User Manual

PROSE High Power Blade HPRU System

Manual Version 1.1

Nov 10, 2023

No part of this documentation may be

excerpted, reproduced, translated, annotated or duplicated.

In any form or by any means

without the prior written permission of PROSE Technologies Co., Ltd

Contents

Introduction 1
1. Safety instructions 3
2. System Introduction 5
3. Product Introduction 6
3.1 Product Outline Drawing and Description 6
3.1.1 PBMU 6
3.1.1.1 PBMU Exterior 6
3.1.1.2 PBMU Ports 7
3.1.1.3 PBMU Configuration 8
3.1.2 IM2U 8
3.1.2.1 IM2U Exterior 8
3.1.2.2 IM2U Ports 9
3.1.2.3 IM2U Configuration 11
3.1.3 HPRU 12
3.1.4 MCU 12
3.1.4.1 MCU Exterior 12
3.1.4.2 MCU Ports 13
3.1.5 LPA 17
3.1.5.1 Sub 3G LPA Exterior 17
3.1.5.2 Sub 3G LPA Port 18
3.1.5.3 5G LPA Exterior 20
3.1.5.4 5G LPA Port 21
3.2 Product Specifications 23
3.2.1 PBMU 23
3.2.2 IM2U 24
3.2.3 HPRU 25
4. Installation 27
4.1 Installation Preparation 27
4.1.1 Select one site location 27
4.1.2 Installation tools 27
4.1.3 Information about the installation 28
4.2 Installation steps 28
4.2.1 Installation 28
4.2.2 Installation of PBMU 29
4.2.2.1 Installation Scenarios 29
4.2.2.2 Installing a PBMU in cabinet 29
4.2.3 Installation of IM2U 31
4.2.3.1 Installation Scenarios 31
4.2.3.2 Installing an IM2U in cabinet 31
4.2.4 Installation of MCU 34
4.2.4.1 Install Accessories for MCU 34
4.2.4.2 Installing an MCU on a wall 35

4.2.4.3 Installing an MCU on a pole 40
4.2.5 Installation of LPA 42
4.2.5.1 Install Accessories for LPA 42
4.2.5.2 Installing an LPA on a wall 44
4.2.5.3 Installing an LPA on a pole 48
4.3 Installation standard 50
4.3.1 Device installation 50
4.3.2 Jumper and connecter 50
4.3.3 Power source 50
4.3.4 The patch cord 50
4.3.5 Ports introduction 51
4.3.5.1 PBMU 51
4.3.5.2 IM2U 52
4.3.6 Fiber and RF cable connection 53
4.3.7 MCU & LPA connection 53
5. Device configuration 55
5.1 PC configuration 55
5.2 Parameter description 56
5.2.1 PBMU 56
5.2.2 PBMU configuration 59
5.2.3 IM2U 62
5.2.4 HPRU 65

Introduction

As the requirement for mobile communication quality keeps enhancing, the operators of wireless network need to pay more attention to improve the network quality and expand the network coverage. Due to the change of electromagnetic environment and increase of mobile subscribers, those existing BTS may be unable to meet the specified performance requirements and the following coverage problems will occur:

1. High call-drop rate
2. Low rate of successful handover
3. Low coverage rate or bad coverage quality
4. Low connection rate
5. Bad conversation quality

To solve all these problems in an all-around way, only adjusting the cell parameters of the BTS is not enough. The adoption of “BTS + Repeaters” is a better solution that has been verified in many sites in village, highway and tourism regions, especially at the edge of a BTS coverage region. And since the repeater requires fewer accessories and no need special equipment-room, operators can get more profit from lower construction and operation cost.

PROSE High Power System is a multi-standards integration system, which has integrated 2G/3G/4G/5G, and support for broadband access to this system. This system mainly consists of two parts. Repeater is especial tailored to provide a comprehensive and flexible coverage solution in complex coverage environments like densely populated residential area, underground areas, tunnels, stations and terminals, Hotels, Meeting rooms and shopping mall and so on. It widely used on the mobile communication networks. The system receives filters, amplifies, and transfers the uplink and downlink radio frequency (RF) signals of the base transceiver station (BTS) to extend and accurately distribute the coverage of the BTS.

PROSE’s High Power Blade Remote Unit (HPRU-P) solution system supports multi operators. The system frequency range is 689MHz-3800MHz. Applicable to subway and tunnel scenarios. The core of the HPRU solution system is the power balance main control unit (PBMU). It is mainly for RF signal processing, and RF signal to optical signal conversion, and then connected with HPRU via optical fiber. Optical signals are transmitted through single-mode fiber with low loss and almost no noise added. It supports a 2X2 MIMO configuration, or 2 channels for SISO.

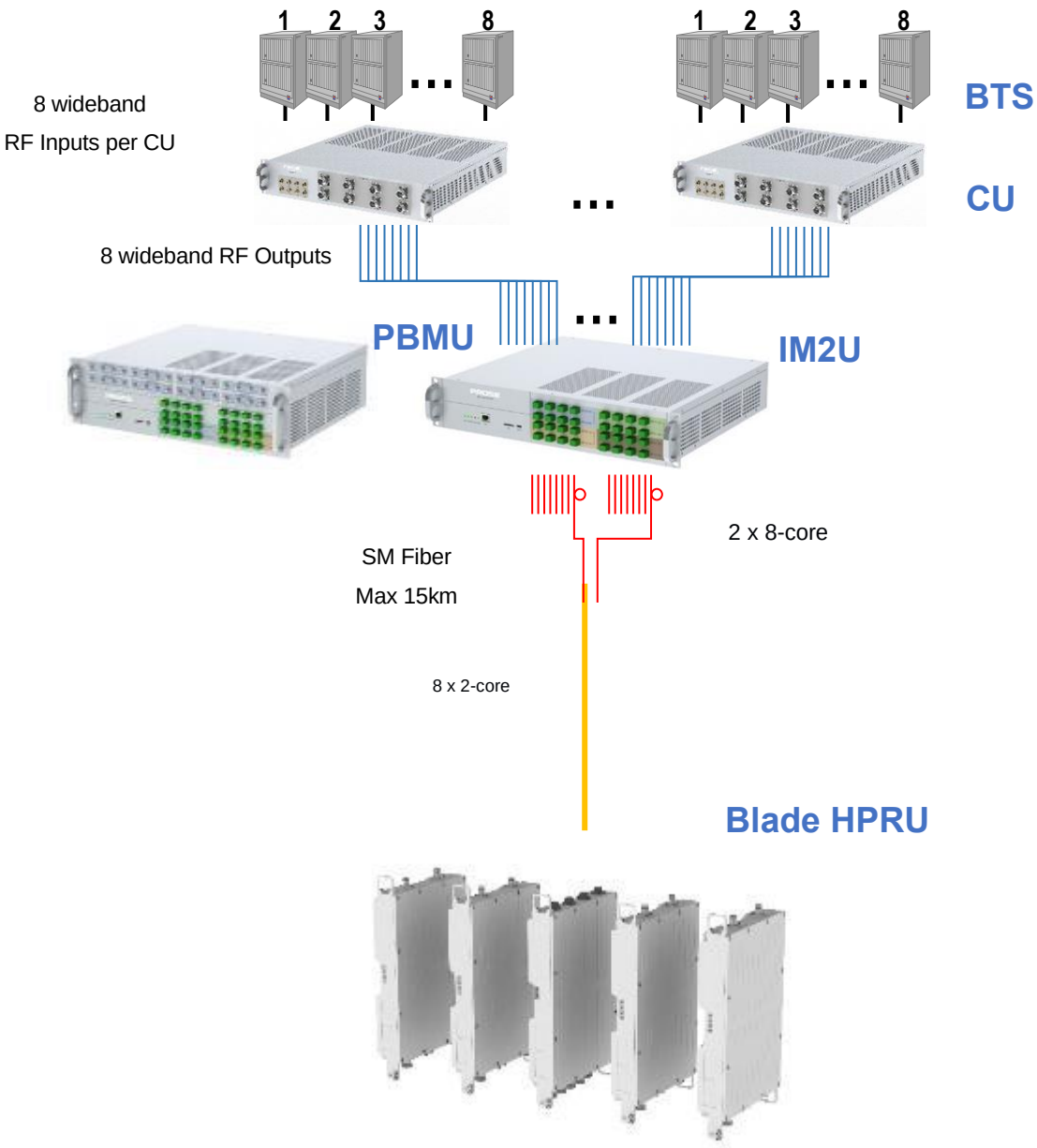


Figure 1.1 Functional Components of PROSE High Power System

1. Safety instructions

It is important to read safety instructions before installing the equipment. These instructions are supplementary to any local safety regulations in place. In case of any conflict, local safety regulations shall prevail.
Installation personnel should have preliminary knowledge about safety operations and must have received training on PROSE equipment installation, maintenance and operations.
Some important safety instructions are discussed in the chapter. PROSE shall not bear any liabilities incurred by violation of universal safety operation requirements, or violation of safety standards for designing, manufacturing and equipment usage.

1. The equipment must follow system requirements with proper grounding & lightning protection.

2. Power supply voltage must satisfy safety requirements. Anybody who installs or modifies equipment must turn off the power supply first. Only certified maintenance staff are allowed to perform operations with power-on.

3. The equipment radiates electromagnetic waves, which can cause damage to the human body. Proper safety and precautions should be taken. People other than maintenance staff should keep away.

4. Do not expose yourself for long periods of time to the FOR system while in operation because the electromagnetic field emitted by the equipment may do harm to your health.

5. If installed at height (onto the pole), the equipment shall be securely fixed to prevent harm and bodily injury from dropping parts.

6. The equipment must be away from fire, as electronic components may explode upon fire.

7. Static electricity produced by human body can damage sensitive components on the circuit board, such as large integrated circuits (ICs).

8.

Hereby, Rosenberger Asia Pacific Electronic Co., Ltd. declares that the radio equipment type LPA/MCU/HPRU is in compliance with Directive 2014/53/EU.
The full text of the EU declaration of conformity is available at the following internet address: *www.address.com/DoC.pdf*

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	UK
	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	
	SE	TR	NO	CH	IS	LI	HR	IT	CY	SI	
	SK	FI	UK(NI)								

RF Exposure Information
This device has been tested and meets applicable limits for Radio Frequency (RF) exposure.

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 510 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

9. **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. You MUST register Part 90 Class B signal boosters (as defined in 47CFR 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.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 510cm between the radiator & your body.

10. WARNING: This is NOT a CONSUMER device. It is designed for installation by an installer approved by an ISED licensee. You MUST have an ISED LICENCE or the express consent of an ISED licensee to operate this device.

WARNING: Industrial zone enhancers are NOT consumer devices. They are designed for installation by ISED licensees and qualified installers who have recognized RF training. You MUST be an ISED licensee to install or operate this device.

2. System Introduction

Overview

PROSE's high power system supports multiple operators deploying multiple mobile technologies. The system operates from 698-3800MHz and extends 2G, 3G, 4G, 5G and broadband data coverage for indoor applications. It is particularly suited for high-capacity application scenarios such as business towers, shopping malls, offices, airports, stadiums, and other indoor application scenarios.
The core of the system, consisting of the Power Balance Master Unit (PBMU), deals with the power level aligning for multiple operators accessing, signal processing and the conversion of RF signals to optical. The optical signals are transmitted over single mode fiber with low loss and virtually no increased in noise floor. The PBMU uses single mode fiber to connect to the High Power Remote Unit (HPRU), where each PBMU can connect 16 units of HPRU for SISO, and 8 units of HPRU for 2x2 MIMO applications.

The advantages of the system are:
• Easy and quick to design and deploy Fiber DAS, where RF radiated power is determined only by each HPRU
• Achieve uniformed coverage, each HPRU provides constant output power for each band
• Precisely adjust the RF output power level in specific applications
• Zero RF loss in signal transmission
• No PIM and VSWR issues
• One PBMU connects a maximum of 16 HPRUs for 2x2 MIMO solution
• Management via OMT or NMS software

3. Product Introduction

Overview

System consists of PBMU and HPRU.

Interconnection between PBMU and HPRU is fiber optical cable via optical module.

Optical interface supports 690-3800MHz band.

3.1 Product Outline Drawing and Description

3.1.1 PBMU

3.1.1.1 PBMU Exterior

Figure 3-1 PBMU exterior

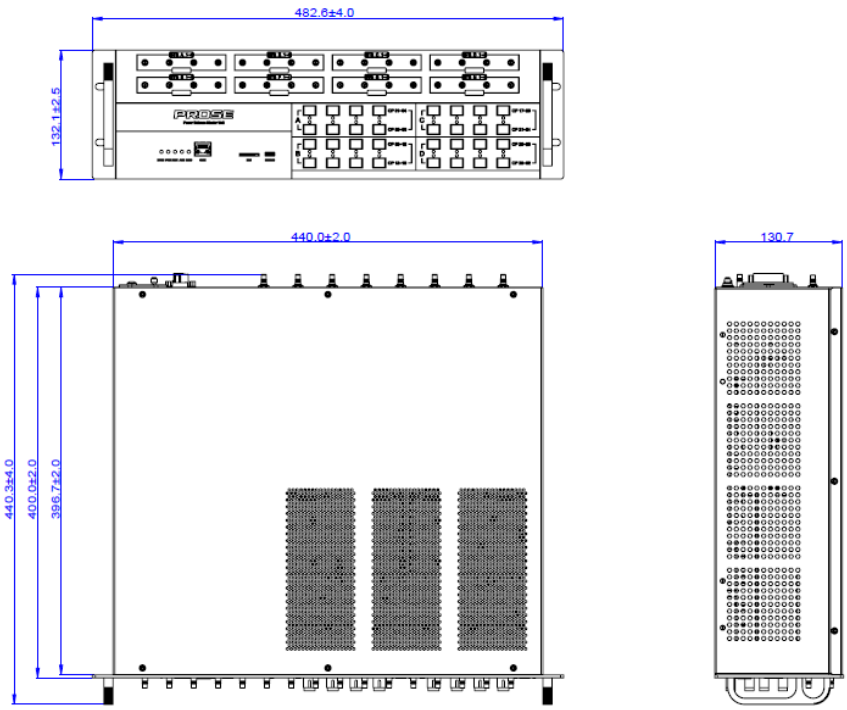


Figure 3-2 PBMU dimensions

3.1.1.2 PBMU Ports

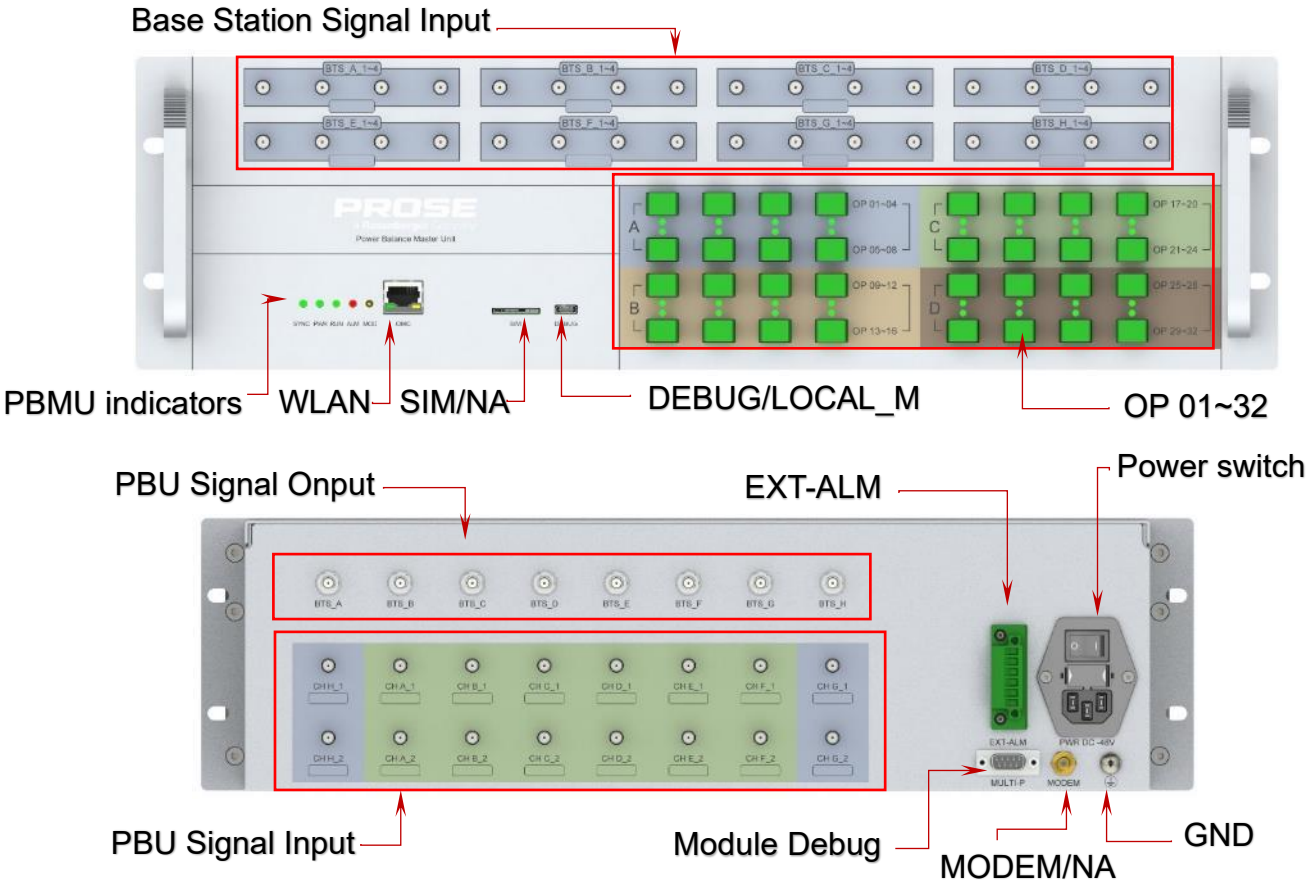


Figure 3-3 Ports in the PBMU front/real panel

Table 3-1 PBMU indicators

Indicator	Color	Status	Meaning
SYNC	Green	Steady off	5G or 4G TDD signals are out of sync
		Steady on	5G or 4G TDD signal synchronization
PWR	Green	Steady on	The power input is available
RUN	Green	Blinking	The software works fine
		Steady on or off	Software operating abnormally or no power
ALM	RED	Steady on	The system has alarm
		Steady off	The system has no alarm
MOD	Green	Blinking	Motherboard MODEM in network
		Steady off	Motherboard MODEM is offline

3.1.1.3 PBMU Configuration

There are several kinds of configurations for PBMU according to customer requirements.

1) The communication ports named with “DUBGE” or “LOCAL_M”.
2) The SIM card slot exist or not.
3) Power supply need backup or not.
4) Power supply port on real panel with two different types as figure 2-3 shown.
5) Port “MODEM” on real panel exist or not.
6) Optical ports quantity 32 or 16 or 8.

3.1.2 IM2U

3.1.2.1 IM2U Exterior

Figure 3-4 IM2U exterior

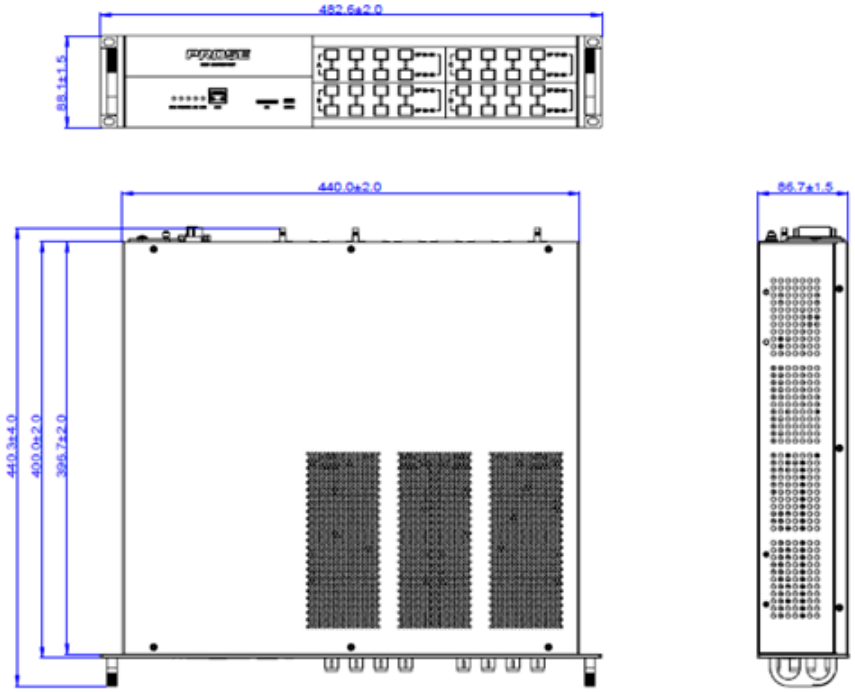


Figure 3-5 IM2U dimensions

3.1.2.2 IM2U Ports

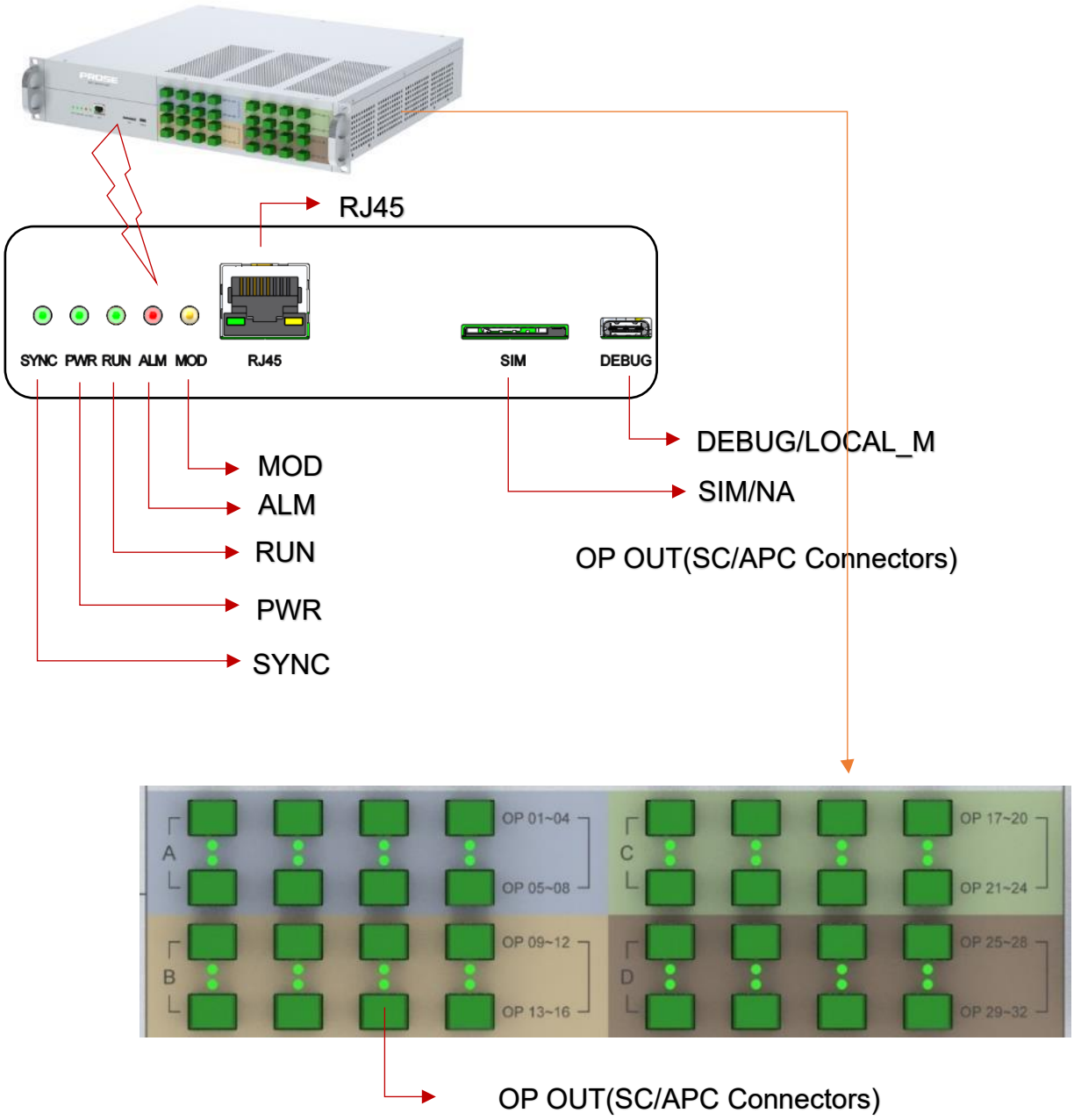


Figure 3-6 Ports in the NEU front panel

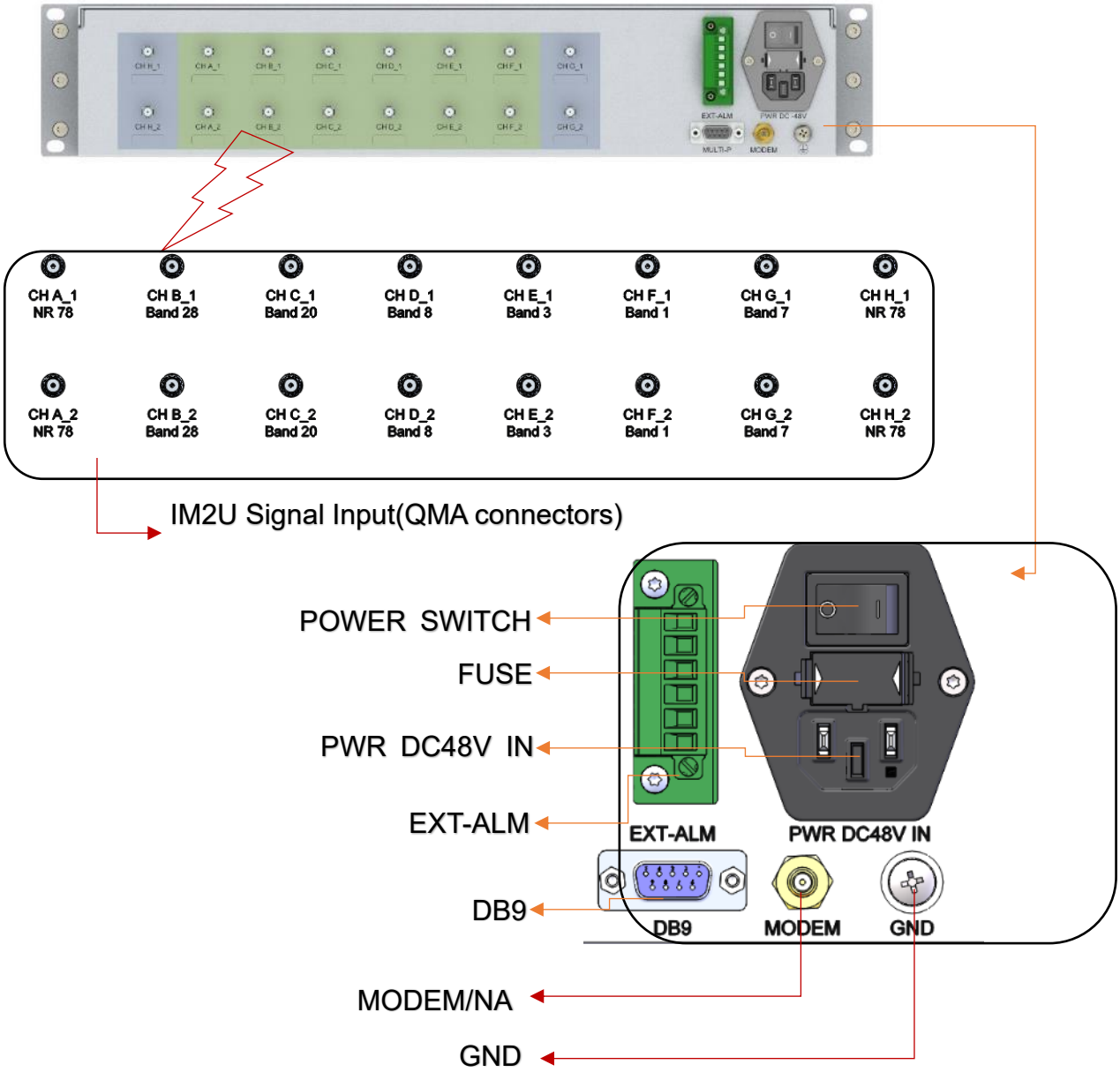


Figure 3-7 Ports in the IM2U rear panel

Table 3-2 Ports and indicators on the IM2U panels

Item	Silkscreen	Remarks
(IM2U) Ports in the front panel	RJ45	Network interface
	SIM	Insert SIM card
	A OP 01~04 OP 05~08	Signal output, connect with optical fiber line
	B OP 09~12 OP 13~16	Signal output, connect with optical fiber line

	C OP 17~20 OP 21~24	Signal output, connect with optical fiber line
	D OP 25~28 OP 29~32	Signal output, connect with optical fiber line
Item	**Silkscreen**	**Remarks**
(IM2U) Ports in the rear panel	PWR DC48V IN	DC48V Power input
	GND	IM2U equipment grounding
	MODEM	Connect the MODEM
	DB9	DB9
	EXT-ALM	Alarm extension
	CH(A~B)_1 (NR78,Band 28……)	IM2U Signal Input (QMA connectors). Frequency can be configured according to the product before delivery
	CH(A~B)_2 (NR78,Band 28……)	IM2U Signal Input (QMA connectors) Frequency can be configured according to the product before delivery

Table 3-3 IM2U indicators

Indicator	Color	Status	Meaning
SYNC	Green	Steady off	5G or 4G TDD signals are out of sync
		Steady on	5G or 4G TDD signal synchronization
PWR	Green	Steady on	The power input is available
RUN	Green	Blinking	The software works fine
		Steady on or off	Software operating abnormally or no power
ALM	RED	Steady on	The system has alarm
		Steady off	The system has no alarm
MOD	Green	Blinking	Motherboard MODEM in network
		Steady off	Motherboard MODEM is offline

3.1.2.3 IM2U Configuration

There are several kinds of configurations for IM2U according to customer requirements.

1) The communication ports named with “DUBGE” or “LOCAL_M”.
2) The SIM card slot exist or not.
3) Optical ports quantity 32 or 16 or 8.
4) Port “MODEM” on real panel exist or not.

3.1.3 HPRU

Figure 3-8(a) HPRU exterior (4G)

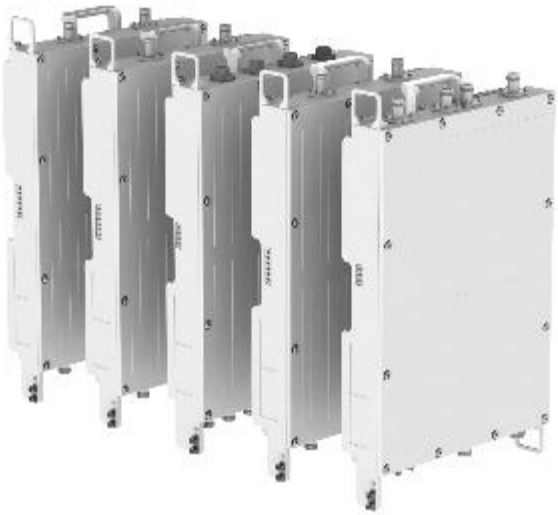


Figure 3-8(b) HPRU exterior (4G+5G)

HPRU consists of MCU and LPAs, the system support up to 4 LPAs connected to 1 MCU.

MCU4-2F16R-XX	Monitoring & Control Unit
LPA2-43-B121314-64F-XX	LPA Unit
LPA2-43-B5B30-64F-XX	LPA Unit
LPA2-43-B25B66-64F-XX	LPA Unit

3.1.4 MCU

3.1.4.1 MCU Exterior

There are two kinds of MCU, one is for 4G and the other one is for 4G+5G applications. They are the same outlook. The only difference is the connector L32 for 5G LPA connection with the opposite polarity as shown in Figure 3-12.

4G MCU

4G+5G MCU

Figure 3-9 MCU exterior

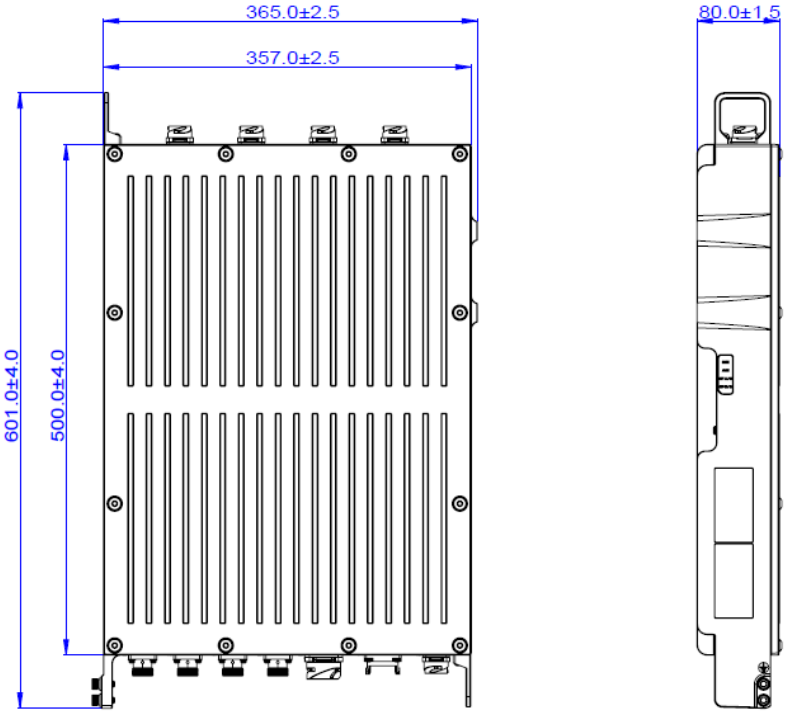


Figure 3-10 MCU dimensions

3.1.4.2 MCU Ports

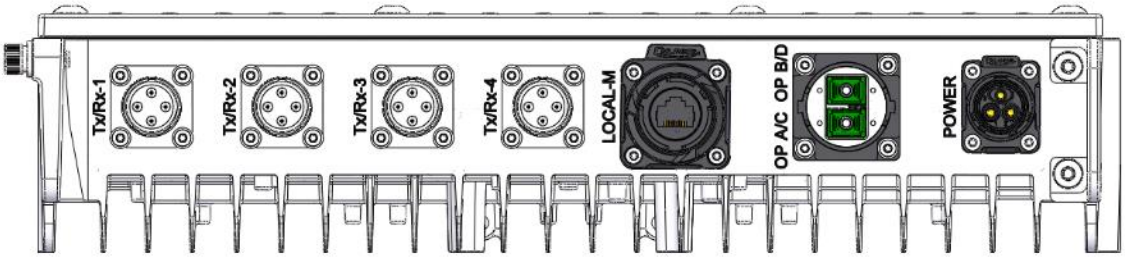


Figure 3-11 Ports in the MCU bottom panel

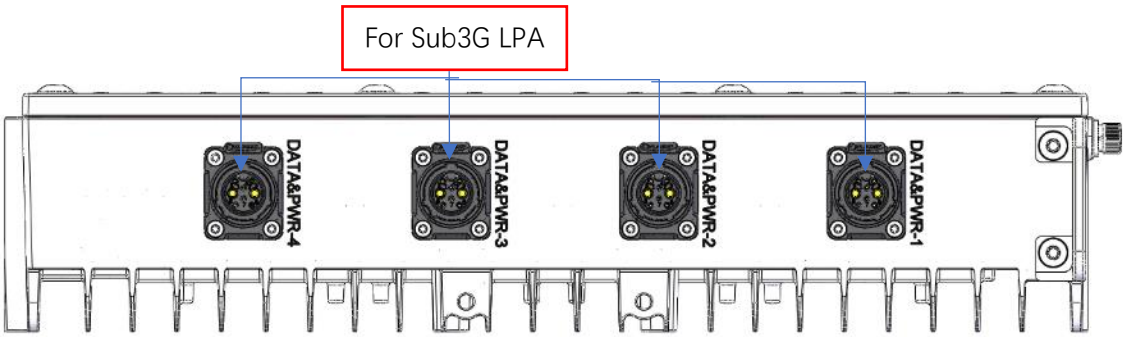


Figure 3-12(a) Ports in 4G MCU top panel

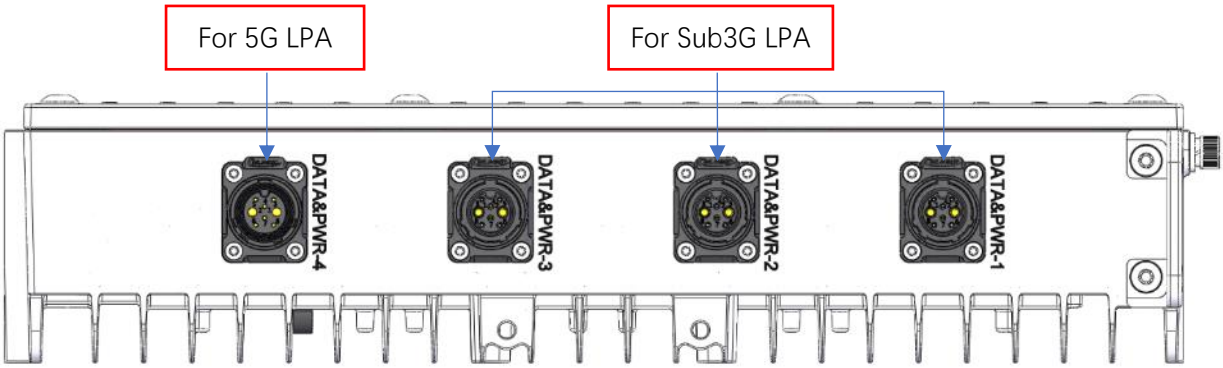


Figure 3-12(b) Ports in 4G+5G MCU top panel

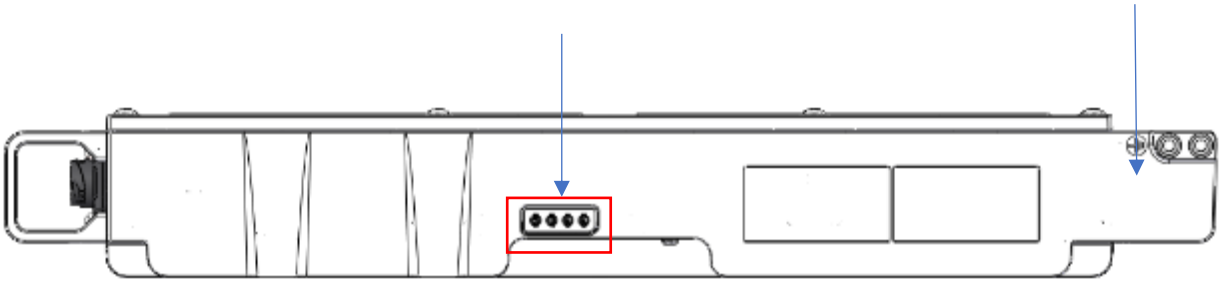


Figure 3-13(a) Ports in the MCU flank panel

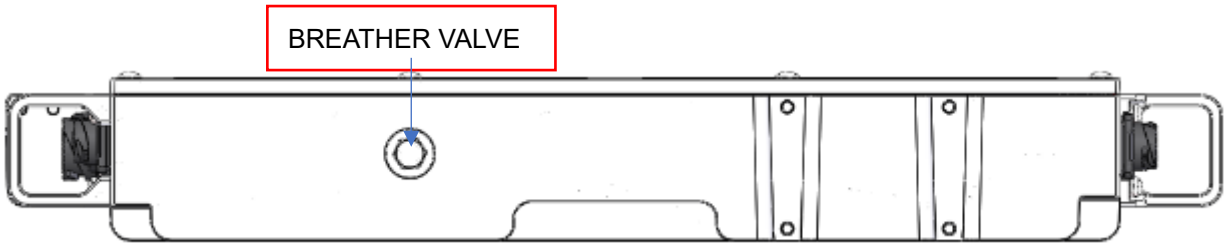


Figure 3-13(b) Ports in the MCU flank panel

Table 3-4 Ports on 4G MCU panels

Item	Silkscreen	Remarks
Ports in the bottom panel	Tx/Rx1-4	Connect to LPA
	Local-M	RJ45 port for MCU
	OP A/C	Optic connector with optical fiber jumper cable and optical adapter
	OP B/D	Optic connector with optical fiber jumper cable and optical adapter
	POWER	AC Power input
Ports in the top panel	DATA&PWR1-4	DC power output and RS485 signal contact for LPA
Ports in the flank panel	GND	Module grounding

Table 3-5 Ports on 4G+5G MCU panels

Item	Silkscreen	Remarks
Ports in the bottom panel	Tx/Rx1-4	Connect to LPA
	Local-M	RJ45 port for MCU
	OP A/C	Optic connector with optical fiber jumper cable and optical adapter
	OP B/D	Optic connector with optical fiber jumper cable and optical adapter
	POWER	AC Power input
Ports in the top panel	DATA&PWR1-3	DC power output and RS485 signal contact for Sub 3G LPA
	DATA&PWR4	DC power output and RS485 signal contact for 5G LPA
Ports in the flank panel	GND	Module grounding

Table 3-6 MCU indicators

ITEM	Indicator	Color	Status	Meaning
MCU	RUN	Green	Blinking	LPA is running properly and the board software is loaded
			Steady on or off	software is not working
	ALM	Red	Steady on	Alarms are generated
			Steady off	No alarms are generated
	OP A/C	Green	Steady on	The optical link is running properly
			Steady off	The optical link is disconnected
	OP B/D	Green	Steady on	The optical link is running properly
			Steady off	The optical link is disconnected

3.1.5 LPA

3.1.5.1 Sub 3G LPA Exterior

Figure 3-14 Sub 3G LPA exterior

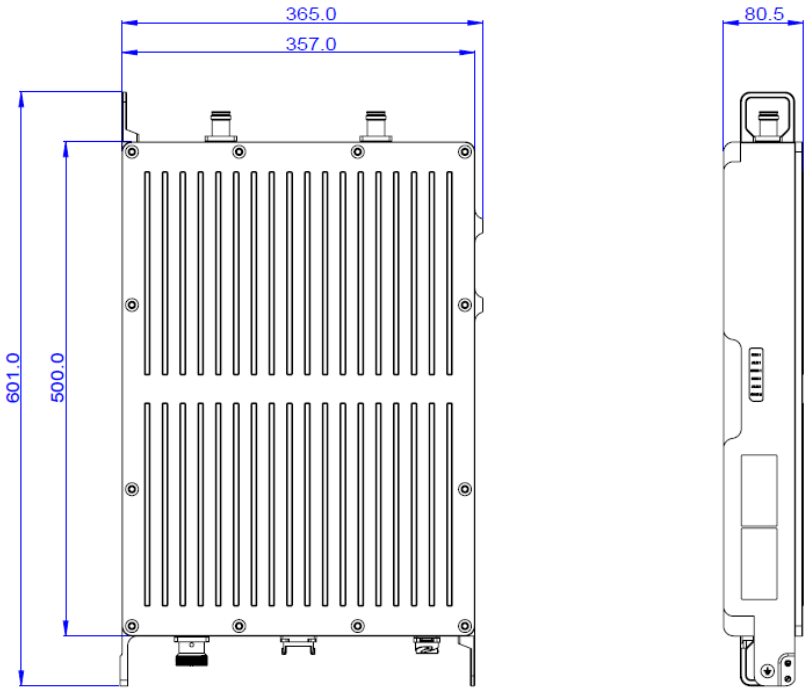


Figure 3-15 Sub 3G LPA dimensions

3.1.5.2 Sub 3G LPA Port

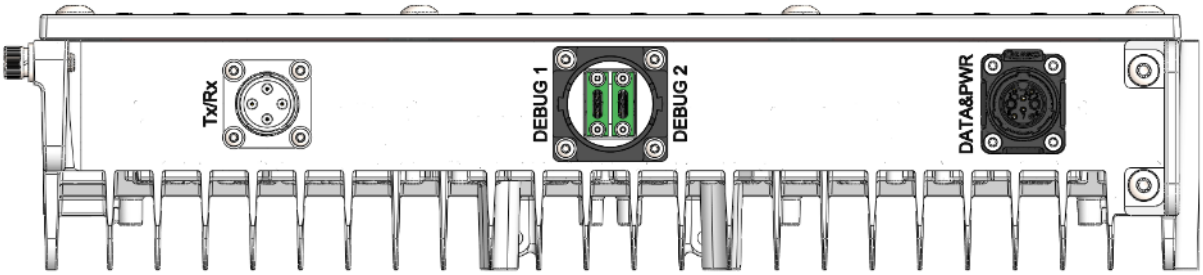


Figure 3-16 Ports in the LPA top panel

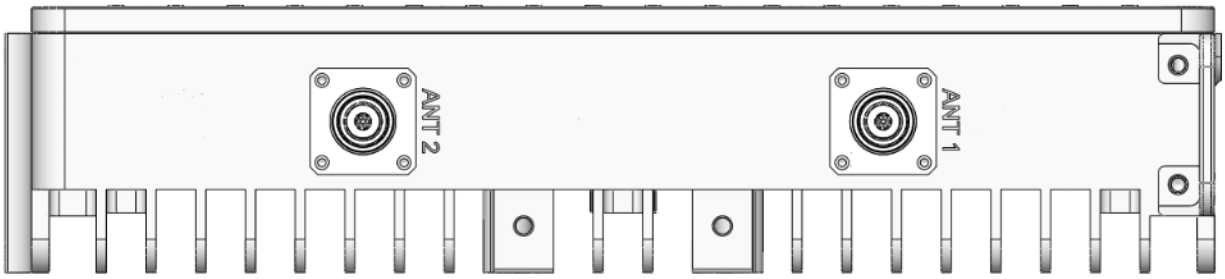


Figure 3-17 Ports in the LPA bottom panel

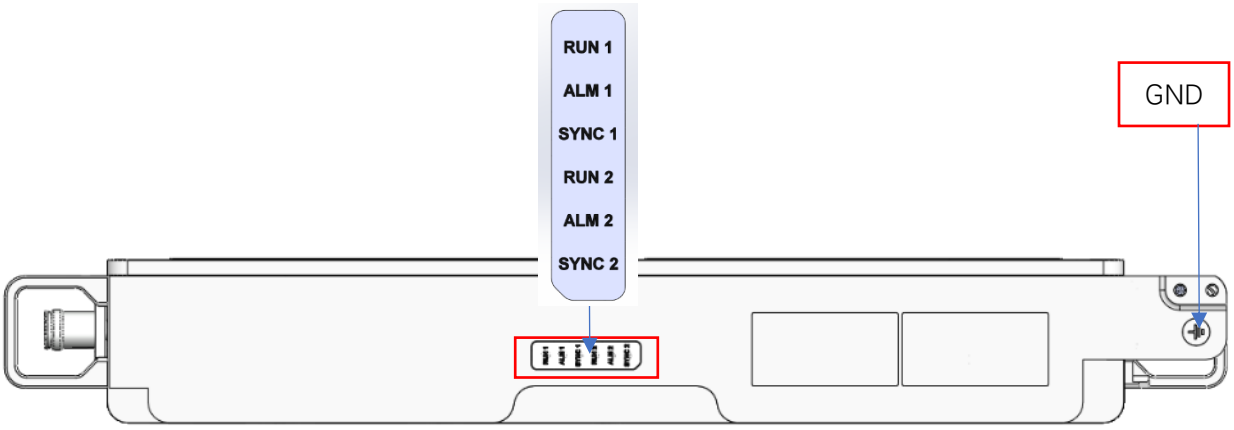


Figure 3-18(a) Ports in the LPA flank panel

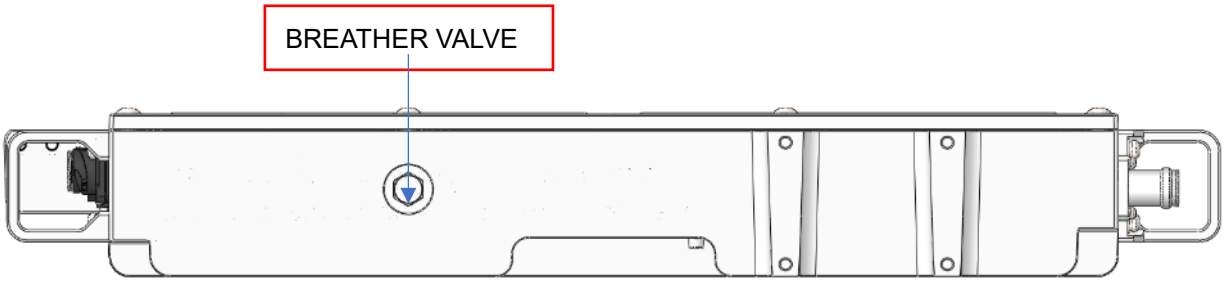


Figure 3-18(b) Ports in the LPA flank panel

Table 3-6 Ports on the LPA panels

Item	Silkscreen	Remarks
Ports in the top panel	ANT1-2	Connect to combiner
Ports in the bottom panel	DATA&PWR	DC power output and RS485 signal contact for LPA
	DEBUG-1	Type C port for LPA
	DEBUG-2	Type C port for LPA
	Rx/Tx	Connect to MCU
Ports in the flank panel	GND	Module grounding

Table 3-7 LPA indicators

ITEM	Indicator	Color	Status	Meaning
LPA	RUN1/ 2	Green	Blinking	LPA is running properly and the board software is loaded
			Steady on or off	software is not working
	ALM1/2	Red	Steady on	Alarms are generated
			Steady off	No alarms are generated
	SYN1/2	Green	Steady on	The PA module is syncing
			Steady off	The PA module is out of sync

3.1.5.3 5G LPA Exterior

2 channels LPA

Single channel LPA

Figure 3-19 5G LPA exterior

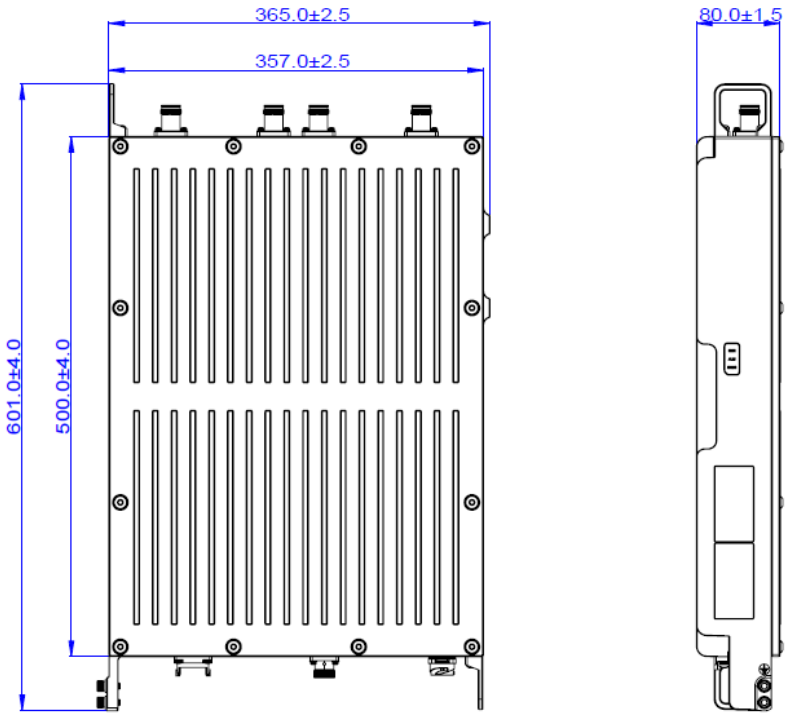


Figure 3-20 5G LPA dimensions

3.1.5.4 5G LPA Port

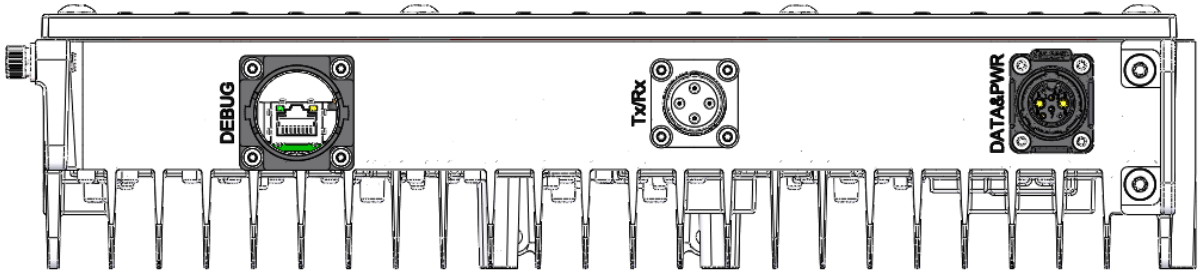


Figure 3-21 Ports in the LPA bottom panel

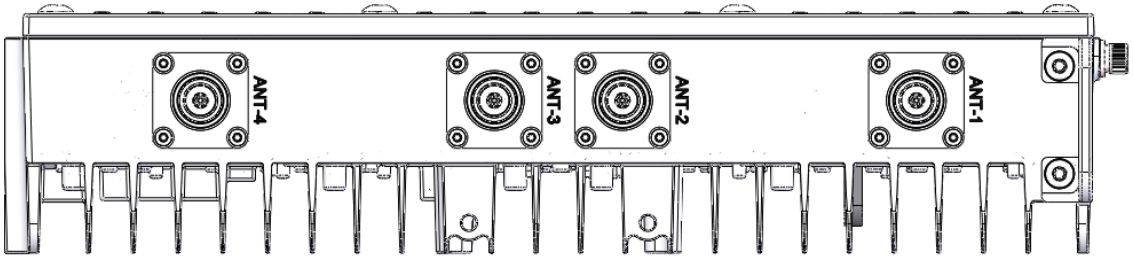


Figure 3-22 Ports in the LPA top panel

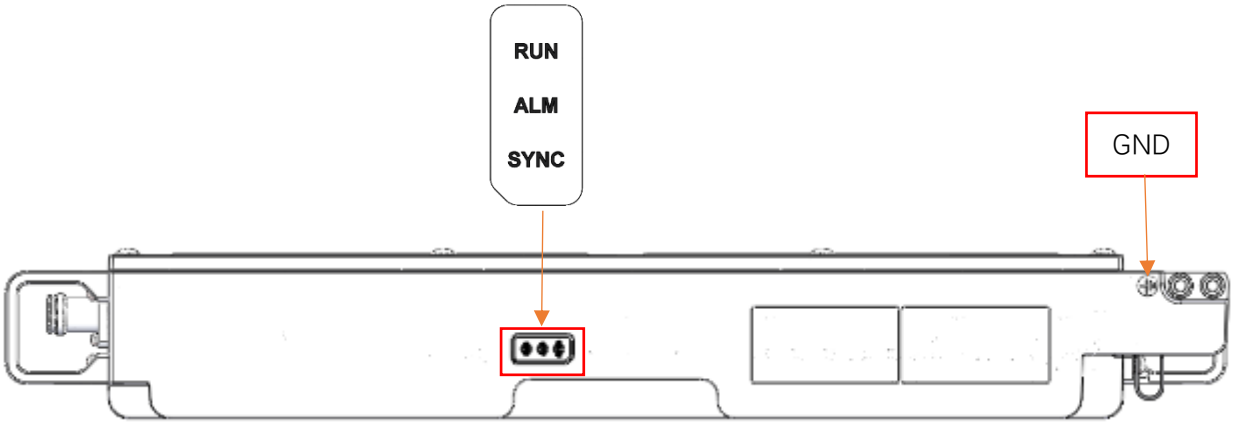


Figure 3-23(a) Ports in the LPA flank panel

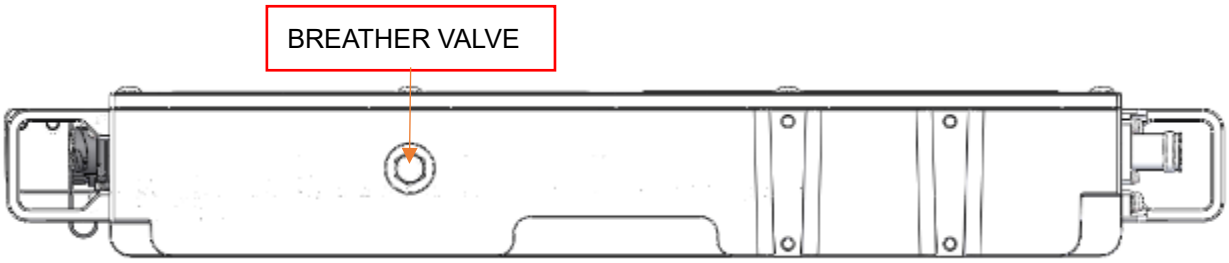


Figure 3-23(b) Ports in the LPA flank panel

Table 3-8 Ports on 5G LPA panels

Item	Silkscreen	Remarks
Ports in the top panel	ANT1-4	Connect to combiner
Ports in the bottom panel	DATA&PWR	DC power output and RS485 signal contact for LPA
	DEBUG	RJ45 port for LPA
	Tx/Rx	Connect to MCU
Ports in the flank panel	GND	Module grounding

Table 3-9 5G LPA indicators

ITEM	Indicator	Color	Status	Meaning
LPA	RUN	Green	Blinking	LPA is running properly, and the board software is loaded
			Steady on or off	software is not working
	ALM	Red	Steady on	Alarms are generated
			Steady off	No alarms are generated
	SYN	Green	Steady on	The PA module is syncing
			Steady off	The PA module is out of sync

3.2 Product Specifications

3.2.1 PBMU

		Uplink	Downlink
Frequency	Band 12	699 - 716 MHz	729 - 746 MHz
	Band 13	777 - 787 MHz	746 - 756 MHz
	Band 14	788 - 2570 MHz	758 - 768 MHz
	Band 5	824 - 849 MHz	869 - 894 MHz
	Band 30	2305 - 2315 MHz	2350 - 2360 MHz
	Band 25	1850 - 1915 MHz	1930 - 1995 MHz
	Band 66	1710 - 1780 MHz	2110 - 2200 MHz
Gain		-20 ± 2 dB	-20 ± 2 dB
RF Output Power		≤ -25 dBm (RF)	---
Optical Power		---	-6 ± 2 dBm (O/P)
Gain Control Range (per operator)		25 dB / 0.1 dB step	25 dB / 0.1 dB step
Gain Control Range (per band)		15 dB / 1 dB step	15 dB / 1 dB step
VSWR		≤ 2.0:1	≤ 2.0:1
Max. operation Input Power		---	≤ 20 dBm
Impedance		50 Ω	50 Ω
Optical Wavelength		1310 nm	1550 nm
Power Supply		DC-48V ± 10%	

Operating temperature range	-10°C to +45°C
Storage temperature range	-40°C to +85°C
Relative humidity	10% - 95%
Ingress protection	IP40 for indoor
Monitoring and control	LAN-RJ45 (local)
	3G&4G wireless modem (remote)
Cooling	Nature cooling
Optical connector	16 sets x SC/APC (4G 2x2 MIMO)
	8 sets x SC/APC (5G 4x4 MIMO)
RF connector	IM2U: 16 x QMA-Female PBU: 32 x QMA-Female
Installation	19" Rack Mounting

3.2.2 IM2U

		Uplink	Downlink
Frequency	Band 12	699 - 716 MHz	729 - 746 MHz
	Band 13	777 - 787 MHz	746 - 756 MHz
	Band 14	788 - 2570 MHz	758 - 768 MHz
	Band 5	824 - 849 MHz	869 - 894 MHz
	Band 30	2305 - 2315 MHz	2350 - 2360 MHz
	Band 25	1850 - 1915 MHz	1930 - 1995 MHz
	Band 66	1710 - 1780 MHz	2110 - 2200 MHz
Gain		-5 ± 2 dB	-5 ± 2 dB
Ripple in Band		± 3 dB	± 3 dB
RF Output Power		⩽ -10 dBm (RF)	---
Optical Power		---	-6 ± 2 dBm (O/P)
VSWR		⩽ 2.0:1	⩽ 2.0:1
Max. Non-destructive Input Power		---	10 dBm
Impedance		50 Ω	50 Ω
Optical Wavelength		1310 nm	1550 nm
Gain Control Range		15 dB / 1 dB step, separate for each path	15 dB / 1 dB step, separate for each path
Power Supply		DC -48V ± 10%	
Operating temperature range		-10°C to +45°C	
Storage temperature range		-40°C to +85°C	
Relative humidity		10% - 95%	
Ingress protection		IP40 for indoor	
Monitoring and control		LAN-RJ45 (local)	
		3G&4G wireless modem (remote)	
Cooling		Nature cooling	
Optical connector		8 sets x SC/APC (5G 4x4 MIMO)	
		16 sets x SC/APC (4G 2x2 MIMO)	
RF connector		TX/RX: 14 x QMA-Female	
Installation		19" Rack Mounting	
Environment Protections		RoHS	

3.2.3 HPRU

MCU

	Uplink	Downlink
Frequency	698 - 4200 MHz	698 - 4200 MHz
Gain	-5 ± 2 dB	-5 ± 2 dB
Fiber Optical Power	5 ± 1 dBm (O/P)	---
Optical Wavelength	1310 nm	1550 nm
Ripple in Band	⩽ ±3 dB (System of 1x PBMU: HPRU via 1m optical fiber)	⩽ ±3 dB (System of 1x PBMU: HPRU via 1m optical fiber)
Group Delay	⩽ 1 μS	⩽ 1 μS
Impedance	50 Ω	50 Ω
Power Supply	AC 90 ~ 264V, 50 ~ 60Hz	
Power Consumption	< 80 W (Without LPA connection)	
Operating temperature range	-40ºC to +55ºC	
Storage temperature	-40°C to +85°C	
Relative humidity	5% - 98%	
Ingress protection	IP67	
Monitoring and control	PC via LAN	
RF connector	4 x L32 (Output to LPA)	
Optical connector	2 x SC/APC	
Power Connector (Output power supply to LPA)	4 x integrated socket with power supply and communication pins	
Installation	Wall/pole mounting	

4G LPA B121314

		Uplink	Downlink
Frequency (Can be configurated)	Band 12	699 - 716 MHz	729 - 746 MHz
	Band 13	777 - 787 MHz	746 - 756 MHz
	Band 14	788 - 2570 MHz	758 - 768 MHz
System gain		Band 12/13:46 ± 1 dB Band 14: 27 ± 1 dB	Band 12/13:46 ± 1 dB Band 14: 27 ± 1 dB
RF Output Power		-5 ± 2 dBm	⩾ 43.5 dBm
Gain Control Range		25 dB/1 dB step	25 dB/1 dB step
Ripple in Band		⩽ 3.5 dB (Single LPA)	⩽ 3.5 dB (Single LPA)
ALC control		When in max output power, if increased 20dB input Level, the variation of the output power can be controlled within 2dB	When in max output power, if increased 10dB input Level, the variation of the output power can be controlled within 2dB
Noise Figure		⩽ 3.5 dB (Single LPA)	---
		⩽ 5 dB (System of 1x PBMU: HPRU via 1m optical fiber)	---
VSWR		⩽ 1.5	⩽ 1.5
Group Delay		⩽ 1 μS	⩽ 1 μS
Spurious Emissions		Meets 3GPP TS 36.106 for LTE, 38.106 for NR	
Max.non-destructive input power		⩽ -10 dBm	⩽ 10 dBm
Power Supply		DC +27.5 ~ +28.5 V	
Power Consumption		< 270 W	
Operating temperature range		-40ºC to +55ºC	
Storage temperature		-40°C to +85°C	
Relative humidity		5% - 98%	
Ingress protection		IP65	
RF Connectors		4 x 4.3-10 female (Output to antenna) 1 x L32 (Input from MCU4)	
Power Connector		1 x integrated socket with power supply and communication pins	
Installation		Wall or ground mounting	

4. Installation

4.1 Installation Preparation

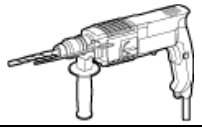
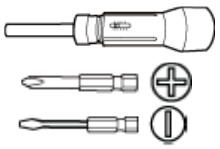
This chapter introduces installation and commissioning flow of the equipment to help installation personnel understand the entire process. Brief introduction to some physical parameters of repeater, such as size, weight, humidity and temperature is also included in this chapter.

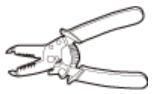
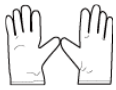
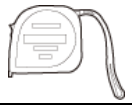
4.1.1 Select one site location

1. Make sure access is restricted to qualified personnel
2. Install the product where power supply and feeder cables are accessible.
3. Site location should be far away from heat source and damp environment.
4. Make sure can get the power supply near the site, and the power voltage is stable.
5. Make sure the grounding is well, and lightning protection is good.

4.1.2 Installation tools

You must prepare the following tools and instruments before the installation.

Item	Description	Remark
1	Hammer drill (a ø 13.5~14)	
2	Rubber Hammer	
3	Adjustable wrench (size: 32mm)	
4	Torque wrench (size:16mm / 20mm / 22mm)	
5	Combination wrench (size:16mm / 20mm / 22mm)	
6	Phillips screwdriver (M3 to M6)	
7	Torque screwdriver kit (Cross head and flat-head M3 to M6)	

8	Wire stripper	
9	Pliers	
10	Safety gloves	
11	Measuring tape	
12	Multimeter	
13	Knife	
14	Safety helmet	
15	Safety goggles	
16	Flash lights	

4.1.3 Information about the installation

Before installing a blade HPRU, you must be familiar with its exterior, ports, indicators, installation options and installation clearance requirements.

4.2 Installation steps

4.2.1 Installation

Before any installation, check that the device has no visible damages or defects. A blade HPRU can be installed on a wall, pole. Installation scenarios must meet heat-dissipation and waterproofing requirements of HPRU.

4.2.2 Installation of PBMU

4.2.2.1 Installation Scenarios

A PBMU be installed in cabinet. Installation scenarios must meet heat-dissipation and waterproofing requirements of the PBMU.

4.2.2.2 Installing a PBMU in cabinet

1. Install bracket on the cabinet with the screw. as shown in Figure 4-1. Attention: Please pay attention to mounting of bracket. as shown in Figure 4-2.
2. Push PBMU into the cabinet. as shown in Figure 4-3
3. Use screw to mount PBMU, as shown in Figure 4-4.

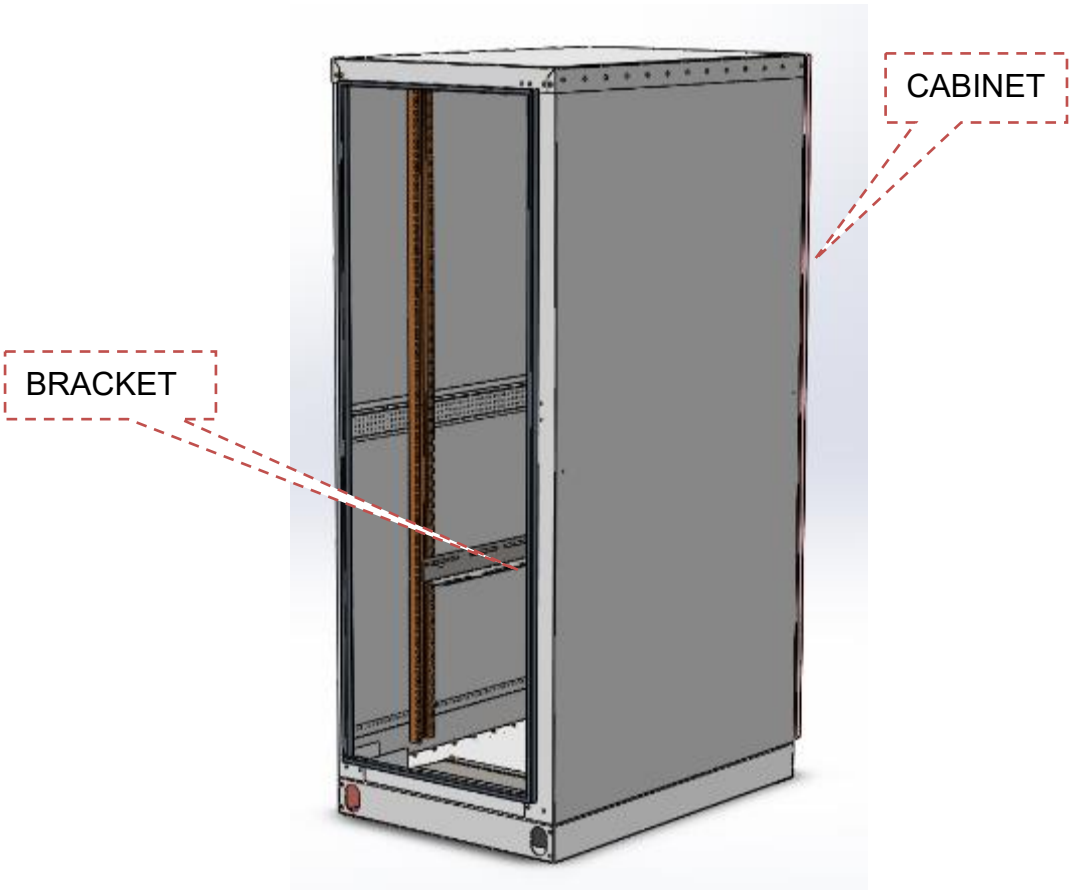


Figure 4-1 pay attention to mounting of bracket.

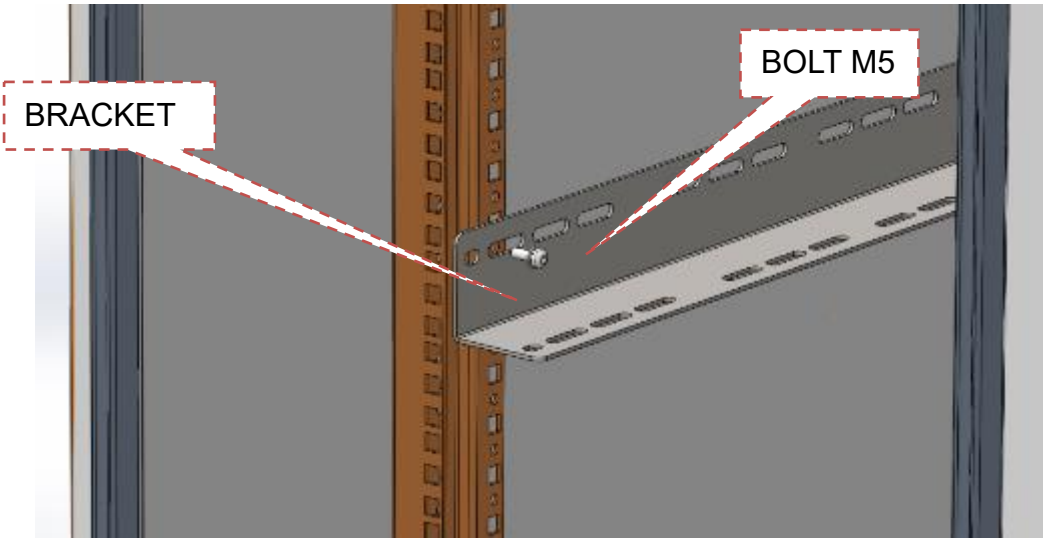


Figure 4-2 Drill holes and Install the Mounting rack on wall

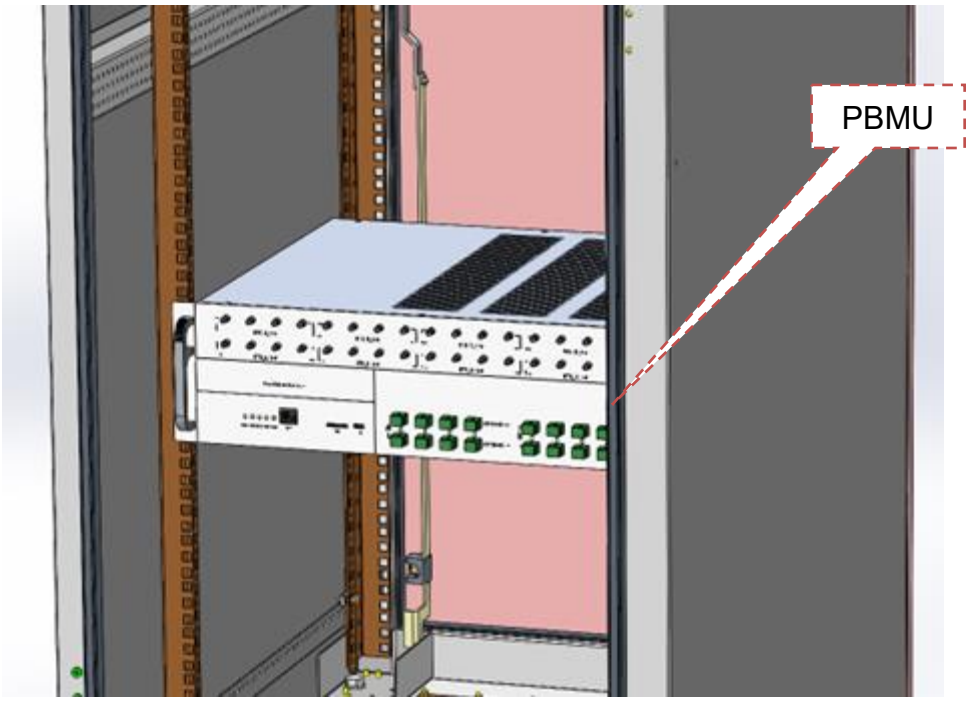


Figure 4-3 Push PBMU into the cabinet.

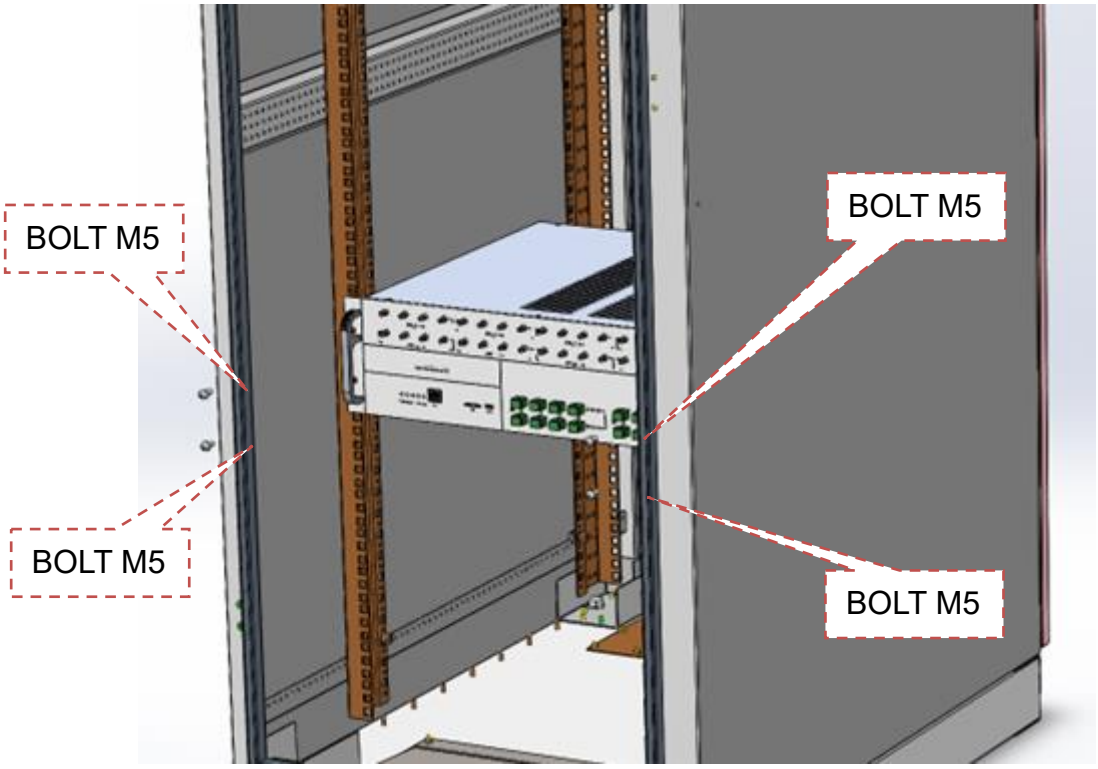


Figure 4-4 Use screw to mount PBMU

4.2.3 Installation of IM2U

4.2.3.1 Installation Scenarios

An IM2U be installed in cabinet. Installation scenarios must meet heat-dissipation and waterproofing requirements of the IM2U.

4.2.3.2 Installing an IM2U in cabinet

1. Install bracket on the cabinet with the screw. as shown in Figure 4-5. Attention: Please pay attention to mounting of bracket. as shown in Figure 4-6.
2. Push IM2U into the cabinet. as shown in Figure 4-7
3. Use screw to mount IM2U, as shown in Figure 4-8.
4. Connect the IM2U to terminal box by patch cord, the patch cord connector type is SC/APC to SC/APC or another type for terminal box
5. Connect the ground cable to ground
6. When connect the power, please check the Power voltage in advance, and need a breaker to protect the IM2U.

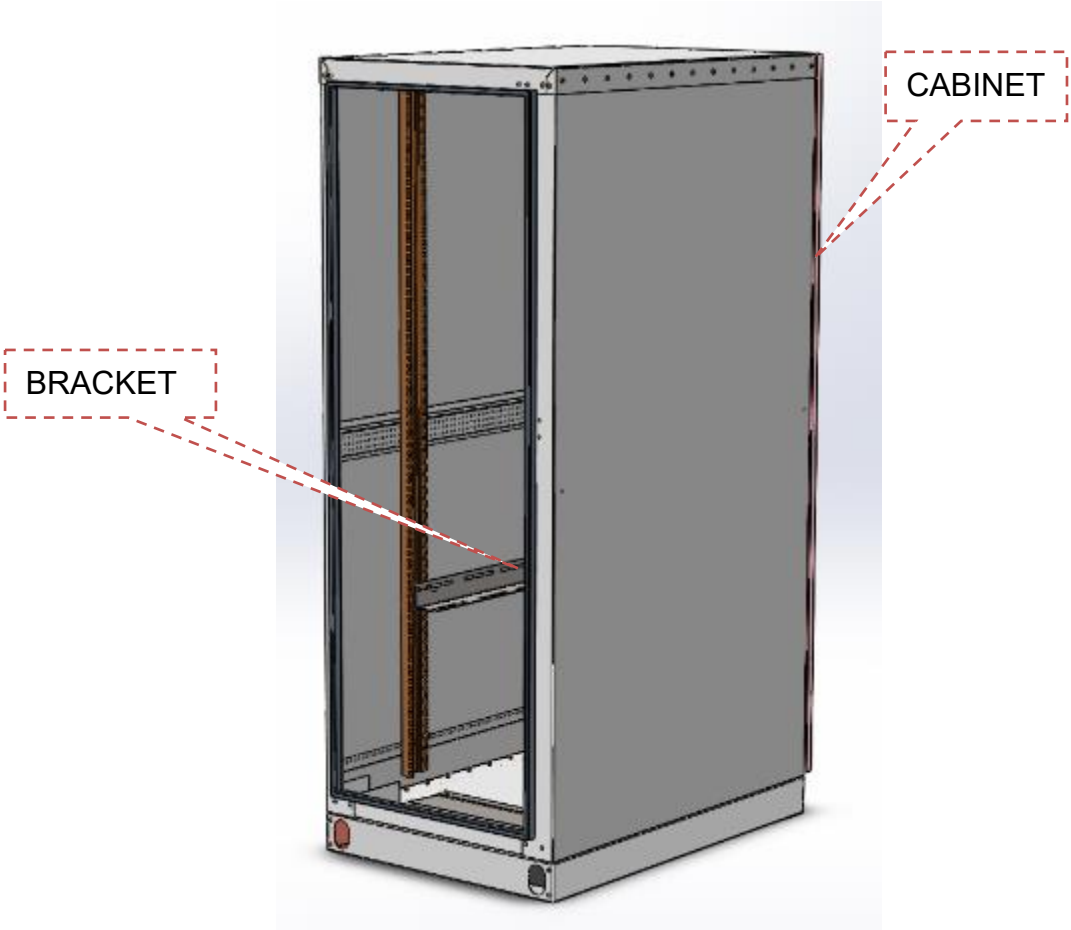


Figure 4-5 pay attention to mounting of bracket.

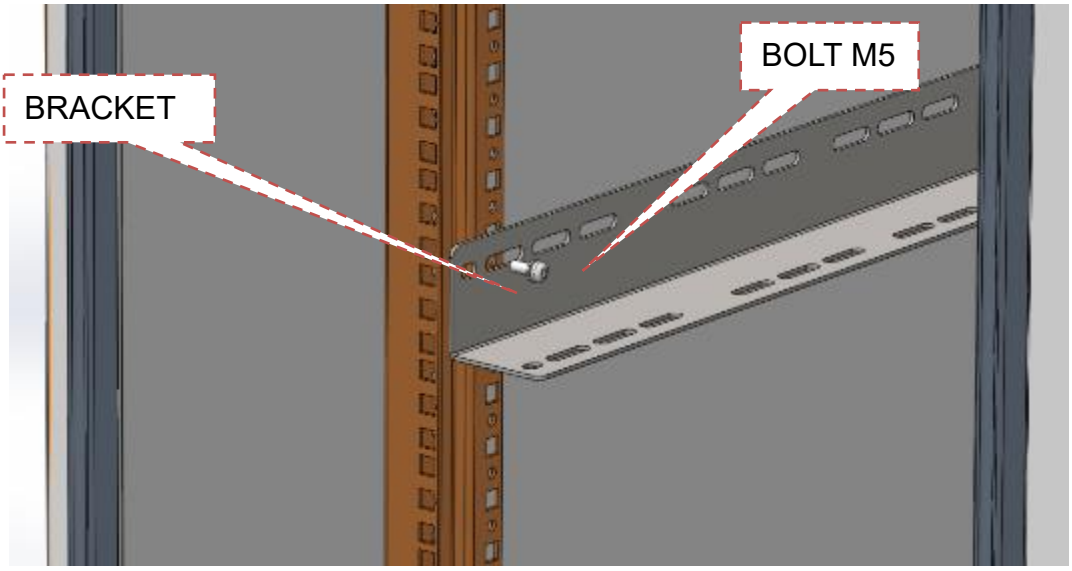


Figure 4-6 Drill holes and Install the Mounting rack on wall

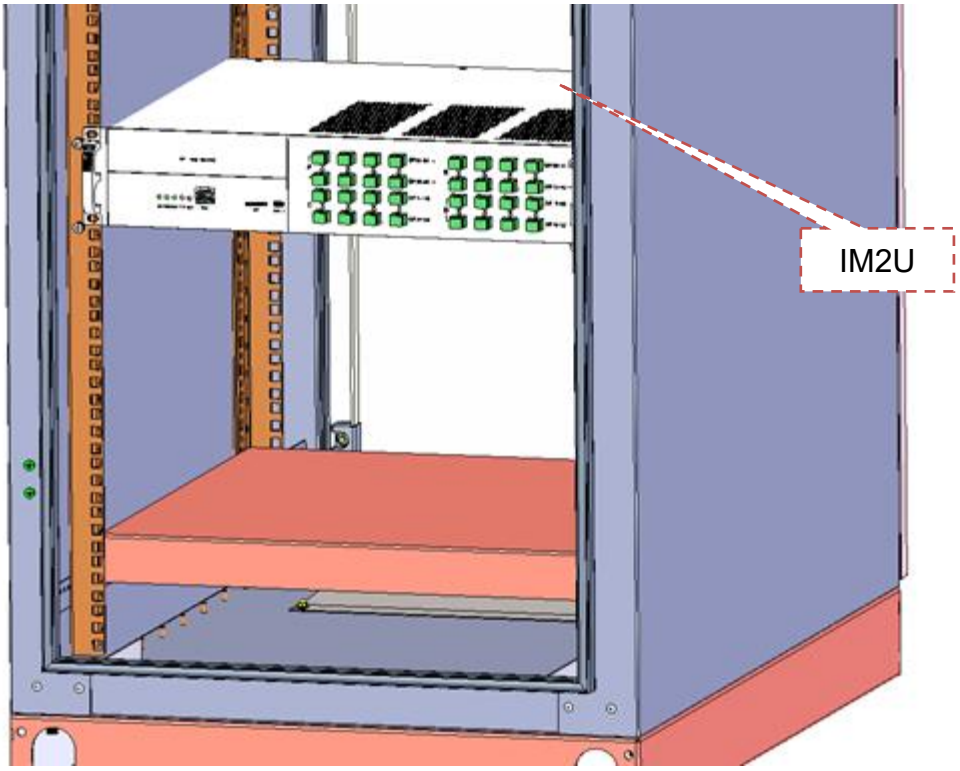


Figure 4-7 Push IM2U into the cabinet.

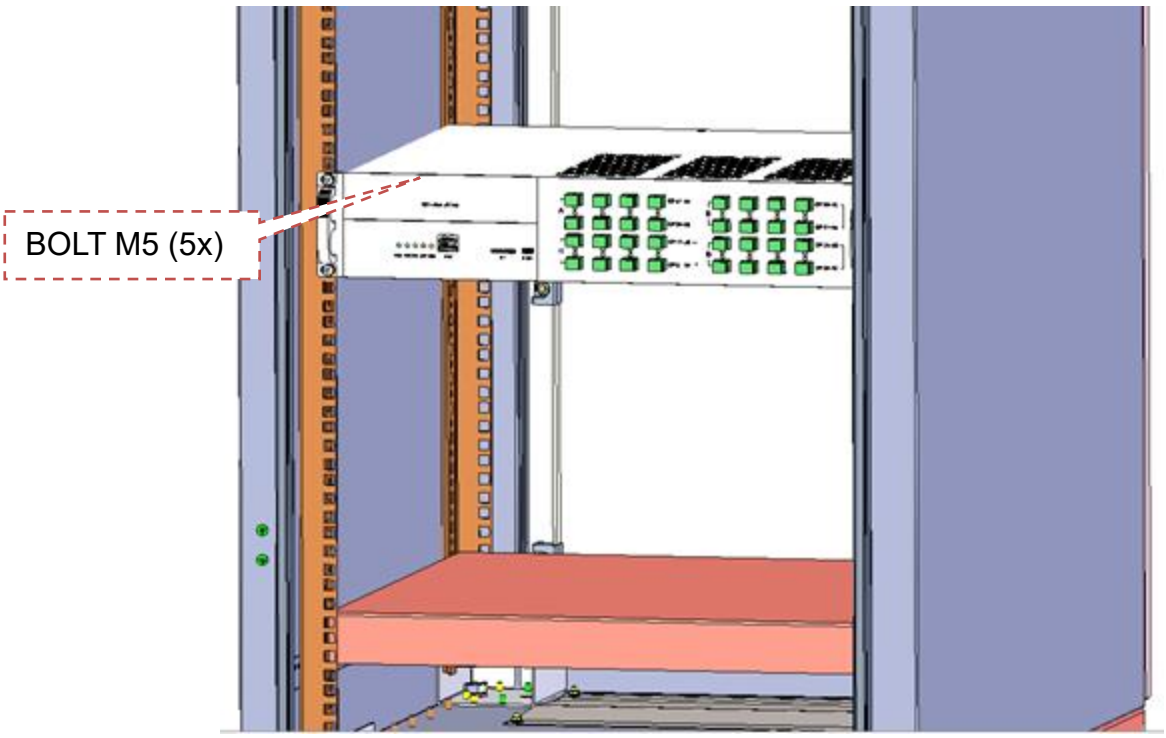


Figure 4-8 Use screw to mount IM2U

4.2.4 Installation of MCU

4.2.4.1 Install Accessories for MCU

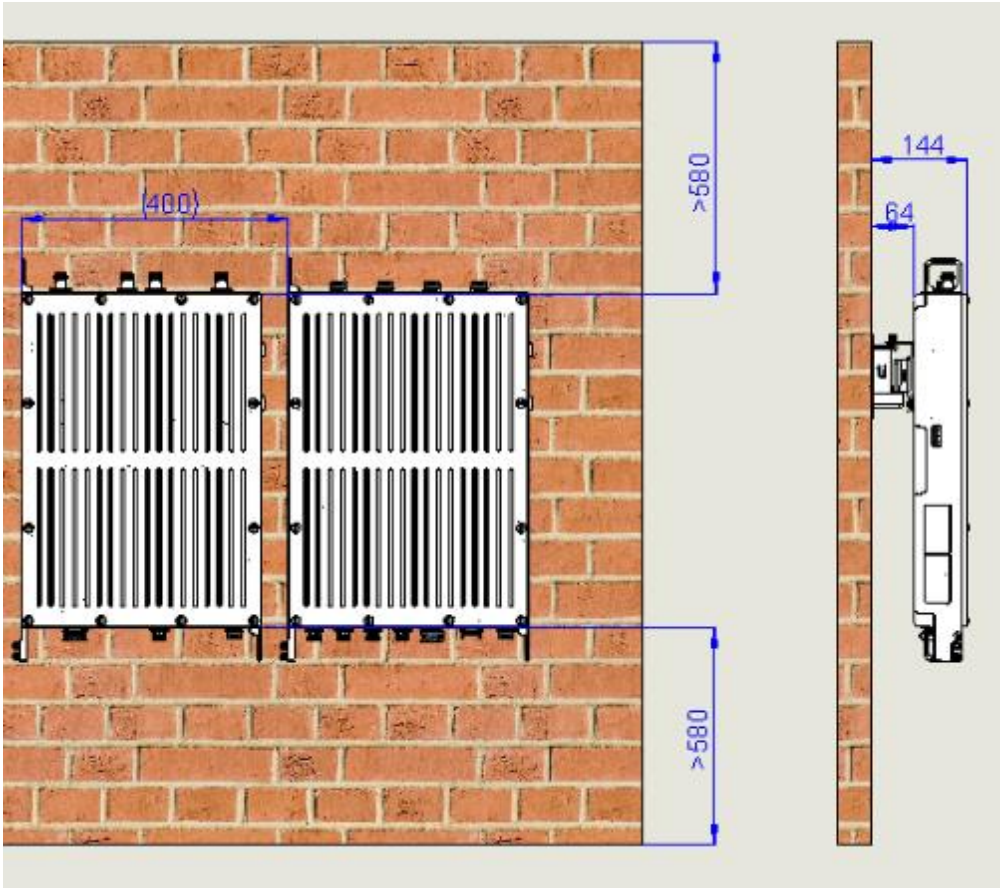
No.	Description	Quantity	Remarks
1	Main Control Unit	1	
2	CABLE ASSY, DATA	1	
3	Fiber optical cable assembly, SC/APC-SC/APC, SM G657A2, 3m, Waterproof, 2 cores	1	
4	Patchcord, SC/APC-SC/APC, G657A2,2.0mm, LSZH,3m	3	
5	RFE Fiber Enclosure without rubber	1	
6	Rubber seal, DIA5mm	1	
7	Ground Wire 16mm2 L3000	1	
8	Heat-shrinkable Tubing	5	
9	Cavity body support	1	
10	Wall hanging bracket	1	
11	Pole bracket	1	
12	M6X16ZA-SS-GB/T 9074.X	5	
13	M10x200ZA-SS316-GB/T12-2013	2	
14	M10ZA-SS-GB/T 6170	4	

15	SW10DK-CS-GB/T 93	2	
16	W10DK-SS-GB/T 97.1	2	
17	M10x100D-SS-JB/ZQ 4763	4	
18	Power Supply Cable-EU	1	
19	Power Supply Cable-EN	1	
20	Power LINE, 4G LPA	1	
21	Power LINE, 5G LPA	1	
22	Cluster radio frequency cable	1	

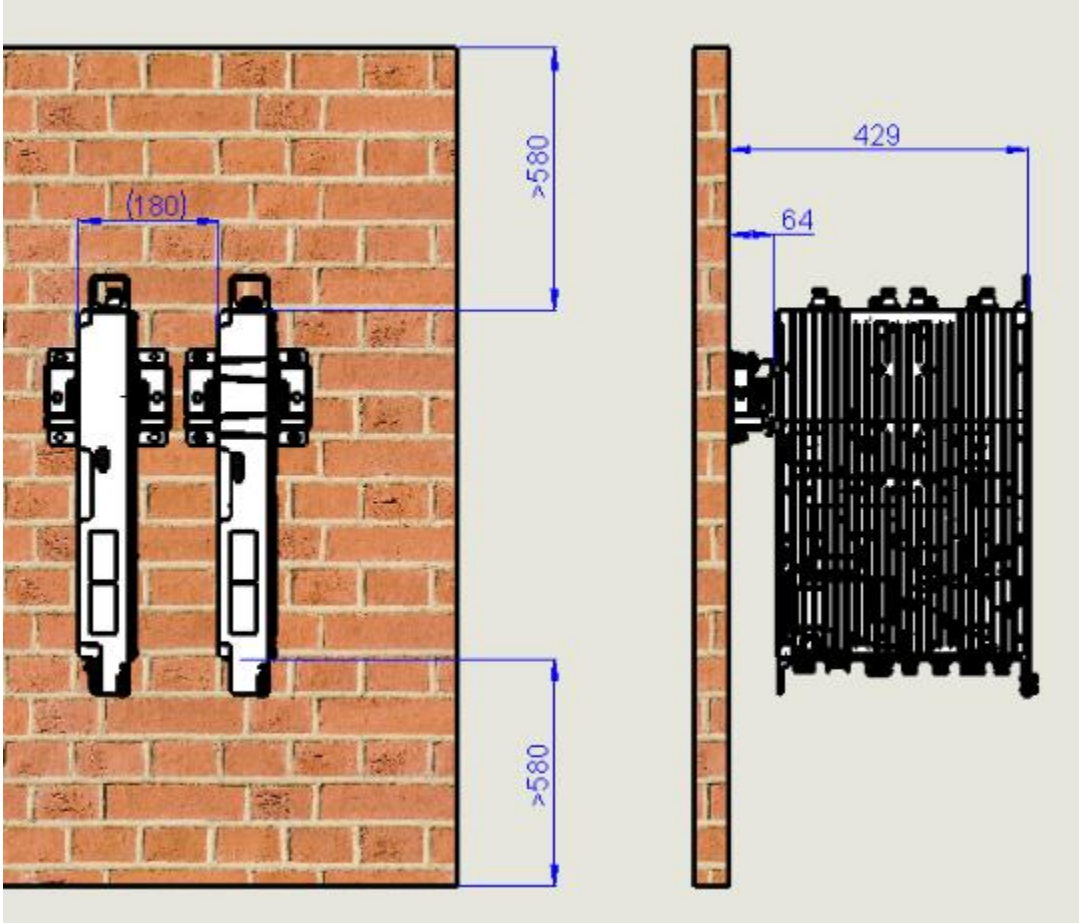
4.2.4.2 Installing an MCU on a wall

1. Refer to Figure 4-9A, 4-9B to check the top, bottom, and wall space of the device. And determine the installation position.
2. Drill four holes on the wall as shown in Figure 4-10.
3. Fix the expansion bolts to the holes and align the mounting activity bracket with the expansion bolts and secure them to the wall with a wrench. Pay attention to the installation direction, as shown in Figure 4-11.
4. Fix a fixed bracket to the MCU. Pay attention to the installation direction. The MCU can be installed in three positions: back and side, as shown in Figure 4-12.
5. Install the MCU device on the support and tighten the screws, as shown in Figure 4-13.
6. Install grounding cables. After tightening screws, connect the grounding cables to the ground. There are two grounding holes to be installed, as shown in Figure 4-14.
7. Connect the MCU to LPA by cluster radio frequency cable, the connector type is L32 female.
8. Install the optical cable, as shown in Figure 4-15.
9. Installing power cables.

10. When connect the power, please check the power voltage in advance, and need a breaker to protect the MCU.



A



B

Figure 4-9 Measure distance between top, bottom, left and right for mounting rack

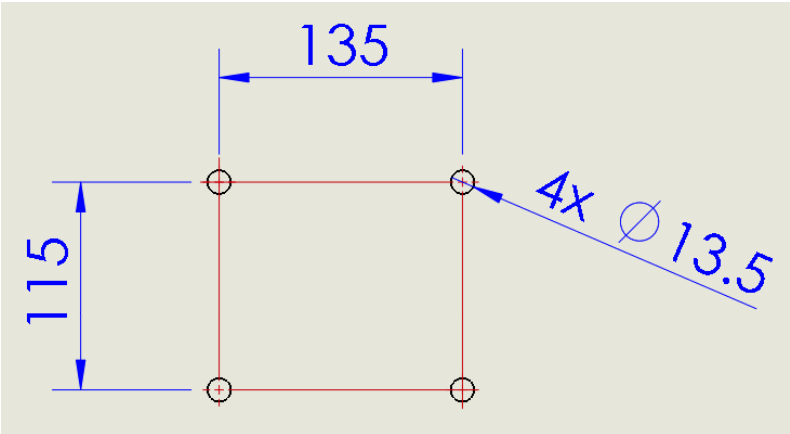


Figure 4-10 Drill holes

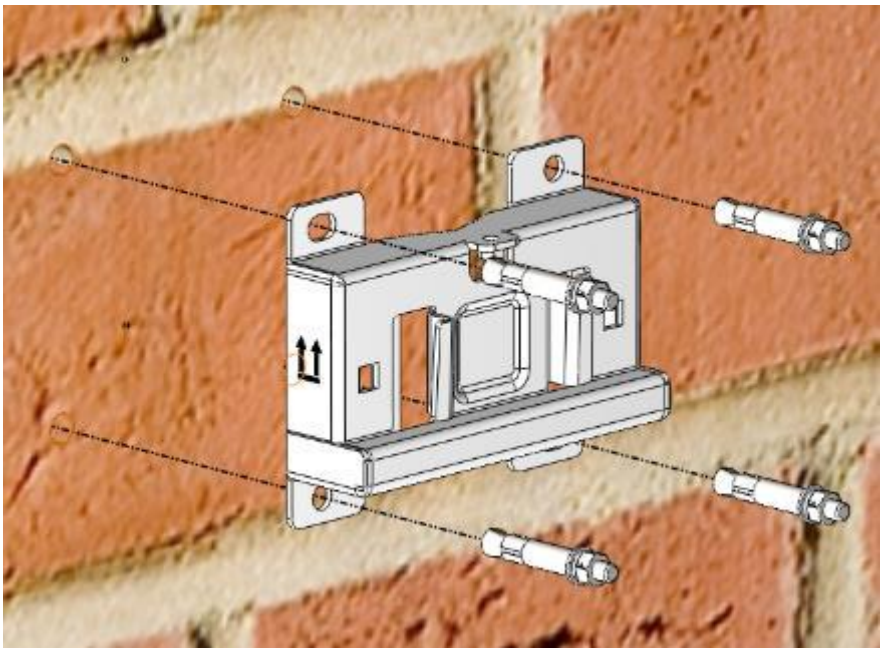


Figure 4-11 Fixed Up-Down activity bracket on the wall

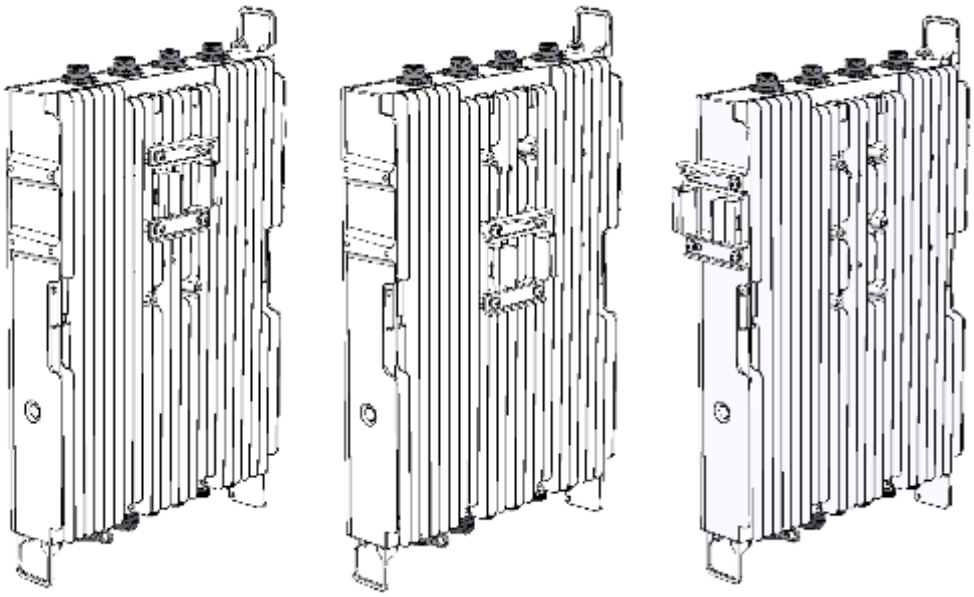


Figure 4-12 Fixed bracket on the equipment

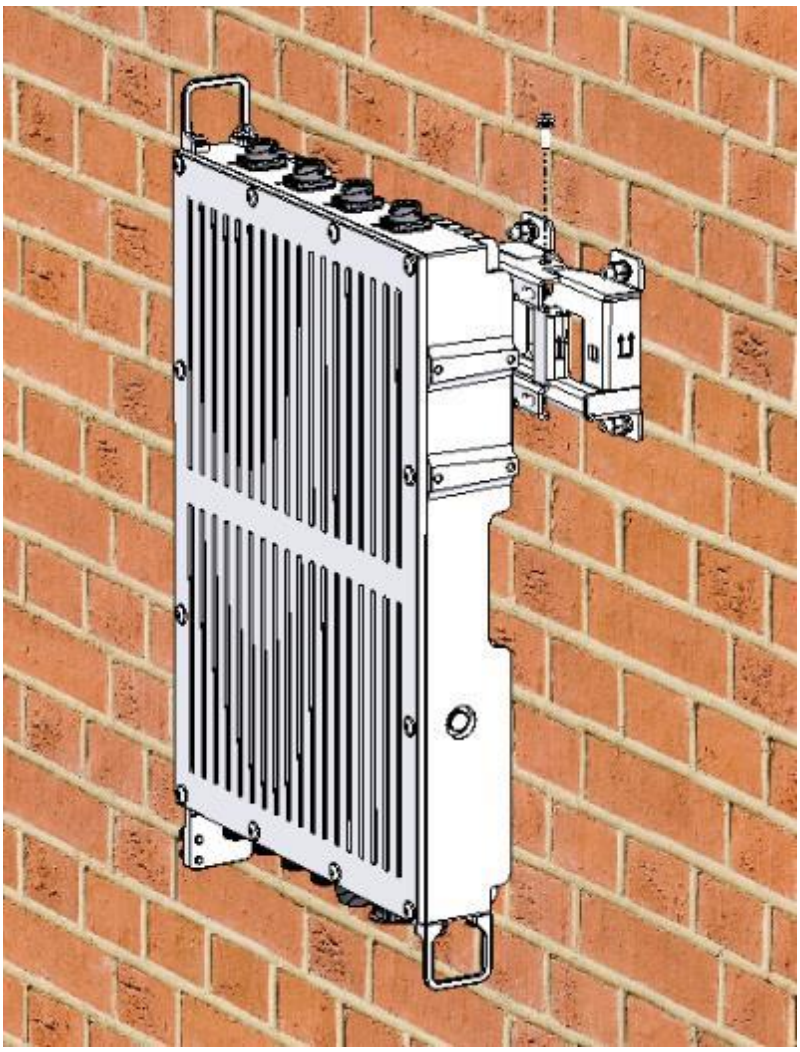


Figure 4-13 Put the device on the support and tighten the screws

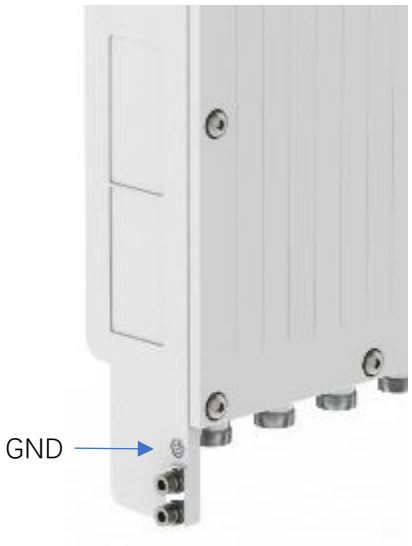


Figure 4-14 Earthing position

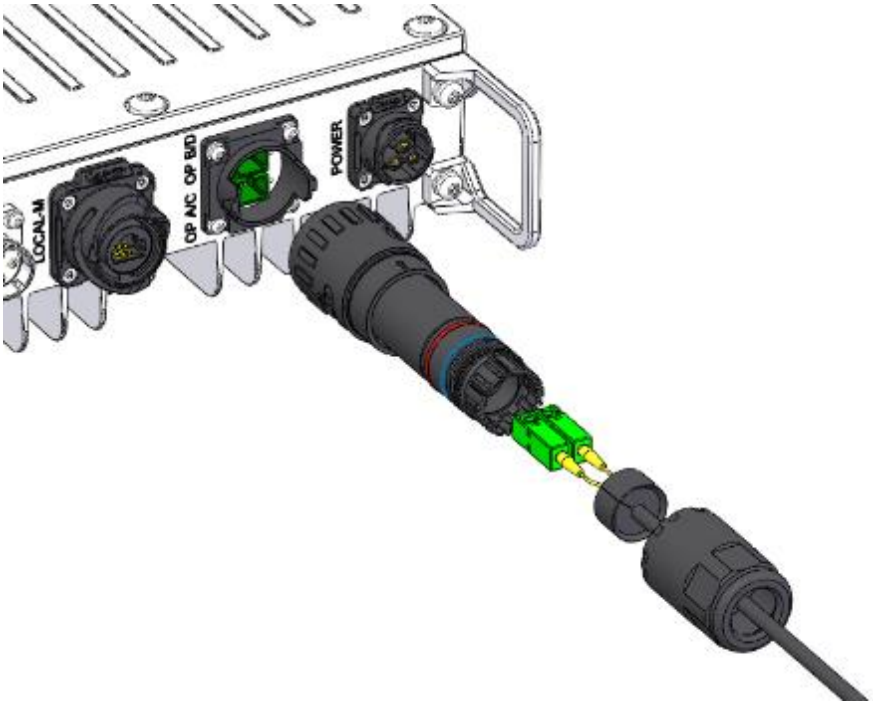


Figure 4-15 Optical fiber installation

4.2.4.3 Installing an MCU on a pole

1. The Up-Down Activity Bracket and Clamp Plate are installed on the holding pole by M10X150 bolts, nuts, flat washers, and spring washers, as shown in figure 4-16. The diameter of the holding pole should be between 40mm and 120mm and the strength should be sufficient.
2. Fix a Fixed plate to the MCU. Pay attention to the installation direction. The MCU can be installed in three positions: back and side, as shown in Figure 4-12.
3. Install the MCU device on the support and tighten the screws, as shown in Figure 4-17.
4. If two devices need to be installed on the same pole, the spacing between the two devices should be 750mm, as shown in Figure 4-18.
5. Install grounding cables. After tightening screws, connect the grounding cables to the ground. There are two grounding holes to be installed, as shown in Figure 4-14.
6. Connect the MCU to LPA by cluster radio frequency cable, the connector type is L32 female.
7. Installing power supply cables.
8. When connect the power, please check the Power voltage in advance, and need a breaker to protect the MCU.

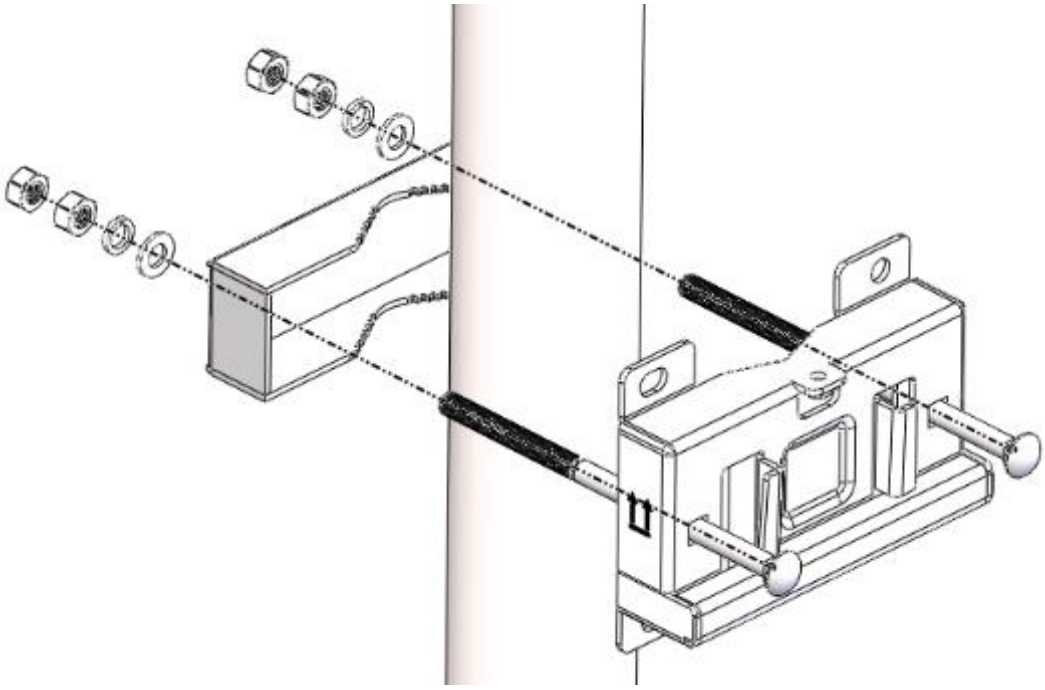


Figure 4-16 Fix the bracket on the rod

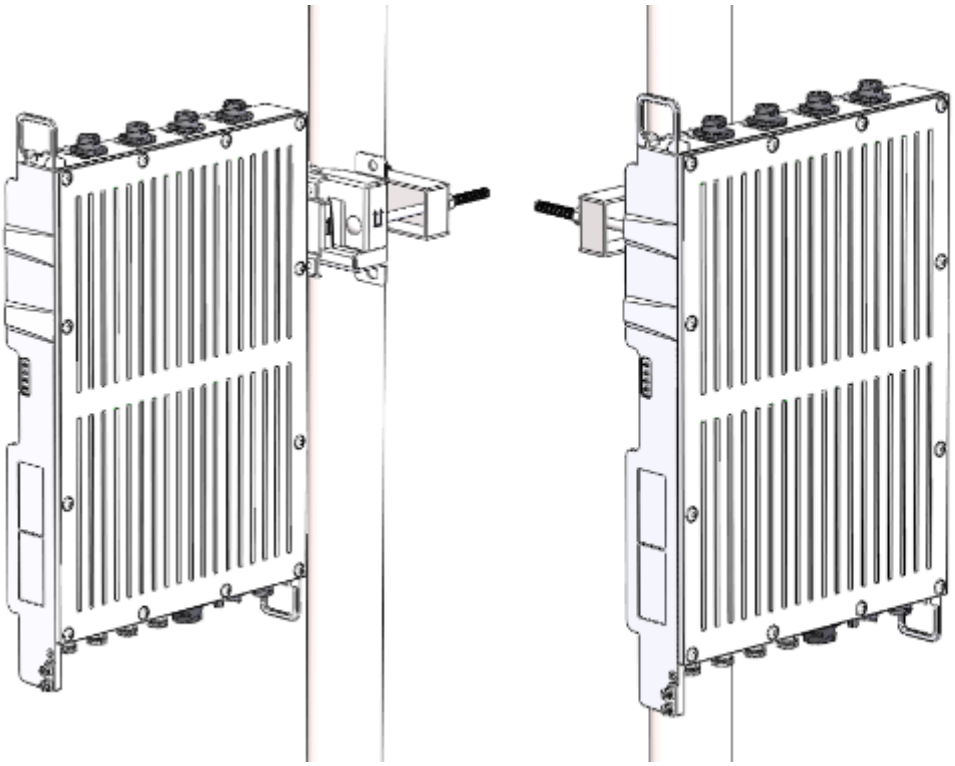


Figure 4-17 Put the equipment on the pole

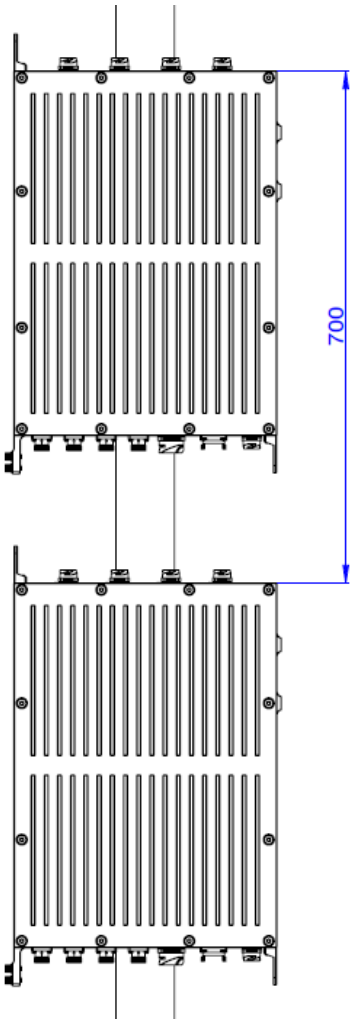


Figure 4-18 Installation spacing

4.2.5 Installation of LPA

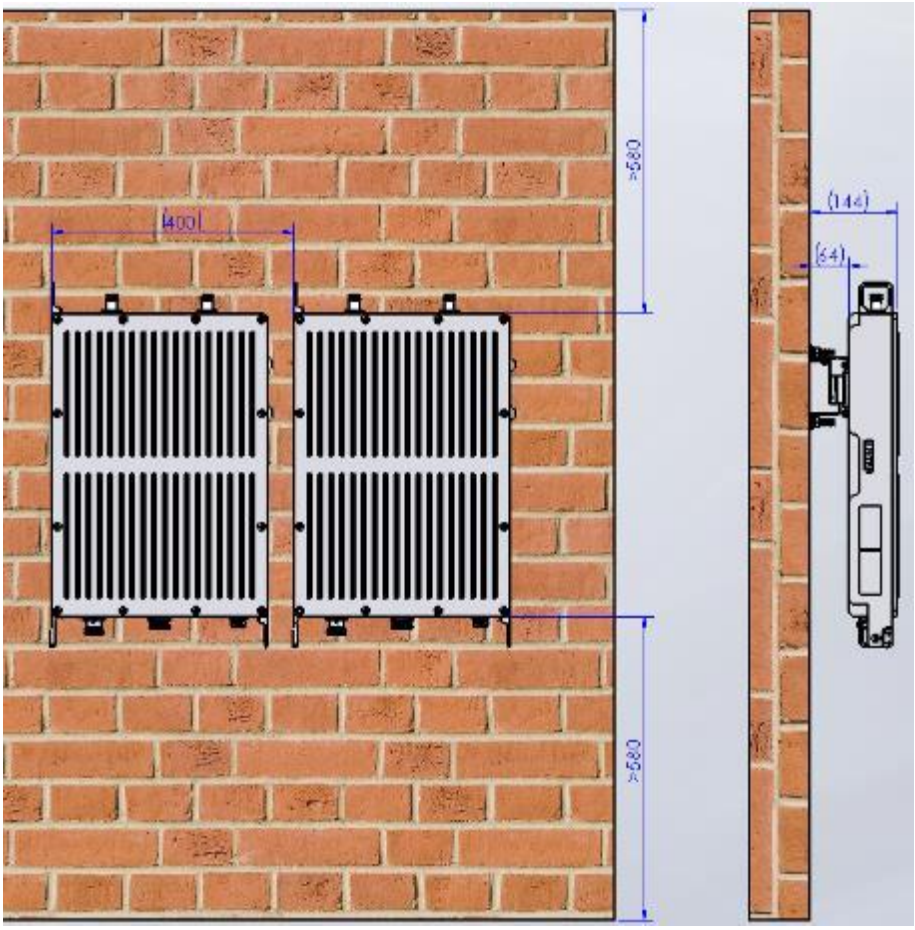
4.2.5.1 Install Accessories for LPA

No.	Description	Quantity	Remarks
1	Fiber Optical Repeater Remote Unit	1	
2	Grounding Cable	1	

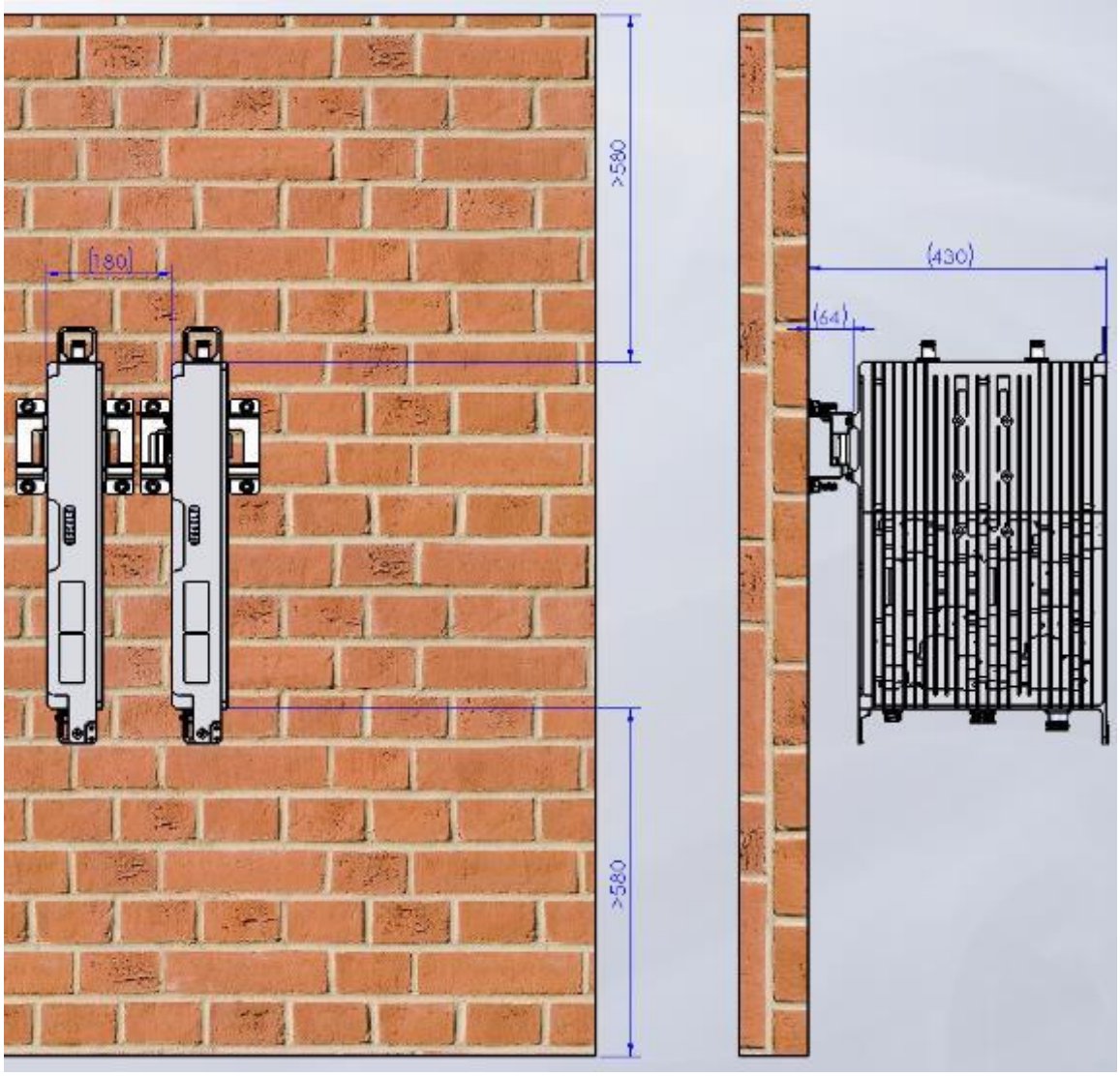
3	Cavity body support	1	
4	Wall hanging bracket	1	
5	Pole bracket	1	
6	M10x200ZA-SS316-GB/T12-2013	2	
7	M10ZA-SS-GB/T 6170	4	
8	SW10DK-CS-GB/T 93	2	
9	W10DK-SS-GB/T 97.1	2	
10	M6X16ZA-SS-GB/T 9074.X	5	
11	POWER LINE	1	
12	Cluster radio frequency cable	1	
13	M10x100D-SS-JB/ZQ 4763	4	
14	LAN cable	1	
15	USB cable	1	

4.2.5.2 Installing an LPA on a wall

1. Refer to Figure 4-19A, 4-19B to check the top, bottom, and wall space of the device. And determine the installation position.
2. Drill four holes on the wall as shown in Figure 4-20.
3. Fix the expansion bolts to the holes and align the mounting bracket with the expansion bolts and secure them to the wall with a wrench. Pay attention to the installation direction, as shown in Figure 4-21.
4. Fix a fixed bracket to the LPA. Pay attention to the installation direction. The LPA can be installed in three positions: back and side, as shown in Figure 4-22.
5. Install the LPA device on the support and tighten the screws, as shown in Figure 4-23.
6. Install grounding cables. After tightening screws, connect the grounding cables to the ground. There are the grounding cables to be installed, as shown in Figure 4-24.
7. Connect the LPA to combiner by jumper, the jumper connector type is 4.3-10 male
8. Install the optical cable, as shown in Figure 4-25.
9. Installing power cables
10. When connect the power, please check the power voltage in advance.



A



B

Figure 4-19 Measure distance between top, bottom, left and right for mounting rack

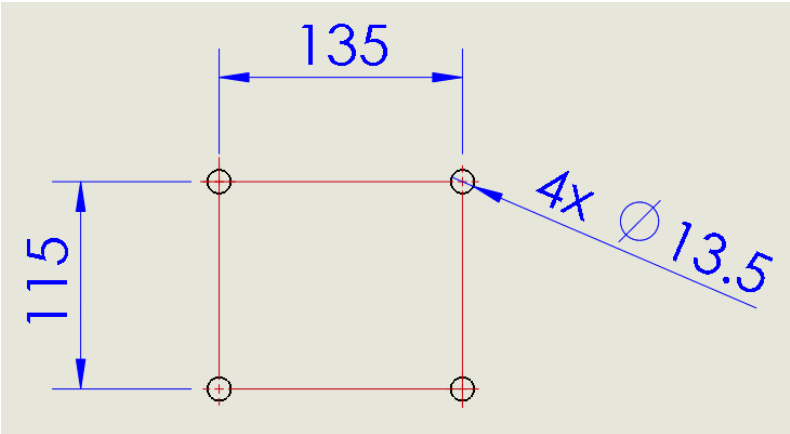


Figure 4-20 Drill holes

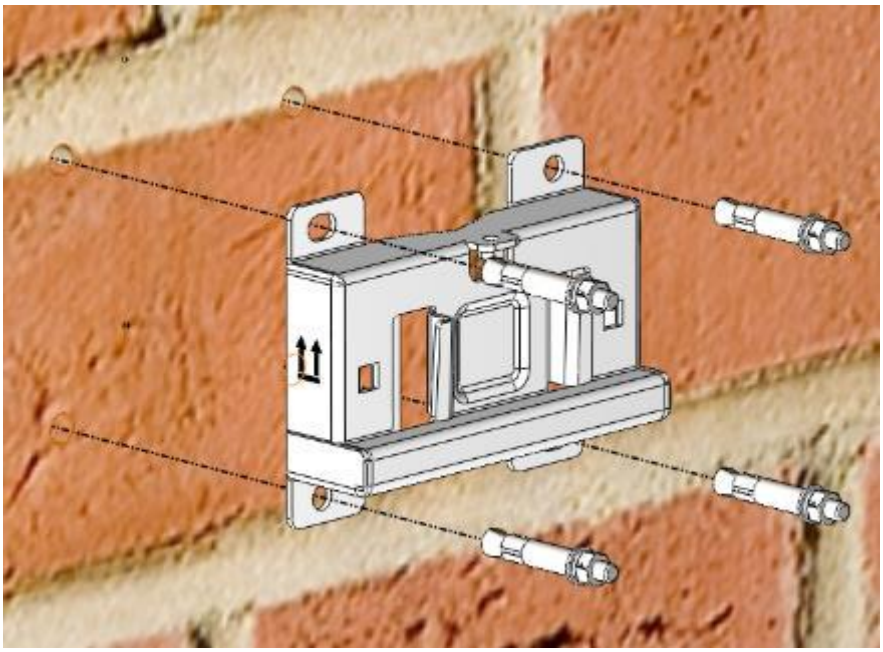


Figure 4-21 Fixed Up-Down activity bracket on wall

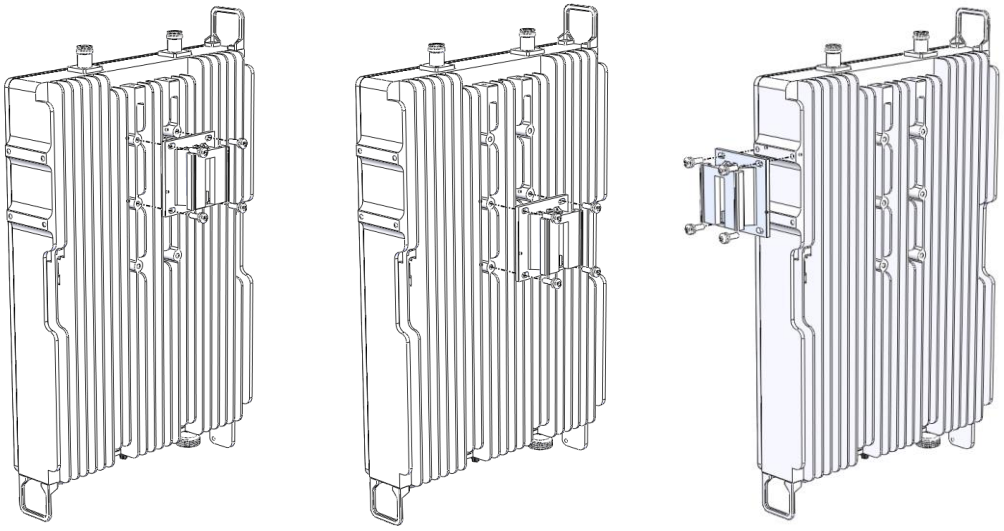


Figure 4-22 Fixed bracket on the equipment

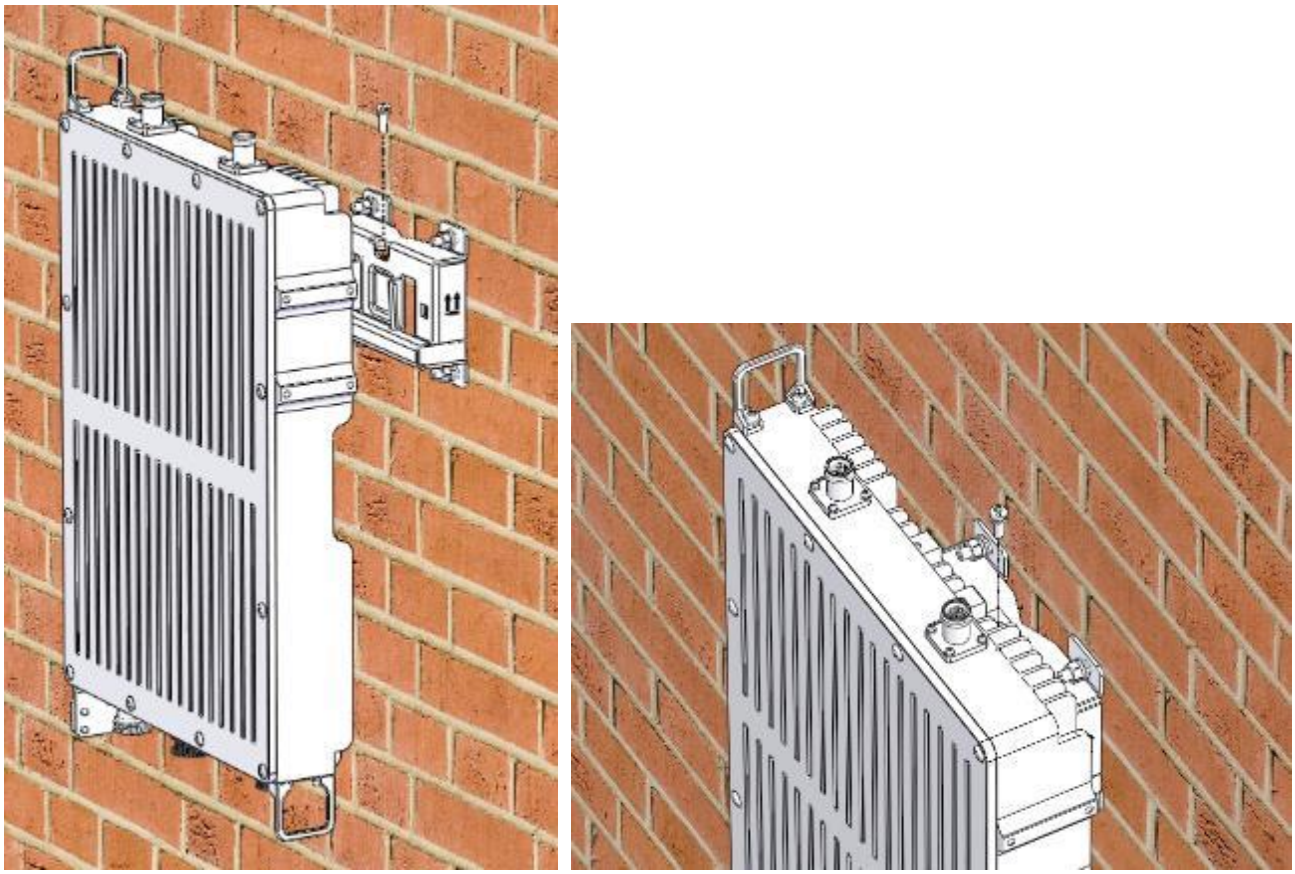


Figure 4-23 Put the device on the support and tighten the screws

Figure 4-24 Earthing position

4.2.5.3 Installing an LPA on a pole

1. The Up-Down Activity Bracket and Clamp Plate are installed on the holding pole by M10X150 bolts, nuts, flat washers, and spring washers, as shown in figure 4-25. The diameter of the Holding pole should be between 40 mm and 120mm and the strength should be sufficient.
2. Fix a fixed bracket to the LPA. Pay attention to the installation direction. The LPA can be installed in three positions: back and side, as shown in Figure 4-25.
3. Install the LPA device on the support and tighten the screws, as shown in Figure 4-26.
4. If two devices need to be installed on the same pole, the spacing between the two devices should be 750mm, as shown in Figure 4-27.
5. Install grounding cables. After tightening screws, connect the grounding cables to the ground. There are the grounding cables to be installed, as shown in Figure 4-24.
6. Connect the LPA to MCU by cluster radio frequency cable, the connector type is L32 female.
7. Installing power cables connected with the MCU

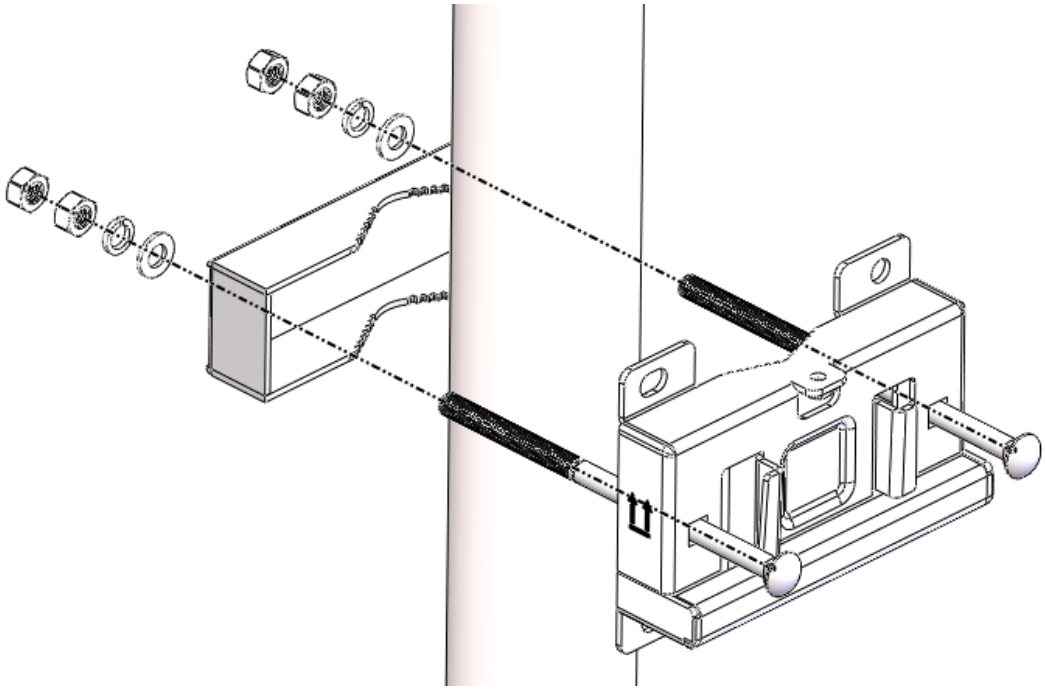


Figure 4-25 Fix the bracket on the rod

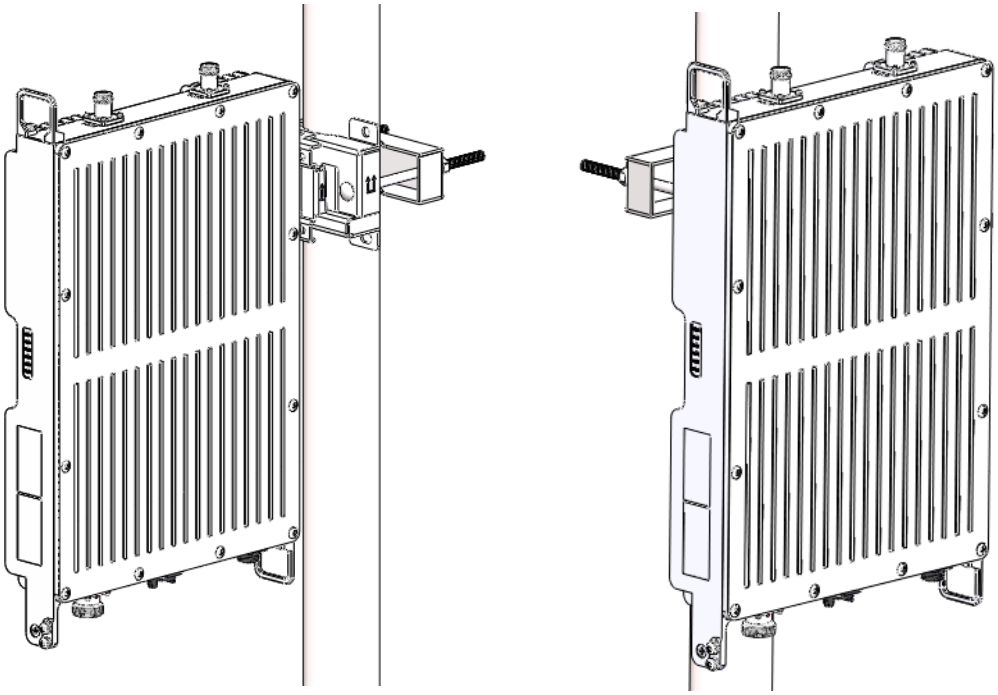


Figure 4-26 Put the equipment on the pole

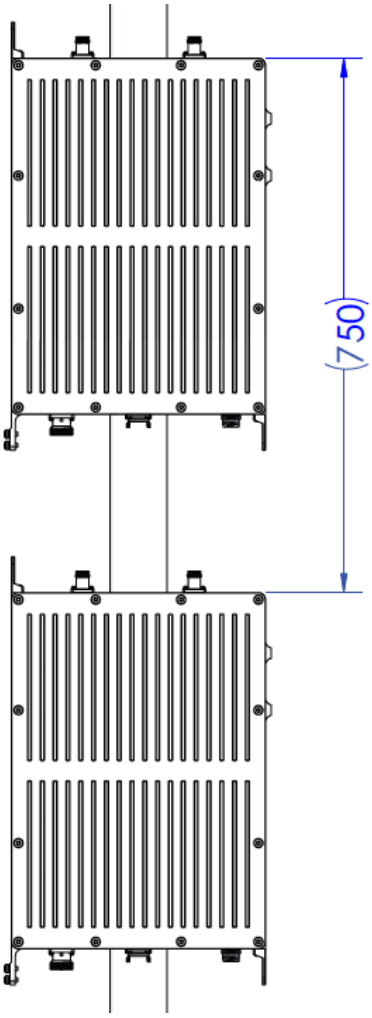


Figure 4-27 Installation spacing

4.3 Installation standard

4.3.1 Device installation

1. The installation position should ensure that there is no interference from strong electric, strong magnetic and corrosive equipment.
2. The installation site should be dry with little dust and good ventilation.
3. The installation should be firm and smooth, and the installation should be fixed with the corresponding installation parts.
4. The mainframe power cable should be installed in the online slot.
5. The ground wire of equipment is earthed to the nearest grounding net from equipment, and the grounding terminal must be welded firmly.

4.3.2 Jumper and connecter

1. It is required that the line should be firm and parallel wiring. The jumper stick to the wall.
2. PVC pipe should be used for jumper running. Keep the line straight horizontally and separate line. Use a plastic pipe card when fixing the wall.
3. The jumper connecter must be installed firmly, and the special head tool should be used correctly Never loosen the joint. Make sure that the contact is good, and the waterproof seal is done.

4.3.3 Power source

1. The power supply of the equipment must be a separate power supply.
2. The power cable should be straight and neat without sharp bending and uneven.
3. The power cable must be put through iron pipe or PVC pipe according to the design requirements. No connection should be made to the power cord through the pipe.
4. Power ground wire and protection ground wire should be laid separately from ac middle.
5. The grounding wire should be connected to the building's integrated grounding grid.
6. Good contact is required, and no looseness is allowed, and the contact surface should be coated with anti-oxidant.

4.3.4 The patch cord

1. The patch cord should be protected by routing pipe, and the part without routing pipe should be tied with Nylon Cable Ties.
2. When fixing the patch cord, it is recommended to wrap the outside of the patch cord around the nylon adhesive tape, and then use the Nylon Cable Ties to fix it.
3. The long patch cord should be coiled in the box or fixed in a circle.
4. The patch cord should be protected by protective sleeve.
5. The patch cord should have a small allowance at the elbow.
6. The patch cord should not be twisted after laying.

4.3.5 Ports introduction

4.3.5.1 PBMU

The QMA ports on the front panel of PBMU are used to combine the signal of the operators. Each set of the ports must be connected to same band. For example, all the four ports of BTS_A can only combine band 78. The eight groups of ports on the front panel correspond to the eight ports on the back panel.

Since each Channel port has a fixed band, which band the BTS ports on the front panel connected to depends on which Channel ports the BTS port on the back panel connected to.

In 4T4R mode, one PBMU can support up to 8 NEUs. There are 4 areas at the front panel of PBMU: A/B/C/D, each area has 8 optic ports. The optic ports at the corresponding location of each area are connected to the same NEU.

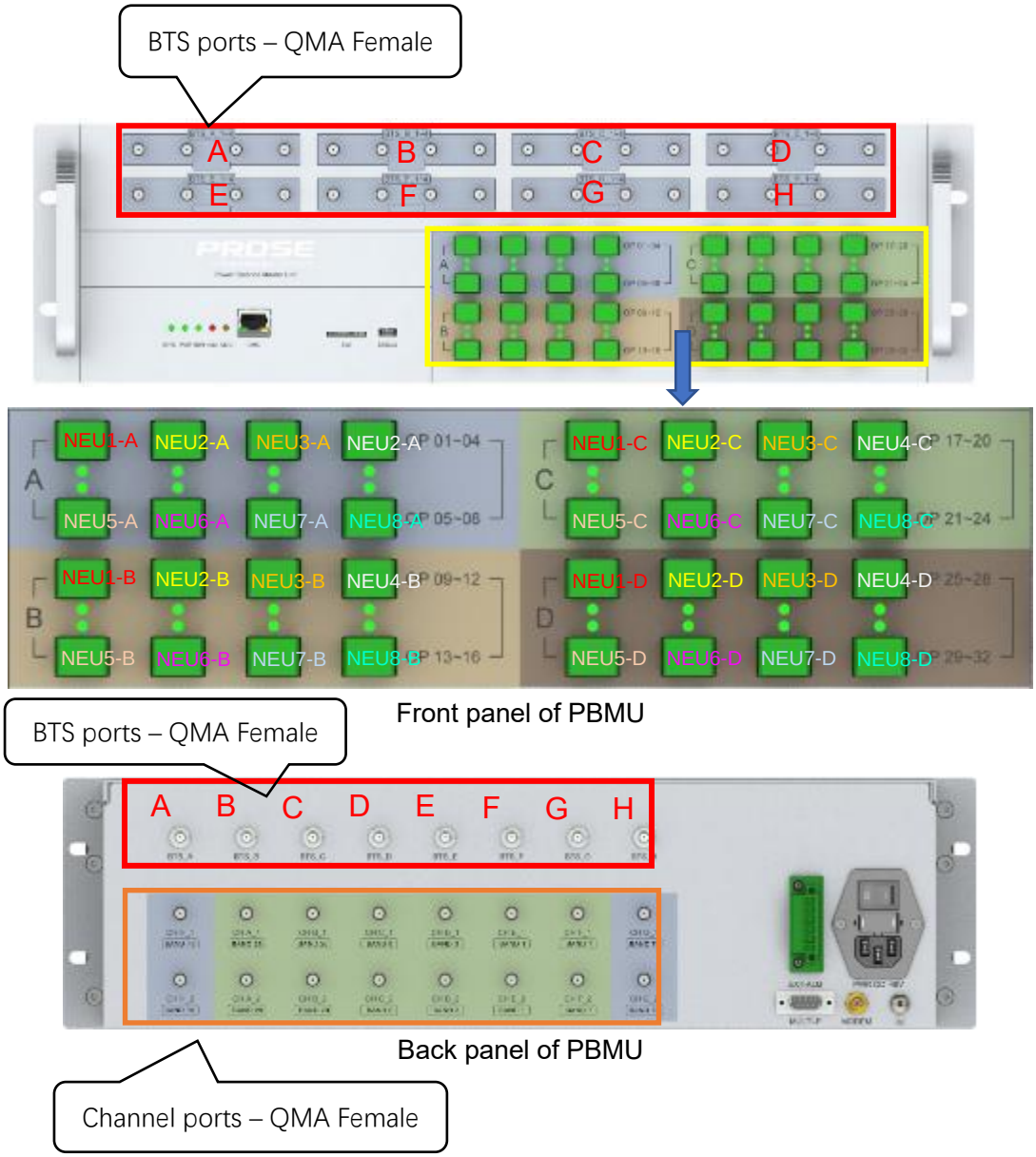


Figure 4-28 PBMU Ports

4.3.5.2 IM2U

In 4T4R mode, one IM2U can support up to 8 NEUs. There are 4 areas at the front panel of IM2U: A/B/C/D, each area has 8 optic ports. The optic ports at the corresponding location of each area are connected to the same NEU.

The channel ports on the back panel of IM2U are connected with the combiner units which are used to combine the signal of the operators. The frequency bands of all channel ports are fixed.

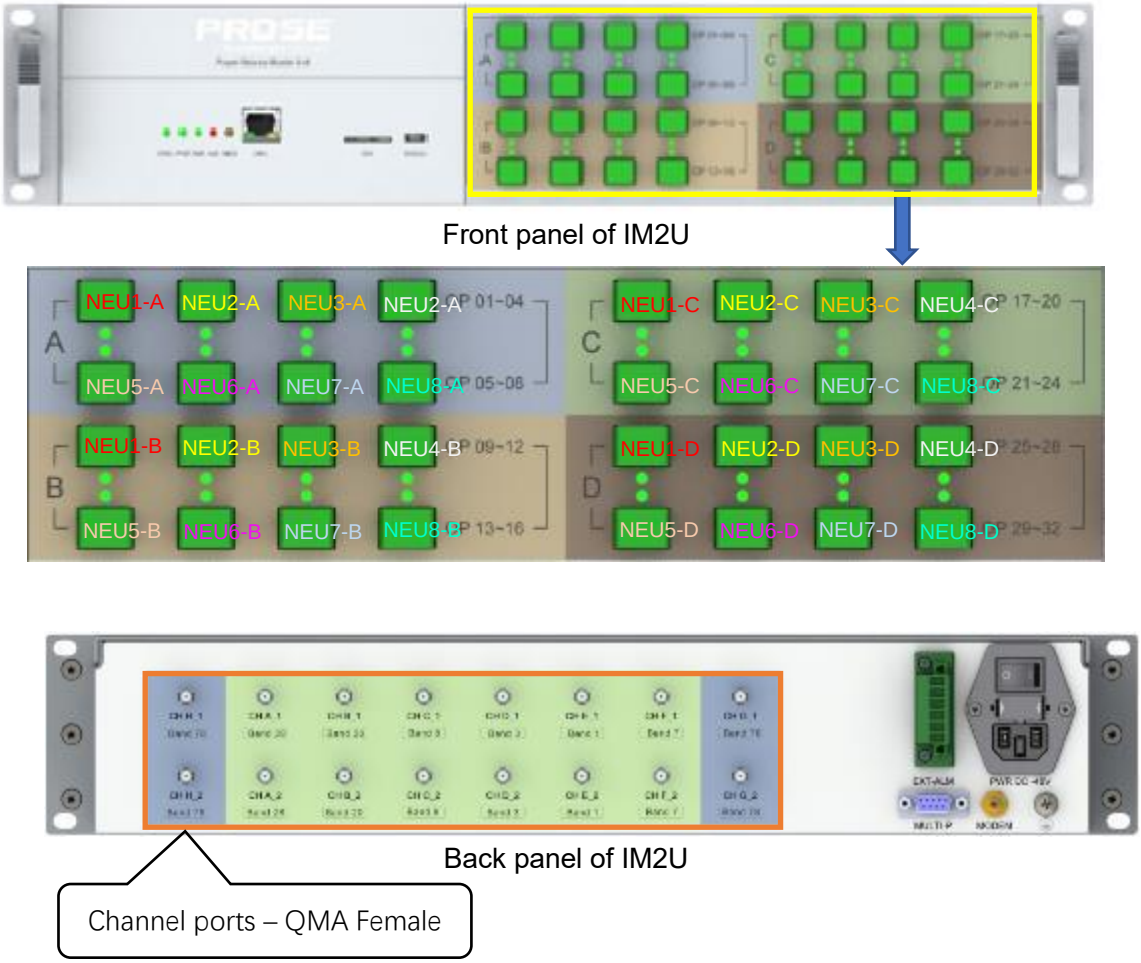


Figure 4-29 IM2U Ports

4.3.6 Fiber and RF cable connection

Here use the connection between PBMU and HPRU as an example:

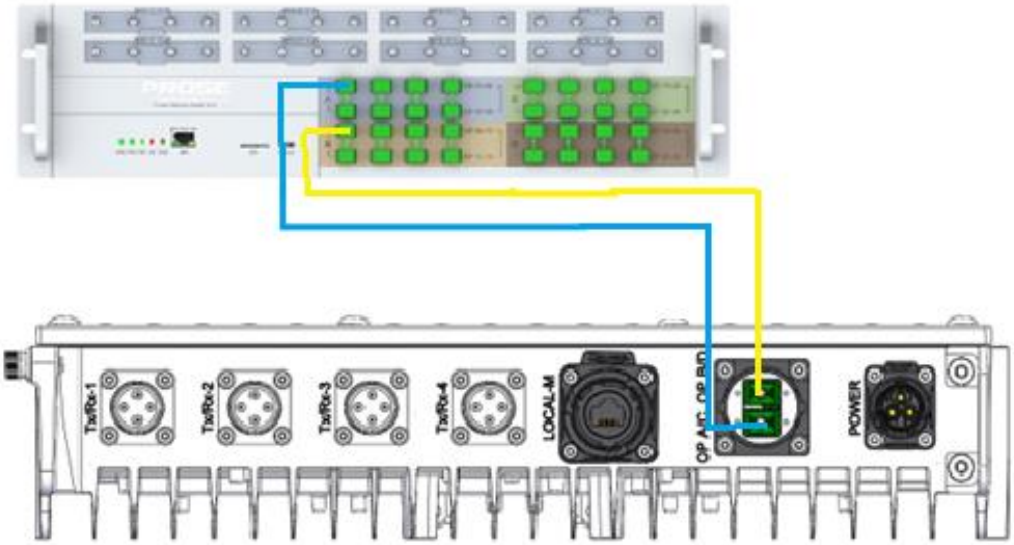


Figure 4-30 Optical connection between PBMU and HPRU

4.3.7 MCU & LPA connection

Here use the connection between MCU and LPA as an example:

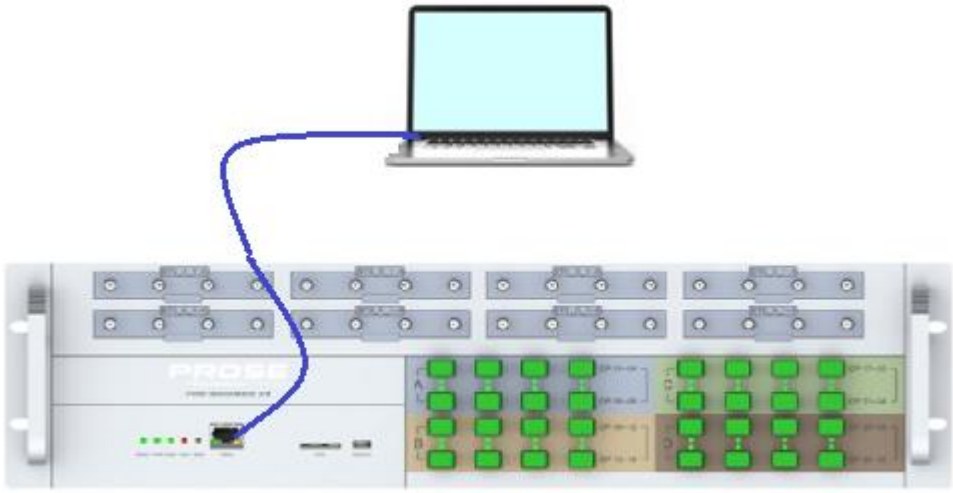
Figure 4-31 Connection for power between MCU and LPAs on the bottom

Figure 4-32 Connection for RF cables between MCU and LPAs

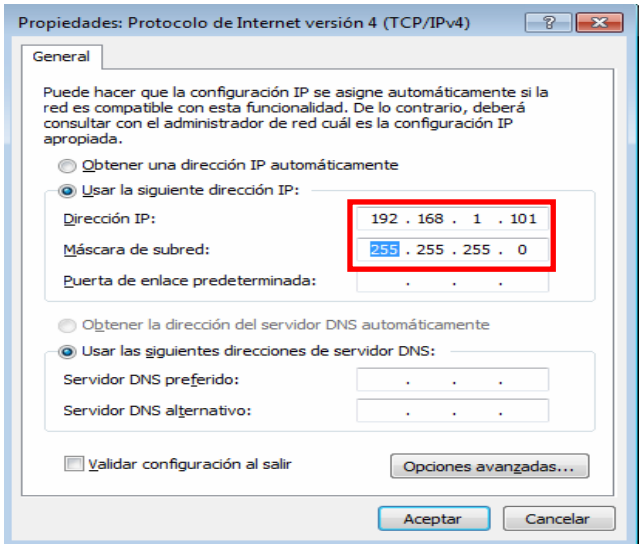
5. Device configuration

5.1 PC configuration

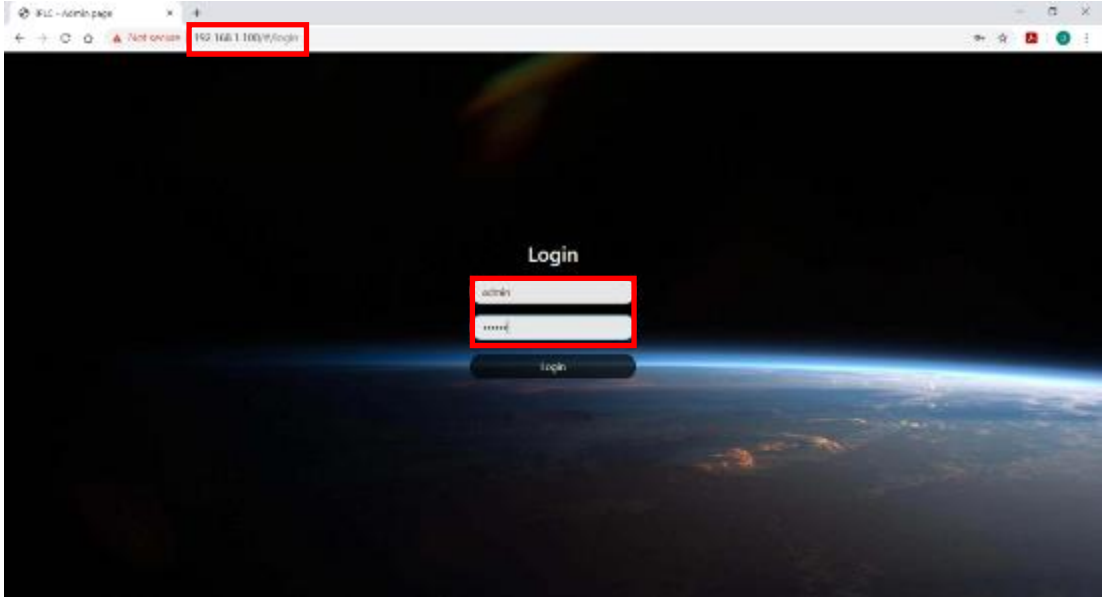
Connect the PC with PBMU via Ethernet cable.



Configure your computer's IPv4 address.

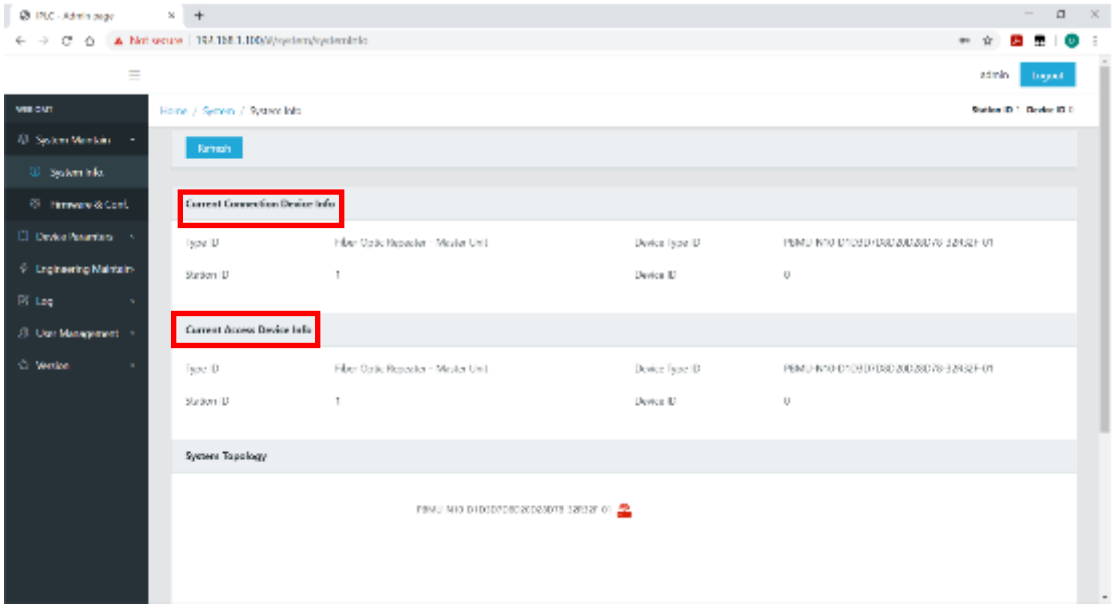


Open the browser and enter 192.189.1.100 in the address bar.
Username: admin
Password: 123456



5.2 Parameter description

5.2.1 PBMU

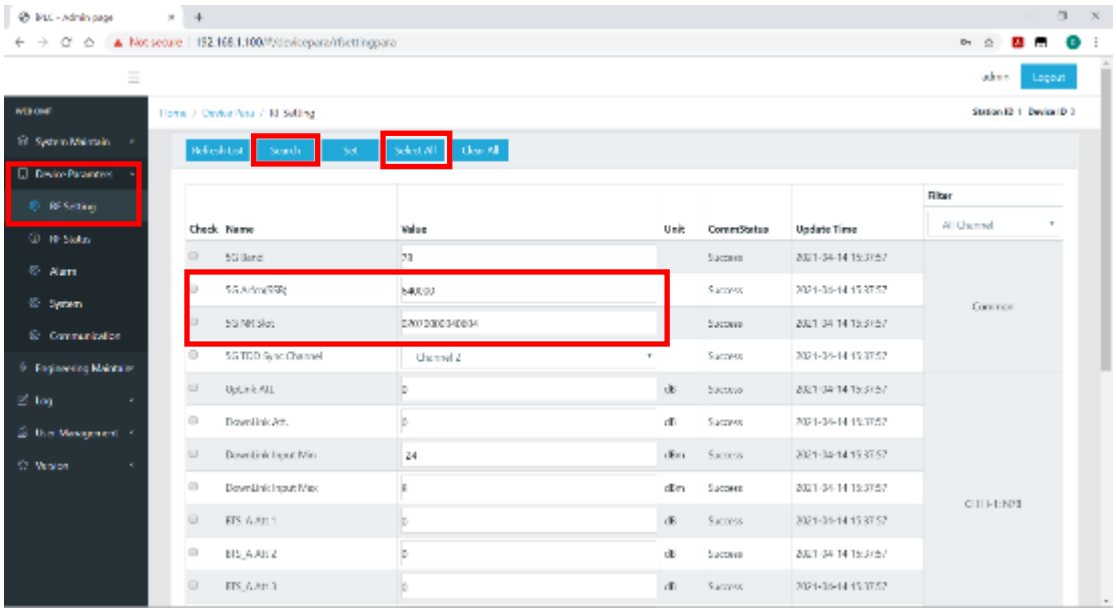


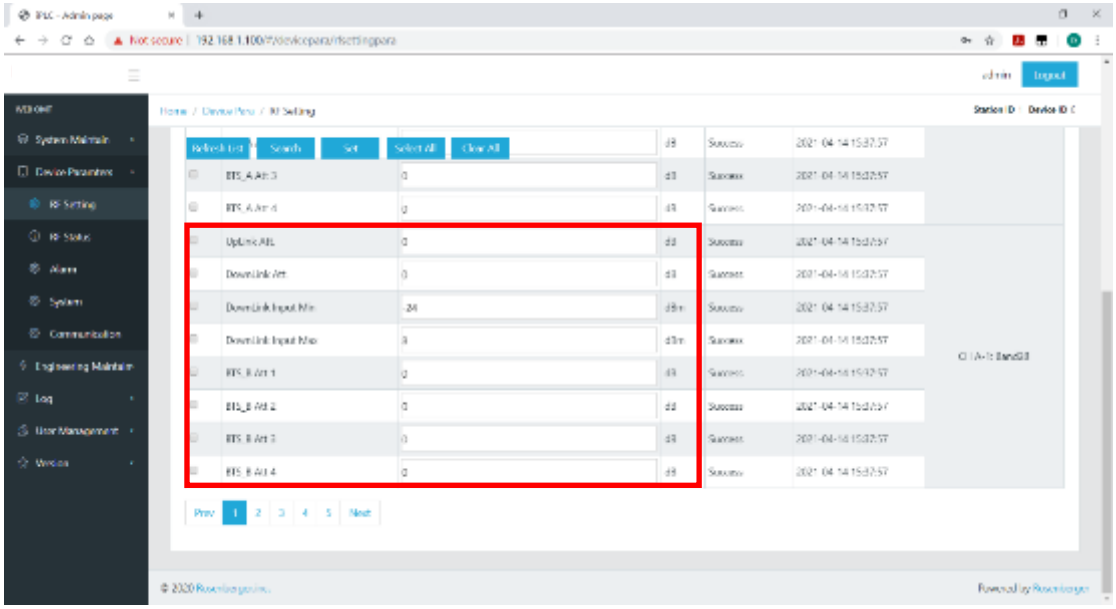
Current Connection Device Info.:

It shows the devices that are currently connected with an Ethernet cable.

Current Access Device Info.:

It shows the device whose parameters are actually being viewed.





Click **Device Parameters**.

Click **Select All**, then **Search**.

Configure **5G ARFCN** and **5G NR Slot** according to the actual configuration of the operator.

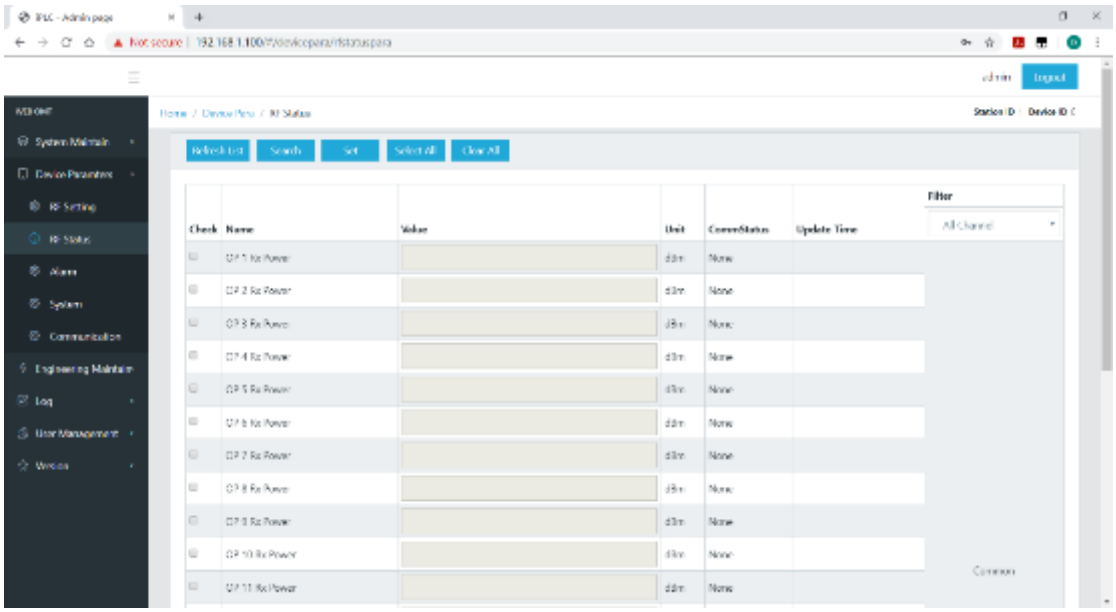
Uplink Att.: Set attenuation for uplink, range: 0 ~ 15 dB.

Downlink Att.: Set attenuation for downlink, range: 0 ~ 15 dB.

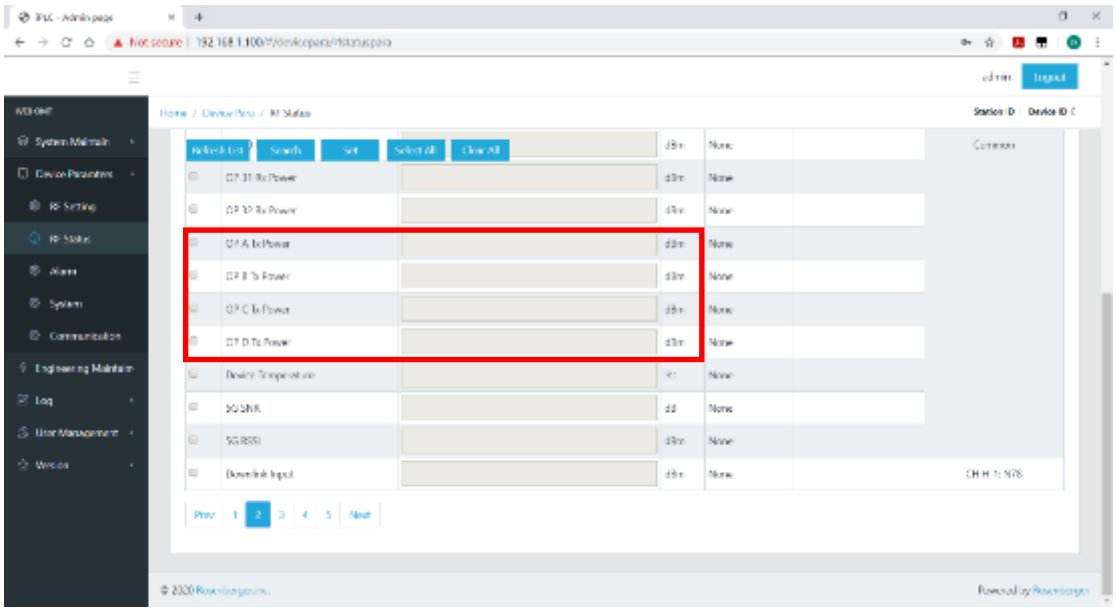
Downlink Input Min: Set minimum threshold value of downlink. There will be alarm if the actual power is lower.

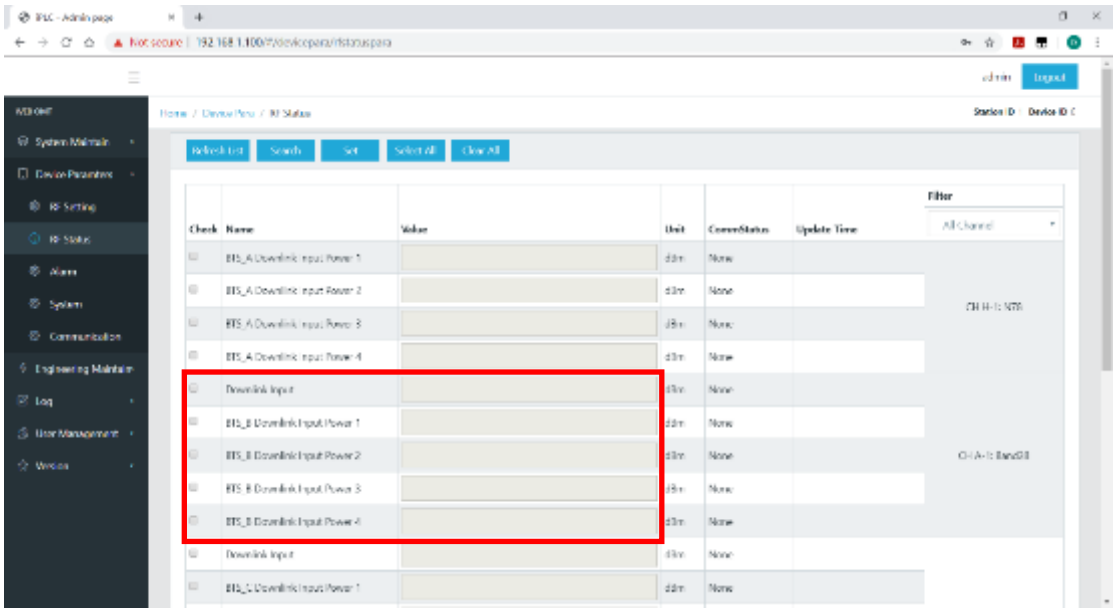
BTS Att: Set attenuation for downlink RF input of the BTS ports on the front panel of PBMU, range: 0 ~ 15 dB.

Downlink Input Max: Set maximum threshold value of downlink. There will be alarm if the actual power is higher.



Optical Rx Power: The optical power received from PBMU (normal range: ≥ -2 dBm).

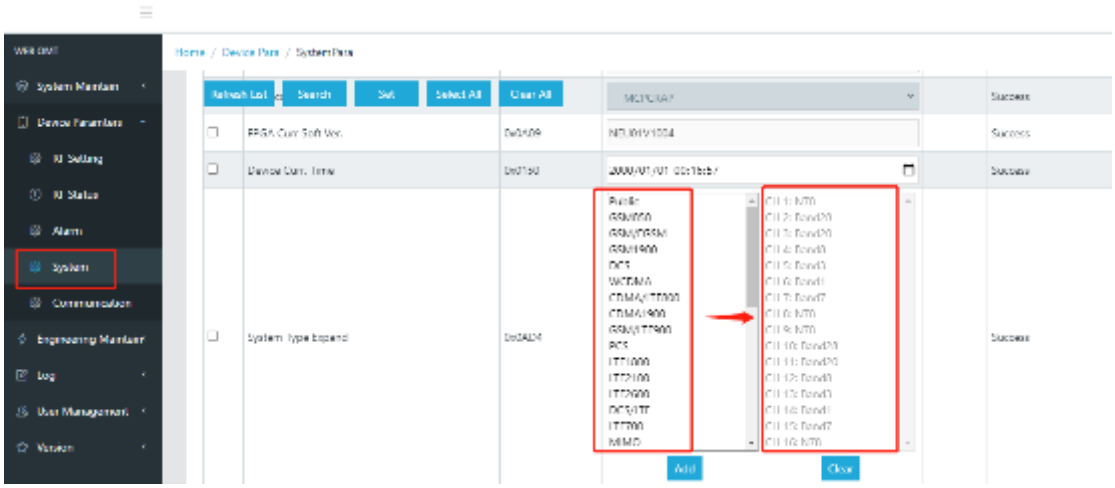




Optical Tx Power: The optical power transmitted by PBMU.
(A_Tx ~ D_Tx: -4 ± 2 dBm)
Downlink Input: The downlink input RF power of the channel ports on the back panel of the PBMU.
BTS Downlink Input Power: The downlink input RF power of the BTS ports on the front panel of the PBMU.

5.2.2 PBMU configuration

5.2.2.1 Band information of Channel port configuration



The flow for configuring Channel port Band information is as follows:
(1) Clear System Type Expand specifies the existing configuration.
(2) Add Band numbers in order (CH 1 to CH 16);Ports CH 1 to CH 16 are added with Band numbers in sequence.And set and query the changed configuration, confirm the configuration is successful!

(3) After the configuration, check the configuration:

Example: The mapping between the device port and System Type Expand port is unchanged, and the Band information can be modified.

Equipment port	System Type Expand (Channel Information)	Band Information (**Modifiable**)
CH H_1	CH 1	N78
CH A_1	CH 2	Band 40
CH B_1	CH 3	Band 28
CH C_1	CH 4	Band 8
CH D_1	CH 5	Band 3
CH E_1	CH 6	Band 1
CH F_1	CH 7	Band 7
CH G_1	CH 8	N78
CH H_2	CH 1	N78
CH A_2	CH 2	Band 40
CH B_2	CH 3	Band 28
CH C_2	CH 4	Band 8
CH D_2	CH 5	Band 3
CH E_2	CH 6	Band 1
CH F_2	CH 7	Band 7
CH G_2	CH 8	N78

Note: this configuration is OK before delivery, please do not modify!!

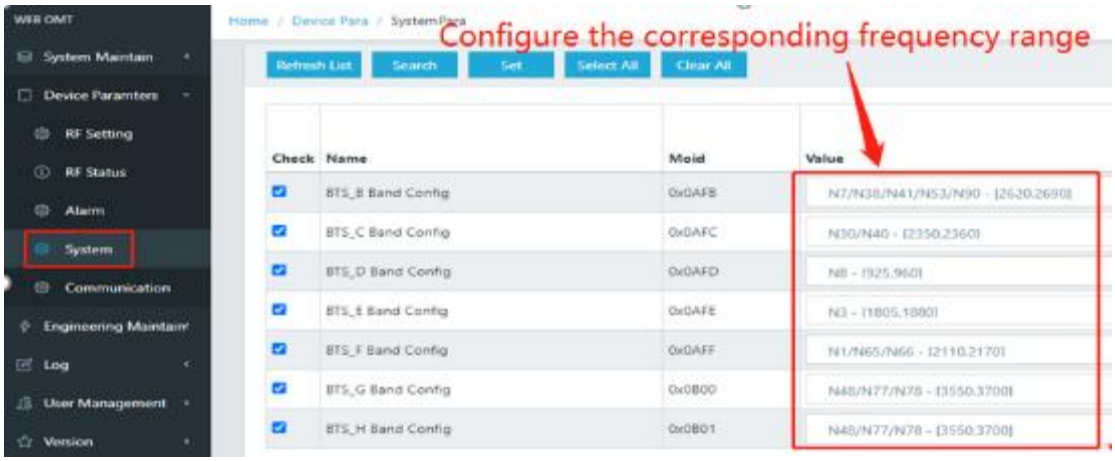
5.2.2.2 Band information of BTS port configuration

To configure Band information for BTS ports, perform the following steps:

(1) BTS A port through BTS A Band Config through the software to configure the Band information;

(2) BTS B to BTS H ports in the same way, the Band of the corresponding CHANNEL BTS port is configured.

(3) After the configuration, query and check the configuration.



5.2.2.3 Matching process of PBMU unit, BTS port and CH (Channel) port

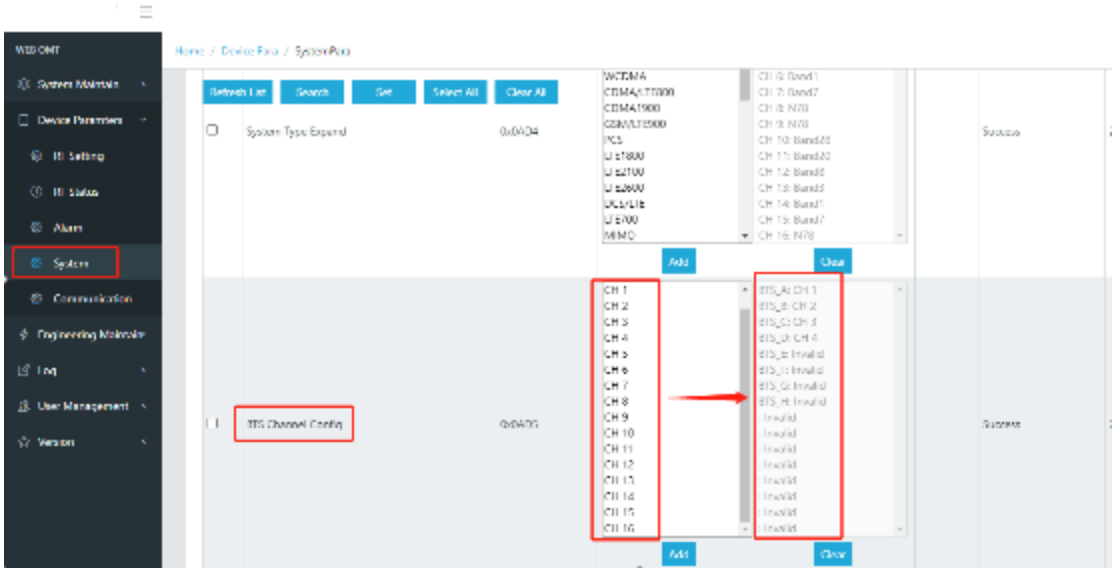
The BTS Channel Config function is used to configure the Band information of the BTS port.The configuration process is as follows:

(1) Clear BTS Channel Config Existing Band configuration information.

(2) Add Channel port numbers in sequence (BTS A to BTS H).Add Channel ports corresponding to BTS ports in sequence (currently, only eight channels from BTSA to BTS H are supported for Channel (CH 1 to CH 16).And set and query the changed configuration, confirm the configuration is successful!

(3) Check the configuration.

Example: BTS port configuration relationship with Channel port:



Note: This configuration needs to be modified according to the base station Band information, and affects the link gain from the BTS interface to the Channel port.

5.2.2.4 PBMU unit, BTS(BTS A ~BTS H) port and Channel(CH A_1~CH H_2) port connection

Before connecting cables, confirm the following information:

(1) Channel port Band configuration in PBMU unit;

(2) BTS port Band configuration in PBMU unit;

(3) THE BTS port in the PBMU unit matches with the Channel port;

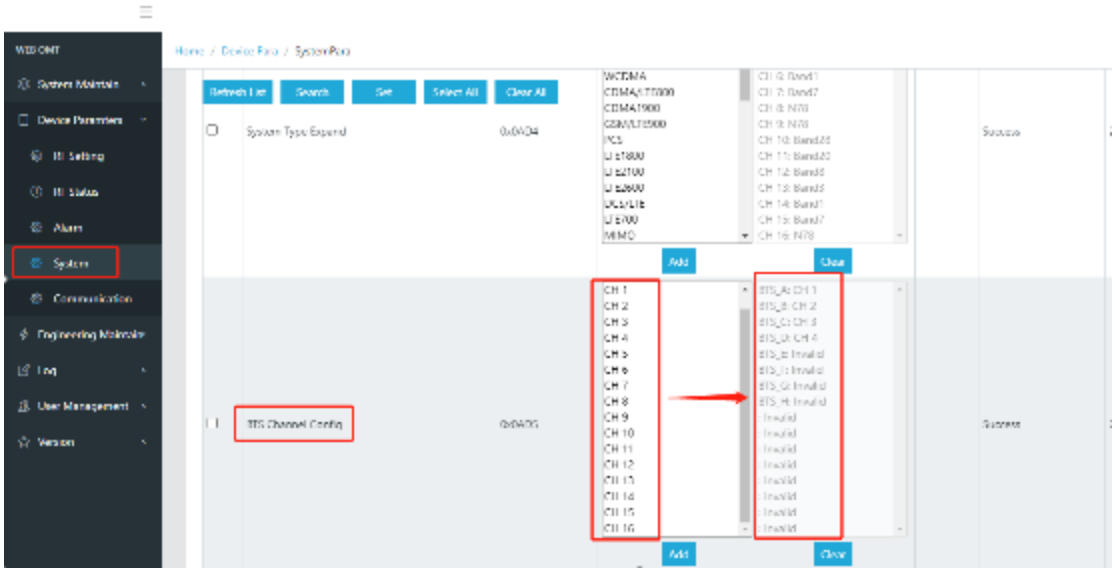
Note: The Band information of the BTS port number is the same as that of the matching Channel port.

After the configuration is complete, the Channel port information summary on the WEBGUI page contains the corresponding BTS port parameters.

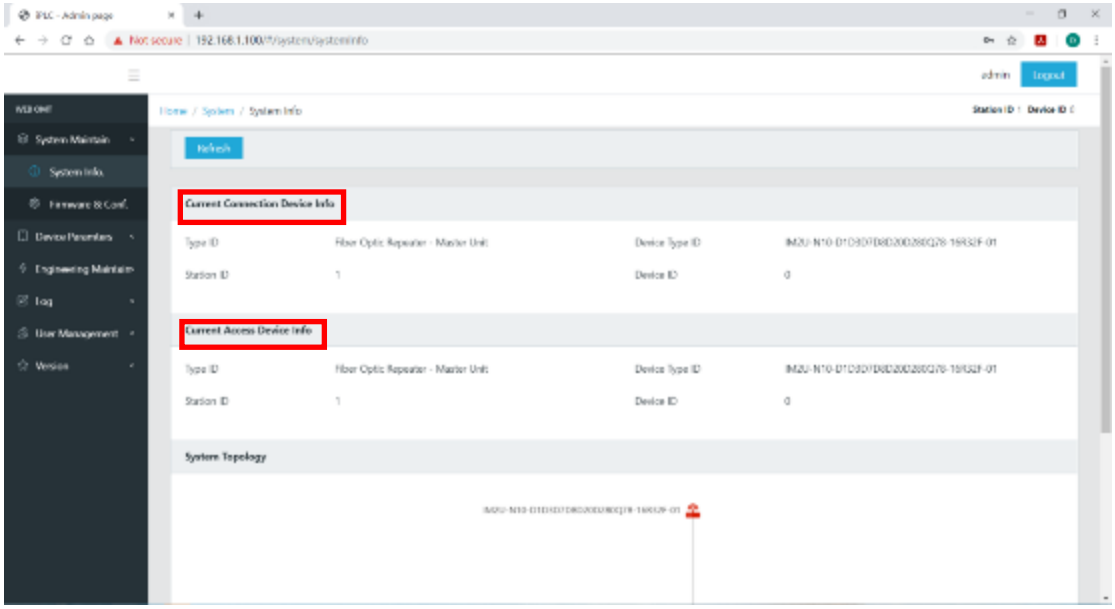
Wiring instructions:

(1) After the Band information is configured for the BTS port, the BTS port is labeled with the corresponding Band label.

(2) According to the BTS port matching the Channel port, the BTS port is connected to the Channel port through the RF jumper.



5.2.3 IM2U

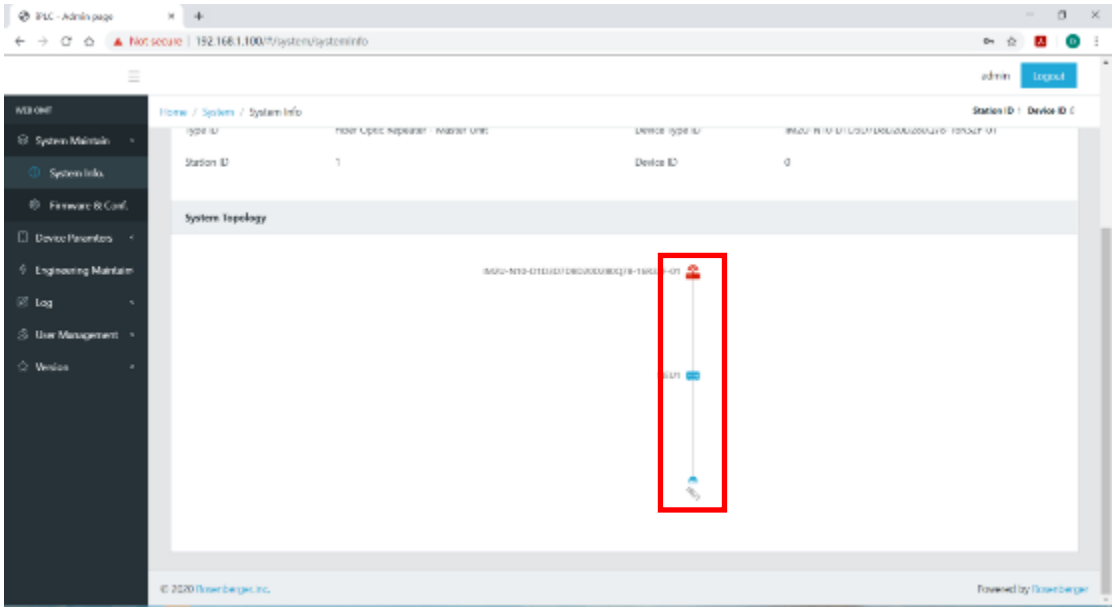


Current Connection Device Info.:

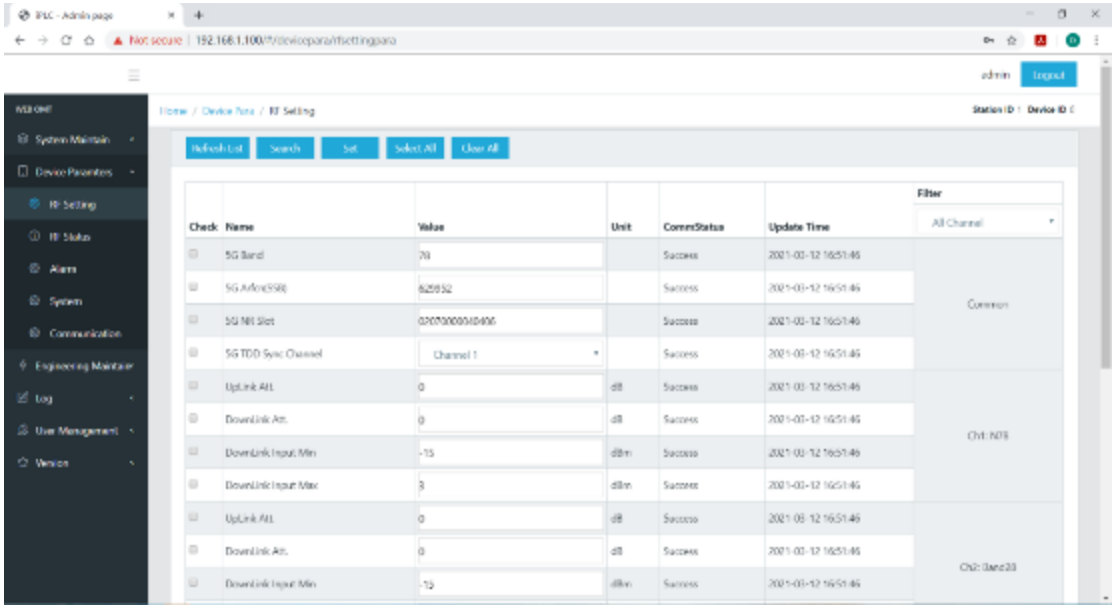
It shows the devices that are currently connected with a Ethernet cable.

Current Access Device Info.:

It shows the device whose parameters are actually being viewed.



Click the icon to switch access to the device.



Click **Device Parameters**.

Click **Select All**, then **Search**.

Configure **5G ARFCN** and **5G NR Slot** according to the actual configuration of the operator.

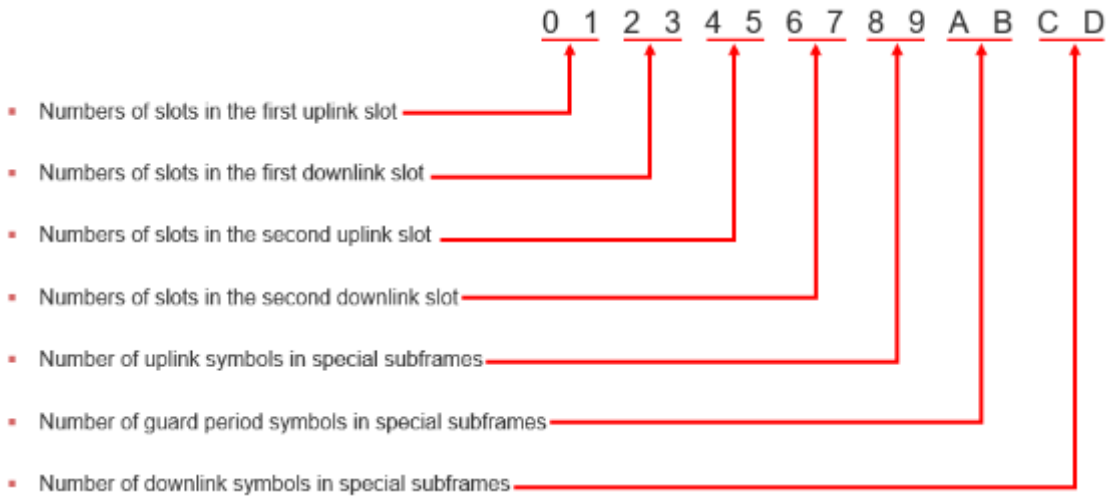
Uplink Att.: Set attenuation for uplink, range: 0 ~ 15 dB

Downlink Att.: Set attenuation for downlink, range: 0 ~ 15 dB

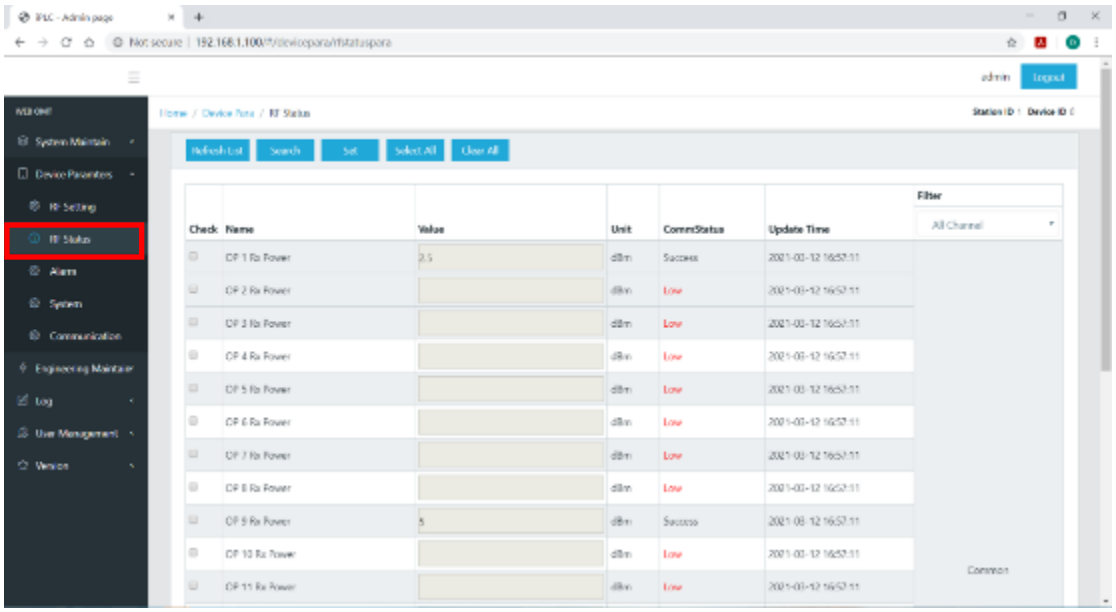
Downlink Input Min: Set minimum threshold value of downlink. There will be alarm if the actual power is lower.

Downlink Input Max: Set maximum threshold value of downlink. There will be alarm if the actual power is higher.

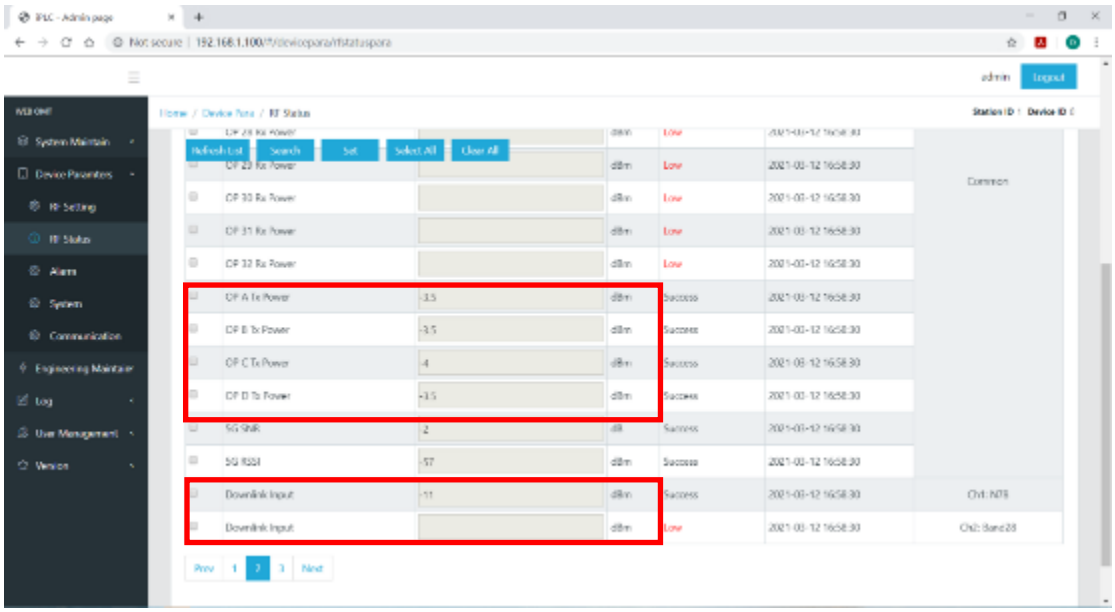
Configuration instruction of **5G NR Slot**:



Note: If NR uplink and downlink are configured as single time slot, the second time slot is configured as 0000.

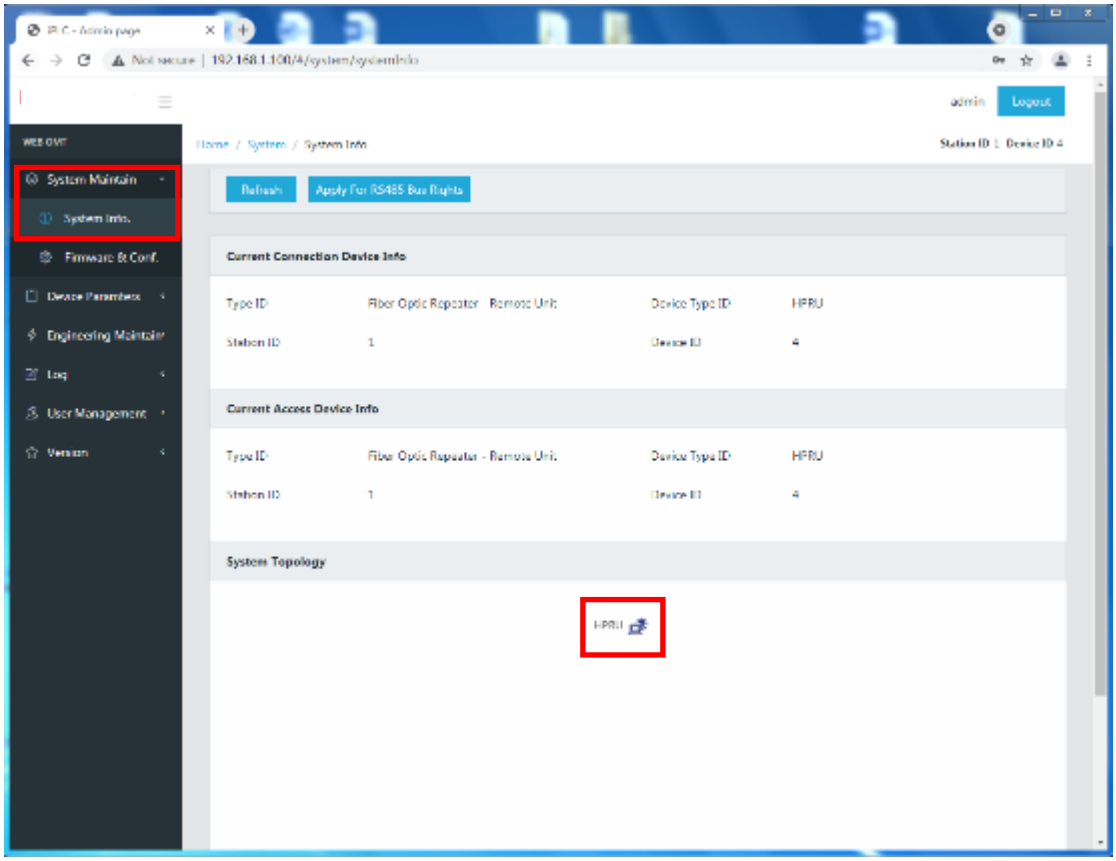


Optical Rx Power: The optical power received from NEU (normal range: ≥ -2 dBm).

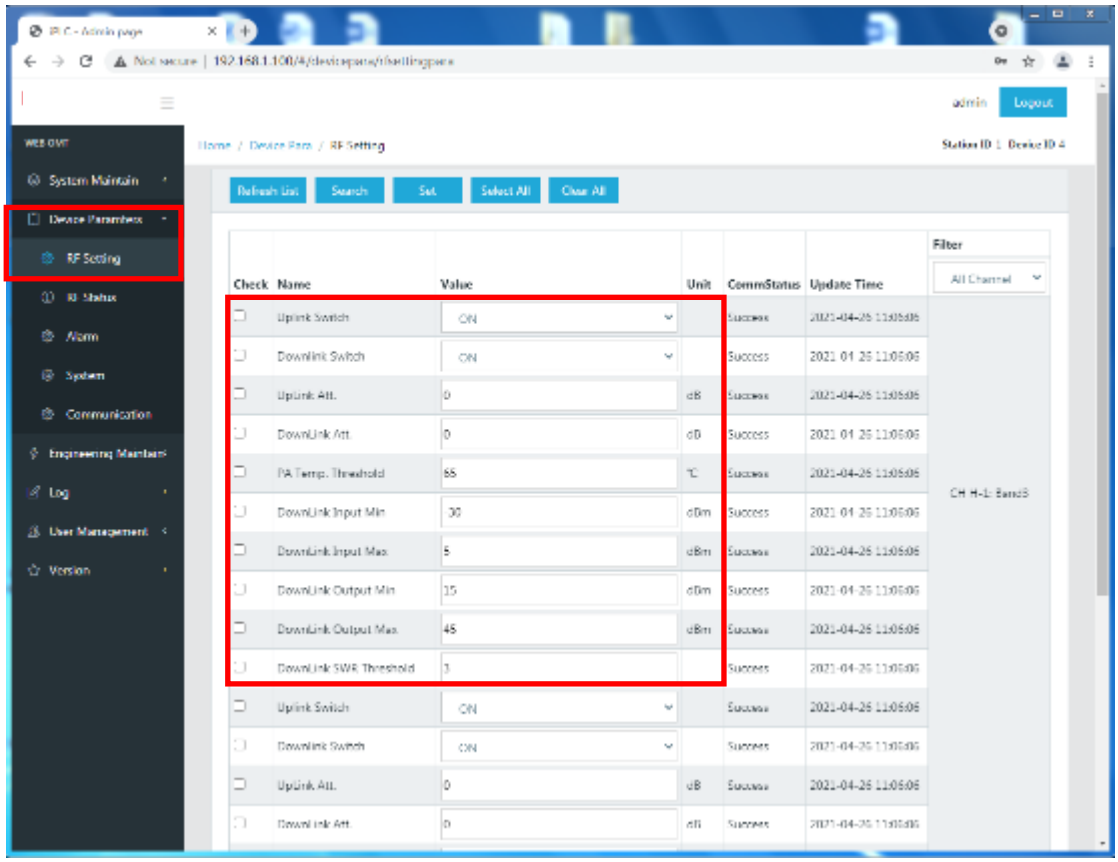


Optical Tx Power: The optical power transmitted by IM2U.
(A_Tx ~ D_Tx: -6 ± 2 dBm)
Downlink Input: The downlink input RF power received from CU.

5.2.4 HPRU

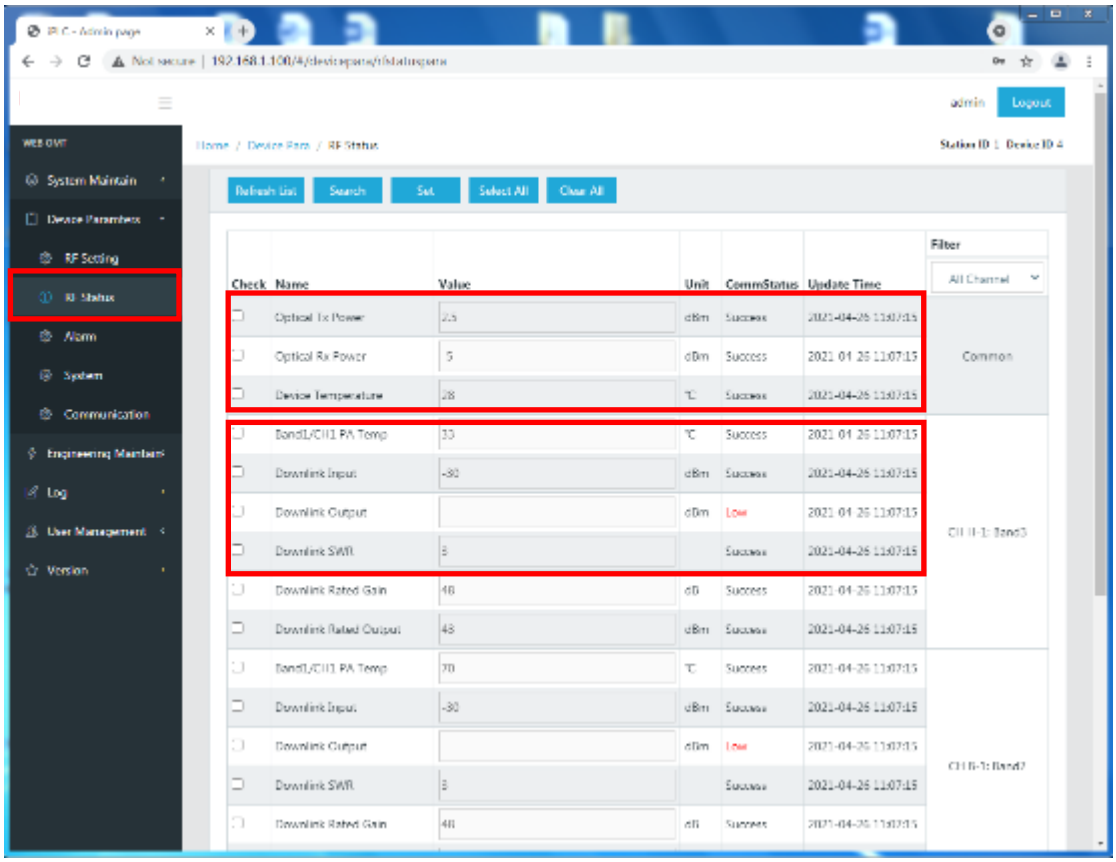


Click **System Info.** and switch access to HPRU.



Uplink Switch: The switch of uplink power amplifier module of HPRU.
Downlink Switch: The switch of downlink power amplifier module of HPRU.
Uplink Att.: Set attenuation for uplink, range: 0 ~ 15 dB.
Downlink Att.: Set attenuation for downlink, range: 0 ~ 15 dB.
PA Temp. Threshold: Set maximum temperature threshold value of power amplifier. There will be alarm if the actual temperature is higher.
Downlink Input Min: Set minimum threshold value of downlink input power. There will be alarm if the actual power is lower.
Downlink Input Max: Set maximum threshold value of downlink input power. There will be alarm if the actual power is higher.
Downlink Output Min: Set minimum threshold value of downlink output power. There will be alarm if the actual power is lower.
Downlink Output Max: Set maximum threshold value of downlink output power. There will be alarm if the actual power is higher.
Downlink SWR Threshold: There will be alarm if the actual SWR value is higher.

Check the downlink output of the channels at page **RF Status**.



Optical Tx Power: The optical power transmitted to PBMU or HPRU.

Optical Rx Power: The optical power received from PBMU or HPRU.

Device Temp.: The temperature of MCU module.

PA Temp.: The temperature of the power amplifier.

Downlink Input: The downlink input power.

Downlink Output: The downlink output of power.

Downlink SWR: The SWR value of downlink.