SAMSUNG

MT3204 Series
Installation Manual

Describes product installation and requirement procedure.

Document Version 1.0
December 2018

Radio Access Network

Document Number: 2600-00NFJUGAA

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 **http://www.samsungdocs.com**

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Preface

This manual describes how to install the 3.5 GHz CBRS MMU, MT3204-48A, including how to connect cables.

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 capital letters and Courier New, bold style. For example, Type the **`RTRV-NE-STS`** command in the input field.
- The YANG object is presented in the small letters and boldface. For example, **eutran-cell-conf-idle**

Revision History

The following table lists all versions of this document.

Document Version	Publication Date	Remarks
1.0	December 2018	First version

Organization of This Document

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

Related Documentation

- LTE eNB System Description

Personal and Product Safety

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

Electrical

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

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

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

Lasers

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

Manual Handling

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

Installation

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

Each power feed to the unit requires a separate fused feed from the provided power supply. The cable between the power distribution point and the installed equipment must have a minimum cross-sectional area of 2.5 mm^2.

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

Maintenance

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

Fire

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

Environment

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

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

Cooling

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

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

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

Anti-Static Precautions

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

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

Grounding

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

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

Power Supply Connection

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

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

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

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

Indirect Connection

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

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

Product Disposal

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

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

Battery Disposal

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

End of life recycling materials information is available from Samsung.

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.'

Compliance Statements for the USA

Any changes or modifications that art not expressly approved by the manufacturer for compliance could void the user's authority to operate the 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.

Protective earth

MMU should be grounded.

Chapter 1 Before Installation

This chapter introduces the MMU system and describes the items that you should know before installation.

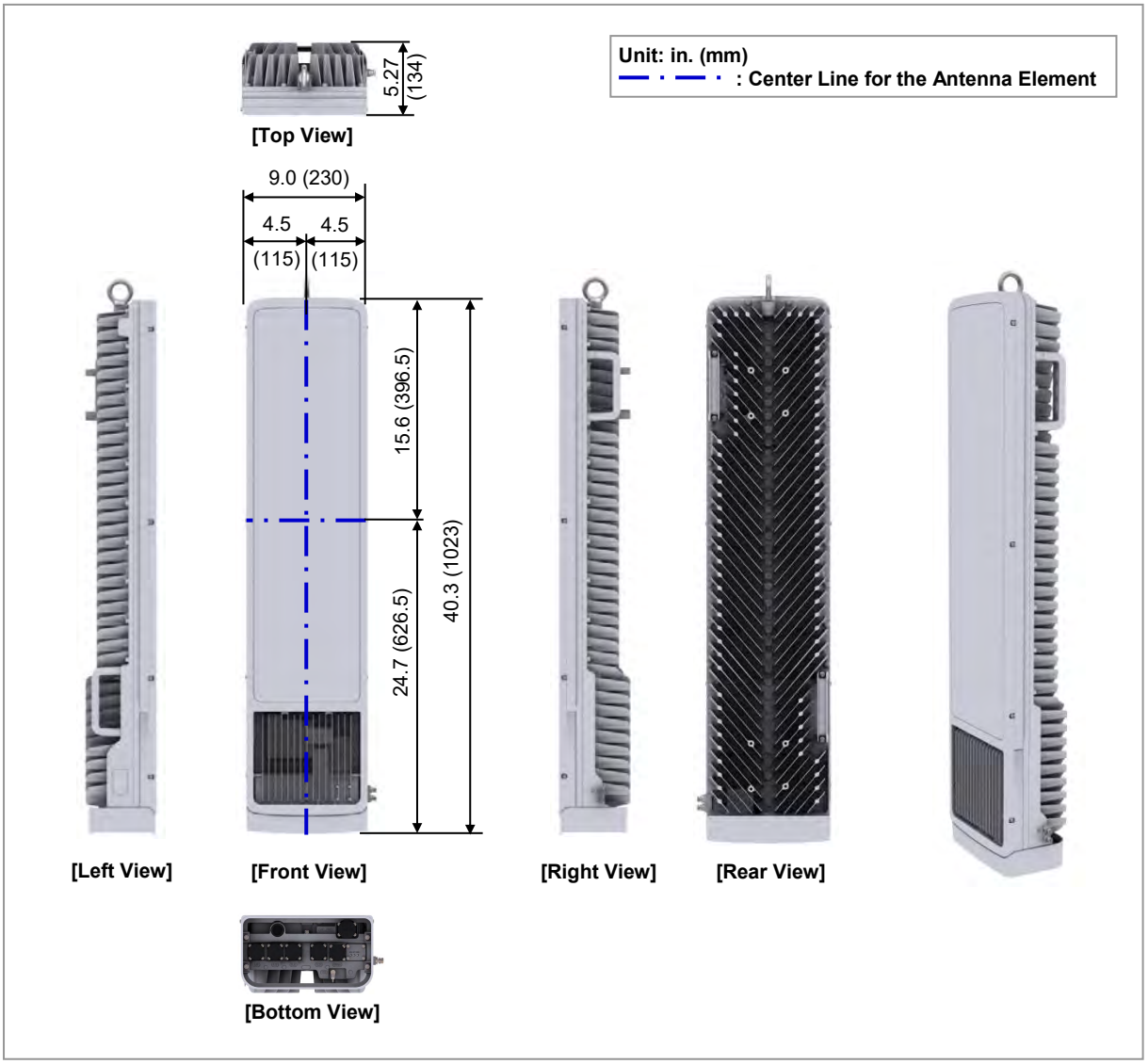
MMU View and External Interface

This section provides the physical structure of the MMU and its interfaces.

MMU View

The figure below depicts the physical structure of the MMU.

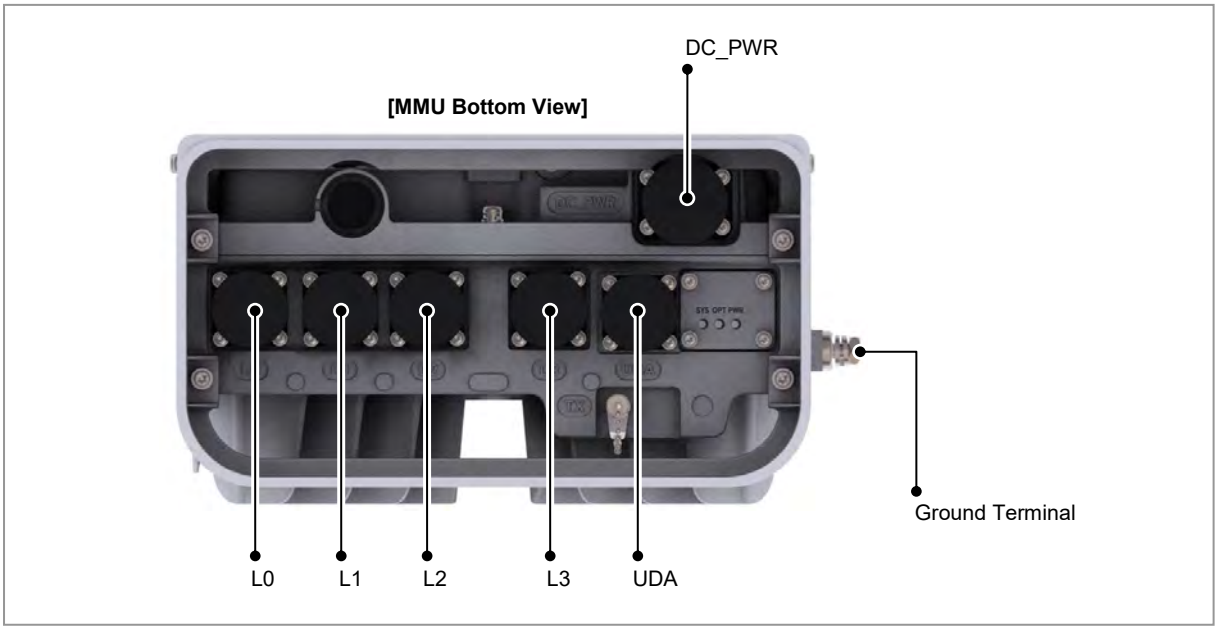
Figure 1. MMU View



MMU External Interface

The figure below depicts the external interface structure of the MMU.

Figure 2. MMU External Interface



Specifications

The table below outlines the main specifications of the MMU.

Table 1. Specifications

Item	MT3204-48A	
Air technology	LTE	
Operating Frequency (MHz)	3,550 to 3,700	
RF Chain	32T32R	
Antenna Element	96 (4V8H)	
IBW/OBW	150 MHz/40 MHz	
Channel Bandwidth/Capacity	20 MHz × 2 Carrier	
RF Output Power/EIRP	6.3 W (47 dBm per 10 MHz EIRP)	
Modulation (DL/UL)	Up to 256 QAM/64 QAM	
MIMO Layer	DL: 8L, UL: 2L	
Fronthaul	CPRI (10 Gbps × 4 port, Duplex)	
Input Voltage	-48 V DC (-38 to -57 V DC)	
Power Consumption	428 W (100% Load, U/D 2-7)	
Dimension (W × D × H)	9.0 in.(230 mm) × 5.3 in.(134 mm) × 40.3 in.(1023 mm)	
Weight	< 53.57 lb (24.3 kg, with port guard)	
Operating Temperature	-40 to +50℃ (without Solar load)	
Operating Humidity	5 to 100[%](RH), condensing, not to exceed 30 g/m^3 absolute humidity	
Cooling Method	Natural convection cooling	
Function Split	LTE:DL-Option 7-2a, UL-Option 8	
Spectrum Analyzer	TX, RX	
Altitude	-60~1,800 m	
Earthquake	Telcordia GR-63-CORE Section 4.4.1 (Earthquake Risk Zone4)	
Vibration in Use Transportation Vibration	Telcordia GR-63-CORE Section 4.4.4 Telcordia GR-63-CORE Section 4.4.5	
IP rating	IP65	
EMC	FCC part 15	
RF	FCC CFR 47 Part 96	
Beam Steering Range	Horizontal	TBD
	Vertical	TBD
Safety	UL 60950-1	
Installation	Pole/Wall mounting	

Cautions for Installation

Observe the safety instructions described in this section when installing the system.

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

Before Installing

Before starting the installation, ensure the following:

- Post warning signs in areas where high-voltage cables are installed.
- Post 'off limit' signs in areas where accidents are most expected.
- Use guardrails or fences to block open areas such as ditches, open roof areas, and scaffolds.

Install the system in the restricted access area.

While Installing

During installation, ensure the following:

The system power must be cut off before installing.

Ensure that the power switch of the power supply is off when installing the system. Installing the system with power on may cause system damage or fatal human injury when connecting or disconnecting cables.

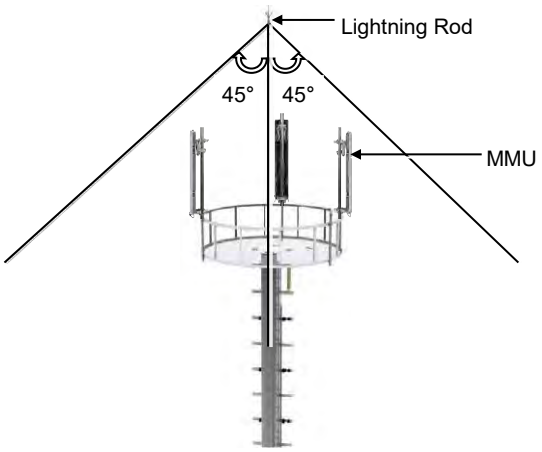
Ensure that workers wear protection gloves and goggles to prevent injury from debris while drilling holes in a wall or ceiling.

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

Cover unused ports with a cap. This prevents foreign substances from entering into the unused ports.

To prevent foreign substances, outdoor air, and moisture from entering the cable inlet (including cable gland and conduit), finish the inlet 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 silicone.

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



Keep a safe distance (1.3m) between the base station antenna and people.

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

After Installing

After installation, 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. The workers must handle the optical cables with care as the laser beam can seriously damage the eyes.

Ensure that the workers do not damage installed cables while cleaning the system.

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

Installation Tools

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

Table 1. Basic Installation Tools

No.	Name	Specification	Purpose of use
1	Torque Driver 	Apply a torque range: 20 to 90 lbf·in	Fastening M6 SEMS
2	Screw Driver Bit	'+', No. 3	Fastening M6 SEMS
3	Screw Driver 	'+', No. 3	Fastening M6 SEMS
4	Torque Wrench 	Apply a torque range: 10 to 50 lbf·in	Tightening M6 hexagonal. bolt
		Apply a torque range: 100 to 400 lbf·in	Tightening M10, M12 hexagonal. bolt
5	Torque Wrench Spanner Head 	Apply hexagonal bolt head: 10 mm (for 10 to 50 lbf·in)	Tightening M6 hexagonal bolt
		Apply hexagonal bolt head: 17 mm (for 100 to 400 lbf·in)	Tightening M10 hexagonal nut
		Apply hexagonal bolt head: 19 mm (for 100 to 400 lbf·in)	Tightening M12 hexagonal nut
6	Spanner 	10 mm	Tightening M6 hexagonal. bolt
		17 mm	Tightening M10 hexagonal. bolt
		19 mm	Tightening M12 hexagonal. bolt
7	Tape Measure 	16 ft./150 ft.	Measuring length
8	Level 	Normal	Levelling horizontality and verticality
9	Power Extension Cable 	100 ft.	Basic tool
10	Hammer Drill	Normal	Wall Type Drilling

No.	Name	Specification	Purpose of use
			
11	Optical Connector Cleaner 	For LC Connector	Cleaning Optical Connector
12	Concrete Drill Bit 	17 mm	Setting M12 Anchor
13	Anchor Punch 	M12	Setting M12 anchor
14	Hammer 	Normal	Fixing anchor
15	Vacuum Cleaner 	Normal	Removing dust during the drilling work
16	Cable Cutter 	0.2-1.3 in. (6-32 mm)	Cutting cable
17	Crimping Tool 	14 AWG-4 AWG (1.5 to 16 mm^2)	Crimping pressure terminal
18	Cable Stripper 	Apply cable thickness: 1.5 to 6.2 in. (4 to 16 mm)	Removing cable sheath
19	Nipper 	Basic Tool	Cutting cable
20	Flush cutter 	Basic Tool	For cutting cable tie
21	Industrial Scissor 	Basic Tool	Cutting
22	Knife 	Basic Tool	Cutting
23	Heating Gun 	50°C to 300°C	Shrinking the feeder cable tube
24	Multi tester	Digital Pocket Tester	Checking voltage and current to

No.	Name	Specification	Purpose of use
			detect cable disconnection
25	Angle Meter 	Normal	Checking MMU Tilting
26	Fiber Optical Test Set 	Wave length: 1270 nm, 1310 nm, 1550 nm (single mode) 850 nm, 1310 nm (multi-mode)	Checking optical level
27	Antenna Alignment Tool 	-	Checking azimuth and tilting

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

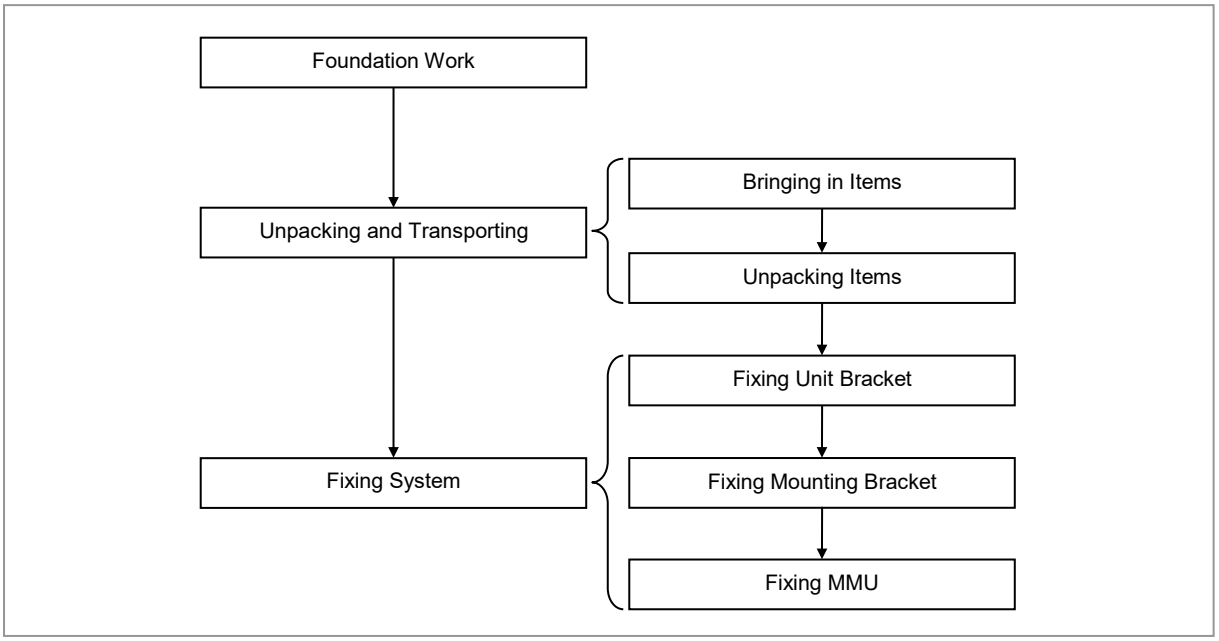
Chapter 2 Installing System

This chapter describes the procedures for transporting, unpacking, and installing the MMU.

Installation Procedure

The figure below depicts the overall procedures for installing the MMU.

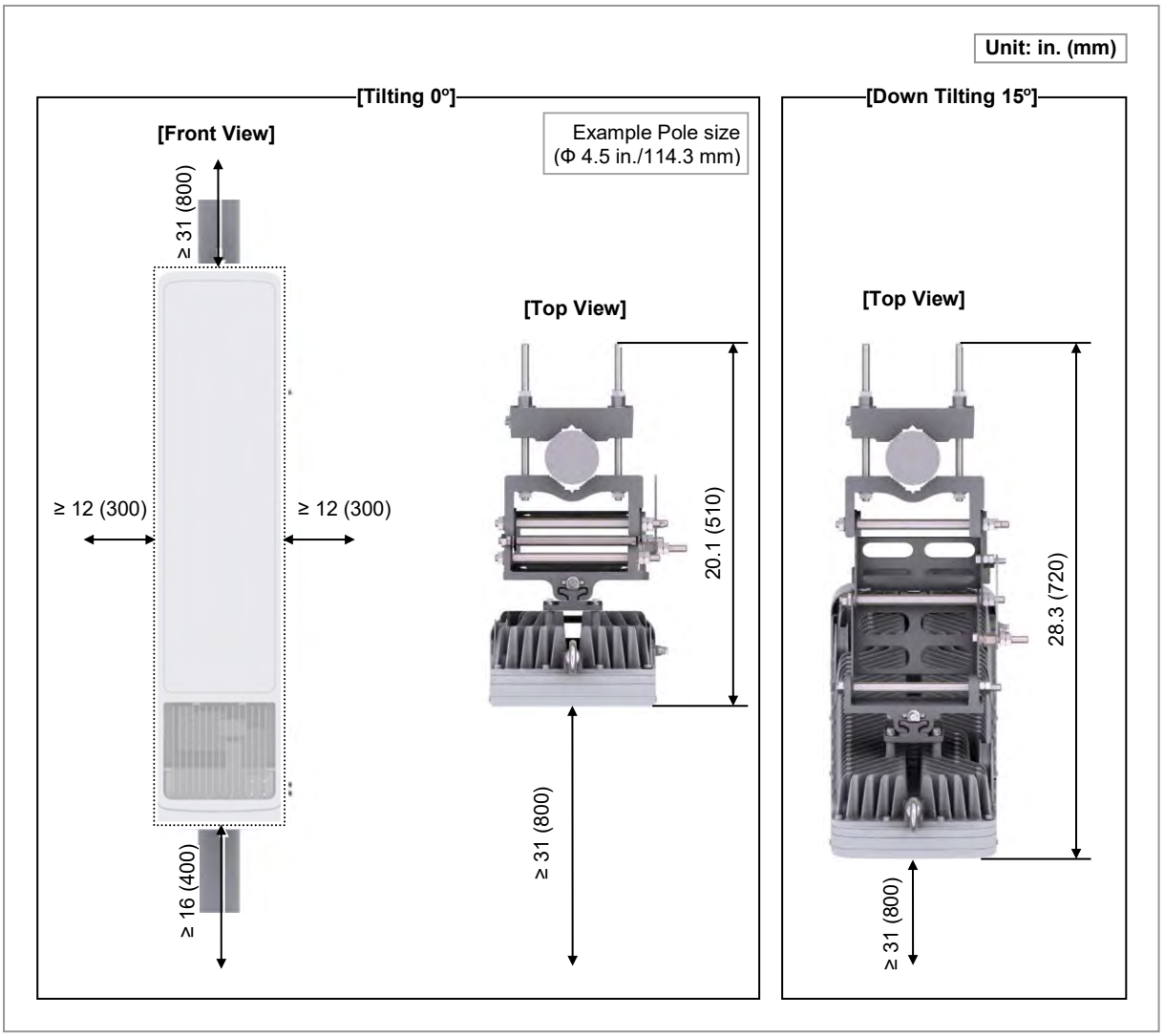
Figure 3. Procedure to Install the MMU



System Arrangement

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

Figure 4. MMU Arrangement_Pole Type Installation

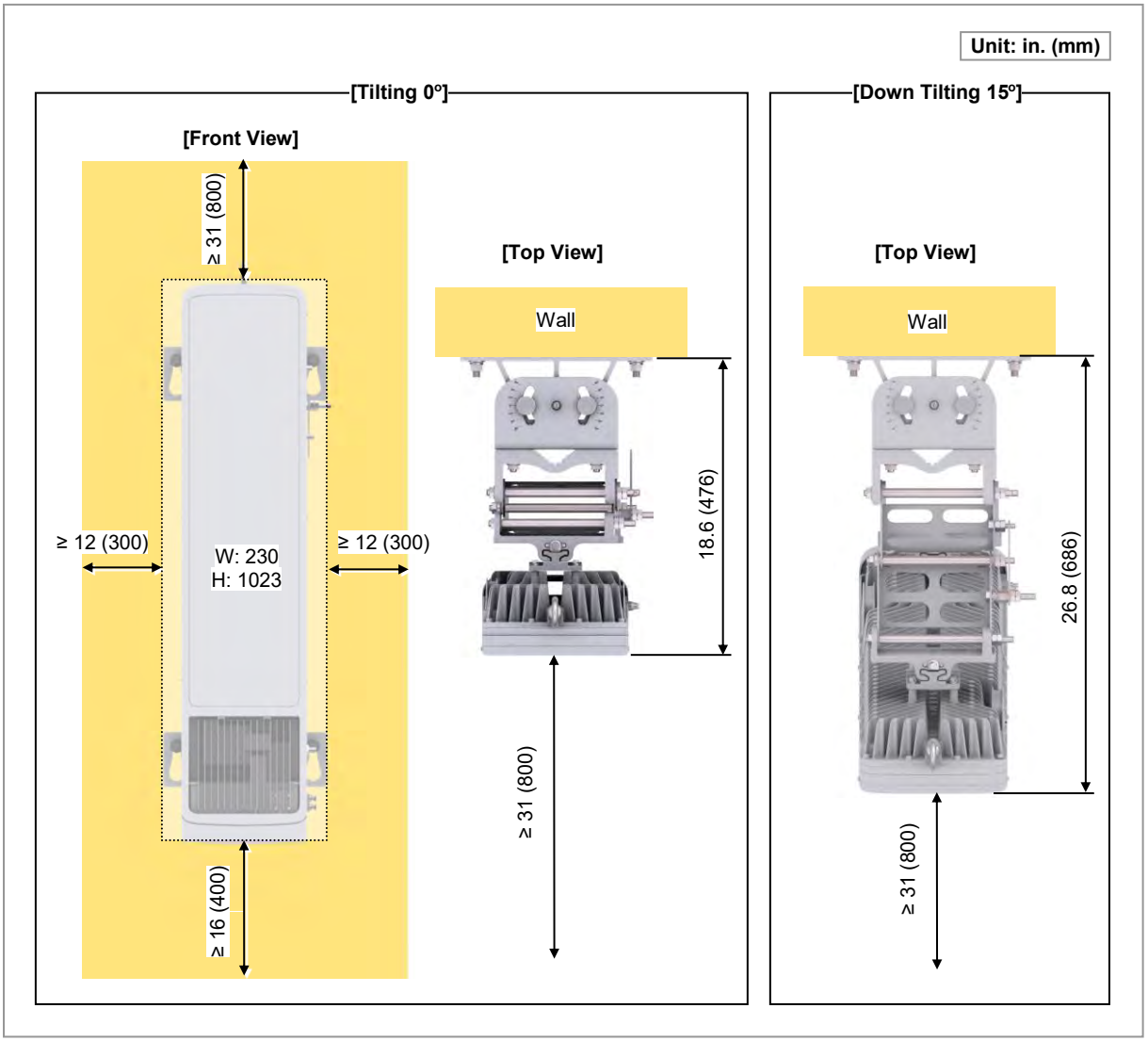


The dimensions of the front of the MMU change according to the tilt angle, and the maximum dimensions are described in the figure below (MMU Arrangement_ Down Tilting 15°).

When fixing a mounting bracket, the length of stud bolts are 8.7 in. (220 mm) for the pole diameter 50~100 A.

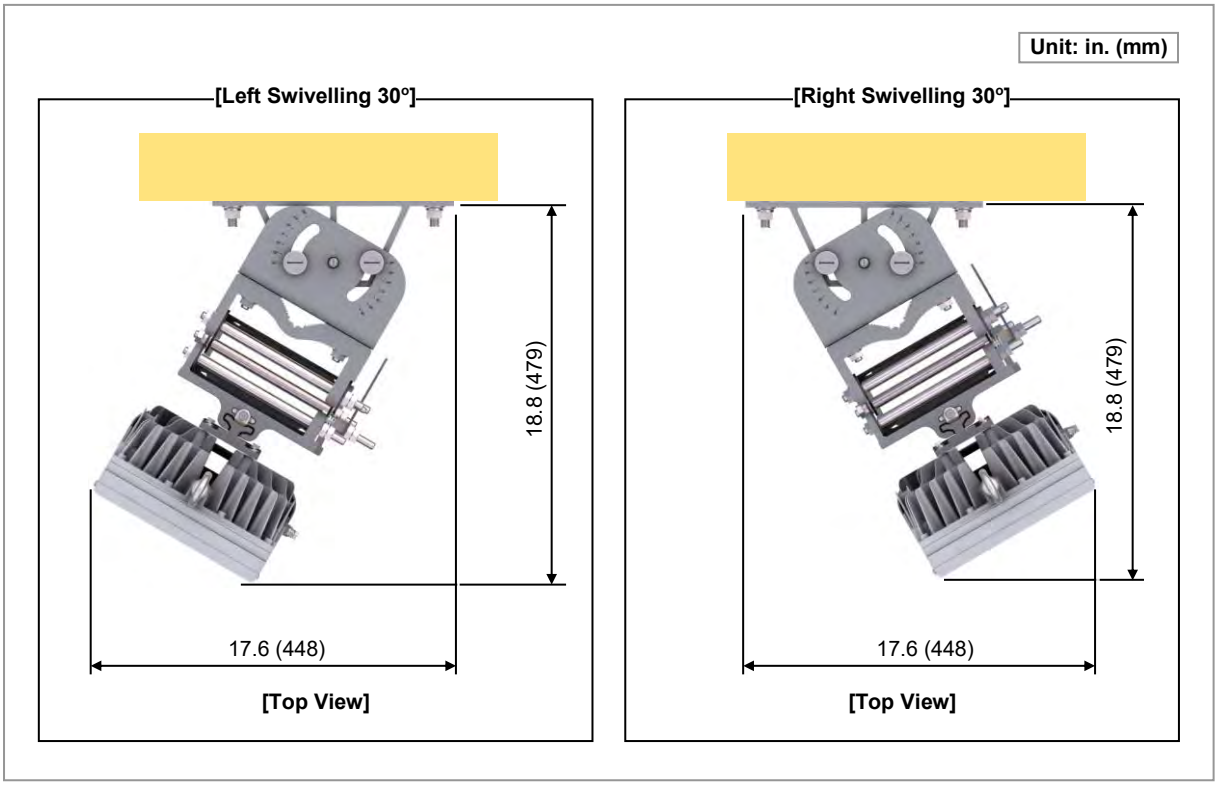
Pole Size (Diameter)	Length of Stud Bolt
50 A, 65 A, 80 A, 90 A, 100 A	8.7 in. (220 mm)

Figure 5. MMU Arrangement_Wall Type Installation



The dimensions of the front of the MMU change according to the tilt angle, and the maximum dimensions are described in the figure below (MMU Arrangement_ Down Tilting 15°).

Figure 6. MMU Arrangement_Swivelling



The dimensions of the front of the MMU change according to the tilt angle, and the maximum dimensions are described in the figure below (MMU Arrangement_ Left, Right Swivelling 30°).

Transporting and Unpacking

This section describes how to transport the items to the installation place and provides the procedure to unpack cabinets and other components.

Bringing in Items

Ensure the following at each stage of transportation of the items:

- Before moving a system, check storage place for the system and remove obstacles in advance.
- When carrying the system:
  - Fasten the system firmly to the transport vehicle or carrier to prevent damage to the system from a vibration or shock.
  - Use an elevator to prevent accidents. However, if the system must be carried by people, ensure there are enough people to carry the system.
- The system must not be shocked physically.
- The system should be protected from dust, moisture, and static electricity.

Unpacking

To unpack the items, ensure the following:

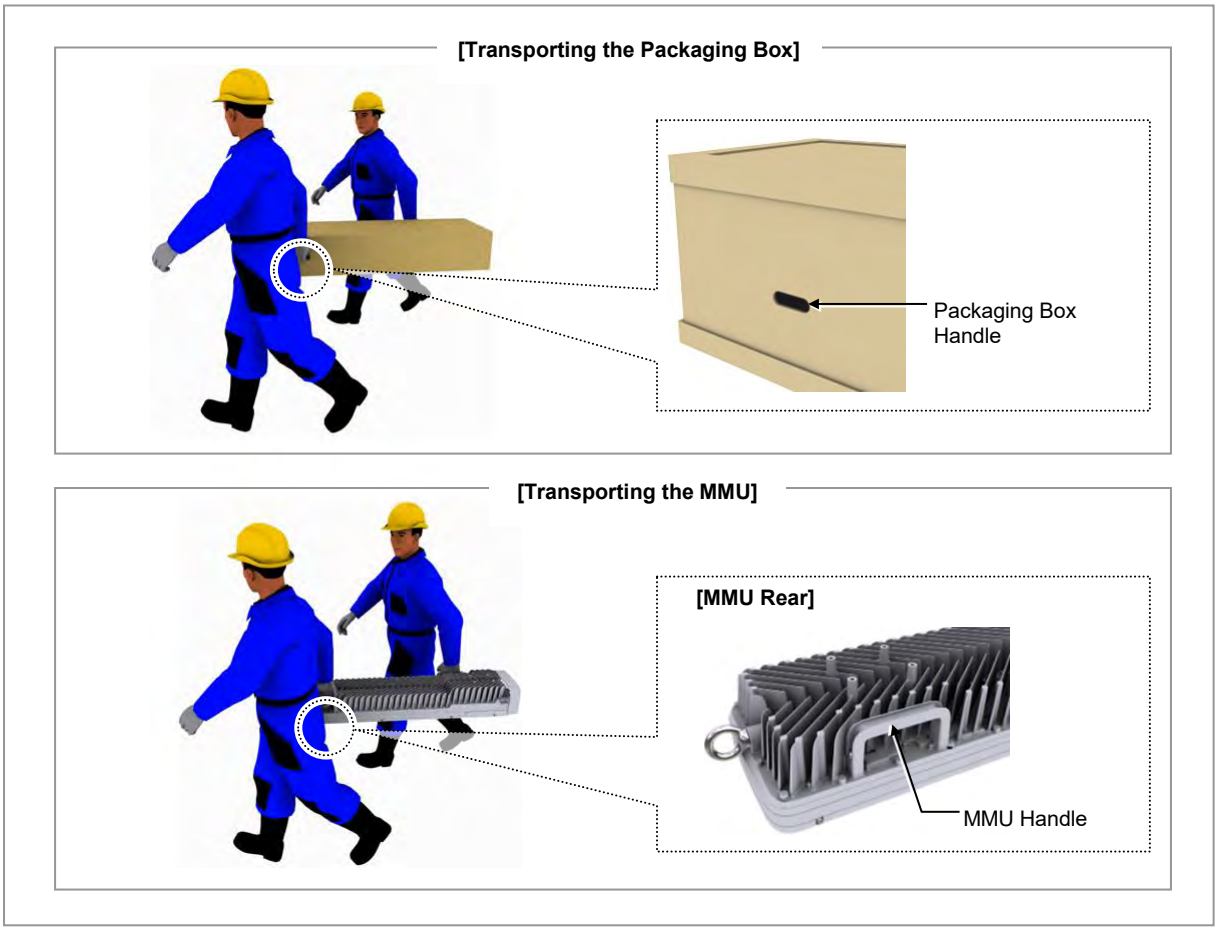
- The items must be packed until they reach the installation place.
- The items are classified in accordance with each job specification and stored at a place that does not interfere with working.
- Unpacked systems must be installed immediately. If immediate installation of the systems is not planned,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

MMU Handling

When moving the MMU or its packaging box, use the handles located on both sides of the MMU or its packaging box.

Lifting Hazard
Single person lift could cause injury. Get help when moving or lifting.

Figure 7. Transporting the MMU



Fixing MMU

This section describes the procedures to fix the MMU by different methods.

Fixing Unit Bracket

These instructions for mounting a unit bracket to the MMU apply to all installation types.

To fix the unit bracket, do the following:

Prerequisites

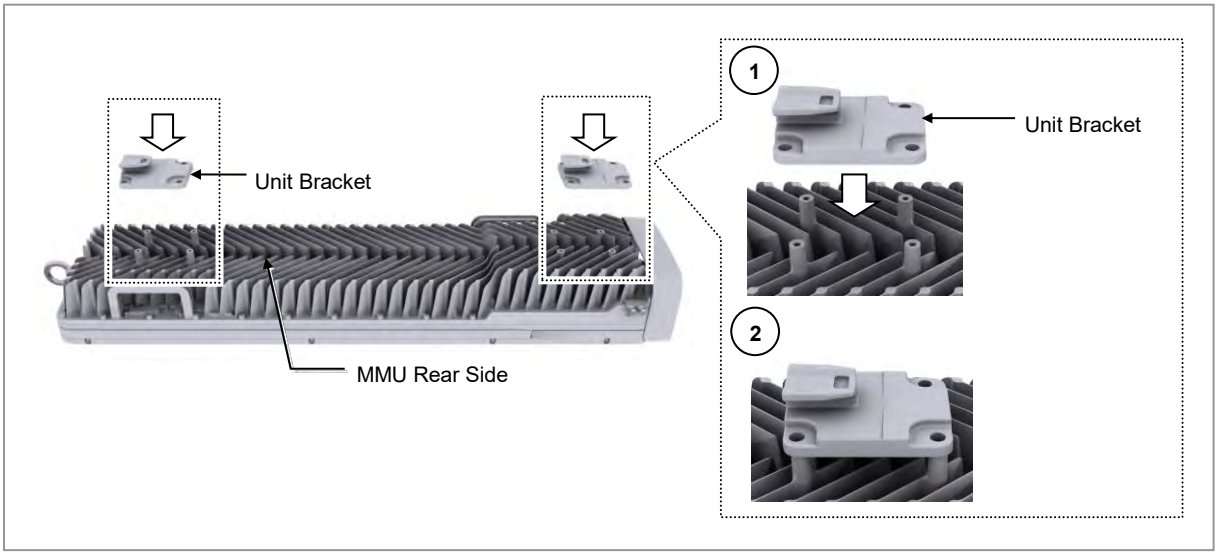
Before proceeding with fixing the unit bracket, make sure that you have the items mentioned in the table below:

Table 2. Parts and Tools for Fixing Unit Bracket on MMU

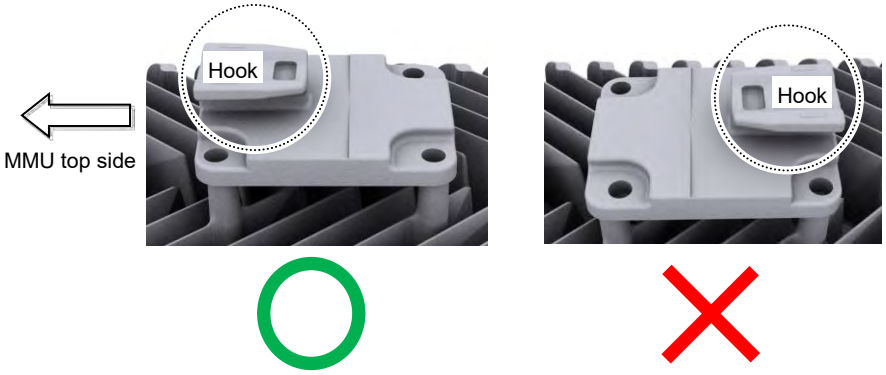
Category	Description		
Parts	Unit Bracket		2 EA
	Fasteners	M6 × L20 hexagonal bolt (Washer assembly)	8 EA
Recommended Torque Value	M6 Hex. Bolt		43 lbf·in
Working Tools	• Torque Wrench (10 to 50 lbf·in) • Torque Wrench Spanner Head (apply hexagonal head: 10 mm) • Spanner (apply hexagonal head: 10 mm)		

1 Check the position for mounting the unit bracket on the back of the MMU and place it in that position.

Figure 8. Fixing Unit Bracket (1)

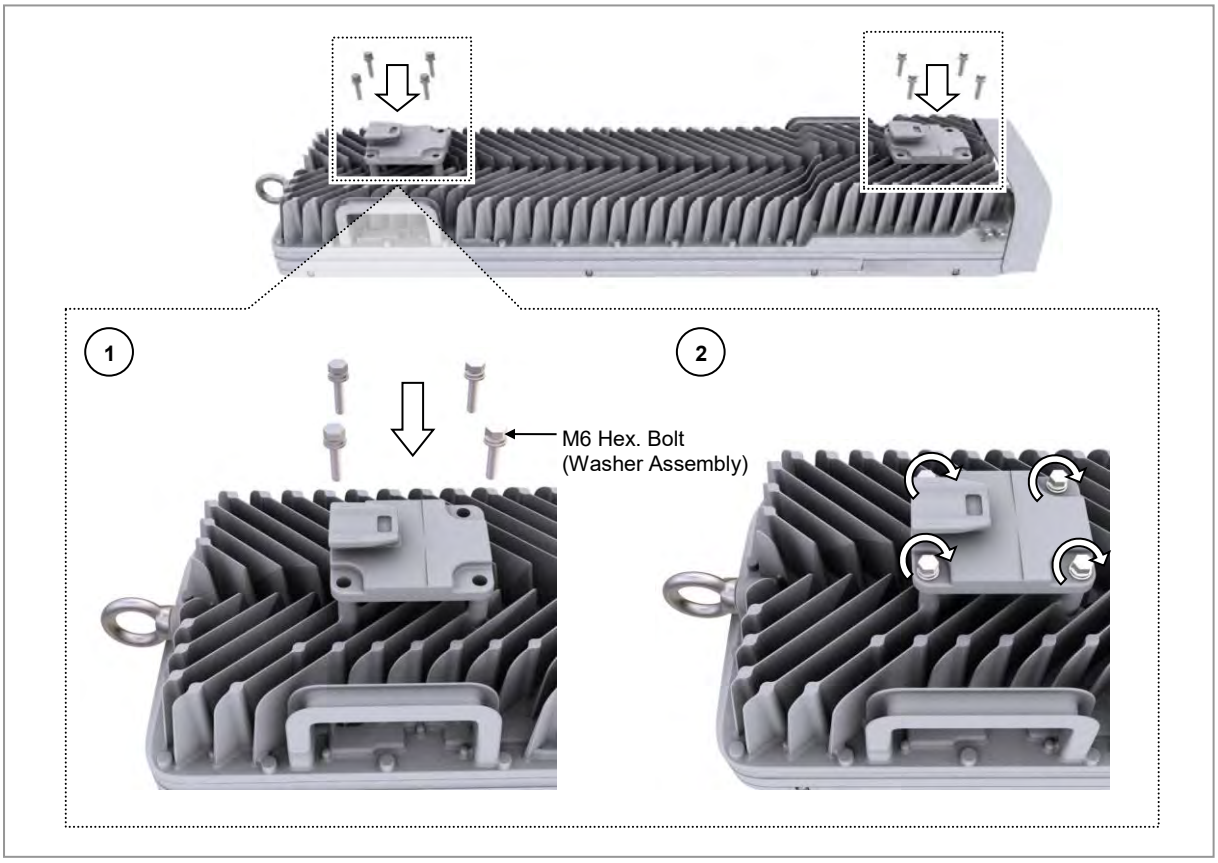


The hooks of the unit brackets should be oriented toward the top of the MMU.



2 Fix the unit bracket using fasteners.

Figure 9. Fixing Unit Bracket (2)



Fixing Pole Type

This section describes the procedures for fixing the system on the pole.

Assembling Pole Mount Bracket-Bottom

To assemble the pole mount bracket-bottom for do the following:

Prerequisites

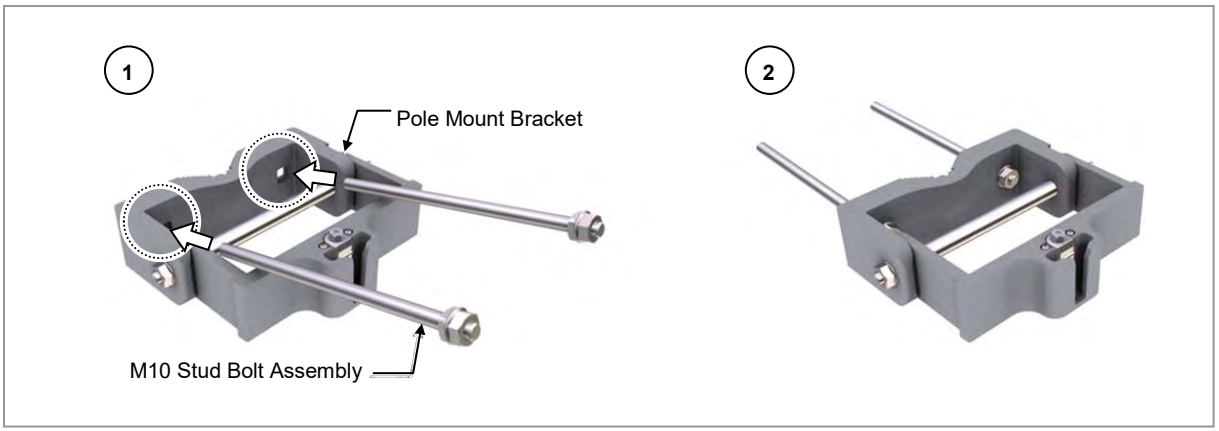
Before proceeding with assembling the pole mount bracket-bottom, make sure that you have the items mentioned in the table below:

Table 3. Parts and Tools for Assembling Pole Mount Bracket-Bottom

Category	Description		
Parts	Mounting Bracket-Bottom Assembly		1 EA
	Rear Bracket		1 EA
	Fasteners	M10 × L220 Stud Bolt Assembly	2 EA
		M10 Flange Nut M10 Hexagon Nut	2 EA 2 EA
Recommended Torque Value	M10 Nut		217 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm) • Spanner (17 mm)		

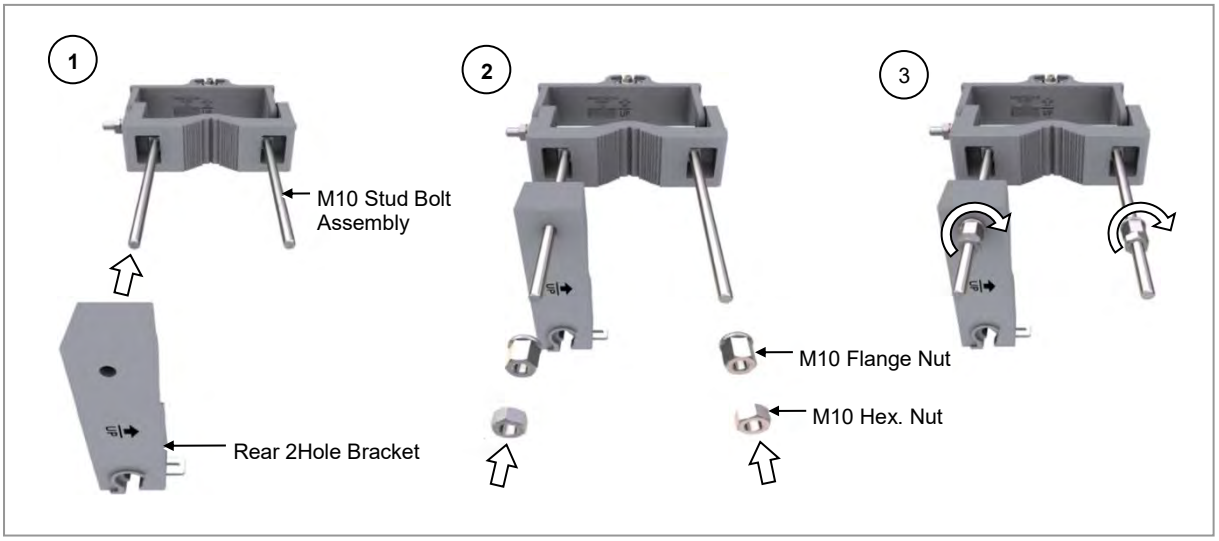
1 Pass the stud bolt assembly through the pole mount bracket holes.

Figure 10. Fixing Pole Mount Bracket-Bottom (1)

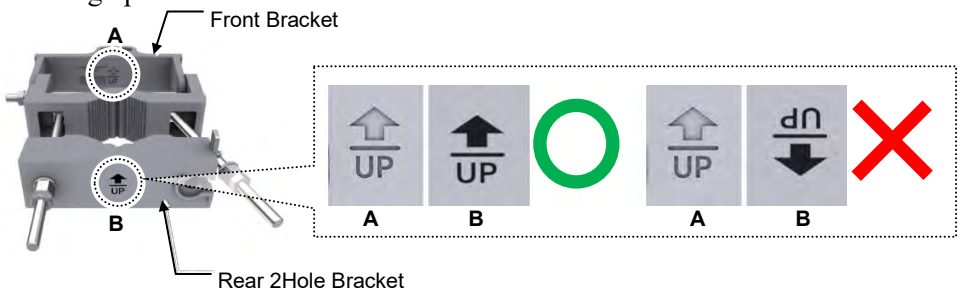


2 Insert the rear bracket into the stud bolt assembly and tighten the fasteners temporarily.

Figure 11. Fixing Pole Mount Bracket-Bottom (2)

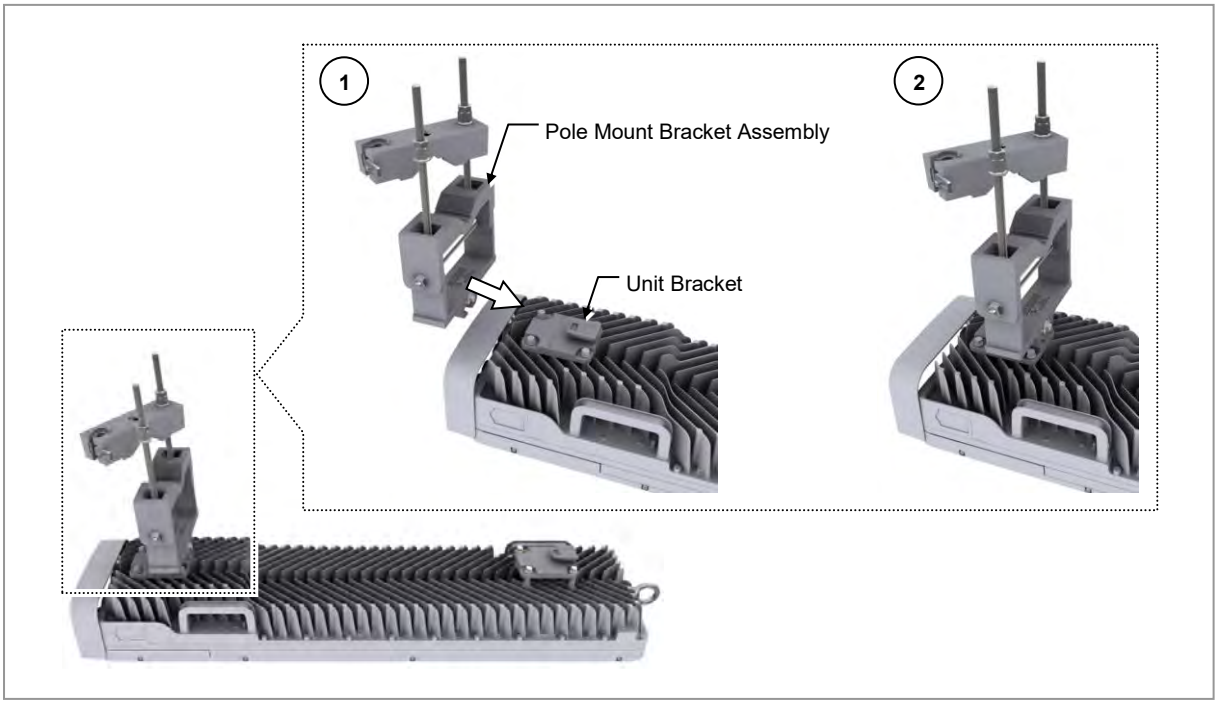


When assembling the front bracket and rear 2hole bracket, make sure the up mark is facing upward.



3 Slide the latch of the unit bracket until the lock of the pole-mount bracket assembly is engaged.

Figure 12. Fixing Pole Mount Bracket-Bottom (3)



If the latch of the unit bracket is not fully inserted and fixed, the pole-mount bracket assembly may detach and fall, which can damage the equipment. Ensure that it is fully fixed before proceeding to the next step.

Assembling Pole Mount Bracket-Top

To assemble the pole mount bracket-top for do the following:

Prerequisites

Before proceeding with assembling the pole mount bracket-top, make sure that you have the items mentioned in the table below:

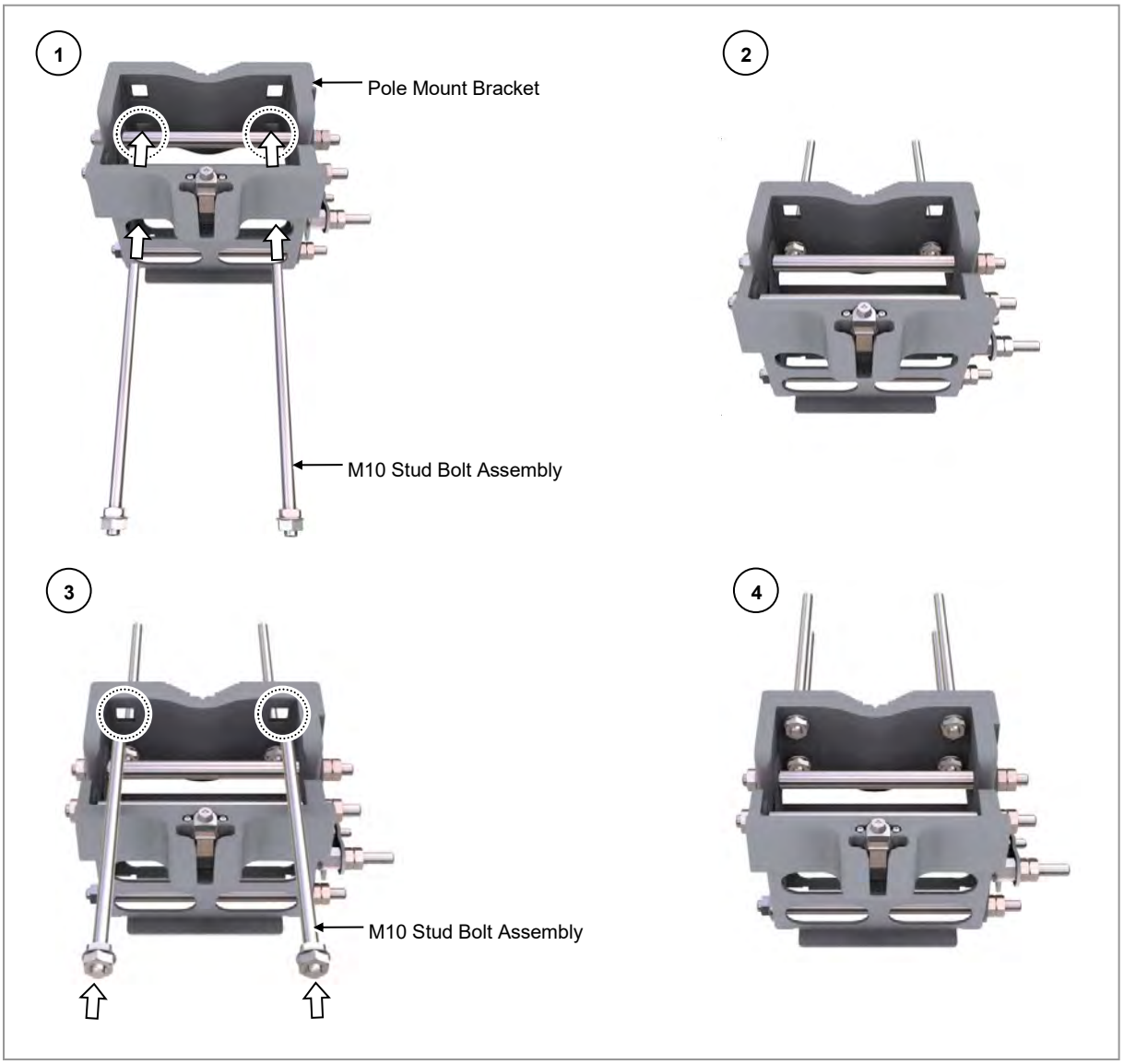
Table 4. Parts and Tools for Fixing Pole Mount Bracket-Top

Category	Description		
Parts	Mounting Bracket-Top Assembly		1 EA
	Rear Bracket		1 EA
	Fasteners	M10 × L220 Stud Bolt Assembly	4 EA
		M10 Flange Nut M10 Hexagon Nut	4 EA 4 EA
Recommended Torque Value	M10 Nut		217 lbf·in

Category	Description
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm) • Spanner (17 mm)

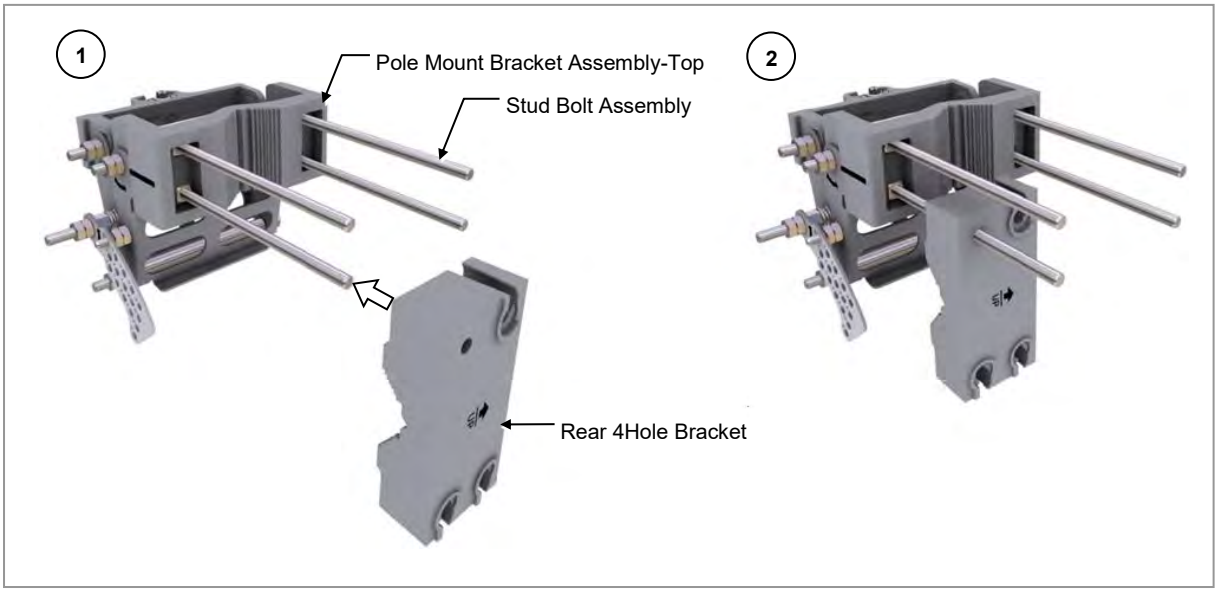
1 Pass the stud bolt assembly through the pole mount bracket holes.

Figure 13. Fixing Pole Mount Bracket-Top (1)



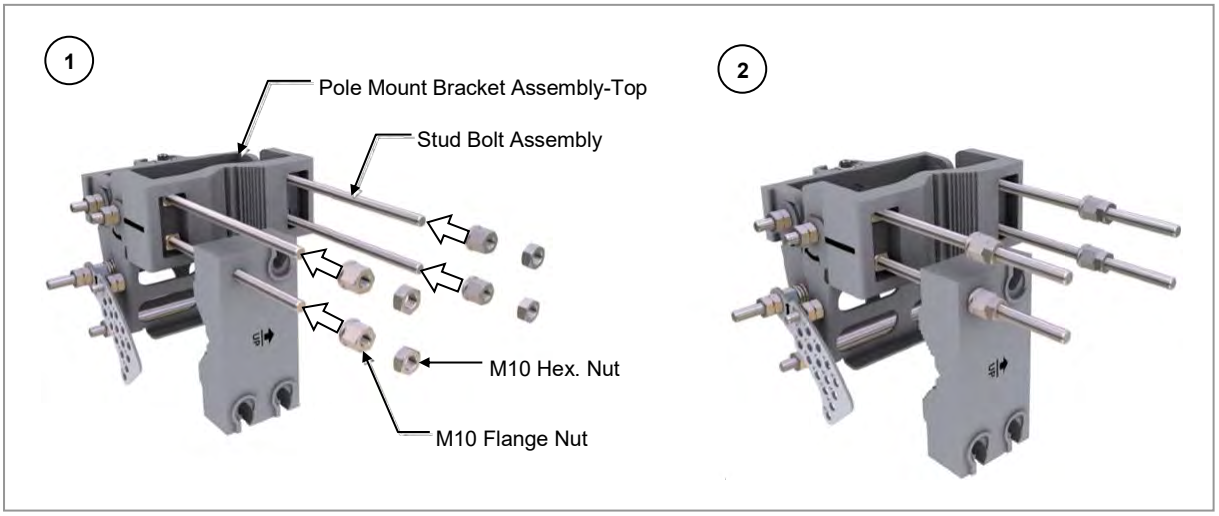
2 Insert the rear 4-hole bracket into the stud bolt.

Figure 14. Fixing Pole Mount Bracket-Top (2)

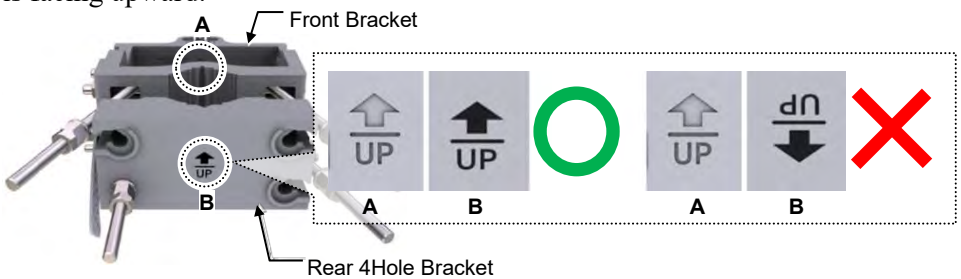


3 Fix the fasteners temporarily.

Figure 15. Fixing Pole Mount Bracket-Top (3)



When assembling the front bracket and rear 4hole bracket, make sure the up mark is facing upward.



Lifting MMU & Pole Mount Bracket Assembly-Top

To lift the MMU, do the following:

1 Tie the rope in two carrying points of MMU.

Figure 16. Lifting MMU & Pole Mount Bracket Assembly-Top (1)

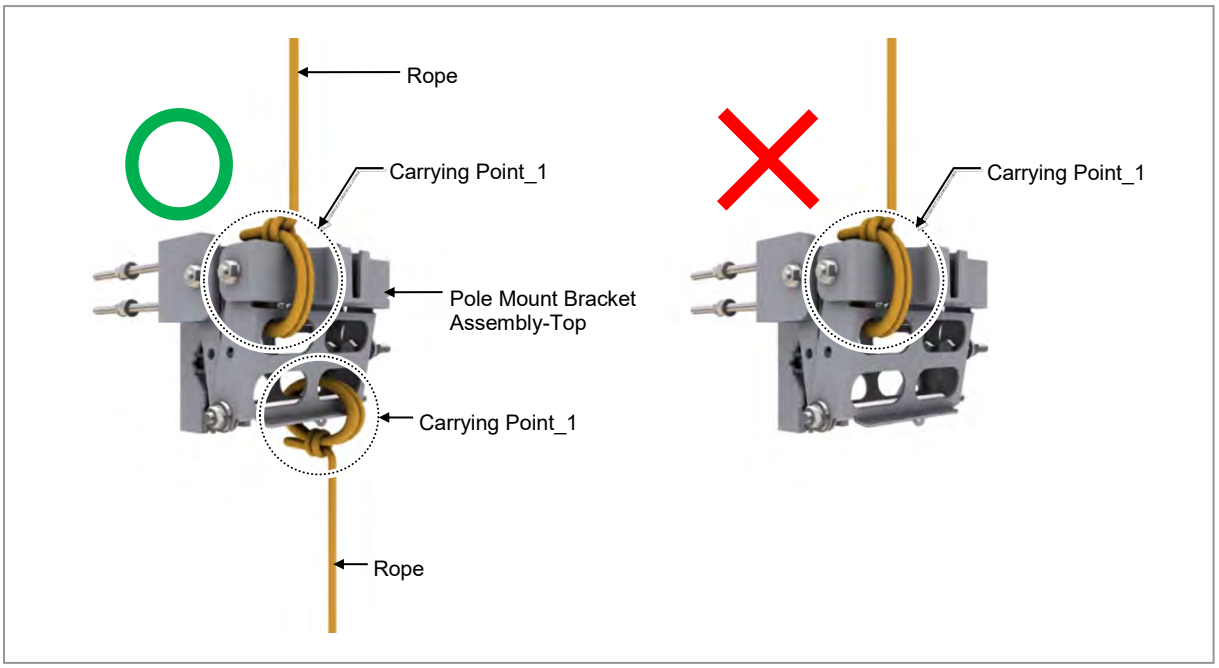
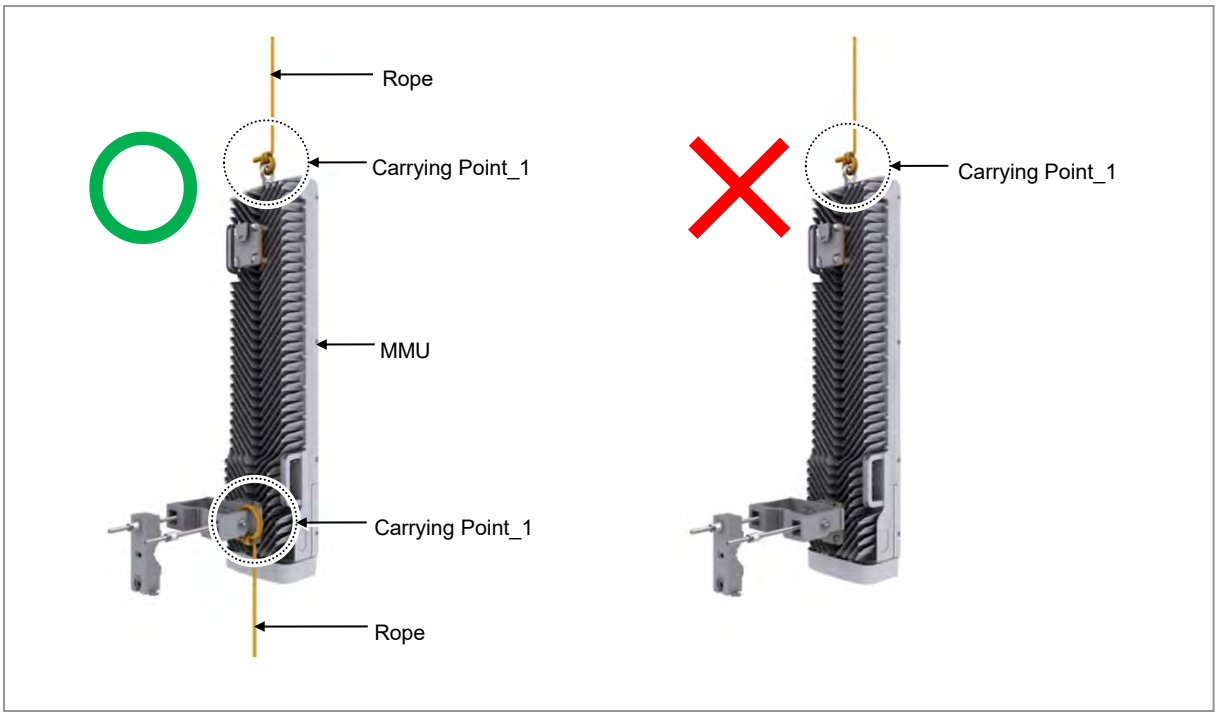


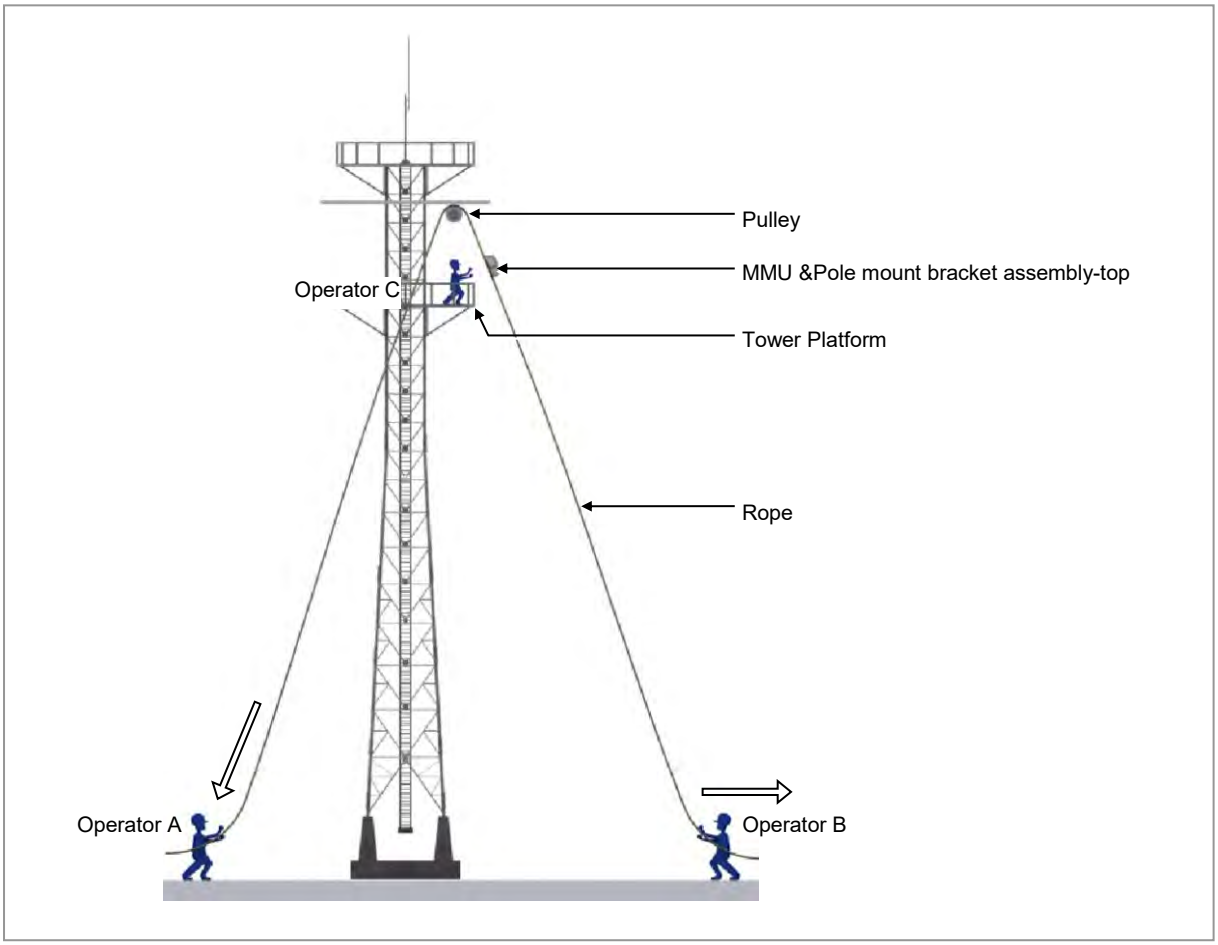
Figure 17. Lifting MMU & Pole Mount Bracket Assembly-Top (2)



2 While Operator A hauls the rope to carry up the MMU, Operator B pulls the rope outward, so that MMU would not hit the tower platform.

3 Operator C catches the MMU when the MMU arrives at the tower platform.

Figure 18. Lifting MMU & Pole Mount Bracket Assembly-Top (3)



Fixing Pole Mount Bracket Assembly-Top on the Pole

To fix the pole mount bracket assembly-top on the pole, do the following:

Prerequisites

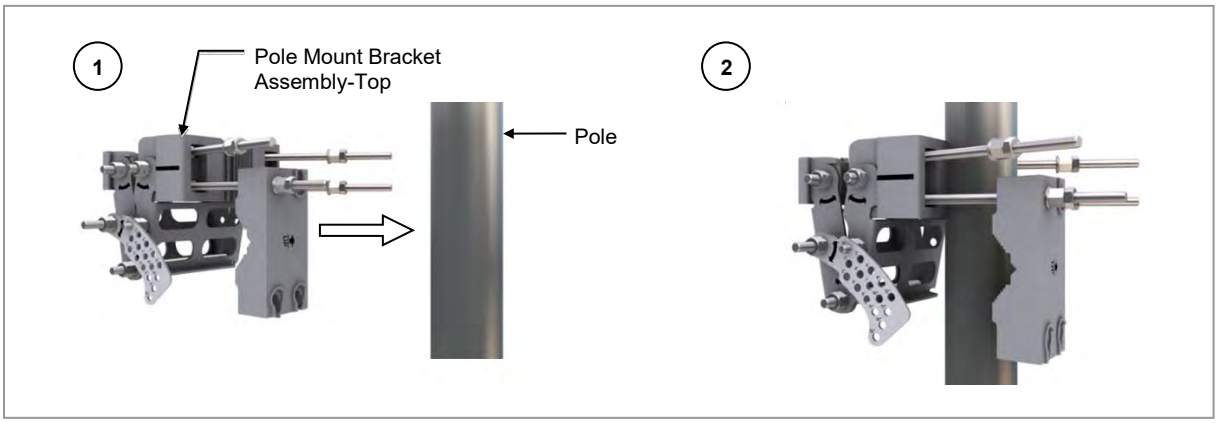
Before proceeding with fixing the pole mount bracket assembly-top on the pole, make sure that you have the items mentioned in the table below:

Table 5. Parts and Tools for Fixing Pole Mount Bracket Assembly-Top

Category	Description	
Parts	Pole Mount Bracket Assembly-Top	1 EA
Recommended Torque Value	M10 Nut	217 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm) • Spanner (17 mm)	

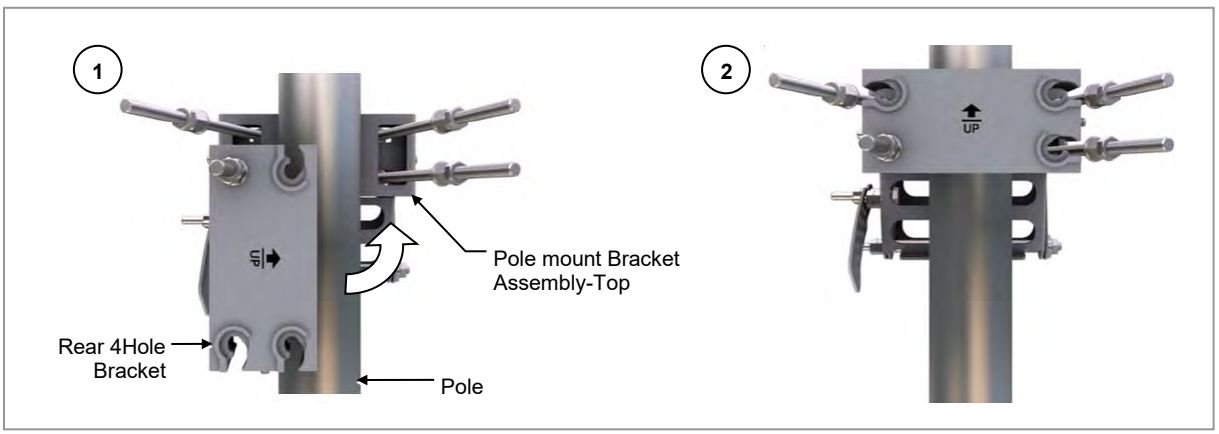
1 Place a pole mount bracket assembly-top to the pole.

Figure 19. Fixing Pole Mount Bracket Assembly-Top (1)



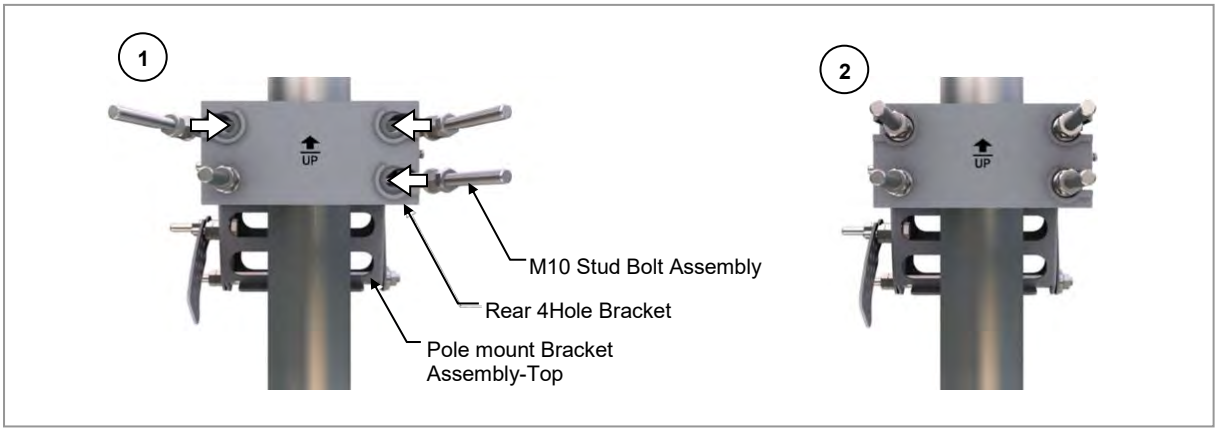
2 Place the rear 4-hole bracket horizontally in the fixed position.

Figure 20. Fixing Pole Mount Bracket Assembly-Top (2)



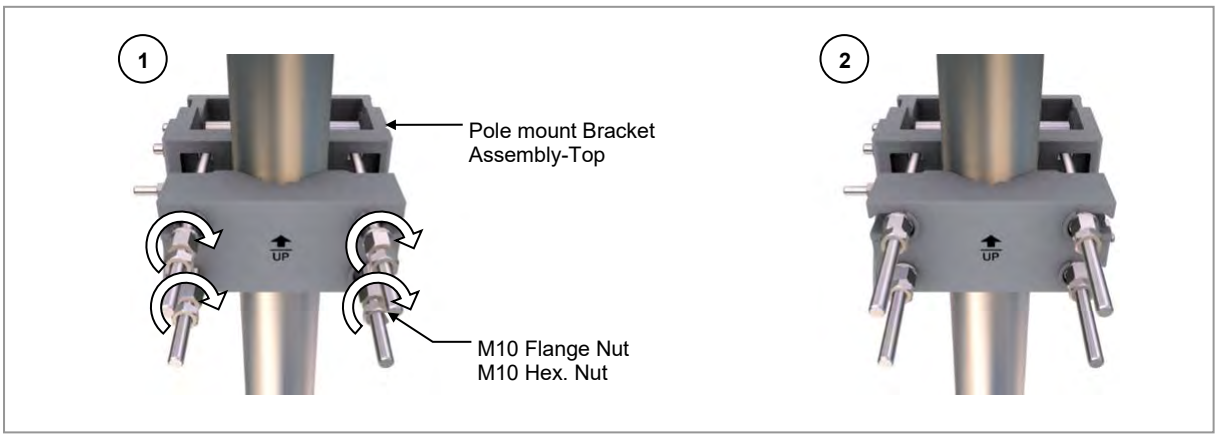
3 Insert the three loosened stud bolt assemblies into the fixing hole of the rear 4-hole bracket.

Figure 21. Fixing Pole Mount Bracket Assembly-Top (3)

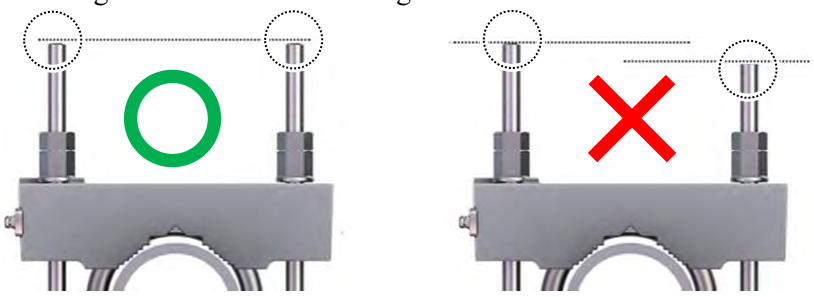


4 Tighten the flange and the hexagon nuts that are fastened to the stud bolt assembly.

Figure 22. Fixing Pole Mount Bracket Assembly-Top (4)

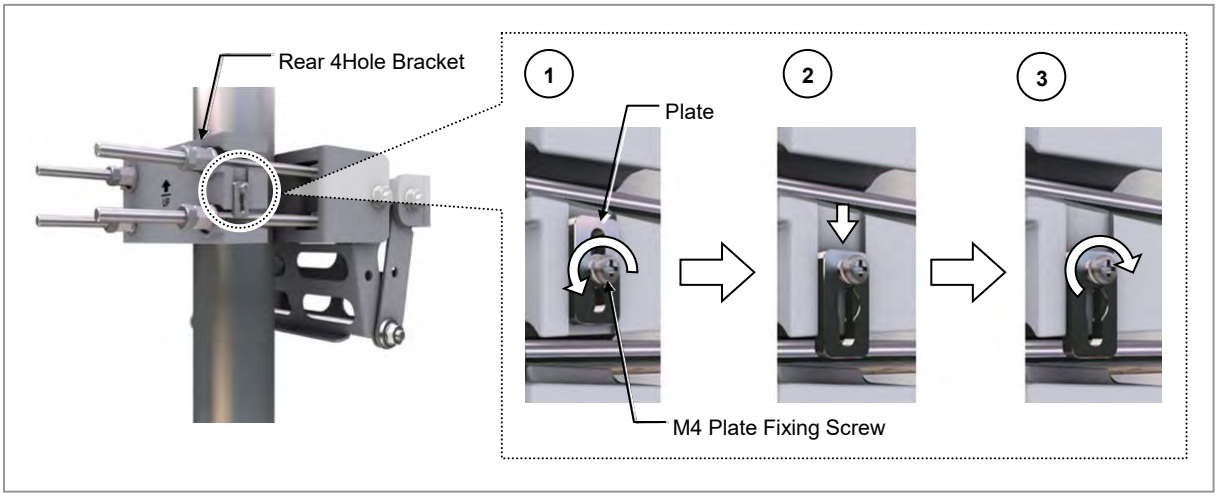


The length of the stud bolts through the rear brackets must be the same.

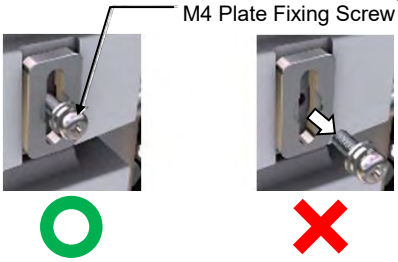


5 Turn it to the left of the plate fixed to the top and bottom of the back of the rear 4hole bracket by rotating them counterclockwise and re-fix the plate.

Figure 23. Fixing Pole Mount Bracket Assembly-Top (5)

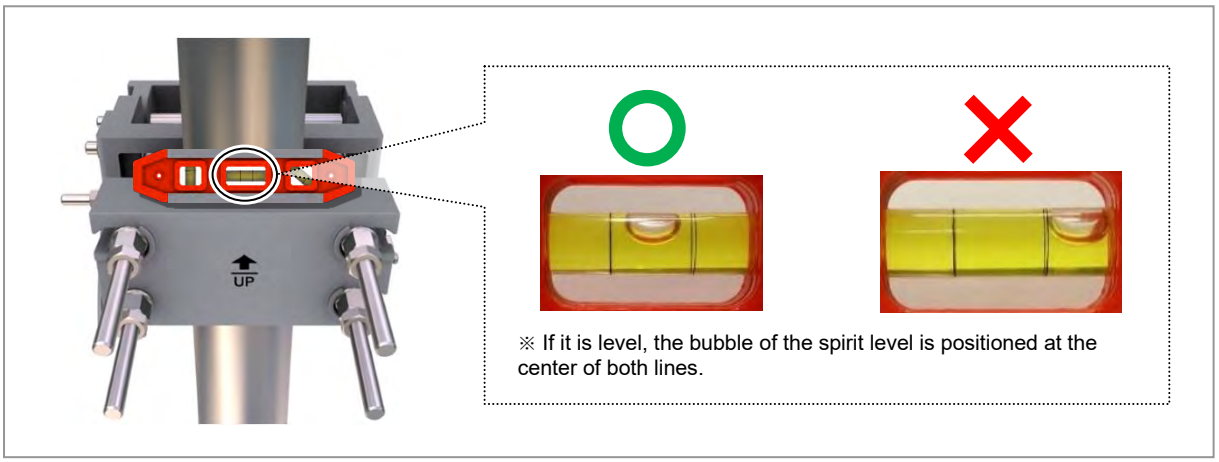


Do not take the fasteners out completely.



6 Check the level of pole mount bracket assembly-top on the pole and adjust the level.

Figure 24. Fixing Pole Mount Bracket Assembly-Top (6)



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

When occurring poor levelling, adjust the position of fasteners used to fix the pole

mount bracket assembly-top or its levelling status.

Fixing MMU on the Pole

To fix the MMU on the pole, do the following:

Prerequisites

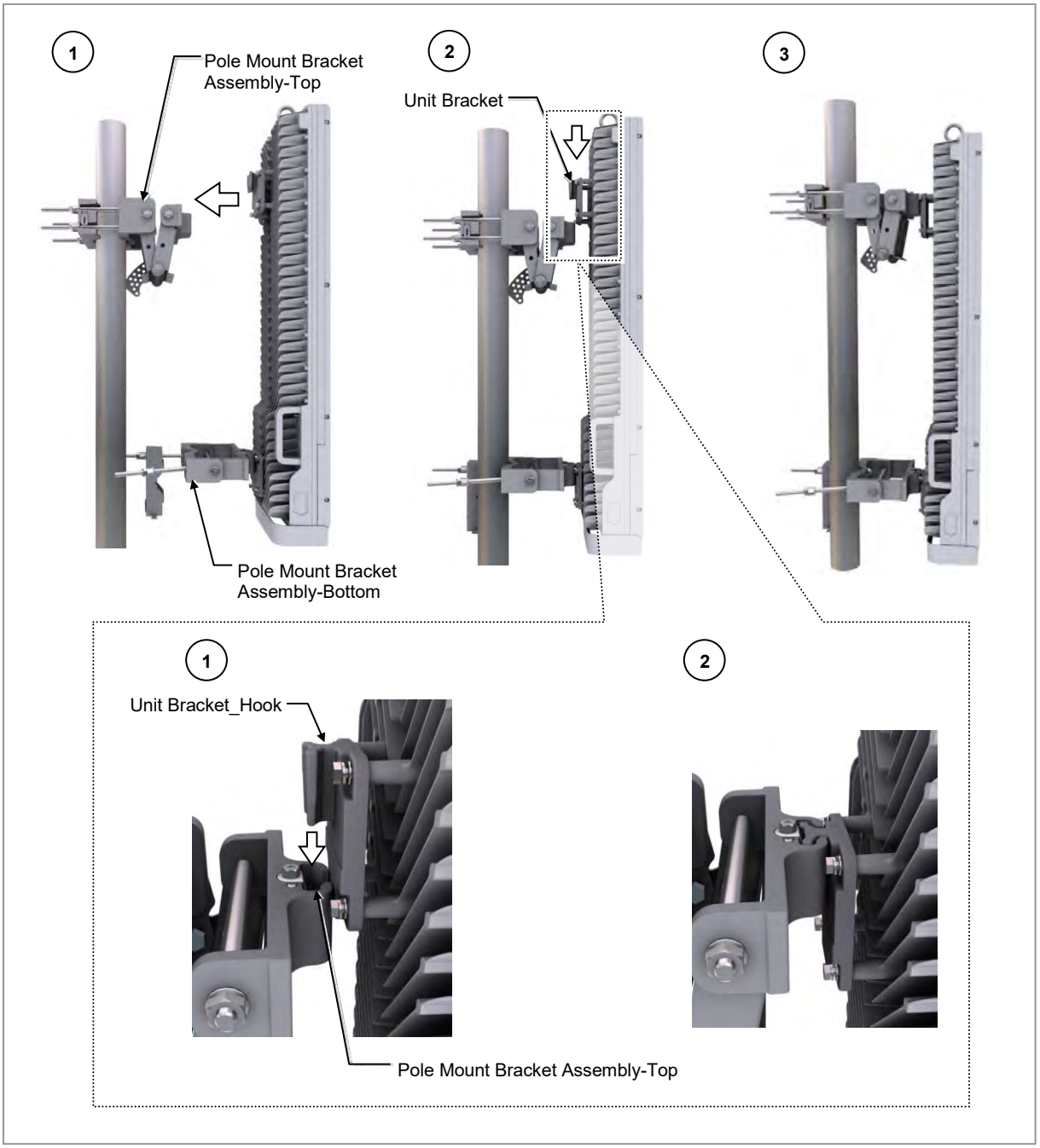
Before proceeding with fixing the MMU on the pole, make sure that you have the items mentioned in the table below:

Table 6. Parts and Tools for Fixing MMU on the Pole

Category	Description	
Recommended Torque Value	M10 Nut	217 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm) • Spanner (17 mm)	

1 Hang the unit bracket hook of MMU on the pole mount assembly-top hook's groove.

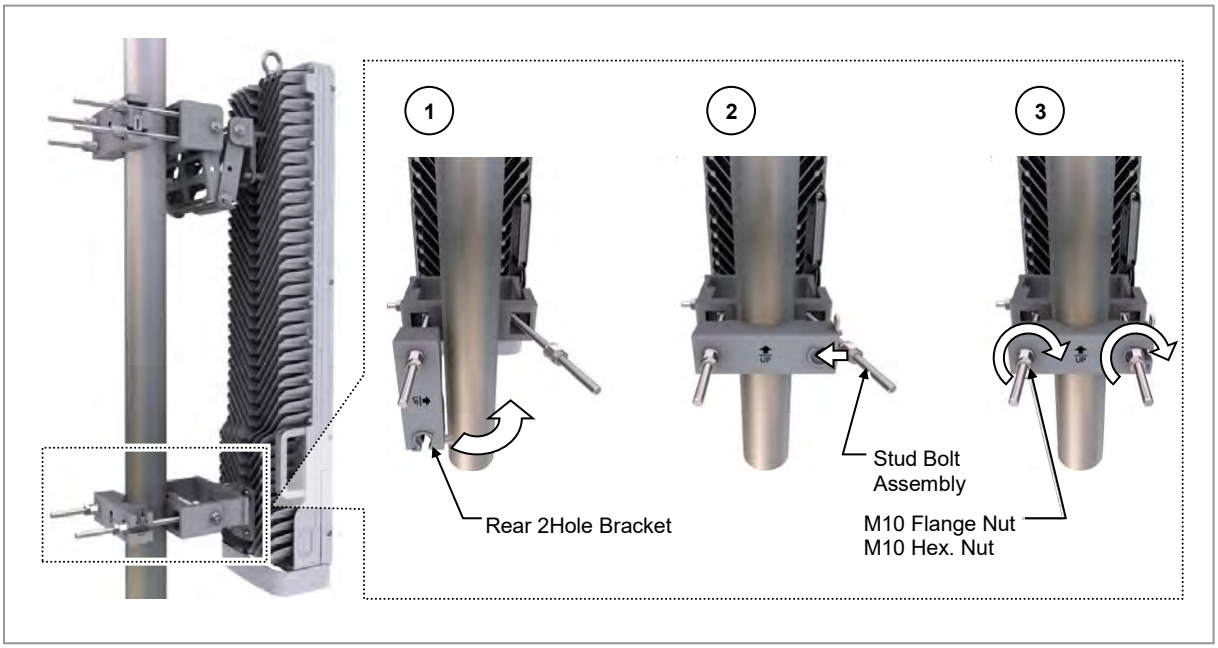
Figure 25. Fixing MMU on the Pole (1)



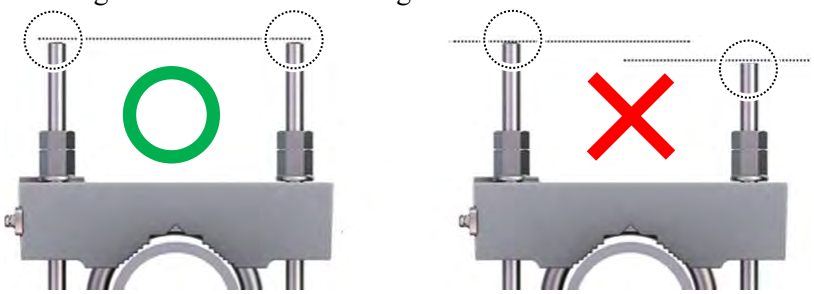
When the MMU is fixed to the mount bracket assembly, the hooks of the unit brackets must be completely inserted into the fixing grooves of the mount bracket assembly. This ensures that the unit brackets stay intact during vibration or from external influences.

2 Place the rear 2-hole bracket horizontally in the fixed position, insert the stud bolt assembly into the rear 2-hole bracket fixing hole, and then fix the flange and the hexagon nuts.

Figure 26. Fixing MMU on the Pole (2)

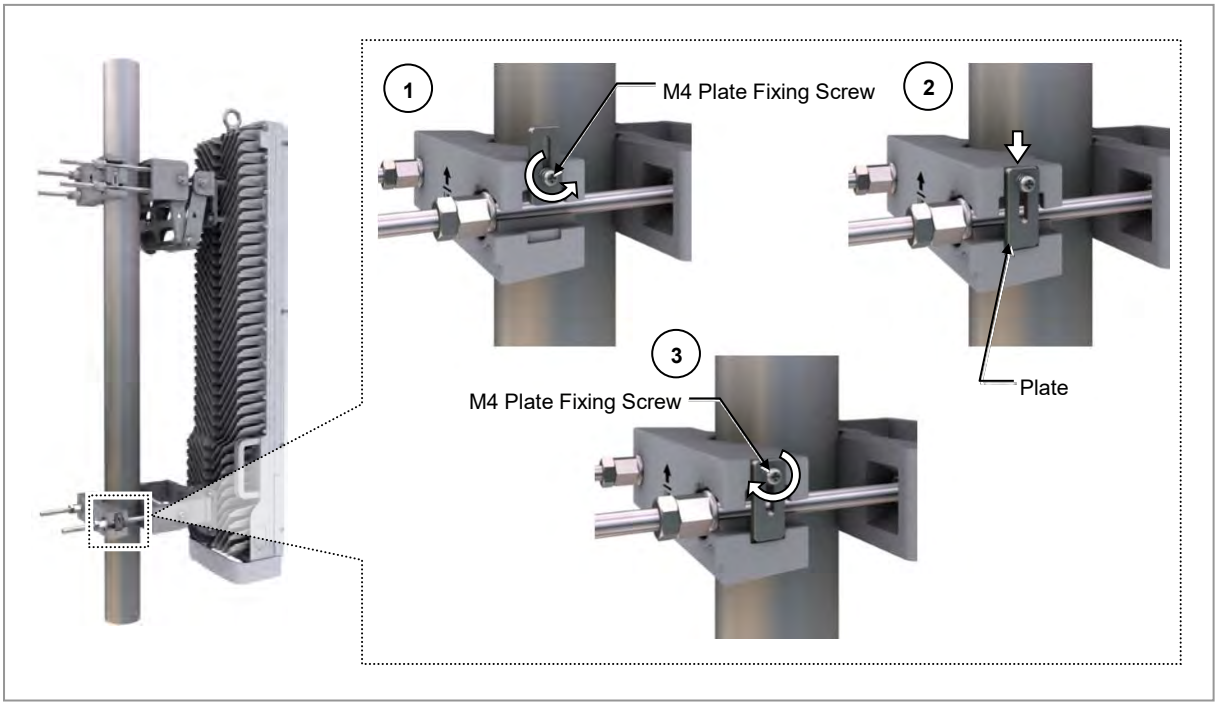


The length of the stud bolts through the rear brackets must be the same.

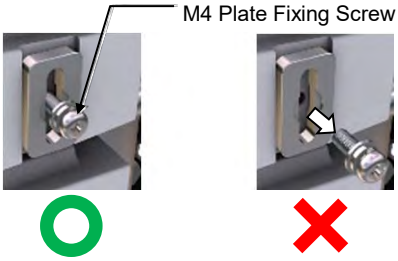


3 Turn it to the left of the plate fixed to the top and bottom of the back of the rear 2hole bracket by rotating them counterclockwise and re-fix the plate.

Figure 27. Fixing MMU on the Pole (3)



Do not take the fasteners out completely.



4 By using the RF alignment tool, check the tilt and the azimuth and adjust when there is an issue.

For detailed instructions of how to use the RF alignment tool, refer to the user manual per each manufacturer.

Fixing Wall Type

This section describes the procedures for fixing the system on the wall.

Marking

To marking, do the following:

Prerequisites

Before proceeding with the marking, make sure that you have items mentioned in the following table

Table 7. Tools for Marking

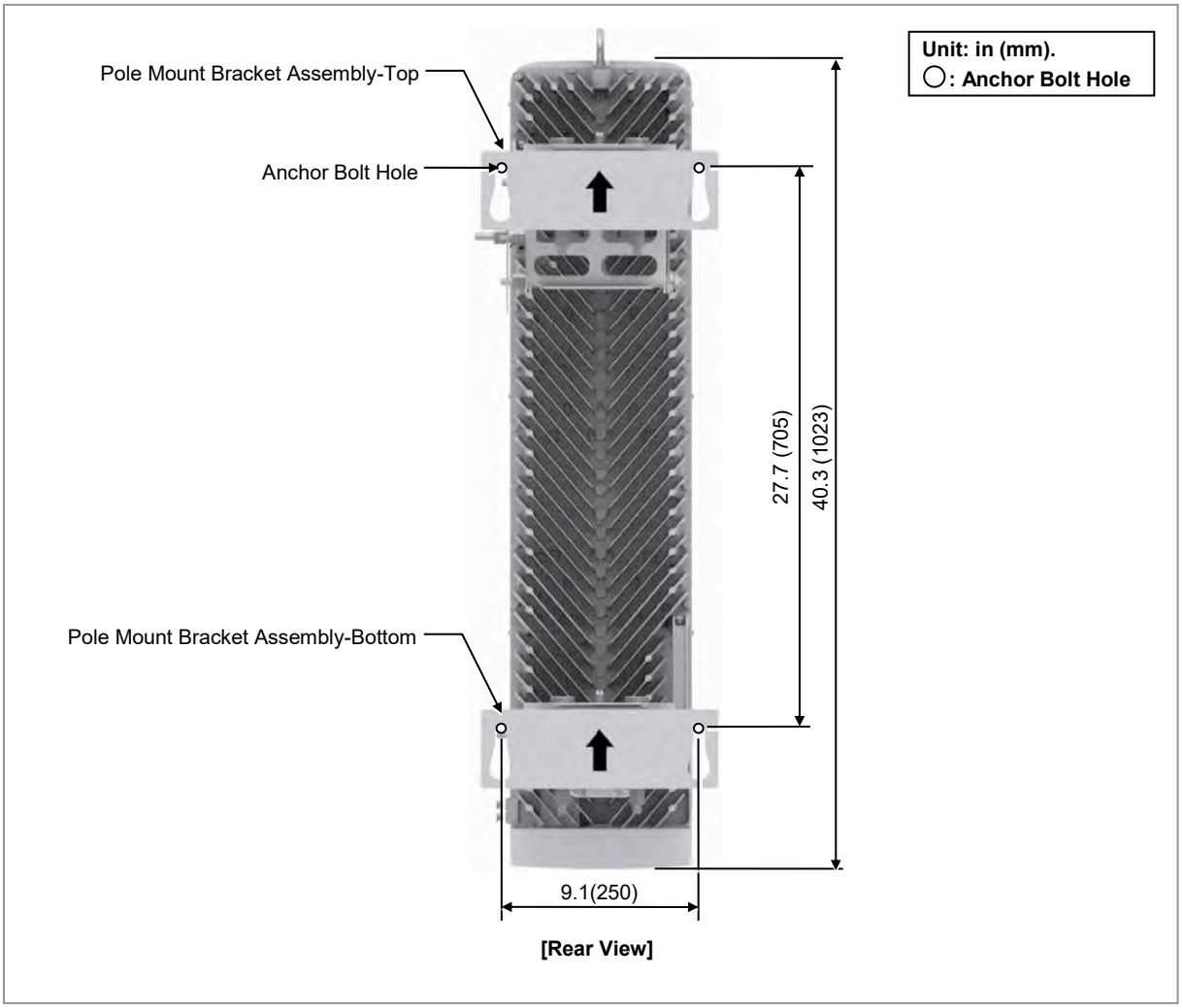
Category	Description
Working Tools	• Tape Measure • Permanent Maker • Level

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

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

1 Check the distance between the location for fixing the MMU and the anchor bolt hole.

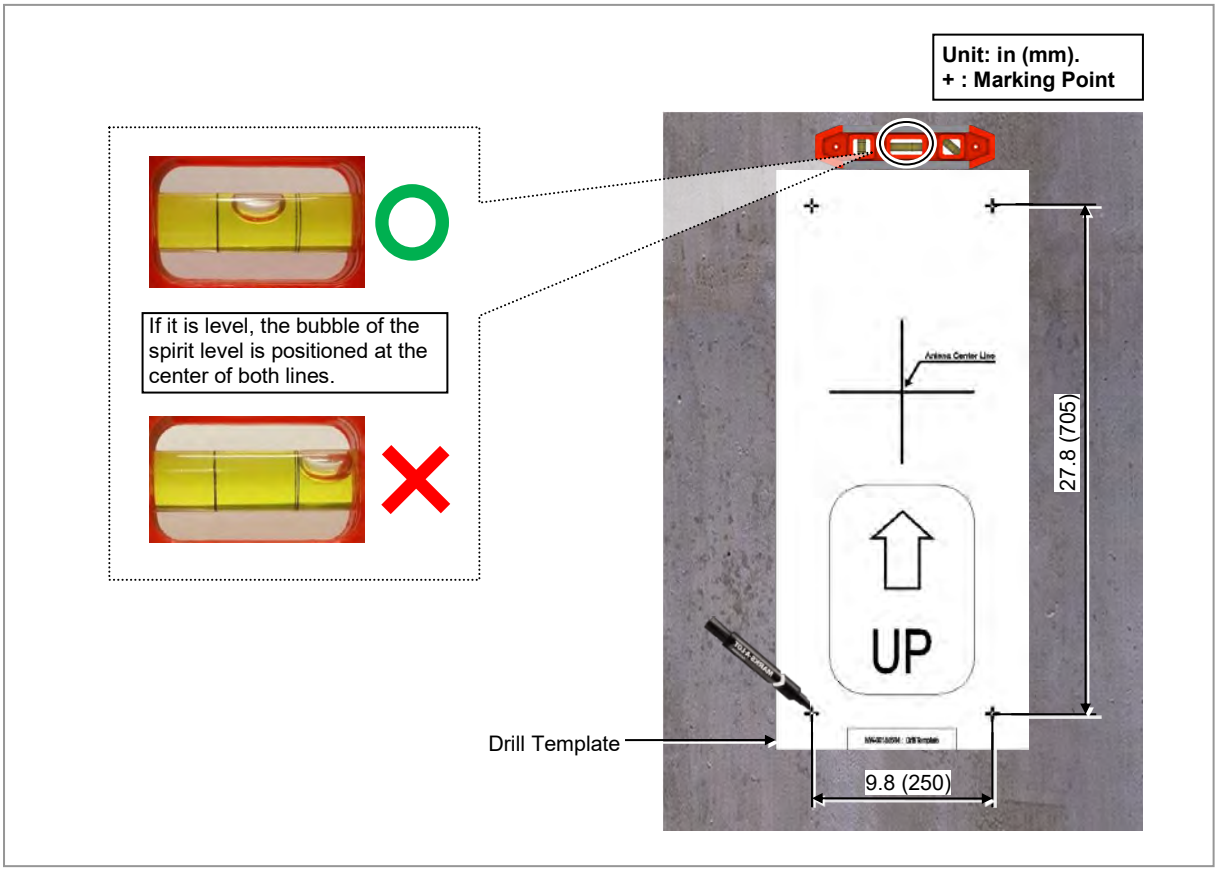
Figure 28. MMU Marking Dimensions



2 Place a marking paper on the fixing location, and then check the level status using a level and adjust the level of marking paper.

3 If the level status is normal, mark the anchor bolt holes on a wall.

Figure 29. Marking_Wall Mount Bracket-Top Assembly



Drilling & Anchoring

To drill an anchor hole, do the following:

Prerequisites

Before proceeding with the drilling & anchoring process, make sure that you have items mentioned in the following table

Table 8. Parts and Tools for Drilling & Anchoring

Category	Description	
Parts	M12 Set Anchor Assembly	4 EA
Working Tools	• Hammer Drill • Concrete Drill Bit [0.7 in. (17 mm)] • Vacuum Cleaner • Hammer • Anchor Punch (for M12 Set Anchor)	

Table 9. Anchor Bolt Drill Bits and Hole Depth

Category	Anchor Bolt	Drill Bits	Hole Depth
Wall Type	M12	0.7 in. (17 mm)	2.2 in. (55 mm)

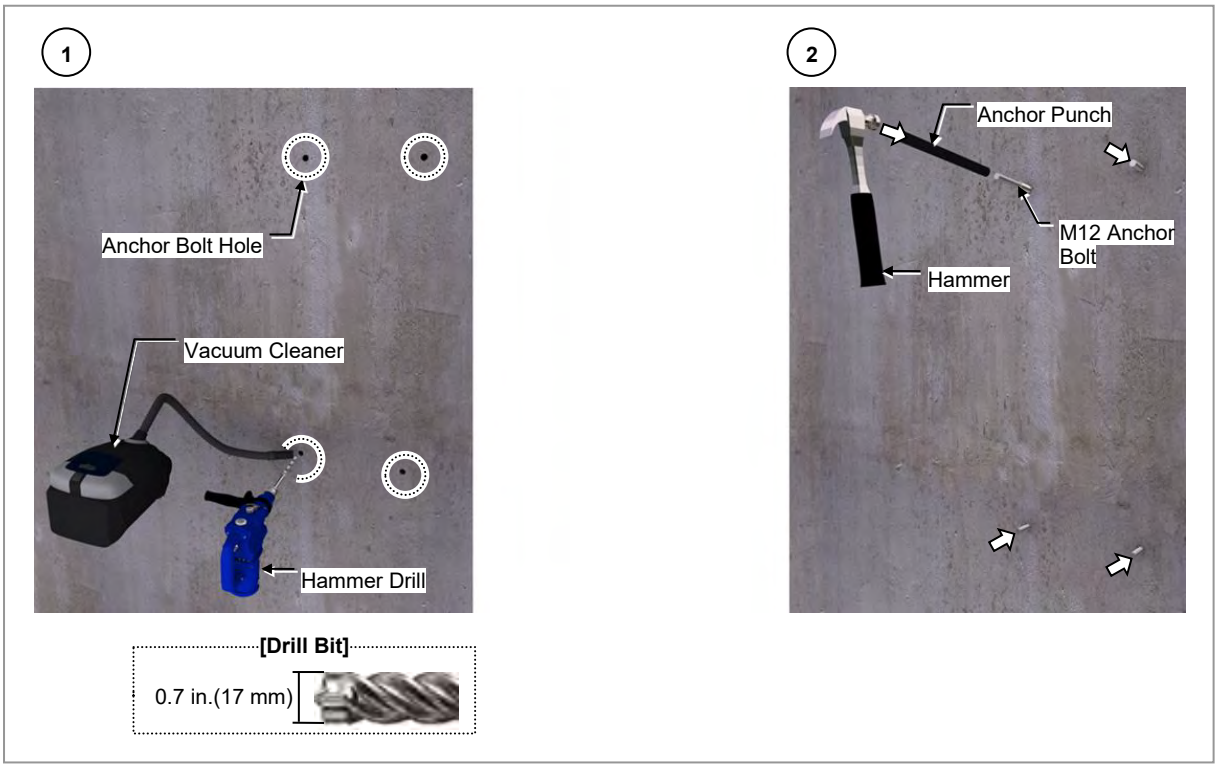
Category	Anchor Bolt	Drill Bits	Hole Depth
[Anchor Hole Cross Section] [O] [X] 2.2 in. (55 mm) * Remove the debris from the drilled hole.		0.7 in. (17 mm)	

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

Operator may drill after drill template is removed or remove the drill template after drilling according to the installation site conditions.

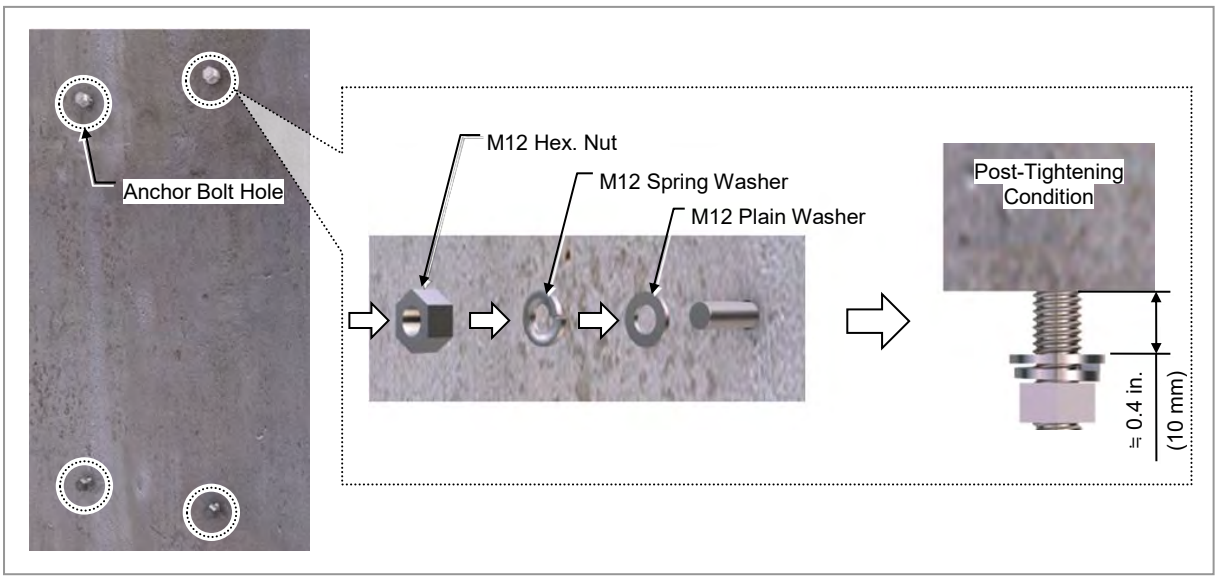
2 Fix set anchor to the drilled hole.

Figure 30. Drilling & Anchor (1)



3 Fix fasteners to anchor bolt temporarily.

Figure 31. Drilling & Anchor (2)



Fixing Mount Bracket-Top Assembly on the Wall

To fix the mount bracket-top assembly on the wall, do the following:

Prerequisites

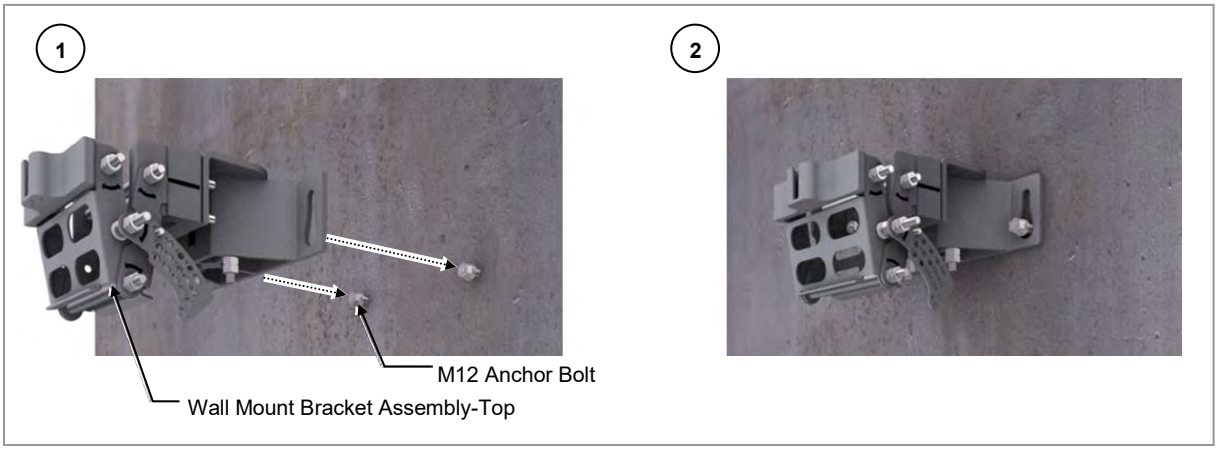
Before proceeding with fixing the mount bracket-top assembly on the wall, ensure that you have the items mentioned in the table below:

Table 10. Parts and Tools for Fixing Mount Bracket-Top Assembly

Category	Description	
Parts	Wall Mount Bracket Assembly-Top Assembly	
Recommended Torque Value	M12 hexagonal Nut	372 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner Head (apply hexagonal head: 19 mm) • Spanner (19 mm)	

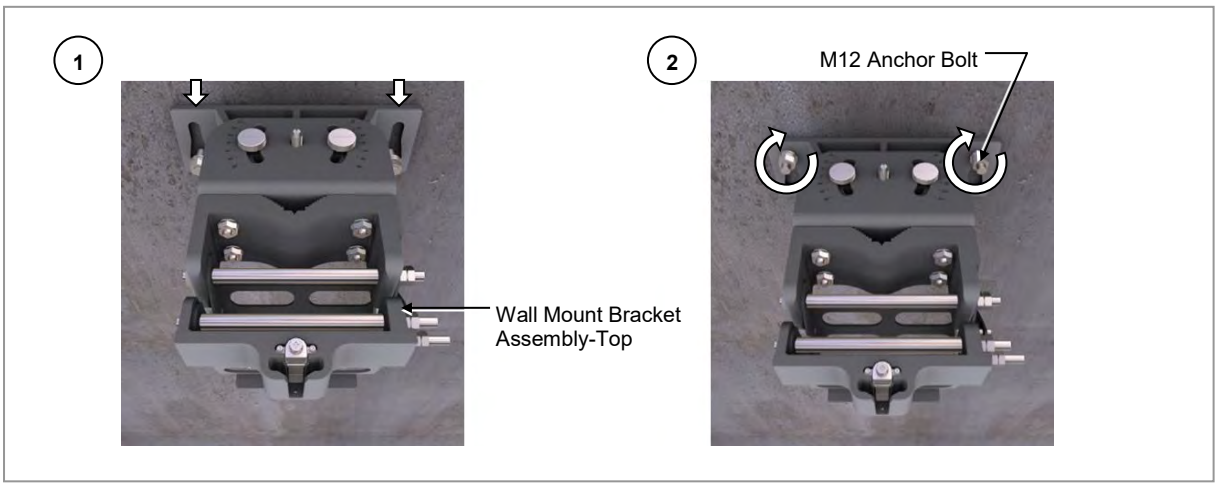
1 Hang the mounting bracket-top assembly fixing hole of MMU rear on the anchor bolt fixed to the wall.

Figure 32. Fixing Wall Mount Bracket-Top Assembly (1)



2 Fix mounting bracket-top assembly using fasteners at the right/left and top/bottom side of it.

Figure 33. Fixing Wall Mount Bracket-Top Assembly (2)



Assembling Pole Mount Bracket-Bottom

To assemble the pole mount bracket-bottom for do the following:

Prerequisites

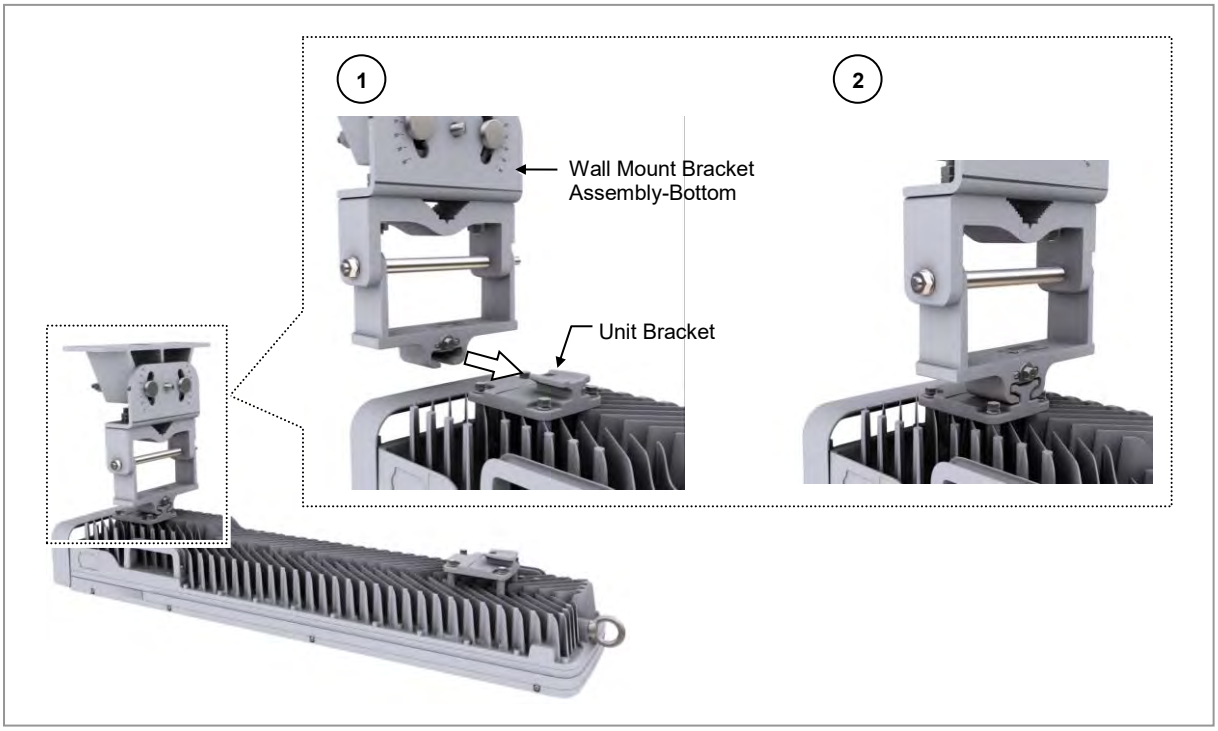
Before proceeding with assembling the pole mount bracket-bottom, make sure that you have the items mentioned in the table below:

Table 11. Parts and Tools for Assembling Wall Mount Bracket-Bottom

Category	Description	
Parts	Wall Mount Bracket Assembly-Bottom	1 EA

1 Slide the latch of the unit bracket until the lock of the wall mount bracket-bottom assembly is engaged.

Figure 34. Assembling Wall Mount Bracket-Bottom



If the latch of the unit bracket is not fully inserted and fixed, the wall mount bracket assembly may detach and fall, which can damage the equipment. Ensure that it is fully fixed before proceeding to the next step.

Fixing MMU on the Wall

To fix the MMU on the wall, do the following:

Prerequisites

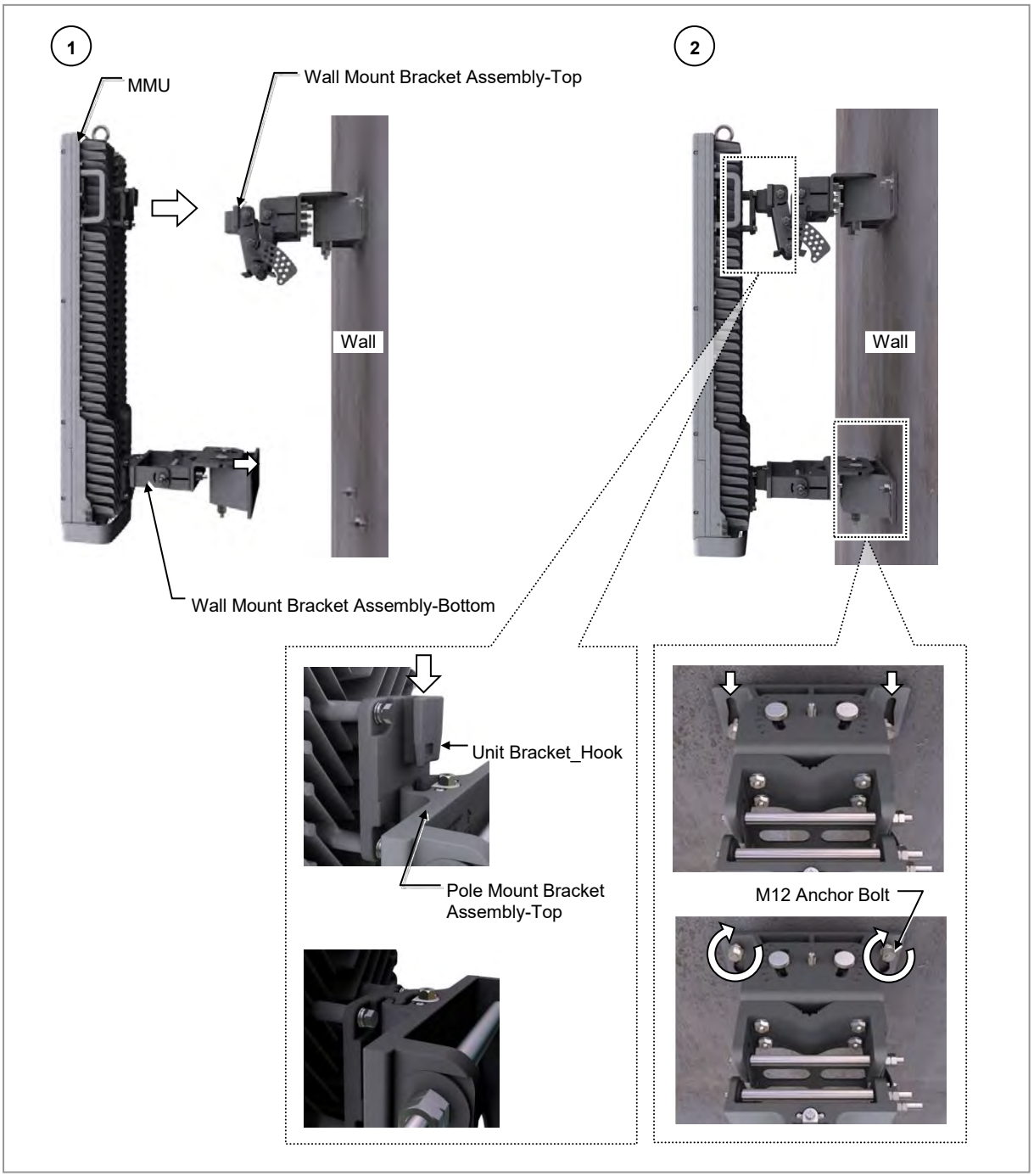
Before proceeding with fixing the MMU on the wall, ensure that you have the items mentioned in the table below:

Table 12. Parts and Tools for Fixing MMU

Category	Description	
Recommended Torque Value	M12 Hexagonal Nut	372 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner Head (apply hexagonal head: 19 mm) • Spanner (19 mm)	

1 Push the hook of the MMU unit bracket completely into the mount bracket-top assembly and fix the fastening material of the lower anchor bolt.

Figure 35. Fixing MMU



2 By using the RF alignment tool, check the tilt and the azimuth and adjust when there is an issue.

For detailed instructions of how to use the RF alignment tool, refer to the user

manual per each manufacturer.

MMU Tilting & Swivelling

Tilting

MMU Down Tilting Adjustment

To adjust the MMU down tilting, do the following:

Prerequisites

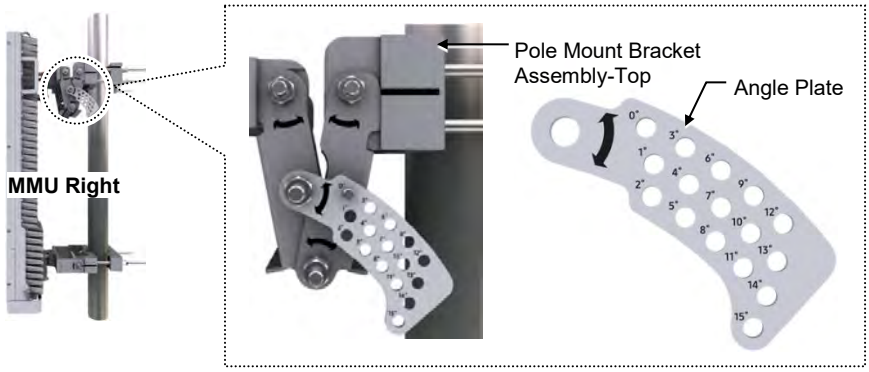
Before proceeding with adjusting the MMU down tilting, make sure that you have the items mentioned in the table below

Table 13. MMU Down Tilting Adjustment Tools

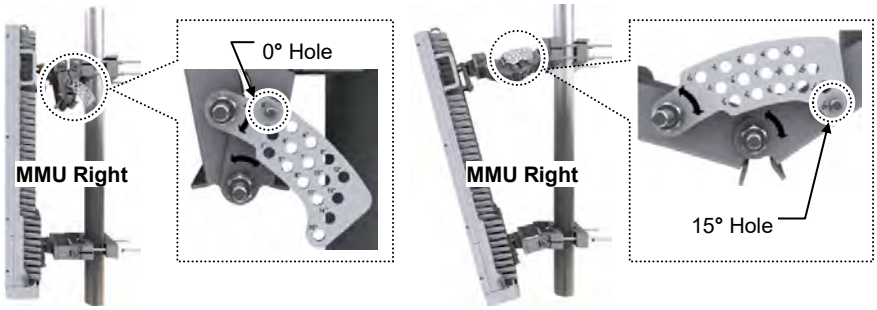
Category	Description	
Recommended Torque Value	M10 Hexagon Nut	217 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm) • Spanner (17 mm)	

The MMU tilt angle can be adjusted down from 0° to 15° by 1°, and the angle plate is used when tilting.

[Angle Plate Configuration]

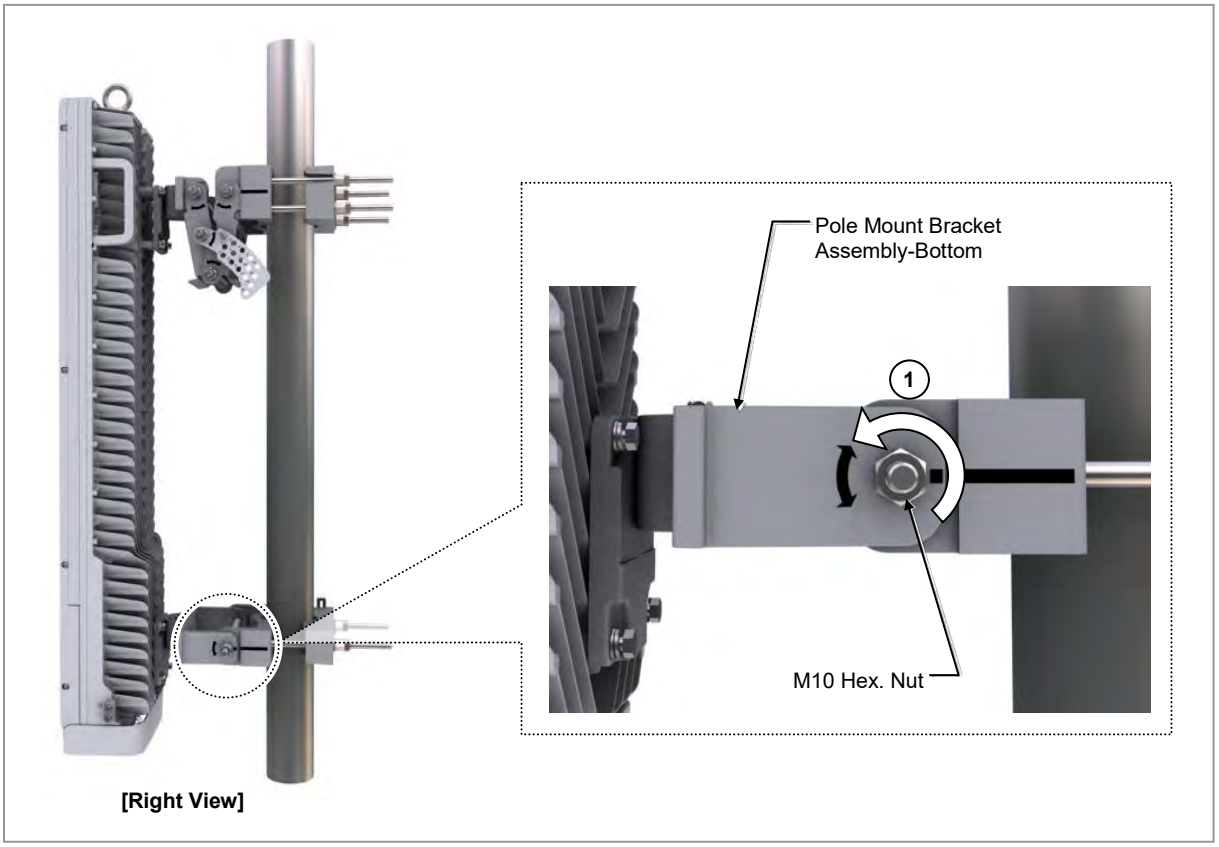


[Example of Using Angle Plate]



1 Rotate counterclockwise the fasteners on the mount bracket assembly-bottom at the once or twice to loosen them.

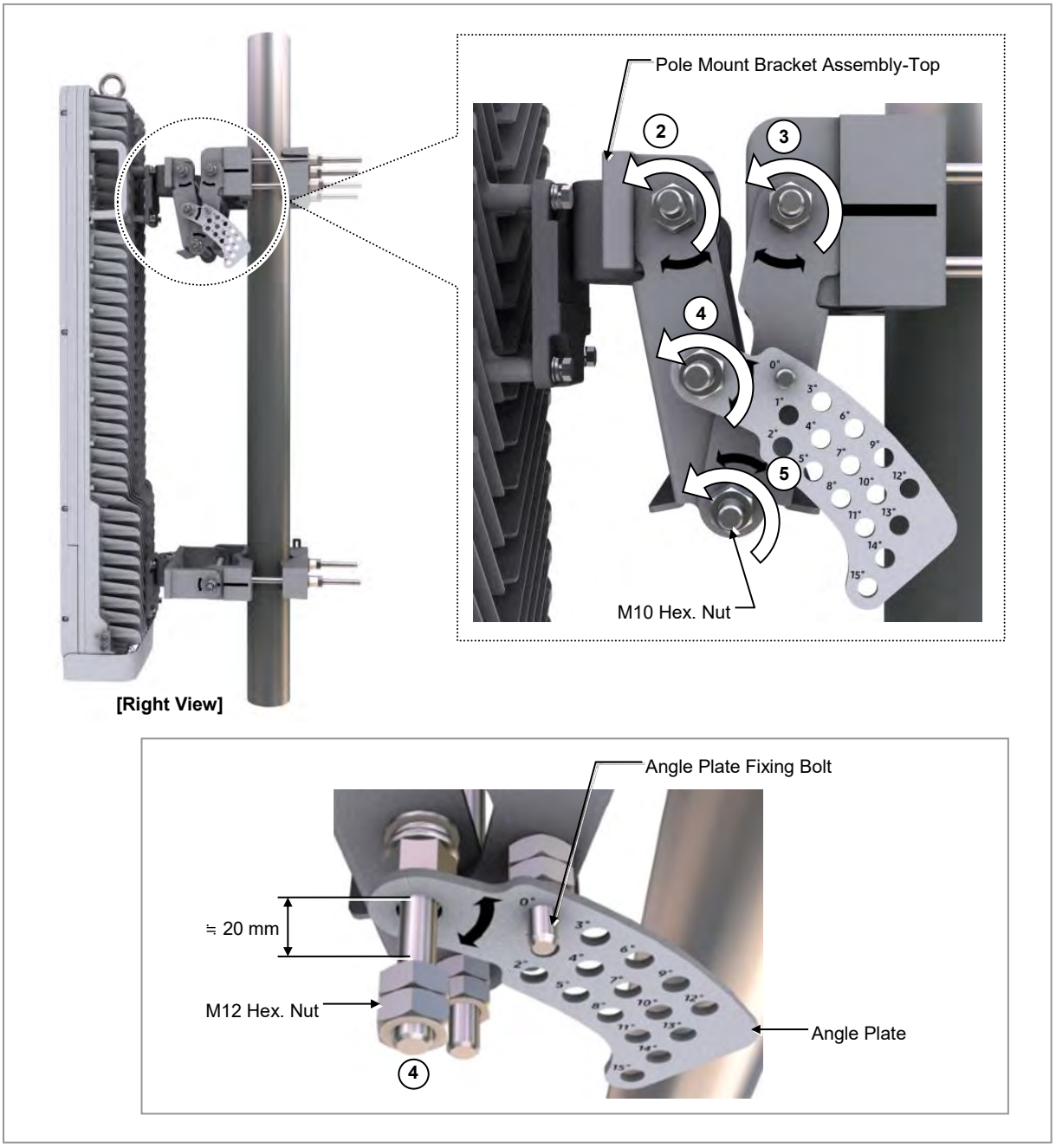
Figure 36. MMU Down Tilting (1)



2 Rotate counterclockwise the fasteners (number 2, 3, 5) on the mount bracket-top assembly at the once or twice to loosen them.

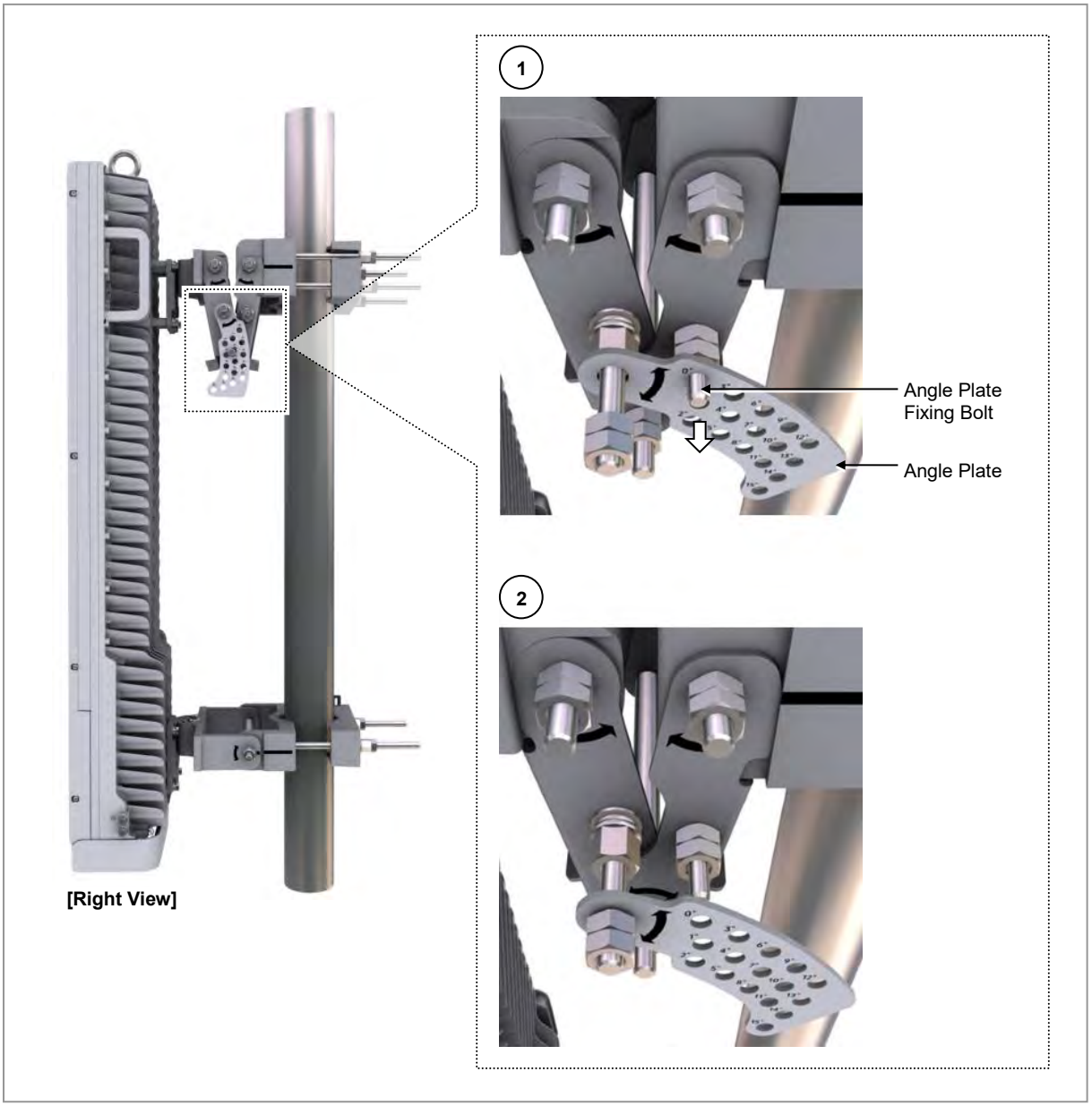
3 Do not detach the fasteners completely and loosen the 20 mm of the fasteners (number 4) of the angle plate.

Figure 37. MMU Down Tilting (2)



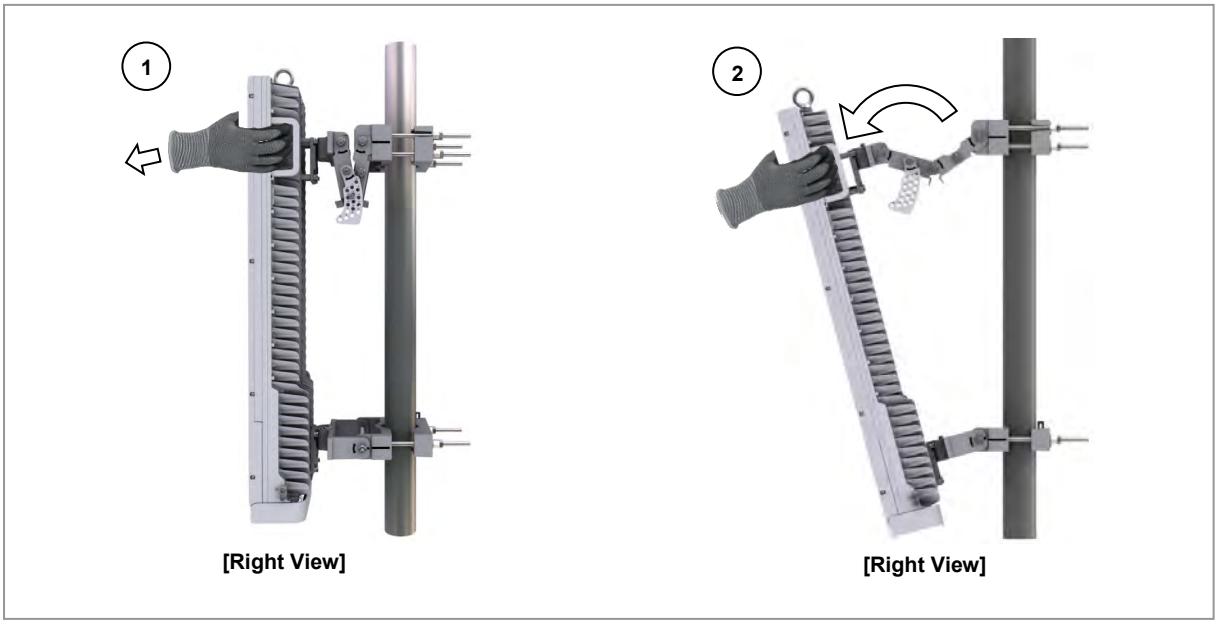
4 Remove the angle plate fixing bolt by pushing the angle plate outward.

Figure 38. MMU Down Tilting (3)



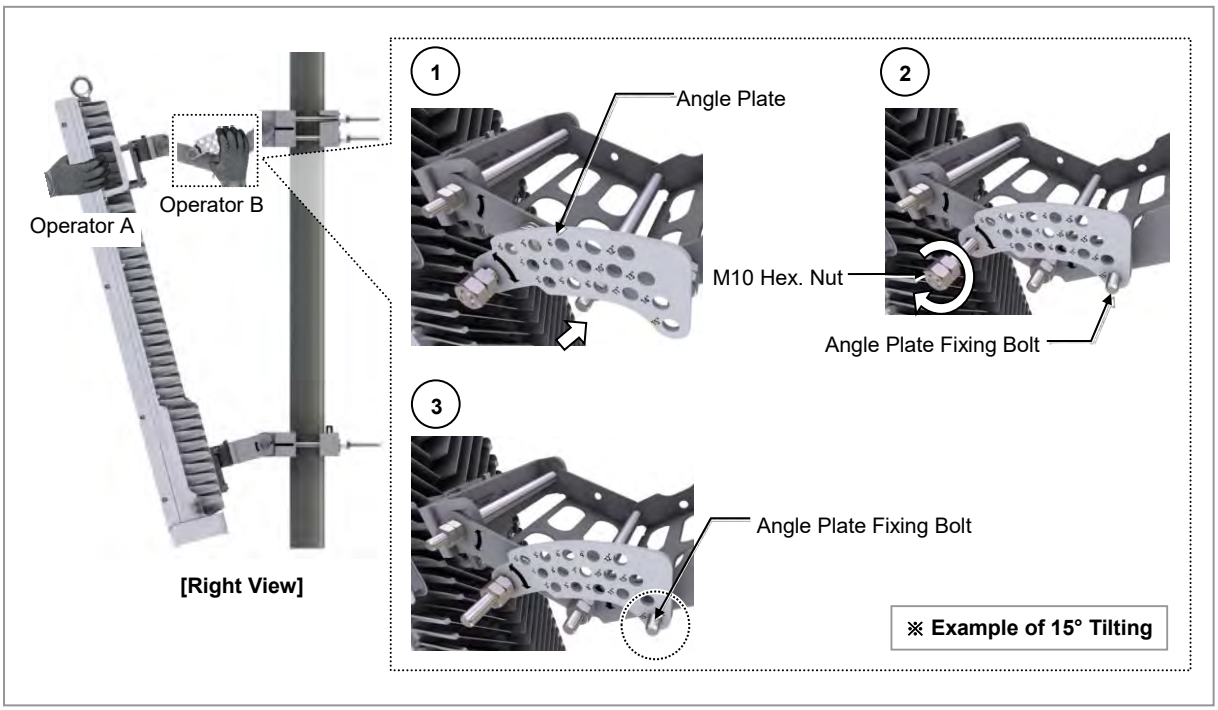
5 Adjust the tilt by pulling the MMU forward.

Figure 39. MMU Down Tilting (4)



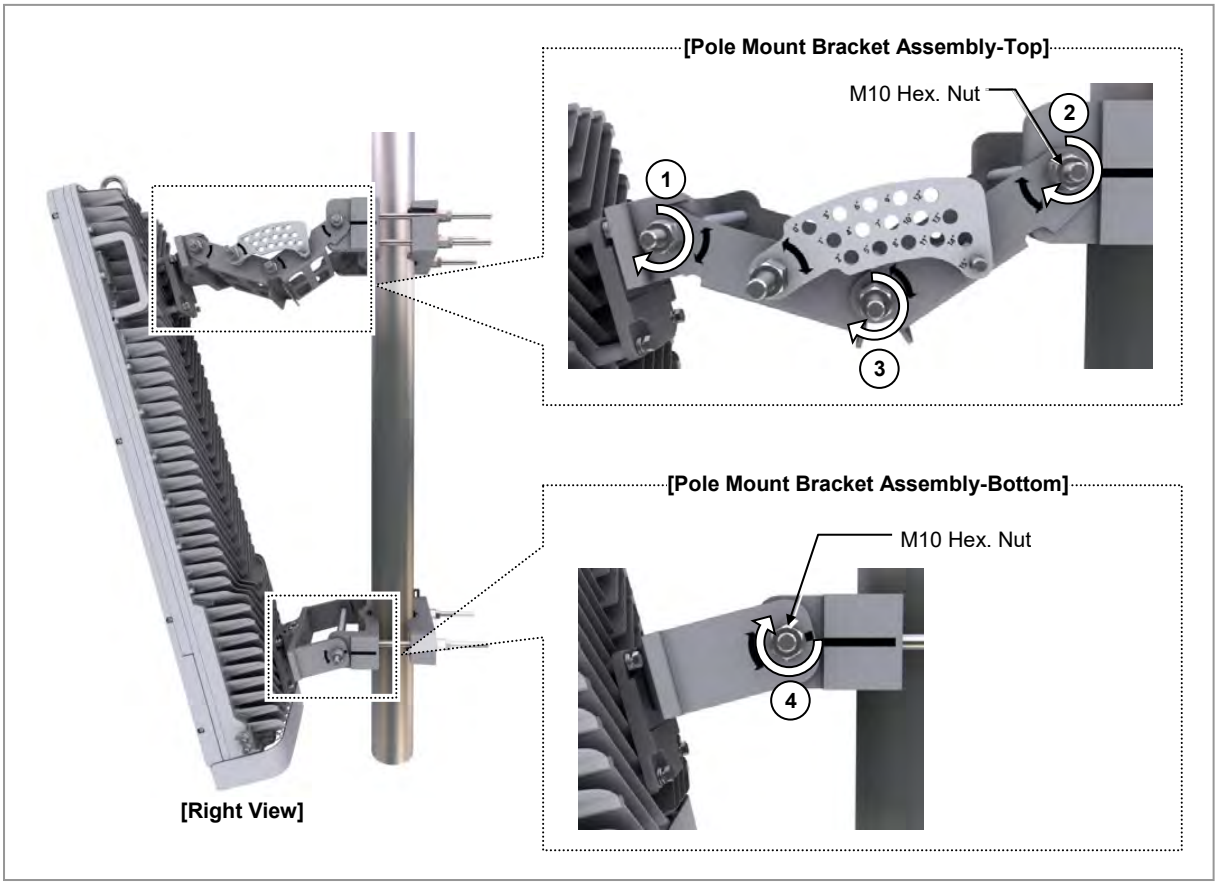
6 Adjust the down tilt of the MMU with the down tilting holes on the angle plate and place the angle plate on the angle plate fixing bolt.

Figure 40. MMU Down Tilting (5)



7 Re-tighten the loosened fasteners.

Figure 41. MMU Down Tilting (6)



8 By using the RF alignment tool, check the tilt and the azimuth and adjust when there is an issue.

For detailed instructions of how to use the RF alignment tool, refer to the user manual per each manufacturer.

MMU Up Tilting Adjustment

To adjust the MMU up tilting, do the following:

Prerequisites

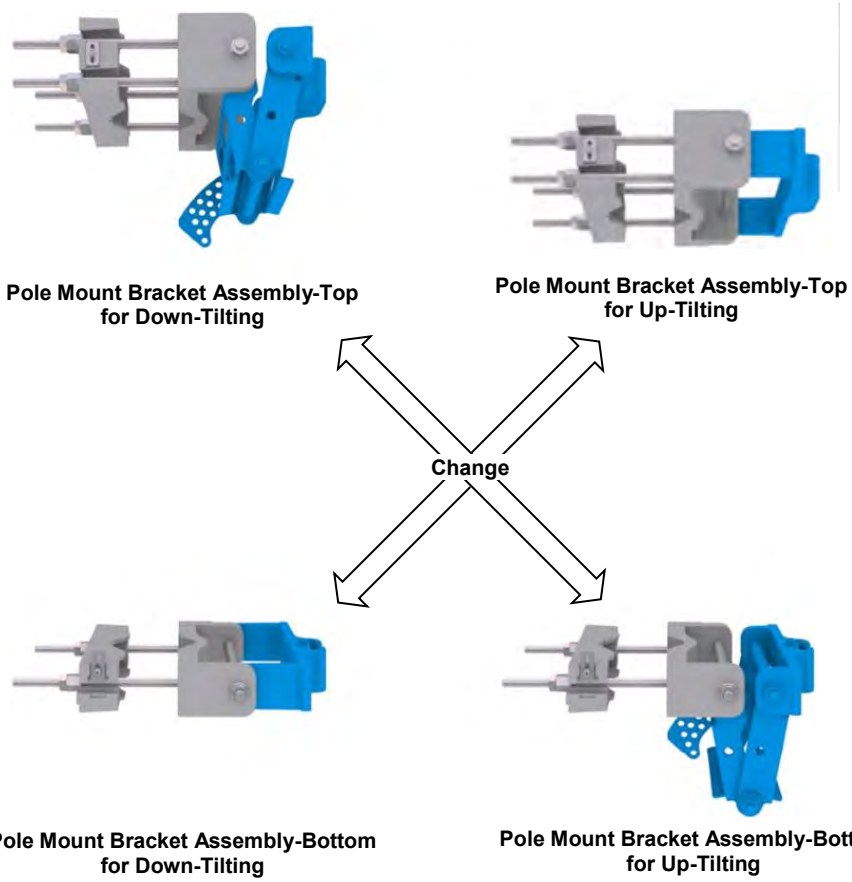
Before proceeding with adjusting the MMU up tilting, make sure that you have the items mentioned in the table below

Table 14. Parts and Tools for MMU Up Tilting

Category	Description	
Parts	Pole Mount Bracket Assembly-Top	1 EA
	Pole Mount Bracket Assembly-Bottom	1 EA
Recommended Torque Value	M10 Nut	217 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm)	

Category	Description
	• Spanner (17 mm)

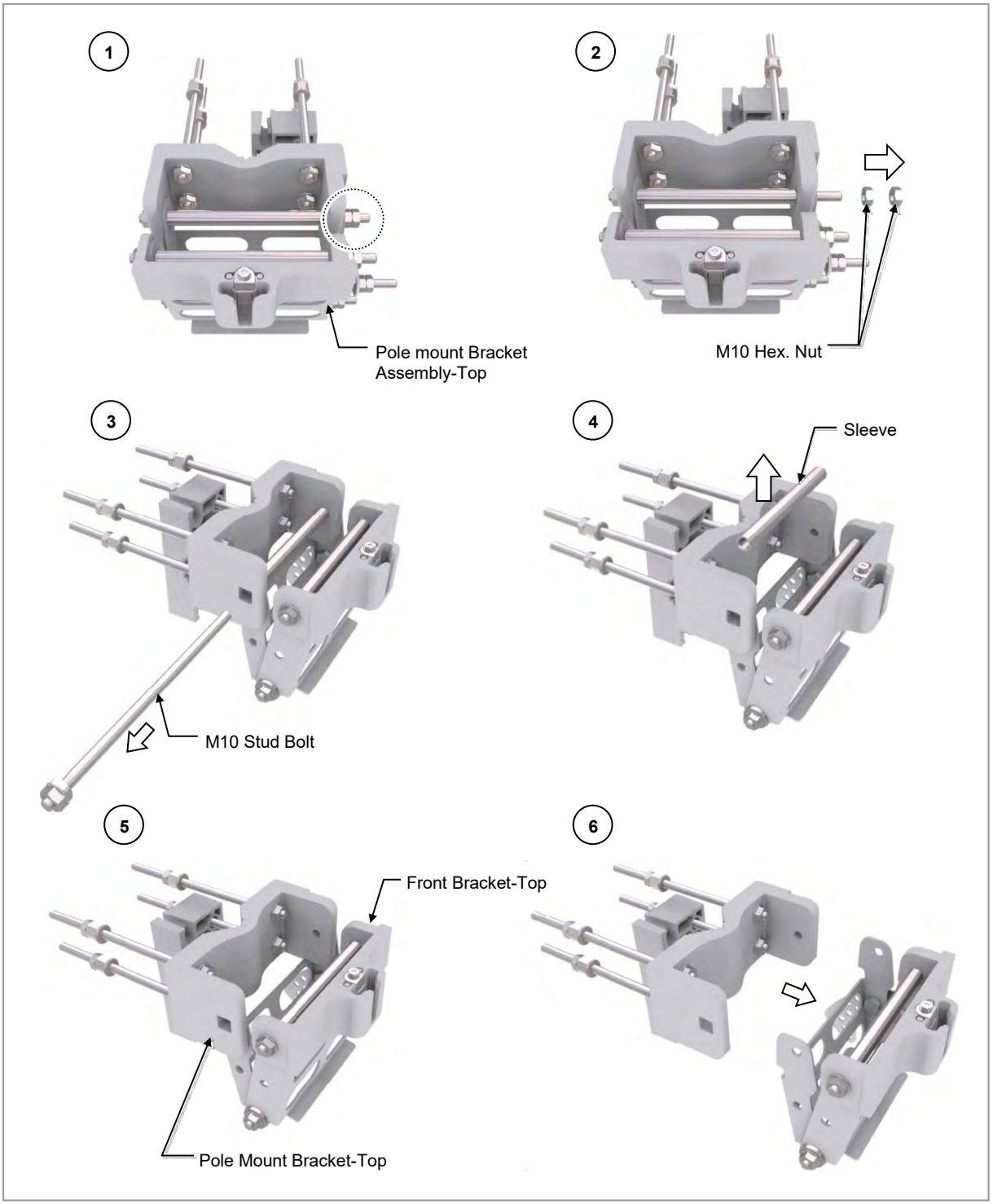
When installing a pole type up tilting, separate the mount bracket assembly-top/bottom, and reassemble.



1 Loosen the fasteners (M10 hex. nut 2 EA) of the pole mount bracket on the mount bracket assembly-top and remove the stud bolt and sleeve.

2 Remove the front bracket-top from the pole mount bracket-top.

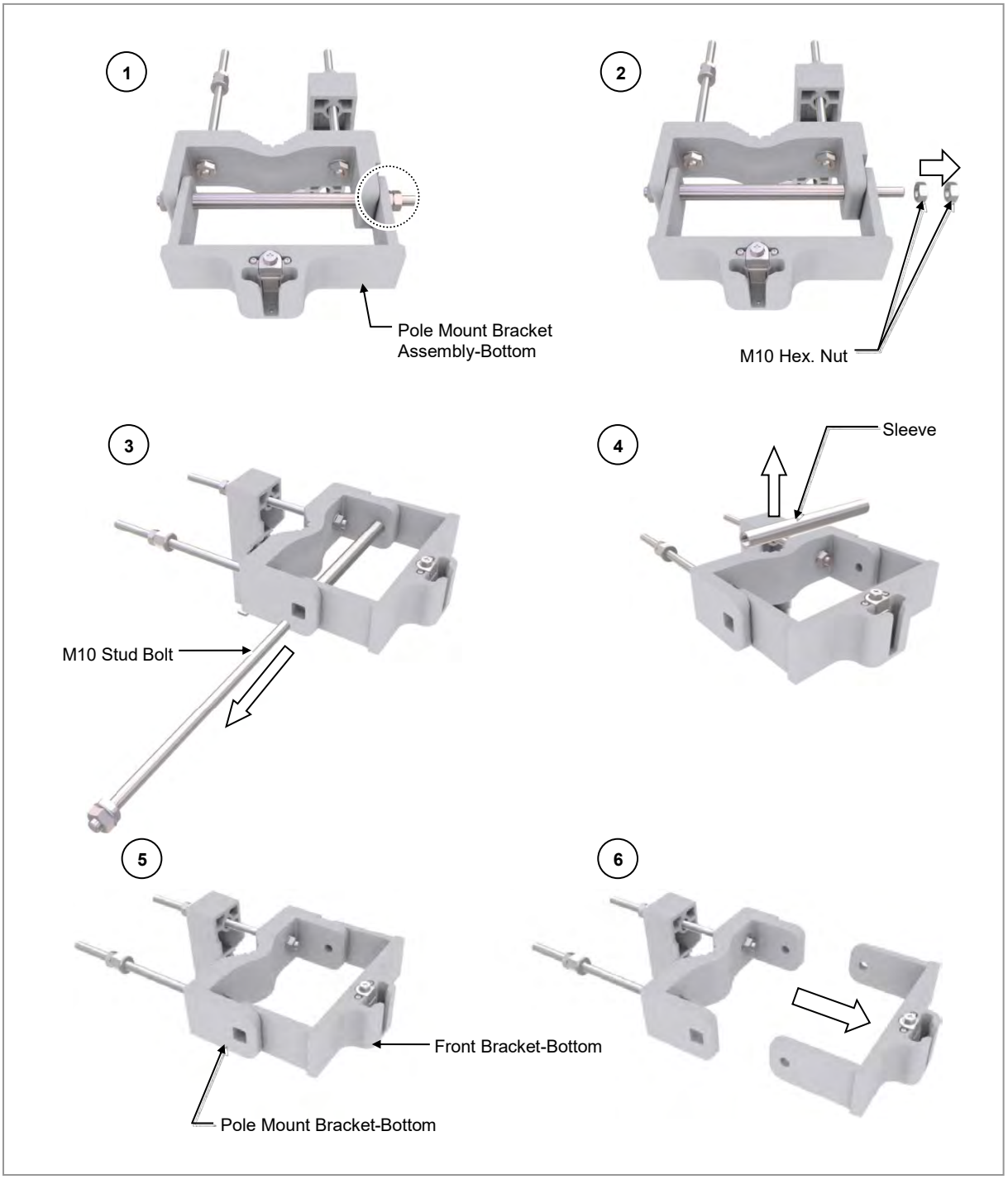
Figure 42. Bracket Change for MMU Up Tilting (1)



3 Loosen the mounting bracket (M10 hex. nut 2 EA) of the pole mount bracket on the mount bracket assembly-bottom and remove the stud bolt and sleeve.

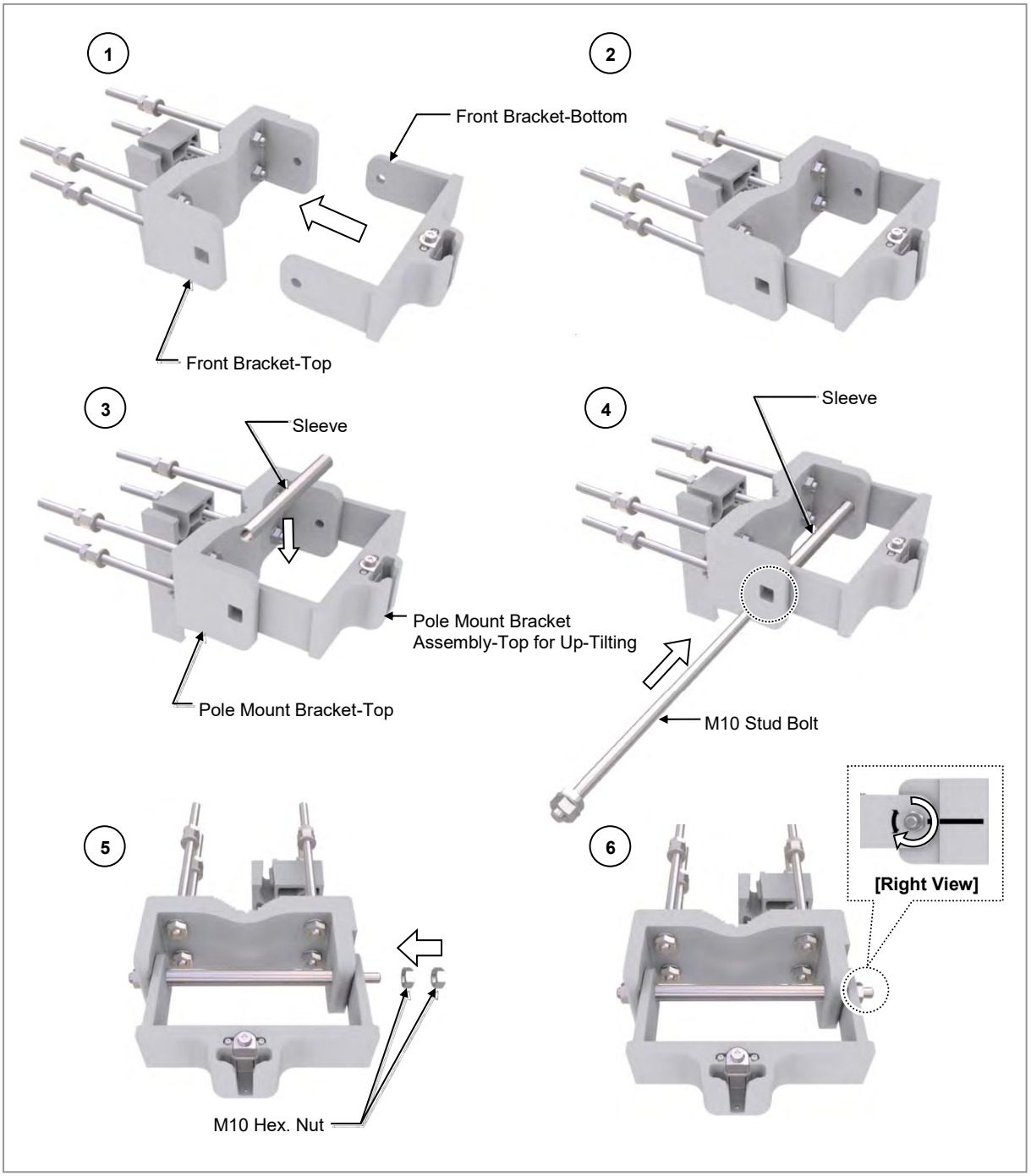
4 Remove the front bracket-bottom from the pole mount bracket-bottom.

Figure 43. Bracket Change for MMU Up Tilting (2)

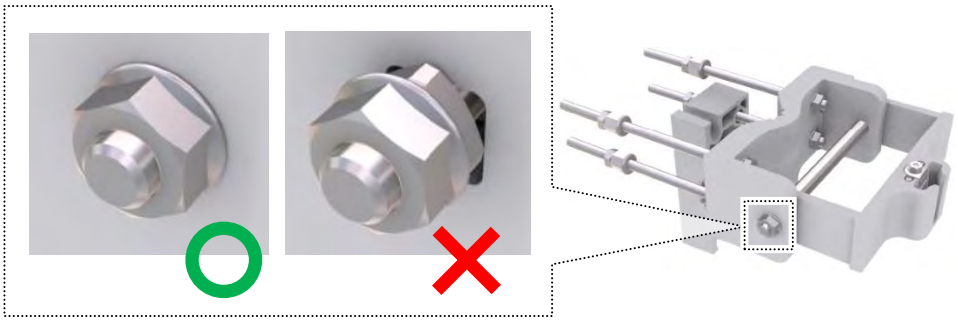


5 Position the front bracket-bottom in line with the fixing hole of the pole mount bracket-top and fix the sleeve and stud bolt with the M10 hex. nut 2 EA.

Figure 44. Bracket Change for MMU Up Tilting (3)

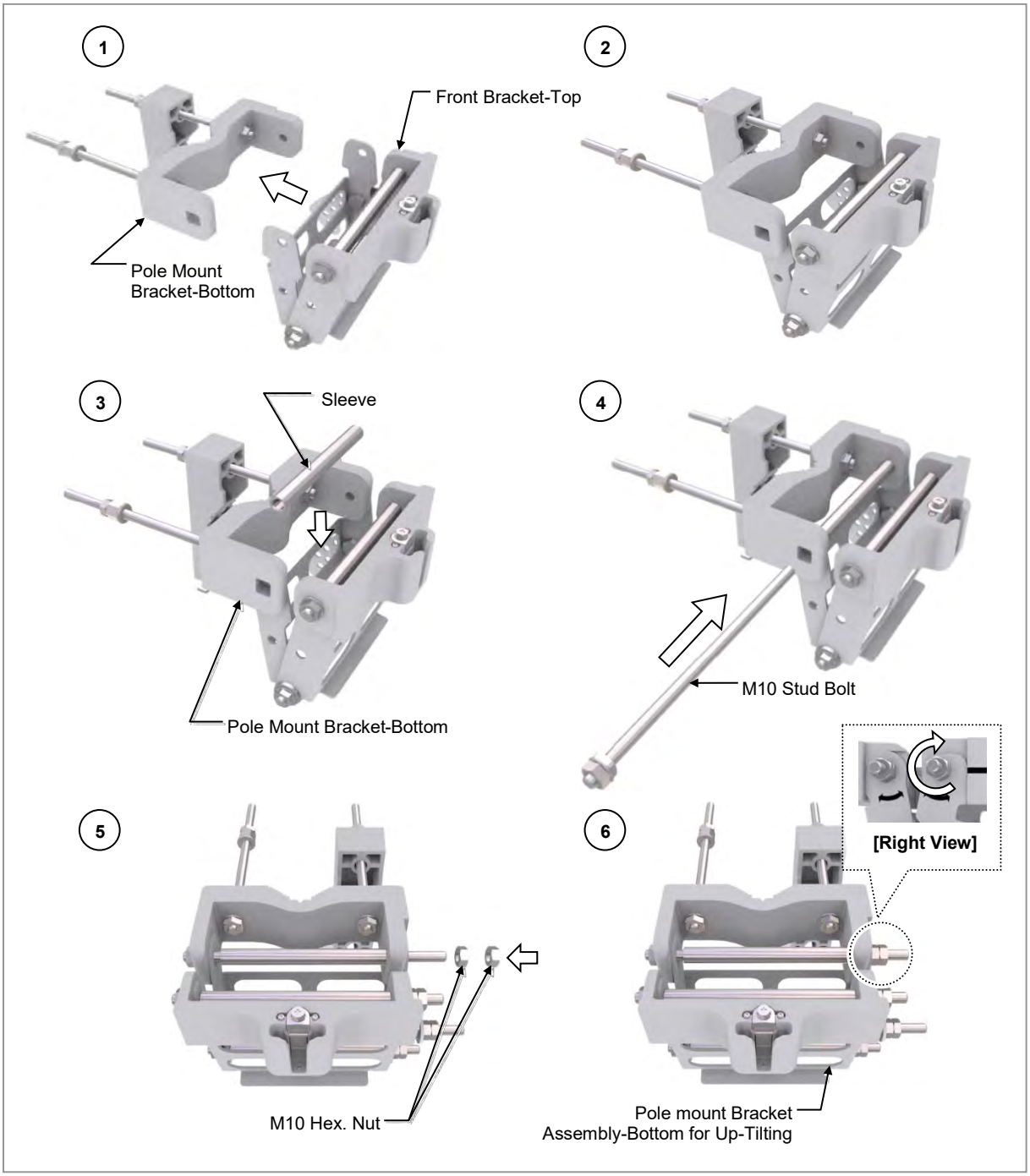


The square nut that is fastened to the stud bolt should be positioned so that it is fully inserted into the square hole of the pole mount bracket.

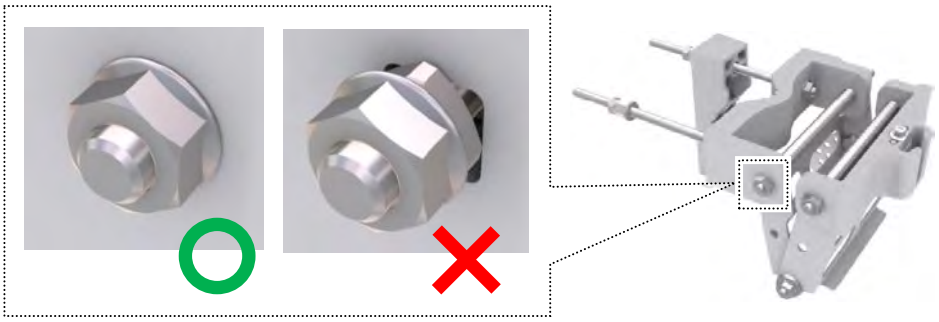


6 Position the front bracket-bottom in line with the fixing hole of the pole mount bracket-bottom and fix the sleeve and stud bolt with the M10 hex. nut 2 EA.

Figure 45. Bracket Change for MMU Up Tilting (4)

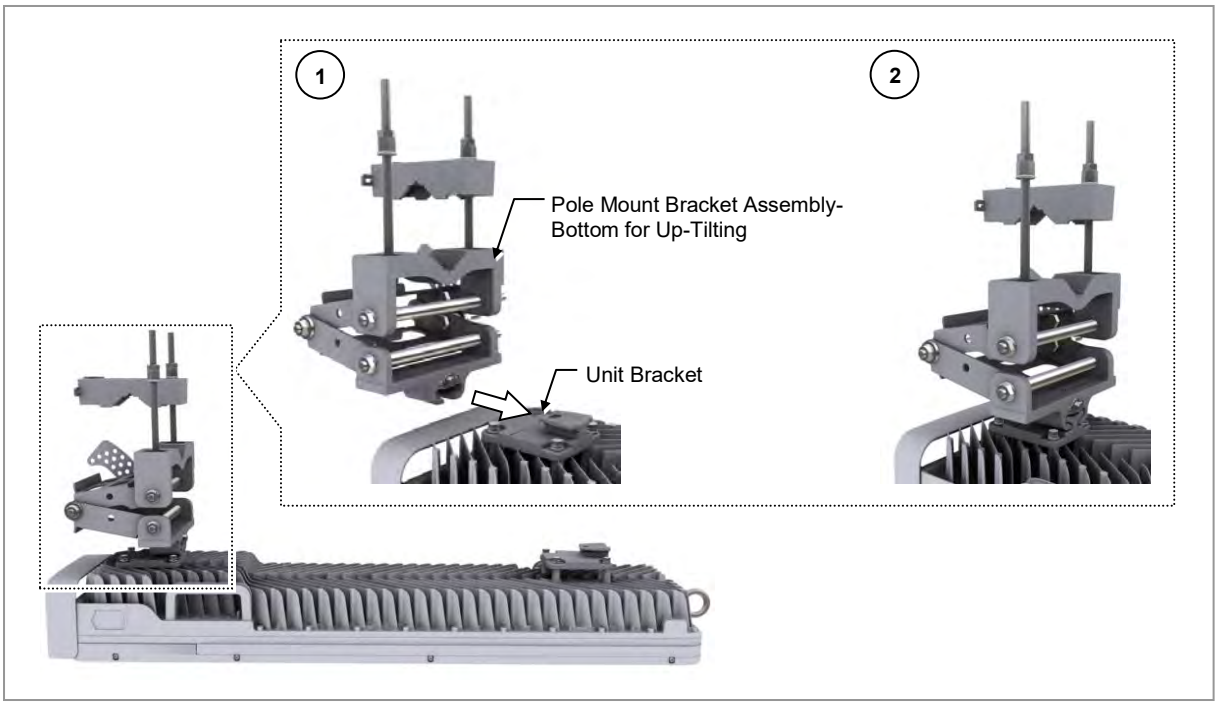


The square nut that is fastened to the stud bolt should be positioned so that it is fully inserted into the square hole of the pole mount bracket.



7 Slide the latch of unit bracket until the lock of the pole mount bracket assembly-bottom is engaged.

Figure 46. Bracket Change for MMU Up Tilting (5)



If the latch of the unit bracket is not fully inserted and fixed, the pole-mount bracket assembly may detach and fall, which can damage the equipment. Ensure that it is fully fixed before proceeding to the next step.

Lifting MMU & Pole Mount Bracket Assembly-Top (Up-Tilting)

To lift the MMU, do the following:

1 Tie the rope in two carrying points of MMU.

Figure 47. Lifting MMU & Pole Mount Bracket Assembly-Top (1)

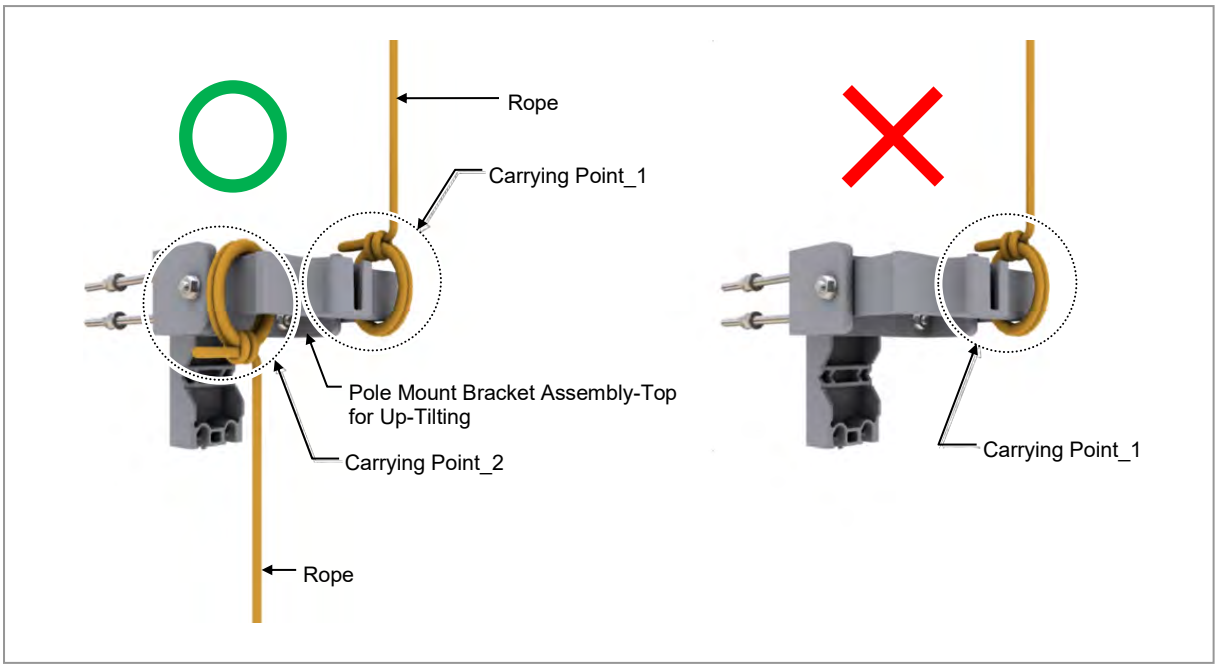
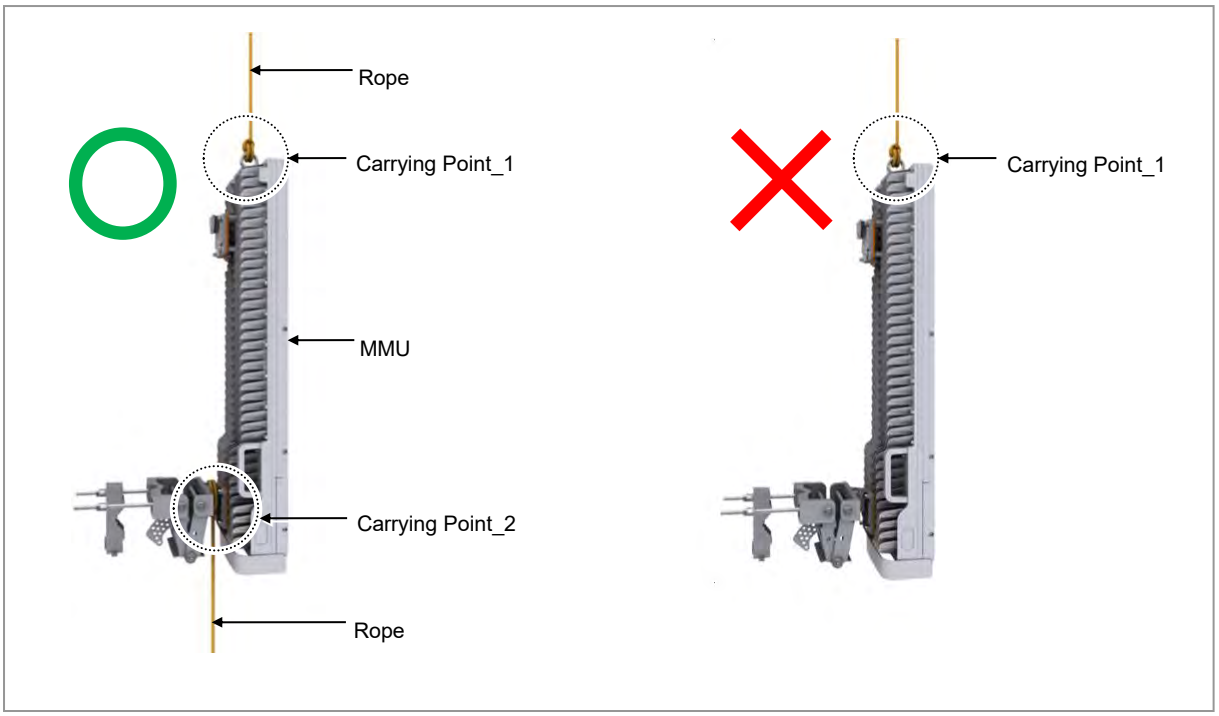


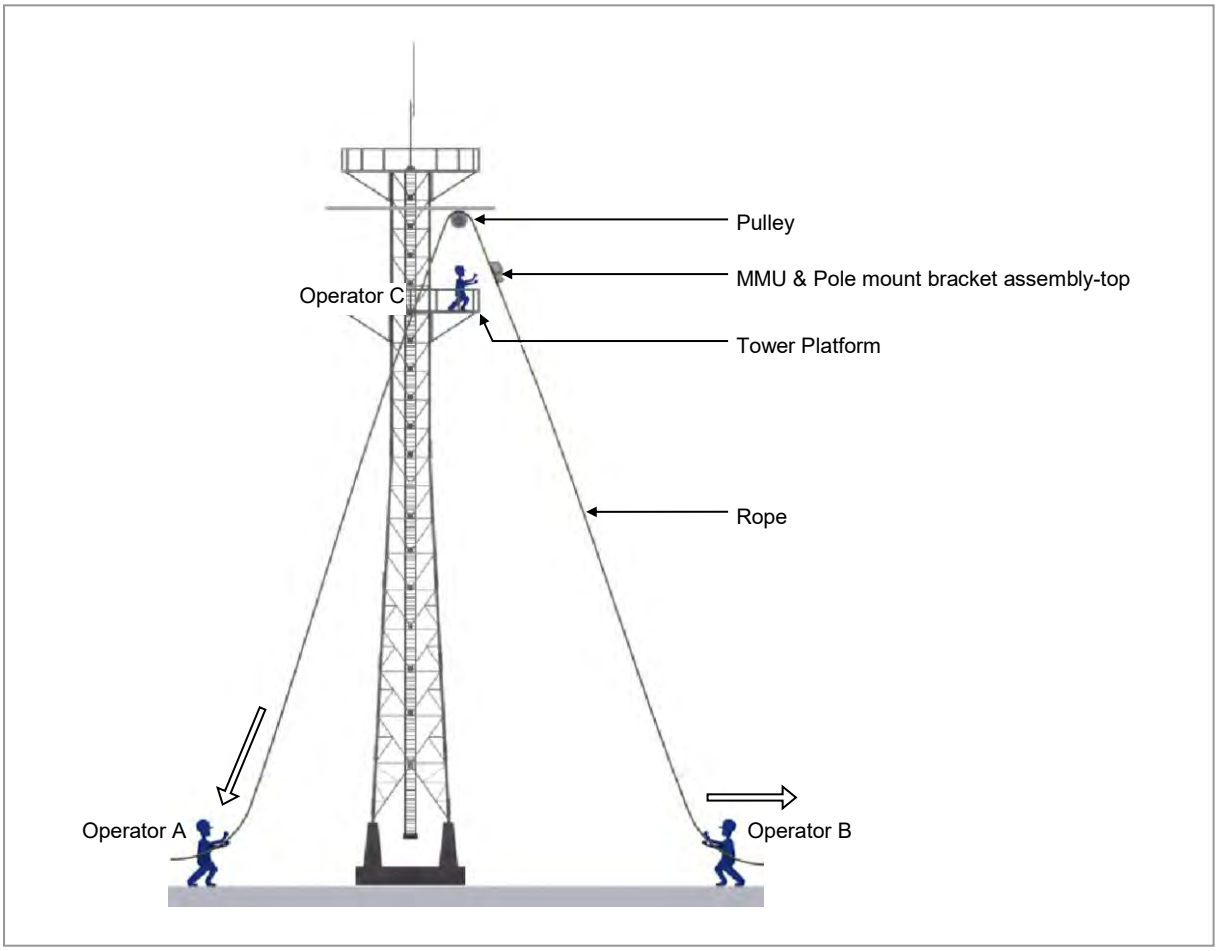
Figure 48. Lifting MMU & Pole Mount Bracket Assembly-Top (2)



2 While Operator A hauls the rope to carry up the MMU, Operator B pulls the rope outward, so that MMU would not hit the tower platform.

3 Operator C catches the MMU when the MMU arrives at the tower platform.

Figure 49. Lifting MMU & Pole Mount Bracket Assembly-Top (3)



To fix the pole mount bracket assembly-top (up-tilting) on the pole, do the following:

Prerequisites

Before proceeding with fixing the pole mount bracket assembly-top (up-tilting) on the pole, make sure that you have the items mentioned in the table below:

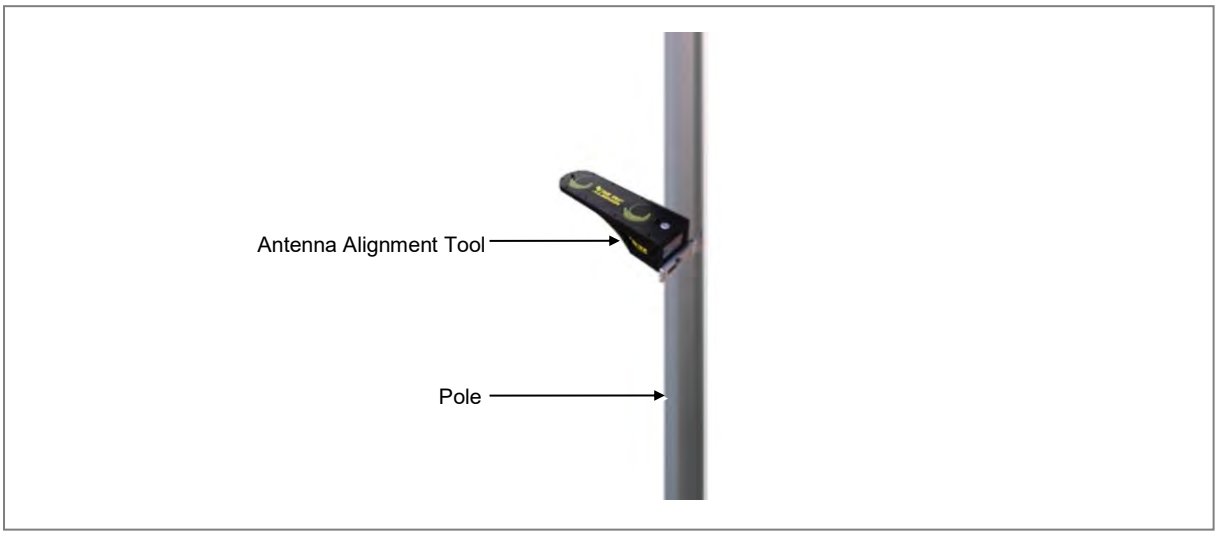
Table 15. Parts and Tools for Fixing Pole Mount Bracket Assembly-Top (Up-Tilting)

Category	Description	
Parts	Pole Mount Bracket Assembly-Top (Up-Tilting)	1 EA
Recommended Torque Value	M10 Nut	217 lbf·in
	M4 Screw	13 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm)	

Category	Description
	• Spanner (17 mm) • Torque Driver (6~22 lbf·in) • Screw Driver Bit ('+', No.2) • Screw Driver ('+', No.2) • Antenna Alignment Tool

1 Use antenna alignment tool to determine the azimuth of the MMU to be installed on the pole.

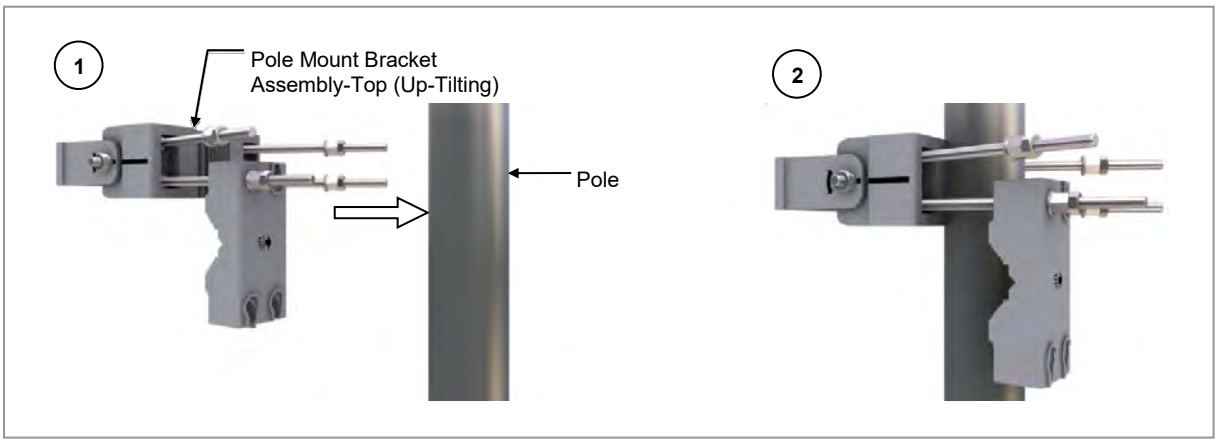
Figure 50. Fixing Pole Mount Bracket Assembly-Top (Up-Tilting) (1)



For detailed instructions of how to use the RF alignment tool, refer to the user manual per each manufacturer.

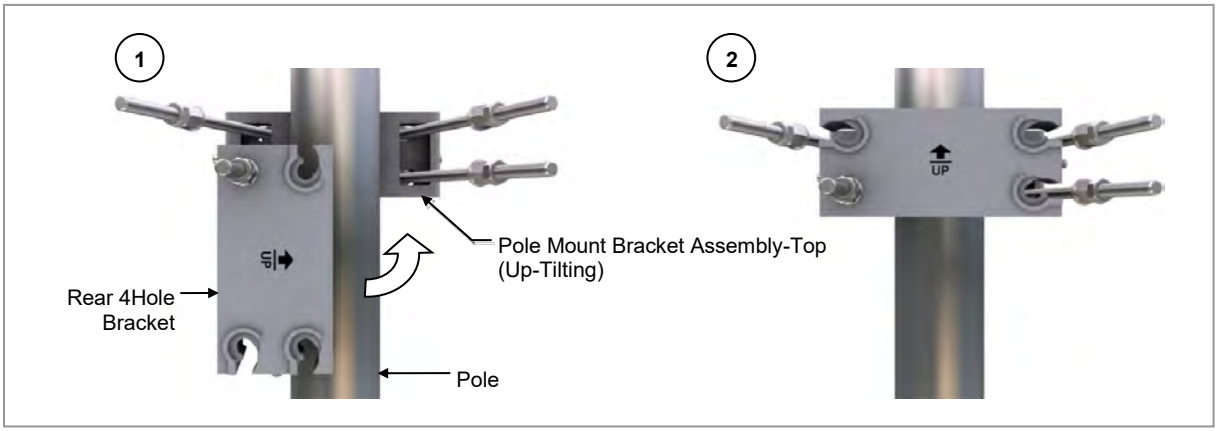
2 Place a pole mount bracket assembly-top (up-tilting) to the pole.

Figure 51. Fixing Pole Mount Bracket Assembly-Top (Up-Tilting) (2)



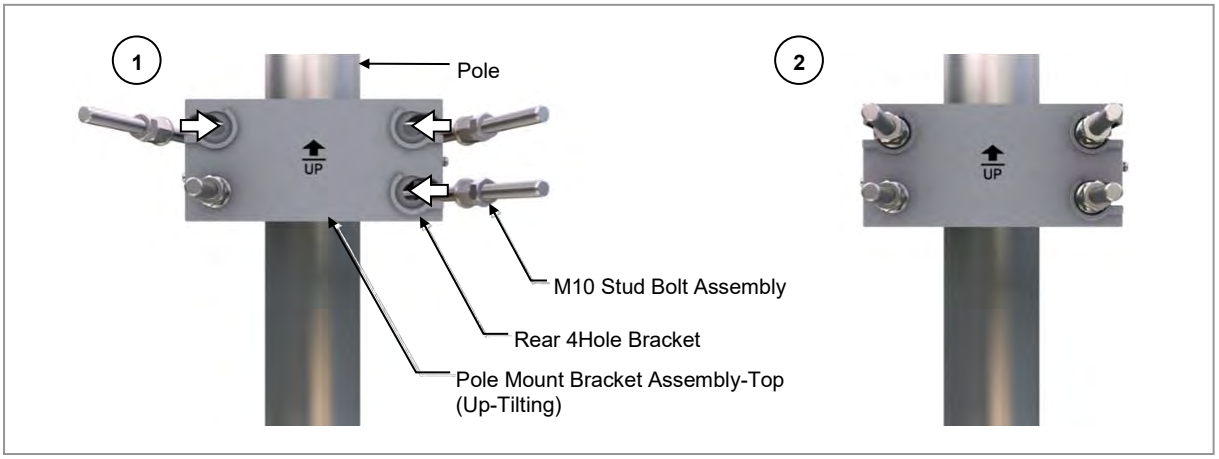
3 Place the rear 4-hole bracket horizontally in the fixed position.

Figure 52. Fixing Pole Mount Bracket Assembly-Top (Up-Tilting) (3)



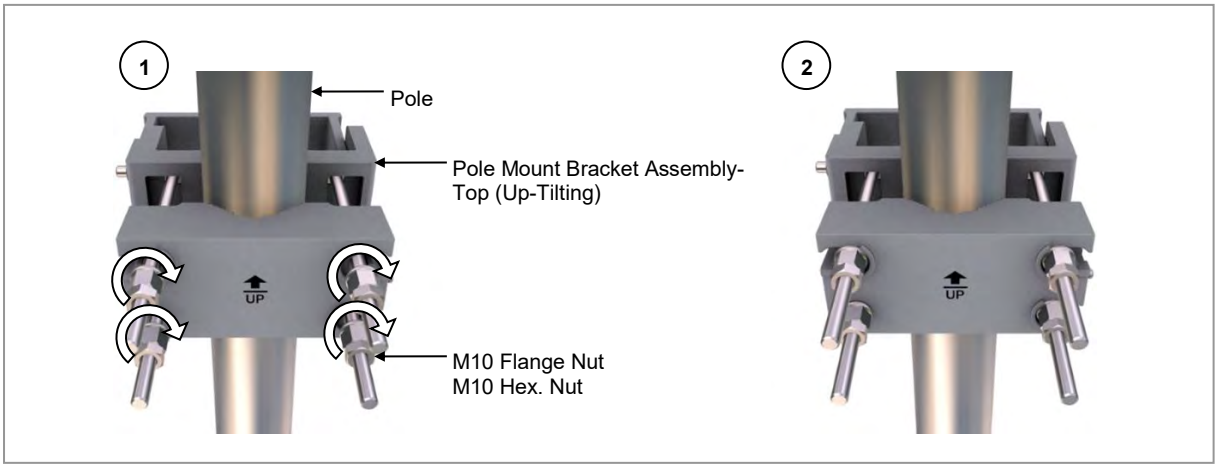
4 Insert the three loosened stud bolt assemblies into the fixing hole of the rear 4-hole bracket.

Figure 53. Fixing Pole Mount Bracket Assembly-Top (Up-Tilting) (4)

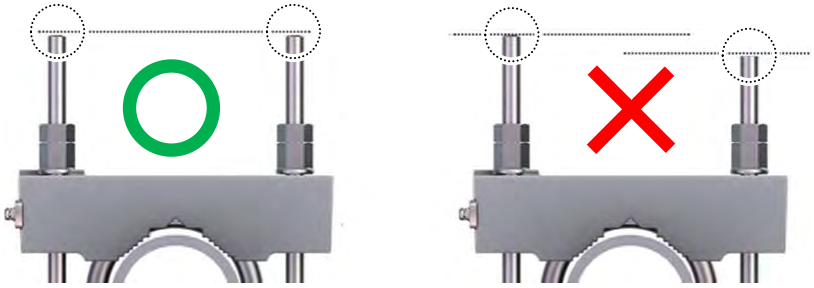


5 Tighten the flange and the hexagon nuts that are fastened to the stud bolt assembly.

Figure 54. Fixing Pole Mount Bracket Assembly-Top (Up-Tilting) (5)

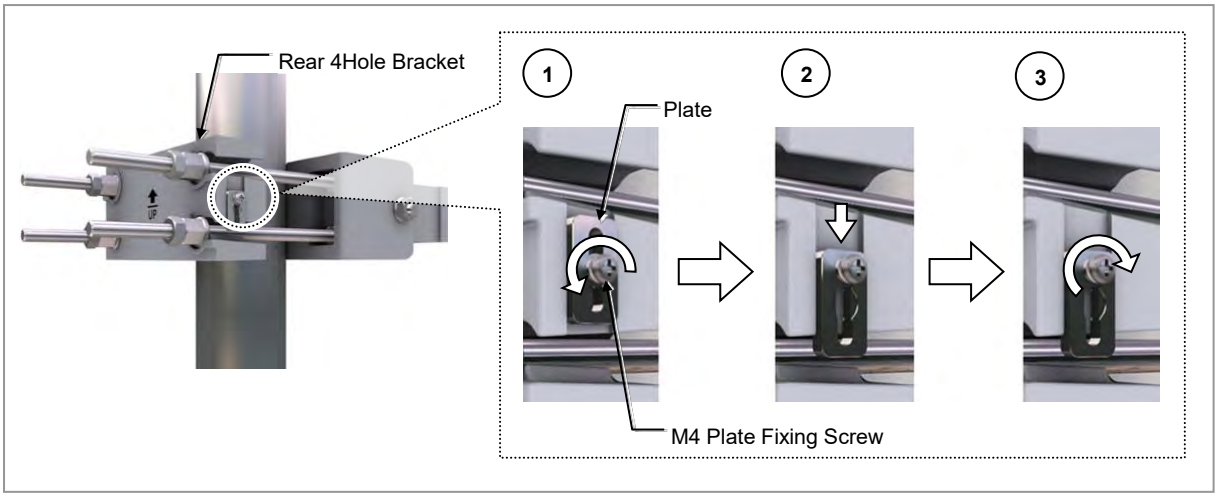


The length of the stud bolts through the rear brackets must be the same.

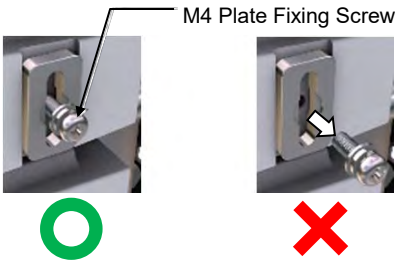


6 Turn it to the left of the plate fixed to the top and bottom of the back of the rear 4hole bracket by rotating them counterclockwise and re-fix the plate.

Figure 55. Fixing Pole Mount Bracket Assembly-Top (Up-Tilting) (6)

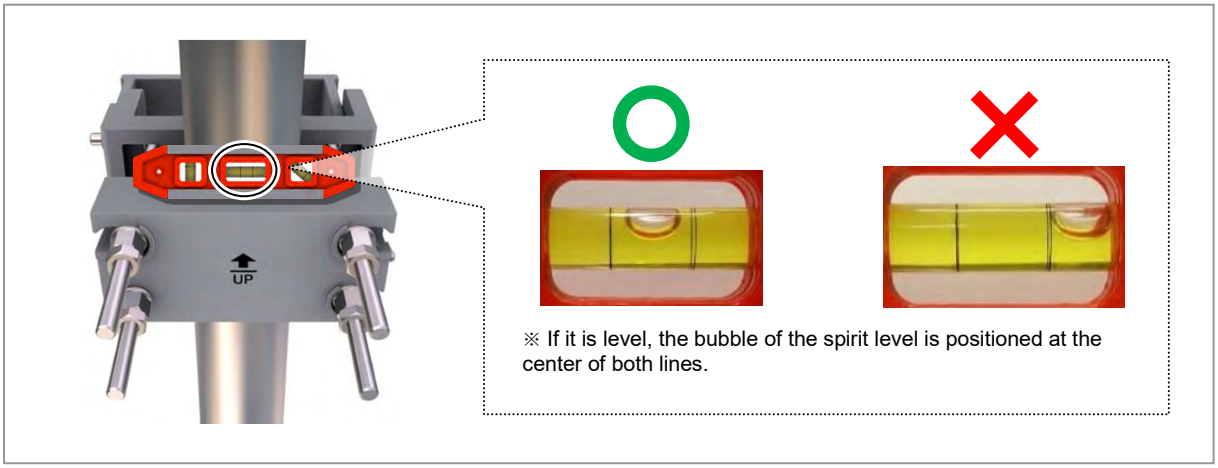


Do not take the fasteners out completely.



7 Check the level of pole mount bracket assembly-top (up-tilting) on the pole and adjust the level.

***Figure 56.** Fixing Pole Mount Bracket Assembly-Top (Up-Tilting) (7)*



When fixing the pole mount bracket assembly-top (up-tilting) on a pole, be sure to check the level of bracket. After finishing the installation, you can adjust the level minutely.

When occurring poor levelling, adjust the position of fasteners used to fix the pole mount bracket assembly-top (up-tilting) or its levelling status.

Fixing MMU (Up-Tilting)

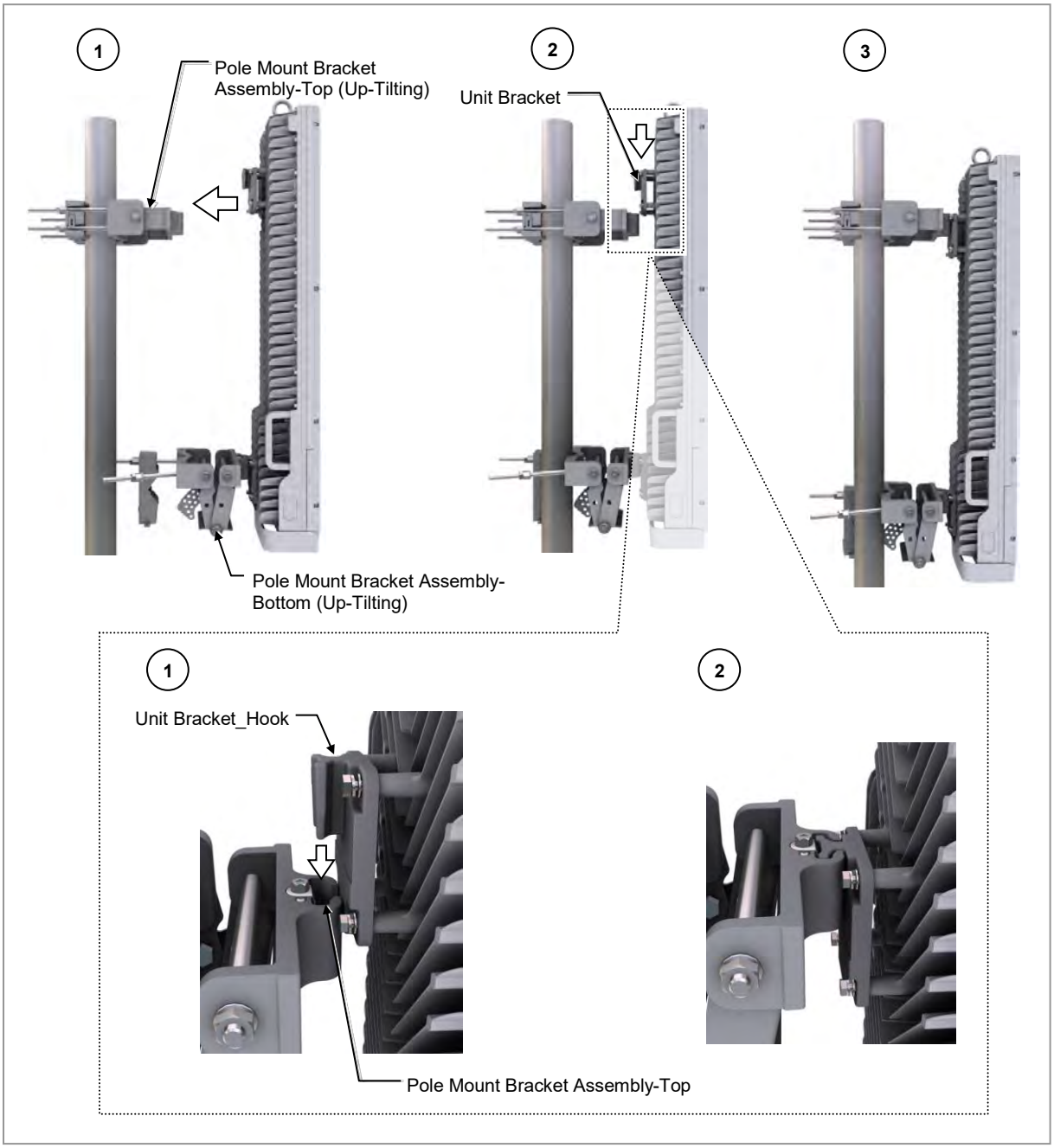
Before proceeding with fixing the MMU on the pole, make sure that you have the items mentioned in the table below:

***Table 16.** Parts and Tools for Fixing MMU on the Pole*

Category	Description	
Recommended Torque Value	M10 Nut	217 lbf·in
	M4 Screw	13 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm) • Spanner (17 mm) • Torque Driver (6 to 22 lbf·in) • Screw Driver Bit (‘+’ No.2) • Screw Driver (‘+’ No.2)	

1 Hang the unit bracket hook of MMU on the pole mount assembly-top hook's groove.

Figure 57. Fixing MMU (Up-Tilting) on the Pole (1)

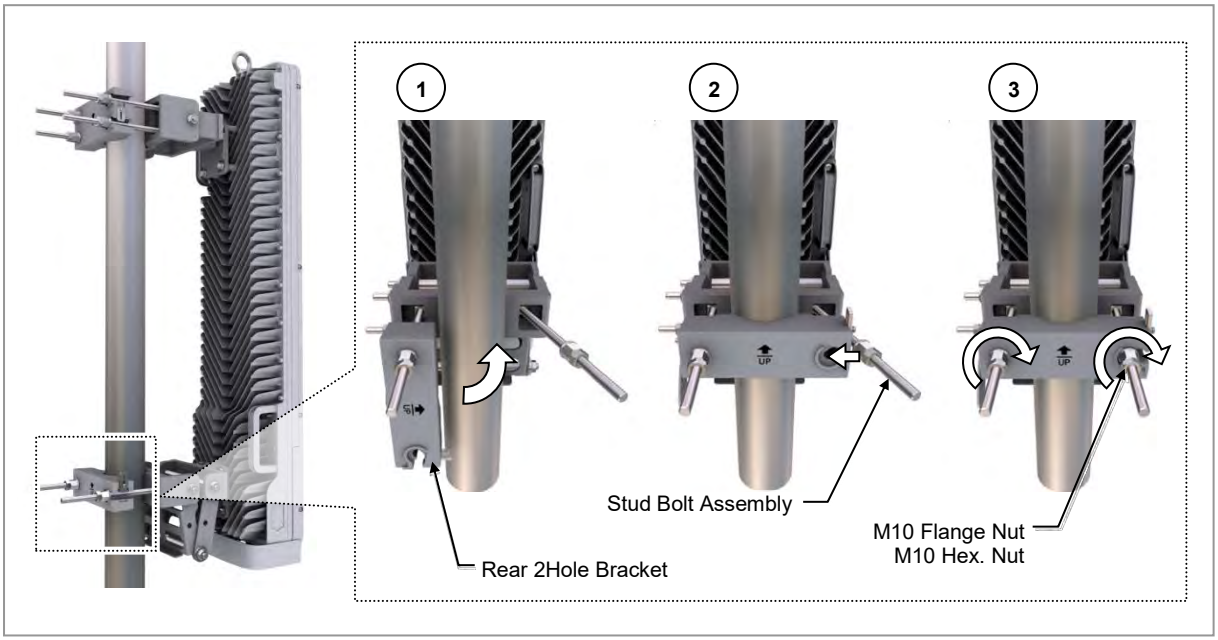


When the MMU is fixed to the mount bracket assembly, the hooks of the unit brackets must be completely inserted into the fixing grooves of the mount bracket assembly. This ensures that the unit brackets stay intact during vibration or from

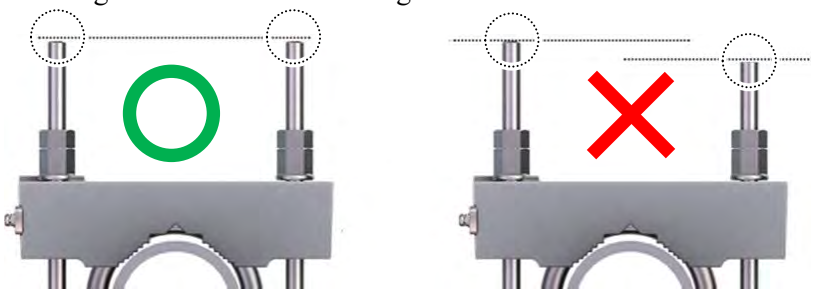
external influences.

2 Place the rear 2-hole bracket horizontally in the fixed position, insert the stud bolt assembly into the rear 2-hole bracket fixing hole, and then fix the flange and the hexagon nuts.

Figure 58. Fixing MMU (Up-Tilting) on the Pole (2)

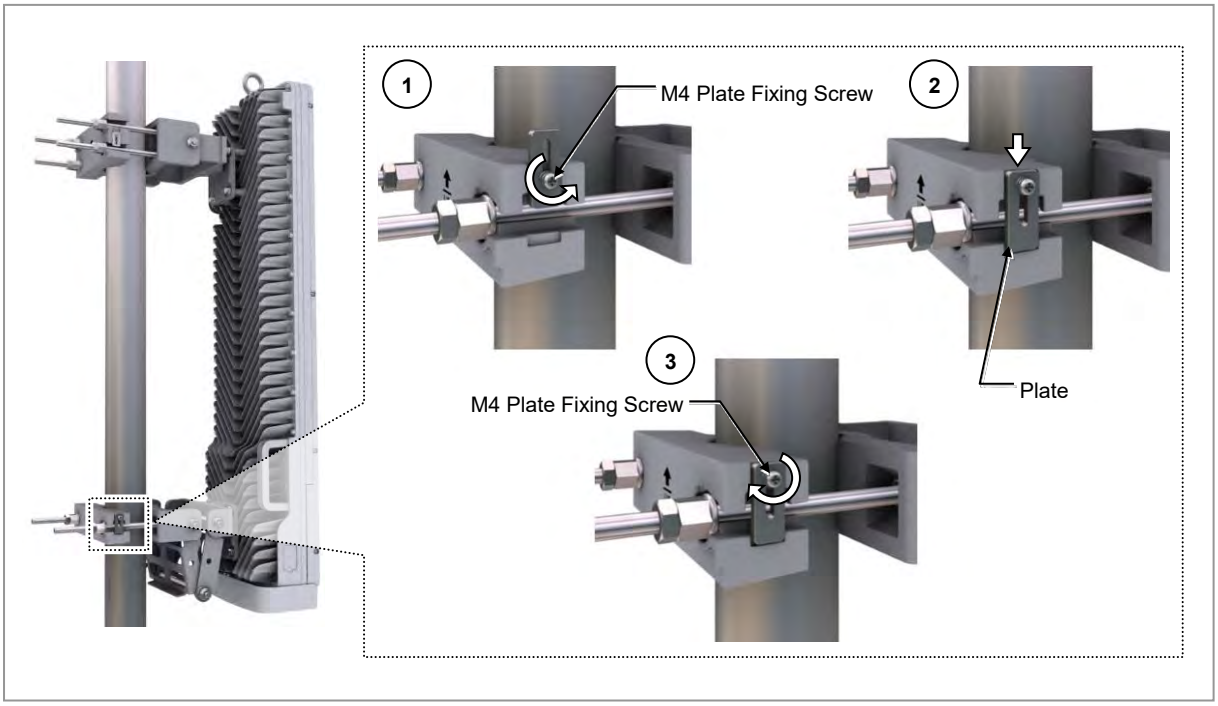


The length of the stud bolts through the rear brackets must be the same.

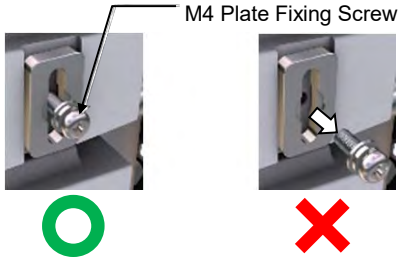


3 Turn it to the left of the plate fixed to the top and bottom of the back of the rear 4hole bracket by rotating them counterclockwise and re-fix the plate.

Figure 59. Fixing MMU on the Pole (3)



Do not take the fasteners out completely.



4 By using the RF alignment tool, check the tilt and the azimuth and adjust when there is an issue.

For detailed instructions of how to use the RF alignment tool, refer to the user manual per each manufacturer.

MMU Up-Tilting Adjustment

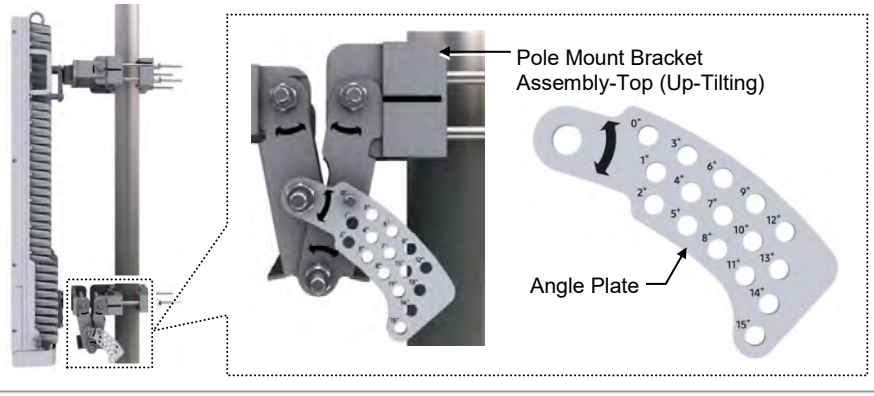
To adjust the MMU up tilting, do the following:

Table 17. MMU Up Tilting Adjustment Tools

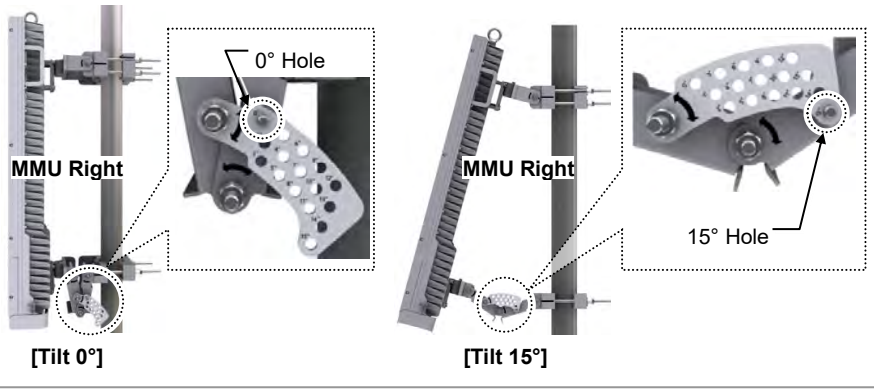
Category	Description	
Recommended Torque Value	M10 Hexagon Nut	217 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm) • Spanner (17 mm)	

The MMU tilt angle can be adjusted down from 0° to 15° by 1°, and the angle plate is used when tilting.

[Angle Plate Configuration]

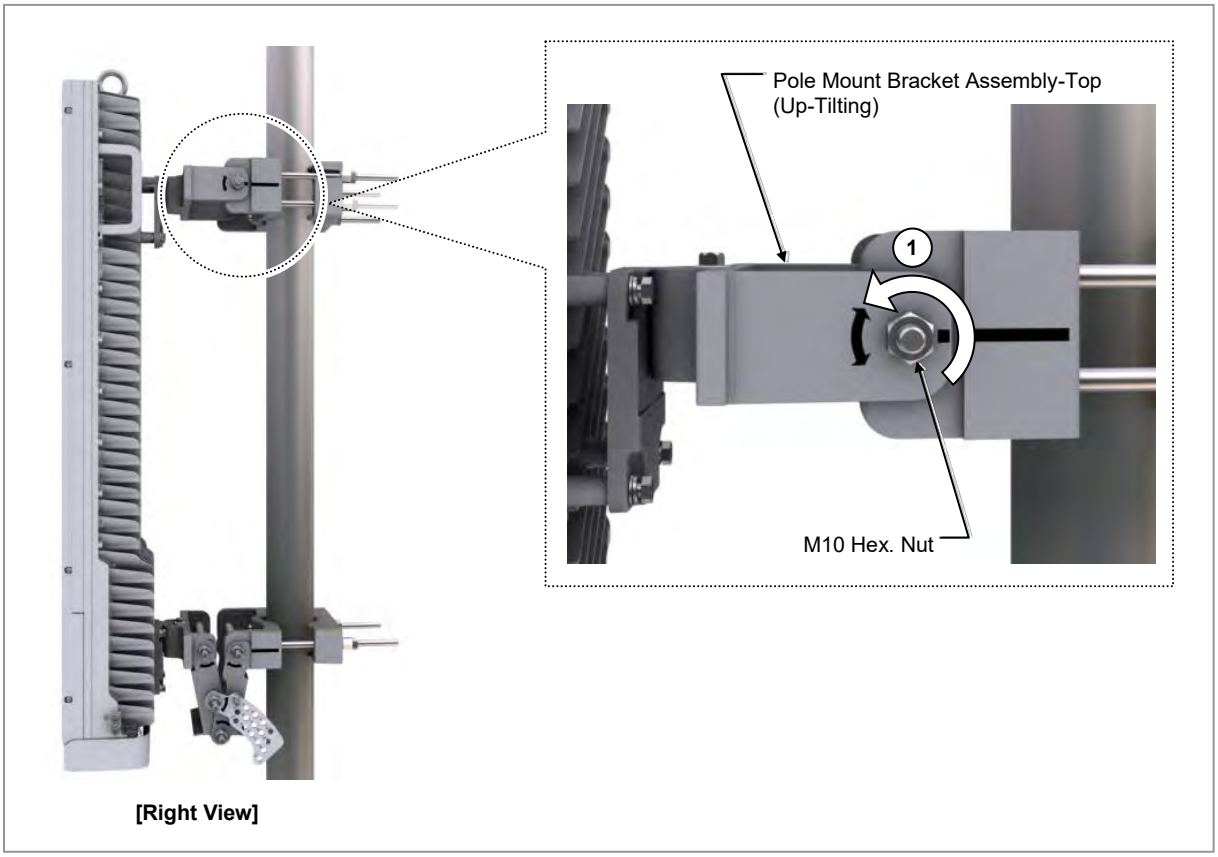


[Example of Using Angle Plate]



1 Rotate counterclockwise the fasteners on the pole mount bracket assembly top (up-tilting) at the once or twice to loosen them.

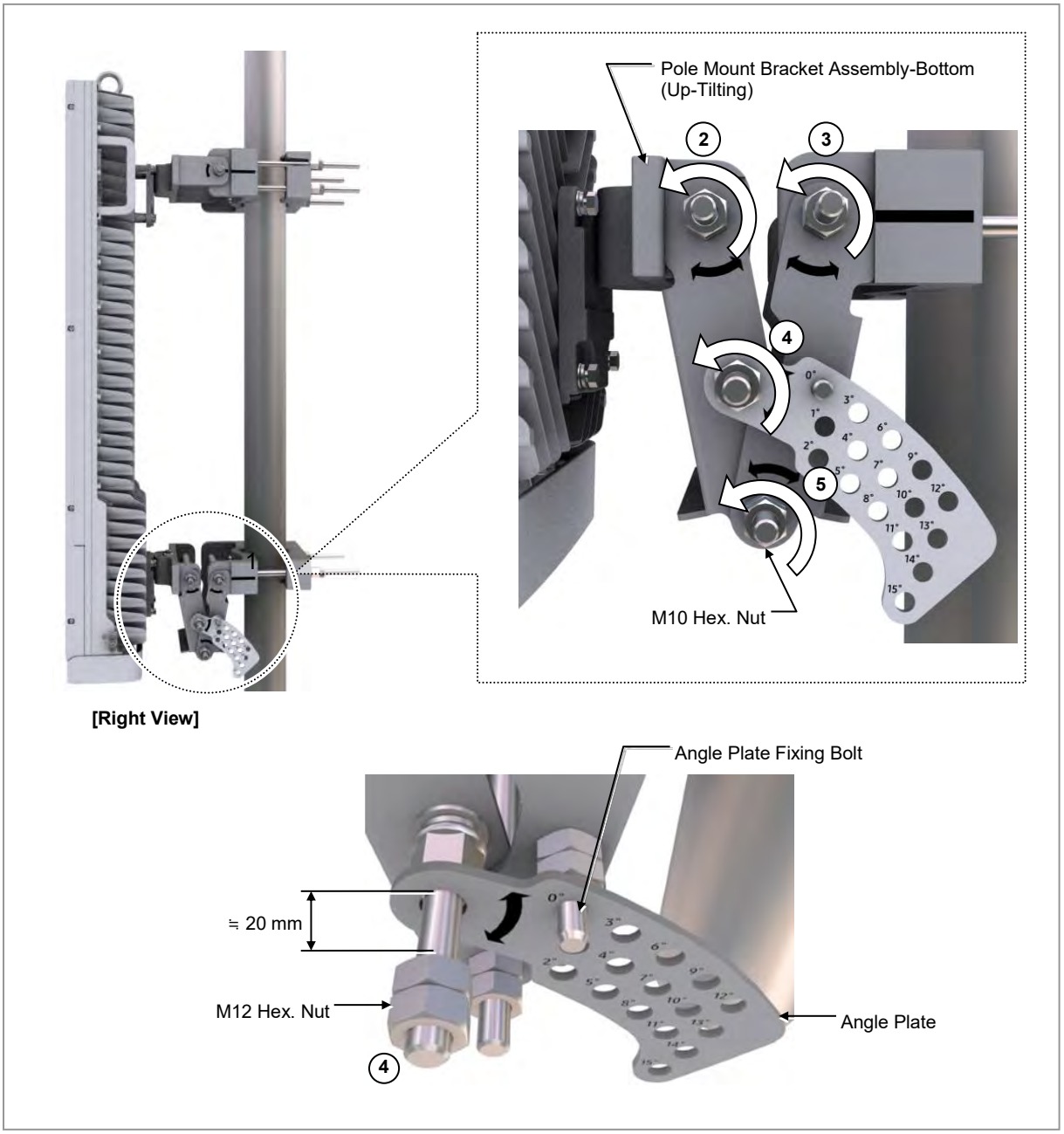
Figure 60. MMU Up Tilting (1)



2 Rotate counterclockwise the fasteners (number 2, 3, 5) on the mount bracket assembly-bottom (up-tilting) at the once or twice to loosen them.

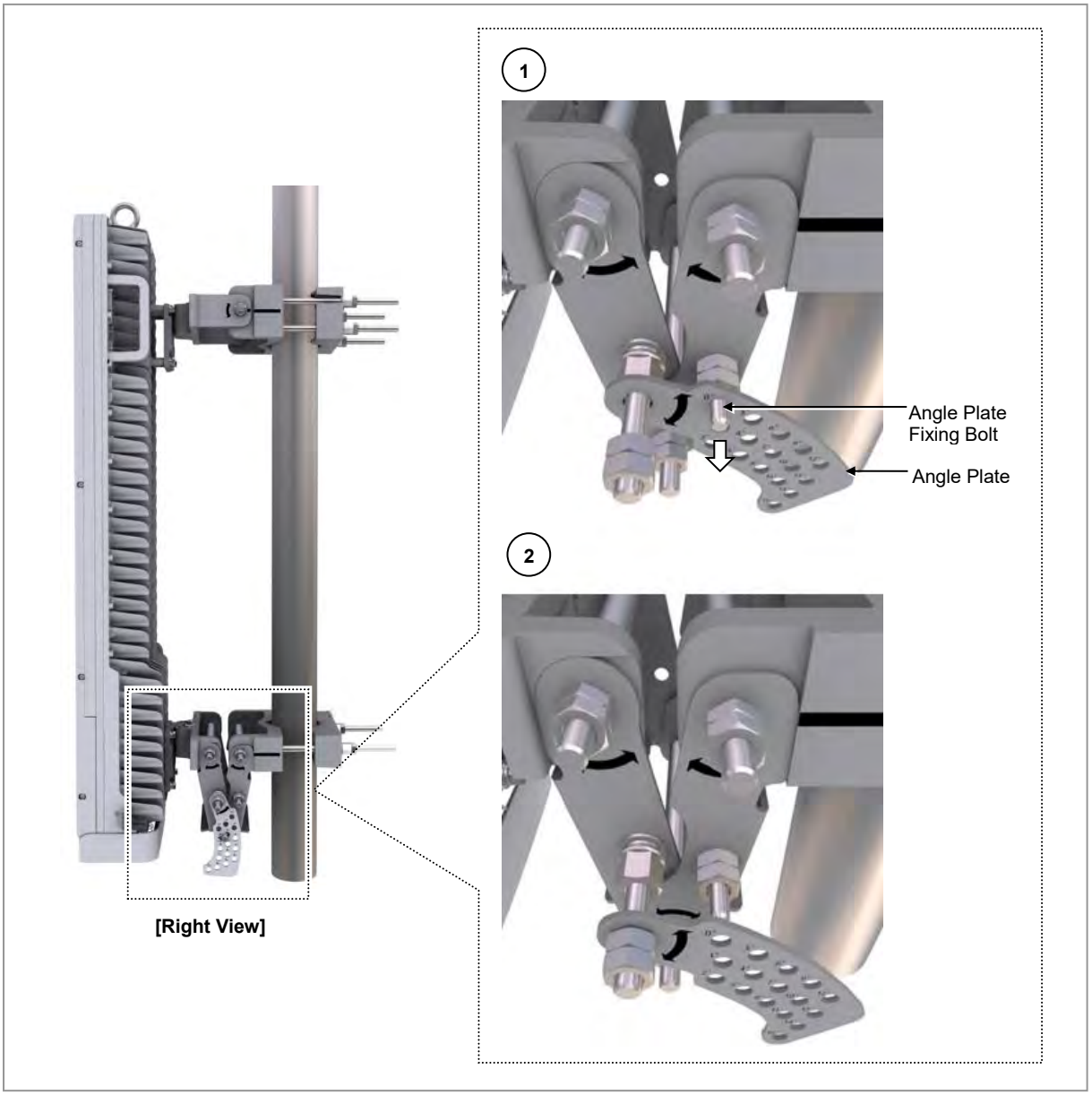
3 Do not detach the fasteners completely and loosen the 20 mm of the fasteners (number 4) of the angle plate.

Figure 61. MMU Up Tilting (2)



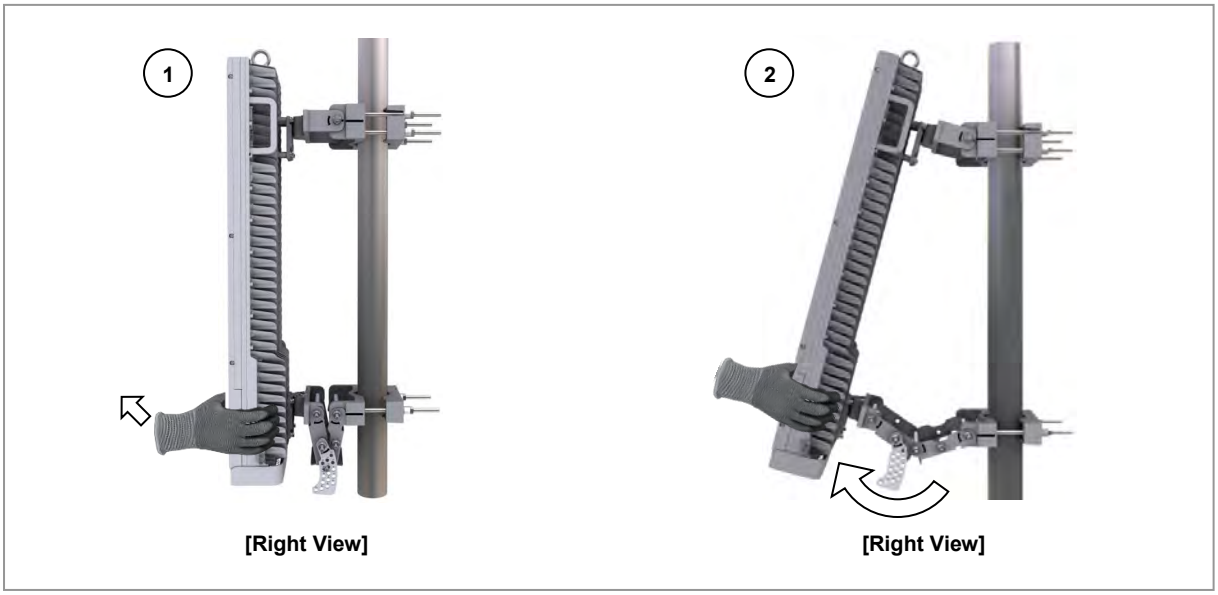
4 Remove the angle plate fixing bolt by pushing the angle plate outward.

Figure 62. MMU Up Tilting (3)



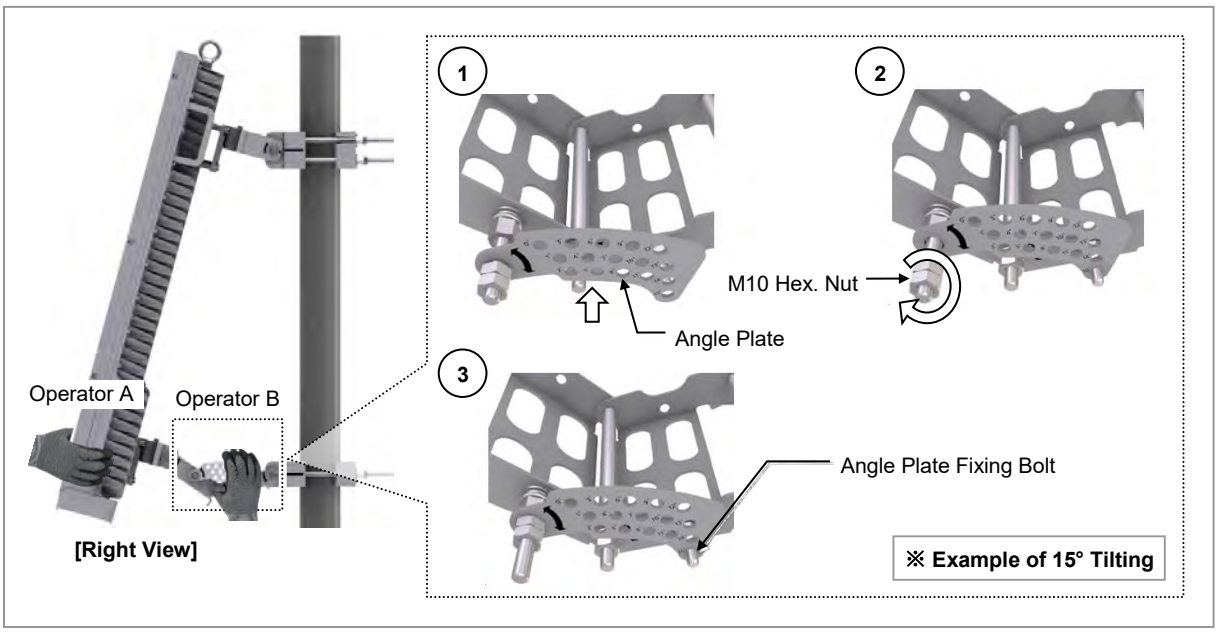
5 Pull the MMU forward to adjust the tilting angle.

Figure 63. MMU Up Tilting (4)



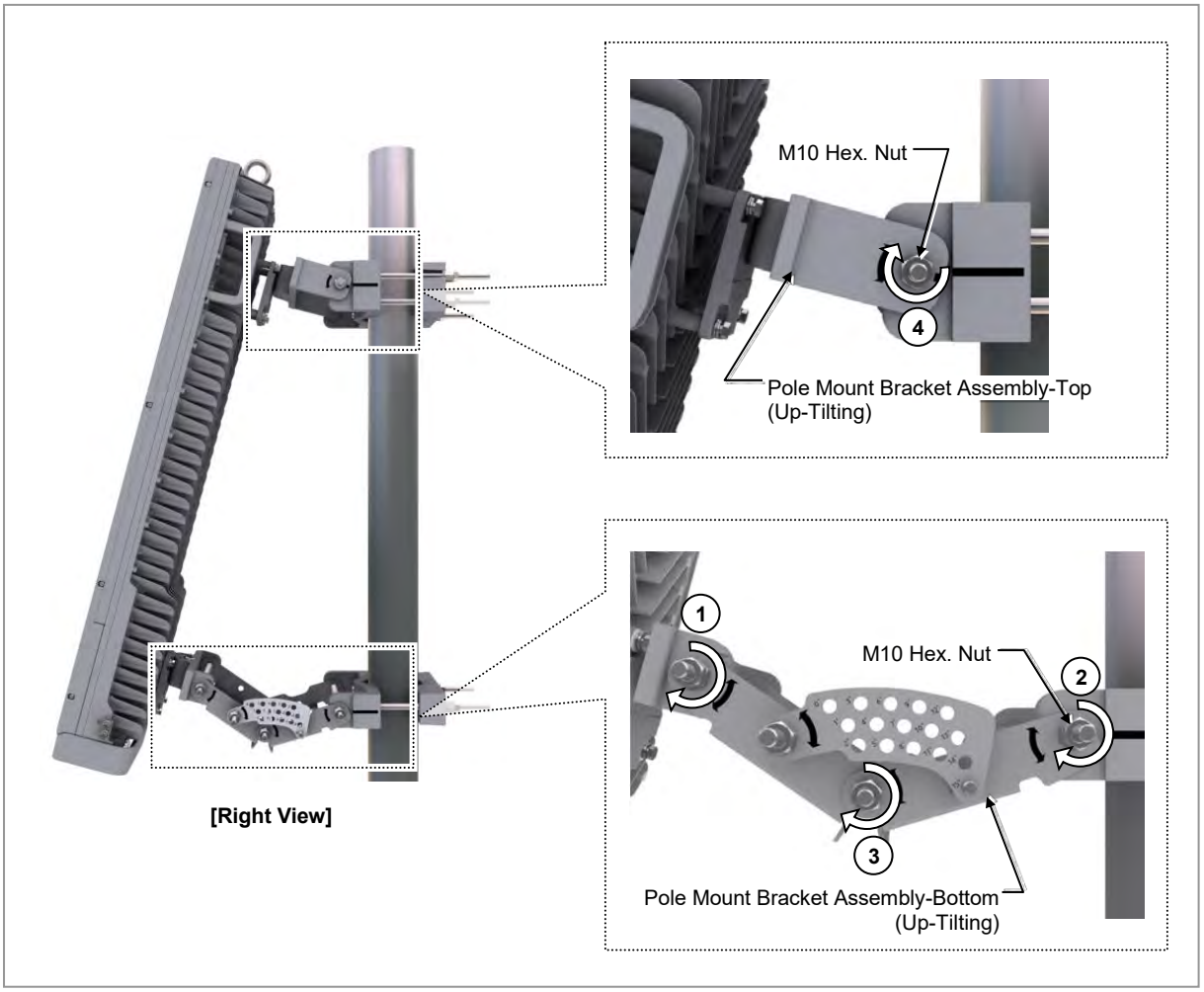
6 Workers A and B hold the MMU and angle plate respectively. They insert the angle plate fixing bolt into the designated hole of the angle plate depending on the required angle and fix the fastening material.

Figure 64. MMU Up Tilting (5)



7 Tighten the loosened fastening material of the mounting bracket assembly-top/-bottom for tilting up (follow the order 1 to 3 indicated in the figure above), and then fix them.

Figure 65. MMU Up Tilting (6)

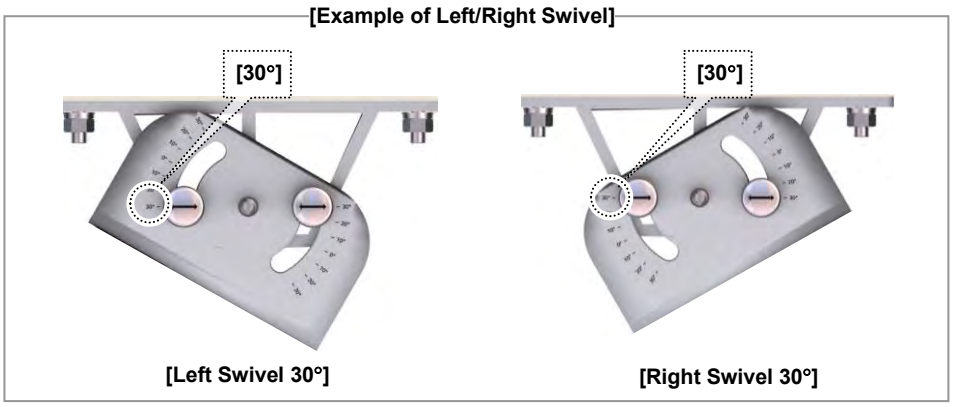


8 By using the RF alignment tool, check the tilt and the azimuth and adjust when there is an issue.

For detailed instructions of how to use the RF alignment tool, refer to the user manual per each manufacturer.

Swiveling

The MMU swivel angle can be adjusted left/right from 0° to 30°.



To adjust the MMU swivelling, do the following

Prerequisites

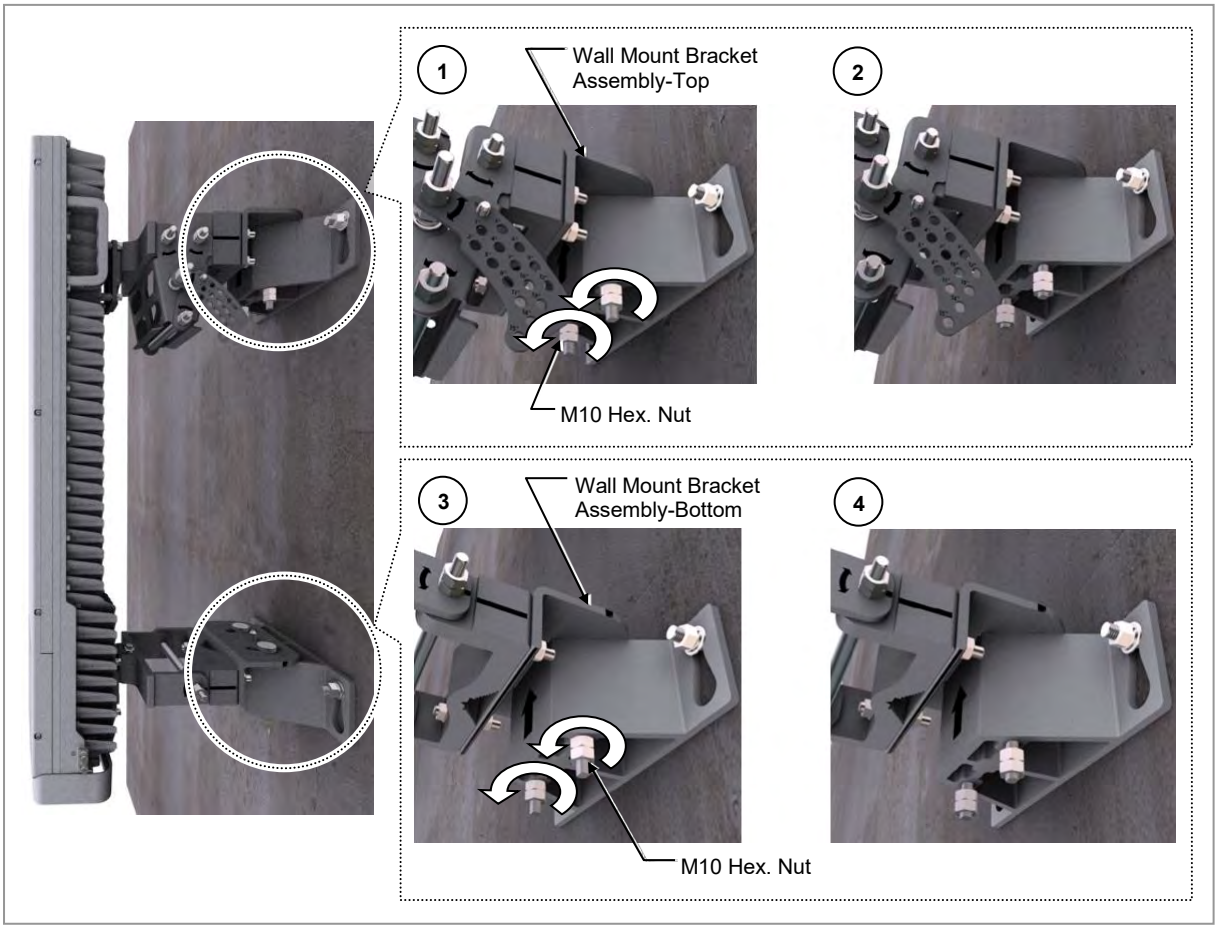
Before proceeding with swiveling the MMU, make sure that you have the items mentioned in the table below:

Table 18. Tools for Swiveling MMU

Category	Description	
Recommended Torque Value	M10 Hexagon Nut	217 lbf·in
Working Tools	• Torque Wrench (100 to 400 lbf·in) • Torque Wrench Spanner head (apply hexagonal. head: 17 mm) • Spanner (17 mm)	

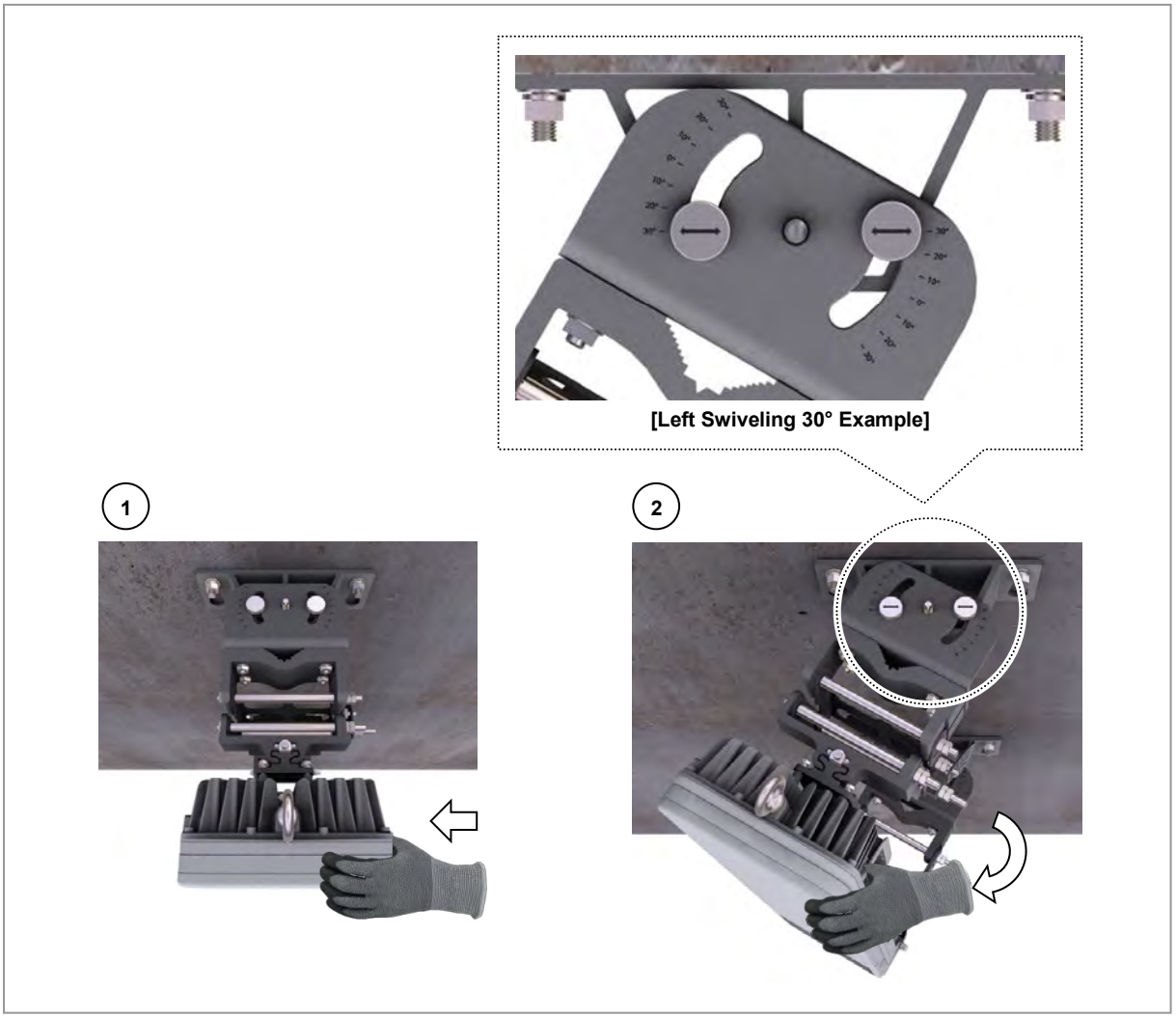
1 Loosen the MMU by turning M10 hexagon nut of mounting bracket two or three times counterclockwise. (Do not separate it completely.)

Figure 66. MMU Swiveling Adjustment (1)



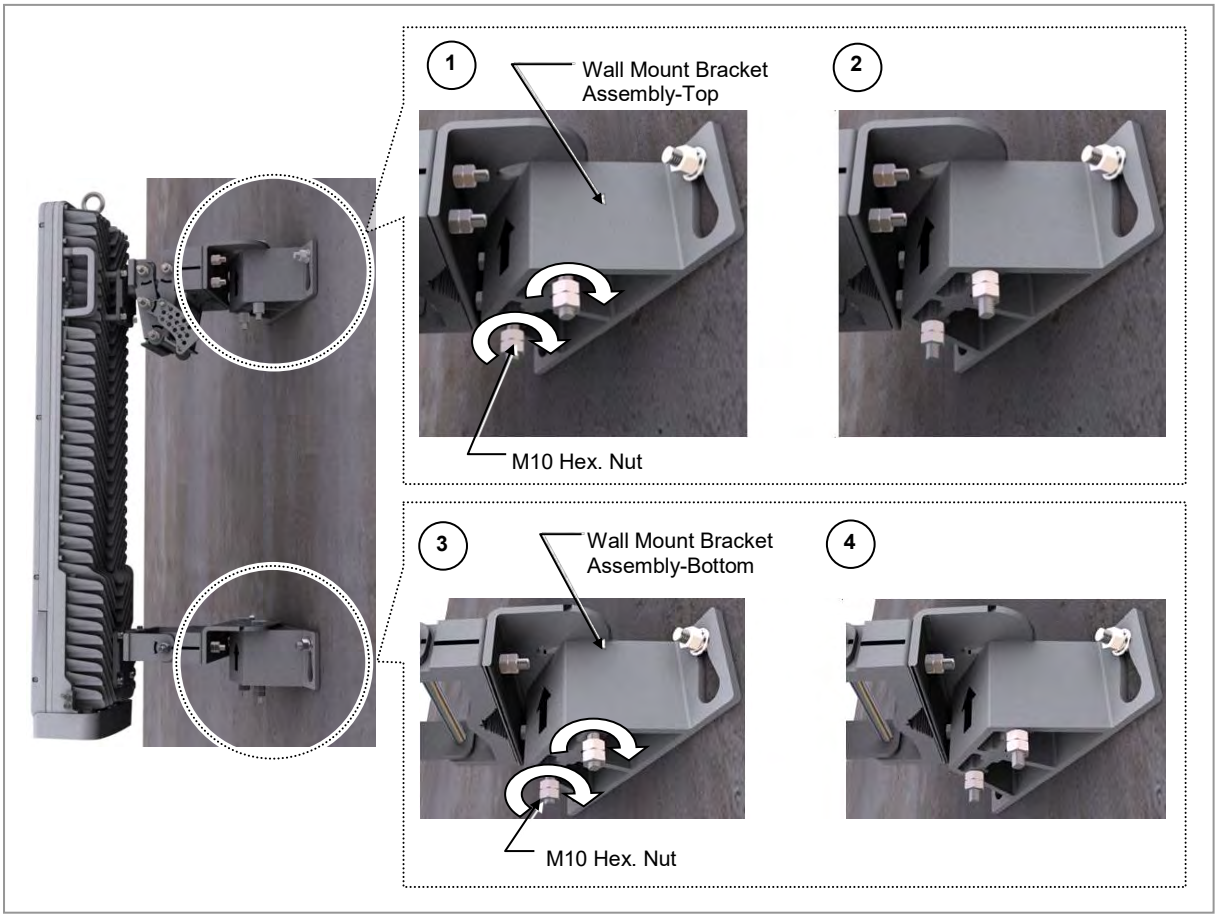
2 Pull the MMU left/right to adjust the swiveling angle.

Figure 67. MMU Swiveling Adjustment (2)



3 Fix the M10 hex. nut of mount bracket-top/bottom assembly.

Figure 68. MMU Swiveling Adjustment (3)



4 By using the RF alignment tool, check the tilt and the azimuth and adjust when there is an issue.

For detailed instructions of how to use the RF alignment tool, refer to the user manual per each manufacturer.

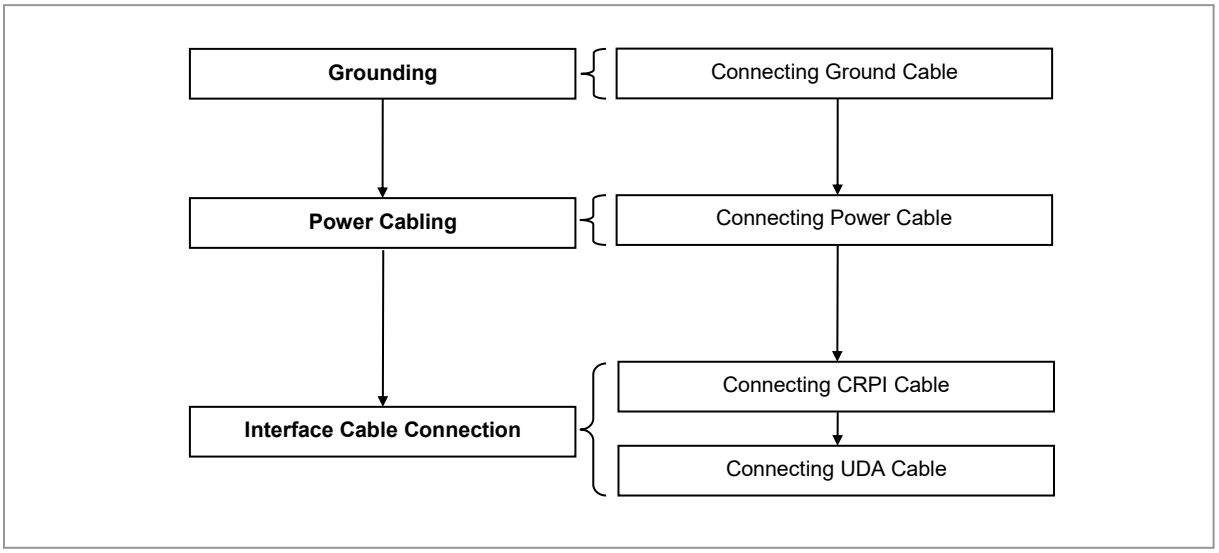
Chapter 3 Connecting Cables

This chapter describes the procedures to connect cables to the MMU system and to label the cables.

Cabling Procedure

The figure below depicts the procedure to connect system cables:

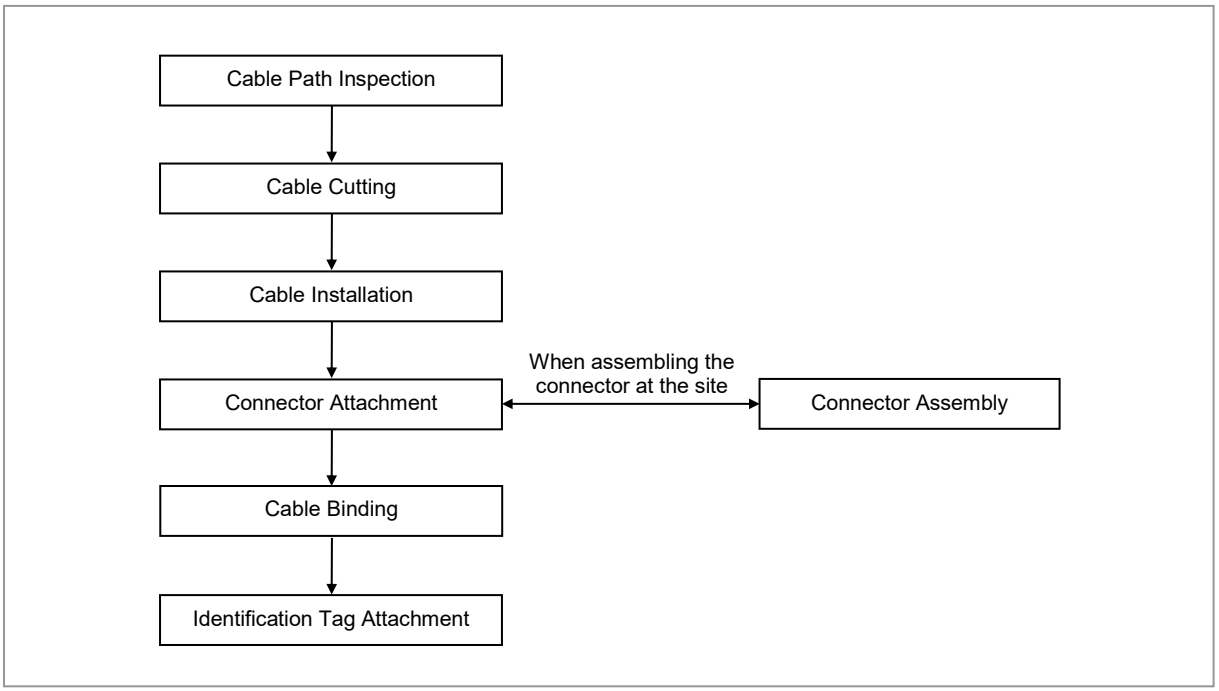
Figure 69. Procedure to Connect System Cable



Guidelines for Cable Connections

The figure below depicts the sequence of operations for connecting cables to the system:

Figure 70. 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 may cause contact failure, or damage to the assembled connector and the cable, due to cable tension or operator mistakes.

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

Cable Path Inspection

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

To inspect the cable path, ensure the following.

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

- The cable must be placed in a location where the cable is not damaged by external factors such as power line, flooding, and footpaths.
- In 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, follow these guidelines:

- Cut the cable to the length determined in the *Cable Path Inspection* step.
- Use a dedicated cable cutting tool.
- Cut the cable at right angles.
- Be careful to keep the cable away from 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 running the cable along the cabling path to the target connector of the system or an auxiliary device. This is done after cable path inspection and cable cutting are completed.

To install the cable, follow these guidelines:

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

The table below outlines the recommended minimum allowed cable bend radius for different types of cables:

Table 19. Recommended Minimum Allowed Cable bend Radius

No	Type	Allowed Cable Bend Radius	
1	Ground Cable	8 × Outer Diameter (OD)	
2	DC Power Cable	Operation: 8 × OD	Installation: 12 × OD
3	Optical Cable (Outdoor)	10 × OD	
4	UDA Cable	Operation: 5 × OD	Installation: 10 × OD

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

Cable Binding

This process involves fixing and arranging an installed cable using binding thread, cable ties, binding wire, and ram clamps.

Follow these guidelines when binding a cable.

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

Connector Attachment

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

Follow these guidelines when attaching the connector.

- Ensure 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 weather proof tape at the connector connection for cables that are installed outdoor, such as feeder lines, to prevent water leakage and corrosion from occurring at the part exposed to the outside.
- Connect each cable of the connector assembly in a straight line.
- Be careful when connecting the cable so that contact failure does not occur at the connector connection due to tension.

Identification Tag Attachment

This process involves attaching a marker cable tie, a nameplate, and a label to both ends of a cable (connections to a connector) to identify the use of the cable and the cabling path.

Follow these guidelines when attaching an identification tag.

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

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

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

After completing cable installation, unused ports must be capped.

When installing, ensure not to overlap or tangle the cables. In addition, consider future expansion. Install the DC power cable and the data transmission cable away from the AC power cable to prevent electromagnetic induction.

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

Cabling Diagram

The figure below depicts the different cabling options of the MMU:

Figure 71. Cable Diagram

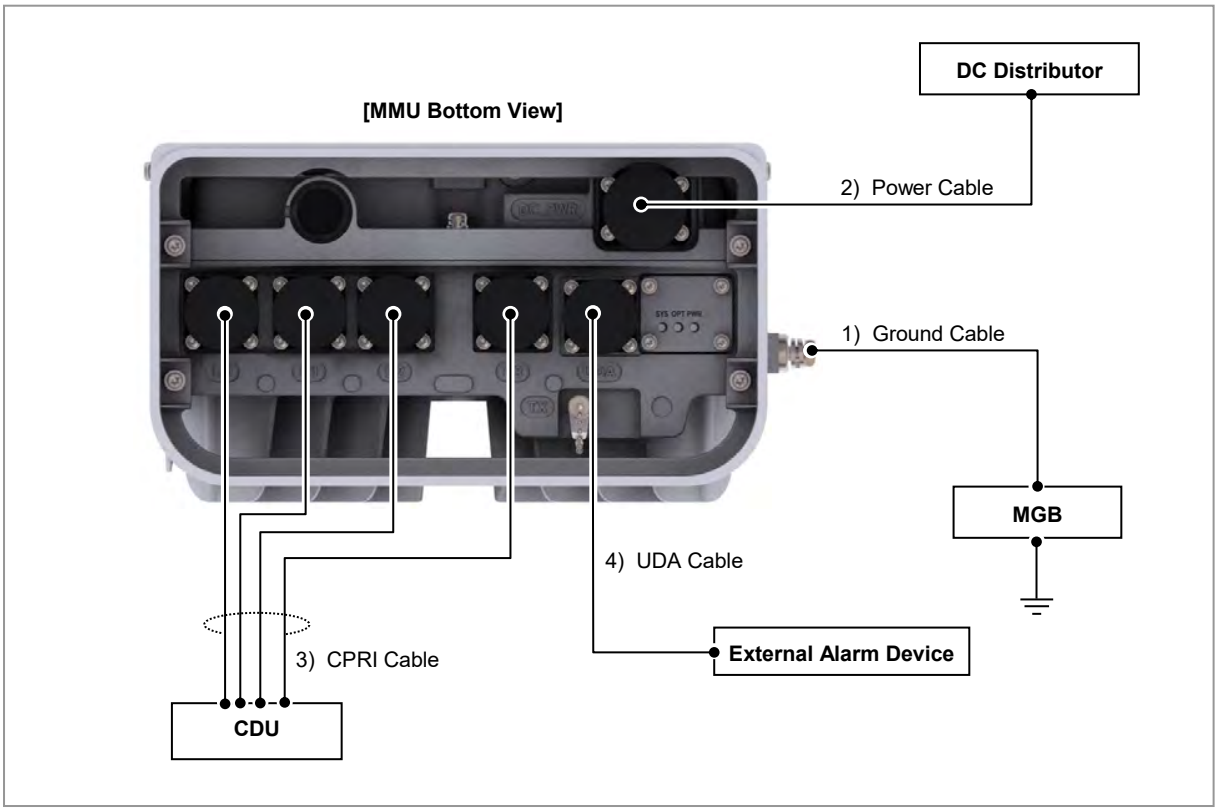


Table 20. MMU Connection Cable

From	To	Cable
MGB	MMU	**1** Ground Cable: 6 AWG × 1C
MMU	Rectifier	**2** Power Cable: 10 AWG × 2C, 8 AWG × 2C
	CDU	**3** CPRI Cable: Single Mode (Outdoor Type)
	External Alarm Device	**4** UDA Cable Assembly

The inlet hole finishing method of external equipment must be done after consultation with operation company, if the cable is connected to external equipment, such as optical distribution box.
- Cables: Power cable, CPRI cables, and UDA cable

Grounding

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

If equipment is grounded through a cabinet or rack, make sure it is done so properly

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

The purposes of the ground construction are as follows:

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

Connecting Ground Cable

To connect a ground cable, do the following:

Prerequisites

Before proceeding with connecting the ground cable, make sure that you have the items mentioned in the table below:

Table 21. Parts and Tools for Connecting Ground Cable

Category	Description	
Installation Section	MGB-MMU Ground Terminal	
Cable	6 AWG × 1C	
Minimum Cable Bend Radius	8 × OD	
Heat Shrink Tube (Spec/Color/Length)	Φ 0.5 in. (12 mm)/Green/2.0 in. (50 mm)	
Pressure Terminal	MGB	Checking MGB specifications per site and preparing connecting parts
	MMU	6 AWG, 2 Hole, Hole diameter: 1/4 in. (6.4 mm), Hole spacing: 0.6 in. (16 mm)
Fastener	MGB	Checking MGB specifications per site and preparing connecting parts

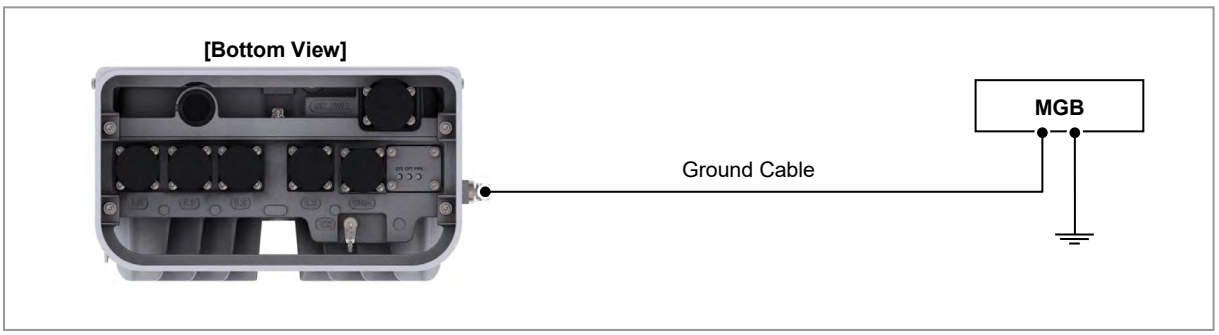
Category	Description	
	MMU	M6 × L12 SEMS (Hex.+)/2 EA
Recommended Torque Value	M6 SEMS	43 lbf·in
Working Tools	• Cable Cutter • Wire Stripper • Crimping tool • Heating Gun • Nipper • Screw Driver ('+', Number 3) • Torque Driver (20 to 90 lbf·in.) • Screw Driver Bit ('+', Number 3)	

For the pressure terminals of the cable, the UL listed products or equivalent must be used.
For example, Manufacturer-Panduit
- MMU: 6 AWG Pressure Terminal (LCD6-14A-L)

It is recommended to apply antioxidant (ex.grease) to prevent oxidation before connecting the pressure terminal.

1 Install the ground cable from the MGB to the MMU ground terminal, as shown in figure below:

Figure 72. Connecting Ground Cable (1)



2 Remove the fastener (M6 SEMS) from the MMU ground terminal.

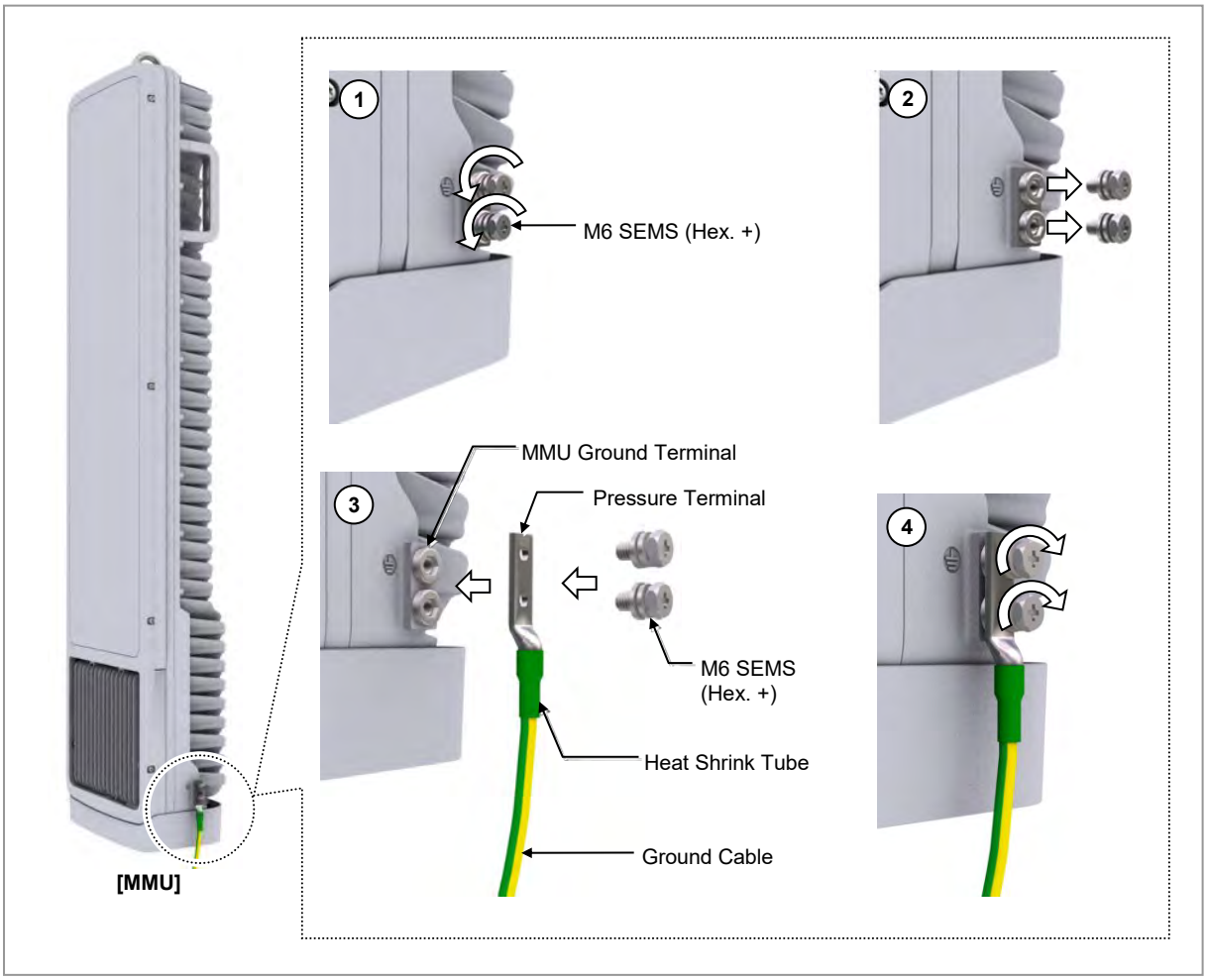
3 Assemble a pressure terminal and a heat shrink tube at the end of the MMU ground cable.

4 Align the pressure terminal to the mounting hole of the MMU ground terminal.

5 Firmly fix the pressure terminal onto the MMU ground terminal using

fasteners.

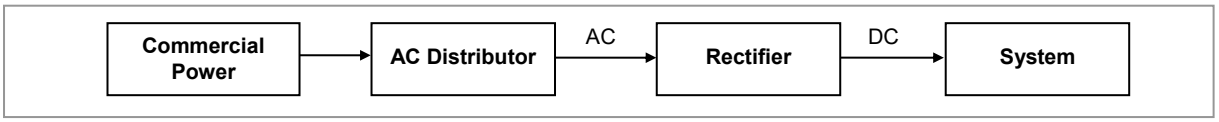
Figure 73. Connecting Ground Cable (2)



Power Cabling

The figure below depicts the elements of a power supply device:

Figure 74. Power Equipment Elements



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

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

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

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

Install the power cable to the power port of the system by considering the radius of curvature of its cable specification and then cut the cable. If 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 may result in poor contact after the cable is connected to the power port.

If you turn the power on and off rapidly (within 1 s), the counter electromotive force caused by cable inductance can damage the system.

Connecting more than one power cable together may increase power loss.

It must be verified that the rectifier or the power distributor has an output voltage within the specified system input range before the power line is connected.

If using the DC power cable, the maximum installation length per type is as follows. Note, however, that the maximum installation length is based on the conditions under which each cable is normally installed and that it may change if the conditions change.

Power Cable Size	Maximum Installation Length
10 AWG	TBD
8 AWG	TBD

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

Connecting Power Cable

To connect a power cable, do the following:

Prerequisites

Before proceeding with connecting the power cable, make sure that you have the items mentioned in the table below:

Table 22. Parts and Tools for Connecting Power Cable

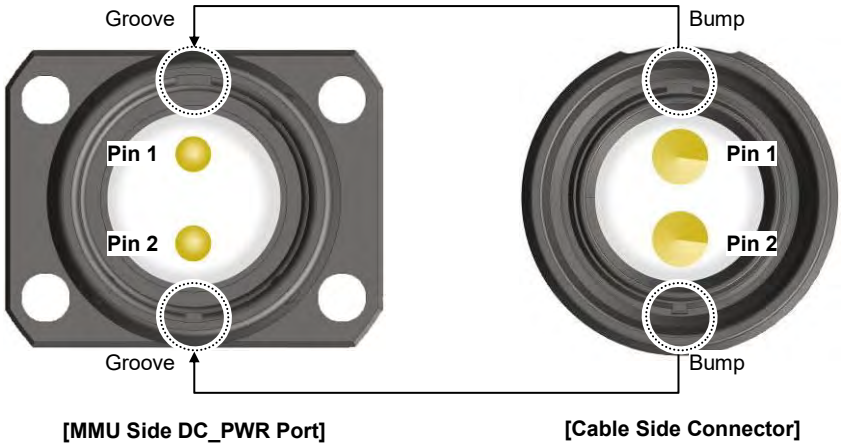
Category	Description	
Installation Section	DC Distributor-MMU power input port	
Cable	10 AWG × 2C, 8 AWG × 2C	
Minimum Cable bend Radius	• Dynamic bend radius: 8 × OD • Static bend radius: 12 × OD	
Connector	Distributor	Check specifications of DC distributor output terminal per site and prepare fasteners.
	MMU (DC)	JONHON, Push Pull Type, CT48J-1502TSCBM-07 to OPEN
Working Tools	• Cable Cutter • Wire Stripper • Compressor • Heating Gun • Nipper	

The table below outlines the power cable connector pin map:

Table 23. DC Power Cable/Connector Pin Map

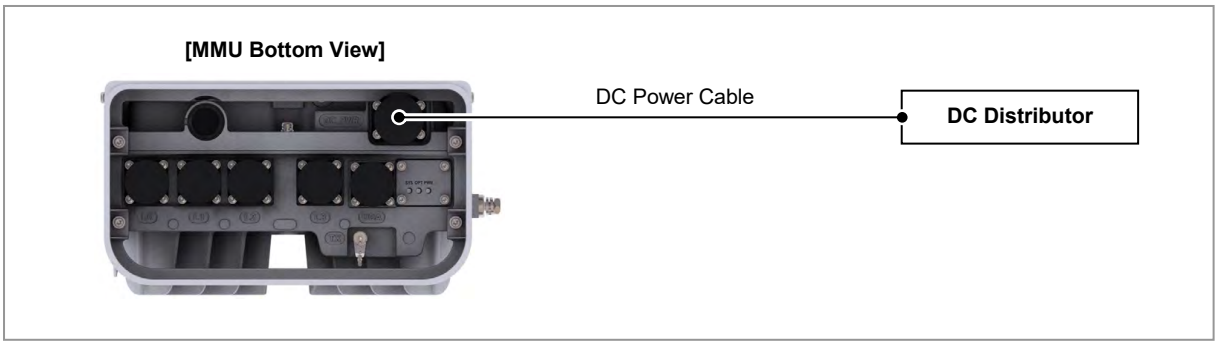
Power Connector Pin Number	Description	Color
Pin 1	-48 V DC	Red
Pin 2	RTN	Black

Power Connector Pin Number	Description	Color



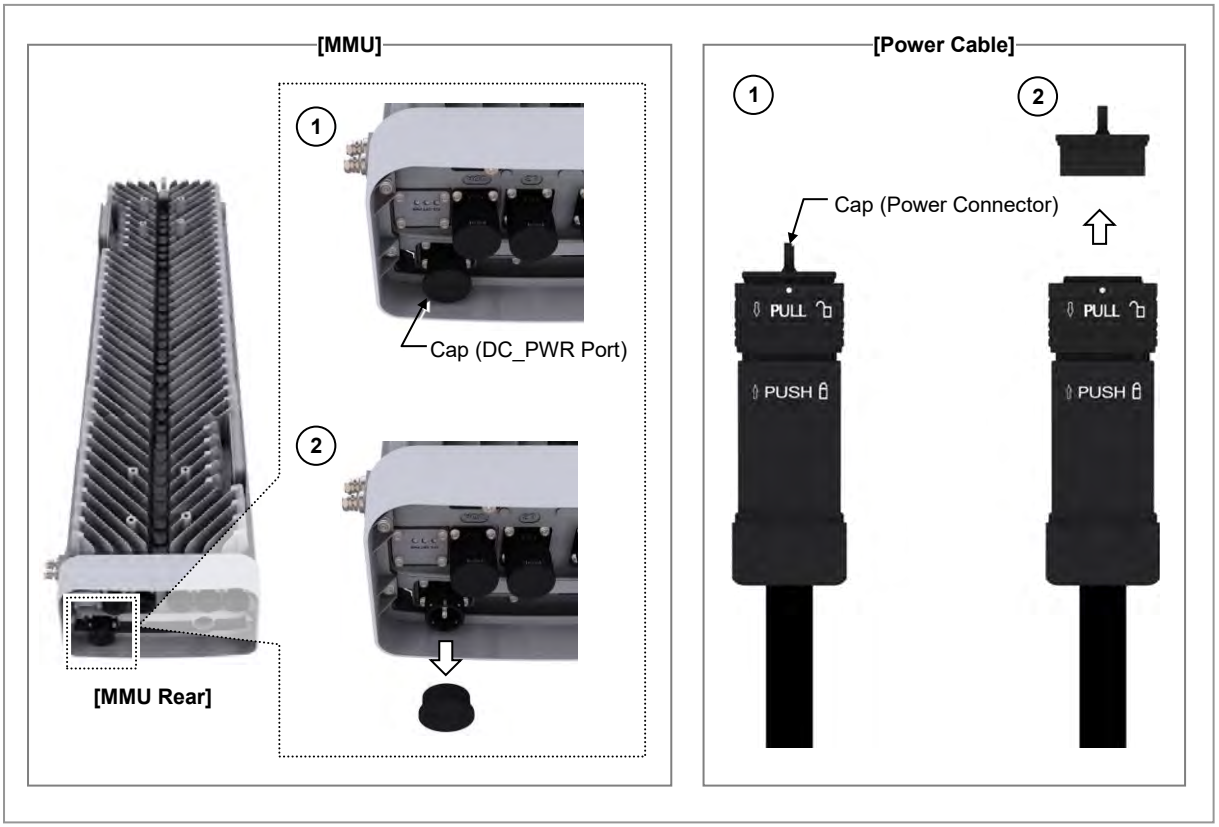
1 Install the power cable from the distributor to the MMU.

Figure 75. Connecting Power Cable (1)



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

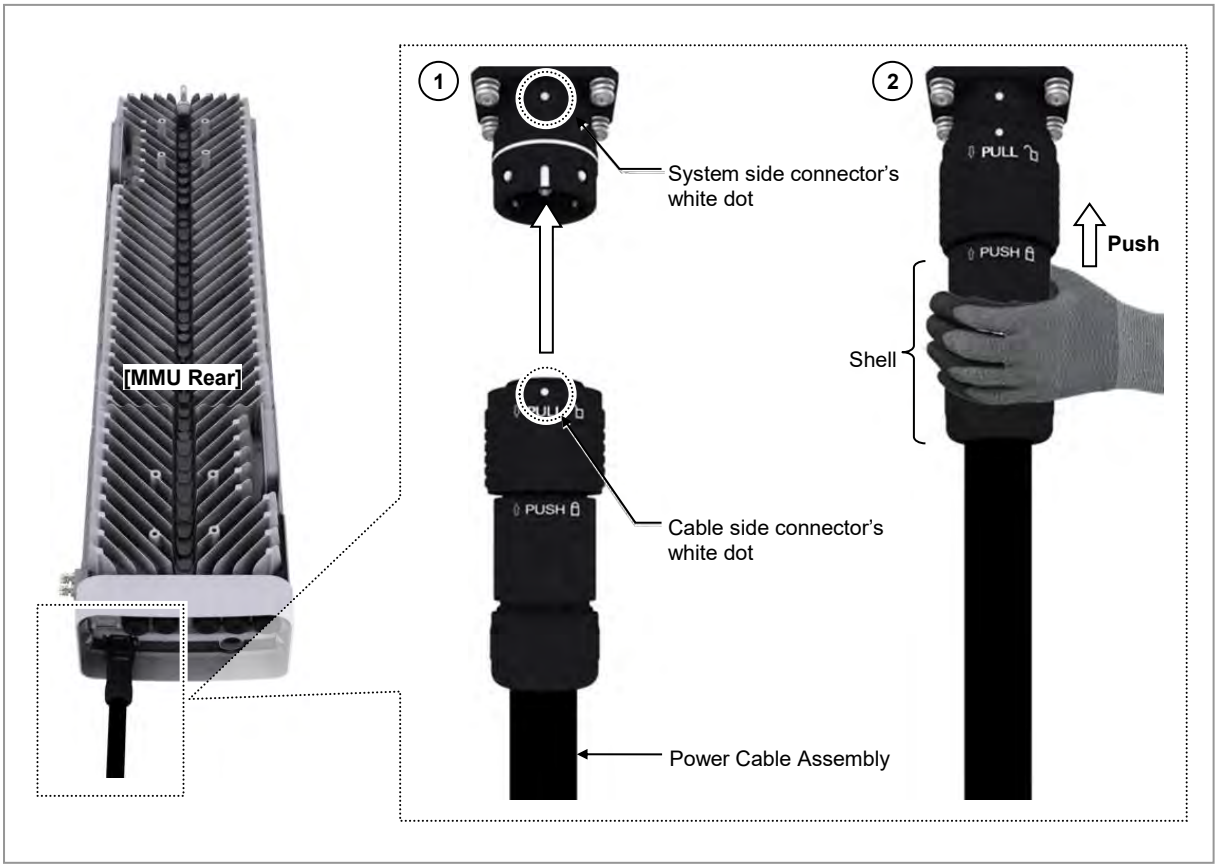
Figure 76. Connecting Power Cable (2)



3 Insert the connector aligning white dot of the cable side connector and white dot of the system side connector.

4 When inserting the connector, push the shell to upper side.

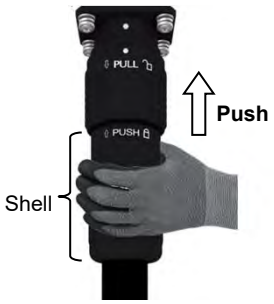
Figure 77. Connecting Power Cable (3)



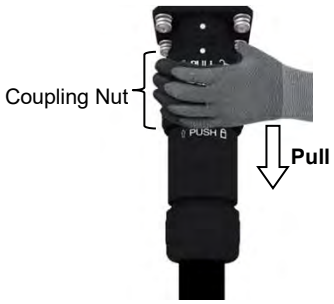
When the connector is fastened tight, the white line on the system side connector becomes invisible.

[White Line is invisible] **[White Line is visible]**

The method for connecting or disconnecting the power connector is as follows:
- For connecting the connector, push the shell to upper side.
- For disconnecting the connector, pull the coupling nut to lower side.



[Connector 연결]



[Connector 분리]

Interface Cable Connection

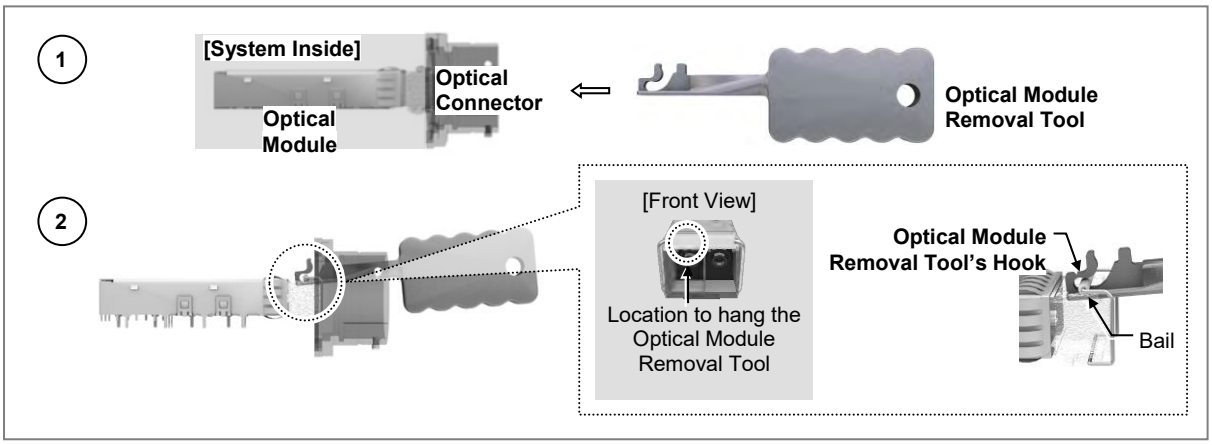
Remove/Insert Optical Module

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

To remove optical module, do the following:

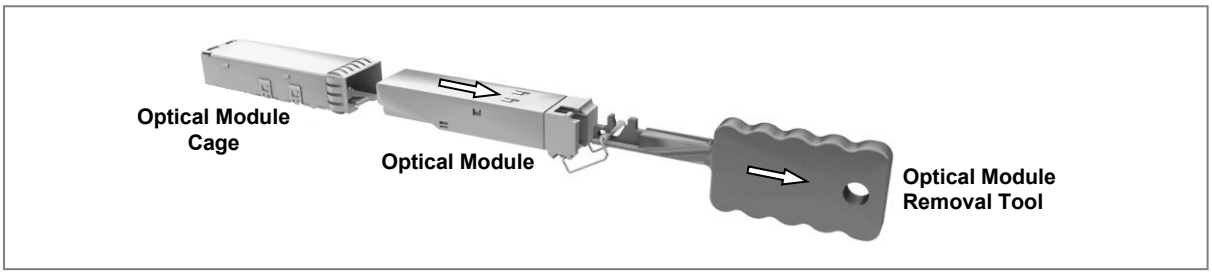
1 Hang the optical transceiver removal tool's hook on the optical module's bail within the system.

Figure 78. Optical Module Removal (1)

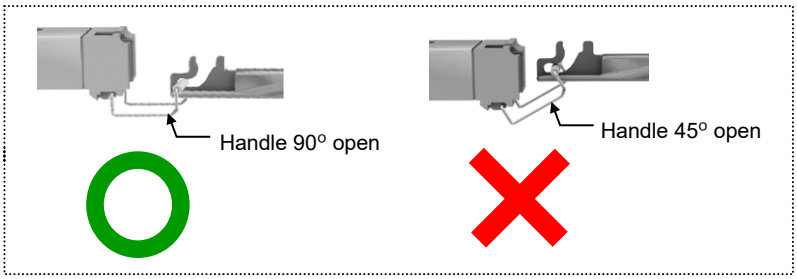


2 Completely remove the optical module from the optical module cage by pulling the optical module removal Tool.

Figure 79. Optical Module Removal (2)

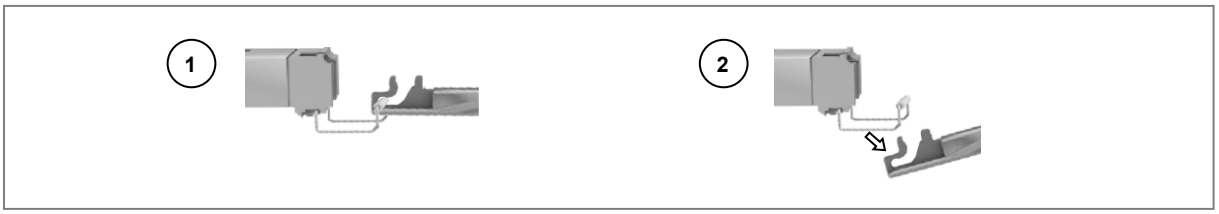


When desorbing an optical module, use a dedicated tool (optical module desorption tool) to remove the handle by opening it for about 90º.
When the optical module is detached without using the dedicated tool, the optical module may be jammed and the handle may be damaged due to a lack of opening capacity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



3 Remove the optical module and the jig by pressing the optical module Removal Tool's hook grip.

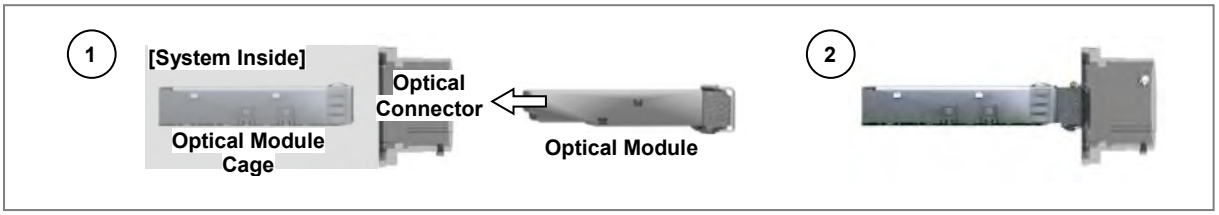
Figure 80. Optical Module Removal (3)



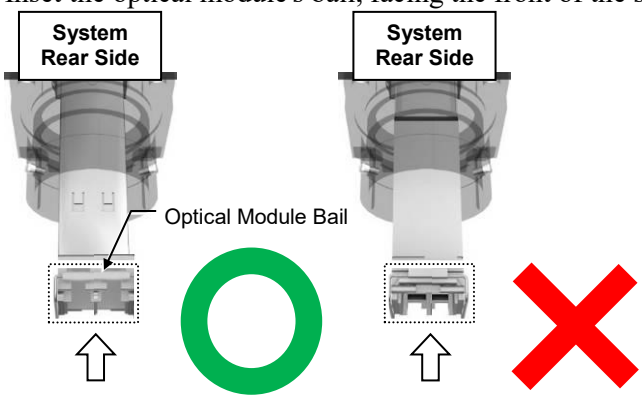
To inset optical module, do the following:

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

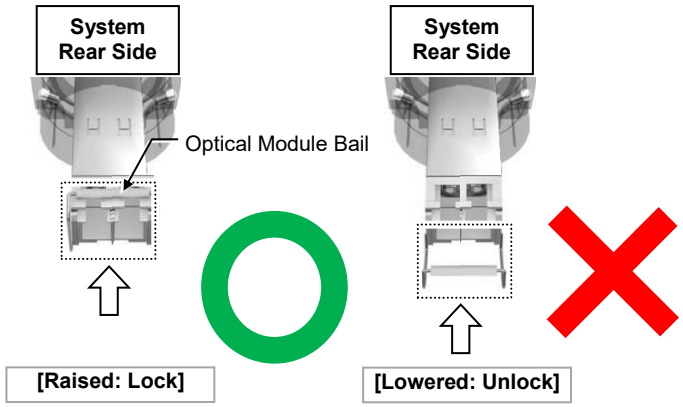
Figure 81. Optical Module Insert



Inset 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 CPRI Cable

To connect a CPRI cable, do the following:

Prerequisites

Before proceeding with connecting the CPRI cable, make sure that you have the items mentioned in the table below:

Table 24. Parts and Tools for connecting CPRI Cable

Category	Description	
Installation Section	CDU to MMU L0 Port	
Cable	CPRI Cable (Optical, Single Mode, for Outdoor Type)	
Bend Radius	10 × OD	
Connector	MMU	JONHON, Push Pull Type, PDLC03T03 (DLC/UPC)
Working Tools	Optical Connector Cleaner	

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

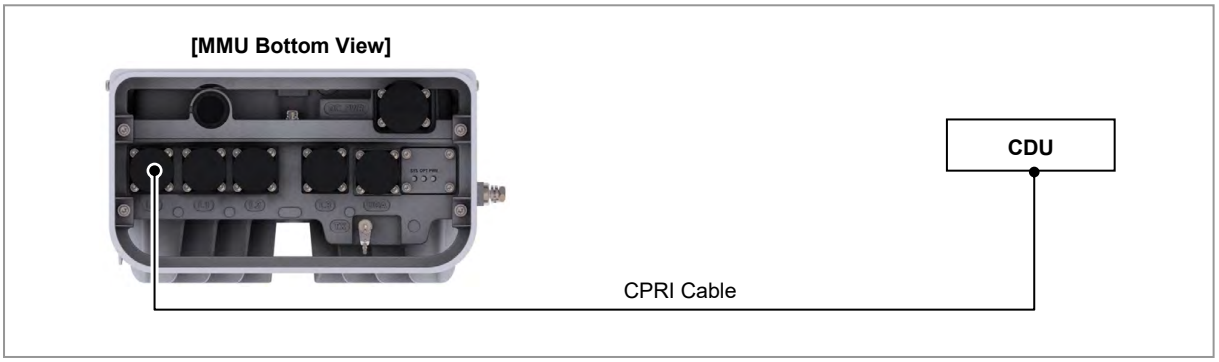
Remove the cap of the optical connector before connecting.
- Before connecting the optical cable, check if the ferrule of the connector is soiled. Be careful to keep the cutting section away from dust or foreign material. If the cable is soiled with foreign material, do not blow to remove them.
- Make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

To migration to 64T64R, an optical cable 6 pair must be prepared.

Before connecting the CPRI cable connector, the ferrule of the connecter of cable side should be cleaned first by using the optical connector cleaner. (Appendix B for more information.)

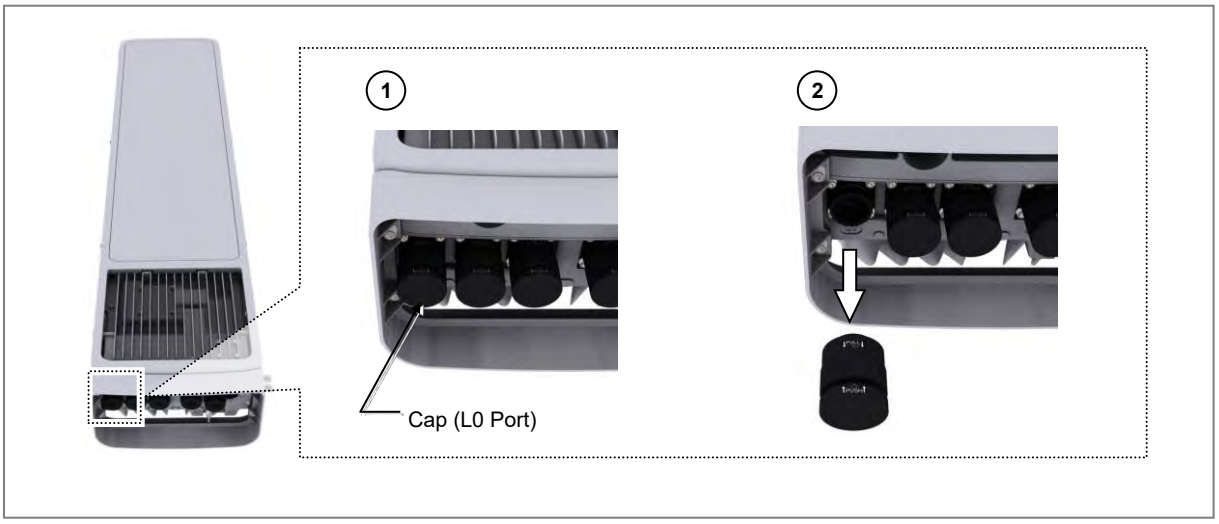
1 Install the CPRI cable from the CDU to the MMU L0 port.

Figure 82. Connecting CPRI Cable (1)



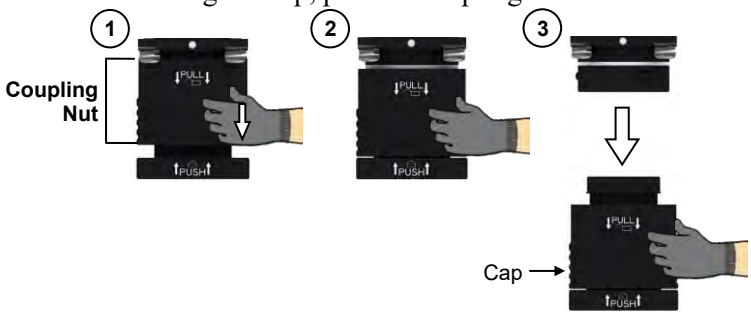
2 Separate the cap from the system side connector (L0 port).

Figure 83. Connecting CPRI Cable (2)



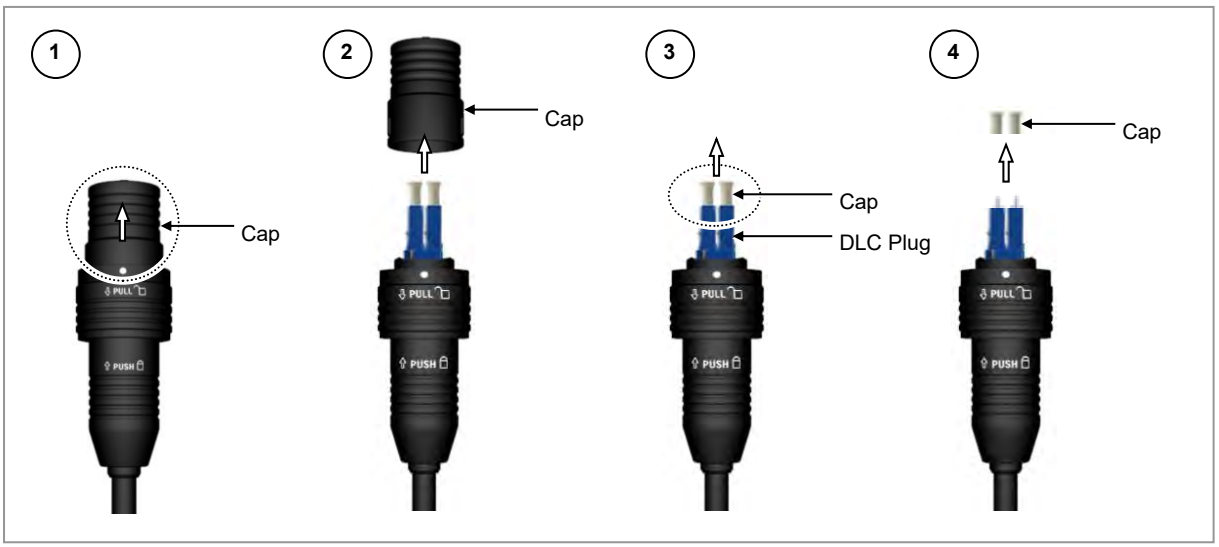
The method for connecting/disconnecting the cap (push-pull type) is as follows:

- For disconnecting the cap, pull the coupling nut to lower side.



3 Separate the cap from the cable side connector.

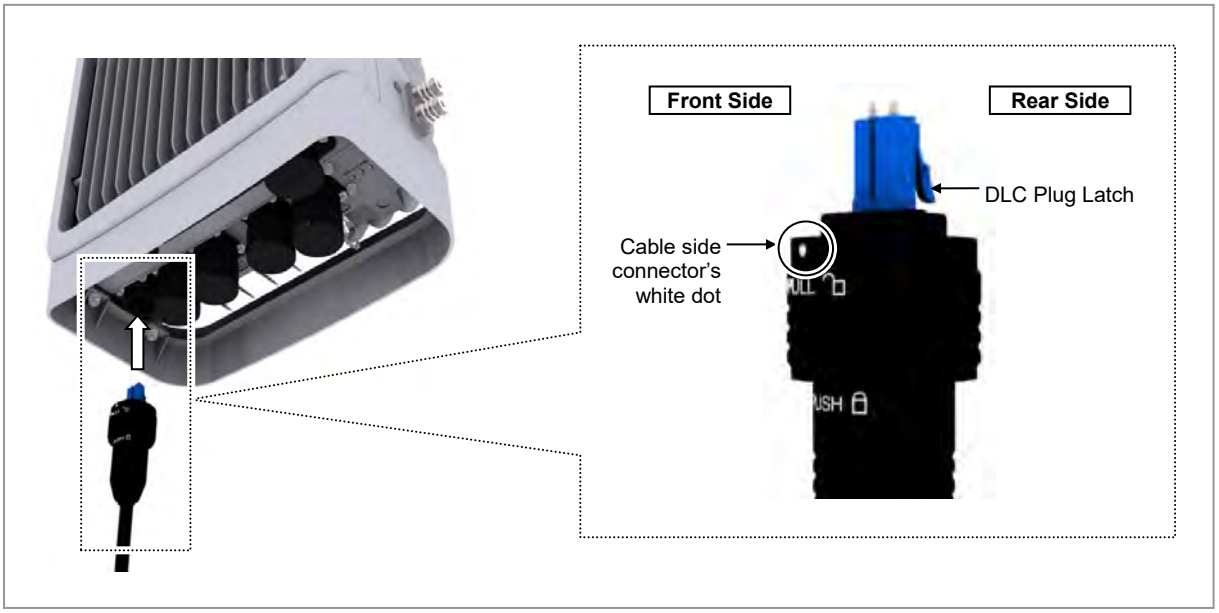
Figure 84. Connecting CPRI Cable (3)



4 The latch of cable side connector should be toward the rear side.

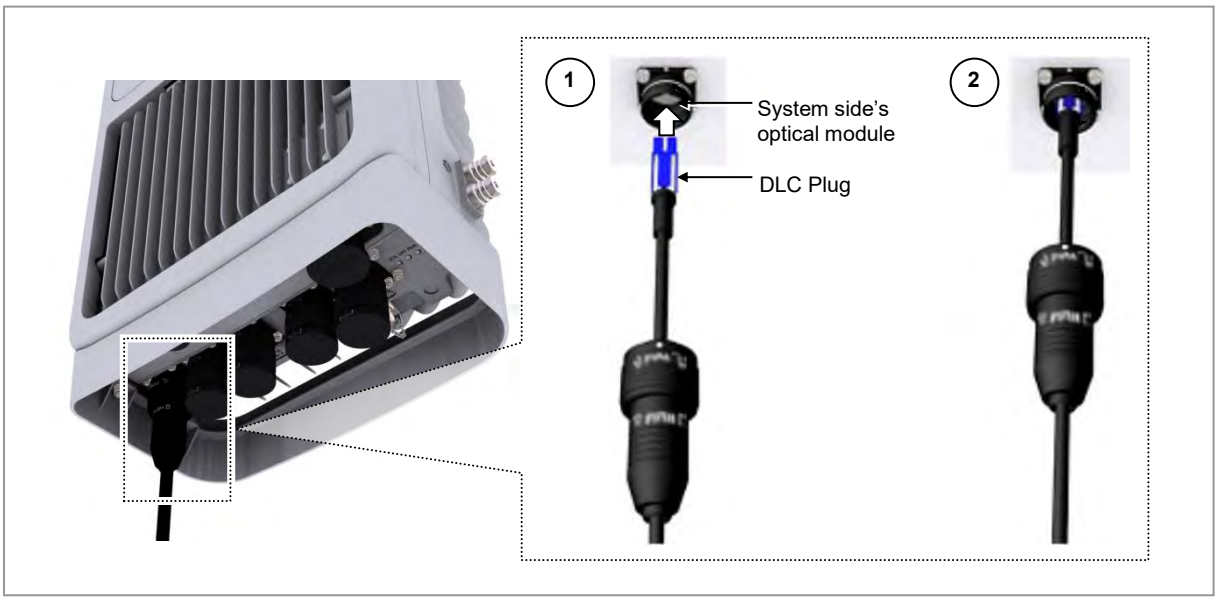
Before connecting the CPRI cable connector, the Ferrule of the connecter of cable side should be cleaned first by using the optical connector cleaner. (Appendix B for more information.)

Figure 85. Connecting CPRI Cable (4)



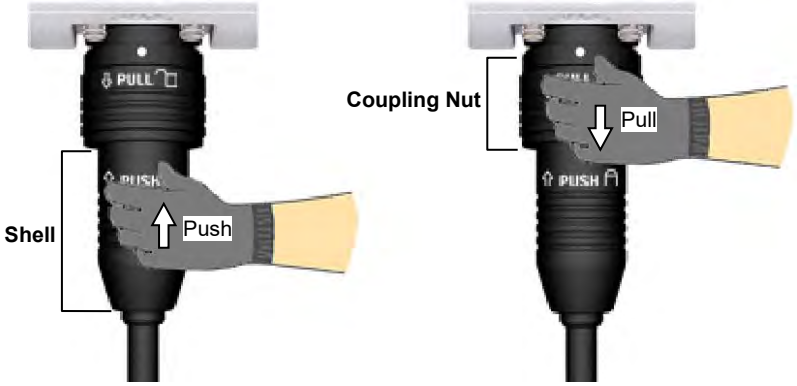
5 Insert the DLC plug to the system side's optical module.

Figure 86. Connecting CPRI Cable (5)



When the connector is fastened tight, the white line on the system side connector should be invisible (or hidden).

The method for connecting/disconnecting the CPRI (optical) connector is as follows:
- For connecting the connector, push the shell to upper side.
- For disconnecting the connector, pull the coupling nut to lower side.



Connecting UDA Cable

To connect a UDA cable, do the following:

Prerequisites

Before proceeding with connecting the UDA cable, make sure that you have the items mentioned in the table below:

Table 25. Parts and Tools for Connecting UDA Cable

Category	Description	
Installation Section	MMU UDA Port to External alarm device	
Cable	UDA Cable Assembly (Cat.5e 24AWG 4P)	
Minimum Cable bend Radius	Operation: 5 × OD	Installation: 10 × OD
Connector	External alarm device	Check specifications of external device output terminal per site and prepare fasteners.
	MMU	JONHON, Push Pull Type, RJ45MF-CT-07

Category	Description
Working Tools	• Cable Cutter • Wire Stripper • Nipper • LAN Tool

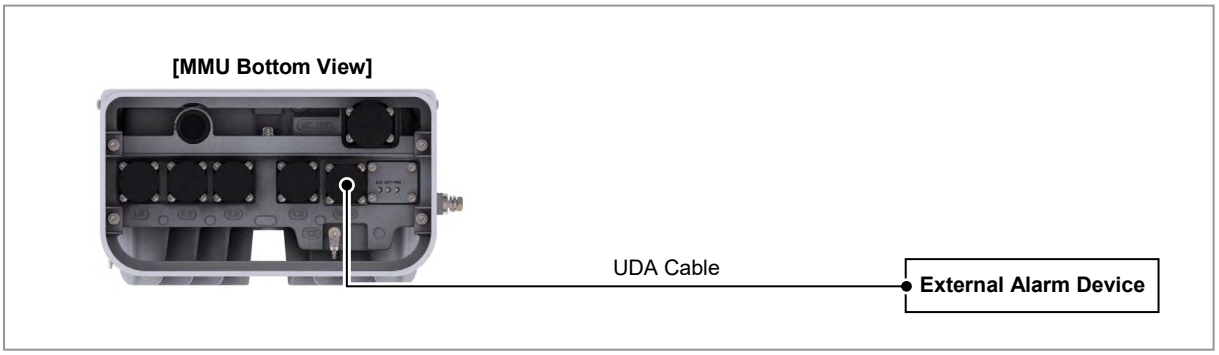
The table below outlines the UDA cable pin map:

Table 26. UDA Cable Pin Map

Pin	Color	Function
1	White/Blue	UDA0
2	Blue	UDA0_RTN
3	White/Orange	UDA1
6	Orange	UDA1_RTN
4	White/Green	UDA2
5	Green	UDA2_RTN
7	White/Brown	UDA3
8	Brown	UDA3_RTN

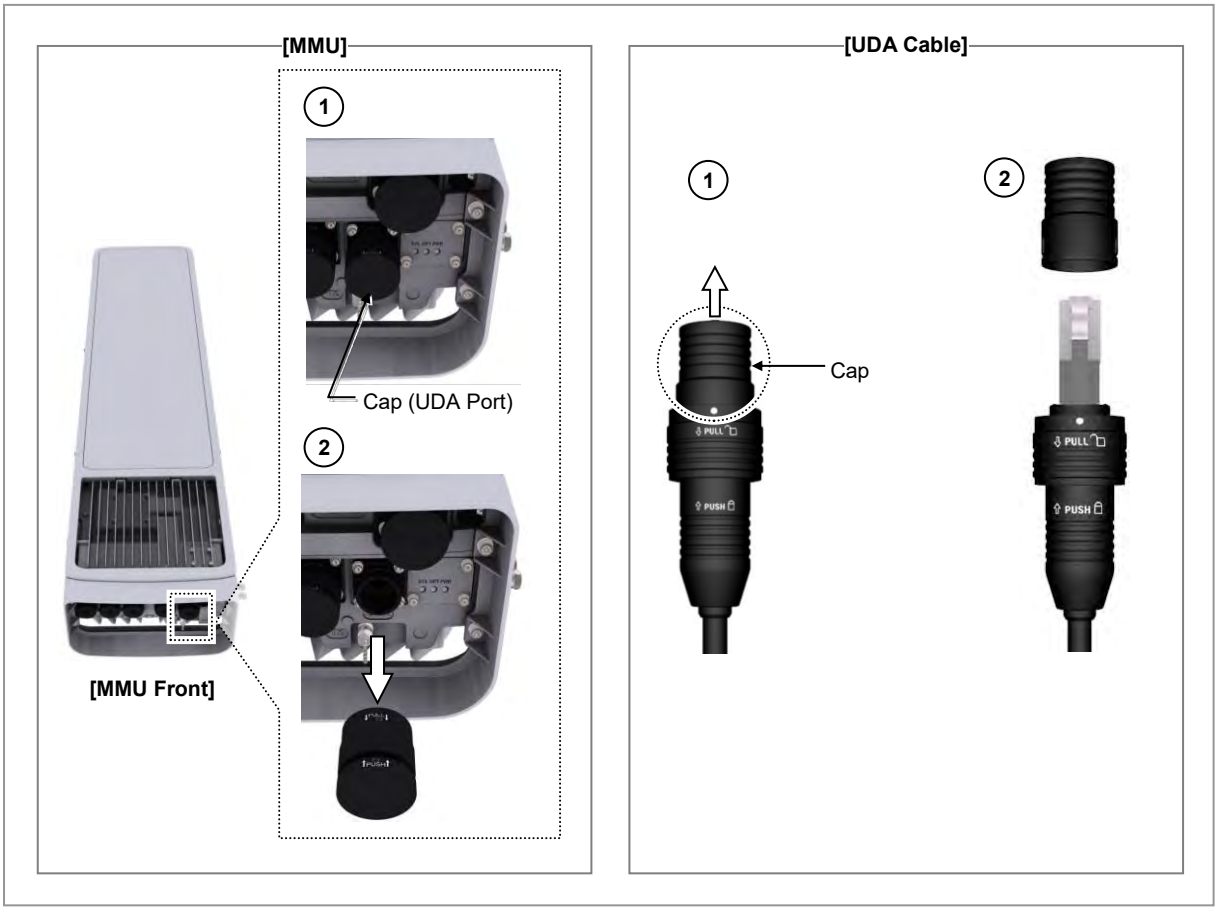
1 Install the UDA cable from the external alarm device to the MMU.

Figure 87. Connecting UDA Cable (1)



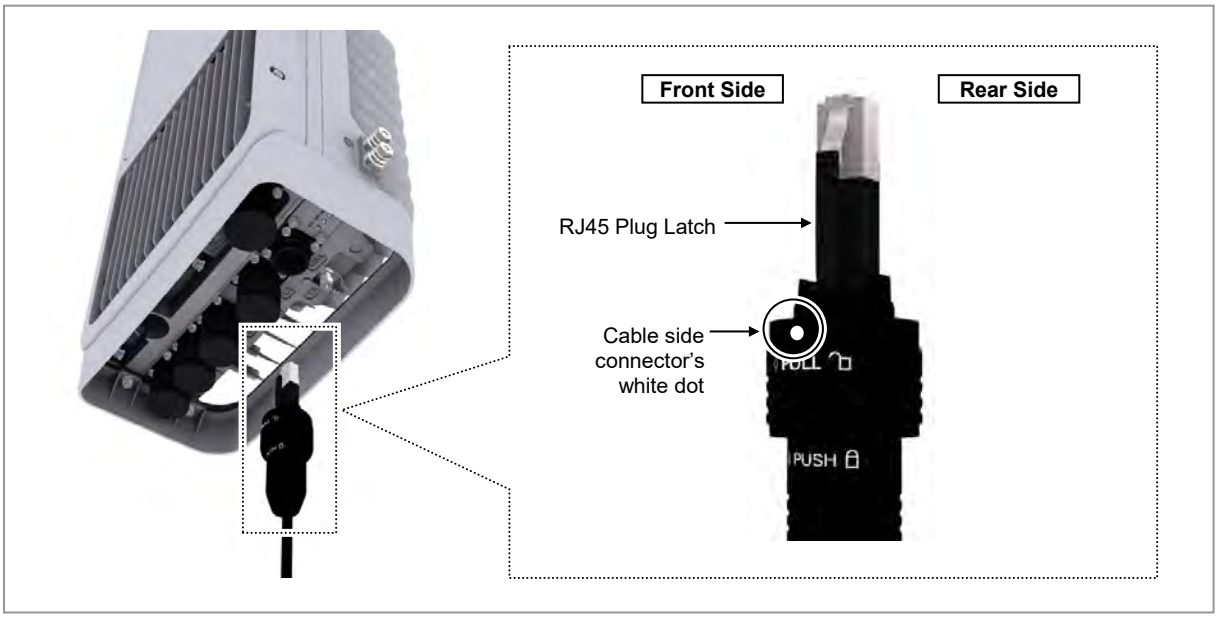
2 Separate the cap from the MMU side and cable side connector.

Figure 88. Connecting UDA Cable (2)



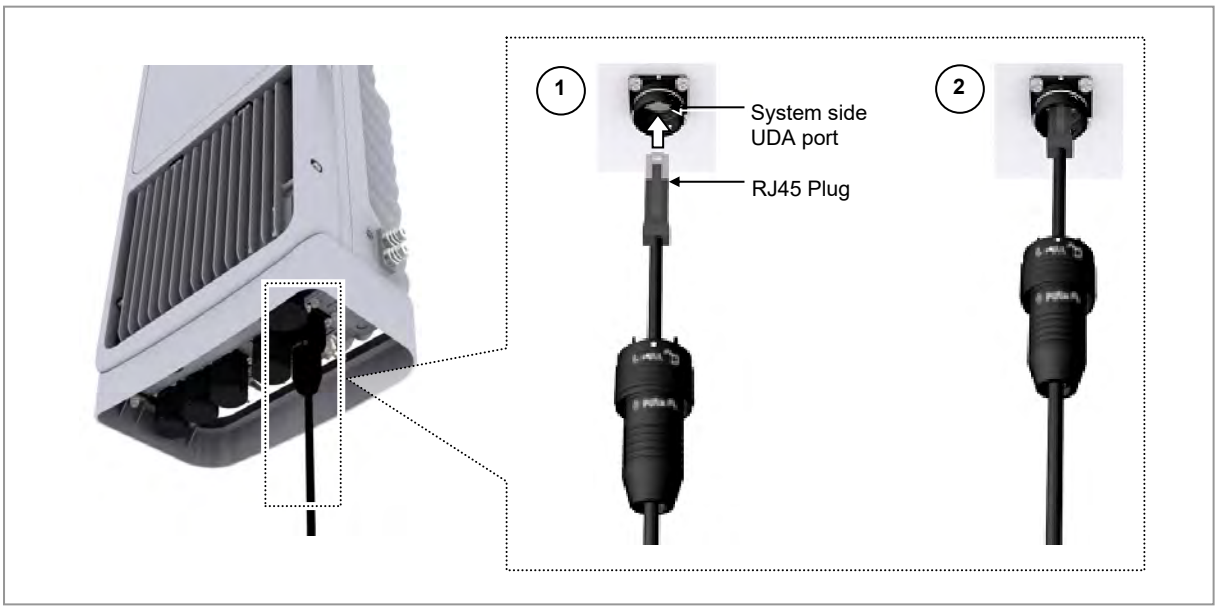
3 The latch of cable side connector should be toward the front of the MMU.

Figure 89. Connecting UDA Cable (3)

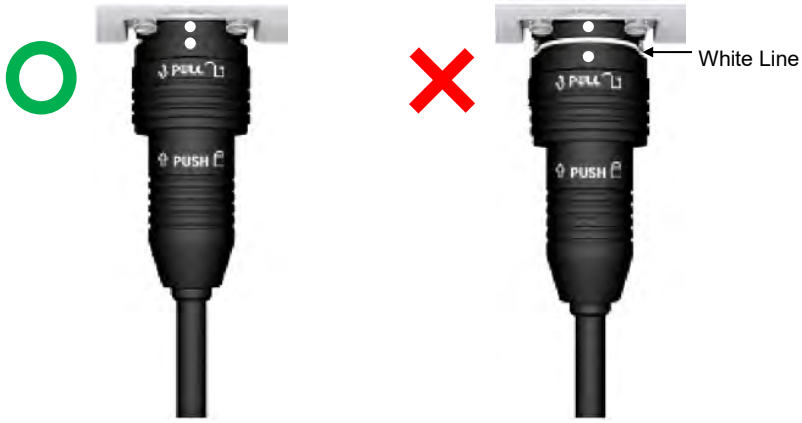


4 Insert the RJ-45 plug to the system side connector.

Figure 90. Connecting UDA Cable (4)

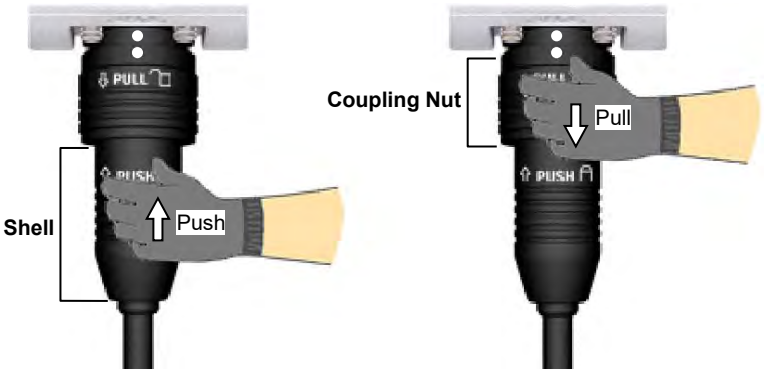


When the connector is fastened tight, the white line on the system side connector becomes invisible.



[White Line is invisible] **[White Line is visible]**

The method for connecting or disconnecting the backhaul (RJ45) connector is as follows:
- For connecting the connector, push the shell to upper side.
- For disconnecting the connector, pull the coupling nut to lower side.

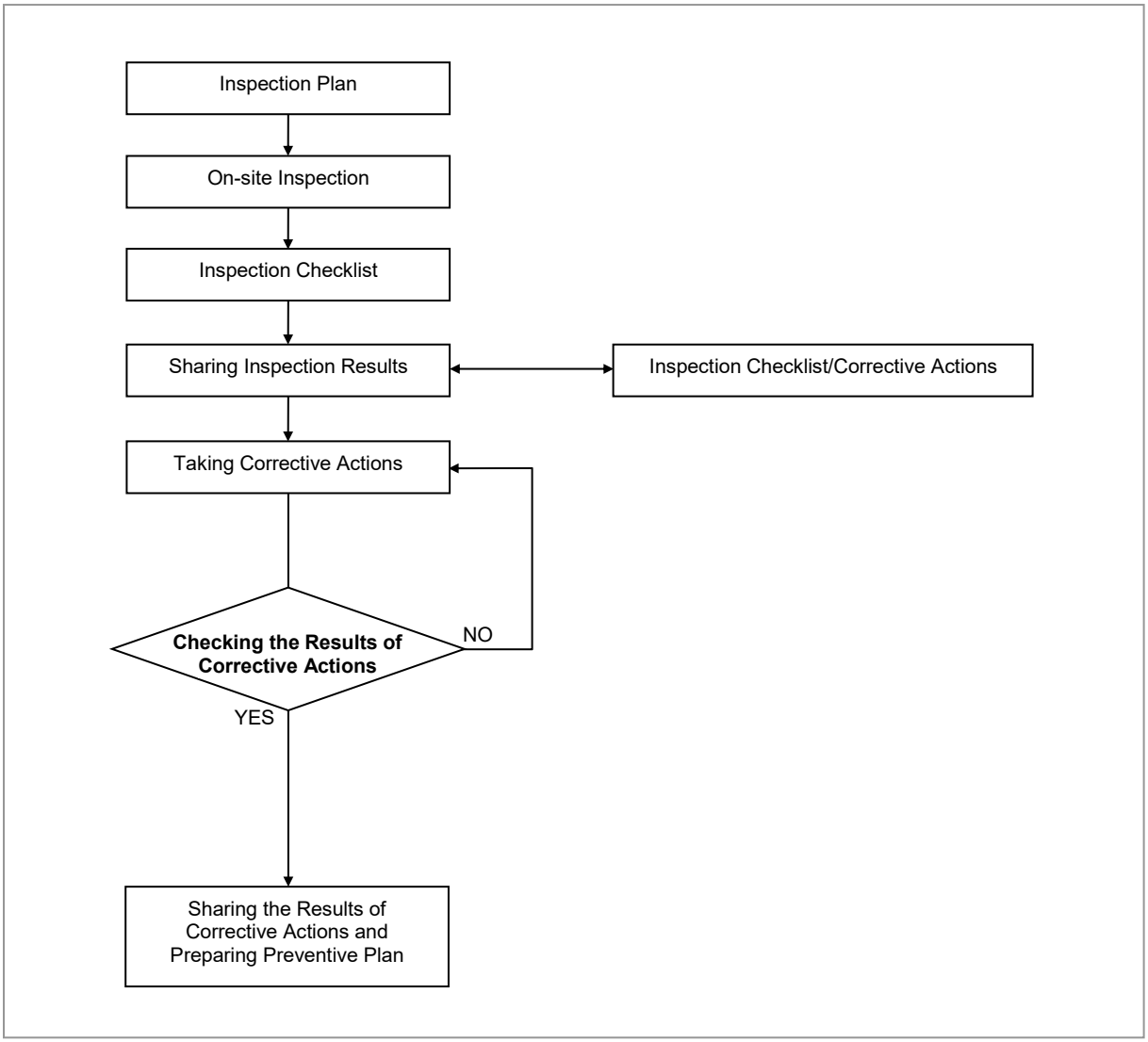


Chapter 4 Inspect the Installation

This chapter describes the procedures to check installation status.

The figure below depicts the overall procedure for inspecting the installation status:

Figure 91. Installation Inspection Procedure



Inspection Plan

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

On-site Inspection and Inspection Checklist

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

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

Sharing Inspection Results and Taking Corrective Actions

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

Checking the Results of Corrective Actions

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

Sharing the Results of Corrective Actions and Preparing Preventive Plan

After the corrective actions are all completed, the inspector must share the results with the installation operator and relevant departments. The inspector must prepare a preventive plan to avoid the reoccurrence of the similar problems.

Construction Situation Checklist

The table below outlines the checklist to inspect the installation of the MMU and other devices.

Table 27. Construction Situation Checklist

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, and washer	Checking fasteners omission		
		Compliance with assembly order of fasteners		
		Compliance with fastening torque value		
	Insulation status	Checking electrical contact between insulators (insulation resistance tester)		
	Azimuth & Tilt	Checking the tilt result is right.		
Grounding	Installation of ground bar	Checking the separation of		

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

Category	Check Items	Criteria	Result	
			Pass	Fail
		Proper installation route		
		Compliance with the radius of curvature		
	Cable binding status	Binding status		
		Binding interval		
		Checking binding materials		
	Cable connection	Checking cable connection (Pin Map)		
		Assembly condition of a connector		
		Fastening condition of a connector		
		Checking compliance with fastening torque value		
	Installation status of cable tag	Position		
		Marking content		
		Checking tag installation method		
		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, and packing materials)		
Opinion				

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Appendix A Acronyms

AC	Alternating Current
CBRS	Citizen Broadband Radio Service
DC	Direct Current
DL	Downlink
MMU	Massive MIMO Unit
MGB	Main Ground Bar
RTN	Return
SELV	Safe Extra Low Voltage
SEMS	pre-asSEMbled washers and screws
S-FTP	Screened-Foiled Twisted Pair
UL	Uplink

Appendix B Clean the Optical Connectors

Introduction

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

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

Examples:

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

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

Manufacturer-The Fibers (www.thefibers.com)

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

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

Measure the Optical Output and Connecting the Optical Connector

To measure the optical output

1 Using an optical power meter check the optical output.

2 If the optical output measurement result meets the reference value, clean the connector again and connect it.

3 If the measurement result does not meet the reference value, discard the cable, replace it with a new cable, and then clean the new one and connect it to the system.

[LC/PC Plug]

[Optical Power meter]

Appendix C Standard Torque

When fastening the bolt, use the standard torque values provided in tables below for tightening nuts and bolts to prevent damage to the equipment. If the torque value for each connection part is predefined, use the defined value.

Table 28. Standard Torque Value for Fastening Bolts

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

Table 29. Brass Bolts Torque Value

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

Table 30. Connector Connection Torque Value

Connector	Torque Value (N·m)	Torque Value (lbf·in)	Torque Value (kgf·cm)
SMA connector	0.59	5.2	6
TNC connector	0.88	7.8	9
N-type connector	2	17	20
DIN-type connector	25	217	250
4.3-10-type connector	5	44	51

The torque values can be different, defending on the material, characteristic, and specification of the equipment and fastener. Ensure that you check the proper torque value for each specification of the equipment and the fastener.

SAMSUNG

MT3204 Series
Installation Manual

Document Version 1.0