# Comflex NG User manual

1. System Introduction

1.1 Introduction

Comflex NG is an industrial-leading in-building distributed antenna solution for enterprise and consumer application, supporting the wide application range of cellular generations: 4G and 5G. This solution is based on analog DAS technology with wide-band and multi-band distribution architecture, flexible off-air or wired connection mode, enabling efficient utilization of signal links. It is designed to support multi-band, multi-technology, and multi-operator networks with flexible configuration and easy commissioning.

1.2 System Architecture
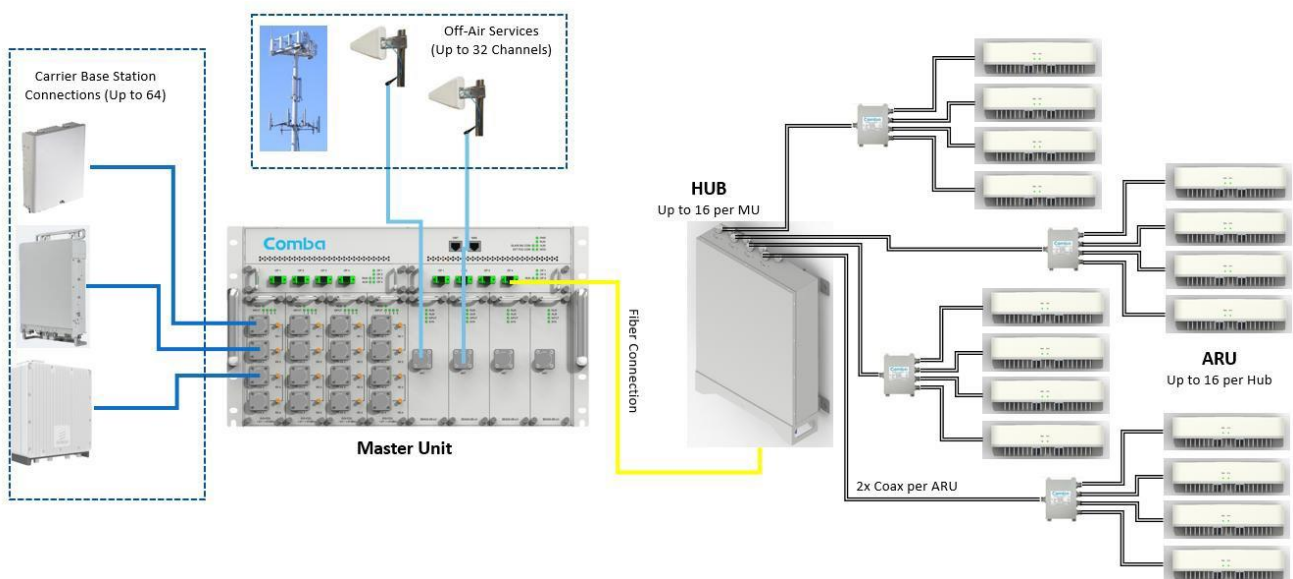
MU – Master Unit

Select dedicated radio signal, transmit to fiber signal and then transfer to fiber Hub. It can support two kinds connectivity to radio signal: off-air connection and wired connection with different module.

Fiber Hub

The Fiber Hub is the central Hub and Distribution element for the analog DAS system. The fiber hub interfaces between the MU and the active antenna unit, allowing it to receive the operators service signals in optical link, and to route signals to the active antenna unit.

Active Antenna Unit

The active antenna unit is a low-power remote antenna unit with 19~22 dBm per MIMO stream per band

1.3 System Function

1.3.1 System features

1) Supports up to 6T6R, 4G and 5G signals
2) Output power
    2.5GHz/3.5GHz: 22dBm
    700MHz/850MHz/1900MHz/EAWS: 19dBm
3) Network topology
    - MU + Fiber HUB + ARU: 1+16+256
    - MU can connect to ONE slave MU
    - MU can extend up to 16pcs fiber Hub
    - Fiber HUB can connect to 16pcs ARU
    - MU-HUB max fiber loss 8dBo；
    - HUB-ARU max fiber loss distance 45dB
4) Power Supply
    MU & HUB: AC 110V
    ARU: DC 48V
5) Couple way
    Off-air couple : MU - BDA Card
    Wired couple: MU - POI card

1.3.2 Monitoring

1) Local monitor: local debug and commission
2) Remote control: Control the system in MU site
3) System upgrade：Software upgrade in MU
4) 4G/5G demodulation: Demodulate the cellular features: RSRP, SINR, PLMN

1.4 Specification

1.4.1 Optical Specification

Optical Specification			
Operation Frequency			600MHz-1GHz,1.7GHz-2.2GHz, 3.3GHz-4GHz
Fiber Mode		/	Simplex
Wavelength		nm	1310, 1550 + WDM
Optical Output	MU	dBm	-2 – +2
	HUB		6-8
Return loss		dB	> 45
Connector Type		/	SC/APC

1.4.2 Cable Specification

Cable Specification		
Operation Frequency		DC-4GHZ
impedance	Ω	50
VSWR	/	≤1.2
Insert Loss	dB	≤（L*0.48+0.2）dB@DC-4GHz @ meter

1.4.3 Radio Specification

			700MHz	850MHz	1900MHz	EAWS	2.5Gband	Cband
Frequency	UL	MHz	698-716 / 777-787/788-798	824-849	1850 – 1915	1710 – 1755	2496-2690	3450-3550 3700-3980
	DL		728-746 / 746-756/758/768	869-894	1930 – 1995	2110 – 2180		
IBW		MHz	18/10	25	65	45/70	194	280
Carrier number (off-air card)							1	1
Carrier IBW(off-air card）		MHz					194	200
Uplink Output Power (PRRU)		dBm	+10——+20dBm input POI card:-40 +20——+37dBm input POI card: -50					
Uplink Output Power (BDA Card)		dBm	19	19	19	19	22	22
Downlink max output power (ARU)		dBm	19	19	19	19	22	22
Downlink input range (BDA Card)		dBm	-95 —— -50(RSRP)				-100—— -55(RSRP)	
Downlink input range (PRRU Card)		/	+10——+20dBm(RSSI) input +20——+37dBm(RSSI) input				+10——+20dBm(RSSI) input +20——+37dBm(RSSI) input	
UL max gain (BDA Card)		dB	80				80	80
DL max gain (BDA Card)		dB	80				80	80
UL max gain (PRRU Card)		dB	+10——+20dBm input: 10 +20——+37dBm input: 0					

DL max gain (PRRU Card)	dB	+10——+20dBm input: 10 +20——+37dBm input: 0					
ATT adjust range	dB	MU: 0 – 30, ARU: 0 – 20					
In-band ripple(P-P)	dB	≤ 4	≤ 6	≤ 6	≤ 6	≤ 6	≤ 6
Emission spur		FCC	FCC	FCC	FCC	FCC	FCC
UL NF at max gain	dB	≤ 10					
System delay (BDA Card)	usec	≤ 10					
System delay (PRRU Card)	usec	≤ 3					
Input VSWR		≤ 1.5					
MU Max input power (BDA Card)	dBm	-10					
MU Max input power (PRRU Card)	dBm	37					
ARU Max input RF power	dBm	-10					

2. INSTALLATION

2.1 WARNINGS AND ALERTS

Laser

Laser light can cause damage to eyes. Laser light is not visible. Viewing it directly does not cause pain. The iris of the eye will not close when viewing a bright light. Consequently, serious damage to the retina of the eye is possible. NEVER LOOK INTO THE END OF A FIBER WHICH MAY HAVE A LASER COUPLED TO IT.

Radio Frequency Energies

There may be situations, particularly for workplace environments near high-powered RF sources, where recommended limits for safe exposure of human beings to RF energy could be exceeded. In such cases, restrictive measures or actions may be necessary to ensure the safe use of RF energy.

High Voltage

The equipment has been designed and constructed to prevent practicable danger, as far as reasonably possible. Any work activity on or near equipment involving installation, operation or maintenance must be free from danger, as far as reasonably possible.

Where there is a risk of damage to electrical systems involving adverse weather, extreme temperatures, wet, corrosive or dirty conditions, flammable or explosive atmospheres, the system must be suitably installed to prevent danger.

Protective Earthing

Equipment provided for the purpose of protecting individuals from electrical risk must be suitable for the purpose and properly maintained and used.

Handling Precautions

This covers a range of activities including lifting, lowering, pushing, pulling, carrying, moving, holding or restraining an object or person. It also covers activities that require the use of force or effort, such as pulling a lever, or operating power tools.

Electrostatic Discharge (ESD)

Observe standard precautions for handling ESD-sensitive devices. Assume that all solid-state

electronic devices are ESD-sensitive. Ensure the use of a grounded wrist strap or equivalent while working with ESD-sensitive devices. Transport, store, and handle ESD-sensitive devices in static-safe environments.

WARNING

This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS.
You MUST have an FCC LICENSE or express consent of an FCC License to operate this device. Unauthorized use may result
in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.
The device not supports home/personal use.
Caution: for use of unauthorized antennas, cables, and/or coupling devices not conforming with ERP/EIRP restrictions is not permitted.
Antenna gain for remote unit Model number: ARU-6B-Internal
Antenna Type:
Internal Antenna
Antenna Gain:
Lower 700MHz: 4dBiUpper 700MHz: 4dBi
Cellular: 4dBi
EAWS: 4dBi
Broadband PCS: 4dBi
BRS/EBS: 5dBi
3.7GHz Service: 3dBi
Antenna gain for MU unit Model number: Comflex NG MU
Antenna Type:
External Dedicated Antenna
Permission Antenna Gain: 14dBi or less
This device is an industrial-leading in-building distributed antenna solution and restricted indoor use only.
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with a minimum distance of 24cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
The installation height of the antenna for AWS 1710-1755MHz band operation is limited 10 meters above ground for compliance with section 27.50.

Part 20 and part 90 signal booster, this is a 90.219 class B device.
WARNING! This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. You must register part 90 Class B signal boosters (as defined in 47 CFR 90.219) online at www.fcc.gov/signal-boosters/registration. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.

Note: The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

WARNING!
Use only authorized and approved antennas, cables and/or coupling devices! The use of unapproved antennas, cables or coupling devices could cause damage and may be of violation of FCC regulations. The use of unapproved antennas, cables and/or coupling devices is illegal under FCC regulations and may subject the user to fines.

Any installation, adjustment, maintenance and repair of the equipment must only be carried out by trained, authorized personnel. At all times, personnel must comply with any safety notices and instructions.
The design of the antenna installation needs to be implemented in such a way so as to ensure RF radiation safety levels and non-environmental pollution during operation.

Note: Antennas, feeders and couplers are not included in the packing list; solution provider should consider these accessories according to site conditions.

WARNING! Antenna gain should not exceed 14dBi
To comply with FCC RF exposure compliance requirements, each individual antenna used for this transmitter must be installed to provide a separation distance greater than 63.5cm or more from all persons during normal operation

and must not be co-located with any other antenna for meeting RF exposure requirements.
Contact information, i.e., licensee for Class B devices at (https://signalboosters.fcc.gov/signal-boosters/).

2.2 SITE PLANNING CONSIDERATIONS

2.2.1 SITE PLANNING

Site Considerations

The MU is designed to be located indoors to facilitate coupling of BTS signals and power supply connections. The input range of MU RF unit is 10~30 dBm.

The site consideration for HUB is listed below:

- The maximum fiber maximum path loss of 8dBo.

- The system delay of the optical system must be taken into consideration when there are neighboring BTS sites overlapping in coverage.

Installation Location

Mounting surface shall be capable of supporting the weight of the equipment.

In order to avoid electromagnetic interference, a proper mounting location must be selected to minimize interference from electromagnetic sources such as large electrical equipment.

Environmental

Humidity has an adverse effect on the reliability of the equipment. It is recommended to install the equipment in locations having stable temperature and unrestricted air-flow.

The installation location for the system should be well ventilated. The equipment has been designed to operate at the temperature range and humidity level as stated in the product specifications.

Grounding Requirement

Verify that the equipment has been well grounded. This includes antennas and all cables connected to the system. Ensure lightning protection for the antennas is properly grounded.

Cable Routing

Depending on equipment configuration, a variety of types of cables are connected to the MU HUB

and RU: coaxial cables, optical fibers, power cable, communication cable, and commissioning cable. Where applicable, ensure cables are properly routed and secured so that they are not damaged.

Manual Handling

During transportation and installation, take necessary handling precautions to avoid potential physical injury to the installation personnel and the equipment.

2.2.2 SYSTEM INSTALLATION CHECKLIST

- Working space available for installation and maintenance for each mounting arrangement. Ensure unrestricted airflow.
- Ensure earthing point is within reach of the ground wire. (2m; 6 ft. 10 in.).
- Ensure a power source is within reach of the power cord and the power source has sufficient capacity.
- Where appropriate, ensure unused RF connectors are terminated.
- Where appropriate, ensure unused optical fiber connectors are protected.
- Do not locate the equipment near large transformers or motors that may cause electromagnetic interference.
- Reduce signal loss in feeder cable by minimizing the length and number of RF connections.
- Ensure the equipment will be operated within the stated environment (refer to datasheet).
- Where needed, couple BTS RF signal with a coupler to prevent damaging the equipment.
- Where appropriate, confirm available of suitably terminated grade of RF and optical fiber.
- Observe handling of all cables to prevent damage.

2.3 INSTALLATION PROCEDURES

2.3.1 GOODS INWARDS INSPECTION

ComFlex was factory tested, inspected, packed, and delivered to the carrier with utmost care. Do not accept shipment from carrier which shows damage or shortage until the carrier's agent endorses a statement of the irregularity on the face of the carrier's receipt. Without documentary evidence, a claim cannot be processed.

Open and check each package against the packing list. For any shortage, contact Comba

Telecom Systems. Do not remove items from packing materials until installation.

2.3.2 TOOLS

See for a full list of tools required for installation and maintenance.

Tool Type	use	Usage Scenario
Impact drill	Drill installation holes to fit M8 expansion bolts	Wall hanging
adjustable wrench	Fix the bolt and tighten the M8 hex nut	Wall hanging
Pentagonal wrench	Fixing screw	Wall hanging
Cross screwdriver	Fixing screws, φ 5mm	Wall hanging

2.3.3 PREPARATION

Optical Fiber:

● Fiber optic cables require proper handling. Do not stretch, puncture, or crush the fiber cable(s) with staples, heavy equipment, doors, etc.

● Always maintain the minimum bending radius specified by the cable manufacturer. The minimum bend radius is usually 10 times the cable's outer diameter. In the case of single optical fiber that is not in a cable, the minimum bending radius to be observed is 3cm. (1.2") .

2.3.4 MU install

MU consists of three parts: MU chassis, RFU, and FOU. All components are individually packaged. Install the MU chassis on the rack first, then insert the RFU module and FOU module into the MU chassis
。

Figure 1: MU unit
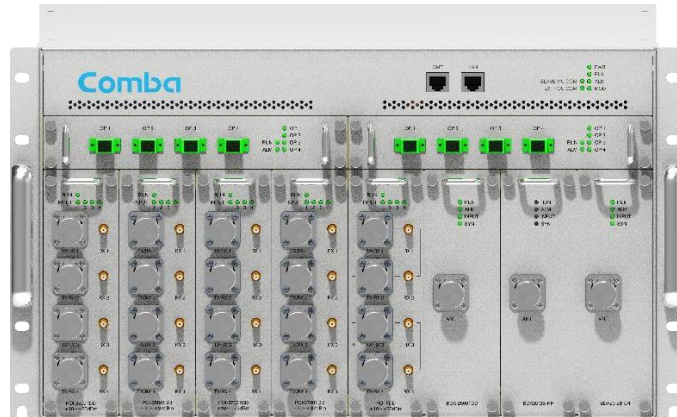
2.3.5 MU chassis mounted in a 19 inch rack

The MU chassis is a 19 inch rack mounted device with a height of 6U, which can be installed into a 19 inch rack as follows:

Figure 2: 19 inch rack
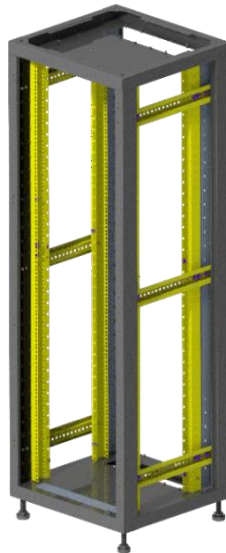
Step 1: Determine the installation position of the MU chassis on the rack, install cabinet nuts on the corresponding holes on both sides of the rack as shown in Figure 3, and install cabinet screws on the 1U cabinet nuts on both sides. The cabinet screws are only screwed in half the length.

Figure 3: Install cabinet nuts and support screws

Step 2: Place the MU chassis inside the rack, with the notches at the bottom of the hanging ears on both sides slightly higher than the cabinet screws. Then slide the MU chassis down to make the cabinet screws snap into the notches.

Figure 4: Install cabinet nuts and support screws

Step 3: Install the remaining 6 cabinet screws on both sides of the MU chassis, tighten the 8 screws (including the pre installed 2 cabinet screws), and complete the installation of the MU chassis.

Figure 5: Install cabinet nuts and support screws

2.3.6 FOU Expansion installation

Figure 1: FOU Expansion unit
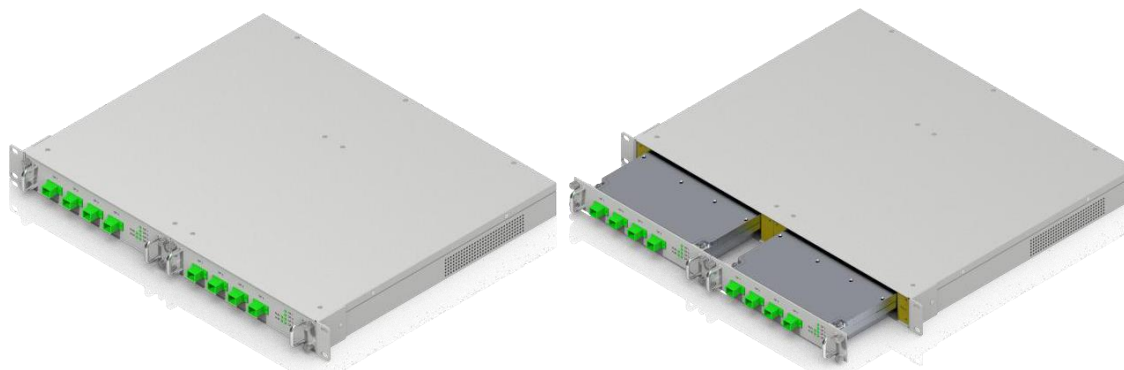
Figure 2: FOU Expansion install
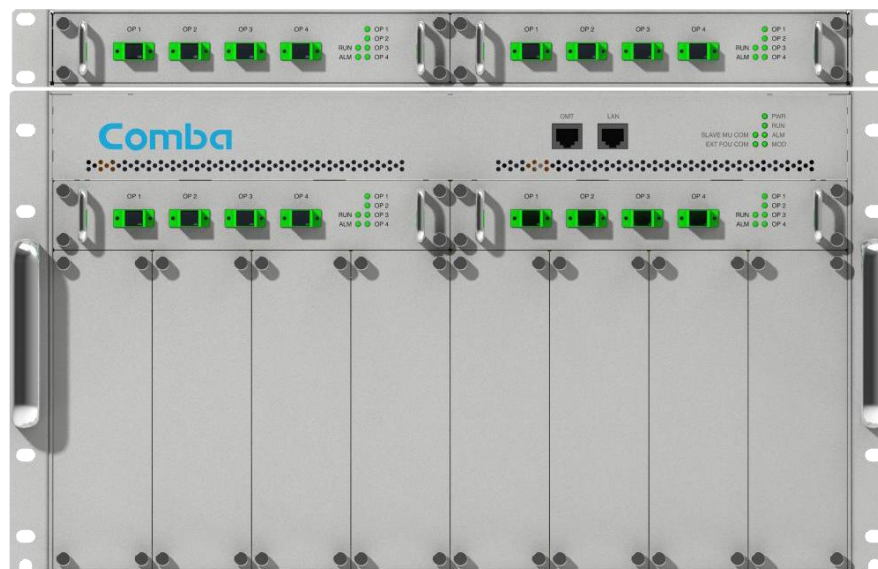
The FOU Expansion is a 19 inch rack mounted device with a height of 1U, which can be installed into a 19 inch rack like MU install

2.3.7 RFU and FOU installation

Step1: RFU module installation: Remove the baffle of the RFU slot in the MU chassis, insert the RFU module, and tighten the fastening screws on the module (10 RFU modules can be inserted into any of 8 RFU slots)

Figure 6: RF Unit Installation

Step2: FOU module installation: Remove the FOU slot baffle from the MU chassis, insert the FOU module, and tighten the fastening screws (FOU module can be inserted into any of the 2 FOU slots)

Figure 7: FOU Installation
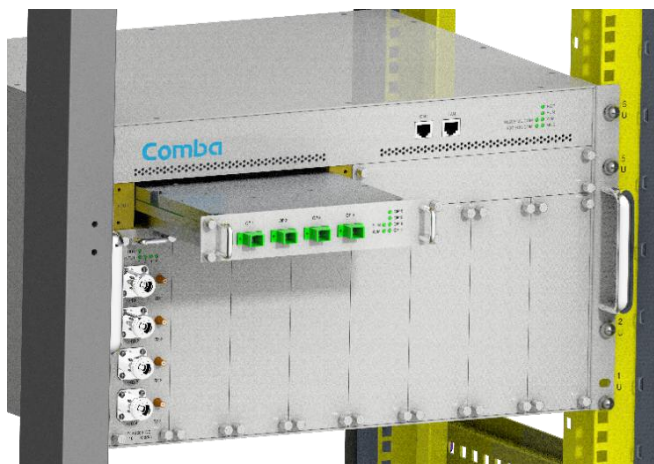
2.3.8 HUB Wall mounted installation

Install HUB onto the wall as follows

Step 1: Choose the appropriate wall position:

The wall can safely bear the weight of HUB

Capable of comfortable wiring at the top and bottom of the HUB

Step 2: Drill installation holes and fix the installation bracket

Use a mounting bracket as a template to mark the positions of four installation holes on the wall. Use a Ø 10 impact drill bit to drill installation holes for M8 expansion bolts, with a depth of no less than 50mm.

Install the expansion bolts into the wall, and then fix the installation bracket to the wall through the expansion bolts

Figure 8: Punch installation holes and fix the installation bracket
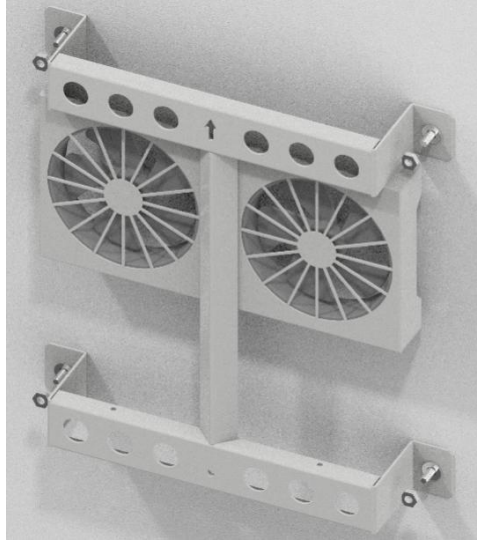
Step 3: Hang HUB

Hang the HUB on the fixed mounting bracket

Figure 9: Hang HUB
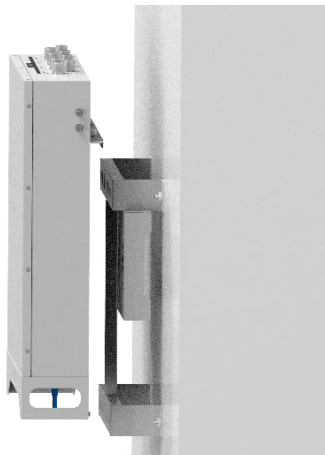
Step 3: Fix HUB and complete installation

At the middle of the bottom of the HUB, use an M6X16 screw to secure the HUB chassis and mounting bracket together to complete the installation.

Figure 10: Tighten the chassis screws
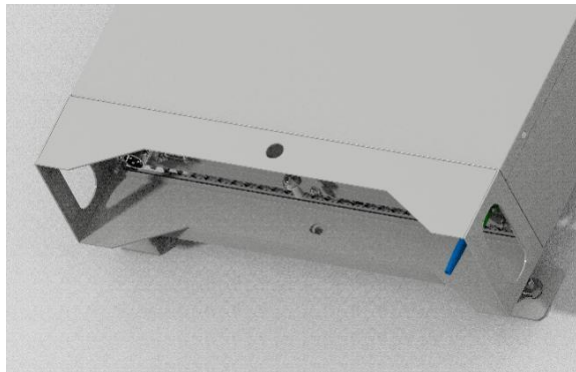
2.3.9 ARUinstall

1.3.6.1   Hanger installation

In the scenario where ARU is fixed with a suspension rod, complete the installation as follows.

Step 1: Fix hanger 1 on the suspension rod.

Use nuts and washers to fix Hanger 1 to the already set suspension rod on site (nuts and washers need to be provided by oneself, supporting M8 to M12 suspension rods)

Figure 11: Hanger 1 mounted on the boom
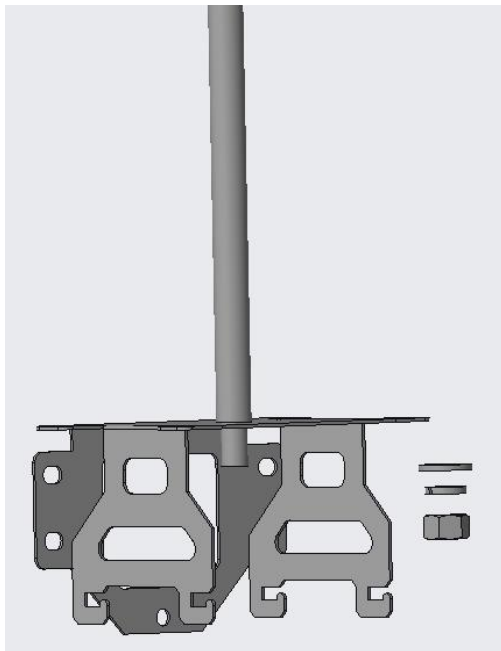
Step 2: Mount Hanger 1 on the boom and secure Hanger 2 to the ARU.

Use M4X10 screws to secure mounting bracket 2 to the ARU.

Figure 12: ARU mounting rack 2
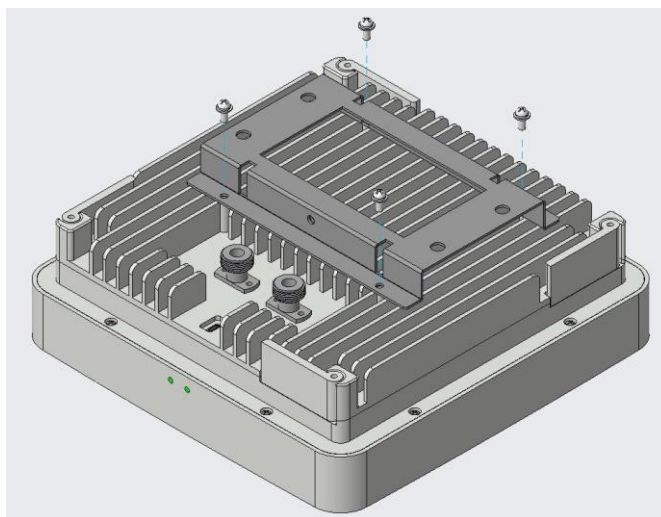
Step 3: Hang the ARU, tighten the screws, and complete the installation.

Hang the ARU on rack 1, tighten the fastening screws on rack 1, and complete the installation.
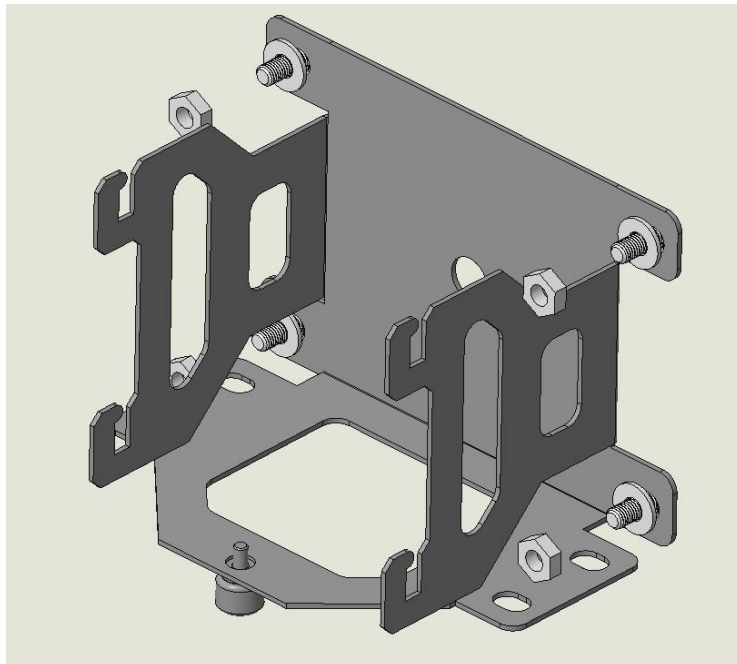
Figure 13: ARU mounting rack 2
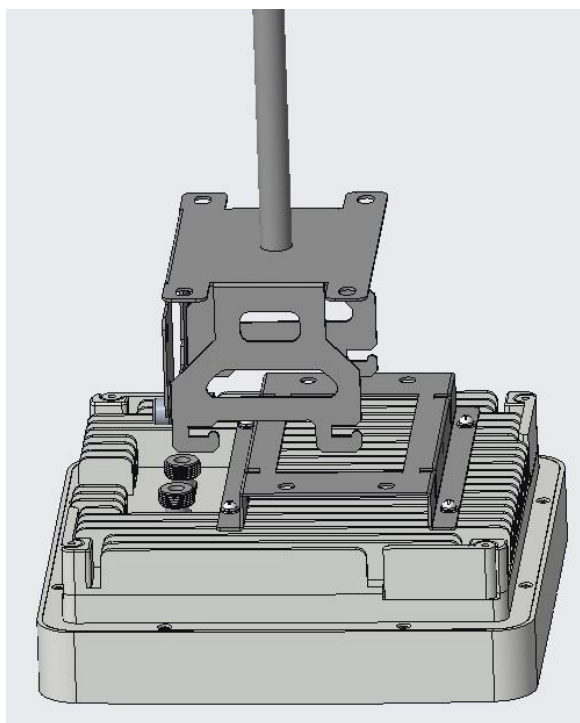
1.3.6.2   Installation of wooden beams

Step 1: Fix the hanger 1 on the wooden beam.

Use four ST6.3X30 wood screws to secure the hanging bracket 1 to the wooden beam.
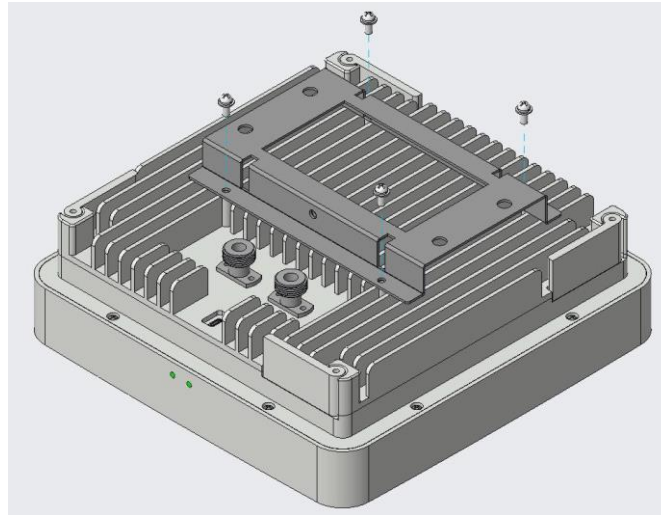
Figure 14: Hanger 1 fixed to wooden beam
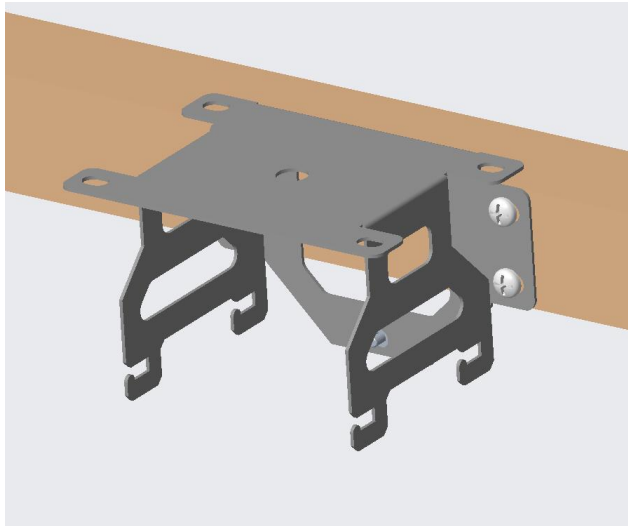
Step 2: Secure rack 2 to the ARU.

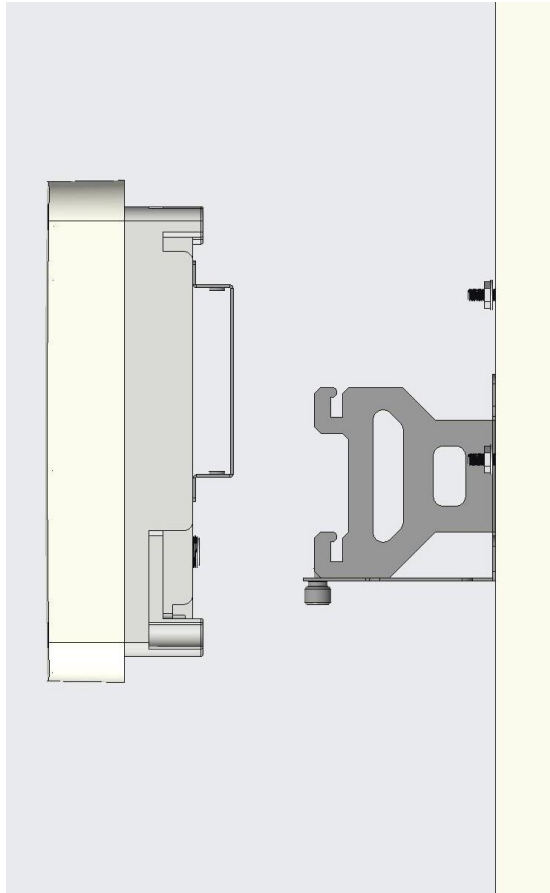Use M4X10 screws to secure mounting bracket 2 to the ARU.

Figure 15: ARU MOUNTING RACK 2
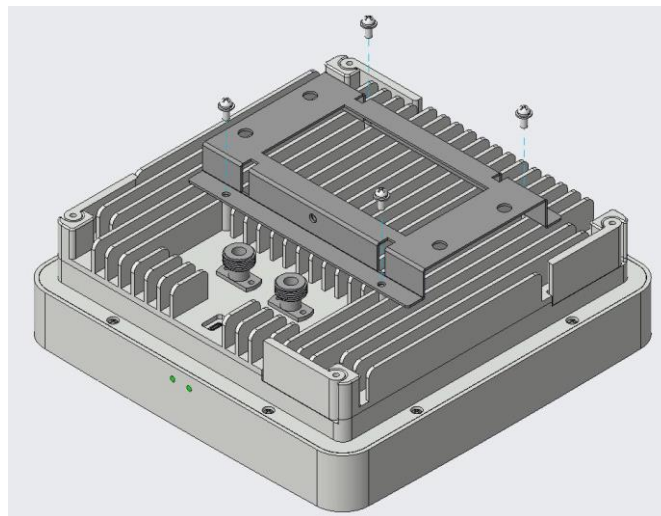
Step 3: Hang the ARU, tighten the screws, and complete the installation.

Hang the ARU on rack 1, tighten the fastening screws on rack 1, and complete the installation.

Figure 16: ARU MOUNTING RACK 2
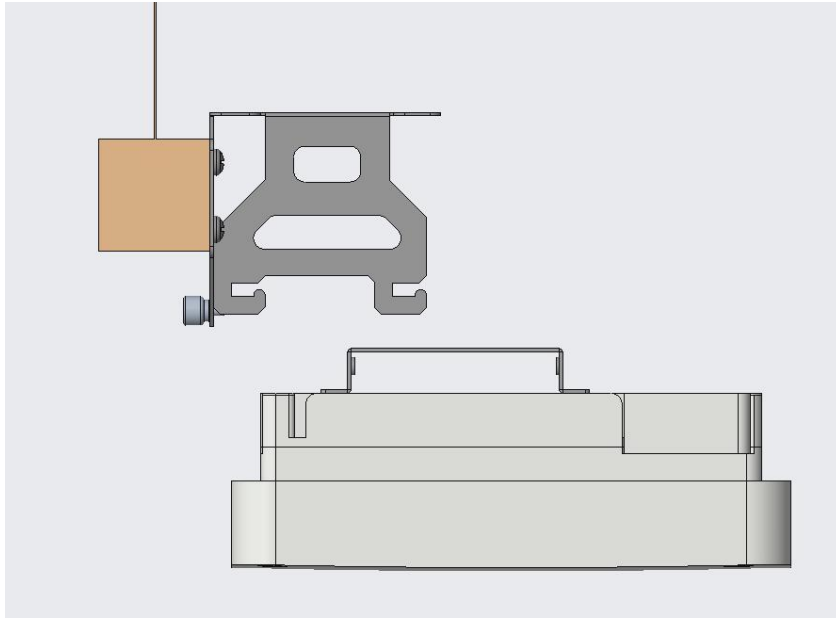
1.3.6.3　Wall mounted installation

Step 1: Fix hanger 1 on the wall.

Use hanging bracket 1 as a template to mark the drilling position on the wall, and use a Ø 8 impact drill bit to drill the installation hole for M6 expansion bolt, with a drilling depth of no less than 40mm.

Install the expansion bolts into the wall, and then fix the installation bracket to the wall through the expansion bolts

Figure 17: Hanger 1 fixed to the wall

Step 2: Secure rack 2 to the ARU.

Use M4X10 screws to secure mounting bracket 2 to the ARU.

Figure 18: ARU MOUNTING RACK 2

Step 3: Hang the ARU, tighten the screws, and complete the installation.

Hang the ARU on rack 1, tighten the fastening screws on rack 1, and complete the installation.

Figure 19: ARU hanging into rack 2

1.3.6.4   Installation of ceiling gantry

Step 1: Fix the screw onto the mounting bracket 2.

Fix the screw onto the mounting bracket 2 using M6 nuts and washers.

Figure 20: Install bracket 2 onto the screw
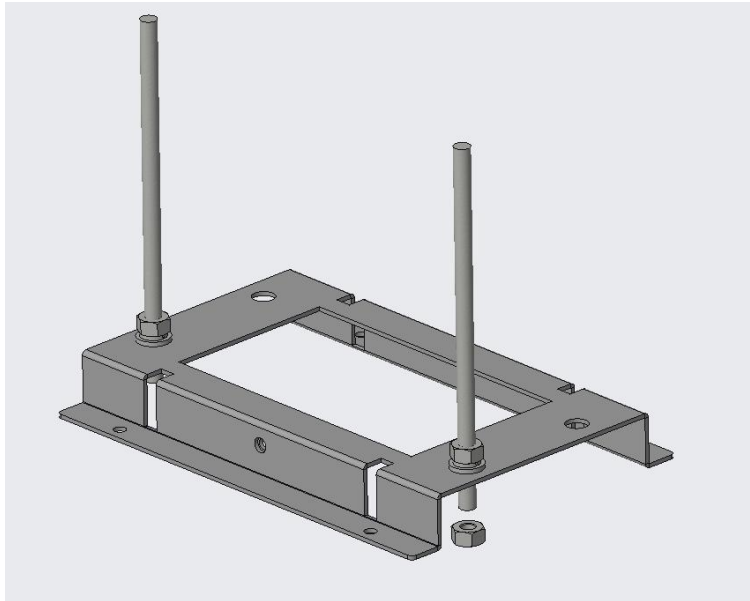
Step 2: Secure rack 2 to the ARU.

Use M4X10 screws to secure mounting bracket 2 to the ARU.

Figure 21: Installation rack 2 installed on ARU
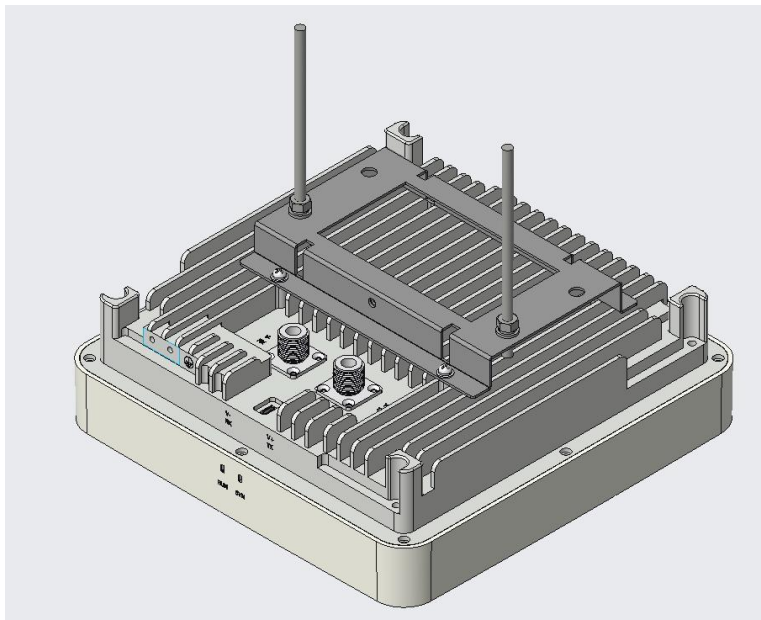
Step 3: Fix the ARU on the gantry.

Use M6 ordinary nuts and butterfly nuts to fix the ARU on the gantry through screws and adjust the appropriate height.

Figure 22: Installation rack 2 installed on ARU
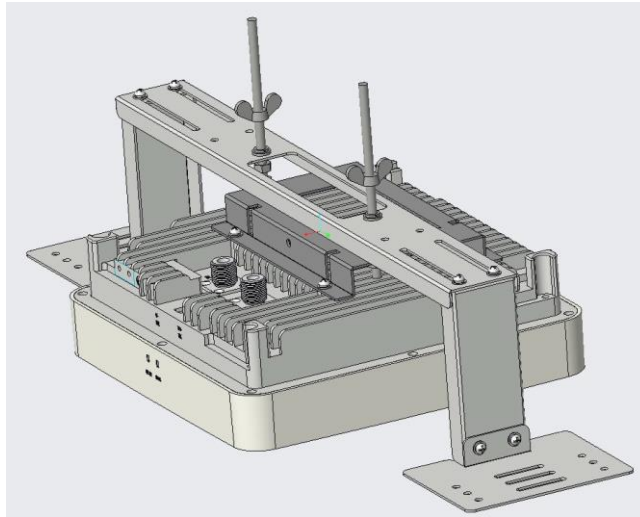
Step 4: Place the gantry on the ceiling and complete the installation.

Adjust the width of the gantry to the appropriate position, and then place the entire structure on the ceiling to complete the installation.
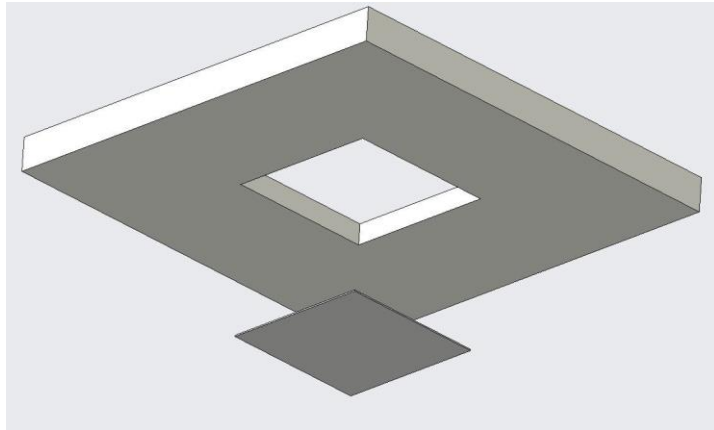
Figure 23: Place the gantry on the ceiling
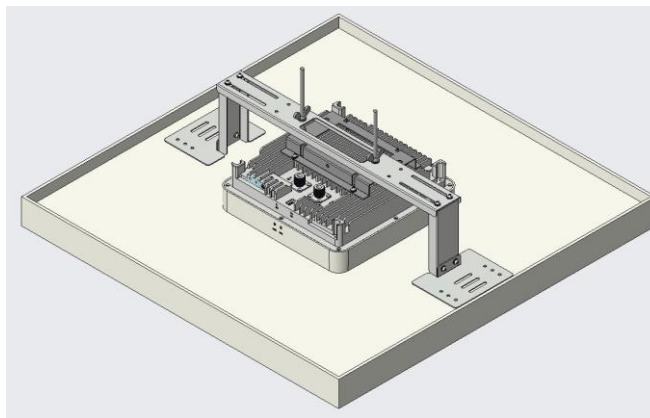
1.3.6.5 Ceiling mounted installation

Step 1: Ceiling openings.

Use a hole template to create a square hole in the ceiling.
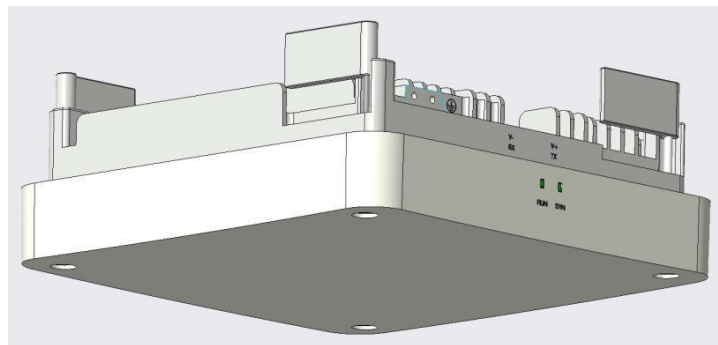
Figure 24: Opening square holes in the ceiling

Step 2: Loosen the corner part screws.

Remove the four plugs from the top cover and loosen the screws that secure the corner pieces. The spacing between the corner pieces to be loosened is determined by the thickness of the ceiling.

Figure 25: Loosen the screws of the corner piece

Step 3: Place the ARU in the ceiling.

Place the ARU into the square hole in the ceiling that has been opened, and use a screwdriver to rotate the fixing screw of the corner piece. The fixing screw will drive the corner piece to rotate and clamp onto the ceiling.

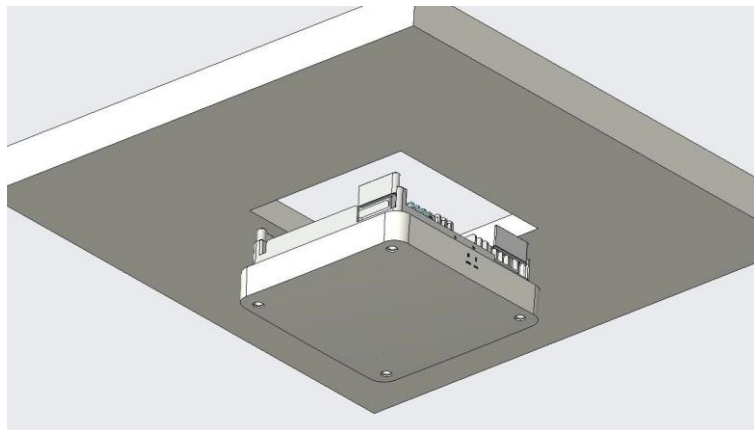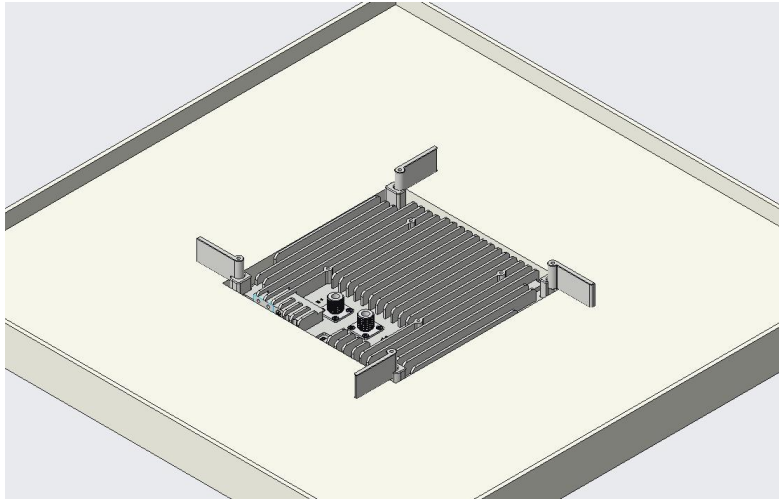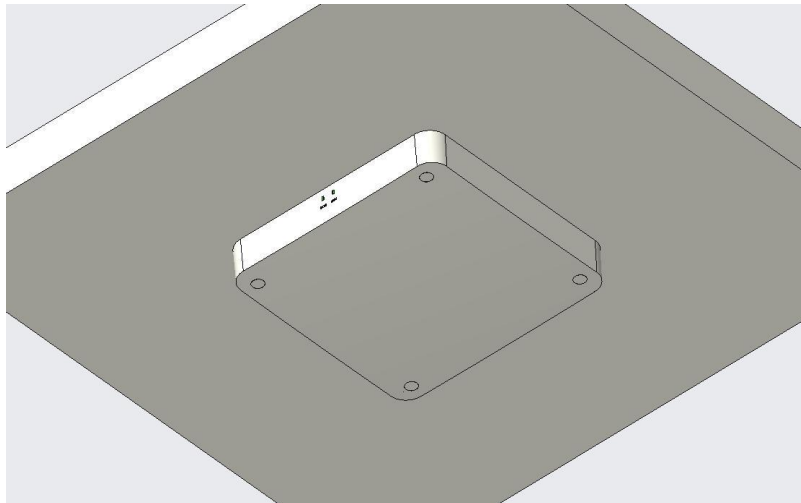Figure 26: Loosen the screws of the corner piece

Figure 27: Corner pieces are clamped to the ceiling

Step 4: Tighten the screws to complete the installation.

Tighten the fixing screws and reinstall the plugs for the four holes to complete the installation.

Figure 28: Complete installation

2.4 Equipment power supply

MU and HUB require 110V AC power supply, and the preferred power supply method is to use the power line cut off method. This power supply method requires single-phase electricity (110V AC) to be extracted from the three-phase electricity in the distribution cabinet

If there is no power cord cutting method available on site, use a socket to take 110V AC power. The power socket must be at a height that is not easily accessible by ordinary people to prevent manual unplugging of the base station power plug.

2.5 Equipment grounding

1) Use the resistance range of a multimeter, with one probe connected to the device's casing screw and one probe connected to the ground wire of the power socket. If the measured resistance value is relatively small (less than 10 Ω), it is considered that the device has good grounding performance. If the resistance value is too large, it can be investigated from the following aspects：

   ➢ Eliminate the problem with the multimeter itself: short circuit the two probes of the multimeter and observe if the resistance value is zero; The resistance value is zero, and the multimeter is normal; Not zero, abnormal multimeter.

   ➢ Is the screw for equipment grounding tightened.

   ➢ Is the grounding wire broken.

2) Touch the device casing with an electric pen. If the electric pen light is on, it indicates that there is current in the equipment casing and there is a leakage situation. Need to check if the equipment grounding is standard.

2.6 Cable connection

The fiber length insertion loss between MU and HUB shall not exceed 8dBo, and the 5D cable insertion loss between HUB and the farthest ARU shall not exceed 45dB.

After the installation of MU, HUB, and ARU is completed, the installation interface needs to be connected and checked for accuracy before turning on the power and working normally.

2.7 Device identification

Each device, as well as wall mounted boxes and meter boxes, should be labeled clearly for future management and maintenance. The labels should be pasted in a visible area on the front of the equipment and equipment. The labels for each cable (such as 5D cable, power cord, tail fiber, etc.) are affixed at 20mm away from the wire head at both ends for easy reading and future management and maintenance. The labeling should be neat and clear.

The label of the device should be prominently placed on the device and not affect the overall harmony of the environment to maintain overall aesthetics. Warning signs must be attached to the host and power supply.

When there are multiple devices or lines running side by side, the labels must be placed on the same horizontal line

2.8 Power on inspection

After powering on, it is possible to observe whether the power supply, optical fiber, etc. are connected

properly, and whether the optical fiber and 5D cable are normal can be confirmed through the device indicator light.

2.9 Routine inspection

Equipment installation: Check whether the installation position of the equipment matches the design, and whether the installation is firm;

Power supply installation: Check whether the power supply is normal and whether the installation process of the power cord is qualified;

Site labels: Check if the equipment, power supply, and other labels are complete and labeled in a standardized manner;

Cable continuity: Use an optometry pen to test whether the physical link of the tail fiber is normal;

Equipment grounding integrity: Use a multimeter to test the resistance of the grounding wire to ground, etc.

Other: After powering on, check if the relevant indicator lights are on, etc

3. Site opening

3.1 Opening process diagram

The activation process is shown in the following figure：

```
                          ┌──────────┐
                          │  start   │
                          └────┬─────┘
                               │
                               ▼
                   ┌───────────────────────┐
                   │   Routine inspection   │
    ┌──────────────│ (Installation, connection,│
    │              │    power supply,        │
    │              │    transmission)        │
    │              └───────────┬───────────┘
    │                          │
    │              NO          ▼
┌─────────────┐         ╱─────────────╲
│ Engineering │◄────────   Check OK
│rectification│         ╲─────────────╱
└─────────────┘                │
                             YES
                               ▼
                     ┌──────────────────┐
                     │  Device power on │
                     │    and online    │
                     └────────┬─────────┘
                              │
                              ▼
                     ┌──────────────────┐
                     │ Configuration of │
                     │ startup parameters│
                     │   (manual or     │
                     │   automatic)     │
                     └────────┬─────────┘
                              │
                              ▼
                     ┌──────────────────┐
          ┌─────────►│     Enable       │
          │          │    testing       │
          │          └────────┬─────────┘
          │                   │
          │        NO         ▼
    ┌──────────┐        ╱─────────────╲
    │optimizatio│◄───────  Is the effect
    │    n      │        ╲    OK?     ╱
    └──────────┘         ╲───────────╱
                              │
                            YES
                              ▼
                       ╭──────────────╮
                       │  Debugging   │
                       │  completed   │
                       ╰──────────────╯
```
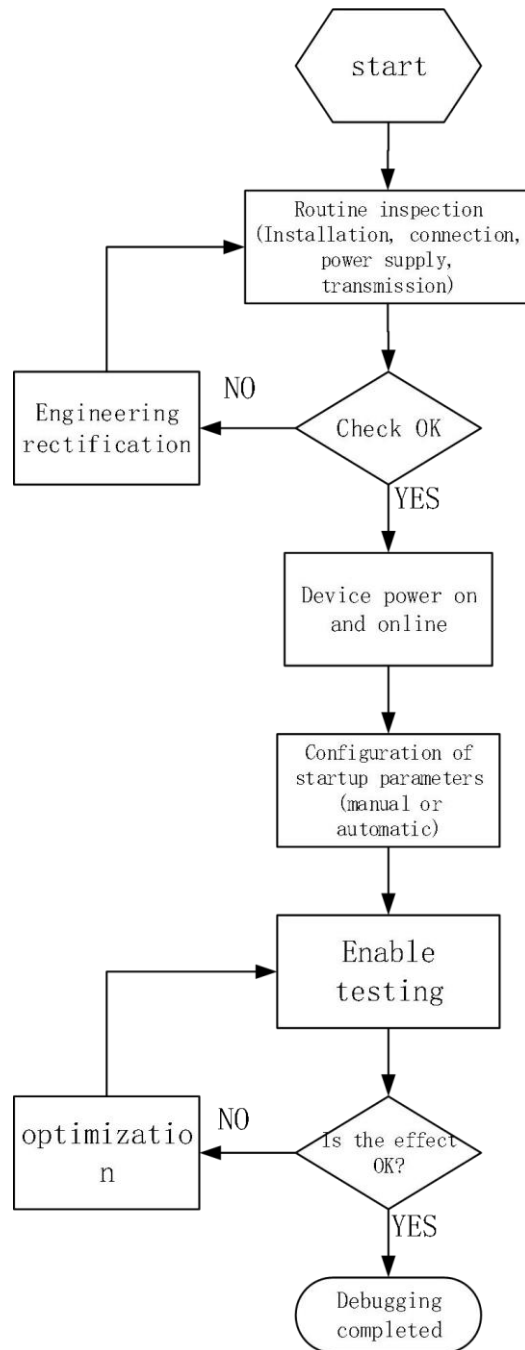
3.2 Equipment power on and online

3.2.1 Power on the device

Before powering on the equipment for testing, it is necessary to carefully read Chapter 2. Check all

connections during installation to ensure they are correct. After the inspection is completed, the equipment can only be powered on and put into use.

3.2.2 Device online

Local WEB enables setting and monitoring of device parameters, and can establish contact between devices and computers through both local and remote online methods.

Currently, only local web connectivity is supported: the local computer is directly connected to the OMT port of the device through an Ethernet port and a network cable.

The steps are as follows：

1. Set the IP address of the local computer to 192.168.1.100 (cannot be 192.168.1.231), the computer network card needs to be set to 100M duplex mode.

2. Open the browser software and enter 192.168.1.231 in the address bar; As shown in the following figure：
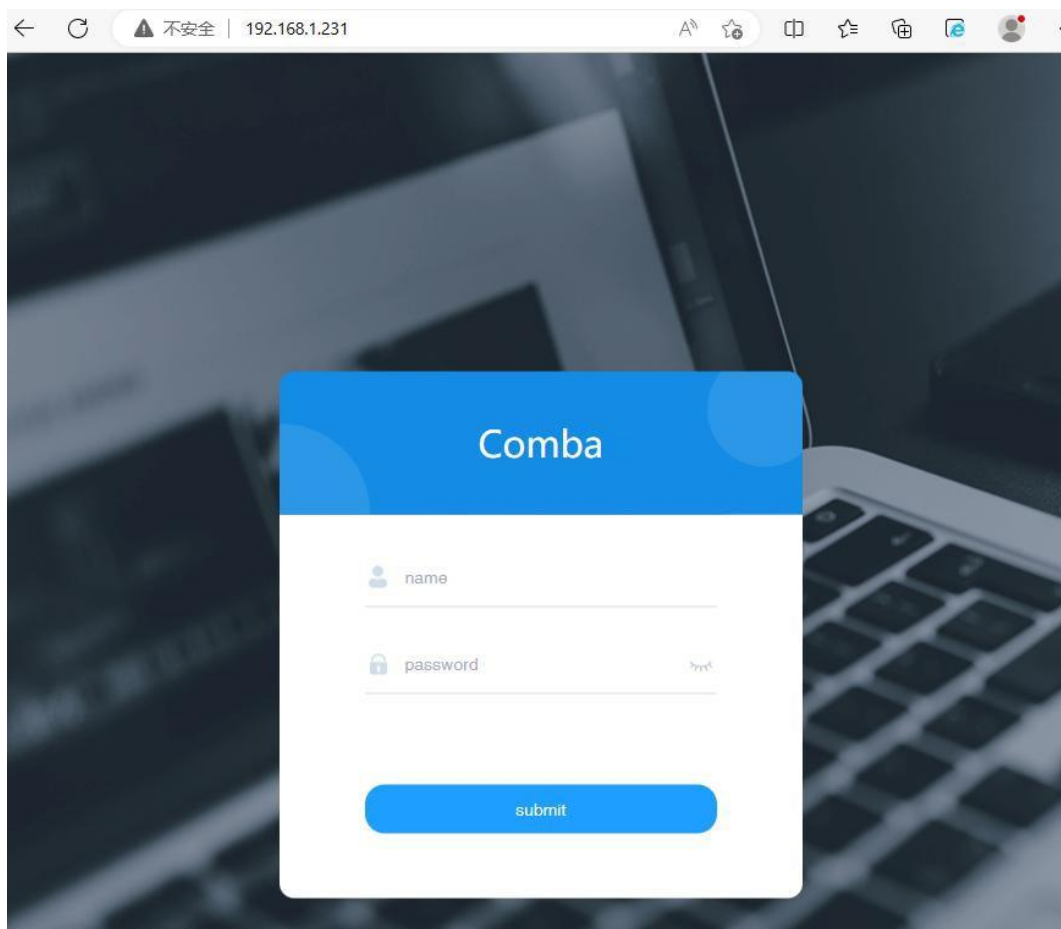
3. Enter the username and password, click submit to enter the device management interface；

    Default username: admin , password: admin

3.3 Manual station opening parameter configuration

This system provides two ways to start a station, namely automatic and manual. This chapter mainly explains the configuration process of manual station opening.

After completing the installation and connection of the device, connect the portable computer, turn on the machine power switch, and wait for the initialization of the monitoring system (i.e. when the RUN/ALM on the monitoring motherboard starts flashing) to start debugging. Users can refer to the following debugging steps for online debugging.

```
              ┌──────────────────────────┐
              〈    Online and status     〉
              〈        inquiry           〉
              └──────────────────────────┘
                          │
                          ▼
        ┌─────────────────────────────────────┐
        │        Search for new devices         │
        └─────────────────────────────────────┘
                          │
                          ▼
        ┌─────────────────────────────────────┐
        │    BDA source parameter settings:    │
        │  operator, center frequency point,   │
        │   SSB frequency point, bandwidth,    │
        │               format                 │
        └─────────────────────────────────────┘
                          │
                          ▼
        ┌─────────────────────────────────────┐
        │  POI source parameter setting: gain  │
        │             modulation               │
        └─────────────────────────────────────┘
                          │
                          ▼
        ┌─────────────────────────────────────┐
        │    HUB device parameter setting:     │
        │          communication mode          │
        └─────────────────────────────────────┘
                          │
                          ▼
        ┌─────────────────────────────────────┐
        │  ARU device parameter settings: gain │
        │             adjustment               │
        └─────────────────────────────────────┘
                          │
                          ▼
        ┌─────────────────────────────────────┐
        │   Device status reading: detecting   │
        │         input/output power           │
        └─────────────────────────────────────┘
                          │
                          ▼
                 ╱─────────────────╲
          NO    ╱  Is the output power╲
        ◄───────   OK?                 
                 ╲─────────────────╱
                          │ YES
                          ▼
        ┌─────────────────────────────────────┐
        │   Network management parameter       │
        │             settings                 │
        └─────────────────────────────────────┘
                          │
                          ▼
        ┌─────────────────────────────────────┐
        │  Coverage area field strength testing │
        │   and user antenna adjustment        │
        └─────────────────────────────────────┘
                          │
                          ▼
                  ╭───────────────╮
                  │   Debugging    │
                  │   completed    │
                  ╰───────────────╯
```

3.3.1 Search for new devices

According to the website opening requirements, click the button in the following figure to search for new devices. The button information is as follows:

MU Cards Discover: Discovers new MU cards, such as BDA;

HUB Discover: Discovering a new HUB machine;

ARU Discover: Discovered a new ARU machine.

A: MU discover function is used to detect all slot hardware in MU.

B: HUB discover function is used to find the HUB that connect to FOU and automatically provide the site number for each HUB.

C: ARU discover function is used to find the ARU which connect to the HUB, and HUB will automatically provide the site number to each ARU.
Note: ABC function is necessary for system that be seen by the GUI

D: ARU calibrate function is used to automatically calibrate the gain from HUB to ARU to adapt to different insertion loss cables, maintaining a balanced system gain setting.

E:Global parameters function is used to Power switch and RF switch for global ARU settings

F:POI-Card Commission function is used to overview POI Card ,use access mode selection and access signal settings
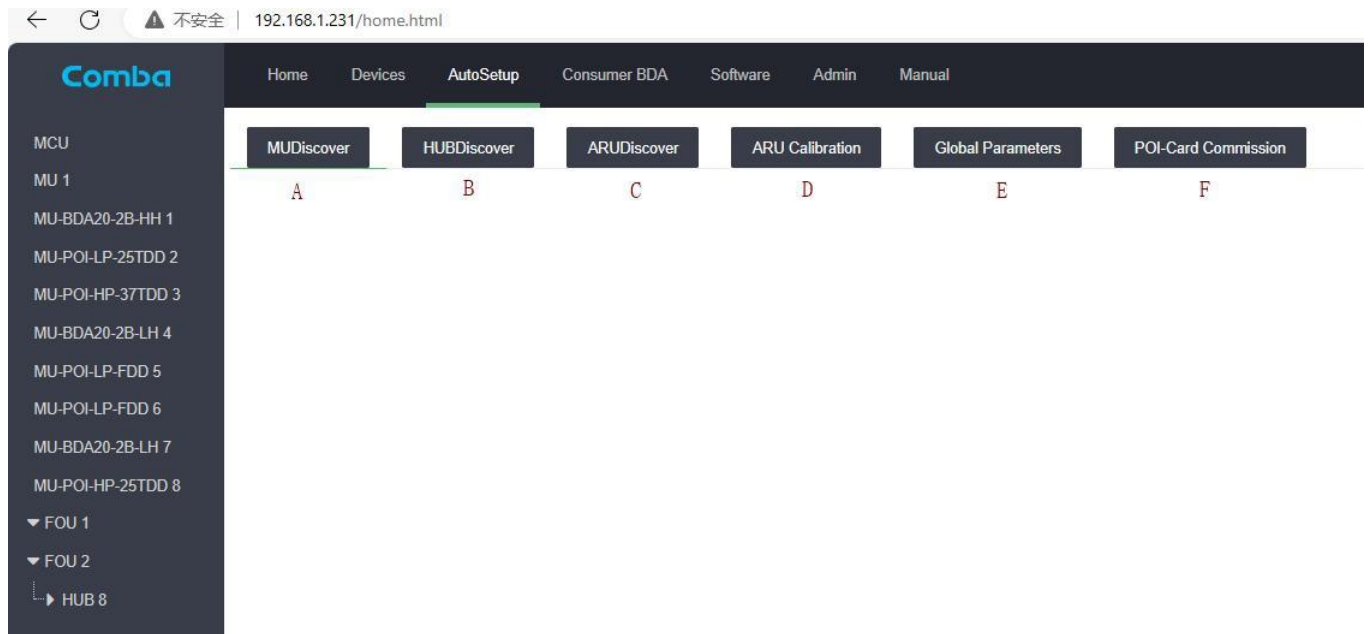
MU discovers
It takes about 30 seconds to complete the detection, and will automatically exit the progress bar. Click the home button after completion, you can see that the MU device on the left sidebar appears, and the module information of each slot will appear in the home view.
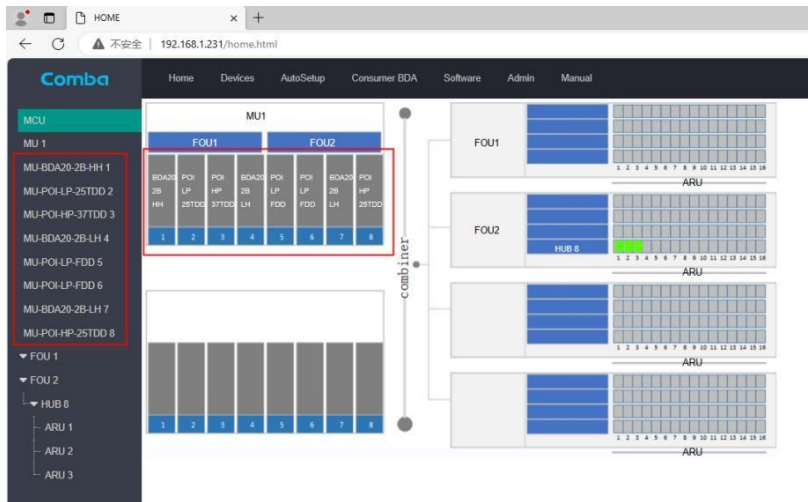
HUB discovers

It takes about 30 seconds to complete the detection, and will automatically exit the progress bar. Click the home button after completion, you can see that the HUB on the left sidebar appears, and the HUB information appear in the home view.
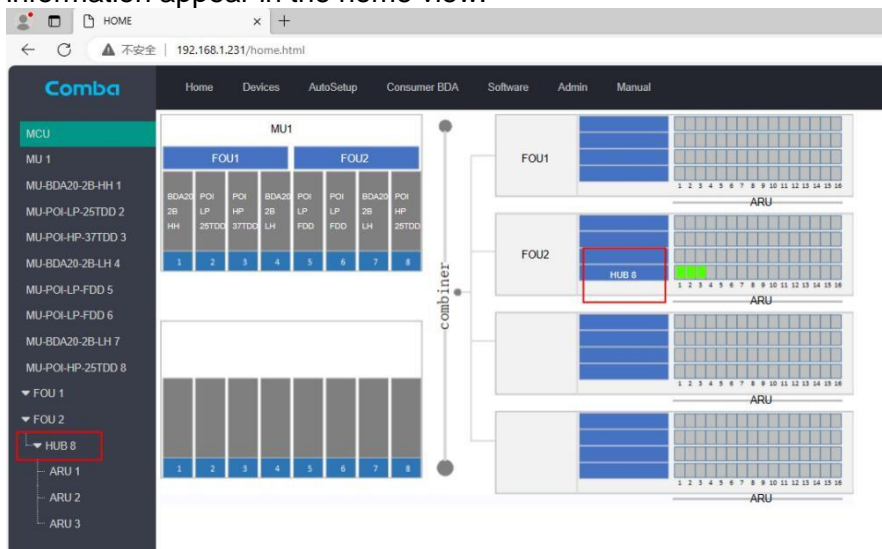
ARU discover

It takes about 120 seconds to complete the detection, and will automatically exit the progress bar. Click the home button after completion, you can see that the ARU on the left sidebar appears, and the ARU position information of each HUB will appear in the home view
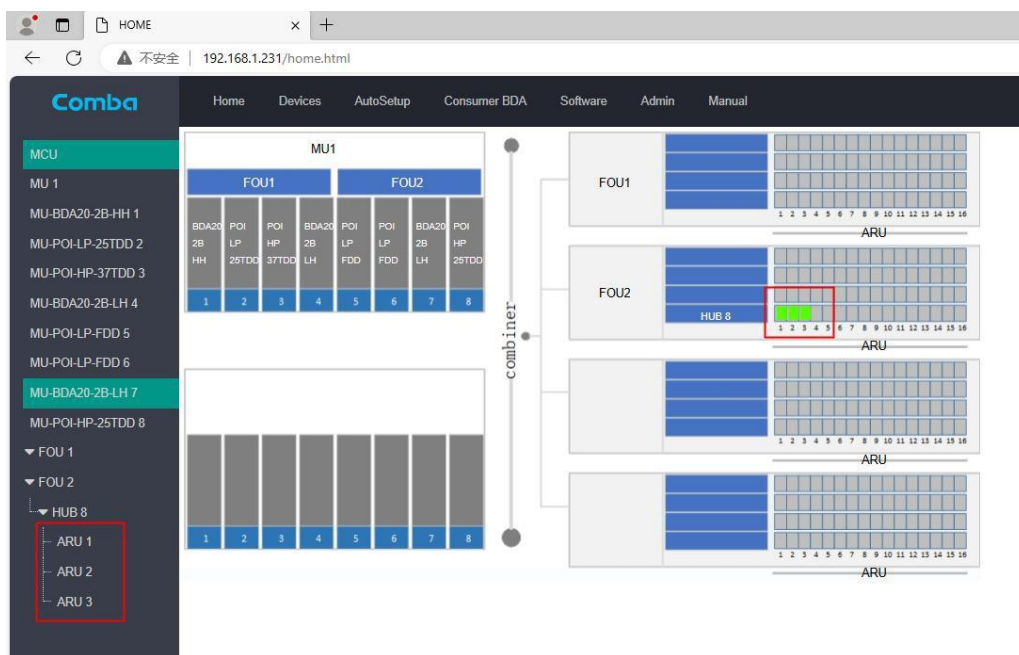
3.3.2 BDA LH/HH Source parameter settings

Manual：

1. Operator settings, set corresponding operators according to user needs.

2. Center frequency point setting

3. SSB frequency setting

4. Carrier bandwidth settings

LH BDA Control Interface

1、Configure specific switching frequency band states by setting the operating frequency band selection；

setting center frequency and bandwith to configure the operation specifications

2、other parameters mainly include ATT and RF switch control.

Automatic

Automatic Consumer BDA

1. After clicking the Consumer BDA button, a list of BDA cards will appear

2. Select Band via the drop-down menu

3. Click the scan button to pop up a pop-up window and a progress bar, after the progress bar is completed, check the appropriate parameters and click done to set it on the device

3.3.3 POI parameter settings

1. The POI card page allows you to set the access mode, adjust the ATT and monitor the alarm status
2. Click autosetup to enter the POI Card commission page, a list of POI cards will be displayed, select simplex or duplex access mode through the drop-down menu, and automatically adjust the ATT of the device by writing the rated power

3.3.4 FOU parameter settings

Can query and set optical signal related parameters and alarms.

	name	type ⇕	current value	set value	min value ⇕	max value ⇕	unit	remarks ⇕
☐	Optical RX Power 1	R	7		-3	8	*	
☐	Optical RX Power 2	R	-5		-3	8	*	
☐	Optical RX Power 3	R	-5		-3	8	*	
☐	Optical RX Power 4	R	-5		-3	8	*	
☐	Optical TX Switch	R/W	1		0	1	*	
☐	Optical RX Switch 1	R/W	1		0	1	/	
☐	Optical RX Switch 2	R/W	1		0	1	/	
☐	Optical RX Switch 3	R/W	1		0	1	/	
☐	Optical RX Switch 4	R/W	1		0	1	/	
☐	RF Switch 1	R/W	1		0	1	/	
☐	RF Switch 2	R/W	1		0	1	/	
☐	RF Switch 3	R/W	1		0	1	/	
☐	RF Switch 4	R/W	1		0	1	/	
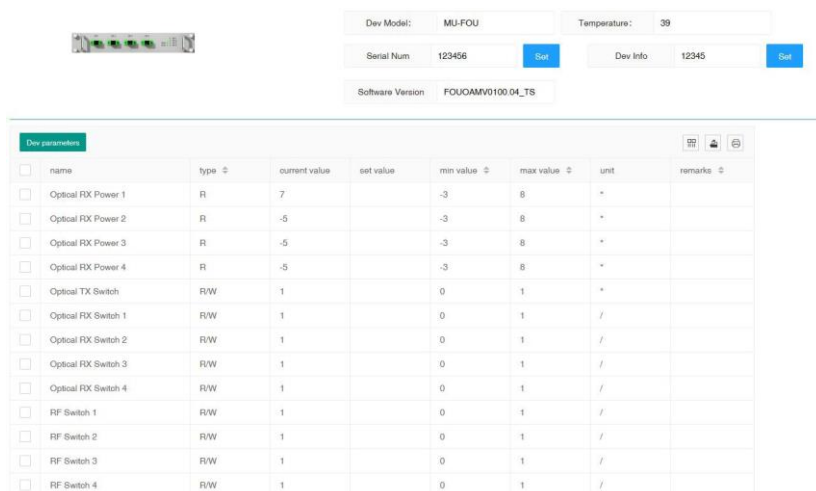
3.3.5 HUB Device parameter settings

There are 5 tables, including RF related parameters, power supply related parameters, optical signal related parameters, TDD synchronization related parameters, and alarms.

HUB Control Interface

1、RF info is used to control the uplink and downlink gain of HUB and observe the output power of each port

2、Power supply info is Used to control the power switch and current monitoring of 4 ports, which can be used to determine whether the ARU is working properly and the power consumption status

name	type	current value	set value	min value	max value	unit	remarks
ARU Power Supply Switch A	R/W	1		0	1	/	
ARU Power Supply Switch B	R/W	1		0	1	/	
ARU Power Supply Switch C	R/W	1		0	1	/	
ARU Power Supply Switch D	R/W	1		0	1	/	
ARU Power Supply current A	R	781				mA	
ARU Power Supply current B	R	688				mA	
ARU Power Supply current C	R	14				mA	
ARU Power Supply current D	R	741				mA	

3.3.6 ARU Device parameter settings

There are 7 tables, namely 700, 850, 1900, 2100, 2600, 3800, and alarms. Each frequency band can be adjusted for gain, RF switching, and power reading.

Dev parameters 700MHz

name	type	current value	set value	min value	max value	unit	remarks
UL RF Switch (ABC)	R/W	1		0	1		
UL RF Switch (Upper C)	R/W	1		0	1		
DL RF Switch	R/W	1		0	1		
UL ATT (ABC)	R/W	15		0	30	dB	
UL ATT (Upper C)	R/W	15		0	30	dB	
DL ATT	R/W	15		0	30	dB	
DL Output Power	R	--		0	20	dBm	

Dev parameters 850MHz

name	type	current value	set value	min value	max value	unit	remarks
UL RF Switch	R/W	1		0	1	/	
DL RF Switch	R/W	1		0	1	/	
UL ATT	R/W	7		0	30	dB	
DL ATT	R/W	7		0	30	dB	
DL Output Power	R	--		0	20	dBm	

Dev parameters 1900MHz

ARU Control Interface

ARU has a parameter table for each frequency band, which mainly includes switch, attenuation, and power reading values, used to control and monitor the working status of each frequency band

The public parameter table of ARU is used to set the attenuation of the common end, that is, when the cable insertion loss is small, by setting the public attenuation, the system gain is too high and the input ARU signal is too strong

ARU calibrate

1、After clicking the button, the HUB button connected to the device will appear

2、After clicking the HUB button, the calibration table for the current HUB will appear

3、After clicking the calibration button for a single ARU, the calibration process for a single ARU begins

4、After clicking calibration refresh, the device will query the calibration results and display them in the table.
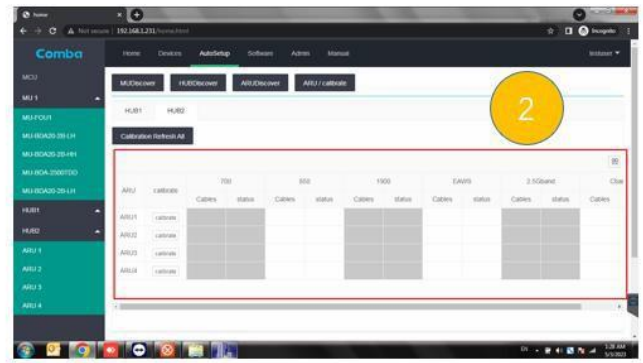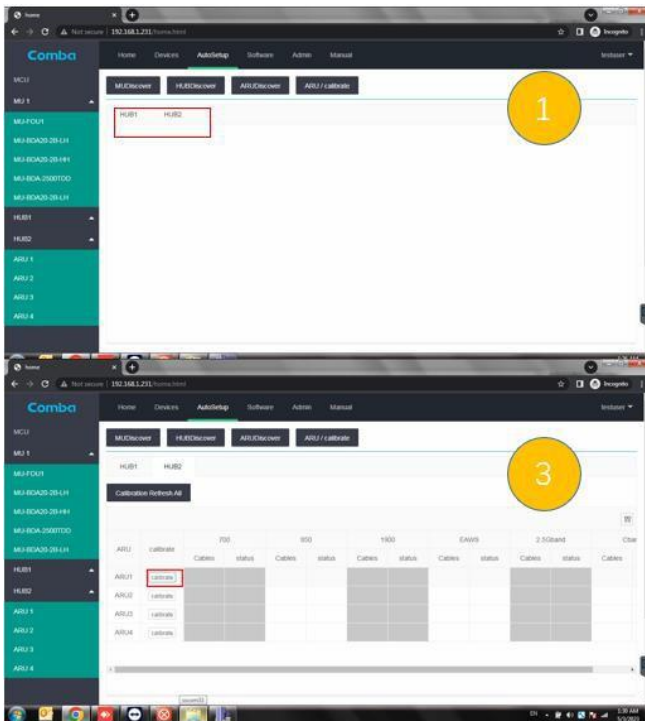
Global parameters

1、After clicking the button, the HUB button connected to the device will appear

2、After clicking the HUB button, A list of the current ARU list and the ARU channel global radio switches for each channel will appear
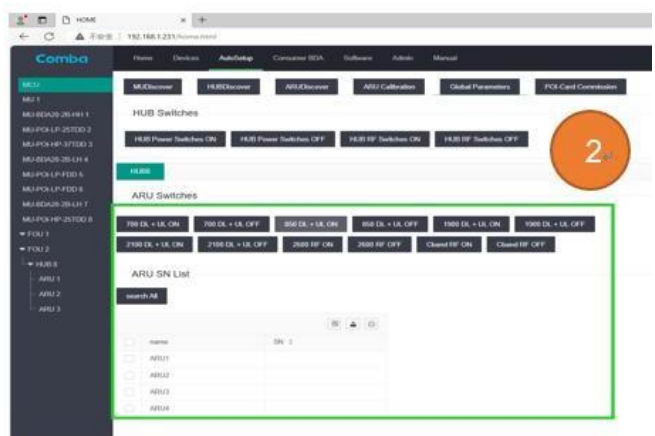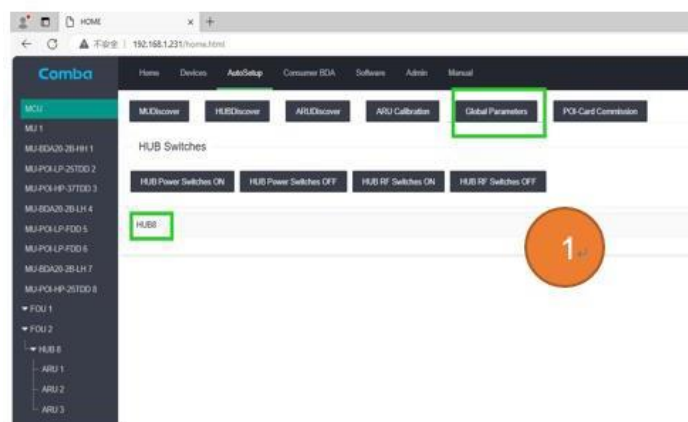
3.3.7 Device status reading

To be updated

3.3.8 SNMP Parameter settings

To be updated

3.4 Common maintenance operations

3.4.1 Upgrade operation

Web: software>web upload>selecting design files>Submit

Equipment: software>Devices upload>Select design files>Submit>Upgrade

MU/FOU/BDA software upgrade

    2、Connect the OMT port of MU using a network cable.

    3、Click the bottom "choose file", click submit ,click software tab and click Upgrade bottom.

    4、wait 3mins, reconnect the web GUI and check the software version.
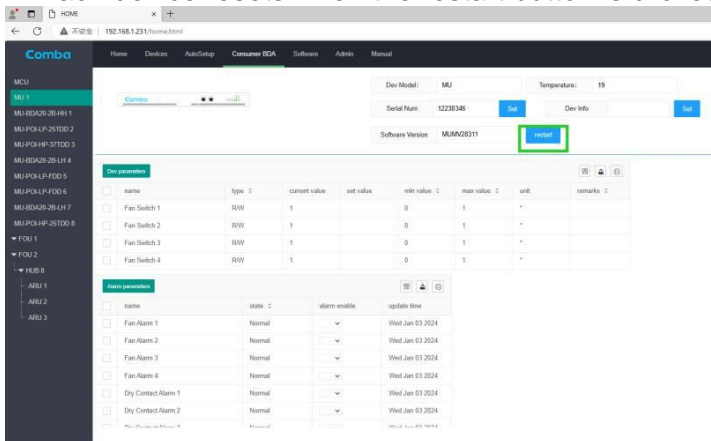
HUB/ARU software upgrade

    1、Connect the TEST port of HUB using a network cable.

    2、Click the bottom "choose file", click submit ,click software tab　and click Upgrade bottom.

    3、wait 3mins, reconnect the web GUI and check the HUB software version.
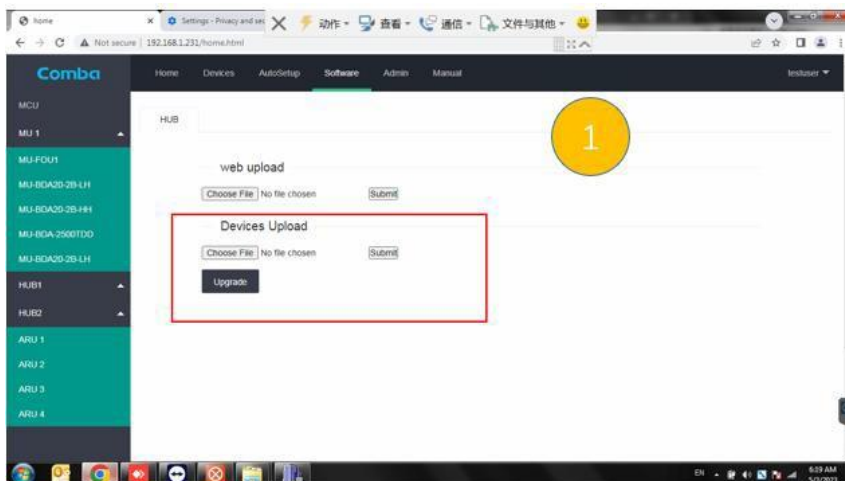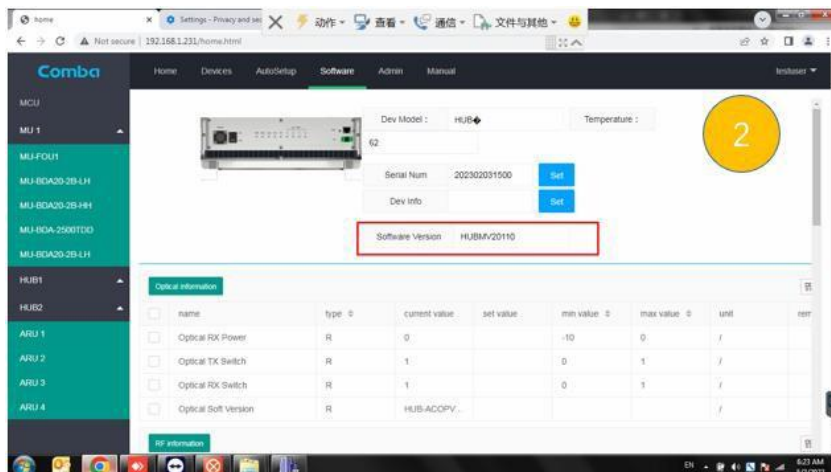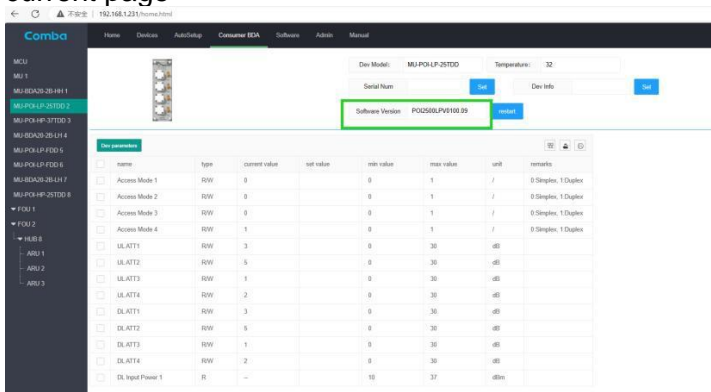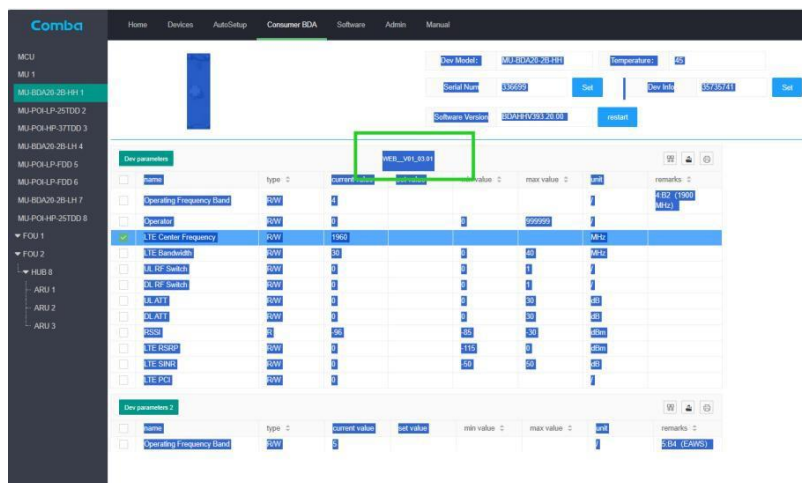
3.4.2 Software Reset

1. Each device resets when the restart button is clicked

3.4.3 Software version query

1. The software version is displayed for each device
2. Using the Ctrl+A Select All function under the current page will display the software version of the current page

3.4.4 Alarm Query

To be updated

3.4.5 Log export

To be updated

Attachment 1 Web Parameter Description

To be updated