FURUNO

Installation Manual
RADAR SENSOR
Model DRS6A X-Class/DRS12A X-Class/DRS25A X-Class

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FURUNO ELECTRIC CO., LTD.

www.furuno.com

SAFETY INSTRUCTIONS

The installer of the equipment must read the safety instructions before attempting to install 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, can result in minor or moderate injury.

Warning, Caution Prohibitive Action Mandatory Action

WARNING

Do not open the equipment unless you are well familiar with electrical circuits.

Only qualified personnel should work inside the equipment.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

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 someone falls from the radar mast.

Turn off the power at the switchboard before beginning the installation.

Fire or electrical shock can result if the power is left on.

WARNING

Keep the objects away from the antenna unit, so as not to impede rotation of the antenna.

Fire, electrical shock or serious injury can result.

Be sure that the power supply is compatible with the voltage rating of the equipment.

Connection of an incorrect power supply can cause fire or damage the equipment.

Use only the specified power and signal cable.

Fire or damage to the equipment can result if a different cable is used.

Use the proper fuse.

Use of a wrong fuse can damage the equipment or cause fire.

Do not depend one navigation device for the navigation of the vessel.

For the safety of vessel and crew, the navigator must check all aids available to confirm position.

⚠ WARNING

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, 50 and 10 W/m^2 exist are given in the table below.

DRS6A X-Class (Magnetron type: MAF1422B)

Radiator	100 W/m^2	50 W/m^2	10 W/m^2
XN10A	0.1 m	0.5 m	3 m
XN12A	N/A	0.4 m	2.2 m
XN13A	N/A	0.2 m	1.9 m

DRS6A X-Class (Magnetron type: MAF1562R)

Radiator	100 W/m^2	50 W/m^2	10 W/m^2
XN10A	0.2 m	0.5 m	2.5 m
XN12A	0.1 m	0.3 m	2.2 m
XN13A	N/A	0.3 m	1.8 m

DRS12A X-Class

Radiator	100 W/m^2	50 W/m^2	10 W/m^2
XN12A	0.3 m	0.8 m	3.1 m
XN13A	0.2 m	0.7 m	2.9 m

DRS25A X-Class

Radiator	100 W/m^2	50 W/m^2	10 W/m^2
XN12A	0.8 m	1.7 m	7.7 m
XN13A	0.7 m	1.6 m	6.8 m

⚠ CAUTION

Ground the equipment to prevent mutual interference.

It is recommended that you connect the antenna unit to a disconnecting device (circuit breaker, etc.) to control the power.

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

Model	Standard compass	Steering compass
DRS6A X-Class	1.40 m	0.90 m
DRS12A X-Class	1.80 m	1.15 m
DRS25A X-Class	2.10 m	1.35 m

WARNING LABEL

A warning label is attached to the antenna unit. Do not remove the label.
If the label is missing or damaged, contact your dealer about replacement.

⚠ WARNING ⚠	⚠ 警 告 ⚠
To avoid electrical shock, do not remove cover. No user-serviceable parts inside.	感電の恐れあり。 サービスマン以外の方はカバーを開けないで下さい。内部には高電圧部分が数多くあり、万一さわると危険です。

Name: Warning Label (2)
Type: 03-129-1001-3
Code No: 100-236-743

Importer in Europe

The following concern acts as our importer in Europe, as defined in DECISION No 768/2008/EC.
- Name: FURUNO EUROPE B.V.
- Address: Siriusstraat 86, 5015 BT, Tilburg, The Netherlands

Importer in UK

The following concern acts as our importer in UK, as defined in SI 2016/1025 as amended SI 2019/470.
- Name: FURUNO (UK) LTD.
- Address: West Building Penner Road Havant Hampshire PO9 1QY, U.K.

Program No.

• 0359355-02.** (** denotes minor modifications.)

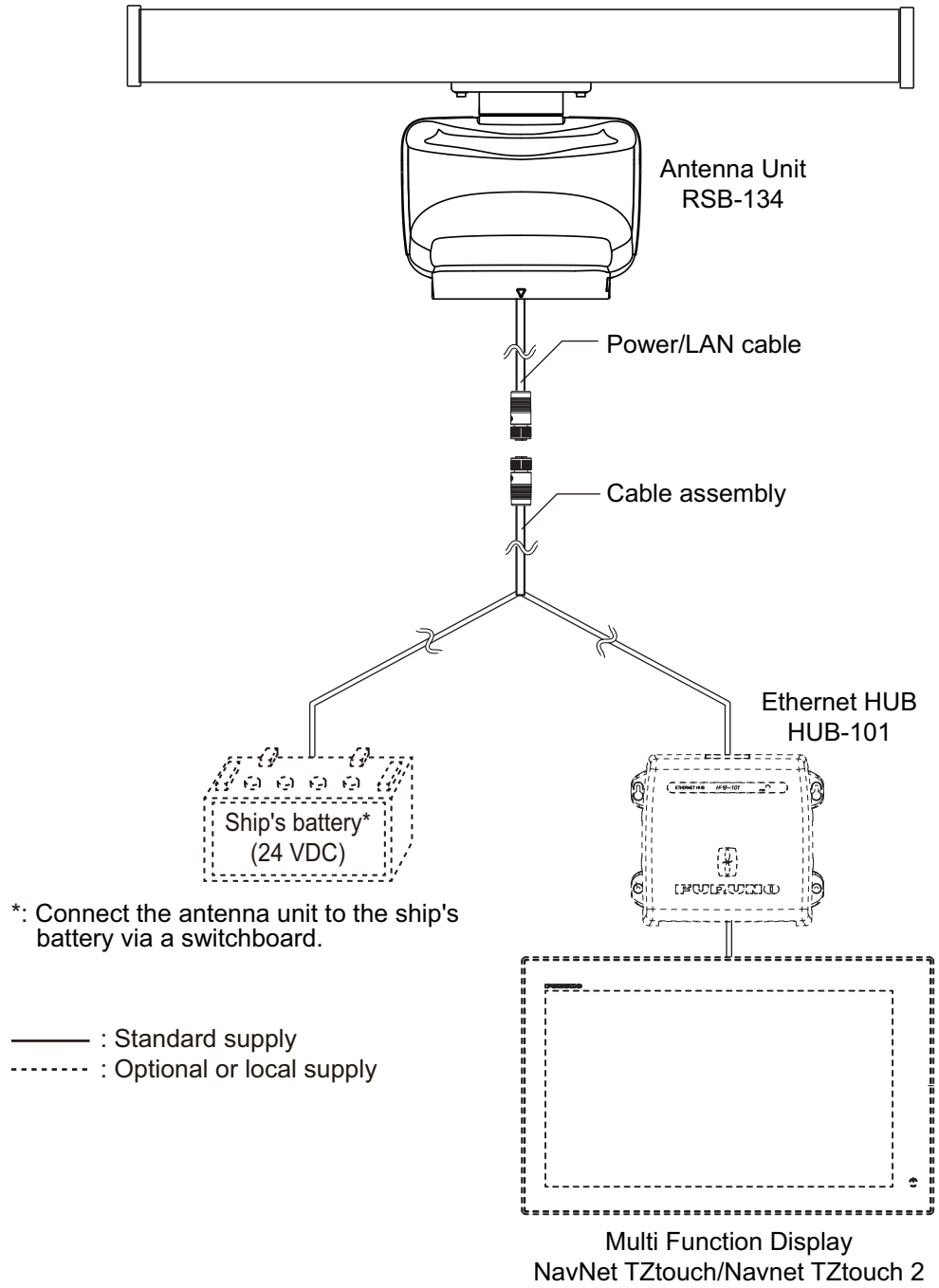
CE/UKCA declaration

With regards to CE/UKCA declarations, please refer to our website (www.furuno.com), for further information about RoHS conformity declarations.

Disclosure of Information about China RoHS

With regards to China RoHS information for our products, please refer to our website (www.furuno.com).

SYSTEM CONFIGURATION



This radar series is compatible with the FURUNO Multi Function Displays and software version combinations shown below. The combination with other models may not operate properly.

- DRS6A X-Class
  TZT9, TZT14 and TZTBB: Version 4.21 or later
  TZTL12F and TZTL15F: Version 3.01 or later
- DRS12A X-Class and DRS25A X-Class
  TZT9, TZT14 and TZTBB: Version 5.01 or later (Planned release: End of 2016)
  TZTL12F and TZTL15F: Version 4.01 or later (Planned release: End of 2016)

EQUIPMENT LISTS

Standard supply

Name	Type	Code No.	Qty	Remarks
Scanner Unit	RSB-134-112	-	1	For DRS6A X-Class
	RSB-134-113	-		For DRS12A X-Class
	RSB-134-114	-		For DRS25A X-Class
Radiator	XN10A*	-	1	3.4 ft
	XN12A	-		4 ft
	XN13A	-		6 ft
Installation Materials	CP03-37101	001-426-290	1	For scanner unit
	CP03-22901	008-523-690	1	For radiator
	CP03-36400	000-027-211	1	Cable assembly (10 m), supplied for DRS6A X-Class
	CP03-36410	000-027-212		Cable assembly (15 m), supplied for DRS6A X-Class
	CP03-36420	000-027-213		Cable assembly (20 m), supplied for DRS6A X-Class
	CP03-36430	000-027-214		Cable assembly (30 m), supplied for DRS6A X-Class
	CP03-37400	000-033-082		Cable assembly (10 m), supplied for DRS12A/25A X-Class
	CP03-37410	000-033-083		Cable assembly (15 m), supplied for DRS12A/25A X-Class
	CP03-37420	000-033-084		Cable assembly (20 m), supplied for DRS12A/25A X-Class
	CP03-37430	000-033-085		Cable assembly (30 m), supplied for DRS12A/25A X-Class
Spare Parts	SP03-18101	001-426-190	1	Fuses (5 A, 10 A and 15 A), supplied for the DRS6A X-Class
	SP03-19601	001-514-020		Fuses (5 A, 10 A and 15 A), supplied for DRS12A/25A X-Class

*: Selectable for DRS6A X-Class only.

Optional supply

Name	Type	Code No.	Remarks
LAN Cable	MOD-Z072-020+	001-167-880-10	2 m
	MOD-Z072-050+	001-167-890-10	5 m
	MOD-Z072-100+	001-167-900-10	10 m
Joint Box	TL-CAT-012	000-167-140-10	For LAN cable extension

1. INSTALLATION AND WIRING

NOTICE

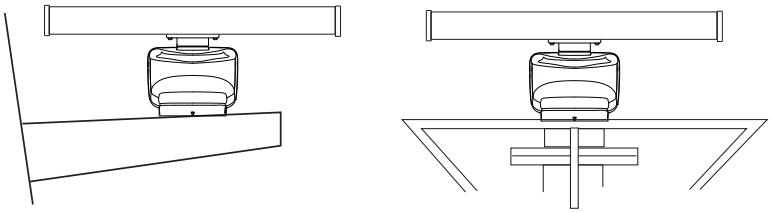
Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

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

1.1 Mounting Considerations

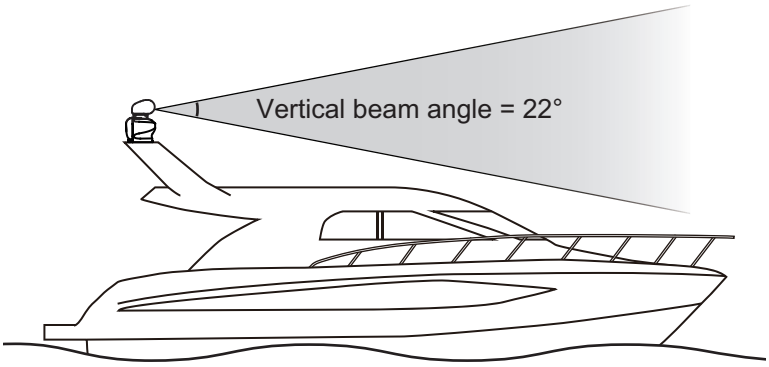
Select a mounting location, keeping in mind the following points:

- Install the antenna unit on the hardtop, radar arch or on a mast on an appropriate platform.



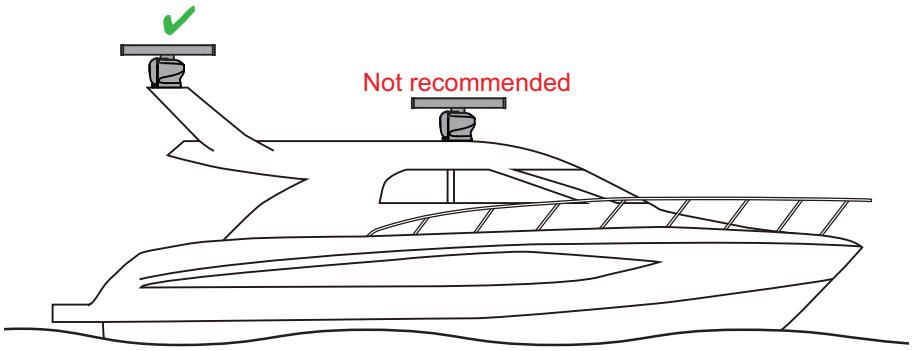
(a) Common mast (b) Radar mast

- Locate the antenna where there is a good all-round view. Where possible, there should be no obstructions to the scanning beam such as superstructure or rigging. Obstructions cause shadow sectors and decrease the overall performance of the radar. The loss of performance can cause false echoes and reduce the quality of the observed images. A mast for instance, with a diameter considerably less than the horizontal beam width of the radiator, will cause only a small shadow sector. However, a horizontal spreader, or cross trees in the same horizontal plane as the antenna unit, would be a much more serious obstruction. You would need to place the antenna unit well above or below it. Be sure there are no metallic objects near the antenna.



- It is rarely possible to place the antenna unit where a completely clear view in all directions is available. After fitting the antenna, determining any shadow sectors, their angle and bearing, and their influence on the radar is recommended.

- In order to reduce electrical interference, avoid routing the power cable near other electrical equipment on-board. Also, avoid running the cable in parallel with other power cables.
- It is not recommended to install the antenna unit on the hardtop of a cabin. Vibrations from the antenna unit will pass through the hardtop and into the cabin.

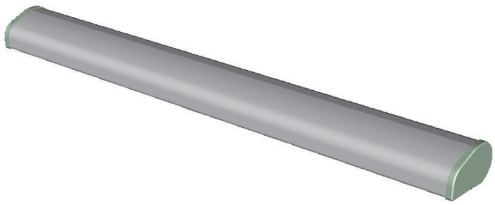


- Setup the antenna unit position on the FURUNO Multi Function Display after installing the unit, referring to the chapter 2. If the antenna unit position is not setup correctly, the radar echoes on the display may not be aligned with the actual target's bearing.
- Select a location that does not allow water to accumulate at the installation location.
- A magnetic compass will be affected if the antenna unit is too close to the compass. Observe the compass safe distances mentioned in the SAFETY INSTRUCTIONS to prevent interference to a magnetic compass.
- To ensure proper emission of radar waves, do not paint the radiator.
- Referring to the outline drawings at the back of this manual, allow space for maintenance and service.
- When this antenna unit is to be installed on a large vessel, consider the following points:
  - The supplied cable assembly runs between the antenna unit and display (or ethernet HUB) and comes in lengths of 10 m, 15 m, 20 m or 30 m. Select the appropriate length when purchasing.
  - Deposits and fumes from a funnel or other exhaust vent can adversely affect the aerial performance and hot gases may distort the antenna unit. The antenna unit must not be mounted where the temperature is more than 55°C(131°F).

1.2 Included Items

Radiator

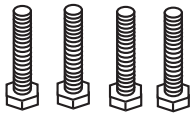
• Radiator*1 (1 pcs):
3.4 ft*2, 4 ft or 6 ft



• Flat washer (M8, 4 pcs)

• Spring washer (M8, 4 pcs)

• Hex. bolt (M8×30, 4 pcs)



• O-ring (1 pcs)

• Adhesive (1 pcs)

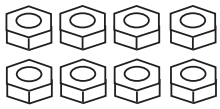
Scanner Unit

• Scanner Unit (1 pcs)

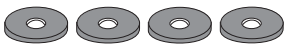
• Flat washer (M12, 4 pcs)

• Spring washer (M12, 4 pcs)

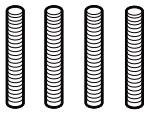
• Hex nut (M12, 8 pcs)



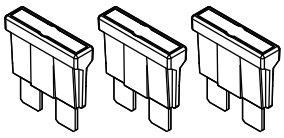
• Insulation sheet
(4 pcs)



• Stud bolt (M12×70, 4 pcs)

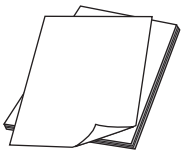


• Spare fuse (3 pcs, 5 A,
10 A and 15 A)



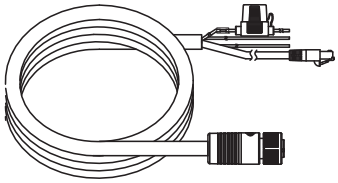
5 A: For DRS6A X-Class
10 A: For DRS12A/25A X-Class
15 A: Not used.

• Documents (1 set):



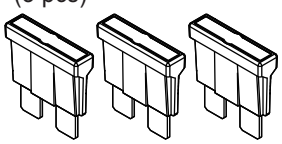
Cable assembly

• Cable assembly*1 (1 pcs):
10 m, 15 m, 20 m or 30 m



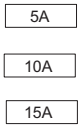
Supplied for DRS12A X-Class and DRS25A X-Class

• Fuse for replacement**
(3 pcs)

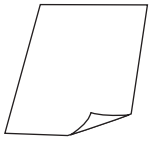


(5 A, 10 A and 15 A)

• Label** (3 pcs)



• How to Replace the Fuse
(1 pcs)

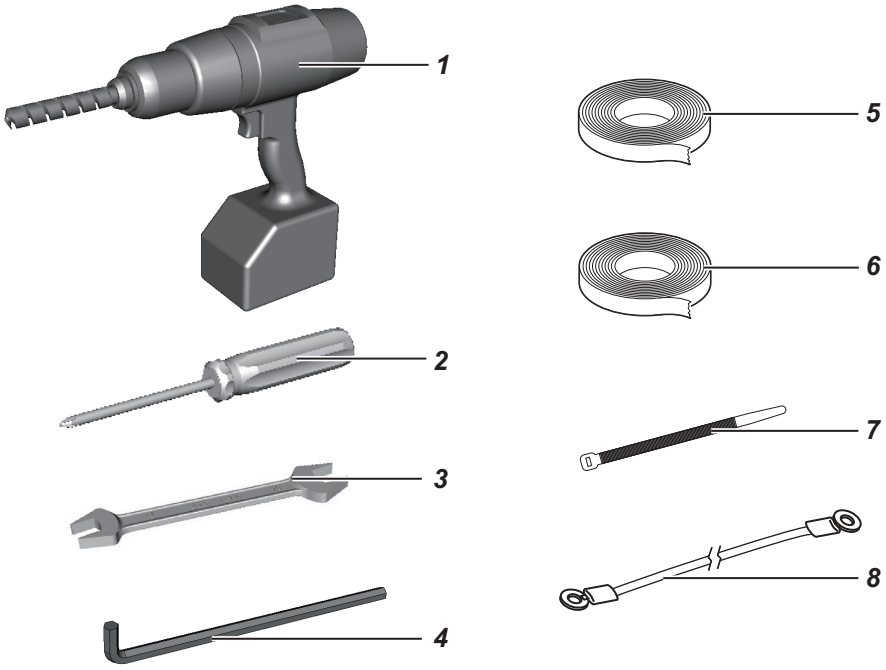


**: Use 10 A fuse and label

*1: Select the appropriate length when purchasing.
*2: Selectable for DRS6A X-Class only.

1.3 Required Tools and Materials

The following tools should be prepared in advance for this installation.

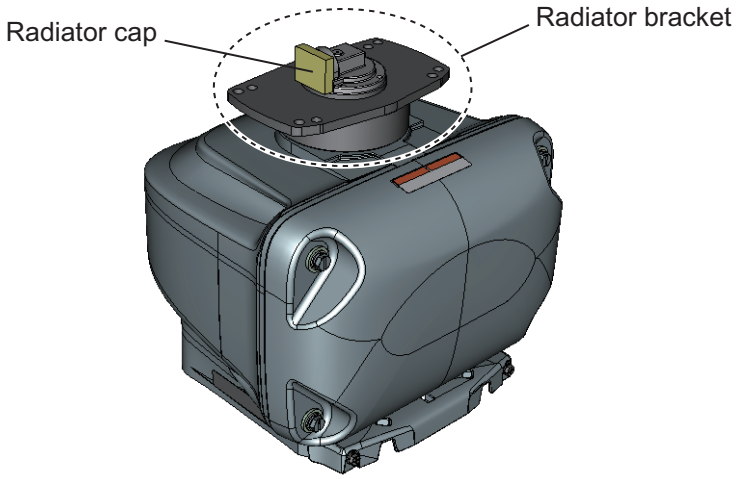


No.	Name	Remarks
1	Electrical drill	For making the mounting holes, drill bit: ϕ 15 mm
2	Phillips-head screw driver	#3, for securing the cable cover
3	Wrench	For M8 (Hex. size 13 mm) and M12 (Hex. size 19 mm)
4	Hex. L-wrench	For fastening the stud bolts (Hex. size 6 mm)
5	Self-vulcanizing tape	For waterproofing the junction of connectors
6	Vinyl tape*	
7	Cable tie	For securing the cables
8	Ground wire	IV-2sq

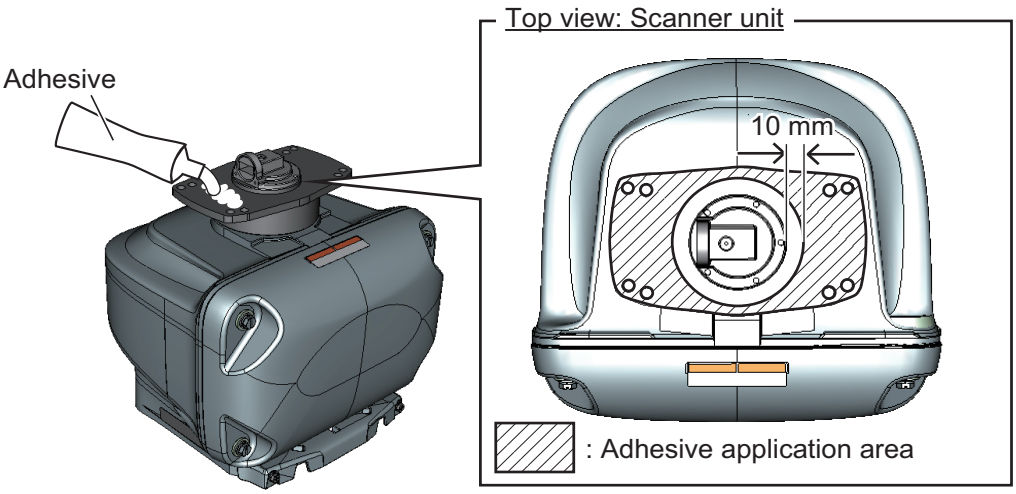
*: For cosmetic purposes, black color vinyl tape (cable color) is recommended.

1.4 Fastening the Radiator to the Radiator Bracket

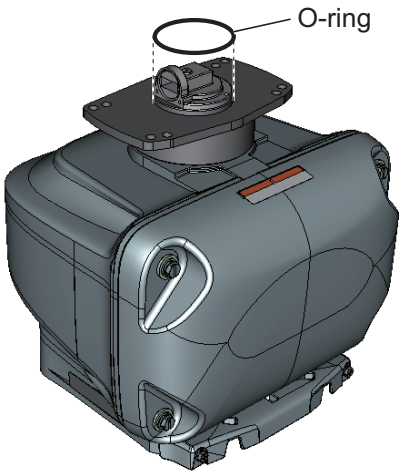
1. Remove the radiator cap from the radiator bracket.



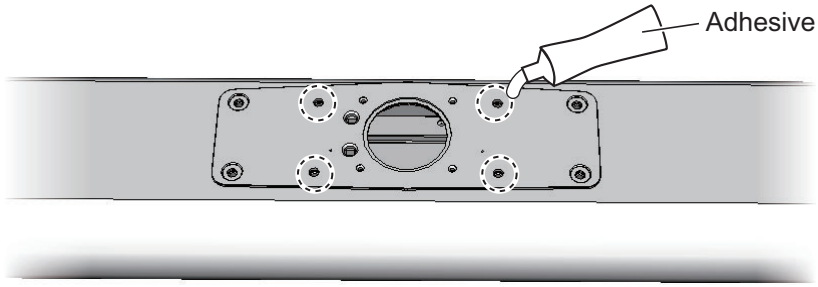
2. Apply adhesive to the surface of the radiator bracket as shown in the figure below.



3. Set the O-ring to the radiator bracket.

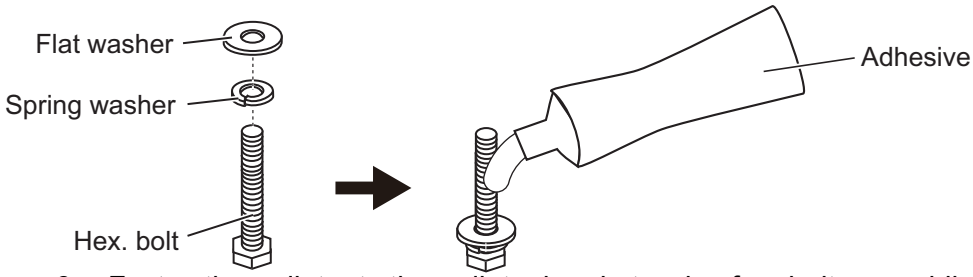


4. Apply adhesive to the thread holes on the bottom of the radiator (4 locations).

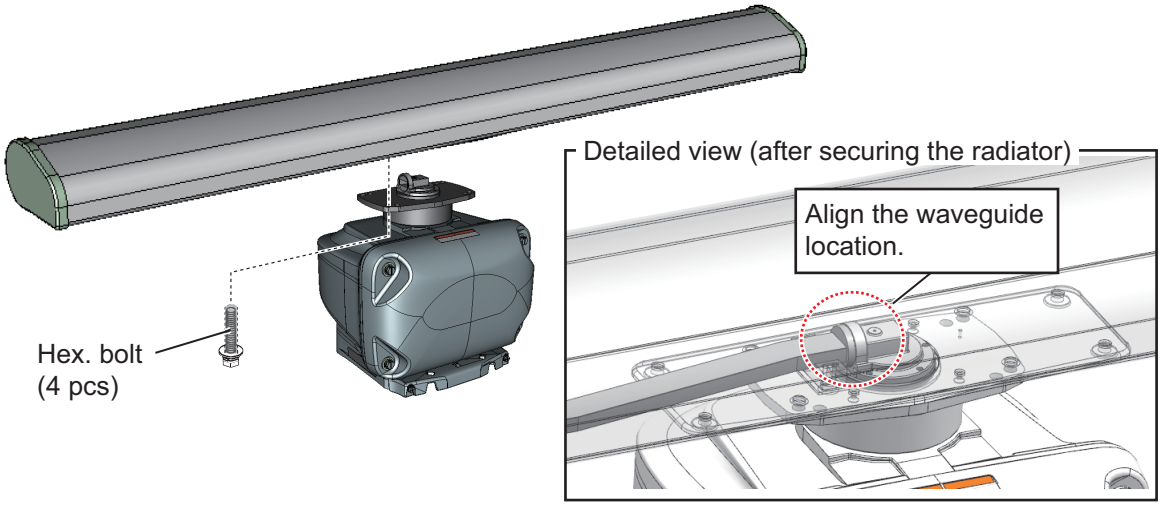


Bottom view: Radiator

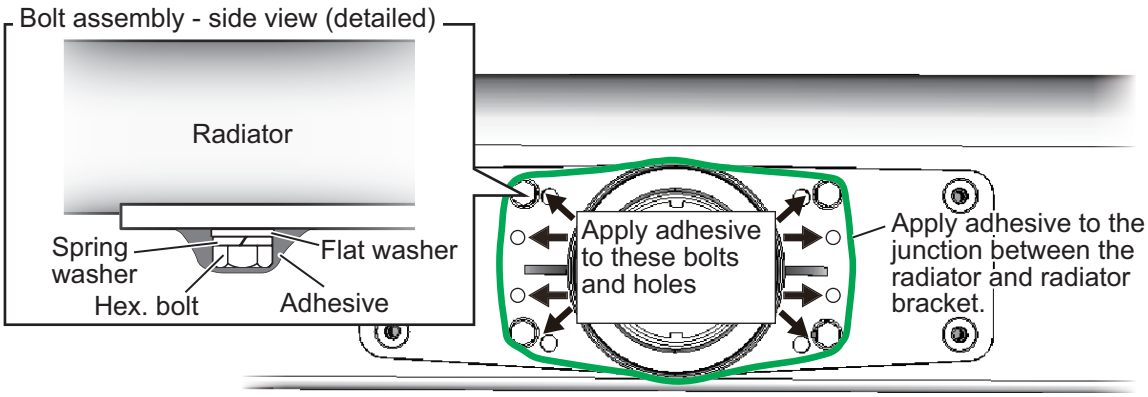
5. Prepare four bolt assemblies; pass the spring washer (M8) and flat washer (M8) through the each hex bolt (M8×30) then apply adhesive.



6. Fasten the radiator to the radiator bracket, using four bolt assemblies prepared at step 5.
   Note: Be sure to align the waveguide location between the radiator and radiator bracket before fastening bolt assemblies.



7. Apply adhesive to the holes and bolts at the locations indicated with arrows in the figure below. Also apply adhesive to the junction between the radiator and the radiator bracket.

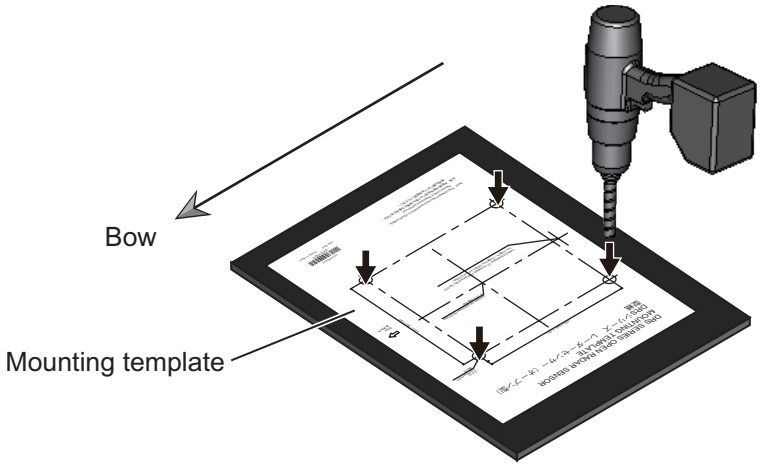


Radiator - bottom view

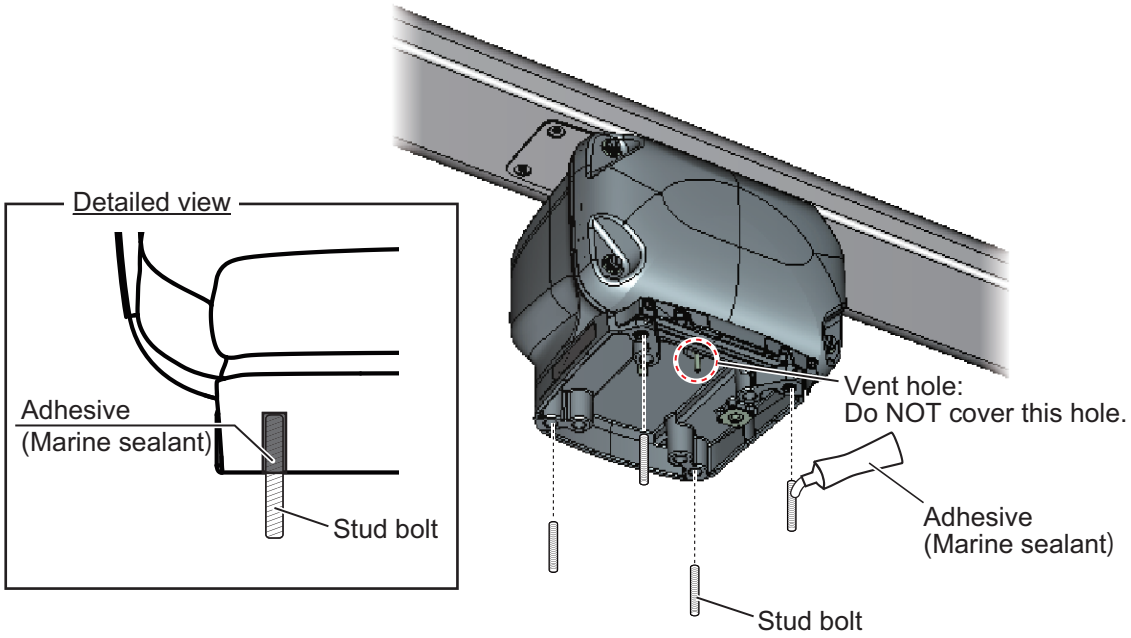
1.5 Mounting the Antenna Unit

The antenna unit can be mounted using the fixing holes on the outside (200 × 200 mm) the antenna unit.

1. Set the supplied mounting template to the mounting location, then drill four fixing holes in the mounting location.
   Note: The holes must be parallel with the fore and aft line.



2. Apply adhesive to the thread of the stud bolts (M12×70, 4 pcs).
   Note: Apply adhesive to the part of the bolt threads that are inside the bolt hole (see the figure at step 3).
3. Insert four stud bolts into the threaded holes in the antenna unit.
   The stud bolts must make contact with the bottom of the threaded holes.
   Note: Do NOT cover the vent hole at the bottom of the unit.

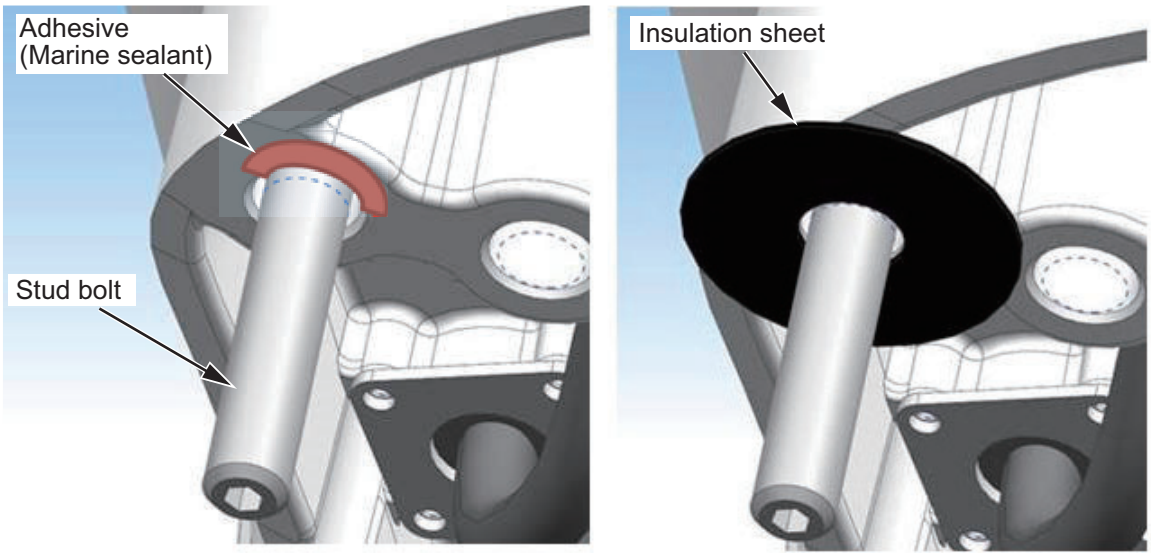


NOTICE

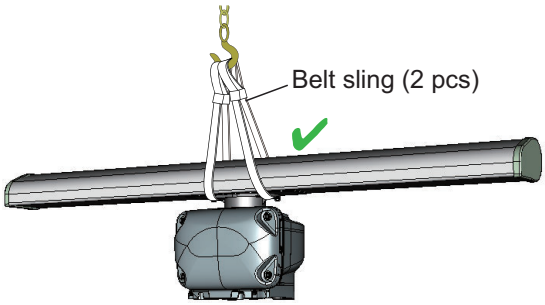
Do not fasten stud bolts tightly after the bolts contact with the bottom of the threaded holes.

If the bolts are fastened excessively, the chassis bottom may be damaged which can result in malfunction.
The projected bolt length after the bolts contact with the bottom of the threaded holes is approx. 50 mm. This data is for reference purpose only.

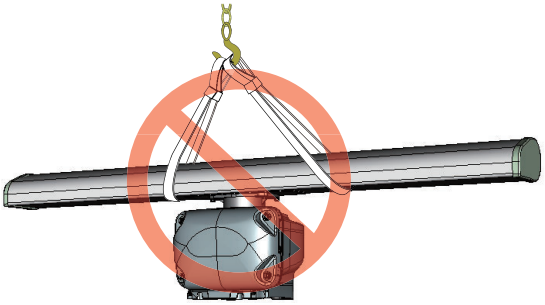
4. Apply adhesive (marine sealant) around the base of the four stud bolts.
   The application of adhesive (marine sealant) also serves to prevent electrical corrosion of the paint on the antenna unit.
5. Set the insulation sheet (supplied) to the four stud bolts.



6. Hoist the antenna unit to the installation location, using two belt slings.
   Note: When you hoist the antenna unit. keep in mind the following points:
   - When you hoist the antenna unit, set two belt slings to the radiator bracket. Do not set the belt slings to the radiator, the radiator may get damaged.



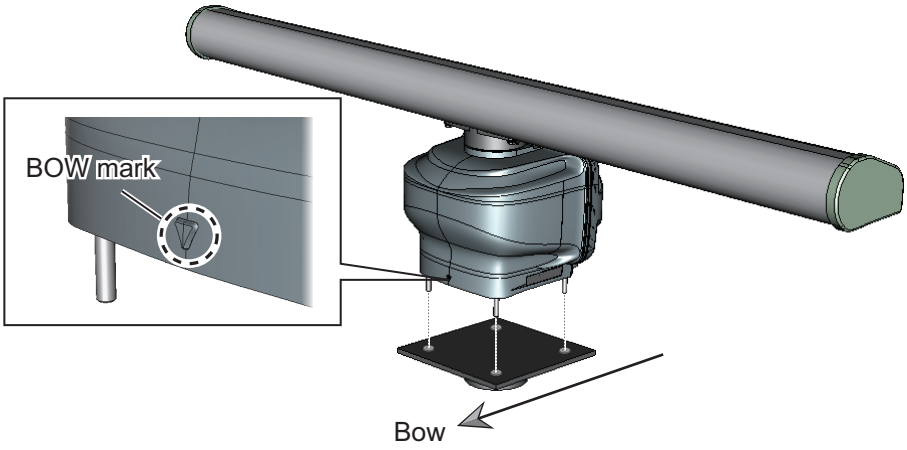
OK: Belt slings are set to the radiator bracket.



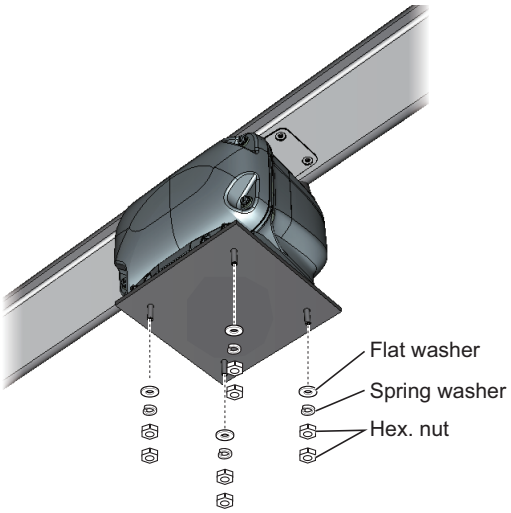
WRONG: Belt slings are set to the radiator.

   - Hoist the antenna unit slowly. If the antenna unit is hoisted too quickly, the bracket can be damaged.

7. Place the antenna unit on the mounting platform with the BOW mark on the unit aligned with the ship's bow.



8. Secure the antenna unit, using the supplied flat washers (M12, 4 pcs), spring washers (M12, 4 pcs), and hex. nuts (M12, 8 pcs).
   Note: For steps 8 and 9, see the page D-3 for details.

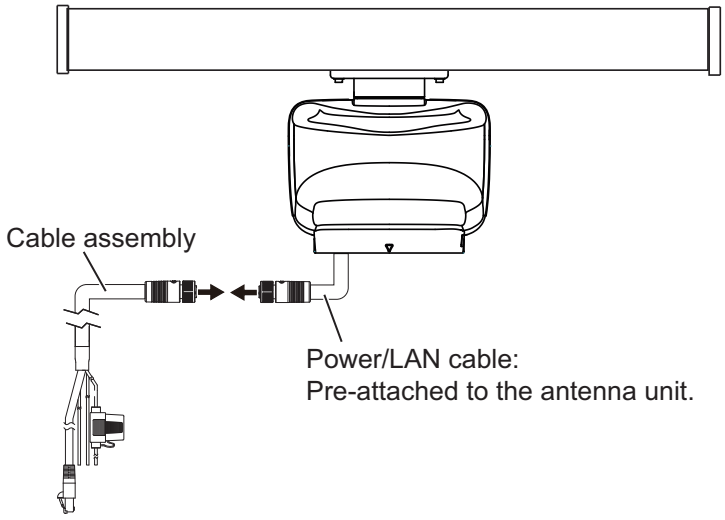


9. Apply adhesive (sealant) to the flat washers, spring washers, and hex. nuts.

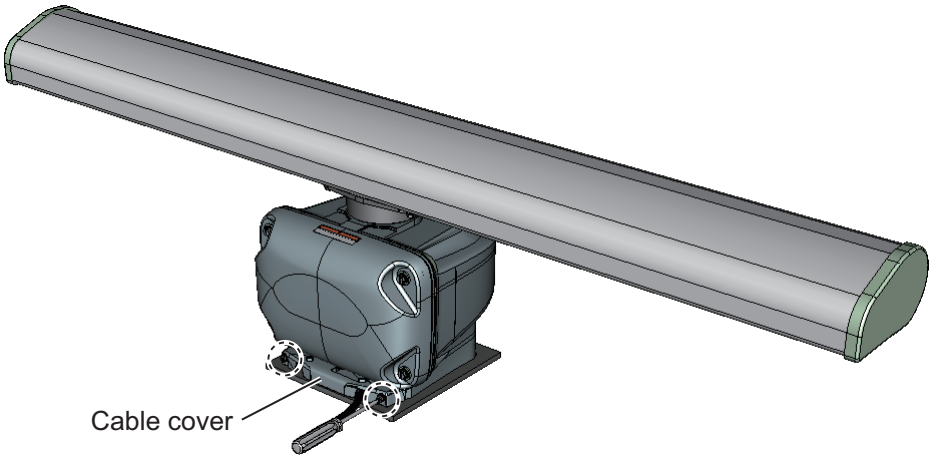
1.6 Wiring

Wiring considerations

- Turn the power at the switchboard off before beginning the wiring.
- **For DRS6A X-Class, in**sert the 5 A fuse in the fuse holder. Attach the supplied fuse rating label to the fuse holder. For details, see “How to Replace the Fuse” (C32-01604).
- **For DRS12A X-Class and DRS25A X-Class**, insert the 10 A fuse in the fuse holder. Also, attach the supplied fuse rating label to the fuse holder. For details, see “How to Replace the Fuse” (C32-01604).
- The cable assembly and power/LAN cables have connector(s). Do NOT cut the cable assembly and power/LAN cables even if the cables are run through a radar mast.
- When you replace the DRS4A/6A/12A/25A with the DRS6A X-Class/DRS12A X-Class/DRS25A X-Class, the existing cable cannot be used. Use only the cable assembly supplied with this radar sensor



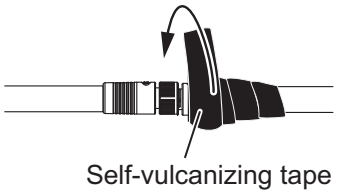
1. Unfasten two screws, circled in the following figure, to remove the cable cover.



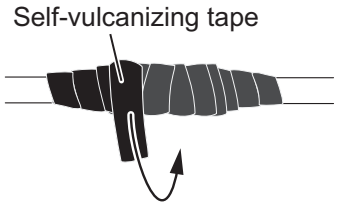
2. Connect the cable assembly (supplied) to the power/LAN cable that is pre-attached to the antenna unit.

3. Wrap the junction of the connectors with self-vulcanizing tape and vinyl tape (local supply) for waterproofing as follows:

1) Wrap the junction of the connectors with one layer of self-vulcanizing tape.

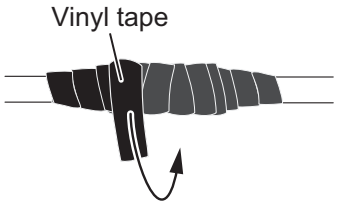


2) Change wrap direction and wrap one layer of the self-vulcanizing tape again.

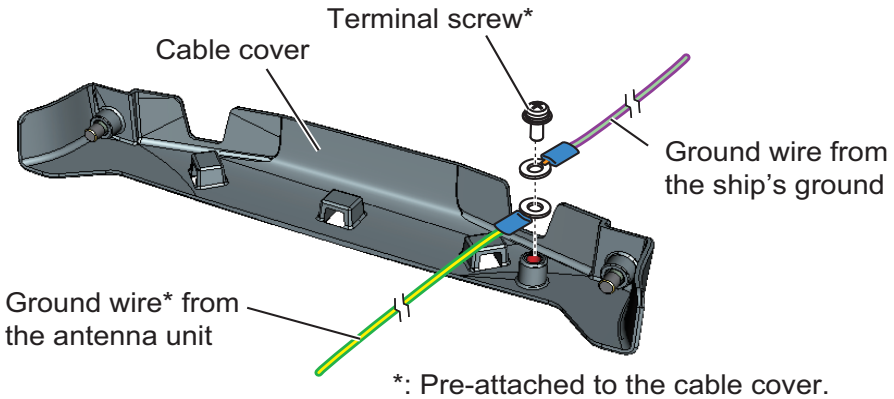


3) Wrap one layer of the vinyl tape over the self-vulcanizing tape.

4) Change wrap direction and wrap one layer of the vinyl tape again.

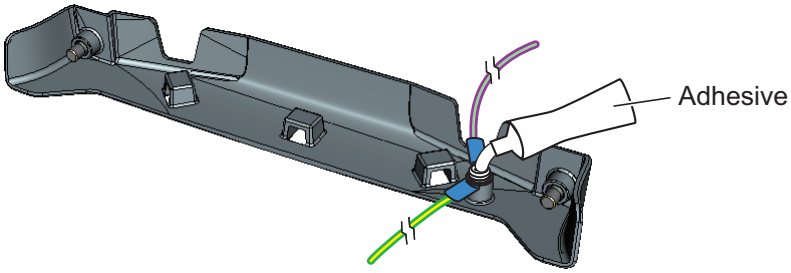


4. As shown in the figure below, secure the ground wire from the ship's ground (IV-2sq, local supply) and ground wire from the antenna unit, using the terminal screw (M4x10) that is pre-attached to the cable cover.

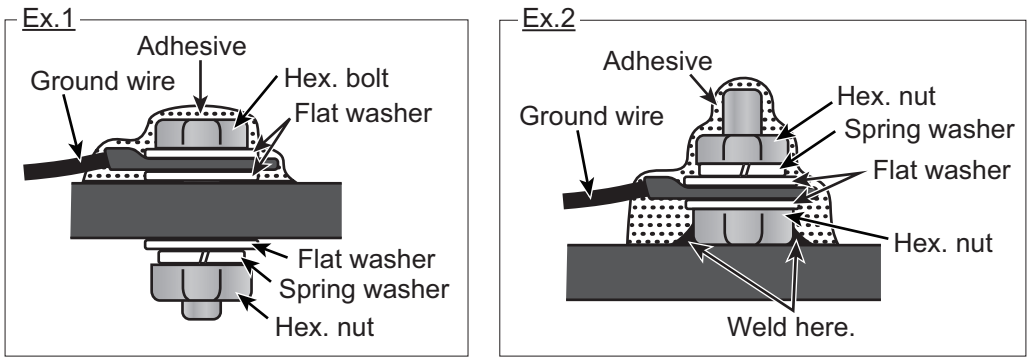


*: Pre-attached to the cable cover.

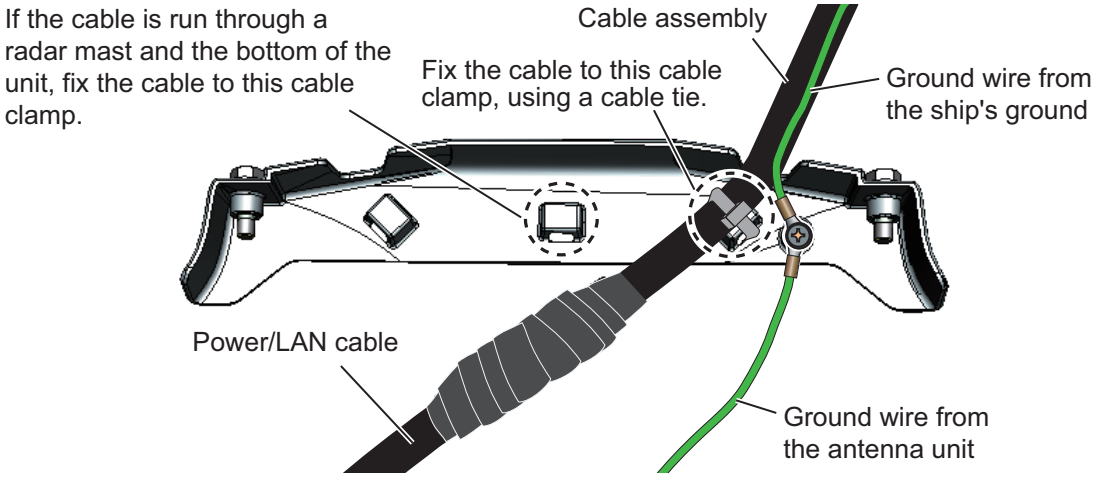
5. Apply adhesive to the ground terminal after fastening the terminal screw.



6. Secure the ground wire to the ship's ground.
   The figures shown below are examples for grounding.

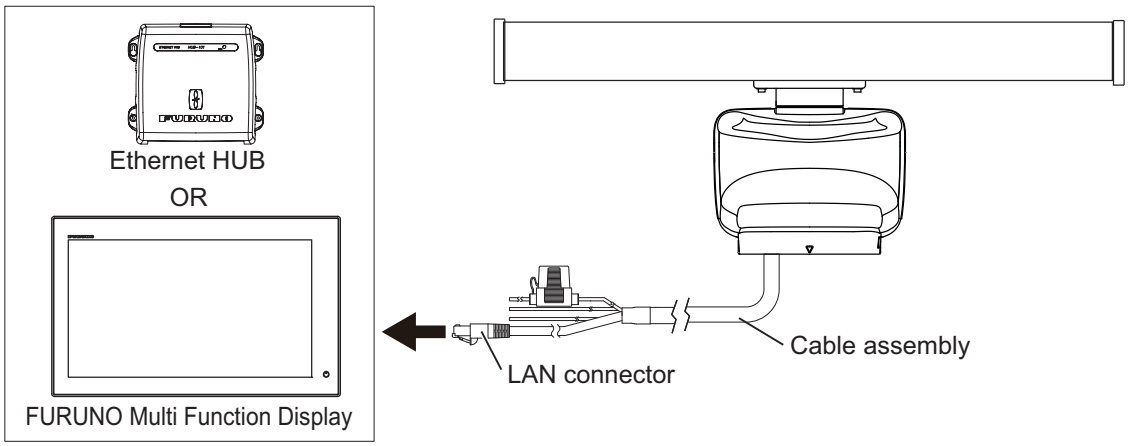


7. Secure the cable assembly to the cable cover with the cable ties (local supply) as shown in the figure below.

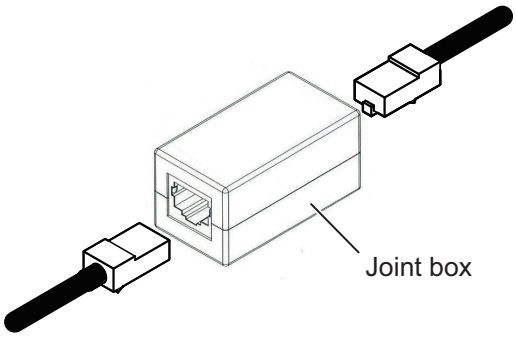


Cable cover - bottom view

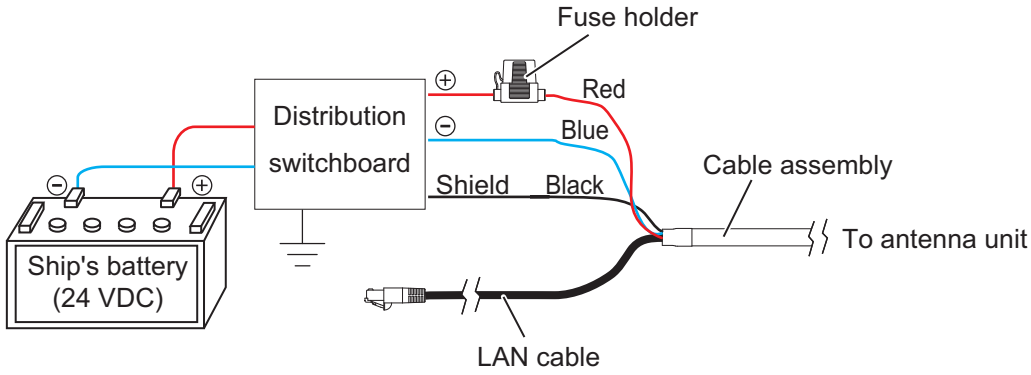
8. Reattach the cable cover.
9. Connect the LAN connector of the cable assembly to a LAN port on the FURUNO Multi Function Display or Ethernet HUB.
   Note 1: Do not connect the LAN connector to on-board LAN.



Note 2: When LAN cable extension is needed, use the optional LAN cable (MOD-Z072) and joint box (TL-CAT-012). After connection is completed, wrap the connector with vinyl tape to waterproof the LAN connector.



10. Connect the power wires to the ship's battery (24 VDC).
    - Red wire: Connect to the positive terminal. The red wire has the fuse holder.
    - Blue wire: Connect to the negative terminal.
    - Black wire: The black wire is a shielding wire for grounding.



Note 1: The antenna unit has no power switch. Connect the antenna unit to a distribution switchboard with a switch for power control.

Note 2: If the voltage of the ship's battery is 12 VDC, prepare a DC-to-DC converter whose output current is 10 A or more.

Note 3: The antenna unit cannot accept input voltage of more than 24 VDC.

2. INITIAL SETUP

⚠ WARNING

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, 50 and 10 W/m^2 exist are given in the table below.

DRS6A X-Class

Radiator	100 W/m^2	50 W/m^2	10 W/m^2
XN10A	0.1 m	0.5 m	3 m
XN12A	N/A	0.4 m	2.2 m
XN13A	N/A	0.2 m	1.9 m

DRS12A X-Class

Radiator	100 W/m^2	50 W/m^2	10 W/m^2
XN12A	0.3 m	0.8 m	3.1 m
XN13A	0.2 m	0.7 m	2.9 m

DRS25A X-Class

Radiator	100 W/m^2	50 W/m^2	10 W/m^2
XN12A	0.8 m	1.7 m	7.7 m
XN13A	0.7 m	1.6 m	6.8 m

⚠ WARNING

Before turning on the radar, be sure no one is near the antenna.

Prevent the potential risk of being struck by the rotating antenna, which can result in serious injury or death.

This radar series is compatible with the FURUNO Multi Function Displays and software version combinations shown below. The combination with other models may not operate properly.

- DRS6A X-Class
  TZT9, TZT14 and TZTBB: Version 4.21 or later
  TZTL12F and TZTL15F: Version 3.01 or later
- DRS12A X-Class and DRS25A X-Class
  TZT9, TZT14 and TZTBB: Version 5.01 or later (Planned release: End of 2016)
  TZTL12F and TZTL15F: Version 4.01 or later (Planned release: End of 2016)

Turn on the antenna unit and FURUNO Multi Function Display. Initial setup for this antenna must be done on the FURUNO Multi Function Display.

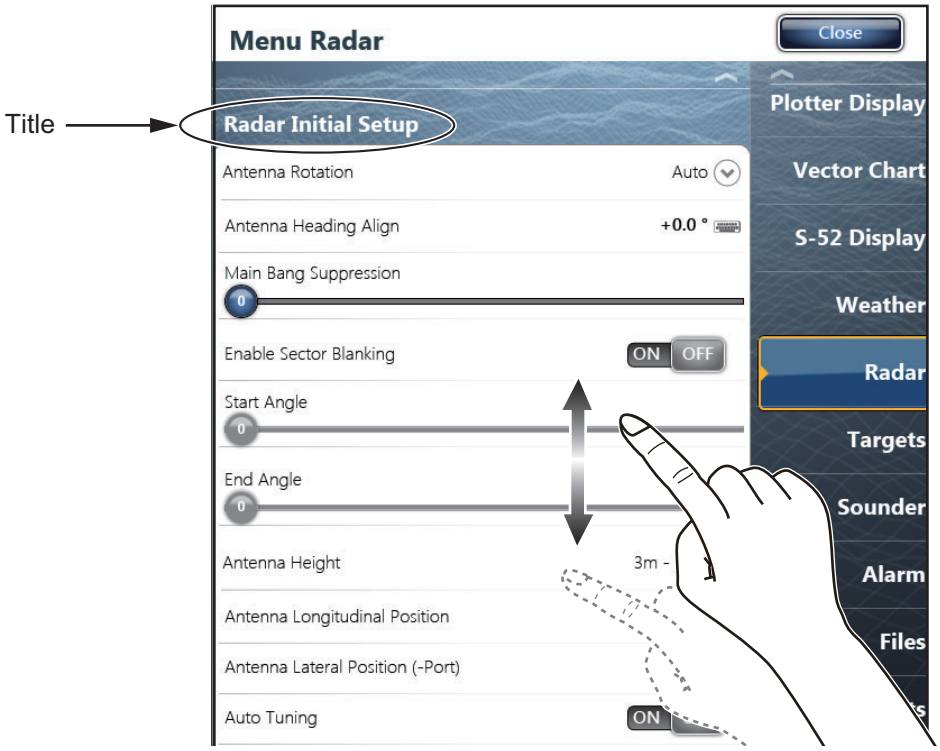
2.1 Initial Setup for TZT9/TZT14/TZTBB

1. Press the **Home** key (or tap the **Home** icon).
2. Select [Menu] on the menu icon bar to open the main menu.
3. Select [Radar].
4. Select [Radar Source] on the [Menu Radar] sub menus, then select the radar type connected.

   Note: If the antenna unit is connected but does not appear in the [Radar Source] list, close the list and open it again. The name of the antenna unit should appear with a check mark, as in the example to the right.

Display example for DRS6A X-Class

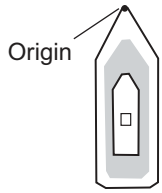
5. Drag the [Menu Radar] sub menus to find the menu item [Radar Initial Setup].



6. Set the items referring to the table shown below

Menu Radar (Radar Initial Setup)

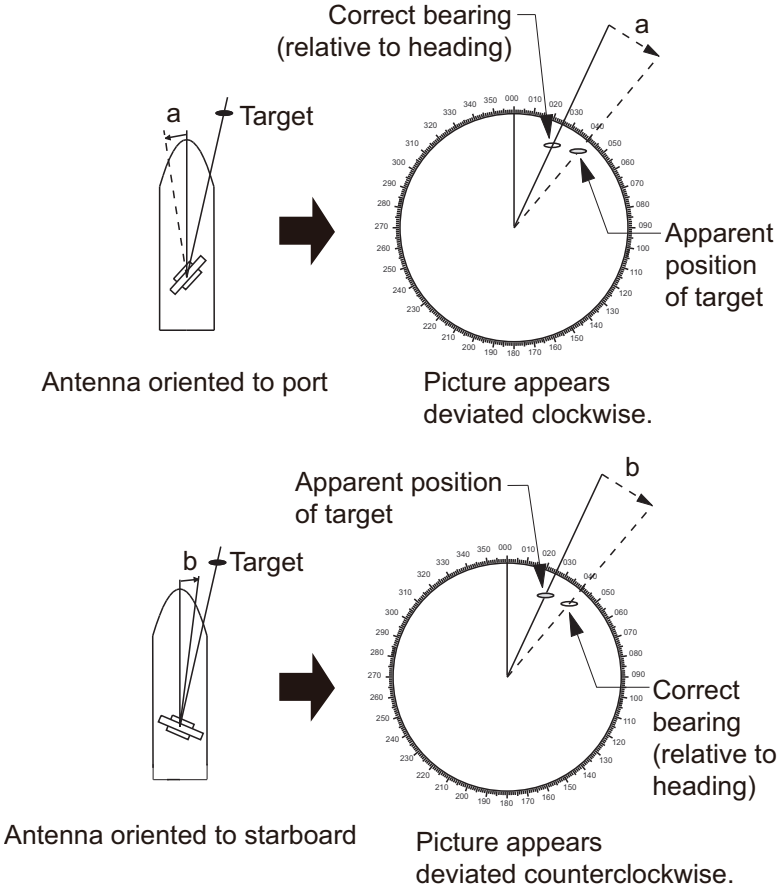
Menu item	Description
[Antenna Rotation]	Select the antenna rotation speed.
[Antenna Heading Align]	See "How to align the antenna heading" on page 16.
[Main Bang Suppression]	If main bang appears at the screen center, slide the circle icon, while watching the radar echo on the left-side of the display, until the main bang disappears.
[Enable Sector Blanking]/ [Enable Sector Blanking2]	Up to two sectors may be selected for blanking (no transmission). Select [ON] to enable this feature. Set the start and end angles (0° to 359°).
[Antenna Height]	Select the height of the antenna above the waterline.

Menu item	Description
[Antenna Longitudinal Position]	Referring to the figure on the right, enter the radar antenna positioning bow-stern (Longitudinal) and port-starboard (Lateral) position from the origin. 
[Antenna Lateral Position (-Port)]	
[Auto Tuning]	Enable/disable auto tuning for the connected radar.
[Tuning Source]	For dual-range display, select the range to use as the manual tuning source.
[Manual Tuning]	Manually tune the radar. Not available when [Auto Tuning] is enabled.
[Radar Monitoring]	Display various information regarding the connected radar.
[Radar Optimization]	Automatically adjust magnetron output and tuning for the connected radar. **Note:** Be sure to perform [Radar Optimization] after replacing the magnetron.
[ARPA Advanced Settings]	Do not change these settings.

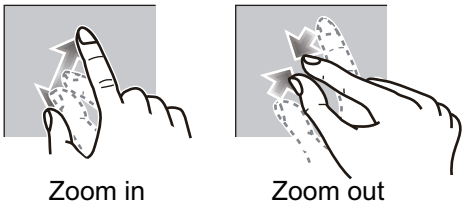
How to align the antenna heading

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

You may observe a minor bearing error on the display. This is due to the difficulty in orienting the radar accurately. The following adjustment will compensate for the error.



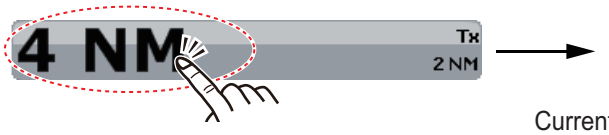
1. Select a range between 0.125 and 0.25 NM and set the mode to "head up". You can select a range by a pinch action. The range and range ring interval appear at the bottom left of the screen.



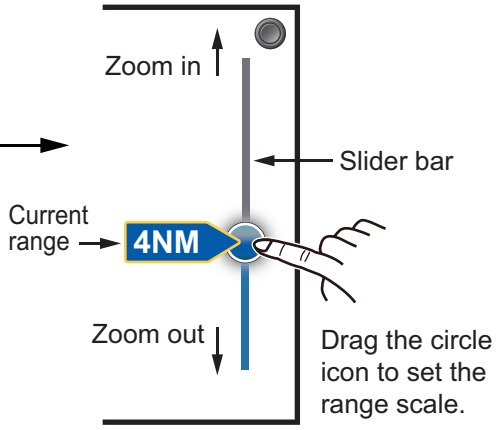
Pinch action

Range indications

For TZTBB, you can also control the range in the operation as follows. Tap the radar scale box at the bottom left-hand corner of the screen to display the slider bar. Drag the circle icon to set the range scale.



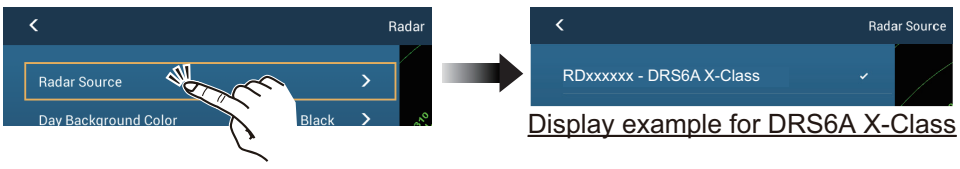
Tap the area circled in the dashed line to display the slider bar.
Note: You can switch between transmit and stand-by by tapping the right side of the radar scale box.



2. Turn the vessel's bow toward a target.
3. Press the **Home** key (or tap the **Home** icon), then select [Menu] icon, [Radar], and [Antenna Heading Align] in that order to show the numeric software keyboard.
4. Key in the offset value so that the target is at the very top of the screen (setting range: +/- 0° to 180°, +: clockwise direction, -: counterclockwise direction), then tap [Save].
5. Confirm that the target echo is displayed at correct bearing on the screen.

2.2 Initial Setup for TZTL12F/TZTL15F

1. Tap the [Home] icon to show the home screen and display mode settings.
2. Tap [Radar] from the [Settings] menu.
3. Tap [Radar Source], then select the appropriate antenna unit.
   Note: If the antenna unit is connected but does not appear in the [Radar Source] list, close the list and open it again. The name of the antenna unit should appear with a check mark, as in the example below.



Display example for DRS6A X-Class

4. Drag the [Radar] menu display the menu item [Radar Initial Setup], then tap [Radar Initial Setup].