FURUNO

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

FURUNO ELECTRIC CO., LTD.

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

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

⚠ 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 ⚠
To avoid electrical shock, do not remove cover.
No user-serviceable parts inside.

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

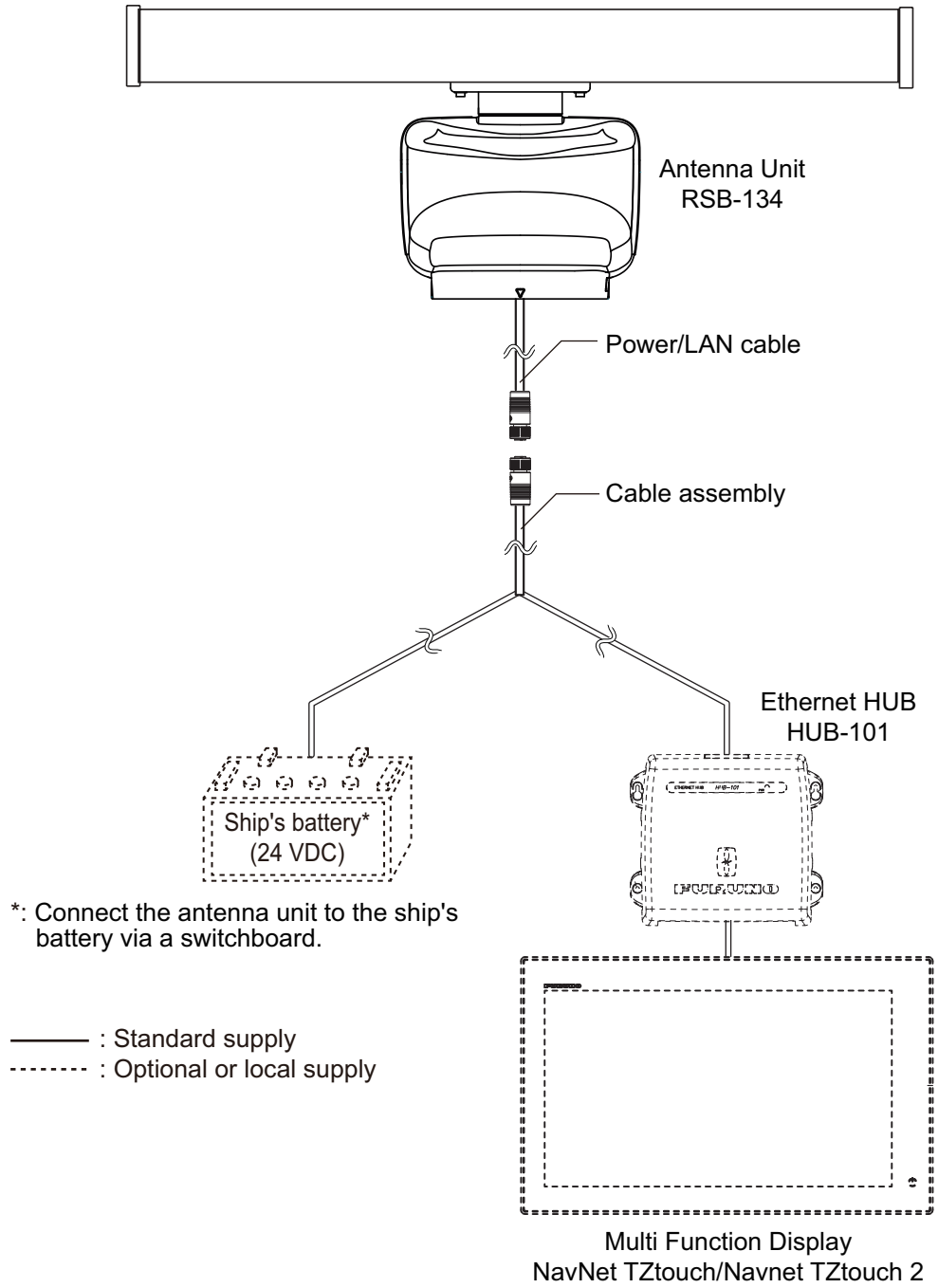
Importer in Europe

The following concern acts as our importer in Europe, as defined in DECISION No 768/2008/EC.
- Name: FURUNO EUROPE B.V.

Program No.

• 0359355-01.**
** denotes minor modifications.

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) and fuse (10 A) for replacement, supplied for DRS12A/25A X-Class
	CP03-37410	000-033-083		Cable assembly (15 m) and fuse (10 A) for replacement, supplied for DRS12A/25A X-Class
	CP03-37420	000-033-084		Cable assembly (20 m), and fuse (10 A) for replacement supplied for DRS12A/25A X-Class
	CP03-37430	000-033-085		Cable assembly (30 m) and fuse (10 A) for replacement, supplied for DRS12A/25A X-Class
Spare Parts	SP03-18101	001-426-190	1	Fuse (5 A), supplied for DRS6A X-Class
	SP03-18301	001-458-590		Fuse (10 A), supplied for DRS12A X-Class and DRS25A 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

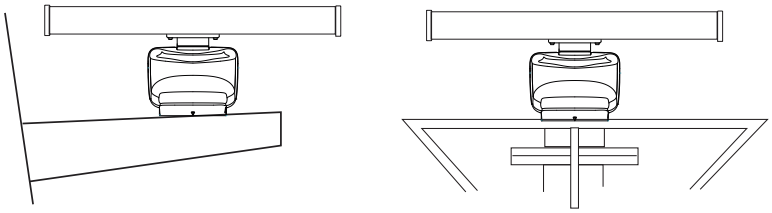
Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

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

1.1 Mounting Considerations

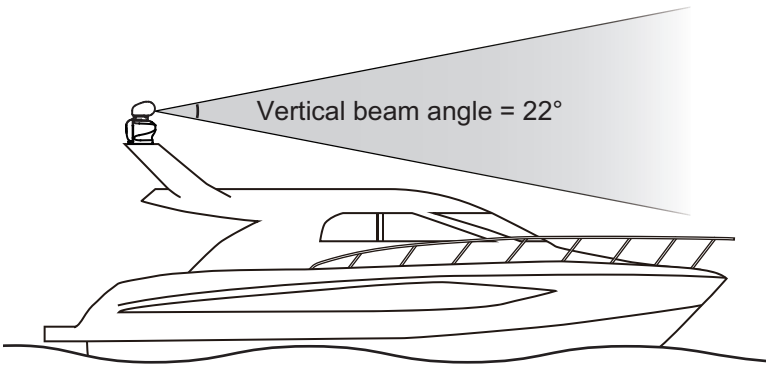
Select a mounting location, keeping in mind the following points:

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



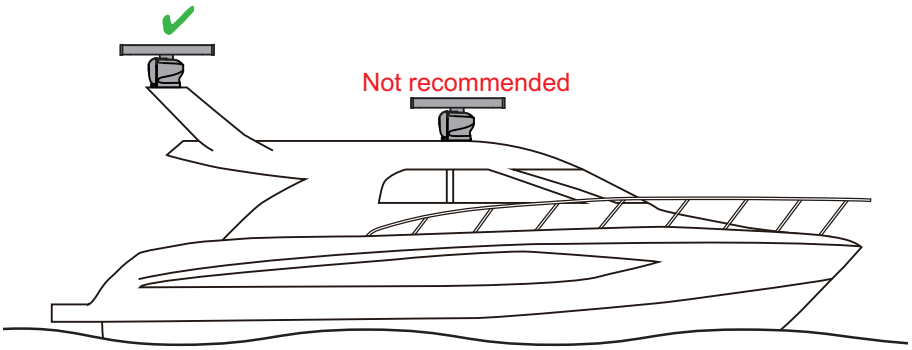
(a) Common mast (b) Radar mast

- 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.

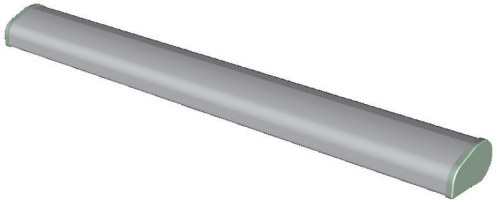


- Setup the antenna unit position on the FURUNO Multi Function Display after installing the unit, referring to the chapter 2. If the antenna unit position is not setup correctly, the radar echoes on the display may not be aligned with the actual target's bearing.
- Select a location that does not allow 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

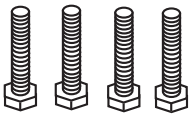
• Radiator*1 (1 pcs):
3.4 ft*2, 4 ft or 6 ft



• Flat washer (M8, 4 pcs)

• Spring washer (M8, 4 pcs)

• Hex. bolt (M8×30, 4 pcs)



• O-ring (1 pcs)

• Silicone rubber (1 pcs)

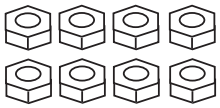
Scanner Unit

• Scanner Unit (1 pcs)

• Flat washer (M12, 4 pcs)

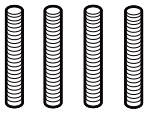
• Spring washer (M12, 4 pcs)

• Hex nut (M12, 8 pcs)

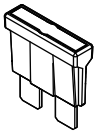


• Corrosion-proof rubber pad (4 pcs)

• Stud bolt (M12×70, 4 pcs)

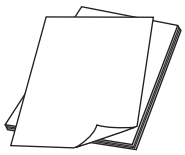


• Spare fuse (1 pcs)



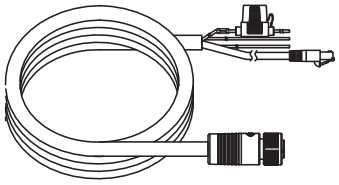
(DRS6A X-Class: 5 A,
DRS12A/25A X-Class: 10 A)

• Documents (1 set):



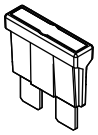
Cable assembly

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



Supplied for DRS12A X-Class and DRS25A X-Class

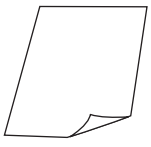
• Fuse for replacement (1 pcs)



(10 A)

• Label (1 pcs)

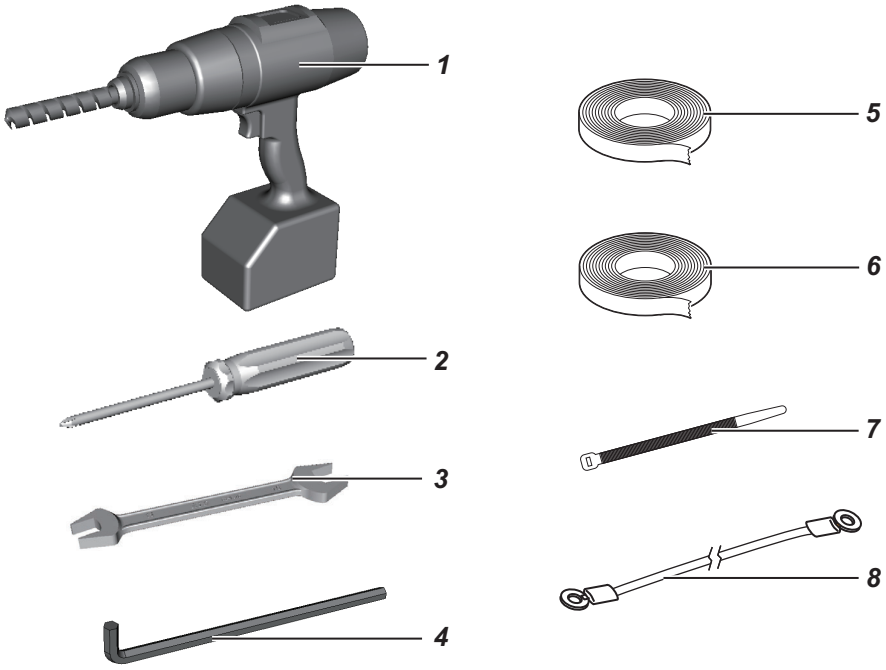
• How to Replace the Fuse (1 pcs)



*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.

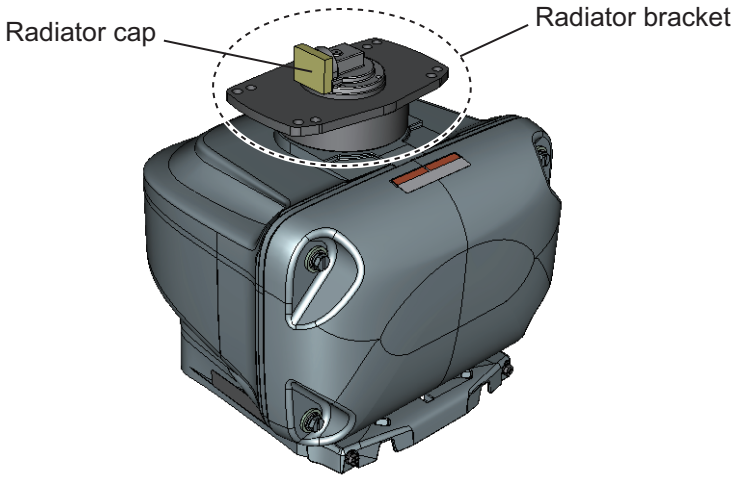


No.	Name	Remarks
1	Electrical drill	For making the mounting holes, drill bit: ϕ 15 mm
2	Phillips-head screw driver	#3, for securing the cable cover
3	Wrench	For M8 (Hex. size 13 mm) and M12 (Hex. size 19 mm)
4	Hex. L-wrench	For fastening the stud bolts (Hex. size 6 mm)
5	Self-vulcanizing tape	For waterproofing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

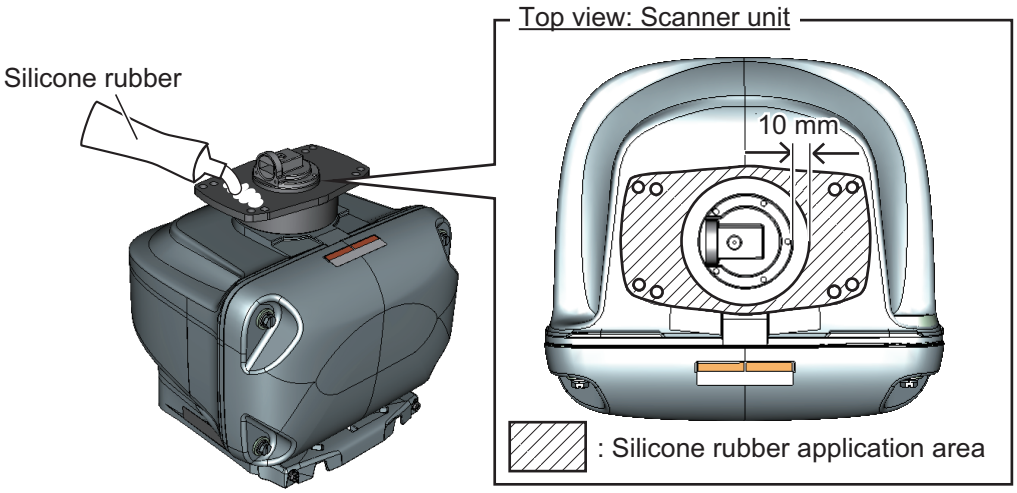
*: For cosmetic purposes, black color vinyl tape (cable color) is recommended.

1.4 Fastening the Radiator to the Radiator Bracket

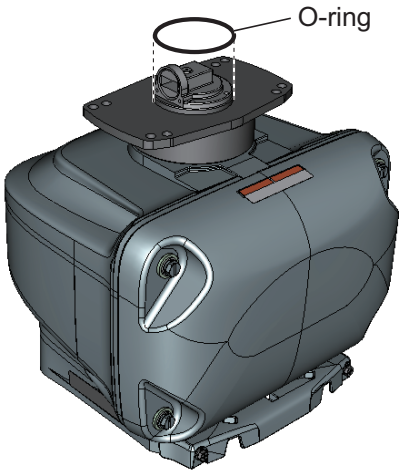
1. Remove the radiator cap from the radiator bracket.



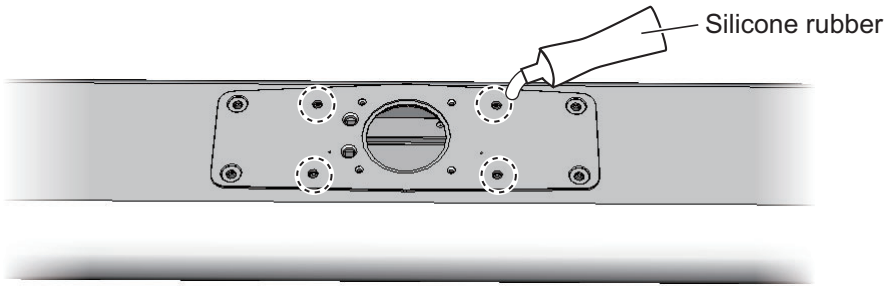
2. Apply silicone rubber to the surface of the radiator bracket as shown in the figure below.



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

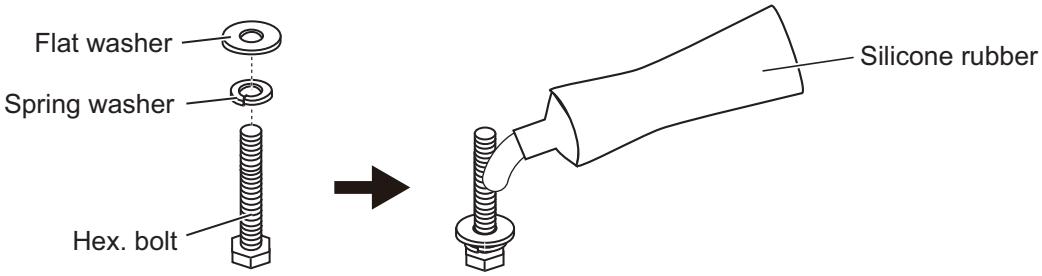


4. Apply silicone rubber to the thread holes on the bottom of the radiator (4 locations).

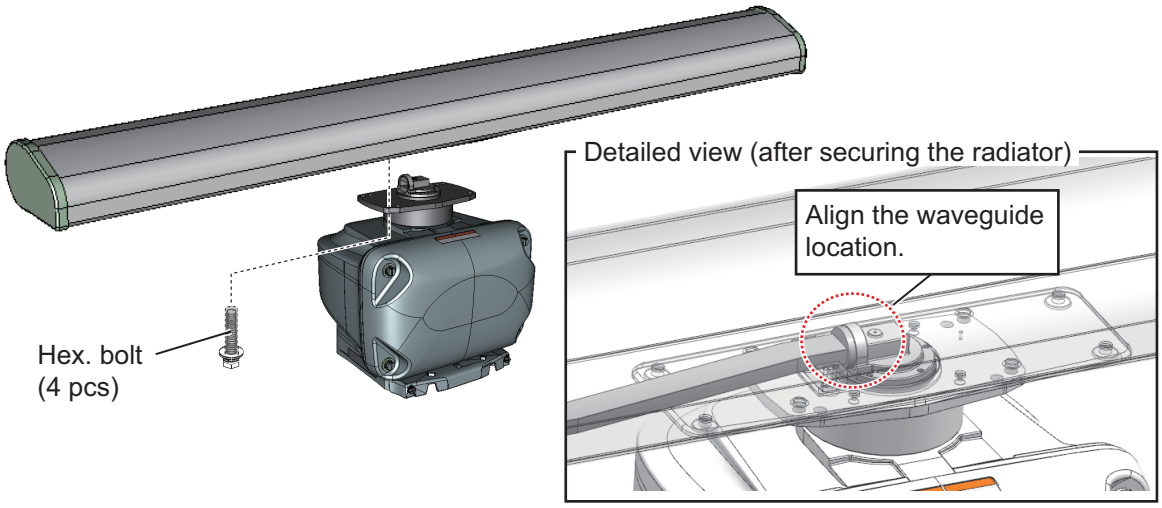


Bottom view: Radiator

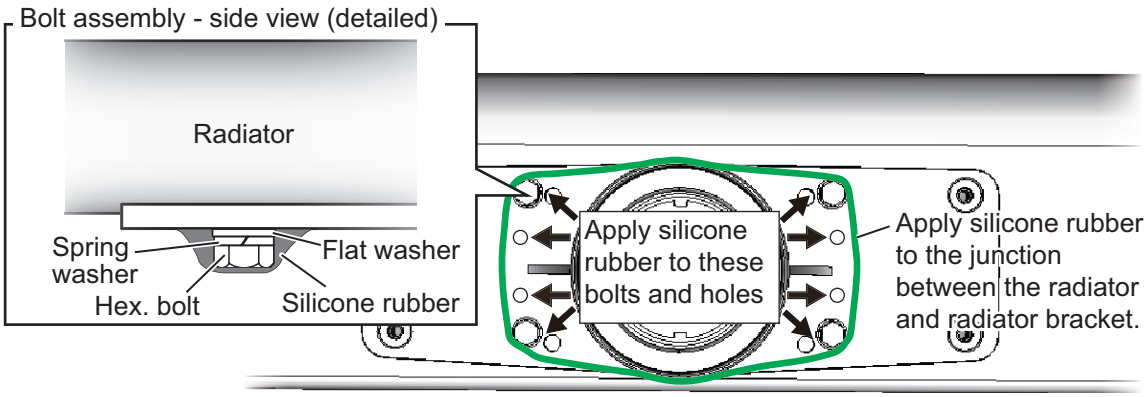
5. Prepare four bolt assemblies; pass the spring washer (M8) and flat washer (M8) through the each hex bolt (M8×30) then apply silicone rubber.



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

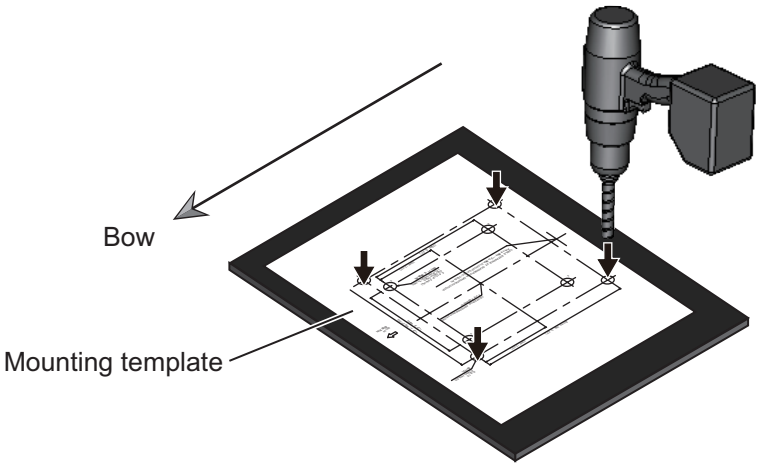


Radiator - bottom view

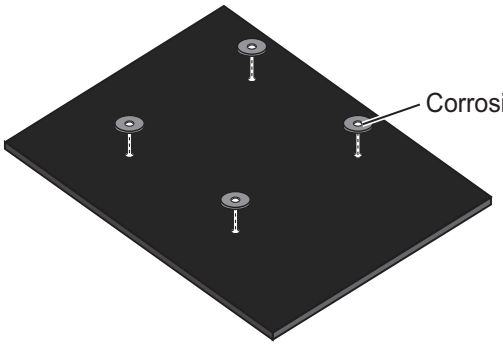
1.5 Mounting the Antenna Unit

The antenna unit can be mounted using the fixing holes on the outside (200 × 200 mm) or inside (140 × 150 mm) the antenna unit. Normally, use the outside fixing holes. When 140 × 150 mm fixing holes already exist on the mounting platform, use the inside fixing holes.

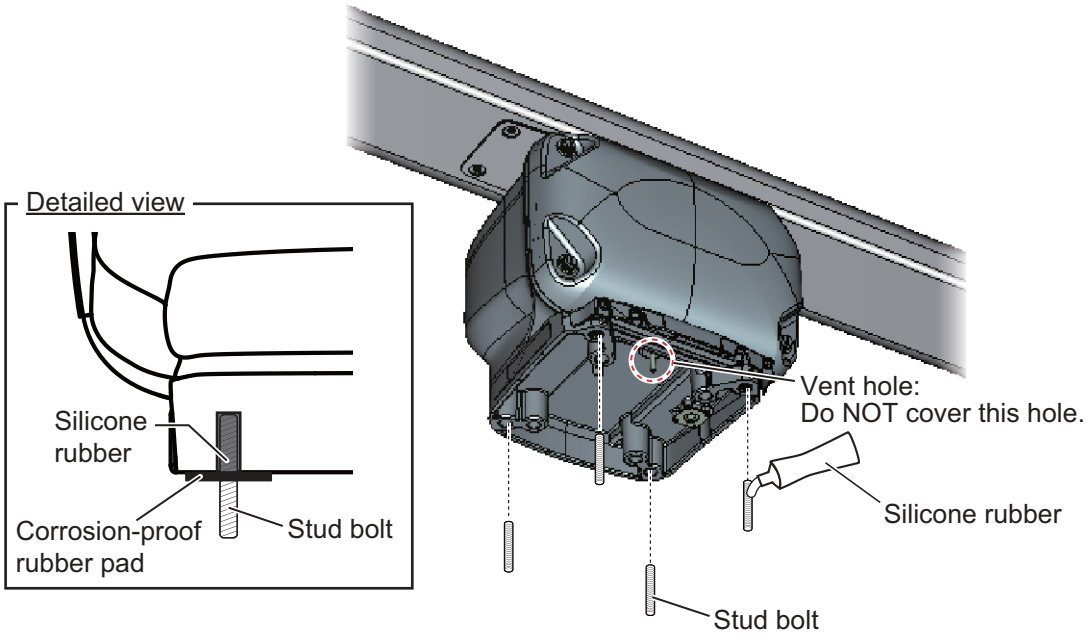
1. Set the supplied mounting template to the mounting location, then drill four fixing holes in the mounting location.
   Note: The holes must be parallel with the fore and aft line.



2. Attach four corrosion-proof rubber pads (supplied) to the mounting holes.



3. Apply silicone rubber to the thread of the stud bolts (M12×70, 4 pcs).
   Note: Apply silicone rubber to the part of thte bolt threads that are inside the bolt hole (see the figure at step 4).
4. 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.

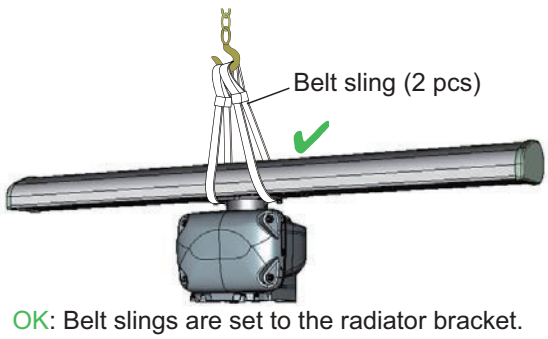


NOTICE

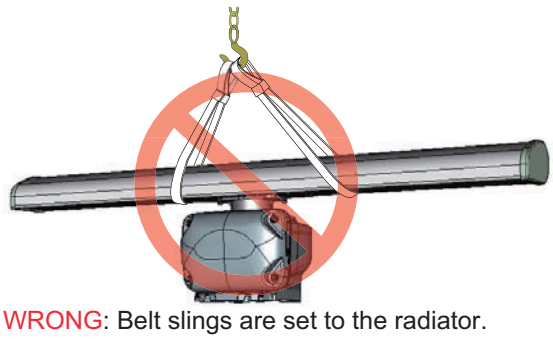
Do not fasten stud bolts tightly after the bolts contact with the bottom of the threaded holes.

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. 46 mm. This data is for reference purpose only.

5. 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.



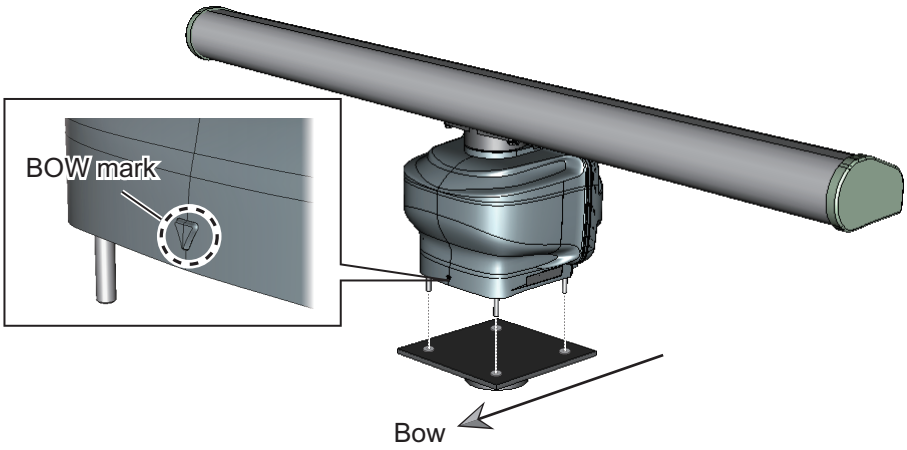
OK: Belt slings are set to the radiator bracket.



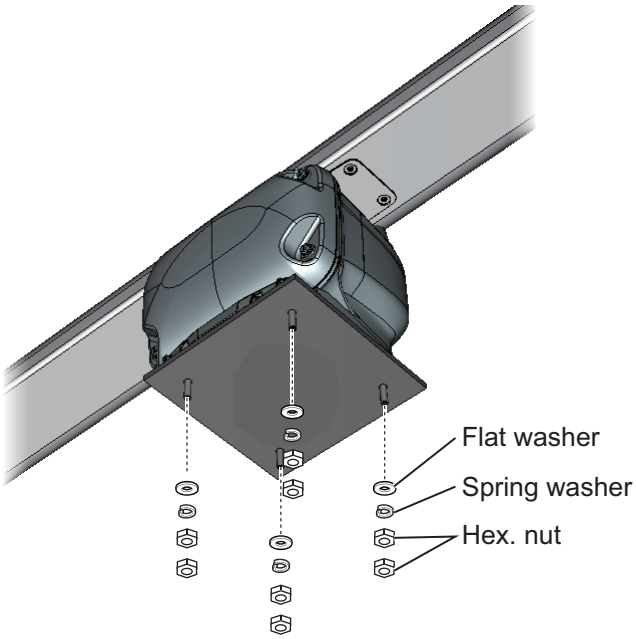
WRONG: Belt slings are set to the radiator.

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

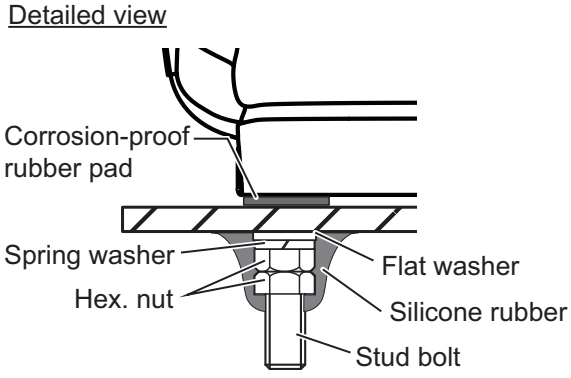
6. Place the antenna unit on the mounting platform with the BOW mark on the unit aligned with the ship's bow.



7. Secure the antenna unit, using the supplied flat washers (M12, 4 pcs), spring washers (M12, 4 pcs), and hex. nuts (M12, 8 pcs).



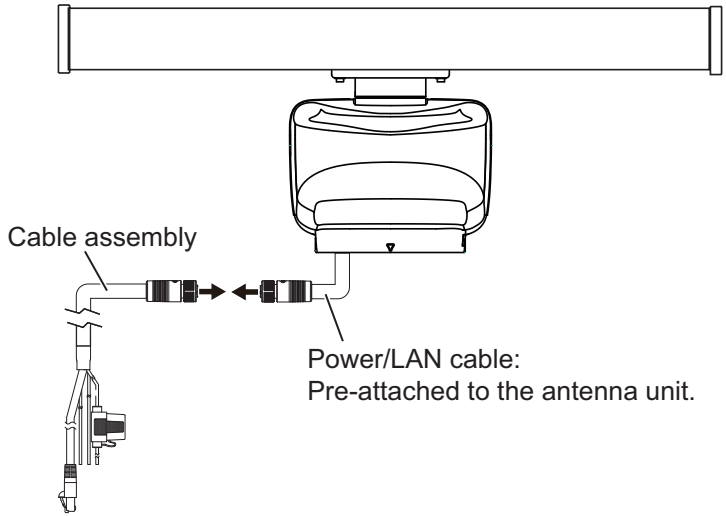
8. Apply silicone rubber to the flat washers, spring washers, and hex. nuts.



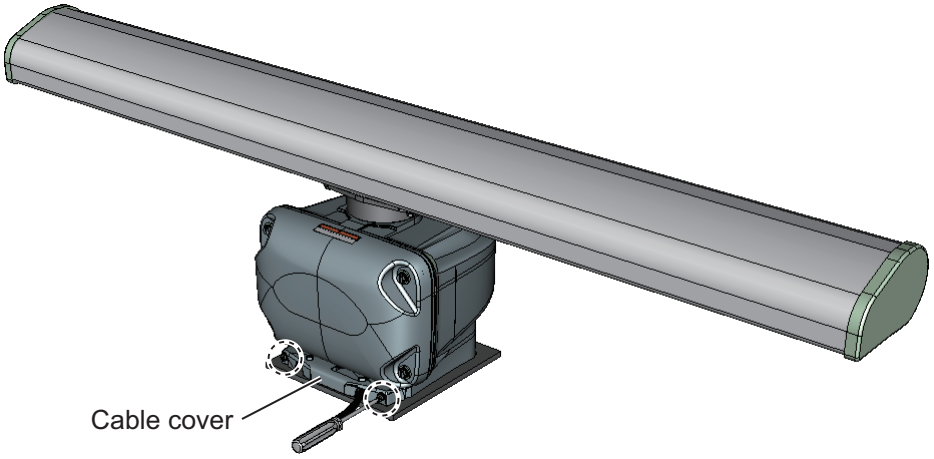
1.6 Wiring

Wiring considerations

- Turn the power at the switchboard off before beginning the wiring.
- **For DRS12A X-Class and DRS25A X-Class**, the 5 A fuse in the fuse holder (supplied with the cable assembly) must be replaced with the supplied 10 A fuse. 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



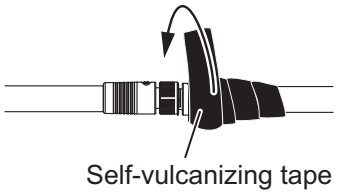
1. Unfasten two screws, circled in the following figure, to remove the cable cover.



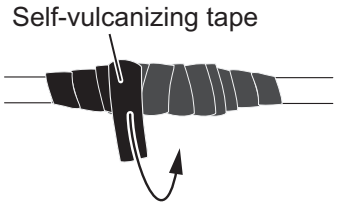
2. Connect the cable assembly (supplied) to the power/LAN cable that is pre-attached to the antenna unit.

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.

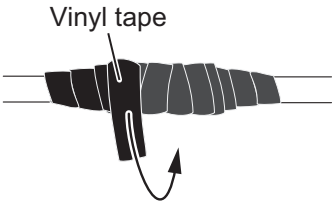


2) Change wrap direction and wrap one layer of the self-vulcanizing tape again.

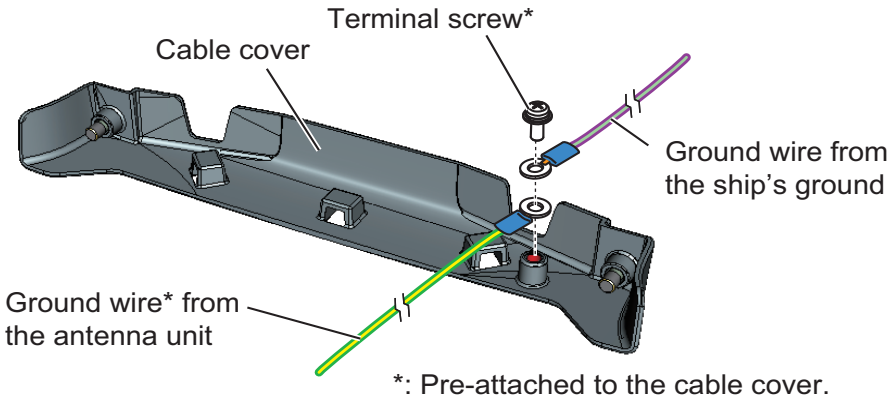


3) Wrap one layer of the vinyl tape over the self-vulcanizing tape.

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

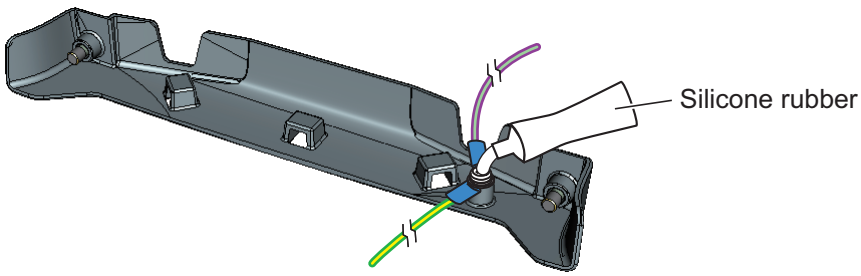


4. As shown in the figure below, secure the ground wire from the ship's ground (IV-2sq, local supply) and ground wire from the antenna unit, using the terminal screw (M4x10) that is pre-attached to the cable cover.

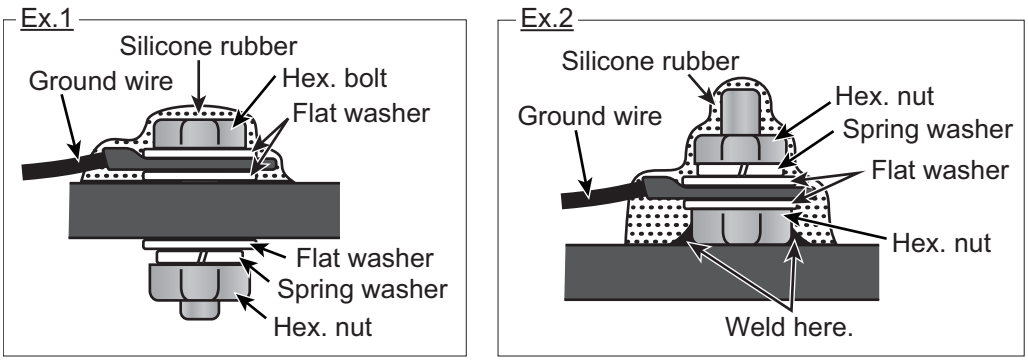


*: Pre-attached to the cable cover.

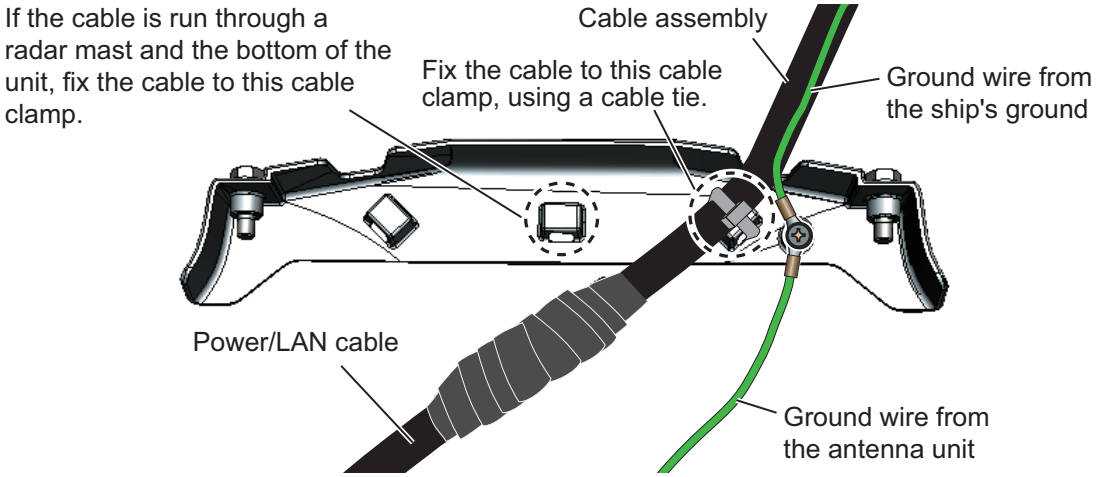
5. Apply silicone rubber to the ground terminal after fastening the terminal screw.



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

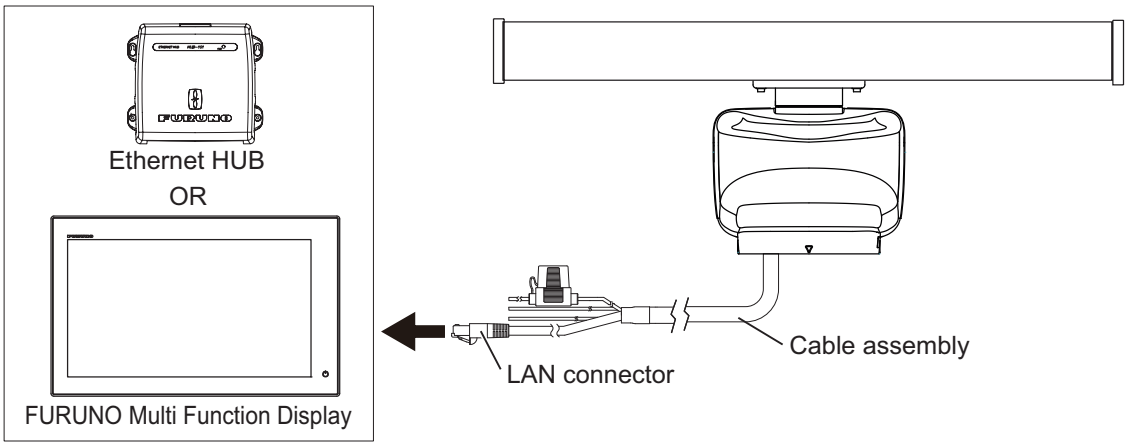


7. Secure the cable assembly to the cable cover with the cable ties (local supply) as shown in the figure below.

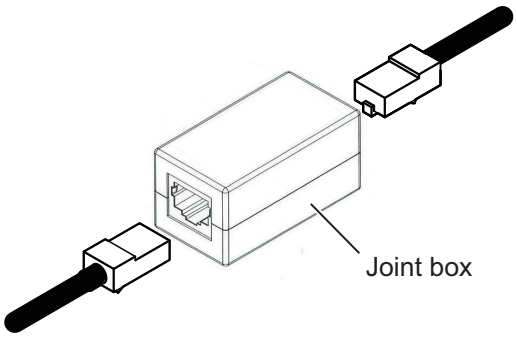


Cable cover - bottom view

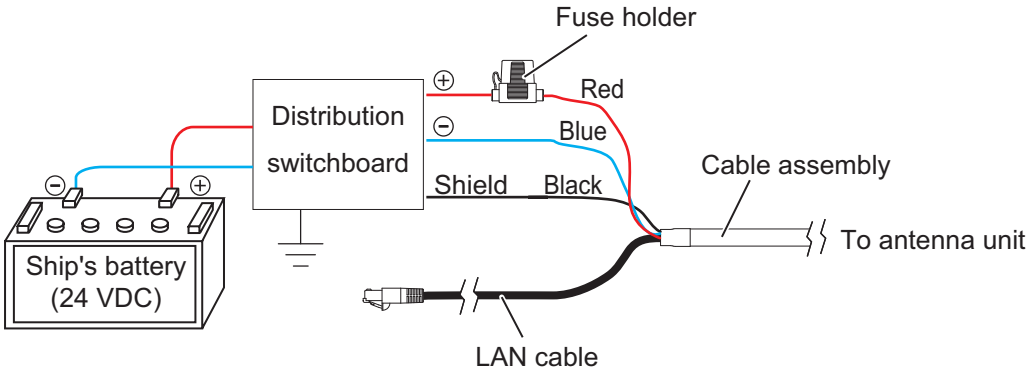
8. Reattach the cable cover.
9. Connect the LAN connector of the cable assembly to a LAN port on the FURUNO Multi Function Display or Ethernet HUB.
   Note 1: Do not connect the LAN connector to on-board LAN.



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.

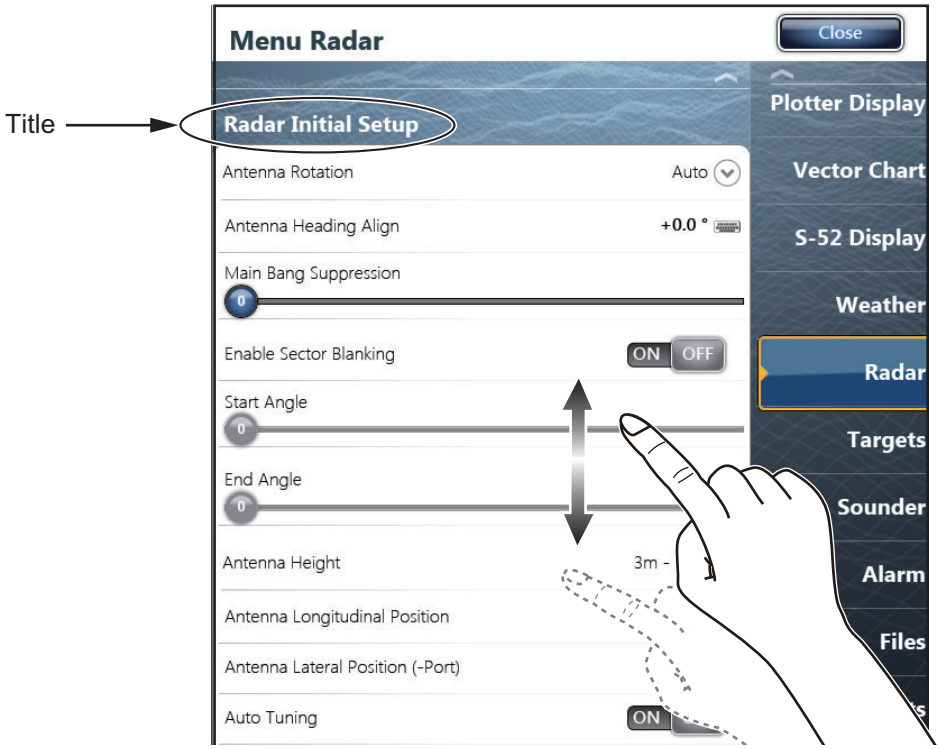
2.1 Initial Setup for TZT9/TZT14/TZTBB

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

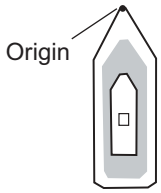
5. Drag the [Menu Radar] sub menus to find the menu item [Radar Initial Setup].



6. Set the items referring to the table shown below

Menu Radar (Radar Initial Setup)

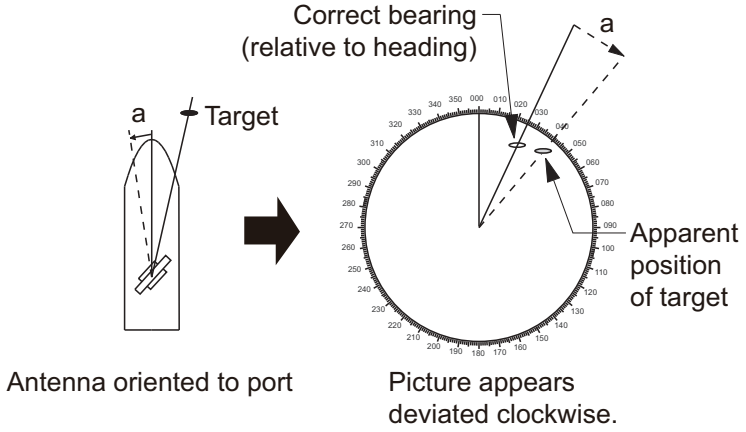
Menu item	Description
[Antenna Rotation]	Select the antenna rotation speed.
[Antenna Heading Align]	See "How to align the antenna heading" on page 16.
[Main Bang Suppression]	If main bang appears at the screen center, slide the circle icon, while watching the radar echo on the left-side of the display, 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.

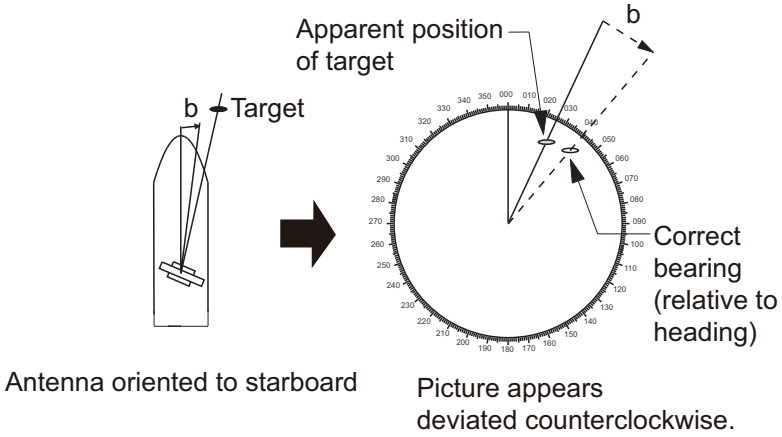
Menu item	Description
[Antenna Longitudinal Position]	Referring to the figure on the right, enter the radar antenna positioning bow-stern (Longitudinal) and port-starboard (Lateral) position from the origin. 
[Antenna Lateral Position (-Port)]	
[Auto Tuning]	Enable/disable auto tuning for the connected 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

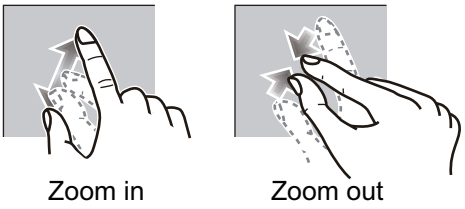
You have mounted the antenna unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually should appear on the heading line (zero degrees).

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.





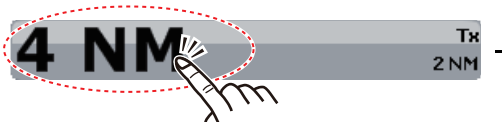
1. Select a range between 0.125 and 0.25 NM and set the mode to “head up“. You can select a range by a pinch action. The range and range ring interval appear at the bottom left of the screen.



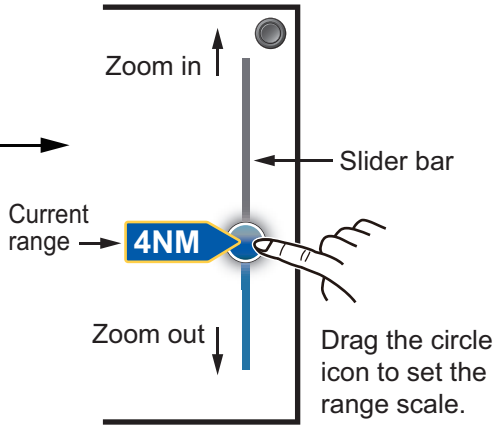
Pinch action

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.



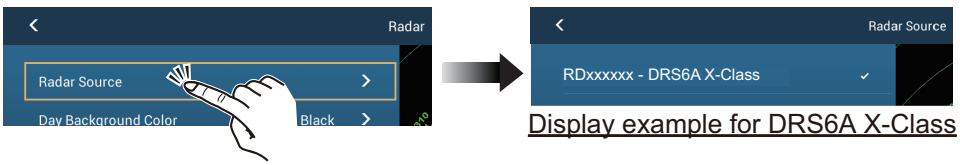
Tap the area circled in the dashed line to display the slider bar.
Note: You can switch between transmit and stand-by by tapping the right side of the radar scale box.



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

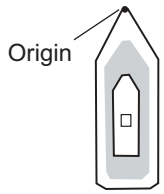
4. Drag the [Radar] menu display the menu item [Radar Initial Setup], then tap [Radar Initial Setup].

5. Referring to the tables below, set up the radar.

[Radar] menu - [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 19.
[Main Bang Suppression]	If main bang appears at the screen center, slide the circle icon so that the main bang disappears, while watching the radar echo at the left-hand side of the display.
[Enable Sector Blanking]	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°).
[Enable Sector 2 Blanking]	

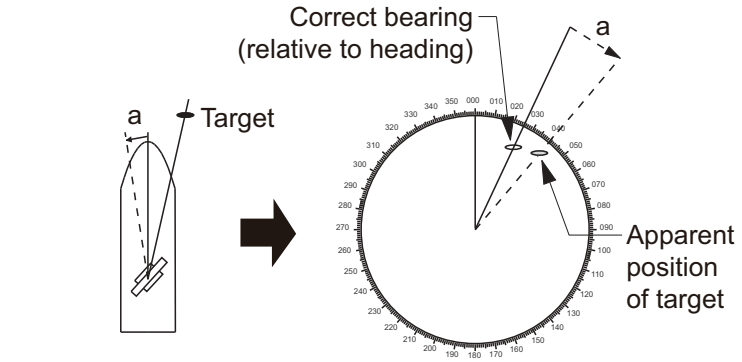
[Radar] menu - [Antenna Position]

Menu item	Description
[Longitudinal (from bow)]	Referring to the figure on the right, enter the radar antenna positioning bow-stern (Longitudinal) and port-starboard (Lateral) position from the origin. 
[Lateral (-Port)]	
[Antenna Height]	Select the height of the antenna above the waterline.
[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.
[Set Hardware To Factory Default]	Resets the radar selected at [Radar Source] to factory default.
[Reset Default Settings]	Resets [Radar] menu settings to default.

How to align the antenna heading

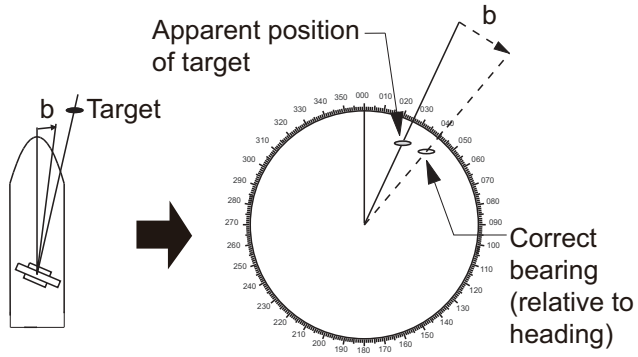
You have mounted the antenna unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually should appear on the heading line (zero degrees).

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.



Antenna oriented to port

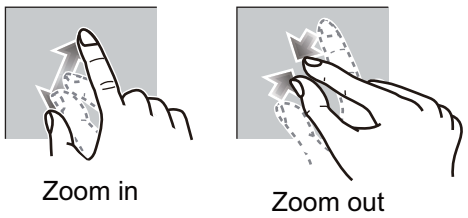
Picture appears
deviated clockwise.



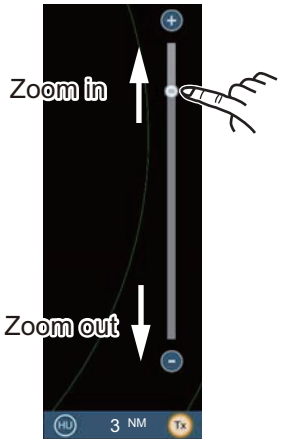
Antenna oriented to starboard

Picture appears
deviated counterclockwise.

1. Set your radar with 0.125 and 0.25 NM range and the head up mode.
   The range scale can be selected two ways, as shown below. The slider bar can be shown or hidden with [Show Scale Slider] in the [Settings] - [Radar] menu.



Method 1: Pinch screen



Method 2: Drag slider
(or tap bar or +, - icons)

2. Turn the vessel's bow toward a target.
3. Tap the [Home] icon to show the home screen and display mode settings.
4. Tap [Radar] to show the [Radar] menu.
5. Drag the [Radar] menu to show the [RADAR INITIAL SETUP] menu.
6. Tap [Antenna Heading Align].
7. Key in the offset value so that the target is displayed at the very top of the screen (setting range: +179.9° to -180°, +: clockwise direction, -: counterclockwise direction), then tap the ✓ icon.
8. Confirm that the target echo is displayed at correct bearing on the screen.

3. MAINTENANCE, TROUBLE SHOOTING

Periodic checks and maintenance are important for proper operation of any electronic system. This chapter contains maintenance and troubleshooting instructions to be followed to obtain optimum performance and the longest possible life of the equipment. Before attempting any maintenance or troubleshooting procedure please review the safety information below and at the front of this manual. If you cannot restore normal operation after following the troubleshooting procedures, do not attempt to check inside any unit; there are no user serviceable parts inside. Contact your dealer to check the equipment.

⚠ WARNING

Do not open the equipment.

Hazardous voltage which can cause electrical shock exists inside the equipment. Only qualified personnel should work inside the equipment.

Turn off the antenna unit before servicing the unit. Post a warning sign near the switch indicating it should not be turned on while the antenna unit is being serviced.

Prevent the potential risk of being struck by the rotating antenna.

A transmitting radar antenna emits electromagnetic waves, which can be harmful, particularly the eyes.

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

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

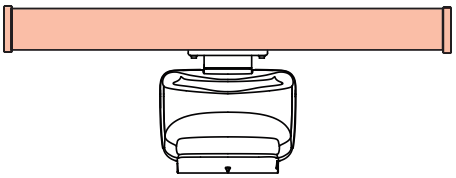
NOTICE

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.

3.1 Maintenance

Regular maintenance is important for good performance. Check the points mentioned below every 3 to 6 months to keep the antenna unit in good working order.

Check point	Action	Remedy, remarks
Check points every 3 to 6 months		
Cable	Check that all cables are firmly connected and are not damaged.	• Connect a cable if it has loosened. • Replace damaged cables.
Exposed bolts and nuts	Check that bolts and nuts are not corroded and are securely fastened.	• Replace corroded bolts. • Tighten loosened bolts. • Coat new bolts with marine sealant.
Radiator	Dust, dirt and salt deposits on the radiator cause signal attenuation, resulting in loss of sensitivity.	• Wipe radiator with a freshwater-moistened cloth. • The radiator is made of AES (Acrylonitrile-Ethylene-Styrene) resin. Therefore, do not used gasoline, benzene and the like to clean the radiator. • If the radiator is iced, use a wooden or plastic headed hammer to remove the ice. DO NOT use a steel hammer.
Ground connection	Check for tight connection and rust.	• Fasten if loosened. • Remove rust if present.
Check points every year		
	Check the scanner unit for rust, corrosion and chipped paint.	• If the scanner unit has rusted or the paint has chipped, paint the affected area. • Paint only the scanner unit. Do not paint the antenna (see figure below). Paint on the antenna can cause loss of sensitivity and crack the antenna.  : Do NOT paint. : Painting area

3.2 Troubleshooting

The table below provides simple troubleshooting procedures to restore normal operation. If you cannot restore normal operation, contact your dealer for advice.

Problem	Remedy
The multi function display cannot control the radar.	• Check that all cables are tightly fastened. • Check if the radar source setting is correct. • Check if the fuse of the cable assembly has blown. • Check that the power supply is compatible with the voltage rating of the antenna unit (24 VDC).
Marks and characters appear, but echoes do not appear.	• Check that the antenna cable is tightly fastened. • Check the cables for damage.
Picture is not updated or the picture freezes.	• Check that all cables are tightly fastened. • Check the cables for damage. • If the picture has frozen, reboot the multi function display.
You tuned the receiver or increased the gain, but radar echoes are too week.	• The magnetron may required replacement. Contact your dealer.
You changed the range, but the radar picture does not change.	• Try to change the range again. • Reboot the multi function display.
Poor discrimination in range.	• Adjust the sea control.
Range rings are not displayed.	• Check if the range rings is turned on in the menu.
You set the radar in the transmit state. The "TX screen" appears momentarily, but the radar soon goes into stand-by.	• The overload protection has activated. To restore normal operation, turn off all equipment in the network. Wait a few seconds then turn on all the equipment.

3.3 Replacement of Fuse

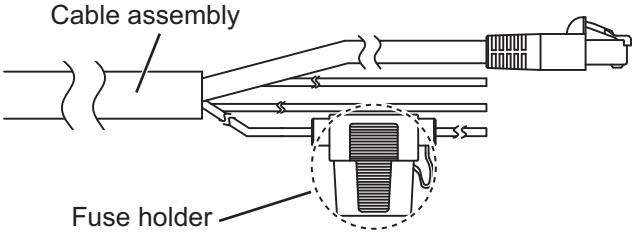
The fuse in the fuse holder on the supplied cable assembly protects the antenna unit from overcurrent and equipment fault. If you cannot turn on the power, check the fuse to see if it has blown. If the fuse has blown, find the reason before you replace the fuse. If the fuse blows again after the replacement, contact your dealer.

Name	Type	Code No.	Remarks
Fuse	FRU-2P5S-FU-5A-B	000-168-869-10	5 A fuse For DRS6A X-Class
	ATV10A60V	000-192-660-10	10 A fuse For DRS12A/25A X-Class

⚠ WARNING

Use the proper fuse.

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



How to replace the fuse

Open the fuse holder cover and replace the fuse. Then close the cover.

3.4 Life of Parts

Magnetron

When a magnetron reaches the end of its life, target echoes become weak and do not appear on the display. If long-range performance appears to have declined, contact your dealer about replacement of the magnetron.

Name	Type	Code No.	Approx. Life	Remarks
Magnetron	MAF1422B	000-158-788-12	5,000 hours	For DRS6A X-Class
	FNE1201	001-245-890	5,000 hours	For DRS12A X-Class
	MG5436	000-140-762-13	5,000 hours	For DRS25A X-Class

Antenna Motor

When an antenna motor reaches the end of its life, the antenna's rotation may stop or abnormal noise sounds from the antenna unit. If such symptom occurs, contact your dealer about replacement of the antenna motor.

Name	Type	Code No.	Approx. Life
Antenna Motor	RSB-134 MOTOR	001-436-400	10,000 hours

APPENDIX 1 RADIO REGULATORY INFORMATION

USA-Federal Communications Commission (FCC)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Caution: Exposure to Radio Frequency Radiation

- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65.
- This equipment should be installed and operated keeping the radiator away from a person's body at the minimum distances shown in the table below.

Antenna Model	Transceiver Unit	Safety Distance
DRS6A X-Class	RTR-112	300 cm
DRS12A X-Class	RTR-113	310 cm
DRS25A X-Class	RTR-114	770 cm

- This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Canada-Industry Canada (IC)

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:
(1) This device may not cause interference, and
(2) This device must accept any interference, including interference that may cause undesired operation of this device.

Caution: Exposure to Radio Frequency Radiation

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator away from a person's body at the minimum distances shown in the table below.

Antenna Model	Transceiver Unit	Safety Distance
DRS6A X-Class	RTR-112	300 cm
DRS12A X-Class	RTR-113	310 cm
DRS25A X-Class	RTR-114	770 cm

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

SPECIFICATIONS OF RADAR SENSOR
DRS6A/12A/25A X-Class

1 ANTENNA UNIT

1.1	Antenna type	Slotted waveguide array
1.2	Antenna length	3.4 ft (XN10A), 4 ft (XN12A), 6 ft (XN13A)
1.3	Horizontal beam width	2.3° (XN10A), 1.9° (XN12A), 1.4° (XN13A) Radiator type XN10A for DRS6A X-Class only
1.4	Vertical beam width	22°
1.5	Gain	27.5 dBi (XN10A), 28.5 dBi (XN12A), 30 dBi (XN13A)
1.6	Sidelobe attenuation	
	XN10A	-20 dB (within ±10°), -28 dB (±10° or more)
	XN12A	-24 dB (within ±10°), -30 dB (±10° or more)
	XN13A	-28 dB (within ±10°), -35 dB (±10° or more)
1.7	Rotation	24/36/48 rpm range coupled or 24 rpm fixed
1.8	Relative wind load	70 kn or less

2 RADAR FUNCTION

2.1	Tx frequency	9410 ±30 MHz
2.2	Output power	
	DRS6A X-Class	6 kW nominal
	DRS12A X-Class	12 kW nominal
	DRS25A X-Class	25 kW nominal
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 0.75	0.08	3000
1 to 1.5	0.15	1500
2	0.3	1000
3 to 4	0.5	600
6 to 8	0.8	600
12 to 64	1.2	600
72 to 120	1.2	550

2.6	Minimum range	25 m
2.7	Range resolution	20 m
2.8	Range accuracy	Within 1% of range in use
2.9	Bearing resolution	2.3 (XN10A), 1.9° (XN12A), 1.4° (XN13A)
2.10	Bearing accuracy	Within ±1°
2.11	Pre-heating time	90 s approx.
2.12	Target tracking (TT)	Auto or manual acquisition: 30 targets between 0.1 NM and 16 NM Past position: 5/10 pts on all activated targets Vector time: 1 to 60 min.

3 INTERFACE

LAN: 1 port, Ethernet, 100Base-TX

4 POWER SUPPLY

DRS6A X-Class	24 VDC: 4.0 A
DRS12A X-Class	24 VDC: 4.5 A
DRS25A X-Class	24 VDC: 5.6 A

5 ENVIRONMENTAL CONDITIONS

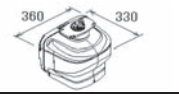
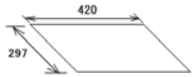
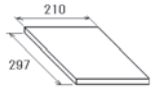
5.1	Ambient temperature	-25°C to +55°C (storage: -30°C to +70°C)
5.2	Relative humidity	95% or less at +40°C
5.3	Degree of protection	IP56
5.4	Vibration	IEC 60945 Ed.4

6 UNIT COLOR

N9.5

PACKING LIST

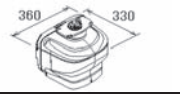
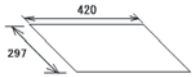
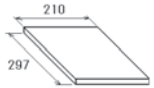
RSB-134-112-E

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
UNIT			
SCANNER UNIT		RSB-134-112 000-029-256-00	1
SPARE PARTS			
SPARE PARTS		SP03-18101 001-426-190-00	1
INSTALLATION MATERIALS			
INSTALLATION MATERIALS		CP03-37101 001-426-290-00	1
DOCUMENT			
TEMPLATE		C32-00703-* ワ/ｲﾚ 000-167-459-1*	1
INSTALLATION MANUAL		IME-36460-* 000-191-085-1*	1

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

PACKING LIST

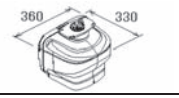
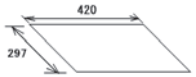
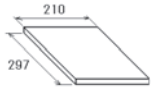
RSB-134-113-E

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
UNIT			
SCANNER UNIT		RSB-134-113 000-030-454-00	1
SPARE PARTS			
SPARE PARTS		SP03-18301 001-458-590-00	1
INSTALLATION MATERIALS			
INSTALLATION MATERIALS		CP03-37101 001-426-290-00	1
DOCUMENT			
TEMPLATE		C32-00703-* ワ/ｲﾚ 000-167-459-1*	1
INSTALLATION MANUAL		IME-36460-* 000-191-085-1*	1

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

PACKING LIST

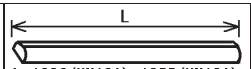
RSB-134-114-E

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
UNIT			
SCANNER UNIT		RSB-134-114 000-030-486-00	1
SPARE PARTS			
SPARE PARTS		SP03-18301 001-458-590-00	1
INSTALLATION MATERIALS			
INSTALLATION MATERIALS		CP03-37101 001-426-290-00	1
DOCUMENT			
TEMPLATE		C32-00703-* ワ/エイ 000-167-459-1*	1
INSTALLATION MANUAL		IME-36460-* 000-191-085-1*	1

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

PACKING LIST

XN10A, XN12A, XN13A, XN12A-N-CKD, XN13A-N-CKD

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
UNIT			
ANTENNA	 L=1036(XN10A), 1255(XN12A), 1795(XN13A)	XN10A/12A/13A 008-390-960-00 **	1
ANTENNA INSTALLATION MATERIALS			
INSTALLATION MATERIALS		CP03-22901 008-523-690-00	1

CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

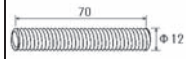
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	001-426-290-00	03HS-X-9401 -0
TYPE	CP03-37101	1/1

INSTALLATION MATERIALS

NO.	NAME	OUTLINE	DESCRIPTIONS	Q'TY	REMARKS
1	CORROSION-PROOF RUBBER		03-189-3108-0 CODE NO. 100-403-040-10	4	
2	HEXAGONAL NUT		M12 SUS304 CODE NO. 000-167-491-10	8	
3	SPRING WASHER		M12 SUS304 CODE NO. 000-167-397-10	4	
4	FLAT WASHER		M12 SUS316L CODE NO. 000-167-417-10	4	
5	HEXAGON SOCKET SET SCREW		M12X70 SUS304 CODE NO. 000-191-051-10	4	

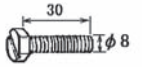
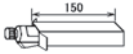
(IMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

FURUNO

CODE NO.	008-523-690-00	19AK-X-9405 -4
TYPE	CP03-22901	1/1

INSTALLATION MATERIALS

NO.	NAME	OUTLINE	DESCRIPTIONS	Q'TY	REMARKS
1	SPRING WASHER		M8 SUS304 CODE NO. 000-167-410-10	4	
2	FLAT WASHER		M8 SUS304 CODE NO. 000-167-464-10	4	
3	HEXAGONAL HEAD SLOT BOLT		M8X30 SUS304 CODE NO. 000-162-922-10	4	
4	O-RING(DIASEAL)		OR NBR-70-1 G80-N CODE NO. 000-171-787-10	1	
5	SILICON RUBBER		S-8400W ｱﾙﾐﾁｭｰﾌﾞ50G CODE NO. 000-158-483-11	1	

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

FURUNO

CODE NO.		03HP-X-9401 -0
TYPE		1/1

INSTALLATION MATERIALS

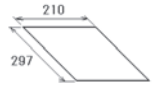
NO.	NAME	OUTLINE	DESCRIPTIONS	Q'TY	REMARKS
1	CABLE ASSEMBLY		FRU-2P5S-FF-10M CODE NO. 001-376-460-00	1	TO BE SELECTED
2	CABLE ASSEMBLY		FRU-2P5S-FF-15M CODE NO. 001-376-480-00	1	TO BE SELECTED
3	CABLE ASSEMBLY		FRU-2P5S-FF-20M CODE NO. 001-376-490-00	1	TO BE SELECTED
4	CABLE ASSEMBLY		FRU-2P5S-FF-30M CODE NO. 001-376-500-00	1	TO BE SELECTED

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

PACKING LIST

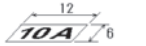
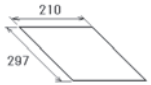
CP03-37400 *10M*

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
INSTALLATION MATERIALS			
CABLE ASSEMBLY		FRU-2P5S-FF-10M 000-168-865-10	1
BLADE FUSE		ATV10A60V 000-192-660-10	1
FUSE LABEL		03-189-3915-0 100-412-050-10	1
HOW TO REPLACE THE FUSE		C32-01604-* 000-192-665-1*	1

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

PACKING LIST

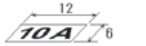
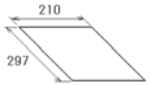
CP03-37410 *15M*

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
INSTALLATION MATERIALS			
CABLE ASSEMBLY		FRU-2P5S-FF-15M 000-168-866-10	1
BLADE FUSE		ATV10A60V 000-192-660-10	1
FUSE LABEL		03-189-3915-0 100-412-050-10	1
HOW TO REPLACE THE FUSE		C32-01604-* 000-192-665-1*	1

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

PACKING LIST

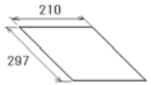
CP03-37420 *20M*

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
INSTALLATION MATERIALS			
CABLE ASSEMBLY		FRU-2P5S-FF-20M 000-168-867-10	1
BLADE FUSE		ATV10A60V 000-192-660-10	1
FUSE LABEL		03-189-3915-0 100-412-050-10	1
HOW TO REPLACE THE FUSE		C32-01604-* 000-192-665-1*	1

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

PACKING LIST

CP03-37430 *30M*

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
INSTALLATION MATERIALS			
CABLE ASSEMBLY		FRU-2P5S-FF-30M 000-168-868-10	1
BLADE FUSE		ATV10A60V 000-192-660-10	1
FUSE LABEL		03-189-3915-0 100-412-050-10	1
HOW TO REPLACE THE FUSE		C32-01604-* 000-192-665-1*	1

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	001-426-190-00	03HR-X-9301-0	1/1
TYPE	SP03-18101	BOX NO.	P

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

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	FUSE		FRU-2P5S-FU-5A-B	1		1	000-168-869-10

MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	C3646-P01-A	1/1

(IMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	001-458-590-00	03HW-X-9301-0 1/1
TYPE	SP03-18301	BOX NO. P

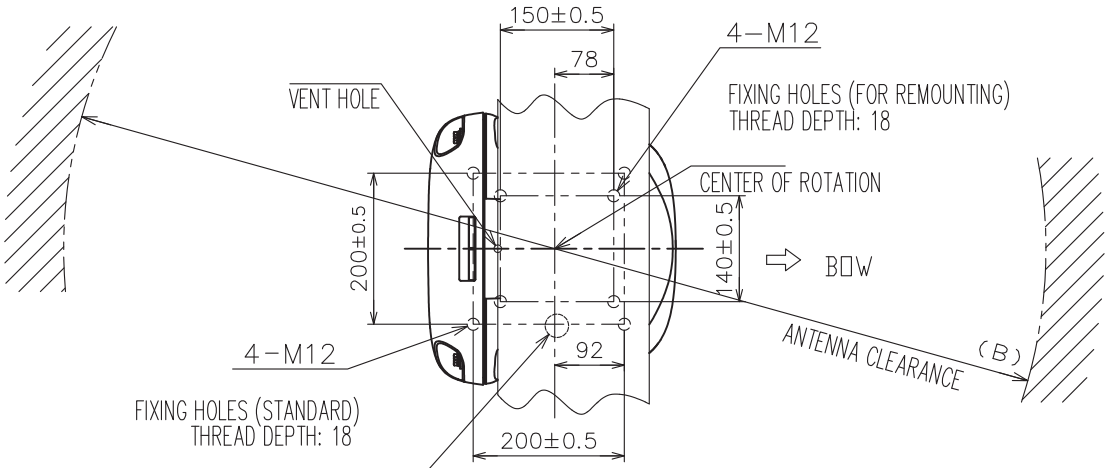
SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL

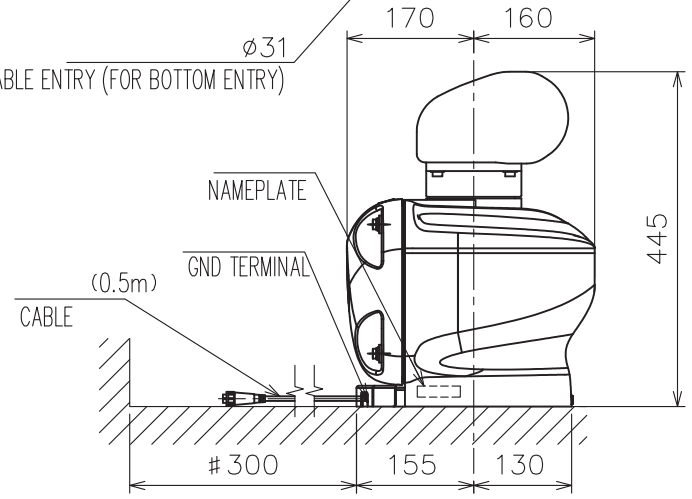
ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	BLADE FUSE		ATV10A60V	1		1	000-192-660-10

MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	C3647-P01-A	1/1

(DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO





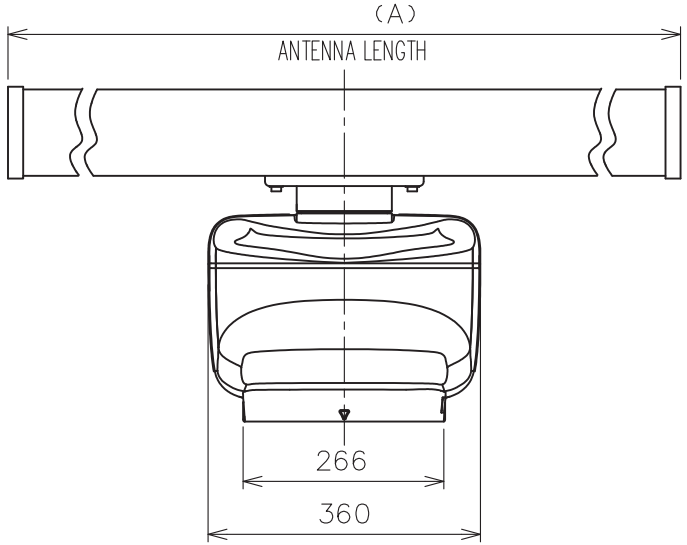


TABLE 2

MODEL	DRS6A X-Class	DRS12A X-Class	
RADIATOR	XN10A	XN12A	XN13A
(A) ANTENNA LENGTH (mm)	1036±10	1255±10	1795±10
(B) ANT. CLEARANCE (mm)	1200	1400	1940
MASS (kg±10%)	20	21	23

TABLE 1

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

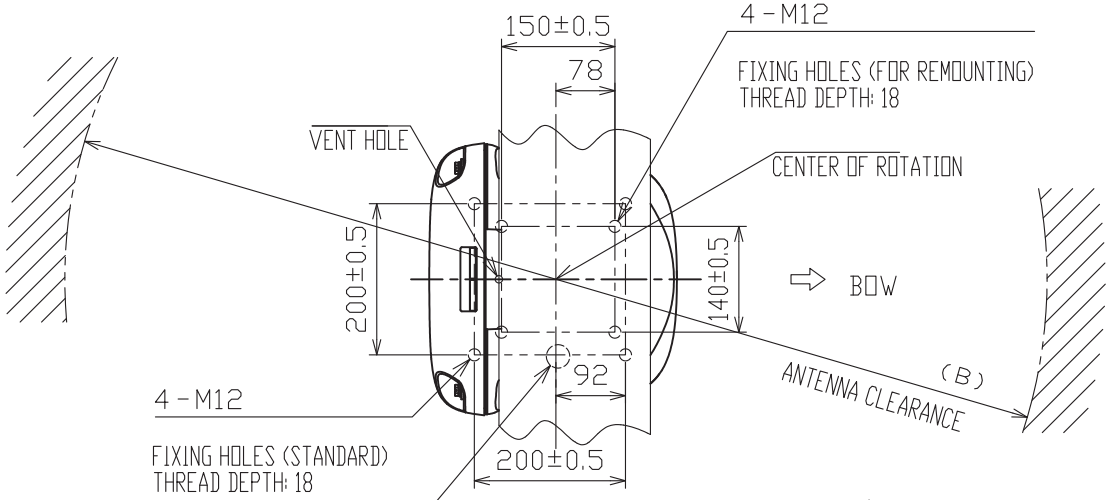
NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPWCIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M12 BOLTS FOR FIXING THE UNIT.
4. DO NOT COVER THE VENT HOLE.

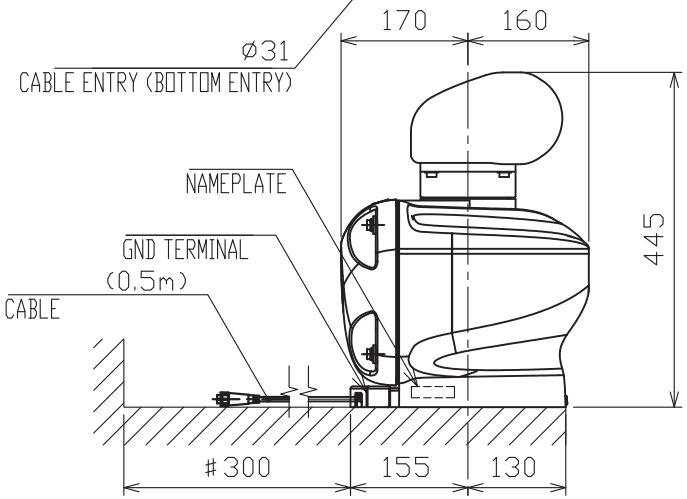
DRAWN T.YAMASAKI		TITLE	RSB-134
CHECKED H.MAKI			
APPROVED 22/Jun/2016 H.MAKI	DRS12A X-Class DRS6A X-Class		
SCALE 1/10 MASS SEE TABLE 2		NAME	ANTENNA UNIT
DWG.No. C3646-G01- C	REF.No. 03-189-300G-2		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

D-1

FURUNO





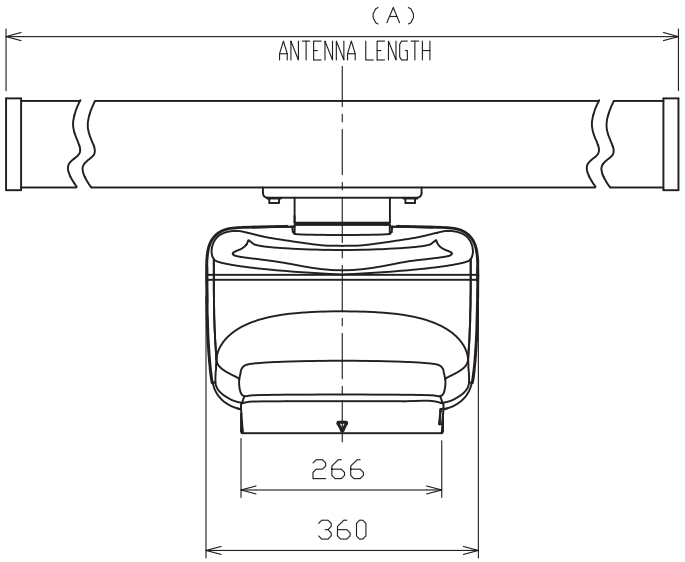


TABLE 1

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

TABLE 2

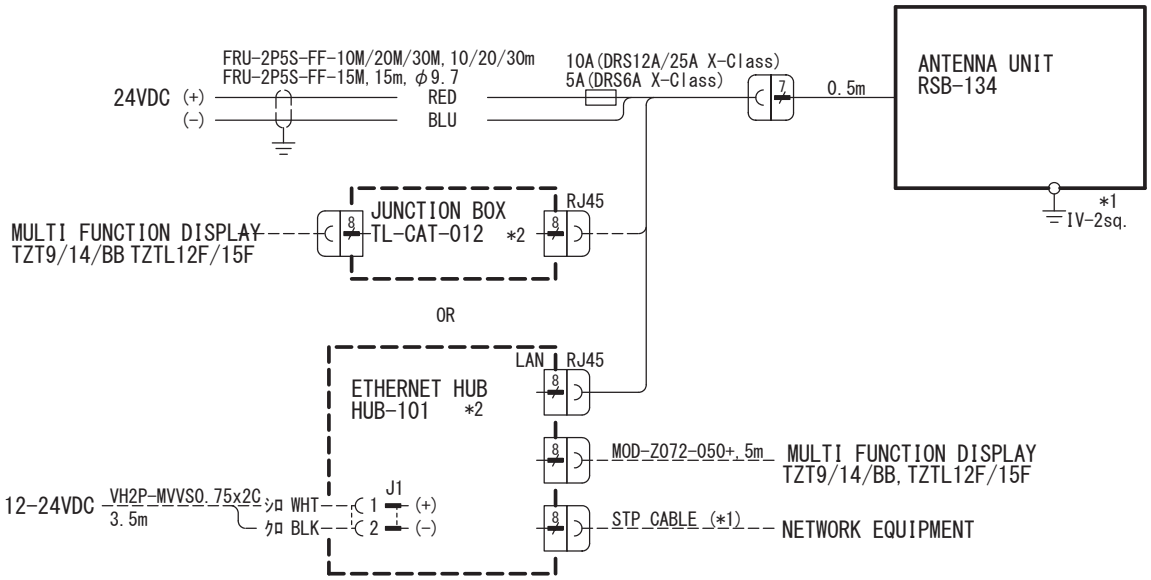
RADIATOR	XN12A	XN13A
ANTENNA LENGTH (A) (mm)	1255±10	1795±10
ANTENNA CLEARANCE (B) (mm)	1400	1940
MASS (kg±10%)	22	24

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPWCIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE M12 BOLTS FOR FIXING THE UNIT.
4. DO NOT COVER THE VENT HOLE.

DRAWN	T.YAMASAKI		TITLE RSB-134
CHECKED	H.MAKI		
APPROVED		DRS25A X-Class	
SCALE 1/10	MASS SEE TABLE 2		NAME ANTENNA UNIT
DWG.No.	C3648-G01- A	REF.No. 03-189-320G-0	UTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO



NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.

DRAWN T.YAMASAKI			TITLE DRS6A/12A/25A X-Class
CHECKED H.MAKI			
APPROVED 3/Aug/2016 H.MAKI			
SCALE	MASS kg		NAME RADAR SENSOR
DWG.No. C3646-C01- B	REF.No. 03-189-6011-0		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

Accept no compromises, choose only quality marine electronics and navigation.