



Smart MBS RRH-B8 Installation Manual

Describes product installation and requirement procedure.

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Radio Access Network

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This manual should be read and used as a guideline for properly installing and/or operating the product. Owing to product variations across the range, any illustrations and photographs used in this manual may not be a wholly accurate depiction of the actual products you are using.

This manual may be changed for system improvement, standardization and other technical reasons without prior notice.

Samsung Networks documentation is available at <http://www.samsungdocs.com>

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Preface

This manual describes procedure and method for installing Smart MBS (Multi-modal Base Station) RRH-B8.

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-ST5** command in the input field.

New and Changed Information

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

- Manual template is changed.
- 2Sector and 3Sector configurations are added.

Revision History

The following table lists all versions of this document.

Version	Publication Date
1.0	December 2013
2.0	February 2014
3.0	February 2015
3.1	May 2015 (update power specification to -38~-56Vdc)
3.2	June 2015 (add antenna clearance distance)

Organization of This Document

Section	Title	Description
Chapter 1	Before Installation	This chapter introduces RRH-B8 and describes items should be understood before installation.
Chapter 2	Installation of RRH-B8	This chapter describes the procedure to install RRH-B8.
Appendix A	Acronyms	This appendix describes the acronyms used in this manual.
Appendix B	Sector Antenna Installation	This annex describes sector antenna configurations and its installation requirements.
Appendix C	Feeder Line Work	This annex describes cautions and allowed radius of curvature when installing feeder line.
Appendix D	Assembling connector	This annex describes the procedure of assembling connector.
Appendix E	Cleaning Optic Connector	This annex describes the procedure of cleaning the optic connector and cleaning tool.
Appendix F	Pressure Terminal Assembly	This annex describes the procedure of assembling the pressure terminal.
Appendix G	Standard Torque	This annex describes the standard torque when assembling the fixing materials.

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

The product is designed to operate from a -48 V DC supply and is therefore classified as Safe Extra Low Voltage (SELV) equipment.

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 EN 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 EN 60825-1. During installation, operation, and maintenance, never look into the end of an optical fiber directly or by reflection either with the naked eye or through an optical instrument. Do not operate equipment with exposed fiber connectors-cover these with fiber cables or blanking caps. Do not remove equipment covers during operation unless requested to do so in the documentation. Carry out normal safety precautions when trimming fibers during installation.

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 should 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.

Each power feed to the unit requires a separate fused feed from the provided power supply. The cable between the power distribution point and the installed equipment must have a minimum cross-sectional area of 2.5 mm².

Rack-mountable equipment must be placed in a standard 19-inch rack and secured with the appropriate fixings as detailed in the installation manual.

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.

Fire

The product is powered from a -48 V DC supply. To protect against fire, the equipment is fused.

Environment

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

Keep all liquids away from the equipment as accidental spillage can cause severe damage.

Cooling

The product cools down by its own set of cooling fans housed in a fan module. Each fan module detects a fan that is not operating normally. LEDs on the front panel of the fan tray provide an alarm indication in the event of fan failure.

In the event of fan failure, take urgent remedial action to restore full cooling capacity.

Take appropriate measures to ensure that fan modules do not start spinning during repair and maintenance procedures.

Anti-Static Precautions

The circuit boards and other modules in the product are sensitive to and easily damaged by static electricity. If any card or sub-assembly is removed from the unit, the following anti-static precautions must be observed at all times:

- Service personnel must wear anti-static wrist straps.
- Circuit boards and sub-assemblies must be placed on ground conductive mats or in conductive bags.
- All tools must be discharged to ground before use.
- The anti-static wrist strap and cord must be checked at regular intervals for their suitability for use.

Grounding

To comply with EN 60950, the equipment must be connected to a safety grounding point via a permanent link. 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.

Power Supply Connection

The equipment is designed to be powered from a -48 V DC supply. Power connections and installation of associated wiring must be carried out by a suitably qualified technician.

Only devices that comply with all relevant national safety requirements should be connected to the unit's power supply inlets. Other usage will invalidate any approval given to this equipment.

Connection of this equipment to devices that are not marked with all relevant national safety requirements may produce hazardous conditions on the network.

When the power supply is obtained by a rectifier/safety isolation transformer, the supply must meet the requirements of EN 60950 providing double/reinforced insulation between hazardous voltages and SELV/TNV circuits. Any battery must be separated from hazardous voltages by reinforced insulation.

Indirect Connection

Before indirectly connecting any equipment to another device through a shared power supply, ALWAYS seek advice from a competent engineer.

Devices that are not marked according to the relevant national safety standards may produce hazardous conditions on the network.

Product Disposal

To reduce the environmental impact of products, Samsung has joined WEEE compliance activities.

The WEEE symbol on the product indicates that the product is covered by the European Directive 2002/96/CE for the disposal of Waste Electrical and Electronic Equipment (WEEE). This means that the product should be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or the local authorities. This will help prevent potential negative consequences for the environment and human health. Please check the terms and conditions of the purchase contract for information about correct disposal.

Battery Disposal

The product contains a battery on the processor card. The battery should not be disposed of with other household waste. Where marked, the chemical symbols Hg, Cd or Pb indicate that the battery contains mercury, cadmium or lead above the reference levels in EC Directive 2006/66. The battery incorporated in this product is not user replaceable. For information on its replacement, please contact your service provider. Do not attempt to remove the battery or dispose it in a fire. Do not disassemble, crush, or puncture the battery.

End of life recycling materials information is available from Samsung.

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.’

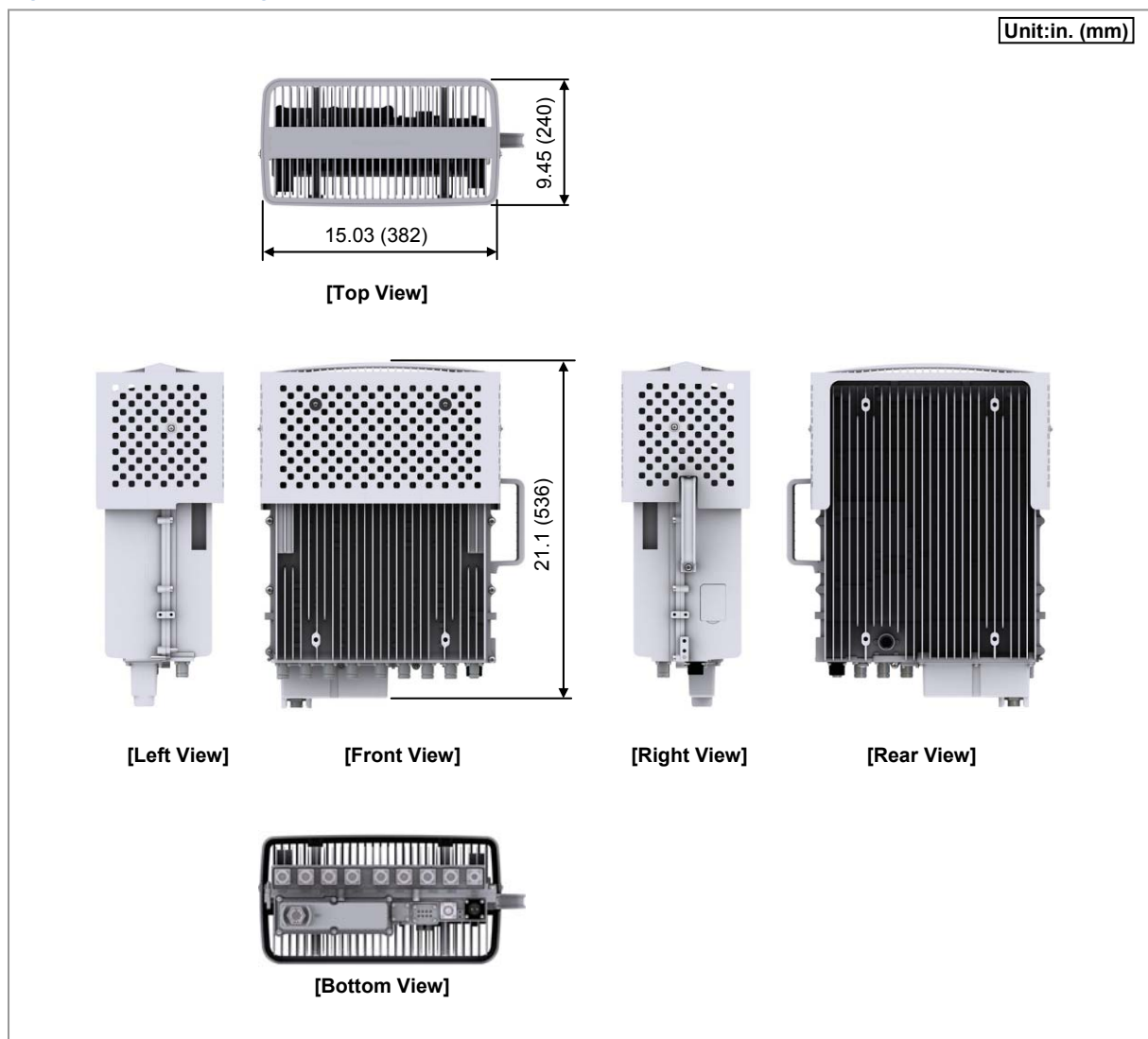
Chapter 1 Before Installation

System Configuration and Interface

RRH-B8 Configuration

The following shows the configuration of RRH-B8.

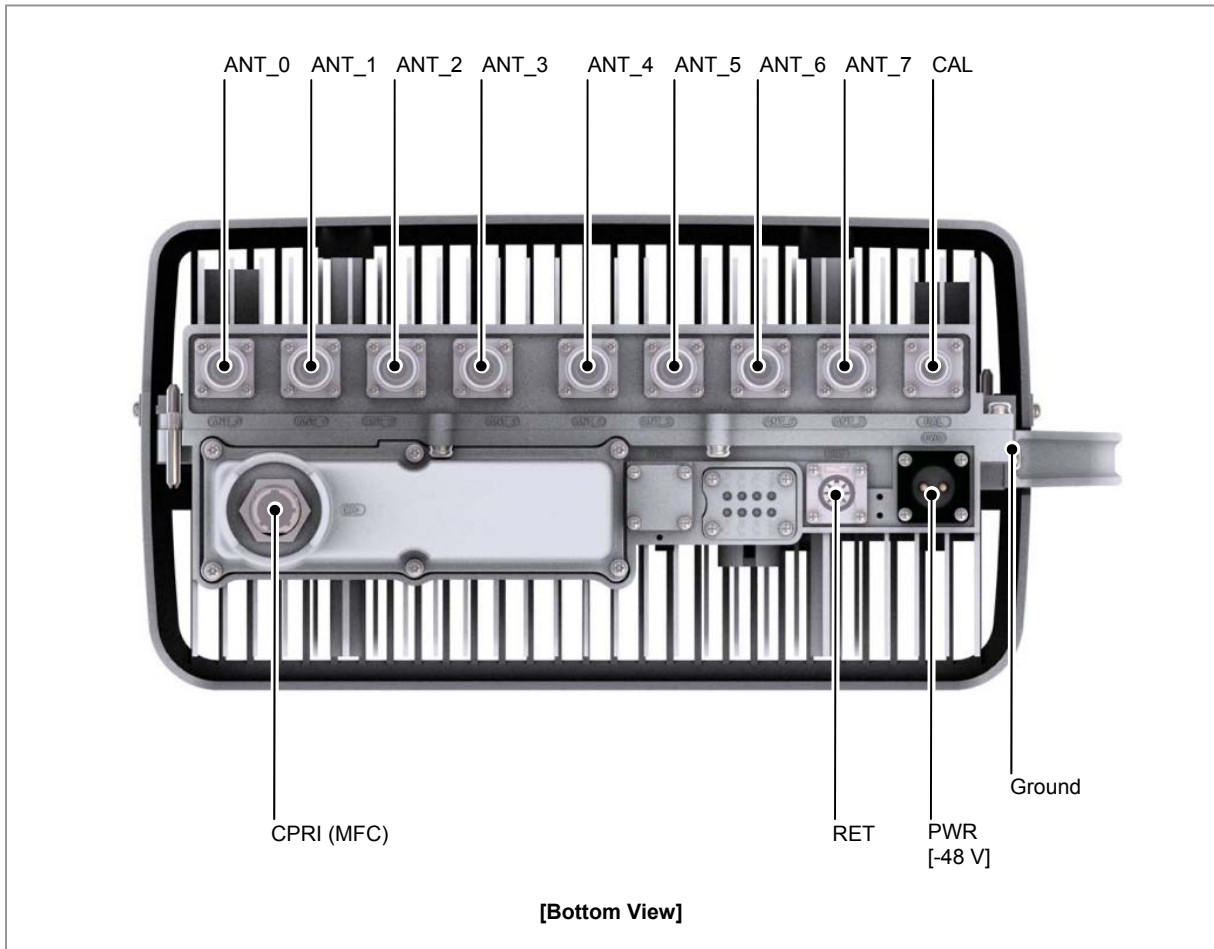
Figure 1. RRH-B8 Configuration



External Interfaces of RRH-B8

The following shows the external interfaces of RRH-B8.

Figure 2. External Interfaces of RRH-B8



Specifications

Key Specifications

The following table shows the key specifications for RRH-B8.

Table 1. Key Specifications

Item	Specifications
Air specification	LTE TDD
Operating Frequency	2496~2690 MHz
RF Power per Sector ^{a)}	40 W × 4Tx (Total 160 W)
Multiple Antenna	8T8R/4T8R/4T4R/2T2R
DU~RRH-B8 Interface	10 Gbps, CPRI 4.0 (Optic)
a) Output power at the RU antenna port. (Not external filter antenna port)	

Power Specifications

The following table shows the power specifications for RRH-B8. RRH-B8 complies with UL60950 safety standard for electrical equipment.

Table 2. Power Specifications

Item	Specifications
Input voltage	-48 V DC: -38~-56 V DC
Current consumption (Max.)	17 A

Unit Size and Weight

The following table shows the size and weight of RRH-B8.

Table 3. Unit Size and Weight

Item	Specifications	
Size (W × D × H)	13.78 × 6.75 × 17.72 (in.) 350 × 171.5 × 450 (mm)	Without. Finger guard, MFC Box
	15.03 × 8.03 × 21.26 (in.) 382 × 204 × 540 (mm)	With. Finger guard, MFC Box
Weight	56.00 lb (25.4 kg)	Without. Finger guard, MFC Box
	59.74 lb (27.1 kg)	With. Finger guard, MFC Box

Ambient Conditions

This section describes the operating temperature, humidity level and other ambient conditions and related standard of RRH-B8.

The following table shows the ambient conditions and related standard of RRH-B8.

Table 4. Ambient Conditions

Item	Range
Temperature ^{a)}	-40~131°F (-40~55°C) without solar load
Humidity ^{a)}	10~95 % The moisture content must not exceed 0.024 kg per 1 kg of air.
Altitude	0~6000 ft (0~1800 m)
Vibration	GR-63-CORE Sec.4.4 <ul style="list-style-type: none"> • Earthquake • Office Vibration • Transportation Vibration
Noise (sound pressure level)	Max. 65 dBA at distance of 5 ft (1.5 m) and height of 3 ft (1.0 m)
Electromagnetic Interference (EMI)	FCC Title47 Part 15 Class B
US Federal Regulation	FCC Title47 Part27
a) Temperature and humidity are measured at 59 in. (1.5 m) above the floor and at 15.8 in. (400 mm) away from the front panel of the RRH-B8.	

Installation Precaution

The following precaution must be observed to prevent accidents during RRH-B8 installation.

Before Installation

- Install a high voltage warning sign near the area where high voltage cable is located.
- Install a restricted entry warning sign near the potential accident area.
- Cover exposed areas such as junctions, ceilings, footholds etc. with safety rails or fence off the area.
- Study use of the fire alarm and the location of the fire extinguisher and how to use it.
- Check the location of the nearest emergency exit.

OSHA Training

It is important that ALL WORKERS AND LEADS PERFORMING AND SUPERVISING THIS STA installation manual is validated as qualified by their G.C. employers as having sufficient training and adequate proficiency in installing and maintaining MMBS and battery systems, and that they are aware, understand, and abide by all requirements as defined in this manual and the Field Site Audit Review systems checklist.



- OSHA stands for the Occupational Safety and Health Administration, an agency of the U.S. Department of Labor
- OSHA's responsibility is worker safety and health protection
- OSHA website: <http://www.osha.gov>

During Installation

- Cut all equipment power before installation.
- Always wear protection gloves and goggles when drilling holes into the wall or ceiling.
To prevent electric shocks from metallic objects, remove all accessories such as watches or rings.



Wearing protection gloves and goggles

Make sure to wear protection gloves and goggles to prevent damages from debris while drilling holes in a wall or ceiling.



Watches, Rings, and Other Metallic Accessories

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



Do not work by yourself

Do not work by yourself in any key process.



Do not use base station antenna within the distance of 1600 cm from people and also do not co-locate nor operate in conjunction with any other antenna or transmitter for the protection of general public from exposure to radio frequency electromagnetic field.

Cable Path Inspection

When installing a cable that connects between the rectifier, Main Ground Bar (MGB), and backhaul device, etc. within the system, the cable path length and the cable installation method, etc. 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, etc.)
- In areas where the cable can be damaged by external factors, ensure that measures are taken to prevent damages to the cable. (Cable tray, ducts, flexible pipe, etc.)

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.
- 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 a PVC channel, spiral sleeve, flexible pipe, and cable rack, etc.

Table 5. Minimum Allowed Cable Bend Radius

No	Type	Min. Allowed Cable Bend Radius	Remarks
1	GV/CV/FR-8	8 times of the cable external diameter	0.6/1 KV cable
2	Optic Cable	20 times of the cable external diameter	-
3	UTP/FTP/S-FTP Cable	4 times of the cable external diameter	PVC/LSZH, 4 Pair
4	1/2 in. Feeder Line (Indoor)	1.26 in. (32 mm)	RFS, LS
5	1/2 in. Feeder Line (Outdoor)	4.92 in. (125 mm)	RFS, LS
6	7/8 in. Feeder Line (Outdoor)	9.84 in. (250 mm)	RFS, LS
7	1 1/4 in. Feeder Line (Outdoor)	14.96 in. (380 mm)	RFS, LS
8	1 5/8 in. Feeder Line (Outdoor)	19.69 in. (500 mm)	RFS, LS
9	LMR-400	1 in. (25.4 mm)	Installation
		4 in. (101.6 mm)	Repeated
10	RG-316D	0.59 in. (15 mm)	-

No	Type		Min. Allowed Cable Bend Radius	Remarks
11	Hybrid Cable	External diameter: 0.98 in. (25 mm)	11.81 in. (300 mm)	-
		External diameter: 1.06 in. (27 mm)	13.0 in. (330 mm)	-
		External diameter: 1.18 in. (30 mm)	15.35 in. (390 mm)	-
		External diameter: 1.26 in. (32 mm)	17.71 in. (450 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 strings, cable ties, binding lines, and ram clamps, etc.

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, etc.) and the use of the cable (power cable, optical cable, RF cable, etc.).
- Do not let the cutting section of a cable tie and binding line, etc. be exposed to the outside. This may cause damage to cables or personal injury. Make sure that the cutting sections of cables are not exposed to the outside.
- Trim the binding string so that you have about 1.97 in. (5 cm) of string left from the knot. And insert the remaining string into the knot and make sure the knot does not loosen.
- If there is a potential danger of contact failure in a connector connection due to tension, install the cable in the shortest distance.

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 you are 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.
- Use a heat shrink tube at a connector connection for cables that are installed outdoor, such as RF cables, 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 not to trigger contact failure at a connector connection due to tension.

Identification Tag Attachment

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

Follow the Cable labeling standards as below;



Category: Full Wrap, Full Flag, Half Flag, etc.



Follow these guidelines when attaching an identification tag.

- When installing a cable outdoor, use relief engraving and coated labels, etc. to prevent 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 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 electrician's mistakes



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.



The cable works require knowledge for the cabling works such as cable installation/binding.

After Installation

- Cover the cable hole on the floor with a solid cover.
- Remove all installation residues; clean the area.



The optical module and cable used in the system emit bright laser beams. Always handle them with care as there is risk of serious injury if the eyes are exposed to the laser beam of the optical cable.









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

Installation Tool

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

Table 6. Basic Installation Tools

No.	Name	Purpose	Specification
1	Torque Driver Set	No.0~+ No.3 (M2.6~M6 '+' Driver) 0.07~4.34 lbf-ft (1.0~60 kgf-cm)	
2	Torque Wrench Set	M6~M14 0.72~2.17 lbf-ft (10~30 kgf-cm), 7.23~36.15 lbf-ft (100~500 kgf-cm), Replaceable head	
3	Drill/Bit Set	0.24~0.67 in. (6~17 mm)	
4	Heating Gun	122~572°F (50~300°C)	
5	Power Extension Cable	98.42 ft (30 m)	
6	Tape Measure	16.4 ft/164 ft (5 m/50 m)	
7	Cable Cutter	12.8 in. (325 mm)	
8	Silicon Gun/Silicon	Normal/Gray & Colorless	
9	Hummer Set	Still/Rubber/PVC	
10	Spanner	0.39 in., 0.51 in., 0.67 in., 0.75 in., 0.94 in., 1.42 in. (10 mm, 13 mm, 17 mm, 19 mm, 24 mm, 36 mm)	
11	Wire Stripper	0.24~0.94 in. (6~24 mm)	
13	Flare Nut Wrench	Hexagon 7/8 in.	



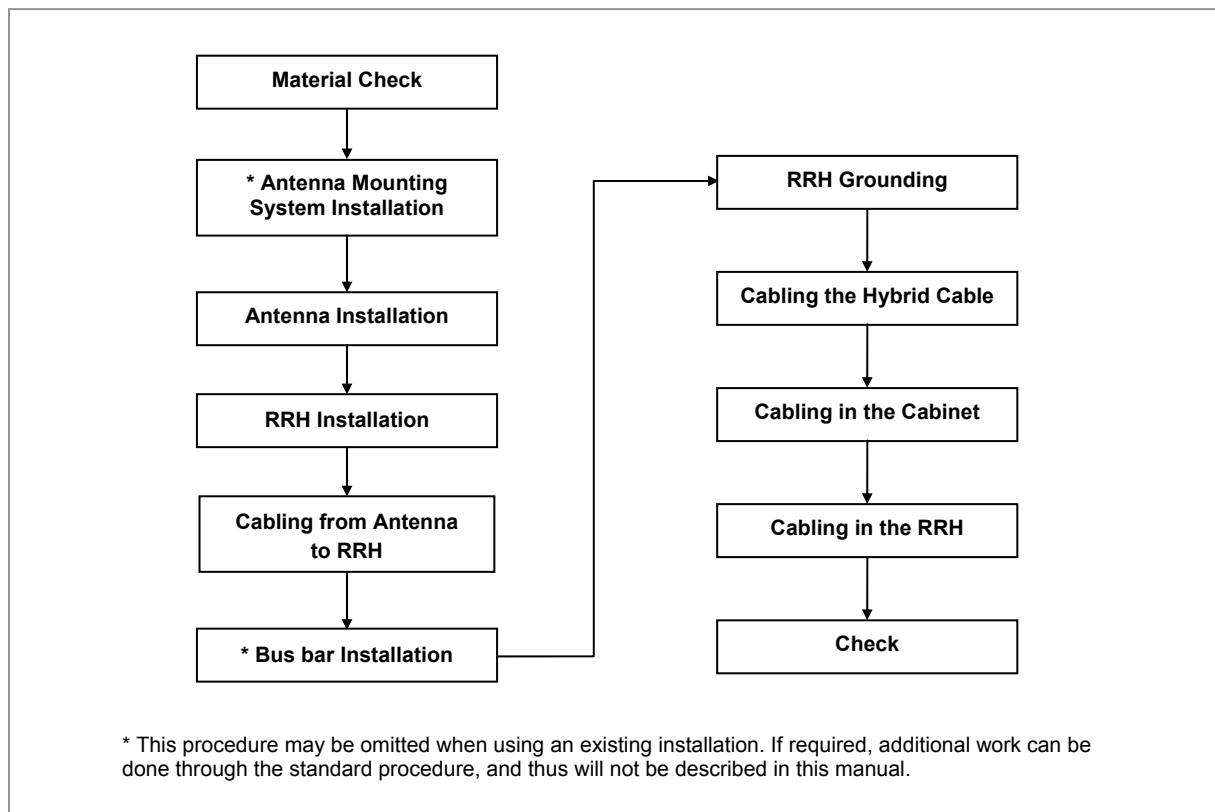
The required installation tools may vary depending on the conditions at the site. In addition to the basic tools, a protractor, compass, GPS receiver, ladder, safety equipment, cleaning tools etc. should also be prepared in consideration of the site conditions.

Chapter 2 Installation of RRH-B8

Installation Procedure

The following diagram shows RRH-B8 installation procedure.

Figure 3. System Installation & Cable Connection Procedure



Foundation Work

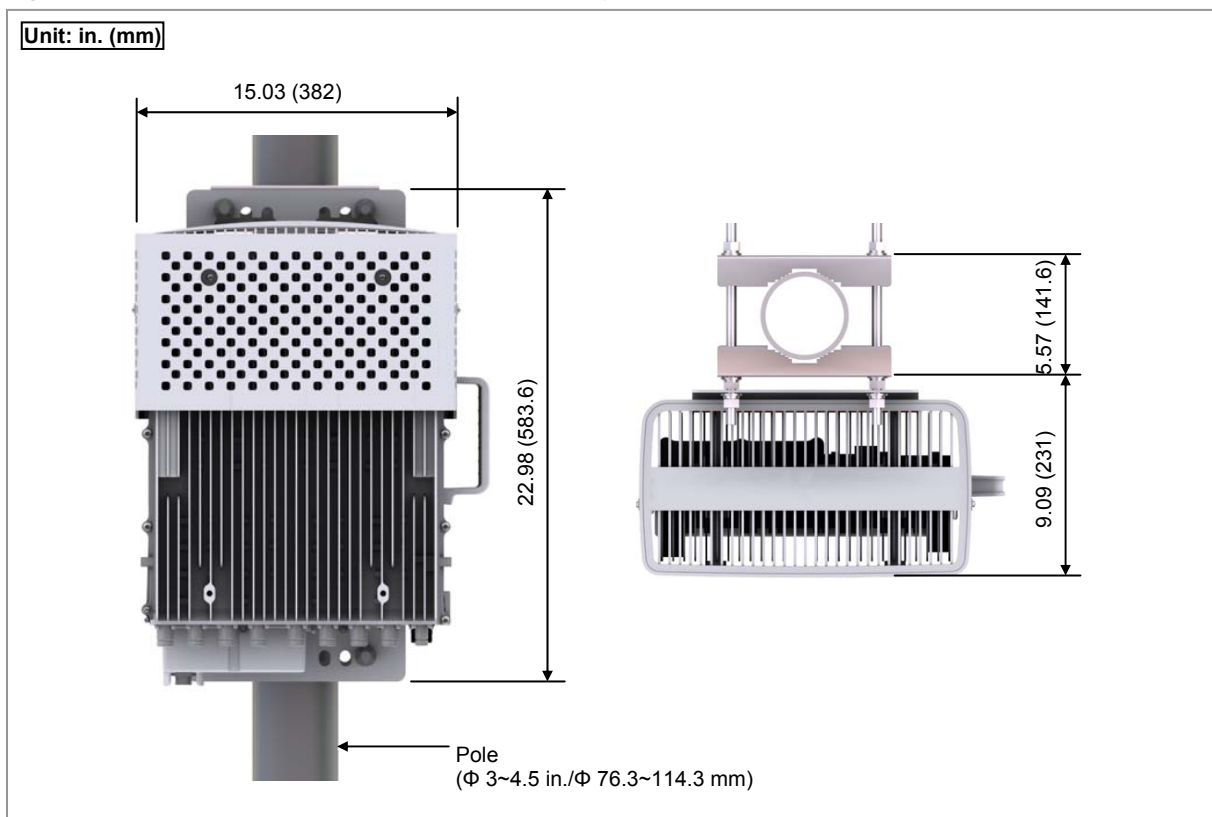
Equipment Arrangement

A minimum distance must be secured around the RRH-B8 in each direction for installation and maintenance.

Table 7. Recommended Distances for System Arrangement

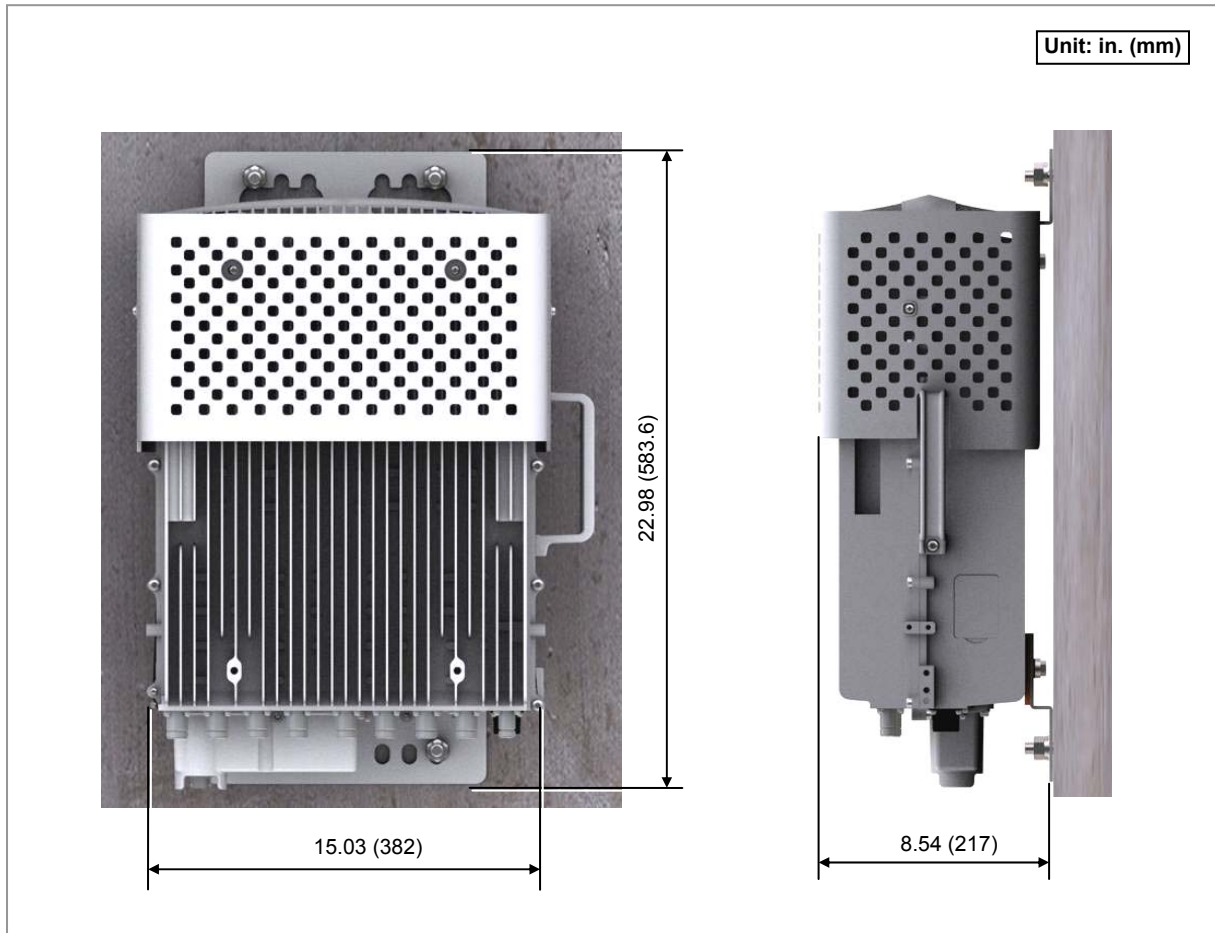
Item	Recommended Distances
Front/Rear	31.5 in. (800 mm) or more
Sides	23.62 in. (600 mm) or more

Figure 4. RRH-B8 Installation Space (1 Sector Pole Type)



The figure above illustrates the installation space using a 4 in. (101.6 mm)/90 A diameter pole. The measures may differ depending on the diameter of the pole.

Figure 5. RRH-B8 Installation Space (Wall Type)



Unpacking and Transporting

This paragraph describes the work to unpack cabinets and other components and transport them to the place to be installed. The cabinet is externally packed and cabinet and other components are individually packed.

- The external packing should be unpacked outside of the building. If necessary, it can be unpacked after transporting to the area near installation place.
- Transport the cabinet to the installation place. Be aware of the damage of walls, pillars, and bottom of the passage when transporting the cabinet.
- Transport other components with packing and sort by types.

Bringing in Items

Bring in items, taking care of the followings:

- Regarding equipment weight and size, check the path to bring the equipment.
- Lay Iron and veneer boards on stairs or doorsills to make the transportation easy.
- When bring in equipment, beware of damage or impairment of main entrance, walls, pillars, and floors of the station. Prepare protection materials and fix them with a high-strength adhesive.
- Carry boards in packing status, and unpack them when installing or mounting.

Vibration Level for Transportation

- When carrying the system, fasten the system firmly not to exceed the proper vibration level from 1 to 500 Hz.
- When carrying system, use a lift to prevent accidents. However, if the system should 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, boards and other devices should not be shocked physically and damaged caused by dust, moisture, and static electricity.

System should be installed in a location whose access is not easy from outside.

Unpacking Items

The procedure to unpack items is as follows:

- The packing items should be packed until they reach the installation place.
- The items are classified in accordance with each job specification and stored on a place with no interference on working.
- Unpacked systems should be installed immediately. If not installed immediately, the systems should be stored in the installation place temporarily.
- Unpack the inner packaging after each system is placed on its installation location.
- Unpack the inner packaging after each system is placed on its installation location.
- Do not recycle the packaging waste. Dispose of them pursuant to the rules.

Fixing the System

Preparations

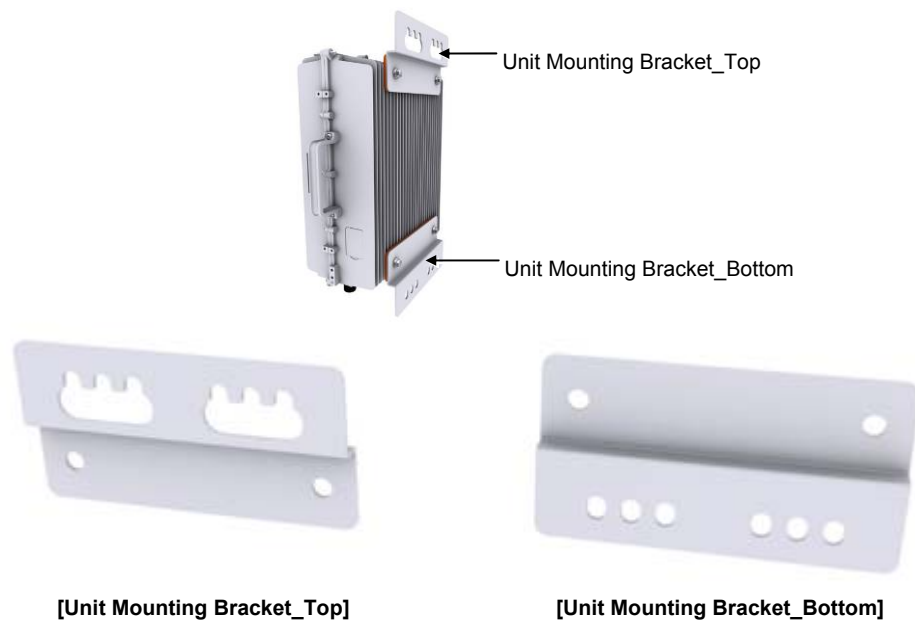
For the system fixation, assemble the unit mounting brackets and finger guard first on the ground.

Fixing Unit Mounting Bracket

▶ Fixing Unit Mounting Bracket

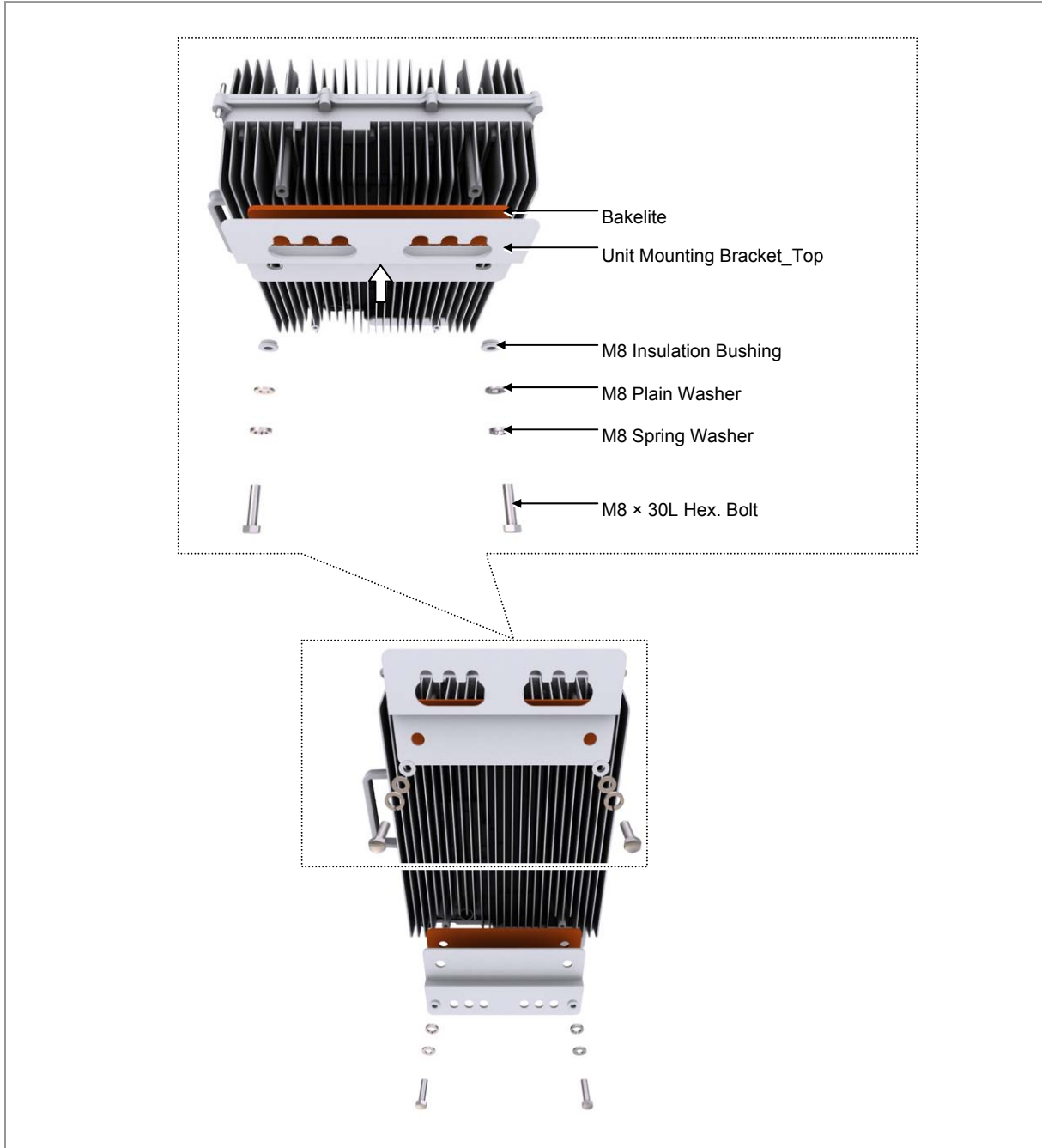


There are two types of unit mounting brackets, for top and bottom.



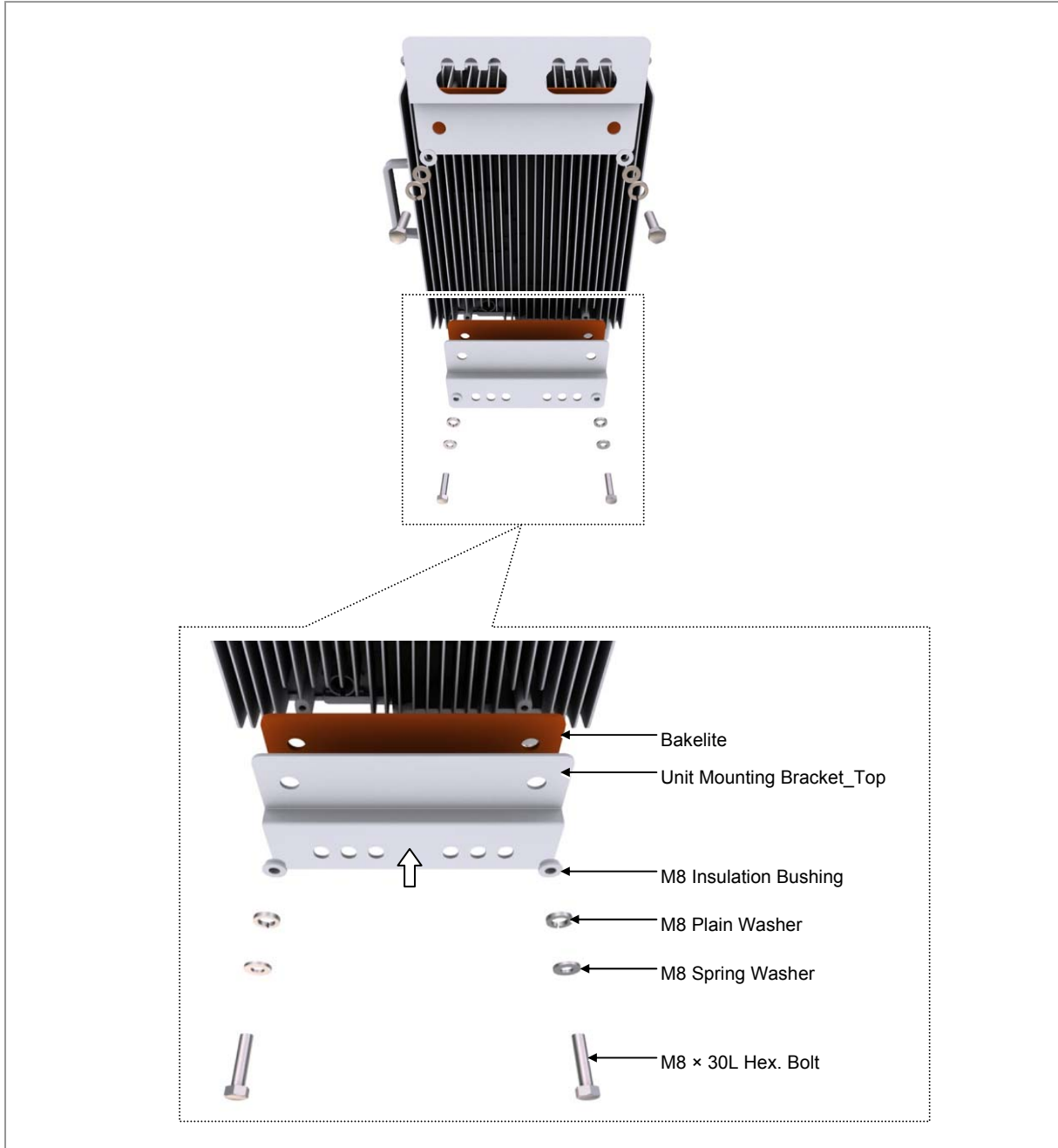
- 1 Align the bakelite and unit mounting bracket_top to the upper rear fixing holes of RRH-B8 and fix them firmly in place using insulation bushings, plain washers, spring washers, and M8 hex. bolts.

Figure 6. Fixing Unit Mounting Bracket (1)



- 2 Align the bakelite and unit mounting bracket_bottom to the lower rear fixing holes of RRH-B8 and fix them firmly in place using insulation bushings, plain washers, spring washers, and M8 hex. bolts.

Figure 7. Fixing Unit Mounting Bracket (2)

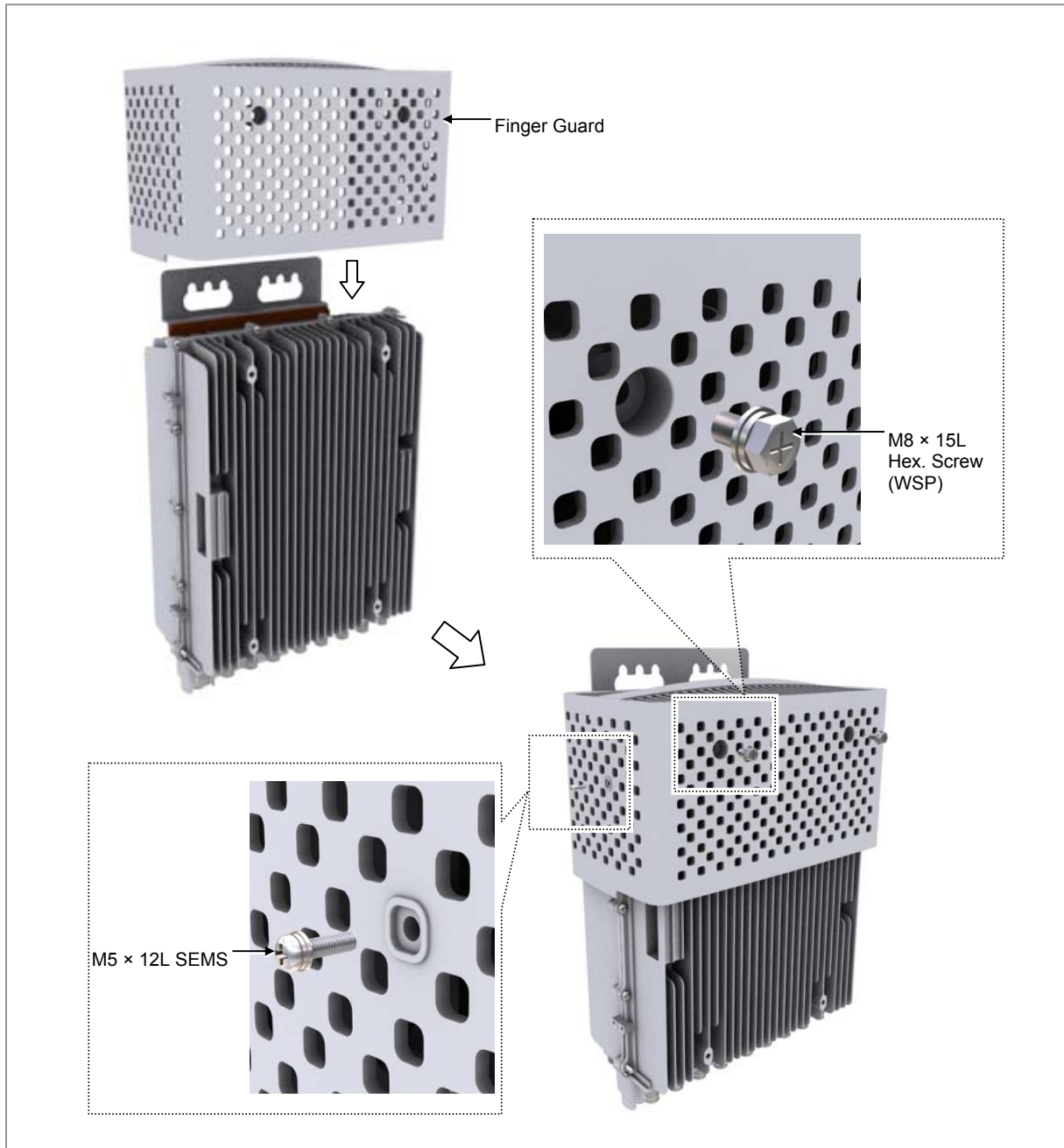


Fixing Finger Guard

▶ Fixing Finger Guard

- 1** Place the finger guard to the fixing holes at the RRH-B8.
- 2** Fix the finger guard to the RRH-B8 using the screws on the front, left, and right sides of RRH-B8.
 - Front side: M8 x 15L Hex. Screw (WSP)
 - Left/Right sides: M5 × 12L SEMS

Figure 8. Fixing Finger Guard

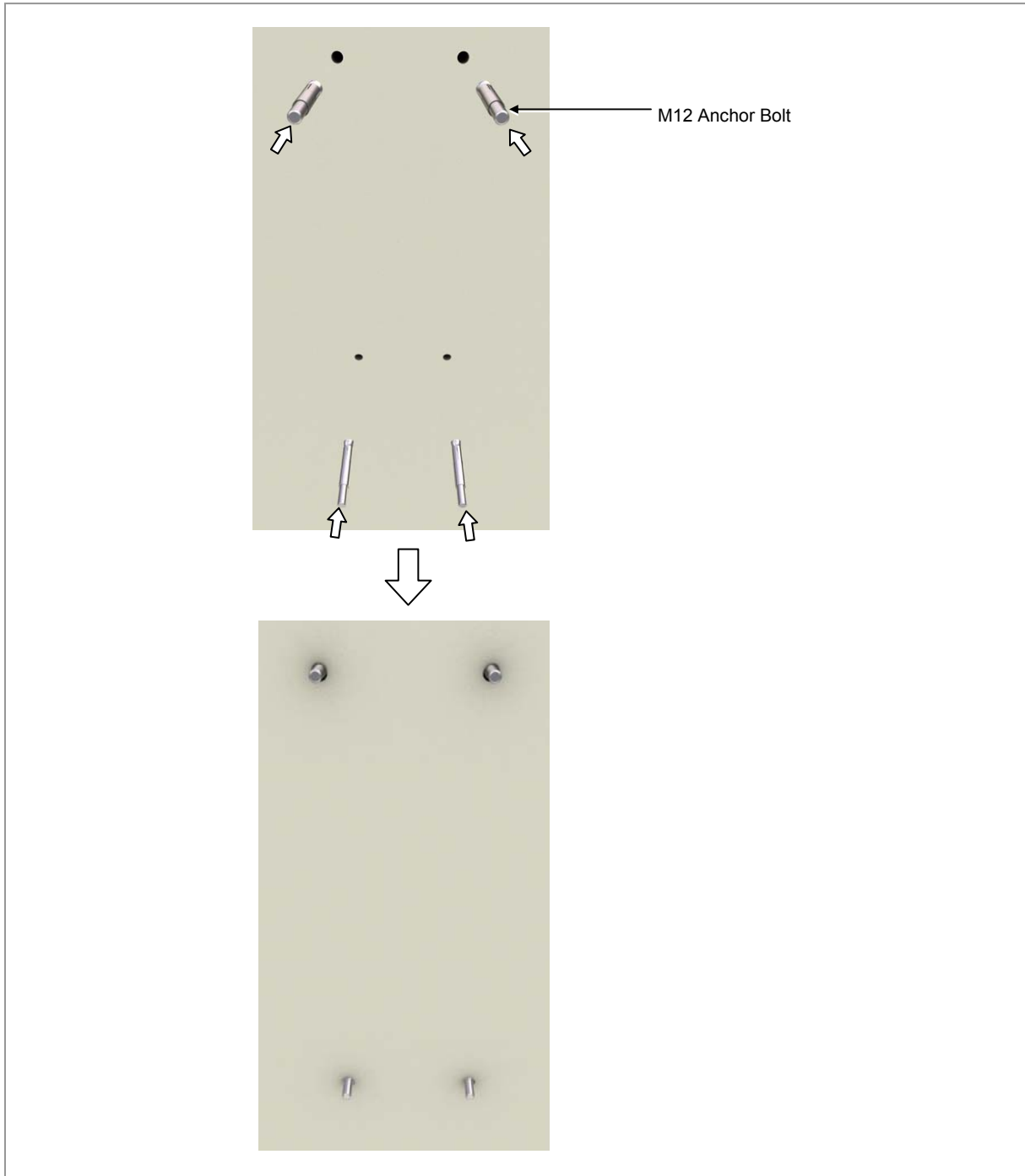


Fixing Wall Mount

▶ Fixing Wall Mount

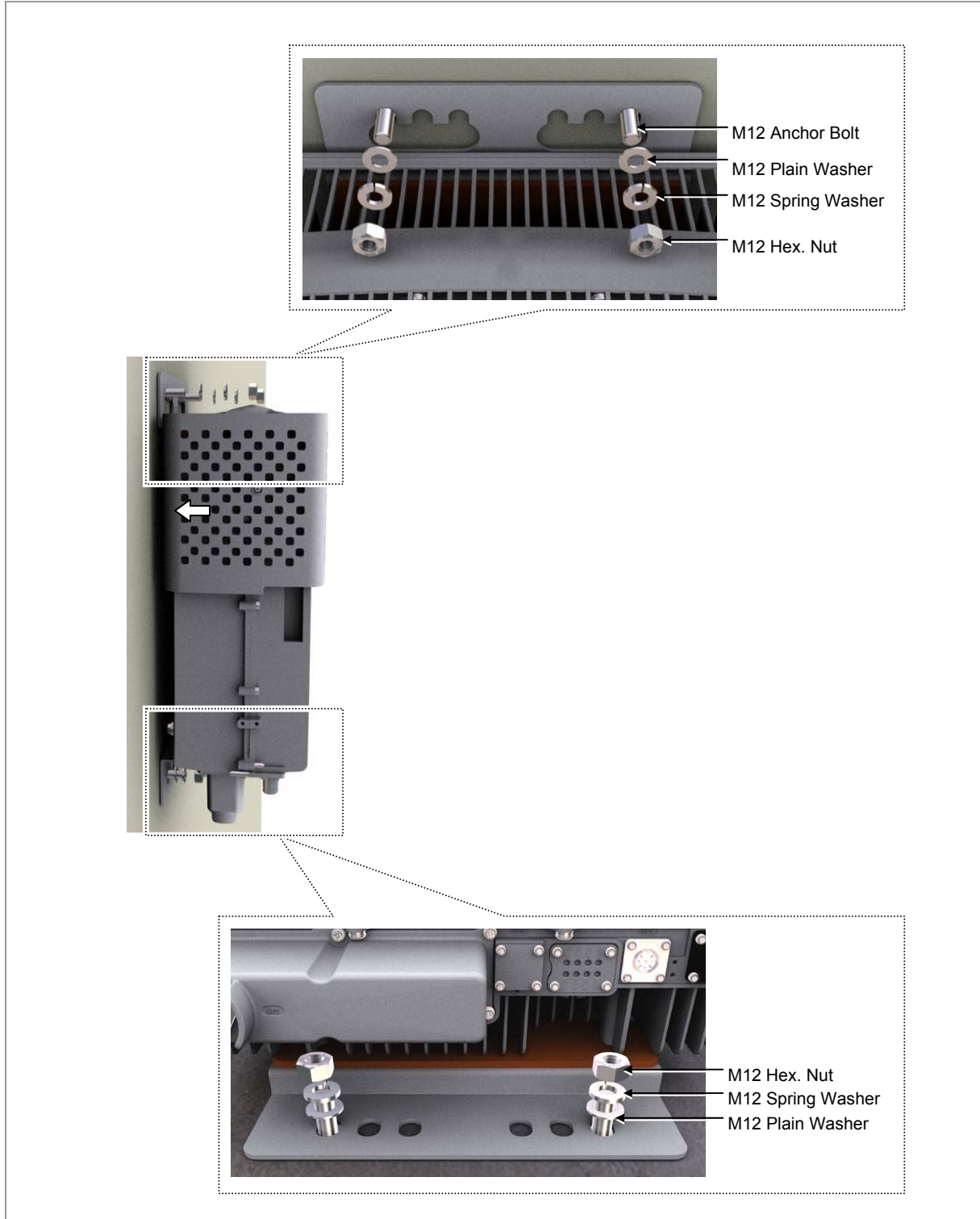
- 1 Fix M12 anchor bolts to the drilled holes on the wall.

Figure 9. Fixing Wall Mount (1)



- 2 Hang the RRH-B8 unit mounting brackets by aligning the bracket holes to the M12 anchor bolts that are fixed on the wall and fix them using M12 plain washers, spring washers, and hex. bolts.

Figure 10. Fixing Wall Mount (2)





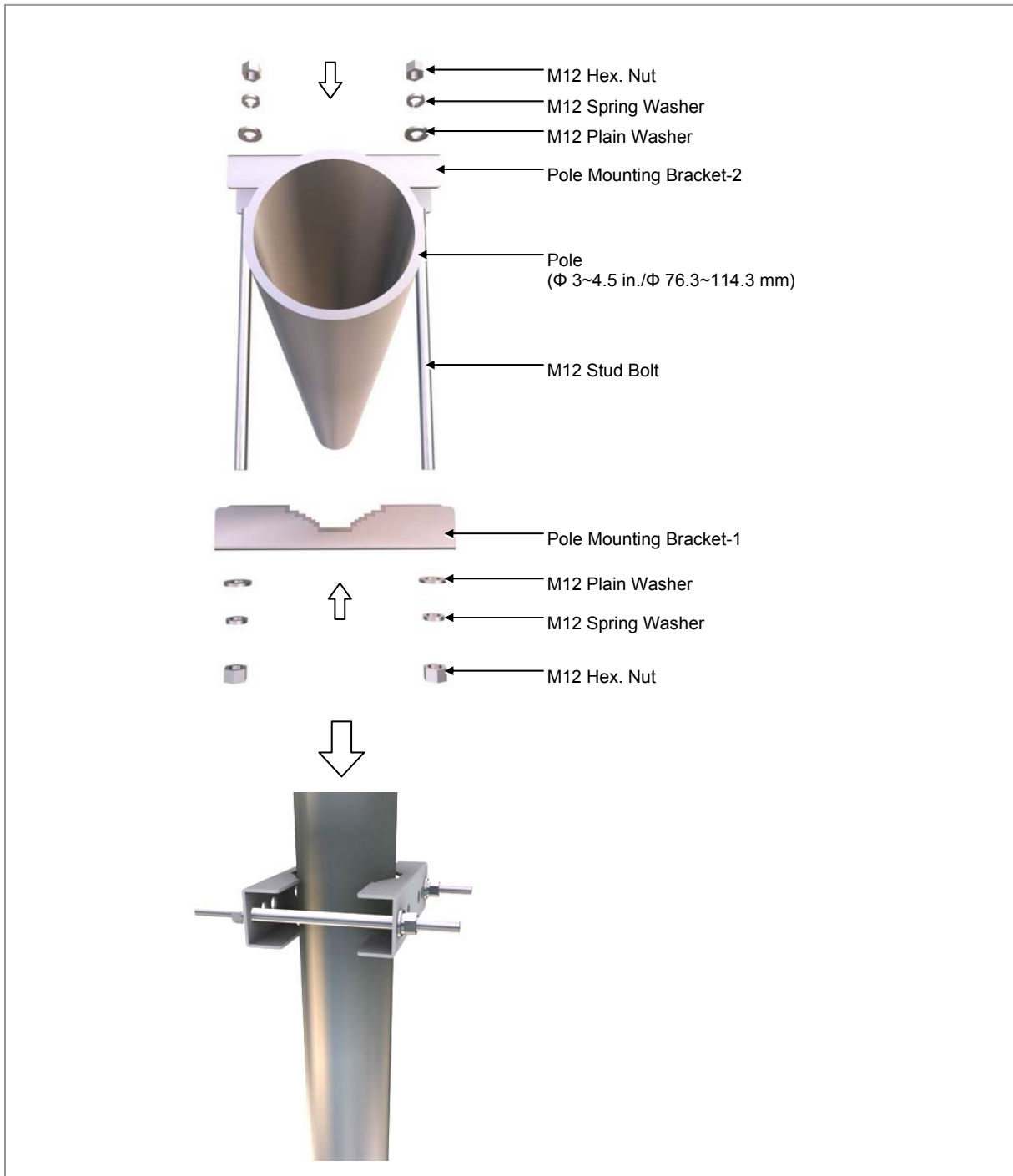
The fasteners used to attach the wall mount, including the anchor bolts, spring washers, plain washers and hex. nuts must be made of stainless steel (STS 304). Otherwise, it may cause corrosion and rust to fixing materials.

1 Sector Pole Fixation

▶ 1 Sector Pole Fixation

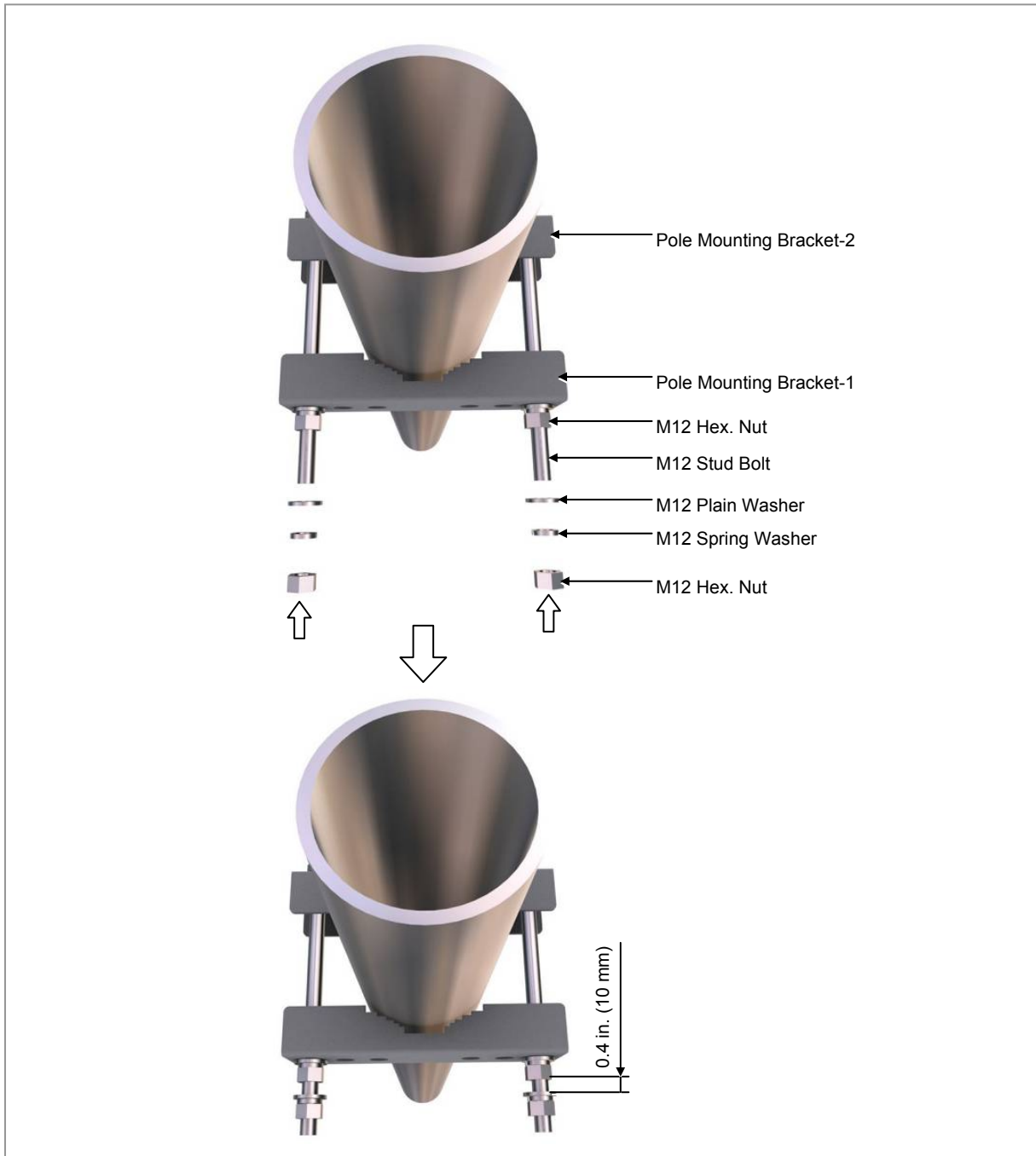
- 1 Attach the pole mounting bracket-1, 2 to match the installation location of RRH-B8.

Figure 11. 1 Sector Pole Fixation (1)



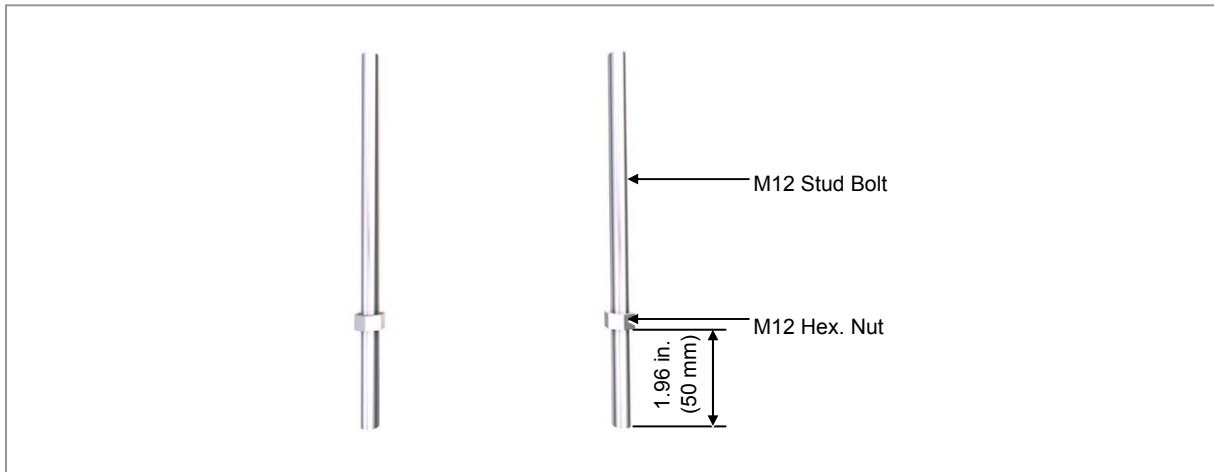
- 2 Temporarily attach the plain washer, spring washer, Hex. Nut to the stud bolt where the RRH-B8 is to be attached.

Figure 12. 1 Sector Pole Fixation (2)



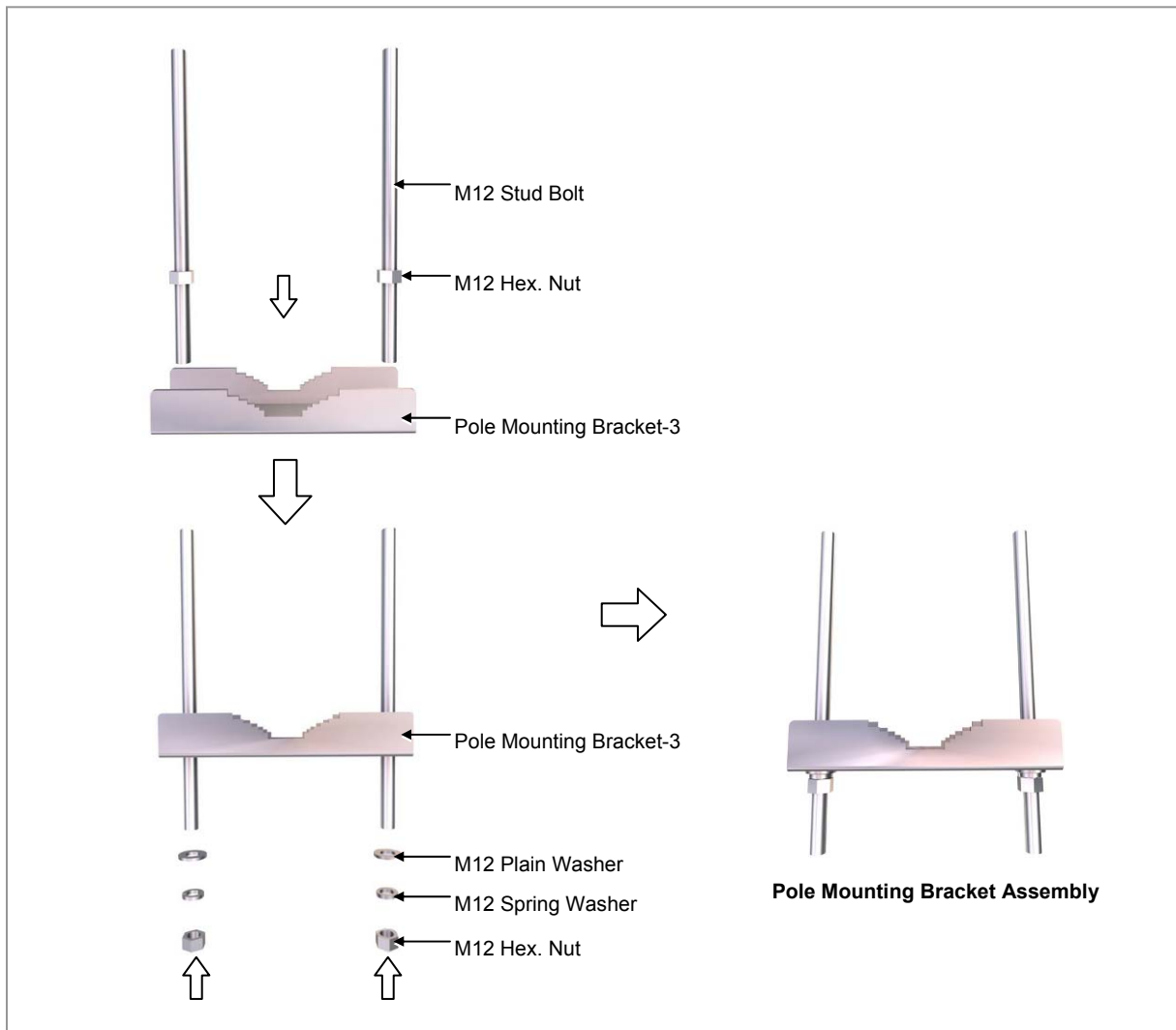
- 3 Attach the M12 Hex. Nut to the point 1.96 in. (50 mm) from one end of the M12 stud bolt.

Figure 13. 1 Sector Pole Fixation (3)



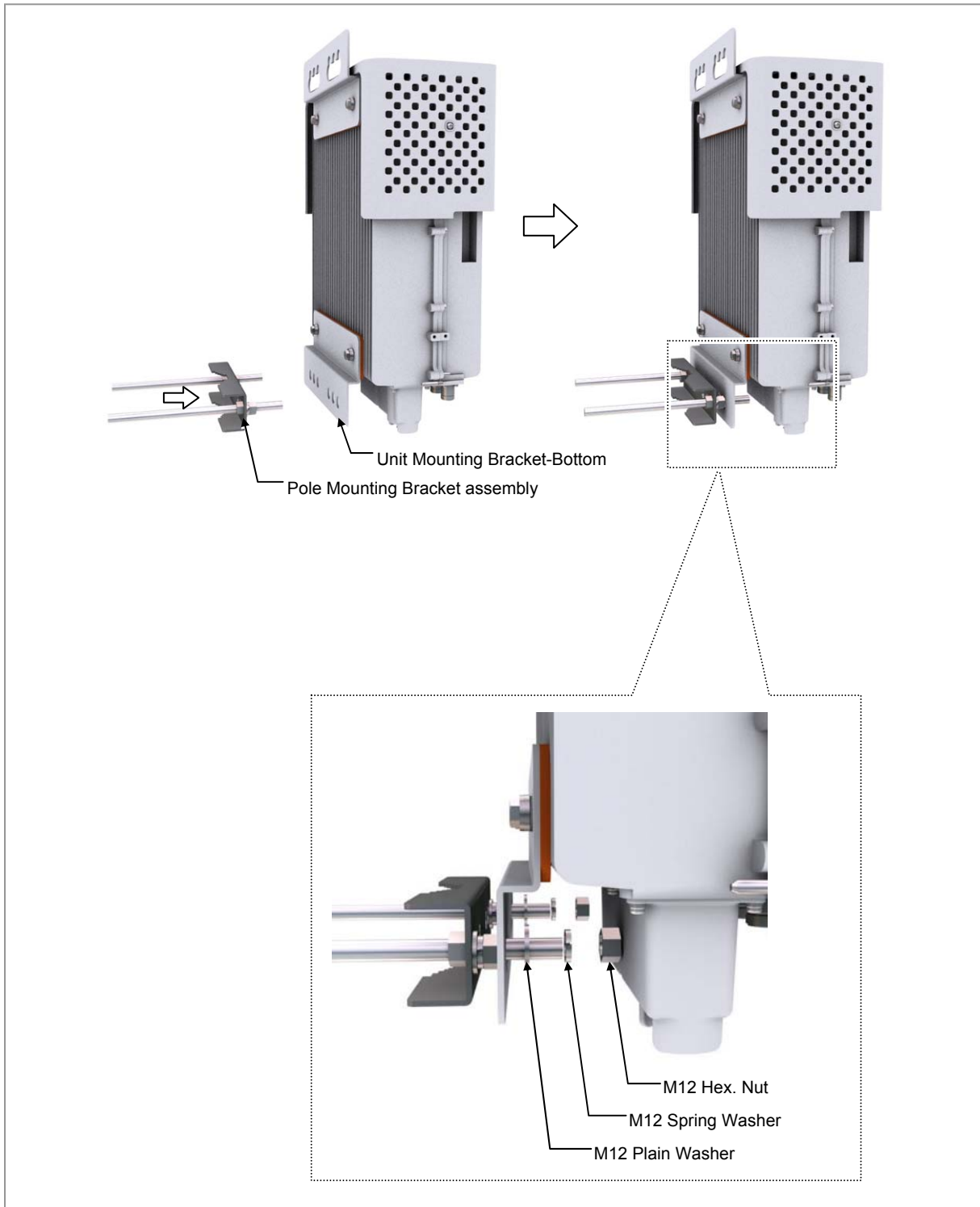
- 4 Insert the M12 stud bolt into the hole of the Pole mounting bracket-3 and use plain washer, spring washer, Hex. Nut to fasten it hard.

Figure 14. 1 Sector Pole Fixation (4)



- 5 Attach the pole mounting bracket assembly to the RRH-B8 unit mounting bracket-bottom.

Figure 15. 1 Sector Pole Fixation (5)



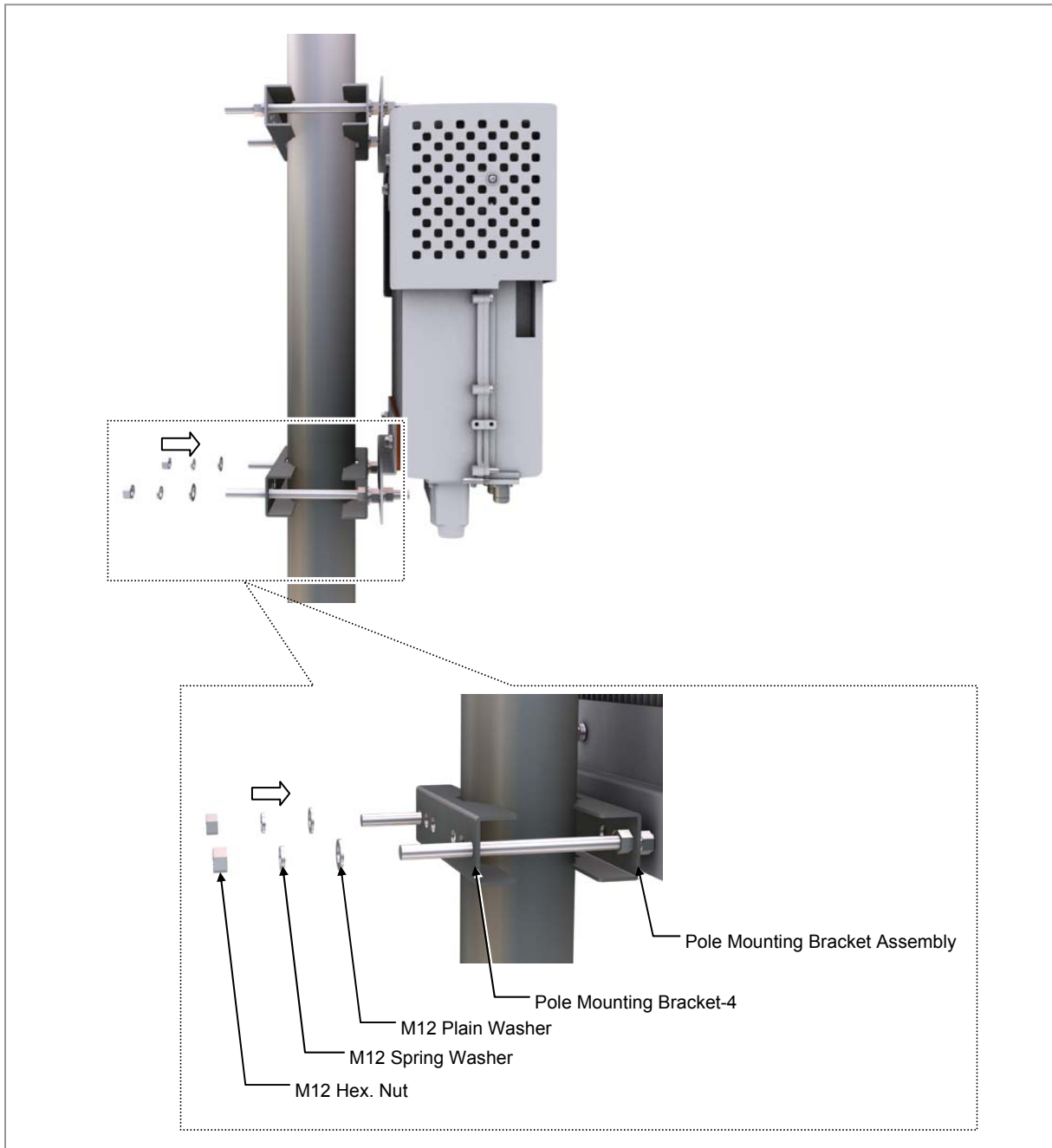
- 6 Hang the RRH-B8 to the stud bolts fixed on the pole using the fixing holes of the RRH-B8 unit mounting bracket-top.

Figure 16. 1 Sector Pole Fixation (6)



- 7 Attach the pole mounting bracket assembly on the lower part of RRH-B8 and the pole mounting bracket-4.

Figure 17. 1 Sector Pole Fixation (7)



The fasteners used to attach the pole, including the hex. bolts, hex. nut, spring washers and plain washers must be made of stainless steel (STS 304). Otherwise, it may cause corrosion and rust to fixing materials.

Cabling

The following shows the cables connected to RRH-B8.

Figure 18. Cabling Diagram

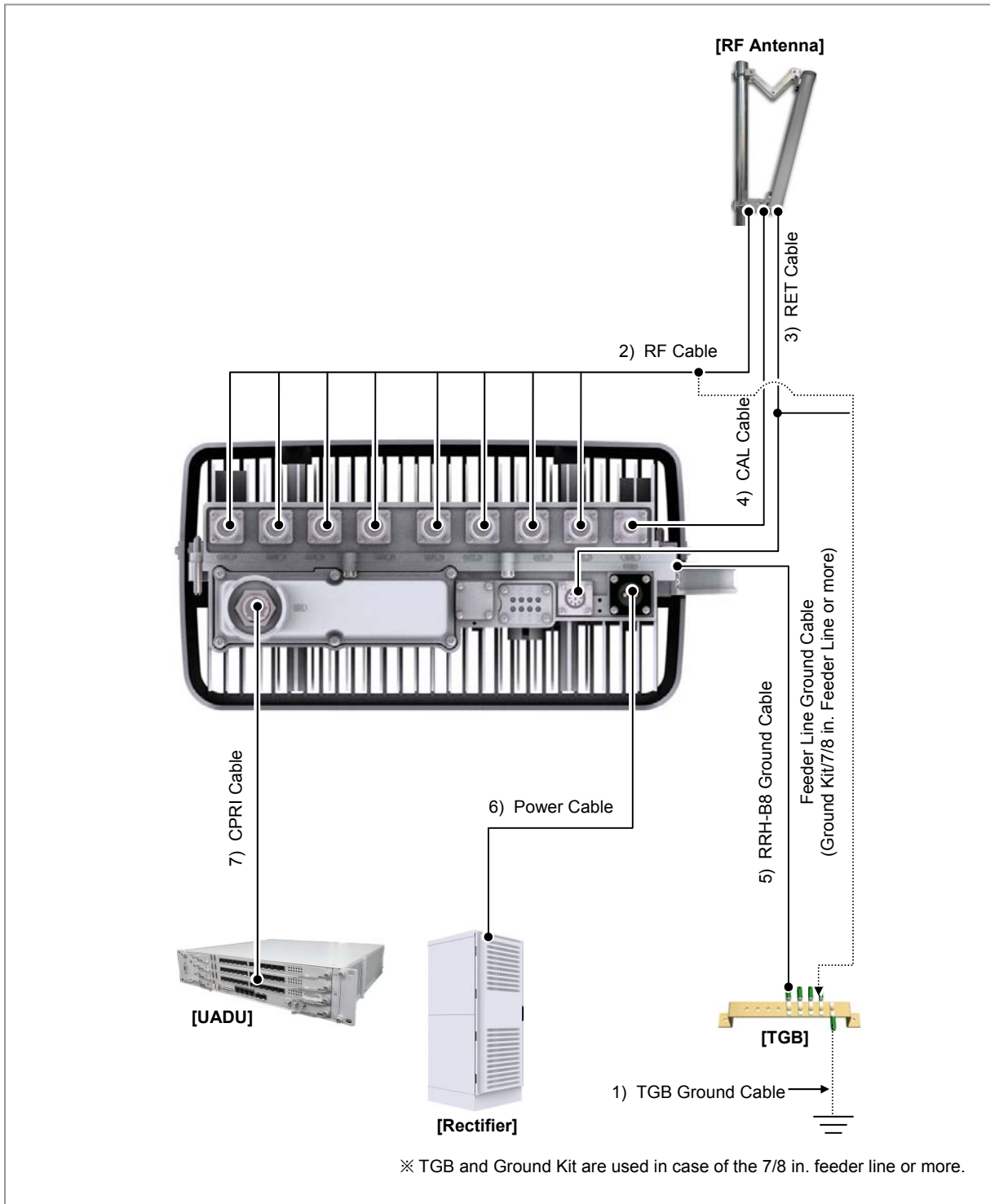


Table 8. System Cabling

From	To	Cable
Underground Ground	TGB (Tower Ground Bar)	1 TGB Ground Cable : AWG2, GV 25 mm ² × 1C (However, This can be different, depending on the standard of service provider)
RRH-B8	RF Antenna	2 RF Cable : 1/2 in. or 7/8 in. Feeder Line Mini Din-Male Connector (10 feet, 3 m; Site Dependant)
		3 RET Cable (Shield Cable)
		4 CAL Cable : 1/2 in. or 7/8 in. Feeder Line N Type-Male Connector (10 feet, 3 m; Site Dependant)
	TGB	5 RRH-B8 Ground Cable : AWG8, GV 6 mm ² × 1C
	Rectifier	6 Power Cable : AWG8,6 mm ² × 2C
UADU	7 CPRI Cable : Optic Cable (Single Mode)	



Refer to Annex C for connecting the tower grounding cable.

Connecting cable between RRH and Antenna

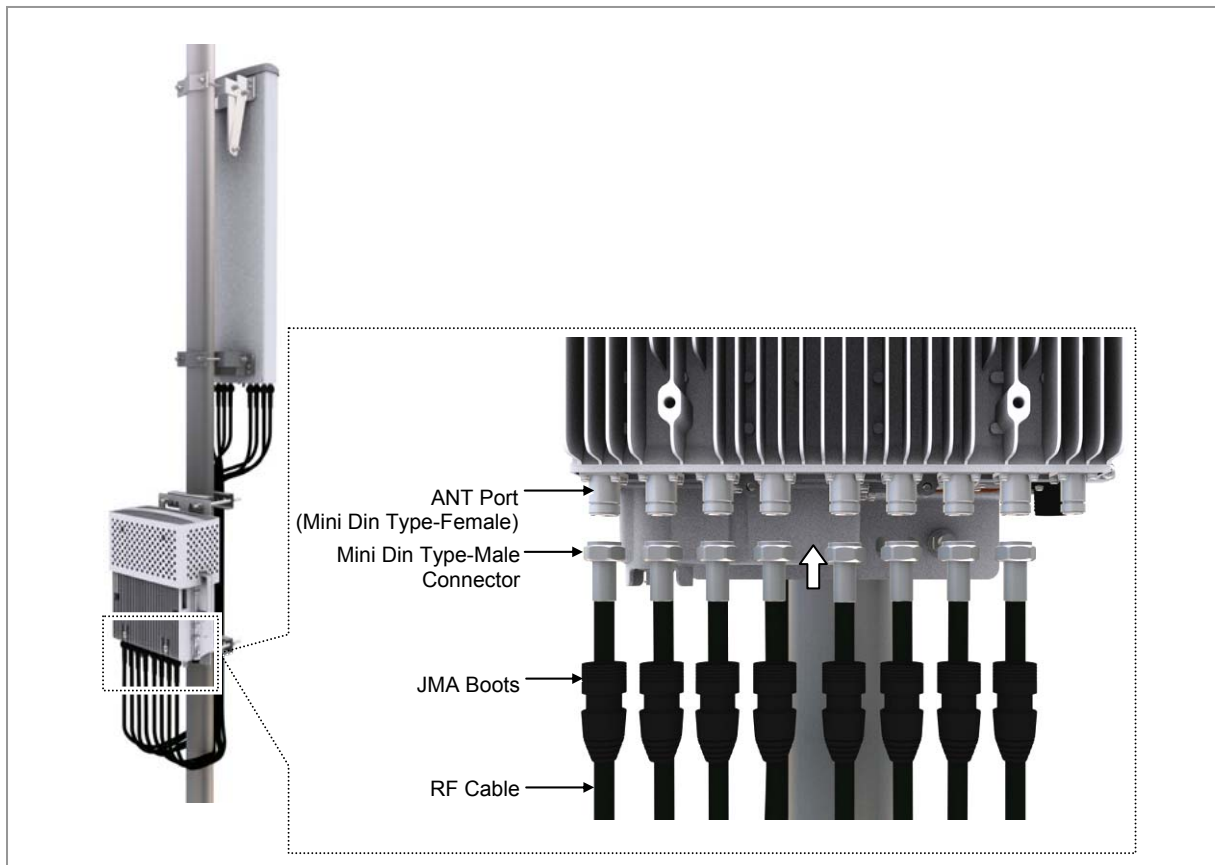
Connecting RF Cable

Follow the steps below to connect the RF cables between an RRH and an antenna.

Type 1_Finishing Connection Part using the JMA Boots

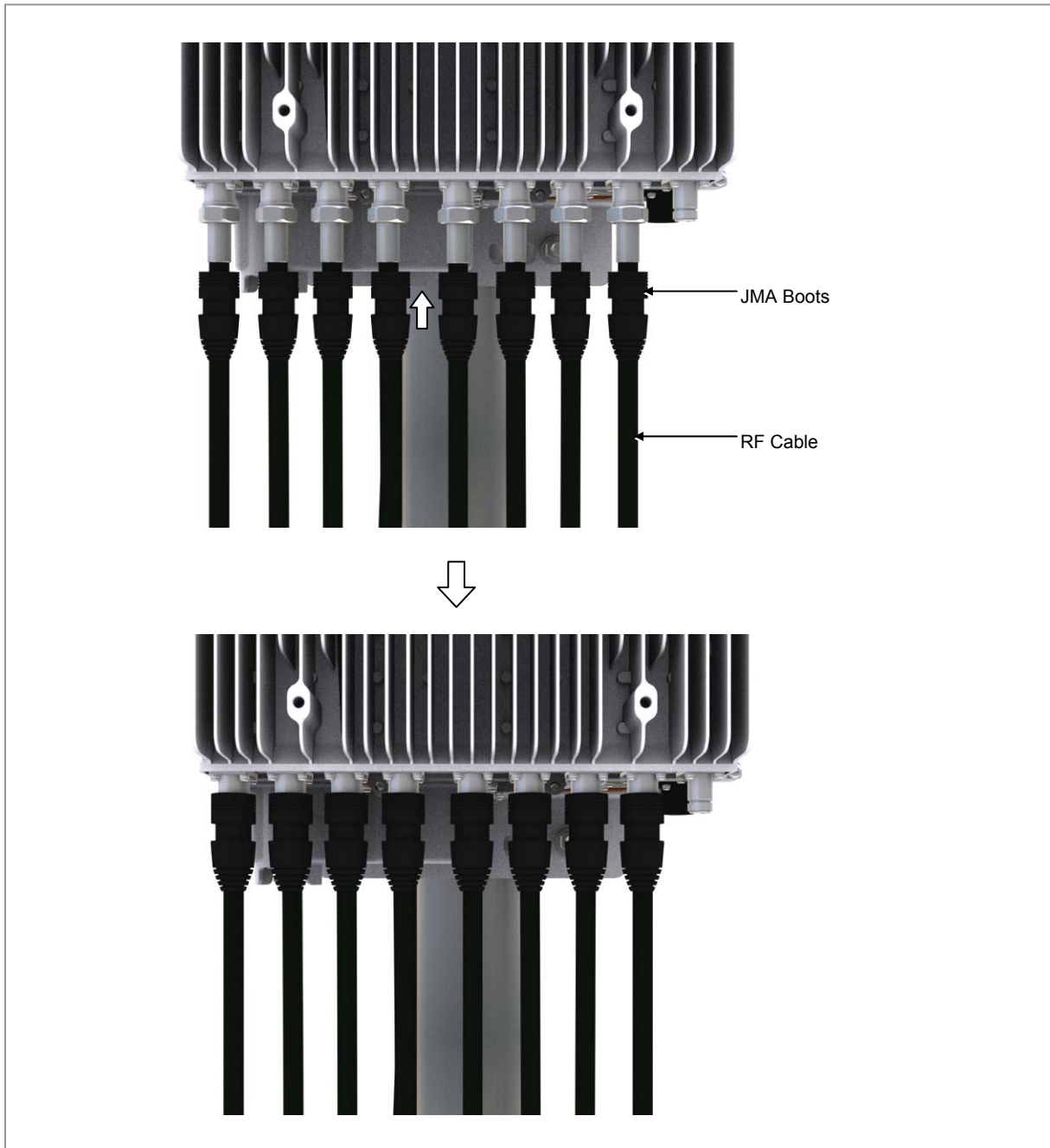
- 1 Install the RF cable assemblies from the RRH-B8 to the RF antenna ports.
(JMA boots are inserted at both ends of the RF cable assemblies.)
 - Connector on the RRH side: Mini Din Type-Male
 - Connector on the RF antenna side: Mini Din Type-Male
- 2 Connect the connectors that are attached at the ends of the RRH-B8 side cables to the ANT_0~7 ports of RRH-B8.

Figure 19. Connecting RF Cable_Type 1 (1)



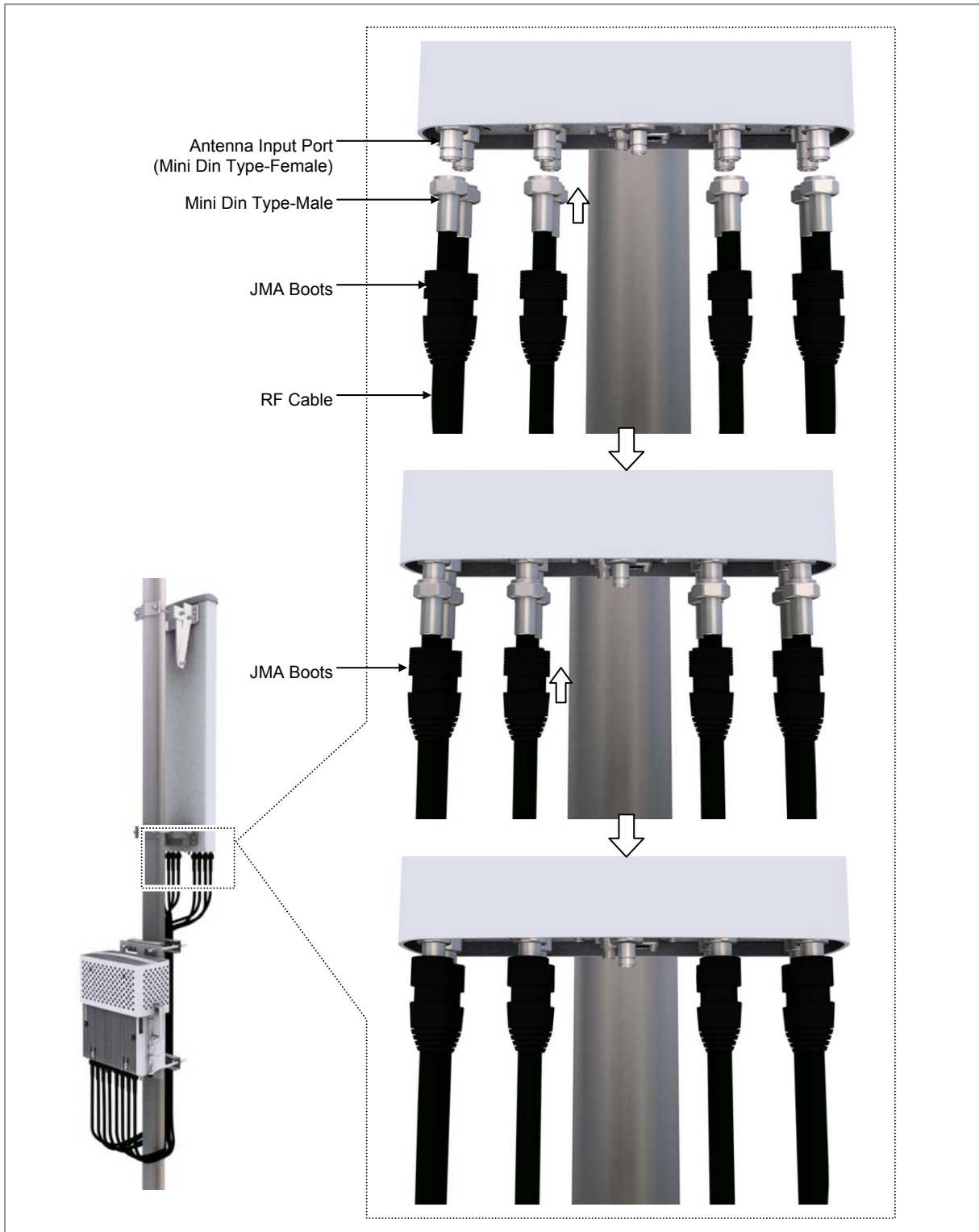
- 3 After connecting the connectors, push up the JMA boots to the connector connection parts.

Figure 20. Connecting RF Cable_Type 1 (2)



- 4 Connect the connectors assembled at the ends of RF antenna side cables to the antenna input ports.
- 5 After connecting the connectors, push up the JMA boots to the connector connection parts.

Figure 21. Connecting RF Cable_Type 1 (3)



Type 2_Finishing using the Cold Shrink Tube

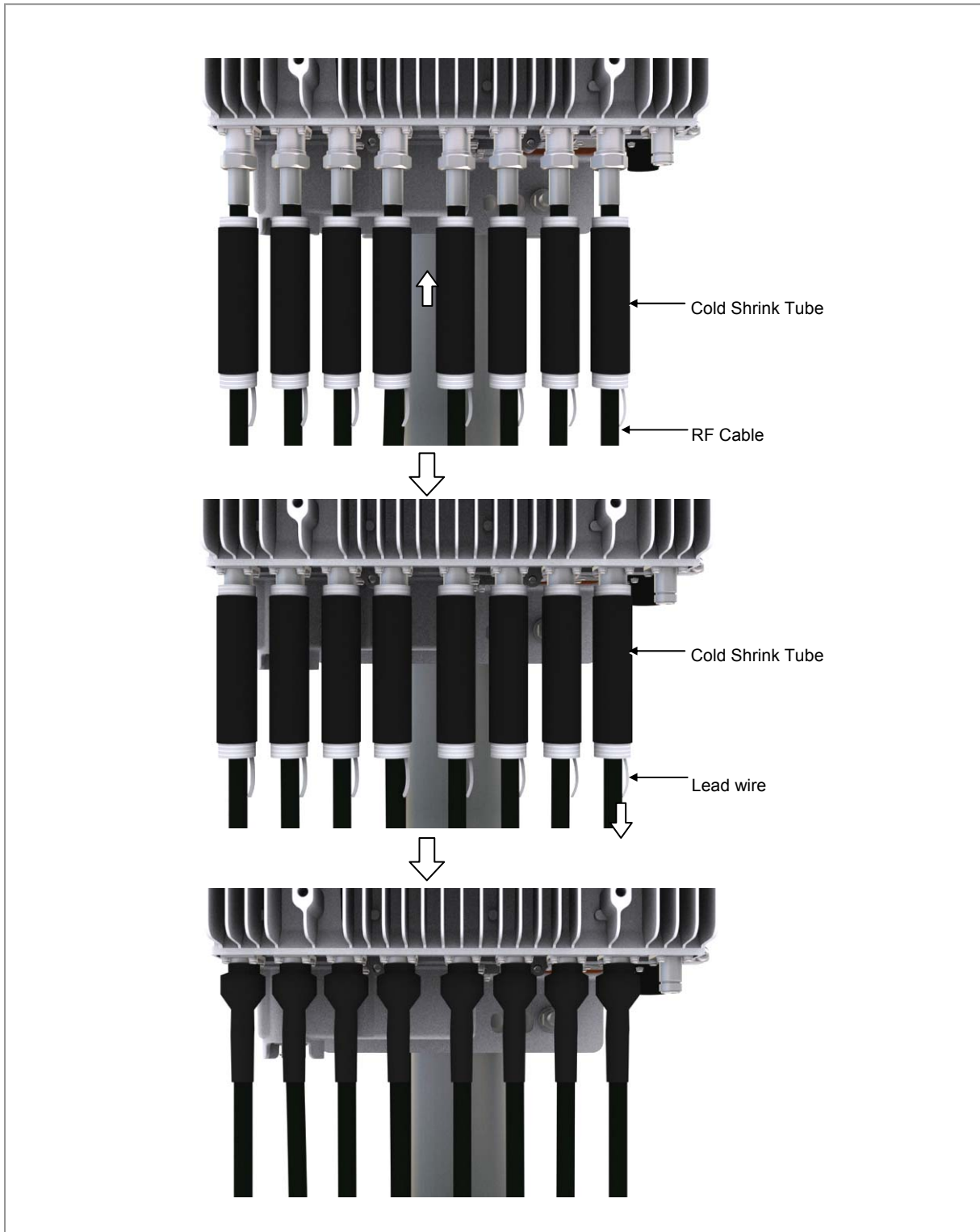
- 1 Install the RF cable assemblies from the RRH-B8 to the RF antenna ports.
 - o Connector on the RRH side: Mini Din Type-Male
 - o Connector on the RF antenna side: Mini Din Type-Male
- 2 Insert cold shrink tubes at the ends of the RRH-B8 side cables.
- 3 Connect the connectors that are attached at the ends of the RRH-B8 side cables to the ANT_0~7 ports of RRH-B8.

Figure 22. Connecting RF Cable_Type 2 (1)



- 4** After connecting the connectors, place the cold shrink tubes to the connector connection parts.
- 5** Hold one side of the cold shrink tube with a hand to make it unmovable and shrink the tube by pulling downward the lead wire.

Figure 23. Connecting RF Cable_Type 2 (2)



- 6 Insert cold shrink tubes at the ends of the RF antenna side cables for finishing and connect the connectors to the antenna input ports.

- 7 After connecting the connectors, place the cold shrink tubes to the connector connection parts and finish the connectors as the same method as the RRH-B8 side connectors.

Figure 24. Connecting RF Cable_Type 2 (3)

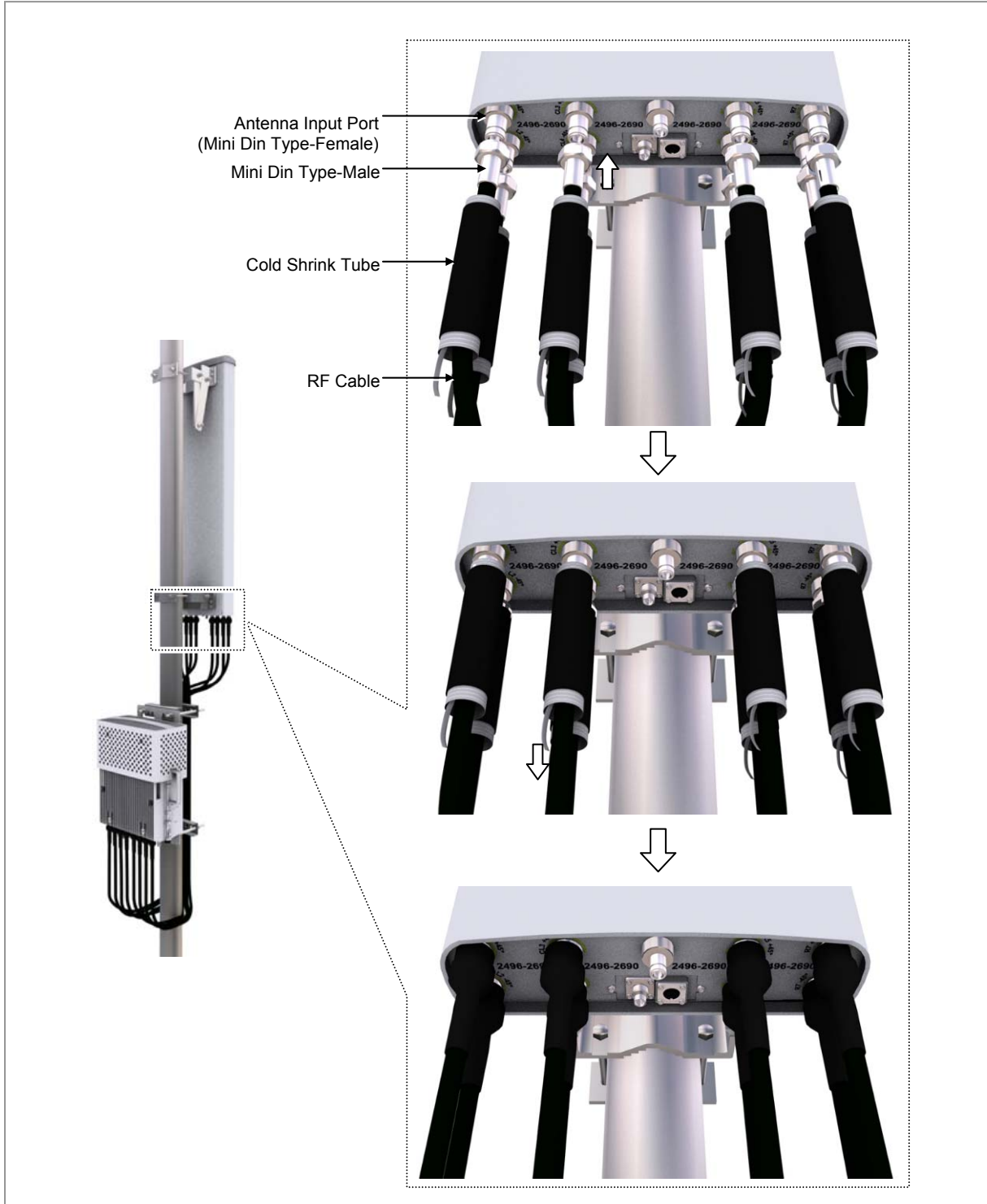


Table 9. RRH to Antenna Mapping (1Sector / RRH)


RRH Port	Cable	8T8R Antenna Port
0	RF Cable	8
1		7
2		6
3		5
4		4
5		3
6		2
7		1

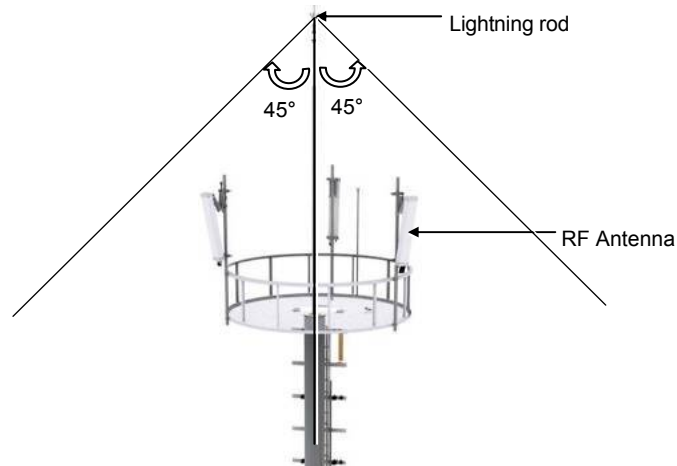
Table 10. RRH to Antenna Mapping (2Sector / RRH : 4T4R 2Sector)


RRH Port	Cable	4T4R Antenna Port
0	RF Cable	α sector - 4
1		α sector - 3
2		α sector - 2
3		α sector - 1
4		β sector - 4
5		β sector - 3
6		β sector - 2
7		β sector - 1

Table 11. RRH to Antenna Mapping (3Sector / RRH : 2T2R 3Sector)


RRH Port	Cable	2T2R Antenna Port
0	RF Cable	α sector - 2
1		α sector - 1
2		β sector - 2
3		β sector - 1
4		γ sector - 2
5		γ sector - 1
6		N/C
7		N/C

-  When you install 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.



-  Check whether the system is turned off before connecting or disconnecting an RF cable connector to or from the RRH-B8 RF port and the RF antenna.

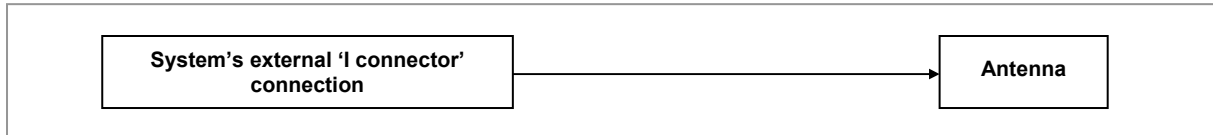
When connecting the RF cable between RRH-B8 RF port and RF antenna, each port and the RF cable connector should be tightened by 8 lbf·ft (110.4 kgf·cm) torque to minimize influence of PIMD.

-  Use a flare nut wrench (Hexagon: 7/8 in.) when connecting/disconnecting the RF cable connector to/from RRH-B8 RF Port and RF Antenna.



Checking Feeder line Connection

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



Take measurements for the sections ①-② for all of the cables.

The standing wave ratio must be equal to or less than the reference value. If not, the cable must be removed, measured for each section again, and necessary actions be taken.



The voltage standing wave ratio (VSWR) of the cable and connector between the system's RF port to the antenna port must be smaller than 1.5 (return loss: 14 dB). If a separate standard has been established with the carrier, the established standard will take precedence.

Identification tag installation

Attach the identification tag in the below table to the feeder line.

Table 12. GPS Identification Tag of Feeder line

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	Fix the feeder cable to the 2 holes on the identification tag with the black cable tie.
Marking	The markings must be prevented from being erased by using relief engraving or coated labels.

Connecting RET cable

Follow the steps below to connect the Remote Electrical Tilting (RET) cable used to control the tilting angle of the antenna from the distance.

- 1 Connect the AISG Male connector of the RET cable assembly to the RET port on the lower part of the RRH-B8.
- 2 Connect the AISG Female connector of the RET cable assembly to the RET port on the lower part of the RF antenna.

Figure 25. Connecting RET cable



Figure 26. RET Cable Connector

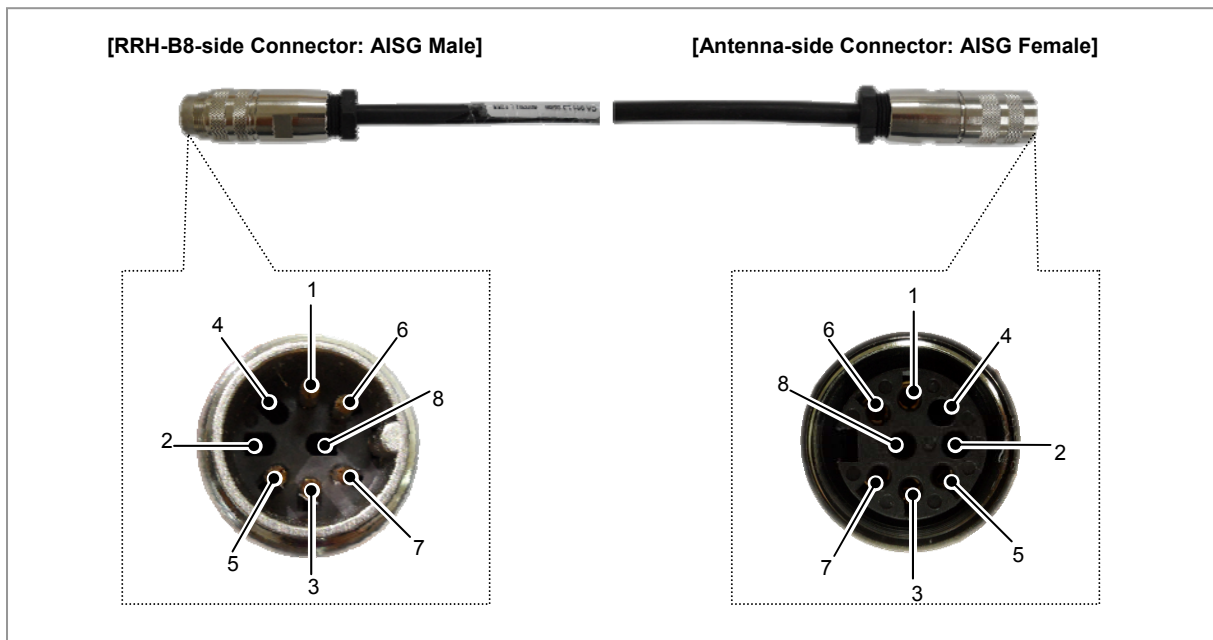


Table 13. RET Cable-Side Connector Pin Map

Amphenol AISG Connector		
Male	Function	Female
1	+12 V Optional (N.C)	1
2	N.C	2
3	RS485 B	3
4	RS485 GND	4
5	RS485 A	5
6	+21 V	6
7	+21 V RTN	7
8	N.C	8

Make sure to turn off the breaker connected to the RRH-B8 power of the DU cabinet before connecting the RET cable between the antenna RET port and the RRH-B8 RET port.

If you connect or disconnect the RET cable while the breaker is turned on, it may cause an electric short circuit resulting in damage to the RET function.

When 21 VDC volts are applied, the current supplied to the RET from RRH-B8 must be 1 A or lower.

The exterior of the RET connector must be made of metal without vent hole or other UL certified material.

Connecting CAL Cable

Follow the steps below to connect the CAL (Calibration) cable.

Type 1_Finishing Connection Part using the JMA Boots

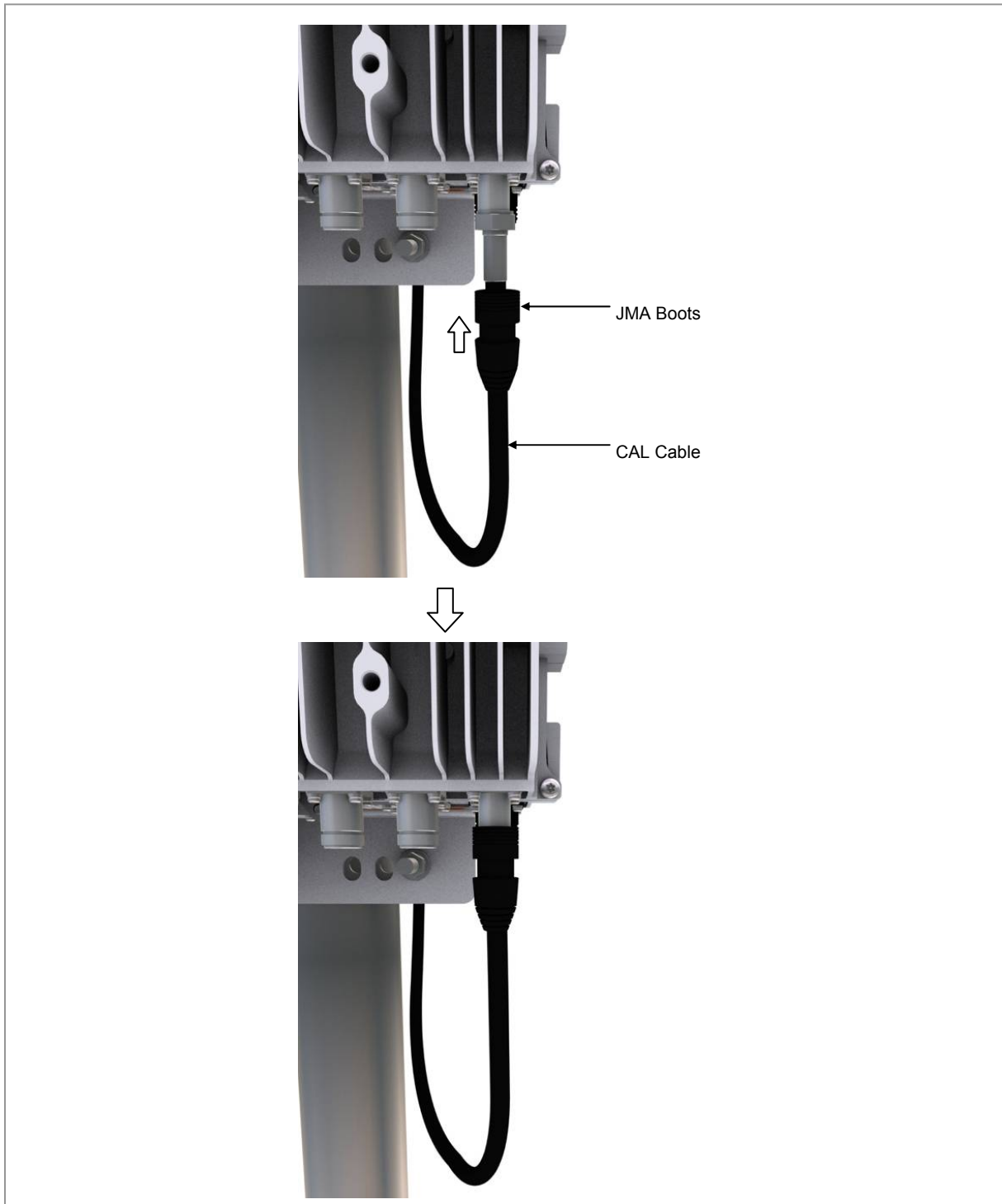
- 1** Install the CAL cable assembly from the RRH-B8 CAL port to the RF antenna CAL port.
(JMA boots are inserted at both ends of the CAL cable assemblies.)
 - Connector on the RRH side: N Type-Male
 - Connector on the RF antenna side: N Type-Male
- 2** Connect the connectors that are attached at the ends of the RRH-B8 side cable to the CAL port of RRH-B8.

Figure 27. Connecting CAL Cable_Type 1 (1)



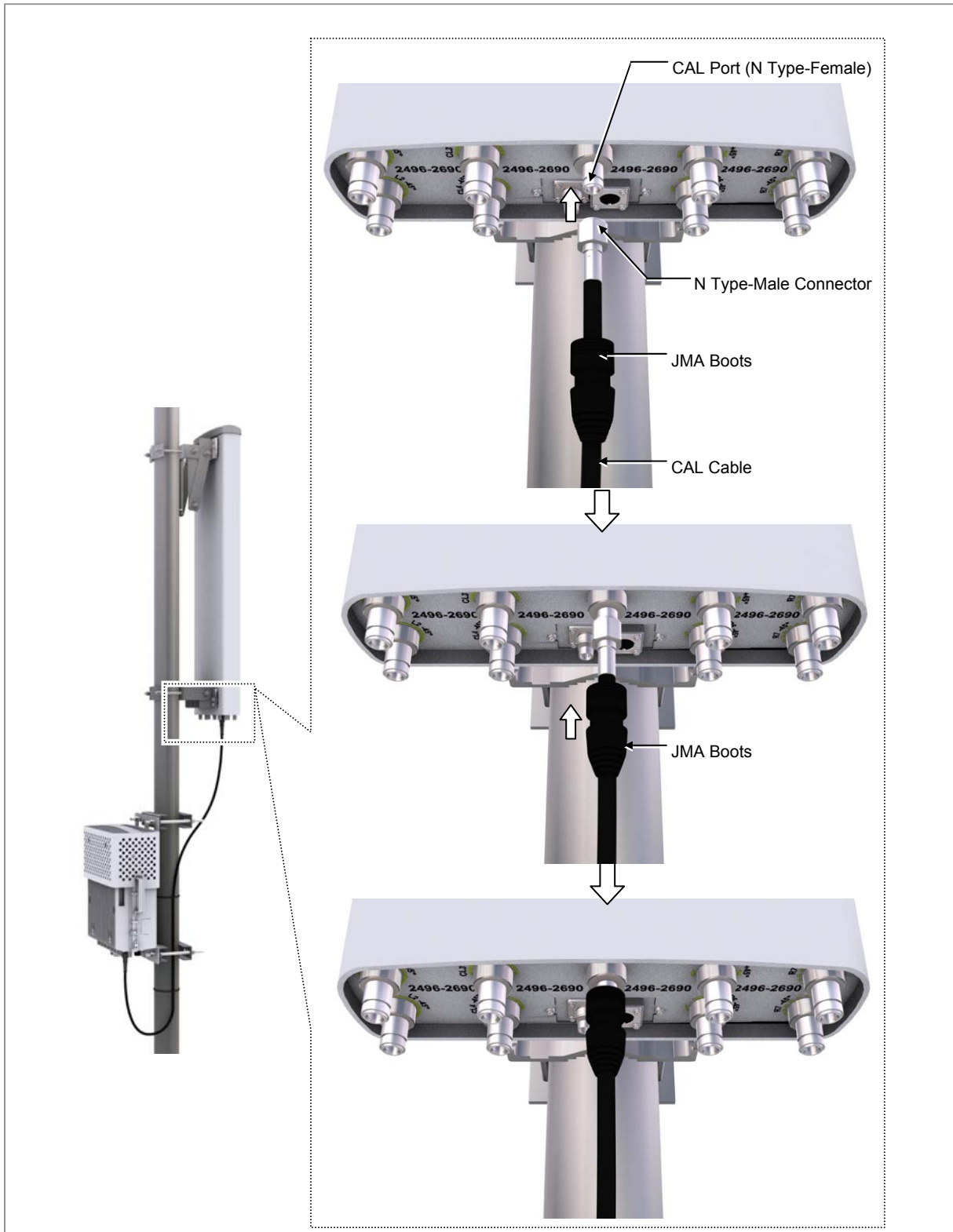
- 3 After connecting the connector, push up the JMA boots to the connector connection part.

Figure 28. Connecting CAL Cable_Type 1 (2)



- 4** Connect the connector attached to the end of the RF antenna-side cable with the CAL port of the antenna.
- 5** After connecting the connector, push up the JMA boots to the connector connection part.

Figure 29. Connecting CAL Cable_Type 1 (3)



Type 2_Finishing using the Cold Shrink Tube

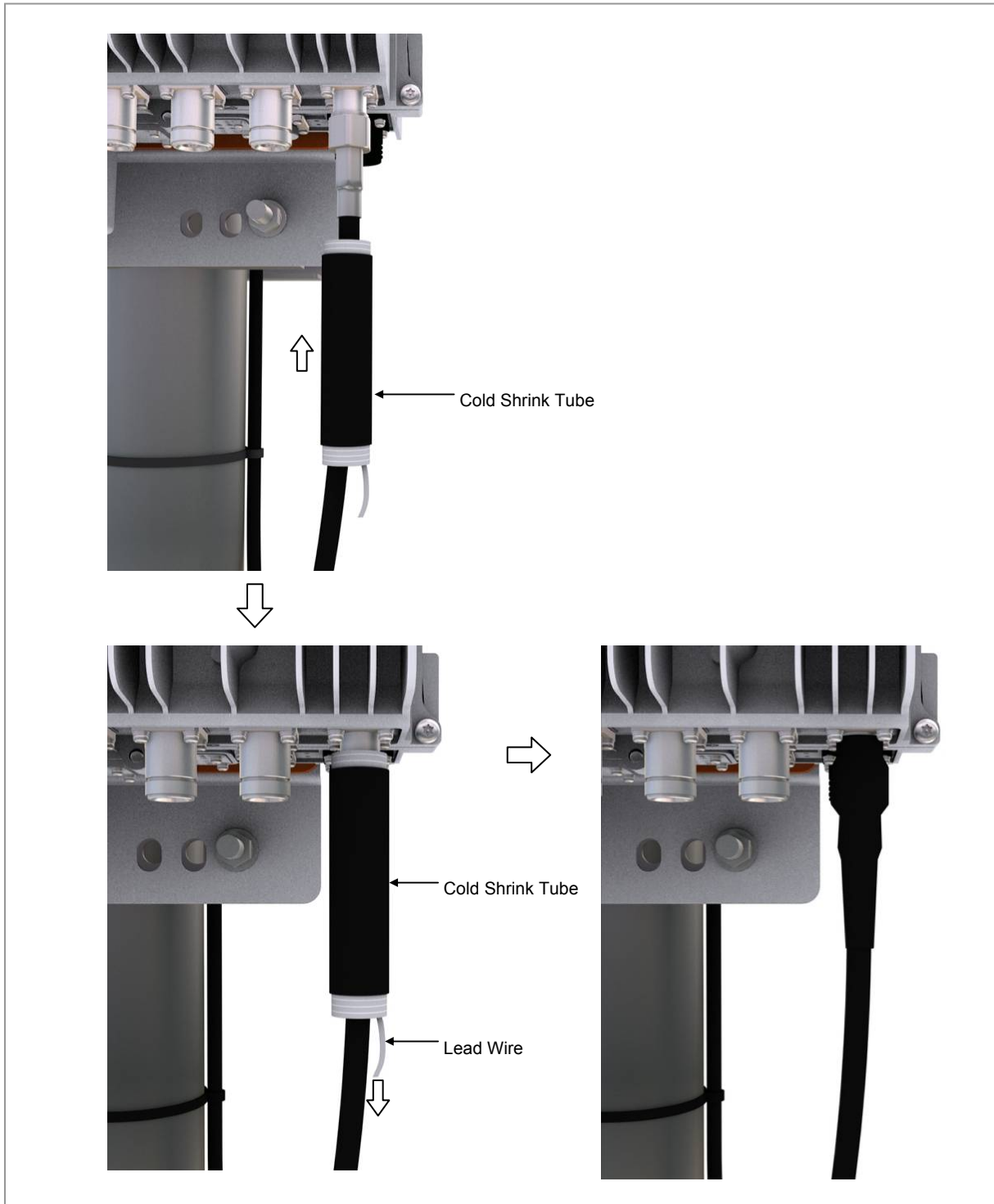
- 1 Install the CAL cable assembly from the RRH-B8 CAL port to the RF antenna CAL port.
 - Connector on the RRH side: N Type-Male
 - Connector on the RF antenna side: N Type-Male
- 2 Insert cold shrink tube at the end of the RRH-B8 side cable for finishing and connect the connector to the CAL port of RRH-B8.

Figure 30. Connecting CAL Cable_Type 2 (1)



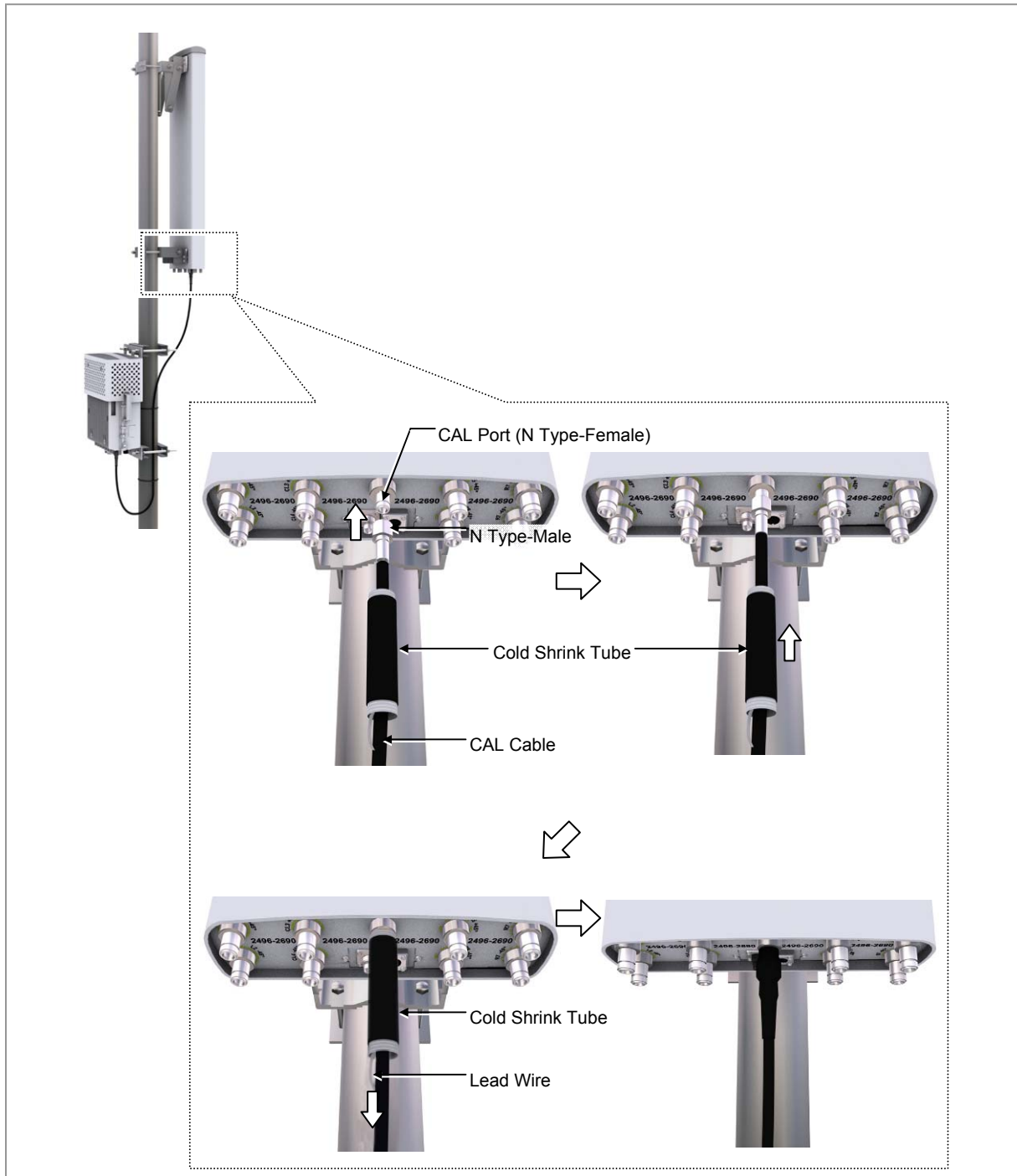
- 3 After connecting the connector, place the cold shrink tube to the connector connection part.
- 4 Hold one side of the cold shrink tube with a hand to make it unmovable and shrink the tube by pulling downward the lead wire.

Figure 31. Connecting CAL Cable_Type 2 (2)



- 5** Insert cold shrink tube at the end of the RF antenna side cable for finishing and connect the connector to the antenna CAL port.
- 6** After connecting the connector, place the cold shrink tube to the connector connection part.
- 7** Hold one side of the cold shrink tube with a hand to make it unmovable and shrink the tube by pulling downward the lead wire.

Figure 32. Connecting CAL Cable_Type 2 (3)

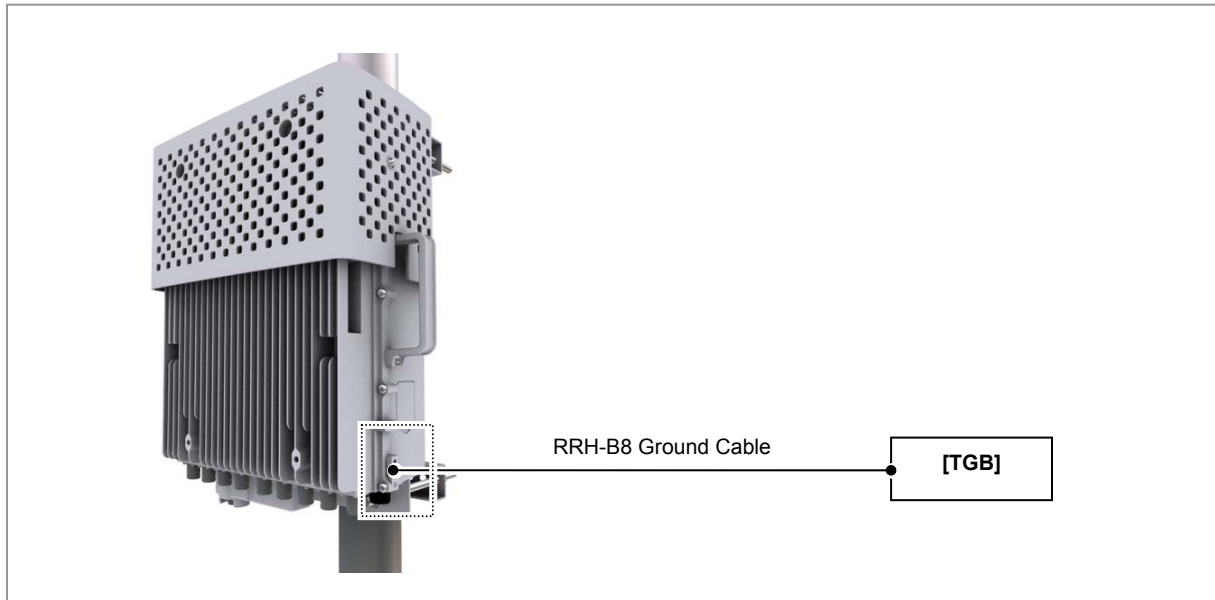


Connecting Ground Cable

Follow the steps below to connect the RRH-B8 ground cable.

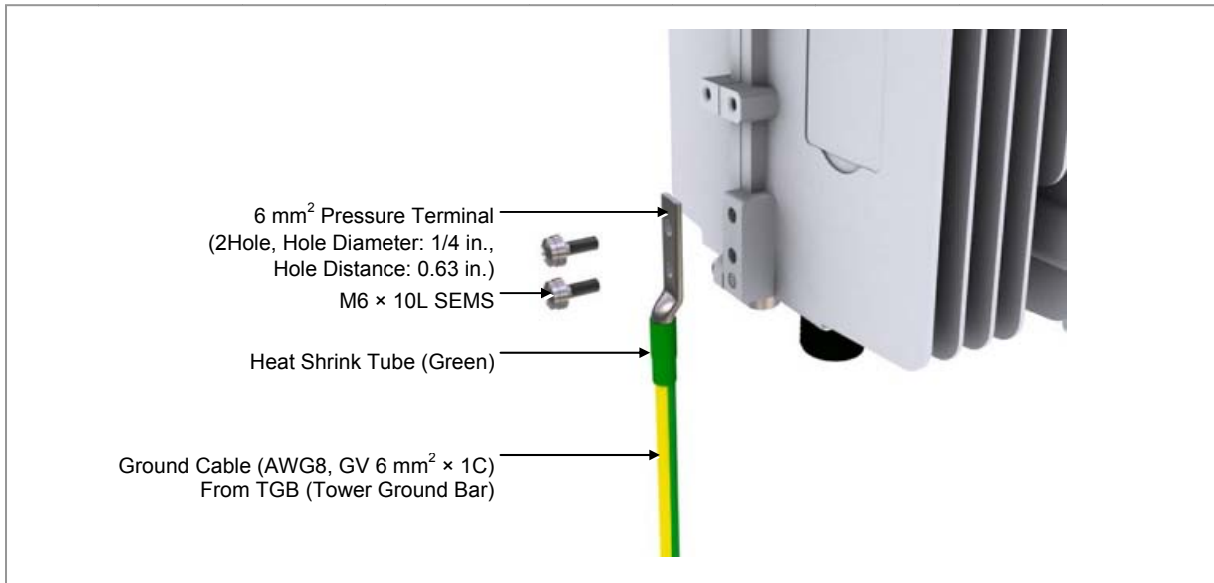
- 1 Install one ground cable (AWG8, GV 6 mm² × 1 C) from TGB to the ground terminal at the right of RRH-B8.

Figure 33. Connecting Ground Cable (1)



- 2 Install the pressure terminal and the heat shrink tube at the end of the cable.
 - Pressure Terminal: 6 mm², 2 hole, Hole Diameter: 1.4 in. (6.3 mm), Hole Distance: 0.63 in. (16 mm)
- 3 Place the pressure terminal at one end of the ground cable of RRH-B8 aligning with the fixing holes and fix it using M6 SEMS. (When being tighten by screw, apply 2.76~3.37 lbf.ft (38.16~46.64 kgf.cm) torque.)

Figure 34. Connecting Ground Cable (2)



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

Ex) Manufacturer-Panduit

RRH-B8: 6 mm² Pressure Terminal (LCD8-14A-L)



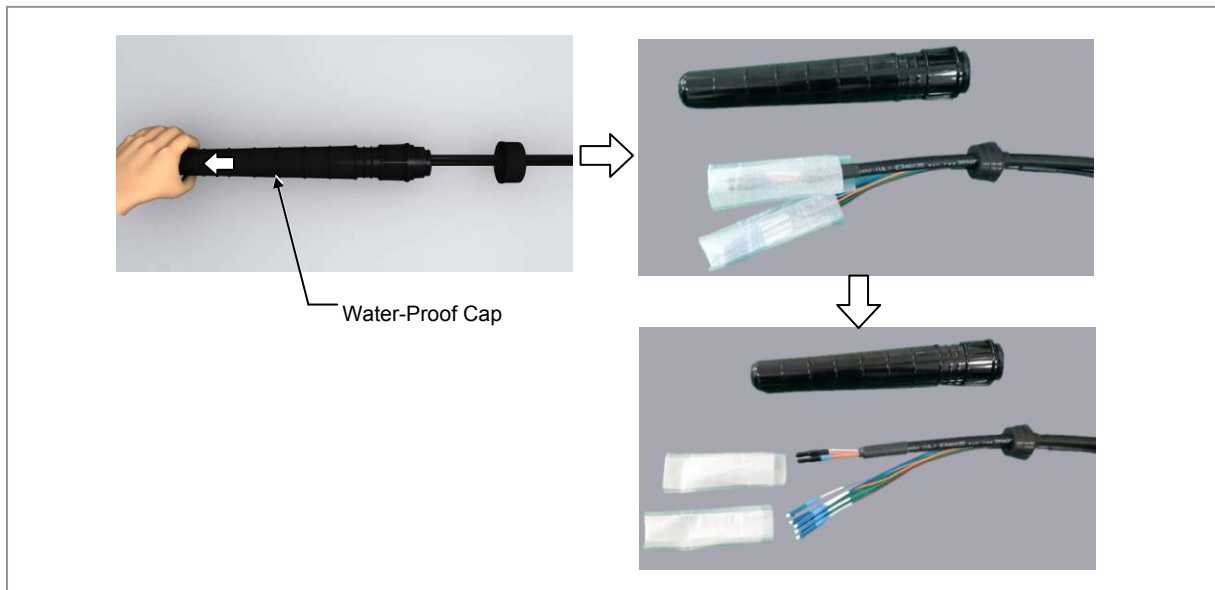
Connecting Power Cable

Follow the steps below to connect the power cable to RRH-B8.

Type 1_Using Hybrid Cable

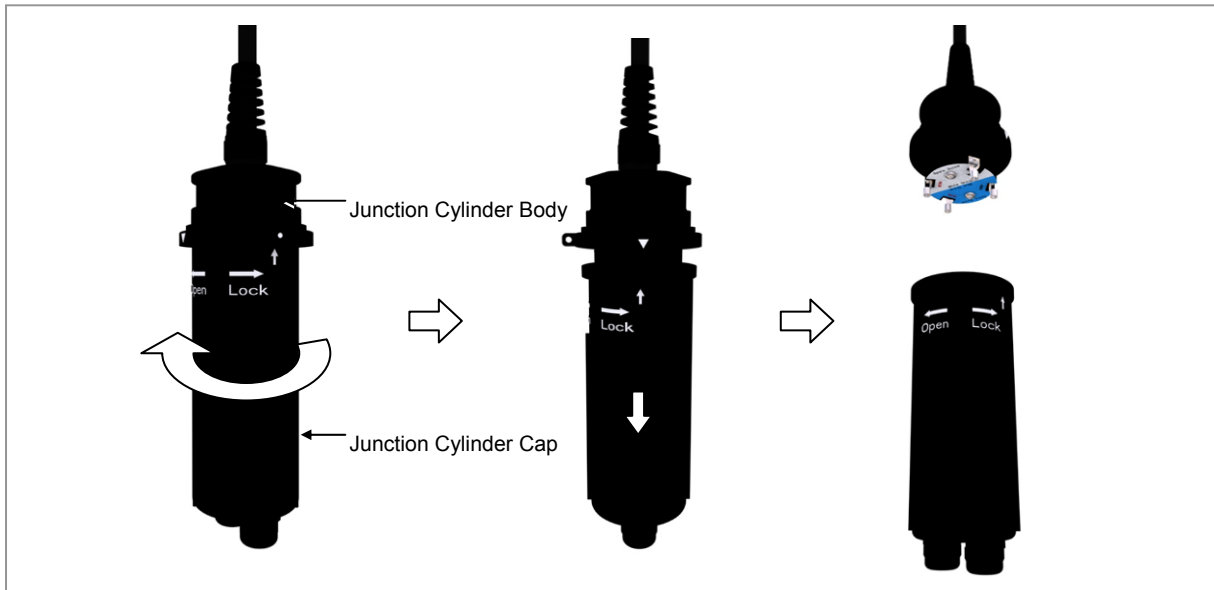
- 1 Disassemble the water-proof cap from the Hybrid cable (blue group, white group).

Figure 35. Connecting Power Cable_Type 1 (1)



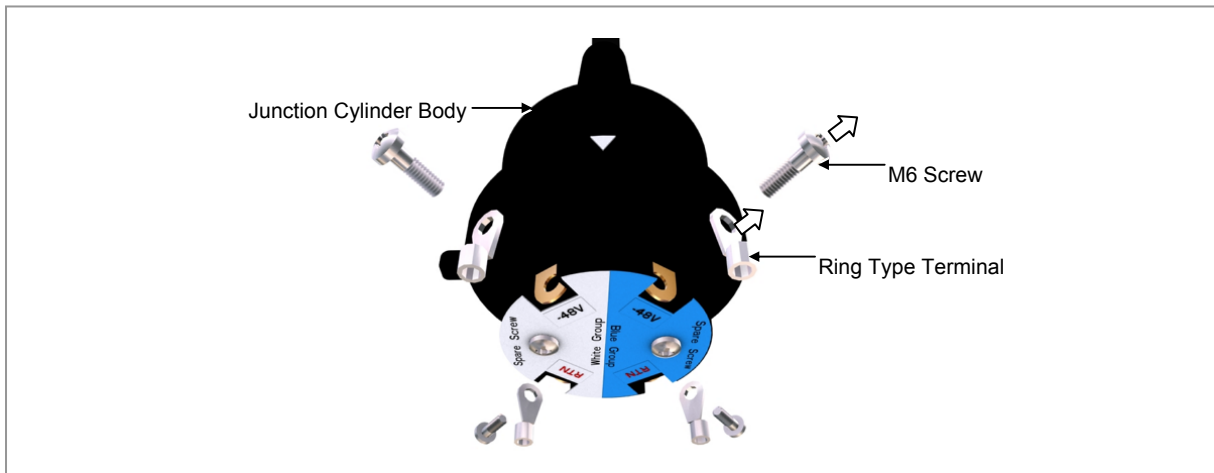
- 2 Disassemble the junction cylinder body and cap by pulling down the junction cylinder cap after rotating the cap to open.

Figure 36. Connecting Power Cable_Type 1 (2)



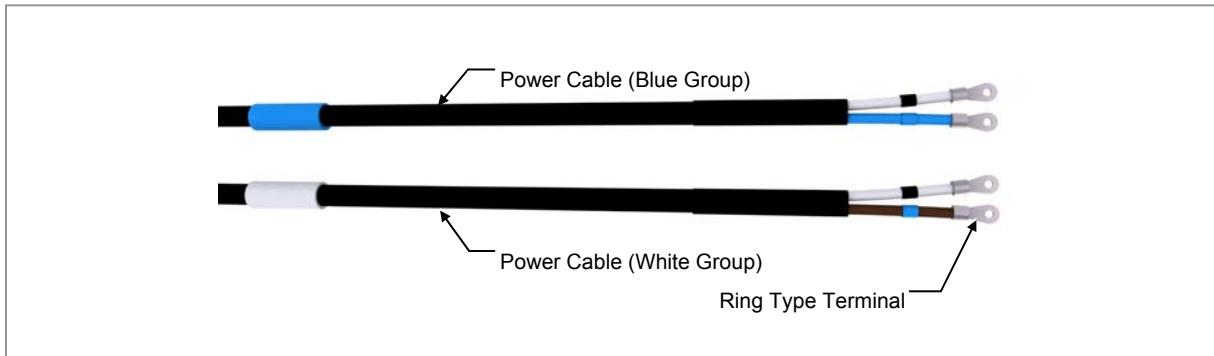
- 3 Disassemble the ring type terminals by removing the M6 screws fixed on the power connection terminals of junction cylinder body. (Be careful not to lose the removed M6 screws.)

Figure 37. Connecting Power Cable_Type 1 (3)



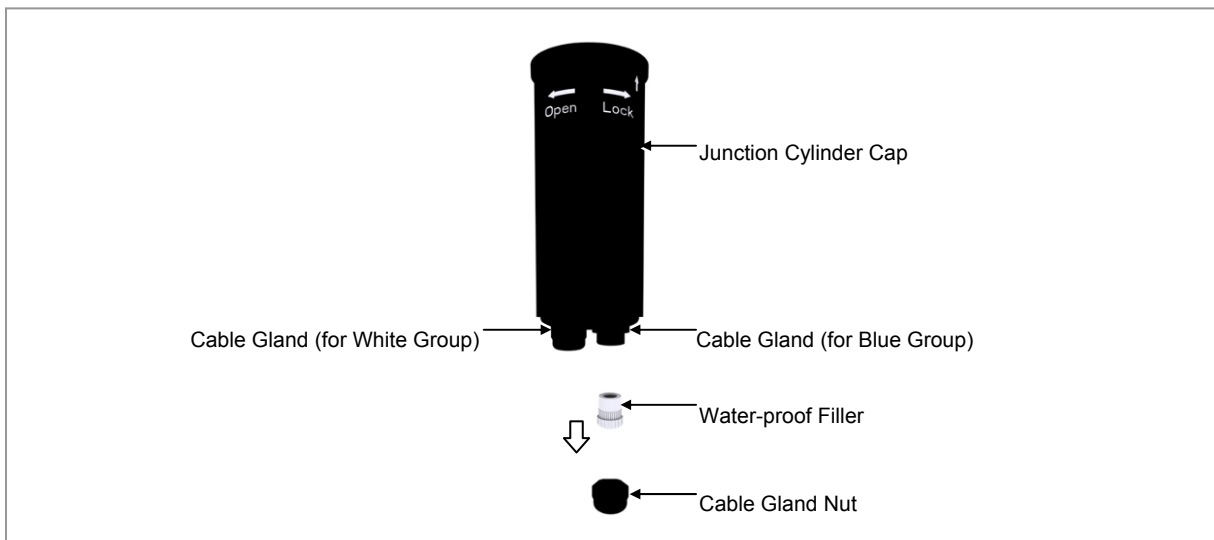
- 4 Attach the disassembled ring type terminals to the blue group/white group power cables.

Figure 38. Connecting Power Cable_Type 1 (4)



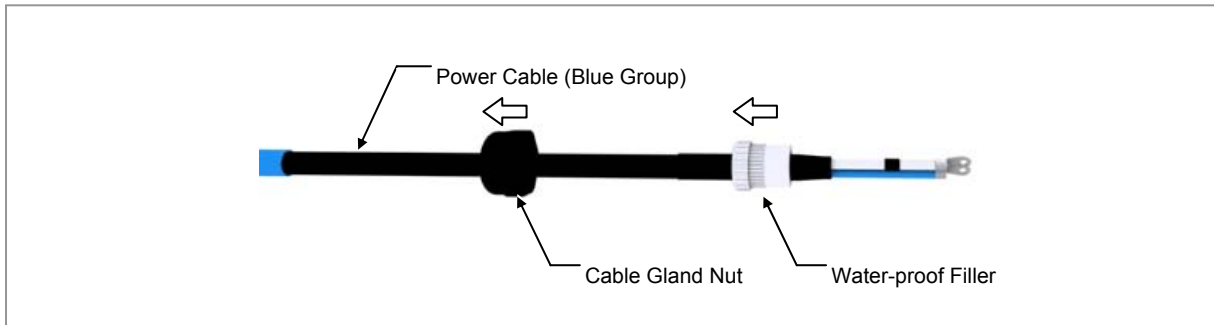
- 5 Disassemble the cable gland nut and water-proof filler for the blue group power cable inlet at the bottom of junction cylinder cap. (Be careful not to lose the removed cable gland nut and water-proof filler.)

Figure 39. Connecting Power Cable_Type 1 (5)



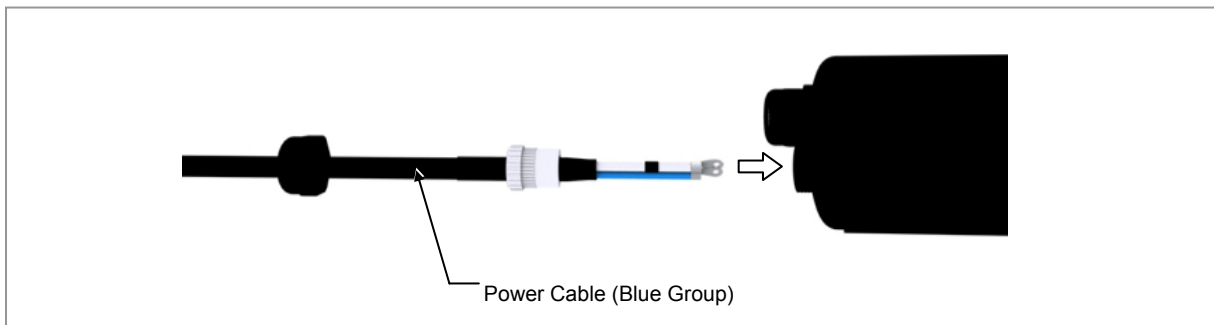
- 6 Insert the removed cable gland nut and water-proof filler to the blue group power cable.

Figure 40. Connecting Power Cable_Type 1 (6)



- 7 Insert the blue group power cable through the cable gland hole (blue group) of junction cylinder cap.

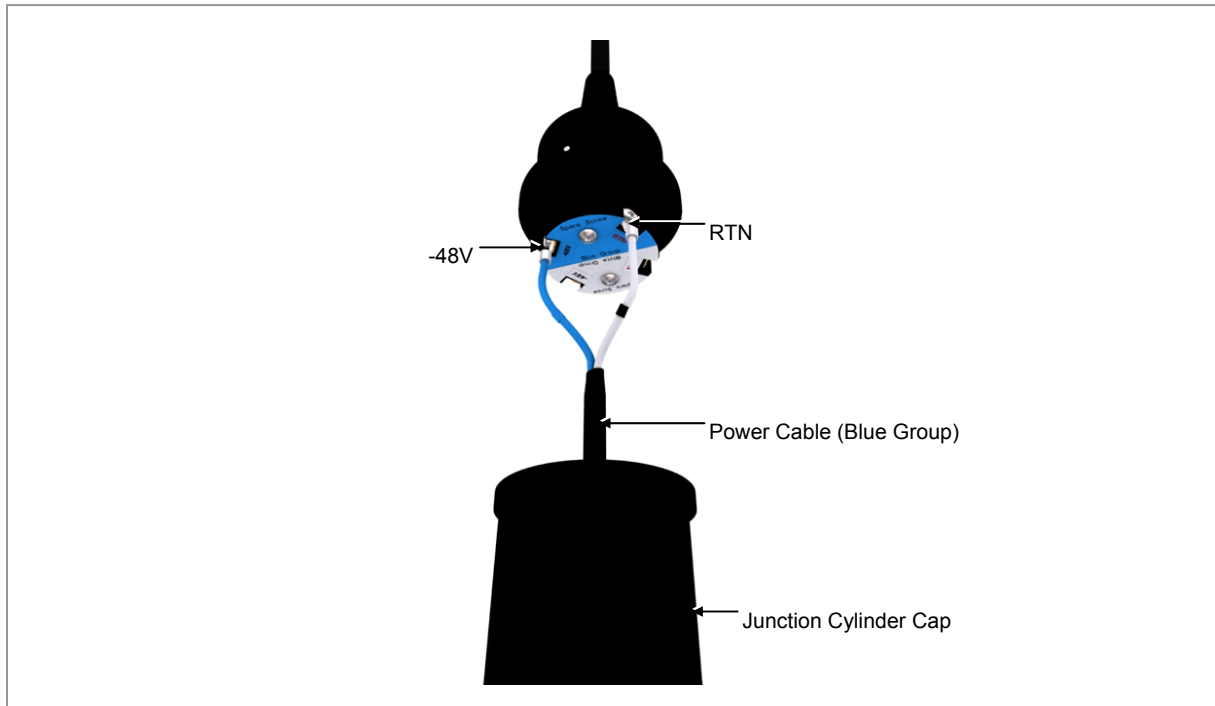
Figure 41. Connecting Power Cable_Type 1 (7)



- 8 Fix the ring type terminals of power cable to the power connection terminal (blue group) at the junction cylinder body according to the polarities. (-48 V: blue, RTN: white/blue strip)

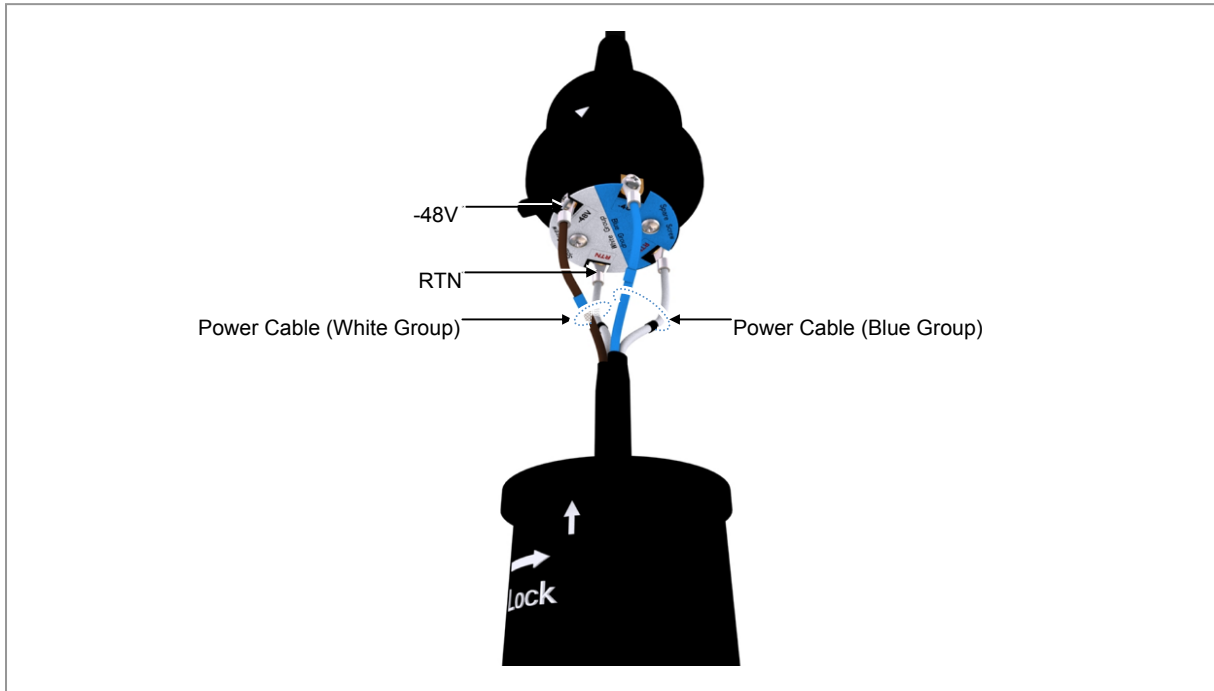
※ Power terminal block screw torque: 1.01 lbf·ft (14 kgf·cm)

Figure 42. Connecting Power Cable_Type 1 (8)



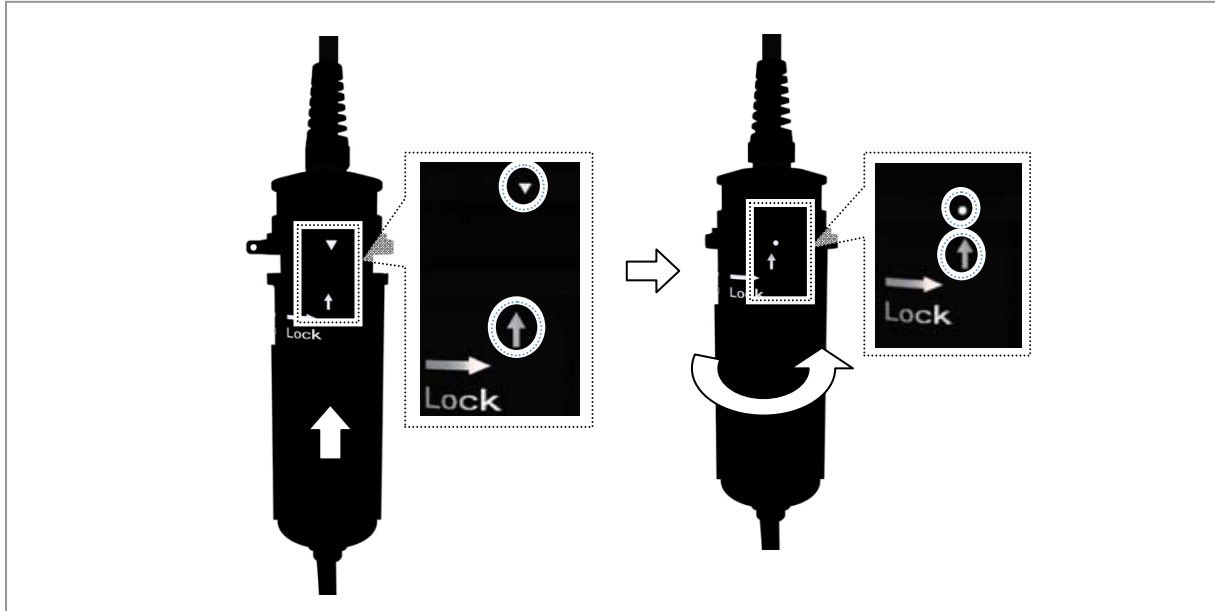
- 9 After working for the white group power cable as the same procedures 5)~7) and fix the ring type terminals of power cable to the power connection terminal (white group) at the junction cylinder body according to the polarities.
(-48 V: brown, RTN: white/brown strip)

Figure 43. Connecting Power Cable_Type 1 (9)



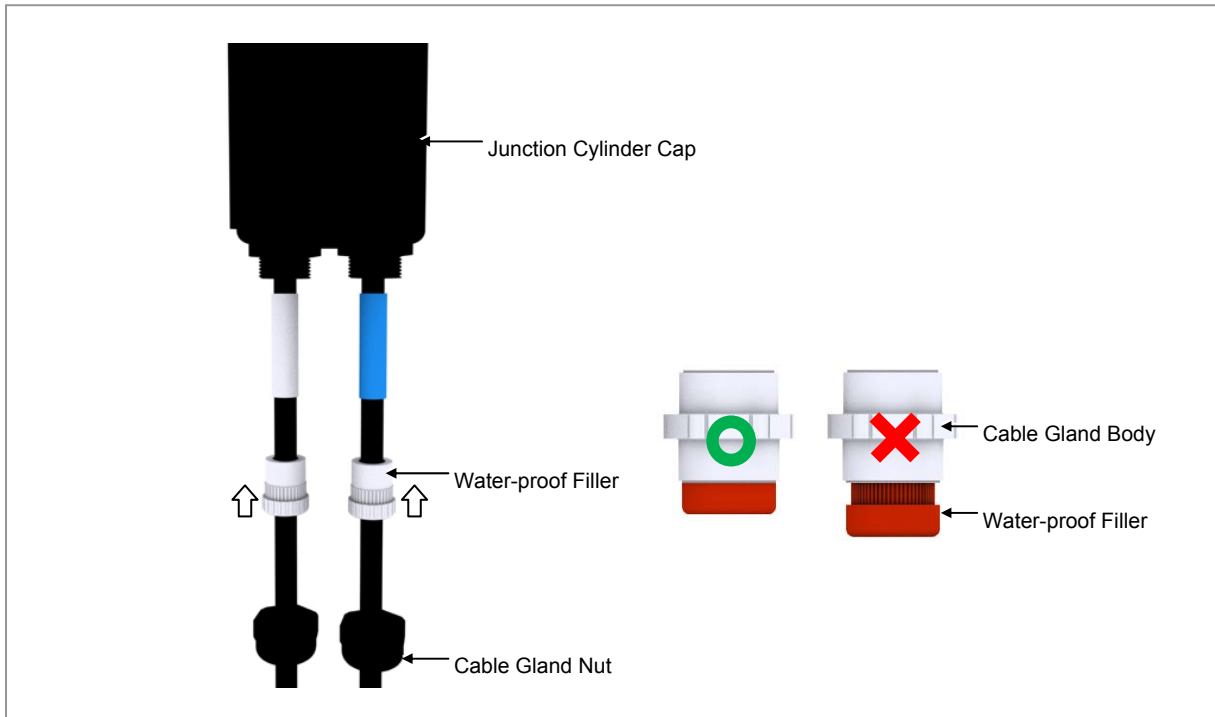
- 10 Insert the junction cylinder body and cap with aligning the ▽ and ↑ marks, and rotate the cap to lock until the ○ and ↑ marks are aligned

Figure 44. Connecting Power Cable_Type 1 (10)



- 11 Push up the water-proof fillers inserted to the power cables to fit in the cable gland body.

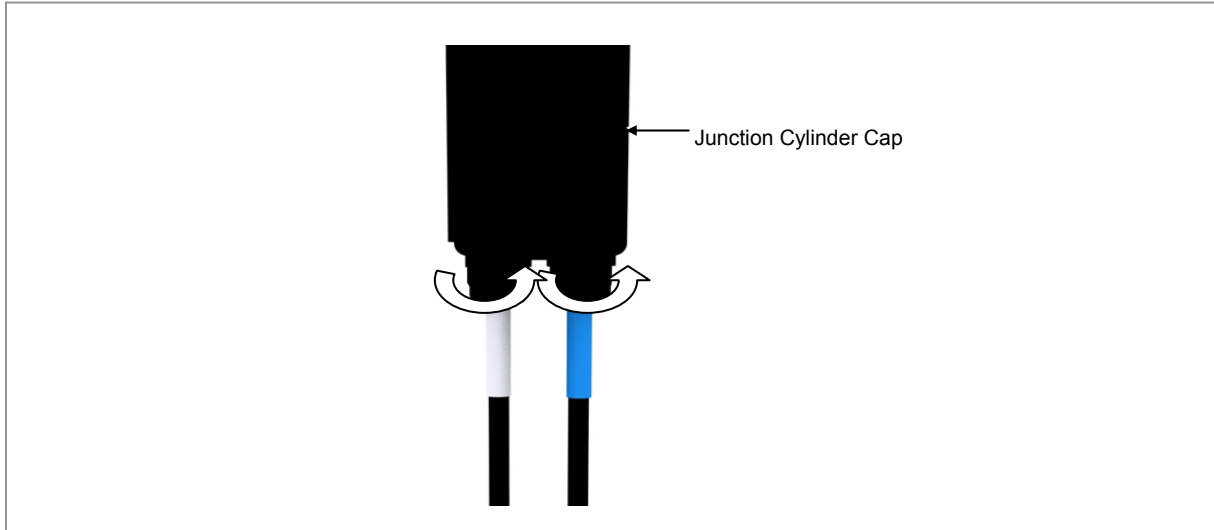
Figure 45. Connecting Power Cable_Type 1 (11)



12 Fasten the cable gland nut to the cable gland body.

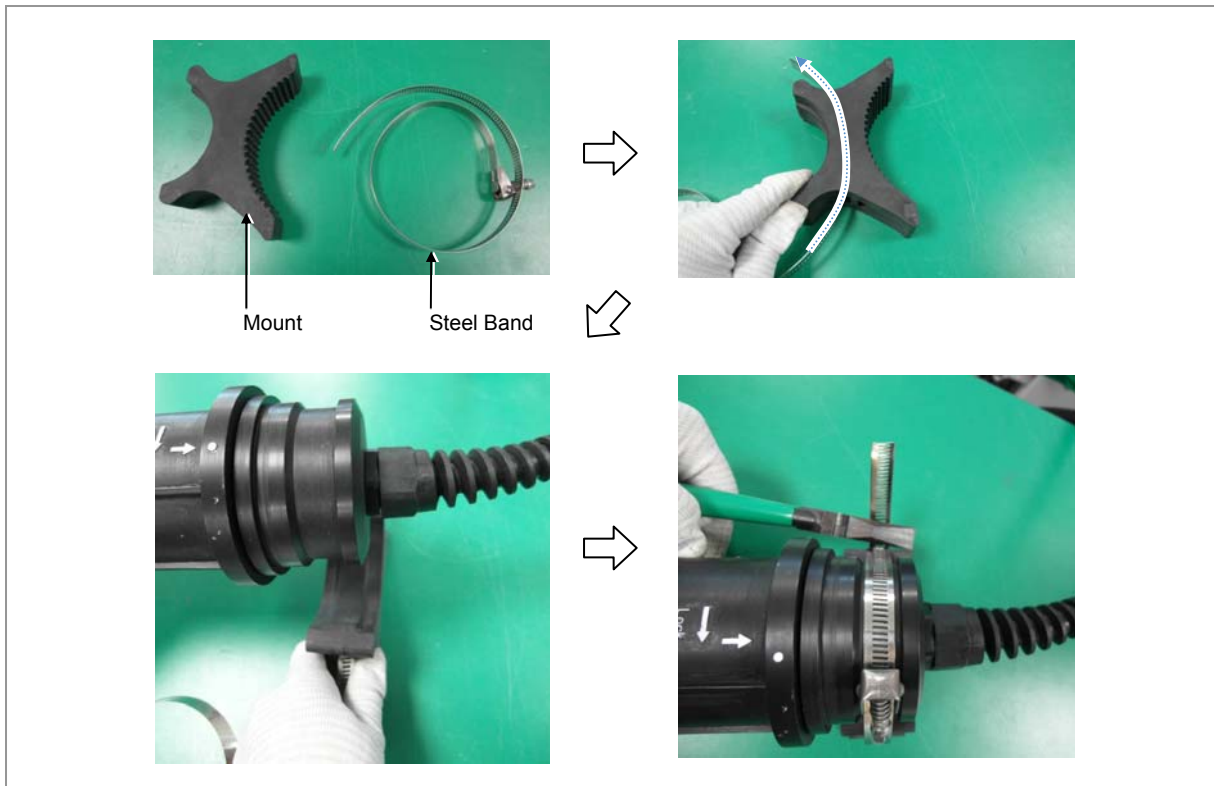
※ Cable gland nut torque: 4.43 lbf·ft (61.2 kgf·cm)

Figure 46. Connecting Power Cable_Type 1 (12)



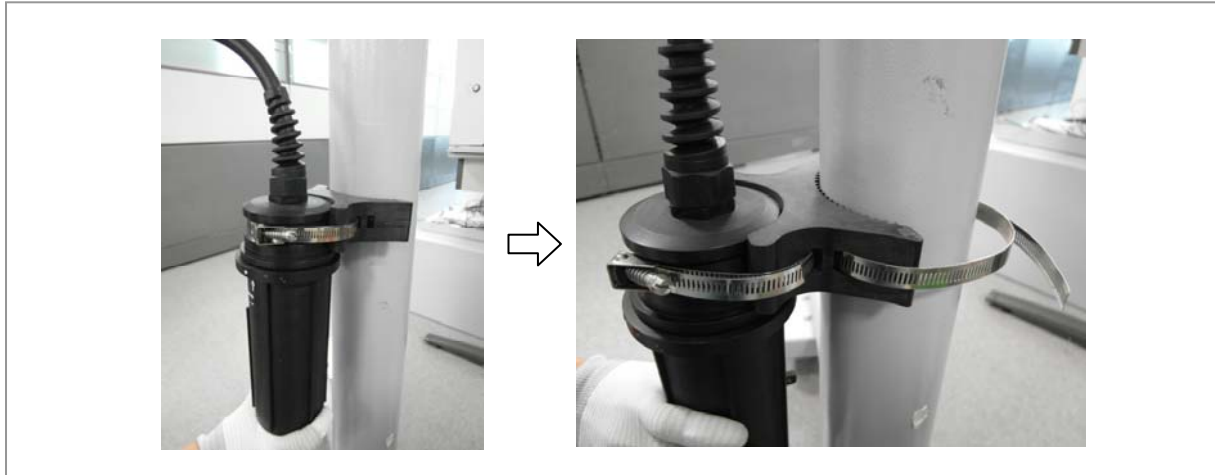
13 Fix the mount to the junction cylinder body using a steel band and cut the remain part using a nipper or plier.

Figure 47. Connecting Power Cable_Type 1 (13)



- 14 Place the fixed mount of junction cylinder to the pole and fix it using a steel band.

Figure 48. Connecting Power Cable_Type 1 (14)



- 15 Install the power cable, which is connected to the junction cylinder, to the power input port (PWR).
- 16 Insert the DC power connector after aligning the mark of power cable connector and ○ mark of RRH-B8 power input port connector.
- 17 Fasten the nut of cable side connector until the clicking sound is not heard.

Figure 49. Connecting Power Cable_Type 1 (15)



Type 2_Using AUX Hybrid Cable

- 1 Install the AUX hybrid cable from power supply to RRH-B8.
- 2 Insert the power connector after aligning the mark of power cable connector and ○ mark of RRH-B8 power input port connector.
- 3 Fasten the nut of cable side connector until the clicking sound is not heard.

Figure 50. Connecting Power Cable_Type 2

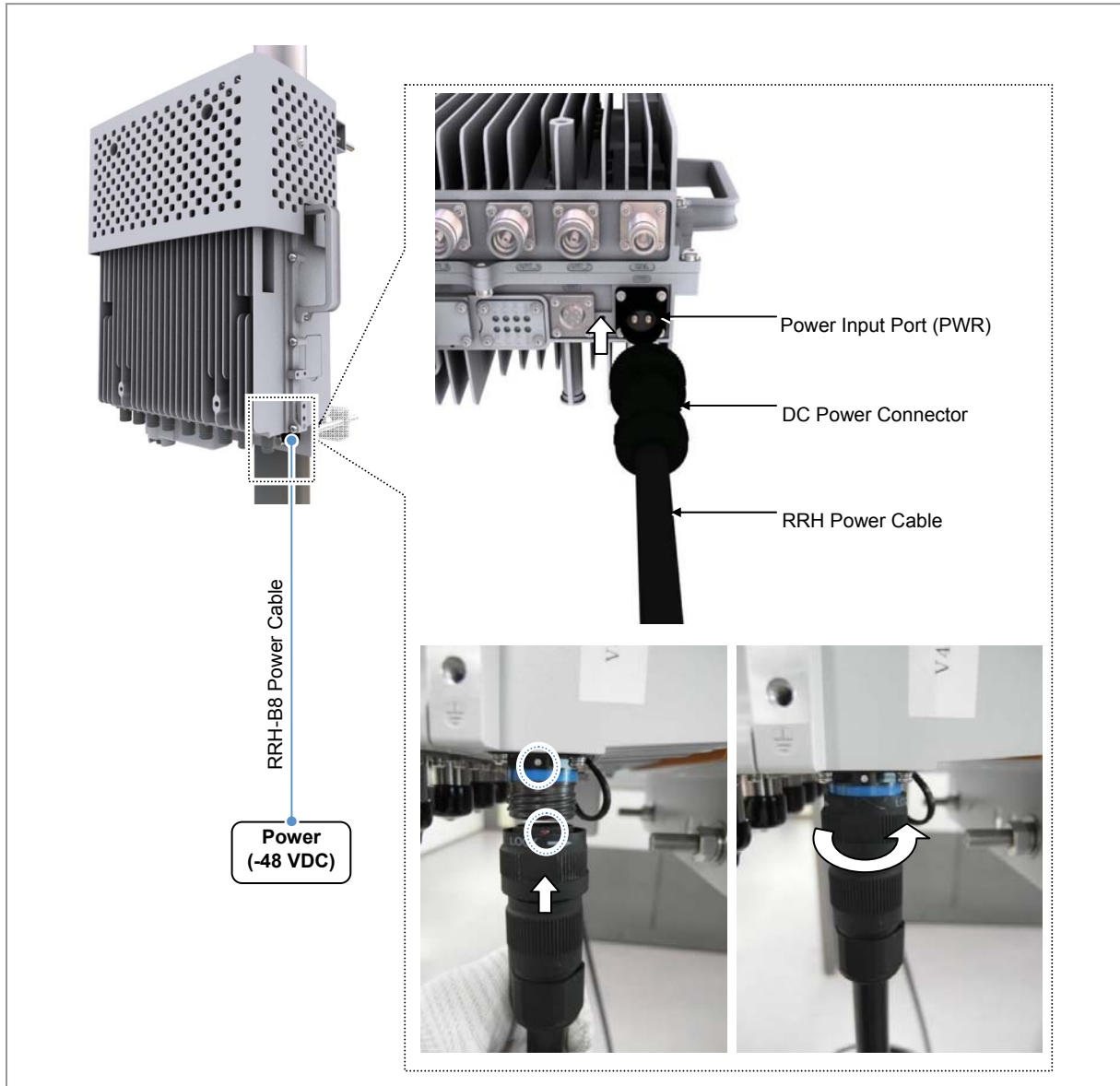
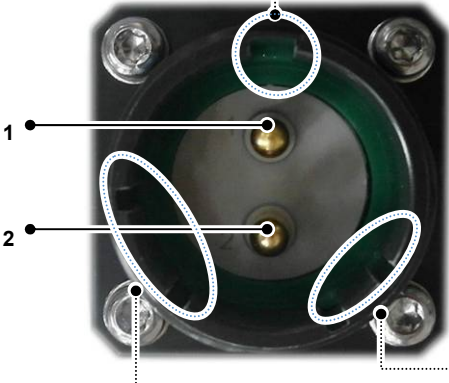
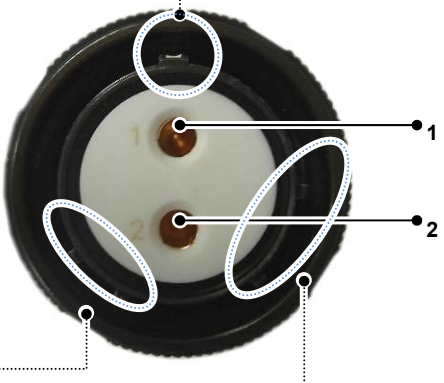


Table 14. Power Connector Pin Map

Connector	Circular Connector	
	1: -48 V	2: RTN
 <p>[System side Connector: JONHON, 003-00028953-03]</p>	 <p>[Cable side Connector: JONHON, 003-00028953-01]</p>	



Cautions for the connecting a power cable to a connector are as follows:

- Place the grooves of a cable side connector on the protrusions of a system side connector to fit into each other and connect them by turning a coupling nut on the top of the cable side connector. If the connectors are not aligned in a line, the connectors can be damaged when connecting the connectors.
- Do not connect the power cable to the connector with excessive force as the connector may be damaged.
- Do not forcefully pull the power cable or bend it beyond the allowed radius of curvature when fixing to the connector.



To ensure stability in power supply, a circuit breaker must be installed on the power cable connected to the rectifier (or power distributor). Capacity of -48 VDC circuit breaker is 32 A.

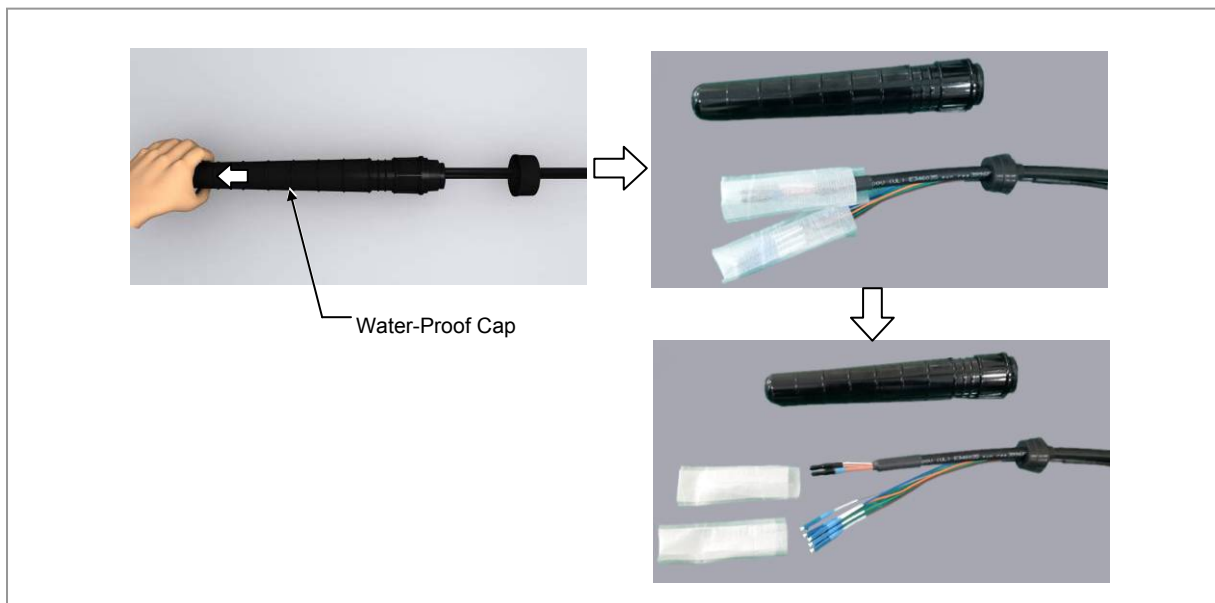
Connecting CPRI cable

Follow the steps below to connect the CPRI cable for the interface between RRH-B8 and UADU.

Type 1_Using Hybrid Cable

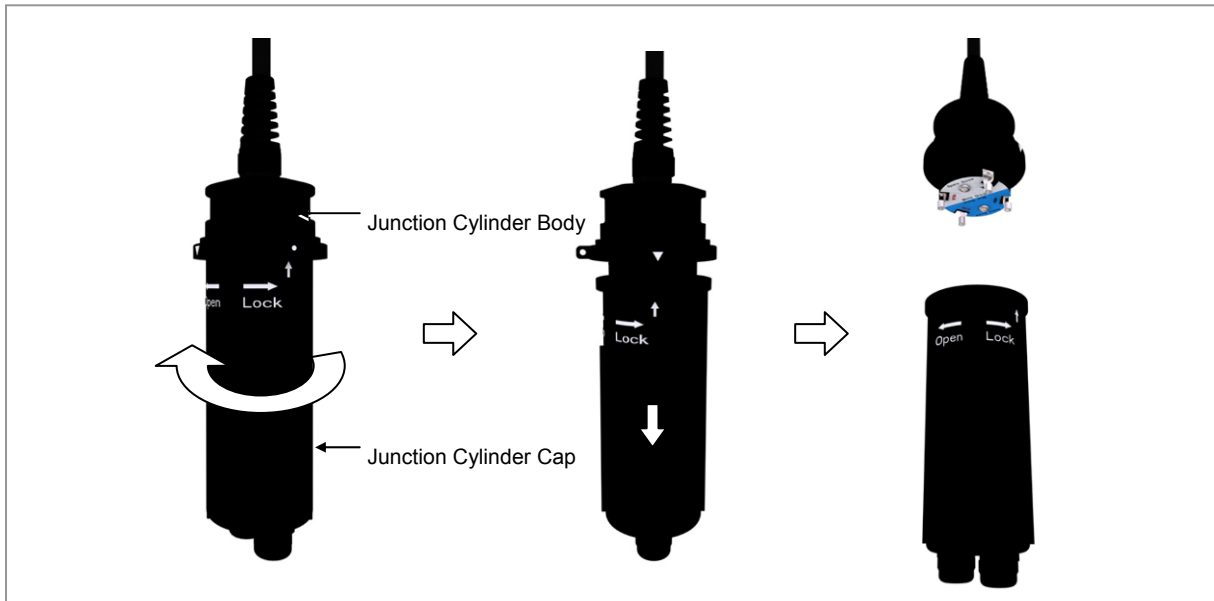
- 1 Disassemble the water-proof cap from the Hybrid cable (blue group, white group).

Figure 51. Connecting CPRI Cable_Type 1 (1)



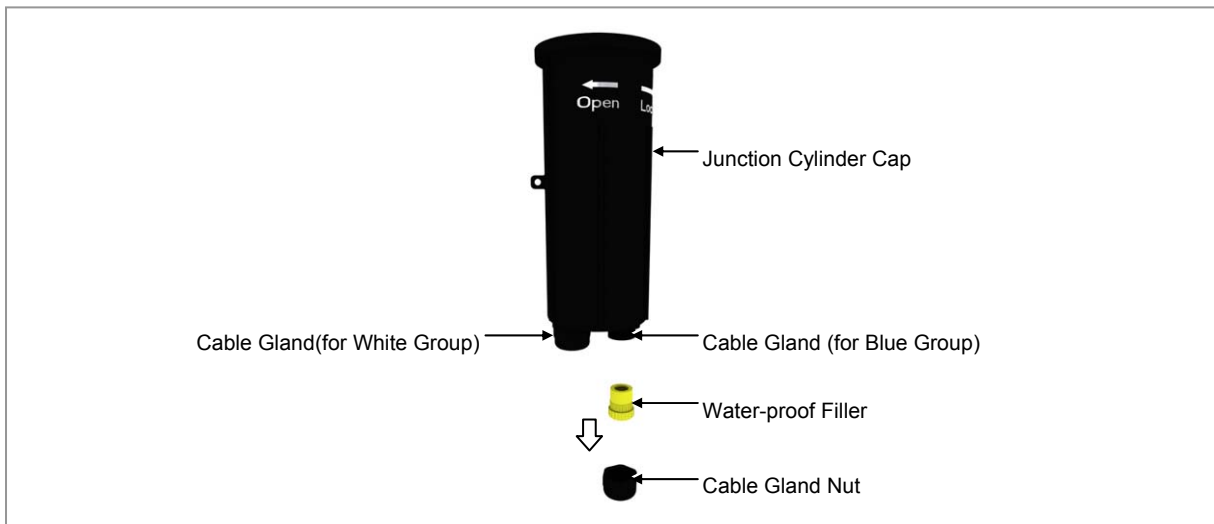
- 2 Disassemble the junction cylinder body and cap by pulling down the junction cylinder cap after rotating the cap to open.

Figure 52. Connecting CPRI Cable_Type 1 (2)



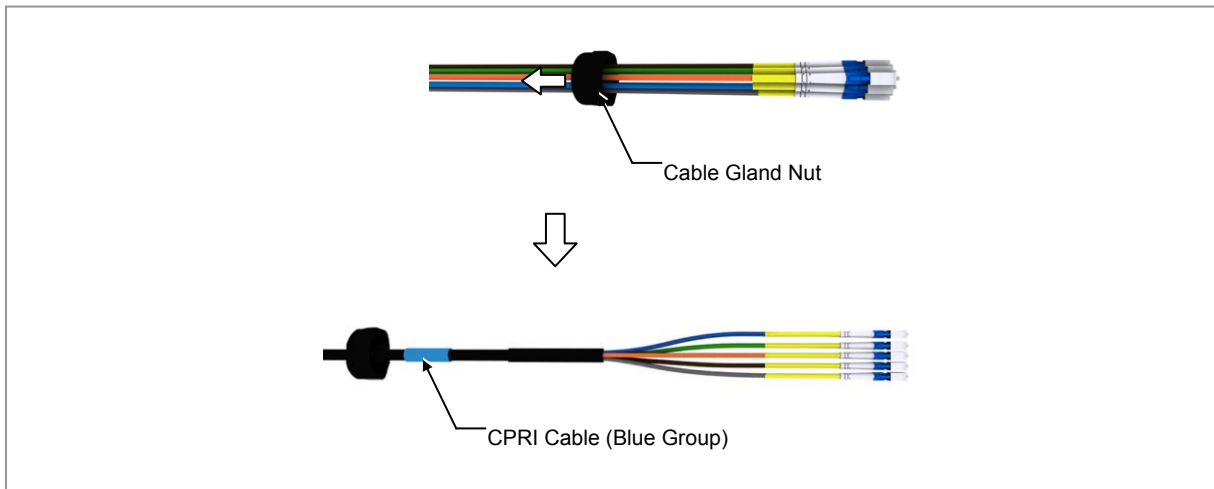
- 3 Disassemble the cable gland nut and water-proof filler for the blue group CPRI cable inlet at the bottom of junction cylinder cap. (Be careful not to lose the removed cable gland nut and water-proof filler.)

Figure 53. Connecting CPRI Cable_Type 1 (3)



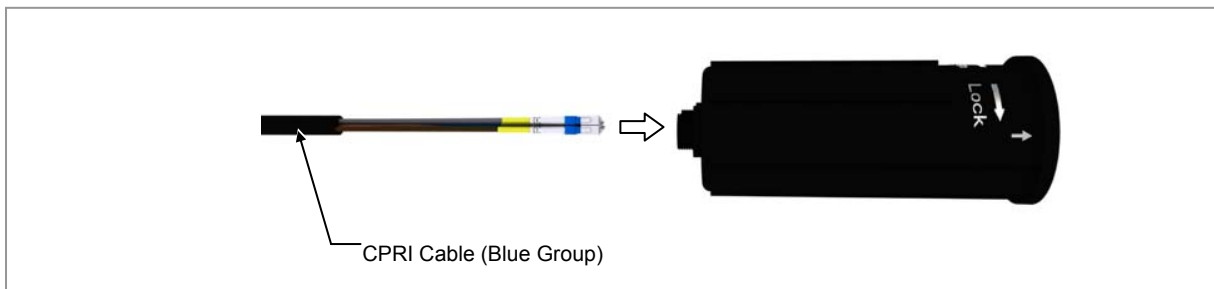
- 4 Insert the removed cable gland nut to the blue group CPRI cable.

Figure 54. Connecting CPRI Cable_Type 1 (4)



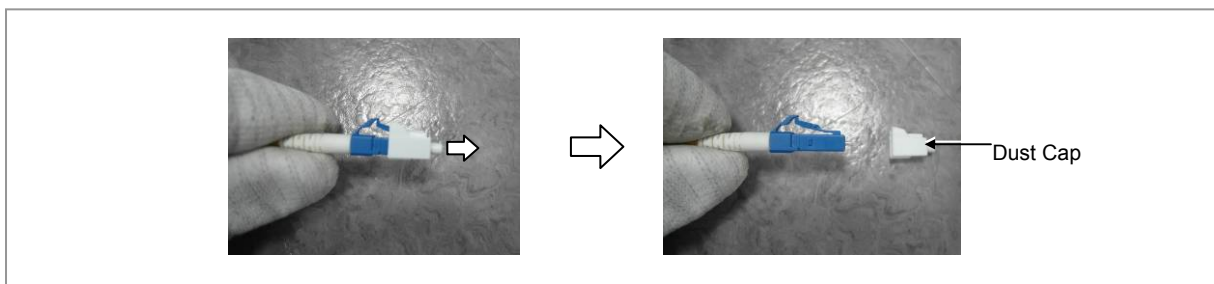
- 5 Insert the blue group CPRI cable through the cable gland hole (blue group) of junction cylinder cap.

Figure 55. Connecting CPRI Cable_Type 1 (5)



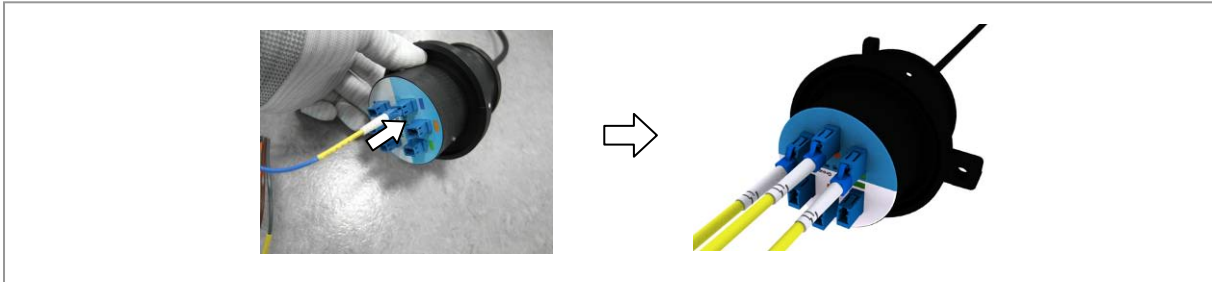
- 6 Remove the dust caps from the blue, orange, and green cables among the blue group CPRI cables.

Figure 56. Connecting CPRI Cable_Type 1 (6)



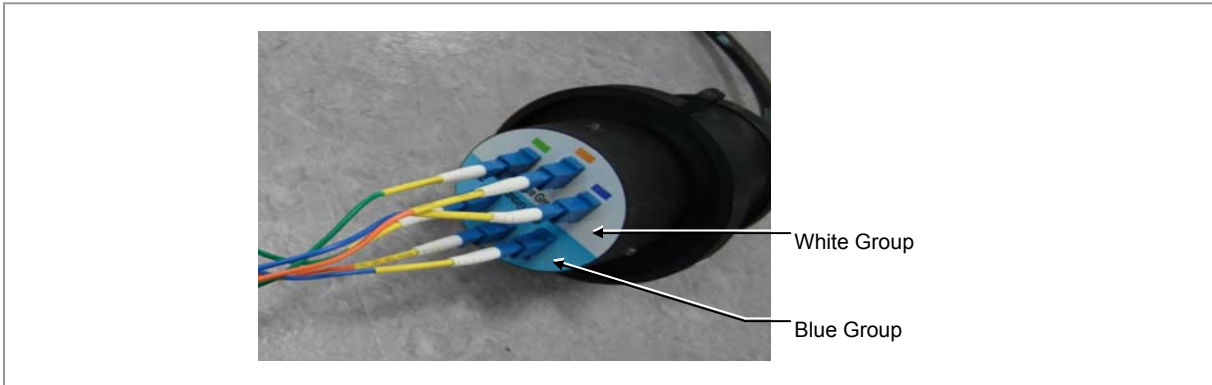
- 7 Connect the connectors of CPRI cables (blue, orange, green) to the blue group optic ports (blue, orange, green) of junction cylinder body.

Figure 57. Connecting CPRI Cable_Type 1 (7)



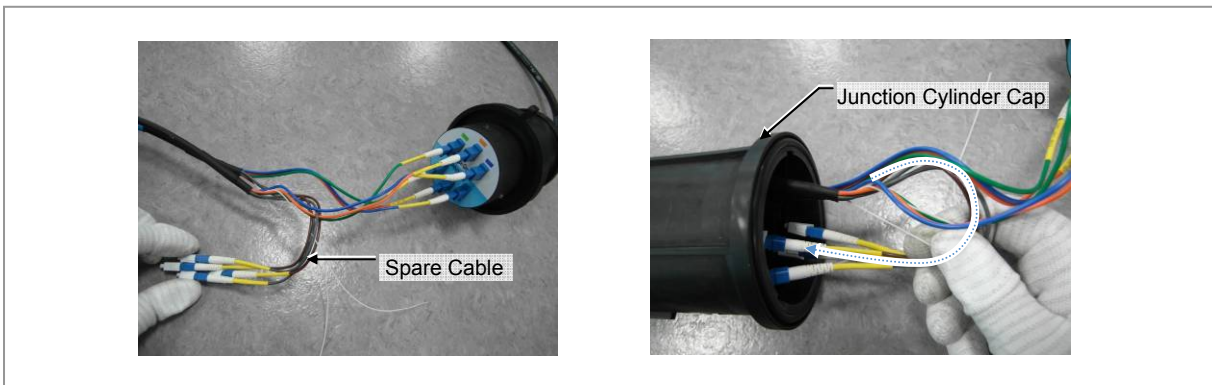
- 8 After working for the white group CPRI cables as the same procedures 3)~6) and connect the connectors to the white group optic ports (blue, orange, green) of junction cylinder body.

Figure 58. Connecting CPRI Cable_Type 1 (8)



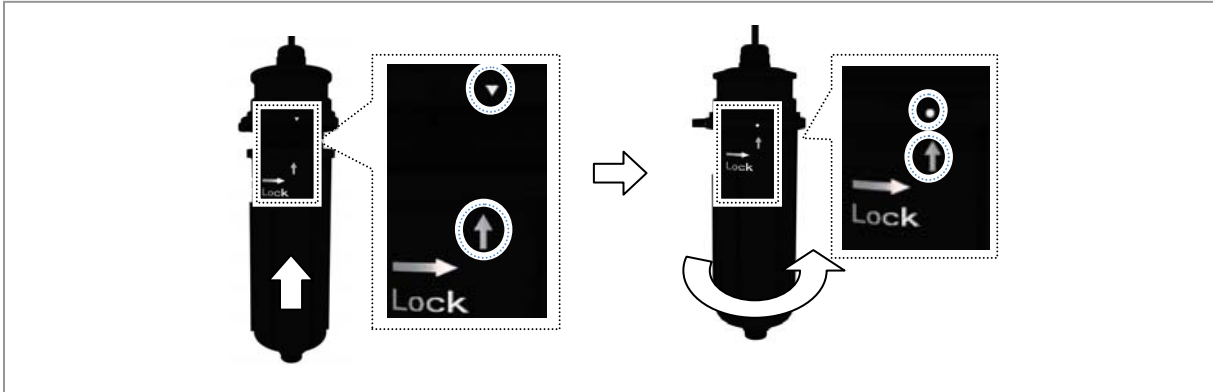
- 9 Roll and put the spare cables of blue group and white group CPRI cables (brown, gray) inside the cylinder cap.

Figure 59. Connecting CPRI Cable_Type 1 (9)



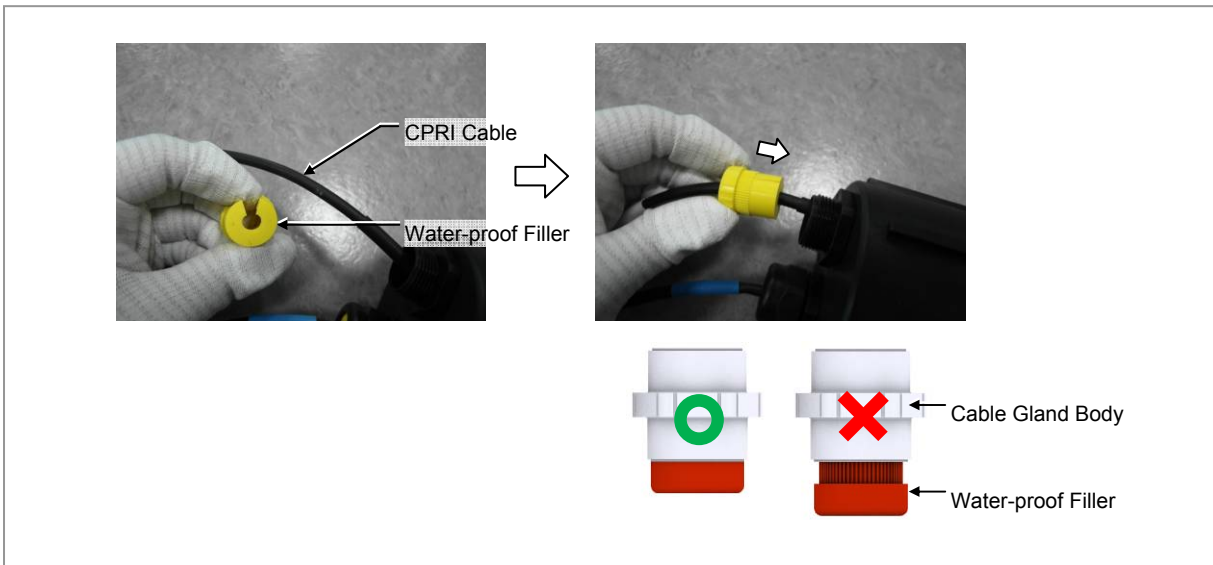
- 10 Insert the junction cylinder body and cap with aligning the ∇ and \uparrow marks, and rotate the cap to lock until the \circ and \uparrow marks are aligned

Figure 60. Connecting CPRI Cable_Type 1 (10)



- 11 Insert the water-proof filler to the CPRI cable and push up the water-proof filler to fit in the cable gland body.

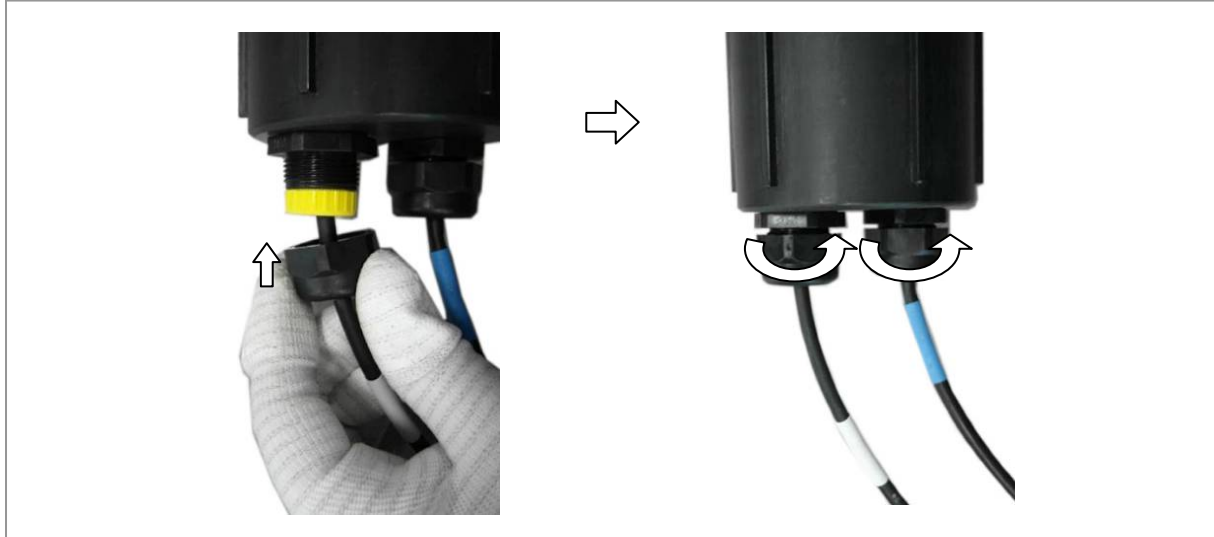
Figure 61. Connecting CPRI Cable_Type 1 (11)



12 Fasten the cable gland nut to the cable gland body.

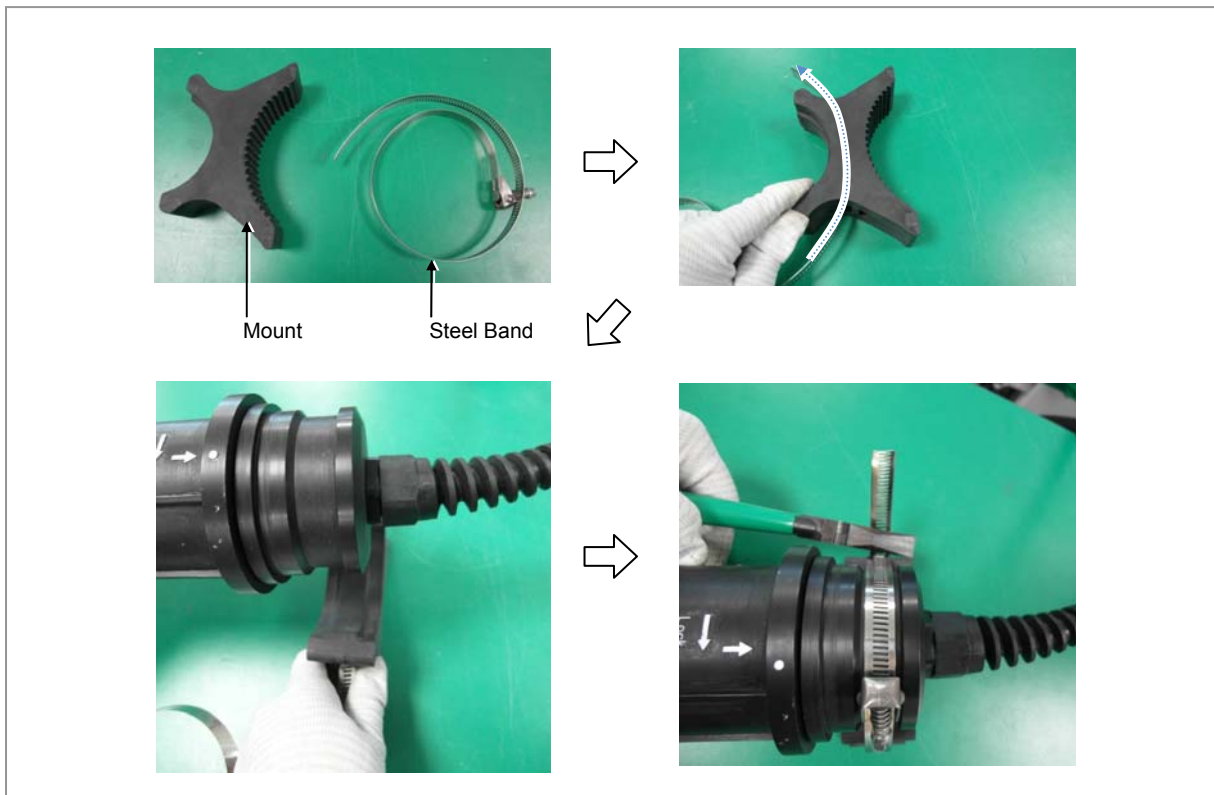
※ Cable gland nut torque: 4.43 lbf·ft (61.2 kgf·cm)

Figure 62. Connecting CPRI Cable_Type 1 (12)



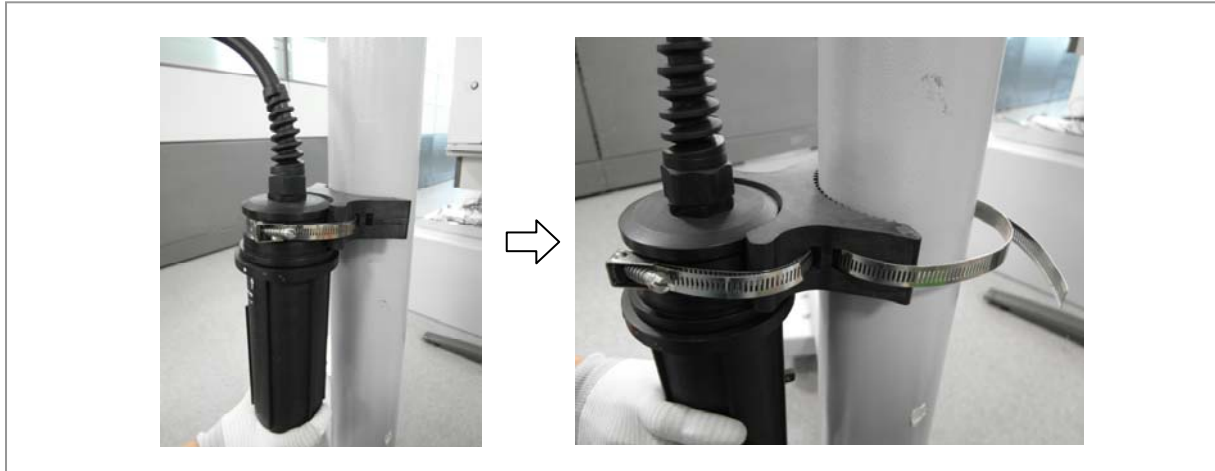
13 Fix the mount to the junction cylinder body using a steel band and cut the remain part using a nipper or plier.

Figure 63. Connecting CPRI Cable_Type 1 (13)



- 14 Place the fixed mount of junction cylinder to the pole and fix it using a steel band.

Figure 64. Connecting CPRI Cable_Type 1 (14)



- 15 Install the CPRI cable, which is connected to the junction cylinder, to the RRH-B8 MFC port.
- 16 Insert the CPRI connector after aligning the mark of CPRI connector and mark of RRH-B8 MFC port connector.
- 17 Fasten the nut of the cable side connector.

Figure 65. Connecting CPRI Cable_Type 1 (15)



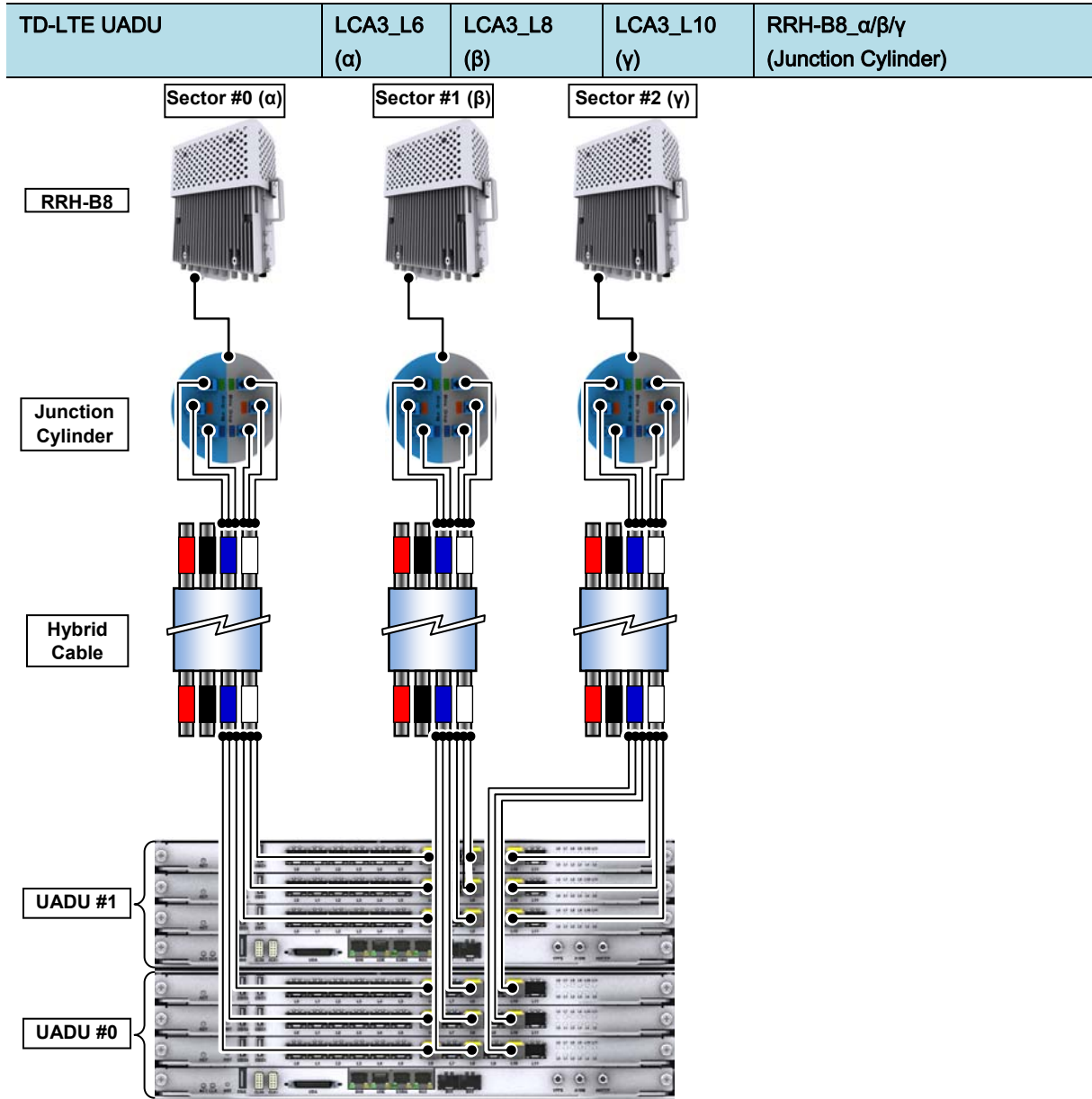
Case 1) 1Sector / RRH Configuration

1 RRH can support max.3 Carriers 1Sector at 8T8R configuration with DU#0, max.6 carriers 1Sector 4T4R configuration with DU#0 and max.6carriers 1Sector 4T8R configuration with DU#0 and DU#1.

The CPRI cable connections are as follows.

Table 15. DU-RRH Optic Junction Cylinder Hybrid Cable Connection Configuration (1Sector / RRH)

TD-LTE UADU		LCA3_L6 (α)	LCA3_L8 (β)	LCA3_L10 (γ)	RRH-B8_α/β/γ (Junction Cylinder)	
DU #1 (White Group)	LCA3 #2	Green	Green	Green	White Group	Port #2 (Green)
	LCA3 #1	Orange	Orange	Orange		Port #1 (Orange)
	LCA3 #0	Blue	Blue	Blue		Port #0 (Blue)
	Spare Cable	Brown	Brown	Brown	Spare Cable	
Gray		Gray	Gray			
DU #0 (Blue Group)	LCA3 #2	Green	Green	Green	Blue Group	Port #2 (Green)
	LCA3 #1	Orange	Orange	Orange		Port #1 (Orange)
	LCA3 #0	Blue	Blue	Blue		Port #0 (Blue)
	Spare Cable	Brown	Brown	Brown	Spare Cable	
Gray		Gray	Gray			



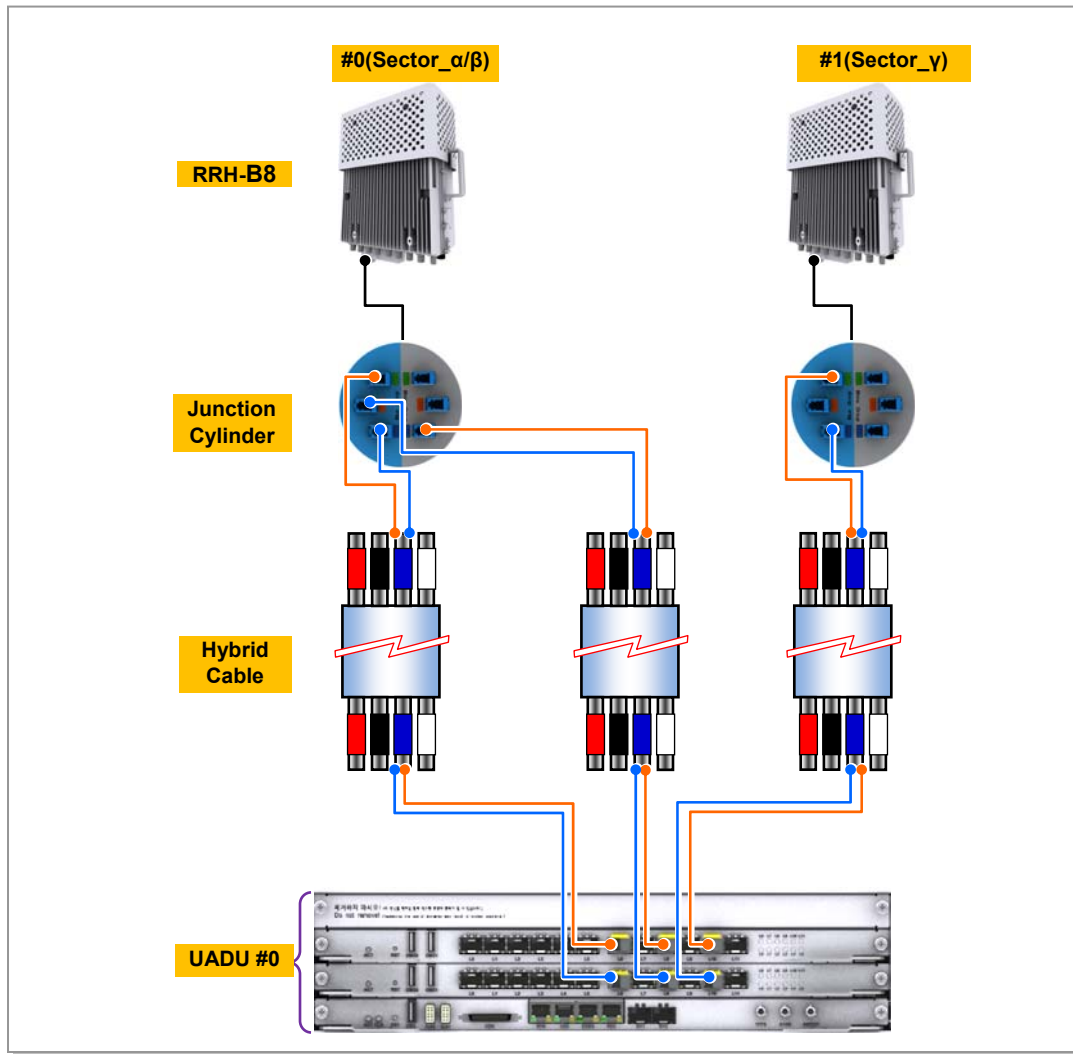
Case 2) 2Sector / RRH Configuration (4T4R 2Sector with 1 RRH)

1 RRH can support max.3 Carriers/2Sector at 4T4R configuration with DU#0.

The CPRI cable connections are as follows

Table 16. DU~RRH Optic Junction Cylinder Hybrid Cable Connection Configuration (4T4R 2Sector with 1 RRH)

TD LTE UADU		Hybrid Cable(Group)			RRH-B8(Junction Cylinder)
		α(Blue)	β(Blue)	γ(Blue)	
DU#0	LCA3#1_L6	Orange	-	-	RRH#0(α/ β)_Blue Group_Port#2(Green)
	LCA3#0_L6	Blue	-	-	RRH#0(α/ β)_Blue Group_Port#0(Blue)
	LCA3#1_L8	-	Orange	-	RRH#0(α/ β)_White Group_Port#0(Blue)
	LCA3#0_L8	-	Blue	-	RRH#0(α/ β)_Blue Group_Port#1(Orange)
	LCA3#1_L10	-	-	Orange	RRH#1(γ)_Blue Group_Port#2(Green)
	LCA3#0_L10	-	-	Blue	RRH#1(γ)_Blue Group_Port#0(Blue)
Spare Cable		Green, Brown, Gray			

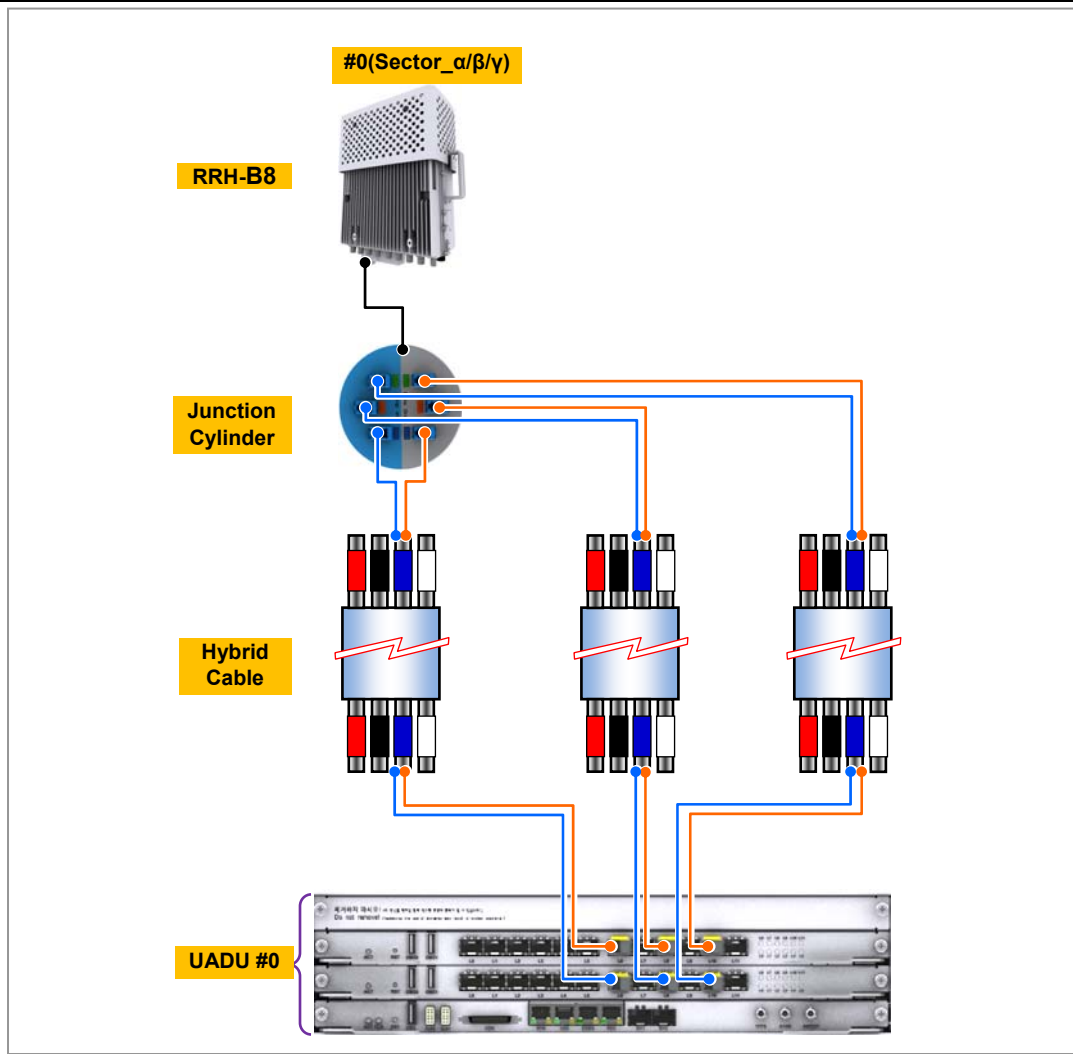


Case 3) 3Sector / RRH Configuration (2T2R 3Sector with 1 RRH)

1 RRH can support max.3 Carriers/3Sector at 2T2R configuration with DU#0.
 The CPRI cable connections are as follows.

Table 17. DU~RRH Optic Junction Cylinder Hybrid Cable Connection Configuration (2T2R 3Sector with 1 RRH)

TD LTE UADU		Hybrid Cable(Group)			RRH-B8(Junction Cylinder)
		α(Blue)	β(Blue)	γ(Blue)	
DU#0	LCA3#1_L6	Orange	-	-	RRH#0(α/ β/ γ)_White Group_Port#0(Blue)
	LCA3#0_L6	Blue	-	-	RRH#0(α/ β/ γ)_Blue Group_Port#0(Blue)
	LCA3#1_L8	-	Orange	-	RRH#0(α/ β/ γ)_White Group_Port#1(Orange)
	LCA3#0_L8	-	Blue	-	RRH#0(α/ β/ γ)_Blue Group_Port#1(Orange)
	LCA3#1_L10	-	-	Orange	RRH#0(α/ β/ γ)_White Group_Port#2(Green)
	LCA3#0_L10	-	-	Blue	RRH#0(α/ β/ γ)_Blue Group_Port#2(Green)
Spare Cable		Green, Brown, Gray			





The optical module and cable used in the system emit bright laser beams. Always handle them with care as there is risk of serious injury if the eyes are exposed to the laser beam of the optical cable.



The cable connection between the UADU CPRI port and RRH-B8 side optic port of the junction cylinder varies according to the number (one or two) of TD-LTE DU installed in the DU cabinet.

Connect the optic cable according to the connection configuration in 'Table 13'. Be careful not to connect the optic cable to a wrong place. If the optic cable is connected to a wrong place, the call connection fails.

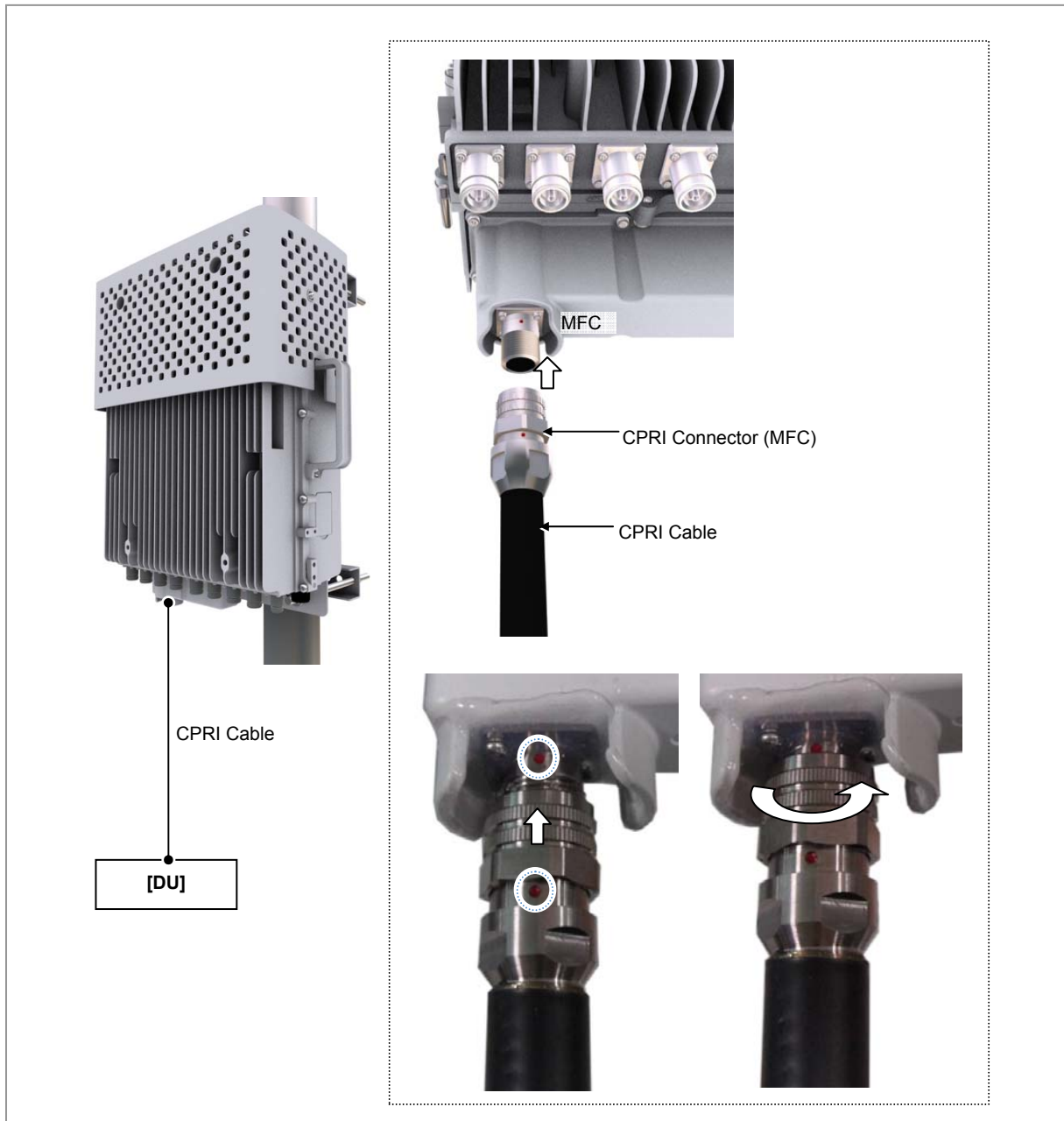


The optic cable consists of 5 cores. The grey cable is the spare cable for the replacement in case that one of the 3-core optic cables would fail.

Type 2_Using AUX Hybrid Cable

- 1 Install the AUX hybrid from the DU to the RRH-B8.
- 2 Insert the CPRI connector after aligning the mark of CPRI connector and mark of RRH-B8 MFC port connector.
- 3 Fasten the nut of the cable side connector.

Figure 66. Connecting CPRI Cable_Type 2



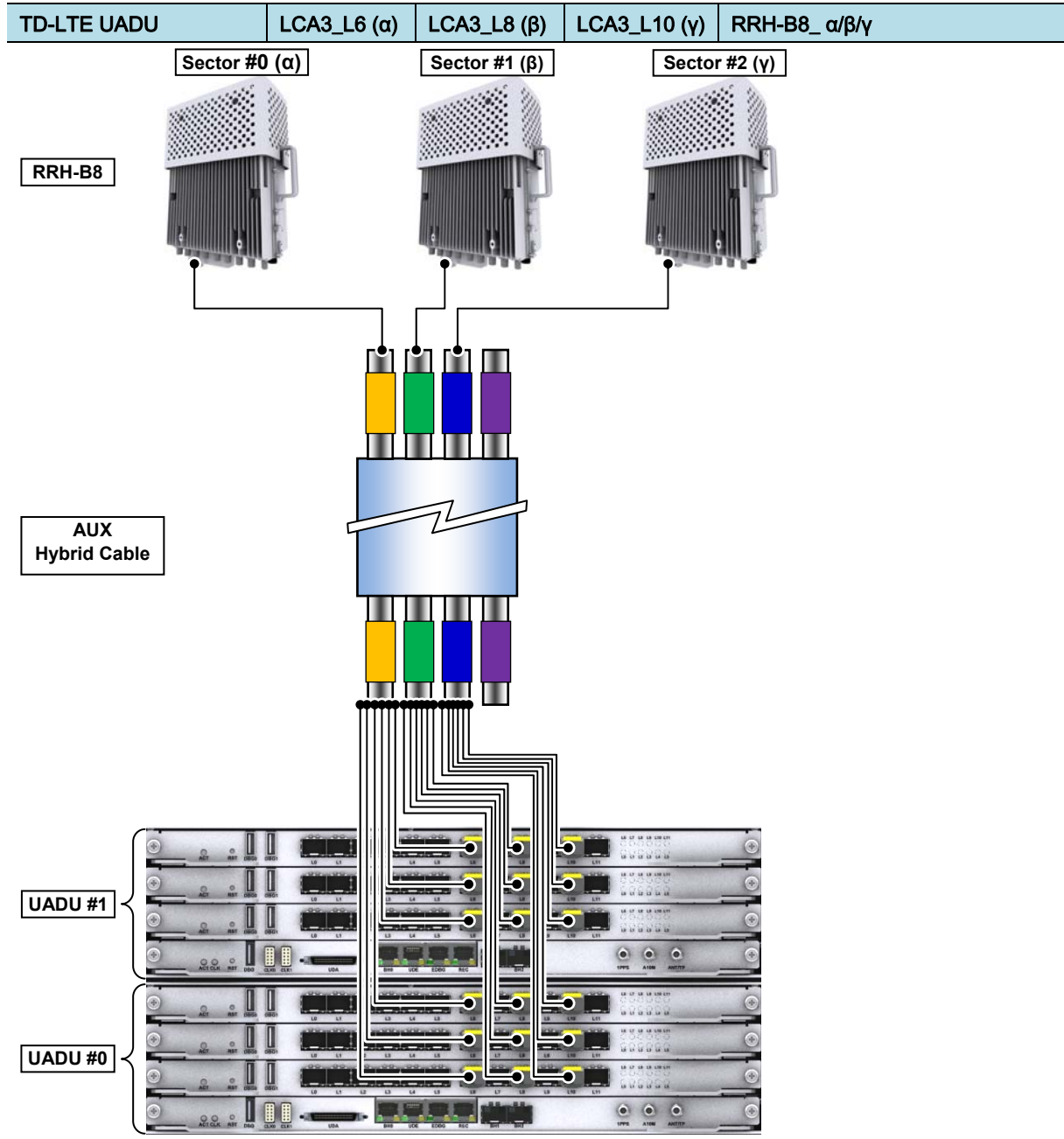
Case 1) 1Sector / RRH Configuration

1 RRH can support max.3 Carriers 1Sector at 8T8R configuration with DU#0, max.6 carriers 1Sector 4T4R configuration with DU#0 and max.6carriers 1Sector 4T8R configuration with DU#0 and DU#1.

The CPRI cable connections are as follows.

Table 18. DU-RRH AUX Hybrid Cable Connection Configuration (1Sector / RRH)

TD-LTE UADU		LCA3_L6 (α)	LCA3_L8 (β)	LCA3_L10 (γ)	RRH-B8_ α/β/γ
DU #1	LCA3 #2	Black	Black	Black	MFC Connector
	LCA3 #1	Gray	Gray	Gray	
	LCA3 #0	Brown	Brown	Brown	
DU #0	LCA3 #2	Green	Green	Green	
	LCA3 #1	Orange	Orange	Orange	
	LCA3 #0	Blue	Blue	Blue	
Tube Color		Orange	Green	Blue	-
Spare Cable		Tube Color: Purple			



Case 2) 2Sector / RRH Configuration (4T4R 2Sector with 1 RRH)

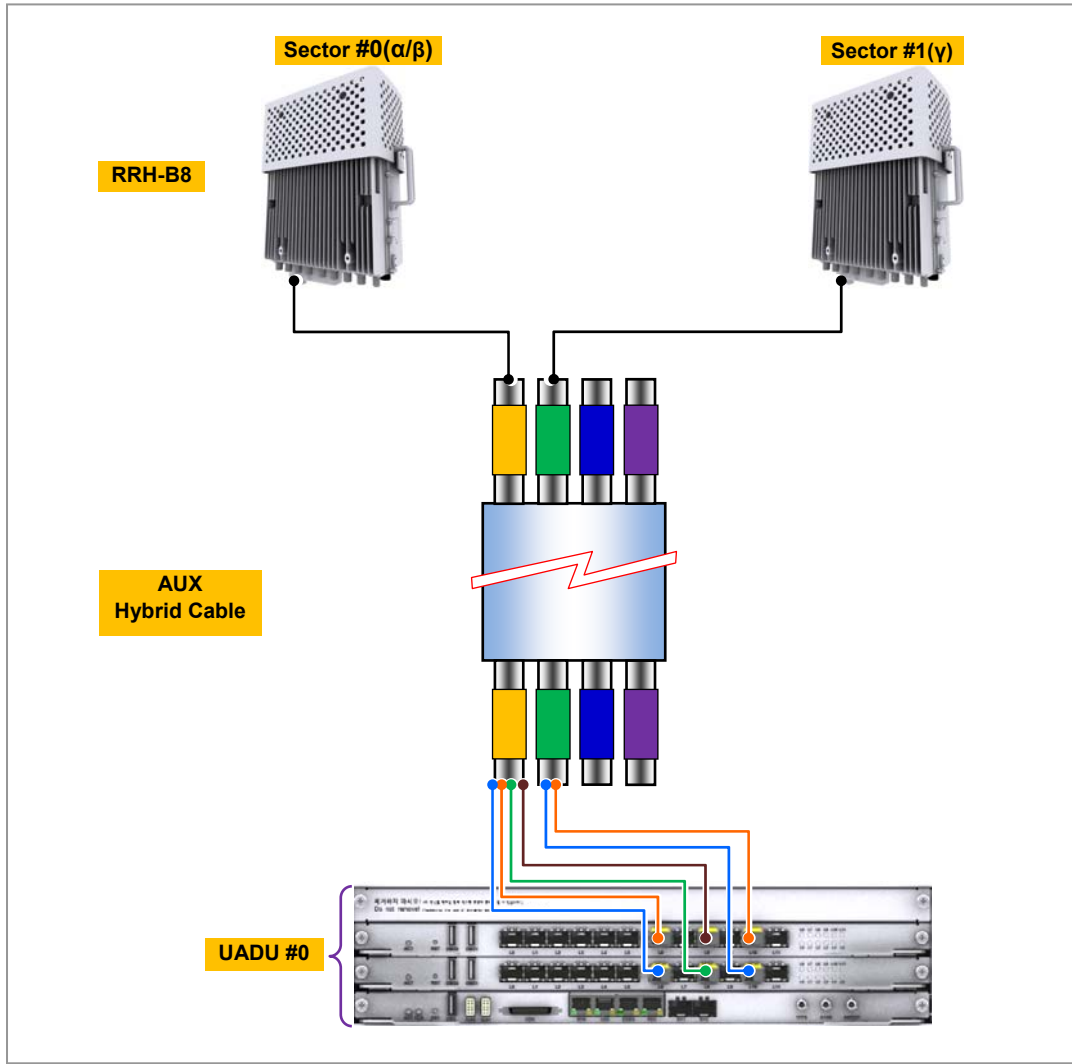
1 RRH can support max.3 Carriers/2Sector at 4T4R configuration with DU#0.

The CPRI cable connections are as follows.

Table 19. DU~RRH AUX Hybrid Cable Connection Configuration (4T4R 2Sector with 1 RRH)

TD LTE UADU		AUX Hybrid Cable Tube Color(Sector)			RRH-B8
		Orange(α)	Orange(β)	Green(γ)	
DU#0	LCA3#1_L6	Orange	-	-	RRH#0(α/ β), MFC Connector
	LCA3#0_L6	Blue	-	-	
	LCA3#1_L8	-	Brown	-	
	LCA3#0_L8	-	Green	-	
	LCA3#1_L10	-	-	Orange	RRH#1(γ), MFC Connector
	LCA3#0_L10	-	-	Blue	
Spare Cable		Gray Black		Green Brown Gray Black	-
		Tube Color : Blue, Purple			

TD LTE UADU	AUX Hybrid Cable Tube Color(Sector)			RRH-B8
	Orange(α)	Orange(β)	Green(γ)	

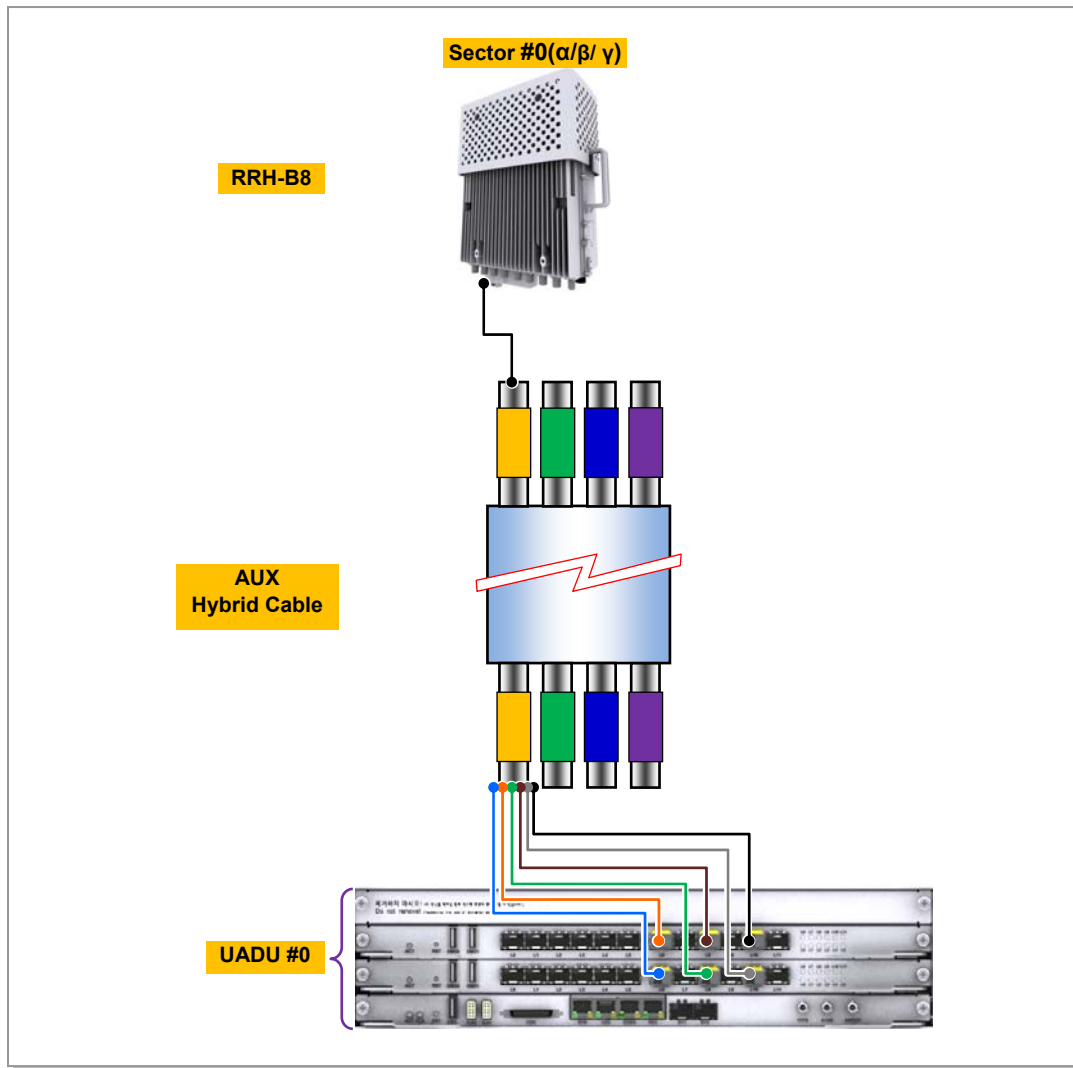


Case 3) 3Sector / RRH Configuration (2T2R 3Sector with 1 RRH)

1 RRH can support max.3 Carriers/3Sector at 2T2R configuration with DU#0.
 The CPRI cable connections are as follows.

Table 20. DU~RRH AUX Hybrid Cable Connection Configuration (2T2R 3Sector with 1 RRH)

TD LTE UADU		AUX Hybrid Cable Tube Color(Sector)			RRH-B8
		Orange(α)	Orange(β)	Green(γ)	
DU#0	LCA3#1_L6	Orange	-	-	RRH#0($\alpha/ \beta/ \gamma$), MFC Connector
	LCA3#0_L6	Blue	-	-	
	LCA3#1_L8	-	Brown	-	
	LCA3#0_L8	-	Green	-	
	LCA3#1_L10	-	-	Black	
	LCA3#0_L10	-	-	Gray	
Spare Cable		Tube Color : Green, Blue, Purple			





The optical module and cable used in the system emit bright laser beams. Always handle them with care as there is a risk of serious injury if the eyes are exposed to the laser beam of the optical cable.



The cable connection between the UADU CPRI port and RRH-B8 varies according to the number (one or two) of TD-LTE DU installed in the DU cabinet. Connect the optic cable according to the connection configuration in 'Table 14'. Be careful not to connect the optic cable to a wrong place. If the optic cable is connected to a wrong place, the call connection fails.



The AUX hybrid cable consists of 4 cable groups (orange/green/blue/purple). The purple cable is the spare cable for the replacement in case that one of the optic cables would fail.

Installation Test

If the installation of the system is complete, progress the installation test to check the status of the system.

Table 21. Construction Status Checklist

Category	Check Items	Criteria	Result		Remarks
			Pass	Fail	
System Installation	System fixing status (Vertical and horizontal)	Horizontal and vertical locations			
	System arrangement status	Horizontal and vertical locations			
	Locking status and standard compatibility of bolts/nuts/washers	Visual inspection and magnet test			
	External wiring and other wirings	Visual inspection for twist, array and arrangement			
	System cable installation status	Checking twist, distortion and installation status			
	External connector connection	Visual inspection to check poor contact (Tightening status)			
	Other appurtenant work (Cable duct installation and others)	Visual inspection			
Power Acceptance	Equipment's power cable specification	Visual inspection			
	Rectifier ↔ System	Visual inspection			
	Cabling Status	Visual inspection for twisted or entangled status			
	Damage of cable sheath	Visual inspection			
	System power connector	<ul style="list-style-type: none"> Visual inspection to check whether the power connector is connected normally without separation. Inspection for the power connector shaking status 			
	System input voltage (BATT voltage)	Measurement by digital meter (voltmeter)			
External interface	Optic Cabling Status	Visual inspection			
Ground Construction	Ground line standard	Visual inspection			
	Ground bar ↔ System	Visual inspection			
	Ground line cabling status	Cabling status check			
	Termination treatment of the ground line (Pressure Terminal)	Visual inspection			
Feeder Line status	Feeder Line installation and fixing status	View, consistency, bending			
	ANT installation and	Visual inspection (ANT stick			

Category	Check Items	Criteria	Result		Remarks
			Pass	Fail	
	connection status	shaking status)			
	Connection and end processing status	View, consistency			
Various TAG Status	Feeder Line tag	Visual inspection (Content: Length, LOSS value, position)			
	Power cable tag	Visual inspection			
	Ground table tag	Visual inspection			
	Attachment status of the label for the real-name construction system <ul style="list-style-type: none"> Indoor: wall side of the gate side Outdoor: inside of the cover of the distribution box 	Visual inspection (size, material, etc.)			
	Cable duct, bolt connection status	Visual inspection			
	Feeder line Entrance end processing status (Outdoor)	Visual inspection (Checking back side Connection)			
	Status of inside/outside of the system and vicinity of the base station	Visual inspection			
General Opinion					

Appendix A Acronyms

AISG	Antenna Interface Standards Group
CAL	Calibration
CPRI	Common Public Radio Interface
DC	Direct Current
DU	Digital Unit
EMI	Electro Magnetic Interference
GPS	Global Positioning Satellite
LCA3	LTE Channel Card Type 3
LTE	Long Term Evolution
MBS	Multi-modal Base Station
MGB	Main Ground Bar
MFC	Multi Fiber Connector
RET	Remote Electrical Tilting
RF	Radio Frequency
RRH	Remote Radio Head
TD	Time Division
TDD	Time Division Duplex
TGB	Tower Ground Bar
UADU	Universal Platform Digital Unit
VSWR	Voltage Standing Wave Ratio

Appendix B Sector Antenna Installation

Cautions when Installing a Sector Antenna

Precautions of antenna installation are as follows.

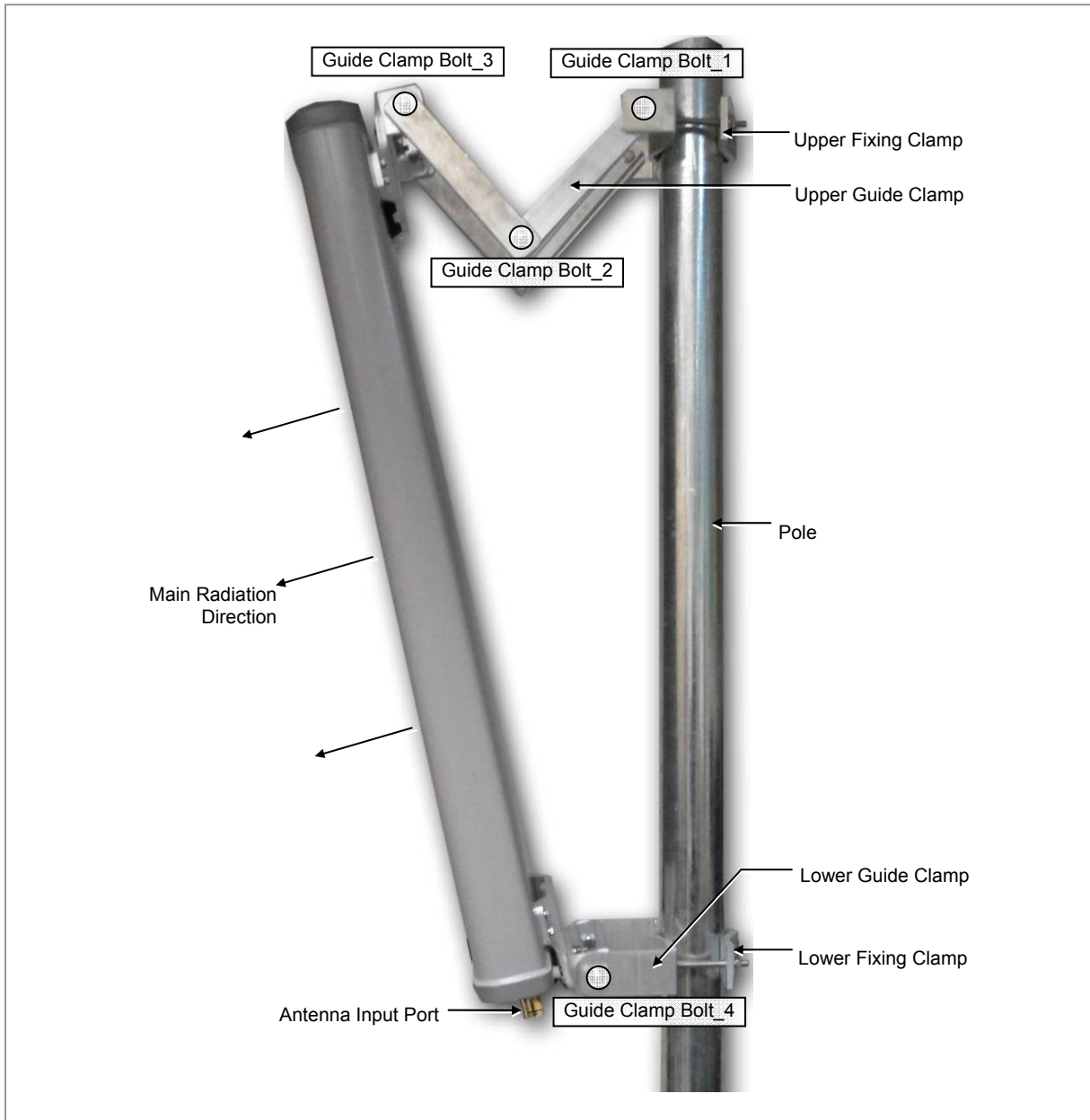
- Sector antennas should be installed vertically. (± 1)
- Antenna is the precise material, so be careful not to make damage or form change.
- When moving antenna, use the tool suitable to rating. In addition, use the rated carrying device which is at least 200 % or more than antenna considering the stability.
- Be careful not to give too much strength to the antenna.
- If it rains, suspend connecting the feeder cable and antenna.
- Fix it after adjusting the direction of antenna exactly.
- Distance between steel tower and antenna and the distance between send-receive antennas are based on the antenna layout.
- Attach the antenna on the position specified in the drawing.
- Install the antenna not to make a feature change of the antenna considering the direction of the radiation
- When connect the connector to the antenna, not making the alien substance flowed and is not under the influence of PIMD.
- Measure VSWR of all antennas and the value should be within the regulated value.


Sector Antenna Installation

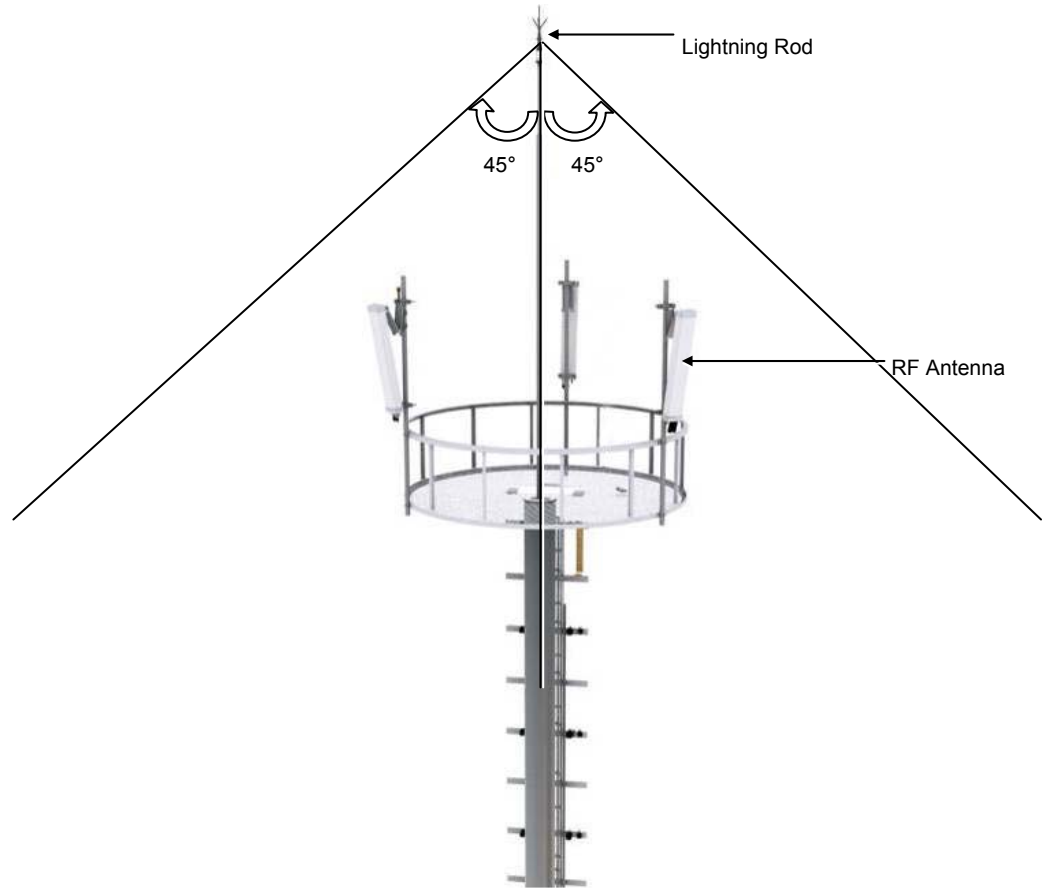
The method of sector antenna installation is as follows.

- 1** Put up an antenna pole and insert the sector antenna into the antenna pole using a fixing clamp.
- 2** Set the antenna's up/down tilt to 0° and fix the fixing clamps at the top and bottom.
- 3** After tightening the fixing clamp, adjust the antenna up/down (tilt) depending on the signal strength. The bolt of the guide clamp must be loosened, so the antenna angle can be adjusted.
- 4** After setting the antenna angle, fasten the bolt of the guide clamp, which was loosened previously. Regarding the nut, the double nut mounting should be used to prevent the nut from coming loose.

Figure 67. Sector Antenna



-  When you install 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.



Appendix C Feeder Line Work

When installing the feeder, the cautions

When installing the feeder, the following cautions shall be considered:

- Put a plate to work not to make damage for the surface of the feeder cable. If there is external damage of the feeder cable, cut the damaged part and work wiring.
- After connecting the antenna to the feeder cable, finish the connection part of the contracted pipe using the contracted tube.
- Attach the cognitive tapes to the both ends of the feeder cable, which makes it easy to recognize.
- When connecting cabinet, antenna and lightning arrester, etc. to the feeder cable, connect strongly to prevent from generating reflected wave.
- The curvature radius should be maximized, keep the minimum curvature radius.

Table 22. Curvature Radius of Feeder Cable for Outdoor

Specification		Allowed Radius of Curvature		Remark
LS Feeder Line	HFC-12D	1/2 in.	4.02 in. (125 mm)	Outdoor
	HFC-22D	7/8 in.	9.84 in. (250 mm)	
	HFC-33D	1-1/4 in.	14.96 in. (380 mm)	
	HFC-42D	1-5/8 in.	20.08 in. (510 mm)	
RFS Feeder Line	LCF12-50	1/2 in.	4.92 in. (125 mm)	
	LCF78-50	7/8 in.	9.84 in. (250 mm)	
	LCFS114-50	1-1/4 in.	14.96 in. (380 mm)	
	LCF158-50	1-5/8 in.	19.69 in. (500 mm)	



Table 23. Curvature Radius of Feeder Cable for Indoor

Specification			Allowed Radius of Curvature	Remark
LS Feeder Line	HFSC 6D	1/4 in.	0.98 in. (25 mm)	Indoor
	HFSC 10D	3/8 in.	0.98 in. (25 mm)	
	HFSC 12D	1/2 in.	1.26 in. (32 mm)	
	HFSC 22D	7/8 in.	4.92 in. (125 mm)	
RFS Feeder Line	SCF14-50	1/4 in.	0.98 in. (25 mm)	
	SCF38-50	3/8 in.	0.98 in. (25 mm)	
	SCF12-50	1/2 in.	1.26 in. (32 mm)	
	UCF78-50	7/8 in.	4.92 in. (125 mm)	



When installing a feeder line, the radius of curvature of the sections where cables bent should be larger than the allowed radius of curvature. If the radius of curvature for the feeder line installation is less than the allowed radius of curvature, it may affect the performance of the system.

- Ensure that the feeder cable does not interfere with steel towers, ladders and in the areas chiefly used by people.
- Connect the connector to the antenna in a straight line and after connecting, do not apply excessive force.
- Wind the self-bonding rubber tape overlapping (keep a distance as the half size of rubber tape) to the connector connection part and wind the vinyl tape for electricity to the 2 times or more and then cover with the heat shrink tube.



Connecting the feeder cable connector is critical process, so the qualified workers who finished the related education should perform.

Table 24. Connector Connection Torque Value

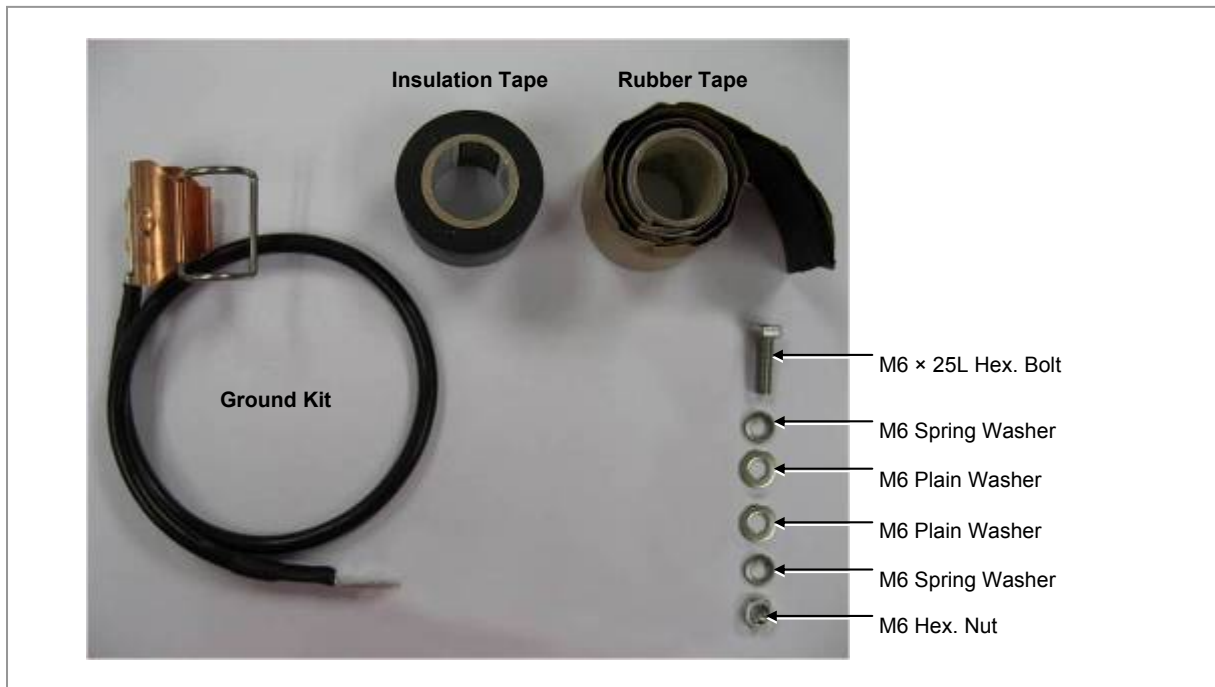
Connector	Torque Value
SMA connector	0.18 lbf·ft (2.5 kgf·cm)
TNC connector	0.65 lbf·ft (9 kgf·cm)
N-type connector	1.45 lbf·ft (20 kgf·cm)
Din-type connector	14.46 lbf·ft (200 kgf·cm)

Antenna Feeder Cable Ground

Ground the antenna feeder line using the grounding kit located under the Tower Ground Bar (TGB) installed in the lower section of the tower or in the antenna feeder line duct.

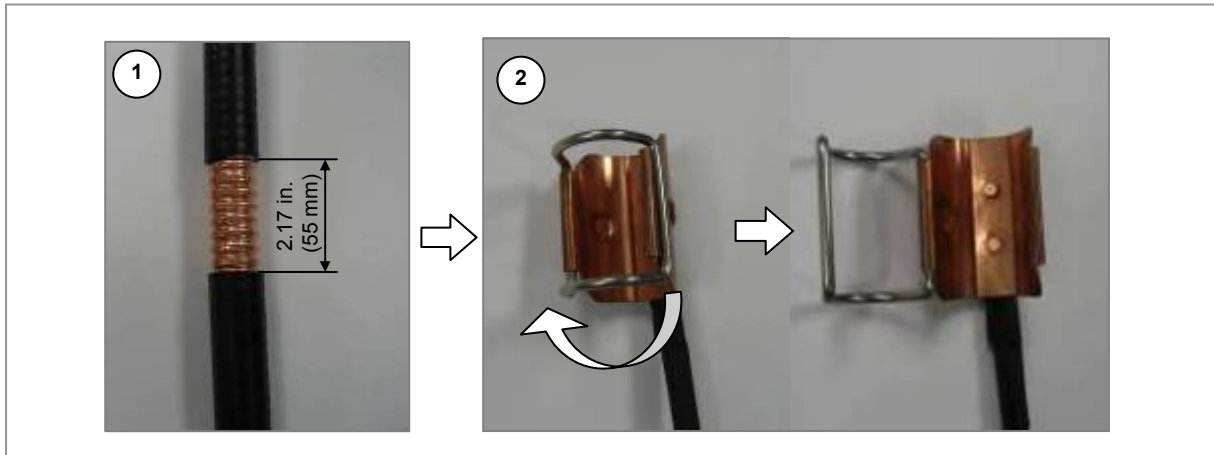
The way to connect the ground kit of feeder is as follows:

Figure 68. Feeder Cable Grounding (1)



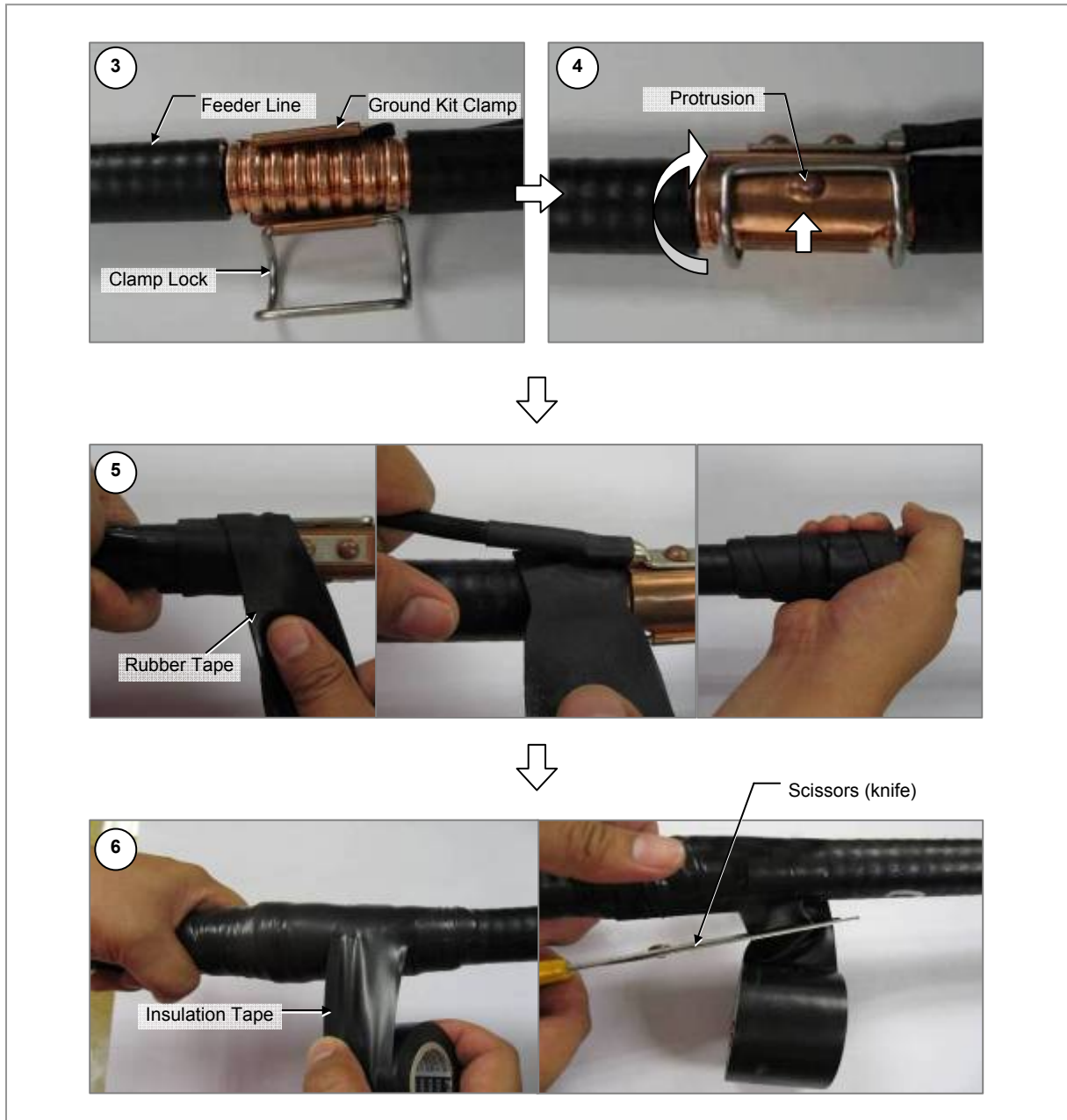
- 1 Remove about 55 mm of the sheath of cable when the 2.17 in. (55 mm). feeder cable is used.
- 2 Open it by returning hook of the clamp fixing for Ground kit in the left direction.

Figure 69. Feeder Cable Grounding (2)



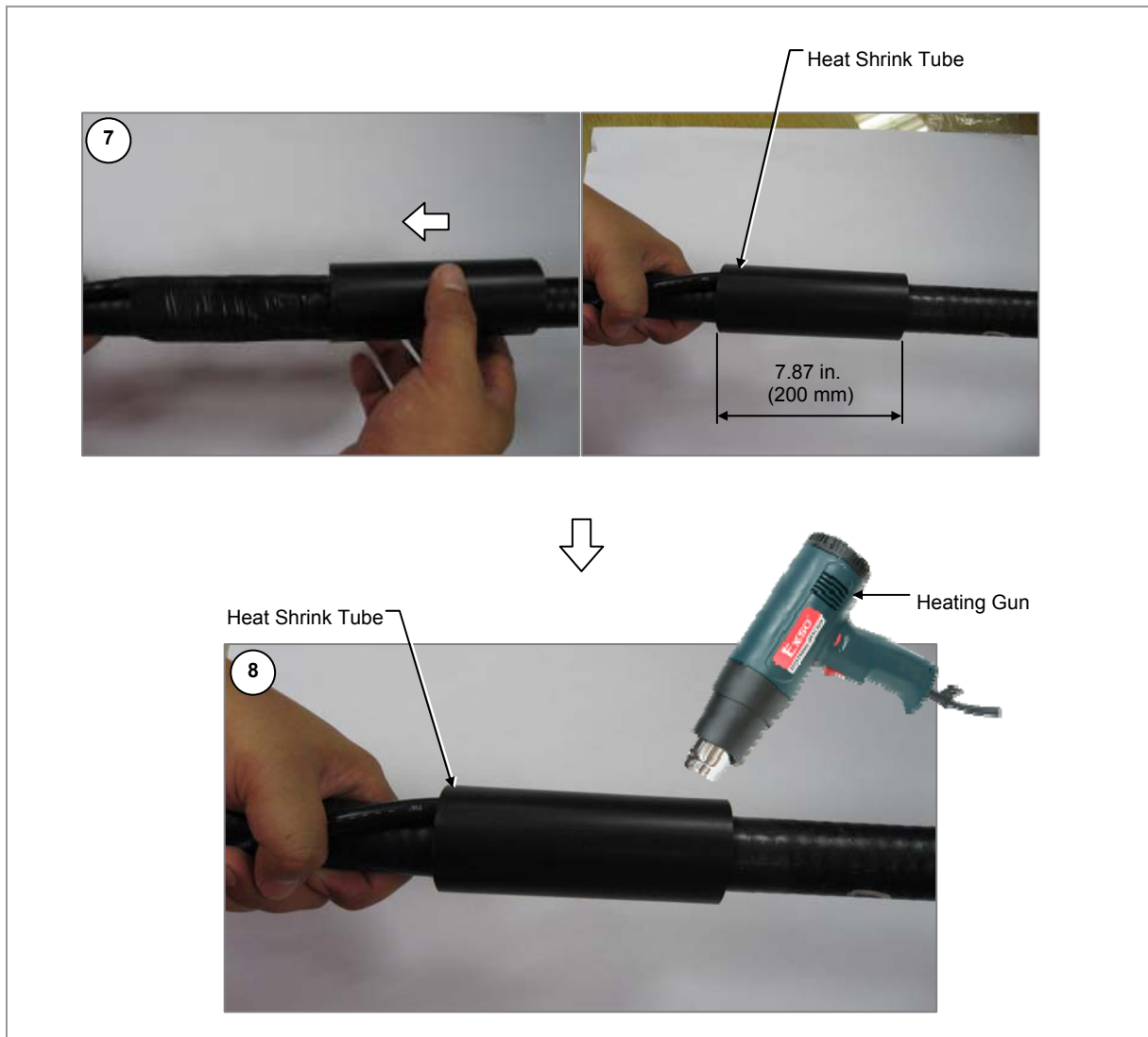
- 3 Insert the ground kit clamp into the place from which the feeder line sheath is removed.
- 4 Pull the clamp lock to the upward so that the lock can be hung on the global protrusion area on the side.
- 5 Overlap the exposed part of the ground kit clamp using rubber tape (Keep a distance as the half size of rubber tape) and press it with your hands lightly to make rubber tape adhere well.
- 6 Wrap the part where the rubber tape is attached using insulation tape two times or more. When cutting off the tape, cut it off neatly using a cutting device such as scissors or a knife.

Figure 70. Feeder Cable Grounding (3)



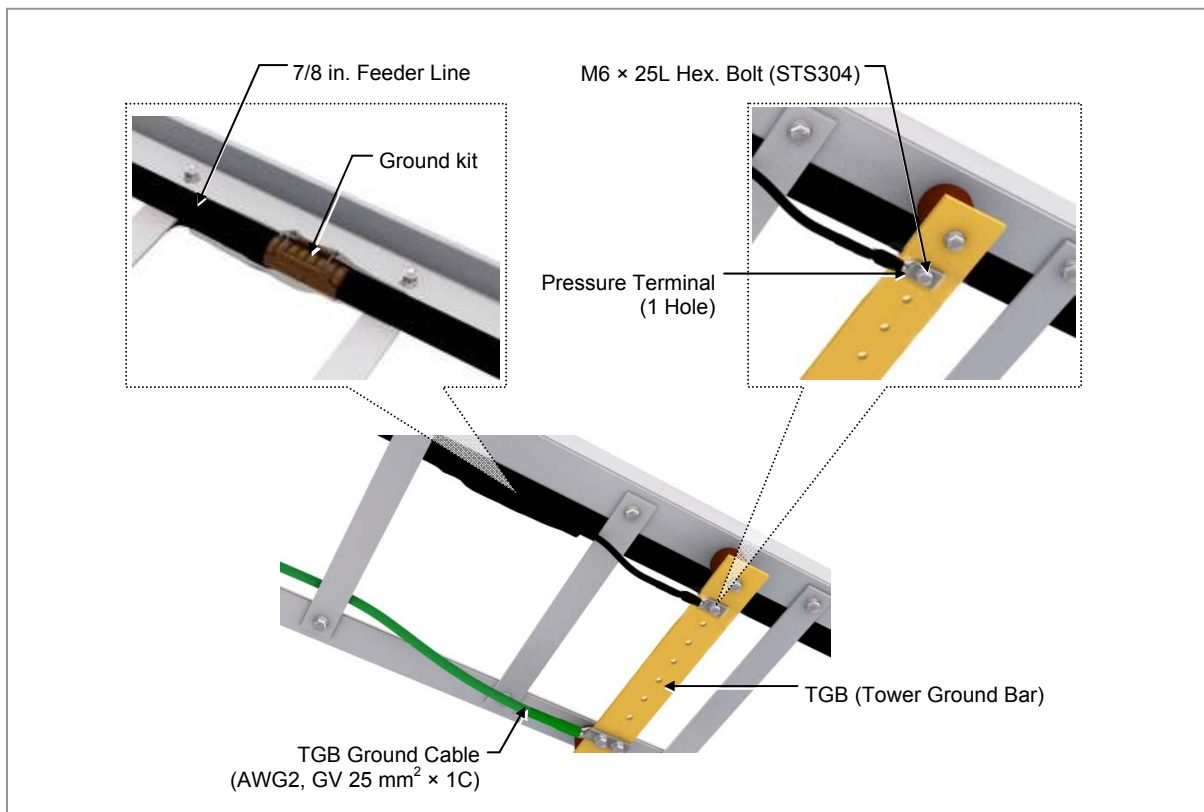
- 7 Align the heat shrink tube, inserted when installing the feeder line, into the fixing part of the ground kit.
 - o Heat shrink tube: Φ 1.65 in., 7.87 in (Φ 42 mm, 200 mm)
- 8 Shrink the heat shrink tube [jelly type, 7.87 in. (200 mm)] by heating gun.

Figure 71. Feeder Cable Grounding (4)



- 9 After the ground kit has been installed to the feeder line, attach the pressure terminal (1 hole) of the ground cable connected to the ground kit to the TGB.
- 10 When attaching the pressure terminal, use M6 × 25L hex. Bolts.

Figure 72. Feeder Cable Grounding (5)



The specifications, clamp, and pressure terminal type of the ground kit and TGB differ depending on manufacturers. Make sure to check the specifications of the ground kit and TGB, and identify the installation method before installing it.

Table 25. TGB Installation Example

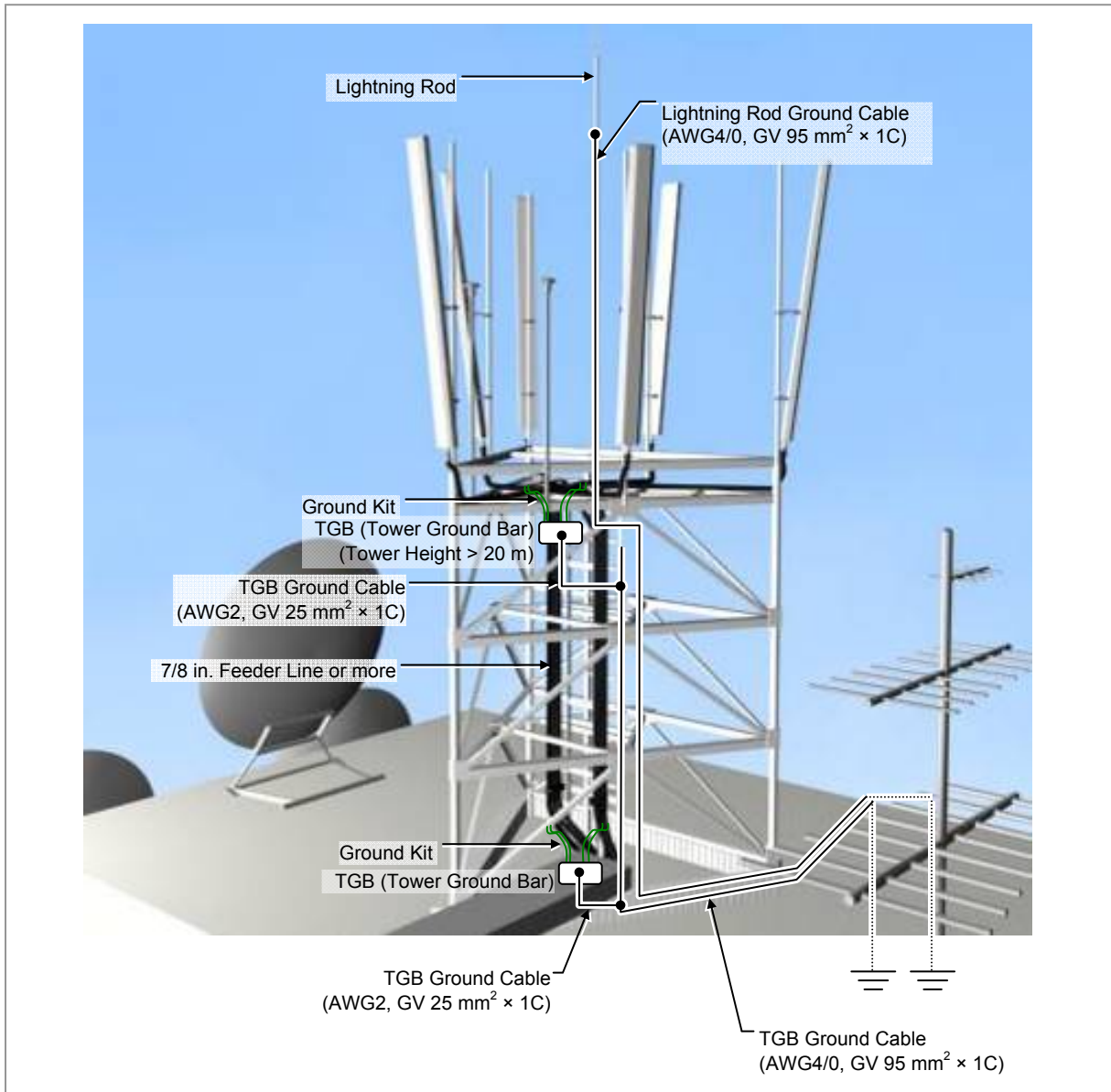
Category	Description
TGB Usage	Earth terminal board for feeder cable for grounding in using the feeder cable of more than 7/8 in.
TGB Location	Lower section of cable rack in feeder cable duck <ul style="list-style-type: none"> • less than 65.62 ft (20 m): 1 (Ex. steel tower lower section) • more than 65.62 ft (20 m): 2 (Ex. steel tower lower and upper section)
Material	Pure copper
Installation Method	Using the insulator to separate from the steel tower electrically
Connection Method	Extract the AWG2, GV 25 mm ² ground cable to the direction of the floor and weld it to the tower's ground cable.

Tower Ground Construction

- 1** Install a Tower Ground Bar (TGB) that will be used to ground a feeder cable onto the tower.

If the height of the tower is more than 65.62 ft (20 m), two or more TGBs should be installed (onto the lower and upper sections of the tower). If the tower is 65.62 ft (20 m) or less, one TGB should be installed. Since the TGB installation location and the number of TGBs to be installed can differ depending on the system environment and provider's standards, consult your service provider.
- 2** Each TGB should be grounded and separated from other grounds. If there is an existing ground bar or ground cable for TGB, install the TGB by branching from it using a ground cable (AWG2, GV 25 mm² × 1C) ground cable.
- 3** Fasten the Ground Kit (feeder cable grounding assembly) to the TGB ground terminal and the tower hole using the pressure terminal hole attached at the end of the ground kit's ground cable.

Figure 73. Connecting the Tower Ground Cable



Appendix D Assembling connector

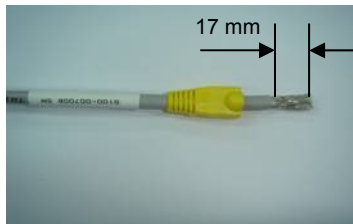
RJ-45 (Shield type)

▶ To assemble the RJ-45 connector (Shield Type):

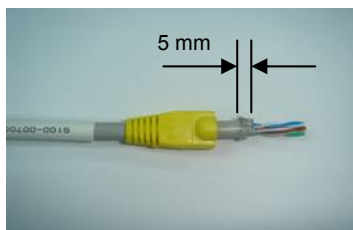
- 1 Prepare work tools and materials: clammer, marking tube, connector cap, and RJ-45 modular plug.



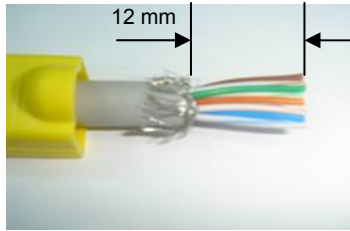
- 2 Fit the marking tube and connector cap on the RJ-45 cable.
- 3 Remove the cable sheath 0.67 in. (17 mm) from the end of the cable.



- 4 Push the aluminum shield backward.
- 5 Cut the shield leaving 0.2 in. (5 mm).



- 6 Arrange the inner cables in reference to the pin map.
- 7 Cut the inner cables to 0.47 in. (12 mm) long.



- 8 Insert the inner cables completely into the RJ-45 modular plug. Make sure that the shield does not get in the RJ-45 modular plug.



- 9 Compress the plug using the clumper.
- 10 Push the connector cap to the connector.



- 11 Make sure proper assembly using the LAN tester after completion of the connector assembly.
(The pin-map and checking the assembly may vary depending on the cable usage.)



Ex) LAN Tester

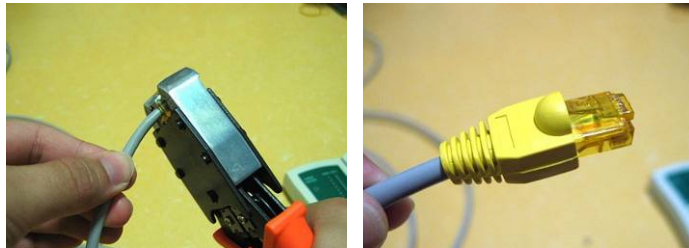
RJ-45 (Normal type)

▶ To assemble the RJ-45 connector (Normal Type):

- 1 Prepare work tools and materials: clammer, connector cap, and RJ-45 modular plug.



- 2 Fit the connector cap on the RJ-45 cable.
- 3 Remove the cable sheath 0.67 in. (17 mm) from the end of the cable.
- 4 Arrange the inner cables in reference to the pin map.
- 5 Cut the inner cables to 0.47 in. (12 mm) long.
- 6 Insert the inner cables completely into the RJ-45 modular plug.
- 7 Compress the plug using the clammer.
- 8 Push the connector cap to the connector.



- 9 Make sure proper assembly using the LAN tester after completion of the connector assembly.
(The pin-map and checking the assembly may vary depending on the cable usage.)

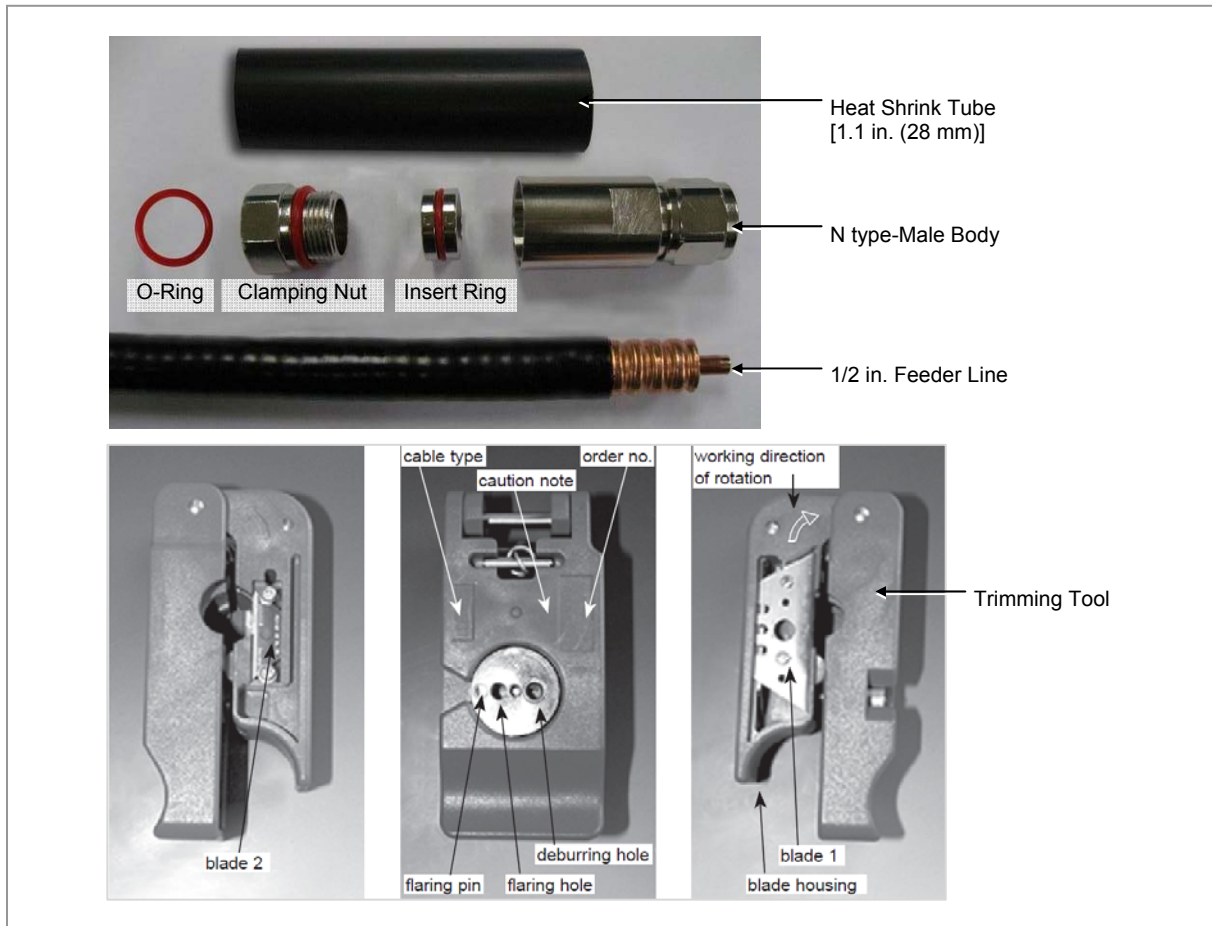


Ex) LAN Tester

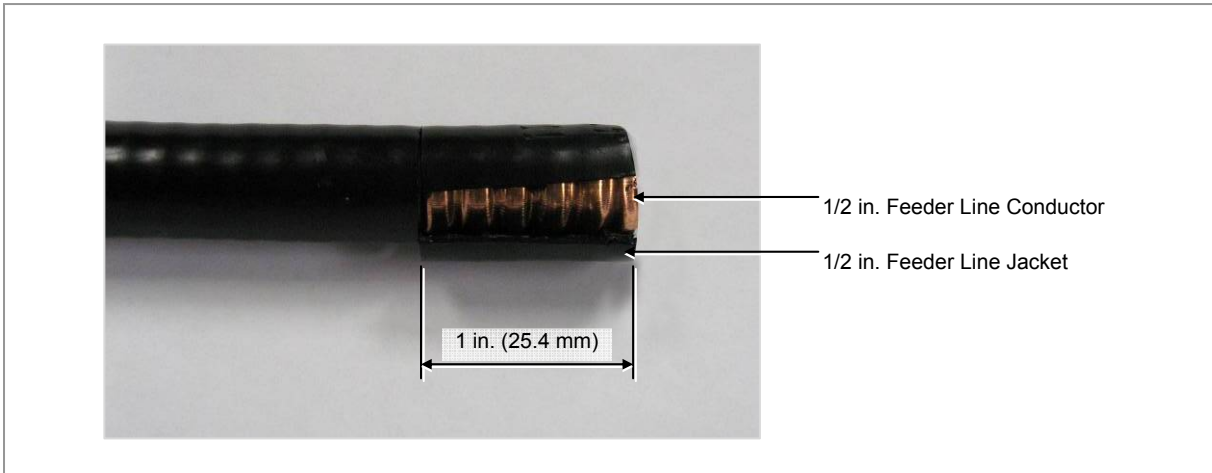
N type-male (1/2 in. feeder line)

Below is the method for assembling the N-type-male connector to the 1/2 in. feeder line.

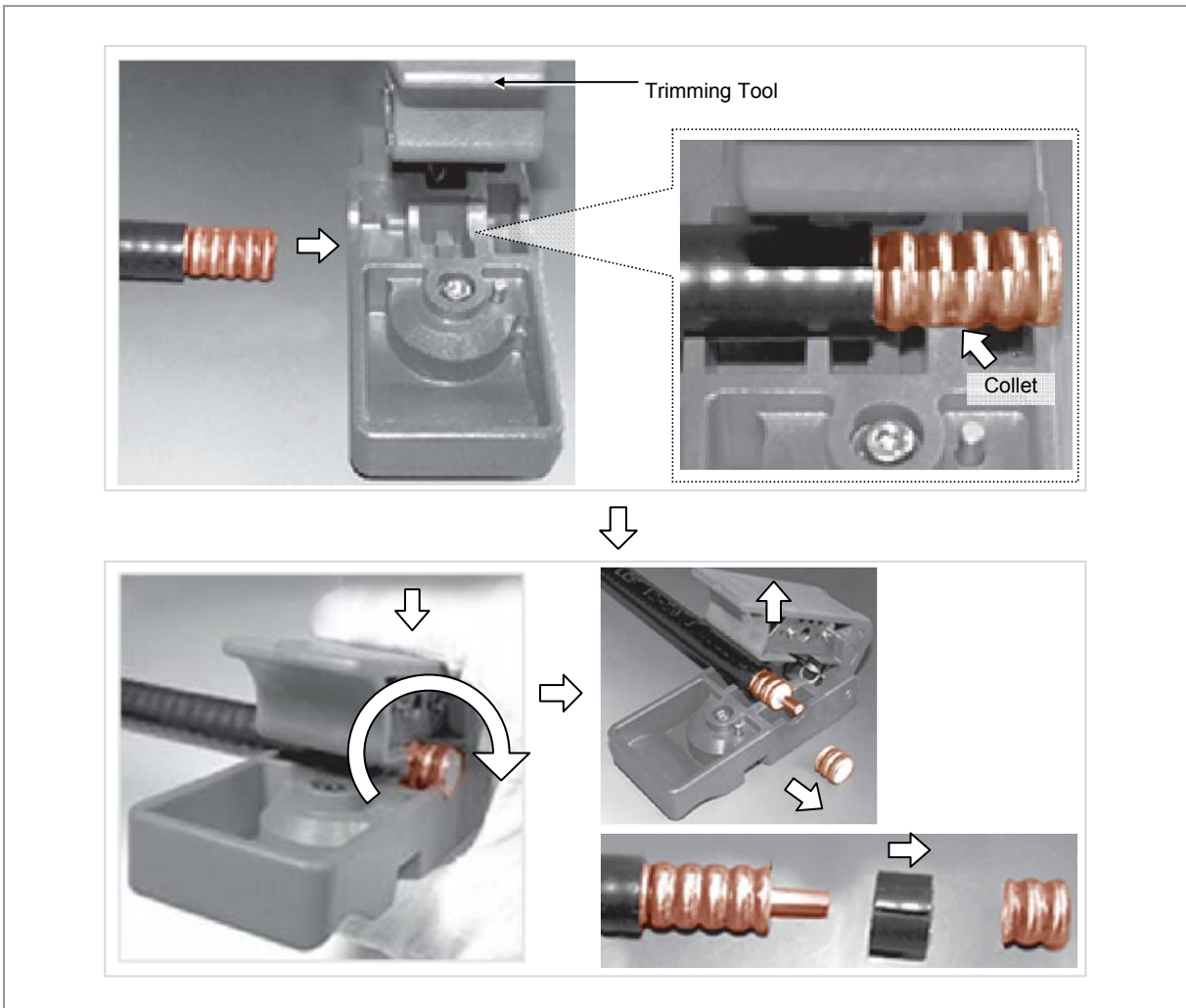
- 1 The components of the N type-male are an N type-male body, an insert ring, a clamp nut, O-ring, and a heat shrink tube, and it is assembled using the wire stripper, trimming tool, spanner, etc.



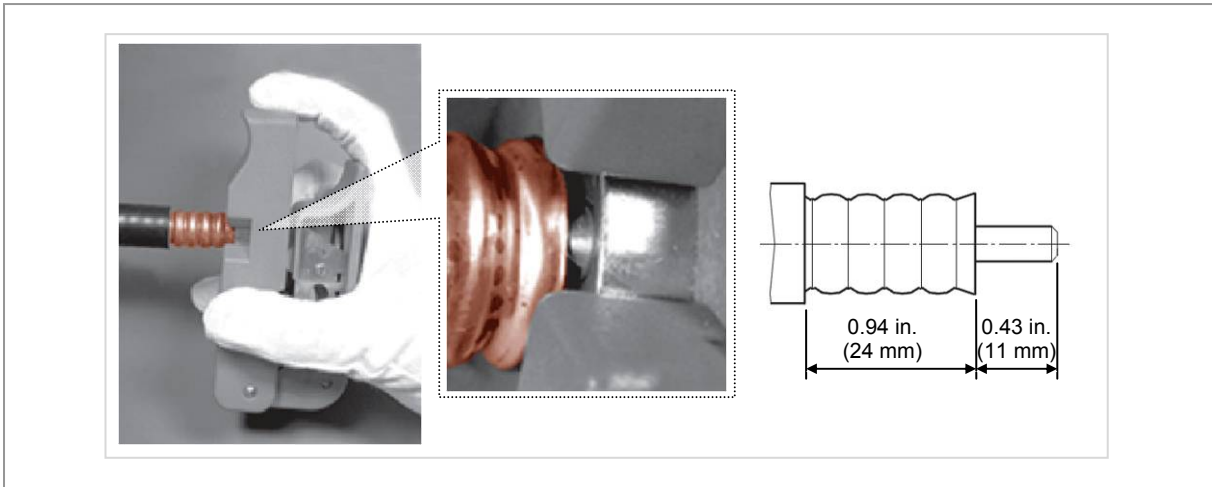
- 2 Using a stripping tool or a knife, strip the 1/2 in. feeder line by 1 in. (25.4 mm) from the end, as shown in the figure below.



- 3 Remove the end 0.43 in. (11 mm) of the external conductor using a trimming tool.



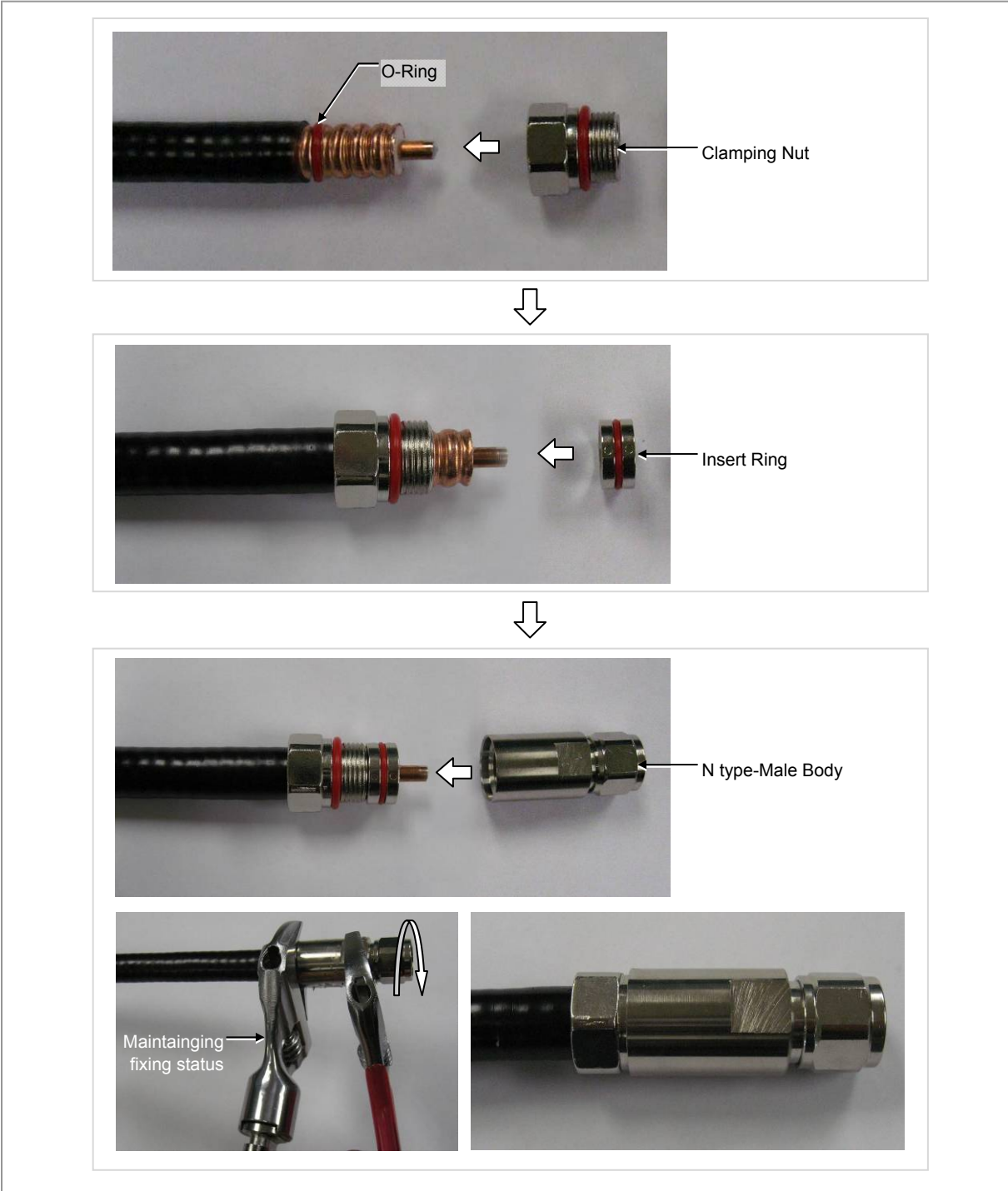
- 4 Insert the internal conductor into the deburring hole at the bottom of the trimming tool to trim it.



- 5 Insert the o-ring, clamping nut, insert ring and N type-male body to the stripped 1/2 in. feeder line in this order.
- 6 Tighten the clamping nut and N type-male body inserted into the 1/2 in. feeder line firmly using a spanner.

The recommended torque for tightening the clamping nut and N type-male body is 306~510 lbf·ft

(30~50 N.m). (Note that it should only be fastened by rotating the clamping nut with the external body in a fixed and stable position.)

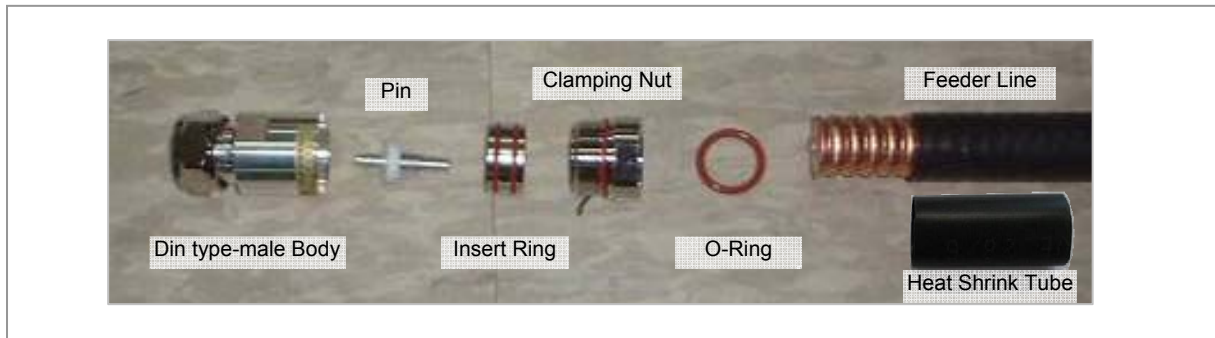


The shape, tool and assembly method may differ depending on the connector type and manufacturer. Make sure to check the user manual provided by the manufacturer before assembling.

Din type-male (1/2 in. Feeder Line)

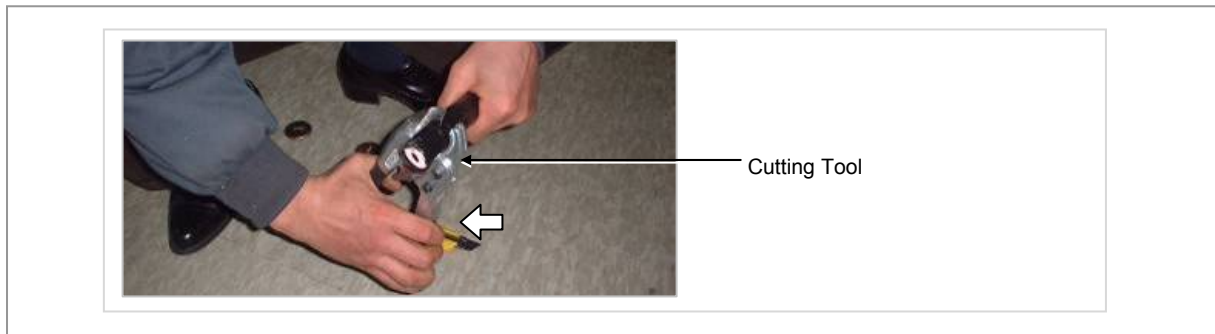
Below is the method for assembling the Din type-male connector to the 1/2 in. feeder line.

- 1 The components of the Din type-male are an Din type-male body, a pin , an insert ring, a clamp nut, o-ring and a heat shrink tube, and it is assembled using the wire stripper, trimming tool, wrench, etc.

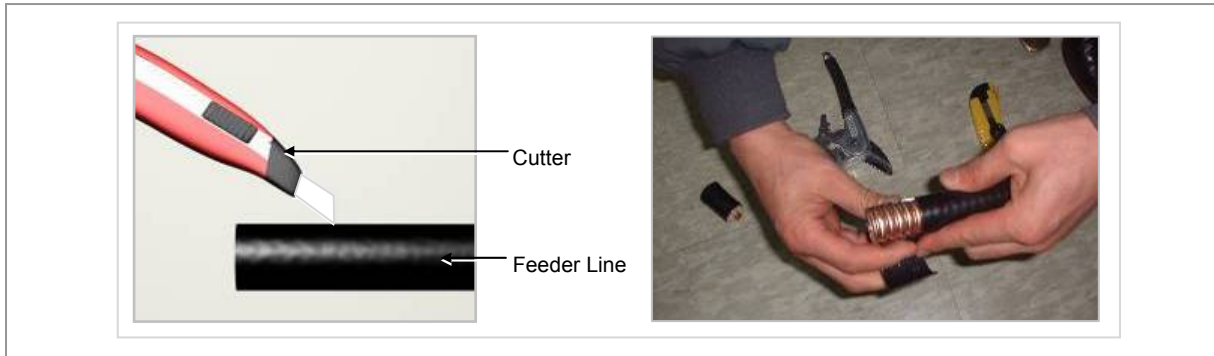


- 2 Straighten the cable, then, using a suitable tool, strip it to the connector's wire strip length.

When cutting the sheath, hold the cable firmly with one hand and cut the cable pulling the cutting tool inwards with the other hand. Gently rotate the tool several times (do not pull it too hard), so that the internal copper line is not damaged.



- 3 Using a cutter, cut the sheath from the stripped edge to the end of the cable and completely strip the sheath.

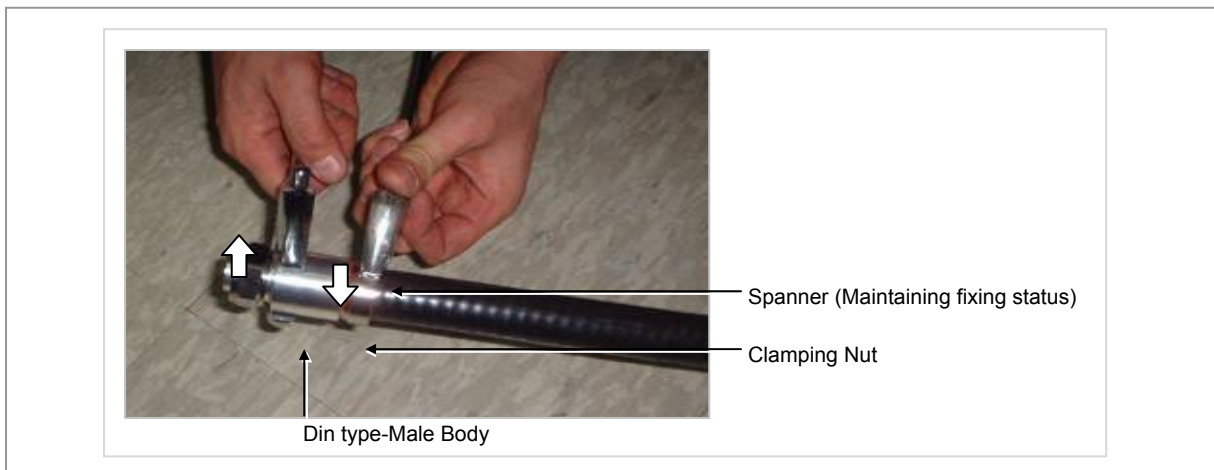


- 4 Insert the O-ring, clamping nut, insert ring, pin and Din type-male body into the stripped feeder line in this order.



- 5 Tighten firmly the clamping nut and Din type-male body inserted to the 1/2 in. feeder line using a wrench.

The recommended torque for tightening the clamping nut and Din type-male body is 306~510 lbf·ft (30~50 N.m). (Note that it should only be fastened by rotating the clamping nut with the external body in a fixed and stable position.)





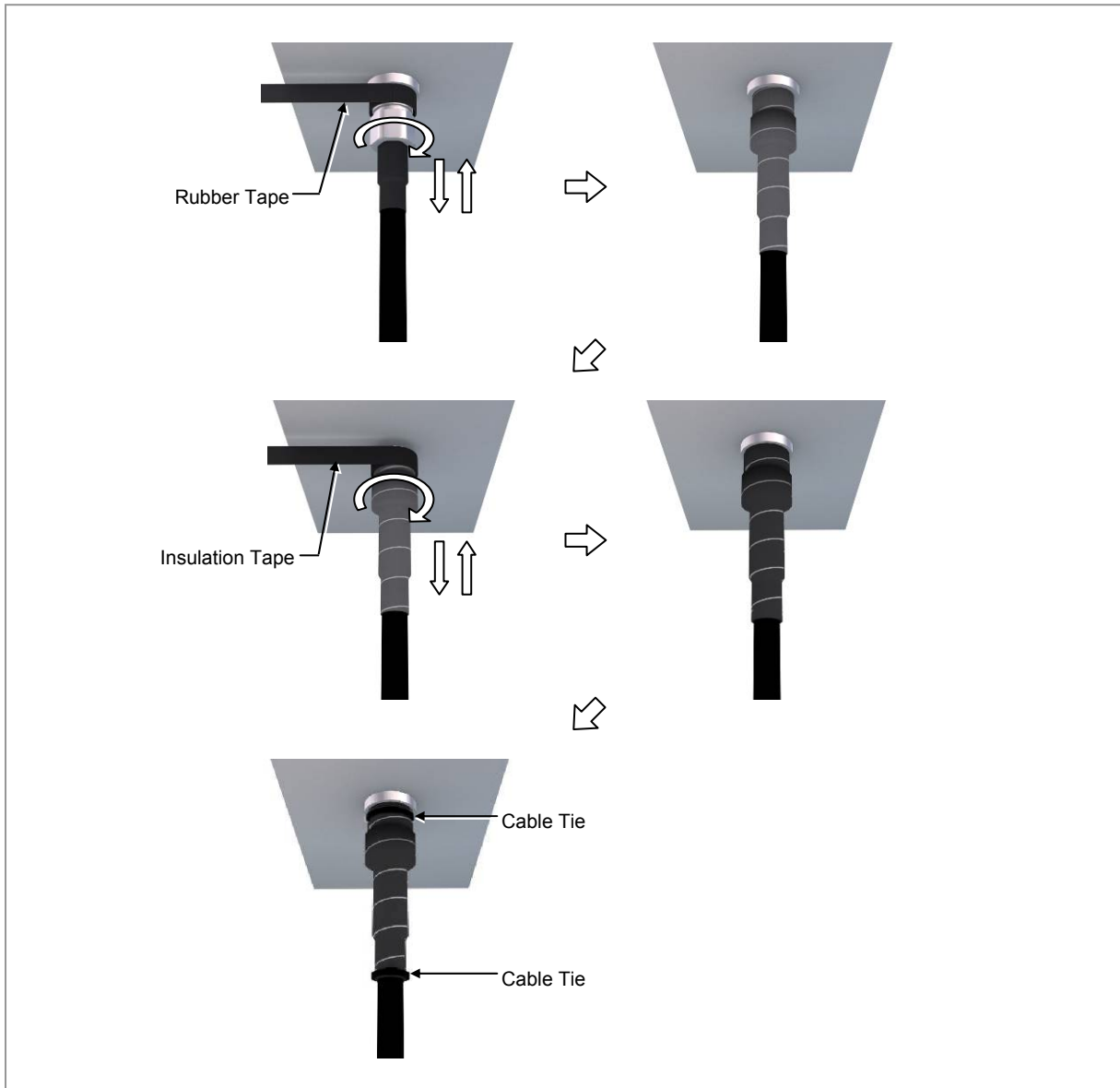
The shape, tool and assembly method may differ depending on the connector type and manufacturer. Make sure to check the user manual provided by the manufacturer before assembling.

Finishing connector connection with a tape

Finishing the connection between connectors with the tape (Insulation tape, rubber tape) at outdoor environment is as follows:

- 1** Overlap the exposed part of the connector connection part using rubber tape (Keep a distance as the half size of rubber tape) and press it with your hands lightly to make rubber tape adhere well.
- 2** Wrap the part where the rubber tape is attached using insulation tape two times or more. When cutting off the tape, cut it off neatly using a cutting device such as scissors or a knife.
- 3** Bind the end part of the insulation tape using cable tie to prevent slips.

Figure 74. Finishing connector connection with the tape



Appendix E Cleaning Optic Connector

Cleaning Optic Connector

When connecting optical cable to the system, performance of system can be decreased or fails can occur if core section of optical connector is dirty due to dust or foreign material. Therefore, worker should clean the optic connector before connecting optic cable to the system to prevent this phenomenon. This manual describes the method that cleans optic connector when using the IBC™ Brand cleaner.



Check whether there is dust or foreign material on the cutting section of the connector core before connecting the optic cable, and keep this 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 below.

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

Ex) 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-TheFibers (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



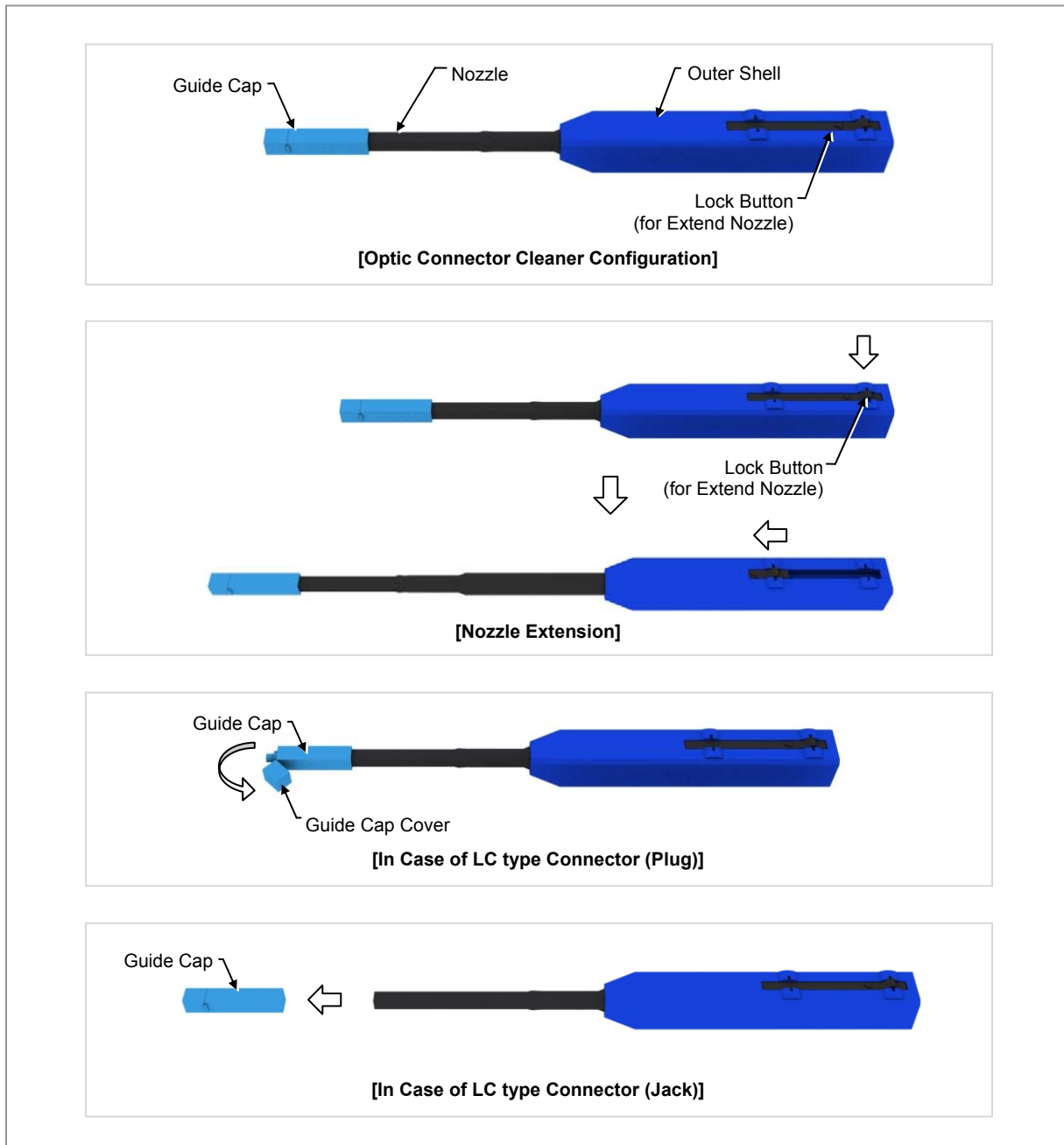
IBC™ Brand Cleaner

Method that uses IBC™ Brand Cleaner is as follows:

IBC™ brand type cleaner (P/N 9393)

Method that uses IBC™ Brand Cleaner (P/N 9393) for LC-LC and MU connector is as follows:

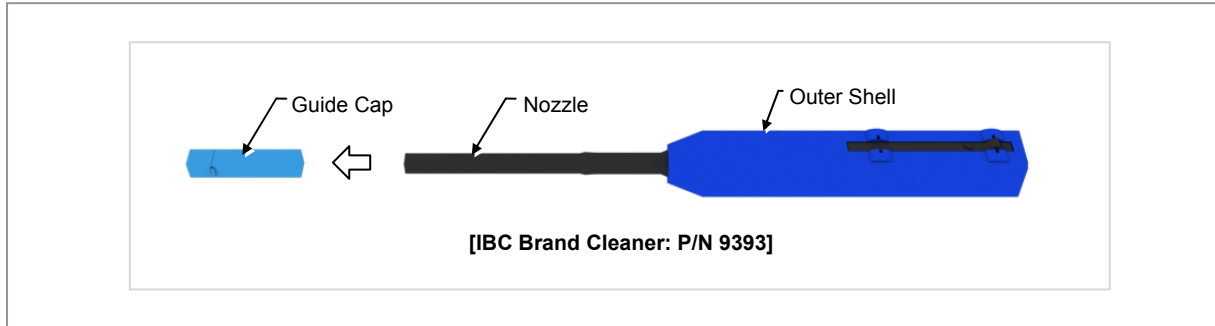
Figure 75. Optic Connector Cleaner (IBC™ Brand Type Cleaner: P/N 9393)



Optic Module Cleaning (LC type Jack)

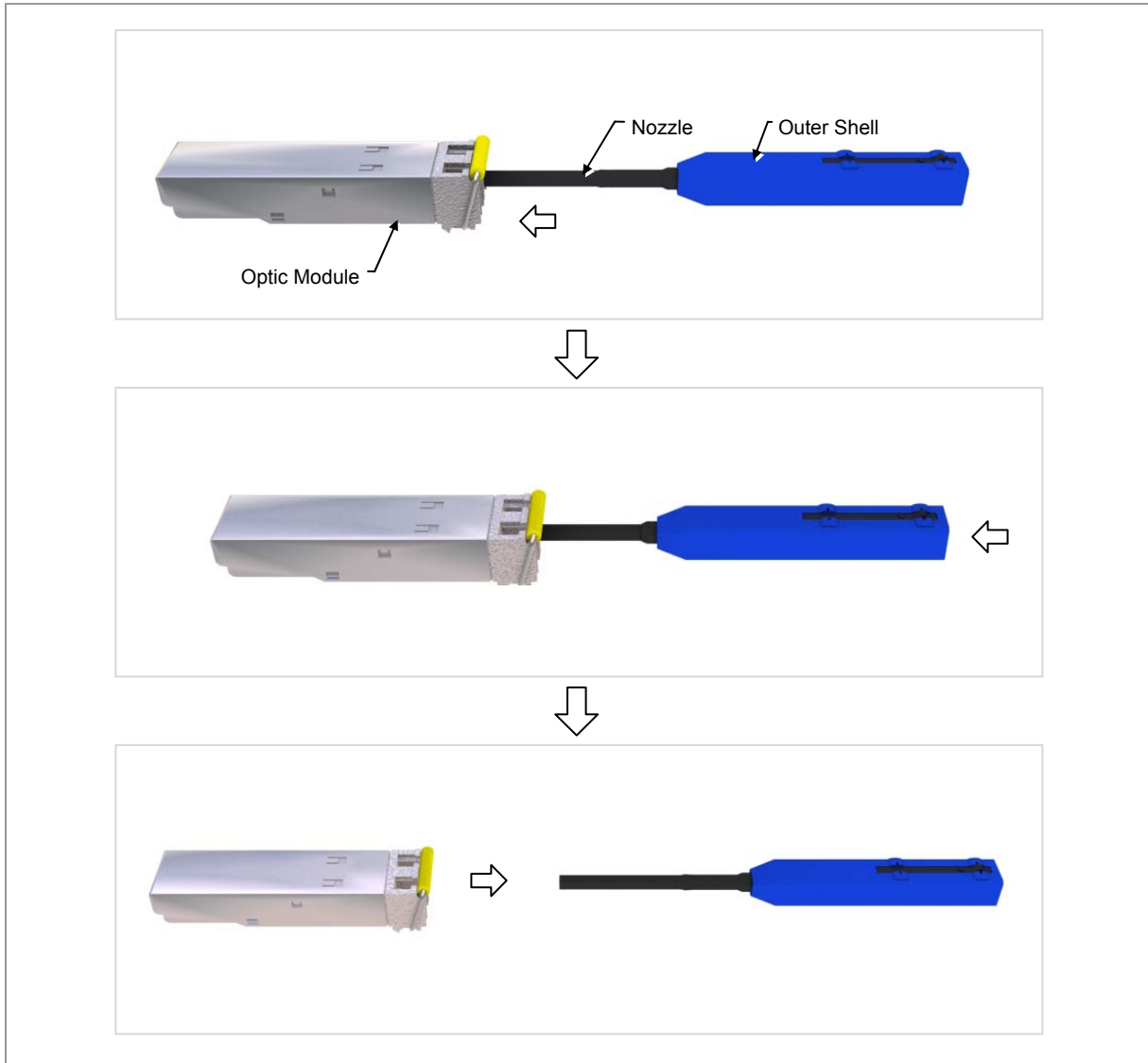
- 1 To clean the optic module, remove the guide cap from the cleaner (P/N: 9393).

Figure 76. Optic Module Cleaning (LC type Jack) (1)



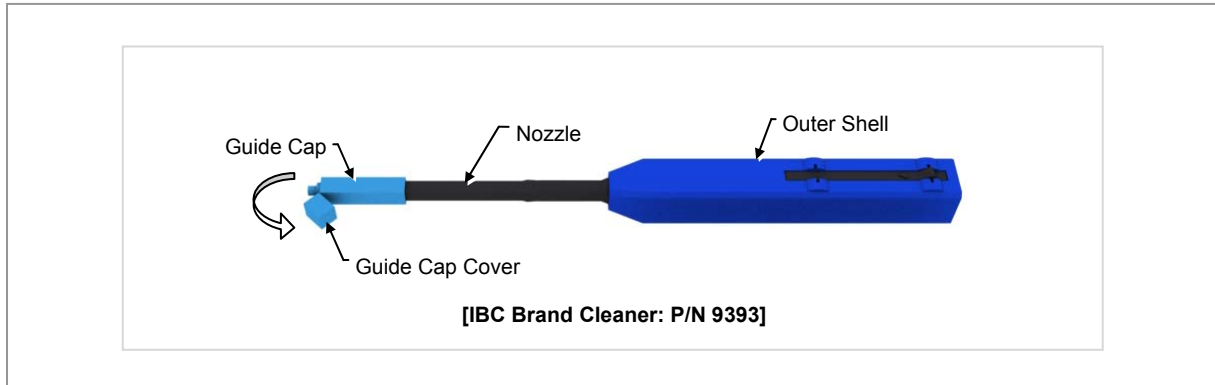
- 2 Insert a cleaner guide cap to every core of the optic module. Clean it by pushing the outer shell toward the nozzle until you hear the sound of the detergent being sprayed. (Repeat once or twice.)

Figure 77. Optic Module Cleaning (LC type Jack) (2)



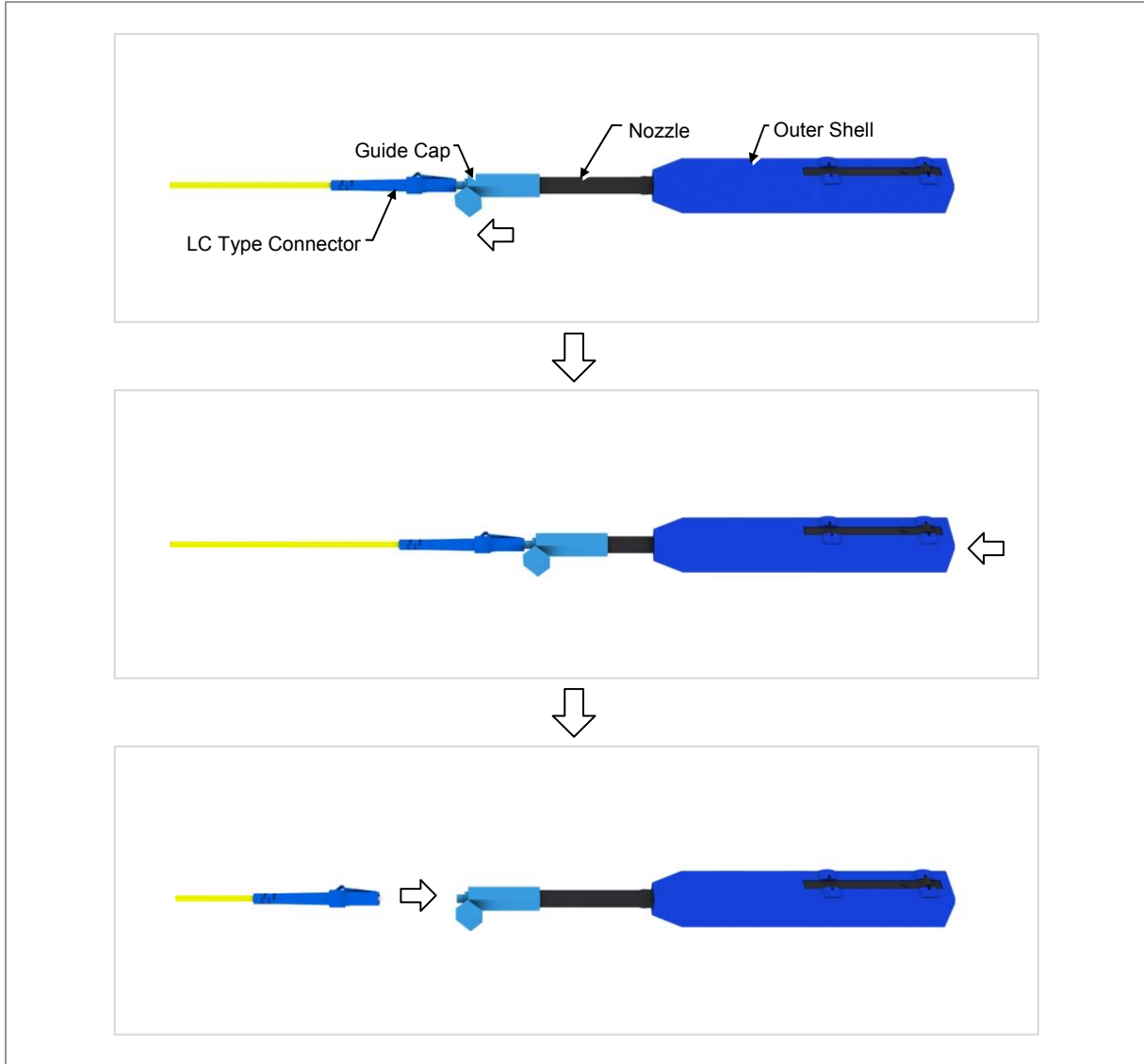
Optic Cable Connector Cleaning (LC type plug)

- 1 To clean the optic cable connector, open the guide cap cover from the cleaner (P/N: 9393).

Figure 78. Optic Cable Connector Cleaning (LC type plug) (1)

- 2 Insert a cleaner guide cap to every core of the optic cable connector. Clean it by pushing the outer shell toward the nozzle until you hear the sound of the detergent being sprayed. (Repeat once or twice.)

Figure 79. Optic Cable Connector Cleaning (LC type plug) (2)



Measuring the Optical Output and Connecting the Optic Connector

- 1 Check the optical output again using an optic power meter.
- 2 If the optical output measurement result meets the reference value, clean the connector again and connect it. 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.

Figure 80. Measuring the Optical Output and Connecting the Optic Connector

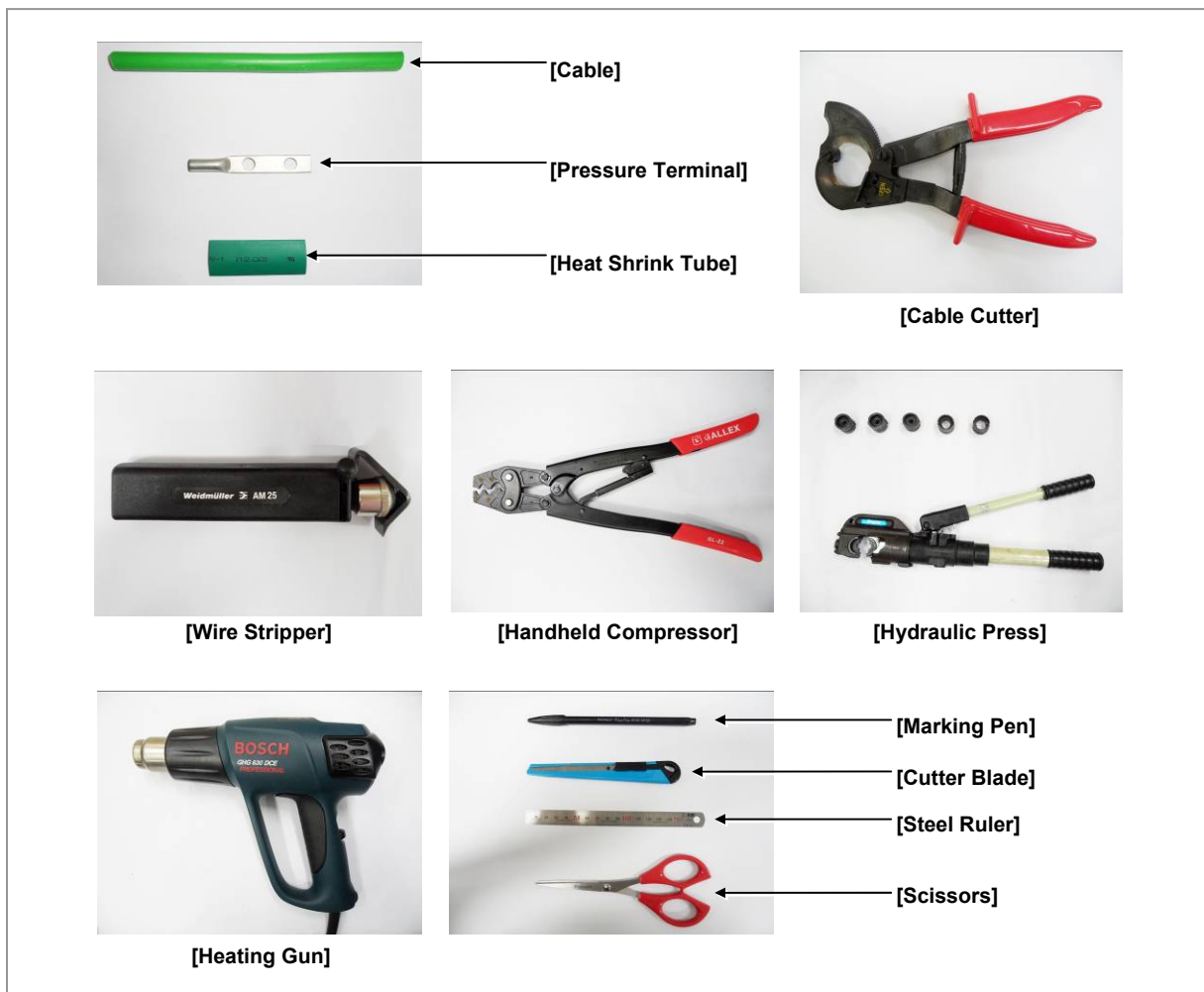


Appendix F Pressure Terminal Assembly

Preparations

The followings must be prepared to connect a pressure terminal to a cable.

Figure 81. Preparations



Pressure Reference Table

The pressure reference table used to assemble a pressure terminal to a cable is shown below.

Table 26. Pressure Reference Table for Pressure Terminal

Category	Copper tube length of a pressure terminal		Number of pressure points
	In.	mm	
Hand	0.43 in. or less	11 mm or less	1
Hand	0.47~0.59 in.	12~15 mm	2
Hand	0.63~0.91 in.	16~23 mm	3
Hand	0.94~1.26 in.	24~32 mm	4
Hand	1.3 in. or more	33 mm or more	5
Hydraulic	1.18 in. or less	30 mm or less	2
Hydraulic	1.22~1.85 in.	31~47 mm	3
Hydraulic	1.89~2.48 in.	48~63 mm	4
Hydraulic	2.52 in. or more	64 mm or more	5

Figure 82. Pressure Reference Drawing (Handheld Compressor)

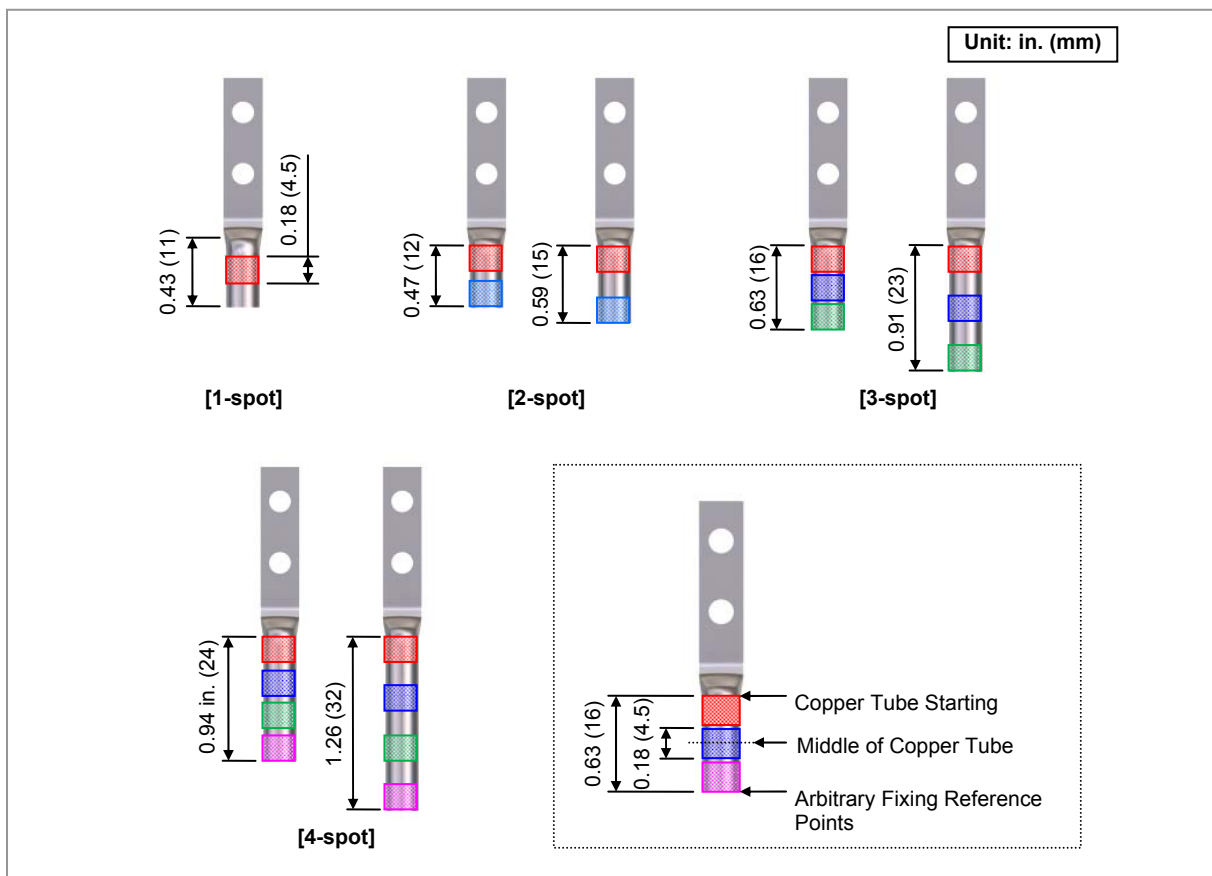


Figure 83. Pressure Reference Drawing (Hydraulic Press)

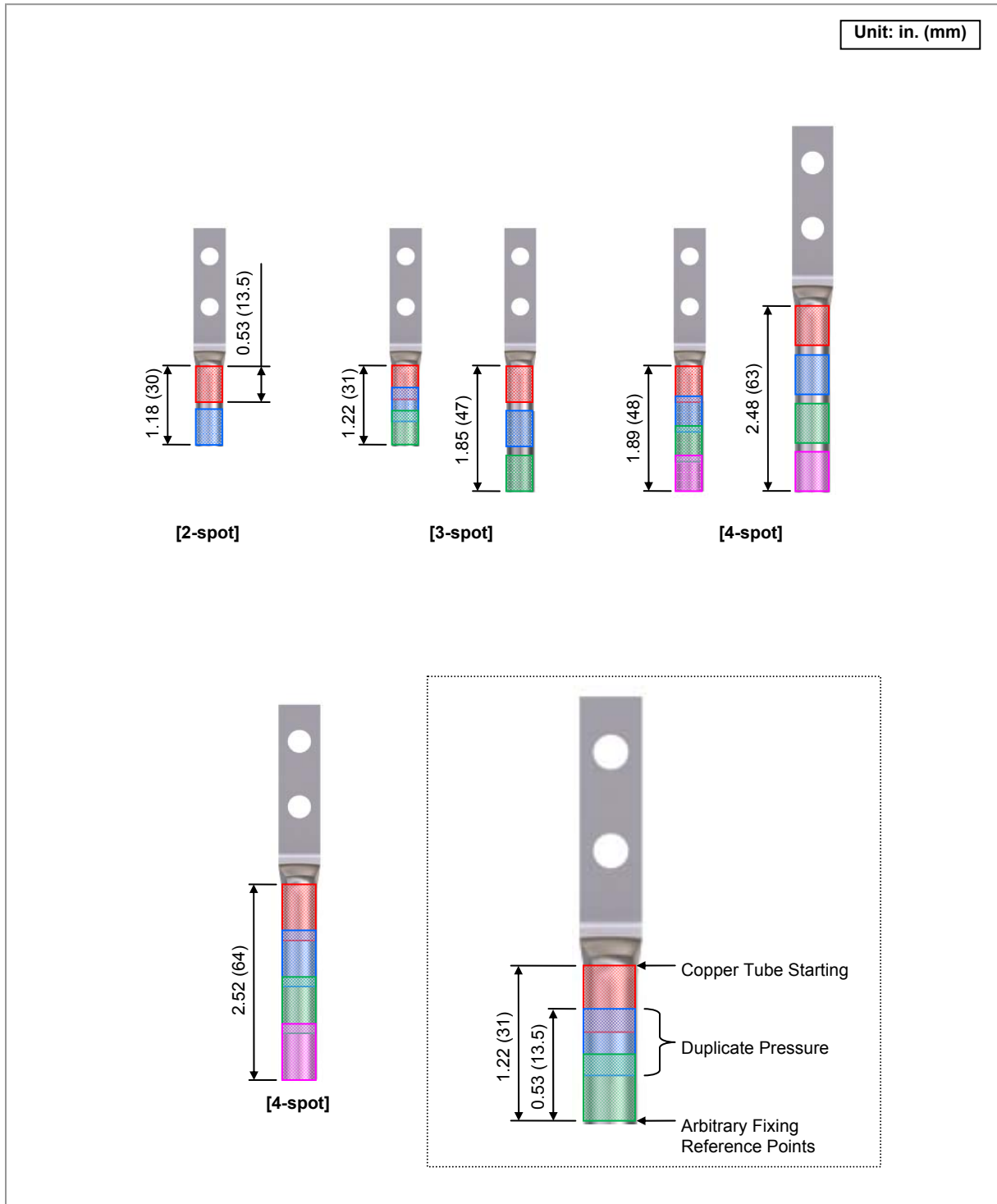


Table 27. Compressor Specifications per Cable Thickness

Cable Size		Press Size		
AWG	mm ²	Small Handheld Press	Large Handheld Press (AK-38, 100)	Hydraulic Press (IZUMI Hexagonal Dies)
12	2.5	2	X	X
10	4	2	X	X
8	6	5.5	X	X
6	10	8	8	X
4	16	14	14	16
2	25	22	22	25
1	35	38	38	35
1/0	50	X	60	50
3/0	70	X	80	70
4/0	95	X	100	95~300

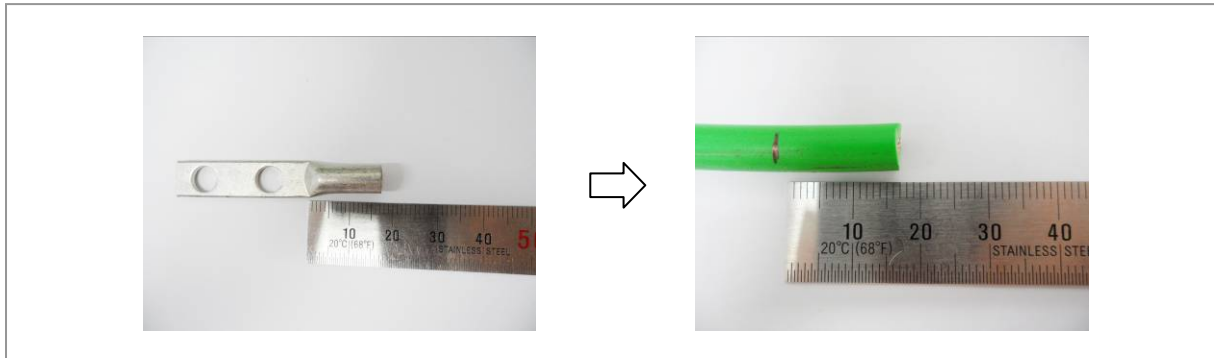
Assembling Pressure Terminal

The procedures for assembling a pressure terminal to a cable are as follows:

Strip the Cable Sheath

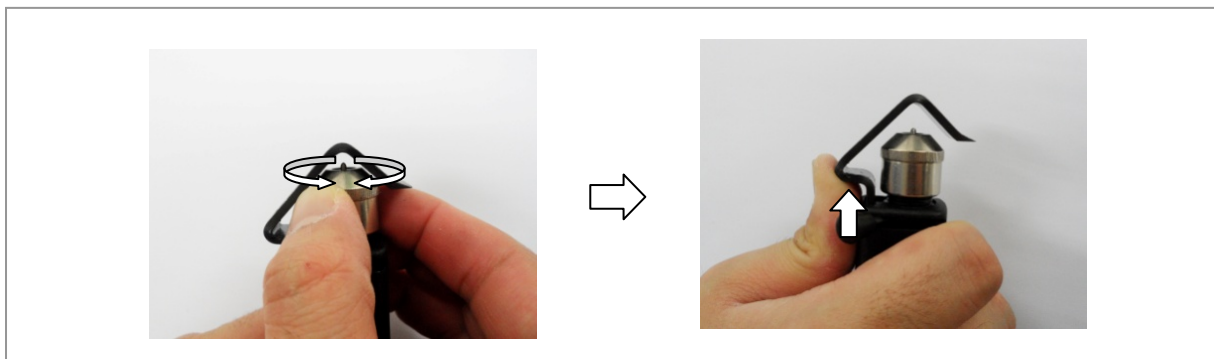
- 1 After checking the inside length of a pressure terminal, mark the cable.

Figure 84. Stripping Cable Sheath (1)



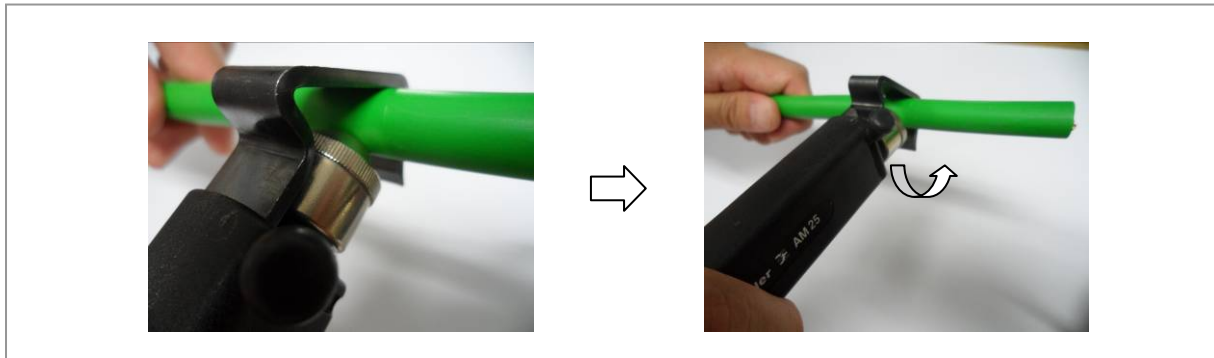
- 2 Adjust the length of a cutter blade according to the sheath thickness of the cable.
- 3 Push the clamp with a thumb according to the cable size to secure a space for the cable.

Figure 85. Stripping Cable Sheath (2)



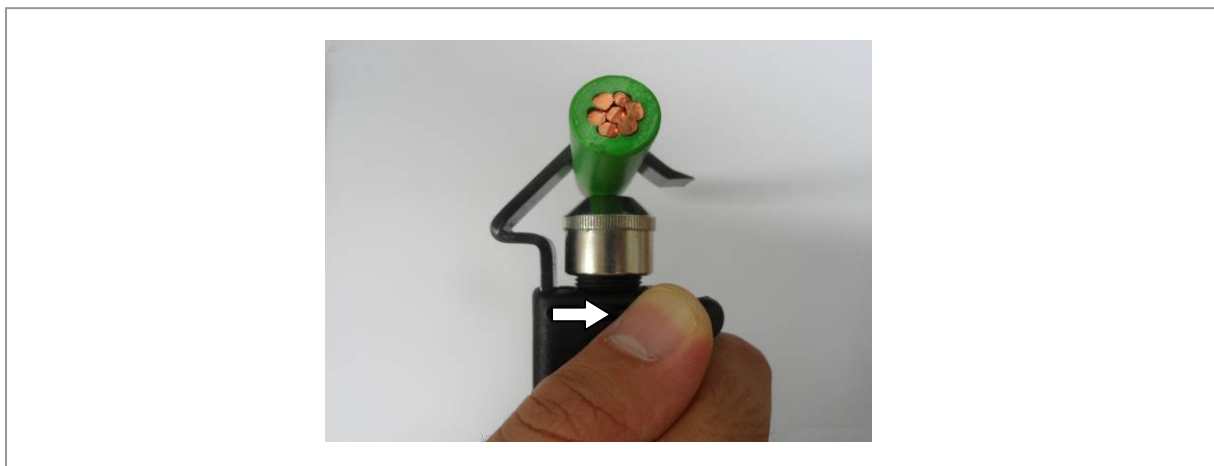
- 4 Put a cable into a clamp, locate a blade on a marking position, and push it into the sheath.
- 5 Align the stripper to be perpendicular to the cable and rotate it more than two laps.

Figure 86. Stripping Cable Sheath (3)



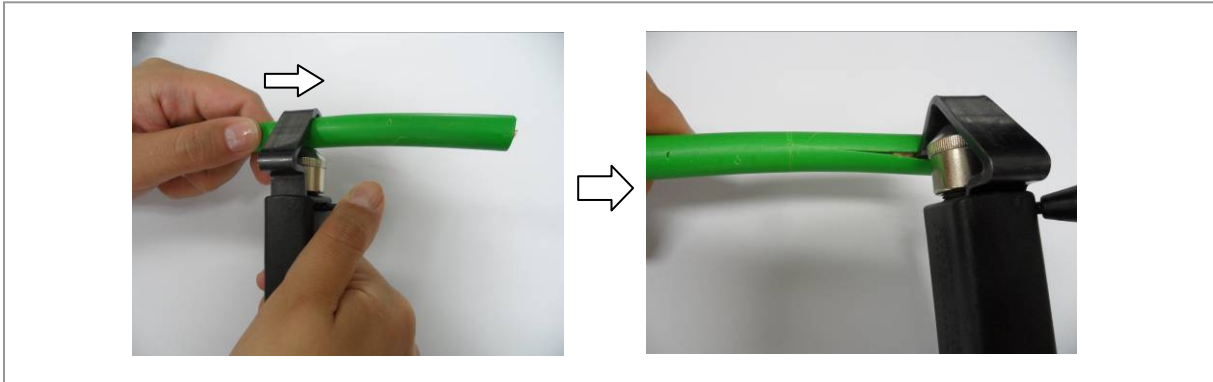
- 6 Push the lever of the stripper to the right to turn its blade at 90°.

Figure 87. Stripping Cable Sheath (4)



- 7 Move the stripper up to the end of cable while maintaining the stripper to be perpendicular to the cable.

Figure 88. Stripping Cable Sheath (5)



- 8 Remove the sheath.

Figure 89. Stripping Cable Sheath (6)





A wire stripper is used differently depending on its manufacturer or type. Therefore, refer to the user manual enclosed with the product.



The specifications and cautions of a wire stripper described in this manual are as follows:



- Vender: Weidmuller
- Model: Weidmuller-AM25 (Order No-9001080000)
- Specifications: For outer diameter 0.24-0.94 in. (6-24 mm) PVC clothing Up to 0.18 in. (4.5 mm) clothing cutting depth
- To prevent the cutter blade of a wire stripper from touching the cable conductor, adjust the length of cutter blade by checking the cable sheath thickness.
- Make sure that the cutter blade goes into the cable sheath completely.
- Rotate the wire stripper perpendicularly to the cable.

[X]



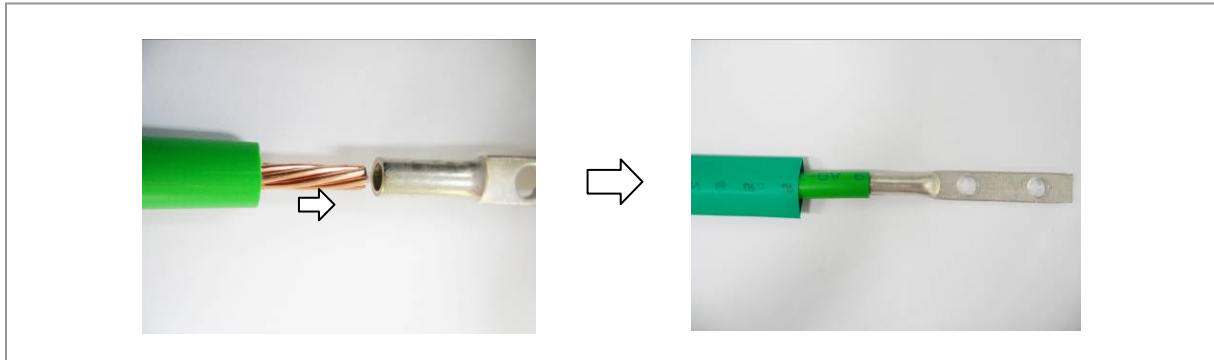
[O]



Fixing Pressure Terminal (Handheld Compressor)

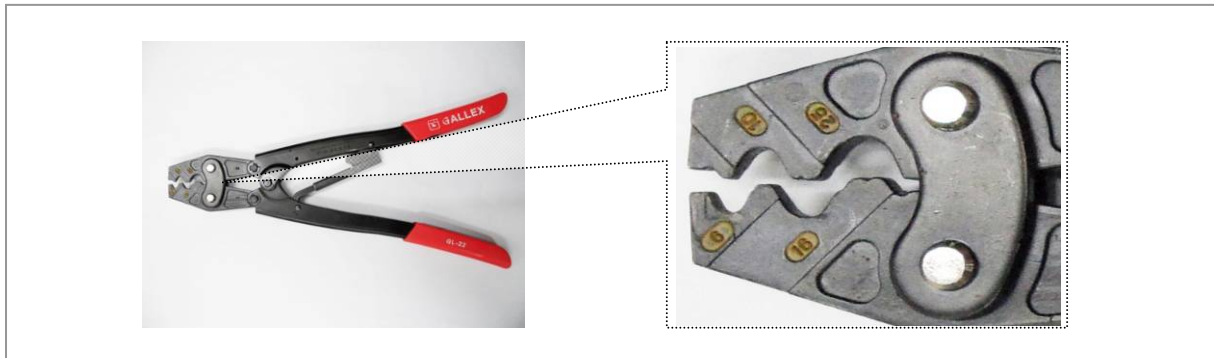
- 1 Insert the conductor of the cable with the sheath stripped to the internal end of pressure terminal.
For a ring type pressure terminal, push it in until the conduct comes out 0.04 in. (1 mm) from the end of the terminal.

Figure 90. Fixing Pressure Terminal_Handheld Compressor (1)



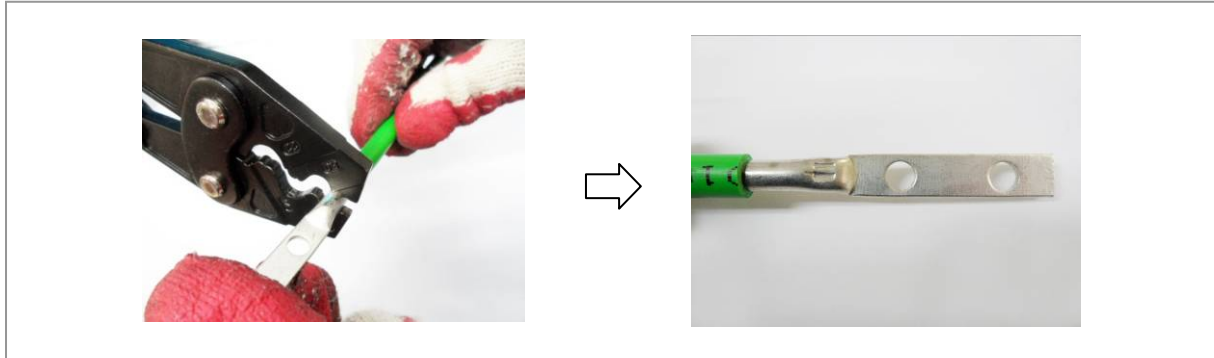
- 2 From the holes of handheld compressor, select one that fits to the pressure terminal.

Figure 91. Fixing Pressure Terminal_Handheld Compressor (2)



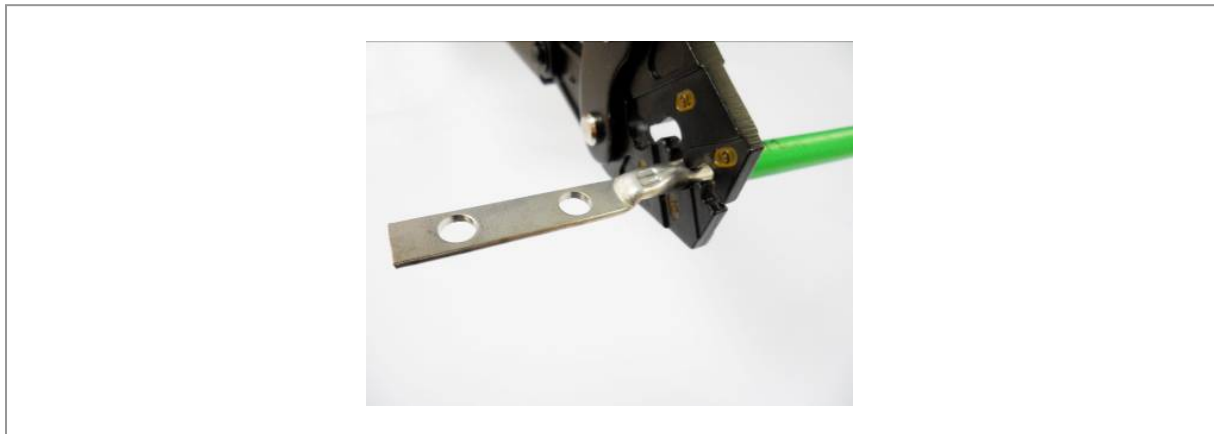
- 3 Insert the pressure terminal to the selected hole.
- 4 Fix the pressure terminal and cable temporarily so the position can be changed later by pressing the compressor.

Figure 92. Fixing Pressure Terminal_Handheld Compressor (3)



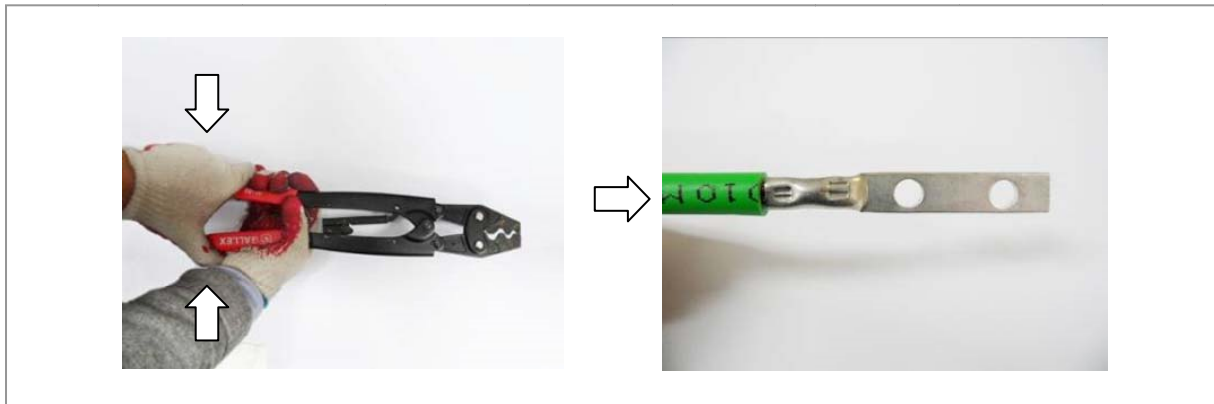
- 5 After complementary of the cable which is temporary fixed, align it to the hole and firmly compress the pressure terminal to secure fix it.

Figure 93. Fixing Pressure Terminal_Handheld Compressor (4)



- 6 Separate the pressure terminal from the handheld compressor. Press down the handle of compressor until a clicking sound is heard to be unlocked.

Figure 94. Fixing Pressure Terminal_Handheld Compressor (5)



A handheld compressor is used differently depending on its manufacturer or type. Therefore, refer to the user manual enclosed with the product.



The specifications and cautions of a handheld compressor described in this manual are as follows:

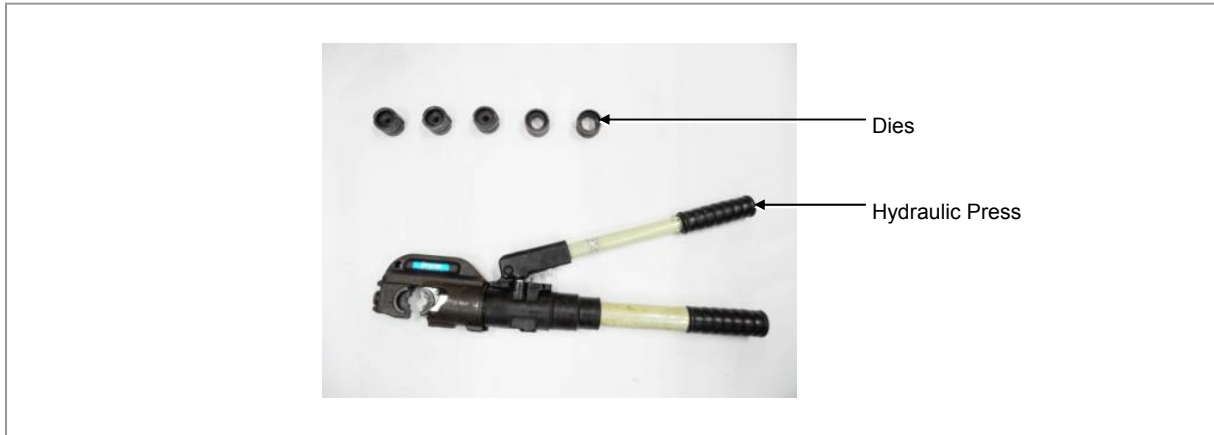


- Vender: GALLEX
- Model: GL-2045A-22
- Specification: 5.5 mm², 8 mm², 14 mm², 22 mm² (JIS), 6 mm², 10 mm², 16 mm², 25 mm² (DIN)

Fixing Pressure Terminal (Hydraulic Press)

- 1 Among the dies of the hydraulic press, select one that fits to the pressure terminal.

Figure 95. Fixing Pressure Terminal_Hydraulic Press (1)



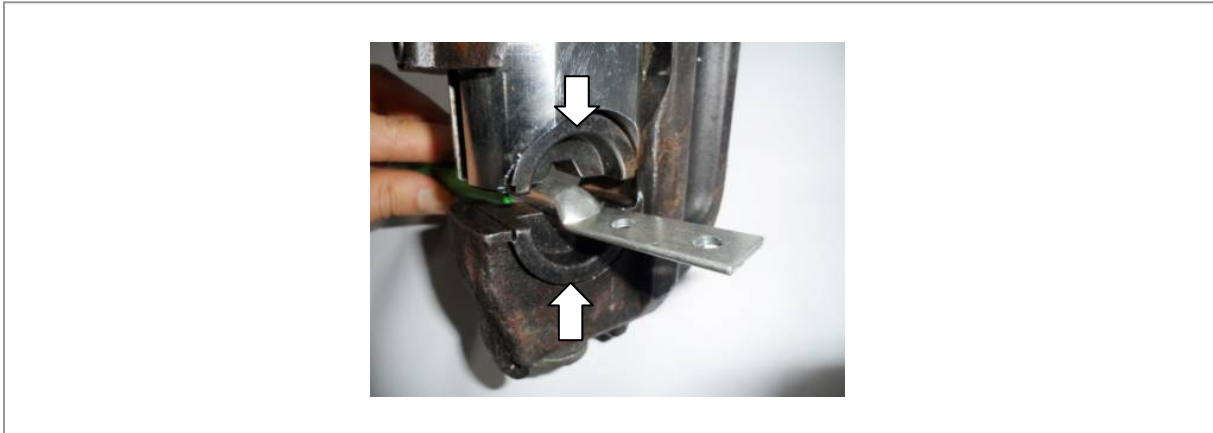
- 2 Assemble the dies to the pressing area of the compressor.

Figure 96. Fixing Pressure Terminal_Hydraulic Press (2)



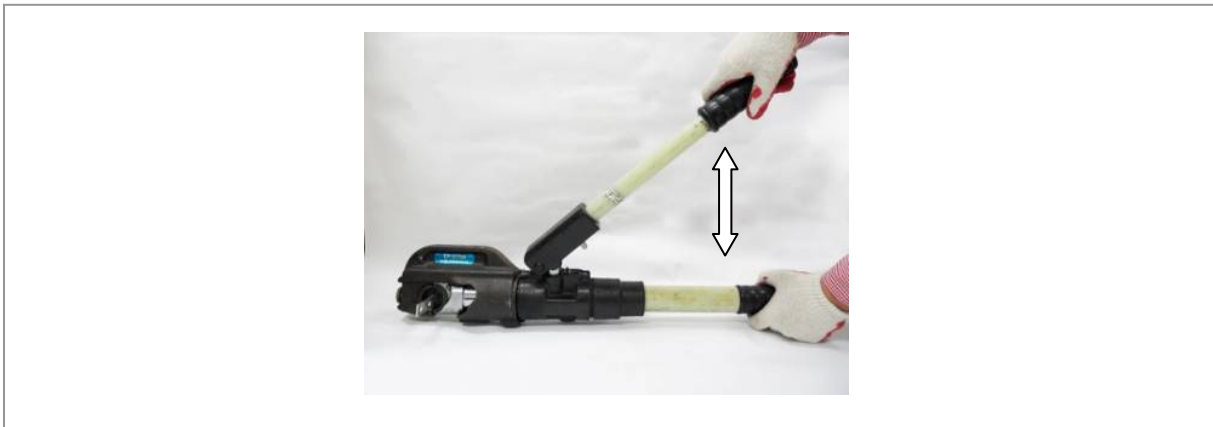
- 3 Insert the pressure terminal into the pressing area and fix it slightly by aligning it to the end of cable sheath.

Figure 97. Fixing Pressure Terminal_Hydraulic Press (3)



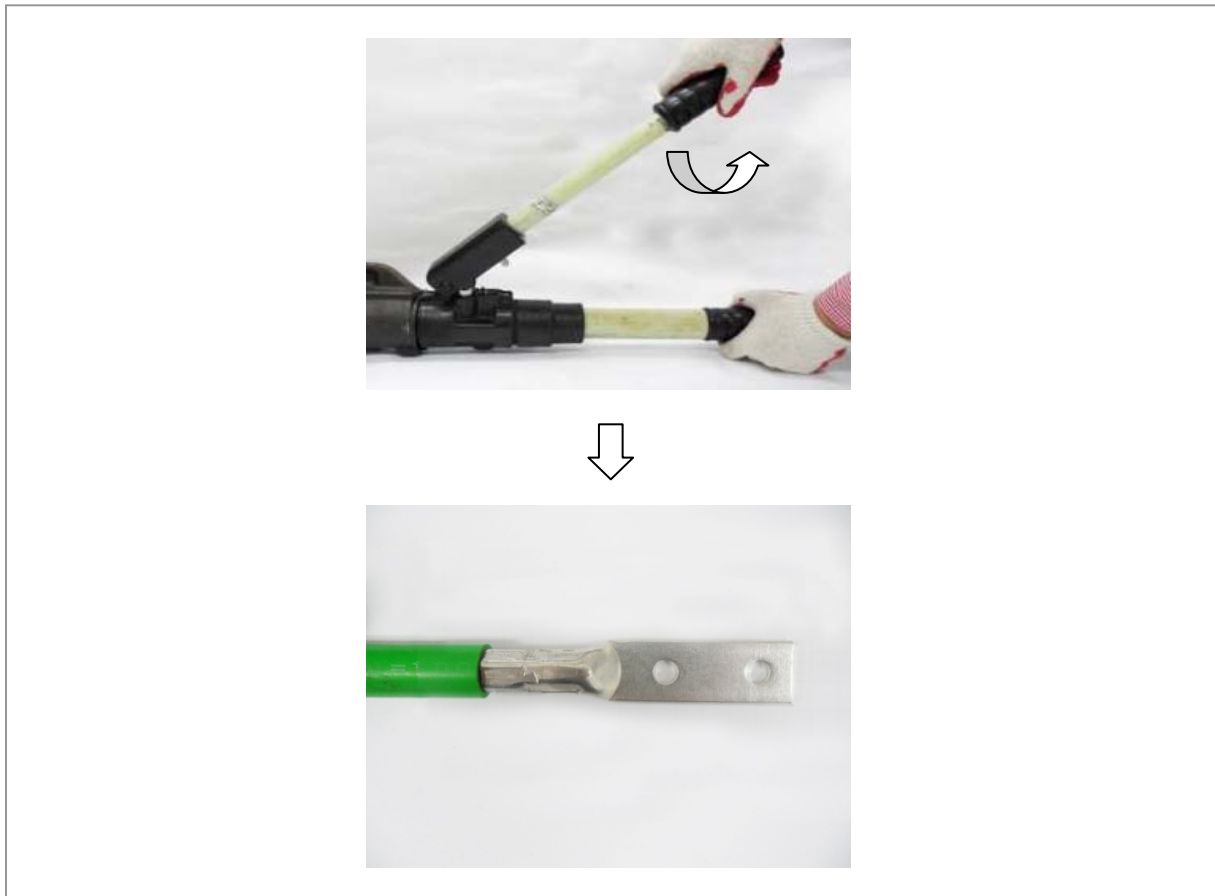
- 4 Move the compressor lever up and down to press the pressure terminal firmly.

Figure 98. Fixing Pressure Terminal_Hydraulic Press (4)



- 5 Turn the top compressing lever clockwise and then push it down. When the pressing area of compressor is loosened, remove the pressure terminal.

Figure 99. Fixing Pressure Terminal_Hydraulic Press (5)





A hydraulic press is used differently depending on its manufacturer or type. Therefore, refer to the user manual enclosed with the product.



The specifications and cautions of a hydraulic press described in this manual are as follows:

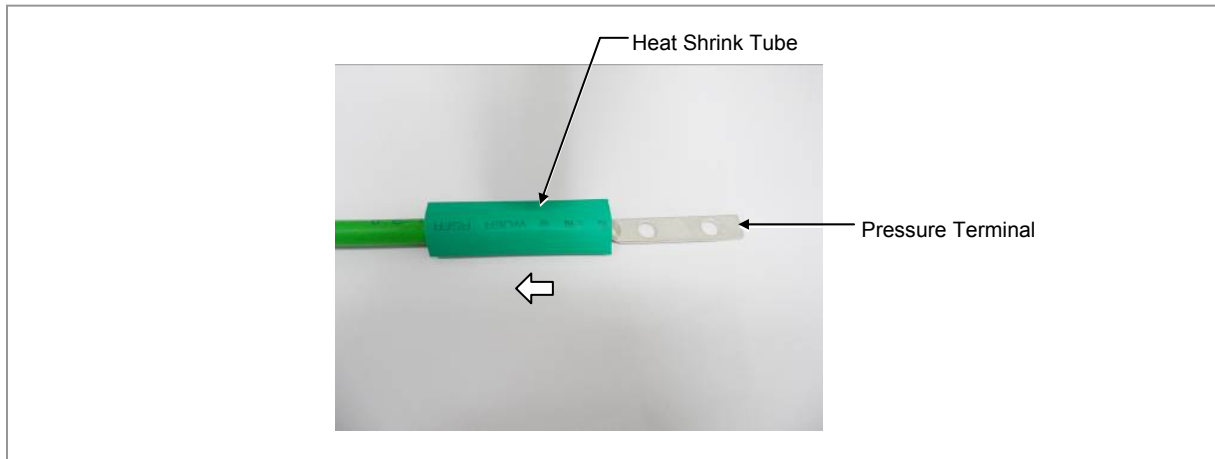


- Vender: IZUMI
- Model: IZUMI-EP-510B
- Specification: Circular 32~160 (SQ) Hex 14~325 (SQ)

Assembling Heat Shrink Tube

- 1 After assembling a pressure terminal, move the heat shrink tube, inserted to the cable, to the end of pressure terminal copper tube.

Figure 100. Assembling Heat Shrink Tube (1)



- 2 Set the temperature of the heat gun to 356~392°F (180~200°C).
- 3 Locate a heat shrink tube to cover the entire copper tube of the pressure terminal.
- 4 Rotate a heat gun 360° to apply heat evenly to shrink the tube.
(Because the pressure terminal and the cable is hot due to the heat of a heating gun, be careful not to have a burn.)

Figure 101. Assembling Heat Shrink Tube (2)



Appendix G Standard Torque

When you fasten the bolt, refer to the standard torque value below to prevent the equipment and bolt from damage and fasten tightly. When the torque value for each connection part is defined already, refer to the defined value.

Table 28. Standard Torque Value for Tightening Bolts

Bolt Spec.	Torque (kgf.cm)	Torque (N.m)	Torque (lbf.ft)
M3	4.08~6.12	0.40~0.60	0.29~0.44
M4	9.52~14.28	0.93~1.40	0.69~1.03
M5	20.0~30.0	1.96~2.94	1.45~2.17
M6	33.28~49.92	3.26~4.90	2.41~3.61
M8	82.4~123.6	8.08~12.12	5.96~8.94
M10	166.4~249.6	16.32~24.48	12.03~18.05
M12	292.0~438.0	28.64~42.65	21.11~31.67

Table 29. Brass Bolts Torque

Bolt Spec.	Torque (kgf.cm)	Torque (N.m)	Torque (lbf.ft)
M6	29.98 ± 10 %	2.94 ± 10 %	2.17 ± 10 %
M8	64.26 ± 10 %	6.3 ± 10 %	4.16 ± 10 %



The torque value can change depending on the equipment and materials, properties and specifications of the fastening bolts. Therefore, you must check the appropriate torque value of each equipment and fastening bolts according to its spec.



**Smart MBS RRH-B8
Installation Manual**

Document Version 3.0

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