SAMSUNG

RF2217d-D1A
Installation Manual

Describes product installation and requirement procedure.

Document Version 1.0
April 2021

Document Number: 2600-00SU01GAA

Radio Access Network

SNMTC-v3-0312

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 **www.samsungdocs.com**

Samsung Networks Website and YouTube Channel
Official Website: **www.samsungnetworks.com**
YouTube: **www.youtube.com/samsung5g**

Contents

Preface viii

Relevance viii
Conventions in this Document viii
Revision History ix
Organization of This Document ix
Related Documentation x
Personal and Product Safety xi
Equipment Markings xv

Chapter 1 Introduction 1

Chapter 2 Before Installation 2
RU View and External Interface 2
Specifications 4
Cautions for Installation 6
Installation Tools 8

Chapter 3 Installing System 11
Installation Procedure 11
Transporting and Unpacking 12
System Arrangement 13
Fixing RU 15

Chapter 4 Connecting Cables 53
Cabling Procedure 53
Guidelines for Cable Connections 54
Cabling Diagram 58
Power Cabling 59
Interface Cable Connection 66

Chapter 5 Inspect the Installation 72

Appendix A Acronyms 76

Appendix B GPS Antenna Installation 77
GPS Antenna System Configuration 77
Interference Signal 80
GPS Antenna Installation 81

Appendix C Cleaning Optical Connectors 82
Introduction 82

Appendix D Standard Torque 84

List of Figures

Figure 1. Installation Procedure 1
Figure 2. RF2217d-D1A View 2
Figure 3. RF2217d-D1A External Interface 3
Figure 4. Procedure to Install the System 11
Figure 5. RU Arrangement_Wall & Ceiling Type Installation 13
Figure 6. RU Arrangement_Pole Type Installation 14
Figure 7. RU Arrangement_Ceiling Type (Inside Ceiling) 14
Figure 8. RF2217d-D1A Marking Dimension 17
Figure 9. Marking 17
Figure 10. Drilling Example 19
Figure 11. Fixing Mount Bracket 20
Figure 12. Fixing Unit Bracket Assembly 20
Figure 13. Fixing RU_Wall & Ceiling Type (1) 21
Figure 14. Fixing RU_Wall & Ceiling Type (2) 22
Figure 15. Fixing Tilted Mount Bracket 23
Figure 16. Fixing Unit Bracket Assembly 23
Figure 17. Fixing RU_Wall & Ceiling Type (1) 24
Figure 18. Fixing RU_Wall & Ceiling Type (2) 25
Figure 19. Fixed Mount - Cosmetic Cover Assembly (1) 26
Figure 20. Fixed Mount - Cosmetic Cover Assembly (2) 27
Figure 21. Fixed Mount - Cosmetic Cover Assembly (3) 27
Figure 22. Fixing Mount Bracket on the Pole (1) 29
Figure 23. Fixing Mount Bracket on the Pole (2) 30
Figure 24. Fixing Mount Bracket on the Pole (3) 30
Figure 25. Fixing RU_Pole Type (1) 31
Figure 26. Fixing RU_Pole Type (2) 32
Figure 27. Tilted Mount - Cosmetic Cover Assembly (1) 33
Figure 28. Tilted Mount - Cosmetic Cover Assembly (2) 33
Figure 29. Tilted Mount - Cosmetic Cover Assembly (3) 34
Figure 30. Tilted Mount - Cosmetic Cover Assembly (4) 34
Figure 31. Fixing Mount Bracket on the Pole (1) 36
Figure 32. Fixing Mount Bracket on the Pole (2) 37
Figure 33. Fixing Mount Bracket on the Pole (3) 37
Figure 34. Fixing RU_Pole Type (1) 38
Figure 35. Fixing RU_Pole Type (2) 39
Figure 36. Installing RU on Ceiling Tile 39
Figure 37. Ceiling 40
Figure 38. Ceiling Mount Kit 40
Figure 39. Drilling anchor holes 41
Figure 40. Drilling Example 41
Figure 41. Fixing Ceiling Mount Kit Assembly 43
Figure 42. Fixing Fixed Ceiling Mount Bracket Assembly 43
Figure 43. Fixing Tilted Ceiling Mount Bracket Assembly 44
Figure 44. Fixing RU_Ceiling - Fixed Mount Kit 45
Figure 45. Fixing RU_Ceiling - Tilt Mount Kit 45
Figure 46. Fixing Ceiling Mount Kit Assembly to Building Structure 46
Figure 47. Installing Suspended RU on Ceiling Tile 46

Figure 48. Ceiling 47
Figure 49. Ceiling Mount Kit 47
Figure 50. Cutting the Ceiling Tile (1) 48
Figure 51. Cutting the Ceiling Tile (2) 48
Figure 52. Ceiling Tile thickness less than 20mm 49
Figure 53. Ceiling Tile thickness greater than 20mm 49
Figure 54. Installing Above Ceiling Kit on the RU 50
Figure 55. Installing the RU height adjustment 51
Figure 56. Fixing Ceiling Mount Kit Assembly to Building Structure 52
Figure 57. Procedure to Connect System Cable 53
Figure 58. Cable Connection Procedure 54
Figure 59. Cable Diagram 58
Figure 60. Power Equipment Elements 59
Figure 61. Connecting Power DC Cable - Fixed Mount Kit 61
Figure 62. Connecting DC Power Cable - Ceiling Tile 62
Figure 63. Connecting PoE Cable - Fixed Mount Kit 63
Figure 64. Connecting PoE Cable - Ceiling Tile 64
Figure 65. Connecting Cables (Pole Type) 65
Figure 66. Optical Module Removal (1) 66
Figure 67. Optical Module Removal (2) 66
Figure 68. Optical Module Insert 67
Figure 69. Connecting Fronthaul Cable (1) 69
Figure 70. Connecting Fronthaul Cable (2) 70
Figure 71. Connecting Fronthaul Cable (3) 70
Figure 72. Connecting Fronthaul Cable (4) 71
Figure 73. Installation Inspection Procedure 72
Figure 74. Example of a Common GPS Antenna System Configuration 77
Figure 75. GPS Antenna Installation 79

List of Tables

Table 1. Specifications 4
Table 2. Basic Installation Tools 8
Table 3. Tools for Marking 16
Table 4. Parts and Tools for Drilling and Anchoring 18
Table 5. Anchor Bolt Drill Bits and Hole Depth 18
Table 6. Parts and Tools for Fixing Mount Bracket on the Wall & Ceiling 19
Table 7. Parts and Tools for Fixing RU on the Wall & Ceiling 21
Table 8. Parts and Tools for Fixing Mount Bracket on the Wall & Ceiling 22
Table 9. Parts and Tools for Fixing RU on the Wall & Ceiling 24
Table 10. Parts and Tools for Fixing Cosmetic Cover 25
Table 11. Parts and Tools for Fixing Mount Bracket on the Pole Type 28
Table 12. Parts and Tools for fixing RU on the Pole Type 31
Table 13. Parts and Tools for Fixing Cosmetic Cover 32
Table 14. Parts and Tools for Fixing Mount Bracket on the Pole Type 35
Table 15. Parts and Tools for fixing RU on the Pole Type 38
Table 16. Anchor Bolt Drill Bits and Hole Depth 41
Table 17. Parts and Tools for Fixing Mount Bracket on the Wall & Ceiling 42
Table 18. Parts and Tools for Fixing RU on the Ceiling Tile 44
Table 19. Parts and Tools for Fixing Fixing Ceiling Mount Kit Assembly to Building Structure 45
Table 20. Parts and Tools for Cutting 47
Table 21. Parts and Tools for Fixing Cosmetic Cover 49
Table 22. Parts and Tools for Fixing RU on the Ceiling Tile 50
Table 23. Parts and Tools for Fixing Ceiling Mount Kit Assembly to Building Structure 51
Table 24. Recommended Minimum Allowed Cable Bending Radius 56
Table 25. System Connection Cable 58
Table 26. Parts and Tools for Connecting DC Power Cable 60
Table 27. Power Cable/Connector Pin Map 60
Table 28. Parts and Tools for Connecting Power Cable 63
Table 29. Parts and Tools for Cable Binding 65
Table 30. Parts and Tools for connecting Fronthaul Cable 68
Table 31. Construction Situation Check list 73
Table 32. GPS Antenna System Configuration 77
Table 33. Standard Torque Value for Fastening Bolts 84
Table 34. Connector Connection Torque Value 84

Preface

This installation manual describes the installation procedures of the indoor RU (RF2217d-D1A, Radio Unit). It also provides the procedures to connect power and interface cables.

Relevance

This manual applies to the following products/software.

Name	Type
RF2217d-D1A	Hardware

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

- The input and output text is presented in the Courier New font. For example, `context <designated epc-context-name>`.
- The CLI command is presented in bold capital letters and Courier New font. For example, Type the **`RTRV-NE-STS`** command in the input field.
- The YANG object is presented in lowercase letters, bold style. For example, **eutran-cell-conf-idle**.

Revision History

The following table lists all versions of this document.

Document Version	Publication Date	Remarks
1.0	April 2021	First Version

Organization of This Document

Section	Title	Description
Chapter 1	Introduction	This chapter describes the introduction of the installation procedure.
Chapter 2	Before Installation	This chapter introduces the system and describes the equipment and items that should be understood before installation.
Chapter 3	Installing System	This chapter describes the procedures to install the system.
Chapter 4	Connecting Cables	This chapter describes the procedures to connect the cables to the installed system.
Chapter 5	Inspect the Installation	This chapter describes the procedures of inspecting the installation status after the system installation and cabling is completed.
Appendix A	Acronyms	This appendix spells out the acronyms used in this manual.
Appendix B	GPS Antenna Installation	This appendix describes the GPS Antenna installation.
Appendix C	Cleaning Optical Connectors	This appendix describes the procedure of cleaning the optical connector and cleaning tool.
Appendix D	Standard Torque	This appendix describes the standard torque when fastening the bolt.

Related Documentation

- 5G NR gNB System Description
- RF2217d-D1A Product Specification

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 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 IEC/EN/UL/CSA 62368 or 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 optical modules rated as Class 1 radiation-emitting devices under IEC/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 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 mm^2/14 AWG.

The equipment can be installed in multiple locations such as Network Telecommunications Facilities, OSP, and locations where the NEC applies. These products are installed on the Outside Plant. These products are installed on the Locations where the NEC applies.

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

To protect against potential fire due to current overload, 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

Natural convention cooling.

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, ensure it is done so properly according to the installation instructions.

Power Supply Connection

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 IEC/EN/UL/CSA 62368 or 60950 providing double/reinforced insulation between hazardous voltages and SELV/TNV circuits.

Any battery must be separated from hazardous voltages by reinforced insulation.

The battery return of the terminals is an Isolated DC return. The RTN of the product is not connected to Grounding.

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.

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.'

FCC Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Equipment Markings

This marking on the product, accessories or literature indicates that the product and its electronic accessories (e.g. charger, headset, USB cable) should not be disposed of with other household waste at the end of their working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources.

Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take these items for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchase contract. This product and its electronic accessories should not be mixed with other commercial wastes for disposal.

Correct disposal of batteries in this product

(Applicable in countries with separate collection systems.)

The marking on the battery, manual or packaging indicates that the battery in this product 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. If you intend to discard the product, the waste collection site will take the appropriate measures for the recycling and treatment of the product, including the battery.

Hot surface warning

Allow to cool before servicing.

Do not touch before cooling.

Notice! Be careful not to touch due to high temperature.

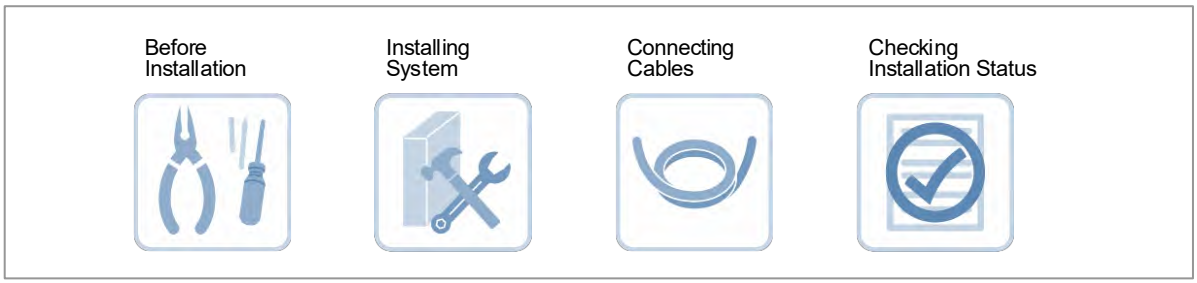
The system must be installed in a restricted area, and make sure the work is done by personnel properly trained for the job.

Chapter 1 Introduction

The installation process presented in this document includes system requirements prior to installation, installing the system, connecting cables and, verifying the installation status.

The following figure depicts the procedure to install the system.

Figure 1. Installation Procedure



This document is divided into the following chapters. This section provides a brief overview of the information covered in each chapter.

- Introduction

  This chapter provides an overview of the procedures required for system installation.

- Before Installation

  This chapter introduces the system and describes the items you should understand before installation.

- Installing System

  This chapter describes the procedures to install the system.

- Connecting Cables

  This chapter explains the cabling procedure, the guidelines for handling cabling, the cabling diagram, the grounding process, and the external interface connection.

- Inspecting Installation

  This chapter explains the procedures to check installation status.

Chapter 2 Before Installation

This chapter provides a view of the RF2217d-D1A and details about the external interface. It also provides cautions and the installation tools required for installing the system.

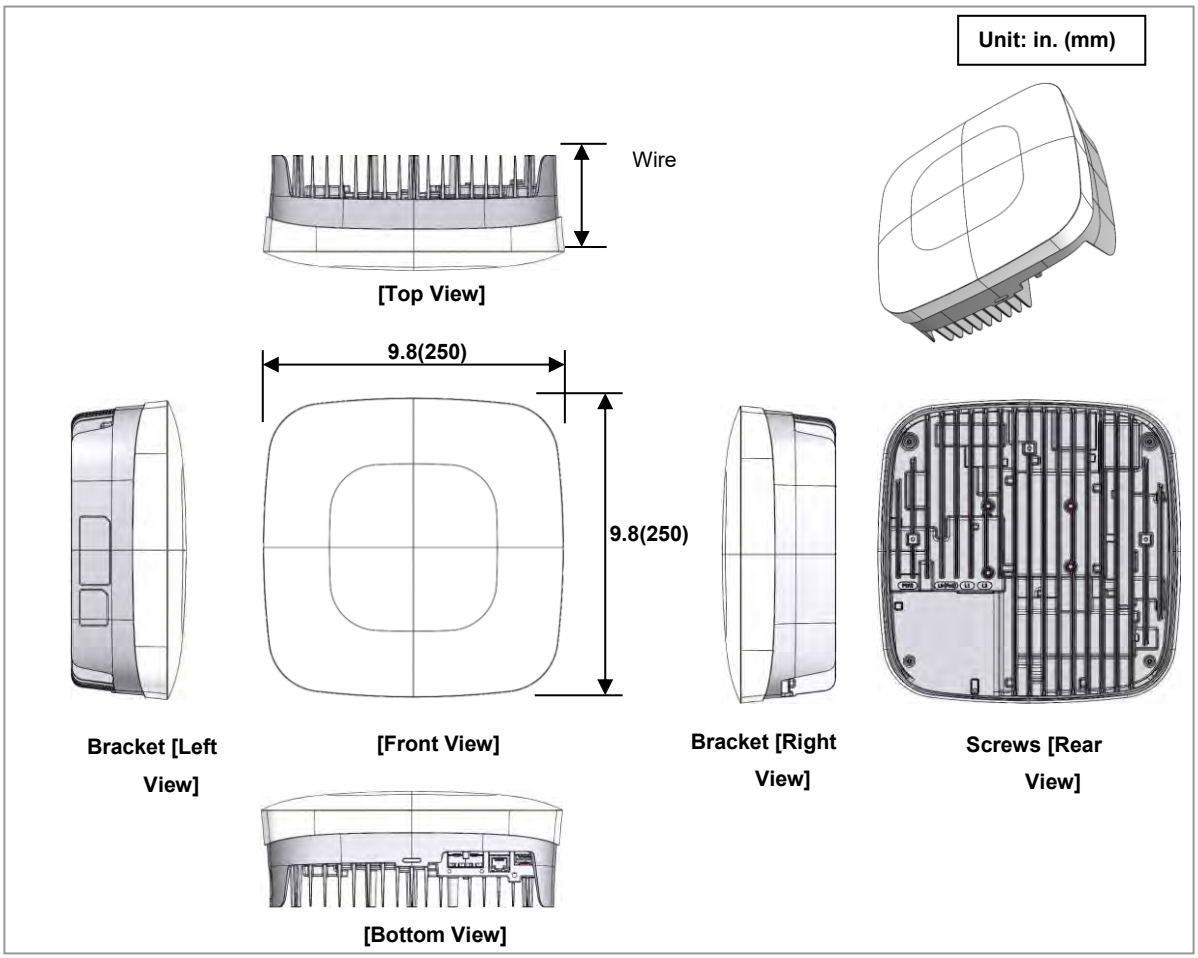
RU View and External Interface

This section provides the pictorial view of the RF2217d-D1A and its interfaces.

RU View

The following figures depict the all-round views of the RF2217d-D1A.

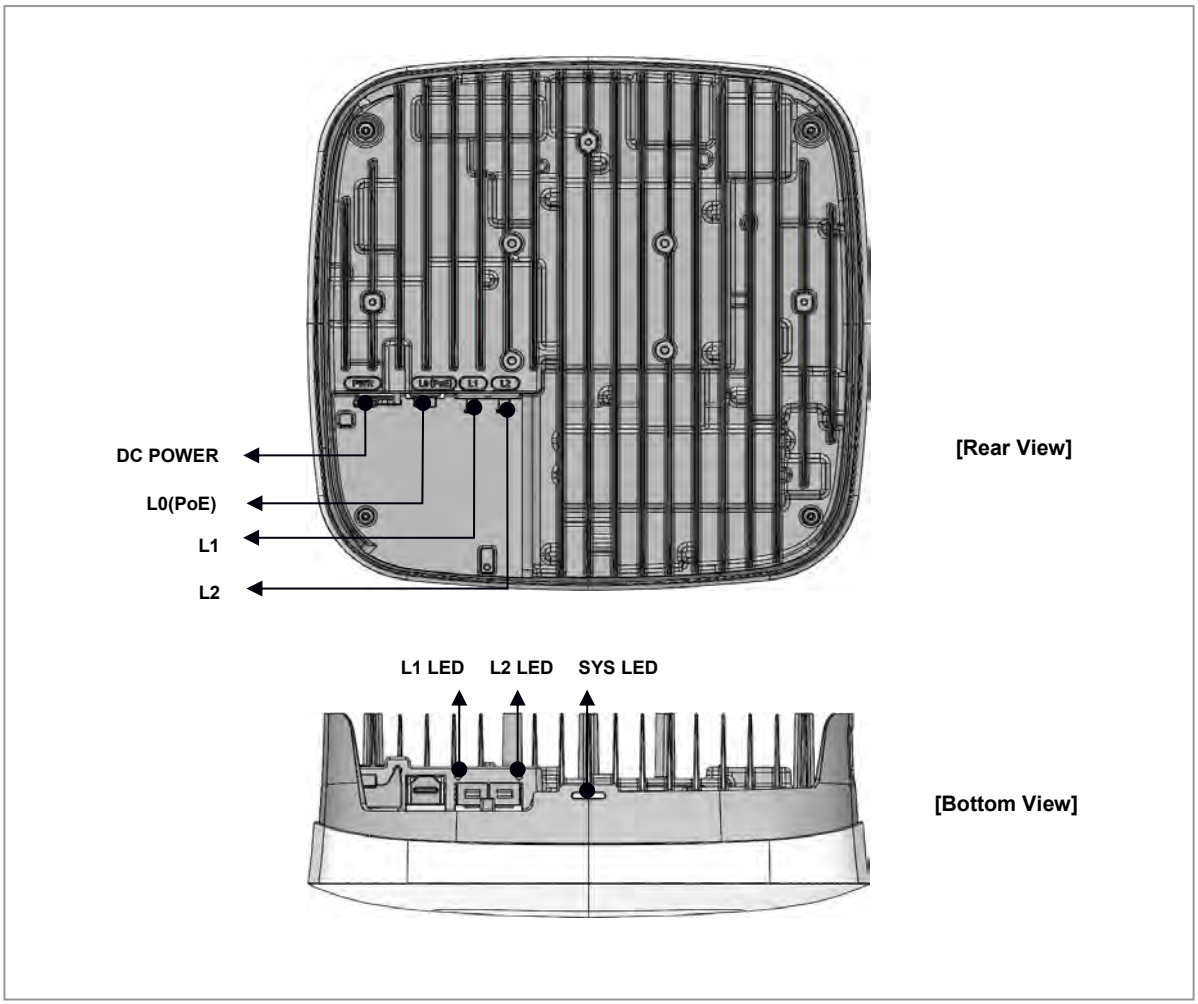
Figure 2. RF2217d-D1A View



RU External Interface

The following figure depicts the external interfaces of the RF2217d-D1A:

Figure 3. RF2217d-D1A External Interface



Specifications

The following table lists the key specifications of the RF2217d-D1A:

Table 1. Specifications

Item		RF2217d-D1A
Radio Technology		5G NR
Output Power		21dBm/path
Operating Frequency	Tx	B5 : 869 - 894 MHz / B2 : 1930 - 1990 MHz
	Rx	B5 : 824 - 849 MHz / B2 : 1850 - 1910 MHz
IBW	Tx	B5 : 25MHz / B2 : 60MHz
	Rx	B5 : 25MHz / B2 : 60MHz
Channel Bandwidth		B5 : 5MHz, 10MHz B2 : 5MHz, 10MHz, 15MHz, 20MHz
OBW	Tx	B5 : 10MHz / B2 : 25MHz
	Rx	B5 : 10MHz / B2 : 25MHz
Interface		2.5/5/10G Copper(RJ45) 1 port (eCPRI only) Reserved 10G Optic(SFP+) 2ports (CPRI and RU Cascade HW ready)
Input Voltage	DC	-48 VDC (Operating -36 to -58VDC)
	PoE	57 VDC (Operating 41.1 to 57VDC)
Power consumption		Typical 73W, Max 76W
Operating Humidity		5~90 % RH, condensing not to exceed 30 g/m3 absolute humidity.
Operating Temperature		• -20°C - 50°C without solar load, wind speed 0.0m/s • Ceiling mount: -20 - 40°C (TBD) with 30mm distance (bracket) from ceiling.
Size (W × D × H, mm)		• 250 × 95 × 250
Weight (kg)		4.0kg (without Mount bracket, Tol.±0.2Kg)
Cooling		Natural convection cooling
Ingress Protection Rating		IP40 (IEC 60529)
Installation		Pole, Wall, Ceiling
Altitude (m)		-60 - 1,800 (Telcordia GR-63-CORE)
Earthquake		Telcordia Earthquake Risk Zone4 (Telcordia GR-63-CORE)
Vibration		Telcordia GR-63-CORE • Office Vibration (Section 4.4.4) • Transportation Vibration (Section 4.4.5)
Noise		Fanless (natural convection cooling)
EMC		FCC Title 47 CFR Part 15 Subpart B
Safety		• UL 62368-1 • UL2043
RF		• FCC Title 47 CFR Part 2 • FCC Title 47 CFR Part 22 • FCC Title 47 CFR Part 24

Cautions for Installation

This section describes the safety instructions that must be observed while installing the system.

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

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.

Keep a safe distance between the base station antenna (RU) and people.

The antenna(s) must be installed such that a minimum separation distance of at least 24 cm is maintained between the radiator (antenna) and all persons at all times.

Do not co-locate nor operate in conjunction with any other antenna or transmitter for the protection of public from exposure to radio frequency electromagnetic field.

- The system power must be cut off before installing.

While Installing

- Be careful not to damage or scratch the boards mounted on the system and the cables among the boards when the system is transported or installed.

Ensure the power switch of power supply is OFF when installing the system. Installing the system with power switch ON can cause system damage or fatal human injury when the cables are not correctly connected.

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

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


Prevent foreign substances from entering unused ports by covering them with a cap.


To prevent foreign substances, outdoor air, and moisture from entering the cable inlet (including cable gland and conduit), finish it as follows:
Unused inlet
Use the hole finishing materials including cap and rubber packing.
Cable-installed inlet
After cable installation, block any space in the inlet with tape, compressed sponge, rubber packing, and silicon.

After Installing

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


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


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


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

Installation Tools

The following table lists the basic tools for installation. The additional tools required for each site should be identified and arranged during a site survey before starting the installation.

Table 2. Basic Installation Tools

No.	Name	Specification	Purpose of use
1	Torque Driver 	No.0~+ No.3 (M2.6 - M6 '+' Driver) 0.07 - 4.34 lbf*ft (1.0~60 Kgf*cm)	For fastening the M3 - M6 screw
2	Screw Driver Bit	'+', No. 2	For fastening the M3, M4 screw
3	Screw Driver 	'+', No. 2	For loosening the M3, M4 screw
4	Torque Wrench 	Apply a torque range: 20 - 90 lbf·in	For tightening the M5 Hex. Bolt (Steel band fixing Hex. bolt)
5	Torque Wrench Spanner Head 	Apply Hex. Head: 8 mm (for 20 - 90 lbf·in)	For tightening the M5 Hex. Bolt (Steel band fixing Hex. bolt)
6	Spanner 	8 mm	For loosening the M5 Hex. bolt
7	Ratchet Wrench 	10 × 13/17 × 19 (4 in 1)	For fastening Hex. bolt
8	Tape Measure 	16.4ft (5M)	Tape measure for length measurement
9	Power Extension Cable 	98.42ft (30M)	Basic tool
10	Horizontal Ruler 	Spirit level 11.8in (300mm)	For horizontality and verticality

No.	Name	Specification	Purpose of use
11	Hammer Drill 	Normal	Drilling
12	Concrete Drill Bit 	0.12~0.20 in (3~6 mm)	Drilling for Φ 6 plastic anchor
13	Vacuum Cleaner 	Normal	For removing dust during the drilling work
14	Industrial Scissor 	Basic Tool	Cutting
15	Knife 	Basic Tool	Cutting
16	Electric drill 	Normal	For fastening the M3, M4 tapping screw
17	Crimping Tool & Die  	20 AWG-12 AWG (0.5-2.5 mm^2) TE 539635-1, 539743-2 or the use of tools of the same specification	Pressure terminal for crimping
18	Wire Stripper 	Apply cable thickness: 1.5-6.2 in. (4-16 mm)	Cable sheath for removal
19	Nipper 	Basic Tool	For cutting the cable
20	Heating Gun 	50°C - 300°C	Shrinking the heat shrink tube
21	Optical Connector Cleaner 	For LC Connector	For optical connector cleaning
22	Multi tester 	Digital Pocket Tester	To check the voltage and current measurements when cable disconnection is suspected
23	Fiber Optical Test Set 	Wave length: 1310 nm, 1550 nm (single mode) 850 nm, 1310 nm (multi-mode)	Optical level check

No.	Name	Specification	Purpose of use
24	ESD Gloves 	Normal	Electrostatic Protection
25	Heat Protection Gloves 	Normal	Heat Protection

The required installation tools can vary depending on the site conditions. In addition to the basic tools, a protractor, ladder, safety equipment, and cleaning tools should also be arranged considering the site conditions.

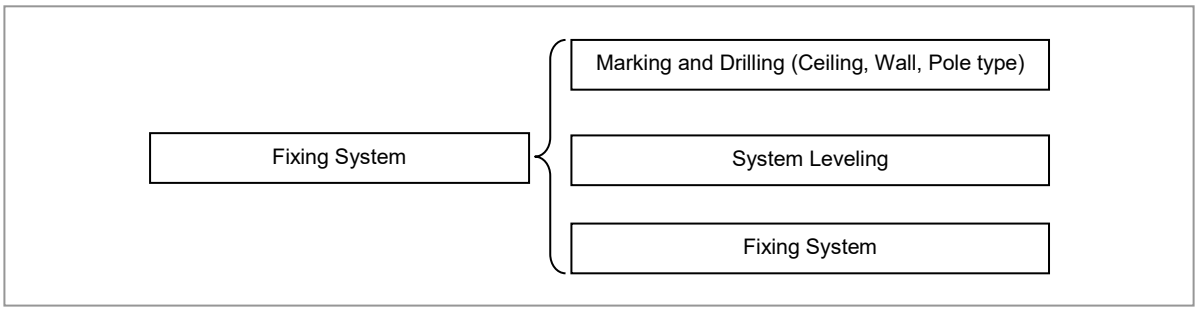
Chapter 3 Installing System

This chapter describes the installation procedures of the RF2217d-D1A.

Installation Procedure

The following figure outlines the installation procedures of the RF2217d-D1A:

Figure 4. Procedure to Install the System



Ensure that the power switch is OFF while installing the system. Installing the system with the power switch ON can cause system damage or fatal human injury when connecting or disconnecting the cables.

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

Transporting and Unpacking

This section describes the procedure to unpack cabinets and other components and transport them to the installation site.

Bringing in Items

While transporting the equipment, check the following guidelines:

- When carrying a system:
  - Fasten the system firmly to the transport vehicle or carrier to prevent damage to the system from vibration or shock.
  - Use a lift to prevent accidents. However, if the system must be carried by people, ensure sufficient people are available to carry the system.
- Before moving the system, check the storage place for the system and remove obstacles.
- While moving the system, the system must be protected from any physical shock.
- The system must be protected from dust, moisture, and static electricity.

Unpacking Items

The procedure to unpack items is as follows:

- The equipment and items should be packed until they reach the installation place.
- The items are classified in accordance with each job specification and stored in a place that does not interfere with work.
- The unpacked systems must be installed immediately. If the system is not installed immediately, it must be stored at the installation site temporarily.
- Unpack only the external packing, leaving the internal packing in packed state.
- The internal packing must be unpacked after each system is placed on its installation location.
- The by-products (packaging waste) must be disposed in accordance with waste management rules. Do not recycle the by-products.

System Arrangement

A minimum clearance must be secured around the RF2217d-D1A, in each direction for installation and maintenance.

The recommended clearance for installing the RF2217d-D1A is outlined in the following table.

Direction	Recommended Distances / in. (mm)		Remarks
	Wall/Ceiling	Pole	
Front	≥ 32 (800)	≥ 32 (800)	-
Sides	≥ 16 (400)	≥ 16 (400)	-
Top	≥ 16 (400)	≥ 16 (400)	-
Bottom	≥ 16 (400)	≥ 16 (400)	-

***Figure 5.** RU Arrangement_Wall & Ceiling Type Installation*

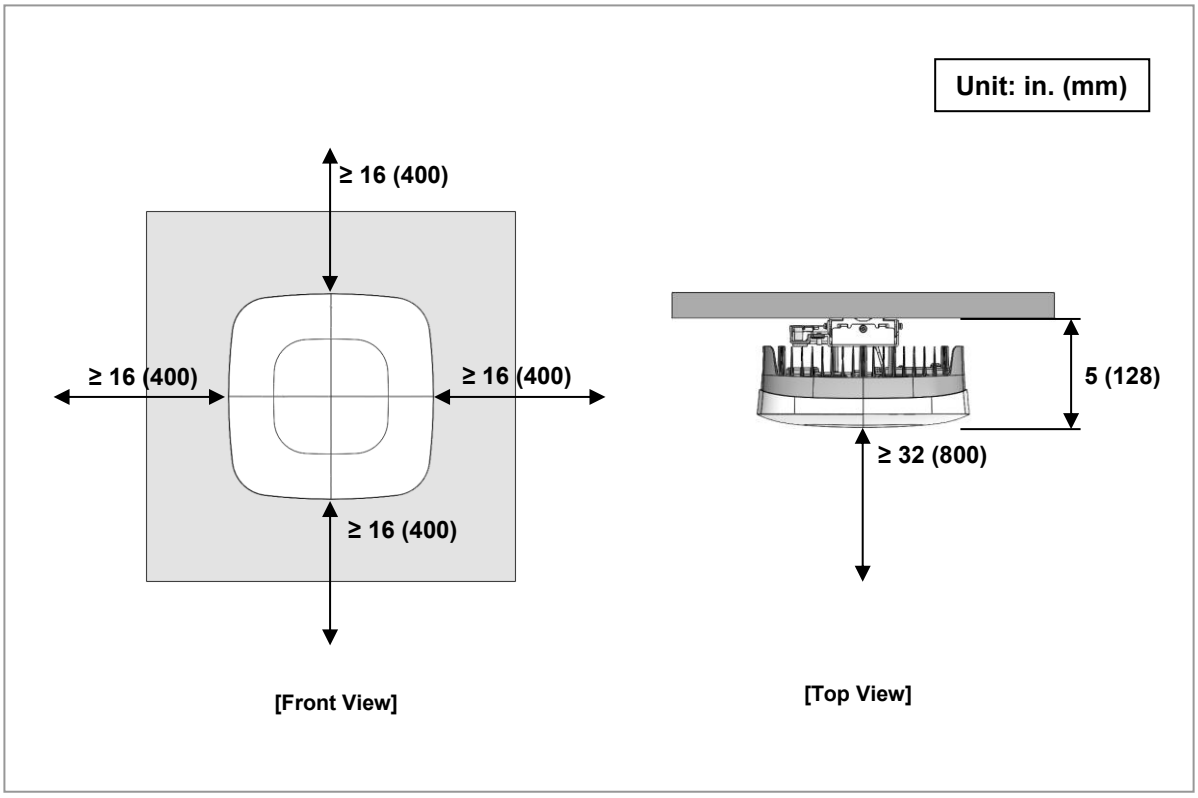
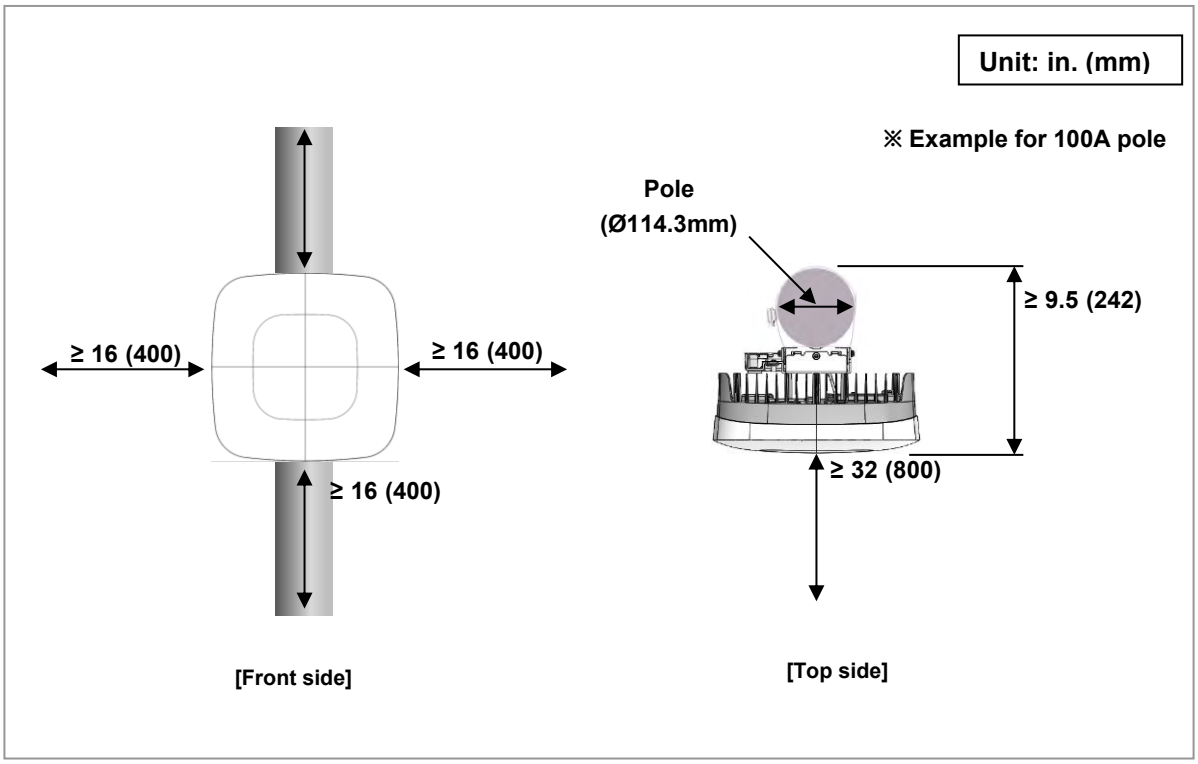
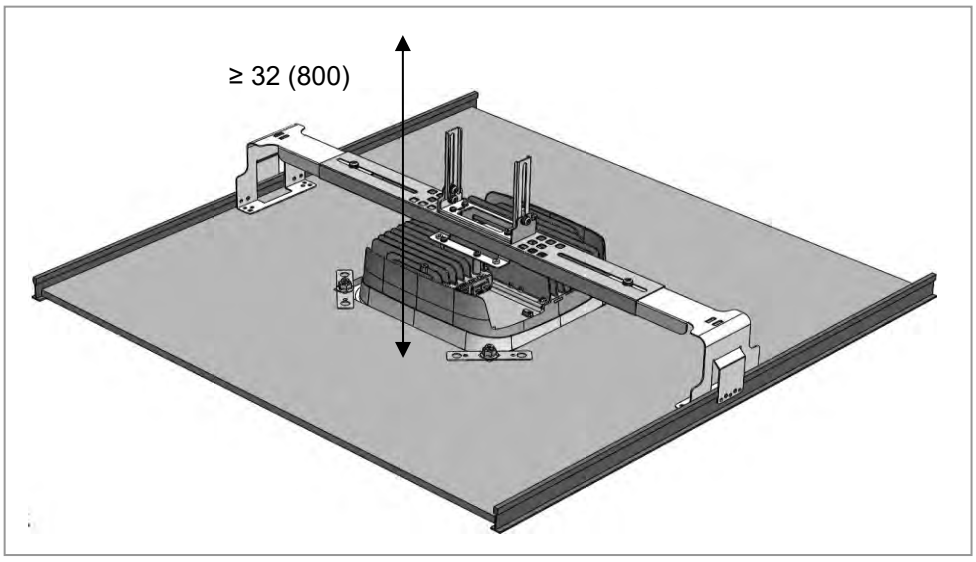


Figure 6. RU Arrangement_Pole Type Installation



The standard of the pole on which the mount bracket can be attached using steel bands is 32A (42.7 mm) - 100A (114.3 mm).

Figure 7. RU Arrangement_Ceiling Type (Inside Ceiling)



Fixing RU

This section describes the procedures to fix the system.

Fixing Wall or Ceiling Type

This section describes the procedures for a wall or ceiling type installation.

The ceiling or wall on which the RF2217d-D1A is installed should be able to withstand a load of four times the weight of the RF2217d-D1A (RF2217d-D1A including all the components) without damage.

When installing the RF2217d-D1A, the entire RF2217d-D1A, including the bracket, should be installed protruding outside the ceiling and wall.

Marking for Wall or Ceiling Mounting

To mark on a Wall or Ceiling, do the following

1 Ensure you have the following equipment:

Table 3. Tools for Marking

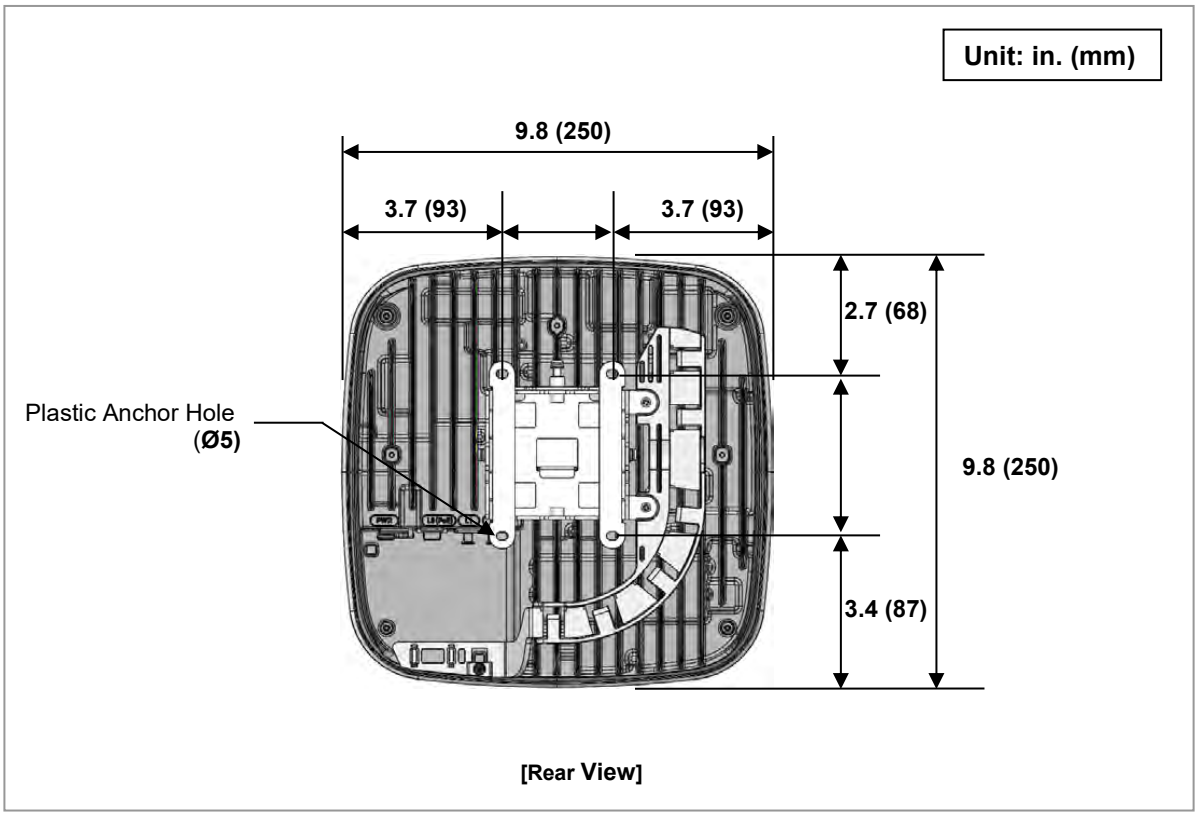
Category	Description
Working Tools	• Tape Measure • Permanent Maker • Level

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

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

2 Check the distance between the location for fixing the RF2217d-D1A and anchor bolt hole.

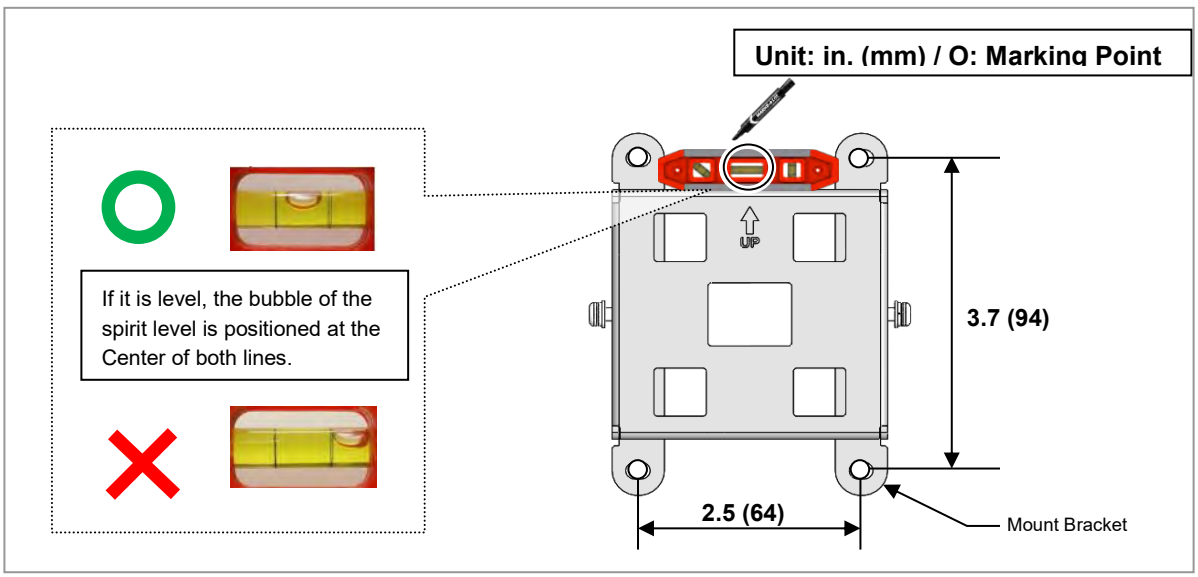
Figure 8. RF2217d-D1A Marking Dimension



3 Place a mount bracket on the fixing location, Check the level status using a level and adjust the level of mount bracket.

4 If the level status is normal, mark the anchor bolt holes on a wall (or ceiling).

Figure 9. Marking



While fixing the wall mount bracket front, you must perform level test for the bracket, as only small adjustments can be made after installation. (Only wall type)

Drilling and Anchoring

This section provides information about drilling and anchoring for fixing the RF2217d-D1A.

Prerequisites

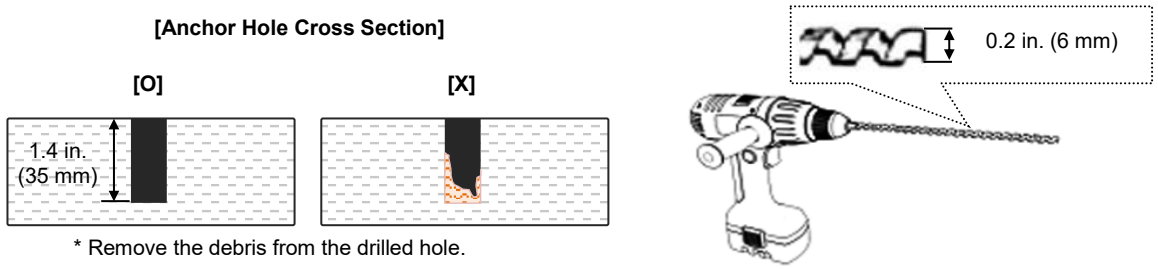
Before proceeding with the drilling and anchoring process, ensure that you have equipment and items mentioned in the following table:

Table 4. Parts and Tools for Drilling and Anchoring

Category	Description	
Parts	M6 × L30 Plastic Anchor	4 EA
Working Tools	• Hammer Drill • Concrete Drill Bit (6 mm) • Vacuum Cleaner	

Table 5. Anchor Bolt Drill Bits and Hole Depth

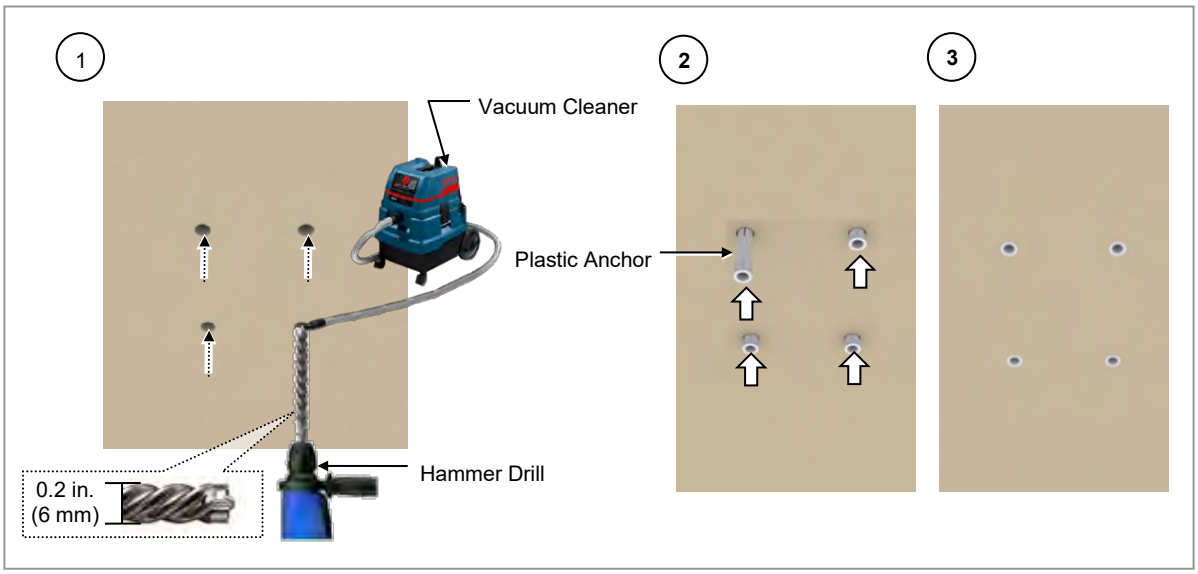
Category	Anchor Bolt	Drill Bits	Hole Depth
System (Wall & Ceiling Type)	M6	0.2 in. (6 mm)	1.4 in. (35 mm)



To drill an anchor hole, do the following:

- Drill anchor holes at marked points. Additionally, remove dust from the holes using a cleaner. Fix plastic anchor to the drilled hole.

Figure 10. Drilling Example



Fixing RU-Fixed Mount

Fixing Mount Bracket

This section describes the process to fix mount bracket for wall and ceiling type.

Prerequisites

Before proceeding with fixing the mount bracket, ensure that you have equipment and items mentioned in the following table:

Table 6. Parts and Tools for Fixing Mount Bracket on the Wall & Ceiling

Category	Description		
Parts	Mount Bracket		1 EA
	Fastener	M4 × L30 (Taptite Screw)	4 EA
Recommended Torque Value	M4 Taptite Screw		13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)		

To fix mount bracket _Wall and Ceiling Type

Place the mount bracket along with the fixed plastic anchors and fix it using fasteners.

Figure 11. Fixing Mount Bracket

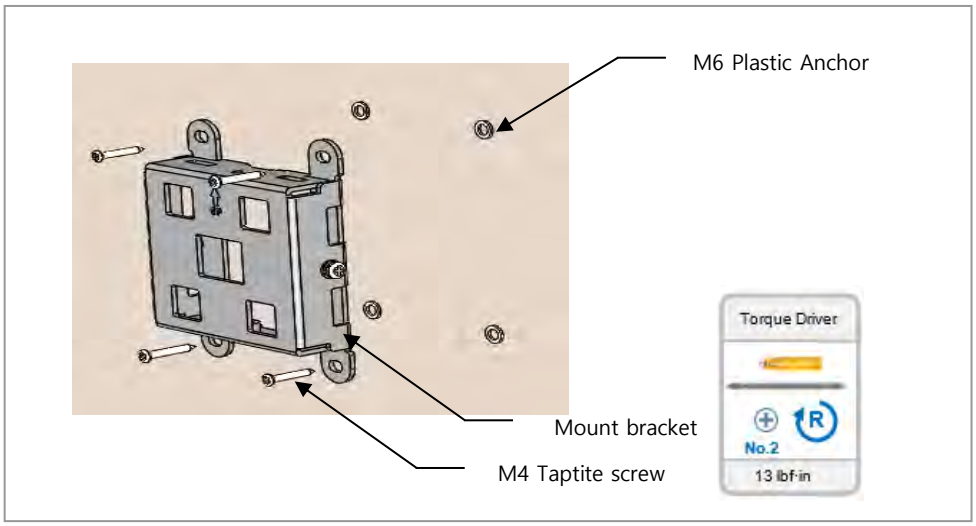
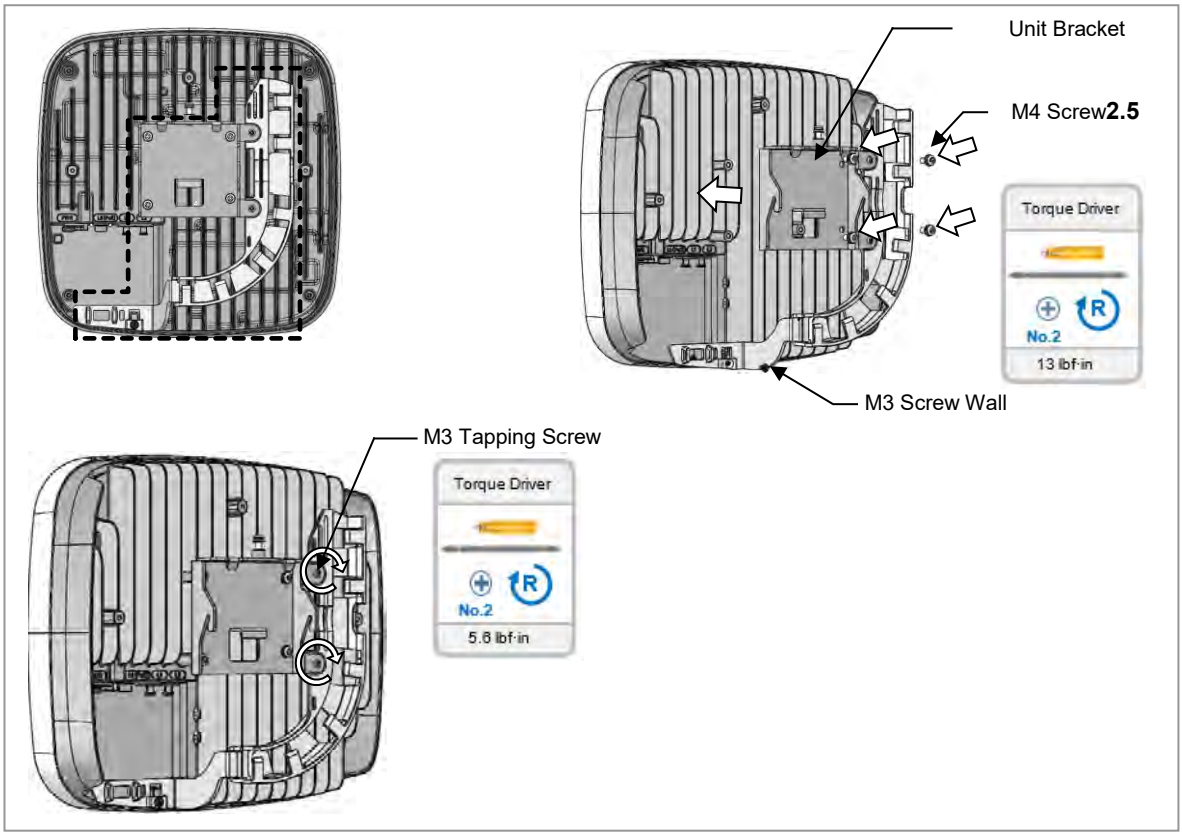


Figure 12. Fixing Unit Bracket Assembly



Fixing RU

This section describes the process to fix RU on the wall and ceiling.

Prerequisites

Before proceeding with fixing the RU, ensure that you have equipment and items mentioned in the following table:

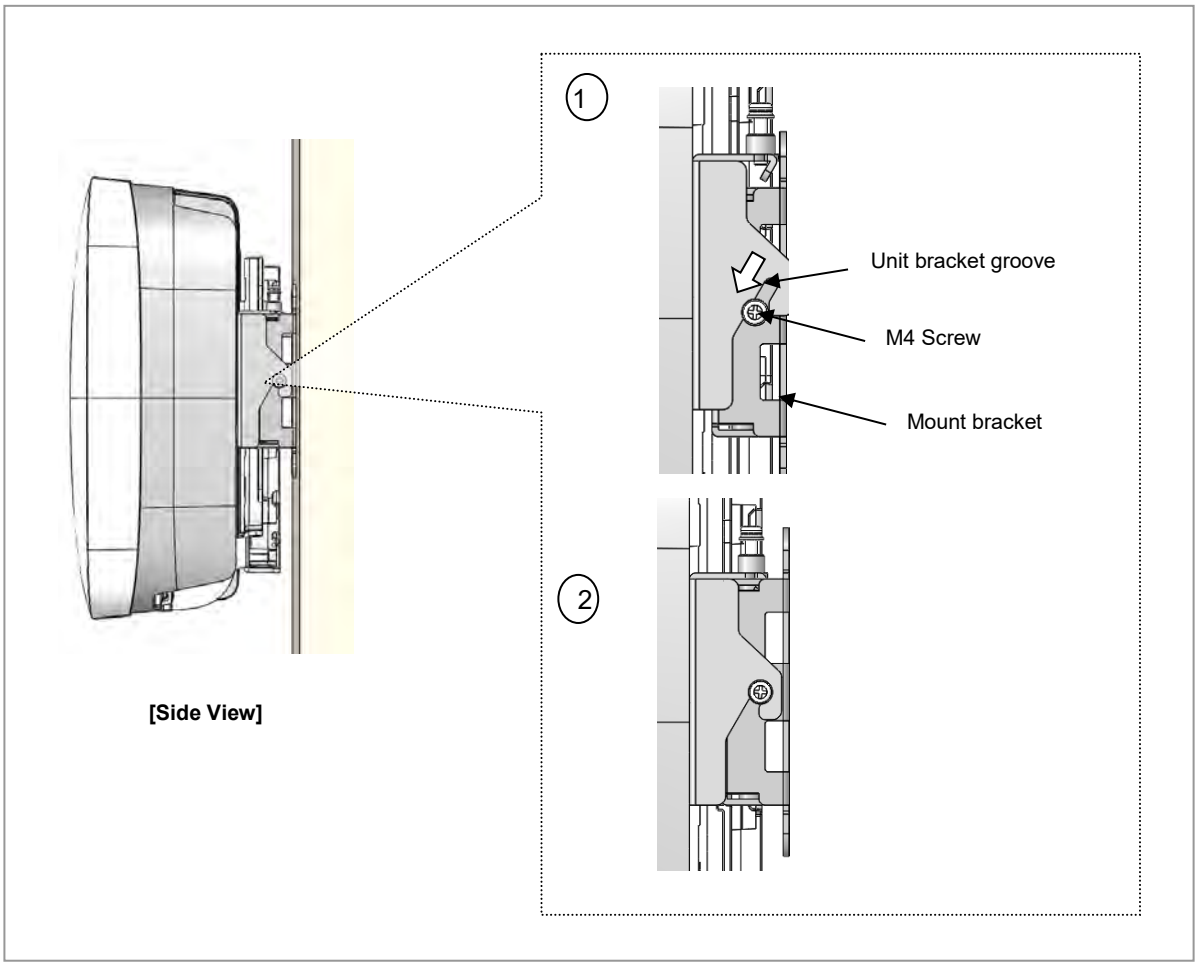
Table 7. Parts and Tools for Fixing RU on the Wall & Ceiling

Category	Description	
Parts	M4 × L16 Screw (Attached to the bracket)	2 EA
Recommended Torque Value	M4 Screw	13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)	

To fix the RU, do the following:

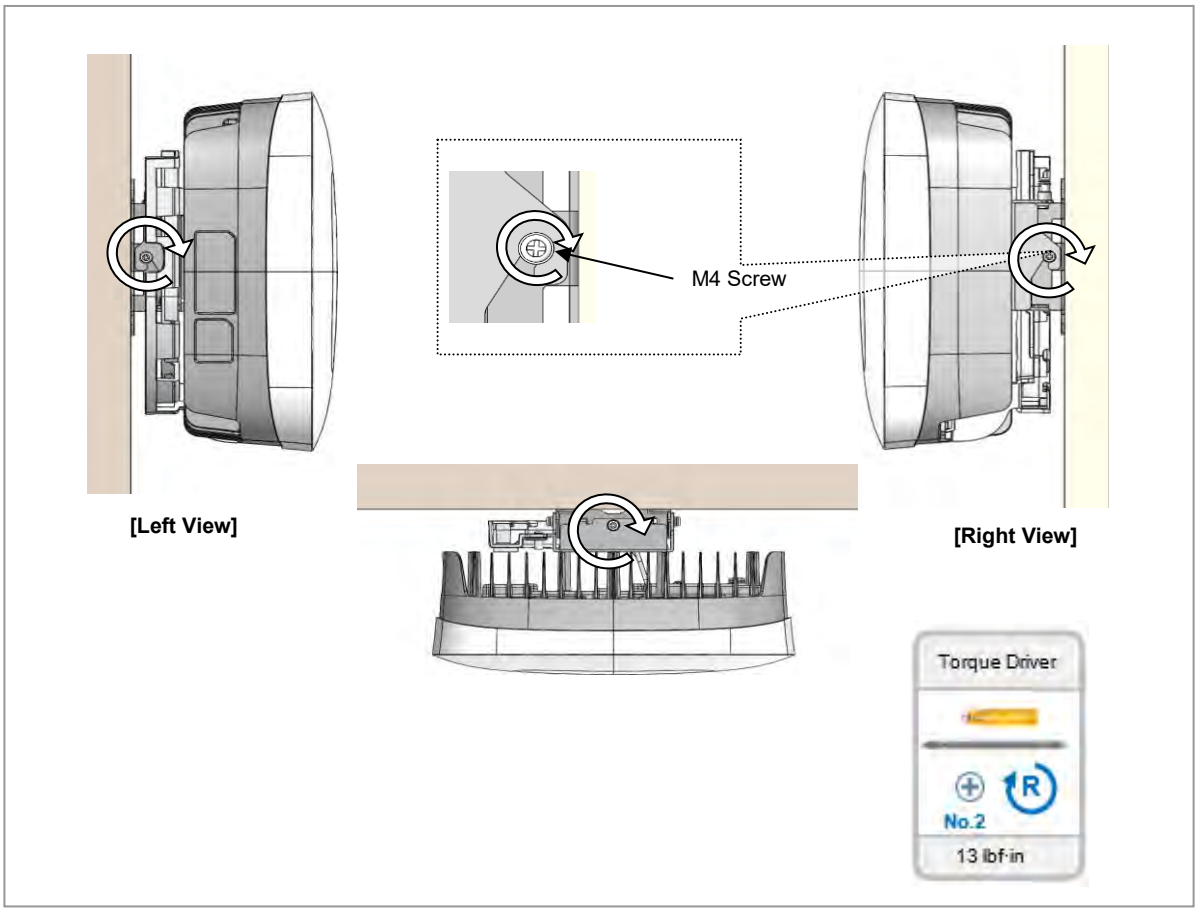
1 Place the unit bracket groove on the fasteners of the mount bracket.

Figure 13. Fixing RU_Wall & Ceiling Type (1)



2 Fix the three points of fasteners of the bracket.

Figure 14. Fixing RU_Wall & Ceiling Type (2)



Fixing RU-Tilt Mount

Fixing Mount Bracket

This section describes the process to fix tilted mount bracket for wall and ceiling type.

Prerequisites

Before proceeding with fixing the tilted mount bracket, ensure that you have equipment and items mentioned in the following table:

Table 8. Parts and Tools for Fixing Mount Bracket on the Wall & Ceiling

Category	Description		
Parts	Tilted Mount Bracket		1 EA
	Fastener	M4 × L30 (Taptite Screw)	4 EA
Recommended Torque Value	M4 Taptite Screw		13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)		

To fix tilted mount bracket _Wall and Ceiling Type

Place the tilted mount bracket along with the fixed plastic anchors and fix it using fasteners.

Figure 15. Fixing Tilted Mount Bracket

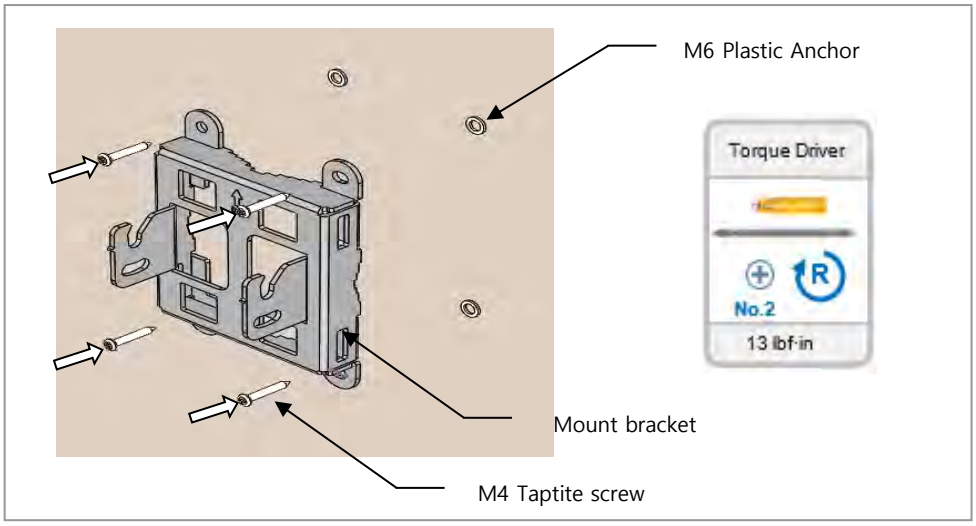
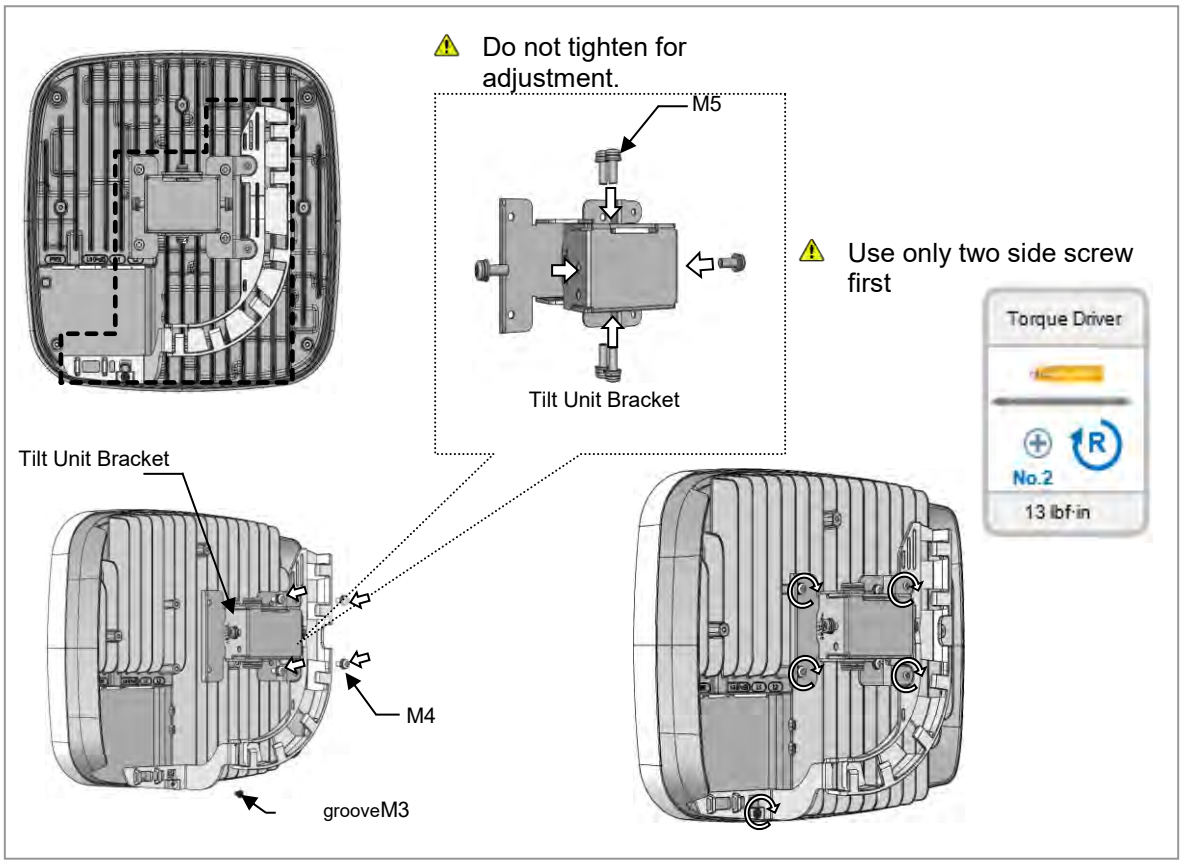


Figure 16. Fixing Unit Bracket Assembly



Fixing RU

This section describes the process to fix RU on the wall and ceiling.

Prerequisites

Before proceeding with fixing the RU, ensure that you have equipment and items mentioned in the following table:

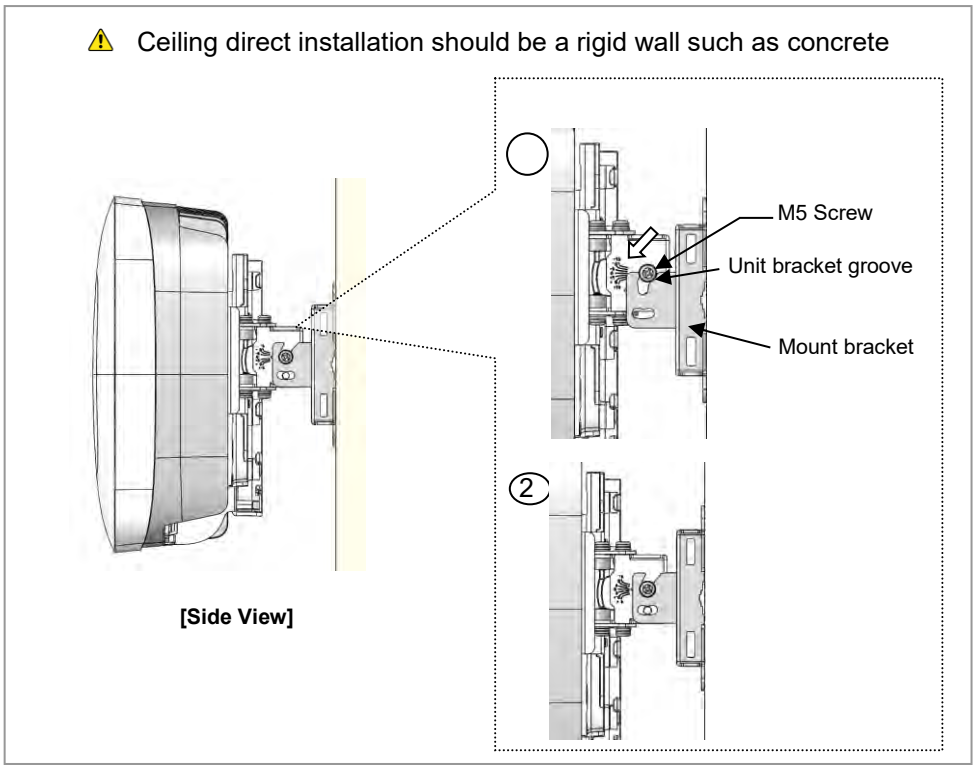
Table 9. Parts and Tools for Fixing RU on the Wall & Ceiling

Category	Description	
Parts	M5 × L14 Screw (Attached to the bracket)	8 EA
Recommended Torque Value	M5 Screw	13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)	

To fix the RU, do the following:

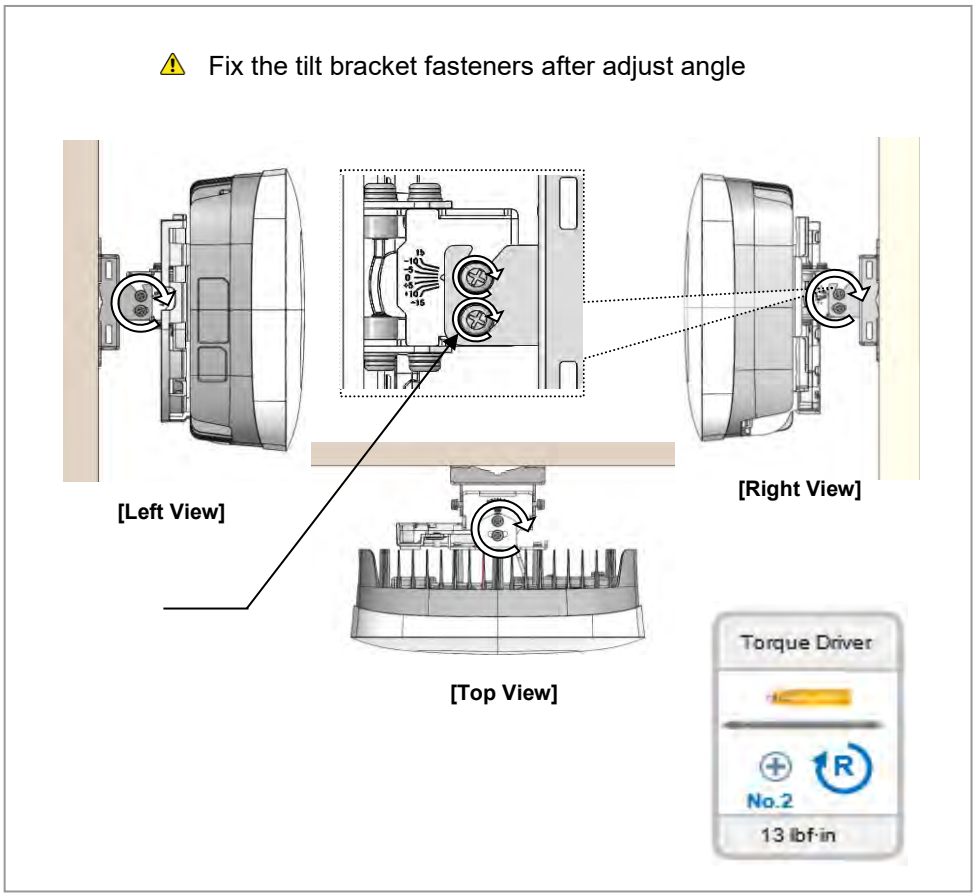
1 Place the tilted unit bracket groove on the fasteners of the tilted mount bracket.

Figure 17. Fixing RU_Wall & Ceiling Type (1)



2 Fix the three points of fasteners of the bracket.

Figure 18. Fixing RU_Wall & Ceiling Type (2)



Fixing Pole Type

This section describes the procedures for a pole type installation.

Fixing RU-Fixed Mount

Fixing Cosmetic Cover Assembly

This section describes the process to fix the cosmetic cover.

Prerequisites

Before proceeding with fixing the cosmetic cover, ensure that you have equipment and items mentioned in the following table:

Table 10. Parts and Tools for Fixing Cosmetic Cover

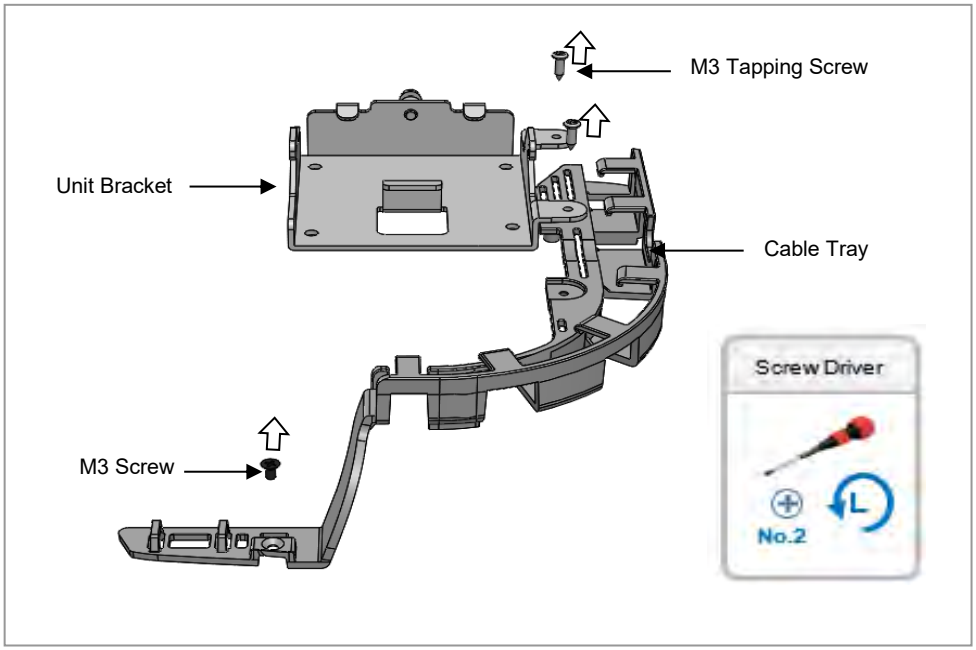
Category	Description		
Parts	Cosmetic Cover		1 EA
	Fasteners	M3 × L8 Screw	3 EA
Recommended Torque Value	M3 Screw		5.6 lbf·in

Category	Description	
	M4 Screw	13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)	

To fix Cosmetic Cover, do the following:

1 Remove the cable tray and unit bracket from the unit bracket assembly.

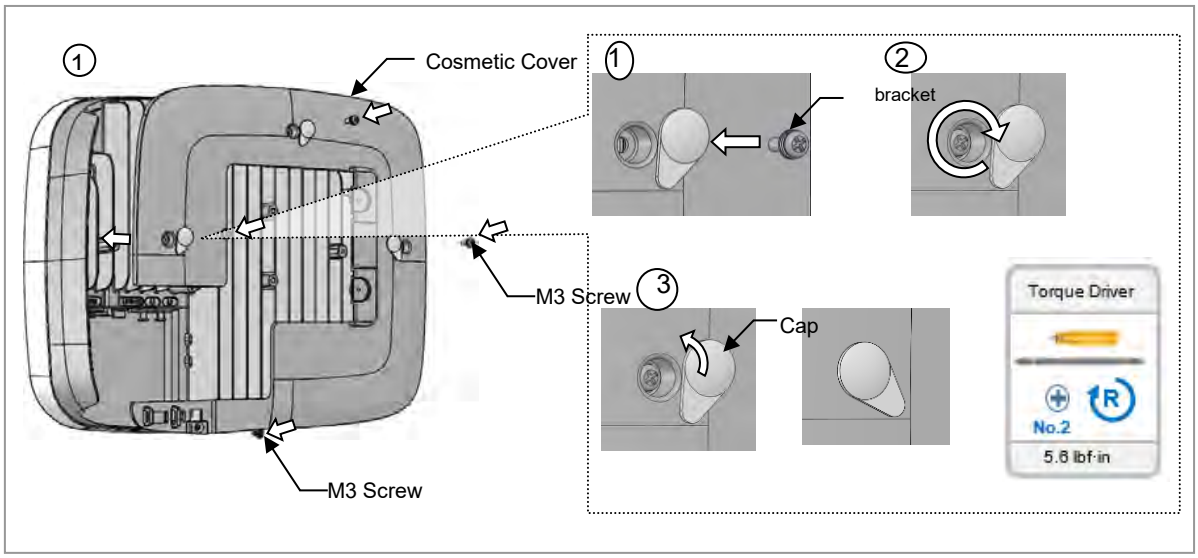
Figure 19. Fixed Mount - Cosmetic Cover Assembly (1)



The M3 screws should be reassembled. Be careful not to lose them.

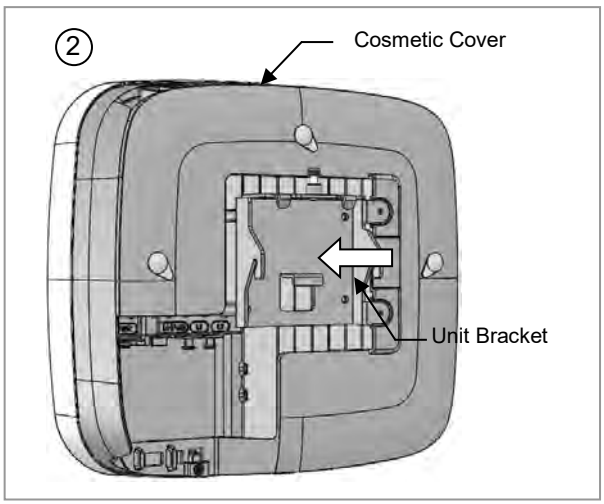
2 Fix the cosmetic cover using fasteners.

Figure 20. Fixed Mount - Cosmetic Cover Assembly (2)



3 Place the unit bracket on the RU.

Figure 21. Fixed Mount - Cosmetic Cover Assembly (3)



4 Fix the unit bracket using fasteners.

Fixing Mount Bracket

This section describes the process to fix the mount bracket (Pole Type).

Prerequisites

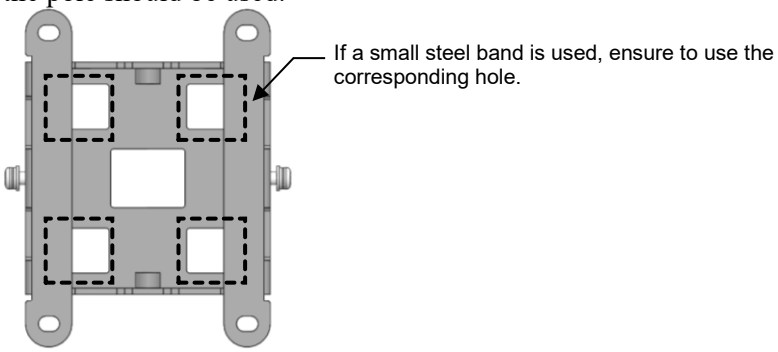
Before proceeding with fixing Pole Type mount bracket, ensure that you have equipment and items mentioned in the following table:

Table 11. Parts and Tools for Fixing Mount Bracket on the Pole Type

Category	Description		
Parts	Mount Bracket		1 EA
	Fasteners	Steel band	2 EA
Recommended Torque Value	Steel band fixing hex. bolt		70 lbf·in
Working Tools	• Torque Wrench (20 - 90 lbf·in) • Torque Wrench Spanner Head (Hex. Head: 8 mm) • Spanner (Hex. Head: 8 mm)		

The standard of the pole on which the mount bracket can be attached using steel bands is 32A (42.7 mm/1.68 inch) - 100A (114.3 mm/4.5 inch).

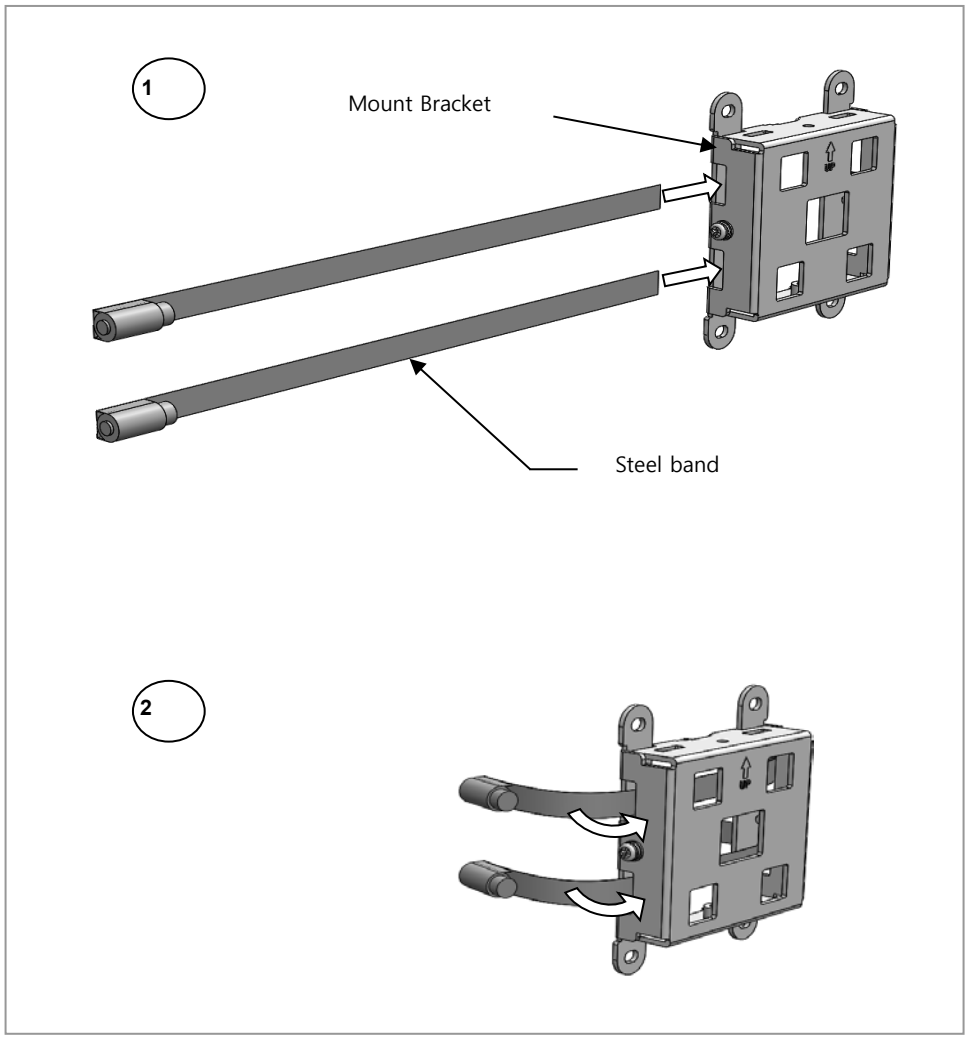
If installed on a pole smaller than 32A (42.7 mm), a small steel band suitable for the pole should be used.



To fix mount bracket (Pole Type), do the following:

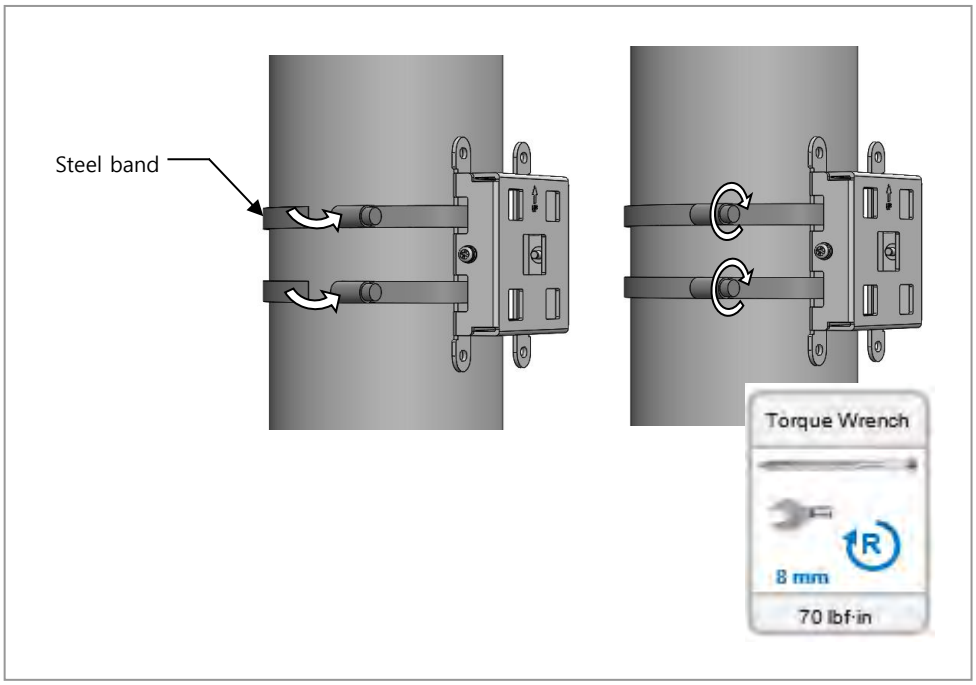
1 Pass the steel band through the fixing hole of the mount bracket.

Figure 22. Fixing Mount Bracket on the Pole (1)



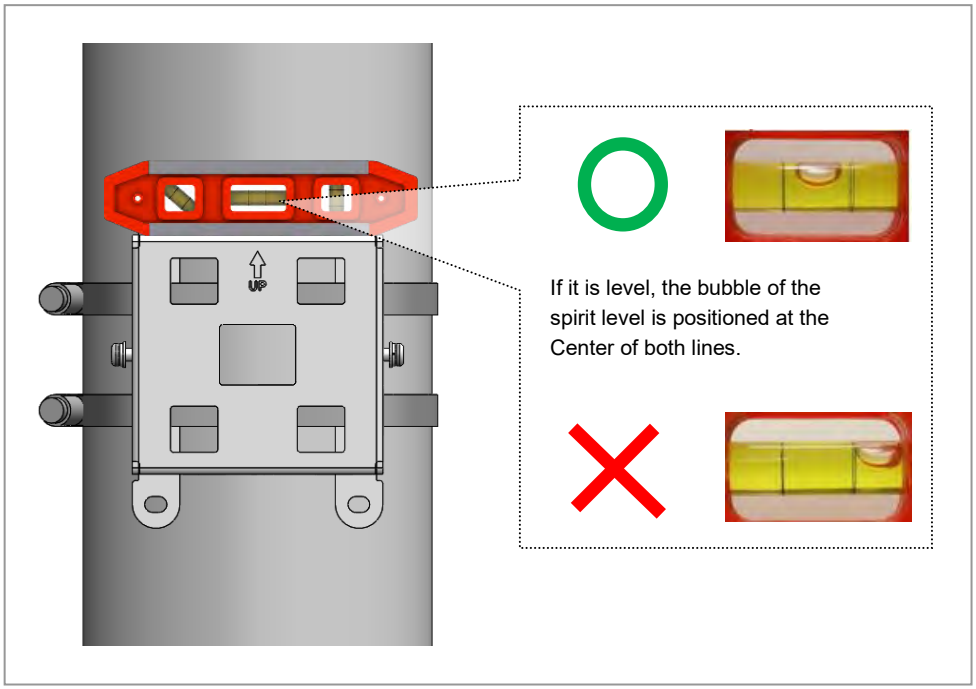
2 Fix the mount bracket to the pole using the steel band.

Figure 23. Fixing Mount Bracket on the Pole (2)



3 Check the level of mount bracket on the pole and adjust the level.

Figure 24. Fixing Mount Bracket on the Pole (3)



While fixing the mount bracket on the pole, ensure to check the level of bracket. After finishing the installation, adjust the level minutely.

In case of poor leveling, adjust the position of fasteners used to fix the mount bracket.

After fixing the steel band, push the remainder of band inside the mount bracket.

Fixing RU

This section describes the process to fix the Pole Type RU.

Prerequisites

Before proceeding with fixing Pole Type RU, ensure that you have equipment and items mentioned in the following table:

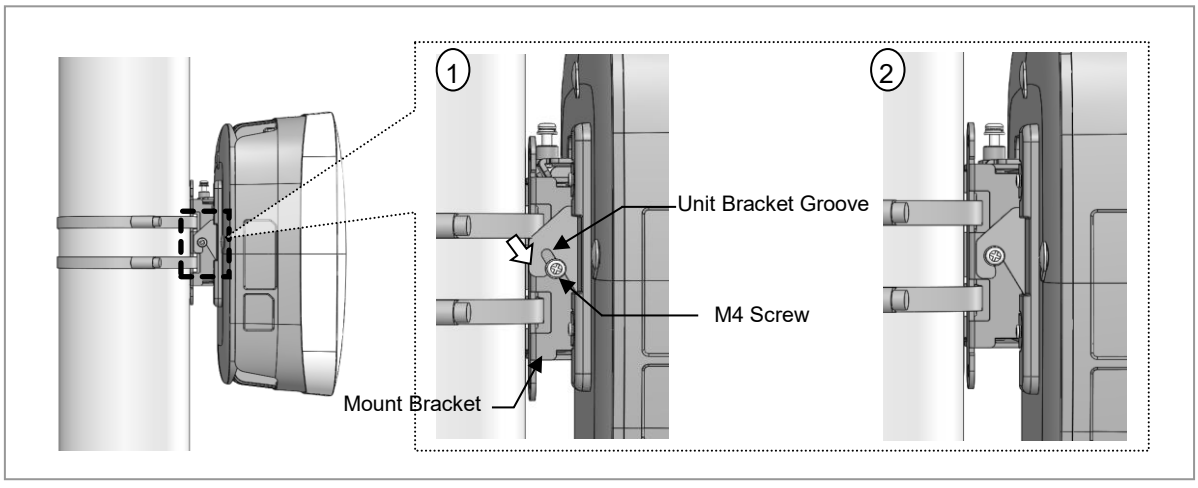
Table 12. Parts and Tools for fixing RU on the Pole Type

Category	Description	
Parts	M4 × L16 Screw (Attached to the bracket)	2 EA
Recommended Torque Value	M4 Screw	13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)	

To fix Pole Type RU, do the following:

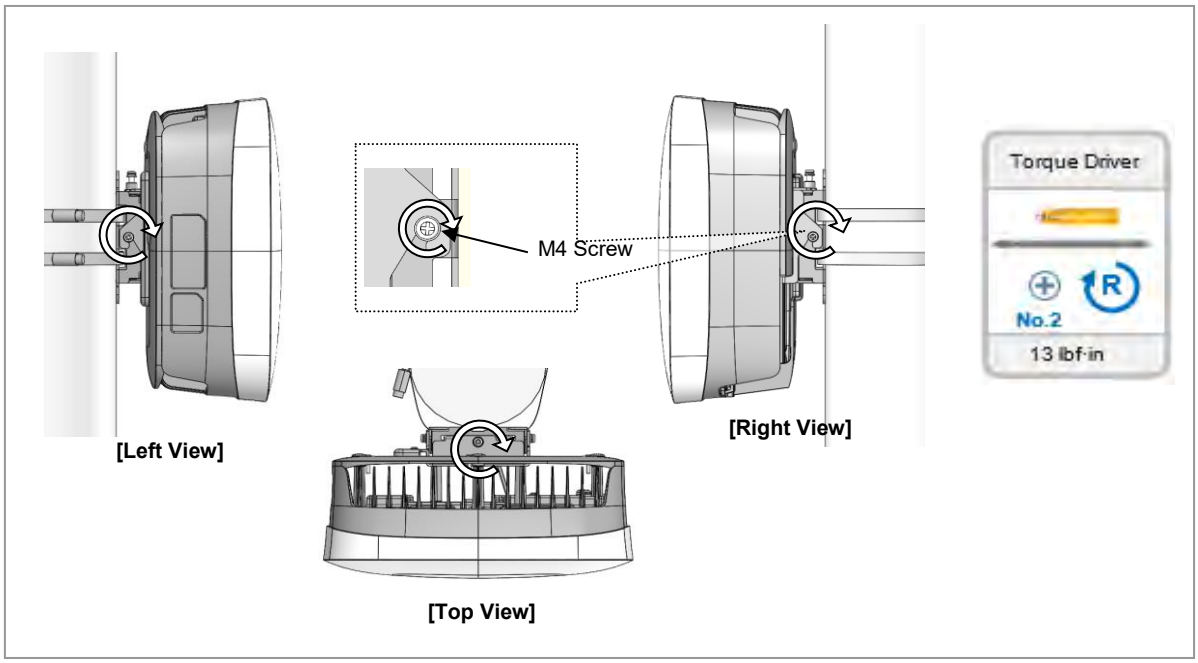
1 Place the unit bracket groove on the fasteners of the mount bracket.

Figure 25. Fixing RU_Pole Type (1)



2 Fix the three points of fasteners of the bracket.

Figure 26. Fixing RU_Pole Type (2)



Fixing RU-Tilted Mount

Fixing Cosmetic Cover Assembly

This section describes the process to fix the cosmetic cover.

Prerequisites

Before proceeding with fixing the cosmetic cover, ensure that you have equipment and items mentioned in the following table:

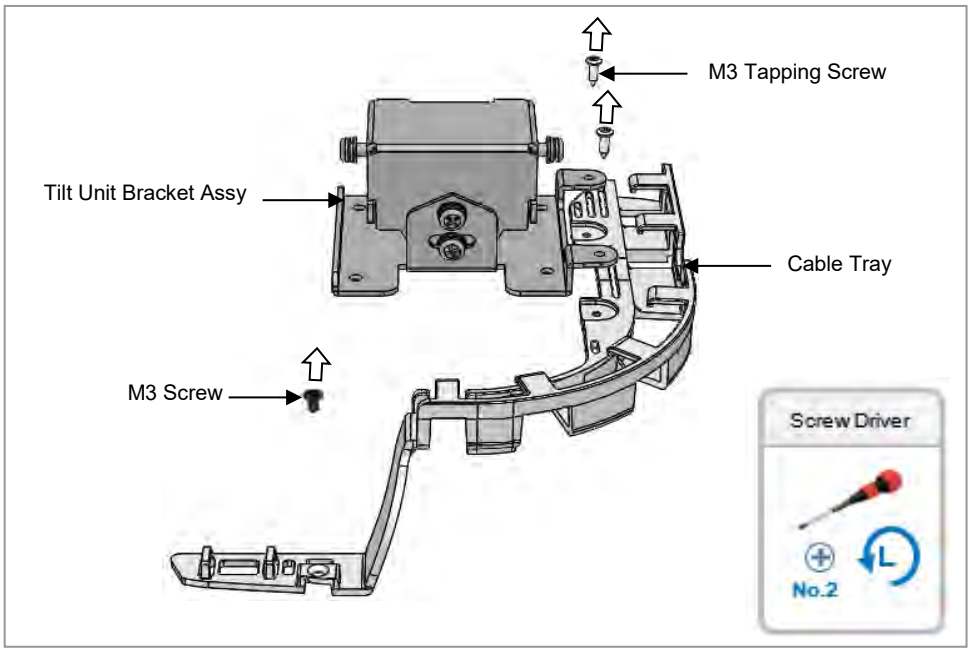
Table 13. Parts and Tools for Fixing Cosmetic Cover

Category	Description		
Parts	Cosmetic Cover		1 EA
	Fasteners	M3 × L8 Screw	3 EA
Recommended Torque Value	M3 Screw		5.6 lbf·in
	M4 Screw		13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)		

To fix Cosmetic Cover, do the following:

1 Remove the cable tray and unit bracket from the tilted unit bracket assembly.

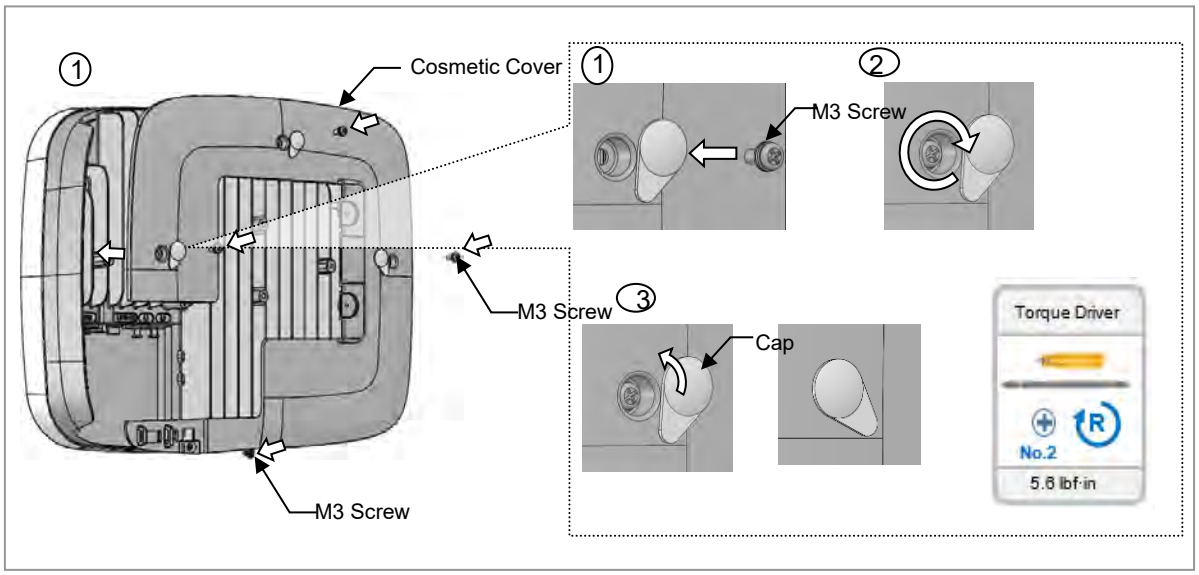
Figure 27. Tilted Mount - Cosmetic Cover Assembly (1)



The M3 screws should be reassembled. Be careful not to lose them.

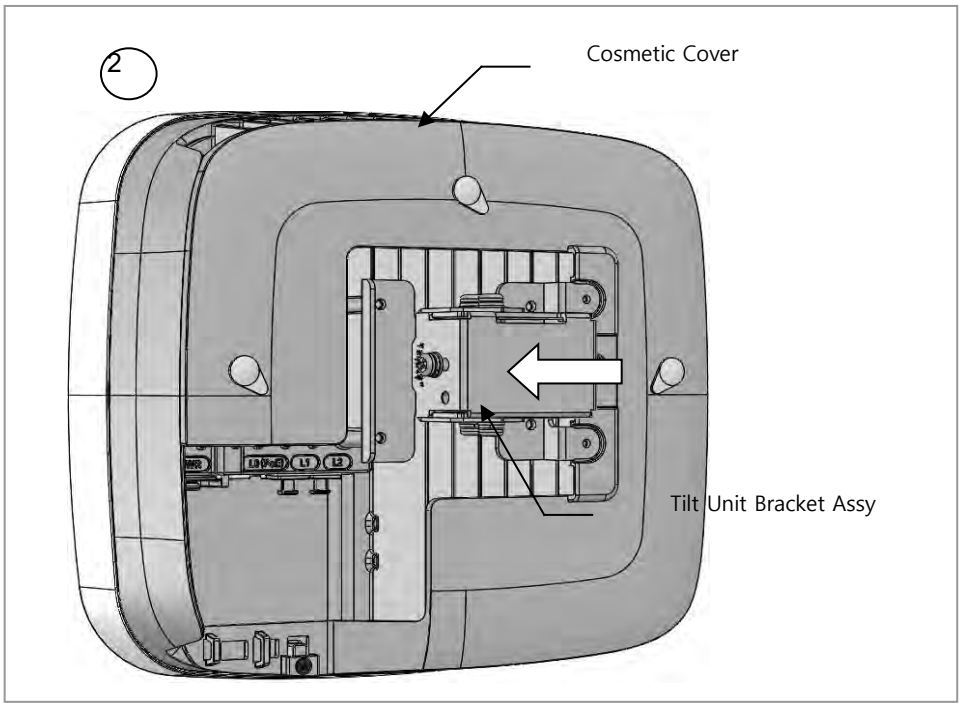
2 Fix the cosmetic cover using fasteners.

Figure 28. Tilted Mount - Cosmetic Cover Assembly (2)



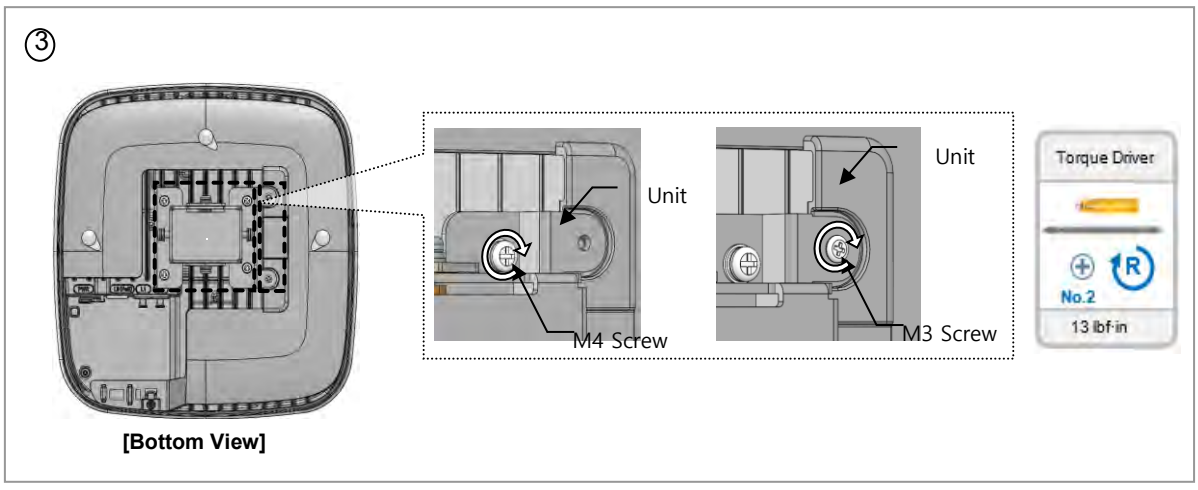
3 Place the unit bracket on the RU.

Figure 29. Tilted Mount - Cosmetic Cover Assembly (3)



4 Fix the unit bracket using fasteners.

Figure 30. Tilted Mount - Cosmetic Cover Assembly (4)



Fixing Mount Bracket

This section describes the process to fix the tilted mount bracket (Pole Type).

Prerequisites

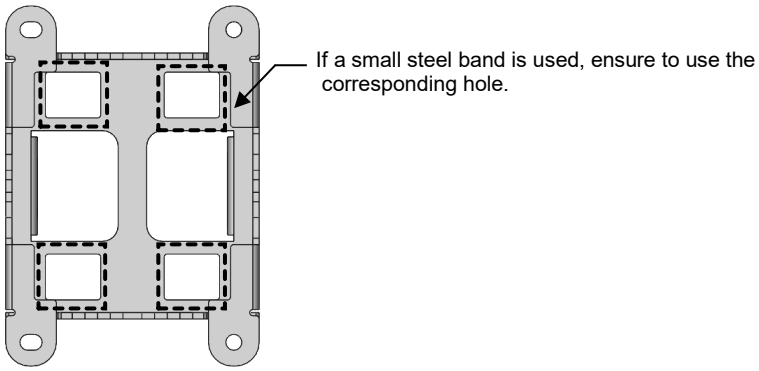
Before proceeding with fixing Pole Type tilted mount bracket, ensure that you have equipment and items mentioned in the following table:

Table 14. Parts and Tools for Fixing Mount Bracket on the Pole Type

Category	Description		
Parts	Tilted Mount Bracket		1 EA
	Fasteners	Steel band	2 EA
Recommended Torque Value	Steel band fixing hex. bolt		70 lbf·in
Working Tools	• Torque Wrench (20 - 90 lbf·in) • Torque Wrench Spanner Head (Hex. Head: 8 mm) • Spanner (Hex. Head: 8 mm)		

The standard of the pole on which the mount bracket can be attached using steel bands is 32A (42.7 mm/1.68 inch) - 100A (114.3 mm/4.5 inch).

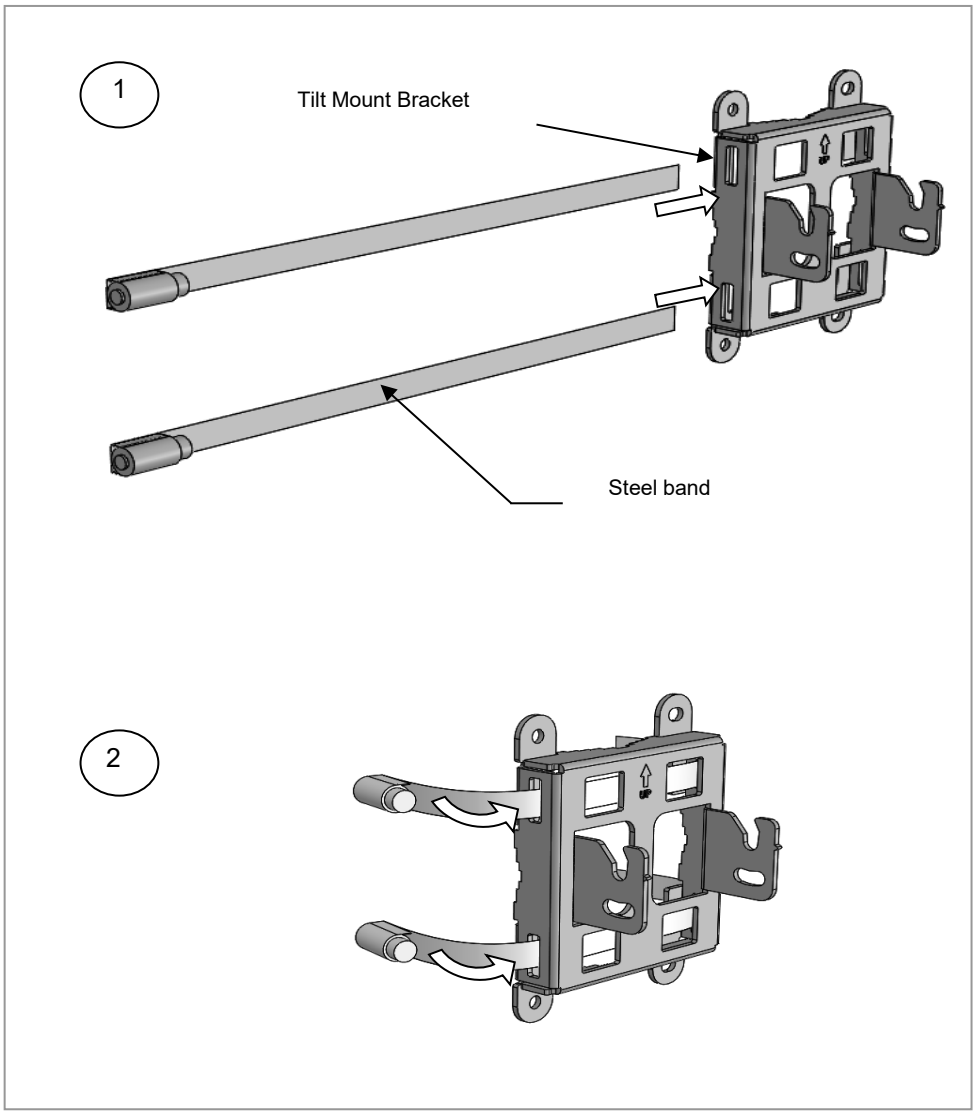
If installed in a pole smaller than 32A (42.7 mm), a small steel band suitable for the pole should be used.



To fix tilted mount bracket (Pole Type), do the following:

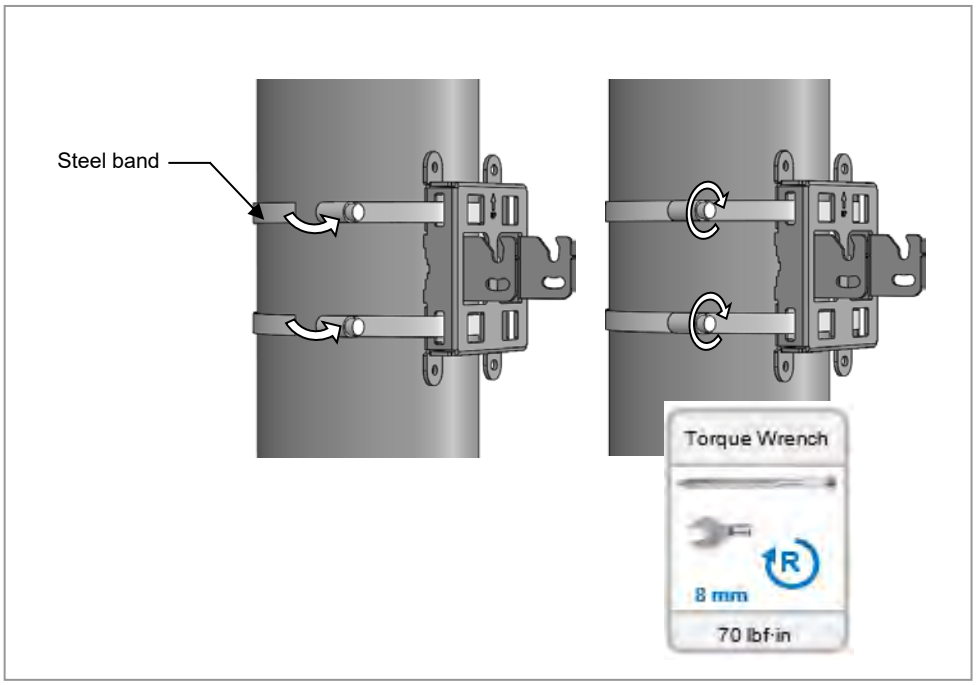
1 Pass the steel band through the fixing hole of the tilted mount bracket.

Figure 31. Fixing Mount Bracket on the Pole (1)



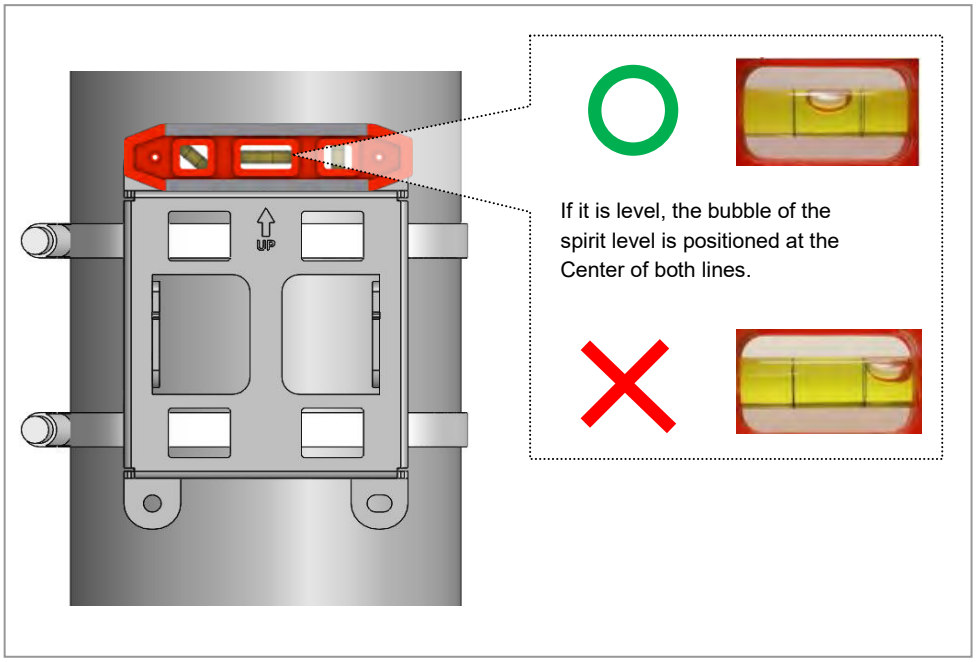
2 Fix the tilted mount bracket to the pole using the steel band.

Figure 32. Fixing Mount Bracket on the Pole (2)



3 Check the level of mount bracket on the pole and adjust the level.

Figure 33. Fixing Mount Bracket on the Pole (3)



While fixing the mount bracket on the pole, be sure to check the level of bracket. After finishing the installation, adjust the level minutely.

In case of poor leveling, adjust the position of fasteners used to fix the mount bracket.

After fixing the steel band, push the remainder of band inside the mount bracket.

Fixing RU

This section describes the process to fix the Pole Type RU.

Prerequisites

Before proceeding with fixing Pole Type RU, ensure that you have equipment and items mentioned in the following table:

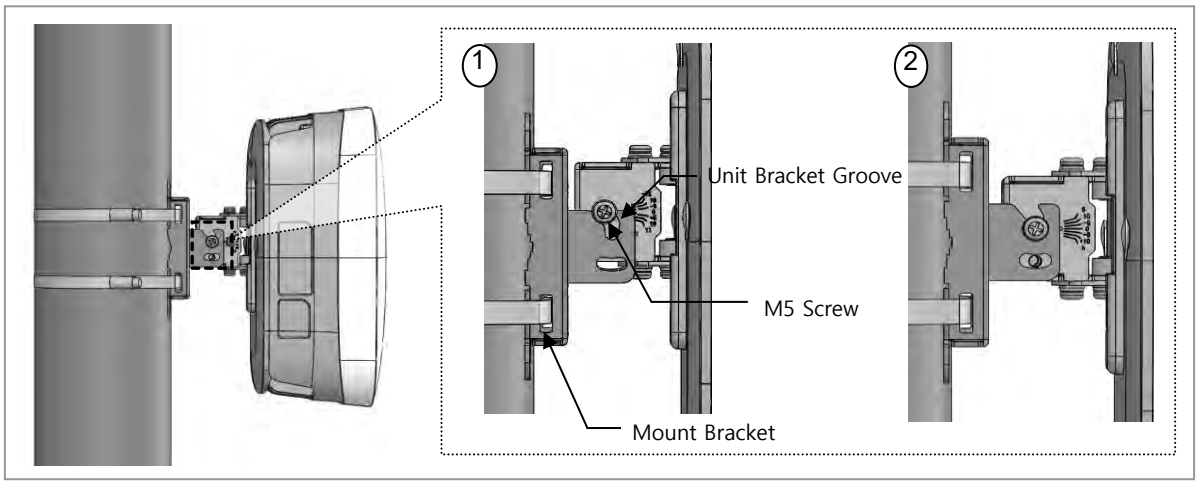
Table 15. Parts and Tools for fixing RU on the Pole Type

Category	Description	
Parts	M5 × L14 Screw (Attached to the bracket)	8 EA
Recommended Torque Value	M5 Screw	13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)	

To fix Pole Type RU, do the following:

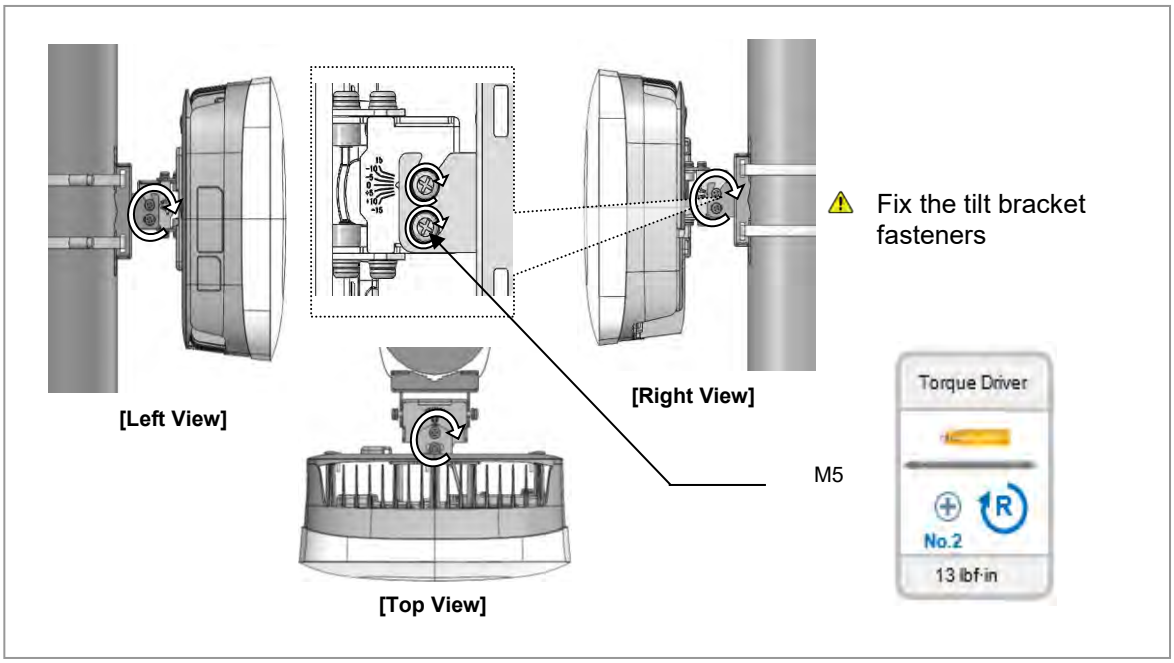
1 Place the unit bracket groove on the fasteners of the mount bracket.

Figure 34. Fixing RU_Pole Type (1)



2 Fix the three points of fasteners of the bracket.

Figure 35. Fixing RU_Pole Type (2)



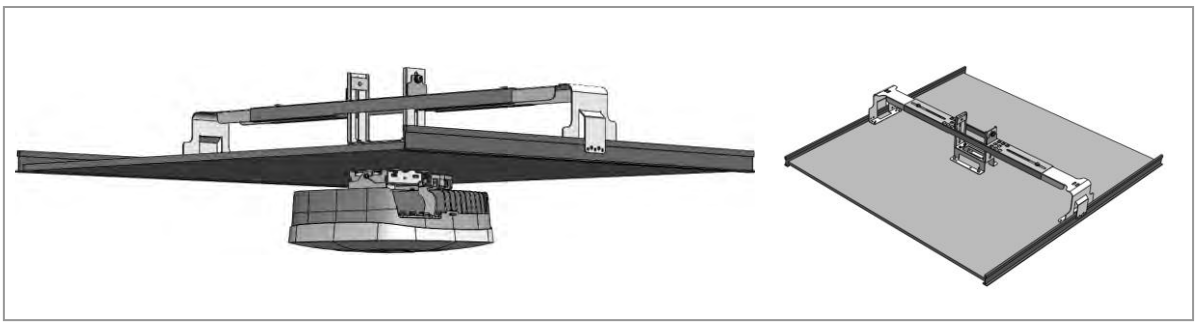
Fixing Ceiling Tile Type

This section describes the procedures for a ceiling tile installation.

There are two ways to install the RU on a ceiling tile, one using a fixed bracket and one using a tilted bracket.

The follow figure depicts the installations of the RU on the ceiling tile:

Figure 36. Installing RU on Ceiling Tile



Drilling for Ceiling Tile

This section provides information about drilling and anchoring for fixing the RF2217d-D1A.

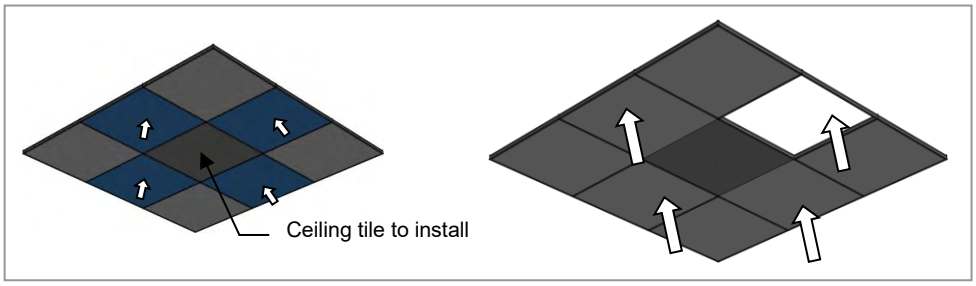
Prerequisites

Before proceeding with the drilling and anchoring process, ensure that you have equipment and items mentioned in the following table:

Before installing the RU, do the following:

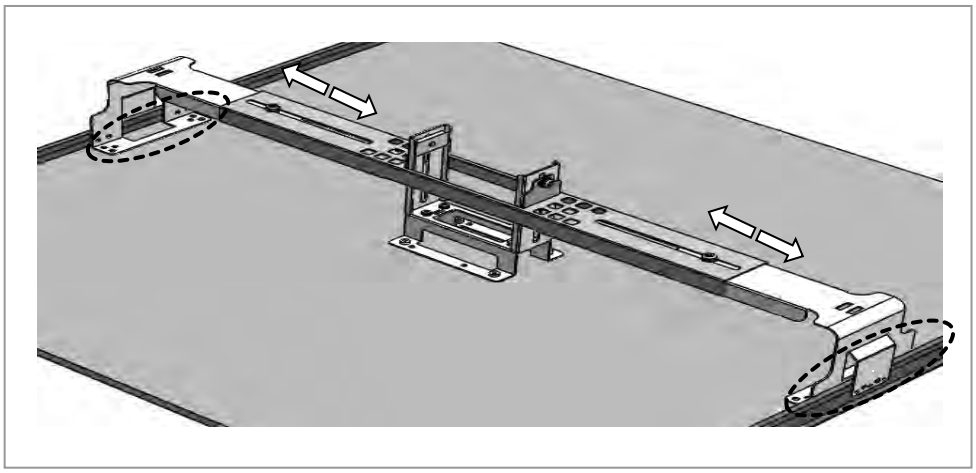
1 Open one of the four surrounding locations. Open at least one place.

Figure 37. Ceiling



2 Put the Ceiling Mount Kit on the tile and adjust it. (600 mm - 765mm (24” - 30”) ceiling tile with T(M) Bar)

Figure 38. Ceiling Mount Kit



3 Drill anchor holes at marked points.

Figure 39. Drilling anchor holes

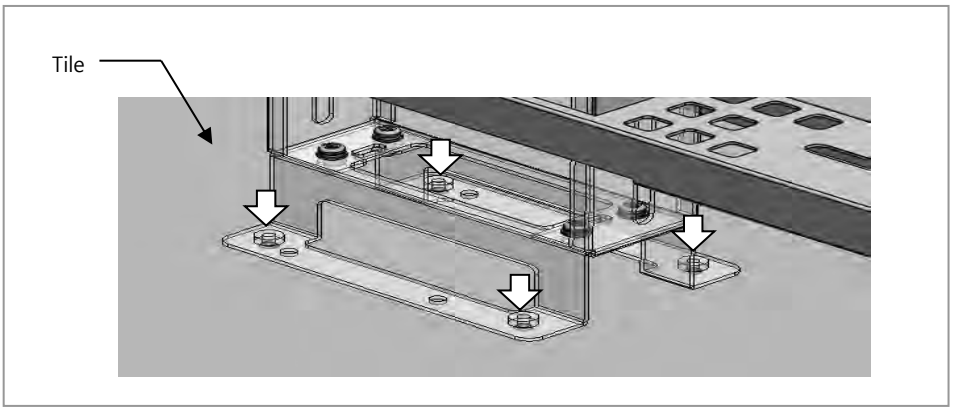
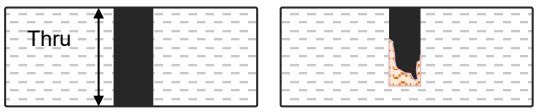


Table 16. Anchor Bolt Drill Bits and Hole Depth

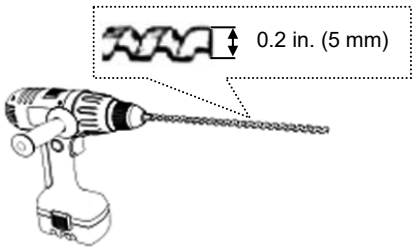
Category	Anchor Bolt	Drill Bits	Hole Depth
System (Ceiling Tile)	M4	0.2 in. (5 mm)	Thru

[Anchor Hole Cross Section]

[O] **[X]**



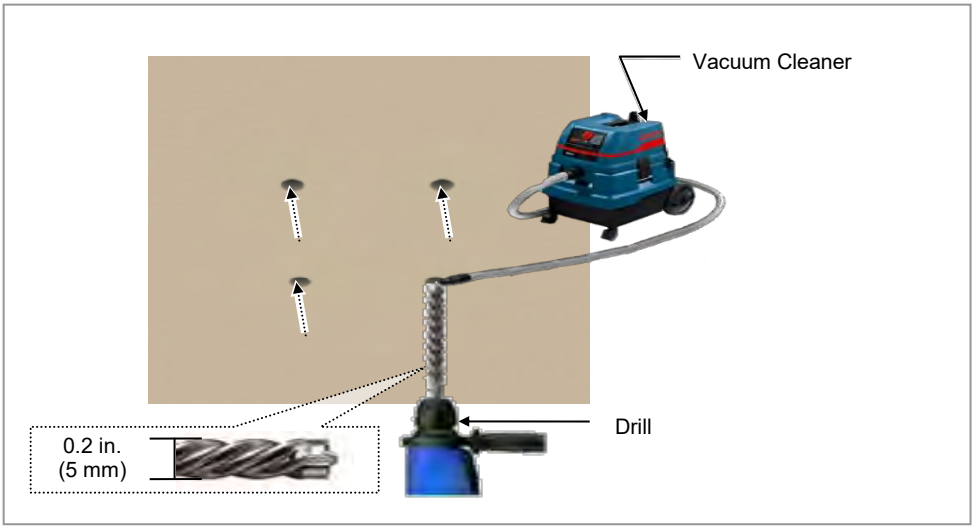
* Remove the debris from the drilled hole.



To drill an anchor hole, do the following:

Drill anchor holes at marked points. Also, remove dust from the holes using a cleaner. Fix plastic anchor to the drilled hole.

Figure 40. Drilling Example



Fixing Mount Bracket

This section describes the process to the fix mount bracket for ceiling tile.

Prerequisites

Before proceeding with fixing the mount bracket, ensure that you have equipment and items mentioned in the following table:

Table 17. Parts and Tools for Fixing Mount Bracket on the Wall & Ceiling

Category	Description		
Parts	Mount Bracket		1 EA
	Fastener	M4 × L30	4 EA
Recommended Torque Value	M4 Screw		13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)		

To fix mount bracket _ Ceiling Tile, do the following:

Place the mount bracket along with the fixed plastic anchors and fix it using fasteners.

Figure 41. Fixing Ceiling Mount Kit Assembly

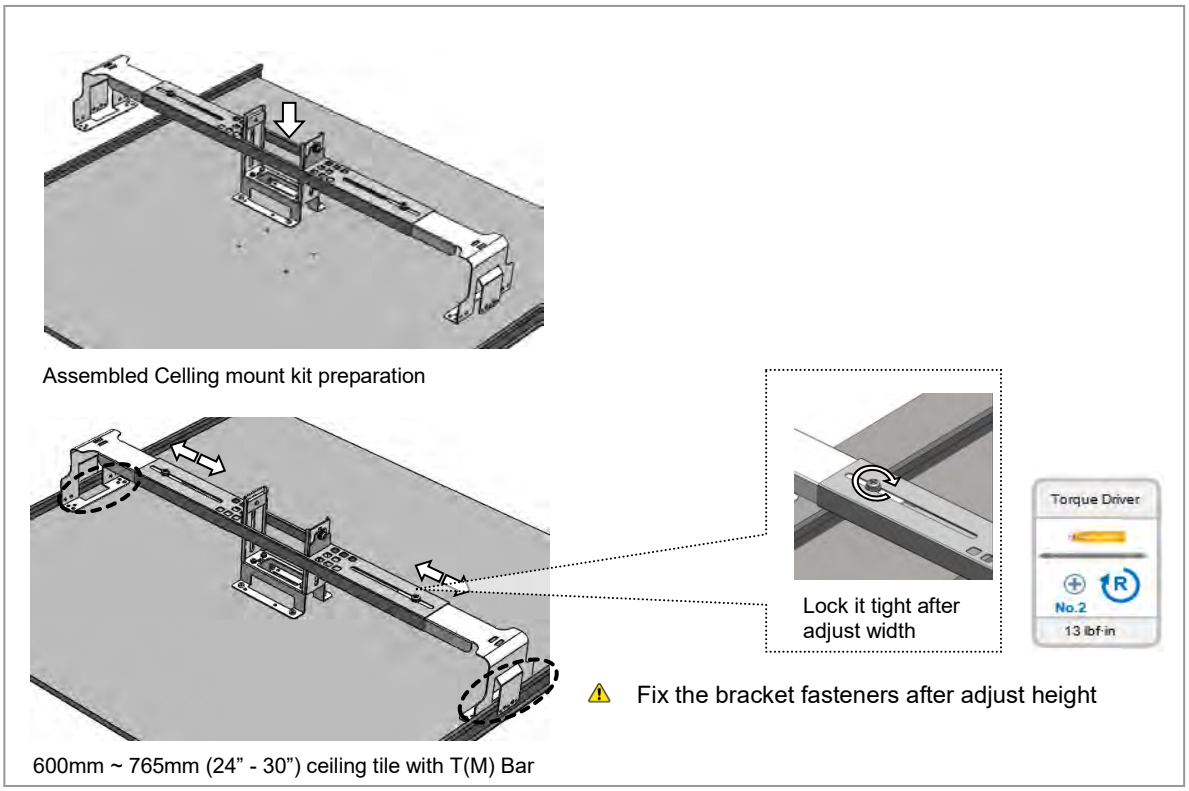


Figure 42. Fixing Fixed Ceiling Mount Bracket Assembly

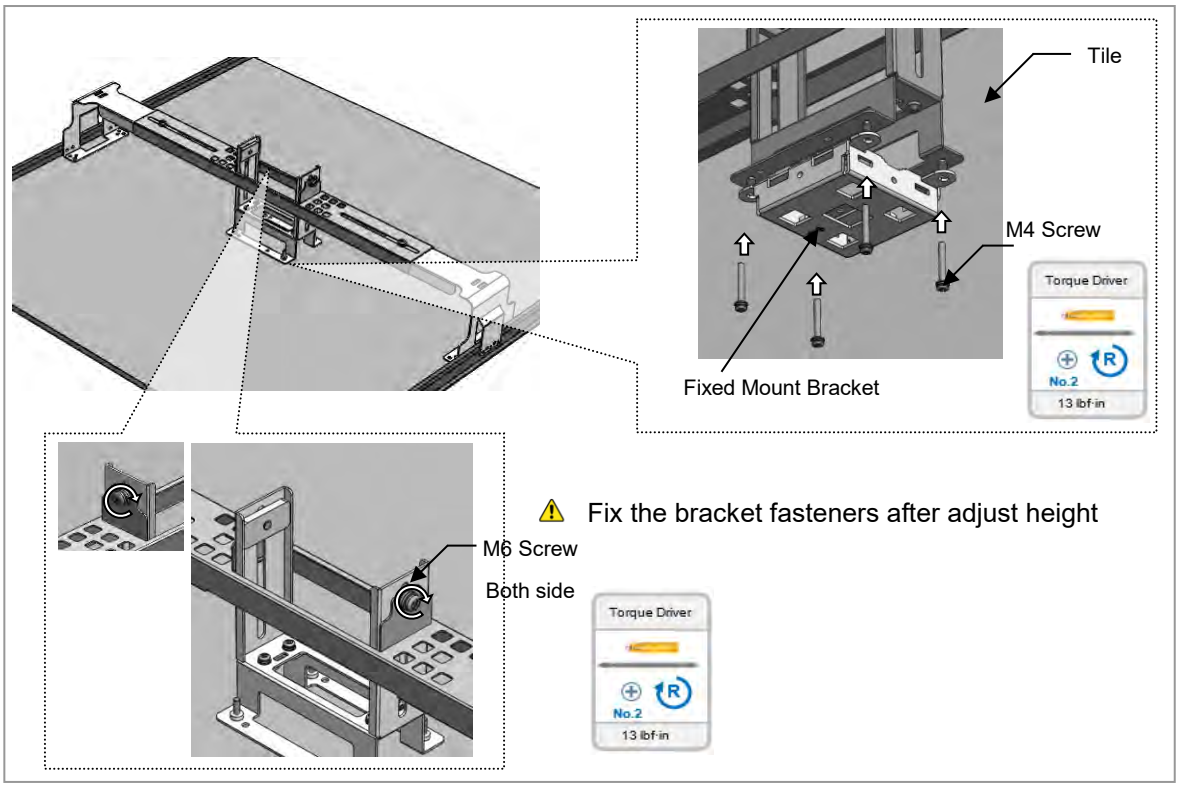
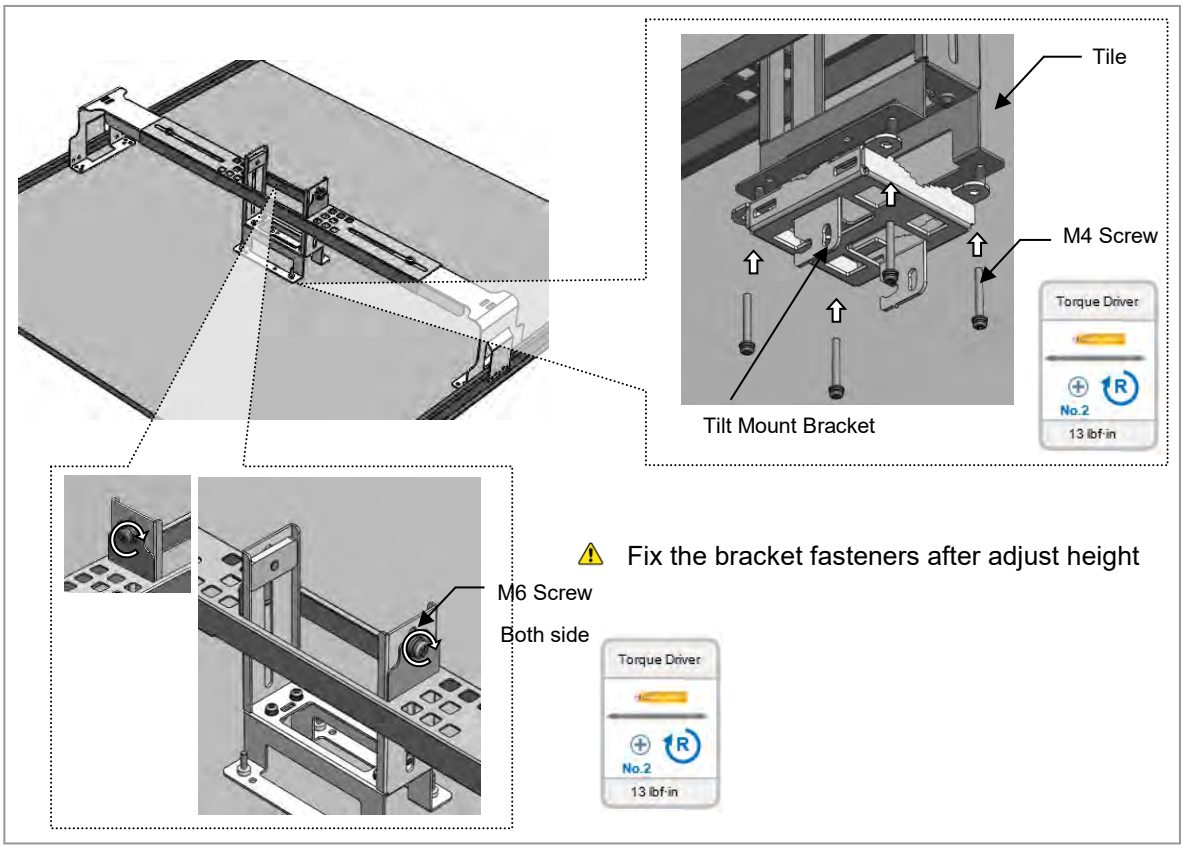


Figure 43. Fixing Tilted Ceiling Mount Bracket Assembly



Fixing RU

This section describes the process to fix the RU on the ceiling tile.

Prerequisites

Before proceeding with fixing the RU, ensure that you have equipment and items mentioned in the following table:

Table 18. Parts and Tools for Fixing RU on the Ceiling Tile

Category	Description	
Parts	M4 × L16 Screw (Attached to the bracket)	2 EA
Recommended Torque Value	M4 Screw	13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)	

To fix the RU, do the following:

1. Place the unit bracket groove on the fasteners of the mount bracket.
2. Fix the points of fasteners of the bracket.

Figure 44. Fixing RU_Ceiling - Fixed Mount Kit

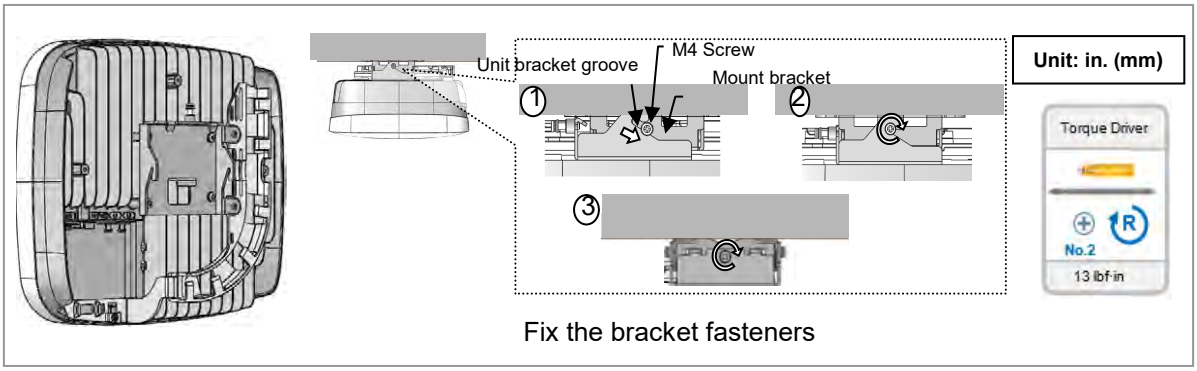
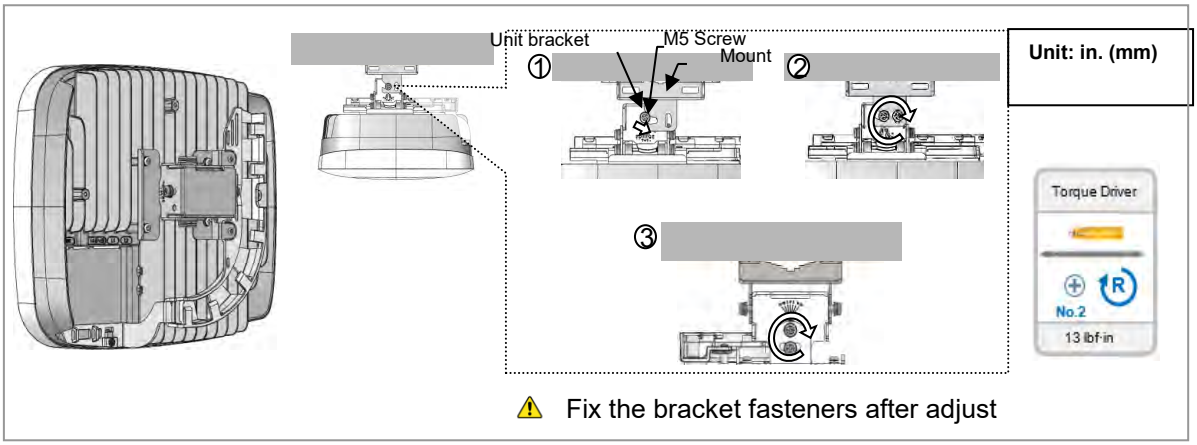


Figure 45. Fixing RU_Ceiling - Tilt Mount Kit



Fixing Ceiling Mount Kit Assembly to Building Structure

This section describes the process to fix the ceiling mount kit assembly to the building structure.

Prerequisites

Before proceeding with fixing the ceiling mount kit assembly, ensure that you have equipment and items mentioned in the following table:

Table 19. Parts and Tools for Fixing Fixing Ceiling Mount Kit Assembly to Building Structure

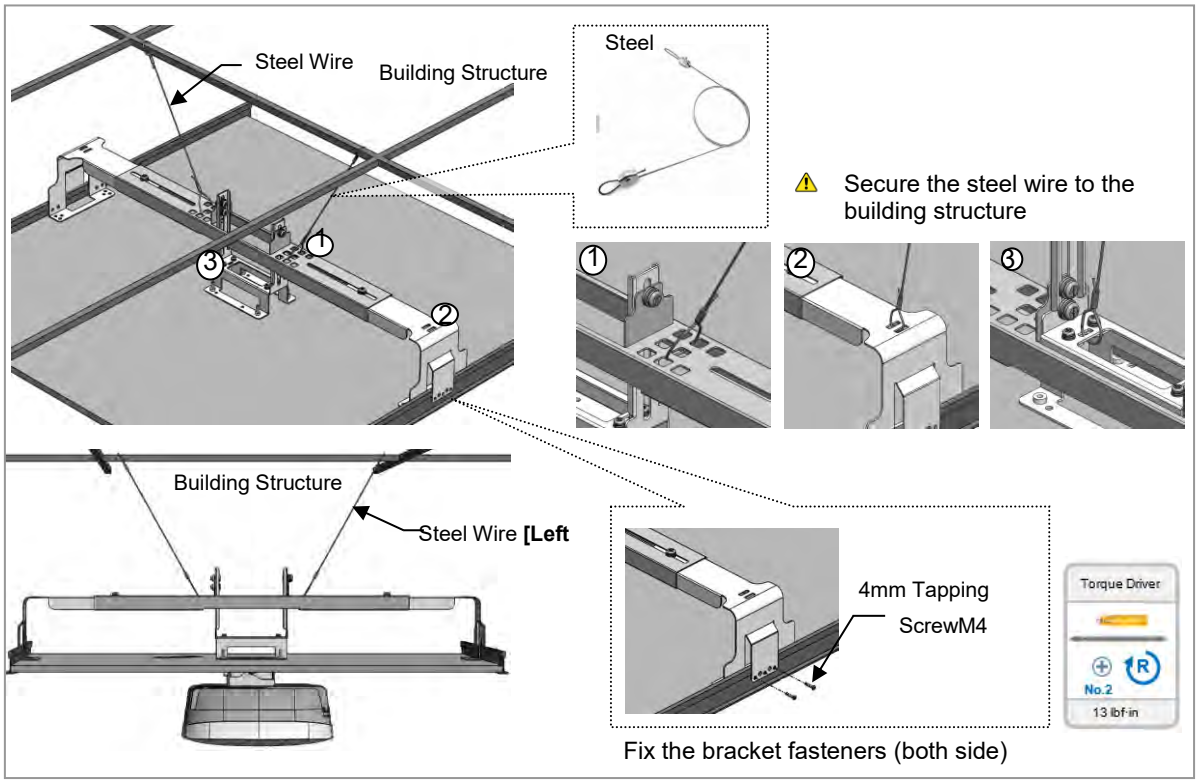
Category	Description	
Parts	M4 × L15 (Taptite Screw)	4 EA
Recommended Torque Value	M4 Taptite Screw	13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)	

To fix the Ceiling Mount Kit Assembly, do the following:

1 Place the unit bracket groove on the fasteners of the mount bracket.

2 Fix the points of fasteners of the bracket.

Figure 46. Fixing Ceiling Mount Kit Assembly to Building Structure

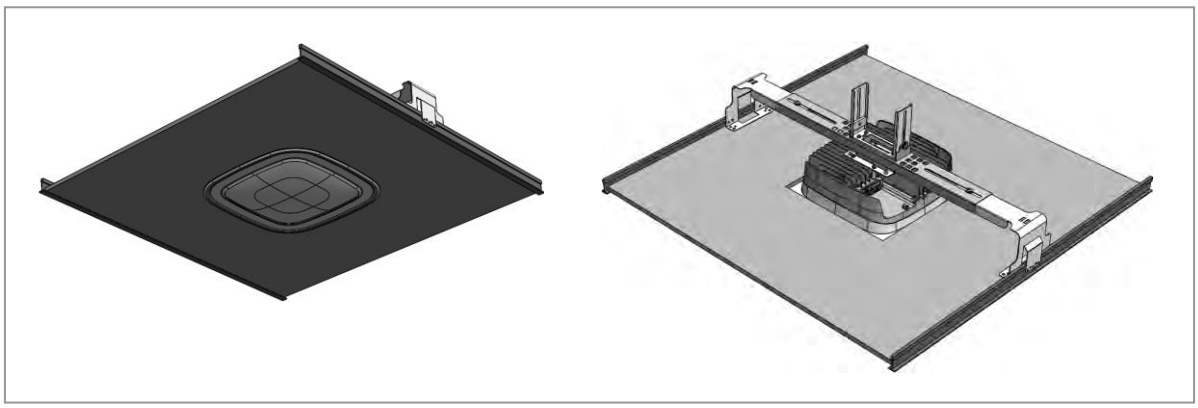


Fixing Suspended Ceiling Tile Type

This section describes the procedures for a suspended ceiling tile installation.

The follow figure depicts installing a suspended RU on ceiling tile:

Figure 47. Installing Suspended RU on Ceiling Tile



Cutting Ceiling Tile

This section describes the procedure for cutting the ceiling tile.

Prerequisites

Before proceeding with the cutting process, ensure that you have equipment and items mentioned in the following table:

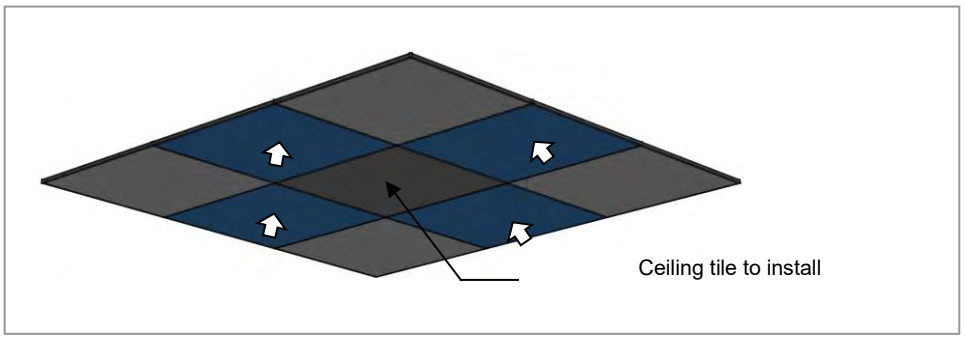
Table 20. Parts and Tools for Cutting

Category	Description
Parts	Ceiling Tile
Working Tools	• Work saw or Knife

Before cutting the ceiling, do the following:

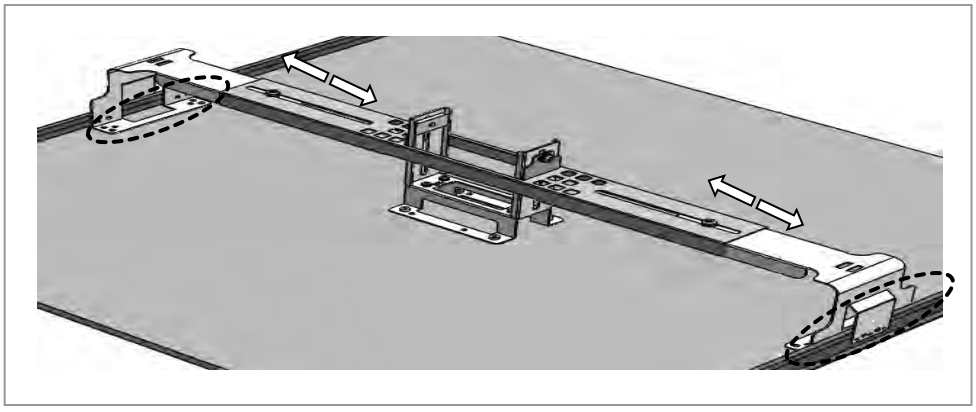
1 Open one of the four surrounding locations.

Figure 48. Ceiling



2 Put the Ceiling Mount Kit on the tile and adjust it. (600mm ~ 765mm (24” - 30”) ceiling tile with T(M) Bar)

Figure 49. Ceiling Mount Kit



3 Align unit bracket suspended with the picture in the drilling template. Cut the ceiling tile the same as the cutting line of the drilling template.

Figure 50. Cutting the Ceiling Tile (1)

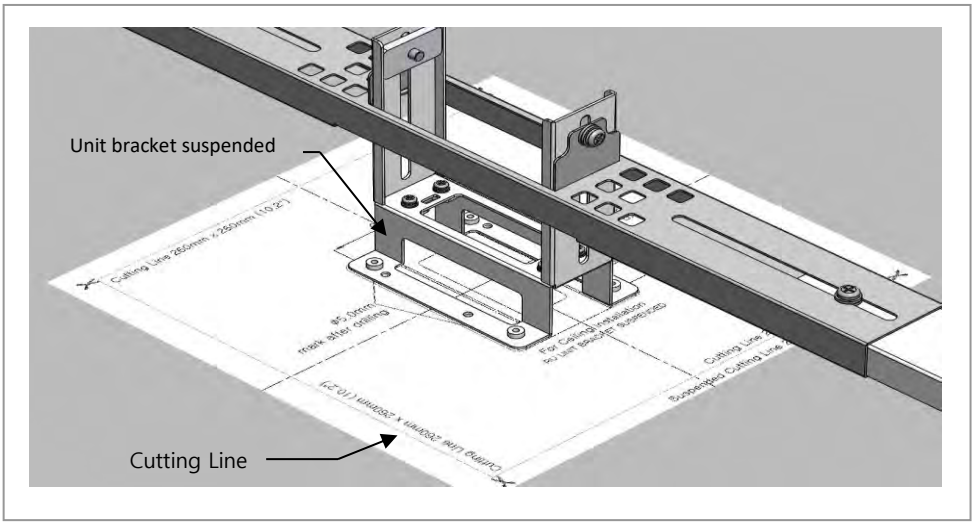
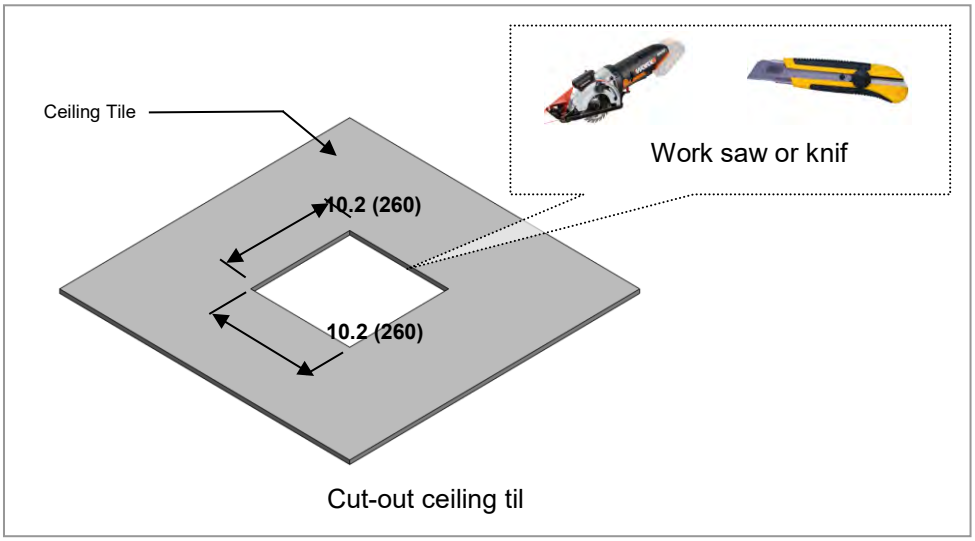


Figure 51. Cutting the Ceiling Tile (2)



Fixing Cosmetic Cover for Ceiling Tile

This section describes the process to fix cosmetic cover for ceiling tile.

Prerequisites

Before proceeding with fixing the cosmetic cover, ensure that you have equipment and items mentioned in the following table:

Table 21. Parts and Tools for Fixing Cosmetic Cover

Category	Description		
Parts	Cosmetic Cover, Cosmetic Cover Bracket		Parts
	Fasteners	M10 Nut	Fasteners
Recommended Torque Value	Do not use tools		Recommended Torque Value
Working Tools	• Do not use tools		

To fix Cosmetic Cover, do the following:

Figure 52. Ceiling Tile thickness less than 20mm

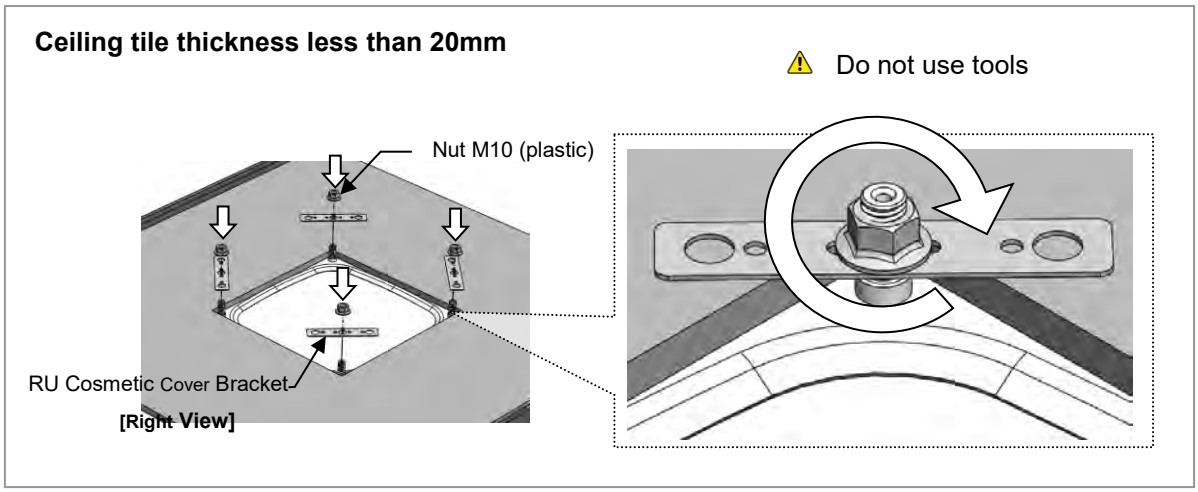
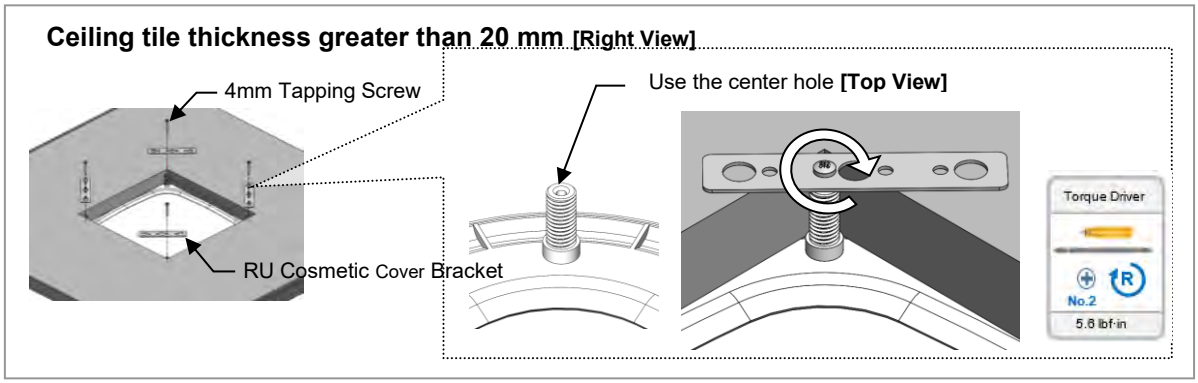


Figure 53. Ceiling Tile thickness greater than 20mm



Fixing RU

This section describes the process to fix the RU on the ceiling tile with cosmetic cover.

Prerequisites

Before proceeding with fixing the RU, ensure that you have equipment and items mentioned in the following table:

Table 22. Parts and Tools for Fixing RU on the Ceiling Tile

Category	Description	
Parts	M4 × L10 Screw	4 EA
Recommended Torque Value	M4 Screw	13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)	

The following figure depicts the process to fix the RU:

Figure 54. Installing Above Ceiling Kit on the RU

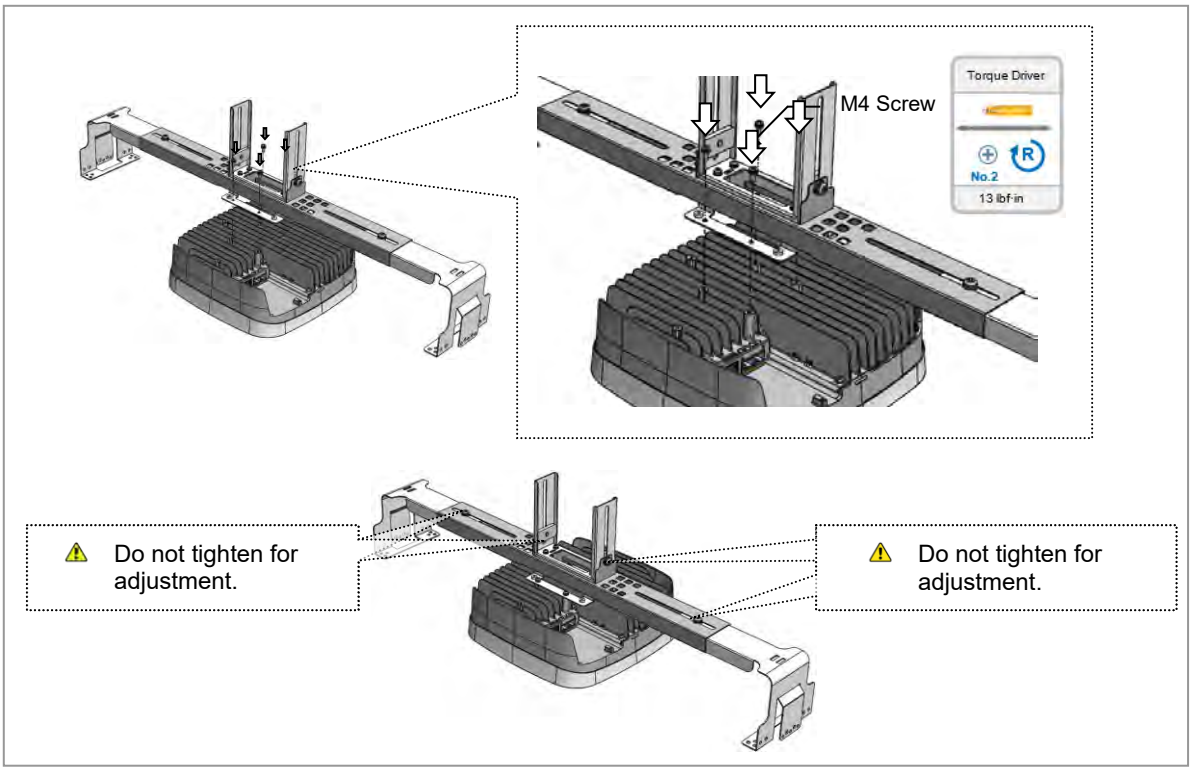
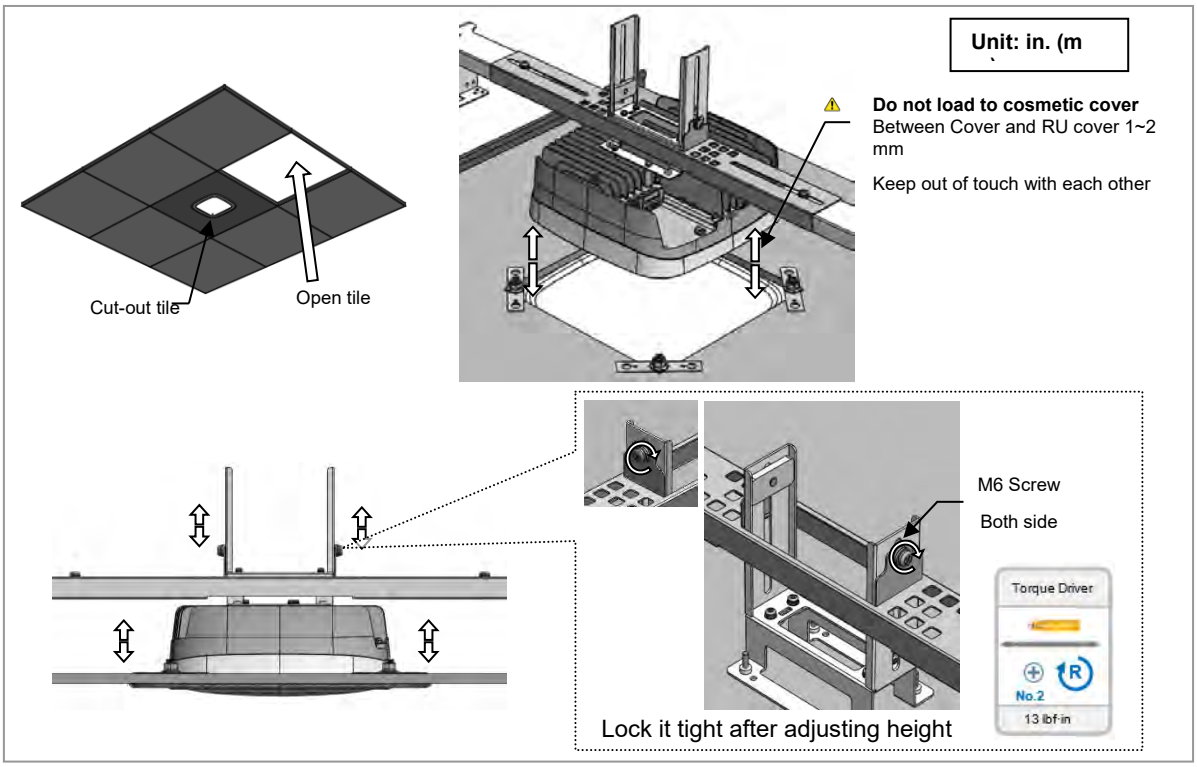


Figure 55. Installing the RU height adjustment



Fixing Ceiling Mount Kit Assembly to Building Structure

This section describes the process to fix the ceiling mount kit assembly to the building structure.

Prerequisites

Before proceeding with fixing the ceiling mount kit assembly, ensure that you have equipment and items mentioned in the following table:

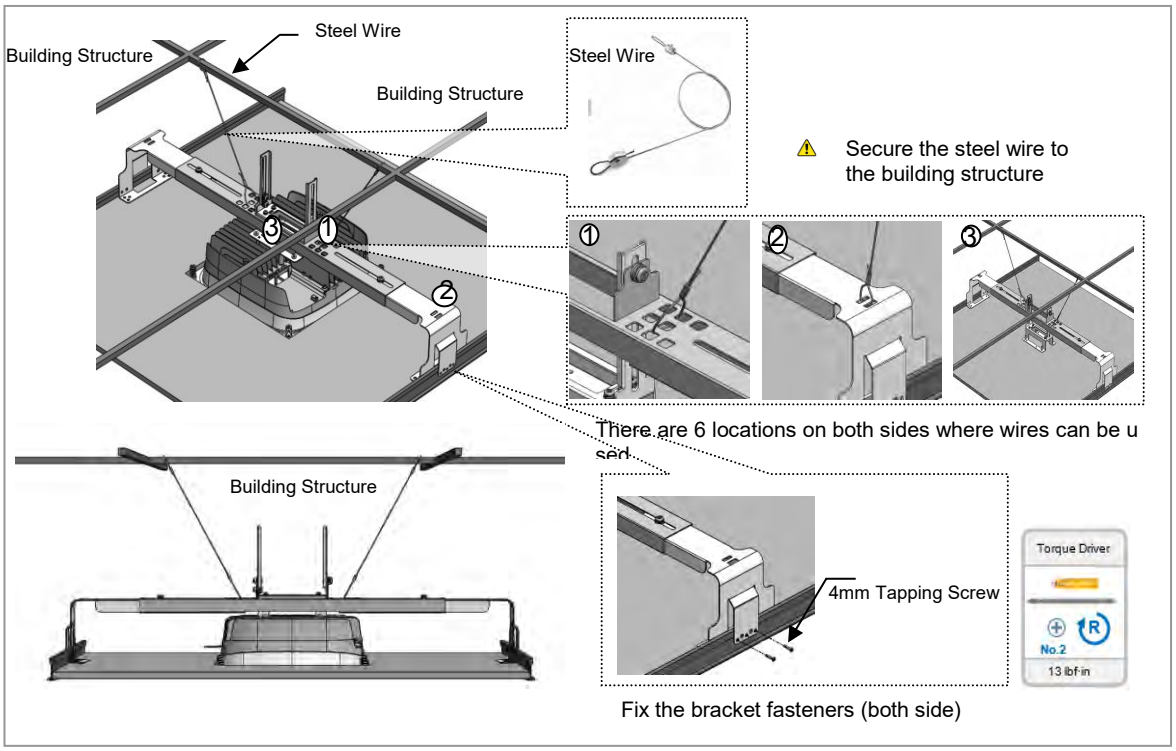
Table 23. Parts and Tools for Fixing Ceiling Mount Kit Assembly to Building Structure

Category	Description	
Parts	M4 × L15 (Taptite Screw)	4 EA
Recommended Torque Value	M4 Screw	13 lbf·in
Working Tools	• Torque Driver (6 - 22 lbf·in) • Screw Driver Bit ('+', No. 2) • Screw Driver ('+', No. 2)	

To fix the Ceiling Mount Kit Assembly, do the following:

1 Fix both sides of the bracket fasteners.

Figure 56. Fixing Ceiling Mount Kit Assembly to Building Structure



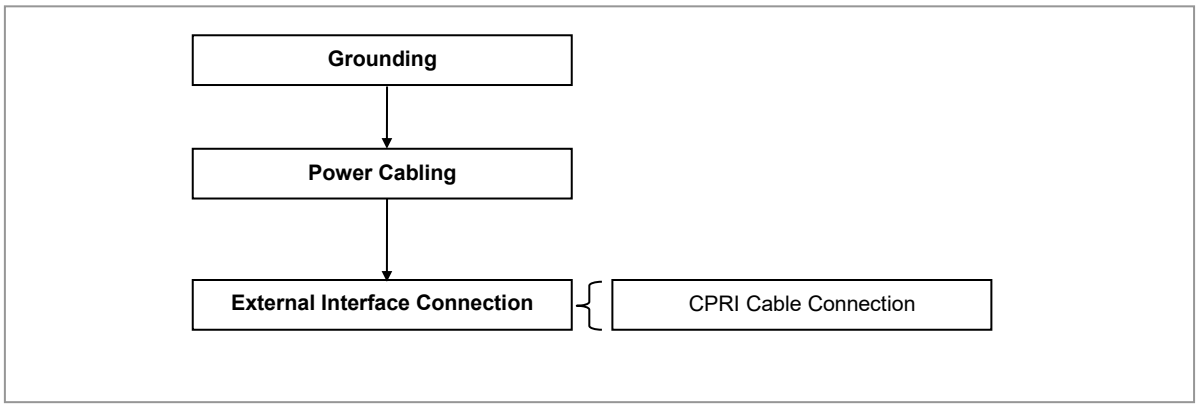
Chapter 4 Connecting Cables

This chapter describes the procedures to label and connect the cables to the RU

Cabling Procedure

The following figure depicts procedure to connect the system cables.

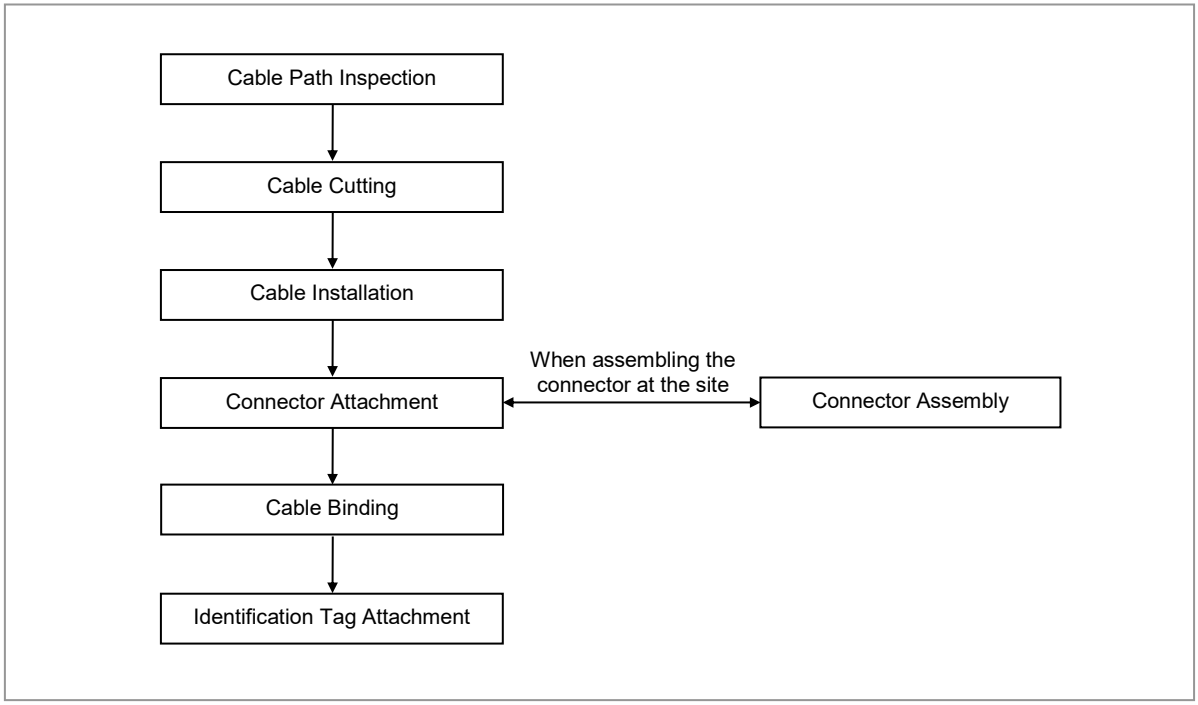
Figure 57. Procedure to Connect System Cable



Guidelines for Cable Connections

The following figure depicts the guidelines for connecting cables to the system.

Figure 58. Cable Connection Procedure



When cutting the cable after installation, ensure that the connector is disconnected. The cable installation while the connector is connected to the system can cause contact failure or damage to the assembled connector and the cable due to cable tension or the mistakes of the workers.

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

While installing a cable that interconnects the rectifier, Main Ground Bar (MGB), and fronthaul device within the system, the cable path, the length, and the cable installation method must be inspected.

To inspect the cable path, ensure the following:

- A minimum cable length must be selected, so 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, such as power line, flooding, and footpaths.
- In the areas where the cable may be damaged by external factors, ensure that measures are taken to prevent damage to the cable, such as cable tray, ducts, and flexible pipe.

Cable Cutting

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

To cut the cable, ensure the following:

- Cut the cable to the length mentioned in the *Cable Path Inspection* step.
- Use a cable cutting tool specific to the cable.
- 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

This process involves laying the cable along the cabling path to the target connector of the system or an auxiliary device. This is done after the cable path inspection and the cable cutting are completed.

To install the cable, ensure the following:

- Be careful not to damage the cable.
- If the cable is damaged, cut out the damaged section before installing or replace the cable.
- Lay the cable so that it is not tangled. Pay attention when installing a cable from a horizontal section to a vertical section to ensure not to reverse the upper and lower lines of the cable.
- Always use the maximum curvature radius possible with the minimum curvature radius specification.
- If the cabling is required to be protected, use a PVC channel, spiral sleeve, flexible conduit, or cable tray.
- Install the DC power cable and the data transmission cable away from the AC power cable to prevent electromagnetic induction.
- Use precaution when removing cables located by heatsink and wear protective gloves.
- The RF should be turned off while maintenance and wait for TBD minutes before touching the unit. This is to further reduce any surface temperature

hazard to personnel when performing maintenance.

The following table outlines the recommended minimum allowed cable bend radius of different types of cables.

Table 24. Recommended Minimum Allowed Cable Bending Radius

No	Type	Allowed Cable Bend Radius	
1	Power Cable	Installed: 8 × OD	During Installation: 12 × OD
2	Optical Cable	Installed:10 × OD	During Installation: 20 × OD

If the manufacturer specifies the allowed cable bending radius, comply with the specified bending radius.
※ OD: Outer Diameter

Connector Attachment

This process involves assembling a connector to an installed cable or to a device on the site.

To attach the connector, ensure the following:

- Ensure that the operator is fully aware of the connector assembly method before assembling the 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 the connector to another connector.
- Use a heat shrink tube at the connector connection for cables that are installed outdoor, such as feeder lines. It prevents water leakage and corrosion of the part exposed to the outer environment.
- Connect each cable of the connector assembly in a straight line.
- Be careful while connecting the cable to prevent from contact failure at the connector connection due to tension.

Cable Binding

Cable binding involves fixing and arranging an installed cable using binding thread, cable ties, binding wire, ram clamps, or other binding material.

To bend the cable, ensure the following:

- Be careful not to damage the cable during binding.
- Use appropriate cable binding tools according to the target location (indoor or outdoor, and so on) and the type of the cable (power supply cable, optical cable, feeder line, and so on).
- Do not route the cable tie, or binding line in such a manner that the cut-end (trimmed end) of the cable tie or binding line is exposed to the outside. This can cause damage to cables or personal injury. Ensure that the cut end of cable

ties and binding lines are positioned to the inside.

- Always trim the excess cable thread in a manner leaving about 50 mm extra length to prevent the knot from easily becoming untied.
- Bind the cable at the closest location to the connector to prevent failure due to excessive tension.

Identification Tag Attachment

The Identification Tag Attachment procedure consists of attaching a marker cable tie, nameplate, and label to both ends of the cable (connections to a connector) identifying its use and cabling path.

While attaching the identification tag, ensure the following:

- When installing an outdoor cable, use relief engraving and coated labels to prevent markings from being erased.
- Required format and attachment methods for identification tags may vary for each provider. The provider must be consulted with before attaching the tags.

When connecting the cables, always connect the ground cable first. If worker comes in contact with the equipment, connects a cable, or performs maintenance without connecting the ground cable, the system can be damaged or a worker can be injured due to static electricity and short circuit.

When performing the cabling tasks on the system, start with establishing the ground cable installation, before any other cabling tasks to avoid static electricity or other related issues from occurring.

After completing cable installation, unused ports should be capped.

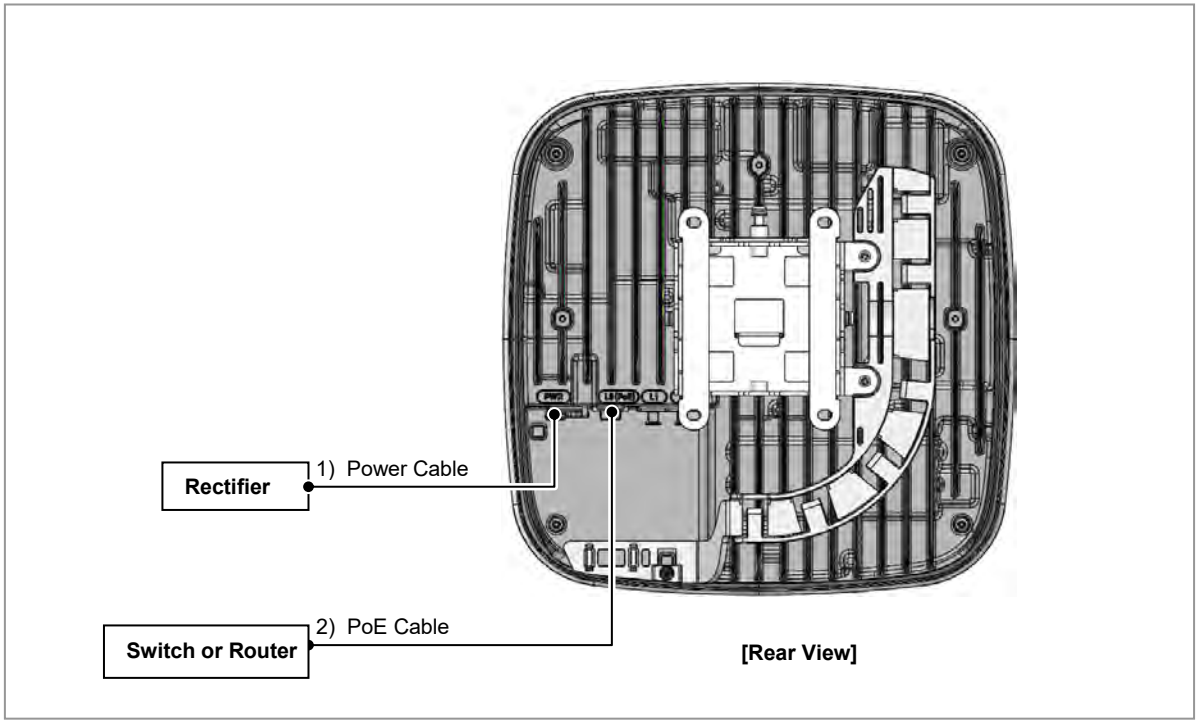
When installing, take care not to overlap or entangle the cables. Additionally, consider future expansion. Install the DC power cable and the data transmission cable away from the AC power cable to prevent electromagnetic induction.

The cable installation process requires trained and experienced personnel trained in industry standard installation and field services procedures to include cable installation activities such as cable installation, securing, tying and binding.

Cabling Diagram

The following figure depicts the interfaces of the RU for cable connections.

Figure 59. Cable Diagram



The following table lists the cables required for interconnecting different units and devices.

Table 25. System Connection Cable

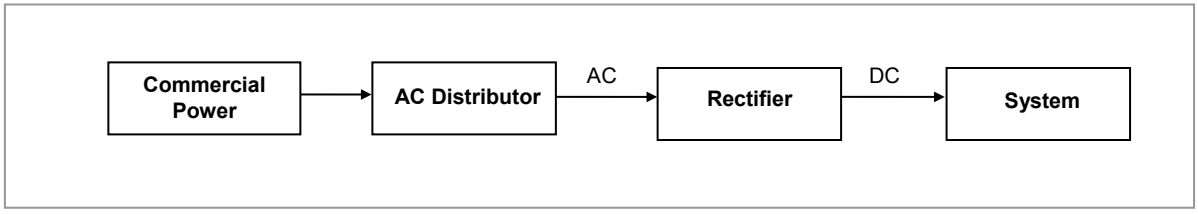
From	To	Cable
Rectifier	RU (PWR port)	**1** Power Cable: 14 AWG × 2C
RHU	RU (L0(PoE) port)	**2** PoE Cable: Cat6A, AWG 23

For cables connecting to external devices, (optic distributor), discuss with the service provider for their preferred method in how to finish the inlets of external devices.
The cable: Power Cable, PoE Cable

Power Cabling

The following figure depicts the elements of the power supply device.

Figure 60. Power Equipment Elements



The power is applied to the system where the power cable is connected by manipulating the circuit breaker of the rectifier. Ensure that the breaker of the rectifier 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 can be critically injured as soon as the cable is connected in the wrong way.

Handling the power cable incorrectly can damage the rack or cause an electric short-circuit through the cable. Ensure that the rectifier power switch or the system power is turned off before proceeding with any tasks.

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

The heat-resistant temperature rating of the power cable must be 90 ℃ or more.

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

When using the same DC power source with an outdoor device, discuss with the installation engineer of manufacturer to protect the system from a residual surge energy.

When using a DC power cable, it is possible to use up to 250 m for 14 AWG. However, the distance is under the condition that the cable is installed normally. When the condition changes, the distance changes.

Install a circuit breaker to a rectifier (or power distributor) for stable power. The capacity of circuit breaker is 4 A. (Use UL Listed circuit breakers.)

Connecting DC Power Cable

This section describes the process to connect the power cable.

Prerequisites

Before proceeding with the power cable connection, ensure that you have the equipment and items mentioned in the following table:

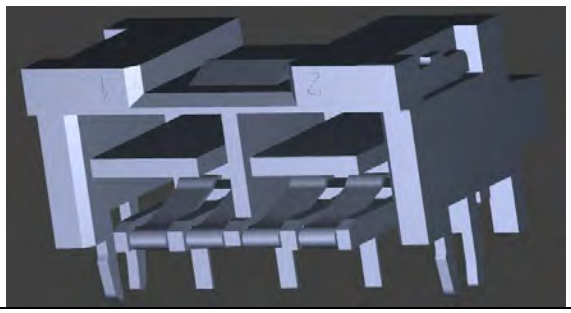
Table 26. Parts and Tools for Connecting DC Power Cable

Category	Description			
Installation Section	Rectifier to RU PWR Port			
Cable	14 AWG			
Bend Radius	Installed : 8 × OD	During Installation: 12 × OD		
Connector	Rectifier	Check specifications of rectifier output terminal per site and prepare fasteners.		
	RU	Pin No.	1	RTN
			2	-48 V DC
Working Tools	• Cable Cutter • Wire Stripper • Crimping Tool • Heating Gun • Nipper			

The following table outlines the pin connectors of the power cable.

Table 27. Power Cable/Connector Pin Map

Power Connector Pin No.	Description	Color
1	RTN	Black
2	-48 V DC	Red



To connect the DC power cable, do the following:

1 Assemble the power cable and terminal.

2 Assemble the terminal according to the pin number of the connector and the color of the power cable. (Pin 1: Black / Pin 2: Red)

To connect the power cable, do the following:

1 Install a DC power cable from the rectifier to the RU. (At this time, allow the power cable to enter the cable tray.)

2 Separate the PWR port cap from the system side.

3 Connect the power cable to the power port. (PWR port)

Figure 61. Connecting Power DC Cable - Fixed Mount Kit

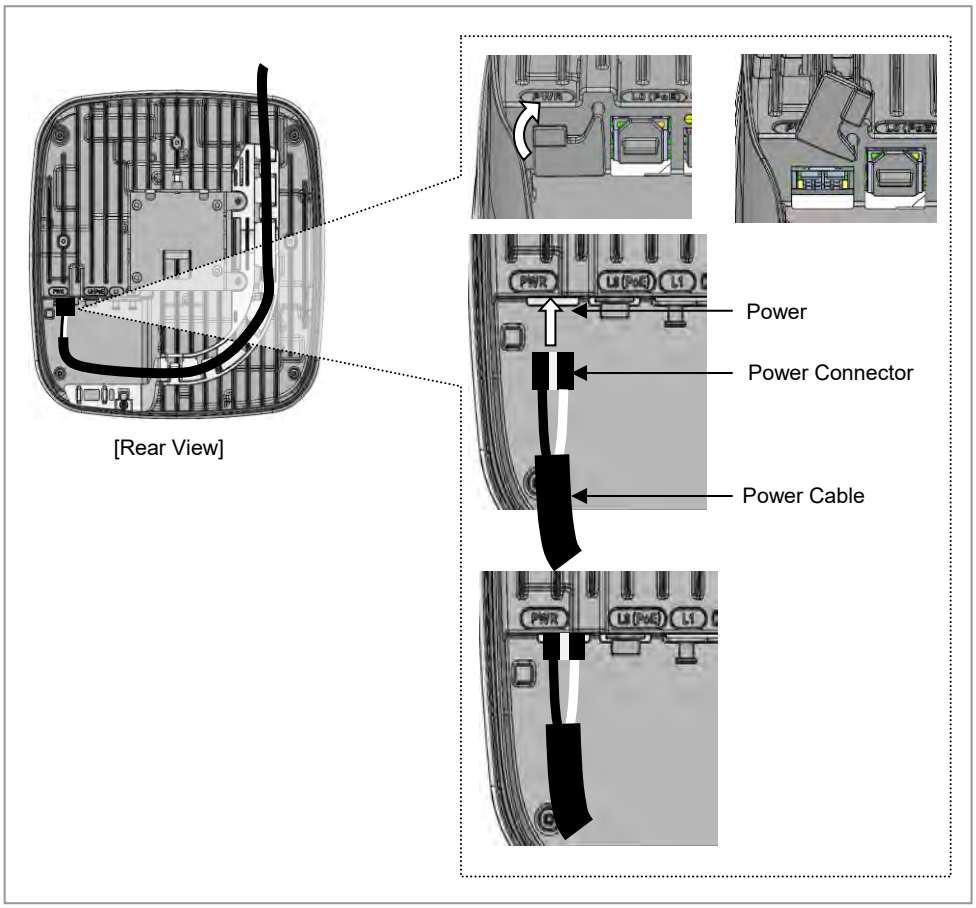
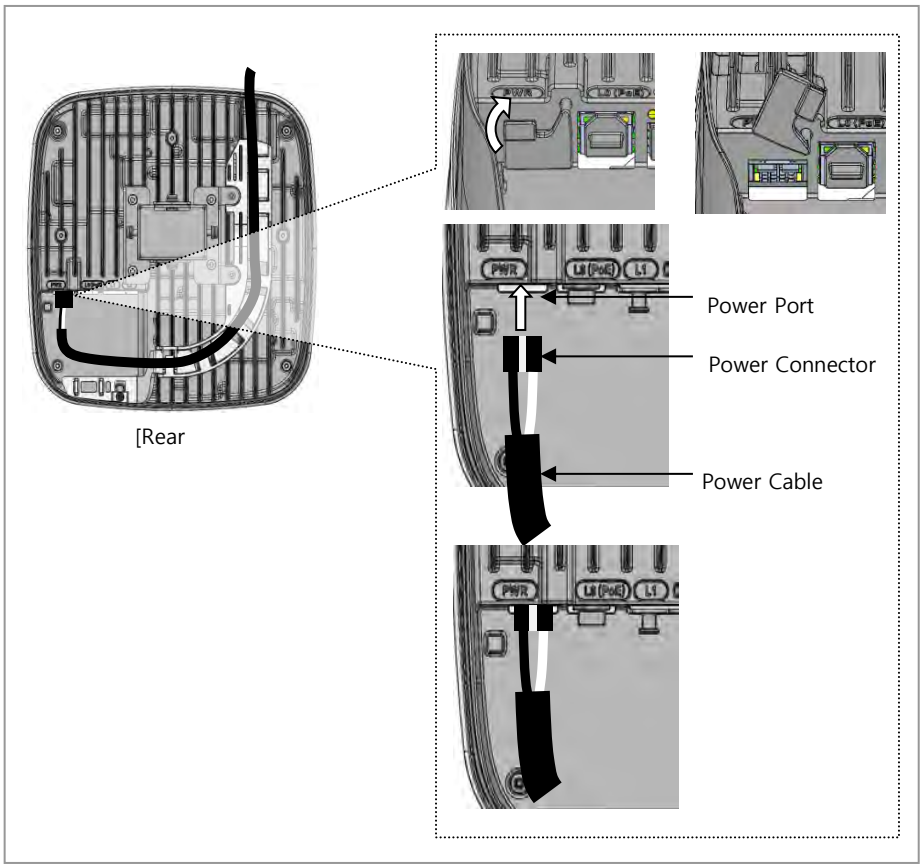


Figure 62. Connecting DC Power Cable - Ceiling Tile



Connecting PoE Cable

This section describes the process to connect the PoE cable.

Prerequisites

Before proceeding with the PoE cable connection, ensure that you have the equipment and items mentioned in the following table:

Table 28. Parts and Tools for Connecting Power Cable

Category	Description	
Installation Section	RHU to RU L0(PoE) Port	
Cable	Cat6a, AWG 23	
Bend Radius	Installed : 8 × OD	During Installation: 12 × OD
Connector	RHU	R0 ~ R6 Port
	RU	2.5G/5G/10GBASE-T
Working Tools	• Cable Cutter • Wire Stripper • Crimping Tool • Heating Gun • Nipper	

Figure 63. Connecting PoE Cable - Fixed Mount Kit

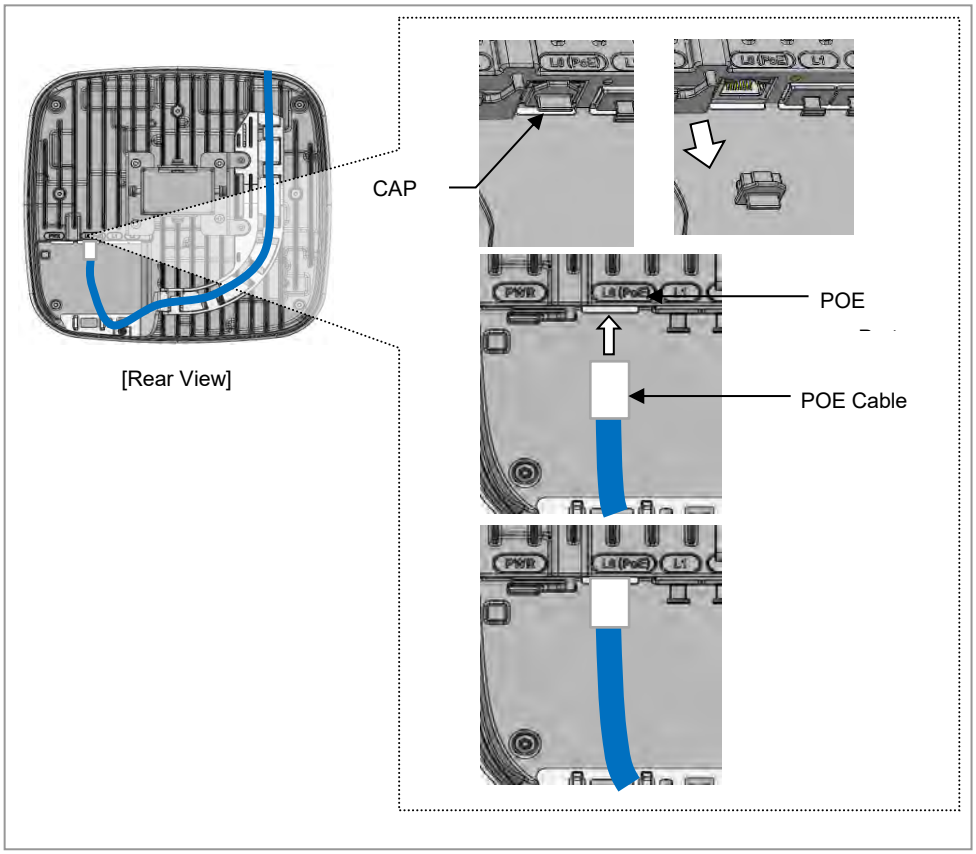
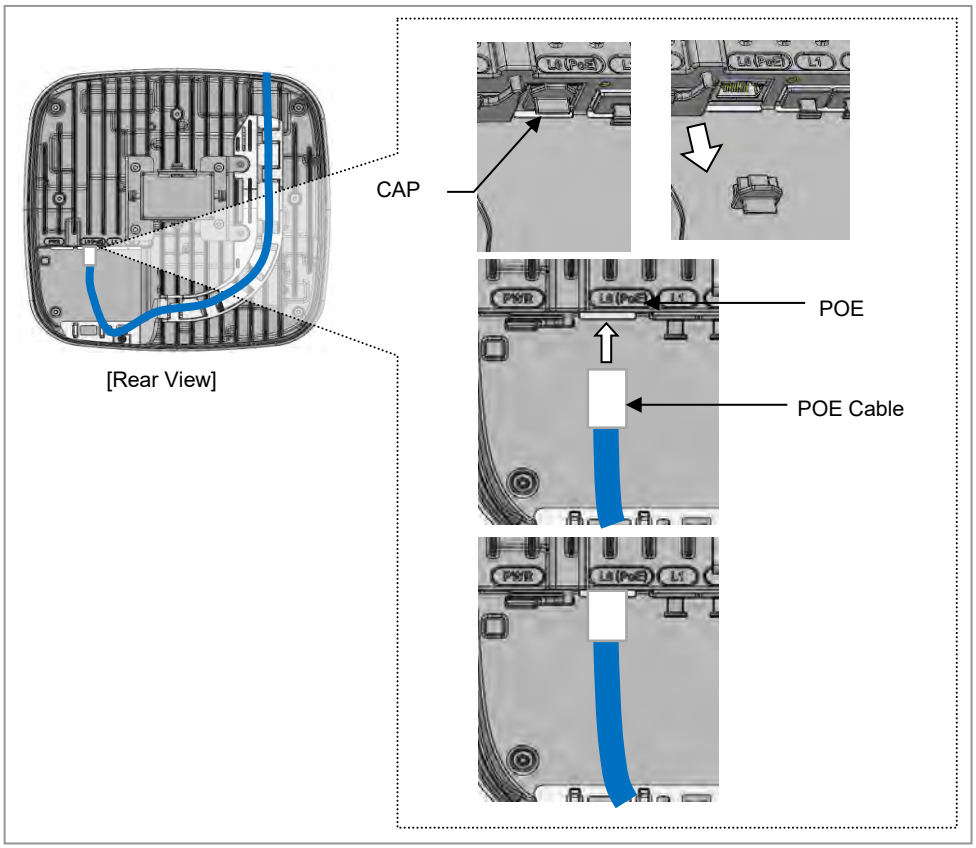


Figure 64. Connecting PoE Cable - Ceiling Tile



Connecting Cable (Only Pole type)

This section describes the process of connecting pole type cable.

Prerequisites

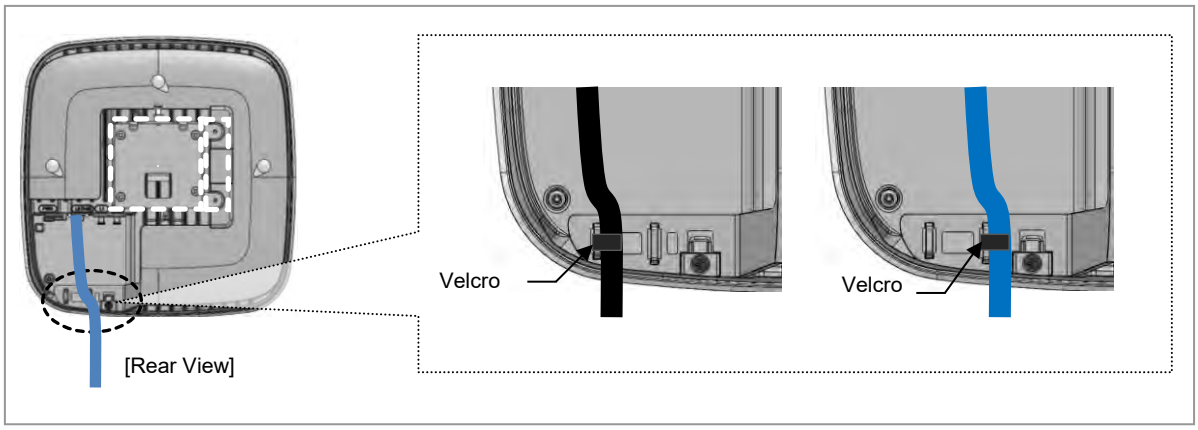
Before proceeding with the pole type cable connection, ensure that you have the equipment and items mentioned in the following table:

Table 29. Parts and Tools for Cable Binding

Category	Description	
Parts	Velcro	1 EA
Working Tools	Scissors	

The following figure depicts the pole type cable connection.

Figure 65. Connecting Cables (Pole Type)



Interface Cable Connection

This section describes the interface cable connection.

Remove/Insert Optical Module

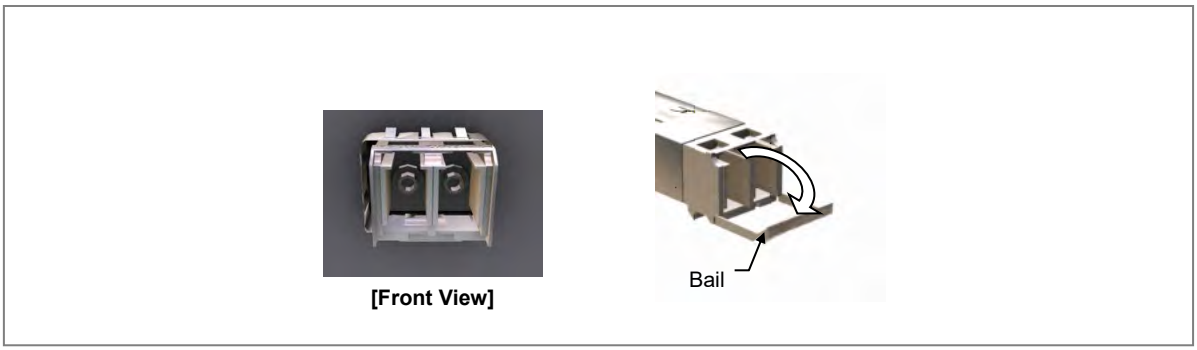
If the optical module is to be removed or inserted before connecting the cable, perform the following process:

Port quantity (Duplex) and Bail of Optical module may differ from the figure.

To remove optical module, do the following:

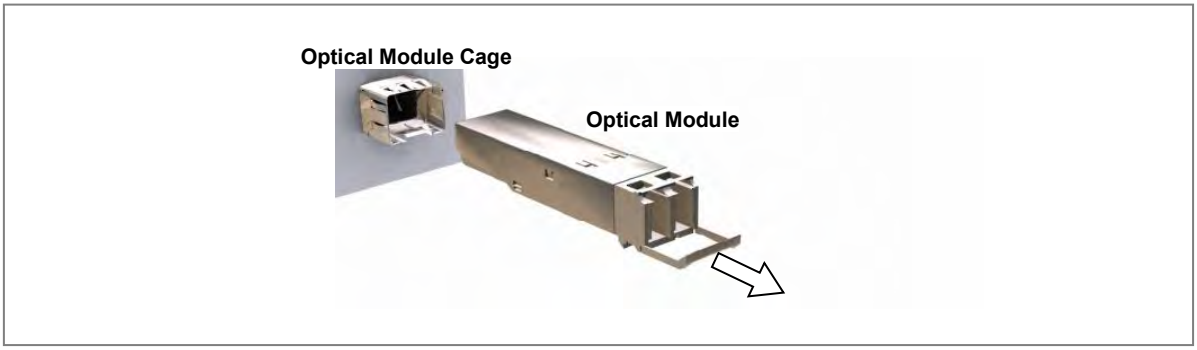
1 Hang the hook of the optical transceiver removal tool on the bail of the optical module within the system.

Figure 66. Optical Module Removal (1)

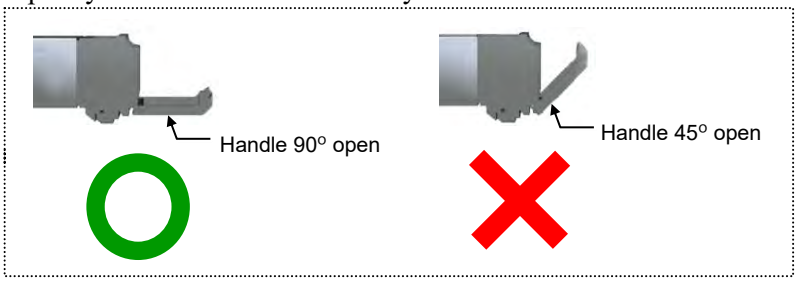


2 Completely remove the optical module from the optical module cage by pulling the optical module removal Tool.

Figure 67. Optical Module Removal (2)



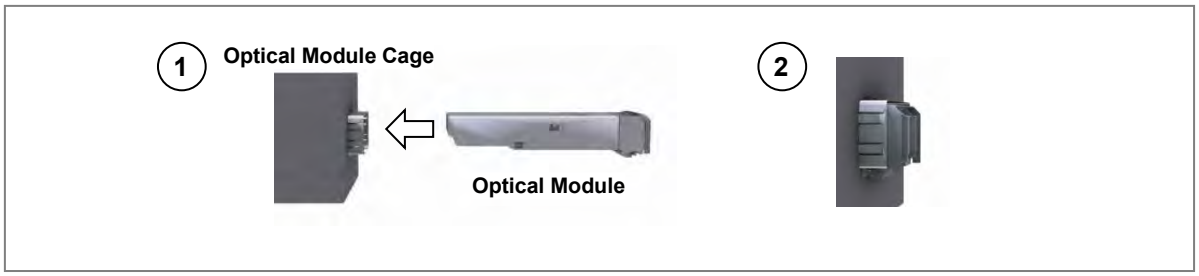
When desorbing an optical module, use a dedicated tool (optical module desorption tool) to remove the handle by opening it for about 90º.
When the optical module is detached without using the dedicated tool, the optical module can be jammed and the handle can be damaged due to a lack of opening capacity of the minimum necessary handle.



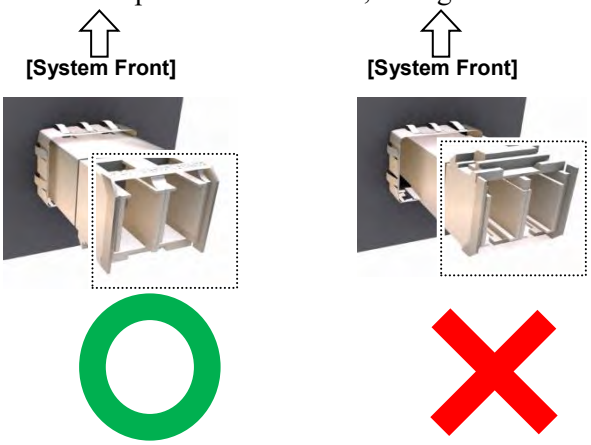
To insert the optical module, do the following:

1 Push the optical module into the optical module cage within the connector.

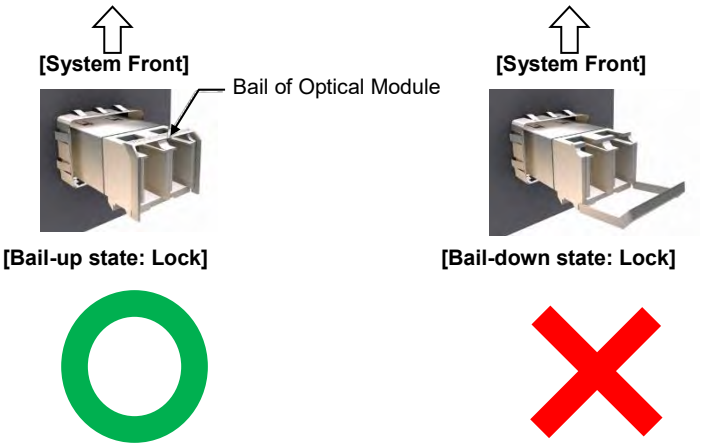
Figure 68. Optical Module Insert



Insert the optical module's bail, facing the front of the system to the port.



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



Connecting Fronthaul Cable

This section describes the process to connect the fronthaul cable.

Prerequisites

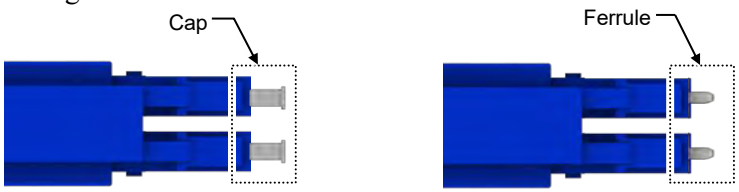
Before proceeding with connecting the fronthaul cable, ensure that you have the required equipment and items mentioned in the following table:

Table 30. Parts and Tools for connecting Fronthaul Cable

Category	Description	
Installation Section	Switch or Router to RU port	
Cable	Single Mode (Optical)	
Bending Radius	Installed: 10 × OD	During Installation: 20 × OD
Connector	Switch or Router	DLC/UPC
	RU	DLC/UPC
Working Tools	• Optical Connector Cleaner • SFP Tool (Jig)	

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

Remove the cap of the optical connector before connecting.
Before connecting the optical cable, check if the ferrule of the connector is soiled.
Be careful to keep the cutting section away from dust or foreign material.
If the cable is soiled with foreign material, do not blow to remove them.
Ensure to clean the connector in accordance with the cleaning directions in *Appendix C: Cleaning Optical Connectors*.
Do not touch the ferrule at the end of optical cable because it can be easily damaged.

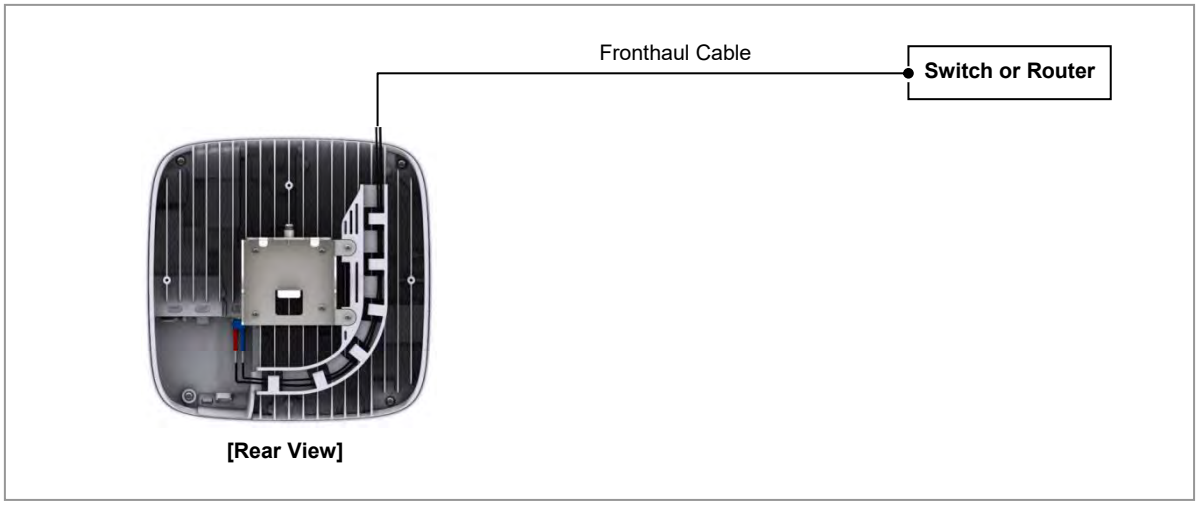


Before connecting the optical cable connector, the ferrule of the connecter of cable side should be cleaned first by using the optical connector cleaner. (For more details, refer to *Appendix C: Cleaning Optical Connectors*.)

To connect a Fronthaul cable, do the following:

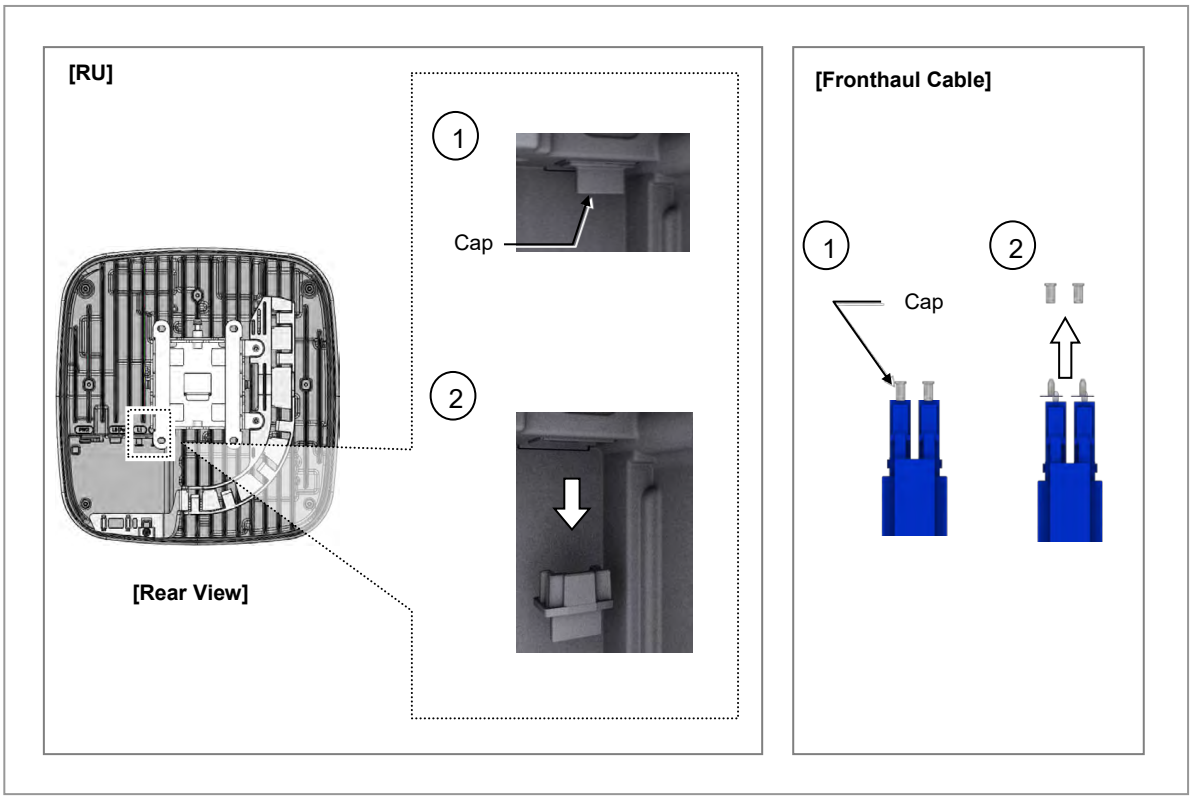
1 Connect the fronthaul cable from the switch/router to the RU L1/L2port. (While connecting, allow the fronthaul cable to enter the cable tray.)

Figure 69. Connecting Fronthaul Cable (1)



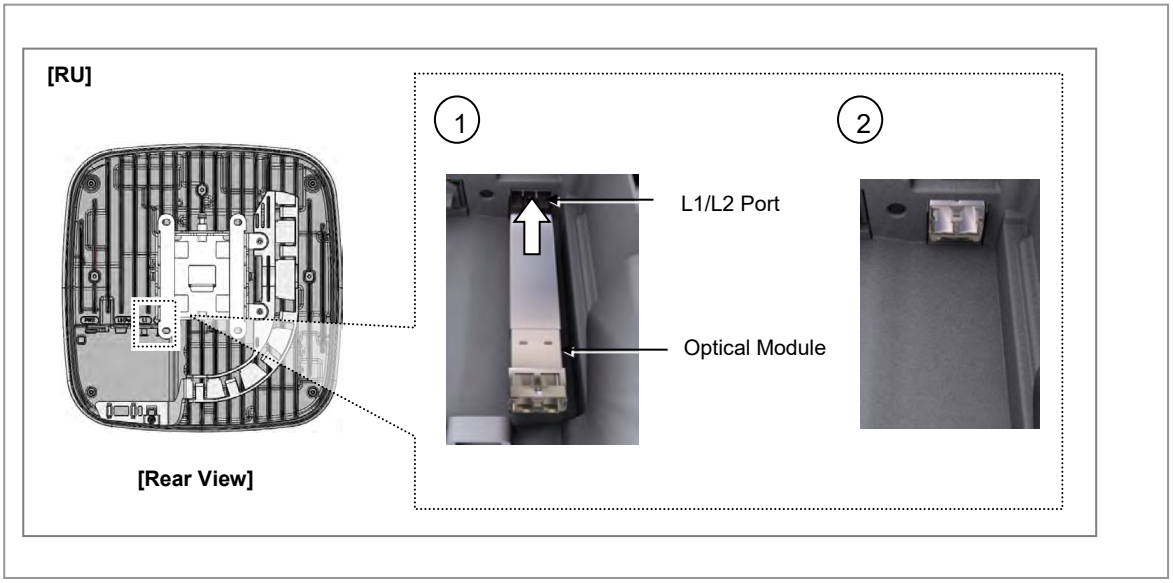
2 Separate the cap from the RU side and cable side connector.

Figure 70. Connecting Fronthaul Cable (2)



3 Connect the optical module to the RU fronthaul port as depicted in the following figure.

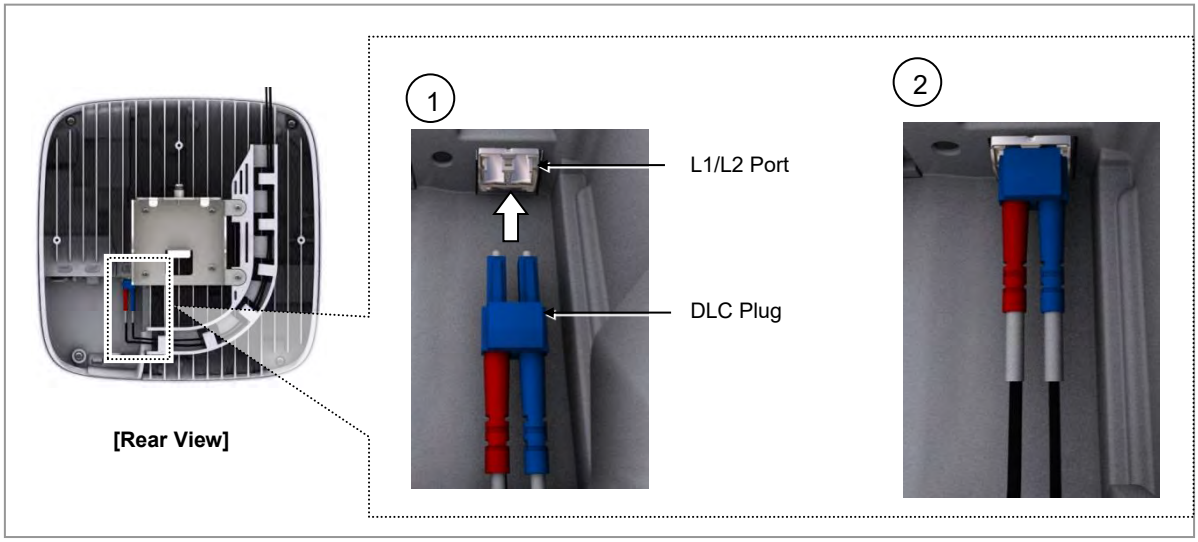
Figure 71. Connecting Fronthaul Cable (3)



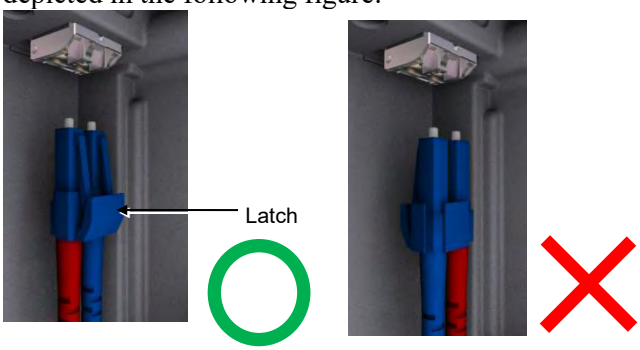
4 Insert the DLC plug to the system side's connector.

Before connecting the backhaul cable connector, the ferrule of the connecter of cable side should be cleaned first by using the optical connector cleaner. (For more details, refer to *Appendix C: Cleaning Optical Connectors*.)

Figure 72. Connecting Fronthaul Cable (4)



The 'Latch' of the DLC plug should be toward the upper side of the system, as depicted in the following figure:

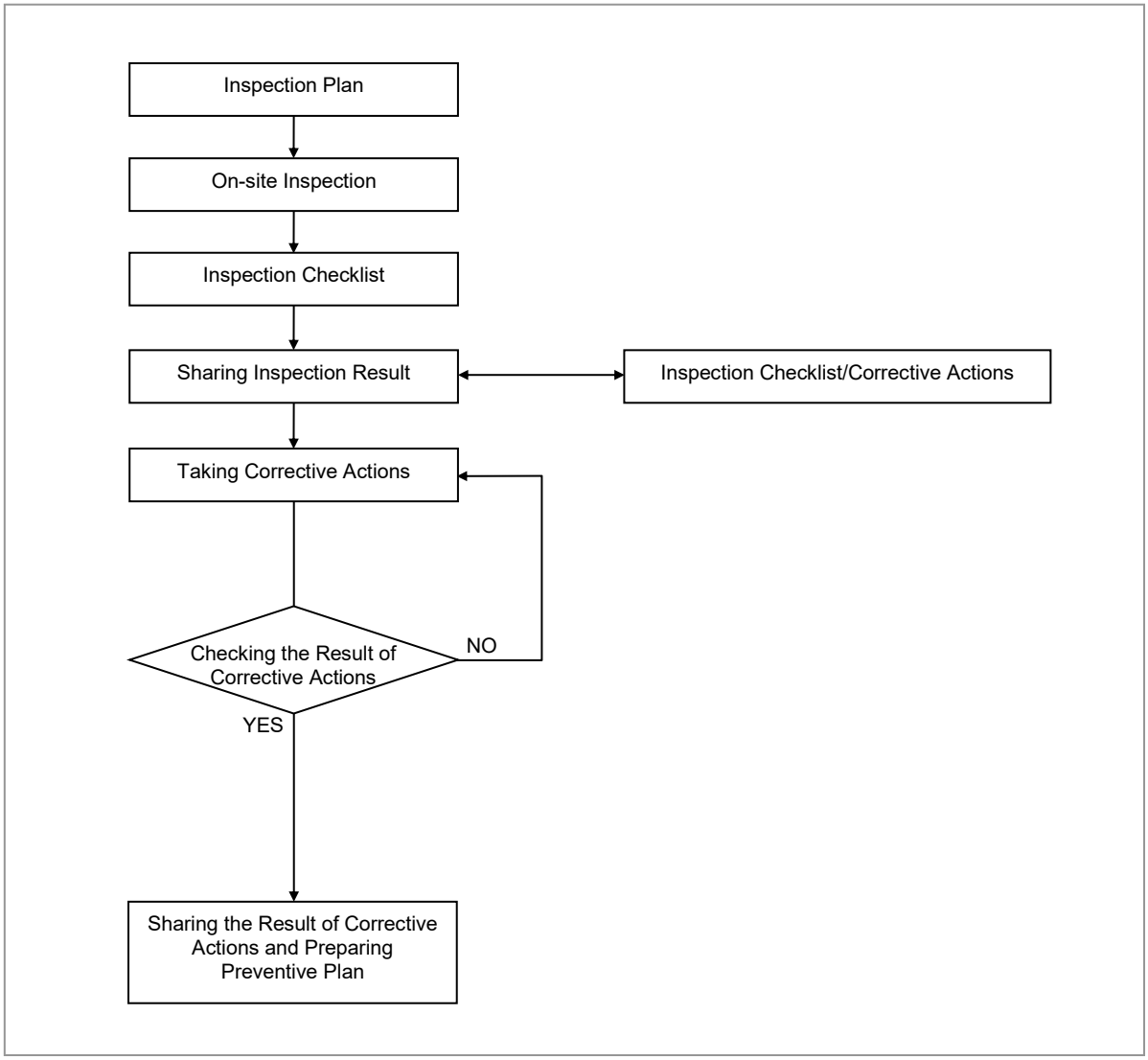


Chapter 5 Inspect the Installation

This chapter describes the procedures to check the installation status.

The following figure depicts the overall procedure for inspecting the installation status.

Figure 73. Installation Inspection Procedure



Inspection Plan

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

On-site Inspection and Inspection Checklist

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

The inspector must record the results in the inspection checklist during or after the field inspection.

Sharing Inspection Results and Taking Corrective Actions

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

Checking the Results of Corrective Actions

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

Sharing the Results of Corrective Actions and Preparing Preventive Plan

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

Construction Situation Checklist

The following table outlines a checklist to check the installation of the AU and other devices.

Table 31. Construction Situation Check list

Category	Check Items	Criteria	Result	
			Pass	Fail
Installing Equipment	Appearance of equipment and mechanical parts	Equipment damage such as dent, scratch, and crack.		
	Placement of equipment and mechanical parts	Maintenance and horizontal/vertical placement		
	Leveling condition of equipment and mechanical parts	Horizontal/vertical status		
	Validity of status and specifications of fastening bolt/nut/washer, and so on	Checking fasteners omission		
		Compliance with assembly order of fasteners		
		Compliance with fastening torque value		
	Insulation status	Checking electrical contact between insulators (insulation resistance tester)		
Grounding	Cable specification	Checking the specification		
	Cabling	Cable damage		
		Proper installation route		
		Compliance with the radius of curvature		

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

Category	Check Items	Criteria	Result	
			Pass	Fail
	Cable connection	Checking cable connection (Pin Map)		
		Assembly condition of a connector		
		Fastening condition of a connector		
		Checking compliance with fastening torque value		
	Installation status of cable tag	Position		
		Marking content		
		Checking tag installation method		
RF	Antenna installation status	Checking specifications		
		Checking installation position		
		Checking fixing status		
		Checking gap between antennas		
	Cable specification	Checking the specification		
	Installation status of arrestor	Checking the specification		
		Checking installation position		
		Checking fixing status		
	Cabling	Cable damage		
		Proper installation route		
		Compliance with the radius of curvature		
	Cable binding status	Binding status		
		Binding interval		
		Checking binding materials		
	Cable connection	Compliance with connector finishing		
	Installation status of cable tag	Position		
		Marking content		
		Checking tag installation method		
		Checking compliance with fastening torque value		
		Compliance with connector finishing		
	Installation status of cable tag	Position		
		Marking content		
		Checking tag installation method		
Others	Reserved ports	Checking port cap fastening status		
	Cable inlet status/Connection of equipment I/O port	Checking fastening status (Conduit/Cable Gland)		
	Cable tray and duct	Checking installation status		
	Status of inside/outside of the equipment and system surrounding area	Checking the stocking condition (waste parts, waste materials, packing materials, and so on)		
Opinion				

■

Appendix A Acronyms

5G NR	5G New Radio
AWG	American Wire Gauge
DC	Direct Current
EMC	Electro Magnetic Compatibility
EN	European Norm
FCC	Federal Communications Commission
IBW	Instantaneous Band Width
IEC	International Electronical Commission
IP40	International Protection 40
MGB	Main Ground Bar
OBW	Occupied Band Width
OD	Outer Diameter
PVC	Polyvinyl Chloride
RF	Radio Frequency
PWR	Power
RTN	Return
SFP	Small Form-factor Pluggable
TNV	Telephone Network Voltage
SELV	Safe Extra Low Voltage
UL	Underwriters Laboratories
WEEE	Waste Electrical and Electronic Equipment

Appendix B GPS Antenna Installation

This appendix describes the GPS Antenna installation.

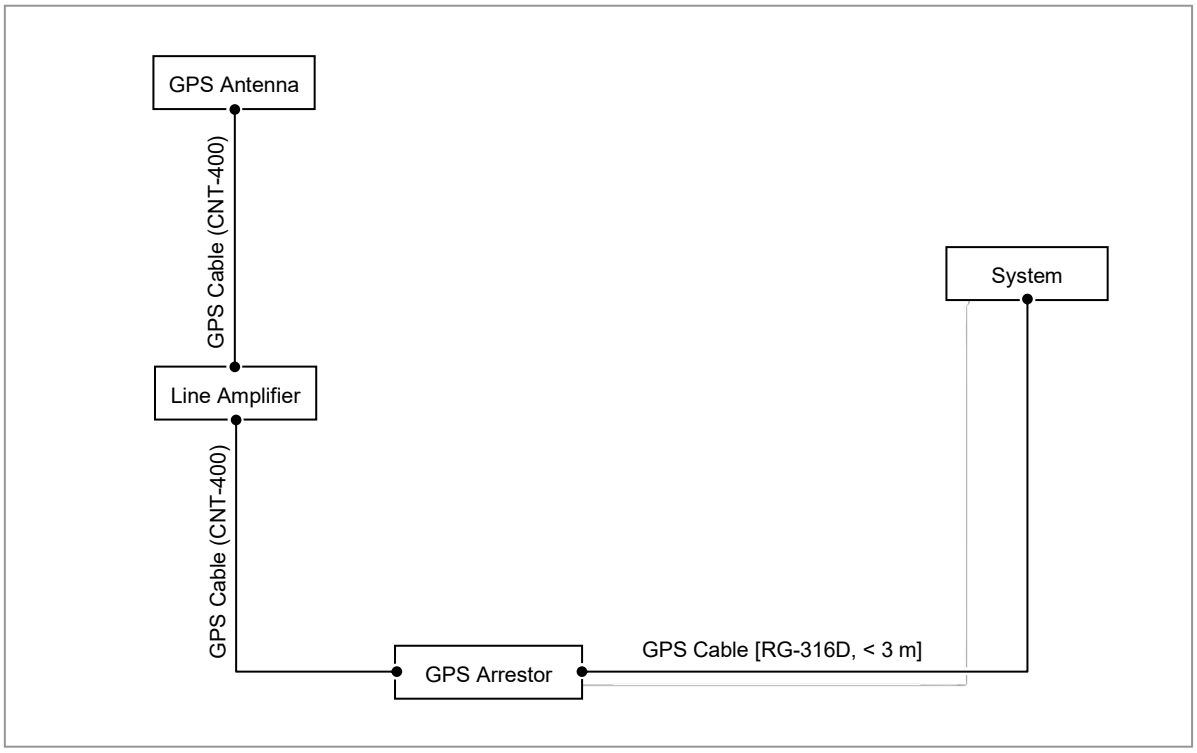
GPS Antenna System Configuration

The GPS antenna system is commonly configured as described in the following table:

Table 32. GPS Antenna System Configuration

Category	Description
GPS Antenna	Device receiving a signal from the GPS satellite
GPS Line amplifier (Option)	Device amplifying the GPS signal received from the GPS antenna (used to compensate the GPS signal loss caused by GPS antenna, GPS arrestor, cable and connector.)
GPS (Lightning) Arrestor	Device protecting people or system from lightning

Figure 74. Example of a Common GPS Antenna System Configuration



Requirements

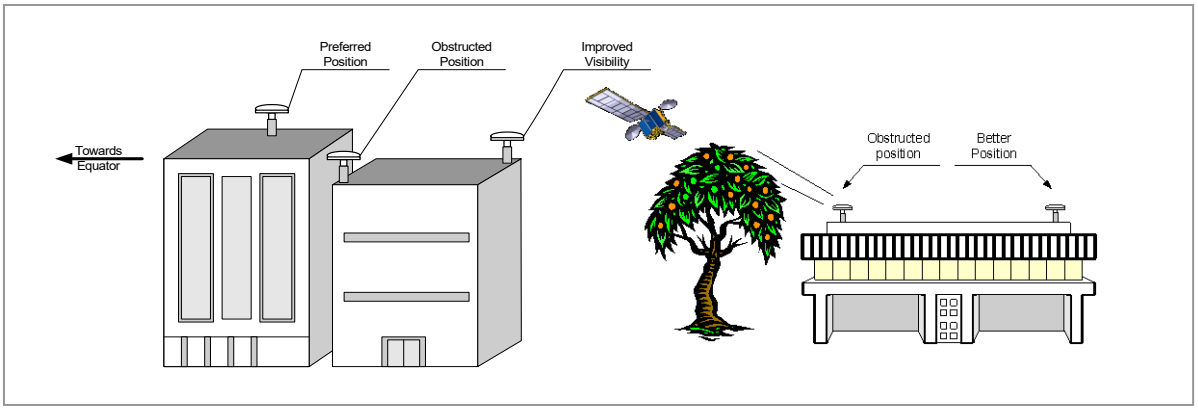
To satisfy the GPS specifications and operate the GPS antenna in a stable manner, the following GPS antenna configuration and installation requirements must be met:

- The GPS antenna must be installed in a location where it has the maximum amount of open sky. The ideal position is one where there are no obstacles that interfere with the antenna within 10 degrees or more of the horizon (the Elevation Angle). This allows the GPS receiver to select the best combination or distribution of GPS satellites which gives optimal performance.
- The GPS antenna installation location must avoid the following:
  - The effect of any obstacle or building that interferes with the reception of GPS signals or causes multi-path.
  - The interference of RF signal that is transmitted/received at any surrounding RF antenna (including Steel-Columned structure for RF antenna) or microwave signal.
  - Any damage from lightning within the coverage area of a lightning rod.

If the GPS antenna is influenced by external interference signals or multi-paths at a certain place, it is best to re-install the antenna at another place. Anti-jamming GPS antenna is recommended if it is not possible to change the location of the antenna.

- To ensure the GPS receiver works properly, it is recommended you install one GPS antenna per GPS receiver. It is also recommended that you do not use a GPS-specific splitter unless absolutely necessary.
- For the GPS receiver to operate at its best, there must always be six GPS satellites with a healthy status, that is, there is no obstacle directly between it and the GPS antenna.
- When installing the GPS antenna using a steel cylinder structure shared by other RF antennas, it must be separated by more than 1 - 1.5 m from that steel structure.
- The GPS antenna must be installed in a place lower than the lightning rod and RF antenna, and must not be installed within a steel tower to avoid lightning current flows into the GPS antenna.
- When you install the antenna, the antenna must be within the protective angle (left/right side 45° each from the central axis) of the lightning rod to protect the antenna from lightning damage.

Figure 75. GPS Antenna Installation



Lightening Arrestor

A lightning arrestor is required when there is a danger of lightning striking a cable or related part. The lightning arrestor must be installed in a place where the antenna cable or set of combined cables enters a building or station, or a place inside the building or station. The purpose of this is to protect the people and equipment inside the building or station.

A lightning arrestor must be grounded to the earth separately with lightning protection grounding to work properly.

If struck directly by lightning, the lightning arrestor, antenna, or cable must be replaced. Furthermore, you must inspect the lightening arrestor periodically, and replace the antenna and cable periodically to ensure protection if lightning occurs frequently at the site.

The lightning arrestor must be well grounded so that it can transmit a large current quickly.

Interference Signal

The GPS system is designed so that it has a strong immunity to noise and can endure interference.

The Samsung GPS receiver provides a quality timing clock in most installations.

However, to ensure that the GPS receiver performs locking successfully and guarantees uninterrupted timing performance, an interference-free environment is required for frequencies near the GPS L1 frequency (1575.42 ± 1 MHz).

Interference Types

There are two types of interference which affect the GPS L1 frequency.

- Narrow band (inband) interference: When a frequency deviation (3.5 kHz), such as an FM wave, inflows around the GPS L1 frequency (1575.42 MHz).

  Narrow band interference is monitored by the spectrum analyzer. However, since it has a time lag, a locking failure or a different type of alarm can occur.

- Wideband interference: When frequency deviation is more than 7 kHz around the GPS L1 frequency (1575.42 MHz).

  Wideband interference includes the interference induced by the harmonics from a communication service with a different frequency bandwidth, increased thermal noise from communication services around the L1 band, inflow of interference due to unauthorized communication, saturation due to oscillation of an accessory device, and so on.

  You cannot monitor these kinds of interference with a device such as a spectrum analyzer. If the system has a wideband interference problem, you should consult an expert in this area.

For bandwidths other than the GPS L1 frequency (1575.42 ± 1 MHz), a GPS Band Pass Filter (BPF) must be included within the GPS antenna to remove the interference from the GPS bandwidth. No outband interference must affect the GPS signals.

Avoiding Interference

If more than one antenna for other communications is installed in the surrounding area, such as an antenna for a base station or satellite communication, the GPS antenna must be installed in a location where no interference signals flow.

If interference exists within the GPS L1 frequency bandwidths (1575.42 ± 1 MHz), use a band pass filter (BPF) to prevent interference from affecting the GPS bandwidth.

Furthermore, if the GPS antenna is installed by a transmitter which operates with a bandwidth similar to the GPS L1 frequency, the possibility of interference increases (in this case, interference is caused by harmonics). If the GPS antenna has a problem due to interference, move it to a different location where interference signals can be avoided or minimized.

Inband noise includes narrow band noise and wide band noise that occur in an inband width. (L1, 1575.42 ± 1 MHz)

- Narrow band noise in an inband width: If it is higher than 108 dBm, it can affect the operation of the GPS receiver.
- Wideband noise in an inband width: It may not be detected by a measuring instrument and may impair the sensitivity of the GPS receiver, and thus affect its operation.

If there is an outband interference problem, reduce the effects of interference on the GPS receiver by applying one or more L1 GPS BPFs.

The filter should be installed at the following locations:

- The input connector of the Samsung GPS receiver
- Behind the antenna or the front end of a line amplifier

These filters are used to reject jamming tones for outband signals. If interferences occur in the inband signals, they will result in serious consequences.

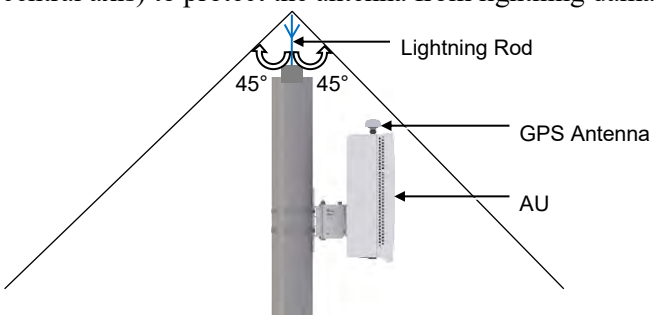
GPS Antenna Installation

The GPS antenna can be fixed to a wall, floor, tower, or pole.

Ensure personal safety when fixing an anchor bolt to a wall and treat the anchor bolt fixing area with a silicon or waterproof finishing material.

Install a concrete block that satisfies the specification about the size and strength. When installing the concrete block, and before forming the concrete, arrange steel reinforcement bars in a mesh layout at 100 mm intervals. (Use either an anchor bolt assembly or a concrete anchor.)

Install the antenna within the protective angle (left/right side 45° each from the central axis) to protect the antenna from lightning damage.



Appendix C Cleaning Optical Connectors

This appendix describes the procedure of cleaning the optical connector and cleaning tool.

Introduction

When connecting an optical cable to the system, the performance of the system can be degraded, or failures can occur — if the core element of an optical connector is dirty — due to dust or other foreign material. Therefore, the operator must clean the optical connector before connecting an optical cable to the system.

When using an optical connector cleaner, use the products given in the following example or their equivalent.

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

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

Manufacturer-The Fibers (www.thefibers.com)

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

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

Measure the Optical Output and Connecting the Optical Connector

To measure the optical output, do the following:

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

[LC/PC Plug]

[Optical Power meter]

Appendix D Standard Torque

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

Table 33. Standard Torque Value for Fastening Bolts

Bolt Spec.	Torque Value (N·m)	Torque Value (lbf·in)	Torque Value (kgf·cm)
M3	0.5 to 0.8	4.5 to 6.7	5.1 to 7.7
M4	1.2 to 1.8	10 to 16	12 to 18
M5	2.2 to 3.4	20 to 30	23 to 35
M6	3.9 to 5.9	34 to 52	40 to 60
M8	10 to 14	88 to 132	102 to 152
M10	20 to 30	174 to 260	200 to 300
M12	34 to 50	298 to 446	342 to 514

Table 34. Connector Connection Torque Value

Connector	Torque Value (N·m)	Torque Value (lbf·in)	Torque Value (kgf·cm)
SMA connector	0.8 to 1.1	7 to 10	8.2 to 11.2
TNC connector	0.46 to 0.69	4.1 to 6.1	4.1 to 7
N-type connector	0.7 to 1.1	6.2 to 9.7	7.1 to 11.2
DIN-type connector	25 to 30	221 to 265	255 to 306
4.3-10-type connector	5 to 11	44 to 97	51 to 112

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

SAMSUNG

RF2217d-D1A
Installation Manual

Document Version 1.0