



COMFLEX NG MRU_c

MEDIUM POWER REMOTE UNIT

USER MANUAL

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Document History

Page No.	Version	Revised By	Details of Change
n/a	1-0-0	HaiLong Deng	First Release

Abbreviation	Meaning
AC	Alternating Current
DC	Direct Current
ANT	Antenna
CLI	Command-Line Interface
GUI	Graphical User Interface
LED	Light-Emitting Diode
LMT	Local Maintenance Terminal
LTE	Long Term Evolution
NR	New Radio
PSU	Power Supply Unit
RF	Radio Frequency
Rx	Receive
Tx	Transmit
UL	Uplink
DL	Downlink

Warning

This is a CONSUMER device.

BEFORE USE, you **MUST REGISTER THIS DEVICE** with your wireless provider and have your provider's consent. Most wireless providers consent to the use of signal boosters. Some providers may not consent to the use of this device on their network. If you are unsure, contact your provider.

You **MUST** operate this device with approved antennas and cables as specified by the manufacturer. Antennas **MUST** be installed at least 20 cm (8 inches) from any person.

You **MUST** cease operating this device immediately if requested by the FCC or a licensed wireless service provider.

WARNING.E911 location information may not be provided or may be inaccurate for calls served by using this device.

This device may be operated **ONLY** in a fixed location for in-building use.

Caution : for use of unauthorized antennas, cables, and/or coupling devices not conforming with ERP/EIRP restrictions is not permitted.

Antenna type and permitted max antenna gain: External Dedicated Antenna with gain 9 dBi, and cable loss is 9 dB.

The 10 meters height limit of Section 27.50(d)(4) applies for Fixed Consumer Signal Boosters transmitting in 1710-1755 MHz. The antenna for the device must be installed to comply with the 10 meter above ground maximum antenna height limitation. Product request the min cable length for both connect donor antenna to booster and server antenna to booster is 5 meters for mitigate any unintended oscillations in uplink and downlink bands.

The server port antennas will be used to provide coverage to different areas within a building and will be installed with a minimum of 10 meters separation between server port antennas.

FOR MORE INFORMATION ON REGISTERING YOUR SIGNAL BOOSTER WITH YOUR WIRELESS PROVIDER, PLEASE SEE BELOW:

Sprint: http://www.sprint.com/legal/fcc_boosters.html

T-Mobile/MetroPCS: <https://support.t-mobile.com/docs/DOC-9827>

Verizon Wireless: <http://www.verizonwireless.com/wcms/consumer/register-signal-booster.html>

AT&T: <https://securec45.securewebsession.com/attsignalbooster.com/>

U.S. Cellular: <http://www.uscellular.com/uscellular/support/fcc-booster-registration.jsp>

1. OVERVIEW

The ComFlex NG DAS system is an analog digital combination system that supports both wireless and direct access methods, and supports 4G and 5G standards. The wireless access method amplifies the RF signal by selecting the corresponding frequency band of the operator through digital signal processing, while the direct access method attenuates the RF signal through POI modules to ensure compatibility between the wireless and wired access sources. MU also converts radio frequency signals into optical signals, which are pulled far to the remote RU through optical fibers. RU amplifies the signal again and covers the network through Passive DAS.

1.1. APPEARANCE

The following figures shows the appearance of the Medium Power Remote.



Figure 1 Medium Power Remote Unit(MRUc)

1.2. NETWORK ARCHITECTURE

Following is the typical network architecture of ComFlex NG series Distributed Antenna System, Medium Power Remote is connected with the MU by optical fiber cable. The RF output of the RU is connected to antenna by RF cables. The MU and RU are powered by PSU in the equipment room or outdoor PSU.

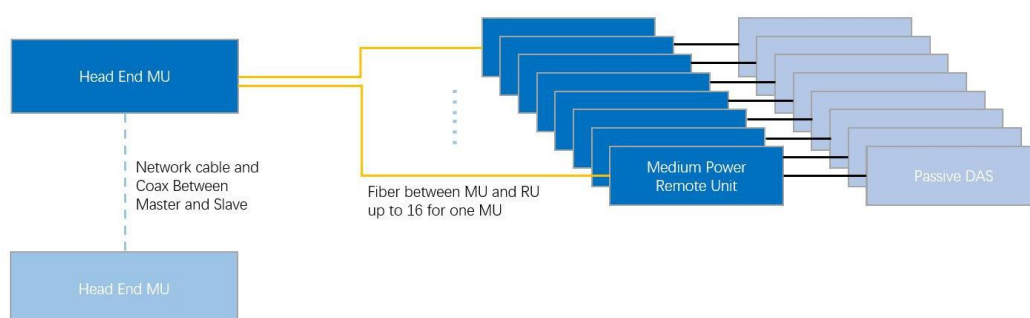


Figure 2 Medium Power Remote Network Diagram

1.3. PHYSICAL PORTS AND INDICATION

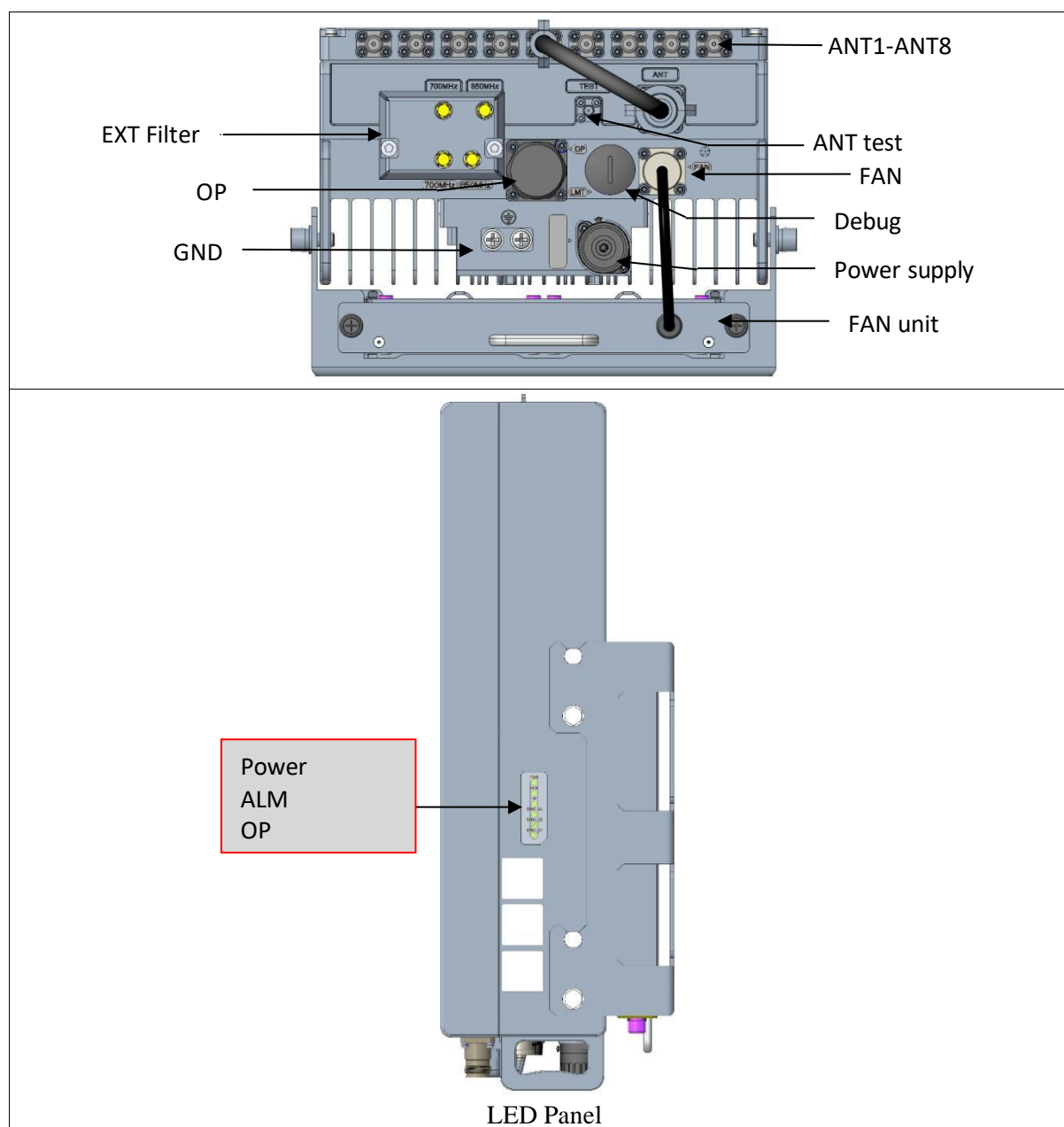


Figure 3 Port and Indication

Table 1 Ports at bottom side

Port	Connector	Description
EXT filter	SMA	Connected ext 700/850MHz filter
OP	SC-APC	Connected optical fiber form MU
GND	M6 bolt	Connected GND wire
ANT test	SMA	Use for ANT port signal test
ANT	NEX10(1-8)	Connected antenna
FAN	8pin-circle	Connected FAN unit
Debug	RJ45	Ethernet interface for LMT
Power supply	4pin-circle	Connected power supply

Table 2 LED indicator

LED Lable	Status	Description
PWR	Solid Green	Unit is powered ON and Operational
	Flashing Green	Unit is powered on and NOT Operational
	Off	Unit is not powered
ALM	Green	RU is NOT in alarm
	Red	RU is in alarm
OP	Green	Optical Link is established and operational
	Red	Optical Link is NOT established and operational

2. TECHNICAL SPECIFICATION

2.1. FREQUENCY BANDS

Table 3 Medium Power Remote frequency bands

Band	TX Frequency (MHz)	RX Frequency (MHz)	IBW (MHz)
B12	728-746	698-716	18
B13	746-757	776-787	11
B14	758-768	788-798	10
B5	869-894	824-849	25
B66	2110-2155	1710-1755	45/45
B25	1930-1995	1850-1915	65/65

2.2. MU+RU GAIN

Table 4 Typical output power allocation

Band	TX Gain (dB)	RX Gain (dB)
B12	70	65
B13	70	65
B14	70	65
B5	70	65
B66	70	65
B25	70	65

2.3. RU OUTPUT POWER

Table 5 Typical output power allocation

Band	TX Frequency (MHz)	Output power(dBm)
B12	728-746	10
B13	746-757	
B14	758-768	
B5	869-894	
B66	2110-2155	
B25	1930-1995	

Note: The RF cable loss and antenna gain add up to 0dB, for example cable loss -9dB and antenna gain 9dB i. Than make sure the RF radiation lower than 10dBm/band.

2.4. ELECTRICAL SPECIFICATION

2.4.1. INPUT POWER VOLTAGE

Table 6 Input power voltage

Unit	Operation Voltage Range
MRUc - AC	100V to 240V AC
MRUc - DC	48V DC

2.4.2. POWER CONSUMPTION

Table 7 Power consumption

Mode	Output Power (dBm)	Typical Power Consumption (W)	Maximum Power Consumption (W)
Normal	25	97	100

2.5. MECHANICAL AND ENVIRONMENTAL

2.5.1. EQUIPMENT SIZE AND WEIGHT

Table 8 Equipment size and weight

Dimension (H x W x H)	Weight
630mm x 250mm x 145mm	16.5 kg (without mounting bracket)

2.5.2. ENVIRONMENTAL

Table 9 Equipment environment specification

Item	Specifications
Operation Temperature(°C)	-20 - +55
Operation Humidity	5 – 95%, non-condensing
Storage Temperature(°C)	-40 - +55
Environmental Protection	IP 30
Cooling	Convection (fans optional)

2.6. TRANSMISSION INTERFACE SPECIFICATION

Table 10 Fronthaul interface specification

Item	Specifications
Port Type	SC-APC
No. of Ports	1
Wave length (nm)	TX 1310+ RX 1550+WDM
Topology	Star
Maximum optical loss	8dBo

2.7. SYSTEM FUNCTION

The booster be able to detect and mitigate (i.e., by automatic gain reduction or shut down), any oscillations in uplink and downlink bands. Oscillation detection and mitigation must occur automatically within 0.3 seconds in the uplink band and within 1 second in the downlink band. In cases where oscillation is detected, the booster must continue mitigation for at least one minute before restarting. After five such restarts, the booster must not resume operation until manually reset.

The booster circuit support that automatically controls the gain of a signal by applying more gain to weaker received signals and less (or no) gain to stronger received signals.

3. INSTALLATION INSTRUCTIONS

3.1. PACKING LIST

Table 11 Package list

NO	Description	Model	Quantity	Remarks
1	MRUc	MRUc-AC /MRUc-DC	1 Pcs	






ACCESSORIES INCLUDED

NO	Description	Item code	Quantity	Remarks
1	GND Cable	6AWG,2m	1 Pcs	
3	Expansion bolt	M10×110	4 Pcs	
4	Mounting bracket 1	ADAS-S5100-5812	1 Pcs	
7	Screw	M6×16	4Pcs	
	FAN	MPRU-S5100	1 Pcs	

3.2. TOOLS REQUIREMENT

The requirement for the installation tools as follows:

Table 12 Tool Requirement

Tool Type	Usage
 Percussion drill	Drill the hole of Φ14 mm
 Open spanner	10 mm and 16 mm
 Hammer	Use to install the expansion bolt when use wall-mounted
 Cross screwdriver	φ5mm
 Hexagon socket universal wrench	Use to open the window coverings and fix the mounting bracket

3.3. INSTALLATIONS

3.3.1. MRU INSTALLATION STEP

The Installation method of MRU is divided into wall-mount.

Step1: Demount the mounting rack from the MRU, use percussion drill to drill 4 pole of $\Phi 14$ with 65-75 mm depth, as shown in Figure 4.

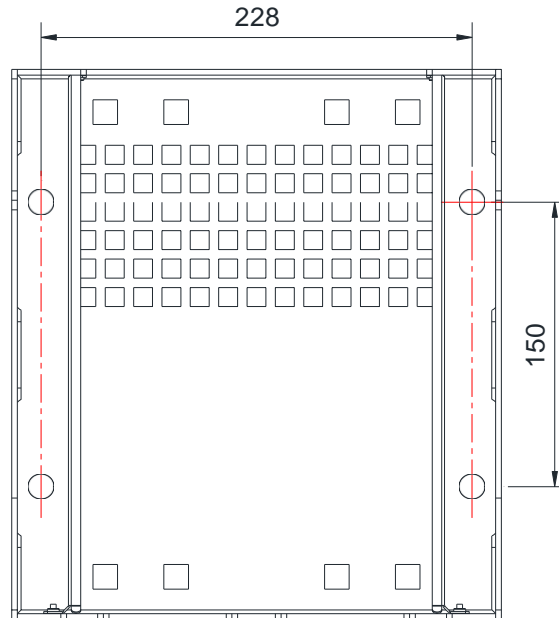


Figure 4 Wall-mounting Drilling Dimension Diagram

Step2: use hammer push 4 M10 expansion bolt into the hole of the wall, fix the mounting bracket (ADAS-S5100-5812) to the wall according the Figure 5.

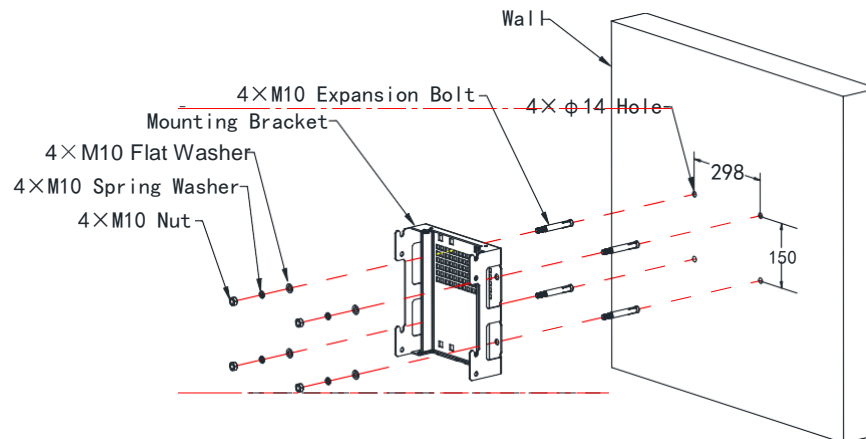


Figure 5 Mounting Bracket Installation Diagram

Step3: Lift the device, align the four mounting screws with the slot of the mounting tray, and tighten the four M8 screws on the left and right sides to secure the device, as shown in Figure 6.

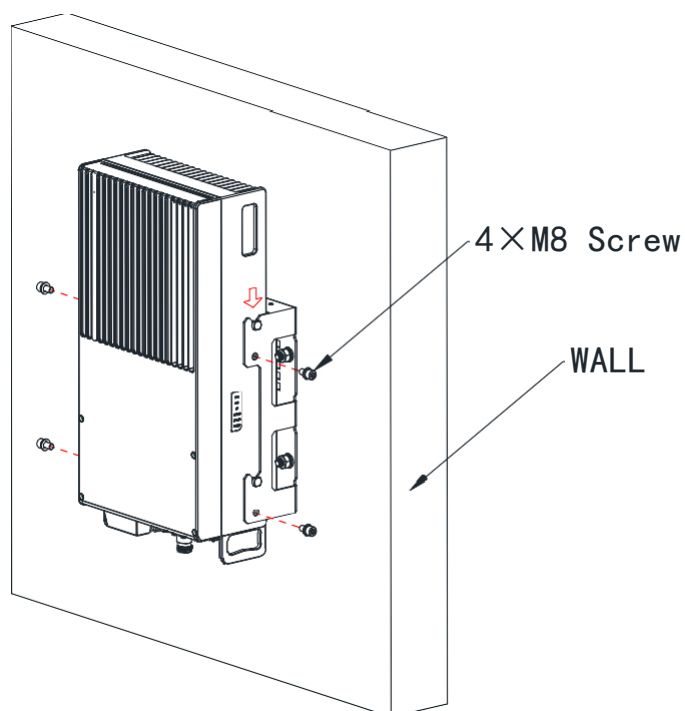


Figure 6 Wall Mounting (without Splitter)

If need the Splitter, please use RF Cable to connect the TX port of MRU to the COM port of splitter, as shown in Figure 7.

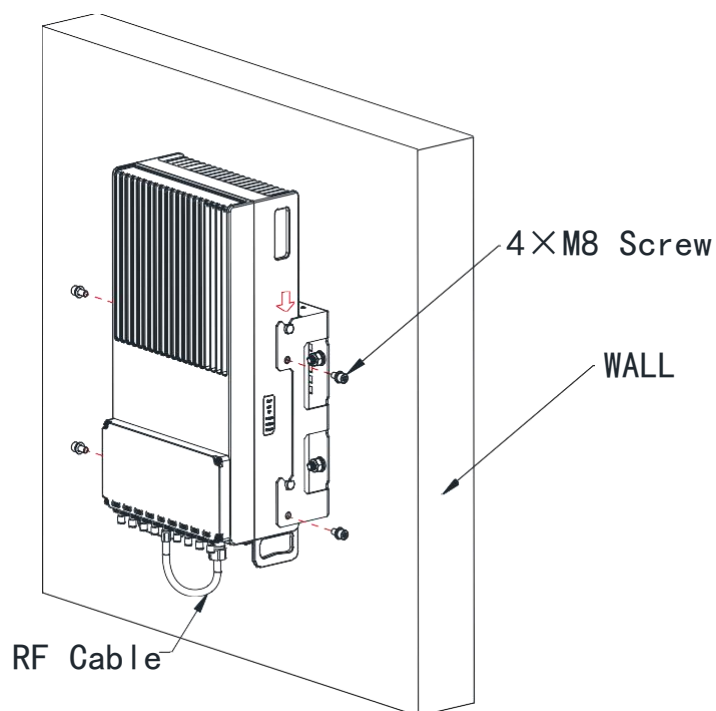


Figure 7 Wall Mounting (with Splitter)

If need the FAN, please insert the fan into the guide rail of the bracket and lock it with two M5 screws, and then connect the plug of the fan to the fan socket of the MRU, as shown in Figure 8.

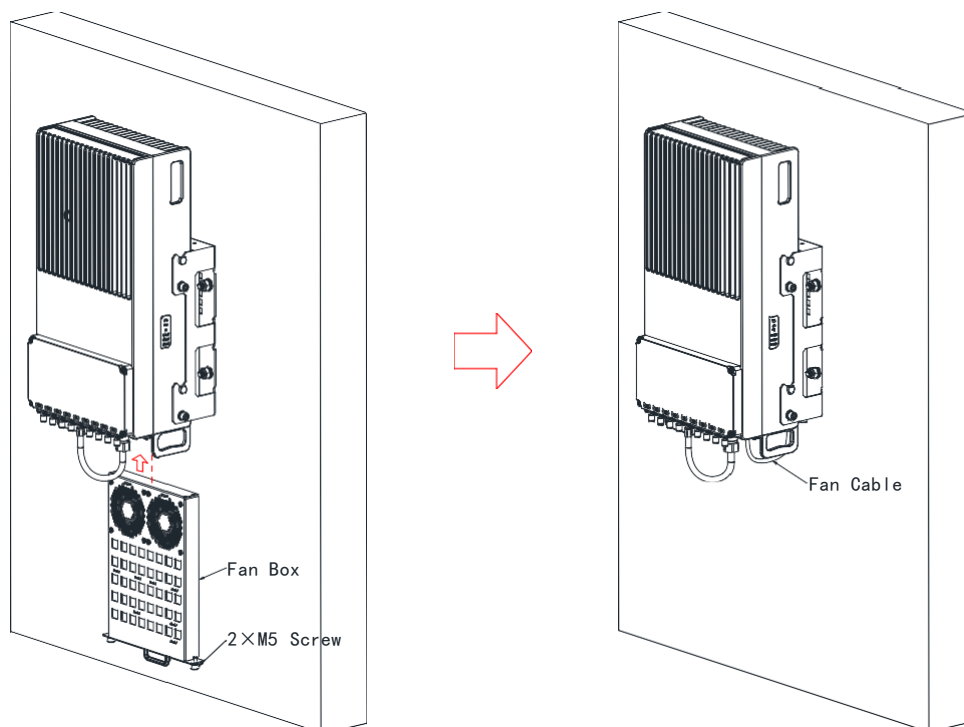


Figure 8 Fan Installation

3.3.2. GROUNDING

The Grounding cable is provided with the screw which will be installed at the chassis as shown in Figure 9.

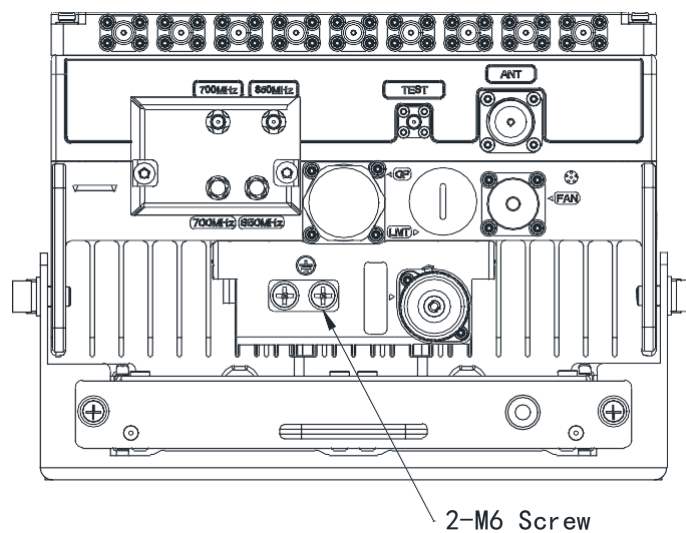


Figure 9 Grounding Cable Diagram

3.3.3. EXTERNAL FILTER CONNECTION

Filter connector is SMA connector, RF cable is recommended for RG402 cable. The 700MHz filter includes B12/B13/B14.

Step1: Unscrew the two M4x14 screws, remove the RF Cable Cover, and use a wrench to unscrew the two RF cables, as shown in Figure 10.

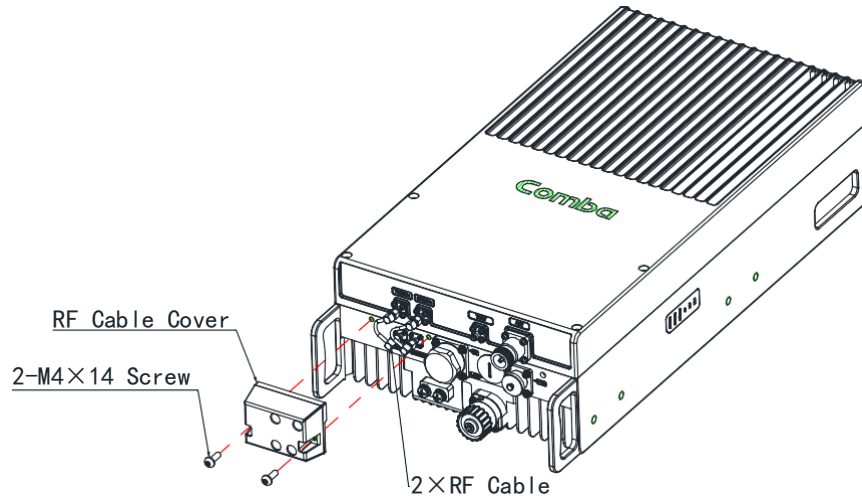


Figure 10 Remove RF Cable Cover

Step2: Please use 4 RF cables to connect 700MHz and 850MHz filter input/output ports, and then use 2 M4x14 screws to lock the RF Cable Cover, as shown in Figure 11, and RF Cable connection as shown in Figure 12 and Figure 13.

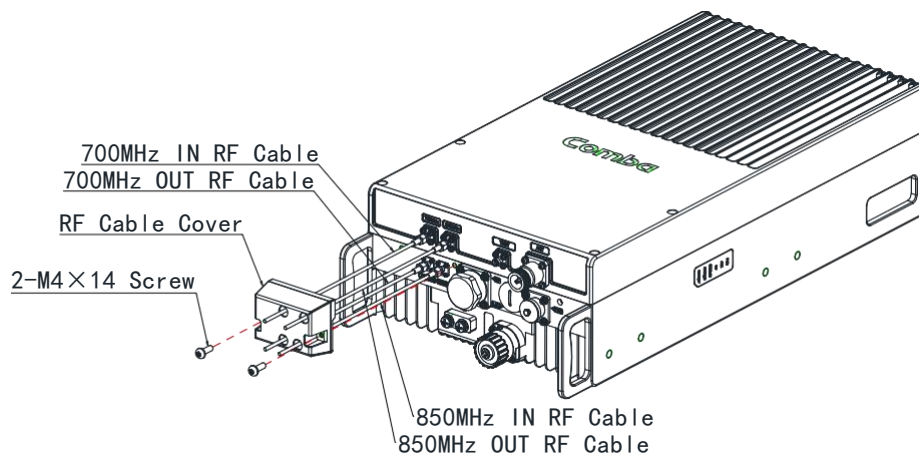


Figure11 Connect the RF cable and Filer

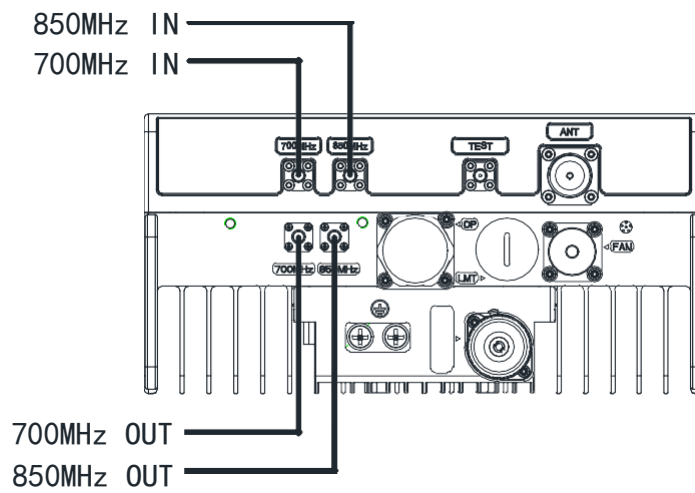


Figure12 700/850 RF Ports

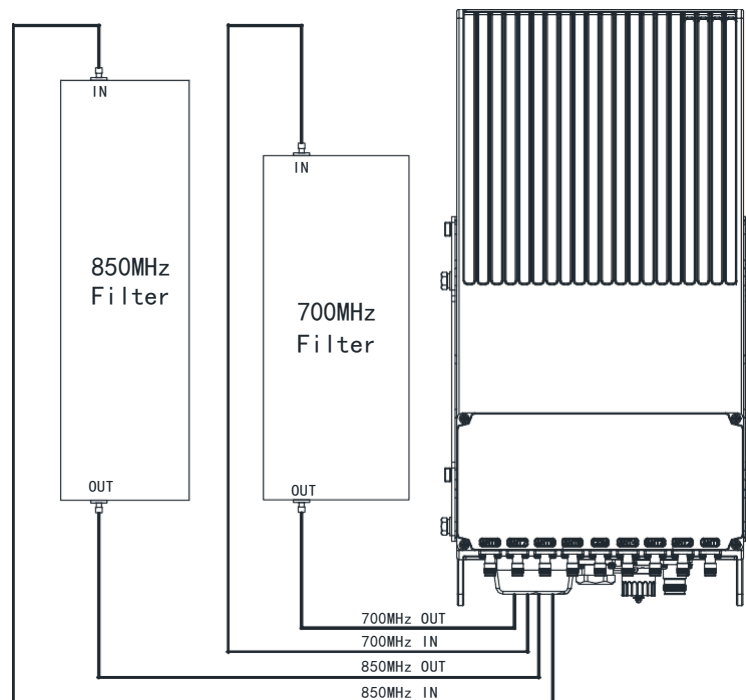


Figure13 Filter Connection

3.3.4. FIBER CONNECTION

Step1: Unscrew the protection cover of the OP port.

Step2: Take out the connector and remove the small rubber plug.



Figure14 remove the small rubber plug

Step3: Pass the optical fibers through the connector in the following order.



Figure15 Pass the fiber

Step4: Insert the optical fiber into the SC-APC connector.

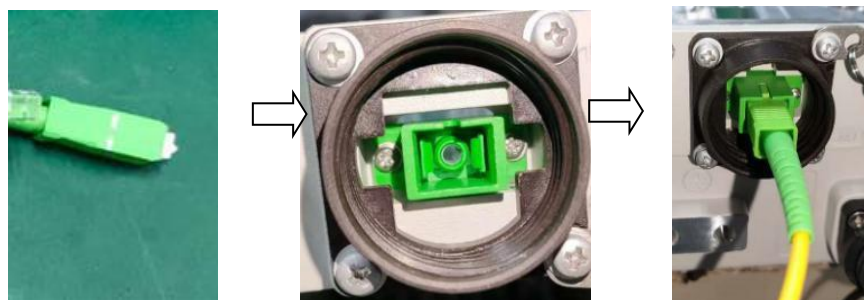


Figure16 Insert the fiber

Step5: Insert the transparent sleeve into the optical fiber waterproof seat.

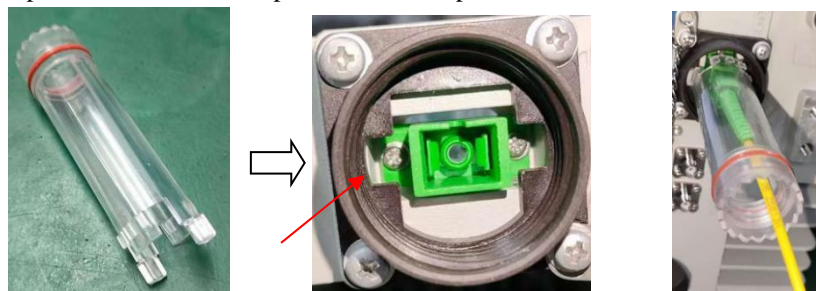


Figure17 Insert the transparent sleeve

Step6: Insert rubber plug.

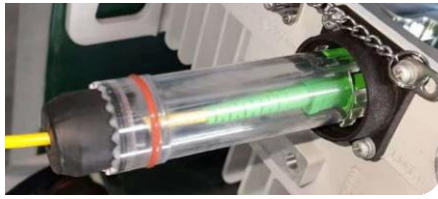


Figure18 Insert rubber plug

Note: When inserting the rubber plug, avoid bending the optical fiber in the transparent sleeve

Step7: Tighten the waterproof cover.

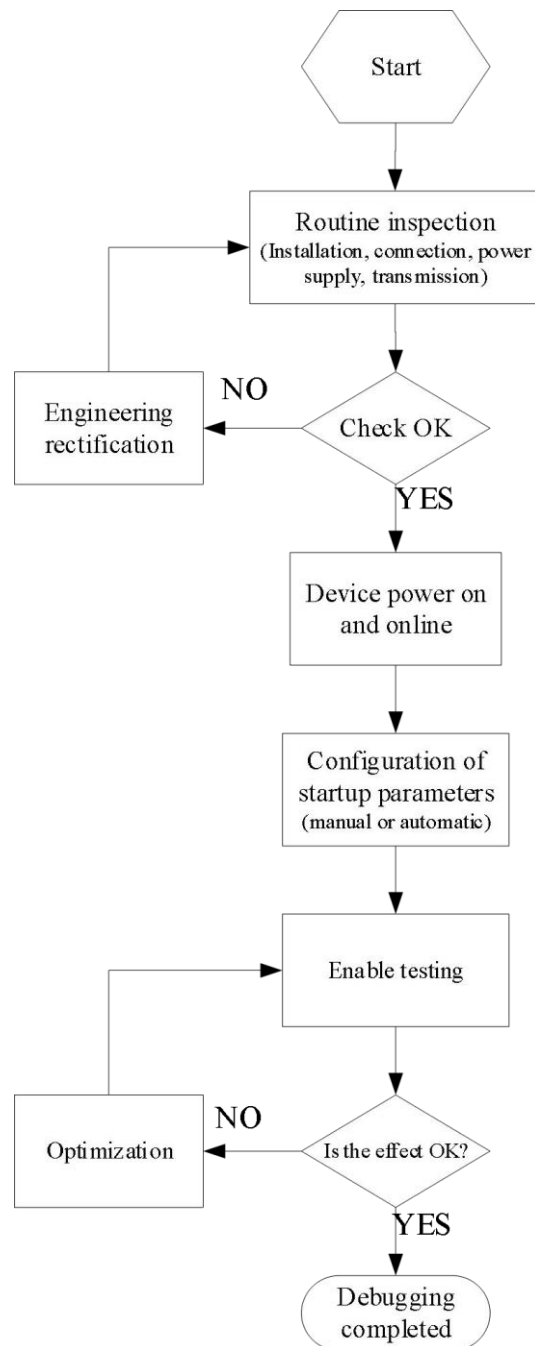


Figure19 Tighten the waterproof cover

4. SYSTEM TUNE UP PROCEDURE

MRU is a kind of RU device connected by optical fiber. The system is mainly controlled from the software of MU. the following is the system of the station opening process.

The activation process is shown in the following figure:



4.1. EQUIPMENT POWER ON AND ONLINE

4.2. POWER ON THE DEVICE

Before powering on the equipment for testing, it is necessary to carefully. 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.

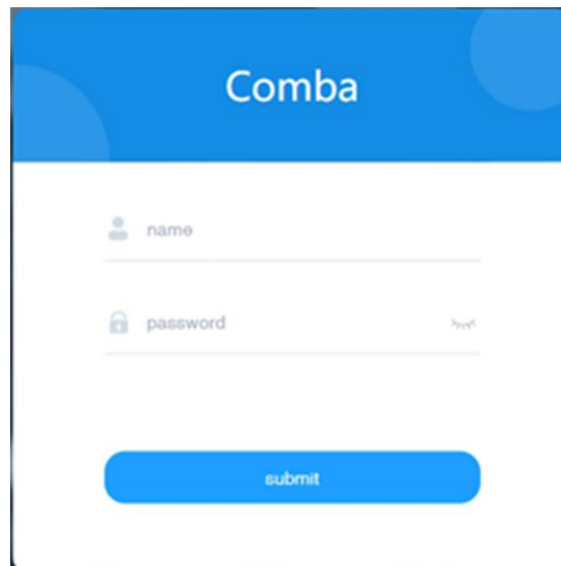
4.2.1. DEVICE ONLINE

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:

- 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.
- Open the browser software and enter 192.168.1.231 in the address bar; As shown in the following figure:

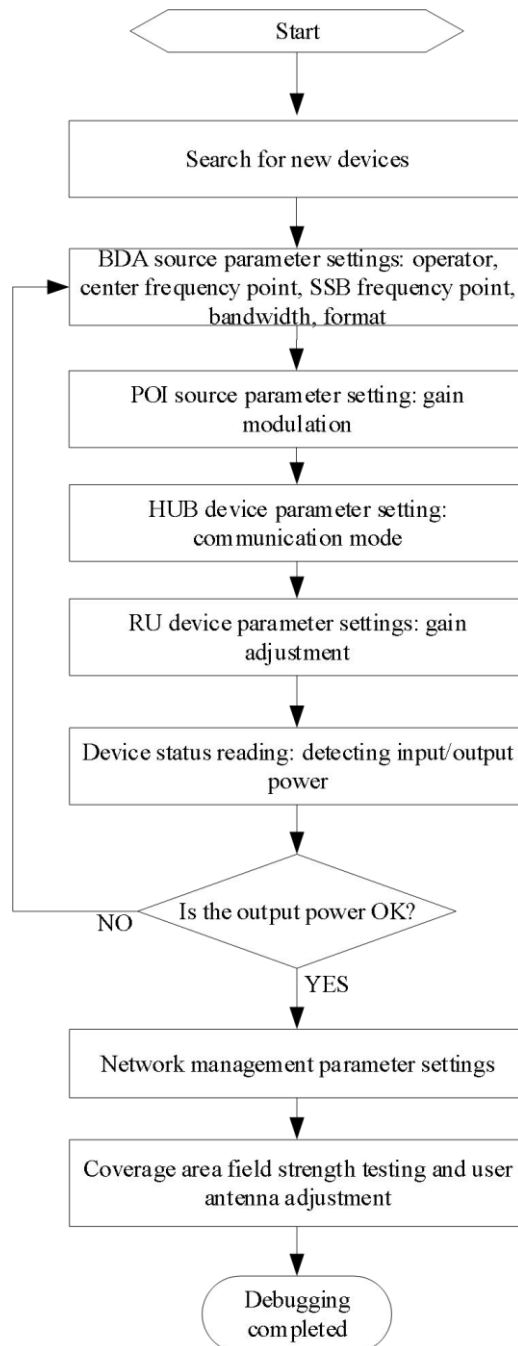


- Enter the username and password, click submit to enter the device management interface.

4.3. 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.



4.3.1. 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 MRU/HUB machine;

ARU Discover: Discovered a new ARU machine.

MRU Discover: Discovered a new MRU machine.

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

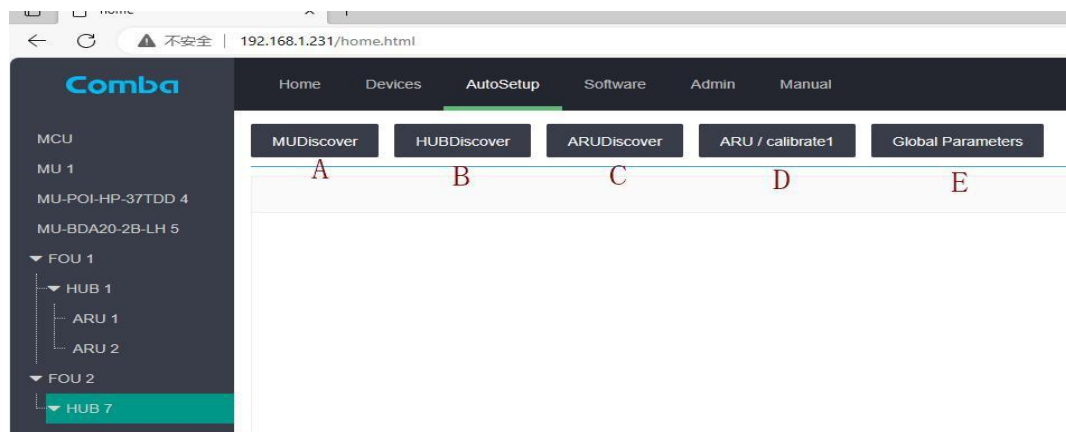
B: HUB discover function is used to find the HUB/MRU that connect to FOU and automatically provide the site number for each HUB/MRU.

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

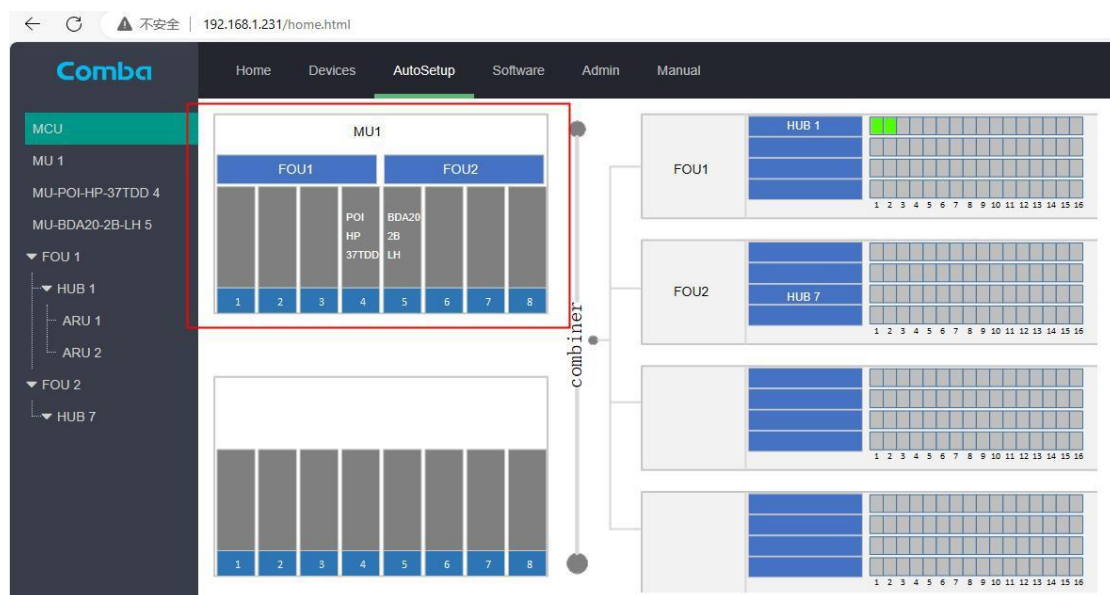
D: ARU calibrate function is used to automatically calibrate the gain from HUB to ARU to adapt to different insertion loss cables, maintaining a balanced system gain setting.

E: Global parameters are used to control RF and HUB DC switches at the touch of a button



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/MRU 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/MRU on the left sidebar appears, and the HUB/MRU 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



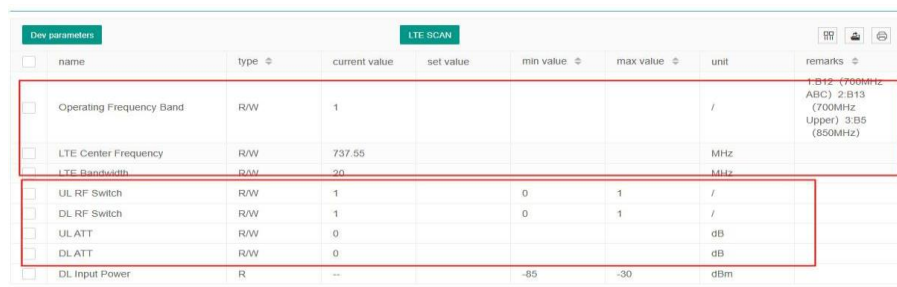
4.3.2. BDA-LH/HH SOURCE PARAMETER SETTINGS

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

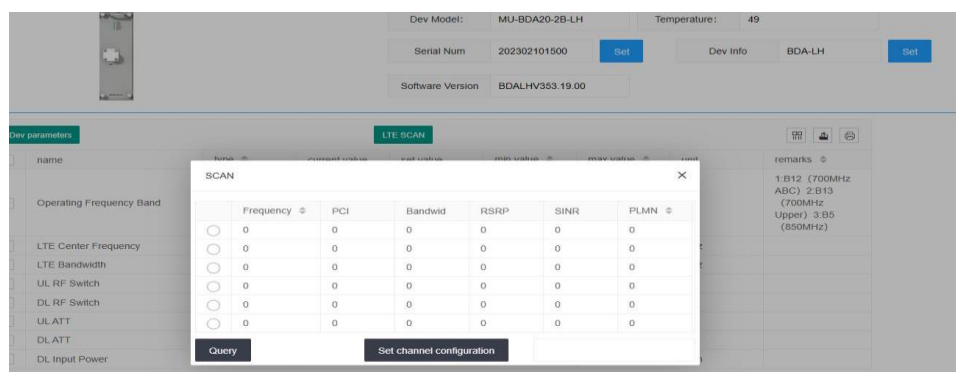
- 1) Configure specific switching frequency band states by setting the operating frequency band selection; setting center frequency and bandwidth to configure the operation specifications
- 2) other parameters mainly include ATT and RF switch control.



name	type	current value	set value	min value	max value	unit	remarks
Operating Frequency Band	R/W	1				/	1:B12 (700MHz ABC) 2:B13 (700MHz Upper) 3:B5 (850MHz)
LTE Center Frequency	R/W	737.55				MHz	
LTE Bandwidth	R/W	20				MHz	
UL RF Switch	R/W	1		0	1	/	
DL RF Switch	R/W	1		0	1	/	
UL ATT	R/W	0				dB	
DL ATT	R/W	0				dB	
DL Input Power	R	---		-85	-30	dBm	


Automatic

- 1) Click on the LTE SCAN button
- 2) A window will pop up on the web, waiting for the device to complete the automatic demodulation and frequency scanning function
- 3) Select the desired channel and click the settings button
- 4) If there is no good signal source, you can adjust the antenna direction and restart the automatic frequency sweep demodulation function.



4.3.3. FOU PARAMETER SETTINGS

Can query and set optical signal related parameters and alarms.



Dev Model: MU-FOU

Temperature: 39

Serial Num: 123456

Dev Info: 12345

Software Version: FOUOAMV0100.04_TS

Dev parameters								
<input type="checkbox"/>	name	type	current value	set value	min value	max value	unit	remarks
<input type="checkbox"/>	Optical RX Power 1	R	7		-3	8	*	
<input type="checkbox"/>	Optical RX Power 2	R	-5		-3	8	*	
<input type="checkbox"/>	Optical RX Power 3	R	-5		-3	8	*	
<input type="checkbox"/>	Optical RX Power 4	R	-5		-3	8	*	
<input type="checkbox"/>	Optical TX Switch	R/W	1		0	1	*	
<input type="checkbox"/>	Optical RX Switch 1	R/W	1		0	1	/	
<input type="checkbox"/>	Optical RX Switch 2	R/W	1		0	1	/	
<input type="checkbox"/>	Optical RX Switch 3	R/W	1		0	1	/	
<input type="checkbox"/>	Optical RX Switch 4	R/W	1		0	1	/	
<input type="checkbox"/>	RF Switch 1	R/W	1		0	1	/	
<input type="checkbox"/>	RF Switch 2	R/W	1		0	1	/	
<input type="checkbox"/>	RF Switch 3	R/W	1		0	1	/	
<input type="checkbox"/>	RF Switch 4	R/W	1		0	1	/	

4.3.4. MRU DEVICE PARAMETER SETTINGS

4.3.4.1. OPTICAL SIGNAL RELATED PARAMETERS

Comba

Home System Status Auto setup Consumer BDA Software Admin

MU 1

FOU 1

MRU 1

MRU 2

MRU 3

Part Number MRU-700951921-AC Software Version MRU5667M07R00.02.01

Serial Number FA14758963 Temperature(°C) 48

Device Name V00.00.00

SW Reset HW Reset DPD Reset

Optical Info RF Info 2500TDD SYNC Info 3500TDD SYNC Info 3700TDD SYNC Info Alarm Info Device Info

Optical Info

Parameter	Value
Peer OP Power(dBm)	-99
Optical RX Power(dBm)	-0.5
Optical TX Power(dBm)	8.5

Output power of MU optical unit

4.3.4.2. RF RELATED PARAMETERS

Comba

Home System Status Auto setup Consumer BDA Software Admin WEB_V01.07.85 admin

MU 1

FOU 1

MRU 1

MRU 2

MRU 3

Part Number MRU-700951921-AC Software Version MRU5667M07R00.02.01

Serial Number FA14758963 Temperature(°C) 48

Device Name V00.00.00

SW Reset HW Reset DPD Reset

Optical Info RF Info 2500TDD SYNC Info 3500TDD SYNC Info 3700TDD SYNC Info Alarm Info Device Info

RF Info

Port	UL Input Power (dBm)	UL ATT (dB)	UL ALC Power (dBm)	UL RF Switch	DL RF Switch	DL Output Power (dBm)	DL ATT (dB)	DL ALC Power (dBm)	DL Rating Power (dBm)
700MHz-L	--	8	-59	ON	OFF	--	0	20	30
700MHz-U	--	7	-58	ON	OFF	--	--	--	--
850MHz	--	6	-57	ON	OFF	--	2	30	30
1900MHz	--	6	-56	ON	OFF	--	3	23	33
2100MHz	--	5	-53	ON	OFF	--	10	25	33
2600MHz	--	14	-52	ON	OFF	--	5	28	37
3500MHz	--	3	-51	ON	OFF	--	6	27	37
3700MHz	--	2	-50	ON	OFF	--	7	27	37

Save Cancel

MRU:

RF parameters include UL input power,UL ATT,UL ALC power,UL RF Switch, DL RF Switch,DL output power,DL ATT,DL ALC power, DL rating power;

- ① UL input power range: -45dBm to -90dBm;
- ② UL ATT/ DL ATT range: 0 to -15dB;
- ③ UL ALC power range: -50dBm to -60dBm;
- ④ DL output power range: ALC power to ALC-28dB;
- ⑤ DL ALC power range: rating power to rating-10dB.

MRUc:

RF parameters include UL input power,UL ATT, UL RF Switch, DL RF Switch,DL output power,DL ATT;

- ① UL input power range: -35dBm to -80dBm;
- ② UL ATT/ DL ATT range: 0 to -15dB;
- ③ DL output power range: -15 to 10dBm.

4.3.4.3. ALARM RELATED PARAMETERS

Comba

Home System Status Auto setup Consumer BDA Software Admin

MU 1
FOU 1
MRU 1
MRU 2
MRU 3

Part Number MRU-700851921-AC Software Version MRU5667M07R00.02.01

Serial Number FA14758963 Temperature(°C) 48

Device Name V00.00.00 Modify

SW Reset HW Reset DPD Reset

Optical Info RF Info 2500TDD SYNC Info 3500TDD SYNC Info 3700TDD SYNC Info Alarm Info Device Info

Default Configuration

Parameter	Enable/Disable	Alarm State	Severity Settings
Equipment Alarm	ON	Normal	Modify
Hardware Fault Alarm	ON	Normal	
Power Supply Alarm	ON	Normal	
FAN Alarm	ON	Normal	
Optical TX Alarm	ON	Normal	
LAN Alarm	ON	Normal	
PA alarm	ON	Normal	
Equipment abnormal Alarm	ON	Normal	
Fiber transmission Alarm	ON	Normal	
700MHz Band Abnormal Alarm	ON	Normal	
850MHz Band Abnormal Alarm	ON	Normal	
1900MHz Band Abnormal Alarm	ON	Normal	
2100MHz Band Abnormal Alarm	ON	Normal	
2600MHz Band Abnormal Alarm	ON	Normal	
3500MHz Band Abnormal Alarm	ON	Normal	
3700MHz Band Abnormal Alarm	OFF	Normal	

Each alarm can be enabled or disabled independently. The alarm level can be critical, major, or minor.

Alarm Configuration	
Parameter	
Equipment Alarm	Critical
Hardware Fault Alarm	Major
Power Supply Alarm	Minor

4.3.4.4. DEVICE INFORMATION

Device information includes the hardware ID and authorization information.

The screenshot shows the Comba web interface with the 'Device Info' tab selected. The table below lists the device parameters and their values:

Parameter	Value
Device ID	****
Authorization ID	Authorized
700MHz Authorization Status	Authorized
800MHz Authorization Status	Authorized
190MHz Authorization Status	Authorized
2100MHz Authorization Status	Authorized
2600MHz Authorization Status	Authorized
3500MHz Authorization Status	Authorized
3700MHz Authorization Status	Authorized

A red arrow points to the 'Modify' button next to the 'Authorization ID' field. A modal window is open, showing the 'Authorization ID' field with a text input and 'Yes'/'No' buttons.

4.3.4.5. DEVICE REST

Software rest: Only software reset, the signal is normal and the service is not affected. The duration is 1-2 minutes.

Hardware rest: Device power rest, the duration is 3-5 minutes;

DPD rest: PA DPD module reset and the signal is normal, the duration is 1-2 minutes.

The screenshot shows the Comba web interface with the 'Device Rest' tab selected. The table below lists the device parameters and their values:

Parameter	Value
Device ID	****
Authorization ID	Authorized
700MHz Authorization Status	Authorized
800MHz Authorization Status	Authorized
190MHz Authorization Status	Authorized
2100MHz Authorization Status	Authorized
2600MHz Authorization Status	Authorized
3500MHz Authorization Status	Authorized
3700MHz Authorization Status	Authorized

A red arrow points to the 'DPD Reset' button.

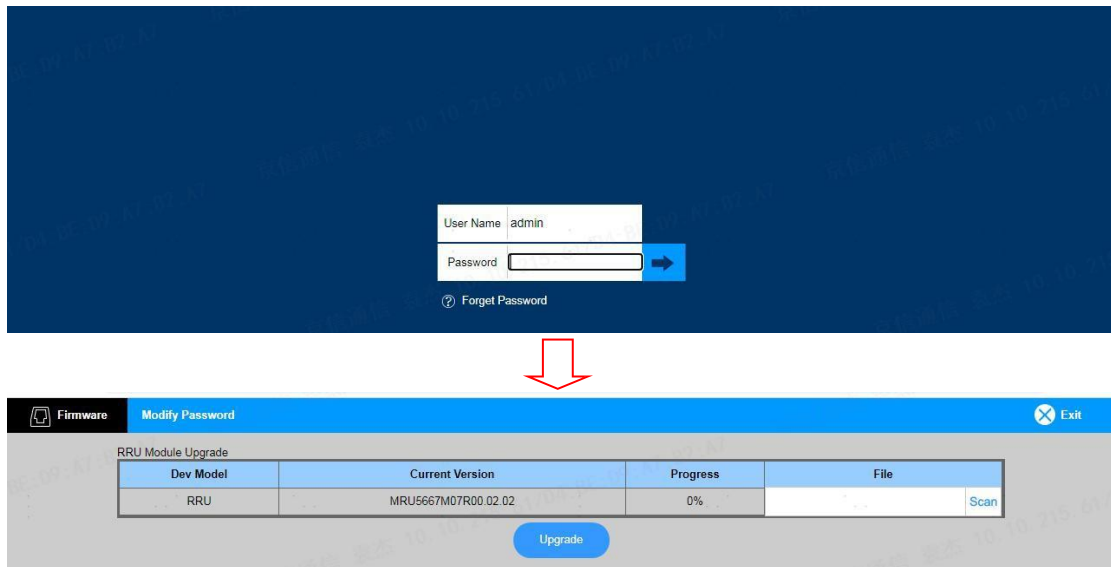
4.3.4.6. SOFTWARE UPGRADE

There are two ways to upgrade software, one is local upgrade, the other is through the MU upgrade.

- Upgrade by MU:



- Local upgrade



--End--