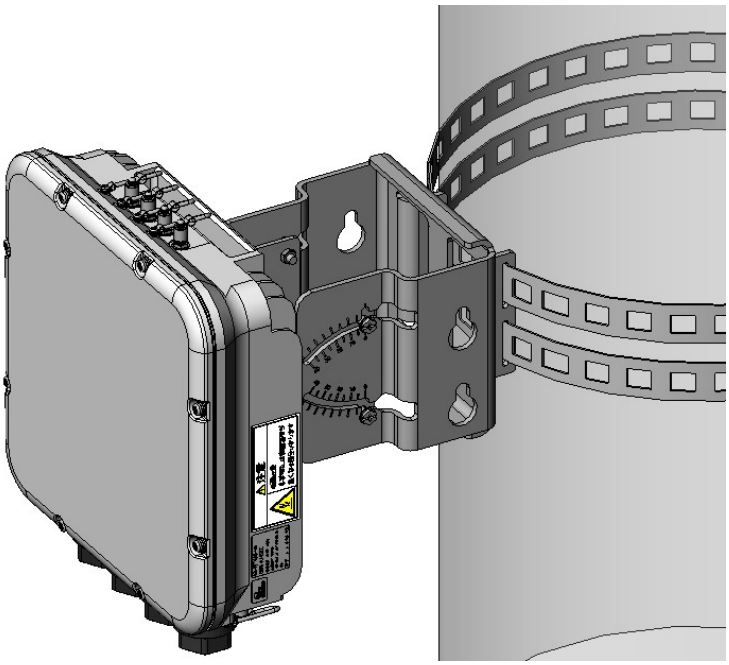
GGS-001385-001
February 2023

NEC

PF54A0-rb480-85

PF54A0-mb480-85

INSTALLATION



NEC Platforms, Ltd.

GGS-001385-001

© 2023 by NEC Platforms, Ltd.

GGS-001385-001

Printed in Japan

O-RU

Installation work

Table of contents

1. OVERVIEW 1-1

2. CONFIGURATION 2-3

2.1 OVERVIEW 2-3
2.2 POWER SUPPLY UNIT AND CIRCUIT BREAKER 2-3
2.2.1 When Using DC Power Input Port (DC –48 V) 2-3
2.2.2 When Using LAN (PoE) Port 2-4
2.3 SYSTEM CONFIGURATION AND REQUIRED MEMBERS 2-7
2.3.1 External Antenna Type/Internal Antenna Type 2-7
2.4 APPEARANCE OF MEMBERS 2-8
2.4.1 O-RU Main Unit 2-8
2.4.3 Fixing Brackets 2-9

3. UNPACKING O-RU 3-1

4. INSTALLING O-RU 4-1

4.1 INSTALLATION OF THE EQUIPMENT 4-1
4.2 INSTALLING O-RU 4-2
4.2.1 Install O-RU on the Pole(Internal antenna type) 4-2
4.3 INSTALL O-RU ON THE POLE(EXTERNAL ANTENNA TYPE) 4-10
4.4 MOUNTING SFP MODULE 4-14

5. CONNECTING CABLES 5-1

5.1 OVERVIEW 5-1
5.2 CONNECTION CONFIGURATION DIAGRAM 5-2
5.2.1 O-RU 5-2
5.3 GROUNDING CABLE 5-3
5.4 POWER CABLE 5-4
5.5 LAN CABLES 5-9
5.5.1 MAINT/PoE Port (RJ-45) 5-9
5.5.2 MFH/MAINT Port (SFP28/SFP+,SFP+) 5-9
5.6 CONNECTING TO EXTERNAL ANTENNAS (EXTERNAL ANTENNA TYPE ONLY) 5-10
5.6.1 Installing External Antennas 5-10
5.6.2 Connecting External Antennas to O-RU 5-10
5.7 LAYING CABLES 5-11
5.7.2 Secure Cables 5-11
5.8 CABLE CREATION (ASSEMBLING) 5-12
5.8.1 Grounding Cable 5-12
5.8.2 Power Cable (2-Core Cable) 5-14

6. GROUNDING O-RU 6-1

7. START, STOP, AND MAINTENANCE 7-1

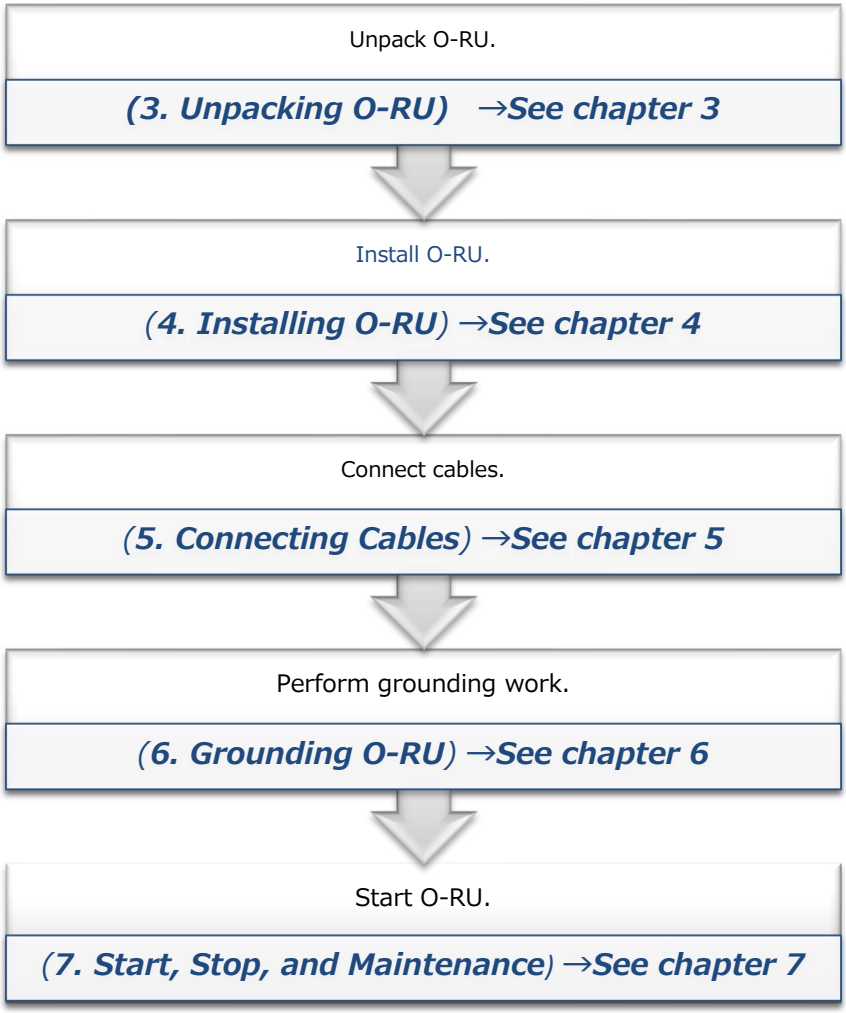
7.1 START O-RU 7-1
7.1.1 Basic Operations 7-1
7.2 STOP O-RU 7-2

7.3 EQUIPMENT STATUS DISPLAY 7-3
7.4 FAILURE MANAGEMENT 7-4
7.5 FAULT MANAGEMENT 7-5
7.6 FAULT MANAGEMENT LOG ACQUISITION METHOD 7-6

1.Overview

This section summarizes the standard installation work. The following is the workflow for the installation work.

Figure 1-1 Installation Flow



This page is intentionally left blank.

2.Configuration

2.1 Overview

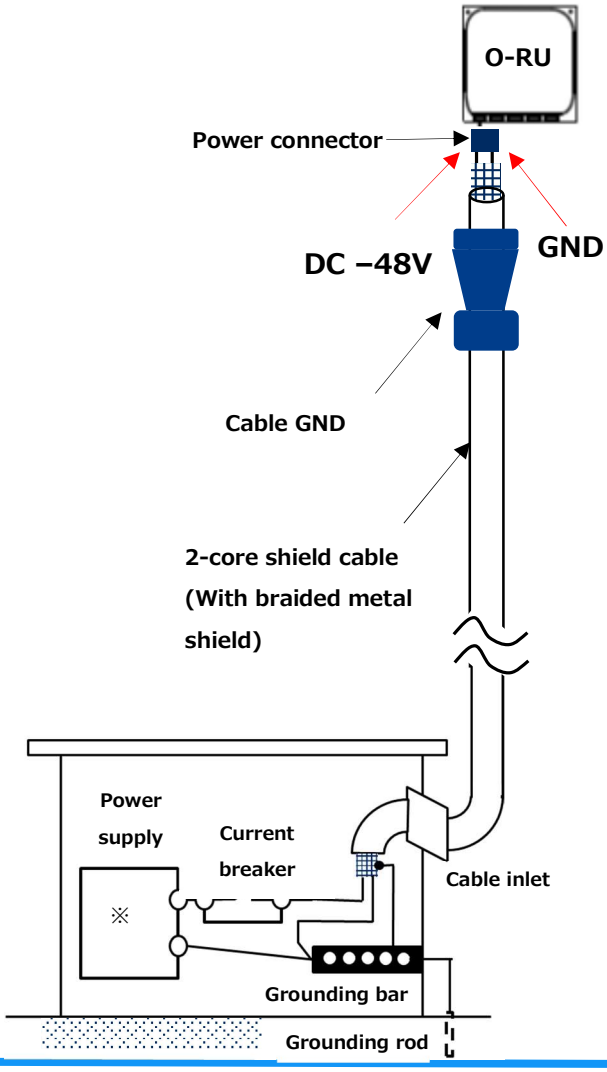
The content items are described below. The O-RU main unit and parts are required for O-RU setup. Please check before starting the installation work.

2.2 Power Supply Unit and Circuit Breaker

O-RU does not have a power on/off switch. O-RU requires an external circuit breaker or breaker function. Please see below.

2.2.1 When Using DC Power Input Port (DC –48 V)

Figure 2-1 Power Supply Unit and Circuit Breaker (standard)



・points of installation

1. Use a power cable with braided metal shield.

2. Connect the metal shielded stranding of the shield conducting wire to the common ground bar at the bottom of the tower or cabinet

3. Do not connect the metal shielded stranding of the shield conducting wire to the frame ground (FG) of the equipment. (Do not expose or connect the shield conductor near the equipment at the top of the tower.)

※Please set the DC power input voltage of the O-RU to DC -48V, taking into account cable loss.

2.2.2 When Using LAN (PoE) Port

When the PoE port is used to supply power, the –48 V DC power port cannot be used. You cannot use both the –48 V DC power port and PoE port at the same time and need to choose one of them at a time.

This equipment complies with the international standard (IEC61000-4-5). Use an external surge protector to further increase the surge capacity.

Note: Recommended specification of the surge protector

Standard IEC 61643 -21 compliant

Specification +/-10kV, 5kA, 8/20μsec

Figure 2-2 When using AC PoE Module Outdoors

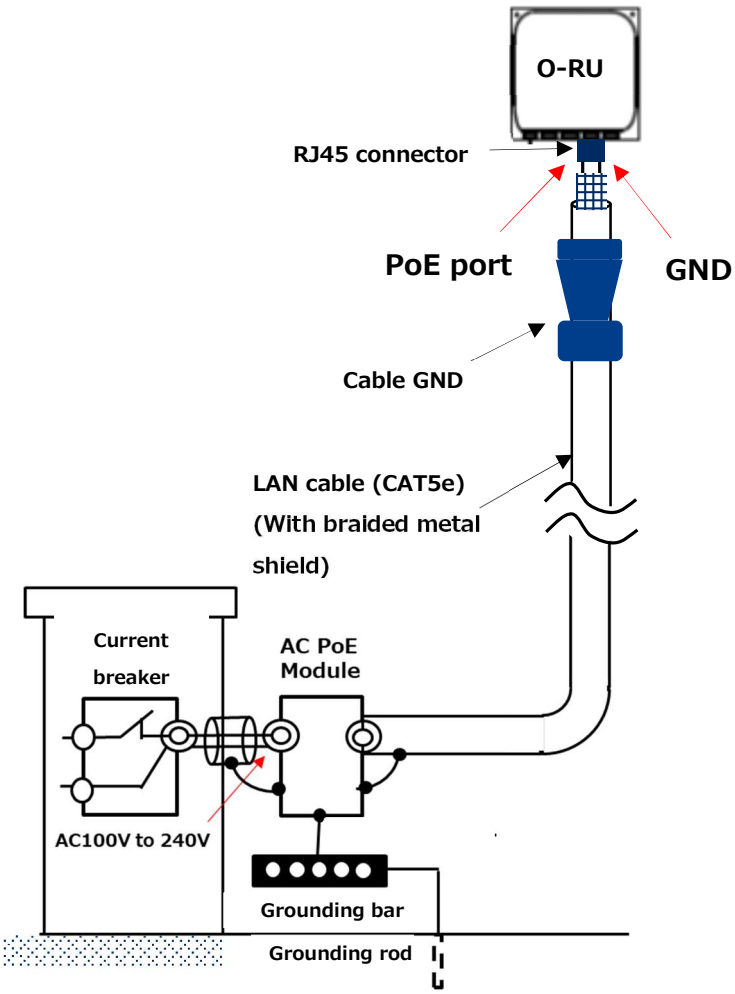
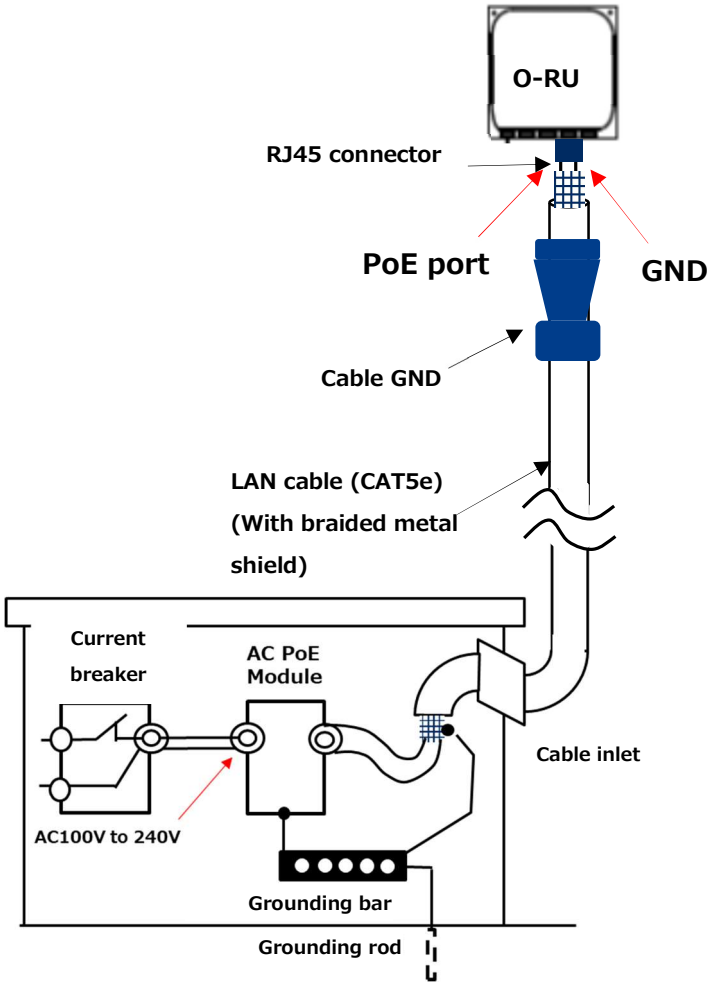


Figure 2-3 When using AC PoE Module Indoors



2.3 System Configuration and Required Members

2.3.1 External Antenna Type/Internal Antenna Type

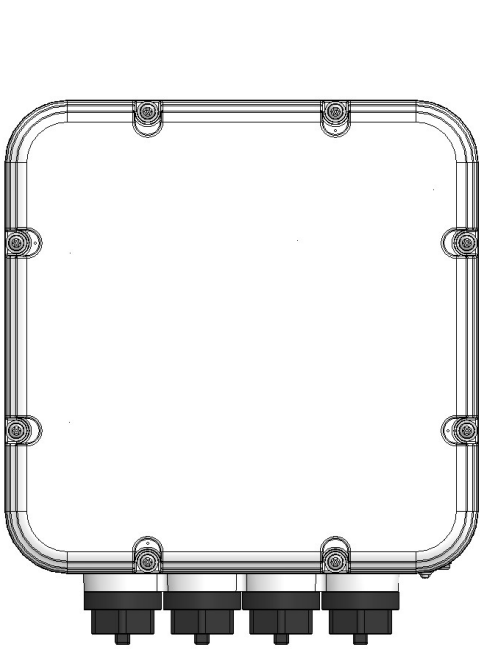
Table 2-1 O-RU Components

CONTENTS	QTY	DESCRIPTION
O-RU	1	PF54A0-rb480-85: NWA-A14522 External antenna type PF54A0-mb480-85: NWA-A14522 Internal antenna type
PoE injector	1	LTPoE++; PoE++(future support)
Power cable	1	Double-Insulated with braided metal shield; with Waterproofing Cap
LAN cable (electrical)	1	For MAINT/PoE Port; RJ-45; Double-shielded; with Waterproofing Cap.
LAN cable (optical)	1 or 2	For MFH and MAINT Ports; LC; with Waterproofing Cap
Grounding cable	1	O-RU must be grounded.
Fixing brackets	2	

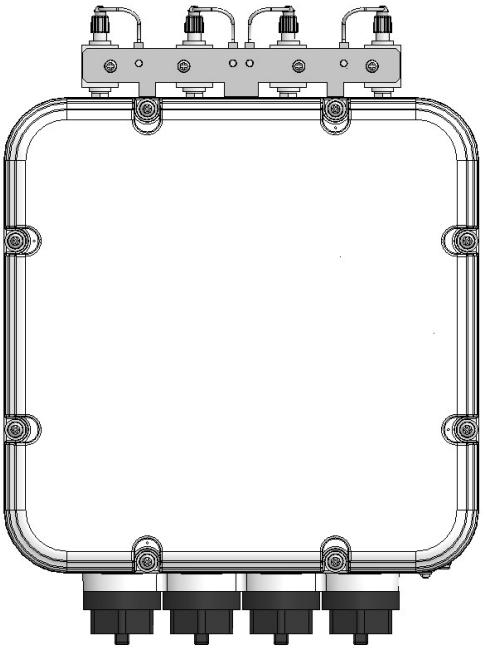
2.4 Appearance of Members

2.4.1 O-RU Main Unit

Figure 2-3 O-RU



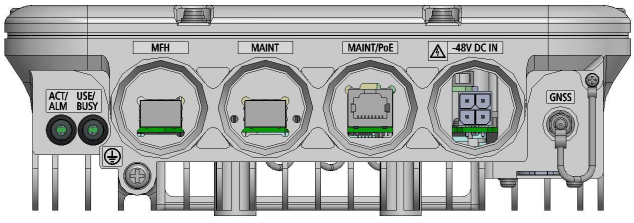
Internal antenna type



External antenna type

(FRONT VIEW)

(PORT-SIDE VIEW)



2.4.3 Fixing Brackets

Figure 2-4 Appearance of Internal Antenna Type Fixing Bracket

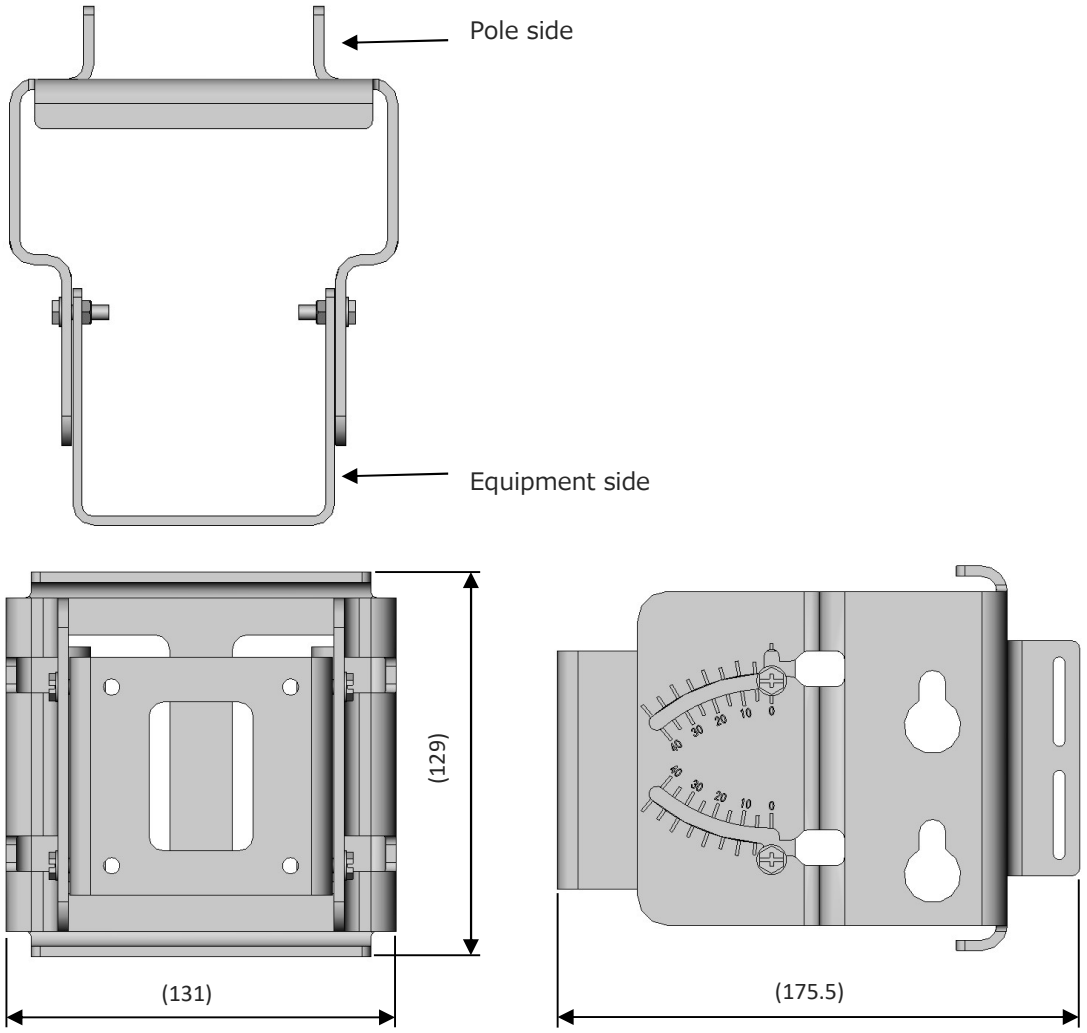
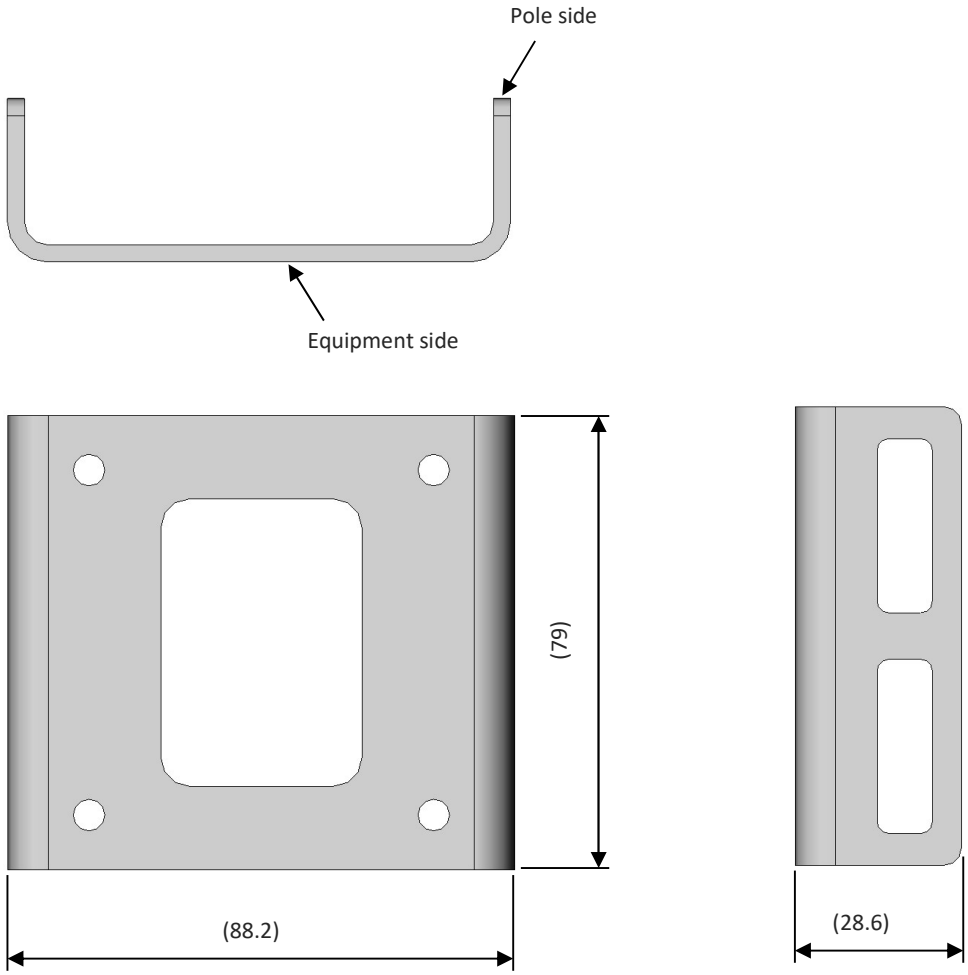


Figure 2-5 Appearance of External Antenna Type Fixing Bracket



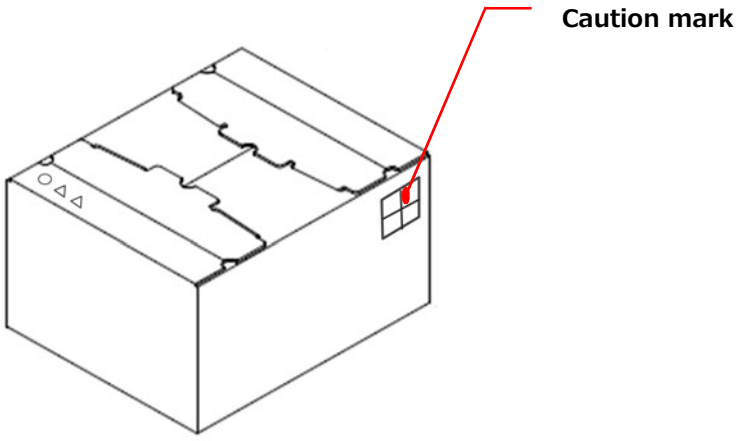
3.Unpacking O-RU

The below describes how to unpack O-RU.

NOTE: Keep the packing box. If the equipment needs to be moved, packing box can be used to prevent damage to the equipment.

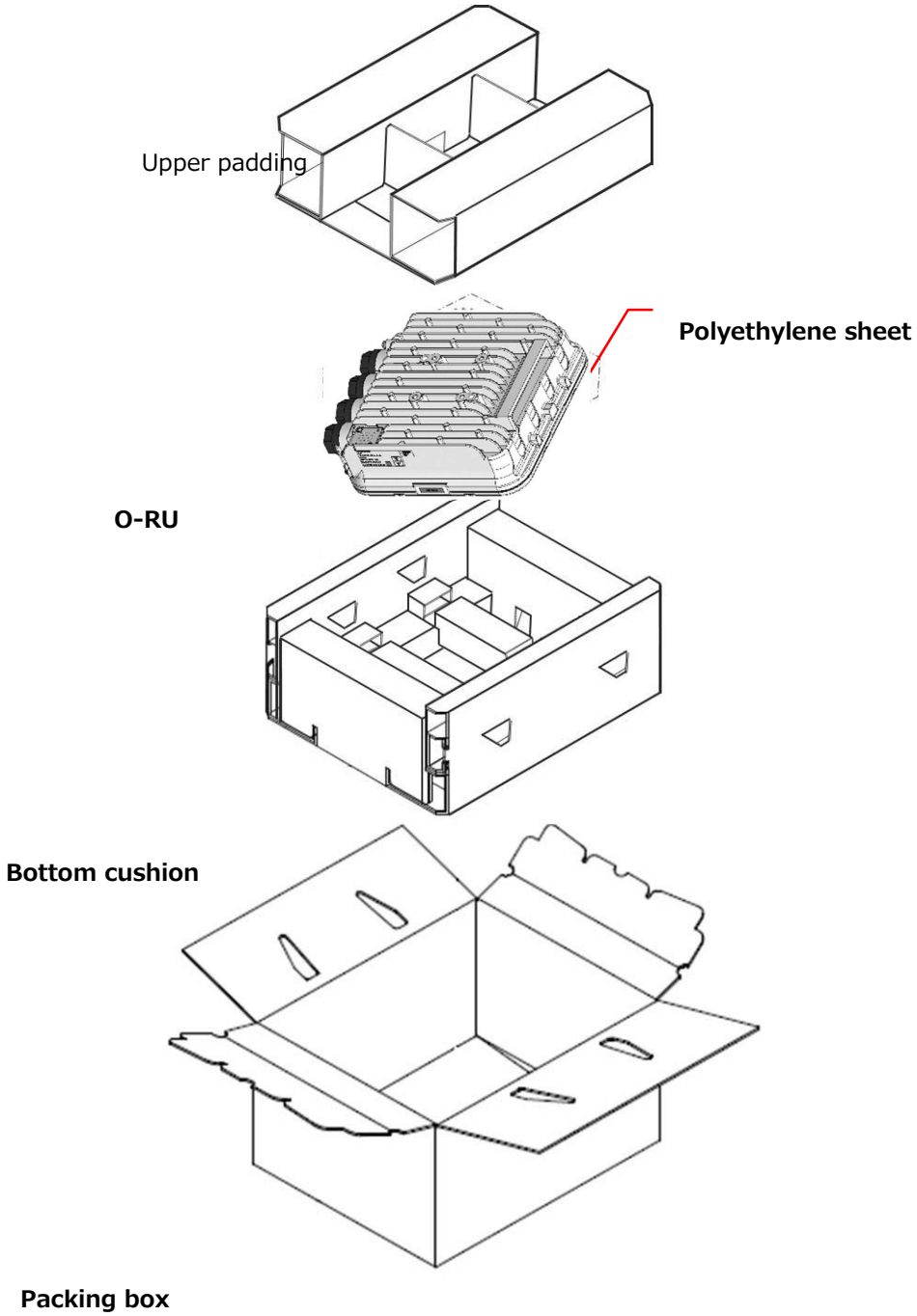
1 Open the top cover and unpack the equipment.

Figure 3-1 Packing Box



2 Remove the contents from the packing box. The equipment is boxed as follows.

Figure 3-2 Packing Condition



3 Remove the polyethylene sheet from the O-RU.

4 Check the O-RU.

This step concludes the procedure.

4.Installing O-RU

This section describes installation instructions to mount O-RU and its antenna on the pole. For details on antenna installation, refer to the instruction manual that came with the antenna.

The tools required for installation are as follows.

Table 4-1 Tools

TOOLS
Wrench, monkey wrench
Driver
Torque wrench

4.1 Installation of the Equipment

◆NOTES

1 O-RU is designated for outdoor use because it produces non-ionizing radiation. If installed indoors, it may cause bodily harm or property damage.

2 O-RU must be installed as follows.

・Verify that the equipment is installed in the correct location. Do not install it in unstable areas. Improper installation can increase the temperature inside and damage the equipment.

・Operations of the equipment should be limited to well-trained service persons or operators with sufficient skill and knowledge of the required regulations, precautions, and installation sites.

・The installation site should be protected by the use of lock and key or equivalent security and managed by the responsible site manager.

・The other end of the grounding cable connected to the grounding terminal must be connected to the grounding point of the wireless station building. For more details, refer to “6. Grounding O-RU”.

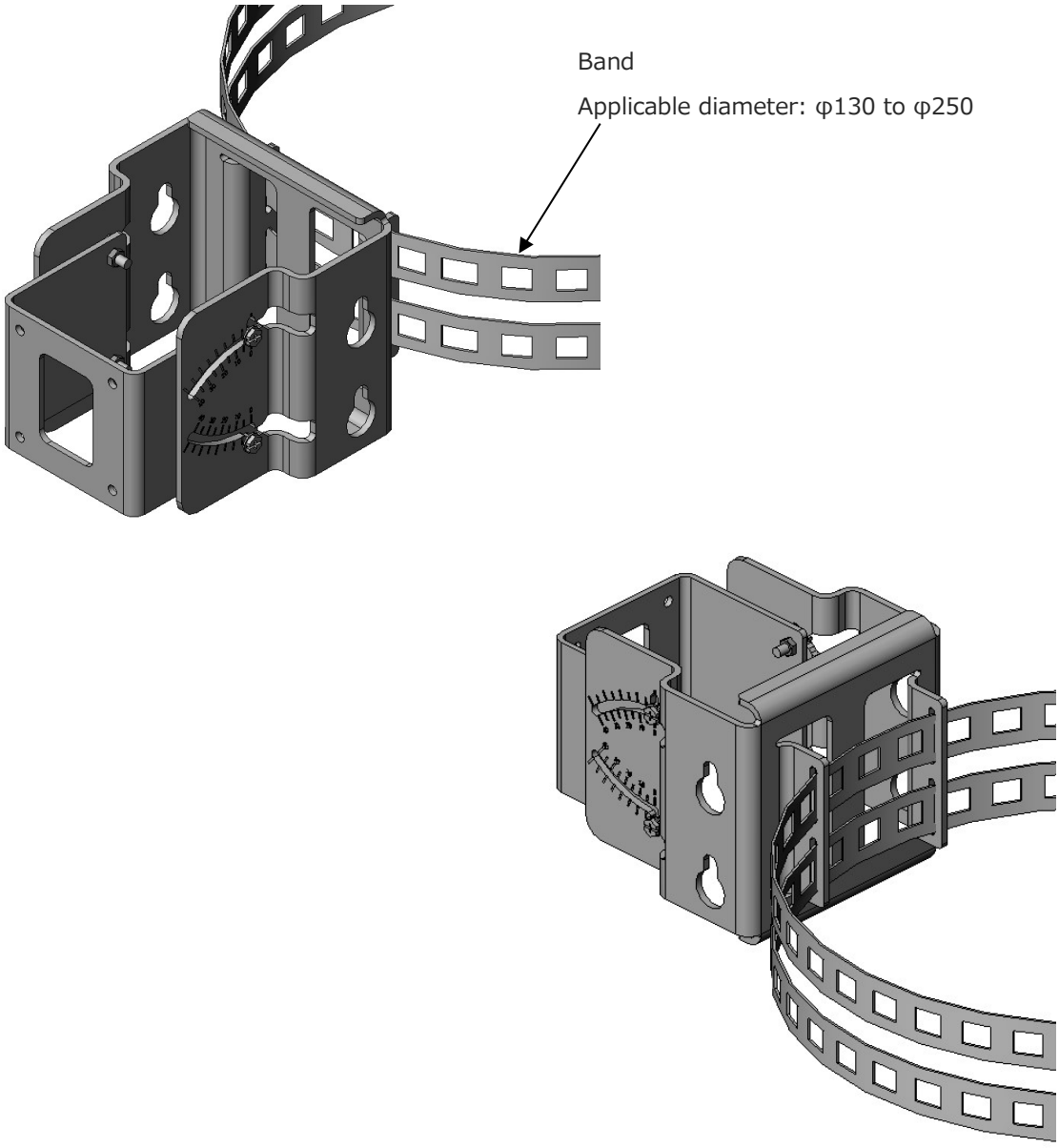
・When removing the Equipment, the protective grounding cable must be removed after turning off the power to the Equipment. (To prevent electric shock)

4.2 Installing O-RU

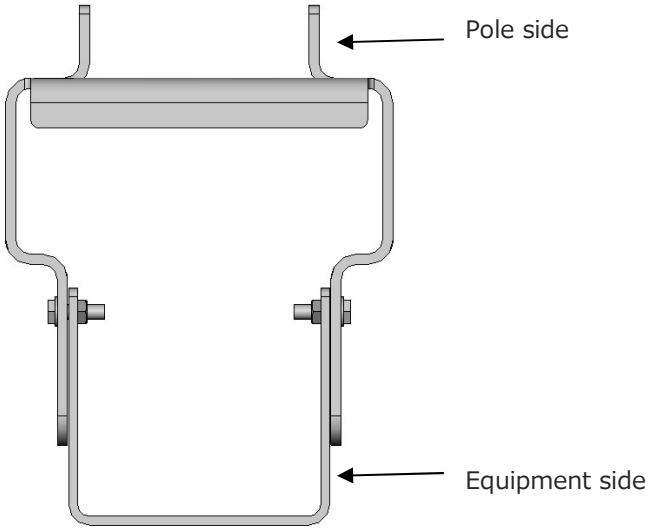
4.2.1 Install O-RU on the Pole (Internal antenna type)

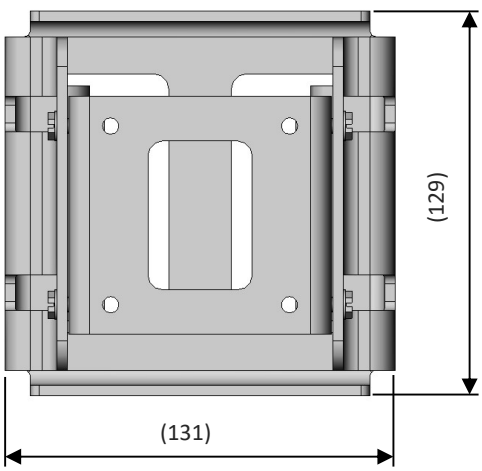
The location to attach O-RU to the pole depends on the usage.

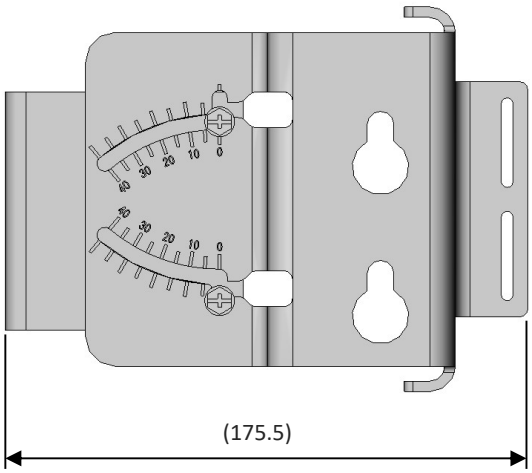
Appearance of fixing bracket (Internal antenna type)



Appearance of fixing bracket (Internal antenna type) (continued)

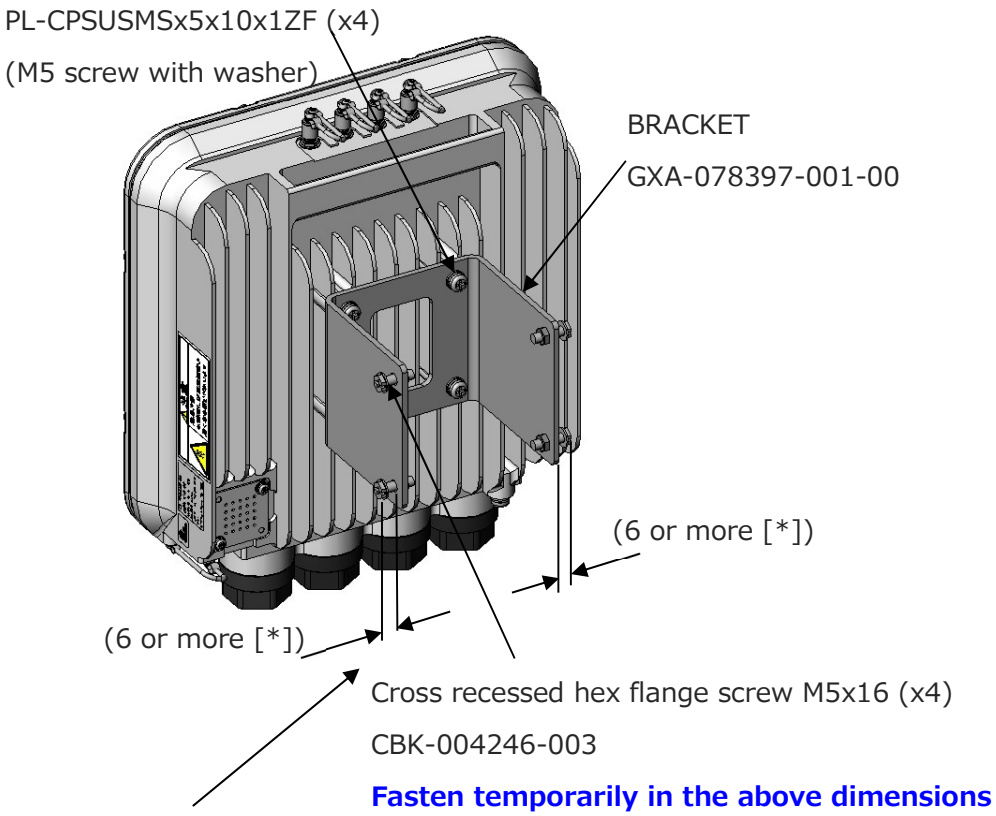






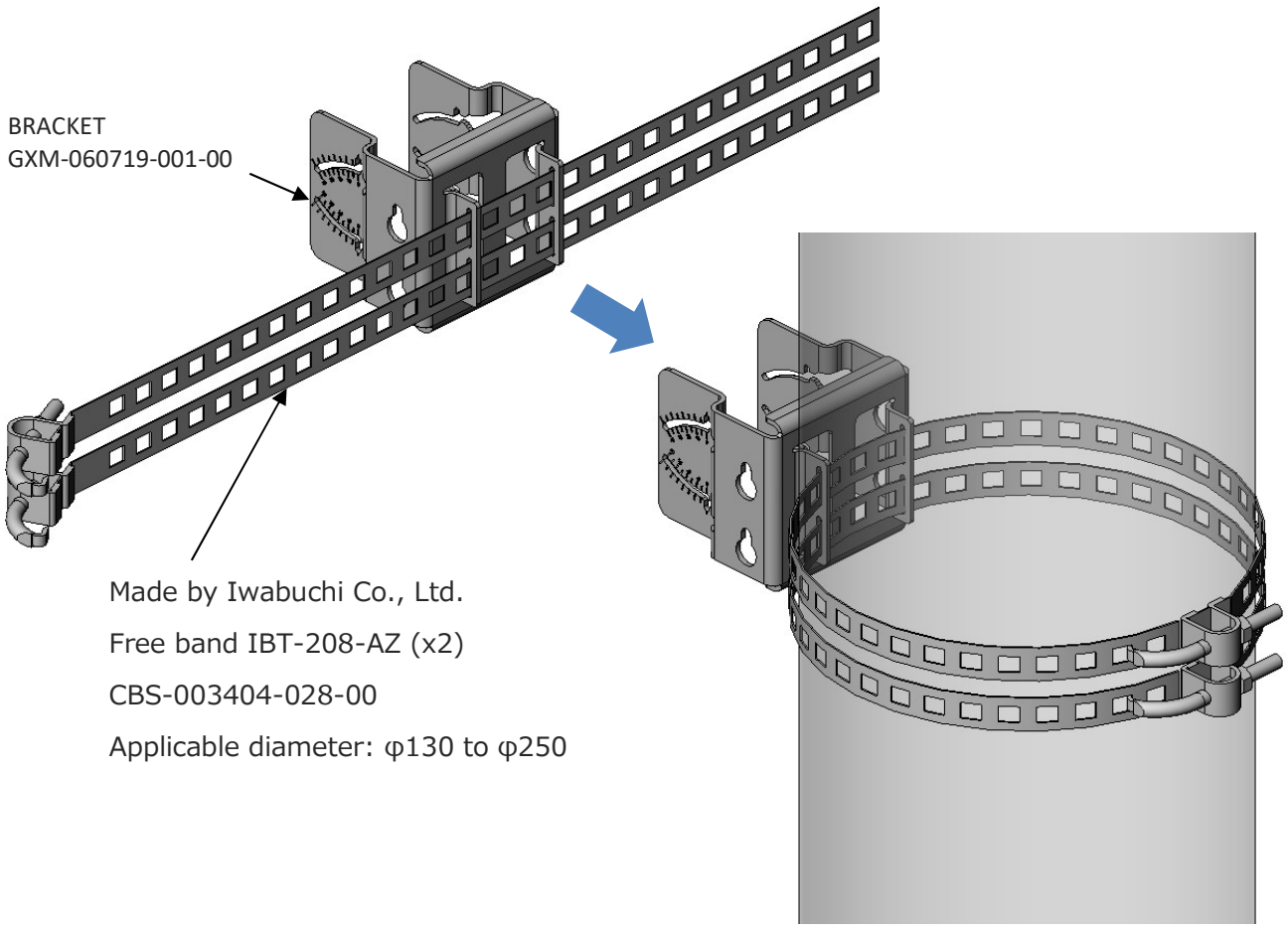
1 Use the M5 screws to mount the bracket (equipment side) to the O-RU. (4 locations)
NOTE: Tightening torque is 2.5 ± 0.5 Nm.

Figure 4-1 Mounting O-RU



* Distance from under the neck of the screw to the bracket

2 Mount the free band to the pole-side bracket (pole-side).



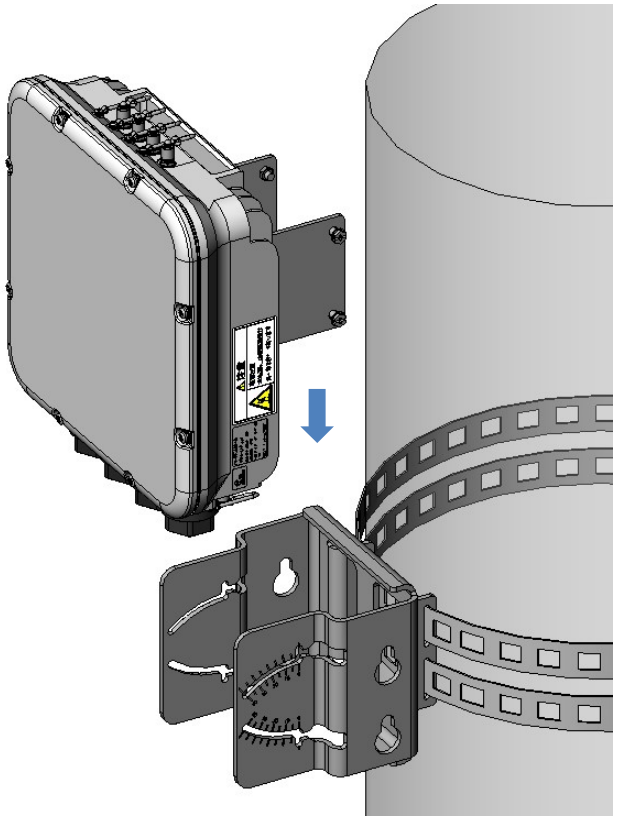
Made by Iwabuchi Co., Ltd.

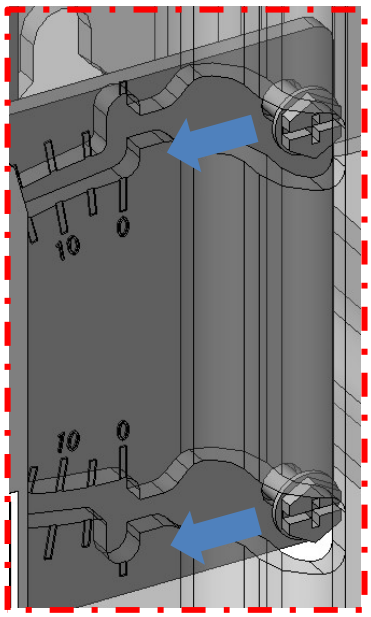
Free band IBT-208-AZ (x2)

CBS-003404-028-00

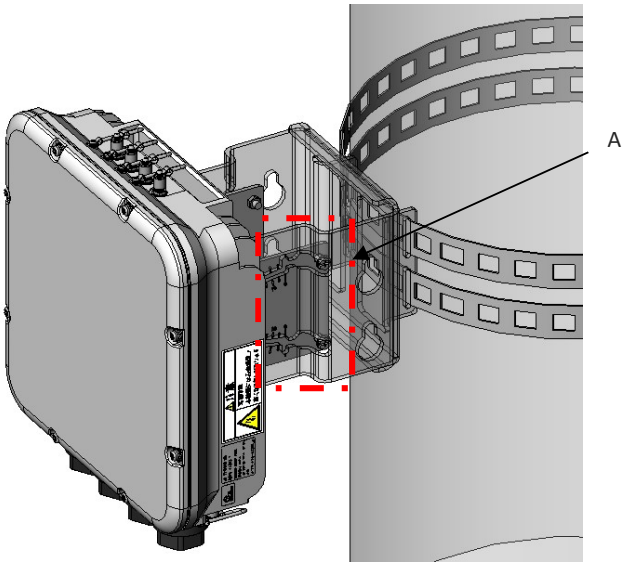
Applicable diameter: φ130 to φ250

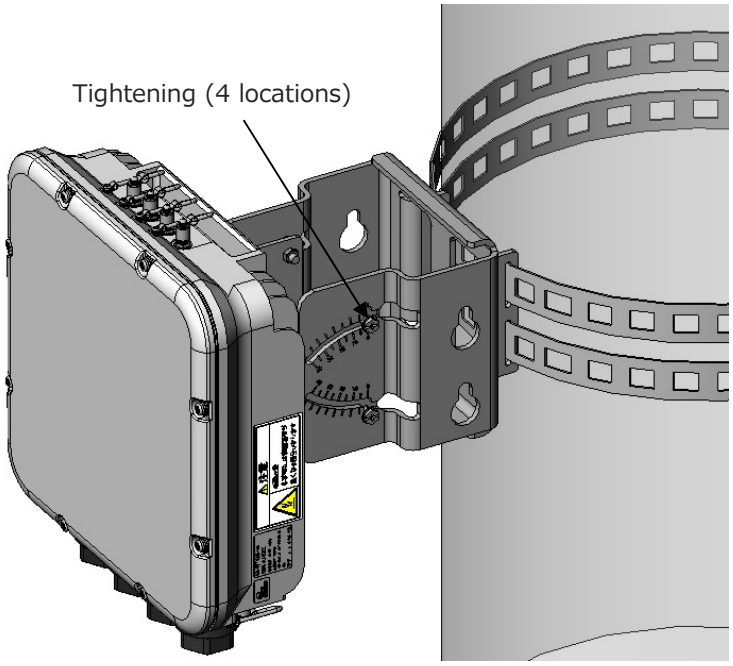
3 Combine the items assembled in steps 1 and 2.





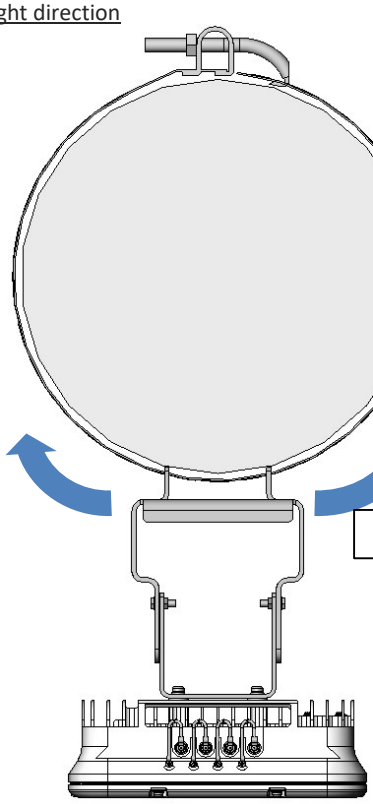
Enlargement of part A below



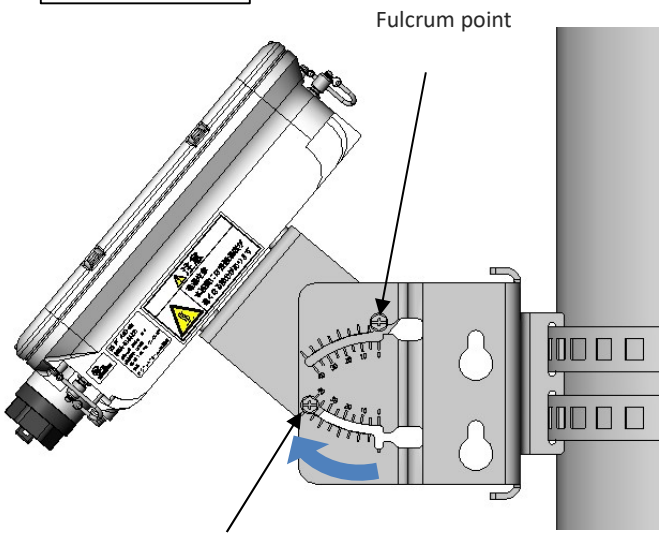

Tightening (4 locations)

4 Adjust the installation accuracy of the equipment. (For internal antenna type only)

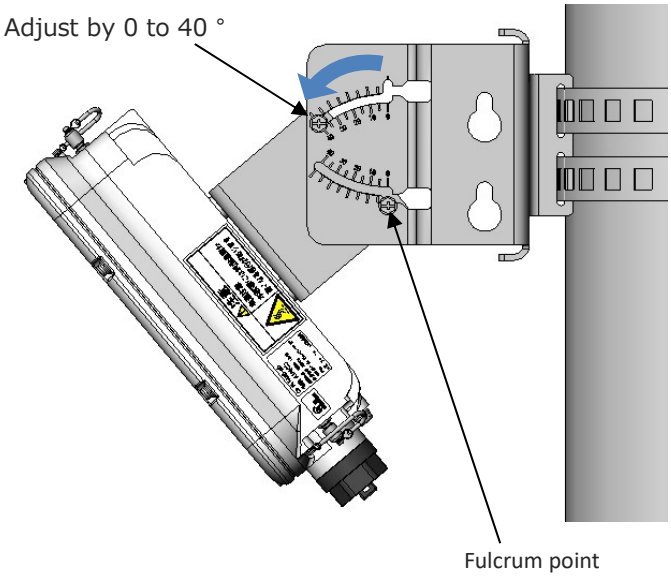
Left/right direction



Upward direction



Downward direction

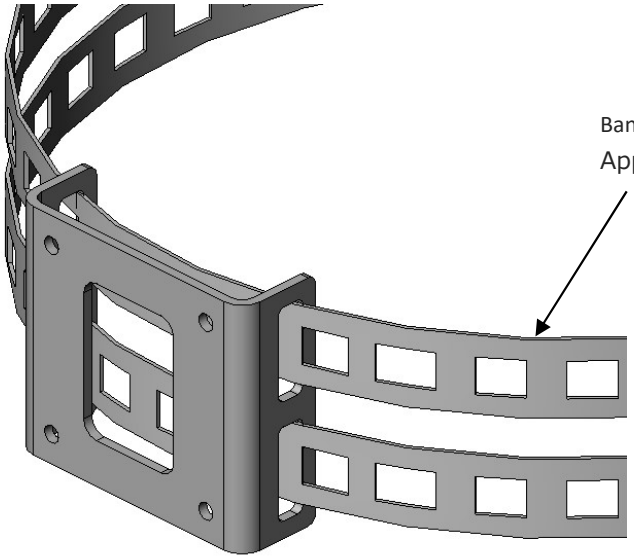


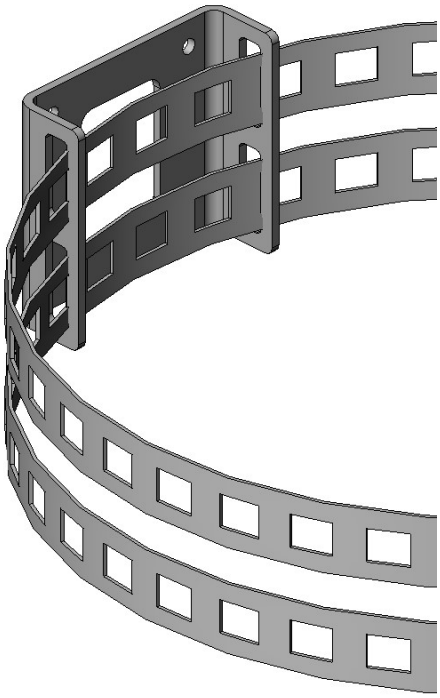
- Loosen four screws when adjusting the direction.
- Be sure to support the equipment with your hands while adjusting the equipment.

4.3 Install O-RU on the Pole (External antenna type)

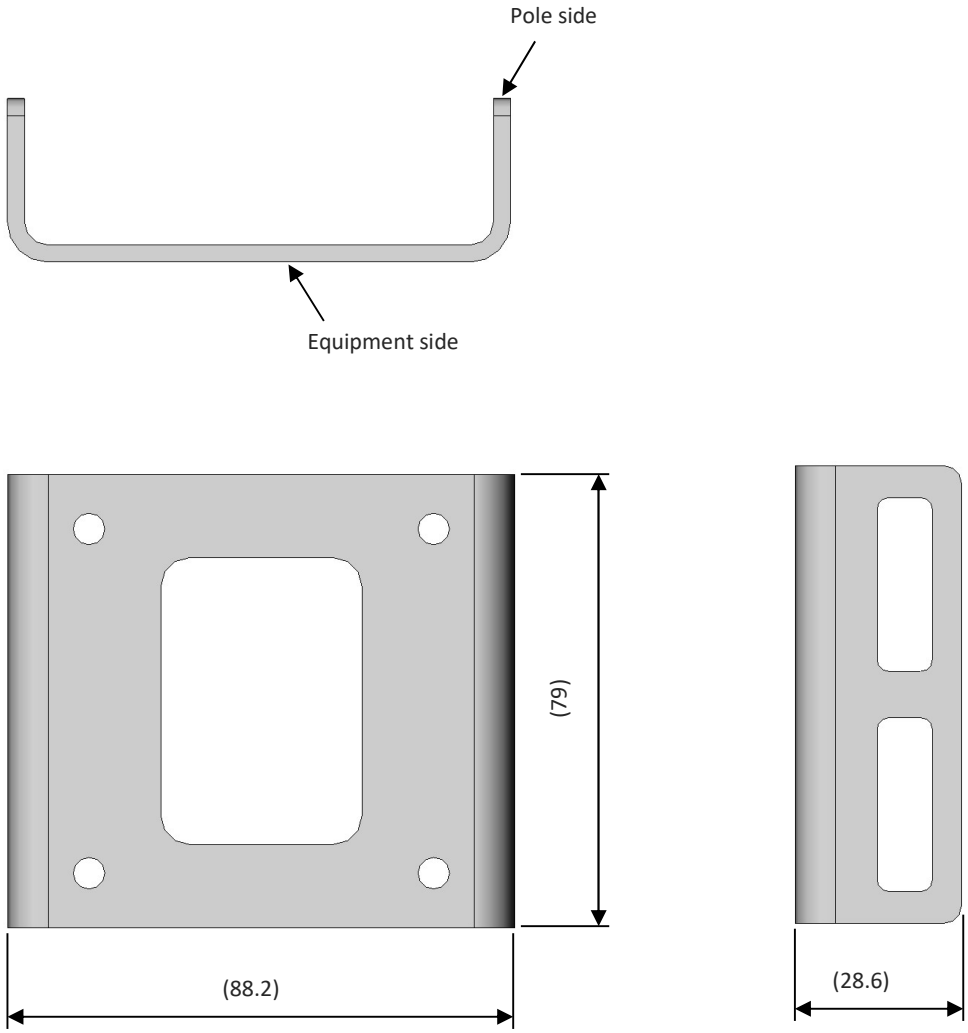
The location to attach O-RU to the pole depends on the usage.

Appearance of fixing bracket (External antenna type)





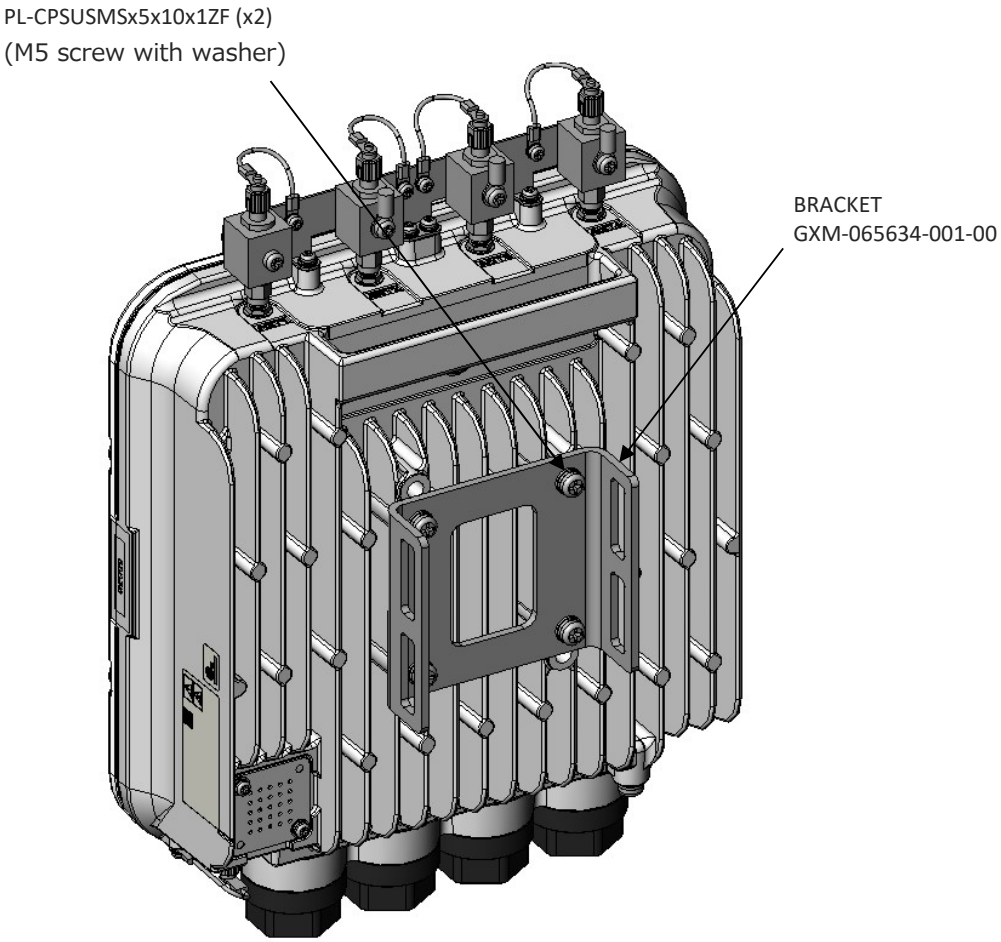
Appearance of fixing bracket (External antenna type) (continued)



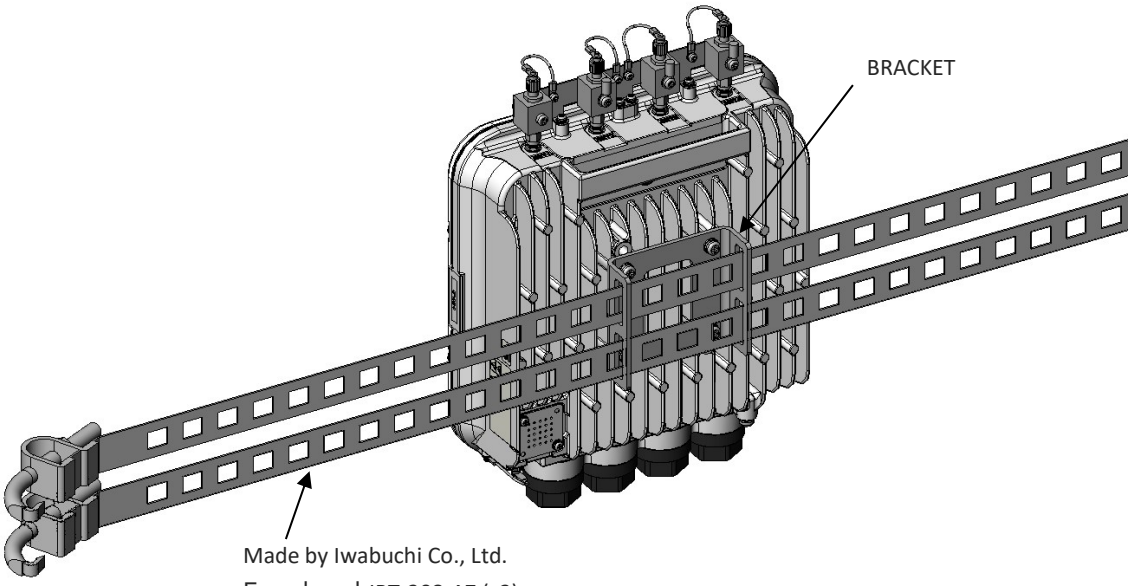
1 Use the M5 screws to mount the bracket (equipment side) to the O-RU. (4 locations)

NOTE: Tightening torque is 2.5 ± 0.5 Nm.

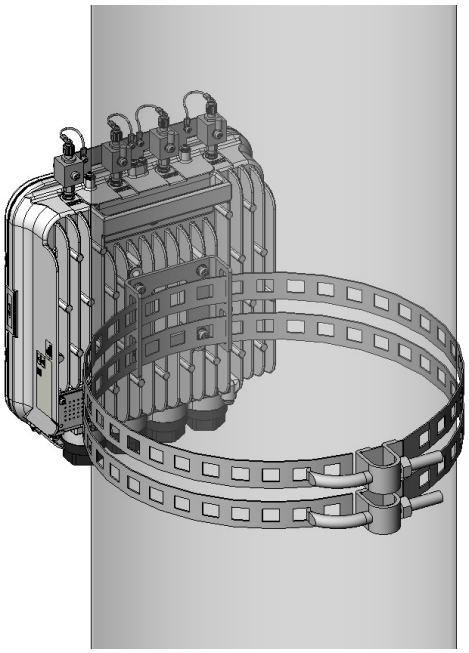
Figure 4-2 Mounting O-RU

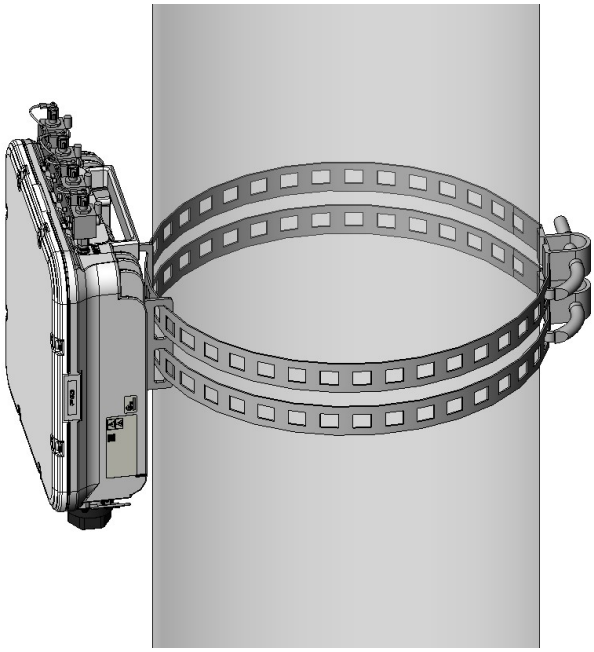


Insert the free band through the bracket and mount it to the pole.



Made by Iwabuchi Co., Ltd.
Free band IBT-208-AZ (x2)
CBS-003404-028-00
Applicable diameter: ϕ130 to ϕ250





4.4 Mounting SFP Module

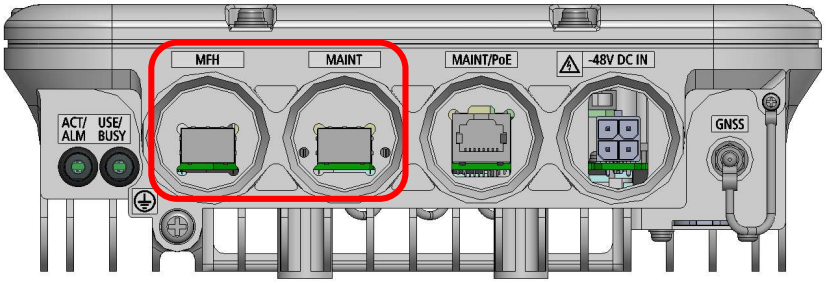
NOTE:

We recommend that you use the SFP specified and provided by NEC Corporation for use with the O-RU. O-RU performance is not guaranteed when other vendor's SFP modules are installed.

Figure 4-2 SFP Module Port

PORTS FOR SFPs

(SFPs are mounted.)



5.Connecting Cables

5.1 Overview

This section describes how to connect the LAN cable and the power cable. This section also describes how to assemble the grounding and power cable to prepare for the work at the site of work as necessary.

The following is a summary of the cable installation.

1 Connect the grounding cable to the O-RU grounding terminal.
NOTE: Tightening torque is 2.5 ± 0.5 Nm.

2 Connect the power cable.
NOTE: When PoE is used, this step is not required. Proceed to step 3.

3 Connect the LAN cable to the DCN (PoE) port.
NOTE: To use this port as an PoE, ensure that the power injector to which you are connecting is powered off. When the power is on, O-RU is turned on once the LAN cable is connected to the DCN (PoE) port.
(1) Connect the LAN cable to the DCN (PoE) port of O-RU.
(2) Connect the other end of the LAN cable.
To use this port as PoE, connect it to the power injector.

4 When using an external antenna, use a coaxial cable to connect the external antenna to the ANT1-ANT4 ports of antenna terminals.
(1) Attach the external antennas to poles or others. Refer to the instruction manual of the antenna.
(2) Connect the coaxial cables to the external antennas.
(3) Connect the coaxial cables to ANT1-ANCT ports of the O-RU.
NOTE: Tightening torque for ANT1-4 of O-RU and SMA connector is 0.59 Nm (allowable torque).
Recommended tool: SH8DX8 | SH Open End Head | TOHNICHI MFG. CO., LTD.

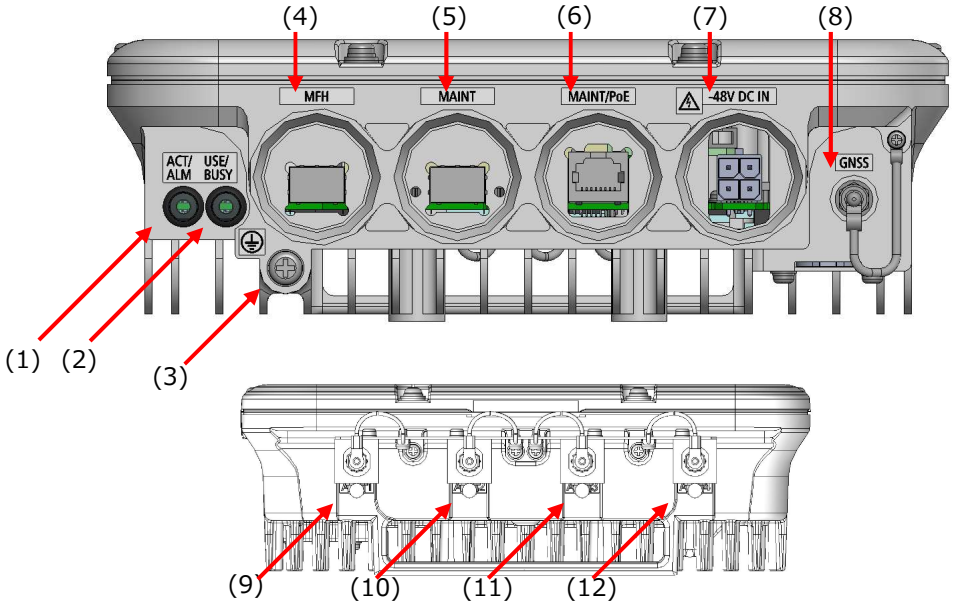
5 Connect the LAN cable to P2 or P3 port as necessary.

5.2 Connection Configuration Diagram

O-RU has following connection terminals. Depending on the angle at which the equipment is installed, each terminal is aligned on the left side of the bottom.

5.2.1 O-RU

Figure 5-1 O-RU Terminal Configuration

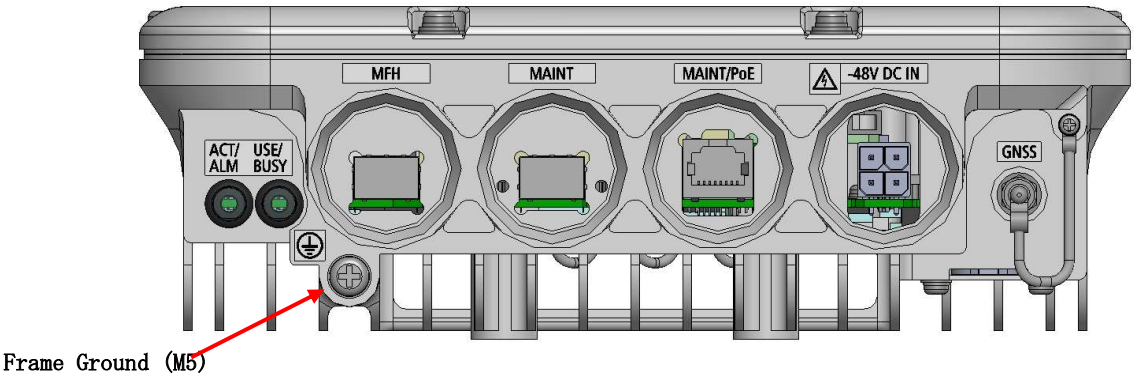


No.	INDICATION	PURPOSE
(1)	**ACT/ALM**	LED display
(2)	**USE/BUSY**	LED display
(3)	⏚	Grounding terminal (M5)
(4)	MFH	SFP+ port (10Gbps) / SFP28 port (25Gbps) O-CU/O-DU connection port (C/U/S/M-Plane)
(5)	MAINT	SFP port (1Gbps)
(6)	MAINT/PoE	RJ45 Ethernet port / LTPoE++(90W type) / PoE++(71W type)
(7)	–48V DCIN	DC Power supply terminal
(8)	GNSS	GPS receiving terminal (SMA-J) * For future expansion, currently not
(9)	ANT1	Antenna terminal (SMA-J) * For external antenna types only
(10)	ANT2	Antenna terminal (SMA-J) * For external antenna types only
(11)	ANT3	Antenna terminal (SMA-J) * For external antenna types only
(12)	ANT4	Antenna terminal (SMA-J) * For external antenna types only

5.3 Grounding Cable

The below shows the grounding terminal of the equipment.

Figure 5-2 Installing Grounding Cable



For more details and installation method is described in “5.7 Laying cables”.

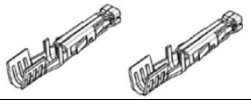
5.4 Power Cable

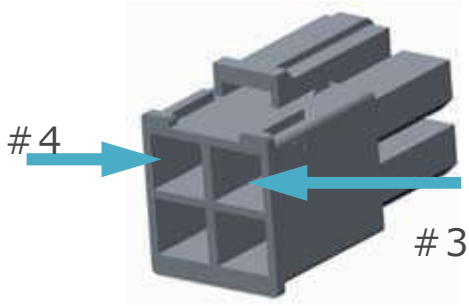
A power cable that connect to O-RU require waterproofing at the connection point.

The following shows how to connect the power cable to the waterproof cover.

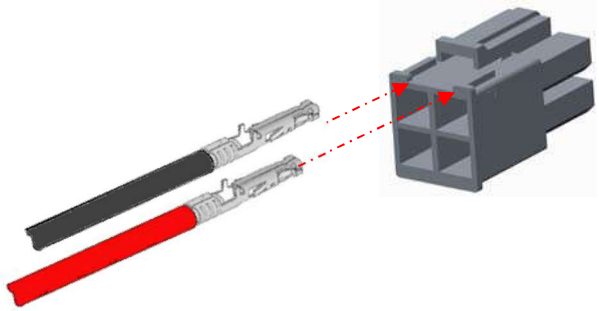
For more details and installation method is described in “5.7 Laying cables”.

1 Create a power cable.

Name	Product Name	Manufacturer	Ecterior
Connect Housing	171692-0104	Molex	
Pin	172063-0311	Molex	
Cable	16 or 14AWG	-	
Tools	63825-7100	Molex	



Pin Number	function
1	NC
2	NC
3	LINE +
4	LINE -



NOTE: Be sure to run the cable through the housing before assembling the power connector with the cable.

2 Remove the power port cover.

(1) Turn the protective cap counterclockwise to remove it.

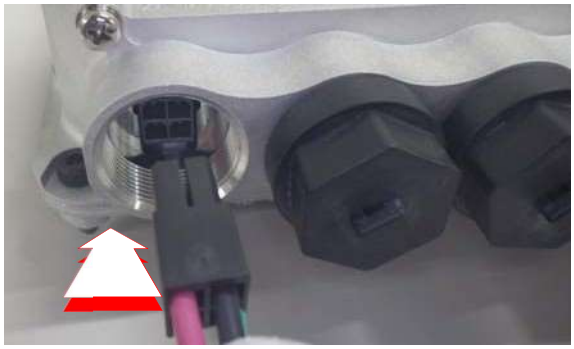
Figure 5-3 Remove the Protective Cap of the Power Port

(2) Keep the removed protective cap.

3 Connect the power cable.

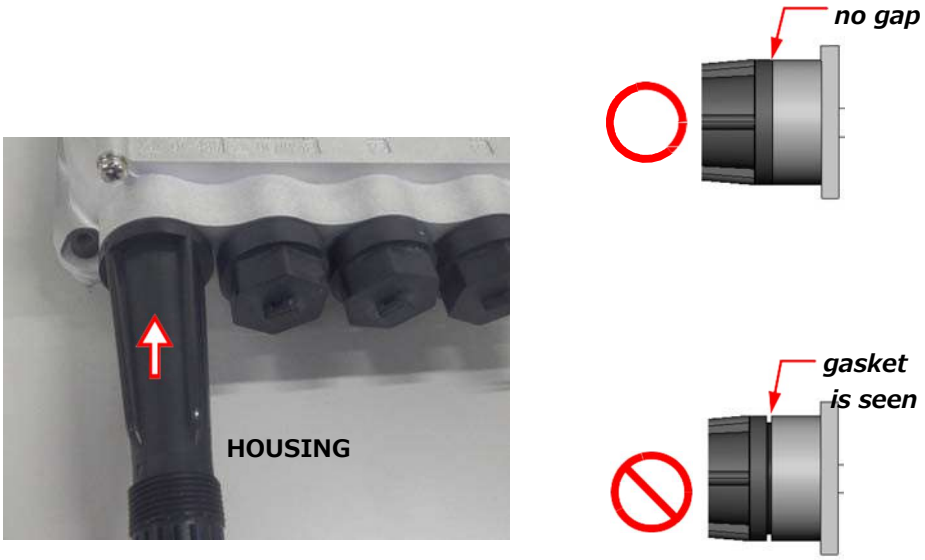
(1) Insert the power cable plug into the uncapped port.

Figure 5-4 Connect the Plug



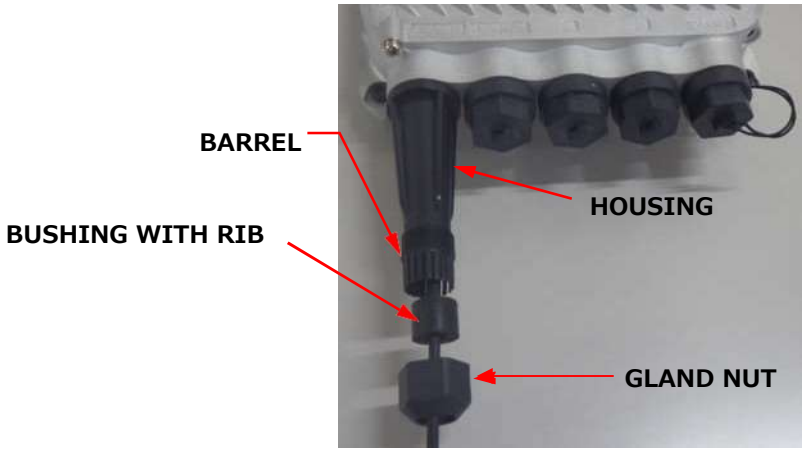
(2) Install the housing (waterproof protection portion).

Figure 5-5 Insert the Housing



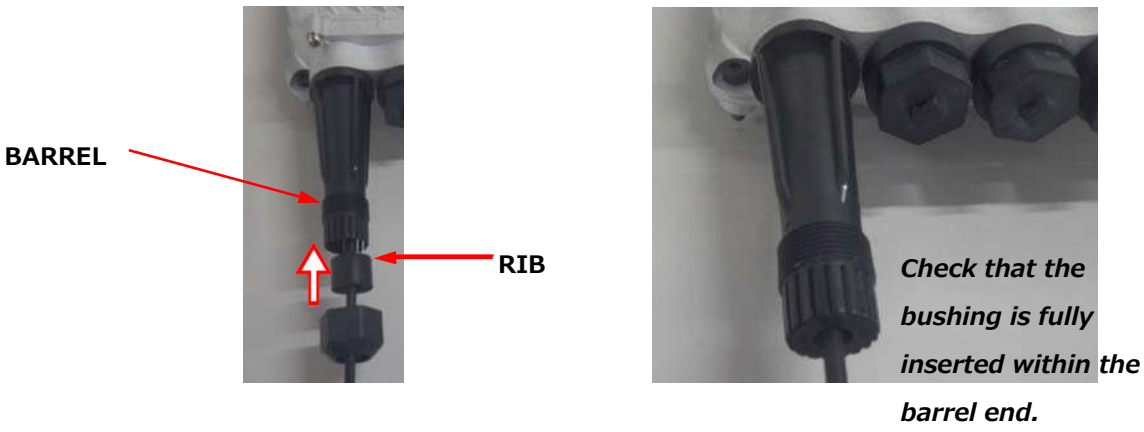
(3) Insert the housing so that there is no gap between the housing and the connector.

Figure 5-6 Place Plug Shell



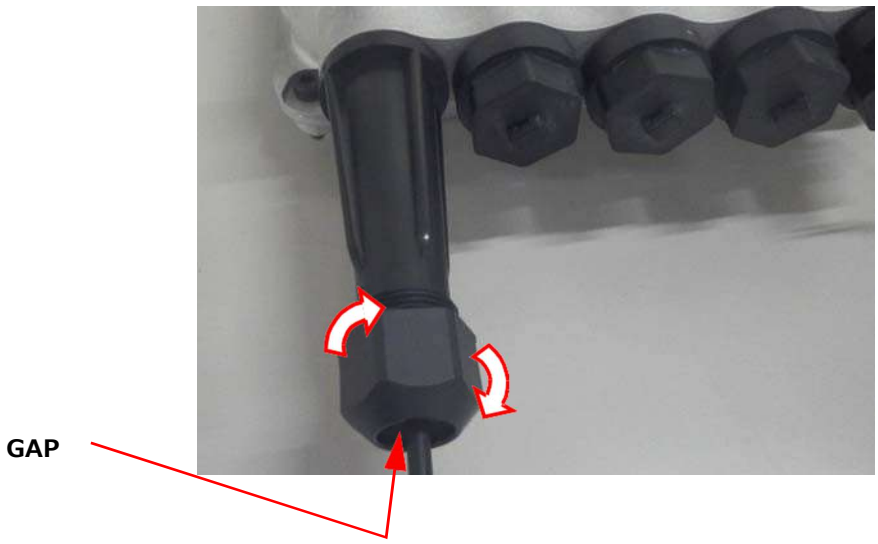
(4) Push the bushing into the barrel.

Figure 5-7 Set Bushing into Barrel



4 Rotate the gland nut to secure the protection.

Figure 5-8 Secure Gland Nut



NOTE: If a thin cable is used, tightening the gland nut will not secure the cable in the proper position. Be careful that the end of the body part does not extend through the gap of the end of the gland nut.

This step concludes the procedure.

5.5 LAN Cables

5.5.1 MAINT/PoE Port (RJ-45)

This equipment complies with the international standard (IEC61000-4-5). Use an external surge protector to further increase the surge capacity. If you use a surge protector, place it close to the equipment.

Note: Recommended specification of the surge protector

Standard IEC 61643 -21 compliant

Specification +/-10kV, 5kA, 8/20μsec

LAN cables to connect to O-RU require waterproofing at the connection point. The following shows how to connect the LAN cable (electrical) to the waterproof cover.

Waterproofing for the LAN cable (electrical) is the same as waterproofing for the power cable.

5.5.2 MFH/MAINT Port (SFP28/SFP+,SFP+)

Each LAN cable to connected to O-RU must have a waterproof cap. The following shows how to connect SFP+ to a LAN cable with a waterproof cap.

Waterproofing for the LAN cable (optical) is the same as waterproofing for the power cable.

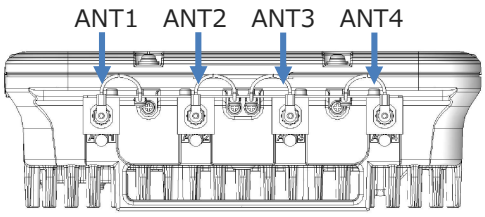
5.6 Connecting to External Antennas (External Antenna Type Only)

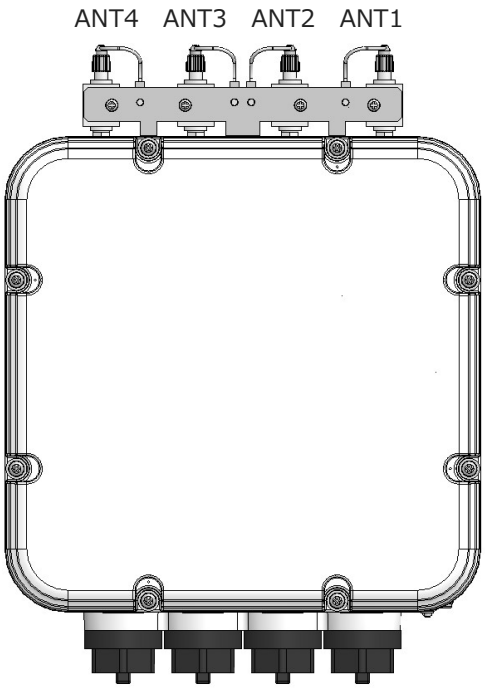
5.6.1 Installing External Antennas

Attach the external antennas to poles or others. Refer to the instruction manual of the antenna.

5.6.2 Connecting External Antennas to O-RU

1. Connect the coaxial cables to the external antennas.
2. Connect the coaxial cables connected to the external antennas to ANT1-ANT4 ports of the O-RU.





5.7 Laying Cables

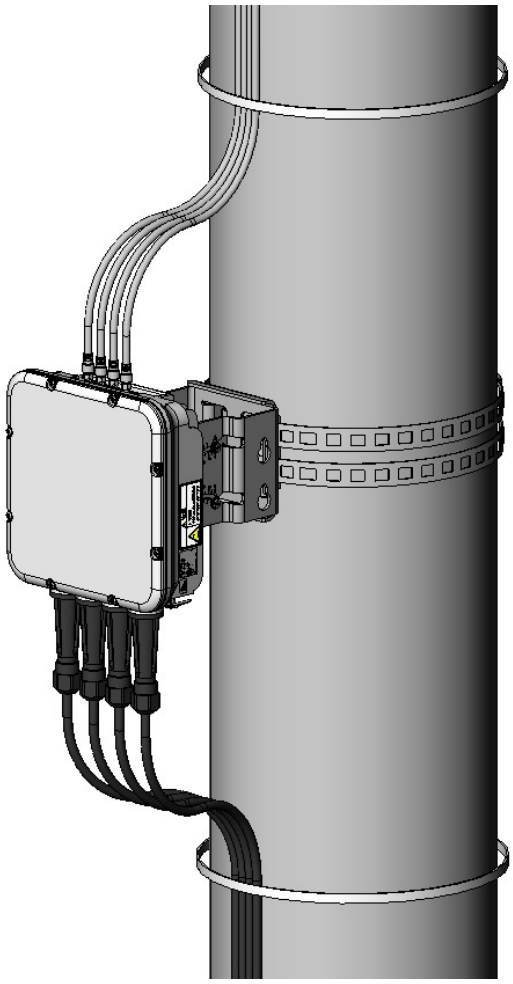
5.7.2 Secure Cables

Bundle the cables and secure them to the pole.

1 Bundle the cables.

2 Secure them to the pole with a bend radius of 60 mm or more.

Figure 5-9 Allowed Bend Radius of Cables



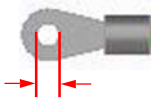
This concludes the procedure.

5.8 Cable Creation (Assembling)

5.8.1 Grounding Cable

5.8.1.1 Required Members

Table 5-1 List of Applicable Cable

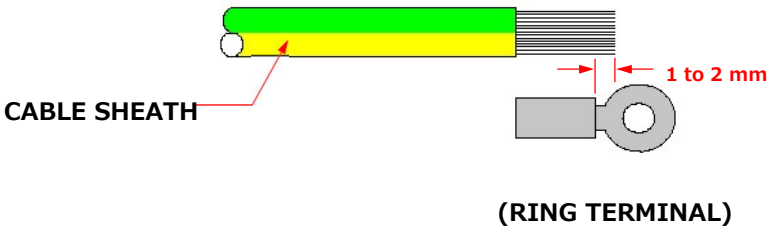
Parts		Descript
Grounding cable	AWG10 (IEC60204-1)	 •Outer Color: Green and Yellow
Grounding terminal	Ring Terminal (for M5 Screw Type)	
	Insulation Sleeve	**5.0 mm**
Necessary tools	Driver	Flat-blade, Phillips-head
	Crimping tool	N/A
	Wire stripper and wire cutter	N/A

5.8.1.2 Procedure

1 Cut the AWG10 cable to the appropriate length.

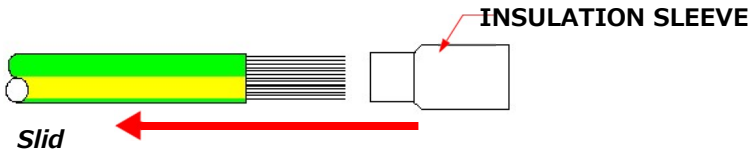
2 Remove a cable sheath of about 7 mm from one end of the cable.

Figure 5-10 Strip the Wire



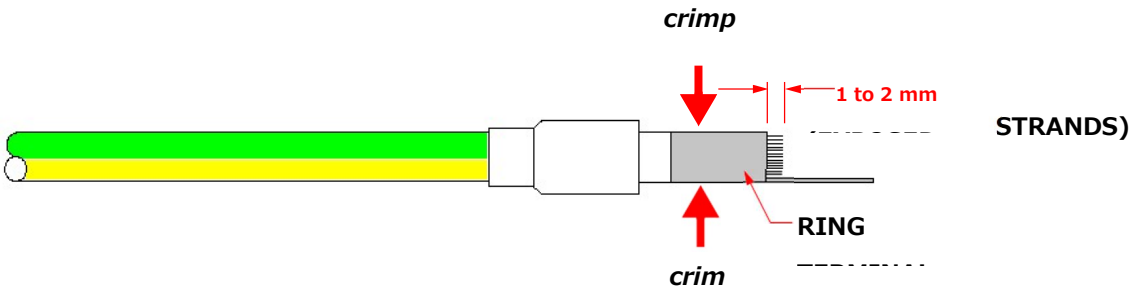
3 Slide the insulation sleeve over the cable.

Figure 5-11 Place Insulation Sleeve on Cable



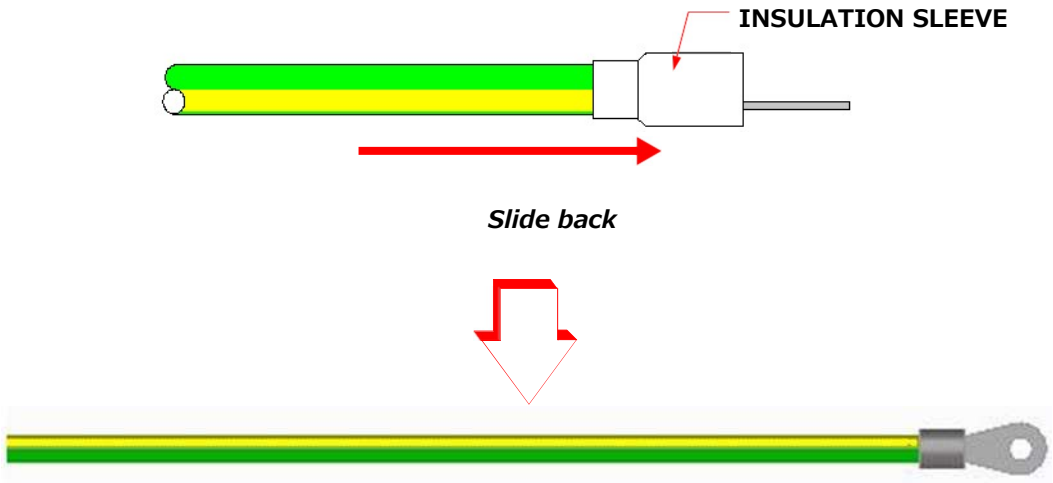
4 Place the crimping ring over the end of the cable and secure it using a crimping tool.

Figure 5-12 Place and Secure Crimp Ring



5 Slide insulation sleeve back to cover the base of the crimp contact.

Figure 5-13 Secure Crimp Contact



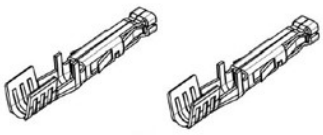
This concludes the procedure.

5.8.2 Power Cable (2-Core Cable)

Use a 2-core cable for the power port. To prepare a power cable at the site of work, refer to the following.

5.8.2.1 Required Members

Table 5-2 Parts List

Part		Descriptio
Connector housing	171692-0104	
Connection	172063-0311	
Cable	AWG14 to AWG16	2-core double insulated cable with braided metal shield, 5.86 to 10.00 mm in diameter: ♦Pin #3: Positive ♦Pin #4: Negative
Necessary tools	63825-7100	
Waterproof plug cover	N/A	

5.8.2.2 Installing the Waterproof Plug Cover

If the diameter of the connector is greater than 14.5 mm and has already been assembled, connect the cable through the waterproof plug cover and waterproof hose before beginning the following procedure.

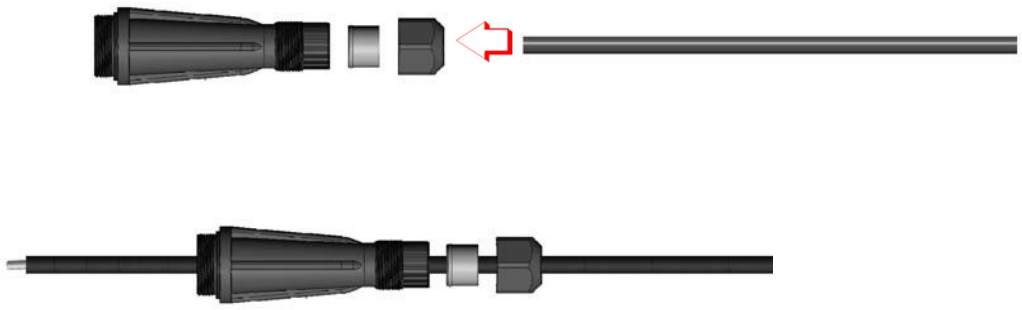
■ Plug cover configuration:

Figure 5-14 Plug Cover

1 Separate all parts from the nut part of the waterproof plug cover.

2 Insert the cable to pass through all of those parts.

Figure 5-15 Set Waterproofing Cover Parts

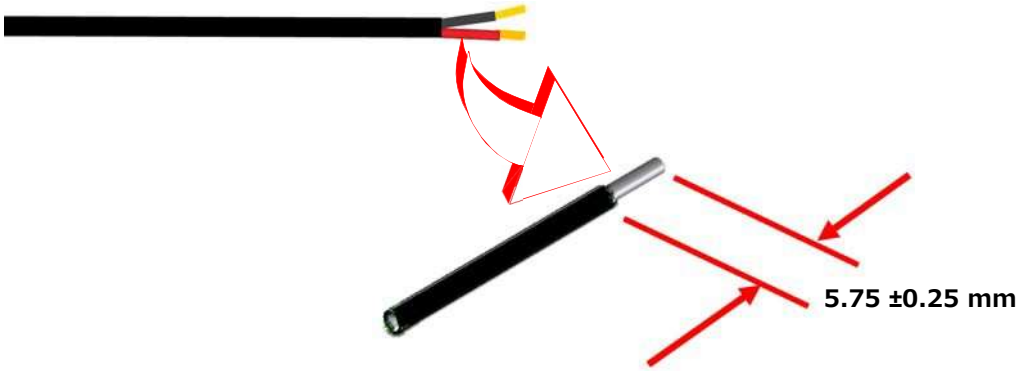


5.8.2.3 Procedure

1 Remove the outer cable cover.

2 Remove the insulation cover to expose the conducting wires inside.

Figure 5-16 Expose Conductor

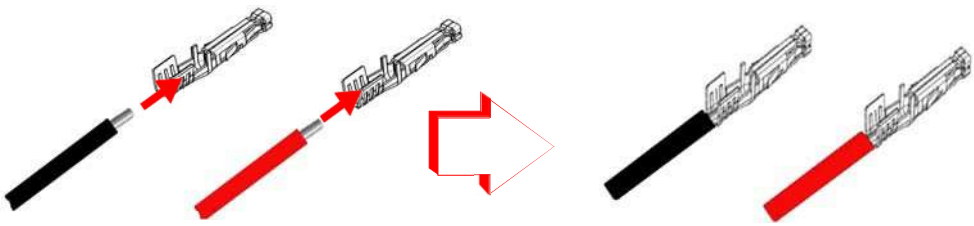


NOTE: Be careful not to damage the conducting wires inside.

Tools	•Knife •Cutter •measurement tool

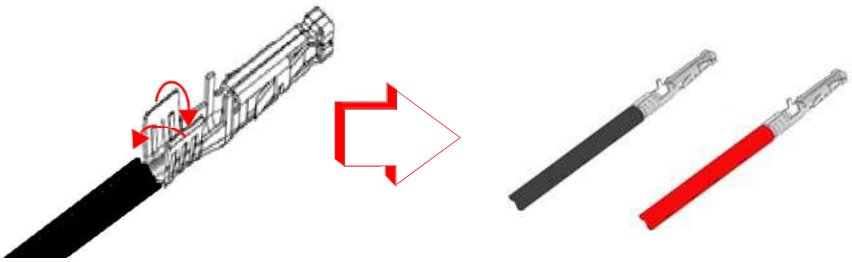
3 Set the conductor on each conducting wire.

Figure 5-17 Set Contacts



4 Crimp the bottom of the clamp.

Figure 5-18 Seal Crimps

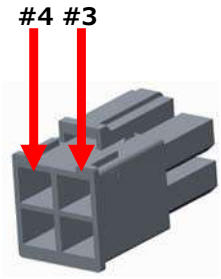


5 Insert both the junctions into the connector housing.

NOTES:

(1) The figure below shows the connector housing upside down for several reasons. Be sure to check the orientation of the completed connector when connecting to the equipment.

(2) The 2-core cable is connected to the 4-pin power port.



POWER CONNECTOR

HOUSING (REAR SIDE)

Wear Waterproofing Plug Cover if Prepared:

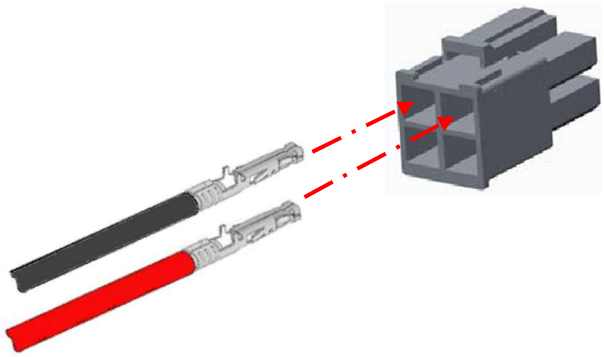
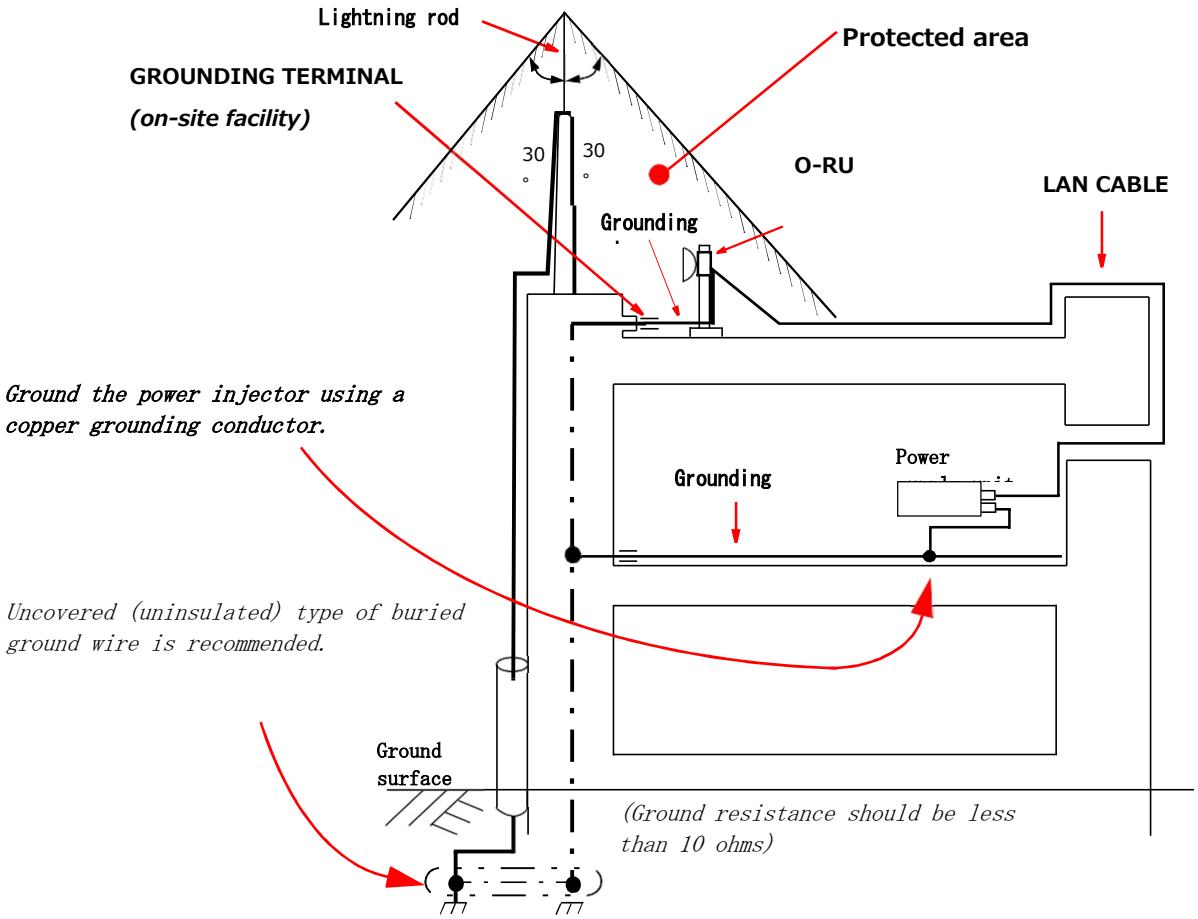


Figure 5-19 Reference for Power Cable with Waterproofing Cover

6.Grounding O-RU

When grounding O-RU, perform grounding work. The grounding work method is shown below.

Figure 6-1 Grounding Method (O-RUsample – 1/2)



NOTES:

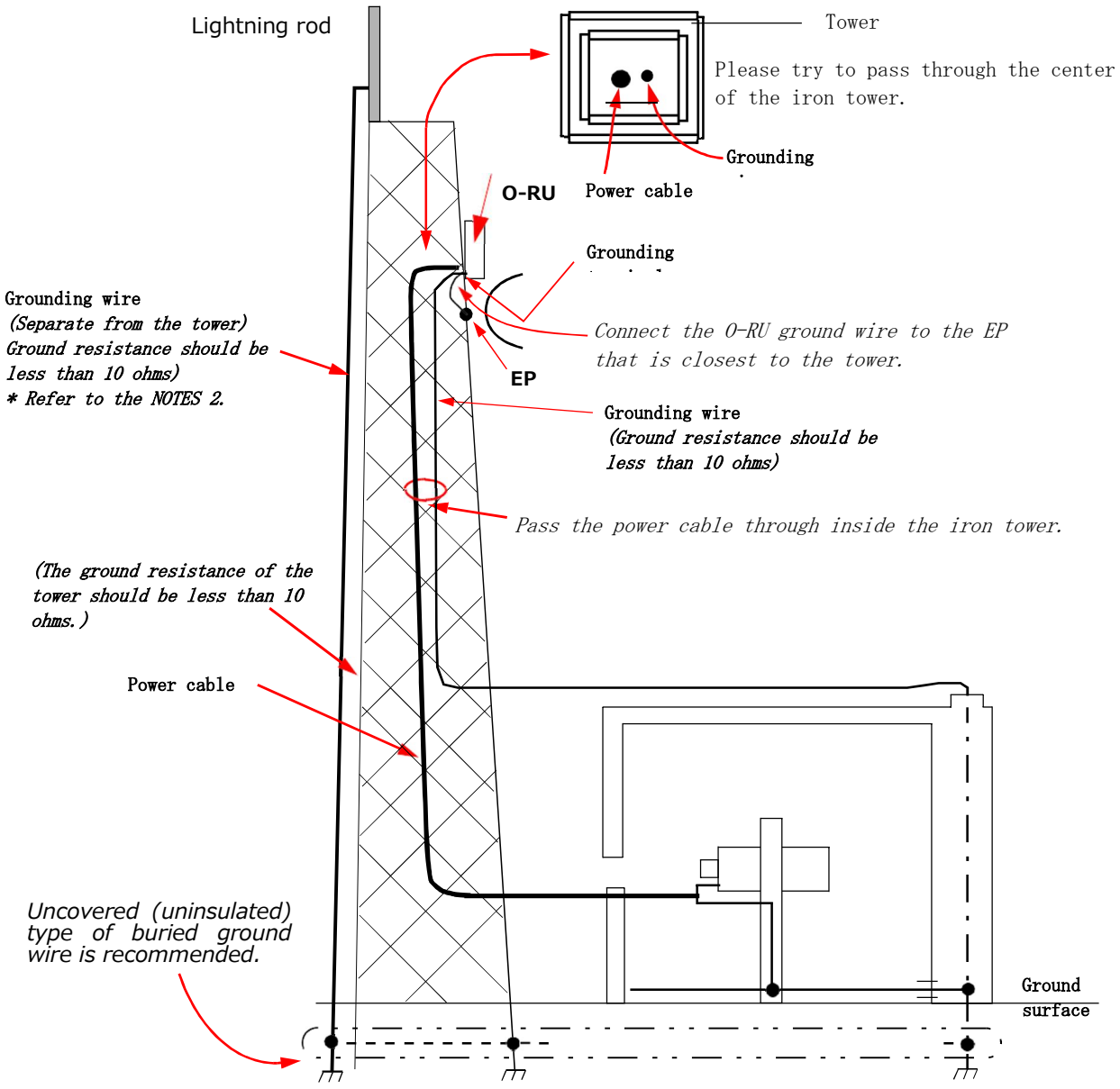
1 Ensure that the O-RU is installed in an area protected by lightning rods.

2 The grounding of the equipment should be connected to the grounding of the lightning rod at ground level to avoid surge current caused by lightning passing through the grounding system of the equipment.

(1) For grounding the O-RU, use a 5 square mm (i.e., 2.5 mm or larger in diameter) AWG10 cable with a crimp terminal.

(2) Tighten the screw within a torque of 2.7 ±0.3 Nm.

Figure 6-2 Grounding Method (O-RUsample – 2/2)



NOTES:

1. NEC recommends that the equipment be connected to a ground wire according to the NEC standard construction method.

2. If the ground resistance of the tower is low enough (less than 10 ohms), a grounding wire for the lightning rod is not required.

EP Earth Point of the tower

7.Start, Stop, and Maintenance

7.1 Start O-RU

7.1.1 Basic Operations

NOTE:

The surface of the equipment may become hot during operation. Do not touch the equipment.

1 Check that the power cable is connected properly.

When a power cable (SELV) is used, check that the power cable is connected to the **–48 V DC** port.

When a PoE cable is used, check that the Ethernet cable is connected to the **DCN** port.

2 The ACT/ALM LED (green) starts flashing when the equipment is powered on.

3 The ACT/ALM LED (green) remains lit when the boot process is completed.

7.2 Stop O-RU

1 Stop the O-RU by turning off the power supply unit or power injector.

Warning

Do not remove the LAN cable from the MAINT/PoE port while the equipment is powered via PoE. The equipment may result in failure.

7.3 Equipment Status Display

You can check the status of the equipment with the LED on the bottom of the equipment.

No.	O-RU status	ACT/ALM	USE/BUSY
1	No power or hardware failure	Unlit	Unlit
2	Hardware failure	**Red**: Lit	Unlit
3	Communication NG	**Green**: Lit	**Red**: intermittent flashing (one time)
4	Synchronization failure	**Green**: Lit	**Red**: intermittent flashing (two times)
5	Starting	**Green**: Flashing	Unlit
6	Waiting for operation	**Green**: Lit	Unlit
7	In operation	**Green**: Lit	**Green**: Lit
8	Communication failure (Other than the reason of communication failure or synchronization failure)	**Green**: Lit	**Red**: Lit
9	Warm UP	**Green**: Lit	**Red**: Continuous flashing (0.2 seconds)

7.4 Failure Management

Failure management is performed according to O-RAN FH Interface specifications.

https://orandownloadsweb.azurewebsites.net/specifications

O-RAN Management Plane Specification

For M-Plane protocol stack, the operation is performed by the protocol stack shown below. Using NETCONF, O-RU performs each functional operation as NETCONF Server and O-CU/O-DU performs each functional operation as NETCONF Client.

Figure Protocol Stack

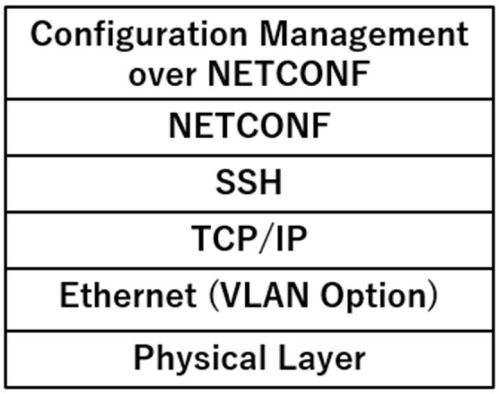
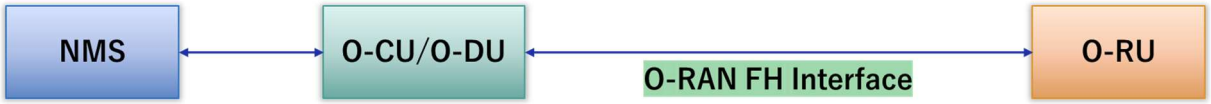


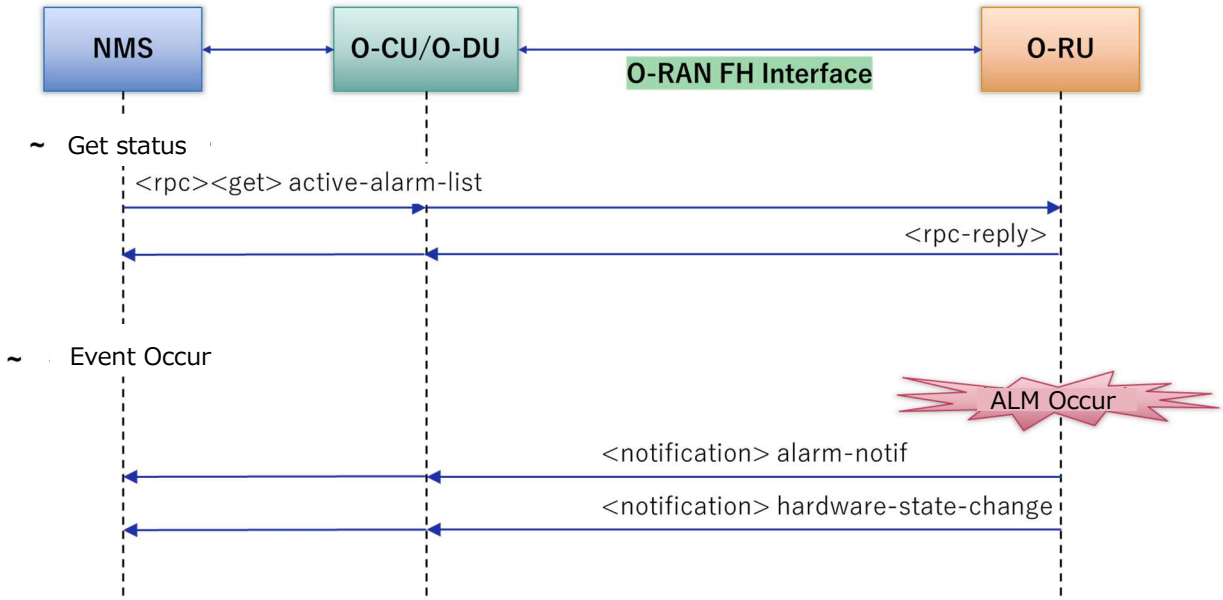
Figure Operation Image in the Hierarchical Model



7.5 Fault Management

Fault Management acquires the status from O-RU and when an event occurs Fault Management receives notification from O-RU.

Figure Fault Management Operation Image



7.6 Fault Management Log Acquisition Method

To perform a detailed analysis when an equipment error occurs, follow the procedure below to obtain equipment logs.

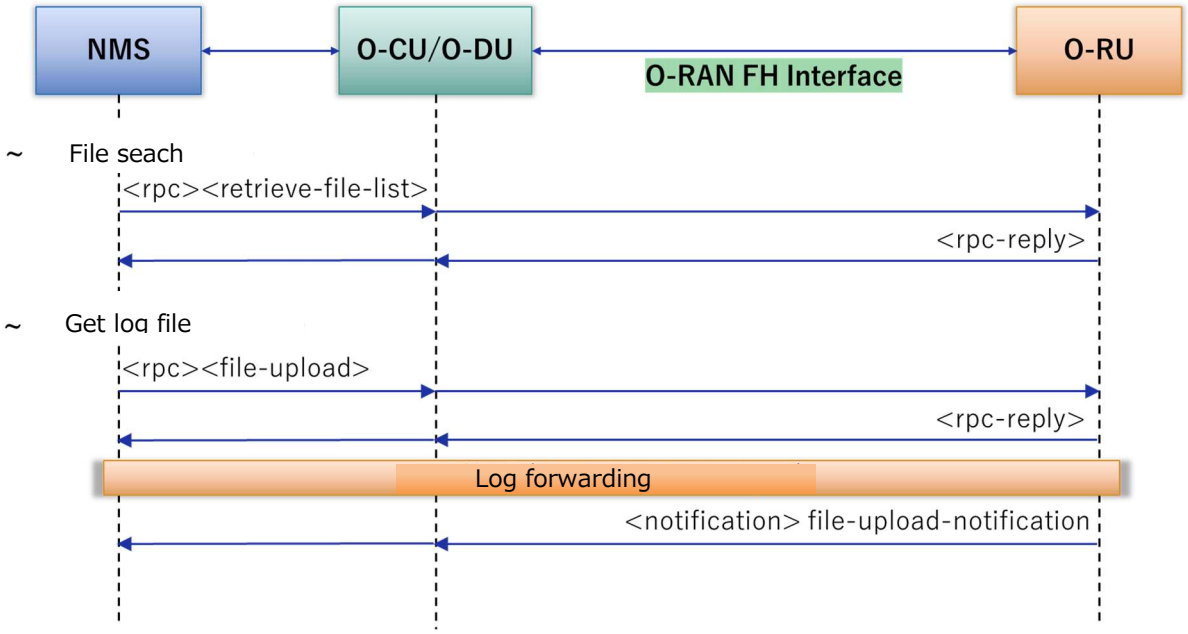



Figure Log Acquisition