

Installation Manual

RADAR SENSOR

MODEL DRS4DL+

(Product Name: RADOME RADAR SENSOR)

SAFETY INFORMATION	i
SYSTEM CONFIGURATION	iv
EQUIPMENT LISTS	v
1. INSTALLATION	1
1.1 Installation Considerations.....	1
1.2 Installation of the Radar Sensor.....	2
2. INITIAL SETUP	7
2.1 Connections.....	7
2.2 Initial Setup for NavNet TZtouch (Model: TZT9/TZT14/TZTBB).....	7
2.3 Initial Setup for NavNet TZtouch2 (Model: TZTL12F/TZTL15F).....	10
2.4 Check Points After Installation.....	12
3. MAINTENANCE, TROUBLE- SHOOTING	14
3.1 Maintenance.....	14
3.2 Replacement of Fuse.....	15
3.3 Troubleshooting.....	15
3.4 Replacement of Magnetron.....	15
APPENDIX 1 RADIO REGULATORY INFORMATION	AP-1
SPECIFICATIONS	SP-1
PACKING LIST(S)	A-1
OUTLINE DRAWING(S)	D-1
INTERCONNECTION DIAGRAM(S)	S-1



FURUNO ELECTRIC CO., LTD.

www.furuno.com

All brand and product names are trademarks, registered trademarks or service marks of their respective holders.



SAFETY INFORMATION

Read these safety instructions before you operate or install the equipment.



WARNING

Indicates a condition that can cause death or serious injury if not avoided.



CAUTION

Indicates a condition that can cause minor or moderate injury if not avoided.



Warning, Caution



Prohibitive Action



Mandatory Action



WARNING

Radio Frequency Radiation Hazard

The radar antenna sends the electromagnetic radio frequency (RF) energy. This energy can be dangerous to you, especially your eyes. Do not look at the radiator or near the antenna when the antenna is rotating.

The distances at which RF radiation levels of 100 W/m², 50 W/m² and 10 W/m² exist are shown in the table.

Note: If the antenna unit is installed at a close distance in front of the wheel house, prevent the transmission in that area to protect passengers and crew from microwave radiation. Set the [Sector Blanks] in the [System] menu.

Distance to 100 W/m ² point	Distance to 50 W/m ² point	Distance to 10 W/m ² point
_____	_____	Worst case 85 cm



WARNING



Do not open the equipment.

The equipment uses high voltage that can cause electrical shock. Refer any repair work to a qualified technician.



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.



If water leaks into the equipment or something is dropped into the equipment, immediately turn off the power at the switchboard.

Fire or electrical shock can result.



If the equipment is giving off smoke or fire, immediately turn off the power at the switchboard.

Fire or electrical shock can result.



Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.



Do not place operate the equipment with wet hands.

Electrical shock can result.

⚠ WARNING**Use the correct fuse.**

Use of a wrong fuse can result in fire or damage to the equipment.

**Do not place liquid-filled containers on the equipment.**

Fire or electrical shock can result if a liquid spills into the equipment.

⚠ CAUTION**The guard zone alarm is an effective aid to anti-collision.**

Its use does not relieve the operator of the responsibility to keep a vigilant watch on his or her surroundings.

⚠ CAUTION**The data presented by this equipment is intended as a source of navigation information.**

The prudent navigator never relies exclusively on any one source of navigation information, for safety of vessel and crew.

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

Unit	Standard Compass	Steering Compass
Antenna unit	1.70 m	1.05 m

**Do not use high-pressure cleaners to clean this equipment.**

This equipment has the waterproof rating outlined in the specifications, at the back of this manual. However, the use of high-pressure cleaning equipment can cause water ingress, resulting in damage to, or failure of, the equipment.

*Target Tracking (TT) safety information***⚠ WARNING****The TT function is a valuable aid to navigation. However, the navigator must check all aids available to avoid collision.**

- The TT automatically tracks an automatically or manually acquired radar target and calculates its course and speed, indicating them with a vector. Since the data generated by the TT depends on the selected radar targets, the radar must be optimally tuned for use with the TT, to ensure required targets will not be lost or unnecessary targets, like sea returns and noise, will not be acquired and tracked.





- A target is not always a landmass, reef, ship, but can also be returns from the sea surface and from clutter. As the level of clutter changes with the environment, the operator must correctly adjust the sea and rain clutter controls and the gain control so that the target echoes do not disappear from the radar screen.

⚠ CAUTION**The plotting accuracy and response of this TT meets IMO standards. Tracking accuracy is affected by the following:**

- Tracking accuracy is affected by course change. One to two minutes is required to restore vectors to full accuracy after an abrupt course change. (The actual amount depends on gyrocompass specifications.)
- The amount of tracking delay is inversely proportional to the relative speed of the target. Delay is approx. 15-30 seconds for the higher relative speed; approx. 30-60 seconds for the lower relative speed. The following factors can affect accuracy:
 - Echo intensity
 - Radar transmission pulse length
 - Radar bearing error
 - Heading sensor error
 - Course change (own ship and targets)

Warning Label(s)

Warning label(s) is(are) attached to the equipment. Do not remove the label(s).
If a label is missing or damaged, contact a FURUNO agent or 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 Sticker
Type: 03-129-1001-3
Code No.: 100-236-743-10

TFT display

The high quality TFT (Thin Film Transistor) LCD displays 99.99% of its picture elements.
The remaining 0.01% may drop out or light. However, this is an inherent property of the TFT;
it is not a sign of malfunction.

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

Program No.

- 0359364-01.**
** denotes minor modifications.

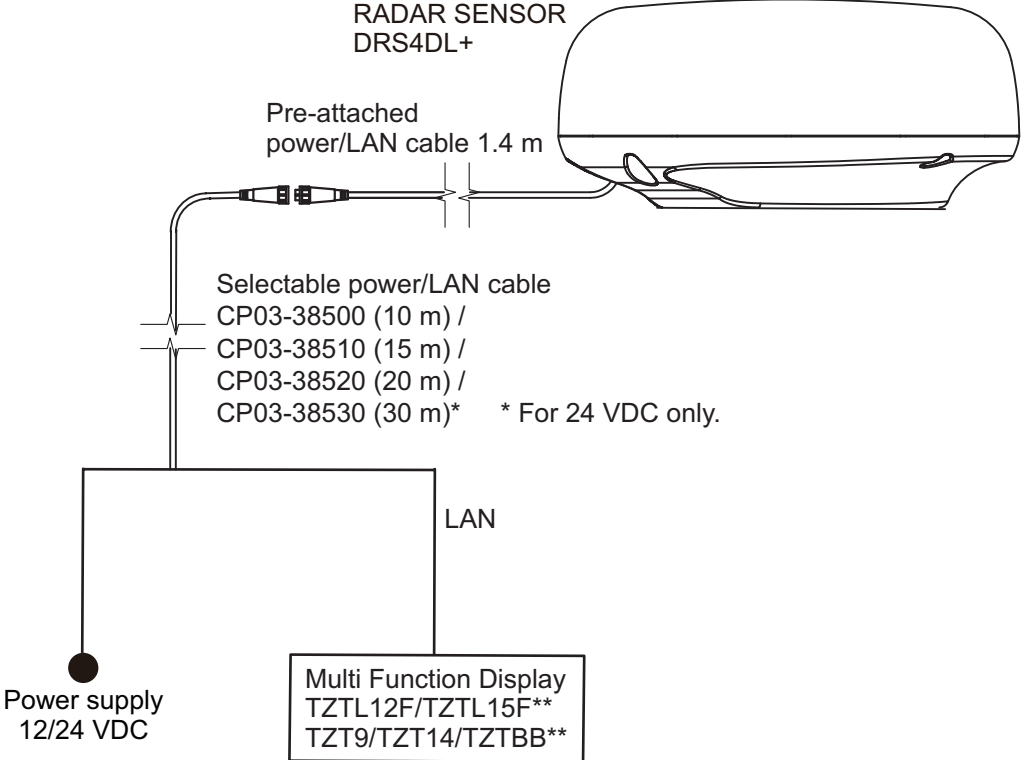
CE declarations

With regard to CE 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



** Software upgrade to V5.01 or after is required.

EQUIPMENT LISTS

Standard supply

Name	Type	Code No.	Qty	Remarks
Radar Sensor	RSB-127-120	-	1	
Installation Materials	CP03-35701	001-351-480	1	
	CP03-38500	000-035-186	Select one	Power / LAN cable 10 m
	CP03-38510	000-035-187		Power / LAN cable 15 m
	CP03-38520	000-035-188		Power / LAN cable 20 m
	CP03-38530	000-035-189		Power / LAN cable 30 m For 24 VDC only
Spare Parts	SP03-19301	001-513-590	1	Fuses
Template	E32-01314-*	000-178-948	1	

Optional supply

Name	Type	Code No.	Qty	Remarks
Radome Mount	OP03-209	001-078-350	1	

1. INSTALLATION

1.1 Installation Considerations

General considerations

NOTICE

Do not use paint, anti-corrosion products, contact spray or other items containing organic solvents on the equipment.

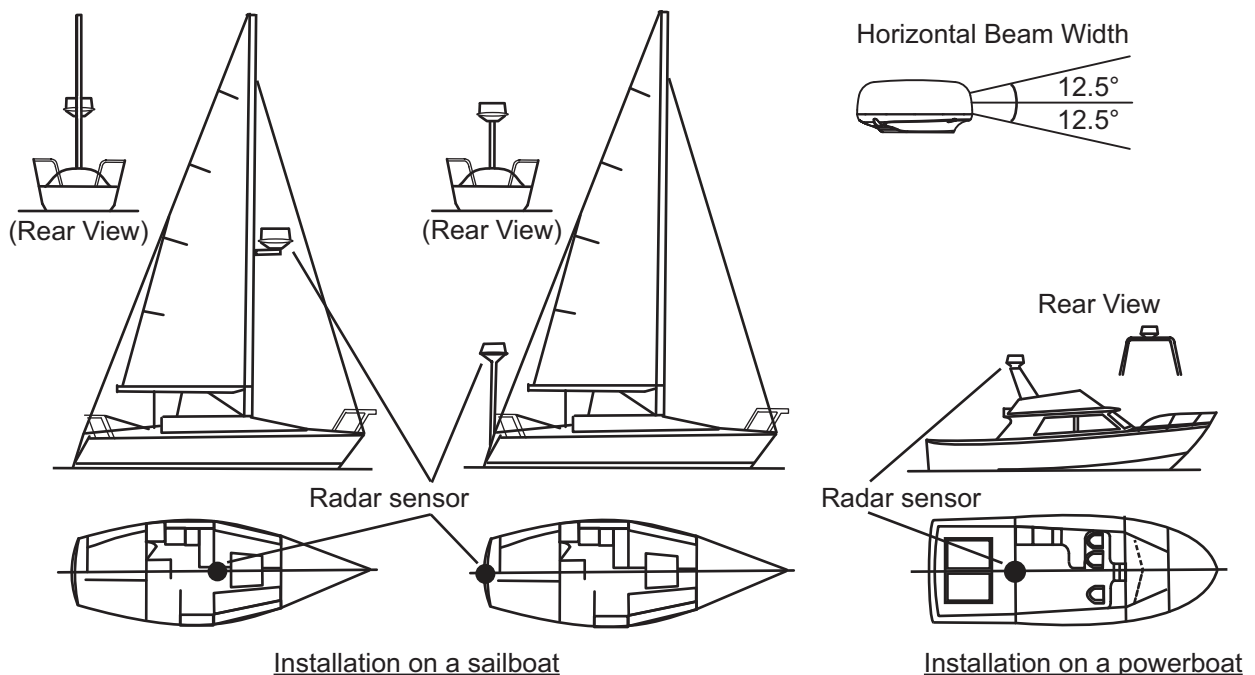
Organic solvents can harm paint and plastic, particularly the connectors.

- The radar sensor has no power switch. Therefore, it is recommended that you connect the sensor to a distribution switchboard with a switch for power control.

Sensor placement

Select a mounting location for the antenna unit considering the following points.

- Install the unit on a common mast, radar mast, etc.
- Install the antenna unit on a solid location, for example radar arch or on a mast on a platform. (For sailboats, a mounting bracket is optionally available.) You must put the antenna unit where there is a good complete view. Make sure that no part of the superstructure is within the scanning beam. Any obstruction causes shadow sectors. For example, a mast with a diameter smaller than the horizontal beam width causes only a small blind sector. A horizontal spreader or crosstrees in the same horizontal plane creates a large obstruction. Install the antenna unit above a horizontal spreader or crosstrees.



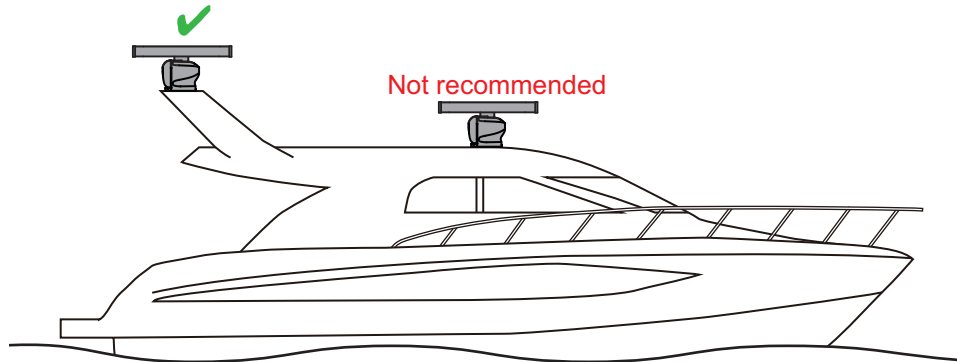
Installation on a sailboat

Installation on a powerboat

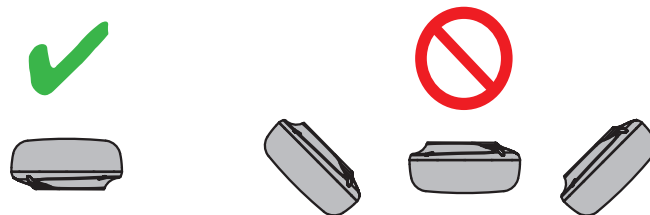
Typical installation on a sailboat and power boat

1. INSTALLATION

- To avoid electrical interference, do not run the antenna cable near other electrical equipment. Also do not run the cable in parallel to power cables.
- Do not install the unit where its motor noise may affect crew or passengers.



- As much as possible install the unit on the ship's centerline, to prevent misplacement of echoes (wrong bearing) on the display.
- Make sure the mounting location does not allow water to accumulate at the mounting platform.
- A magnetic compass will be affected if the display unit is placed too close to the compass. Observe the compass safe distances in the safety instructions to prevent interference to the compass.
- To ensure proper emission of radar waves, do not paint the radome.
- Referring to the outline drawings at the back of this manual, allow space for maintenance and service.
- If the unit is installed on a large vessel observe the following points.
 - The antenna cable comes in lengths of 10, 15 and 20 m (30 m optionally available). Consider the length of the cable when selecting a mounting location.
 - Keep the unit away from smoke and exhaust stacks. Hot air affects antenna performance. Hot air can also damage the unit. The temperature at the mounting location should not exceed 55°C (131°F).
- The radar sensor should not be operated or stored in any position other than the proper operational position (upright).



1.2 Installation of the Radar Sensor

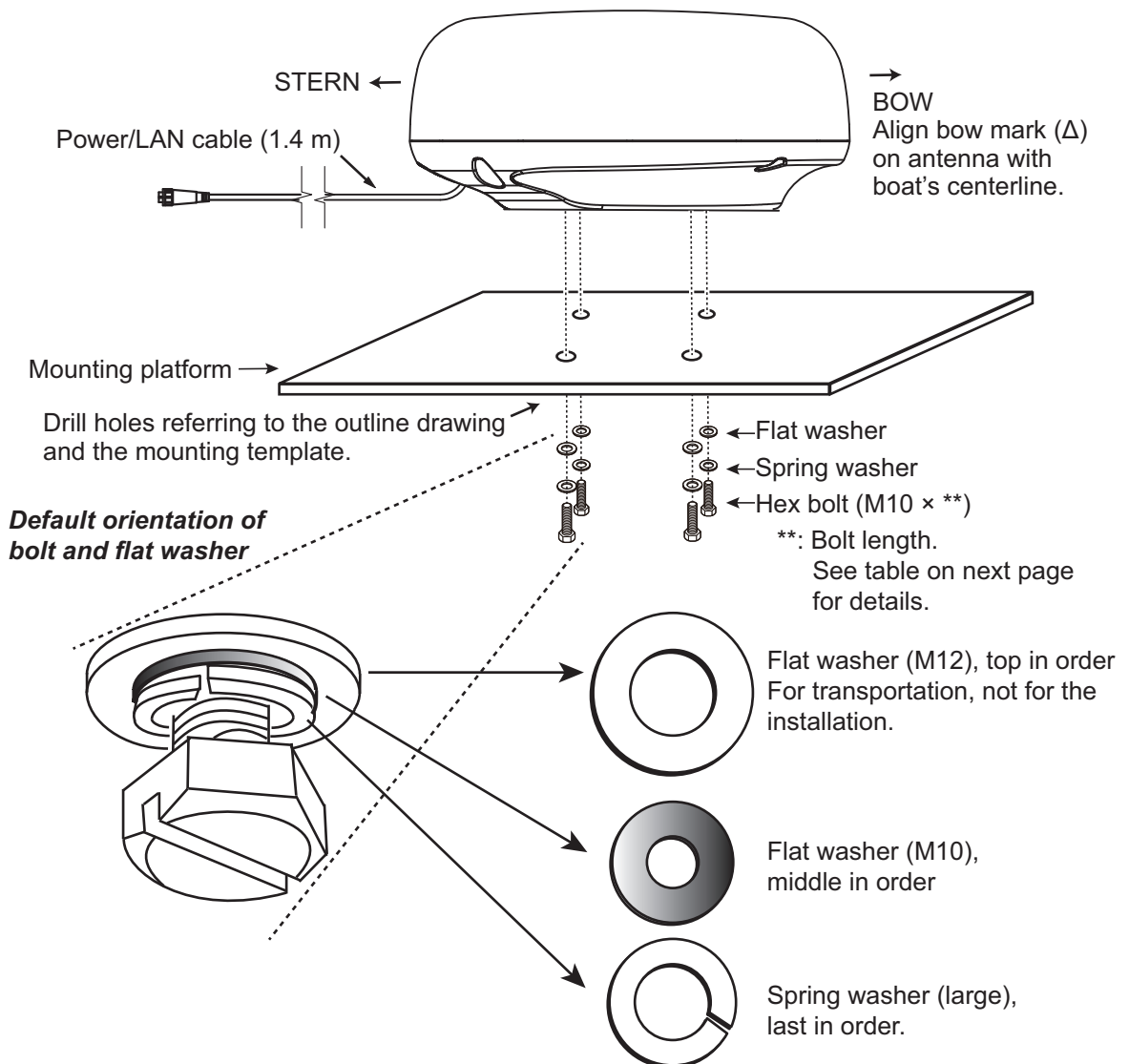
Determine the suitability of the mounting location **BEFORE** permanently mounting the sensor. Incoming and outgoing signals may overlap one another depending on the shape of the vessel, preventing communication between the radar and display. Set the sensor on the selected location and connect the sensor to the distribution switchboard and display unit. Turn on the sensor and the display unit. Check that the picture is updated with each sweep on the display unit. Some trial and error may be necessary to find a suitable location.

Tools and materials for mounting

Name	Usage
Electric drill	Drill holes for mounting. Drill bit: $\phi 11$ mm
Hexagonal wrench	Fastening bolts: Diagonal: 6 mm
Self-vulcanizing tape	For water proofing of connector junction.
Vinyl tape	
Cable tie	For tying up the cable.
Marine sealant	For coating exposed parts of bolts.

Installation on a platform

Follow the instructions below to install the sensor on a platform.

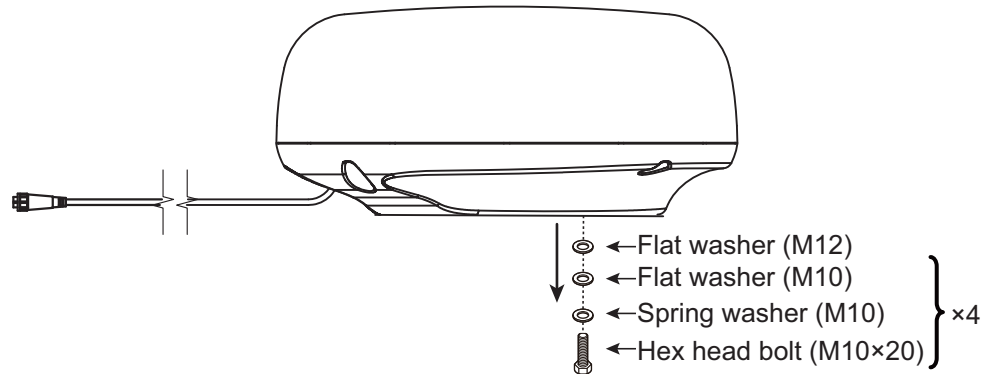


Note: On the bolt and washers,

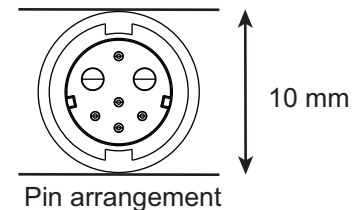
- DO NOT detach the hex bolts and flat washers until the installation.
- DO NOT turn the radome upside down after detaching the hex bolts and flat washers.
- If the radome is put upside down with only the small flat washer and hex bolt in place, the hex bolt and flat washer may protrude into the radome and damage the RT unit.

1. INSTALLATION

1. Use the mounting template (supplied) to mark the location of fixing holes in the mounting platform. Be sure to drill the holes parallel with the bow.
2. From the bottom of the radome, remove flat washers (M12), spring washers (M10), flat washers (M10) and hex head bolts (M10 × 20).

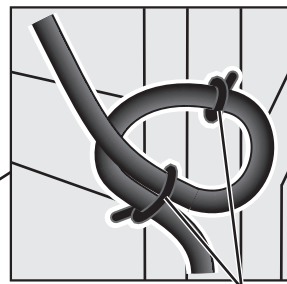


3. Lay the antenna unit on the mounting platform with the bow mark (Δ) on the antenna unit facing the bow.
4. When the thickness of platform is less than 5 mm, use hex bolts*, flat washers and spring washers (removed at step 2) to fasten the radar sensor to the platform.
Note: Please refer to the "Radar Open Antenna Torque for Fastening Installation Procedure" on page D-2 about the details.
5. Connect the power/LAN cable from the radar sensor to the ship's power/LAN cable. The connector pin arrangement is as shown to the right.



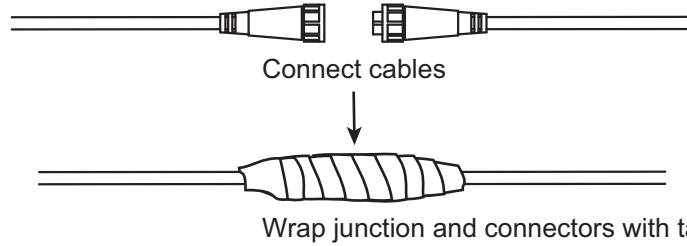
Observe below guidelines for laying the power/LAN cable.

- The connectors must not strike any part of the vessel by wind, etc.
- The load applied to the connectors must not be more than the power/LAN cable.
- If the cable is passed through a mast on a sailboat, be sure the cable does not touch ropes (sheet, halyard, etc.).
- Do not fasten the cable to the hull.
- The cable must be secured so no tension is applied to the connectors. To prevent tension, create a loop in the cable close to the sensor and secure the loop with cable ties, as shown in the figure below.

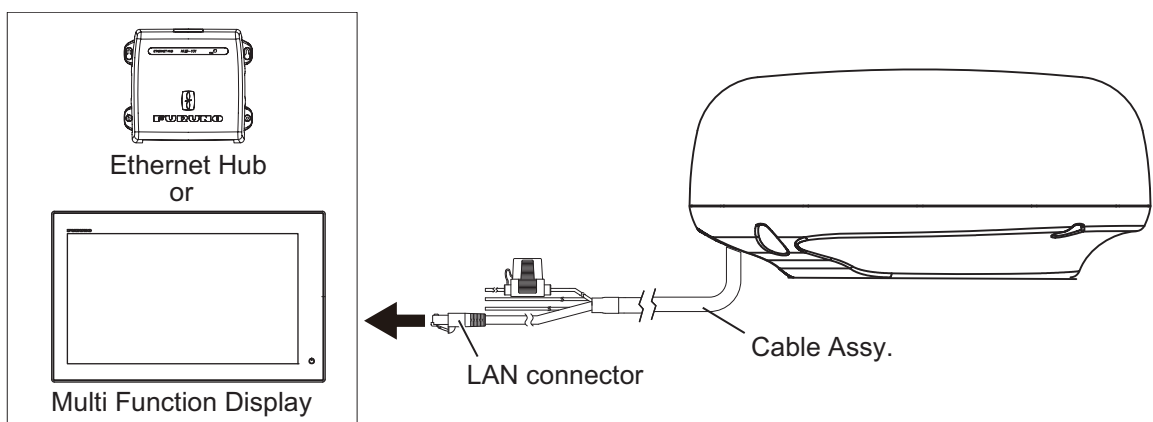


Loop cable and secure loop with cable ties.
The minimum bend radius is 80 mm.

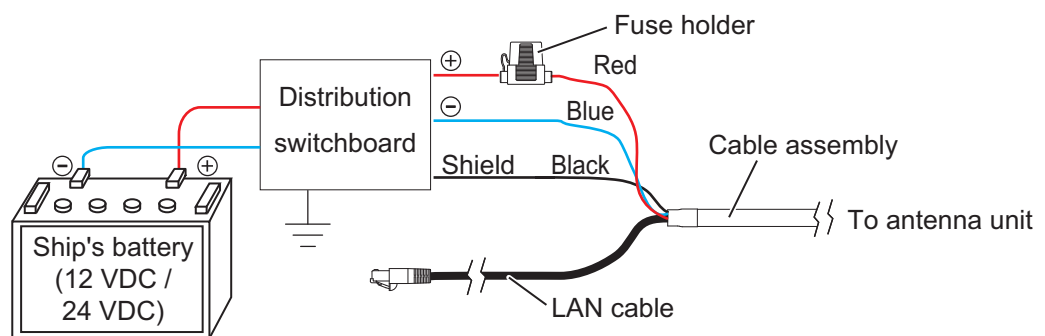
- Wrap the junction of the connectors with self-vulcanizing tape for waterproofing.



- Using a cable tie, fasten the cable to the mast, etc. at the neck of each connector.
6. Insert a fuse (attached to the cable) to the fuse holder by referring the “HOW TO ATTACH THE FUSE” (C32-01604-**) supplied with the cable. Attach the supplied fuse rating label (5 A) on the fuse holder cover.
 7. Connect the LAN connector of the cable assembly to a LAN port on the FURUNO Multi Function Display or Ethernet HUB.



8. Connect the power wires to the ship's battery (12 VDC or 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: The antenna unit cannot accept input voltage of more than 24 VDC.

1. INSTALLATION

Installation with the radome mount

The optional radome mount lets you install the radar sensor to a mast on a sailboat.

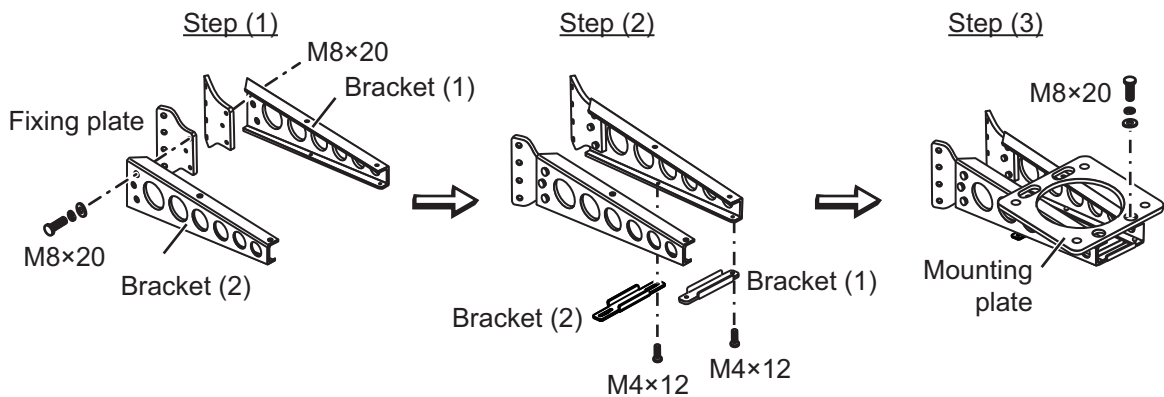
Name, Type: Radome Mount, OP03-209

Code No.: 001-078-350

Name	Type	Code No.	Qty
Mounting plate	03-018-9001-0	100-206-740-10	1
Support plate (1)	03-018-9005-0	100-206-780-10	1
Support plate (2)	03-018-9006-0	100-206-790-10	1
Bracket (1)	03-028-9101-2	100-206-812-10	1
Bracket (2)	03-028-9102-2	100-206-822-10	1
Fixing plate	03-028-9103-2	100-206-832-10	2
Hex bolt w/washer	M8×20 SUS304	000-162-955-10	10
Hex bolt w/washer	M4×12 SUS304	000-162-956-10	4

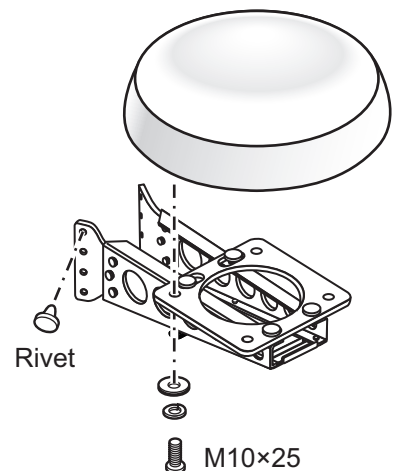
How to assemble the bracket

1. Fasten the fixing plates to brackets (1) and (2) with four M8×20 hex bolts.
2. Fit brackets (1) and (2) loosely with support plates (1) and (2) using four M4×12 hex bolts, so that the gap between the brackets can be adjusted.
3. Place the mounting plate on the bracket and fix it loosely with four M8×20 hex bolts.




How to fasten the bracket to the mast

1. Drill eight holes of 6.5 mm diameter in the mast. Fasten the bracket to the mast with eight stainless steel rivets (local supply) whose diameter is 6.4 mm.
2. Tighten the bolts on the bracket.
3. Fasten the antenna unit to the bracket with bolts (M10 × 25).



2. INITIAL SETUP

2.1 Connections

 **WARNING**

Radio Frequency Radiation Hazard

The radar antenna sends the electromagnetic radio frequency (RF) energy. This energy can be dangerous to you, especially your eyes. Do not look at the radiator or near the antenna when the antenna is rotating.

The distances at which RF radiation levels of 100 W/m², 50 W/m² and 10 W/m² exist are shown in the table.

Note: If the antenna unit is installed at a close distance in front of the wheel house, prevent the transmission in that area to protect passengers and crew from microwave radiation. Set the [Sector Blanks] in the [System] menu.

Distance to 100 W/m ² point	Distance to 50 W/m ² point	Distance to 10 W/m ² point
_____	_____	Worst case 85 cm

2.1.1 Power Requirement

The DRS4DL+ requires either 12 VDC or 24 VDC power. The 10/15/20 m cables are for 12 or 24 VDC, and the 30 m cable is for 24 VDC only. Connect the red cable to the positive terminal of ship's battery; the blue cable to the negative terminal. The black cable is a shielding cable for grounding.

2.1.2 LAN Cable Connection

Connect LAN cable to the multi function display device or Ethernet HUB.

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

- TZT9, TZT14 and TZTBB: Version 5.01 or later.
TZTL12F and TZTL15F: Version 5.01 or later.

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

2.2 Initial Setup for NavNet TZtouch (Model: 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].

2. INITIAL SETUP

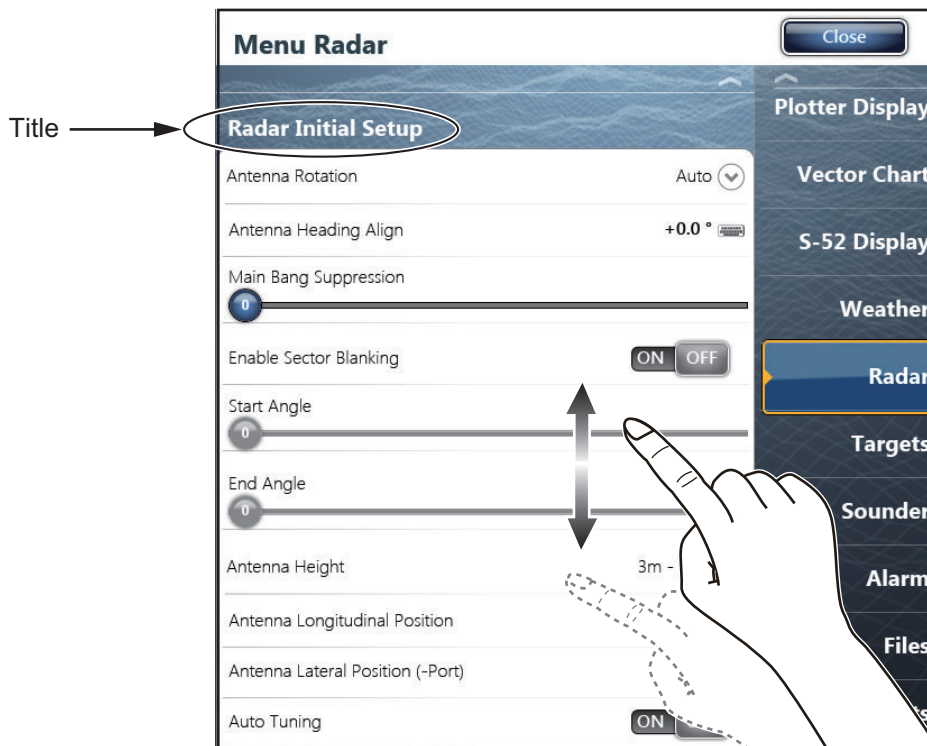
- Select [Radar Source] on the [Menu Radar] sub menus, then select the radar type connected.

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 DRS4DL+

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

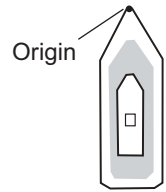


- Set the items referring to the table shown below.

Menu Radar (Radar Initial Setup)

Menu item	Description
[Antenna Rotation]	Select the antenna rotation speed from [Auto] or [24 RPM]. The default setting is [Auto].
[Antenna Heading Align]	See "How to align the antenna heading" on page 9.
[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 from [Under 3 m], [3 m - 10 m] or [Over 10 m].

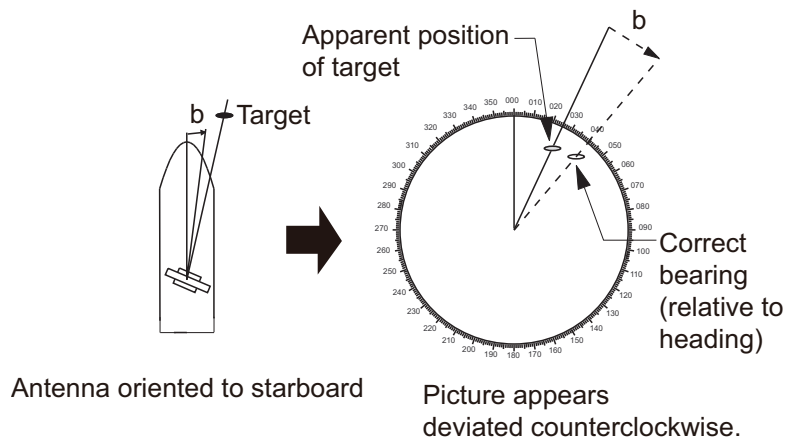
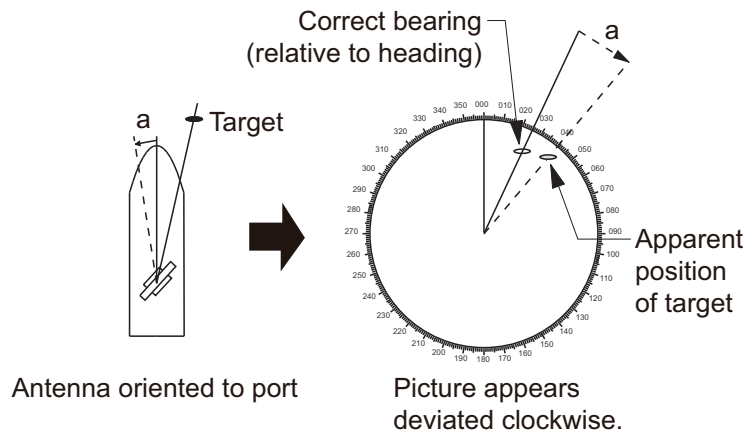
Menu item	Description
[Antenna Longitudinal Position]	Referring to the figure on the right, enter the radar antenna positioning bow-stern (Longitudinal) and port-starboard (Lateral) position from the origin.
[Antenna Lateral Position (-Port)]	
[Auto Tuning]	Enable/disable auto tuning for the connected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

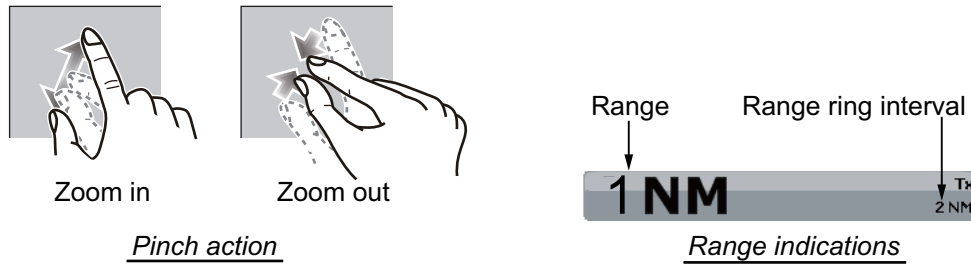
You have mounted the antenna unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually should appear on the heading line (zero degrees).

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.

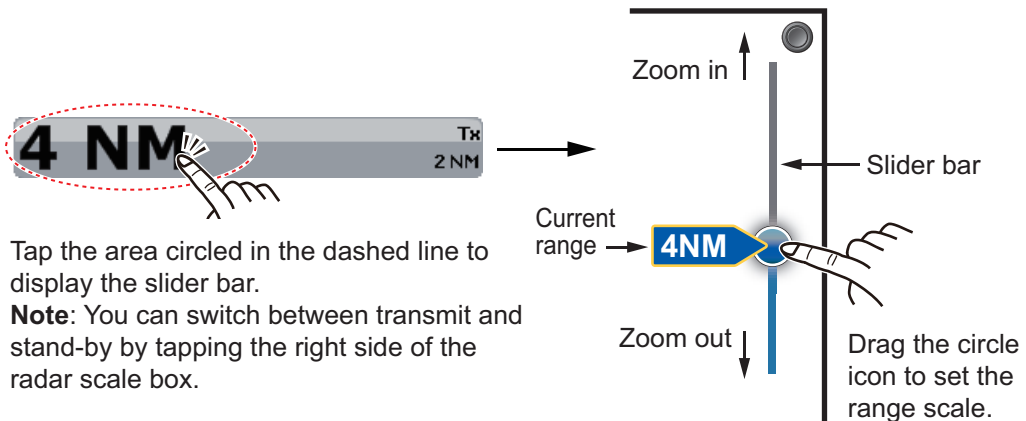


2. INITIAL SETUP

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.



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.

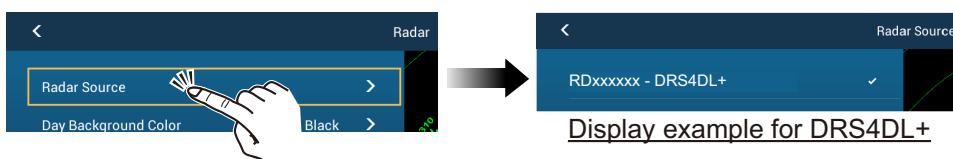
Note: You can switch between transmit and stand-by by tapping the right side of the radar scale box.

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.

2.3 Initial Setup for NavNet TZtouch2 (Model: TZ-TL12F/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.

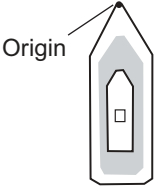


4. Drag the [Radar] menu display the menu item [Radar Initial Setup], then tap [Radar Initial Setup].
5. Referring to the tables below, set up the radar.

[Radar] menu - [Radar Initial Setup]

Menu item	Description
[Antenna Rotation]	Select the antenna rotation speed from [Auto] or [24 RPM]. The default setting is [Auto].
[Antenna Heading Align]	See "How to align the antenna heading" on page 11.
[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]

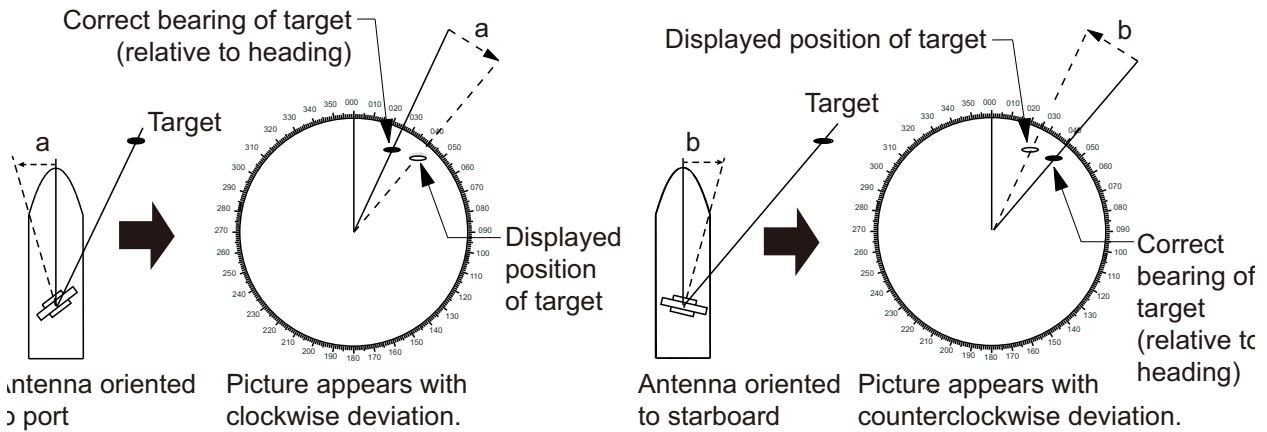
Menu item	Description
[Longitudinal (from bow)] [Lateral (-Port)]	Referring to the figure on the right, enter the radar antenna positioning bow-stern (Longitudinal) and port-starboard (Lateral) position from the origin.  The diagram shows a top-down view of a boat's hull. A small square is located at the center of the hull, representing the 'Origin' point. A line points from the word 'Origin' to this square.
[Antenna Height]	Select the height of the antenna above the waterline from [Under 3 m], [3 m - 10 m] or [Over 10 m].
[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

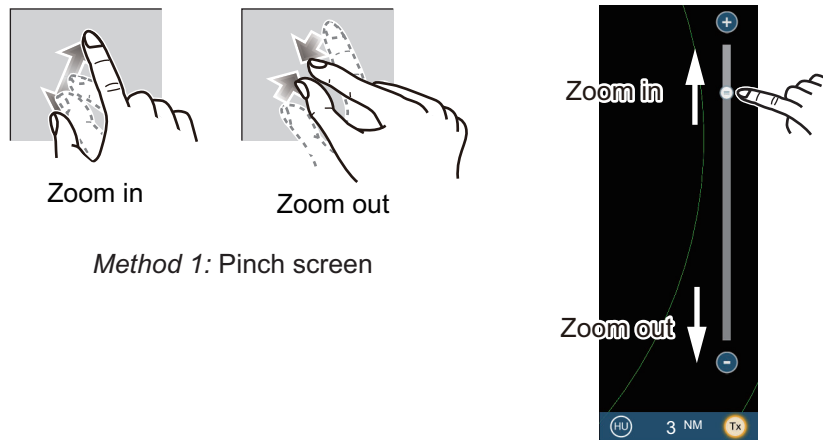
You have mounted the antenna unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually should appear on the heading line (zero degrees).

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.

2. INITIAL SETUP



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.



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: $+179.9^\circ$ to -180° , +: clockwise direction, -: counterclockwise direction), then tap the icon.
8. Confirm that the target echo is displayed at correct bearing on the screen.

2.4 Check Points After Installation

Before using the product, carry out the following:

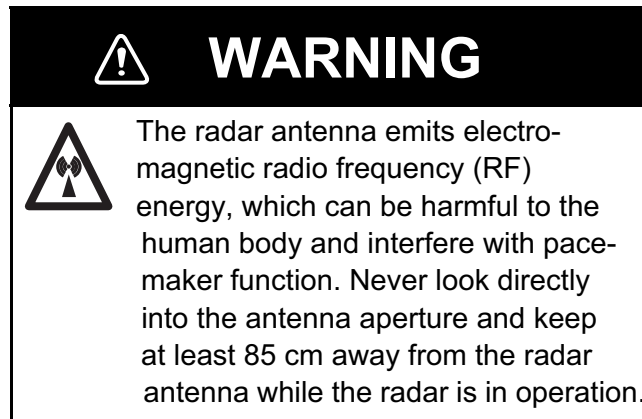
- Mechanical checks
- Turning the power on and initial setup

Mechanical checks

Check below points before switching on the DRS4DL+.

- All washers are in place and bolts are fully tightened.
- All connections are secure.
- All connecting cables and wires are secured.
- LAN cable is connected to the multi function display device.

Turning the power on and initial setup






Use the information in this manual and the manual for TZTL12F/TZTL15F/TZT9/TZT14/TZTBB* to power the sensor and to proceed with initial setup.

* Hereafter these units are referred to as “multi function display device”.

1. Press and hold down the power key of your multi function display device until the unit is ON. The magnetron warm-up sequence starts. When the warm-up sequence is completed, the unit goes into the standby mode.
Note: Power is supplied to the antenna unit even when the power is shut off at the display unit. If the radar is not to be used for an extended period, shut off the radar from the switchboard.
2. Ensure that all personnel are clear of antenna.
3. Take the appropriate action on your multi function display device to turn on the DRS4DL+.
4. If necessary, adjust the brightness and change the language on the multi function display device.
5. Check if the heading is correctly aligned - targets should appear at their correct bearing relative to the boat's bow. Adjust the alignment if necessary, referring to installation manual of your multi function display device.
6. Check the display timing, referring to installation manual of your multi function display device.

3. MAINTENANCE, TROUBLE-SHOOTING

 WARNING	NOTICE
 DO NOT OPEN THE SENSOR. Electrical shock hazard There are no user-serviceable parts inside. Only qualified personnel are allowed to work inside the equipment.	Do not use paint, anti-corrosion products, contact spray or other items containing organic solvents on the equipment. Organic solvents can harm paint and plastic, particularly the connectors.
 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.	

3.1 Maintenance

Regular maintenance is important for good performance. Check the points mentioned below every 3 to 6 months to keep the radar sensor in good working order. Observe the safety instructions at the front of this manual when working on the mast.

Check point	Action
Fixing bolts <ul style="list-style-type: none"> • Corrosion • If they are tightly fastened 	<ul style="list-style-type: none"> • Replace corroded bolts. • Tighten loosened bolts. • Coat new bolts with marine sealant.
Radome <ul style="list-style-type: none"> • Cracks • Foreign material 	If a crack is found, repair it temporarily with a small amount of sealing compound or adhesive. Bring the unit to your dealer for permanent repairs. Foreign material on the radome can cause a considerable drop in sensitivity. Remove foreign material with a freshwater-moistened cloth. Do not use commercial cleaners to clean the sensor; they can remove paint and markings or deform the plastic.

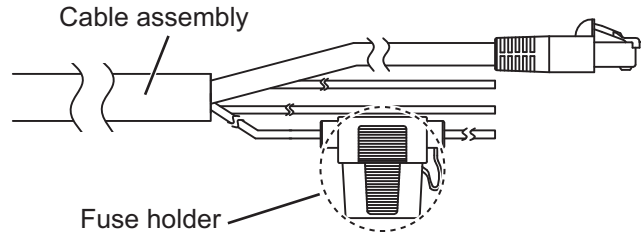
3.2 Replacement of Fuse

The fuse on the power cable protects the equipment from overcurrent and equipment fault. If the fuse blows, find the cause before you replace the fuse. Use the correct fuse. A wrong fuse can damage the equipment. If the fuse blows again, contact your dealer for advice.

WARNING

Use the proper fuse.

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



Fuse holder

How to replace the fuse

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

Type	Code No.	Remarks
FRU-2P5S-FU-5A-B	000-168-869-10	12-24 VDC

3.3 Troubleshooting

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

Trouble	Remedy
The power cannot be turned on.	<ul style="list-style-type: none"> • Check if the power/LAN cable is connected to the power source and the power source is on. Refer to the section 2.2. • Check the power cable for damage. • Check if the fuse has blown.
Picture is not updated or the picture freezes.	<ul style="list-style-type: none"> • Check antenna cable. • If the picture freezes, reboot the display unit.
Marks and characters appear on the display, but echoes do not appear.	Check that the antenna cable is fastened.
You changed the range, but the radar picture does not change.	<ul style="list-style-type: none"> • Try to zoom in or out the radar display. • Turn the power off and on.
Signal strength is too low.	Have a technician check the magnetron.

3.4 Replacement of Magnetron

When the life of the magnetron is reached, no targets appear on the display. If long range performance appears to have decreased, contact a FURUNO agent or dealer about replacement of the magnetron.

Name	Type	Code No.	Estimated life
Magnetron	80-0691	001-302-480	Approx. 5,000 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 at least 85 cm or more away from person's body.
- This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Canada-Industry Canada (IC)

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 at least 85 cm or more away from person's body.

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipement doit être installé et utilisé en gardant une distance de 85 cm ou plus entre le dispositif rayonnant et le corps.

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 DRS4DL+

1 RADIATOR

- 1.1 Antenna type Patch array antenna
- 1.2 Antenna length 19-inch
- 1.3 Horizontal beam width 5.2° typical (3 dB)
- 1.4 Vertical beam width 25° (3 dB)
- 1.5 Sidelobe attenuation -20 dB (within ±20°), -25 dB (±20° or more)
- 1.6 Rotation 24 rpm

2 RADAR FUNCTION

- 2.1 Tx frequency 9410±30 MHz, P0N
- 2.2 Output power 4 kW
- 2.3 Duplexer Ferrite circulator
- 2.4 Intermediate frequency 60 MHz
- 2.5 Range, Pulse length and Pulse repetition rate

Range (NM)	Pulse length (μs)	PRR (Hz approx.)
0.0625 to 0.5	0.08	360
0.75 to 2	0.3	360
3 to 36	0.8	360

- 2.6 Minimum range 25 m
- 2.7 Range resolution 25 m
- 2.8 Range accuracy 1 % of range in use or 0.01 NM, which is the greater
- 2.9 Bearing resolution 5.2°
- 2.10 Bearing accuracy ±1°
- 2.11 Warming up time 90 s

3 INTERFACE

- LAN 1 port, Ethernet 100Base-T, RJ45

4 POWER SUPPLY

12-24 VDC (10.8-31.2 V): 2.1-1.0 A (stand-by: 0.8-0.4 A)

5 ENVIRONMENTAL CONDITIONS

- 5.1 Ambient temperature -25°C to +55°C (storage: +70°C or less)
- 5.2 Relative humidity 95% or less at +40°C
- 5.3 Degree of protection IP26
- 5.4 Vibration IEC 60945 Ed.4

6 UNIT COLOR




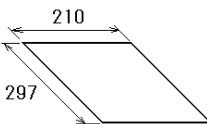
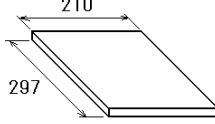
N9.5 (cover), 2.5PB3.5/10 (bottom)

PACKING LIST

031B-X-9851 -2 1/1

DRS4DL+E-MIJ

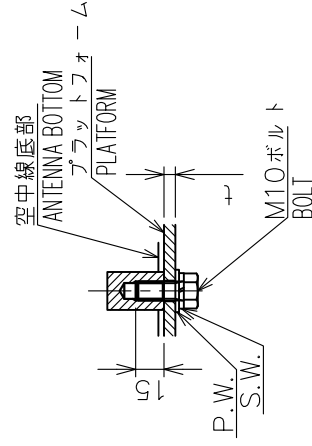
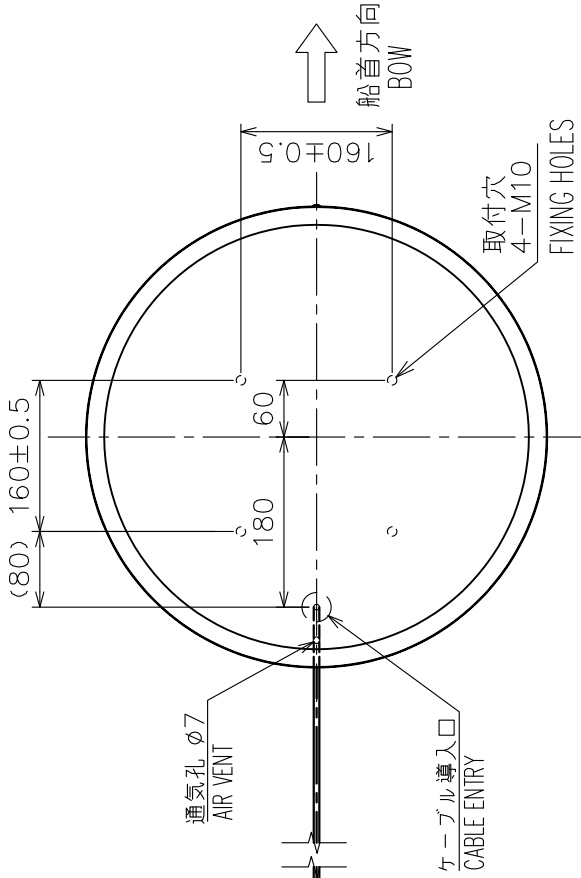
A-1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q' TY
ユニット UNIT			
空中線部 ANTENNA UNIT		RSB-127-120-E-MIJ 000-035-105-00	1
予備品 SPARE PARTS			
予備品 SPARE PARTS		SP03-19301 001-513-590-00	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP03-35701 001-351-480-00	1
図書 DOCUMENT			
型紙 TEMPLATE		E32-01314-* 000-178-948-1*	1
装備要領書 INSTALLATION MANUAL		IM*-36690-* 000-193-608-1*	1

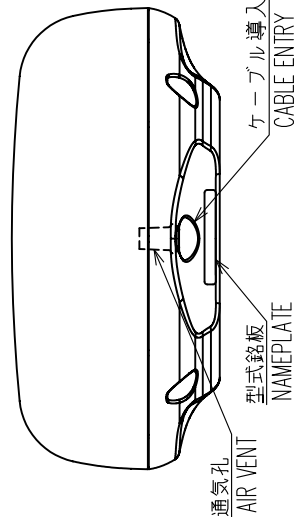
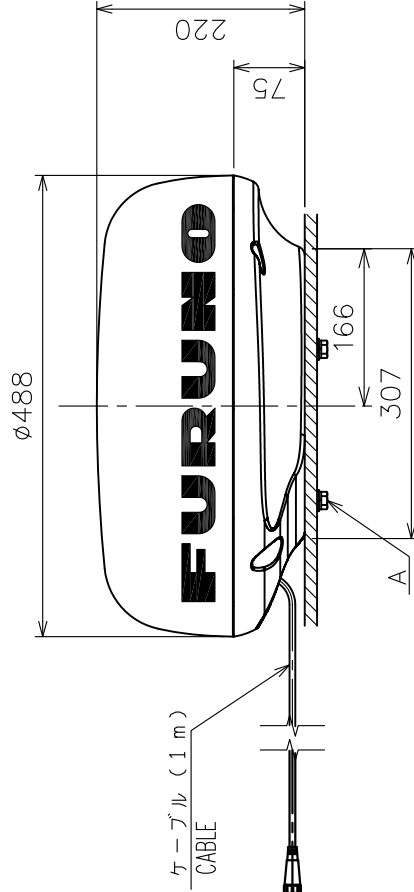
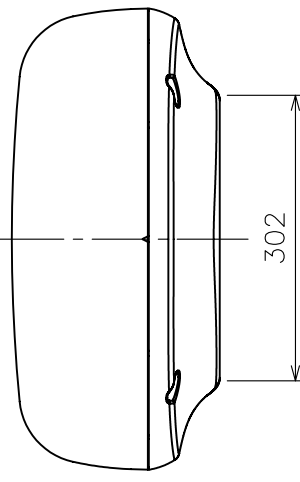
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

表 1 TABLE 1

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



A 部 詳細 (尺度: 1 / 4)
DETAIL OF A (SCALE: 1/4)



注 記

- 指定外の寸法公差は表 1 による。
- 取付用ネジは M10 ボルトを使用のこと。ネジ長さは板厚 (t) に応じ、 $20 (5 < t < 10)$ または $25 (5 < t < 10)$ とする。

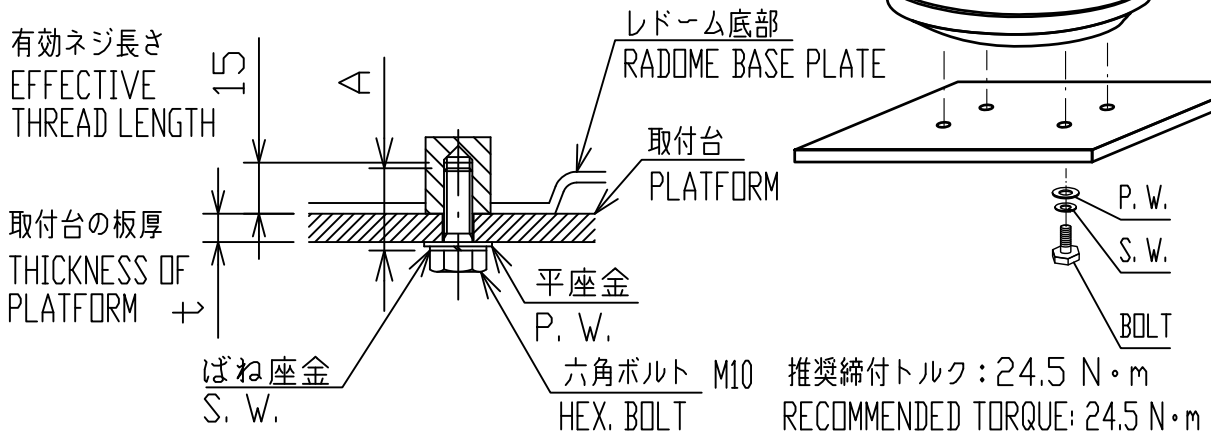
NOTE

- TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
- USE M10 BOLTS FOR FIXING THE UNIT. SCREW LENGTH SHOULD BE $20 (t \leq 5)$ OR $25 (5 < t < 10)$. t: THICKNESS OF PLATFORM.

DRAWN	21/Aug/2017 I.YAMASAKI	TITLE	RSB-127-104/120
CHECKED	21/Aug/2017 H.MAKI	名称	レーダーセンサー
APPROVED	23/Aug/2018 H.MAKI	外寸図	
SCALE	1/8 MASS 5.7 kg	質量はケーブル (1 m) を含む。 MASS INCLUDES 1m CABLE.	
FIG.No.	C-3637-601-C	REF.No.	03-184-310G-1

MODEL	1815
DRS/DL	
NAME	RADAR SENSOR
OUTLINE DRAWING	

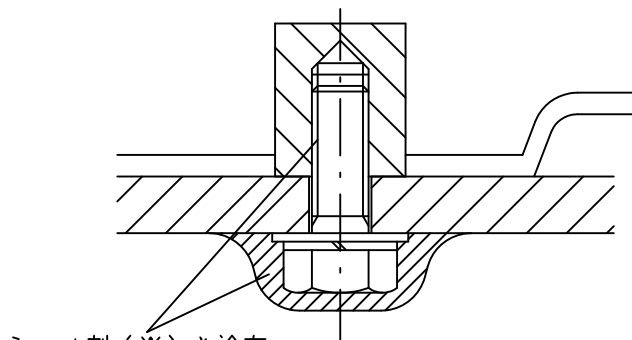
1. レドームアンテナ基部の取付 INSTALLATION FOR BOTTOM UNIT OF RADOME ANTENNA



工材のボルト (M10×25) で取付可能な板厚は5~10です。それ以外の板厚には必要なネジ長さ (A=t+15) のボルトを現地手配願います。

THE THICKNESS OF PLATFORM IS FROM 5 TO 10 WITH PROVIDED BOLTS (M10x25).
PREPARE THE BOLTS AT LOCALLY, FOR OTHER THICKNESS(t) OF PLATFORM. (A=t+15)

2. ボルト締付部の防水 WATERPROOFING FOR BOLT HEAD

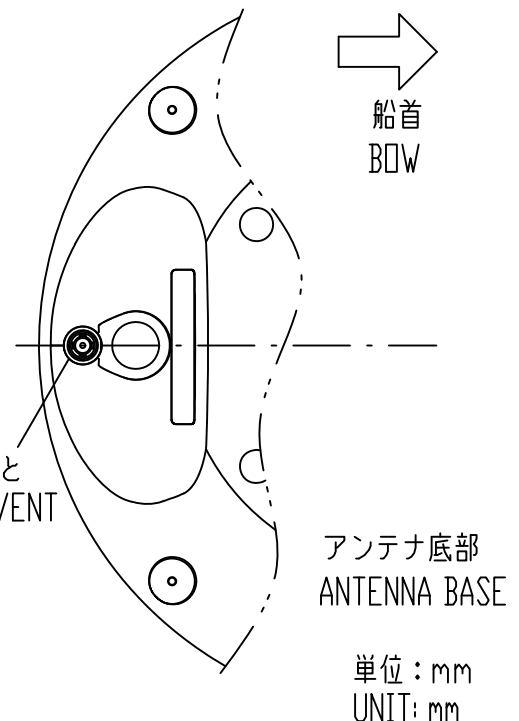


シール剤(※)を塗布
APPLY ADHESIVE(※)

※スリーボンドTB5211 (推奨)
THREE BOND TB5211 (RECOMMENDED)

3. 通気口の確保 KEEPING VENTIRATION

通気口をふさがらないこと
DO NOT COVER AIR VENT

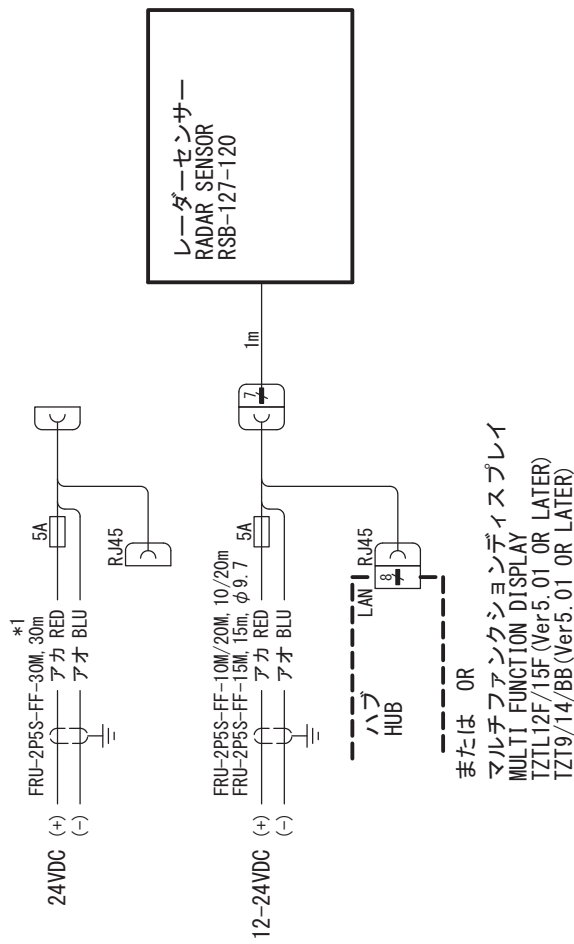


DRAWN	19/Oct/2021 T.YAMASAKI	TITLE	RADAR RADOME ANTENNA
CHECKED	19/Oct/2021 H.MAKI	名称	レーダーレドームアンテナ (締付トルク)
APPROVED	13/Dec/2021 H.MAKI		装備要領図
SCALE	- MASS - ±10% kg	NAME	TORQUE FOR FASTENING (RADOME ANTENNA)
DWG. No.	C3900-Y02-A	REF. No.	INSTALLATION PROCEDURE

4

3

2



注記

* 1) 30mケーブル使用時は24Vに接続のこと。

NOTE

*1: 30m CABLE REQUIRES 24V SOURCE.

DRAWN	24/Dec/2020	T. YAMASAKI	TITLE	DRS4DL+
CHECKED	24/Dec/2020	H. MAKI	名称	レーダーセンサー
APPROVED	19/Jan/2021	H. MAKI		相互結線図
SCALE	MASS	kg	NAME	RADAR SENSOR
DWG. No.	C3669-C01-B	REF. No.	03-184-6012-1	INTERCONNECTION DIAGRAM

Declaration of Conformity

[DRS4DL+]

Bulgarian (BG)	<p>С настоящото Furuno Electric Co., Ltd. декларира, че гореспоменат тип радиосъоръжение е в съответствие с Директива 2014/53/ЕС. Цялостният текст на ЕС декларацията за съответствие може да се намери на следния интернет адрес:</p>
Spanish (ES)	<p>Por la presente, Furuno Electric Co., Ltd. declara que el tipo de equipo radioeléctrico arriba mencionado es conforme con la Directiva 2014/53/UE. El texto completo de la declaración UE de conformidad está disponible en la dirección Internet siguiente:</p>
Czech (CS)	<p>Tímto Furuno Electric Co., Ltd. prohlašuje, že výše zmíněné typ rádiového zařízení je v souladu se směrnicí 2014/53/EU. Úplné znění EU prohlášení o shodě je k dispozici na této internetové adrese:</p>
Danish (DA)	<p>Hermed erklærer Furuno Electric Co., Ltd., at ovennævnte radioudstyr er i overensstemmelse med direktiv 2014/53/EU. EU-overensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse:</p>
German (DE)	<p>Hiermit erkläre die Furuno Electric Co., Ltd., dass der oben genannte Funkanlagentyp der Richtlinie 2014/53/EU entspricht. Der vollständige Text der EU-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar:</p>
Estonian (ET)	<p>Käesolevaga deklareerib Furuno Electric Co., Ltd., et ülalmainitud raadioseadme tüüp vastab direktiivi 2014/53/EL nõuetele. ELi vastavusdeklaratsiooni täielik tekst on kättesaadav järgmisel internetiaadressil:</p>
Greek (EL)	<p>Με την παρούσα η Furuno Electric Co., Ltd., δηλώνει ότι ο προαναφερθέντας ραδιοεξοπλισμός πληροί την οδηγία 2014/53/ΕΕ. Το πλήρες κείμενο της δήλωσης συμμόρφωσης ΕΕ διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο:</p>
English (EN)	<p>Hereby, Furuno Electric Co., Ltd. declares that the above-mentioned radio equipment type is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address:</p>
French (FR)	<p>Le soussigné, Furuno Electric Co., Ltd., déclare que l'équipement radioélectrique du type mentionné ci-dessus est conforme à la directive 2014/53/UE. Le texte complet de la déclaration UE de conformité est disponible à l'adresse internet suivante:</p>
Croatian (HR)	<p>Furuno Electric Co., Ltd. ovime izjavljuje da je gore rečeno radijska oprema tipa u skladu s Direktivom 2014/53/EU. Cjeloviti tekst EU izjave o sukladnosti dostupan je na sljedećoj internetskoj adresi:</p>
Italian (IT)	<p>Il fabbricante, Furuno Electric Co., Ltd., dichiara che il tipo di apparecchiatura radio menzionato sopra è conforme alla direttiva 2014/53/UE. Il testo completo della dichiarazione di conformità UE è disponibile al seguente indirizzo Internet:</p>
Latvian (LV)	<p>Ar šo Furuno Electric Co., Ltd. deklarē, ka augstāk minēts radioiekārta atbilst Direktīvai 2014/53/ES. Pilns ES atbilstības deklarācijas teksts ir pieejams šādā interneta vietnē:</p>

Lithuanian (LT)	Aš, Furuno Electric Co., Ltd., patvirtinu, kad pirmiau minėta radijo įrenginių tipas atitinka Direktyvą 2014/53/ES. Visas ES atitikties deklaracijos tekstas prieinamas šiuo interneto adresu:
Hungarian (HU)	Furuno Electric Co., Ltd. igazolja, hogy fent említett típusú rádióberendezés megfelel a 2014/53/EU irányelvnek. Az EU-megfelelőségi nyilatkozat teljes szövege elérhető a következő internetes címen:
Maltese (MT)	B'dan, Furuno Electric Co., Ltd., niddikjara li msemmija hawn fuq-tip ta' tagħmir tar-radju huwa konformi mad-Direttiva 2014/53/UE. It-test kollu tad-dikjarazzjoni ta' konformità tal-UE huwa disponibbli f'dan l-indirizz tal-Internet li ġej:
Dutch (NL)	Hierbij verklaar ik, Furuno Electric Co., Ltd., dat het hierboven genoemde type radioapparaat conform is met Richtlijn 2014/53/EU. De volledige tekst van de EU-conformiteitsverklaring kan worden geraadpleegd op het volgende internetadres:
Polish (PL)	Furuno Electric Co., Ltd. niniejszym oświadczam, że wyżej wymieniony typ urządzenia radiowego jest zgodny z dyrektywą 2014/53/UE. Pełny tekst deklaracji zgodności UE jest dostępny pod następującym adresem internetowym:
Portuguese (PT)	O(a) abaixo assinado(a) Furuno Electric Co., Ltd. declara que o mencionado acima tipo de equipamento de rádio está em conformidade com a Diretiva 2014/53/UE. O texto integral da declaração de conformidade está disponível no seguinte endereço de Internet:
Romanian (RO)	Prin prezenta, Furuno Electric Co., Ltd. declară că menționat mai sus tipul de echipamente radio este în conformitate cu Directiva 2014/53/UE. Textul integral al declarației UE de conformitate este disponibil la următoarea adresă internet:
Slovak (SK)	Furuno Electric Co., Ltd. týmto vyhlasuje, že vyššie spomínané rádiové zariadenie typu je v súlade so smernicou 2014/53/EÚ. Úplné EÚ vyhlásenie o zhode je k dispozícii na tejto internetovej adrese:
Slovenian (SL)	Furuno Electric Co., Ltd. potrjuje, da je zgoraj omenjeno tip radijske opreme skladen z Direktivo 2014/53/EU. Celotno besedilo izjave EU o skladnosti je na voljo na naslednjem spletnem naslovu:
Finnish (FI)	Furuno Electric Co., Ltd. vakuuttaa, että yllä mainittu radiolaitetyyppi on direktiivin 2014/53/EU mukainen. EU-vaatimusten mukaisuusvakuutuksen täysimittainen teksti on saatavilla seuraavassa internetosoitteessa:
Swedish (SV)	Härmed försäkrar Furuno Electric Co., Ltd. att ovan nämnda typ av radioutrustning överensstämmer med direktiv 2014/53/EU. Den fullständiga texten till EU-försäkran om överensstämmelse finns på följande webbadress:

Online Resource

http://www.furuno.com/en/support/red_doc

ECF

(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

FURUNO ELECTRIC CO., LTD.

9-52 Ashihara-cho,
Nishinomiya, 662-8580, JAPAN

• FURUNO Authorized Distributor/Dealer

All rights reserved. Printed in Japan

Pub. No. IME-36690-C

(TASU) DRS4DL+

A : MAY 2017

C : JUN. 22, 2022



0 0 0 1 9 3 6 0 8 1 2