Document Number	QW_02_0036.001

GIoT ODU

Installation Guide

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- Lightning Arrester*2
- 3G/4G Antenna*1
- GPS Antenna*1
- PoE
- WAN
- Power

— RF Cable
— Ethernet
— Power

Distance at least 100 cm

Antenna 915MHz

Antenna 915MHz

Lightning Arrester

Lightning Arrester

3G/4G

Gateway

GPS Antenna

3G/4G Antenna

WAN

Poe
Input:100-240V
~0.8A 50-60Hz
Output:56V 0.536A

Power
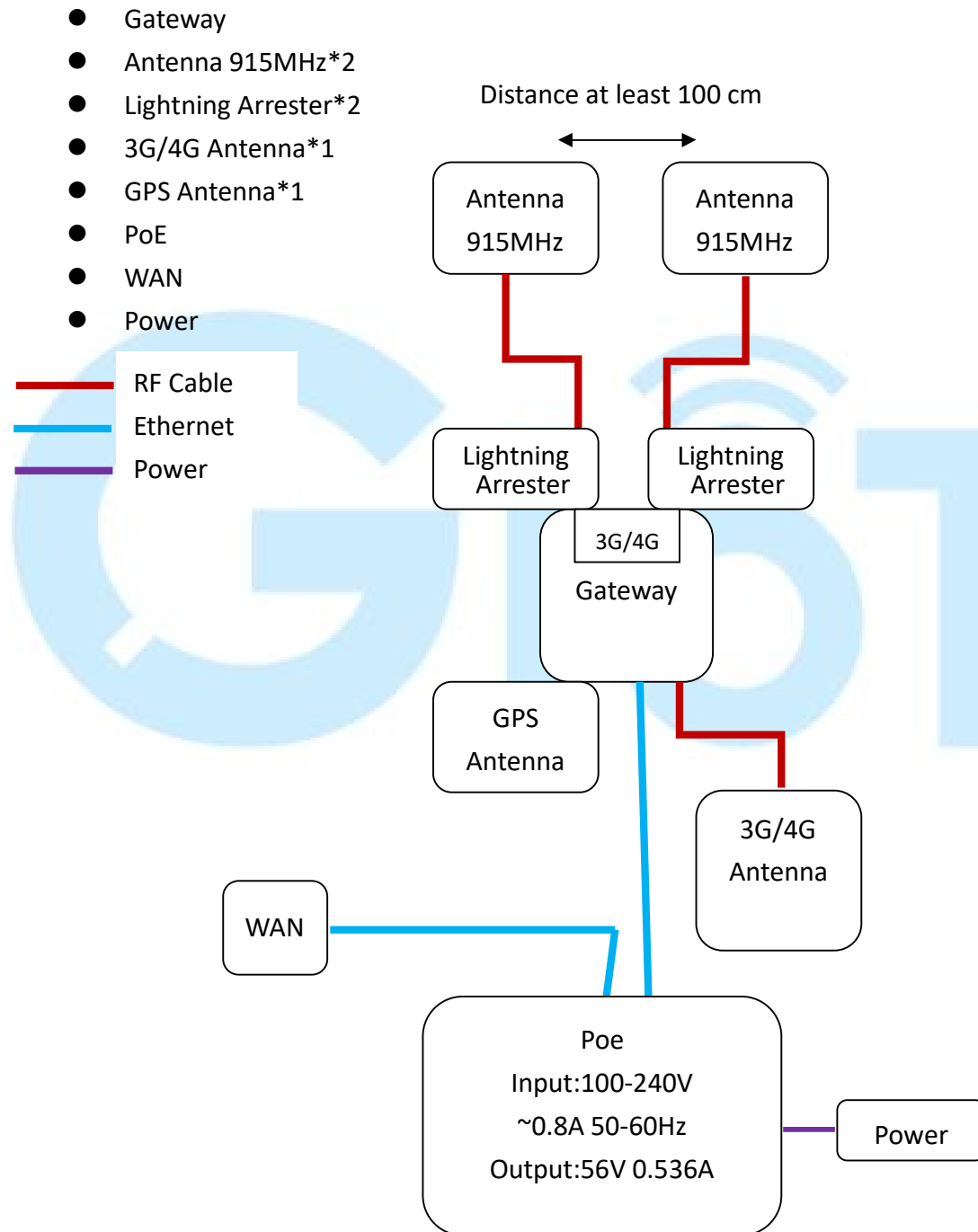
Figure 1   GioT System Architecture Diagram

1.2 Diagram of Standard Product Equipment

No	TITLE	Q'TY	No	TITLE	Q'TY
1	WAPS-232N324	1	8	DIPOLE ANT. 110MM	1
2	PE BAG	1	9	POWER CORD	1
3	GPS ANT.	1	10	POE ADAP.	1
4	MOUNT KIT ASS'Y	1	11	BOX	1
5	HOLD-EPE	1	12	CARTON(455*375*548mm)	1/6
6	RJ45 CONNECTOR	1	13	PALLET(120*100cm)	1/72
7	RF CABLE	1			
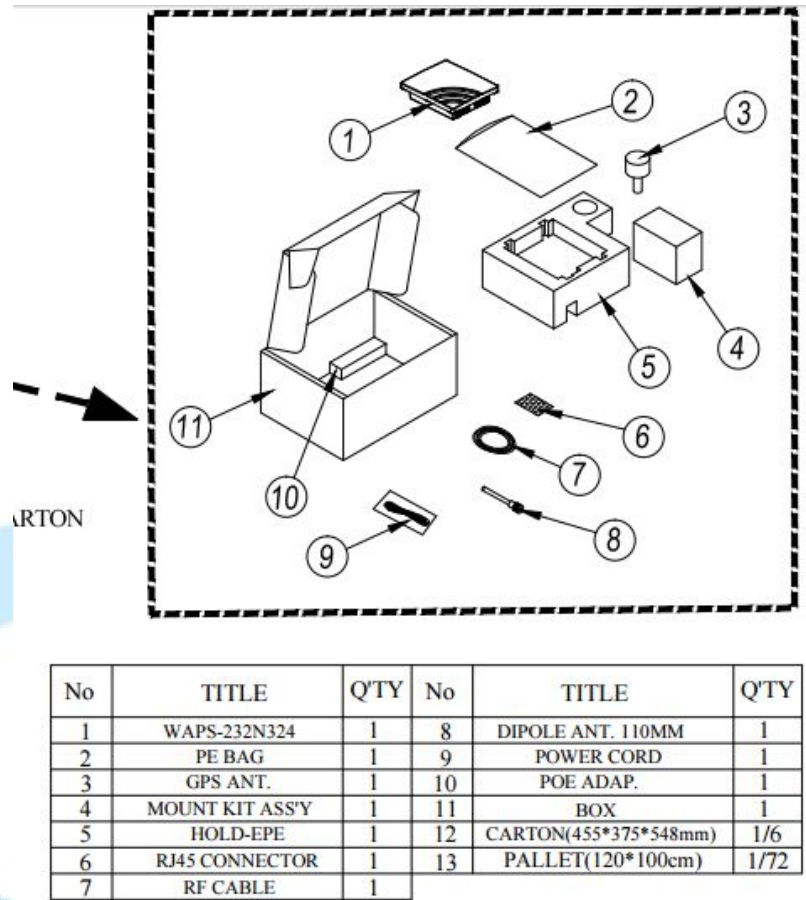
Figure 2   Diagram of Standard Product Equipment

Figure 3   Actual View of Standard Equipment

Table 1 Device Specifications

No.	Name	Quantity	Remark
List of Specification Items			
Gateway			
1	Gateway(WAPS-232N_LW)	1	● Wireless Frequency Band **902 ~ 928MHz ISM (SKU-US)** **862 ~ 870MHz ISM (SKU-EU)** **470 ~ 510MHz ISM (SKU-CN)** ● Operating Voltage: 48V ± 10% (POE adapter) ● Transmit Power 0.5W (up to 27 dBm) ● Receive Sensitivity -142 dBm ● Antenna Type N-Type connected antenna ● Operating Temperature -20ºC ~ 60ºC
2	Gateway Protective Pouch	1	
3.	GPS Antenna(1.5GHz)	1	● Frequency Range :1575.42 ± 1.023 MHz. ● Gain :　90° : 5.0 dBi Min. 　　　　　20° : -2.0 dBi Min. Mounted on the 60mm*60mm ground plane. ● Polarization : RHCP ● Axial Ratio : 90° : Max 3.0dB Mounted on the 60mm*60mm ground plane.
4.	Mount kit	1	Gateway mount kit (accessories included)
5	Gateway Protection Foam		
6.	Waterproof Connector	1.	RJ45 CABLE CONNECTOR ASS'Y (R) WAPA-216N29WW OUTDOOR ODS
7.	GPS RF cable	1	3 Meter RF cable(Return loss < -20dB)
8.	3G/4G Antenna	1	● Frequency Range 698~960MHz/1710~2700MHz ● Average Gain:0~1dBi ● Polarization:Vertical Linear ● Connector type: N-type
9.	Power code	1	According to country standards
10.	Power over Ethernet (PoE)	1	● Power over Ethernet Output: Pin Assignment and Polarity:4/5 (+), 7/8 (–)

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			Output Power Voltage: 55Vdc User Port Power: 30Watts (Guaranteed) ● Input Power Requirements: AC Input Voltage: 100 to 240 Vac AC Input Current: 0.8A @100-240Vac AC Frequency: 50 to 60 Hz ● Environmental Conditions Operating Ambient Temperature: -4º to 104ºF (-20 to 40ºC) @ 30W -4º to 131ºF (-20 to 55ºC) @ 22.5W Operating Humidity: Maximum 90%, Non-condensing Storage Temperature: -4º to 158ºF (-20º to 70ºC) Storage Humidity: Maximum 95%, Non-condensing ● Regulatory Compliance IEEE 802.3at (PoE,) RoHS Compliant, WEEE Compliant, CE ● Power cord: connect to PoE Input/Output:220V
11	Ethernet Cable (not included)	2	1 connected to PoE、 1 connected to WAN Cat5e FTP
12	Antenna(915MHz)	2	● 6, 7.2 or 10 dBi Antenna for Lora ● Distance between the two antennas must be at least 100cm
13	Lighting arrester	2	● VSWR < 1.5

For item 12 antenna table:

Gain(dBi)	6	7.2	10
Length(cm)	130	155	170
VSWR	<1.5	<1.5	<1.5

Node			
1.	Node Antenna((915MHz))	1	902MHz~928MHz / ≥ 0 dBi/ SMA plug
2.	GIoT GPS node	1	

Note: Items listed in red are optional accessories which are not included within the product package. Please contact GIoT personnel for additional purchases.

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Chapter 2 GIoT Gateway System Installation Instructions

2.1 Exterior Appearance of the Gateway Device:

Isometric view - A   Isometric view - B
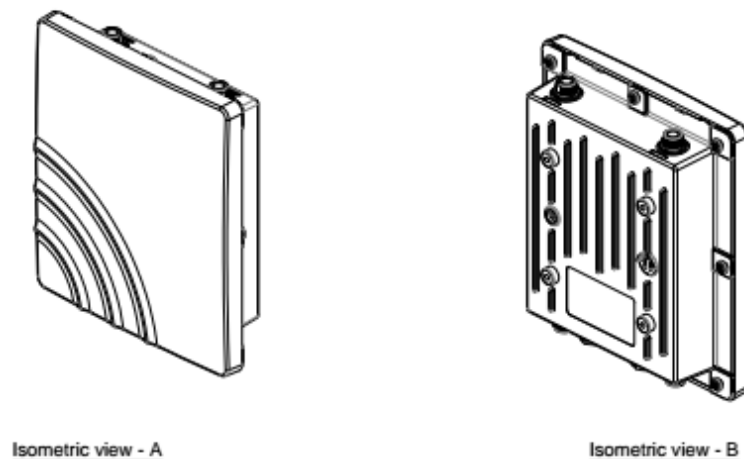
Figure 4   Gateway Front and Rear View

Access Point(AP)

Size:230*200*68mm

1. 915MHz Antenna(N-type female)

2. 915MHz Antenna(N-type female)

3. 3G/4G mini SIM card

4. GPS1.5GHz Antenna(N-type female)

5. Ethernet 至 PoE(Connected to Gateway installed with waterproof connector)

6. 3G/4G Antenna(N-type female)

Figure 5   Gateway Installation Instructions

2.2 Equipment Installation

Device installation can be physically supported by either post mount or wall mount. Installation instructions are stated in the following sections and diagrams.

Figure 6　Diagram of Equipment Installation Procedures

2.2.1 Post Mounting

Pre-installation preparations

Please make sure that all required tools and components are available prior to installation.

➢Tools: Allen wrenches (M5 and M8) or an adjustable wrench, Philips screwdriver

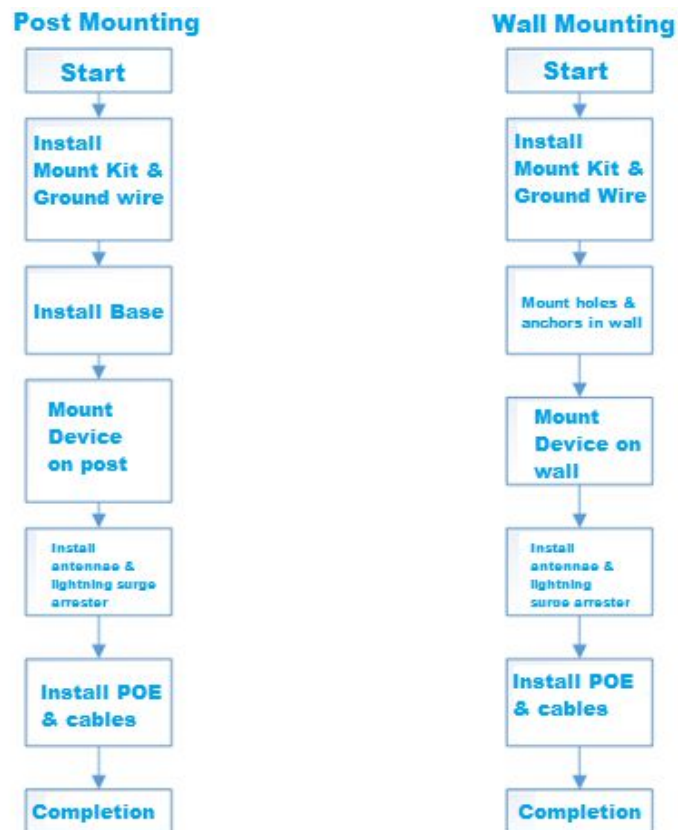➢List of components:
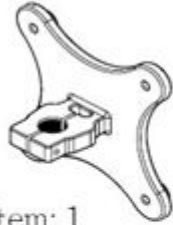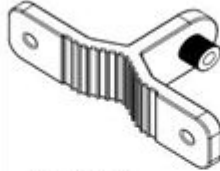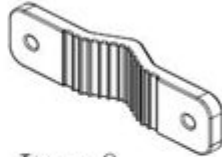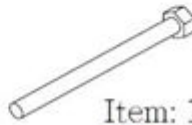
Table 2   List of Gateway Mounting Kit Components

CODE	Name of Component	QTY
1	Outdoor Gateway	1
2	Mounting Base Frame	1
3	Adjustable Plate	1
4	Fixing Plate	1
5	Pack of Screws (includes the necessary types of screws)	1

➢Component details as described in the following:

Table 3   Description of Gateway Mounting Kit Components

⚠	Mount kits, frames, screws, and anchors are not included in the standard product and must be purchased separately.

Step 1

Secure the base frame of the mount kit to the Gateway device, as shown in the figure below:
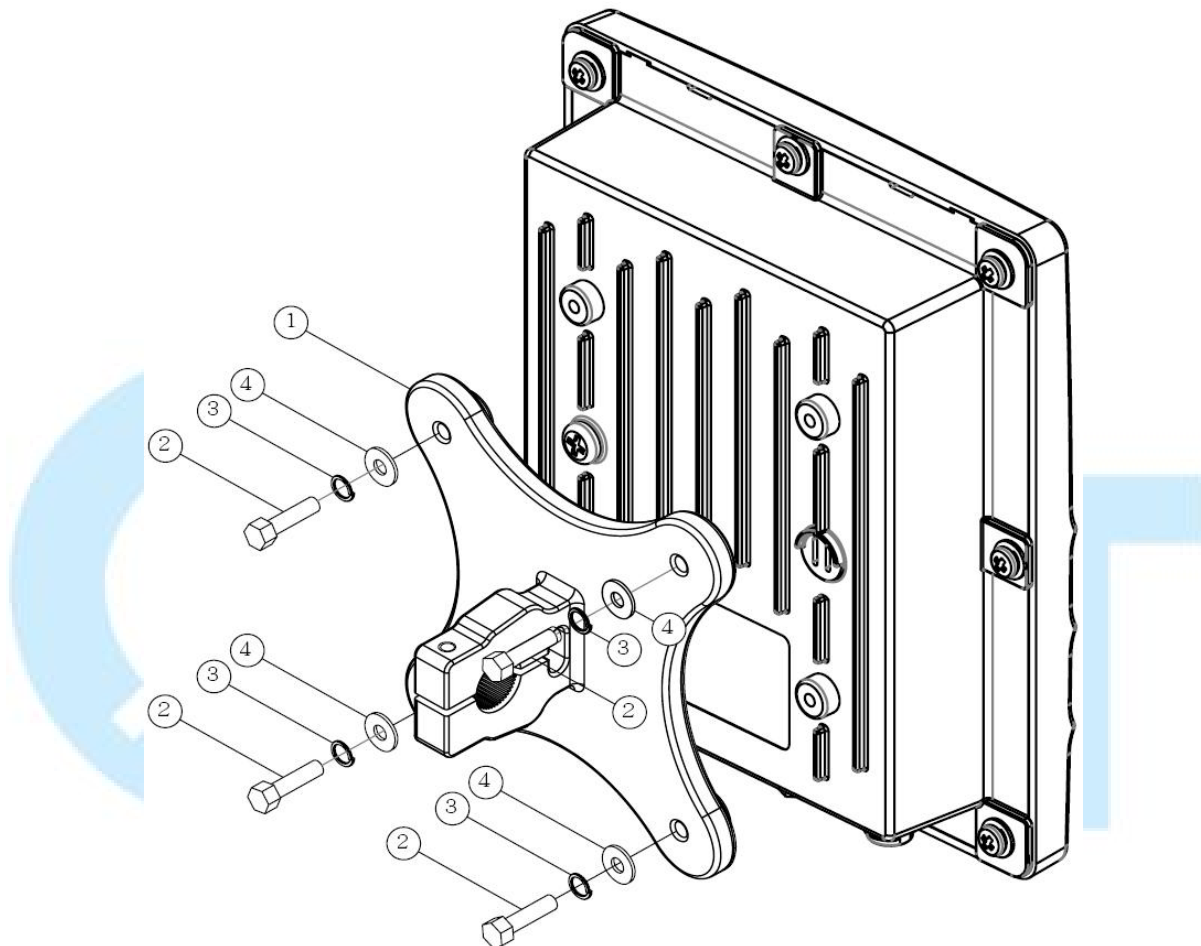
Figure 7   Assembling the Base Frame - Diagram I

Step 2

Secure the adjustable plate to the base frame. Please take note NOT to fasten the locking screws and adjustment screws in a tight manner at this point of installation.

Adjustment Screws
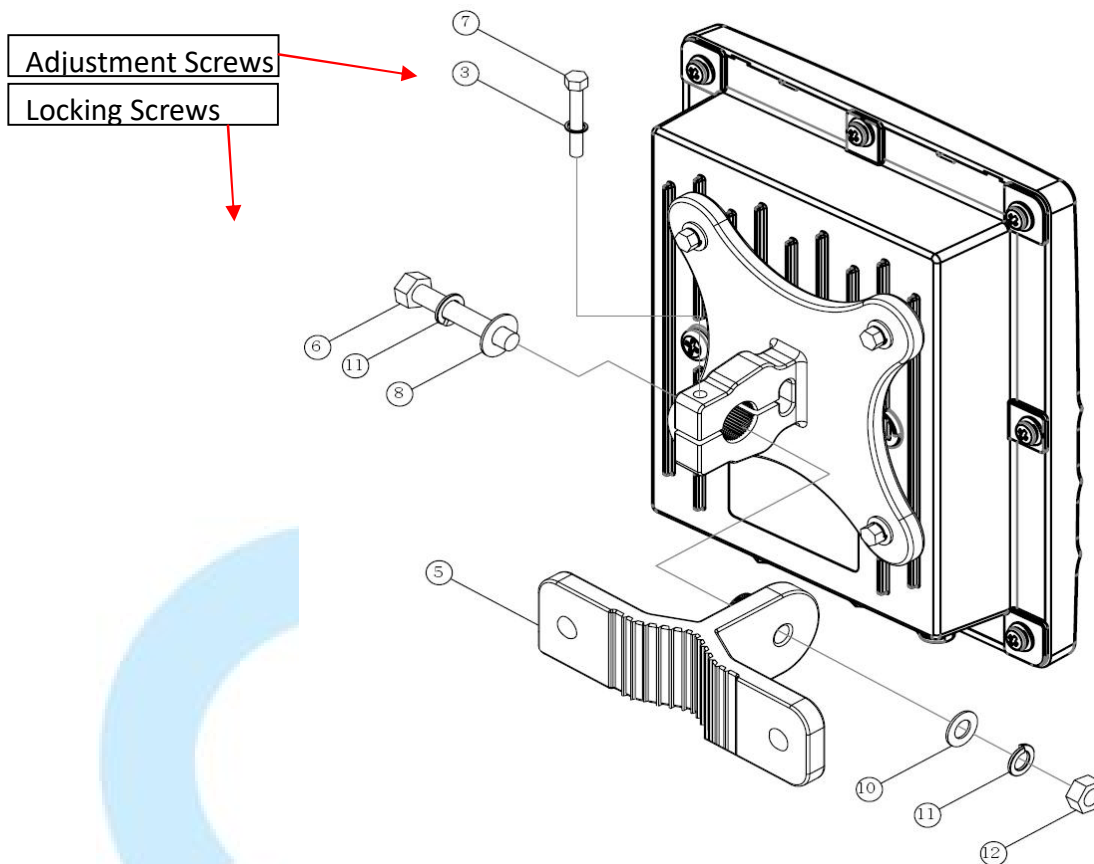
Locking Screws

Figure 8   Assembling the Base Frame - Diagram II

Step 3

Install the base frame of the Gateway device against the pole by tightly fastening the fixing plate to the adjustable plate by using locking screws and adjustable screws. (It is recommended to install the Ethernet portal downwards.)
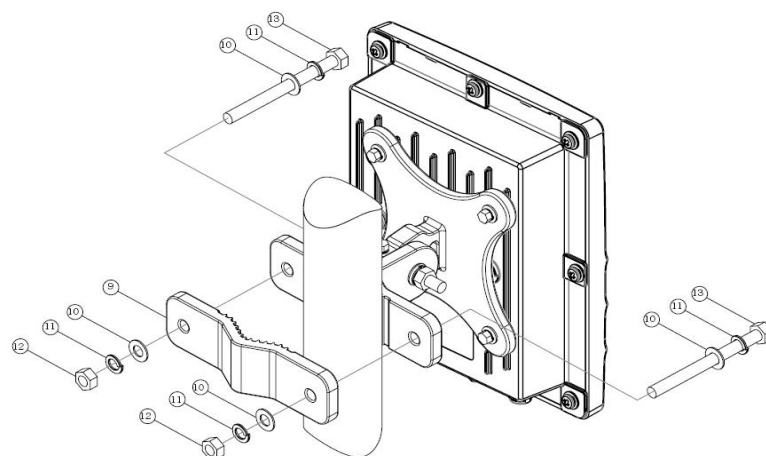
Figure 9   Diagram I of Pole Installation

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Step 4

The ground wire portal is situated at the corner of the Gateway with a ⊖ icon. When the ground wire resistance is less than 5 ohm, the recommended diameter of the ground wire would be less than 6 mm^2.
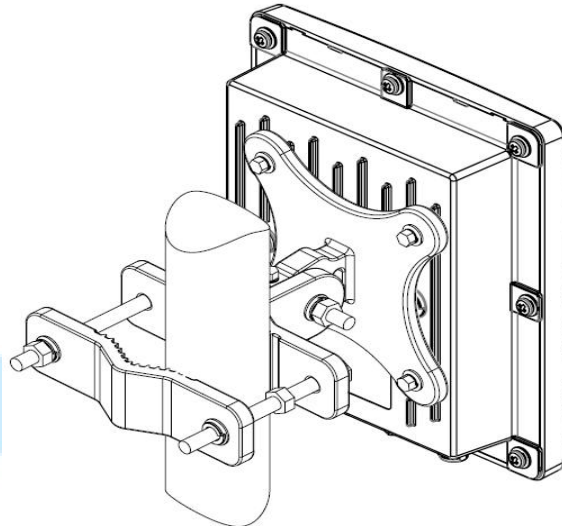
Figure 10   Diagram II of Pole Installation

2.2.2 Wall Mounting

Pre-installation preparations

Please make sure that all required tools and components are available prior to installation.

➢Tools: Allen wrenches (M5 and M8) or an adjustable wrench, Philips screw, impact drill and drill bits (the diameter of the drill bit has to be Φ12.7mm), measuring tape 120mm or longer, iron hammer

➢List of components:

Table 4   List of Gateway Mounting Kit Components

CODE	Name of Component	QTY
1	Outdoor Gateway	1
2	Mounting Base Frame	1
3	Adjustable Plate	1
4	Pack of Screws (includes the necessary types of screws)	1
5	Expansion anchors (stainless steel)	2

Step 1: Positioning the wall mounting holes

Mark and drill suitable spots on the wall based on the measurements taken from the mounting kit. The width between the two mounting holes ought to be 114mm apart and 38.1mm deep by using a Φ12.7mm drill bit. As shown in the following figure below.
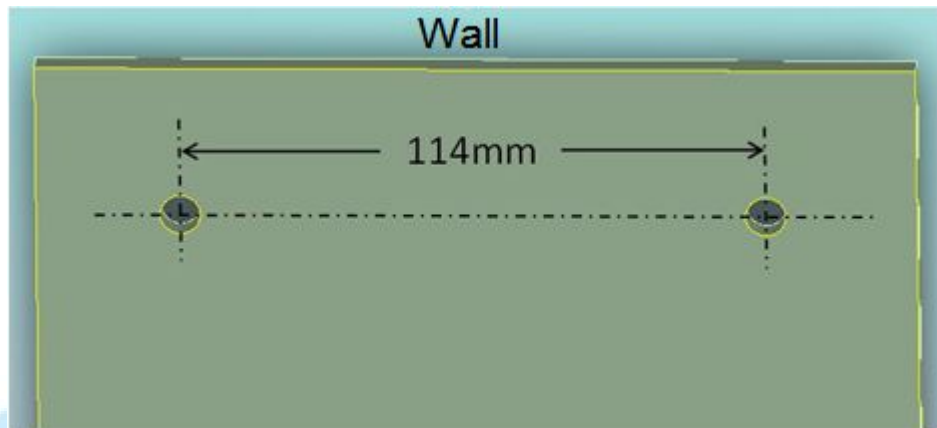
Figure 11   Width between the wall mounting holes

Step 2: **Inserting stainless steel anchors**

After drilling holes in the wall, insert and drive stainless steel anchors into the holes with a hammer until they are fully fixed inside the wall.
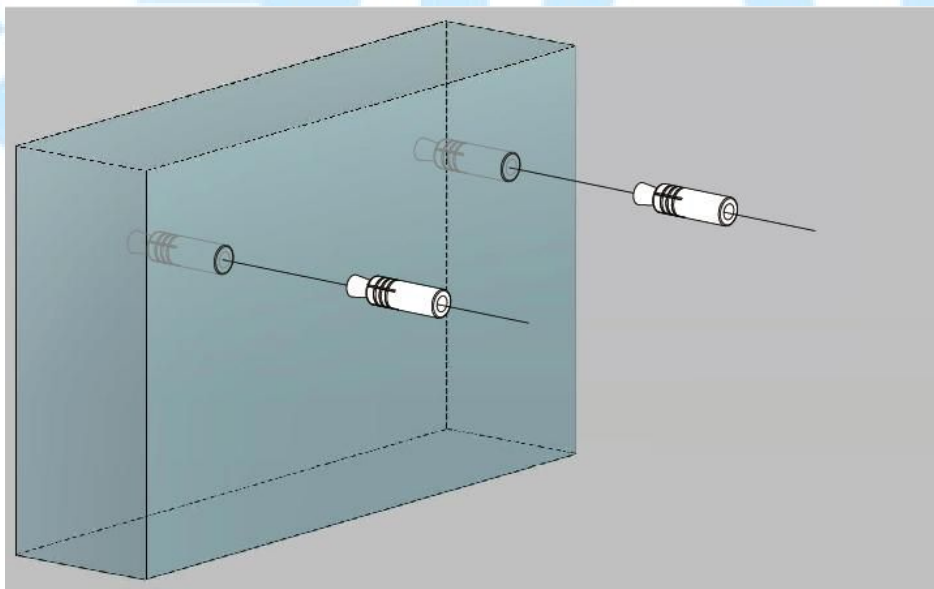
Figure 12   Installation Diagram of Wall Mount Anchors (Stainless Steel)

Step 3: **Installing the Adjustable Plate**

Fasten the adjustable plate against the wall by securing it with hexagon screws. Figure as illustrated in the following.
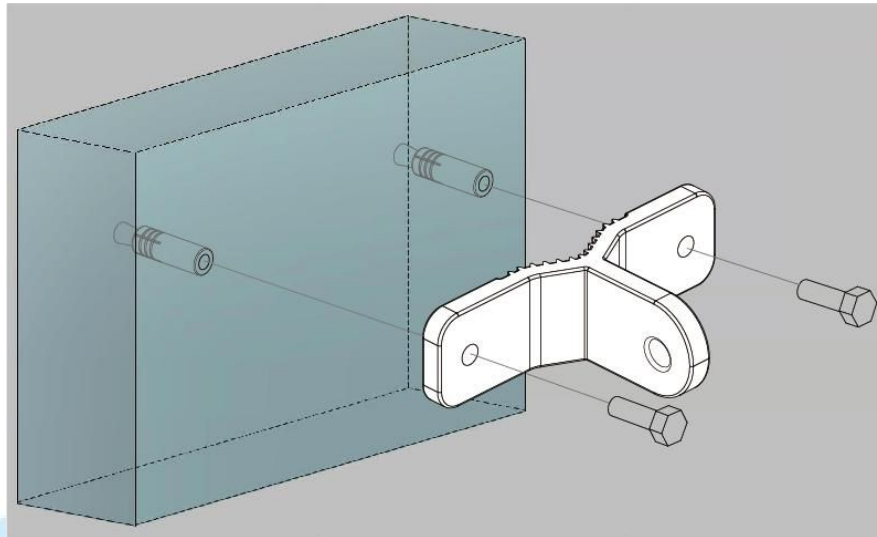
Figure 13   Installation Diagram of Adjustable Plate

Step 4: **Assembling the Base Frame and Ground Wire**

Secure the base frame of the mount kit to the Gateway with M5x8mm screws and connect the ground wire. The ground wire portal is situated at the corner of the Gateway with a ⏚ icon.
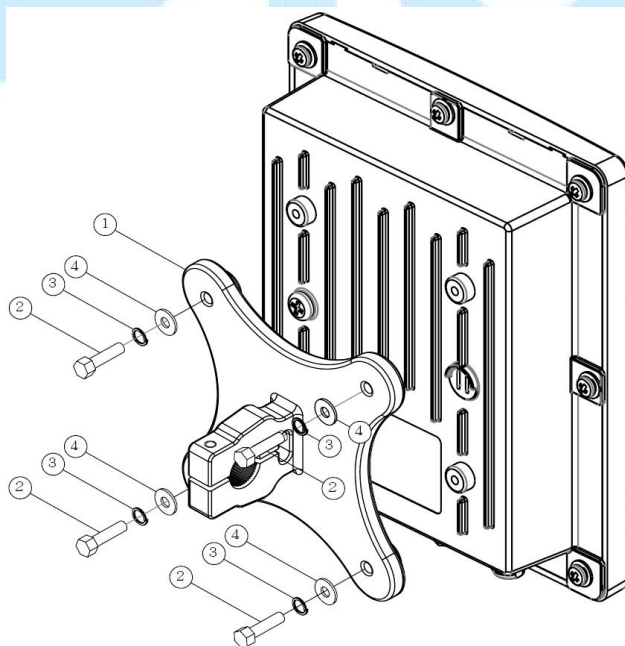
Figure 14   Assembling Diagram of Base Frame
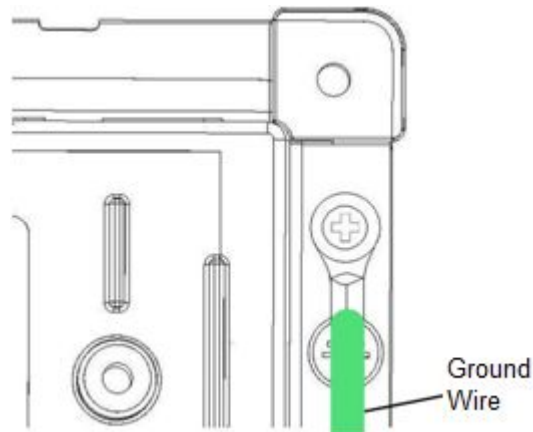
Figure 15   Depiction of Ground Wire

Step 5: **Fastening the Gateway to complete the installation**

Match and secure the Gateway base frame against the adjustable plate by inserting
M8x50mm locking screws through the conjoining ends and fasten the screw with nuts.
Adjust the Gateway to the appropriate angle and fasten with M5x35mm adjustable screws to
secure the device in place. Please see the following diagram:
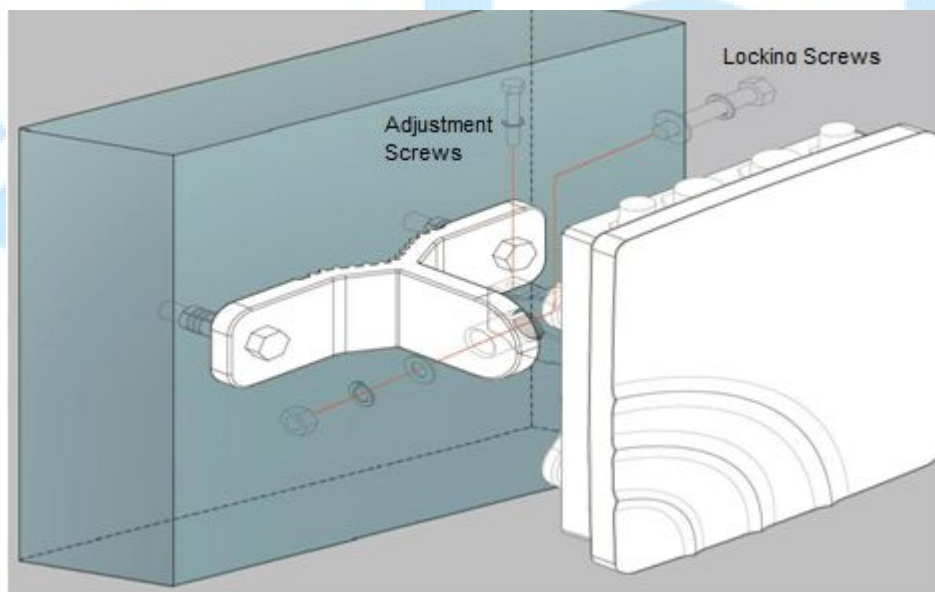
Figure 16   Installation Completion

Step 6: Connecting the RF cable

The RF (*Radio Frequency*) cable is used to connect the antenna and the gateway with a lightning arrester nested in between.

⚠️	**Note:** Install the lightning arrester between the antenna and the gateway device.
⚠️	**Note:** The device could be damaged if no-load power occurs when the high-power antenna is connected. This type of damage is not warranted.
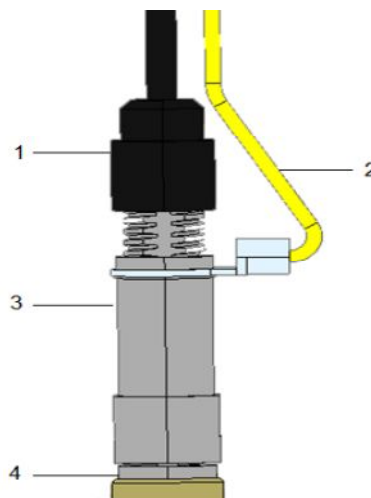
Figure 17   Connecting the RF Cable

Table 5   Connecting the RF Cable

1	RF cable type N connector	**3**	Lightning arrester
2	Lightning arrester ground wire	**4**	Antenna connector

●**Steps for installation:**

1. Connect one end of the lightning arrester to the antenna connector.

2. Connect the type N connector of the RF cable to the lightning arrester.

Step 7: Connecting the power and data cables

⚠️	**Note:** Power and data cables are not included in this product and must be purchased separately.

- Please use network cables that comply with the 802.3at cable specification
- Please use a POE+ switch that complies with the 802.3at power standard

2.2.3 Assembling and Securing the Waterproof Connector

The outdoor gateway device requires specialized waterproof Ethernet connectors. The product device comes with one set of waterproof connector components [Waterproof connector - Included in the waterproof packet].

Prior to installation, a RJ-45 Ethernet connector, cable and the waterproof connector must be conjoined. Make sure that the Ethernet cable used should be a FTP (*Foiled Twisted Pair*) outdoor cable and that the gateway device is properly grounded. Please follow the steps below to assemble the waterproof connector. While installing, please ensure that the nut is securely fastened to prevent water or air from entering the gateway device.

①Insert the main body of the waterproof connector into the metal nut	②Place the clamp and the sealing sleeve into the narrow end of the main body	③Insert the Ethernet cable through the waterproof components and sealing nut cap
Nut	Clamp Seal	Ethernet cable Sealing nut cap

④Press down the clip and push the RJ-45 into the waterproof contraption.	⑤ Tighten the sealing nut once the RJ-45 is stationed in the main body.	⑥Place the waterproof liner through the RJ-45 and secure it to the main body
RJ-45 Ethernet connector	RJ-45 Ethernet connector	Waterproof liner

Description of various components

RJ-45 Ethernet connector

Sealing nut cap   Clamp   Seal   Metal nut   Main body   Waterproof liner

Side view

Waterproof liner

Sealing nut cap   Clamp   Seal   Metal nut   Main body   RJ-45 Ethernet connector

Figure 18   Steps for Installation

⚠	**Note:** Cable assembly and installation must be handled by a professional.
⚠	1. The device complies with the IP-67 waterproof standard. 2. After the installation is completed, we recommend the use of waterproof tape to seal the adjoining parts of the RJ-45 Ethernet connector and the antenna connector to enhance the level of waterproof protection.

2.3 Power

Power is supplied to the gateway device via PoE (*Power over Ethernet*). Users can verify whether the PoE device is working correctly by viewing the indicator light.

- Power over Ethernet (PoE):
  - ➢ Output: connects to the gateway device
  - ➢ Input: connects to WAN
  - ➢ Power Supply Specification:
    AC Input Voltage: 100 to 240 Vac
    AC Input Current: 0.8A @100-240Vac
    AC Frequency: 50 to 60 Hz

Figure 19   PoE Installation Instructions

2.4 WAN

The gateway device is to transmit data to the Server. Means of transmission can be divided into two types: Ethernet (wired network) and 3G / 4G (mobile network). The Ethernet PoE In port (WAN) needs to be connected to a physical network device. As for 3G / 4G wireless network connections, a mini Sim card is inserted in the gateway device (Figure 20) to acquire access to mobile networks. PoE Out port (LAN) is to be connected to the Gateway Ethernet connector regardless of the transmission type.

Note: The length of the network cable has to be less than 100m.

Figure 20   Sim card installation

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Chapter 3 Base Station Installation Reference

Subject to different environments, the base station should be installed in specialized manners. Installation can be roughly divided into two types: wall-mount installation and base-mount installation. In general, wall-mount installation is the preferable choice since wall-mount installations are less likely to result in a water leak in the roof (you need to make sure there are no water pipes inside the wall and that there are no water towers above the wall) and this type of installation is relatively less expensive. However, in order to make the right choice, the physical presence of a construction professional and the owner of the building are required in order to evaluate and draw the final decision.

In addition, please note

1. Network cables should not be longer than 100(m). The location of the base station will affect the length of the network cable.
2. The height of the antenna must not exceed the 45 degrees cone of protection from the lightning rod.
3. A certain level of attenuation will exist on the RF Cable
4. Waterproof measures must be applied to the installation site.
5. Please ensure that there are no obstacles blocking the antenna and that the antenna is in a vertical state.
6. The way the gateway is installed should make it easy to maintain
7. The gateway, lightning surge arresters, and other relative equipments must be properly grounded.
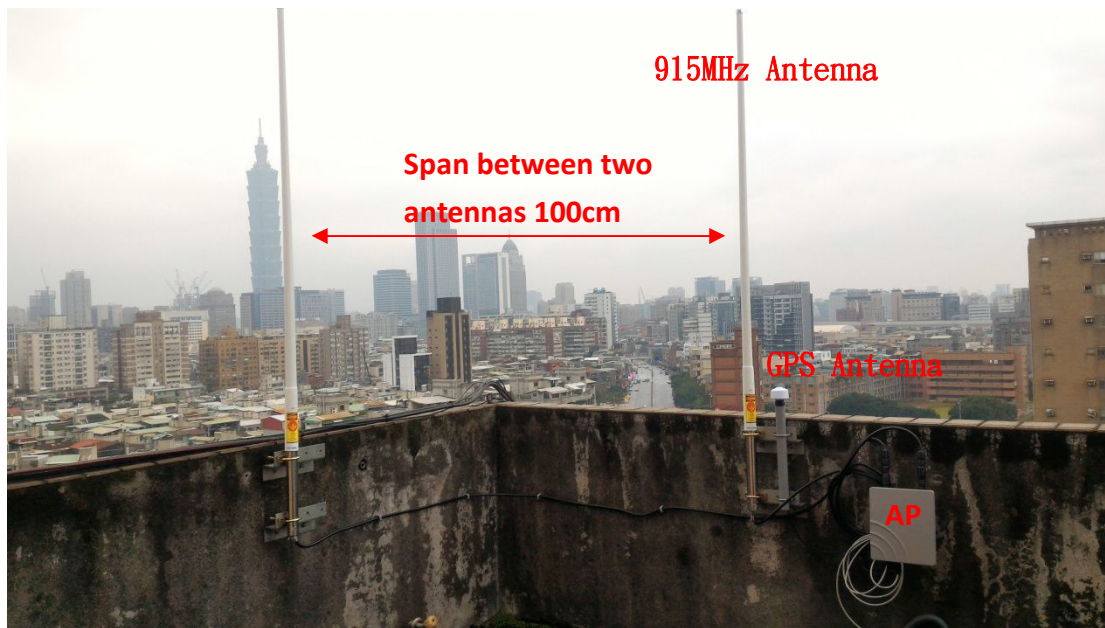
3.1 Wall-mount Installation

Figure 21   Actual View of a Wall-mount Installation

Step 1. Please avoid walls that are connected to the water tower (an assessment made by a professional is required).

Step 2. Use anchors to help secure the mount kit on the wall. Attach the Gateway device to the mount kit.

Figure 22   Wall-mount Installation – Image 1

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Figure 23   Wall-mount Installation – Image 2

Step 3. The GPS and antenna are secured onto the wall by using a customized metal bracket.

1. The antenna is secured onto the bracket by using the mounting kit or a customized U ring.
   Note: Use a level to make sure that the antenna is completely vertical.

Figure 24   The Level

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2. Insert the GPS antenna into a 1 inch PVC pipe. Then, use two 1 inch U rings to secure the pipe to the rod.

Figure 25   Customized Metal Bracket – Image 1

Figure 26   Customized Metal Bracket – Image 2

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Figure 27   Customized Metal Bracket – Image 3
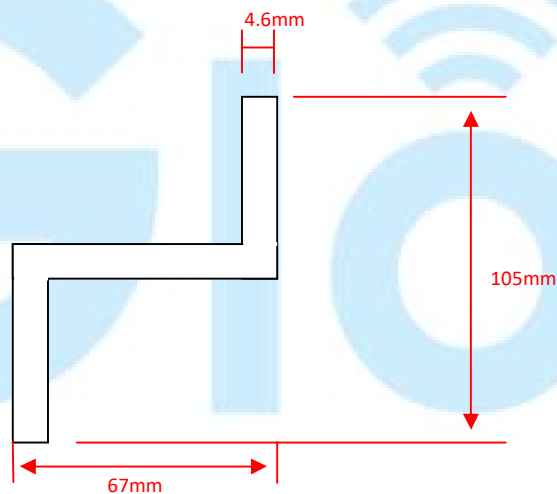

Figure 28   Specifications for Customized Metal Bracket – Image 1
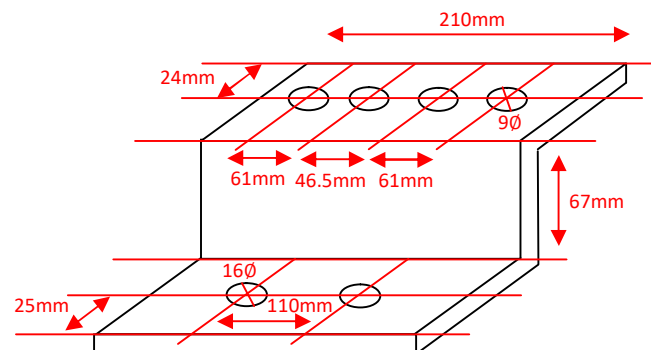

Figure 29   Specifications for Customized Metal Bracket – Image 2

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Step 4. The grounding wire that connects the lightning arrester to the gateway device should be 5.5mm^2 in diameter. The ground wire should be secured to ground copper bars or an equipment grounding conductor. If grounding apparatus are not available, please fasten the ground wire to the mount kit to deliver a similar grounding effect.

Figure 30　Lightning Protections and Grounding Equipment – Image 1

Figure 31　Lightning Protections and Grounding Equipment – Image 2

Step 5. The antenna and RF cable connectors should be wrapped with electrical tape or covered with waterproof materials to resist water penetration.

Step 6. Waterproof connectors should be used for connecting network cables. Network cables near the machine room should be wrapped with conduits, e.g. size 6 PVC cable protection hose. Network cables and RF cables should be secured to avoid wind-induced vibrations.

Figure 32   6 PVC cable protection hose

3.2 Base-mount Installation

Figure 33   Actual View of a Base-mount Installation

Step 1. Please make sure that the installation will not cause a leak in the roof (an assessment made by a professional is required)

Step 2. Establish a cement base (with a thickness of at least 6cm). The amount of time required for the cement to harden may vary based on different cement compositions. Make sure that there is sufficient thickness to support the base-mount.

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Step 3. Secure the base of the galvanized pipe. Please see image as shown below.
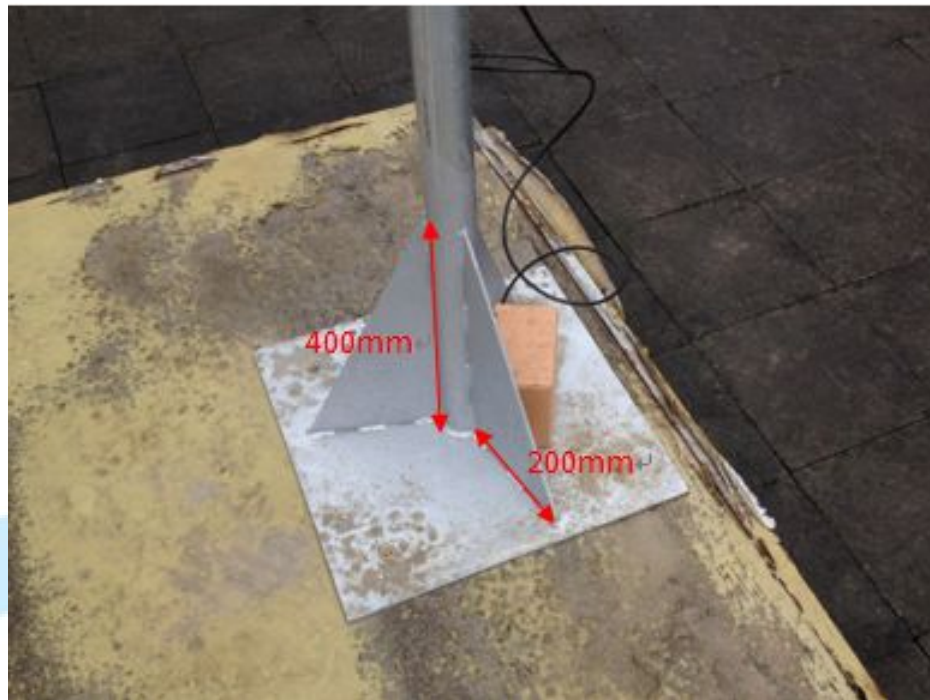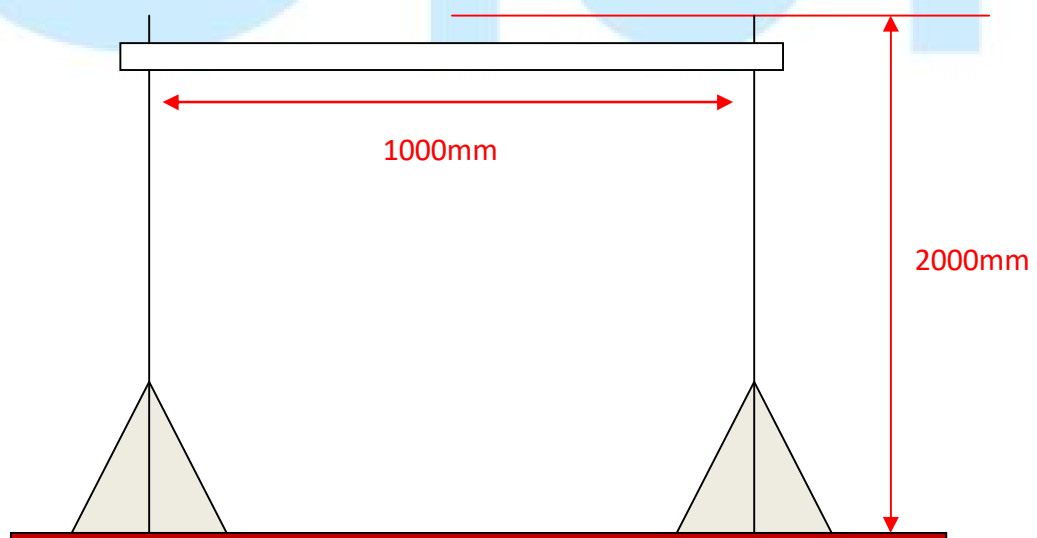

Figure 34   Establishing the Base -1

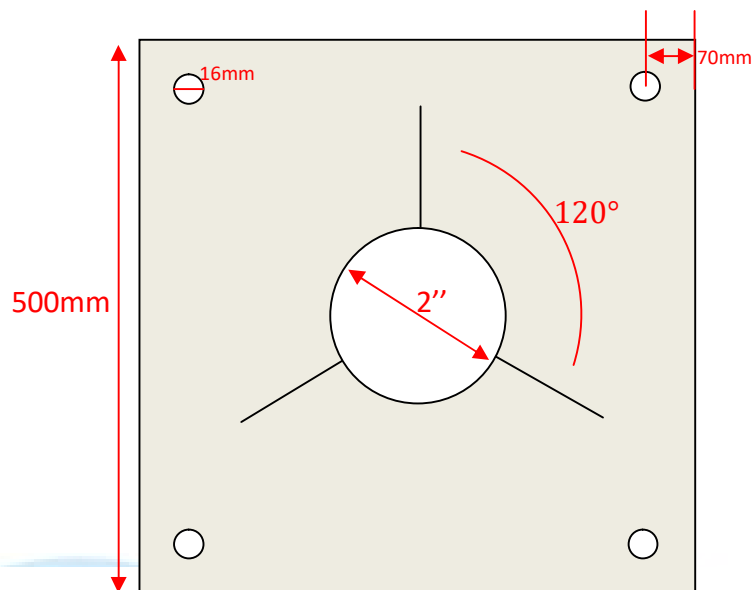Figure 35   Establishing the Base -2

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Figure 36   Establishing the Base -3

Step 4. Attach the metal bracket (5mm thick) to the galvanized pipe with a U-ring.

Step 5. Secure the Gateway mount kit to the galvanized pipe.

Step 6. Secure the antenna to the galvanized pipe by using the mount kit or the customized U-ring.
    Note: Please use a level to verify whether the antenna is vertically erected.

Step 7. Insert the GPS antenna into a 1 inch PVC pipe. Then, use 1 inch U screws *2 to secure the pipe to the pole.

Step 8. The antenna and RF cable connectors should be wrapped with electrical tape or covered with waterproof materials to resist water penetration.

Step 9. Waterproof connectors should be used for connecting network cables. Network cables near the machine room should be wrapped with conduits, e.g. size 6 PVC cable protection hose. Network cables and RF cables should be secured to avoid wind-induced vibrations.

Step 10. The grounding wire that connects the lightning arrester to the gateway device should be 5.5mm^2 in diameter.

Chapter 4 Base Station Function Test

A function test is expected to be performed followed by the completion of the base station. The test is categorized into two types: Connection Test and Signal Test. The main purpose of the Connection Test is to verify the operation status of the base station. On the other hand, the Signal Test is to analyze and determine whether or not the functionalities of the base station are operating on track based on its collected data. The overall testing and monitoring can be achieved via various web platforms (please see below) to grasp a better understanding of the current connection and signal quality.

4.1   ODU GUI

The ODU GUI is a web interface for gateways to conduct configurations over the internet. The ODU GUI uses the IP address assigned by the Gateway to enter the network setting page.

(1) Connect the PoE Output cable to the Gateway Ethernet connector. Connect the PoE Input cable to the network connection device.

Figure 37   ODU GUI-1

(2) Enter the IP Address assigned by the Gateway into the web browser to acquire access to the ODU GUI interface. Type in the Provision Code.
Note: As shown in the following figure as an example, the IP Address is default as DHCP. Please contact GIoT FAE Team if you encounter problems or questions associated with the Provision Code.
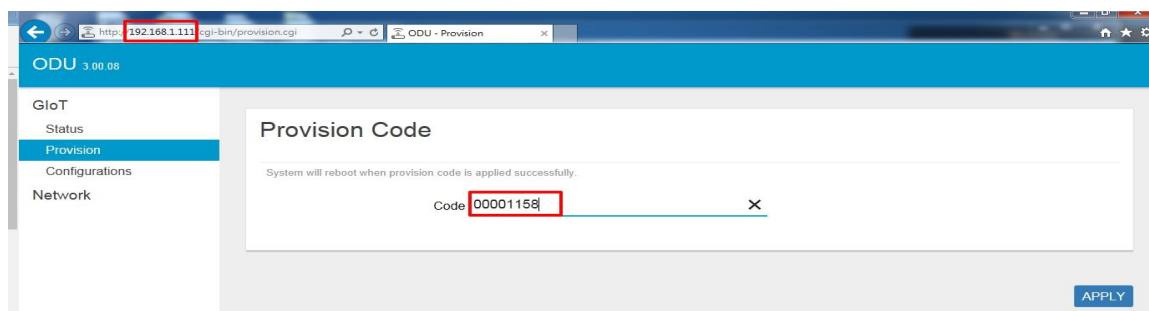
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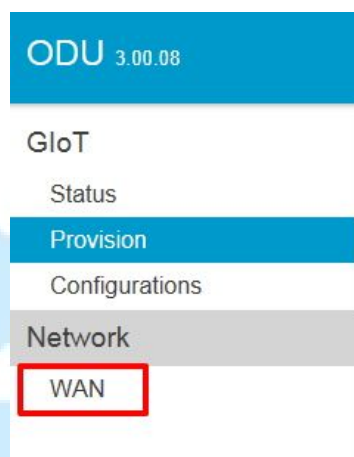Figure 38   ODU GUI-2

(3)Select Network→ WAN in the menu.

Figure 39   ODU GUI-3

(4)Users may see two option buttons lined on top of the main content box: "Ethernet WAN" and "3G/4G LTE".   Please select according to transmission requirements.
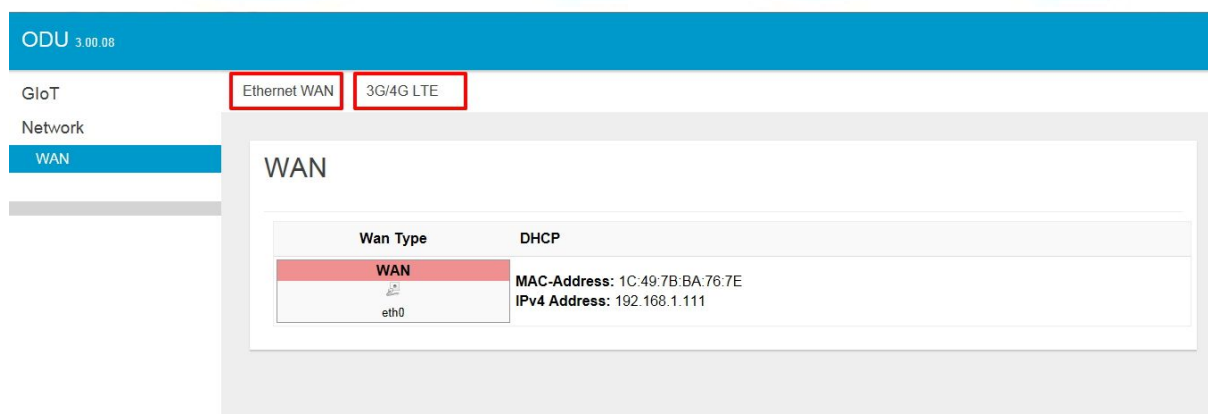

Figure 40   ODU GUI-4

Choose "Ethernet WAN" when physical network connection is required. Next, select "DHCP Client" to automatically retrieve default IP; select "Static IP" when using Fixed or Manual IP. For the latter, enter the IP Address, Subnet Mask, Gateway and DNS Server. Click "Apply".

Figure 41   ODU GUI-5

Choose "3G/4G LTE" for wireless connection. Enter APN and PIN (Skip PIN code if SIM Card does not have one setup). Click "Apply" once all required fields are entered.
Note: Once 3G/4G LTE setup is completed, please access Gateway webpage via "192.168.11.10" for 192.168.11.XX.

Figure 42   ODU GUI-6

Table 6   APN

Country	Telecom Co	APN
Taiwan	Chunghwa	Internet
Taiwan	FarEasTone	Internet
Taiwan	Taiwan Mobile	Internet
Taiwan	Taiwan Star	Internet
Taiwan	Asia Pacific	Gtnet
China	China Mobile	Cmnet
China	China Unicom	3gnet
China	China Telecommunications Corporation	Ctnet

Note: APN may be subject to different country locations and telecommunication service providers. Please contact the local telecommunication companies for inquiries.

(5) Click "Apply". The system will automatically reboot to complete the setup.

Figure 43   ODU GUI-7

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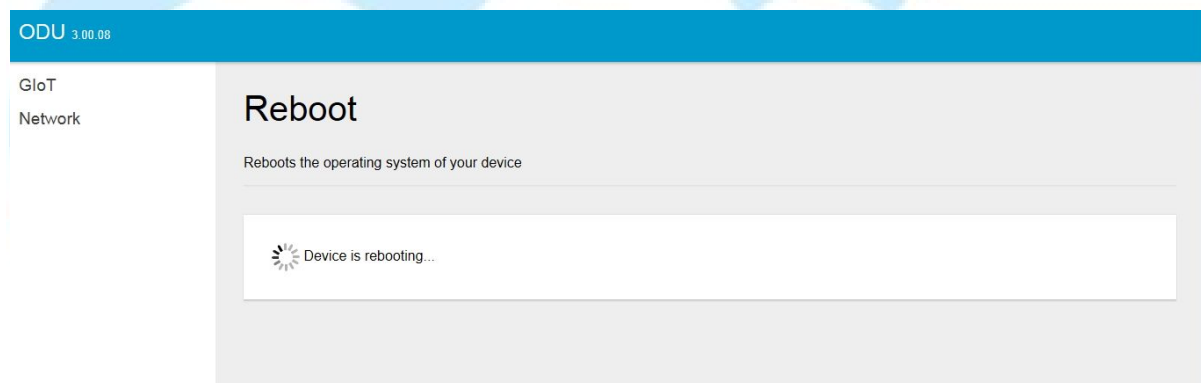
4.2   GNMS

Gemtek GNMS, a powerful network management server platform that allows the IT managers to control, configure and monitor their network devices all over the world. GNMS management function contains fault management, configuration management, security management, performance management and online status monitoring. It allows full control and assists the IT professional to manage their network.

(1) Login to GNMS. Select "Device Management"➔"Device List" to query device information.

Figure 44   GNMS-1

(2) Device information can be verified by inserting the AP MAC or other criteria in the search field.

Figure 45   GNMS-2

(3)Verify device serial number(AP MAC), product type, software version and IP address.
The device serial number and product type has to be exactly the same as the information that is listed at the rear of the Gateway device. Please make sure that the software version and IP address are correct.

|	Device ID ▲▼	OUI ▲▼	Manufacturer ▲▼	Product Class ▲▼	Software Version ▲▼	IP ▲▼	Register ▲▼	Mode ▲▼	Gateway Type	Online ▲▼	Created Account ▲▼	Operation
	1c:49:7b:0b:7b:d8	1c497b	Gemtek	Lora-WAPS-232n	WAPS-232N.2.00.11 CwmpcO.1.01.010	192.168.0.225	Y	NAT 210.66.161.42	Micro	🟢	gtkmarson	🔍 ✏ 🖼

Figure 46   GNMS-3

(4)Verify device status and information
・Online: Green indicator light
・Offline: Red indicator light
・Exclamation mark: GPS positioning incomplete

A normal functioning device is represented by a Green indicator light (normal connection and GPS positioning)

Table 7   GNMS(Indicator Light)

Indicator Light	Icon
Green	🟢
Red	🔴
Green with exclamation mark	🟡
Red with exclamation mark	🔴

"View" function: to view device information, device status, account information (relevant data verification)

Figure 47   GNMS-4

"Map" function: Displays the device location (to verify the correct set up location of the device)

Figure 48   GNMS-5

Figure 49　GNMS-6

4.3　Deployment Tools

Deployment Tools is a signal test management platform. It utilizes the information received from its bound devices to monitor the signal coverage and quality status of the base station. Select "Device" in the menu after login. Add device to the platform to undergo the testing process.

Figure 50　Deployment Tools-1

(2)Once the devices are successfully added, proceed with the signal test.

Figure 51   Deployment Tools-2

Switch the webpage to "Deployment Tools", select device entry, click "Details" to view its Received time and geographical coordinates.
It can be confirmed that the gateway is operating on track when the 0n-site test results match the details on the webpage.

DETAIL		MAP		RF-MERIT			SENSITIVITY	

HsinchuTest-CH10   H   H   1   / 256   C   ☐ Auto Refresh   ⬇   📅

	Received time	Latitude	Longitude	GPS time	UL RSSI/SNR	UL SF	Channel	ApId
13	2016/12/02 18:08:18	24.872180	121.009000	2016/12/02 18:08:17	-81/10.5	10	925375000	00001c497b7dba41
14	2016/12/02 18:08:14	24.872186	121.008980	2016/12/02 18:08:13	-80/9.8	10	925375000	00001c497b7dba41
15	2016/12/02 18:08:10	24.872211	121.008958	2016/12/02 18:08:09	-78/11.2	10	925375000	00001c497b7dba41
16	2016/12/02 18:08:06	24.872248	121.008920	2016/12/02 18:08:05	-79/10	10	925375000	00001c497b7dba41
17	2016/12/02 18:08:02	24.872290	121.008910	2016/12/02 18:08:01	-81/10.8	10	925375000	00001c497b7dba41
18	2016/12/02 18:07:58	24.872298	121.008905	2016/12/02 18:07:57	-78/10.5	10	925375000	00001c497b7dba41
19	2016/12/02 18:07:54	24.872311	121.008906	2016/12/02 18:07:53	-81/11	10	925375000	00001c497b7dba41
20	2016/12/02 18:07:50	24.872325	121.008930	2016/12/02 18:07:49	-78/10.5	10	925375000	00001c497b7dba41
21	2016/12/02 18:07:46	24.872355	121.008951	2016/12/02 18:07:45	-79/11.2	10	925375000	00001c497b7dba41

Figure 52   Deployment Tools-3