

FURUNO

INSTALLATION HANDBOOK OF FURUNO DEEP SEA EQUIPMENTS



FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

© **FURUNO ELECTRIC CO., LTD.**

9-52, Ashihara-cho,
Nishinomiya, Japan

Telephone: 0798-65-2111
Telefax: 0798-65-4200

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Printed in Japan

FIRST EDITION : APR. 2003

PUB. No. TIE-00150-A

(MAYA) DEEP SEA EQUIPMENT



* TIE00150A00 *

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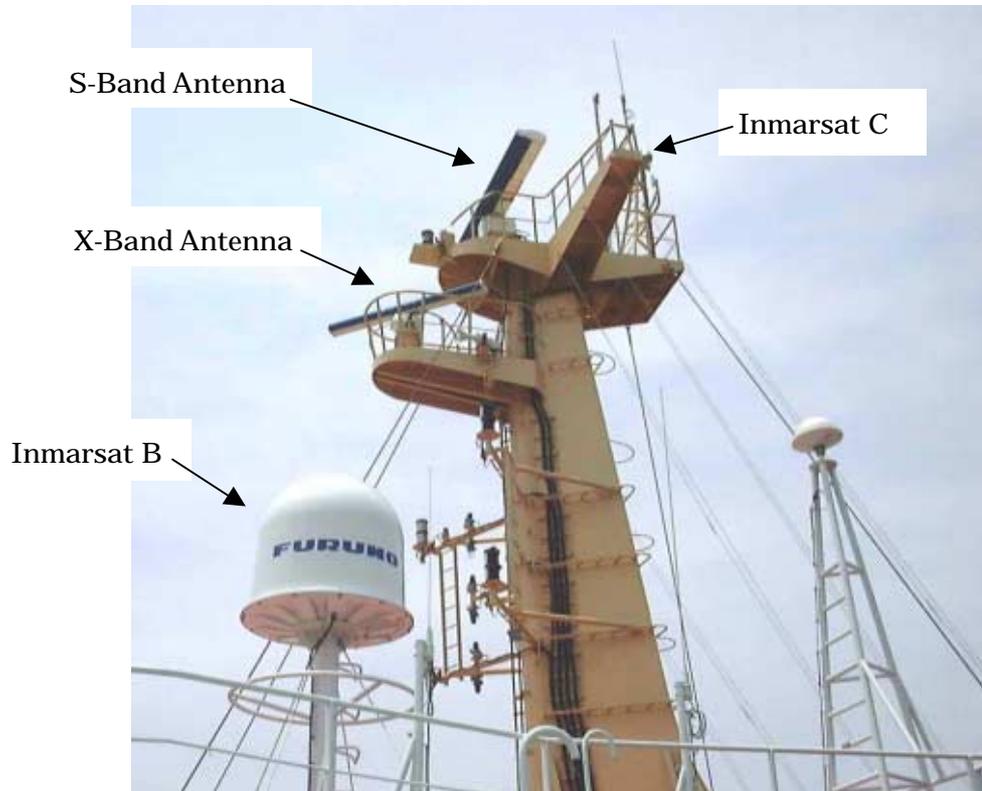
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1.1 Radar scanner mast

Example of a radar scanner mast



Example of a radar scanner mast, enlarged

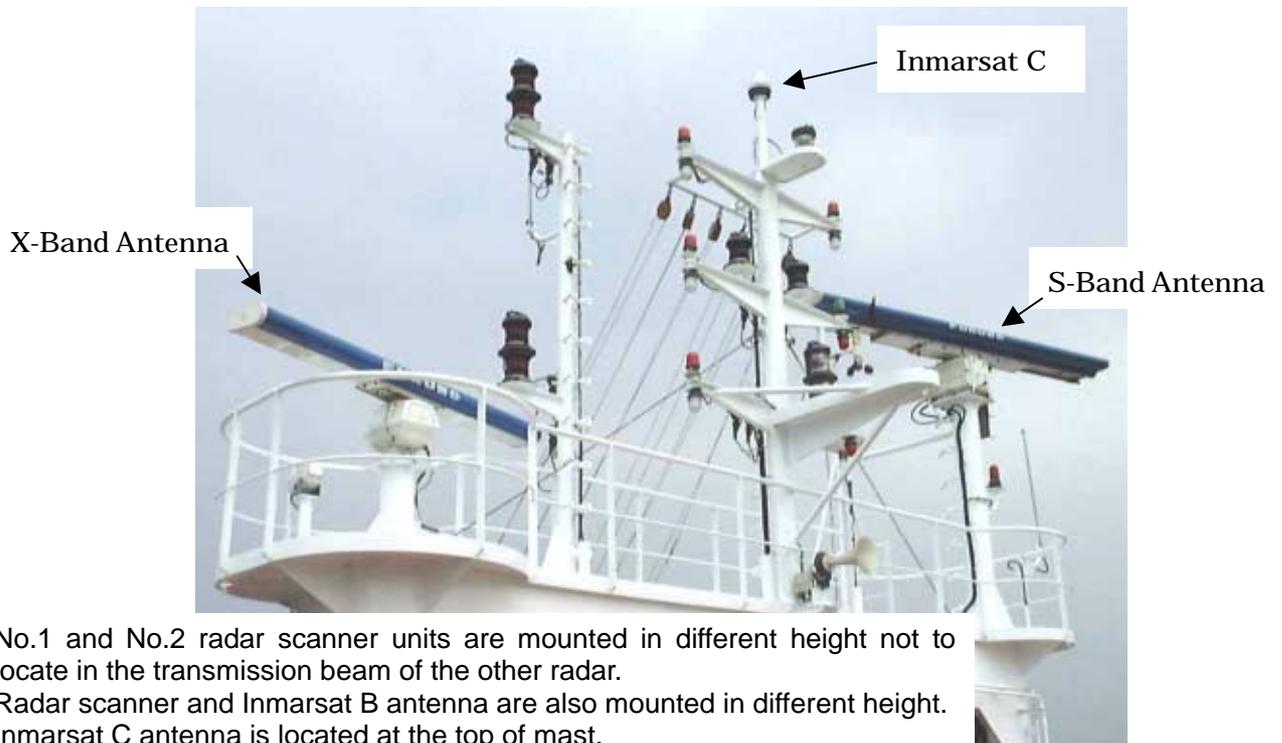


Fig. 1-2 Radar scanner mast, enlarged

1.1.1 Mounting X-band radar antenna unit

The scanner unit must be placed on the corrosion proof rubber mat supplied.



Fig. 1-3 Corrosion proof rubber mat

Bolts and nuts must be coated with anticorrosive silicone sealant.



Fig. 1-4 Applying silicone sealant

1.1.2 X-band radar (TR-UP Type)

Apply silicone sealant on to grounding points and terminals.

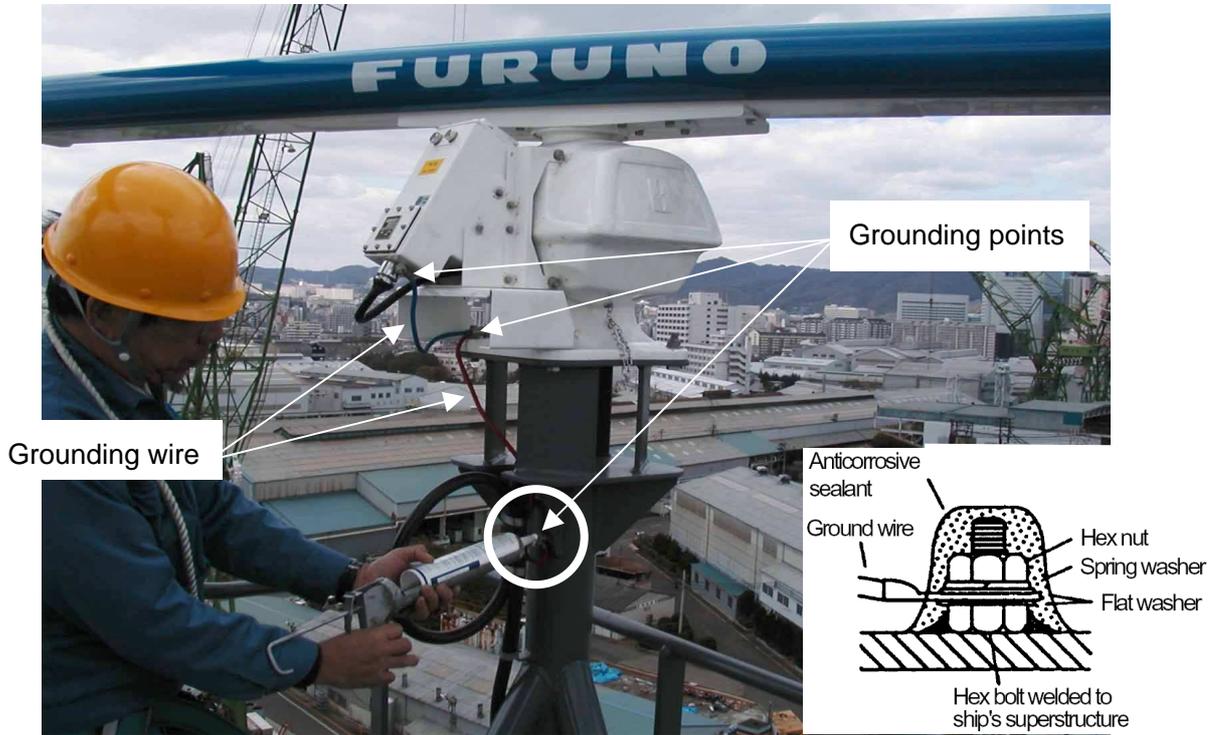


Fig. 1-5 Applying silicone sealant

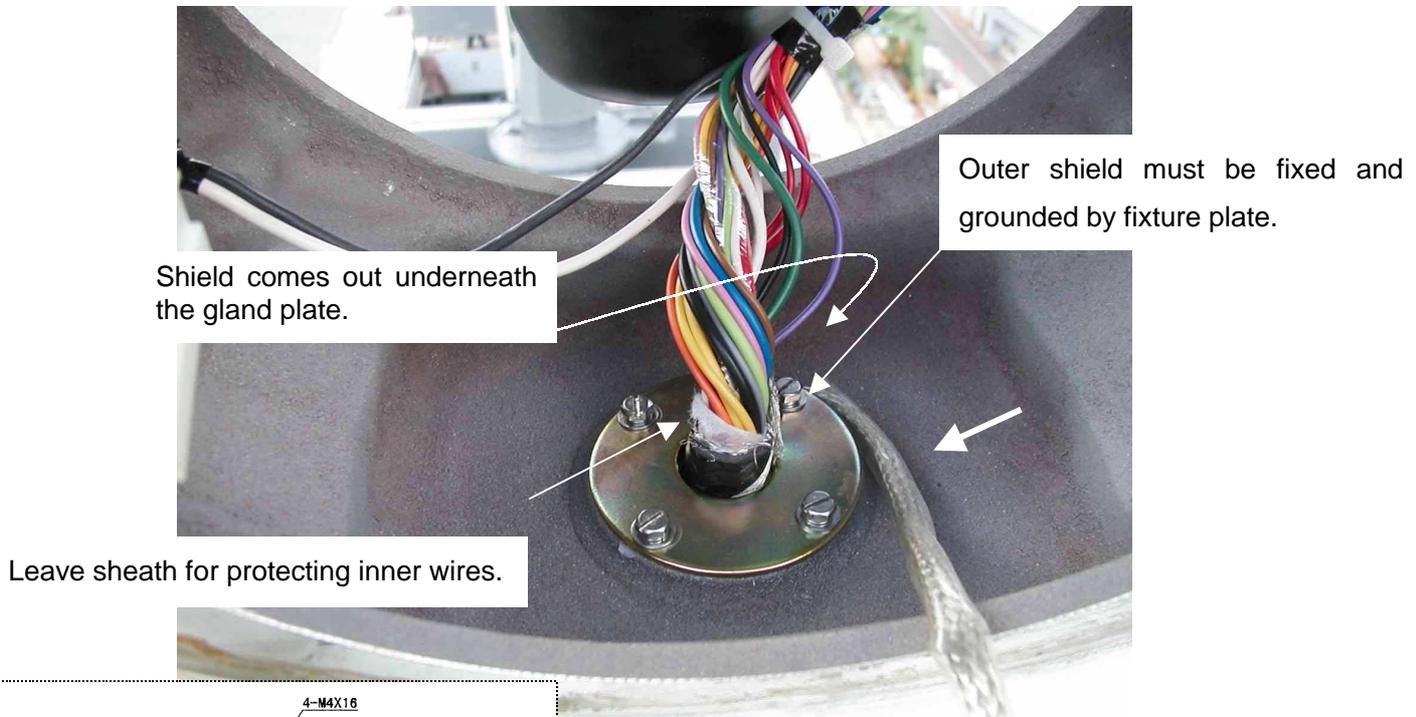
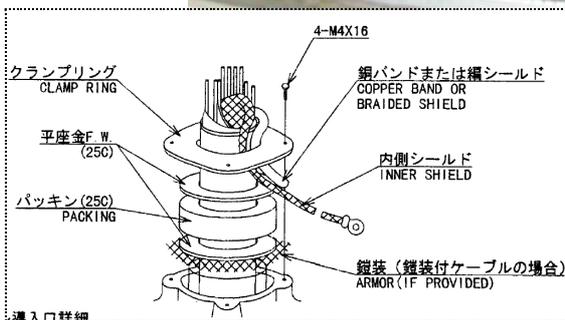
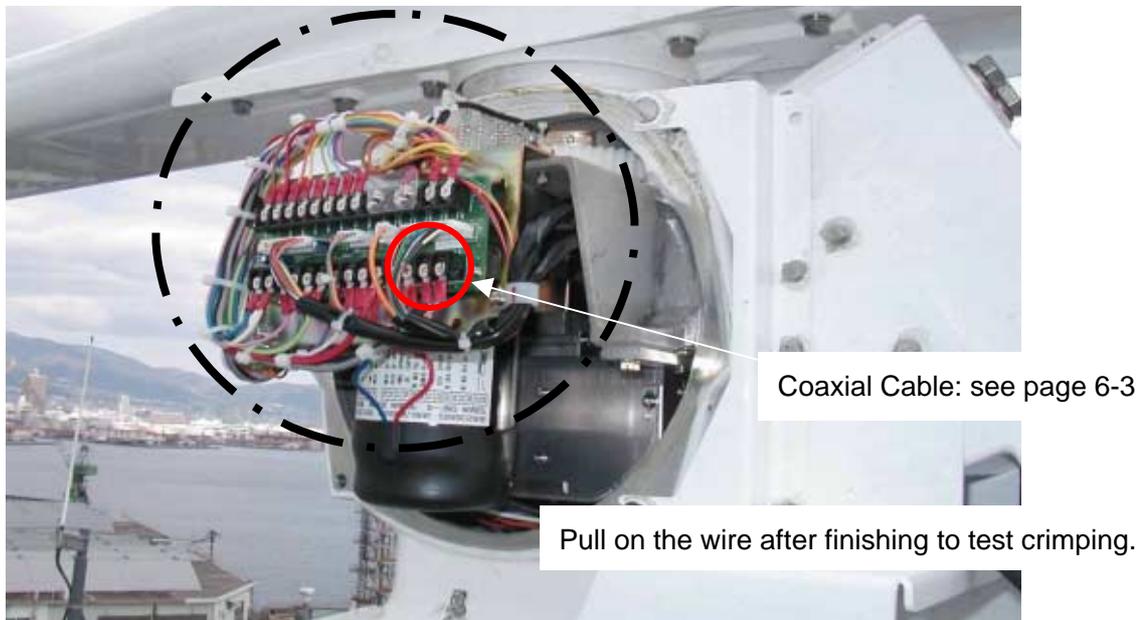


Fig. 1-6 Cable entry of scanner base



1.1.3 Terminal board in X-band scanner unit

Antenna cable is connected to the terminal board in the scanner unit. The connection is made by referring to the interconnection diagram in the installation manual. Bind cables with cable ties for a better appearance.



Coaxial Cable: see page 6-3

Pull on the wire after finishing to test crimping.

Fig. 1-7 Terminal board in X-band scanner unit

1.1.4 Performance monitor on X-band scanner unit

Figure below shows the performance monitor fitted on the scanner unit.

Readjustment of VRs are required when the performance monitor is reinstalled.



Fig. 1-8 Performance monitor on X-band scanner unit

1.1.5 S-band scanner unit

Ground the scanner unit securely. Apply silicone sealant over grounding point and terminal.

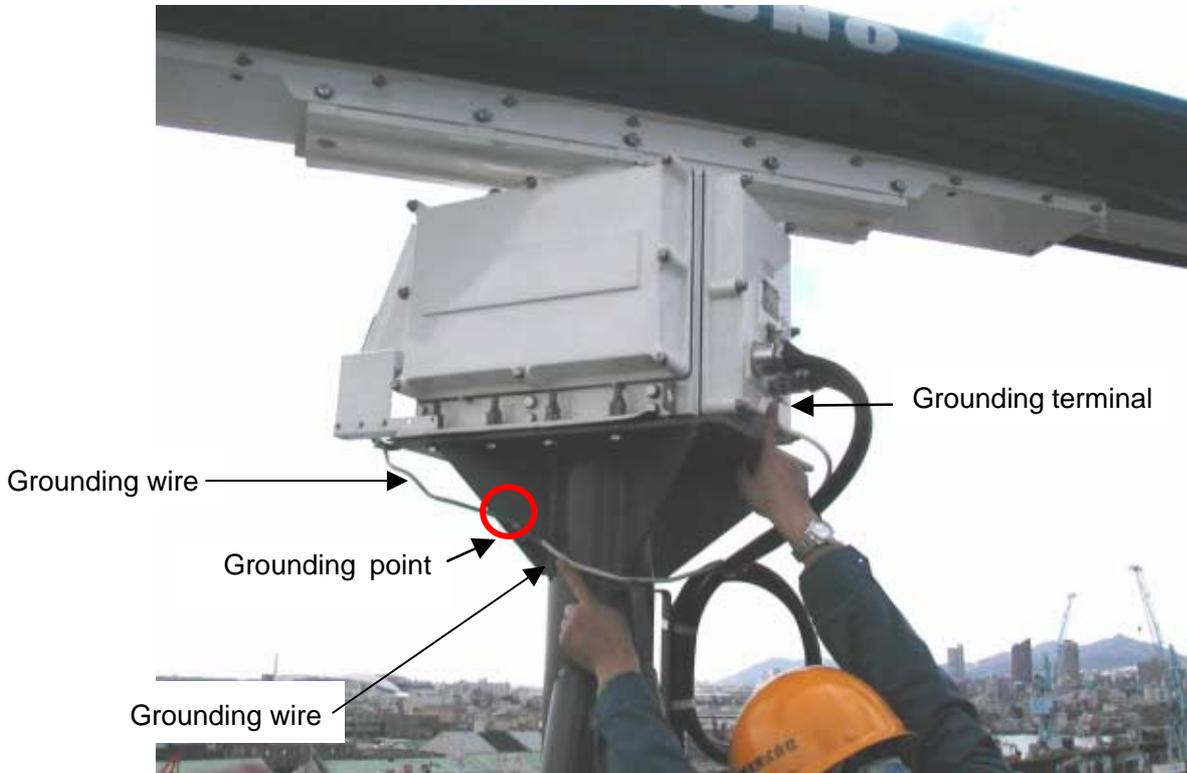


Fig. 1-9 Grounding scanner unit

Tighten the cable gland securely. Use monkey shit for waterproofing.

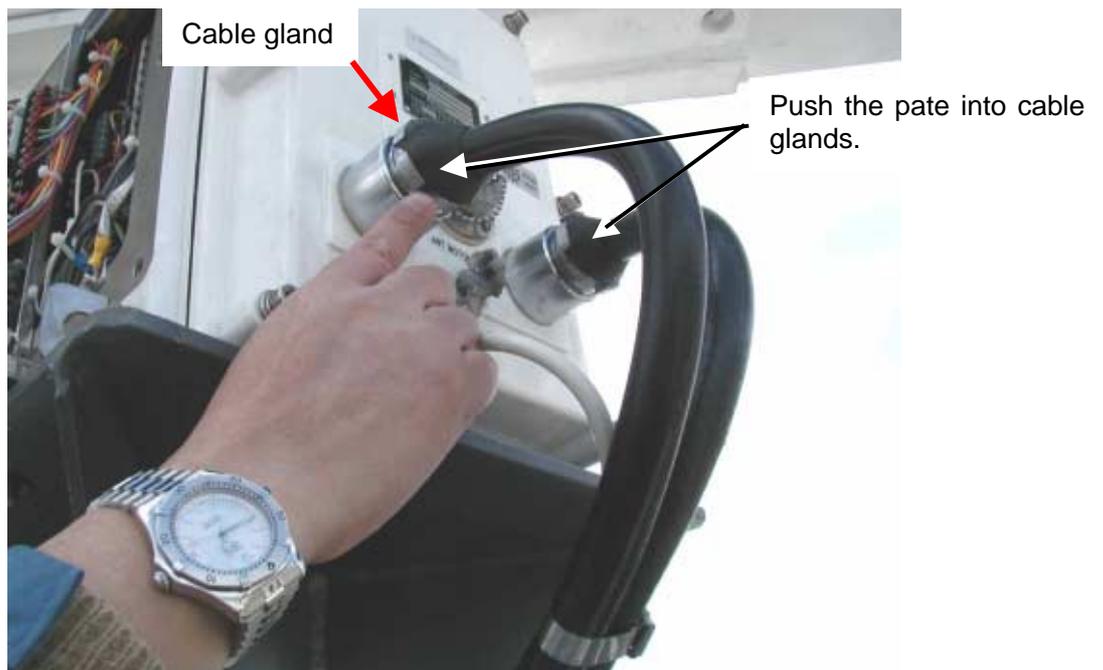
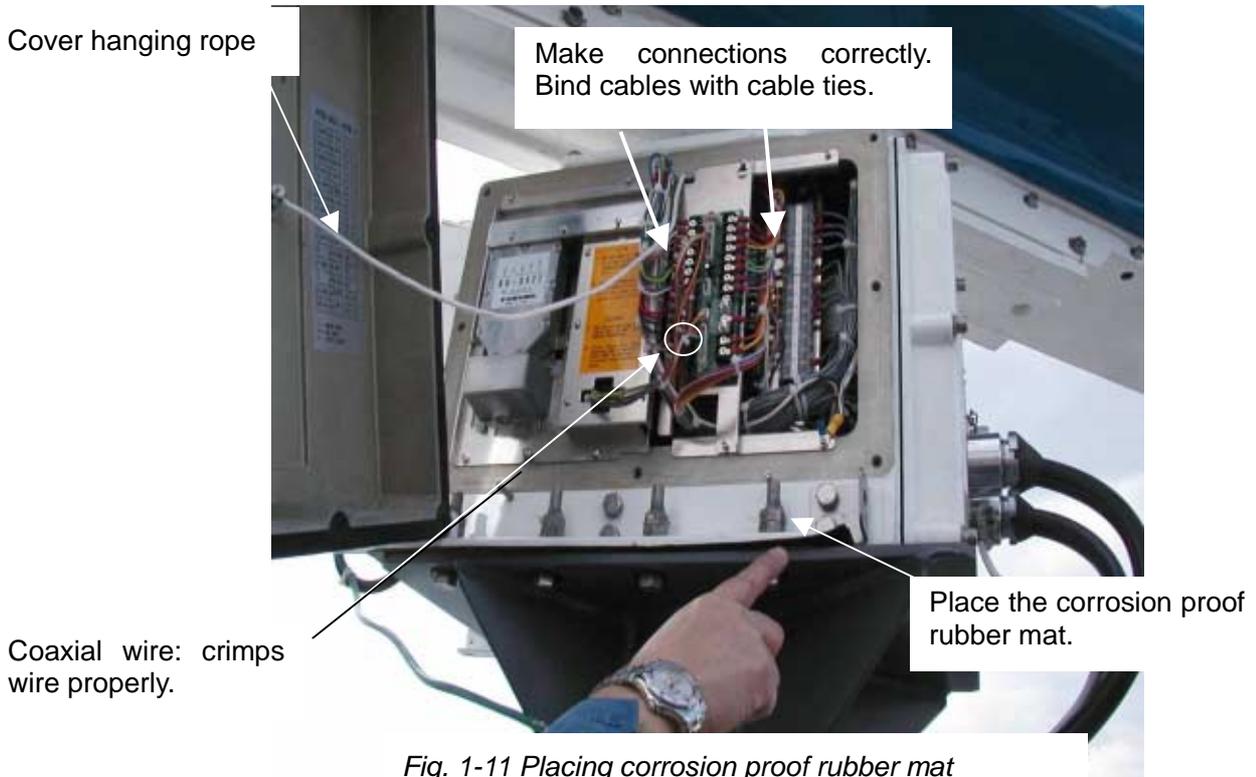
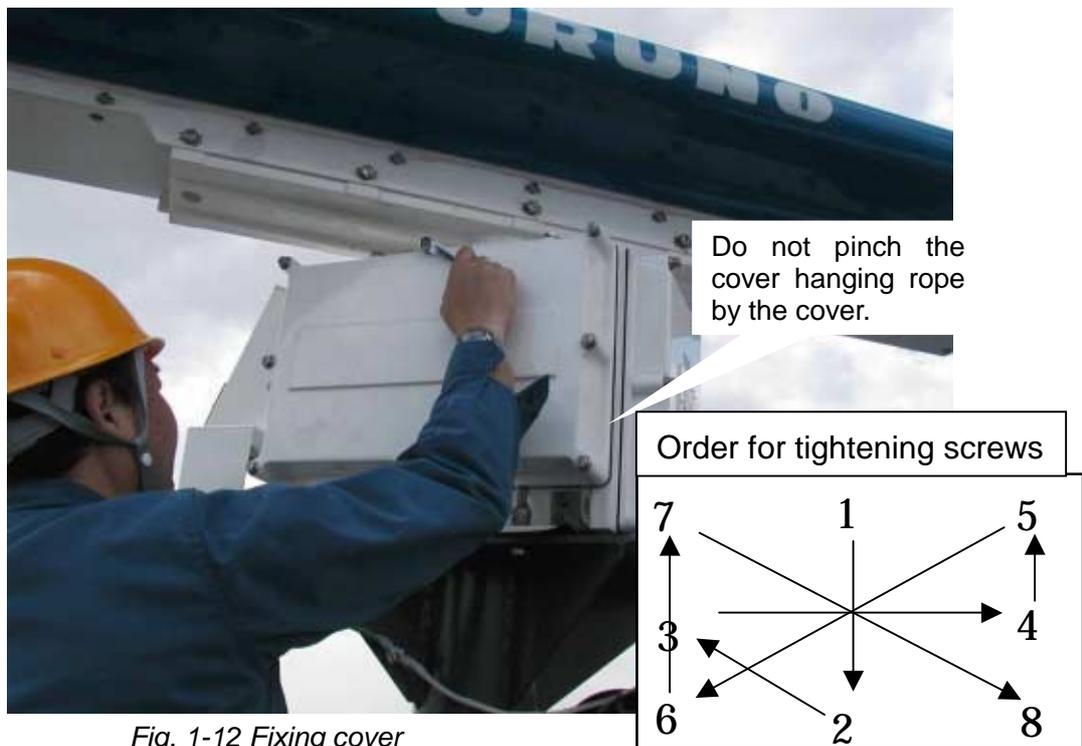


Fig. 1-10 Cable gland

1.1.6 S-band scanner unit



After the connection, tighten screws by following arrows in the figure below.



1.1.7 S-band scanner unit

The performance monitor is fixed as below.



Performance monitor faces to port-side.

Fig. 1-13 S-band scanner unit with performance monitor fitted.

1.2 How to work on X-band waveguide

Necessary tools

If necessary, order these tools to FURUNO. See xx for FURUNO code number.



Fig. 1-14 Tools needed

No	Item	Type	No	Item	Type
1	FR-90 power tool	03S9199	8	File	L-150
2	Brush		9	Heavy duty snips	No.150
3	Gauge (Square)	03-009-0534-0	10	Edge gauge	03-009-0530-0
4	Wrench	For M4	11	Tapes	Vinyl and waterproofing tapes
5	Knife	DK-N	12	Silicone rubber	1211
6	Hack saw	HFJ-12	13	Wooden hammer	
7	Saw	250x24	14	Tool box	#2207

* See chapter 7 for detail.

Flexible waveguide flange - Antenna side

The connector of the antenna side has been factory-fitted.

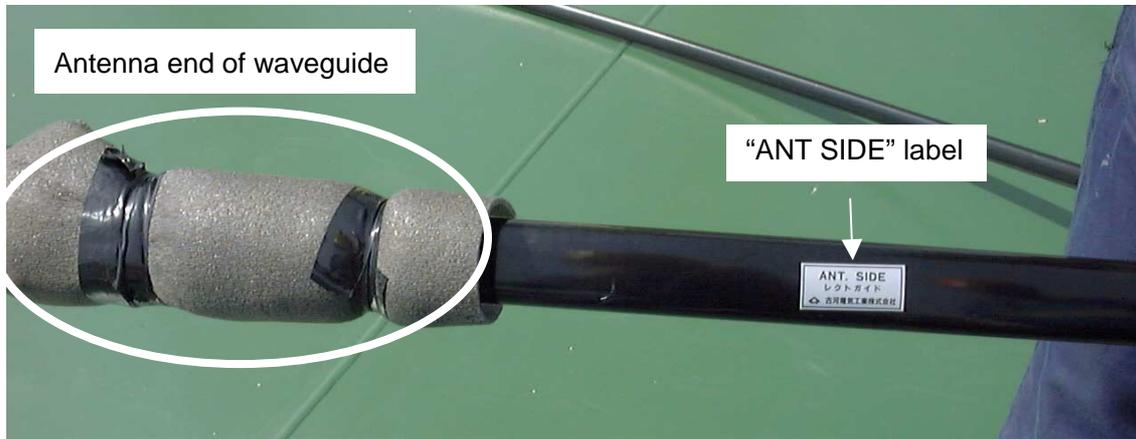


Fig. 1-15 Flexible waveguide, antenna side

Flexible waveguide flange - Transceiver side

Cut the waveguide to length at this end.

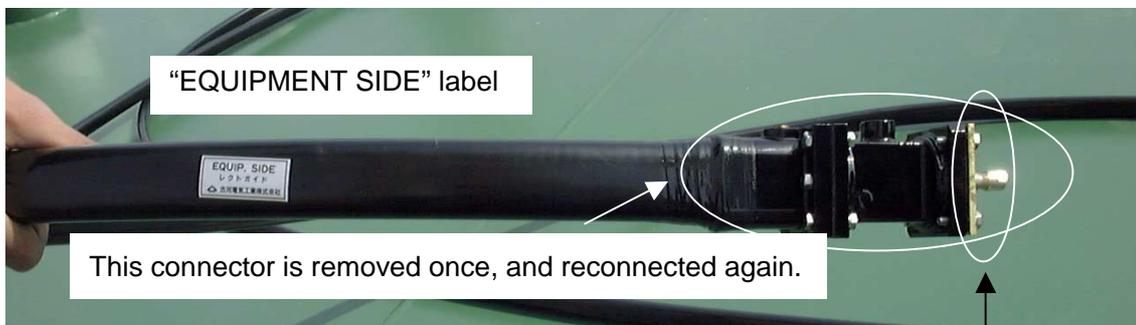


Fig. 1-16 Flexible waveguide, transceiver side

The Connector of the transceiver side has been fitted for a airtightness test.

Plug for airtightness test.
This connector is not used.

Lying X-band and S-band waveguide

Following bending radius must be taking into account to prevent the waveguide from being damaged.

Minimum bending radius

X-band E plane bend: 200 mm
H plane bend: 400 mm

S-band: 150 mm

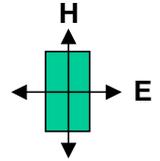


Fig. 1-17 Lying waveguide

Cutting waveguide

Cut the waveguide at the height of the TR unit.



Fig. 1-18 Cutting waveguide

Waveguide Termination

Connect the connector referring to the chapter 7.

Cut off the jacket (sheath) 40 mm.

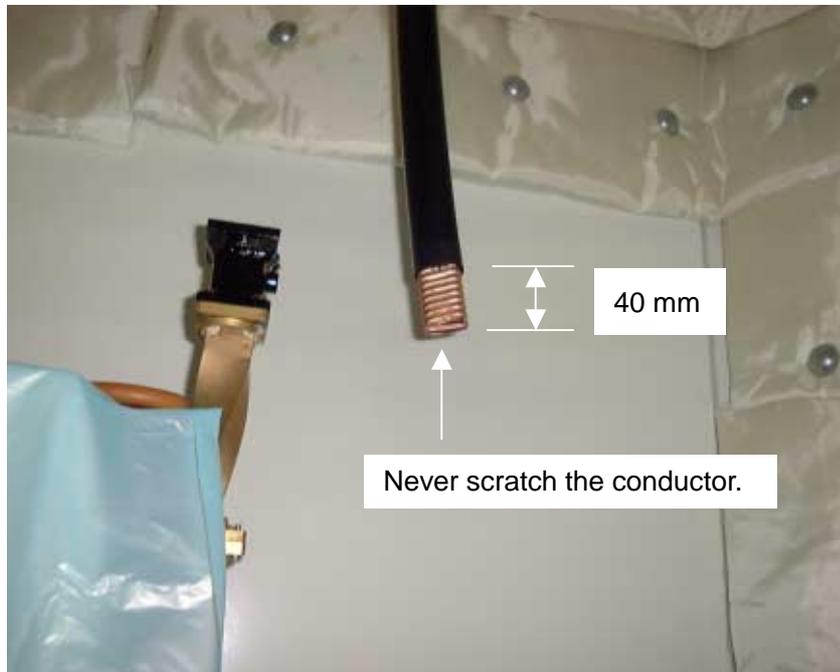


Fig. 1-19 Waveguide termination

When fix the connector, use standard tool.



Fig. 1-20 Widening waveguide opening

Good and bad examples of waveguide flange fitting

Good example) Appropriate tool is used.

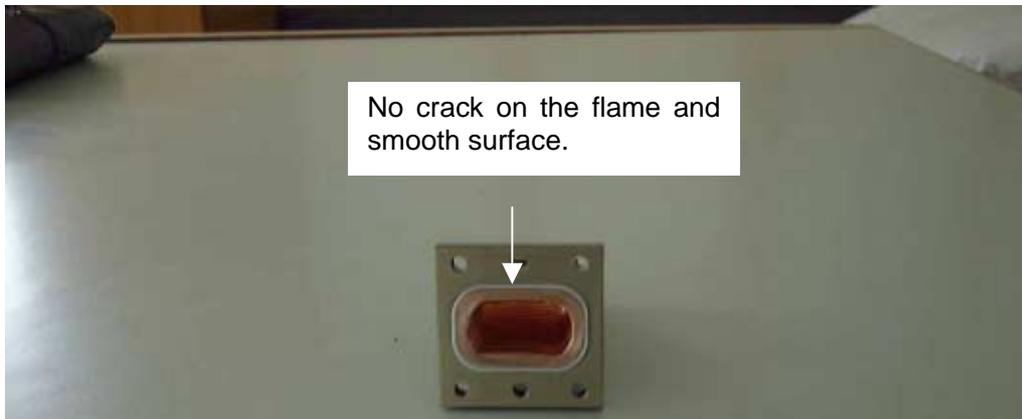


Fig. 1-21 Good example

Bad example) Appropriate tool is not used.



Fig. 1-22 Bad example

Radar performance degrades if the flange is fitted inadequately.

After fitting the connector, apply the silicone rubber from filling opening, then tape the waterproofing tape. Then, tape vinyl tape over the waterproofing tape.

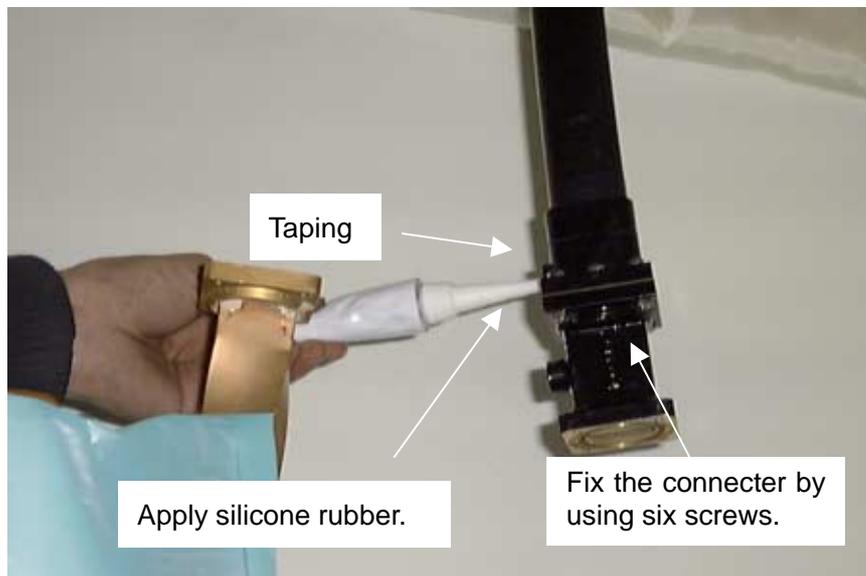


Fig. 1-23 Fitting guide connector

Connect the waveguide to the TR unit.
If necessary, use E-bend, H-bend and/or twist bend.



Fig. 1-24 Connecting waveguide to transceiver

1.3 Display unit

1.3.1 FAR-2805 Radar

The example below shows two radar display units side by side.



Fig. 1-25 Display units

Enlarged picture of the white circle in Fig1-25.

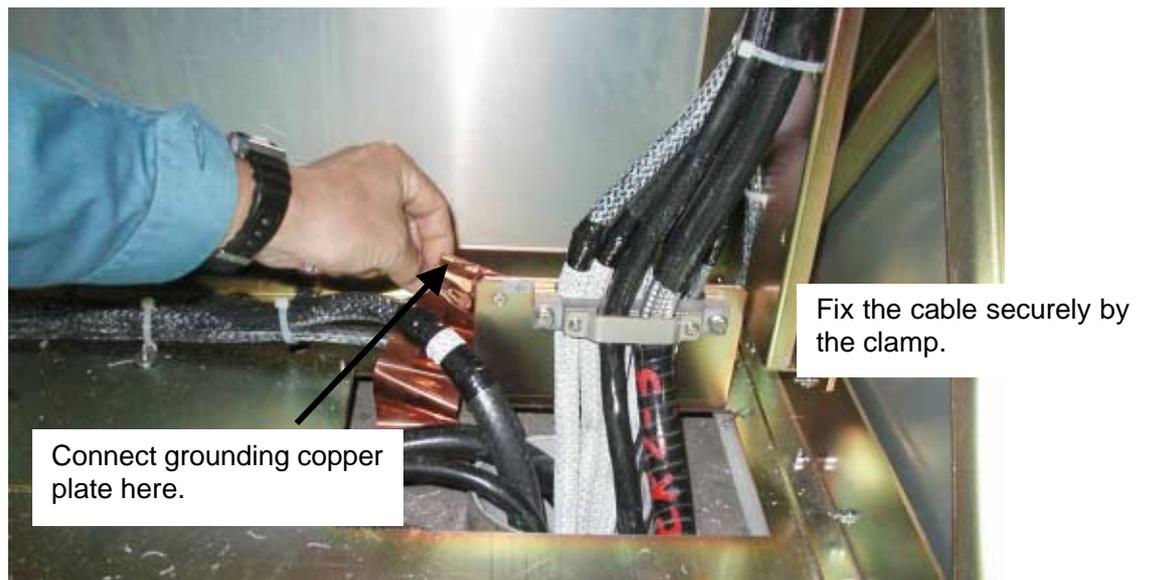


Fig. 1-26 Grounding chassis

Fix cables to the cable guide with cable ties.

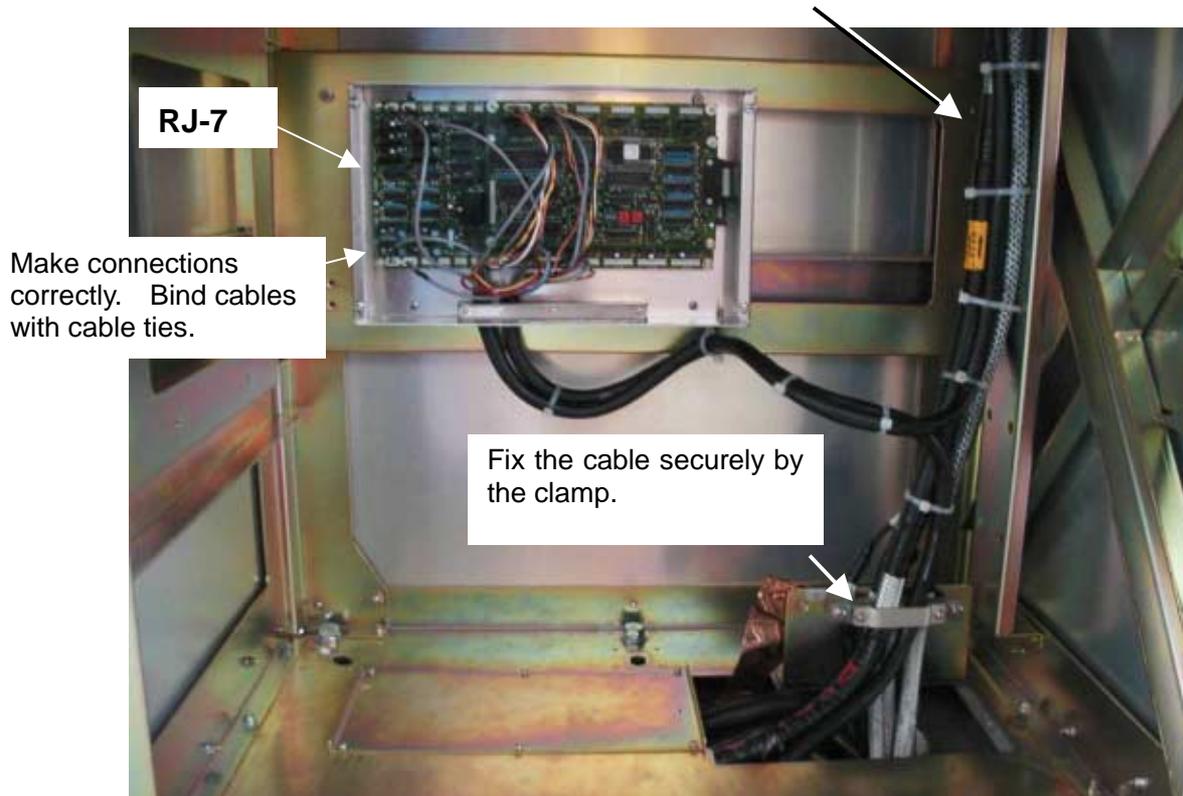


Fig. 1-27 Fixing cables

Note: RJ-7 (antenna exchanger) and power control unit (PSU-004) must be fixed in the shipyard.

The example below shows the power control unit fitted in the console.

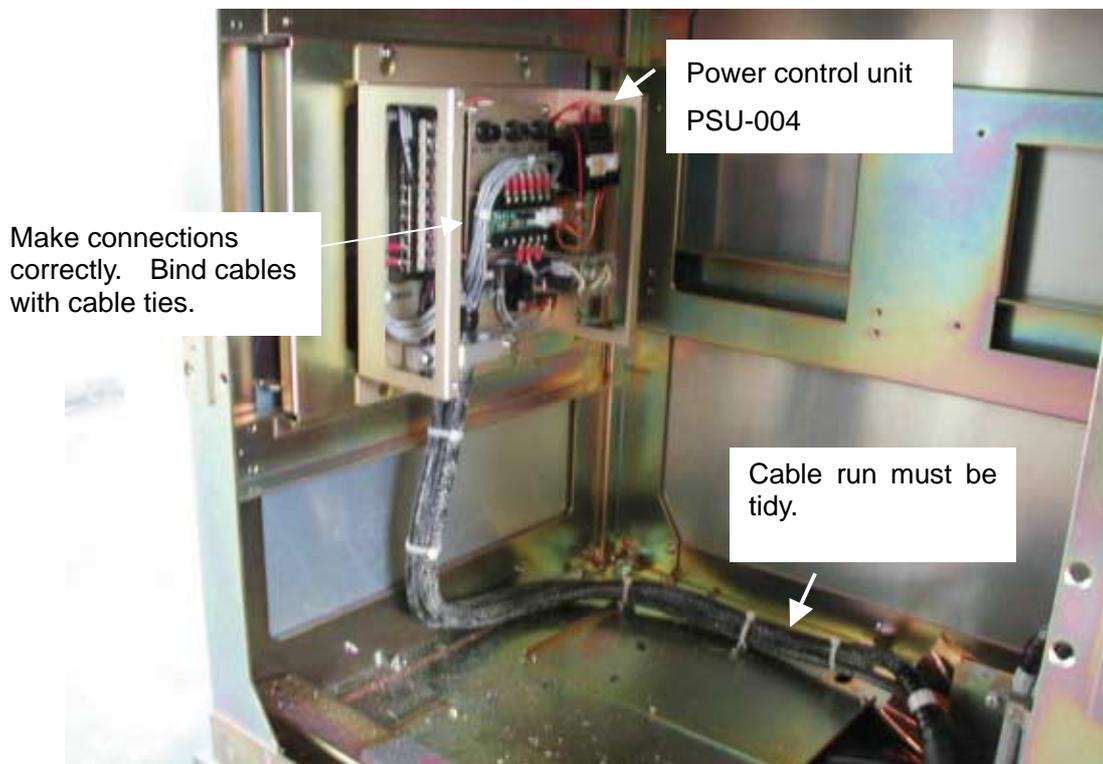


Fig. 1-28 Power control unit

Fix cables coming in the display unit by the clamp.

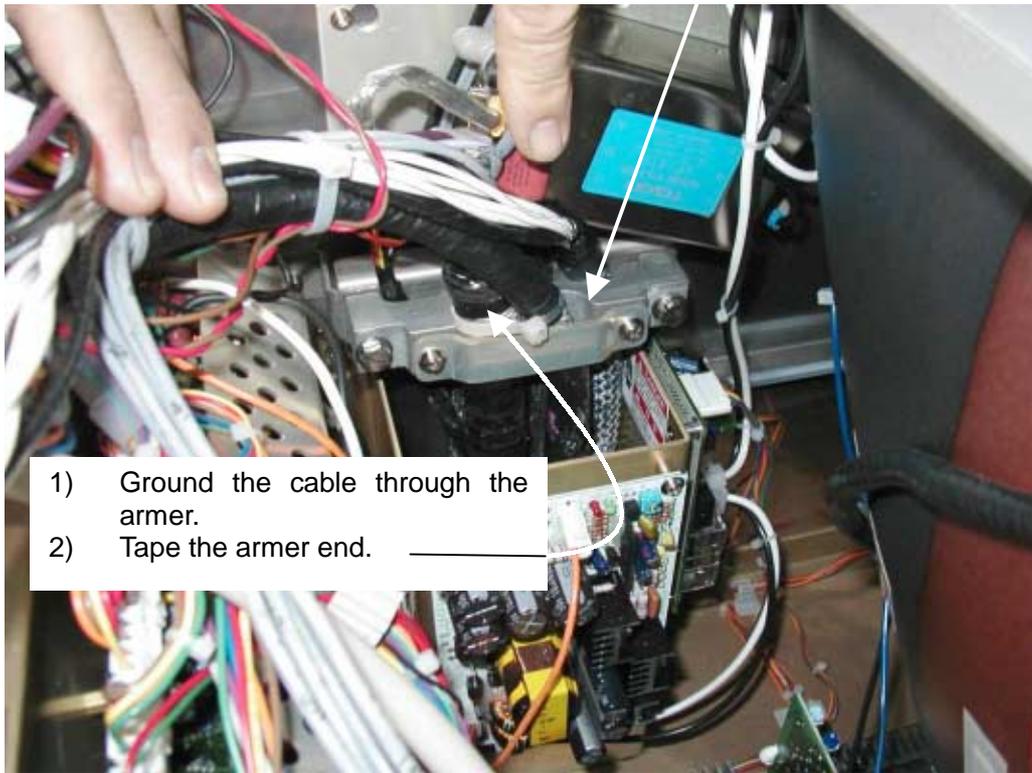


Fig. 1-29 Grounding cables

Use protective caps supplied after the connection.

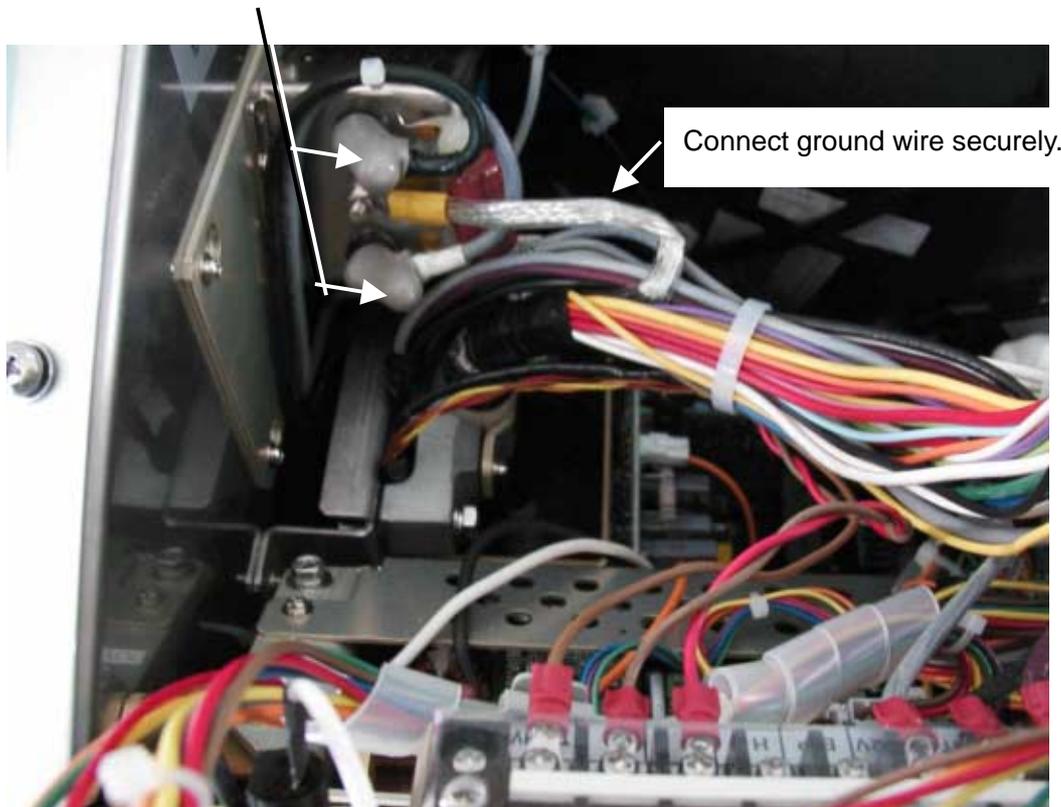


Fig. 1-30 Using protective caps

2.1 Inmarsat B

2.1.1 Antenna unit

- ◇ Installation site: Select the location where it will have a good view of the sky in all directions.
- ◇ Refer to the installation manual for the drawing of the mounting base.
- ◇ Never put the rubber mat between the mounting base and the antenna base.
- ◇ Do not cover the drain hole.

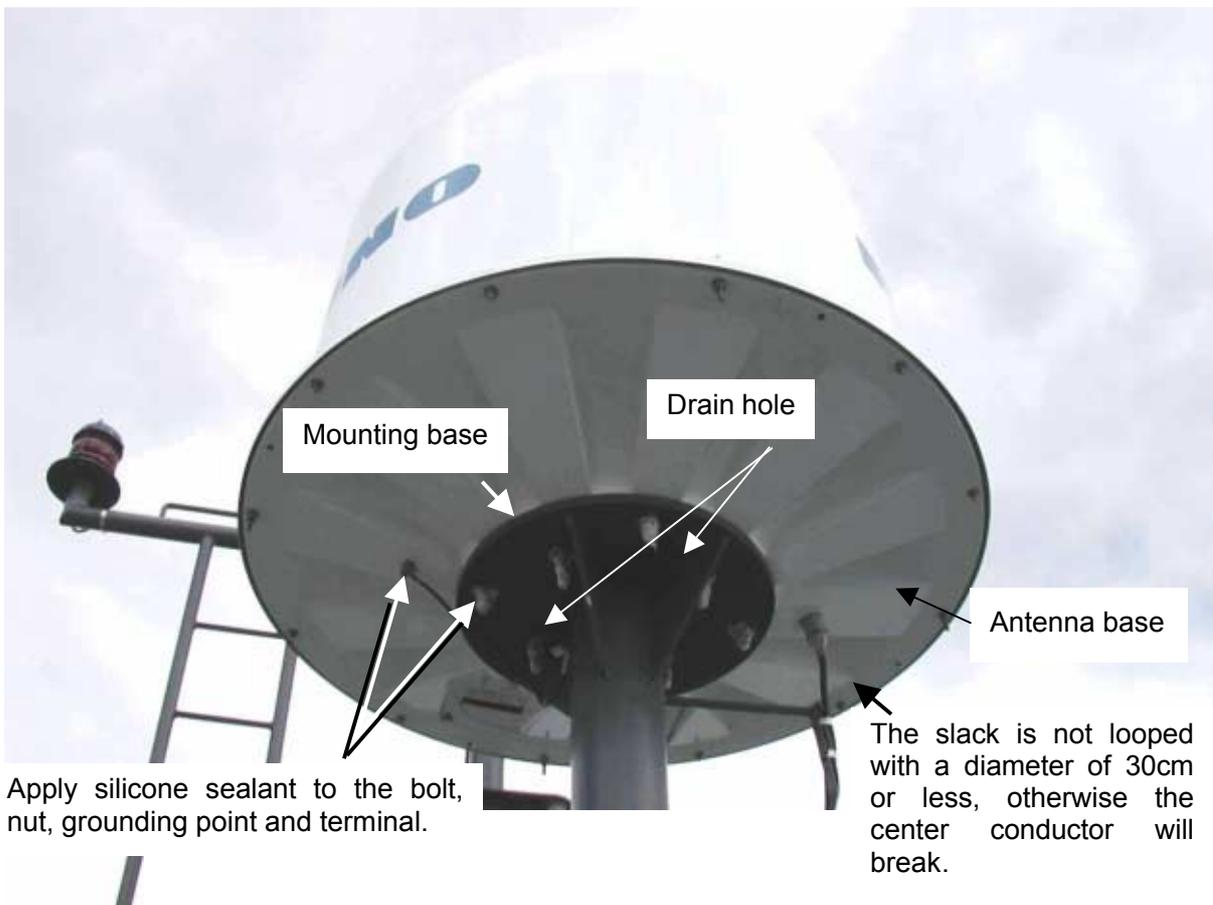


Fig. 2-1 Inmarsat B antenna unit

2.1.2 Connecting coaxial cable in radome (FELCOM 82)

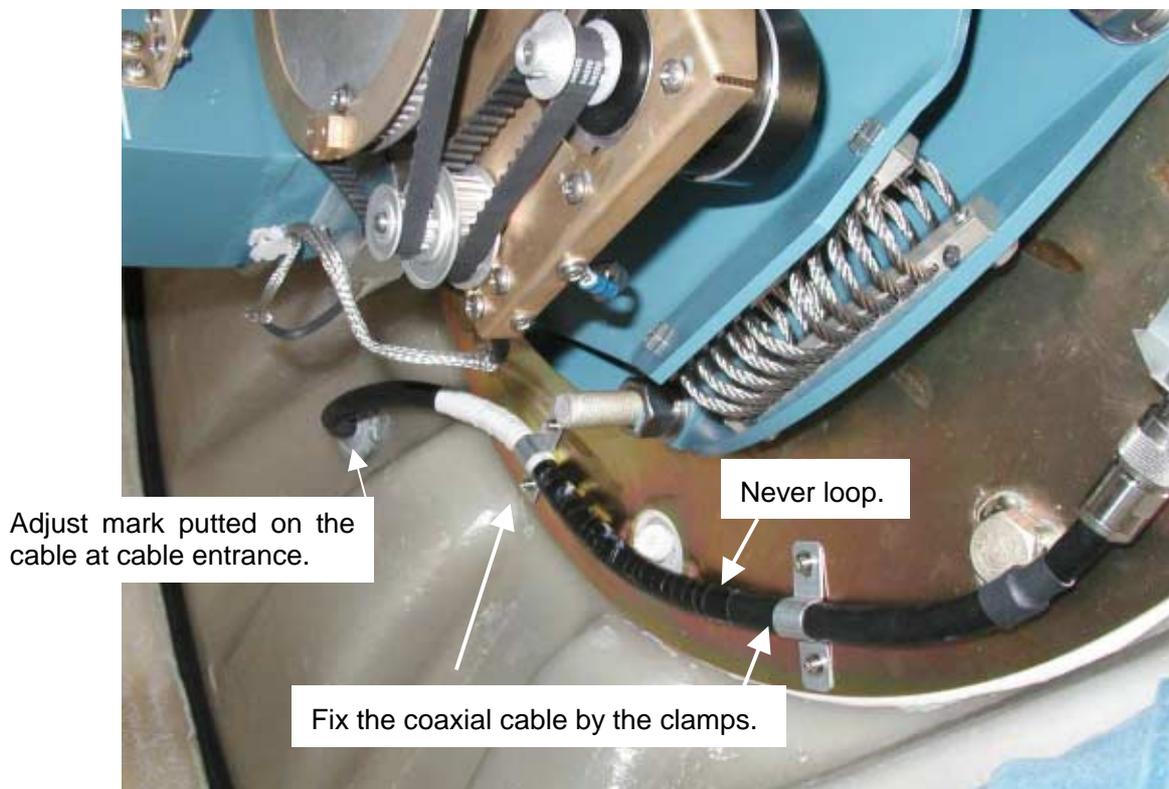


Fig. 2-2 Connecting cable in radome

2.1.3 Installation of transceiver unit and junction box

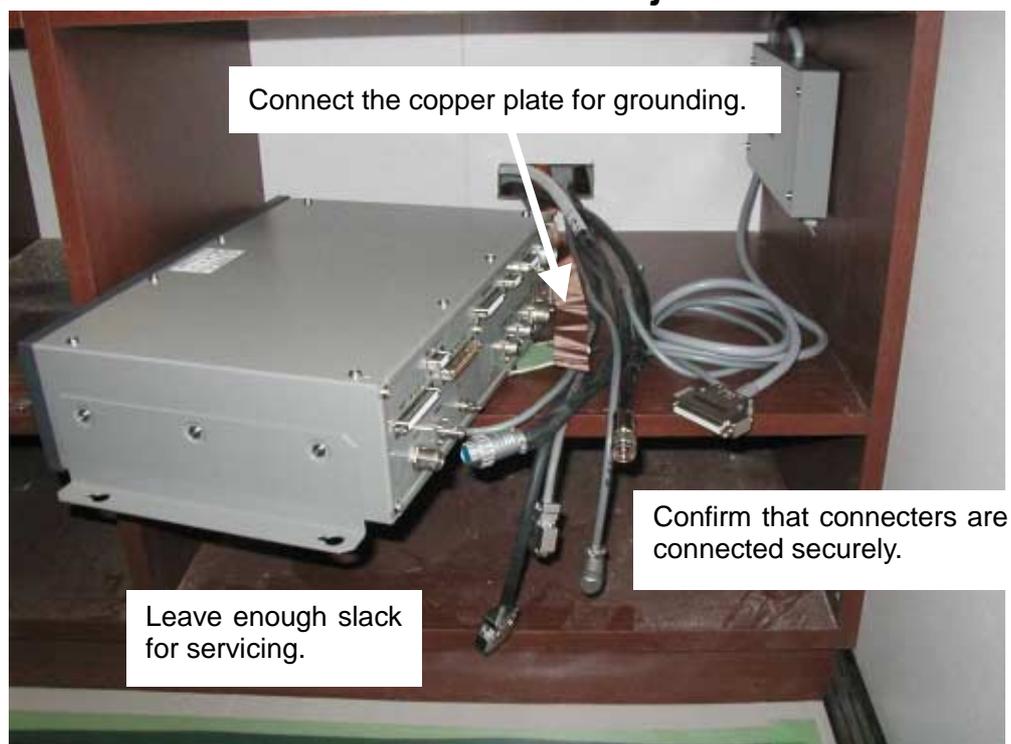


Fig. 2-3 Cable slack for servicing

2.1.4 FELCOM 82 handset

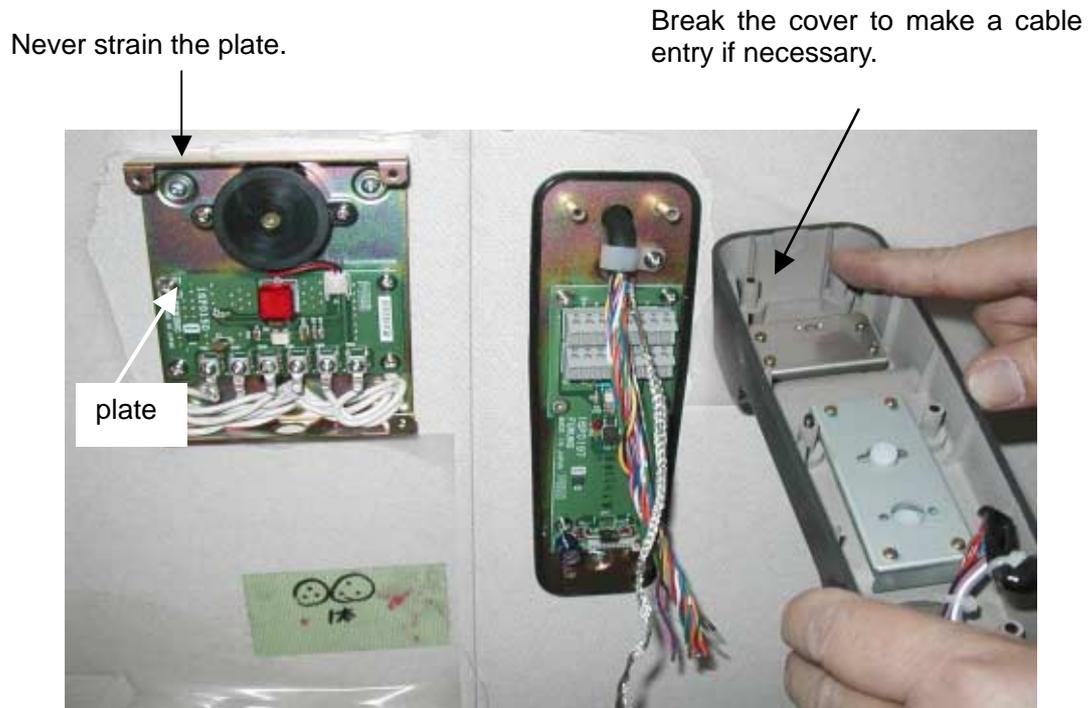
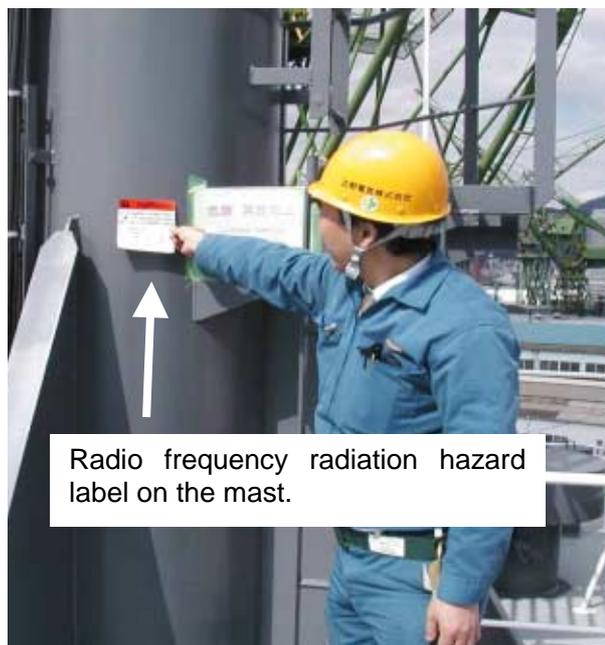


Fig. 2-4 FELCOM 82 Handset

2.1.5 Inmarsat B radio frequency radiation hazard label

The supplied label must be adhered to the mast at the visible place so that one can notice RF radiation hazard. Put label keeping distance (6m) from antenna.



The label on the radome tells safety distance.

Fig. 2-5 Radio frequency radiation hazard label

2.2 Inmarsat C

2.2.1 Antenna unit

- ◇ Installation site: Select the location where it will have a good view of the sky in all directions.
- ◇ Weld the antenna mounting pipe directly to the antenna pole. Mounting it with clamps is not recommended. (Fig. 2-6)
- ◇ Apply silicone sealant to the bolt, nut, grounding point and terminal.
- ◇ The diameter of the service (drip) loop must be 30 cm or more.

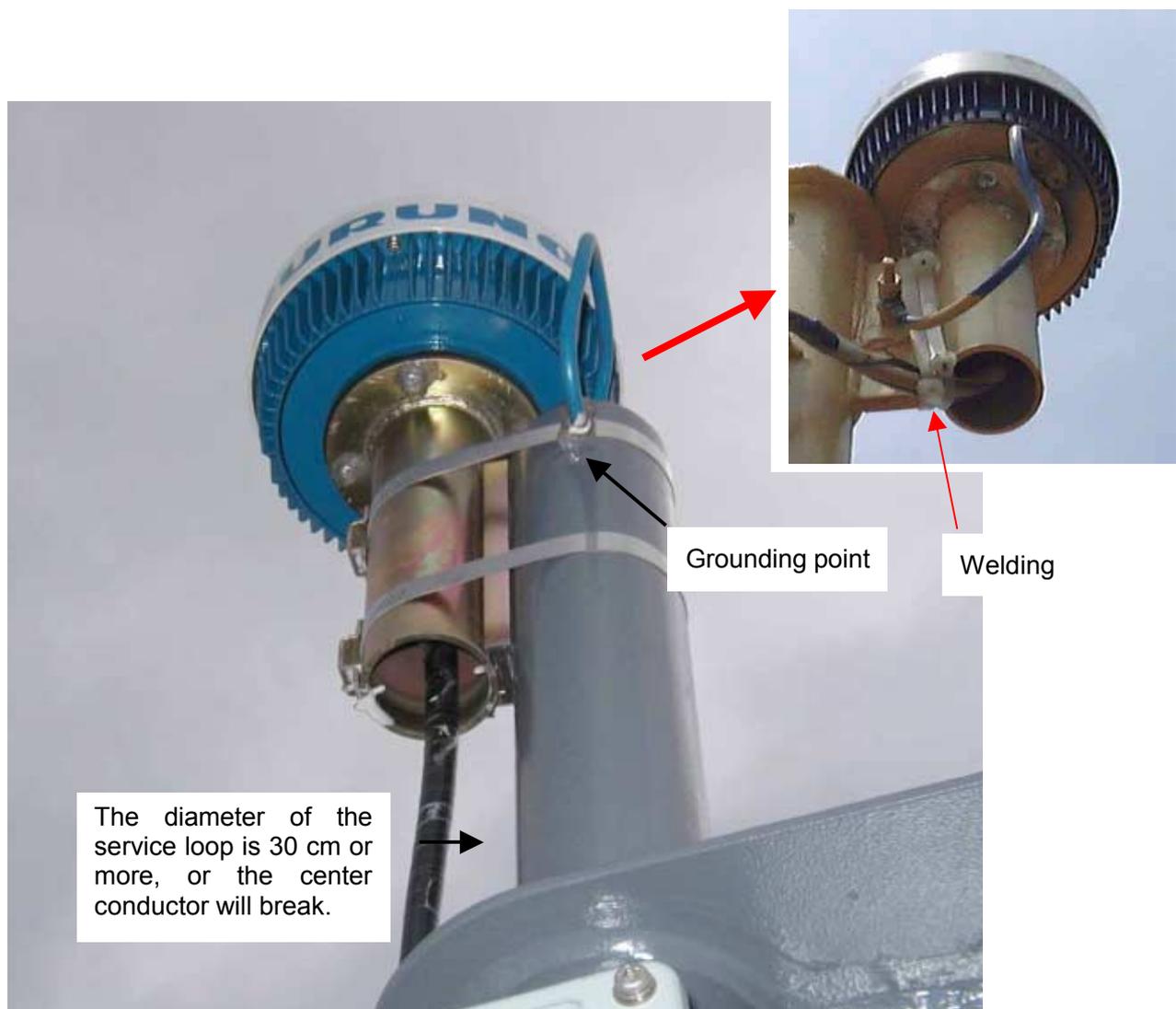


Fig. 2-6 Inmarsat C antenna unit

Chapter 3. Communications

3.1 MF/HF antenna

3.1.1 General

In the shipyard, put red clothes to the antenna wire for calling the crane operator's attention.



Fig. 3-1 Measure of safety

3.1.2 Feeder of 10 m antenna

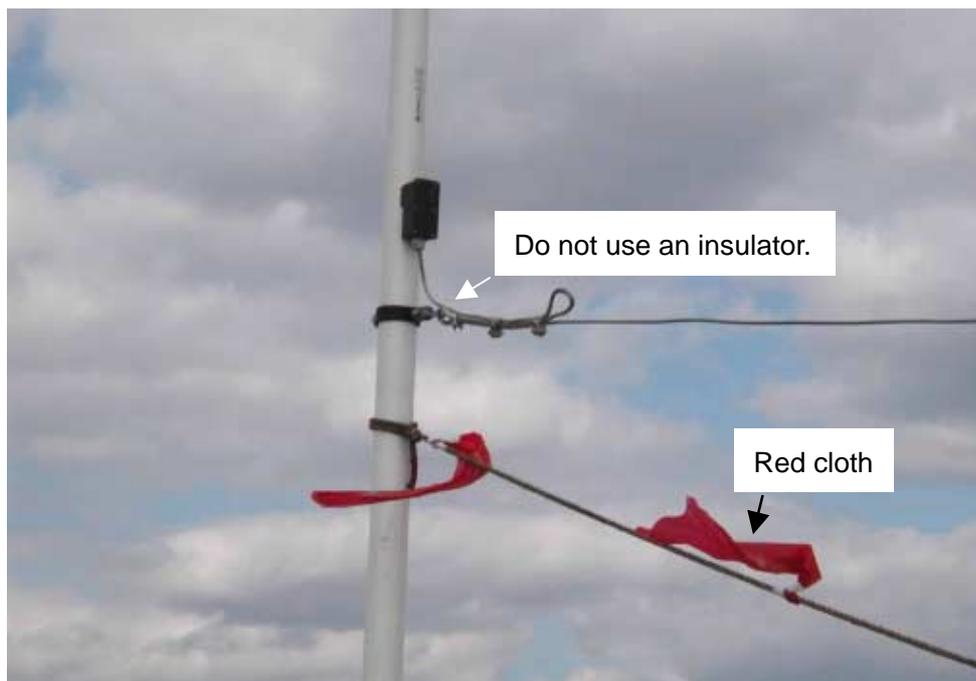


Fig. 3-2 10 m antenna

3.1.3 Antenna feeder

Use a support wire to reinforce the feeder.

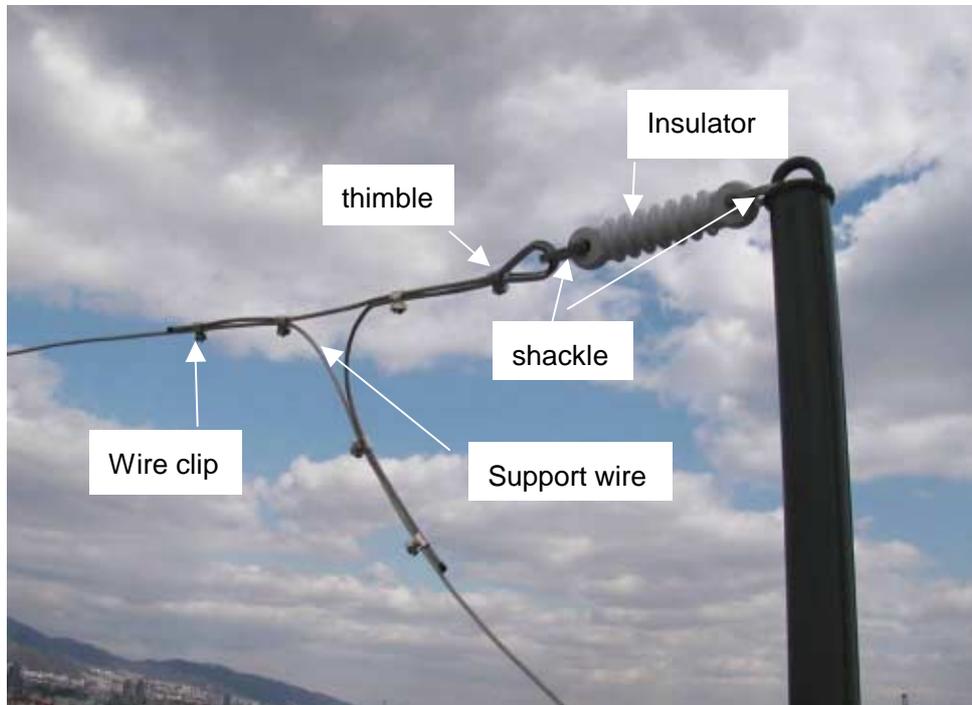


Fig. 3-3 Antenna feeder

Fix the feeder with an insulator.

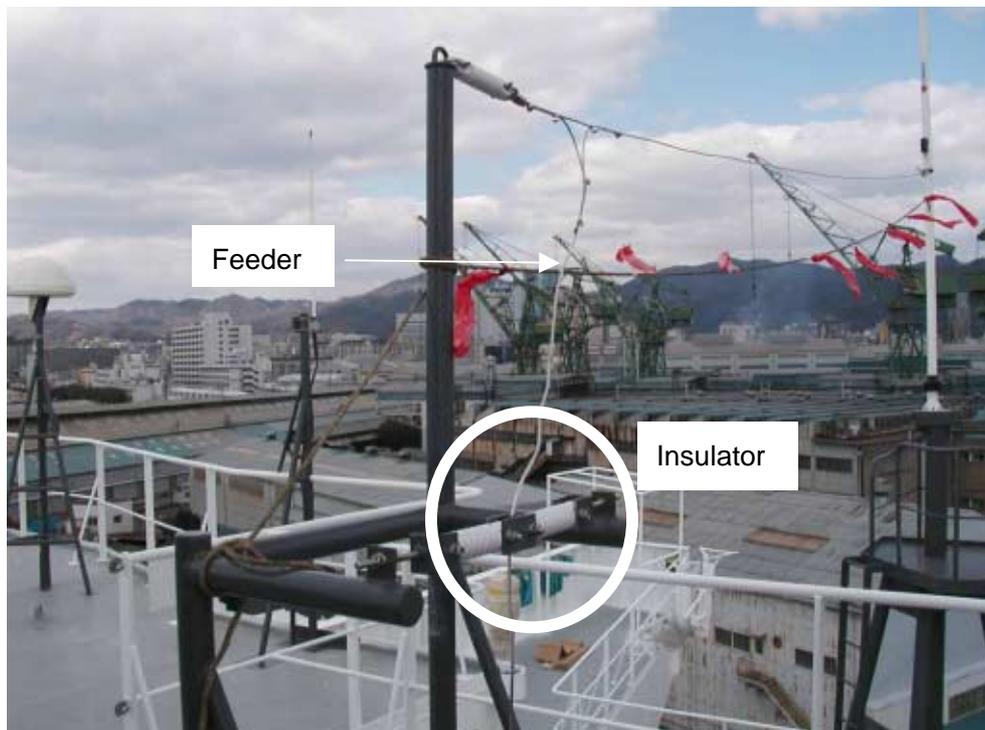


Fig. 3-4 Fixing feeder

Use lead-in insulator to lead the feeder into the radio room.



Fig. 3-5 Antenna lead-in insulator

Tighten the antenna wire firmly.

For example, by using the extra antenna wire, thicken the insert diameter.



Fig. 3-6 Fixing antenna wire

3.1.4 For safety

Arrange the safety fence to separate the antenna feeder from humankind and put the danger sign at the entry.

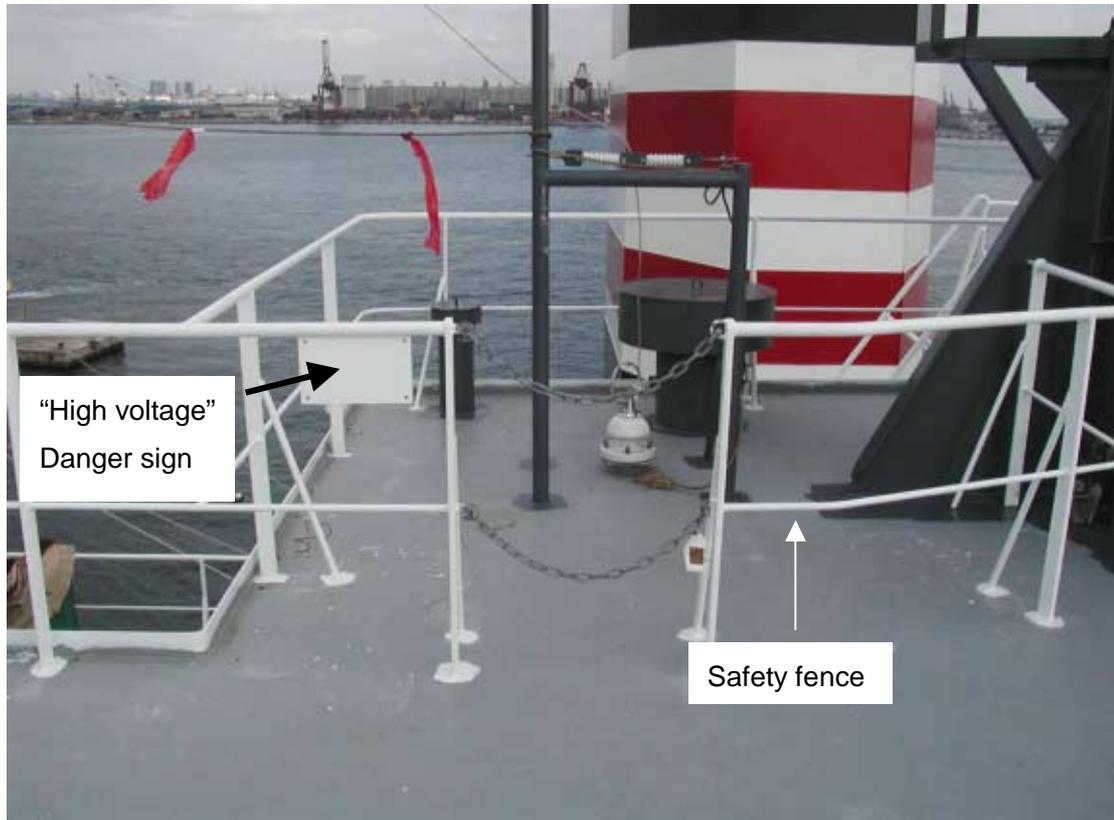


Fig. 3-7 Arrange safety fence

Note: When install safety fence, keep enough distance from antenna feeder so as to prevent touching antenna feeder.

3.1.5 Indoor feed line

Connect the lead-in insulator to the antenna changeover by a copper pipe. The pipe is fixed using stand insulators.

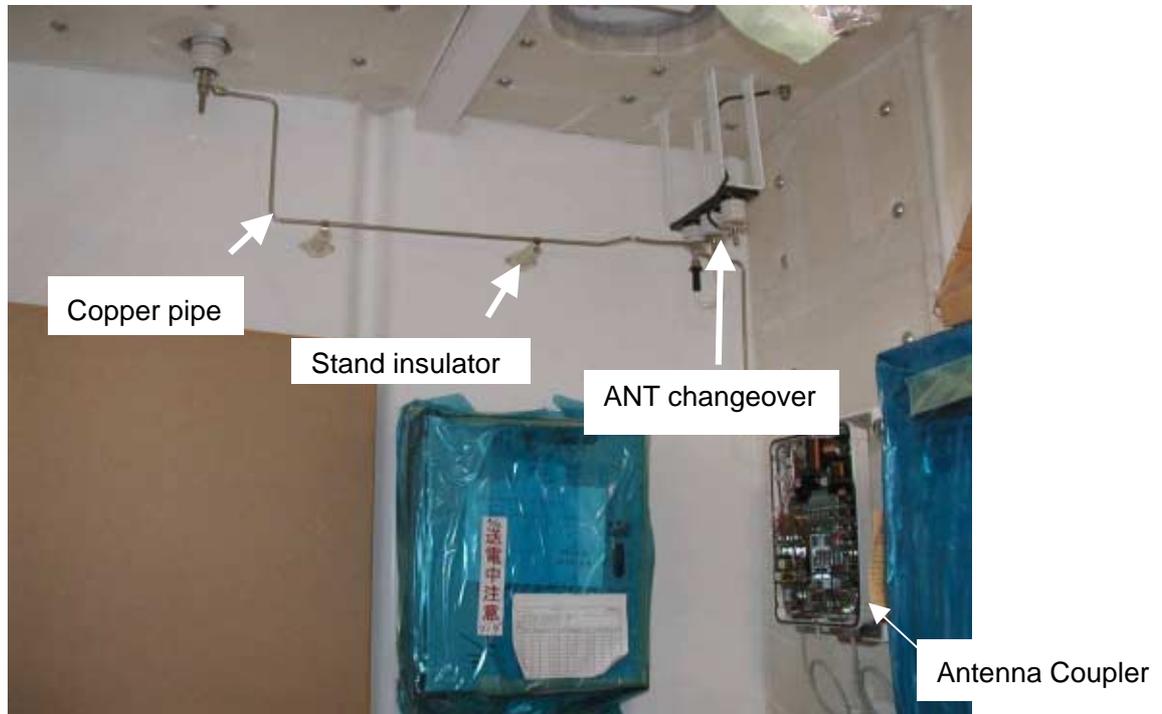


Fig. 3-8 Indoor feed line

The antenna changeover is installed for lightning protection.

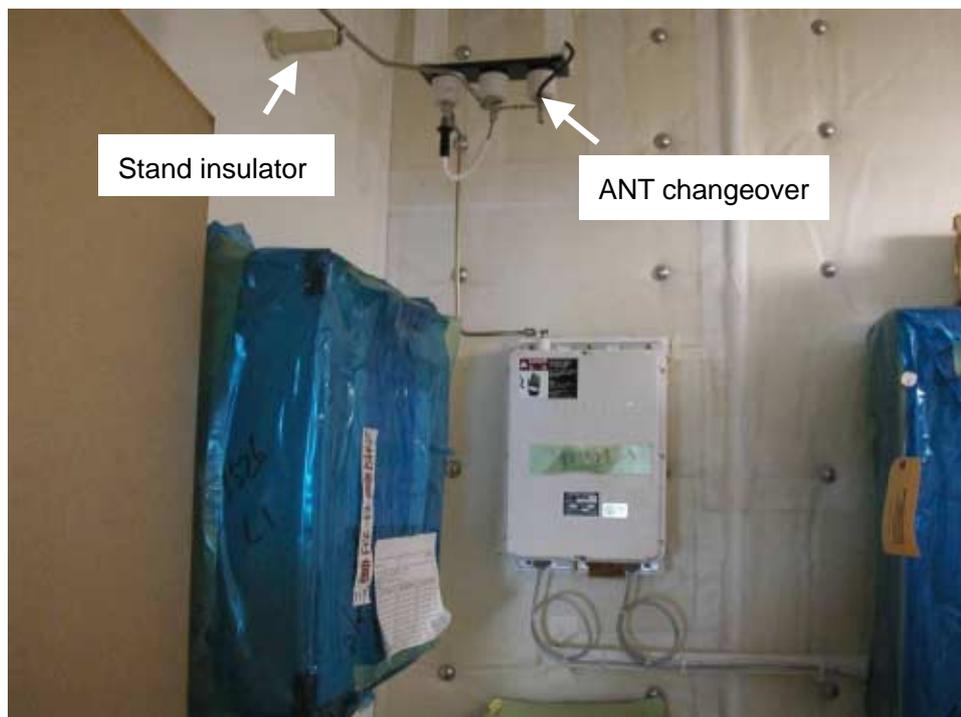


Fig. 3-9 Antenna changeover

3.1.6 Grounding of antenna coupler

Ground the antenna coupler by the copper plate securely.



Fig. 3-10 Grounding antenna coupler

Use wing nuts to connect the copper plate to the antenna coupler.
Hold the braid of the coaxial cable for clamping.

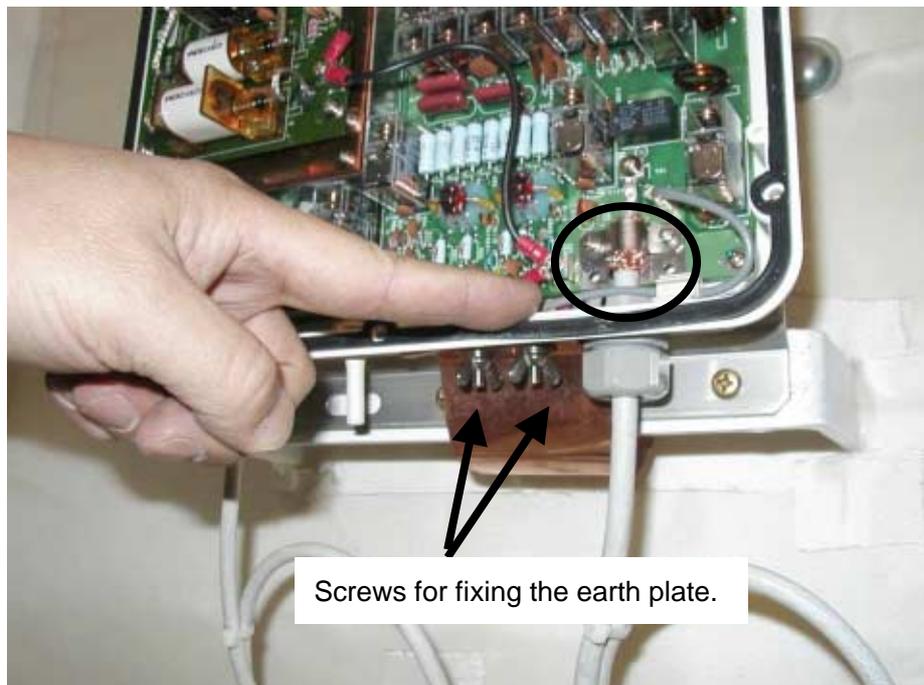


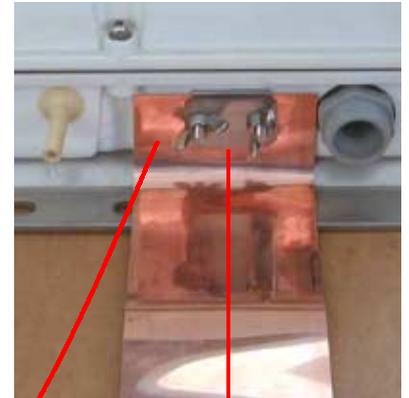
Fig. 3-11 Connecting copper plate to antenna coupler

3.1.7 MF/HF Antenna installation, when antenna coupler is installed in the open.



Stretch the wire so that the wire may not swing.

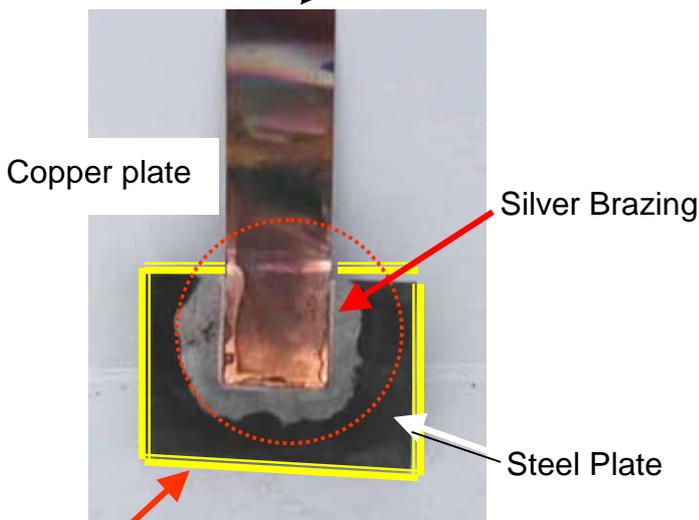
Ground the antenna coupler by the copper plate.



Tighten the antenna wire firmly.



Coat bolts and plate with anticorrosive sealant or pate.



Weld ground plate to ship's hull.

3.2 VHF antenna

Antenna connector must be waterproofed by the waterproofing and vinyl tapes.



Fig. 3-12 Waterproofing of antenna connector

The service (drip) loop of the antenna cable is not smaller than 30 cm in diameter. If not, the center conductor of the cable will break.

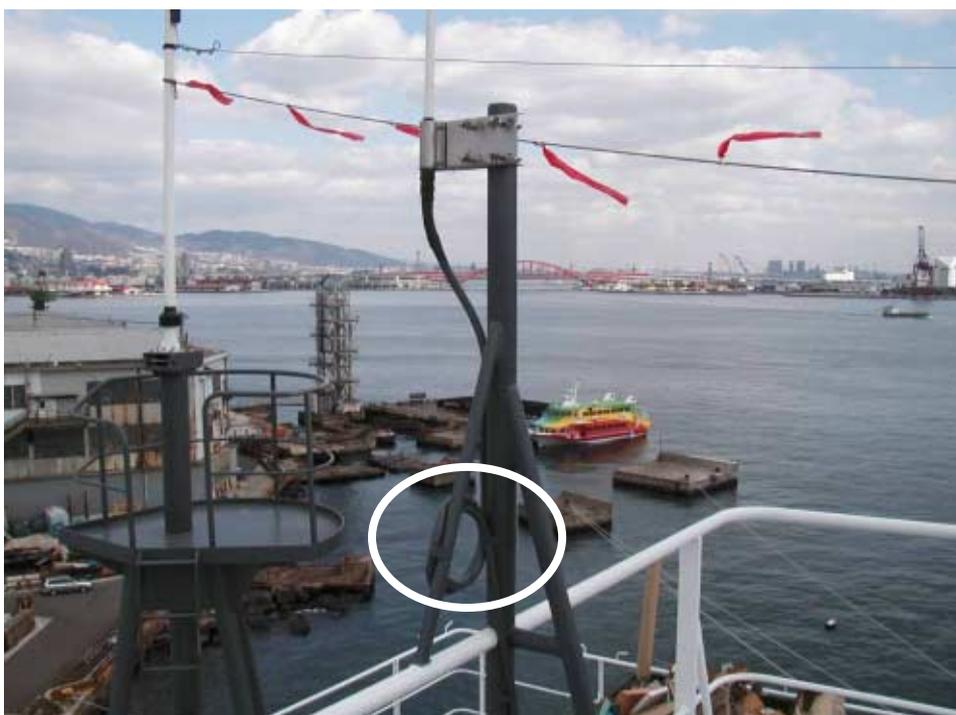


Fig. 3-13 Antenna cable

3.3 NAVTEX/FAX antenna coupler

- ◇ Fix the coupler onto the antenna pole by using hose clamps supplied.
- ◇ Grounding wire must be 8 sq or above.

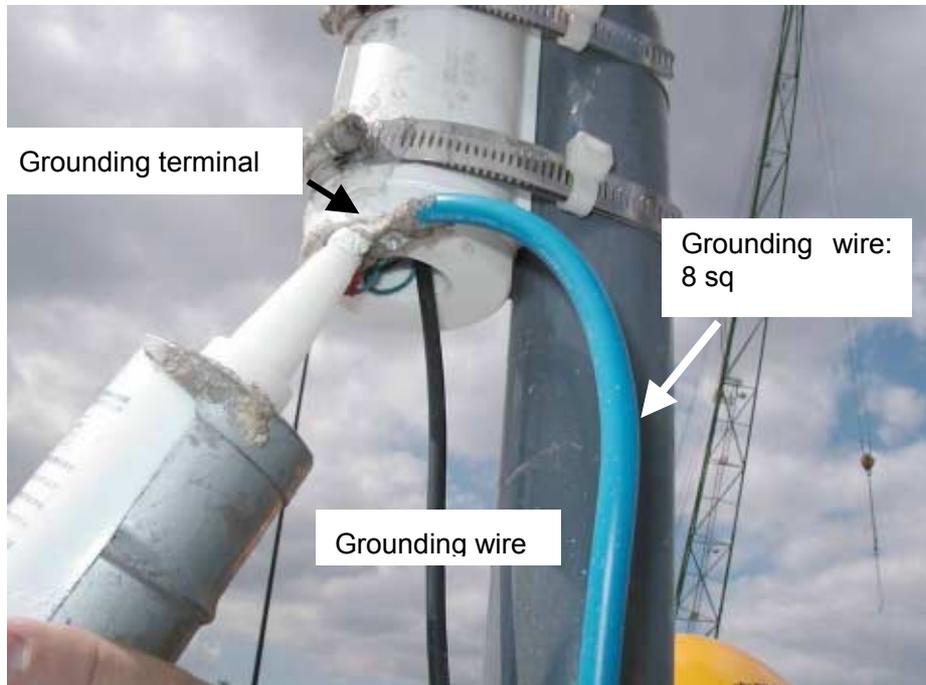


Fig. 3-14 Grounding antenna coupler

Fix internal grounding wire and external grounding wire together at the grounding terminal. Apply anticorrosive silicone sealant to grounding points and terminals.

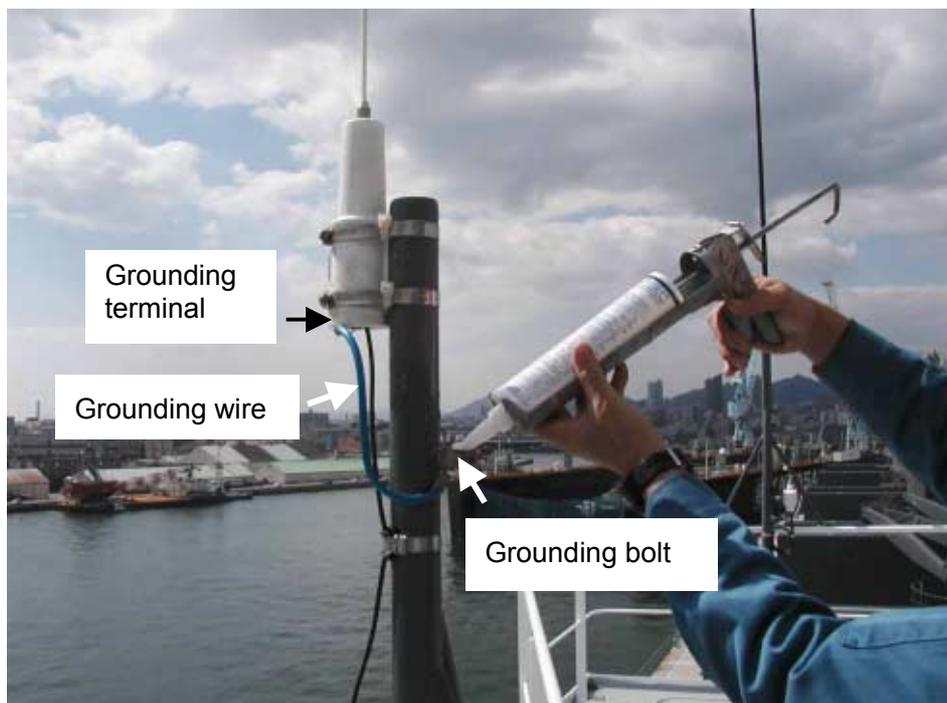


Fig. 3-15 Protecting grounding terminal

Apply anticorrosive silicone sealant around the base of the whip antenna.



Fig. 3-16 Waterproofing of whip antenna base

3.4 Antenna junction box

- ◇ All connection must be tight.
- ◇ Apply anticorrosive silicone sealant to bolts, nuts, grounding points and terminals.

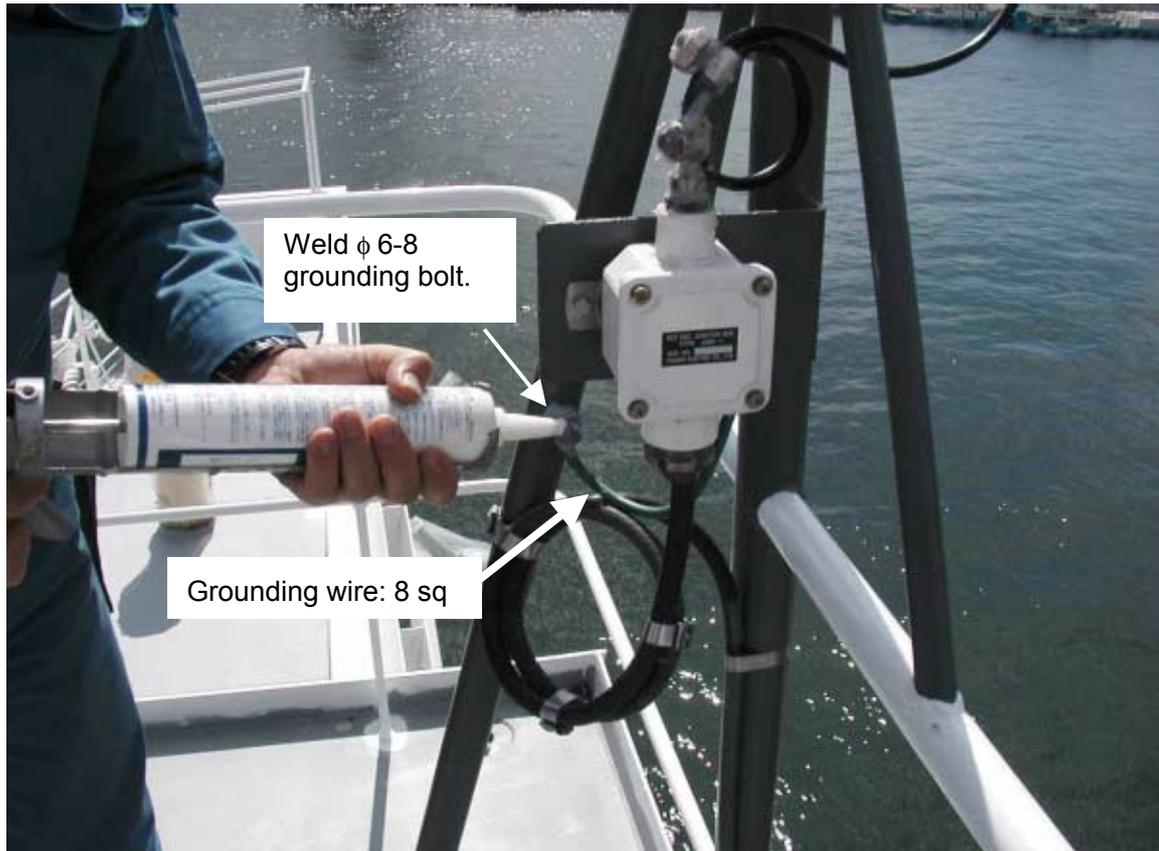


Fig. 3-17 Grounding antenna junction box

3.5 Radio console

3.5.1 RC-1800F

Put a protective cardboard on the table not to scratch it. Cover the console with a vinyl sheet to keep dust away when not working.



Fig. 3-18 Radio console



Fig. 3-19 Radio console with protective cardboard

3.5.2 RC-1800F grounding and leading-in cables

The cable coaming locates at appropriate position so that no stress is on any cable.

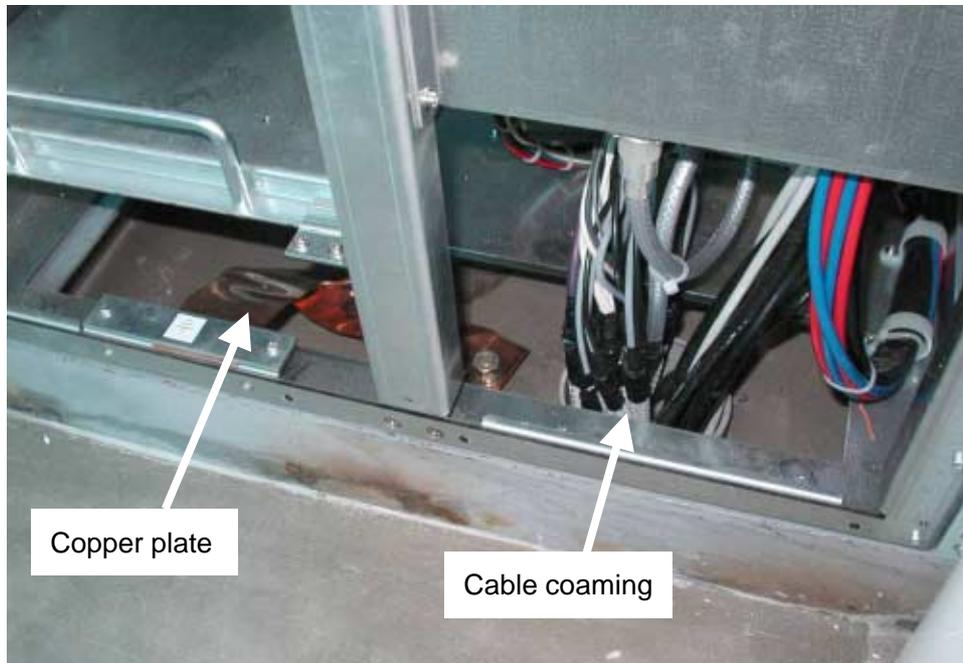


Fig. 3-20 Cable entry

Connect the grounding copper plate as below.

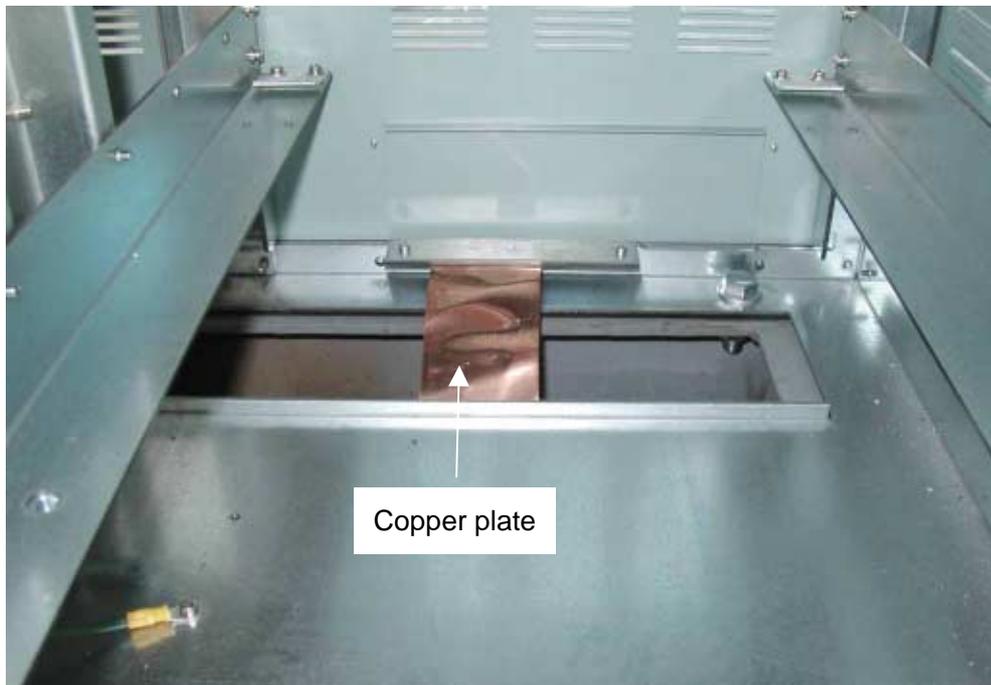


Fig. 3-21 Grounding console chassis

3.5.3 RC-1800F routing cables

Connection must be tight. Bind cables for a better appearance.



Fig. 3-22 RC-1800F with front panel removed

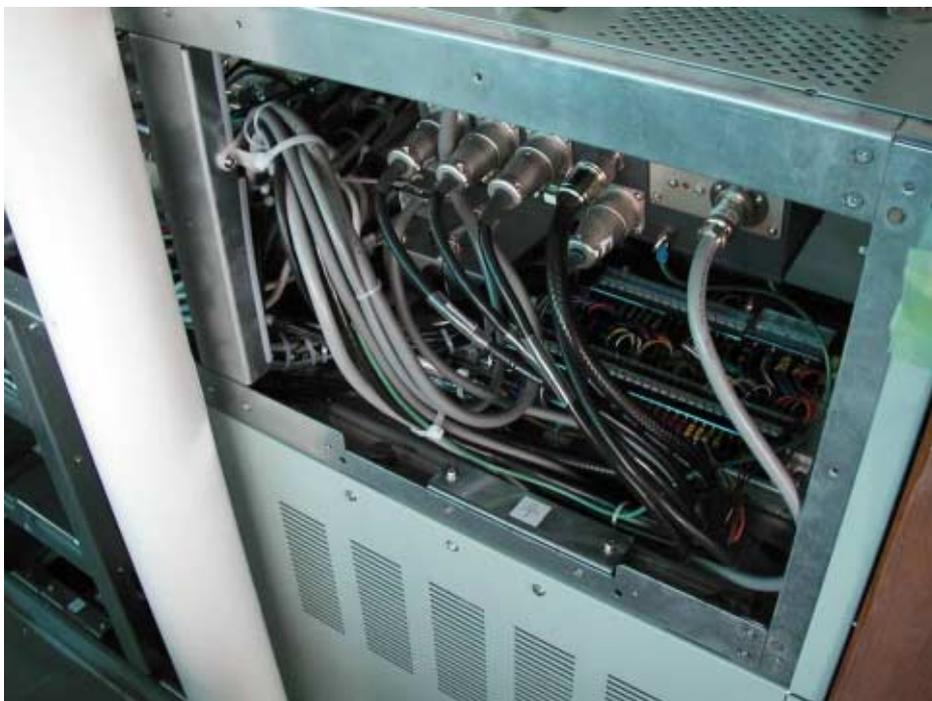


Fig. 3-23 RC-1800F with rear panel removed

The length of coaxial cable between MH/HF antenna coupler and PA must be as short as possible. A slack for servicing is needed.

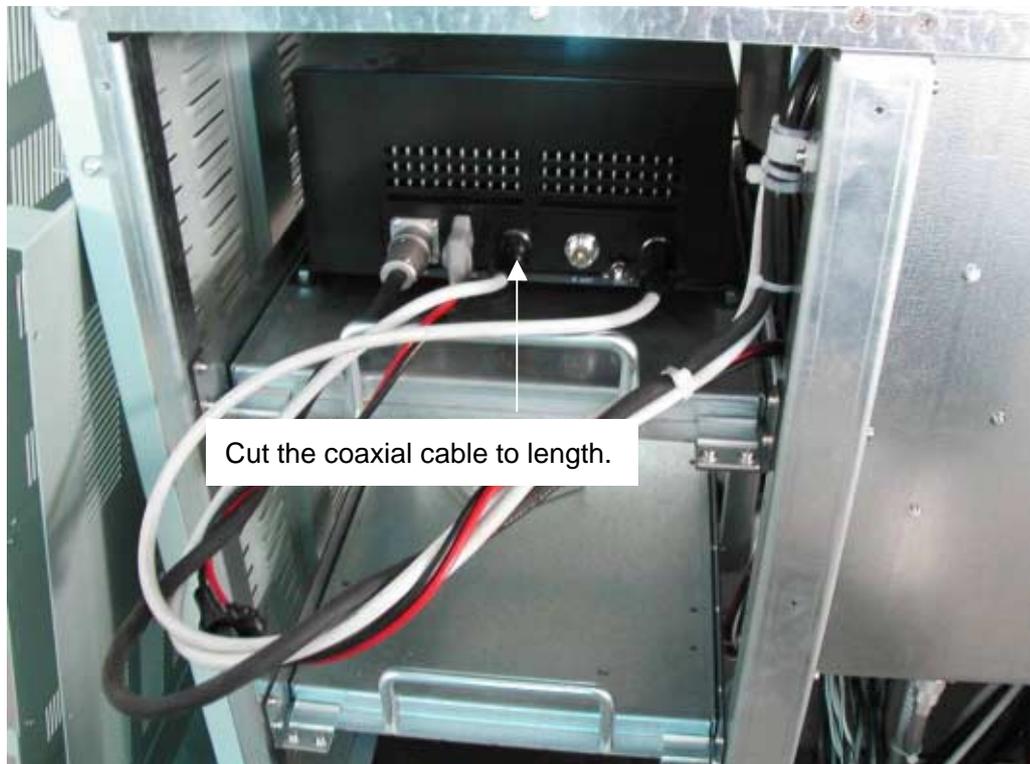


Fig. 3-24 cable length for servicing

Be sure to follow carefully the instruction on the later page to fit Inmarsat C antenna connector.

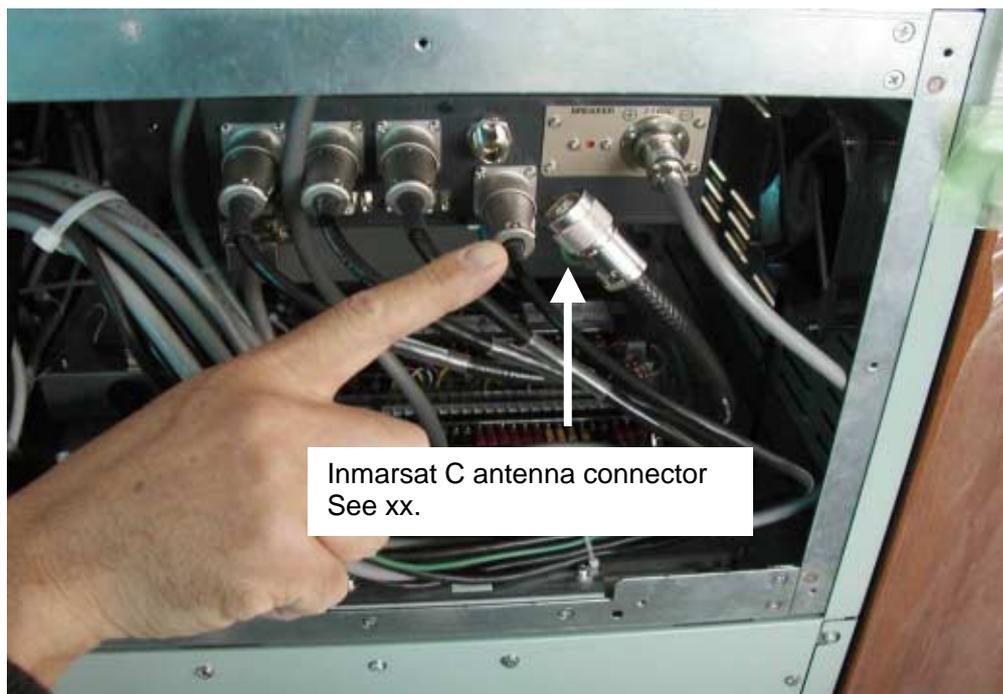


Fig. 3-25 Inmarsat C antenna connector

3.6 VHF radio

3.6.1 Wiring in VHF console

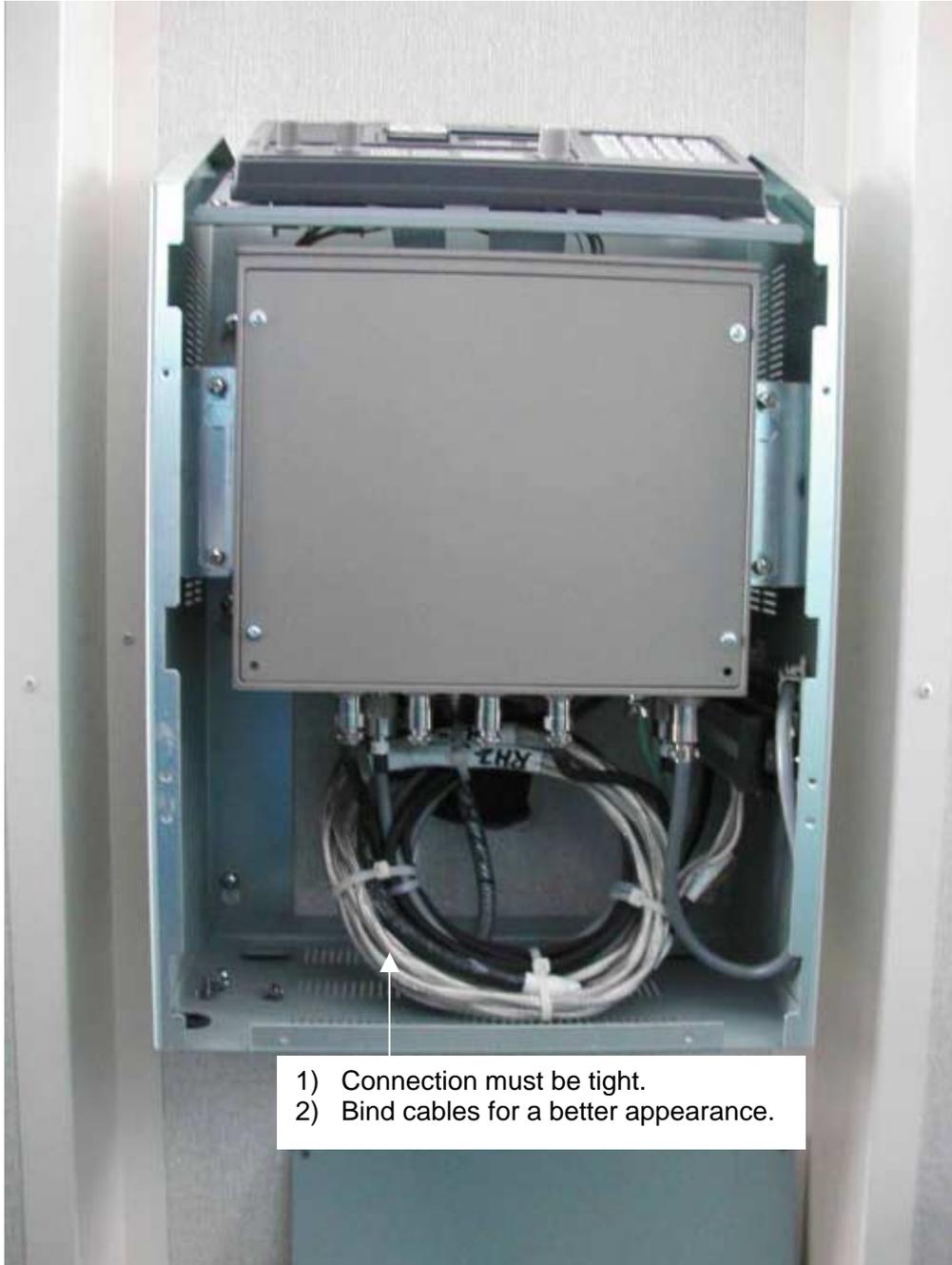


Fig. 3-26 Cables in VHF console

3.6.2 Junction box for VHF radio wing handset

The handset is installed in a watertight box to prevent it from corroding.

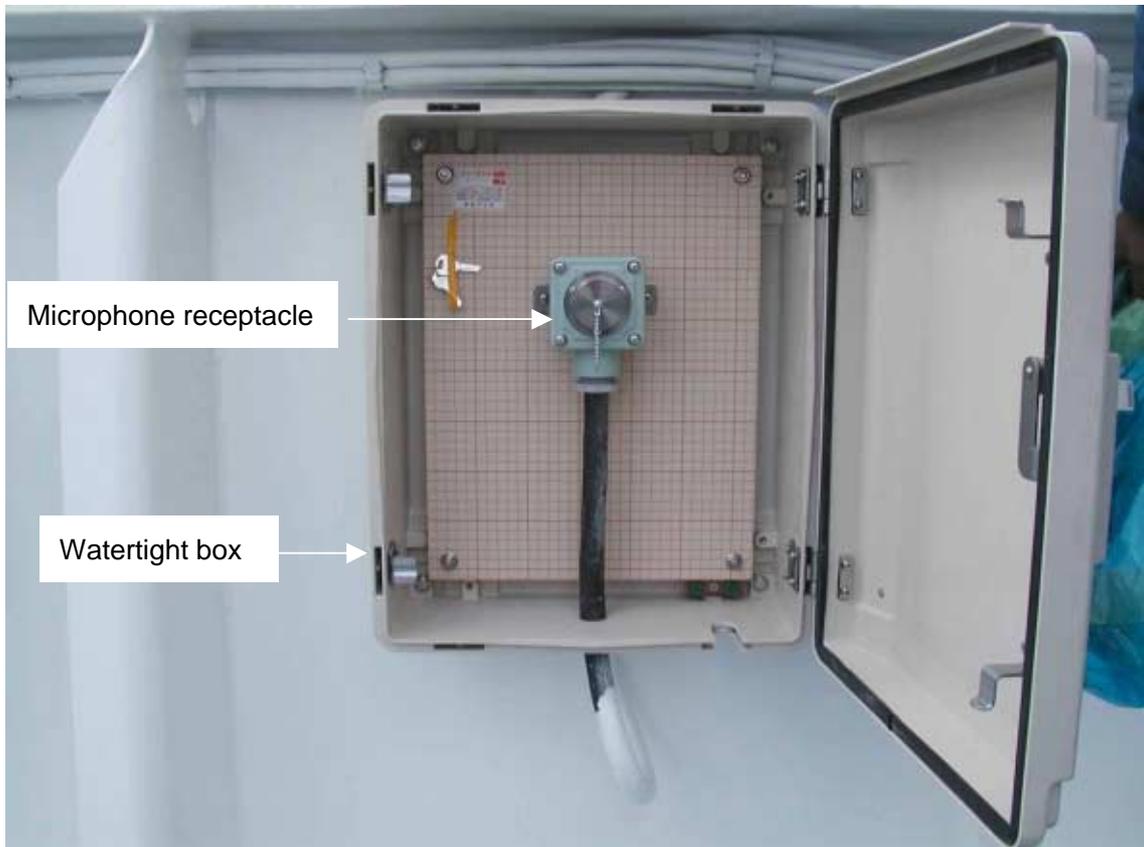


Fig. 3-27 Microphone receptacle in watertight box

3.7 Weather FAX receiver

Grounding must be securely and connections tight.

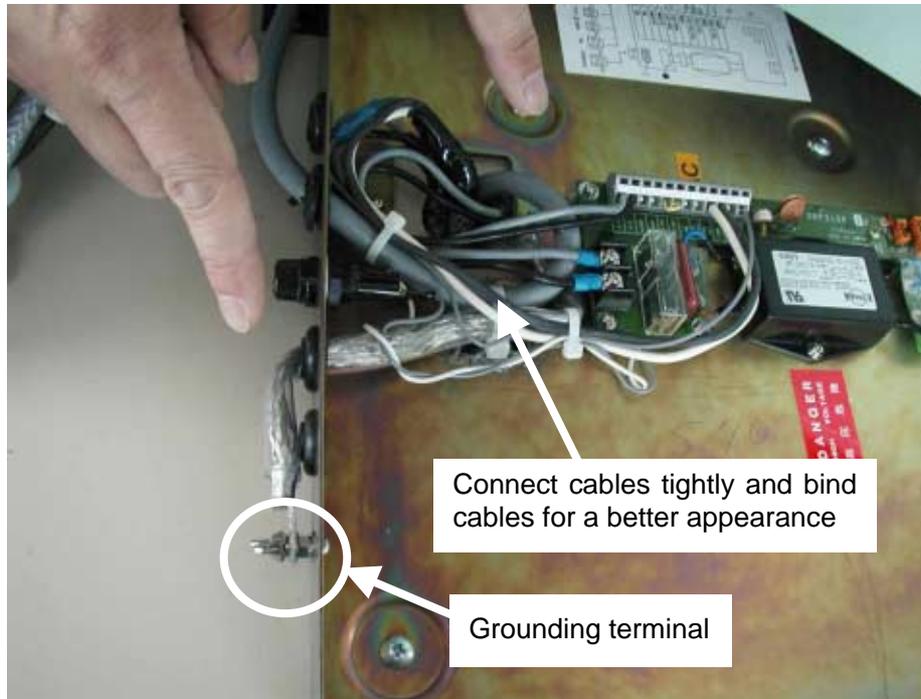


Fig. 3-28 Grounding and wiring in FAX receiver unit

3.8 NAVTEX receiver

Grounding must be securely and connections tight.

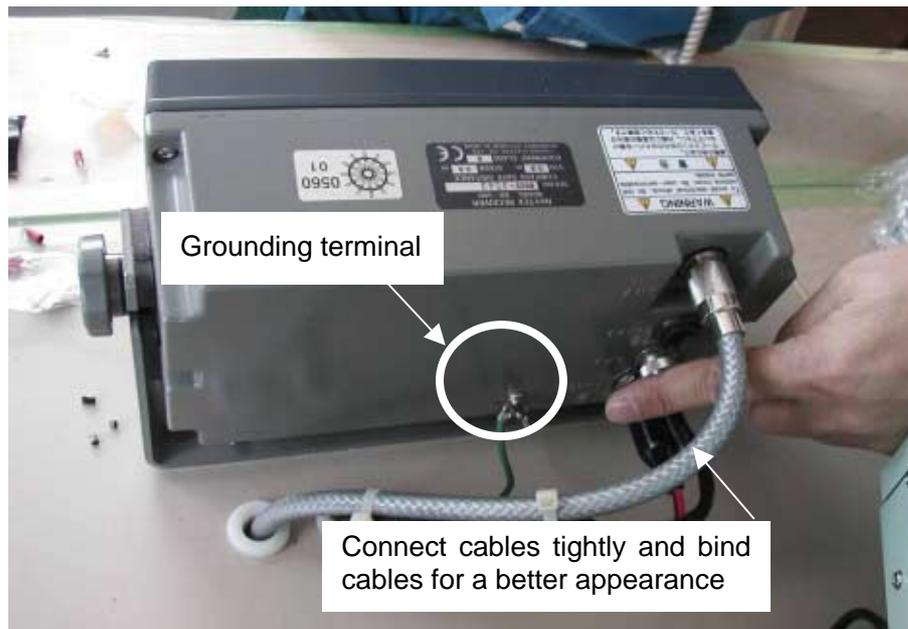


Fig. 3-29 Connections on NAVTEX

3.9 Reserve source (Battery)

Battery cables must have sufficient dimensions to prevent voltage reduction. Connections must be tight. Apply grease or vaseline to battery terminals.

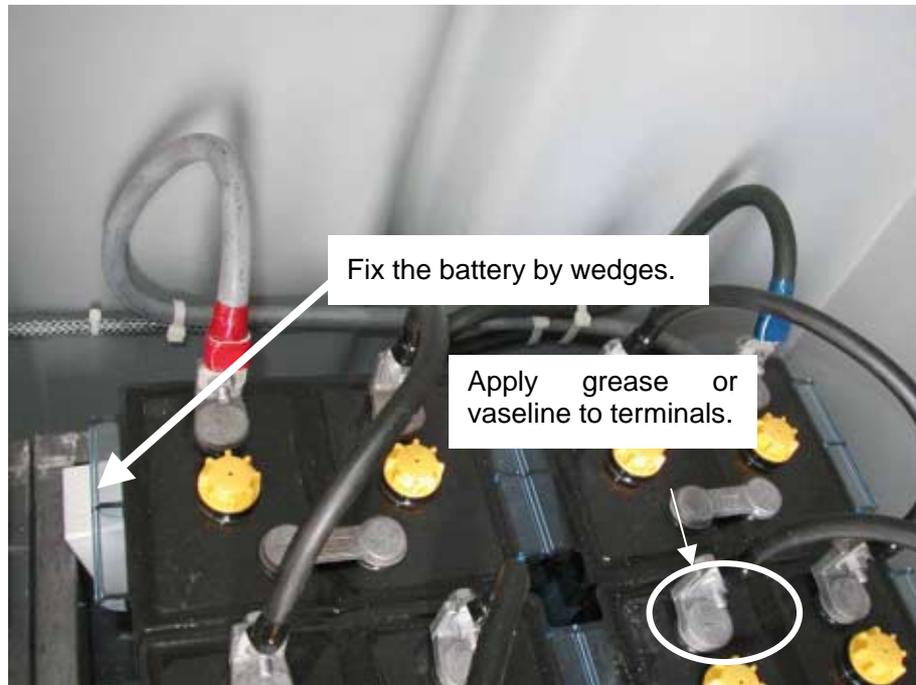


Fig. 3-30 Reserve source

Board up the inside of the box with copper plates for corrosion-proof. Spare parts must include the distilled water, specific gravity meter, voltmeter.

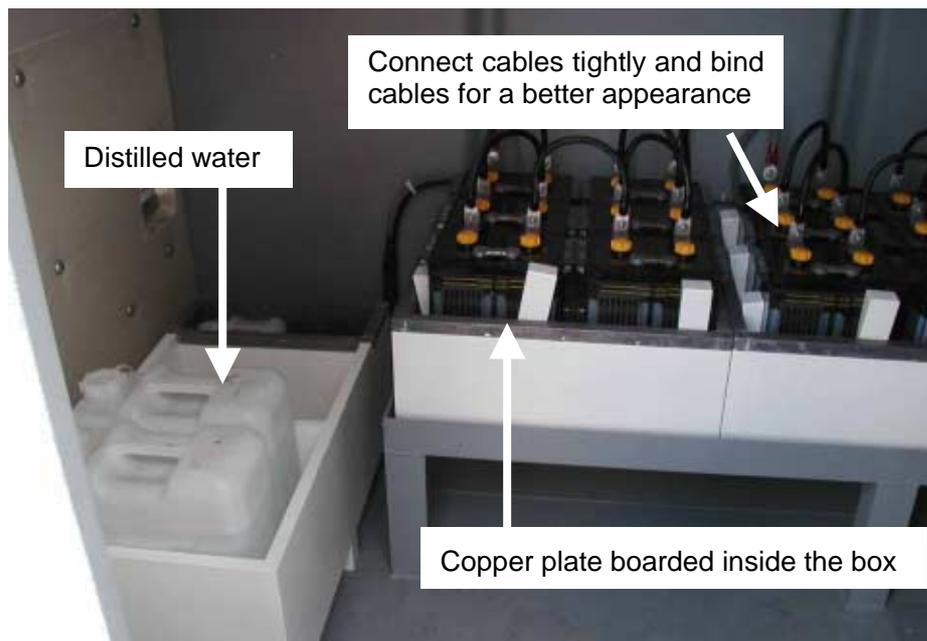


Fig. 3-31 Reserve source

3.10 SART

3.10.1 Installation site

Typically the SART is installed near the door either port or starboard side on the bridge.

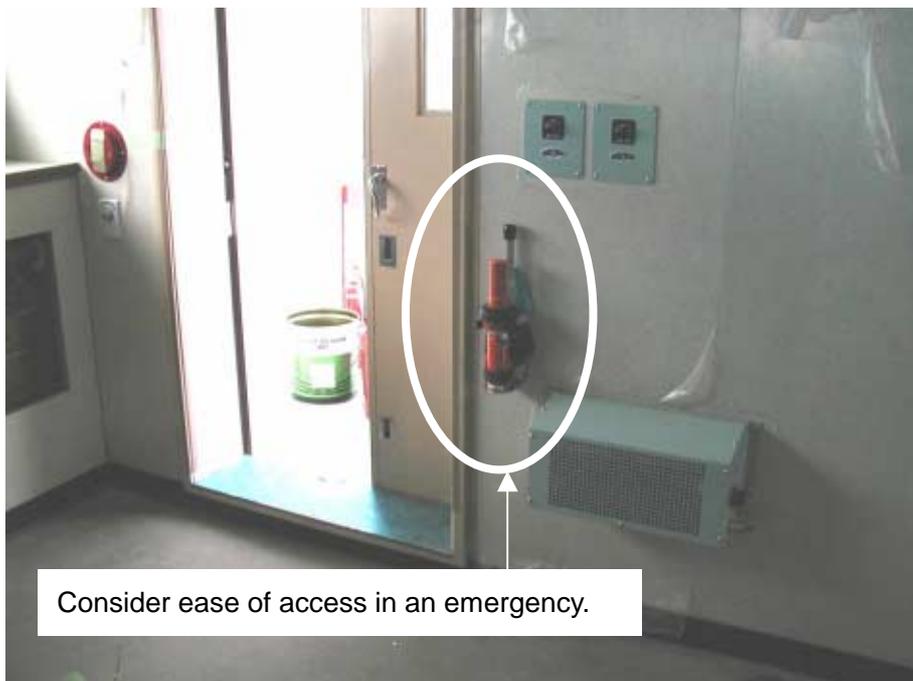


Fig. 3-32 Installing SART

3.10.2 Fitting SART mounting bracket

Fit the SART mounting bracket onto the lifeboat.

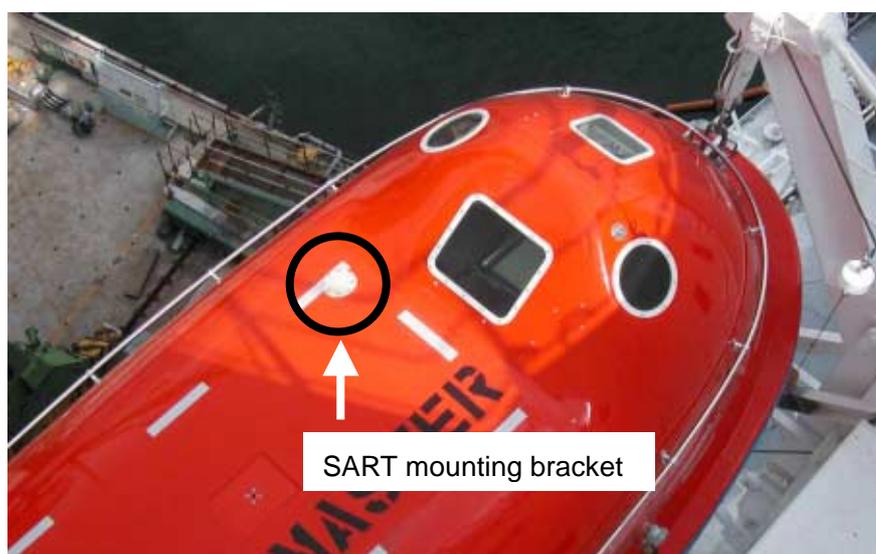


Fig. 3-33 SART mounting bracket

3.11 Two-Way radio

Set the switch to either 110 V or 220 V according to ship's main, and change the fuse accordingly.



Fig. 3-34 Two-Way Radio charger

Place primary batteries (BP-1208) beside the charger.



Fig. 3-35 Primary batteries

3.12 EPIRB

3.12.1 Mounting base for KANNAD406WH

Mount the EPIRB at the position with sufficient space for lid ejection and maintenance.

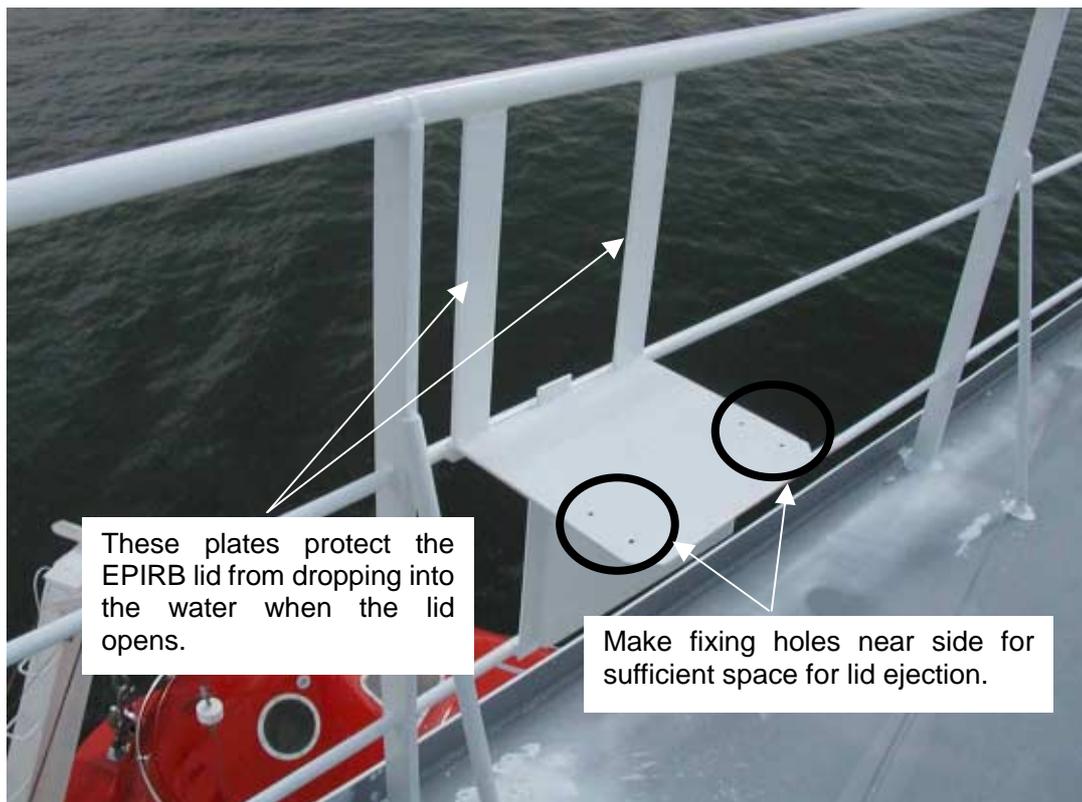
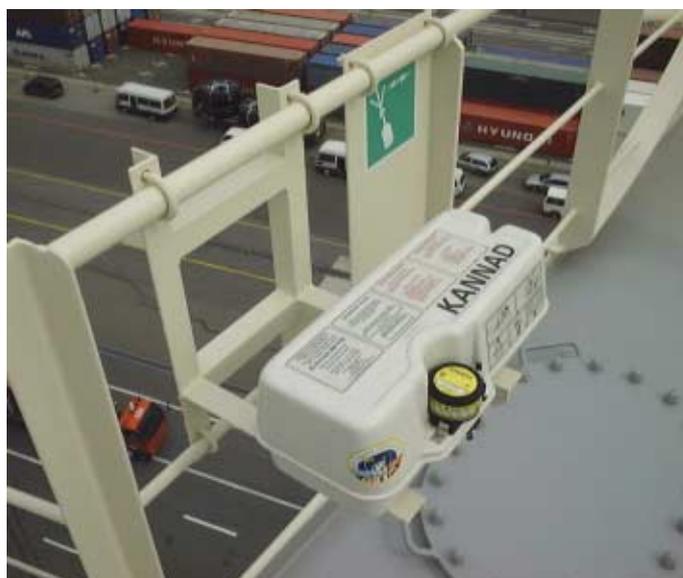


Fig. 3-36 EPIRB mounting base



Chapter 4. GPS receiver

4.1 GPS antenna

- Use the antenna fixture supplied when fixing the GPS antenna.
- Waterproof the cable joint with waterproofing and vinyl tapes.
- The diameter of the service loop is 30 cm or more, or the center conductor will break.



Fig. 4-1 Installing GPS antenna

4.2 GPS signal distribution box



Fig. 4-2 Distribution MD-500

SRC connector

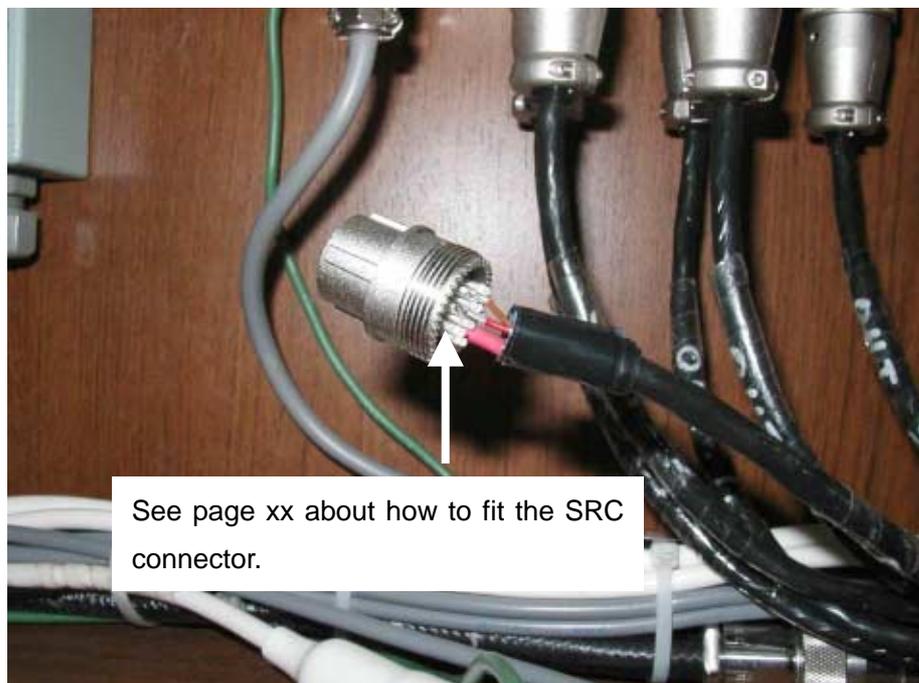


Fig. 4-3 Fitting SRC connector

Chapter 5. Acoustic equipment

5.1 Transducer position (DS-30/50/80, FE-700)

5.1.1 Best location

Select following locations for the transducer of acoustic equipment such as a doppler sonar and echosounder,

1. Location where is least affected by bubbles.
2. Location where is least affected by propeller and side thruster noises.

The most important is to avoid bubbles.

Flow of air bubbles created at ship's bow varies from hull to hull and according to ship's speed. Typically, bubbles flow along the hull as shown in Fig. 5-1.

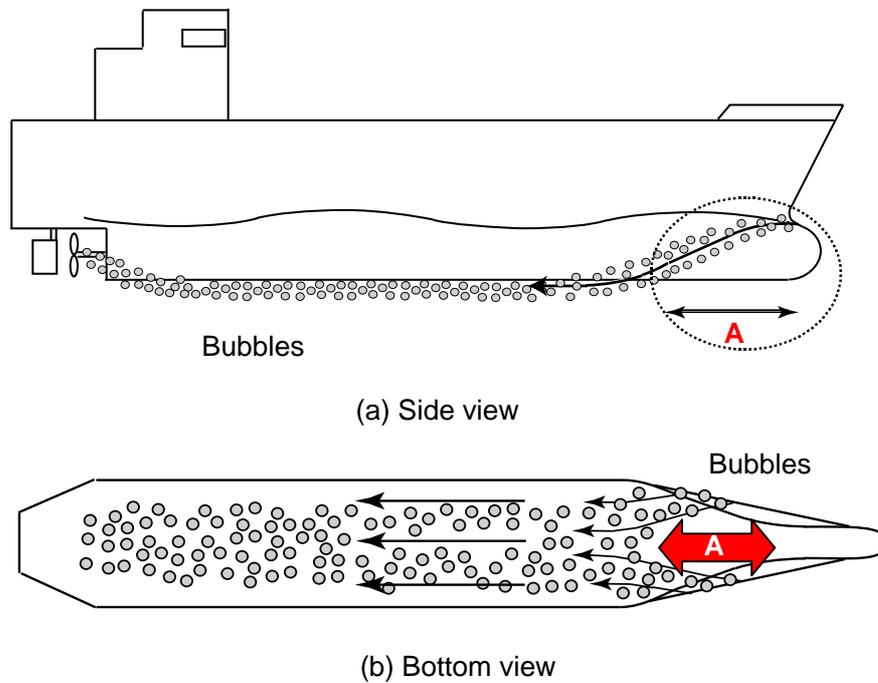


Fig.5-1 Flow of bubbles

Arrow A in Fig. 5-1 shows the best location for the transducer.

Fig.5-2 is the example of an installation.

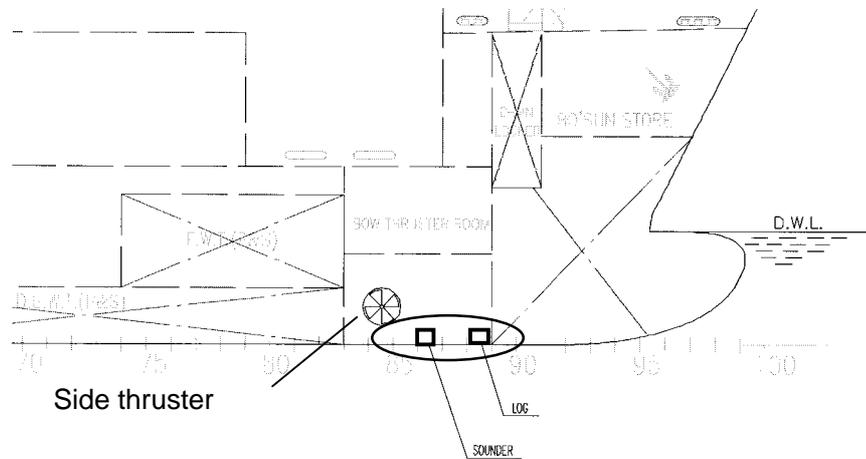


Fig.5-2 Location of transducer

The performance of the doppler sonar is easily degraded by bubbles so the transducer must be placed at the location "A" as shown in Fig. 5-1.

Transversely, the transducer is mounted on the keel or as near to the keel as possible.

▪ **When side thruster is installed**

The transducer is mounted in front of the side thruster about 1 m.

Installation at bow bulb

If the bottom is not flat, the transducer tank must be welded as shown in Fig. 5-3 to make the transducer surface flat. The installation at an angle will cause a false reading of depth.

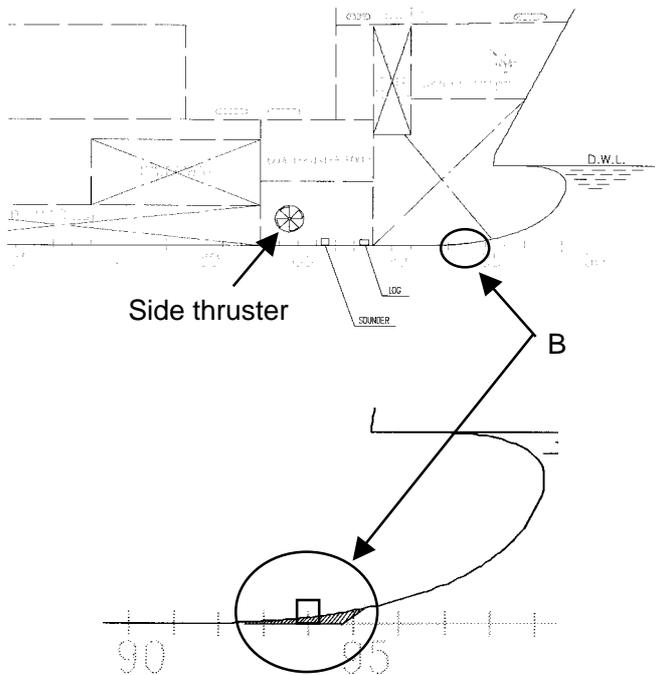


Fig.5-3 Installation at bow bulb

▪ **Location for transducer of echosounder**

The best position is the above-mentioned A. Installation at other areas may be affected by air bubbles and cause unstable depth indications.

The lower the frequency, the more the air bubble interference. Use 200 kHz transducer where there is the possibility of air bubble interference.

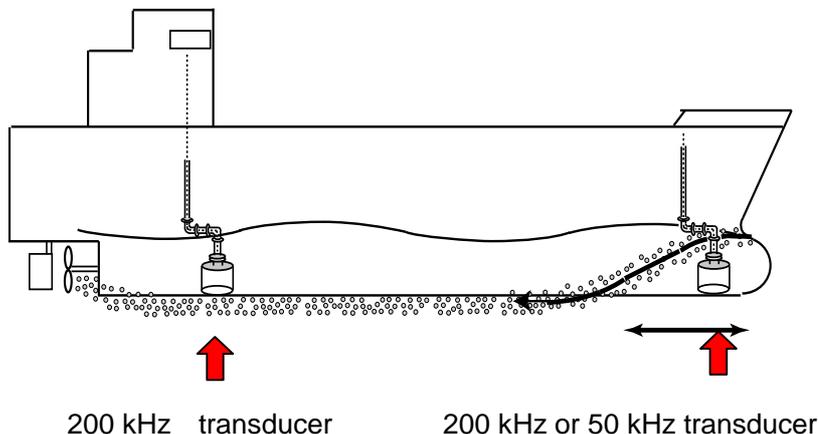


Fig.5-4 Location of echosounder transducer

5.1.2 Installation of echosounder and doppler sonar transducers

Decide location of doppler sonar transducer first.

When installing doppler sonar and echosounder transducers, decide the location for the doppler sonar transducer first. The echosounder transducer is placed behind the doppler sonar transducer about 2 m or more.

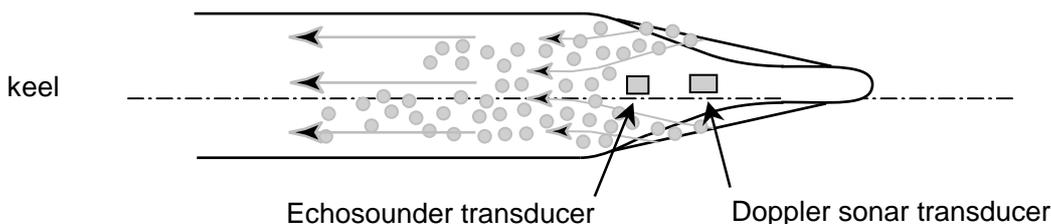


Fig.5-5 Echosounder and doppler sonar transducers

Fig. 5-6 shows the recommended area for echosounder transducer to be mounted.

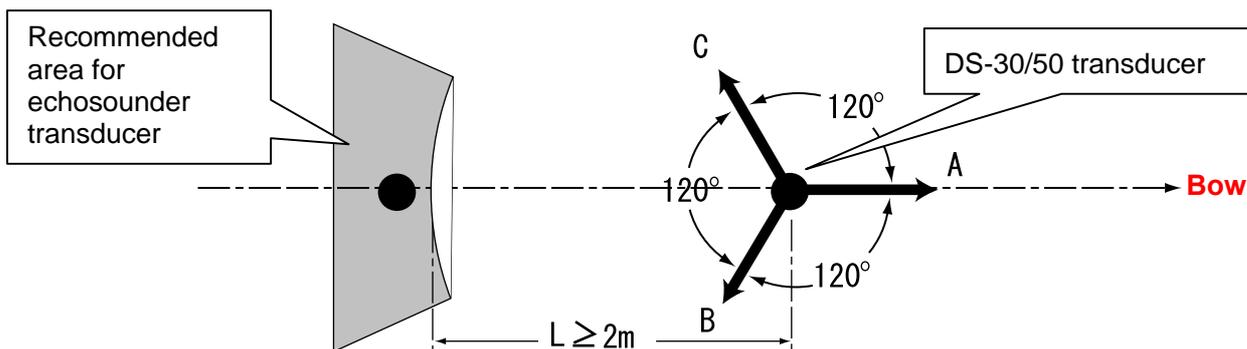


Fig.5-6 DS-30/50 and FE-700 transducers

Doppler sonar transmits three beams in directions A, B and C. Never place the echosounder transducer in the directions A, B and C.

▪ DS-80 and FE-700

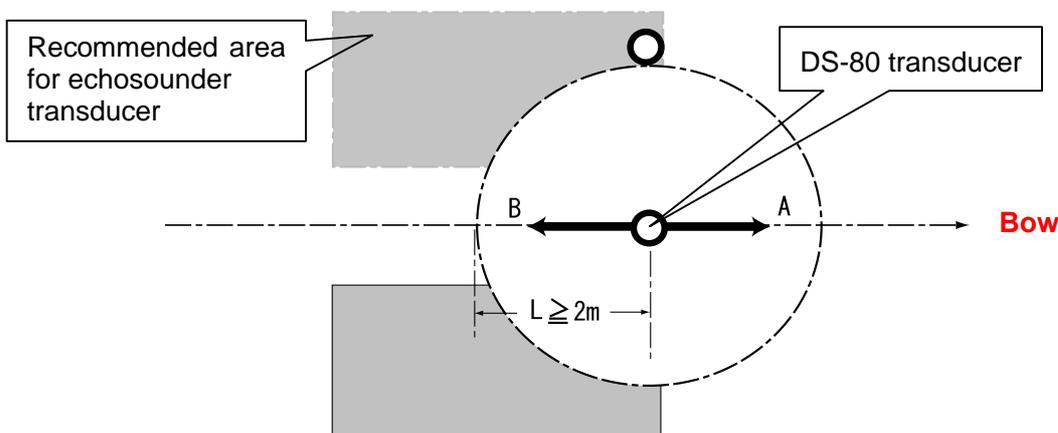


Fig.5-7 DS-80 and FE-700 transducers

5.2 Piping transducer cable

Pipe the cable from the transducer flange to the transducer or matching box.

Note: The transducer cable of doppler sonar must be piped.

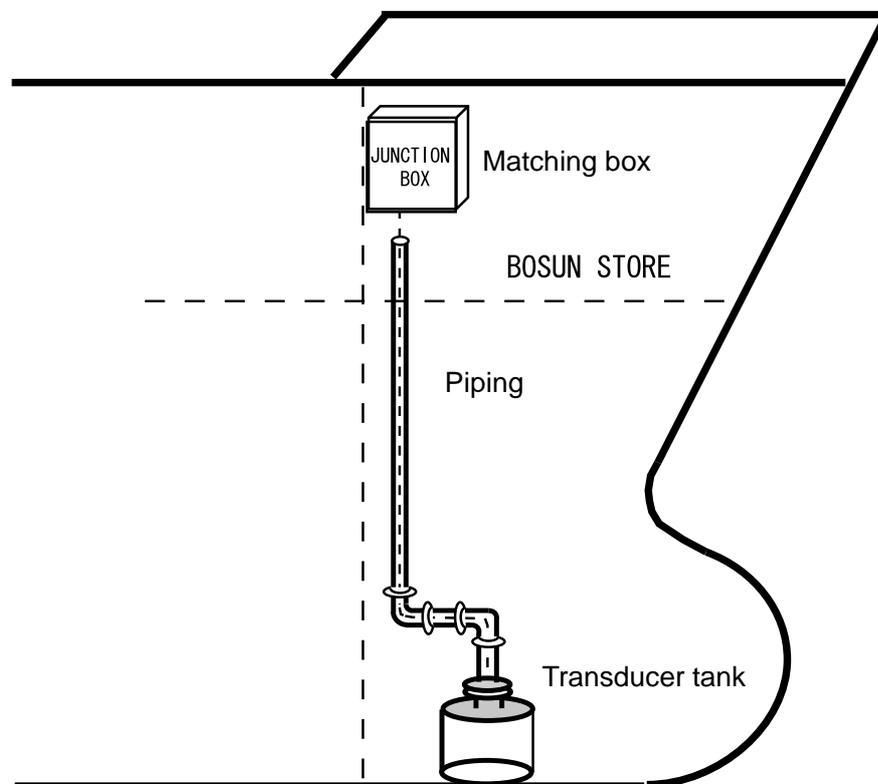


Fig.5-8 Piping transducer cable

5.3 Installation on ship with protruded keel

When the transducer is mounted in the keel, take followings into account to prevent the adverse affect from bubbles.

(1) "in keel" installation

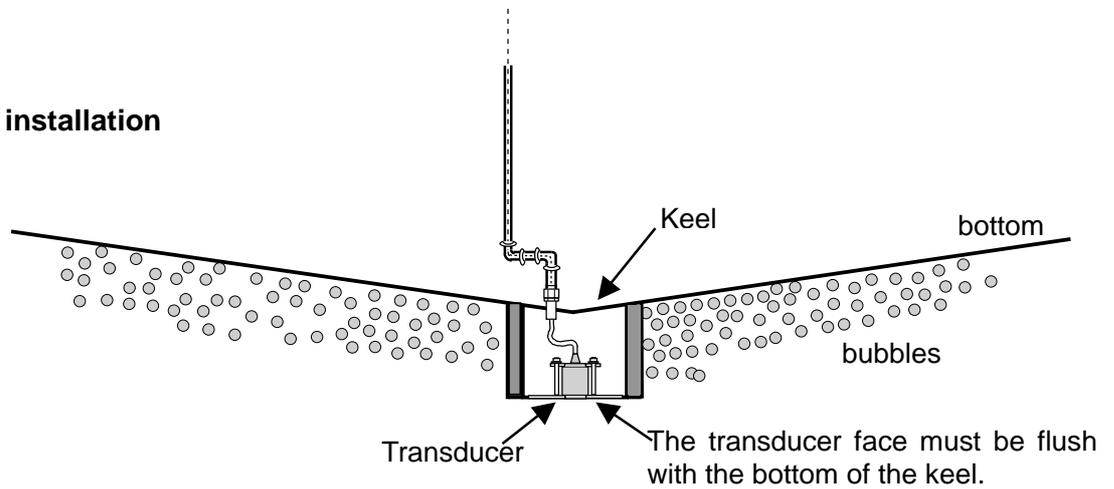


Fig.5-9 "In keel" Installation

(2) "beside keel" installation (Using tank)

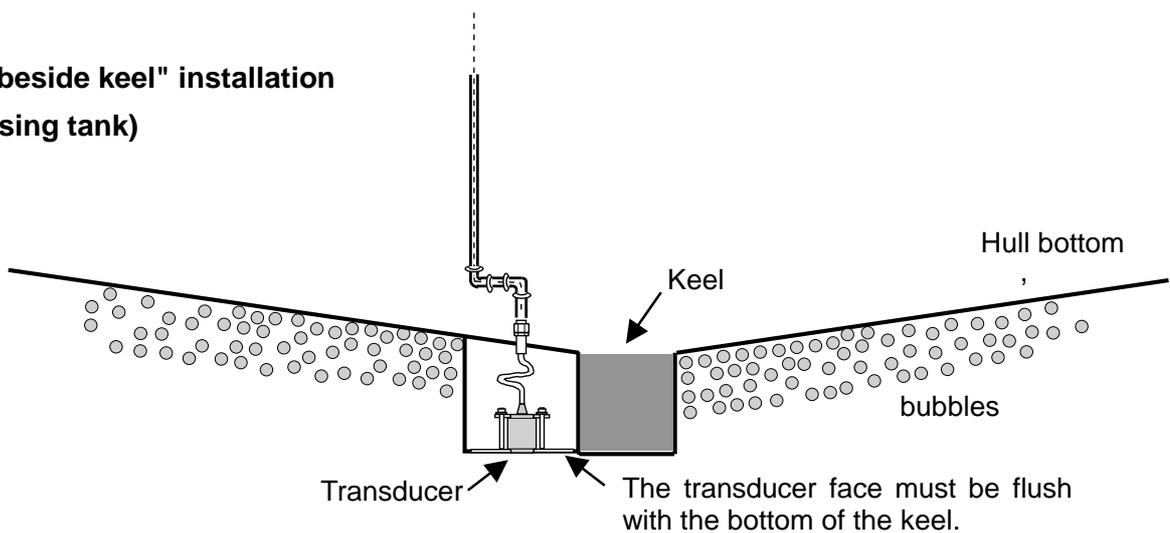


Fig.5-10 "Beside keel" installation

(3) "parallel to keel" installation (Using tank)

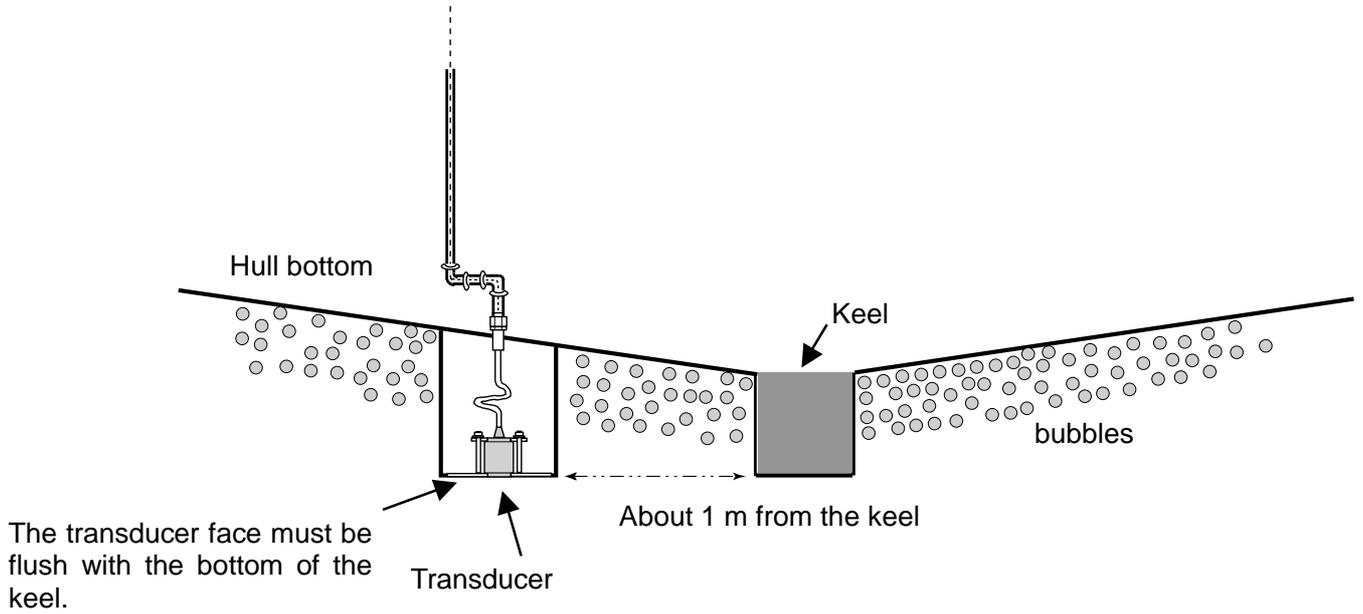


Fig.5-11 "Parallel to keel" installation

5.4 Installing DS-30 transducer

5.4.1 Hull fixed tank

- 1) Align the transducer tank so that the bow mark is in fore direction.
(The tank supplied by FURUNO carries "bow mark".)

DS-331-A

DS-331-N

注記
 1. 船底タンク板厚は標準25mmです。それ以上の厚さが必要な場合は別途打合せ願います。
 2. 船底タンク材質KSTPG370の化学成分は表2の通りです。
 3. (5)のケーブルグランドは標準支給の予備品工具で締付けてください。

NOTES
 1. STANDARD THICKNESS OF THE CASING IS 25 mm.
 CONSULT WITH FURUNO WHEN THICKER ONE IS REQUIRED.
 2. CHEMICAL COMPOSITION OF THE CASING MATERIAL IS AS TABLE 2.
 3. CABLE GLAND (5) CAN BE TIGHTENED BY THE TOOL SUPPLIED.

表2 TABLE 2

化学成分 CHEMICAL COMPOSITION (%)	C	Si	Mn	P	S	Mo
容許値 CONTENT	0.25 以下 OR LESS	0.35 以下 OR LESS	0.30-0.90	0.04 以下 OR LESS	0.04 以下 OR LESS	0.2 以下 OR LESS

表1 TABLE 1

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

品番 ITEM	品名 NAME	材質 MATERIAL	数量 QTY	図番 FIG. NO.	備考 REMARKS
21	バネ金 SPRING WASHER	SUS304	4	M16	
20	六角ボルト HEX BOLT	SUS304	4	M16 x 45	
19	環状フランジ RING FLANGE	FC20	1	JIS B-2220	造船所手配 SHIPYARD SUPPLY
18	ガasket GASKET	T No.1995	1	JIS 19Kx50A	
17	電線管フラング CONDUIT FLANGE	SS400	1	66-019-1251	
16	船底タンクカバー CASING TOP COVER	SM400	1		
15	六角ボルト HEX BOLT	SUS304	1	M6 x 30	
14	C/N環状フランジ RING HOLDER	TB35C	1	66-019-1303	
13	キャップ ROLL CAP	FC20	3	66-019-1983	
12	平金 FLAT WASHER	SUS304	3	66-019-1205	
11	バネ金 SPRING WASHER	SUS304	6	M12	
10	六角ボルト HEX BOLT	SUS304	3	66-019-1984	
9	バネ金 SPRING WASHER	TB340	2	M6	
8	平金 FLAT WASHER	TB340	2	M6	
7	ナット HEX NUT	TB340	2	M6	
6	C/N環状フランジ RING HOLDER	TP35C	1	66-019-1302	
5	ケーブルグランド CABLE GLAND	SUS316	1	66-019-1204	
4	平金 FLAT WASHER	SUS316	1	66-019-1203	
3	船底コネクタ RUBBER GASKET	CR	1	66-019-1202	
2	船底タンク CASING	KSTPG370	1	66-019-1201	予備品 RESERVED MATERIAL
1	送受信機 TRANSDUCER		1	DS-330/331	

Fig.5-12 DS-331A/331N tank



Fig.5-13 DS-331A tank

2) Install the tank parallel to draft line longitudinally and transversely.

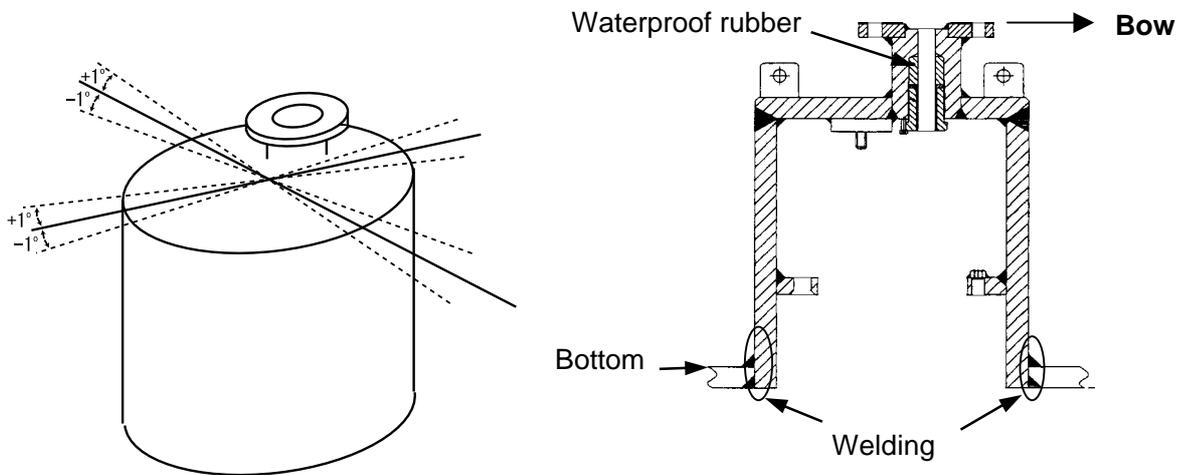


Fig.5-14 DS-331A tank

When welding the tank, remove the waterproof rubber of the transducer to prevent the damage from the heat.

3) Leave a slack of the transducer cable in the tank for servicing.

Procedure

1. Let the cable gland, flat washer and waterproof rubber through the transducer cable in order.
2. Put the cable through the cable gland from the bottom. The length between the connector and the cable gland is 700 to 900 mm. A slack is required for servicing.
3. Hand-tighten the cable gland.
4. Tighten the gland securely using the wrench supplied.
5. Fix the hex. bolt to prevent the gland from loosening.

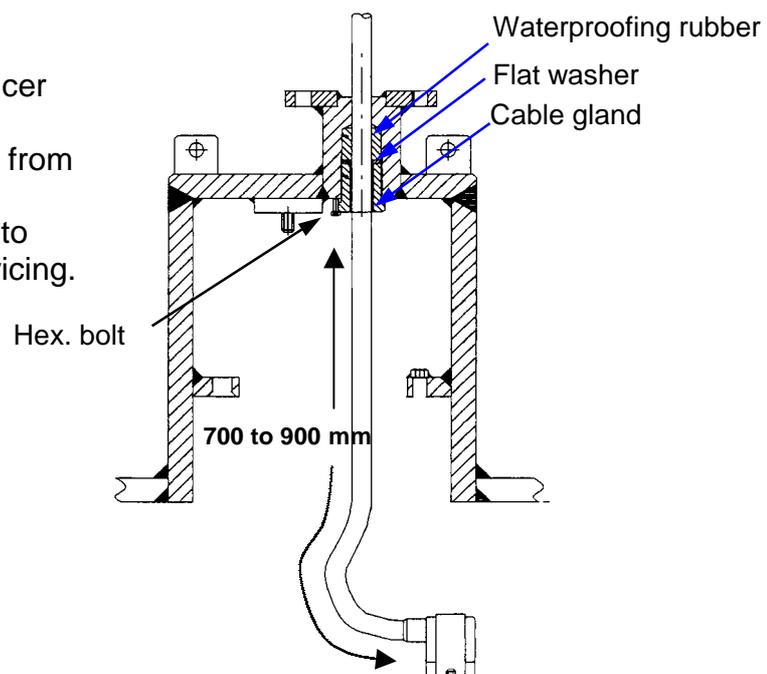


Fig.5-15 Installing transducer cable

4) Connecting waterproof transducer connector



Fig.5-16 Transducer, DS-330

1. Apply silicone grease (supplied in installation materials) on the connector face. (Whole area) Excess grease will isolate pin contacts.



Fig.5-17 Waterproof connector

2. Plug the connector while holding up the connector ring.

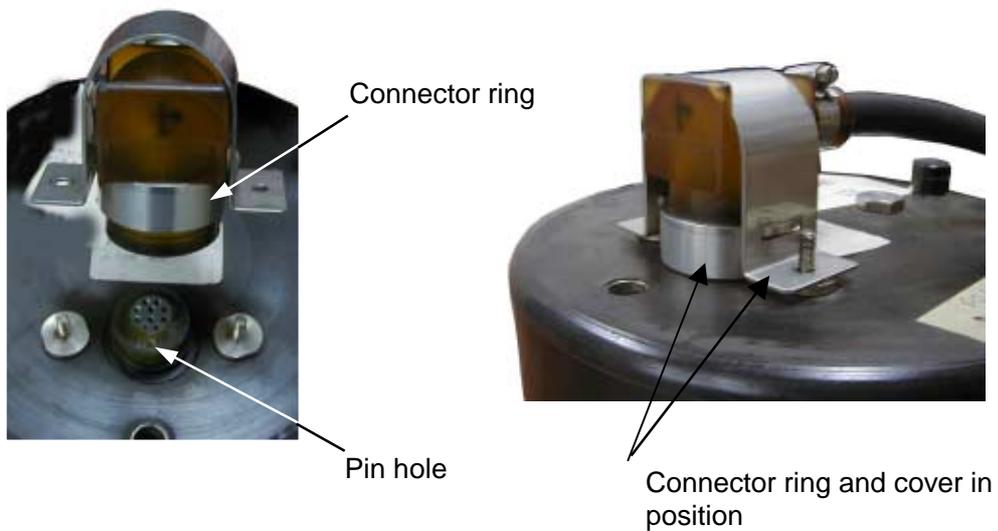


Fig.5-18 Installing waterproof connector

- Place the connector ring in position and fix the connector cover using the supplied flat washer, spring washer and nut.

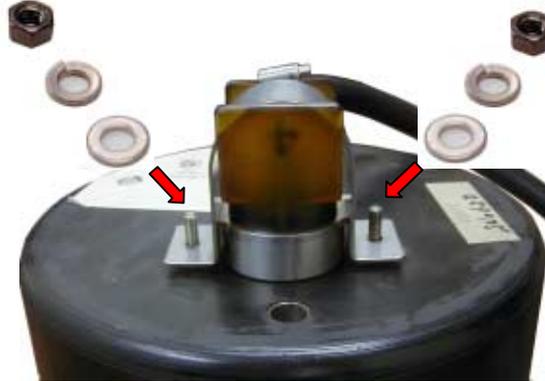


Fig.5-19 Fixing waterproof connector

Use the titanium nuts and washers or equivalents to fix the connector cover. If not, corrosion will result.

- Place the transducer with a correct alignment.

The protuberance on the DS-30 transducer should be in stern direction. Fix the transducer with three bolts supplied.

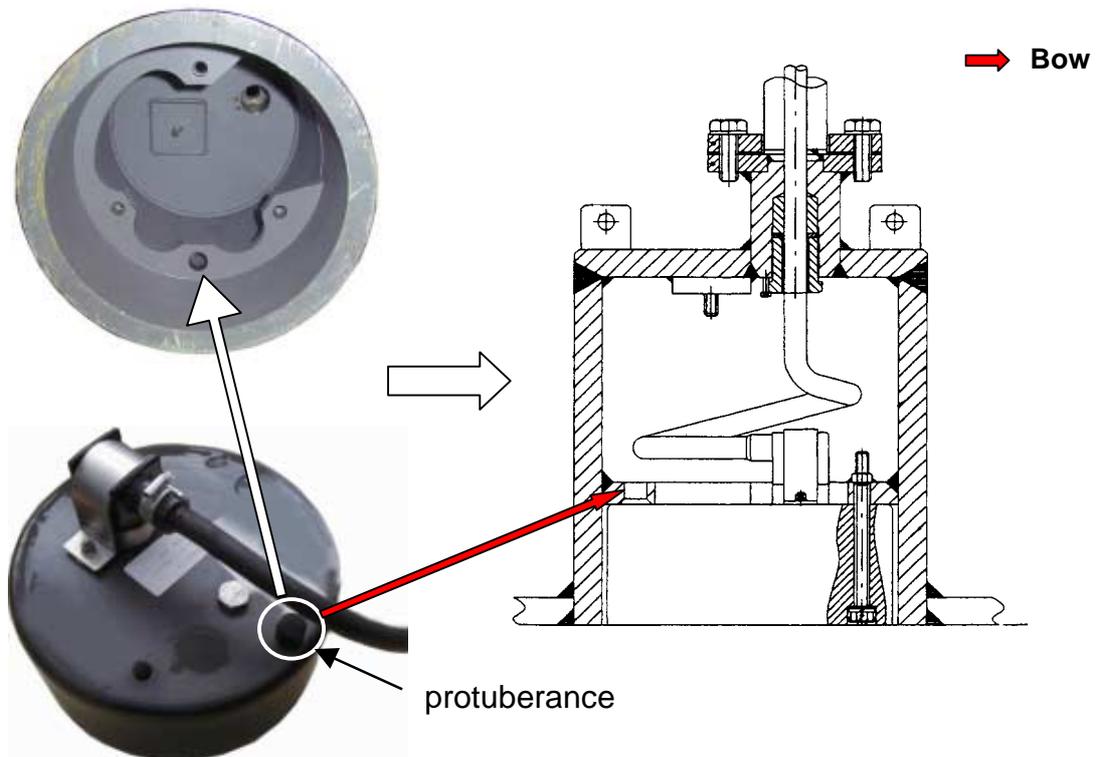


Fig.5-20 Mounting transducer

- 6) After fixing the transducer, apply supplied silicone sealant on the head of three bolts.

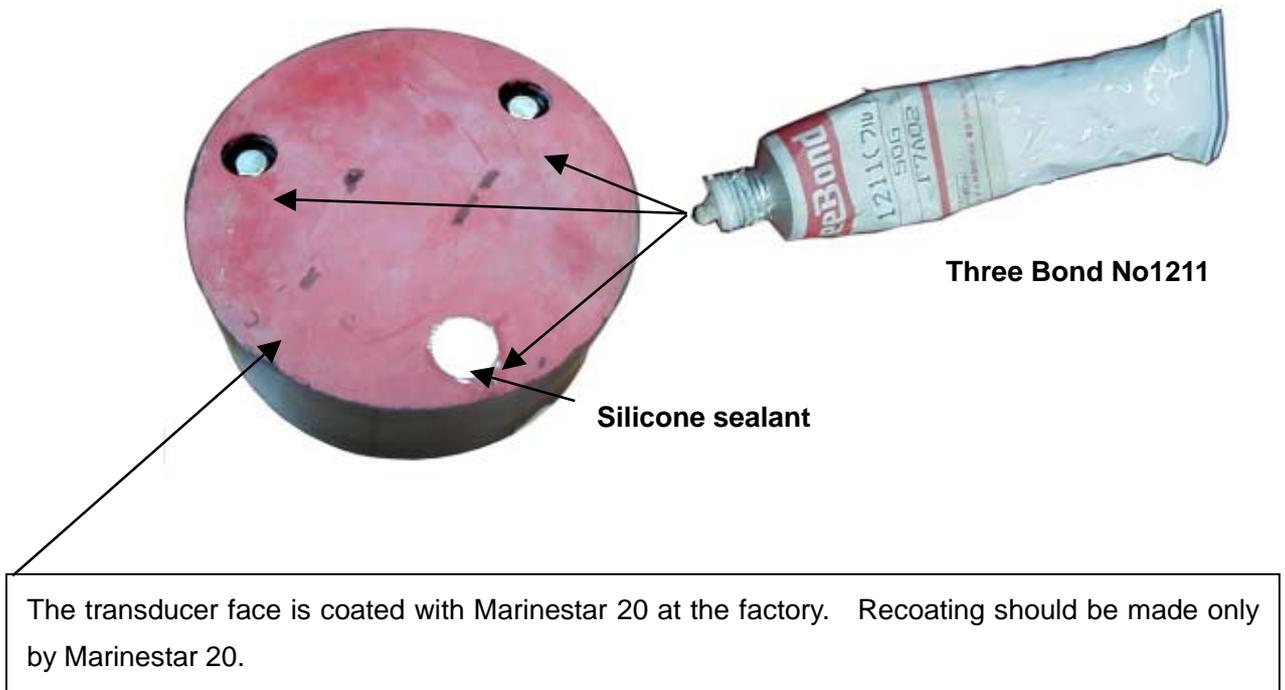


Fig.5-21 Applying silicone sealant



Fig.5-22 Check at hull bottom

Confirm that the face of transducer is level to hull bottom plate, or projected a little (0.5 to 1 mm).

5.4.2 Gatevalve Tank

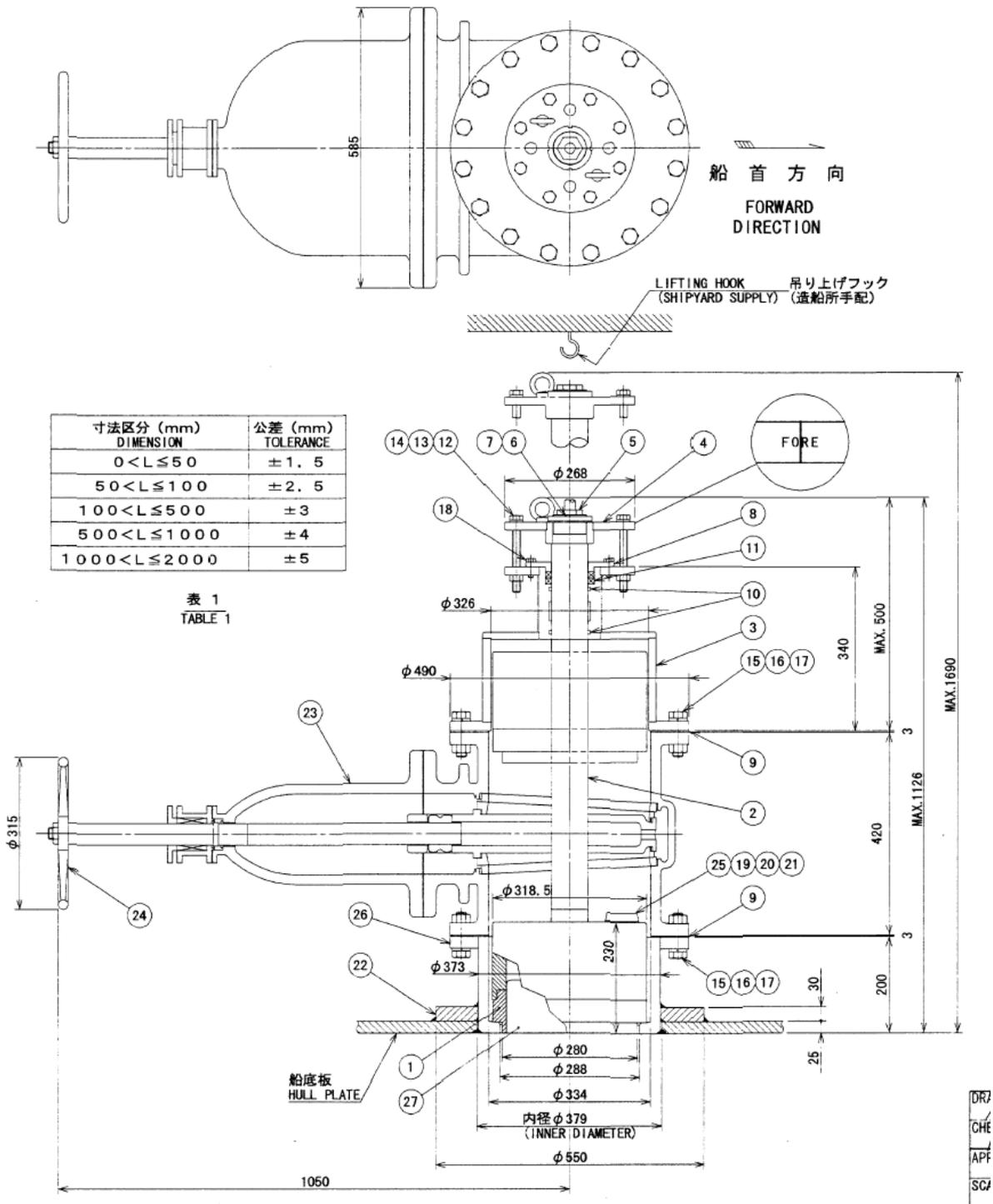


Fig.5-23 Gatevalve DS335

27	送受波器 TRANSDUCER		1	DS-330	
26	スペーサ SPACER	SM400/KSTPG410	1	66-019-1431	
25	防蝕塗料 ANTI-CORROSIVE ZINC		3	ZAP B-1 1/2	
24	ハンドル HANDLE	FC200	1		SHIPYARD SUPPLY
23	ゲートバルブ GATE VALVE	9.8 × 10 ⁵ Pa SC450	1	JIS F7366-350	SHIPYARD SUPPLY
22	船底補強板 DOUBLING PLATE	KA	1	66-019-1432	
21	座金 WASHER	SUS316L	3	M12	
20	バネ座金 SPRING WASHER	SUS316L	3	M12	
19	ボルト BOLT	SUS316L	3	M12 × 20	
18	ボルト BOLT	SUS316L	4	M10 × 35	
17	ナット NUT	SUS316L	32	M22	
16	バネ座金 SPRING WASHER	SUS316L	32	M22	
15	ボルト BOLT	SUS316L	32	M22 × 80	
14	ナット NUT	SUS316L	8	M16	
13	バネ座金 SPRING WASHER	SUS316L	8	M16	
12	ボルト BOLT	SUS316L	8	M16 × 150	
11	ブラインドシール BRIND SEAL		1 SET	VALQUA No. 7061	
10	Oリング O-RING	CR	2	JIS B2401 1A P75	
9	ガスケット GASKET	t=3mm NONASBESTOS JOINT SHEET	2	66-019-1404	NICHIASU No. 1995
8	固定金具 FIXING PLATE	SUS304	1	66-019-1407	
7	バネ座金 WASHER	SUS304	1	AW14	
6	ナット NUT	SUS304	1	AN14	
5	取付金具 FIXING GRAND	SUS316	1	66-019-1204	
4	押しえ板 UPPER PLATE	SS400	1	66-019-1403	
3	蓋 SEACHEST CAP	SM400/KSTPG370	1	66-019-1402	
2	シャフト SHAFT	SUS316L	1	66-019-1433	
1	ヘッドキャップ HEAD CAP	SUS316L	1	66-019-1434	
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. No.	補要 REMARKS

1) Installing Spacer Tank

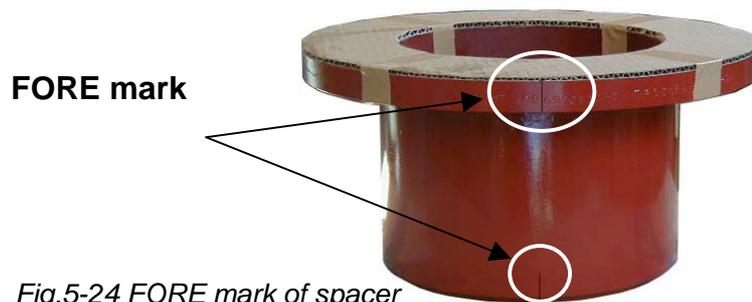
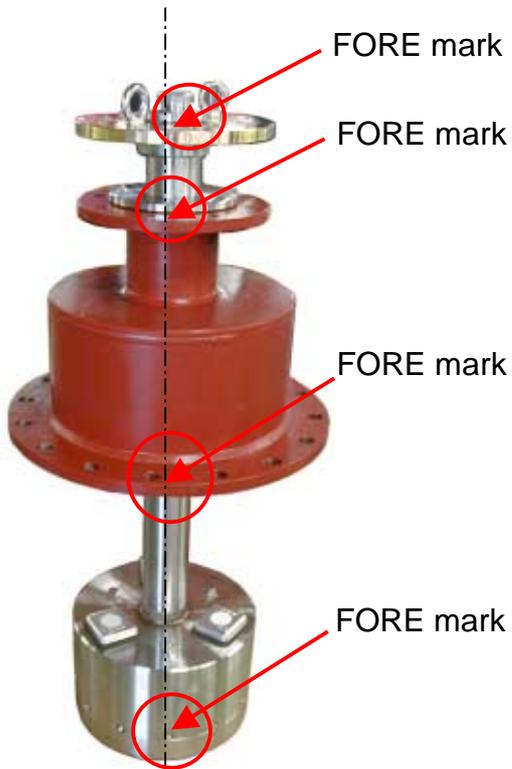


Fig.5-24 FORE mark of spacer

- ◆ Align “FORE” mark of the tank to ship’s bow direction.
(Accuracy must be within 1 degree)
- ◆ The tank is mounted at right angles to the draft line.
- ◆ Never cut the tank.

2) Orienting "FORE" marks of gatevalve assembly



Fix shaft plate to shaft flange by 8 bolts supplied, after oriented the "FORE" marks.



3) Fixing transducer

Remove these three bolts and fix the transducer by bolts supplied

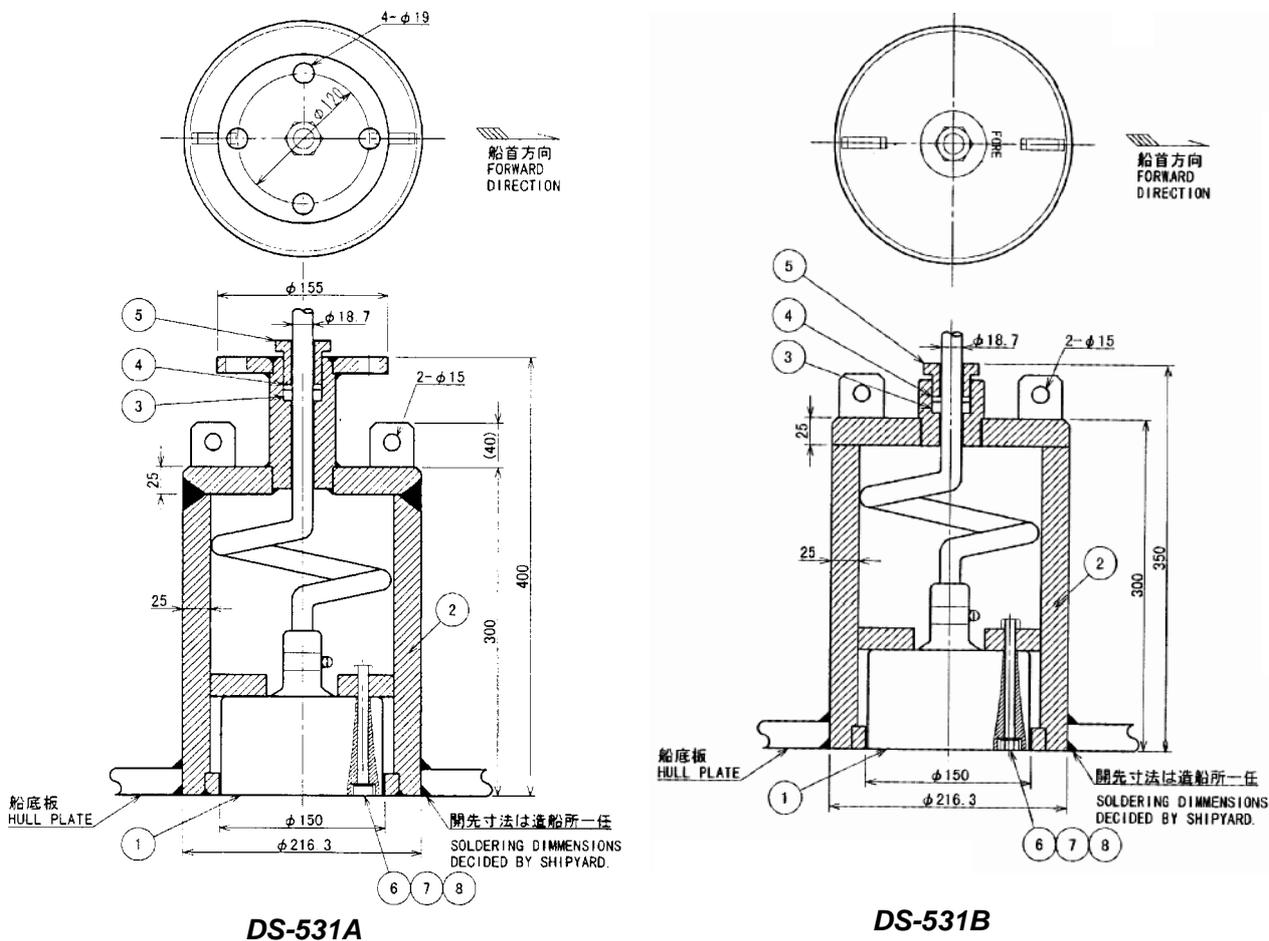


All "FORE" marks must be on one vertical line

This hole is for the protuberance (stern direction) of the transducer.

5.5 Installing DS-50 transducer

5.5.1 Hull tank



8	平座金 FLAT WASHER	M10	SUS304	3	
7	バネ座金 SPRING WASHER	M10	SUS304	3	
6	六角ボルト HEX. BOLT	M10×110	SUS304	3	
5	結付グラウンド CABLE GRAND		SUS304	1	66-017-1404
4	座金 WASHER		SUS304	1	66-017-1402
3	VAパッキン RUBBER BASKET		CR	1	VA-25
2	船底タンク CASING		KSTPG370	1	66-022-7001
1	送受波器 TRANSDUCER			1	DS-530
品番 ITEM	品名 NAME		材質 MATERIAL	数量 QTY	図番 DWG. NO.

Fig.5-25 DS-50 Hull tank DS-531A/531B

"Bow mark"

The mark on the tank points toward the FORE direction.

Alignment error is within 1 degree. The tank is mounted at the right angles to the draft line.

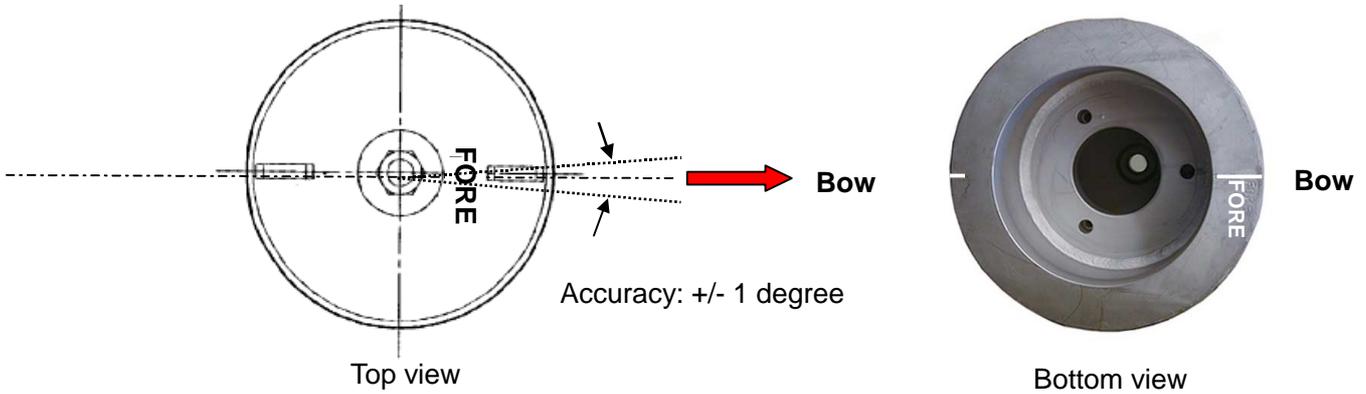


Fig.5-26 DS-50 Hull tank

Mounting transducer

Transducer is also mounted with correct alignment.

The fixing hole which is closest to the edge locates in the fore direction.

If the transducer is inserted into the tank in wrong direction, it cannot be fixed. See Fig.5-23.

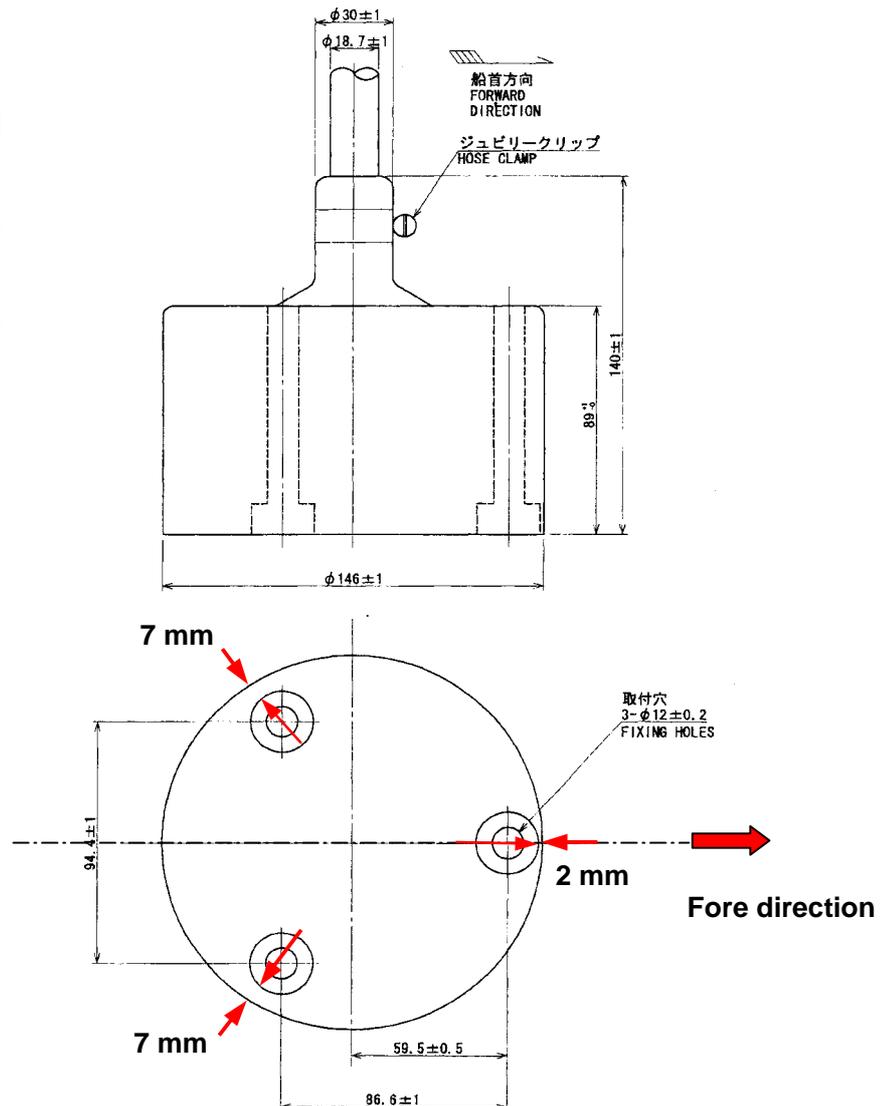


Fig.5-27 DS-50 transducer: DS-530

After mounting the transducer, apply supplied silicone sealant on the head of three bolts.

The transducer face is coated with MarineStar 20 at the factory. Coating is not necessary at installation. For maintenance, use MarineStar 20 only.

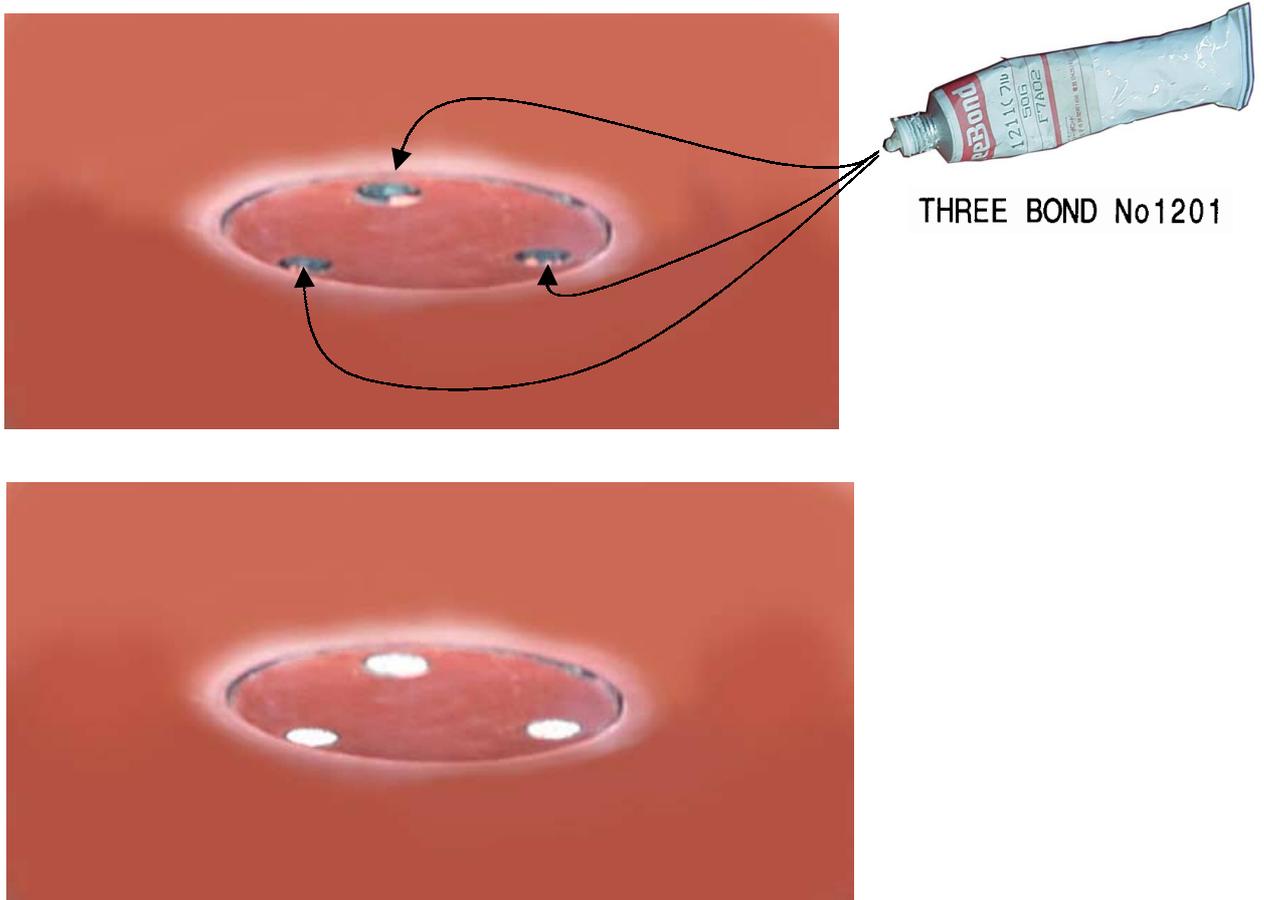


Fig.5-28 Applying silicone sealant

Confirm that the face of transducer is level to hull bottom plate, or projected a little (0.5 to 1 mm).

If the transducer face sinks from the hull bottom level, reinstall the tank.

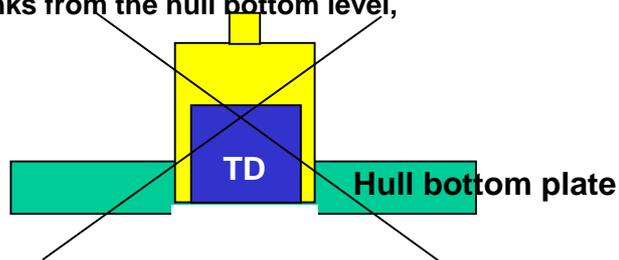
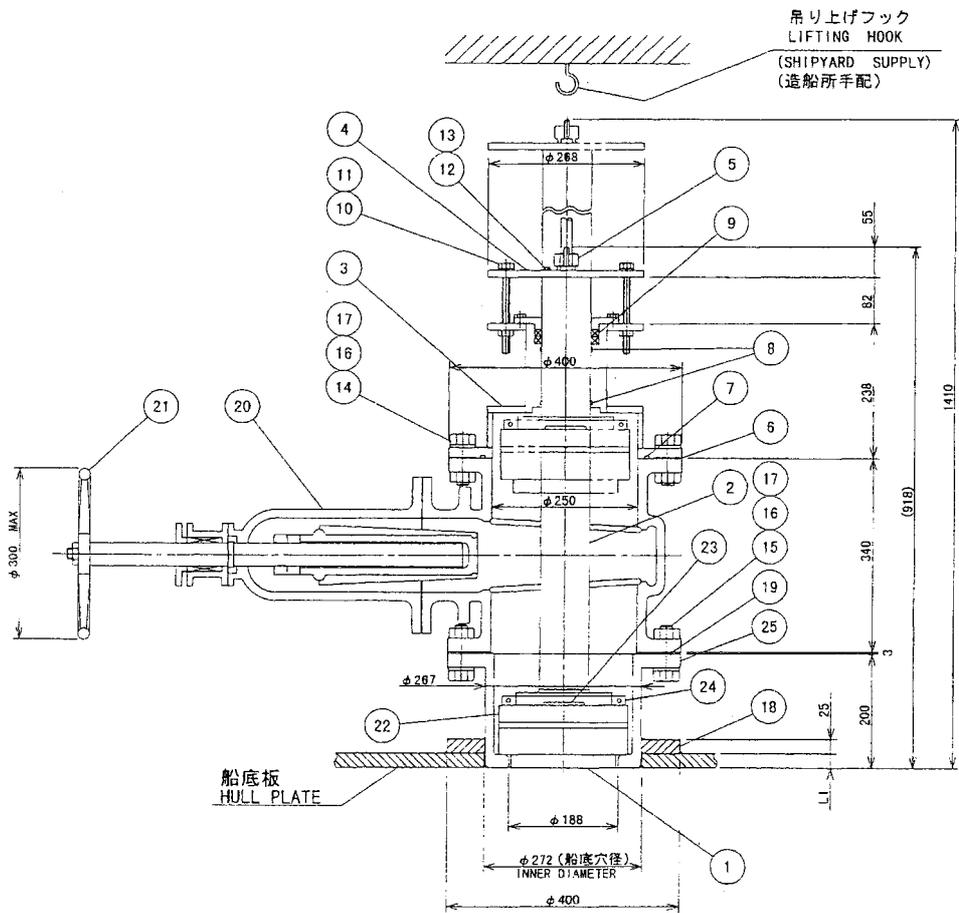


Fig.5-29 Check level of transducert

5.5.2 Installing tank with gatevalve



25	スペーサ SPACER	STPG370	1		
24	クランプ CLAMP BAND	SUS304	2		
23	クランプピン CLAMP PIN	SUS304	2		
22	防蝕亜鉛 ANTI-CORROSIVE ZINC	ZAP	2		
21	ハンドル HANDLE	FC20	1		造船所手配 SHIPYARD SUPPLY
20	ゲートバルブ GATE VALVE 9.8×10 ⁵ Pa	SC46	1	JIS F7366-250B	造船所手配 SHIPYARD SUPPLY
19	ガスケット GASKET	アスベスト複合シート ASBESTOS JOINT SHEET	1	t=3 mm	
18	船底補強板 DOUBLING PLATE	KA	1		
17	ナット NUT	M22	SUS304	12	
16	ハネ座金 SPRING WASHER	M22	SUS304	12	
15	六角ボルト BOLT	M22×80	SUS304	12	
14	六角ボルト BOLT	M22×65	SUS304	12	
13	ハネ座金 SPRING WASHER	M6	SUS304	12	
12	六角ボルト BOLT	M6×12	SUS304	12	
11	ハネ座金 SPRING WASHER	M12	SUS304	12	
10	六角ボルト BOLT	M12×150	SUS304	12	
9	グリース綿 GREASE COTTON				
8	O-リング O-RING	NBR	2		
7	O-リング O-RING	NBR	1		
6	ガスケット GASKET	CR	1	t=2 mm	
5	取付金具 FIXING GRIND	SUS304	1		
4	押さえ板 UPPER PLATE	SS400	1		
3	蓋 SEACHEST CAP	SS400	1		
2	シャフト SHAFT	SUS304	1		
1	浸透波器 TRANSDUCER		1		
品番 ITEM	品名 NAME	材質 MATERIAL	数量 QTY	図番 DWG. NO.	備考 REMARKS

Fig.5-30 Transducer tank with gatevalve: DS-532

Bow mark on the flange must locate in fore direction.

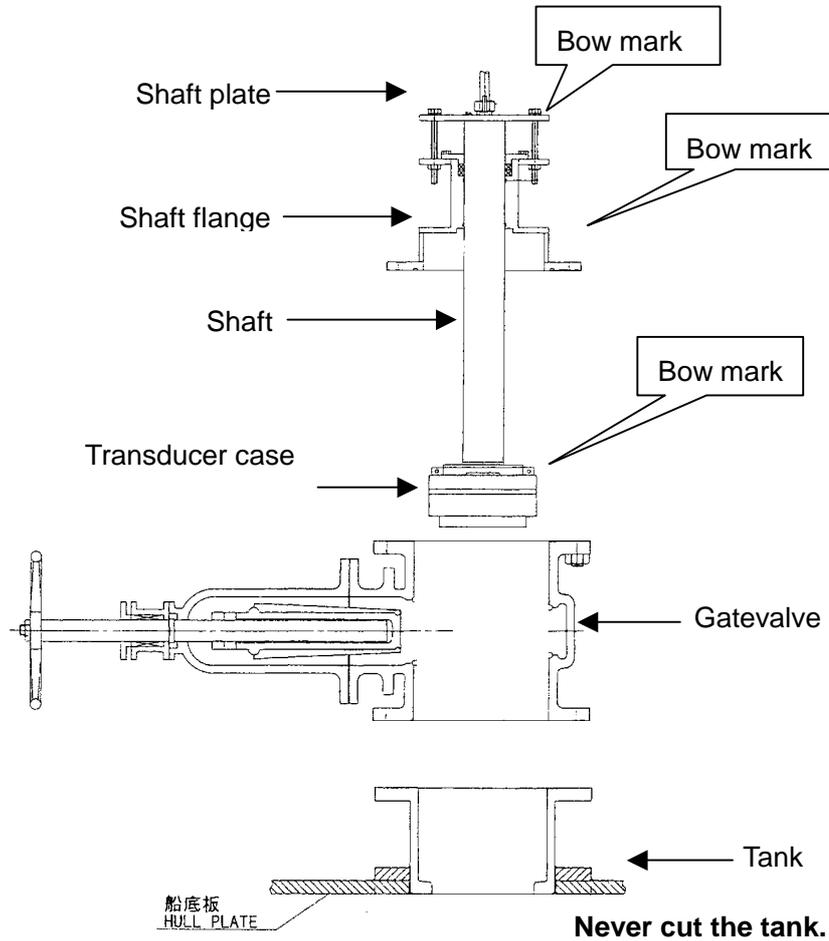


Fig.5-31 Transducer tank with gatevalve,exploded

Installing tank

The center line between the fixing holes is the fore-aft line.

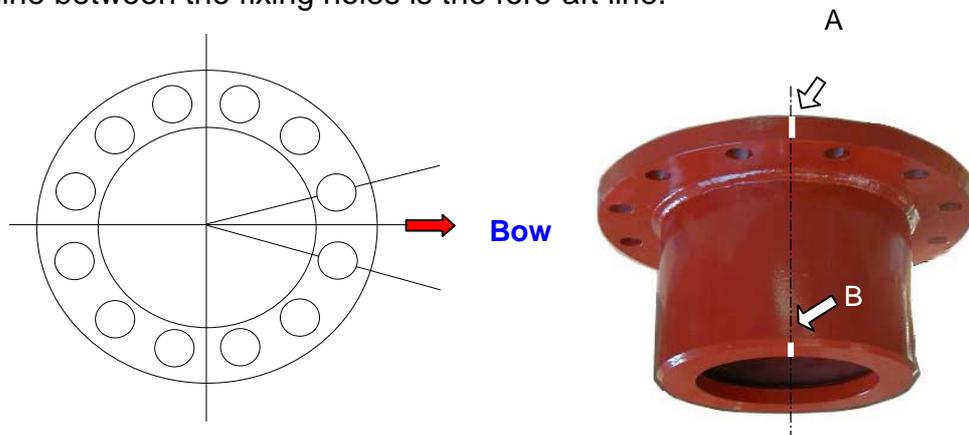


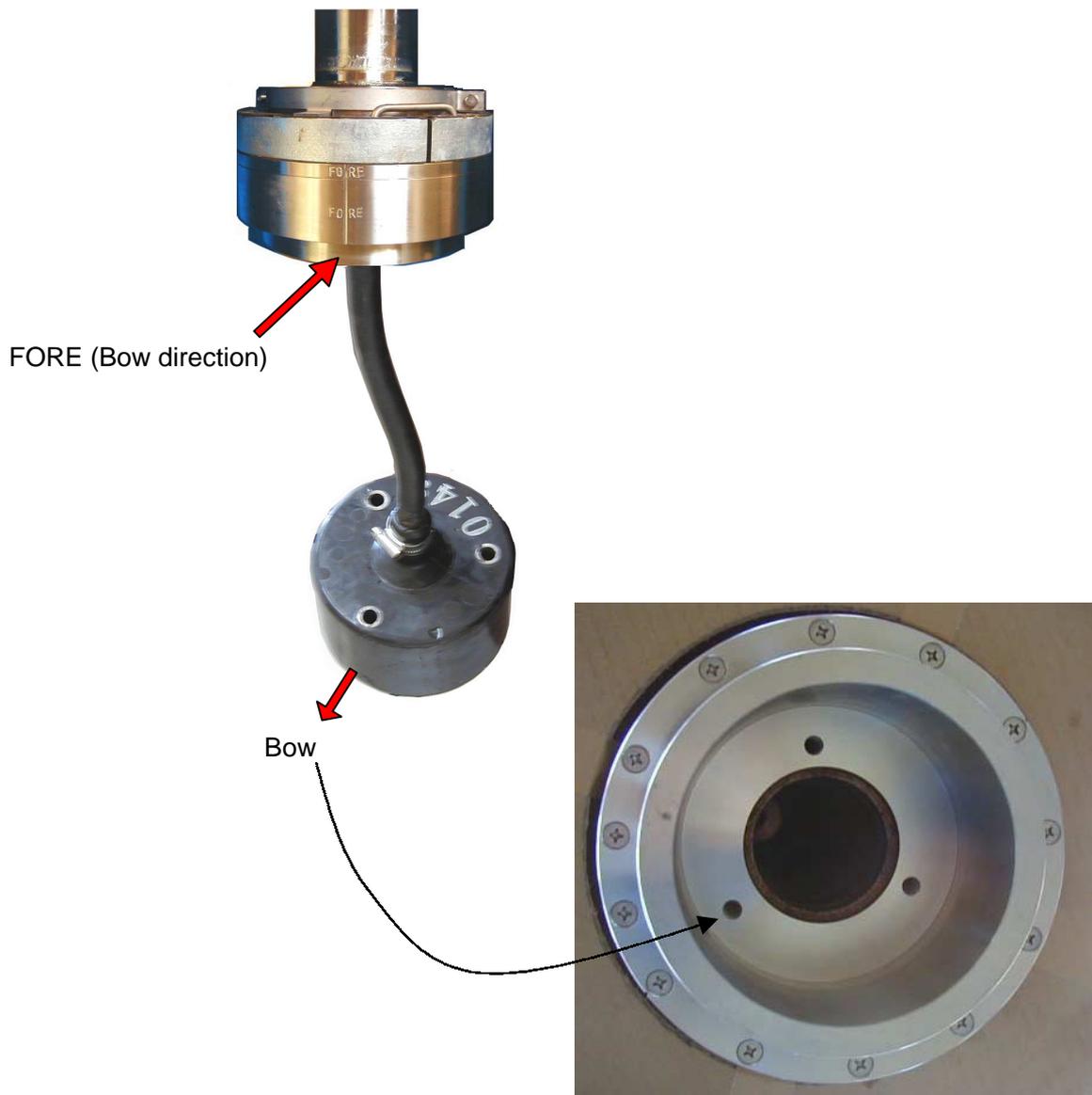
Fig.5-32 Bow direction of tank

Before mounting tank

Put bow marks A and B on the tank as shown in the Fig.5-26. (Accuracy: within 1 degree) The tank is mounted at right angles to the draft line.

Installing transducer

Insert the transducer into the case. The transducer fixing hole which is closest to the edge matches to the fore mark on the case. The transducer is fixed with three bolts supplied.



Bottom View of transducer case

Fig.5-33 Mounting transducer

Caution on mounting shaft / transducer assembly to gatevalve

"FORE" marks must be in bow direction.

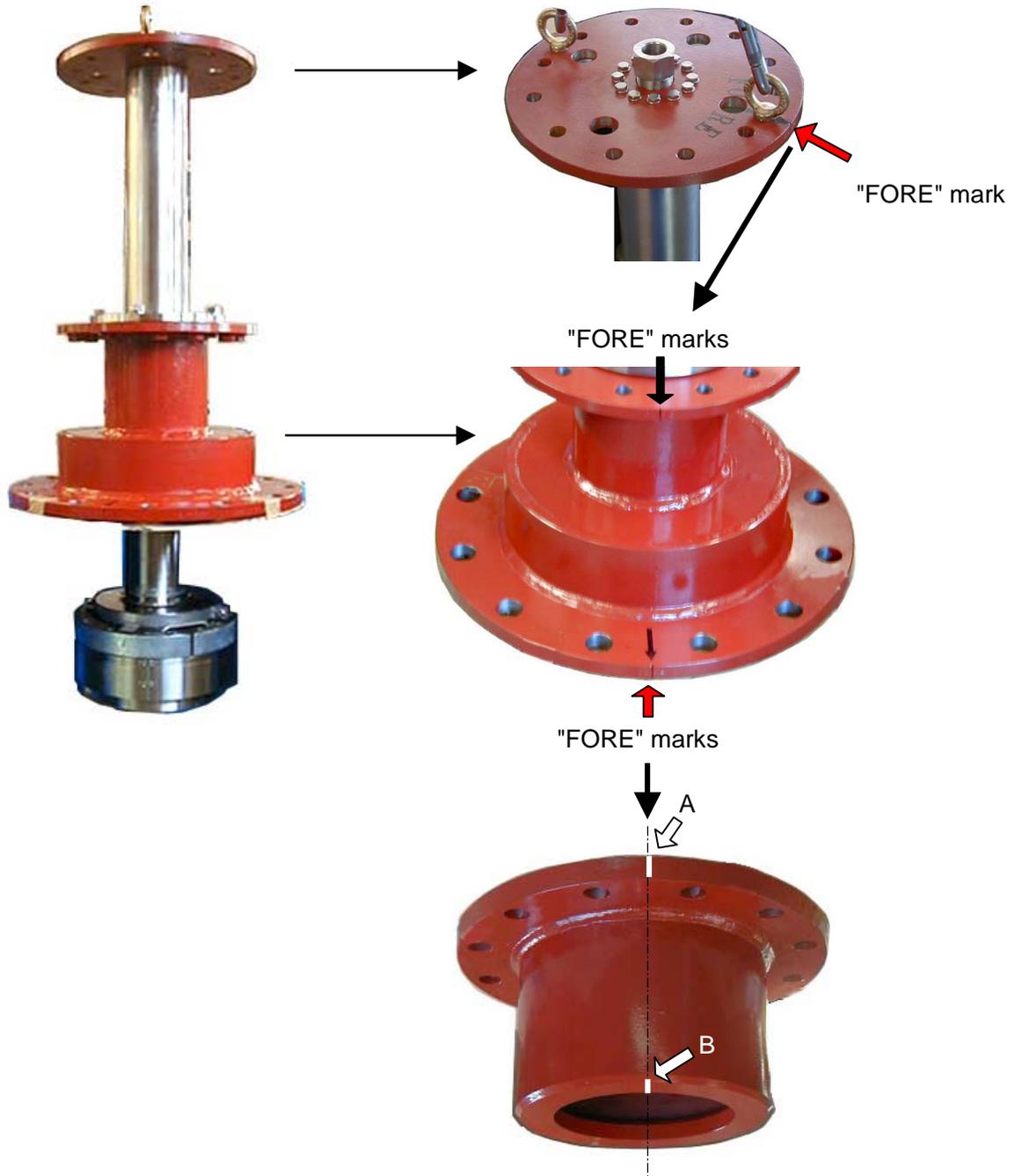


Fig.5-34 Orienting "FORE" marks

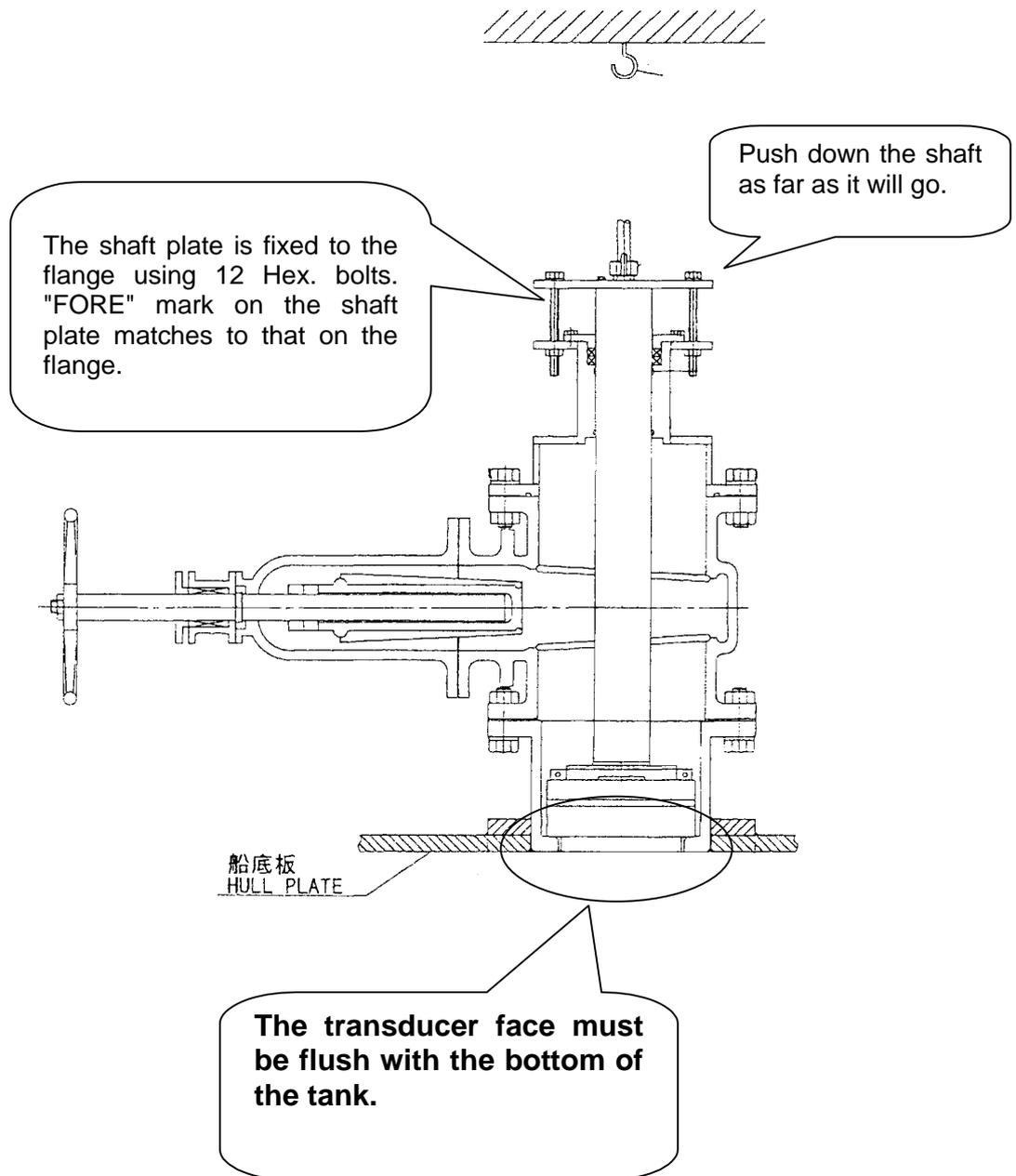
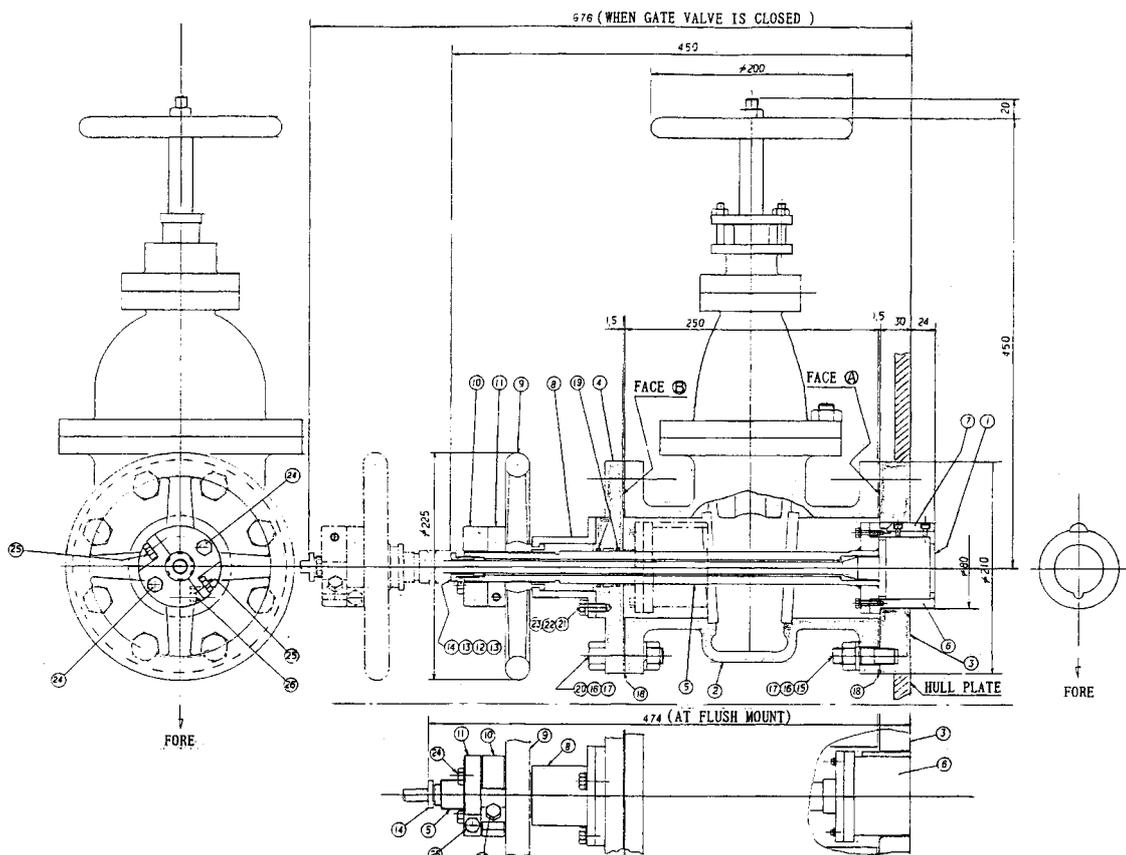


Fig.5-35 Mounting transducer

5.6 Installation of DS-80 transducer

5.6.1 Gatevalve tank: DS-782

Type: DS-782



No.	NAME	Q'TY	No.	NAME	Q'TY
1	TRANSDUCER	1	14	CABLE GLAND	1
2	GATEVALVE	1	15	STUD BOLT	8
3	HULL FLANGE	1	16	SPRING WASHER	16
4	UPPER FLANGE	1	17	HEX. NUT	16
5	RETRACTION SHAFT	1	18	GASKET	2
6	TRANSDUCER CASE	1	19	O-RING	2
7	TURNING STOPPER	1	20	HEX. BOLT	8
8	LOCK RING	2	21	FLAT WASHER	4
9	HANDLE	1	22	SPRING WASHER	4
10	SPACER	2	23	BOX. BOLT	4
11	LOCK RING	1	24	HEX. BOLT	2
12	GASKET	1	25	HEX. BOLT	2
13	SECURE RING	2	26	HEX. BOLT	1

Fig.5-36 DS-80 gatevalve tank: DS-782

(1) Weld the hull flange (3) to the hull bottom with the FORE mark pointing toward the bow direction and reference marks on the side of the hull flange aligned with the fore-aft line.

- Fore-aft alignment is accurate within ± 1 degree.
- The flange must be parallel to the draft line within ± 1 degree.
- Grind the welding area outside the hull bottom to accomplish flatness.

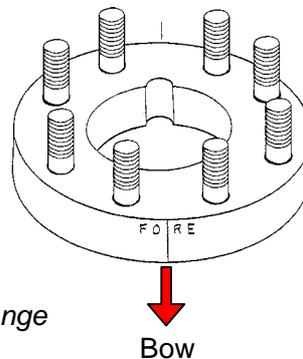


Fig.5-37 Bottom flange

(2) Apply KINORUSTER or alternative anticorrosive sealant to the flanges and the gasket as shown in Fig. 5-32. Use the sealant for both side of the gasket.

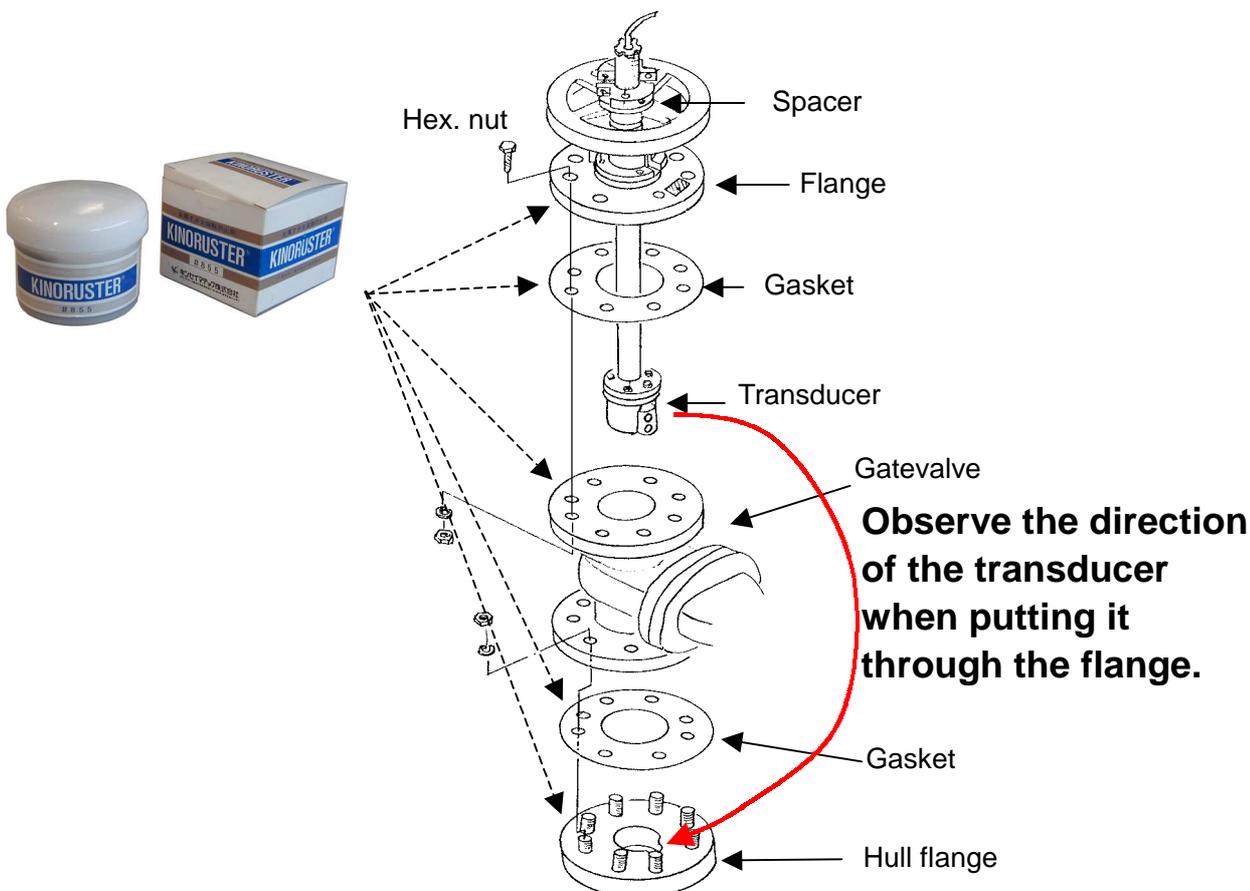


Fig.5-38 Gatevalve DS-782, enlarged

(3) Mounting transducer

Insert the transducer into the head cap so that the protuberance of the transducer engages to location mark. Then, fix the transducer to the head cap with the Hex. bolts.



The protuberance of the transducer points toward fore direction.

Fig.5-33 Transducer (DS-820)

Remove Hose clamp.



Never remove screws.

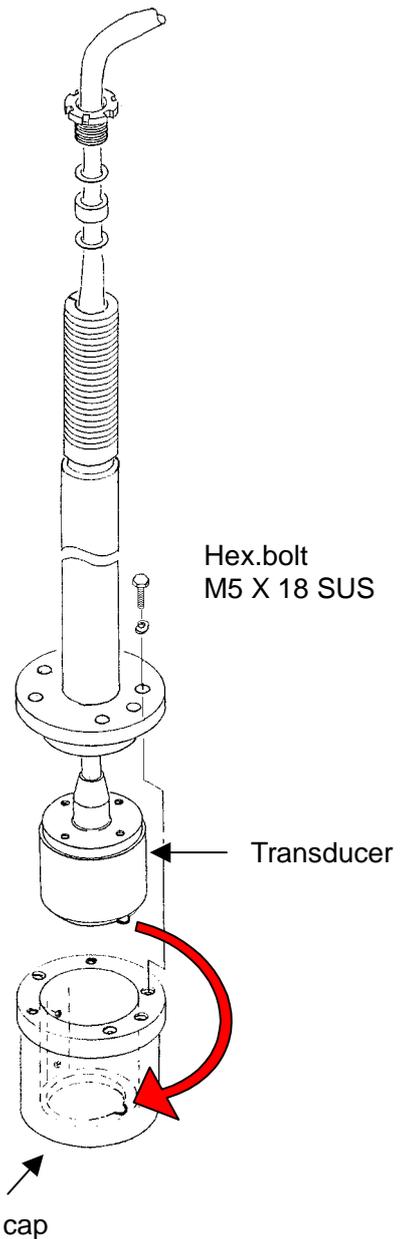
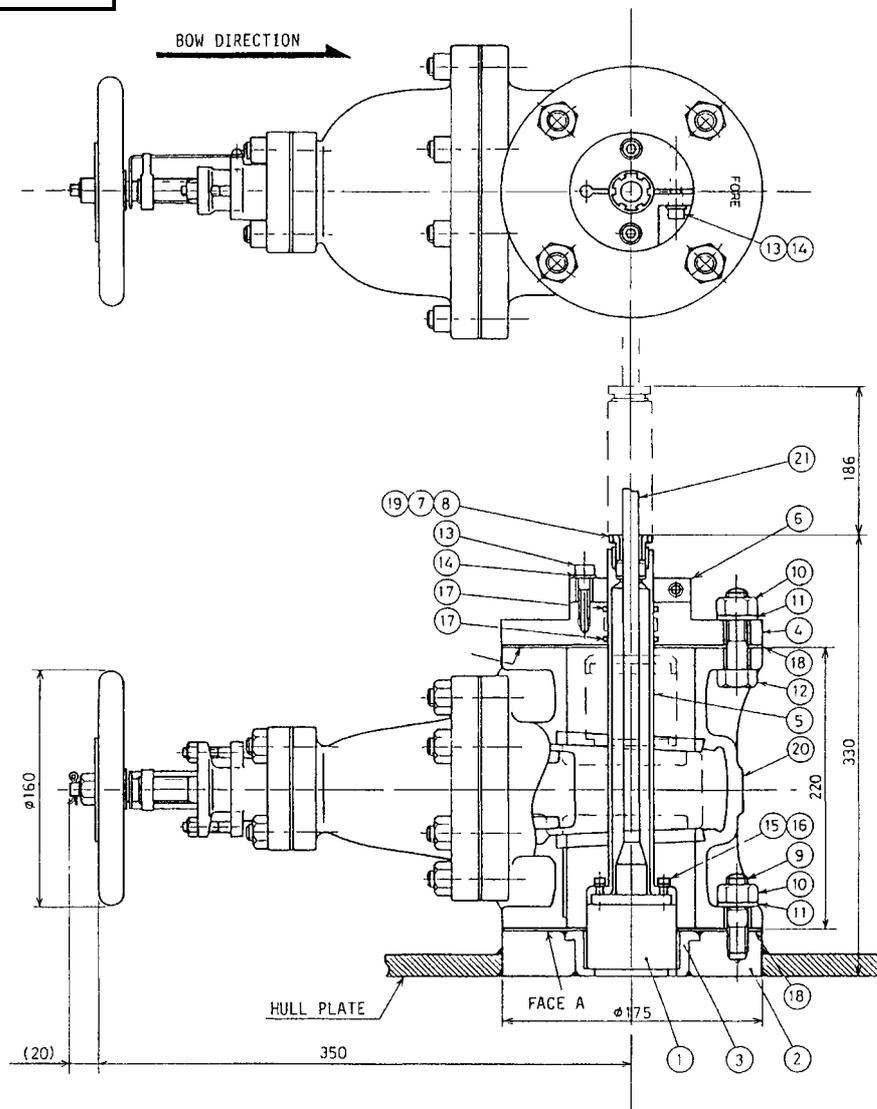


Fig.5-39 Mounting transducer

5.6.2 Gatevalve tank: DS-786

Type: DS-786



No.		Q'TY	No.		Q'TY
1	TRANSDUCER		12	HEX.BOLT	
2	HULL FLANGE		13	HEX. SOCKET HEAD BOLT	
3	BUSHING		14	SPRING WASHER	
4	4FLANGE		15	HEX. SOCKET HEAD BOLT	
5	SHAFT		16	SEAL WASHER	
6	6 LOCKRING		17	O RING	
7	GASKET		18	GASKET	
8	WASHER		19	FIXING GLAND	
9	TAP-END STUD BOLT		20	GATE VALVE	
10	HEX. NUT		21	CONNECTION CABLE	
11	SPRING WASHER				

Fig.5-40 DS-80 gatevalve hull tank: DS-786

Mounting transducer

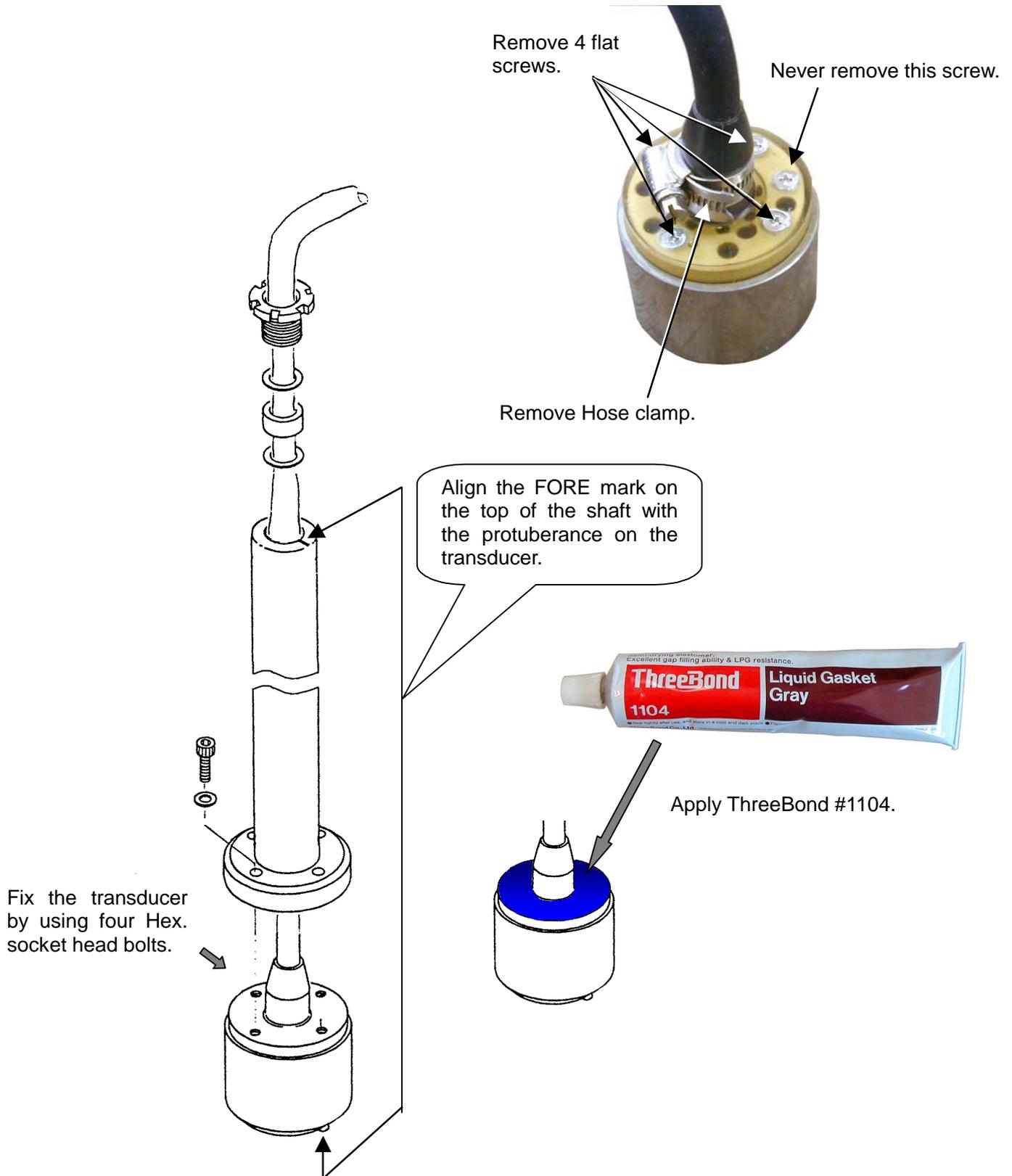


Fig.5-41 Mounting DS-80 transducer

Weld the hull flange with FORE mark aligned to the bow direction and the reference marks to the fore-aft line.

- Fore-aft alignment is accurate within ± 1 degree.
- The flange must be parallel to the draft line within ± 1 degree.
- Grind the welding area outside the hull bottom to accomplish flatness.

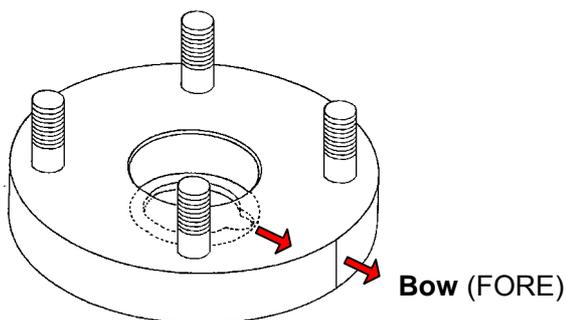


Fig.5-42 Mounting bottom flange

Apply KINORUSTER or alternative anticorrosive sealant to the flanges and the gasket as shown in Fig. 5-32. Use the sealant for both side of the gasket.



Align FORE mark on the flange with that on the bottom flange.

Align FORE mark on the top of the shaft with that on the flange.

Confirm that the transducer face flushes with the hull bottom.

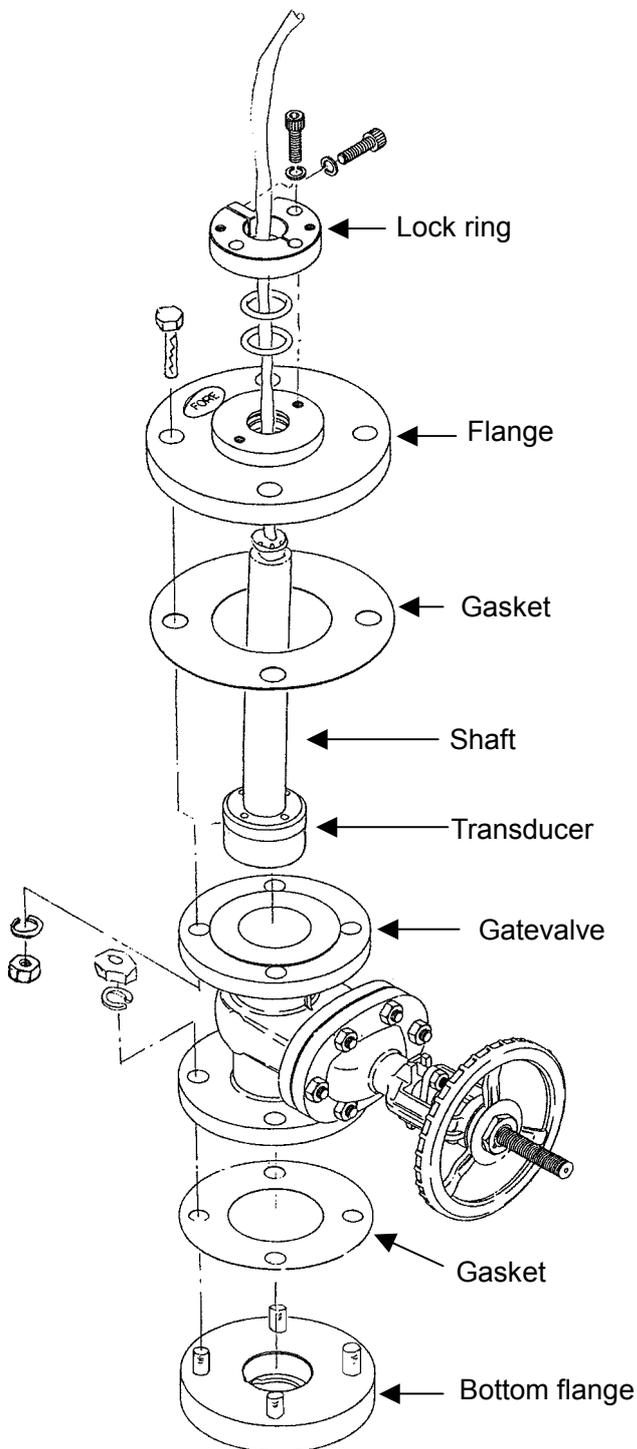
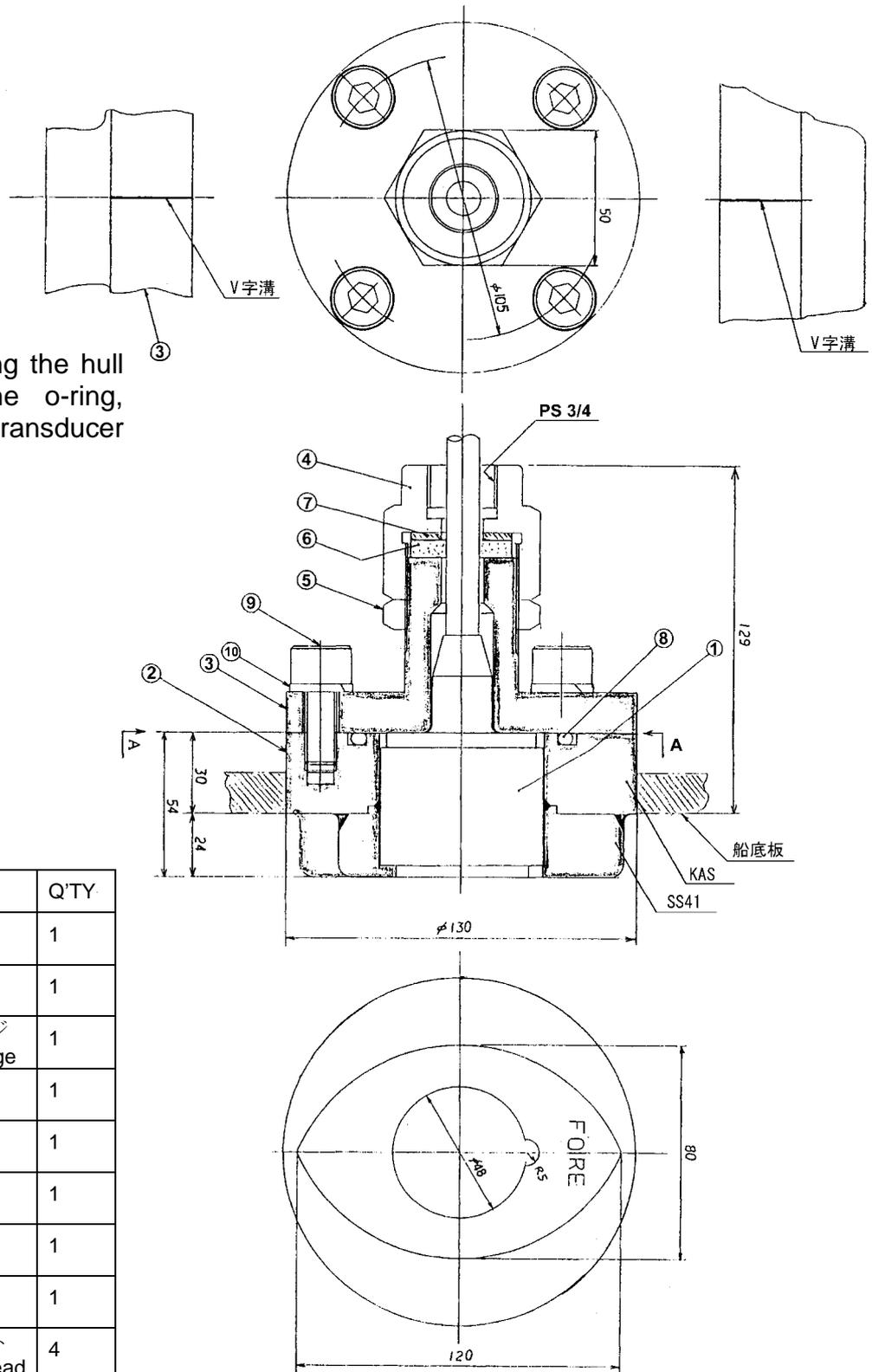


Fig.5-43 DS-786 enlarged

5.6.3 Hull tank: DS-783

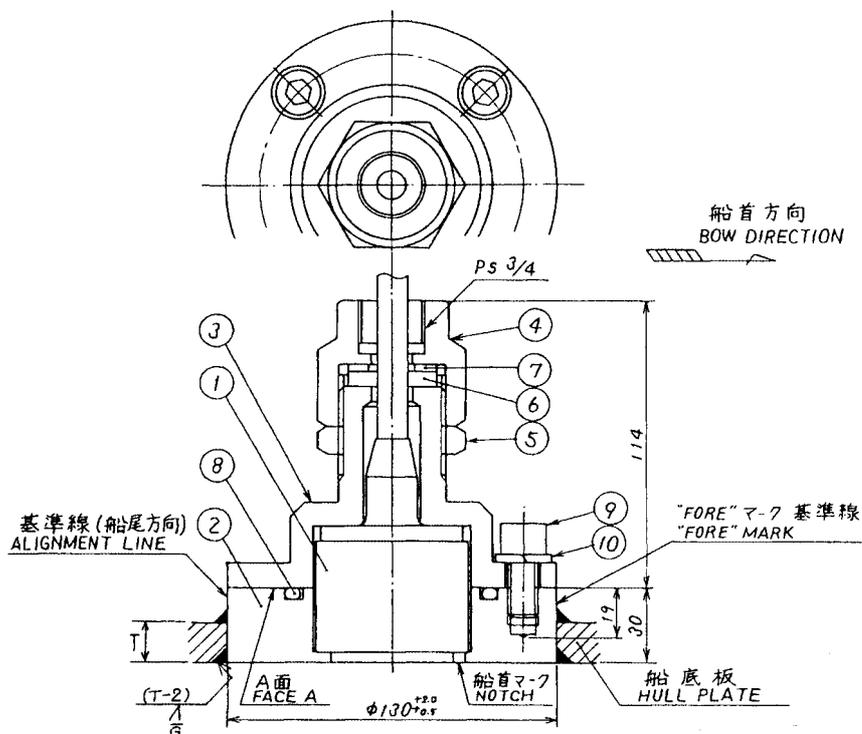


Note: Before welding the hull flange, remove the o-ring, transducer and transducer flange.

No.	NAME	Q'TY
①	送受波器 Transducer	1
②	船底フランジ Flange	1
③	送受波器フランジ Transducer Flange	1
④	キャップナット CAP NUT	1
⑤	トメナット Nut	1
⑥	ガスケット Gasket	1
⑦	平座金 FlatWasher	1
⑧	○ リング O-Ring	1
⑨	六角穴付きボルト Hex. Socket Head bolt	4
⑩	バネ座金 Spring Washer	4

Fig.5-44 Hull tank: DS-783

5.6.4 Hull Tank : DS-784



Note: Before welding the hull flange, remove the o-ring, transducer and transducer flange.

ITEM	NAME	Q'TY
①	送受波器 Transducer	1
②	船底フランジ Flange	1
③	送受波器フランジ Transducer Flange	1
④	キャップナット CAP NUT	1
⑤	トメナット Nut	1
⑥	ガスケット Gasket	1
⑦	平座金 FlatWasher	1
⑧	O リング O-Ring	1
⑨	六角穴付きボルト Hex. Socket Head bolt	4
⑩	バネ座金 Spring Washer	4

Fig.5-45 Hull tank: DS-784

Apply KINORUSTER or alternative anticorrosive sealant to the o-ring groove, o-ring, transducer flange and Hex. nut.



Engage the protuberance of the transducer to the slot of the hull flange.

FORE mark on the bottom points toward the fore direction. Weld the flange with reference marks aligned to the fore-aft line. (Accuracy: within 1 degree)

The flange must be parallel to the draft line within ± 1 degree. Grind the welding area outside the hull bottom to accomplish flatness.

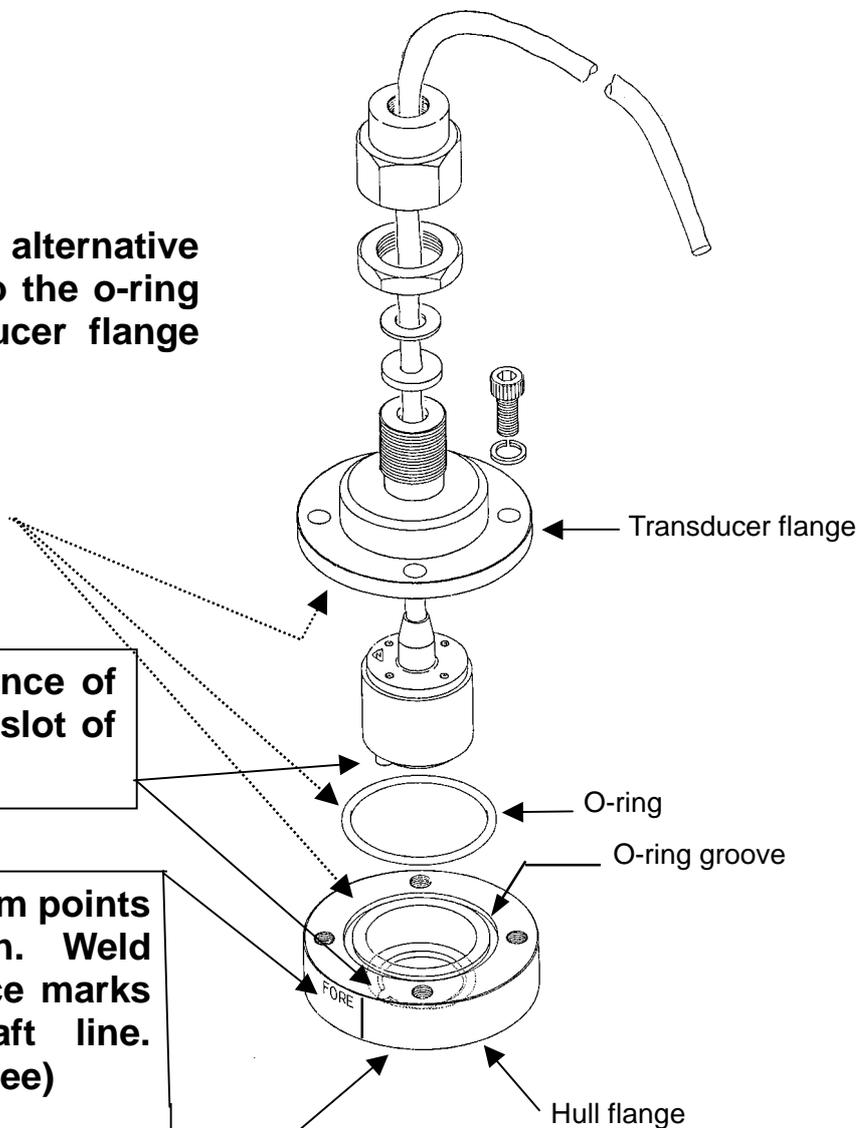


Fig.5-46 DS-784 enlarged

5.6.5 Protruded hull tank

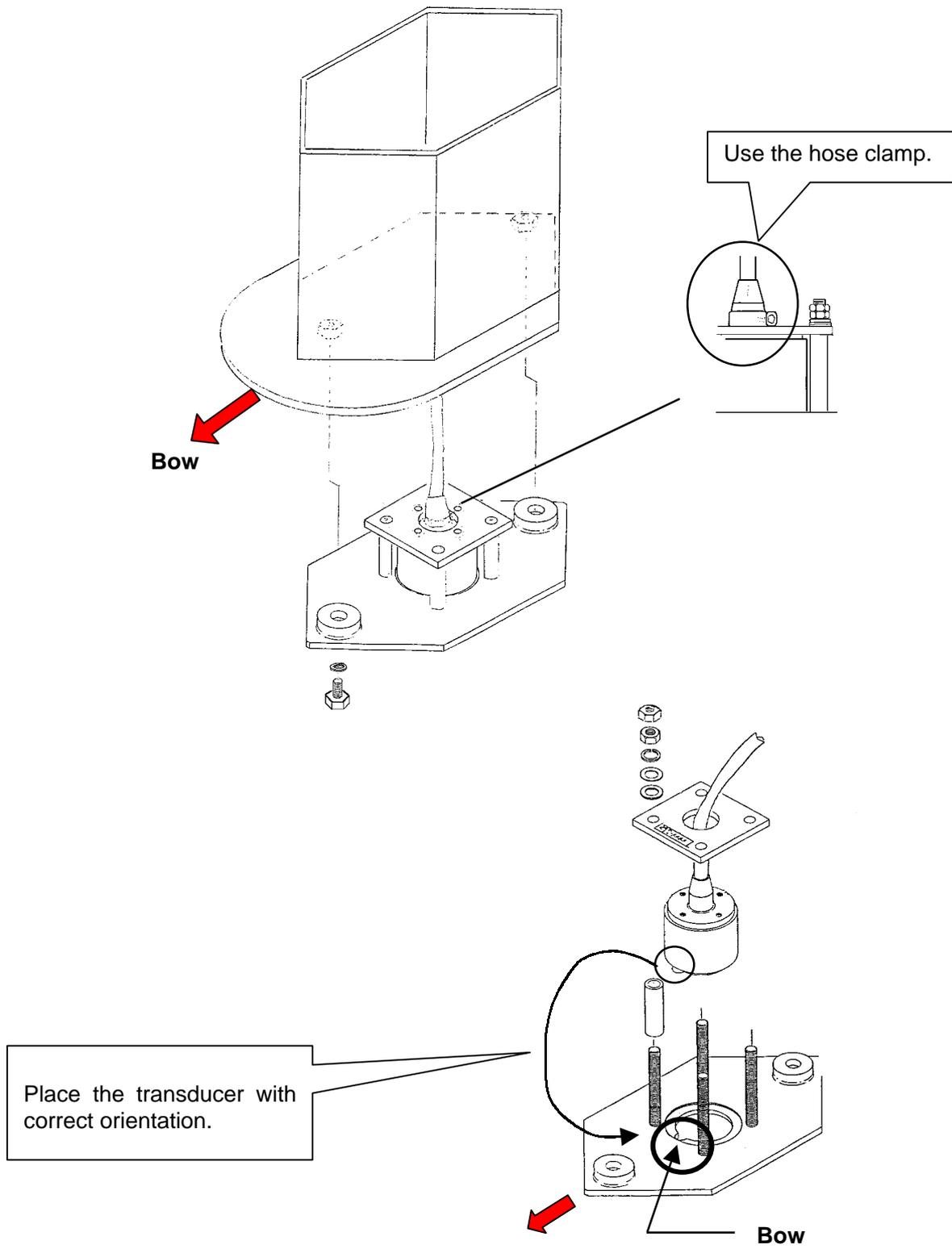


Fig.5-47 Mounting DS-781

5.7 Installing echosounder FE-700

Figure below shows an example of the installation of FE-700 on the switch board.



Fig.5-48 Installation of FE-700 echosounder

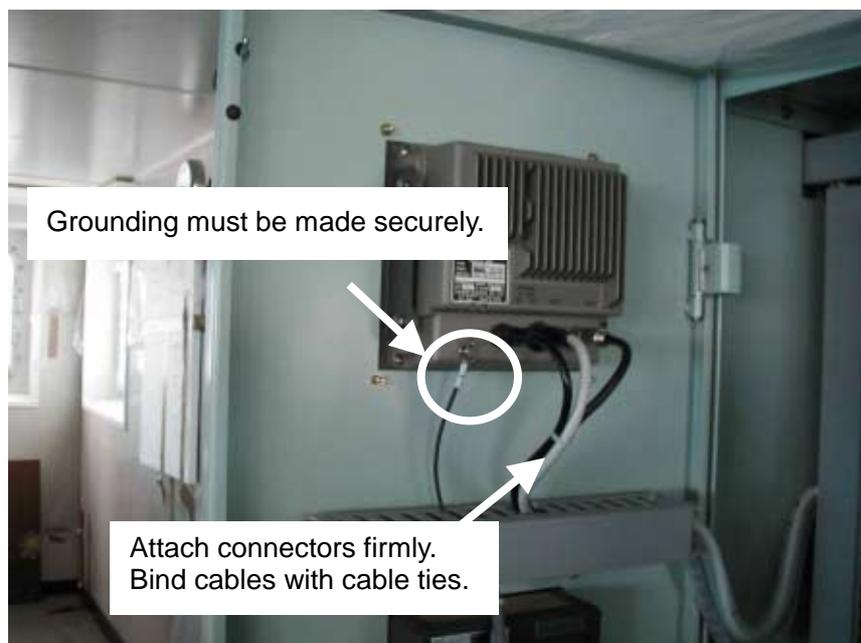


Fig.5-49 Rear side view of FE-700 echosounder

The processor unit is mounted inside the switch box.



Fig.5-50 Installation of FE-700 processor unit

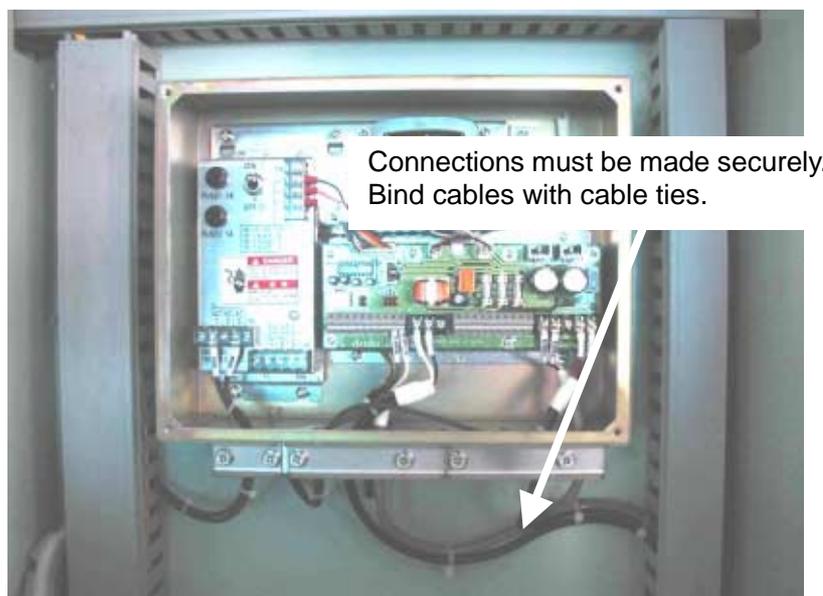


Fig.5-51 FE-700 processor unit, enlarged

Matching box

Typically, the matching box is installed in the engine room. Connect the cables correctly. Cut the transducer cable to length.



For 200KHz
Matching Box MB-504

For 50KHz
Matching Box MB-502

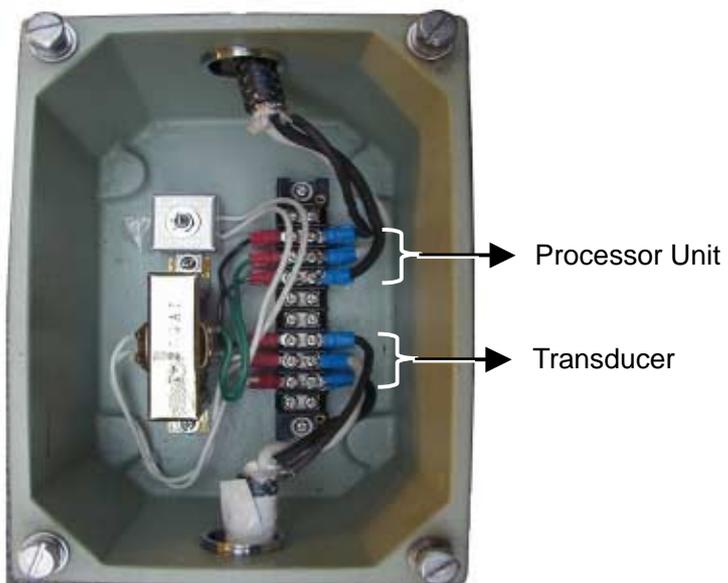


Fig.5-52 Installation of FE-700 matching box

Transducer cable /flange

Fix the transducer cable to the cable guide.



Fix the transducer cable to the cable guide.

Tighten the cable gland securely.

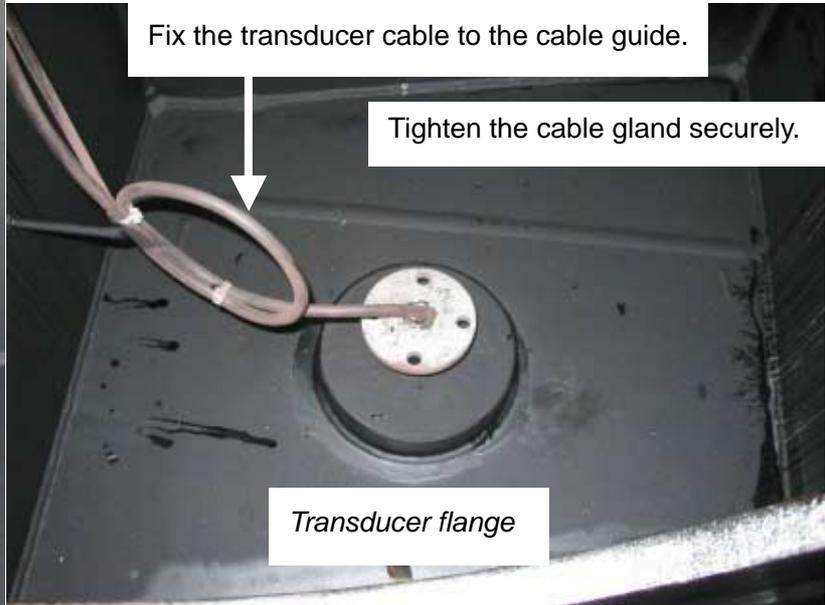


Fig.5-53 Transducer cable

Do not paint to the face of transducer.

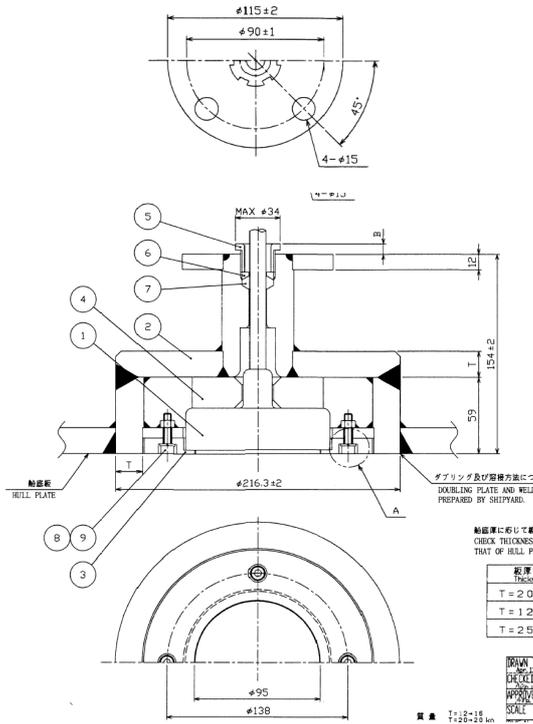


Completed.

Paint around the transducer.

Fig.5-54 Hull bottom

Inner Hull Tank TTF-2000



9	バネ座金 SPRING WASHER	SUS304	4	M6
8	六角穴付きボルト HEX. S.H.C.SCREW	SUS304	4	M6×25
7	ゴムパッキン GASKET	CR	1	TPB-11-08
6	座金 WASHER	C3604B	1	TPB-11-07
5	締付けグランド GLAND NUT	C3604B	1	JIS F8801 20 1a
4	押えゴム DAMPER	CR	1	TTF-2000-03
3	取付フランジ FIXING FLANGE	SUS304	1	TTF-2000-02
2	タンク本体 CASING	KSTPG370	1	TTF-2000-01
1	送受波器 TRANSDUCER		1	200B-8B

● The transducer tank should be welded flush with ship's hull plate.

● Peel off surface of welding part of casing '2' before welding.

● To avoid distortion by heat, put "Fixing flange" without transducer, damper, and gasket onto casing while welding.

● Material of tank meets NK standard KSTPG370.

● The transducer tank is finished by zing flake chromated dispersion coating.

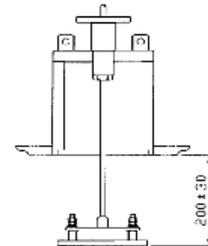
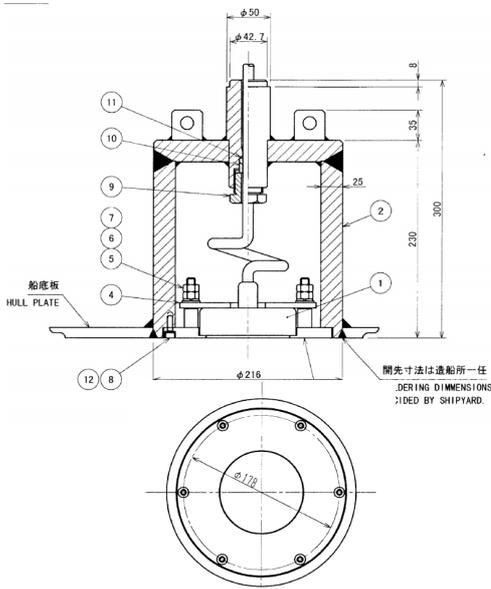
● It is recommended to apply epoxy shop primer of high adhesion from coating.

● Do not paint transducer face.

● Tighten grand nut so that dimension 'B' becomes between 7.0 mm and 7.5 mm.

● Fill the space of position 'A' and the gap between casing and fixing flange with silicone after attaching the transducer.

Inner Hull Tank TTF-2001

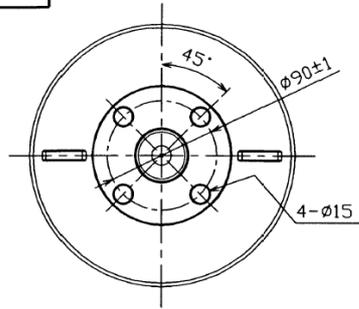


12	バネ座金 SPRING WASHER	SUS304	6	M6
11	防水ゴム PACKING	CR	1	TWB-1009
10	防水ゴム押え金具 WASHER	SUS316	1	65-007-6006
9	締付ナット TIGHTENING NUT	SUS316	1	65-007-6005
8	六角穴付きボルト HEX. BOLT	SUS304	6	M6X20
7	六角ナット HEX. NUT	SUS304	8	M10
6	バネ座金 SPRING WASHER	SUS304	4	M10
5	平座金 FLAT WASHER	SUS304	4	M10
4	押え板 FIXING PLATE	SS400	1	02-129-7012
3	フランジ FLANGE	SUS316L	1	02-129-7011
2	タンク本体 CASING	KSTPG370	1	02-129-6017
1	送受波器 TRANSDUCER		1	200B-8B
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. No.

Inner Hull Tank: TTF-2002

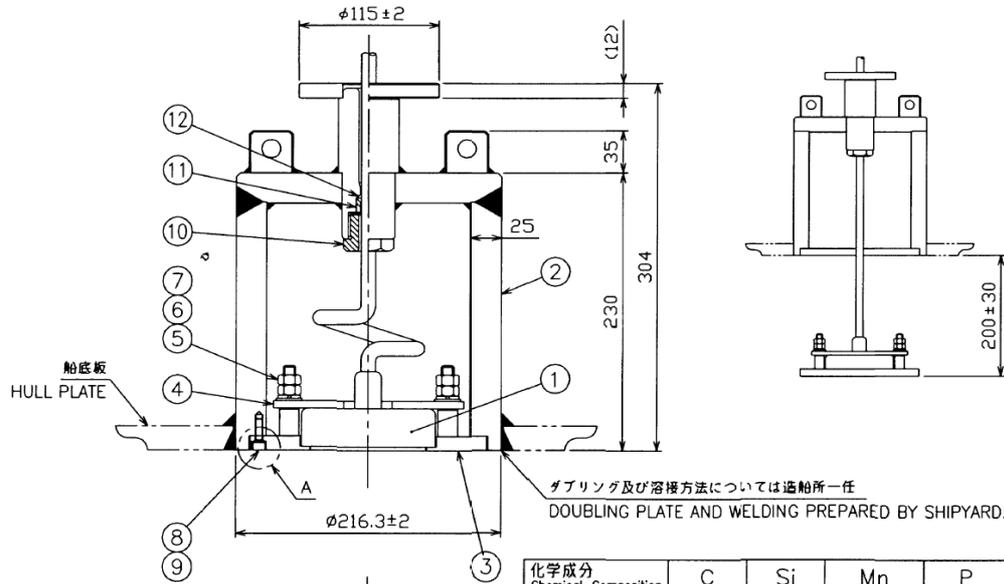
FREQUENCY

注

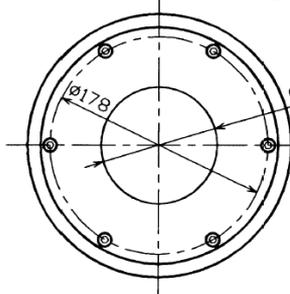


寸法範囲 (mm) Dimension	公差 (mm) Tolerance
$L \leq 50$	± 1.5
$50 < L \leq 100$	± 2.5
$100 < L \leq 500$	± 3

表 2 (Table 2)

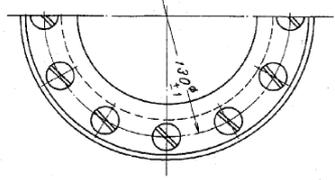
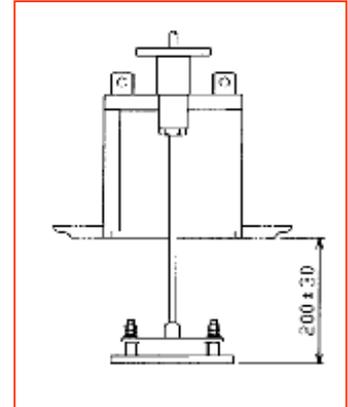
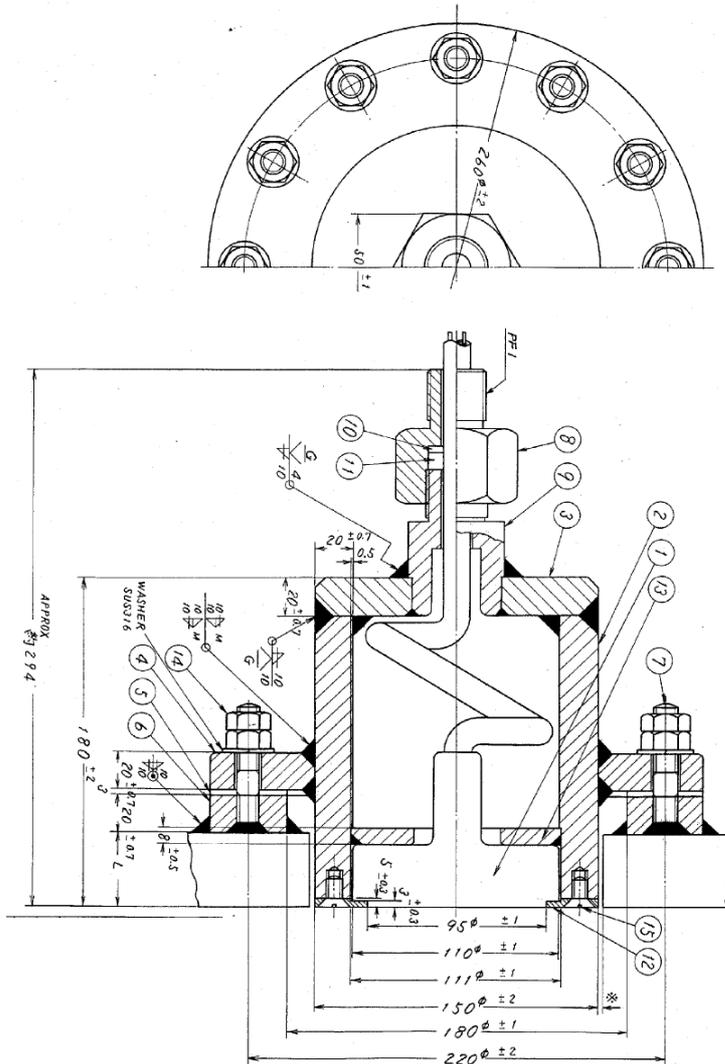


化学成分 Chemical Composition	C	Si	Mn	P
含有量 (%) Content (%)	0.25以下 or less	0.35以下 or less	0.30~0.90	0.040以下 or less



品名 NAME	材質 MATERIAL	数量 QTY	図番 DWG. NO.
12 防水ゴム GASKET	CR		1009
11 防水ゴム押え金具 WASHER	SUS316	1	65-007-6006
10 締付ナット TIGHTENING NUT	SUS316	1	65-007-6005
9 バネ座金 SPRING WASHER	SUS304	6	M6
8 六角穴付きボルト HEX. BOLT	SUS304	6	M6X20
7 六角ナット HEX. NUT	SUS304	8	M10
6 バネ座金 SPRING WASHER	SUS304	4	M10
5 平座金 FLAT WASHER	SUS304	4	M10
4 押え板 FIXING PLATE	SS400	1	02-129-7012
3 フランジ FLANGE	SUS316L	1	02-129-7011
2 タンク本体 CASING	KSTPG370	1	02-129-6017
1 送波器 TRANSDUCER		1	200B-8B

Inner Hull Tank TTS-2000-2



TTS-2000



Chapter 6. Basic installation knowhow

6.1 Cable termination

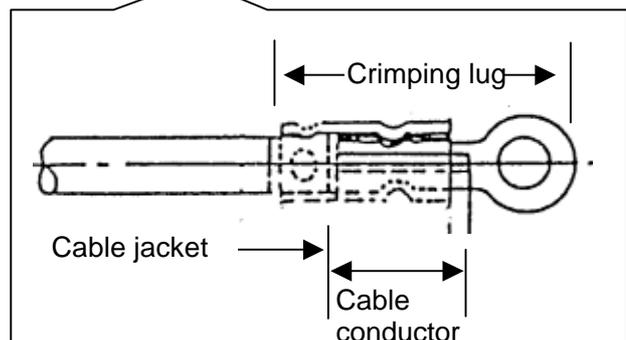
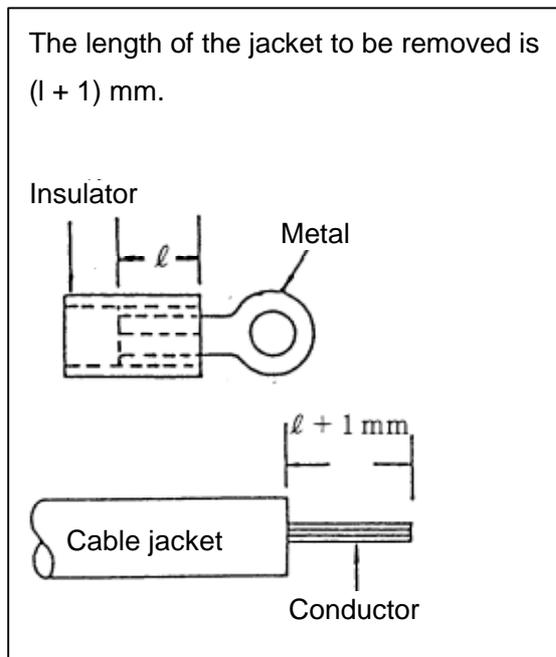
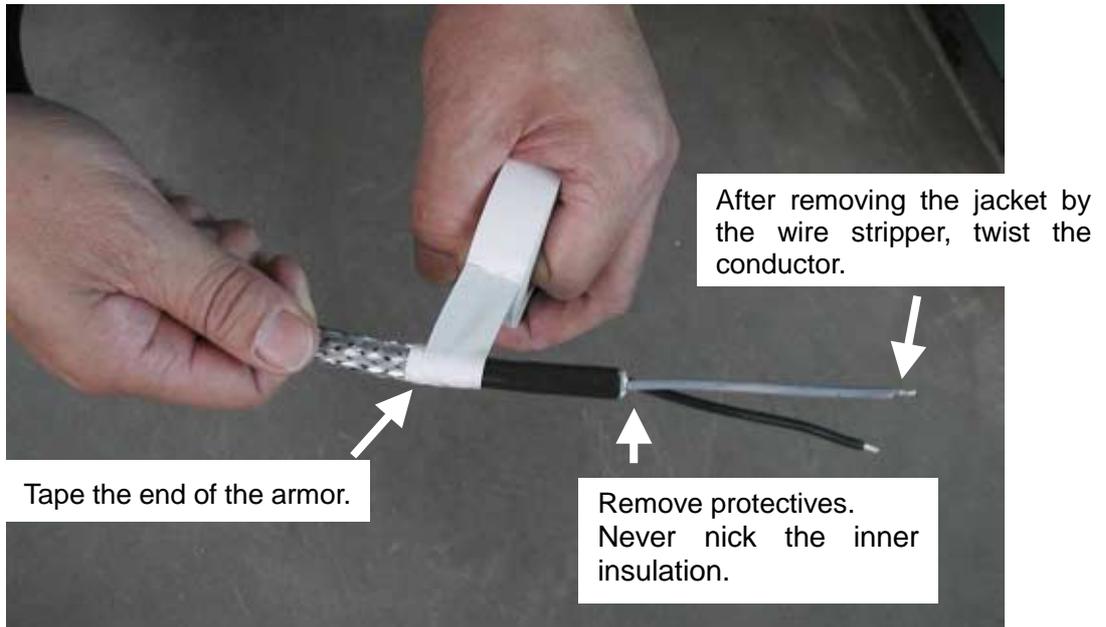
6.1.1 Fixing crimp-on lug

- 1) Use a crimper for correct gauge.
- 2) Use the proper size terminal for the wire.

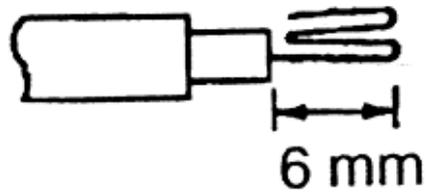
Tools (Example)

Tool	Model	Manufacturer	Photo
Insulated terminal crimper	MH-112	Minoru Kogyo	1
Insulated terminal crimper	CR1MPCX 34S	Izumi	2
Noninsulated terminal crimper	P-75	Hozan	3

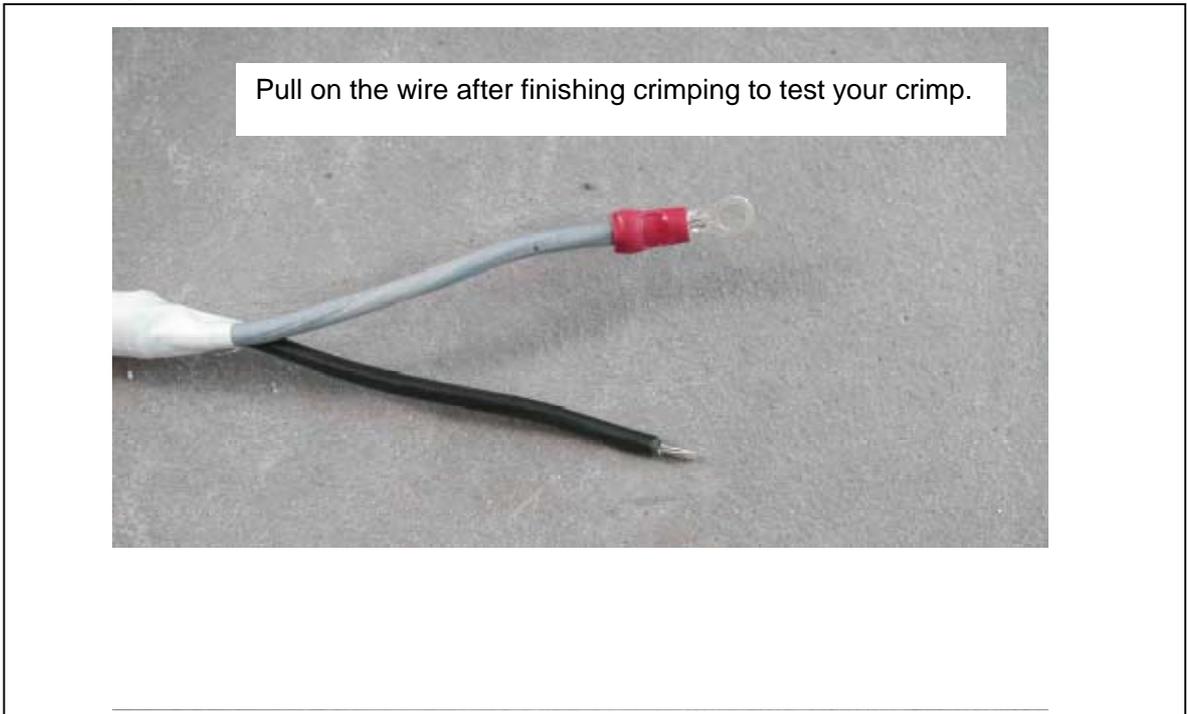




When crimping a lug on the coaxial cable, fold the conductor.



Finishing



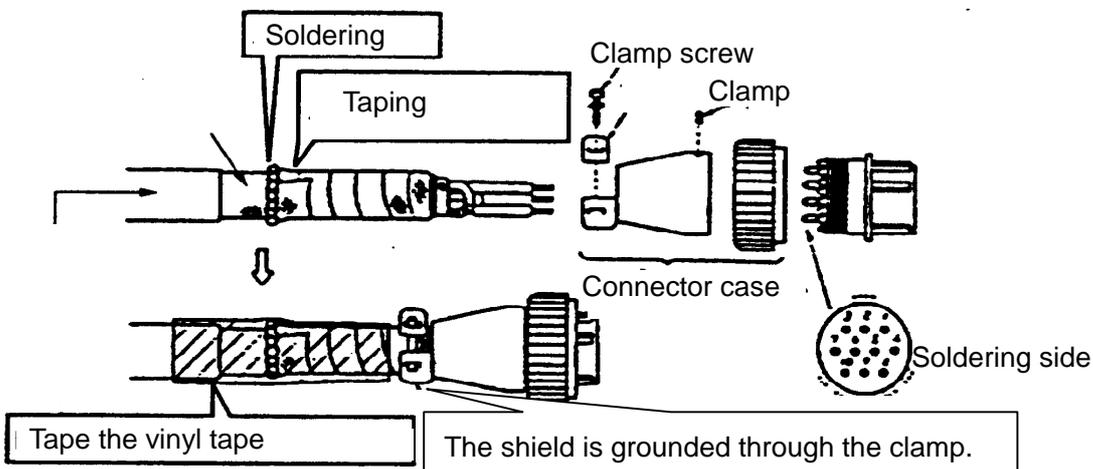
6.1.2 SRCN connector



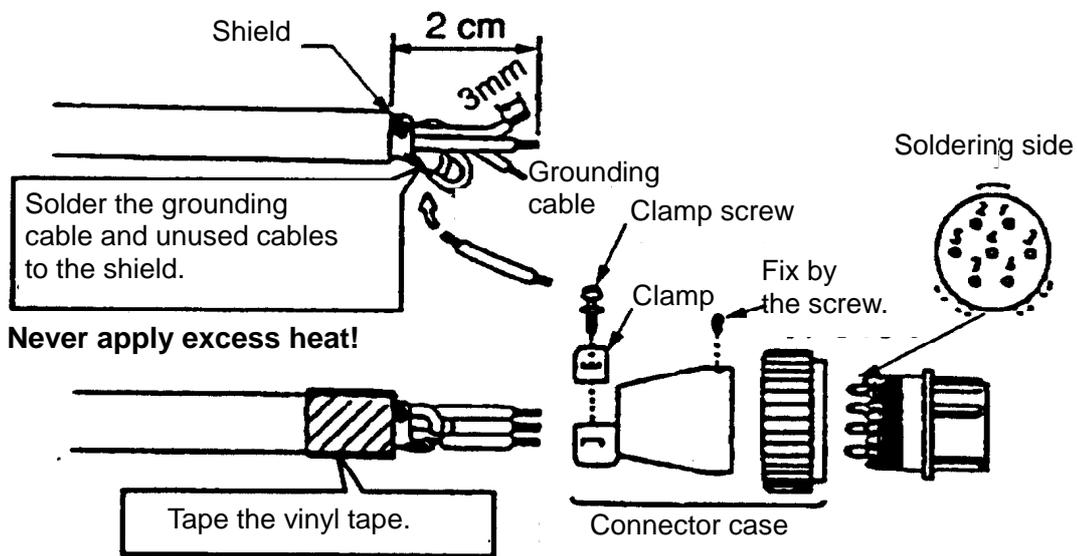
Wires must be soldered to pins properly.
Never burn the insulator by the soldering iron.

It is recommended to use heat shrink tubes, 7 mm in length to prevent pins from being short-circuited to the case.

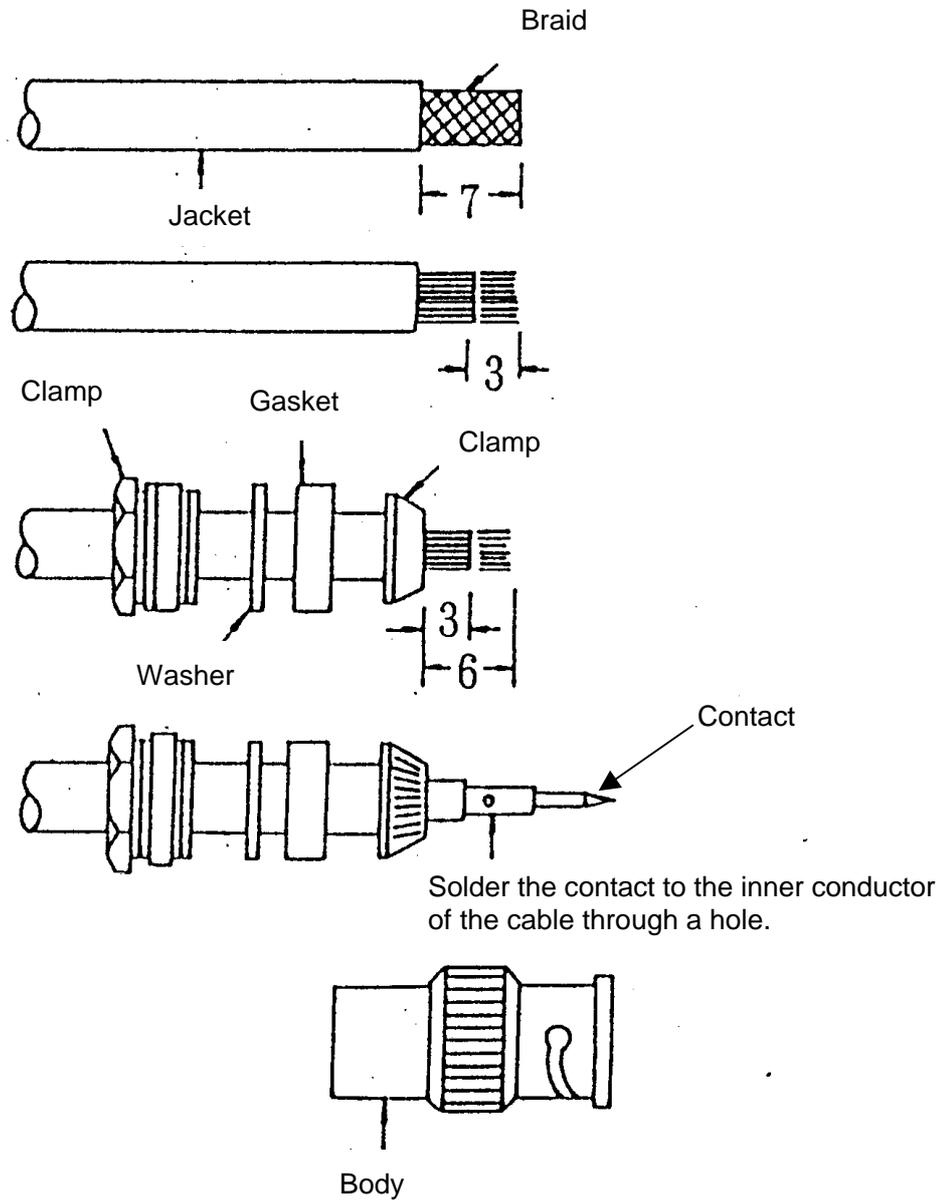
SRCN connector When grounding the grounding cable



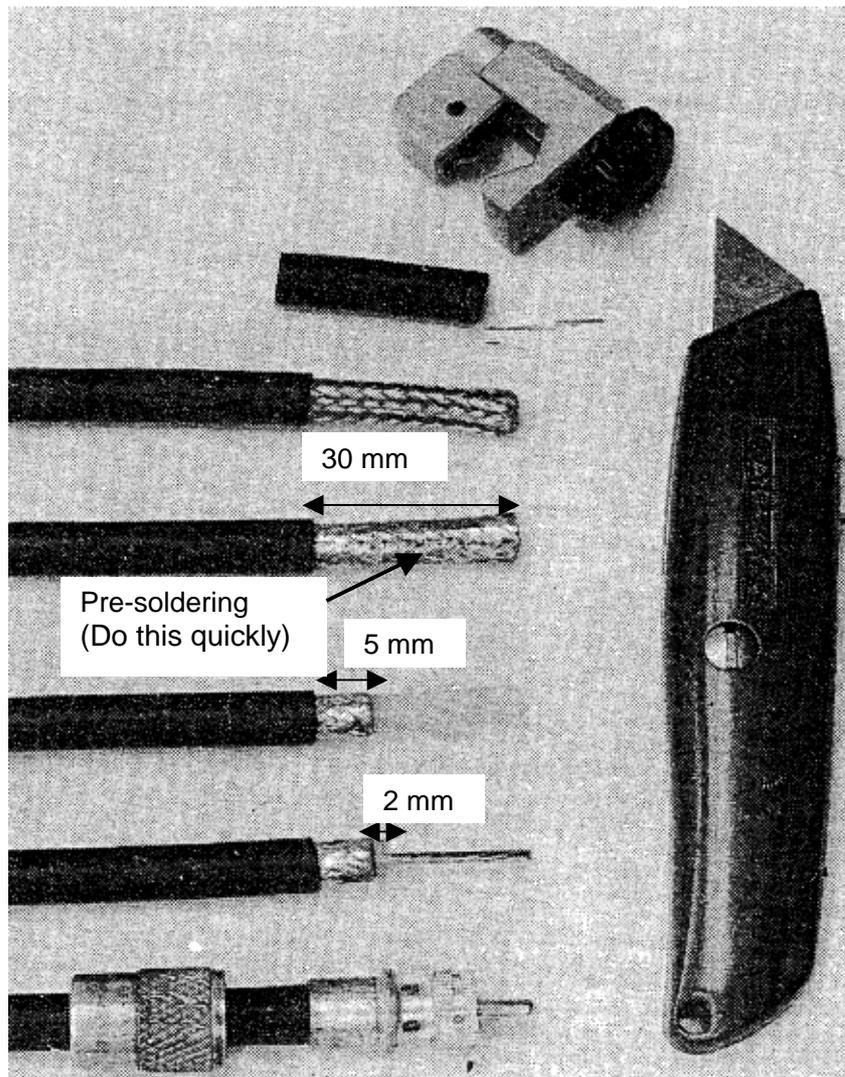
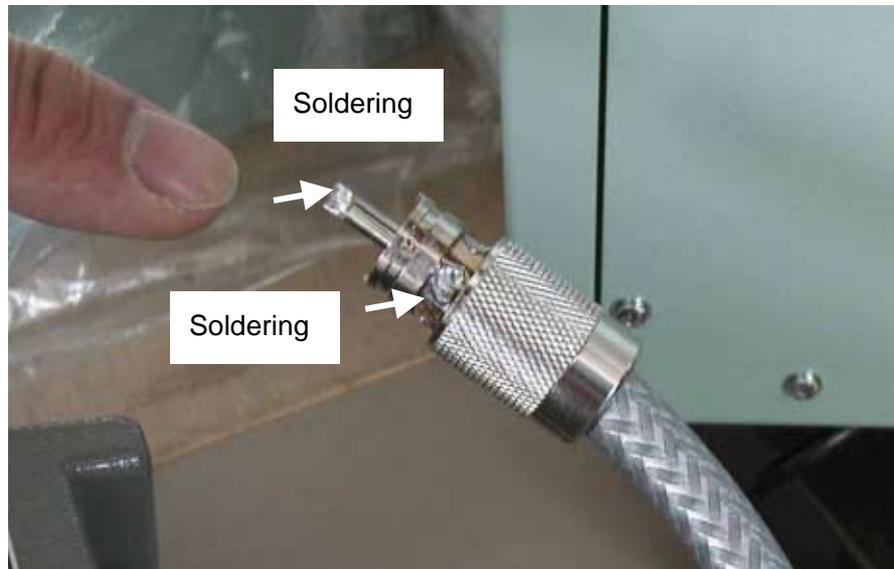
When not grounding the grounding cable



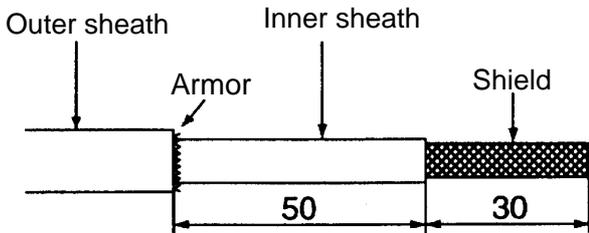
6.1.3 Fitting BNC coaxial connector



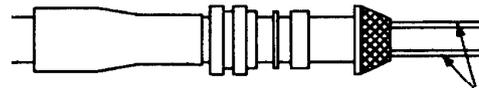
6.1.4 Fitting M-type coaxial connector



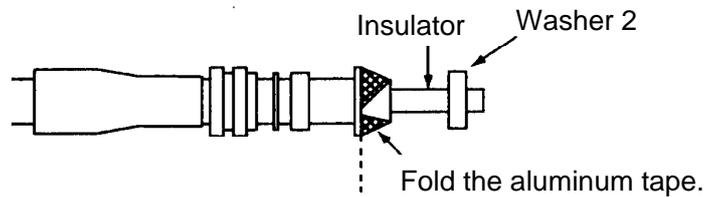
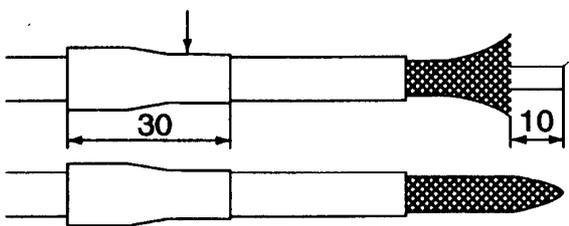
6.1.5 N-type coaxial connector (N-P-8DFB)



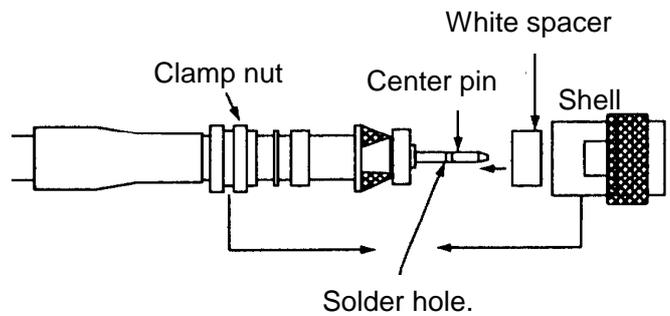
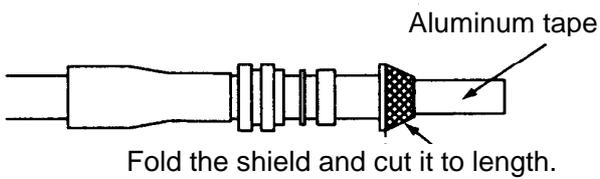
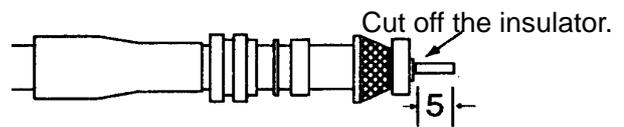
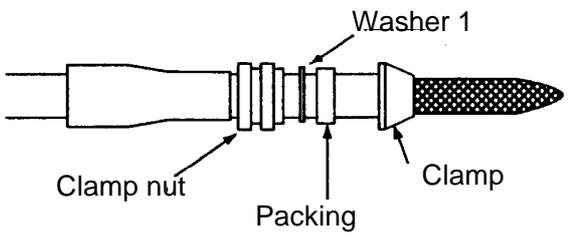
Cut a break to the aluminum tape every 90 degrees.



Heat shrinking tube



Cut the aluminum tape even.



6.2 How to solder

Use a suitable soldering iron!

Use 30 to 80 W soldering iron for indoor, 100 W or more for outdoor. Using the soldering iron of lower wattage results in bad soldering.

Use a good quality multicore solder (rosin-core solder); a standard 60 % tin, 40 % lead alloy solder with cores of non-corrosive flux.



Example Tin: Lead = 6: 4

The shape of the tip is important.
This type of the tip is ideal for soldering wires.



Example 15 to 150 W adjustable soldering iron

Procedure

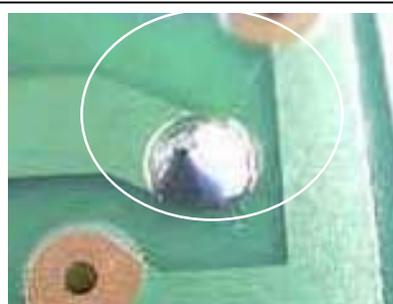
Apply a thin layer of solder to the part to be soldered.

Heat both parts of the joint by soldering iron.

In a couple of seconds, the two parts to be jointed will reach the solder's melting temperature. Now apply the solder to the point where parts of the joint and the soldering iron are all touching one another.

Remove the iron from the joint. Make sure that no parts of the joint move after the soldering iron is removed until the solder is completely hard.

Good and bad examples of the soldering



Good example



Bad example: Not enough temperature



Bad example:
Excess solder (causing
vibration problem)



Bad example:
Little solder (Half finished
appearance)



Bad example:
Bridge to other contact

Soldering connector plug

Multi-pin connector

1. Strip the jacket.



2. Twist conductors.



3. Apply a thin coating of the solder.



4. Cut the conductor to length.



5. Apply a thin layer of solder to the tap.



6. Put the heat shrinking tube over the sheath.



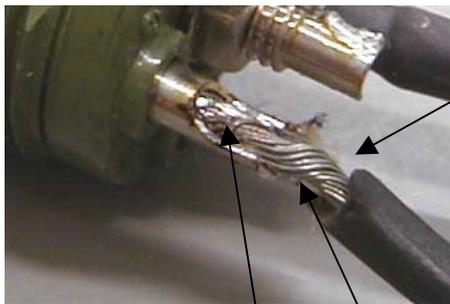
7. Place the tinned wire on the tap and heat them. When the solder starts melting, apply the end of the solder.



8. Use the right amount of solder. Do not move parts until the solder has cooled.



Bad example



Conductors are not thoroughly covered by solder because of low temperature.

Jacket is removed too long.

Too little of solder

9. Place the heat shrinking tube in place.



10. Heat the tube by the soldering iron.



Example: Connecting M-P connector

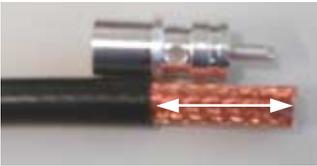
1. M-P connector



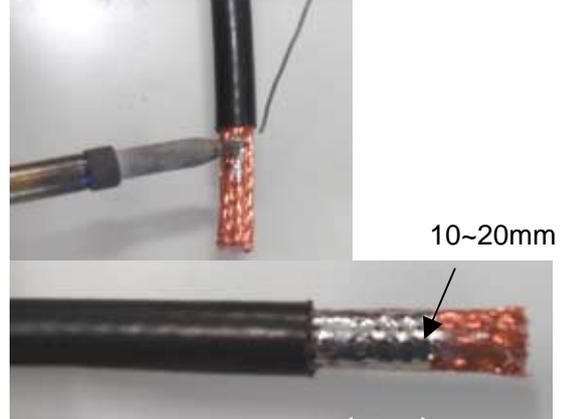
2. Slide the coupler over the cable.



3. Strip the cable 300 to 400 mm.
Do not nick the braid.



4. Apply a thin layer of solder.



5. Tape the soldered area.



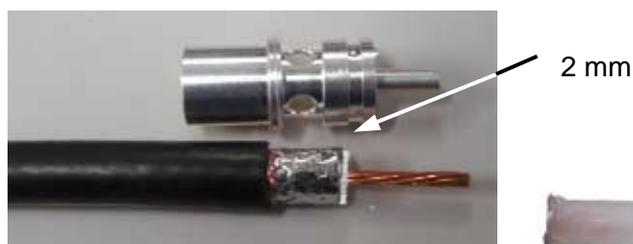
6. Mark 10 mm from the end.



7. Remove the shield from the mark.



8. Remove the insulator leaving it 2 mm from the shield end.



Never nick the center conductor.

10. Tin the end of the center conductor.



11. Insert the cable in the M-P connector as far as it will go.



12. Solder the connector and shield through holes.



13. Solder the center conductor.



Do not apply excess solder.

14. Trim the center connector.



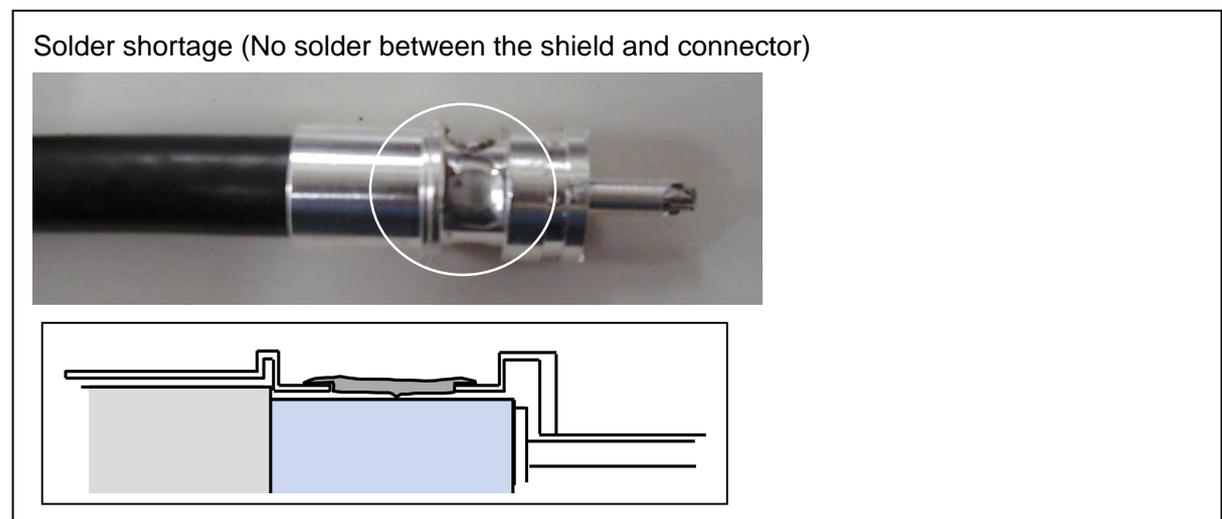
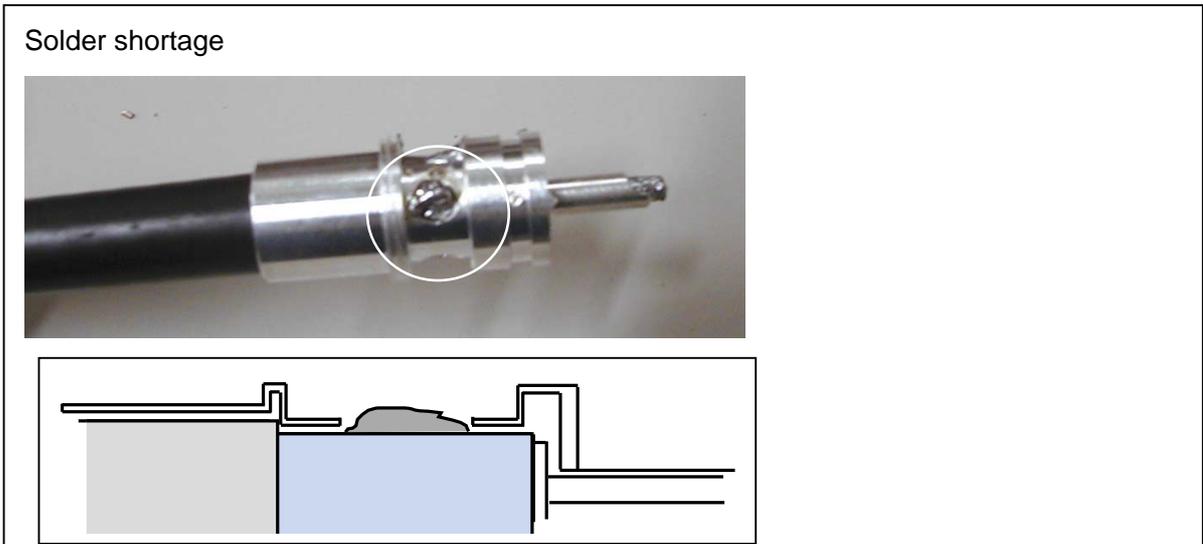
15. Be sure that the solder covers holes entirely with a smooth shiny appearance.



Appearance of good soldering



Bad example



6.3 Waterproofing by taping

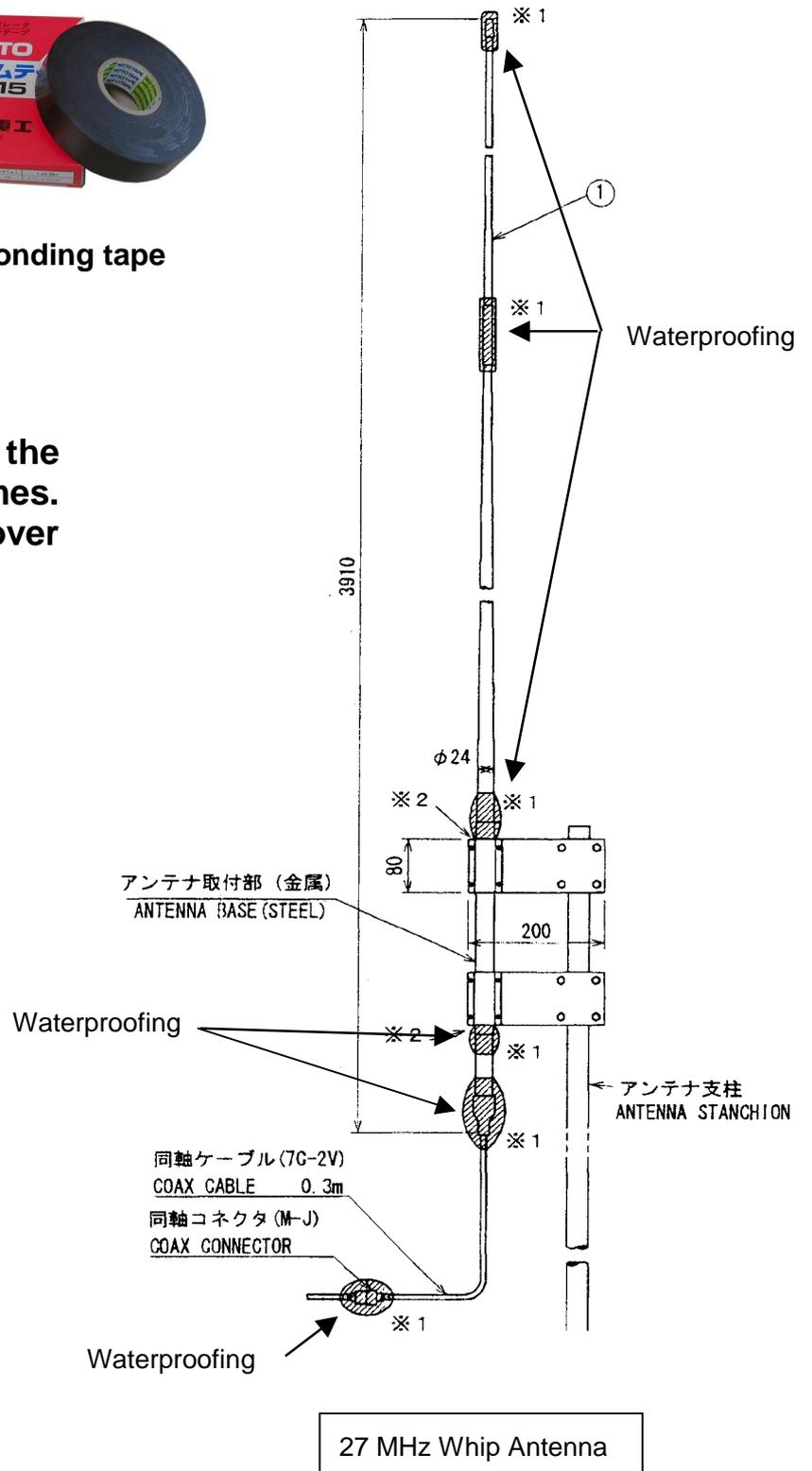


Vinyl tape

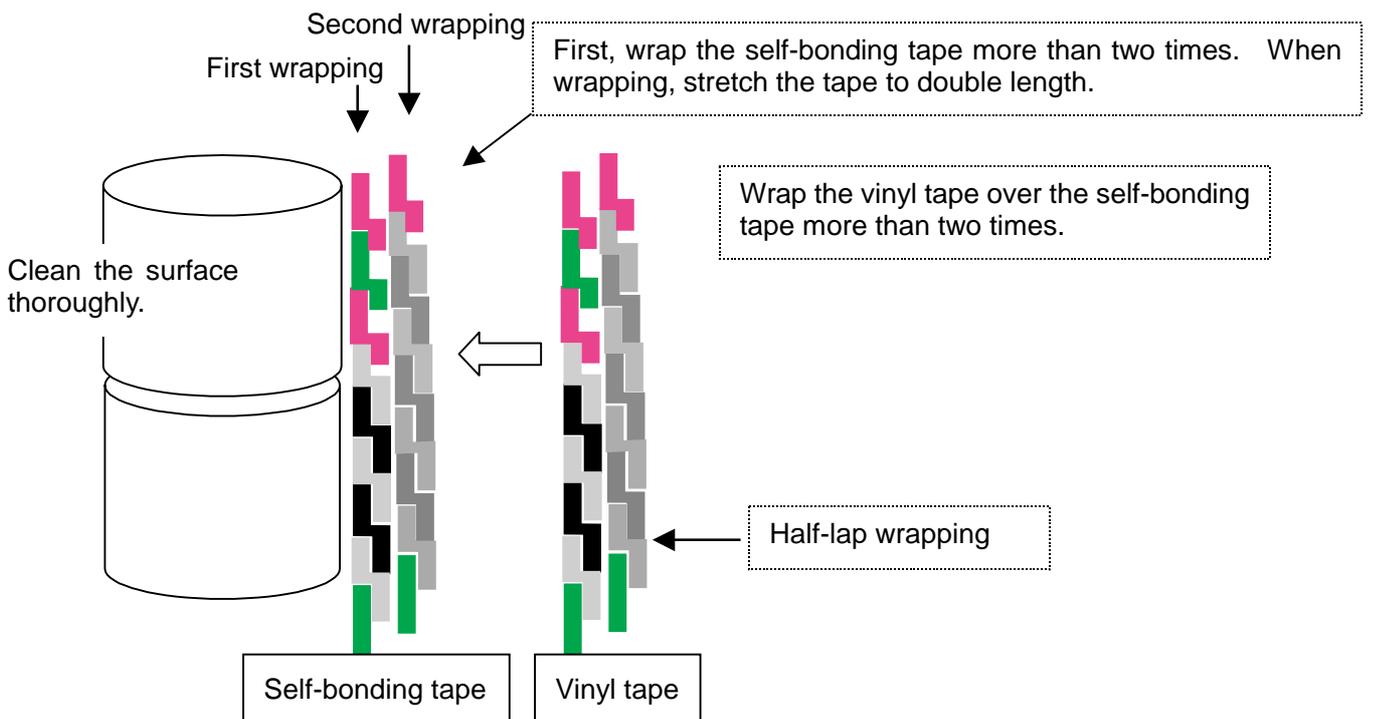
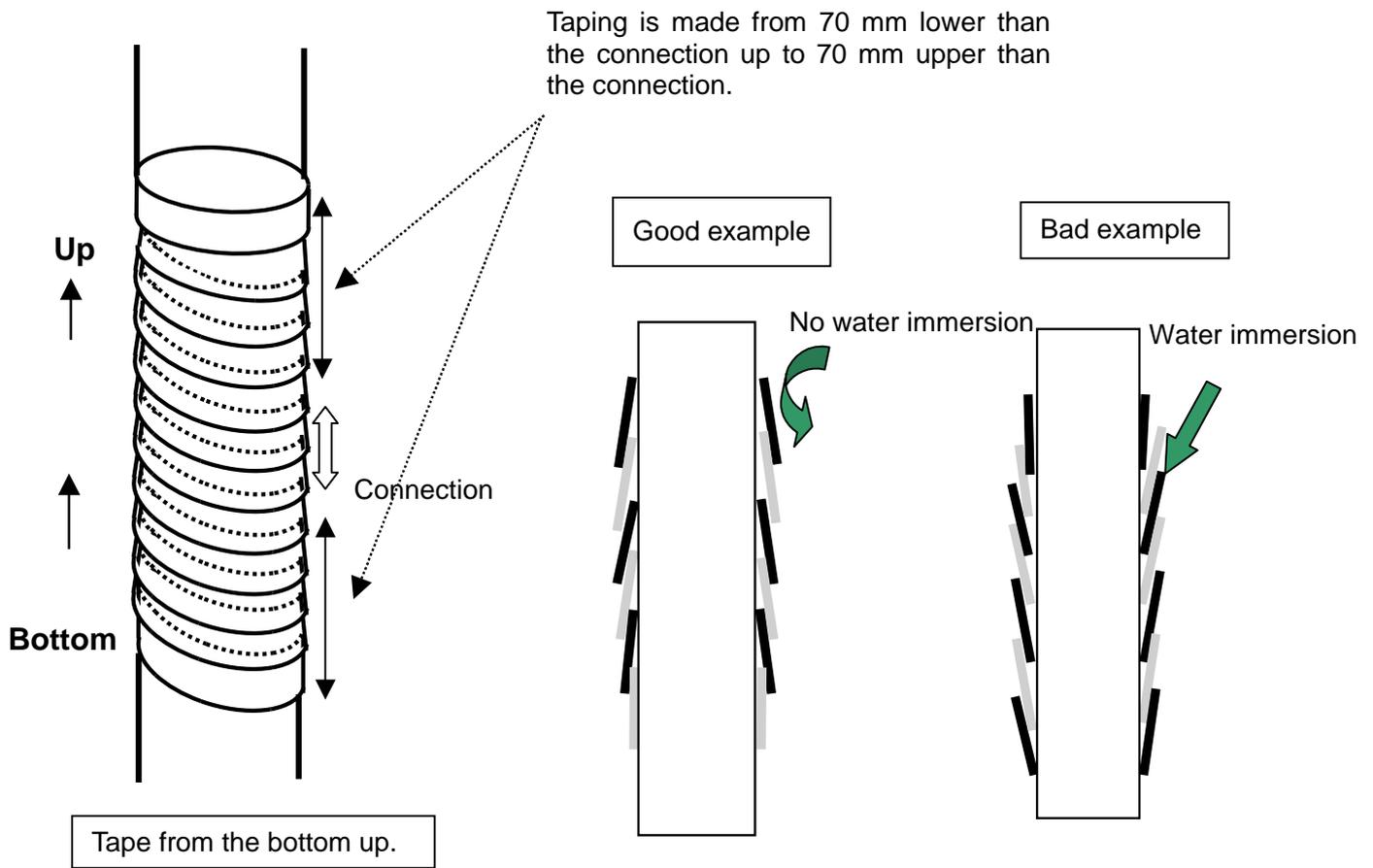


Self-bonding tape

For waterproofing, wrap the self-bonding tape three times. Then, wrap vinyl tape over the self-bonding tape.



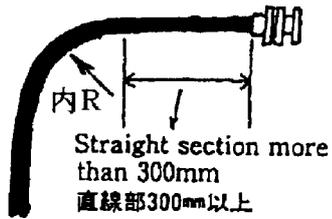
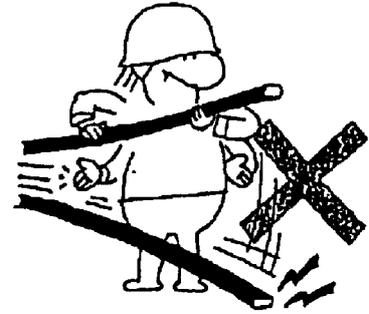
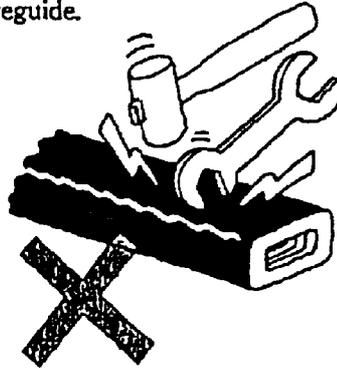
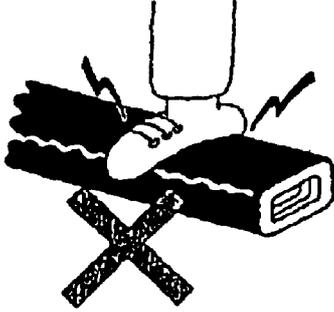
How to tape



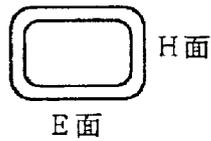
Chapter 7. Radar waveguide

(1) Caution on handling waveguide

Be careful not to deform the waveguide.
衝撃を与えないよう注意して下さい。



Minimum bending radius



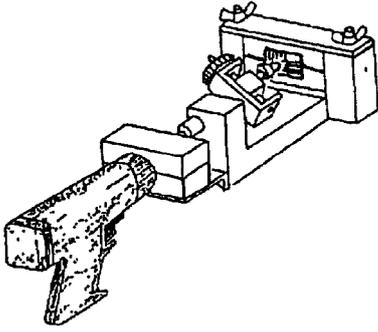
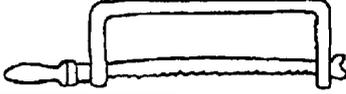
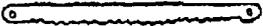
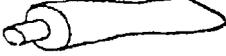
E bend $R_{min} = 200mm$
H bend $R_{min} = 400mm$

7.1 Waveguide for X-band radar

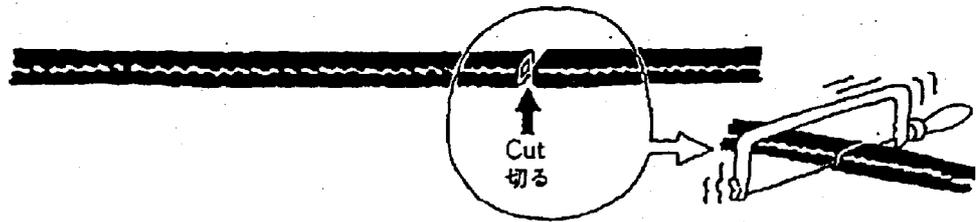
(2) Necessary tools

○: Needs separate order

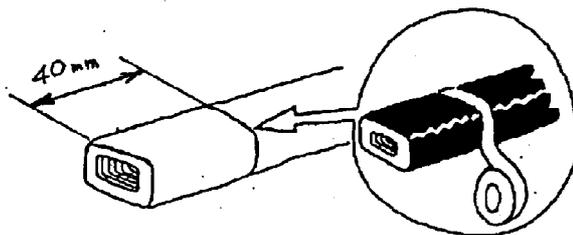
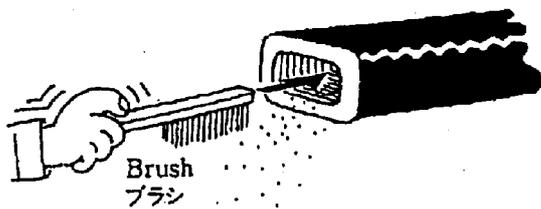
*: Supplied with waveguide

<p>○FR-90 power tool(03S9199) Code : 000-805-737</p> 	<p>○ Hack saw (HFJ-12) Code : 000-805-850</p> 
	<p>○ Saw (250x24) Code : 000-805-851</p> <p>6 saws</p> 
	<p>○ File (L150) Code: 000-805-852 Fine file Code: 000-805-853</p>  <p>2 files a set</p>
<p>○ Brush Code : 000-805-848</p> 	<p>○ TONE heavy duty snips (No.150) Code : 000-805-855</p> 
<p>○ Gauge (Square) (03-009-0534-0) Code: 100-207-540</p> 	<p>○ Edge gauge (03-009-0530-0) Code : 100-207-500</p> 
<p>○ Wrench (For M4) Code : 000-805-849</p> 	<p>※ PVC tape and tape</p> 
<p>Cloth</p> 	<p>※ Silicone compound</p> 
	<p>Hammer</p> 
<p>○ Knife (DK-N) Code . 000-805-854</p> 	<p>○ TONE tool box (# 2207) Code: 000-805-847</p> 

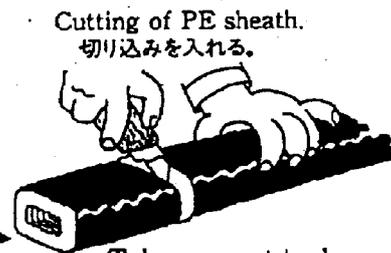
(3) How to terminate



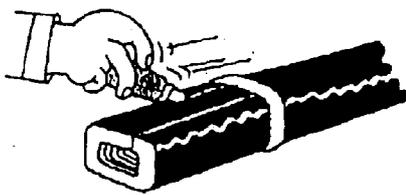
Make sure not to leave scrapings in the waveguide.
導波管の中の切屑を取り除いて下さい。



Wind a PVC tape at a part away from the cutting point.
切断位置にビニールテープを巻く。

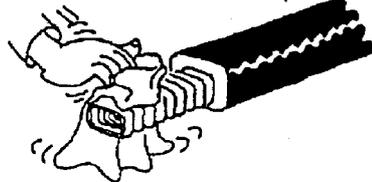
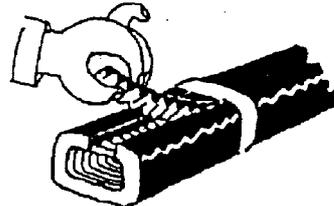


Take care not to damage the conductor with knife.
導管にキズを付けないようにご注意下さい。

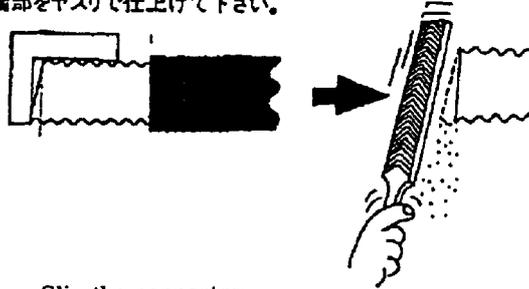


Wipe the compound with cloth.
布ぎれで、コンパウンドをふき取って下さい。

Raise up and remove the sheath.
シースをはぎ取る



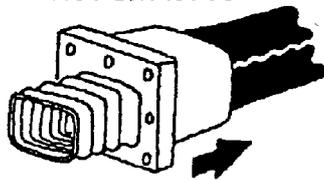
Finish the edge of the conductor with a file.
 導体端部をヤスリで仕上げてください。



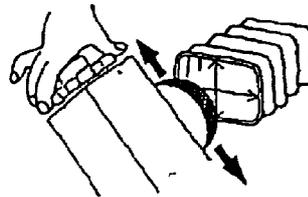
Check the angle
 直角であるかチェックして下さい。



Slip the connector
 コネクタを挿入します。

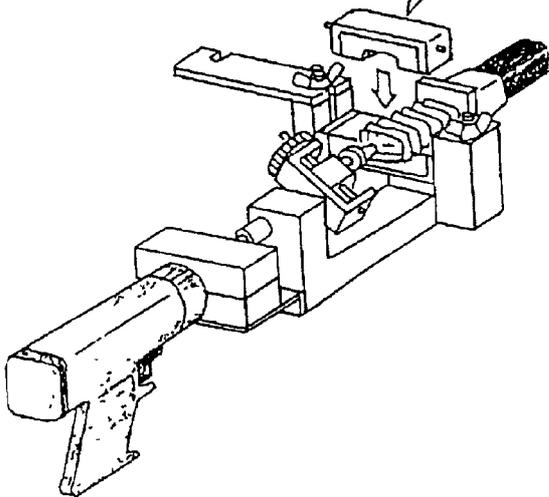
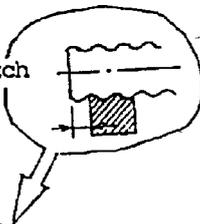


Turn the feed gear counterclockwise and bring flare roller to the center of the holder.
 送りギヤを反時計方向に回して導波管固定用ホルダーの中央に持ってきます。

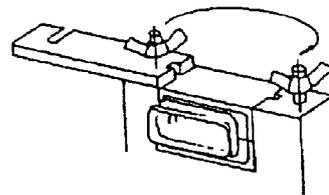


Put forth the conductor one pitch from the end of attachment.

アタッチメント端面から、導体を1山分出してセッティングします。



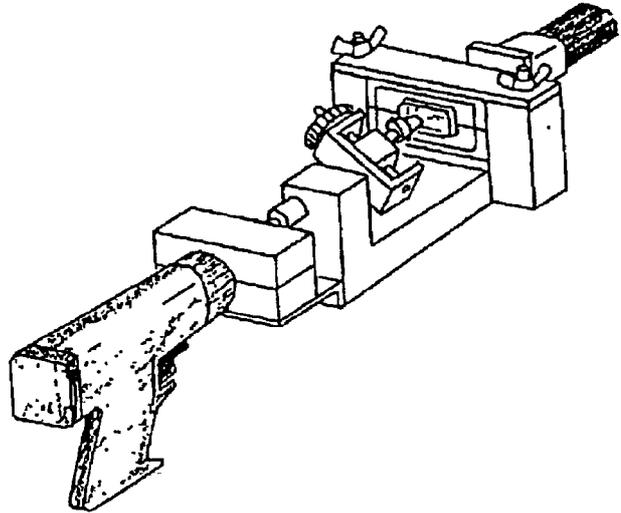
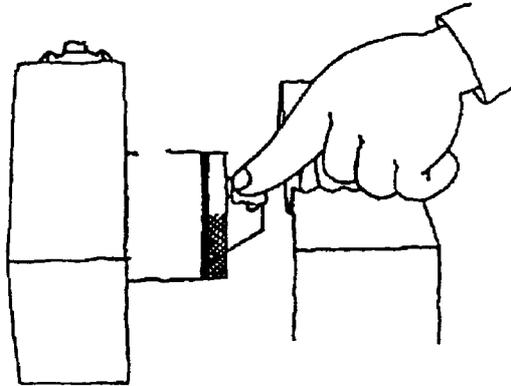
Avoid accidental starting.
 Don't carry tool with finger on switch.



After upper attachment put on the conductor, fix it by metal fittings.

上側のアタッチメントを乗せた後、押さえ金具で固定して下さい。

Apply silicone grease to the end of the flare roller.
シリコングリスを塗ります。



Change the switch to flaring mode (R).

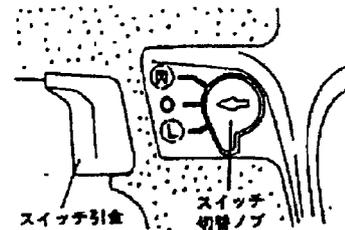
モーター部の取っ手にある回転方向切替スイッチをR方向にして下さい。

Do not touch movable parts or accessories unless the power source has been disconnected.



R: flaring mode
L: reverse mode
O: neutral mode

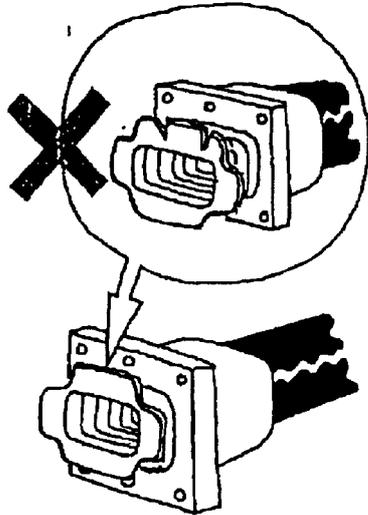
R: フレア加工をする時
L: ローラーを元に戻す時
O: ニュートラル



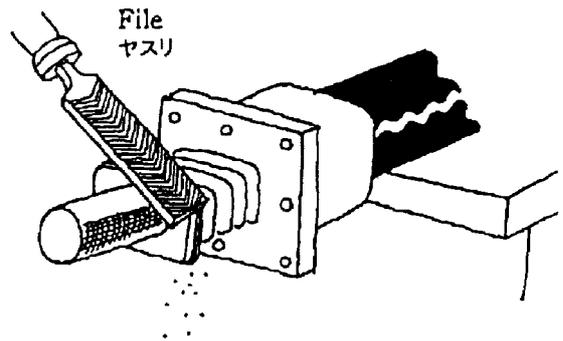
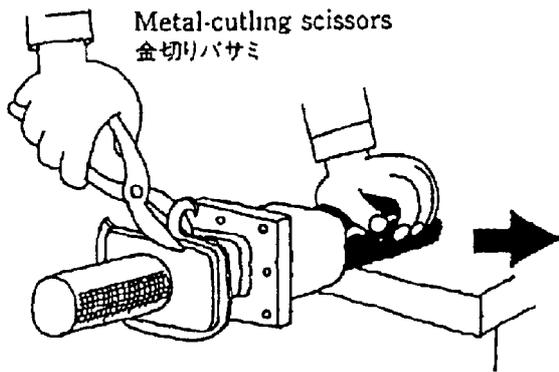
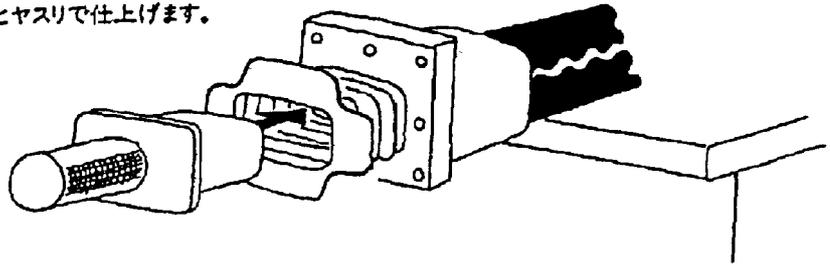
Push the switch, and flaring starts.

スイッチ引き金を押すと回転が始まります。

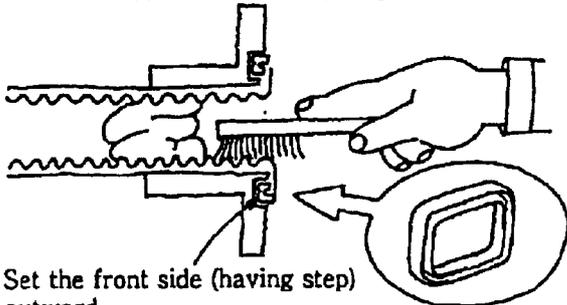
If give crack, once more /
もし、フレヤー部が割れた場合にはやり直して下さい。



Insert the "edge locating jig" into the waveguide
and finish with scissors and a file.
フチ切り治具を導波管に挿入し、
導体の端部が治具と一致するようにハサミとヤスリで仕上げます。



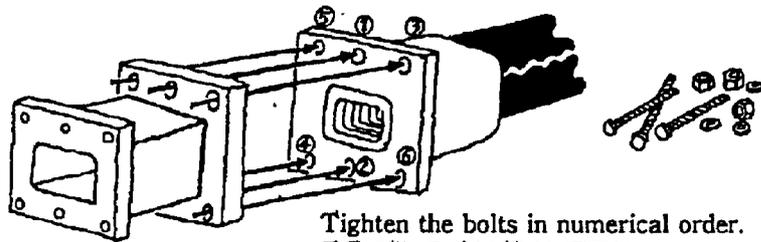
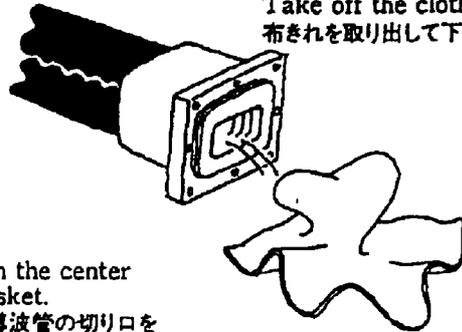
Cleanse well the inner surface of the conductor.
 ブラシで内面をきれいにして下さい。



Set the front side (having step)
 outward.
 バックインに裏表があります、ご注意下さい。

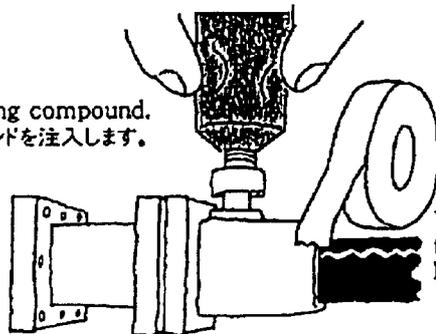
Set the conductor in the center
 of groove of the gasket.
 バックインの溝の中央に導波管の切り口を
 合わせて下さい。

Take off the cloth.
 布きれを取り出して下さい。



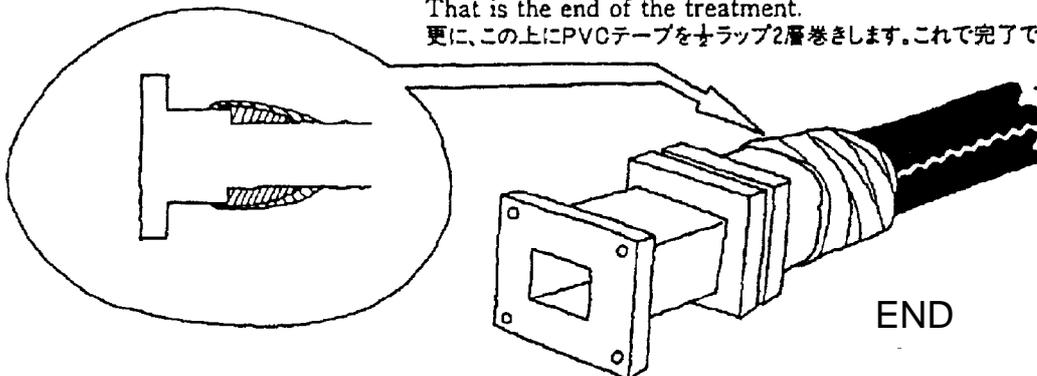
Tighten the bolts in numerical order.
 番号に従ってボルト締めして下さい。

Pouring of sealing compound.
 シーリングコンパウンドを注入します。



Wind the self-bonding tape (FCO tape) between
 the ends of the connector and PE sheath,
 half-lapped in two layers.
 自己融着テープ(エフコテープ)で半ラップ2層巻きます。

Further, wind PVC tape half-lapped in two layers
 That is the end of the treatment.
 更に、この上にPVCテープを半ラップ2層巻きます。これで完了です。



END

7.2 Waveguide for S-band radar

High frequency Coaxial cable

The scanner unit is connected to the transceiver unit by a high frequency coaxial cable. It is necessary to install the connector at the transceiver side of the coaxial cable. The connector for the scanner unit side has been installed at the factory.

Installing coaxial cable

Use the cable band for fixing the cable supplied.



The cable band Fig. 7-1 (Type: 03-011-3228, Code: 100-049-62) is also available optionally.

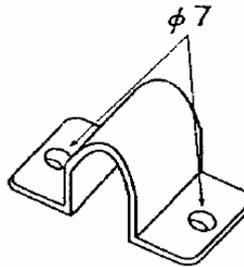


Fig. 7-1 Cable band, optional

Necessary tools

No	Items	Amount	
1	Heavy duty saw	1	For cable cutting
2	Knife	1	For cable sheath cutting
3	File	1	For taking out inner conductor and removing burr
4	Cutter knife	1	For cutting insulator
5	Scale	1	For scaling
6	Wrench for M4 (S7)	1	For fixing the bolts
7	Gauge	1	For finishing the cable conductor edge

Installation Material

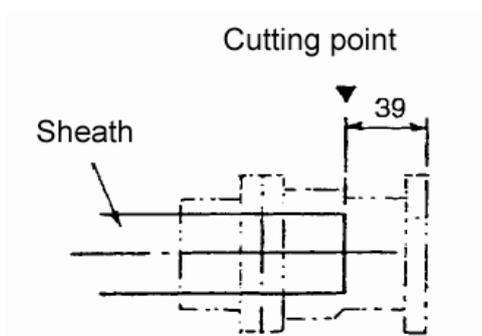


Note1: Prevent foreign substances from being entered into the cable during the work.
 Note2: A minimum cable bending radius of 150 mm must be observed at the cable run.

When bending the cable twice or more in close points, the bending radius should be more than 250 mm.

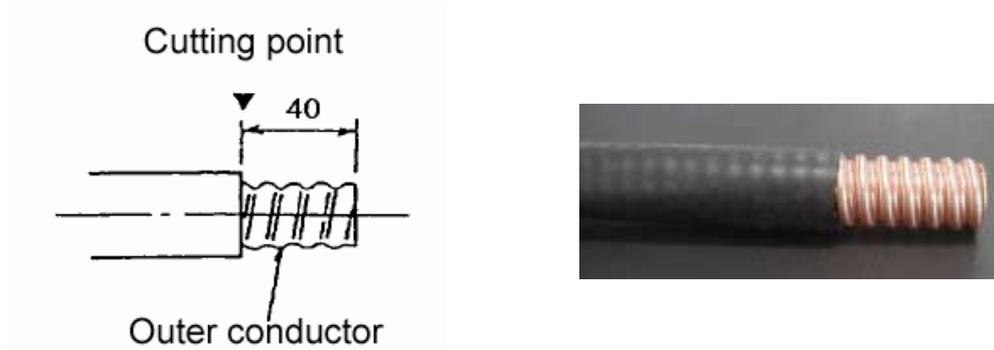
Procedure

1. Straighten the cable and cut it even using the hacksaw and scale (gauge).

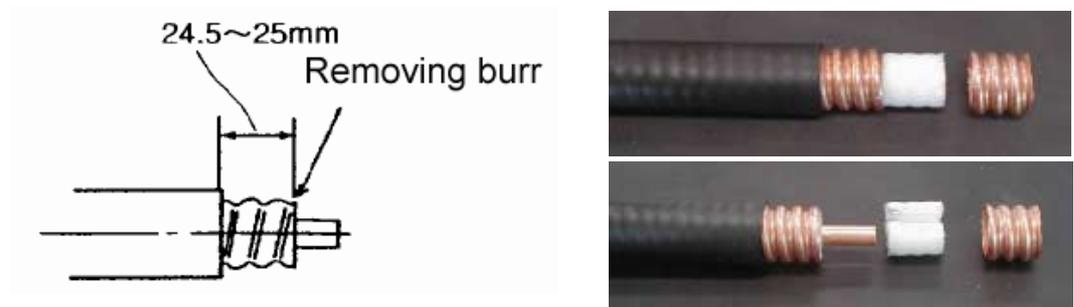


2. Remove the sheath 40 mm using the tubing cutter and scale.

Note: Be careful not to nick the outer conductor.

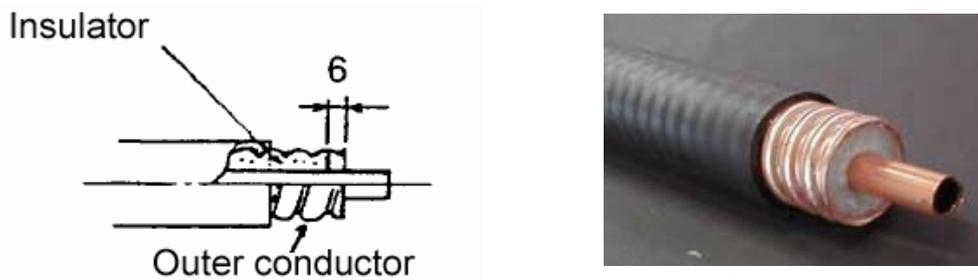


3. Remove the outer conductor and the insulator. (Tools: Hacksaw, scale)



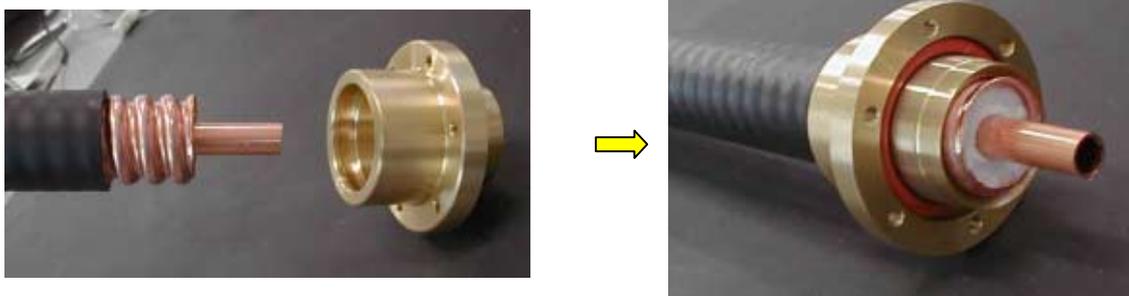
4. Removing burr of the outer conductor with the file.

5. Remove the insulator in the outer conductor 6 mm.

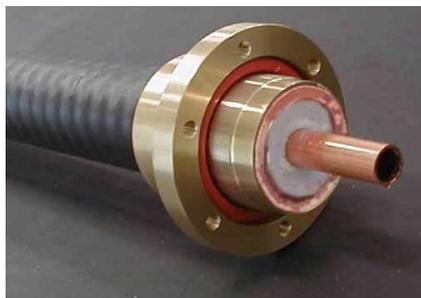
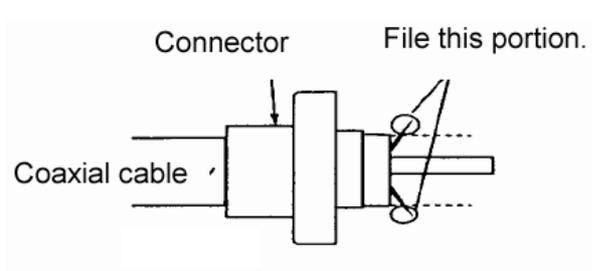
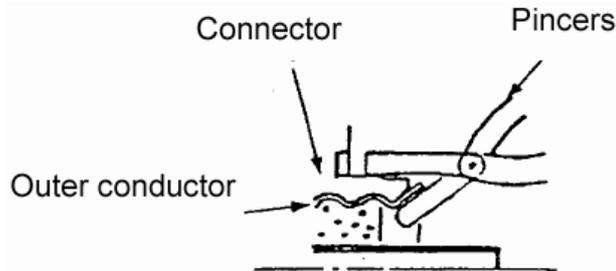


6. Connect the connector to the coaxial cable.

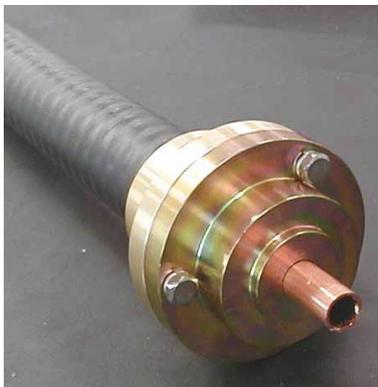
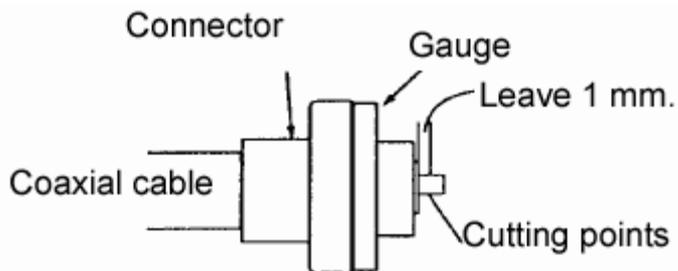
Screw connector onto the coaxial cable.



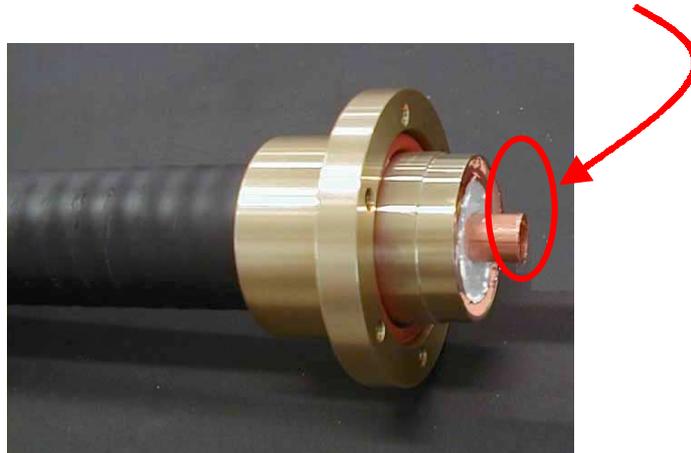
7. Flare the outer conductor along the connector by a pincers.
8. File the outer conductor beyond the diameter of the connector.



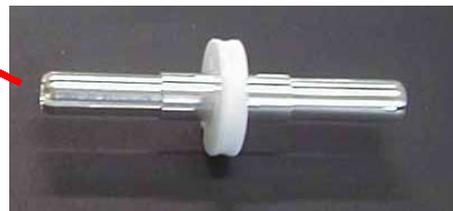
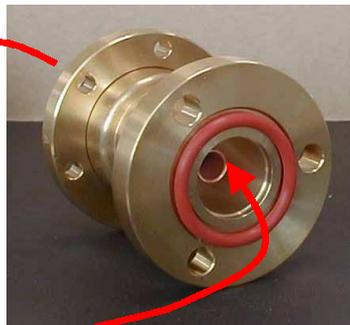
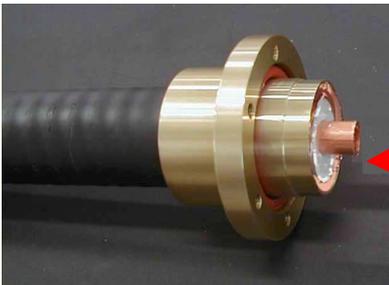
9. Insert the gauge through the connector. Fix the gauge by the bolts and then cut the inner conductor leaving 1 mm for finishing. (Tools: Gauge, M4 Wrench, Hacksaw)



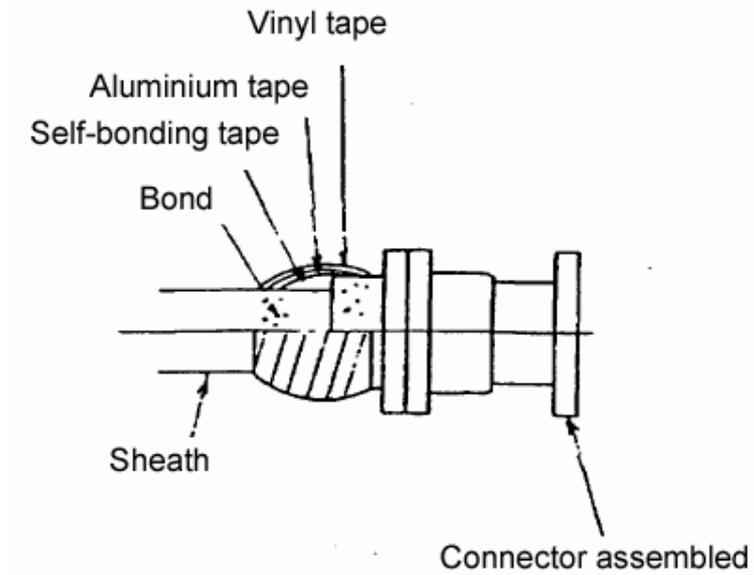
10. Remove the gauge. Then, file the inner conductor to finish.



11. Assemble relay connector and relay conductor, and then connect it to the coaxial cable.



12. Tape the self-bonding tape twice or more on the cable and connector. And then tape the PVC tape over the self-bonding.

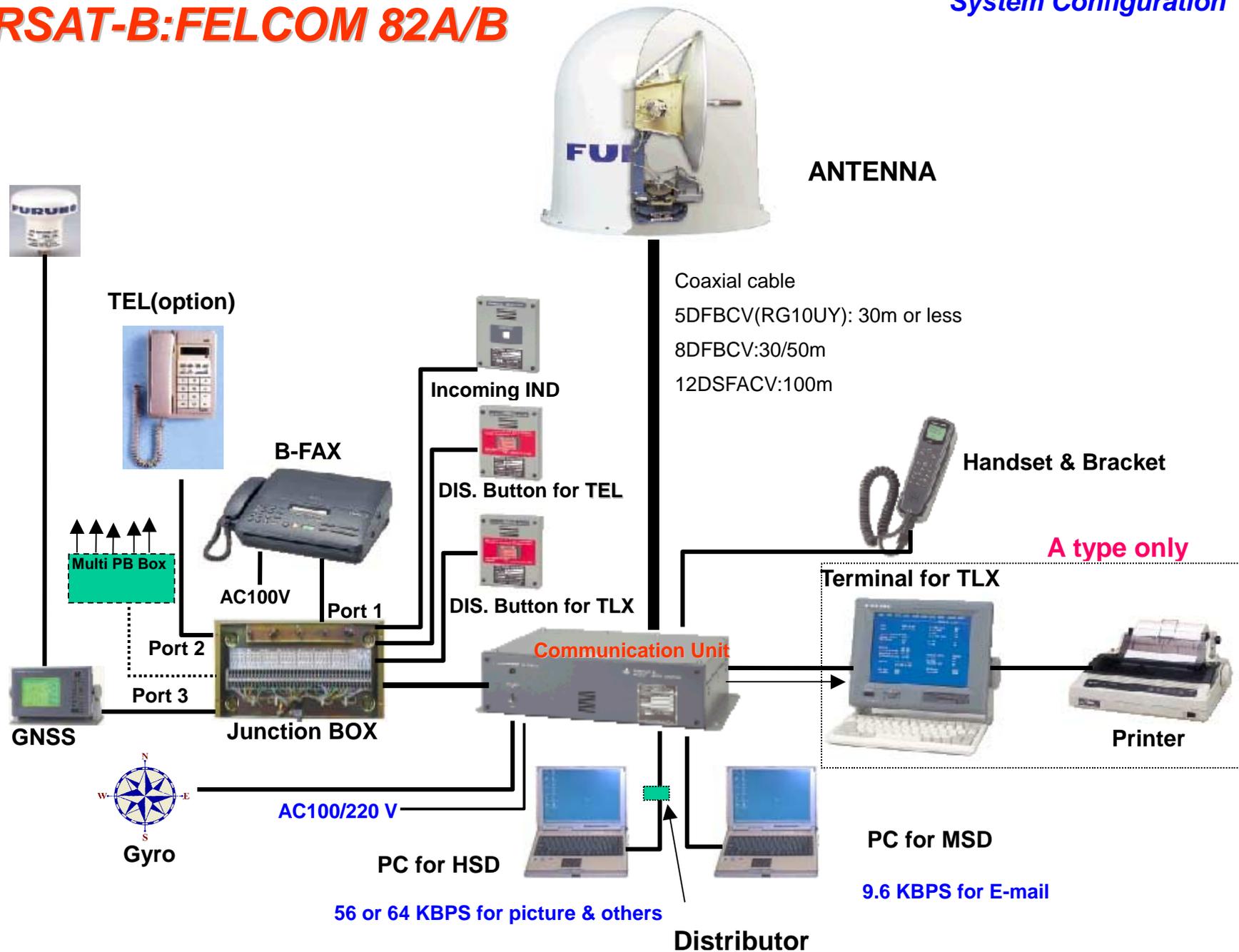


Appendix.1 System Configuration

- ***INMARSAT-B:FELCOM 82A***
- ***GMDSS:RC-1800T***
- ***RADAR***
- ***NAVTEX Receiver***
- ***WEATHER FAX***
- ***DOPPLER SPEEDLOG***
- ***NAVIGATIONAL ECHO SOUNDER***
- ***AIS***
- ***VDR***

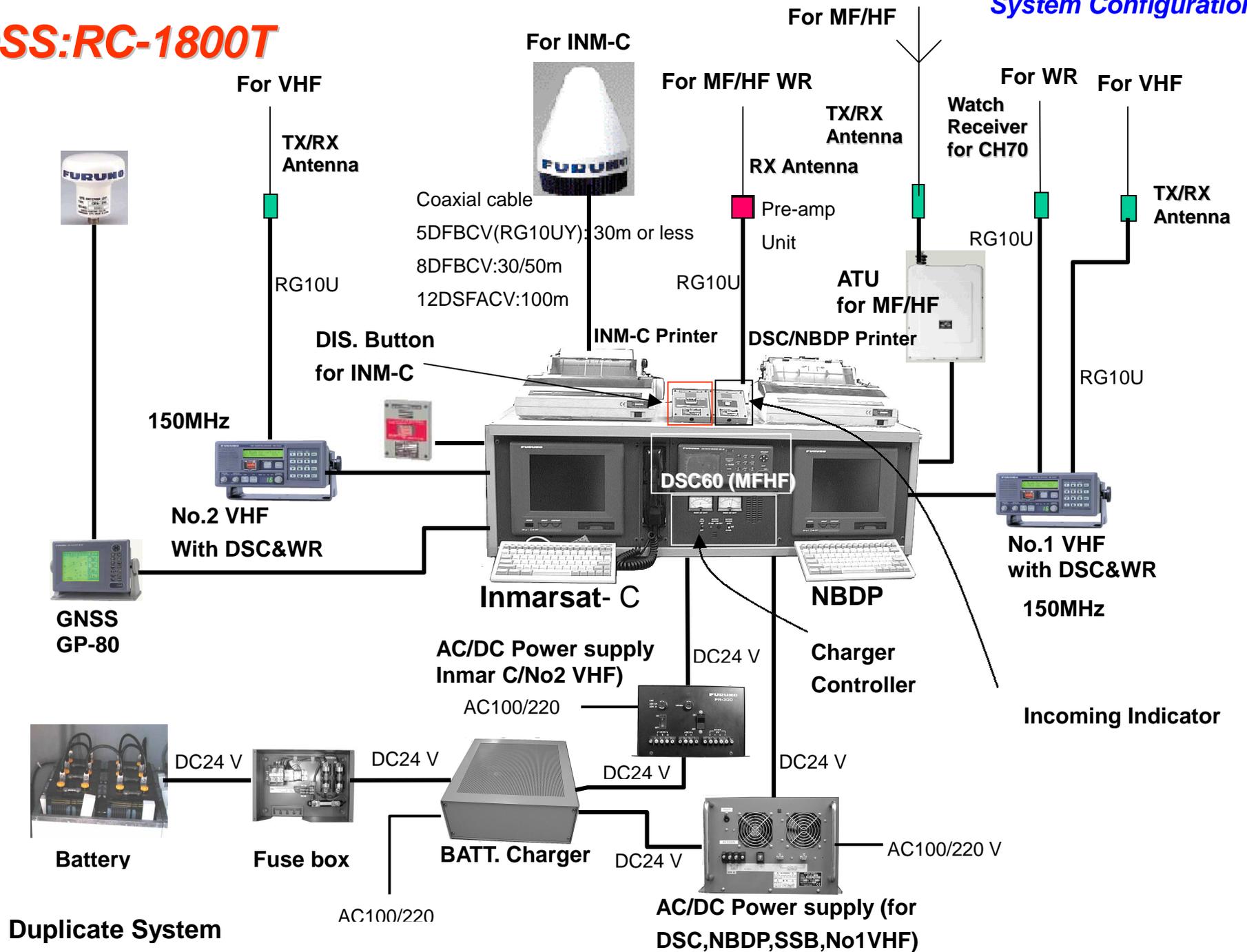
INMARSAT-B:FELCOM 82A/B

System Configuration



GMDSS:RC-1800T

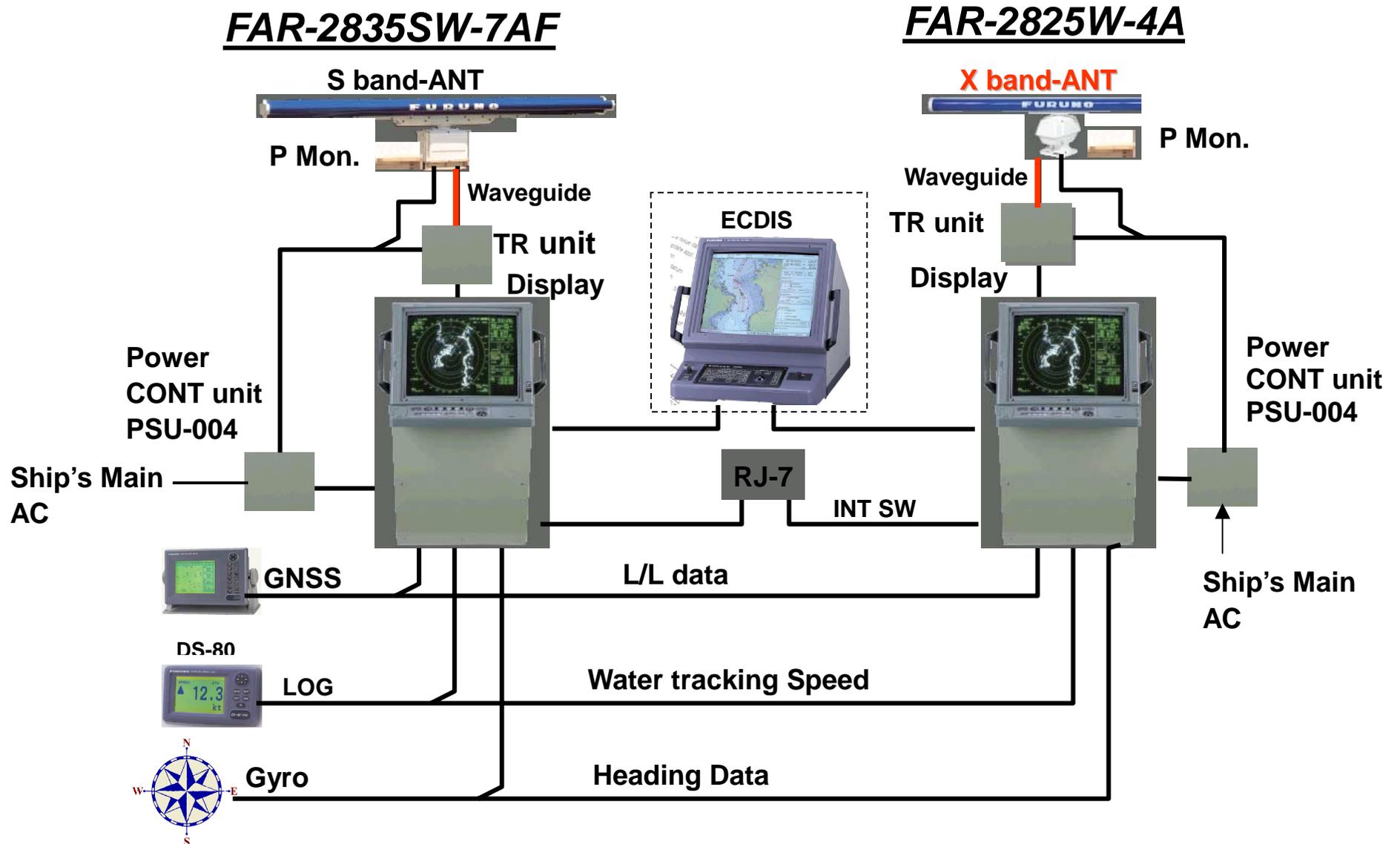
System Configuration



RADAR

System Configuration

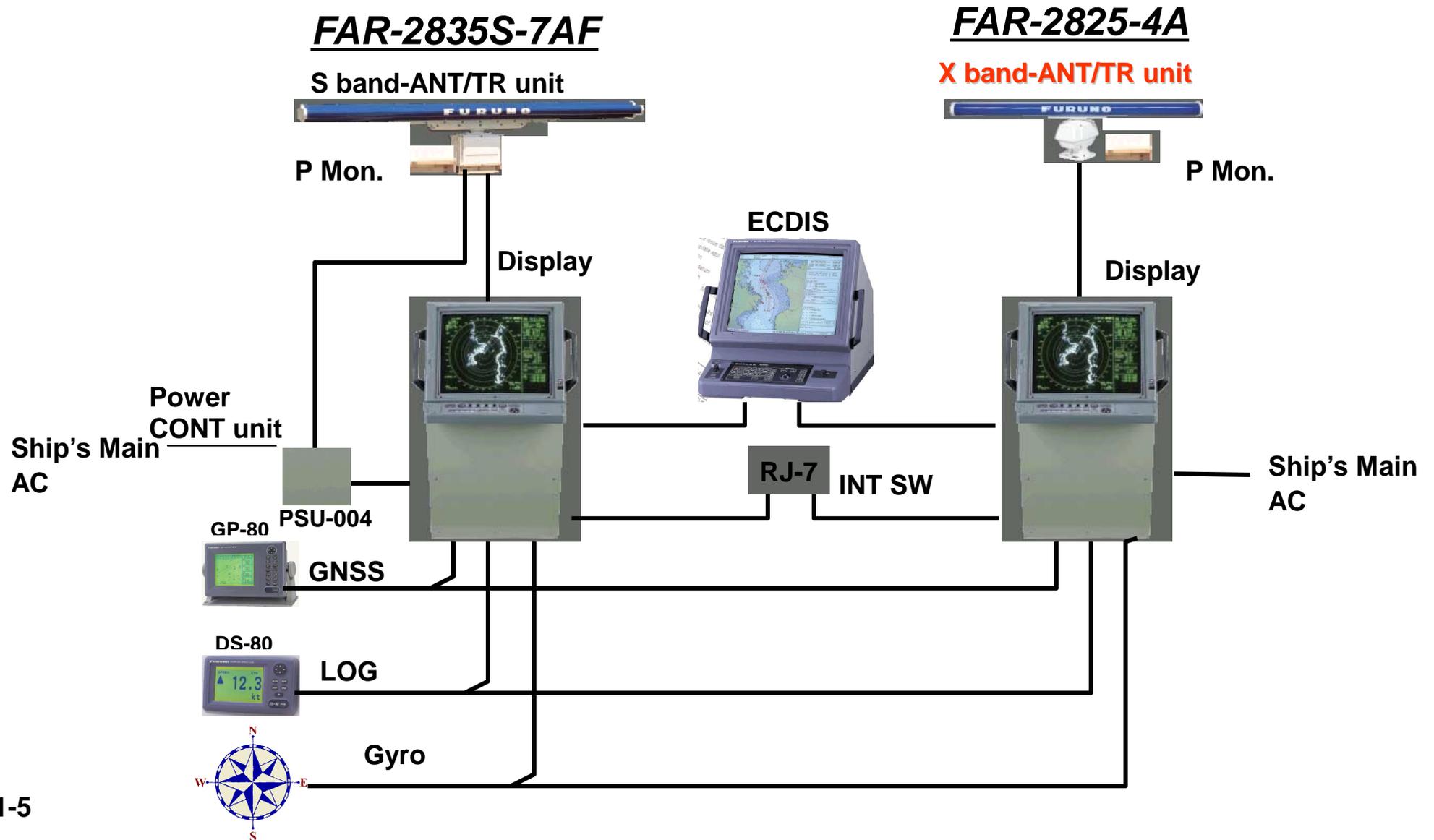
The TR unit installed in W/H. (TR Down:Three Unit Type)



RADAR

System Configuration

The TR unit is incorporated in ANT unit. (TR UP:Two Units Type)



WEATHER FAX

FAX210/214/215

Option : NAVTEX ANT
Pre-AMP unit+2.6m Whip ANT

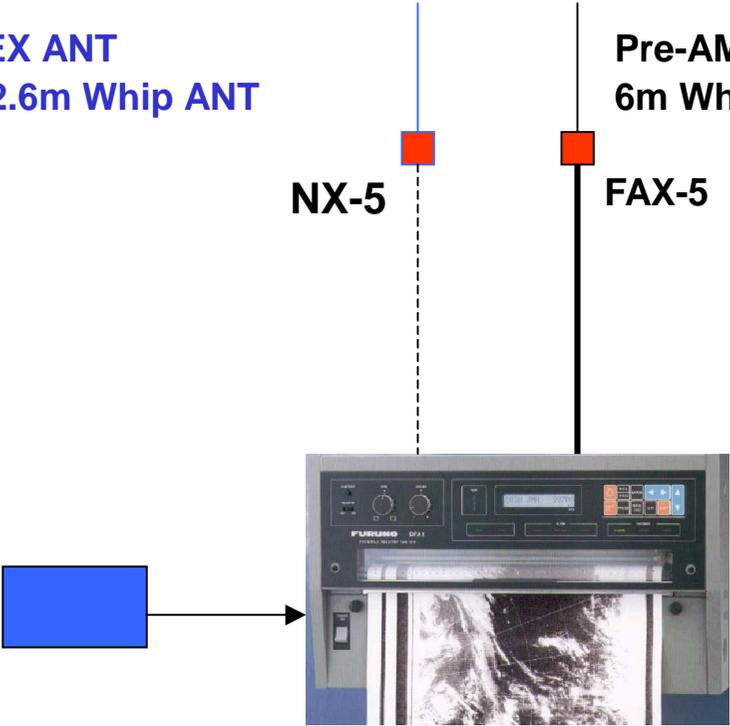
Pre-AMP unit+2.6m Whip ANT or
6m Whip ANT

NX-5

FAX-5

Note: Even though NAVTEX receiver is incorporated in FAX receiver, independent NAVTEX receiver (NX-500), which is type-approved, is required by regulation.

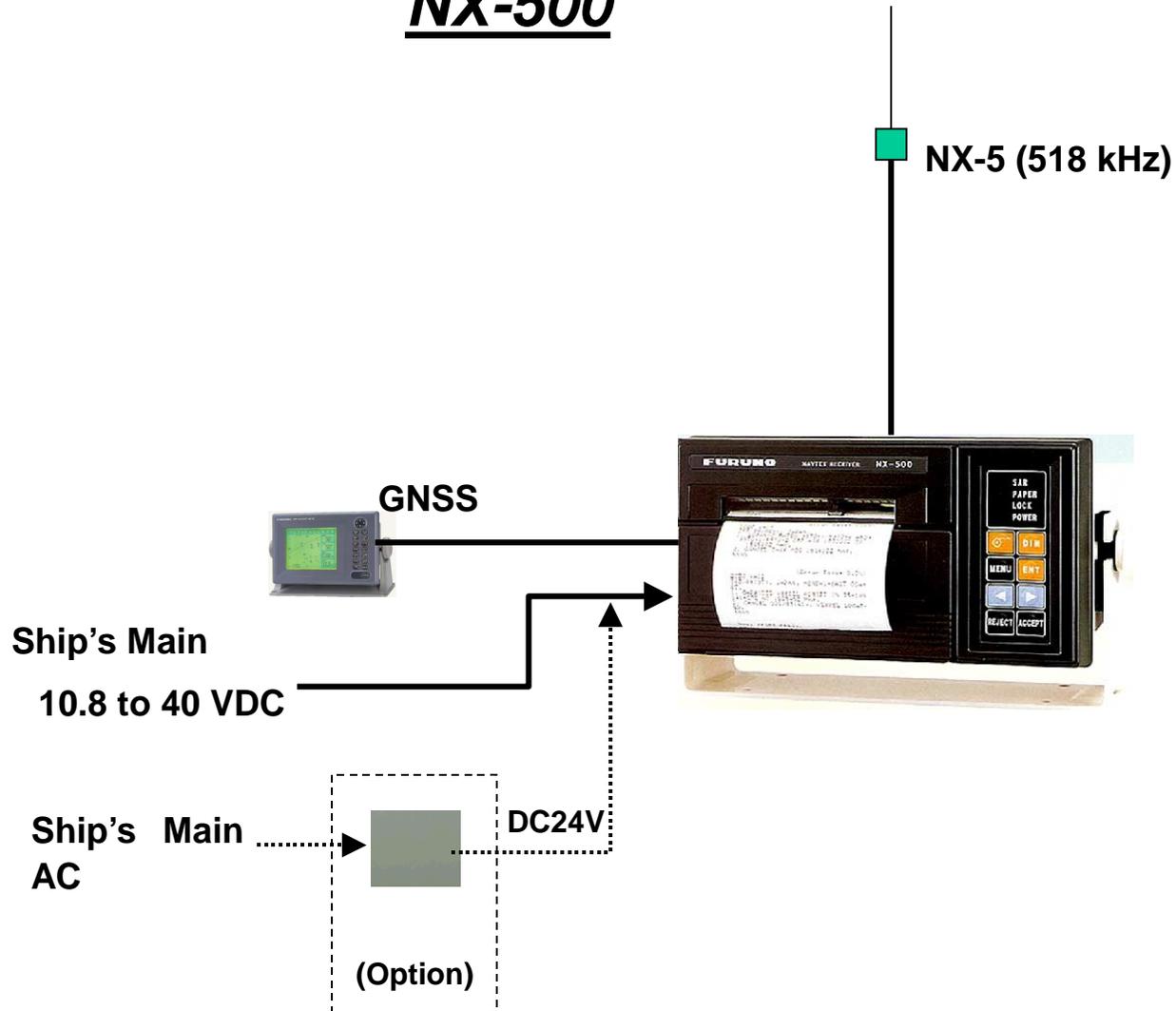
Option:
NAVTEX Receiver P.C.B



NAVTEX Receiver

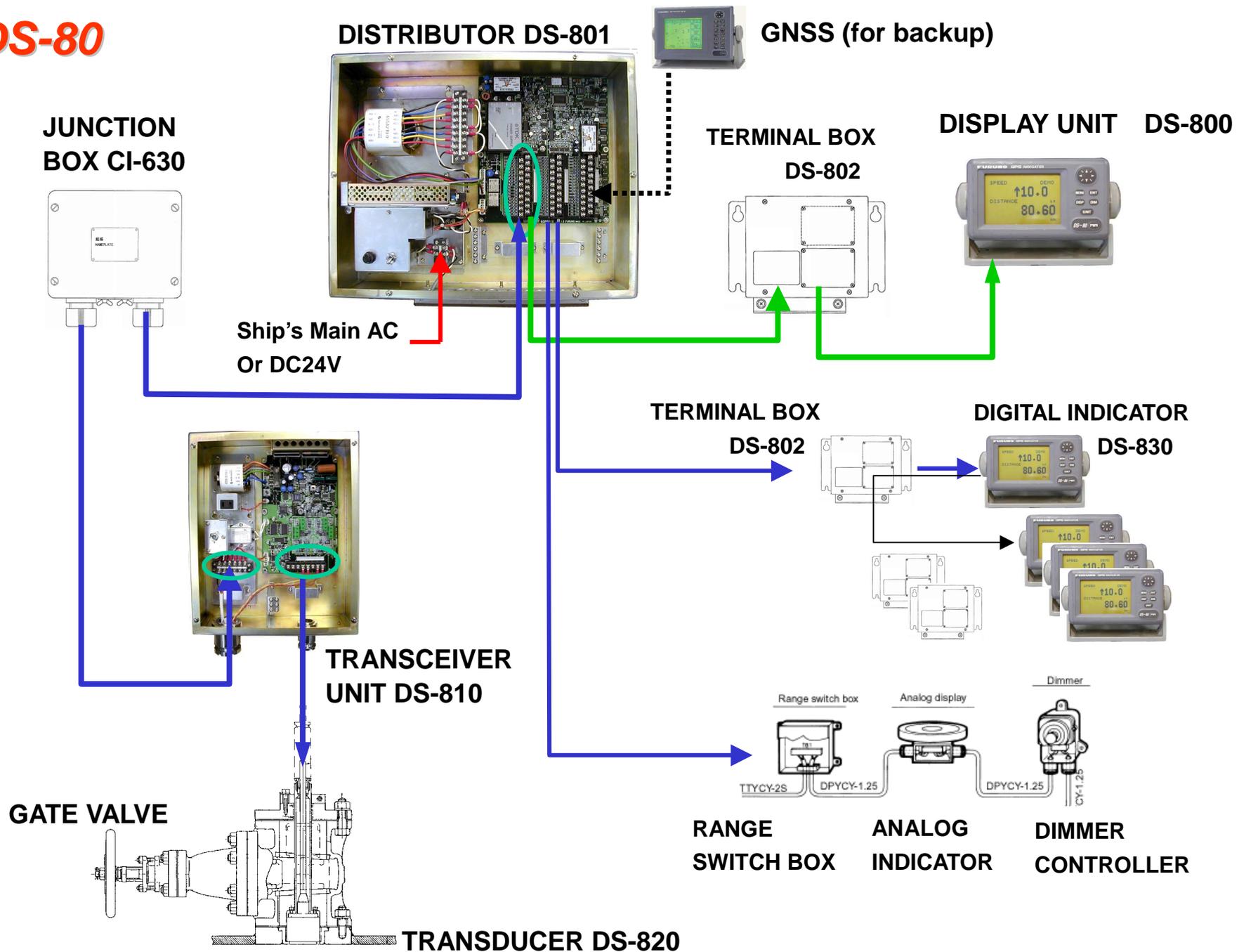
NX-500 has type-approvals.

NX-500

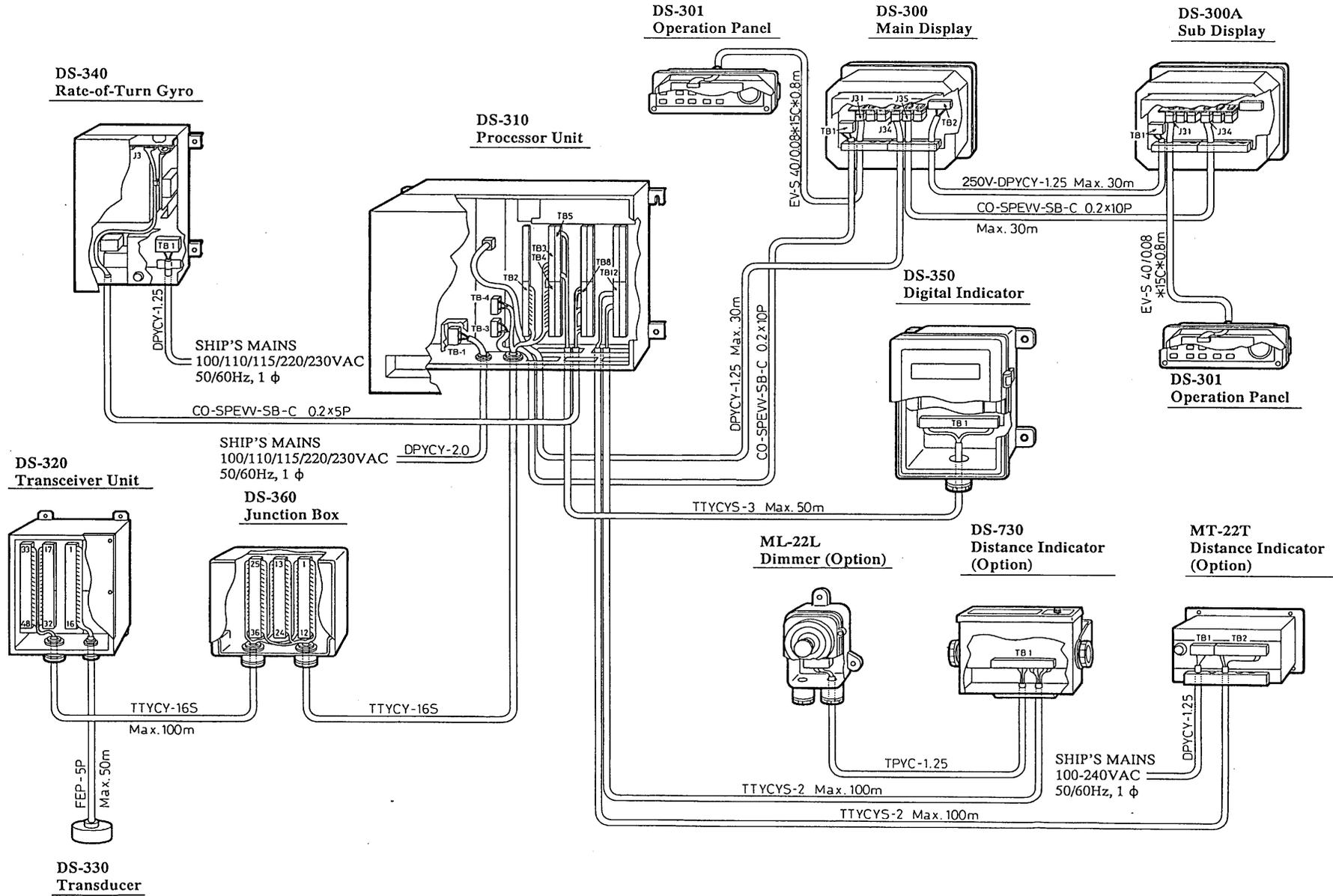


DOPPLER SPEEDLOG DS-80

System Configuration DS-80

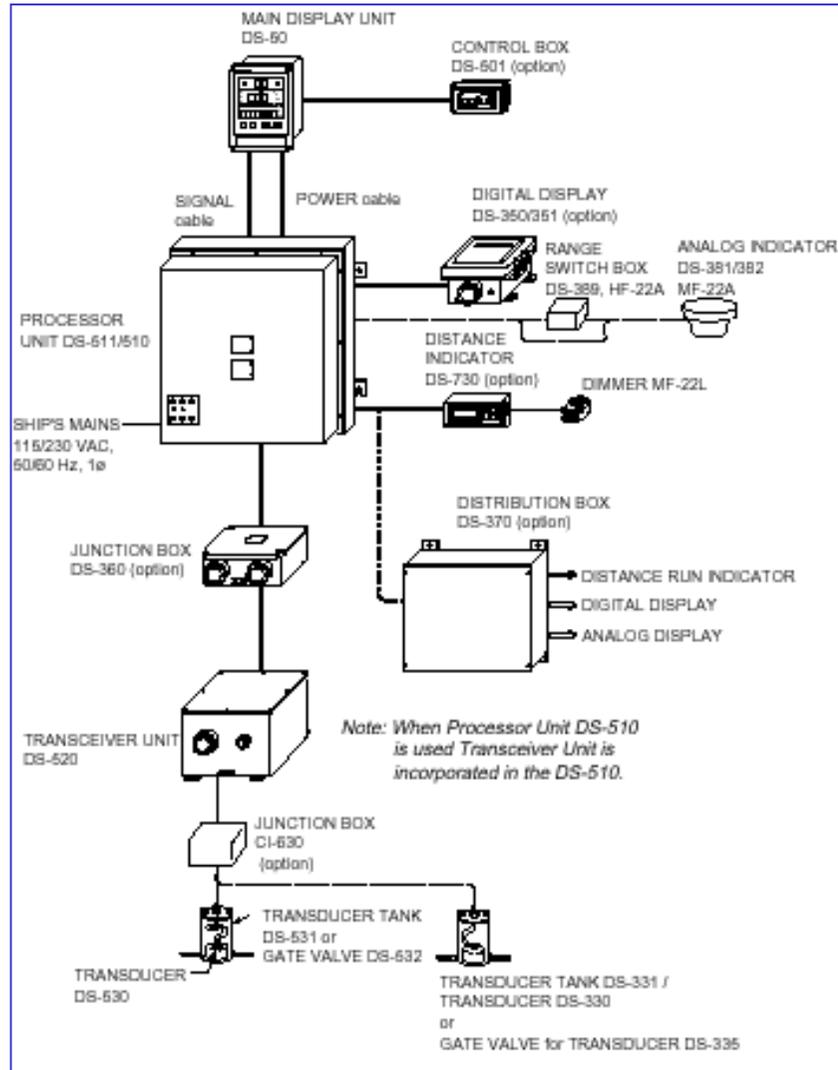


DOPPLER SPEEDLOG: DS-30

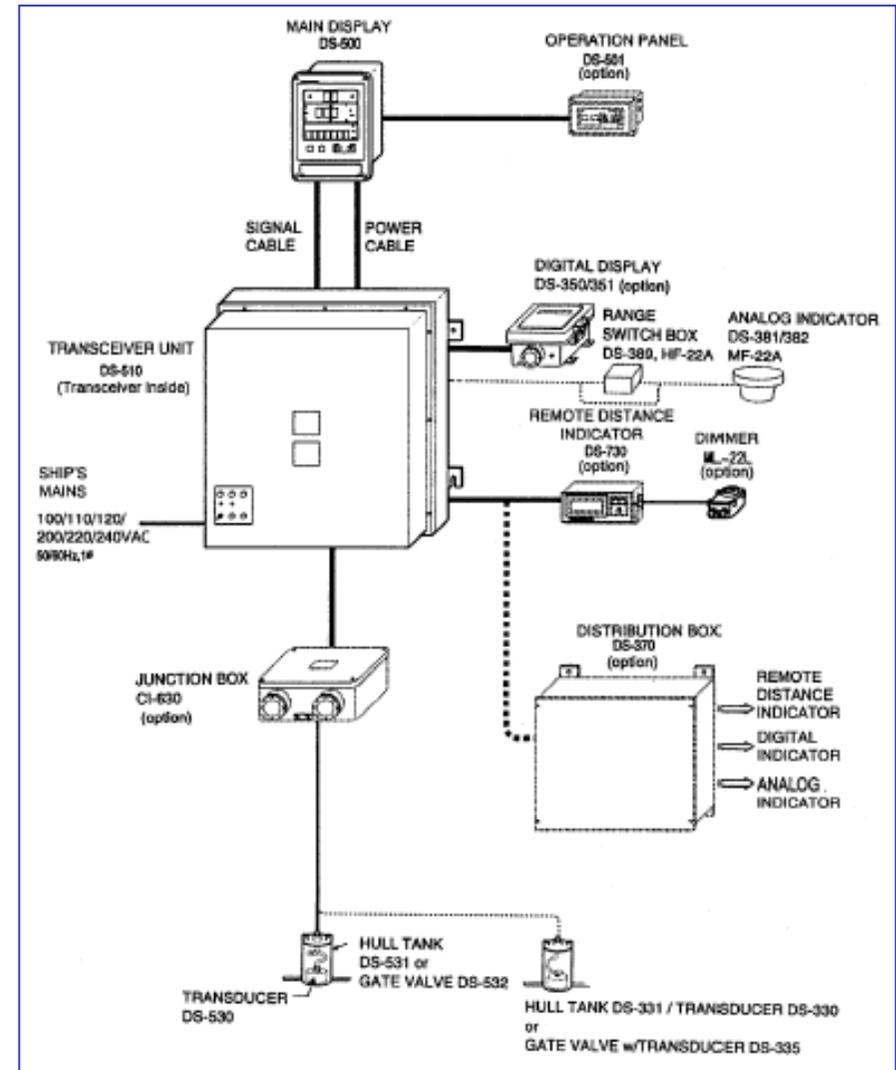


DOPPLER SPEEDLOG: DS-50

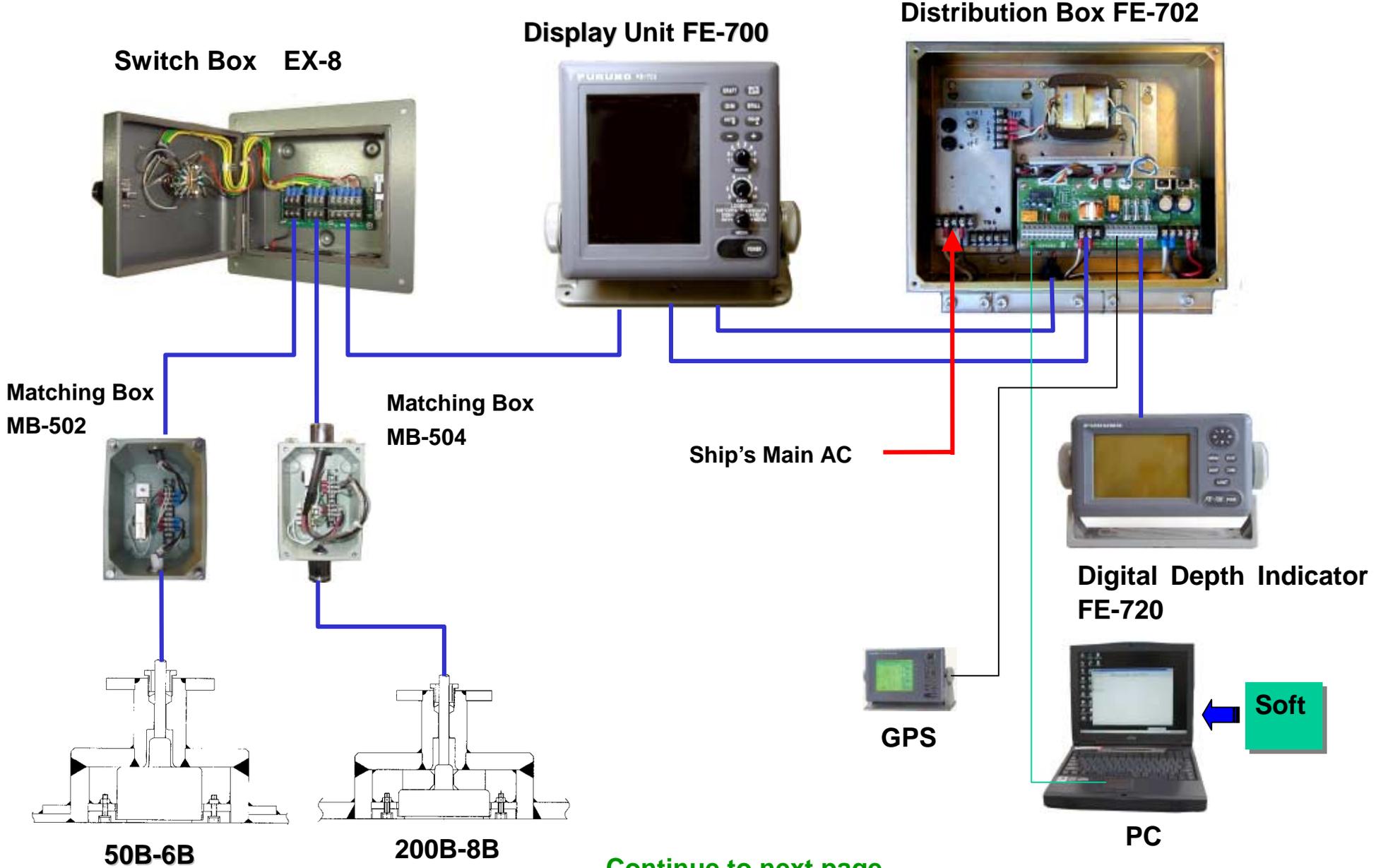
Processor and Transceiver Units Separate Type.



Processor and Transceiver Units Combination Type.



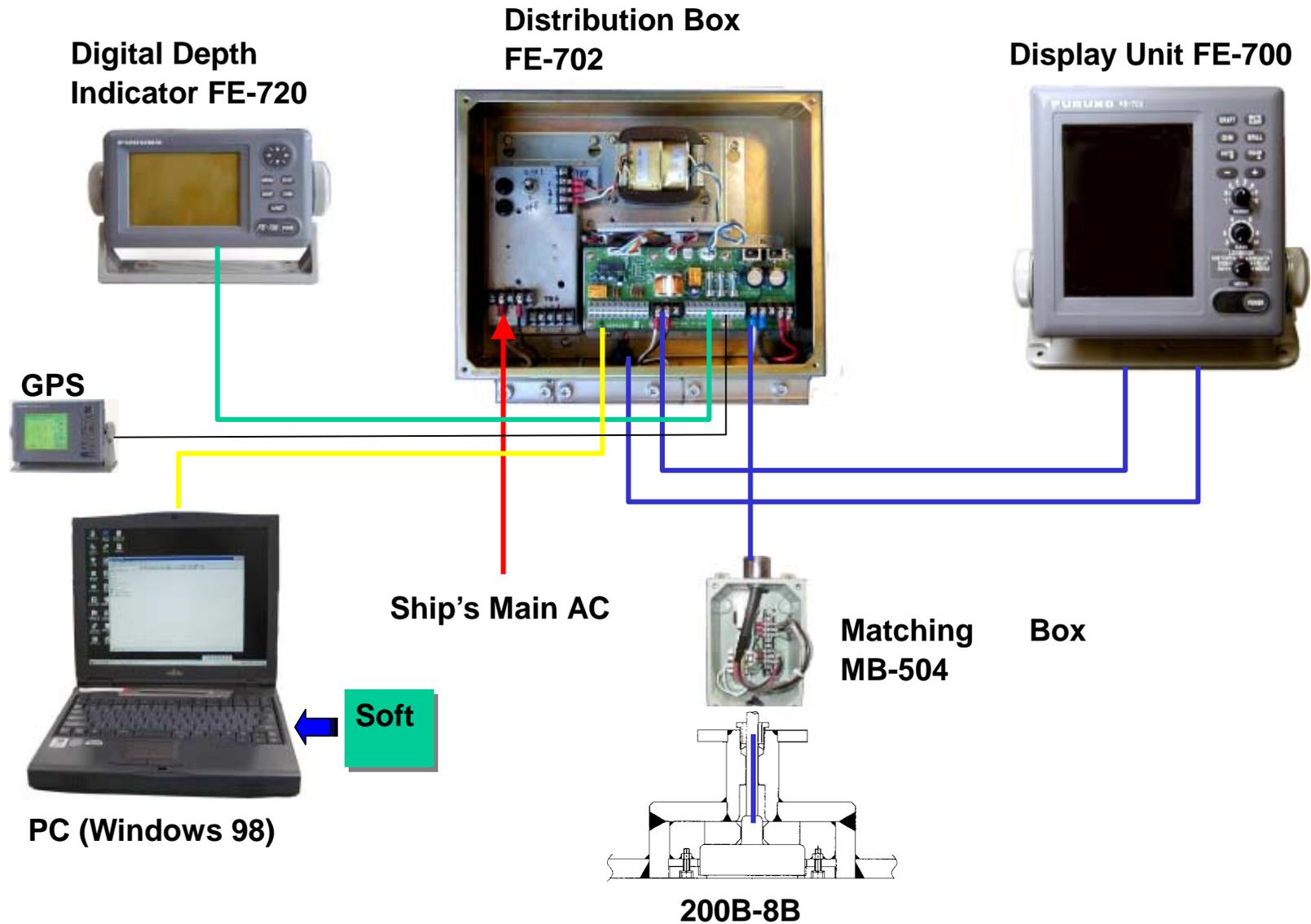
NAVIGATIONAL ECHO SOUNDER: FE-700



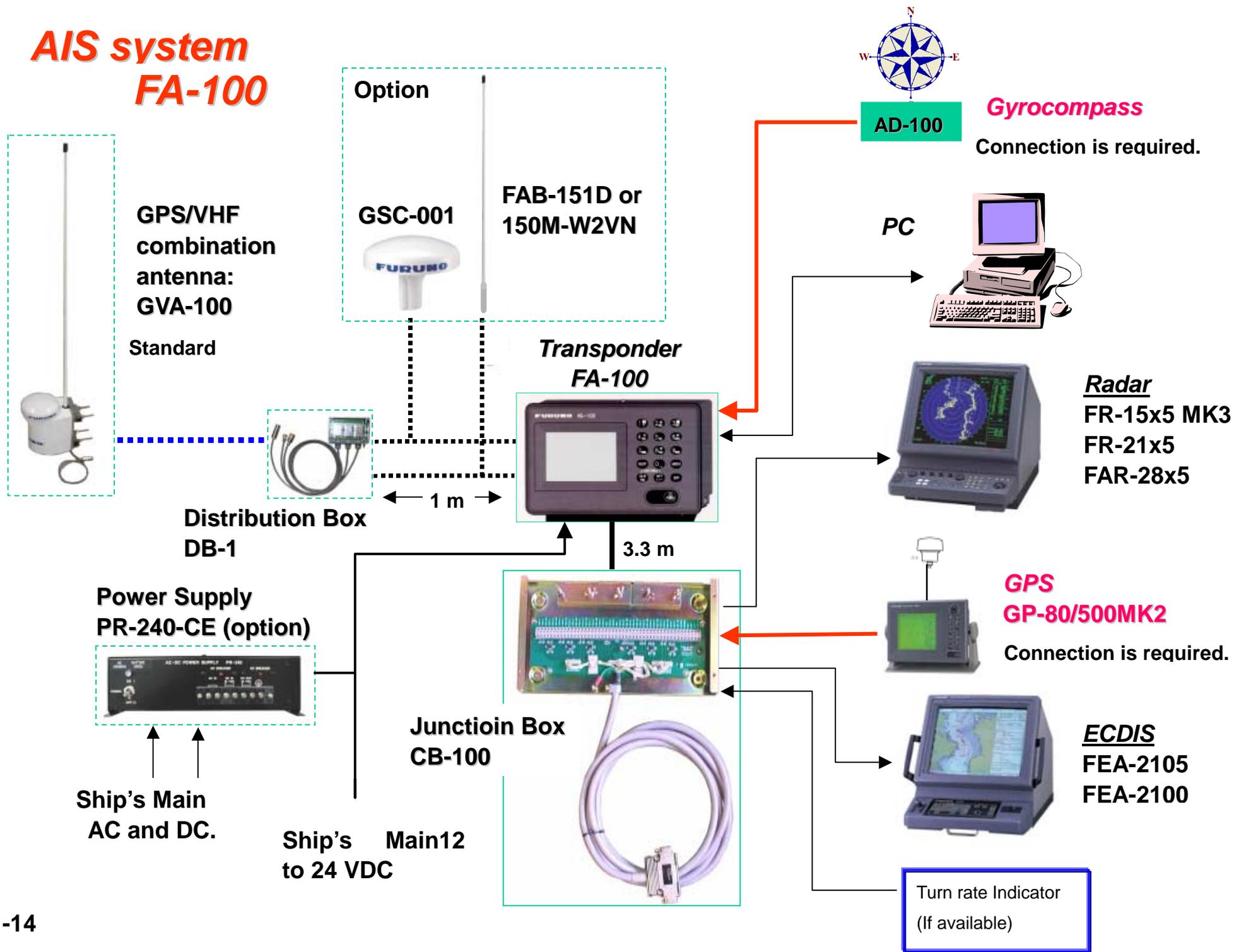
Continue to next page

NAVIGATIONAL ECHO SOUNDER

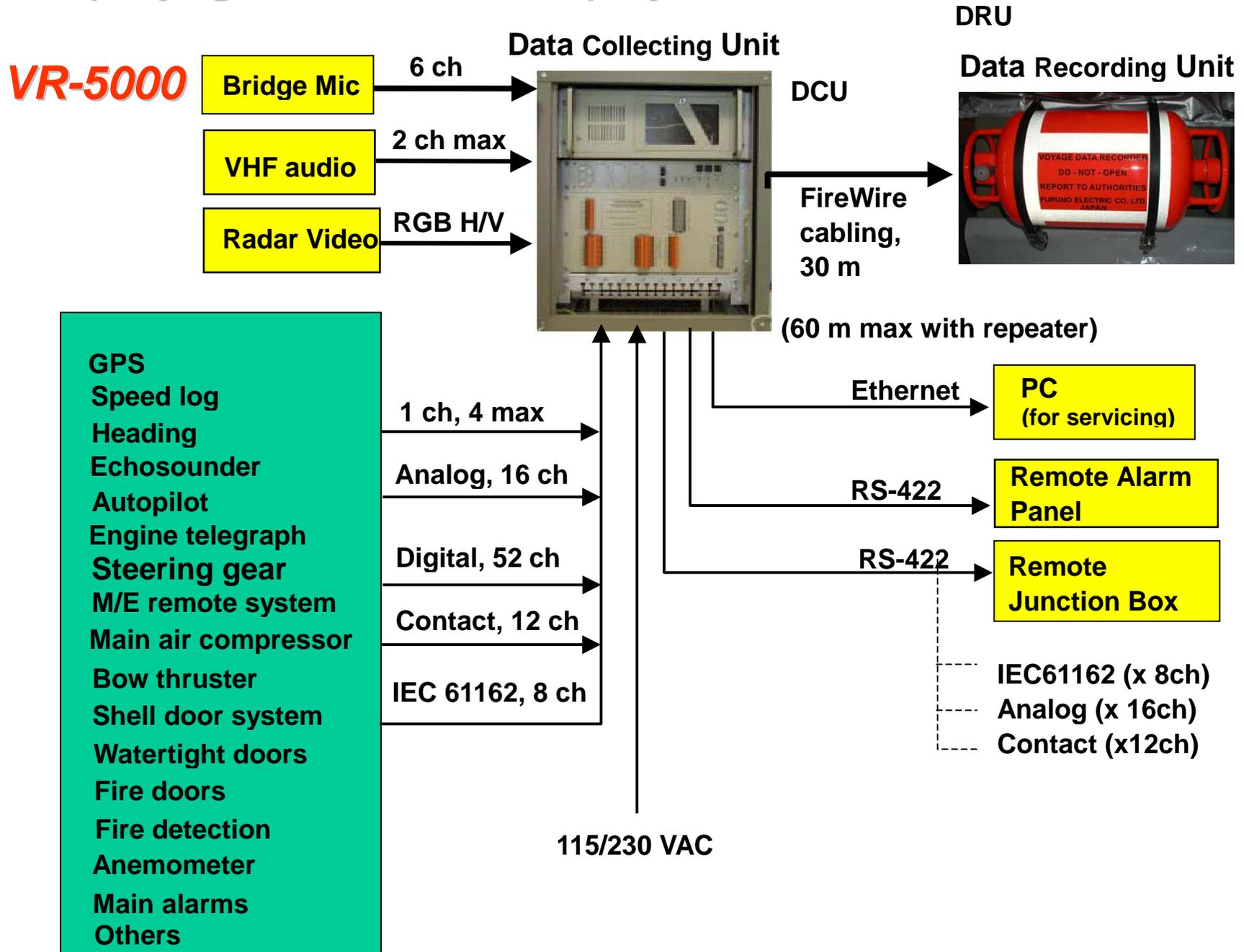
System Configuration FE-700



AIS system FA-100



VDR (Voyage Data Recorder) System



Appendix.2 Mounting Location of Antenna

1. Inmarsat C

1. Mounting location should be atop a mast, where no obstacle appears in fore and aft directions down to -5 degrees and down to -15 degrees in port and starboard directions.

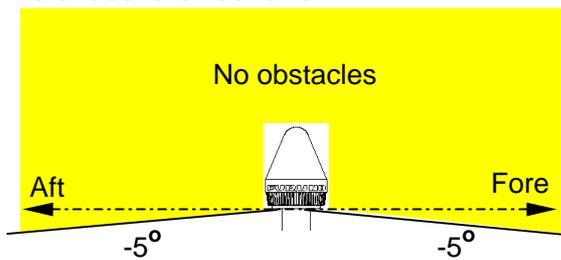


Figure 1 Fore-Aft direction

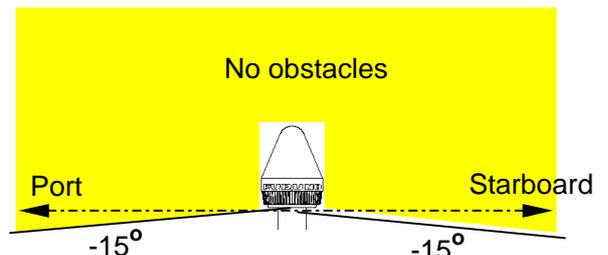


Figure 2 Port-Starboard direction

The blind sector caused by any obstruction in the above area should be within 2 degrees. The sector size depends on the size of the obstruction and the distance to it. Figure 3 shows the size and the distance of the obstruction which causes 2 degrees blind sector.

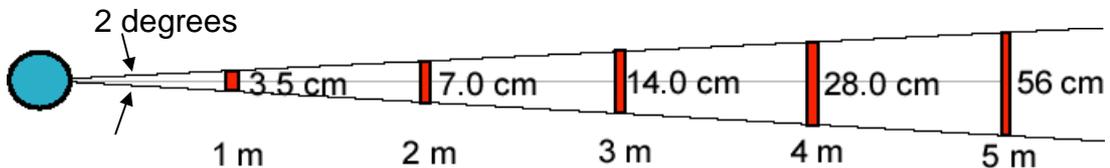


Figure 3

Separate the antenna unit from a S-band radar, Inmarsat A/B, and GPS antennas as follows.

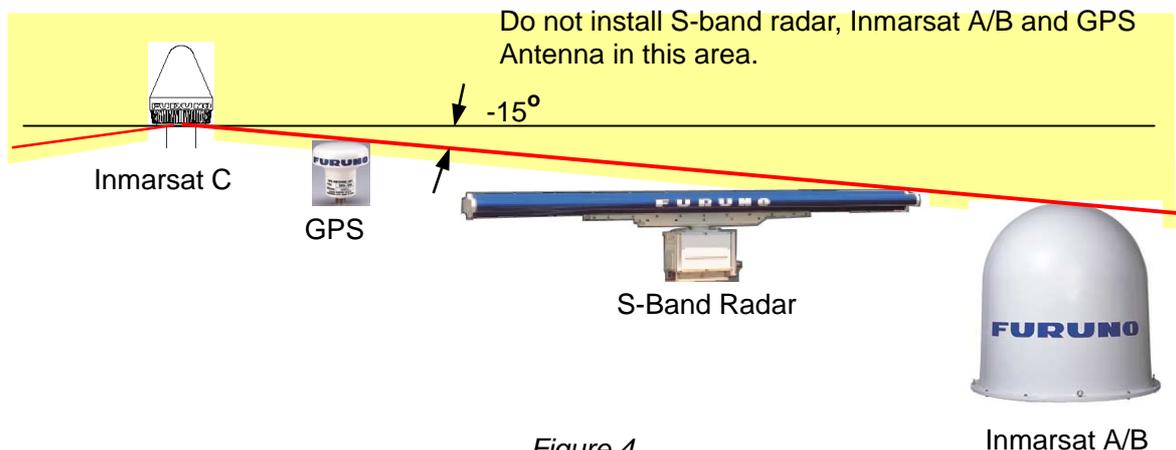


Figure 4

When S-band radar is installed, never install Inmarsat C antenna in the hatched area in figure 5.

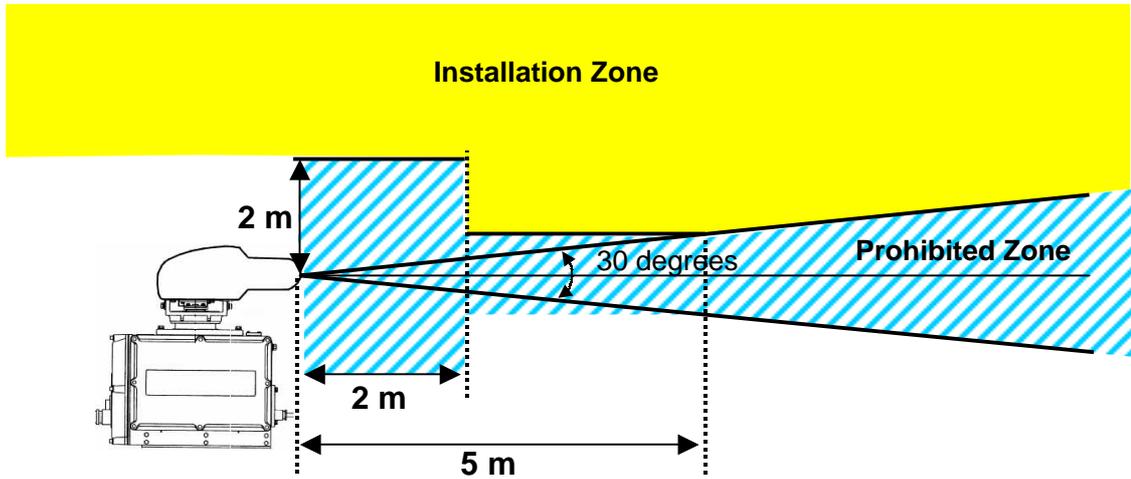


Figure 5

When two Inmarsat C antennas are installed, both antenna should be separated as follows.

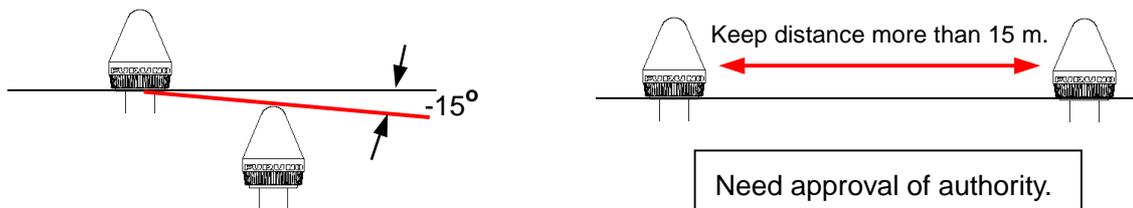


Figure 6

2. Inmarsat B

Radio waves can be harmful to human body. Since safe distances vary by country and ship construction, there is no uniform formula for calculating safe distance. However, below are general guidelines.

- Unprotected persons should not approach an area in which the radiation level is higher than $100\text{W}/\text{m}^2$. For an Inmarsat A/B antenna is less than $100\text{W}/\text{m}^2$ at 1 meter distance from the radiation surface*
- Unprotected persons should not approach within 6 meters of a transmitting Inmarsat antenna*

The ideal mounting location secures an unobstructed path between the antenna unit and the satellites, from horizontal to zenith. In other words, whatever the direction the antenna unit is pointing there are no interfering objects within the main beam (12 degrees).

While this might be feasible on some vessels, on others it is impossible due to space considerations. The antenna unit should be located at least 3 meters away from masts less than 15 centimeters in diameter.

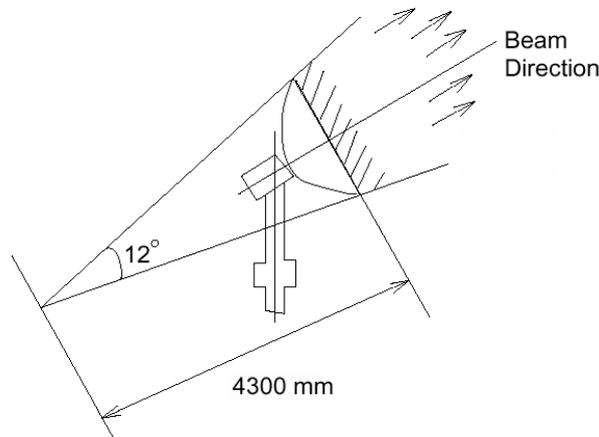


Figure 7

Minimum distance from other antenna

1. HF antenna, communication/navigation antennas
 - HF antenna should be at least **5 meters** away from the Inmarsat A/B antenna.
 - VHF, GPS and other communication antennas should be at least **4 meters** away.
2. The radar antenna should be at least 5 meters away. And the Inmarsat antenna should not be within the radar beam as shown in Figure 8.

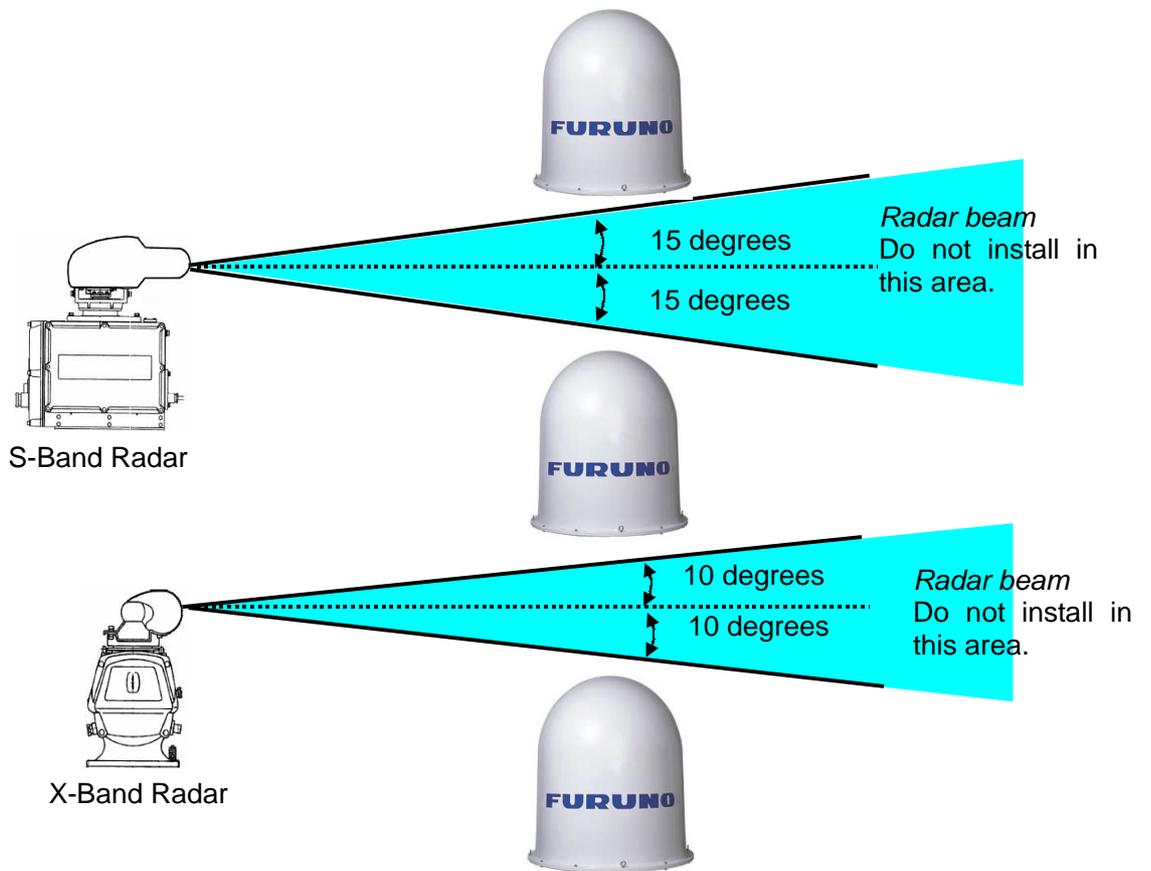


Figure 8

3. Radar

1. Install radar antennas so that the beams never overlap each other.

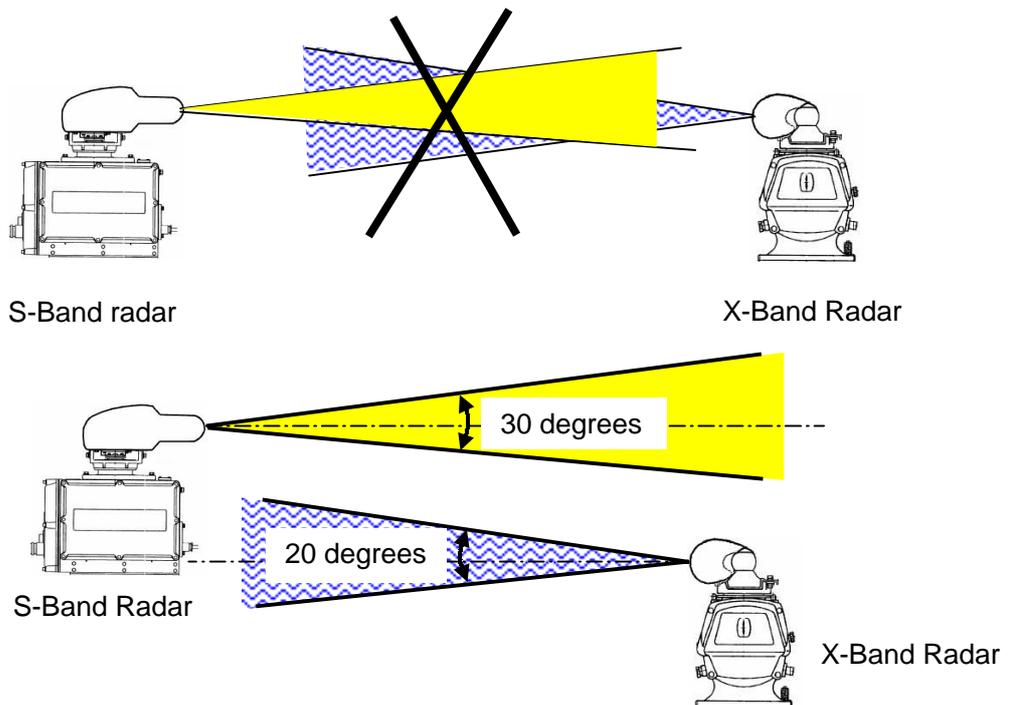


Figure 9

2. Do not locate the GPS and Inmarsat A/B/C antennas in the S-band radar beam.

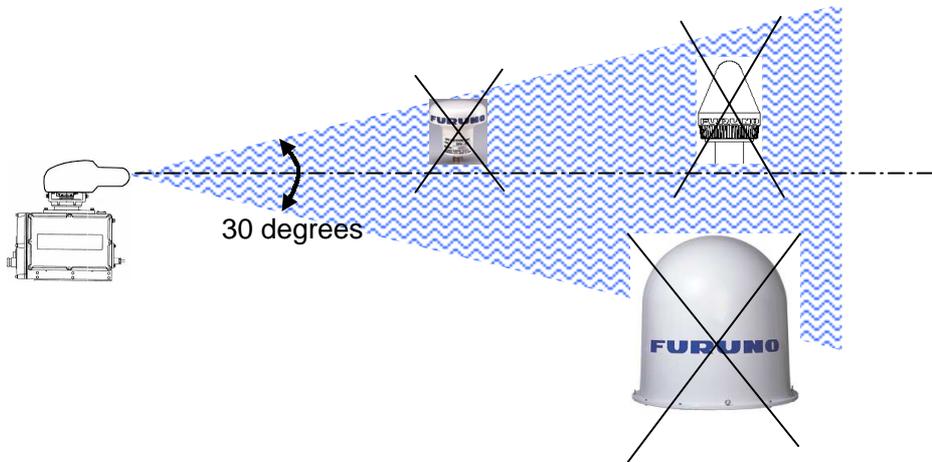


Figure 10

4. Antenna of Radio

4.1 MF/HF Antenna

1. Keep the distance between the TX and RX antennas as long as possible.

Note:

- If TX and RX antennas are installed without having enough distance between them, it may cause the interference problem. Specially, when FS-5000 with duplex mode is installed, transmission signal interfere the reception.
- Locating the RX antennas of other equipment without having enough distance from the MF/HF TX antenna interferes the reception.

For example, when TX antenna of the MF/HF is located at far starboard of compass deck, install RX antennas at far port side of compass deck as shown in Figure 11.

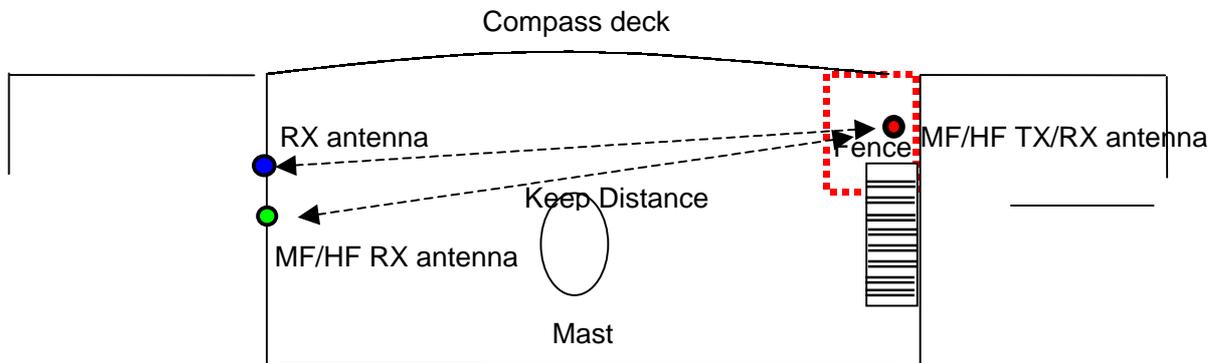
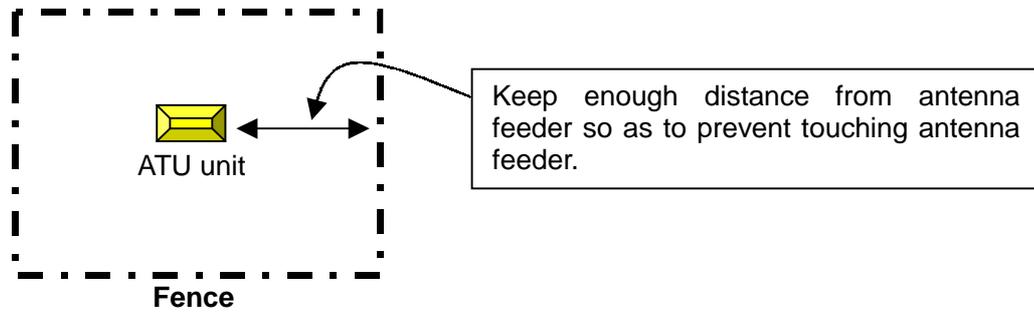


Figure 11

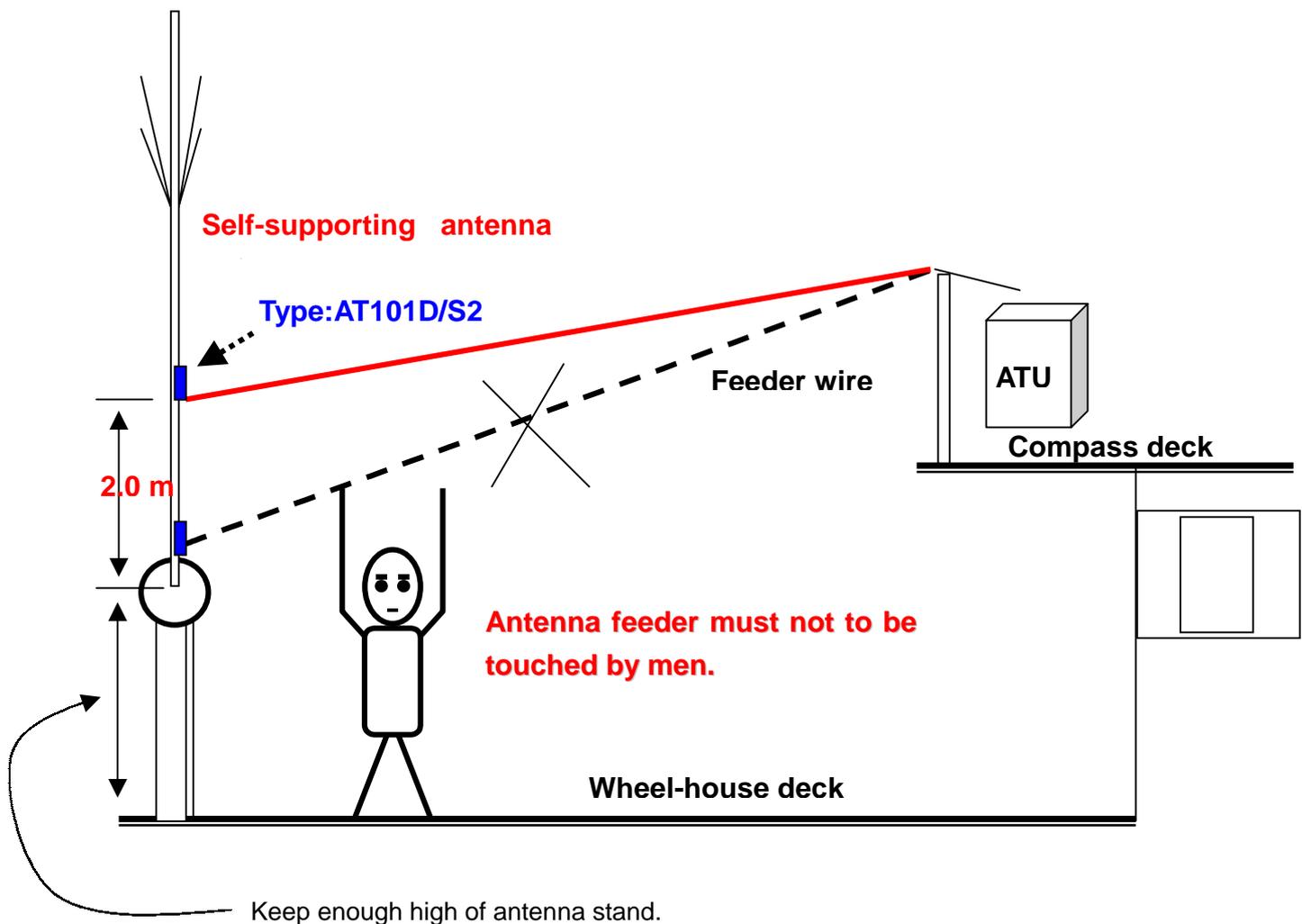
The TX antenna and antenna feeder should be fenced in order to separate a human being from them.

Keep safe distance from the antenna feeder and antenna tuning unit.

Install the safety fence to separate the antenna feeder from humankind.



Keep enough high of antenna feeder.



4.2 VHF TX/RX Antenna

- Keep the distance between the TX and RX antennas as far as possible.
- When TX/RX antennas are installed in different height, the TX antenna is located at the upper position such as at the top of mast.

When TX and RX antennas are separate horizontally, the more the horizontal distance, the more the vertical distance.

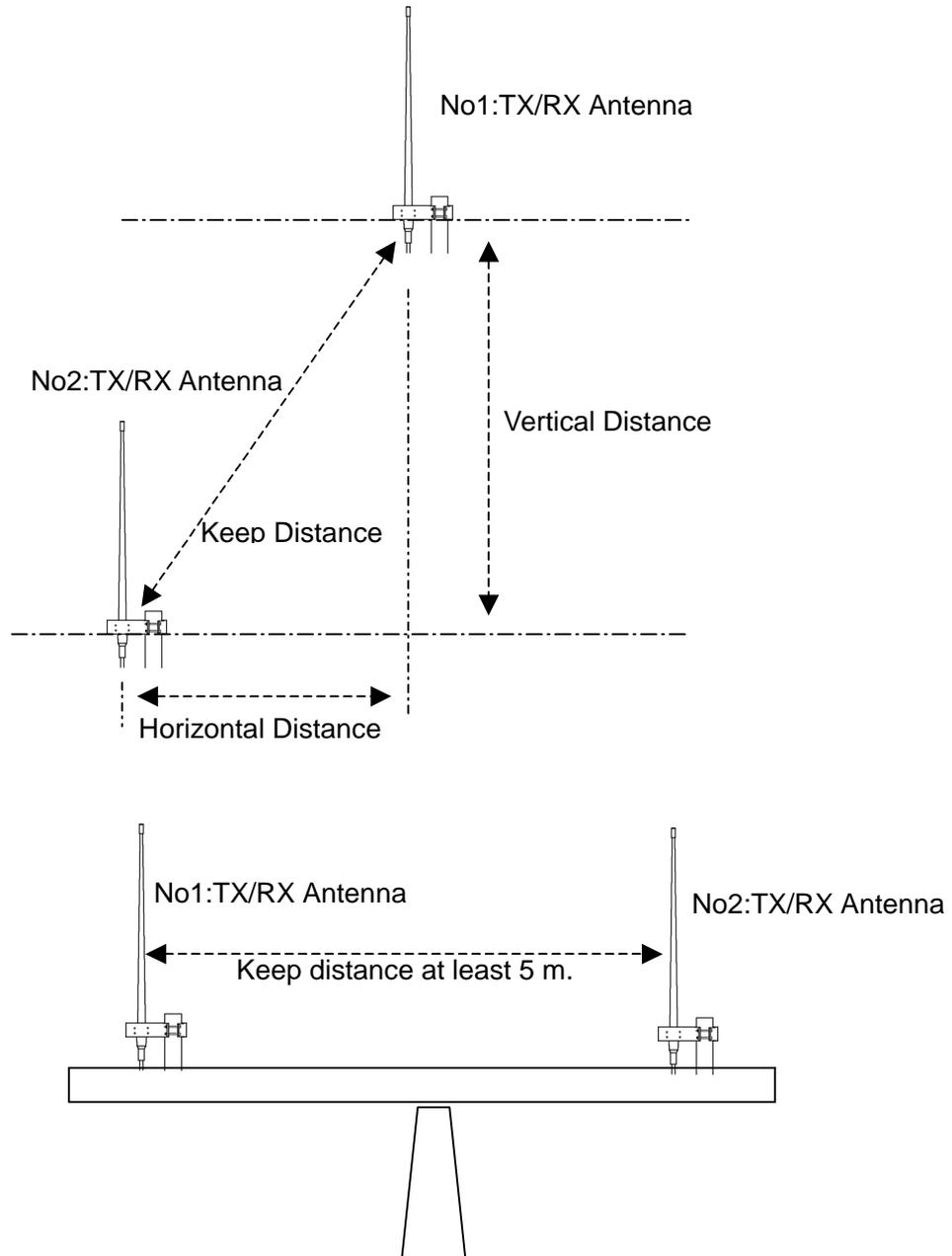


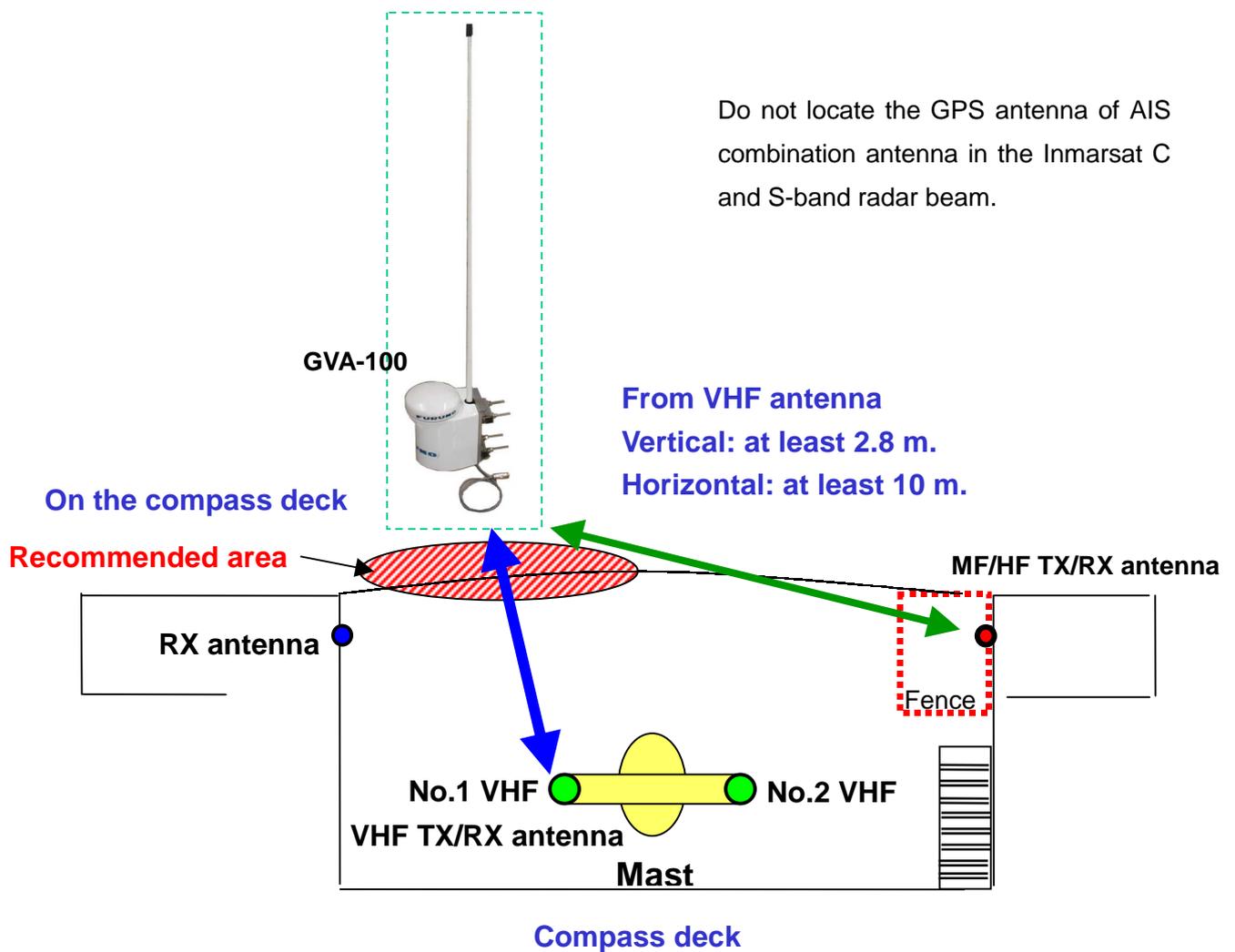
Figure 12 VHF TX/RX Antenna location

Do not install the antennas beneath or at the side of steel plate.

5. AIS Antenna

Keep distance the AIS antenna from other VHF TX antenna and MF/HF TX antenna.

- When VHF TX antenna has been installed atop of mast, install the AIS antenna at the front end of Compass deck
- When TX antenna of MF/HF antenna is located at far starboard of compass deck, install AIS antenna at far port side of compass deck



Appendix. 3 How to Select Power Supply Cable

- **Loss of the ship's main voltage caused by the supply cable.**
- Generally, tolerance of the power supply voltage for navigational equipment must be **within +/-10 %** of the standard voltage.
- Since the voltage decreases in accordance with the length and thickness of cable, the type of the cable must be determined so as to keep the voltage within this range.
- Generally, the type of cable is selected so that the decrease of voltage is limited **within 3 to 5 %** of the standard voltage.

Voltage drop

The voltage "Vd" decreased by the cable is given by the following equation;

$$Vd = K i r L / 1000$$

K: Coefficient

Single phase AC and DC voltage: **2**

Three phase AC: **square root of 3**

i: Current flow in cable (A)

r: resistance of cable (ohm/km)

L: length of cable

Maximum Cable length

$$L = 1000 Vd / K i r$$

Resistance of the cable (ohm/km)

Type	Nominal area (mm ²)	Number of wires/diameter of each wire (mm)	Resistance of cable (ohm/km)
DPYC-1.5	1.5	7/0.52	12.1
DPYC-2.5	2.5	7/0.67	7.41
DPYC-4	4.0	7/0.85	4.61
DPYC-6	6.0	7/1.04	3.08
DPYC-10	10.0	7/1.35	1.83
DPYC-16	16.0	7/1.70	1.15
DPYC-25	25.0	7/2.14	0.73
DPYC-35	35.0	7/2.52	0.52
DPYC-50	50.0	19/1.78	0.39

Calculation of the maximum length of power supply cable.

- Example 1: VHF model FM-8500 (24 VDC)

When type of the cable is DPYC-6 (6 mm², r = 3.08 ohm/km), and transmission current is 7A, the length of cable which decrease the voltage to 3 % of standard voltage (24V) is 16.7 m.

$$V_d = 24 \times 0.03 = 0.72V,$$
$$L = (1000 \times 0.72) / (2 \times 7 \times 3.08)$$
$$= 16.7 \text{ m.}$$

If longer cable is required, Type DPYC-10 or thicker one is appropriate.

- Example 2: Cable for battery (back up:24VDC)

When type of the cable is DPYC-35 (35 mm², r = 0.524 ohm/km), and consumption of current is 50 A, the length of cable which decrease the voltage to 5 % of standard voltage (24VDC) is 22.9 m.

$$V_d = 24 \times 0.05 = 1.2V$$
$$L = (1000 \times 1.2) / (2 \times 50 \times 0.524)$$
$$= 22.9 \text{ m}$$

If longer cable is required, Type DPYC-50 or thicker one is appropriate.

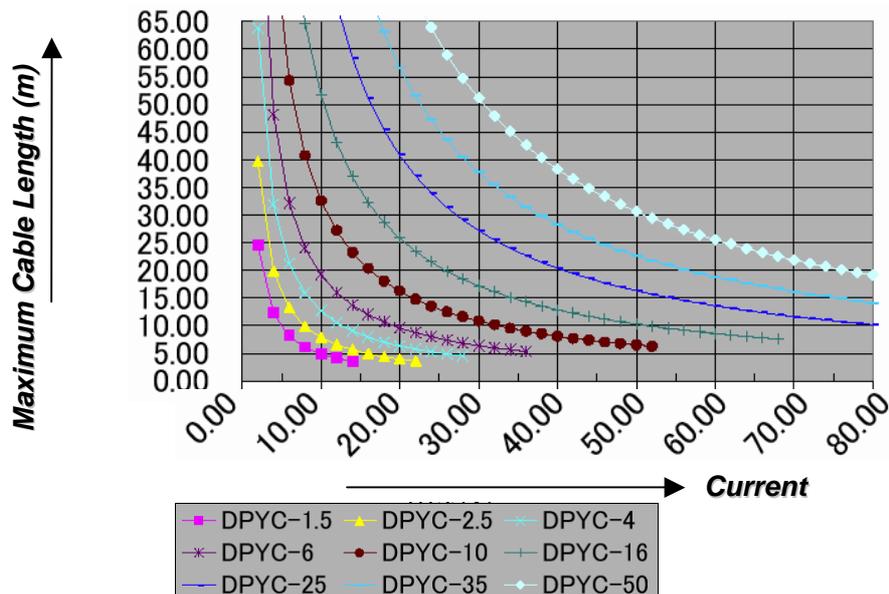
- Example 3: PR-850A (AC/DC Power supply)

When the type of the cable is the DPYC-4 (4 mm², r = 4.61 ohm/km), and current consumption is 7A (220 VAC), the length of cable which decrease the voltage to 5 % of standard voltage (220VAC) is 170 m.

$$V_d = 220 \times 0.05 = 11 \text{ V}$$
$$L = (1000 \times 11) / (2 \times 7 \times 4.61)$$
$$= 170 \text{ m}$$

If longer cable is required, Type DPYC-6 or thicker one is appropriate.

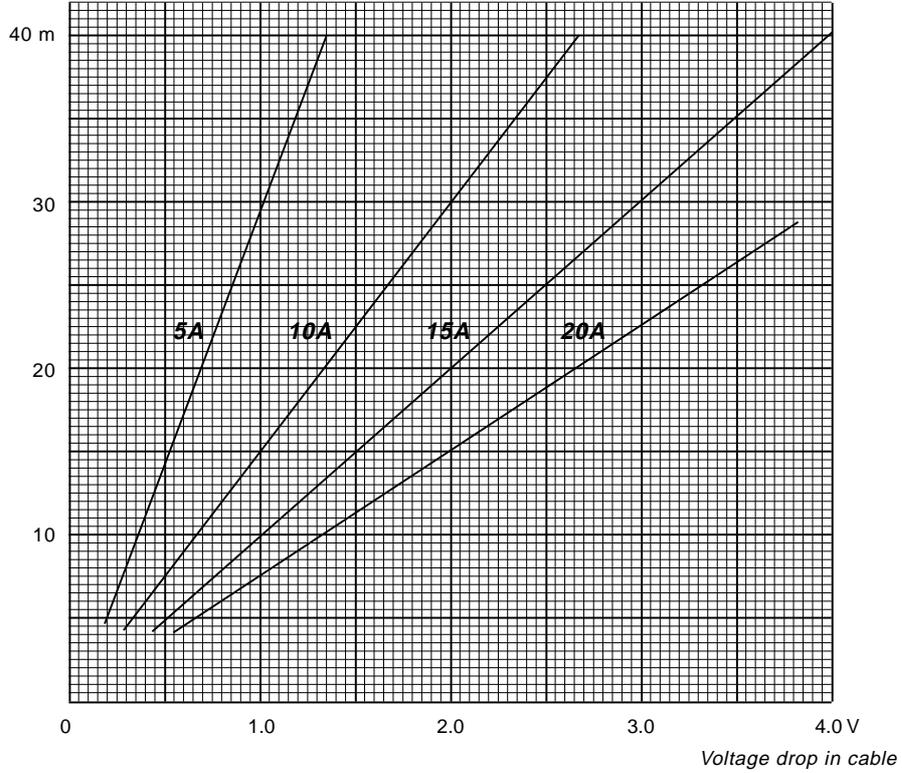
Current vs. maximum length of cable.



K=2 (Single phase and DC)

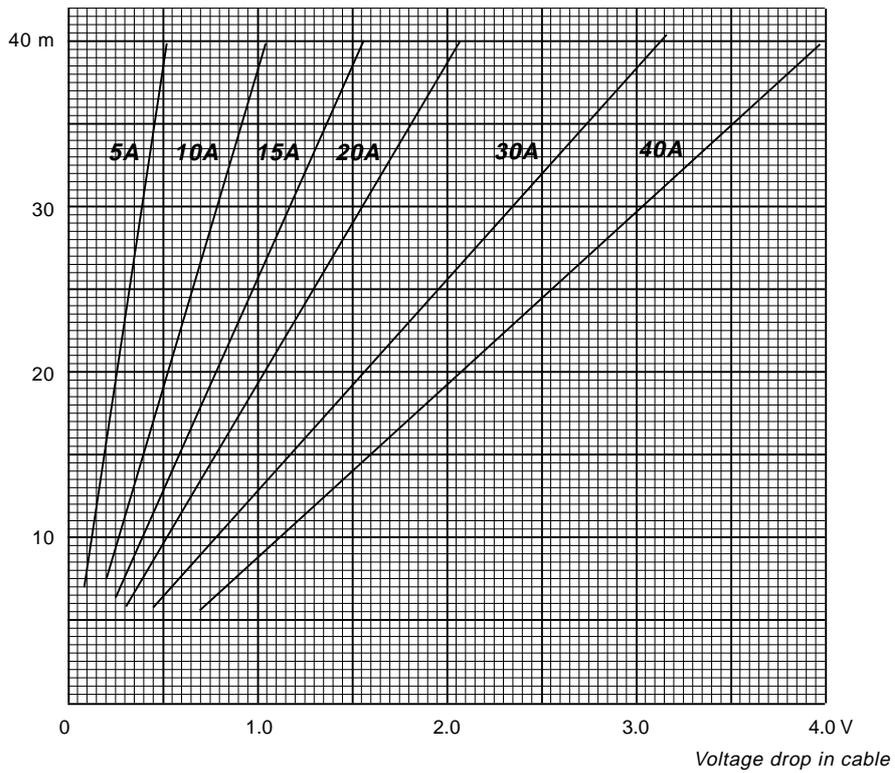
Cable length

5.5sq = 3.36 ohm/km



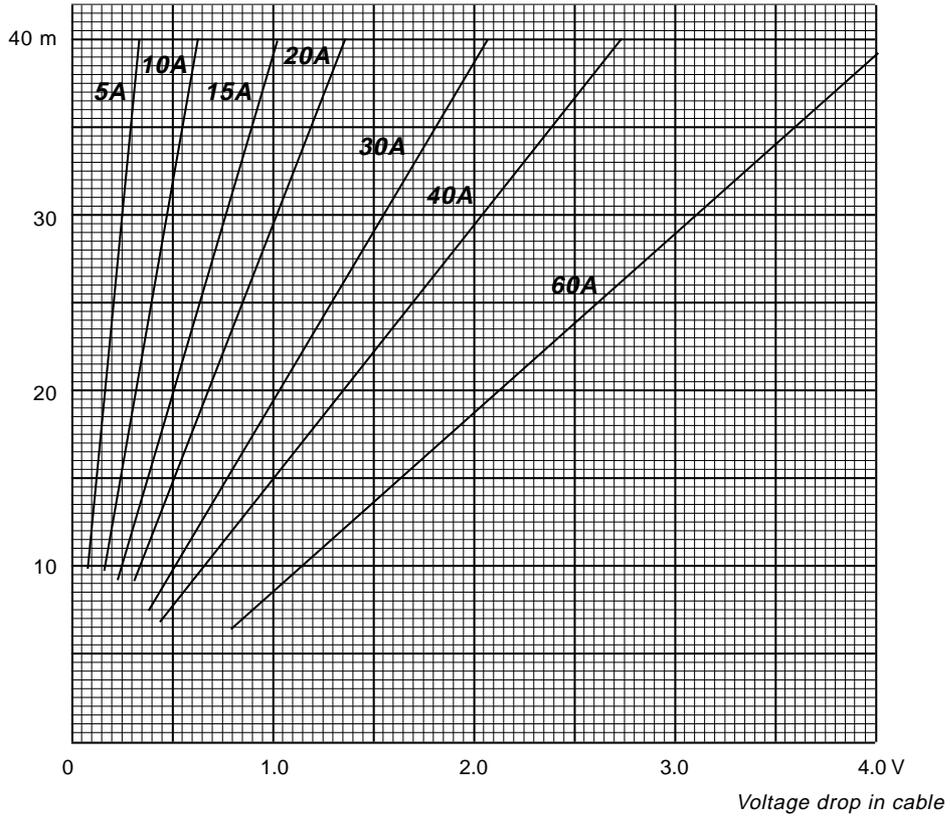
Cable length

14 sq = 1.31 ohm/km



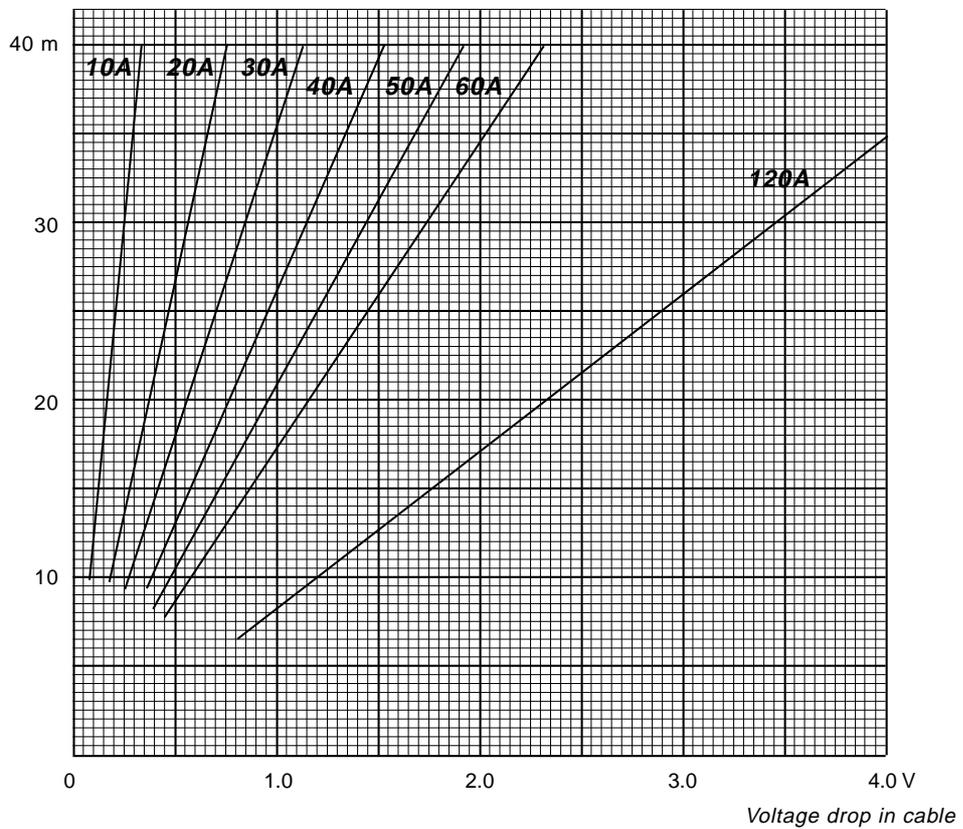
Cable length

22 sq = 0.859 ohm/km



Cable length

38 sq = 0.483 ohm/km



Conductor Resistance at 20°C(Ω/km)

Conductor Sectional Area	DPYC-1.5	DPYC-2.5	DPYC-4	DPYC-6	DPYC-10	DPYC-16	DPYC-25	DPYC-35	DPYC-50
Conductor Resistance (Ω/km)at 20°C	12.2	7.56	4.7	3.11	1.84	1.16	0.734	0.529	0.391

$L=1000 \times e / (2 \times I \times R)$

L: length, I: current, R: resistance, e: voltage drop

Cable length(m) v.s. current(A) at Vd=1.2V (drops 5% of ship's main 24V)

Cable length(m) v.s. current(A) at e=1.2V

CURRENT (A)	DPYC-1.5 (m)	DPYC-2.5 (m)	DPYC-4 (m)	DPYC-6 (m)	DPYC-10 (m)	DPYC-16 (m)	DPYC-25 (m)	DPYC-35 (m)	DPYC-50 (m)
0.00									
2.00	24.59	39.68	63.83	96.46					
4.00	12.30	19.84	31.91	48.23	81.52				
6.00	8.20	13.23	21.28	32.15	54.35	86.21			
8.00	6.15	9.92	15.96	24.12	40.76	64.66			
10.00	4.92	7.94	12.77	19.29	32.61	51.72			
12.00	4.10	6.61	10.64	16.08	27.17	43.10	68.12		
14.00	3.51	5.67	9.12	13.78	23.29	36.95	58.39		
16.00		4.96	7.98	12.06	20.38	32.33	51.09	70.89	
18.00		4.41	7.09	10.72	18.12	28.74	45.41	63.01	
20.00		3.97	6.38	9.65	16.30	25.86	40.87	56.71	
22.00		3.61	5.80	8.77	14.82	23.51	37.16	51.56	69.75
24.00			5.32	8.04	13.59	21.55	34.06	47.26	63.94
26.00			4.91	7.42	12.54	19.89	31.44	43.62	59.02
28.00			4.56	6.89	11.65	18.47	29.19	40.51	54.80
30.00				6.43	10.87	17.24	27.25	37.81	51.15
32.00				6.03	10.19	16.16	25.54	35.44	47.95
34.00				5.67	9.59	15.21	24.04	33.36	45.13
36.00				5.36	9.06	14.37	22.71	31.51	42.63
38.00					8.58	13.61	21.51	29.85	40.38
40.00					8.15	12.93	20.44	28.36	38.36
42.00					7.76	12.32	19.46	27.01	36.54
44.00					7.41	11.76	18.58	25.78	34.88
46.00					7.09	11.24	17.77	24.66	33.36
48.00					6.79	10.78	17.03	23.63	31.97
50.00					6.52	10.34	16.35	22.68	30.69
52.00					6.27	9.95	15.72	21.81	29.51
54.00						9.58	15.14	21.00	28.42
56.00						9.24	14.60	20.25	27.40
58.00						8.92	14.09	19.56	26.46
60.00						8.62	13.62	18.90	25.58
62.00						8.34	13.18	18.29	24.75
64.00						8.08	12.77	17.72	23.98
66.00						7.84	12.39	17.19	23.25
68.00						7.61	12.02	16.68	22.57
70.00							11.68	16.20	21.92
72.00							11.35	15.75	21.31
74.00							11.05	15.33	20.74
76.00							10.76	14.92	20.19
78.00							10.48	14.54	19.67
80.00							10.22	14.18	19.18