



# RFD01F Series Installation Manual

*Describes product installation and requirement procedure.*

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*Radio Access Network*

**Document Number: -**

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# Contents

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<b>Preface</b>		<b>viii</b>
Relevance .....	오류! 책갈피가 정의되어 있지 않습니다.	
Conventions in this Document .....		viii
New and Changed Information .....		ix
Revision History.....		ix
Organization of This Document .....		ix
Personal and Product Safety .....		ix
<b>Chapter 1 Before Installation</b>		<b>1</b>
System Configuration and Interface .....		1
<i>RRU Configuration</i> .....		1
<i>RRU Interface</i> .....		2
Specifications .....		3
Cautions for Installation .....		3
<i>Before Installing</i> .....		4
<i>While Installing</i> .....		4
<i>After Installing</i> .....		5
Installation Tools .....		5
<b>Chapter 2 Installing System</b>		<b>9</b>
Installation Procedure .....		9
System Arrangement .....		10
Unpacking and Transporting .....		12
<i>Bringing in Items</i> .....		12
<i>Unpacking Items</i> .....		12
RRU Handling .....		13
Fixing RRU .....		14
<i>Fixing Unit Bracket</i> .....		14
<i>Fixing Pole Type</i> .....		17
<i>Fixing Wall Type</i> .....		28
<b>Chapter 3 Connecting Cables</b>		<b>38</b>
Cabling Procedure .....		38
Guidelines for Cable Connections .....		39
<i>Cable Path Inspection</i> .....		39
<i>Cable Cutting</i> .....		40
<i>Cable Installation</i> .....		40
<i>Cable Binding</i> .....		41
<i>Connector Attachment</i> .....		41
<i>Identification Tag Attachment</i> .....		42
Cabling Diagram .....		43
Grounding .....		45
<i>Ground Cable Connection</i> .....		46
Power Cabling .....		48
<i>Power Cable Connection</i> .....		49
Interface Cable Connection .....		59
<i>Remove/Insert Optic Module</i> .....		59

---

	<i>Optic Cable Connection</i> .....	60
	<i>RET Cable Connection</i> .....	71
	<i>RF Cable Connection</i> .....	75
<b>Chapter 4</b>	<b>Inspect the Installation</b>	<b>86</b>
<b>Appendix A</b>	<b>Acronyms</b>	<b>91</b>
<b>Appendix B</b>	<b>Clean the Optical Connectors</b>	<b>92</b>
	Introduction .....	92
	<i>Measure the Optical Output and Connecting the Optical Connector</i> .....	93
<b>Appendix C</b>	<b>Standard Torque</b>	<b>94</b>

# List of Figures

---

Figure 1.	RRU Configuration.....	1
Figure 2.	RRU Interface .....	2
Figure 3.	Procedure to Install the RRU.....	9
Figure 4.	RRU_Wall Type Standard Installation .....	10
Figure 5.	RRU Arrangement_Pole Type Installation.....	11
Figure 6.	Using a Handle to transport an RRU .....	13
Figure 7.	Unit Bracket Fixing Type.....	14
Figure 8.	Unit Bracket Fixing (Standard Installation).....	15
Figure 9.	Unit Bracket Fixing (Side Installation) .....	16
Figure 10.	Assembling the Mounting Bracket_Pole Type(1).....	17
Figure 11.	Assembling the Mounting Bracket_Pole Type(2).....	18
Figure 12.	Lifting RRU & Pole Mounting Bracket Assembly_Pole Type(1) .....	19
Figure 13.	Lifting RRU/Pole Mounting Bracket Assembly_Pole Type(2) .....	20
Figure 14.	Assembling the Mounting Bracket Assembly_Pole Type(1).....	21
Figure 15.	Assembling the Mounting Bracket Assembly_Pole Type(2).....	22
Figure 16.	Leveling Pole Mounting Bracket Assembly .....	23
Figure 17.	RRU Fixing_Pole Type (Standard Installation) .....	24
Figure 18.	RRU Fixing_Pole Type (Standard Installation) .....	25
Figure 19.	RRU Fixing_Pole Type (Side Installation).....	26
Figure 20.	RRU Fixing_Pole Type (Side Installation).....	27
Figure 21.	RRU dimensions for Wall Type (Standard Installation) .....	29
Figure 22.	RRU dimensions for Wall Type (Side Installation) .....	29
Figure 23.	Example of Marking_Use the Mounting bracket .....	30
Figure 24.	Drilling & Anchoring Example .....	31
Figure 25.	Fixing Mounting Bracket on a Wall .....	32
Figure 26.	RRU Fixing_Wall Type Standard Installation(1).....	34
Figure 27.	RRU Fixing_Wall Type Standard Installation(2).....	35
Figure 28.	RRU Fixing_Wall Type Side Installation(1) .....	36
Figure 29.	RRU Fixing_Wall Type Side Installation(2) .....	37
Figure 30.	Procedure to Connect System Cable.....	38
Figure 31.	Cable Connection Procedure.....	39
Figure 32.	Cable Diagram .....	43
Figure 33.	Ground Cable Connection (1).....	47
Figure 34.	Ground Cable Connection (2).....	47
Figure 35.	Power Equipment Elements.....	48
Figure 36.	Power Connector Assembly (1).....	50
Figure 37.	Power Connector Assembly (2).....	50
Figure 38.	Power Connector Assembly (3).....	51
Figure 39.	Power Connector Assembly (4).....	51
Figure 40.	Power Connector Assembly (5).....	52
Figure 41.	Power Connector Assembly (6).....	52
Figure 42.	Power Connector Assembly (7).....	53
Figure 43.	Power Connector Assembly (8).....	54
Figure 44.	Power Connector Assembly (9).....	55
Figure 45.	Power Connector Assembly (10).....	55
Figure 46.	Hybrid(Power) Cable Connection (1) .....	57

Figure 47.	Hybrid(Power) Cable Connection (2) .....	58
Figure 48.	Optic Module Removal (1) .....	59
Figure 49.	Optic Module Removal (2) .....	59
Figure 50.	Optic Module Removal (3) .....	59
Figure 51.	Optic Module Inset.....	60
Figure 52.	Optic Cable Adapter Assembly (1) .....	62
Figure 53.	Optic Cable Adapter Assembly (2) .....	62
Figure 54.	Optic Cable Adapter Assembly (3) .....	63
Figure 55.	Optic Cable Adapter Assembly (4) .....	63
Figure 56.	Optic Cable Adapter Assembly (5) .....	64
Figure 57.	Optic Cable Adapter Assembly (6) .....	65
Figure 58.	Optic Cable Adapter Assembly (7) .....	65
Figure 59.	Optic Cable Adapter Assembly (8) .....	66
Figure 60.	Optic Cable Adapter Assembly (9) .....	66
Figure 61.	Optic Cable Adapter Assembly (10) .....	67
Figure 62.	Optic Cable Adapter Assembly (11) .....	67
Figure 63.	Optic cable connection (1) .....	68
Figure 64.	Optic cable connection (2) .....	69
Figure 65.	Optic cable connection (3) .....	69
Figure 66.	Optic cable connection (4) .....	70
Figure 67.	RET Cable Connection (1) .....	72
Figure 68.	RET Cable Connection (2) .....	73
Figure 69.	RET Cable Connection (3) .....	74
Figure 70.	RF Cable Connection using JMA Boots (1).....	76
Figure 71.	RF Cable Connection using JMA Boots (2).....	77
Figure 72.	RF Cable Connection using JMA Boots (3).....	78
Figure 73.	RF Cable Connection using a Cold Shrink Tube (1).....	80
Figure 74.	RF Cable Connection using a Cold Shrink Tube (2).....	80
Figure 75.	RF Cable Connection using a Cold Shrink Tube (3).....	81
Figure 76.	RF Cable Connection using a Cold Shrink Tube (4).....	82
Figure 77.	RF Cable Connection using a Cold Shrink Tube (5).....	83
Figure 78.	Installation Inspection Procedure .....	86

# List of Tables

Table 1.	Specifications .....	3
Table 2.	Basic Installation Tools .....	5
Table 3.	Parts a Tools for fixing Unit Bracket (Standard Installation).....	15
Table 4.	Parts a Tools for fixing Unit Bracket (Side Installation) .....	16
Table 5.	Parts a Tools for fixing Pole Mounting Bracket .....	17
Table 6.	Parts a Tools for fixing Pole Mounting Bracket Assembly_Pole Type .....	21
Table 7.	Leveling Using a Level .....	22
Table 8.	Parts a Tools for fixing RRU_Pole Type (Standard Installation).....	24
Table 9.	Parts a Tools for fixing RRU_Pole Type (Side Installation) .....	26
Table 10.	Tools for Marking .....	28
Table 11.	Parts and Tools for Drilling & Fixing Anchor.....	31
Table 12.	Anchor Bolt Drill Bits and Hole Depth .....	31
Table 13.	Parts and Tools for Fixing Bracket Assembly.....	32
Table 14.	Parts a Tools for fixing RRU_Wall Type Standard Installation.....	34
Table 15.	Parts and Tools for Fixing RRU 1Sector Standard_Wall Type.....	36
Table 16.	Recommended Minimum Allowed Cable bend Radius .....	41
Table 17.	RRU Connection Cable .....	44
Table 18.	Parts and Tools for Grounding .....	46
Table 19.	Parts and Tools for Power Connector Assembly .....	49
Table 20.	Parts and Tools for Power Cable Connection.....	56
Table 21.	Power Cable/Connector Pin Map.....	56
Table 22.	Parts and Tools for Optic Cable Adapter Assembly.....	60
Table 23.	Parts for RET Cable Connection.....	71
Table 24.	RET Cable Pin Map .....	71
Table 25.	RF Cable Minimum Radius of Curvature .....	75
Table 26.	Parts and Tools for connecting RF cable .....	76
Table 27.	Parts and Tools for connecting RF cable .....	79
Table 28.	RF Cable Identification Tag.....	84
Table 29.	Construction Situation Check list .....	87
Table 30.	Standard Torque Value for Fastening Bolts .....	94
Table 31.	Brass Bolts Torque Value.....	94
Table 32.	Connector Connection Torque Value.....	94

# Preface







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This manual describes how to install the 850MHz RRU including how to connect cables. This manual includes the following 850MHz RRU(SLS-BR03U):

## Conventions in this Document

Samsung Networks product documentation uses the following conventions.

### Symbols

Symbol	Description
	Indicates a task.
	Indicates a shortcut or an alternative method.
	Provides additional information.
	Provides information or instructions that you should follow to avoid service failure or damage to equipment.
	Provides information or instructions that you should follow to avoid personal injury or fatality.
	Provides antistatic precautions that you should observe.

### Menu Commands

**menu | command**

This indicates that you must select a command on a menu, where **menu** is the name of the menu, and **command** is the name of the command on that menu.

### File Names and Paths

These are indicated by a bold typeface. For example:

Copy **filename.ext** into the **/home/folder1/folder2/bin/** folder.

### User Input and Console Screen Output Text

Input and output text is presented in the Courier font. For example,

```
context <designated epc-context-name>
```

CLI commands are presented in bold small caps. For example,

Type the **RTRV-NE-ST**s command in the input field.



## New and Changed Information

This section describes information that has been changed since the previous publication of this manual.

- The product name was corrected.

## Revision History

The following table lists all versions of this document.

Document Number	Product/Software Version	Document Version	Publication Date	Remarks
-	RFD01F Series	1.0	January 2017	-

## Organization of This Document

Section	Title	Description
Chapter 1	Before Installation	This chapter introduces RRU and describes items should be understood before installation.
Chapter 2	Installing System	This chapter describes the procedures to install the RRU.
Chapter 3	Connecting Cables	This chapter describes the procedures to connect the cables to the RRU installed.
Chapter 4	Inspect the Installation	This chapter describes the procedures of inspecting installation status after RRU installation and cabling is completed.
Appendix A	Acronyms	This annex describes the acronyms used in this manual.
Appendix B	Clean the Optical Connectors	This annex describes the procedure of cleaning the optical connector and cleaning tool.
Appendix C	Standard Torque	This annex describes the standard torque when fastening the bolt.

## Personal and Product Safety

*This product safety information includes European directives, which you must follow. If these do not apply in your country, please follow similar directives that do apply in your country.*

### Electrical

All structural parts are grounded and all input and outputs have built-in isolation from the network. All input and output ports that connect to external power sources are designed to meet relevant national safety requirements.

The product contains hazardous energy levels as defined by UL 60950. Care must be taken when maintaining this equipment as injury to personnel or damage to the equipment could result from mistakes. Maintenance should only be carried out by trained and competent engineers who are familiar with the relevant procedures and instructions.

## Lasers

The product is fitted with optic modules rated as Class 1 radiation-emitting devices under IEC 60825-1.

## Manual Handling

Care should be taken when handling equipment. Give due consideration to the weight of the equipment, the physical capability of the individual(s) handling the equipment, and movements such as twisting, bending and stooping, which could lead to skeletal and muscular injuries.

## Installation

Installation must be carried out by trained and competent engineers only. All relevant safety measures must be taken to ensure equipment is not connected to live power and transmission sources during installation. Equipment must be correctly installed in order to meet the relevant safety standards and approval conditions.

The cable between the power distribution point and the installed equipment must have a cross-sectional area of 1.5 mm<sup>2</sup>.

## Maintenance

Maintenance must only be carried out by a suitably trained and competent technician. All safety instructions must be carefully observed at all times. Equipment covers should not be removed while live power and transmission is connected unless in a controlled environment by trained technicians.

## Environment

The product must be operated in an environment within the specified relative humidity and ambient temperature ranges.

## Grounding

To comply with UL 60950, the equipment must be connected to a safety grounding point via a permanent connection. Grounding points are located on the product for this purpose. Always connect the ground cable before fitting other cables. The product must remain grounded continuously unless all connections to the power supply and data network are all removed.

If equipment is grounded through a cabinet or rack, make sure it is done so properly according to the installation instructions.

## Chemical Warning

This product contains chemicals known to the State of California to cause cancer and reproductive toxicity.

## California USA Only

This Perchlorate warning applies only to primary CR (Manganese Dioxide) Lithium coin cells in the product sold or distributed ONLY in California USA

'Perchlorate Material-special handling may apply, See [www.dtsc.ca.gov/hazardouswaste/perchlorate](http://www.dtsc.ca.gov/hazardouswaste/perchlorate).'

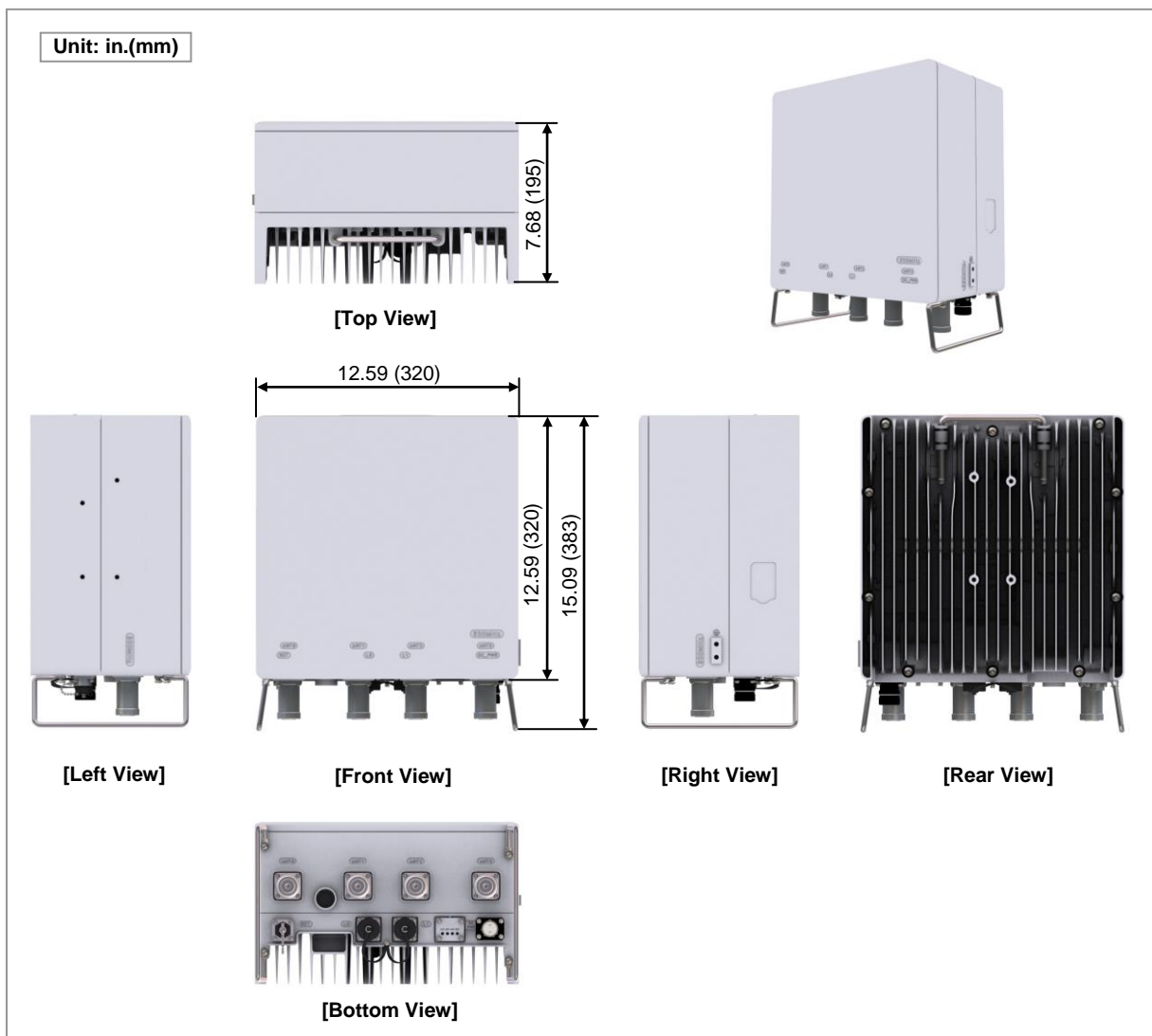
# Chapter 1 Before Installation

## System Configuration and Interface

### RRU Configuration

The configuration of RRU is as follows:

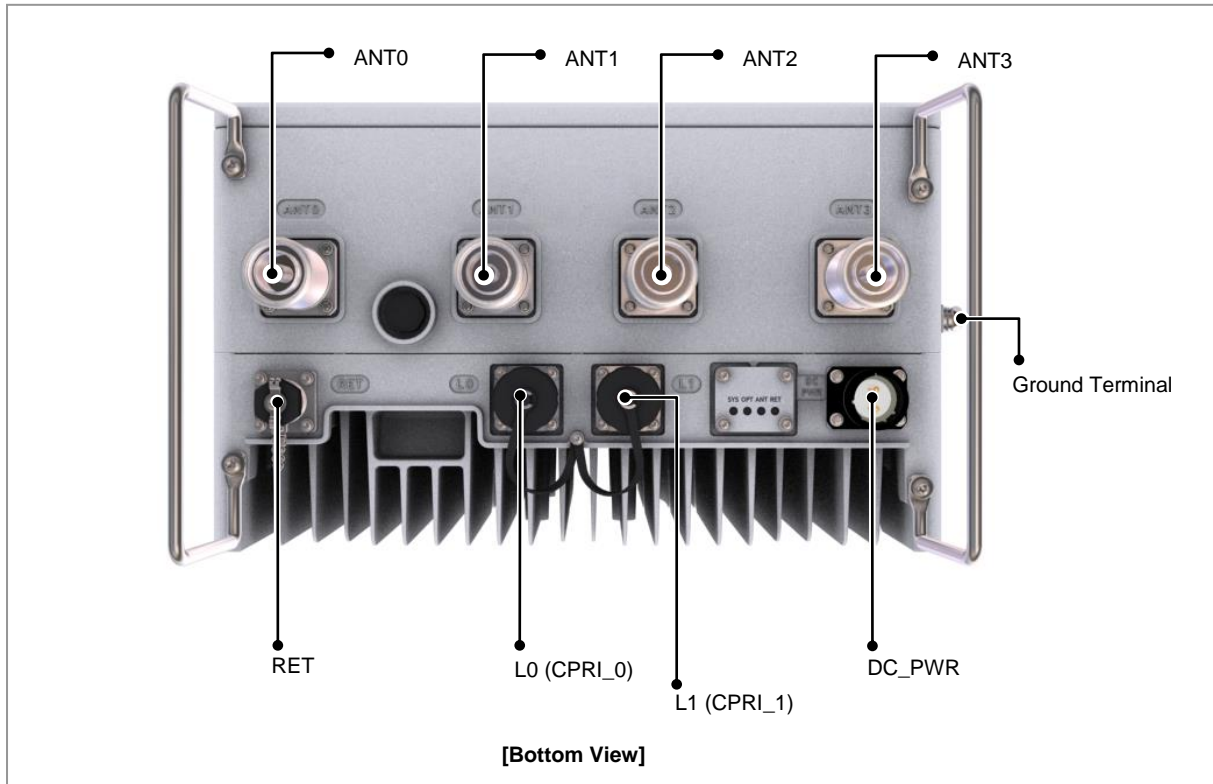
Figure 1. RRU Configuration



## RRU Interface

The interface structure of RRU is as follows:

Figure 2. RRU Interface



# Specifications

The table below lists the main specifications of the RFD01F-26A.

**Table 1. Specifications**

Item	RRU
Air technology	FDD LTE
Operating Frequency	<ul style="list-style-type: none"> <li>• DL: 862~869MHz (7 MHz)</li> <li>• UL: 817~824 MHz(7MHz)</li> </ul>
Channel Bandwidth	1.23 MHz(CDMA), 3/5 MHz (LTE, Scalable BW)
RF Power per sector	40 W × 2 T
CDU-RU interface	CPRI (2.5 Gbps optic 2 ports, 20 km)
Input Voltage	-48 V DC (-38 ~ -57V DC)
Dimension (in./mm)	12.60/320(W) × 7.68/195(D) × 12.60/320(H)
Weight	Under 22 kg
Operating Temperature (Ambient)	-40°C ~ 55°C
Operating Humidity	5~100 %RH.
Ingress Protection Rating	IP65
Salt Fog / Salt Spray	Telcordia GR-487-CORE, Section 3.38.1
Seismic Specification	<ul style="list-style-type: none"> <li>• Telcordia GR-63-CORE,</li> <li>• Earthquake (Zone 4) (Section 4.4.1)</li> <li>• Office Vibration (Section 4.4.4)</li> <li>• Transportation Vibration (Section 4.4.5)</li> </ul>
Wind Resistance	Telcordia GR-487-CORE, Section 3.34
EMC	FCC Title 47 CFR Part 15
Surge Protection	<ul style="list-style-type: none"> <li>• DC : ± 20kA (Line to Line, Line to PE)</li> <li>• RET : ± 3kA (All core to PE)</li> <li>• ANT : ± 20kA (Core to PE)</li> </ul>
ESD	Contact Discharge : ± 8kV Air Discharge : ± 15kV
Safety	UL 60950-1 2nd Ed.
RF	FCC Title 47 CFR Part 90
Health	OET Bulletin 65

## Cautions for Installation

Observe the following safety instructions when installing the system:

Installation shall be in accordance with the applicable local electric codes.

The equipment shall be located in restricted access locations.

## Before Installing

- Post warning signs in areas where high-voltage cables are installed.
- Post 'off limit' signs in areas where accidents are most expected.
- With guardrails or fences, block open areas such as connecting parts, roof, and scaffold.

## While Installing

- The system power must be cut off before installing.
- Be careful not to damage or scratch the boards mounted on the system and the cables among the boards when the system is transported or installed.



Make sure the power switch of power supply is off when installing the system. Installing the system with power switch on may cause system damage or fatal human injury when cables are not correctly connected.



Make sure that worker wears protection gloves and goggles to prevent damage from debris while drilling holes in a wall or ceiling.



Do not wear accessories such as watches and rings in order to prevent electrical shock.

---



Never allow foreign substances to be inserted into unused ports by covering them with a waterproof cap.



To prevent foreign substances, outdoor air and moisture from entering the cable inlet (including cable gland and conduit), finish it as follows:

- Unused inlet

Use the hole finishing materials including dust cap and rubber packing.

- Cable-installed inlet

After cable installation, block any space in the inlet with tape, compressed sponge, rubber packing, and silicon.

---

## After Installing

Remove any debris produced during the work and clean up the installation site.



In the system, the laser beam light runs through the optical cable. Handle the optical cables with care as the laser beam can seriously damage the worker's eyes.



Make sure that worker does not damage installed cables while cleaning the system.








While cleaning the power supply device, take caution that the device does not come in contact with foreign objects that may cause power failure.













## Installation Tools













The basic tools for installation are listed in the table below. The additional tools required for each site need to be identified and prepared during a site survey before starting installation.




**Table 2. Basic Installation Tools**

No.	Name	Specification	Purpose of use
1	Torque Driver 	Apply a torque range : 10~50 lbf.in.	For fastening M6 Screw fixing
2	Screw Driver Bit 	'+', No. 1	For fastening Power Connector
		'+', No. 3	For fastening M6 Screw fixing
3	Screw Driver 	'+', No. 1	For fastening Power Connector
		'+', No. 3	For fastening M6 Screw fixing
4	Torque Wrench 	Apply a torque range : 10~50 lbf.in.(30~150 kgf-cm)	For fastening M6 Hex. Bolt
		Apply a torque range : 100~400 lbf.in (100~500 kgf-cm)	For fastening M10 Hex. Bolt/Nut For fastening DIN Type Connector
5	Adjustable Torque Wrench 	Apply a torque range : 10~50 lbf.in.(30~150 kgf-cm)	For fastening Optic Cable Adapter
6	Torque Wrench Spanner Head	Hexagon Head: 0.39 in.(10 mm)	For fastening M6 Hex. Bolt



No.	Name	Specification	Purpose of use
		(for 30~150 kgf-cm) Hexagon Head: 0.66 in.(17 mm) (for 100~500 kgf-cm) Hexagon Head: 1.25 in.(32 mm) (for 100~500 kgf-cm)	For fastening M10 Hex. Bolt/Nut For fastening DIN Type Connector
7	Adjustable Spanner 	Hexagon Head: 2.04 in.(52mm)	For fastening Optic Cable Adapter
8	Spanner 	0.39 in.(10 mm), 0.66 in. (17 mm), 1.25 in.(32 mm)	For fastening Hex. Bolt For fastening DIN Type Connector
9	Tape Measure 	16.40ft/ 164.04ft (5 m/50 m)	Tape measure for length measurement
10	Level 	Normal	For horizontality and verticality
11	Power Extension Cable 	30 m	For Power Extension
12	Hammer Drill 	Normal	Wall Type Drilling
13	Optic Connector Cleaner 	For LC Connector	For Optic Connector Cleaning
14	LAN Tool 	Basic Tool	RJ45 Crimper
15	Concrete Drill Bit 	0.55 in.(14 mm)	For M10 Set Anchor Bolt
16	Anchor Punch 	M10	For M10 Set Anchor Bolt
17	Hammer 	Normal	Anchor fixing
18	Vacuum Cleaner	Normal	For removing dust during the drilling work

No.	Name	Specification	Purpose of use
			
19	Cable Cutter 	0.23~1.25 in.(6~32 mm)	Cable cutting
20	Crimping Tool 	1.5~16 mm <sup>2</sup>	Pressure terminal for crimping
21	Ratchet Wrench 	10 × 13/17 × 19(4 in 1)	For fastening Hex. Bolt
22	Cable Stripper 	Apply cable thickness: 0.15~0.62 in. (4~16 mm)	Cable sheath for removal
23	Nipper 	Basic Tool	For cutting cable & cable tie
24	Industrial Scissor 	Normal	Cutting
25	Knife 	Normal	Cutting
26	Heating Gun 	50~300°C	Shrinking Heat Shrink Tube
27	Multi tester 	Digital Pocket Tester	The voltage and current measurements Whether measured cable disconnection
28	Angle Meter 	Normal	Antenna angle measurement
29	Multi master(VSWR & RF Power) 	Normal	Feeder VSWR measurement
30	Fiber Optic Test Set	Wave length: 1270 nm, 1310 nm, 1550	Optical level check

No.	Name	Specification	Purpose of use
		nm(single mode) 850 nm, 1310 nm(multi mode)	
32	Jig Tool 	Normal	Separate the Optical Module
33	Compass 	Normal	Check azimuth during installation



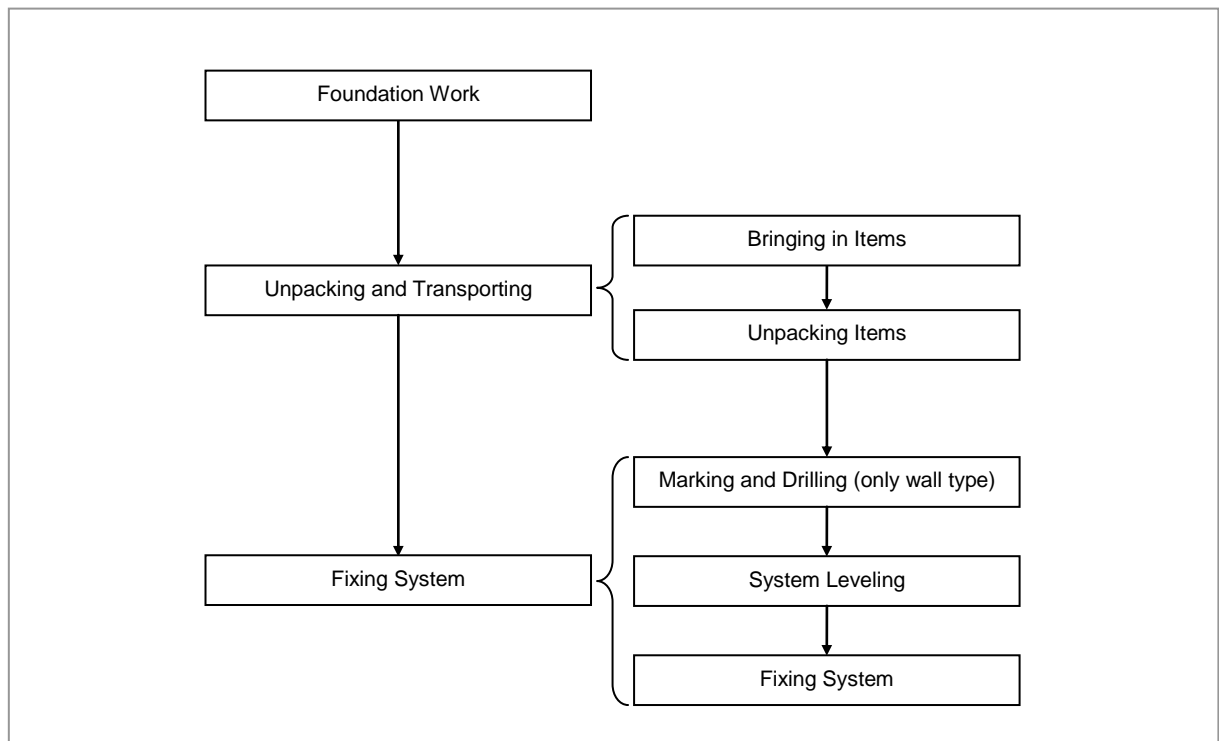
The required installation tools may vary depending on the conditions at the site. In addition to the basic tools, a protractor, GPS receiver, ladder, safety equipment, cleaning tools, and so on should also be prepared in consideration of the site conditions.

# Chapter 2 Installing System

## Installation Procedure

The procedure to install the RRU is as follows:

Figure 3. Procedure to Install the RRU



Make sure that the power switch of the power supply is OFF when installing the system. Installing the system with the power switch ON may cause system damage or fatal human injury when connecting or disconnecting the cables.



To prevent the risk of electrical shock do not wear accessories such as watches and rings.

# System Arrangement

A minimum distance must be secured around the RRU, in each direction for installation and maintenance.

**Figure 4. RRU\_Wall Type Standard Installation**

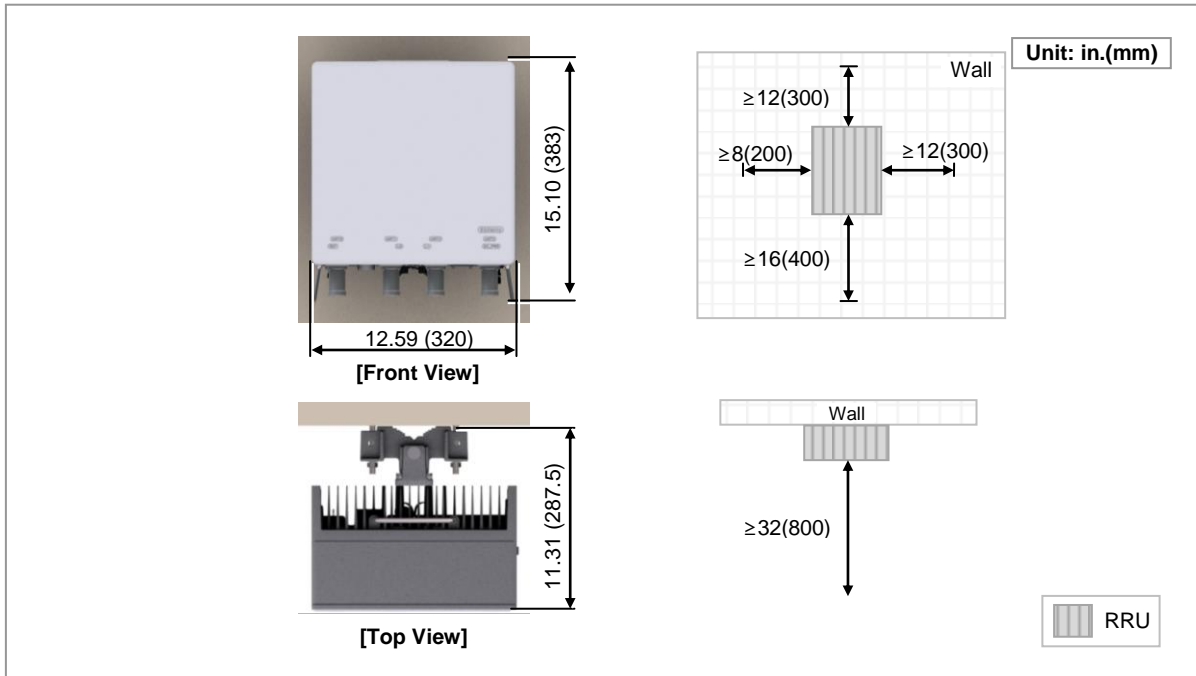
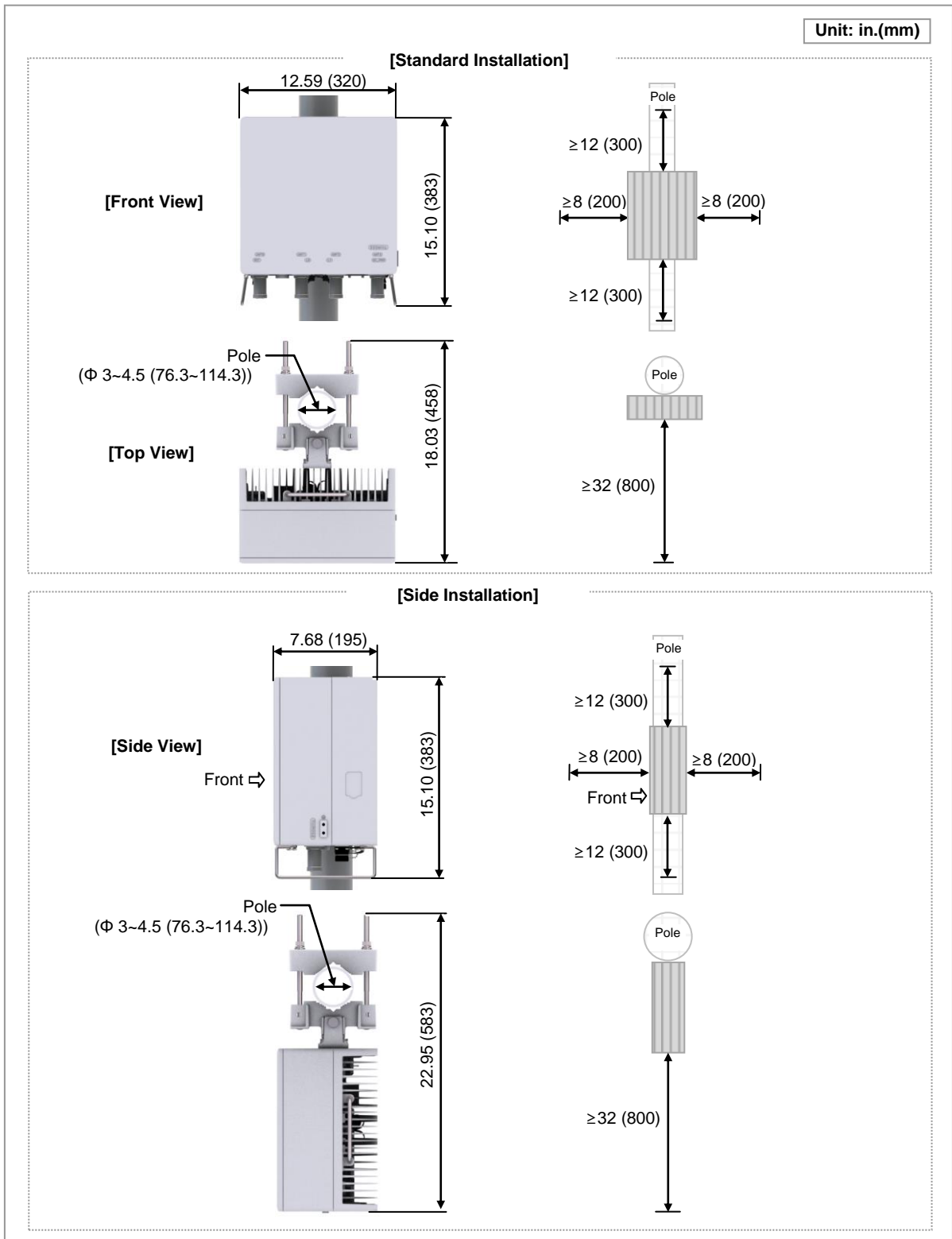


Figure 5. RRU Arrangement\_Pole Type Installation



# Unpacking and Transporting

This paragraph describes the work to unpack cabinets and other components and transport them to the place to be installed.

## Bringing in Items

Bring in items, taking care of the followings:

- When carrying a system, fasten the system firmly to the transport vehicle or carrier to prevent a damage to the system for a vibration or shock.
- When carrying system, use a lift to prevent accidents. However, if the system must be carried by people, enough people are required to carry the system.
- Before moving the system, check the storage place for the system and remove obstacles in advance.
- While moving system, the system should not be shocked physically and damaged caused by dust, moisture, and static electricity.

## Unpacking Items

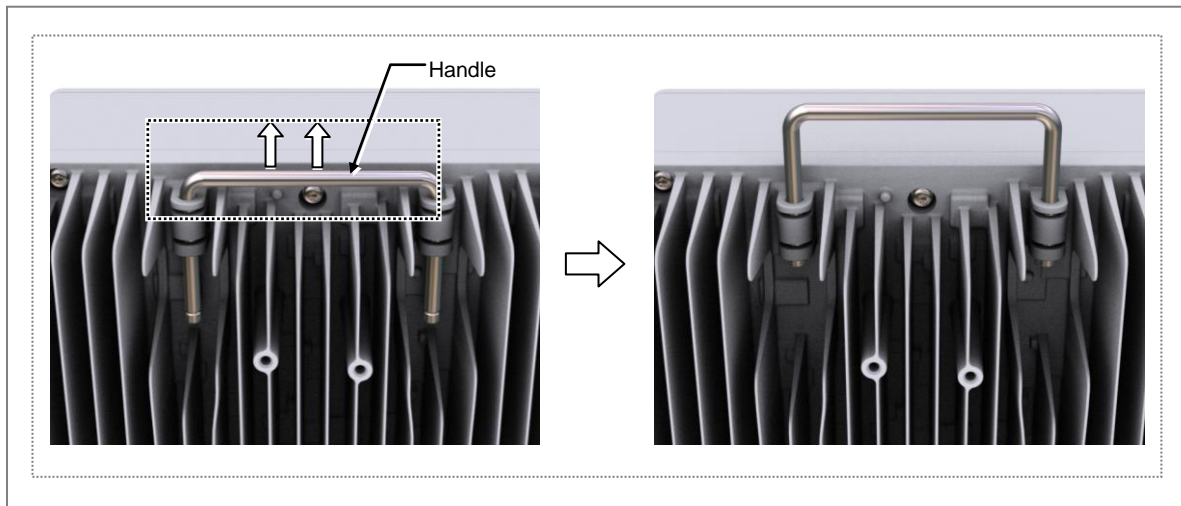
The procedure to unpack items is as follows:

- The packing items must be packed until they reach the installation place.
- The items are classified in accordance with each job specification and stored on a place that does not interfere with working.
- Unpacked systems must be installed immediately. If not installed immediately, the systems must be stored in the installation place temporarily.
- Unpack only external packing, leaving the internal packing in unpacked status.
- Unpack the inner packaging after each system is placed on its installation location.
- Scrap by-products (packaging waste) in accordance with the rule. Do not recycle the by-products.

## RRU Handling

When transporting an RRU, hold a handle at the top of the RRU. (No tool is needed for using the handle.)

*Figure 6. Using a Handle to transport an RRU*





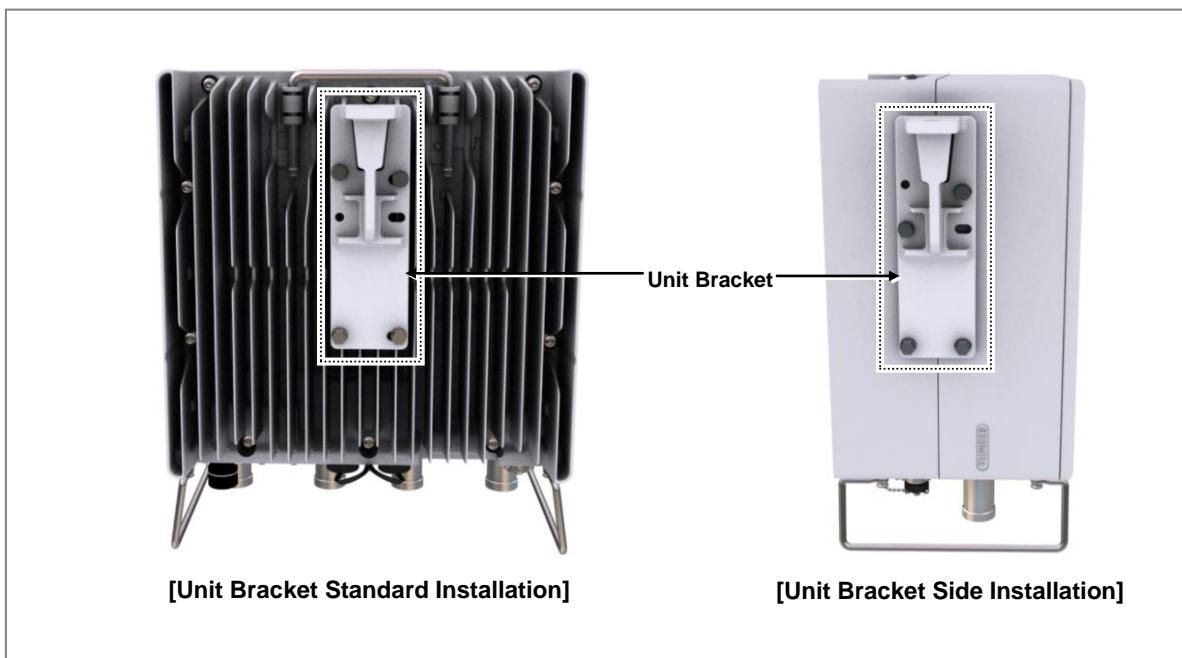
# Fixing RRU

## Fixing Unit Bracket

There are two ways to fix a unit bracket to the RRU. One is fixing a unit mounting bracket to the rear side of RRU (Standard installation). The other is fixing a unit bracket to the side of RRU (Side installation).

These are the same for the wall type and pole type installation procedures.

*Figure 7. Unit Bracket Fixing Type*



▶ To fix Unit Bracket (Standard Installation)

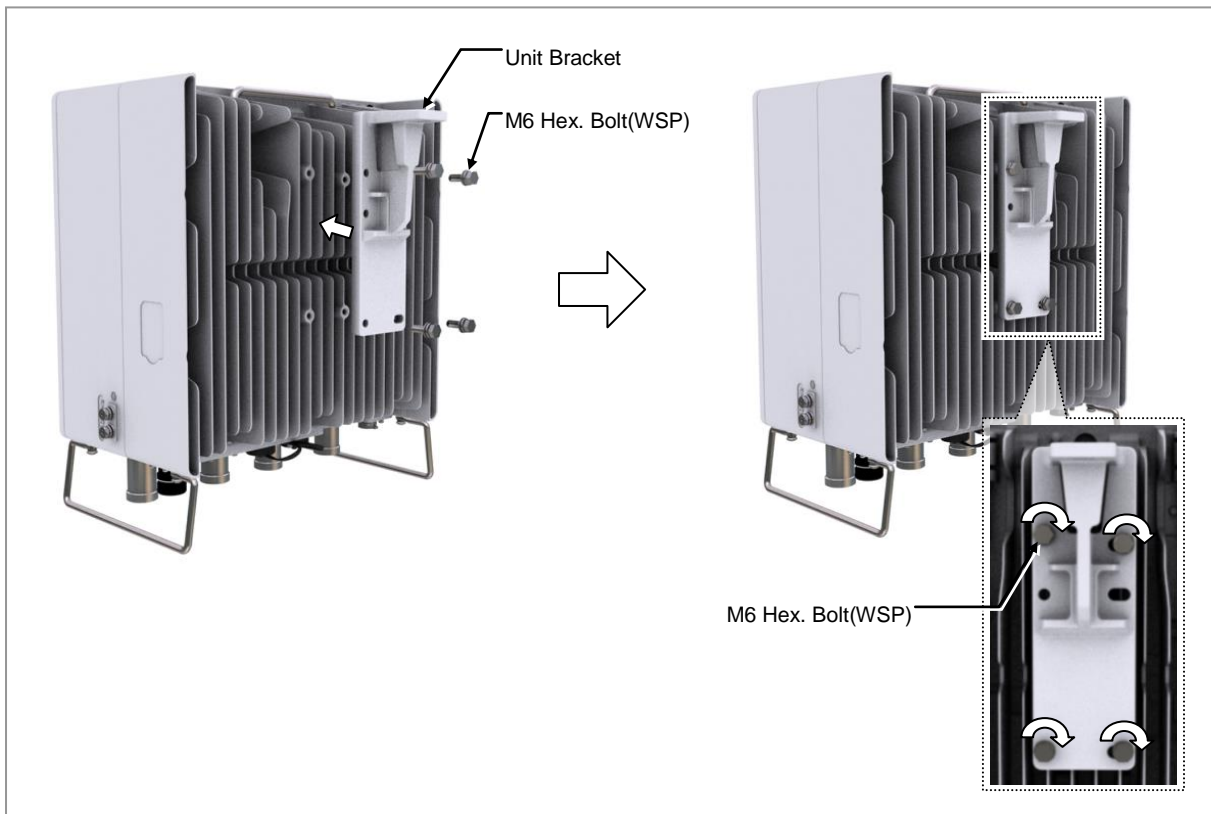
**1** Make sure you have the following items:

**Table 3. Parts a Tools for fixing Unit Bracket (Standard Installation)**

Category	Description	
Parts	Unit bracket	1 EA
	Fasteners	M6 × 20L Hex. Bolt(WSP) 4 EA/RRU
Recommended Torque Value	M6 × 20L Hex. Bolt	43 lbf-in
Working Tools	Torque Wrench(10~50 lbf-in), Spanner Head(Hexagon Head: 0.39 in.(10 mm)), Screw Driver(+, No.2)	

**2** Place a unit bracket to the RRU rear and fix it using fasteners.

**Figure 8. Unit Bracket Fixing (Standard Installation)**



▶ To fix Unit bracket (Side Installation)

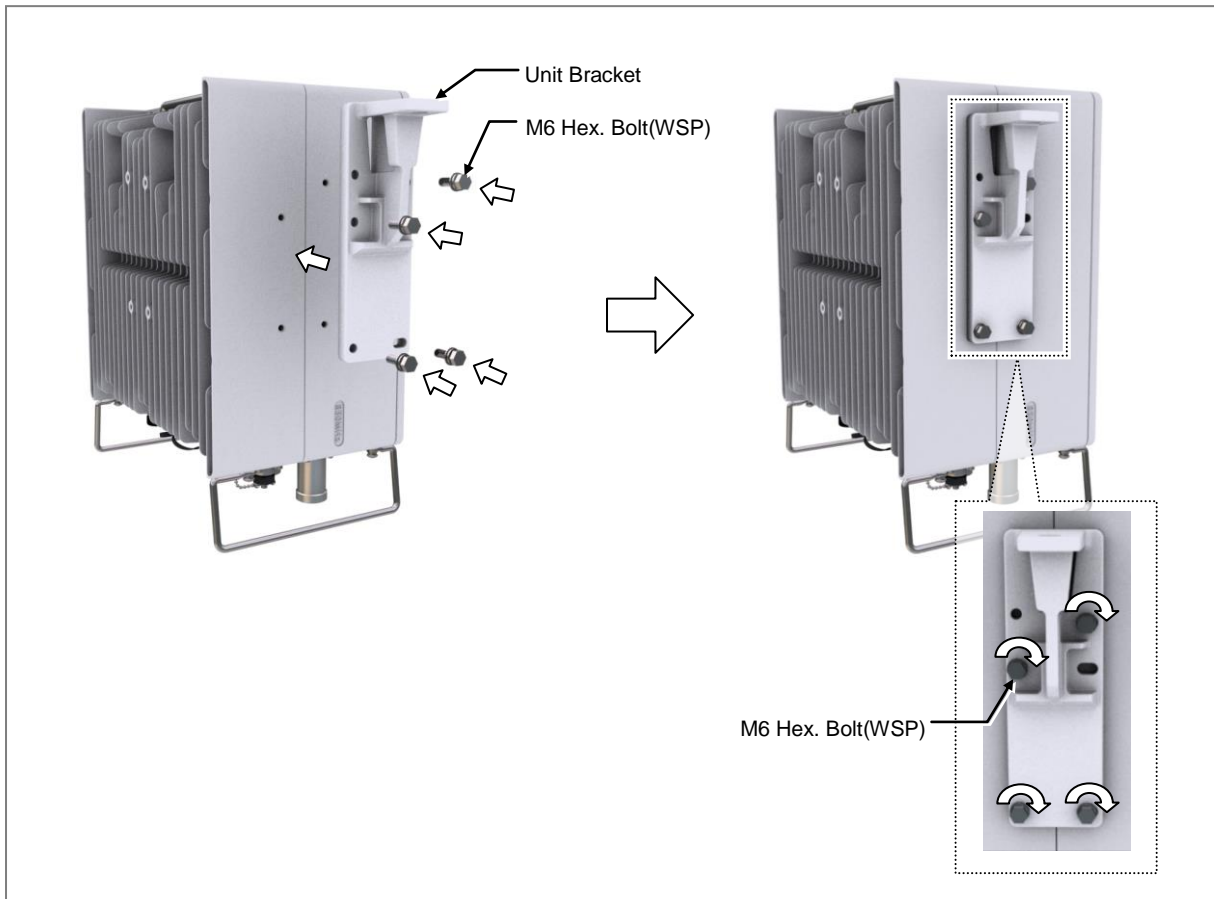
**1** Make sure you have the following items:

**Table 4. Parts a Tools for fixing Unit Bracket (Side Installation)**

Category	Description	
Parts	Unit bracket	1 EA
	Fasteners	M6 × 20L Hex. Bolt(WSP) 4 EA/RRU
Recommended Torque Value	M6 × 20L Hex. Bolt	43 lbf-in
Working Tools	Torque Wrench(10~50 lbf-in), Spanner Head(Hexagon Head: 0.39 in.(10 mm)), Screw Driver(+, No.2)	

**2** Place a unit bracket to the RRU side and fix it using fasteners.

**Figure 9. Unit Bracket Fixing (Side Installation)**



## Fixing Pole Type

▶ To fix Pole Mounting Bracket

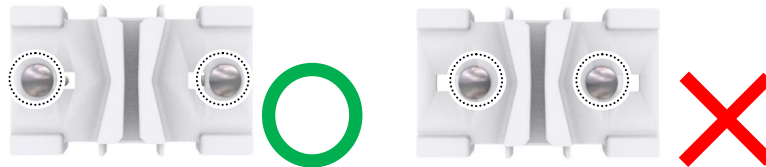
1 Make sure you have the following items:

**Table 5. Parts a Tools for fixing Pole Mounting Bracket**

Category	Description		
Parts	Mounting Bracket_Front		1 EA
	Mounting Bracket_Rear		1 EA
	Fasteners	M10 × 220L Carriage Bolt	2 EA
		M10 Plain Washer	2 EA
M10 Spring Washer		2 EA	
M10 Hex. Nut		2 EA	
Working Tools	Spanner(Hexagon: 0.66 in.(17 mm))		

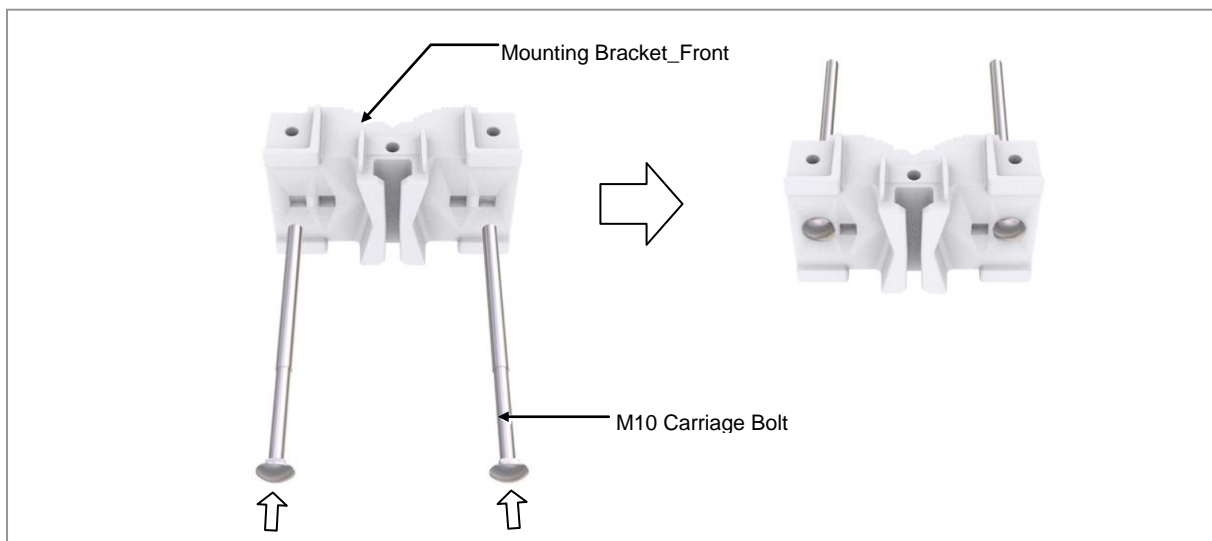


When fixing the pole mounting bracket, the specification of carriage bolt is M10 × 220L for the pole diameter from 3in. (76.3mm) to 4.5in. (114.3mm).



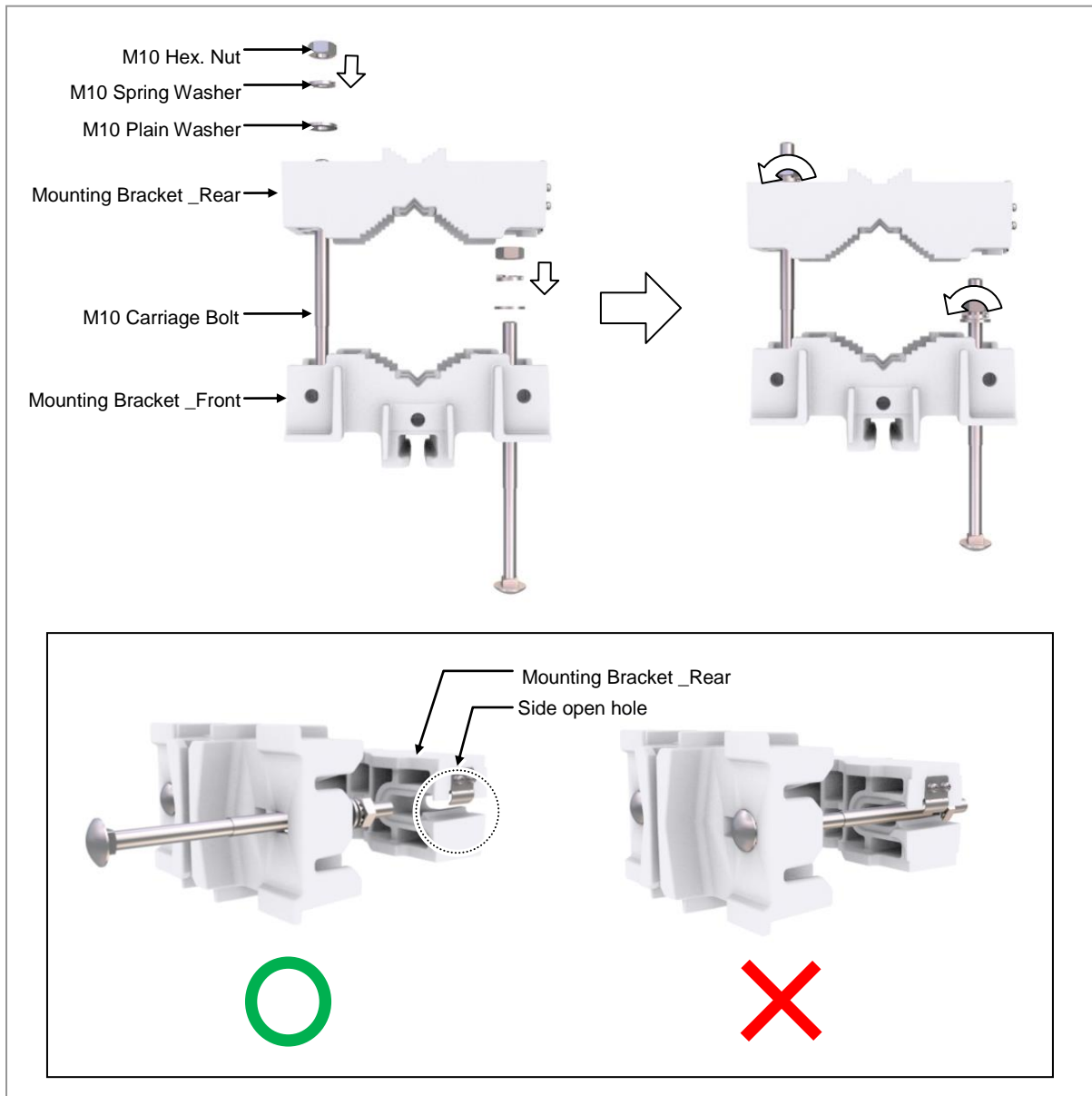
2 Insert carriage bolts to the Mounting bracket\_front.

**Figure 10. Assembling the Mounting Bracket\_Pole Type(1)**



- 3 Pass the carriage bolt through the side closed hole of the mounting bracket\_rear, fix the fastening material, and fasten the other carriage bolt to the mounting bracket\_front only.

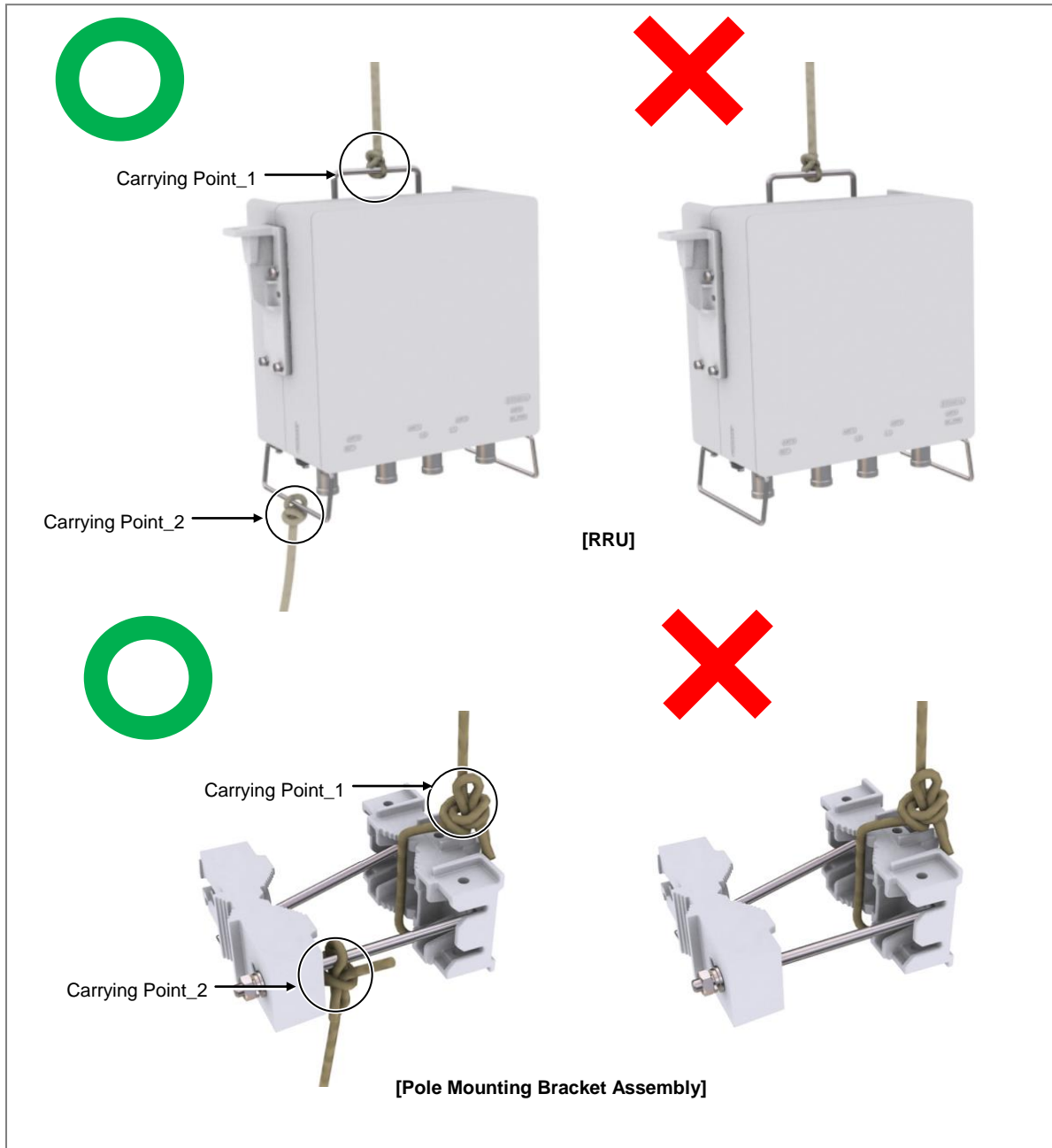
Figure 11. Assembling the Mounting Bracket\_Pole Type(2)



▶ To lift RRU/Pole Mounting Bracket Assembly\_Pole Type

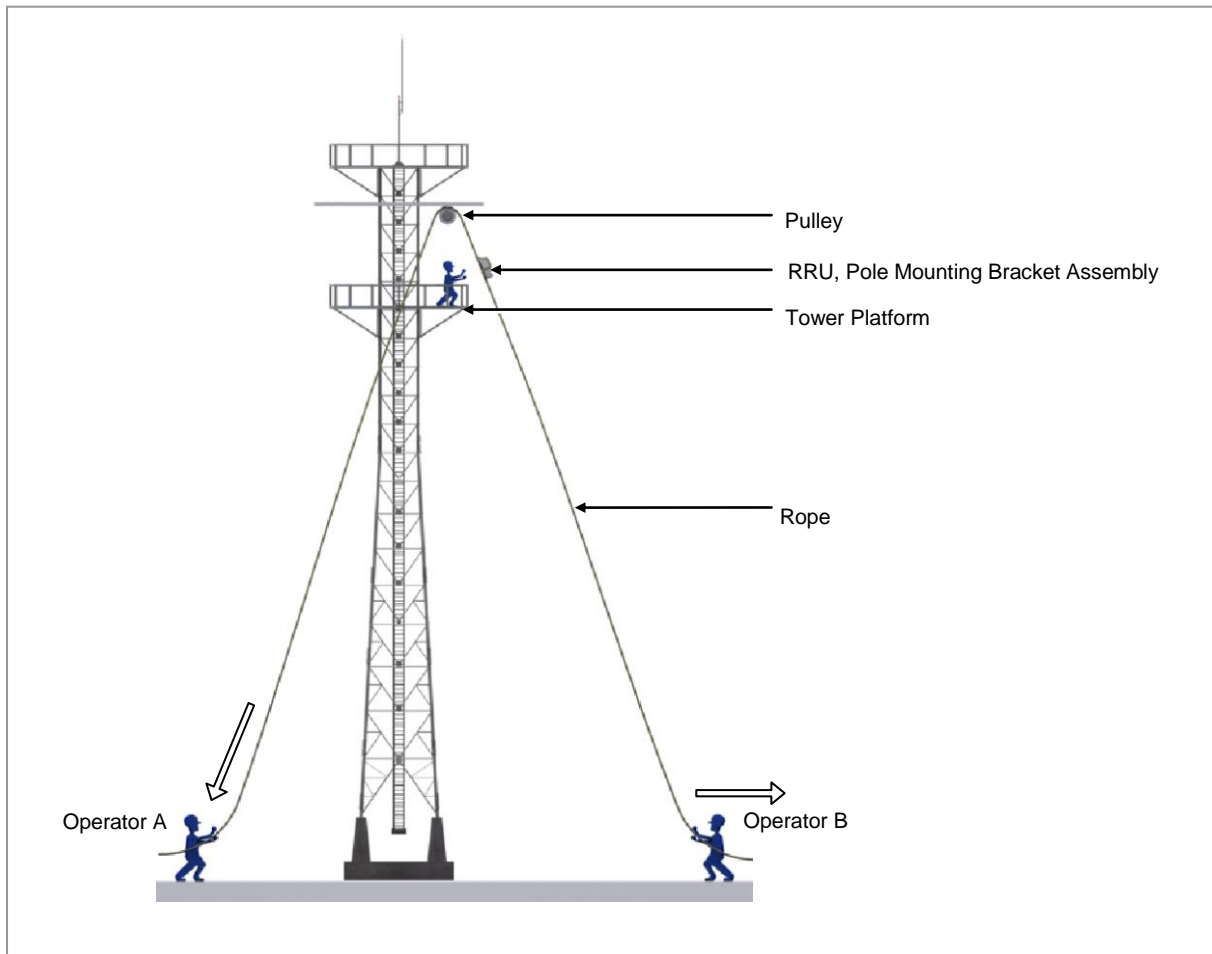
- 1 Tie the rope in two carrying points.

Figure 12. Lifting RRU & Pole Mounting Bracket Assembly\_Pole Type(1)



- 2 While Operator A hauls the rope to carry up the RRU/pole mounting bracket assembly, Operator B pulls the rope outward so that RRU/pole mounting bracket assembly would not hit the tower platform.

**Figure 13. Lifting RRU/Pole Mounting Bracket Assembly\_Pole Type(2)**



▶ To fix Pole mounting bracket assembly

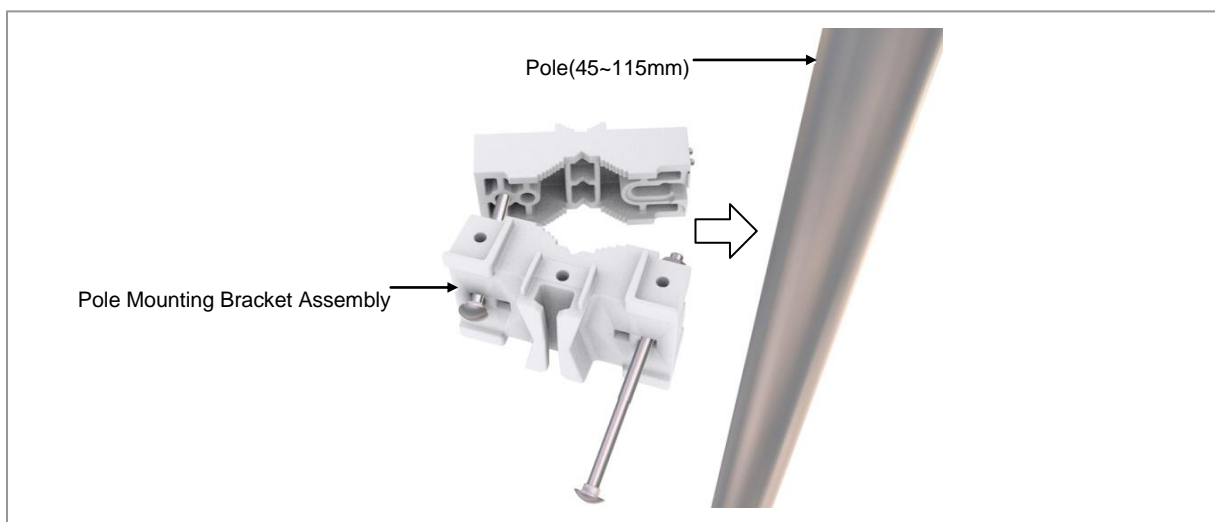
- 1 Make sure that you have the following items.

**Table 6. Parts a Tools for fixing Pole Mounting Bracket Assembly\_Pole Type**

Category	Description	
Parts	Pole Mounting Bracket Assembly	1 Set
Recommended Torque Value	M10 Hex. Nut	217 lbf-in
Working Tools	Torque Wrench(100~400 lbf-in), Spanner Head(Hexagon Head: 0.66 in.(17 mm)) Spanner (Hexagon Head: 0.66 in.(17 mm))	

- 2 Place the pole mounting bracket assembly on a pole.

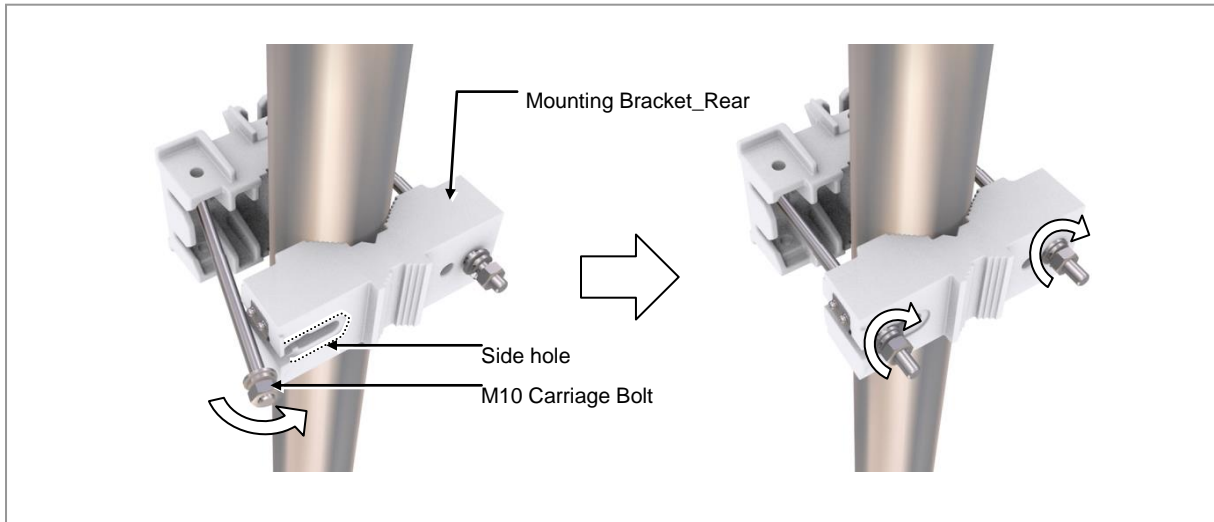
**Figure 14. Assembling the Mounting Bracket Assembly\_Pole Type(1)**







- 3 Locate the carriage bolt in the side open hole of the mounting bracket\_rear and fix the fastening materials on both sides.

Figure 15. Assembling the Mounting Bracket Assembly\_Pole Type(2)



- 4 Check the level of pole mounting bracket assembly on a pole and adjust the level.

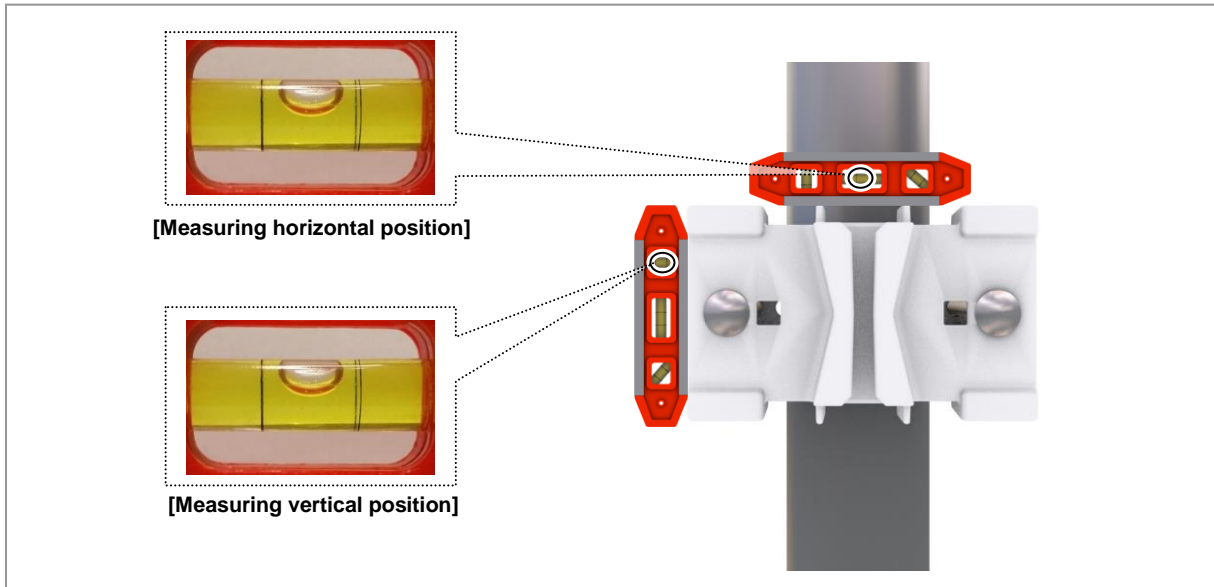
Table 7. Leveling Using a Level

Category	Description	
Test method	The level is measured based on the position of a bubble after attaching the spirit level to the top and side of the system.	
Evaluation criteria	<b>Good</b>	<b>Poor</b>
		
	If it is level, the bubble of the spirit level is positioned at the center of both lines.	
Corrective measures for poor leveling	Adjust the position of fasteners used to fix the Mounting bracket_front or its leveling status.	



When fixing the pole mounting bracket assembly on a pole, be sure to check the level of bracket. After finishing the installation, you can adjust the level minutely.

Figure 16. Leveling Pole Mounting Bracket Assembly



▶ To fix RRU\_Pole Type (Standard Installation)

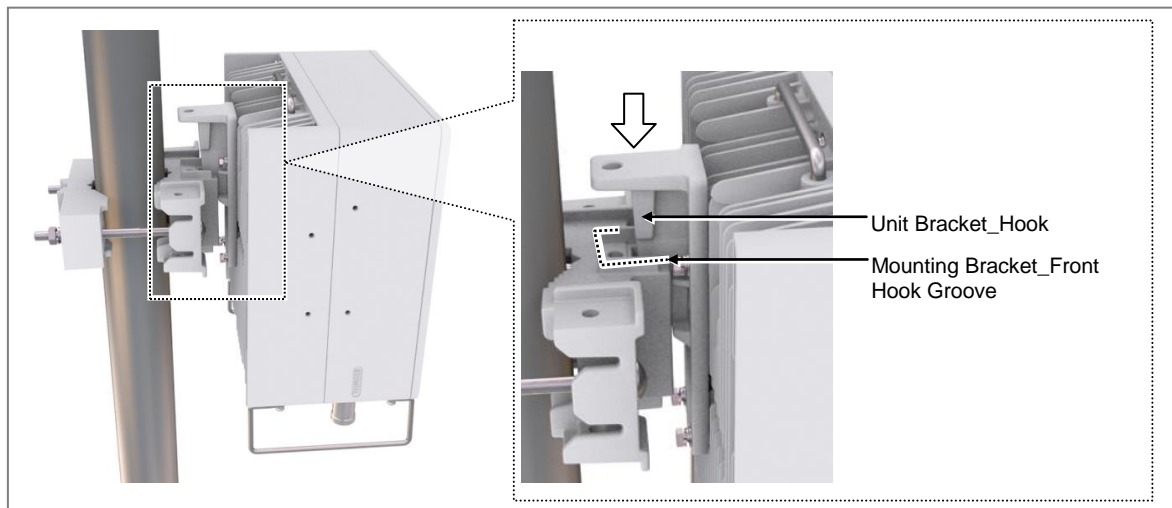
1 Make sure you have the following items:

**Table 8. Parts a Tools for fixing RRU\_Pole Type (Standard Installation)**

Category	Description	
Parts	M10 × 25L Hex. Bolt(WSP)	1 EA
Recommended Torque Value	M10 Hex. Bolt	217 lbf-in
Working Tools	Torque Wrench(100~400 lbf-in), Spanner Head(Hexagon Head: 0.66 in.(17 mm))	

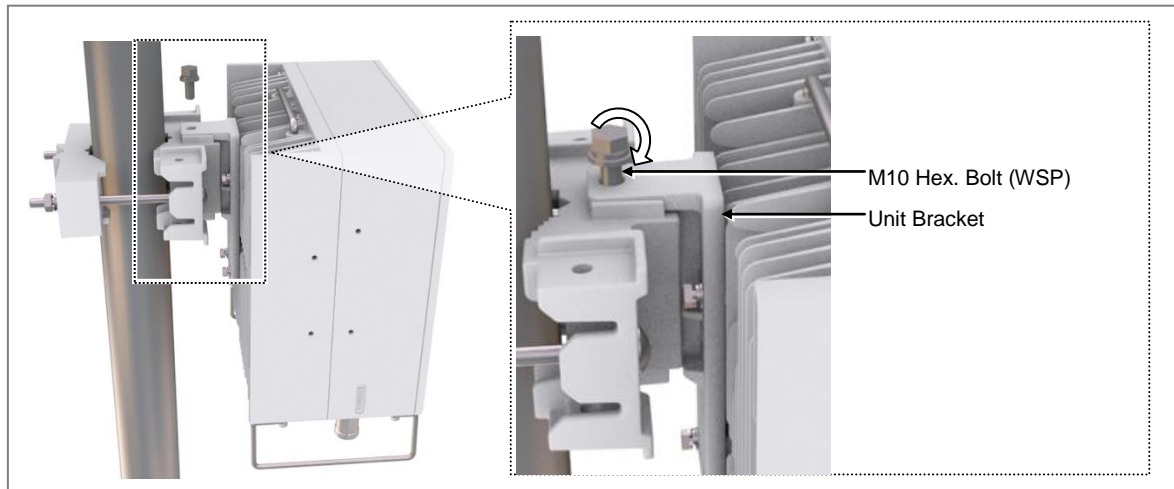
2 Hang the unit bracket\_hook of of RRU rear on the mounting bracket\_front hook's groove.

**Figure 17. RRU Fixing\_Pole Type (Standard Installation)**



3 Fix the RRU using fasteners.

Figure 18. RRU Fixing\_Pole Type (Standard Installation)



▶ To fix RRU\_Pole Type (Side Installation)

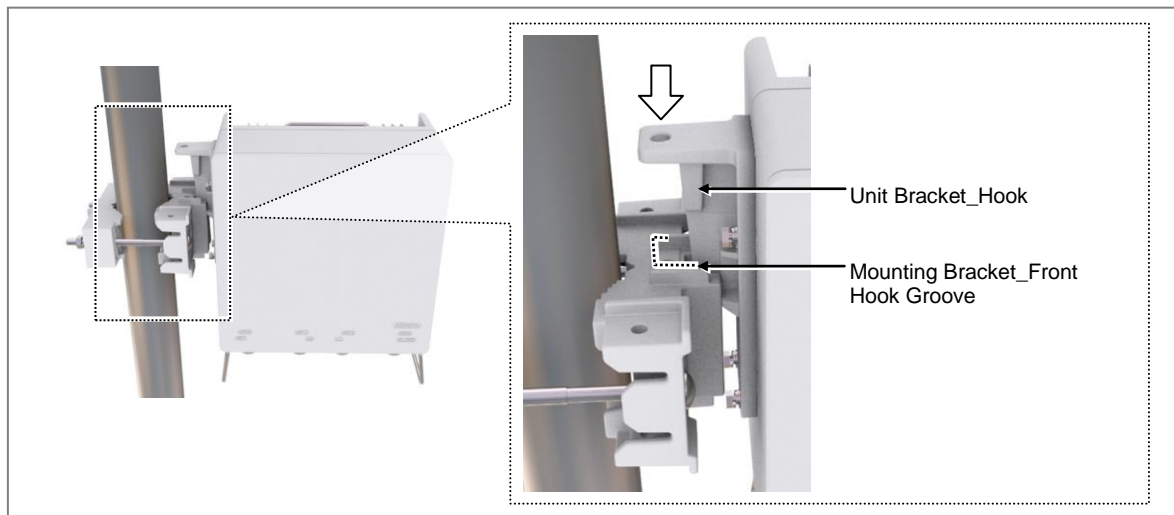
1 Make sure you have the following items:

**Table 9. Parts a Tools for fixing RRU\_Pole Type (Side Installation)**

Category	Description	
Parts	M10 × 25L Hex. Bolt(WSP)	1 EA
Recommended Torque Value	M10 Hex. Bolt	217 lbf-in
Working Tools	Torque Wrench(100~400 lbf-in), Spanner Head(Hexagon Head: 0.66 in.(17 mm))	

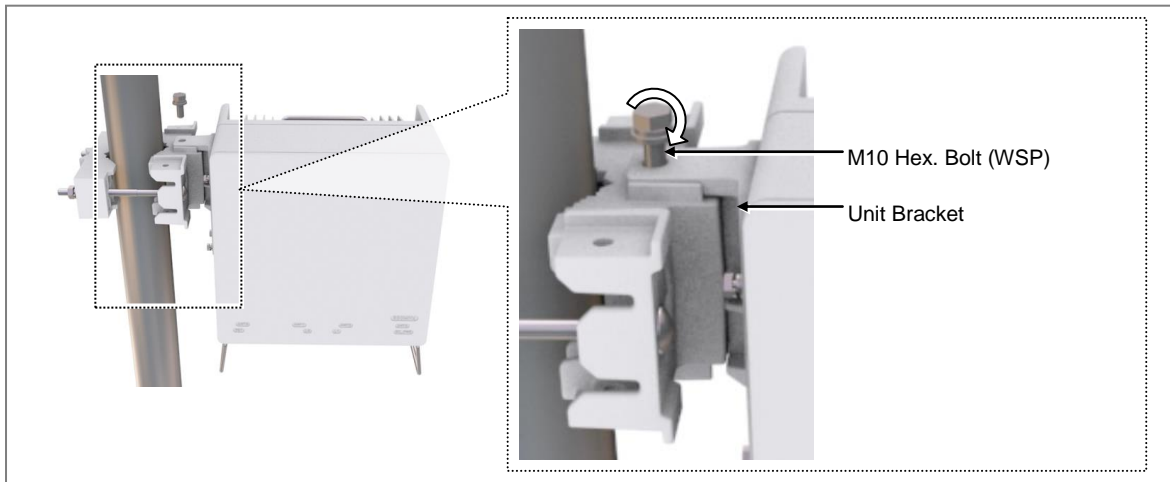
2 Hang the unit bracket\_hook of RRU side on the mounting bracket\_front hook's groove.

**Figure 19. RRU Fixing\_Pole Type (Side Installation)**




3 Fix the RRU using fasteners.

Figure 20. RRU Fixing\_Pole Type (Side Installation)



## Fixing Wall Type

### Marking and Drilling for Wall Mounting

 To mark on a wall

- 1 Make sure you have the following items:

**Table 10. Tools for Marking**

Category	Description
Working Tools	Tape Measure, Permanent Marker, Level



To mount the system on a wall, perform the leveling test by referring to System Leveling to check the positions are marked to be horizontal or vertical before drilling. If the result shows they are not horizontal or vertical, modify the marking positions.



When the position where the system will be placed is determined, place the system on that position and then mark the positions where anchor bolts will be fixed. This will reduce marking error range.

2 Check the location and anchor hole distance for fixing the system.

Figure 21. RRU dimensions for Wall Type (Standard Installation)

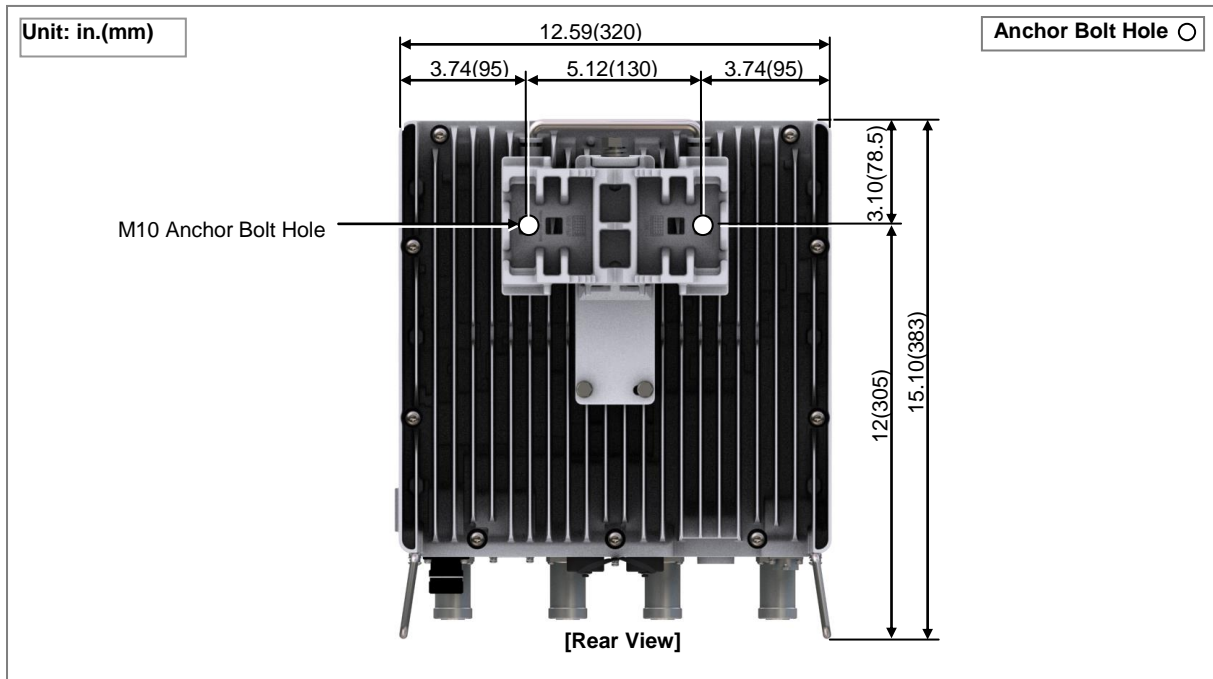
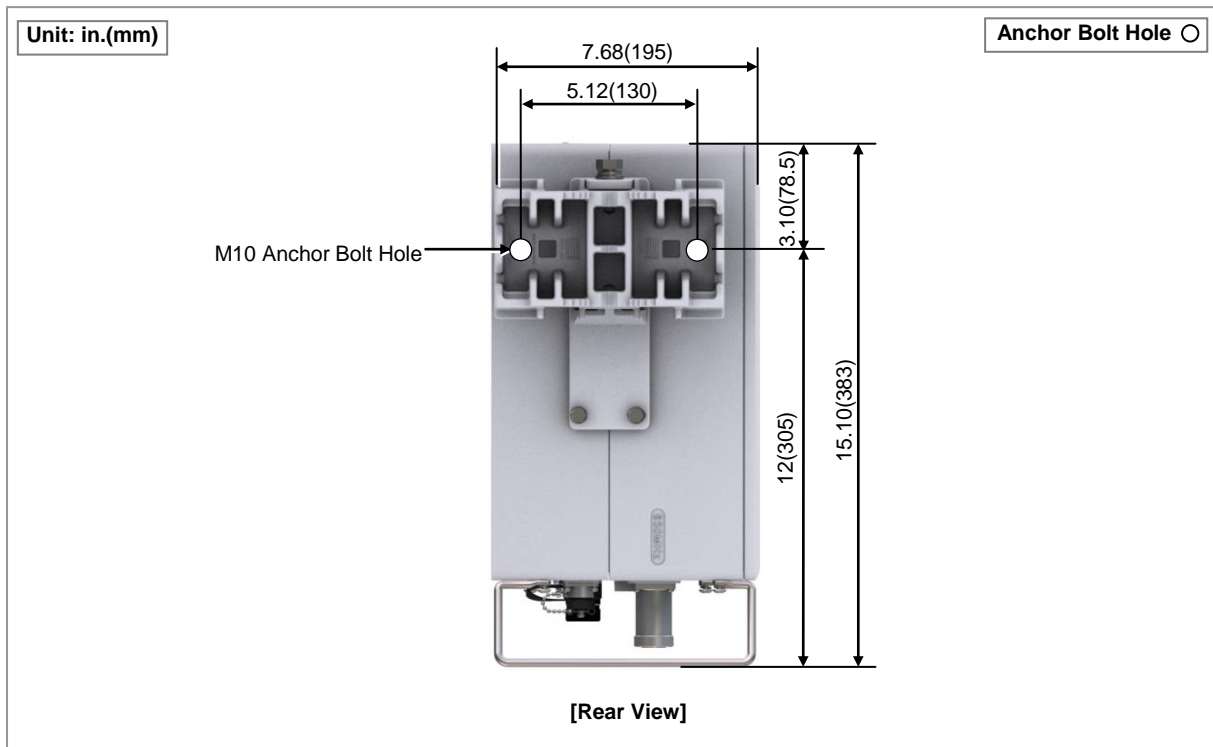


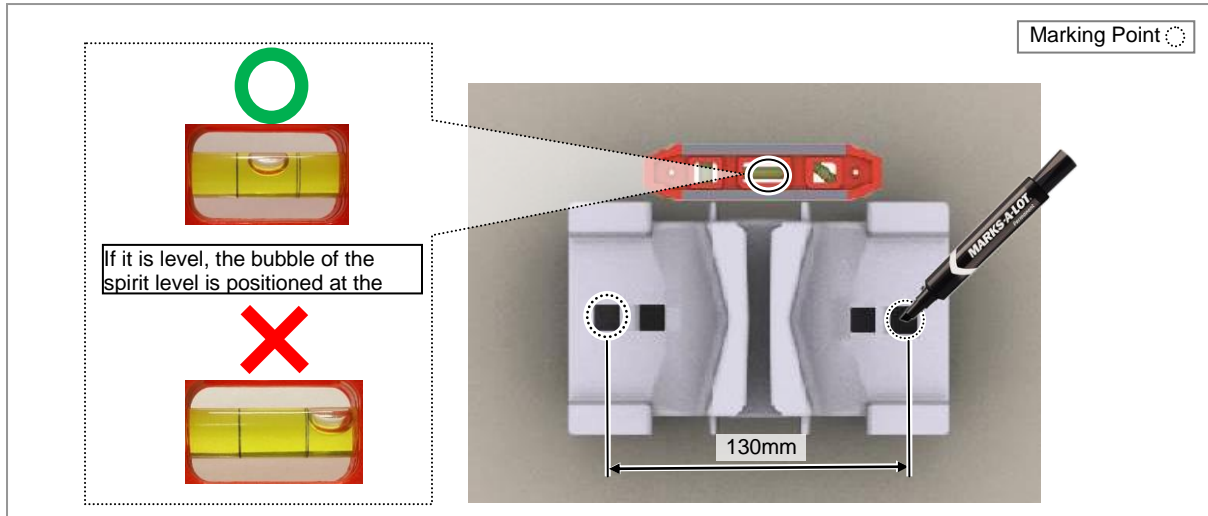
Figure 22. RRU dimensions for Wall Type (Side Installation)





- 3 Place a bracket assembly on the fixing location.
- 4 Check the level status using a level and adjust the level of bracket assembly.
- 5 Mark the anchor holes on a wall.

Figure 23. Example of Marking Use the Mounting bracket



- 6 Drill anchor holes at the marked locations on a wall.

▶ To drill anchor holes and fix anchors

1 Make sure that you have the following items:

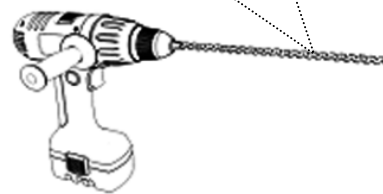
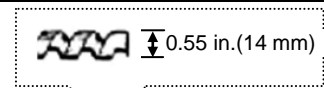
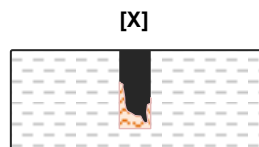
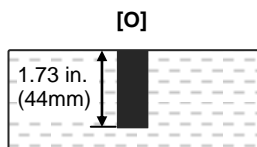
**Table 11. Parts and Tools for Drilling & Fixing Anchor**

Category	Description	
Parts	M10 Strong Anchor	2 EA
Working Tools	Hammer Drill, Concrete Drill Bit(0.55 in.(14 mm)), Vacuum Cleaner, Hammer, Anchor Punch(For M10 Set Anchor)	

**Table 12. Anchor Bolt Drill Bits and Hole Depth**

Category	Anchor Bolt	Drill Bits	Hole Depth
RRU (Wall Type)	M10	0.55 in.(14 mm)	1.73 in.(44 mm)

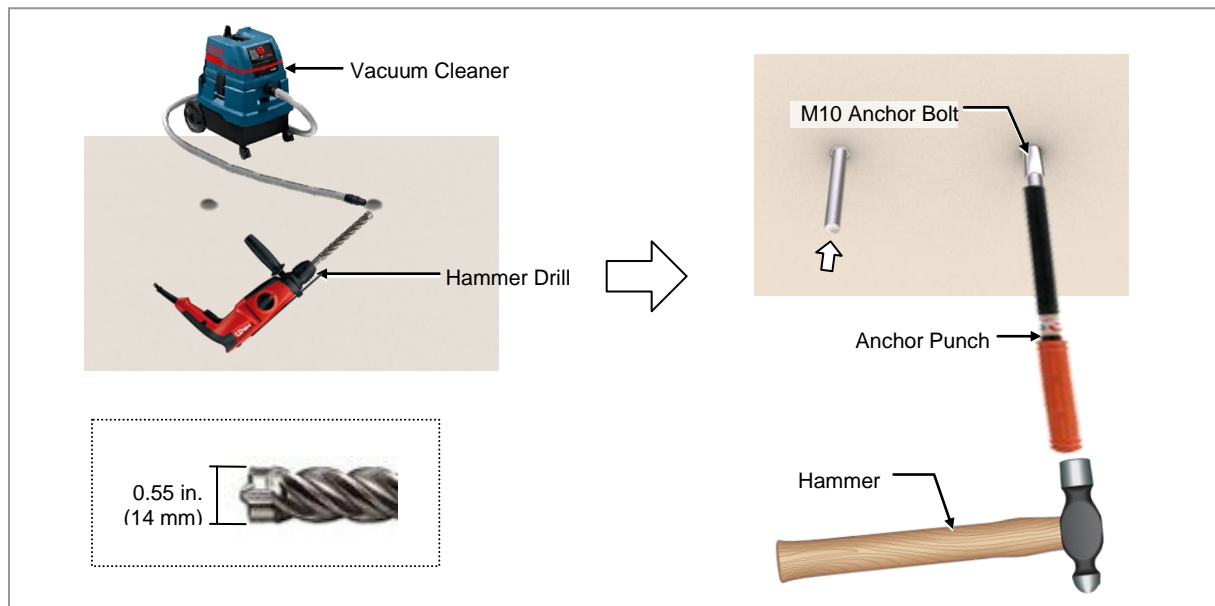
[Anchor Hole Cross Section]



\* Remove the debris from the drilled hole.

2 Drill anchor holes at marked points with removing dust from the holes using a cleaner.

**Figure 24. Drilling & Anchoring Example**



## Fixing Mounting Bracket\_Front

▶ To fix bracket assembly

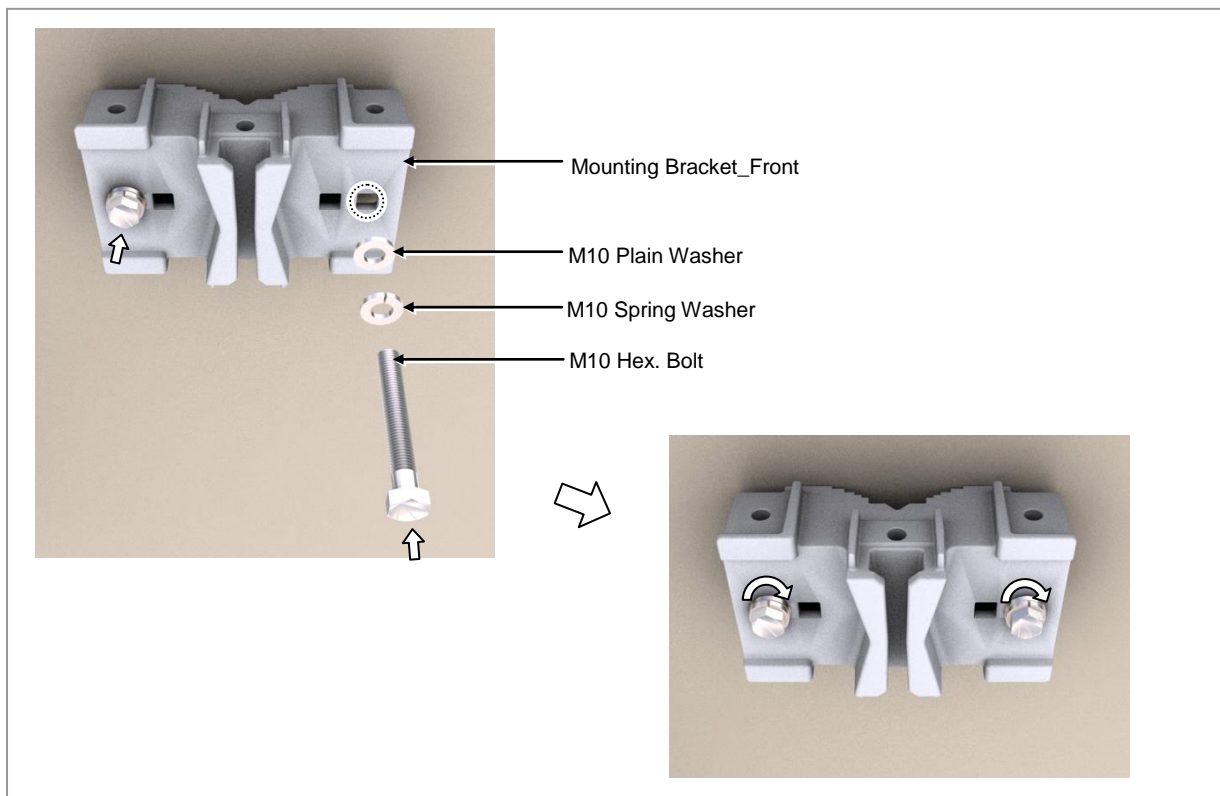
- 1 Make sure that you have the following items:

**Table 13. Parts and Tools for Fixing Bracket Assembly**

Category	Description		
Parts	Mounting Bracket_Front		1 EA
	Fastener	M10 Plain Washer	2 EA
		M10 Spring Washer	2 EA
	M10 x 70L Hex. Bolt	2 EA	
Recommended Torque Value	M10 Hex. Nut	217 lbf·in	
Working Tools	Torque Wrench(100~400 lbf·in), Spanner Head(Hexagon Head: 0.66 in.(17 mm)),Spanner (17 mm)		

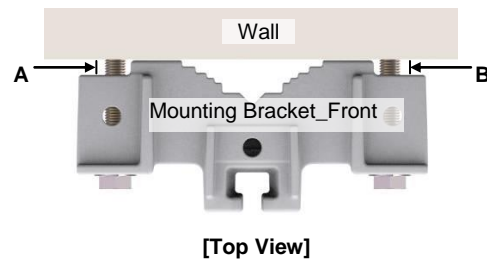
- 2 Place the mounting bracket\_front along with the fixed strong anchors.
- 3 Fix the mounting bracket\_front using fasteners.

**Figure 25. Fixing Mounting Bracket on a Wall**





When fixing the mounting bracket\_front on a wall, the clearances between the wall and left (A)/right (B) sides of mounting bracket\_front should be the same.



▶ Wall Type\_Standard Installation

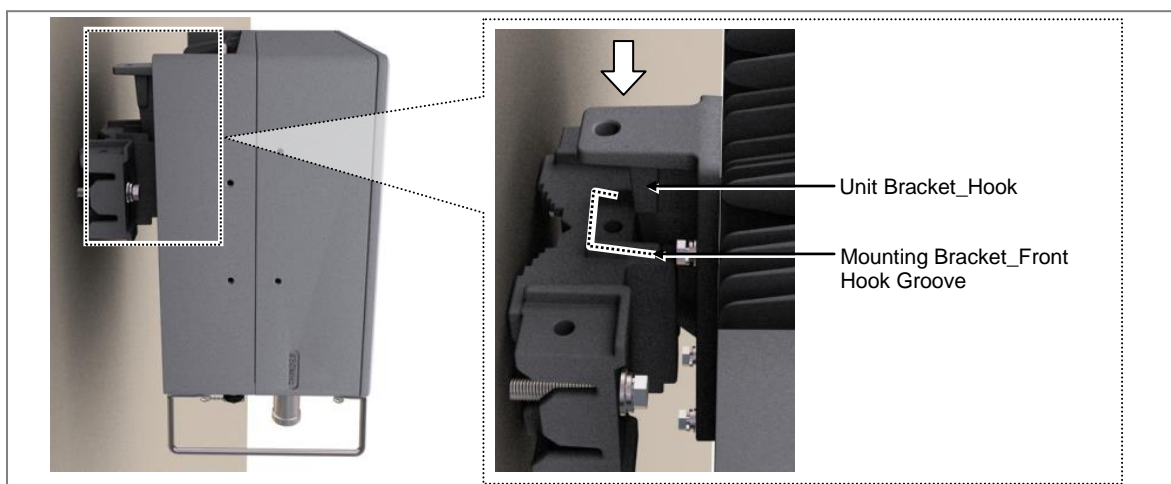
- 1 Make sure that you have the following items.

**Table 14. Parts a Tools for fixing RRU\_Wall Type Standard Installation**

Category	Description	
Fasteners	M10 × 25L Hex. Bolt(WSP)	1 EA
Recommended Torque Value	M10 Hex. Bolt	217 lbf·in
Working Tools	Torque Wrench(100~400 lbf·in), Spanner Head(Hexagon Head: 0.66 in.(17 mm))	

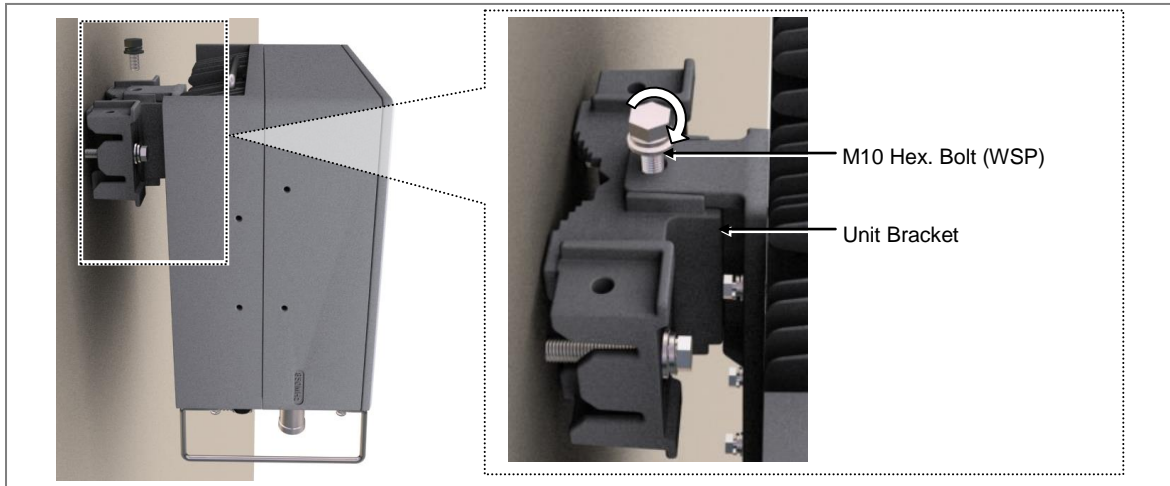
- 2 Hang the unit bracket\_hook of of RRU rear on the mounting bracket\_front hook's groove.

**Figure 26. RRU Fixing\_Wall Type Standard Installation(1)**



3 Fix the RRU using fasteners.

Figure 27. RRU Fixing\_Wall Type Standard Installation(2)



▶ Wall Type\_Side Installation

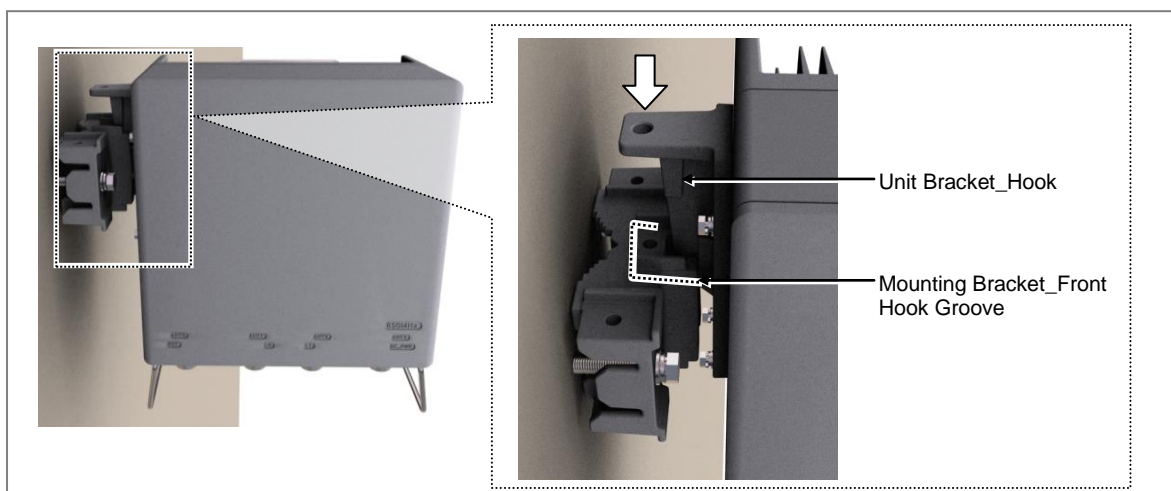
- 1 Make sure that you have the following items:

**Table 15. Parts and Tools for Fixing RRU 1Sector Standard\_Wall Type**

Category	Description	
Fasteners	M10 × 25L Hex. Bolt(WSP)	1 EA
Recommended Torque Value	M10 Hex. Bolt	217 lbf·in
Working Tools	Torque Wrench(100~400 lbf·in), Spanner Head(Hexagon Head: 0.66 in.(17 mm))	

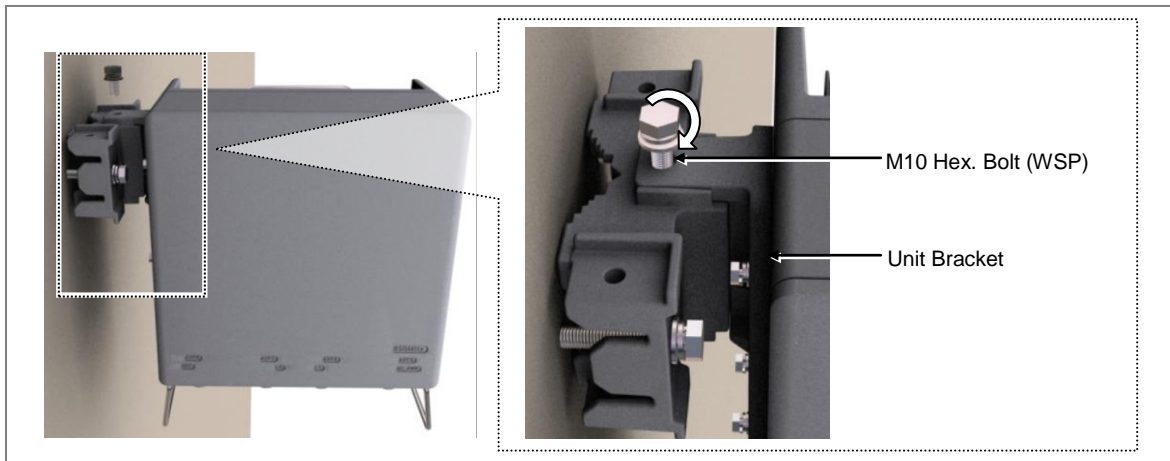
- 2 Hang the unit bracket\_hook of of RRU side on the mounting bracket\_front hook's groove.

**Figure 28. RRU Fixing\_Wall Type Side Installation(1)**



3 Fix the RRU using fasteners.

Figure 29. RRU Fixing\_Wall Type Side Installation(2)



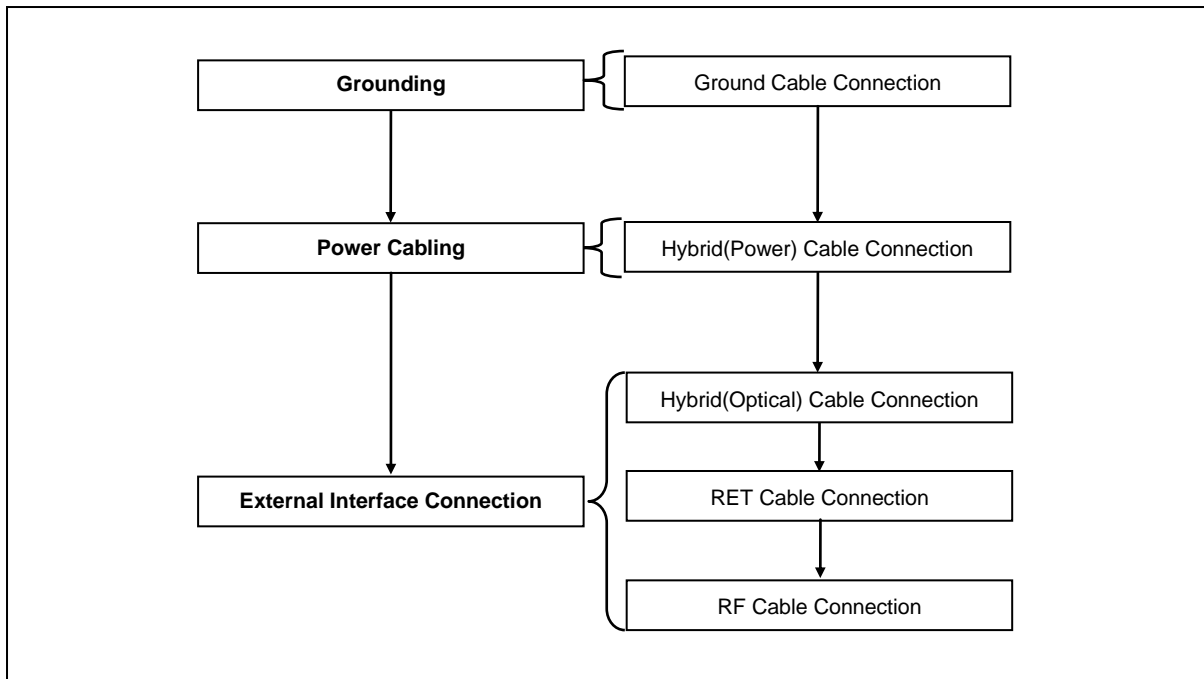


# Chapter 3 Connecting Cables

## Cabling Procedure

The procedure to connect system cables is as follows:

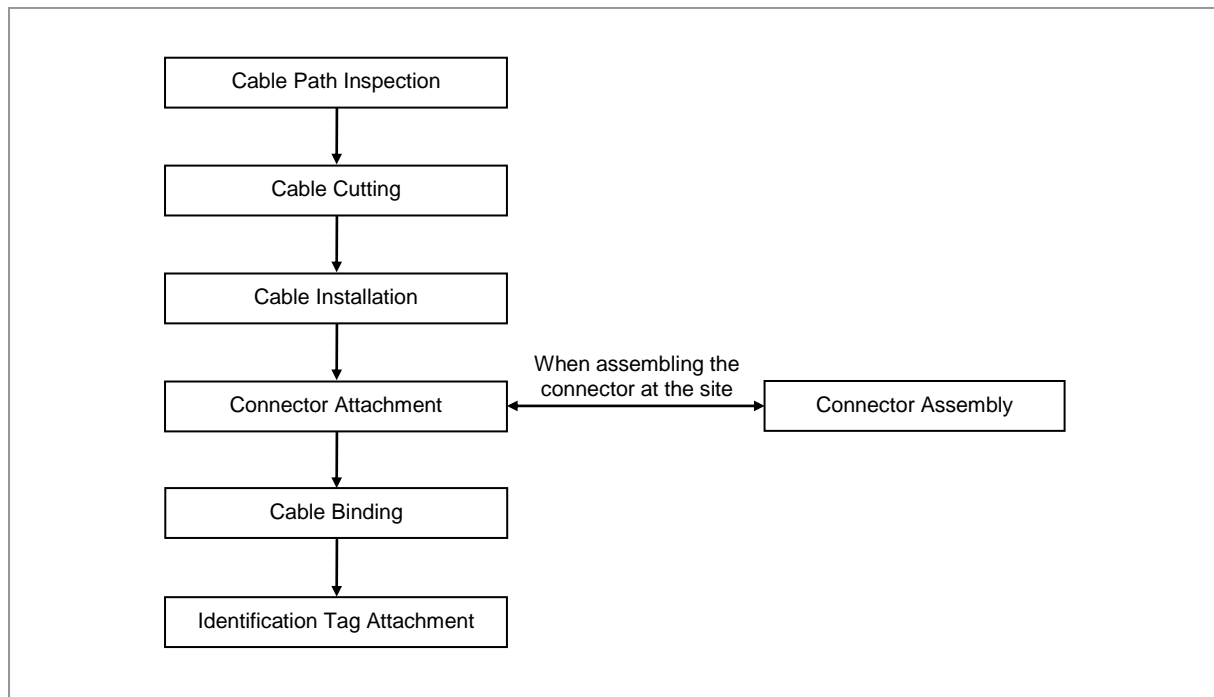
*Figure 30. Procedure to Connect System Cable*




# Guidelines for Cable Connections

The procedure for cable connections is as follows:

Figure 31. Cable Connection Procedure



 When cutting the cable after installation, make sure that the connector is disconnected. Installation of the cable with the connector connected to the system may cause contact failure or damage to the connector assembled to the system and the cable due to cable tension or the operator's mistakes.



The sequence of cable cutting and installation of the cable workflow can be changed depending on the field situation such as 'cutting after installing' or 'installing after cutting'.

## Cable Path Inspection

When installing a cable that connects between the rectifier, Main Ground Bar (MGB), and backhaul device, and so on within the system, the cable path, length and the cable installation method, and so on must be inspected.

Follow these guidelines when inspecting the cabling path.

- A minimum cable length must be selected provided that it does not affect the cable installation and maintenance.

- The cable must be placed in a location where it will not be damaged by external factors (power line, flooding, footpaths, and so on).
- In areas where the cable may be damaged by external factors, ensure that measures are taken to prevent damage to the cable (cable tray, ducts, flexible pipe, and so on).

## Cable Cutting

Measure the exact distance, carefully checking the route, and cut the cable using a cutting tool.

Follow these guidelines when cutting the cable.

- Cut the cable to the length determined in the Cable Path Inspection step.
- Use a dedicated cable cutting tool.
- Cut the cable at right angles.
- Be careful to keep the cable away from any moisture, iron, lead, dust, or other foreign material when cutting.
- Remove any foreign material attached to the cable using solvent and a brush.

## Cable Installation

Cable installation involves running the cable along the cabling path to the target connector of the system or an auxiliary device after cable path inspection and cable cutting have been completed.

Follow these guidelines when installing a cable:

- Be careful not to damage the cable.
- If the cable is damaged, cut out the damaged section before installing, or replace the cable.
- Run the cable so that it is not tangled. In particular, when installing a cable from a horizontal section to a vertical section, be careful not to reverse the upper and lower lines of the cable.
- Always use the maximum curvature radius possible, and make sure that the minimum curvature radius specification is complied with.
- If the cable needs to be protected, use for example, a PVC channel, spiral sleeve, flexible pipe, cable rack, and so on.
- Install the DC power cable and data transmission cable away from the AC power cable to prevent electromagnetic induction.

**Table 16. Recommended Minimum Allowed Cable bend Radius**

No	Type	Allowed Cable Bend Radius	
1	Ground/Power Cable	8 times of the cable external diameter	
2	Optical Cable (indoor)	Unloaded Condition (Installed) : 20 times of cable external diameter	Loaded Condition (During Installation) : 40 times of cable external diameter
3	Optical Cable (Outdoor)	Unloaded Condition (Installed) : 10 times of cable external diameter	Loaded Condition (During Installation) : 20 times of cable external diameter
4	UTP/FTP/S-FTP Cable	4 times of the cable external diameter	
5	1/2 in. Feeder Line (Flexible)	4.92 in.(125 mm)	

※ If the allowed cable bend radius is specified by the manufacturer, comply with the bend radius specified.

## Cable Binding

Cable binding involves fixing and arranging an installed cable using binding thread, cable ties, binding wire, and ram clamps, and so on.

Follow these guidelines when binding a cable.

- Be careful not to damage the cable during binding.
- Use appropriate cable binding tools according to the target location (indoor or outdoor, and so on) and the type of the cable (power supply cable, optical cable, feeder line, and so on).
- Do not let the cutting section of a cable tie and binding line, and so on be exposed to the outside. This may cause damage to cables or personal injury. Make sure that the cutting sections of cable ties and binding lines, and so on are not exposed to the outside.
- Cut off the remainder of the cable thread by leaving about 50 mm of extra length to prevent the knot from easily getting untied.
- If there is a danger that contact failure may occur in a connector connection due to tension, bind the cable at the closest location to the connector.

## Connector Attachment

Connector attachment involves assembling a connector to an installed cable or to a device on the site.

Follow these guidelines when attaching a connector.

- Make sure operator is fully aware of the connector assembly method before assembling a connector. Assemble the connector in accordance with its pin map.
- Each connector has a hook to prevent its core positions from being changed.

- Check the corresponding grooves before connecting a connector to another connector.
- Use a heat shrink tube at a connector connection for cables that are installed outdoor, such as feeder lines, to prevent water leakage and corrosion from occurring at the part exposed to the outside.
- Connect each cable of the connector assembly in a straight line.
- Be careful when connecting a cable so that contact failure does not occur at a connector connection due to tension.

## Identification Tag Attachment

Identification tag attachment involves attaching a marker cable tie, nameplate, and label, and so on to the both ends of a cable (connections to a connector) to identify its use and cabling path.

Follow these guidelines when attaching an identification tag.

- When installing a cable outdoor, use relief engraving and coated labels, and so on to prevent the markings from being erased.
- Since the form and attachment method for identification tags are different for each provider, consult with the provider before attaching them.



When connecting the cables, always connect the ground cable first. If worker contacts the equipment, connect a cable or perform maintenance without connecting the ground cable, the system can be damaged or a worker may be injured due to static electricity and short circuit.

---



When performing cable work for the system, proceed with the ground work before any other work to prevent errors occurring due to static electricity and other reasons.

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When installing, take care not to overlap or tangle the cables; also, consider future expansion. Install the DC power cable and data transmission cable away from the AC power cable to prevent electromagnetic induction.



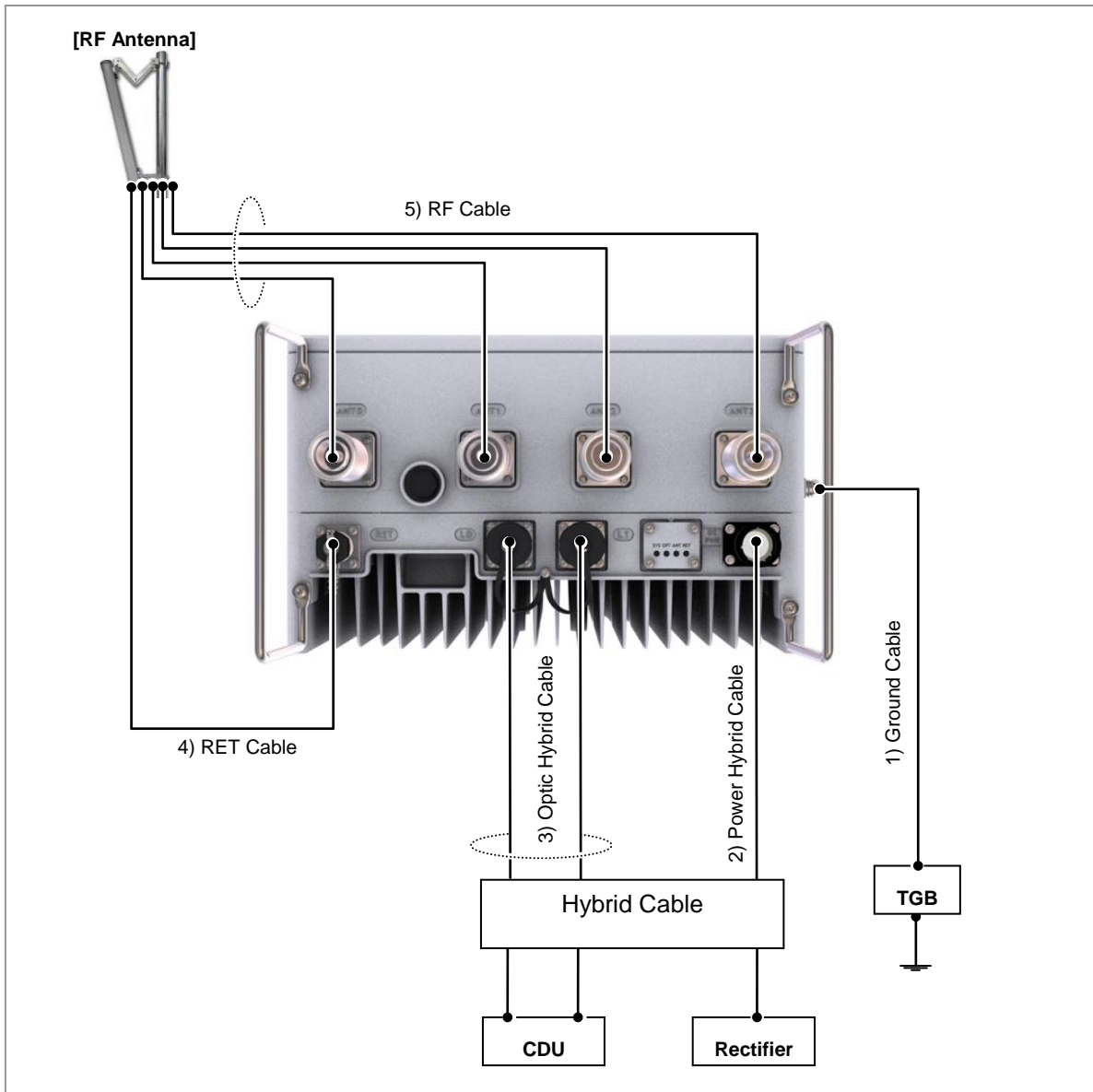
Make sure the work is done by personnel properly trained for the cabling job.

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# Cabling Diagram

The cabling diagram of the RRU is as follows:

Figure 32. Cable Diagram



**Table 17. RRU Connection Cable**

From	To	Cable
TGB	RRU	<b>1</b> Ground Cable : F-GV AWG8 x 1C
RRU	Rectifier	<b>2</b> Power Cable : AWG 8 x 2C
	CDU	<b>3</b> CPRI Cable : Single Mode (Outdoor Type)
	RF Antenna	<b>4</b> RET Cable Assembly <b>5</b> RF Cable : 1/2 in. Feeder Line



The inlet hole finishing method of external equipment must be progressed after consultation with operation company in case of the cable connected to external equipment. (Optic distribution box, etc)

- The Cable: Hybrid(Power) Cable, Hybrid(Optical) Cable

# Grounding

Grounding is the process of operating an electronic system (for example, power supplying system, communication system, and control system) stably from a lightning, transient-current, transient-voltage and electric noise and of preventing injury from electric shock.

Ground equipment minimizes the electrical potential of the electronic device to that of the ground, which is zero electrical potential, so that it can prevent the device from occurring electrification.



Connect the ground cable first. In cabling, the connection of cables without the connection to the ground cable may cause damage of the equipment or bodily injury to personnel.

---

The purposes of the ground construction are as follows:

- To prevent human life and the system from over-current, over-voltage, and lightning
- To provide a discharge path for surge voltage generated by lightning and power switch
- To protect the system from static electricity
- To eliminate or minimize the high-frequency potential in the system housing
- To provide a conductor for the balance and stability of high-frequency current
- To stabilize the potential of the circuit against the ground



## Ground Cable Connection

▶ To connect the ground cable

- 1 Make sure that operator has the following items:

**Table 18. Parts and Tools for Grounding**

Category	Description	
Installation Section	RRU Grounding Terminal~TGB	
Cable	F-GV AWG8× 1C	
Heat Shrink Tube (Spec/Color/Length)	Φ 0.39 in.(10 mm)/ Green/1.96 in.(50 mm)	
Pressure Terminal	TGB	Check TGB specifications per site and prepare pressure terminals.
	RRU	AWG8, 2 Hole, Hole Diameter: 1/4 in.(6.3 mm), Hole Distance: 0.63 in.(16 mm)
Fastener	TGB	Check TGB specifications per site and prepare connecting parts.
	RRU	M6 × 12L SEMS/2 EA
Recommended Torque Value	M6 SEMS	43 lbf·in
Working Tools	Torque Driver((10~50 lbf·in)), Screw Driver Bit('+', No.3), Cable Cutter(0.23~1.25 in.(6~32 mm)), Crimping Tool(1.5~16 mm <sup>2</sup> ), Cable Stripper(0.15~0.62 in.(4~16 mm)), Heating Gun, Nipper, Screw Driver('+', No.3)	



For the pressure terminal or the cable, the UL Listed products or equivalent should be used.

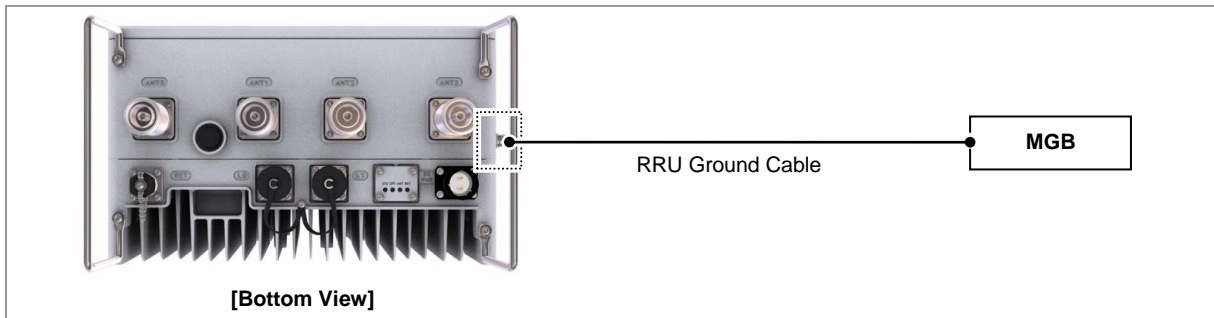
Ex) Manufacturer-Panduit

RRU: AWG8 Pressure Terminal(LCD8-14A-L)



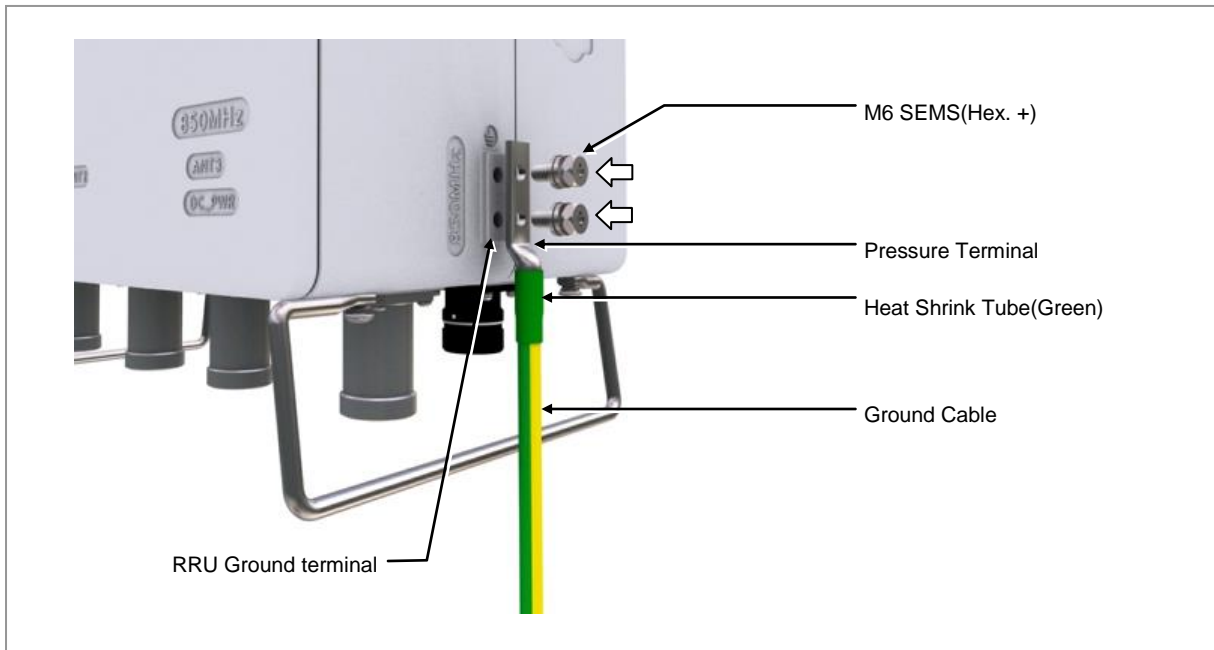
- 2 Install a ground cable from the TGB to the RRU ground terminal.

Figure 33. Ground Cable Connection (1)



- 3 Align the pressure terminal to the mounting hole of the RRU ground terminal.
- 4 Firmly fix the pressure terminal onto the RRU ground terminal using Hex. +type.

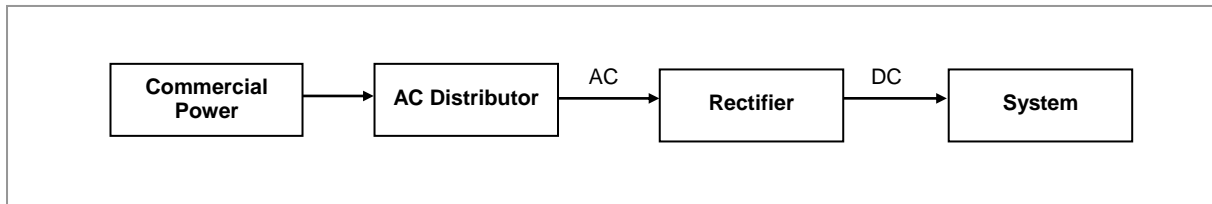
Figure 34. Ground Cable Connection (2)



# Power Cabling

The power supply device consists of the following elements:

Figure 35. Power Equipment Elements



Since power is applied to the system where the power cable is connected by manipulating the circuit breaker of the rectifier, be sure to check the rectifier's breaker is turned off (open) before connecting the power cable to the power connector. If the system is installed while the circuit breaker is on, the worker may be critically injured as soon as the cable is connected in the wrong way.



Handling the power cable incorrectly may damage the rack or cause an electric short-circuit through the cable. Ensure the power switch on the rectifier or the system is turned off before handling the power.



The fasteners for power cable must be tightly secured to prevent electrical accidents.



The heat-resistant temperature of the power cable should be 90°C or more.



Install the power cable to the power port of the system by considering the radius of curvature of its cable specification and then cut the cable. If operator installs the cable after cutting, there may be length difference among the core wires at the end of the cable because of cable curvature. This may result in poor contact after the cable is connected to the power port.



Install a circuit breaker to a rectifier (or power distributor) for the stable power. The capacity of circuit breaker is 20 A or 25A. (Use UL Listed circuit breakers.)

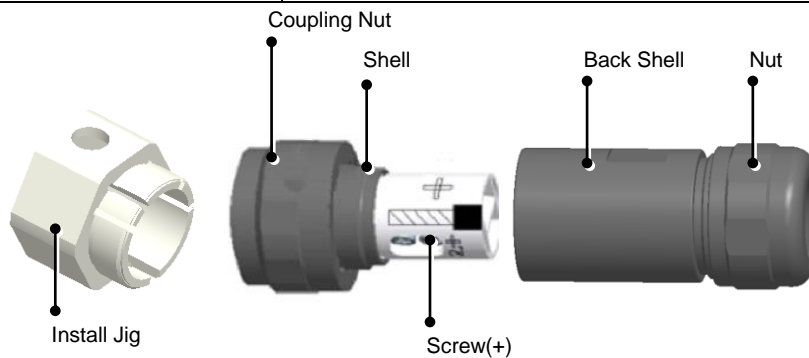
## Power Cable Connection

▶ To assemble Power Connector

- 1 Make sure that you have the following items:

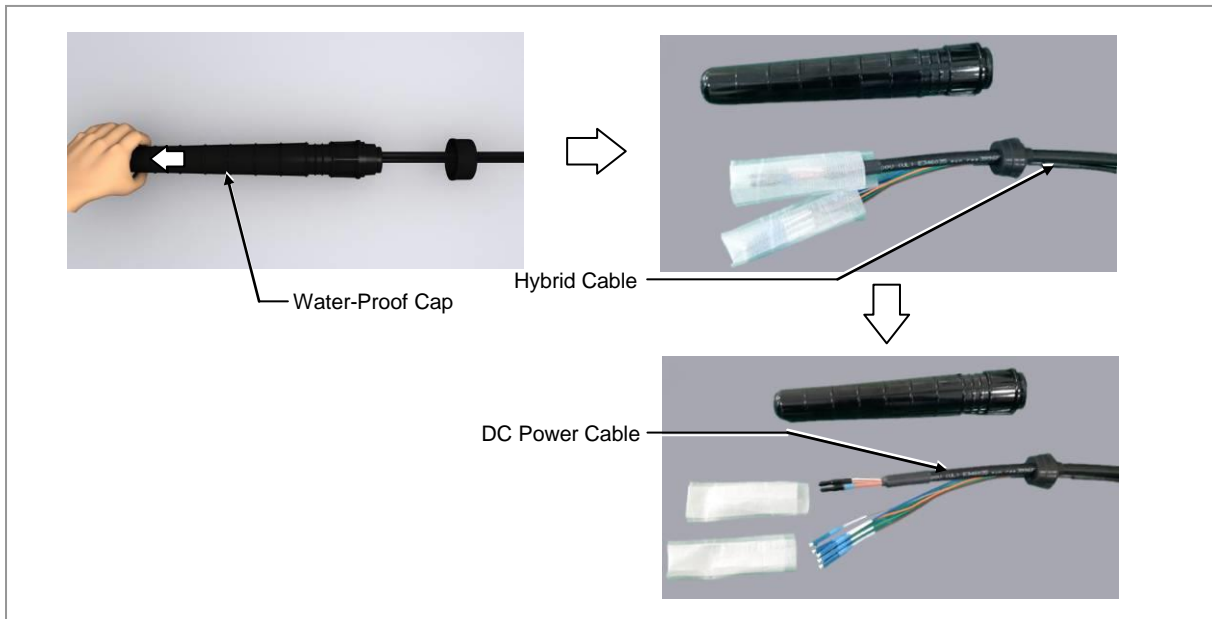
**Table 19. Parts and Tools for Power Connector Assembly**

Category	Description
Connector	JONHON, CT48C-2T-07
Cable	AWG 8 x 2C
Material	Cable Tie
Recommended Torque Value	- Screw : 13 lbf.in - Back shell / Nut : 18.23 lbf.in
Working Tools	Cable Cutter, Wire Stripper, Nipper, Torque Driver(+, No.1), Adjustable Head:0.31~1.26 in.( 8~32mm)), Adjustable Wrench: 10~50 lbf.in., Multi Tester



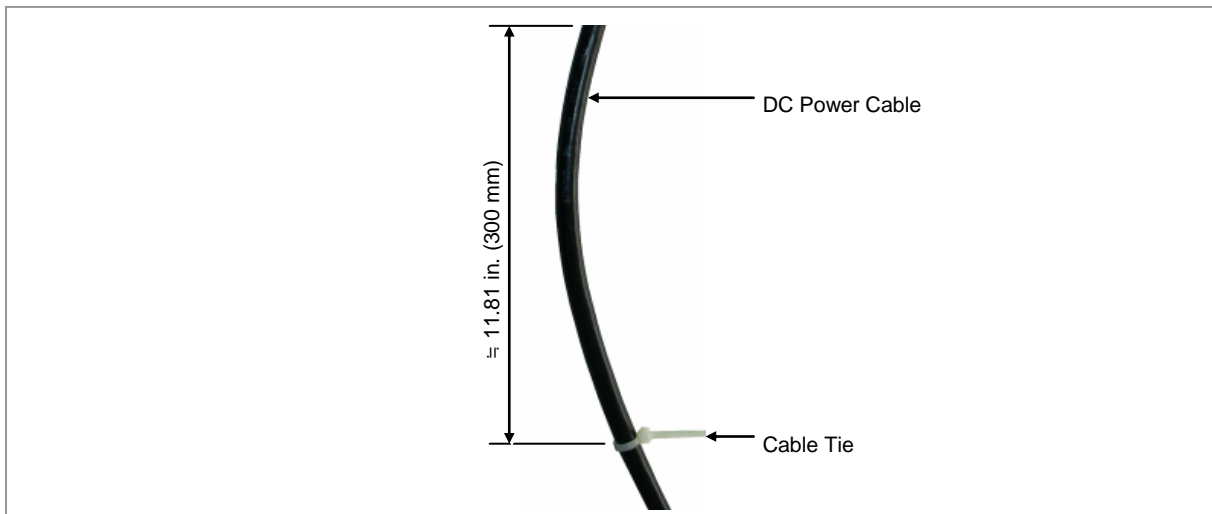
- 2 Separate the waterproof cap from the hybrid cable.

Figure 36. Power Connector Assembly (1)



- 3 Tie the cable tie at 11.81 in. (300 mm) from the end of the power cable.

Figure 37. Power Connector Assembly (2)



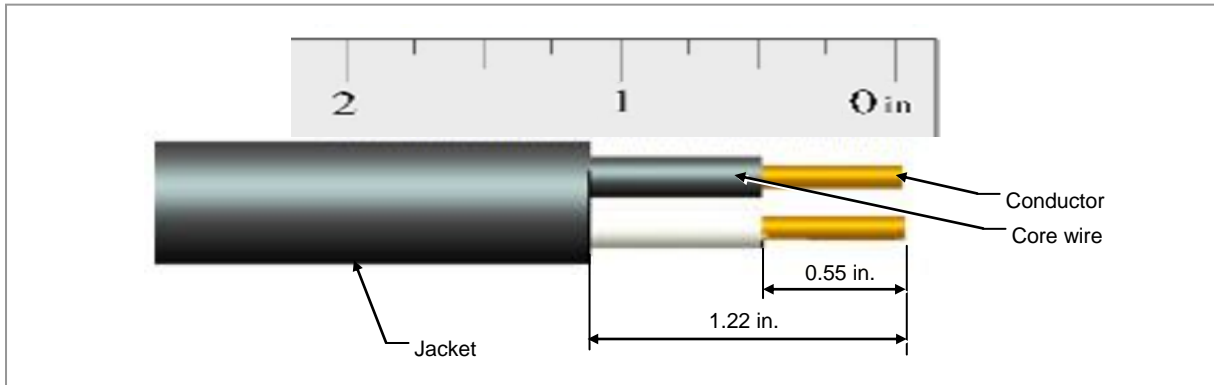
- 4 Insert the back shell of the power connector into the power cable.

Figure 38. Power Connector Assembly (3)




- 5 Strip the jacket of the power cable and the sheath of the core wire as shown in the following figure.

Figure 39. Power Connector Assembly (4)

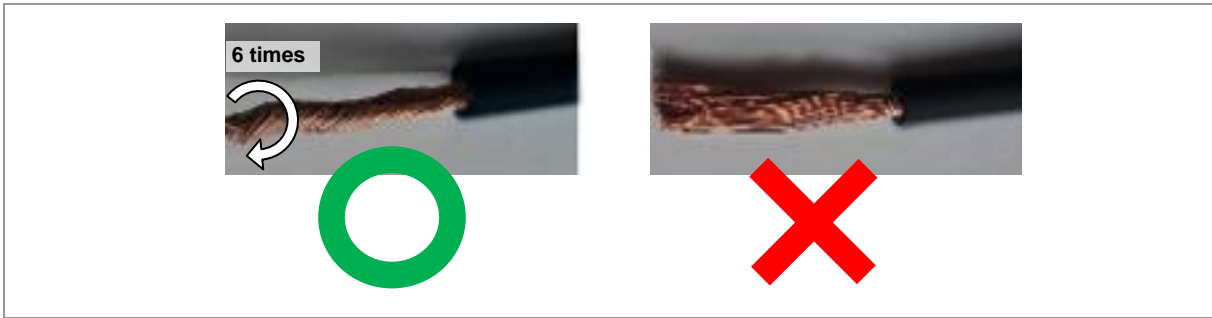


**!** Be careful when stripping the cable, Please don't damage the core wire and the conductor.

 The color of the core wire can be changed according to the specification of the cable used.

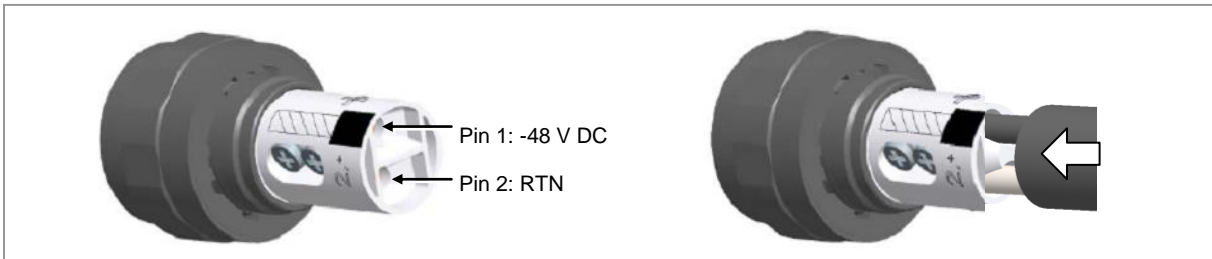
- 6 Hold the conductor of the cable by hand and twist it about 6 turns.

Figure 40. Power Connector Assembly (5)



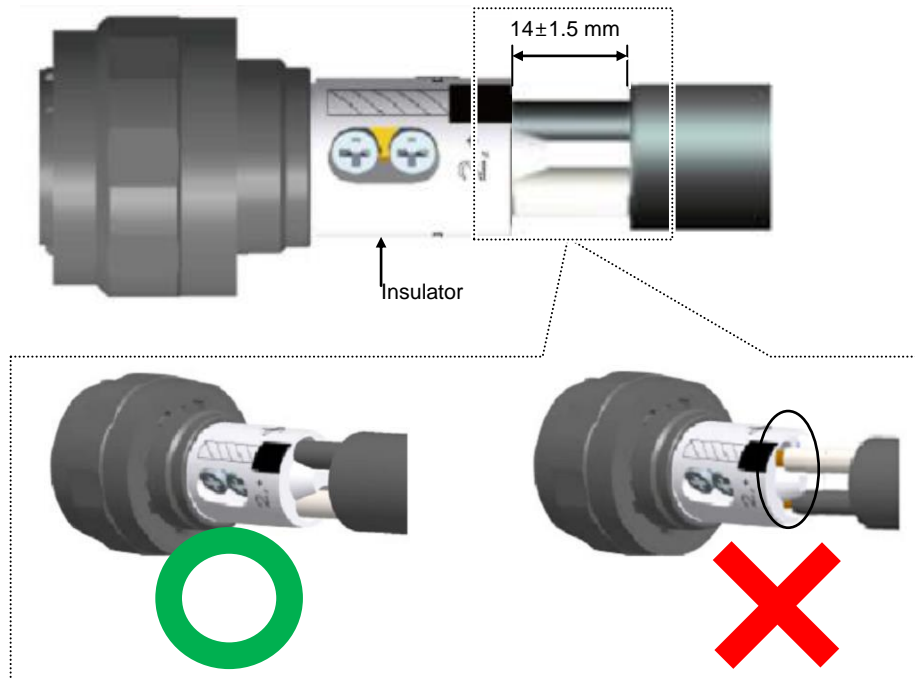
- 7 Check the color of the core wire and push it into the holes of Pin 1 and Pin 2.

Figure 41. Power Connector Assembly (6)



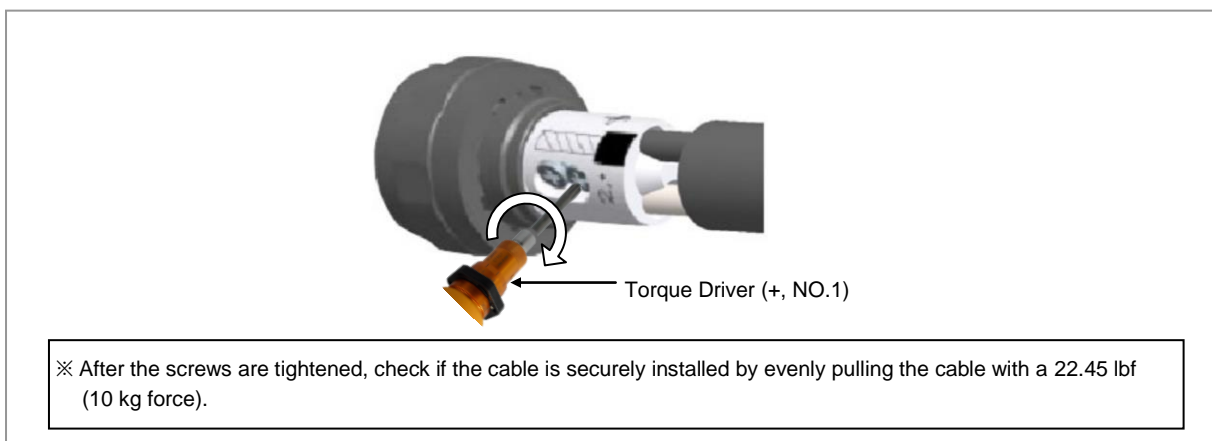


Check the dimension in the below picture. The conductor can not be seen from the end of insulator.



- 8 Fix the two screws of pin 1 and pin 2, respectively with the torque driver (+, No.1).

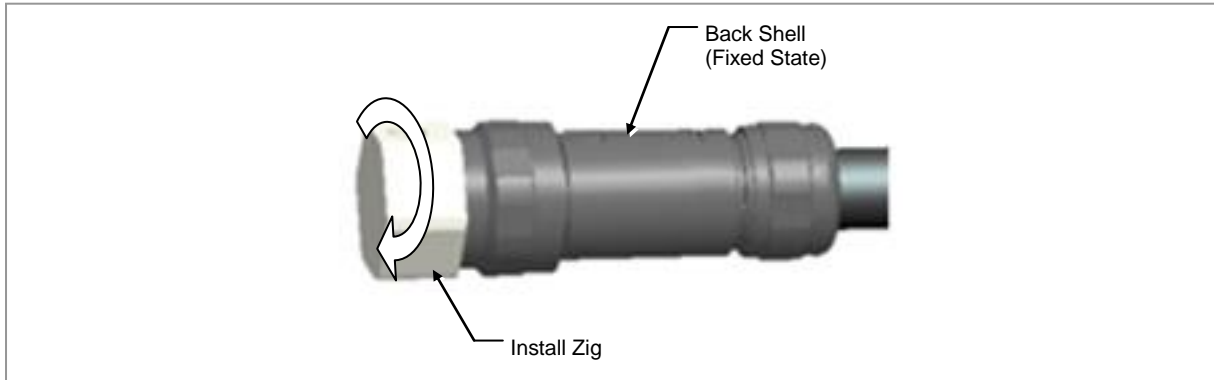
Figure 42. Power Connector Assembly (7)





- 9 Fix the back shell not to rotate, rotate install zig and fix it with a torque wrench.

Figure 43. Power Connector Assembly (8)



Before tightened the back shell, the cable can't be tightened by the nut.

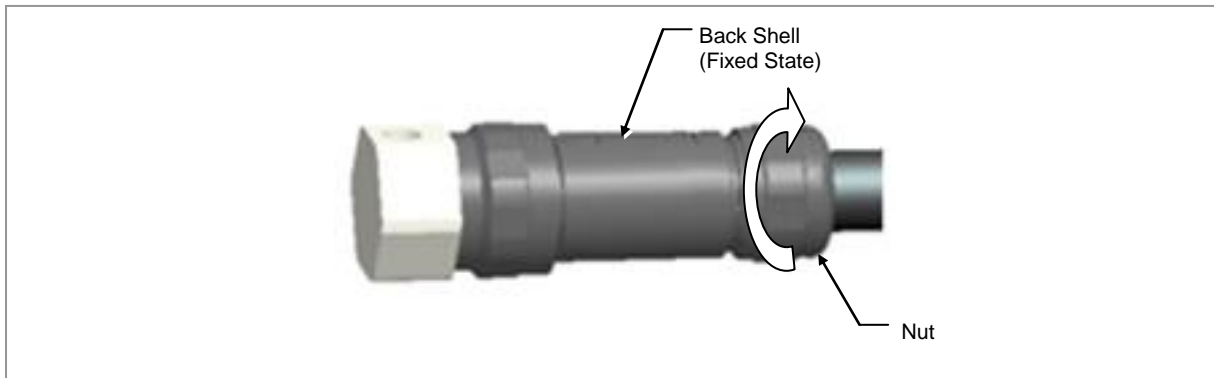


The torque wrench used to assemble the power connector should be a product with a rubber tube on the spanner head.



**10** Fix the back shell not to rotate, rotate nut and fix it with a torque wrench.

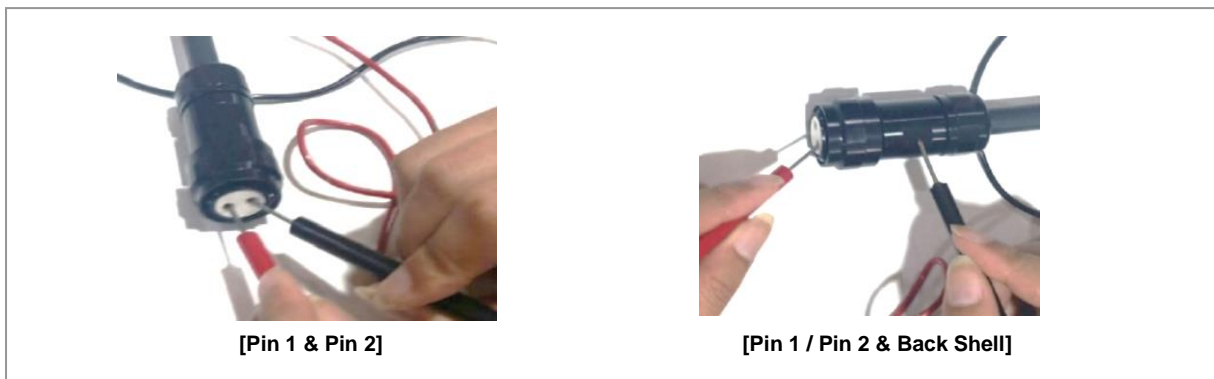
*Figure 44. Power Connector Assembly (9)*



**11** Check electrical isolation with a Multi tester.

- Pin 1 & Pin 2
- Pin 1/Pin 2 & Back shell

*Figure 45. Power Connector Assembly (10)*



**12** After completing the assembly of the power connector, remove the cable tie from the cable.

▶ To connect Power cable

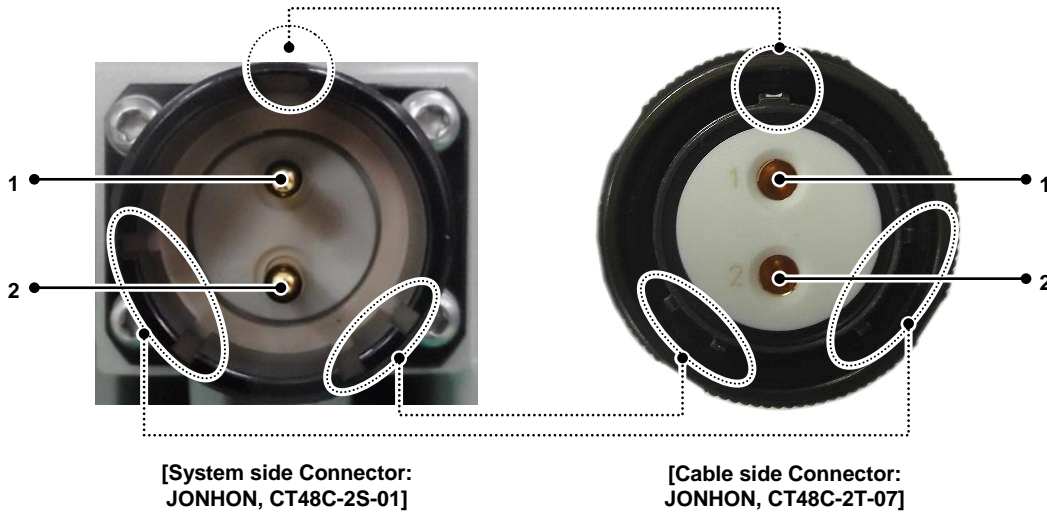
1 Make sure that you have the following items:

**Table 20. Parts and Tools for Power Cable Connection**

Category	Description		
Installation Section	RRH Power Input Port~Rectifier		
Cable	AWG8 × 2C		
Connector	JONHON, CT48C-2T-07	1	-48 V DC
		2	RTN

**Table 21. Power Cable/Connector Pin Map**

Power Connector Pin No.	Description	Color
1	-48 V DC	If the color coding is needed for the cable, comply with the specifications which have been agreed with the service provider.
2	RTN	

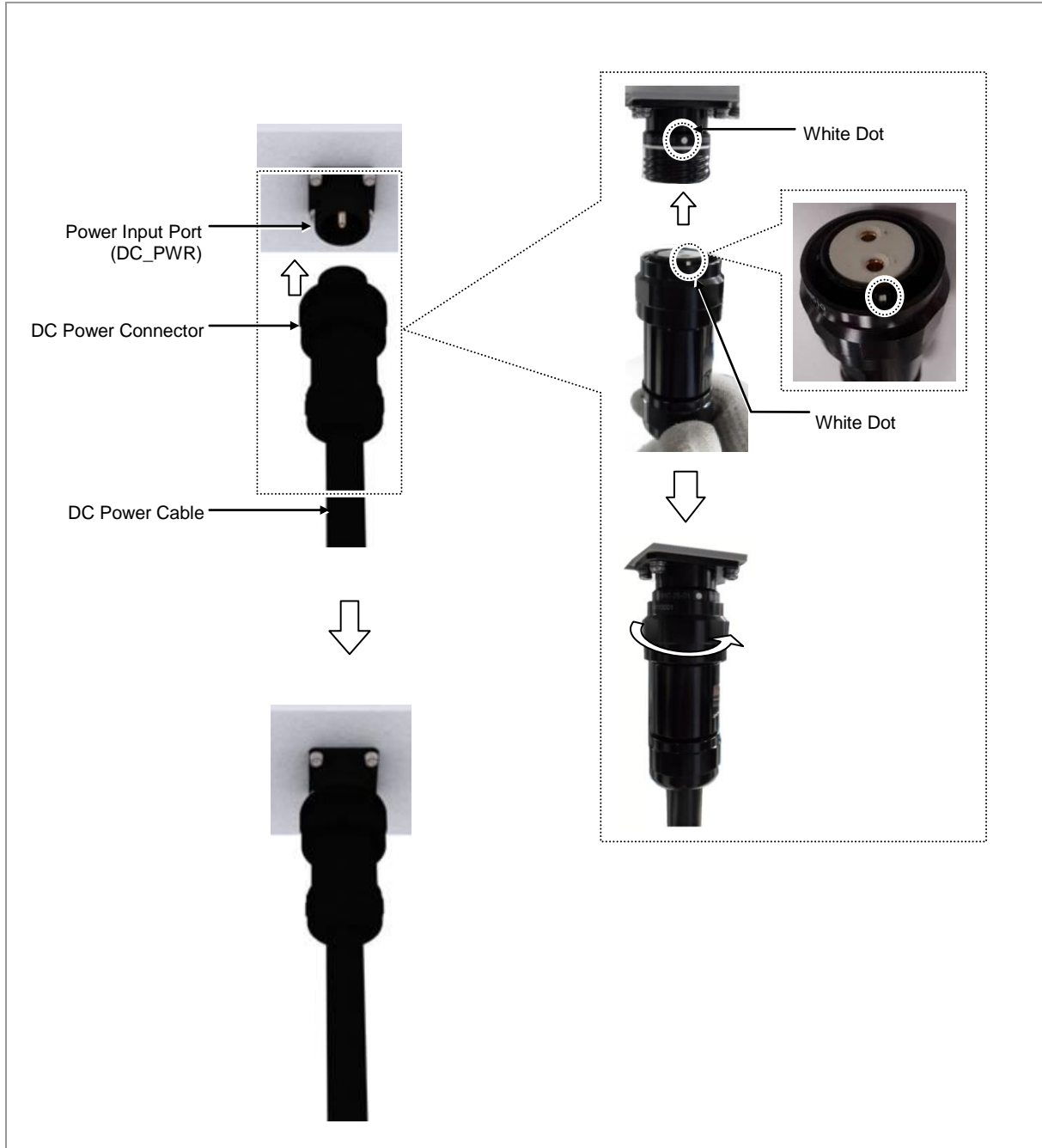


**⚠** To prevent foreign substances, air and moisture from entering the cable inlet (including cable gland and conduit), finish it as follows:

- Unused inlet  
Use the hole finishing materials including waterproof cap and rubber packing.
- Cable-installed inlet  
After cable installation, block any space in the inlet with tape, compressed sponge, rubber packing and silicon.

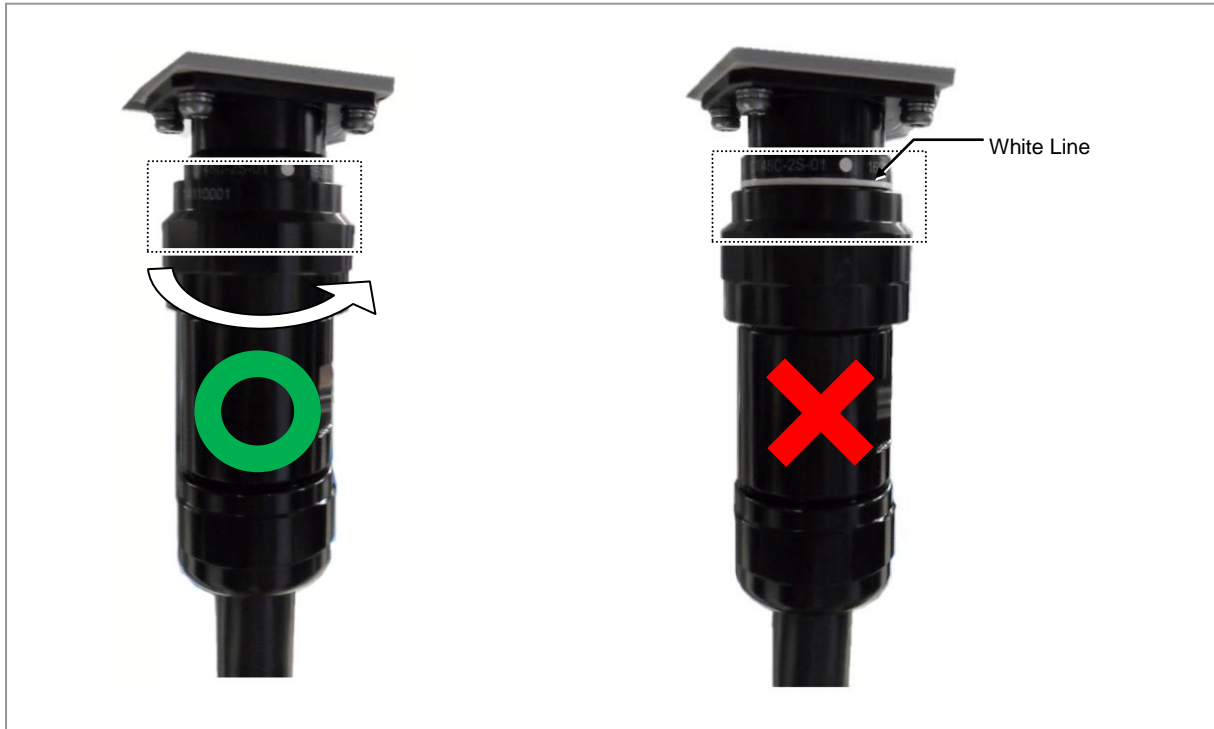
- 2 Align the ○ marks of cable side connector and system side connector, and assemble the connectors.
- 3 Fasten the nut of cable side connector by turning it clockwise until the clicking sound is not heard.

Figure 46. Hybrid(Power) Cable Connection (1)



- 4 When the nut is fastened tight, the white line on the receptacle connector should be invisible (or hidden).

Figure 47. Hybrid(Power) Cable Connection (2)



# Interface Cable Connection

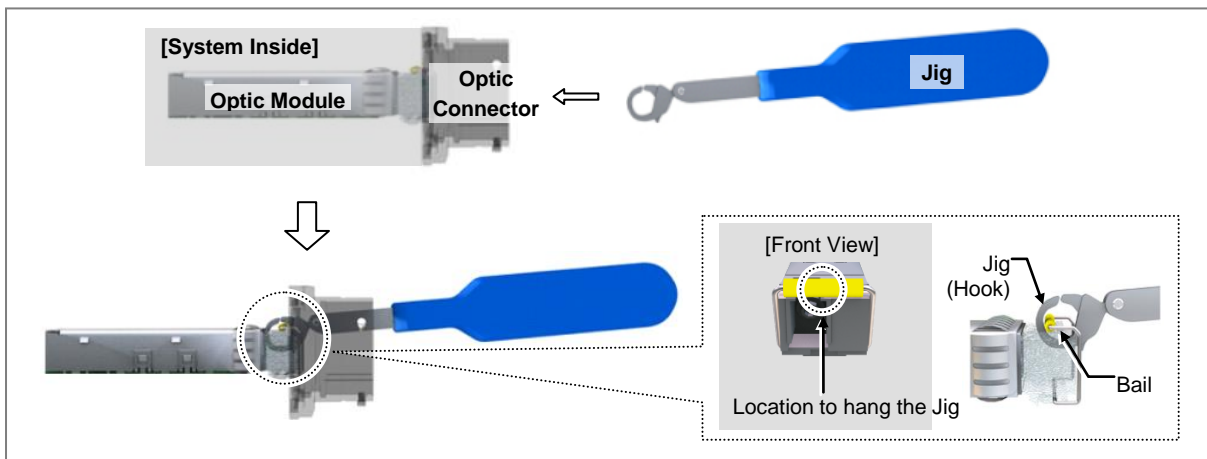
## Remove/Insert Optic Module

If the optic module needs to be removed or inserted before connecting the cable, follow the below process.

▶ To remove Optical Module

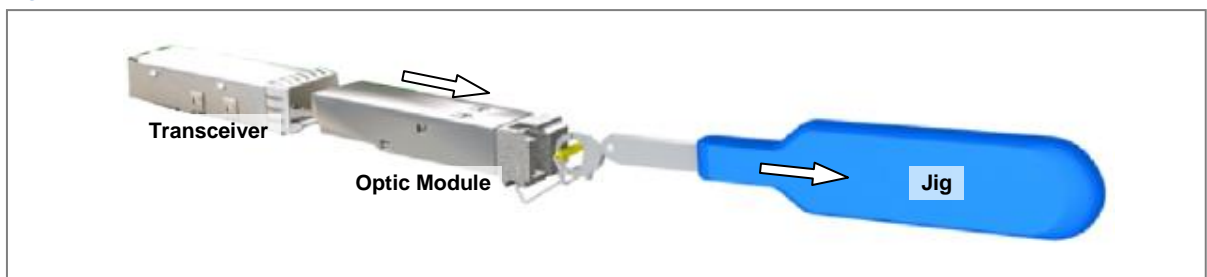
- 1 Hang the jig hook on the optic module's bail within the system.

Figure 48. Optic Module Removal (1)



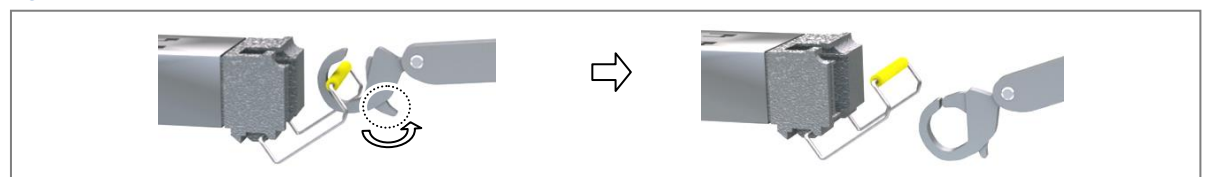
- 2 Completely remove the optic module from the transceiver by pulling the jig.

Figure 49. Optic Module Removal (2)



- 3 Remove the optic module and the jig by pressing the jig's hook grip.

Figure 50. Optic Module Removal (3)



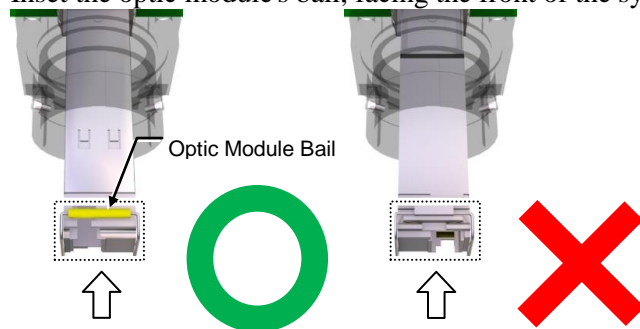
▶ To inset Optic Module

Push the optic module into the transceiver within the connector.

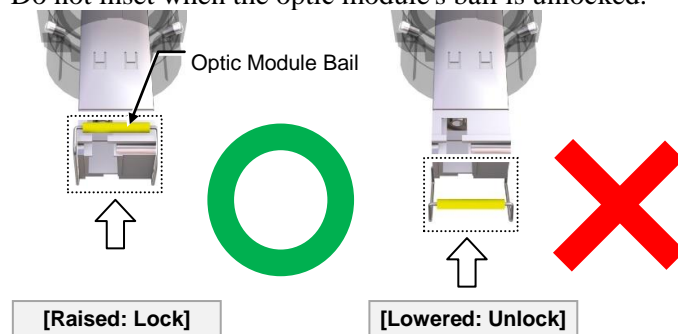
Figure 51. Optic Module Inset



Inset the optic module's bail, facing the front of the system, to the port.



Do not inset when the optic module's bail is unlocked.



## Optic Cable Connection

▶ To connect optic cable

- 1 Make sure that you have the following items:

Table 22. Parts and Tools for Optic Cable Adapter Assembly

Category	Description	
Parts	Optic Cable Adapter Assembly	1 Set
Recommended Torque Value	Gland Nut	17.70 lbf-in
Working Tools	Adjustable Torque Wrench(10~50 lbf.in.), Adjustable Spanner (Hexagon Head: 2.04	

Category	Description
	in.(52mm))

Gland

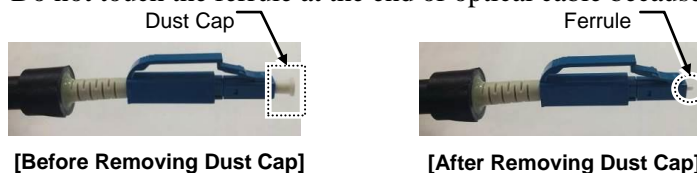
Bayonet Connector

Water Proof Cap

In the system, the laser beam light runs through the optical cable. The exposure of the laser beam on worker's eye may cause serious injury so that it should be handled with care.

Remove the dust cap of the optical connector before connecting.

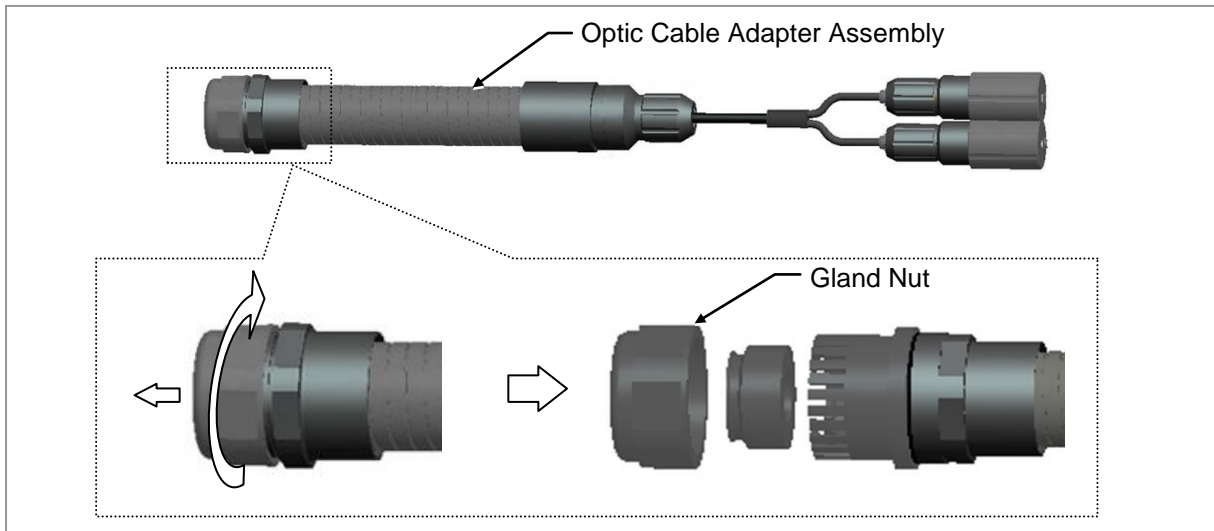
- Before connecting the optical cable, check if the ferrule of the connector is soiled. Be careful to keep the cutting section away from dust or foreign material. If the cable is soiled with foreign material, do not blow to remove them.
- Make sure to clean the connector in accordance with the cleaning directions in Annex.
- Do not touch the ferrule at the end of optical cable because it is easy to be damaged.





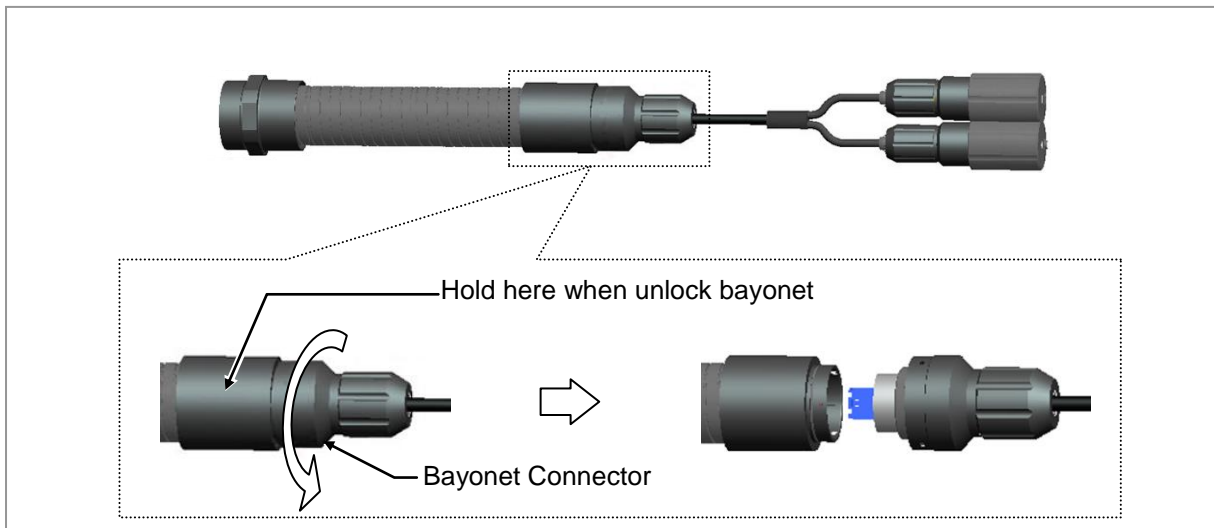
1 Unlock the gland.

Figure 52. Optic Cable Adapter Assembly (1)



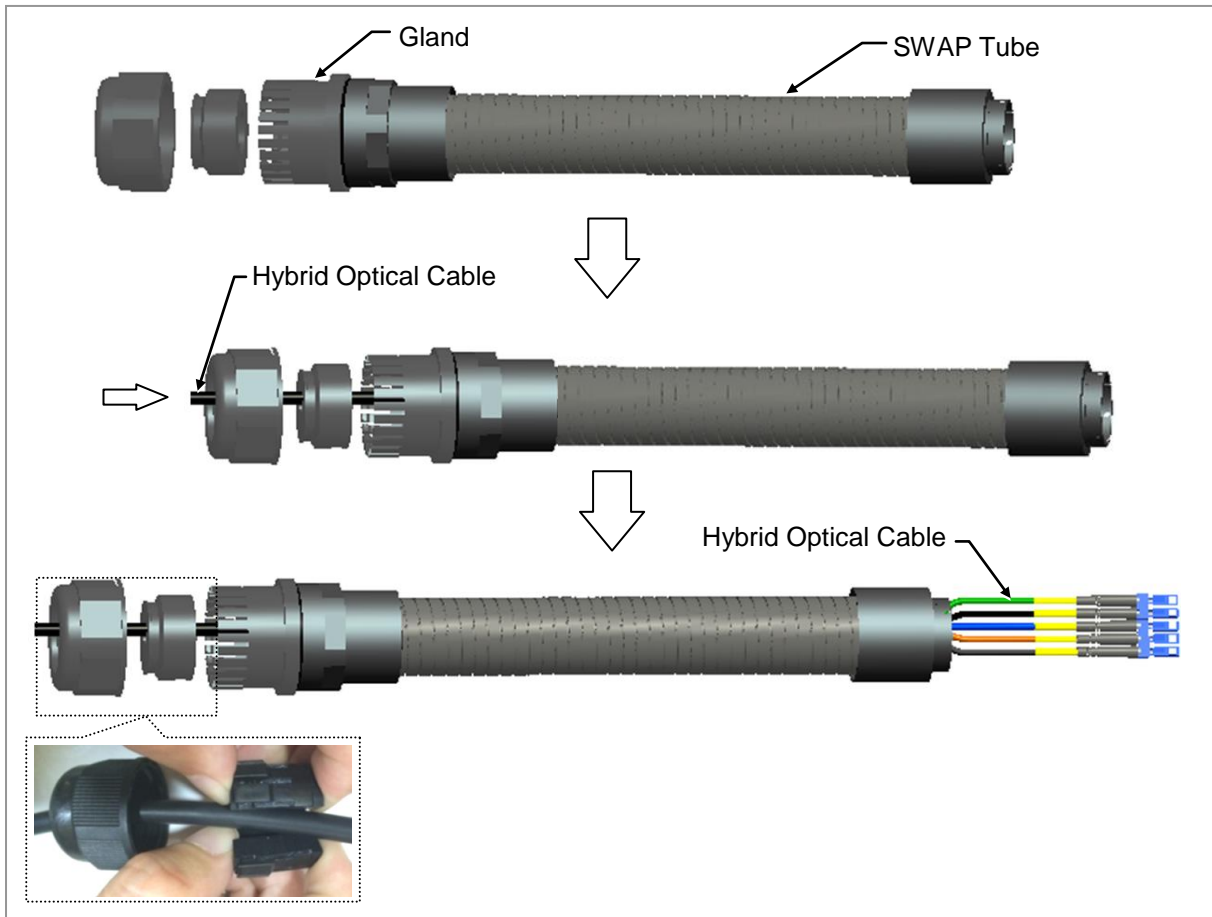
2 Unlock the bayonet connector.

Figure 53. Optic Cable Adapter Assembly (2)



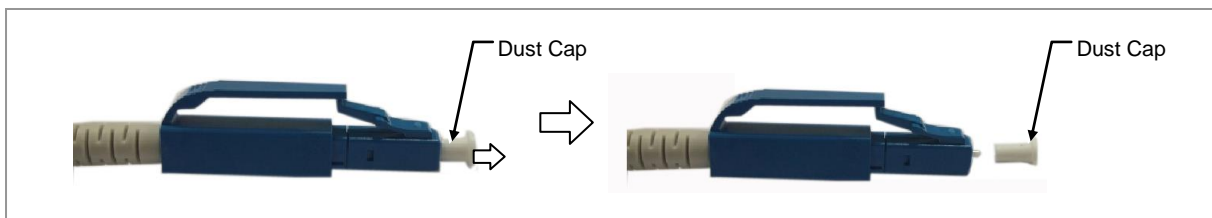
- 3 Get the cable through the SWAP Tube.

Figure 54. Optic Cable Adapter Assembly (3)



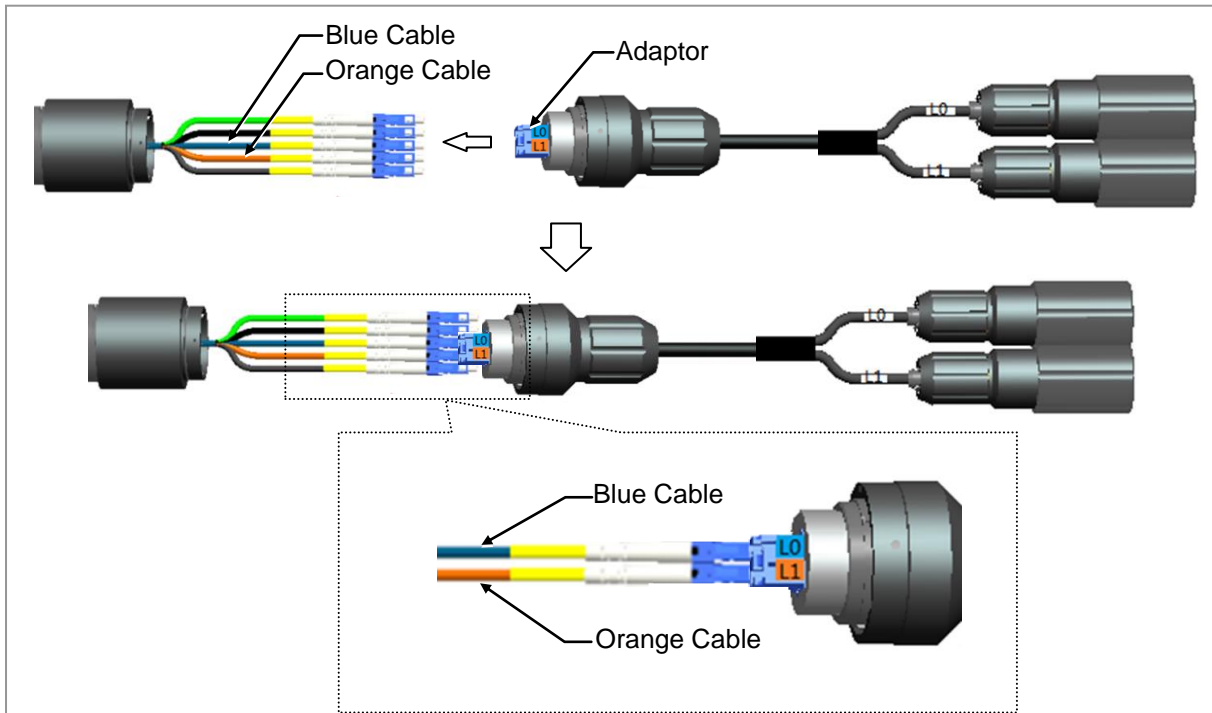
- 4 Remove the dust cap from blue and orange cable.

Figure 55. Optic Cable Adapter Assembly (4)



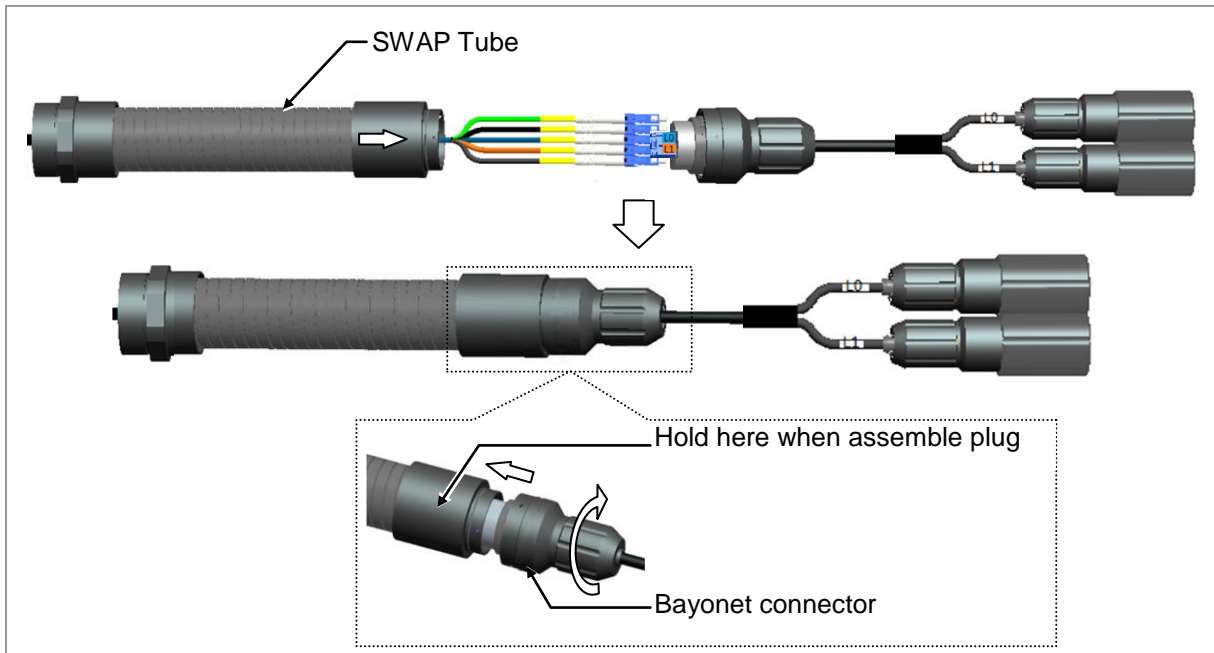
- 5 Get the plug with blue and orange cable to connect to adaptor corresponding color.

Figure 56. Optic Cable Adapter Assembly (5)



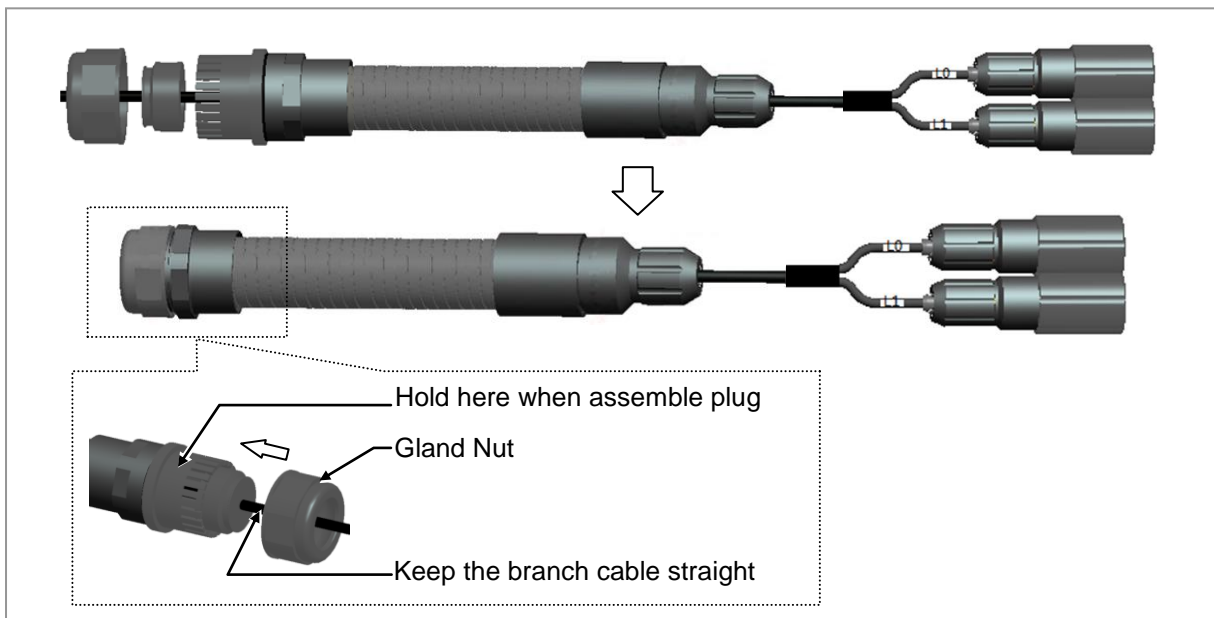
- Put the five cables into tube and lock the bayonet.

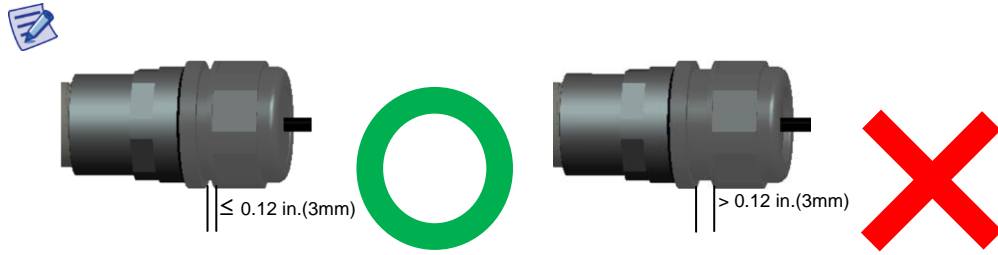
Figure 57. Optic Cable Adapter Assembly (6)



- Lock the gland nut.

Figure 58. Optic Cable Adapter Assembly (7)

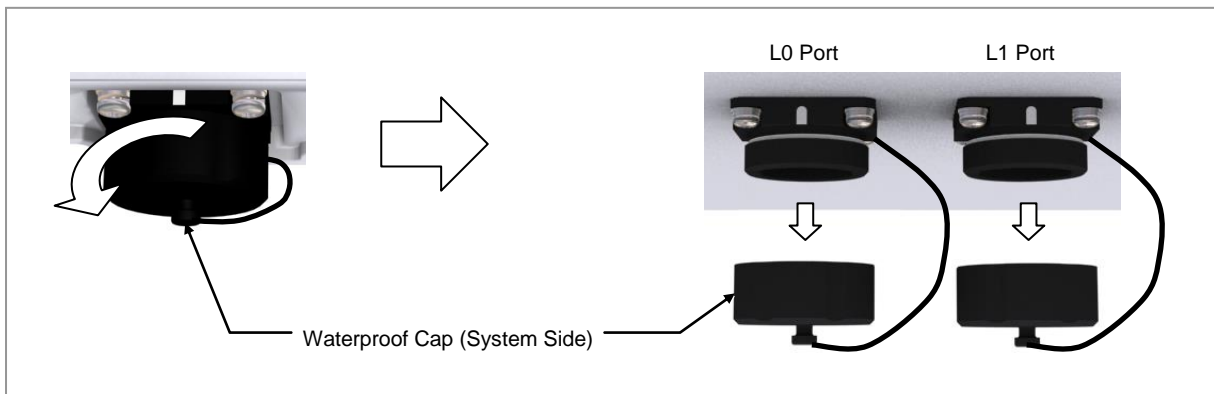




When the outdoor cable's diameter is around 0.24 in. (6mm)

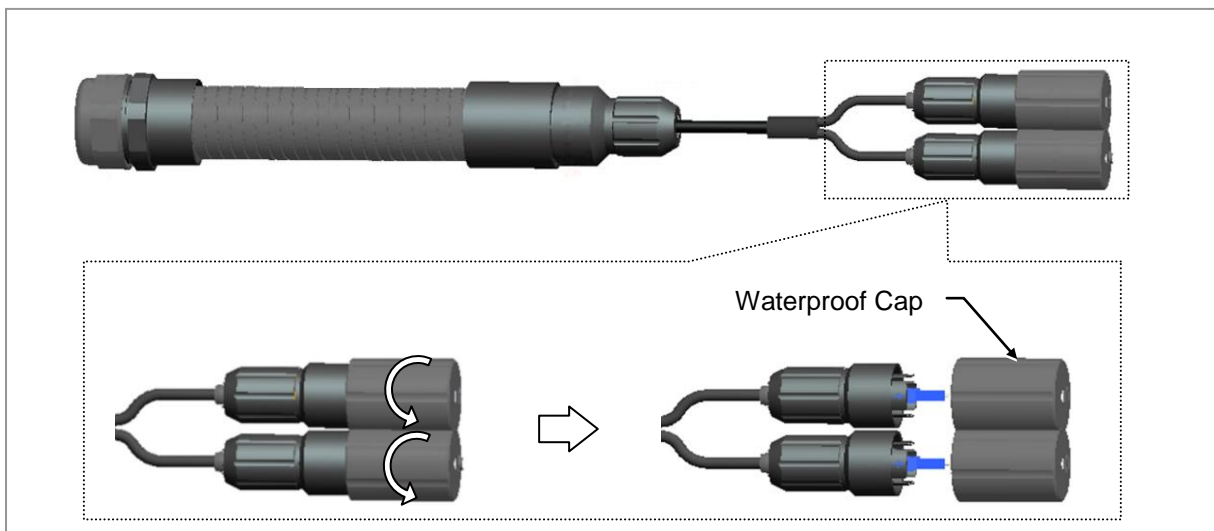
- 8 Separate the waterproof cap from the system side connector.

Figure 59. Optic Cable Adapter Assembly (8)



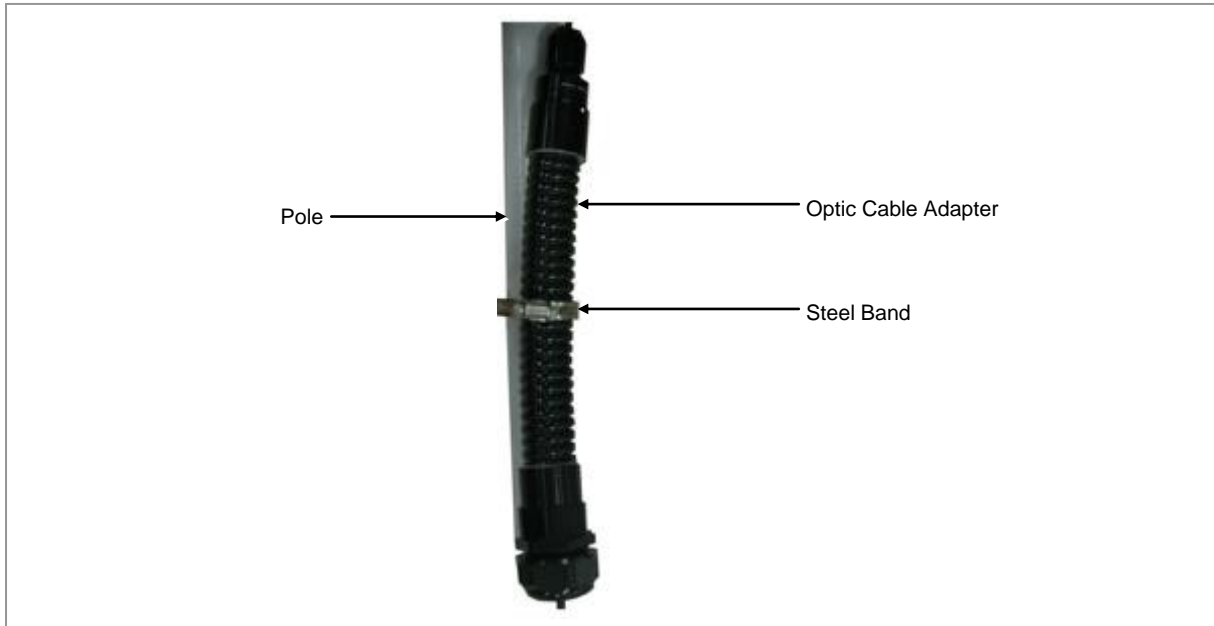
- 9 Unlock the waterproof cap of Optic Cable Adapter Assembly.

Figure 60. Optic Cable Adapter Assembly (9)



**10** Fix Optic Cable Adapter to the Pole with a Steel Band.

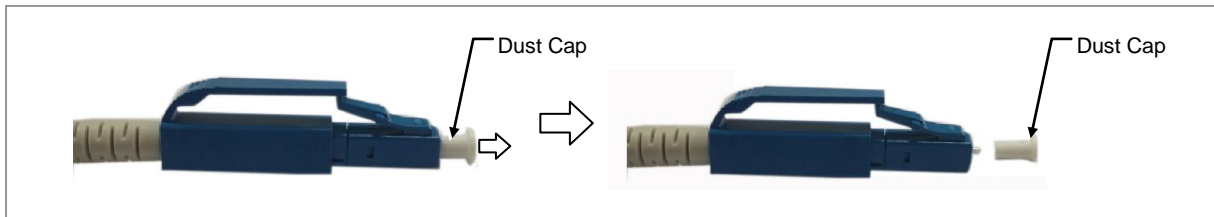
*Figure 61. Optic Cable Adapter Assembly (10)*



**11** Install a optic cable to the RRU L0, L1 ports.

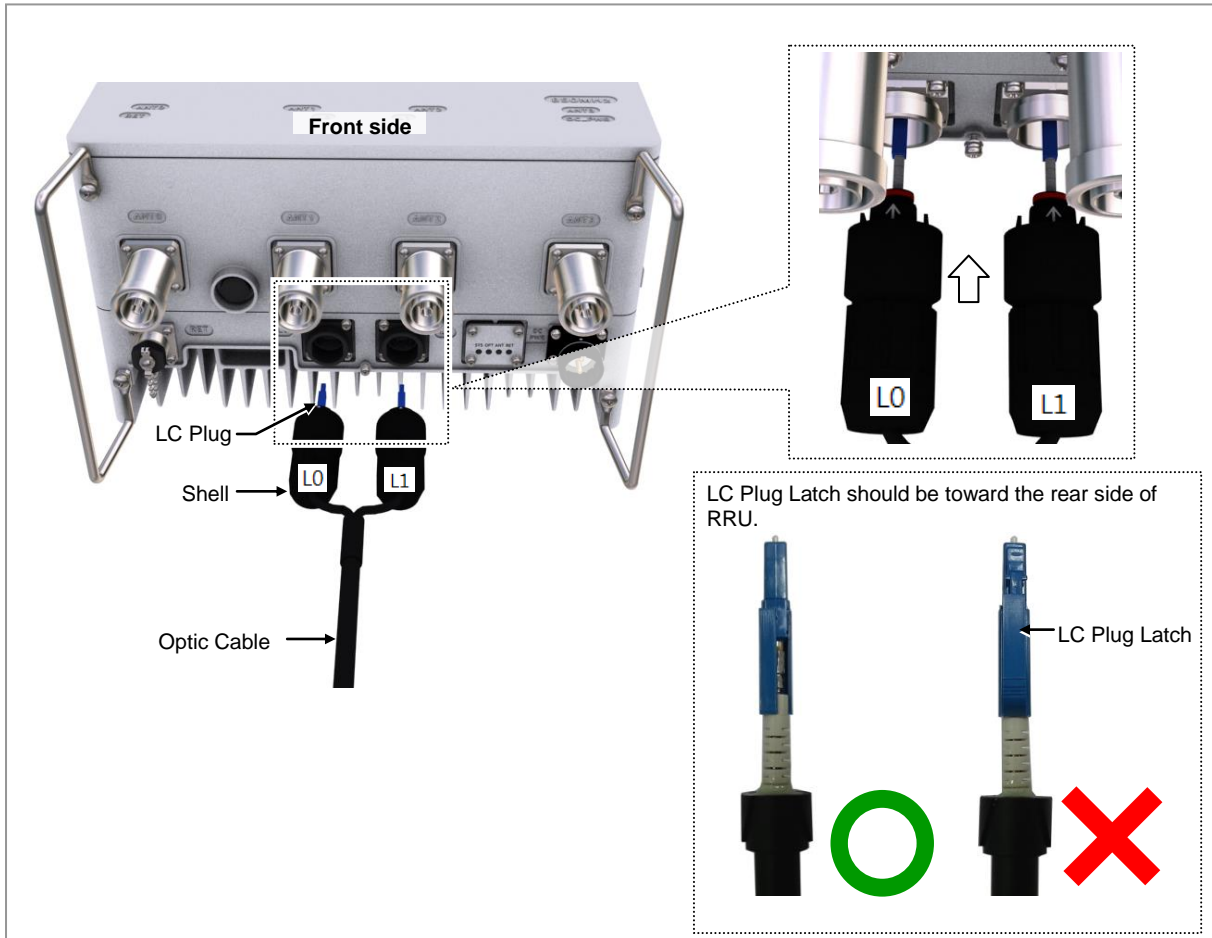
**12** Remove the dust cap from the LC plug of CPRI cable.

*Figure 62. Optic Cable Adapter Assembly (11)*



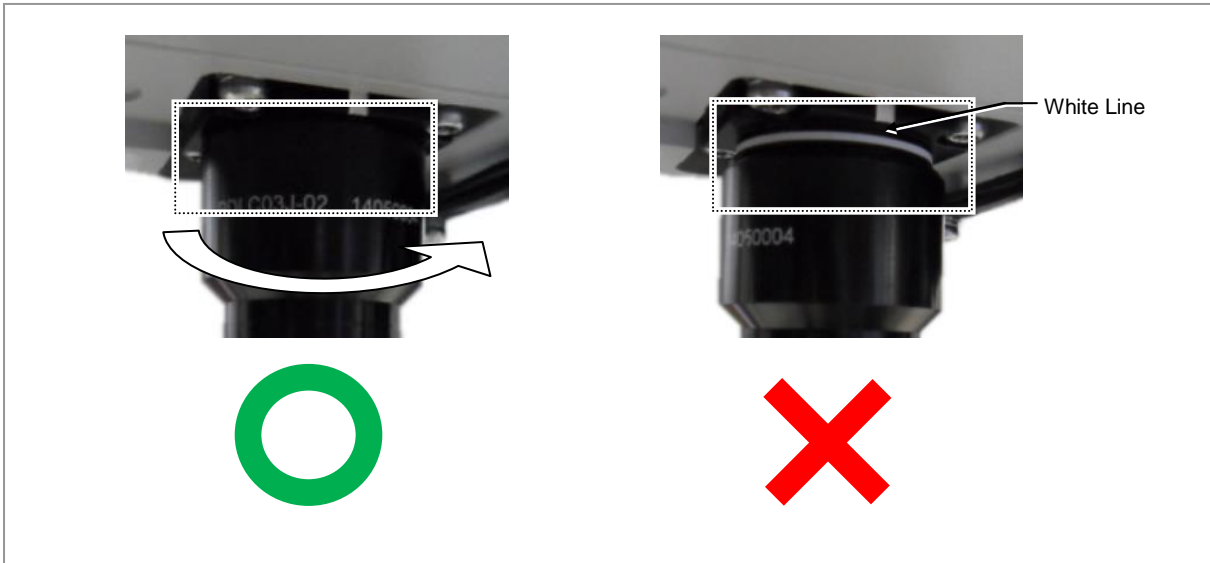
- 13 Connect the LC plug of optic cable to the SFP module of RRU\_L0, L1 port. At this time, LC plug latch should be toward the rear side of RRU and check the 'click' sound which confirms the latch is inserted completely.

Figure 63. Optic cable connection (1)



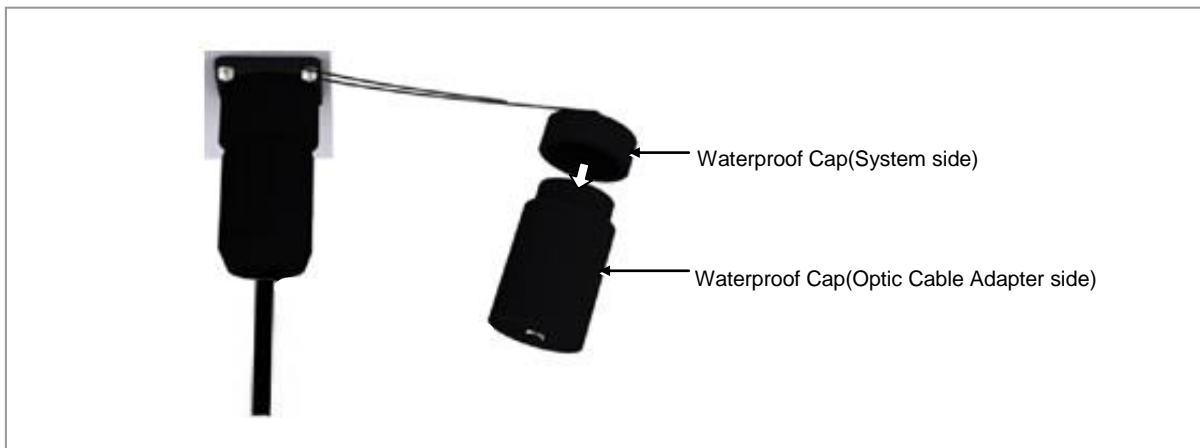
**14** Fasten the shell until the white line of connector is not shown.

*Figure 64. Optic cable connection (2)*



**15** After connecting the optical cable, assemble the water proof caps at the system side and the Optic Cable Adapter side.

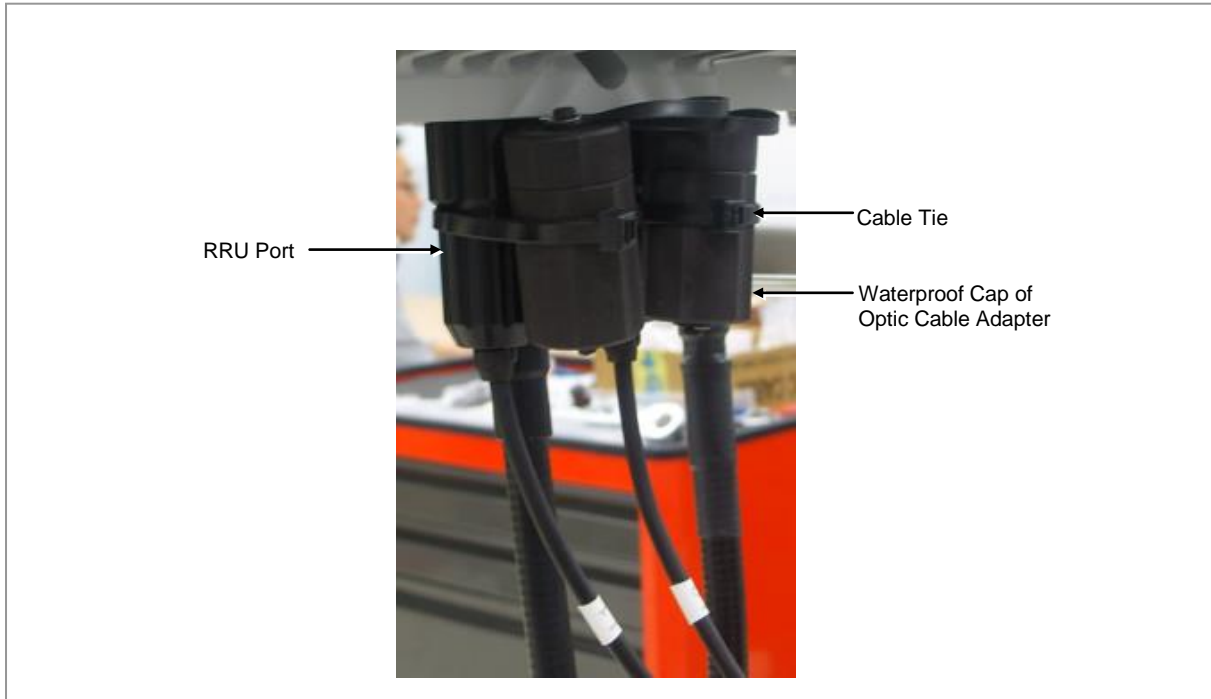
*Figure 65. Optic cable connection (3)*





- 16** Fasten the waterproof cap of the optic cable adapter to the RRU\_L0, L1 port using a cable tie.

*Figure 66. Optic cable connection (4)*



## RET Cable Connection

▶ To connect the RET cable

- 1 Make sure operator has the following items:

**Table 23. Parts for RET Cable Connection**

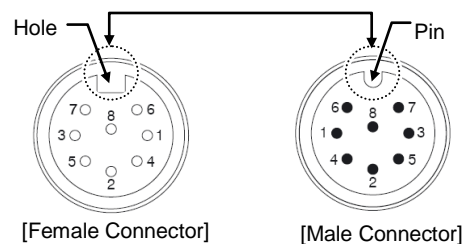
Category	Description	
Installation Section	RRU RET port~RF Antenna	
Cable	RET Cable Assembly	
Connector	RRU	AISG 2.0
	RF Antenna	Check the RF antenna (RETu) RET connector specification per site

**Table 24. RET Cable Pin Map**

Pin No	Description	Cable Color
1	N/C (Not Connected)	-
2	N/C (Not Connected)	-
3	RS485 B	White
4	GND	Blue
5	RS485 A	Brown
6	+24 V DC	Red
7	DC Return	Black
8	N/C (Not Connected)	-

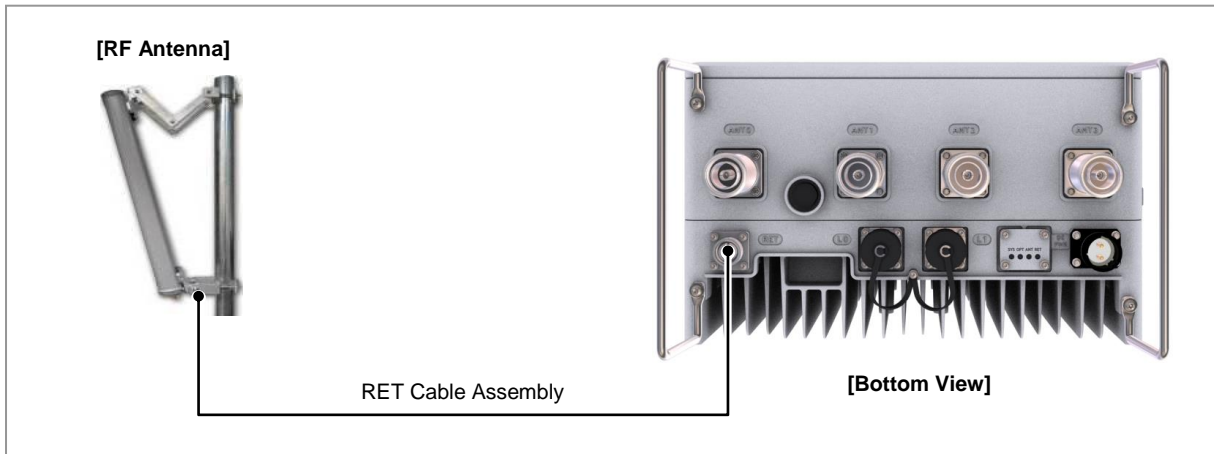


Before fitting the RET connector, make sure to align the female connector's hole with the male connector's pin first.



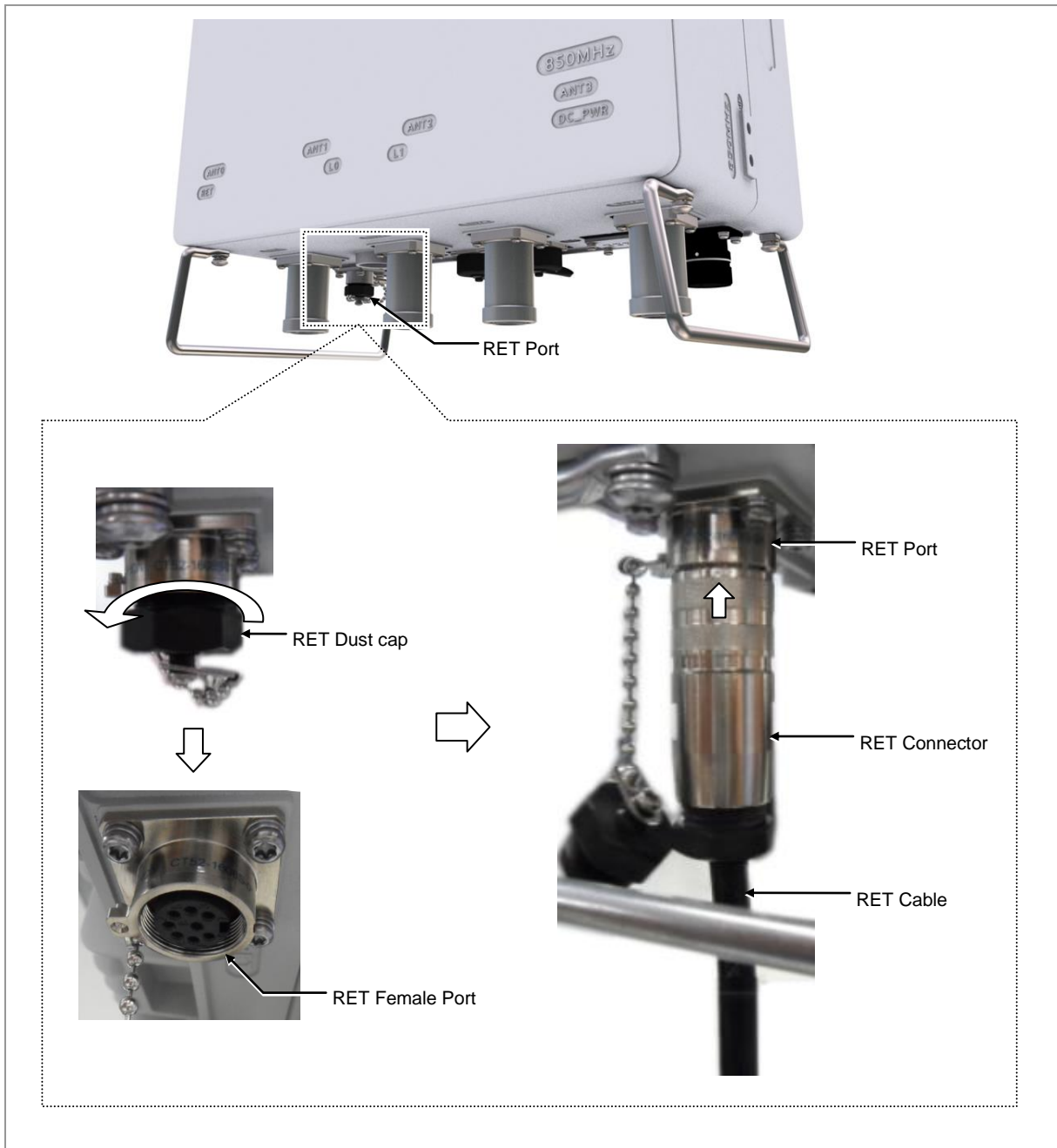
- 2 Install an RET cable from the RF Antenna to the RRU RET port.

Figure 67. RET Cable Connection (1)



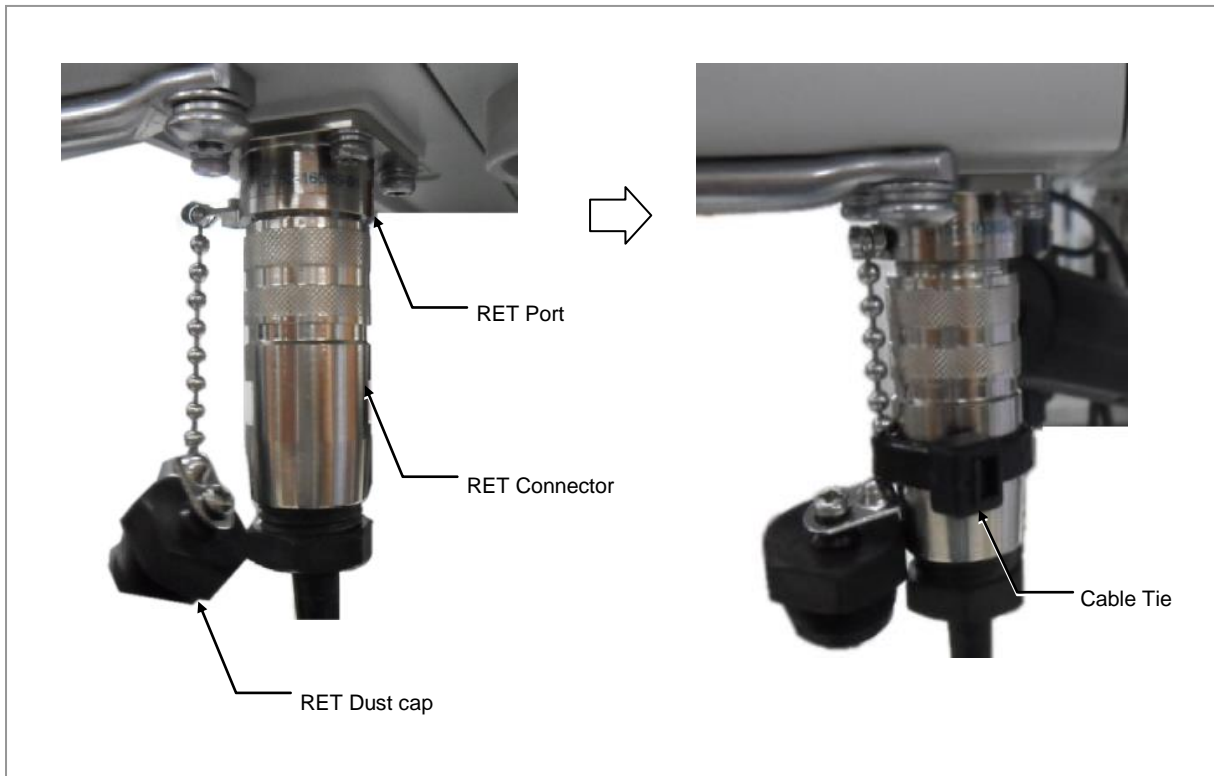
3 Connect the RET connector to the RRU RET port.

Figure 68. RET Cable Connection (2)



- 4 Tie the RET port's dust cap to the RET connector with a cable tie.

Figure 69. RET Cable Connection (3)



## RF Cable Connection



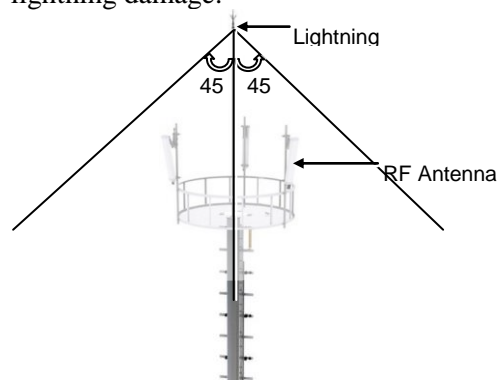
The RF cable minimum radius of curvature must be observed.

**Table 25. RF Cable Minimum Radius of Curvature**

Category	Description		
RF cable min. radius of curvature	1/2 in. Feeder Line	Super Flexible Type	1.26 in.(32 mm)
		Flexible Type	4.92 in.(125 mm)



When operator installs the antenna, the antenna must be within the protective angle (left/right side 45° each from the central axis) to prevent the antenna from lightning damage.



As different connector types may be used depending on the RF antenna type, check the antenna connector before connecting the cable.

▶ To connect RF cable using JMA Boots

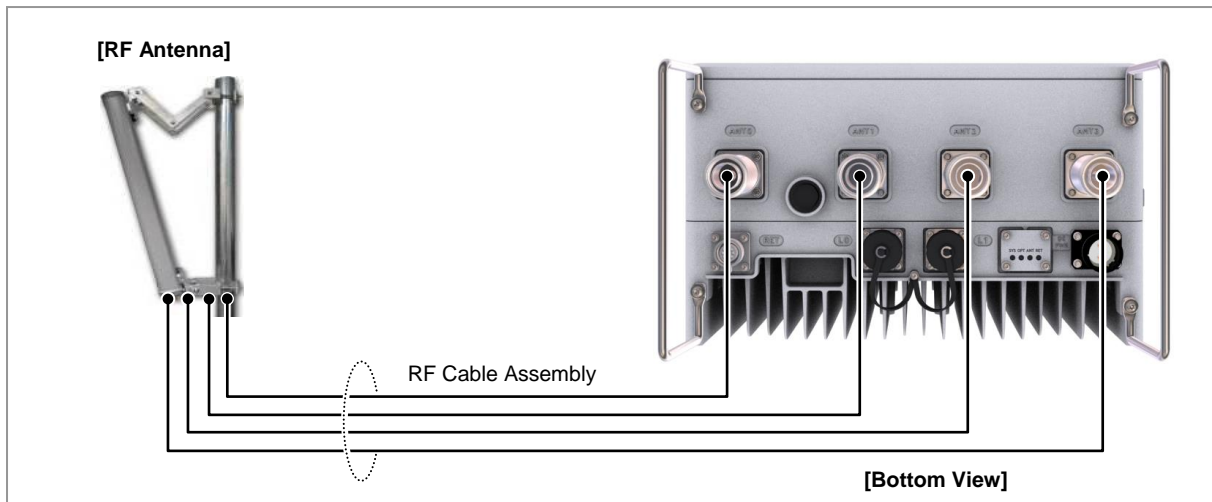
- 1 Make sure that operator has the following items:

**Table 26. Parts and Tools for connecting RF cable**

Category	Description	
Installation Section	RRU ANT0, ANT1, ANT2, ANT3 ~RF Antenna	
Cable	RF Cable Assembly (1/2 in. Feeder Line)	
Connector	RRU	DIN Type-Male, Straight
	RF antenna	DIN Type-Male (Check the RF antenna specification and prepare connecting parts.)
Recommended Torque Value	RRU	217 lbf·in
	RF antenna	217 lbf·in
Working Tools	Torque Wrench(100~400 lbf·in), Spanner Head(Hexagon Head: 1.25 in.(32 mm)), Spanner(Hexagon: 1.25 in.(32 mm))	

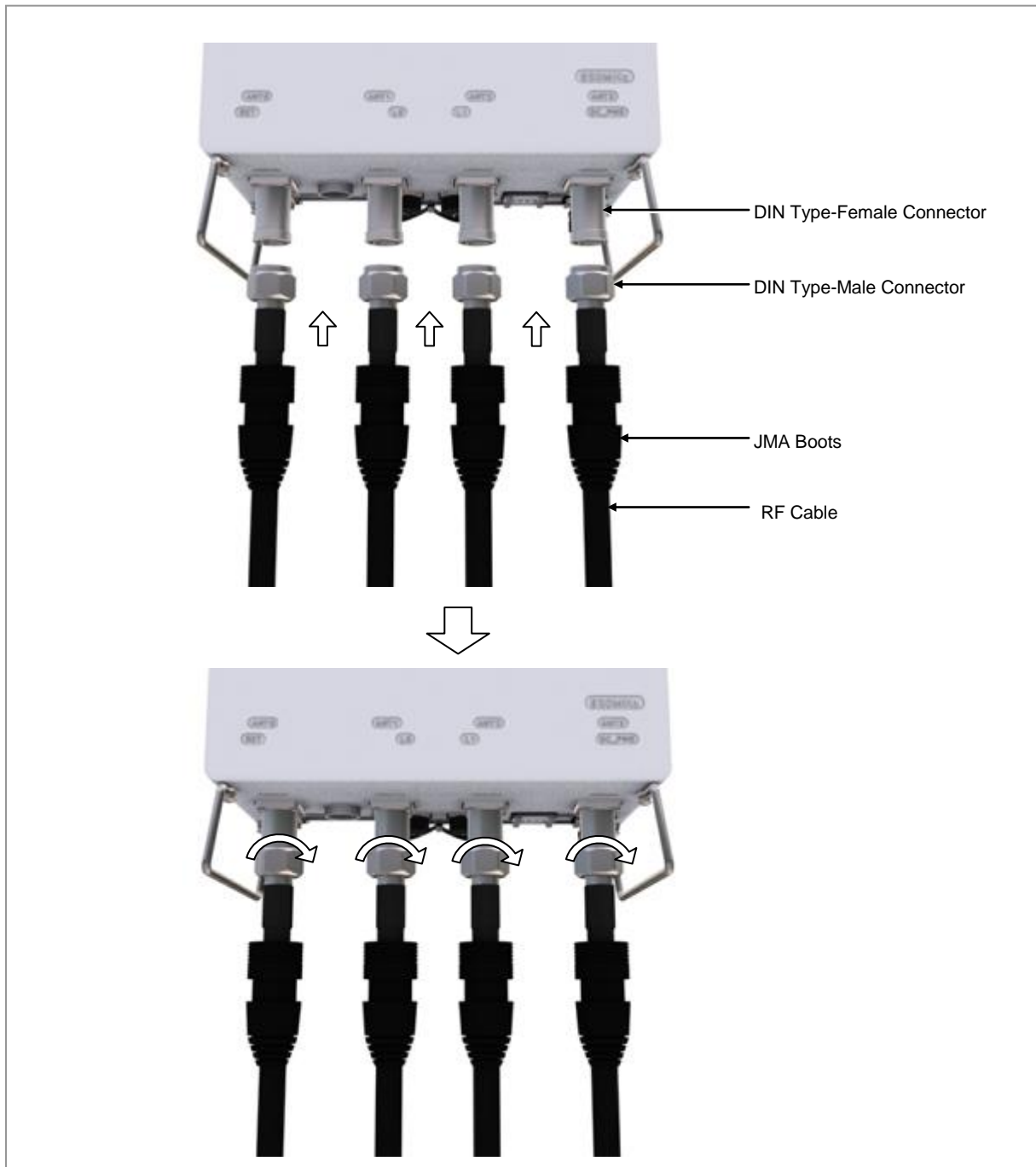
- 2 Install RF cable assembly from the RRU ANT0, ANT1, ANT2, ANT3 ports to the RF antenna. (There are JMA boots on both sides of the RF cable assembly.)

**Figure 70. RF Cable Connection using JMA Boots (1)**



- 3 Connect the connector assembled at the end of RRU side's cable to the ANT\_0, ANT\_1, ANT\_2, ANT\_3 ports.

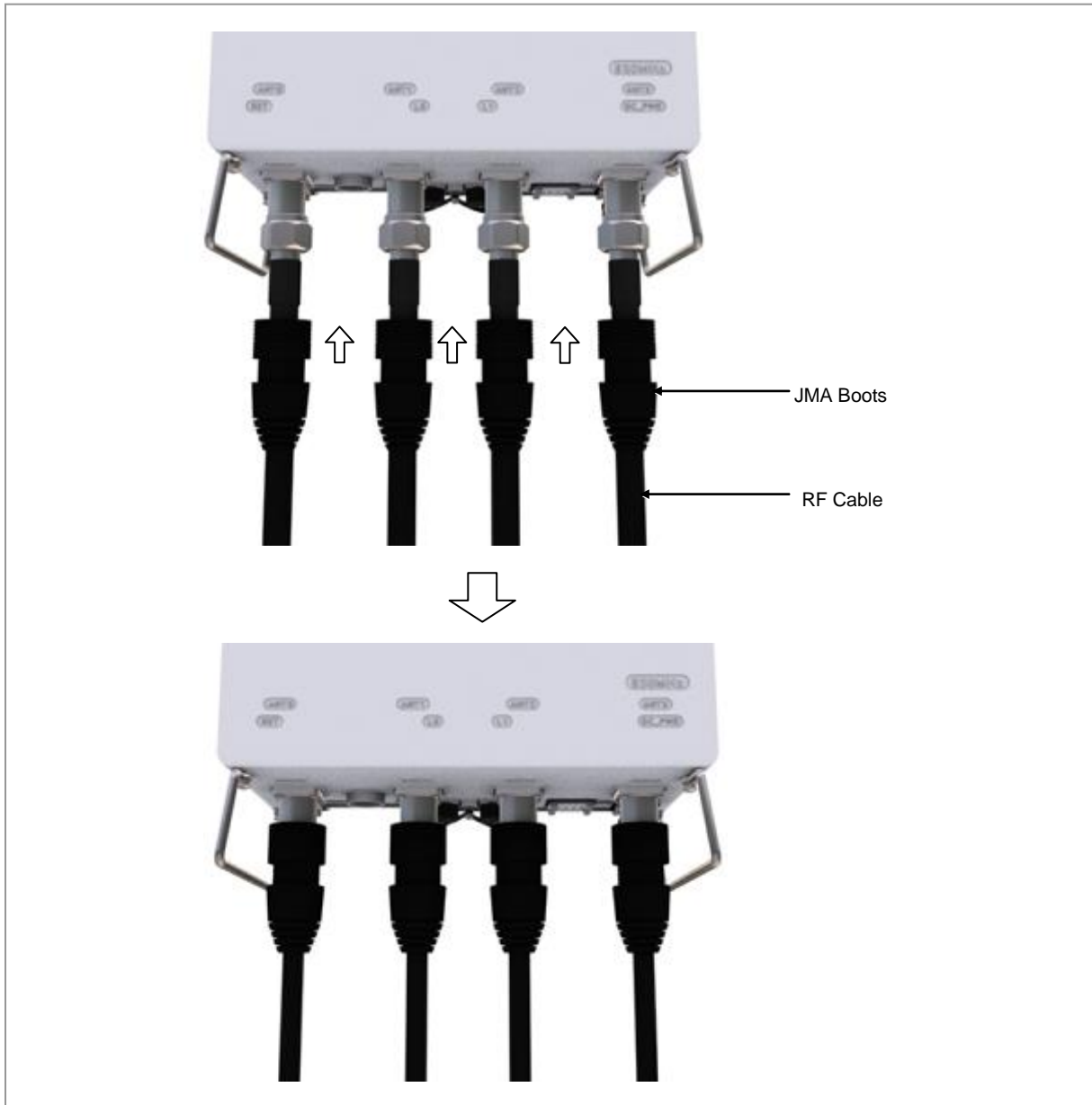
Figure 71. RF Cable Connection using JMA Boots (2)





- 4 After connecting the connector, push JMA Boots up to the connector connection.

Figure 72. RF Cable Connection using JMA Boots (3)



▶ To connect RF cable using a Cold Shrink Tube

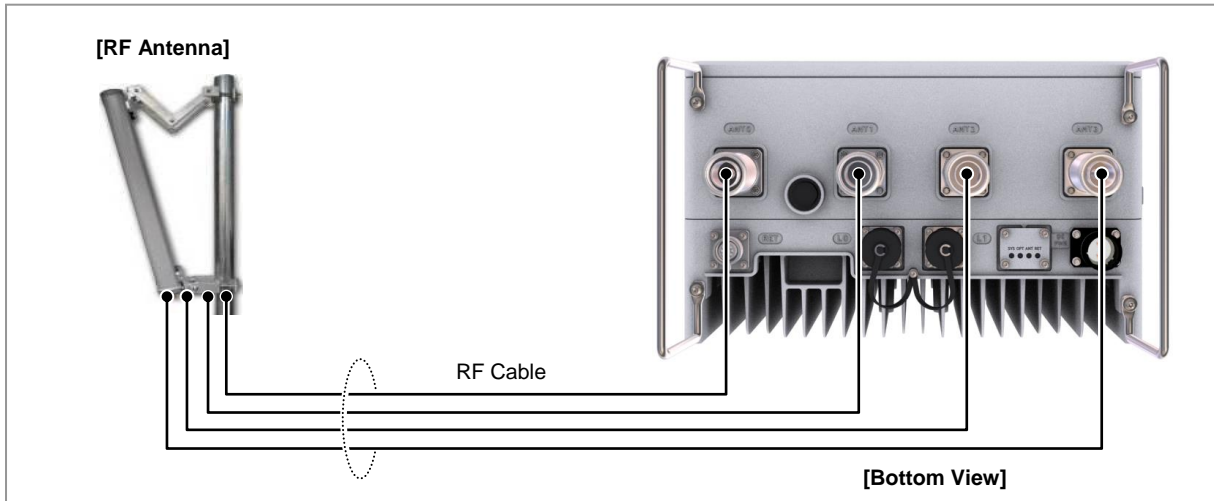
- 1 Make sure that operator has the following items:

**Table 27. Parts and Tools for connecting RF cable**

Category	Description	
Installation Section	RRU ANT0, ANT1, ANT2, ANT3 ~RF Antenna	
Cable	RF Cable Assembly (1/2 in. Feeder Line)	
Connector	RRU	DIN Type-Male, Straight
	RF antenna	DIN Type-Male (Check the RF antenna specification and prepare connecting parts.)
Recommended Torque Value	RRU	217 lbf·in
	RF antenna	217 lbf·in
Working Tools	Torque Wrench(100~400 lbf·in), Spanner Head(Hexagon Head: 1.25 in.(32 mm)), Spanner(Hexagon: 1.25 in.(32 mm))	

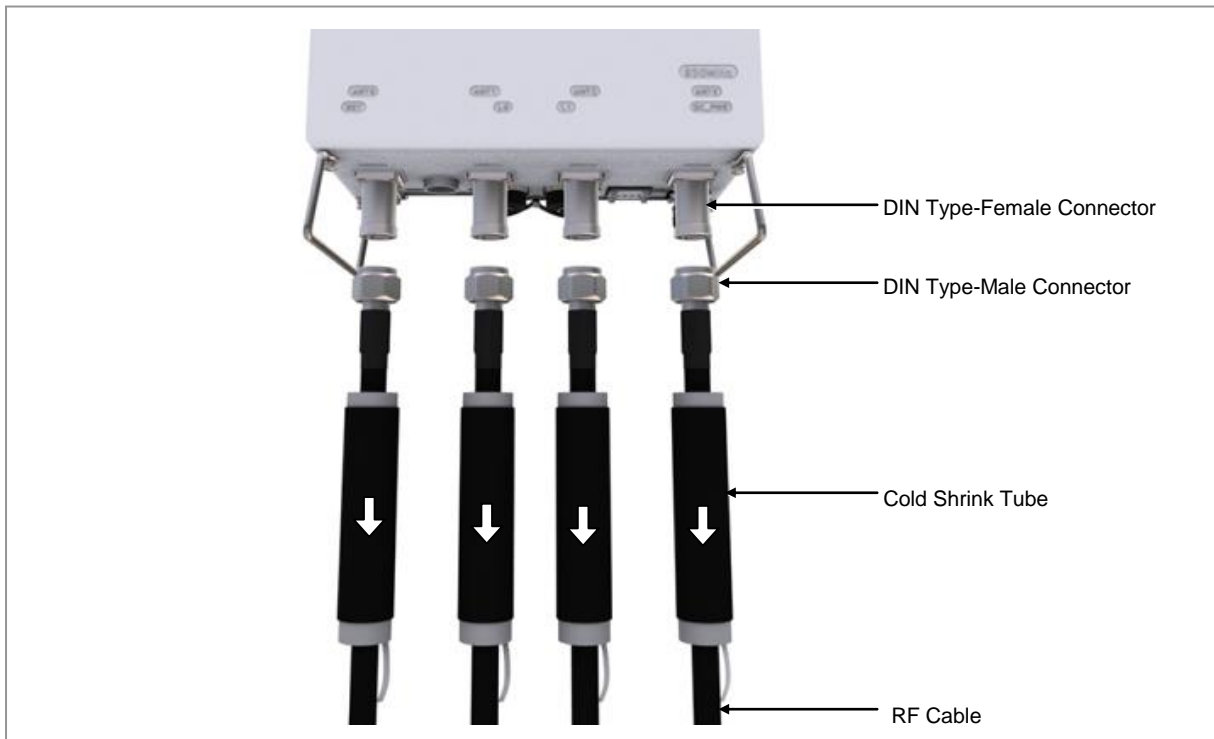
- 2 Install RF cable assembly from the RRU ANT0, ANT1, ANT2, ANT3 ports to the RF antenna.

Figure 73. RF Cable Connection using a Cold Shrink Tube (1)



- 3 Insert cold shrink tube to the end of RRU side's cable.

Figure 74. RF Cable Connection using a Cold Shrink Tube (2)



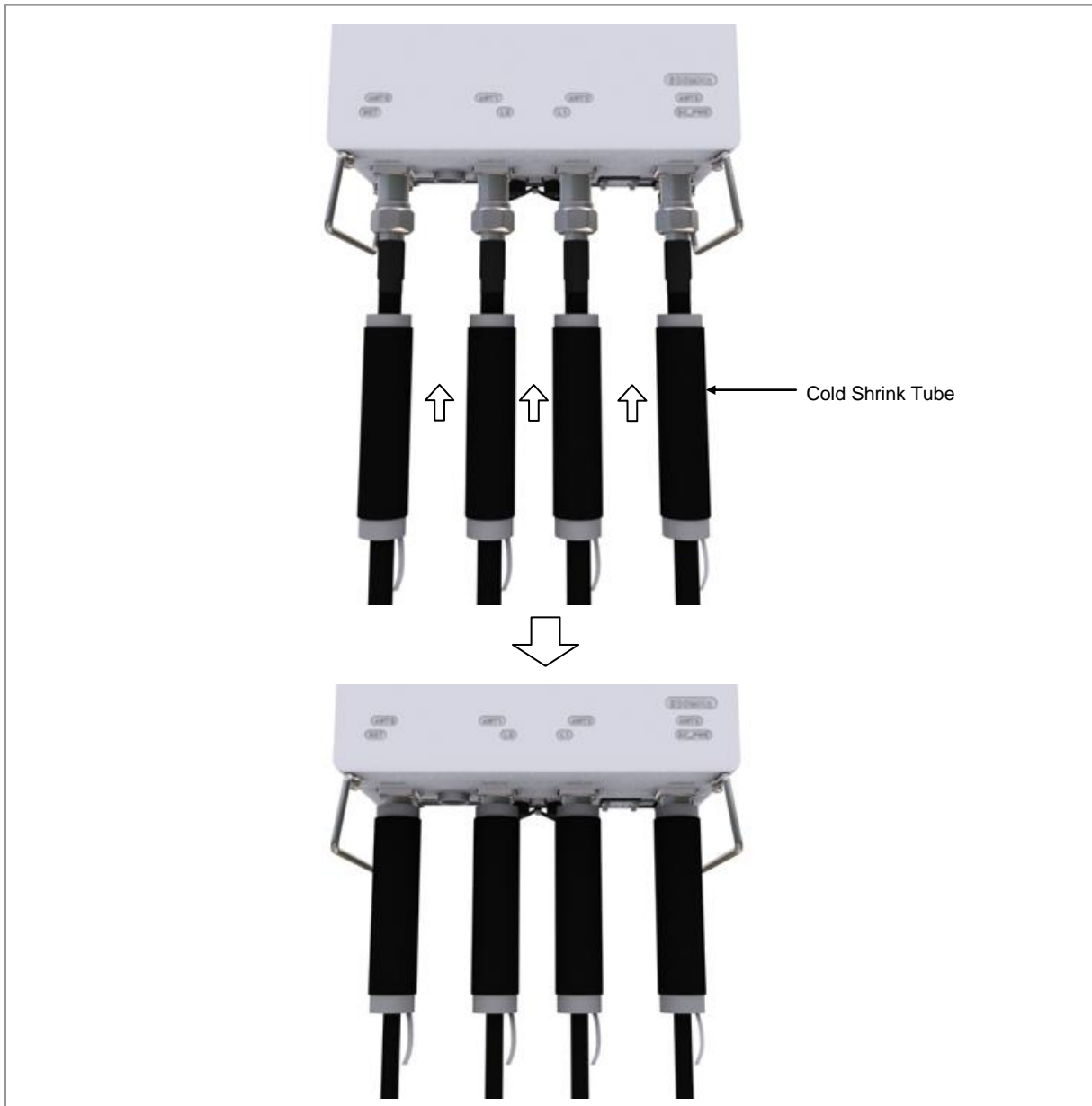
- 4 Connect the connector assembled at the end of RRU side's cable to the ANT\_0, ANT\_1, ANT\_2, ANT\_3 ports.

*Figure 75. RF Cable Connection using a Cold Shrink Tube (3)*



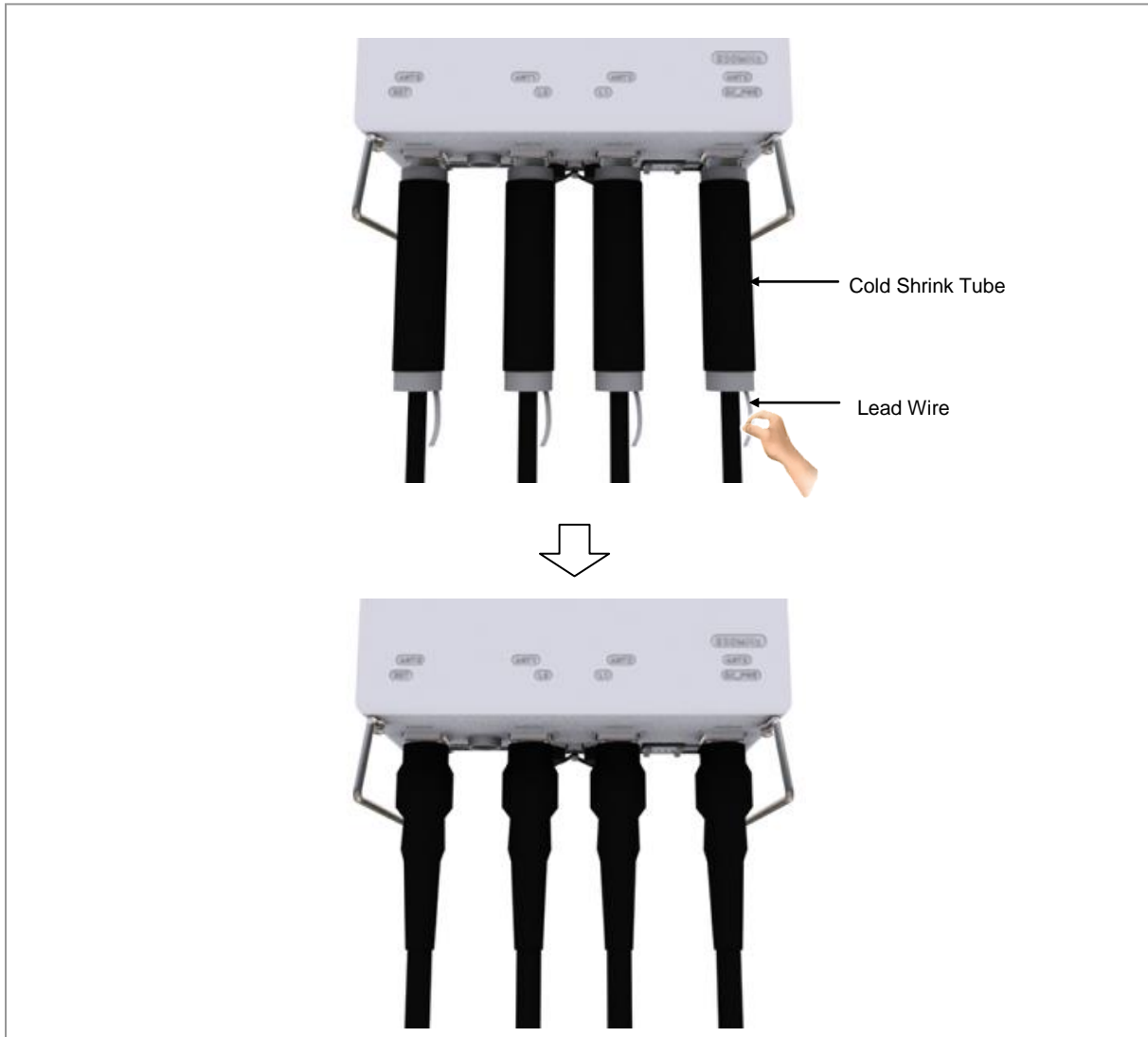
- 5 Push cold shrink tube up to the end of RF antenna port.

*Figure 76. RF Cable Connection using a Cold Shrink Tube (4)*



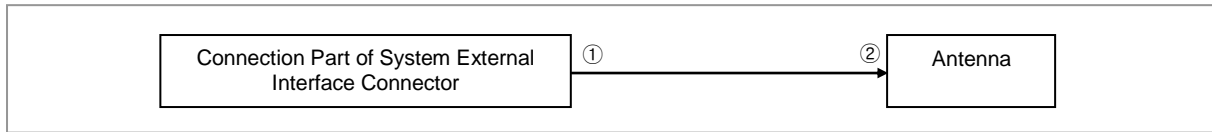
- 6 Hold the cold shrink tube with one hand so that it does not move, and pull the lead wire to shrink it.

Figure 77. RF Cable Connection using a Cold Shrink Tube (5)





### Checking RF Cable Connection


After connecting the RF cables, perform the continuity test and feeder cable return loss to check if the RF cable is changed and measure VSWR of antenna and RF cable.



Measure all cables of section ①~②. The measured VSWR should be the specification value or less. If the VSWR exceeds the specification value, disassemble the connector and measure each section separately.

- 

If the VSWR value for minimum cable bend radius and length of RF cable is not applied, system may not work properly because RF signals cannot transmit or receive smoothly. So, the VSWR value for minimum cable bend radius and length of RF cable must be checked and applied.
- 

When measuring VSWR, if operator opens the antenna port when the transmission output is not completely off, a spike signal may flow into the reception path, which may cause damage to LNA. Make sure the transmission output is completely off when measuring VSWR.
- 

When RF cable connection integrated RET signal and DC power is applied using ANT0 port of RRU, RET cable should be installed separated from RF cable to RF Antenna.



Depending on the supplier or manufacturer of antenna/arrestor the connector type may be different. Also, the detail specifications of a connector may be different depending on cable type even for the same connector type. Therefore, check the detail specifications of a connector before preparing parts.

Ex) DIN Type-Male: for 1/2 in. Feeder line, for 7/8 in. Feeder Line

### RF Cable Identification Tag Installation

Attach the identification tape in the below table to the RF cable.

**Table 28. RF Cable Identification Tag**

Category	Description
Installation position	Attach the identification tag to the both ends of the antenna.
Materials	Use the material of aluminum coated by vinyl for the identification tag.
Fixing method	<ul style="list-style-type: none"> <li>• Antenna side: Attach the tag to the feeder line using binding strings through the two holes on the tag.</li> <li>• Equipment Side: Cover up the feeder line with the tag and fix it using</li> </ul>

---

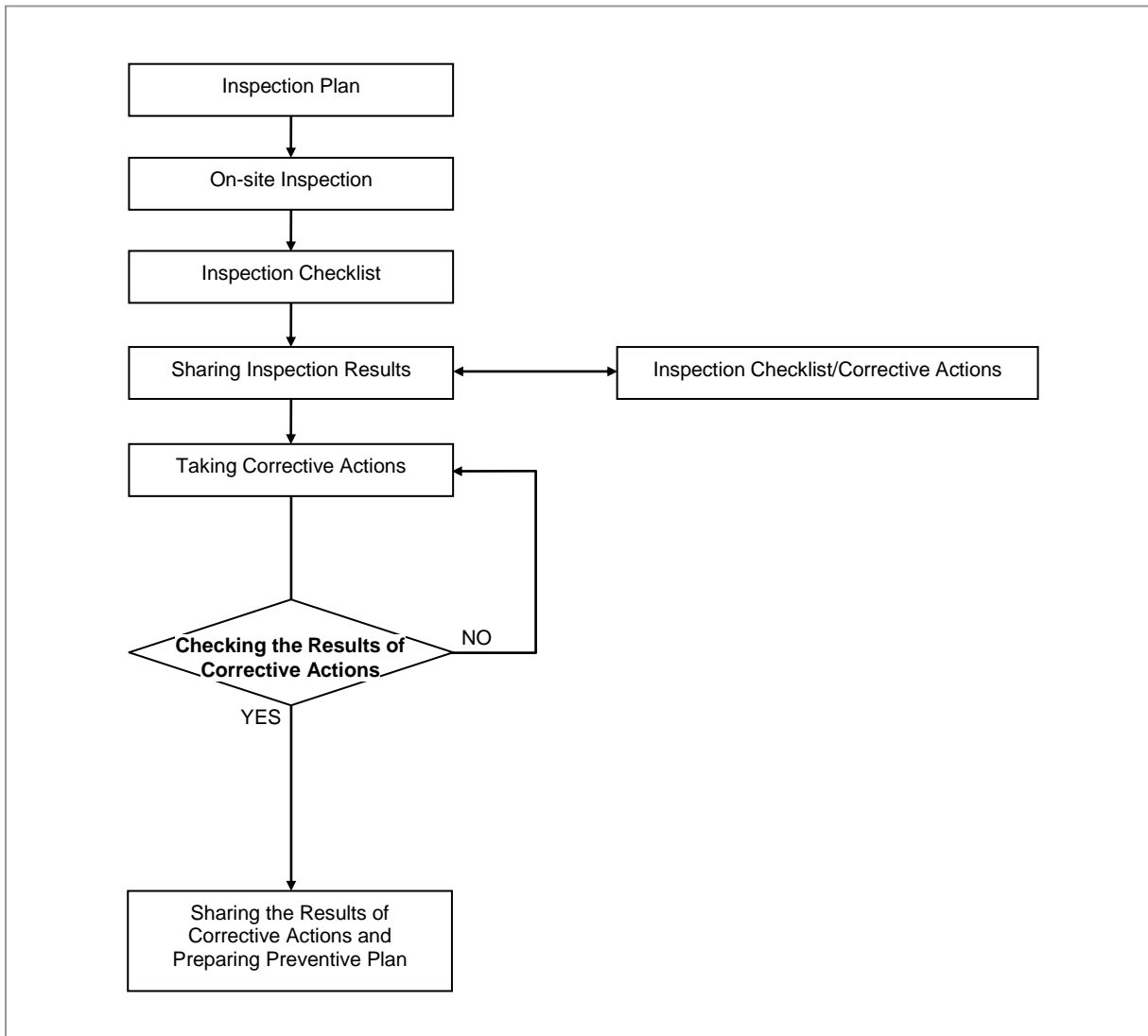
Category	Description
	binding strings through the two holes on the tag.
Identification method	The markings must be prevented from being erased by using relief engraving or coated labels.



# Chapter 4 Inspect the Installation

The procedure to check the installation status is as follows:

*Figure 78. Installation Inspection Procedure*



### Inspection Plan

Create an inspection sheet per system and select an inspector to set an inspection schedule per site.

### On-site Inspection and Inspection Checklist

The on-site inspection is to perform inspection visually or using instruments for each specification, standard, and installation status, and so on based on the inspection checklist actually at a site where the system is installed.

The inspector must record the results onto the inspection checklist during or after filed inspection.

### Sharing Inspection Results and Taking Corrective Actions

The inspector must share the inspection results (inspection checklist/corrective actions) with an installation operator and, the installation operator must take the corrective actions if necessary after reviewing the requirements.

### Checking the Results of Corrective Actions

The inspector must check if the corrective actions are properly taken. If they are not sufficient, the inspector must ask the installation operator to take the corrective actions again.

### Sharing the Results of Corrective Actions and Preparing Preventive Plan

After the corrective actions are all completed, the inspector must share the results with the installation operator and relevant departments and prepare a preventive plan to prevent the same or similar problems from re-occurring.

### Construction Situation Checklist

**Table 29. Construction Situation Check list**

Category	Check Items	Criteria	Result	
			Pass	Fail
Installing Equipment	Appearance of equipment and mechanical parts	Equipment damage such as Dent, scratch and crack, and so on		
	Placement of equipment and mechanical parts	Maintenance and horizontal/vertical placement		
	Leveling condition of equipment and mechanical parts	Horizontal/vertical status		
	Validity of status and specifications of fastening bolt/nut/washer, and so on	Checking fasteners omission		
		Compliance with assembly order of fasteners		
	Compliance with fastening torque value			
Insulation status	Checking electrical contact between			

Category	Check Items	Criteria	Result	
			Pass	Fail
		insulators (insulation resistance tester)		
Grounding	Installation of ground bar	Checking the separation of communication/power/lightning grounding		
	Cable specification	Checking the specification		
	Cabling	Cable damage		
		Proper installation route		
		Compliance with the radius of curvature		
	Cable binding status	Binding status		
		Binding interval		
		Checking binding materials		
	Cable connection	Assembly condition of a pressure terminal		
		Fastening condition of a pressure terminal		
		Checking compliance with fastening torque value		
	Installation status of cable tag	Position		
		Marking content		
		Checking tag installation method		
Power	Installation status of power supply	Power supply capacity		
		Output voltage (tester)		
	Installation of circuit breaker	Checking circuit breaker capacity		
	Cable specification	Checking the specification		
		Checking the limit distance		
	Cabling	Cable damage		
		Proper installation route		
		Compliance with the radius of curvature		
	Cable binding status	Binding status		
		Binding interval		
		Checking binding materials		
	Cable connection	Checking cable connection (Pin Map)		
		Input voltage		
		Assembly condition of a pressure terminal and connector		
		Fastening condition of a pressure terminal and connector		
		Checking compliance with fastening torque value		
	Installation status of cable	Position		

Category	Check Items	Criteria	Result	
			Pass	Fail
	tag	Marking content		
		Checking tag installation method		
Other data cables	Cable specification	Checking the specification		
	Cabling	Cable damage		
		Proper installation route		
		Compliance with the radius of curvature		
	Cable binding status	Binding status		
		Binding interval		
		Checking binding materials		
	Cable connection	Checking cable connection (Pin Map)		
		Assembly condition of a connector		
		Fastening condition of a connector		
		Checking compliance with fastening torque value		
	Installation status of cable tag	Position		
		Marking content		
Checking tag installation method				
RF	Antenna installation status	Checking specifications		
		Checking installation position		
		Checking fixing status		
		Checking gap between antennas		
	Cable specification	Checking the specification		
	Installation status of arrester	Checking the specification		
		Checking installation position		
		Checking fixing status		
	Cabling	Cable damage		
		Proper installation route		
		Compliance with the radius of curvature		
	Cable binding status	Binding status		
		Binding interval		
		Checking binding materials		
	Cable connection	Compliance with connector finishing		
	Installation status of cable tag	Position		
		Marking content		
		Checking tag installation method		
		Checking compliance with fastening torque value		
		Compliance with connector finishing		
Installation status of cable	Position			

Category	Check Items	Criteria	Result	
			Pass	Fail
	tag	Marking content		
		Checking tag installation method		
Others	Reserved ports	Checking port cap fastening status <ul style="list-style-type: none"> <li>• Indoor: Dust cap</li> <li>• Outdoor: Water proof cap</li> </ul>		
	Cable inlet status /Connection of equipment I/O port	Checking fastening status (Conduit/Cable Gland)		
	Cable tray and duct	Checking installation status		
	Status of inside/outside of the equipment and system surrounding area	Checking the stocking condition (waste parts, waste materials, packing materials, and so on)		
Opinion				

# Appendix A Acronyms

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AC	Alternating Current
CDU	Cabinet Digital Unit
CPRI	Common Public Radio Interface
DC	Direct Current
DL	Down-Link
FD	Frequency Division Duplex
FTP	Foiled Twisted Pair
LTE	Long Term Evolution
TGB	Tower Ground Bar
RET	Remote Electrical Tilting
RF	Radio Frequency
RTN	Return
RRU	Remote Radio Unit
UL	Up-Link
VSWR	Voltage Standing Waveform Ratio

# Appendix B Clean the Optical Connectors

## Introduction

When connecting an optical cable to the system, the performance of the system can be decreased or failures can occur if the core section of an optical connector is dirty due to dust or foreign material. Therefore, operator should clean the optical connector before connecting an optical cable to the system.

When using an optical connector cleaner, use the products shown in the example below or their equivalents.

Examples:

Manufacturer-USCONEC (<http://www.usconec.com>)

- IBC™ Brand Cleaner (P/N: 9393): For LC-LC and MU Connector Cleaning
- IBC™ Brand Cleaner (P/N: 9392): For SC Connector Cleaning
- IBC™ Brand Cleaner (P/N: 12910): For ODC Connector Cleaning



Manufacturer-The Fibers ([www.thefibers.com](http://www.thefibers.com))

- HuxCleaner 1.25 mm Type: For LC and MU Connector Cleaning
- HuxCleaner 2.5 mm Type: For SC, FC and ST Connector Cleaning



Follow the manufacturer's instructions for cleaning the optical connectors.

## Measure the Optical Output and Connecting the Optical Connector

▶ To measure the optical output

- 1 Using an optical power meter check the optical output.
- 2 If the optical output measurement result meets the reference value, clean the connector again and connect it.
- 3 If the measurement result does not meet the reference value, discard the cable, replace it with a new cable, and then clean the new one and connect it to the system.



[LC/PC Plug]



[Optical Power meter]



# Appendix C Standard Torque

When operator fastens the bolt, refer to the standard torque value below to prevent the equipment and bolt from damage and secure by fastening. When the torque value for each connection part is defined already, refer to the defined value.

**Table 30. Standard Torque Value for Fastening Bolts**

Bolt Spec.	Torque Value (kgf·cm)	Torque Value (N·m)	Torque Value (lbf·in)
M3	6.4	0.63	5.6
M4	15	1.5	13
M5	29	2.8	25
M6	50	4.9	43
M8	127	12	110
M10	250	25	217
M12	428	42	372

**Table 31. Brass Bolts Torque Value**

Bolt Spec.	Torque Value (kgf·cm)	Torque Value (N·m)	Torque Value (lbf·in)
M6	30	2.9	26
M8	64	6.3	56

**Table 32. Connector Connection Torque Value**

Connector	Torque Value (kgf·cm)	Torque Value (N·m)	Torque Value (lbf·in)
SMA connector	6 kgf·cm	0.59	5.2
TNC connector	9 kgf·cm	0.88	7.8
N-type connector	20 kgf·cm	2	17
DIN-type connector	250 kgf·cm	25	217



Torque value can be different, depending on the material, characteristic and specification of the equipment and fastener. Make sure to check the proper torque value for each specification of the equipment and fastener.



**RFD01F Series  
Installation Manual**

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