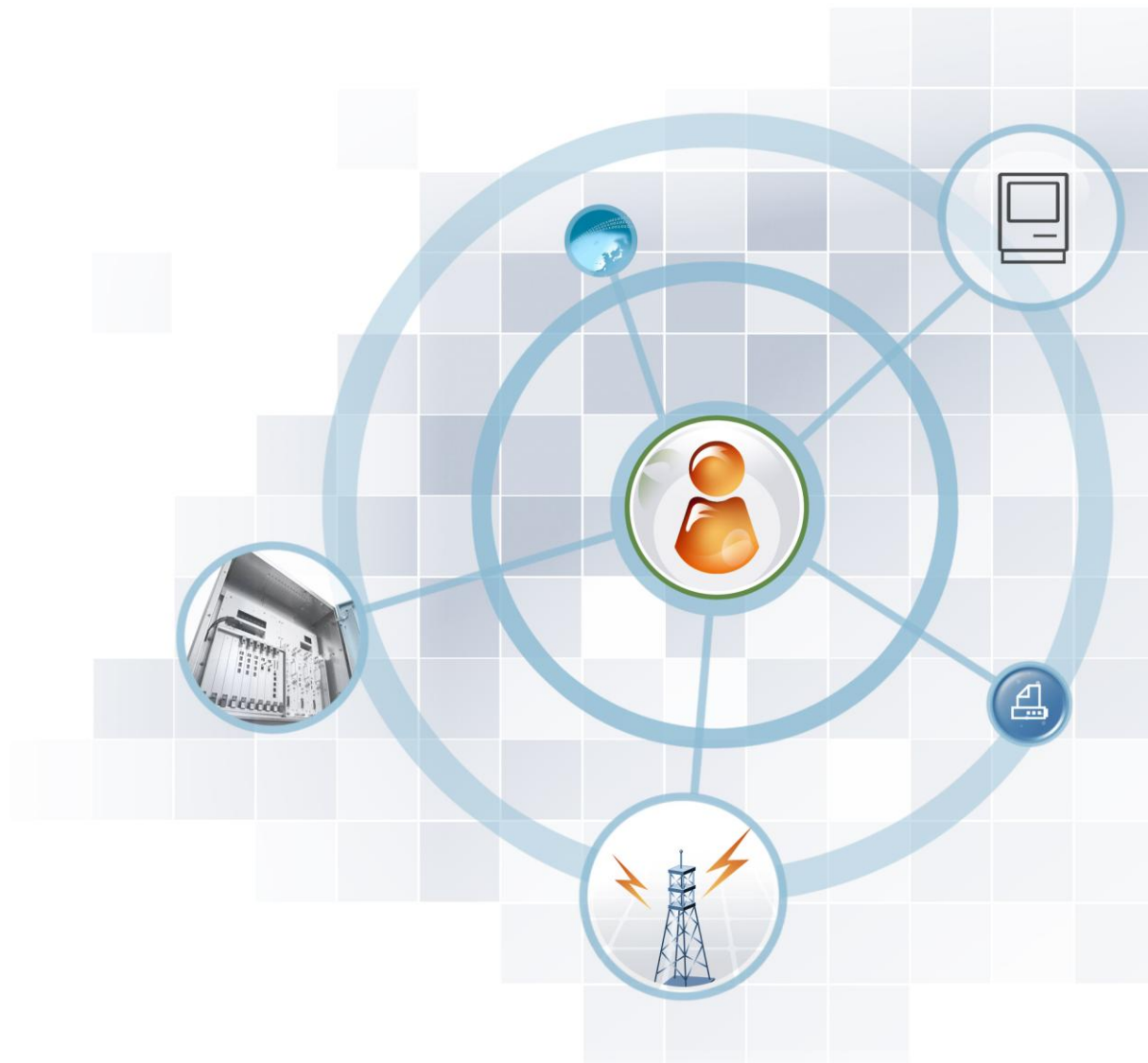


Mobile WiMAX/TD-LTE Smart MBS, U-RAS Flexible V2 RRH-B4 Installation Manual



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INTRODUCTION

Purpose

This manual describes how to install the RRH-B4 and how to connect cables. RRH-B4 can be connected to the following systems:

- U-RAS Flexible V2 DU, which is a Base Station (BS) of Mobile WiMAX/TD-LTE multi-mode
- Smart MBS UADU, which is an eNB of TD-LTE

Document Content and Organization

This document consists of 4 Chapters, 7 Annex and Abbreviation, which are summarized as follows:

CHAPTER 1. Before Installation

This chapter introduces the safety rules that must be understood for installing the RRH-B4 and describes the block diagram of the RRH-B4.

CHAPTER 2. Installing System

This chapter describes the procedures to install the RRH-B4.

CHAPTER 3. Connecting Cables

This chapter describes the procedures to connect the cables to the RRH-B4 installed.

CHAPTER 4. Checking Installation Status

This chapter describes the procedures of inspecting installation status after RRH-B4 installation and cabling is completed.

ANNEX A. Sector Antenna Installation

This annex describes the sector antenna configurations and its installation requirements.

ANNEX B. Installing Feeder Cable

This annex describes cautions and allowed radius of curvature when installing feeder line.

ANNEX C. Connector Assembly

This annex describes the procedure of assembling the connector.

ANNEX D. Cleaning Optic Connector

This annex describes the procedure of cleaning the optic connector and cleaning tool.

ANNEX E. Cable Gland Assembly

This annex describes the procedure of assembling the cable gland.

ANNEX F. Pressure Terminal Assembly

This annex describes the procedure of assembling the pressure terminal.

ANNEX G. Standard Torque

This annex describes the standard torque when tightening the bolt.

ABBREVIATION

Describes the acronyms used in this manual.

Conventions

The following types of paragraphs contain special information that must be carefully read and thoroughly understood. Such information may or may not be enclosed in a rectangular box, separating it from the main text, but is always preceded by an icon and/or a bold title.



WARNING

Provides information or instructions that the reader should follow in order to avoid personal injury or fatality.



CAUTION

Provides information or instructions that the reader should follow in order to avoid a service failure or damage to the system.



CHECKPOINT

Provides the operator with checkpoints for stable system operation.



NOTE

NOTE

Indicates additional information as a reference.

Revision History

VERSION	DATE OF ISSUE	REMARKS
4.0	11. 2012.	Changed 'Specifications' (Main Specifications, Environmental Condition, and RF Specification)
3.0	10. 2012.	- Changed 'System Consumption Current' (1.2) - Changed Cable Gland Specification: M20 22051y7 → M25 2253y8 (Figure 1.2 and Figure 3.22)
2.0	09. 2012.	- Added contents for Smart MBS - U-RAS Flexible V2: WiMAX only → WiMAX/TD-LTE multi-mode support
1.0	08. 2012.	First Version



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SAFETY CONCERNS

The purpose of the Safety Concerns section is to ensure the safety of users and prevent property damage. Please read this document carefully for proper use.

Symbols

**Caution**

Indication of a general caution

**Restriction**

Indication for prohibiting an action for a product

**Instruction**

Indication for commanding a specifically required action

WARNING

Power and Grounding



Cautions When Using Insulation Tester

Pay attention to the followings to prevent any personal injury caused by an electric shock when using an insulation tester.

- Make sure the polarity is correct when connecting the Earth COM (black) and AC.V (red) lead lines. And do not touch the connected probes (inspecting part of the lead line) with a hand and avoid body contact.
- Avoid body contact to the system when measuring an insulation resistance.



Watches, rings, and other metallic accessories

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



Power Switch Off

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



Connecting Ground Cable

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.



Turning Off the Circuit Breaker before Connecting the Power Cable

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

Installation**Warning for Laser Beam Running through Optical Cables**

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

**Warning for Worker's Injury**

When installing cables in a small area, do not apply excessive force. Worker may bump against a wall or equipment.

**Protection gloves and goggles**

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



CAUTION

Power and Feeder line



Cautions while Cleaning Power Supply

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



Precautions While Measuring Insulation Resistance

Observe the followings to prevent any system damage when measuring insulation resistance because there is a very high voltage.

- Before measuring insulation resistance, disconnect all the cables connected to the system.
- Do not measure insulation resistance when power is on.
- Do not measure insulation resistance at any other positions such as system internal units or parts other than the targeted insulation resistance measuring points.



System Grounding Method

Ground bar for lightning protector/power/communication must be isolated from each other. These three ground bars can be grounded as the isolation grounding method, or branched from ground mesh buried in the underground as common grounding method.



Precautions When Connecting Power Cable

To secure rainproof performance of a cable gland, min. 11.81 in. (300 mm) straight section must be maintained. Here, the radius of curvature must be considered according to the cable specification.



When Using Power Cables

- When handling the power cable, ensure the power switch of a rectifier is turned off to prevent the risk from the power cable and electric short-circuit of related cables.
- Because a power accident may occur when fixing parts get loosened, make sure that fasteners to fix the power cable should be firmly fastened.

**Check When Fixing the Power Cable**

Fix the power cable and the power cable bracket using a stainless steel tie for preventing loose contact due to cable tension and leakage problems.

It is recommended to use the designated tools to tighten the stainless steel tie.

**Caution for Rain-proof Gasket Damage**

Be careful the rain-proof gasket is not damaged during work, and check again the gasket is not damaged before closing power/DTA window cover. If the rain-proof gasket is damaged, replace the RRH-B4.

**Power Window Cover**

Be sure to check the circuit breaker for RRH-B4 is turned off before opening or closing the power window cover. If the cover is open or close while the circuit breaker is on, the system can be damaged or a worker may be critically injured due to electrical short-circuit.

**Precautions When Cutting Power Cable**

Install the power cable to the power port of system by considering the radius of curvature of its cable specification and then cut the cable.

If you install the cable after cutting, there may be length difference among the core wires at the end of the cable because of cable curvature. This may result in poor contact after the cable is connected to the power port.

**Installing the 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.

**Checking VSWR for Minimum Cable Bend Radius and Length of RF Cable**

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



Cautions When Measuring VSWR

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



Cable Work Sequence

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



Radius of Curvature of Feeder Line

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.



Connection of Feeder Cable Connector

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

Installation



Cautions while Cleaning the Rack

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



Do not Work by Yourself

Worker must not work alone in any key process.



Managing Unused Ports

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

**Finishing the Cable Inlet**

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

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

**Management of Unused Ports**

Cover the unused ports (conduit, cable gland, etc.) with waterproof cap (sealing cap) to prevent infiltration of foreign material such as dust, moisture, or bug.

**Caution When Connecting the Optical Cable**

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 in 'ANNEX D'.

**Caution When Assembling Cable Gland**

If the parts of a cable gland in the system are not correctly installed, outdoor air and moisture may flow into the system and cause corrosion, system fault, or serious fault to the cooling system.

Therefore, assemble and finish the cable gland accurately.

**Caution When Installing Cable in the Cable Gland**

Only one cable of permitted specification (thickness) should be installed in the cable gland.

- The outdoor air or moisture may flow into the system if a cable that is thinner than the specification is used.
- If a cable is thicker than the specification or more than two cables are installed, the cable gland may be damaged.



Checking Assembly State of the Unused Cable Gland

All components of the unused cable gland must be secured in the original factory configuration. If the cable gland nut is fitted without the waterproof filler or the protection cover in place, reassemble them as illustrated in 'Unused Cable Gland Inspection and Assembly'.

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.'

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ABBREVIATION **I**

C ~ U	I
V	II

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CHAPTER 1. Before Installation

1.1 System Configuration

RRH-B4 Configuration

The configuration of RRH-B4 is as follows:

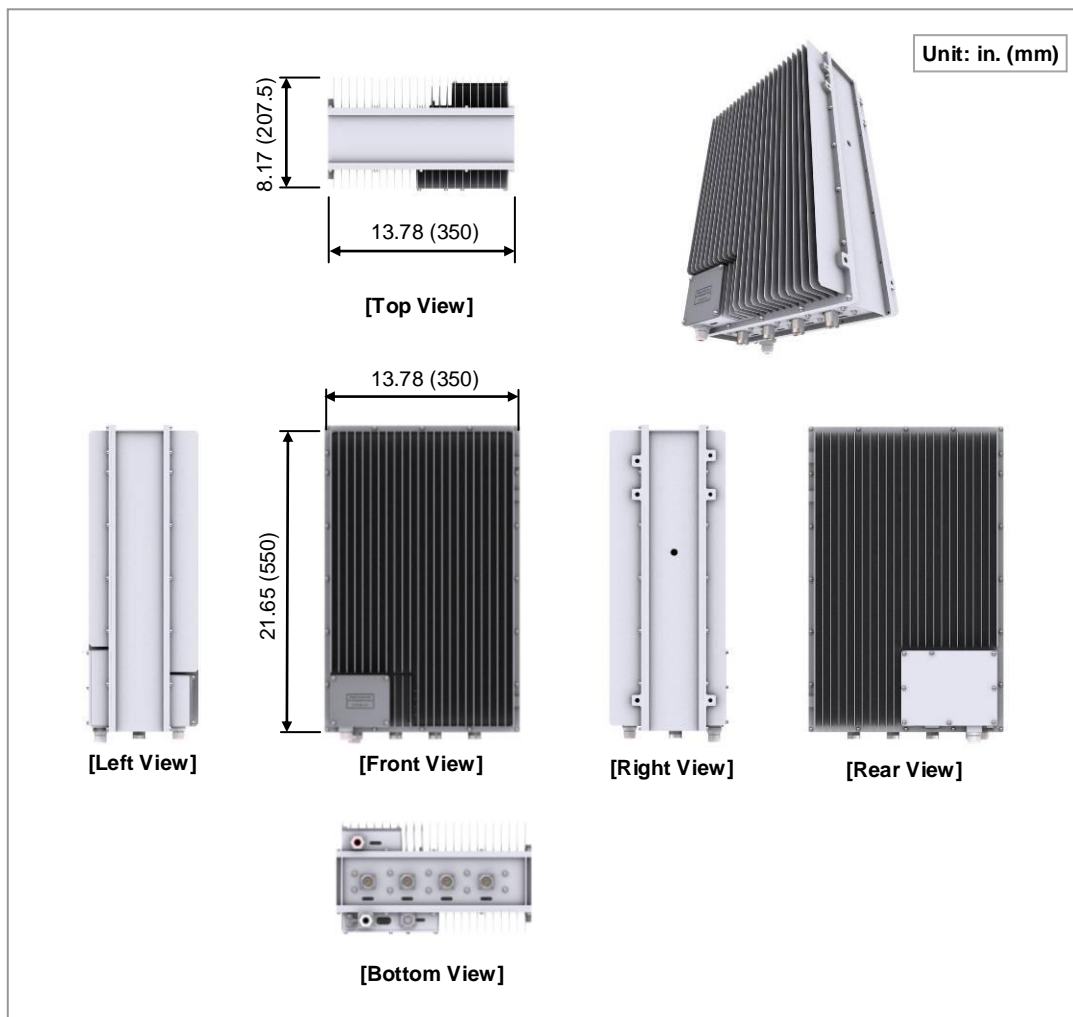


Figure 1.1 RRH-B4 Configuration

External Interface of RRH-B4

The external interface structure of RRH-B4 is as follows:

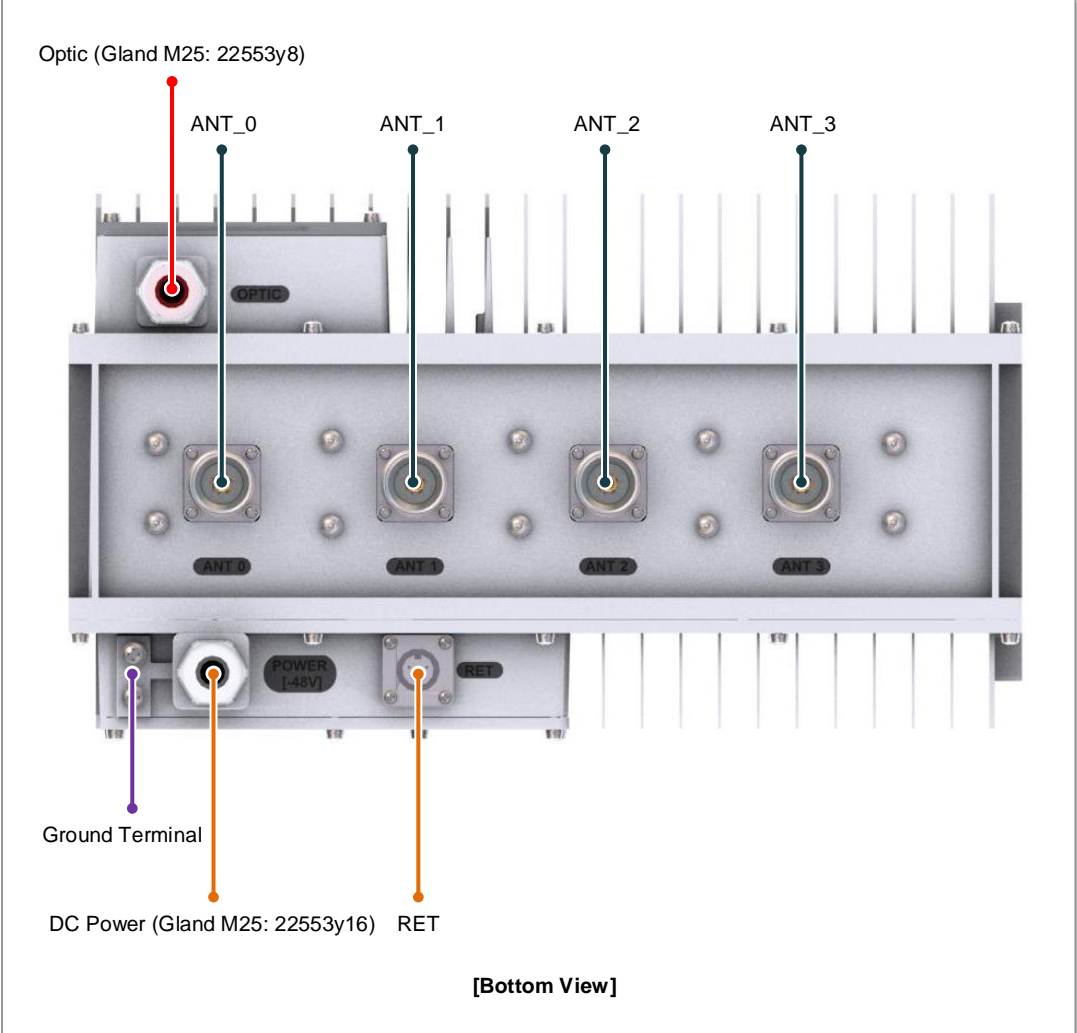


Figure 1.2 External Interface of RRH-B4

1.2 Specifications

Main Specifications

The table below lists the main specifications of the system.

Category	System Capacity
Air specification	WiMAX/TD-LTE
Channel Bandwidth	- Mobile WiMAX: 10 MHz - TD-LTE: 20 MHz
Operating Frequency	2,496~2,690 MHz (BC41)
RRH-B4 Capacity	- WiMAX 4 Carriers - TD-LTE 2 Carriers
Interface between DU and RRH-B4	- WiMAX: 1.25 Gbps CPRI - TD-LTE: 2.5 Gbps CPRI
Output	Antenna port based - WiMAX: 5 W/Carrier/Path - TD-LTE: 20 W/Carrier/Path

Input Power

The table below lists the power standard for the RRH-B4. The RRH-B4 satisfies the electrical safety standard prescribed in UL60950. If an operator wants to use AC system input voltage, the operator can supply power using an external rectifier (provided by a service provider).

Category	Standard
System Input Voltage	-48 VDC (Voltage Variation Range: -40~-56 VDC)
System Consumption Current	9.27 A AVG. @ 48 V, 28: 18 (DL UL ratio)

* Each of the DU (UADU) and RRH-B4 receives -48 VDC of power for its operation.

Unit Size and Weight

The table below lists the size and weight of the RRH-B4.

Category	Standard
Size [W x D x H, in. (mm)]	13.8 (350) x 8 (207.5) x 21.7 (550)
Weight [lb (kg)]	About 50.7 (23)

Environmental Condition

The table below lists the environmental conditions and related standards such as operational temperature and humidity.

Category	Range
Temperature Condition ^{a)}	-40~122°F (-40~+50°C)
Humidity Condition ^{a)}	5~100 %, condensing, not to exceed 30 g/m ³ absolute humidity
Altitude	-197~5,905 ft (-60~1,800 m)
Vibration	GR-487-CORE Sec.3.39 - Transportation shock - Transportation vibration - Installation shock - Environmentally induced vibration - Earthquake resistance
Sound Pressure Level	Under 65 dBA in height of 3 ft (1.0 m) and distance of 5 ft (1.5 m).
EMI	- FCC Title 47 Part 15 Class B - EN 301 489 Section 7.1 EMC emission - GR-1089-CORE (Issue4) Sec. 3.2 Emission Criteria
US Federal Regulation	FCC Title 47 Part 27

a) The standards of temperature/humidity conditions are based on the value on the position where is 15.75 in. (400 mm) away from the front of the system and in the height of 4.92 ft (1.5 m) on the bottom.

Environmental Alarm

The table below lists the environmental alarm provided in the Smart MBS, U-RAS Flexible V2 in default.

Category	Standard
Temperature Alarm	High Temperature, Low Temperature
Fan Fail	Fan Fail
Voltage Alarm	High Voltage, Low Voltage

RF Specification

The table below lists the RF characteristics of the RRH-B4.

Category	Standard
Total Tx Output Power	<ul style="list-style-type: none"> - Mobile WiMAX, 10 MHz Channel Bandwidth <ul style="list-style-type: none"> • 20 W @ avg power per carrier/sector, 4T4R • 10 W @ avg power per carrier/sector, 2T2R/2T4R - TD-LTE, 20 MHz Channel Bandwidth <ul style="list-style-type: none"> • 40 W @ avg power per carrier/sector, 4T4R • 20 W @ avg power per carrier/sector, 2T2R/2T4R
Tx Constellation error	<ul style="list-style-type: none"> - Mobile WiMAX: In accordance with the 802.16e RCT standard - TD-LTE: In accordance with the 3GPP LTE standard
RX Sensitivity	<ul style="list-style-type: none"> - Mobile WiMAX: In accordance with the 802.16e RCT standard - TD-LTE: In accordance with the 3GPP LTE standard

1.3 Cautions for Installation

Observe the following safety instructions when installing the RRH-B4:

Before Installing

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

While Installing

- The power must be cut off before installing.
- Be careful that boards mounted on the system and the cables among the boards are damaged or scratched when the system is transported or installed.



Wearing Protective Gloves and Glasses

The workers should wear the protective gloves and glasses because they can be injured by the debris generated when drilling holes on walls or ceilings.



Do Not Wear Metal Things such as Watch, Ring, Etc.

Do not let the electric short circuit occur due to metal things such as watch or ring.



Warning for Worker's Injury

When installing cables in a small area, do not apply excessive force. Worker may bump against a wall or equipment.



Do not Work by Yourself

Worker must not work alone in any key process.



Managing Unused Ports

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

**CAUTION****Finishing the Cable Inlet**

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

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

**CHECK****Outdoor Fastening Materials**

The outdoor fastening materials such as stud bolts, hex. nuts, spring washers and plane washers must be made of stainless steel (STS 304).

Otherwise, it may cause corrosion and rust to fixing materials.

After Installing

- Cover the cable holes drilled on the floor with a solid cover.
- Remove any debris produced during the work and clean up the installation site.

**WARNING****Warning for Laser Beam Running through Optical Cables**

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

**CAUTION****Cautions while Cleaning the Rack**

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

**CAUTION****Cautions while Cleaning Power Supply**

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

1.4 Pre-survey

To enable seamless construction, the installer and the service provider should perform pre-construction inspection to examine and analyze the following items.

- Examination about the conformance and the economical efficiency of the place that the system is transported or installed.
- Status of external interfaces
- Power capacity and wiring status
- Possibility of system extension
- Review if the place has the enough space to operate and maintain.

If there is a need for improvement or an issue, the installer and the service provider must discuss measures to resolve any issue arising.

1.5 Installation Tools

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

Table 1.1 Basic Installation Tools

No.	Name	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~M12 0.72~2.17 lbf·ft (10~30 kgf.cm), 7.23~36.15 lbf·ft (100~500 kgf.cm), Replaceable head
3	Nut driver set	0.24~0.39 in. (6~10 mm)
4	Hacksaw Frame/Blade	Normal/HIS
5	Level/Plumb bobs	Normal/1.10 lb (500 g)
6	Heating gun	122~572°F (50~300°C)
7	Torx Driver	T20H
8	Power extension cable	98.42 ft (30 m)
9	Tape measure	16.4 ft/164 ft (5 m/50 m)
10	Cable cutter	12.8 in. (325 mm)
11	Silicon gun/Silicon	Normal/Gray & Colorless
12	Spanner	0.75 in. 0.94 in. 1.42 in. (19 mm, 24 mm, 36 mm)



NOTE

Precautions when Using the Installation Tools:

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.



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CHAPTER 2. Installing System

2.1 Installing the RRH-B4

The procedure to install the RRH-B4 is listed in the flow chart below.

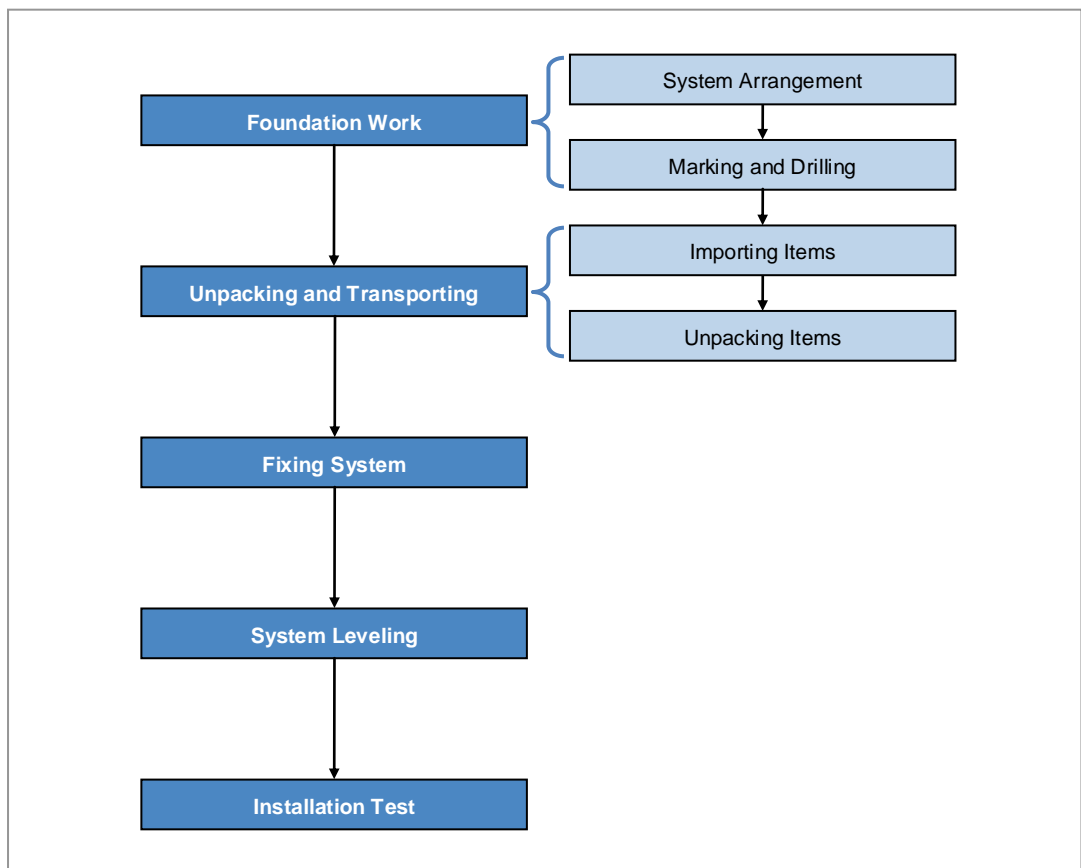


Figure 2.1 Procedure to Install the RRH-B4

2.2 Foundation Work

2.2.1 System Arrangement

A minimum distance must be secured around the RRH-B4, in each direction for installation and maintenance.

Table 2.1 Recommended Distances for RRH-B4 Installation

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

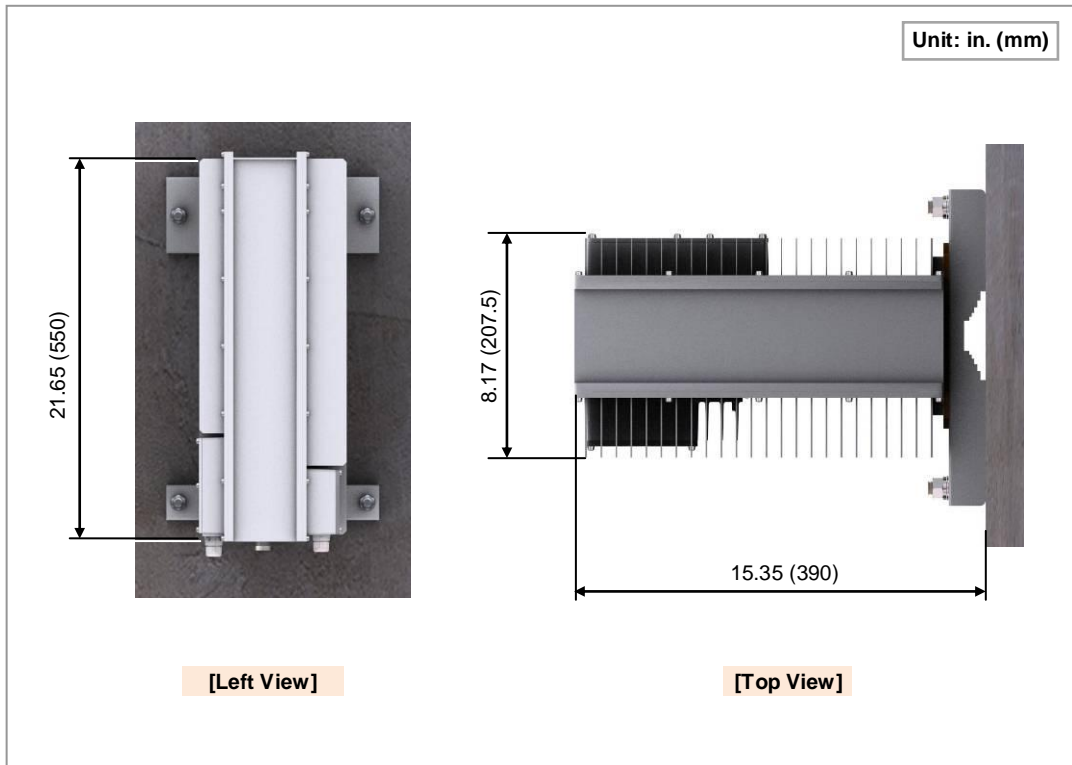


Figure 2.2 RRH-B4 Arrangement (Wall Type)

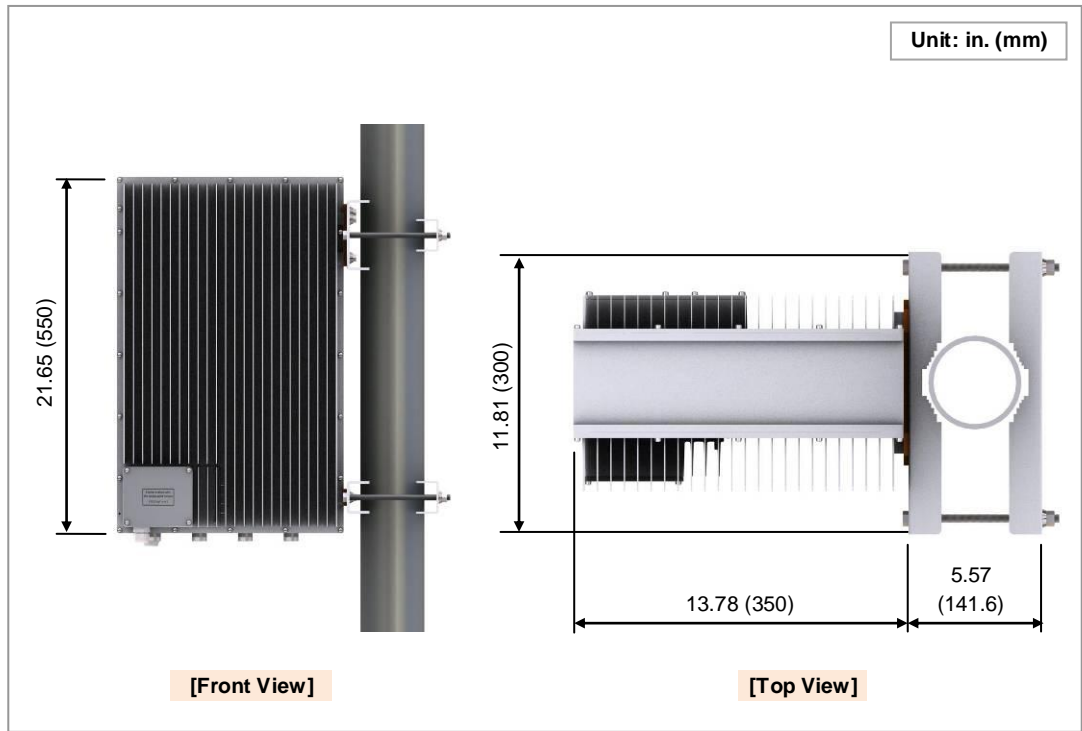


Figure 2.3 RRH-B4 Arrangement (Sector Pole Type)



NOTE

System Installation Spaces

The space specifications in the figure above apply when the pole diameter is 3 in. (76.3 mm). The dimensions may vary depending on the diameter of the pole.

2.2.2 Marking and Drilling

Marking

Before placing the system, mark the position where the system will be installed and also the positions where anchor bolts will be fixed using an ink line or a pen.



CAUTION

Checking Marking (horizontal/vertical) When Mounting the System on Wall

If you do the drilling or anchoring on a wall when the positions are not marked to be horizontal or vertical, only limited range of tuning is allowed for leveling after the system is mounted.

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



NOTE

Marking Using the System

When the position where the system will be placed is determined, place the system on the position and then mark the positions where anchor bolts will be fixed using a pen. This will reduce marking error range caused by a worker.

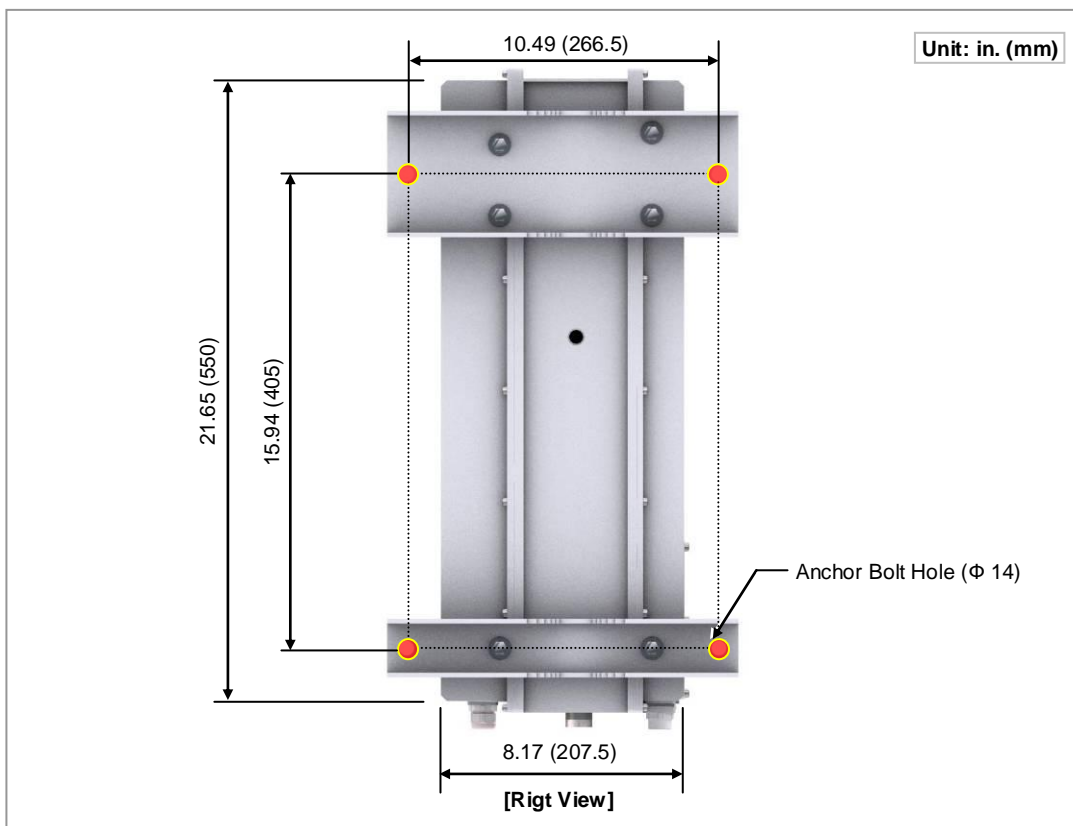


Figure 2.4 System Marking-Wall Type

Drilling

When marking is completed, drill holes for anchor bolts.

Table 2.2 Anchor Bolt Drill Bits and Hole Depth

Category	Anchor Bolt	Drill Bits	Hole Depth
RRH-B4 (Wall Type)	M12	0.67 in. (17 mm)	2.17 in. (55 mm)

2.3 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 must be unpacked in the outside. If necessary, the packing can be unpacked after transported into the area near installation place.
- Transport the cabinet to the installation place. Beware of the damage of walls, pillars, and bottom of the passage when transporting the cabinet.
- Transport other components with packing and sort by types.

2.3.1 Importing 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.

Vibration Level for Transportation

When carrying the system, tighten the system firmly not to exceed the proper vibration level from 1 to 500 Hz.

When carrying system, use a cart or lift to prevent accidents. However, if the system must be carried by people, enough people are required to carry the system.

Before moving the system, check the storage place for the system and remove obstacles in advance. While moving system, boards and other devices should not be shocked physically and damaged caused by dust, moisture, and static electricity.

When installing the items imported, system must be installed in a location whose access is not easy from outside.

2.3.2 Unpacking Items

The procedure to unpack items is as follows:

- The packing items must be packed until they reach the installation place.
- The items are classified in accordance with each job specification and stored on a place that does not interfere with working.
- Unpacked systems must be installed immediately. If not installed immediately, the systems must be stored in the installation place temporarily.
- Unpack the inner packaging after each system is placed on its installation location.
- Do not recycle packaging waste. Dispose of it in accordance with waste management act.

2.4 Fixing System

2.4.1 Fixing Unit Mounting Bracket

The procedure for fixing the unit mounting bracket is as follows:

Table 2.3 Unit Mounting Bracket Fixing Parts And Tool

Classification	Description		
Parts	Unit Mounting Bracket Ass'y (1 Set)	Unit Mounting Bracket_Top	1 EA/1 Set
		Unit Mounting Bracket_Bottom	1 EA/1 Set
		Bakelite_Top1	1 EA/1 Set
		Bakelite_Top2	1 EA/1 Set
		Bakelite_Bottom	1 EA/1 Set
		Fastener	- M8 Plane Washer - M8 Spring Washer - M8 x 25L Hex. Bolt - Insulation Bushing
Recommended Torque Value	M8 x 25L Hex. Bolt	5.96~8.94 lbf.ft (82.4~123.6 kgf.cm)	
Working Tools	Torque Wrench and Level		



CHECK

Checking Top/Bottom When Fixing Unit Mount Bracket

To install the system accurately, fix the unit mounting brackets by distinguishing its top and bottom as shown below.

- 1) Place the bakelite-top 1, 2 and unit mounting bracket_top to the RRH-B4's top fixing holes and fix these firmly with fasteners.
- 2) Place the bakelite-bottom and unit mounting bracket_bottom to the RRH-B4's bottom fixing holes and fix these firmly with fasteners.

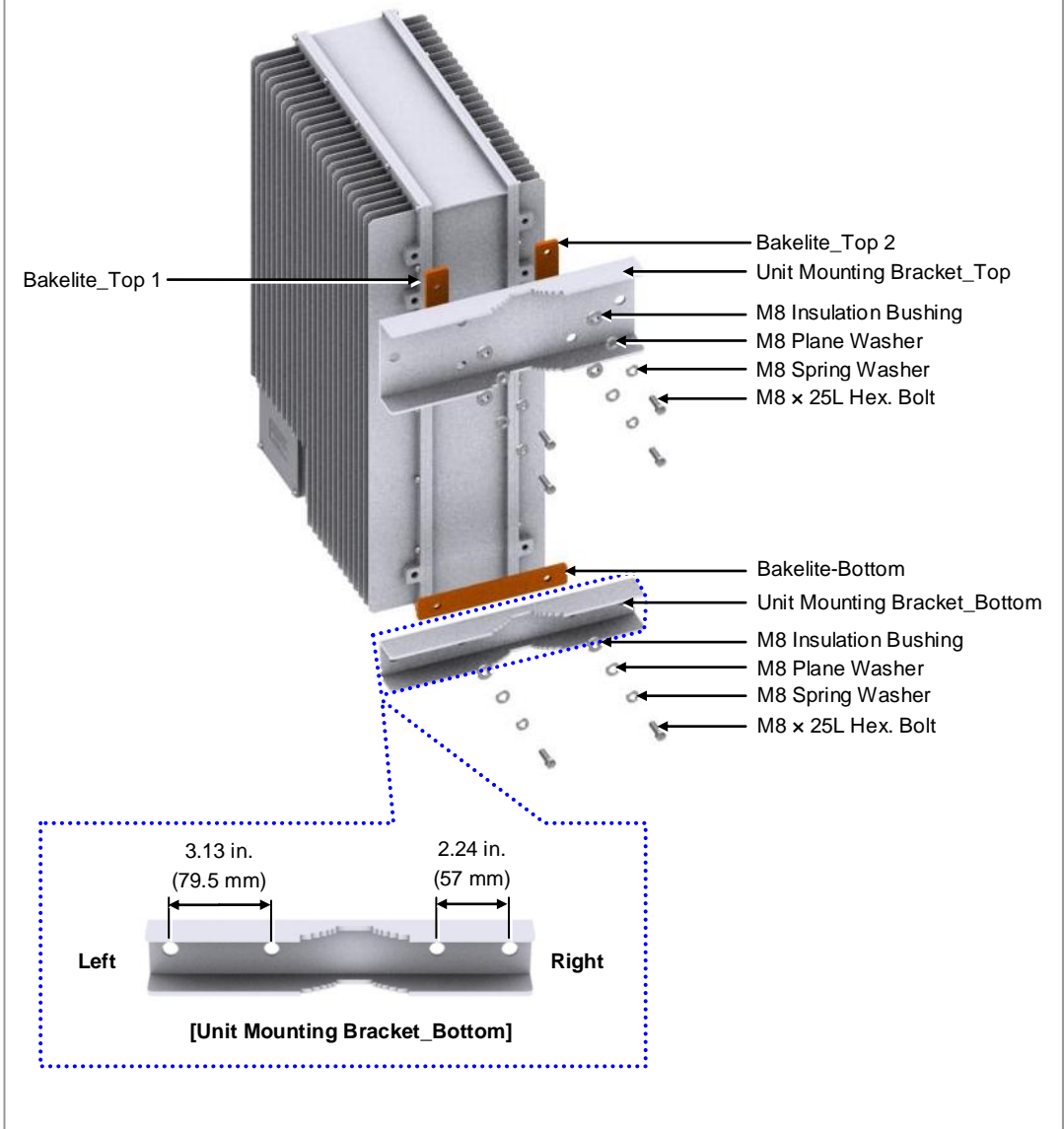


Figure 2.5 Fixing Unit Mounting Bracket

2.4.2 Fixing RRH-B4

RRH-B4 can be fixed to the wall or pole.

Fixing RRH-B4 (Wall Type)

The procedure for fixing the RRH-B4 to the wall is as follows:

Table 2.4 RRH-B4 Fixing Parts and Tools (Wall Type)

Classification	Description		
Parts	Fastener	M10 Anchor Bolt Ass'y - M10 Anchor Bolt - M10 Plane Washer - M10 Spring Washer - M10 Hex. Nut	4 Set 1 EA/Set 1 EA/Set 1 EA/Set 1 EA/Set
Recommended Torque Value	M10 Hex. Nut		12.03~18.05 lbf.ft (166.4~249.6 kgf.cm)
Working Tools	Drill, Hammer, Torque Wrench and Level		



CHECK

Cautions When Using Wall Mount Fasteners

The fasteners such as anchor bolt, spring washer, plane washer and hex. nut used to fix the system to a wall must be made of stainless steel (STS 304). Otherwise, it may cause corrosion and rust to fasteners.

Fix unit mounting bracket_top and unit mounting bracket_bottom (attached to the RRH-B4) to the wall with fasteners.

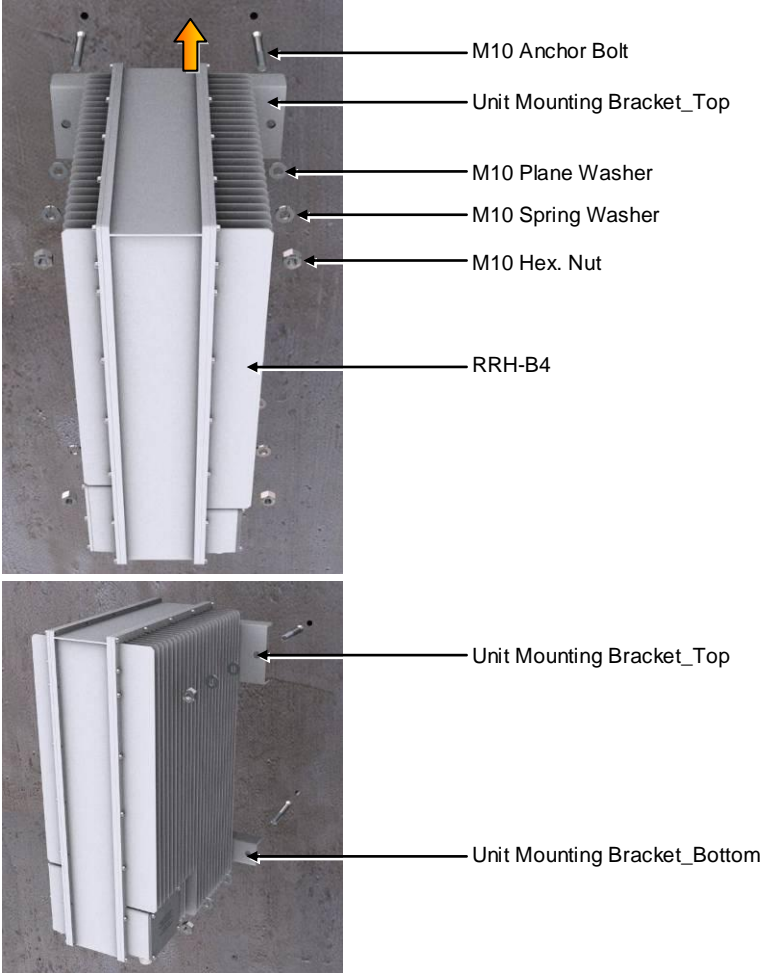


Figure 2.6 Fixing RRH-B4 (Wall Type)

Fixing RRH-B4 (Pole Type)

The procedure for fixing the RRH-B4 to the pole is as follows:

Table 2.5 RRH-B4 Fixing Parts and Tools (Pole Type)

Classification	Description		
Parts	Rear Bracket	2 EA	
	Fastener	- M12 Hex. Bolt	4 EA/set
		- M12 Plane Washer	4 EA/set
		- M12 Spring Washer	4 EA/set
- M12 Hex. Nut		4 EA/set	
Recommended Torque Value	M12 Hex. Nut	21.11~31.67 lbf.ft (292.0~438.0 kgf.cm)	
Working Tools	Torque Wrench		



CHECK

Cautions When Using Pole Fasteners

The fasteners such as hex. bolt, hex. nut, spring washer, and plane washer used to fix the system to a pole must be made of stainless steel (STS 304). Otherwise, it may cause corrosion and rust to fasteners.

Place the RRH-B4 (attaching unit mounting bracket_top, bottom) to the pole front, place the rear bracket to the pole rear, and fix these firmly with fasteners.

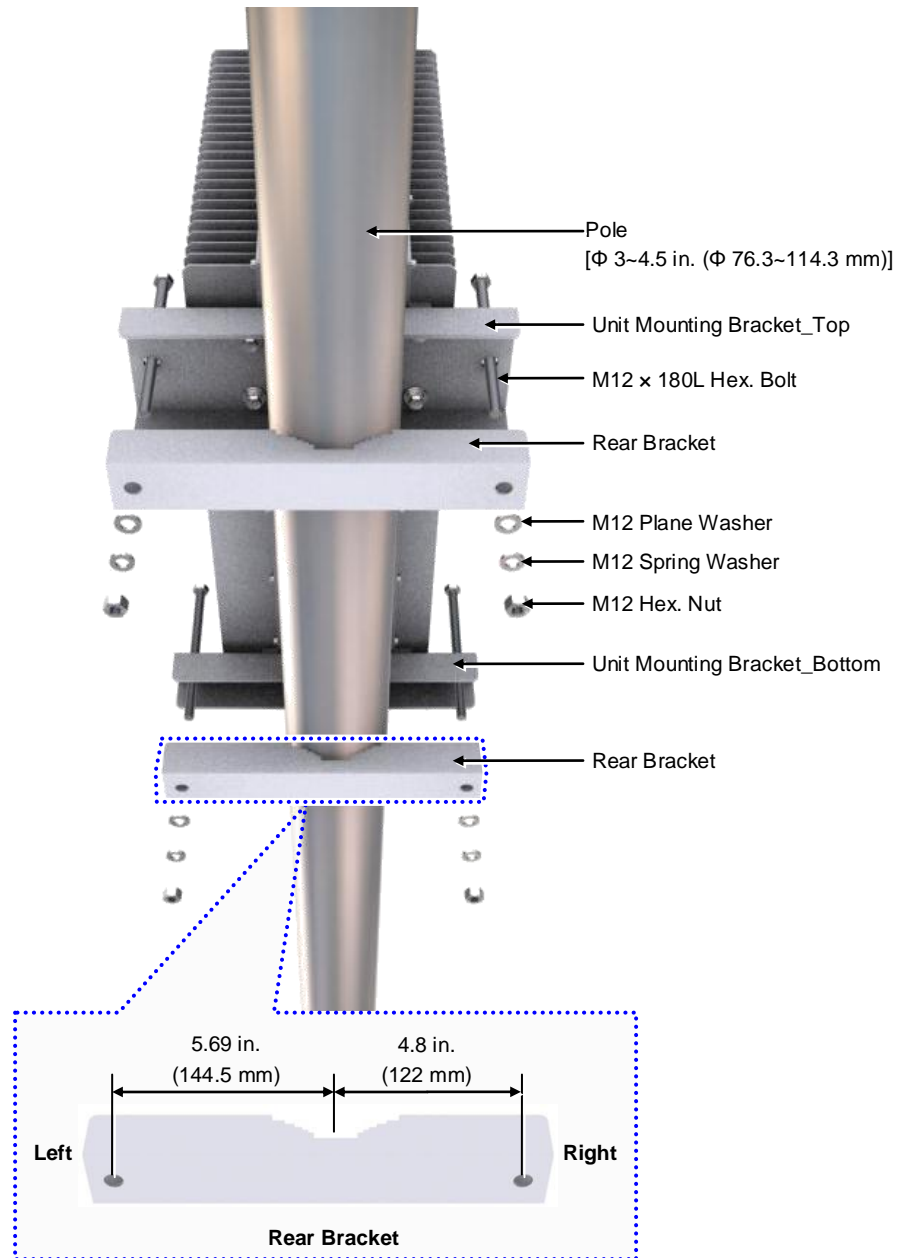
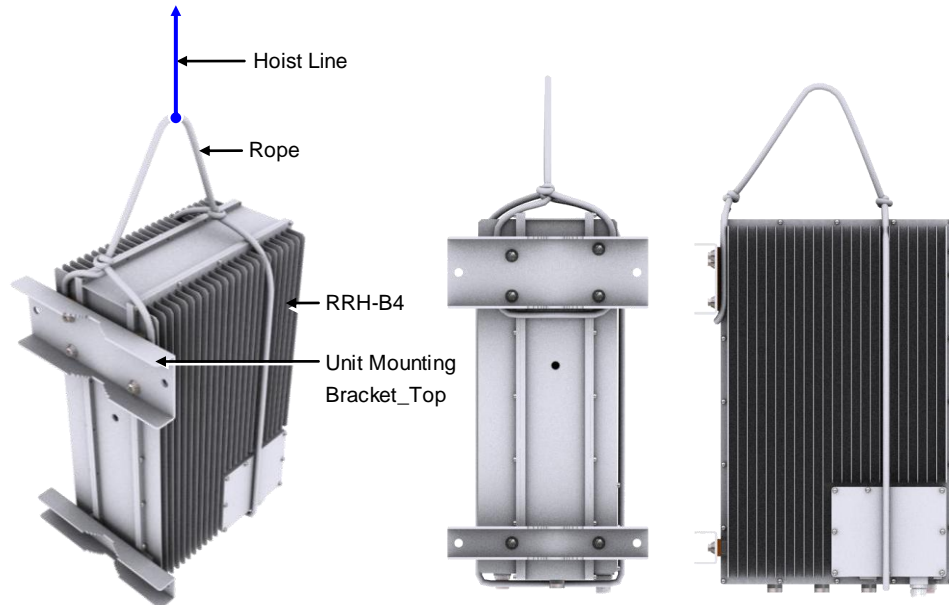


Figure 2.7 Fixing RRH-B4 (Pole Type)

**CHECK**

How to lift up RRH-B4

When lifting up the RRH-B4 for installation, after fixing the unit mounting bracket of RRH-B4 side, bind the rope to the heat sink of RRH-B4 and a space between unit mounting bracket_top and RRH-B4, lift up using a hoist lift as shown below. For the safety, maintain the status of lifting up by completing RRH-B4 installation. Unbind the rope after the installation is complete.



2.5 System Leveling



Leveling refers to compensating for the level difference on the floor that is generated during floor work to install devices horizontally or vertically. Leveling can be carried out using a vinyl hose, a balance weight, or a level.

In this manual, a commonly used method, which uses a spirit level, is described.

Leveling Using a Level

Leveling method using a level is as follows:

Table 2.6 Leveling Using a Level

Classification	Description	
Test method	The level is measured based on the position of a bubble after attaching the spirit level to the top and side of the system.	
Evaluation criteria	Good	Poor
		
	If it is leveled, the bubble of the spirit level is positioned at the center of both lines.	
Corrective measures for poor leveling	Use an aid such as bakelite on the back side of the system or an auxiliary fixture to adjust the height. Adjust the position of fasteners used to fix the system or its leveling status.	

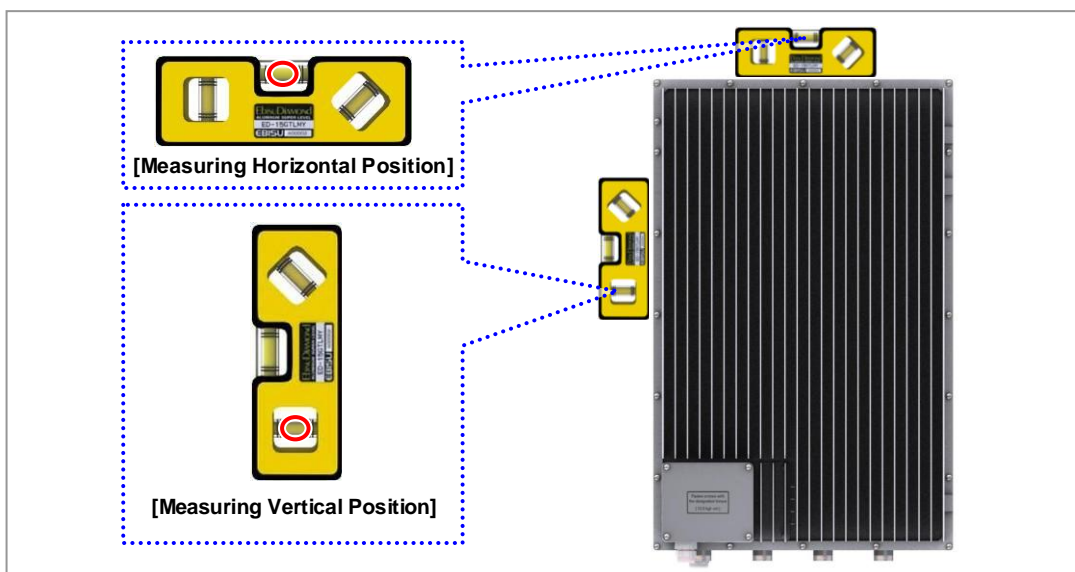


Figure 2.8 Leveling Using a Level (Example)

2.6 Insulation Test

Insulation test procedure is as follows:

Table 2.7 Insulation Test

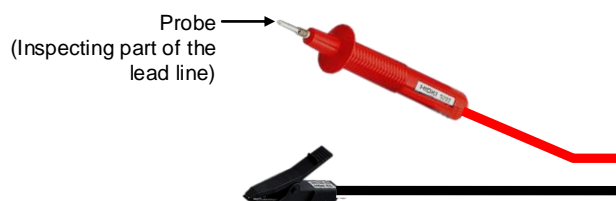
Classification	Description			
Test method	The insulation tester (Megger) is used for measurement.			
	Position of lead line of insulation tester	Wall Type	Lead line_A	Bracket fixing anchor bolt
			Lead line_B	System's screw
		Pole Type	Lead line_A	Bracket fixing Hex. Bolt.
Lead line_B			System's screw	
Evaluation criteria	Good		Poor	
	500 V/100 MΩ or more		Less than 500 V/100 MΩ	
Corrective measures for poor leveling	<ul style="list-style-type: none"> - Check the contact between the system and anchor bolt and re-assemble it. (But, the anchor bolt must be shielded using an insulator such as an insulation bushing, etc.) - Check damage of an insulator such as an insulation busing or bakelite, etc. and replace it. 			



Cautions When Using Insulation Tester

Pay attention to the followings to prevent any personal injury caused by an electric shock when using an insulation tester.

- Make sure the polarity is correct when connecting the Earth COM (black) and AC.V (red) lead lines. And do not touch the connected probes inspecting part of the lead line) with a hand and avoid body contact.
- Avoid body contact to the system when measuring an insulation resistance.



Precautions While Measuring Insulation Resistance

Observe the followings to prevent any system damage when measuring insulation resistance because there is a very high voltage.

- Before measuring insulation resistance, disconnect all the cables connected to the system.
- Do not measure insulation resistance when power is on.
- Do not measure insulation resistance at any other positions such as system internal units or parts other than the targeted insulation resistance measuring points.

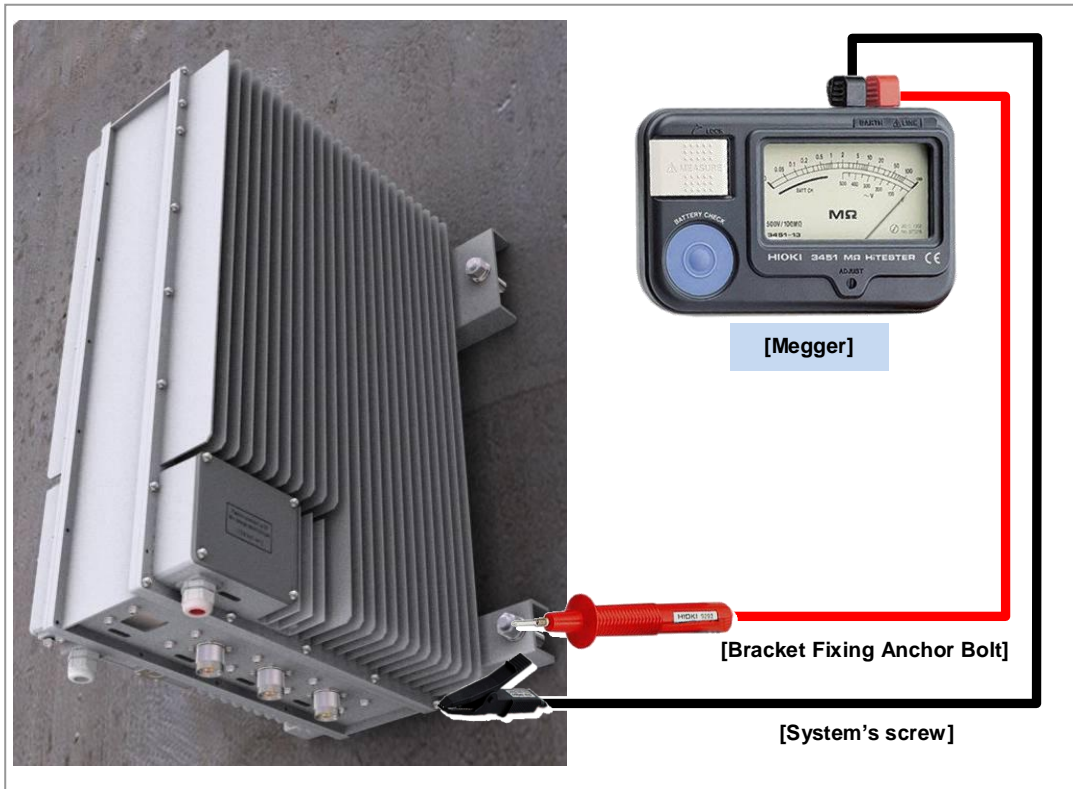


Figure 2.9 Schematic Diagram for Insulation Test (Wall Type)

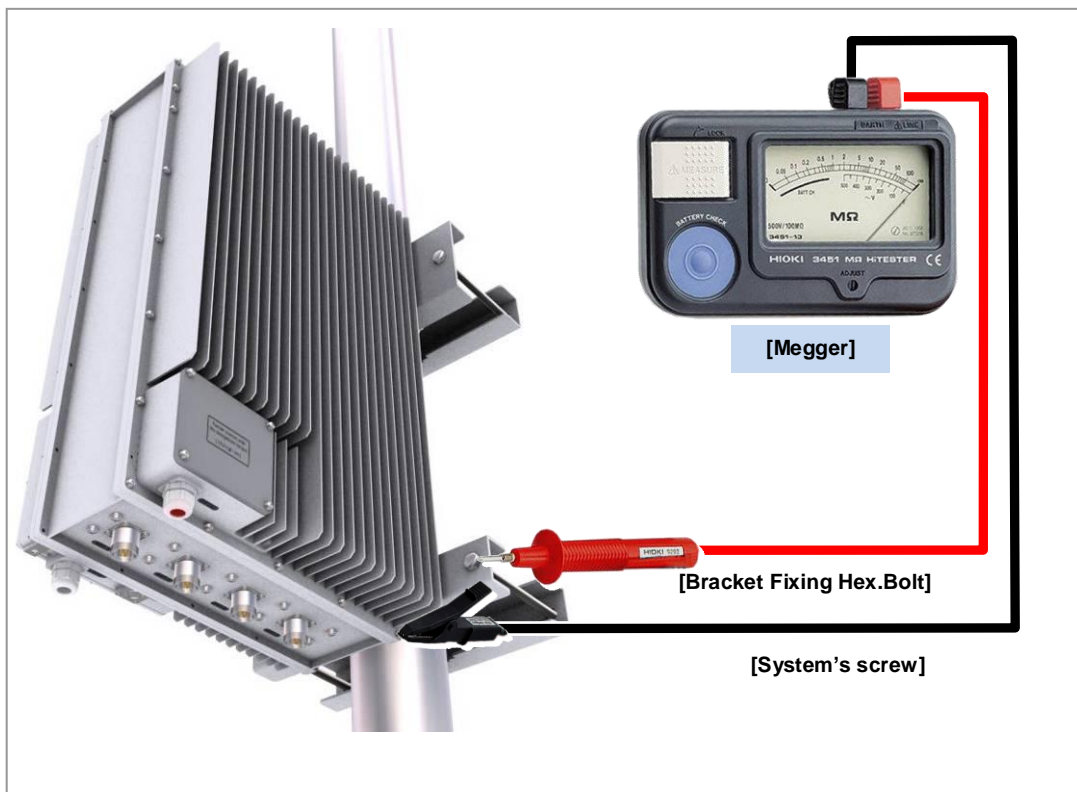


Figure 2.10 Schematic Diagram for Insulation Test (Pole Type)

CHAPTER 3. Connecting Cables

3.1 Work Flow for Cabling

The cable workflow for the system is as follows:

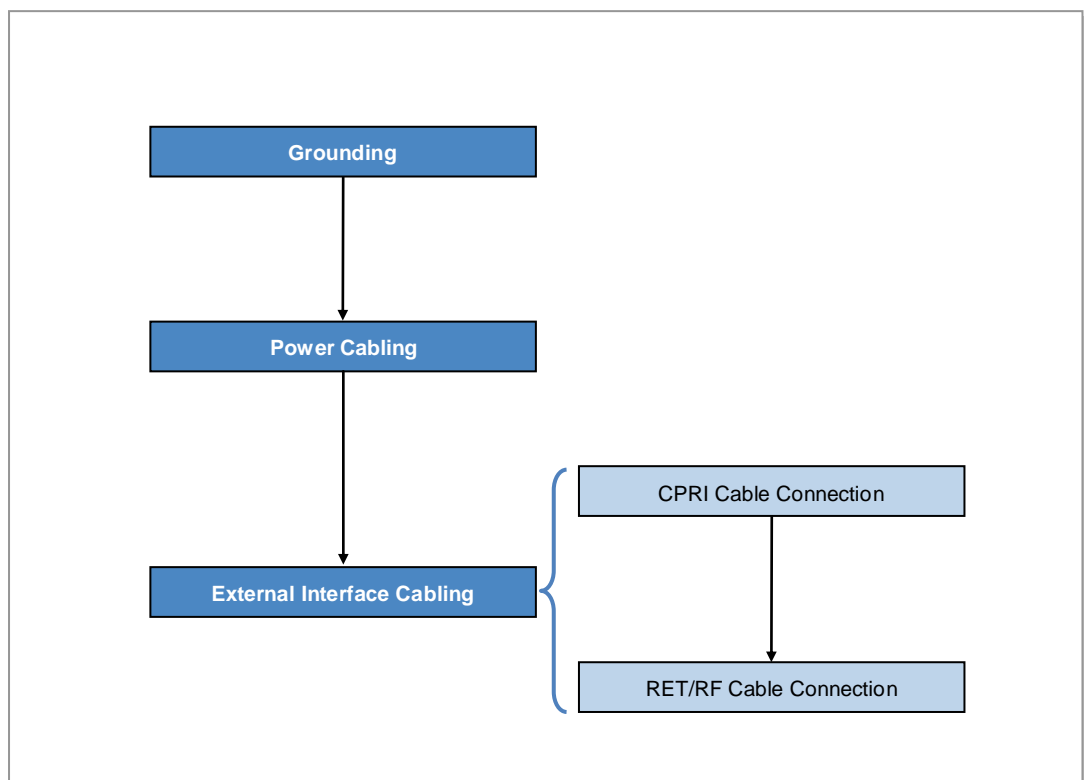


Figure 3.1 Work Flow for System Cabling

The detailed procedure of cabling is as follows:

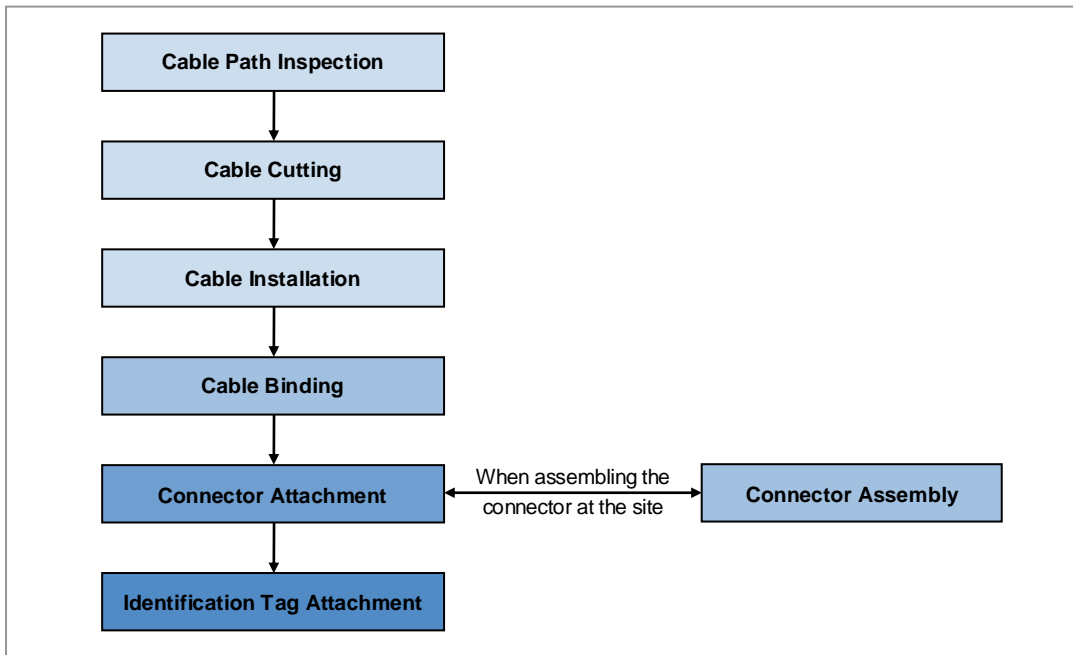


Figure 3.2 Detailed Cabling Procedure



CAUTION

Considerations when Cutting the Cable after Installation

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



NOTE

Cabling Workflow

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

Cable Path Inspection

When installing a cable that connects between the rectifier, Main Ground Bar (MGB), and backhaul device, 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 may be damaged by external factors, ensure that measures are taken to prevent damage 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.
- When installing the cable over other cables, make sure the cable is installed on the other cables. Pay more attention to the vertical and horizontal cross sections where the cables are usually reversed.
- 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 tray, etc.

Table 3.1 Recommended Minimum Allowed Cable Bend Radius

No	Type	Allowed Cable Bend Radius	Remark
1	F-GV/F-CV/F-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)	-

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

Cable Binding

Cable binding involves fixing and arranging an installed cable using binding thread, cable ties, binding wire, and ram clamps, 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 supply cable, optical cable, feeder line, 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 cable binding cord at about 5 cm (1.97 in.) distance from its knob and insert it into the knot so that the knot does not loosen.
- If there is a danger that contact failure may occur in a connector connection due to tension, install the cable as short as possible.

Assembling and Connecting Connectors

Connector connection involves assembling a connector to an installed cable and connecting the assembled connector to a device.

Follow these guidelines when assembling and connecting connectors.

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

Identification Tag Attachment

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



NOTE

Marker Cable Tie

On the marker cable tie, a label can be attached.
The appearance and specification may differ depending on the type and manufacturer.



Follow these guidelines when attaching an identification tag.

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



WARNING

Connecting Ground Cable

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.



CAUTION

Management of Unused Ports

Cover the unused ports (conduit, cable gland, etc.) with waterproof cap (sealing cap) to prevent infiltration of foreign material such as dust, moisture, or bug.



CHECK

Cable Installation Checklist

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.



NOTE

Cable Works

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

3.2 Cabling

The cabling diagram of the RRH-B4 is as follows:

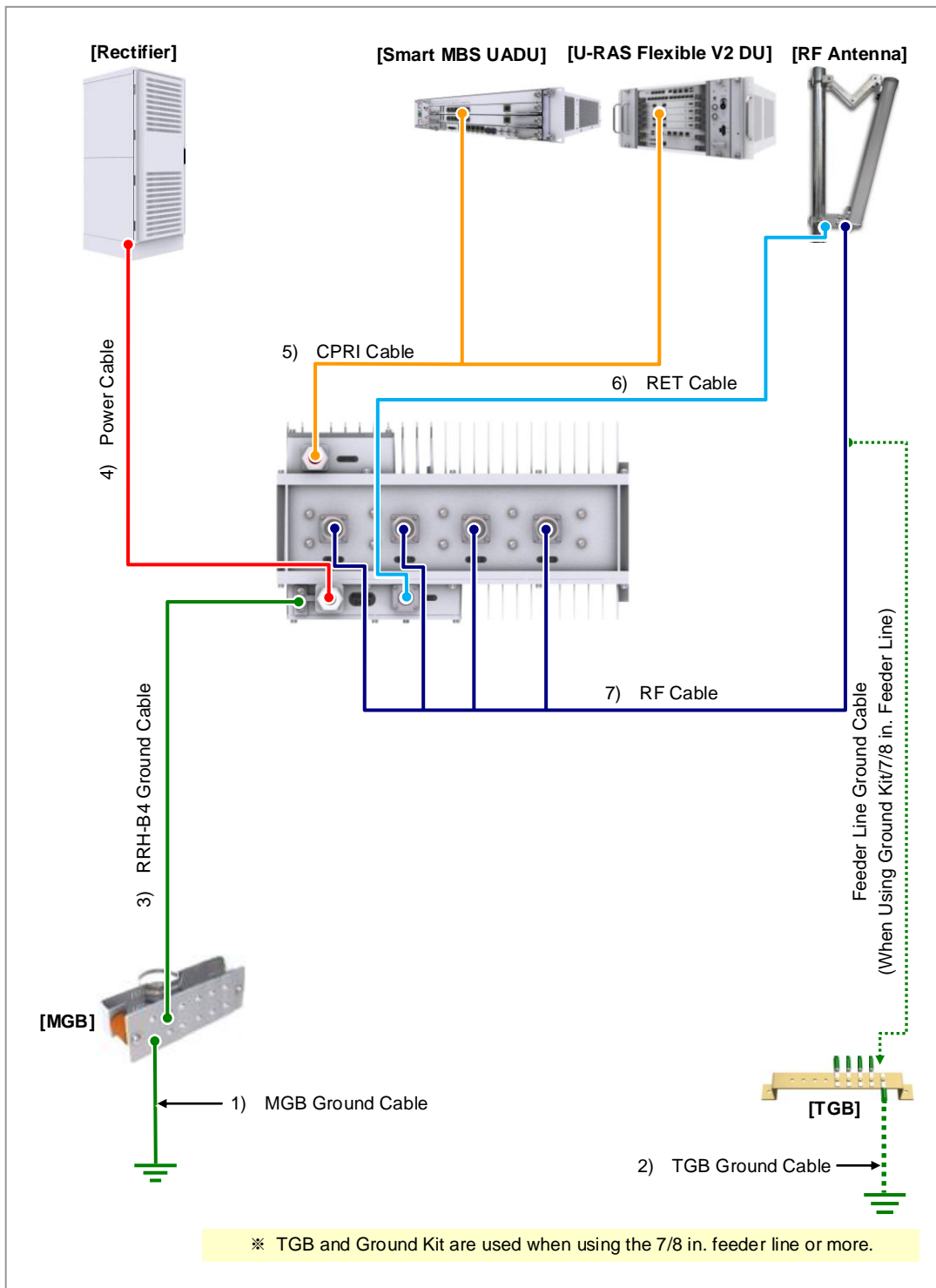


Figure 3.3 Cabling Diagram

Table 3.2 RRH-B4 Connection Cable

From	To	Cable
Underground ground	MGB (Main Ground Bar)	1) MGB Ground Cable : AWG4/0, F-GV 95 mm ² × 1C (However, this can be changed depending on the standards of each provider.)
	TGB (Tower Ground Bar)	2) TGB Ground Cable : AWG2, F-GV 35 mm ² × 1C (However, this can be changed depending on the standards of each provider.)
RRH-B4	MGB	3) RRH-B4 Ground Cable : AWG8, F-GV 6 mm ² × 1C
	Rectifier	4) Power Cable : AWG10, F-CV 4 mm ² × 2C (or AWG8, F-CV 6 mm ² × 2C)
	Smart MBS UADU	5) CPRI Cable : Optic Cable (Single Mode)
	U-RAS Flexible V2 DU	
	RF Antenna	
7) RF Cable : 1/2 in. or 7/8 in. Feeder Line		

3.3 Grounding

Grounding is required for protecting complex electronic or electric systems such as power system, communication system, and control system from lightning, over-current, over-voltage, and electric noise. Thus, the systems can operate properly and protect human life from electrical shock. Ground equipment minimizes the electrical potential of the electronic device to that of the ground, which is zero electrical potential, so that it can prevent the device from occurring electrification.

The purposes of the ground construction are as follows:

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



WARNING

Connecting Ground Cable

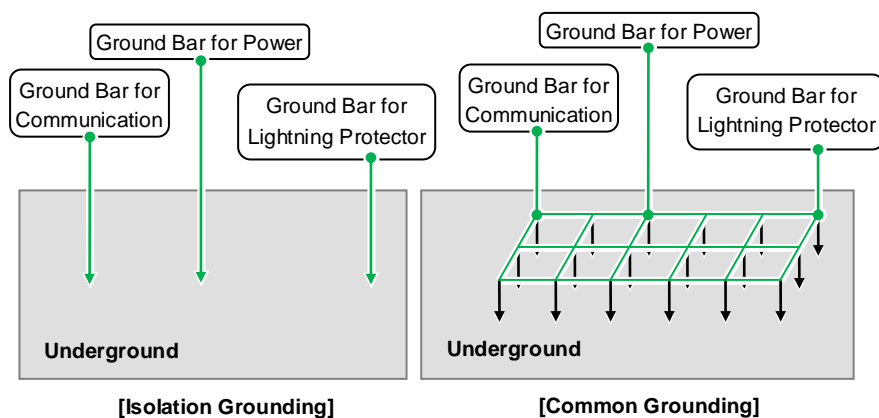
In cabling, the connection of cables without the connection to the ground cable may cause the damage of the equipment or the bodily injury of the worker. Connect the ground cable first.



CAUTION

System Grounding Method

Ground bar for lightning protector/power/communication must be isolated from each other. These three ground bars can be grounded as the isolation grounding method, or branched from ground mesh buried in the underground as common grounding method.



3.3.1 Grounding the System

The way to connect the ground cable of RRH-B4 is as follows:

Table 3.3 Grounding the RRH-B4 (MGB~RRH-B4)

Classification	Description	
Installation Section	MGB~RRH-B4 Grounding Terminal	
Cable	AWG8, F-GV 6 mm ² x 1C	
Heat Shrink Tube (Spec/Color/Length)	Φ 0.39 in. (10 mm)/Green/1.96 in. (50 mm)	
Pressure Terminal	MGB	Checking MGB specifications per site and preparing fasteners
	RRH-B4	AWG8 (6 mm ²), 2 Hole, Hole Dia.: 1/4 in. (6.35 mm), Hole Space: 0.63 in. (16 mm)
Fastener	MGB	Checking MGB specifications per site and preparing fasteners
	RRH-B4	M6 x 10L SEMS/2 EA
Recommended Torque Value	M6 SEMS	5.96~8.94 lbf.ft (82.4~123.6 kgf.cm)
Working Tools	Cable Cutter, Wire Stripper, Compressor, Heating Gun, Torque Driver (+), Torque Wrench, Nipper	



CHECK

Pressure Terminal for Grounding

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

Ex) Manufacturer: Panduit
RRH-B4: AWG8 (6 mm²) Pressure Terminal (LCD8-14AF-L)



NOTE

Assembling a Pressure Terminal and a Heat Shrink Tube

Refer to the 'ANNEX F' to see how to assemble a pressure terminal and a heat shrink tube to a cable.

- 1) Install the ground cable from the MGB to the RRH-B4 ground terminal.
- 2) Assemble a pressure terminal and a heat shrink tube at the end of the RRH-B4 ground cable.
- 3) Align the pressure terminal assembled to a ground cable to the mounting hole of the RRH-B4 ground terminal.
- 4) Firmly fix the pressure terminal onto the RRH-B4 ground terminal using fasteners.

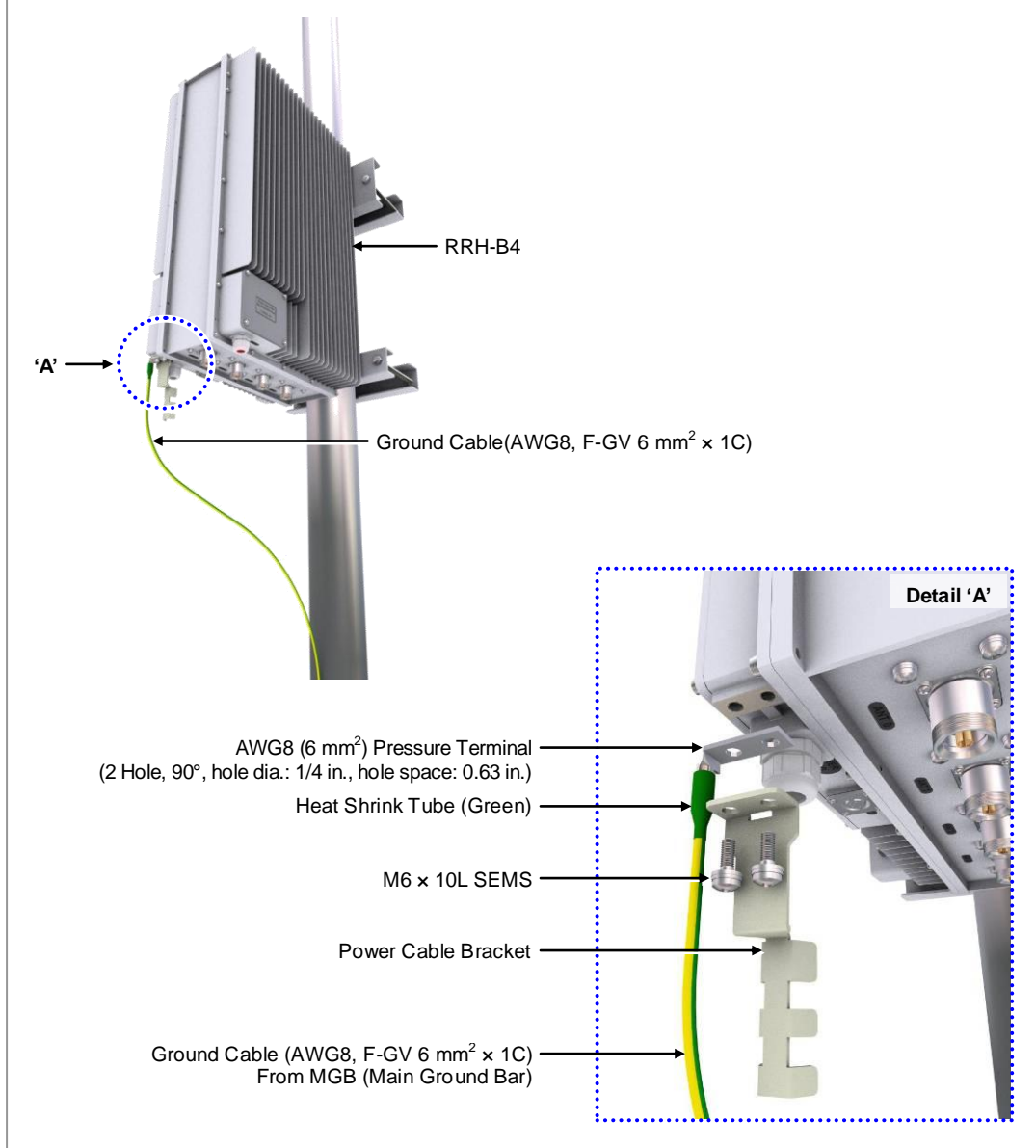


Figure 3.4 Connection of the RRH-B4 Ground Cable

3.4 Power Cabling

The power supply device consists of the followings, including an AC distributor and rectifier.

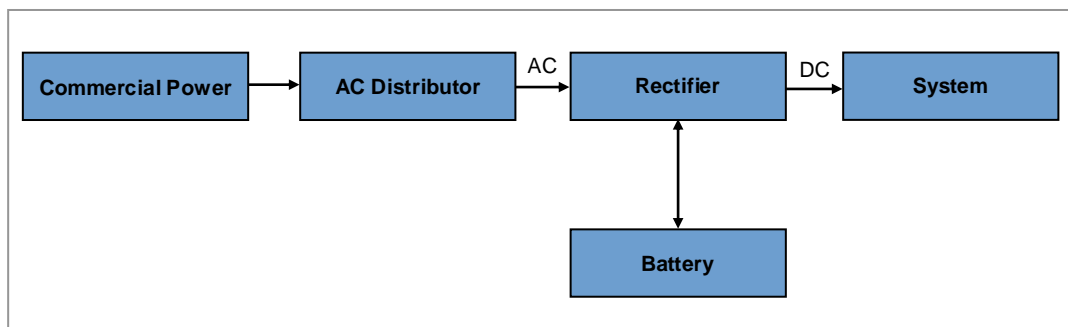


Figure 3.5 Power Equipment Diagram



WARNING

Turning Off the Circuit Breaker before Connecting the Power Cable

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



CAUTION

When Using Power Cables

- When handling the power cable, ensure the power switch of a rectifier is turned off to prevent the risk from the power cable and electric short-circuit of related cables.
- Because a power accident may occur when fixing parts get loosened, make sure that fasteners to fix the power cable should be firmly fastened.

3.4.1 Connecting the RRH-B4 Power Cable

3.4.1.1 When Using the Power Cable (AWG8)

Follow the steps below to connect the RRH-B4 power cable when using power cable (AWG8).

Table 3.4 Connecting the DC Power Cable (AWG8, DC Distributor~RRH-B4)

Classification	Description		
Installation Section	DC Distributor~RRH-B4 power input terminal		
Cable	-48 V	AWG8, F-CV, 6 mm ² x 2C	Black
	RTN		Red
Heat Shrink Tube (Spec/Color/Length)	-48 V	Φ 0.3 in. (8 mm)/Blue/1.18 in. (30 mm)	
	RTN	Φ 0.3 in. (8 mm)/Red/1.18 in. (30 mm)	
Pressure Terminal	DC Distributor	Check the specification of DC distributor output terminal and prepare fasteners.	
	RRH-B4	AWG8 (6 mm ²), Ring Type, Hole Dia.: 0.2 in. (5.3 mm)	
Fastener	DC Distributor	Check the specification of DC distributor output terminal and prepare fasteners.	
	RRH-B4	DC Power Input Terminal	M5 SEMS/2 EA
Recommended Torque Value (kgf.cm)	Cable Gland	1.81 lbf.ft (25.0 kgf.cm)	
	M5 SEMS	1.45~2.17 lbf.ft (20.0~30.0 kgf.cm)	
	Torx Screw	0.87 lbf.ft (12.0 kgf.cm)	
Working Tools	Cable Cutter, Wire Stripper, Compressor, Heating Gun, Torque Driver (+), Torque Wrench, Nipper, Torx Driver		



CHECK

Pressure Terminal for Power

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

- Ex) Manufacturer-Spec-Kon
RRH-B4: AWG8, Pressure Terminal (K8-10R-D)





CHECK

Circuit Breaker Installation

To supply stable power to the system, a circuit breaker must be installed to a power supplier. The capacity of -48 VDC circuit breaker is 32 A.



NOTE

Assembling a Pressure Terminal and a Heat Shrink Tube

Refer to the 'ANNEX F' to see how to assemble a pressure terminal and a heat shrink tube to a cable.



NOTE

Tools to Tighten Stainless Steel Tie

It is recommended to use the following tools or their equivalents to tighten the stainless steel tie that is used to fix an external power cable support bracket and a power cable.

Ex) Manufacture-Dong A bestech
Part No: DAS 250



Disassembling the Cover of RRH-B4 Power Window

Open the power window at the rear bottom of RRH-B4 by loosening the Torx screws for fixing cover with a Torx driver (T20).

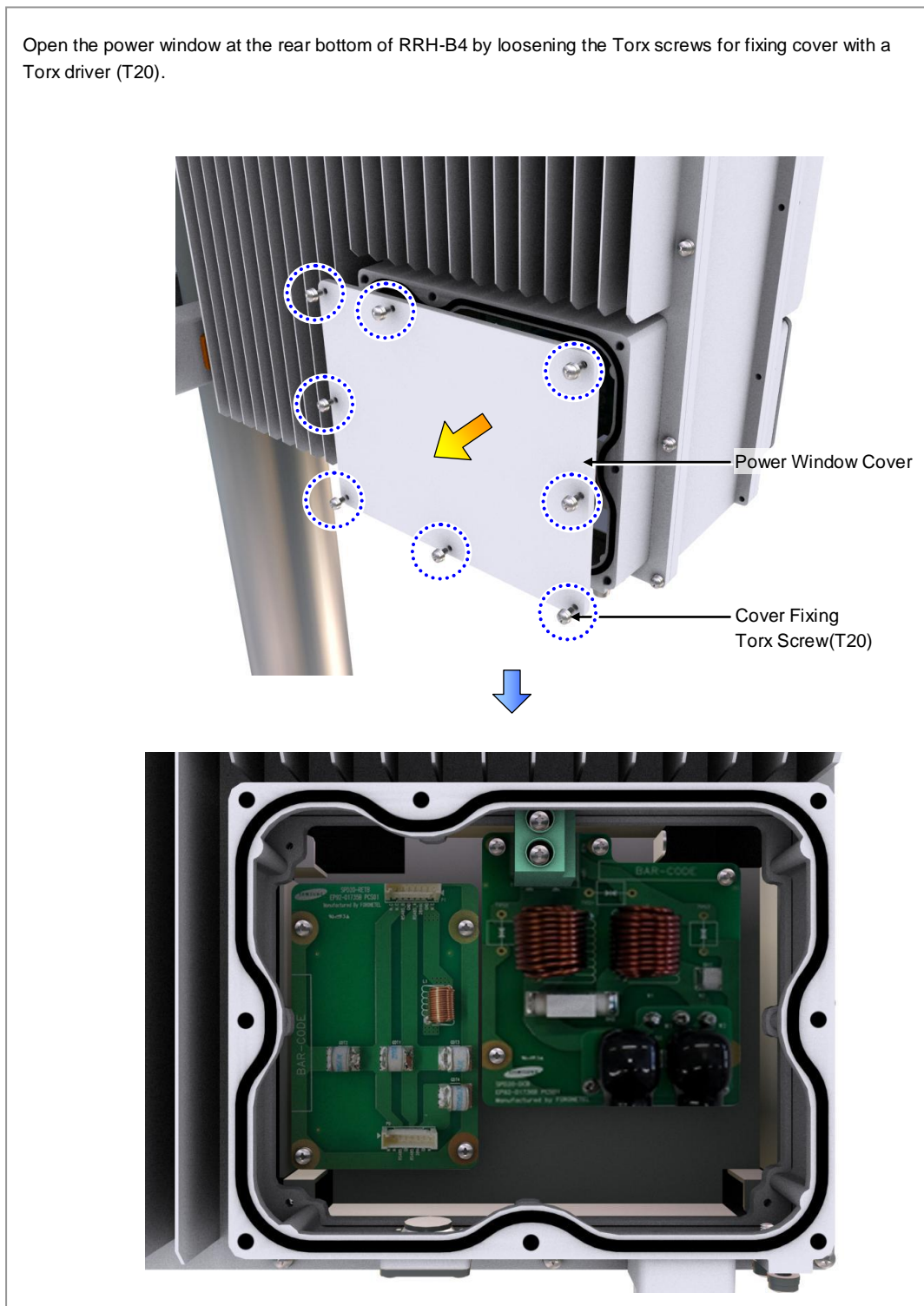


Figure 3.6 Connecting the RRH-B4 Power Cable_AWG8 (1)

Connecting the RRH-B4 Power Cable

- 1) Install power cable up to the power port of RRH-B4, referring to the 'Cautions When Installing Power Cable'.
- 2) Cut the power cable installed to the power port, strip the cable sheath, and strip the core wire.
- 3) Insert a heat shrink tube to each core, and install the compression terminal and compressing it.
- 4) Place the heat shrink tube on the pressure terminal assembly (-48 V: blue, RTN: red), and shrink it using a heating gun.

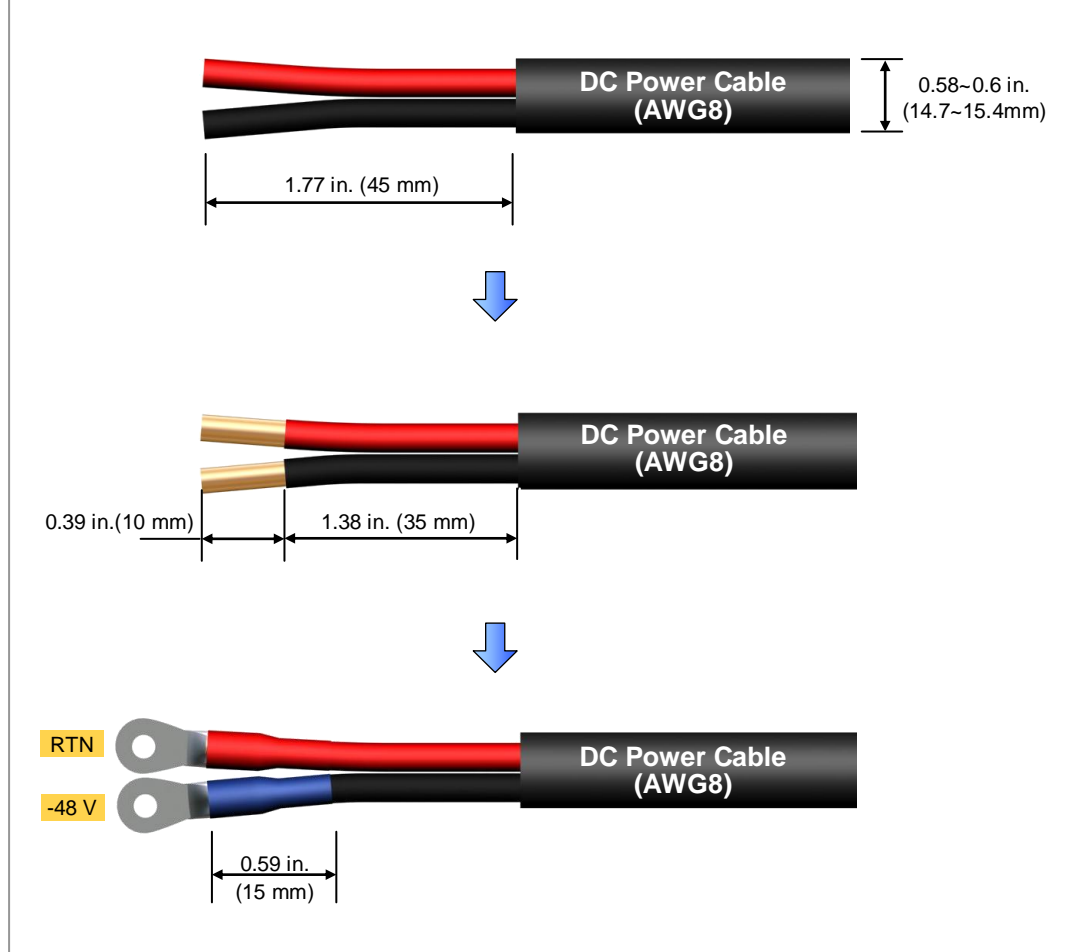
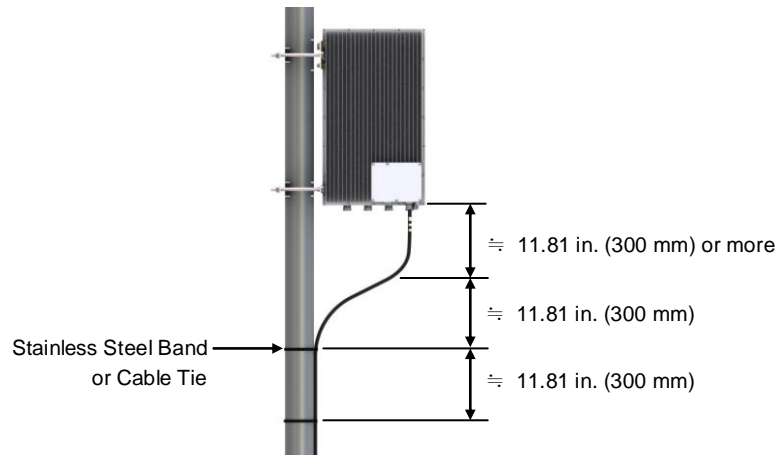


Figure 3.7 Connecting the RRH-B4 Power Cable_AWG8 (2)



Precautions When Connecting Power Cable

To secure rainproof performance of a cable gland, min. 11.81 in. (300 mm) straight section must be maintained. Here, the radius of curvature must be considered according to the cable specification.



Precautions When Cutting Power Cable

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

- 5) Remove the protection cap of power terminal.

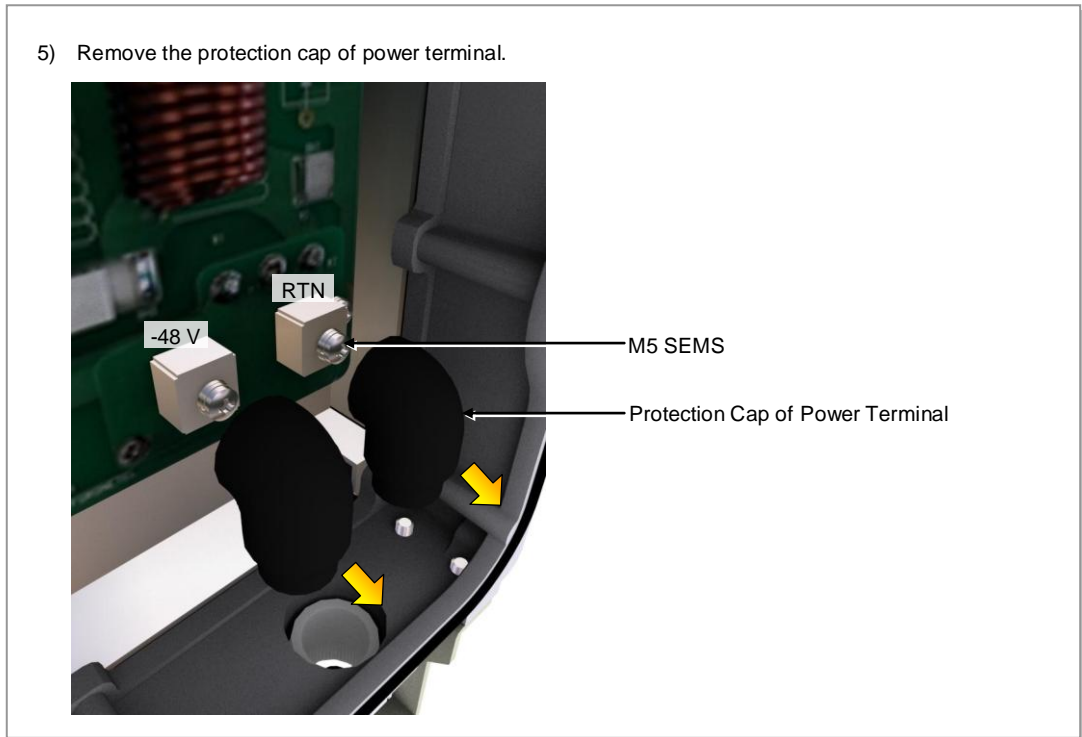


Figure 3.8 Connecting the RRH-B4 Power Cable_AWG8 (3)

- 6) Remove the rain-proof filler and the cable gland nut from the cable gland for power cable input at the bottom of RRH-B4.
- 7) Insert the rain-proof filler and the cable gland nut removed from the 1 power cable (AWG8, F-CV 6 mm² × 2C).
- 8) Pass the power cable through the cable gland at the bottom of the RRH-B4, and install it inside the power window.

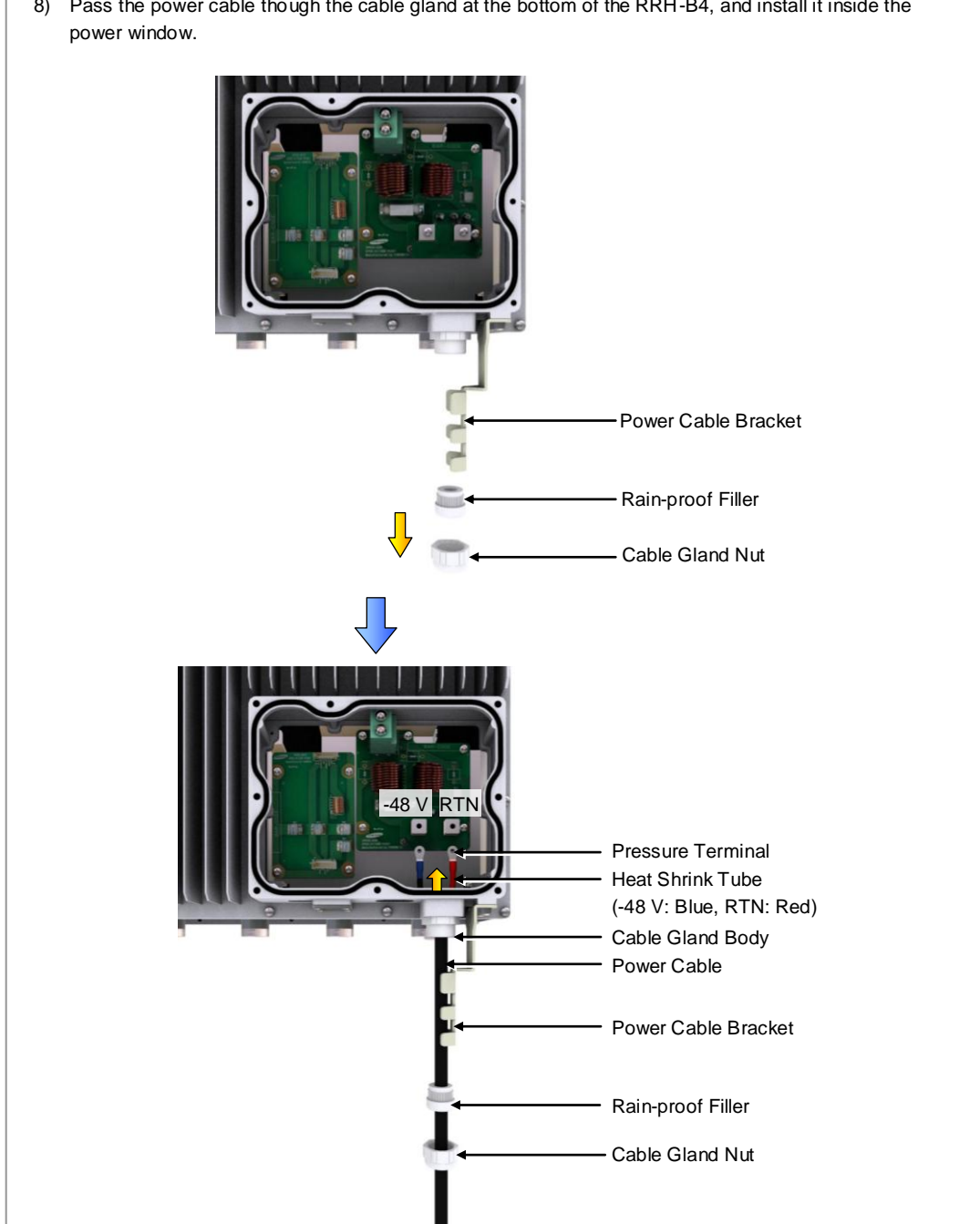


Figure 3.9 Connecting the RRH-B4 Power Cable_AWG8 (4)

- 9) Place the pressure terminal installed to the power cable according to the polarity of the power terminal block, and fix it with fasteners.

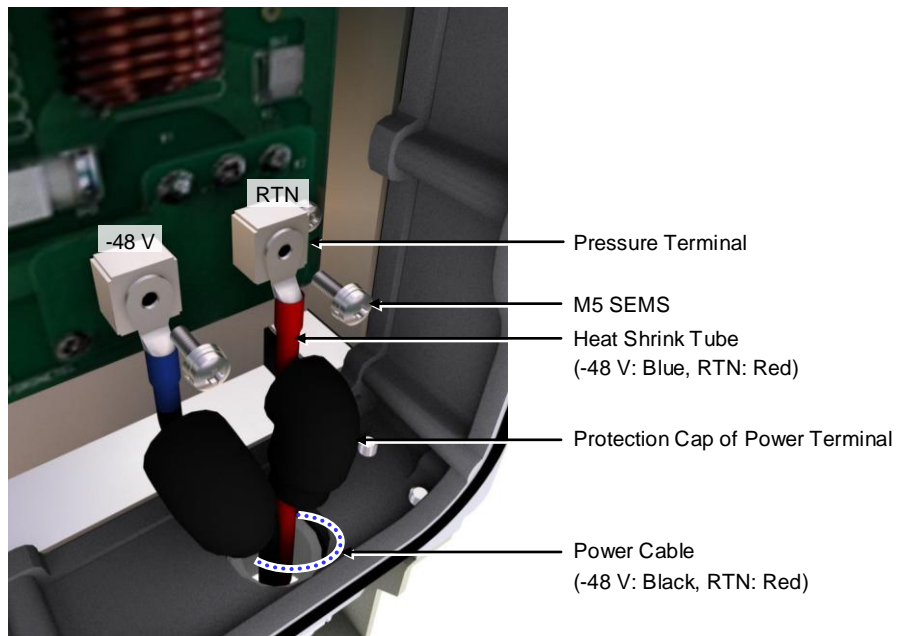


Figure 3.10 Connecting the RRH-B4 Power Cable_AWG8 (5)

- 10) Fully insert the rain-proof filler to the cable gland body, and tighten the cable gland nut using a torque wrench with torque value 2.17 lbf.ft (30 kgf.cm).

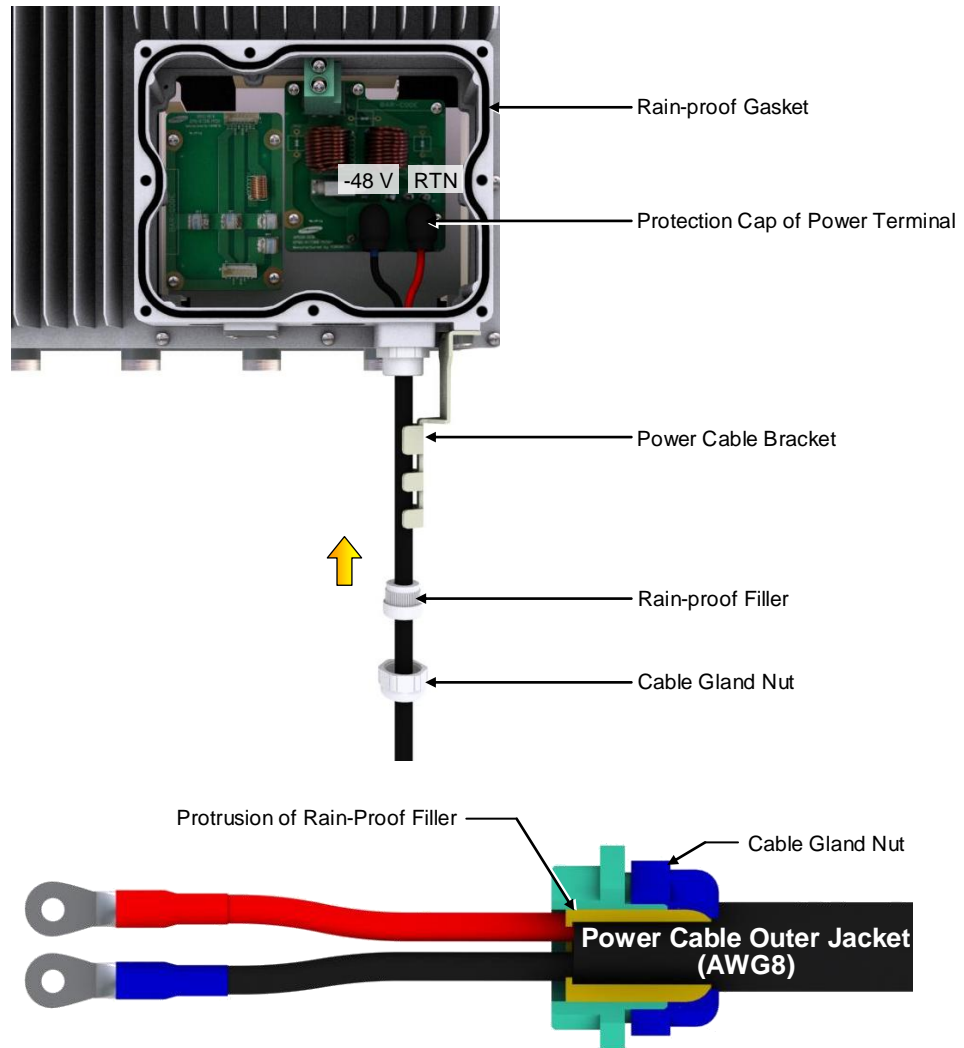


Figure 3.11 Connecting the RRH-B4 Power Cable_AWG8 (6)



Caution for Rain-proof Gasket Damage

Be careful the rain-proof gasket is not damaged during work, and check again the gasket is not damaged before closing power/DTA window cover. If the rain-proof gasket is damaged, replace the RRH-B4.

11) Close the power window, and tighten the Torx screws with a torque driver (T20) with torque value 0.87 lbf.ft (12 kgf.cm). Tightening order is ① → ② → ③ → ④ → ⑤ → ⑥ → ⑦ → ⑧.

12) Fix the RRH-B4 power cable and the power cable bracket using a stainless steel tie.

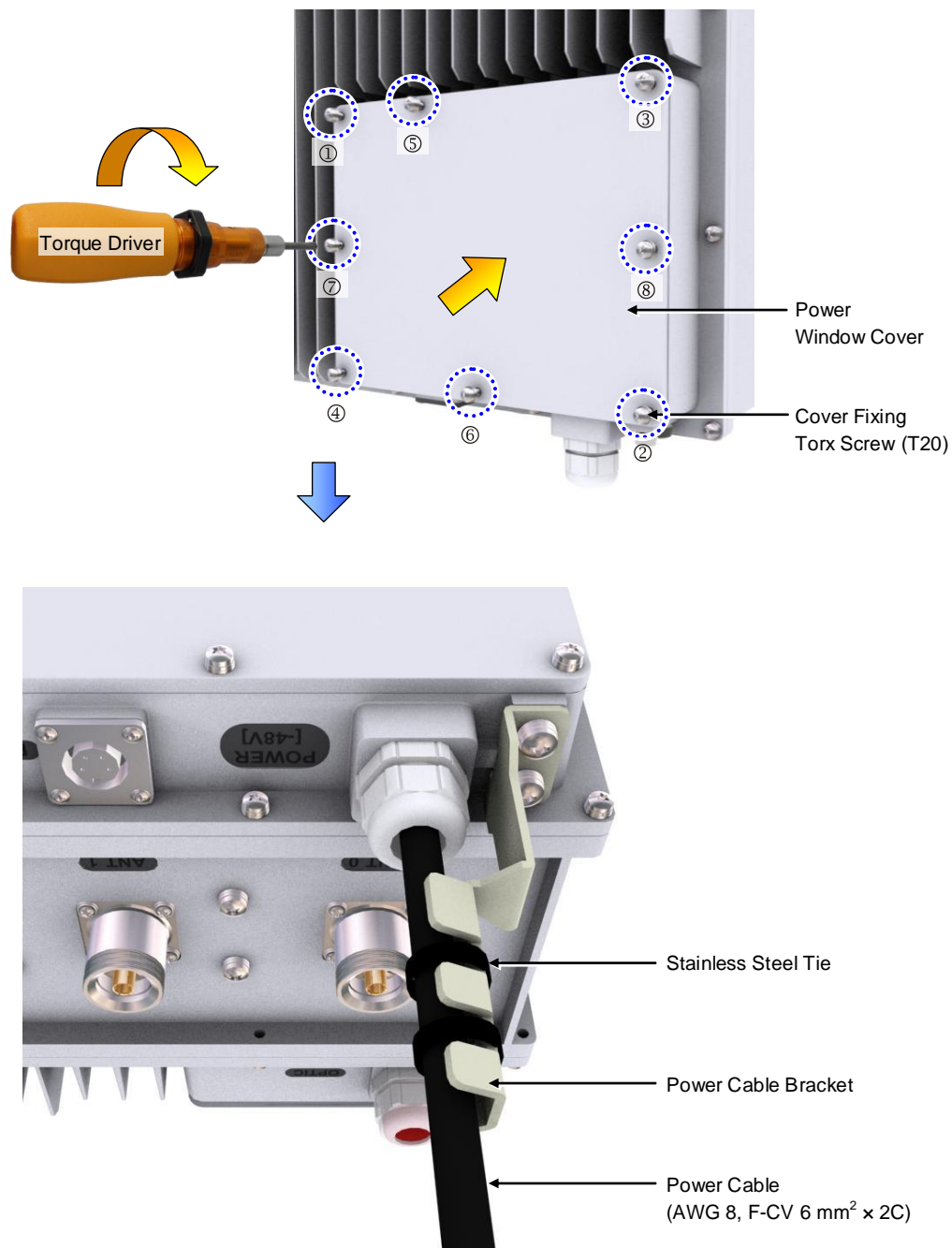


Figure 3.12 Connecting the RRH-B4 Power Cable_AWG8 (7)



Check When Fixing the Power Cable

Fix the power cable and the power cable bracket using a stainless steel tie for preventing loose contact due to cable tension and leakage problems.

It is recommended to use the designated tools to tighten the stainless steel tie.

3.4.1.2 When Using the Power Cable (AWG10)

Follow the steps below to connect the RRH-B4 power cable when using power cable (AWG10).

Table 3.5 Connecting the DC Power Cable (AWG10, DC Distributor~RRH-B4)

Classification	Description		
Installation Section	DC Distributor~RRH-B4 power input terminal		
Cable	-48 V	AWG10, F-CV 4 mm ² × 2C	Black
	RTN		Red
Heat Shrink Tube (Spec/Color/Length)	-48 V	Φ 0.3 in. (8 mm)/Blue/1.18 in. (30 mm)	
	RTN	Φ 0.3 in. (8 mm)/Red/1.18 in. (30 mm)	
Pressure Terminal	DC Distributor	Check the specification of DC distributor output terminal and prepare fasteners.	
	RRH-B4	AWG10 (4 mm ²), Ring Type, Hole Dia.: 0.2 in. (5.3 mm)	
Fastener	DC Distributor	Check the specification of DC distributor output terminal and prepare fasteners.	
	RRH-B4	DC Power Input Terminal	M5 SEMS/2 EA
Recommended Torque Value (kgf.cm)	Cable Gland	1.74 lbf.ft (25.0 kgf.cm)	
	M5 SEMS	1.45~2.17 lbf.ft (20.0~30.0 kgf.cm)	
	Torx Screw	0.83 lbf.ft (12.0 kgf.cm)	
Working Tools	Cable Cutter, Wire Stripper, Compressor, Heating Gun, Torque Driver (+, T20), Torque Wrench, Nipper, Driver (+, T20)		



CHECK

Pressure Terminal for Power

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

- Ex) Manufacturer-Donga bestech
RRH-B4: AWG10 (4 mm²) Pressure Terminal (PTSR0306)



CHECK

Circuit Breaker Installation

To supply stable power to the system, a circuit breaker must be installed to a power supplier. The capacity of -48 VDC circuit breaker is 32 A.



NOTE

Assembling a Pressure Terminal and a Heat Shrink Tube

Refer to the 'ANNEX F' to see how to assemble a pressure terminal and a heat shrink tube to a cable.



NOTE

Tools to Tighten Stainless Steel Tie

It is recommended to use the following tools or their equivalents to tighten the stainless steel tie that is used to fix an external power cable support bracket and a power cable.

- Ex) Manufacture-Dong A bestech
Part No: DAS 250



Disassembling the Cover of RRH-B4 Power Window

Open the power window on the rear bottom of the RRH-B4 by loosening the cover fixing Torx screws with a Torx driver (T20).

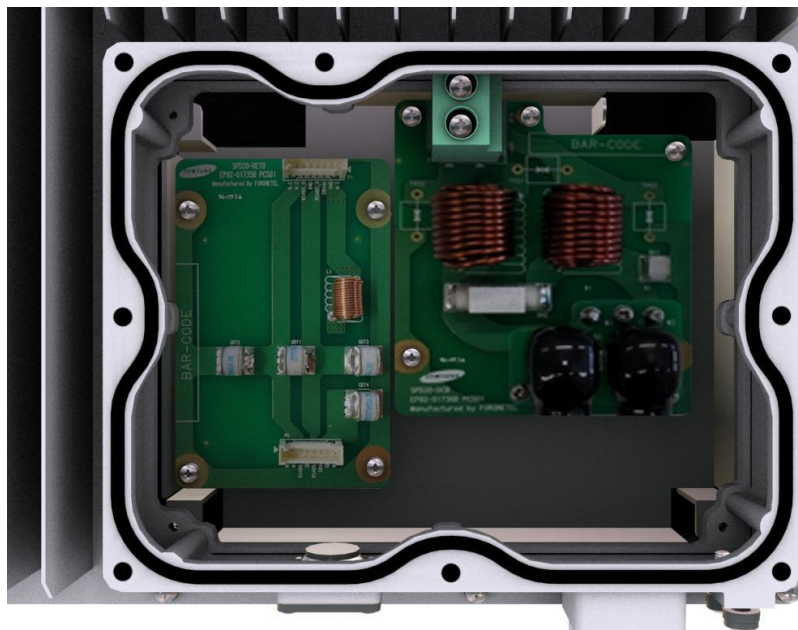
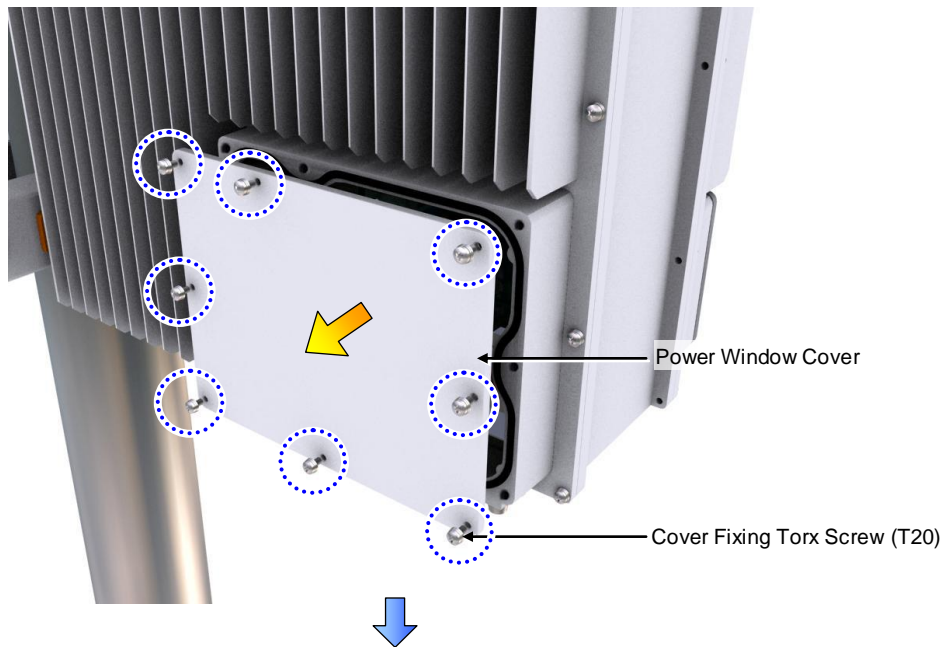


Figure 3.13 Connecting the RRH-B4 Power Cable_AWG10 (1)

Connecting the RRH-B4 Power Cable

- 1) Install power cable up to the power port of RRH-B4, referring to the 'Cautions When Installing Power Cable'.
- 2) Cut the power cable installed to the power port, strip the cable sheath, and strip the core wire.
- 3) Insert a heat shrink tube to each core, and install the compression terminal and compressing it.
- 4) Place the heat shrink tube on the pressure terminal assembly (-48 V: blue, RTN: red), and shrink it using a heating gun.
- 5) Insert a heat shrink tube(jelly type, black) to the part, which the external sheath is removed, and shrink it using a heating gun.

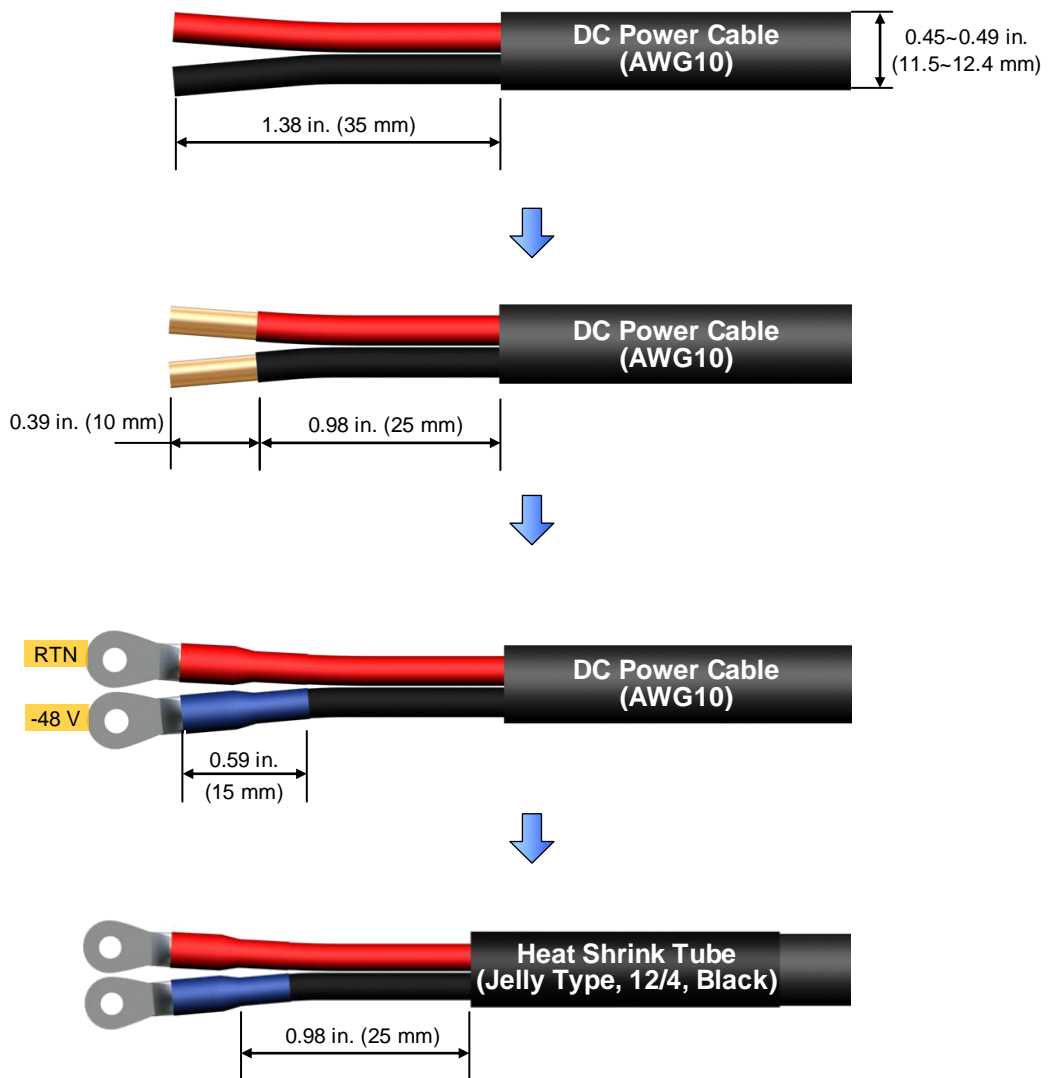
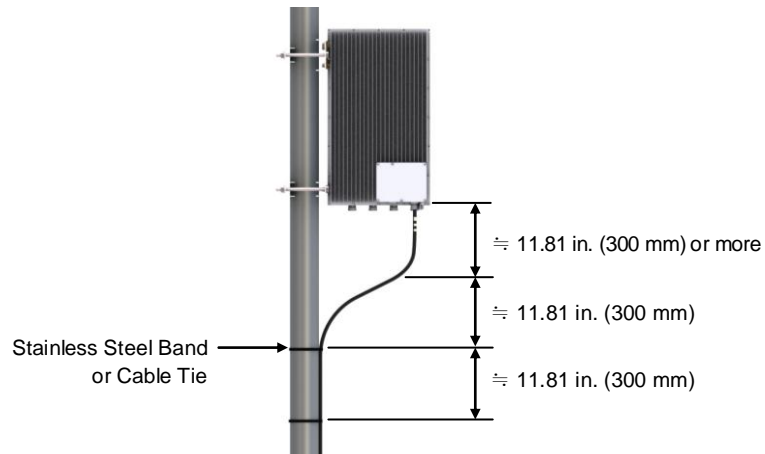


Figure 3.14 Connecting the RRH-B4 Power Cable_AWG10 (2)



Precautions When Connecting Power Cable

To secure rainproof performance of a cable gland, min. 11.81 in. (300 mm) straight section must be maintained. Here, the radius of curvature must be considered according to the cable specification.



Precautions When Cutting Power Cable

Install the power cable to the power port of system by considering the radius of curvature of its cable specification and then cut the cable.

If you install the cable after cutting, there may be length difference among the core wires at the end of the cable because of cable curvature. This may result in poor contact after the cable is connected to the power port.

- 6) Remove the protection cap of power terminal.

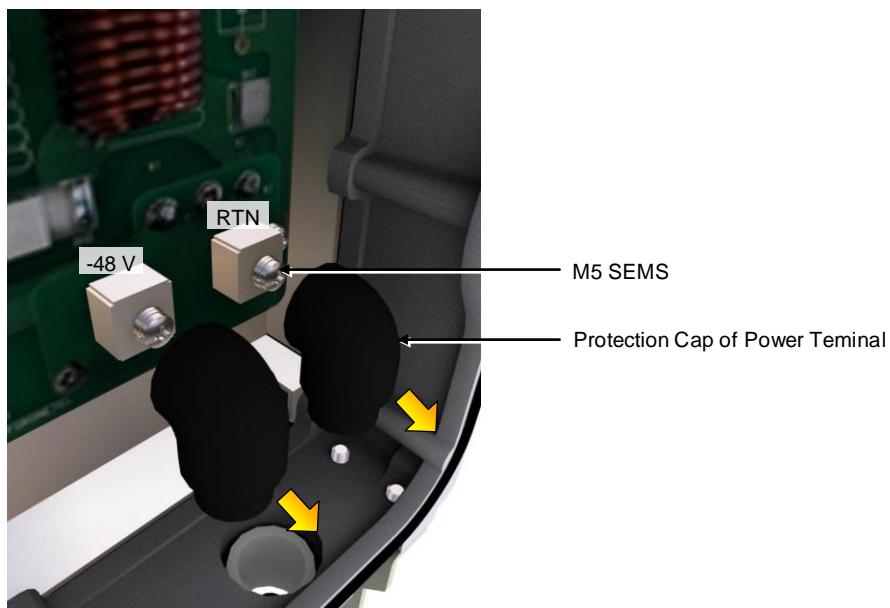


Figure 3.15 Connecting the RRH-B4 Power Cable_AWG10 (3)

- 7) Remove the rain-proof filler and the cable gland nut from the cable gland for power cable input at the bottom of RRH-B4.
- 8) Insert the rain-proof filler and the cable gland nut removed from the 1 power cable (AWG10, F-CV 4 mm² × 2C).
- 9) Pass the power cable through the cable gland at the bottom of the RRH-B4, and install it inside the power window.

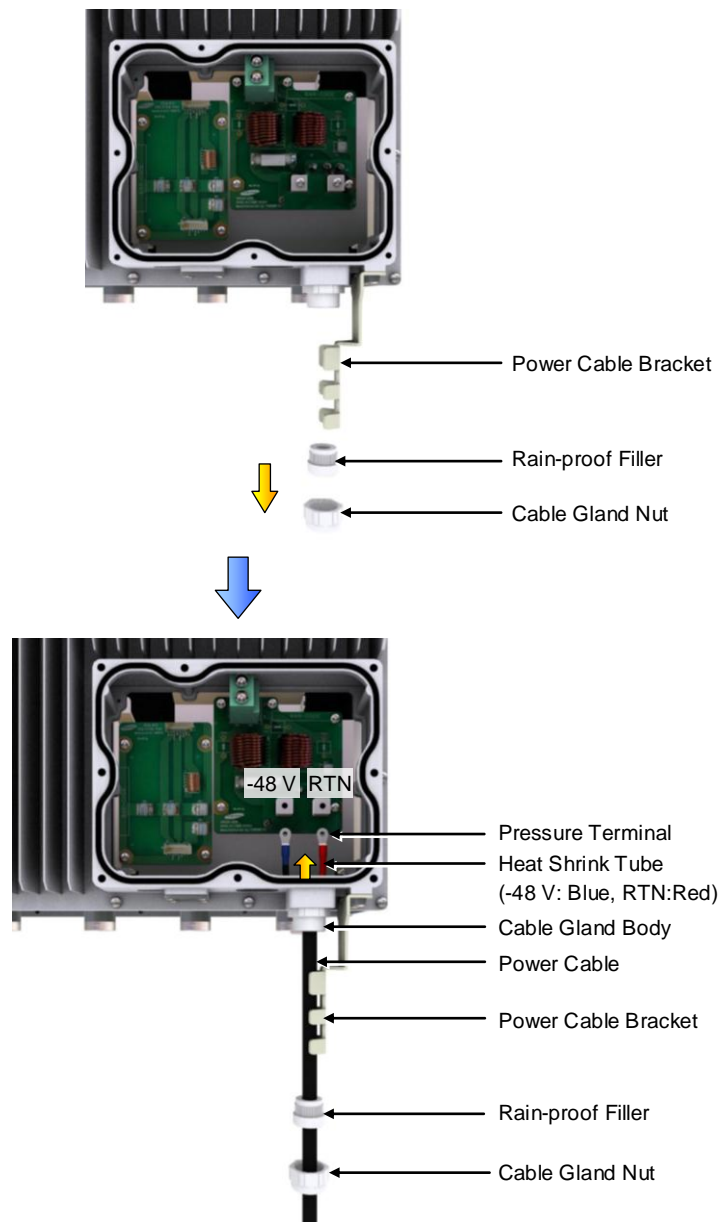


Figure 3.16 Connecting the RRH-B4 Power Cable_AWG10 (4)

10) Place the pressure terminal installed to the power cable according to the polarity of the power terminal block, and fix it with fasteners.

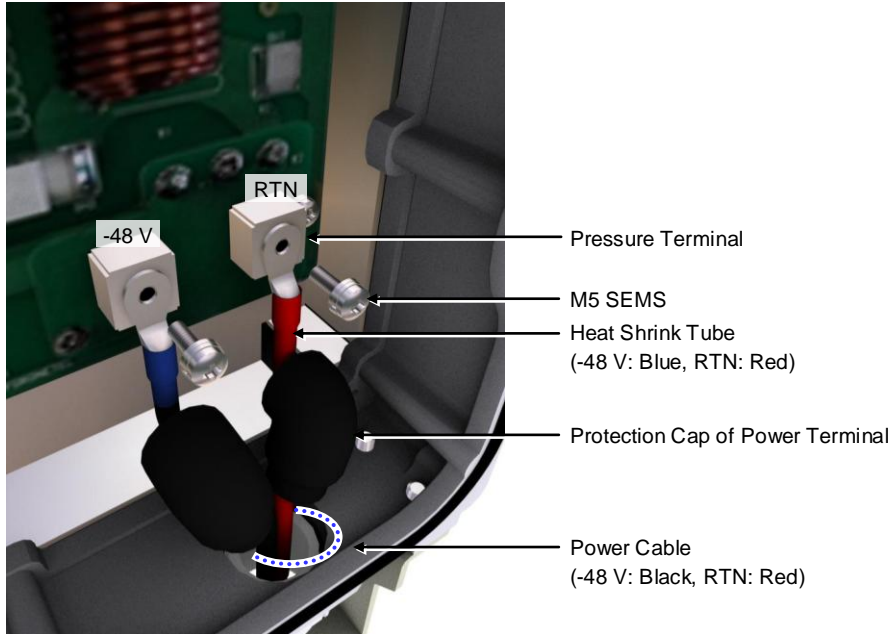


Figure 3.17 Connecting the RRH-B4 Power Cable_AWG10 (5)

- 11) Fully insert the rain-proof filler to the cable gland body, and tighten the cable gland nut using a torque wrench with torque value 2.17 lbf.ft (30 kgf.cm).

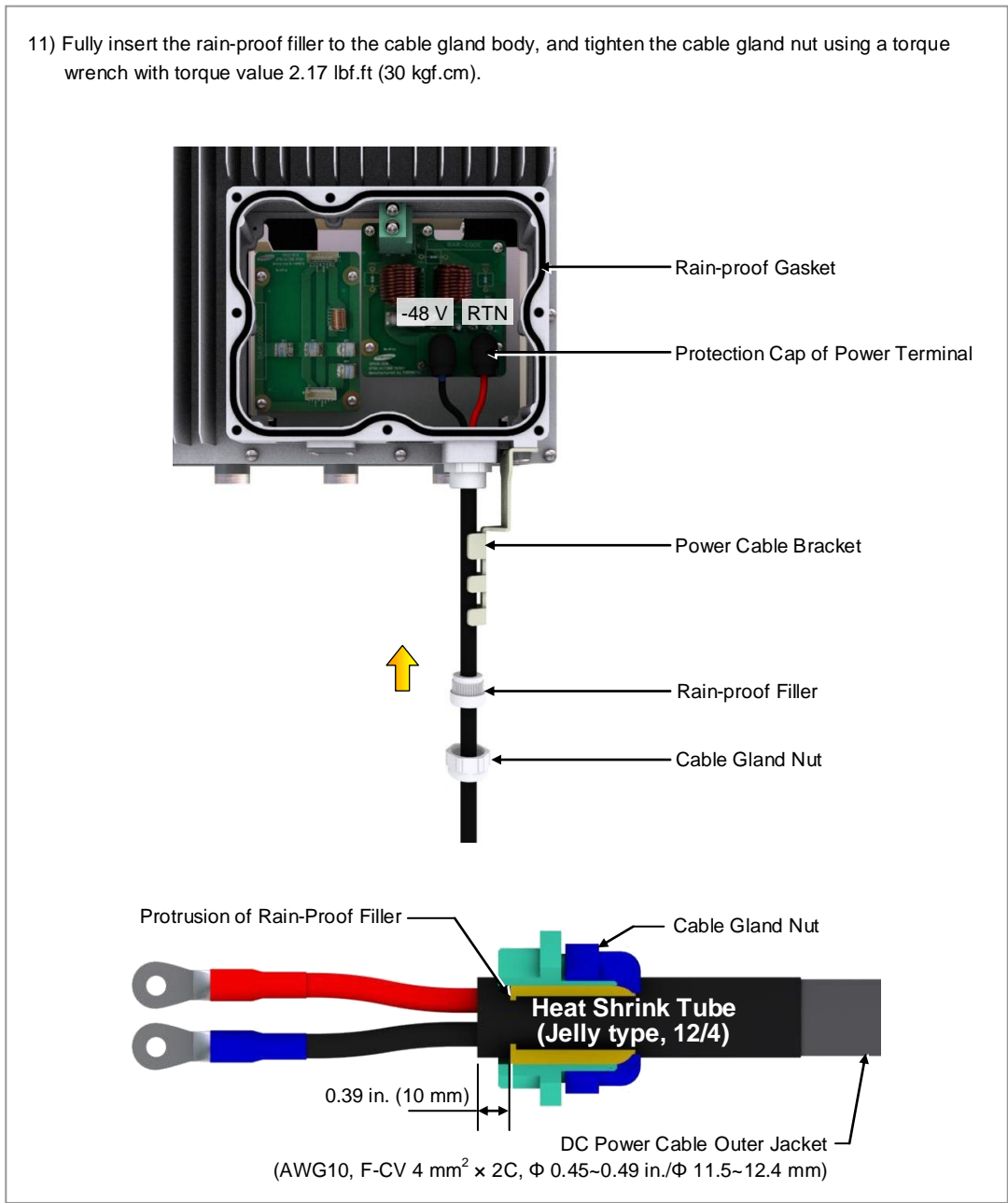


Figure 3.18 Connecting the RRH-B4 Power Cable_AWG10 (6)



Caution for Rain-proof Gasket Damage

Be careful the rain-proof gasket is not damaged during work, and check again the gasket is not damaged before closing power/DTA window cover. If the rain-proof gasket is damaged, replace the RRH-B4.

12) Close the power window, and tighten the Torx screws with a torque driver (T20) with torque value 0.87 lbf.ft (12 kgf.cm). Tightening order is ① → ② → ③ → ④ → ⑤ → ⑥ → ⑦ → ⑧.

13) Fix the RRH-B4 power cable and the power cable bracket using a stainless steel tie.

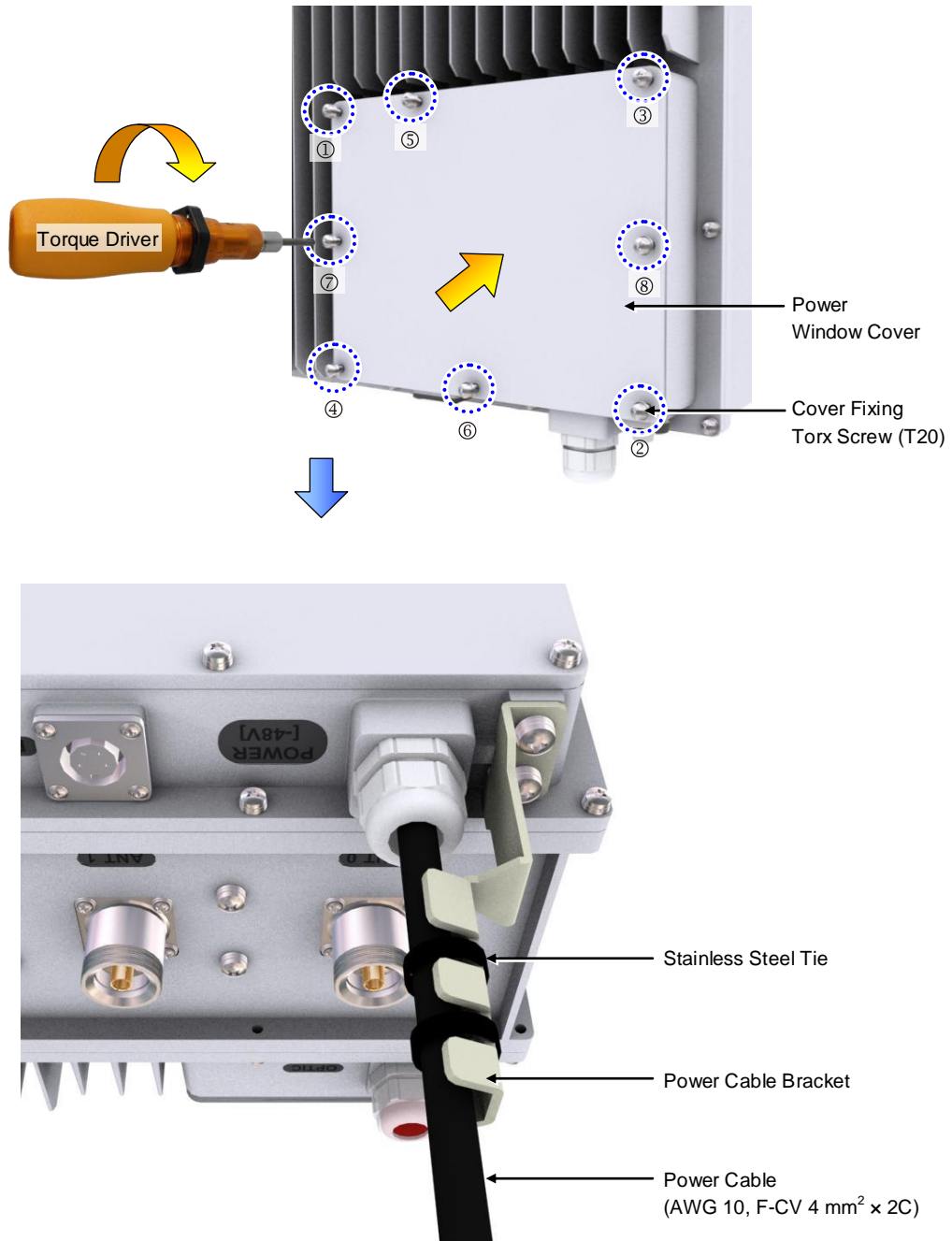


Figure 3.19 Connecting the RRH-B4 Power Cable_AWG10 (7)



CAUTION

Check When Fixing the Power Cable

Fix the power cable and the power cable bracket using a stainless steel tie for preventing loose contact due to cable tension and leakage problems.

It is recommended to use the designated tools to tighten the stainless steel tie.

3.4.2 Power Test

Perform the power test of the system for the following areas.

- Power cable connection stability check
Check the power cable connection for the power source such as a rectifier and verify if the power cable is securely tightened into the RRH-B4 input terminal.
- Supply voltage of the power source
Use a digital voltage meter to check if the power supplied is within the allowed input voltage range of the RRH-B4. (Rated input voltage: -48 V, Allowed input voltage: -40~-56 V)
- Power on/off test
Turn the power switch on/off to check if the system operates normally.



CAUTION

Power Window Cover


Be sure to check the circuit breaker for RRH-B4 is turned off before opening or closing the power window cover. If the cover is open or close while the circuit breaker is on, the system can be damaged or a worker may be critically injured due to electrical short-circuit.

3.5 External Interface Construction

3.5.1 RRH-B4 Interface (CPRI) Cable Connection


Consider the following cases when connecting the CPRI cable (RRH-4 interface).

- For U-RAS Flexible V2: WiMAX+TD-LTE Multi-Mode (Case #1~Case #3)
- For Smart MBS: TD-LTE (Case #1 and Case #2)
- For stacking between U-RAS Flexible V2 (WiMAX) and Smart MBS (Case #1~Case #3)



Warning for Laser Beam Running through Optical Cables

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



Connecting the Optic Cable

Before connecting the optical cable, check if the cutting section of the connector core is soiled. Be careful to keep the cutting section away from dust or foreign material. If the cable is soiled with foreign material, do not blow to remove them. Make sure to clean the connector in accordance with the cleaning directions for the optic cable. Refer the 'ANNEX D'.

Table 3.6 Interface (CPRI) Cable Connection

Classification	Description	
Installation Section	DU (UADU)~RRH-B4	
Cable	Optic Cable (Single Mode, for Outdoor)	
Connector	DU	LC/PC
	RRH-B4	LC/PC
Working Tools	Nipper, Optic Connector Cleaner, Torque Driver (T20), Torx Driver (T20)	

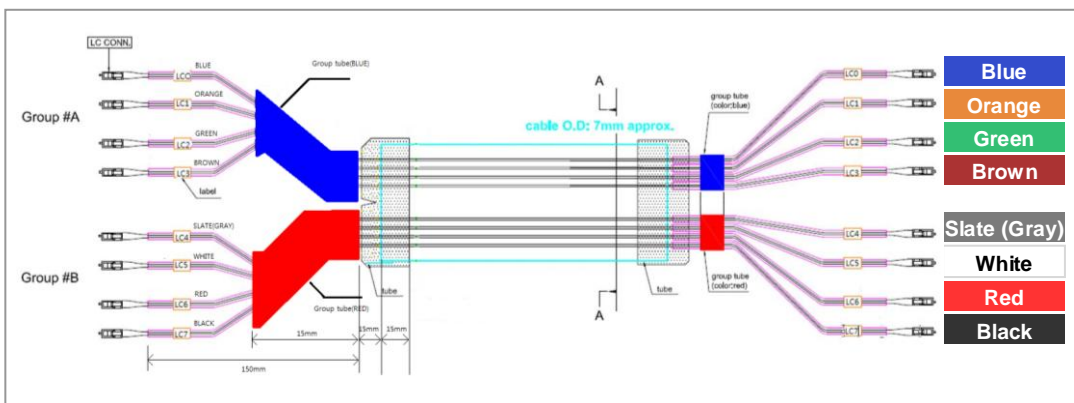


Figure 3.20 Specifications of CPRI Cable and Connector

Follow the steps below to connect the interface (CPRI) cable.

Disassembling the Cover of RRH-B4 DTA Window

- 1) Open the DTA window on the bottom left of the RRH-B4 by loosening the cover fixing screws with a Torx driver (T20).

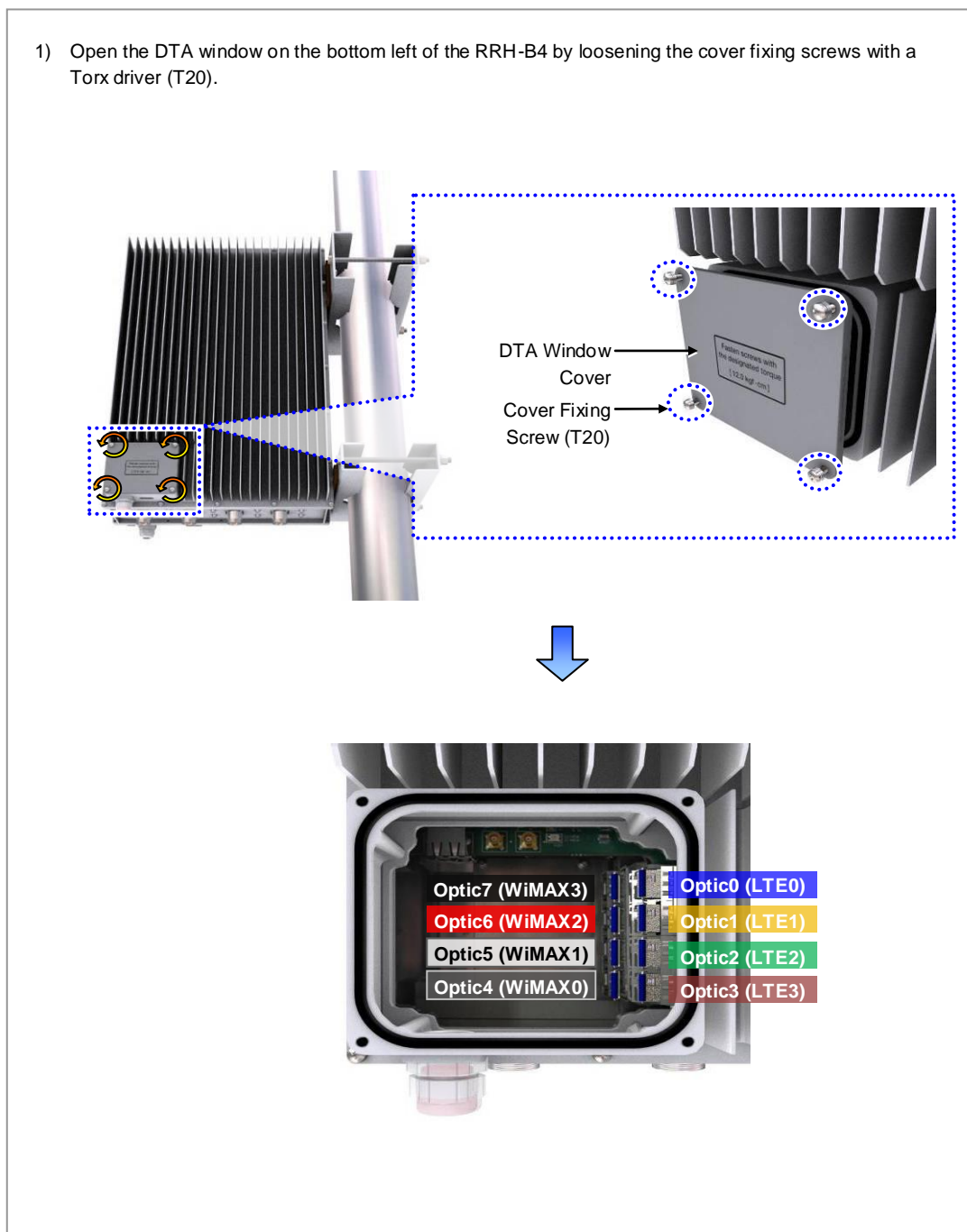


Figure 3.21 RRH-B4 Interface (CPRI) Cable Connection (1)

- 2) Remove the cable gland nut and the rain-proof filler from the optic cable gland (M25) at the left bottom of RRH-B4.
- 3) Insert the cable gland nut cable and then the rain-proof filler to the RRH-B4 interface (CPRI) cable. Place the rain-proof filler top-end on the end of heat shrink tube.

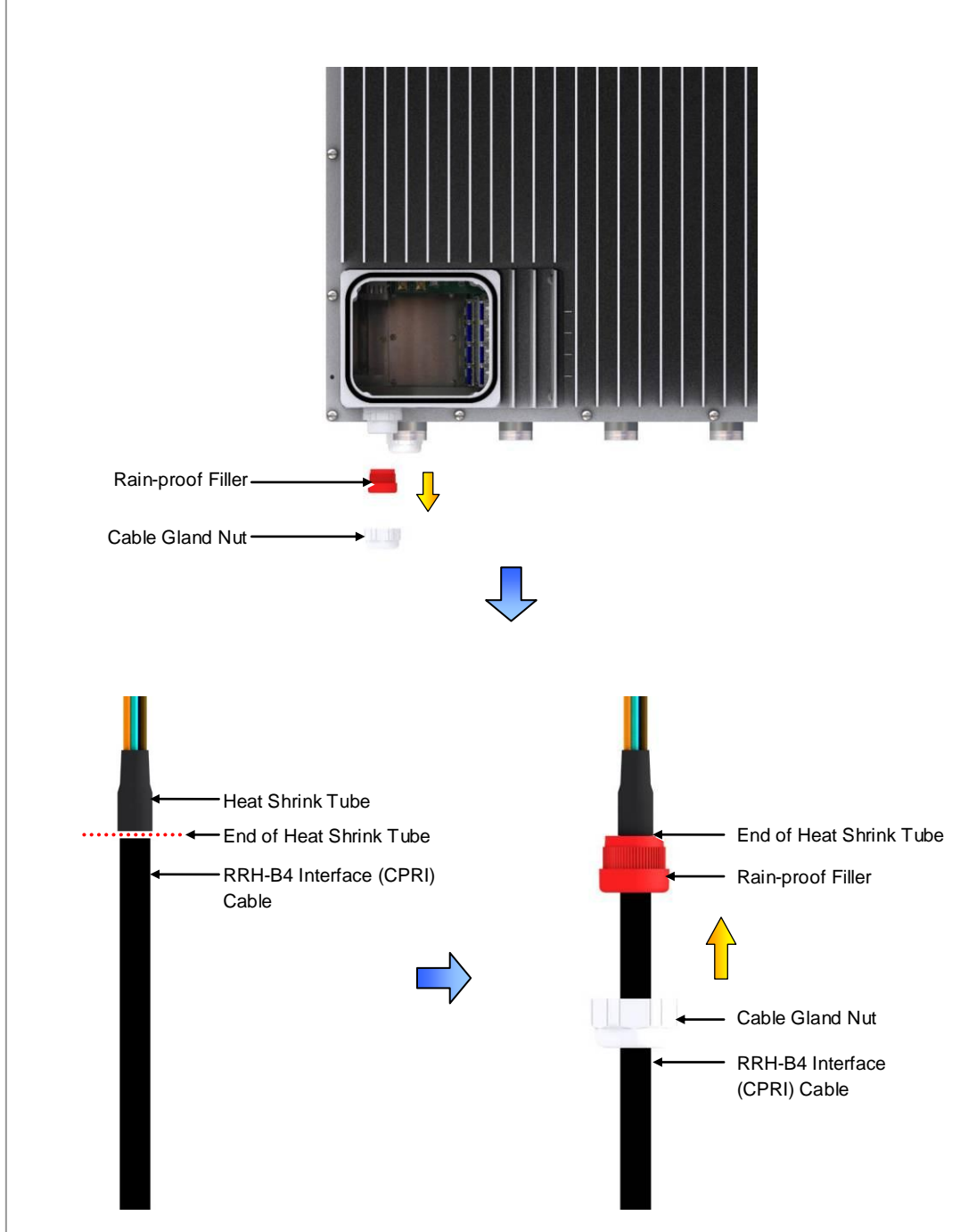


Figure 3.22 RRH-B4 Interface (CPRI) Cable Connection (2)

- 4) Insert the RRH-B4 interface (CPRI) cable from the bottom of the RRH-B4 through the optic cable gland and install it inside the DTA window.
- 5) Fully insert the rain-proof filler to the cable gland body, and tighten the cable gland nut using a torque wrench with torque value 2.17 lbf.ft (25 kgf.cm).
- 6) Connect the RRH-B4 interface (CPRI) optic connector to the SFP module ① → ② → ③ → ④ → ⑤ → ⑥ → ⑦ → ⑧, in order of figure 3.24. (See the cable color of figure 3.20.)

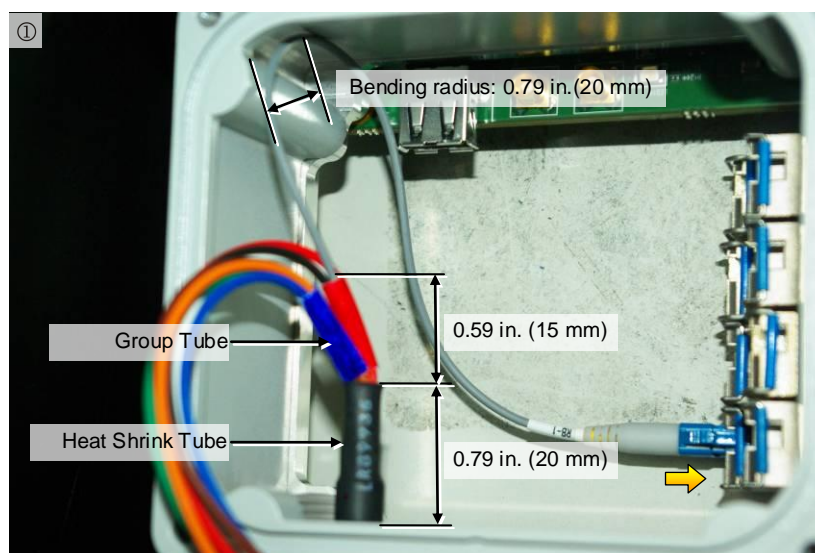
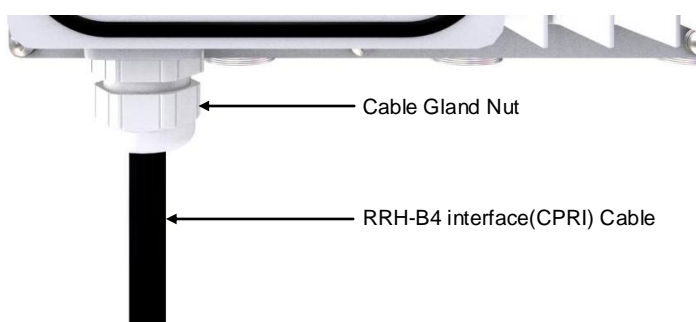


Figure 3.23 RRH-B4 Interface (CPRI) Cable Connection (3)

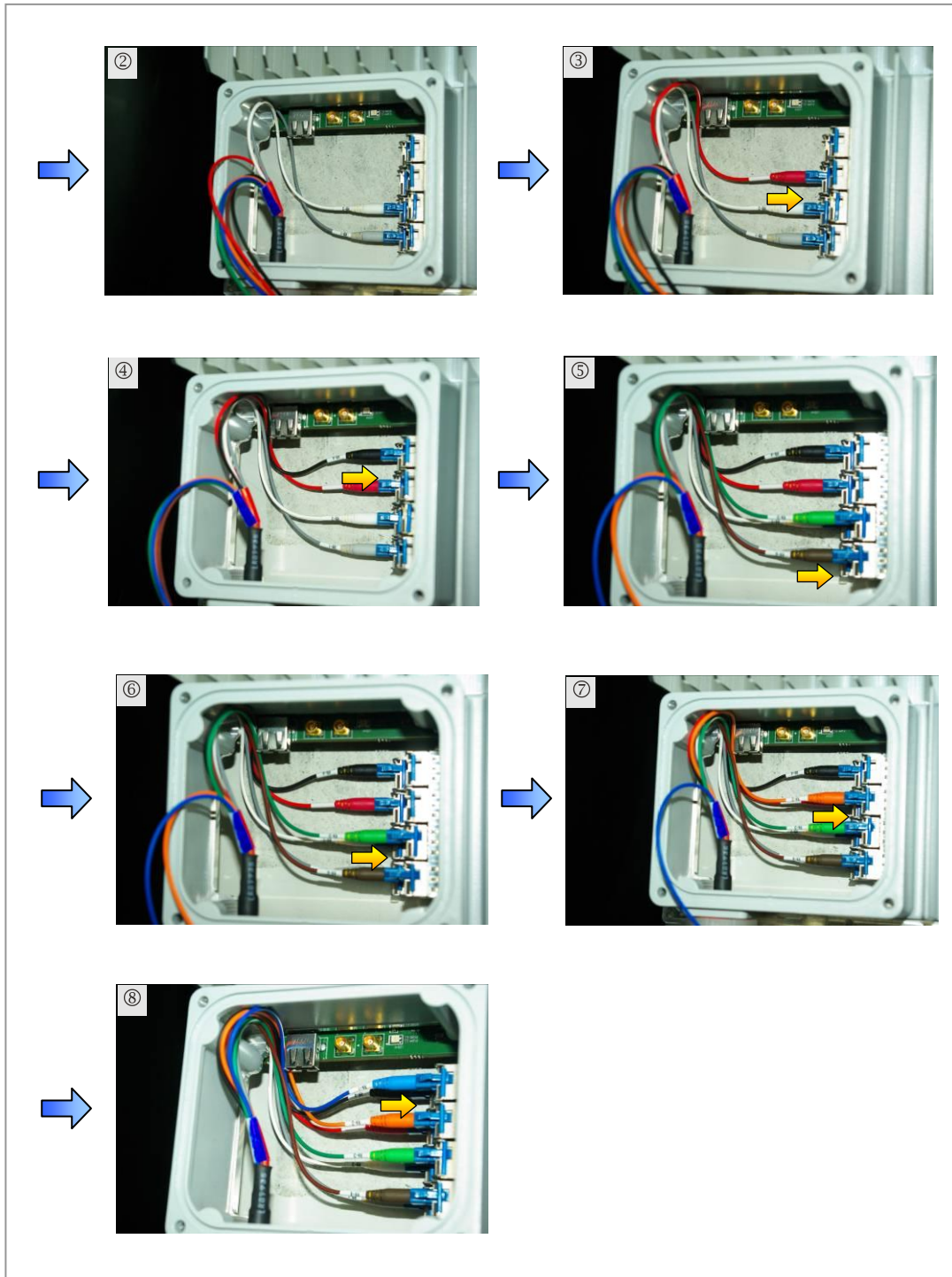


Figure 3.24 RRH-B4 Interface (CPRI) Cable Connection (4)

- 7) Close the DTA window cover, and tighten the screws using a torque driver (T20) with torque value 0.87 lbf.ft (12 kgf.cm).

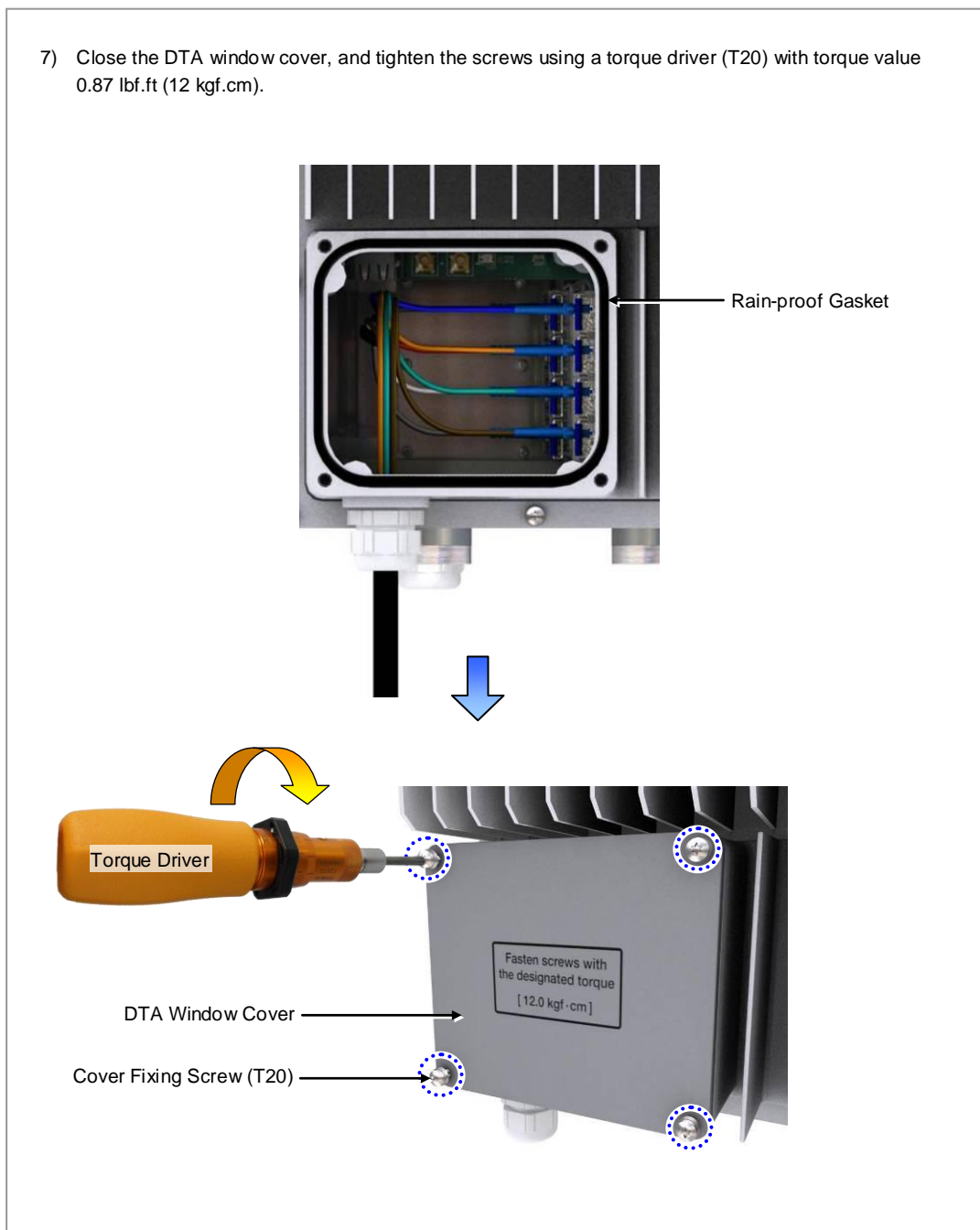


Figure 3.25 RRH-B4 Interface (CPRI) Cable Connection (5)



Caution for Rain-proof Gasket Damage

Be careful the rain-proof gasket is not damaged during work, and check again the gasket is not damaged before closing power/DTA window cover. If the rain-proof gasket is damaged, replace the RRH-B4.

3.5.1.1 For U-RAS Flexible V2: WiMAX + TD-LTE Multi-Mode

Consider the following cases when connecting the CPRI cable (RRH-4 interface) for WiMAX + TD-LTE multi-mode.

Case #1: WiMAX+TD-LTE, 2Tx/2Rx

Follow the steps below to connect CPRI cables for 2Tx/2Rx configuration of the U-RAS Flexible V2.

Table 3.7 CPRI Cable Connector Pin Map (U-RAS Flexible V2, Case #1)

DU Port		Optic Cable Color (Cable Marker)	RRH-B4	
MRA-F #0	L0	Slate[Gray] (LC4)	RRH-B4 #0	
	L1	-		
MRA-F #1	L0	Slate[Gray] (LC4)	RRH-B4 #1	
	L1	-		
MRA-F #2	L0	Slate[Gray] (LC4)	RRH-B4 #2	
	L1	-		
MRA-F #3	L0	White (LC5)	RRH-B4 #0 or #1 or #2	
	L1	-		
MRA-L	A0	Blue (LC0)	RRH-B4 #0	
	A1	-		
	A2	NC		
	A3	NC		
	B0	B0	Blue (LC0)	RRH-B4 #1
		B1	-	
		B2	NC	
		B3	NC	
	C0	C0	Blue (LC0)	RRH-B4 #2
		C1	-	
		C2	NC	
		C3	NC	

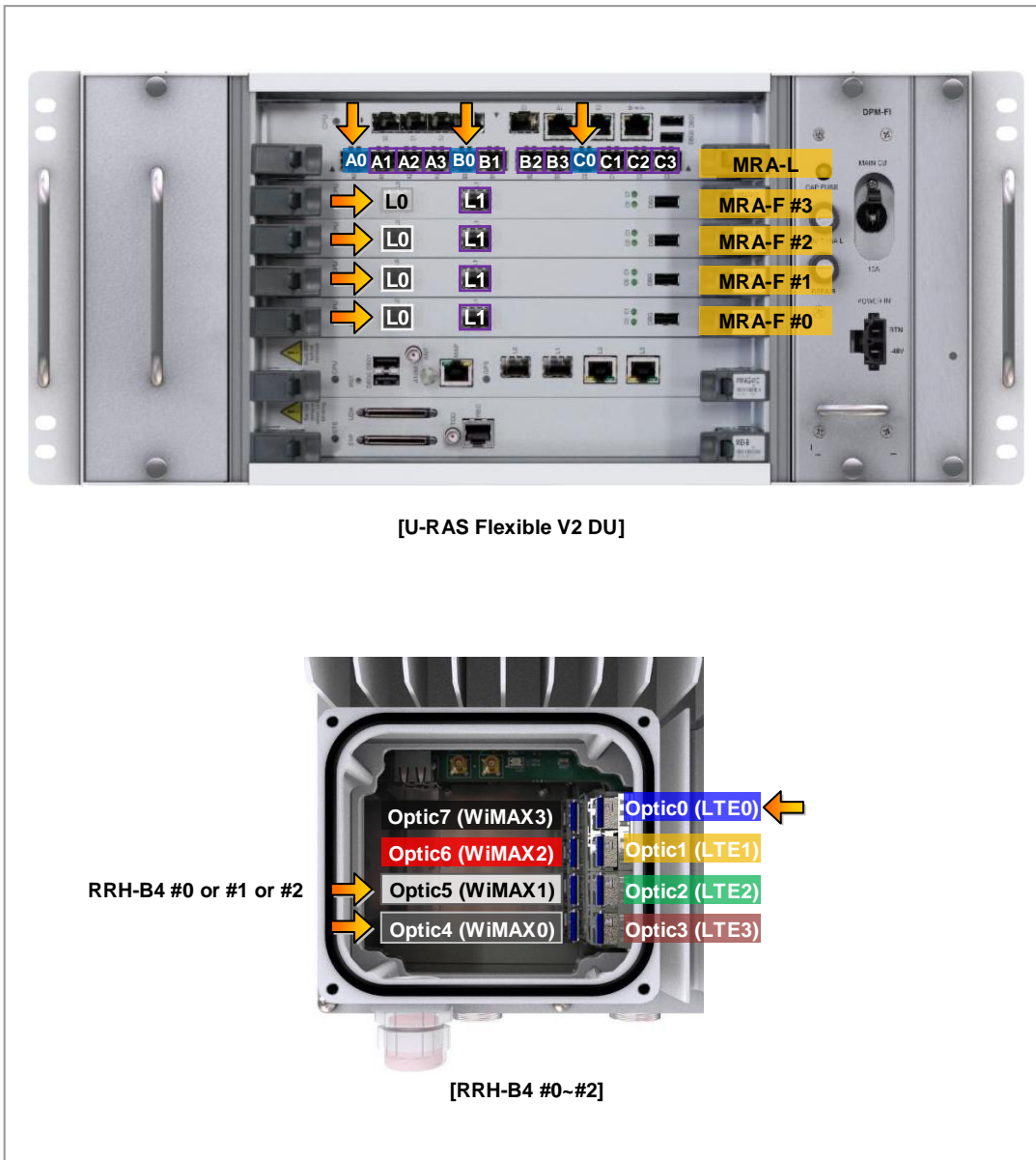


Figure 3.26 CPRI Cable Pin Map (U-RAS Flexible V2, Case #1)

- 1) Install the CPRI cable (RRH-B4 interface) from the U-RAS Flexible V2 DU to the optic port on RRH-B4.
- 2) Connect RRH-B4 side connector of CPRI cable to the optic port.

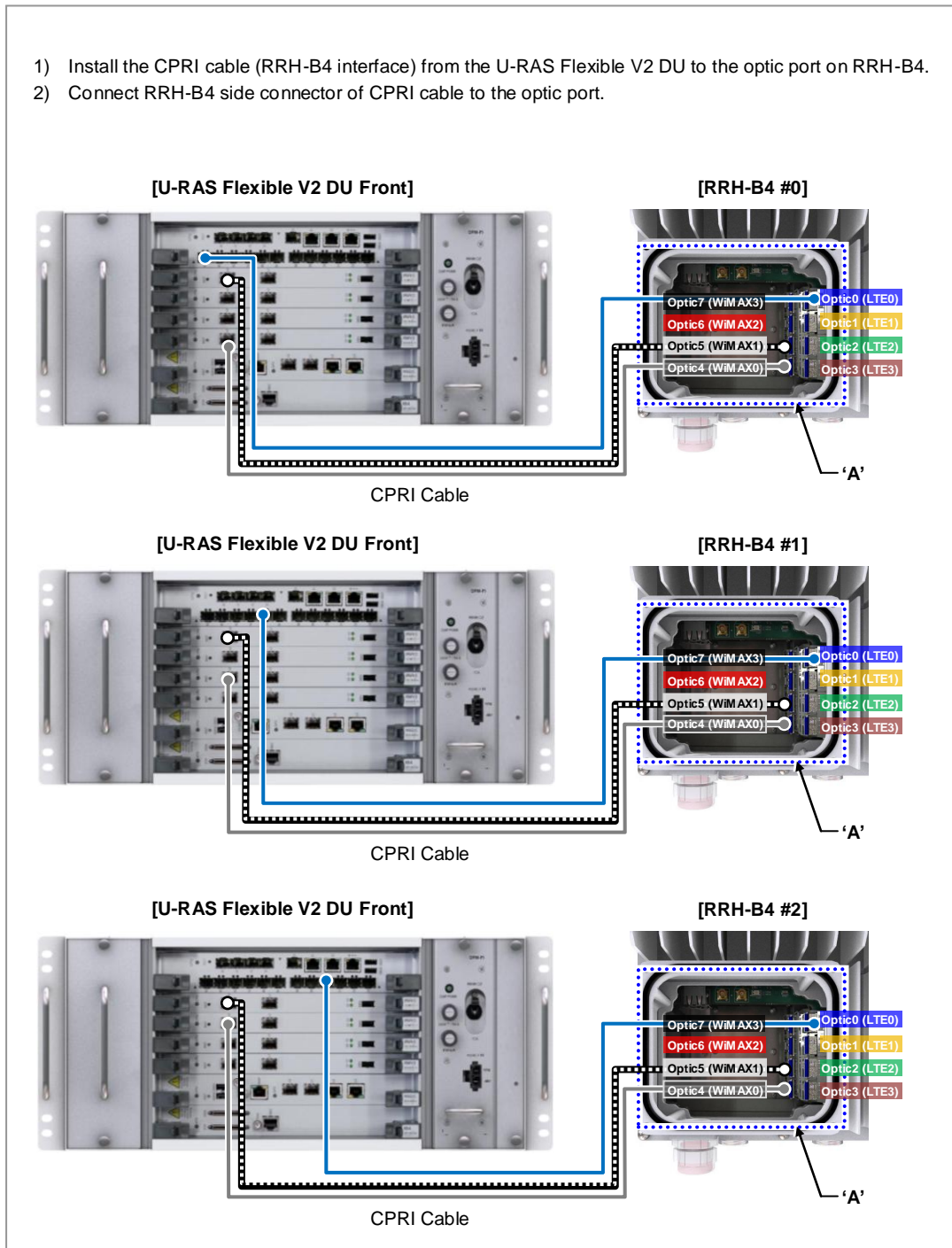


Figure 3.27 CPRI Cable Connection_U-RAS Flexible V2, Case #1 (1)

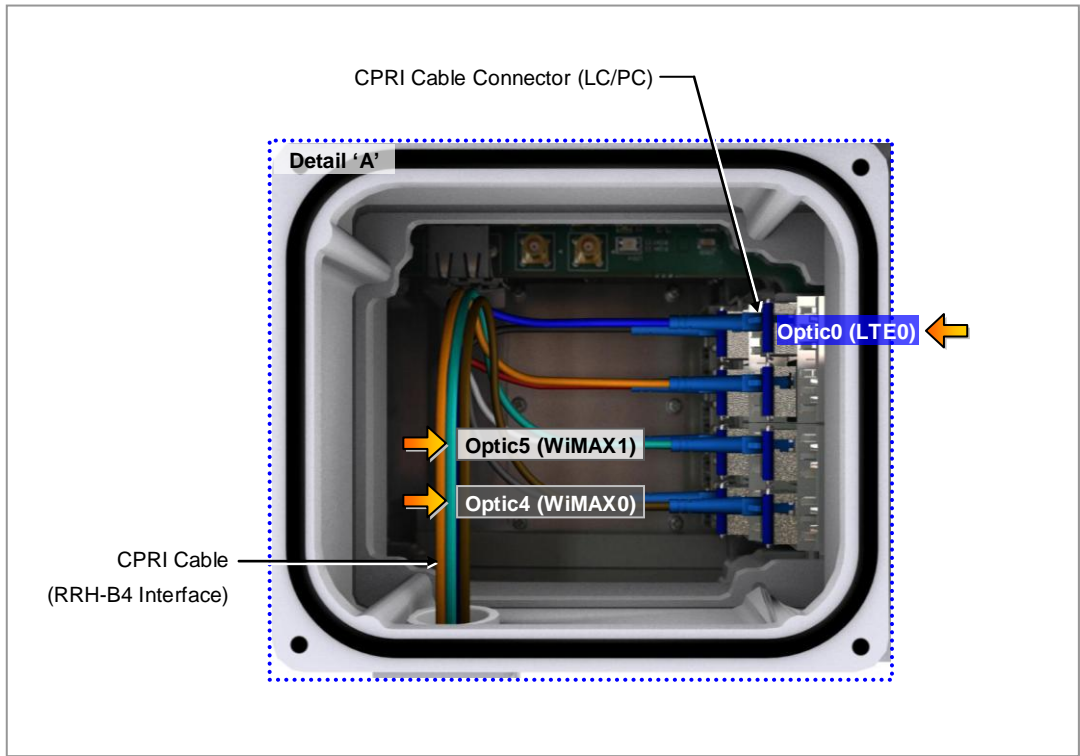


Figure 3.28 CPRI Cable Connection_U-RAS Flexible V2, Case #1 (2)

Case #2: WiMAX 4 Subcells+TD-LTE 1 Carrier/3 Sector, 2Tx/2Rx

Follow the steps below to connect CPRI cables for WiMAX 4 subcells + TD-LTE 1 Carrier/3 Sector 2Tx/2Rx configuration of U-RAS Flexible V2.

When U-RAS Flexible V2 supports WiMAX/TD-LTE multi-mode, up to 4 WiMAX channel cards (MRA-F) can be mounted on the U-RAS Flexible V2 to support 4 subcells. The operator can set operating sectors and frequencies for each subcell.

The following example shows the pin map where an alpha sector has 3 and a beta sector has 1 respectively among 6 WiMAX subcells.

Table 3.8 CPRI Cable Connector Pin Map (U-RAS Flexible V2, Case #2)

DU Port		Optic Cable Color (Cable Marker)	RRH-B4
MRA-F #0	L0	Slate[Gray] (LC4)	RRH-B4 #0
	L1	-	
MRA-F #1	L0	White (LC5)	RRH-B4 #0
	L1	-	
MRA-F #2	L0	Red (LC6)	RRH-B4 #0
	L1	-	
MRA-F #3	L0	Slate[Gray] (LC4)	RRH-B4 #1
	L1	-	
MRA-L	A0	Blue (LC0)	RRH-B4 #0
	A1	-	
	A2	NC	
	A3	NC	
	B0	Blue (LC0)	RRH-B4 #1
	B1	-	
	B2	NC	
	B3	NC	
	C0	Blue (LC0)	RRH-B4 #2
	C1	-	
C2	NC		
C3	NC		

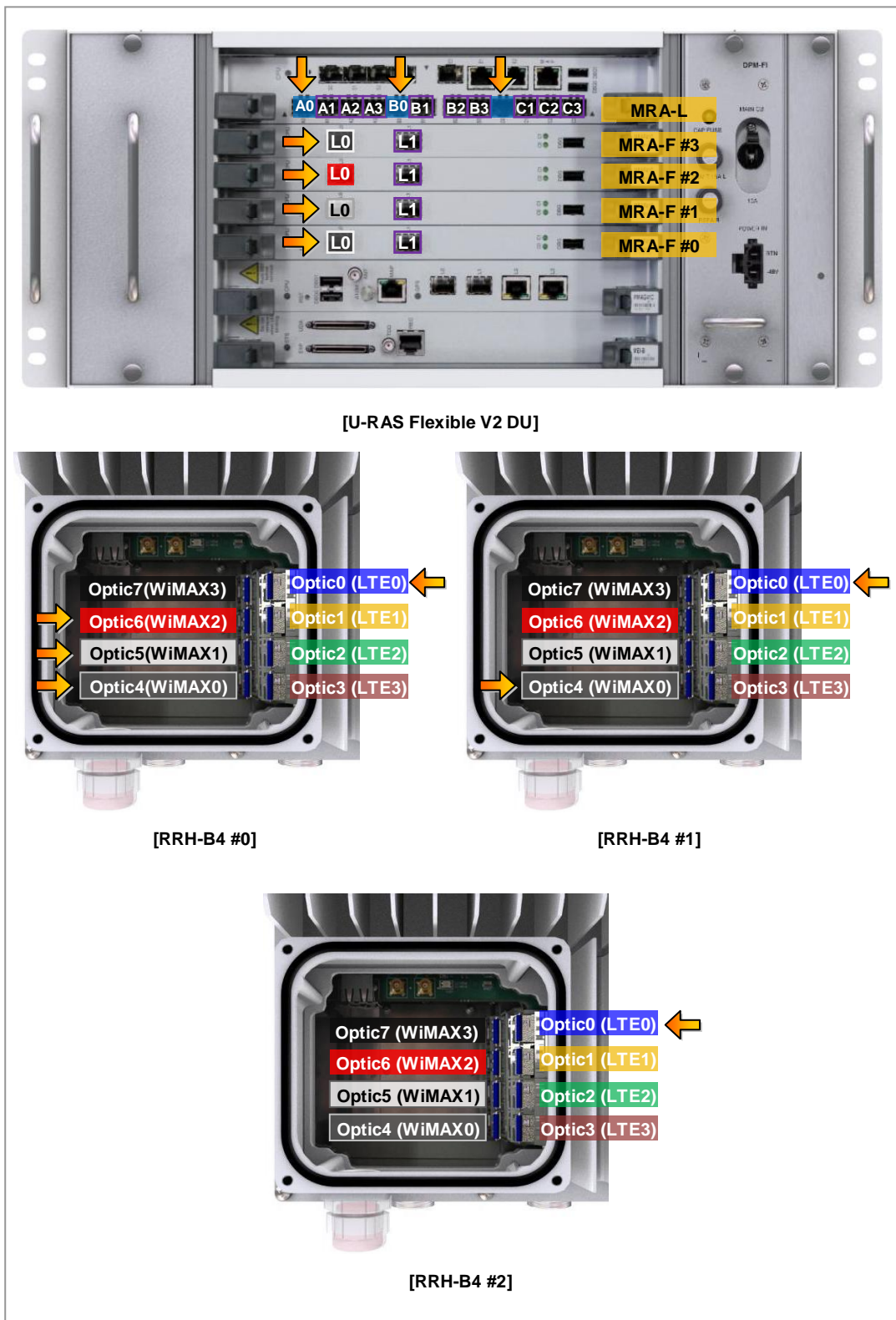


Figure 3.29 CPRI Cable Pin Map (U-RAS Flexible V2, Case #2)

- 1) Install the CPRI cable (RRH-B4 interface) from the U-RAS Flexible V2 DU to the optic port on RRH-B4.
- 2) Connect RRH-B4 side connector of CPRI cable to the optic port.

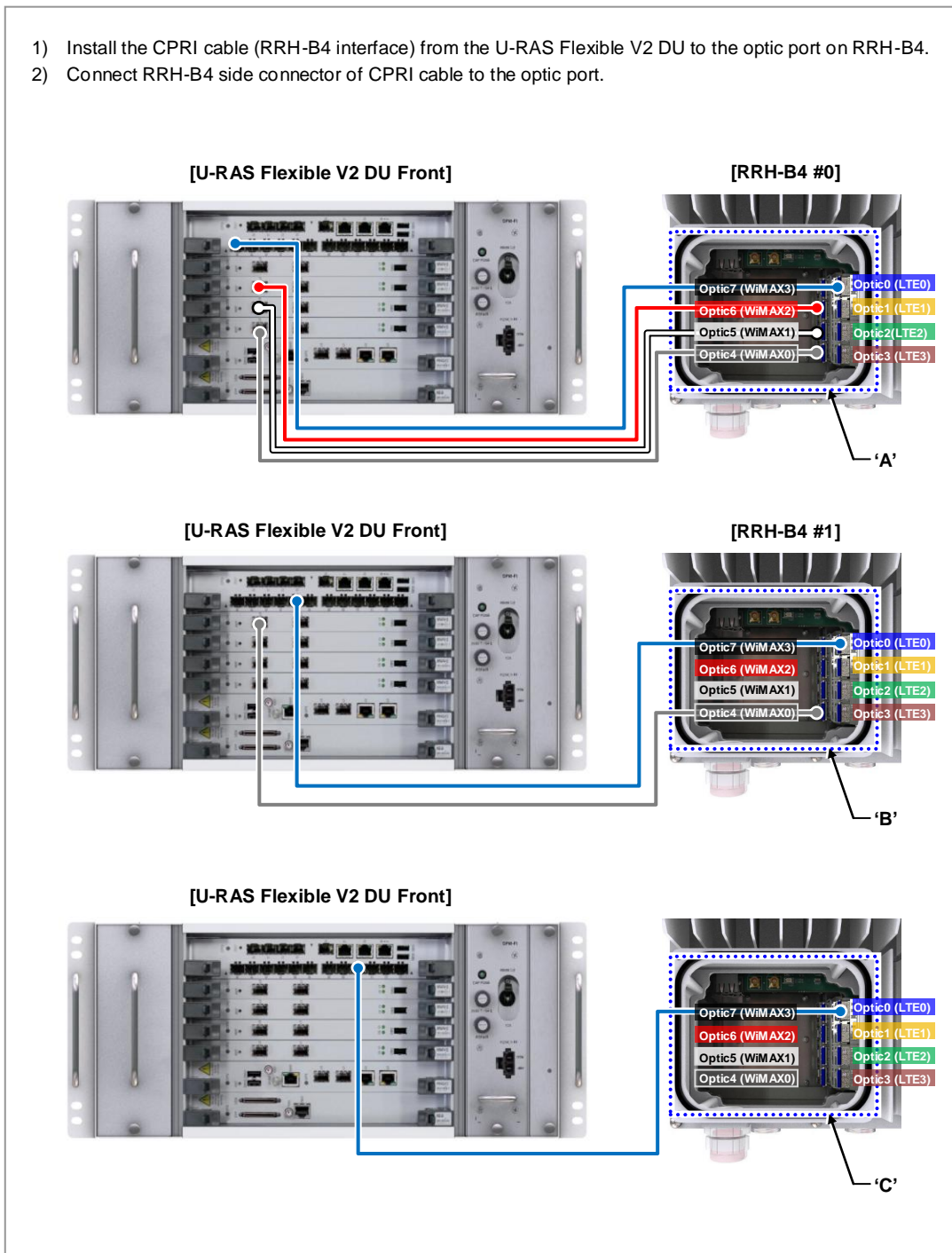


Figure 3.30 CPRI Cable Connection_U-RAS Flexible V2, Case #2 (1)

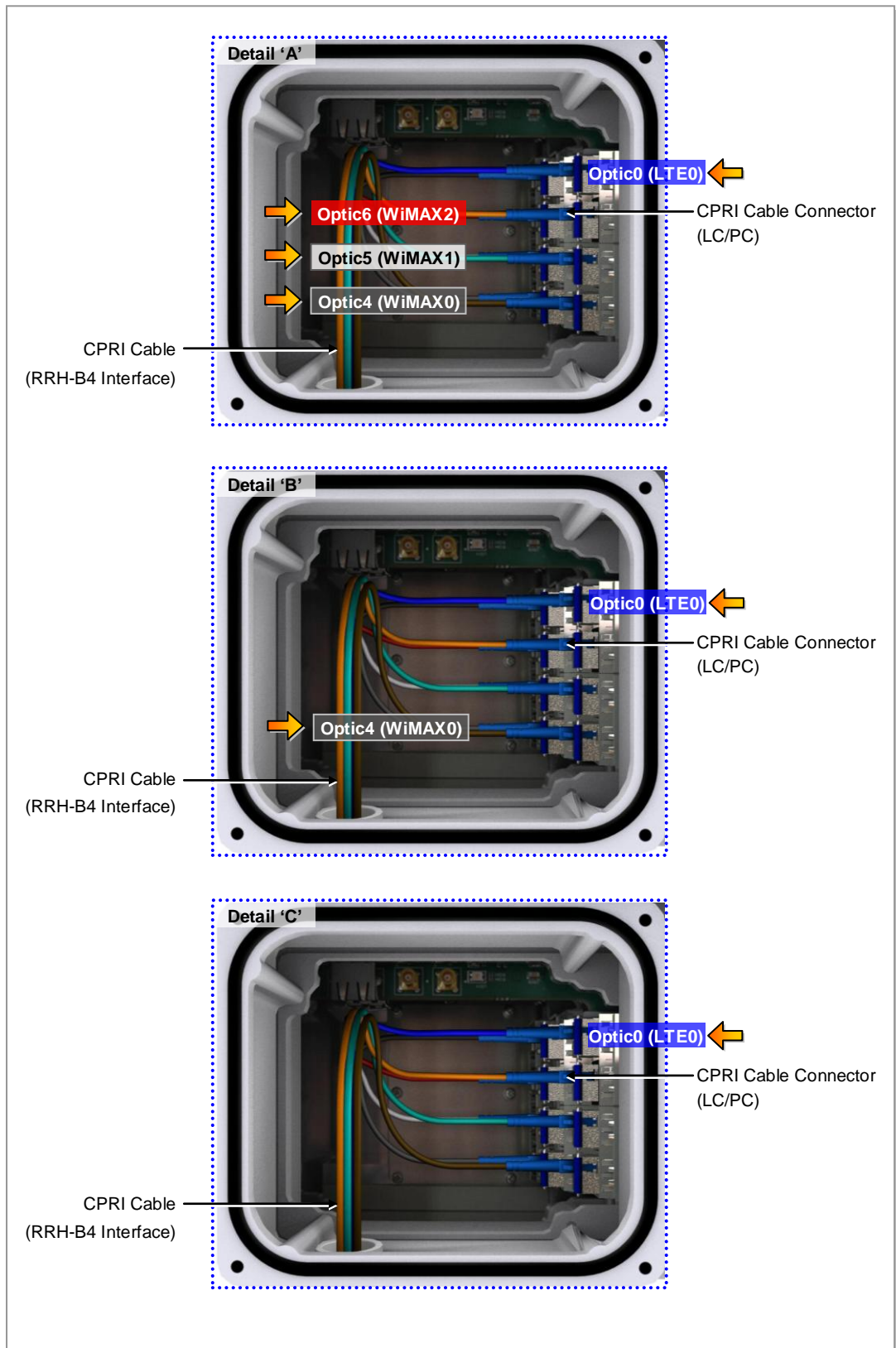


Figure 3.31 CPRI Cable Connection_U-RAS Flexible V2, Case #2 (2)

Case #3: 2Tx/4Rx or 4Tx/4Rx

Follow the steps below to connect CPRI cables for 2Tx/4Rx or 4Tx/4Rx configuration of the U-RAS Flexible V2.

Table 3.9 CPRI Cable Connector Pin Map (U-RAS Flexible V2, Case #3)

DU Port		Optic Cable Color (Cable Marker)	RRH-B4
MRA-F #0	L0	Slate[Gray] (LC4)	RRH-B4 #0
	L1	Red (LC6)	
MRA-F #1	L0	Slate[Gray] (LC4)	RRH-B4 #1
	L1	Red (LC6)	
MRA-F #2	L0	Slate[Gray] (LC4)	RRH-B4 #2
	L1	Red (LC6)	
MRA-F #3	L0	White (LC5)	RRH-B4 #0 or #1 or #2
	L1	Black (LC7)	
MRA-L	A0	Blue (LC0)	RRH-B4 #0
	A1	Green (LC1)	
	A2	NC	
	A3	NC	
	B0	Blue (LC0)	RRH-B4 #1
	B1	Green (LC1)	
	B2	NC	
	B3	NC	
	C0	Blue (LC0)	RRH-B4 #2
	C1	Green (LC1)	
	C2	NC	
	C3	NC	

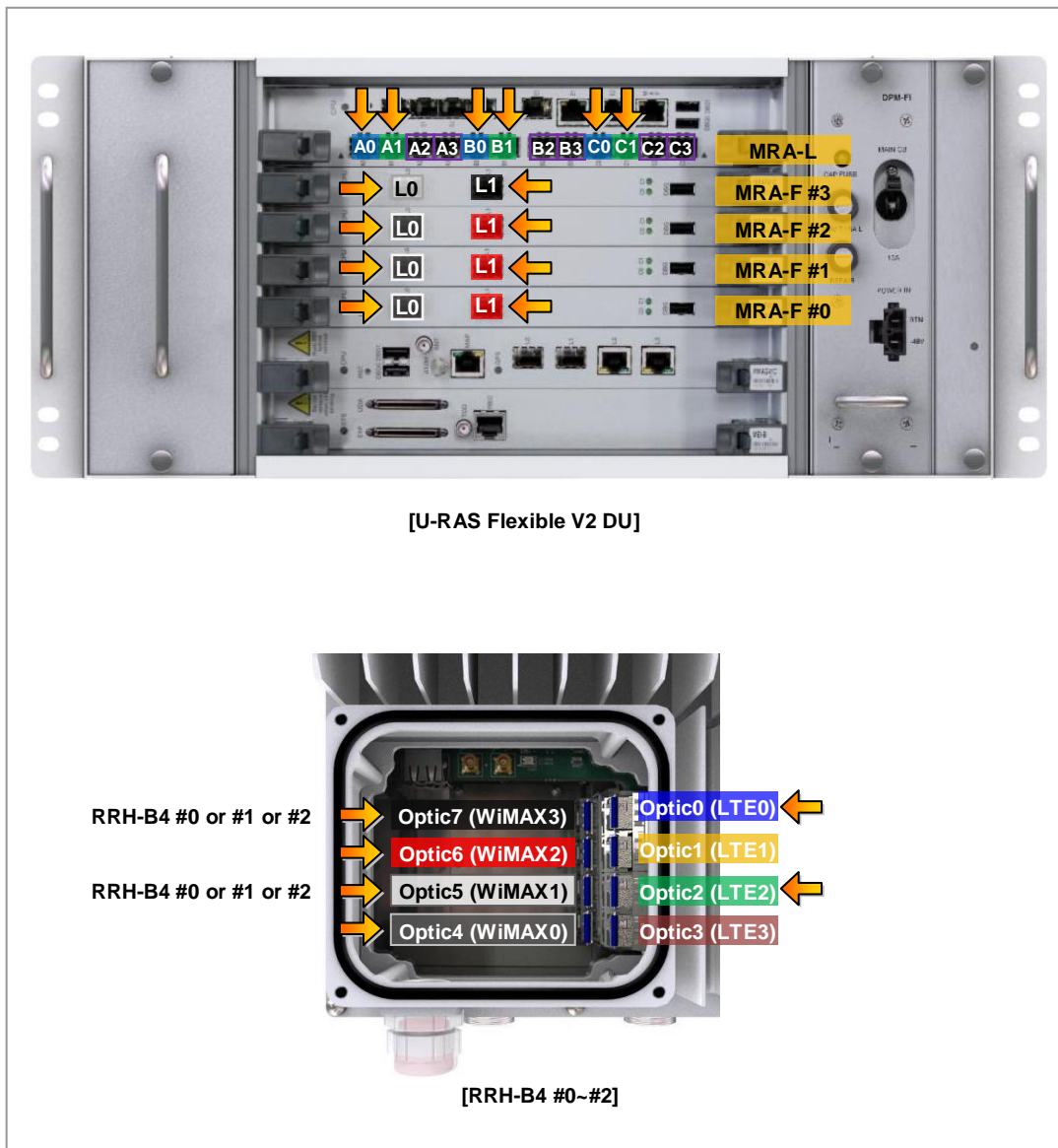


Figure 3.32 CPRI Cable Pin Map (U-RAS Flexible V2, Case #3)

- 1) Install the CPRI cable (RRH-B4 interface) from the U-RAS Flexible V2 DU to the optic port on RRH-B4.
- 2) Connect RRH-B4 side connector of CPRI cable to the optic port.

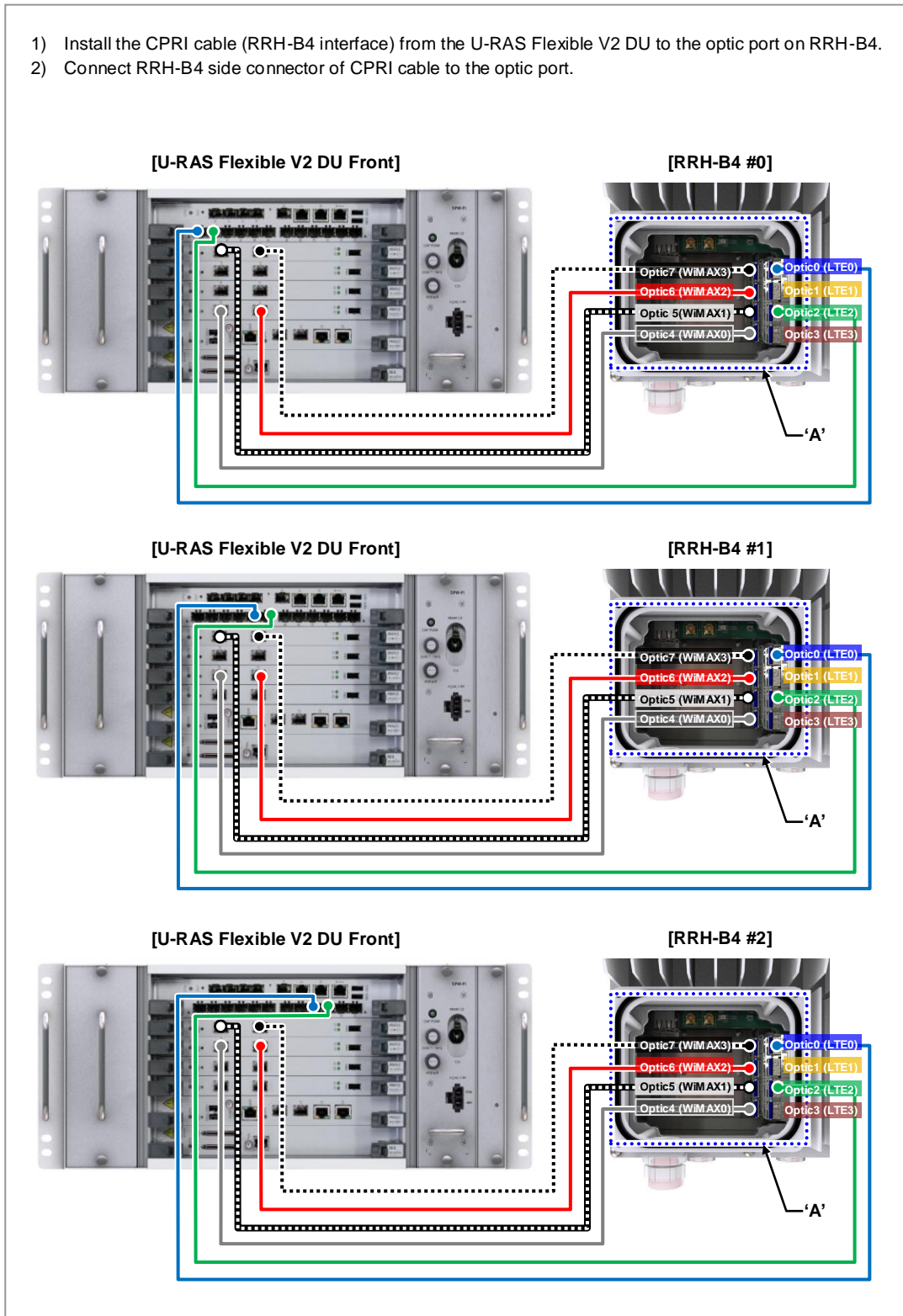


Figure 3.33 CPRI Cable Connection_U-RAS Flexible V2, Case #3 (1)

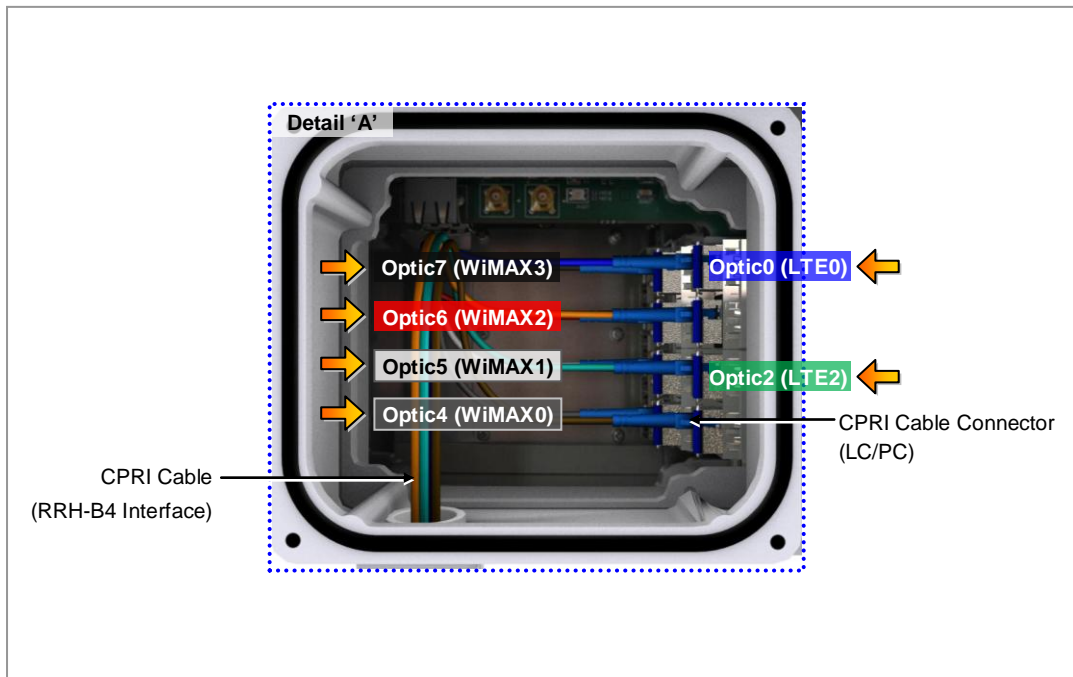


Figure 3.34 CPRI Cable Connection_U-RAS Flexible V2, Case #3 (2)

3.5.1.2 For Smart MBS: TD-LTE

Consider the following cases when connecting the CPRI cable (RRH-4 interface) for TD-LTE.

Case #1: TD-LTE 2 Carrier/3 Sector 2Tx/2Rx

Follow the steps below to connect CPRI cables for TD-LTE 2 Carrier/3 Sector 2Tx/2Rx configuration of the Smart MBS.

Table 3.10 CPRI Cable Connector Pin Map (Smart MBS, Case #1)

UADU Port		Optic Cable Color (Cable Marker)	RRH-B4
L9CA #0	L0	Blue (LC0)	RRH-B4 #0
	L1	-	
	L2	Blue (LC0)	RRH-B4 #1
	L3	-	
	L4	Blue (LC0)	RRH-B4 #2
	L5	-	
L9CA #0	L0	Orange (LC1)	RRH-B4 #0
	L1	-	
	L2	Orange (LC1)	RRH-B4 #1
	L3	-	
	L4	Orange (LC1)	RRH-B4 #2
	L5	-	

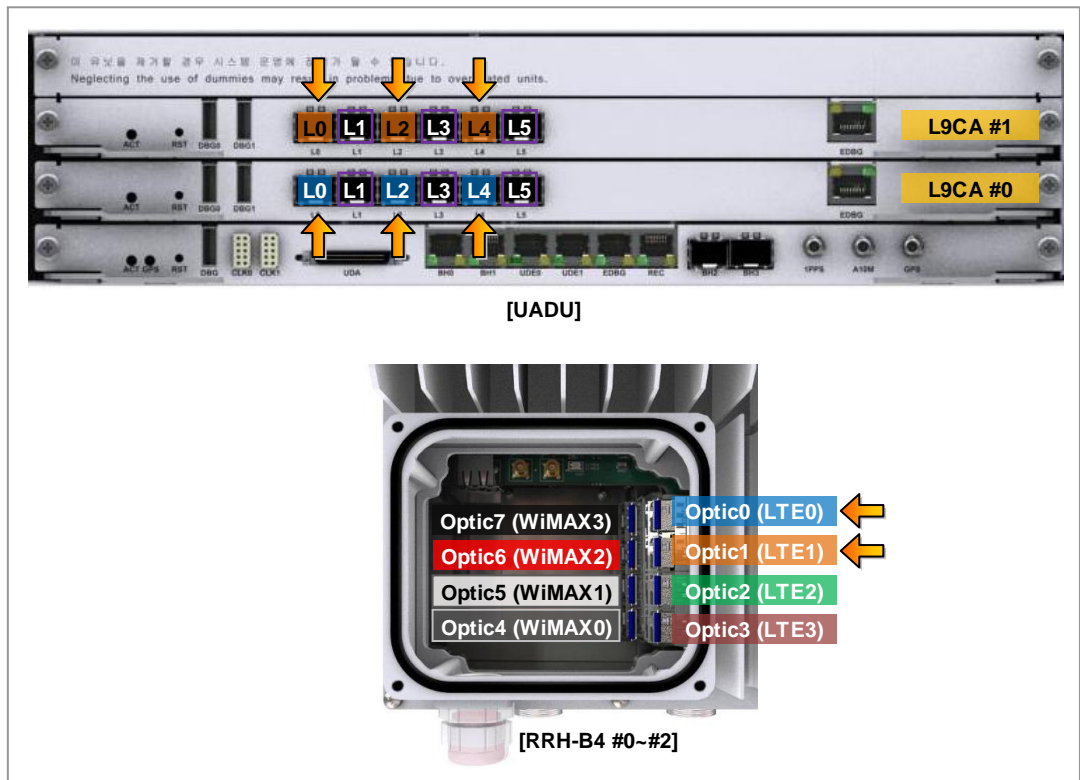


Figure 3.35 CPRI Cable Pin Map (Smart MBS, Case #1)

- 1) Install the CPRI cable (RRH-B4 interface) from the Smart MBS UADU to the optic port on RRH-B4.
- 2) Connect RRH-B4 side connector of CPRI cable to the optic port.

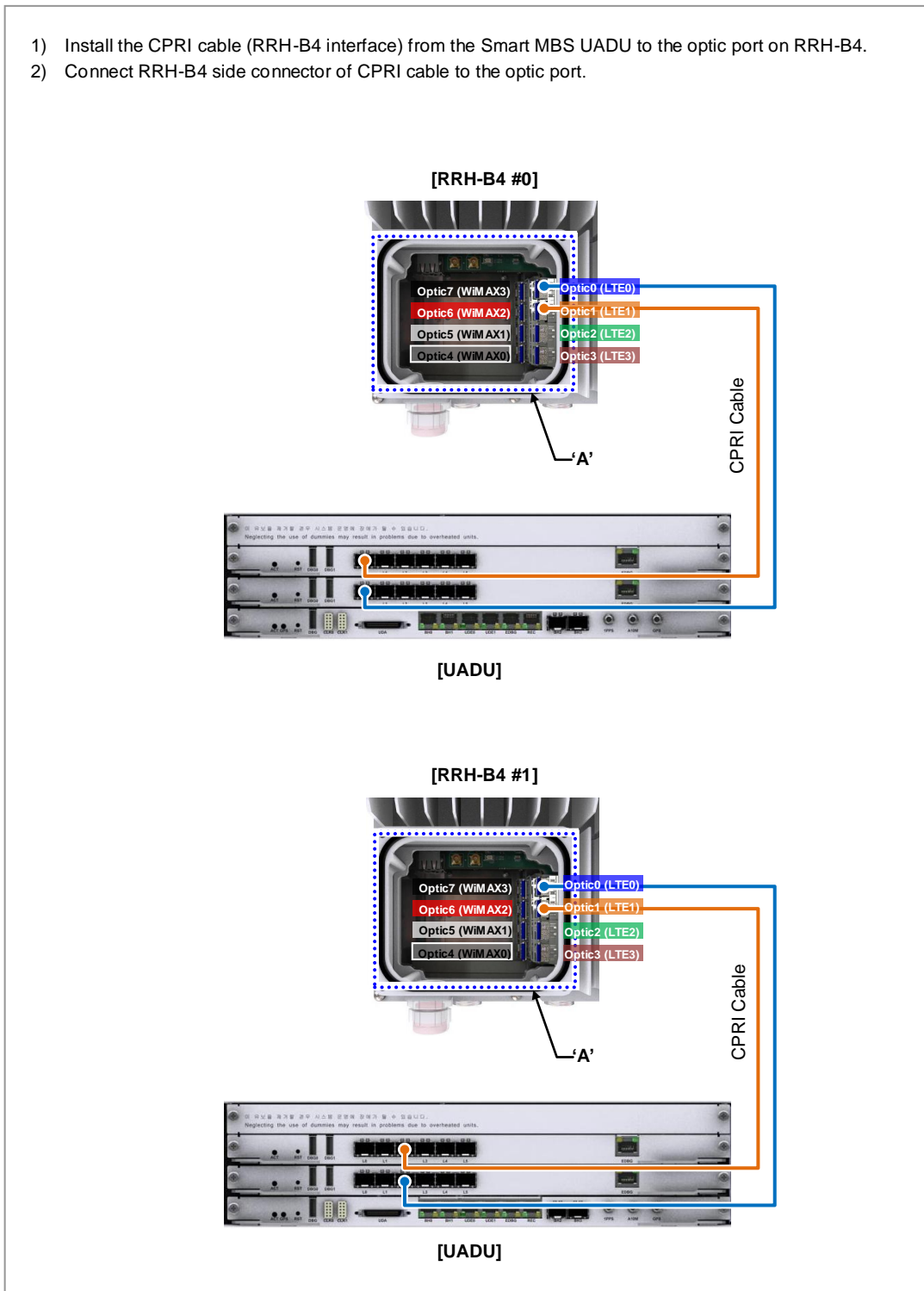


Figure 3.36 CPRI Cable Connection_Smart MBS, Case #1 (1)

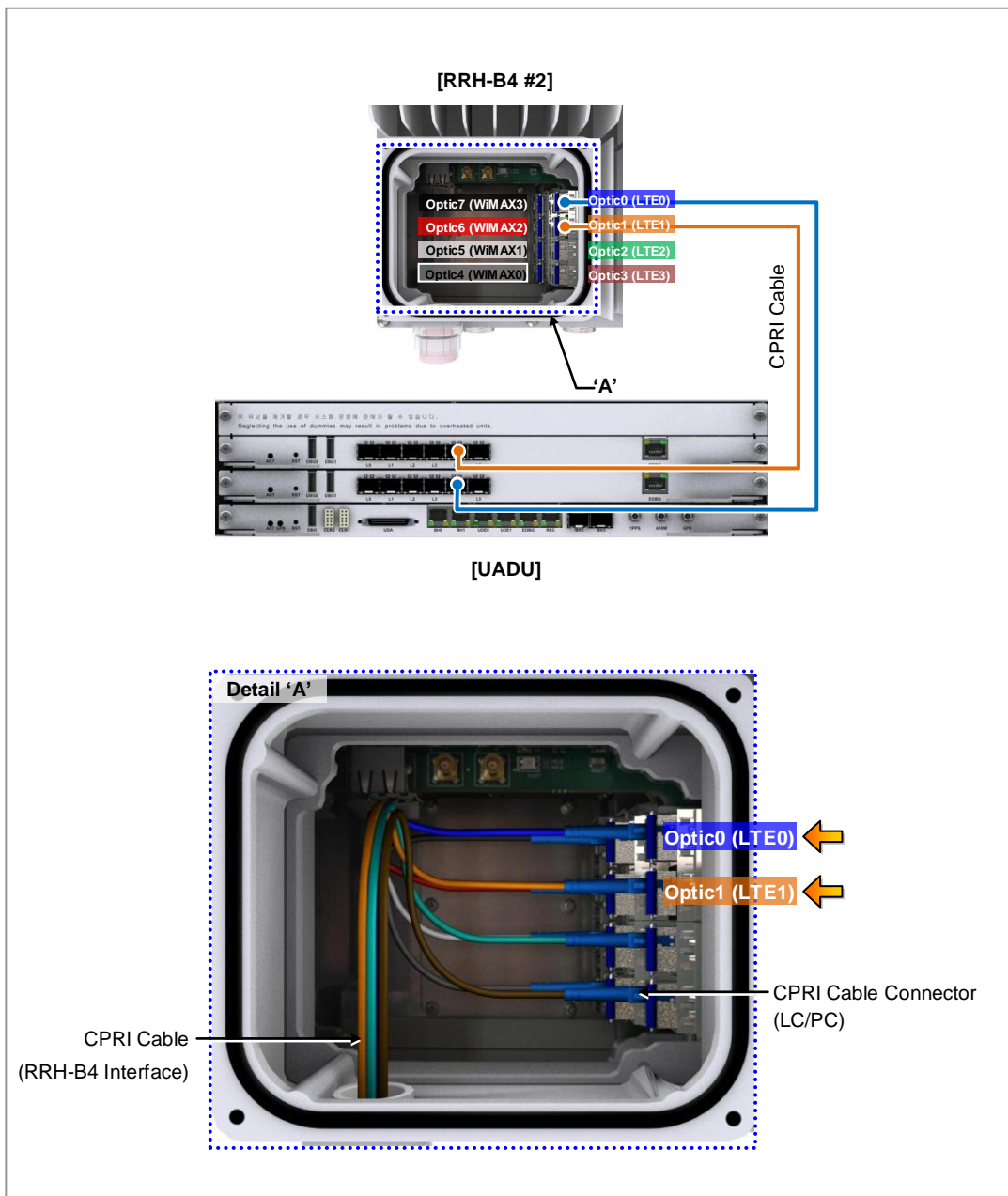


Figure 3.37 CPRI Cable Connection_Smart MBS, Case #1 (2)

Case #2: TD-LTE 2 Carrier/3 Sector 2Tx/4Rx or 4Tx/4Rx

Follow the steps below to connect CPRI cables for TD-LTE 2 Carrier/3 Sector 2Tx/4Rx or 4Tx/4Rx configuration of the Smart MBS.

Table 3.11 CPRI Cable Connector Pin Map (Smart MBS, Case #2)

UADU Port		Optic Cable Color (Cable Marker)	RRH-B4
L9CA #0	L0	Blue (LC0)	RRH-B4 #0
	L1	Green (LC2)	
	L2	Blue (LC0)	RRH-B4 #1
	L3	Green (LC2)	
	L4	Blue (LC0)	RRH-B4 #2
	L5	Green (LC2)	
L9CA #1	L0	Orange (LC1)	RRH-B4 #0
	L1	Brown (LC3)	
	L2	Orange (LC1)	RRH-B4 #1
	L3	Brown (LC3)	
	L4	Orange (LC1)	RRH-B4 #2
	L5	Brown (LC3)	

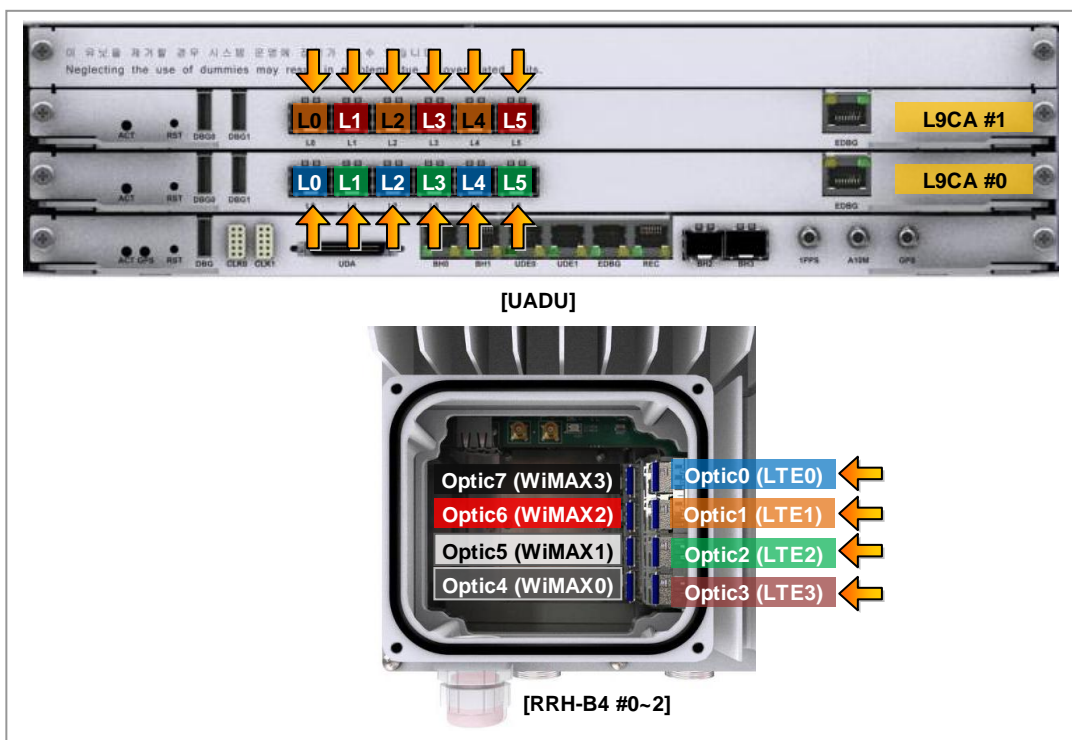


Figure 3.38 CPRI Cable Pin Map (Smart MBS, Case #2)

- 1) Install the CPRI cable (RRH-B4 interface) from the Smart MBS UADU to the optic port on RRH-B4.
- 2) Connect RRH-B4 side connector of CPRI cable to the optic port.

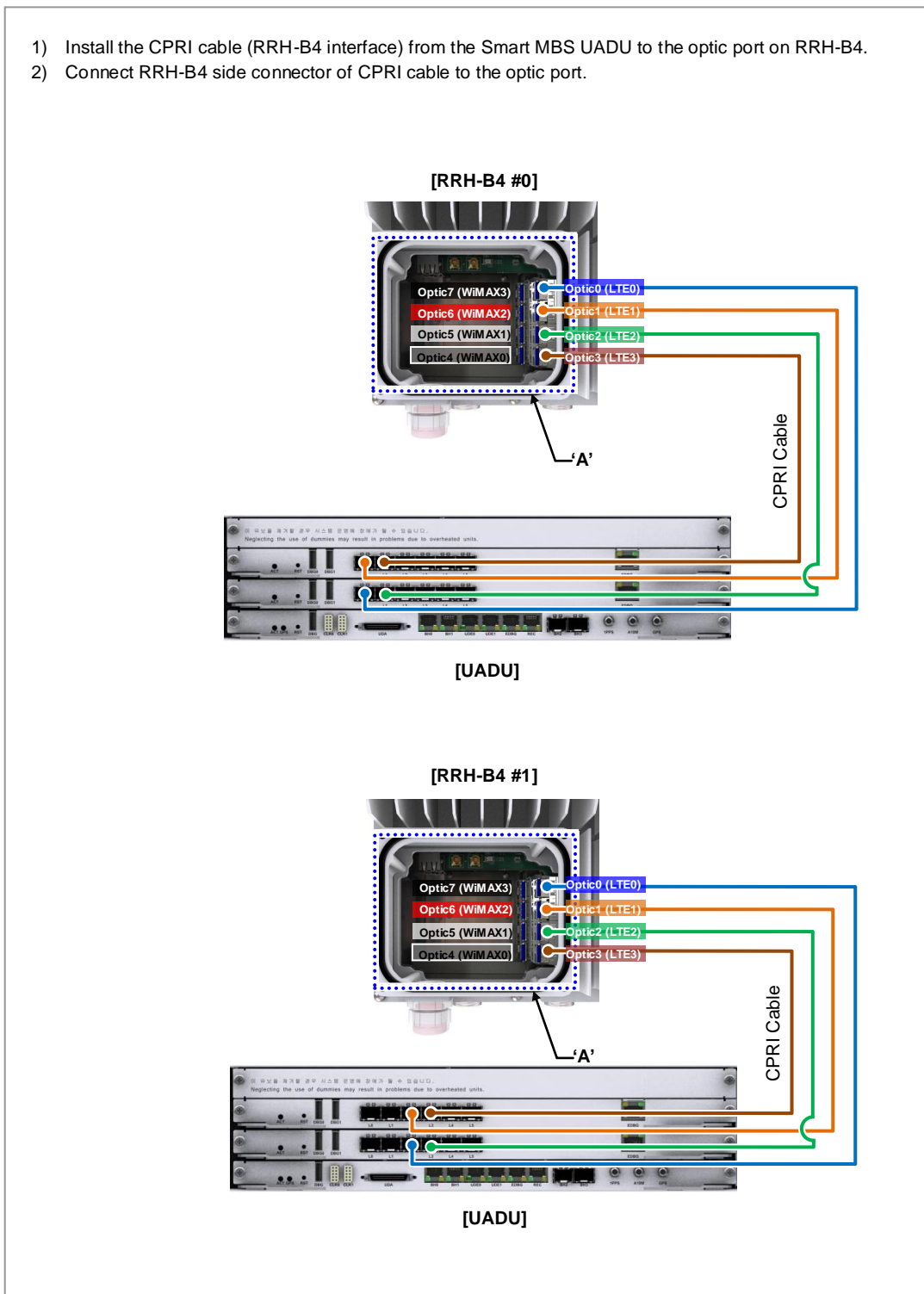


Figure 3.39 CPRI Cable Connection_Smart MBS, Case #2 (1)

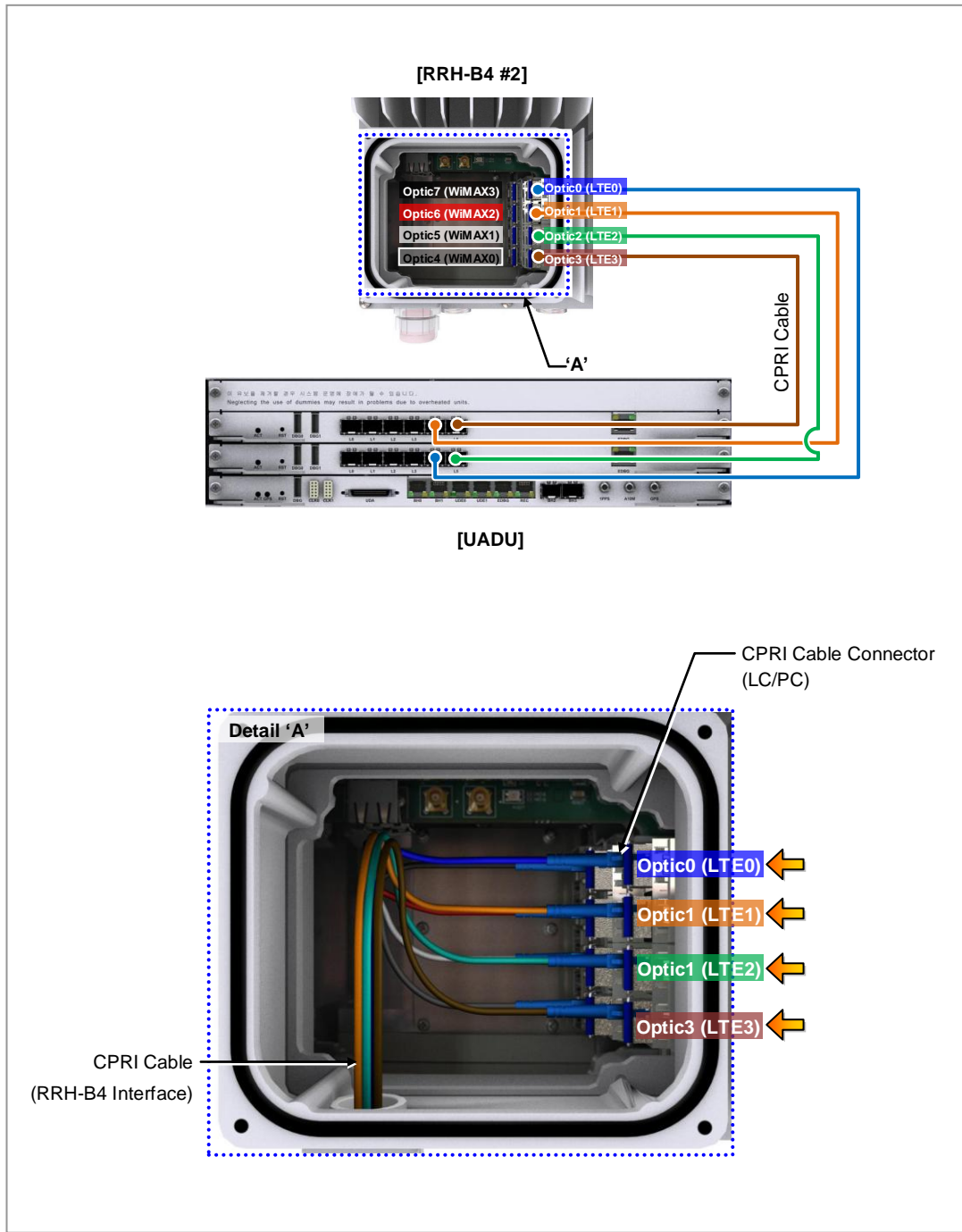


Figure 3.40 CPRI Cable Connection_Smart MBS, Case #2 (2)

3.5.1.3 For Stacking between U-RAS Flexible V2 (WiMAX) and Smart MBS

Following shows how to connect CPRI cables for stacking between U-RAS Flexible V2 (WiMAX) and Smart MBS (TD-LTE).

Case#1: WiMAX 2 Carrier/3 Sector 2Tx/2Rx+TD-LTE 2 Carrier/3 Sector 2Tx/2Rx

Follow the steps below to connect CPRI cables for WiMAX 2 Carrier/3 Sector 2Tx/2Rx + TD-LTE 2 Carrier/3 Sector 2Tx/2Rx configuration of U-RAS Flexible V2 and Smart MBS.

Table 3.12 CPRI Cable Connector Pin Map (Stacking, Case #1)

DU (UADU)	DU (UADU) Port		Optic Cable Color (Cable Marker)	RRH-B4	
U-RAS Flexible V2	MRA-F #0	L0	Slate[Gray] (LC4)	RRH-B4 #0	
		L1	-		
	MRA-F #1	L0	Slate[Gray] (LC4)	RRH-B4 #1	
		L1	-		
	MRA-F #2	L0	Slate[Gray] (LC4)	RRH-B4 #2	
		L1	-		
	MRA-F #3	L0	White (LC5)	RRH-B4 #0	
		L1	-		
	MRA-F #4	L0	White (LC5)	RRH-B4 #1	
		L1	-		
	MRA-F #5	L0	White (LC5)	RRH-B4 #2	
		L1	-		
	Smart MBS	L9CA #0	L0	Blue (LC0)	RRH-B4 #0
			L1	-	
L2			Blue (LC0)	RRH-B4 #1	
L3			-		
L4			Blue (LC0)	RRH-B4 #2	
L5		-			
L9CA #1		L0	Orange (LC1)	RRH-B4 #0	
		L1	-		
		L2	Orange (LC1)	RRH-B4 #1	
		L3	-		
	L4	Orange (LC1)	RRH-B4 #2		
L5	-				

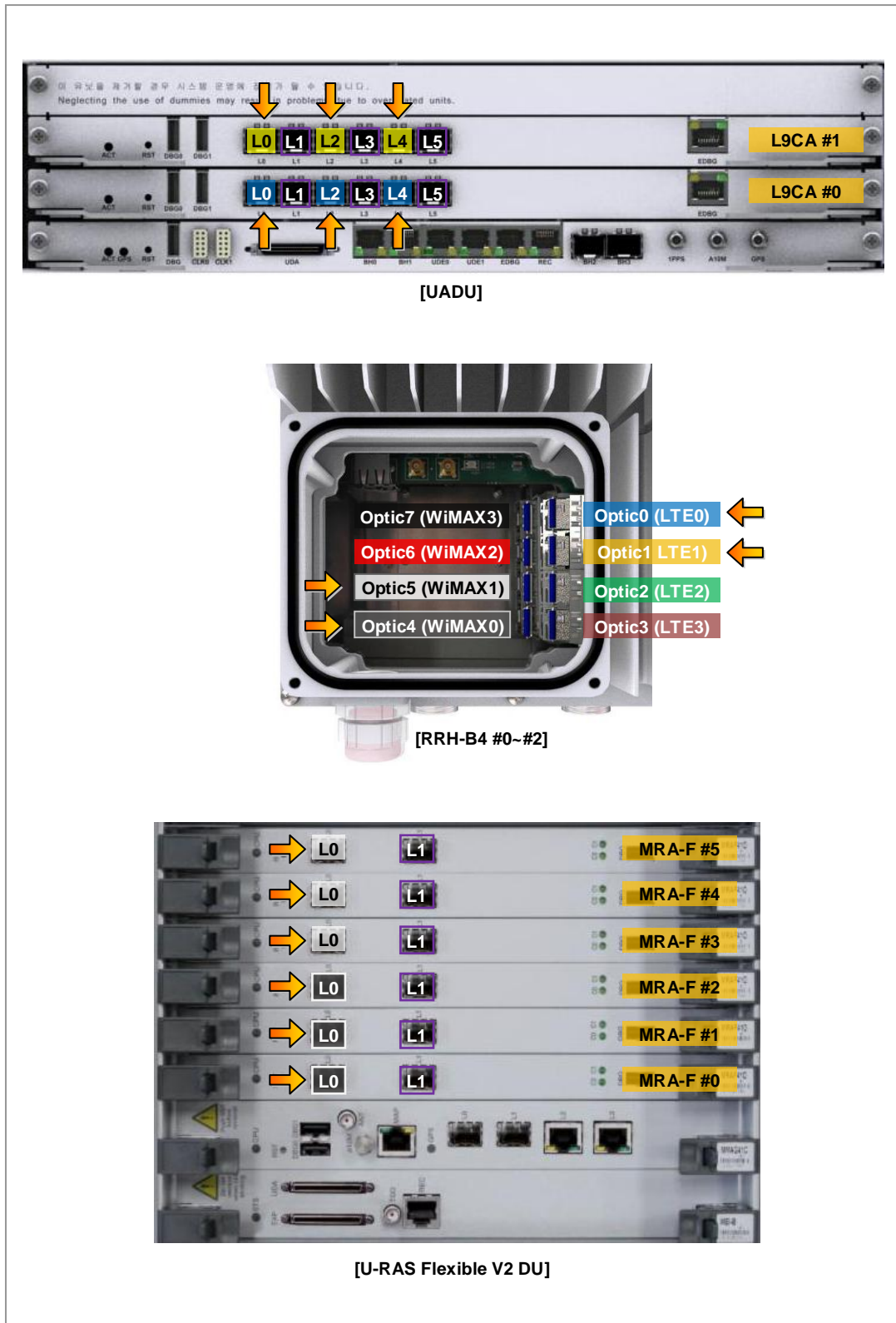


Figure 3.41 CPRI Cable Pin Map (Stacking, Case #1)

- 1) Install CPRI cables (RRH-B4 interface) between:
 - RRH-B4 and L0, L2, and L4 ports on UADU L9CA #0 and #1
 - RRH-B4 and L0 ports on U-RAS Flexible V2 DU MRA-F #0-#5
- 2) Connect the UADU- and U-RAS Flexible V2 DU-side connectors to the following ports.
 - L0, L2, and L4 ports on UADU L9CA #0 and #1
 - L0 ports on U-RAS Flexible V2 DU MRA-F #0-#5

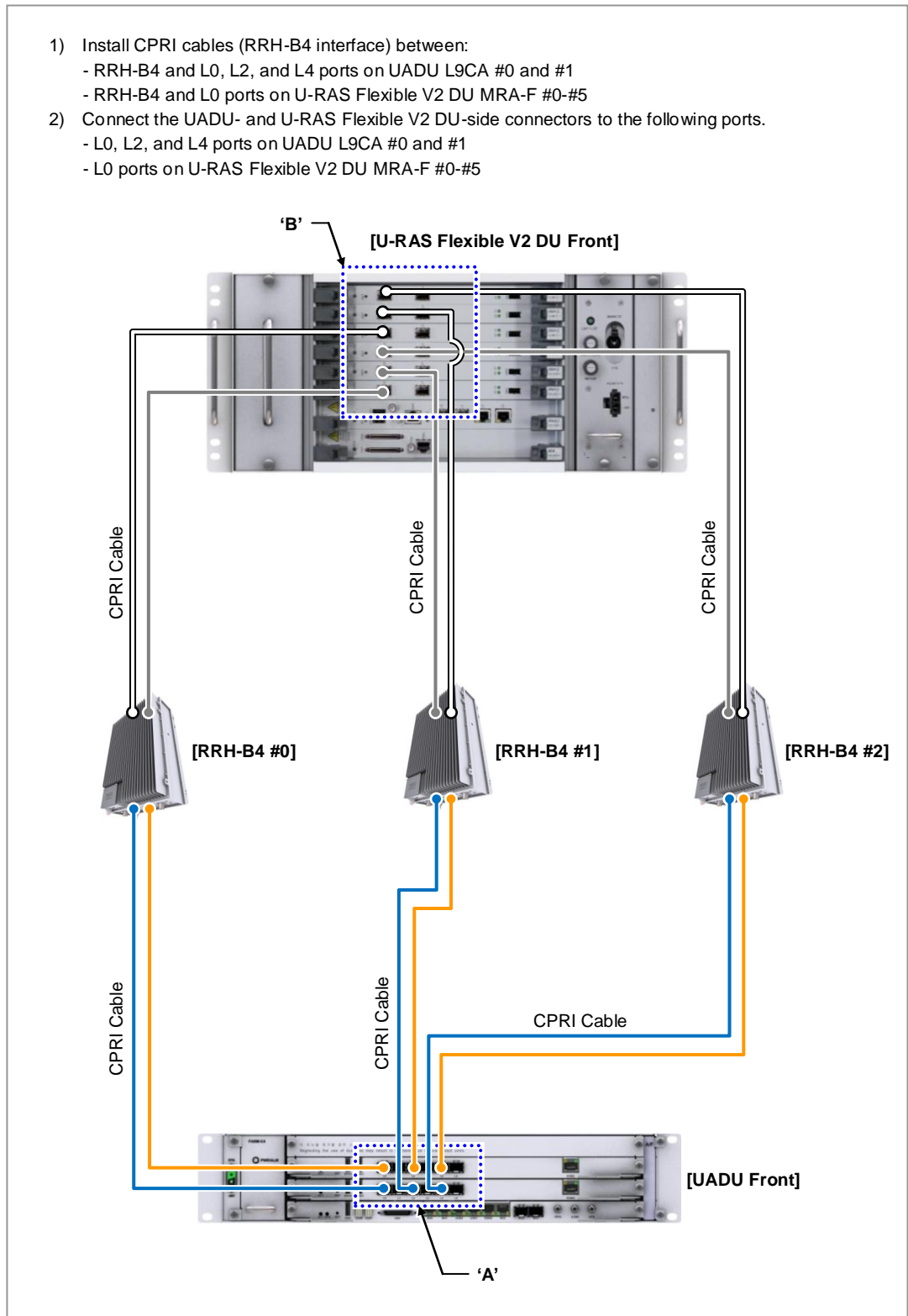


Figure 3.42 CPRI Cable Connection_Stacking, Case #1 (1)

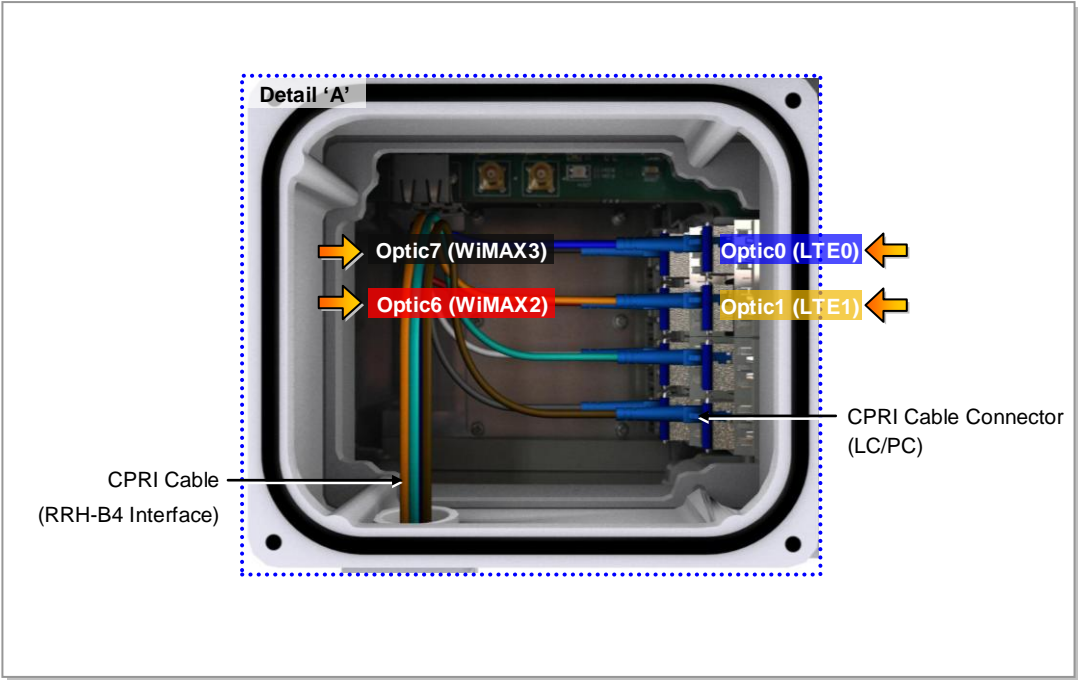


Figure 3.43 CPRI Cable Connection_Stacking, Case #1 (2)

Case #2: WiMAX 2 Carrier/3 Sector 2Tx/4Rx + TD-LTE 2 Carrier/3 Sector 2Tx/4Rx

Follow the steps below to connect CPRI cables for WiMAX 2 Carrier/3 Sector 2Tx/4Rx + TD-LTE 2 Carrier/3 Sector 2Tx/4Rx configuration of U-RAS Flexible V2 and Smart MBS.

Table 3.13 CPRI Cable Connector Pin Map (Stacking, Case #2)

DU (UADU)	DU (UADU) Port		Optic Cable Color (Cable Marker)	RRH-B4	
U-RAS Flexible V2	MRA-F #0	L0	Slate[Gray] (LC4)	RRH-B4 #0	
		L1	Red (LC6)		
	MRA-F #1	L0	Slate[Gray] (LC4)	RRH-B4 #1	
		L1	Red (LC6)		
	MRA-F #2	L0	Slate[Gray] (LC4)	RRH-B4 #2	
		L1	Red (LC6)		
	MRA-F #3	L0	White (LC5)	RRH-B4 #0	
		L1	Black (LC7)		
	MRA-F #4	L0	White (LC5)	RRH-B4 #1	
		L1	Black (LC7)		
	MRA-F #5	L0	White (LC5)	RRH-B4 #2	
		L1	Black (LC7)		
	Smart MBS	L9CA #0	L0	Blue (LC0)	RRH-B4 #0
			L1	Green (LC2)	
L2			Blue (LC0)	RRH-B4 #1	
L3			Green (LC2)		
L4			Blue (LC0)		
L5		Green (LC2)	RRH-B4 #2		
L9CA #1		L0	Orange (LC1)	RRH-B4 #0	
		L1	Brown (LC3)		
		L2	Orange (LC1)	RRH-B4 #1	
		L3	Brown (LC3)		
		L4	Orange (LC1)	RRH-B4 #2	
	L5	Brown (LC3)			

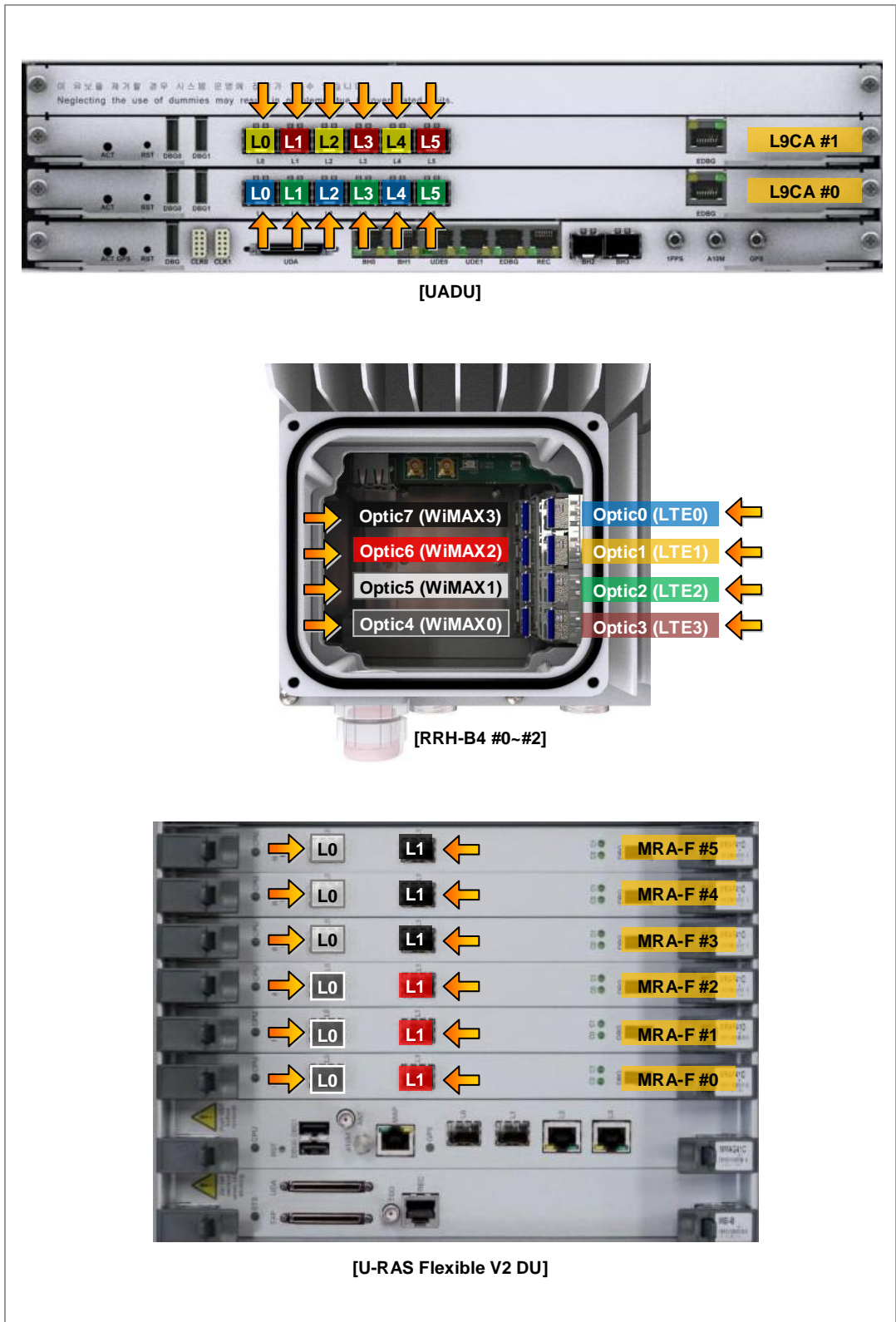


Figure 3.44 CPRI Cable Pin Map (Stacking, Case #2)

- 1) Install CPRI cables (RRH-B4 interface) between:
 - RRH-B4 and L0~L5 ports on UADU L9CA #0 and #1
 - RRH-B4 and L0 and L1 ports on U-RAS Flexible V2 DU MRA-F #0-#5
- 2) Connect the UADU- and U-RAS Flexible V2 DU-side connectors to the following ports.
 - L0~L5 ports on UADU L9CA #0 and #1
 - L0 and L1 ports on U-RAS Flexible V2 DU MRA-F #0-#5

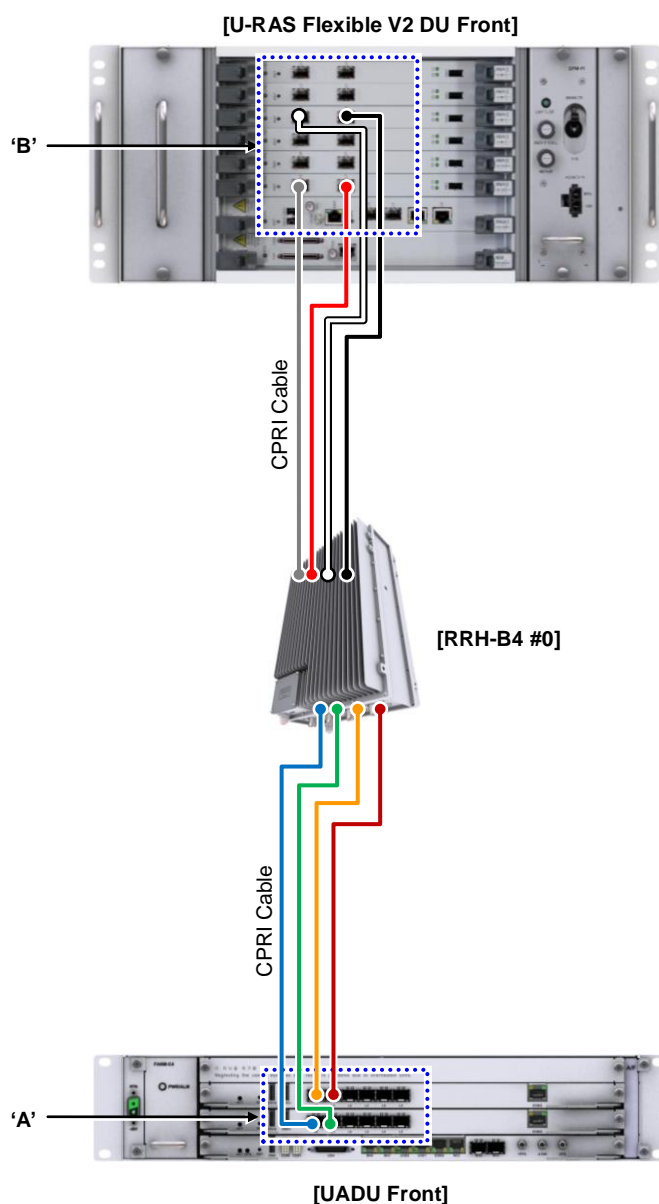


Figure 3.45 CPRI Cable Connection_Stacking, Case #2 (1)

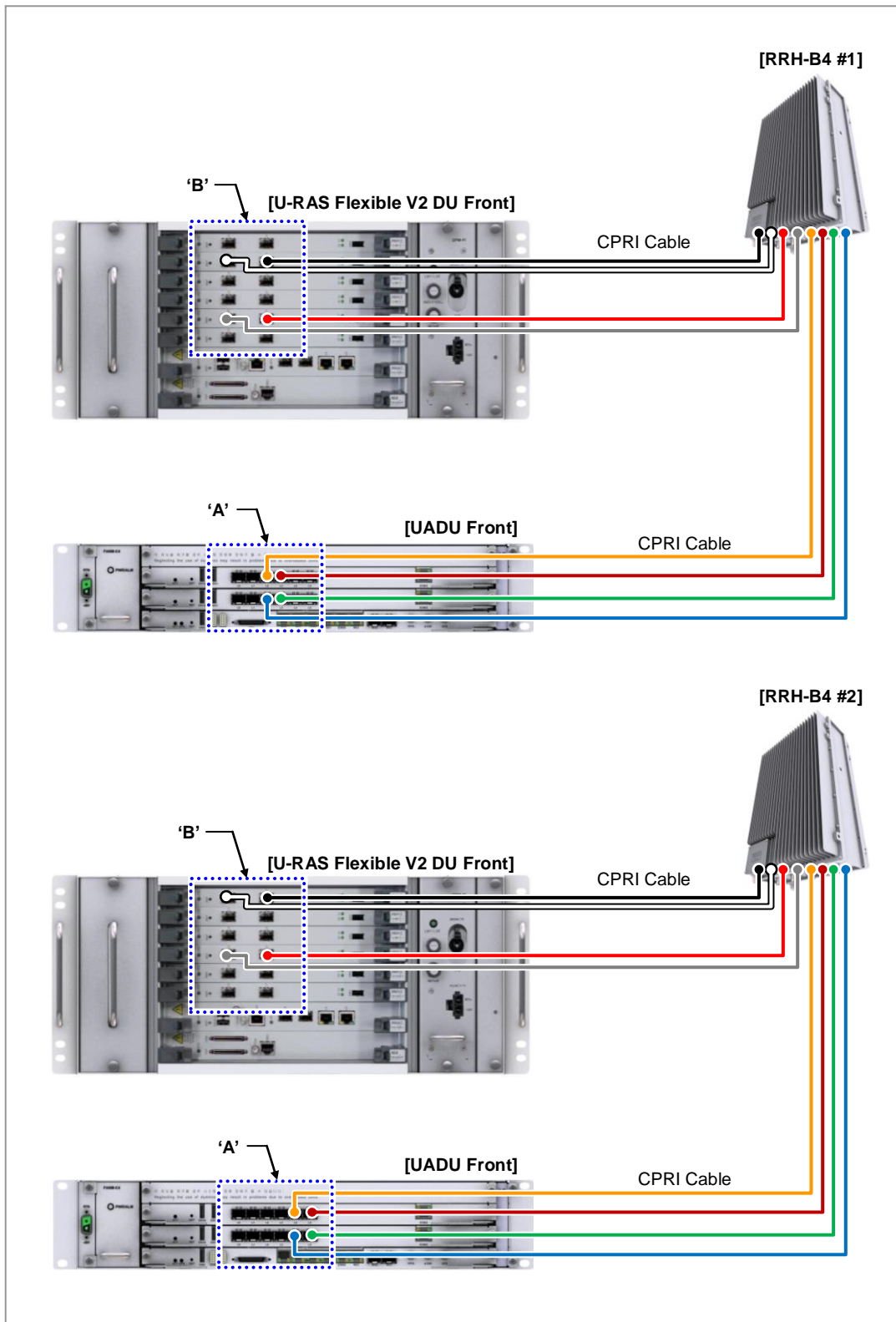


Figure 3.46 CPRI Cable Connection_Stacking, Case #2 (2)

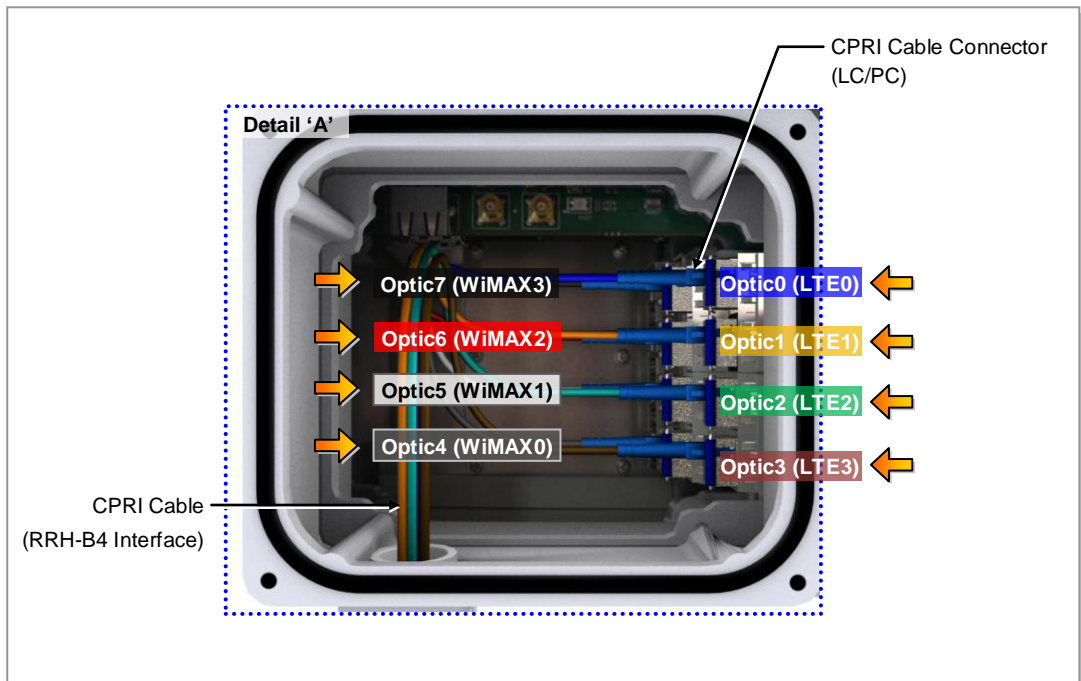


Figure 3.47 CPRI Cable Connection_Stacking, Case #2 (3)

Case #3: WiMAX 6 Subcell 2Tx/2Rx + TD-LTE 2 Carrier/3 Sector 2Tx/2Rx

U-RAS Flexible V2 DU interfaces with Smart MBS to support the WiMAX and TD-LTE services simultaneously. Up to 6 WiMAX channel cards (MRA-F) can be mounted on the U-RAS Flexible V2 to support 6 subcells. The operator can set operating sectors and frequencies for each subcell.

The following example shows the pin map where an alpha sector has 4 and a beta sector has 2 respectively among 6 WiMAX subcells.

Table 3.14 CPRI Cable Connector Pin Map (Stacking, Case #3)

DU (UADU)	DU (UADU) Port		Optic Cable Color (Cable Marker)	RRH-B4	
U-RAS Flexible V2	MRA-F #0	L0	Slate[Gray] (LC4)	RRH-B4 #0	
		L1	-		
	MRA-F #1	L0	White (LC5)	RRH-B4 #0	
		L1	-		
	MRA-F #2	L0	Red (LC6)	RRH-B4 #0	
		L1	-		
	MRA-F #3	L0	Black (LC7)	RRH-B4 #0	
		L1	-		
	MRA-F #4	L0	Slate[Gray] (LC4)	RRH-B4 #1	
		L1	-		
	MRA-F #5	L0	White (LC5)	RRH-B4 #1	
		L1	-		
	Smart MBS	L9CA #0	L0	Blue (LC0)	RRH-B4 #0
			L1	-	
L2			Blue (LC0)	RRH-B4 #1	
L3			-		
L4			Blue (LC0)	RRH-B4 #2	
L5			-		
L9CA #1		L0	Orange (LC1)	RRH-B4 #0	
		L1	-		
		L2	Orange (LC1)	RRH-B4 #1	
		L3	-		
		L4	Orange (LC1)	RRH-B4 #2	
		L5	-		