FURUNO

Installation Manual
RADAR SENSOR
DRS2D/DRS4D/
DRS4A/DRS6A/DRS12A/DRS25A
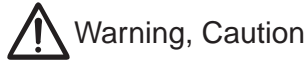
FURUNO ELECTRIC CO., LTD.

⚠ SAFETY INSTRUCTIONS

Read these safety instructions before installing the equipment.

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

⚠ Warning, Caution	🚫 Prohibitive Action	❗ Mandatory Action

⚠ WARNING

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

Only qualified personnel should work inside the equipment.

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

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

Construct a suitable service platform from which to install the antenna unit.

Serious injury or death can result if the power is left on or is applied while the equipment is being installed.

Turn off the power at the mains switch board before beginning the installation.

Fire, electrical shock or serious injury can result if the power is left on or is applied while the equipment is being installed.

⚠ CAUTION

Ground the equipment to prevent electrical shock and mutual interference.

Observe the following compass safe distance to prevent deviation of a magnetic compass.

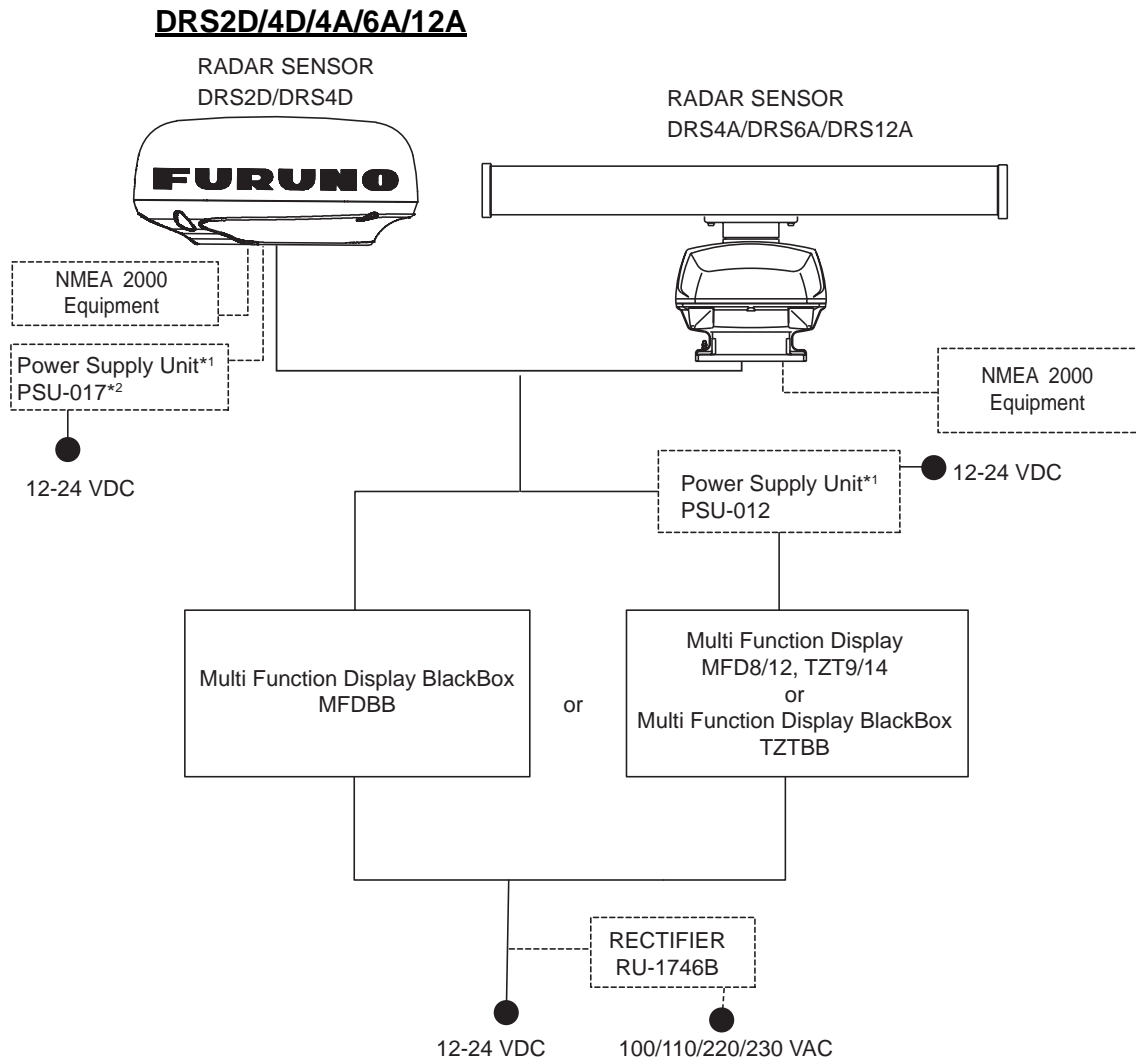| Model	Standard	Steering
DRS4A	0.80 m	0.50 m
DRS6A	0.85 m	0.55 m
DRS12A	1.15 m	0.70 m
DRS25A	1.00 m	0.60 m
DRS2D	1.35 m	0.80 m
DRS4D	1.40 m	0.85 m
PSU-012	0.30 m	0.30 m
PSU-013	0.30 m	0.30 m
PSU-017	0.30 m	0.30 m

⚠ WARNING

Radio Frequency Radiation Hazard

The radar antenna emits electromagnetic radio frequency (RF) energy which can be harmful, particularly to your eyes. Never look directly into the antenna aperture from a close distance while the radar is in operation or expose yourself to the transmitting antenna at a close distance.

Distances at which RF radiation levels of 100 and 10 W/m^2 exist are given in the table below.

Note: If the antenna unit is installed at a close distance in front of the wheel house, your administration may require halt of transmission within a certain sector of antenna revolution. This is possible - Ask your FURUNO represenative or dealer to provide this feature.

Model	Distance to 100 W/m^2 point	Distance to 10 W/m^2 point
DRS4A	Nil	1.20 m
DRS6A	Nil	1.20 m
DRS12A (XN12A)	0.20 m	2.40 m
DRS12A (XN13A)	0.20 m	1.90 m
DRS25A (XN12A)	0.50 m	5.30 m
DRS25A (XN13A)	0.40 m	4.40 m
DRS2D	Nil	0.40 m
DRS4D	0.10 m	1.40 m

SYSTEM CONFIGURATION

DRS2D/4D/4A/6A/12A

RADAR SENSOR
DRS2D/DRS4D

RADAR SENSOR
DRS4A/DRS6A/DRS12A

FURUNO

NMEA 2000
Equipment

Power Supply Unit*1
PSU-017*2

12-24 VDC

NMEA 2000
Equipment

Power Supply Unit*1
PSU-012

12-24 VDC

Multi Function Display BlackBox
MFDBB

or

Multi Function Display
MFD8/12, TZT9/14
or
Multi Function Display BlackBox
TZTBB

RECTIFIER
RU-1746B

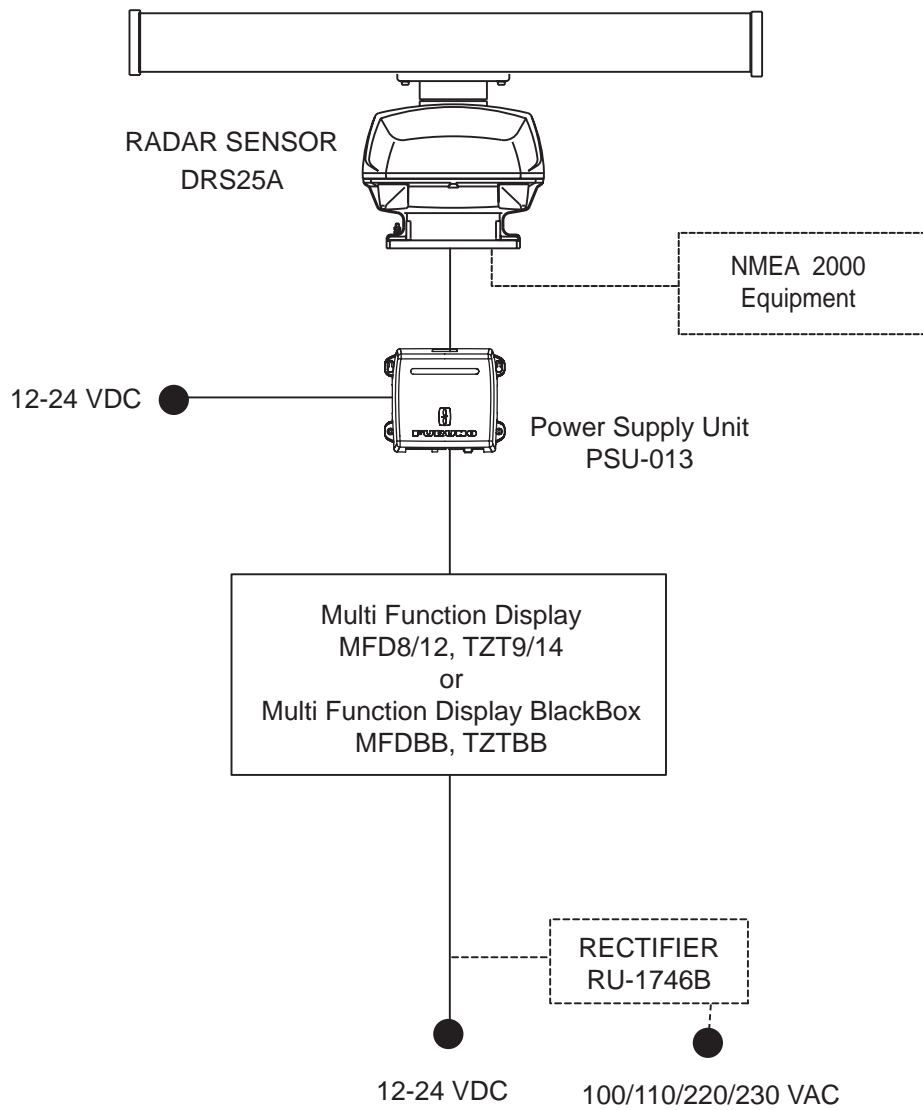12-24 VDC   100/110/220/230 VAC

*1: The power supply unit (PSU-012/017) is necessary in the combination of radar sensor and multi function display.

	DRS2D/4D	DRS4A	DRS6A	DRS12A
MFD8	NO	PSU-012	PSU-012	PSU-012
MFD12	NO	NO	NO	PSU-012
MFDBB	NO	NO	NO	NO
TZT9	PSU-012 or PSU-017	PSU-012	PSU-012	PSU-012
TZT14	PSU-012 or PSU-017	PSU-012	PSU-012	PSU-012
TZTBB	PSU-012 or PSU-017	PSU-012	PSU-012	PSU-012

*2: The disconnecting device (breaker, etc.) is required when the power cable of PSU-017 is connected to ship's mains.

DRS25A

RADAR SENSOR
DRS25A

NMEA 2000
Equipment

12-24 VDC

Power Supply Unit
PSU-013

Multi Function Display
MFD8/12, TZT9/14
or
Multi Function Display BlackBox
MFDBB, TZTBB

RECTIFIER
RU-1746B

12-24 VDC   100/110/220/230 VAC

EQUIPMENT LISTS

<u>**Standard supply**</u>

Name	Type	Code No.	Qty	Remarks
Radar Sensor	XN10A-RSB-118-092	-	1	For DRS4A, w/CP03-32601
	XN12A-RSB-118-093		1	For DRS6A, w/CP03-32601
	XN12A-RSB-118-094	-	1	For DRS12A, 1255 mm, w/CP03-32601
	XN13A-RSB-118-094		1	For DRS12A, 1795 mm, w/CP03-32601
	XN12A-RSB-118-095	-	1	For DRS25A, 1255 mm, w/CP03-32601
	XN13A-RSB-118-095	-	1	For DRS25A, 1795 mm, w/CP03-32601
	DRS2D	-	1	Radome, 2 kW, w/CP03-32101
	DRS4D	-	1	Radome, 4 kW, w/CP03-32101
Power Supply Unit	PSU-013	-	1	For DRS25A, w/SP03-16101 and CP03-32700
Installation Materials	CP03-32101	001-025-270	1 set	For DRS2D/4D
	CP03-32601	001-025-780	1 set	For DRS4A/6A/12A/25A
	CP03-32200	000-011-720	1	Two-way cable, MOD-ASW0001-100+, 10 m, for DRS2D/4D/4A/6A/12A
	CP03-32300	000-011-721		Two-way cable, MOD-ASW0001-150+, 15 m, for DRS2D/4D/4A/6A/12A
	CP03-32400	000-011-722		Two-way cable, MOD-ASW0001-200+, 20 m, for DRS2D/4D/4A/6A/12A
	CP03-32500	000-011-723		Two-way cable, MOD-ASW0001-300+, 30 m, for DRS2D/4D/4A/6A/12A
	CP03-32800	000-011-990		Two-way cable, MOD-ASW0002-100+, 10 m, for DRS25A
	CP03-32810	000-011-991		Two-way cable, MOD-ASW0002-150+, 15 m, for DRS25A
	CP03-32820	000-011-992		Two-way cable, MOD-ASW0002-200+, 20 m, for DRS25A
	CP03-32830	000-011-993		Two-way cable, MOD-ASW0002-300+, 30 m, for DRS25A

Optional supply

Name	Type	Code No.	Remarks
Power Supply Unit	PSU-012	-	
	PSU-017	-	For DRS2D/4D
Gasket	OP03-203	001-025-290	For DRS2D/4D, ϕ10 NMEA2000 cable
	OP03-205	001-025-790	For DRS4A/6A, ϕ10 NMEA2000 cable
	OP03-206	001-035-290	For DRS25A, ϕ10 NMEA2000 cable
Resister Assy	OP03-204	001-025-300	For NMEA2000 connection with a unit
Radome Mount	OP03-208	001-078-340	For DRS4D
	OP03-209	001-078-350	For DRS2D
Joint Box*	TL-CAT-012	000-167-140-10	For LAN cable extension
LAN Cable	MOD-Z072-020+	000-167-175-10	2 m
	MOD-Z072-050+	000-167-176-10	5 m
	MOD-Z072-100+	000-167-177-10	10 m
Cable Assy	M12-05BFFM-010	000-167-965-10	NMEA2000, ϕ6, w/connector, 1 m
	M12-05BFFM-020	000-167-966-10	NMEA2000, ϕ6, w/connector, 2 m
	M12-05BFFM-060	000-167-967-10	NMEA2000, ϕ6, w/connector, 6 m
	CB-05BFFM-010	000-167-971-10	NMEA2000, ϕ10, w/connector, 1 m
	CB-05BFFM-020	000-167-972-10	NMEA2000, ϕ10, w/connector, 2 m
	CB-05BFFM-060	000-167-973-10	NMEA2000, ϕ10, w/connector, 6 m

*: After the wiring, it is required to wind the vinyl tape around the LAN connector to waterproof.
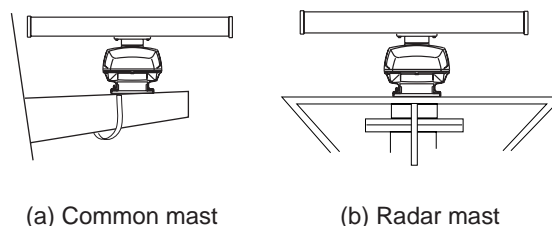
1. MOUNTING

NOTICE

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

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


1.1   Mounting Considerations

• The radar sensor is generally installed either on top of the wheelhouse or on the radar mast on a suitable platform. Locate the radar sensor where there is a good all-round view. Any obstruction will cause shadow and blind sectors. A mast for instance, with a diameter considerably less than the horizontal beamwidth of the radiator, will cause only a small blind sector, but a horizontal spreader or crosstrees in the same horizontal plane as the radar sensor would be a much more serious obstruction; you would need to place the radar sensor well above or below it.

• It is rarely possible to place the radar sensor where a completely clear view in all directions is available. Thus, you should determine the angular width and relative bearing of any shadow sectors for their influence on the radar at the first opportunity after fitting.

• A magnetic compass will be affected if the radar sensor is placed too close to it. Observe the compass safe distances mentioned in the SAFETY INSTRUCTIONS to prevent interference to a magnetic compass.

• Do not paint the radiator aperture and radome to ensure proper emision of the radar waves.

• When this radar sensor is to be installed on large vessels, consider the following points:

  • The two-way cable run between the radar sensor and MFDBB, MFD8, MFD12 or PSU-012 comes in lengths of 10 m, 15 m, 20 m or 30 m.

  • Deposits and fumes from a funnel or other exhaust vent can adversely affect the aerial performance and hot gases may distort the radiator portion. The radar sensor must not be mounted where the temperature is more than 55 degrees centigrade.

As shown in the figure below, the radar sensor may be installed on a common mast or on the radar mast.

(a) Common mast   (b) Radar mast

For DRS4A/6A/12A/25A
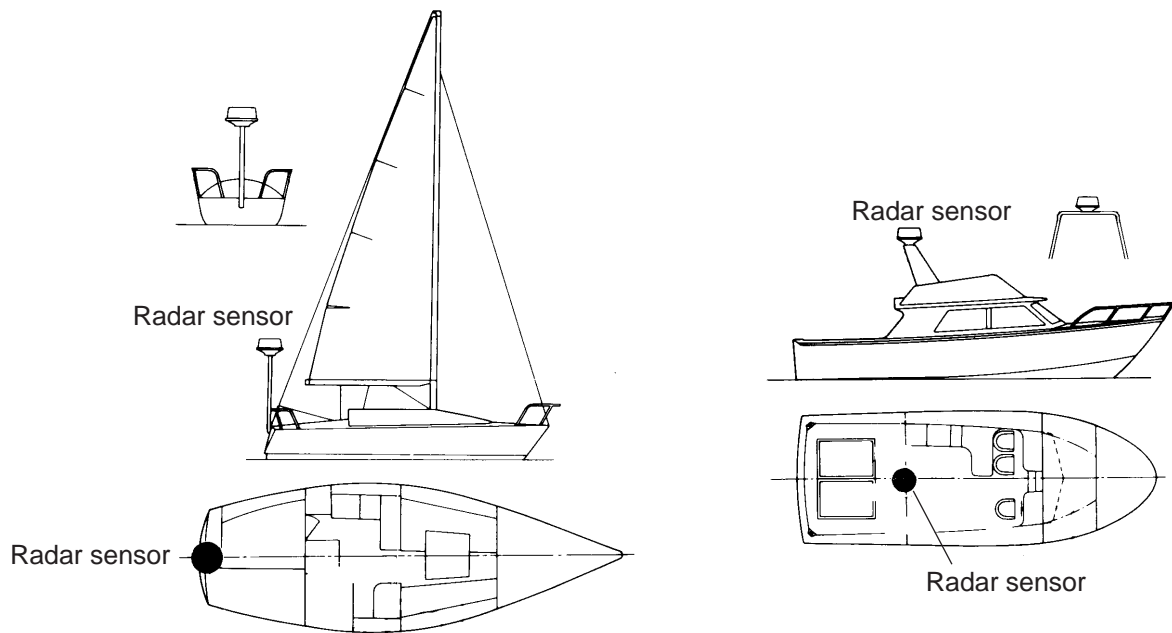
For DRS2D/4D

1.2 Mounting Procedure for DRS2D/4D

1. Remove mounting hardware at the bottom of the radar sensor, four each of hex bolts (M10x20), spring washers and flat washers. Save the spring washers and flat washers to use them to fix the radome base to the platform, at step 3. If the thickness of the mounting platform is 5 mm or less, also save the bolts.
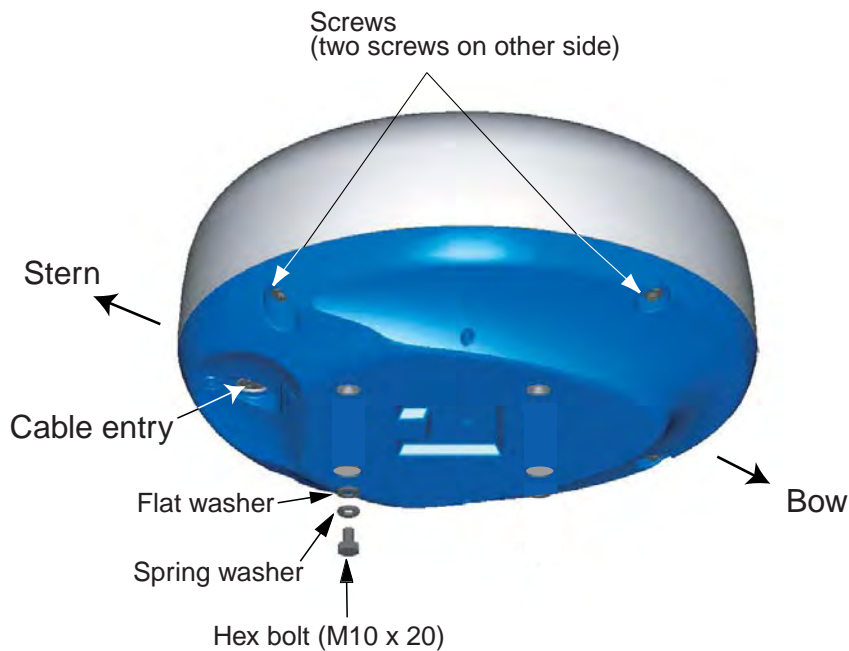

2. Construct a platform (steel or aluminum) 6-10 mm in thickness referring to the outline drawing at the back of this manual. Fasten the platform to the mounting location. Next, position the base so the cable entrance is facing the stern.

Note: When drilling holes in the platform, be sure they are parallel with the fore and aft line.

3. Use the hex bolts*, flat washers and spring washers removed at step 1, and fasten the radome base to the platform. The torque should be between 19.6-24.5N•m.

*If the thickness of the platform is 6-10 mm, use M10x25 bolts (supplied). For thicker platform, use locally supplied bolts.
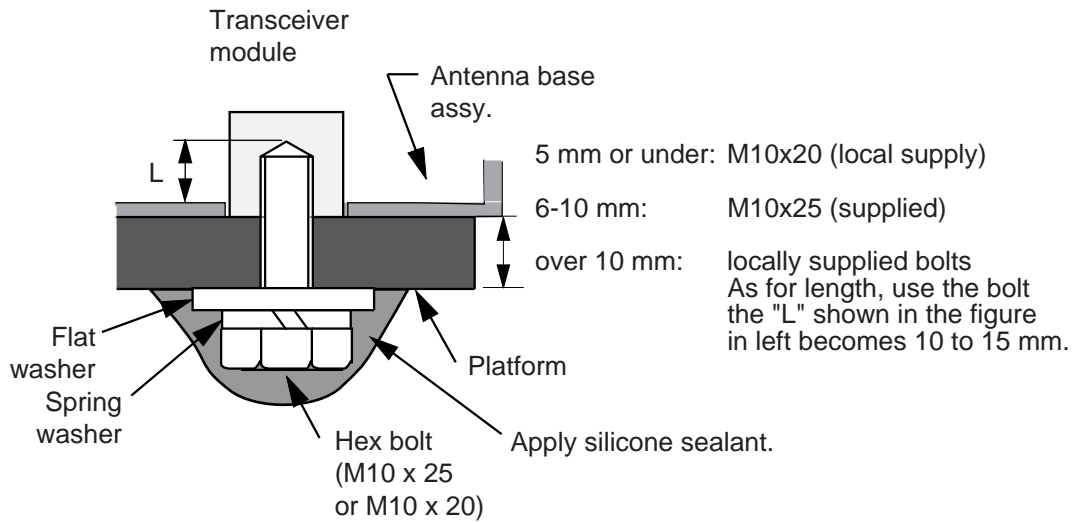
4. Mount the cover tentatively. The cover is opened for wiring at Chapter 2.

1.3   Mounting Procedure for DRS4A/6A/12A/25A

Refer to the outline drawing at the back of this manual, and drill five holes in the mounting platform: four holes of 15 mm in diameter for fixing the radar sensor and one hole of 25-30 mm in diameter for the signal cable. The outline drawing shows two cable entrance holes, one on the radar sensor and one on the rubber mat. Use only the one on the rubber mat.

1.3.1   Fastening the radiator to the radiator bracket

1. Remove the radiator cap from the radiator bracket.
2. Coat the surface of the radiator bracket with silicone sealant as shown in the figure below.
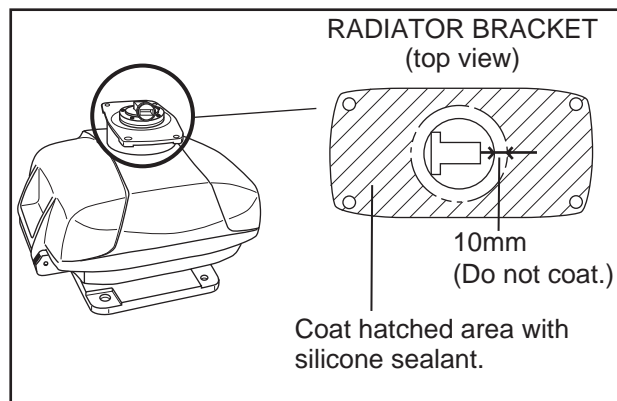
3. Coat threaded holes on the antenna radiator with silicone sealant.
4. Grease the O-ring and set it to the radiator bracket.

5. Coat the hex bolts (4 pcs.) with silicone sealant. Fasten the antenna radiator to the radiator bracket with the hex bolts, flat washers and spring washers supplied with the radiator Then, apply silicone sealant around the junction part between the radiator and bracket.

6. Apply silicone sealant to holes to prevent water ingress.
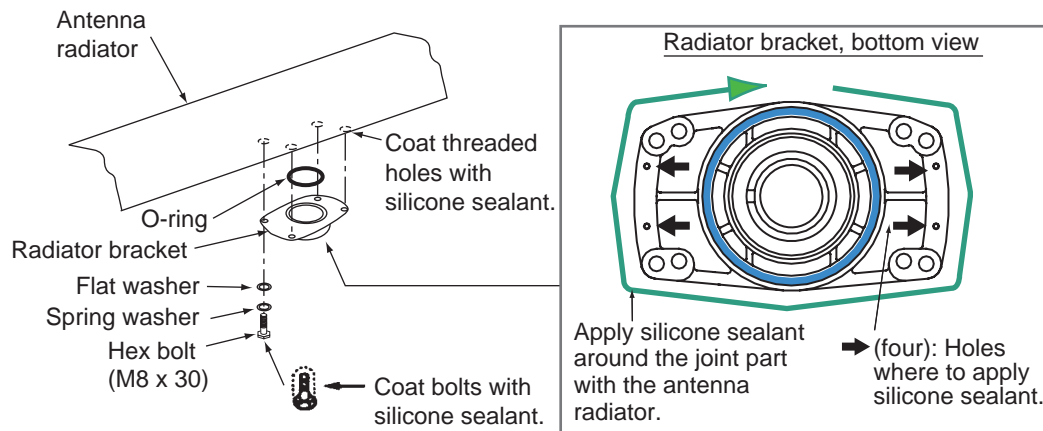
1.3.2   Mounting the radar sensor

The radar sensor can be mounted using the fixing holes on the outside (200 x 200 mm) or inside (140 x 150 mm) the radar sensor.

Using outside fixing holes of radar sensor

Use the hex bolts (supplied) to mount the radar sensor as below.

1. Lay the corrosion-proof rubber mat (supplied) on the mounting platform.
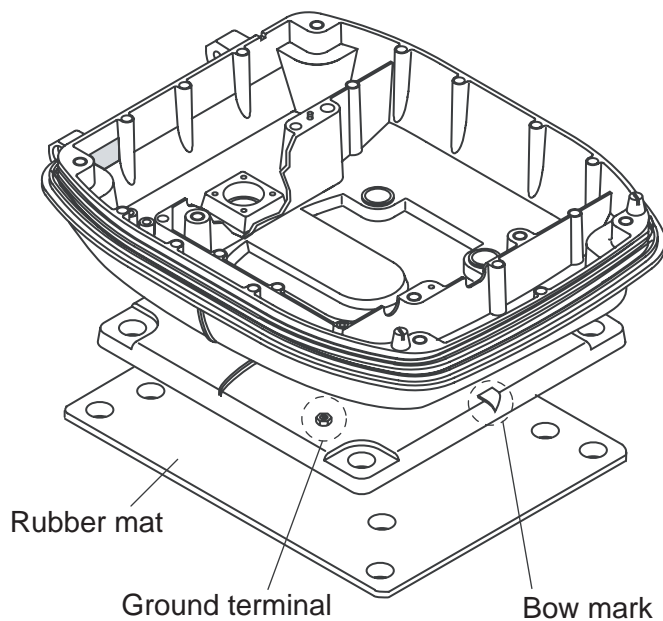
2. Lay the radar sensor on the mounting platform, orienting it as shown below. (The hinges must face toward the stern.)

STERN ← Hinge → BOW
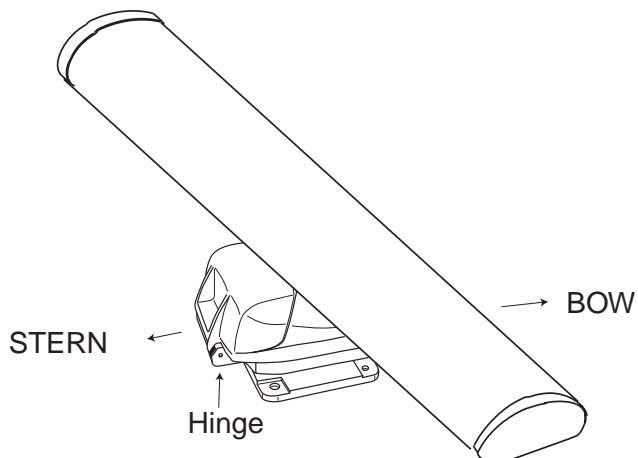
⚠ **CAUTION**

Do not lift the radar sensor by the radiator; lift it by the housing.

The radiator may be damaged.

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3. Insert four hex bolts (M12 x 60, supplied) and seal washers (ϕ30, supplied) from the top of the housing, as shown below.

Hex. bolt
Seal washer
(Face projecting part down.)
Flat washer
Spring washer
Nut

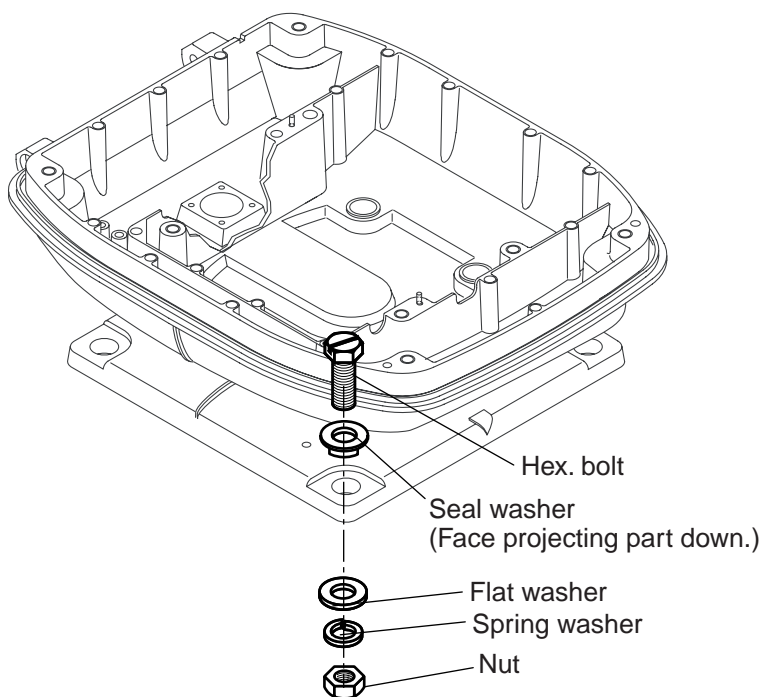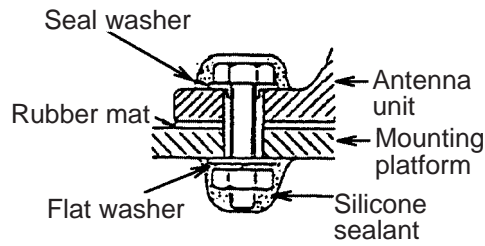4. Pass flat washers (M12, supplied), spring washers (M12, supplied) and nuts (M12, supplied) onto hex. bolts. Fasten by tightening nuts. Do not fasten by tightening the hex. bolts; seal washers may be damaged.

Seal washer
Antenna unit
Rubber mat
Mounting platform
Flat washer
Silicone sealant

5. Coat flat washers, spring washers, nuts and exposed parts of bolts with anticorrosive sealant.

6. Prepare ground point in mounting platform (within 300 mm of ground terminal on radar sensor) using M6 x 25 bolt, nut and flat washer (supplied).

7. Run the ground wire (RW-4747, 340 mm, supplied) between the ground terminal and ground point.

8. Coat ground terminal and ground point with silicone sealant as shown below.

Hex. bolt
Flat washer
Ground wire
Flat washer
Spring washer
Hex. nut
Silicone sealant
OR
GROUND POINT
Ground wire
Hex. nut
Spring washer
Flat washer
Hex. nut
Weld here.

GROUND TERMINAL
Silicone sealant
Ground wire
antenna unit
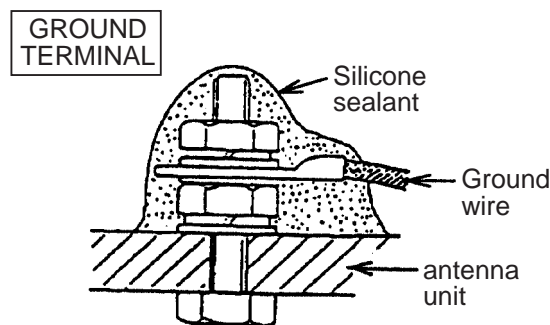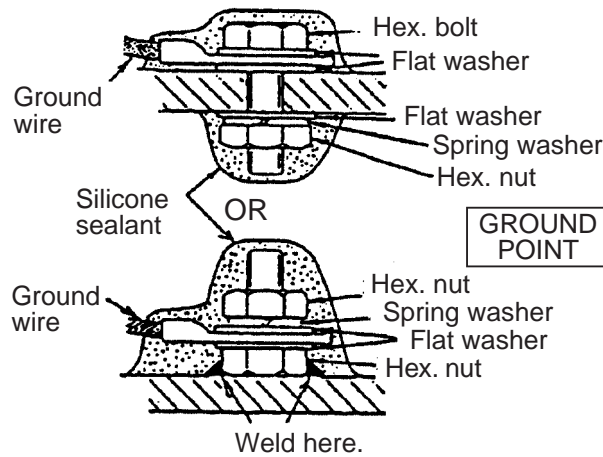
Using inside fixing holes of the sensor housing

If this radar is replacing a FURUNO radar whose mounting dimensions are the same as this one (140 x 150 mm), it may be possible to use its mounting platform. This method requires removal of the RF unit from the radar sensor to access inside fixing holes. Use hex bolts, flat washers, spring washers and nuts (local supply) to mount the radar sensor.

1. Unfasten four bolts from the cover to open the radar sensor.

2. Unplug the PCS connector from RF unit.

3. Separate upper chassis from lower chassis by removing two bolts (M8x25).

4. Remove RF unit by unfastening two hex bolts and two fixing bolt.

(Example: DRS4A/6A)
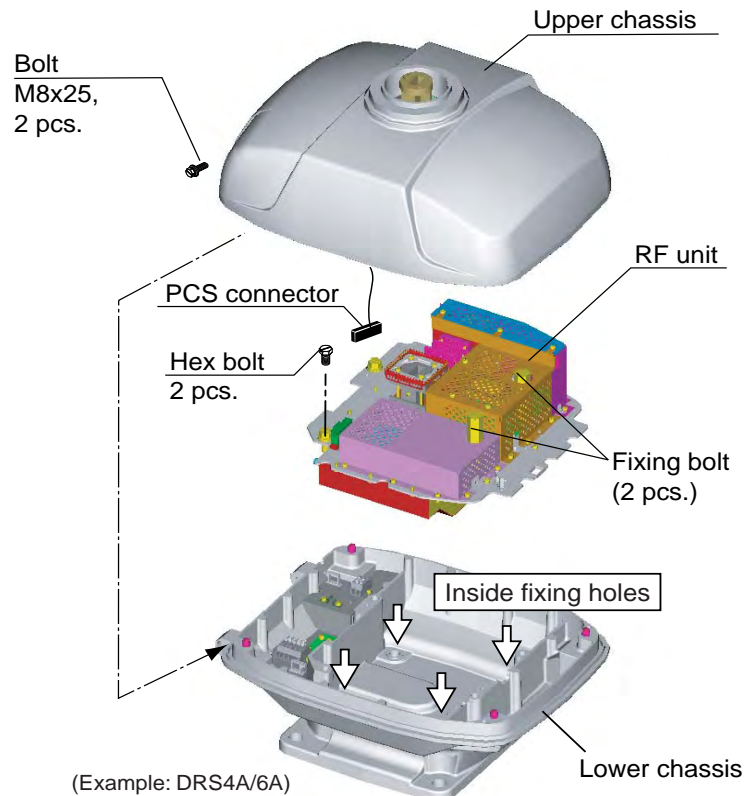
For DRS12A/25A, unfasten four hex bolts, not two fixing bolts, to remove the RF unit.

5. Lay the corrosion-proof rubber mat (supplied) on the mounting platform.

6. Fasten the lower chassis to the mounting platform with hex bolts, spring washers, flat washers and nuts (local supply), and then coat flat washers, nuts and exposed parts of bolts with silicone sealant. Cut a slit in the rubber bushing and insert bolt into the bushing. Do not use seal washers.

7. Remount RF unit.

8. Coat outside fixing holes with silicone sealant and then attach caps (supplied) to holes.

9. Do steps 6-8 on page 6.

1.4   Mounting of Power Supply Unit

1.4.1   PSU-013 (for DRS25A)/PSU-012 (Option)

For combinations shown below, the optional power supply unit PSU-012 or PSU-017 is necessary.
The PSU-013 is required for any DRS25A installation

	DRS2D/4D	DRS4A	DRS6A	DRS12A
MFD8	NO	**PSU-012**	**PSU-012**	**PSU-012**
MFD12	NO	NO	NO	**PSU-012**
MFDBB	NO	NO	NO	NO
TZT9	**PSU-012 or PSU-017***	**PSU-012**	**PSU-012**	**PSU-012**
TZT14	**PSU-012 or PSU-017***	**PSU-012**	**PSU-012**	**PSU-012**
TZTBB	**PSU-012 or PSU-017***	**PSU-012**	**PSU-012**	**PSU-012**

*: The PSU-017 is available in the combination of DRS2D/4D and TZT9/14/BB. See section 1.4.2.

<u>**Contents of PSU-012/013**</u>

Name	Type	Code No.	Qty	Remarks
Power supply unit	PSU-012	-	1	
	PSU-013	-		For DRS25A
Cable assy	VL3P-VV-S2X2C-AA050	000-152-217-11	1	5 m
LAN cable	MOD-Z072-050+	000-167-176-10	1	5 m, standard
Self-tapping screw	4x20, SUS304	000-158-850-10	4	
Fuse*	FGB0 250V 10A	000-155-839-10	2	For 24 VDC
	FGB0 250V 15A	000-157-874-10	2	For 12 VDC
XH Connector Assembly	03-2345(2P)	001-183-760-00	1	For TZT9/14/BB

*: The power supply unit is shipped with 15A fuse. Replace fuse with 10A when using the unit with
24V ship's battery.

Mounting

When selecting a location, keep in mind the following points. Fix the power supply unit on the desktop or bulkhead with four self-tapping screws (4x20, supplied).

• Location is dry, well ventilated.

• Make sufficient maintenance space.

• Installed within 2, 5 or 10 m (2 and 10 m: optional supply) from the multi function display.

Self-tapping screw
(4x20, 4 pcs.)
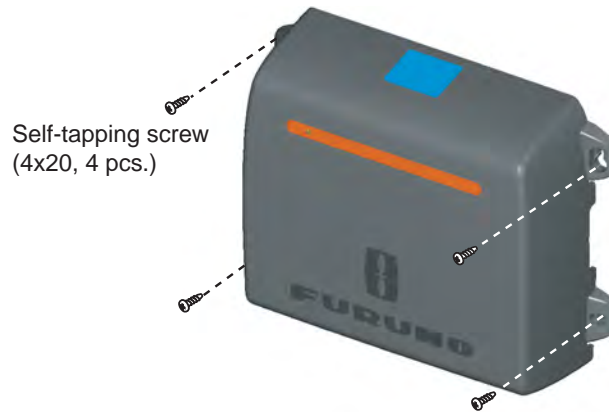
Note: When you install the unit on the bulkhead, fix the unit with the following direction.

UP
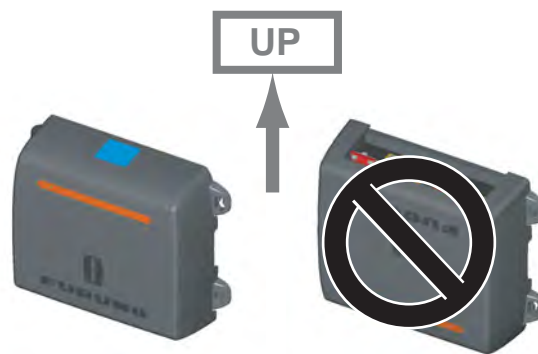
1.4.2 PSU-017 (option)

A power supply unit is required when you connect a radar sensor. The PSU-017 is available in the combination of DRS2D/4D and TZT9/14/BB. Use the PSU-012 or PSU-013 in all other combinations.

LED for the operation check:
Lights in green when the unit
outputs 48 VDC.

Power cable (5 m):
The power cable is preattached to
the unit.
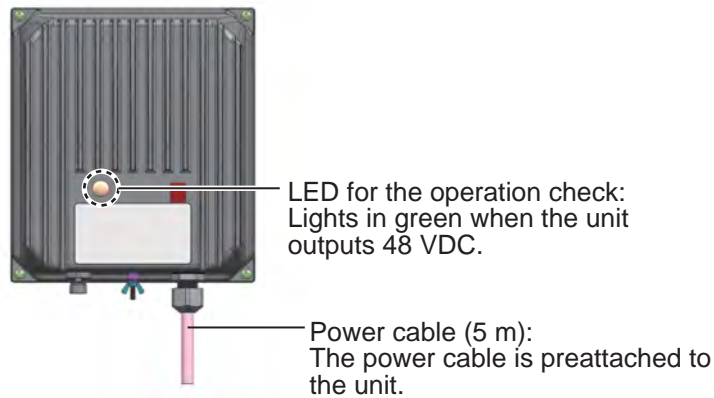
Note: When the fuse in this unit blows, the LED does not light. At this time, the PSU-017 can not output 48 VDC, but high voltage is still present inside. Turn off the unit from the ship's mains to service the unit.

Contents of PSU-017

Name	Type	Code No.	Qty	Remarks
Power supply unit	PSU-017	-	1	
Self-tapping screw	4x20, SUS304	000-158-850-10	4	
Fuse	FGMB 125V 7A PBF	000-157-493-10	1	For the replacement
	FGMB 125V 1.5A PBF	000-157-464-10	1	

### Mounting

When selecting a location, keep in mind the following points. Fix the power supply unit on the desktop or bulkhead with four tapping screws (4x20, supplied).

• Location is dry, well ventilated.

• Make sufficient maintenance space.

• A disconnecting device (breaker, etc.) is required when the power cable is connected to ship's mains.

2. WIRING

The MFDBB, MFD8, MFD12, PSU-012 or PSU-017 connects to the radar sensor with the two-way cable MOD-ASW0001 (MOD-ASW0002 for DRS25A). In order to minimize the chance of picking up electrical interference, avoid where possible routing the two-way cable near other onboard electrical equipment. After passing the cable through the hole in the radar sensor, apply sealing compound around the hole for waterproofing. When connecting to other NMEA2000 equipment, use the optional cable M12-05BFFM (φ6) or CB-05BFFM (φ10).

Note: When TZT9/14/BB is connected to the radar sensor, confirm that the program version of the radar sensor is 0359235-01.16 or higher.

NOTICE

Before connecting or disconnecting the NMEA2000 cable, turn off the radar sensor.

The sensor may become damaged if the power is not turned off.

Wiring for DRS2D/4D/4A/6A/12A without PSU-012

RADAR SENSOR
DRS2D/DRS4D

RADAR SENSOR
DRS4A/DRS6A/DRS12A

NMEA2000 Equipment

Two-way cable
MOD-ASW0001
(10/15/20/30 m)

NMEA2000 cable
M12-05BFFM (φ6) or
CB-05BFFM (φ10)

NMEA2000 Equipment

NMEA2000 cable
M12-05BFFM (φ6) or
CB-05BFFM (φ10)

———— : Standard Supply
-------- : Optional Supply

To Multi Function Display BlackBox
MFDBB or Multi Function Display
MFD8/12
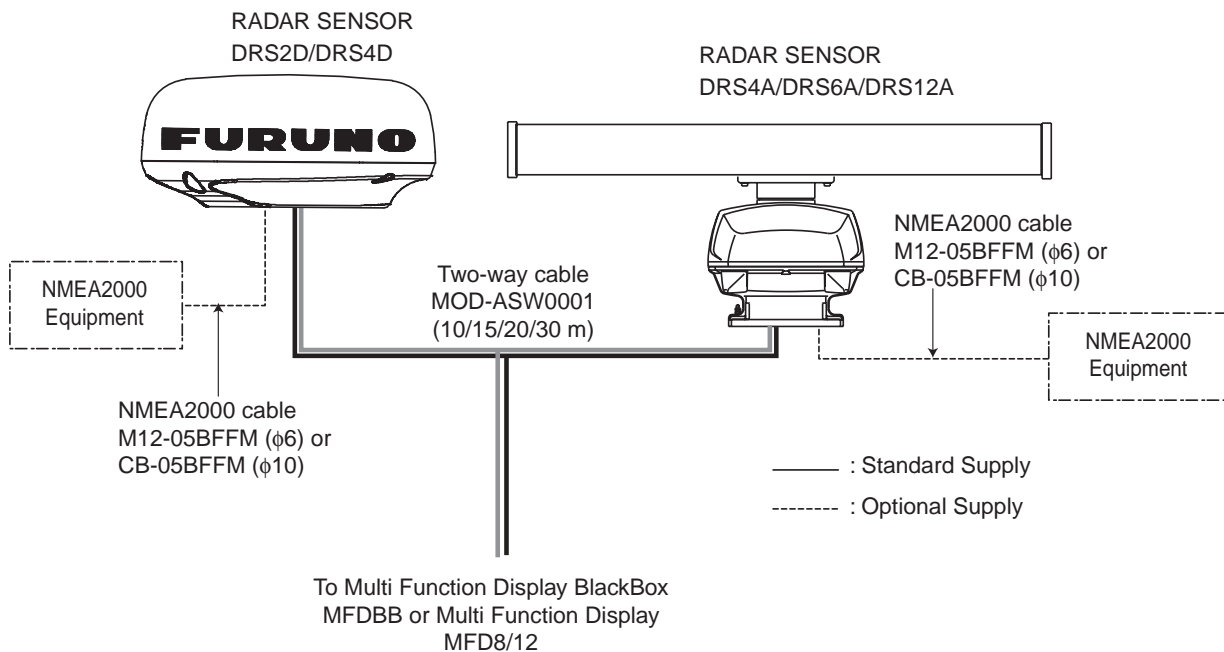
Wiring for DRS2D/4D/4A/6A/12A with PSU-012

Radar Sensor
DRS2D/DRS4D

Radar Sensor
DRS4A/DRS6A/DRS12A

NMEA2000 cable
M12-05BFFM (ø6) or
CB-05BFFM (ø10)

NMEA2000
Equipment

Two-way cable
MOD-ASW0001
(10/15/20/30 m)

NMEA2000
Equipment

NMEA2000 cable
M12-05BFFM (ø6) or
CB-05BFFM (ø10)

(LAN) (Power)

Power Supply Unit
PSU-012

12-24 VDC

———— : Standard Supply

-------- : Optional Supply

-·-··- : Local Supply

Power cable
VL3P-VV-S2X2C-AA050
(supplied with PSU-012)

LAN cable
MOD-WPAS0001-030+

3 m: supplied with
MFD8/12/BB, TZT9/14/BB

To ship's ground

Ground wire
(Local supply, IV-2sq)

To Multi Function Display BlackBox
MFDBB/TZTBB or Multi Function Display
MFD8/12, TZT9/14

Wiring for DRS2D/4D with PSU-017

Radar Sensor
DRS2D/DRS4D

———— : Standard Supply

-------- : Optional Supply

-·-··- : Local Supply

LAN cable

NMEA2000
Equipment

Two-way cable
MOD-ASW0001
(10/15/20/30 m)

NMEA2000 cable
M12-05BFFM (ø6) or
CB-05BFFM (ø10)

Power Supply Unit
PSU-017

To Multi Function Display BlackBox
TZTBB or Multi Function Display
TZT9/14

To ship's ground

12-24 VDC

Power cable*
(The input voltage range at the edge of the power cable:
10.8 to 31.2 VDC.)

Ground wire
(Local supply, IV-2sq)

＊：The power cable is supplied with attached to the unit. When connecting the power cable to ship's mains,
pass through the disconnecting device (breaker, etc.).

12

Wiring for DRS25A

RADAR SENSOR
DRS25A

NMEA2000 cable
M12-05BFFM (ø6) or
CB-05BFFM (ø10)

NMEA2000
Equipment

Two-way cable
MOD-ASW0002 cable
(10/15/20/30 m)

(POWER)

(LAN)

Power cable
VL3P-VV-S2X2C-AA050
(Supplied with PSU-013)

Power Supply Unit
PSU-013

12-24 VDC

Ground wire
(Local supply, IV-2sq)

LAN cable
MOD-2072-050

To ship's ground

To Multi Function Display BlackBox
MFDBB/TZTBB or Multi Function Display
MFD8/12, TZT9/14

———— : Standard Supply

-------- : Optional Supply

-·-·-·- : Local Supply

13
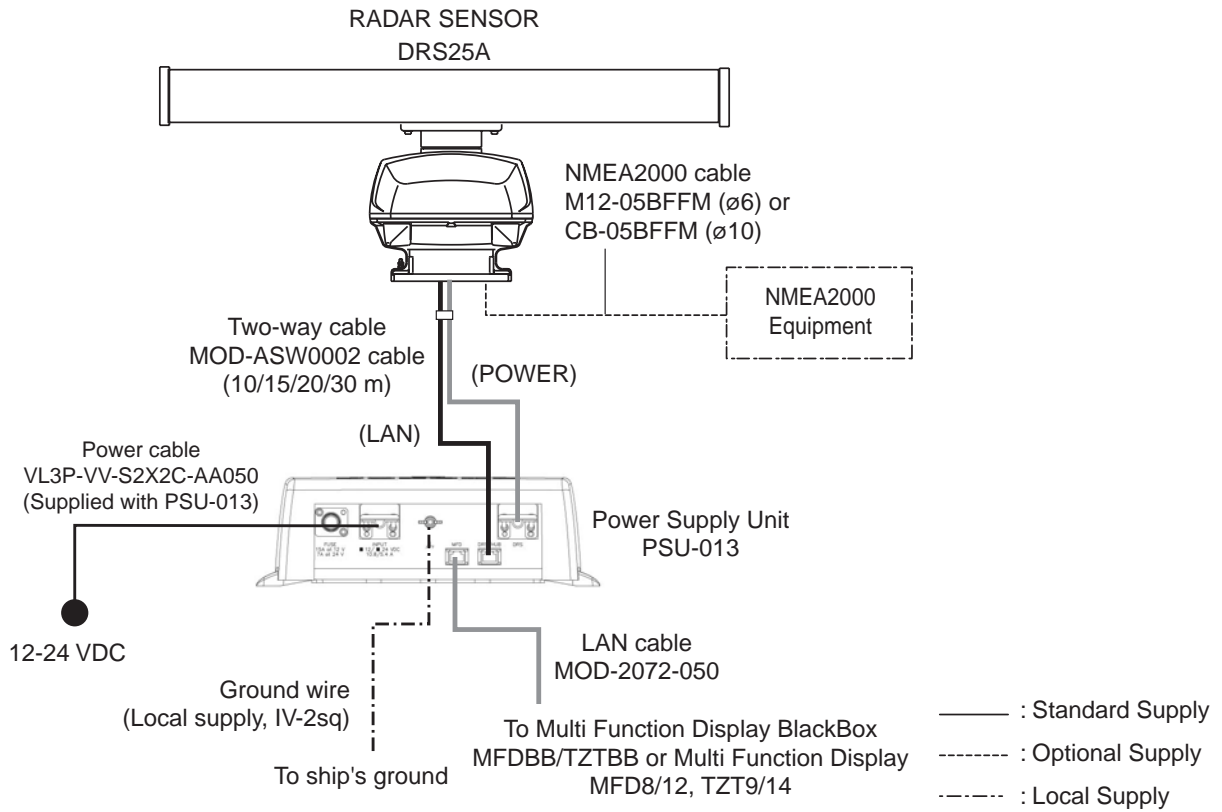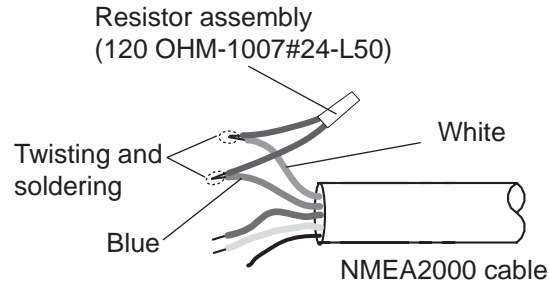
How to terminate of NMEA2000 connection

When connecting the radar sensor and an NMEA2000 equipment using the optional cable M12-05BFFM (ϕ6) or CB-05BFFM (ϕ10), attach the terminator (supplied as installation materials) to the NMEA connector in the radar sensor.

1. Twist the lead wire of the resistor assembly to the cable M12-05BFFM (ϕ6) or CB-05BFFM (ϕ10), and solder them as below.

Resistor assembly
(120 OHM-1007#24-L50)

White

Twisting and soldering

Blue

NMEA2000 cable

2. Connect wires to the NMEA connector consulting the label on the connector.

NMEA2000 connector
(in the sensor)
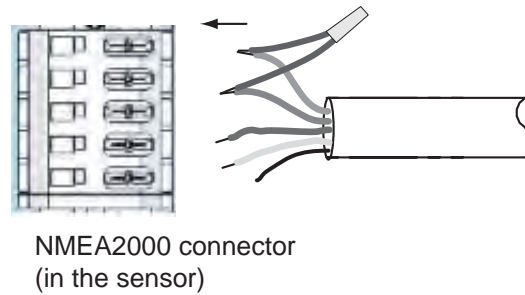
Note: This fabrication is not necessary when the external terminators are attached as below.

DRS2D/DRS4D   or   DRS4A/DRS6A/DRS12A

NMEA2000 equipment

External terminator 1

Backbone cable

External terminator 2
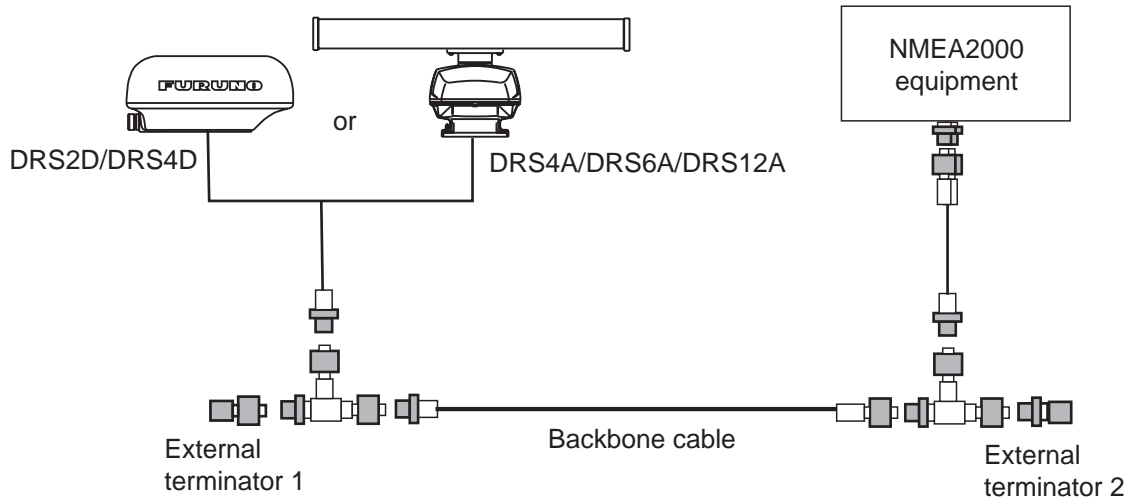
2.1   Wiring inside DRS2D/4D

Two-way cable connection

1. Unfasten three screws at the bottom of the mounting base to remove the fixing plate for the gasket.
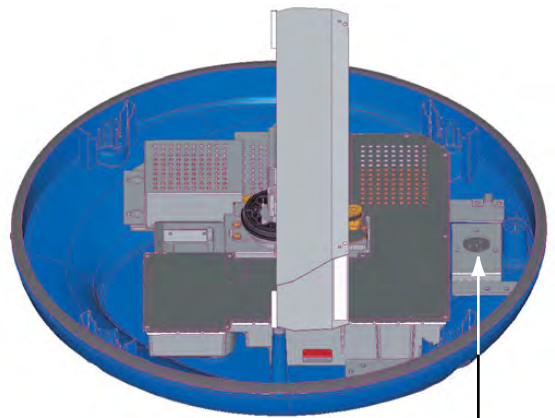
Fixing plate
(for gasket)

2. Remove the gasket, and pass the two-way cable MOD-ASW0001.
3. Fasten the shield of the cable (power) with the cable clamp in the radar sensor, and connect the connector of cable (power) to the power terminal.
4. Connect the RJ-45 connector of the cable (LAN) to the LAN terminal in the radar sensor.

LAN terminal

Power terminal

Fix the cable (LAN)
with this locking saddle.

Fix the shield cable
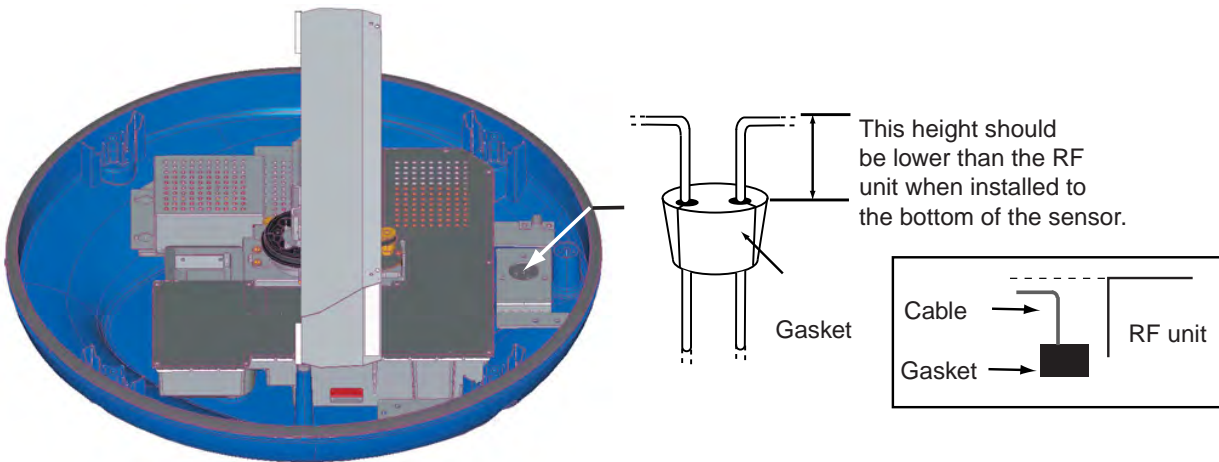(power) with this clamp.
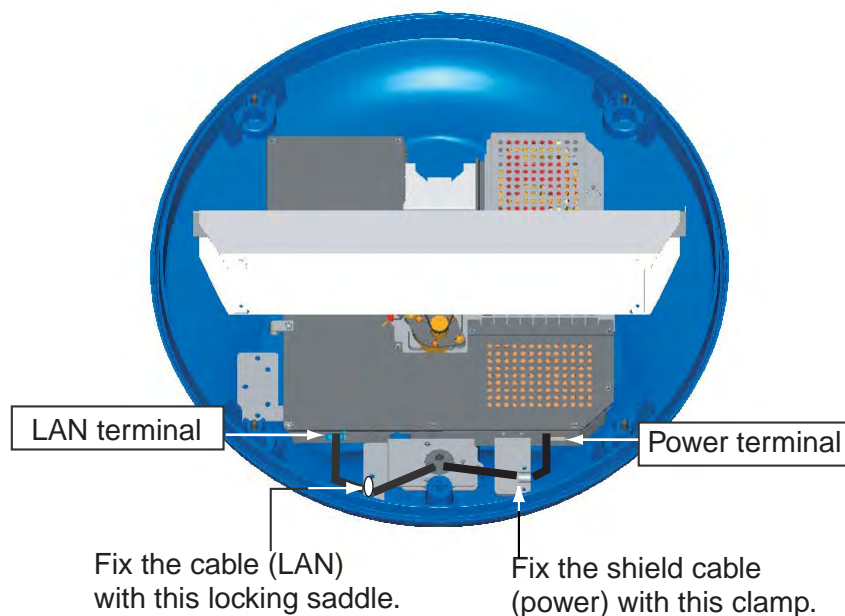
5. Push cables of the two-way cable into the slits of the gasket inside the radar sensor.

**Note:** The ends of the gasket are different. Larger end should be up.

Large

Up

Small

6. Slide the gasket on cables so that the amount of cable above the gasket is lower than the RF chassis.

This height should be lower than the RF unit when installed to the bottom of the sensor.

Gasket

Cable →

Gasket →

RF unit

Note: If the two-way cable touches the platform near the mounting base, wind vinyl tape around the cable at the point where it is bent.

7. Confirm that the rubber gasket is properly positioned and that the triangle mark on the cover is aligned with the triangle mark on the mounting base, then tighten the fixing screws for the cover.

Cover →

Mounting base →

Triangle marks
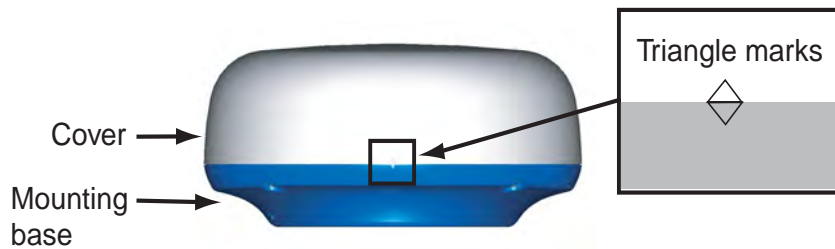
Connecting to NMEA2000 equipment

To connect NMEA2000 equipment to the sensor, wire an optional NMEA2000 cable, M12-05BFFM (φ6) or CB-05BFFM (φ10), as shown below. Also, the gasket at the bottom of mounting base must be replaced.

1. Do steps 1 to 4 on the previous page.
2. Refer to the figure below, and fabricate the cable M12-05BFFM (φ6) or CB-05BFFM (φ10).

5   15 (Area fastened with the cable clamp)

M12-05BFFM cable

100   Shield
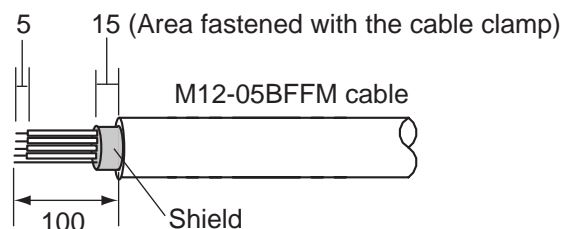
Fabrication of cable M12-05BFFM (φ6)

16

5
15
Shield
CB-05BFFM cable
370

Fasten the cable tie (supplied) within 15 mm from the end of vinyl sheath.

Wind vinyl tape. (supplied)

CB-05BFFM cable

20
65
15 (Area fastened with the cable clamp)
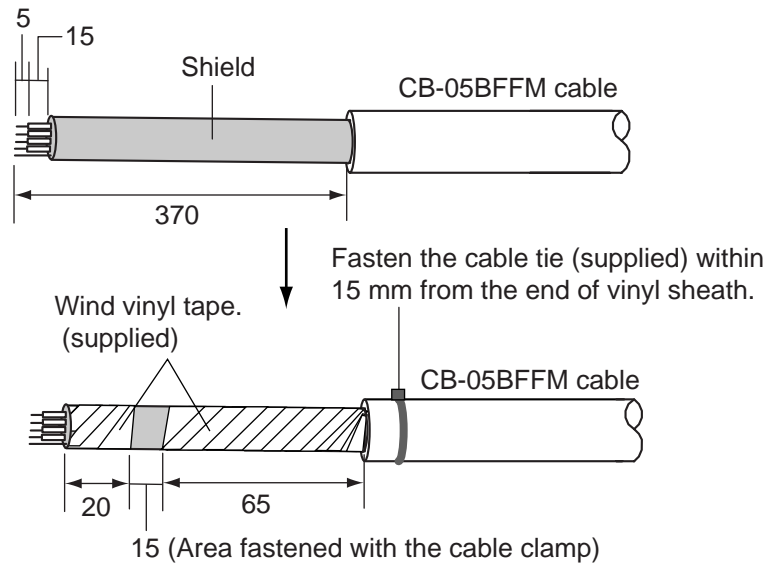
Fabrication of CB-05BFFM cable

3. Insert wires of cable M12-05BFFM (ϕ6) or CB-05BFFM (ϕ10) to the NMEA connector inside the radar sensor, consulting the label on the connector for location. As for shield, use the cable clamp shown below.

Cable	M12-05BFFM (ϕ6)	CB-05BFFM (ϕ10)
Clamp	Use the clamp pre-attached inside the radar sensor.	Use the clamp supplied with the optional gasket (Type: OP03-203, Code No.: 001-025-290)

Zoom up

Location of the cable clamp

Attach the cable clamp using this screw for CB-05BFFM cable. (Face projecting part down.)

Cable clamp
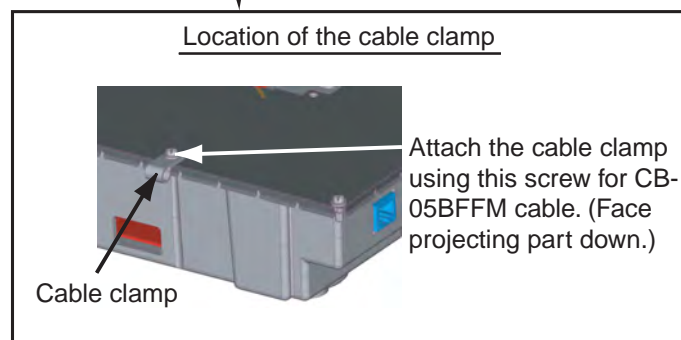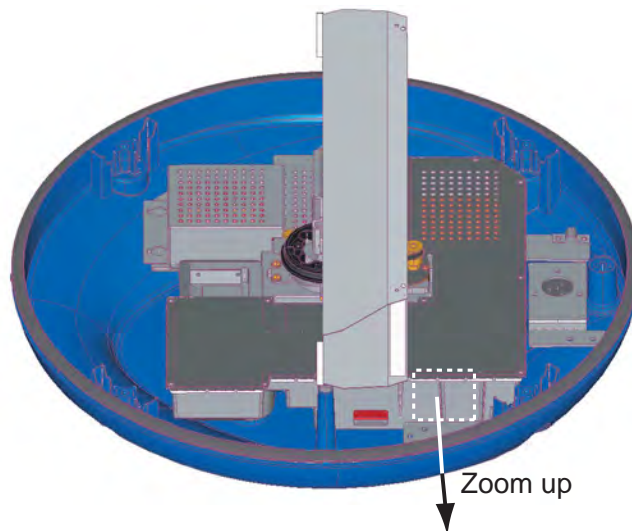
4. Push LAN and POWER cables of the two-way cable and cable M12-05BFFM (φ6) or CB-05BFFM (φ10) into the slits of the gasket inside the mounting base. Depending on the NMEA2000 cable used, replace the gasket as shown below.

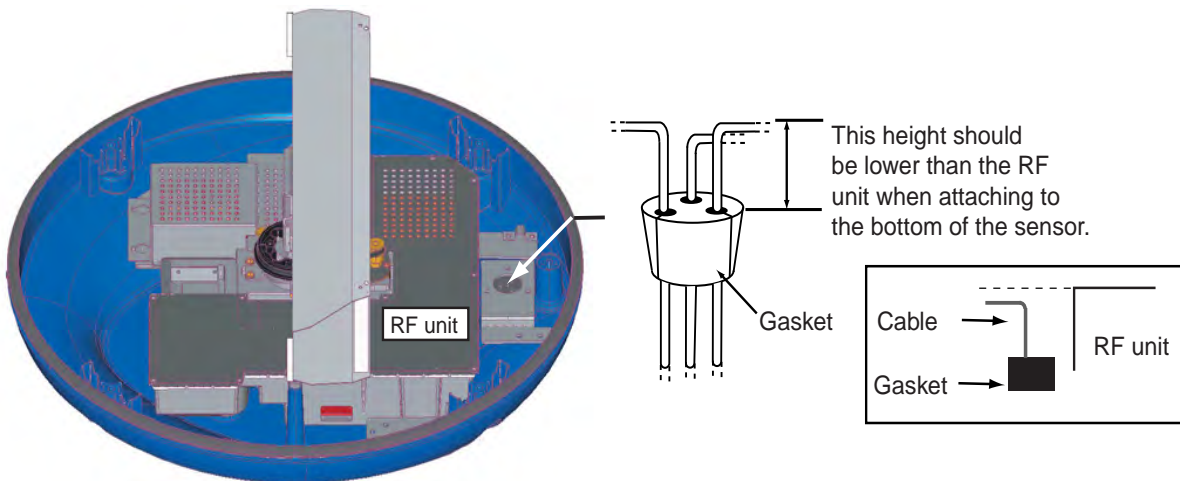| Cable type	M12-05BFFM (φ6)	CB-05BFFM (φ10)
Gasket	Use the gasket supplied in the plastic bag inside the radar sensor.	Use the optional gasket. (Type: OP03-203, Code No.: 001-025-290)

Note: The ends of the gasket are different. Larger end should be up)

Large
Up
Small

5. Slide the gasket on cables so that the amount of cable above the gasket is lower than the RF chassis.

RF unit

This height should be lower than the RF unit when attaching to the bottom of the sensor.

Gasket

Cable
RF unit
Gasket

Note: If the two-way cable touches the platform near the radar sensor base, wind vinyl tape around the cable at the point where is bent.

6. Confirm that the rubber gasket is properly positioned and that the triangle mark on the cover is aligned with the triangle mark on the mounting base, then tighten the fixing screws for the cover.

2.2 Wiring inside DRS4A/6A/12A/25A

Two-way cable connection

If you have no NMEA2000 equipment to connect, use the MOD-ASW0001 cable (standard supply).

1. Open the radar sensor cover by loosening four bolts, and fix the stay for safety purpose.

2. Unfasten four bolts to detach the plate, gasket, washer and lid. Discard the lid at the bottom of the hole for the gasket.
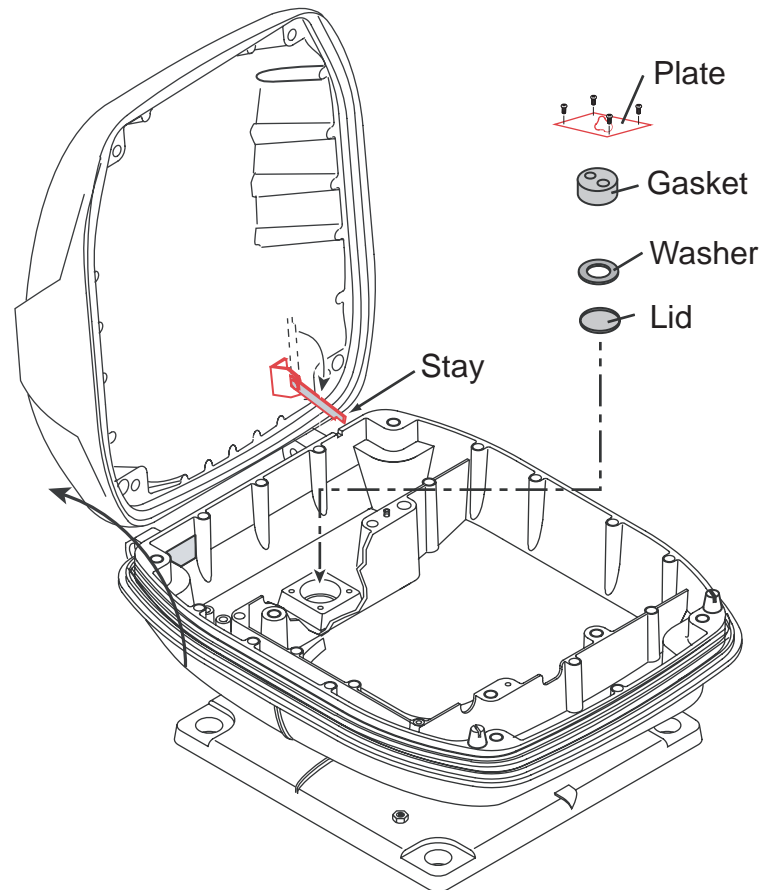
3. Pass the two-way cable MOD-ASW0001 (MOD-ASW0002 for DRS25A) through the bottom of the chassis and washer.

4. Fasten the shield of the power cable of the two-way cable (part of the foil) with the cable clamp in the radar sensor, and then connect the power cable to the power terminal as shown on next page.

5. Attach the LAN cable of the two-way cable to the LAN terminal in the radar sensor.

Fix the power cable at the foil part with this cable clamp.

Power cable

White

Black

Power terminal

LAN cable

RF unit

LAN terminal

DRS4A/6A/12A

Fix the power cable at the copper foil part with this cable clamp.

LAN cable

Gasket

White

Power terminal

Blue

Red

Power cable

Black

LAN terminal
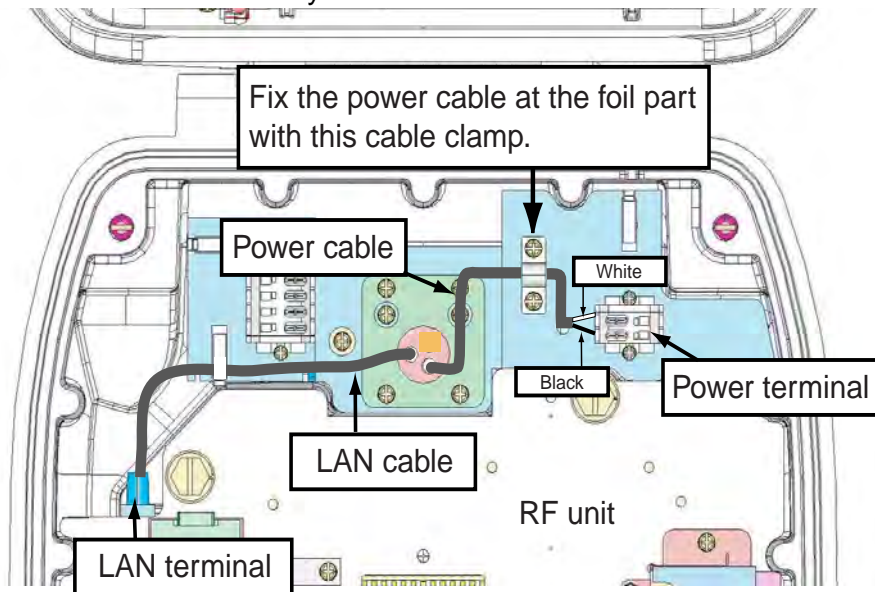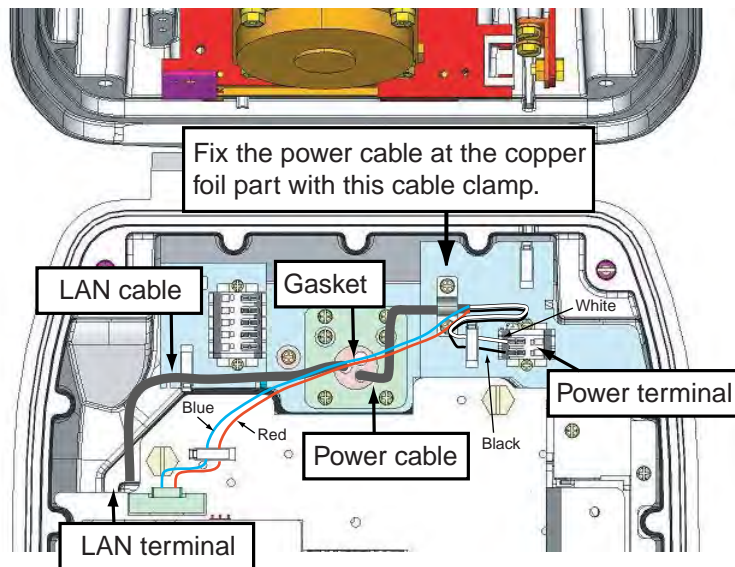
DRS25A

6. Refer to the illustration shown below, and attach the gasket to the two-way cable, inserting the cable into the slits on the gasket.

7. Slide the gasket on cables so that the amount of cable above the gasket is lower than the RF chassis.

This height should be lower than the RF unit when installed to the bottom of the sensor.

Cable

RF unit

Gasket

Washers

Gasket

8. Push the gasket and washers into the hole at the bottom of the radar sensor, then fasten four pan head screws to fix the plate to the sensor.

9. Release the stay and close the cover.

Note: When closing the cover, set the gaskets to grooves in the bottom chassis, then tighten bolts.
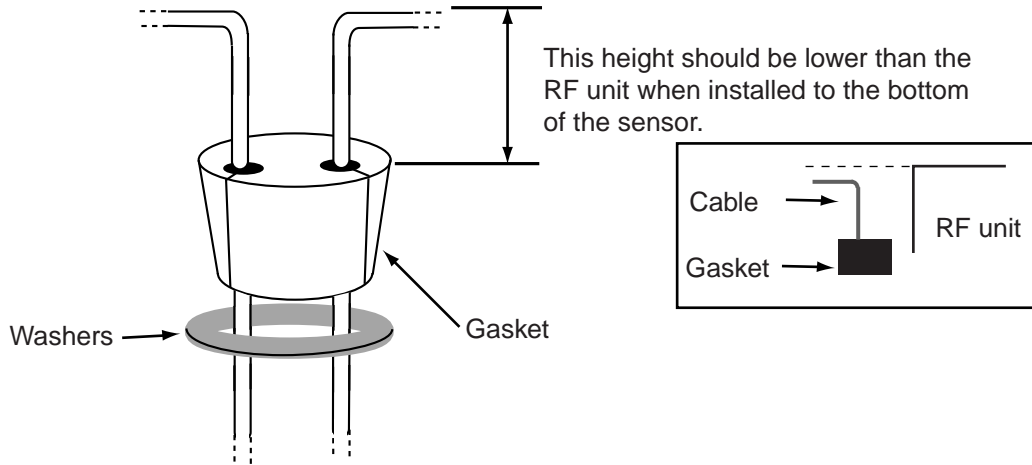
BOTTOM CHASSIS

GROOVE

GASKET

HEX BOLT

Torque : 9.8 ±0.1 N·m

Connecting to NMEA2000 equipment

To connect NMEA2000 equipment to the sensor, use an optional NMEA2000 cable, M12-05BFFM (φ6) or CB-05BFFM (φ10). Also, the gasket at the bottom of the antenna sensor must be replaced.

1. Do steps 1 to 5 on pages 19 and 20.

2. Fabricate the cable M12-05BFFM (φ6) or CB-05BFFM (φ10) as shown below.

5

95

Cable M12-05BFFM or CB-05BFFM
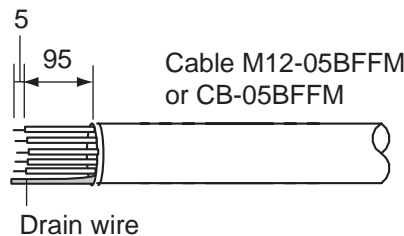
Drain wire

3. Pass the cable through the bottom of the chassis.

4. Insert wires of the cable M12-05BFFM (φ6) or CB-05BFFM (φ10) to the NMEA connector inside the radar sensor, consulting the label on the connector for location. As for drain wire, attach

the crimp-on lug (pre-attached at the bottom of the chassis) to the drain wire, and fasten it with the screw shown below.
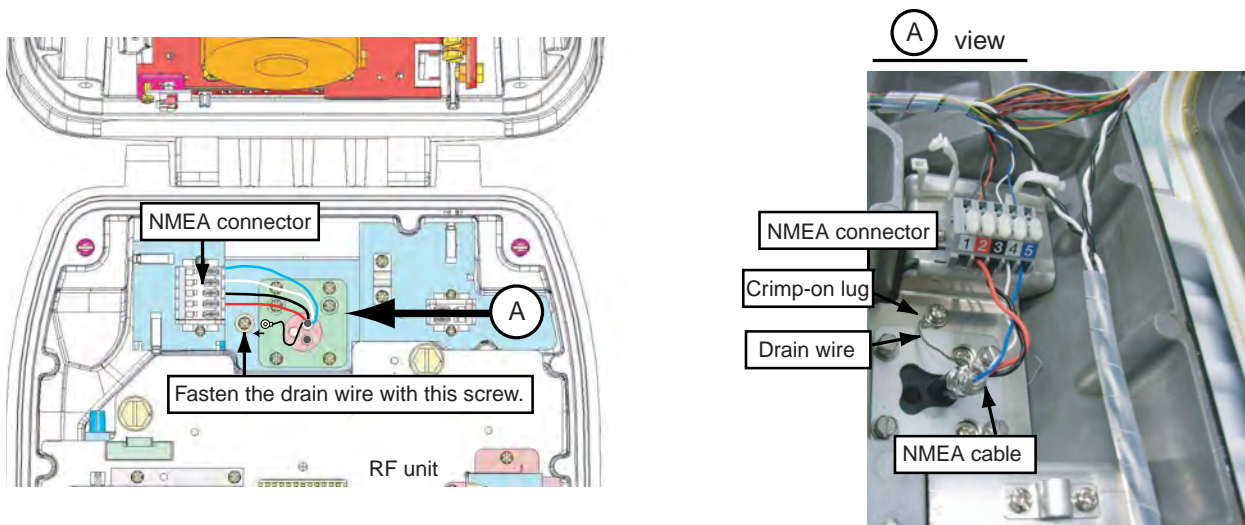
5. Depending on the NMEA2000 used, replace the gasket as shown below.

DRS4A/6A/12A

Cable type	M12-05BFFM (φ6)	CB-05BFFM (φ10)
Gasket	Use the gasket supplied in the plastic bag inside the radar sensor.	Use the optional gasket. (Type: OP03-205, Code No.: 001-025-790)

DRS25A

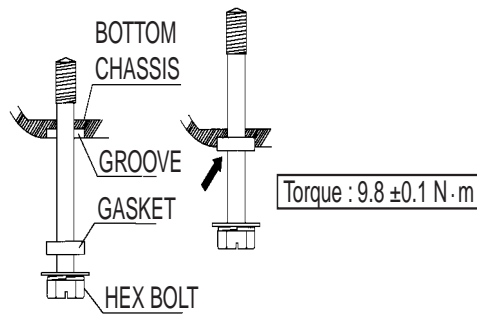| Cable type	M12-05BFFM (φ6)	CB-05BFFM (φ10)
Gasket	Use the gasket supplied in the plastic bag inside the radar sensor.	Use the optional gasket. (Type: OP03-206, Code No.: 001-035-290)

6. Refer to the illustration shown on next page, and attach the gasket to the two-way cable inserting the cable into the slits on the gasket.

7. Slide the gasket on cables so that the amount of cable above the gasket is lower than the RF chassis.
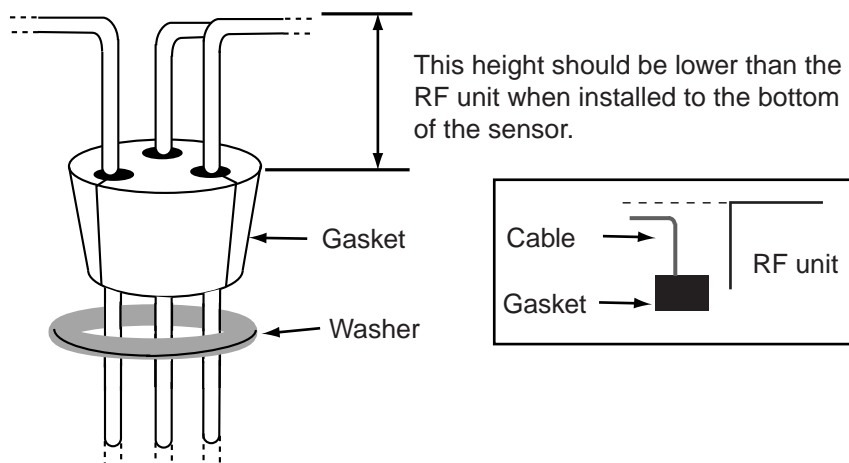
8. Do steps 8 and 9 on the previous page.

2.3 Wiring of Power Supply Unit

2.3.1 Wiring inside power supply unit PSU-013 (for DRS25A)

1. Detach the body cover by hand.

2. Loosen six pan head screws (M3x8) and slide the shield cover upward to remove it.

3. Unfasten four pan head screws (M14x10) to remove two cable clamps.
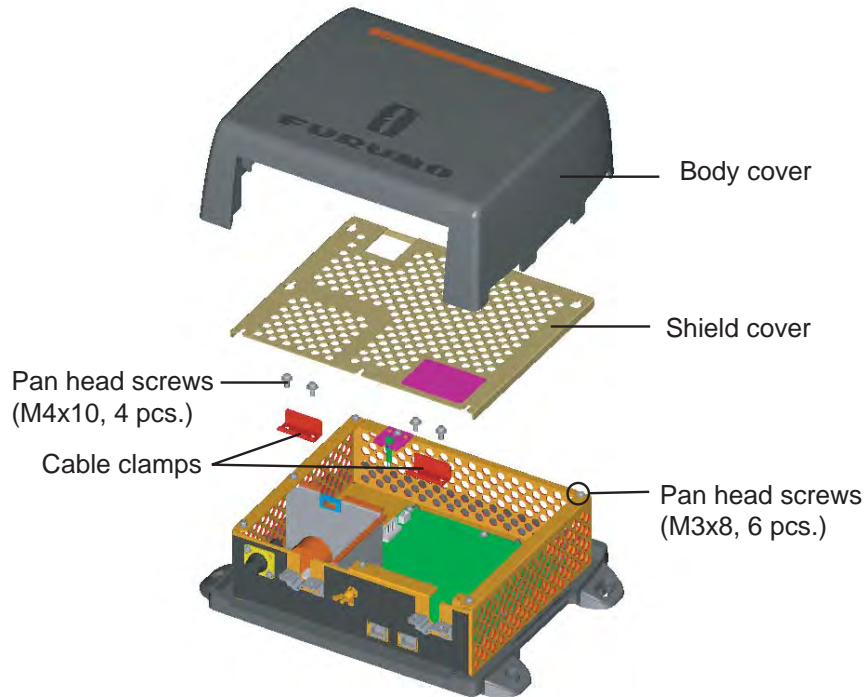
4. Connect the VL3P-VV-S2X2C-AA050 and MOD-ASW0002 cables (supplied) to appropriate connectors in the power supply unit as shown below.

   Note: When the power supply unit is connected to TZT9/14/BB, attach the XH Connector Asembly (supplied with PSU-013) to J7 on the PWR board. For details, see "How to connect TZT9/14/BB" (supplied with PSU-013).
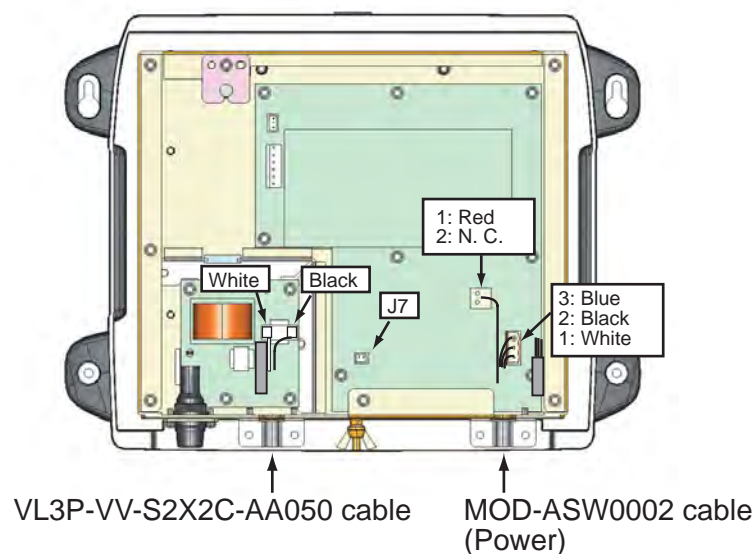
5. Remove two cable clamps, shield cover and body cover in that order.

6. Connect other cables.

2.3.2 Wiring inside power supply unit PSU-012 (Option)

1. Detach the body cover by hand.

2. Loosen six pan head screws (M3x8) and slide the shield cover upward to remove it.

3. Unfasten two pan head screws (M4x12) to remove the cable clamp.
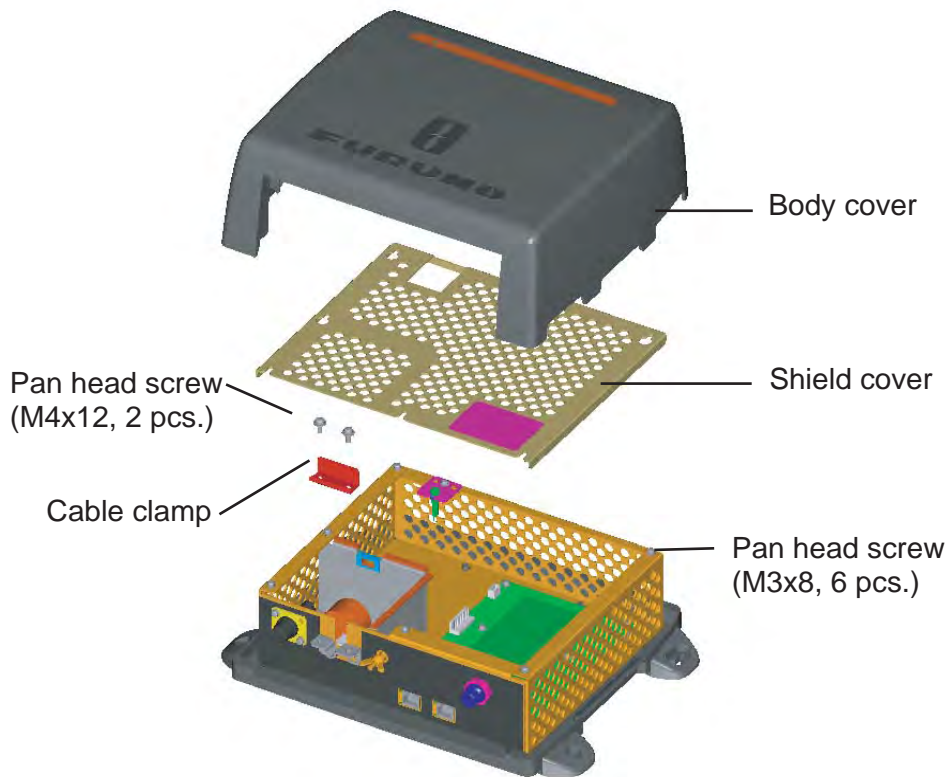
4. Connect the cable VL3P-VV-S2X2C-AA050 (supplied) to the power connector in the PSU-012.

   Note: When the power supply unit is connected to TZT9/14/BB, attach the XH Connector Assembly (supplied with PSU-012) to J7 on the PWR board. For details, see "How to connect TZT9/14/BB" (supplied with PSU-012).
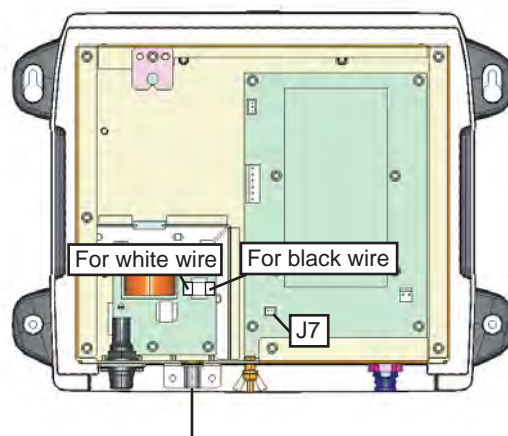
Put the cable VL3P-VV-S2X2C-AA050 here at the shield part.

5. Remount the cable clamp, shield cover and body cover in that order.

6. Connect other cables.

2.3.3 Wiring the power supply unit PSU-017 (option, for DRS2D/4D)

Connect the power cable and MOD-ASW0001 cables to appropriate connectors of the power supply unit as shown below. When you connect the power cable to ship's mains, pass through the disconnecting device (breaker, etc.).

MOD-ASW0001 cable

Power cable[1]

To ship's mains (12-24 VDC)[2]

To radar sensor DRS2D/4D

[1]: Input voltage range at the edge of the power cable: 10.8 to 31.2 VDC.

[2]: Be sure to pass through a disconnecting device (breaker, etc.).
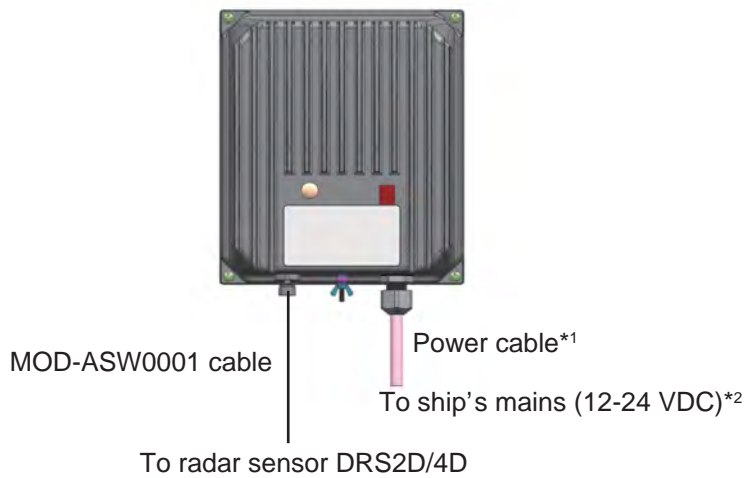
Replacement of the fuse

1. Remove four self-tapping screws (4x20) to dismount the unit.
2. Remove four screws (M3x8) at the back of the unit to remove the base.

Screws (M3x8)

Base

Waterproofing gasket
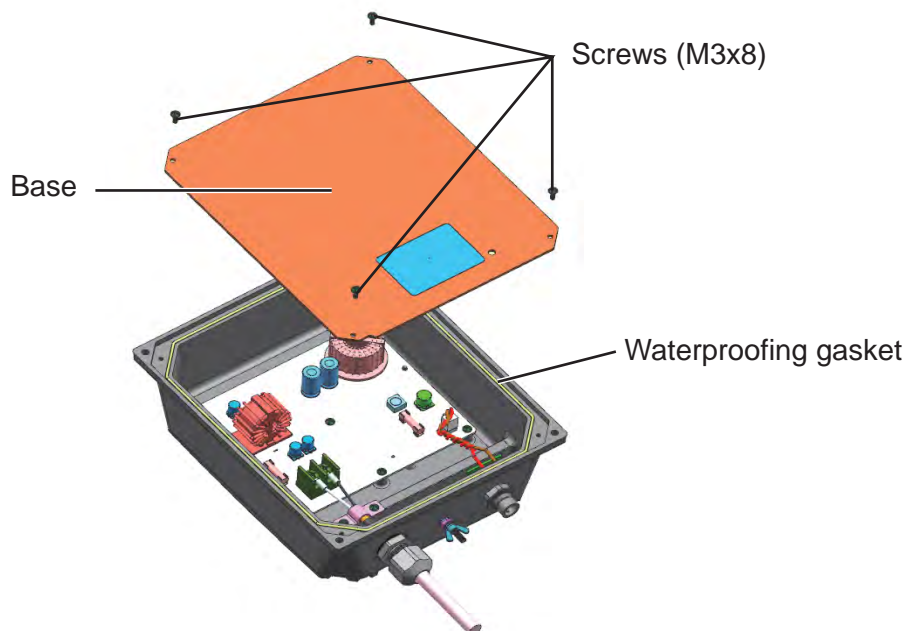
3. Confirm that the LED on the board is OFF, and then replace the fuse.

Note: DO NOT change the fuse if the LED is ON; this indicates high voltage is present.

Fuse F1 (7A 125V)

Fuse F2 (1.5A 125V)

TB1
1: White (DC_P)
2: Black (DC_N)

J1
1: Brown (P48V)
2: Red (DC_N)

LED
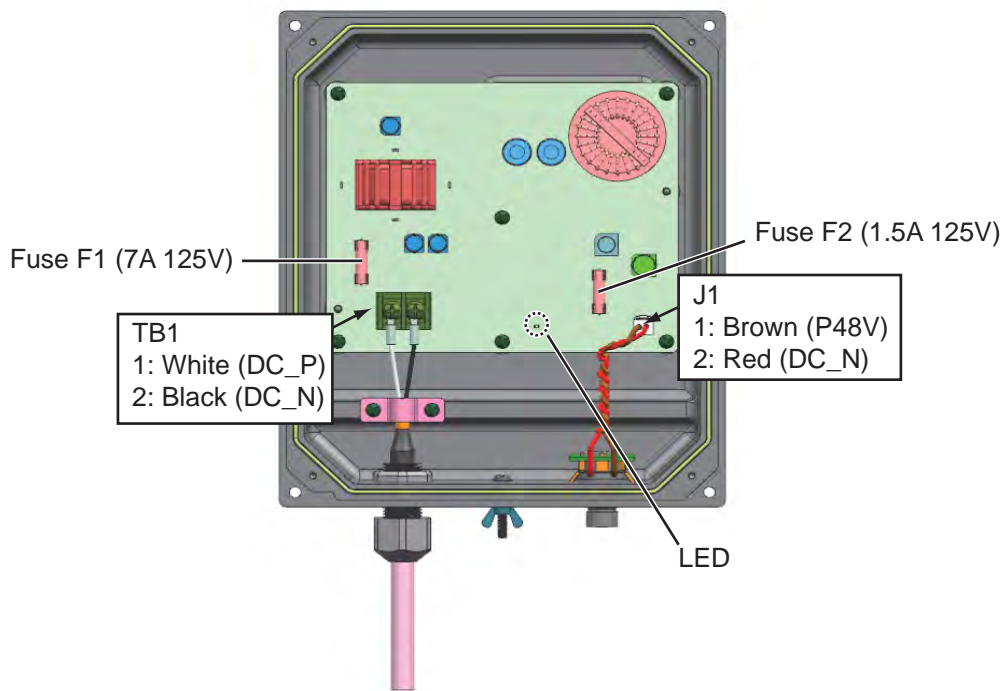
4. Reattach the base and install the unit.

Note: Before fixing the base, make sure the waterproofing gasket is correctly seated in the groove in the chassis.

Waterproofing gasket

Groove in chassis
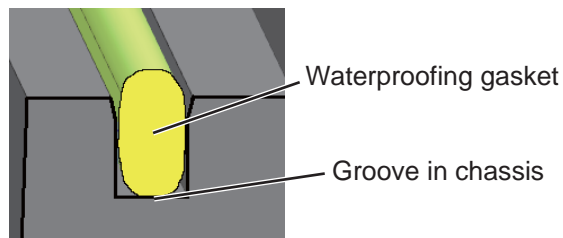
SPECIFICATIONS OF RADAR SENSOR
DRS SERIES

1 RADIATOR

1.1 Antenna type

DRS2D/4D	Patched waveguide array antenna
DRS4A/6A/12A/25A	Slotted waveguide array antenna

1.2 Antenna length

DRS2D	19-inch
DRS4D	24-inch
DRS4A	3.4 ft
DRS6A	4 ft
DRS12A/25A	4 ft (XN12A), 6 ft (XN13A)

1.3 Horizontal beam width (3 dB)

DRS2D	5.2°
DRS4D	4.0°
DRS4A	2.3°
DRS6A	1.9°
DRS12A/25A	1.9° (XN12A), 1.4° (XN13A)

1.4 Vertical beam width (3 dB)

DRS2D/4D	25°
DRS4A/6A/12A/25A	22°

1.5 Gain

DRS2D	21.5dBi
DRS4D	23.0dBi
DRS4A	27.5dBi
DRS6A	28.5dBi
DRS12A/25A	28.5dBi (XN12A), 30dBi (XN13A)

1.6 Sidelobe attenuation

DRS2D	-24 dB (within ±20°), -26 dB (±20° or more)
DRS4D	-25 dB (within ±20°), -27 dB (±20° or more)
DRS4A	-20 dB (within ±20°), -28 dB (±20° or more)
DRS6A/12A/25A	-27 dB (within ±10°), -28 dB (±10° or more)

1.7 Rotation   24/36/48 rpm

2 RADAR FUNCTION

2.1 TX frequency   9410±30 MHz, P0N

2.2 Output power (nominal) DRS2D: 2.2 kW, DRS4D/4A: 4 kW, DRS6A: 6 kW, DRS12A: 12 kW
DRS25A: 25 kW

2.3 Duplexer   Ferrite circulator with diode limiter

2.4 Intermediate frequency 60 MHz

2.5 Range, Pulse length and Pulse Repetition Rate (PRR)

Range (nm)	Pulse length (µs)	PRR (Hz approx.)
0.125 to 1.5	0.08	3000
1.5 to 3	0.3	1500
3 to 24	0.5	1000
12 to 48	0.7	600
32 to 64 (72/96)	0.8	600 (550)

2.6	Maximum range	DRS2D: 24 NM, DRS4D: 36 NM, DRS4A: 48 NM, DRS6A: 64 NM, DSR12A: 72 NM, DRS25A: 96 NM
2.7	Minimum range	25 m
2.8	Range resolution	20 m
2.9	Bearing resolution	DRS2D: 5.2°, DRS4D: 4°, DRS4A: 2.3°, DRS6A: 1.9°, DRS12A/25A: 1.9° (XN12A) or 1.4° (XN13A)
2.10	Bearing accuracy	±1°
2.11	Range accuracy	0.9% of range in use or 8 m, whichever is the greater

3   POWER SUPPLY

3.1	Radar sensor	48 VDC, supplied by Multi-function display, w/o CAN bus load
		DRS2D: 0.4 A, DRS4D: 0.5 A, DRS4A: 1 A, DRS6A: 1.4 A
		DRS12A: 1.3 A

3.2   Radar sensor w/ power supply unit

DRS25A + PSU-013   12-24 VDC: 10.2-4.7 A (12.0-5.6 A: wind speed 70kt)

3.3   Power supply unit (option) set (unit: A, 12-24 VDC, ( ): wind speed 70kt)

Model	DRS2D	DRS4D	DRS4A	DRS6A,	DRS12A
PSU-012	3.8-1.9 A	4.1-2.0	5.0-2.8 (6.2-3.0)	8.0-3.8 (8.5-4.1)	7.8-3.7 (9.8-4.7)
PSU-017	3.6-1.7 A	4.0-1.9			

4   ENVIRONMENTAL CONDITION

4.1	Ambient temperature	-30°C to +55°C (storage: +70°C or less)
4.2	Relative humidity	95% at 40°C
4.3	Degree of protection	
	Radar sensor	IP26
	Power supply unit	PSU-012/013: IPX0, PSU-017: IP25
4.4	Vibration	IEC 60945

5   COATING COLOR
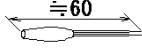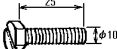
5.1	Radar sensor	N9.5
5.2	Power supply unit	N2.5

6   COMPASS SAFE DISTANCE

6.1	Radar sensor	
	DRS2D	Standard: 1.35 m, Steering: 0.80 m
	DRS4D	Standard: 1.40 m, Steering: 0.85 m
	DRS4A	Standard: 0.80 m, Steering: 0.50 m
	DRS6A	Standard: 0.85 m, Steering: 0.55 m
	DRS12A	Standard: 1.15 m, Steering: 0.70 m
	DRS25A	Standard: 1.00 m, Steering: 0.60 m
6.2	Power supply unit	
	PSU-012/013/017	Standard: 0.30 m, Steering: 0.30 m

FURUNO

CODE NO.	001-025-270-00	03HA-X-9401 -0
TYPE	CP03-32101	1/1

INSTALLATION MATERIALS

NO.	NAME	OUTLINE	DESCRIPTIONS	Q'TY	REMARKS
1	RESISTOR ASSEMBLY	≒60	120 OHM-1007#24-L50 / CODE NO. 000-167-746-10	1	
2	FLAT WASHER	φ21	M10 SUS304 / M10 SUS304 / CODE NO. 000-167-232-10 / 000-864-131-00	4	
3	SPRING WASHER	18	M10 SUS304 / M10 SUS304 / CODE NO. 000-167-233-10 / 000-864-261-00	4	
4	HEX.BOLT (SLOTTED HEAD)	25 φ10	M10X25 SUS304 / CODE NO. 000-162-883-10	4	
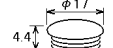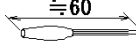
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

C3567-M01-A

FURUNO

CODE NO.	001-025-780-00	03GY-X-9401 -3
TYPE	CP03-32601	1/2

RSB-118-092/093/094
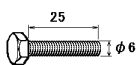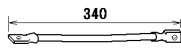
INSTALLATION MATERIALS

NO.	NAME	OUTLINE	DESCRIPTIONS	Q'TY	REMARKS
1	SEAL WASHER	φ30	03-001-3002-0 ROHS / CODE NO. 300-130-020-10	4	
2	CORROSION-PROOF RUBBER MAT	256 / 256	03-142-3001-0 ROHS / CODE NO. 100-275-580-10	1	
3	KNOB CAP	φ17 / 4.4	040-4010 / CODE NO. 000-164-929-10	4	
4	RESISTOR ASSEMBLY	≒60	120 OHM-1007#24-L50 / CODE NO. 000-167-746-10	1	
5	SPRING WASHER	22	M12 SUS304 / CODE NO. 000-167-397-10	4	
6	FLAT WASHER	φ24	M12 SUS304 / CODE NO. 000-167-446-10	4	
7	HEXAGONAL NUT	10 / 19	M12 SUS304 / CODE NO. 000-167-491-10	4	
8	HEXAGON HEAD SCREW	60 / φ12	M12X60 SUS304 / CODE NO. 000-162-813-10	4	
9	HEXAGONAL NUT	5 / 10	M6 SUS304 / CODE NO. 000-158-856-10	1	
10	SPRING WASHER	12	M6 SUS304 / CODE NO. 000-158-855-10	1	

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

C3569-M01-D(1)

FURUNO

CODE NO.	001-025-780-00	03GY-X-9401 -3
TYPE	CP03-32601	2/2

RSB-118-092/093/094

INSTALLATION MATERIALS

NO.	NAME	OUTLINE	DESCRIPTIONS	Q'TY	REMARKS
11	FLAT WASHER	φ13	M6 SUS304 / CODE NO. 000-158-854-10	3	
12	HEXAGONAL HEAD BOLT	25 φ6	M6X25 SUS304 / CODE NO. 000-162-871-10	1	
13	CABLE ASSY.	340	RW-4747 / RW-4747-1 / CODE NO. 000-566-000-12 / 000-566-000-01	1	
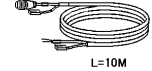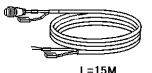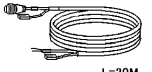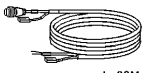
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.　C3569-M01-D(2)

FURUNO

CODE NO.		03HA-X-9402 -1
TYPE		1/1

RADAR SENSOR

DRS2D/4D, DRS4A/6A/12A

INSTALLATION MATERIALS

NO.	NAME	OUTLINE	DESCRIPTIONS	Q'TY	REMARKS
1	CABLE ASSY.	L=10M	MOD-ASW0001-100+ / CODE NO. 000-167-635-00	1	選択 TO BE SELECTED
2	CABLE ASSY.	L=15M	MOD-ASW0001-150+ / CODE NO. 000-167-636-00	1	選択 TO BE SELECTED
3	CABLE ASSY.	L=20M	MOD-ASW0001-200+ / CODE NO. 000-167-637-00	1	選択 TO BE SELECTED
4	CABLE ASSY.	L=30M	MOD-ASW0001-300+ / CODE NO. 000-167-638-00	1	選択 TO BE SELECTED

STANDARD LENGTH IS 15M. OTHER LENGTHS ARE ALSO AVAILABLE.

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)
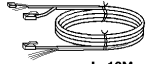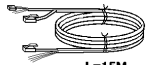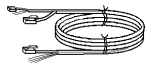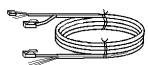
FURUNO ELECTRIC CO ., LTD.　C3567-M02-B

FURUNO

CODE NO.		03HC-X-9402 -0
TYPE		1/1

INSTALLATION MATERIALS	RADAR SENSOR DRS25A	

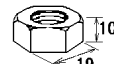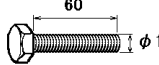| NO.	NAME	OUTLINE	DESCRIPTIONS	Q'TY	REMARKS
1	CABLE ASSY.	L=10M	MOD-ASW0002-100+ CODE NO. 000-167-639-00	1	*選択 TO BE SELECT
2	CABLE ASSY.	L=15M	MOD-ASW0002-150+ CODE NO. 000-167-640-00	1	*選択 TO BE SELECT
3	CABLE ASSY.	L=20M	MOD-ASW0002-200+ CODE NO. 000-167-641-00	1	*選択 TO BE SELECT
4	CABLE ASSY.	L=30M	MOD-ASW0002-300+ CODE NO. 000-167-642-00	1	*選択 TO BE SELECT

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER
PRODUCT. QUALITY IS THE SAME.
   (DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

C3573-M02-A

FURUNO

TABLE 1

DIMENSION (mm)	TOLERANCE (mm)
L ≤ 50	± 1.5
50 < L ≤ 100	± 2.5
100 < L ≤ 500	± 3

180   60

φ7
AIR VENT

160±0.5

CABLE ENTRY

160±0.5

BOW

4−M10
FIXING HOLES

φ488

220

75

AIR VENT

302

NAMEPLATE   CABLE ENTRY

166

307

A

ANTENNA BOTTOM
PLATFORM
15
t
S.W.   F.W.
M10 BOLT

DETAIL OF A (SCALE: 1/4)
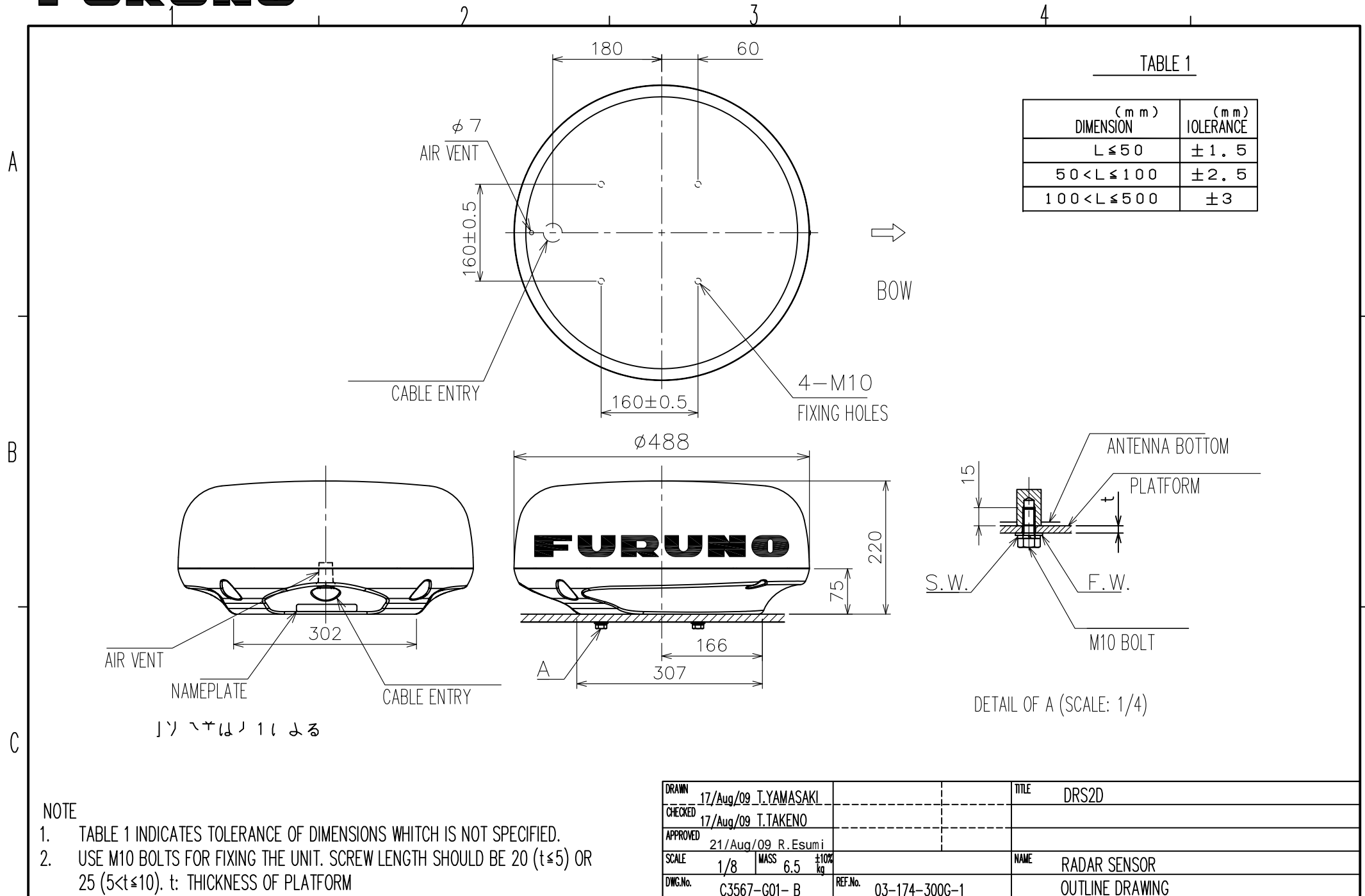
NOTE
1.   TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHITCH IS NOT SPECIFIED.
2.   USE M10 BOLTS FOR FIXING THE UNIT. SCREW LENGTH SHOULD BE 20 (t≤5) OR
      25 (5<t≤10). t: THICKNESS OF PLATFORM

DRAWN	17/Aug/09 T.YAMASAKI			TITLE	DRS2D
CHECKED	17/Aug/09 T.TAKENO				
APPROVED	21/Aug/09 R.Esumi				
SCALE 1/8	MASS 6.5 kg ±10%			NAME	RADAR SENSOR
DWG.No. C3567−G01−B	REF.No. 03−174−300G−1				OUTLINE DRAWING

D-1

FURUNO ELECTRIC CO., LTD.

FURUNO

TABLE 1

DIMENSION （mm）	TOLERANCE （mm）
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3

225

（φ7）
AIR VENT

160±0.5

BOW

CABLE ENTRY

4－M10
FIXING HOLES

60

（125）　160±0.5

φ610

ANTENNA BOTTOM

PLATFORM

15

t

S.W.　　　F.W.

M10 BOLT

220

75

FURUNO

通気孔
AIR VENT　銘板
NAMEPLATE

ケーブル導入口
CABLE ENTRY

165

A

338

DETAIL OF A (SCALE: 1/5)

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHITCH IS NOT SPECIFIED.
2. USE M10 BOLTS FOR FIXING THE UNIT. SCREW LENGTH SHOULD BE 20 (t≤5) OR
   25 (5<t≤10). t: THICKNESS OF PLATFORM

DRAWN	10/Mar/08 T.YAMASAKI			TITLE	DRS4D
CHECKED	10/Mar/08 T.TAKENO				
APPROVED	22/Mar/08 R.Esumi				
SCALE 1/10	MASS 7.5 ±10% kg			NAME	RADAR SENSOR
DWG.No. C3568-G01-B	REF.No. 03-174-310G-1				OUTLINE DRAWING

D-2

FURUNO ELECTRIC CO., LTD.

FURUNO
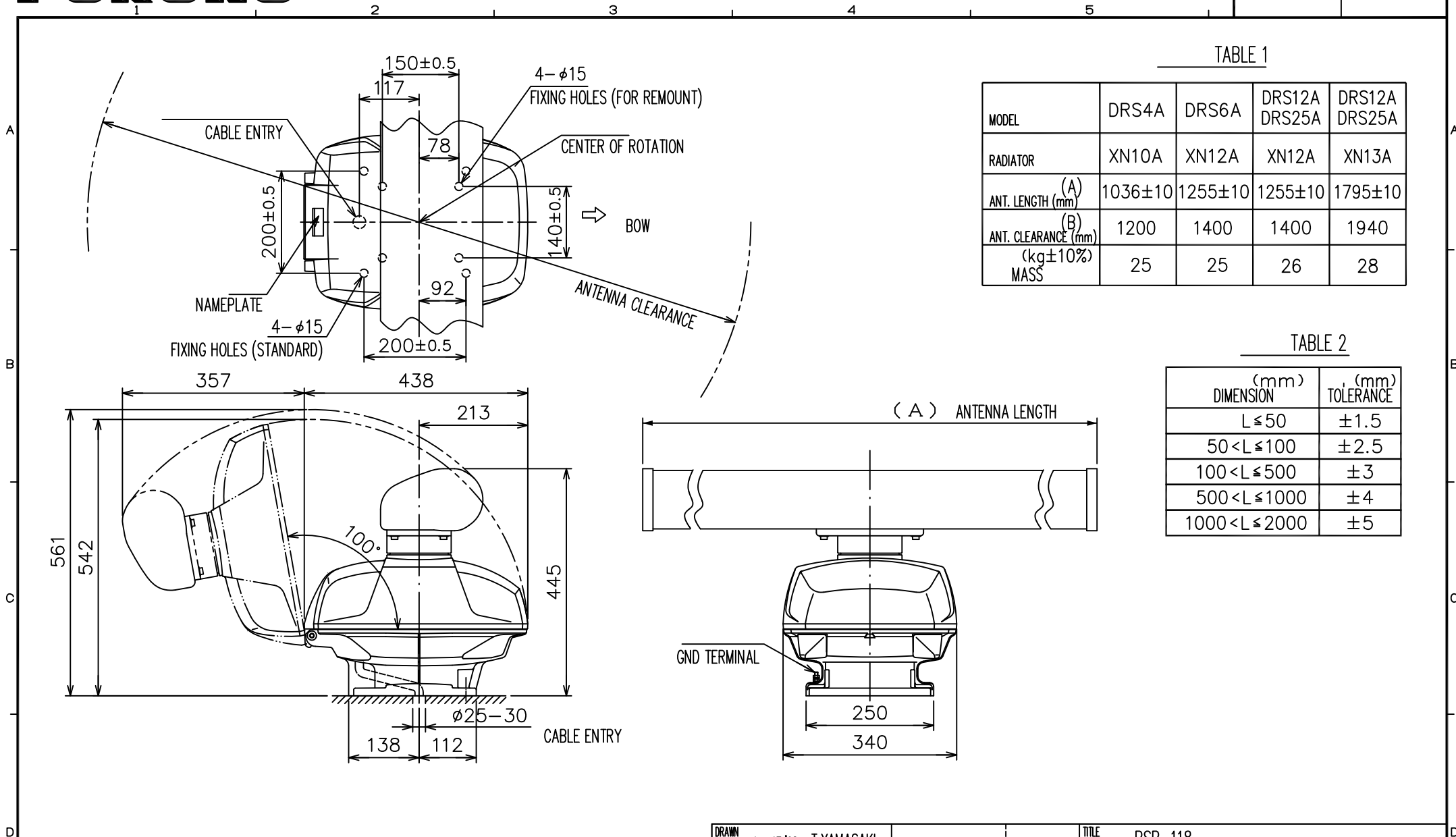
TABLE 1

MODEL	DRS4A	DRS6A	DRS12A DRS25A	DRS12A DRS25A
RADIATOR	XN10A	XN12A	XN12A	XN13A
ANT. LENGTH (mm) (A)	1036±10	1255±10	1255±10	1795±10
ANT. CLEARANCE (mm) (B)	1200	1400	1400	1940
MASS (kg±10%)	25	25	26	28

TABLE 2

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

150±0.5
117
78
4−φ15 FIXING HOLES (FOR REMOUNT)
CABLE ENTRY
CENTER OF ROTATION
200±0.5
140±0.5
BOW
NAMEPLATE
92
4−φ15
FIXING HOLES (STANDARD)
200±0.5
ANTENNA CLEARANCE

357
438
213
561
542
445
100°
φ25−30
CABLE ENTRY
138   112

（A） ANTENNA LENGTH
GND TERMINAL
250
340

NOTE
1.   TABLE 2 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2.   USE M12 BOLTS FOR FIXING THE UNIT,

DRAWN	Jan. 17 '08 T.YAMASAKI		TITLE	RSB-118
CHECKED	Jan. 17 '08 T.TAKENO			
APPROVED	Jan. 18 '08 R. Esumi	DRS4A/6A/12A/25A		
SCALE	1/10	MASS 表1参照 SEE TABLE 1	NAME	ANTENNA UNIT
DWG.No.	C3569-G01-B	REF.No. 03-174-504G-2		OUTLINE DRAWING
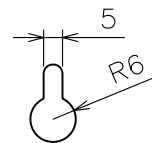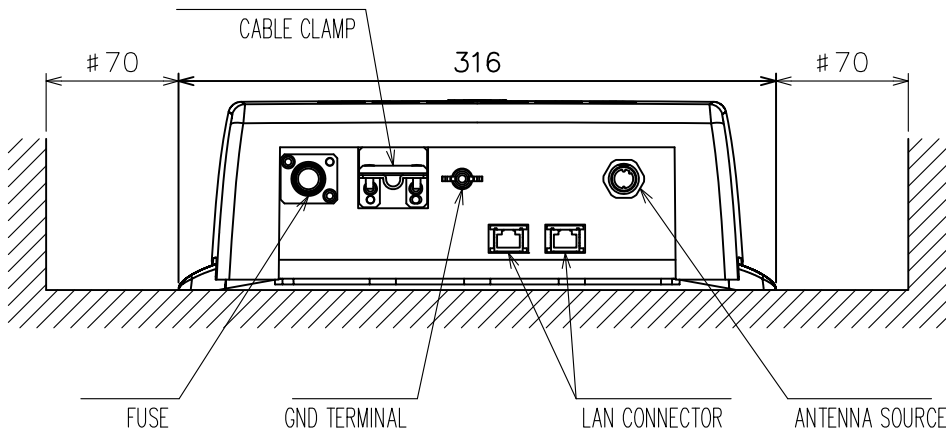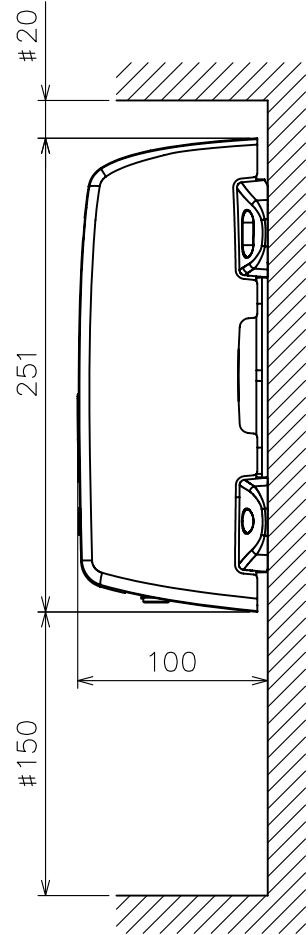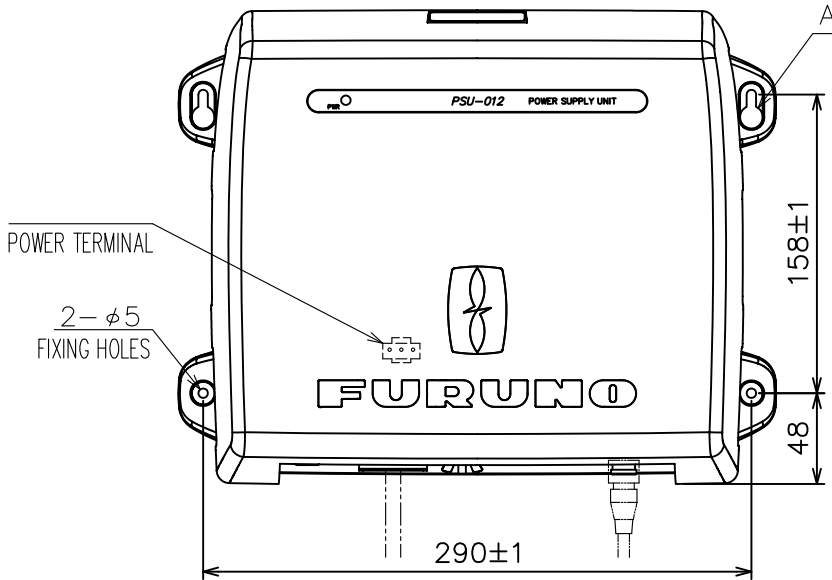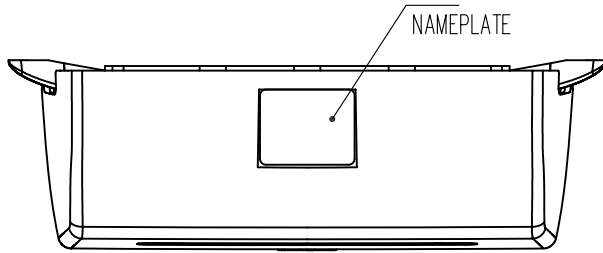
D-3

FURUNO ELECTRIC CO., LTD.

TABLE 1

DIMENSION (mm)	TOLERANCE (mm)
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3

NAMEPLATE

#20

251

#150

100

PSU-012   POWER SUPPLY UNIT
PWR

A

POWER TERMINAL

158±1

2−φ5
FIXING HOLES

48

290±1

CABLE CLAMP

#70   316   #70

5

R6

FUSE   GND TERMINAL   LAN CONNECTOR   ANTENNA SOURCE

DETAIL OF A (SCALE: 1/2)

NOTE   1.   #: MINIMUM SERVICE CLEARANCE.
2.   TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3.   USE TAPPING SCREWS φ4x20 FOR FIXING THE UNIT.

DRAWN	1/Apr/08 T.YAMASAKI			TITLE	PSU-012
CHECKED	1/Apr/08 T.TAKENO				
APPROVED	2/Apr/08 R. Esumi	DRS4A/6A/12A			
SCALE	1/4	MASS 1.8 ±10% kg		NAME	POWER SUPPLY UNIT
DWG.No.	C3569-G02-D	REF.No. 03-174-900G-2			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

TABLE 1

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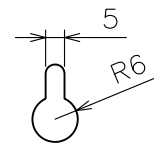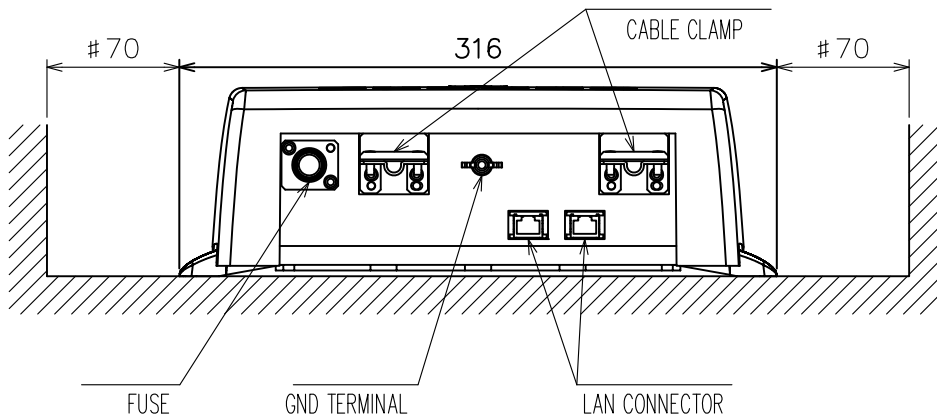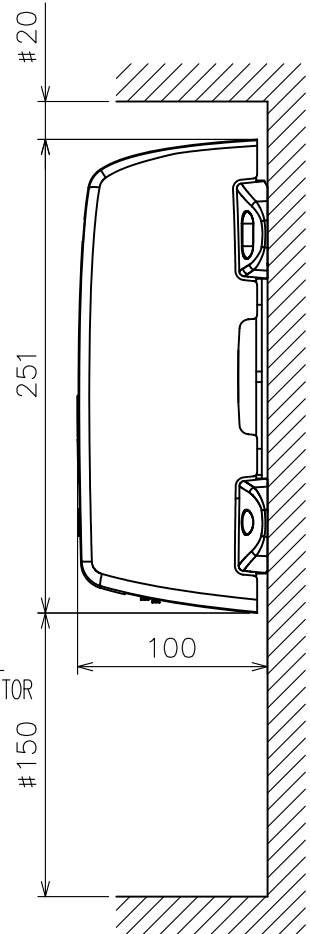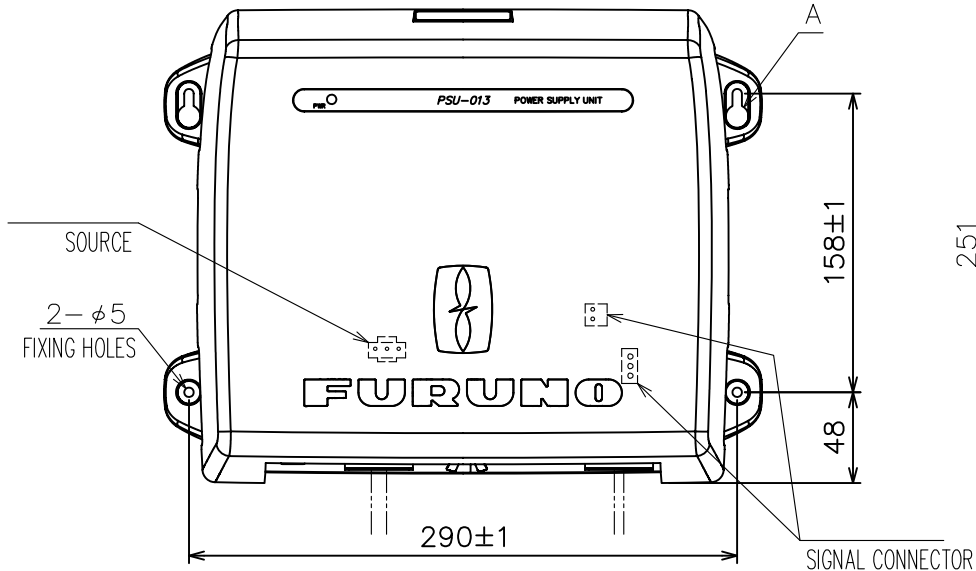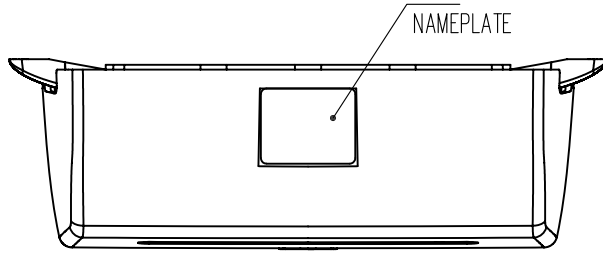
NAMEPLATE

A

PSU-013   POWER SUPPLY UNIT

PWR

SOURCE

2-φ5
FIXING HOLES

FURUNO

158±1

48

290±1

SIGNAL CONNECTOR

#20

251

100

#150

#70   316   CABLE CLAMP   #70

FUSE   GND TERMINAL   LAN CONNECTOR

5

R6

DETAIL OF A (SCALE: 1/2)

NOTE   1.   #: MINIMUM SERVICE CLEARANCE.
2.   TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3.   USE TAPPING SCREWS φ4x20 FOR FIXING THE UNIT.

DRAWN	15/Apr/08	T.YAMASAKI			TITLE	PSU-013
CHECKED	15/Apr/08	T.TAKENO				
APPROVED	28/Apr/08	R. Esumi	DRS25A			
SCALE	1/4	MASS 1.8 ±10% kg			NAME	POWER SUPPLY UNIT
DWG.No.	C3573-G01-B		REF.No. 03-174-910G-2			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

4- φ5
FIXING HOLES

176.4±0.5

228

214.4±0.5

6.8

NAMEPLATE

SIGNAL CABLE

GND TERMINAL

POWER CABLE

#30

70

253

#150

#30 190 #30

TABLE 1

DIMENSION (mm)	TOLERANCE ⁻(mm)
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS φ4x20 FOR FIXING THE UNIT.

DRAWN	15/Oct/2012 T.YAMASAKI		TITLE	PSU-017
CHECKED	15/Oct/2012 H.MAKI			
APPROVED	16/Oct/2012 Y. NISHIYAMA	DRS2D/4D		
SCALE 1/3	MASS 2.3 ±10% kg	MASS INCLUDES 5m POWER CABLE.	NAME	POWER SUPPLY UNIT
DWG. No. C3567-G02-B	REF. No. 03-181-900G-C			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

| | 1 | 2 | 3 | 4 |

A

NAV. EQUIPMENT OR SENSOR

GP-330B
SC-30
WS-200 etc.

*2 FMC1.5/6ST

M12-05BFFM, 1/2/6m
CB-05BFFM, 1/2/6m

RED
BLK
WHT
BLU

B1 RTR-090A/091A

J603 NMEA2000

RADAR SENSOR
DRS2D/4D

1 < SHIELD
2 < NC
3 < NET-S
4 < NET-C
5 < NET-H
6 < NET-L

MULTI FUNCTION DISPLAY

MFD8/12
MFDBB(MPU-001)

*3 RJ45   MOD-ASW0001, 10/15/20/30m, φ6

E_TD-P > 1
E_TD-N > 2
E_RD-P > 3
NC > 4
NC > 5
E_RD-N > 6
NC > 7
NC > 8

*3 RJ45   J207 NETWORK

1 < E_TD-P
2 < E_TD-N
3 < E_RD-P
4 < NC
5 < NC
6 < E_RD-N
7 < NC
8 < NC

*3 MJ-A3SPF

+48V > 1
GND > 2
SHIELD > 3

φ7 WHT
BLK

J301 POWER

1 48V-H
2 48V-C

CONNECTION TO MULTI FUNCTION DISPLAY TZT9/14

MOD-WPAS0001

TZT9/14

RJ45   HUB-101   RJ45
MOD-Z072

RJ45

POWER SUPPLY UNIT

*2
PSU-012

または OR

*2
PSU-017

RJ45   MOD-ASW0001   RJ45

DRS2D/4D

3.5m

24VDC

5m

12-24VDC

TZT9/14 REQUIRES PSU-012 OR PSU-017 TO CONNECT A RADAR SENSOR.
PSU-017 REQUIRES BREAKER TO CONNECT SOURCE.

B

OR

MOD-WPAS0001, 3m
*2

RJ45   JUNCTION BOX   RJ45
TL-CAT-012 *2

OR

*2
MOD-Z072, 2/5/10m, φ6(CROSS) OR
MOD-WPAS0001, 3m

ETHERNET HUB
HUB-101

DRS2D/4D

MFD8/12
MFDBB(MPU-001)

*3 RJ45

E_TD-P > 1
E_TD-N > 2
E_RD-P > 3
NC > 4
NC > 5
E_RD-N > 6
NC > 7
NC > 8

*3 RJ45   *2
1 <
2 <
3 <
4 <
5 <
6 <
7 <
8 <

J3
(+) (-)
1 2

*3 RJ45   MOD-ASW0001, φ6
10/15/20/30m

*3 RJ45   J207 NETWORK

1 < E_TD-P
2 < E_TD-N
3 < E_RD-P
4 < NC
5 < NC
6 < E_RD-N
7 < NC
8 < NC

*3 MJ-A3SPF

+48V > 1
GND > 2
SHIELD > 3

12-24VDC   VVR×2C *1

φ7 シロ WHT
クロ BLK

J301 POWER

1 48V-H
2 48V-C

C

NOTE
1. SHIPYARD SUPPLY.
2. OPTION.
3. CONNECTOR PLUG FITTED AT FACTORY.

DRAWN 18/Oct/2012 T. YAMASAKI			TITLE DRS2D/4D
CHECKED 18/Oct/2012 H. MAKI			
APPROVED 22/Oct/2012 Y. NISHIYAMA			
SCALE	MASS kg		NAME RADAR SENSOR
DWG. No. C3567-C01- D	REF. No. 03-174-6001-2		INTERCONNECTION DIAGRAM

S-1

FURUNO ELECTRIC CO., LTD.

FURUNO

NAV. EQUIPMENT OR SENSOR

GP-330B
SC-30
WS-200 etc.

M12-05BFFM, 1/2/6m, *2
CB-05BFFM, 1/2/6m

NMEA2000
TB102

	SHIELD
1	
2	NET-S
3	NET-C
4	NET-H
5	NET-L

RED
BLK
WHT
BLU

ANTENNA UNIT
RSB-118

A

MULTI FUNCTION DISPLAY

MFD8/12
MFDBB(MPU-001)

*3
RJ45

E_TD-P	1
E_TD-N	2
E_RD-P	3
NC	4
NC	5
E_RD-N	6
NC	7
NC	8

(2/10m *2)
MOD-Z072, 5m, φ6

*3
RJ45

J2 POWER SUPPLY UNIT
PSU-012
*2

E_TD-P	1
E_TD-N	2
E_RD-P	3
NC	4
NC	5
E_RD-N	6
NC	7
NC	8

*3
RJ45

MOD-ASW0001,
10/15/20/30m, φ6

*3
RJ45

B2 RTR-092A/093A
NETWORK

E_TD-P	1
E_TD-N	2
E_RD-P	3
NC	4
NC	5
E_RD-N	6
NC	7
NC	8

*3
MJ-A3SPF

+48V	1
GND	2
SHIELD	3

VL3P-VVS2x2C, 5m

12-24VDC   WHT

BLK

J1

1	(+)
2	
3	(−)

J11
48V-H 1
48V-L 2
SHIELD 3

*3
MJ-A3SPF

φ7   WHT

BLK

TB101 POWER
| 1 | 48V-H |
| 2 | 48V-C |

WHEN PSU-012 IS NOT USED

IV-2sq.   *1

RW-4747, 0.3m

B

MFD8/12
MFDBB(MPU-001)

*3
RJ45

MOD-WPAS0001, 3m   *2

RJ45   JUNCTION BOX
TL-CAT-012 *2
OR
ETHERNET HUB
HUB-101
*2

RJ45

RSB-118 OR
PSU-012

NETWORK

E_TD-P	1
E_TD-N	2
E_RD-P	3
NC	4
NC	5
E_RD-N	6
NC	7
NC	8

*2
MOD-Z072, 2/5/10m, φ6 (CROSS) OR
MOD-WPAS0001, 3m

*3
RJ45

| 1 |
| 2 |
| 3 |
| 4 |
| 5 |
| 6 |
| 7 |
| 8 |

MOD-ASW0001, φ6
10/15/20/30m

*3
RJ45

E_TD-P	1
E_TD-N	2
E_RD-P	3
NC	4
NC	5
E_RD-N	6
NC	7
NC	8

J3
| 1 | (+) |
| 2 | (−) |

*3
MJ-A3SPF

+48V	1
GND	2
SHIELD	3

12-24VDC   VVRx2C *1

φ7   WHT

BLK

POWER
| 1 | 48V-H |
| 2 | 48V-C |

CONNECTION TO MULTI FUNCTION DISPLAY TZT9/14

TZT9/14 — MOD-WPAS0001 — RJ45 — HUB-101 — MOD-Z072 — RJ45 — PSU-012 *2 — RJ45 — RSB-118

MOD-ASW0001

3.5m   5m
24VDC   12-24VDC

TZT9/14 REQUIRES PSU-012 TO CONNECT A RADAR SENSOR.

C

NOTE
1. SHIPYARD SUPPLY.
2. OPTION.
3. CONNECTOR PLUG FITTED AT FACTORY.

S-2

FURUNO ELECTRIC CO., LTD.

FURUNO

NAV. EQUIPMENT OR SENSOR

GP-330B
SC-30
WS-200 etc.

NMEA2000
TB102
1 SHIELD
2 NET-S
3 NET-C
4 NET-H
5 NET-L *4

ANTENNA UNIT
RSB-118

B2 RTR-094A
J207 NETWORK

MULTI-FUNCTION DISPLAY

MFDBB(MPU-001)
MFD8/12

*3 RJ45   MOD-Z072, 2/5/10m, φ6   *2   *3 RJ45

J2   PSU-012   *2   J3   *3 RJ45   MOD-ASW0001, 10/15/20/30m, φ6   *3 RJ45

POWER SUPPLY UNIT

E_TD-P 1
E_TD-N 2
E_RD-P 3
NC 4
NC 5
E_RD-N 6
NC 7
NC 8

1 E_TD-P
2 E_TD-N
3 E_RD-P
4 NC
5 NC
6 E_RD-N
7 NC
8 NC

E_TD-P 1
E_TD-N 2
E_RD-P 3
NC 4
NC 5
E_RD-N 6
NC 7
NC 8

1 E_TD-P
2 E_TD-N
3 E_RD-P
4 NC
5 NC
6 E_RD-N
7 NC
8 NC

MFDBB(MPU-001) ONLY   MJ-A3SPF *3

+48V 1
GND 2
SHIELD 3

12-24VDC

VL3P-VVS2x2C, 5m   WHT
BLK

J1
1 (+)
2
3 (−)

J11   MJ-A3SPF *3
48V-H 1
48V-L 2
SHIELD 3

φ7 シロ WHT
クロ BLK

TB101 POWER
1 48V-H
2 48V-C

RW-4747, 0.3m

*1
IV-2sq.

WHEN PSU-012 IS NOT USED (FOR MFDBB ONLY)

MOD-WPAS0001, 3m

JUNCTION BOX
TL-CAT-012
OR
ETHERNET HUB
HUB-101

MFDBB(MPU-001)
MFD8/12

*3 RJ45   MOD-Z072, 2/5/10m, φ6(CROSS) OR   *3 RJ45
MOD-WPAS0001, 3m

*3 RJ45   MOD-Z072, 2/5/10m, φ6   *3 RJ45   PSU-012 J2

E_TD-P 1
E_TD-N 2
E_RD-P 3
NC 4
NC 5
E_RD-N 6
NC 7
NC 8

1
2
3
4
5
6
7
8

1
2
3
4
5
6
7
8

1 E_TD-P
2 E_TD-N
3 E_RD-P
4 NC
5 NC
6 E_RD-N
7 NC
8 NC

J3
1 (+)
2 (−)

12-24VDC   VVRx2C *1

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: CONNECTOR PLUG FITTED AT FACTORY.
*4: ATTACH A TERMINATOR.

DRAWN   25/May/2011 T. YAMASAKI
CHECKED   25/May/2011 H. MAKI
APPROVED   25/May/2011 Y.NISHIYAMA
SCALE   MASS   kg
DWG. No. C3571-C01- E   REF. No. 03-174-6003-4

TITLE DRS12A
NAME RADAR SENSOR
INTERCONNECTION DIAGRAM

S-3

FURUNO ELECTRIC CO., LTD.

FURUNO

NAV. EQUIPMENT OR SENSOR

GP-330B
SC-30
WS-200 etc.

M12-05BFFM, 1/2/6m *2
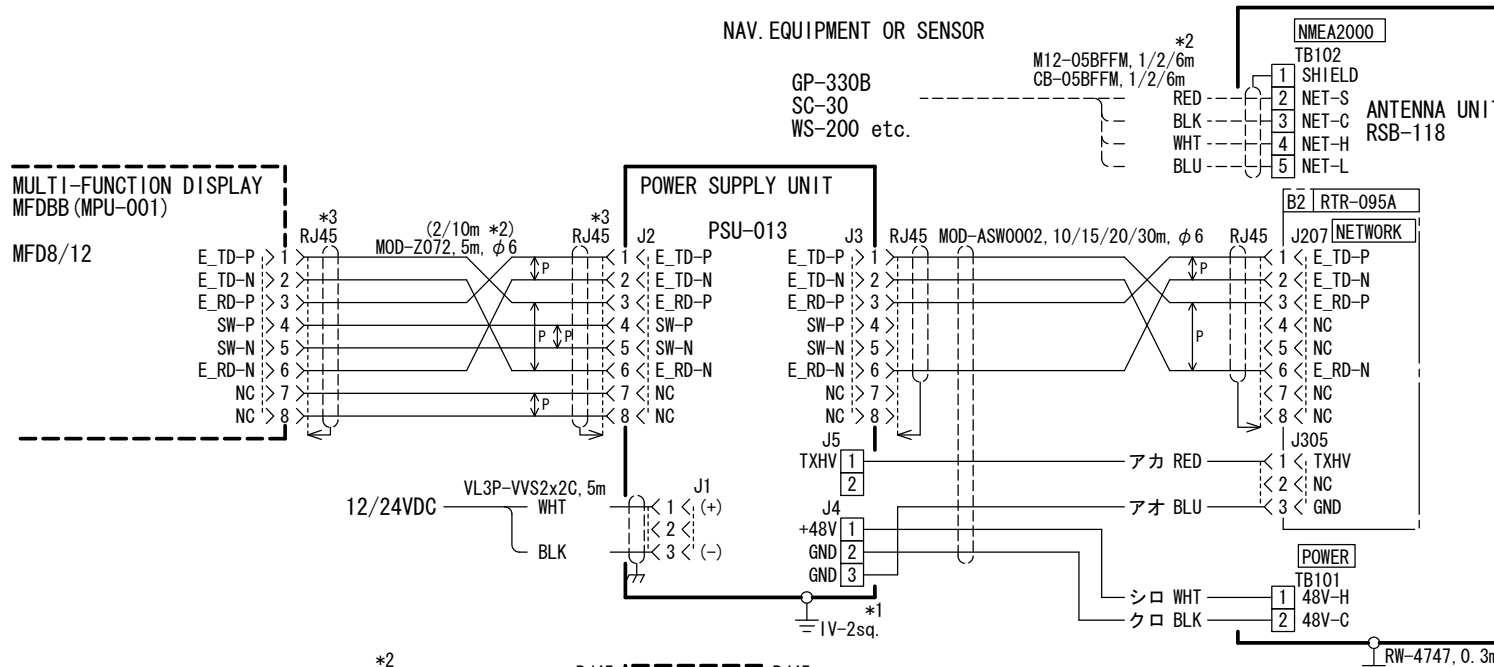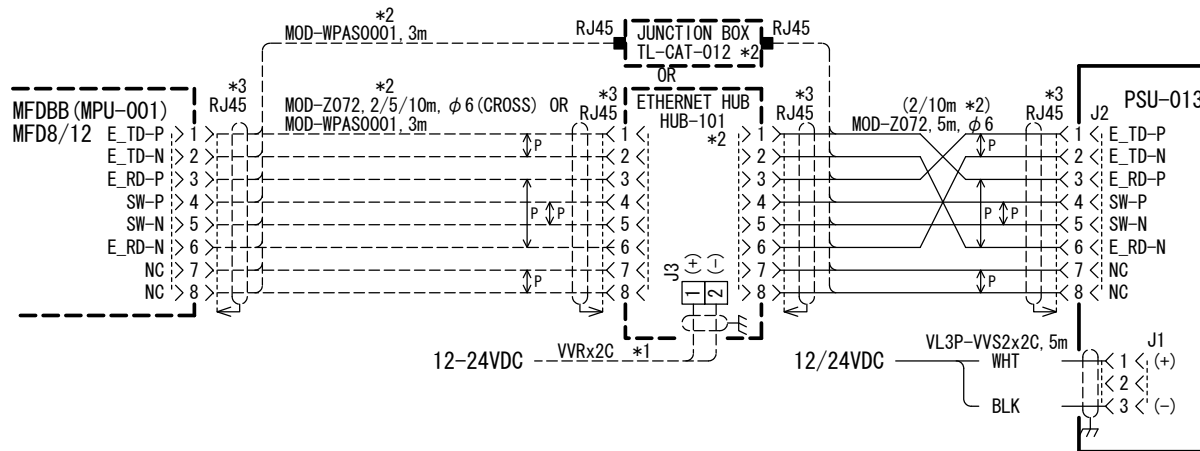CB-05BFFM, 1/2/6m

NMEA2000
TB102

1	SHIELD
2	NET-S
3	NET-C
4	NET-H
5	NET-L

RED
BLK
WHT
BLU

ANTENNA UNIT
RSB-118

A

MULTI-FUNCTION DISPLAY
MFDBB(MPU-001)

MFD8/12

POWER SUPPLY UNIT
PSU-013

B2 RTR-095A

J207 NETWORK

*3
RJ45

(2/10m *2)
MOD-Z072, 5m, φ6

*3
RJ45

J2

J3 RJ45 MOD-ASW0002, 10/15/20/30m, φ6 RJ45 J207

E_TD-P	1		1	E_TD-P
E_TD-N	2		2	E_TD-N
E_RD-P	3		3	E_RD-P
SW-P	4		4	SW-P
SW-N	5		5	SW-N
E_RD-N	6		6	E_RD-N
NC	7		7	NC
NC	8		8	NC

E_TD-P	1		1	E_TD-P
E_TD-N	2		2	E_TD-N
E_RD-P	3		3	E_RD-P
SW-P	4		4	NC
SW-N	5		5	NC
E_RD-N	6		6	E_RD-N
NC	7		7	NC
NC	8		8	NC

J5
TXHV 1
2

アカ RED

J305
1 TXHV
2 NC

VL3P-VVS2x2C, 5m
12/24VDC — WHT

J1
1 (+)
2
3 (−)

J4
+48V 1
GND 2
GND 3

アオ BLU

3 GND

BLK

*1
IV-2sq.

POWER
TB101
1 48V-H
2 48V-C

シロ WHT
クロ BLK

RW-4747, 0.3m

B

MOD-WPAS0001, 3m *2

RJ45 JUNCTION BOX RJ45
TL-CAT-012 *2
OR

MFDBB(MPU-001)
MFD8/12

*3
RJ45

*2
MOD-Z072, 2/5/10m, φ6(CROSS) OR
MOD-WPAS0001, 3m

*3
RJ45

ETHERNET HUB
HUB-101
*2

*3
RJ45

(2/10m *2)
MOD-Z072, 5m φ6

*3
RJ45

J2

PSU-013

E_TD-P	1		1		1	E_TD-P
E_TD-N	2		2		2	E_TD-N
E_RD-P	3		3		3	E_RD-P
SW-P	4		4		4	SW-P
SW-N	5		5		5	SW-N
E_RD-N	6		6		6	E_RD-N
NC	7		7		7	NC
NC	8		8		8	NC

J3
(+) (−)
1 2

12-24VDC VVRx2C *1

12/24VDC — WHT

VL3P-VVS2x2C, 5m

J1
1 (+)
2
3 (−)

BLK

C

NOTE
1. SHIPYARD SUPPLY.
2. OPTION.
3. CONNECTOR PLUG FITTED AT FACTORY.

FURUNO Worldwide Warranty for Pleasure Boats (Except North America)

This warranty is valid for products manufactured by Furuno Electric Co. (hereafter FURUNO) and installed on a pleasure boat. Any web based purchases that are imported into other countries by anyone other than a FURUNO certified dealer may not comply with local standards. FURUNO strongly recommends against importing these products from international websites as the imported product may not work correctly and may interfere with other electronic devices. The imported product may also be in breach of the local laws and mandated technical requirements. Products imported into other countries as described previously shall not be eligible for local warranty service.

For products purchased outside of your country please contact the national distributor of Furuno products in the country where purchased.

This warranty is in addition to the customer´s statutory legal rights.

1. Terms and Conditions of Warranty

FURUNO guarantees that each new FURUNO product is the result of quality materials and workmanship. The warranty is valid for a period of 2 years (24 months) from the date of the invoice, or the date of commissioning of the product by the installing certified dealer.

2. FURUNO Standard Warranty

The FURUNO standard warranty covers spare parts and labour costs associated with a warranty claim, provided that the product is returned to a FURUNO national distributor by prepaid carrier.

The FURUNO standard warranty includes:

- Repair at a FURUNO national distributor
- All spare parts for the repair
- Cost for economical shipment to customer

3. FURUNO Onboard Warranty

If the product was installed/commissioned and registered by a certified FURUNO dealer, the customer has the right to the onboard warranty.

The FURUNO onboard warranty includes

- Free shipping of the necessary parts
- Labour: Normal working hours only
- Travel time: Up to a maximum of two (2) hours
- Travel distance: Up to a maximum of one hundred and sixty (160) KM by car for the complete journey

4. Warranty Registration

For the Standard Warranty - presentation of product with serial number (8 digits serial number, 1234-5678) is sufficient. Otherwise, the invoice with serial number, name and stamp of the dealer and date of purchase is shown.

For the Onboard Warranty your FURUNO certified dealer will take care of all registrations.

5. Warranty Claims

For the Standard Warranty - simply send the defective product together with the invoice to a FURUNO national distributor. For the Onboard Warranty – contact a FURUNO national distributor or a certified dealer. Give the product´s serial number and describe the problem as accurately as possible.

Warranty repairs carried out by companies/persons other than a FURUNO national distributor or a certified dealer is not covered by this warranty.

6. Warranty Limitations

When a claim is made, FURUNO has a right to choose whether to repair the product or replace it.

The FURUNO warranty is only valid if the product was correctly installed and used. Therefore, it is necessary for the customer to comply with the instructions in the handbook. Problems which result from not complying with the instruction manual are not covered by the warranty.

FURUNO is not liable for any damage caused to the vessel by using a FURUNO product.

The following are excluded from this warranty:

a.   Second-hand product

b.   Underwater unit such as transducer and hull unit

c.   Routine maintenance, alignment and calibration services.

d.   Replacement of consumable parts such as fuses, lamps, recording papers, drive belts, cables, protective covers and batteries.

e.   Magnetron and MIC with more than 1000 transmitting hours or older than 12 months, whichever comes first.

f.   Costs associated with the replacement of a transducer (e.g. Crane, docking or diver etc.).

g.   Sea trial, test and evaluation or other demonstrations.

h.   Products repaired or altered by anyone other than the FURUNO national distributor or an authorized dealer.

i.   Products on which the serial number is altered, defaced or removed.

j.   Problems resulting from an accident, negligence, misuse, improper installation, vandalism or water penetration.

k.   Damage resulting from a force majeure or other natural catastrophe or calamity.

l.   Damage from shipping or transit.

m.   Software updates, except when deemed necessary and warrantable by FURUNO.

n.   Overtime, extra labour outside of normal hours such as weekend/holiday, and travel costs above the 160 KM allowance

o.   Operator familiarization and orientation.

FURUNO Electric Company, March 1, 2011

FURUNO Warranty for North America

FURUNO U.S.A., Limited Warranty provides a twenty-four (24) months LABOR and twenty-four (24) months PARTS warranty on products from the date of installation or purchase by the original owner. Products or components that are represented as being waterproof are guaranteed to be waterproof only for, and within the limits, of the warranty period stated above. The warranty start date may not exceed eighteen (18) months from the original date of purchase by dealer from Furuno USA and applies to new equipment installed and operated in accordance with Furuno USA's published instructions.

Magnetrons and Microwave devices will be warranted for a period of 12 months from date of original equipment installation.

Furuno U.S.A., Inc. warrants each new product to be of sound material and workmanship and through its authorized dealer will exchange any parts proven to be defective in material or workmanship under normal use at no charge for a period of 24 months from the date of installation or purchase.

Furuno U.S.A., Inc., through an authorized Furuno dealer will provide labor at no cost to replace defective parts, exclusive of routine maintenance or normal adjustments, for a period of 24 months from installation date provided the work is done by Furuno U.S.A., Inc. or an AUTHORIZED Furuno dealer during normal shop hours and within a radius of 50 miles of the shop location.

A suitable proof of purchase showing date of purchase, or installation certification must be available to Furuno U.S.A., Inc., or its authorized dealer at the time of request for warranty service.

This warranty is valid for installation of products manufactured by Furuno Electric Co. (hereafter FURUNO). Any purchases from brick and mortar or web-based resellers that are imported into other countries by anyone other than a FURUNO certified dealer, agent or subsidiary may not comply with local standards. FURUNO strongly recommends against importing these products from international websites or other resellers, as the imported product may not work correctly and may interfere with other electronic devices. The imported product may also be in breach of the local laws and mandated technical requirements. Products imported into other countries, as described previously, shall not be eligible for local warranty service.

For products purchased outside of your country please contact the national distributor of Furuno products in the country where purchased.

WARRANTY REGISTRATION AND INFORMATION
To register your product for warranty, as well as see the complete warranty guidelines and limitations. In order to expedite repairs, warranty service on Furuno equipment is provided through its authorized dealer network. If this is not possible or practical, please contact Furuno U.S.A., Inc. to arrange warranty service.

Furuno U.S.A., Inc. is proud to supply you with the highest quality in Marine Electronics. We know you had several choices when making your selection of equipment, and from everyone at Furuno we thank you. Furuno takes great pride in customer service.