SAMSUNG

MTP02P Series
Installation Manual

Describes product installation and requirement procedure.

Document Version 1.0
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Radio Access Network

Document Number: 2600-00M896GAA

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 2.5 GHz MMU including how to connect cables. This manual includes the following 2.5 GHz MMU:

- MTP02P-41A

Conventions in this Document

Samsung Networks product documentation uses the following conventions.

Symbols

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

Menu Commands

menu | command

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

File Names and Paths

These are indicated by a bold typeface. For example:

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

User Input and Console Screen Output Text

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

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

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

Type the **RTRV-NE-STS** command in the input field.

Revision History

The following table lists all versions of this document.

Document Version	Publication Date	Remarks
1.0	April 2018	First Version

Organization of This Document

Section	Title	Description
Chapter 1	Before Installation	This chapter introduces MMU and describes items 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 MMU installed.
Chapter 4	Inspect the Installation	This chapter describes the procedures of inspecting installation status after MMU installation and cabling is completed.
Appendix A	Acronyms	This annex describes the acronyms used in this manual.
Appendix B	Clean the Optical Connectors	This annex describes the procedure of cleaning the optical connector and cleaning tool.
Appendix C	Standard Torque	This annex describes the standard torque when fastening the bolt.

Related Documentation

- LTE SMBS 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.

Proposition 65 (US Only)

State of California Proposition 65 Warning (US only)

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

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 optical 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 10 mm^2.

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 is natural convection cooling type.

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.

California USA Only

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

‘Perchlorate Material-special handling may apply, See

www.dtsc.ca.gov/hazardouswaste/perchlorate.'

FCC Statement

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.
These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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.

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.

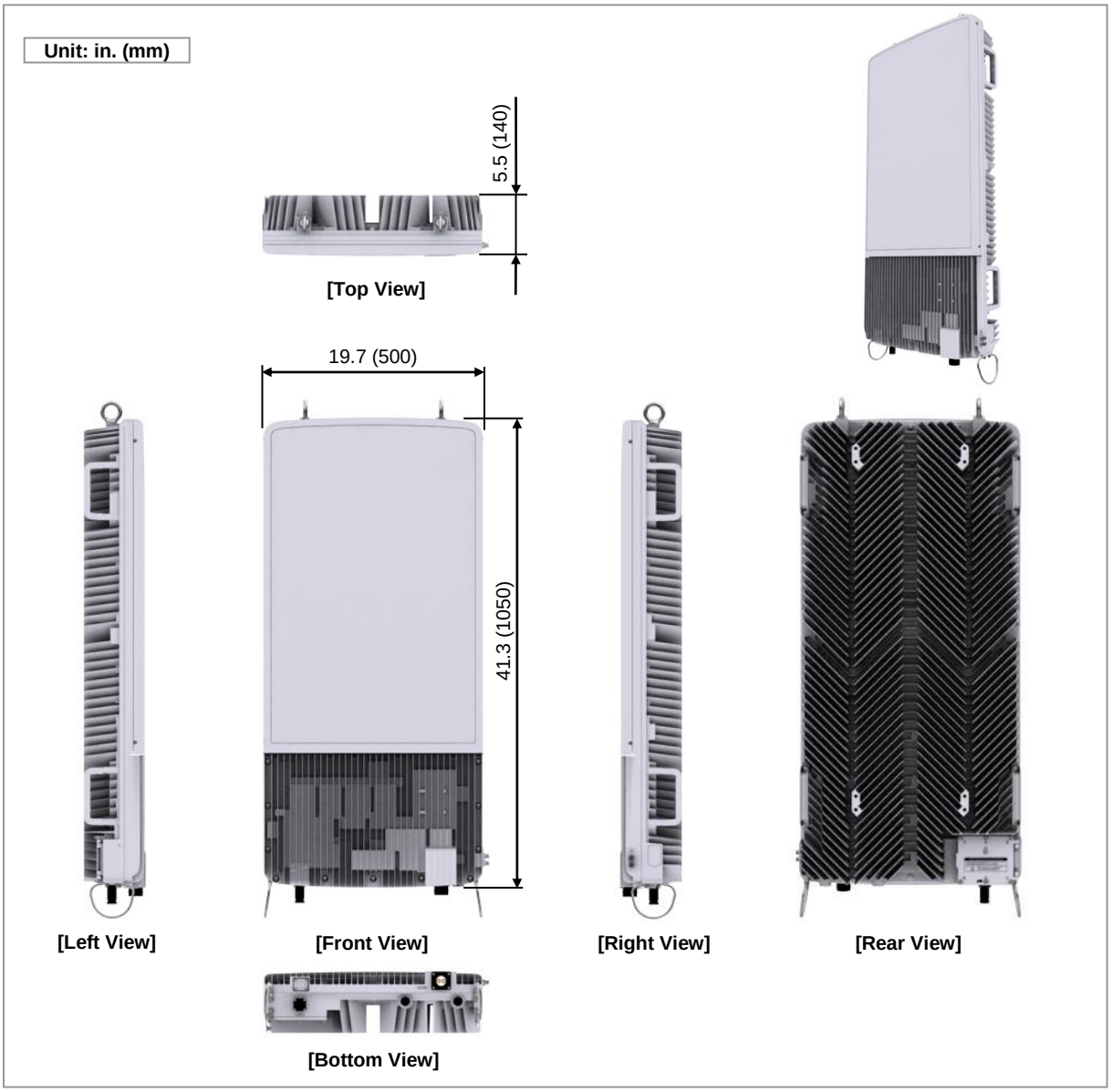
Chapter 1 Before Installation

System Configuration and Interface

MMU Configuration

The configuration of MMU is as follows.

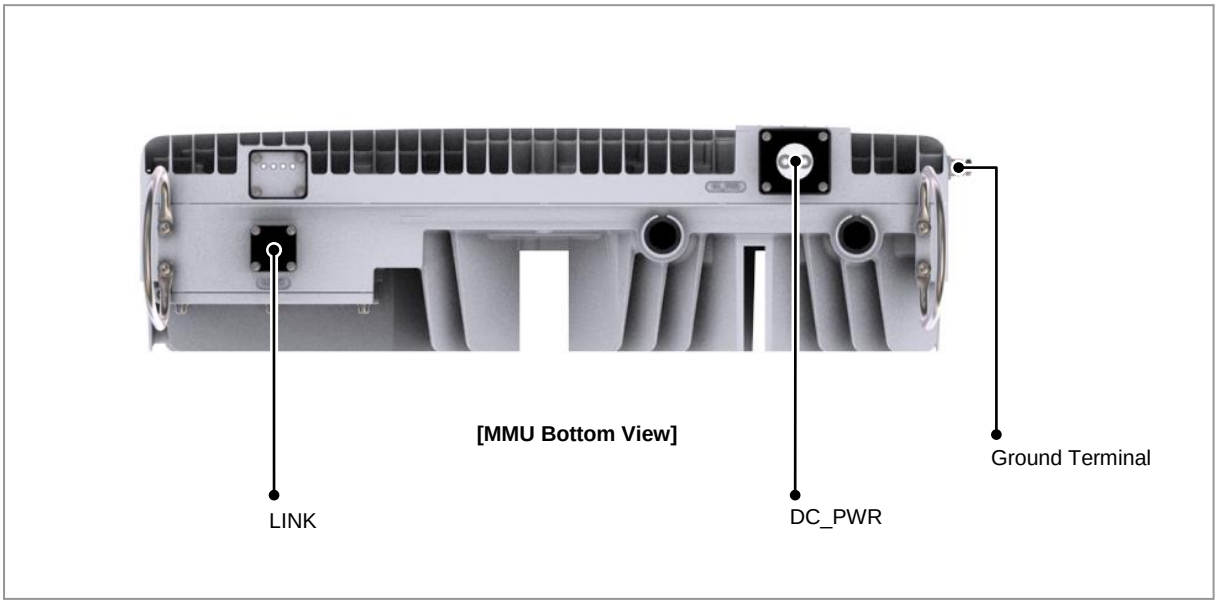
Figure 1. MMU Configuration



MMU Interface

The interface structure of MMU is as follows.

Figure 2. MMU Interface



Specifications

The table below lists the main specifications of the MMU.

Table 1. Specifications

Item	MTP02P-41A
Air technology	TDD LTE
Operating Frequency (MHz)	2,496~2,690
Channel Bandwidth (MHz)	15/20
CDU~MMU Interface	CPRI 4.2
Input Voltage	-48 V DC (-38~57 V DC)
Input Current	27 A @-48 V DC
Power Consumption	Max: 1530 W, Typical: 1305 W
Dimensions (mm)	500 (W) × 137.5 (D) × 1050 (H)
Weight (kg)	Less than 60
Operating Temperature	-40~55°C
Operating Humidity	5~100 % RH
Altitude	-60~1800 m
Earthquake	Telcordia Earthquake Risk Zone4 (Telcordia GR-63-CORE)
Vibration in Use Transportation Vibration	• 5~100 Hz, 0.15 grms (Telcordia GR-63-CORE) • 5~200 Hz, 0.89 grms (Telcordia GR-63-CORE)
EMC	FCC part 15 subpart B
Safety	EN 60950-1 EN 60950-22
RF	FCC part27

Cautions for Installation

Observe the following safety instructions when installing the system:

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

Before Installing

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

Install the system in the Restrict Access Area.

While Installing

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

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

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

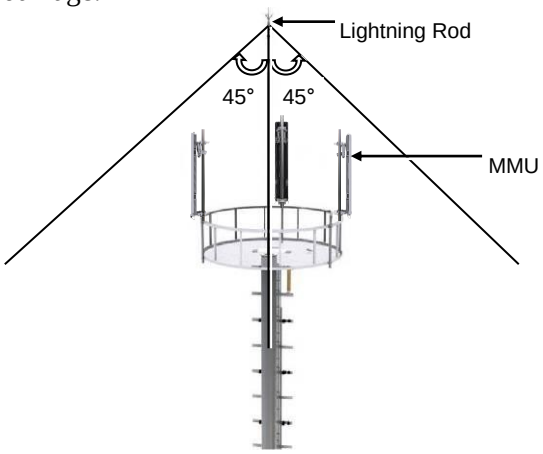
Do not wear accessories such as watches and rings in order to prevent electrical shock.

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

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

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.



After Installing

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

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

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

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

Installation Tools

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

Table 2. Basic Installation Tools

No.	Name	Specification	Purpose of use
1	Torque Driver 	Apply a torque range : 6-22 lbf·in	For fastening M4 Screw
		Apply a torque range : 20-90 lbf·in	For fastening M6 SEMS (Hex.+)
2	Screw Driver Bit	'+', No. 2	For fastening M4 screw fixing
		'+', No. 3	For fastening M6 screw fixing
3	Screw Driver 	'+', No. 2	For fastening M4 screw fixing
		'+', No. 3	For fastening M6 screw fixing
4	Torque Wrench 	Apply a torque range : 100-400 lbf·in	For fastening M8, M12 hex. Bolt and nut.
5	Torque Wrench Spanner Head 	Apply Hex. Head: 13 mm (for 100-400 lbf·in)	For fastening M8 Hex. bolt
		Apply Hex. Head: 19 mm (for 100-400 lbf·in)	For fastening M12 flange, Hex. nut
6	Spanner 	Hex. Head: 13 mm	For loosening the M8 Hex. Bolt
		Hex. Head: 19 mm	For loosening the M12 Hex. Nut
7	Tape Measure 	16 ft./150 ft.	Tape measure for length measurement
8	Level 	Normal	For horizontality of MMU, and so on
9	Power Extension Cable 	100 ft.	Basic tool
10	Heating Gun 	122~572°F (50~300°C)	Shrinking heat shrink tube

No.	Name	Specification	Purpose of use
11	Hammer Drill 	Normal	Wall Type Drilling
12	Concrete Drill Bit 	0.67 in. (17 mm)	For M12 Set Anchor
13	Anchor Punch 	M12	For M12 Set Anchor
14	Hammer 	Normal	Anchor fixing
15	Cable Cutter 	0.24-1.26 in. (6-32 mm)	Cable cutting
16	Crimping Tool 	14 AWG-4 AWG (1.5-16 mm^2)	Pressure terminal for crimping
17	Ratchet Wrench 	10 × 13/17 × 19 (4 in 1)	For fastening Hex. Bolt
18	Cable Stripper 	Apply cable thickness: 1.5-6.2 in. (4-16 mm)	Cable sheath for removal
19	Nipper 	Basic Tool	For cutting cable & cable tie
20	Industrial Scissor 	Basic Tool	Cutting
21	Knife 	Basic Tool	Cutting
22	Multi tester 	Digital Pocket Tester	The voltage and current measurements Whether measured cable disconnection
23	Angle Meter 	Normal	MMU angle measurement
24	Compass 	Normal	Check azimuth during installation
25	Permanent Marker	Should be marked ‘Permanent’ on the pen (Black Color, 2 mm Tip)	After system installation, I-marking To mark the site ID, Name on the name plate, and so on.

No.	Name	Specification	Purpose of use
			(Not to erase permanently)
26	Optical Connector Cleaner 	For LC Connector	For Optical Connector Cleaning

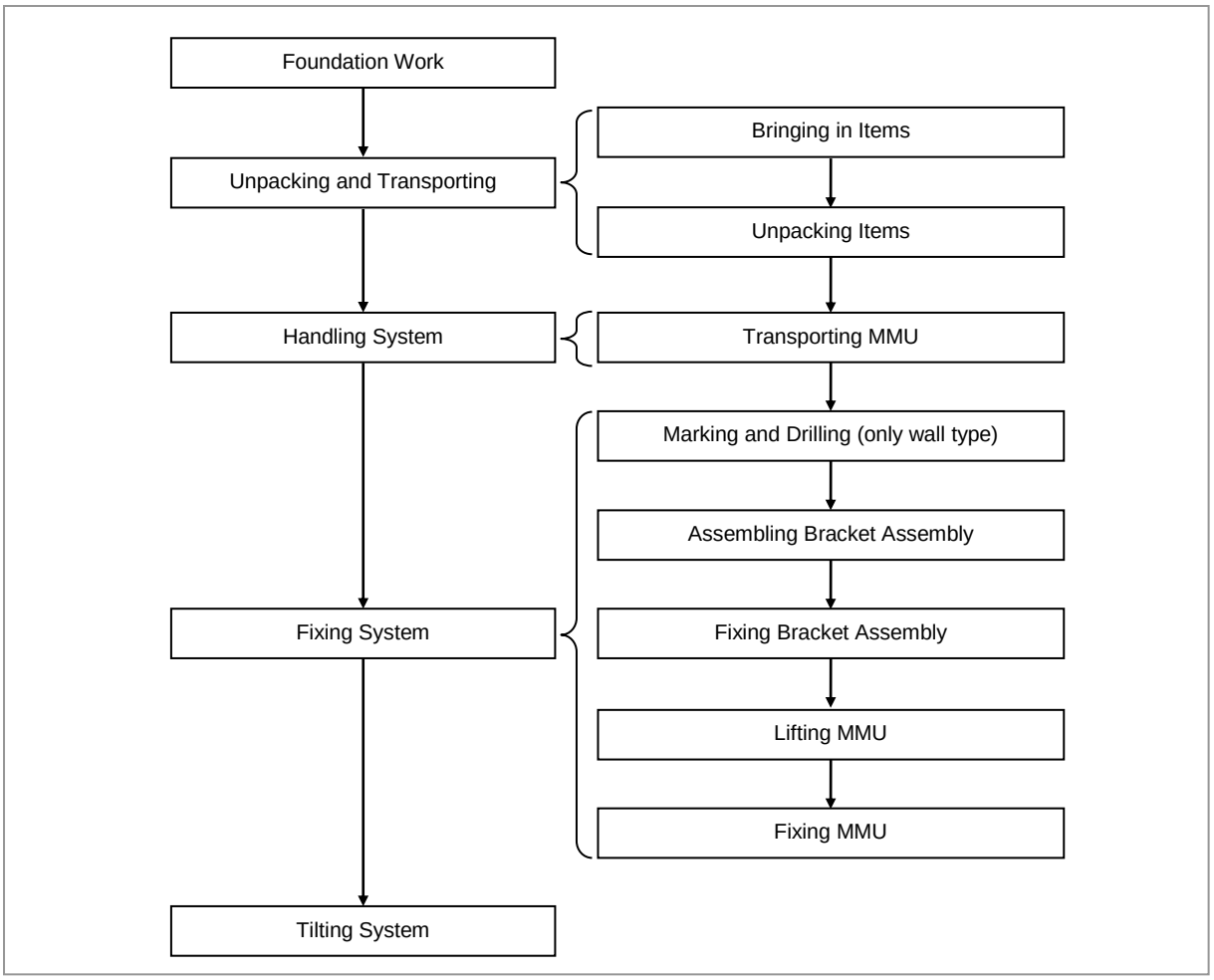
The required installation tools may vary depending on the conditions at the site. In addition to the basic tools, a protractor, ladder, safety equipment, cleaning tools, and so on should also be prepared in consideration of the site conditions.

Chapter 2 Installing System

Installation Procedure

The procedure to install the MMU is as follows:

Figure 3. Procedure to Install the MMU



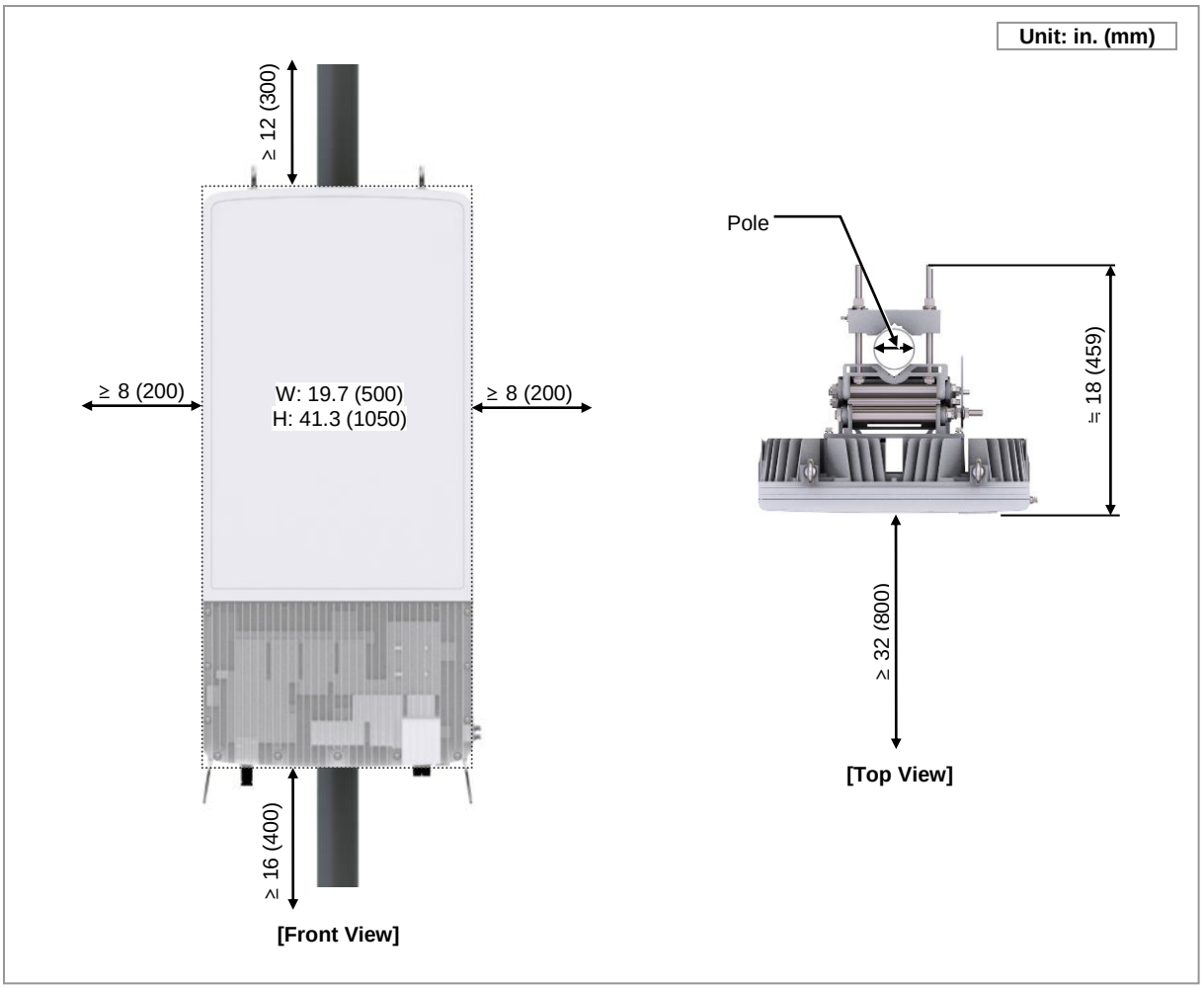
Make sure that the power switch of the power supply is OFF when installing the system. Installing the system with the power switch ON may cause system damage or fatal human injury when connecting or disconnecting the cables.

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

System Arrangement

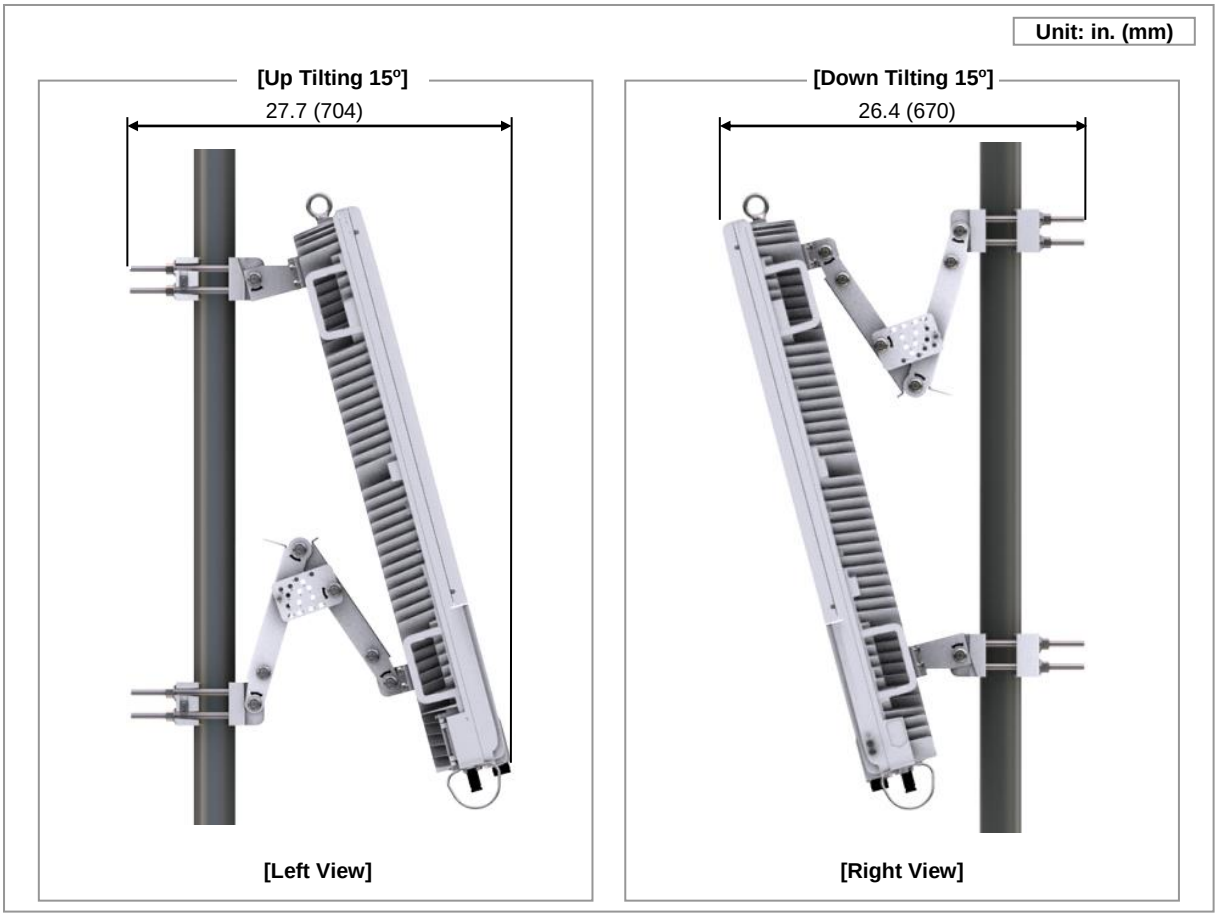
A minimum distance must be secured around the MMU, in each direction for installation and maintenance.

Figure 4. MMU Arrangement_Pole Type



The dimensions of the front of the MMU change according to the tilt angle, and the maximum dimensions are described in the figure below.

Figure 5. MMU Arrangement_Pole Type_Up/Down Tilting



When fixing a mounting bracket, the length of stud bolts are 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	220 mm

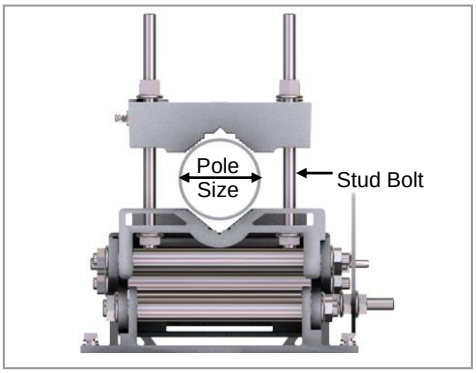
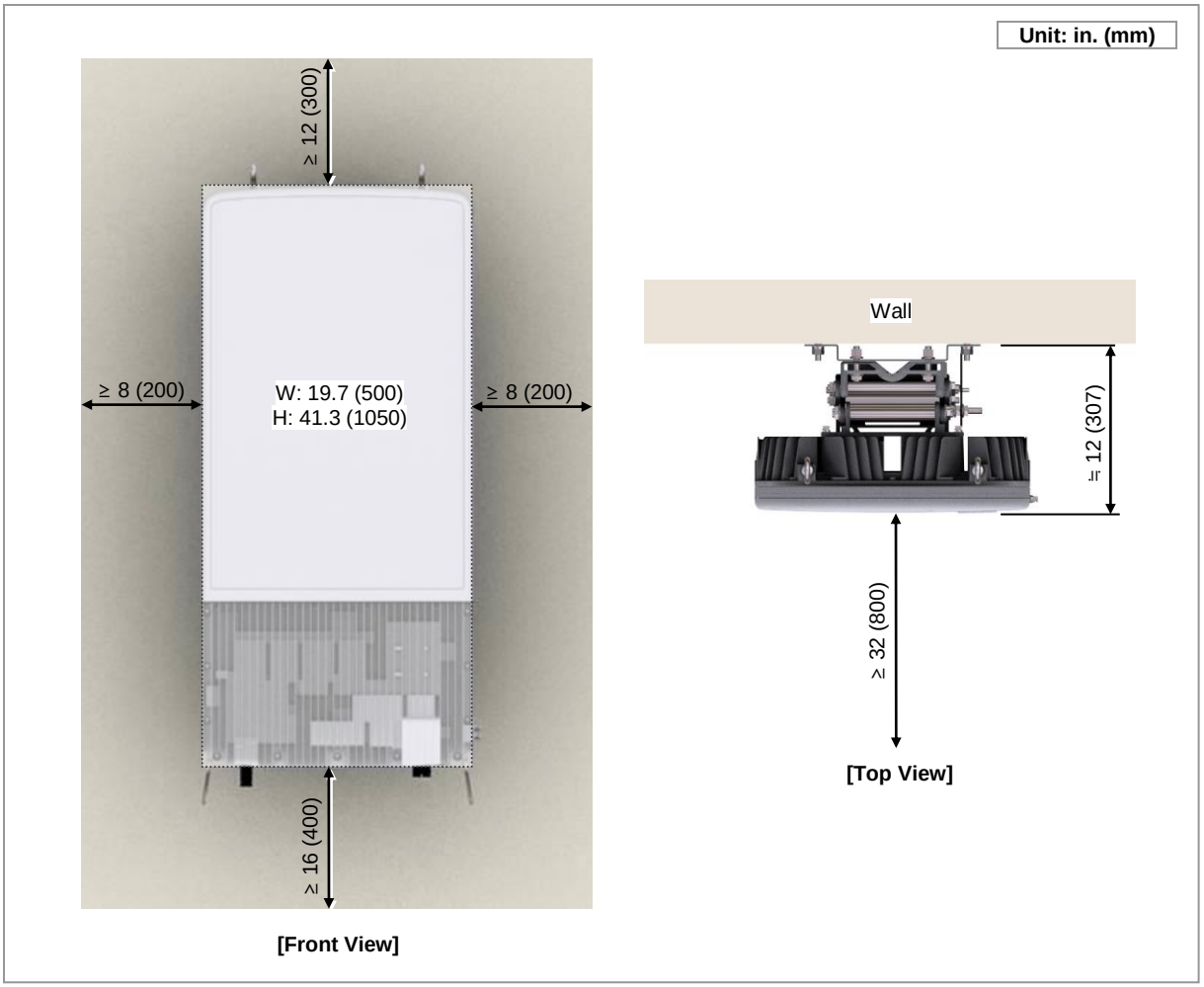
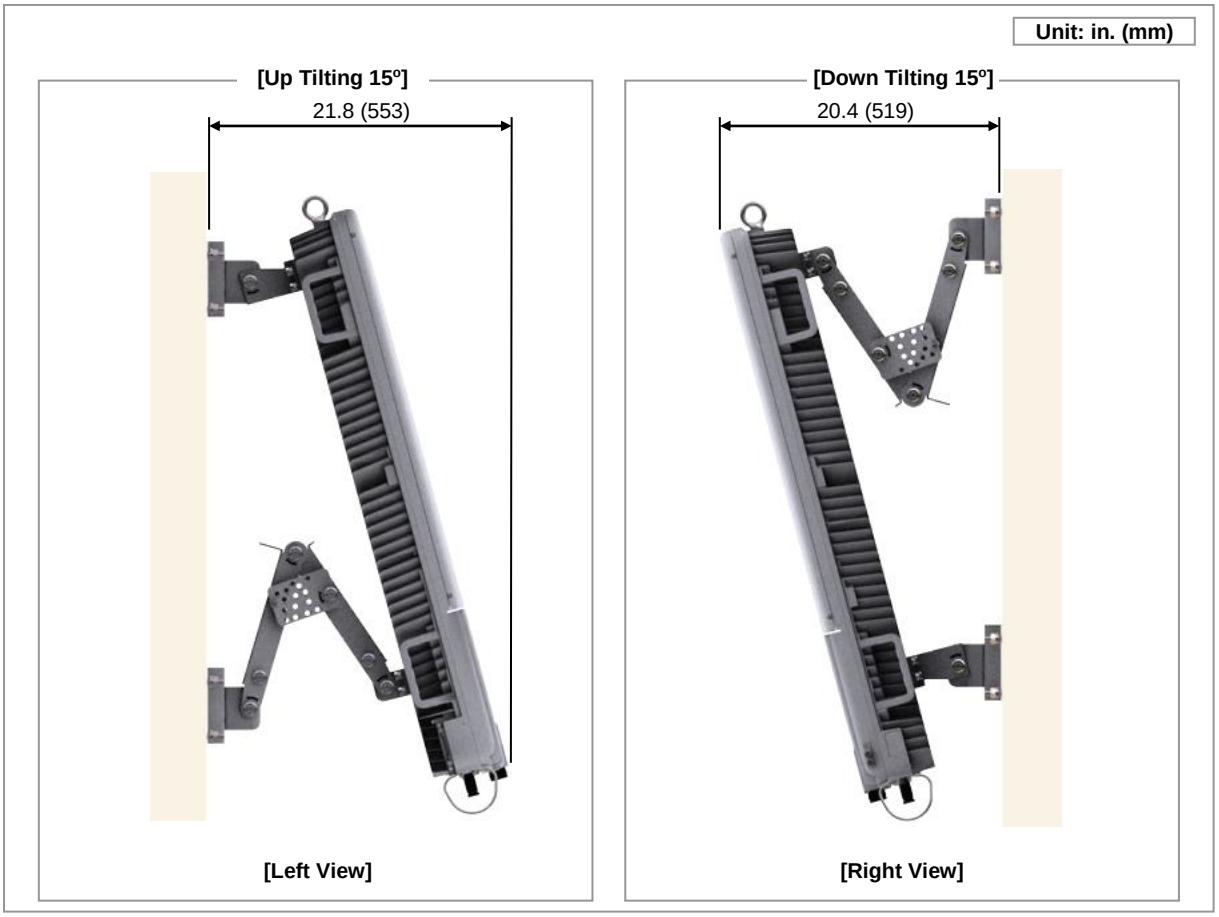


Figure 6. MMU Arrangement_Wall Type



The dimensions of the front of the MMU change according to the tilt angle, and the maximum dimensions are described in the figure below.

Figure 7. MMU Arrangement_Wall Type_Up/Down Tilting



Unpacking and Transporting

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

Bringing in Items

Bring in items, taking care of the followings:

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

Unpacking Items

The procedure to unpack items is as follows:

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

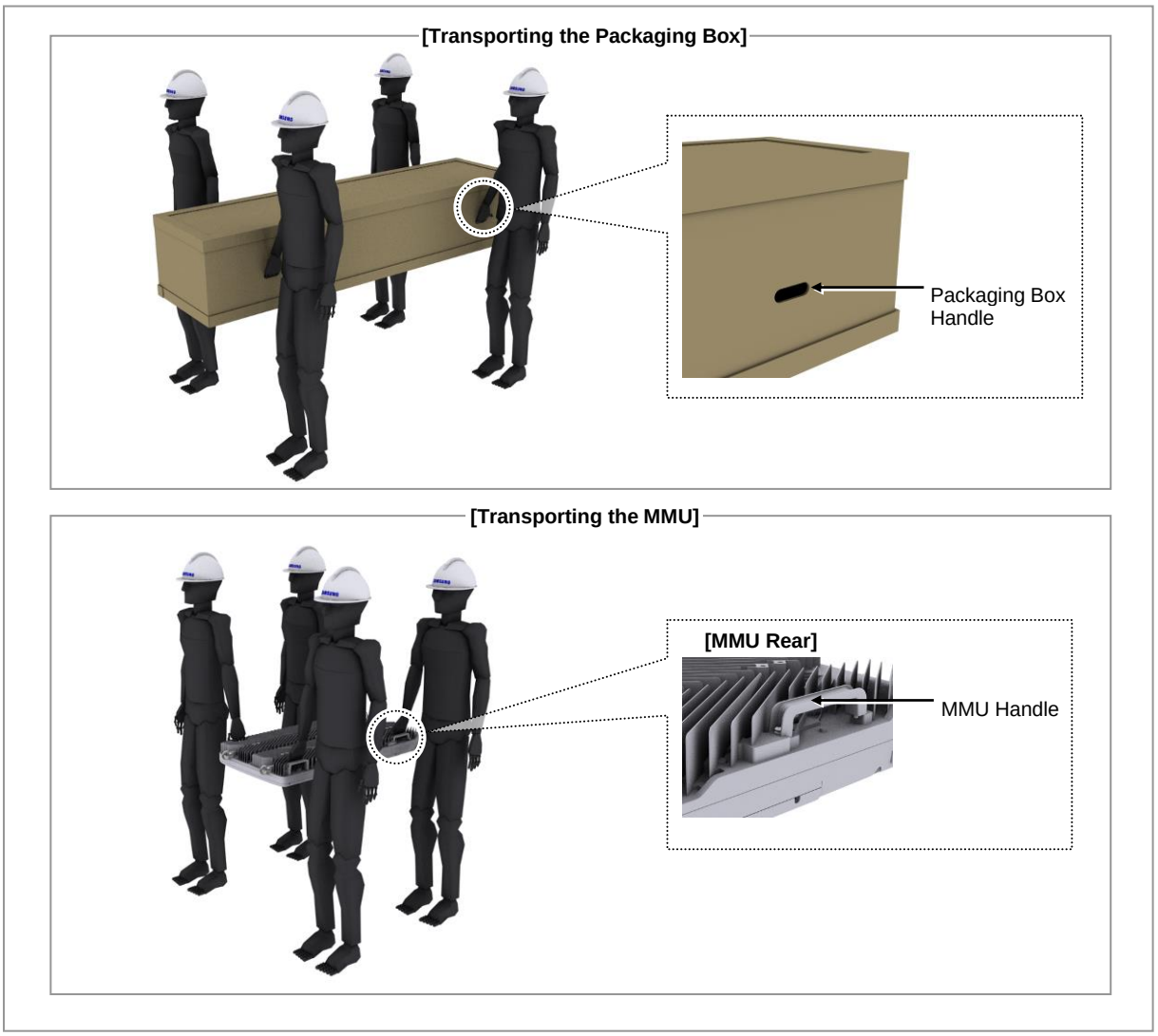
Handling the System

Transporting the MMU

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 8. Transporting the MMU



Fixing System

Fixing Pole Type_Down Tilting Installation

Assembling Bracket Assembly_Down Tilting Installation

To assemble Fixed Bracket Assembly

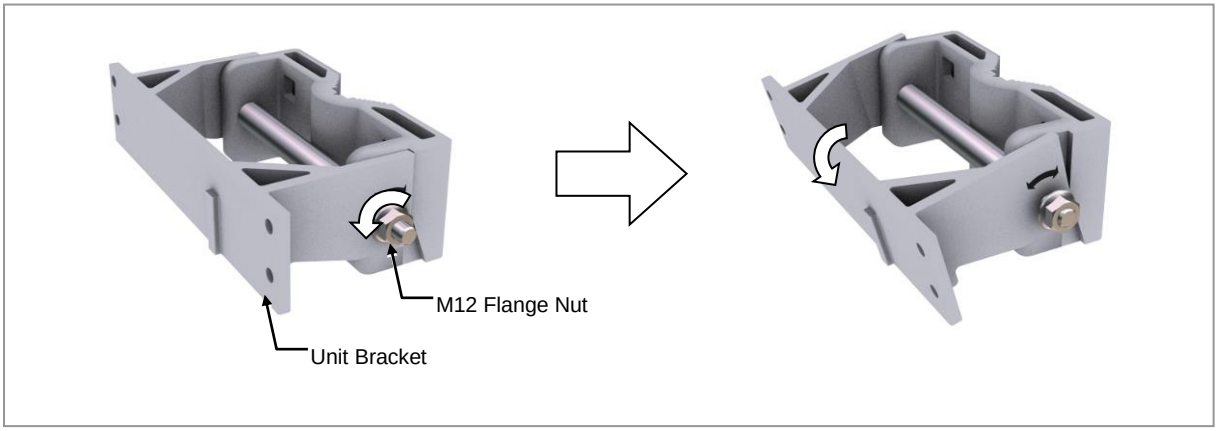
1 Make sure you have the following items:

Table 3. Parts and Tools for Assembling Fixed Bracket Assembly

Category	Description		
Parts	Fixed Bracket Assembly		1 EA
	Rear Bracket		1 EA
	Fasteners	M12 Stud Bolt Assembly	4 EA
		M12 Flange Nut	4 EA
Recommended Torque Value	M12 Flange Nut		372 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (Hex. Head: 19 mm)		

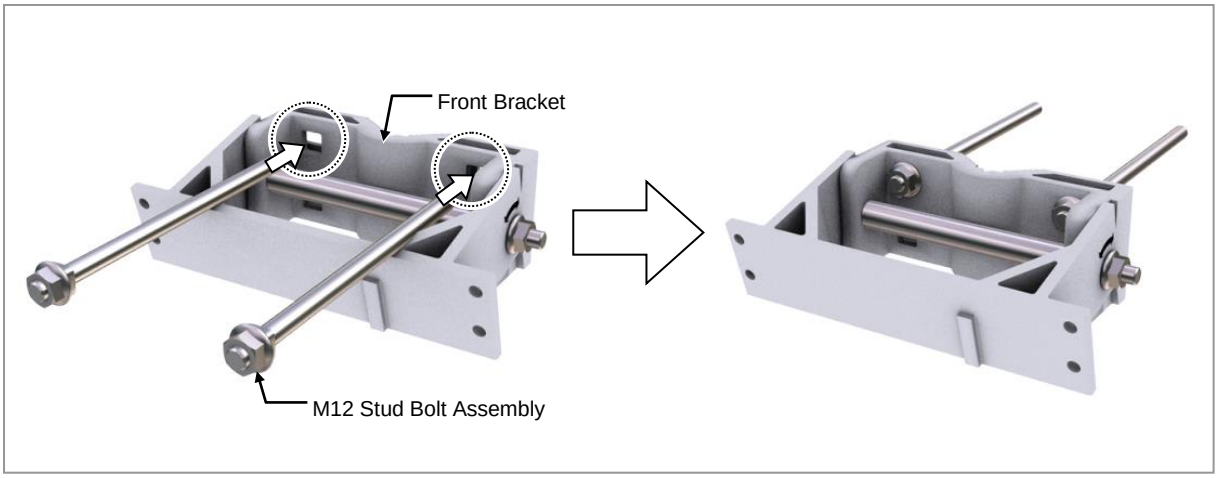
2 Loosen the flange nut by turning it two turns to the left, and attach the unit bracket tilt down.

Figure 9. Assembling Fixed Bracket Assembly_Down Tilting Installation (1)



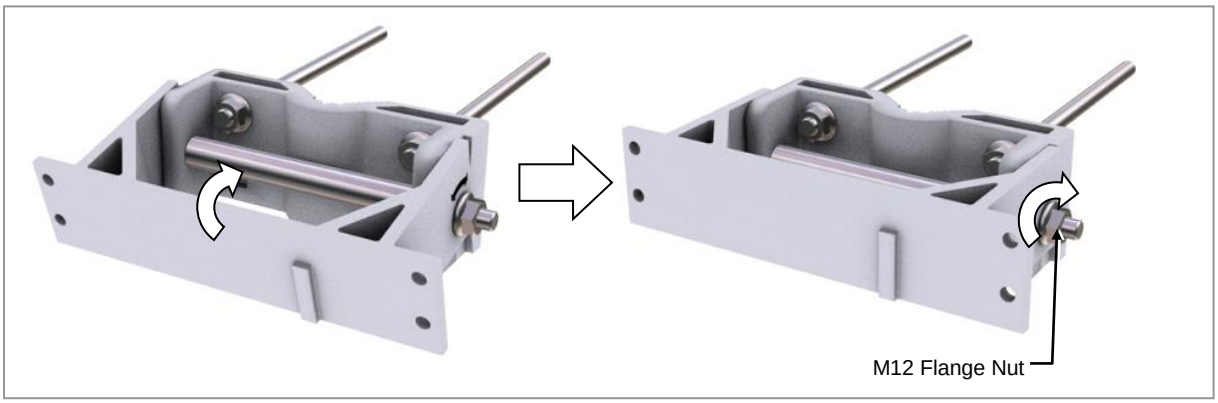
3 Pass the stud bolt assembly through the front bracket holes.

Figure 10. Assembling Fixed Bracket Assembly_Down Tilting Installation (2)



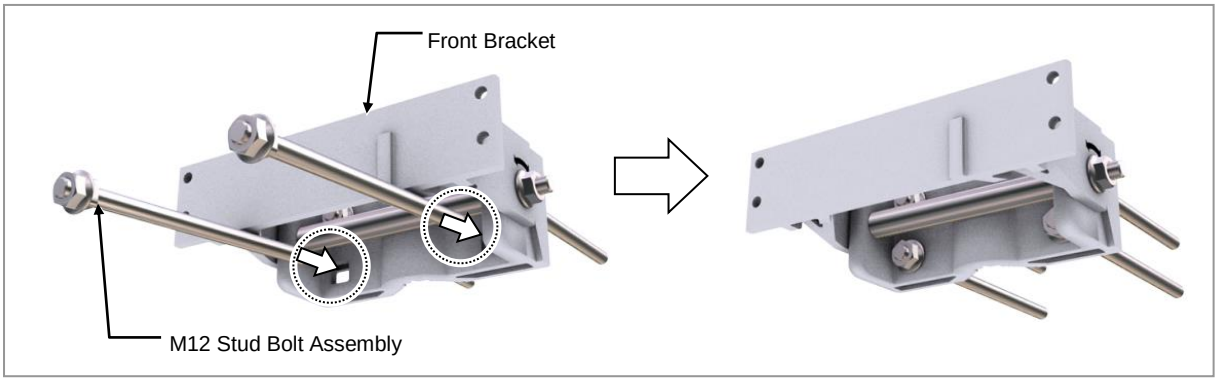
4 Tilt the unit bracket upward, tighten the M12 flange nut. Make sure the unit bracket is vertical when tilting it back to the original position.

Figure 11. Assembling Fixed Bracket Assembly_Down Tilting Installation (3)



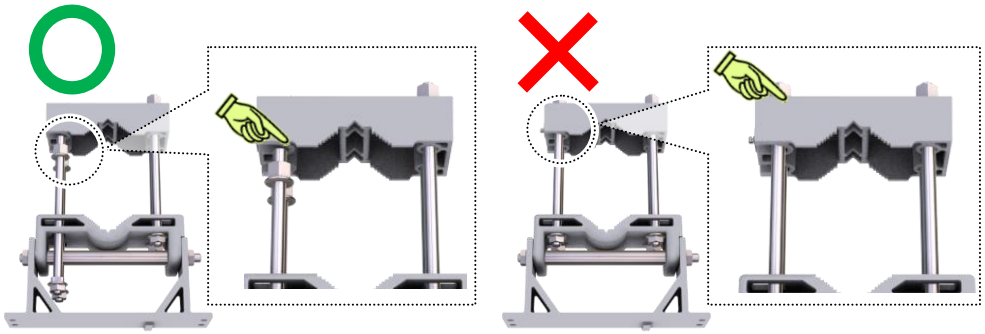
5 Pass the stud bolt assembly through the front bracket holes.

Figure 12. Assembling Fixed Bracket Assembly_Down Tilting Installation (4)

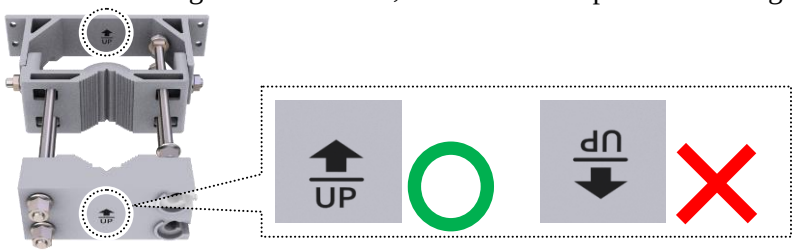


When assembling the rear bracket, make sure the stud bolts do not pass through

the side holes.

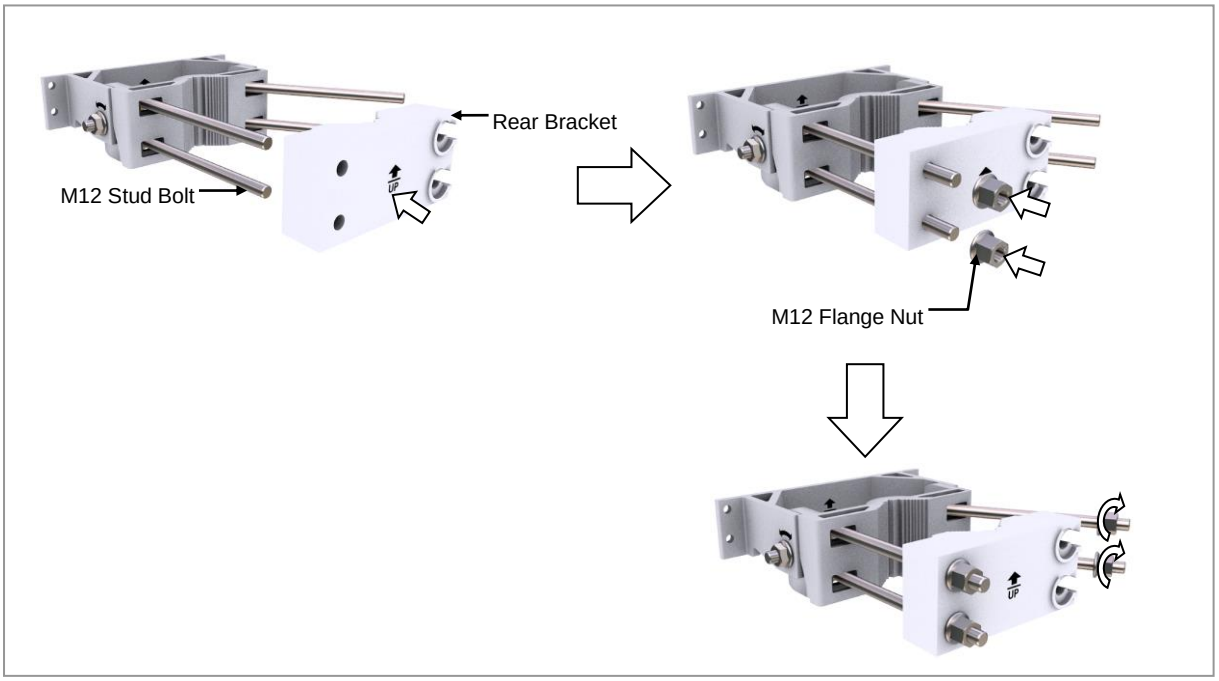


When assembling the rear bracket, make sure the up mark is facing upward.



6 Insert the stud bolts into the rear bracket holes and tighten the fasteners temporarily.

Figure 13. Assembling Fixed Bracket Assembly_Down Tilting Installation (5)



To assemble Scissors Bracket Assembly

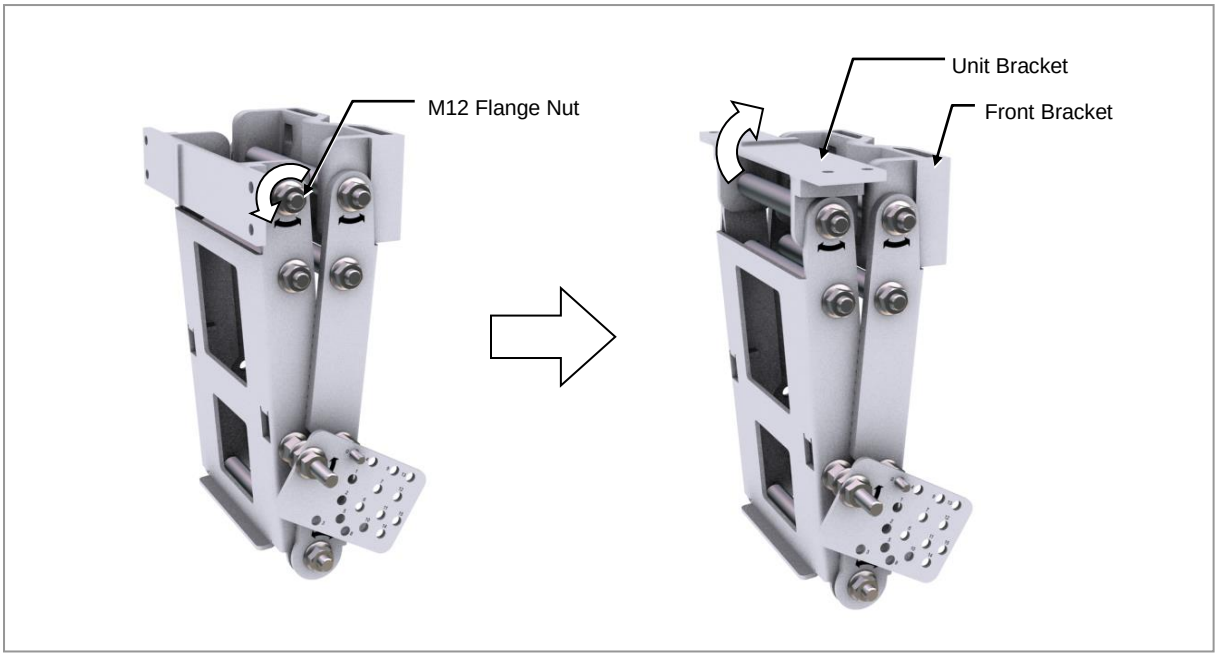
1 Make sure you have the following items:

Table 4. Parts and Tools for Assembling Scissors Bracket Assembly

Category	Description		
Parts	Scissors Bracket Assembly		1 EA
	Rear Bracket		1 EA
	Fasteners	M12 Stud Bolt Assembly	4 EA
		M12 Flange Nut	4 EA
Recommended Torque Value	M12 Flange Nut		372 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (Hex. Head: 19 mm)		

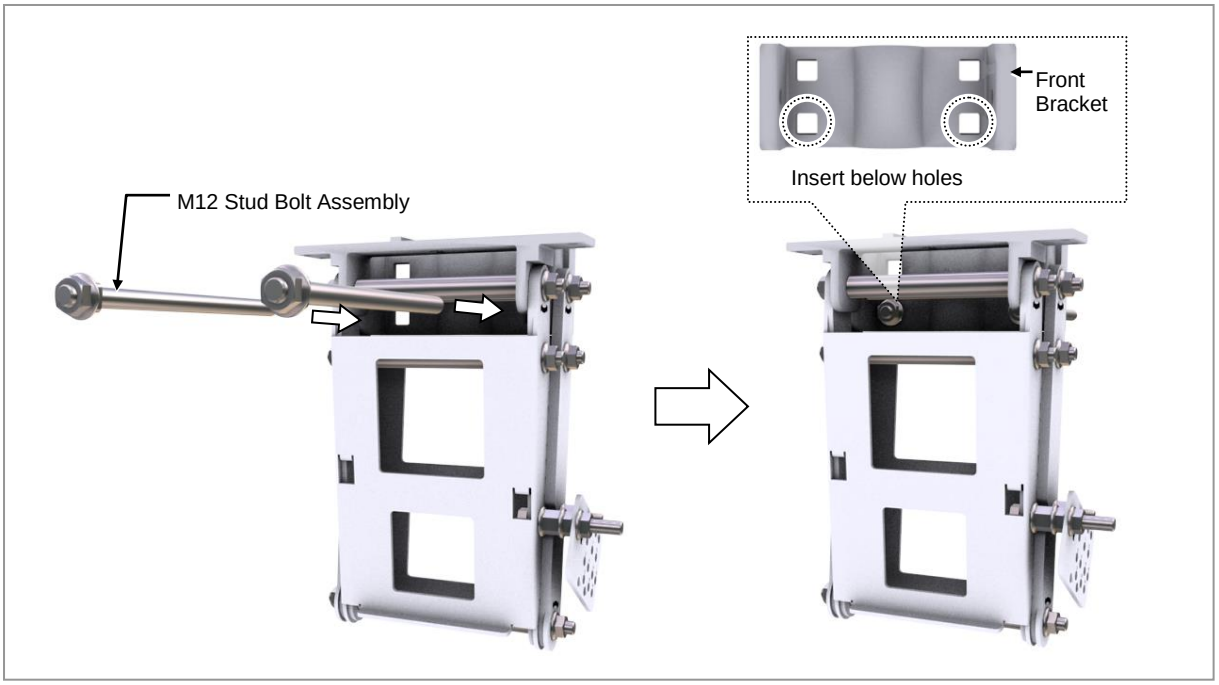
2 Loosen the flange nut by turning it two turns to the left, and attach the unit bracket tilt up.

Figure 14. Assembling Scissors Bracket Assembly_Down Tilting Installation (1)



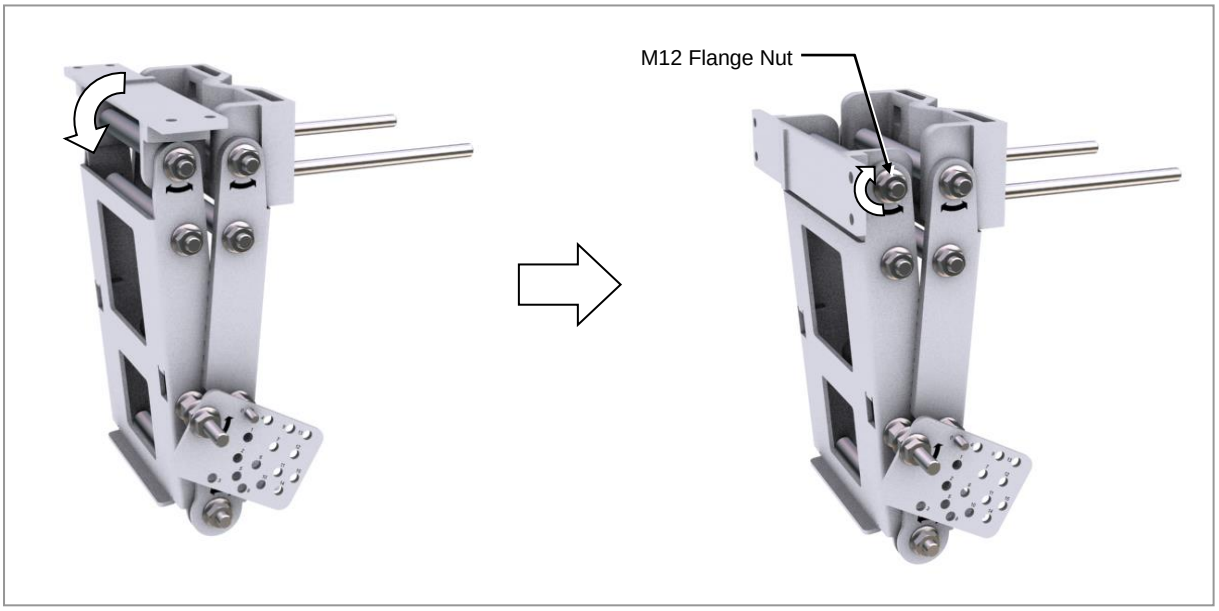
3 Pass the stud bolt assembly through the front bracket holes.

Figure 15. Assembling Scissors Bracket Assembly_Down Tilting Installation (2)



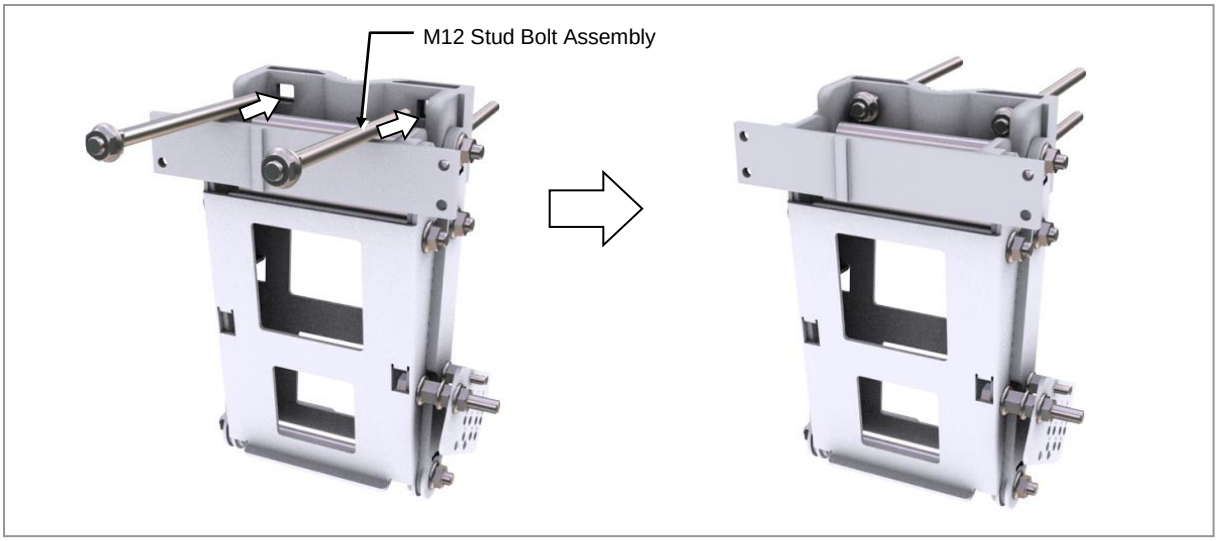
4 Tilt the unit bracket downward, tighten the M12 flange nut. Make sure the unit bracket is vertical when tilting it back to the original position.

Figure 16. Assembling Scissors Bracket Assembly_Down Tilting Installation (3)

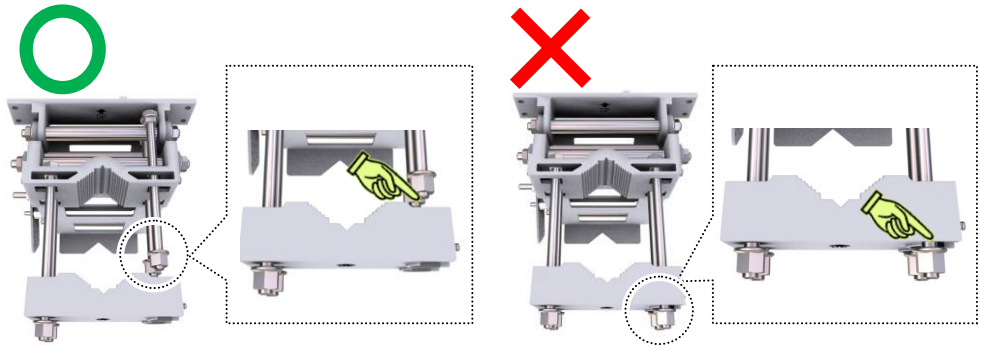


5 Pass the stud bolt assembly through the front bracket holes.

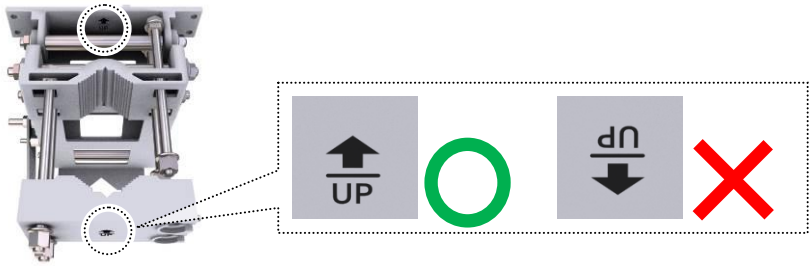
Figure 17. Assembling Scissors Bracket Assembly_Down Tilting Installation (4)



When assembling the rear bracket, make sure the stud bolts do not pass through the side holes.

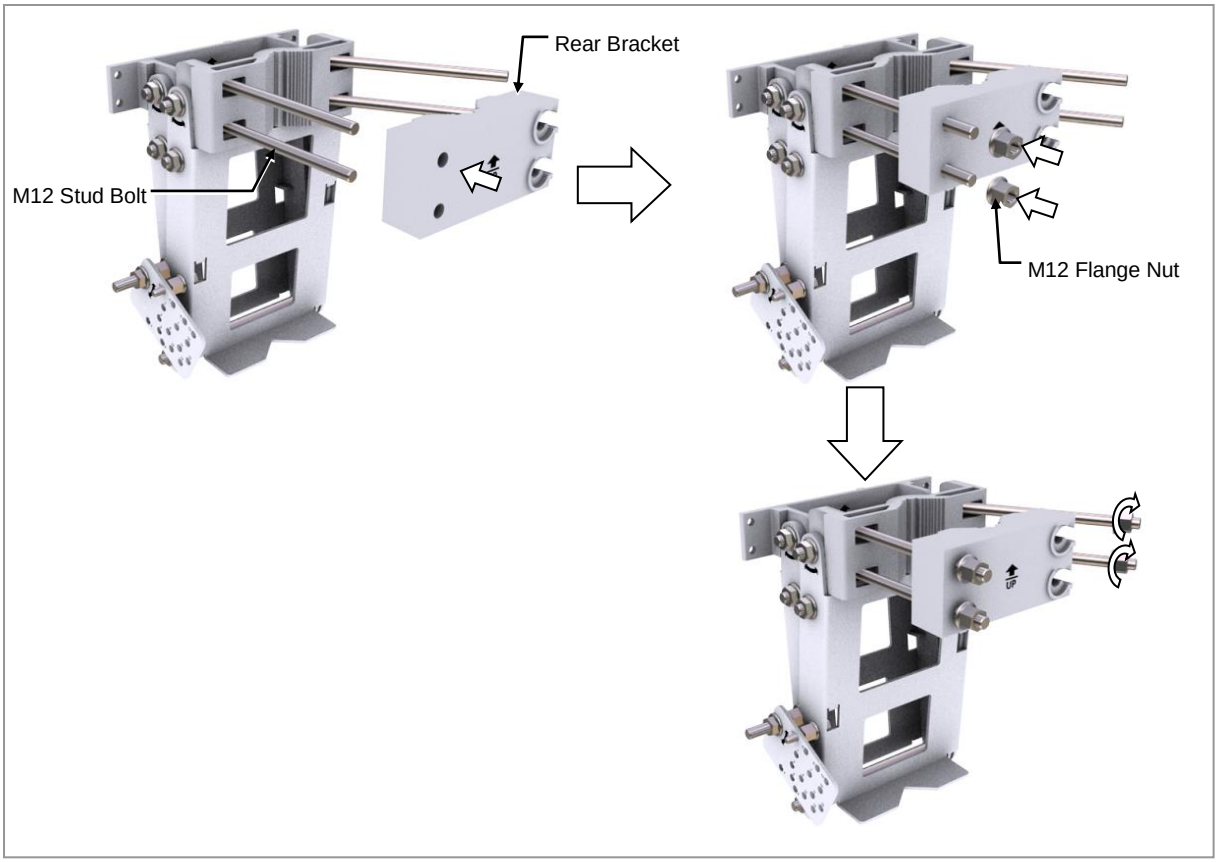


When assembling the rear bracket, make sure the up mark is facing upward.



6 Insert the stud bolts into the rear bracket holes and tighten the fasteners temporarily.

Figure 18. Assembling Scissors Bracket Assembly_Down Tilting Installation (5)



Fixing Bracket Assembly to the MMU

To fix Scissors Bracket Assembly

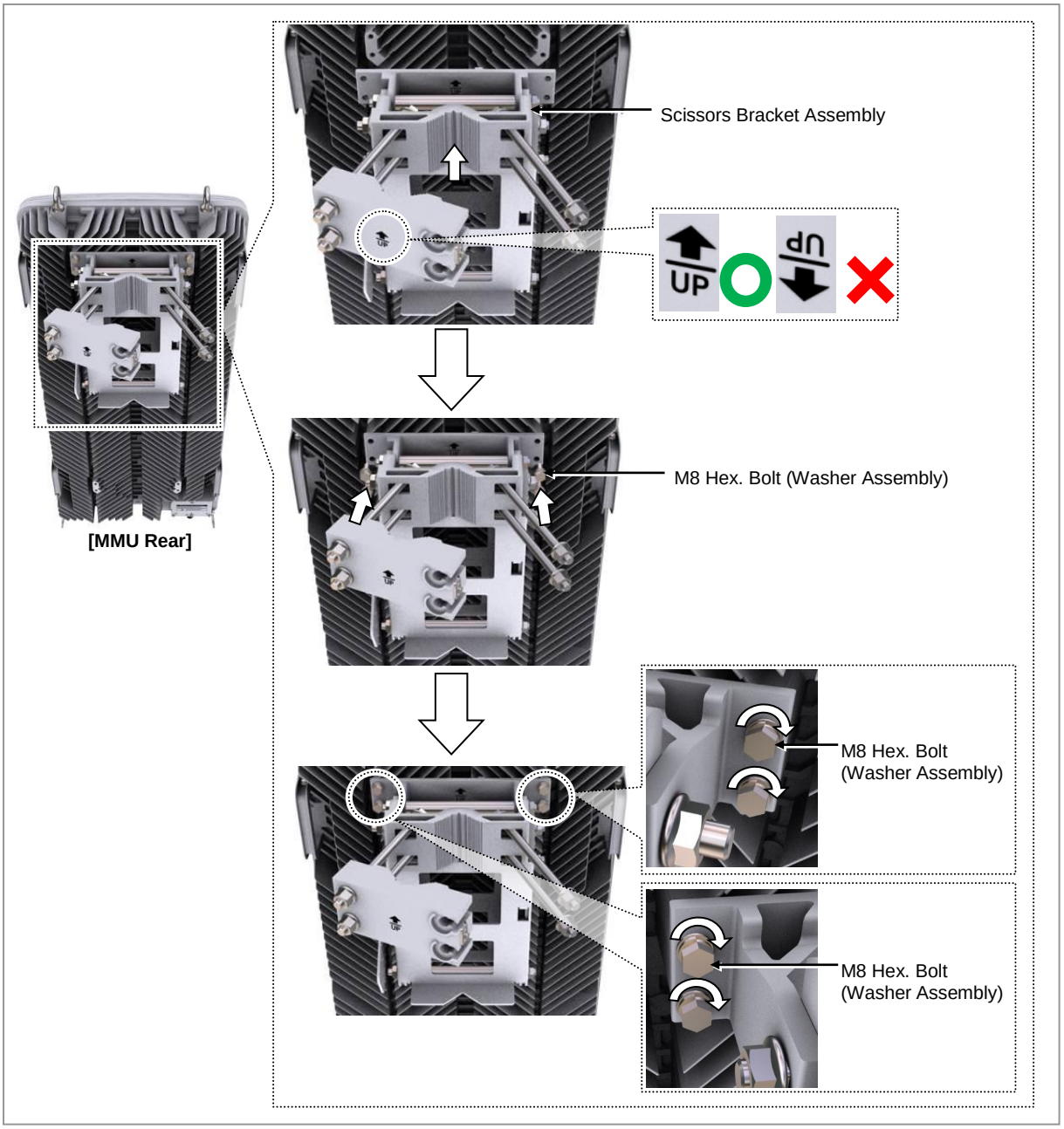
1 Make sure you have the following items:

Table 5. Parts and Tools for fixing Scissors Bracket Assembly to the MMU

Category	Description		
Parts	Scissors Bracket Assembly		1 EA
	Fasteners	M8 × L25 Hex. Bolt (washer assembly)	4 EA
Recommended Torque Value	M8 Hex. Bolt		110 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 13 mm) • Spanner (13 mm)		

2 Place the scissors bracket assembly, on the fixing location at the top of the back of the MMU and fix it with the fasteners.

Figure 19. Fixing Scissors Bracket Assembly_Down Tilting Installation



To fix Fixed Bracket Assembly

1 Make sure you have the following items:

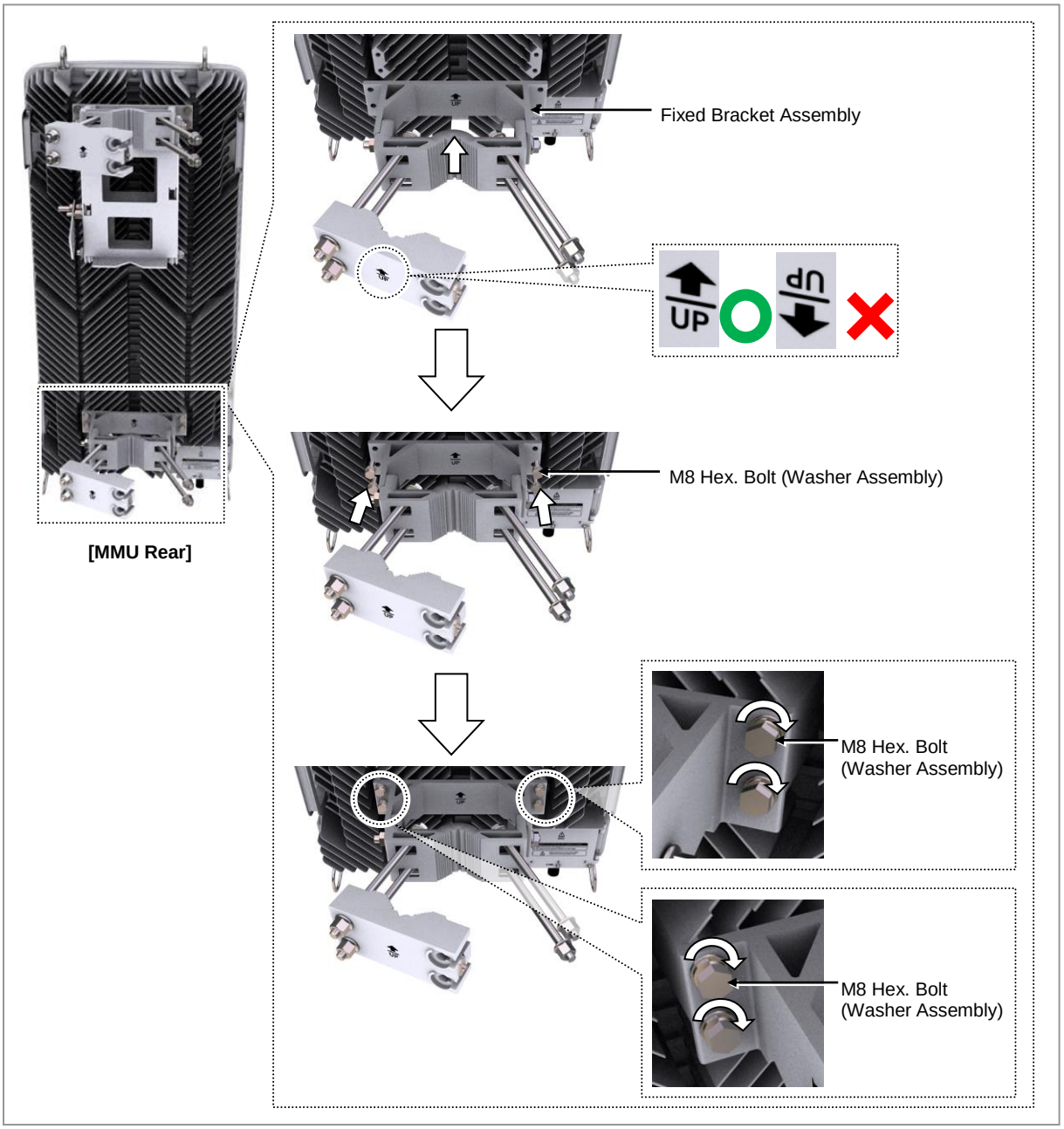
Table 6. Parts and Tools for fixing Fixed Bracket Assembly to the MMU

Category	Description		
Parts	Fixed Bracket Assembly		1 EA
	Fasteners	M8 × L25 Hex. Bolt (washer assembly)	4 EA
Recommended Torque Value	M8 Hex. Bolt		110 lbf·in

Category	Description
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 13 mm) • Spanner (13 mm)

2 Place the fixed bracket assembly, on the fixing location at the bottom of the back of the MMU and fix it with the fasteners.

Figure 20. Fixing Fixed Bracket Assembly_Down Tilting Installation



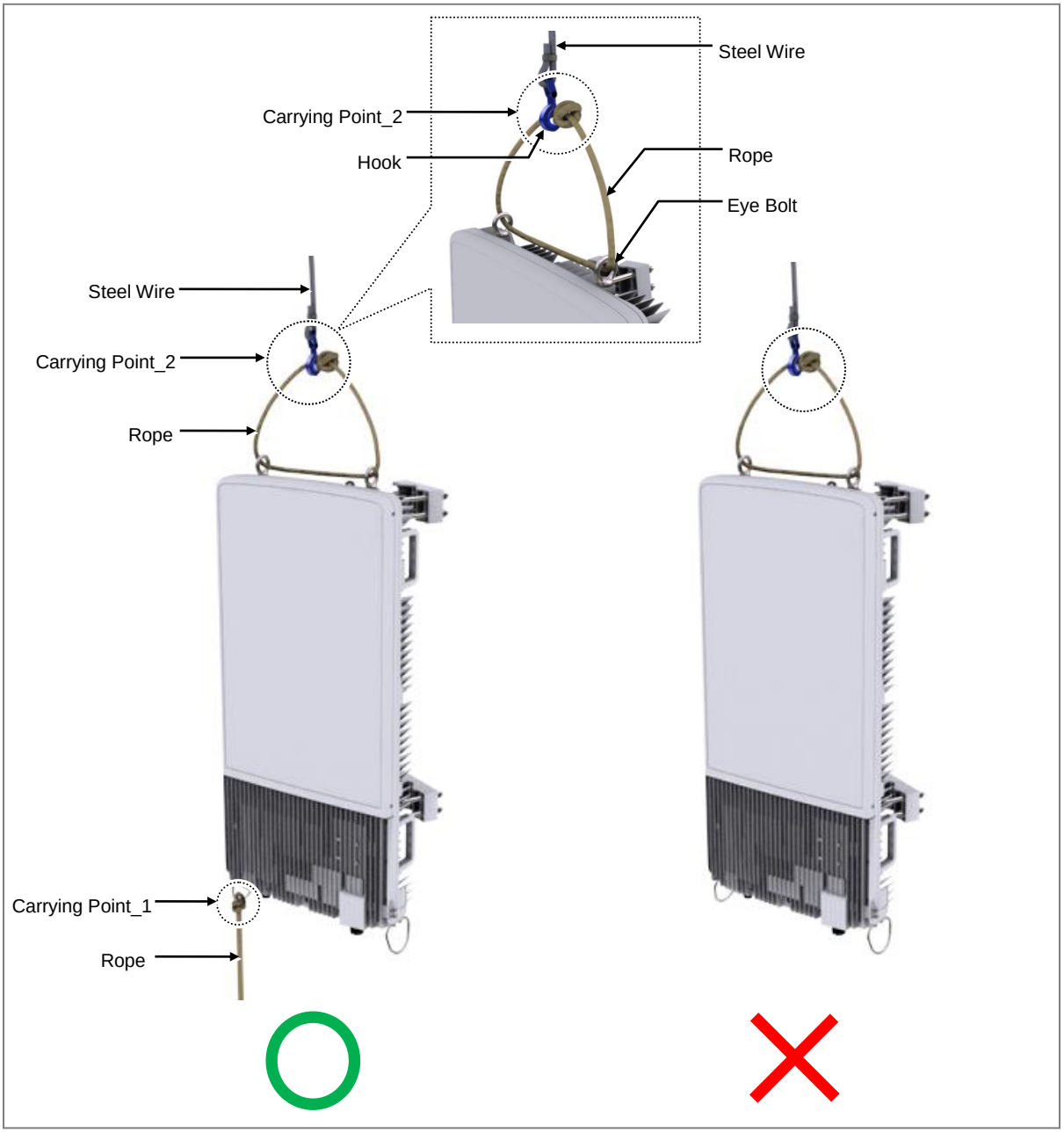
Lifting MMU

Lifting the MMU

1 Tie the MMU eye bolt and support bracket when lifting.

- Steel wire: connecting to the eye bolt
- Rope: connecting to the support bracket

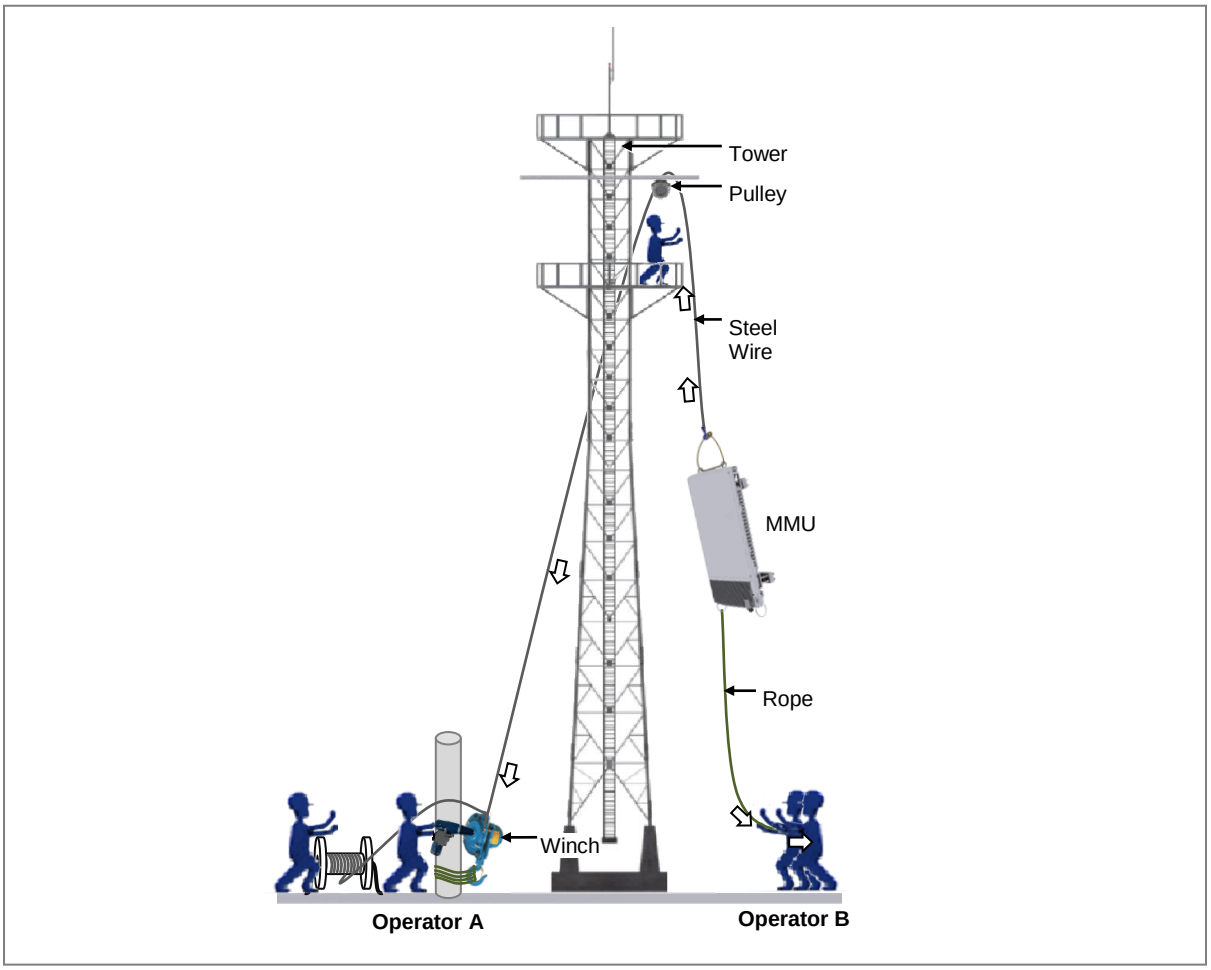
Figure 21. Lifting the MMU (1)



2 Operator A operates the winch to lift the MMU while Operator B pulls the

rope outward to prevent the MMU from hitting the tower.

Figure 22. Lifting the MMU (2)



Fixing MMU on the Pole_Down Tilting Installation

To fix MMU on the Pole_Down Tilting Installation

1 Make sure that you have the following items:

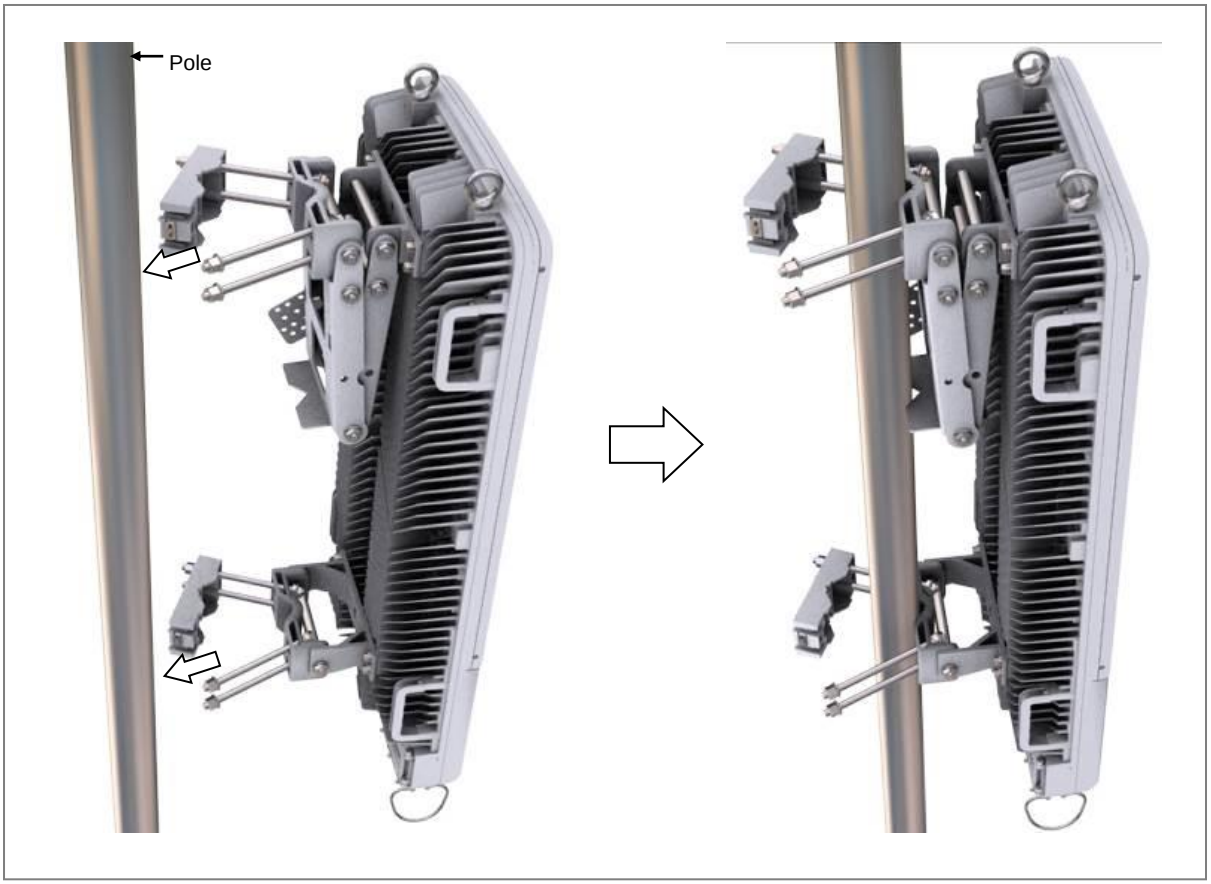
Table 7. Tools for fixing MMU on the Pole_Down Tilting Installation

Category	Description	
Recommended Torque Value	M12 Flange Nut	372 lbf·in
	M4 Plate Fixing Screw	13 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (Hex. Head: 19 mm) • Level • Torque Driver (6~22 lbf·in) • Screw Driver Bit (‘+’, No.2)	

Category	Description
	• Screw Driver (‘+’, No.2)

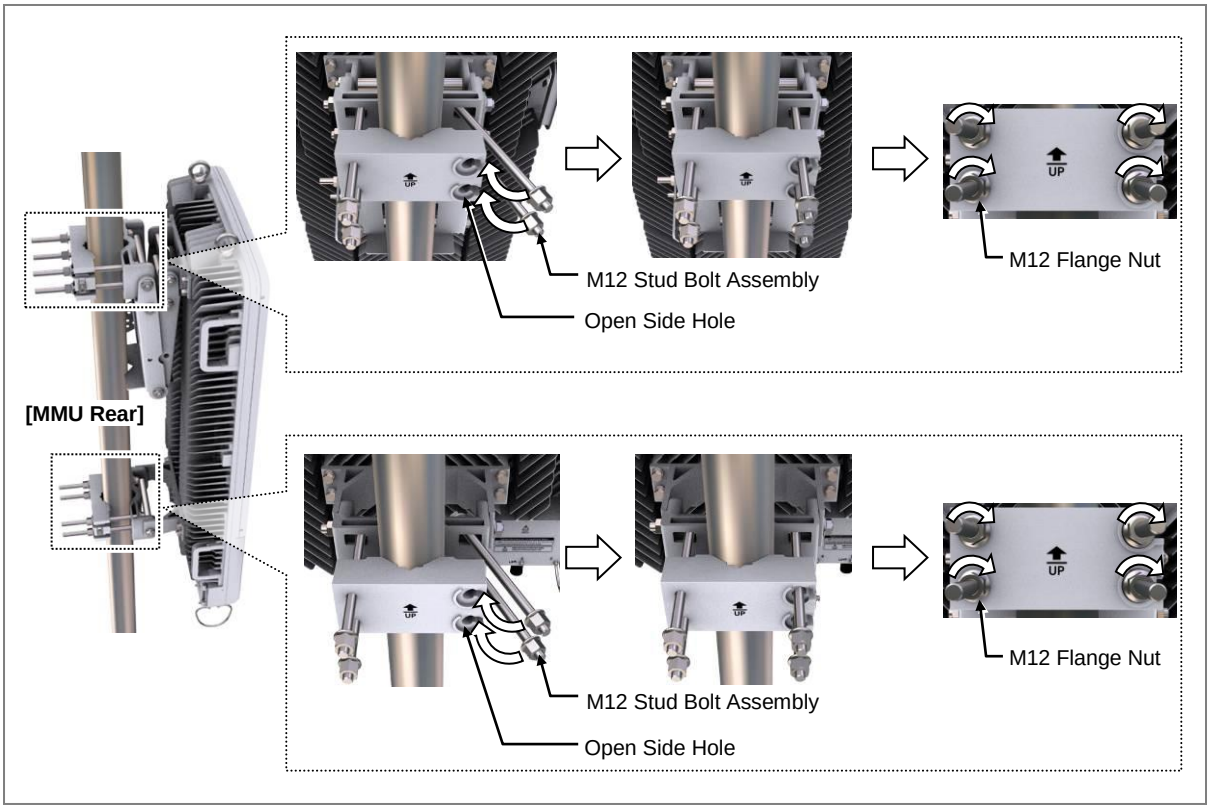
2 Unfold the rear brackets at the top and bottom of the back of the MMU and place the MMU on the pole.

Figure 23. Fixing MMU on the Pole_Down Tilting Installation (1)

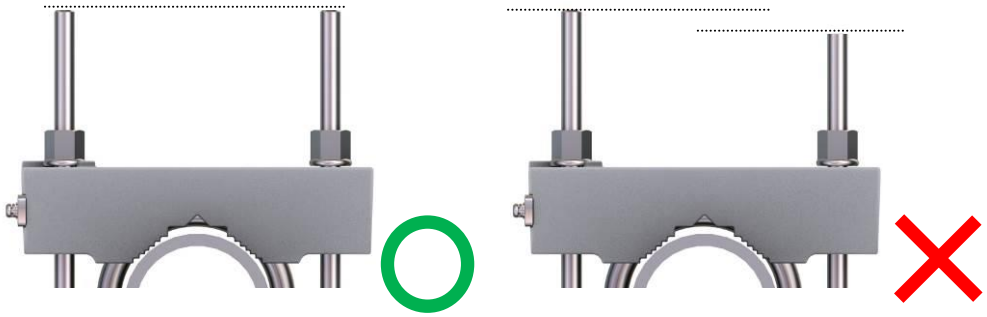


3 Place the stud bolts on the open side holes of the rear brackets at the top and bottom of the back of the MMU, and tighten the fasteners on both sides.

Figure 24. Fixing MMU on the Pole_Down Tilting Installation (2)

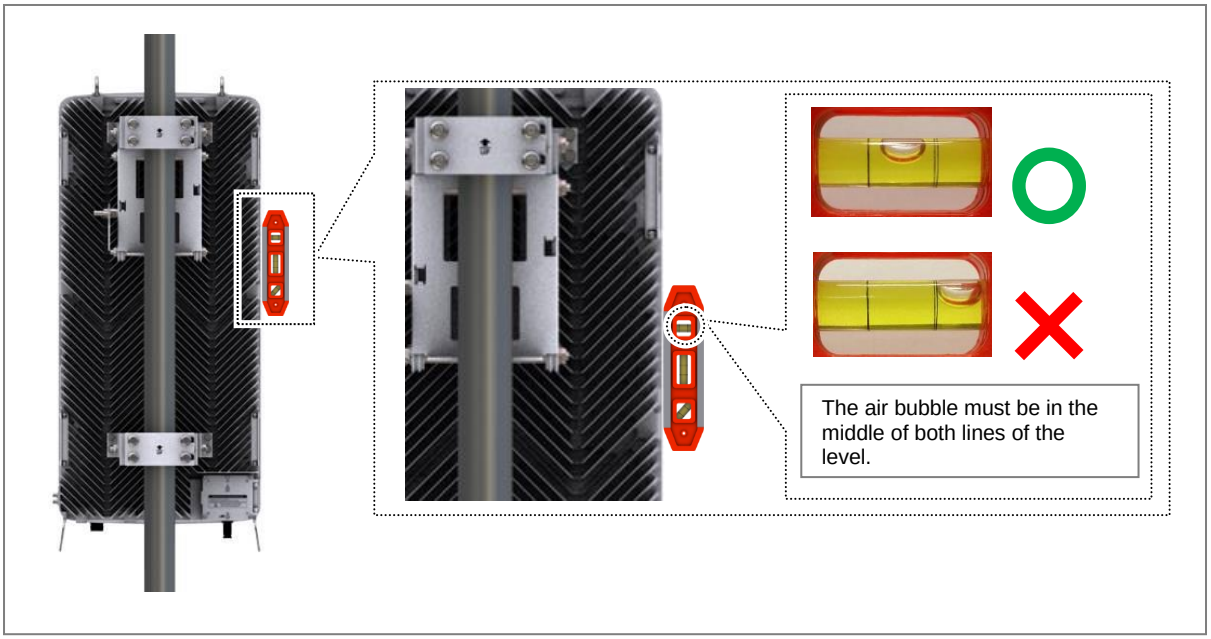


The length of the stud bolts through the rear brackets must be the same.



4 Check if the sides of the MMU are vertical using a level.

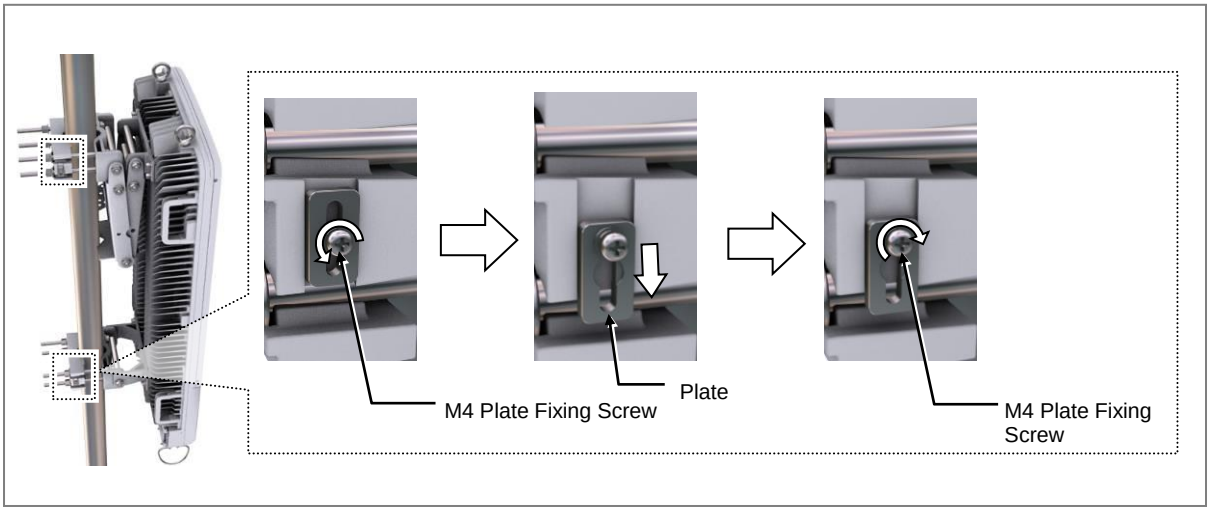
Figure 25. Leveling MMU on the Pole_Down Tilting Installation



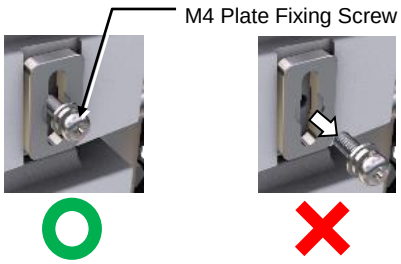
If there is a leveling error, undo the fasteners of the rear bracket, re-align it vertically and horizontally, and tighten the fasteners.

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

Figure 26. Plate Adjustment



Do not take the fasteners out completely.



Fixing Pole Type_Up Tilting Installation

Assembling Bracket Assembly_Up Tilting Installation

To assemble Fixed Bracket Assembly

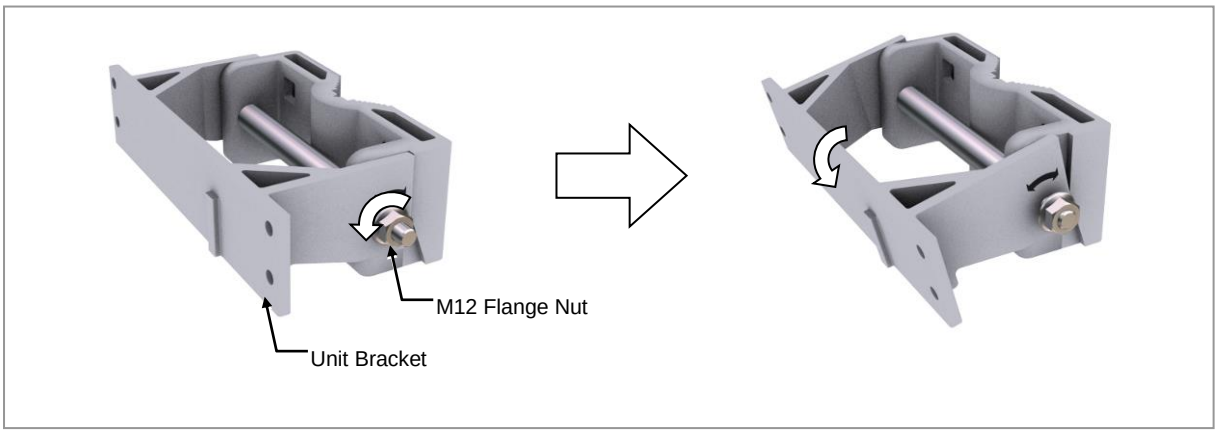
1 Make sure you have the following items:

Table 8. Parts and Tools for Assembling Mounting Bracket_Top Assembly

Category	Description		
Parts	Mounting Bracket_Top Assembly		1 EA
	Rear Bracket		1 EA
	Fasteners	M12 Stud Bolt Assembly	4 EA
		M12 Flange Nut	4 EA
Recommended Torque Value	M12 Flange Nut		372 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (Hex. Head: 19 mm)		

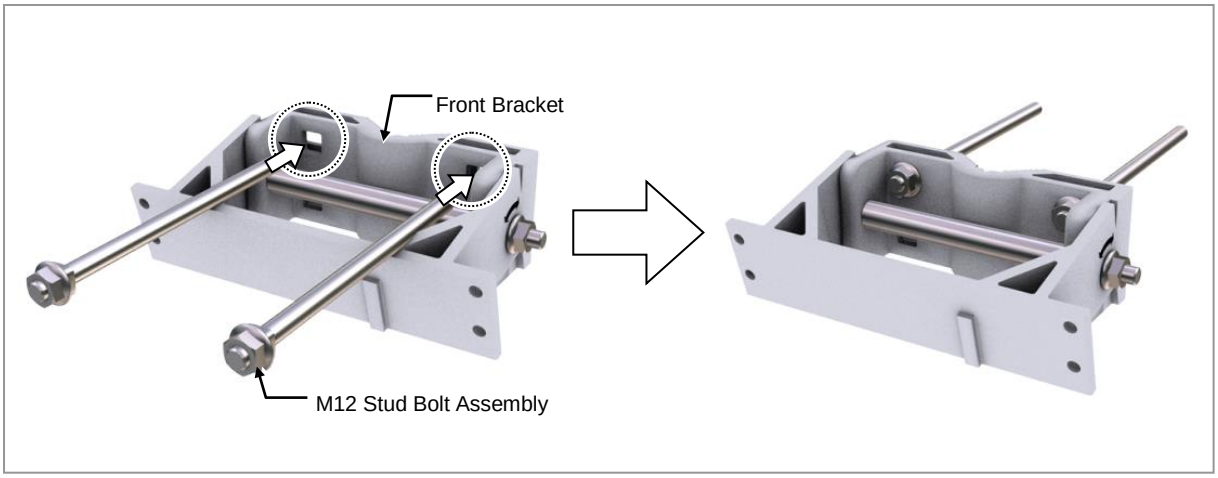
2 Loosen the flange nut by turning it two turns to the left, and attach the unit bracket tilt down.

Figure 27. Assembling Fixed Bracket Assembly_Up Tilting Installation (1)



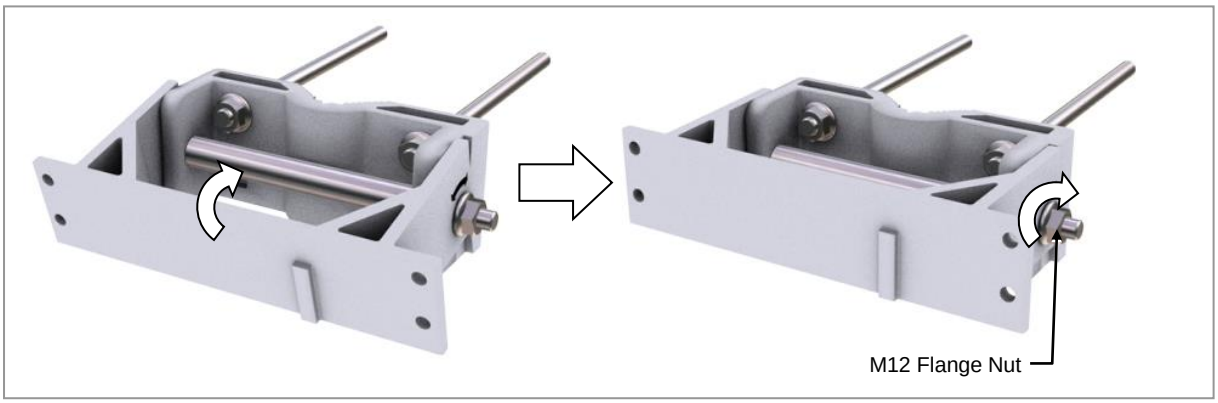
3 Pass the stud bolt assembly through the front bracket holes.

Figure 28. Assembling Fixed Bracket Assembly_Up Tilting Installation (2)



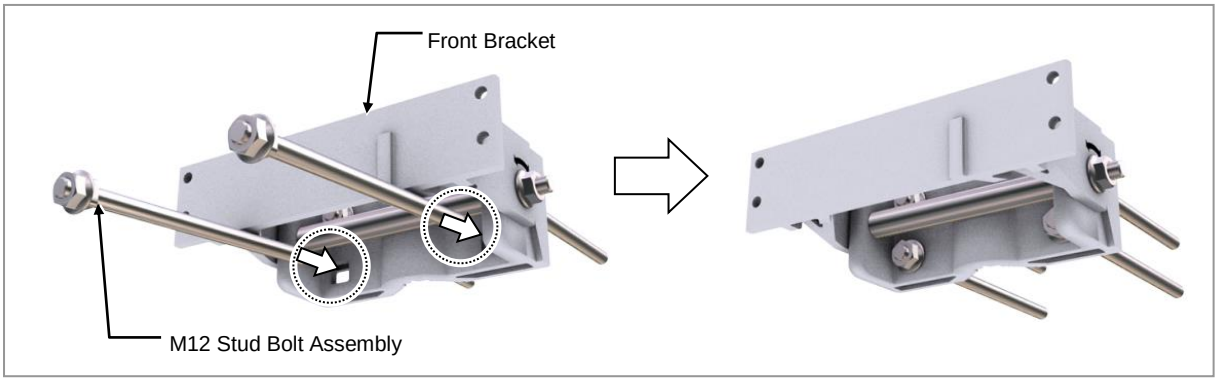
4 Tilt the unit bracket upward, tighten the M12 flange nut. Make sure the unit bracket is vertical when tilting it back to the original position.

Figure 29. Assembling Fixed Bracket Assembly_Up Tilting Installation (3)



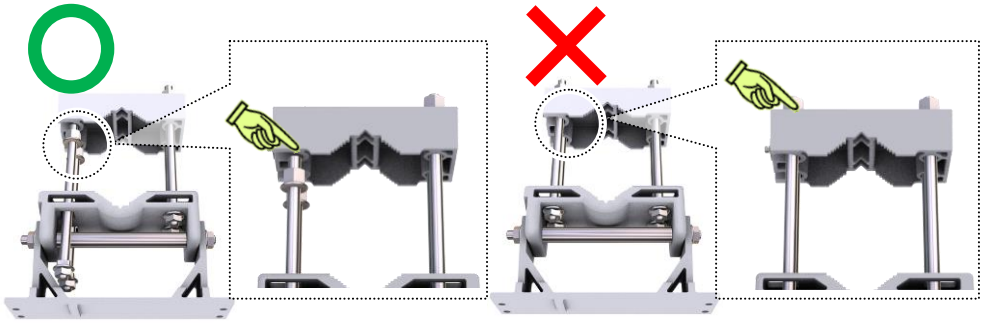
5 Pass the stud bolt assembly through the front bracket holes.

Figure 30. Assembling Fixed Bracket Assembly_Up Tilting Installation (4)

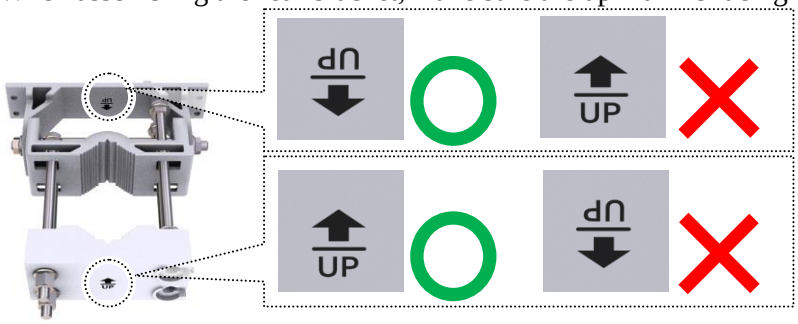


When assembling the rear bracket, make sure the stud bolts do not pass through

the side holes.

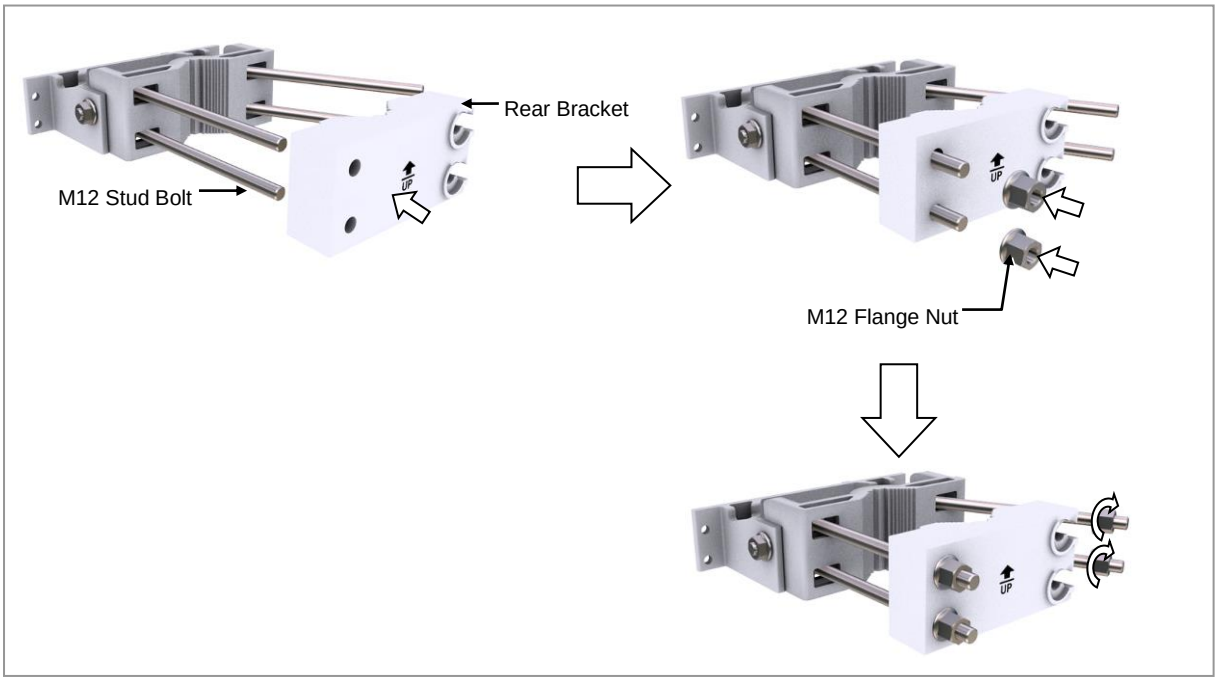


When assembling the rear bracket, make sure the up mark is facing upward.



6 Insert the stud bolts into the rear bracket holes and tighten the fasteners temporarily.

Figure 31. Assembling Fixed Bracket Assembly_Up Tilting Installation (5)



To assemble Scissors Bracket Assembly

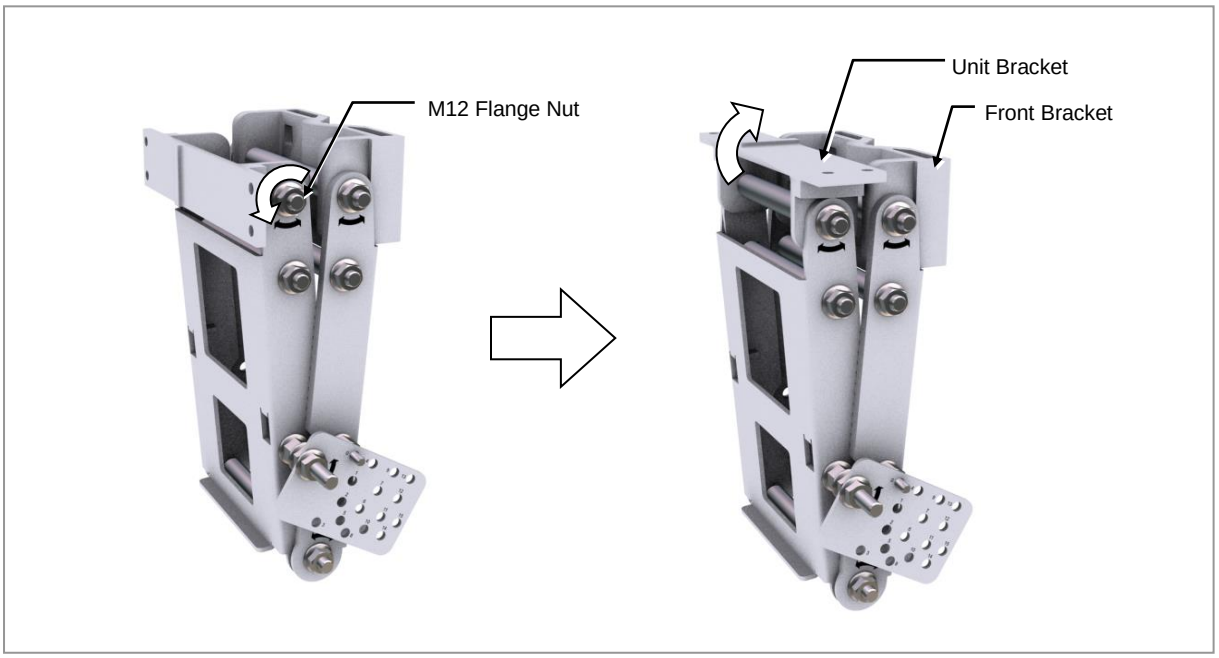
1 Make sure you have the following items:

Table 9. Parts and Tools for Assembling Mounting Bracket_Top Assembly

Category	Description		
Parts	Scissors Bracket Assembly		1 EA
	Rear Bracket		1 EA
	Fasteners	M12 Stud Bolt Assembly	4 EA
		M12 Flange Nut	4 EA
Recommended Torque Value	M12 Flange Nut		372 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (Hex. Head: 19 mm)		

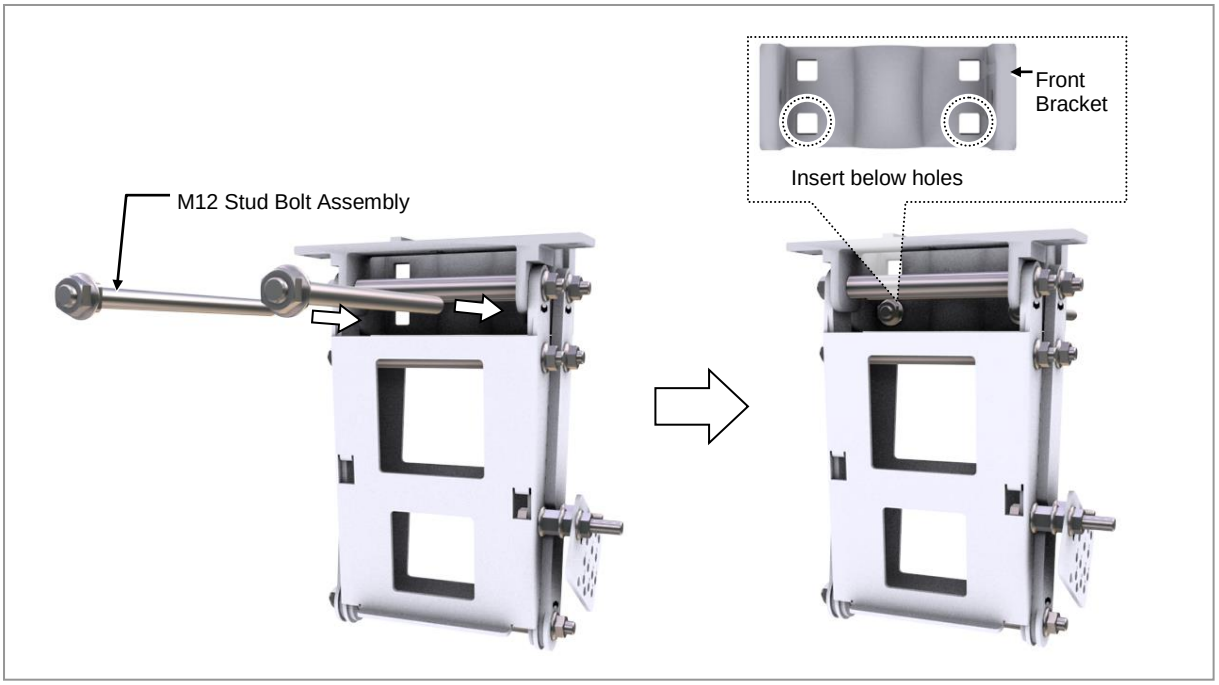
2 Loosen the flange nut by turning it two turns to the left, and attach the unit bracket tilt up.

Figure 32. Assembling Scissors Bracket Assembly_Up Tilting Installation (1)



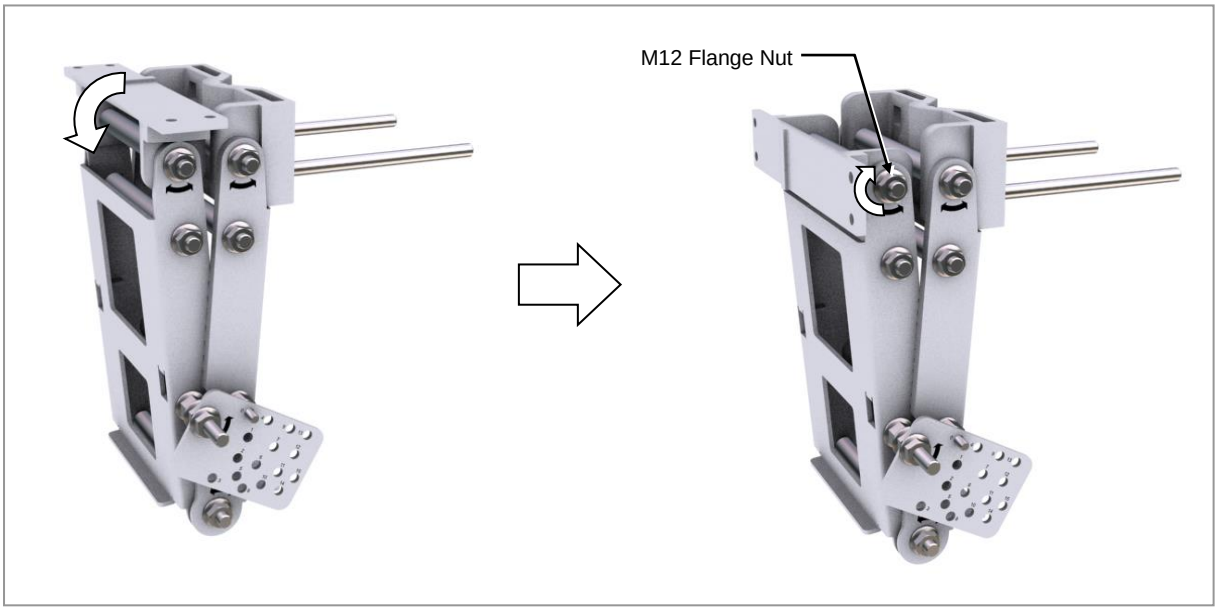
3 Pass the stud bolt assembly through the front bracket holes.

Figure 33. Assembling Scissors Bracket Assembly_Up Tilting Installation (2)



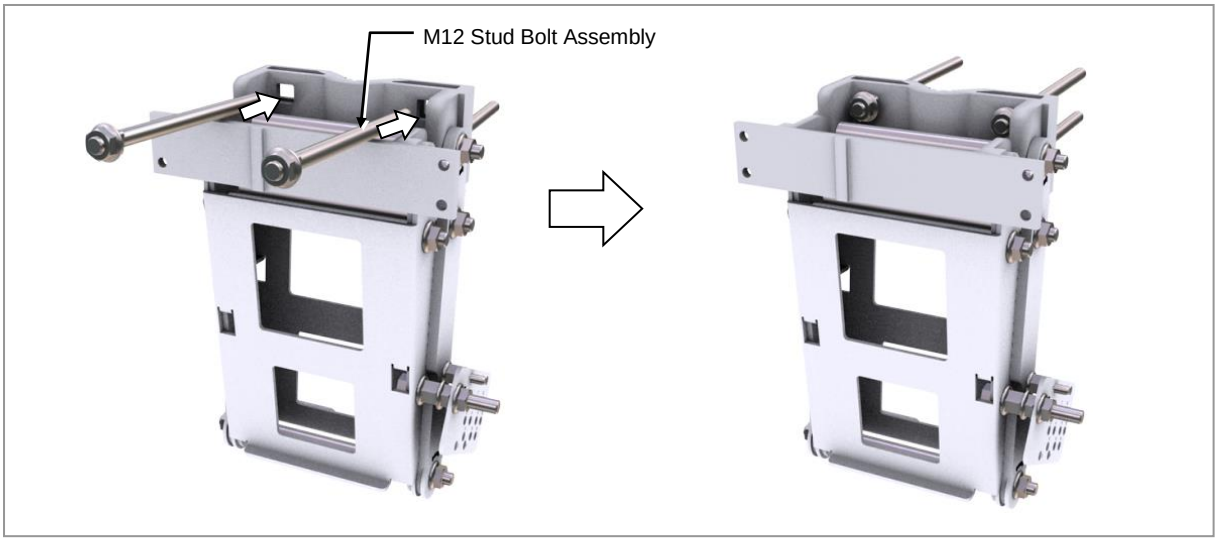
4 Tilt the unit bracket downward, tighten the M12 flange nut. Make sure the unit bracket is vertical when tilting it back to the original position.

Figure 34. Assembling Scissors Bracket Assembly_Up Tilting Installation (3)

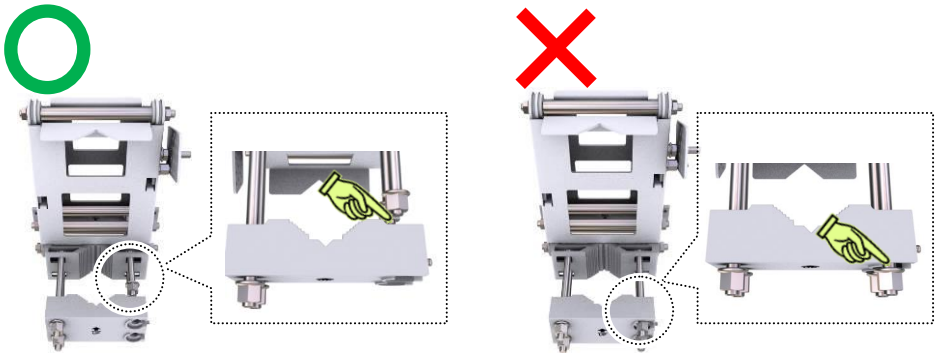


5 Pass the stud bolt assembly through the front bracket holes.

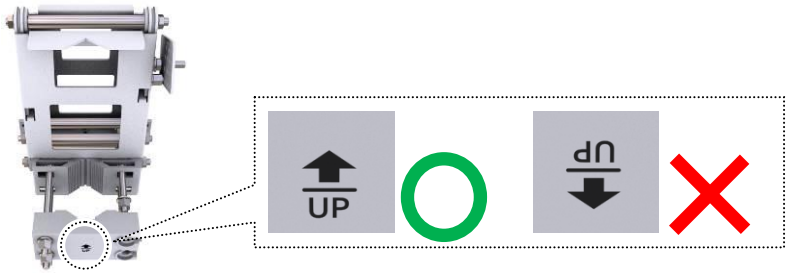
Figure 35. Assembling Scissors Bracket Assembly_Up Tilting Installation (4)



When assembling the rear bracket, make sure the stud bolts do not pass through the side holes.

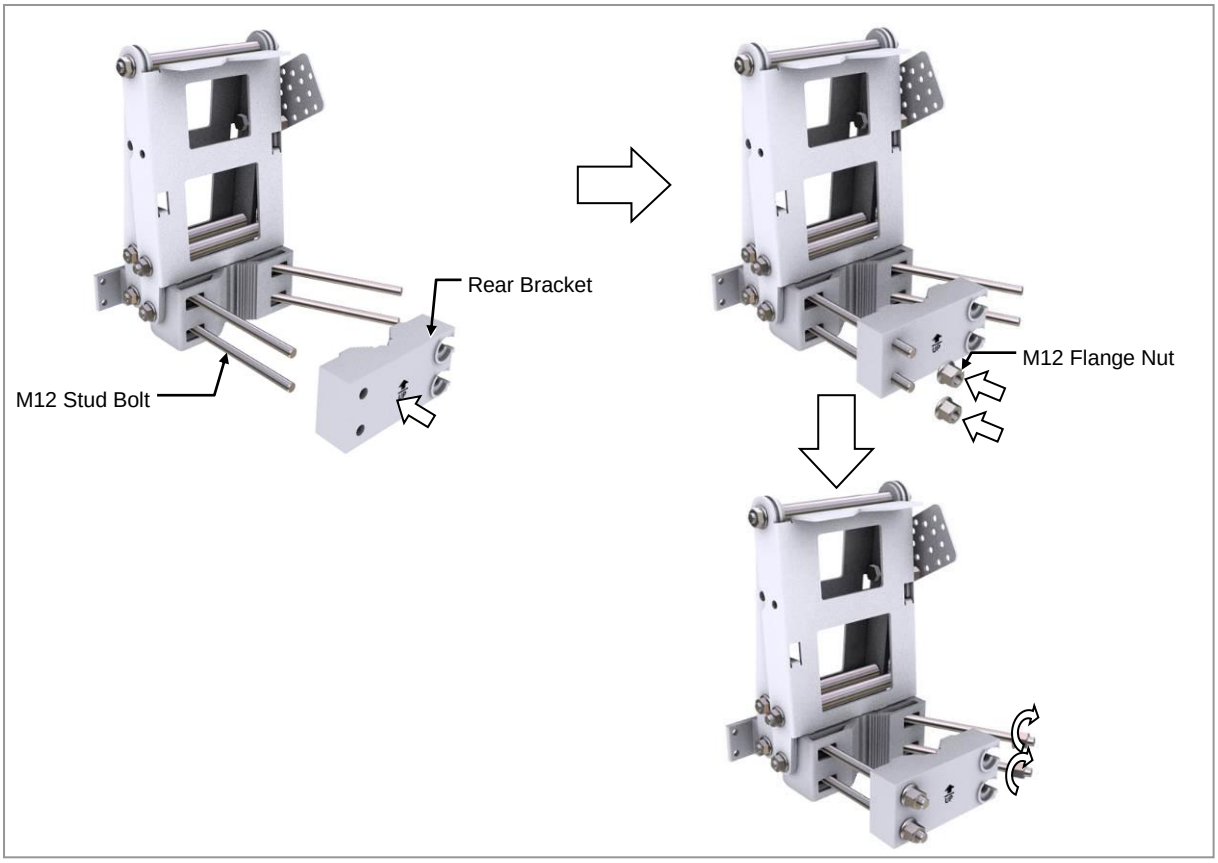


When assembling the rear bracket, make sure the up mark is facing upward.



6 Insert the stud bolts into the rear bracket holes and tighten the fasteners temporarily.

Figure 36. Assembling Scissors Bracket Assembly_Up Tilting Installation (5)



Fixing Bracket Assembly to the MMU

To fix Fixed Bracket Assembly

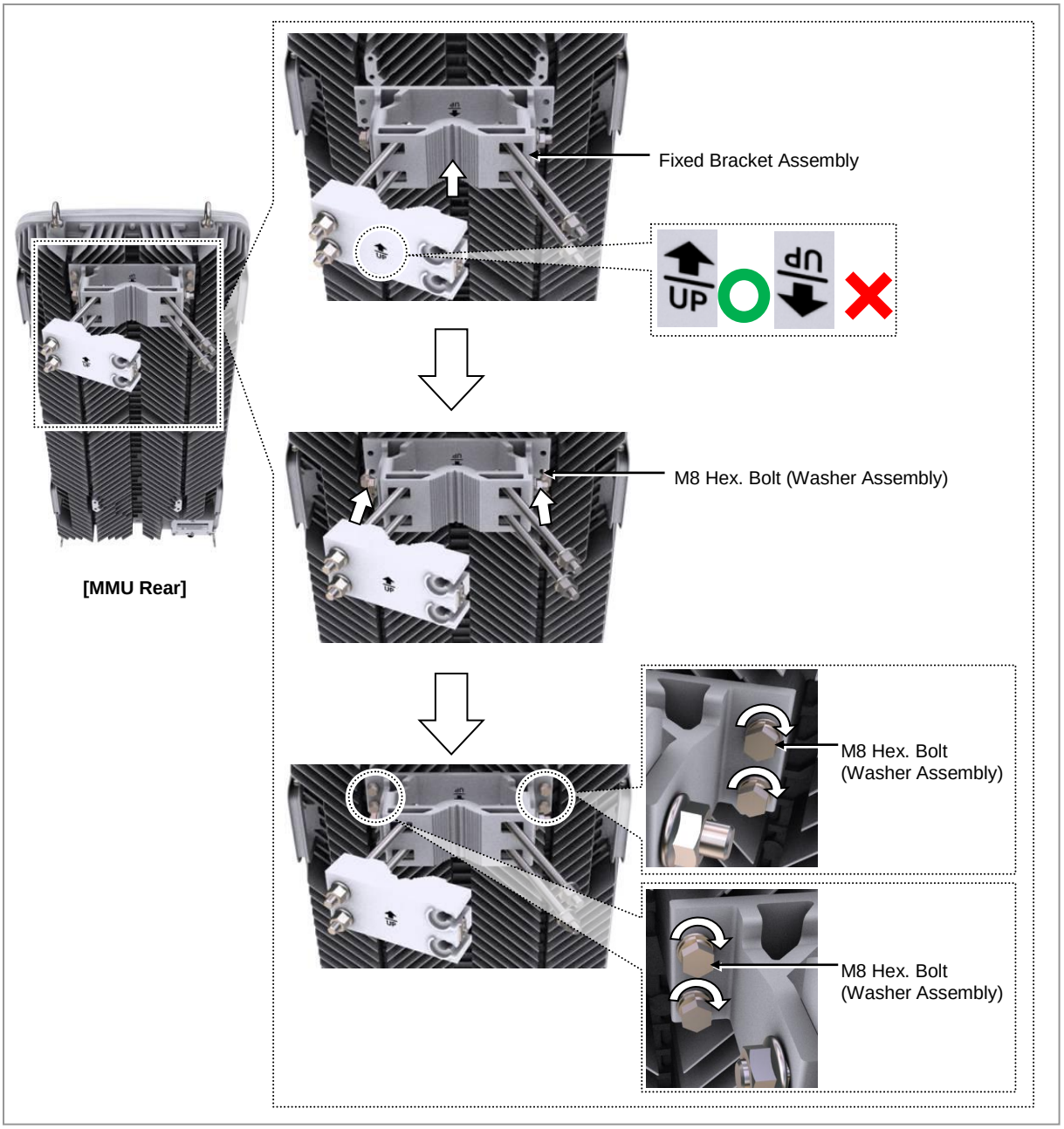
1 Make sure you have the following items:

Table 10. Parts and Tools for fixing Fixed Bracket Assembly to the MMU

Category	Description		
Parts	Fixed Bracket Assembly		1 EA
	Fasteners	M8 × L25 Hex. Bolt (washer assembly)	4 EA
Recommended Torque Value	M8 Hex. Bolt		110 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 13 mm) • Spanner (13 mm)		

2 Place the fixed bracket assembly, on the fixing location at the top of the back of the MMU and fix it with the fasteners.

Figure 37. Fixing Fixed Bracket Assembly to the MMU



To fix Scissors Bracket Assembly

1 Make sure you have the following items:

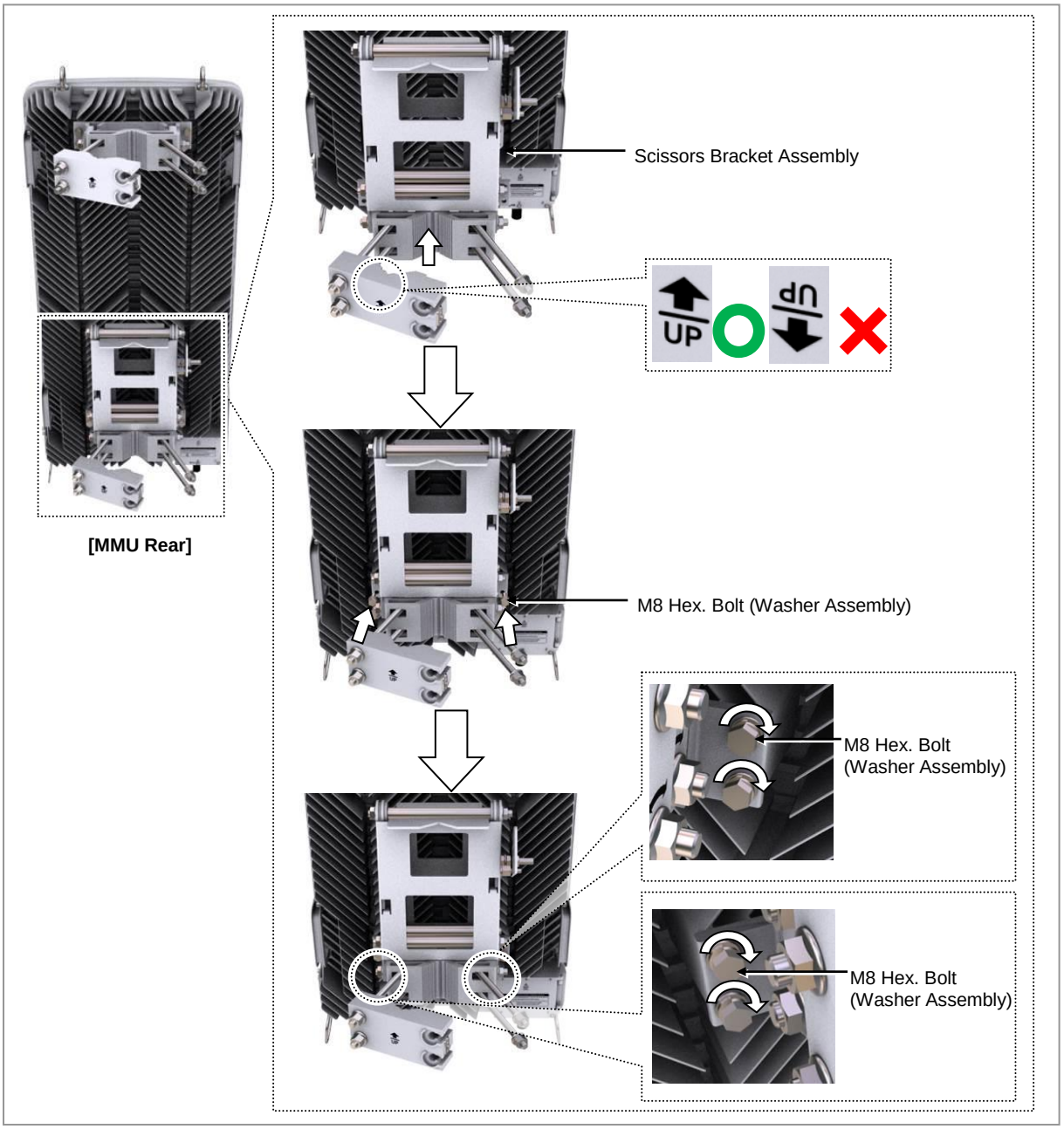
Table 11. Parts and Tools for fixing Scissors Bracket Assembly to the MMU

Category	Description		
Parts	Scissors Bracket Assembly		1 EA
	Fasteners	M8 × L25 Hex. Bolt (washer assembly)	4 EA
Recommended Torque Value	M8 Hex. Bolt		110 lbf·in

Category	Description
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 13 mm) • Spanner (13 mm)

2 Place the scissors bracket assembly, on the fixing location at the bottom of the back of the MMU and fix it with the fasteners.

Figure 38. Fixing Scissors Bracket Assembly to the MMU



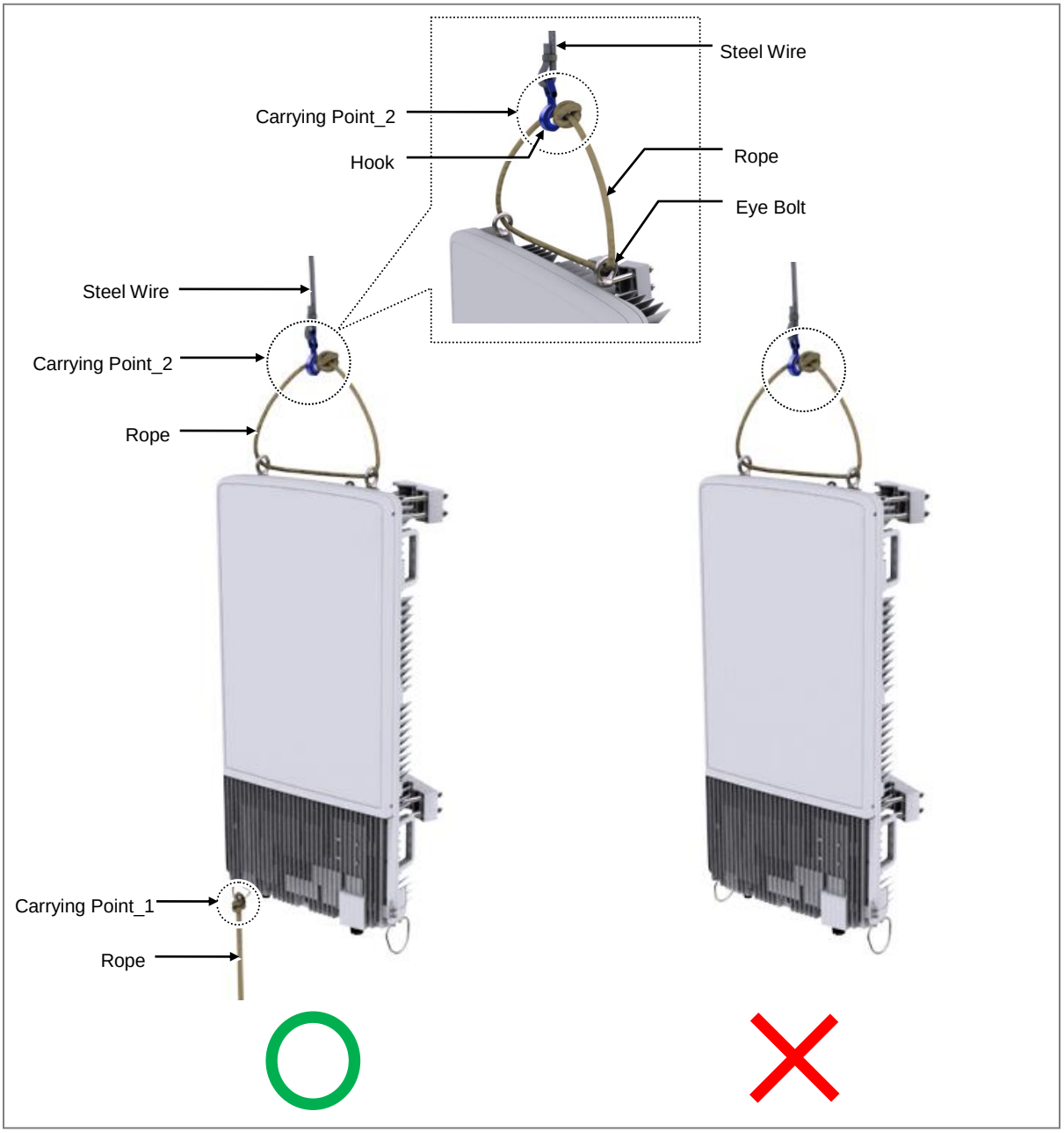
Lifting MMU

Lifting the MMU

1 Tie the MMU eye bolt and support bracket when lifting.

- Steel wire: connecting to the eye bolt
- Rope: connecting to the support bracket

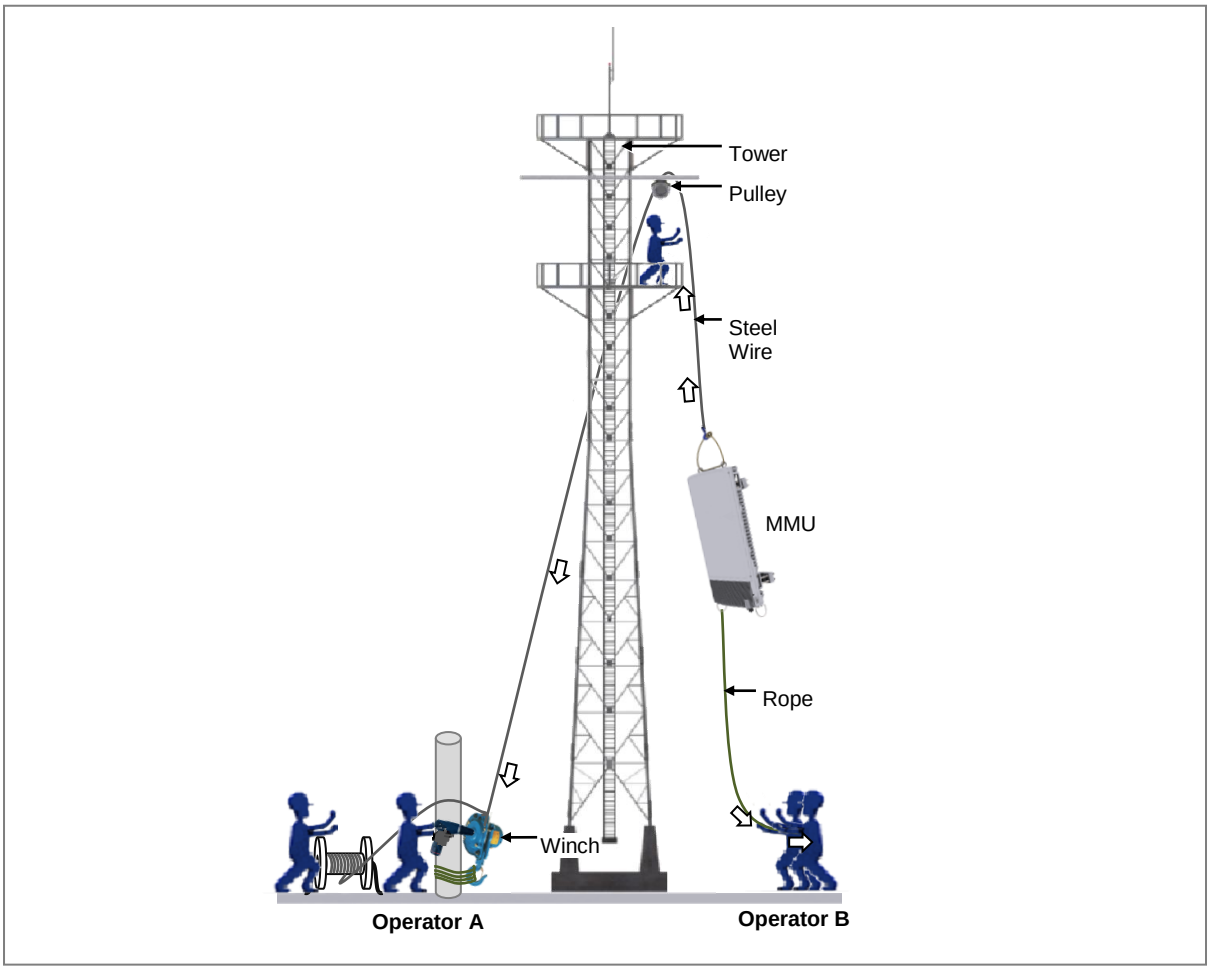
Figure 39. Lifting the MMU (1)



2 Operator A operates the winch to lift the MMU while Operator B pulls the

rope outward to prevent the MMU from hitting the tower.

Figure 40. Lifting the MMU (2)



Fixing MMU on the Pole_Up Tilting Installation

To fix MMU on the Pole_Up Tilting Installation

1 Make sure that you have the following items:

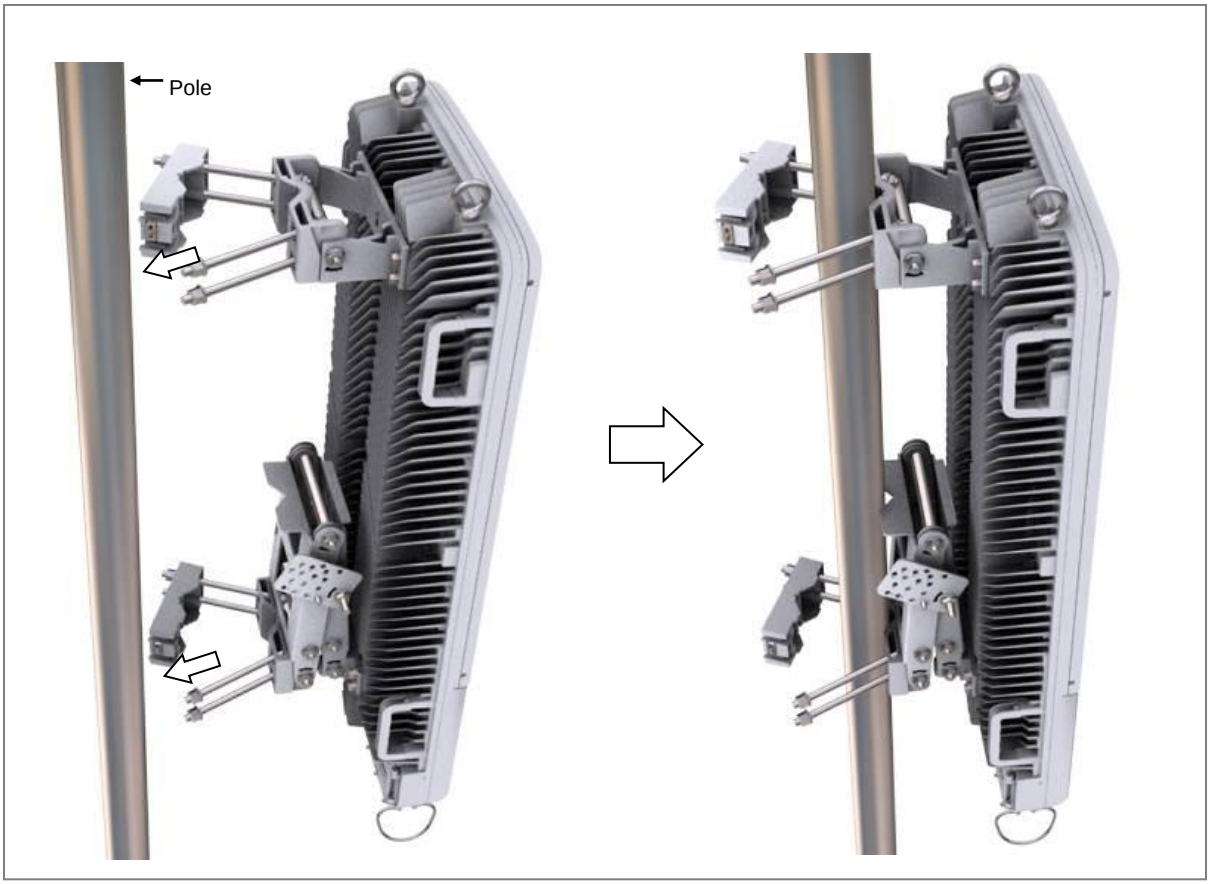
Table 12. Tools for fixing MMU on the Pole_Up Tilting Installation

Category	Description	
Recommended Torque Value	M12 Flange Nut	372 lbf·in
	M4 Plate Fixing Screw	13 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (Hex. Head: 19 mm) • Level • Torque Driver (6~22 lbf·in) • Screw Driver Bit (‘+’, No.2)	

Category	Description
	• Screw Driver ('+', No.2)

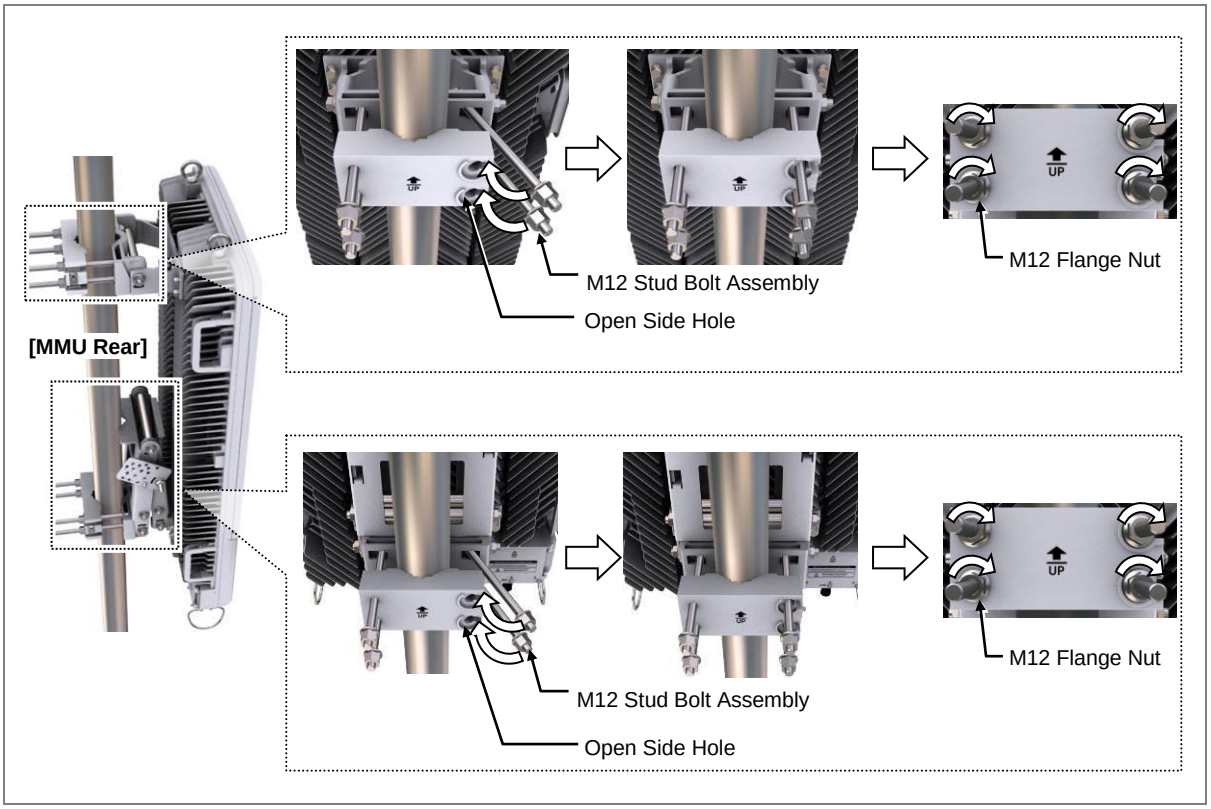
2 Unfold the rear brackets at the top and bottom of the back of the MMU and place the MMU on the pole.

Figure 41. Fixing MMU on the Pole_Up Tilting Installation (1)

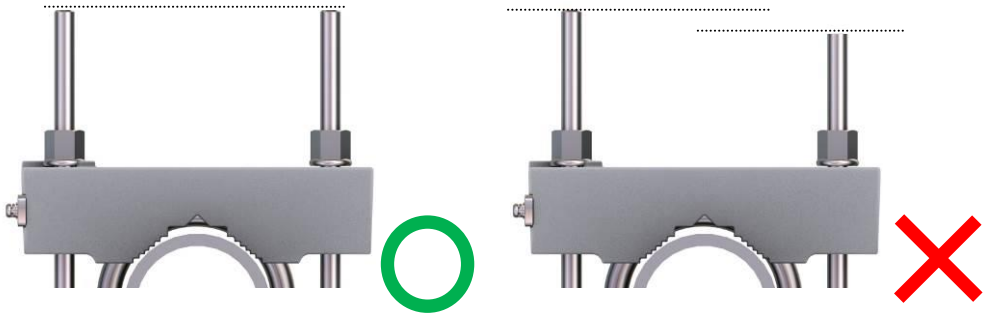


3 Place the stud bolts on the open side holes of the rear brackets at the top and bottom of the back of the MMU, and tighten the fasteners on both sides.

Figure 42. Fixing MMU on the Pole_Up Tilting Installation (2)

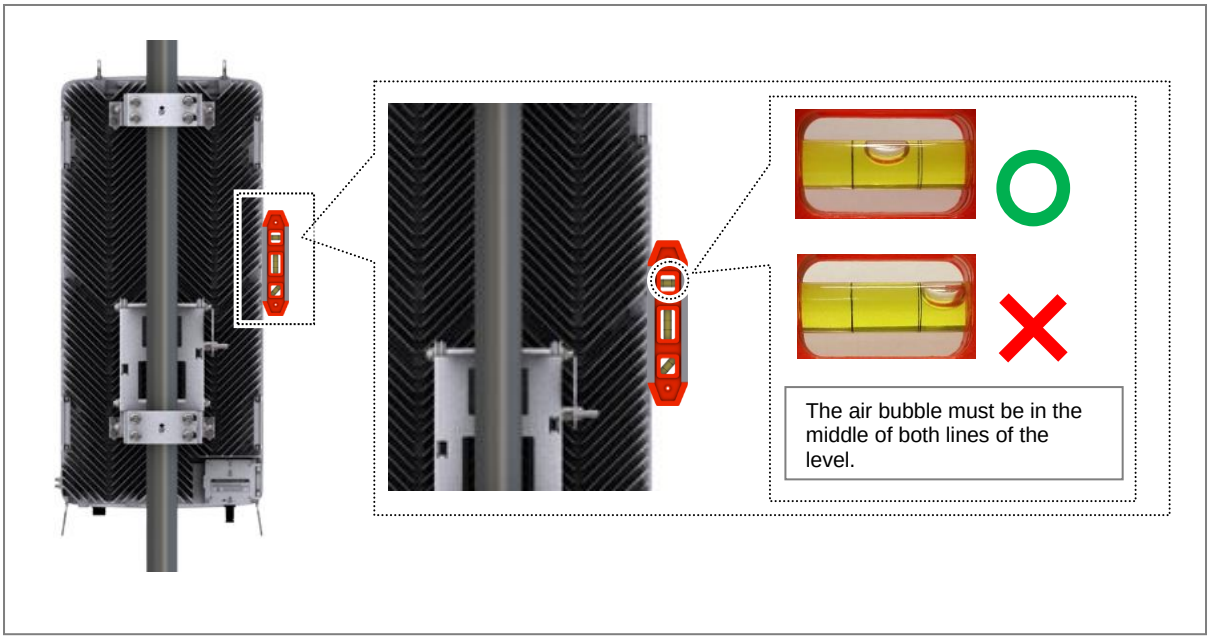


The length of the stud bolts through the rear brackets must be the same.



4 Check if the sides of the MMU are vertical using a level.

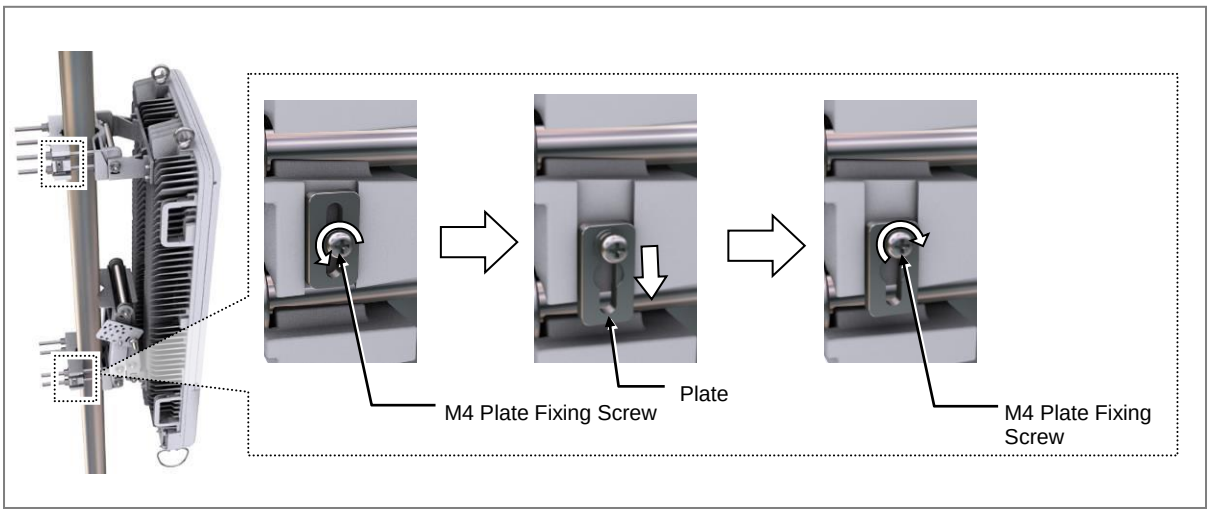
Figure 43. Leveling MMU on the Pole_Up Tilting Installation



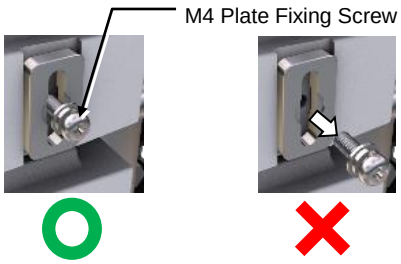
If there is a leveling error, undo the fasteners of the rear bracket, re-align it vertically and horizontally, and tighten the fasteners.

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

Figure 44. Plate Adjustment



Do not take the fasteners out completely.



Fixing Wall Type

Marking and Drilling for Wall Mounting

To mark on a wall

1 Make sure you have the following items:

Table 13. Tools for Marking

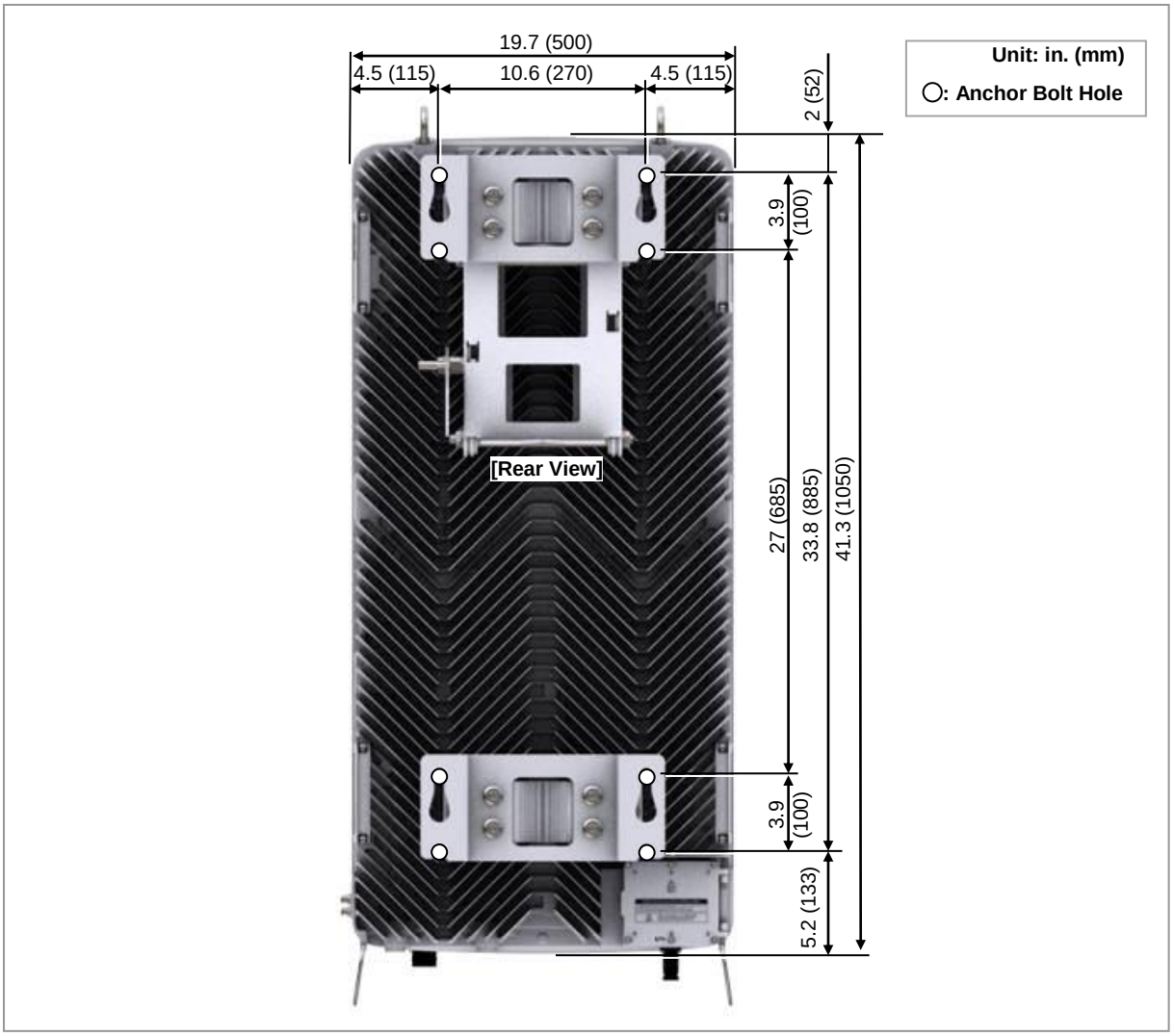
Category	Description	
Parts	Wall Mounting Bracket	2 EA
Working Tools	• Tape Measure • Permanent Marker • Level	

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

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

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

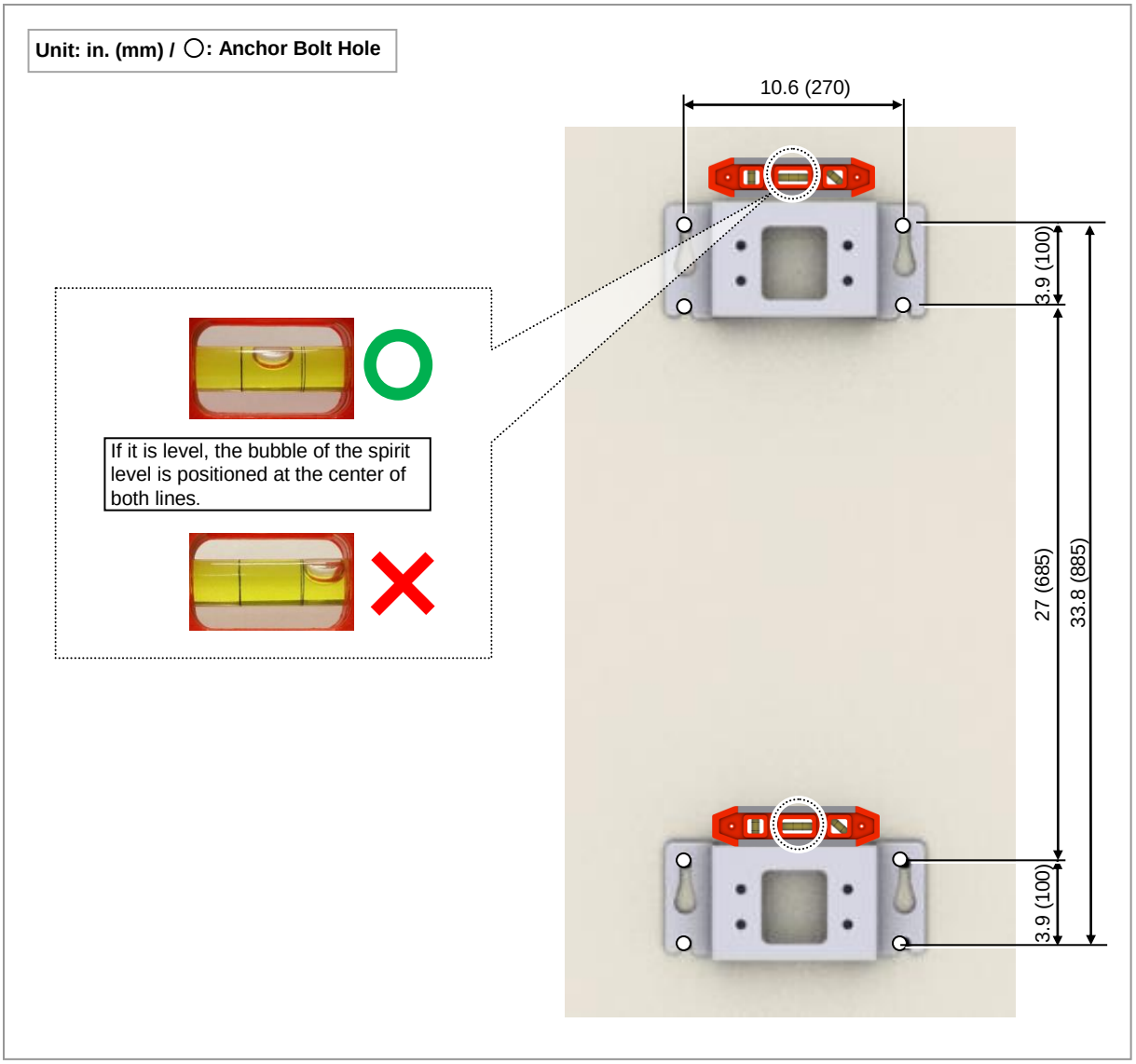
Figure 45. MMU Marking Dimensions



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

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

Figure 46. Marking_Wall Type



To drill anchor holes and fix anchors

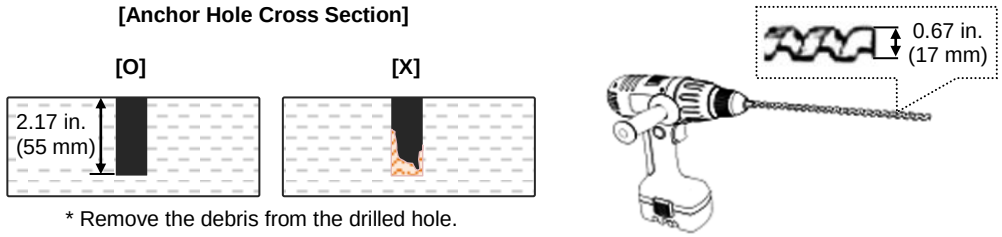
1 Make sure you have the following items:

Table 14. Parts and Tools for Drilling & Anchoring

Category	Description	
Parts	M12 Set Anchor Assembly	8 EA
Woking Tools	• Hammer Drill • Concrete Drill Bit [0.55 in. (14 mm)] • Vacuum Cleaner • Hammer • Anchor Punch (for M12 Set Anchor)	

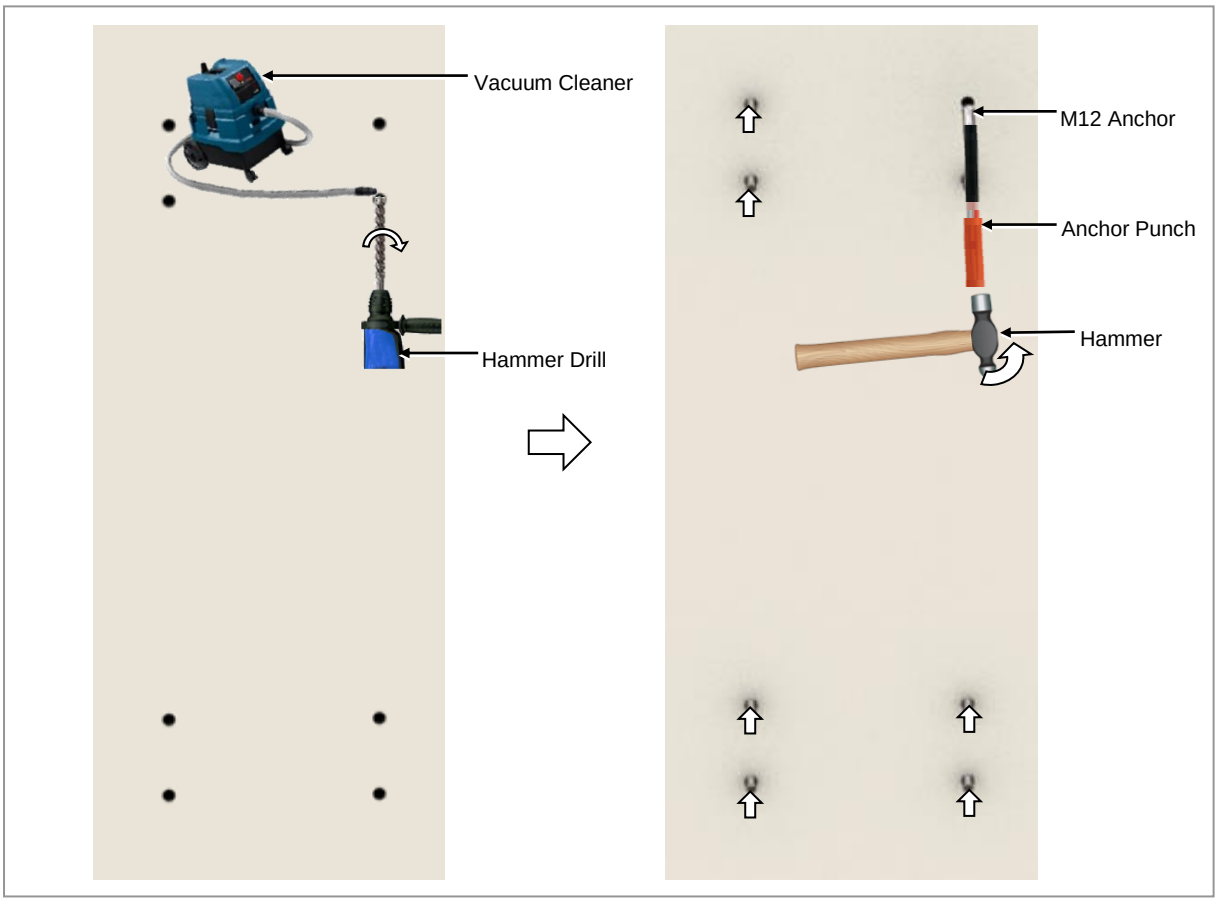
Table 15. Anchor Bolt Drill Bits and Hole Depth

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



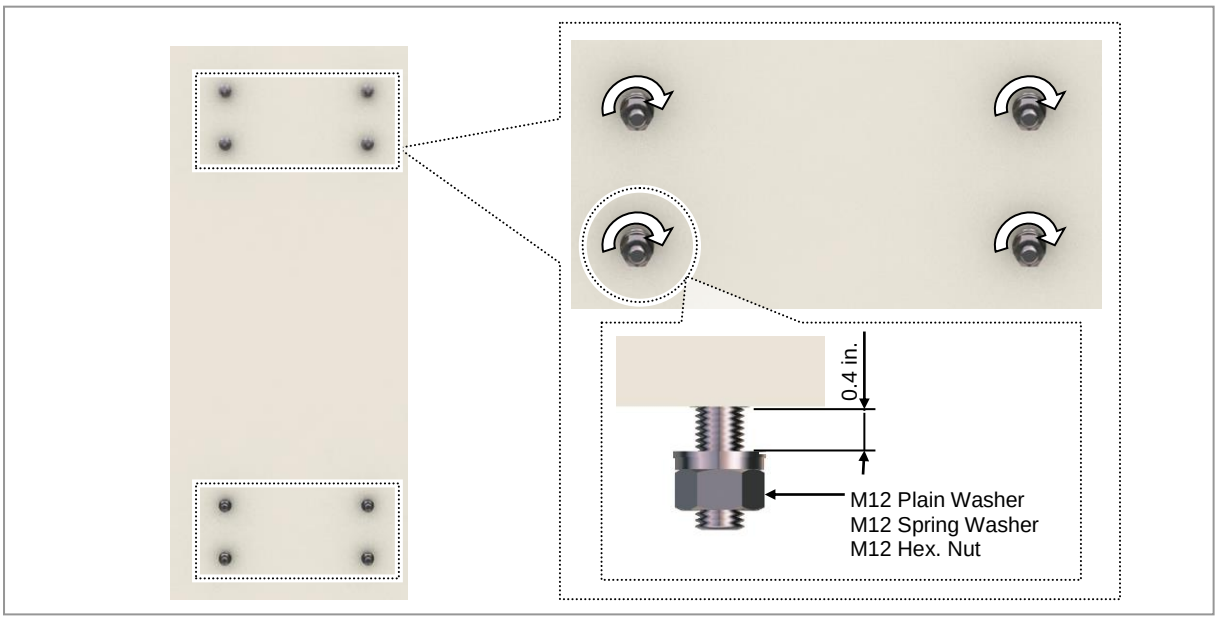
2 Drill anchor holes at marked points with removing dust from the holes using a cleaner. Fix set anchor to the drilled hole.

Figure 47. Drilling & Anchoring (1)



3 Fix fasteners to anchor bolt temporarily.

Figure 48. Drilling & Anchoring (2)



Assembling Bracket Assembly

To assemble Fixed Bracket Assembly

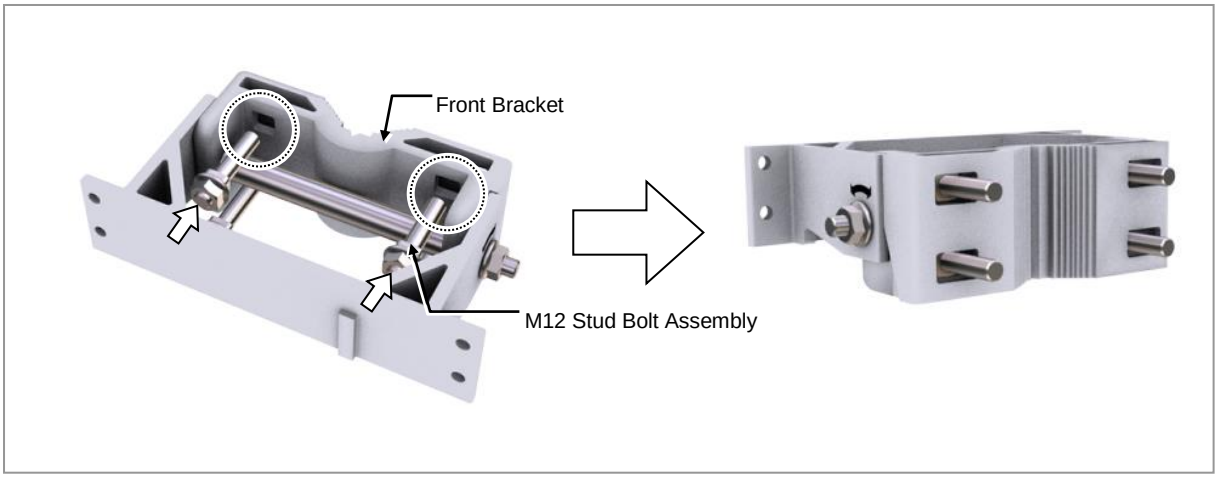
1 Make sure you have the following items:

Table 16. Parts and Tools for Assembling Fixed Bracket Assembly

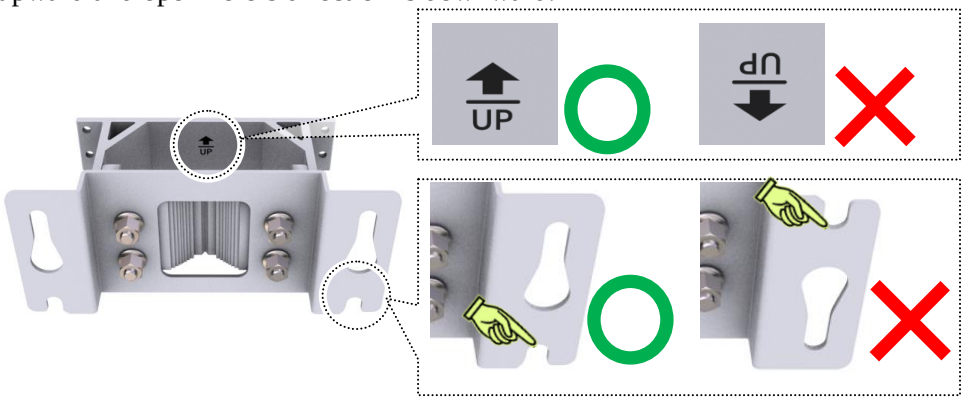
Category	Description		
Parts	Fixed Bracket Assembly		1 EA
	Wall Mounting Bracket		1 EA
	Fasteners	M12 Stud Bolt Assembly	4 EA
		M12 Flange Nut	4 EA
Recommended Torque Value	M12 Flange Nut		372 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (Hex. Head: 19 mm)		

2 Pass the stud bolt assembly through the front bracket holes.

Figure 49. Assembling Fixed Bracket Assembly_Wall Type (1)

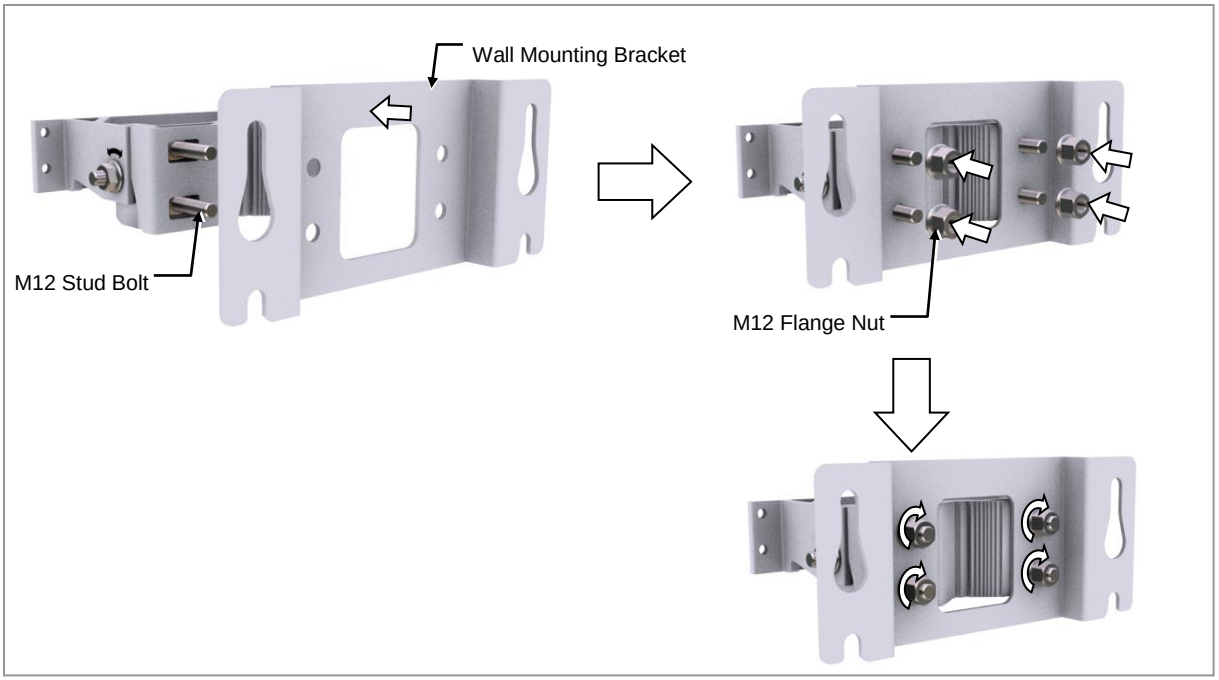


When assembling the wall mounting bracket, make sure the up mark is facing upward and open hole's direction is downward.



3 Insert the stud bolts into the wall mounting bracket holes and tighten the fasteners temporarily.

Figure 50. Assembling Fixed Bracket Assembly_Wall Type (2)



To assemble Scissors Bracket Assembly

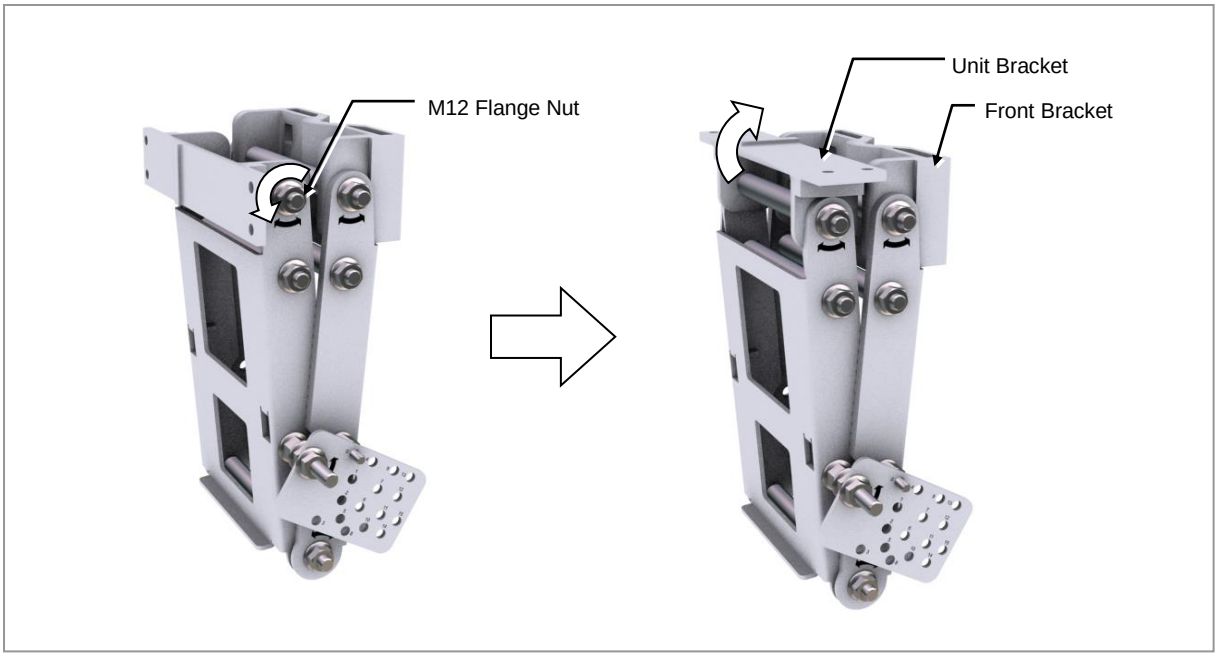
1 Make sure you have the following items:

Table 17. Parts and Tools for Assembling Scissors Bracket Assembly

Category	Description		
Parts	Scissors Bracket Assembly		1 EA
	Wall Mounting Bracket		1 EA
	Fasteners	M12 Stud Bolt Assembly	4 EA
		M12 Flange Nut	4 EA
Recommended Torque Value	M12 Flange Nut		372 lbf·in (428 kgf·cm)
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (Hex. Head: 19 mm)		

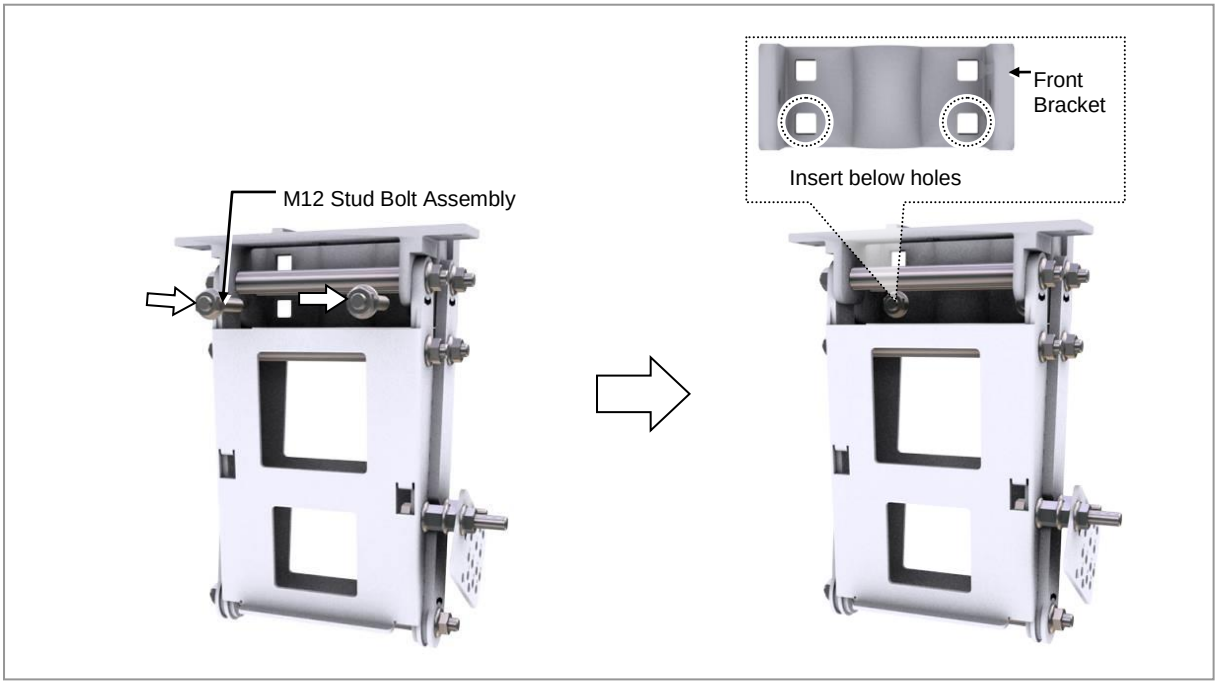
2 Loosen the flange nut by turning it two turns to the left, and attach the unit bracket tilt up.

Figure 51. Assembling Scissors Bracket Assembly_Wall Type (1)



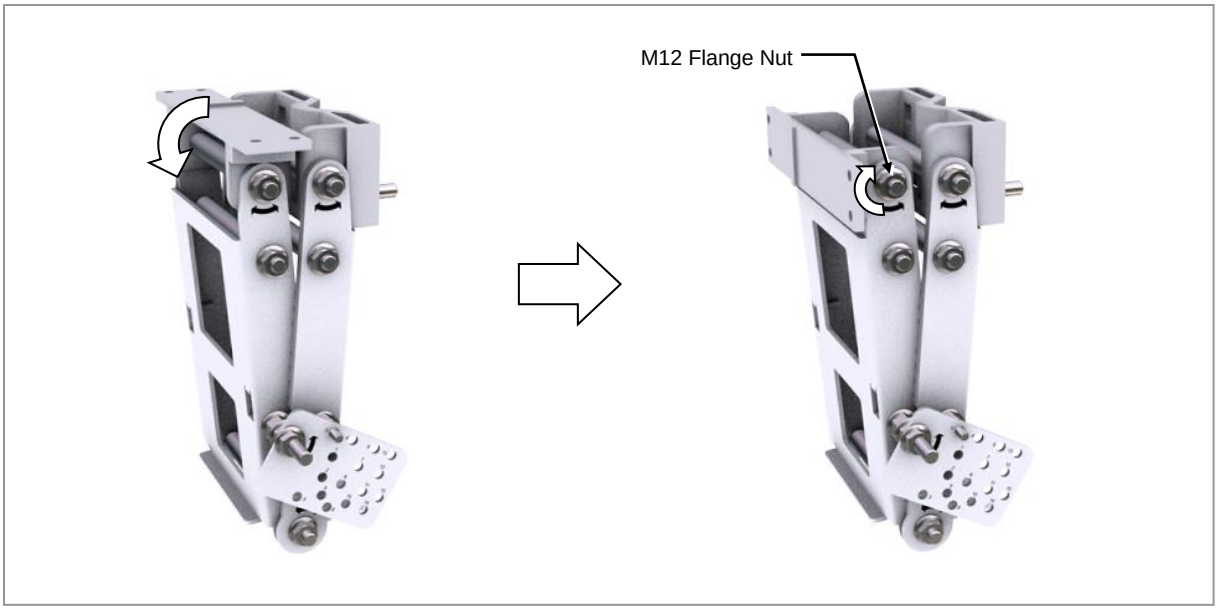
3 Pass the stud bolt assembly through the front bracket holes.

Figure 52. Assembling Scissors Bracket Assembly_Wall Type (2)



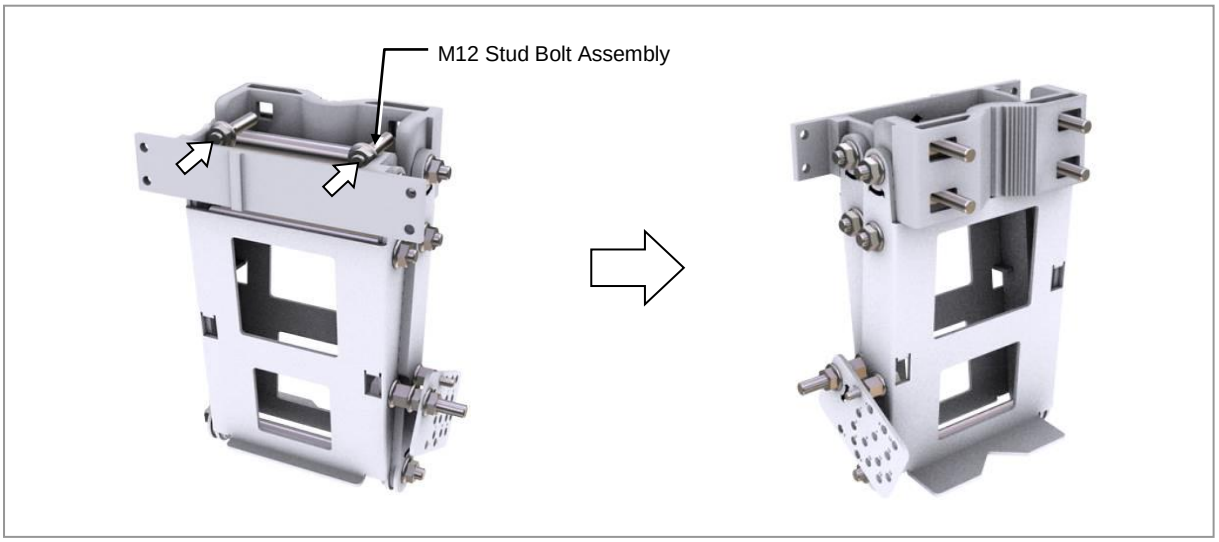
4 Tilt the unit bracket downward, tighten the M12 flange nut. Make sure the unit bracket is vertical when tilting it back to the original position.

Figure 53. Assembling Scissors Bracket Assembly_Wall Type (3)

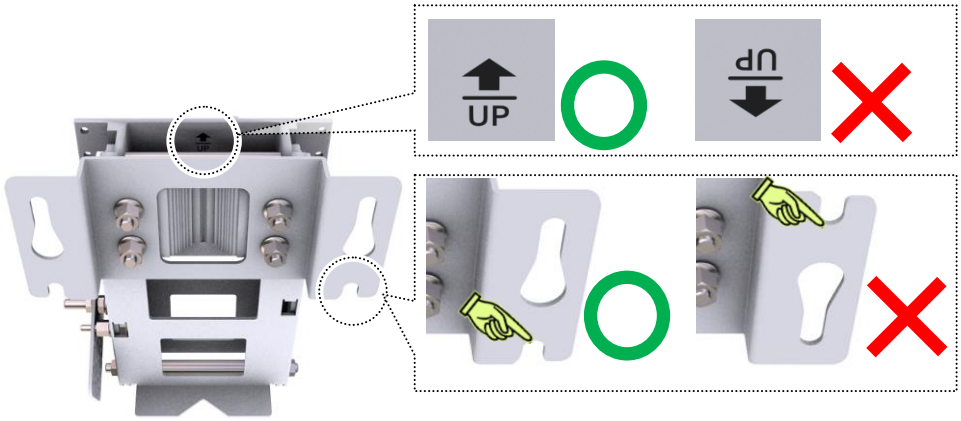


5 Pass the stud bolt assembly through the front bracket holes.

Figure 54. Assembling Scissors Bracket Assembly_Wall Type (4)

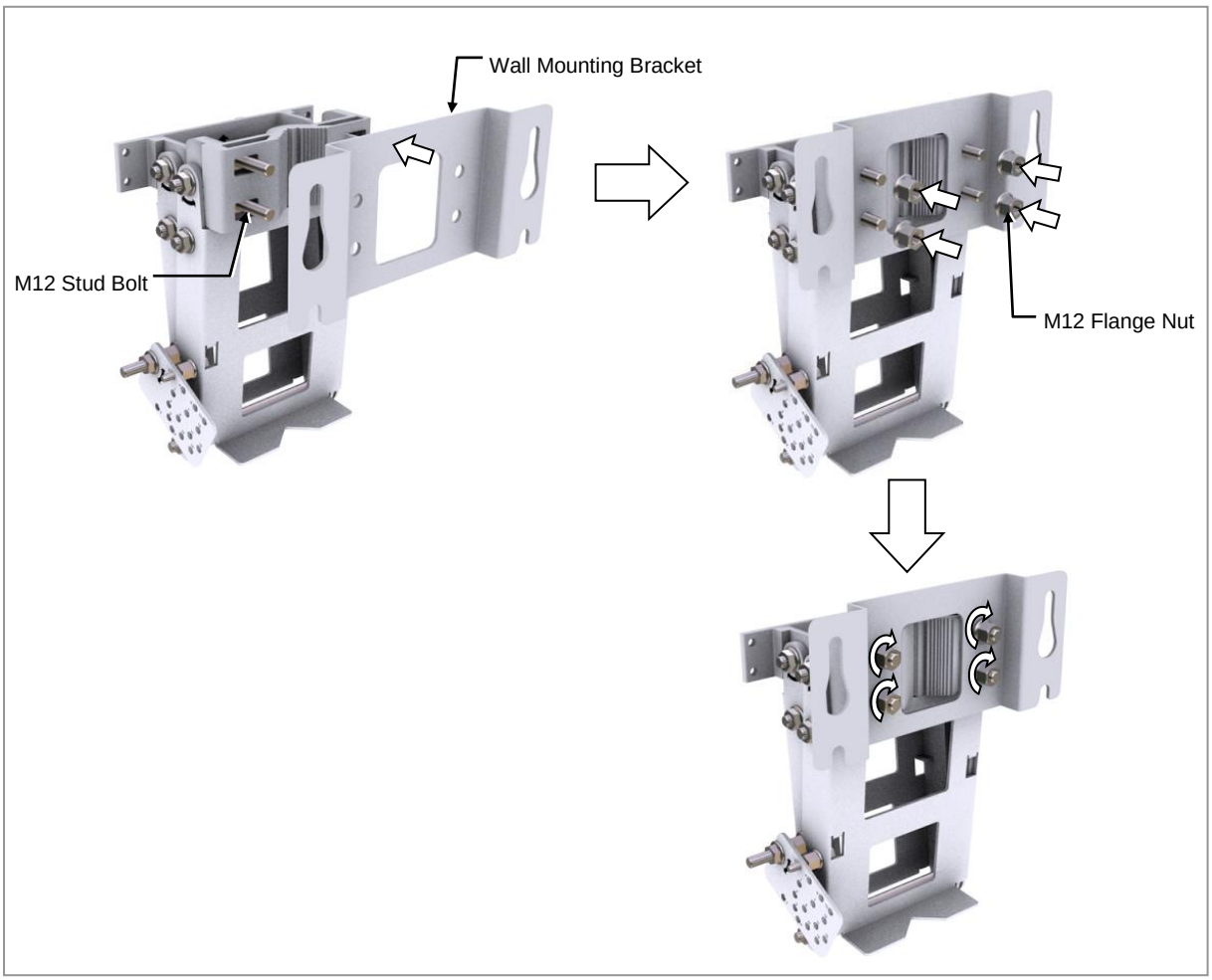


When assembling the wall mounting bracket, make sure the up mark is facing upward and open hole's direction is downward.



6 Insert the stud bolts into the rear bracket holes and tighten the fasteners temporarily.

Figure 55. Assembling Scissors Bracket Assembly_Wall Type (5)



Fixing Bracket Assembly to the MMU

To fix Scissors Bracket Assembly

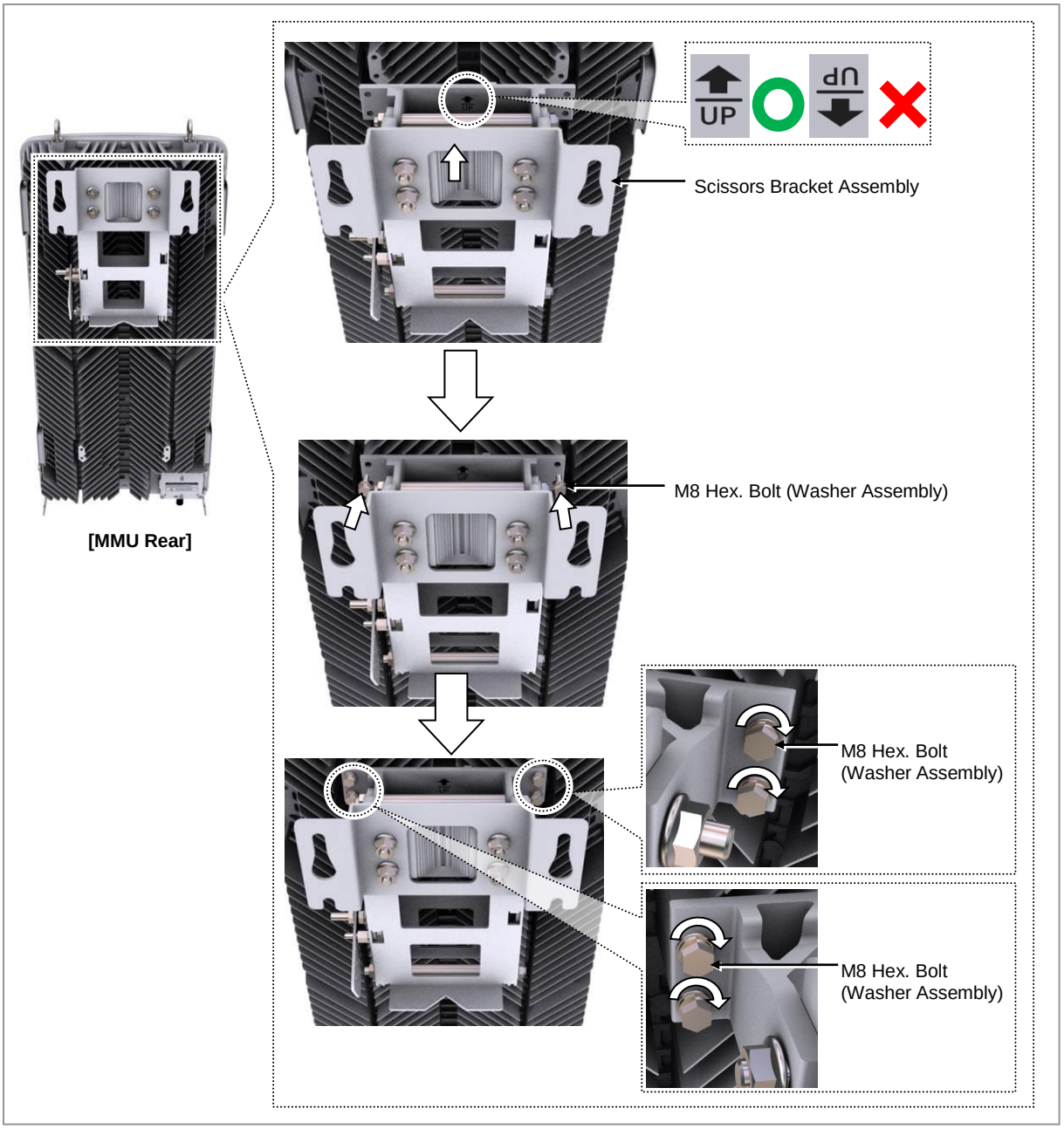
1 Make sure you have the following items:

Table 18. Parts and Tools for fixing Scissors Bracket Assembly to the MMU

Category	Description		
Parts	Scissors Bracket Assembly		1 EA
	Fasteners	M8 × L25 Hex. Bolt (washer assembly)	4 EA
Recommended Torque Value	M8 Hex. Bolt		110 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 13 mm) • Spanner (13 mm)		

2 Place the scissors bracket assembly, on the fixing location at the top of the back of the MMU and fix it with the fasteners.

Figure 56. Fixing Scissors Bracket Assembly_Wall Type



To fix Fixed Bracket Assembly

1 Make sure you have the following items:

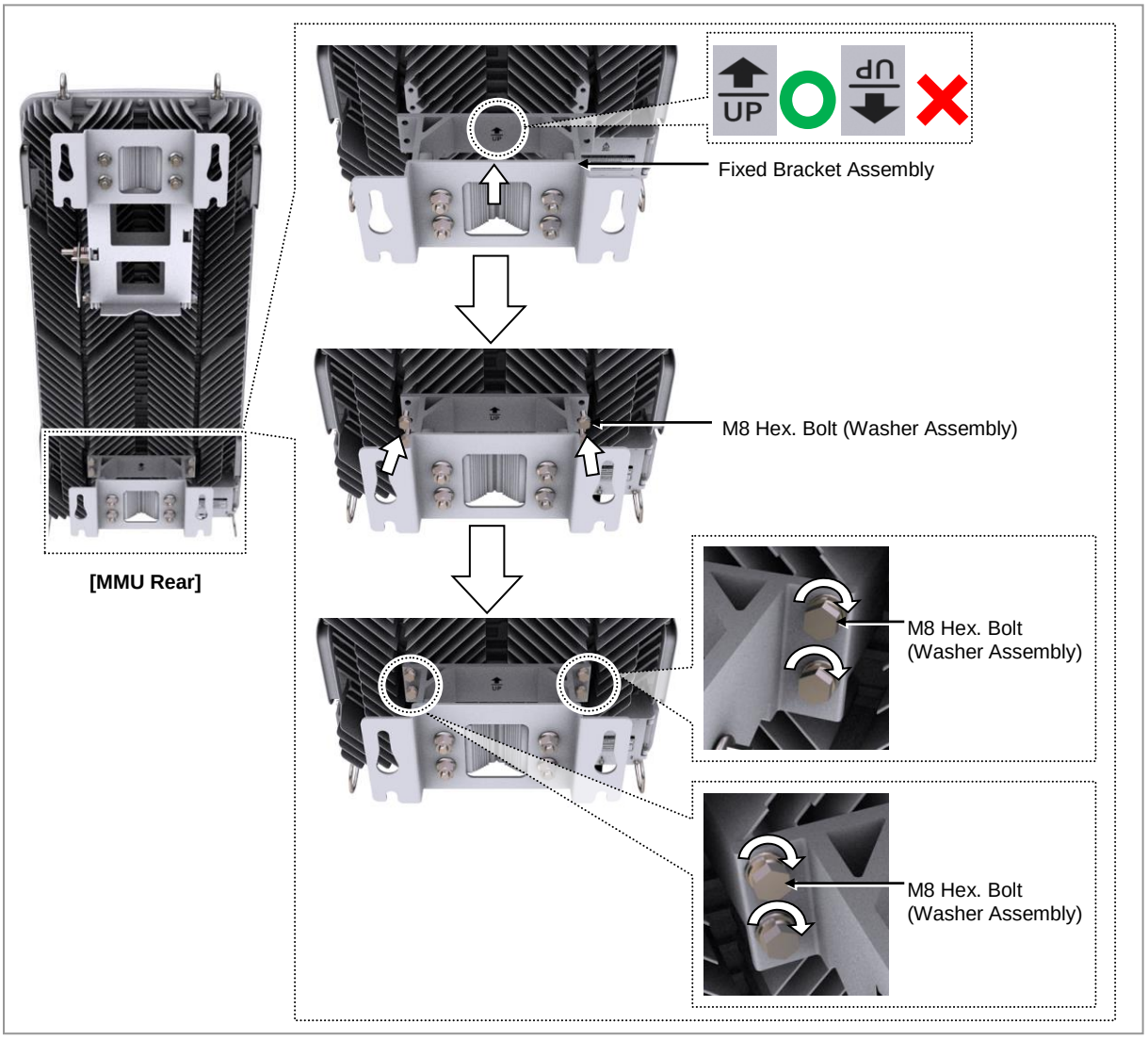
Table 19. Parts and Tools for fixing Fixed Bracket Assembly to the MMU

Category	Description		
Parts	Fixed Bracket Assembly		1 EA
	Fasteners	M8 × L25 Hex. Bolt (washer assembly)	4 EA
Recommended Torque Value	M8 Hex. Bolt		110 lbf·in

Category	Description
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 13 mm) • Spanner (13 mm)

2 Place the fixed bracket assembly, on the fixing location at the bottom of the back of the MMU and fix it with the fasteners.

Figure 57. Fixing Fixed Bracket Assembly_Wall Type



Fixing MMU on the Wall

To fix MMU on the Wall

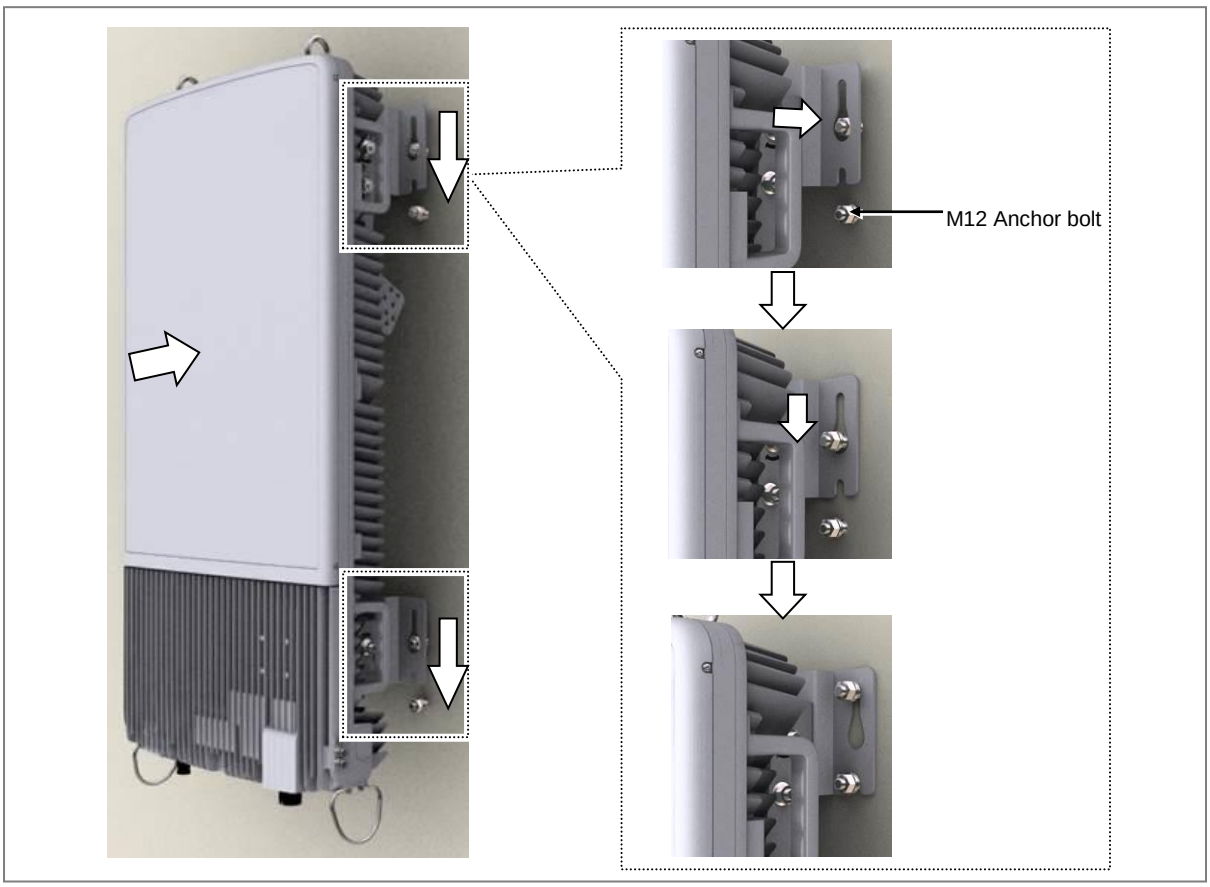
1 Make sure that you have the following items:

Table 20. Tools for fixing MMU on the Wall

Category	Description	
Recommended Torque Value	M12 Flange Nut	372 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (Hex. Head: 19 mm) • Level	

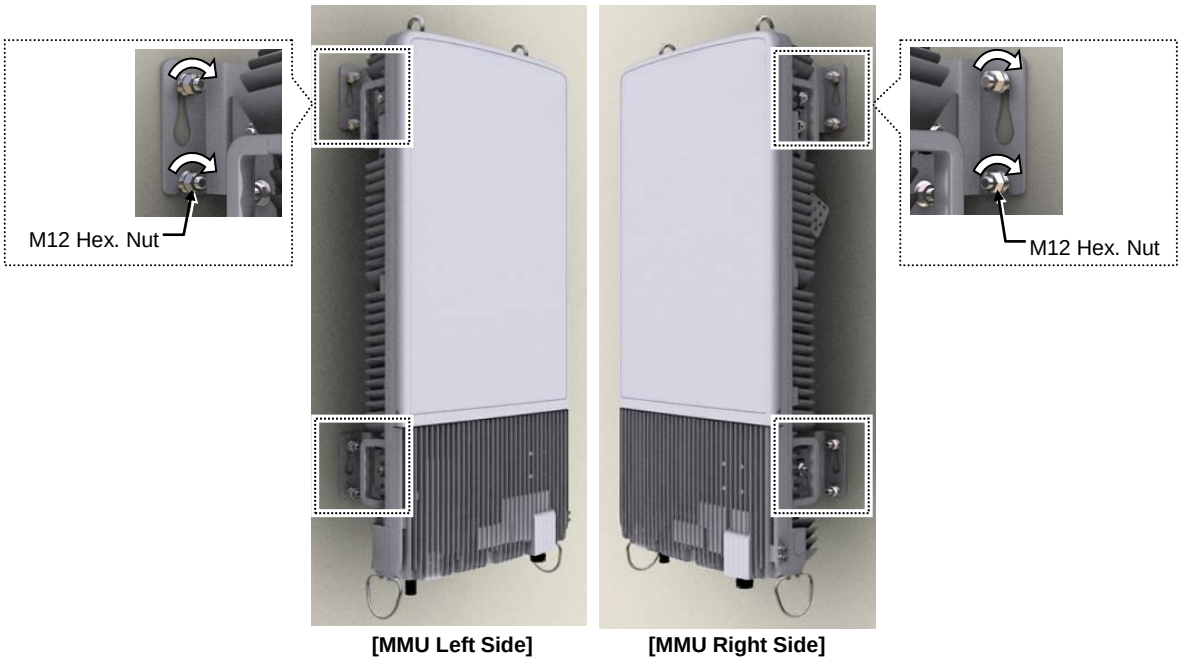
2 Hang the wall mounting bracket fixing hole of MMU rear on the anchor bolt fixed to the wall.

Figure 58. Fixing MMU on the Wall (1)



3 Fix MMU using fasteners at the right/left and top/bottom side of it.

Figure 59. Fixing MMU on the Wall (2)

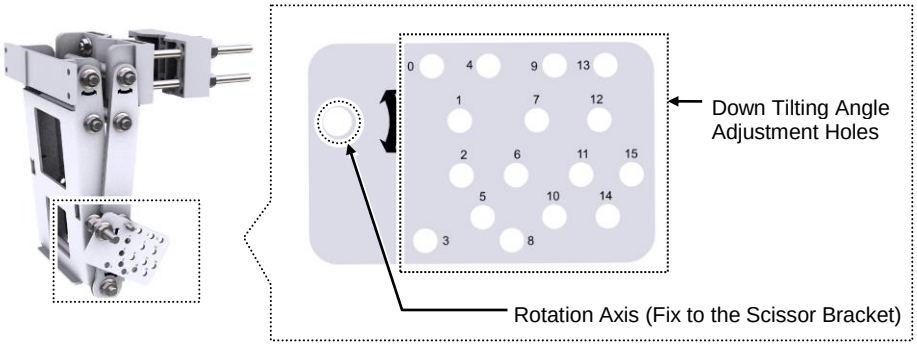


When using up tilting installation of wall type, switch the location of scissors bracket assembly and fixed bracket assembly. Refer to ‘Fixing MMU on the Pole_Up Tilting Installation’

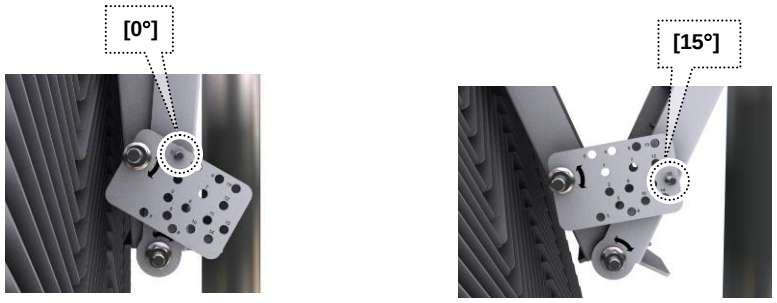
Tilting System

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]



[Tilt 0°] **[Down Tilt 15°]**

MMU Down Tilting Adjustment

1 Make sure you have the following items:

Table 21. MMU Down Tilting Adjustment Tools

Category	Description	
Recommended Torque Value	M12 Flange Nut	372 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (19 mm)	

2 Rotate counter-clockwise the fasteners on the installation brackets at the top and bottom of the MMU once or twice to loosen them. (Do not detach the fasteners completely and loosen the 0.8 in. of the M12 flange nut of the angle plate.)

- Location of the fasteners to loosen at the top of the MMU

i M12 flange nut to connect the unit bracket to the scissors bracket

ii M12 flange nut to connect the scissors bracket to the front bracket_top

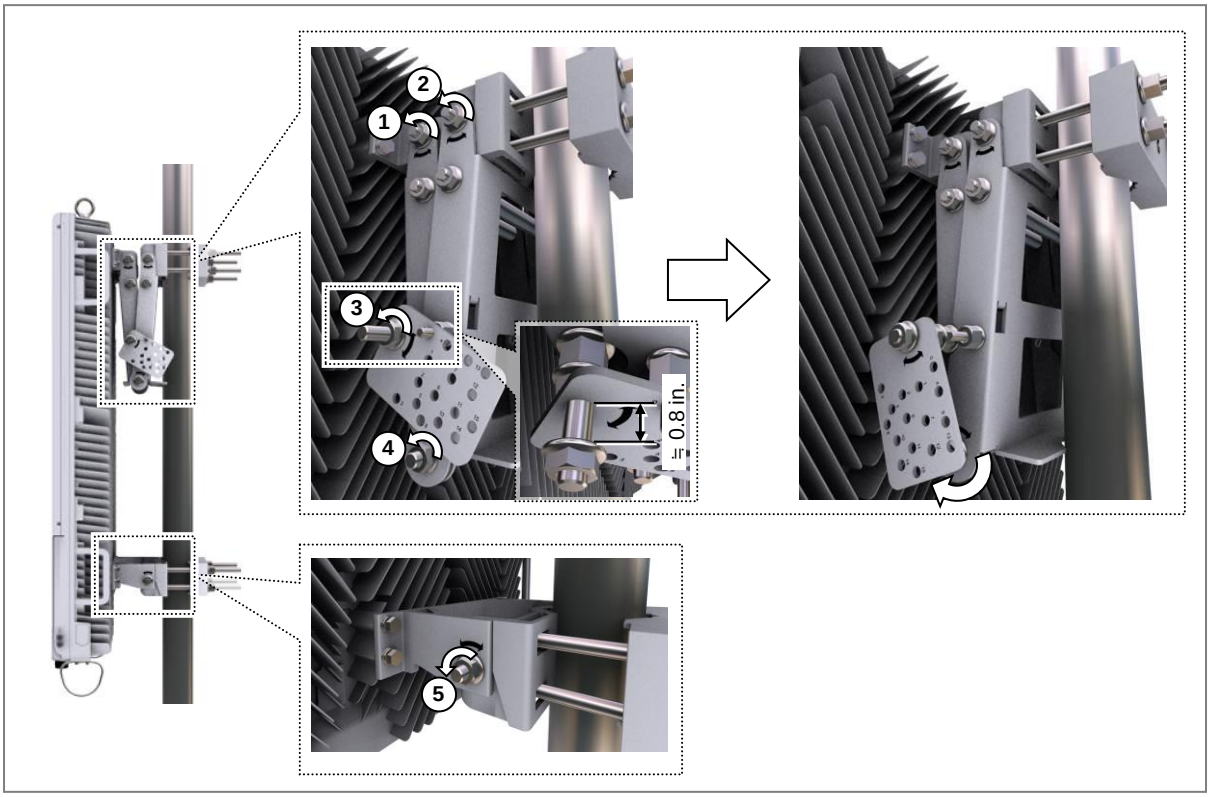
iii M12 flange nut to fix the angle plate (angle plate rotation axis)

iv M12 flange nut to connect the scissors brackets

- Location of the fasteners to loosen at the bottom of the MMU

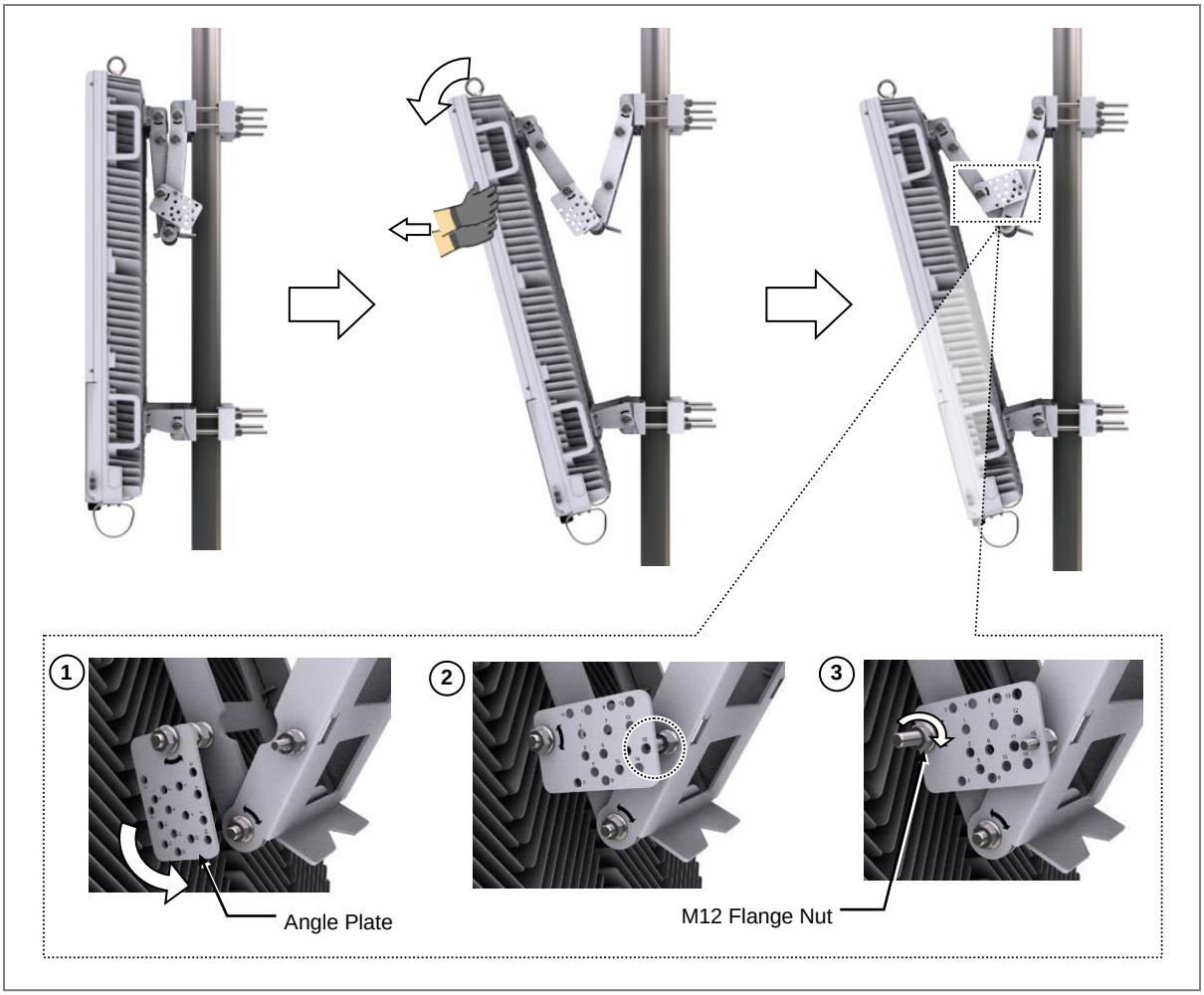
  i M12 flange nut to connect the fixed bracket to the front bracket

Figure 60. MMU Down Tilting (1)



3 Adjust the down tilt of the MMU with the down tilting holes on the angle plate and place the angle plate on the scissors bracket.

Figure 61. MMU Down Tilting (2)



4 Re-tighten the loosened fasteners.

Figure 62. MMU Down Tilting (3)

MMU Up Tilting Adjustment

1 Make sure you have the following items:

Table 22. MMU Up Tilting Adjustment Tools

Category	Description	
Recommended Torque Value	M12 Flange Nut	372 lbf·in
Working Tools	• Torque Wrench (100~400 lbf·in) • Torque Wrench Spanner head (apply Hex. Head: 19 mm) • Spanner (19 mm)	

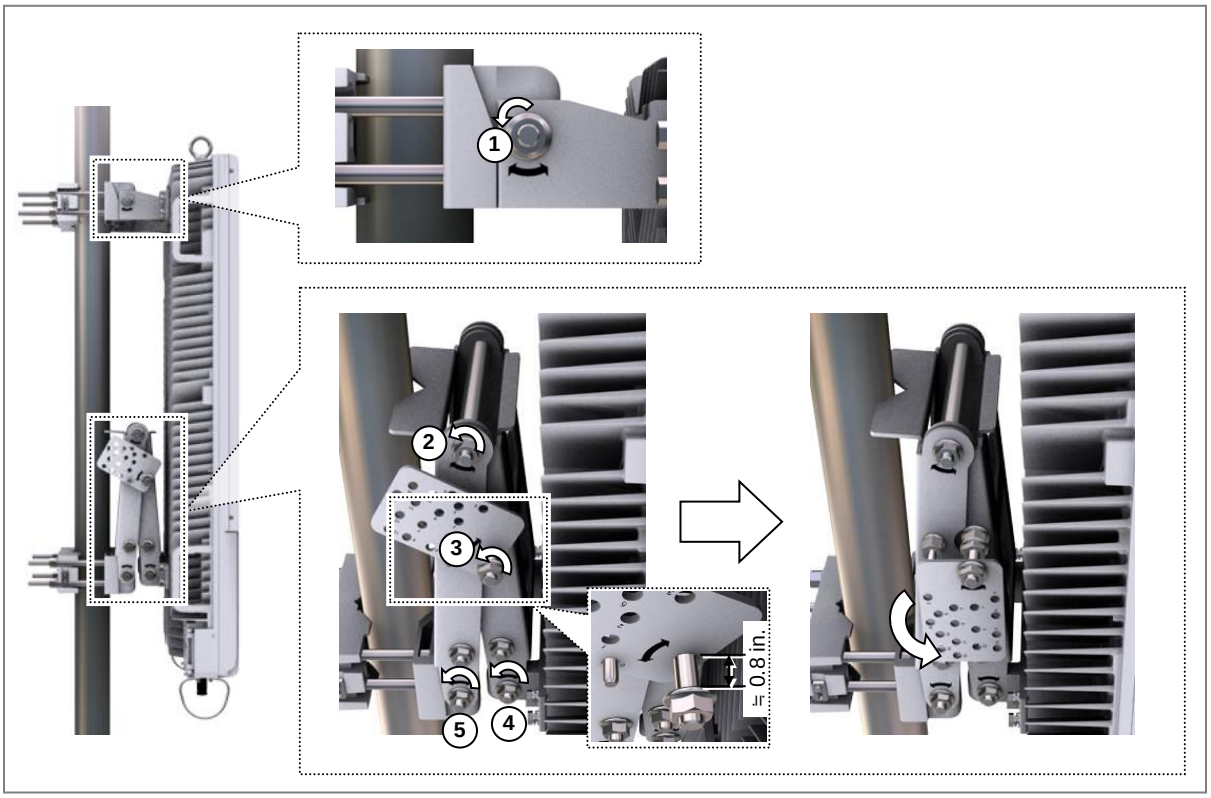
2 Rotate counter-clockwise the fasteners on the installation brackets at the top and bottom of the MMU once or twice to loosen them. (Do not detach the fasteners completely and loosen the 0.8 in. of the M12 flange nut of the angle plate.)

- Location of the fasteners to loosen at the top of the MMU

  i M12 flange nut to connect the fixed bracket to the front bracket_top

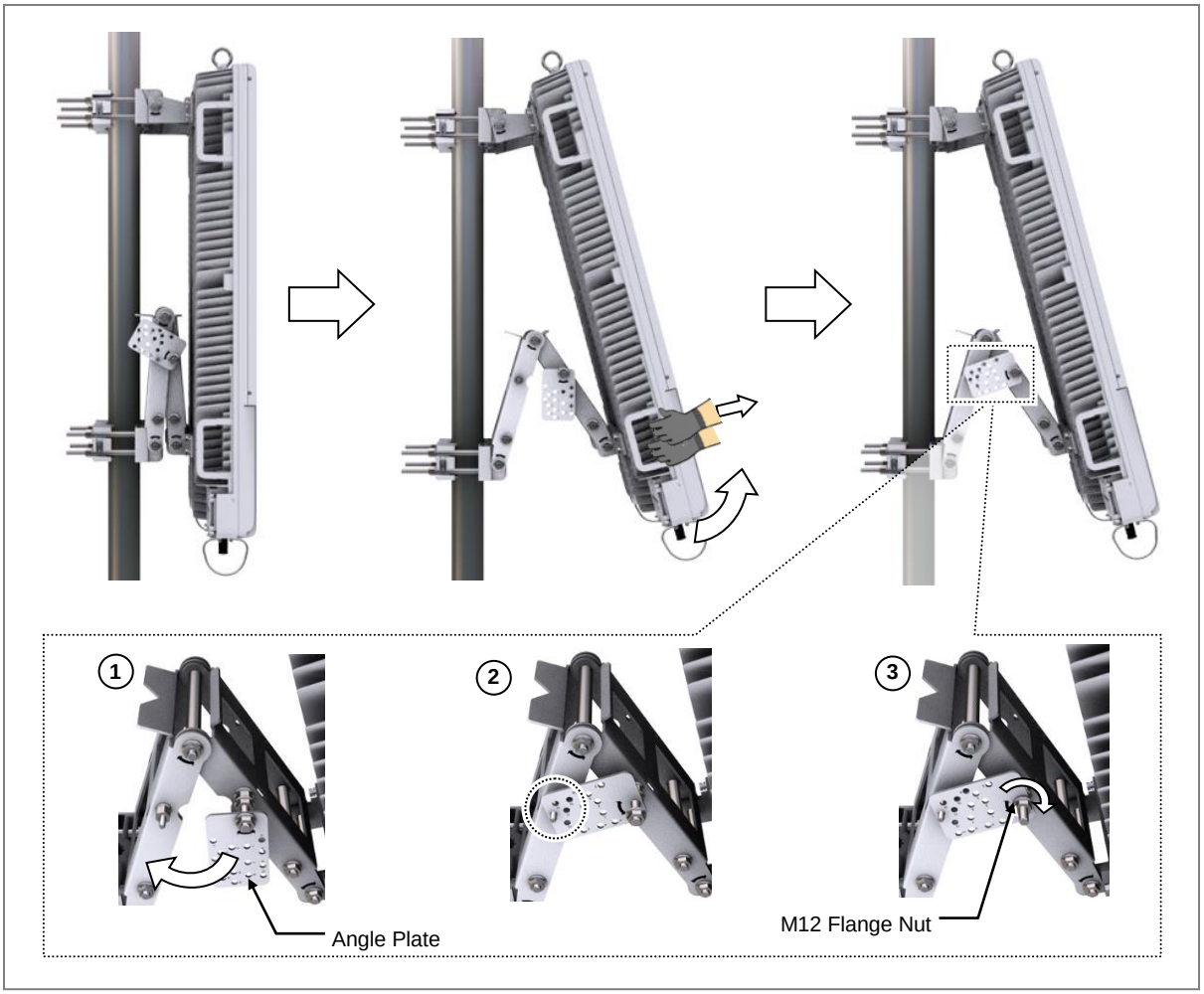
- Location of the fasteners to loosen at the bottom of the MMU
  - **i** M12 flange nut to connect the scissors brackets
  - **ii** M12 flange nut to fix the angle plate (angle plate rotation axis)
  - **iii** M12 flange nut to connect the unit bracket to the scissors bracket
  - **iv** M12 flange nut to connect the scissors bracket to the front bracket_bottom

Figure 63. MMU Up Tilting (1)



3 Adjust the up tilt of the MMU with the down tilting holes on the angle plate and place the angle plate on the scissors bracket.

Figure 64. MMU Up Tilting (2)



4 Re-tighten the loosened fasteners.

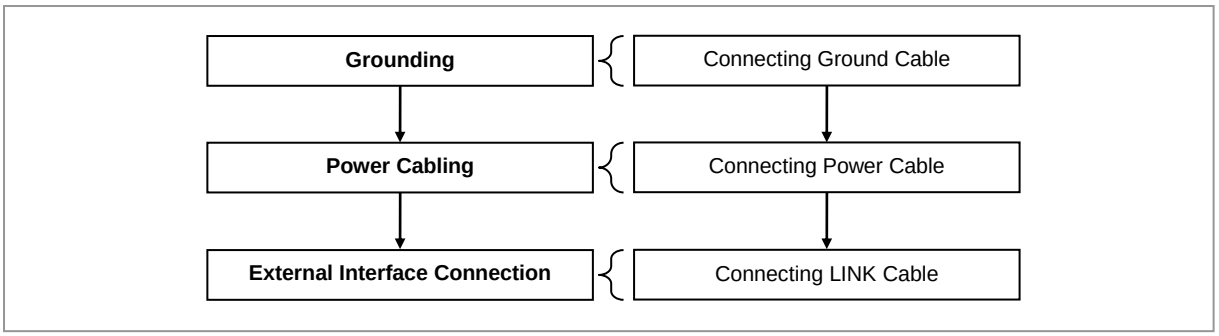
Figure 65. MMU Up Tilting (3)

Chapter 3 Connecting Cables

Cabling Procedure

The procedure to connect system cables is as follows:

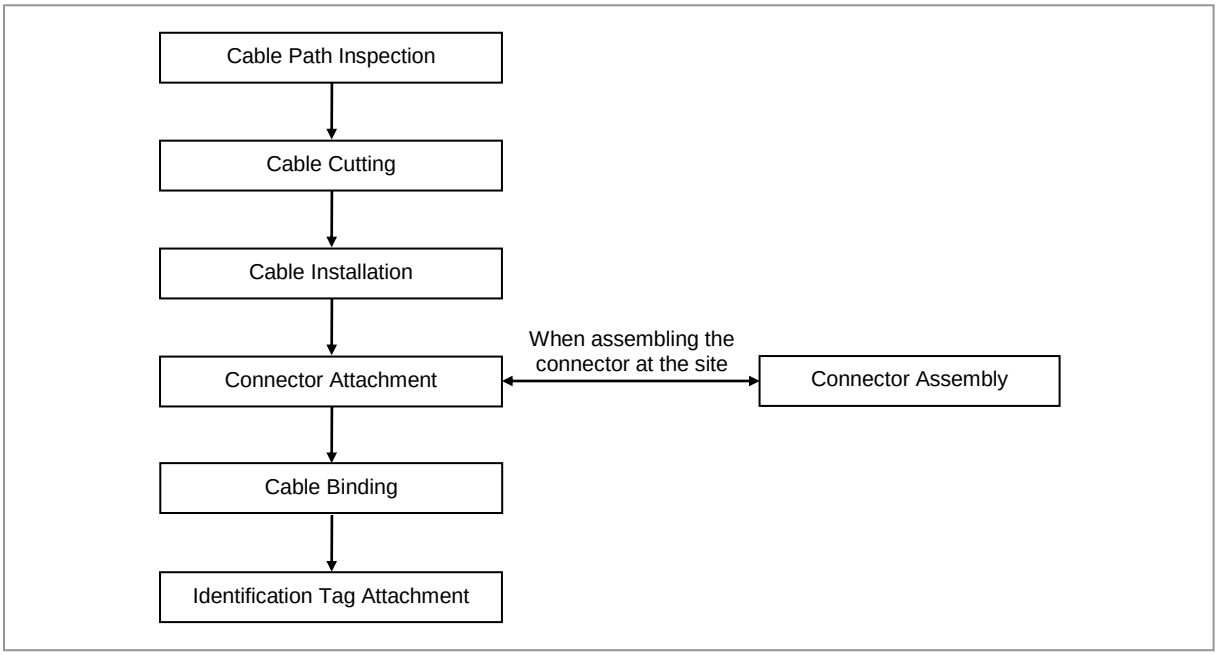
Figure 66. Procedure to Connect MMU Cables



Guidelines for Cable Connections

The procedure for cable connections is as follows:

Figure 67. Cable Connection Procedure



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

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

Cable Path Inspection

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

Follow these guidelines when inspecting the cabling path.

- A minimum cable length must be selected provided that it does not affect the cable installation and maintenance.
- The cable must be placed in a location where it will not be damaged by external factors (power line, flooding, footpaths, and so on).

- In areas where the cable may be damaged by external factors, ensure that measures are taken to prevent damage to the cable (cable tray, ducts, flexible pipe, and so on).

Cable Cutting

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

Follow these guidelines when cutting the cable.

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

Cable Installation

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

Follow these guidelines when installing a cable:

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

Table 23. Recommended Minimum Allowed Cable bend Radius

No	Type	Allowed Cable Bend Radius	
1	Ground/Power Cable	8 × OD	
2	Optical Cable (indoor)	Unloaded Condition (Installed) : 20 × OD	Unloaded Condition (Installed) : 20 × OD
3	Optical Cable (Outdoor)	Unloaded Condition (Installed)	Loaded Condition (During Installation)

No	Type	Allowed Cable Bend Radius	
		: 10 × OD	: 20 × OD

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

※ OD: Outer Diameter

Cable Binding

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

Follow these guidelines when binding a cable.

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

Connector Attachment

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

Follow these guidelines when attaching a connector.

- Make sure operator is fully aware of the connector assembly method before assembling a connector. Assemble the connector in accordance with its pin map.
- Each connector has a hook to prevent its core positions from being changed.
- Check the corresponding grooves before connecting a connector to another connector.
- Use a heat shrink tube at a connector connection for cables that are installed outdoor, such as feeder lines, to prevent water leakage and corrosion from occurring at the part exposed to the outside.
- Connect each cable of the connector assembly in a straight line.
- Be careful when connecting a cable so that contact failure does not occur at a connector connection due to tension.

Identification Tag Attachment

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

Follow these guidelines when attaching an identification tag.

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

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

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

After completing cable installation, unused port should be capped.

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

Cabling Diagram

The cabling diagram of the MMU is as follows:

Figure 68. Cable Diagram

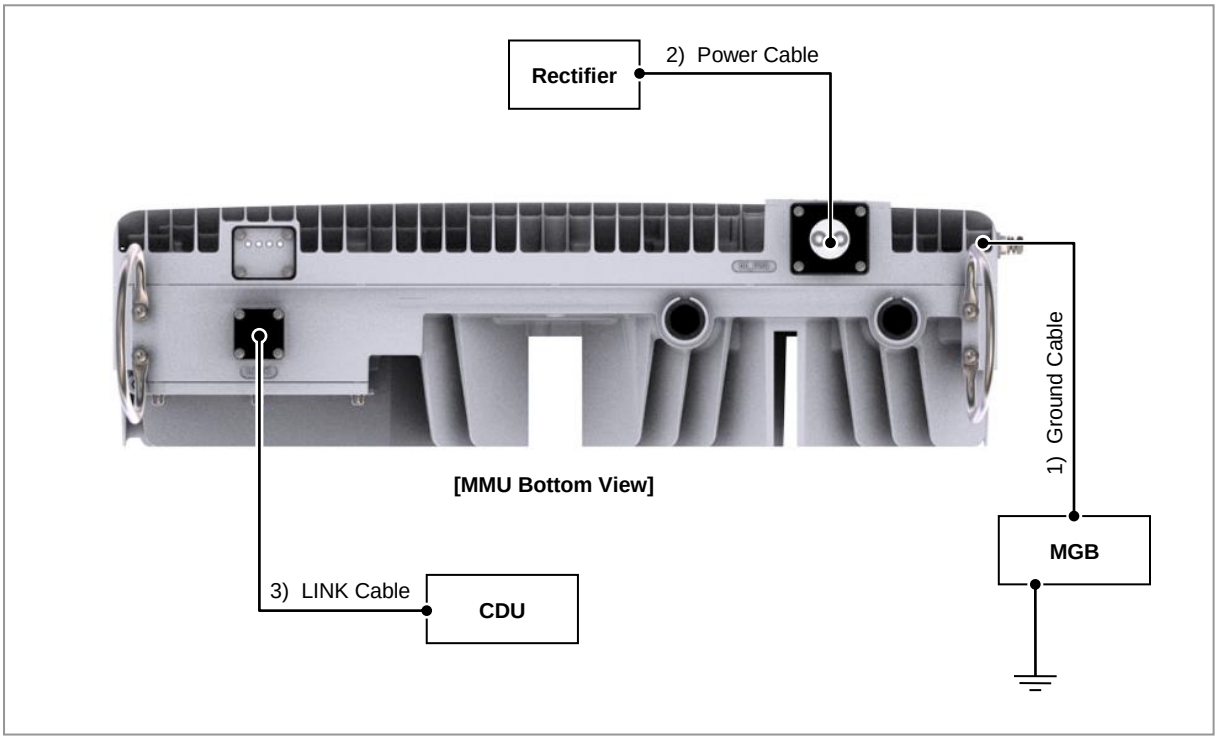


Table 24. MMU Connection Cable

From	To	Cable		
TGB or OGB	MMU	**1** Ground Cable : 6 AWG × 1C		
MMU	Rectifier	**2** Power Cable	Distance	Cable
			~20 m (75 ft)	: 8 AWG × 2C
			~35 m (115 ft)	: 6 AWG × 2C
	CDU	**3** LINK Cable : Optical Cable (Single mode, Outdoor Type, MPO to LC/UPC)		

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

Grounding

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

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

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

The purposes of the ground construction are as follows:

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

Connecting Ground Cable

To connect the ground cable

1 Make sure that operator has the following items:

Table 25. Parts and Tools for MMU Grounding

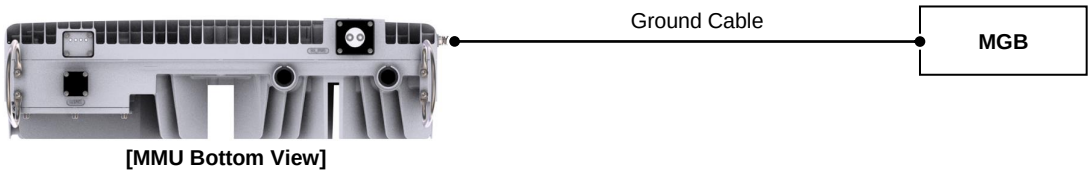
Category	Description	
Installation Section	MMU Grounding Terminal~MGB	
Cable	6 AWG × 1C	
Minimum Cable bend Radius	8 × OD	
Heat Shrink Tube (Spec/Color/Length)	Φ 0.47 in. (12 mm)/Green/1.96 in. (50 mm)	
Pressure Terminal	MGB	Check MGB specifications per site and prepare pressure terminals.
	MMU	6 AWG, 2 Hole, Hole diameter: 1/4 in. (6.4 mm), Hole spacing: 0.63 in. (16 mm)
Fastener	MGB	Check MGB specifications per site and prepare connecting parts.
	MMU	M6 × L12 SEMS (Hex. +)/2 EA

Category	Description	
Recommended Torque Value	M6 SEMS	43 lbf·in
Working Tools	• Cable Cutter • Cable Stripper • Crimping tool • Heating Gun • Nipper • Screw Driver (‘+’, Number 3) • Torque Driver (20-90 lbf·in.) • Screw Driver Bit (‘+’, Number 3)	

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

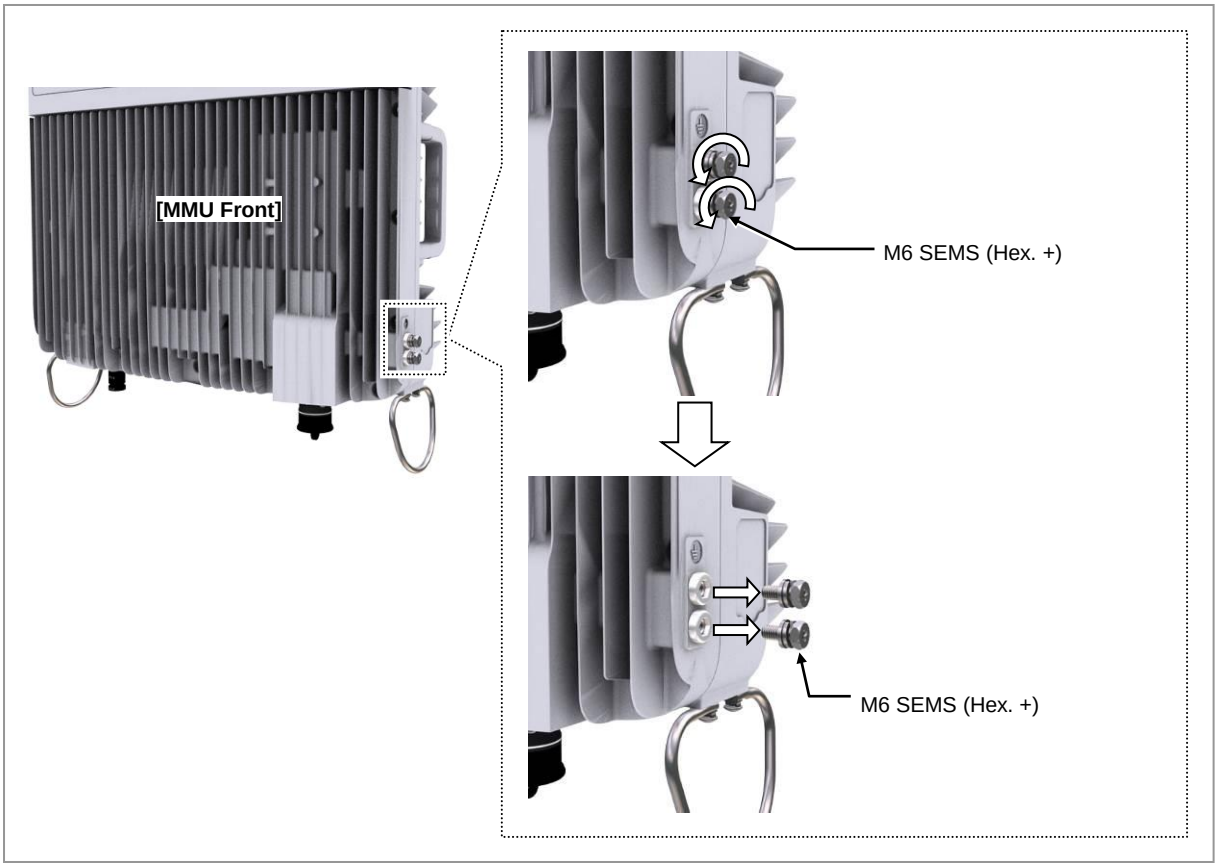
2 Install the ground cable from the MGB to the MMU ground terminal as shown in figure below.

Figure 69. Connecting Ground Cable (1)



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

Figure 70. Connecting Ground Cable (2)

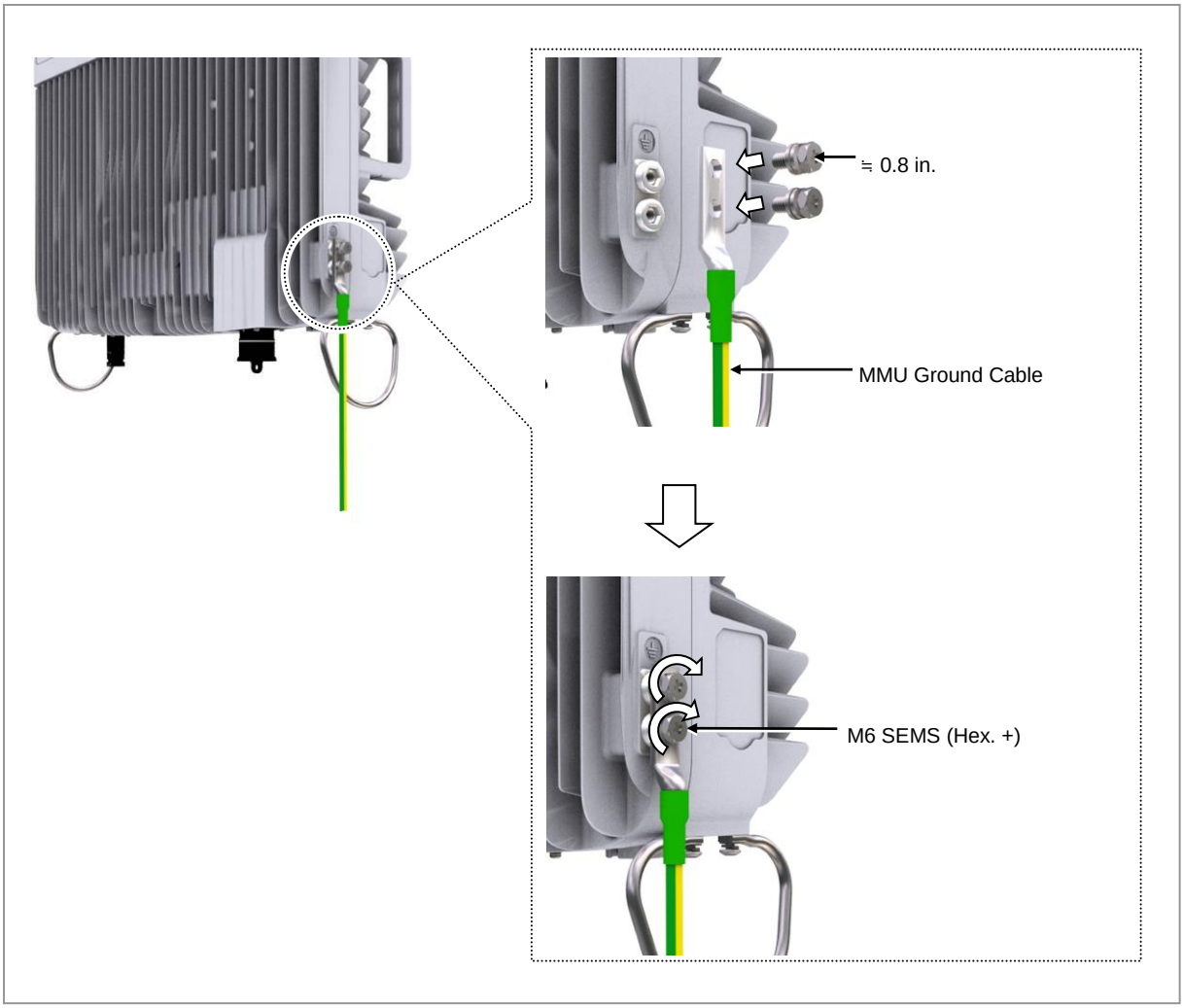


4 Assemble a pressure terminal and a heat shrink tube at the end of the MMU ground cable.

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

6 Firmly fix the pressure terminal onto the MMU ground terminal using M6 SEMS.

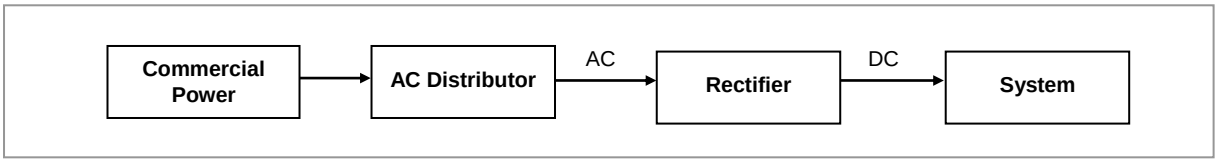
Figure 71. Connecting Ground Cable (3)



Power Cabling

The power supply device consists of the following elements:

Figure 72. Power Equipment Elements



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

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

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

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

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

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
8 AWG	20 m (75 ft)
6 AWG	35 m (115 ft)

Install a circuit breaker to a rectifier (or power distributor) for the stable power. The capacity of circuit breaker is 50 A. (Use UL Listed circuit breakers.)

Connecting Power Cable

To connect Power cable

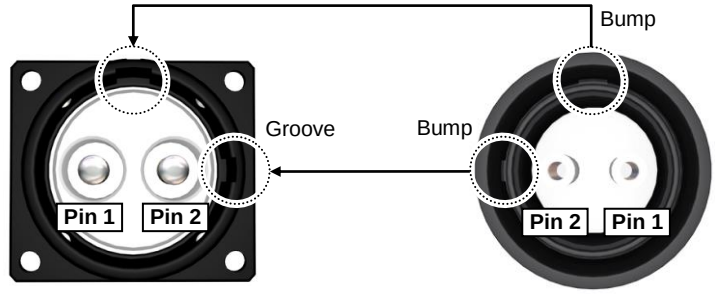
1 Make sure you have the following items:

Table 26. Parts and Tools for connecting Power Cable

Category	Description		
Installation Section	Rectifier~MMU Power Input Port		
Cable	Distance	Cable	The color of the core wire can be changed according to the specification of the cable used.
	~20 m (75 ft)	8 AWG × 2C	
	~35 m (115 ft)	6 AWG × 2C	
Minimum Cable bend Radius	• Dynamic bend radius: 8 × OD • Static bend radius: 12 × OD		
Connector	Rectifier	Check specifications of rectifier output terminal per site and prepare fasteners.	
	MMU	JONHON, Push Pull Type, CT48J-2102TSCBM-08A	
Working Tools	• Cable Cutter • Wire Stripper • Compressor • Heating Gun • Nipper		

Table 27. Power Cable/Connector Pin Map

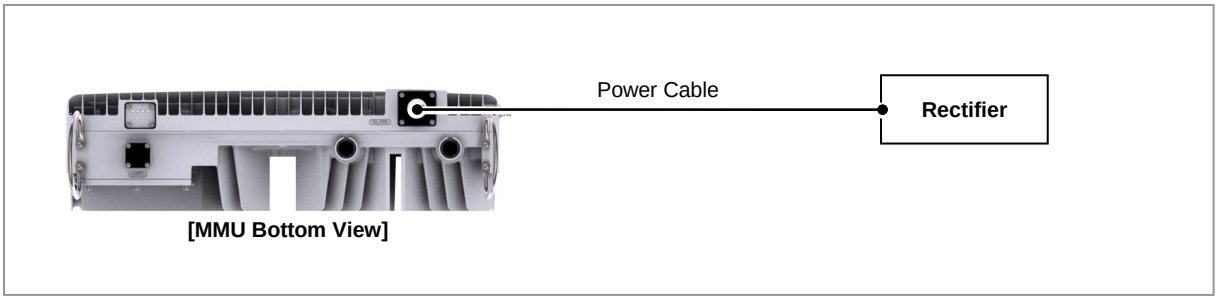
Power Connector Pin No.	Description	Color
Pin 1	-48 V DC	The color of the core wire can be changed according to the specification of the cable used.
Pin 2	RTN	



[Cable side Connector]

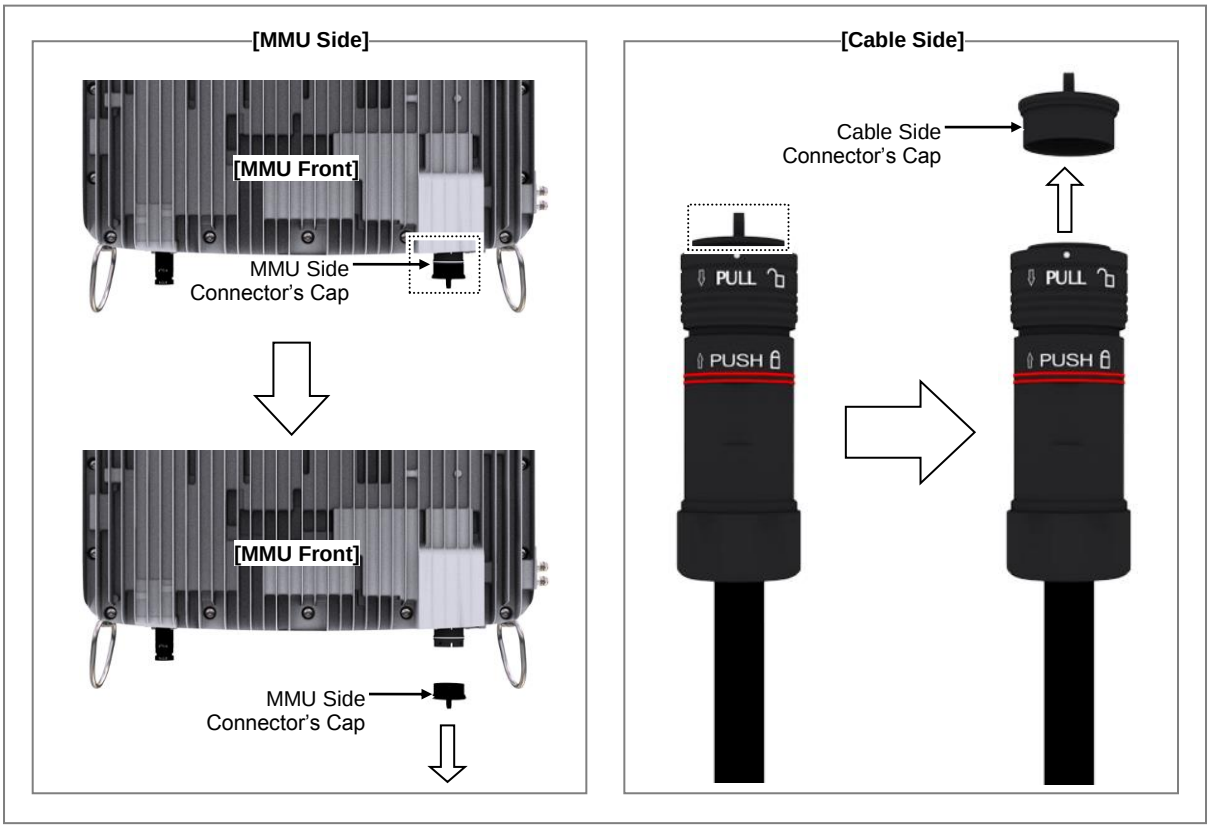
2 Install a DC power cable from the rectifier to the MMU.

Figure 73. Connecting Power Cable (1)



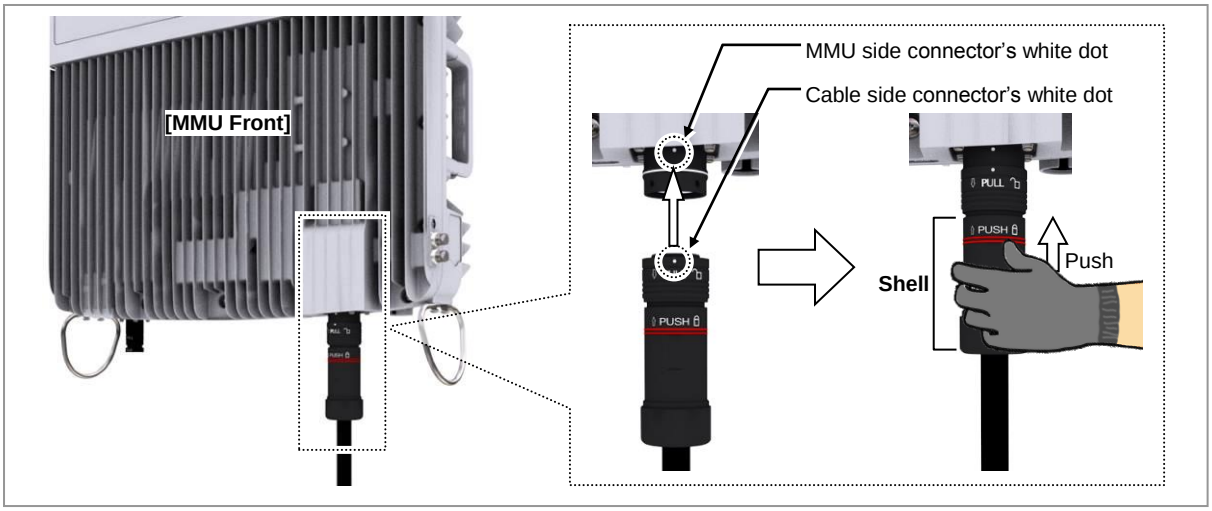
3 Separate the cap from the MMU/cable side connector.

Figure 74. Connecting Power Cable (2)



4 Insert the connector aligning the cable side connector's white dot and system side connector's white dot. When inserting the connector, push the shell to upper side.

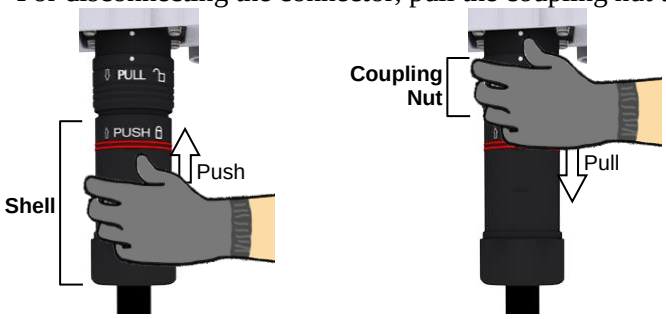
Figure 75. Connecting Power Cable (3)



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

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

The method for connecting/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.



[Connecting Connector] **[Disconnecting Connector]**

External Interface Connection

This section describes the procedures to connect the interface cables.

Connecting LINK Cable

To connect LINK cable

1 Make sure operator has the following items:

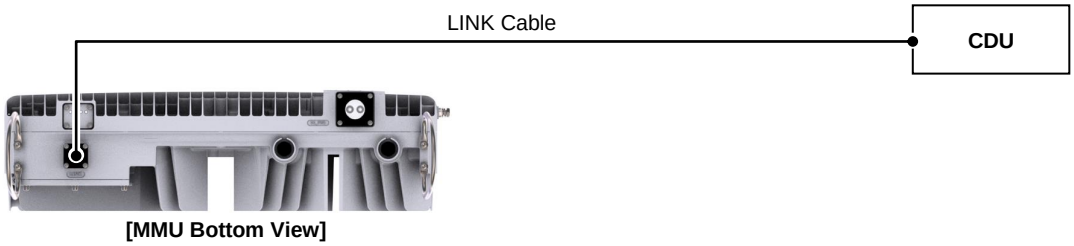
Table 28. Parts and Tools for LINK Cable Connection

Category	Description	
Installation Section	CDU~MMU	
Cable	Optical Cable (Single Mode, for Outdoor Type)	
Minimum Cable bend Radius	10 × OD	
Connector	MMU_LINK	MPO [JONHON, PAMPT1AM02 Plug]
	CDU	LC/UPC
		

The light from the laser beam runs through the optical cable. Handle the optical cables with care as the exposure to the laser beam can seriously injure worker's eye.

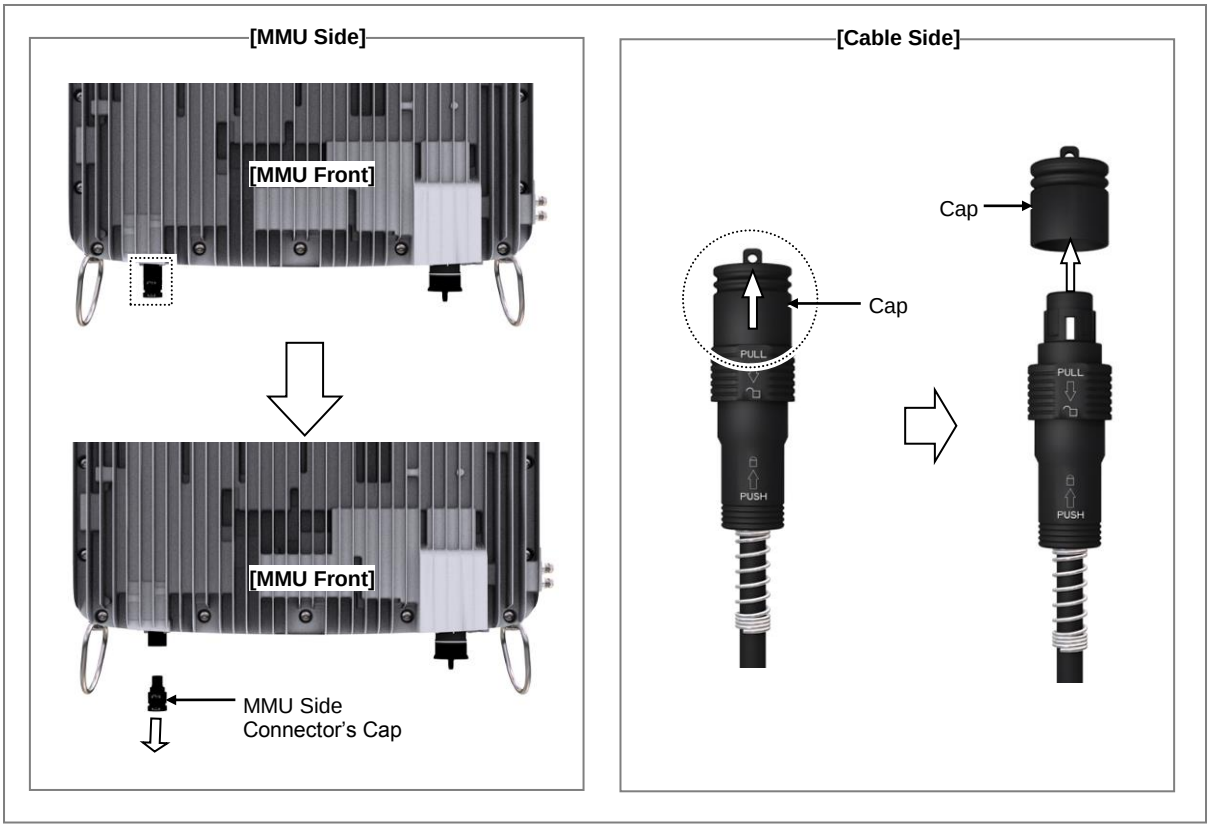
2 Install the LINK cable from the CDU to the MMU LINK port.

Figure 76. Connecting LINK Cable (1)



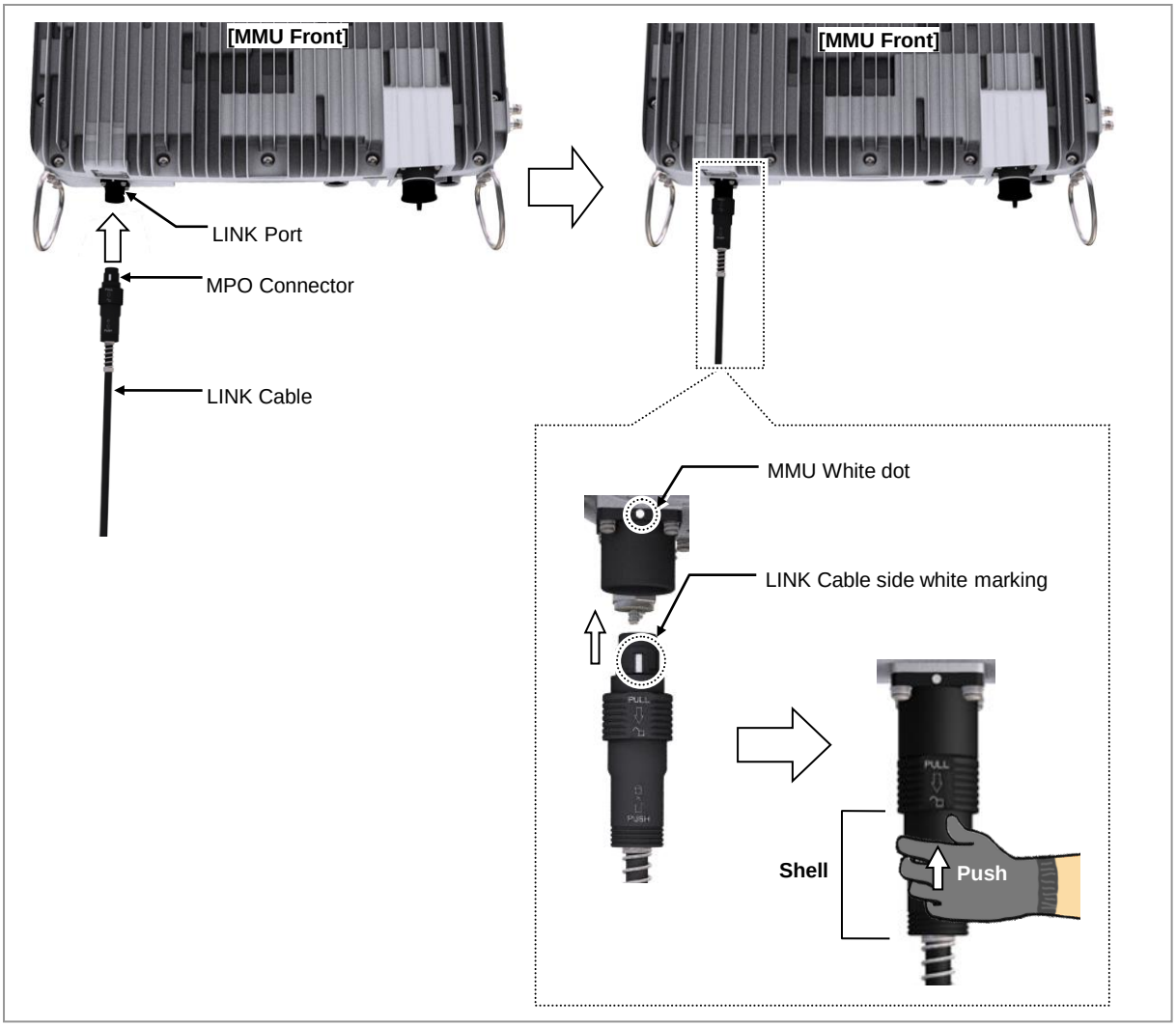
3 Separate the cap from the MMU/cable side connector.

Figure 77. Connecting LINK Cable (2)

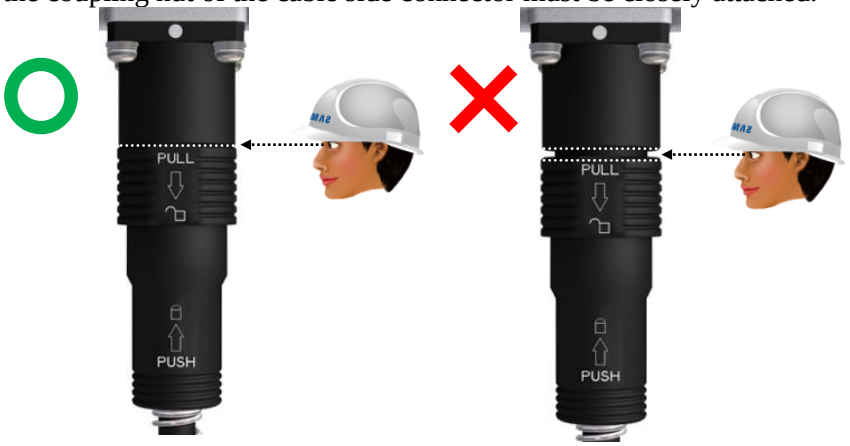


4 Insert the connector aligning the cable side connector's white marking and system side connector's white dot. When inserting the connector, push the shell to upper side.

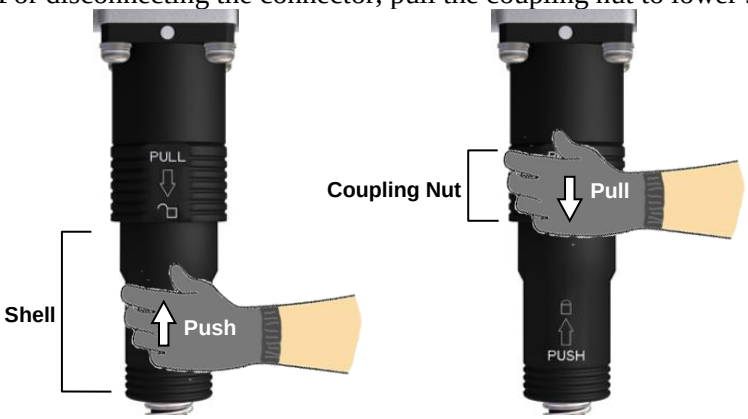
Figure 78. Connecting LINK Cable (3)



When the MPO connector connection is completed, the system side receptacle and the coupling nut of the cable side connector must be closely attached.



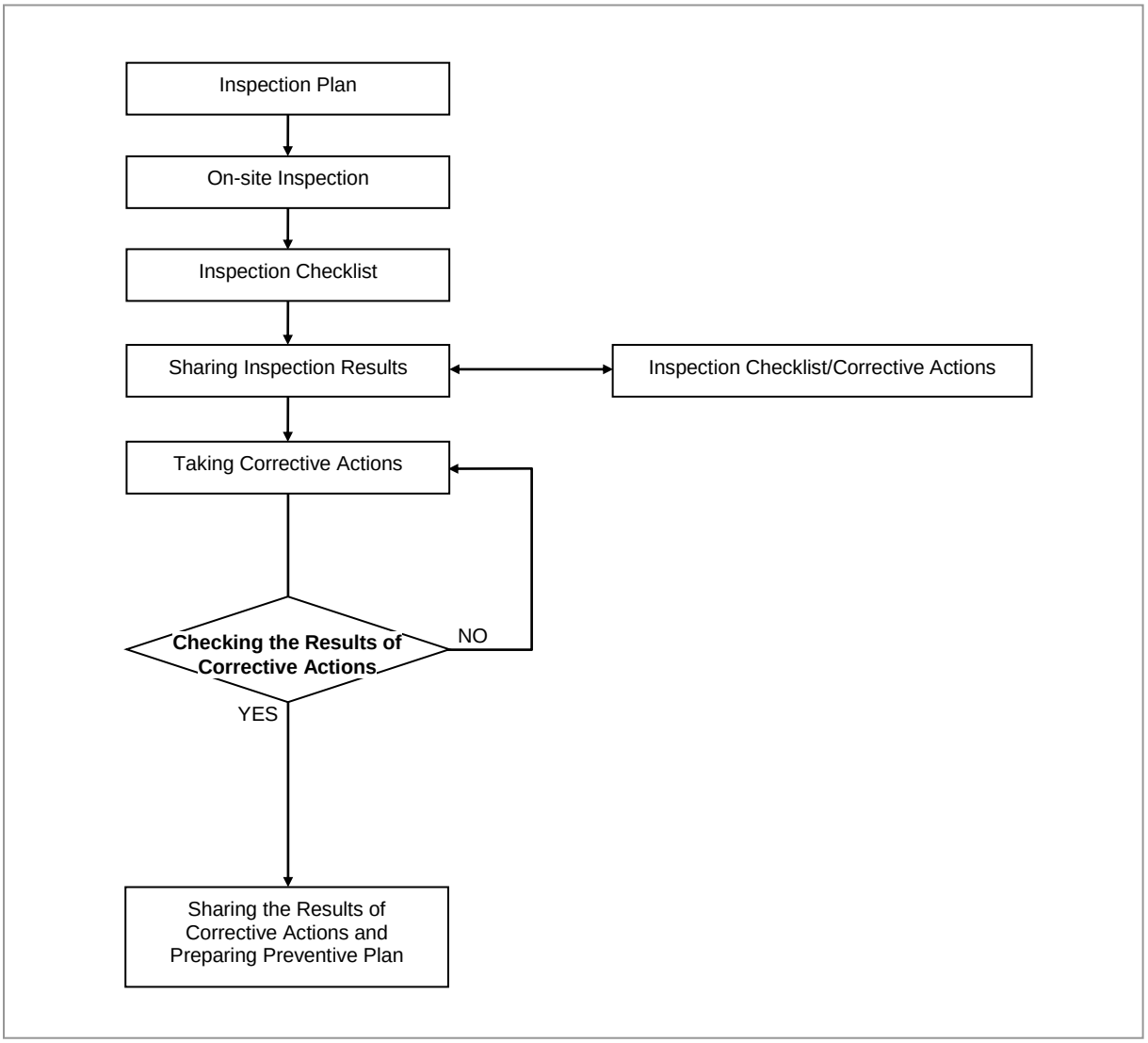
The method for connecting/disconnecting the MPO connector is as follows:
- For connecting the connector, push the shell to upper side.
- For disconnecting the connector, pull the coupling nut to lower side.



Chapter 4 Inspect the Installation

The procedure to check the installation status is as follows:

Figure 79. Installation Inspection Procedure



Inspection Plan

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

On-site Inspection and Inspection Checklist

The on-site inspection is to perform inspection visually or using instruments for

each specification, standard, and installation status, and so on based on the inspection checklist actually at a site where the system is installed.

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

Sharing Inspection Results and Taking Corrective Actions

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

Checking the Results of Corrective Actions

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

Sharing the Results of Corrective Actions and Preparing Preventive Plan

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

Construction Situation Checklist

Table 29. Construction Situation Check list

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

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

Category	Check Items	Criteria	Result	
			Pass	Fail
		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		
Others	Reserved ports	Checking port cap fastening status		
	Cable inlet status/Connection of equipment I/O port	Checking fastening status (Conduit/Cable Gland)		
	Cable tray and duct	Checking installation status		
	Status of inside/outside of the equipment and system surrounding area	Checking the stocking condition (waste parts, waste materials, packing materials, and so on)		
Opinion				

■

Appendix A Acronyms

AC	Alternating Current
DC	Direct Current
DL	Downlink
CDU	Cabinet Digital Unit
eNB	Evolved UTRAN Node-B
EMC	Electro-Magnetic Compatibility
LTE	Long Term Evolution
MGB	Main Ground Bar
MIMO	Multiple-Input Multiple-Output
MMU	Massive MIMO Unit
RF	Radio Frequency
RTN	Return
SEMS	pre-asSEMbled washers and screws
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 operator fastens the bolt, refer to the standard torque value below to prevent the equipment and bolt from damage and secure by fastening. When the torque value for each connection part is defined already, refer to the defined value.

Table 30. Standard Torque Value for Fastening Bolts

Bolt Spec.	Torque Value (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 31. 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 32. 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

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

SAMSUNG

MTP02P Series
Installation Manual

Document Version 1.0