



Samsung 5G Station Outdoor Installation Manual

Describes product installation and requirement procedure.

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This equipment is suitable for installation at locations where NEC and OSP apply.

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>

NOTE :

This equipment should be installed and operated with minimum distance 68cm between the radiator & your body.

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Preface

This manual describes how to install a 5G Customer Premises Equipment (CPE) Outdoor and how to connect its cables. This manual includes the following 5G CPE Outdoor:

- CPE Outdoor

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.txt** 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-STTS** command in the input field.

New and Changed Information

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

Change Type	Change Description
Changed	Changed 'Interface Cable Connection' in Chapter 3.

Revision History

The following table lists all versions of this document.

Document Version	Publication Date	Remarks
1.0	June 2020	First version

Organization of This Document

Section	Title	Description
Chapter 1	Before Installation	This chapter introduces CPE Outdoor and describes items should be understood before installation.
Chapter 2	Installing System	This chapter describes the procedures to install the CPE Outdoor.
Chapter 3	Connecting Cables	This chapter describes the procedures to connect the cables to the CPE Outdoor installed.
Chapter 4	Inspect the Installation	This chapter describes the procedures of inspecting installation status after CPE Outdoor installation and cabling is completed.
Appendix A	Acronyms	This annex describes the acronyms used in this manual.
Appendix B	Standard Torque	This annex describes the standard torque when fastening the bolt.

Personal and Product Safety

This product safety information includes American 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 Warning (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 120 V AC supply.

The product contains hazardous energy levels as defined by UL 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.

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.

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 120 V AC 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.

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.

Power Supply Connection

The equipment is designed to be powered from a 120 V AC supply. Power connections and installation of associated wiring must be carried out by a suitably qualified technician.

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.

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.

Chapter 1 Before Installation

This chapter introduces CPE Outdoor and describes the items that you should know before installation.

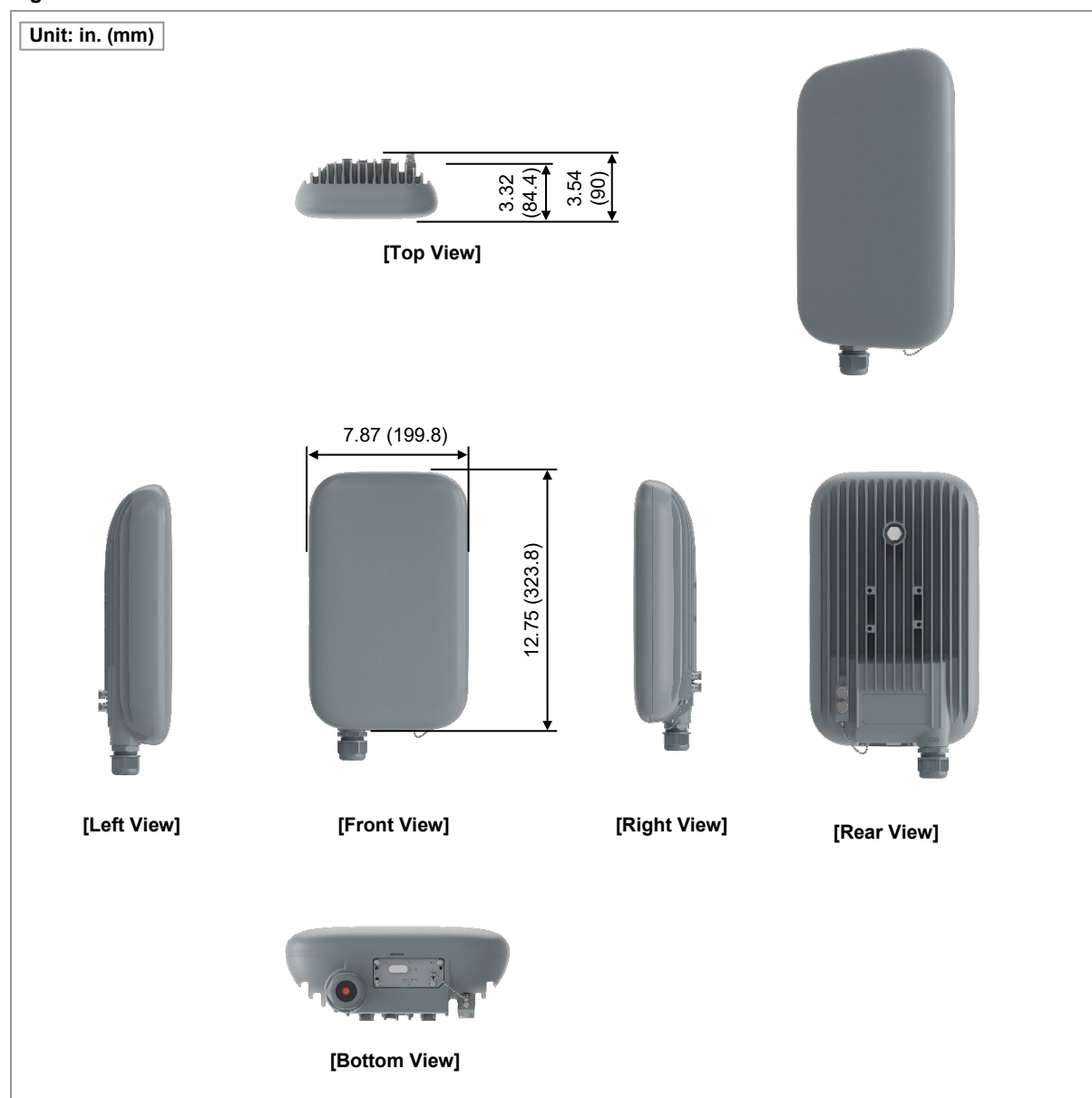
System View and External Interface

This section provides the pictorial view of the CPE Outdoor and its interfaces.

CPE Outdoor View

Figure below depicts the physical structure of the CPE Outdoor.

Figure 1. CPE Outdoor View

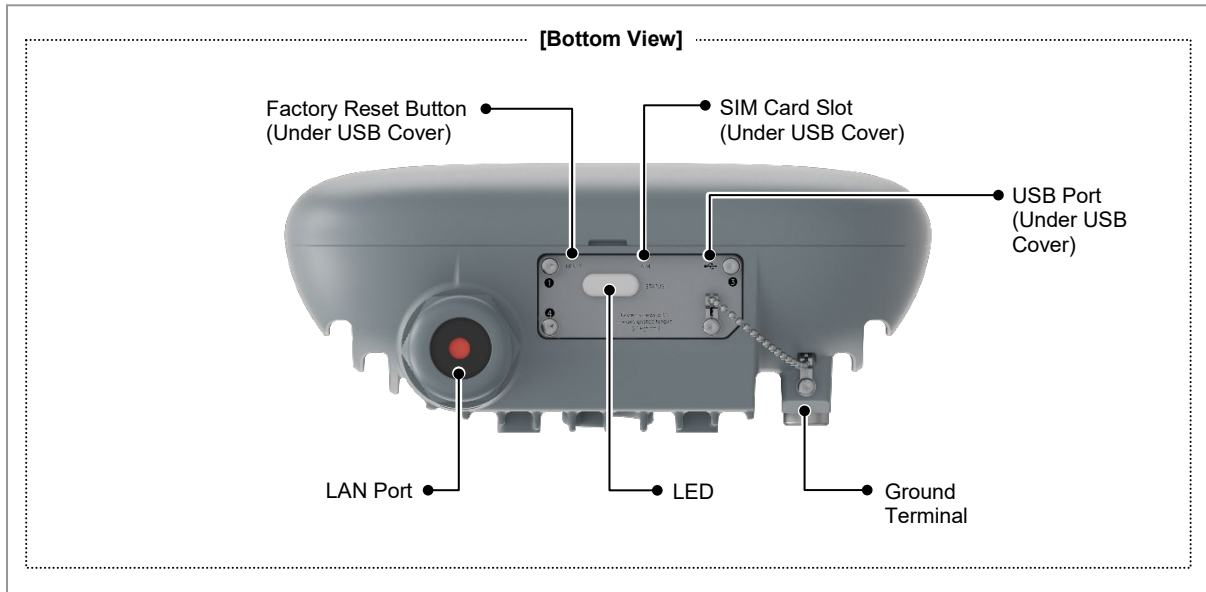


An Ethernet cable is not supplied in the package.

CPE Outdoor External Interface

Figure below depicts the external interface structure of the CPE Outdoor.

Figure 2. CPE Outdoor External Interface



Cautions for Installation

Observe the safety instructions described in this section when installing the system. Installation must be done 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.
- Use guardrails or fences to block open areas such as ditches, open roof areas, and scaffolds.



Install the system in the restricted access area.



Use the power supplies that meets LPS.

While Installing

The system power must be cut off before installing.



Ensure 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 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.

After Installing

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



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

Table below lists the basic tools needed for installation. 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

Number	Name	Specification	Purpose of use
1		Apply a torque range : 2–10 lbf·in	For fastening M3 Screw (T10)
		Apply a torque range : 6–22 lbf·in	For fastening M4 (Hex., +)
		Apply a torque range : 20–90 lbf·in	For fastening M5 SEMS (+), M6 SEMS (+)
2		T10	For fastening M3 Screw (T10)
		+, No. 2	For fastening M4 SEMS (+), M4 SEMS (Hex., +), M5 SEMS (+)
		+, No. 3	For fastening M6 SEMS (+)
3		+, No. 2	For loosening M4 SEMS (+), M5 SEMS (+)
		+, No. 3	For loosening M6 SEMS (+)
4		T10	For fastening Torx Screw (M3-T10)
5		Apply a torque range : 10–60 lbf·in	For fastening Cable Gland Nut
6		Apply Hexagon Head: 33 mm (for 10–50 lbf·in)	For fastening Cable Gland Nut
7		33 mm	For loosening Cable Gland Nut
8		16 ft./150 ft.	Tape measure for length measurement
9		100 ft.	Basic tool

11	Level 	Normal	For horizontality and verticality
12	Hammer Drill 	Normal	Wall type drilling
13	Concrete Drill Bit 	1/4 in. (6 mm)	For making a hole for inserting Plastic anchor
14	Cable Cutter 	0.24–1.26 in. (6–32 mm)	Cable cutting
15	Crimping Tool 	14 AWG–4 AWG (1.5–16 mm ²)	Pressure terminal for crimping
16	Cable Stripper 	Apply cable thickness: 1.5–6.2 in. (4–16 mm)	Cable sheath for removal
17	Nipper 	Basic Tool	For cutting cable
18	LAN Tool 	Basic Tool	RJ45 crimper
19	Industrial Scissor 	Basic Tool	Cutting
20	Knife 	Basic Tool	Cutting
21	Multi tester 	Digital Pocket Tester	To measure voltage and current to detect cable disconnection
22	Compass 	Normal	Check azimuth during installation

23	Heating Gun 	50–300 °C	Shrinking Heat Shrink Tube
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The required installation tools may vary depending on the conditions at the site. In addition to the basic tools, a protractor, compass, GPS receiver, ladder, safety equipment, cleaning tools, and so on should also be prepared in consideration of the site conditions.

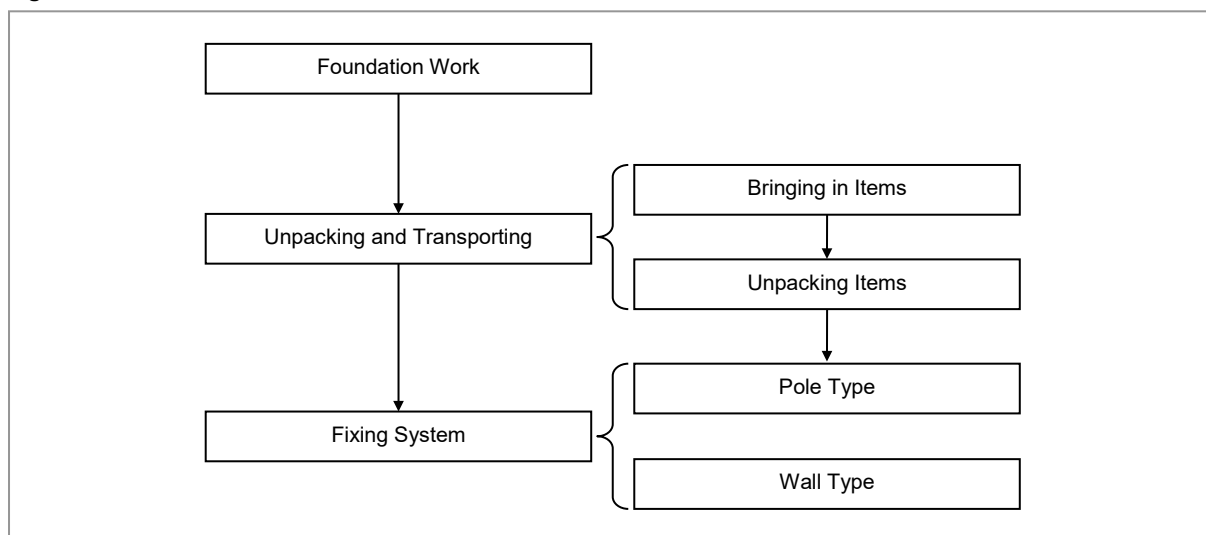
Chapter 2 Installing System

This chapter describes installation procedure of the CPE Outdoor.

Installation Procedure

Figure below depicts the procedure to install the CPE Outdoor.

Figure 3. Procedure to Install the CPE Outdoor



System Arrangement

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

Figure below depicts the minimum distance that must be secured for pole type installation of the CPE Outdoor.

Figure 4. CPE Outdoor Arrangement Pole type Installation

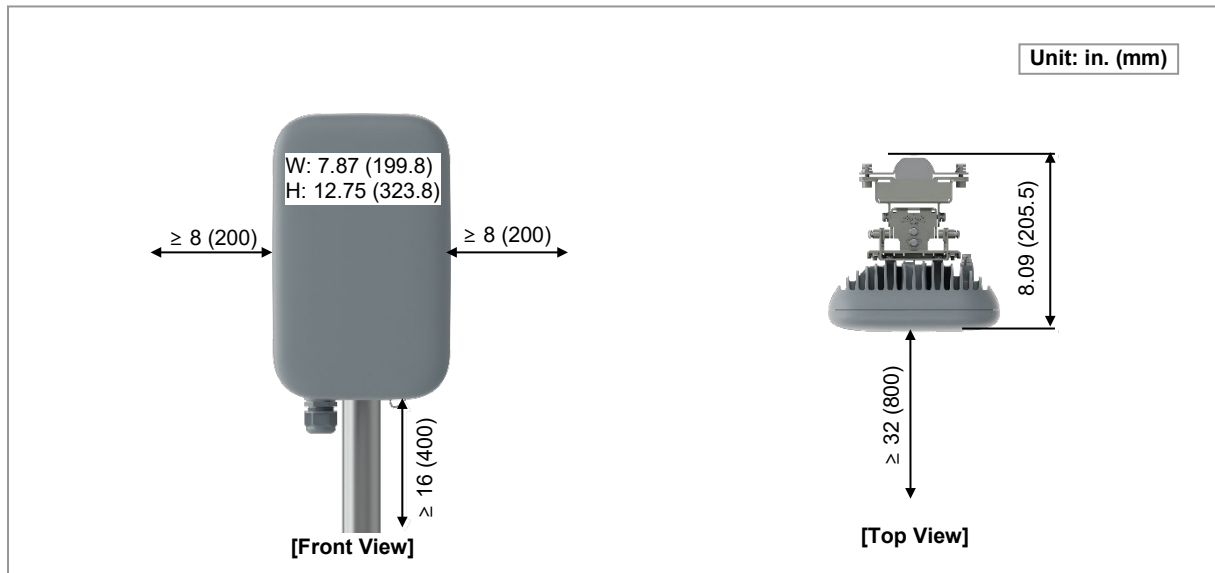
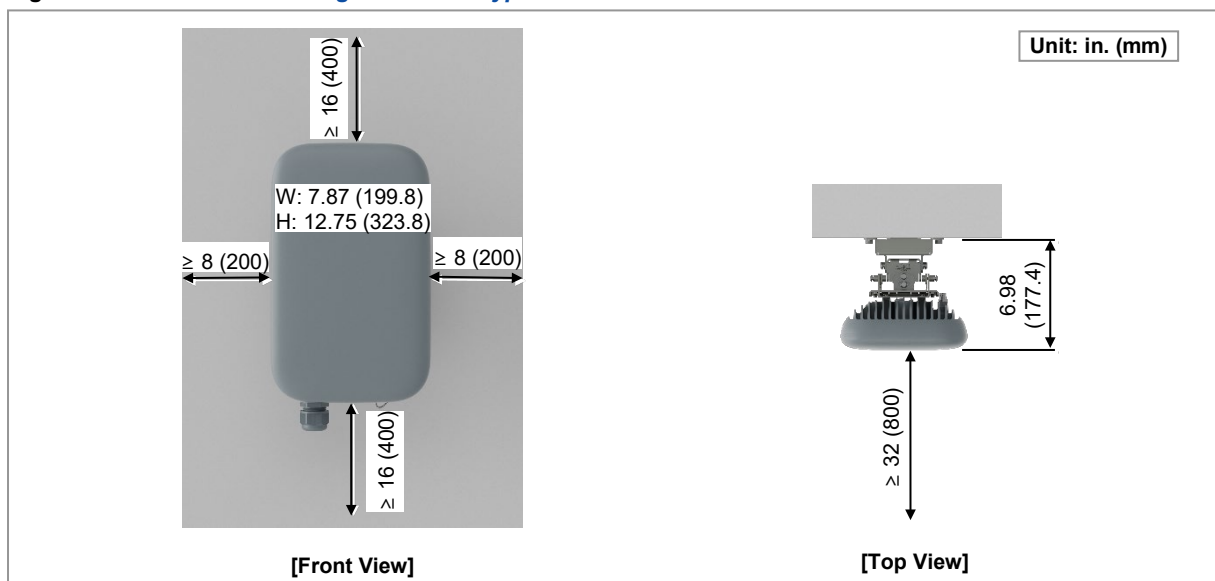


Figure below depicts the minimum distance that must be secured for wall type installation of the CPE Outdoor.

Figure 5. CPE Outdoor Arrangement Wall type Installation



Transporting and Unpacking

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

Bringing in Items

Take care of the following at each stage of transportation of the items:

- Check storage place for the system and remove obstacles in advance.
- 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.
- Care must be taken to protect the system from dust, moisture, and static electricity.

Unpacking Items

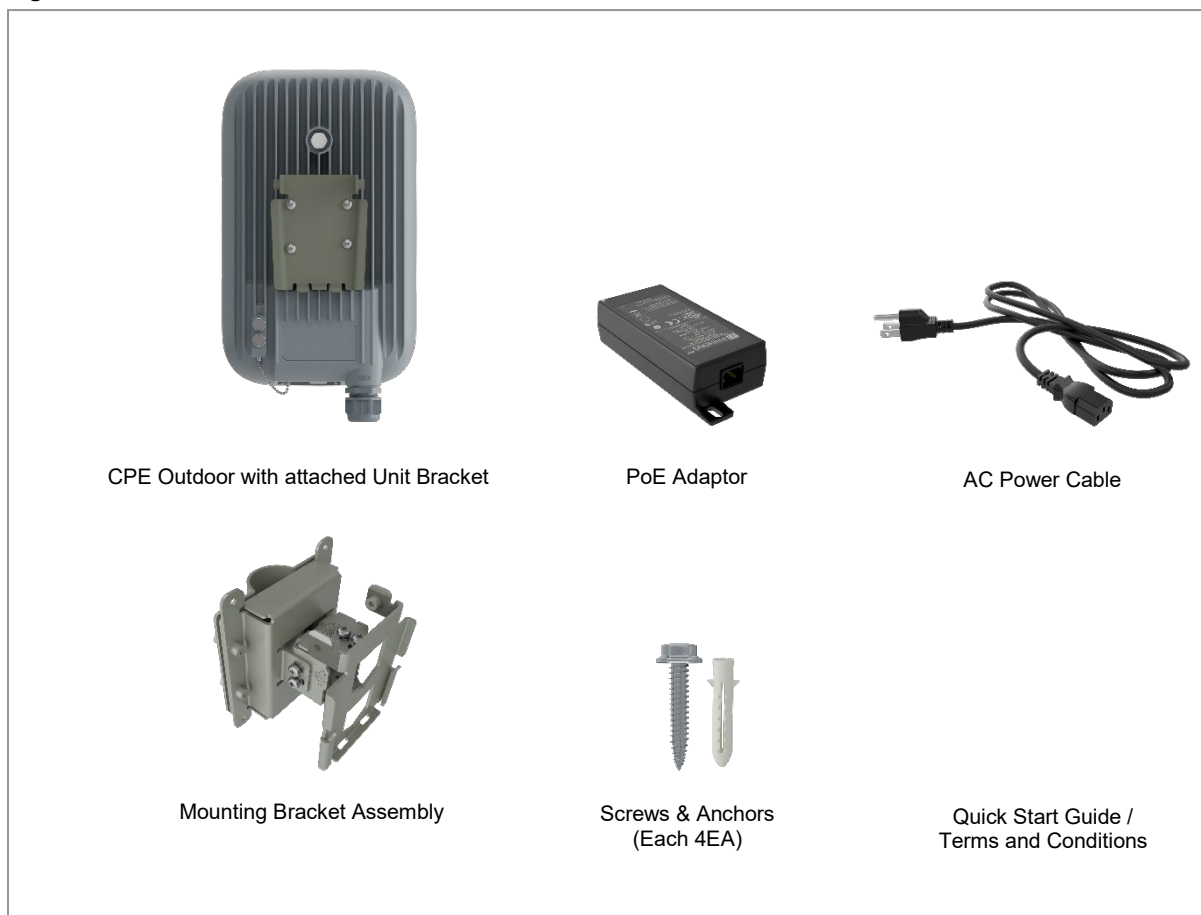
To unpack the items, ensure the following:

- 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.

Item List

Figure below depicts the packed item list.

Figure 6. *Item List*



Fixing System

This section details the procedure to fix the CPE Outdoor.

Replacing SIM



Before shipping the CPE Outdoor, a SIM should be inserted to it. If replacing a SIM, refer to the following procedures below.

▶ To replace the Subscriber Identity Module (SIM)

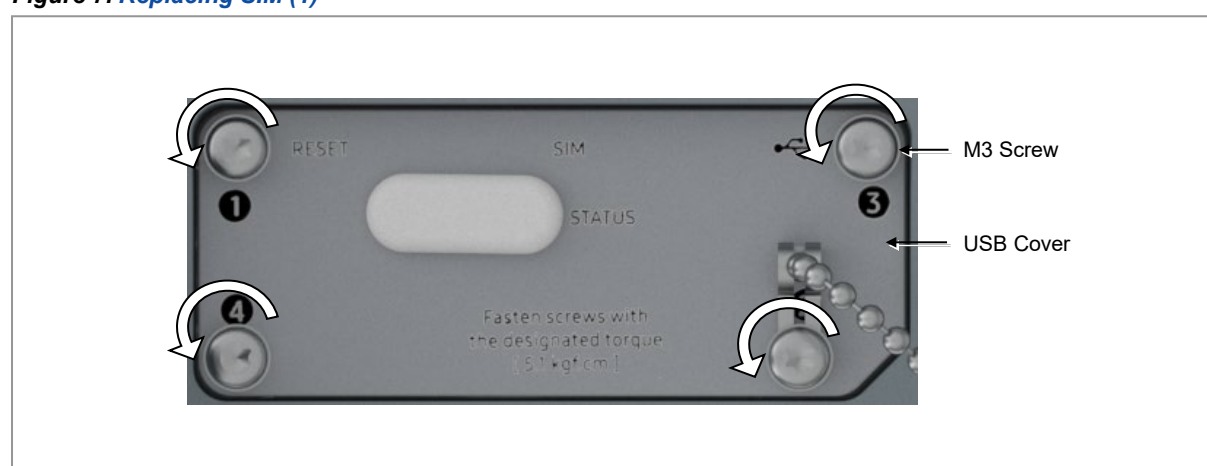
- 1 Ensure that the items mentioned in below table are available.

Table 2. Parts and Tools for Replacing the SIM

Category	Description		
Parts	Fastener	M3 x L12 SEMS (T10)	4 EA
Recommended Torque Value	M3 Screw		4.4 lbf·in (5.1 kgf·cm)
Working Tools	• Torque Driver (2–10 lbf·in) • Screw Driver Bit (Hex, T10) • Screw Driver (Hex, T10)		

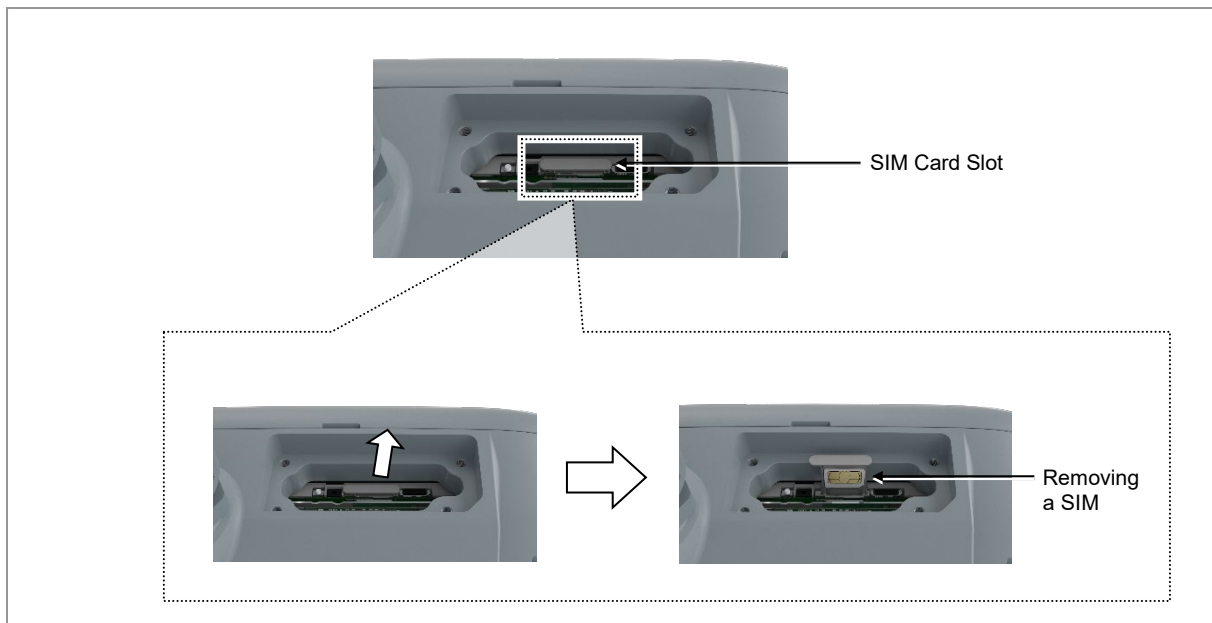
- 2 Unscrew the screw for fixing USB cover and separate the USB cover.

Figure 7. Replacing SIM (1)



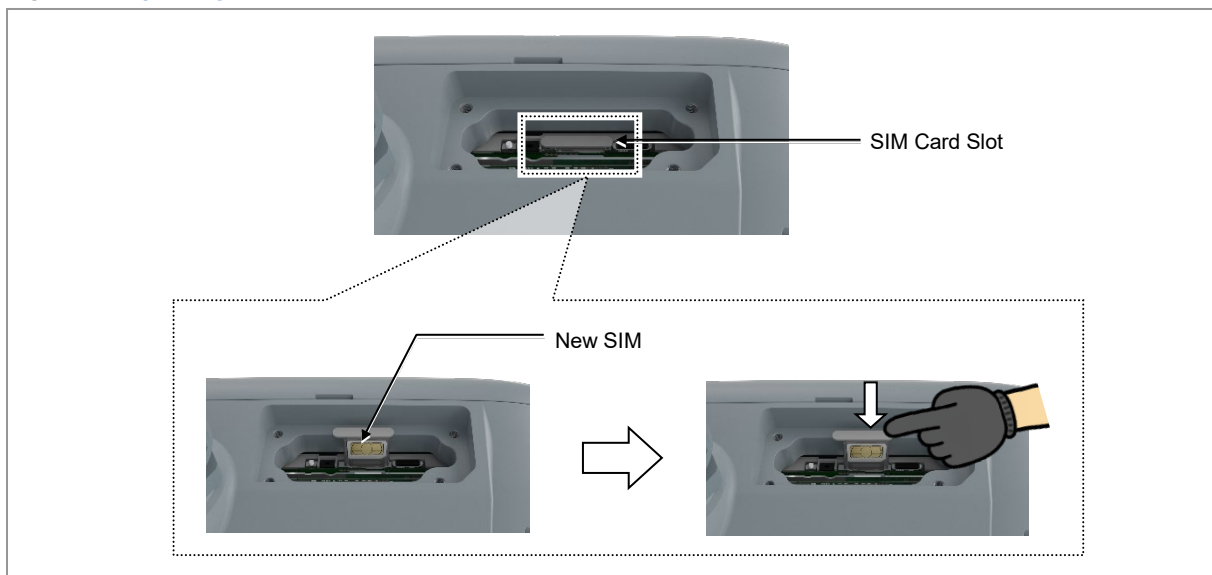
- 3 Remove the USB cover.
- 4 Pull out the tray gently from the tray slot.
- 5 Separate a SIM from SIM card slot.

Figure 8. Replacing SIM (2)



- 6 Place a new SIM card to the SIM card tray with the gold-colored contacts facing downwards.
- 7 Insert the tray back into the tray slot.

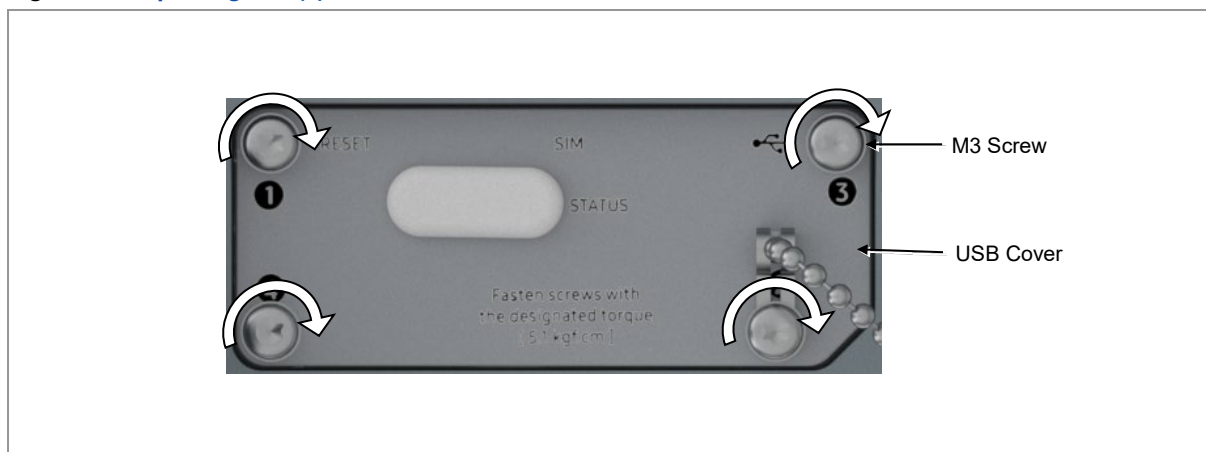
Figure 9. Replacing SIM (2)



- 8 Fix the USB cover by fastening screws in numerical order (1 → 2 → 3 → 4).



When fastening the number two screw, be sure to put a chain assembly under the screw first.

Figure 10. Replacing SIM (3)

When fixing the USB cover, make sure to check the order of screw fastening and standard torque value (4.4 lbf·in).

Fixing System on a Pole Type

The CPE Outdoor can be fixed on pole. This section details both procedures.

▶ To fix a Mounting Bracket Assembly on the pole

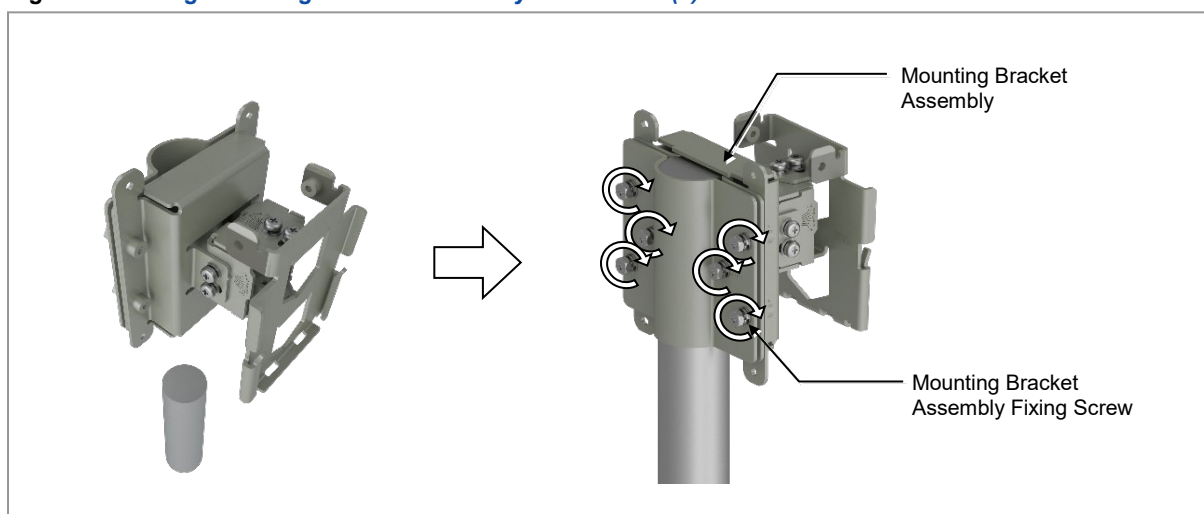
- 1 Ensure that the items mentioned in below table are available.

Table 3. Parts and Tools for Fixing Mounting Bracket Assembly on the Pole

Category	Description	
Parts	Mounting Bracket Assembly	1 EA
Recommended Torque Value	Mounting Bracket Assembly Fixing Screw	52 lbf-in (60 kgf-cm)
Working Tools	Torque Driver (10–60 lbf-in)	

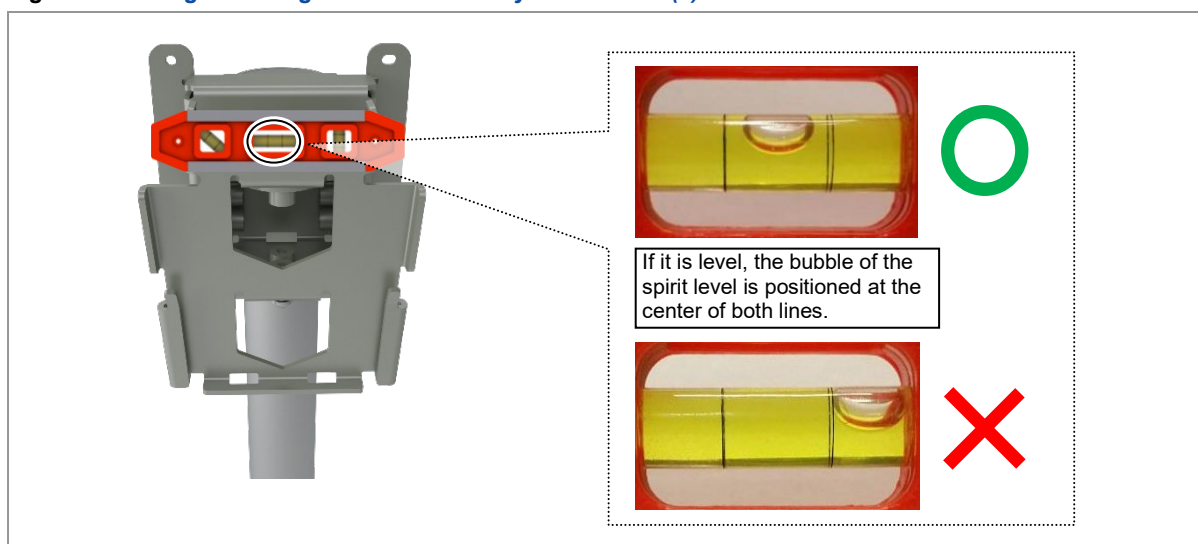
- 2 Put the mounting bracket assembly on the pole. Then, fasten six screws to fix it to the pole.

Figure 11. Fixing Mounting Bracket Assembly on the Pole (2)



- 3 Check the level of mounting bracket assembly on the pole and adjust the level, as detailed in figure below.

Figure 12. Fixing Mounting Bracket Assembly on the Pole (3)



When fixing the mounting bracket assembly on the pole, be sure to check the level of bracket. After finishing the installation, adjust the level minutely.



When poor leveling happens, adjust the position of fasteners used to fix the mounting bracket assembly.

► To fix the CPE Outdoor on the pole

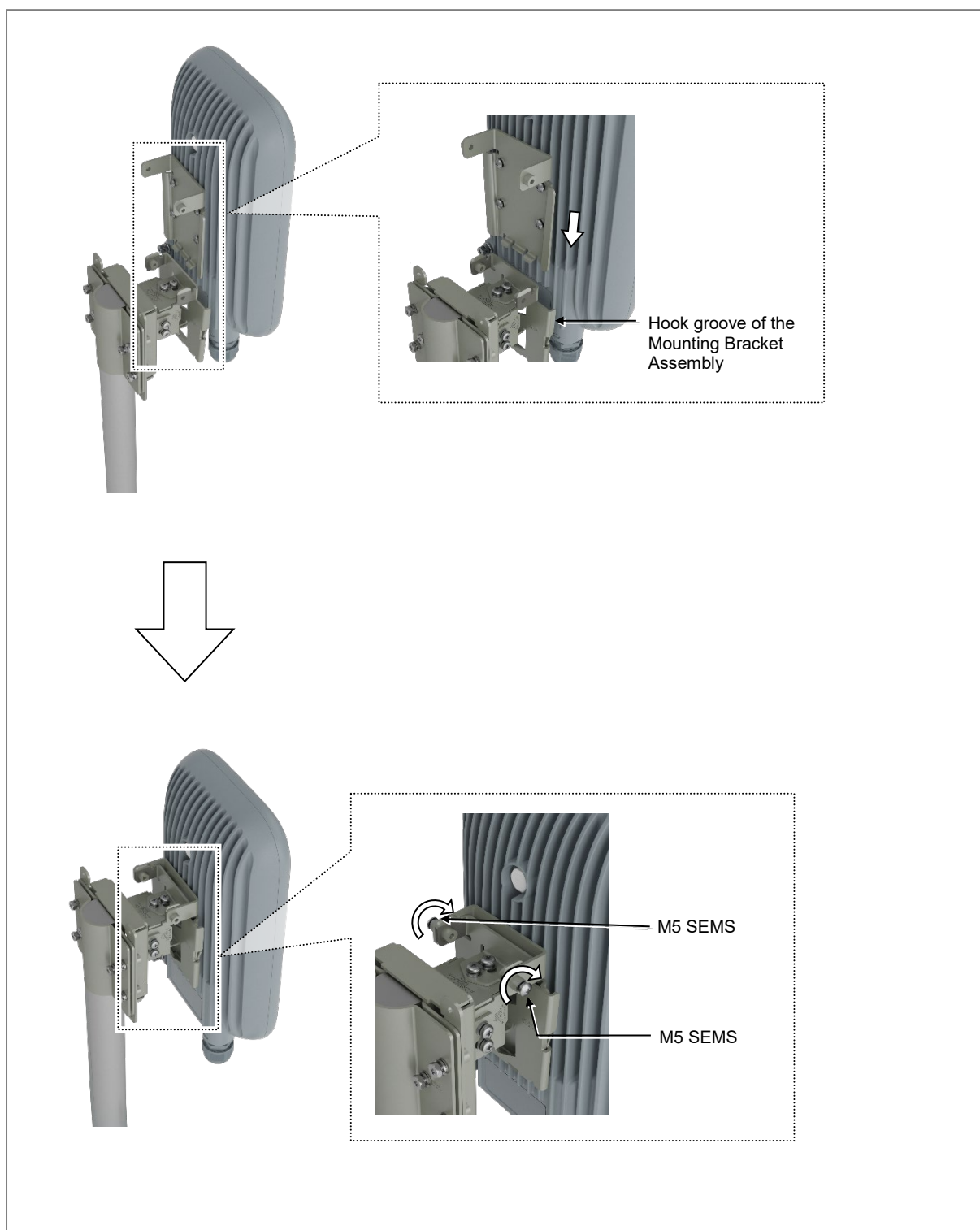
- 1 Ensure that the items mentioned in below table are available.

Table 4. Parts and Tools for Fixing CPE Outdoor on the Pole

Category	Description		
Parts	Fastener	M5 x L20 SEMS (CAPTIVE)	2 EA
Recommended Torque Value	M5 SEMS		4.4 lbf-in (5.1 kgf-cm)
Working Tools	• Screw Driver Bit (+, No.2) • Torque Driver (2–10 lbf-in)		

- 2 Insert the unit bracket which is connected to the CPE Outdoor into the hook groove of the mounting bracket assembly which is on the pole. Then, fasten the two M3 screws. This is depicted in the figure below.

Figure 13. Fixing CPE Outdoor on the Pole Mounting Bracket Assembly



Fixing System on a Wall Type

A CPE Outdoor can be fixed on wall using a mounting bracket. This section details the procedures for fixing the mounting bracket on the wall and fixing the CPE Outdoor on the mounting bracket.

To mark on the wall

- 1 Ensure that the items mentioned in below table are available.

Table 5. Tools for Marking

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

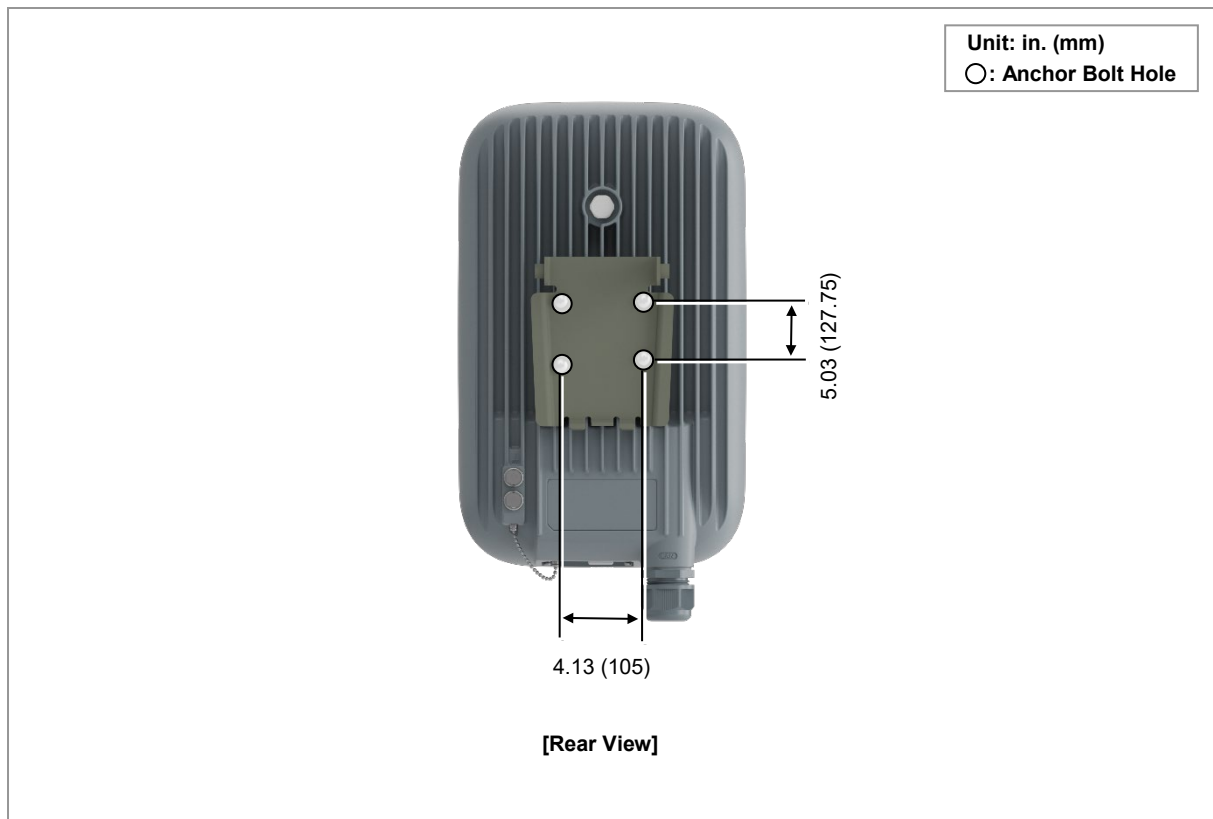


Perform leveling test before drilling by referring to *System Leveling*, to ensure the positions marked are horizontal or vertical. If the result shows the marked positions are not horizontal or vertical, modify the marking positions.



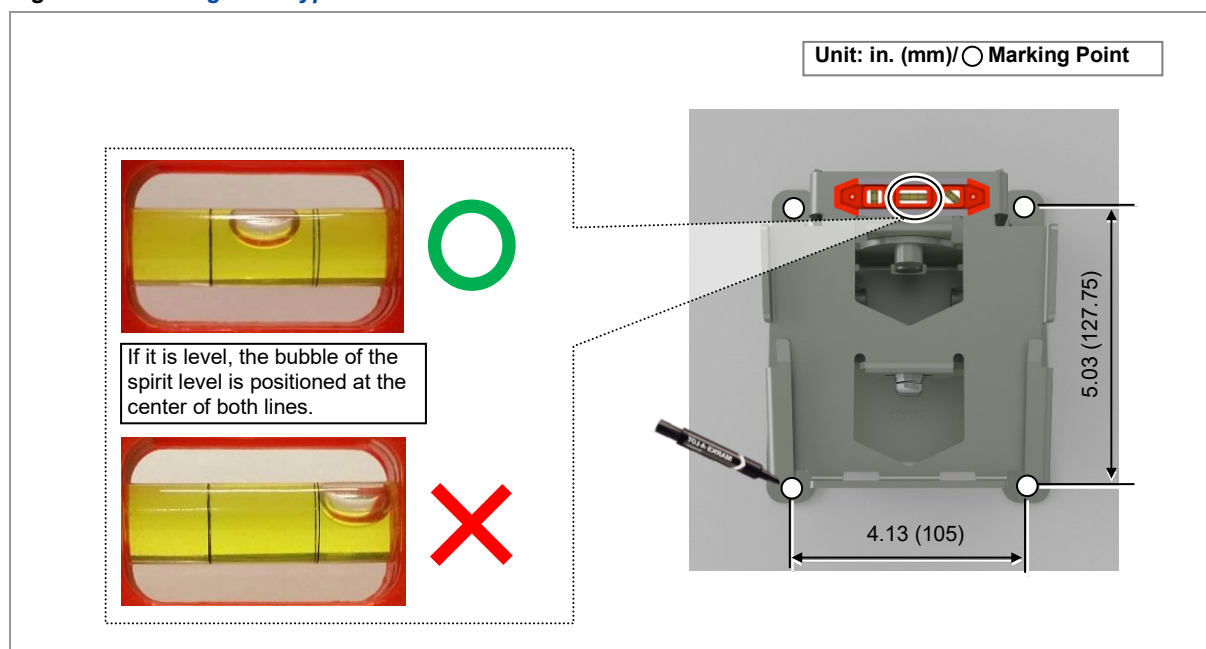
When the position to place the system is determined, place the system on that position and then mark the positions where anchor bolts are to be fixed. This reduces marking error range.

- 2 Check the distance between the location for fixing the CPE Outdoor and the anchor bolt hole, as shown in figure below.

Figure 14. CPE Outdoor Marking Dimensions for Wall Type

- 3 Place the mounting bracket on the fixing location, check the level status using a level, and adjust the level of the bracket assembly.
- 4 If the level status is normal, mark the anchor bolt holes on the wall. This is detailed in figure below.

Figure 15. Marking Wall Type



► To drill the anchor holes

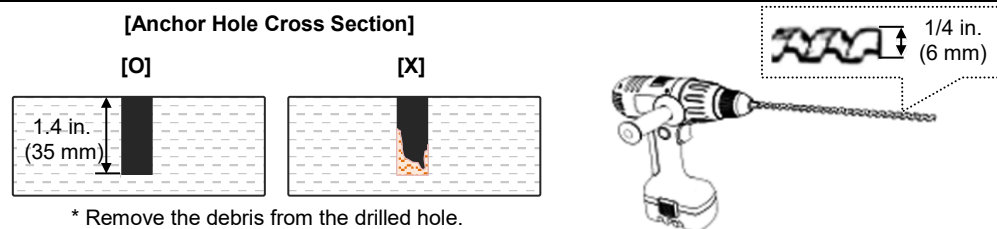
- 1 Ensure that the items mentioned in below table are available.

Table 6. Tools for Drilling

Category	Description
Working Tools	Hammer Drill Drill Bit (1/4 inch) Vacuum Cleaner

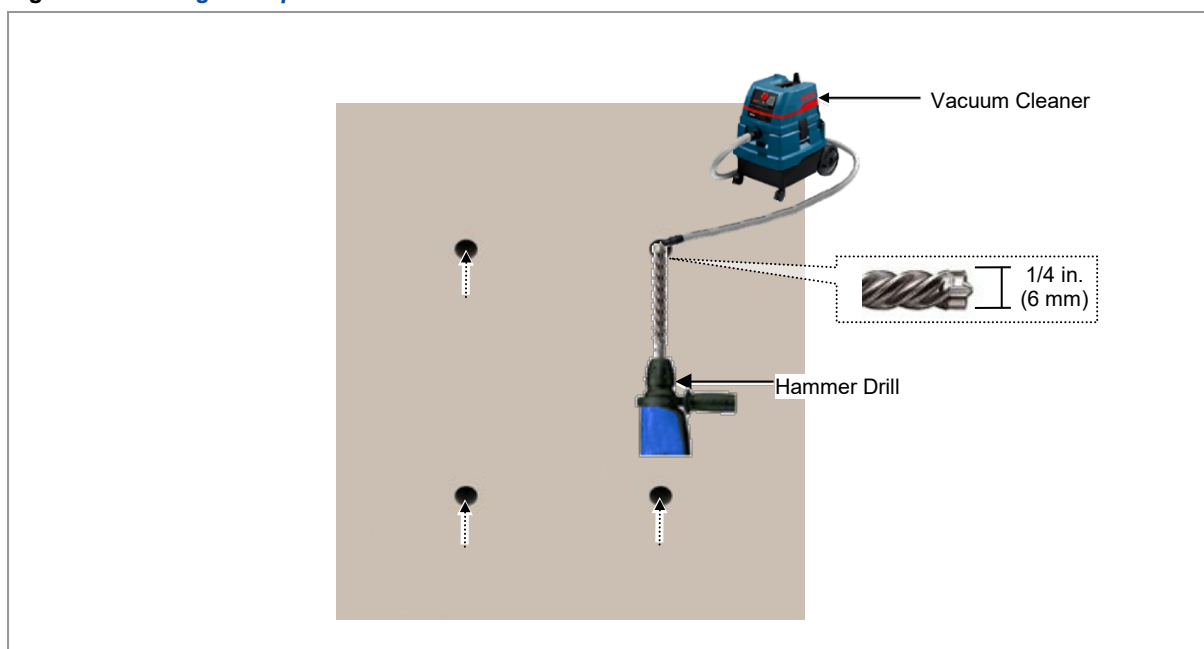
Table 7. Anchor Bolt Drill Bits and Hole Depth

Category	Anchor Bolt	Drill Bits	Hole Depth
CPE Outdoor	Φ 6	1/4 in. (6 mm)	1.4 in. (35 mm)



- 2 Drill anchor holes at the marked points. Remove dust from the holes using a vacuum cleaner.

Figure 16. Drilling Example



▶ To fix the Mounting Bracket on the wall

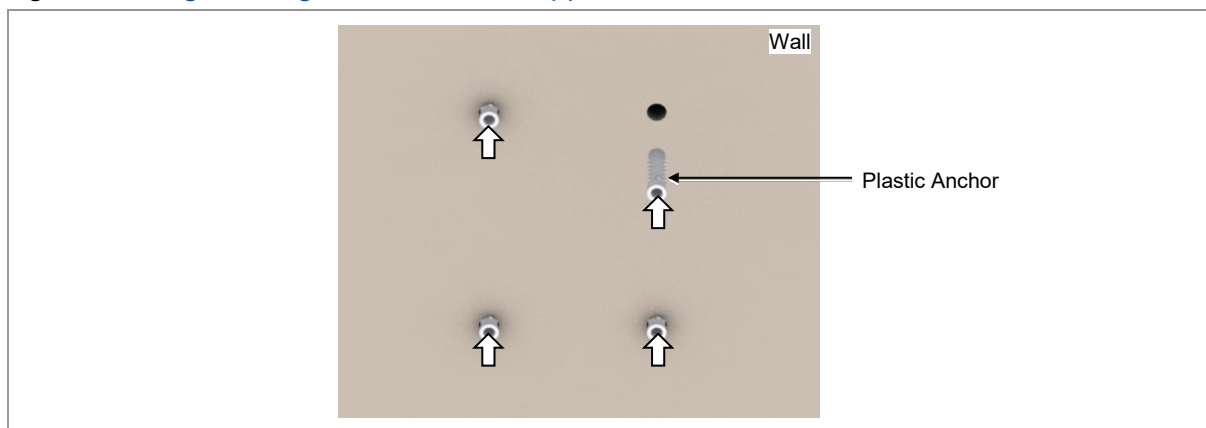
- 1 Ensure that the items mentioned in below table are available.

Table 8. Parts and Tools for Fixing Mounting Bracket on the Wall

Category	Description		
Parts	Mounting Bracket		1 EA
	Fasteners	M4, L25, Hex, Taptite Screw	4 EA
		Φ 6 × L30 Plastic Anchor	4 EA
Recommended Torque Value	M4 PH+ Tapping Screw		13 lbf·in (15 kgf·cm)
Working Tools	Torque Driver (6–22 lbf·in)		
	Screw Driver Bit ('+', No. 2)		

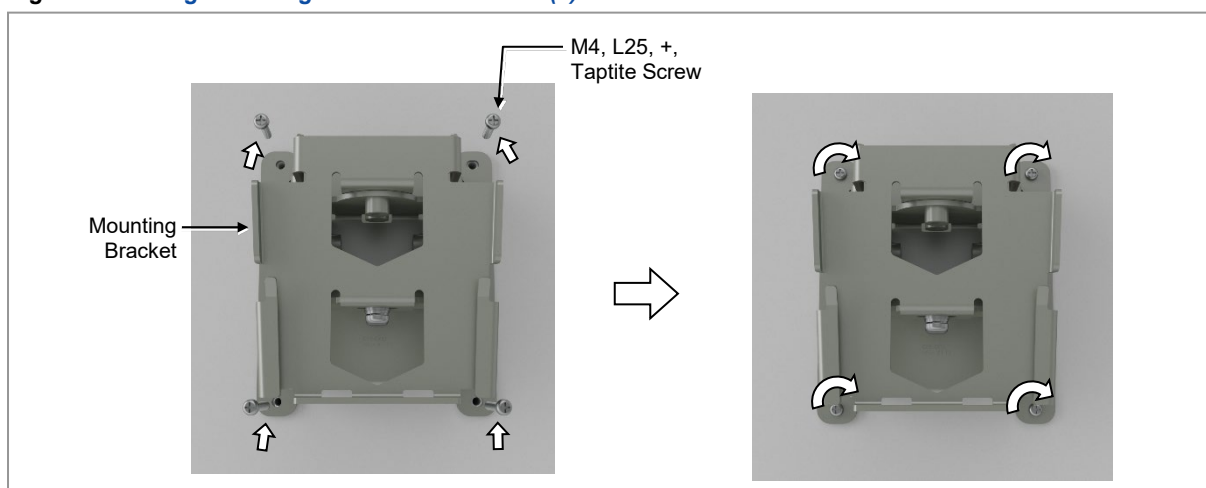
- 2 Fix the Φ 6 plastic anchors to the holes drilled on the wall.

Figure 17. Fixing Mounting Bracket on the Wall (1)

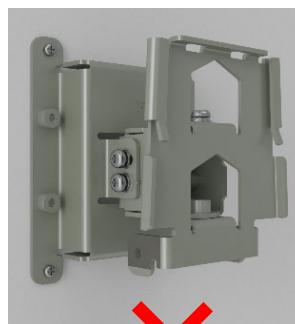
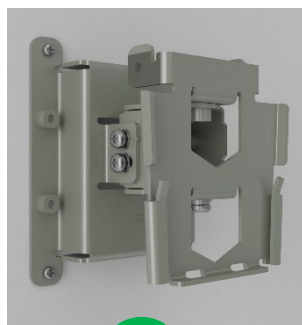


- 3 Place the mounting bracket along with the fixed plastic anchors.

Figure 18. Fixing Mounting Bracket on the Wall (2)



When fixing the mounting bracket, be sure to fix it in the correct orientation. The imprinted angle mark must be on the top.



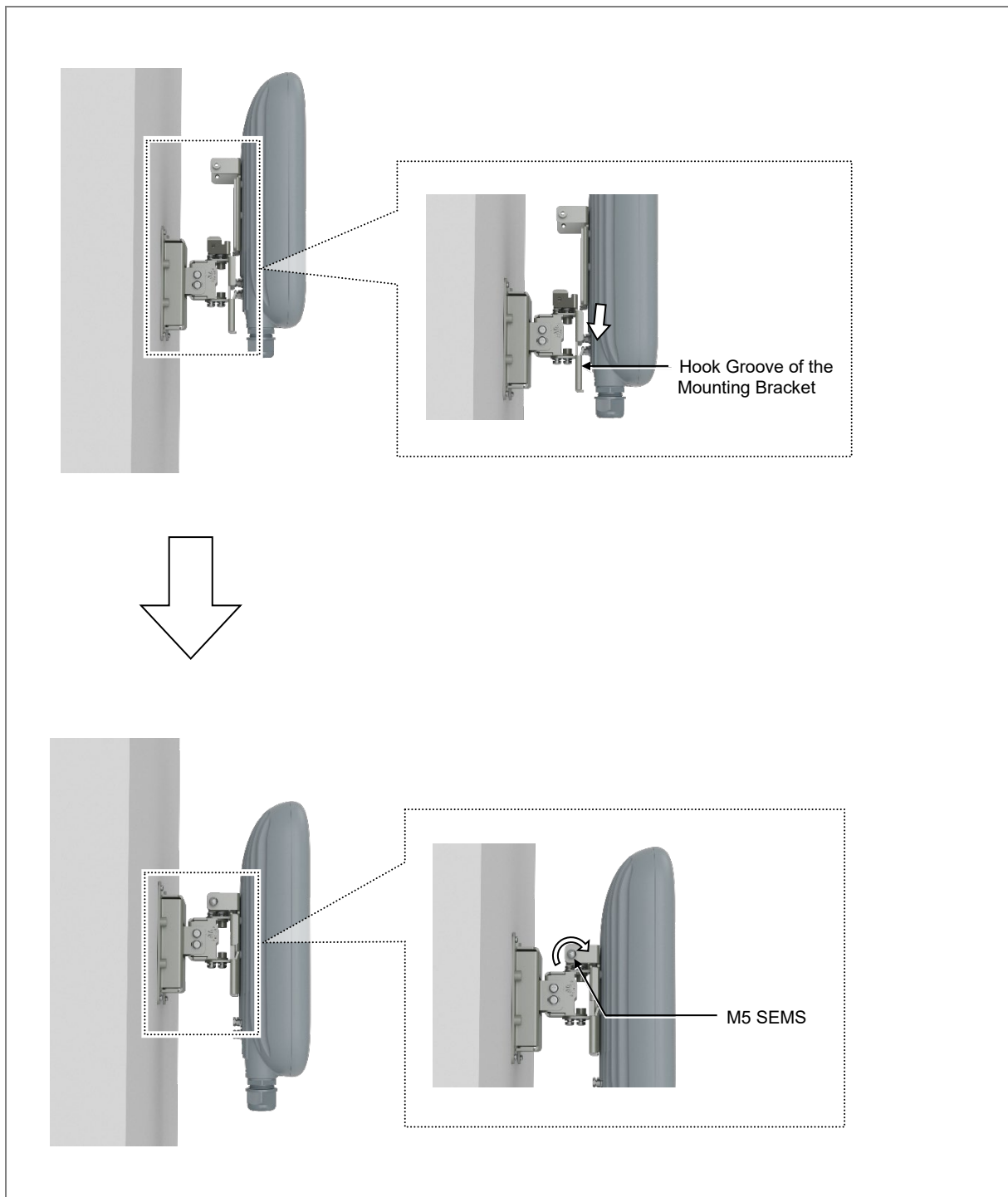
▶ To fix the CPE Outdoor on the wall

- 1 Ensure that the items mentioned in below table are available.

Table 9. Parts and Tools for Fixing CPE Outdoor on the Wall

Category	Description		
Parts	Fastener	M5 x L20 SEMS (CAPTIVE)	2 EA
Recommended Torque Value	M5 SEMS		4.4 lbf·in (5.1 kgf·cm)
Working Tools	• Screw Driver Bit (+, No.2) • Torque Driver (2–10 lbf·in)		

- 2 Insert the unit bracket which is connected to the CPE Outdoor into the hook groove of the mounting bracket which is on the wall. Then, fasten the two M3 screws. This is depicted in the figure below.

Figure 19. Fixing CPE Outdoor on the Wall Mounting Bracket

System Tilting & Swiveling

▶ To tilt the system

- 1 Ensure that the items mentioned in below table are available.



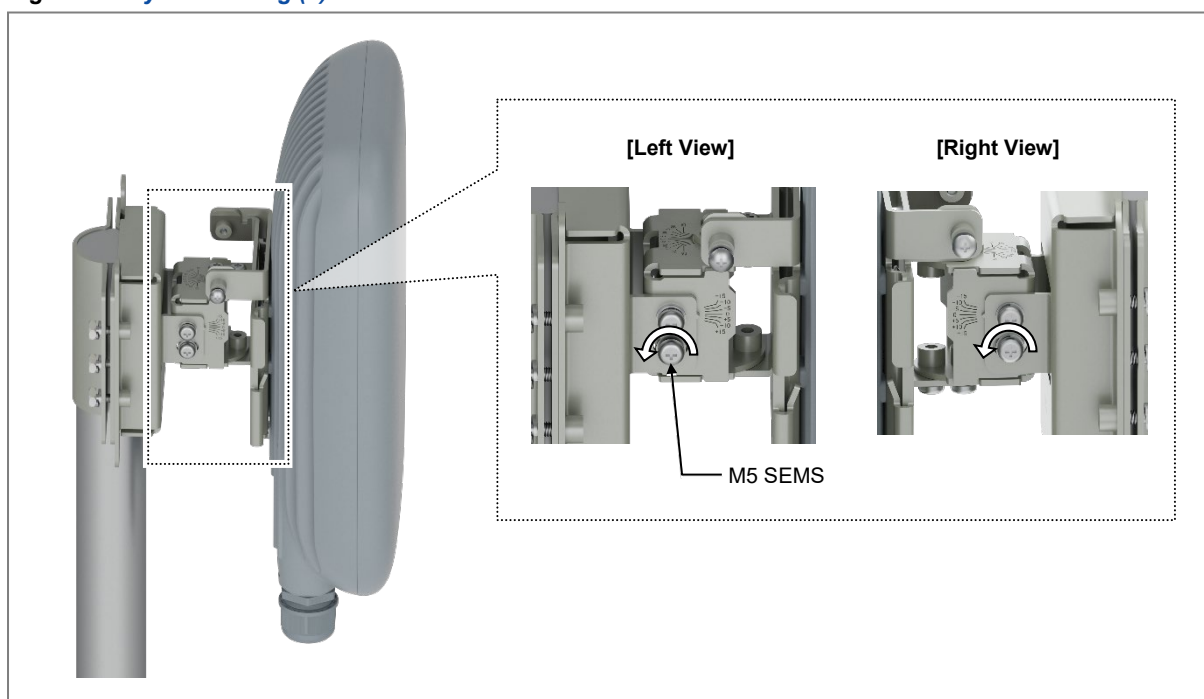
The description and the images in this section are based on the CPE Outdoor installed on a pole. However, you can also tilt and swivel the CPE Outdoor when it is installed on a wall just as like you can with one installed on a pole.

Table 10. Tools for System Tilting

Category	Description	
Recommended Torque Value	M5 SEMS	25 lbf·in (29 kgf·cm)
Working Tools	• Screw Driver Bit (+, No.2) • Torque Driver (20–90 lbf·in) • Screw Driver (+, No.2)	

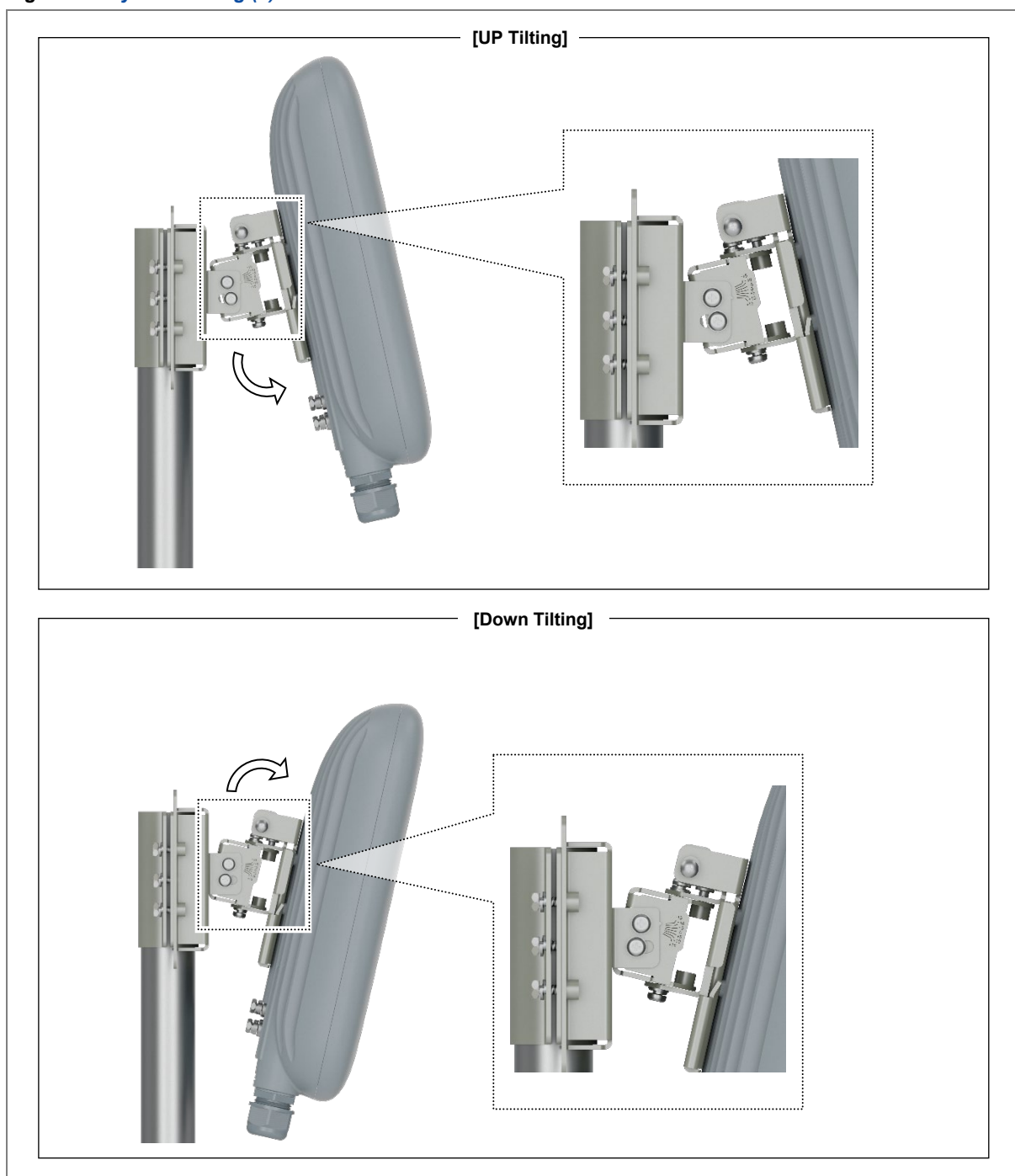
- 2 Turn the screws (used to adjust the angle) on both sides of the mounting bracket assembly counter clockwise.

Figure 20. System Tilting (1)



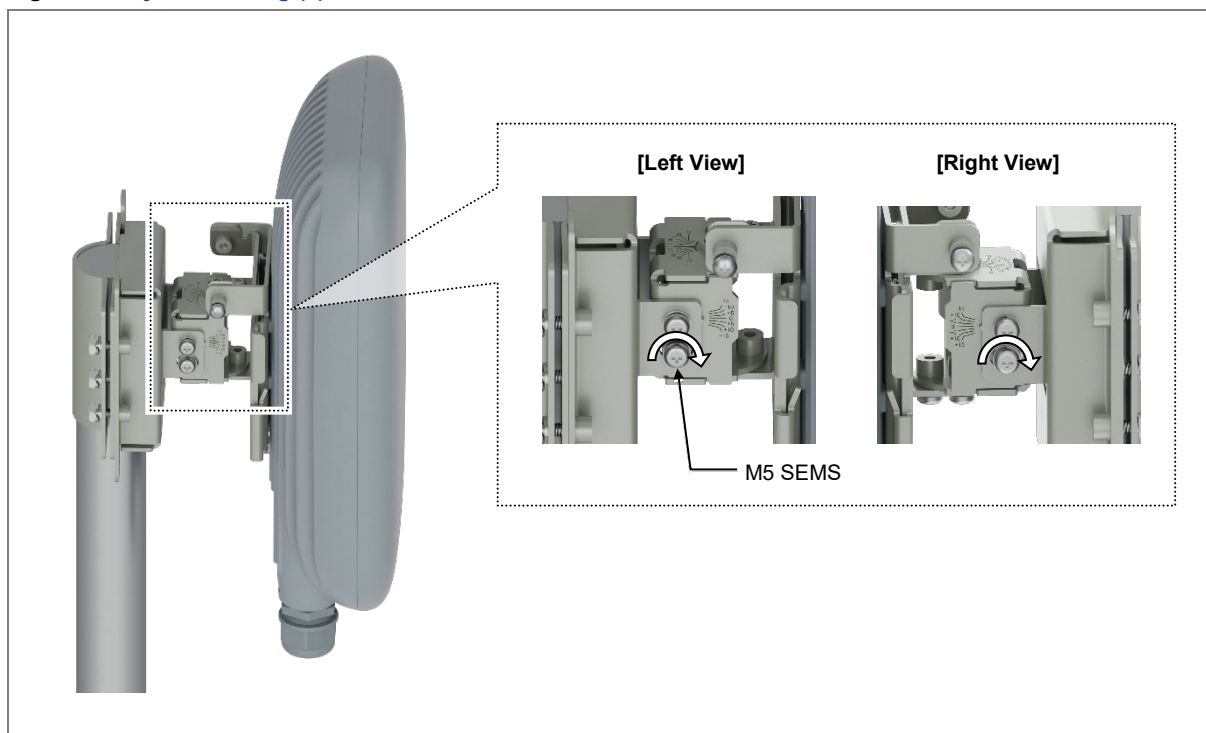
- 3 Adjust the tilting angle by pulling the up and down tilt of CPE Outdoor.
 - Up tilting: +6°/+12°/+15°
 - Down tilting: -6°/-12°/-15°

Figure 21. System Tilting (2)



- 4 Turn the screws (used to adjust the angle) on both sides of the mounting bracket assembly clockwise to fix the CPE Outdoor.

Figure 22. System Tilting (3)



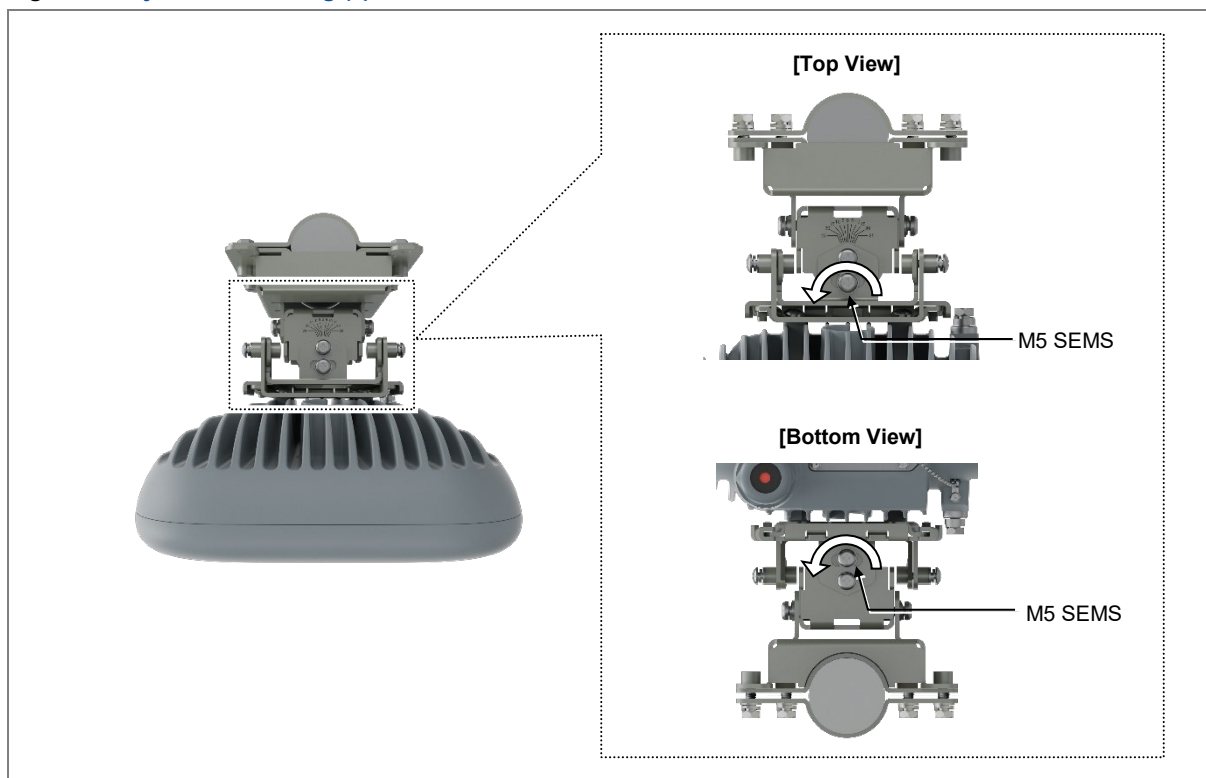
▶ To swivel the system

- 1 Ensure that the items mentioned in below table are available.

Table 11. Tools for System Swivelling

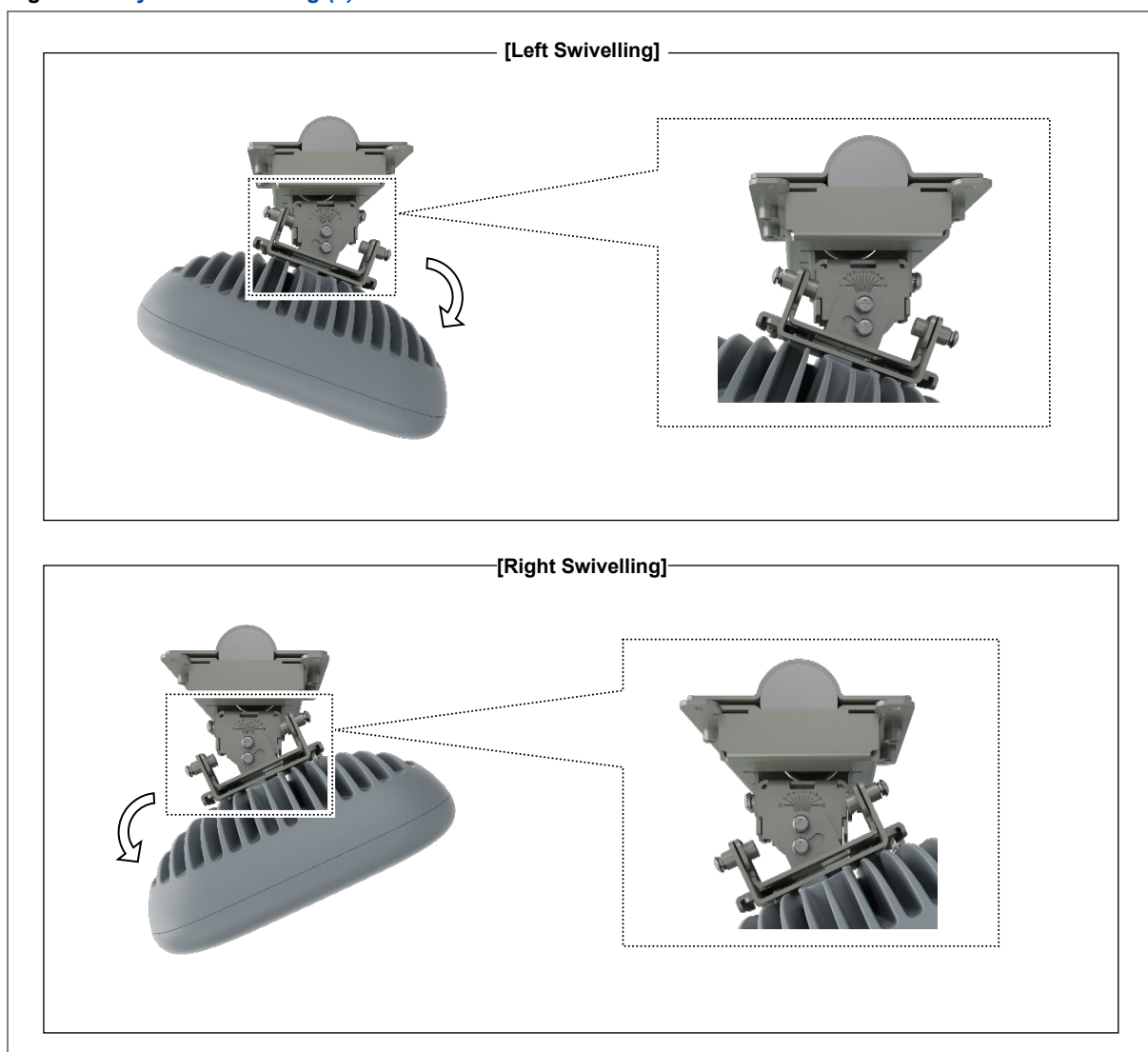
Category	Description	
Recommended Torque Value	M5 SEMS	25 lbf·in (29 kgf·cm)
Working Tools	• Screw Driver Bit (+, No.2) • Torque Driver (20–90 lbf·in) • Screw Driver (+, No.2)	

- 2 Turn the screws (used to adjust the angle) on the top and bottom of the mounting bracket assembly counter clockwise.

Figure 23. System Swivelling (1)

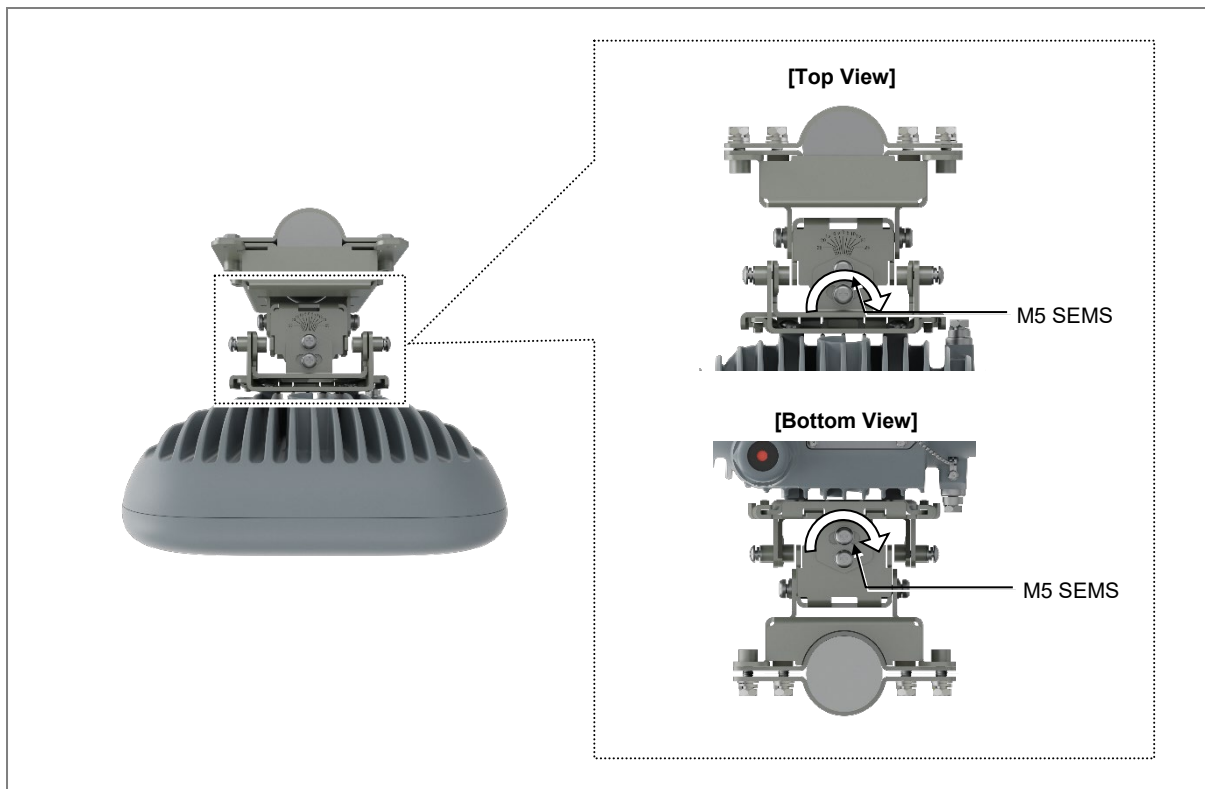
- 3 Adjust the swivelling angle by pulling the CPE Outdoor to the left or right.
 - Left swivelling: 5°/10°/15°/20°/25°
 - Right swivelling: 5°/10°/15°/20°/25°

Figure 24. System Swivelling (2)



- 4 Turn the screws (used to adjust the angle) on the top and bottom of the mounting bracket assembly clockwise to fix the CPE Outdoor.

Figure 25. System Swivelling (3)



Chapter 3

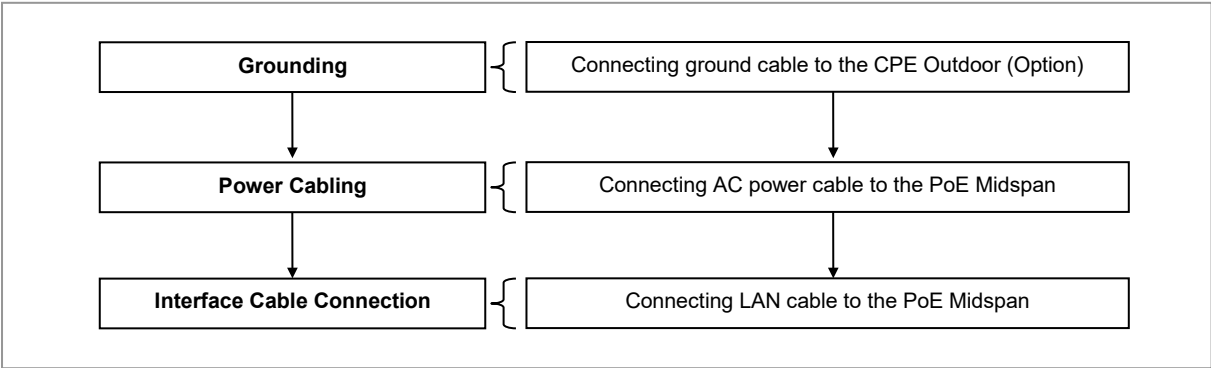
Connecting Cables

This chapter describes the procedures to connect cables to a CPE Outdoor system and to label the cables.

Cabling Procedure

Figure below depicts the procedure to connect system cables.

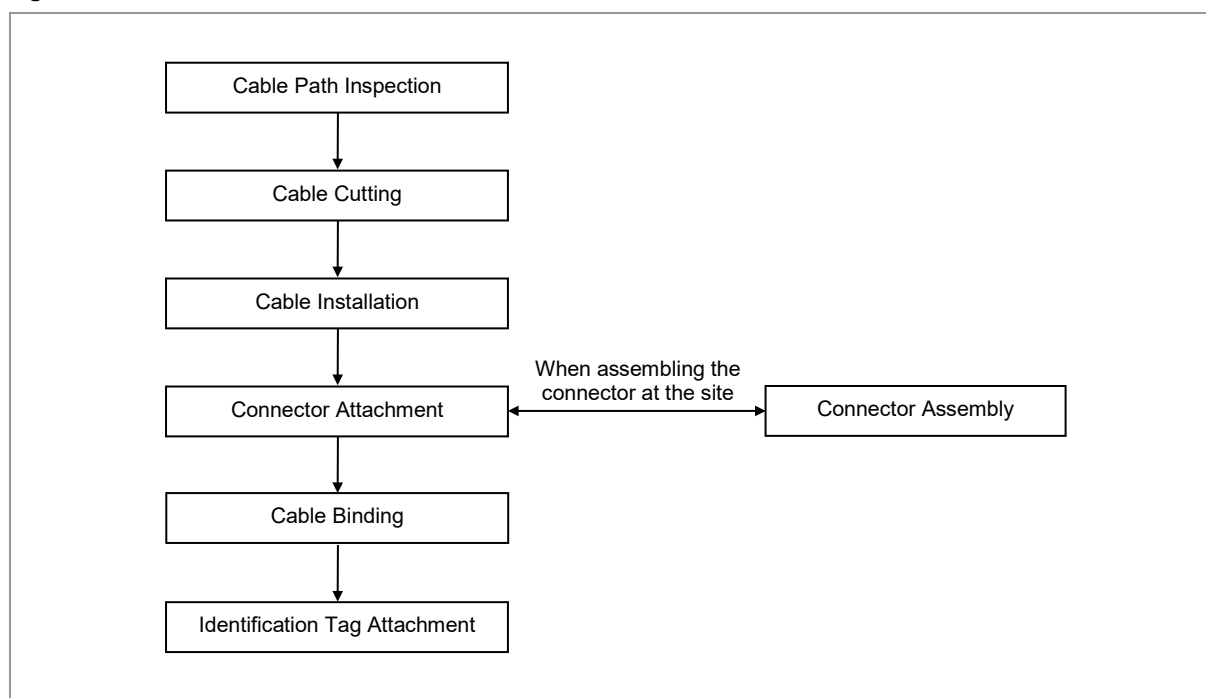
Figure 26. Procedure to Connect System Cable



Guidelines for Cable Connections

Figure below depicts the sequence of operations for connecting cables to the system.

Figure 27. 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 a cable that interconnects rectifier, Main Ground Bar (MGB), and backhaul device, within the system, 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.

Table below provides the recommended minimum allowed cable bend radius of different types of cables

Table 12. Recommended Minimum Allowed Cable Bending Radius

No	Cable	Allowed Cable Bending Radius
1	Ground/Power Cable	• Operation: $8 \times OD$ • Installation: $12 \times OD$
2	Ethernet Cable	$4 \times OD$

※ If the allowed cable bending 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 heat shrink tube 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, take care not to overlap or tangle the cables. In addition, consider future expansion. Install DC power cable and data transmission cable away from AC power cable to prevent electromagnetic induction.



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

Cabling Diagram

The cabling diagram of the system is as follows:

Figure below depicts the cabling diagram of CPE Outdoor.

Figure 28. Cable Diagram

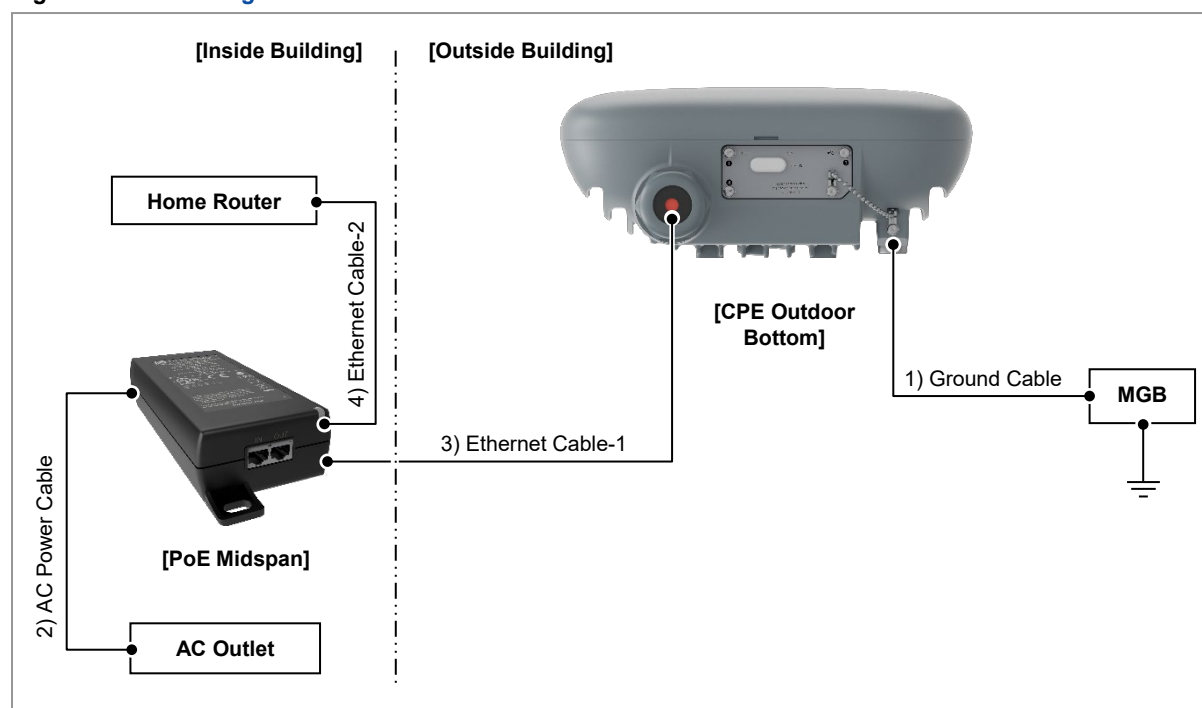


Table below lists the main specifications of the CPE Outdoor cable connections.

Table 13. CPE Outdoor Connection Cable

From	To	Cable
MGB	CPE Outdoor	1) Ground Cable (Option) : 14 AWG × 1C
PoE Midspan	AC Outlet	2) AC Power Cable
	CPE Outdoor	3) Ethernet Cable-1 : CAT6 SFTP Cable or higher, 23 AWG, 8.3 mm in diameter (Outdoor Type)
	Home Router	4) Ethernet Cable-2 : CAT6 SFTP cable or higher that can support 5Gbps (Indoor Type)



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, Ethernet cable

Grounding

Grounding is the process of operating an electronic system such as power supply system, communication system, and control system, stably without damage from lightning, transient-current, transient-voltage, and electric noise. Grounding also helps in 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. This prevents electrification of the electronic device.



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 (Option)



When connecting the ground cables, connect the ground cable first for before installing system to prevent errors.

▶ To connect a ground cable

- 1 Ensure that the items mentioned in below table are available.

Table 14. Parts and Tools for Connecting Ground Cable to the CPE Outdoor

Category	Description	
Installation Section	MGB-CPE Outdoor Ground Terminal	
Cable	14 AWG × 1C	
Bending Radius	8 × OD	
Heat Shrink Tube (Spec/Color/Length)	Φ 0.4 in. (10 mm)/Clear/2 in. (50 mm)	
Pressure Terminal	MGB	Checking MGB specifications per site and preparing connecting parts
	CPE Outdoor	14 AWG, 2 Hole, Hole diameter: 1/4 in. (6.4 mm), Hole spacing: 0.63 in. (16 mm)

Category	Description	
Fastener	MGB	Checking MGB specifications per site and preparing connecting parts
	CPE Outdoor	M6 × L12 SEMS (Hex., +)/2 EA
Recommended Torque Value	M6 SEMS	43 lbf·in (50 kgf·cm)
Working Tools	• Cable Cutter • Wire Stripper • Crimping tool • Heating Gun • Nipper • Screw Driver ('+', Number 3) • Torque Driver (20–90 lbf·in) • Screw Driver Bit ('+', Number 3)	



For the pressure terminals of the cable, the UL Listed products or equivalent must be used.

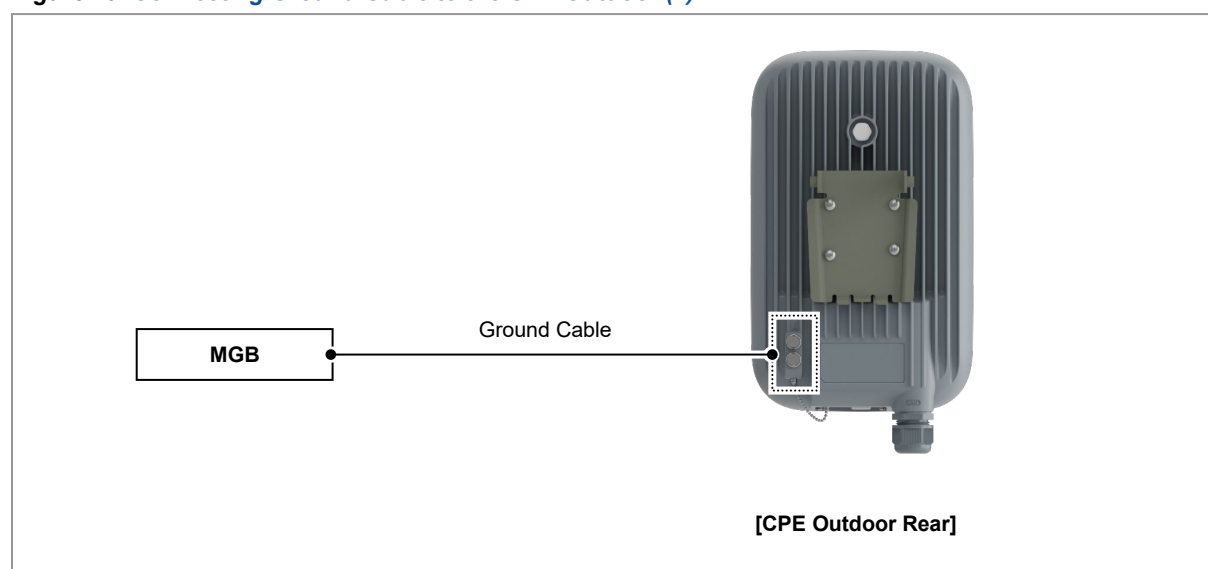
Example: Manufacturer-Panduit

CPE Outdoor: 14 AWG Pressure Terminal (LCD10-14A-L)



- 2 Install the ground cable from the MGB to the CPE Outdoor ground terminal as shown in figure below.

Figure 29. Connecting Ground Cable to the CPE Outdoor (1)

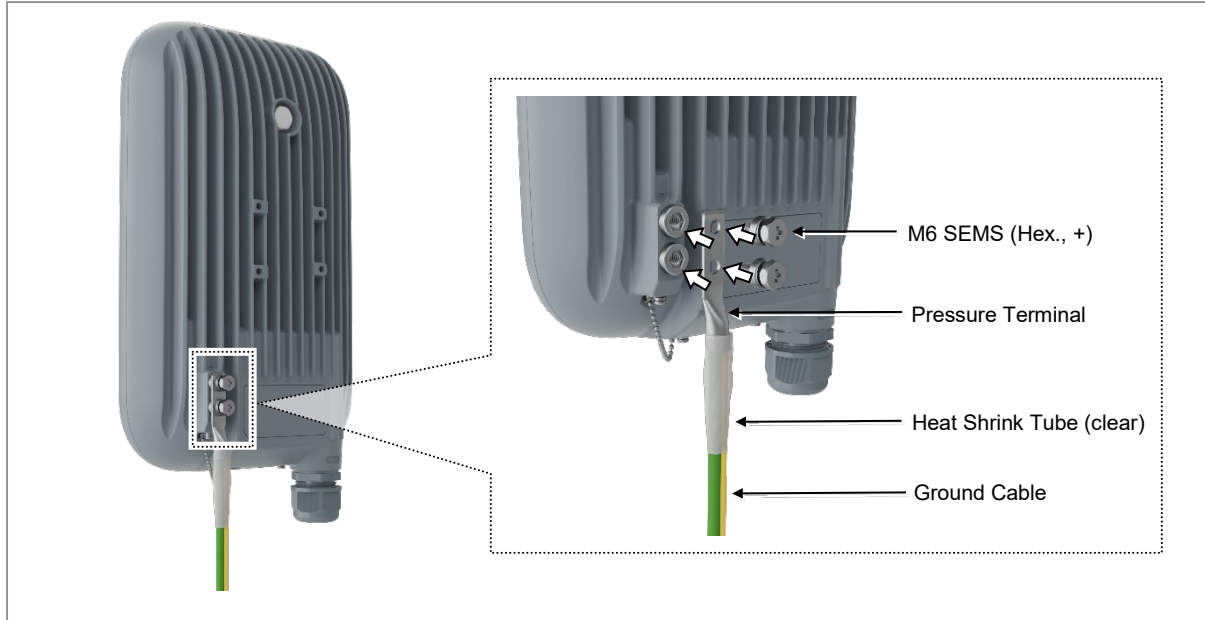


- 3 Assemble a pressure terminal and a heat shrink tube at the end of the CPE Outdoor ground cable.

- 4 Align the pressure terminal to the mounting hole of the CPE Outdoor ground terminal.
- 5 Firmly fix the pressure terminal onto the CPE Outdoor ground terminal using fasteners.

Figure below depicts the steps 3 to 5.

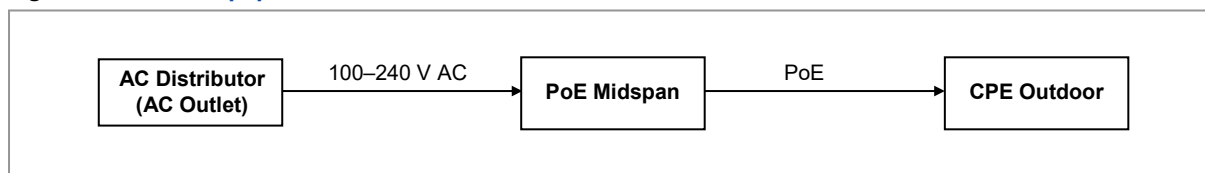
Figure 30. Connecting Ground Cable to the CPE Outdoor (2)



Power Cabling

Figure below depicts the elements of a power supply device.

Figure 31. Power Equipment Elements



-  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 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.

Connecting AC Power Cable

► To connect an AC power cable to the PoE Midspan

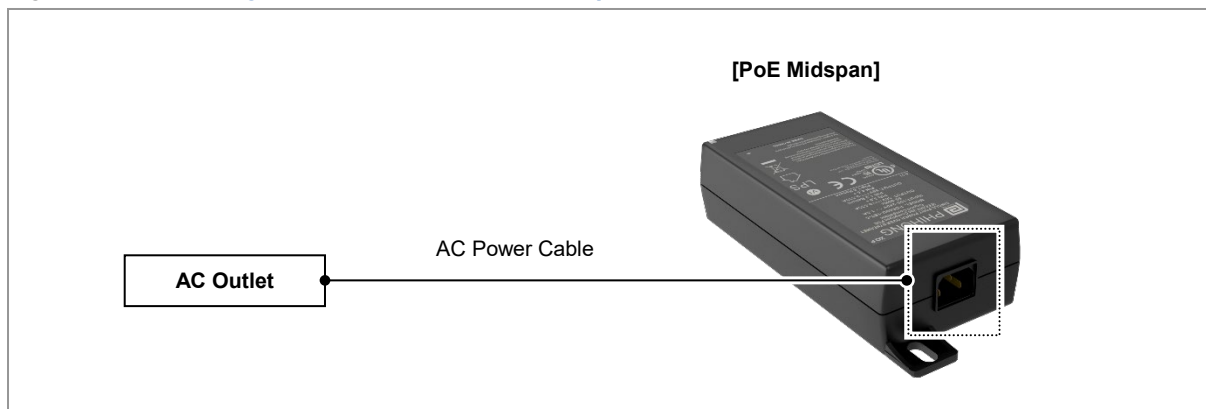
- 1 Ensure that the items mentioned in below table are available.

Table 15. Parts and Tools for Connecting AC Power Cable to the PoE Midspan

Category	Description
Installation Section	AC Outlet-PoE Midspan AC IN port
Cable	AC Power Cable Assembly
Bending Radius	8 × OD

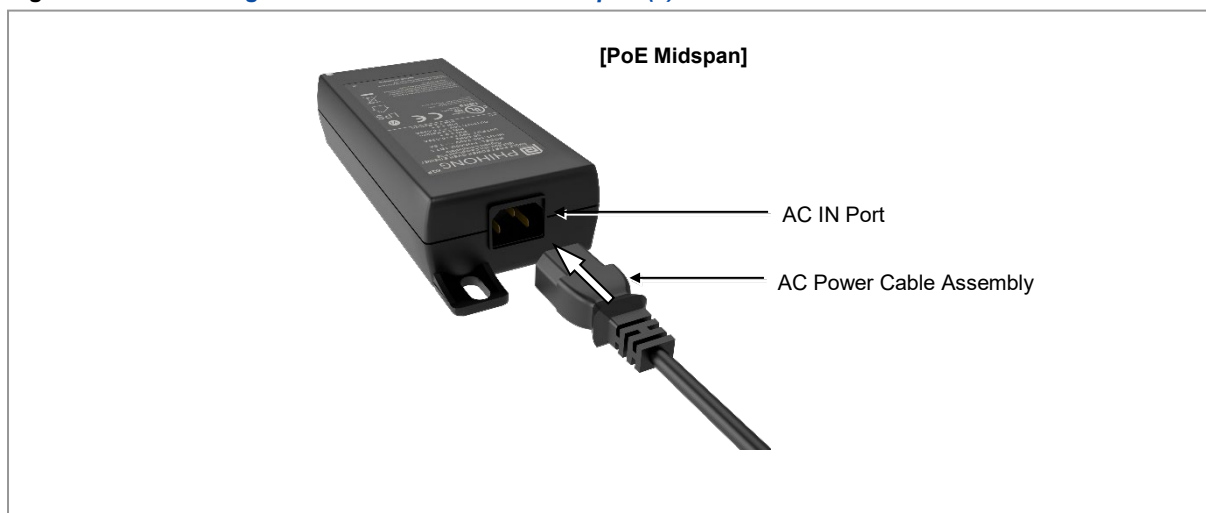
- 2 Install the AC power cable from the AC distributor to the PoE midspan, as shown in figure below.

Figure 32. Connecting Power Cable to the PoE Midspan (1)



- 3 Insert the connector to the AC IN port of PoE midspan.

Figure 33. Connecting Power Cable to the PoE Midspan (2)



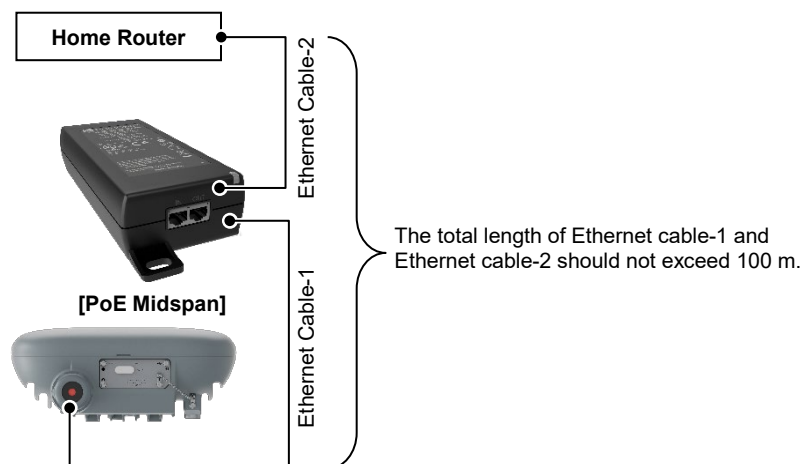
Interface Cable Connection

This section describes the procedures to connect interface cables.

Connecting Ethernet Cable



The Ethernet cable total length between home router, PoE midspan and CPE Outdoor should not exceed 100 m.



The Ethernet cable should be installed before installing the CPE Outdoor. When replacing the Ethernet cable, refer to the 'Changing Ethernet Cable from the CPE Outdoor' below.

Changing Ethernet Cable from the CPE Outdoor

► To change an Ethernet Cable from the CPE Outdoor

- 1 Ensure that the items mentioned in below table are available.

Table 16. Parts and Tools for Changing Ethernet Cable from the CPE Outdoor

Category	Description	
Installation Section	CPE Outdoor LAN port	
Cable	CAT6 SFTP Cable or higher, 23 AWG, 8.3 mm in diameter (Outdoor Type)	
Bending Radius	4 × OD	
Connector	CPE Outdoor	RJ-45 Plug
Recommended Torque Value	Cable Gland Sealing Nut	47.4 lbf·in (56.6 kgf·cm)
Working Tools	• Torque Wrench (10–50 lbf·in) • Torque Wrench Spanner Head (apply Hexagon Head: 33 mm) • Spanner (Hexagon Head: 33 mm) • LAN Tool • LAN Cable Tester • Nipper	

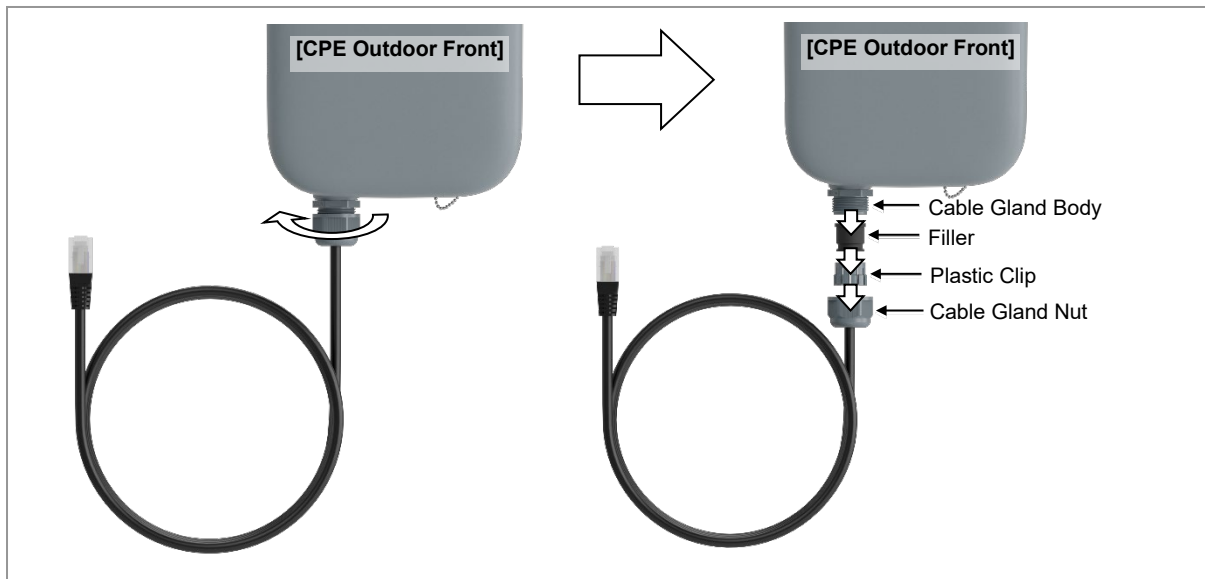
Table below provides the Ethernet cable connector pin map.

Table 17. Ethernet Cable Pin Map (CPE ~ PoE Midspan)

System side	Color Map	PoE Midspan	Function
1	White/Orange	1	BI_DA+
2	Orange	2	BI_DA-
3	White/Green	3	BI_DB+
4	Blue	4	BI_DC+
5	White/Blue	5	BI_DC-
6	Green	6	BI_DB-
7	White/Brown	7	BI_DD+
8	Brown	8	BI_DD-

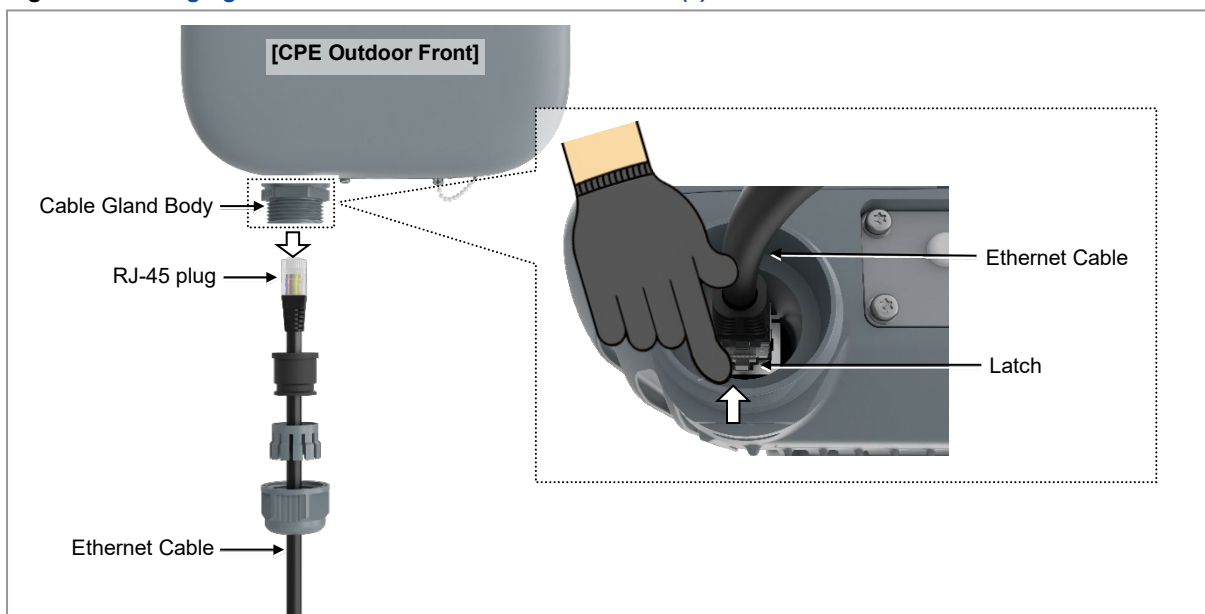
- 2 Unfasten a cable gland nut and separate a filler and plastic clip from cable gland body.

Figure 34. Changing Ethernet Cable from the CPE Outdoor (1)



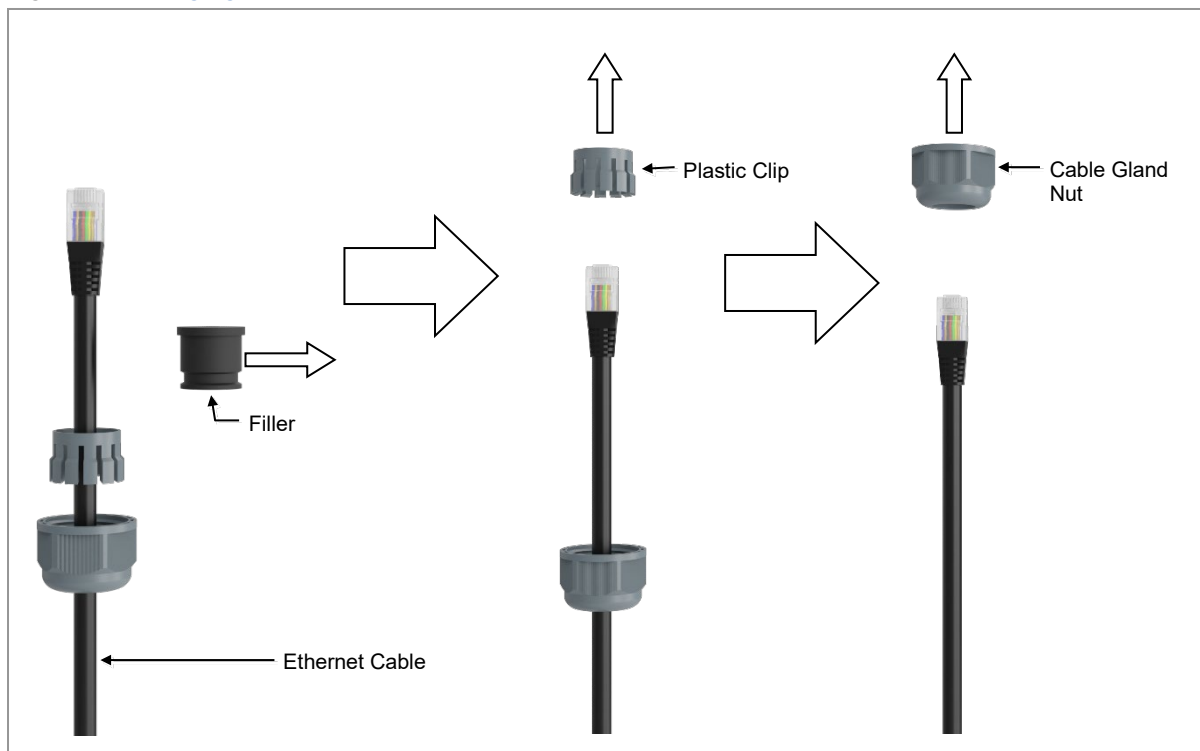
- 3 Remove the RJ-45 plug from the system side's LAN port. Press the latch with the fingers, remove the cable from the connector.

Figure 35. Changing Ethernet Cable from the CPE Outdoor (2)



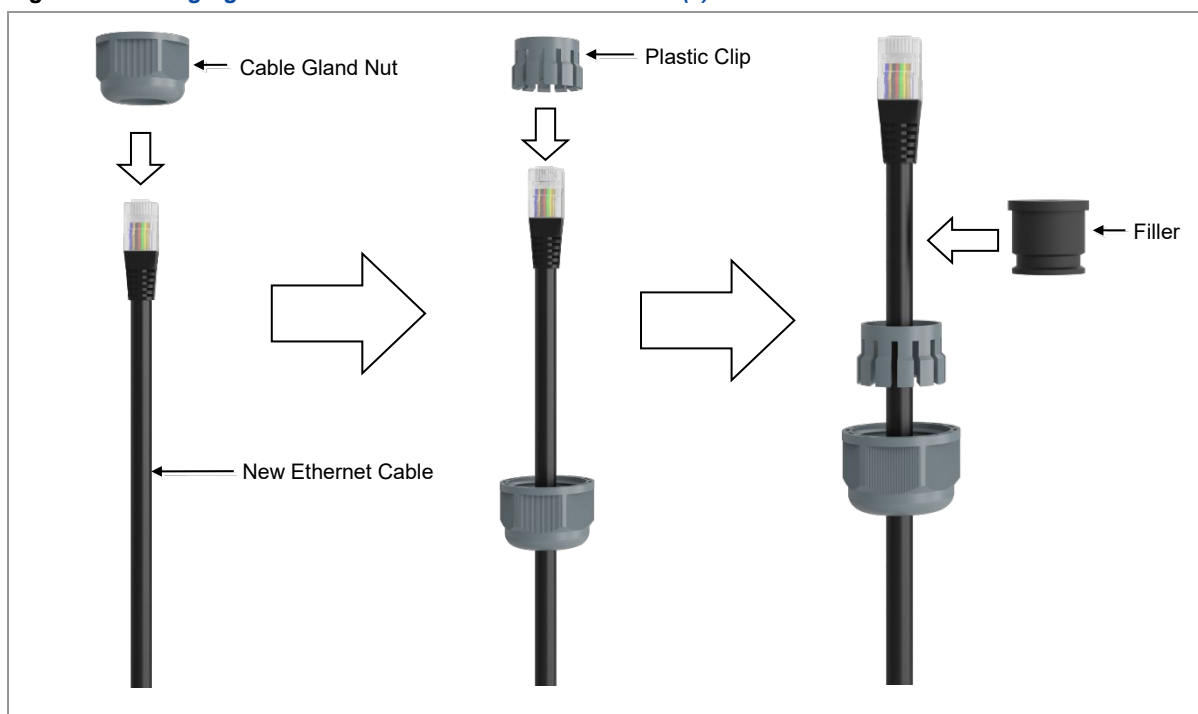
- 4 Separate the filler, plastic clip and cable gland nut in order from the Ethernet cable.

Figure 36. Changing Ethernet Cable from the CPE Outdoor (3)



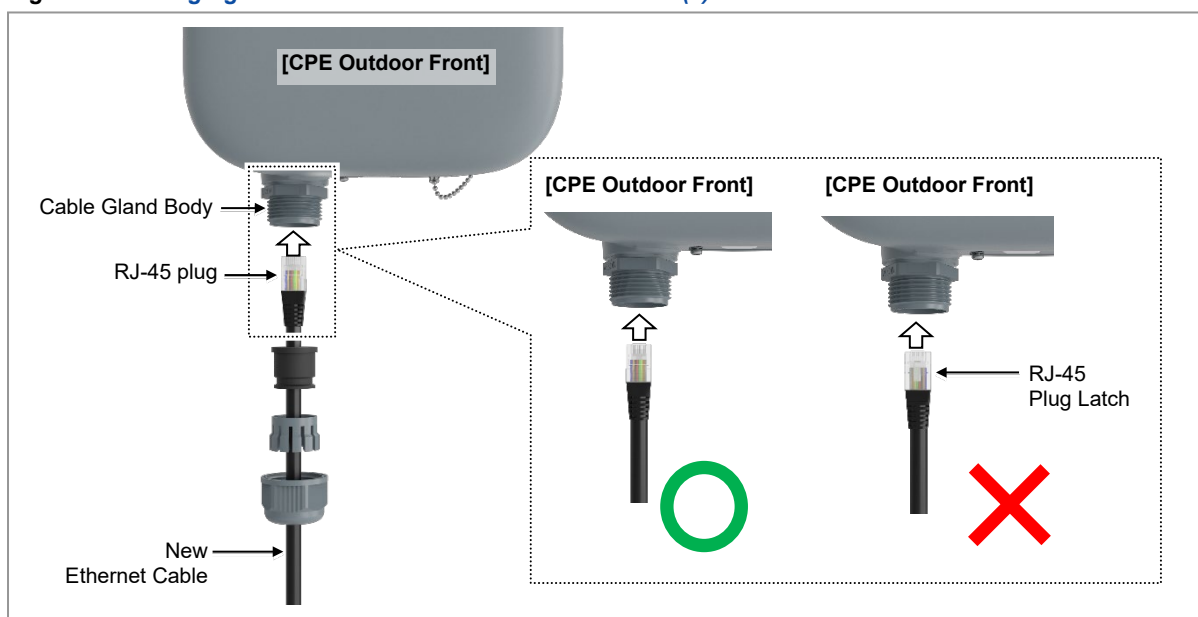
- 5 Insert the cable gland nut, plastic clip and filler nut in order to the new Ethernet cable.

Figure 37. Changing Ethernet Cable from the CPE Outdoor (4)



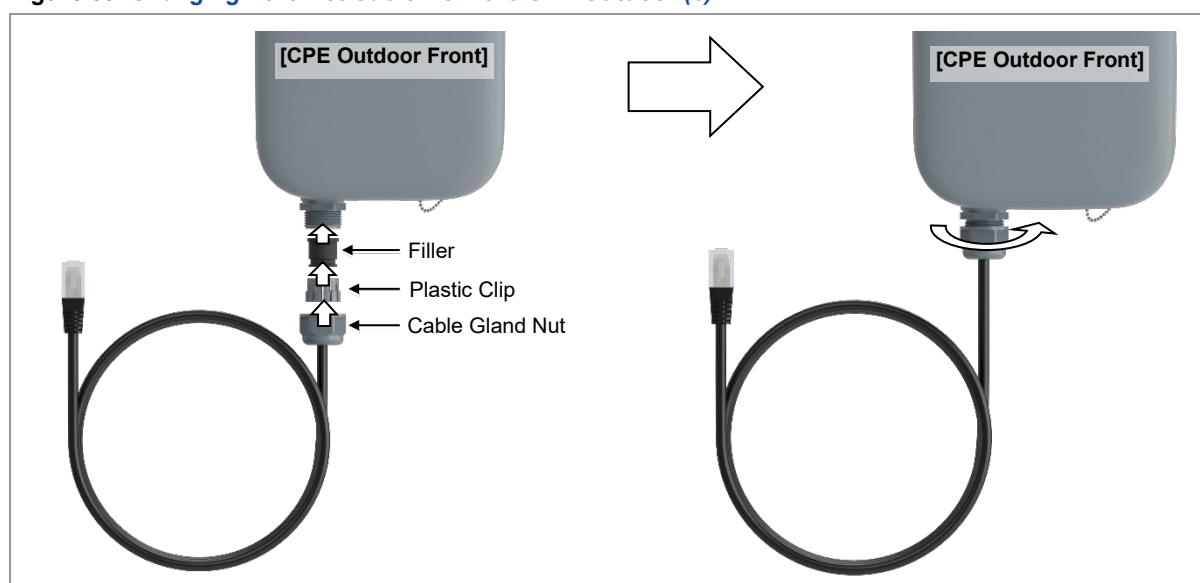
- 6 Insert the RJ-45 plug to the system side's LAN port. (At this time the latch of cable side connector should be toward to the rear side.)

Figure 38. Changing Ethernet Cable from the CPE Outdoor (5)



- 7 Push the filler and plastic clip to the cable gland body and connect the cable gland nut.

Figure 39. Changing Ethernet Cable from the CPE Outdoor (6)



Connecting Ethernet Cable to the PoE Midspan

▶ To connect an Ethernet Cable to the PoE Midspan

- 1 Ensure that the items mentioned in below table are available.

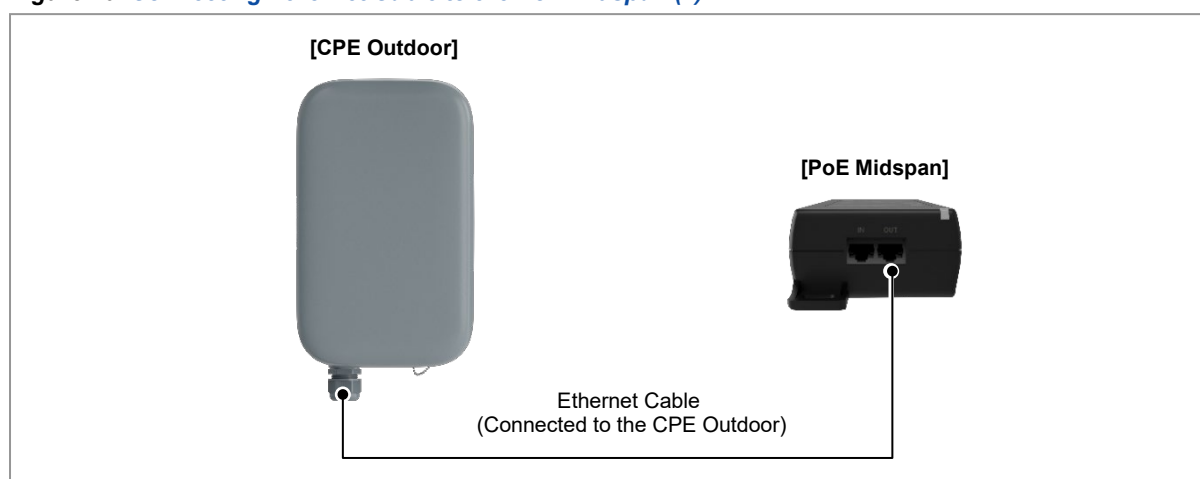
Table 18. Parts and Tools for Connecting Ethernet Cable to the PoE Midspan

Category	Description	
Installation Section/ Cable	CPE Outdoor LAN port ~ PoE Midspan PoE/OUT Port	CAT6 SFTP Cable or higher, 23 AWG, 8.3 mm in diameter (Outdoor Type)
	PoE Midspan DATA/IN port ~ Home Router	CAT6 SFTP Cable or higher, and a cable that can support 5 Gbps (Indoor Type)
Bending Radius	4 × OD	
Connector	PoE Midspan	RJ-45 Plug
	Home Router	RJ-45 Plug
Working Tools	• LAN Tool • LAN Cable Tester • Nipper	

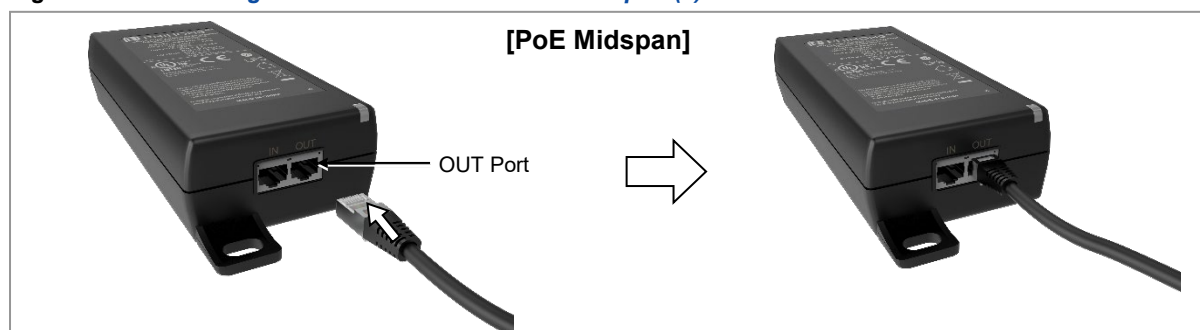
Table 19. Ethernet Cable Pin Map (PoE Midspan ~ Home Router)

PoE Midspan	Color Map	Home Router	Function
1	White/Orange	1	BI_DA+
2	Orange	2	BI_DA-
3	White/Green	3	BI_DB+
4	Blue	4	BI_DC+
5	White/Blue	5	BI_DC-
6	Green	6	BI_DB-
7	White/Brown	7	BI_DD+
8	Brown	8	BI_DD-

- 2 Connect an Ethernet cable from CPE Outdoor to PoE midspan.

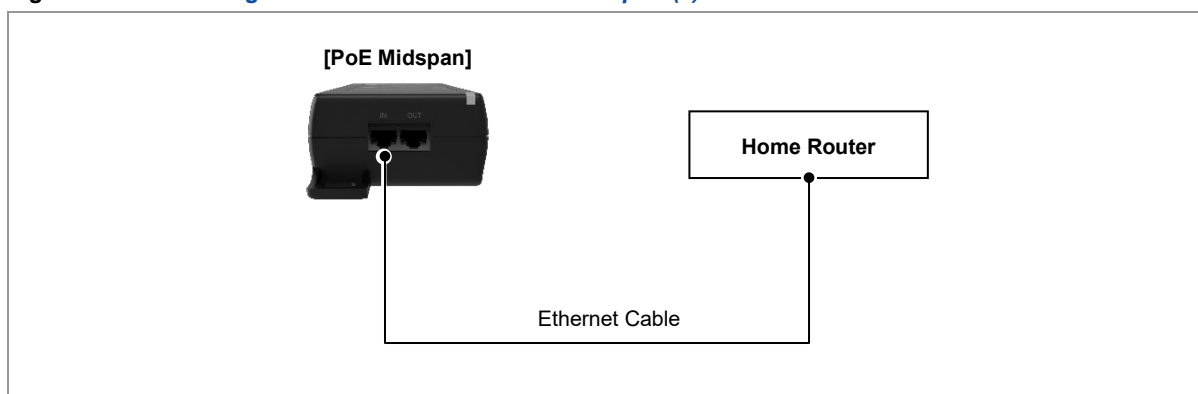
Figure 40. Connecting Ethernet Cable to the PoE Midspan (1)

- 3 Connect the RJ-45 latch of Ethernet cable to PoE midspan OUT port.

Figure 41. Connecting Ethernet Cable to the PoE Midspan (2)

- 4 Connect an Ethernet cable from PoE midspan to home router.

Figure 42. Connecting Ethernet Cable to the PoE Midspan (3)



- 5 Connect the RJ-45 latch of Ethernet cable to PoE Midspan IN port.

Figure 43. Connecting Ethernet Cable to the PoE Midspan (4)



► To check a LED

- 1 After turning the power on CPE Outdoor, check the status of LED.

Table 20. LED Indication

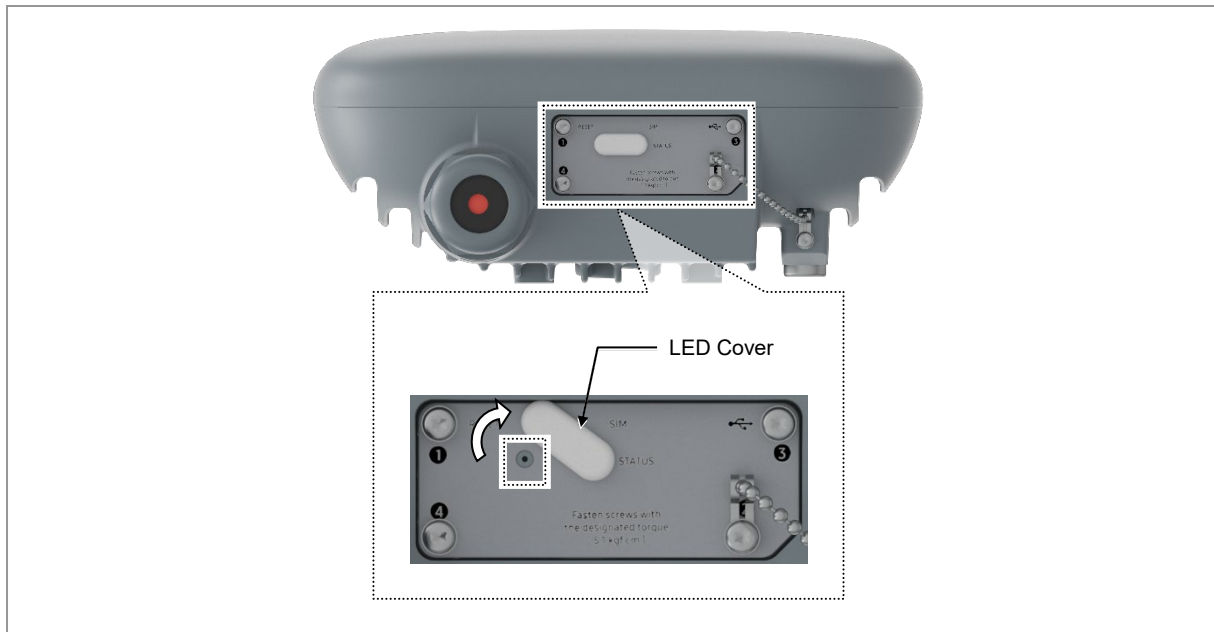
Process	Status	LED	Cycle	Detail
Boot up	No power			No LED indication
	Power on			Solid Cyan, until system bootup
	System booting / initializing / activating			Cyan blinking (600 ms ON, 600 ms OFF) till device is ready
5G signal test (installation mode)	Pairing BT (Shows for 60 seconds or until the device is paired before 60 seconds)			Cyan to OFF to Green to OFF (switch every 200 ms)
	Adequate signal (strong)			Sold Green
	Adequate signal (weak)			Solid Yellow
	No signal			Solid Red

Process	Status	LED	Cycle	Detail
Regular mode	Internet available (app confirms 5G signal test is done)			Solid Cyan dimmed to 50 % brightness
	Internet disabled through device settings			Yellow blinking (600 ms ON, 600 ms OFF) until Internet's available
Pairing result states	BT connection success			Cyan blinking (200 ms ON, 200 ms OFF) x 3
	BT connection failure			Red blinking (200 ms ON, 200 ms OFF) x 3
Changing modes manually	Changing from installation mode to regular mode (press RESET key for 3 seconds)			Cyan blinking (200 ms ON, 200 ms OFF) x 3
	Changing from regular mode to installation mode (press RESET key for 3 seconds)			Yellow blinking (200 ms ON, 200 ms OFF) x 3
	Error / Lost connection to Internet / No SIM card / SIM card error or locked			Red blinking (600 ms ON, 600 ms OFF)
	FW update			Cyan blinking (200 ms ON, 200 ms OFF) x 3 until FW update is completed

Table 21. LED time cycle

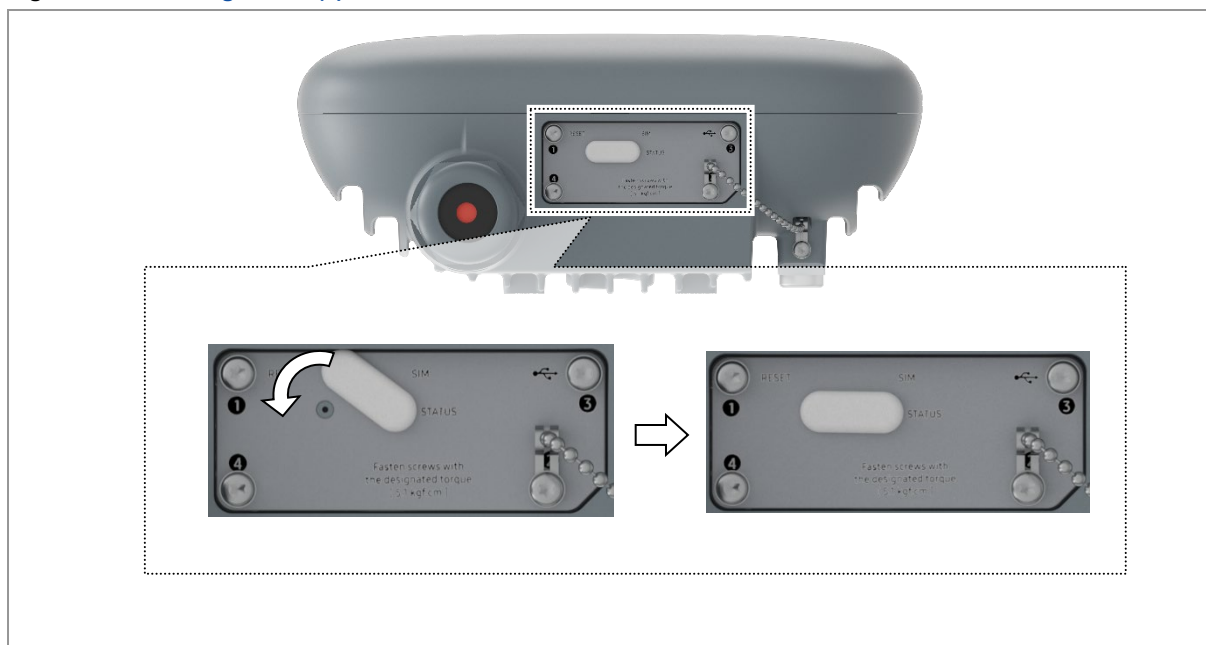
Cycle	Description
	• 600 ms ON • 600 ms OFF
	• 200 ms ON • 200 ms OFF
	• Switch color 1: - 200 ms ON - 200 ms OFF • Switch color 2: - 200 ms ON - 200 ms OFF
	ON (Solid)

- 2 Open the LED cover of CPE Outdoor and check the status of LED.

Figure 44. Checking a LED (1)

- After turning on the CPE Outdoor, connect an auxiliary battery. It will operate in installation mode, and you can check the 5G signal strength with the LED. If there is nothing wrong, disconnect the auxiliary battery and connect the cable.
- After completing the installation, use the RESET key to switch from installation mode to regular mode. If you find any problem in regular mode, switch to installation mode again and recheck the LED.
- Refer to Table 22. LED Indication for more specific details on the LED status.

- 3 After checking whether the CPE Outdoor is in working order, close the LED cover.

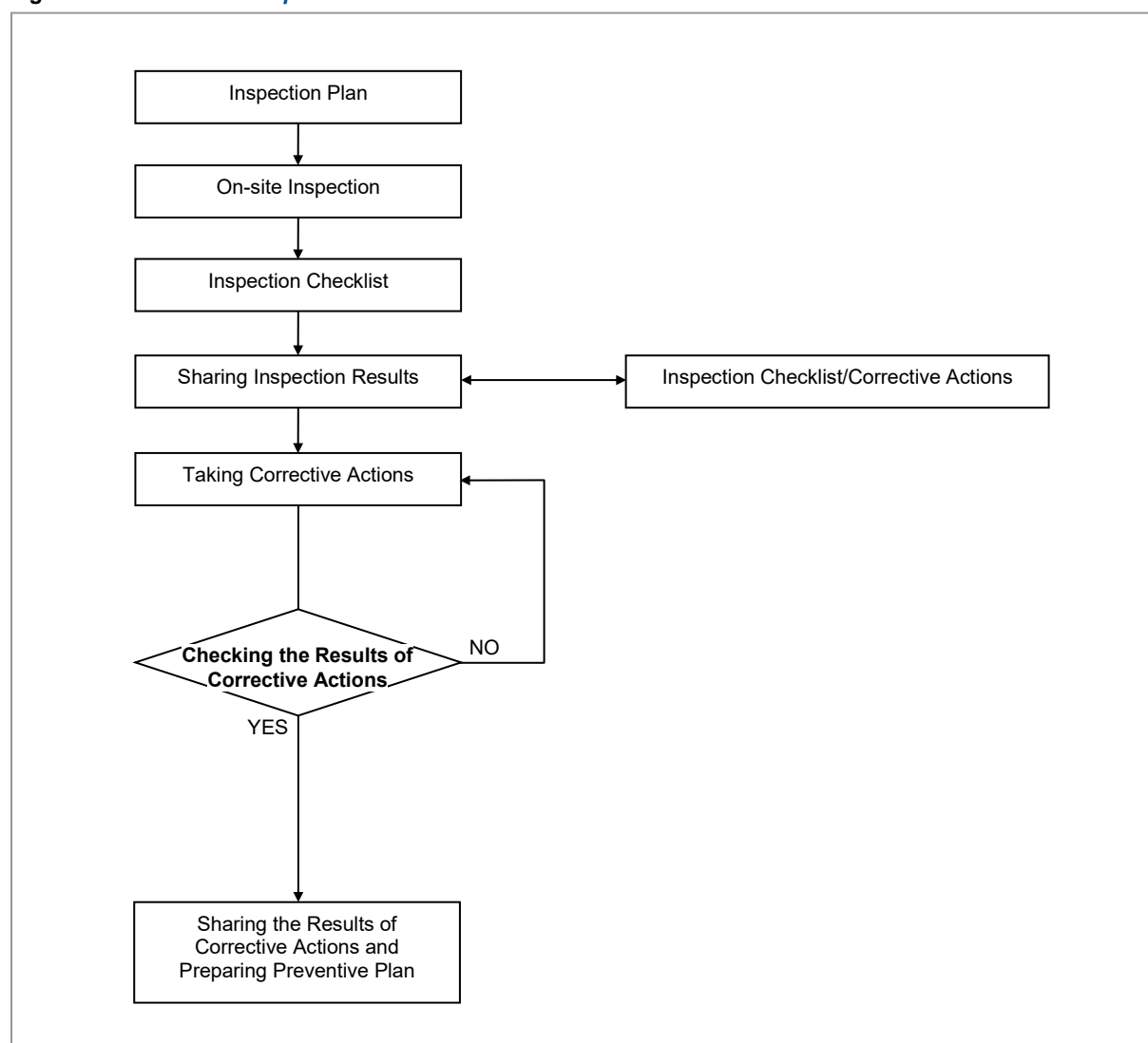
Figure 45. Checking a LED (2)

Chapter 4 Inspect the Installation

This chapter describes the procedures to check installation status.

Figure below depicts the overall procedure for inspecting the installation status.

Figure 46. 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 prevent the same or similar problems from re-occurring.

Construction Situation Checklist

Table below provides the checklist to check the installation of the CPE Outdoor and other devices.

Table 22. 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		
Grounding	Installation of ground bar	Checking the separation of communication/power/lightning grounding		
	Cable specification	Checking the specification		

Category	Check Items	Criteria	Result	
			Pass	Fail
	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		
Power	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		
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)		
		Assembly condition of a connector		
		Fastening condition of a connector		
Opinion				

Appendix A Acronyms

AC	Alternating Current
CPE	Customer Premises Equipment
DC	Direct Current
EMC	Electromagnetic Compatibility
MGB	Main Ground Bar
PoE	Power over Ethernet
RTN	Return
SEMS	pre-asSEMBled washers and screws
SIM	Subscriber Identity Module
UTP	Unshielded Twisted Pair

Appendix B Standard Torque

When operator fastens the bolt, use the standard torque values provided in tables below to prevent the equipment and bolt from damage and secure by fastening. When the torque value for each connection part is defined already, use the defined value.

Table 23. 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 24. 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 25. 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, depending 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.

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Installation Manual**

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