the desktop or overhead with four self-tapping screws (ϕ5×20, installation material). The hanger should be oriented with the insertion slots facing forward. For mounting dimensions and required clearance, see the outline drawing at the back of this manual.



Desktop installation



Overhead installation

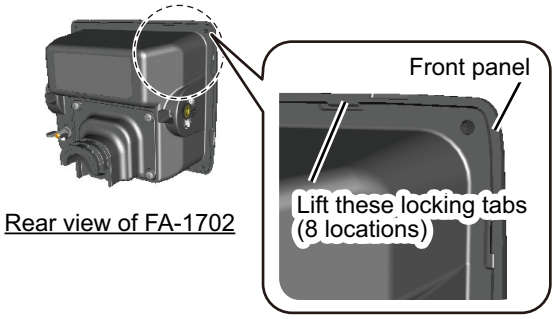
4. Referring to section 2.3.1, connect the cabling to the monitor unit.
5. Fit the monitor unit to the hanger and tighten the bolts on either side evenly. Adjust the angle of the monitor unit so that the screen can be viewed clearly.

1.2.4 How to flush mount the FA-1702

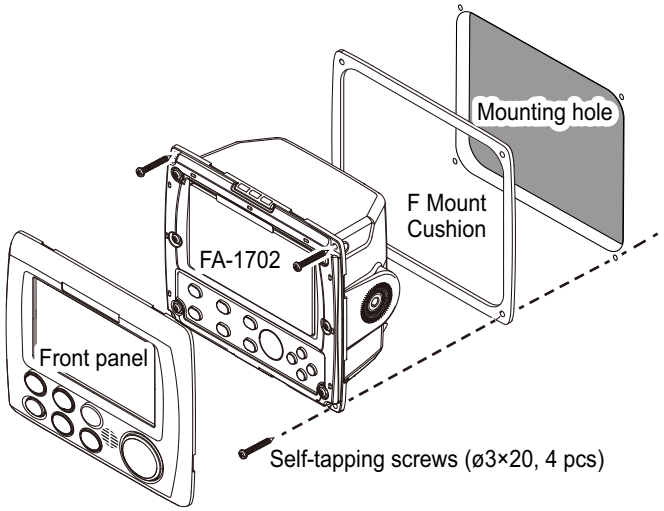
There are two methods for flush mounting the monitor unit, flush mounting the monitor unit directly to the installation location or with using the optional front fixing panel kit.

Flush mounting the monitor unit (unit only)

1. Cut a hole in the installation location, using the template at the back of this manual.
2. Drill four holes for the self-tapping screws (ϕ3×20).
3. Place the monitor unit on a firm, flat surface, then unfasten the two knobs on either side of the monitor unit to separate the monitor unit and a hanger. The hanger can be disposed.
4. Gently lift the locking tabs at the rear of the front panel, then the remove the front panel. Be careful not to damage the locking tabs or the front panel.



5. Fit the F Mount Cushion (20-032-106, installation material) to the rear of the monitor unit or to the installation hole.
6. Run the cabling through the cutout, then, referring to section 2.3.1, connect the necessary cabling to the FA-1702.



7. Referring to the figure above, fit the FA-1702 to the cutout, then use the supplied self-tapping screws (ϕ3×20) to secure the FA-1702 to the flush mount panel.

Flush mounting the FA-1702 (with optional front fixing panel kit)

Use the optional kit (OP24-35), referring to the outline drawings at the back of this manual and the installation instructions (C42-01310) included with the optional kit.

1.3 How to Install the FA-1701 Transponder Unit

Mount the transponder where it is protected from rain and water splash. This unit can be installed on a bulkhead, wall or on the floor. Install it referring to the outline drawing at the back of this manual for dimensions.

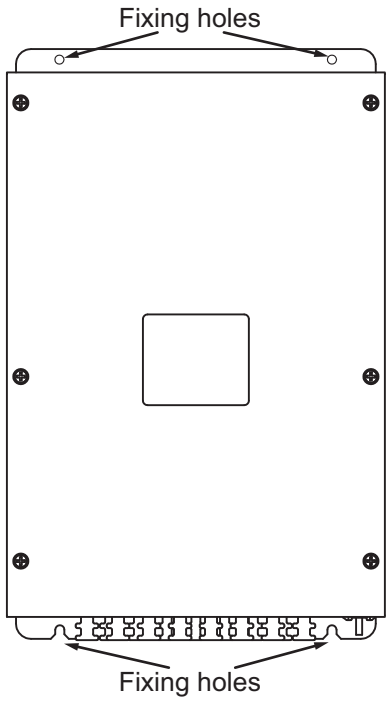
When selecting a mounting location for the transponder, keep the following in mind:

- Keep the transponder out of direct sunlight.
- The temperature and humidity should be moderate and stable. (Operating temperature range: -15°C to +55°C)
- Locate the unit away from exhaust pipes and vents.
- The mounting location should be well ventilated.
- Mount the unit where shock and vibration are minimal.
- Keep the unit away from electromagnetic field generating equipment such as motor, generator.
- For maintenance and checking purposes, leave sufficient space at the sides and rear of the unit and leave slack in cables. Refer to the outline drawing.
- A magnetic compass will be affected if the unit is placed too close to it. Observe the following compass safe distances to prevent disturbance to the magnetic compass:

  Standard compass: 1.70 meters
  Steering compass: 1.10 meters
- Avoid floor mounting the transponder in locations where there is water splash. Keep the cable entry away from water spray and splash.

Mounting

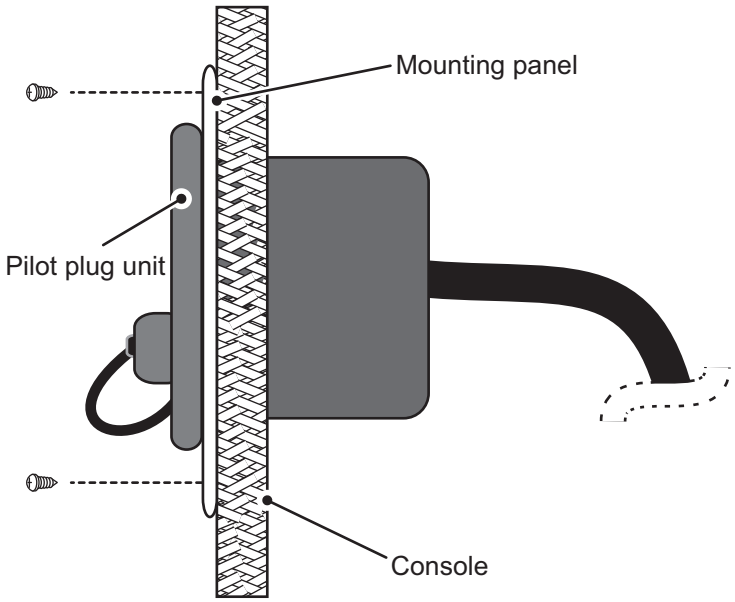
1. Select a mounting location, referring to the recommendations listed above.
2. Referring to the outline drawing at the back of this manual, fit two self-tapping screws at the location for the bottom fixing holes. Leave approximately 5 mm of thread exposed.
3. Place the FA-1701 on the two screws.
4. Fasten two self-tapping screws to the top fixing holes.
5. Fasten all screws to secure the FA-1701.

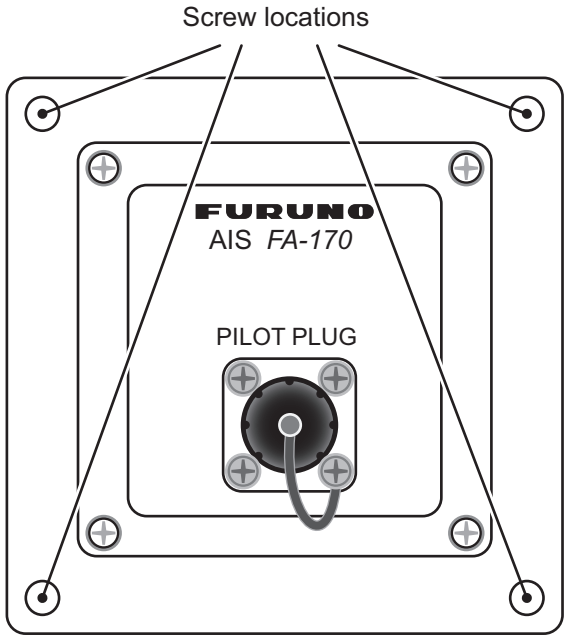


1.4 How to Install the FA-1703 Pilot Plug Unit (option)

The pilot plug unit is only available in the flushmount configuration and should be mounted near where the pilot steers the ship. This plug is used to connect a PC to display AIS information for use by the pilot.

1. Cut a mounting hole in the mounting location, referring to the outline drawing at the back of this manual for mounting dimensions.
2. Feed the necessary cables through the cutout, then referring to chapter 2, connect the pilot plug unit.
3. Set the pilot plug unit to the cutout. Use caution to prevent damage to cables when setting the pilot plug unit into the cutout.





4. Secure the pilot plug unit in place with the supplied screws, referring to the figures above.

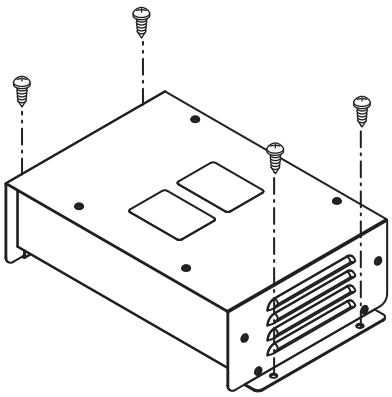
1.5 How to Install the PR-241/PR-240 Power Supply (option)

When selecting a mounting location for the unit, keep the following in mind:

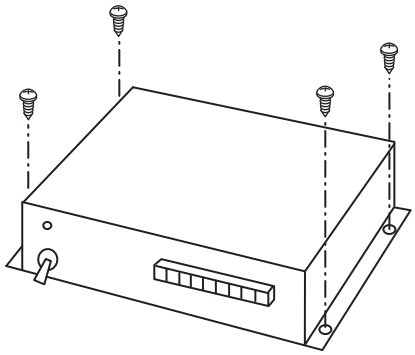
- Keep the unit away from areas subject to water splash.
- Locate the unit away from exhaust pipes and vents.
- The mounting location should be well ventilated.
- Mount the unit where shock and vibration are minimal.
- A magnetic compass will be affected if the unit is placed too close to it. Observe the following compass safe distances to prevent disturbance to the magnetic compass:

When using the PR-241	Standard compass: 0.85 meters Steering compass: 0.55 meters
When using the PR-240	Standard compass: 0.90 meters Steering compass: 0.60 meters

Fix the unit with four self-tapping screws (4×16) to a desktop or the deck as shown in the figure below. It is not necessary to open the cover.



PR-241



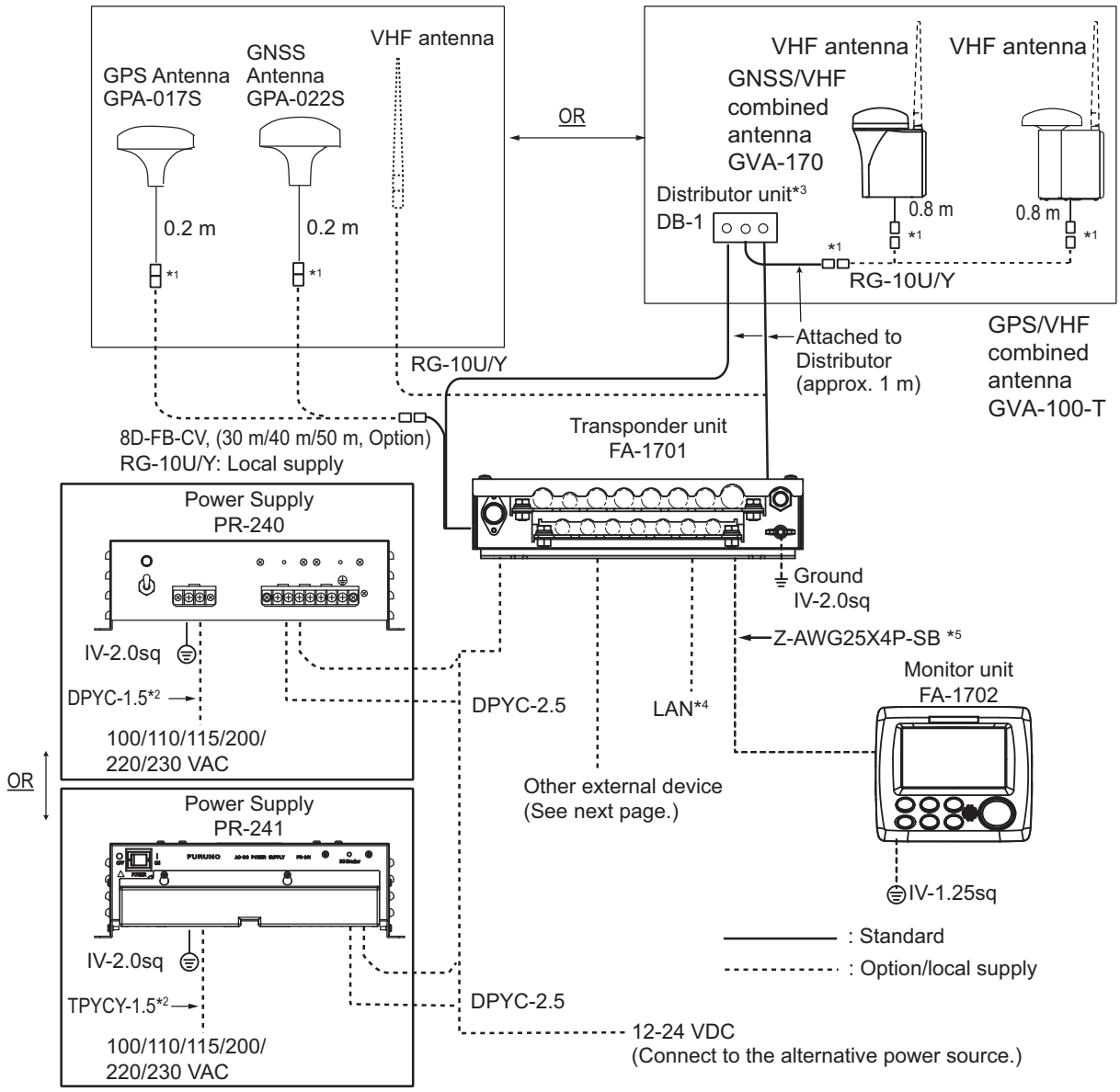
PR-240

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2. WIRING

2.1 Connection Overview

Connect the equipment, referring to the interconnection diagram at the back of this manual.

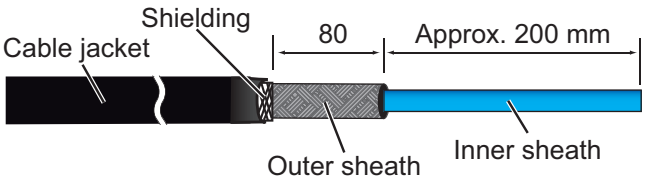


Power supply specifications	
Transponder Unit	12-24 VDC, 6-3 A
Monitor Unit	12 VDC, 0.3 A max.
AC/DC Power Supply Unit	100-115/200-230 VAC, 1 phase, 50/60 Hz

*1: Connections must be waterproofed. See “How to secure and waterproof exposed connections” on page 2-3.
*2: DPYC-2.5, TPYCY-1.5, TTYCSLA-1, TTYCSLA-1Q, TTYCSLA-4 and TTYCSLA-7 are Japan Industry Standard cables.
Use them or the equivalents, referring to the "JIS CABLE GUIDE" on page AP-1.
*3: Ground is not required.
*4: When connecting the LAN cable, leave approx. 200 mm slack before clamping the cable at the cable clamps.
*5: Cable type varies depending on configuration. Z-AWG25X4P-SB cable may be substituted for TTYCSLA-4 type cable or locally supplied cable.

2.2 How to Fabricate the Cables

LAN cable fabrication



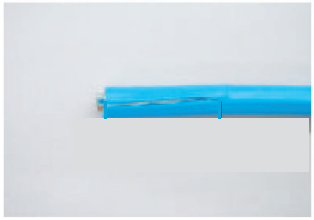
Expose the inner and outer sheaths as shown to the left.



Cover the cable jacket at the cut as shown to the left.

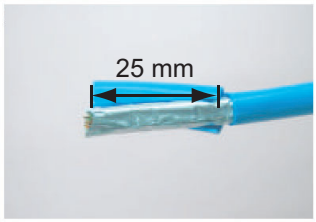
Cover the cable jacket with insulated tape (20 mm width)

1



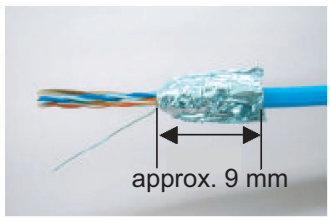
Expose inner vinyl sheath.

2



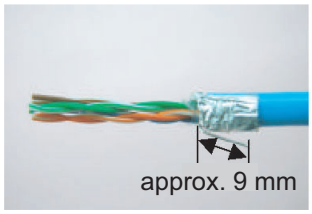
Remove the outer sheath by approx 25 mm. Be careful not to damage inner shield and cores.

3



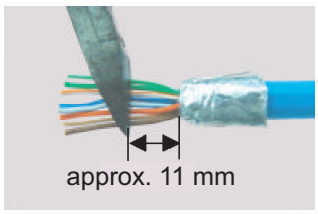
Fold back the shield, wrap it onto the outer sheath and cut it, leaving 9 mm.

4



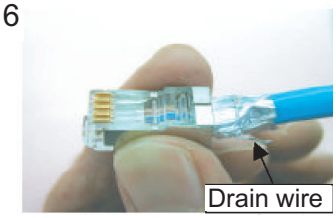
Fold back drain wire and cut it, leaving 9 mm.

5



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

6

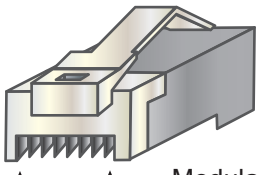


Insert the cable into the modular plug so that the folded part of the shield enters the modular plug. The drain wire must be on the tab side of the jack.

7



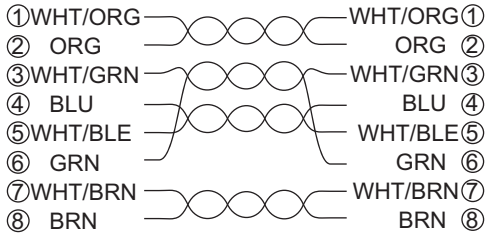
Using special crimping tool MPT5-8AS (PANDUIT CORP.), crimp the modular plug. Finally check the plug visually.



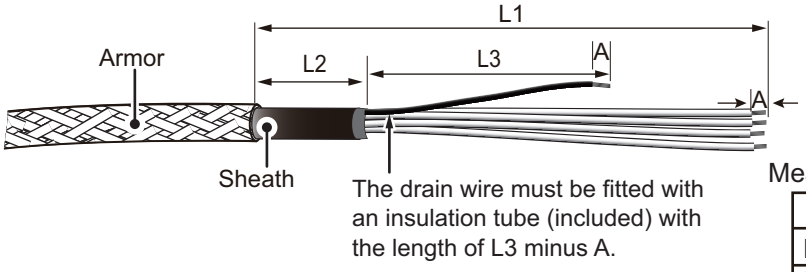
Modular plug

1 8

[Straight cable]



Fabrication of cables TTYCSLA-4, TYCSLA-7, TTYCSLA-1Q and TTYCSLA-1



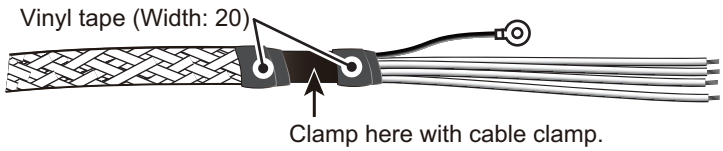
Measurements are displayed in mm

Unit	L1	L2	L3	A
FA-1701	*	80	80	6
FA-1702	130	80	60	6
FA-1703	170	100	80	9

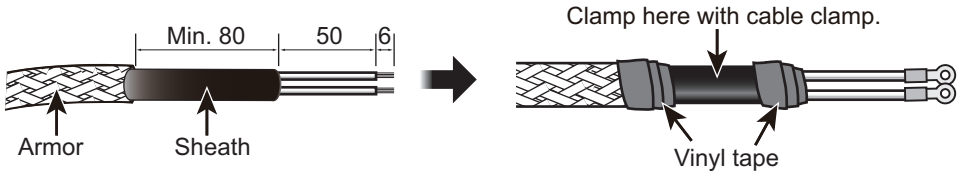
*: Length depends on installation configuration. When fabricating this cable, ensure enough slack is left to allow easy access for maintenance and service.

Note: L2 lengths displayed in the table above are the minimum recommended length. Adjust the length according to the installation configuration.

Using the terminals supplied on the inside of the FA-1701, fit the drain wire of each TTYCSLA cable with a terminal, then attach the terminal to the inside of the FA-1701 (the same place it was situated originally).



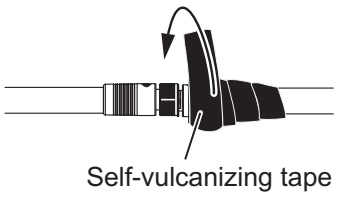
Fabrication of power cable DPYC-2.5



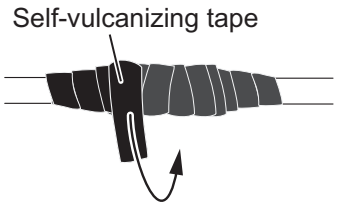
2.2.1 How to secure and waterproof exposed connections

All exposed connections between units should be secured and waterproofed using the procedure below.

1) Wrap the connection with self-vulcanizing tape.



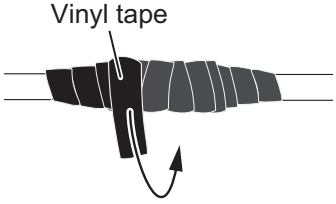
2) Wrap a second layer of self-vulcanizing tape in the opposite direction.



3) Wrap vinyl tape over the self-vulcanizing tape.



4) Wrap a second layer of vinyl tape in the opposite direction.

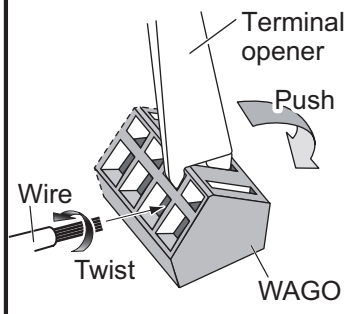


2.3 Unit Interconnection

The transponder unit (FA-1701), monitor unit (FA-1702) and the pilot plug unit (FA-1703) use different connectors for interconnection. See the figures below to fabricate the connections.

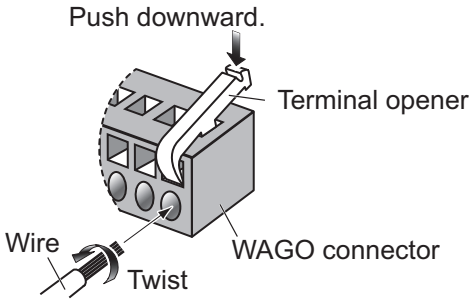
How to attach wires to the connectors

Transponder unit FA-1701
Terminal opener is located on rear of the FA-1701 cover.



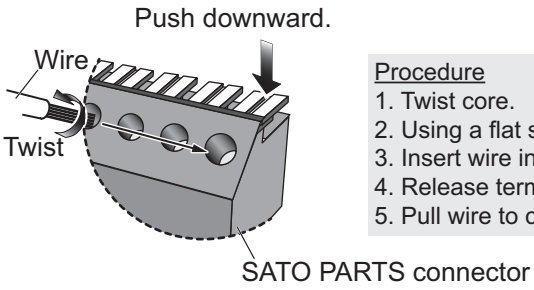
Procedure
1. Twist core.
2. Insert terminal opener and push.
3. Insert wire into hole. Be careful not to pinch the sheath.
4. Release terminal opener.
5. Pull wire to confirm it is correctly inserted.

Monitor unit FA-1702
Terminal opener is located inside cable clamp (rear cover).



Procedure
1. Twist the cores.
2. Push 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.

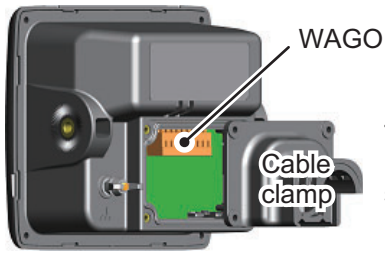
Pilot plug unit FA-1703
Use a flat head screwdriver to open the terminals.



Procedure
1. Twist core.
2. Using a flat screw driver, push the terminal opener.
3. Insert wire into hole. Be careful not to pinch the sheath.
4. Release terminal opener.
5. Pull wire to confirm it is correctly inserted.

2.3.1 How to connect the FA-1702 monitor unit

1. Unfasten the four screws on the rear cable clamp, then remove the cable clamp to reveal the WAGO connector.



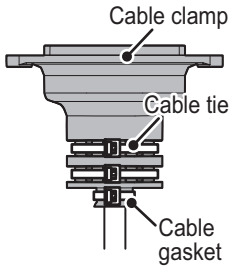
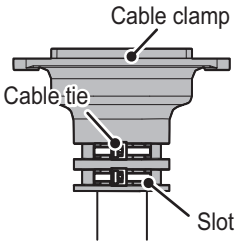
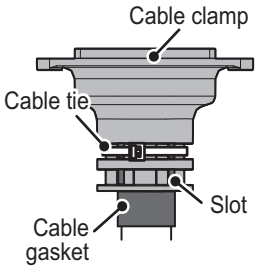
The cable clamp must be oriented as shown in this figure.

2. Unplug the WAGO connector from the FA-1702.
3. Pass the cable through the cable clamp.
   Note: To maintain the IPx5 waterproof rating, the cable must be TTYCSLA-4 (or equivalent) with a diameter of ϕ14.4±0.4 mm.
4. Referring to the table below and the interconnection diagram at the back of this manual, connect the FA-1702 using the WAGO connector inside the unit.

WAGO Pin No.	Connection		WAGO Pin No.	Connection
1	P12V_P		6	TD-B
2	GND		7	RD-A
3	PON-H		8	RD-B
4	PON-C		9	Drain wire
5	TD-A			

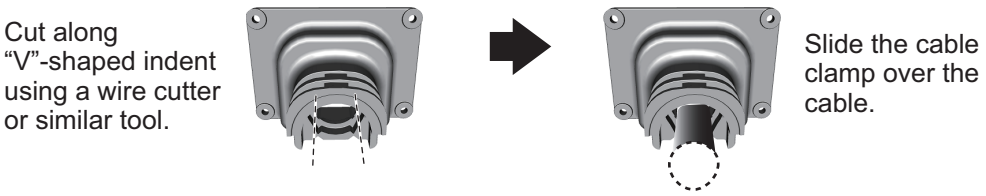
5. Slide the cable clamp along the cable towards the FA-1702, then fasten the four screws which were removed at step 1. The cable clamp must be oriented as shown the figure above.
6. Secure the cable to the cable clamp with cable tie(s) (included). The location and number of cable tie(s) is different, depending on whether the cable assembly OP05-146-1, OP05-146-2, optional cable protection kit or waterproofing kit is installed. Refer to the figure below for the correct location and numbers.

Top view of cable clamp

When using the cable assembly OP05-146-1, OP05-146-2 or the cable protection kit (OP05-147)	When using the cable (TTYCSLA-4)	
	Without using the waterproofing kit (OP05-139)	With using the waterproofing kit (OP05-139)
With three cable ties	With two cable ties	With a single cable tie
 Secure the cable gasket also with a cable tie.	 Wind cable ties through the slots.	 Wind a cable tie outside of the cable clamp.

In cases where the WAGO connector is connected to the cable before the cable is passed through the cable clamp, the cable clamp can be adjusted to allow connection.

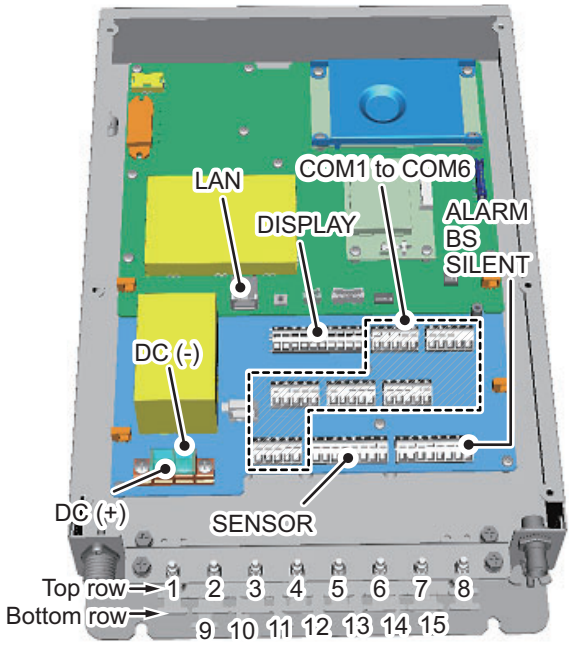
Note: Adjusting the cable clamp as outlined in the figure below voids the IPx5 waterproof rating of the clamp and the unit. To keep the IPx5 rating, remove the WAGO connector, then repeat the procedure above. When the following adjustment is done, the protection rating will be IPx2 even if any cable gasket is used.



2.3.2 How to connect the FA-1701 transponder unit

Referring to the figure and table below, connect the FA-1701. The figure below also shows the recommended entry point for connected cables. (Based on a vessel configured to use all WAGO connection points.)

The WAGO connection points are individually marked on the TRX-PWR PC board.



No.	Connection point
1	COM6
2	LAN
3	COM5
4	COM4
5	COM3
6	COM2
7	COM1
8	DISP
9	DC_IN
10	SENSOR1
11	SENSOR2
12	SENSOR3
13	ALARM
14	BS (Blue Sign)
15	Silent

Cable entry #8 should be used for DISP cabling, regardless of vessel configuration, as the entry hole is larger than the other entry points.

Cable entry #2 should be used for LAN connection, regardless of vessel configuration, to avoid excess stress on the LAN cable.

Port	Description
COM1 to COM3	Long range communication device (Inmarsat C, etc.) or External display (Radar, ECDIS, NavNet 2, NavNet 3D), BEACON or Pilot Plug Unit
COM4 to COM6	Long range communication device (Inmarsat C, etc.) or External display (Radar, ECDIS, NavNet 2, NavNet 3D), Pilot Plug Unit, BEACON or Sensor (GNSS, Gyrocompass, Speed log, ROT)
DISPLAY	Connects to Monitor Unit FA-1702.
ALARM	Connects to on-board alarm system.

Port	Description
BS (Blue Sign)	Connects a Blue Sign device, a lighting device mounted on the bridge which gives off a blue light to warn oncoming vessels when the vessel is navigating a channel in the reverse direction.
SENSOR	GNSS, Gyrocompass, Speed log, ROT.

Note 1: The cable entry points (for the top row only) are protected from foreign material with small plastic spacers. Remove the spacers as required when connecting cables to the FA-1701.

Note 2: The port to which the Pilot Plug Unit (the FA-1703) will be connected needs to be selected in the [INITIAL SET] - [I/O PORT] menu. (Refer to the note 3 of the section 3.5.)

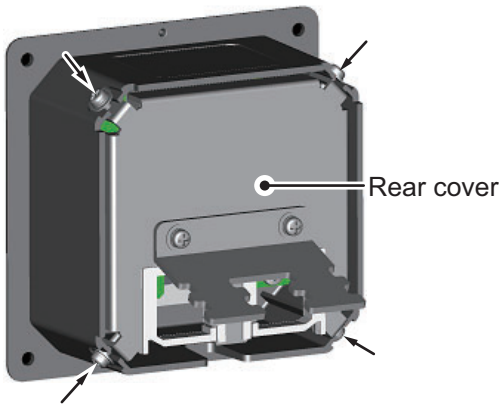
All cables should be secured at the cable clamps (indicated as #1 through #15 in the figure above) using cable ties (included). The LAN cable in particular should be secured with the outer sheath of the LAN cable on the cable clamp.

2.3.3 How to connect the FA-1703 (Pilot Plug Unit, optional)

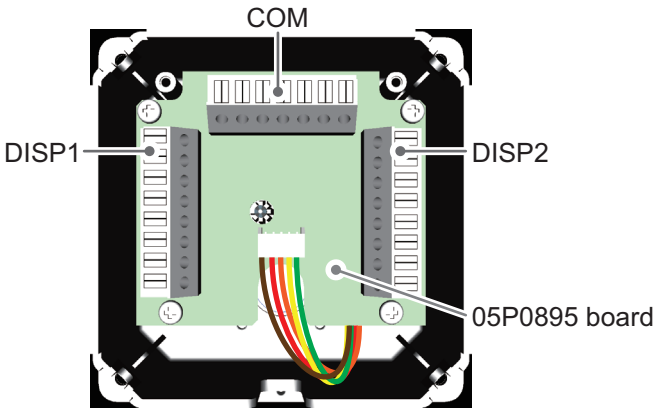
The FA-1703 is shipped with a flushmount panel attached. The flushmount panel can be removed if it is not required.

The example figures below show the FA-1703 without a flushmount panel.

1. Unfasten the four screws at the locations indicated with arrows in the figure below.

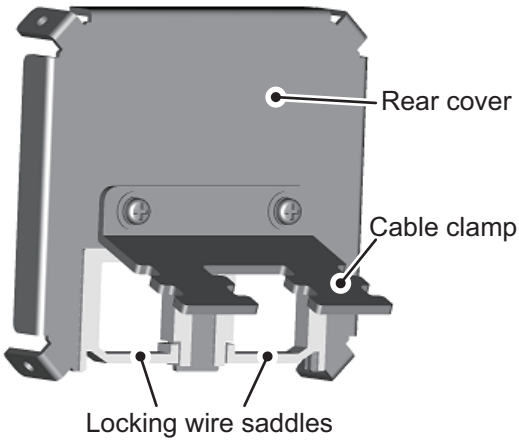


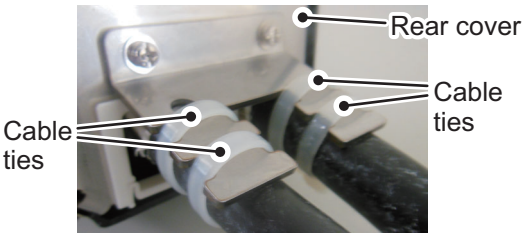
2. Remove the rear cover of the FA-1703. The 05P0895 board, with three SATO PARTS connectors, is exposed.



3. Referring to "Unit Interconnection" on page 2-4 and the interconnection diagram at the rear of this manual, connect the FA-1703.

4. Pass the connected cables through the locking wire saddle on the rear cover, then fit the rear cover to the FA-1703.





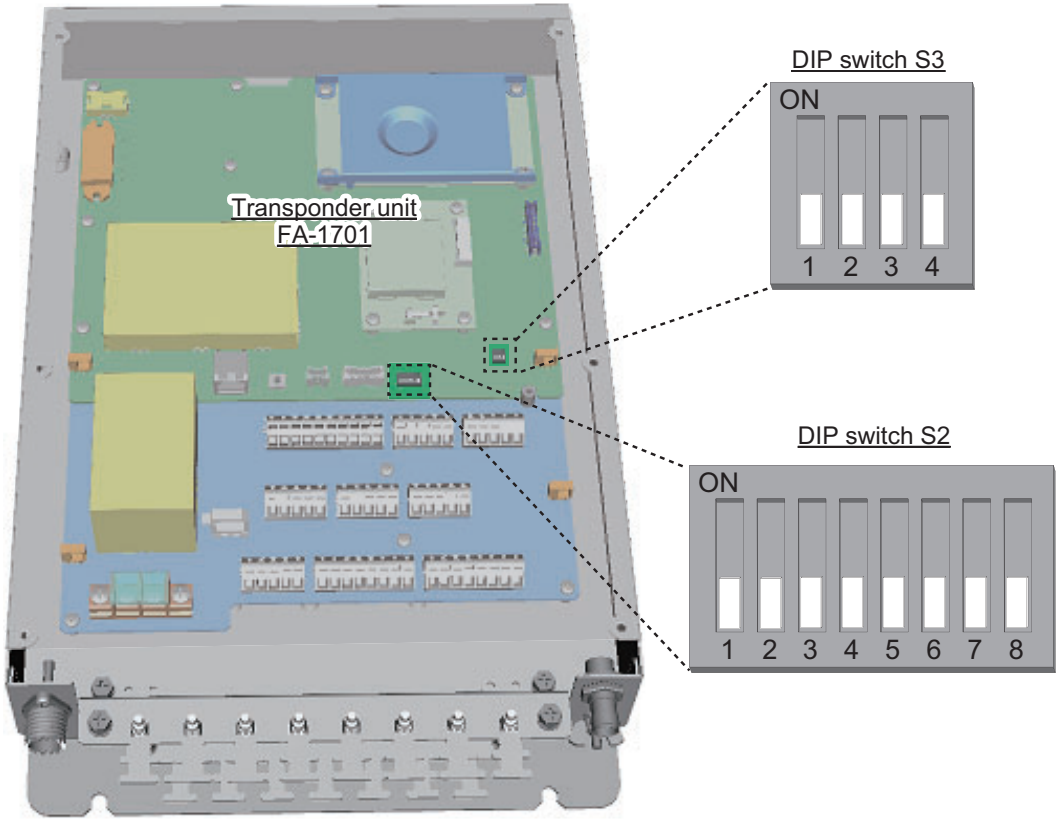
5. Fasten the four screws removed at step 1, then secure the connected cables to the cable clamp with cable ties.

2.4 How to Terminate COM Ports (For IEC 61162-1/2 signal)

When the output/input signal used is IEC61162-2 format, terminate at the DIP switch (S2, S3) as required. The DIP switch is located on the TRX-PWR board, see the figure below.

Note 1: Incorrect termination may cause communication errors.

Note 2: The factory default setting DIP switch S2 and S3 are shown in the figure below.



COM port	Termination
COM1	Set S2 #1 to ON.
COM2	Set S2 #2 to ON.

Note: S2 #3 to #8 are for qualified technicians only. Do not change these settings.

COM port	Termination
COM3	Set S3 #1 to ON.
COM4	Set S3 #2 to ON.
COM5	Set S3 #3 to ON.
COM6	Set S3 #4 to ON.

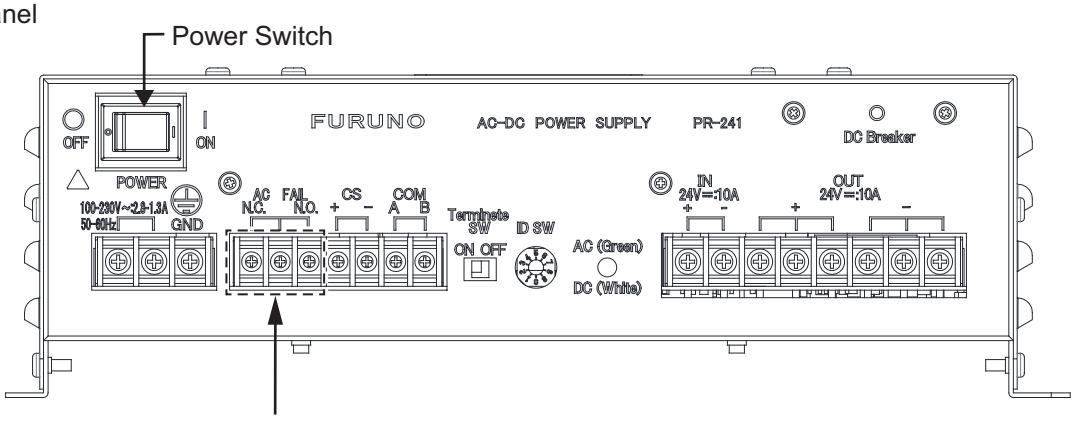
Note: When using the COM ports as IEC61162-1, termination must be OFF.

Where the FA-1701 is part of a daisy chain, and is not the last unit in the daisy chain, the DIP switch for the daisy chained COM port must be OFF. Where the FA-1701 is the last unit in the daisy chain, do not change the DIP switch settings.

2.5 Connection of Ship's Main and AC-DC Power Supply

The AC-DC power supply PR-241 is shipped ready for connection to a 100-230 VAC ship's main.

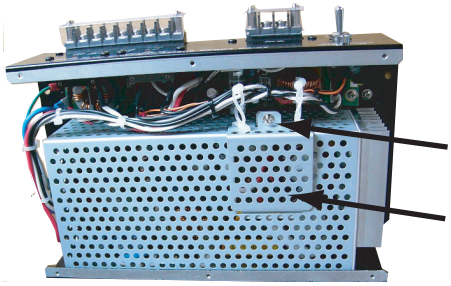
Front panel

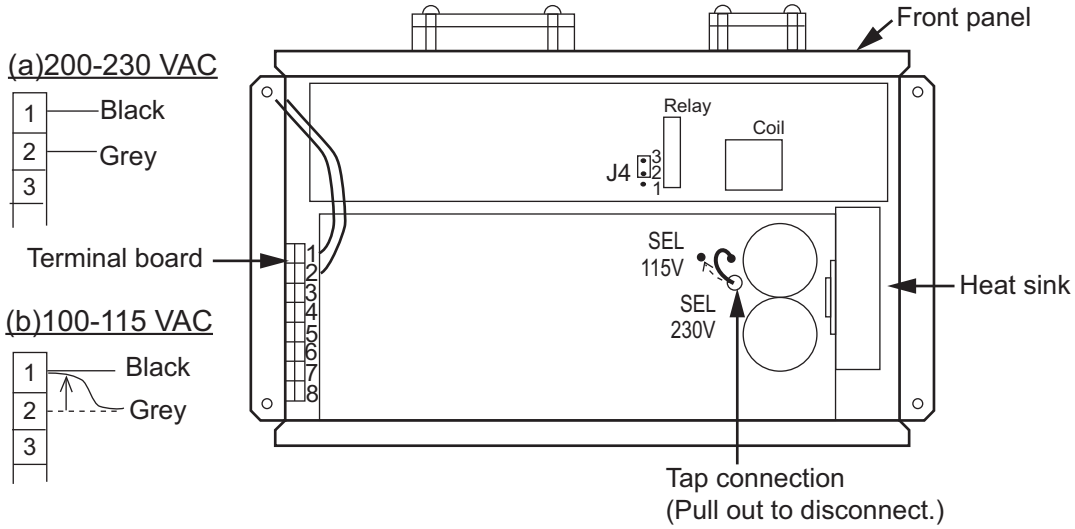


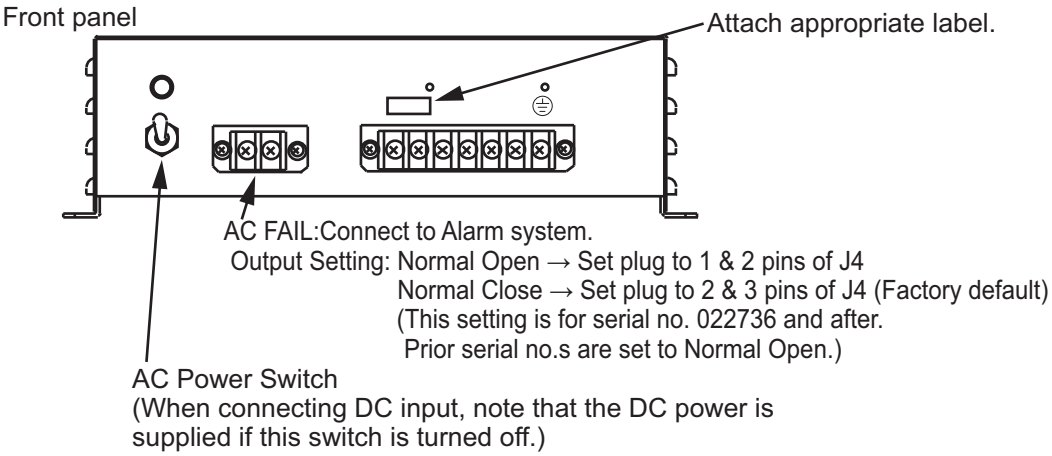
AC FAIL: Connect to Alarm system.
Output Setting: Normal Open → Connect to N.O. terminal (Right terminal)
Normal Close → Connect to N.C. terminal (Left terminal)

The AC-DC power supply PR-240 is shipped ready for connection to a 200-230 VAC ship's main. If the ship's main is 100 VAC-115 VAC, change the tap connection and terminal board connection as below. Attach label supplied as accessories to the front panel according to the ship's main.

Ship's main	Tap connection	Terminal board	Label
200-230 VAC	SEL 230 V	Below (a)	200-230 VAC 2.5-2.0 A 1ϕ, 50/60 Hz
100-115 VAC	SEL 115 V	Below (b)	100-115 VAC 4.0-3.5 A 1ϕ, 50/60 Hz







Note: The DC output load must be less than 8A.

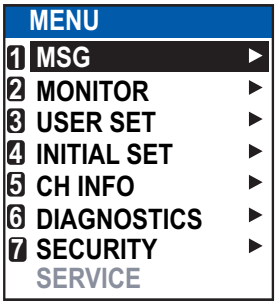
3. SETTINGS AND ADJUSTMENTS

After installing the equipment, set up the own ship's static information (MMSI, IMO number, ship's name, call sign, ship and GNSS antenna position) and interface.

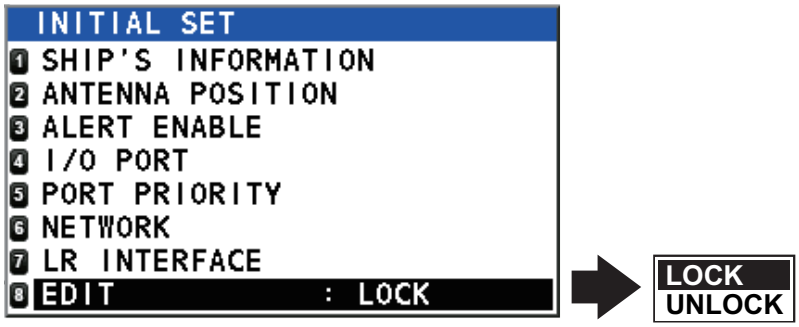
How to access the [INITIAL SET] menu

The [INITAL SET] menu can be accessed at any time, however it is recommended that the qualified technicians change the settings on the [INITIAL SET] menu. Contact your dealer to change the settings.

1. Press the **MENU/ESC** key to open the menu.



2. Select [INITIAL SET], then press the **ENT/ACK** key.
3. Select [EDIT], then press the **ENT/ACK** key. A pop up options window is displayed.



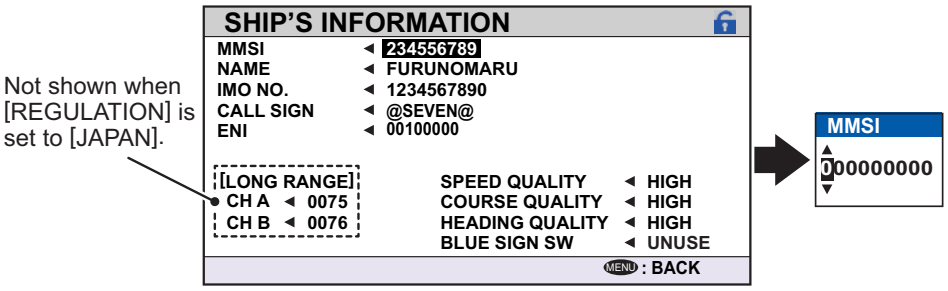
4. Select [UNLOCK], then press the **ENT/ACK** key.
   Note: Contact your dealer to change [EDIT] to [UNLOCK].

When [EDIT] is set to [UNLOCK], the [INITIAL SET] menu items can be edited. The lock icon, found on settings screens, changes to a blue colored open lock icon.

3.1 How to Set MMSI, IMO No., Name and Call Sign

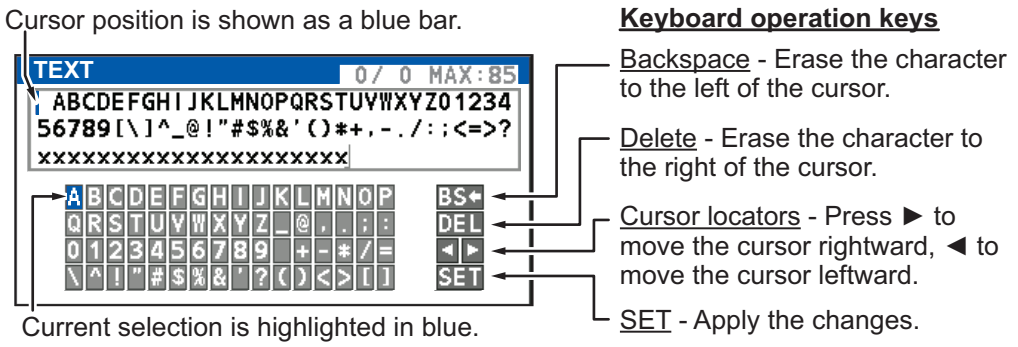
This section covers the basic setup for CLASS A AIS systems. Inland AIS systems require several Inland AIS specific settings, outlined in section 3.2.

1. Access the [INITIAL SET] menu, following the procedure outlined in "How to access the [INITIAL SET] menu" on page 3-1.
2. Select [SHIP'S INFORMATION], then press the **ENT/ACK** key.
3. Select [MMSI], then press the **ENT/ACK** key to display the [MMSI] pop up window.



Note: [ENI], [SPEED QUALITY], [COURSE QUALITY], [HEADING QUALITY] and [BLUE SIGN SW] are Inland AIS settings. These items do not appear for other AIS modes. For Inland AIS settings, see section 3.2.

4. Use the arrow keys to set the [MMSI], then press the **ENT/ACK** key. The characters are cycled in the following order when ▲ is pressed: 1, 2 ... 9, 0, 1, 2... press ▼ to cycle through characters in the opposite direction. Press ▶ or ◀ to move the selection cursor.
5. Input the IMO number in a similar manner to MMSI.
   IMO: Ten digits. If the IMO number has 8 digits, enter "0" twice followed by IMO number. If the ship has no IMO number, enter ten zeros. Inland AIS is fixed at "0".
6. For [NAME] and [CALL SIGN], the software keyboard is displayed when the item is selected.



   1) Referring to the figure above, press the arrow keys to select a character or keyboard operation.
   2) Press the **ENT/ACK** key to confirm your selection.
   3) Repeat steps 1 and 2 to complete the alphanumeric input.
   4) Select [SET], then press the **ENT/ACK** key.
7. After entering data, press the **DISP** key to close the menu.

Note 1: You can use up to 20 alphanumeric characters to enter the [NAME] and up to 7 alphanumeric characters to enter the [CALL SIGN]. "\", " ^", "!", ",", "$", and "*" count as three characters.

Note 2: If you enter incorrect data, do the procedure from step 1.

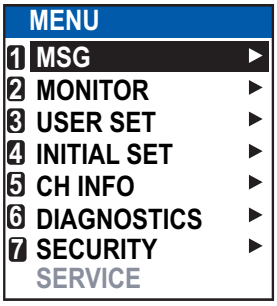
3.2 Inland AIS Specific Settings

This section shows how to activate and set up the Inland AIS feature. The AIS activation key is obtained from the place of purchase.

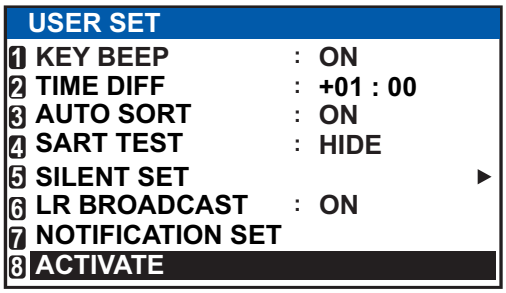
3.2.1 How to activate the Inland AIS

Input your key number (received from dealer) to activate the Inland AIS.

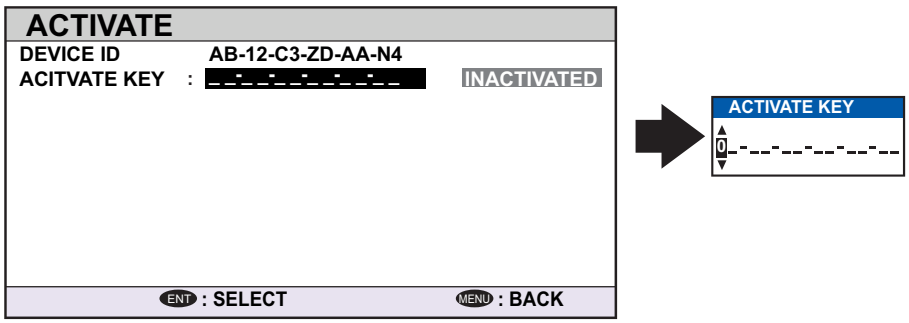
1. Press the **MENU/ESC** key to open the menu.



2. Select [USER SET] then press the **ENT/ACK** key.



3. Select [ACTIVATE] then press the **ENT/ACK** key.



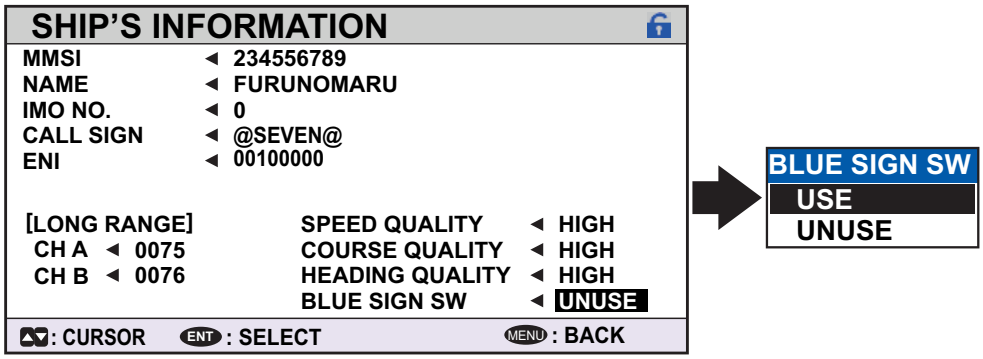
4. Press the **ENT/ACK** key to display the alphanumeric pop up window.
   The characters are cycled in the following order when ▲ is pressed: 1, 2 ... 8, 9, A, B, C ... X, Y, Z, 1, 2... press ▼ to cycle through characters in the opposite direction. Press ▶ or ◀ to move the selection cursor.
5. Input the activation key, then press the **ENT/ACK** key.

If you entered the activation key correctly, the indication "ACTIVATED. SYSTEM WILL RESTART" appears then the system is automatically restarted.

3.2.2 How to set blue sign status

Blue sign (a day-sign), which in combination with a white flashing light, must be shown if you are sailing on the port-side shore (against traffic direction).

1. Access the INITIAL SET menu, following the procedure outlined in "How to access the [INITIAL SET] menu" on page 3-1.
2. Select [SHIP'S INFORMATION] then press the **ENT/ACK** key.
   Note: [SHIP TYPE] is not displayed and the [IMO NO.] for your vessel is displayed as "0" when using [INLAND] mode.
3. Select [BLUE SIGN SW], then press the **ENT/ACK** key. A pop up options window is displayed.



4. Select [UNUSE] (not in use) or [USE] (in use) as applicable, then press the **ENT/ACK** key.

3.2.3 Other inland AIS specific settings

Inland AIS requires the following additional settings:

ENI

1. Select [ENI], then press the **ENT/ACK** key to display the [ENI] pop up window.
2. Use the arrow keys to set the [ENI], then press the **ENT/ACK** key. The charcters are cycled in the following order when ▲ is pressed: 1, 2 ... 9, 0, 1, 2... press ▼ to cycle through characters in the opposite direction. Press ▶ or ◀ to move the selection cursor.

Sensor quality

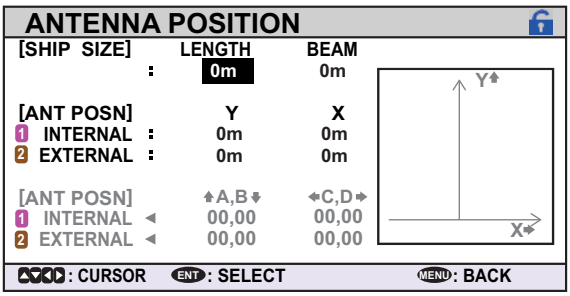
Set [SPEED QUALITY], [COURSE QUALITY] and [HEADING QUALITY] as follows:

1. Select [SPEED QUALITY], then press the **ENT/ACK** key to display the [SENSOR QUALITY (SPEED)] pop up window.
2. Select the [HIGH] or [LOW] as appropriate, then press the **ENT/ACK** key.
   Select [HIGH] where there is three or more referenced sensors, giving a higher quality reading.
   Select [LOW] where there is only one or two sensors, giving a reading which may require periodic adjustment.
3. Set [COURSE QUALITY] and [HEADING QUALITY] in the same manner.

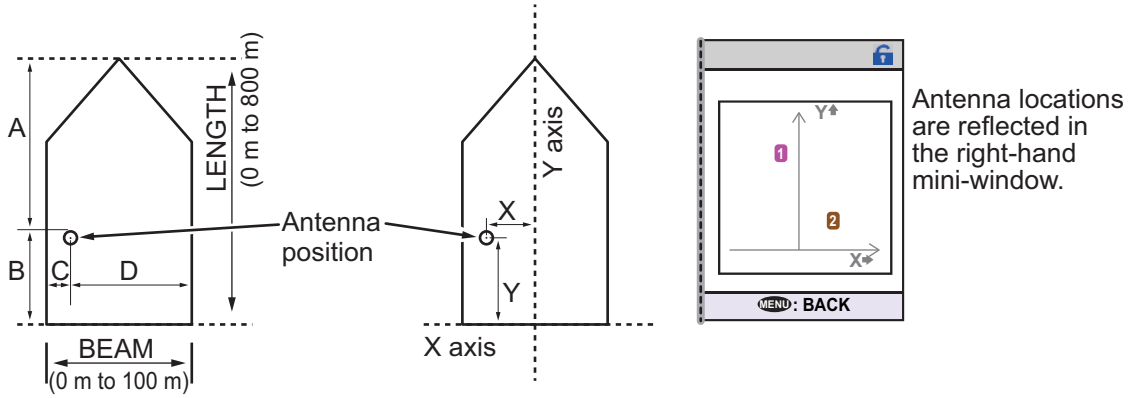
3.3 How to Set GNSS Antenna Position

Set the antenna position using this procedure. For INLAND AIS users, this procedure must be done in both INLAND mode and SOLAS mode.

1. Access the [INITIAL SET] menu, following the procedure outlined in "How to access the [INITIAL SET] menu" on page 3-1.
2. Select [ANTENNA POSITION], then press the **ENT/ACK** key. The settings screen for [ANTENNA POSITION] is displayed.



3. The [LENGTH] option is selected, press the **ENT/ACK** key to input the vessel length. The available range for length is 0 m to 800 m. Press the **ENT/ACK** key to apply the setting.
4. Select [BEAM], then press the **ENT/ACK** key to input the vessel beam. The available range for beam is 0 m to 100 m. Press the **ENT/ACK** key to apply the setting.



Antenna locations are reflected in the right-hand mini-window.

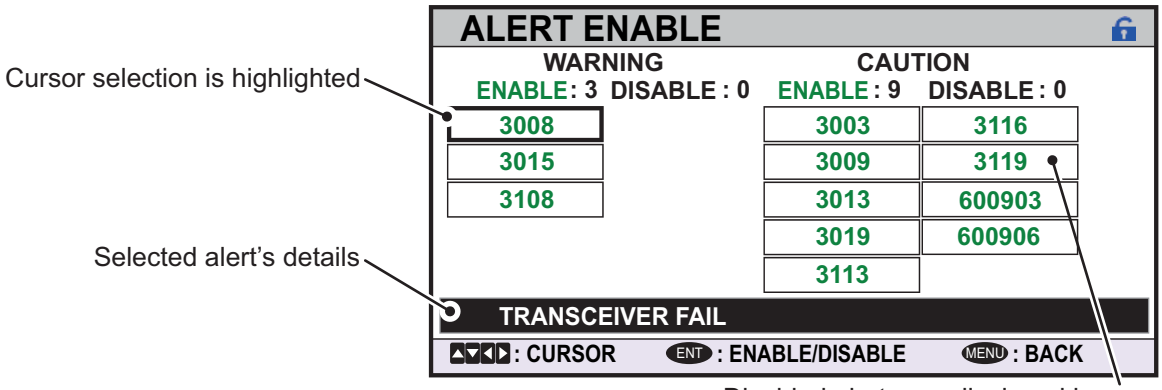
5. Select the Y indication for the internal antenna, then press the **ENT/ACK** key. A settings pop up window is displayed. The pop up shows the available setting range at the bottom.
   The Y axis coordinates are calculated from the stern of the vessel. The setting range varies depending on the vessel's dimensions.
6. Set the bow-stern position for the antenna, then press the **ENT/ACK** key.
7. Select the X indication for internal antenna, then press the **ENT/ACK** key.
   The X coordinates are calculated from the center of the vessel. Negative settings give a port-side positioning, positive settings give a starboard-side positioning.
8. Set the port-starboard position for the antenna, then press the **ENT/ACK** key.
9. Set the position for the external antenna, then press the **ENT/ACK** key. A settings pop up window is displayed. The pop up shows the available setting range at the bottom.
   Note: The settings for the antenna position are reflected at the bottom of the screen, in gray, as [A,B] for bow-stern positioning and [C,D] for port-starboard positioning, and the antenna numbers are also shown in the right-hand mini-window.
10. Press the **MENU/ESC** key to return to the [INITIAL SET] menu.

3.4 How to Enable or Disable Alerts

You can enable or disable alerts from the [ALERT ENABLE] menu. Disabling an alert in this menu will disable all related alerts for the disabled alert.

Note: All alerts are set to [ENABLE] by default.

1. Access the [INITIAL SET] menu, following the procedure outlined in "How to access the [INITIAL SET] menu" on page 3-1.
2. Select [ALERT ENABLE], then press the **ENT/ACK** key.

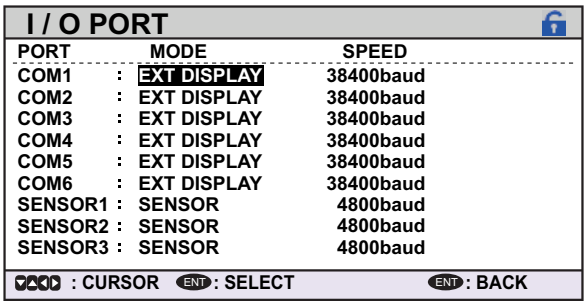


Note: This display is when Alert Mode is set to Alert IF2.

3. Select an alert, then press the **ENT/ACK** key to enable or disable the alert. Enabled alerts are displayed in green color text, disabled alerts are displayed in gray color text.
4. Press the **MENU/ESC** key to return to the [INITIAL SET] menu.

3.5 How to Set Up the I/O Ports

1. Access the [INITIAL SET] menu, following the procedure outlined in "How to access the [INITIAL SET] menu" on page 3-1.
2. Select [I/O PORT], then press the **ENT/ACK** key.



Note: The figure above shows the default settings for all ports.

The available port settings are outlined in the table on the following page.

PORT	MODE	SPEED (baud)
COM1	EXT DISPLAY	4800, 38400
	PILOT PLUG	38400
	LONG RANGE	4800, 38400
	BEACON	4800
	MONITOR	57600
	DISABLE	-
COM2 to COM3	Same as COM1.	Same as COM1.
COM4	EXT DISPLAY	4800, 38400
	PILOT PLUG	38400
	LONG RANGE	4800, 38400
	SENSOR	4800, 38400
	BEACON	4800
	MONITOR	57600
	DISABLE	-
COM5 to COM6	Same as COM4.	Same as COM4.
SENSOR1	SENSOR	Fixed at 4800
	DISABLE	-
SENSOR2 & SENSOR3	Same as SENSOR1.	Same as SENSOR1.

Note 1: When [MODE] is set to [PILOT PLUG], [BEACON] or [MONITOR], speed settings are fixed at the default setting.

Note 2: For detailed information on data format and related speeds, see "DIGITAL INTERFACE" on page AP-2.

Note 3: When a port is set as [PILOT PLUG], the port can be connected to the Pilot Plug Unit FA-1703 and to a PC. The default setting of [SECURITY] - [PILOT PLUG] menu is [ON]. Upon the start of using this equipment, this menu needs to be deactivated by the system administrator from the [SECURITY] - [PILOT PLUG] menu by entering a system administrator password and change the setting to [OFF]. When connecting the Pilot Plug Unit FA-1703 and a PC, the Pilot Plug needs to be activated from the [SECURITY] - [PILOT PLUG] menu by entering a system administrator password and change the setting to [ON]. When finished using the pilot plug, make sure to change the setting to [OFF].

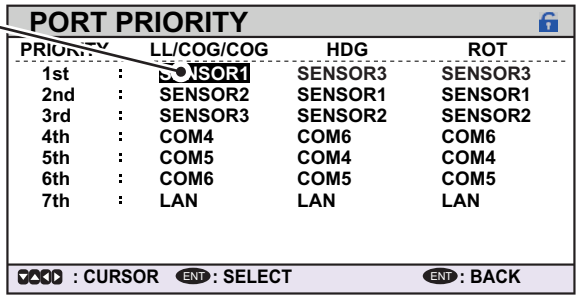
Mode definitions

MODE	Definition
EXT DISPLAY	External display (Radar, ECDIS, Pilot plug, etc.).
PILOT PLUG	External display (Radar, ECDIS, Pilot plug, etc.). Heading and rate of turn are output.
LONG RANGE	Long range communication device (Inmarsat C, etc.).
SENSOR	GNSS, Gyrocompass, ROT, etc.
MONITOR	For FA-1702 Monitor Unit.
BEACON	For Beacon Receiver.
DISABLE	Disable the port.

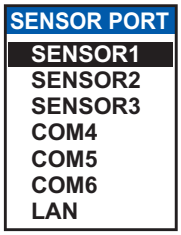
3.5.1 How to set port priority

1. Access the [INITIAL SET] menu, following the procedure outlined in "How to access the [INITIAL SET] menu" on page 3-1.
2. Select [PORT PRIORITY], then press the **ENT/ACK** key.

Selected item is highlighted in reverse video.



3. Select the sensor whose priority you want to adjust, then press the **ENT/ACK** key. The [SENSOR PORT] pop up window is displayed.
4. Select the appropriate port, then press the **ENT/ACK** key.
5. Repeat step 3 to step 4 for other port priorities.
6. Press the **MENU/ESC** key to return to the [INITAL SET] menu.



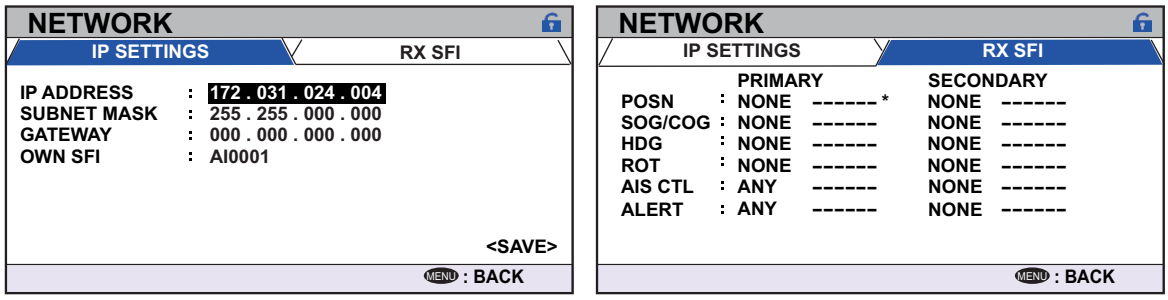
3.6 Network Set Up

The procedure for network setup differs depending on the setting for [NW PROTOCOL]. Follow the procedure which is appropriate for your settings; either [450] (IEC61162-450 compliant) or [NAVNET]. (Refer to "How to set the network protocol" on page 3-13 and the "NETWORK AND SECURITY CONFIGURATIONS SETTINGS" on page AP-17.)

When [450] (IEC61162-450) is selected

1. Access the [INITIAL SET] menu, following the procedure outlined in "How to access the [INITIAL SET] menu" on page 3-1.

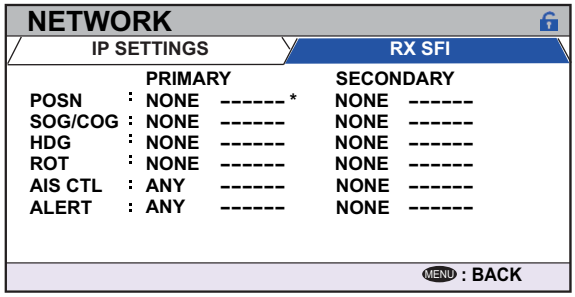
2. Select [NETWORK], then press the **ENT/ACK** key.



*: XXYYYY (X: A to Z, YYYY: 0000 to 9999)

Settings screens for [450]

3. [IP ADDRESS] is selected. Press the **ENT/ACK** key to show the IP address settings pop up window.
4. Set the IP address, then press the **ENT/ACK** key.
5. Select and set [SUBNET MASK], [GATEWAY] and [OWN SFI] in a similar fashion.
   Note: Be sure to use an SFI not used by other devices in the shipboard network.
6. Press ◀ or ▶ to display [RX SFI] tab.
   The [RX SFI] tab is for selecting the data source on the network for each item. Up to two sensors can be selected as the data source ([PRIMARY] and [SECONDARY]). The sensor which is set as [PRIMARY] is prioritized.



*: XXYYYY (X: A to Z, YYYY: 0000 to 9999)

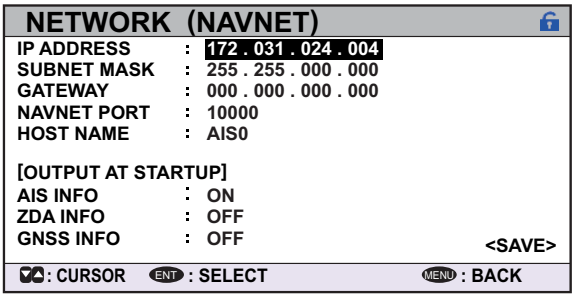
- [POSN]: Data source for position
- [SOG/COG]: Data source for Speed Over the Ground and Course Over the Ground
- [HDG]: Data source for Heading
- [ROT]: Data source for the Rate Of Turn
- [AIS CTL]: Data source for AIS Control
- [ALERT]: Data source for alert

7. Select [GROUP] of [POSN] - [PRIMARY] from [NONE] and [SFI].
   Note: There are other options for the [GROUP] of other items.
   The meanings of [GROUP] are as follows.
   [NONE]: Does not receive data from the sensors.
   [SFI]: Receives data from the sensor which has the SFI set on [------] ([SFI]). When part of a LAN network, the FA-170, may receive data for the same item from several sources, which can result in unstable calculations. For stable calculations, set the [SFI] for the sensor to be used as the fixed data source.
   [ANY]: Receives data from any connected sensor.
8. If [SFI] was selected, press ▼ to move the cursor to [------] ([SFI]), then set the SFI for the sensor to receive data from. If [NONE] was selected, go to the next step in this procedure.
9. Press ▼ to move the cursor to [POSN] - [SECONDARY] and select the [GROUP] from [NONE] and [SFI].

10. If [SFI] was selected, press ▼ to move the cursor to [------] ([SFI]), then set the SFI for the sensor to receive data from. If [NONE] was selected, go to the next step in this procedure.
11. Repeat step 7 to 10 for other items as required.
12. Confirm the settings on the [IP ADDRESS] tab are correct, then select [<SAVE>] and press the **ENT/ACK** key. A confirmation pop up is displayed.
    Note: If no changes are made to the settings on [IP ADDRESS] tab, [<SAVE>] is not selectable.
13. Select [NO] to change the settings further. Select [YES] to accept the new settings, the unit now shuts down automatically to apply the new settings. After the unit shuts down, press the power key to restart the unit.

When [NAVNET] is selected on [SERVICE] - [NW PROTOCOL]

1. Access the [INITIAL SET] menu, following the procedure outlined in "How to access the [INITIAL SET] menu" on page 3-1.
2. Select [NETWORK], then press the **ENT/ACK** key.



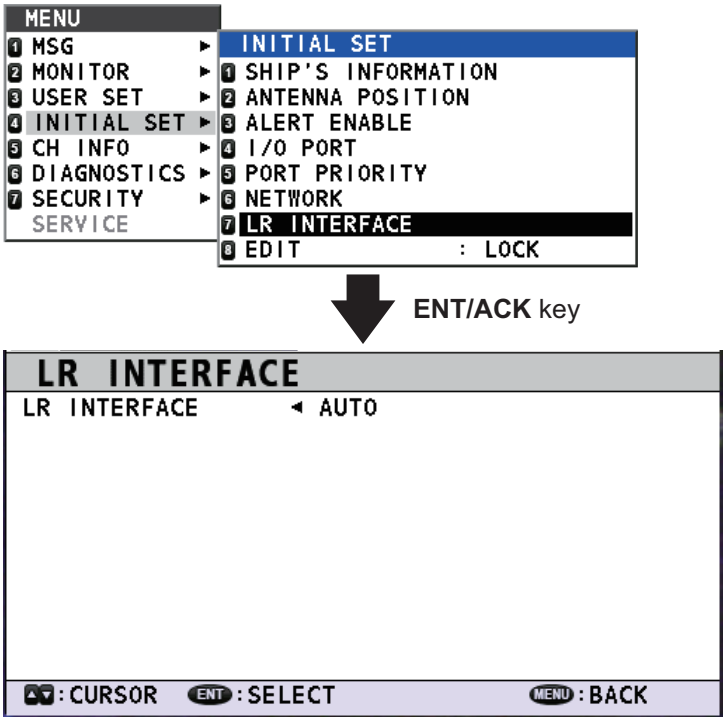
NAVNET network settings screen.

3. [IP ADDRESS] is selected. Press the **ENT/ACK** key to show the IP address settings pop up window.
4. Set the IP address, then press the **ENT/ACK** key.
5. Select and set [SUBNET MASK] and [GATEWAY] in a similar fashion.
6. Select [NAVNET PORT], then press the **ENT/ACK** key.
7. Input the NavNet port which this unit is connected to, then press the **ENT/ACK** key.
8. Select [HOST NAME], then press the **ENT/ACK** key.
9. Input the name for this unit within the NavNet network, then press the **ENT/ACK** key.
10. Select [AIS INFO], then press the **ENT/ACK** key.
11. Select [ON] to enable AIS data output to the NavNet network when this unit is turned on. Select [OFF] to disable AIS data output when this unit is turned on.
12. Set [ZDA INFO] and [GNSS INFO] in the same manner as [AIS INFO].
    [AIS INFO]: Turns on/off the output of AIS data.
    [ZDA INFO]: Turns on/off the output of ZDA sentence (current date and time).
    [GNSS INFO]: Turns on/off the position data.
13. Confirm the settings are correct, then select [<SAVE>] and press the **ENT/ACK** key. A confirmation pop up is displayed.
    Note: If no changes are made to the settings, [<SAVE>] is not selectable.
14. Select [NO] to change the settings further. Select [YES] to accept the new settings, the unit now shuts down automatically to apply the new settings. After the unit shuts down, press the power key to restart the unit.

3.7 How to Set the LR Interface

Select how to reply to a request for own ship data from a distant station, for example, an Inmarsat C station. The available options are [AUTO] (automatically) or [MANUAL] (manually).

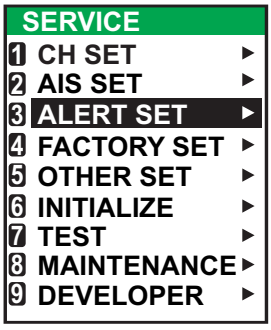
1. Access the [INITIAL SET] menu, following the procedure outlined in "How to access the [INITIAL SET] menu" on page 3-1.
2. Select [LR INTERFACE], then press the **ENT/ACK** key.



3. Select [LR INTERFACE], then press the **ENT/ACK** key.
4. Select [AUTO] (auto reply) or [MANUAL] (manual reply) as appropriate, then press the **ENT/ACK** key.
5. Press the **MENU/ESC** key to return to the [INITIAL SET] menu.

3.8 SERVICE Menu Operations

The [SERVICE] menu is only for the qualified technicians. To change the settings of the [SERVICE] menu, contact FURUNO for password details.



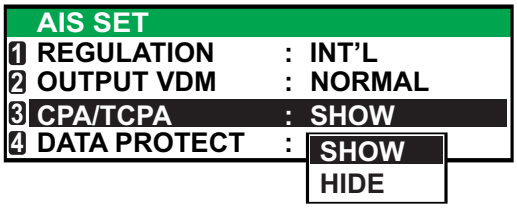
[SERVICE] menu access is required to setup the following items:

- [ALERT MODE] settings
- Network protocol settings
- Restore Factory settings etc.

3.8.1 How to hide CPA/TCPA

Factory default settings show CPA/TCPA. You can hide (or re-show) the CPA/TCPA indications, by doing the following:

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [AIS SET], then press the **ENT/ACK** key.
3. Select [CPA/TCPA], then press the **ENT/ACK** key. The options pop up window appears.
4. Select [SHOW] or [HIDE] as appropriate, then press the **ENT** key.

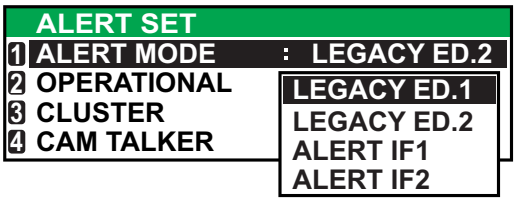


5. Press the **MENU/ESC** key to return to the [INTIAL SET] menu, or press the **DISP** key to close all open menus.

3.8.2 How to set the alert mode

The alert mode can be set according to the vessel's configuration. The available alert modes are: [LEGACY ED.1], [LEGACY ED.2], [ALERT IF1] and [ALERT IF2].

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [ALERT SET], then press the **ENT/ACK** key.
3. Select [ALERT MODE], then press the **ENT/ACK** key.
   Note: The [OPERATIONAL] setting is for qualified technicians only. Do not change this setting.
4. Select the appropriate [ALERT MODE] setting, then press the **ENT/ACK** key. Select [ALERT IF1] for vessels configured with AMS, [ALERT IF2] for vessels configured with BAM.



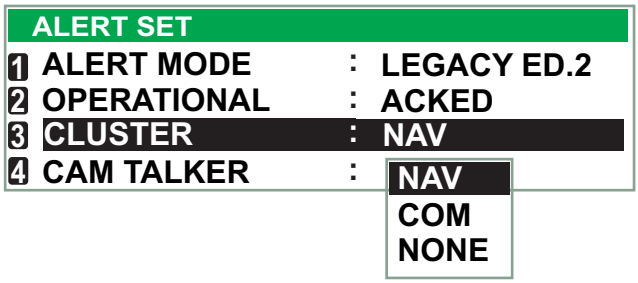
5. Press the **MENU/ESC** key to return to the [INTIAL SET] menu, or press the **DISP** key to close all open menus.

3.8.3 How to set the Cluster menu

The [CLUSTER] menu is available only when the [ALERT MODE] is set to [ALERT IF2] (when connecting to BAM). The cluster to which this equipment belongs can be specified with this menu.

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [ALERT SET], then press the **ENT/ACK** key.

3. Select [CLUSTER], then press the **ENT/ACK** key.



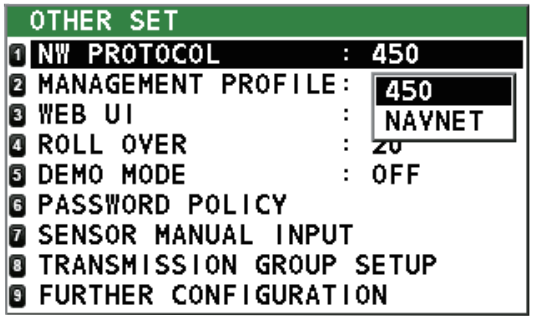
4. Select the appropriate [CLUSTER] setting, then press the **ENT/ACK** key.
5. Press the **MENU/ESC** key to return to the [ALERT SET] menu, or press the **DISP** key to close all open menus.

3.8.4 How to set the network protocol

Set the LAN network protocol according to the vessel's on-board network. [NAVNET] protocol should be used where a NavNet series unit is the LAN network hub. Select [450] for all other LAN networks. Refer to the "NETWORK AND SECURITY CONFIGURATIONS SETTINGS" on page AP-17 for the recommended settings.

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [OTHER SET], then press the **ENT/ACK** key.
3. Select [NW PROTOCOL], then press the **ENT/ACK** key.

   Note: The rest of the [OTHER SET] menu items are for qualified technicians only. Do not change these setting.



4. Select the appropriate protocol, then press the **ENT/ACK** key. A confirmation pop up is displayed.
   Note: When using the IEC61162-450 protocol, select [450].
5. Select [YES] to accept the new setting or [NO] to cancel and return to the options. Selecting [YES] will restart the unit.

3.8.5 How to set the management profile

The Remote Monitoring function can be turned on/off from the [MANAGEMENT PROFILE] menu. Refer to the "NETWORK AND SECURITY CONFIGURATIONS SETTINGS" on page AP-17 for the recommended settings.

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [OTHER SET], then press the **ENT/ACK** key.
3. Select [MANAGEMENT PROFILE], then press the **ENT/ACK** key.
4. Select [ON] or [OFF], then press the **ENT/ACK** key.
   When using the Remote Monitoring function, set to [ON].
5. Press the **MENU/ESC** key to return to the [OTHER SET] menu, or press the **DISP** key to close all open menus.

3.8.6 How to set the Web UI

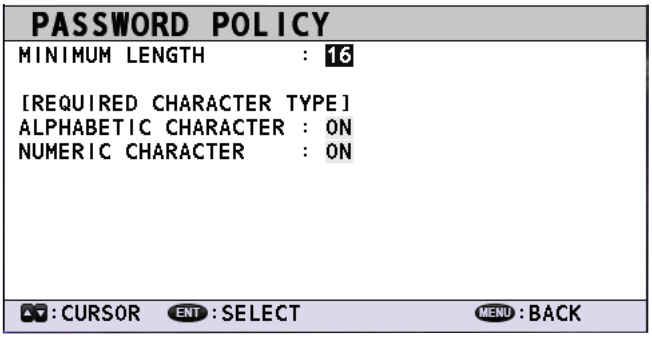
The Web browser can be used for the maintenance according to the setting of [WEB UI] menu. Refer to the "NETWORK AND SECURITY CONFIGURATIONS SETTINGS" on page AP-17 for the recommended settings.

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [OTHER SET], then press the **ENT/ACK** key.
3. Select [WEB UI], then press the **ENT/ACK** key.
4. Select [ON] or [OFF], then press the **ENT/ACK** key.
   When using the Web browser for the maintenance, set to [ON].
   Make sure so set to [OFF] when not using the Web browser for the maintenance.
5. Press the **MENU/ESC** key to return to the [OTHER SET] menu, or press the **DISP** key to close all open menus.

3.8.7 How to set the password policy

To strengthen security, you can set the required conditions for creating an system administrator and security administrator passwords here. Follow the instructions below. Refer to the "NETWORK AND SECURITY CONFIGURATIONS SETTINGS" on page AP-17 for the recommended settings.

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [OTHER SET], then press the **ENT/ACK** key.
3. Select [PASSWORD POLICY], then press the **ENT/ACK** key.
   Setting window opens.



Settings and policies are as follows.

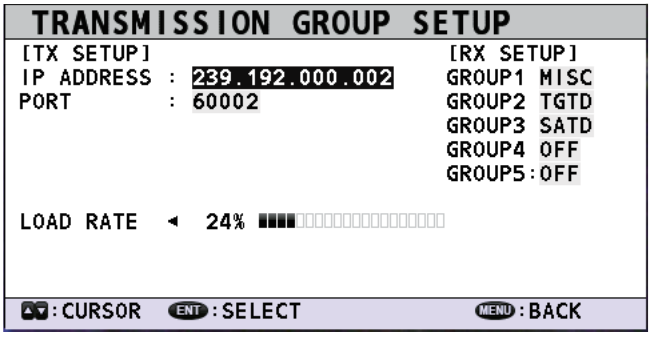
- [MINIMUM LENGTH]: The minimum number of characters to be used for the [SYSTEM ADMINISTRATOR] and [SECURITY ADMINISTRATOR] passwords. 16 characters at the maximum can be used when setting a password in the [SECURITY] - [SET PASSWORD] menu no matter how many characters is set on this menu.
- [ALPHABETIC CHARACTER] - [ON] - At least one alphabet needs to be included in the password. [OFF] - Alphabet does not need to be included in the password.
- [NUMERIC CHARACTER] - [ON] - At least one number needs to be included in the password. [OFF] - Number does not need to be included in the password.

4. Press the **MENU/ESC** key to return to the [INITIAL SET] menu, or press the **DISP** key to close all open menus.

3.8.8 How to set the transmission group

Set the transmission group. Refer to the "NETWORK AND SECURITY CONFIGURATIONS SETTINGS" on page AP-17 for the recommended settings.

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [OTHER SET], then press the **ENT/ACK** key.
3. Select [TRANSMISSION GROUP SETUP], then press the **ENT/ACK** key.



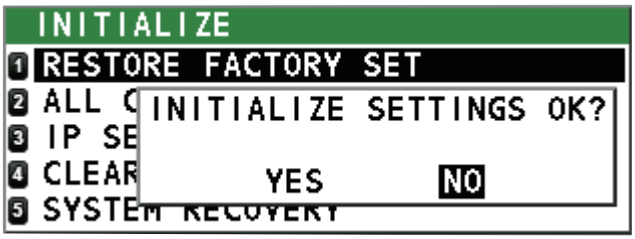
- [TX SETUP] - [IP ADDRESS] and [PORT]: Set the IP address and communication port for TX.
- [RX SETUP] - [GROUP1] to [GROUP5]: Set the transmission group for receiving the selected data. Select from MISC, TGTD, SATD, NAVD, PROP, BAM1, BAM2, CAM1, CAM2 and OFF. Set to [OFF] if the data reception is not required.

3.8.9 How to restore factory settings

This procedure resets the units to factory settings.

Be sure to set all appropriate settings from the [INITIAL SET] menu after completing this procedure.

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [INTIALIZE], then press the **ENT/ACK** key.
3. Select [RESTORE FACTORY SET], then press the **ENT/ACK** key. The confirmation pop up window shown below-right is displayed.
   Note: The rest of the [INTIALIZE] menu items are for qualified technicians only. Do not change these settings.



4. Select the [YES] or [NO] as appropriate, then press the **ENT/ACK** key.
   [YES]: Accept the new settings and restart the unit.
   [NO]: Cancel and return to the options.

3.8.10 How to check the audit log

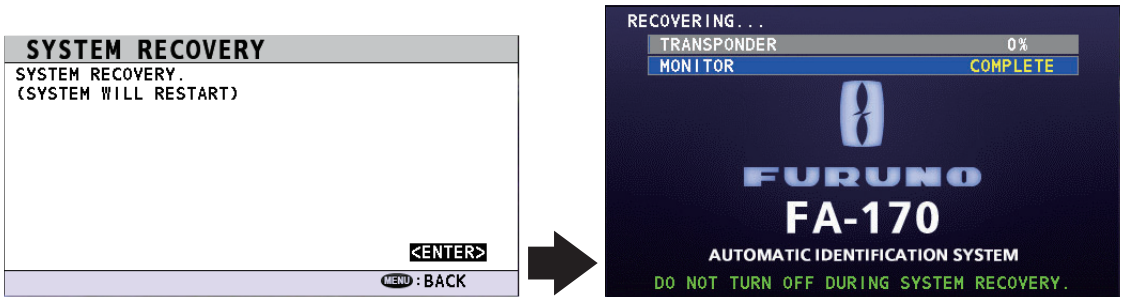
The installer can check the audit log from the [SERVICE] - [MAINTENANCE] - [AUDIT LOG] menu. The contents of the audit log are the same as what can be checked from the [SECURITY] - [AUDIT LOG] menu. Refer the Operator's Manual for the contents.

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [MAINTENANCE], then press the **ENT/ACK** key.
3. Select [AUDIT LOG], then press the **ENT/ACK** key.

3.8.11 How to recover the system

If the system crashes, recover it as follows.

1. Access the [SERVICE] menu referring to the procedure outlined at the start of this section.
2. Select [INTIALIZE], then press the **ENT/ACK** key.
3. Select [SYSTEM RECOVERY], then press the **ENT/ACK** key.
   The screen changes as below.



ENT/ACK key

4. Press **ENT/ACK** key. The system restarts automatically and performs the recovery procedure.

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 (mm²)* 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

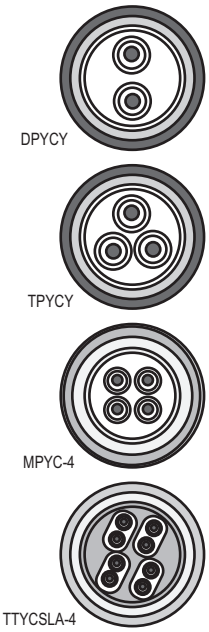
C: Steel

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



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

MPYC - 4 (1 2 3 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 DIGITAL INTERFACE

IEC61162-1/2 data sentences

IEC61162-1/2 format data is input or output from the data port COM1-COM6.

The table below shows the input/output data specifications for the transponder unit (FA-1701).

Port	Menu setting	Input/Output	Data format	Speed
COM1 to COM3	EXT DISPLAY	Input/output	IEC61162-1/2	4800 or 38400 bps
	PILOT PLUG	Input/output	IEC61162-2	38400 bps
	LONG RANGE	Input/output	IEC61162-1/2	4800 or 38400 bps
	BEACON	Input	RTCM SC104	4800bps
COM4 to COM6	EXT DISPLAY	Input/output	IEC61162-1/2	4800 or 38400 bps
	PILOT PLUG	Input/output	IEC61162-2	38400 bps
	LONG RANGE	Input/output	IEC61162-1/2	4800 or 38400 bps
	SENSOR	Input	IEC61162-1/2	4800 or 38400 bps
	BEACON	Input	RTCM SC104	4800bps
SENSOR1 to SENSOR3	SENSOR	Input	IEC61162-1	4800bps

Priority for input data/sentences

Sentence (Priority)	Contents
GNS>GLL>GGA>RMC	Position
VBW>RMC>VTG>OSD	Speed over ground
RMC>VTG>OSD	Course over ground
THS>HDT>OSD	Heading
ROT> Calculated value	Rate of turn

Digital Interface (IEC 61162-1 Edition 5, IEC 61162-2)

Sentence data

Input sentences

ABM, ACA, ACK, ACM, ACN, AIQ, AIR, BBM, DTM, EPV, GBS, GGA, GLL, GNS, HBT, HDT, LRF, LRI, OSD, PIWWIVD, PIWWSPW, PIWWSSD, PIWWVSD, RMC, ROT, SPW, SSA, SSD, THS, VBW, VSD, VTG

Output sentences

ABK, ACA, ACS, ALC, ALF, ALR, ARC, EPV, HBT, HDT, LRI, LRF, LR1, LR2, LR3, NAK, ROT, SSD, THS, TRL, TXT, PIWWIVD, PIWWSPR, PIWWSSD, PIWWVSD, VDM, VDO, VER, VSD

Transmission intervals

Sentence	Interval	Sentence	Interval
ABK	With each event	ACA	When requested, or with each event
ACS	Transmitted after ACA	ALC	30 seconds
ALF	When requested, or with each event	ALR	30 seconds
ARC	With each event	EPV	When requested, or with each event

Sentence	Interval	Sentence	Interval
HBT	50 seconds	HDT	With each event
LR1	With each event	LR2	With each event
LR3	With each event	LRF	With each event
LRI	With each event	NAK	With each event
PIWWIVD	When requested, or with each event	PIWWSPR	When requested, or with each event
PIWWSSD	When requested, or with each event	PIWWVSD	When requested, or with each event
ROT	With each event	SSD	When requested, or with each event
SPR	When requested, or with each event	THS	With each event
TRL	When requested, or with each event	TXT	When requested, or with each event
VDM	With each event	VDO	1 second or with each event
VER	When requested, or with each event, or powered on	VSD	When requested, or with each event

Load requirements as listener
Isolation: Provided
Input Impedance: Input Impedance: 110 ohms (130K ohms without jumper plug)
Max. Voltage: ±14 V to GNDiso
Threshold: ±0.2 V (A-B)

Output drive capability

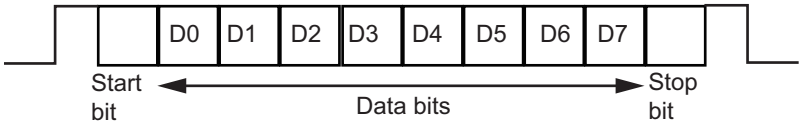
Differential driver output
R=50 ohm 2 v min.
R=27 ohm 1.5 V min.

Driver short-circuit current
60 mA min. 150 mA max.

Data transmission
Data is transmitted in serial asynchronous form in accordance with the standard referenced in 2.1 of IEC 61162-1/2. The first bit is a start bit and is followed by data bits, least-significant-bit as illustrated below.

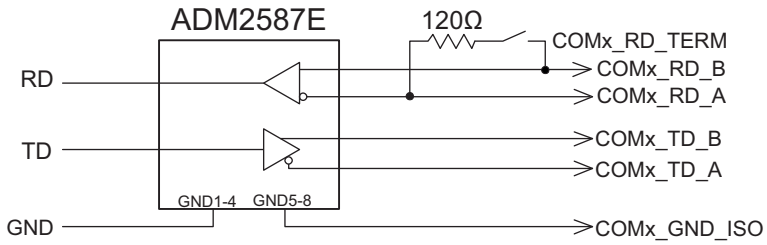
The following parameters are used:
Baud rate: 38.4 Kbps /4800 bps
Data bits: 8 (D7 = 0), parity none
Stop bits: 1

IEC61162-1:Edition 5.0 2016-08
IEC61162-2:First Edition 1998-09
IEC61162-450:Edition 2.0 2018-05

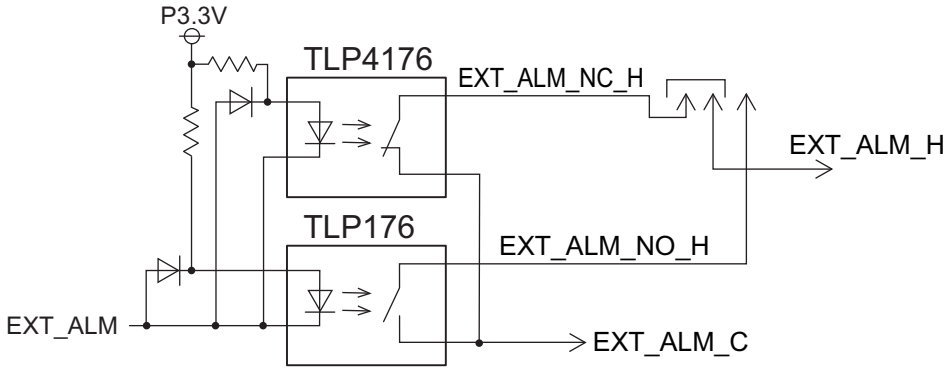


Serial & contact interface I/O circuit

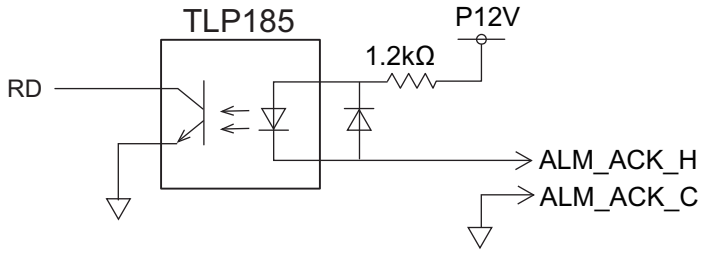
COM1 to 6



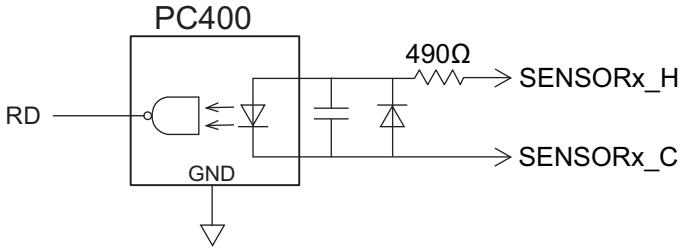
External Alarm



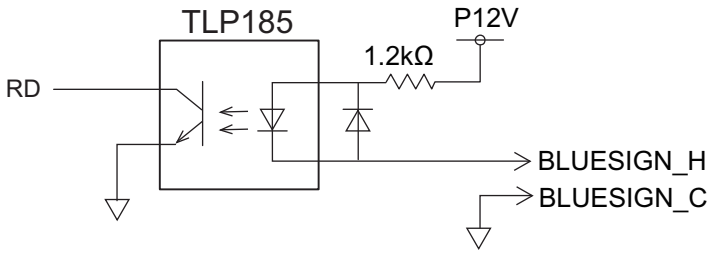
Alarm Acknowledge



Sensor Input



Blue Sign



Sentence description

Input sentences

ABM - Addressed binary and safety related message

!**ABM, x, x, x, xxxxxxxxx, x, x.x, 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, NULL)
5. AIS channel for broadcast of the radio message (0 to 3, NULL)
6. VDL message number (6, 12, 25, 26, 70, 71, NULL), see ITU-R M.1371
7. Encapsulated data (1 to 63 bytes)
8. Number of fill-bits (0 to 5)

ACA - AIS regional channel assignment message

$**ACA,x,llll.ll, a,yyyyy.yy,a,llll.ll,a,yyyyy.yy,a,x,xxxx,x,xxxx,x,x,x,a,x,hhmmss.ss,*hh<CR><LF>
1 2 3 4 5 6 7 8 9 1011121314 15

1. Sequence number (0 to 9, NULL)
2. Region Northeast corner latitude (N, S, NULL)
3. Region Northeast corner longitude (E, W, NULL)
4. Region Southwest corner latitude (N, S, NULL)
5. Region Southwest corner longitude (E, W, NULL)
6. Transition Zone Size
7. Channel A
8. Channel A bandwidth
9. Channel B
10. Channel B bandwidth
11. Tx/Rx mode control
12. Power level control
13. Information source
14. In-use flag
15. Time of “in-use” change

ACK - Acknowledge

$**ACK,xxx,*hh<CR><LF>
1

1. Local alarm number (identifier) (000 to 999)

ACN(ACM) - Alert command

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

1. Time
2. Manufacturer mnemonic code
3. Alert Identifier
4. Alert Instance (1 to 999999)
5. Alert command
   (A=acknowledge, Q=request/repeat information, O=responsibility transfer S=silence)
6. Sentence status flag

AIQ - Query sentence

$**AIQ,ccc,*hh<CR><LF>
1

1. Information requested (ACA*3, IWWIVD*1*2, IWWVSD*1*2, IWWSSD*1*2, PIWWIVD*2, PIWWVSD*2, PIWWSSD*2, SSD, TRL, TXT, VER, VSD)

*1: Compatible with Tresco Inland ECDIS viewer.
*2: Valid only when AIS is in INLAND mode.
*3: When ACA is requested, ACS is also sent immediately after ACA.

AIR - AIS interrogation request

$**AIR,xxxxxxxxx,x.x,x,x.x,x,xxxxxxxxx,x.x,x, a, x.x, x.x, x.x *hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12

1. MMSI of interrogated station 1
2. ITU-R M.1371 message requested from station 1
3. Message sub-section
4. ITU-R M.1371 second message requested from station 1
5. Message sub-section
6. MMSI of interrogated station 2
7. ITU-R M.1371 message requested from station 2
8. Message sub-section
9. Channel used on request
10. No use. Response slot for Message ID 1.1 of Message 15
11. No use. Response slot for Message ID 1.2 of Message 15
12. No use. Response slot for Message ID 2.1 of Message 15

BBM - AIS broadcast binary message.

$**BBM,x,x,x,x,xx,s--s,x,*hh<CR><LF>
12 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
5. VDL message no. (8, 14, 25, 26, 70 or 71, NULL)
6. Encapsulated data
7. Number of fill-bits, 0 to 5

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, User defined=999, IHO datum code, NULL)
2. Local datum subdivision code (NULL or one character)
3. Lat offset, min (-59.99999 to 59.99999)
4. N/S
5. Lon offset, min (-59.99999 to 59.99999)
6. E/W
7. Altitude offset, meters (no use)
8. Reference datum (W84=WGS84, W72=WGS72, S85=SGS85, P90=PE90)

EPV - Command or report equipment property value

$ **EPV,s,cc,c--c,x.x,c--c*hh<CR><LF>
1 2 3 4 5

1. Sentence status flag (C=Configuration command)
2. Equipment type
3. Unique indentifier (MMSI)
4. Property identifier for property to be set
5. Value of property to be set

Note 1: When the field 4 is set as 108 (Long-range interface configuration), the accepted value for the field 5 is “A” (Automatic) or “M” (Manual) only.
Note 2: When the field 4 is set as 101 (Sensor 1 baud), the settings for the COM port 4 will switch.
Note 3: When the field 4 is set as 102 (Sensor 2 baud), the speed for the COM port 5 will switch.
Note 4: When the field 4 is set as 103 (Sensor 3 baud), the speed for the COM port 6 will switch.

GBS - GNSS satellite fault detection

$**GBS, hhmmss.ss, x.x, x.x, x.x, xx, x.x, x.x, x.x h, h, *hh<CR><LF>
1 2 3 4 5 6 7 8 9 10

1. UTC time of GGA or GNS fix associated with this sentence
2. Expected error in latitude (0.0 to 999.9)
3. Expected error in longitude (0.0 to 999.9)
4. Expected error in altitude (no use)
5. ID number of most likely failed satellite (no use)
6. Probability of missed detection for most likely failed satellite (no use)
7. Estimate of bias in meters on most likely failed satellite (no use)
8. Standard deviation of bias estimate (no use)
9. GNSS system ID
10 GNSS signal ID

GGA - Global positioning system (GPS) 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 (0.00 to 235959.99)
2. Latitude (0.00000 to 9000.00000)
3. N/S
4. Longitude (0.00000 to 18000.00000)
5. E/W
6. GPS quality indicator
7. Number of satellites in use,00 to 12, may be different from the number in view (no use)
8. Horizontal dilution of precision (no use)
9. Antenna altitude above/below mean sea level (geoid) (no use)
10. Units of antenna altitude, m (no use)
11. Geoidal separation (no use)
12. Units of geoidal separation, m (no use)
13. Age of differential GPS data (no use)
14. Differential reference station ID, 0000 to 1023 (no use)

GLL - Geographic position - latitude/longitude

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

1. Latitude (0.00000 to 9000.00000)
2. N/S
3. Longitude (0.00000 to 18000.00000)
4. E/W
5. UTC of position (0.00 to 235959.99)
6. Status (A=data valid)
7. Mode indicator (A=Autonomous, D=Differential, R=Real time kinematic, F=Float RTK, P=Precise)

GNS - GNSS fix data

$**GNS,hhmmss.ss,llll.ll,a,IIIII.II,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 12 13

1. UTC of position (0.00 to 235959.99)
2. Latitude (0.00000 to 9000.00000)
3. N/S
4. Longitude (0.00000 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 (Not used)
8. HDOP (Not used)
9. Antenna altitude, meters (Not used)
10. Geoidal separation (Not used)
11. Age of differential data (Not used)
12. Differential reference station ID (Not used)
13. Navigational status indicator (S=Safe; C=Caution; U=Unsafe; V=Not valid)

HBT - Heart beat supervision

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

1. Configured repeat interval (1 to 999, NULL)
2. Equipment status (A/V)
3. Sequential sentence identifier (0 to 9, NULL)

HDT - Heading - true

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

1. Heading, degrees (0.000 to 359.999)
2. True (T, NULL)

LRF - Long-range function

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

1. Sequence number (0 to 9)
2. MMSI of requester
3. Name of requester (1 to 20 characters, NULL)
4. Function request
   (1 to 26 characters (Preceded by A, B, C, E, F, I ,O, P, U, W), NULL)
   A : Ship's name, call sign and IMO No.
   B : Date and time of message composition
   C : Position
   E : Course Over Ground
   F : Speed Over Ground
   I : Destination and Estimated Time of Arrival (ETA)
   O : Draught
   P : Ship/Cargo
   U : Ship's length, breadth and type
   W : Persons on board
5. Function reply status
   (1 to 26 characters (Preceded by 2, 3, 4), NULL)
   2: Information available and provided in the following LR1, LR2, LR3 sentence;
   3: Information not available from AIS unit;
   4: Information is available but not provided (i.e. restricted access determined by the ship's master)

LRI - Long-range interrogation

$**LRI,x,a,xxxxxxxxx,xxxxxxxxx,llll.ll,a,yyyyy.yy,a,llll.ll,a,yyyyy.yy,a*hh<CR><LF>
1 2 3 4 5 6 7 8

1. Sequence number (0 to 9)
2. Control flag
3. MMSI of requestor
4. MMSI of destination
5. Latitude - N/S for north-east corner (0000.0000 to 9000.0000, NULL)
6. Longitude - E/W for north-east corner (0000.0000 to 18000.0000, NULL)
7. Latitude - N/S for south-west corner (0000.0000 to 9000.0000, NULL)
8. Longitude - E/W for south-west corner (0000.0000 to 18000.0000, NULL)

OSD - Own ship data

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

1. Heading, degrees true (0.00 to 359.99)
2. Heading status (A=data valid)
3. Vessel course, degrees true (0.00 to 359.99)
4. Course reference (B=Bottom tracking log, R=Radar tracking (of fixed target), P=Positioning system ground reference)
5. Vessel speed (0.00 to 999.999)
6. Speed refereence, (B/R/P) (See 4.)
7. Vessel set, degrees true, manually entered (Not used)
8. Vessel drift (speed), manually entered (Not used)
9. Speed units (K=km/h N=Knots S=statute miles/h)

RMC - Recommended minimum specific GPS/TRANSIT data

$**RMC, 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 11 12 13

1. UTC of position fix (0.00 to 235959.99)
2. Status (A=data valid)
3. Latitude (0000.0000 to 9000.0000)
4. N/S
5. Longitude (0000.0000 to 18000.0000)
6. E/W
7. Speed over ground, knots (0.00 to 999.99)
8. Course over ground, degrees true (0.00 to 359.99)
9. Date (010100 to 311299)
10. Magnetic variation, degrees E/W (Not used)
11. E/W (Not used)
12. Mode indicator (A= Autonomous, D= Differential, F=Float RTK, P=Precise, R=Real time kinematic)
13. Navigational status indication (S=Safe; C=Caution; U=Unsafe; V=Navigational status not valid, equipment is not providing navigational status indication, NULL)

ROT - Rate of turn

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

1. Rate of turn, deg/min, "-"=bow turns to port (-9999.99 to 9999.99)
2. Status (A=data valid)

SRP - System function ID resolution protocol

\s:ccxxxx*hh\$**SRP,x,hhhhhhhhhhhh,c--c*hh<CR><LF>
1 2 3 4

1. Reported SFI of the transmitter
2. 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,…).
3. Reported MAC address used by SFI, 48bit hexadecimal number, for example, 32613C4EB605.
4. Reported IP address used by SFI as text string, for example, 239.192.0.1.

This sentence can be used only in the IEC61162-450 network.

SPW - Security password sentence

$ **SPW,ccc,c--c,x,c--c*hh<CR><LF>
1 2 3 4

1. Password protected sentence
2. Unique identifier (MMSI=000000000 to 999999999, NULL)
3. Password level (2=Administrator)
4. Password (8 characters)

Note: SPW cannot be used in the IEC61162-450 network.

SSA - Signature

$--SSA,ccc,c,h--h*hh<CR><LF>
1 2 3

1. Signature protected sentence (EPV or SSD)
2. Signature calculation method (1: MD5, P: Proprietary)
3. Signature authentification (Hexadecimal representation of the signature.)

SSD - AIS ship static data

$**SSD,c--c,c--c,xxx,xxx,xx,xx,c, aa*hh<CR><LF>
1 2 3 4 5 6 7 8

1. Ship's call sign (1 to 7 characters, NULL)
2. Ship's name (1 to 20 characters, NULL)
3. Pos. ref. point distance, "A," from bow (0 to 511 Meters, NULL)
4. Pos. ref. point distance, "B," from stern (0 to 511 Meters, NULL)
5. Pos. ref. point distance, "C," from port beam (0 to 63 Meters, NULL)
6. Pos. ref. point distance, "D," from starboard beam (0 to 63 Meters, NULL)
7. DTE indicator flag
8. Source identifier (2 characters, NULL)

THS - True heading and status

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

1. Heading, degrees true (0.00 to 359.99)
2. Mode indicator (A=Autonomous)

VBW - Dual ground/water speed

$**VBW,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. (No use) Longitudinal water speed, knots (-9999.99 to 9999.99)
2. (No use) Transverse water speed, knots (-9999.99 to 9999.99)
3. (No use) Status: water speed, A=data valid V=data invalid
4. Longitudinal ground speed, knots (-999.999 to 999.999)
5. Transverse ground speed, knots (-999.999 to 999.999)
6. Status: ground speed (A=data valid, NULL)
7. (No use) Stern transverse water speed, knots (-9999.99 - 9999.99)
8. (No use) Status: stern water speed, A=data valid V=data invalid
9. (No use) Stern transverse ground speed, knots (-9999.99 - 9999.99)
10. (No use) Status: stern ground speed, A=data valid V=data invalid

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 25.5m, NULL)
3. Persons on-board (0 to 8191, NULL)
4. Destination (1 to 20 characters, NULL)
5. Estimated UTC of arrival at destination (0 to 235959.99, NULL)
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 (0 to 15, 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 359.99)
2. T=True (fixed)
3. (No use) Course over ground, degrees (0.0 to 359.99)
4. (No use) M=Magnetic (fixed)
5. Speed over ground, knots (0.00 to 999.99)
6. N=Knots (fixed)
7. Speed over ground (0.00 to 999.99)
8. K=km/h (fixed)
9. Mode indicator (A=Autonomous mode, D=Differential mode, P=Precise)

Output sentences

ABK - AIS 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
2. AIS channel of reception
3. Message ID
4. Message sequence number
5. Type of acknowledgement

ACA - See “ACA - AIS regional channel assignment message” on page AP-5.

ACS - Channel management information source

$**ACS,x,xxxxxxxxx,hhmmss.ss,xx,xx,xxxx,*hh<CR><LF>
1 2 3 4 5 6

1. Sequence number (0 to 9)
2. MMSI of originator (000000000 to 999999999, NULL)
3. UTC at receipt of channel management information (000000 to 235959, NULL)
4. UTC day (01 to 31, NULL)
5. UTC month (01 to 12, NULL)
6. UTC year (2010 to 2060, NULL)

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
5. Manufacturer mnemonic code
6. Alert identifier
7. Alert instance
8. Revision counter

Alert entry 1
See Note

9. Additional Alert entries (see Note)

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

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 (hhmmss.ss, NULL)
5. Alert category (B=Category B, C=Category C, NULL)
6. Alert priority (W=Warning, C=Caution, NULL)
7. Alert state
   V=active - unacknowledged, S=active - silenced,
   A=active - acknowledged or active, O=active - responsibility transferred,
   U=rectified - unacknowledged, N=normal, NULL
8. Manufacturer mnemonic code (FEC, NULL)
9. Alert identifier (001 to 999999)
10. Alert instance (NULL)
11. Revision counter (1 to 99)
12. Escalation counter (0 to 9)
13. Alert text

ALR - Set state

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

1. Time of alarm condition change, UTC
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)

ARC - Alert command refused

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

1. Time
2. Manufacturer mnemonic code
3. Alert identifier (001 to 99999)
4. Alert instance (NULL)
5. Refused alert command
   A=acknowledge
   Q=request/repeat information
   O=responsibility transfer
   S=silence

EPV - Command or report equipment property value"

$ **EPV,s,cc,c--c,x.x,c--c*hh<CR><LF>
1 2 3 4 5

1. Sentence status flag (Fixed: R=Response)
2. Equipment type (Fixed: AI)
3. Unique indentifier (MMSI: 00000000 to 999999999)
4. Property identifier for property to be set
5. Value of property to be set

HBT - Heart beat supervision

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

1. Configured repeat interval (50)
2. Equipment status (A)
3. Sequential sentence identifier (0 to 9)

LRF - See "LRF - Long-range function" on page AP-8.

LR1 - Long-range reply with destination for function request "A"

$**LR1,x,xxxxxxxxx,xxxxxxxxx,c--c,c--c,xxxxxxxxx*hh<CR><LF>
1 2 3 4 5 6

1. Sequence number
2. MMSI of responder
3. MMSI of requester (reply destination)
4. Ship's name (1 to 20 characters)
5. Call sign (1 to 7 characters)
6. IMO number, (9-digit number)

LR2 - Long-range reply for function requests "B, C, E, and F"

$**LR2,x,xxxxxxxxx,xxxxxx,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x.x,T,x.x,N*hh<CR><LF>
1 2 3 4 5 6 7 8

1. Sequence number
2. MMSI of responder
3. Date (ddmmyy)
4. UTC of Position
5. Latitude - N/S
6. Longitude - E/W
7. Course over ground, degrees True
8. Speed over ground, Knots

LR3 - Long-range reply for function requests “I, O, P, U and W”

$**LR3,x,xxxxxxxxx,c--c,xxxxxx,hhmmss.ss,x.x,cc,x.x,x.x,cc,x.x*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11

1. Sequence number
2. MMSI of responder
3. Voyage destination (1 to 20 characters)
4. ETA date (ddmmyy)
5. ETA time
6. Draught
7. Ship/cargo
8. Ship length
9. Ship breadth
10. Ship type
11. Persons (0 to 8191)

LRI - See “LRI - Long-range interrogation” on page AP-9.

NAK - Negative acknowledgment

$**NAK,cc,ccc,c--c,x.x,c--c *hh<CR><LF>
1 2 3 4 5

1. Talker identifier
2. Affected sentence formatter
3. Unique identifier
4. Reason code for negative ackowledgment (0=Query functionality not supported, 1=Sentence formatter not supported, 2=Sentence formatter supported, but not enabled; 3=Senetence formatter supported and enabled, but temporarily unavailable; 4=Sentence formatter supported, but query for this sentence formatter is not supported; 5=Access denied, for sentence formatter requested; 6=Sentence not accepted due to bad checksum; 7=Sentence not accepted due to listener processing issue; 8,9=Reserved for future use; 10=Cannot perform the requested operation; 11=cannot fulfill request or command because of a problem with a data field in the sentence; 12 to 48=Reserved for future use; 49=Other reason as described in field 5.)
5. Negative acknowledgment’s descriptive text

SRP - See "SRP - System function ID resolution protocol" on page AP-9.

SSD - See "SSD - AIS ship static data" on page AP-10.

TRL - AIS transmitter non functioning log

$**TRL,x.x,x.x,x,xxxxxxxx,hhmmss.ss,xxxxxxxx,hhmmss.ss,x,*hh<CR><LF>
1 2 3 4 5 6 7 8

1. Total number of log entries (0 to 10)
2. Log entry number (1 to 10, NULL)
3. Sequential message indentifier (0 to 9, NULL)
4. Switch off date (ddmmyyyy, NULL)
5. Switch off UTC time (000000 to 235959, NULL)
6. Switch on date (ddmmyy, NULL)
7. Switch on UTC time (000000 to 235959, NULL)
8. Reason code (1 to 5, NULL) 1=power off, 2=silent mode, 3=transmission switched off by channel management command, 4=equipment malfunction, 5=invalid configuration.

TXT - Text transmission

$--TXT,xx,xx,xx,c--c*hh<CR><LF>
1 2 3 4

1. Total number of sentences (01 to 99)
2. Sentence number (01 to 99)
3. Text identifier
4. Text message

VDM - VHF data-link message

!AIVDM,x,x,x,a,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)
5. Encapsulated ITU-R M.1371 radio message (1 - 63 bytes)
6. Number of fill-bits (0 to 5)

VDO - AIS 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 63 bytes)
6. Number of fill-bits (0 to 5)

VER - Version

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

1. Total number of sentences needed (1 to 9)
2. Sentence number (1 to 9)
3. Device type (AI)
4. Vendor ID
5. Unique Identifier
6. Manufacturer serial number
7. Model code (product code)
8. Software revision
9. Hardware revision
10. Sequential message identifier (0 to 9)

VSD - See "VSD - AIS voyage static data" on page AP-11.

Inland AIS specific sentences

Input sentences and output sentences

PIWWIVD - Inland waterway voyage data

$PIWWIVD x, x, x, xx.xx, xx.xx, x , xxx, xxxx, xxx, x.x, x.x, x.x, x.x, hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13

1. Reporting rate: 0 to 15, NULL (See table to the right)
2. No. of blue cones: 0 to 3, 4=B-Flag, 5=unknown (default), NULL
3. Loaded/unloaded: 1=loaded, 2=unloaded, 0=not available (default), NULL
4. Inland draught: 0.01 to 20.00(m), 0=unknown (default), NULL
5. Air draught: 0.01 to 40.00(m), 0=unknown (default), NULL
6. No. of tugboats: 0 to 6, 7=unknown (default), NULL
7. No. of crew members: 0 to 254, 255=unknown (default), NULL
8. No. of passengers: 0 to 8190, 8191=unknown (default), NULL
9. No. of shipboard personnel: 0 to 254, 255=unknown (default), NULL
10. Convoy extensiont o bow: 0.0 to 800.0, NULL
11. Convoy extension to stern: 0.0 to 800.0, NULL
12. Convoy extension to port-side: 0.0 to 100.0, NULL
13. Convoy extension to starboard-side: 0.0 to 100.0, NULL

0	Return to Autonomous mode
1	10 minutes
2	6 minutes
3	3 minutes
4	1 minute
5	30 seconds
6	15 seconds
7	10 seconds
8	5 seconds
9	Next longer
10	Next shorter
11	2 seconds
12 to 15	Reserved for future use

PIWWSSD - Inland waterway static ship data

```
$PIWWSSD CCCCCCCC, xxxx, xxxx, xxxx, x, x, x, x.x, x.x, x.x, x.x, hh<CR><LF>
                   1          2     3     4   5 6 7   8   9   10  11
```

1. ENI no. (00000000 to 99999999, NULL)
2. ERI ship type (0 to 9999, NULL)
3. Length of ship (0.0 to 800.0(m), NULL)
4. Beam of ship (0.0 to 100.0(m), NULL)
5. Quality of speed information (1: High, 0: Low, NULL)
6. Quality of course information (1: High, 0: Low, NULL)
7. Quality of heading information (1: High, 0: Low, NULL)
8. B value for internal position (0.0 to 800.0, NULL)
9. C value for internal position (0.0 to 100.0, NULL)
10. B value for external position (0.0 to 800.0, NULL)
11. C value for external position (0.0 to 100.0, NULL)

PIWWVSD - Inland waterway voyage data

```
$PIWWVSD x,  x, x,  x, xx.xx, xx.xx, x,  xxx, xxxx, xxx, hh<CR><LF>
              1  2 3 4    5       6    7   8
             9    10
```

1. Reporting rate. 1: SOLAS reporting rate, 2: 2s, 0:not available (default)
2. Blue sign, 1: Not set, 2: Set, 0: Not available (default)
3. Hazardous cargo 0-3, 4=B-Flag, 5=unknown (default)
4. Loaded/unloaded, 1=loaded, 2=unloaded, 0=not available (default)
5. Static draught, 0.01 to 20.00(m), 0=unknown (default)
6. Air draught, 0.01 to 40.00(m), 0=unknown (default)
7. No. of tugboats, 0 to 6,7=unknown (default)
8. No. of crew members, 0 to 254, 255=unknown (default)
9. No. of passengers, 0 to 8190, 8191=unknown (default)
10. No. of shipboard personnel, 0 to 254, 255=unknown (default)

Input only sentence

PIWWSPW - Inland AIS security password

```
$PIWWSPW a, x, c - - - c, x, hh<CR><LF>
              1  2     3      4
```

1. Mode (E: Password input, C: Password change)
2. Password level (1: Administrator)
3. Password (8 characters)
4. Valid time (0 and 1 to 60 (s))

Output only sentence

PIWWSPR - Inland AIS security password response

```
$PIWWSPR a, x, x, x, hh<CR><LF>
              1  2  3  4
```

1. Mode (E: Password input, C: Password change)
2. Password level (1: Administrator)
3. Valid time (0 to 60 (s), NULL)
4. Status (0: Pass, 1: Fail)

APPX. 3 NETWORK AND SECURITY CONFIGURATIONS SETTINGS

This equipment has been provided with the least functionalities and services, accordingly security hardening is NOT necessary. The menu items, recommended settings, and defaults settings related to security functions are shown in the table below.

Security Data	Menu	Item	Recommended Settings	Default Settings
System Administrator Password	[SECURITY] - [SET PASSWORD]	SYSTEM ADMINISTRATOR	Set password by the administrator (for example, by the captain) for authentication. See also subsection 3.8.5 of the Operator's Manual for details.	No password
Security Administrator Password		SECURITY ADMINISTRATOR		No password
Pre-shared key	[SECURITY] - [PRE-SHARED KEY]	KEY	When the settings from the external equipment is required, set the pre-shared key.	No Key
Pilot Plug	[SECURITY] - [PILOT PLUG]		[OFF] - Upon the start of using the equipment. Set to [ON] when the pilot plug needs to be used. Set to [OFF] again when finished using the pilot plug.	ON
I/O port*1	[INITIAL SET] - [I/O PORT]	• COM1 - 6 • SENSOR1 - 3	Set to suit with the unit to connect. If no unit is connected, set to off.	• EXT DISPLAY • SENSOR
I/O port priority*1	[INITIAL SET] - [PORT PRIORITY]	1st - 7th	Set to suit with the sensor to connect.	Refer another table below.*3
Network Settings*1	[INITIAL SET] - [NETWORK] - [IP SETTINGS]	• IP ADDRESS • SUBNET MASK • GATEWAY	Use the default settings. Set according to the shipboard network when the default settings are not suitable.	Refer another table below.*4
		OWN SFI	Set to suit with the sensor to connect. **Note:** Be sure that the SFI is not used by other devices in the shipboard network.	AI0001
	[INITIAL SET] - [NETWORK] - [RX SFI]	• POSN • SOG/COG • HDG • ROT	Set the SFI of sensor source. **Note:** If data reception is not required, set to "NONE".	NONE
		• AIS CTL • ALERT	Set according to the shipboard network.	ANY
Network Settings (protocol)*2	[SERVICE] - [OTHER SET] - [NW PROTOCOL]		Use the default settings.	450

Security Data	Menu	Item	Recommended Settings	Default Settings
RMS function*2	[SERVICE] - [OTHER SET] - [MANAGEMENT PROFILE]		Set to on when remote monitoring is required. Otherwise, set to off.	OFF
WEB UI*2	[SERVICE] - [OTHER SET] - [WEB UI]		Use the default settings.	OFF
Password policy*2	[SERVICE] - [OTHER SET] - [PASSWORD POLICY]	• MINIMUM LENGTH [REQUIRED CHARACTER TYPE] • ALPHABETIC CHARACTER • NUMERIC CHARACTER	Use the default settings.	• 16 • ON • ON
Network Settings (Transmission Group)*2	[SERVICE] - [OTHER SET] - [TRANSMISSION GROUP SETUP]	• IP ADDRESS • PORT	Use the default settings.	Refer another table below.*5
		GROUP1 - 5	Use the default settings.	

*1: Contact your local FURUNO dealer to change these settings.

*2: Contact your local FURUNO dealer to check and change these settings.

*3 *Default setting of I/O port priority*

PRIORITY	LL/SOG/COG	HDG	ROT
1st	SENSOR 1	SENSOR 3	SENSOR 3
2nd	SENSOR 2	SENSOR 1	SENSOR 1
3rd	SENSOR 3	SENSOR 2	SENSOR 2
4th	COM4	COM6	COM6
5th	COM5	COM4	COM4
6th	COM6	COM5	COM5
7th	LAN	LAN	LAN

*4 *Default setting of Network settings*

Item	IP ADDRESS
IP ADRESS	172.031.024.004
SUBNET MASK	255.255.000.000
GATEWAY	000.000.000.000

*5. *Default setting of Network settings (Transmission Group)*

TX SETUP	
Item	Default Setting
IP ADRESS	239.192.000.002
PORT	60002

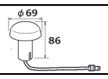
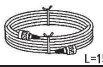
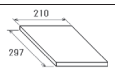
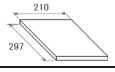
RX SETUP	
Item	Default Setting
GROUP1	MISC
GROUP2	TGTD
GROUP3	SATD
GROUP4	OFF
GROUP5	OFF

PACKING LIST

05ES-X-9859 -11 1/1

A-1

FA-170-E-5-FCC

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ﾄﾗﾝｽﾎﾟﾝﾀﾞ部箱詰品 TRANSPONDER UNIT IN BOX		FA-1701-E-FCC 000-029-979-00	1
表示部一式箱詰品 MONITOR UNIT COMPLETE SET		FA-1702 000-030-012-00	1
ｱﾝﾃﾅ ANTENNA UNIT		GPA-017S 000-192-734-12	1
予備品 SPARE PARTS			
予備品 SPARE PARTS		SP05-06501 001-426-300-00	1
工事材料 INSTALLATION MATERIALS			
ｹｰﾌﾞﾙ(組品) CABLE ASSEMBLY		Z-AWG25X4P-SB L050 001-426-390-00	1
ｹｰﾌﾞﾙ組品 CABLE ASSEMBLY		TNC-PS/PS-3D-L15M-R 001-173-110-10	1
工事材料 INSTALLATION MATERIALS		CP05-13601 001-426-480-00	1
工事材料 INSTALLATION MATERIALS		CP05-13621 001-546-360-00	1
図書 DOCUMENT			
取扱説明書(英) OPERATOR'S MANUAL (EN)		OME-44900-* 000-201-959-1*	1
装備要領書(英) INSTALLATION MANUAL (EN)		IME-44900-* 000-191-093-1*	1

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

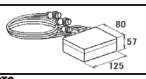
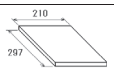
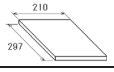
C4490-Z09-M

PACKING LIST

05ES-X-9854 -7 1/1

A-2

FA-170-E-5-DB1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ﾄﾗﾝｽﾎﾟﾝﾀﾞ部箱詰品 TRANSPONDER UNIT IN BOX		FA-1701-E 000-029-977-00 **	1
表示部一式箱詰品 MONITOR UNIT COMPLETE SET		FA-1702 000-030-012-00 **	1
分配器 DISTRIBUTER UNIT		DB-1 000-053-854-00	1
予備品 SPARE PARTS			
予備品 SPARE PARTS		SP05-06501 001-426-300-00	1
工事材料 INSTALLATION MATERIALS			
ｹｰﾌﾞﾙ(組品) CABLE ASSEMBLY		Z-AWG25X4P-SB L050 001-426-390-00	1
工事材料 INSTALLATION MATERIALS		CP05-13601 001-426-480-00	1
工事材料 INSTALLATION MATERIALS		CP24-00101 005-950-730-00	1
工事材料 INSTALLATION MATERIALS		CP05-13621 001-546-360-00	1
図書 DOCUMENT			
取扱説明書(英) OPERATOR'S MANUAL (EN)		OME-44900-* 000-201-959-1*	1
装備要領書(英) INSTALLATION MANUAL (EN)		IME-44900-* 000-191-093-1*	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.)

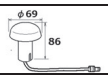
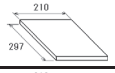
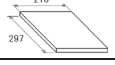
C4490-Z04-H

PACKING LIST

05ES-X-9857 -10 1/1

A-3

FA-170-E-5-GPA

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ﾄﾗﾝｽﾎﾟﾝﾀﾞ部箱詰品 TRANSPONDER UNIT IN BOX		FA-1701-E 000-029-977-00 **	1
表示部一式箱詰品 MONITOR UNIT COMPLETE SET		FA-1702 000-030-012-00 **	1
ｱﾝﾃﾅ ANTENNA UNIT		GPA-017S 000-192-734-12	1
予備品 SPARE PARTS			
予備品 SPARE PARTS		SP05-06501 001-426-300-00	1
工事材料 INSTALLATION MATERIALS			
ｹｰﾌﾞﾙ(組品) CABLE ASSEMBLY		Z-AWG25X4P-SB L050 001-426-390-00	1
工事材料 INSTALLATION MATERIALS		CP05-13601 001-426-480-00	1
工事材料 INSTALLATION MATERIALS		CP05-13621 001-546-360-00	1
図書 DOCUMENT			
取扱説明書(英) OPERATOR'S MANUAL (EN)		OME-44900-* 000-201-959-1*	1
装備要領書(英) INSTALLATION MANUAL (EN)		IME-44900-* 000-191-093-1*	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.)

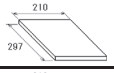
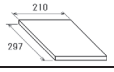
C4490-Z07-L

PACKING LIST

05ES-X-9856 -5 1/1

A-4

FA-170-E-V ,FA-170-E-HK-V

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ﾄﾗﾝｽﾎﾟﾝﾀﾞ部箱詰品 TRANSPONDER UNIT IN BOX		FA-1701-E 000-029-977-00 **	1
表示部一式箱詰品 MONITOR UNIT COMPLETE SET		FA-1702-V/-HK-V 000-030-014-00 **	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP05-13601 001-426-480-00	1
図書 DOCUMENT			
取扱説明書(英) OPERATOR'S MANUAL (EN)		OME-44900-* 000-201-959-1*	1
装備要領書(英) INSTALLATION MANUAL (EN)		IME-44900-* 000-191-093-1*	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.)

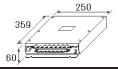
C4490-Z06-F

PACKING LIST

05ES-X-9851 -2 1/1

FA-170-*

A-5

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ﾄﾗﾝｽﾎﾟﾝﾀﾞ部 TRANSPONDER UNIT		FA-1701-* 000-029-976-00 **	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.)

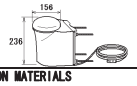
C4490-Z01-C

PACKING LIST

24AC-X-9870 -1 1/1

GVA-100-T/-HK

A-6

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
複合空中線部 GPS/VHF COMBINED ANTENNA		GVA-100-T/HK 000-041-942-00 **	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP24-00141 001-176-030-00	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.)

C4431-Z19-B

PACKING LIST

05ES-X-9863 -0 1/1

FA-1702/-HK

A-7

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
表示部 MONITOR UNIT		FA-1702* 000-029-280-00 **	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP05-13701 001-426-520-00	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.)

C4490-Z13-A

A-8

FURUNO

CODE NO.	001-426-300-00	05ES-X-9301-2 1/1
TYPE	SP05-06501	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL

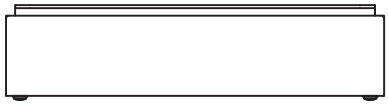
ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	ﾋｭｰｽﾞ GLASS TUBE FUSE		FGMB-S 125V 8A PBF	1	1	2	000-191-004-10

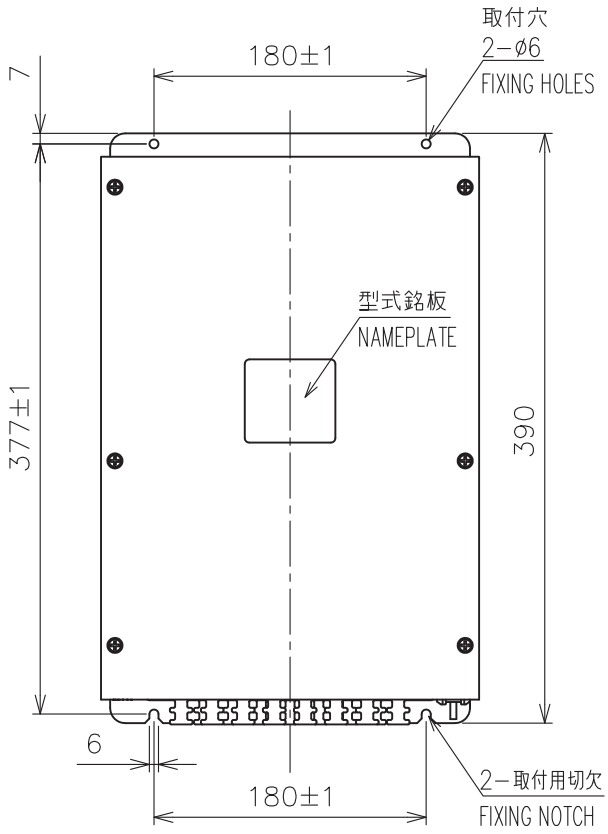
MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	C4490-P01-C	1/1

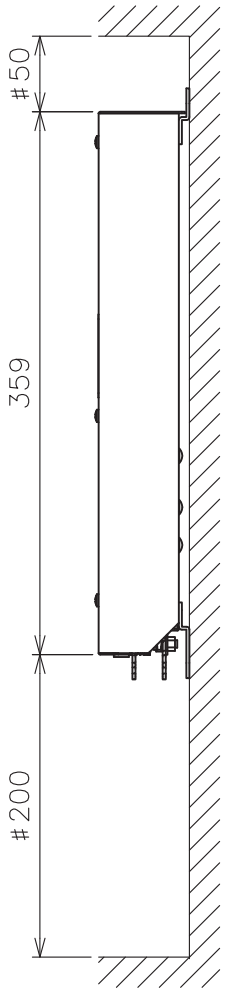
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

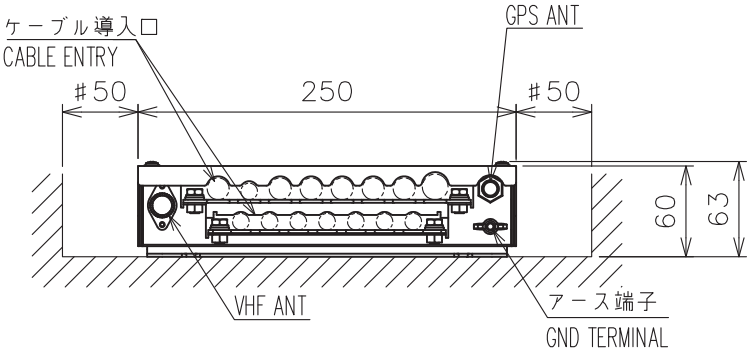
表1 TABLE 1

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。

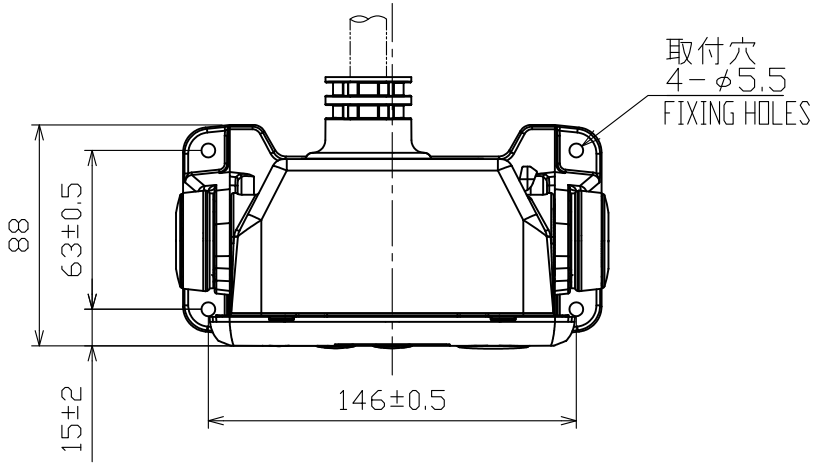
3）取付用ネジはタッピンネジ呼び径5×20、またはM5ボルトを使用のこと。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø5x20 OR M5 BOLTS FOR FIXING THE UNIT.

DRAWN 15/Oct/2015 T.YAMASAKI		TITLE	FA-1701
CHECKED 15/Oct/2015 H.MAKI		名称	トランスポンダ部
APPROVED 15/Oct/2015 H.MAKI	FA-170		外寸図
SCALE 1/5 MASS 3.0 ±10% kg		NAME	TRANSPONDER UNIT
DWG. No. C4490-G01- B	REF. No. 05-109-250G-2		OUTLINE DRAWING

FURUNO



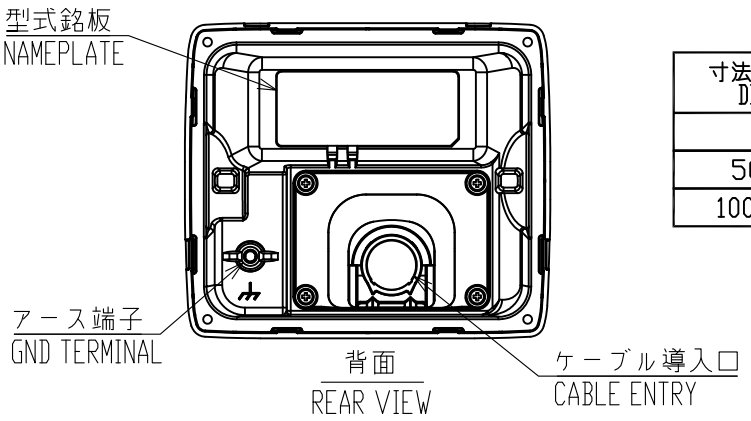
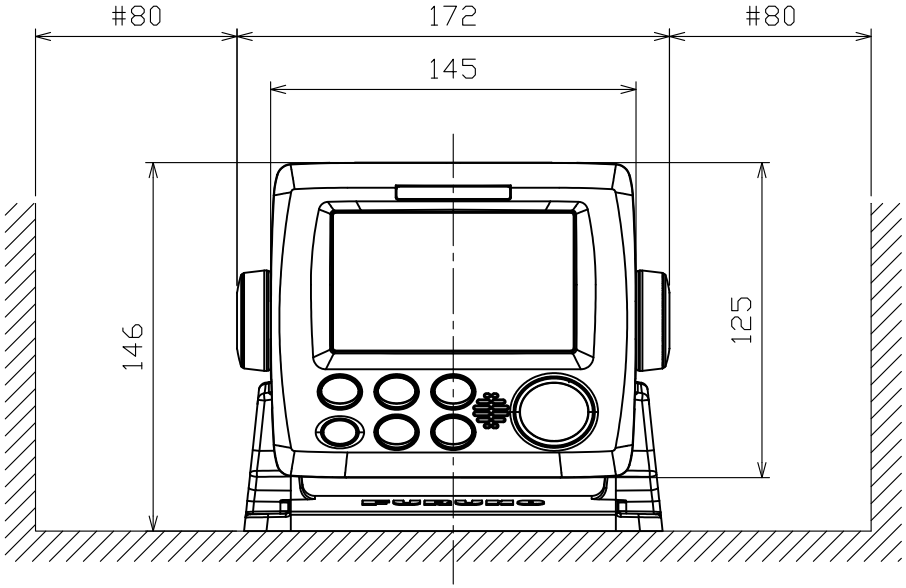
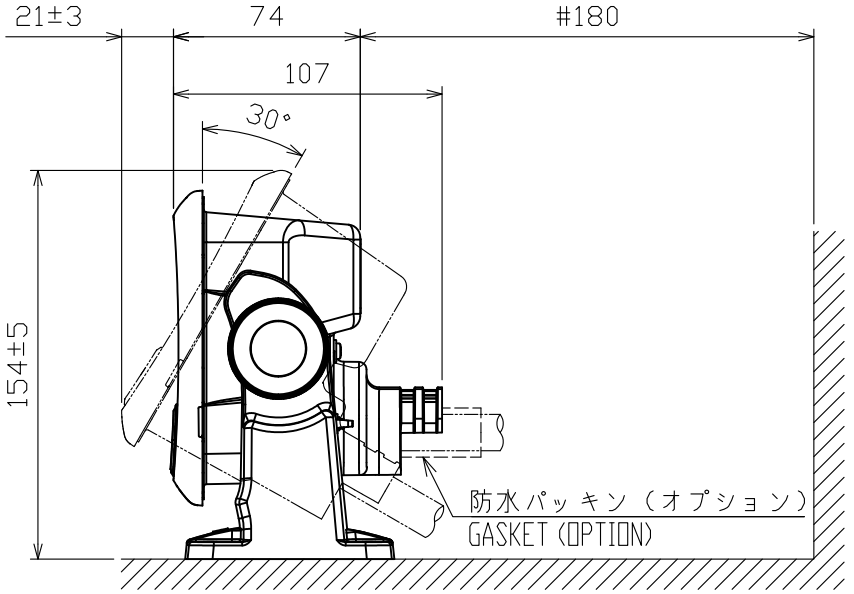


表1 TABLE 1

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５×２０を使用のこと。

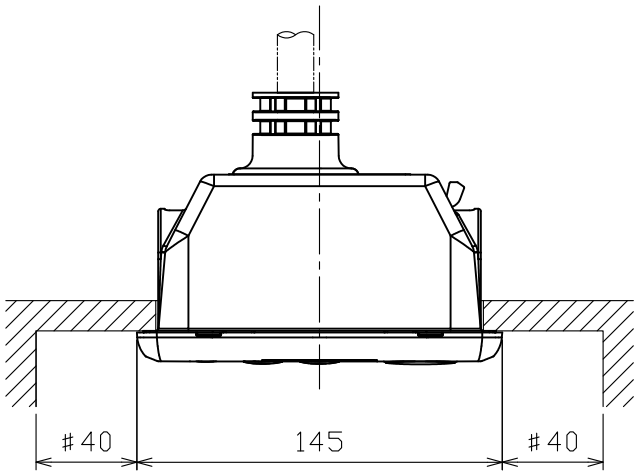
NOTE

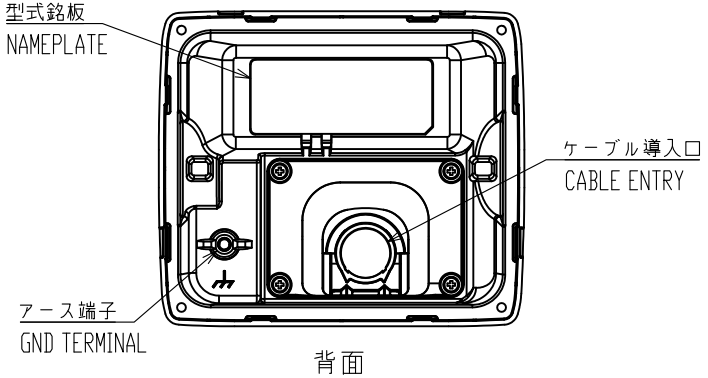
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø5x20 FOR FIXING THE UNIT.

DRAWN 25/Sep/2018 T.YAMASAKI		TITLE	FA-1702
CHECKED 25/Sep/2018 H.MAKI		名称	表示部（卓上装備）
APPROVED 27/Sep/2018 H.MAKI	FA-170		外寸図
SCALE 1/3 MASS 0.7 ±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 (TABLETOP MOUNT)
DWG.No. C4490-G02- D	REF.No. 05-109-350G-3		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

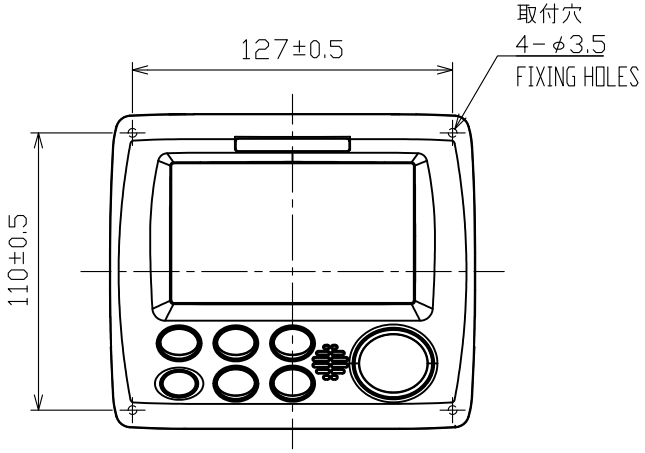


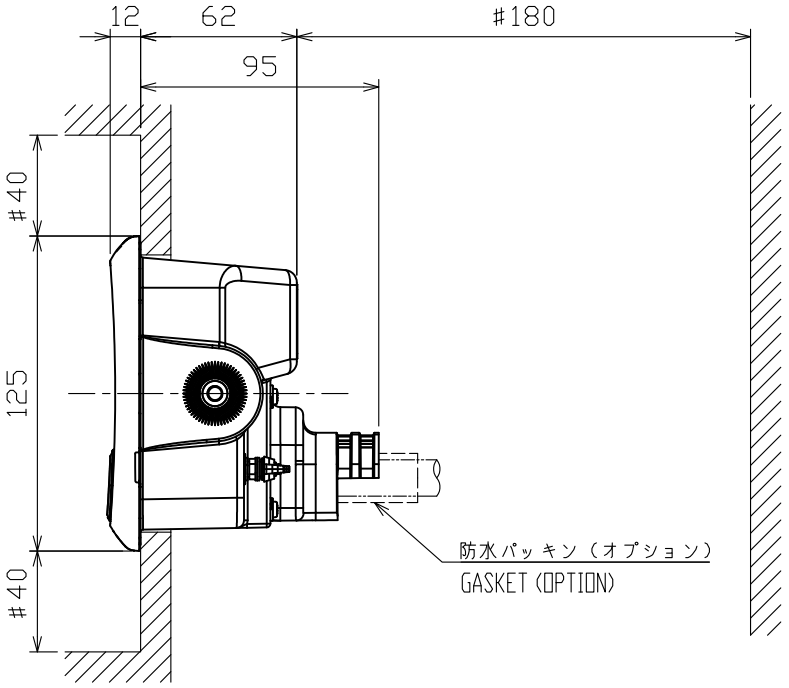


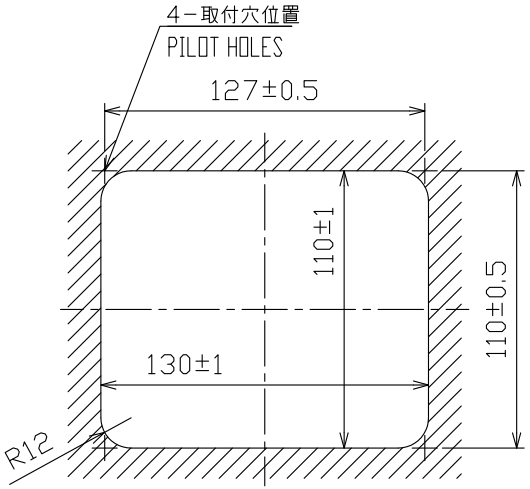
背面
REAR VIEW

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







取付穴寸法
CUTOUT DIMENSIONS

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）　取付用ネジはナベタッピンネジ呼び径３×２０を使用のこと。

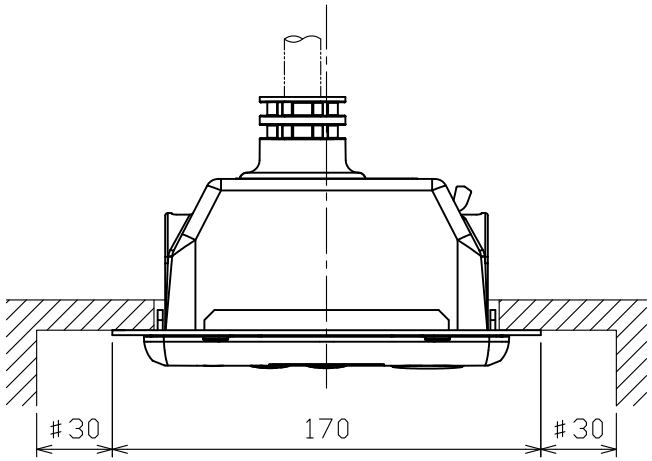
NOTE

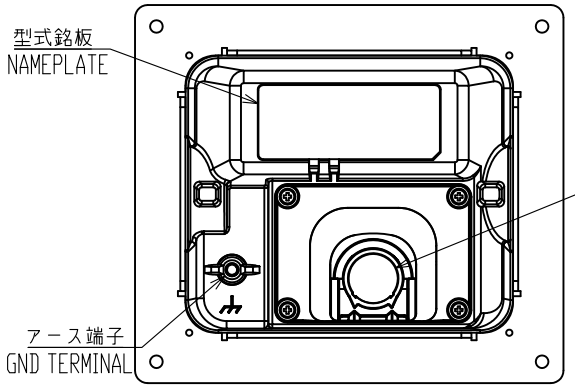
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø3x20 FOR FIXING THE UNIT.

DRAWN 25/Sep/2018 T.YAMASAKI		TITLE	FA-1702
CHECKED 25/Sep/2018 H.MAKI		名称	表示部（埋込装備）
APPROVED 25/Sep/2018 H.MAKI	FA-170		外寸図
SCALE 1/3 MASS 0.6 ±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 (FLUSH MOUNT)
DWG.No. C4490-G03- D	REF.No. 05-109-351G-3		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

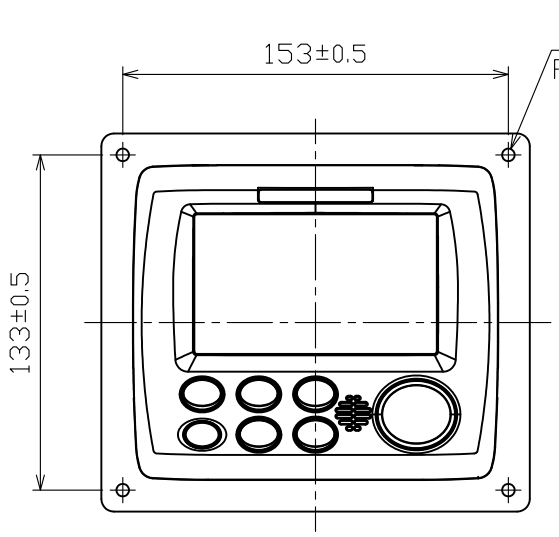


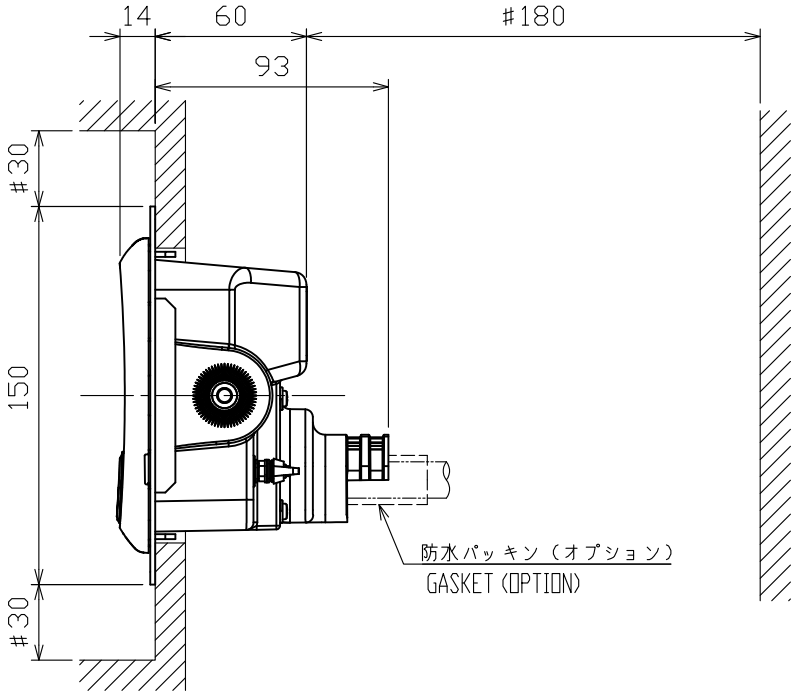


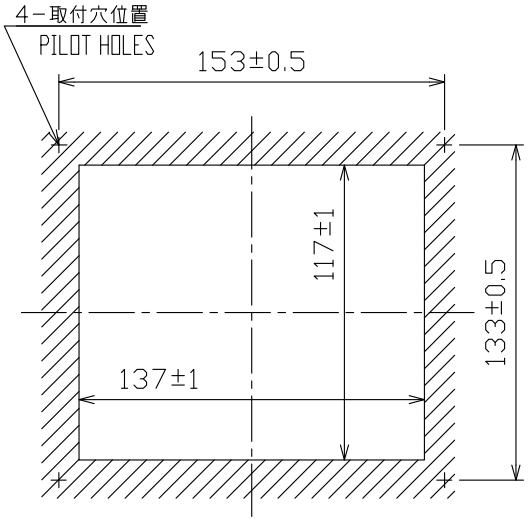
背面
REAR VIEW

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







取付穴寸法
CUTOUT DIMENSIONS

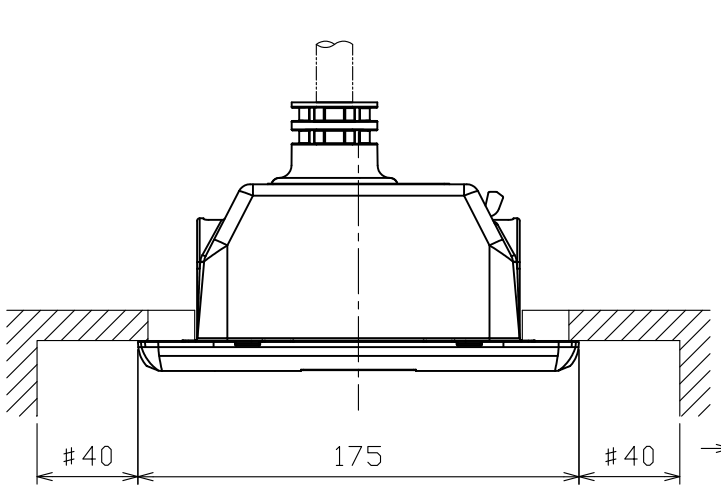
注 記
1） 指定外寸法公差は表１による。
2） #印寸法は、最小サービス空間寸法とする。
3） 取付用ネジはトラスタッピンネジ呼び径４×１６を使用のこと。

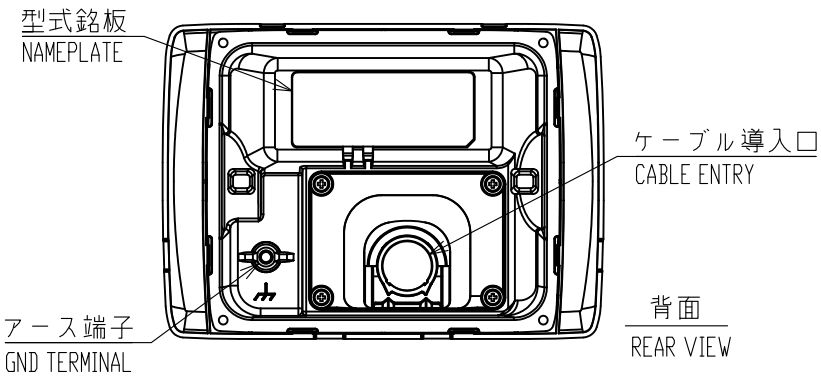
NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4x16 FOR FIXING THE UNIT.

DRAWN 25/Sep/2018 T.YAMASAKI		TITLE	FA-1702
CHECKED 25/Sep/2018 H.MAKI		名称	表示部（パネル装備）
APPROVED 28/Sep/2018 H.MAKI	FA-170		外寸図
SCALE 1/3	MASS 0.65 ±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 (PANEL MOUNT)
DWG.No. C4490-G04- D	REF.No. 05-109-352G-3		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

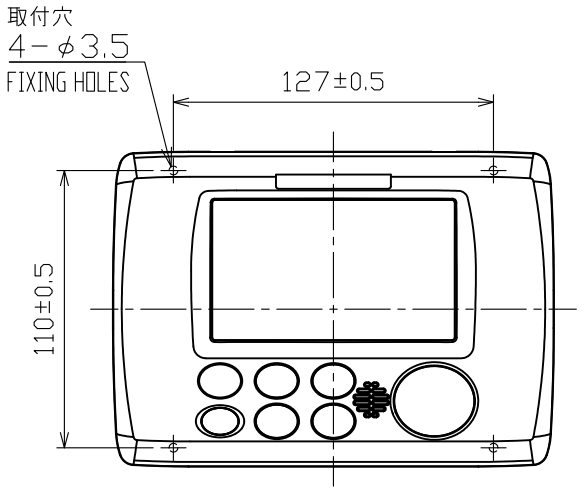


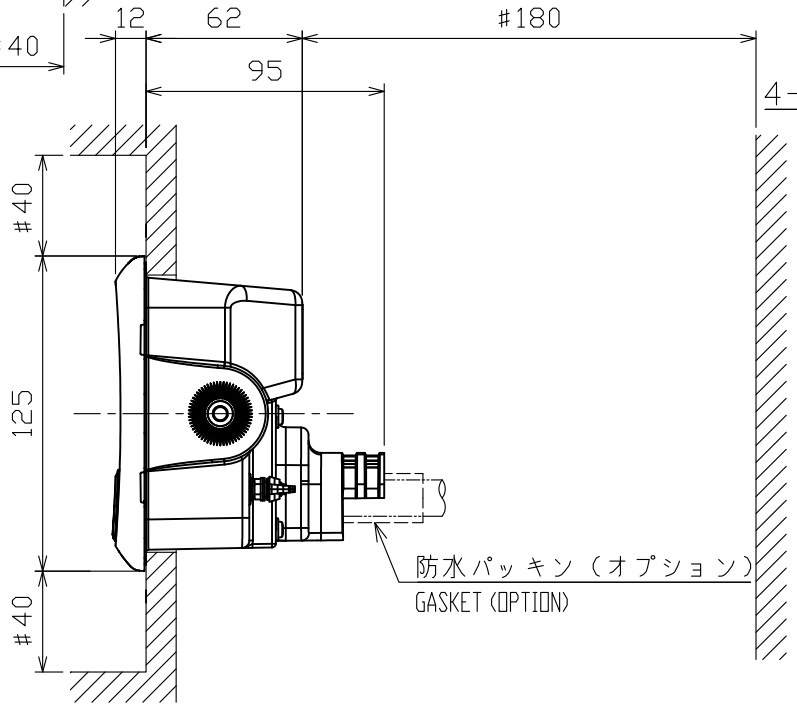


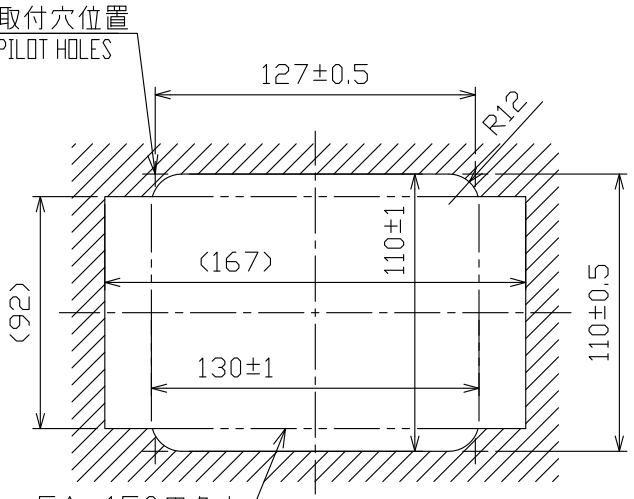
背面
REAR VIEW

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







取付穴寸法
CUTOUT DIMENSIONS

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）　取付用ネジはナベタッピンネジ呼び径3×20を使用のこと。

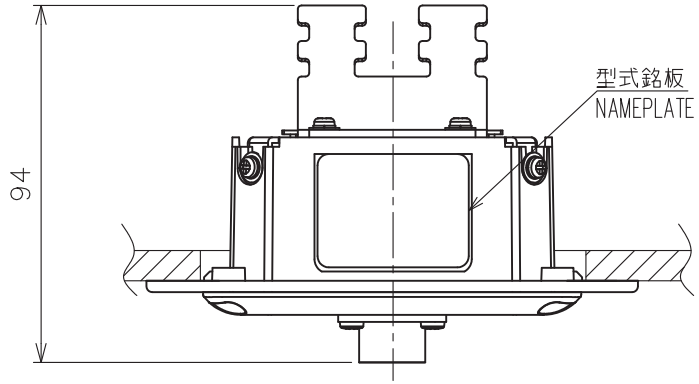
NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø3x20 FOR FIXING THE UNIT.

DRAWN 25/Sep/2018 T.YAMASAKI		TITLE	FA-1702
CHECKED 25/Sep/2018 H.MAKI		名称	表示部（パネル装備、FA−150換装）
APPROVED 28/Sep/2018 H.MAKI	FA-170		外寸図
SCALE 1/3 MASS 0.6 ±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 (FOR FA-150 PANEL REMOUNT)
DWG.No. C4490-G06- C	REF.No. 05-109-353G-2		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO



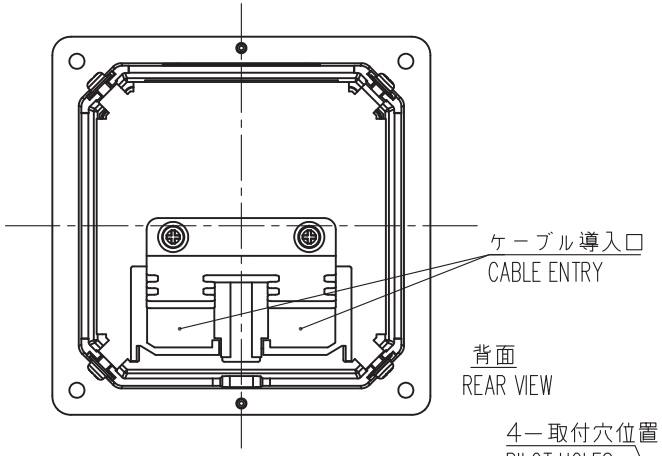
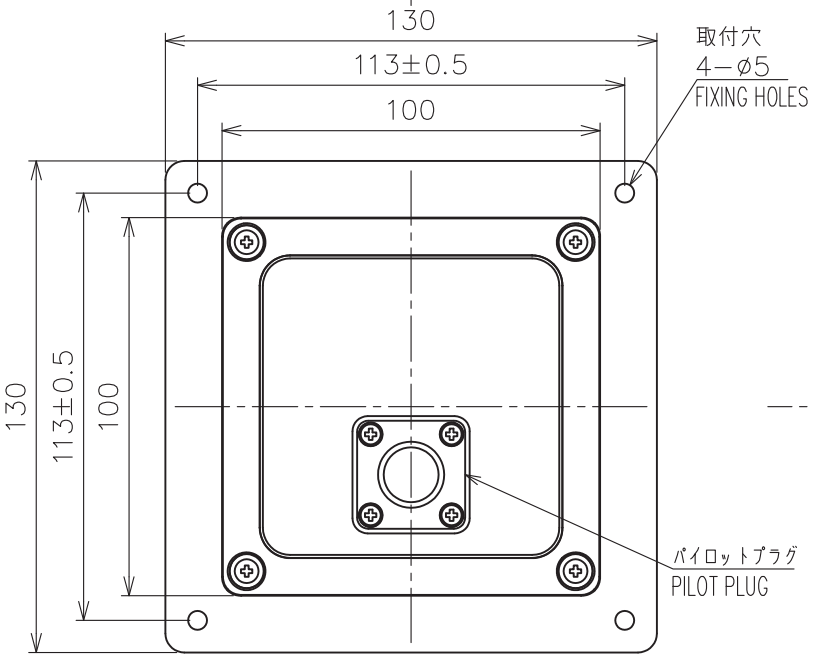
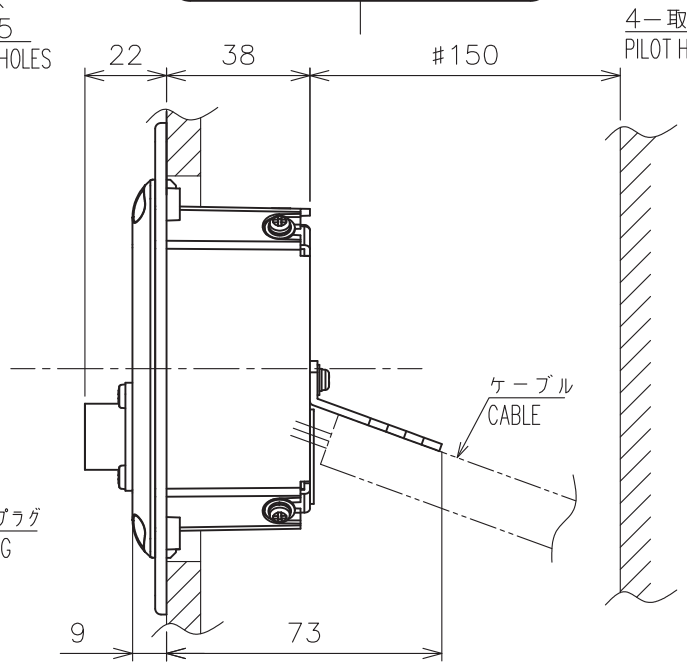
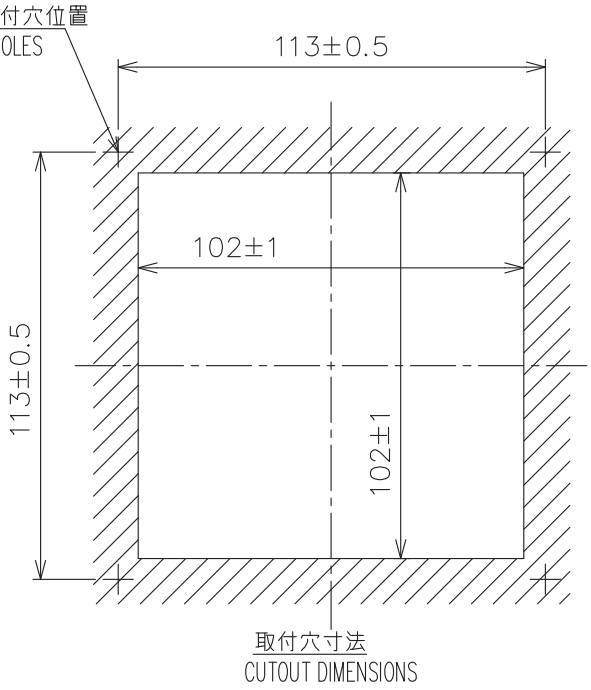


表 1 TABLE 1

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）　取付にはトラスタッピンネジ呼び径４×１６を使用のこと。

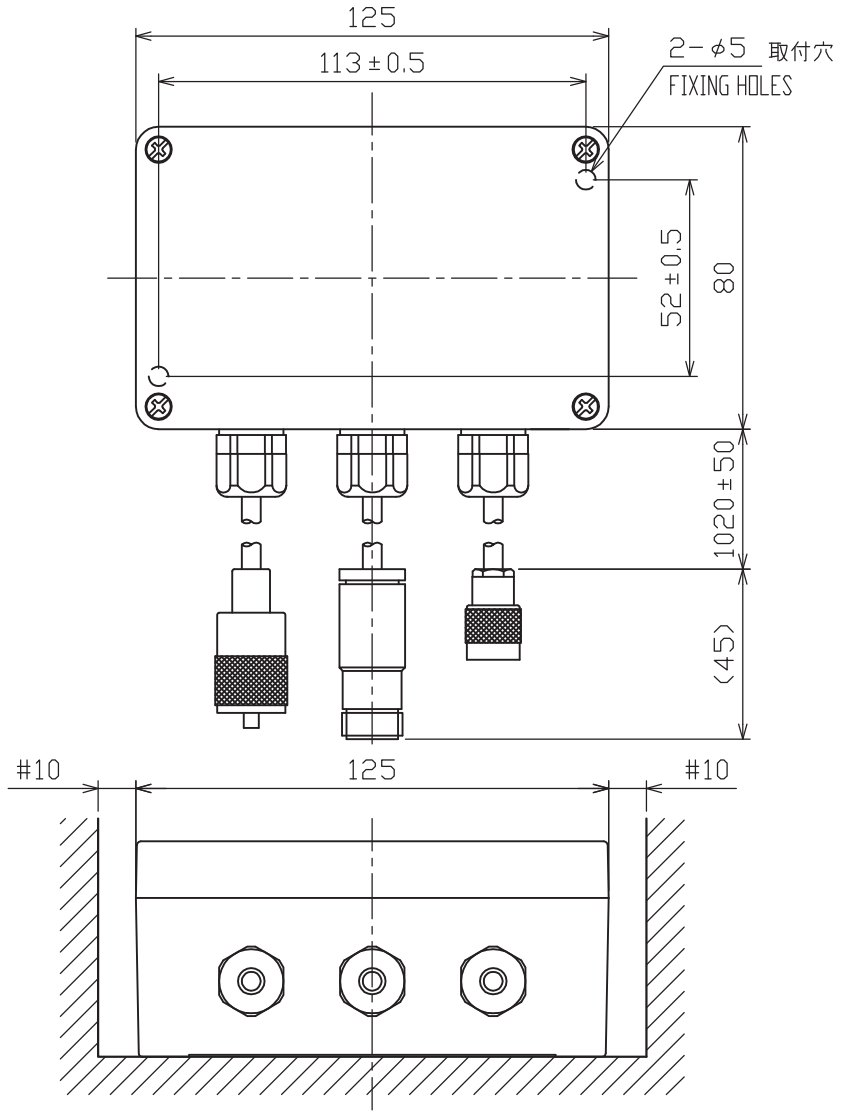
NOTE

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 19/Oct/2015 T.YAMASAKI		TITLE	FA-1703
CHECKED 20/Oct/2015 H.MAKI		名称	パイロットプラグユニット
APPROVED 20/Oct/2015 H.MAKI	FA-170		外寸図
SCALE 1/2 MASS 0.28 ±10% kg	質量はケーブルを含まず。 MASS DOES NOT INCLUDE CABLE.	NAME	PILOT PLUG UNIT
DWG.No. C4490-G05- C	REF.No. 05-109-451G-2		OUTLINE DRAWING

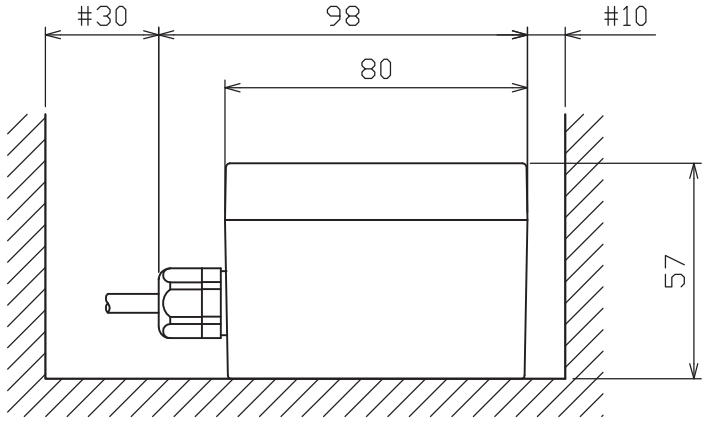
FURUNO ELECTRIC CO., LTD.

FURUNO



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

表1 TABLE 1



注　記　1）＃印寸法は最小サービス空間寸法とする。
　　2）指定外の寸法公差は表1による。
　　3）取付用ネジは＋ナベタッピンネジ４×３０を使用のこと。

NOTE　1. #: RECOMMENDED SERVICE CLEARANCE.
　　2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
　　3. USE TAPPING SCREWS 4x30 FOR FIXING THE UNIT.

DRAWN Jan. 9 '03 T.YAMASAKI			TITLE DB-1
CHECKED Jan. 9 '03 Y.KIMURA			名称 分配器
APPROVED Jan. 9. '03 Y. Kimura	FA-100		外寸図
SCALE 1/2	MASS 0.85 ±10% kg		NAME DISTRIBUTOR
DWG No. C4417-G04-C	24-003-320G-4		OUTLINE DRAWING

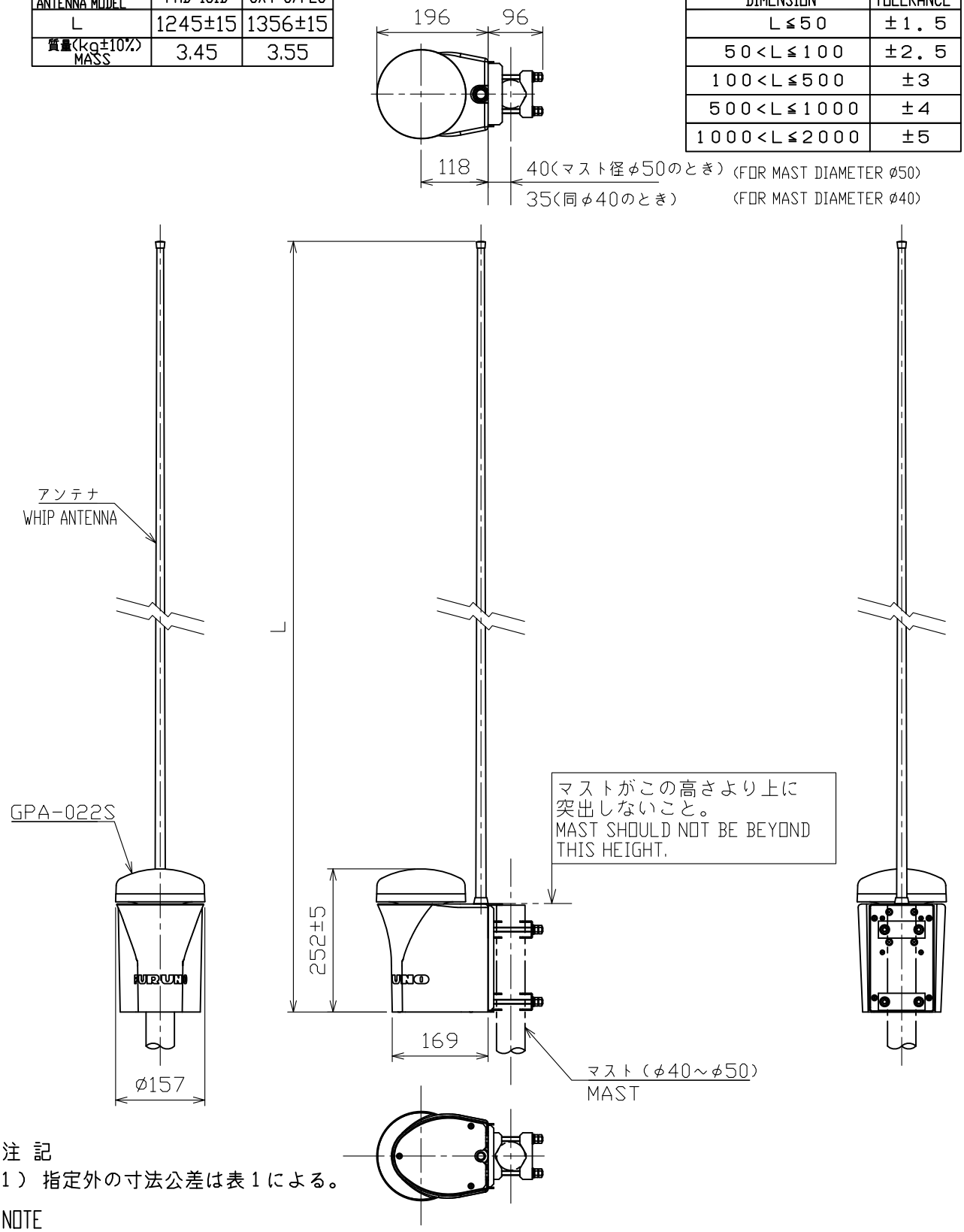
FURUNO ELECTRIC CO., LTD.

表 2 TABLE 2

アンテナ型式 ANTENNA MODEL	FAB-151D	CX4-3/FEC
L	1245±15	1356±15
質量(kg±10%) MASS	3.45	3.55

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



注 記

1） 指定外の寸法公差は表 1 による。

NOTE

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

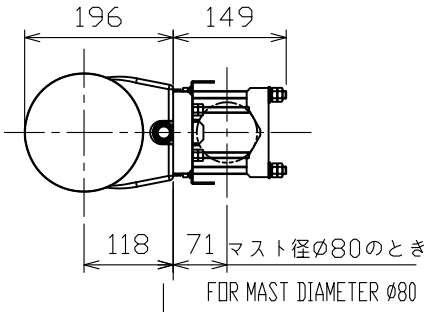
DRAWN 31/Aug/2020 T.YAMASAKI		TITLE	GVA-170
CHECKED 31/Aug/2020 H.MAKI		名称	GPS/VHF複合空中線部
APPROVED 3/Sep/2020 H.MAKI	FA-170		外寸図
SCALE 1/10 MASS 表2参照 SEE TABLE 2		NAME	GPS/VHF COMBINED ANTENNA
DWG. No. C4490-G07- A	REF. No. 05-109-550G- 0		OUTLINE DRAWING

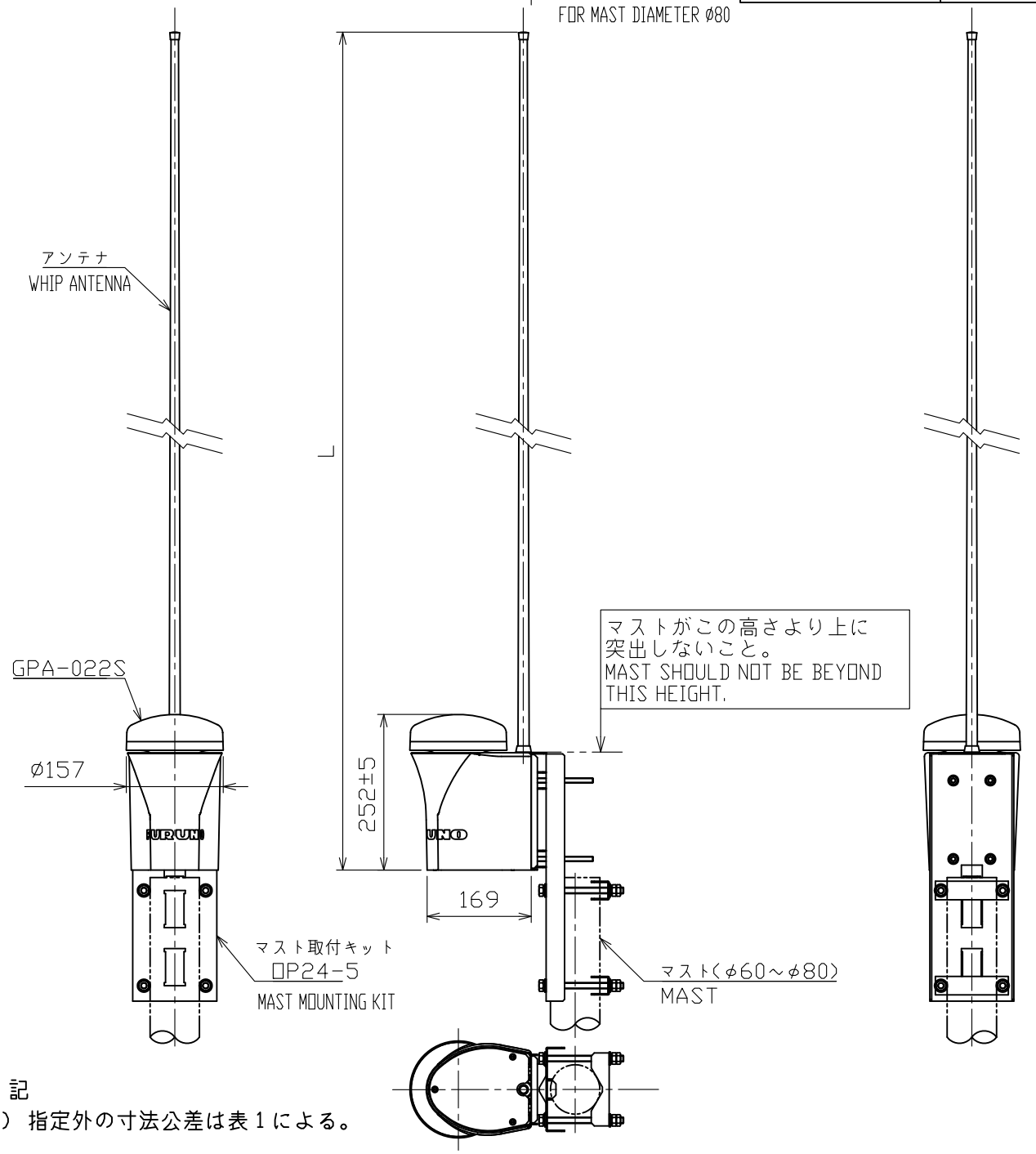
表2 TABLE 2

アンテナ型式 ANTENNA MODEL	FAB-151D	CX4-3/FEC
L	1245±15	1356±15
質量(kg±10%) MASS	5.25	5.35

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





注 記

1） 指定外の寸法公差は表1による。

NOTE

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

DRAWN 31/Aug/2020 T.YAMASAKI		TITLE	GVA-170
CHECKED 31/Aug/2020 H.MAKI		名称	GPS/VHF複合空中線部（取付キット）
APPROVED 3/Sep/2020 H.MAKI	FA-170		外寸図
SCALE 1/10 MASS 表2参照 SEE TABLE 2		NAME	GPS/VHF COMBINED ANTENNA (MAST MOUNTING KIT)
DWG. No. C4490-G08- A	REF. No. 05-109-551G- 0		OUTLINE DRAWING

表2 TABLE 2

アンテナ型式 ANTENNA MODEL	FAB-151D	CX4-3/FEC
L(mm)	1245±15	1356±15
質量 MASS (kg±10%)	3.3	3.4

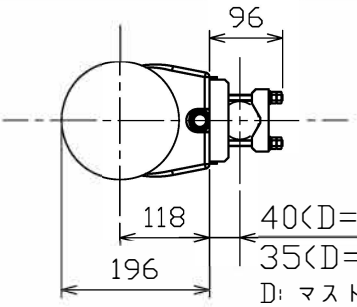
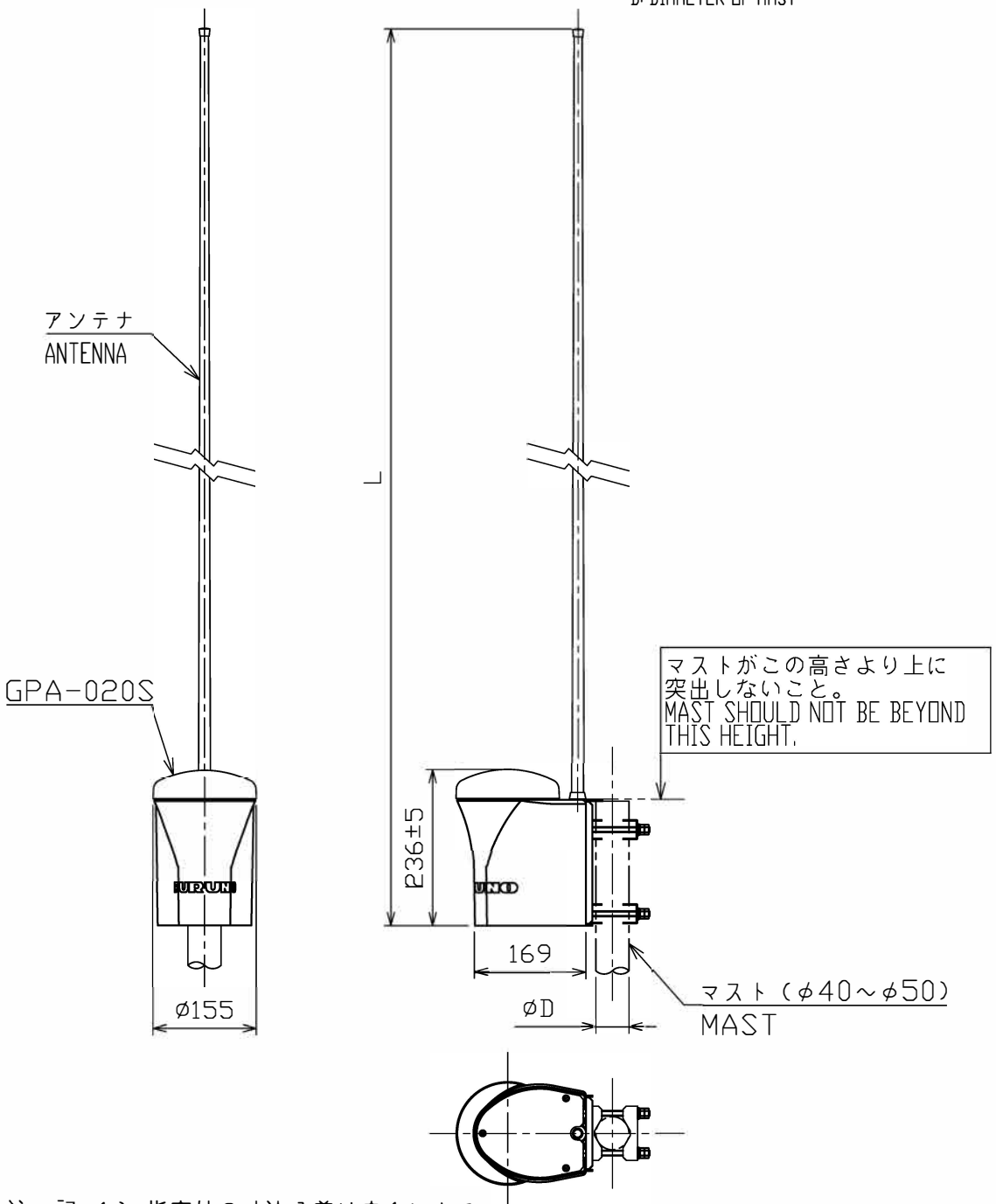


表1 TABLE 1

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



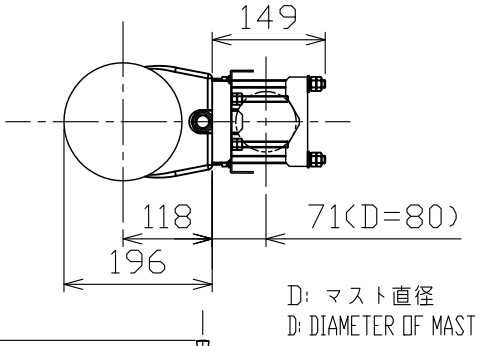
注 記 1) 指定外の寸法公差は表1による。

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

DRAWN 17/Jun/2019 T.YAMASAKI		TITLE GVA-100-T
CHECKED 17/Jun/2019 H.MAKI		名称 GPS/VHF 複合空中線部
APPROVED 17/Jun/2019 H.MAKI	FA-100/50/150/170	外寸図
SCALE 1/10 MASS 表2参照 TABLE 2		NAME GPS/VHF COMBINED ANTENNA
DWG. No. C4417-G02-L	REF. No. 24-003-301G-4	OUTLINE DRAWING

表2 TABLE 2

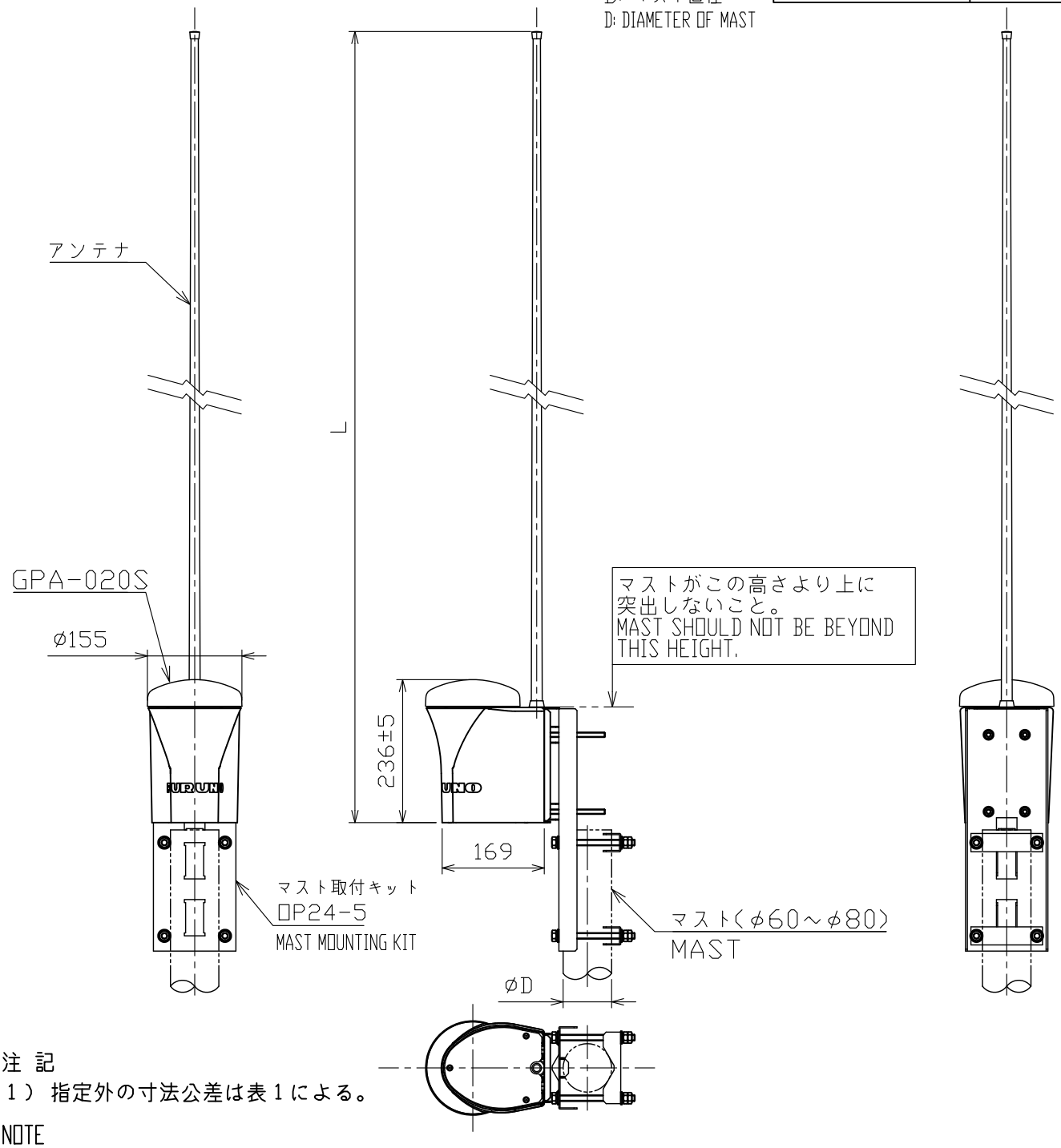
アンテナ型式 ANTENNA MODEL	FAB-151D	CX4-3/FEC
L(mm)	1245±15	1356±15
質量 MASS (kg±10%)	5.1	5.2



D: マスト直径
D: DIAMETER OF MAST

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



注 記

1） 指定外の寸法公差は表1による。

NOTE

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

DRAWN 19/Nov/2018 T.YAMASAKI		TITLE	GVA-100-T
CHECKED 19/Nov/2018 H.MAKI		名称	GPS/VHF複合空中線部（取付キット）
APPROVED 20/Nov/2018 H.MAKI	FA-100/50/150/170		外寸図
SCALE 1/10 MASS 表2参照 TABLE 2		NAME	GPS/VHF COMBINED ANTENNA (MAST MOUNTING KIT)
DWG. No. C4417-G10- E	REF. No. 24-003-303G-4		OUTLINE DRAWING

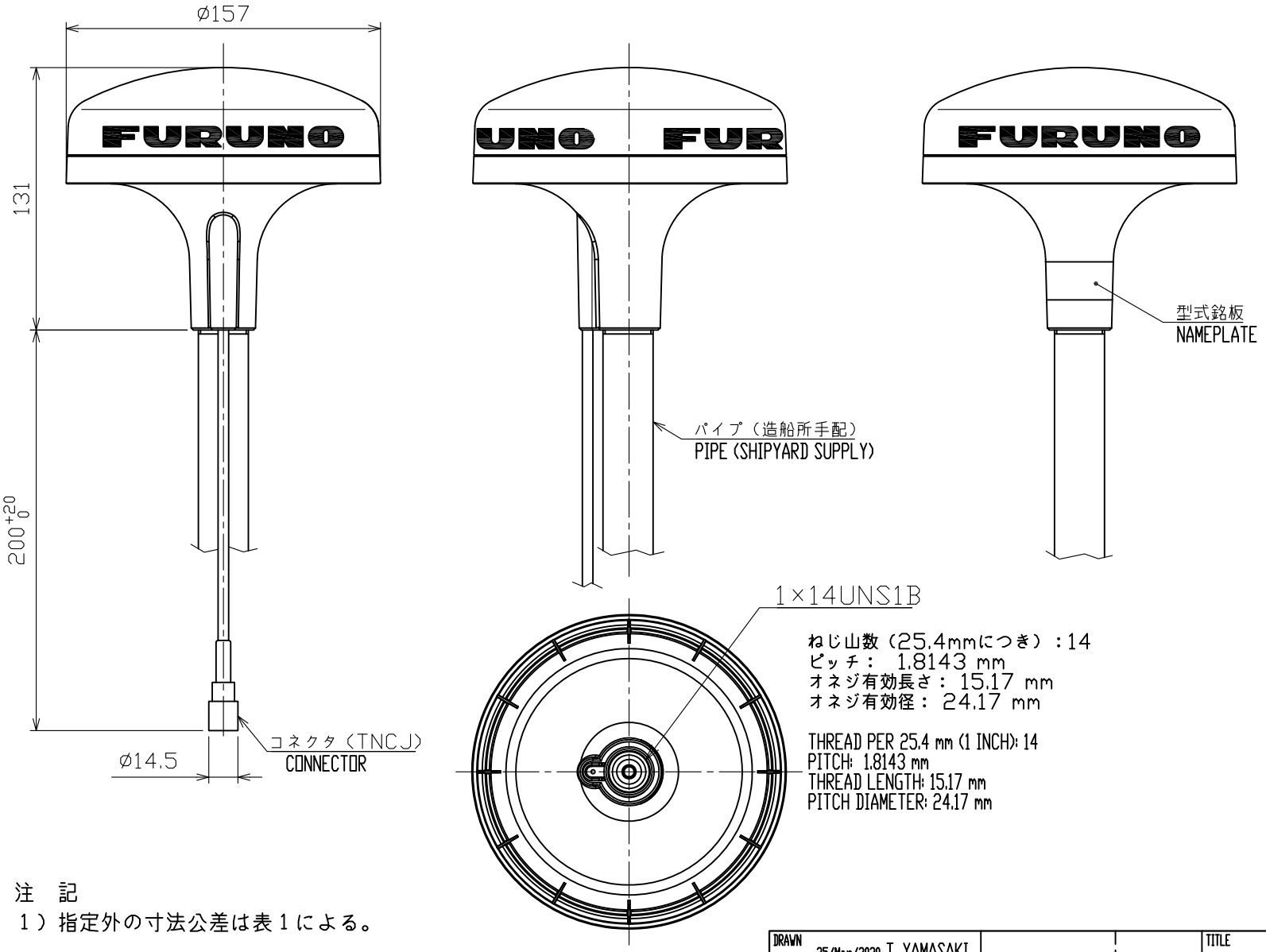


表1 TABLE 1

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

表2 TABLE 2

型式 MODEL	質量(kg±10%) MASS
GPA-022S	0.47
GPA-023S	0.65

注　記

1）指定外の寸法公差は表1による。

NOTE

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

DRAWN 25/Mar/2020 T. YAMASAKI		TITLE	GPA-022S/023S
CHECKED 25/Mar/2020 H. MAKI		名称	空中線部（パイプ固定）
APPROVED 13/May/2020 MAKI			外寸図
SCALE 1/3	MASS 表2参照 TABLE 2	質量はパイプを含まず。 MASS DOES NOT INCLUDE PIPE.	NAME ANTENNA UNIT (PIPE MOUNT)
DWG. No. C4482-G04- A	REF. No. 20-035-500G-2		OUTLINE DRAWING

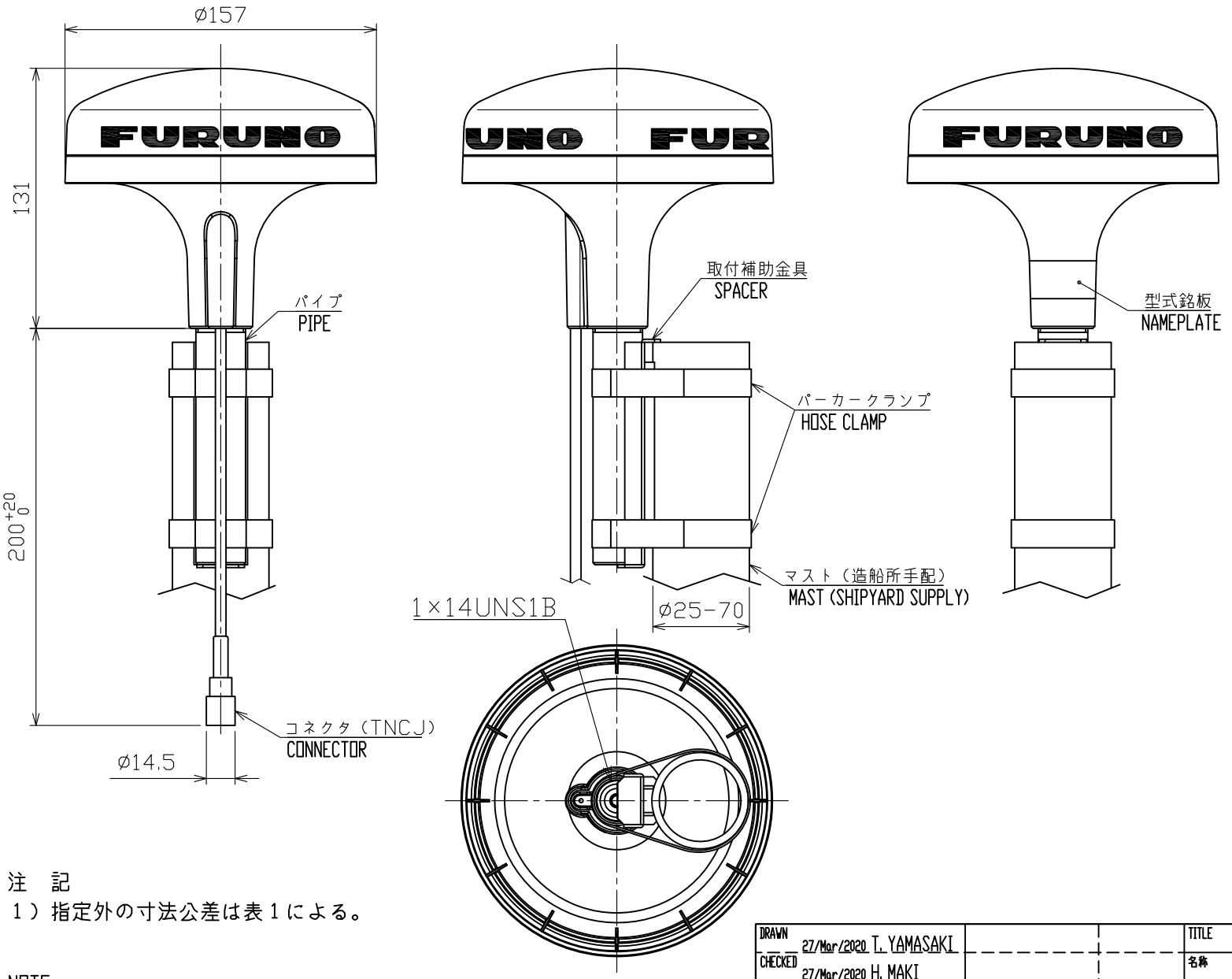


表1 TABLE 1

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

表2 TABLE 2

型式 MODEL	質量(kg±10%) MASS
GPA-022S	0.47
GPA-023S	0.65

注　記

1）指定外の寸法公差は表1による。

NOTE

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

DRAWN 27/Mar/2020 T. YAMASAKI		TITLE	GPA-022S/023S
CHECKED 27/Mar/2020 H. MAKI		名称	空中線部（金具取付）
APPROVED 13/May/2020 H.MAKI			外寸図
SCALE 1/3 MASS 表2参照 TABLE 2	質量は金具類を含まず。 MASS DOES NOT INCLUDE FIXTURES.	NAME	ANTENNA UNIT (FIXTURE MOUNT)
DWG. No. C4482-G05- A	REF. No. 20-035-501G-0		OUTLINE DRAWING

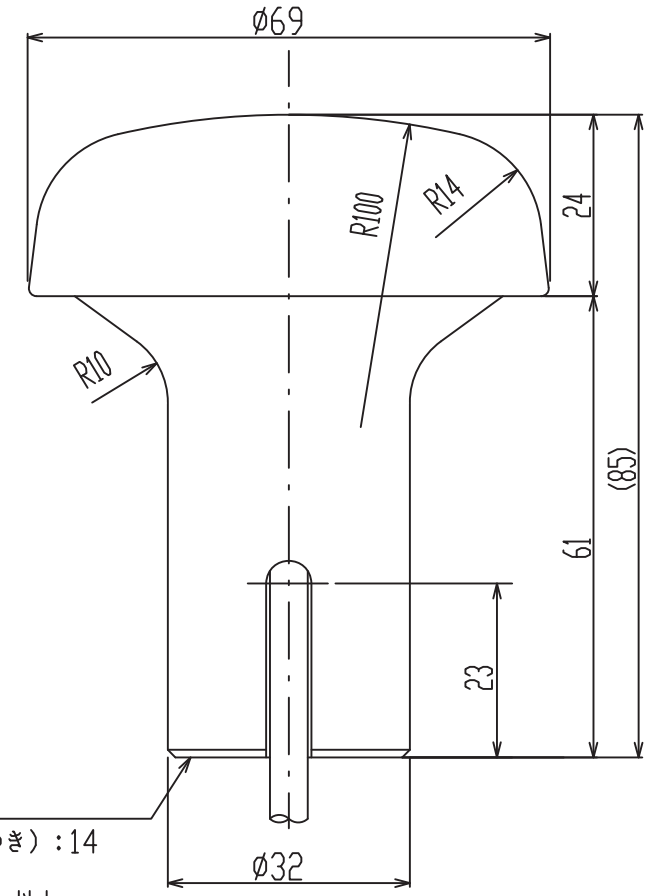


表1 TABLE 1

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

1-14UNS1B
ねじ山数(25.4mmにつき):14
ピッチ: 1.8143 mm
オネジ有効長さ:19 mm以上
オネジ有効径:24.17mm

THREAD PER 25.4mm (1 INCH): 14
PITCH: 1.8143 mm
THREAD LENGTH: 19 mm OR MORE
PITCH DIAMETER: 24.17mm

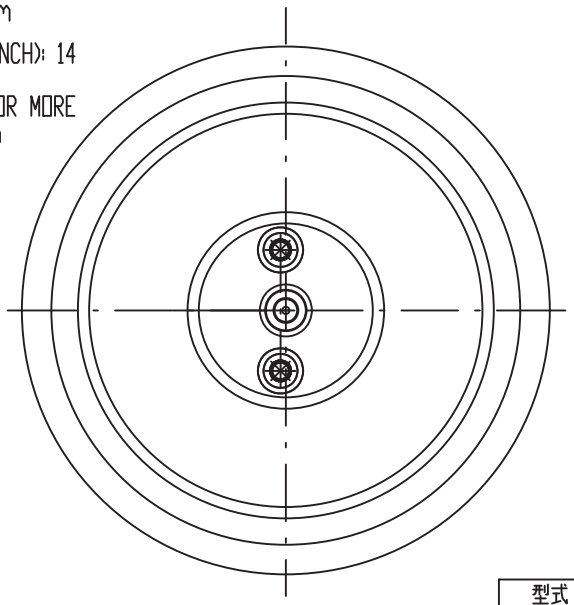


表2 TABLE 2

型式 TYPE	ケーブル長(m) CABLE LENGTH	プラグ PLAG	質量(kg±10%) MASS
GPA-017	10	TNC-P-3	0.6
GPA-017S	0.2	TNC-J-3	0.15

注記
指定外の寸法公差は表1による。

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

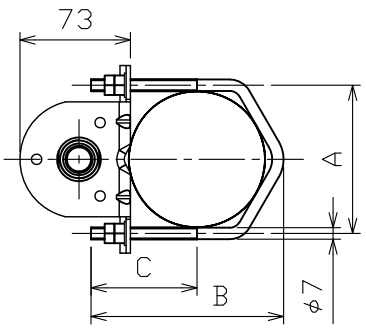
DRAWN Mar. 27 '07 T.YAMASAKI		TITLE GPA-017/017S
CHECKED Mar. 27 '07 T.TAKENO		名称 空中線部
APPROVED Mar.27'07 R.Esumi		外寸図
SCALE 1/1 MASS TABLE 2 表2参照		NAME ANTENNA UNIT
DWG.No. C4384-G04- L		OUTLINE DRAWING

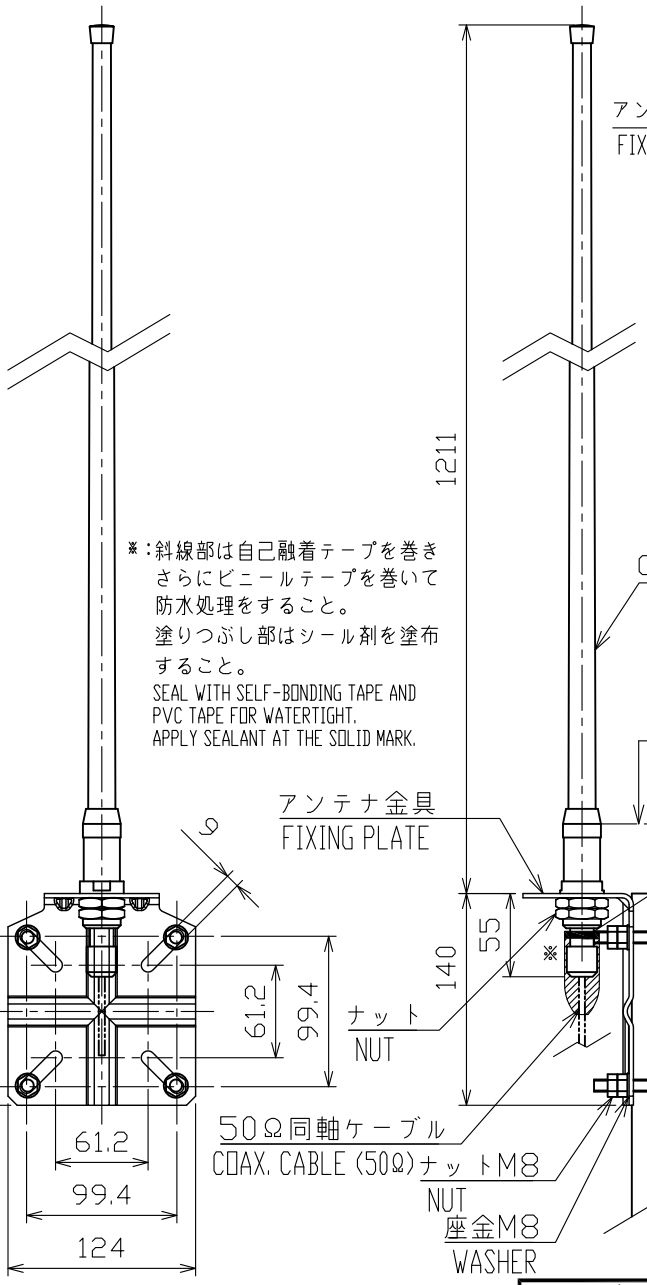
表1 (Table1)

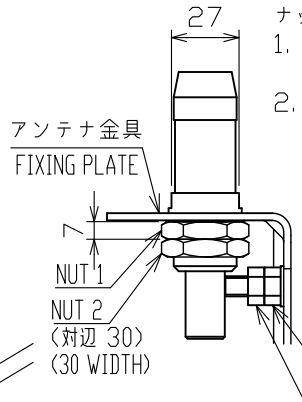
寸法区分 (mm) Dimension	公差 (mm) Tolerance
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4
1000<L≦2000	±5

品目 ITEM	型式 MODEL	材質 MATERIAL
アンテナ金具 FIXING PLATE	N173F/174F	SUS316
ナット1/2 NUT1/2	SW30	C3603B
Uボルト U-BOLT	M8	SUS316
座金・ナット WASHER/NUT	M8	SUS316

表3(Table3)



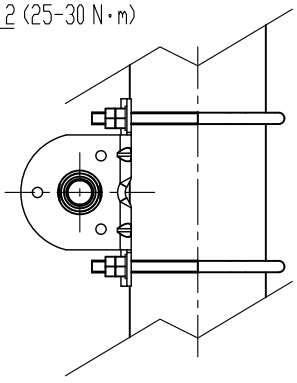




ナット締付手順
1. アンテナを対辺27のスパナで固定しナット1をトルク40N・mで締付ける。
2. 1と同様にアンテナを固定し、ナット2をトルク80N・mで締付ける。

NUT FASTENING PROCEDURE
1. FIX THE ANTENNA WITH 27 WIDTH SPANNER, THEN FASTEN THE NUT 1 W/TORQUE 40N・m.
2. FIX THE ANTENNA SAME AS STEP 1, THEN FASTEN THE NUT 2 W/TORQUE 80N・m.

取付部詳細 (尺度:1/3)
DETAIL FOR FIXING (SCALE:1/3)



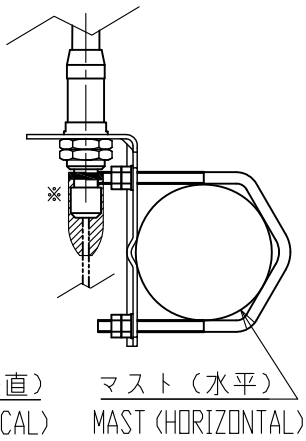


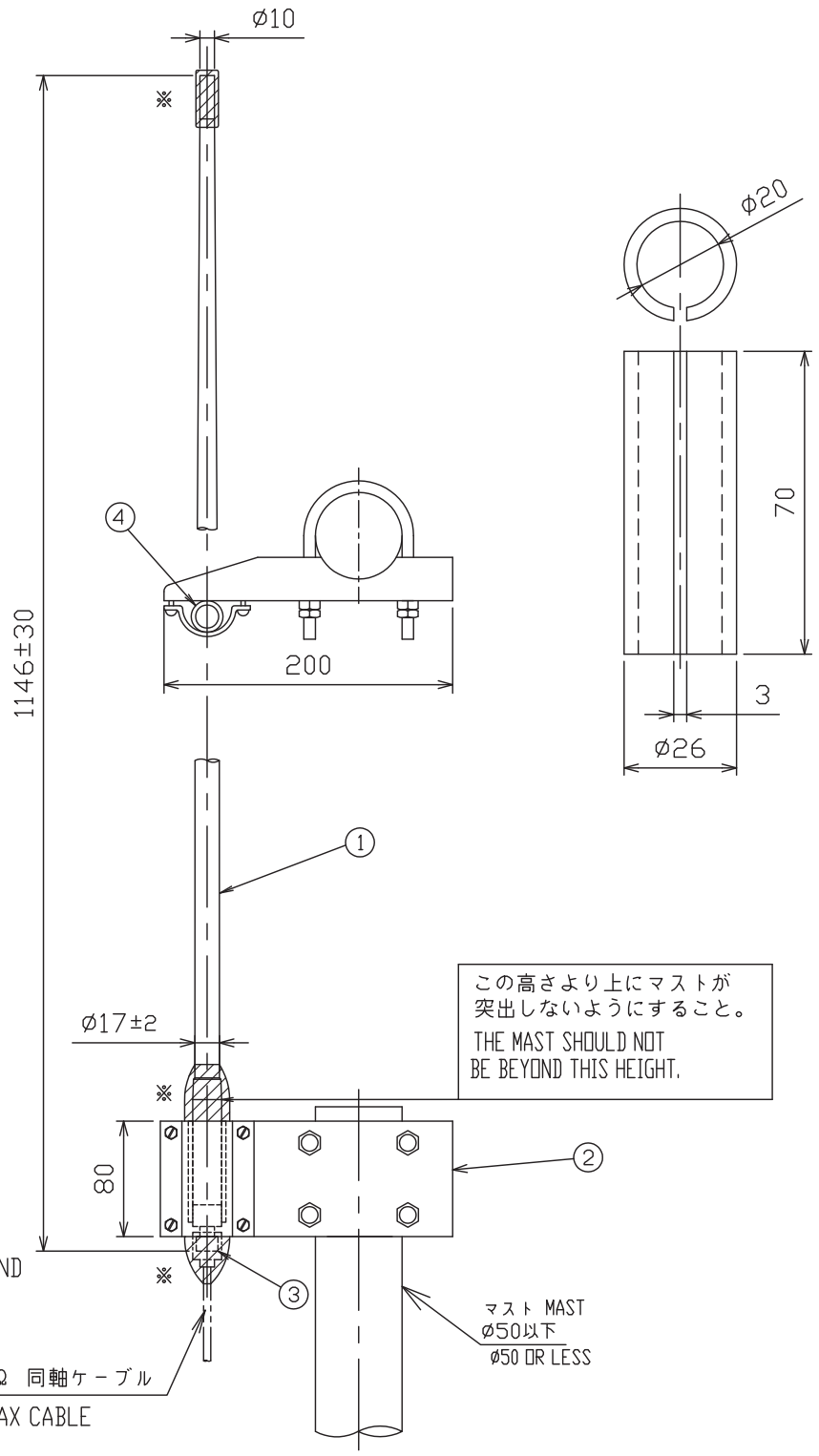
表2(Table2)

アンテナ金具型式 FIXING PLATE	Uボルト型式 U-BOLT TYPE	適合マスト径 MAST DIAMETER	A	B	C
N173F/FEC	412-0051-01	ø49 - ø90	98	127	70
N174F/FEC	412-0024-02	ø30 - ø61	69	117	83

注記 1) 指定外の寸法公差は表1による。

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

DRAWN 18/Nov/2021 T.YAMASAKI		TITLE	CX4-3/FEC
CHECKED 18/Nov/2021 H.MAKI		名称	アンテナ
APPROVED 9/Dec/2021 H.MAKI			外寸図
SCALE 1/5	MASS 1.2 ±10% kg 質量は取付金具を含まず。 MASS DOES NOT INCLUDE FIXTURE.	NAME	ANTENNA
DWG. No. C5013-G04- G	REF. No. 05-104-355G-3		OUTLINE DRAWING

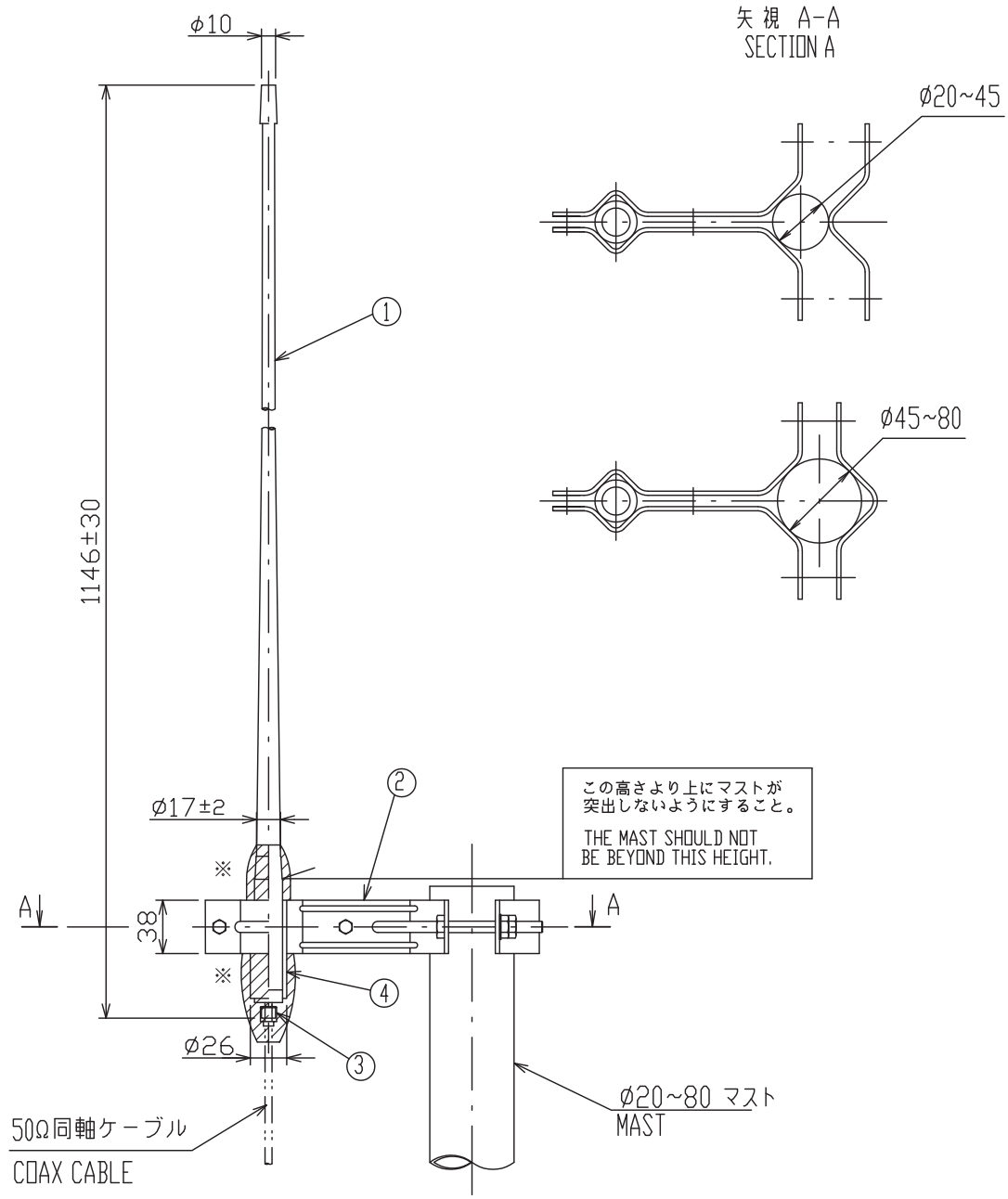


※ 斜線部は自己融着テープを巻き
更にビニールテープを巻いて
防水処理をおこなうこと。

SEAL WITH SELF-BONDING TAPE AND
PVC TAPE FOR WATERTIGHTNESS.

ITEM 品番	NAME 品名	MATERIAL 材質	Q'TY 数量	DWG.No. 図番	REMARKS 摘要
4	固定用パイプ LINER PIPE	硬質塩ビ VINYL CHLORIDE	1		
3	同軸コネクタ COAX. CONNECTOR		1		M-R
2	アンテナ取付金具 ANTENNA BRACKET	SUS	1 式 SET	4-310071	0.6kg
1	アンテナ棒 ANTENNA ELEMENT	FRP	1		0.25kg

DRAWN 4/Aug/2017 T.YAMASAKI		TITLE FAB-151D
CHECKED 4/Aug/2017 H.MAKI		名称 150MHz ホイップアンテナ
APPROVED 10/Aug/2017 H.MAKI		外寸図
SCALE 1/5 MASS 0.85 ±10% kg		NAME 150MHz WHIP ANTENNA
DWG.No. C5013-019-L	4-110718	OUTLINE DRAWING



※： 斜線部は自己融着テープを巻き
さらにビニールテープを巻いて
防水処理を行うこと。
SEAL WITH SELF-BONDING TAPE AND
PVC TAPE FOR WATERTIGHTNESS.

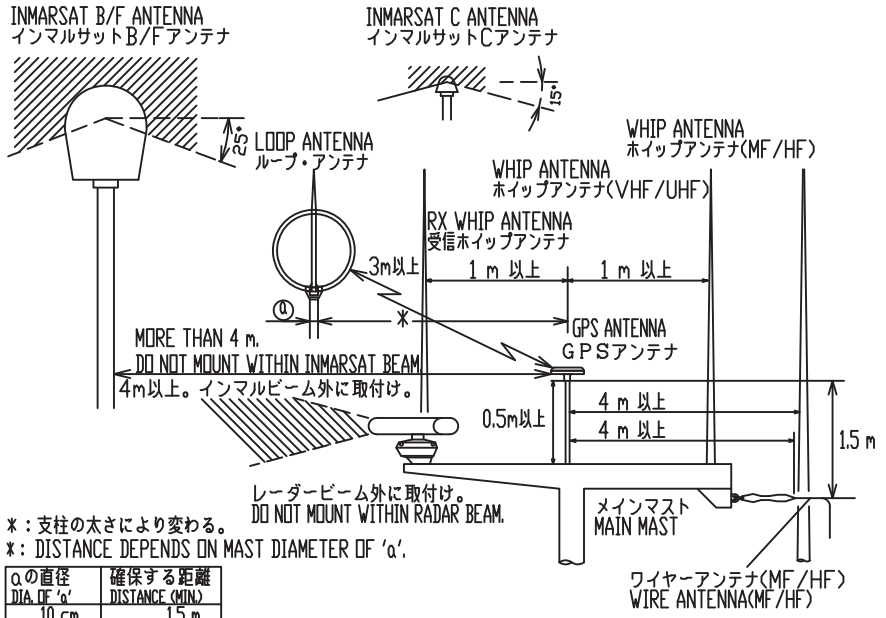
ITEM 品番	NAME 品名	MATERIAL 材質	QTY 数量	DWG. No. 図番	REMARKS 摘要
4	固定用パイプ LINEAR PIPE	硬質塩ビ VINYL CHLORIDE	1		
3	同軸コネクタ COAX. CONNECTOR		1		M-R
2	アンテナ取付金具 ANTENNA BRACKET	SUS316L	1 式 SET	M-15AS	t2.5
1	アンテナ棒 ANTENNA ELEMENT	FRP	1	FAB-151D	0.25 kg

DRAWN 4/Aug/2017 T.YAMASAKI		TITLE FAB-151D + M-15AS1
CHECKED 4/Aug/2017 H.MAKI		名称 150MHzホイップアンテナ(取付金具)
APPROVED 10/Aug/2017 H.MAKI		外寸図
SCALE 1/5 MASS 0.7 ±10% kg	質量は取付金具を含む。 MASS INCLUDES BRACKET.	NAME 150MHz WHIP ANTENNA w/ BRACKET
DWG. No. C5011-042- G	REF. No.	OUTLINE DRAWING

FURUNO

取付位置
MOUNTING LOCATION

他の機器のアンテナから下の図の距離以上離す。
THIS FIGURE SHOWS THE SEPARATION DISTANCES FROM OTHER ANTENNAS TO AVOID MUTUAL INTERFERENCE.

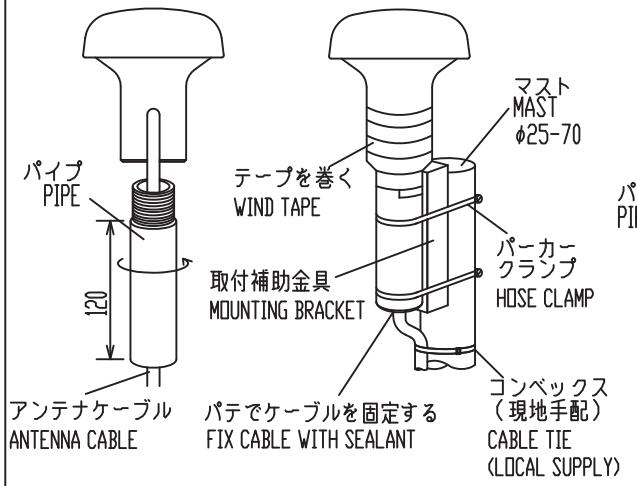


*：支柱の太さにより変わる。
*: DISTANCE DEPENDS ON MAST DIAMETER OF 'a'.

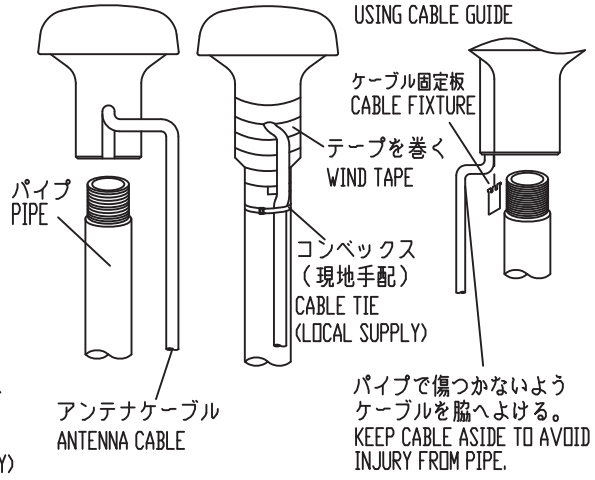
aの直径 DIA. OF 'a'	確保する距離 DISTANCE (MIN.)
10 cm	1.5 m
30 cm	3 m

A）マストへの取付け　MAST MOUNTING

a)マスト取付金具CP20-01111(工事材料)でマストに固定する。
USE MAST MOUNTING KIT CP20-01111.



b)パイプのみを使うとき
USE A PIPE ONLY.

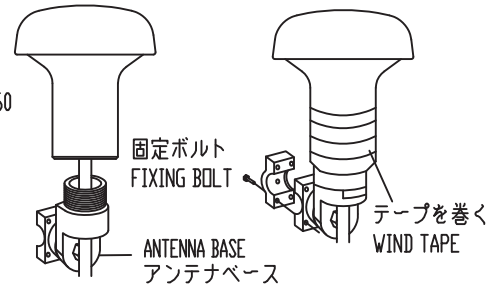


B）スタンションやパルピットにつけるとき

レール用アンテナベース No.13-RC5160
（取付可能レール直径：ø19~ø32）
（コード番号：000-806-114）

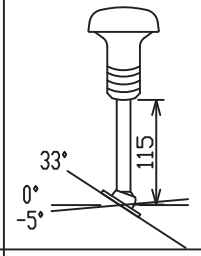
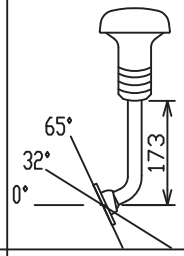
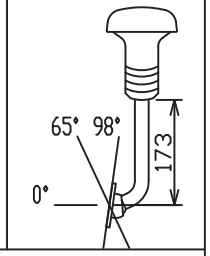
HANDRAIL MOUNTING

USE HANDRAIL MOUNTING BASE No.13-RC5160 (CODE No.000-806-114, OPTION).
THE DIAMETER OF THE HANDRAIL MAY BE FROM ø19mm TO ø32mm.

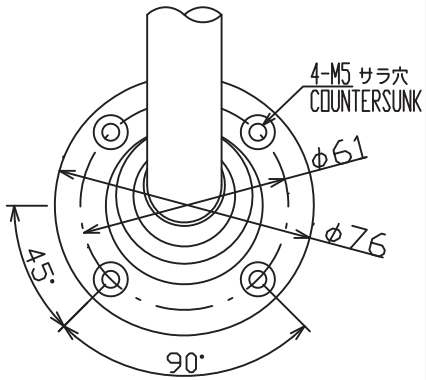


C）取付ける場所が傾斜しているとき　ANTENNA BASE MOUNTING

オプションのアンテナベースを使う。
USE OPTIONAL ANTENNA BASE.

傾斜 INCLINATION	-5° - 33°	32° - 65°	65° - 98°
装備方法 MOUNTING METHOD			
アンテナベース型式 ANT. BASE TYPE コード番号 CODE No.	直型アンテナベース RIGHT ANGLE ANTENNA BASE No.13-QA330 000-803-239	L型アンテナベース L-TYPE ANTENNA BASE No.13-QA310 000-803-240	

アンテナベース基部
MOUNTING DIMENSIONS OF ANTENNA BASE.



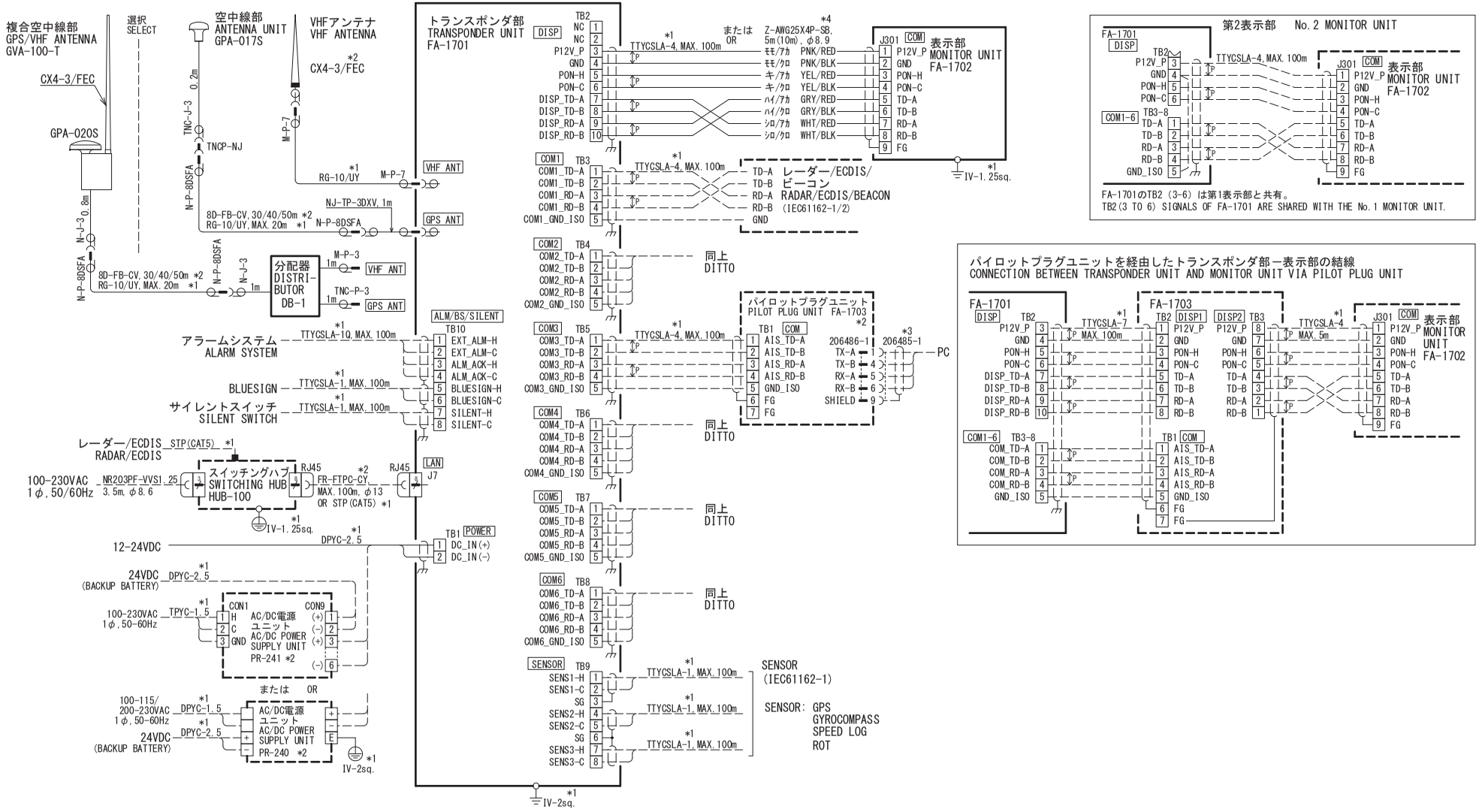
注記 1）パイプやアンテナベースはアンテナユニットにねじ込んだ後に固定する。
2）アンテナを固定するときはパイプ（アンテナベース）をアンテナにねじ込むこと。
アンテナ側をねじるとコネクタ部やケーブルに無理がかかり、故障の原因となる。

NOTE 1. FASTEN PIPE(ANTENNA BASE) TO ANTENNA UNIT FIRST THEN FIX THEM TO MAST OR HANDRAIL.
2. WHEN FIXING ANTENNA, TURN PIPE OR ANTENNA BASE; NOT THE ANTENNA.
TURNING THE ANTENNA MAY TWIST THE CABLE AND PLACE STRESS ON CONNECTOR.

DRAWN 14/MAY/2014 T.YAMASAKI		TITLE	GPA series
CHECKED 14/MAY/2014 H.MAKI		名称	空中線部
APPROVED 15/May/2014 H.MAKI			装備要領図
SCALE / MASS		NAME	ANTENNA UNIT
DWG.No. C4384-Y01- F			INSTALLATION PROCEDURE

FURUNO ELECTRIC CO., LTD.

FURUNO



注記
＊1）造船所手配。
＊2）オプション。
＊3）TYCO ELECTRONICS社（旧AMP社）製。
＊4）国際向専用ケーブル。カラーコードは専用ケーブルのもの。

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: PRODUCED BY TYCO ELECTRONICS (AMP) INC.
*4: 5m:STANDARD SUPPLY. 10m:OPTION. COLOR CODES SHOW CORES OF THE SUPPLIED CABLE.

DRAWN 18/Dec/2024 S. HAN		TITLE	FA-170
CHECKED 18/Dec/2024 T. YAMASAKI		名称	国際船舶自動識別装置
APPROVED 5/May/2025 A. Murao			相互結線図
SCALE / MASS kg		NAME	U-AIS TRANSPONDER
DWG No. C4490-C01- H	REF. No. 05-109-1001-0		INTERCONNECTION DIAGRAM

S-1

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