Comba

COMFLEX-6Q00 5W

COMFLEX SERIES DISTRIBUTED ANTENNA SYSTEM

USER MANUAL

COMFLEX-6Q00 5W QE 1-0-1

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文件历史记录

文件编号	*COMFLEX-6Q00 5W QE*		
文件标题	*COMFLEX SERIES DISTRIBUTED ANTENNA SYSTEM MANUAL*		
文件履历			
版本	编制	日期	更改内容（条款）
A	林怀佳	2018-06-21	首次发行

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DISTRIBUTED ANTENNA SYSTEM

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0.3 HISTORY

Change No.	ENU	Details of Change
1	1-0-0	Initial released in Jun 2018.
2	1-0-1	Deleted MIMO related description.

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0.4 GLOSSARY OF TERMS

ALC	Automatic Level Control
ATT	Attenuation
BDA	Bi-direction Amplifier
BS	Base Station
BTS	Base Transceiver Station
DL	Downlink
DT	Donor Terminal
FOU	Fiber Optical Unit
GUI	Graphic User Interface
ID	Identification
LNA	Low Noise Amplifier
MCU	Main Control Unit
MT	Mobile Terminal
MTBF	Mean Time Between Failures
MU	Master Unit
NC	Normally Closed
NF	Noise Figure
NO	Normally Open
OMC	Operation & Maintenance Center
OMT	Operation & Maintenance Terminal
OP	Optical Fiber
OPEX	OperatingExpense
PA	Power Amplifier
PIM	Passive Inter Modulation
PLL	Phase Locked Loop
POI	Point of Interconnects
PSU	Power Supply Unit
RF	Radio Frequency
RFU	Radio Frequency Unit
RU	Remote Unit
SMA	Sub-Miniature “A” Connector
TX/RX	Transmit/Receive
UL	Uplink
VAC	Volts Alternating Current
VSWR	Voltage Standing Wave Ratio
WCDMA	Wideband Code Division Multiple Access

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0.5 SAFETY NOTICES AND ADMONISHMENTS

This document contains safety notices in accordance with appropriate standards. In the interests of conformity with the territory standards for the country concerned, the equivalent territorial admonishments are also shown.

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.

Specific hazards are indicated by symbol labels on or near the affected parts of the equipment. The labels conform to international standards, are triangular in shape, and are coloured black on a yellow background. An informative text label may accompany the symbol label.

Hazard labeling is supplemented by safety notices in the appropriate equipment manual. These notices contain additional information on the nature of the hazard and may also specify precautions.

Warning:
These draw the attention of personnel to hazards that may cause death or injury to the operator or others. Examples of use are cases of high voltage, laser emission, toxic substances, point of high temperature, etc.

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 12.5 dBi.

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. 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.

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 94.562cm or more from all persons during normal operation and must not be co-located with any other antenna for meeting RF exposure requirements.

Alert:
These draw the attention of personnel to hazards that may cause damage to the equipment. An example of use is the case of static electricity hazard.

Caution notices may also be used in the handbook to draw attention to matters that do not constitute a risk of causing damage to the equipment but where there is a possibility of seriously impairing its performance, e.g. by mishandling or gross maladjustment. Warnings and Cautions within the main text do not incorporate labels and may be in shortened form.

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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.

End of Section

Copyright - refer to title page

1 GENERAL INFORMATION

The ComFlex-6Q00 Series Distributed Antenna System (hereinafter called “ComFlex”) consists of Master Unit (MU) and Remote Unit (RU). The MU includes the MU Chassis, Power Supply Unit (PSU), Fiber Optical Unit (FOU) and RF Unit (RFU). With a modular design, it can support up to 8 independent RF inputs and 8 Remote Units. The Remote Unit is designed with a compact and slim form factor for easy installation; it is an integrated design which supports 3 bands, including 600MHz, WCS and TDD 2500MHz bands.
The low signal transmission loss of optical fiber is applicable for long distance transmission. ComFlex can support the optical transmission of up to 6.5dBo optical loss, equivalent to 8 miles fiber length.

Main feature:

- Industry’s first DAS system with superior PIM performance 4.3-10 RF connectors
- Modular Master Unit supports flexible field upgrade and maintenance
- Independent gain control for each RF source
- High MTBF and low noise design with modular PSU and convection cooling
- RF module supports both simplex and duplex
- Compact, slim Remote Unit for OPEX saving
- Supports multi-operator and mixed mode applications
- Optical link auto gain control
- Web based GUI for intelligent commissioning and configuration

The figures below show the ComFlex Master and Remote unit enclosure.

Figure 1: Master Unit (MU)

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Figure 2: Remote Unit (RU)

End of Section

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2 EQUIPMENT DESCRIPTION

2.1 SYSTEM DIAGRAM

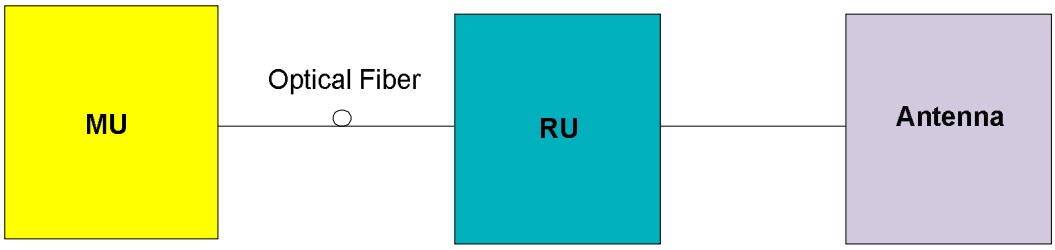

Figure 3: System Diagram

On the DL, signals from the BTSs or BDA are converted into optical signals after amplification in the MU.Then the optical signals are transmitted to the RU via optical fiber. The Optical TX/RX Module of RU converts the DL optical signals into RF signals. After amplification, the signals are transmitted at the MT port to the service antenna.

On the UL, the signals transmitted by the mobile are converted into optical signals, and then via the UL optical fiber, the signals are transmitted to MU, which then converts the optical signals back to RF signals.

2.2 TYPICAL APPLICATION

Shown below are the typical SISO applications of MU and RUs.

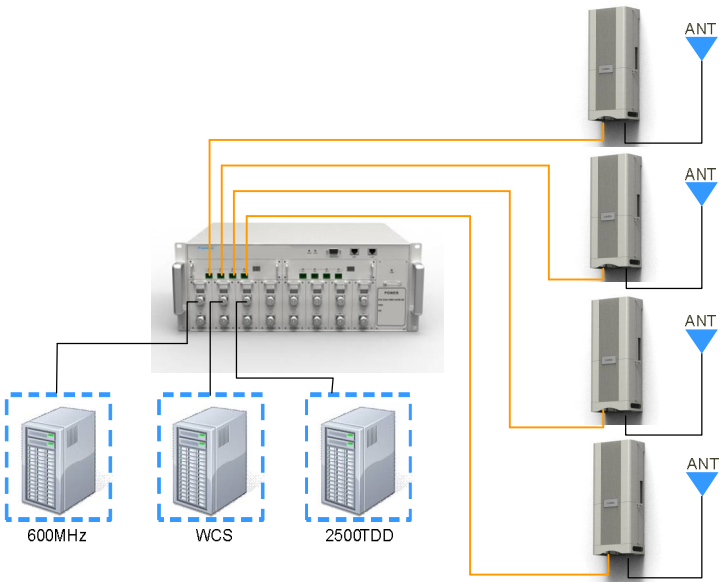

Figure 4: Typiccal SISO Application

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2.3 EQUIPMENT CONSTITUTION

MU consists of the following parts:

Table 1: MU Components

Module	Description
MU01-RACK	Master Unit Chassis includes eight slots for RF Unit, two slots for Fiber Optical Unit, and one slot for Power Supply Unit.
MU01-PSU	iDAS Master Unit Power Supply Unit (PSU) converts the input voltage into stable DC to supply power for other modules of Master Unit.
MU01-FOU	Master Unit Fiber Optical Unit (FOU) completes optical signal and RF signal conversion. One FOU has four optical ports, which means each FOU can support up to four RUs.
MU01-RFU	Master Unit RF Unit completes separation and combination of uplink and downlink signal with independent gain control, supports either simplex or duplex.

RU consists of the following parts:

Table 2: RU Components

Module	Description
MRU01-6Q00	Medium Power Remote Unit (5W); A compact and slim design which supports 3 bands, including 600MHz, WCS and TDD 2500MHz bands.
LRU01-PSU	Remote Unit Power Supply Unit (PSU) converts the input AC voltage into stable DC, to supply power for Remote Unit. It can be installed on RU or on wall beside RU.

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2.4 KIT OF PART

Table 3: Master Unit (MU) KOP

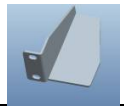
Item	Qty	Image
MU Chassis	1	
RF Unit (RFU)	1~8	
Fiber Optical Unit (FOU)	1~2	
Power Supply Unit (PSU)	1	
Power Supply Cable (13 Feet 1 inch)	1	
Communication Cable	1	
Right Angle Bracket (for MU 19“rack mounting)	1	
Left Angle Bracket (for MU 19“ rack mounting)	1	

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Table 4: Remote Unit (RU) KOP

Item	Qty	Image
Remote Unit	1	
RU Power Supply Unit (with1 foot 9 inches. DC cable and 13 feet 1 inch AC cable)	1	
Mounting Rack (for RU wall mounting)	1	
Masonry Bolt (set) M8x80 (for RU concrete wall mounting)	4	
Masonry Bolt (set) M8x80 (for PSU concrete wall mounting)	2	
Nuts M6x10, Spring Washers Φ6, Plain Washers Φ6 (for PSU mounting on RU)	2 pieces each	
Nuts M6x10, Spring Washers Φ6, Plain Washers Φ6 (for RU grounding)	4 pieces each	
GND Cable (for RU grounding)	2	

End of Section

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3 INSTALLATION

3.1 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.

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3.2 SITE PLANNING CONSIDERATIONS

3.2.1 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 RU is listed below:

- The distance between the service antenna of RU and coverage area should satisfy line of sight requirements for maximum coverage area.
- The maximum fiber length is 8 miles, with a maximum path loss of 6.5dBo.
- 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.

Powering

The power supply unit (PSU) provides power to all modules within the equipment. Depending on the product variant, it is recommended that the PSU operates on a dedicated AC circuit breaker or fused circuit.

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 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.

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Manual Handling

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

3.2.2 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.

3.3 INSTALLATION PROCEDURES

3.3.1 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.

3.3.2 TOOLS

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

3.3.3 PREPARATION

Optical Fiber:

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- 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")

3.3.4 MU ASSEMBLING

ComFlex Master Unit consists of 4 parts: Chassis, RFU, FOU and PSU. All the units are packed separately. Follow the steps below to assemble.

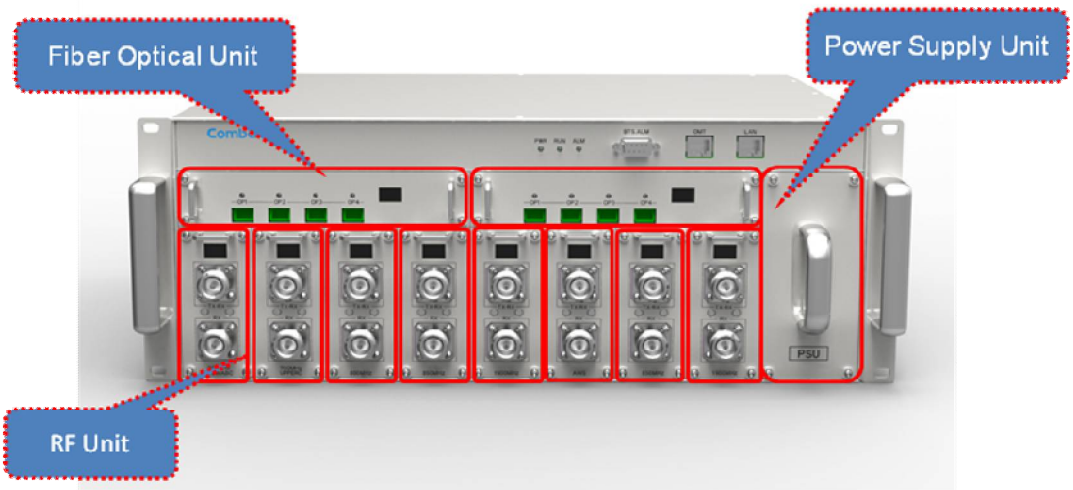

Figure 5: ComFlex Master Unit

Step1: RF Unit installation: Remove RFU slot cover plate on Chassis, insert RFU and fasten the screws. (Each Unit can be installed in any one of eight RFU slots)

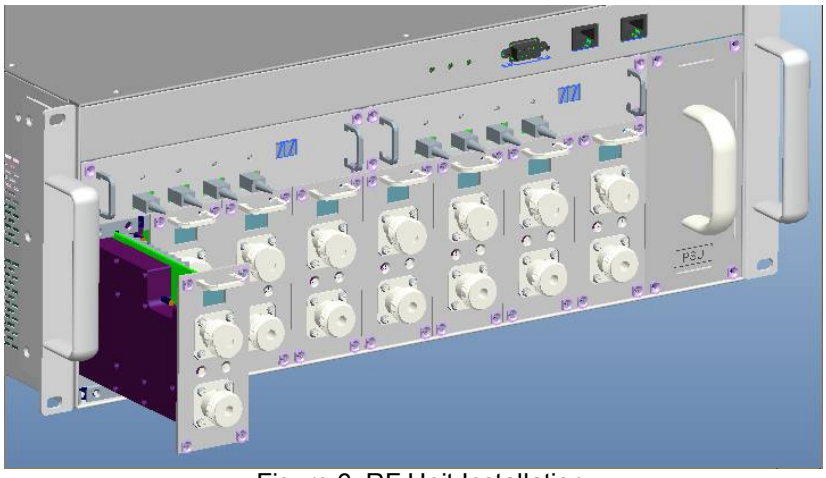

Figure 6: RF Unit Installation

Step2: FOU installation: Remove FOU slot cover plate on Chassis, insert FOU and fasten the screws. (Each Unit can be installed in either one of two FOU slots)

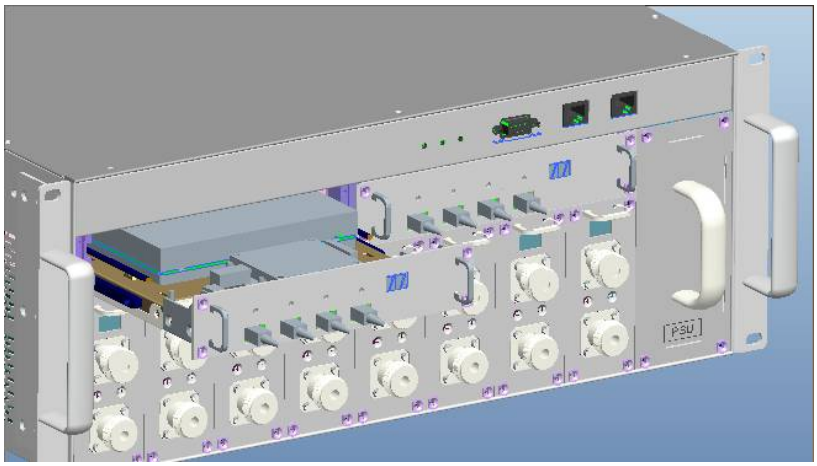

Figure 7: FOU Installation

Step3: PSU installation: Remove PSU slot cover plate on the right side of Chassis, insert PSU and fasten the screws.

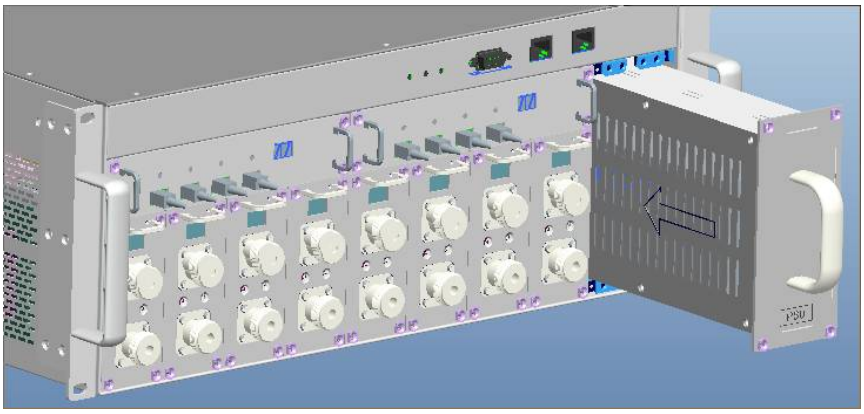

Figure 8: PSU Installation

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Step4: Backup PSU installation (Optional): 1) install 2 M4 x 10 bolt kits in the back of MU; 2) hang the backup PSU on the bolts, then use another 4 M4 x 10 bolts kits to fasten the PSU; 3) .Fix cable clip, connect output cable and ground cable to MU.

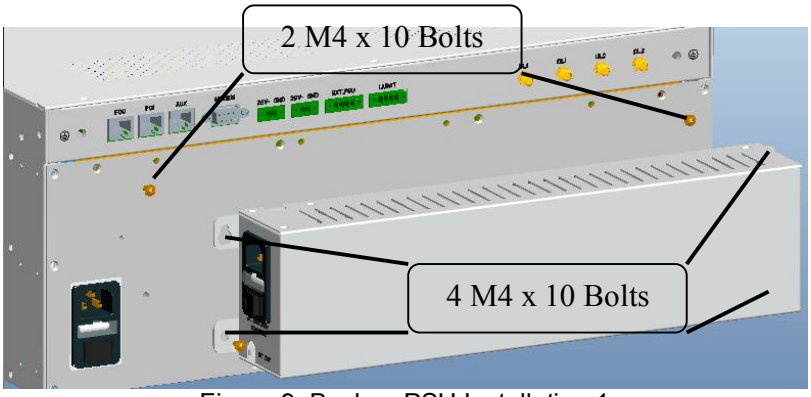

Figure 9: Backup PSU Installation 1

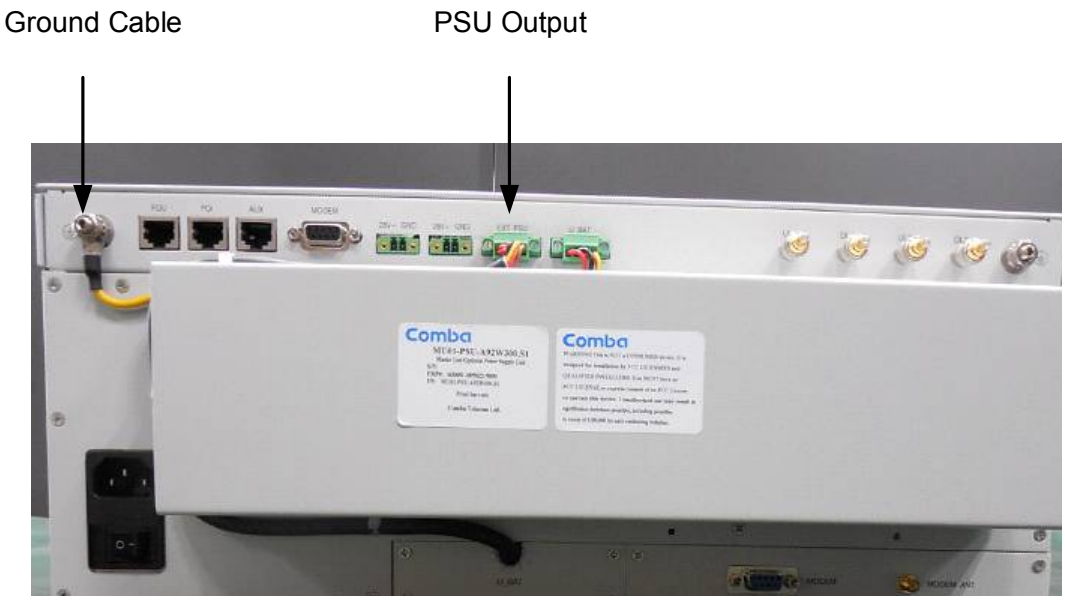

Figure 10: Backup PSU Installation 2

3.3.5 MU IN 19" RACK MOUNTING

MU is an indoor type device; the installation procedures are shown as below:

Step 1: Install right angle bracket and left angle bracket on back of the mounting rack. (Rack nuts and screws are not provided.) Use rack nuts and screws as recommended by rack manufacturer**.**

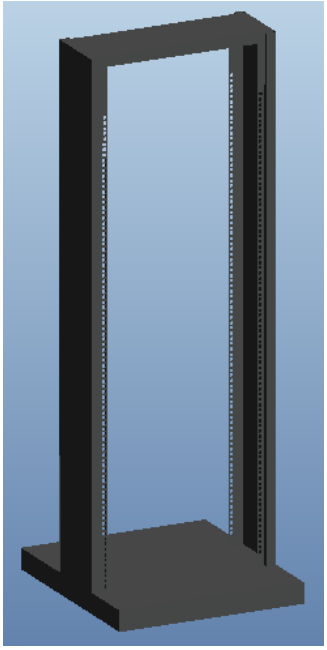

Figure 10: Mounting Rack

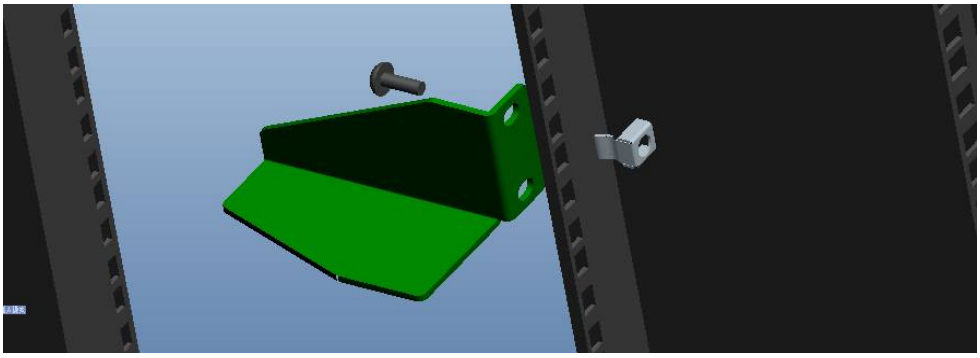

Figure 11: Angle Iron Installation

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Step2: Slide the MU on to the angle brackets and confirm it is level.

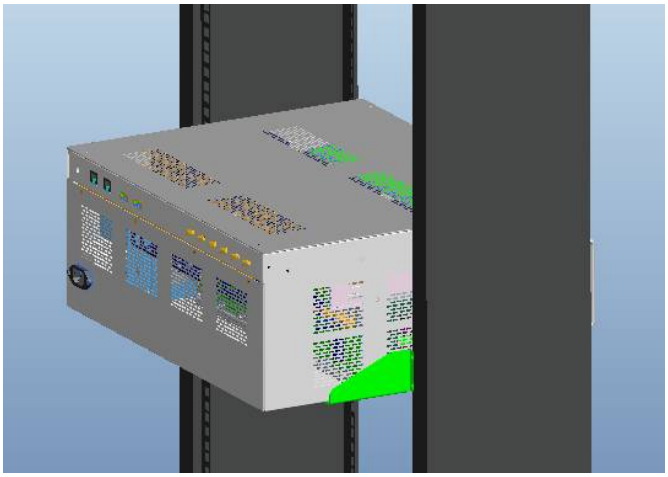

Figure 12: MU Installation

Step 3: Attach the MU onto the rack with the recommended rack screws.

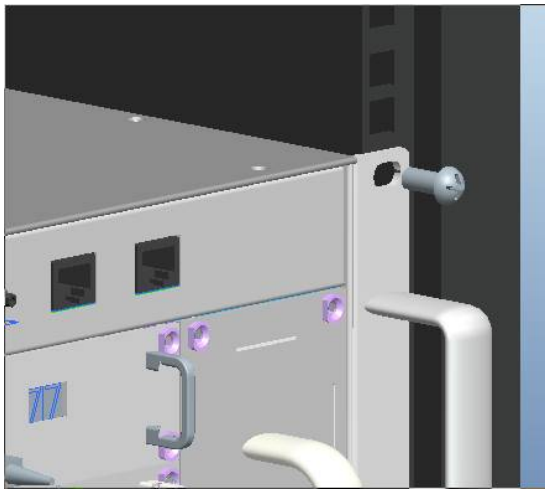

Figure 13: Secure the Enclosure

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Step 4: Finish installation.

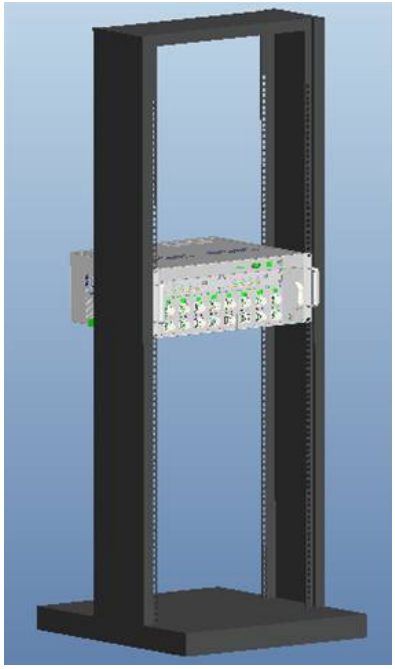


Figure 14: Finish Installaiton

3.3.6 RU WALL MOUNTING

RU wall mounting steps are shown below.

Step 1: Select the wall mount location according to the following criteria:

- General surroundings
- If mounting on dry wall, 0.75 In (min) plywood backboard is required to support the weight of the equipment.
- Ventilated and easy-to-reach area (for maintenance and on-site inspection)
- Proximity to DAS antenna in order to minimize cable loss

Step 2: Measure and mark the locations of 4 holes on the wall. Refer to below figure for the wall drilling dimensions of MRU. Use a Φ10 drill bit for masonry bolts.

Copyright - refer to title page

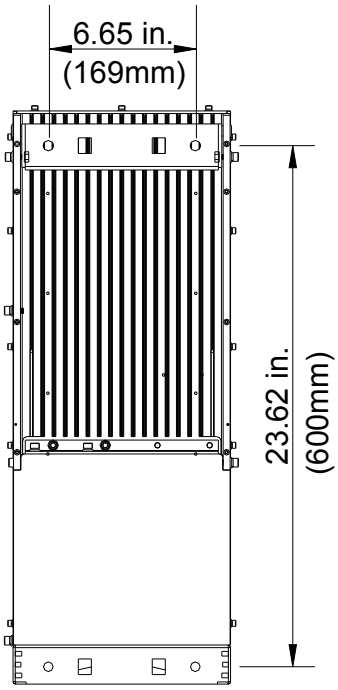


Figure 15: Wall Drilling Dimensions of MRU

Step 3: Attach the mounting rack on a wall. If a concrete wall, use the 2 M8×80 masonry bolts. (Bolts are provided; lag bolts or screws are not provided for plywood mounting)

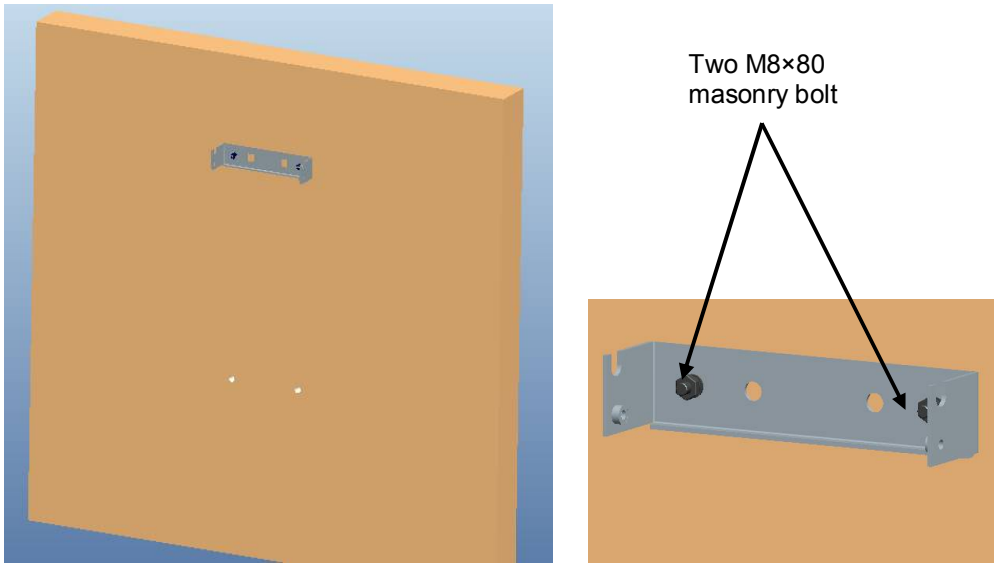


Figure 16: Install Mounting Rack on the Wall

Copyright - refer to title page

Step 4: Ensure the antenna and other connectors are facing down, hang RU onto semicircle slot of mounting rack.

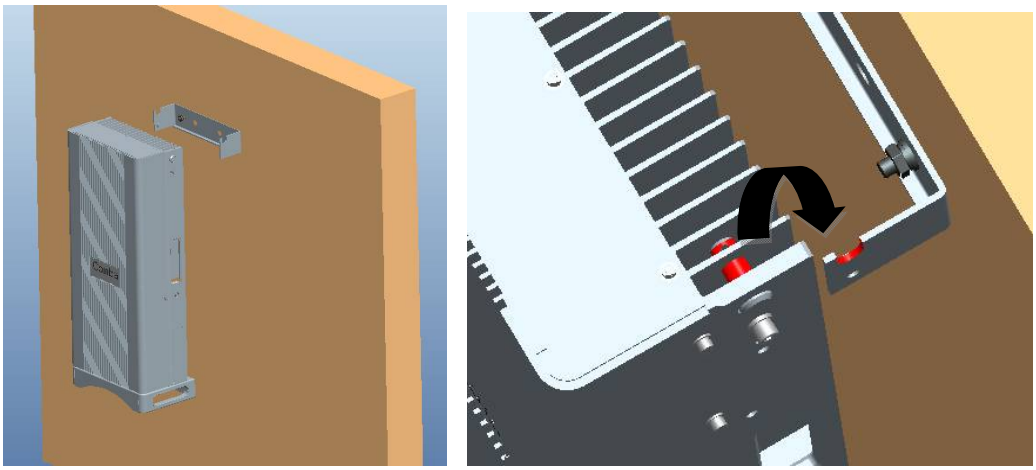


Figure 17: Hang RU onto the Mounting Rack

Step 5: Tighten the bottom two M8×80 masonry bolts on RU.

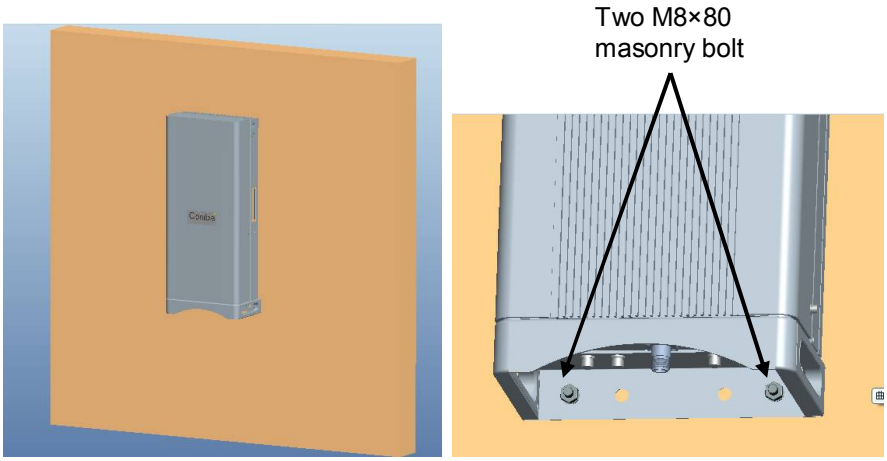


Figure 18: Tighten the Screws at the Bottom of RU

Copyright - refer to title page

Step 6: Tighten M6×20 hexagon screws on the left and right sides of RU to fasten it with mounting rack.

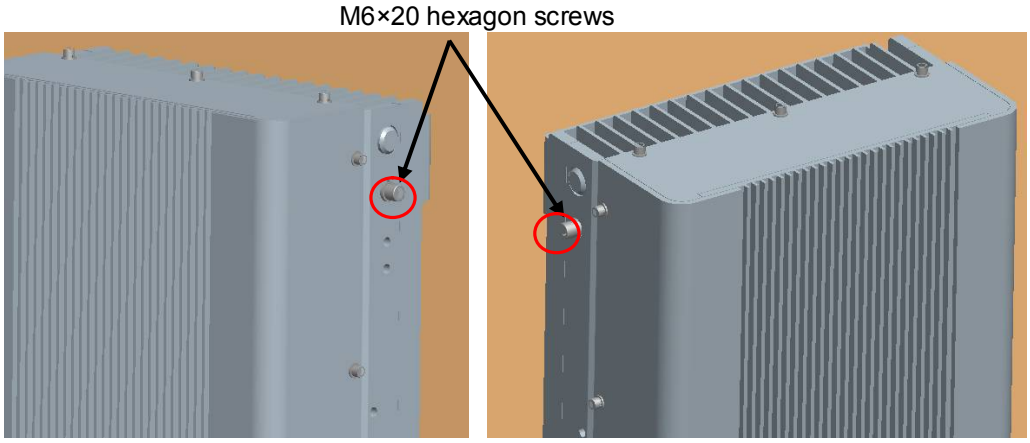


Figure 19: Tighten Two Hexagon Screws

3.3.7 PSU INSTALLATION

RU Power Supply Unit should be installed after the RU is mounted. RU Power Supply Unit can be installed in two ways – attached to RU or mounted on wall.

PSU attached to RU

Attach the PSU on the right of the RU with two M6×10 hexagon screws (screws are provided).

Figure 20: Install PSU on RU

Copyright - refer to title page

PSU mounted on wall

Step 1: Measure and mark the locations of 2 holes on the wall close to RU. Use Φ10 drill head.
(**NOTE: DC cable is 1 foot 9 inches; AC cable is 13 feet 1 inch**)

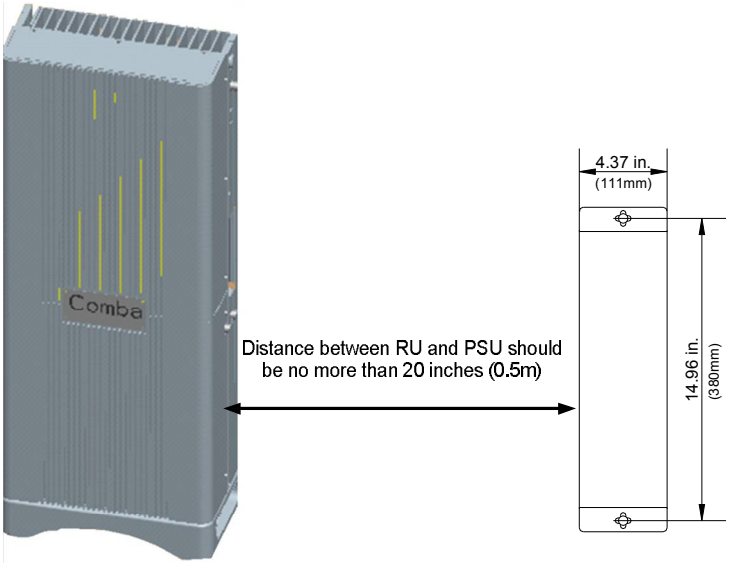


Figure 21: Wall Drilling Dimensions of PSU

Step 2: Attach the PSU on the wall with two M8×80 hexagon screws (Screws are provided)

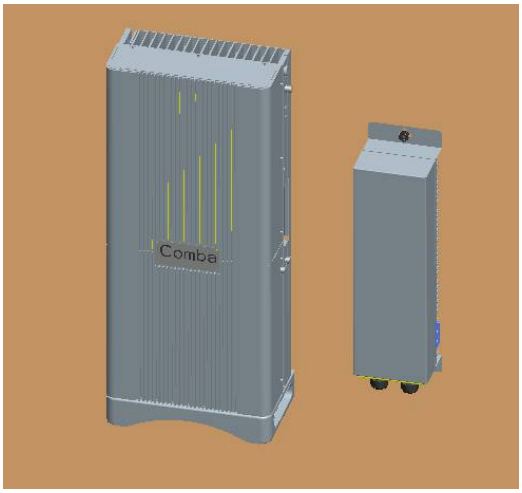


Figure 22: Install PSU on the Wall

3.3.8 DRIP-LOOP

Comba recommends that every horizontal cable entry to the equipment forms a 'U' before it's entry to the equipment. Any accumulated water on the cable will drip down at the bottom of the loop and will not climb up to the equipment.

Copyright - refer to title page

3.4 EQUIPMENT CONNECTORS

The figures below present the connectors of ComFlex MU.

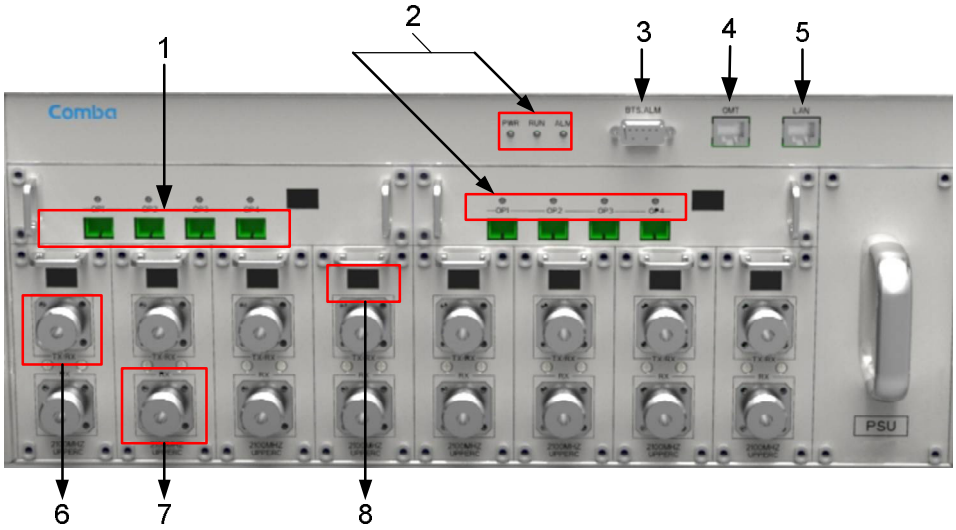


Figure 23: MU Front Panel Connectors

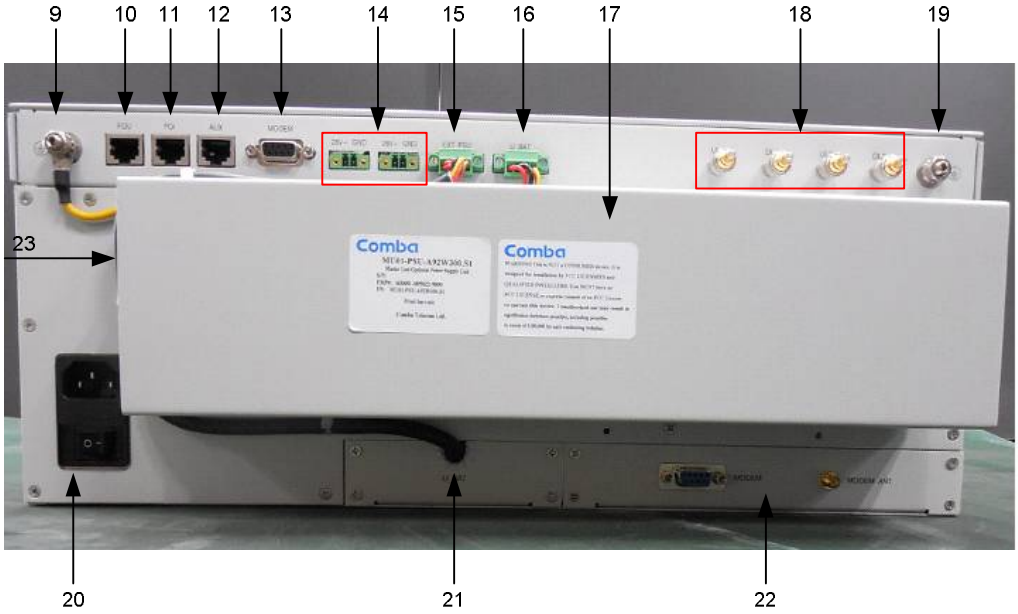


Figure 24: MU Rear Panel Connectors

Copyright - refer to title page

Table 5: MU Connections

Identifier	Functional Description
1. OP1~OP4	SC/APC optical fiber access port
2. LED indicator	LED indicator. See Chapter 4 for the description of each indicator.
3. BTS_ALM	DB9-F connector for BTS alarm.
4. OMT	RJ45 connector connects PC with equipment for local and remote monitoring.
5. LAN	Reserved RJ45 port for remote monitoring.
6. TX/RX	RF access port, 4.3-10 connectors.
7. RX	RF access port, 4.3-10 connectors.
8. 88	Digital display tube. See chapter 4 for the detailed description.
9. ⏚	Grounding connector.
10. FOU	Expansion FOU communication connector
11. POI	POI communication connector
12. AUX	Expansion unit communication connector
13. MODEM	Optional modem unit communication connector
14. 28V+ GND	Expansion FOU and RFU external power supply
15. EXT_PSU	Redundant PSU power supply connector
16. LI_BAT	Optional Li-Battery unit power supply connector
17. /	
18. UL1,DL1; UL2,DL2	Reserved for RF interface of extended FOU
19. ⏚	Grounding connector for rack
20. Power Supply	Main PSU AC/DC output port
21. LI_BAT	Power supply connector of optional Li-Battery unit
22. MODEM/MODEM ANT	Communication connector / Antenna port of optional moedem unit
23. AC100~240V 50Hz/60Hz	Redundant PSU AC/DC output port

*4.3-10 Female Dimension is shown in figure below.

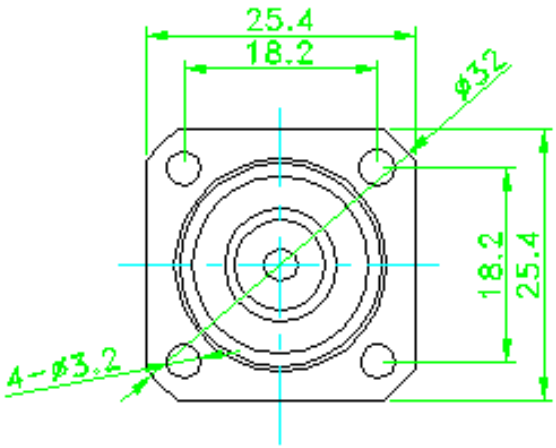


Figure 25: 4.3-10 Female Dimension

Copyright - refer to title page

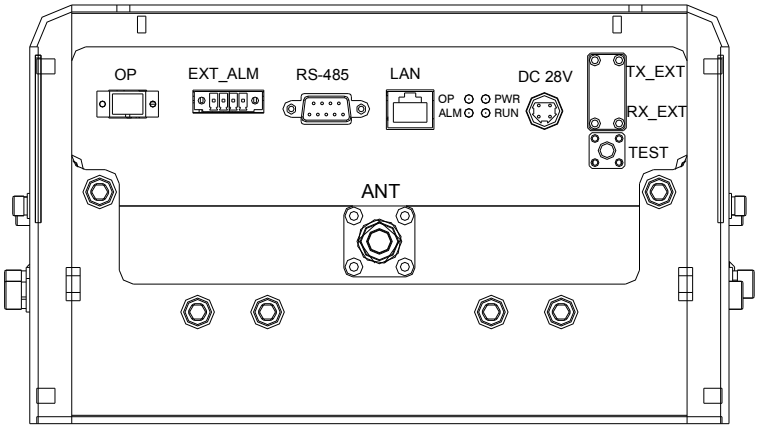


Figure 26: RU Connectors

Table 6: RU Connections

Identifier	Functional Description
ANT	4.3-10 connector, antenna system connection port
OP	SC/APC optical fiber access port
EXT_ALM	External alarm port. It provides an alarm report interface for other devices to report their alarms to CMS.
RS-485	Reserved.
LAN	Reserved.
DC28V	Power supply interface, conntects with Power Supply Unit.
TEST	QMA female connector, downlink output power test port.

Copyright - refer to title page

3.5 EQUIPMENT CONNECTION

3.5.1 GROUNDING CONNECTION

⚠WARNING!
This unit must always be grounded. Consult an appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.
Do not connect power before grounding.

3.5.2 MU GROUNDING CONNECTION

Step 1: Connect the GND cable to the GND connector and the building EARTH. Recommended GND cable size is # 12 AWG.

Step 2: Ensure the GND cable is connected to building GND.

Figure 27: MU Grounding (MU Rear Panel)

3.5.3 RU GROUNDING CONNECTION

Step 1: Connect one side of the supplied copper wire GND cable to right side of RU with two M6×10 hexagon Screws (screws are provided). Connect the other side of the supplied copper wire GND cable to the building EARTH with two M6 screws (screws are not provided).

Step 2: Connect one side of the supplied copper wire GND cable to RU with two M6×10 hexagon Screws (screws are provided). Connect the other side of the supplied copper wire GND cable to the building EARTH with two M6 screws (screws are not provided).

Note: There are two GND ports on both sides of PSU, users can use one of them according to real situation.

Step 3: Ensure all GND cables are well grounded to building GND.

Copyright - refer to title page

Figure 28: RU Grounding

3.5.4 MU CONNECTIONS

Step1: Connect the MU OP (optical) port to one of the RU OP port. (NOTE: requires Single Mode fiber with SC/APC connectors; MAXIMUM OPTICAL LOSS = 6.5dBo)

Step 2: For duplex application, connect the MU RFU TX/RX port to the RF Source (BTS or BDA) using 50Ohm coaxial cable. For simplex application, connect the MU RFU TX/RX port to the RF Source downlink, and then connect MU RFU RX port with RF Source uplink. (NOTE: Coaxial cable must be mini-DIN Male on the MU side)

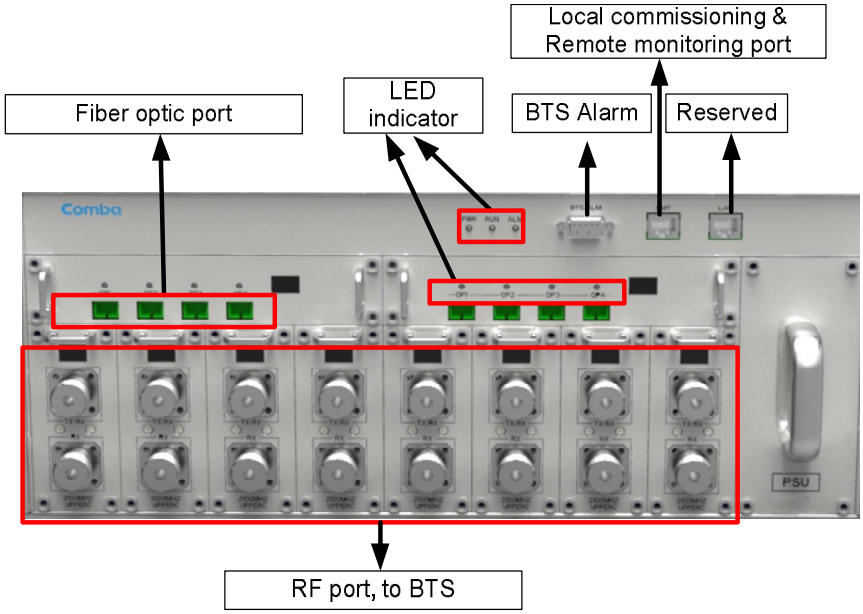


Figure 29: Fiber Optical and RF Port Connection

Step 3: Connect the power cable to the power supply port (100-240VAC, 1Amp maximum).

Figure 30: MU Power Connection (Rear Panel)

3.5.5 RU CONNECTION

Step 1: Connect the RU OP (optic) port to one of the OP port located on MU FOU front panel.

Step 2: Connect ANT port to a broadband antenna using 50Ohm coaxial cabel. Note: coaxial cable must be mini-Din male on the RU side, antenna shoule be 50Ohm.

Step 3: Connect DC 28V port to RU Power Supply Unit DC 28V port.

Step 4: Connect power cable on PSU with the public power grid (110~220VAC, 6A maximum).

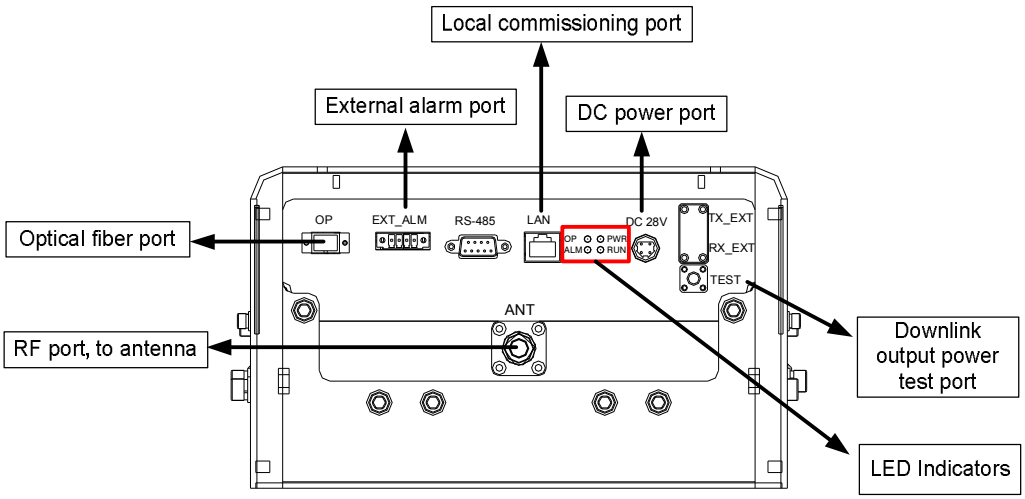


Figure 31: RU Fiber Optical and RF Port Connection

Copyright - refer to title page

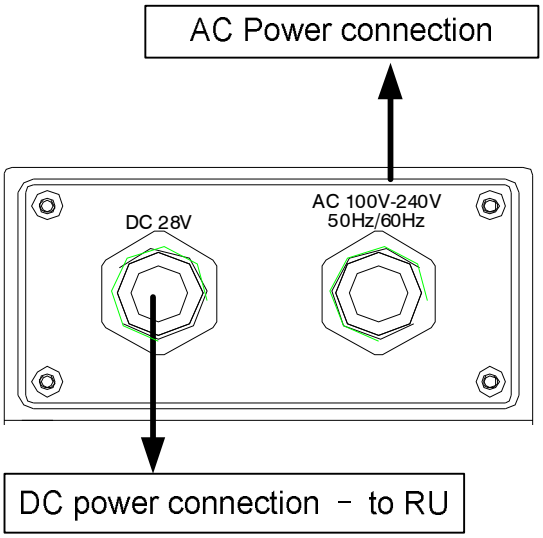


Figure 32: PSU Power Port Connection

3.5.6 RU EXTERNAL ALARM CONNECTION

For RU, this is a 4-pin connector. The following figure and table show the pin allocation and definition. Pin numbering are shown looking-into the connector on the enclosure.

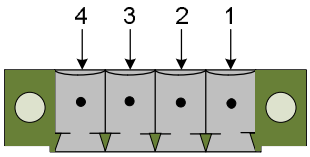


Figure 33: Pins Allocation for “EXT_ALM” Port for RU

Table 7: Pin Definition of “EXT_ALM” Port for RU

Pin number	1	2	3	4
Alarm definition	EXT. Alarm 1	GND	EXT. Alarm 2	GND

Note: Users need to configure Ext Alm 1~2 on WEB GUI to realize External Alarm (Refer to Chapter 5).

3.5.7 MU BTS ALARM CONNECTION

The equipment alarms can be signaled to the BTS via voltage-free relay contacts. The voltage-free relay connections are connected to the DB-9 port “BTS_ALAM” located on the MU. The following figure and table show the pin allocation and definition.

 Copyright - refer to title page

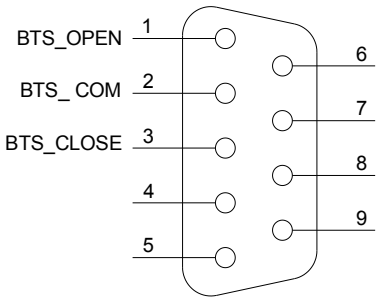


Figure 34: Pins Allocation for “BTS_ALM” Port

Table 8: Pin Definition of “BTS_ALM” Port

Pin Number	Definition	Description
1	BTS_OPEN	Connects to the open terminal of the voltage free relay.
2	BTS_COM	Connects to the common terminal of the voltage free relay.
3	BTS_CLOSE	Connects to the close terminal of the voltage free relay.
4 ~ 9	NC	Reserved.

3.5.8 CONNECT TO PC

The local commissioning and management for MU and RU is achieved through connecting to the WEB base GUI.

Connect MU to PC

Connect MU “OMT” port (RJ45) to the RJ45 port of PC with supplied Ethernet cable to achieve local monitoring and management.

End of Section

4 COMMISSIONING

4.1 PRE-COMMISSIONING TASKS

After equipment installation, perform the following steps before equipment powering and commissioning, check that the expected voltage, current, and power levels do not violate any ratings. Double check all connections including ground before applying power. Do not manipulate circuits or make changes when power is applied:

- Visually inspect the power connection within the equipment. Ensure that all cables are correctly and securely connected, including power cables, grounding wires, RF cables and optical cables.
- Check grounding connection and verify that the ground resistance is less than 5Ω.
- Connect the equipment to the PC.
- Power on MU and RU.
- Monitor the initialization of the MU and RU though the LEDs on the panel. Refer to detailed LEDs information in the next section.

 Copyright - refer to title page

4.2 LED INDICATORS

Diagnostic LEDs are located on the MU front panel and RU bottom panel; each indicates the status of a particular function:

Table 9: MU LED Indications

LED Indicator	Normal Status	Indication
PWR	Steady green	Power indicator. If LED is off, it indicates the system has no power.
RUN	Flashing green (1 time/sec)	MU operation indicator. After initialization (1~2 minutes), the LED should flash at once per sec. (When upgrade firmware, LED will flash rapidly)
ALM	OFF	Alarm indicator. If LED is RED, there is an alarm.
OP	Steady green	Located on Fiber Optical Unit (FOU), it is an indicator for receive optical power. If LED is off, it indicates the receiving optical power is less than -10dBm.

Table 10: RU LED Indications

LED Indicator	Normal Status	Indication
PWR	Steady green	Power indicator. If LED is off, it indicates the system has no power.
RUN	Flashing green (1 time/sec)	RU operation indicator. After initialization (1~2 minutes), the LED will flash once per sec. (When upgrade firmware, LED will flash rapidly)
ALM	OFF	Alarm indicator. If LED is RED, there is an alarm.
OP	Steady green	Located on Fiber Optical Unit (FOU), it is an indicator of Receiving optical power. If LED is off, it indicates the receiving optical power is less than -10dBm.

4.3 DIGITAL DISPLAY INDICATORS

4.3.1 DIGITAL DISPLAY ON RFU

The digital display tube on RFU shows the DL input power. The range of DL input power shown on the display tube is from -19 to 33 (dBm), when DL input power is lower than -19dBm, it will show L, when DL input power is higher than 33, it will display H.

Figure 35: RFU Digital Display

Copyright - refer to title page

Table 11: RFU Digital Display

Figure	DL Input Power Level
L	< -19dBm
-19~33	-19~33dBm
H	> 33dBm

4.3.2 DIGITAL DISPLAY ON FOU

The digital display tube on optical module has two digits.

The first digit will display A, b, C and d which presents the No. of optical port. Refer to below figure for the relationship.

The second digit will display the optical loss of each port. See the following table for the relationship of figure and optical loss.

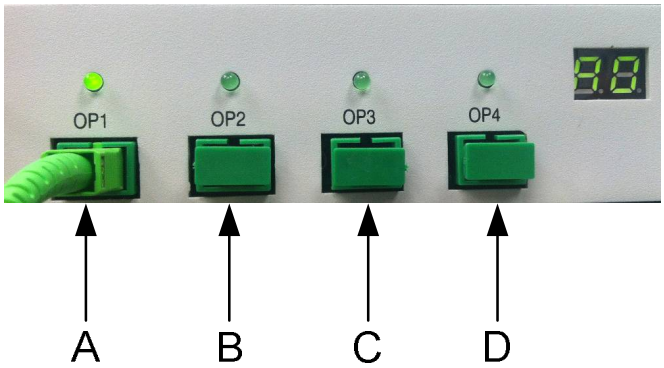


Figure 36: Optical Port No. and Digital Display

Table 12: FOU Digital Display

Figure	Optical Loss
0~9	0~9dBo
H	> 9dBo

End of Section

Copyright - refer to title page

5 WEB GUI

ComFlex can be monitored and controlled by WEB GUI, follow below contents to achive system parameter setting and commissioning.

5.1 WEB GUI CONNECTION

Step 1: Connect MU OMT port to PC RJ45 port with the supplied Ethernet cable to set up a physical connection.

Step 2: Go to laptop Control Panel\Network and Internet\Local Area Connection. Right click it and click Properties. Then follow the steps shown in figure below.

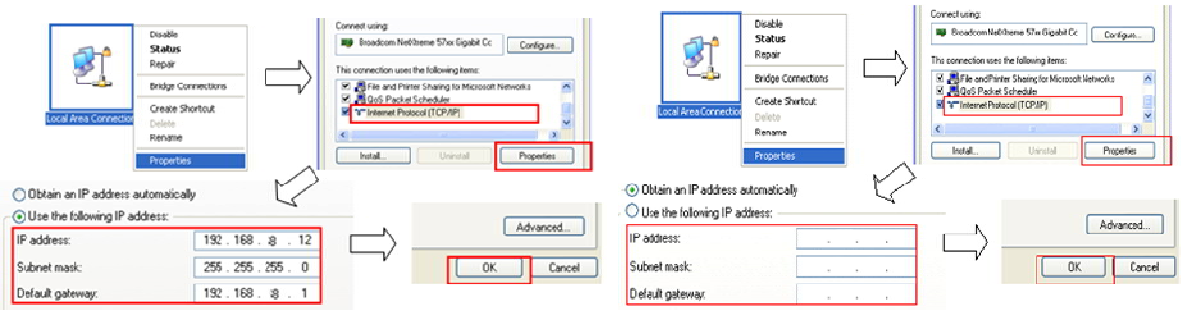


Figure 37: PC IP Address Setting

Step 3: Open browser (browser IE7.0, IE8.0, Chrome or Firefox, suggest disply resolution is 1024×768), input Web GUI **IP address: 192.168.8.101**, click [Enter].

Figure 38: Input IP Address

Step 4: Input **User Name: admin; Password** (default password: **admin**). Click [Log in].

Figure 39: Input User Name and Password

5.2 WEB GUI INTRODUCTION

After login, the Web GUI main screen will appear.

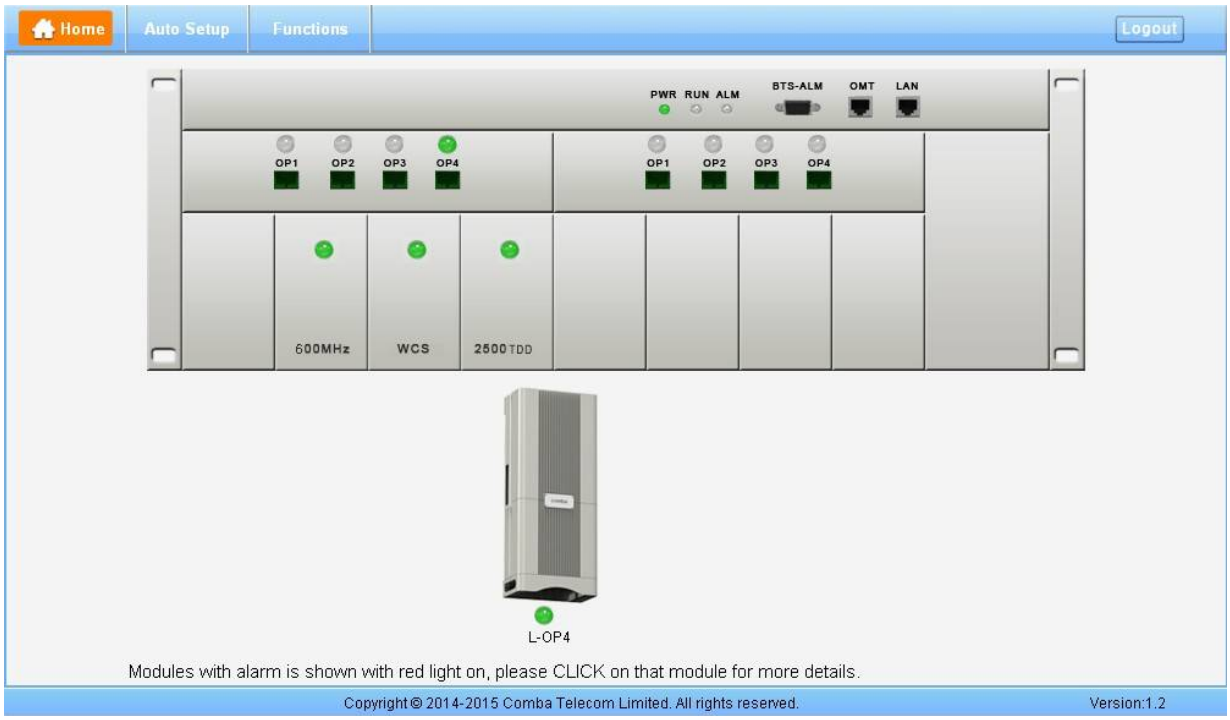


Figure 40: Web GUI Main Screen

On Comba Web GUI Home page, there are three Menu bars: ***[Home], [Auto Setup] and [Function].***

5.2.1 [HOME]

The [Home] page shows the actual connection diagram of MU and RU.

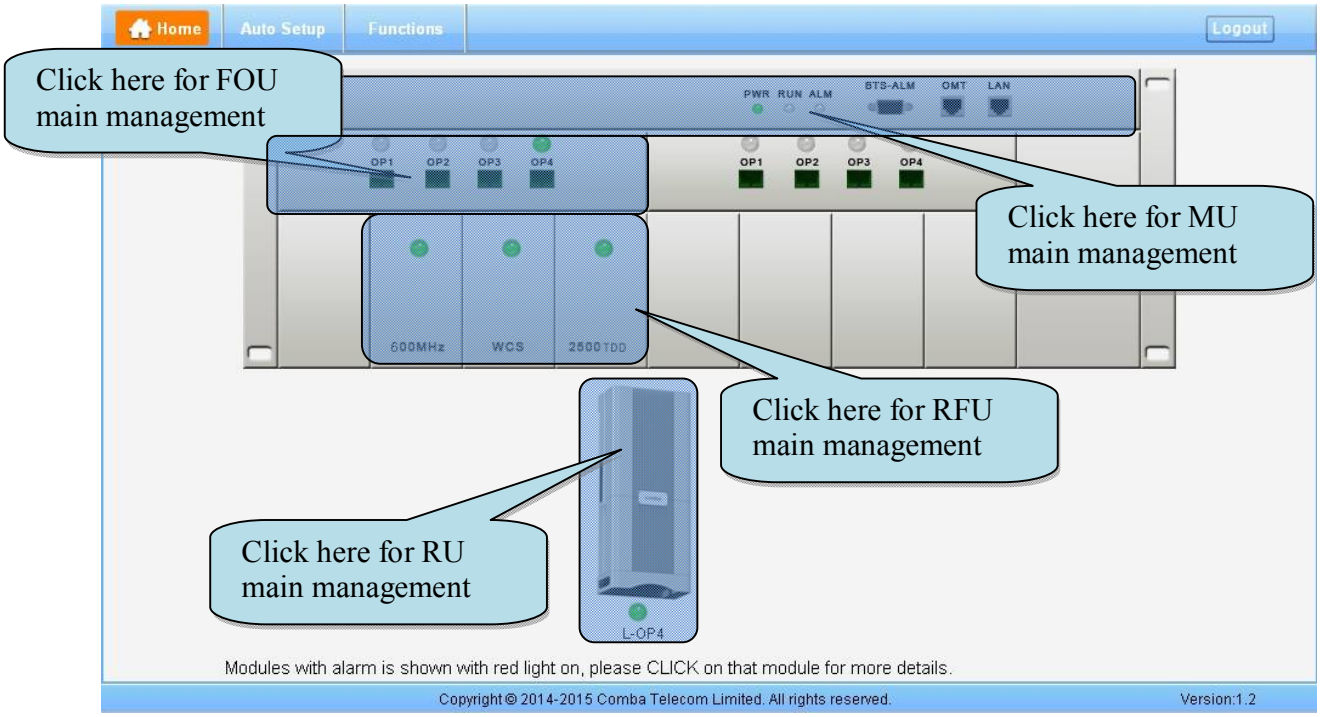


Figure 41: [Devices] Sceen

MU Main Management Screen

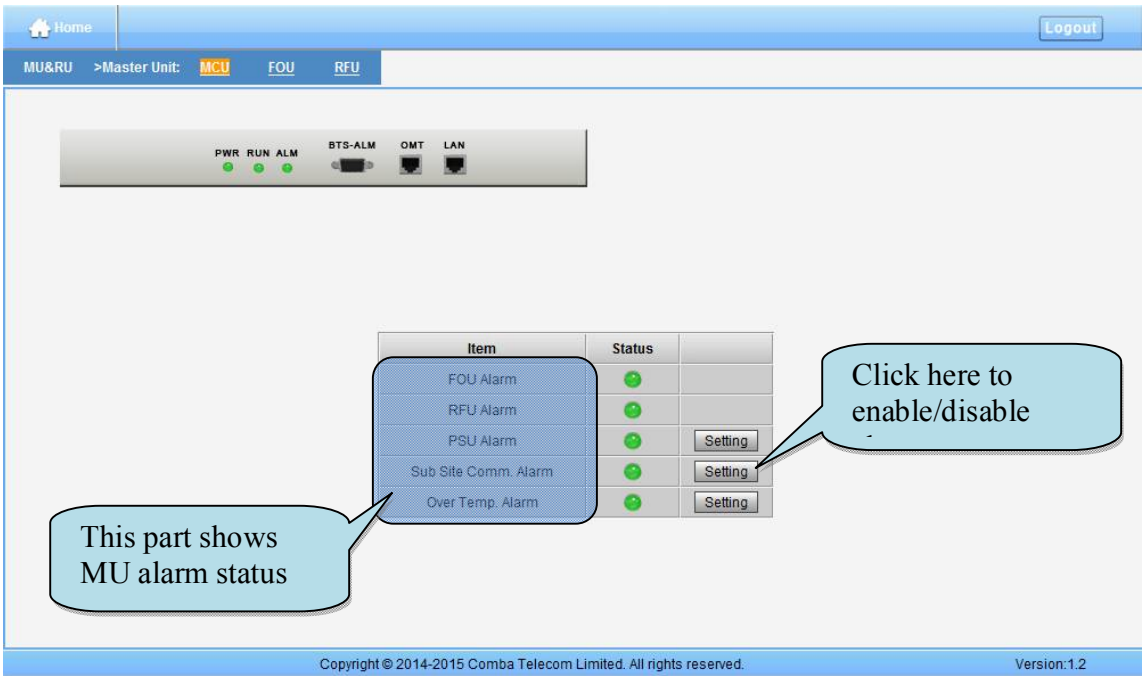


Figure 42: MU Device - Monitoring Unit

Optical Unit Management Screen

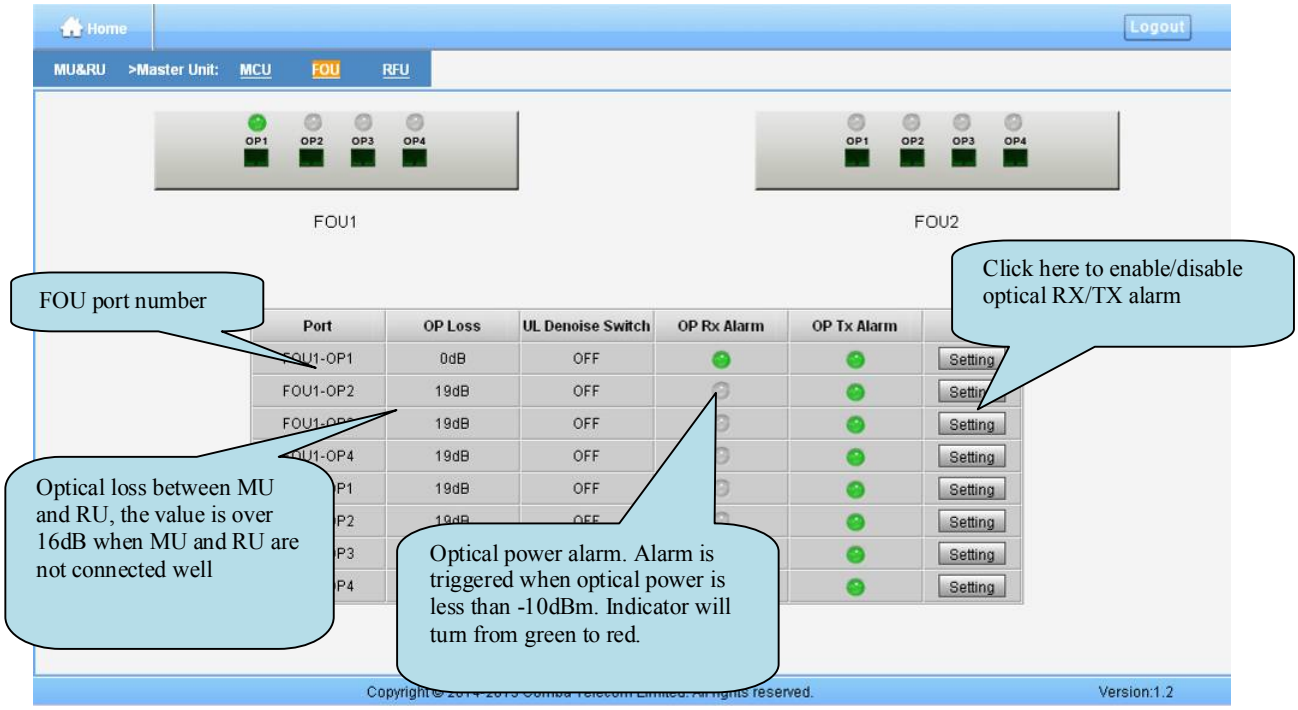


Figure 43: MU Device - Optical Unit

Note: MU transmit optical power is -4~-2dBm.

RF Unit Management Screen

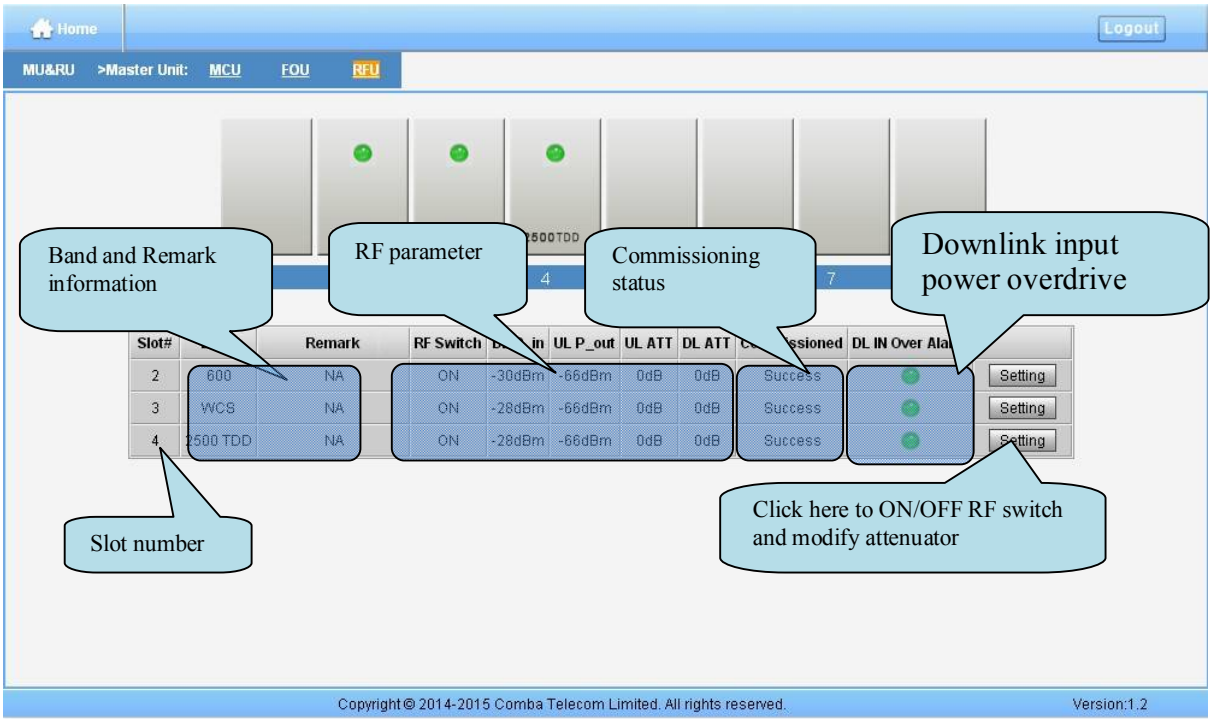


Figure 44: MU Device - RF Unit

Remote Unit Management Screen

Click RU photo, users can visit RU directly. Make sure two steps are done before visit RU:

- RU and MU are connected by optical fiber.
- RU device scanning is done. Note: Go to [Commissioning] page or [Management] page for device scanning.

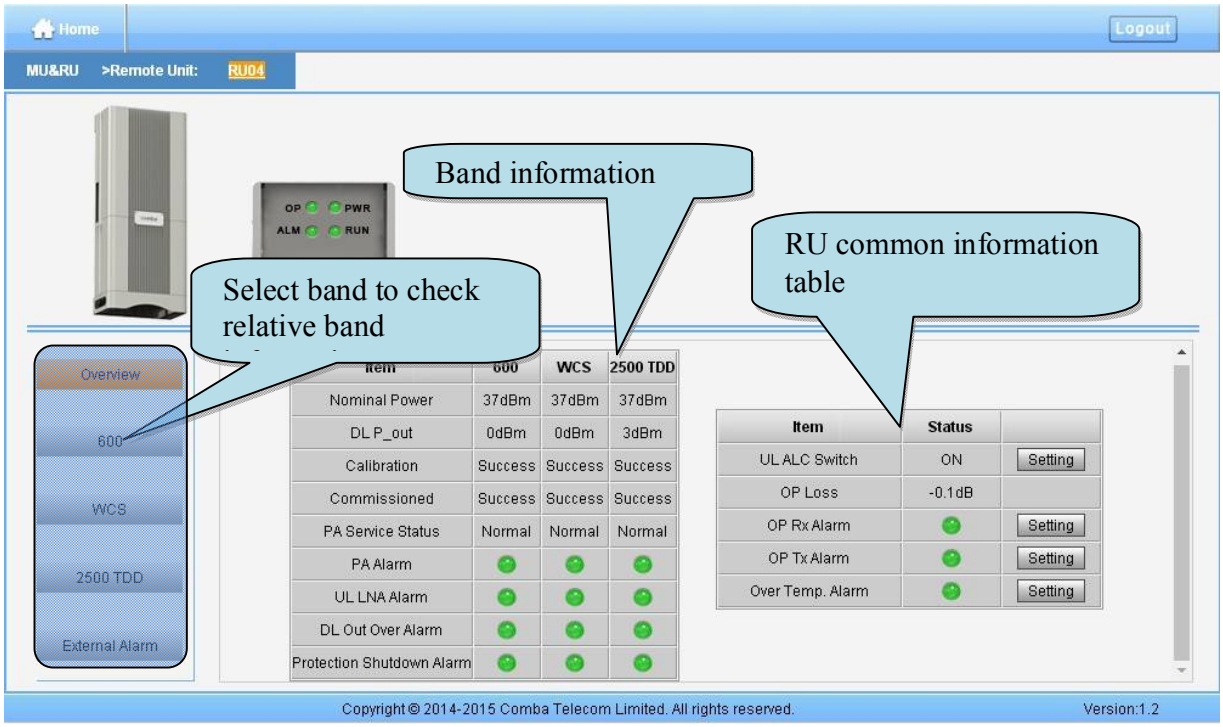


Figure 45: RU Device

NOTE: There are three statuses for PA Service: ***Normal***, ***Recovery*** and ***Shutdown***. If PA output power or reflected power exceeds the threshold (39dBm for MRU), software will trigger Recovery:

- It will reset PA and then re-detect the PA output power and reflected power, if they are normal, the PA Service Status will turn to ***Normal***, if PA output power or reflected power is still over the threshold, PA Service Status will turn to ***Recovery*** again.
- If PA output power or reflected power is still over the threshold after six times of PA Recovery, PA Service status will be ***Shutdown*** which will need to be reset manually. Reset at Management > PA Reset.

Click on a specific band on the left side of RU Device page, the corresponding band information will show.

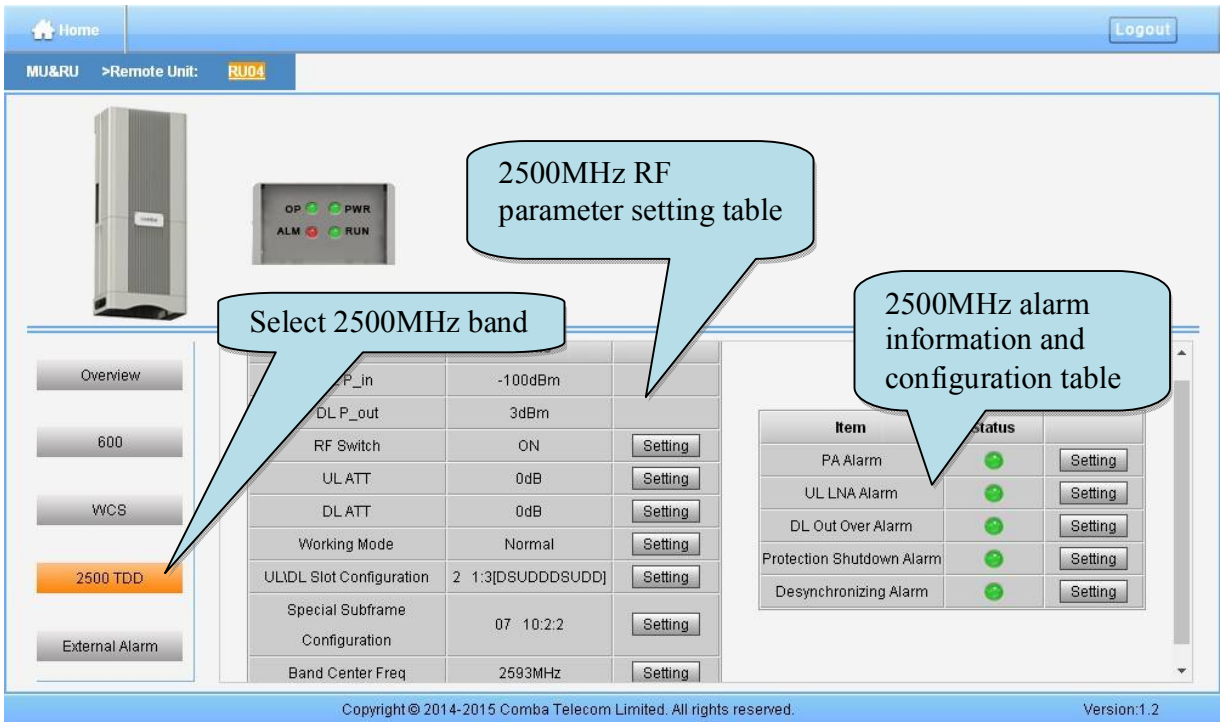


Figure 46: RU Device – 2500MHz

5.2.2 [AUTO SETUP]

A work flow of the commissioning process is shown on [Auto Setup] page. Click the [Start] button, the software will guide you through the commissioning step by step. For details, please refer to chapter 5.3.

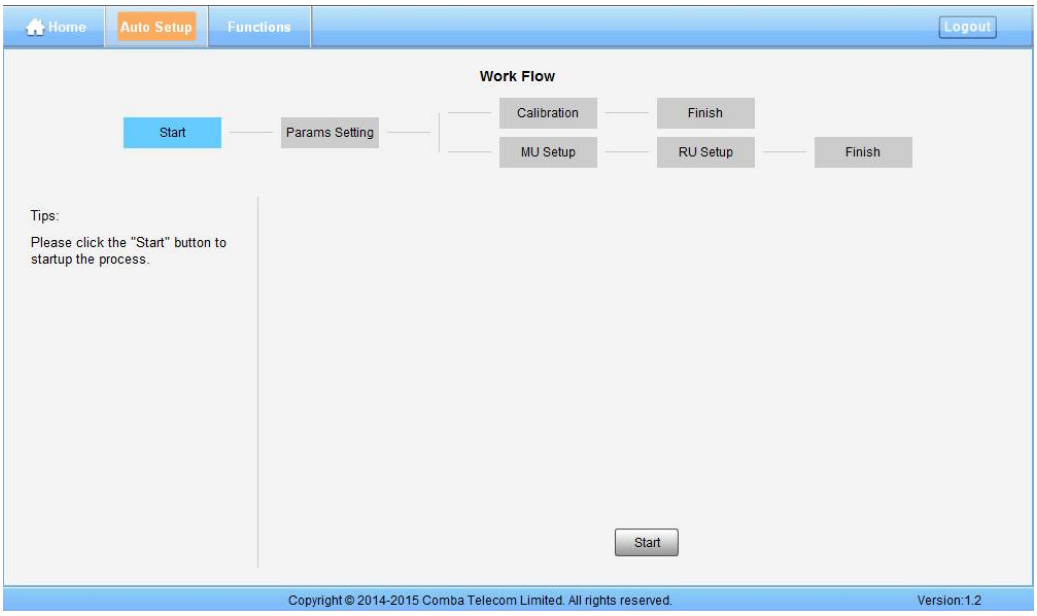


Figure 47: [Auto Setup] Screen

5.2.3 [FUNCTION]

Other parameters can be configured on [Function] page.

There are fifteen function bars list in the left side of the [Mangement] page. Below figures are the introduction of each function bar.

➢ **Devic Info.**

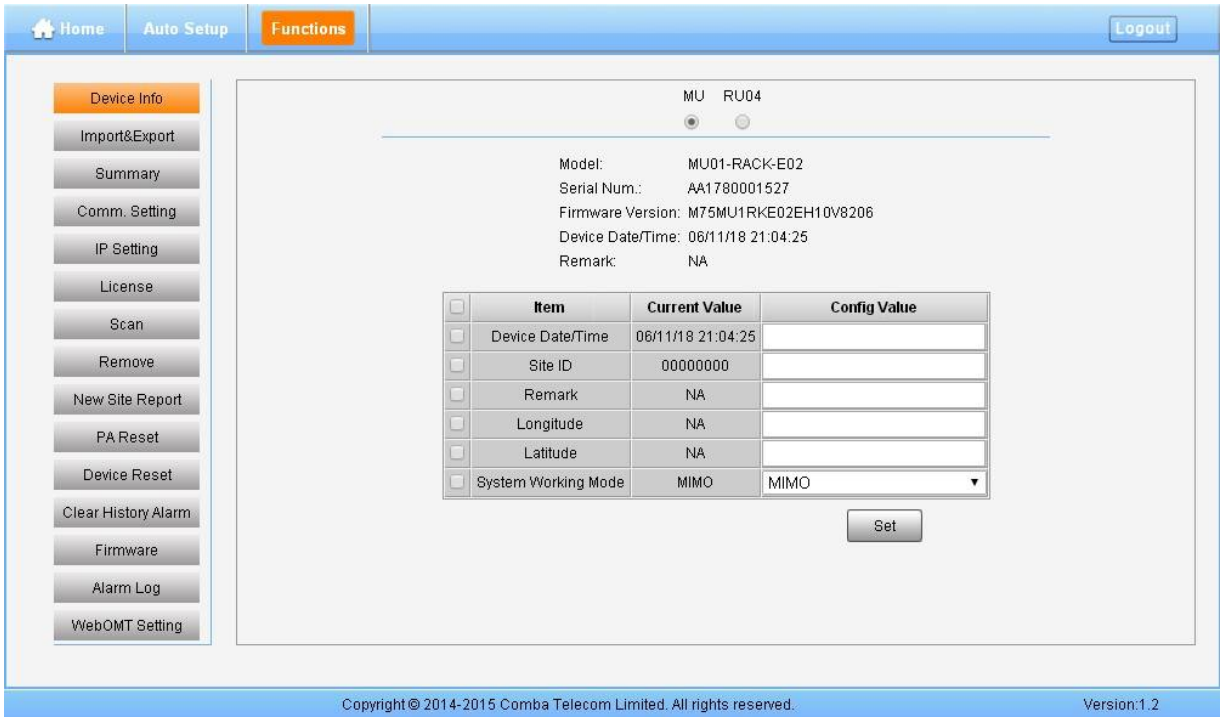


Figure 48: Function - Device Info.

Note: Users can input maximum 30 bytes characters in Device Info.

➢ Import&Export

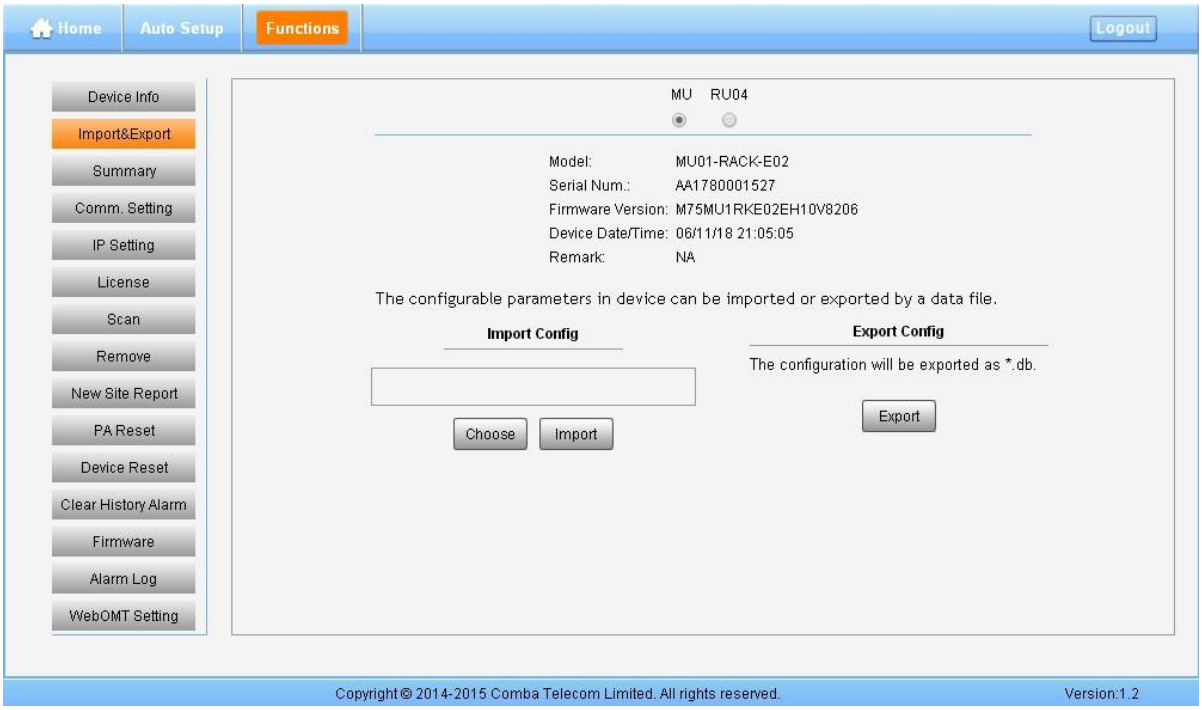


Figure 49: Function - Import&Export

Below table list the parameters that can be import/export:

Table 13: Import/Export Parameters

Device	Paremeter	Device	Parameter
MU	Alarm Enable	RU	Alarm Enable
	ATT value		ATT value
	RF Switch		RF Switch
	SNMP parameter		Over temperature alarm threshold
			DL over output power threshold
			External Alarm level

Import and Export can help users quickly configure MU and RU parameters. For example, if one MU/RU finished configuration, users can export its parameters and save as a file in PC, and then import this file to other MU/RU to fast finish the MU/RU parameter setting.

➢ Summary

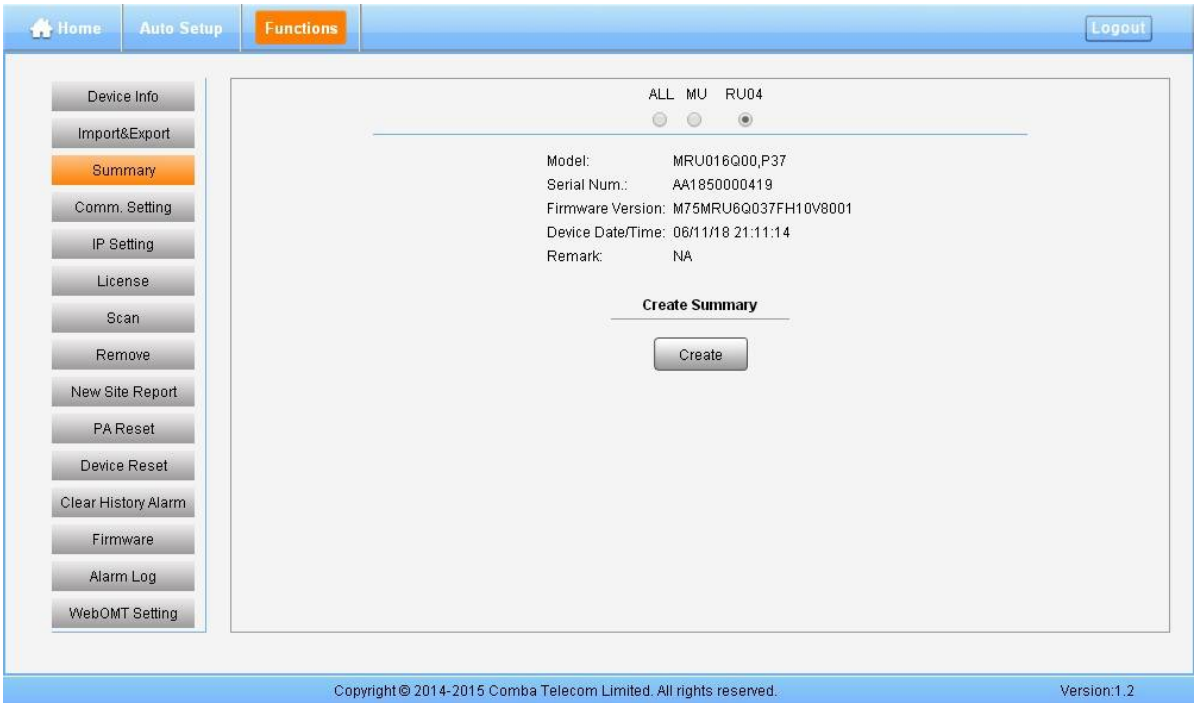


Figure 50: Function - Summary

➢ Comm. Setting

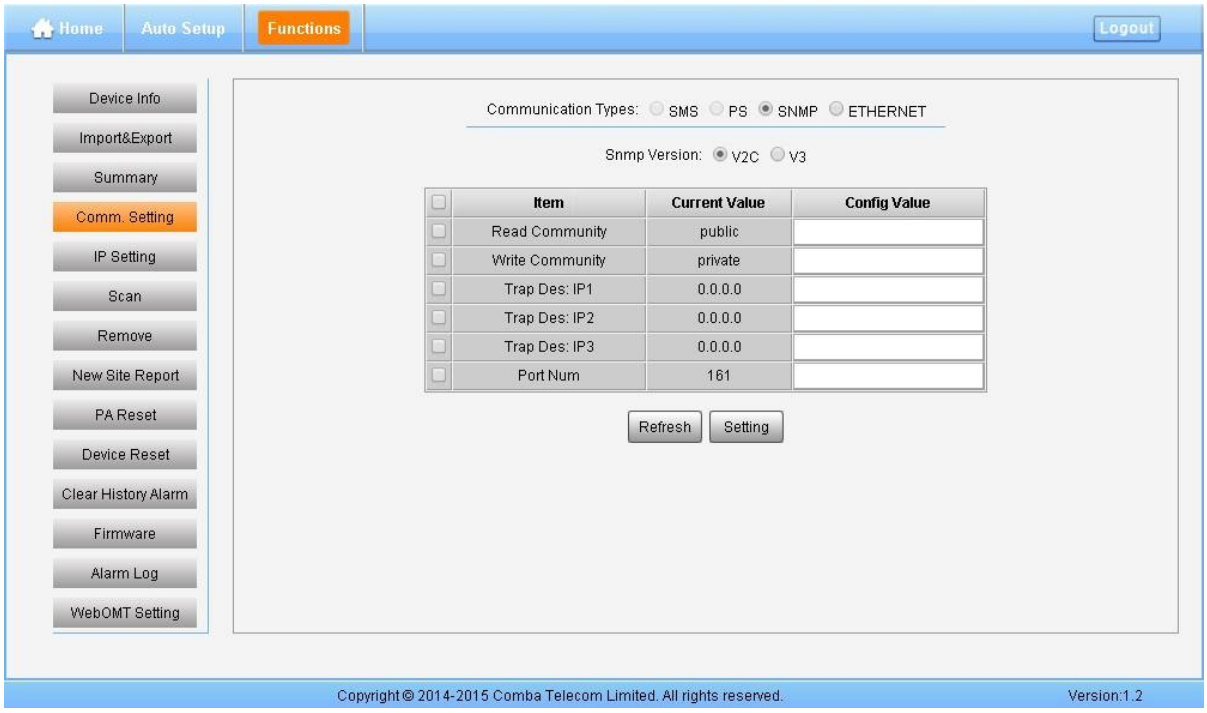


Figure 51: Function - Comm. Setting (SNMP)

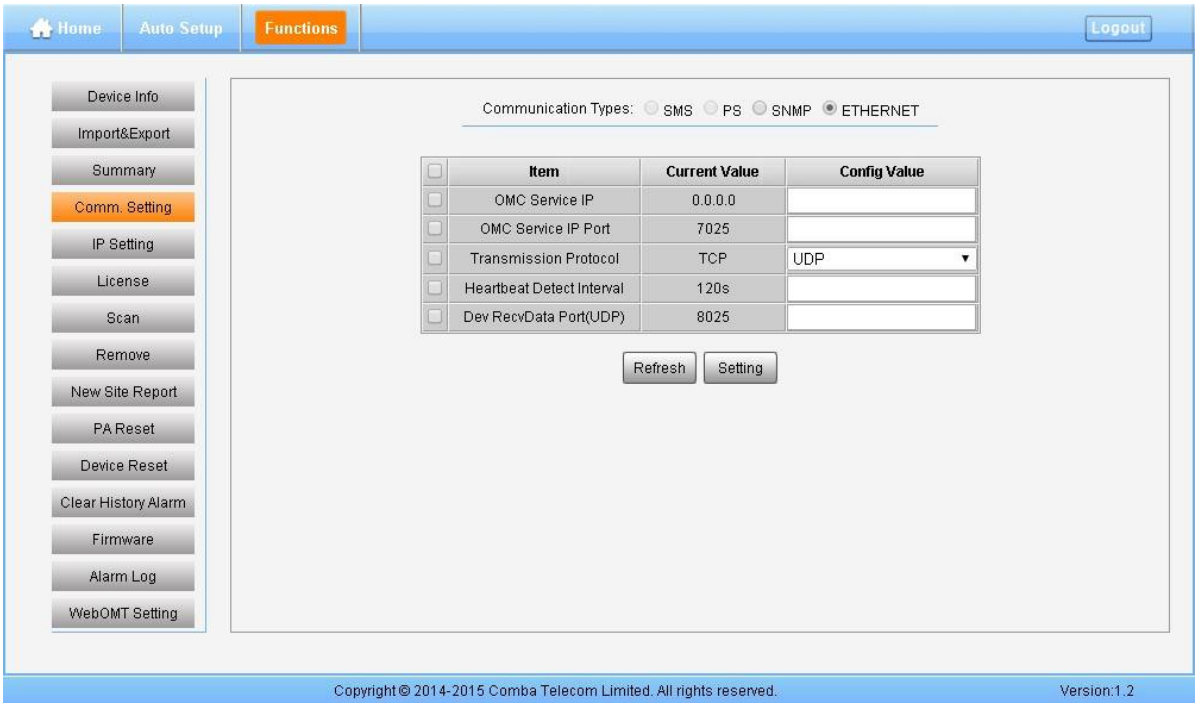


Figure 52: Function - Comm. Setting (UDP)

➢ IP Setting

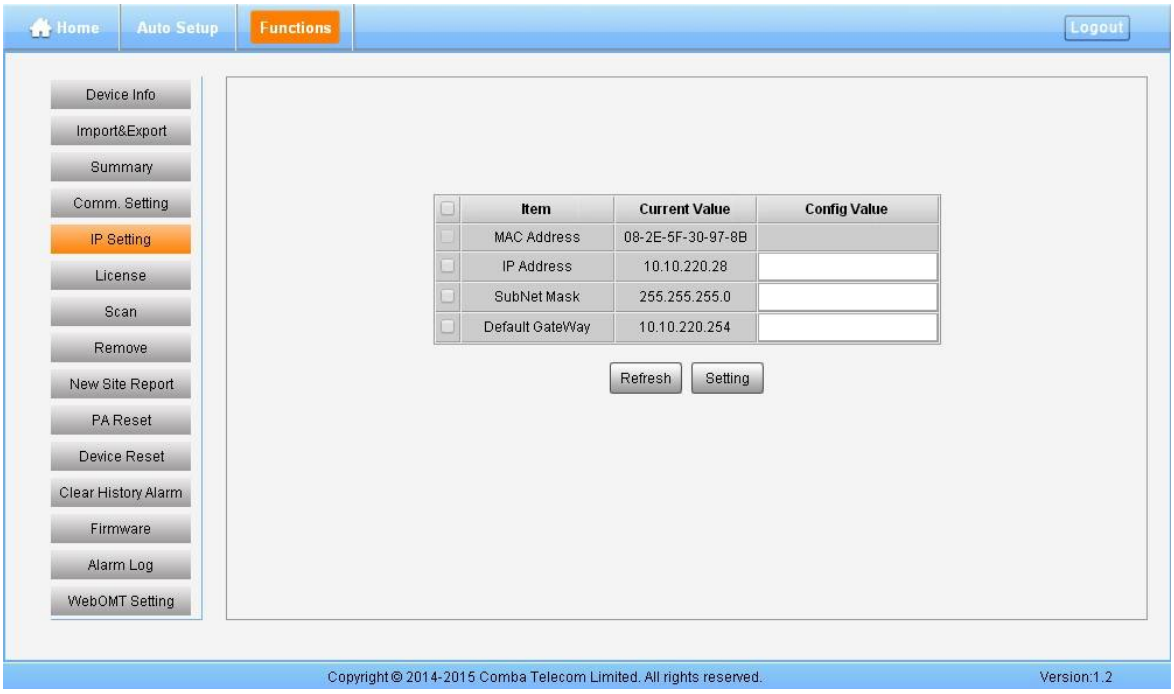
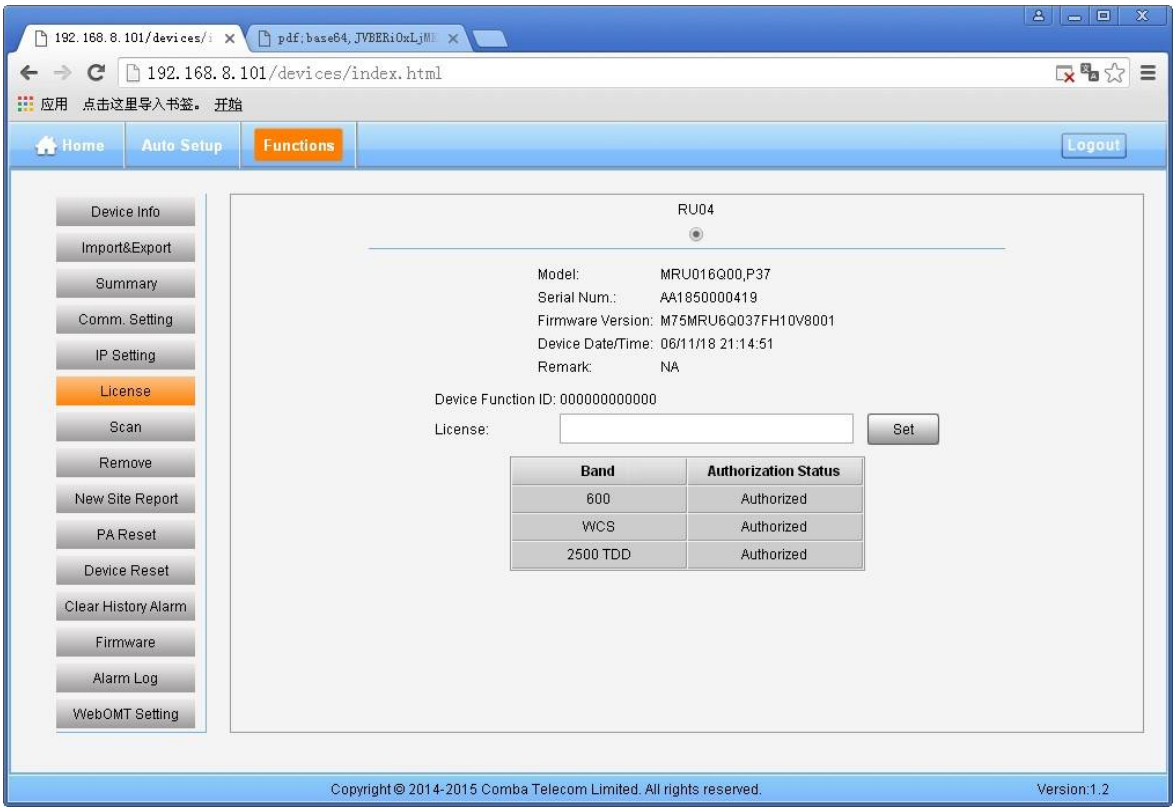


Figure 53: Function - IP Setting

Note: For remote monitoring, the IP Address must be set correctly according to the location IP of remote connection. If there is more than one equipment is connected to the public network through the same router, the router's local IP ***CANNOT*** be set as 192.168.8.*.

- **License**



➢ Scan

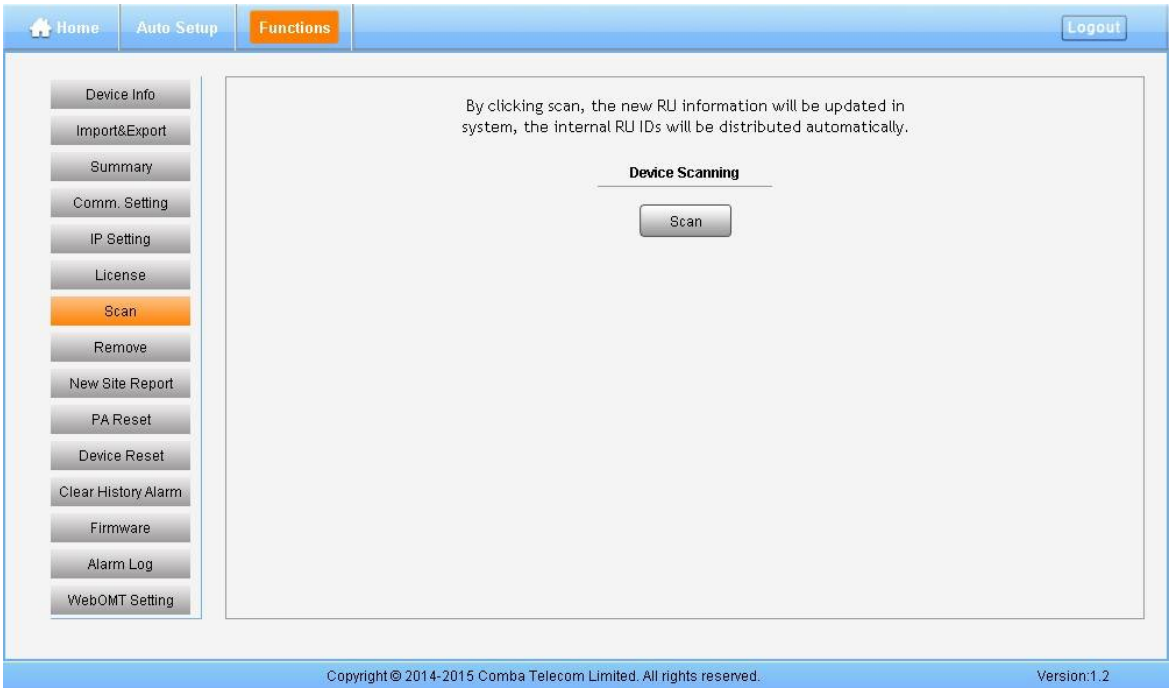


Figure 54: Function - Scan

Figure 55: Function – After Scan

➢ Device Remove

Figure 56: Function - Device Remove

Note: If the RU has been scanned and identified by MU, to remove the RU from the system,users ***must*** remove this RU on this [Remove] page, otherwise, RU will still be shown on the Home page and will trigger optical alarm.

➢ New Site Report

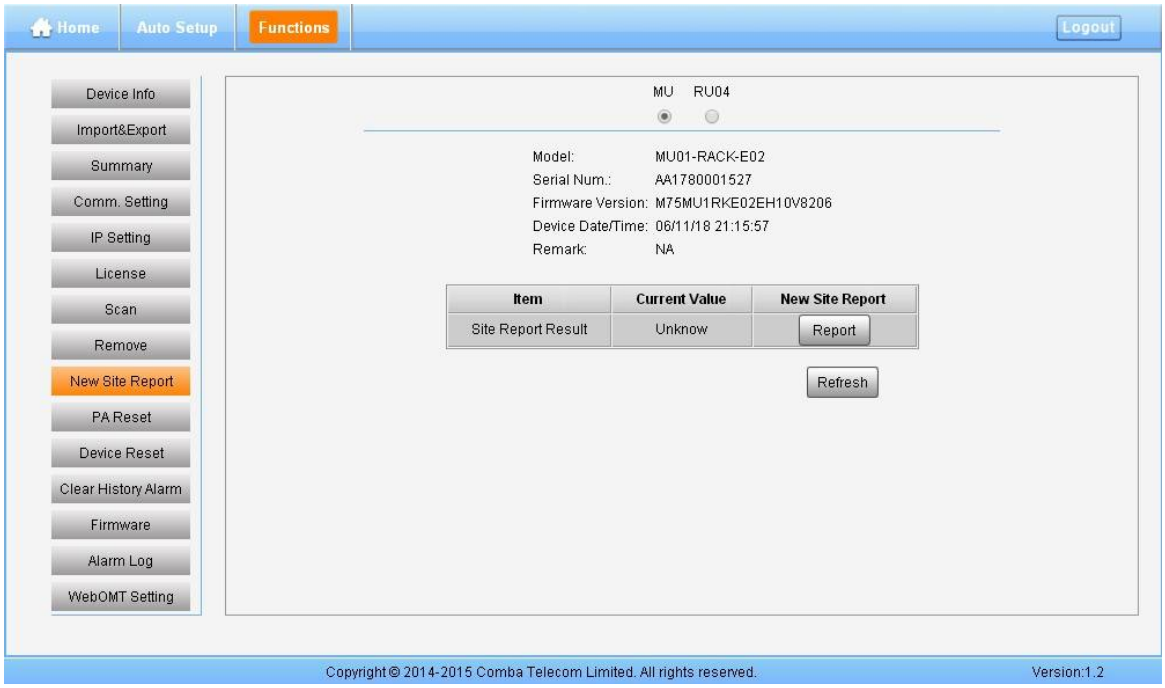


Figure 57: Function - New Site Report

➢ PA Reset

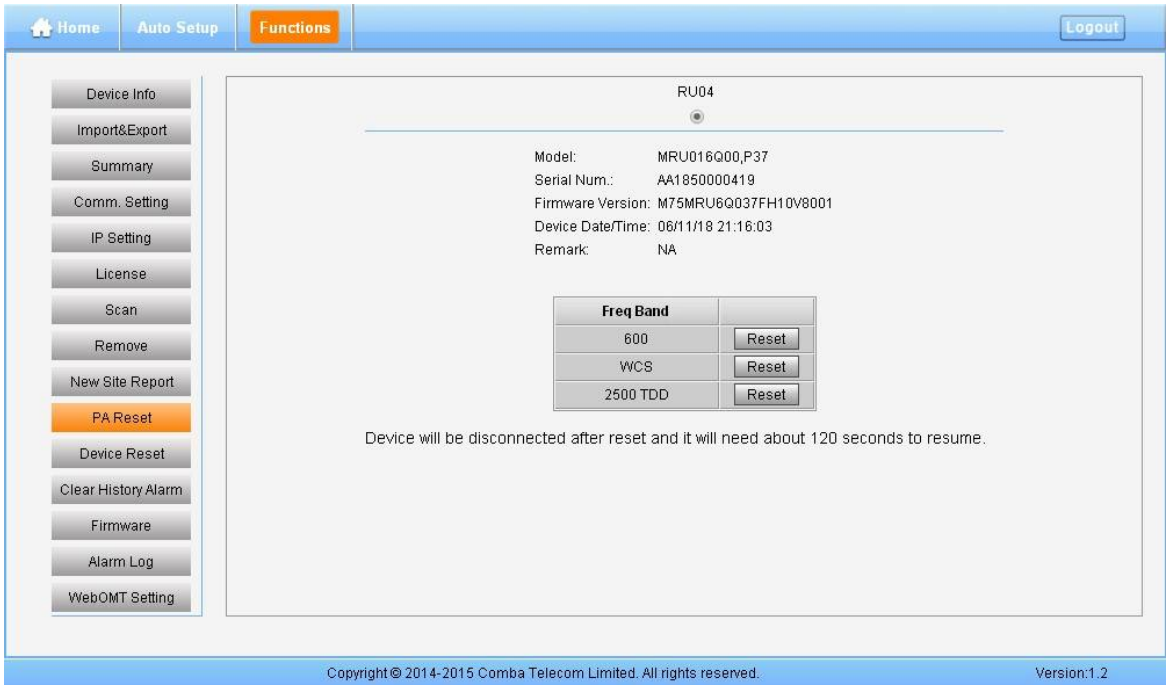


Figure 58: Function - PA Reset

Note: PA will be turned off by software when PA output power or (VSWR) reflected power is exceed the threshold. Users need to reset PA after debugging.

➢ Device Reset

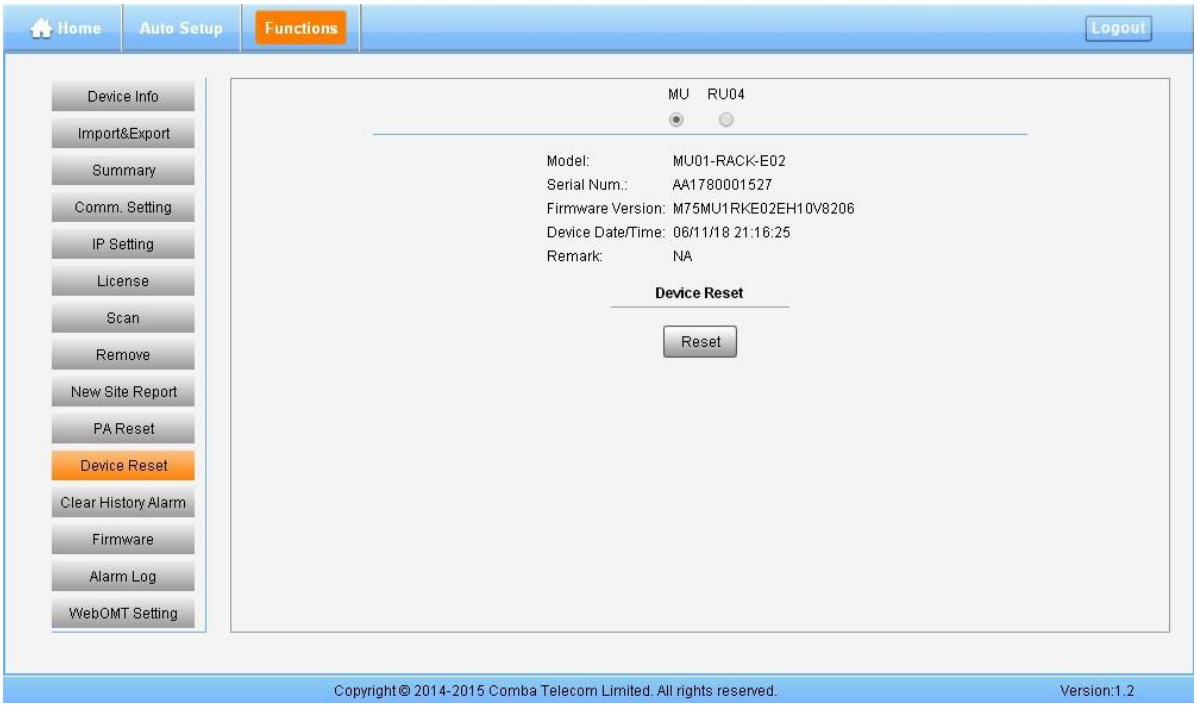


Figure 59: Function - Device Reset

Note: Device Reset process will last about 2~4 minutes. For MU monitor reset, users need to re-login WEB GUI.

➢ Clear History Alarm

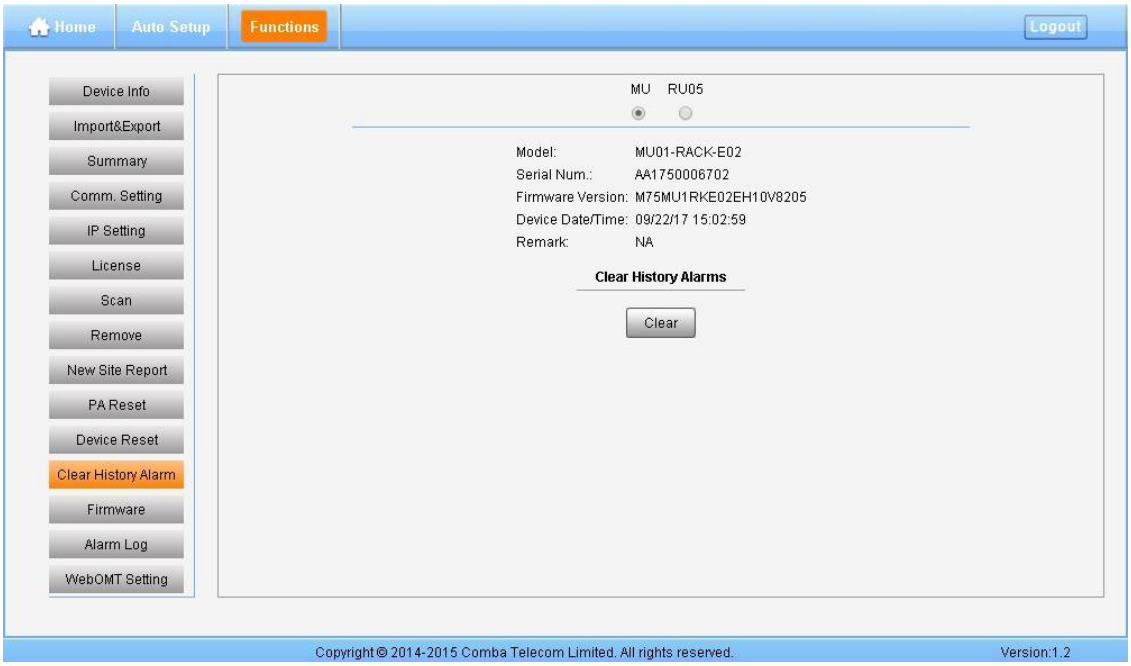


Figure 60: Function - Clear History Alarm

➢ Firmware

There are three functions on the [Firmware] bar: [Monitoring Upgrade], [Swap] and [Module Upgrade]. [Monitoring Upgrade] is used to upgrade software. [Swap] is to replace current firmware version to the previous one. [Module Upgrade] is used to upgrade module software.

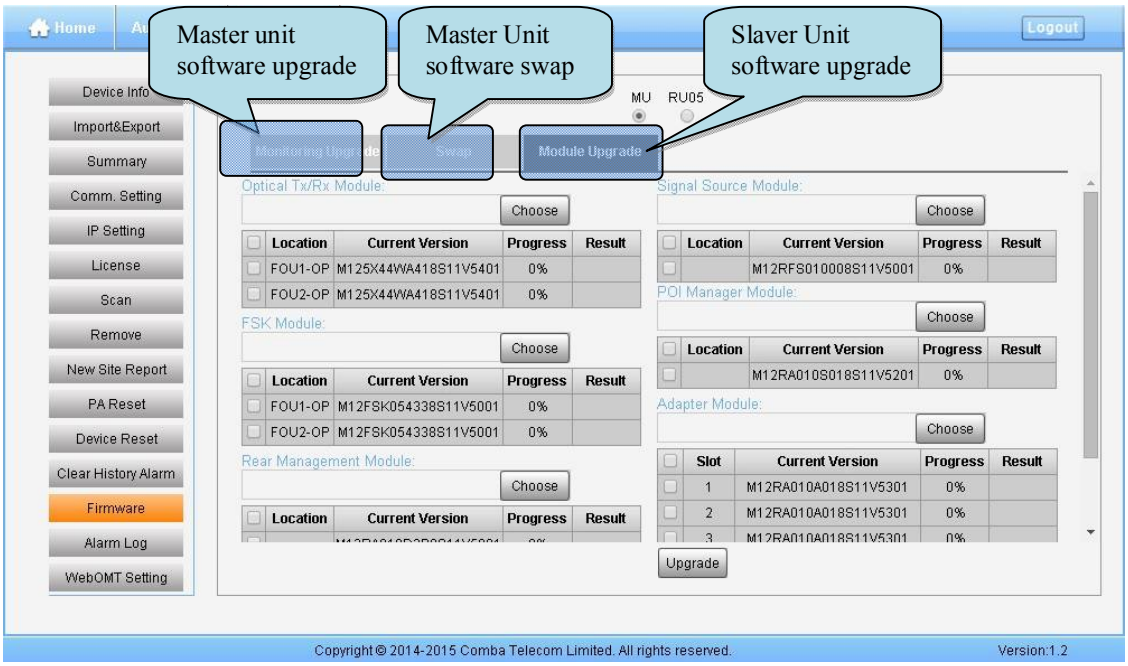


Figure 61: Function - Firmware

➢ Alarm Log

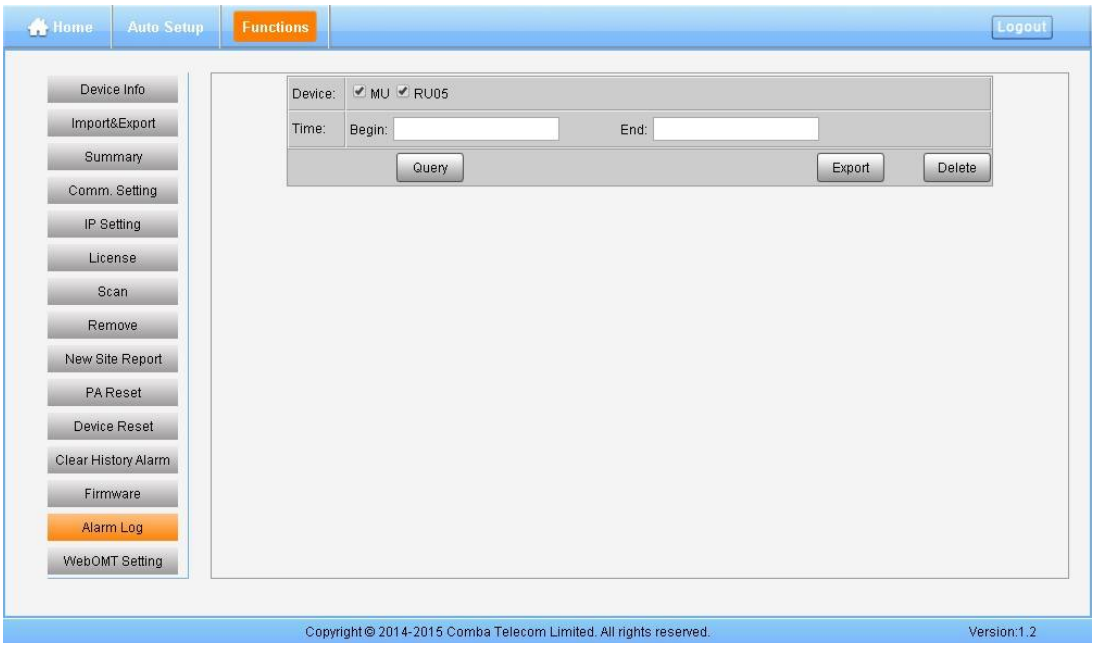


Figure 62: Function – Alarm Log

➢ **WebOMT Setting**

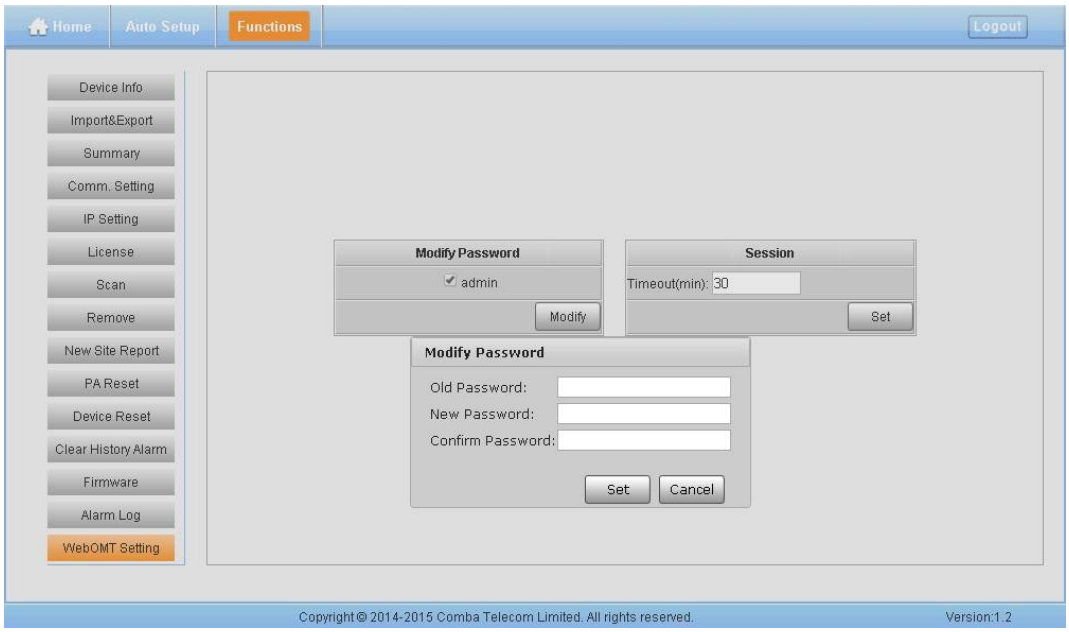


Figure 63: Function – WebOMT Setting

5.3 COMMISSIONING PROCEDURE

To complete the installation and commissioning, users need to follow the steps below.

Step 1: Click Menu bar [Auto Setup] on home page, a work flow will show up.

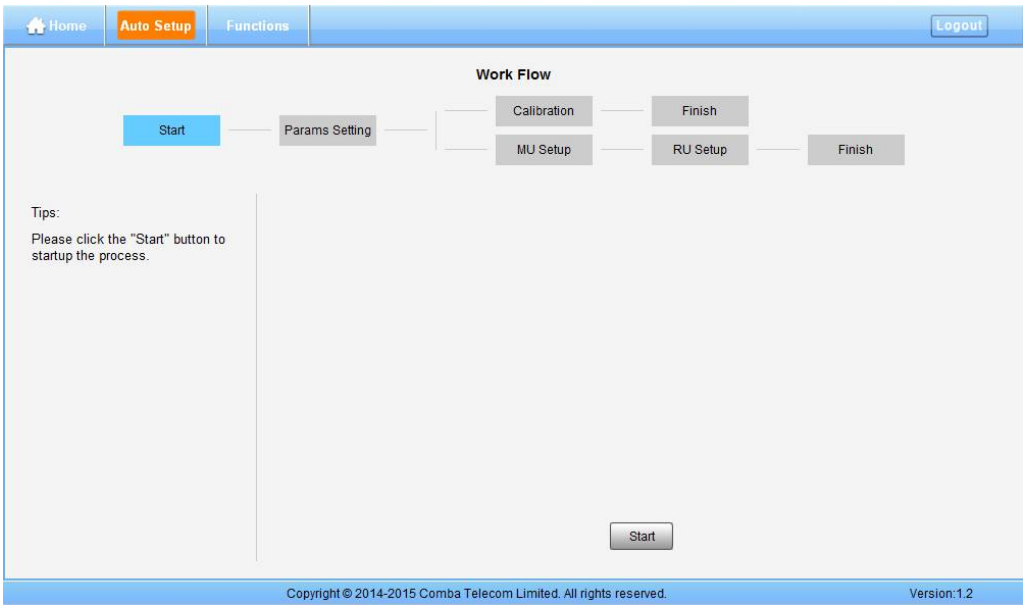


Figure 64: Commissioning Procedure - Start

Step 2: Click Start to start RU device scan, this step will take about 1 minute.

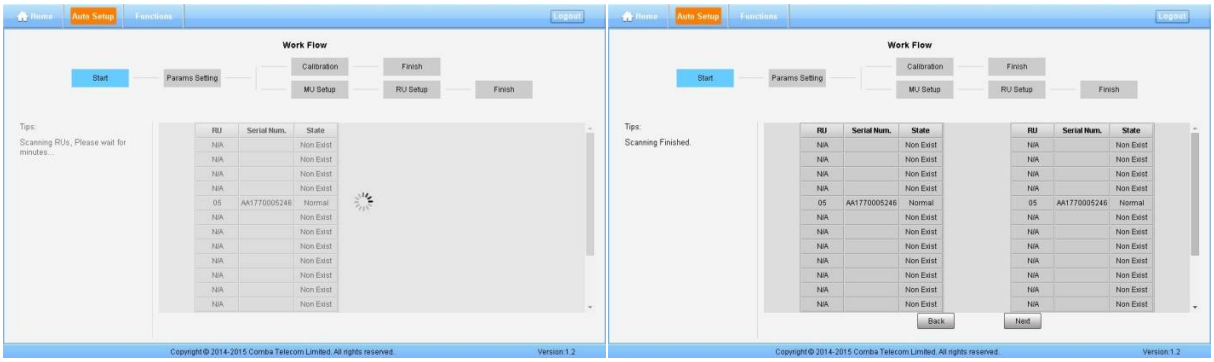


Figure 65: Commissioning Procedure - Device Scan

Step 3 Go to [Home] page, click RU, config the Working Mode of 2500 TDD to DL Normal Open.

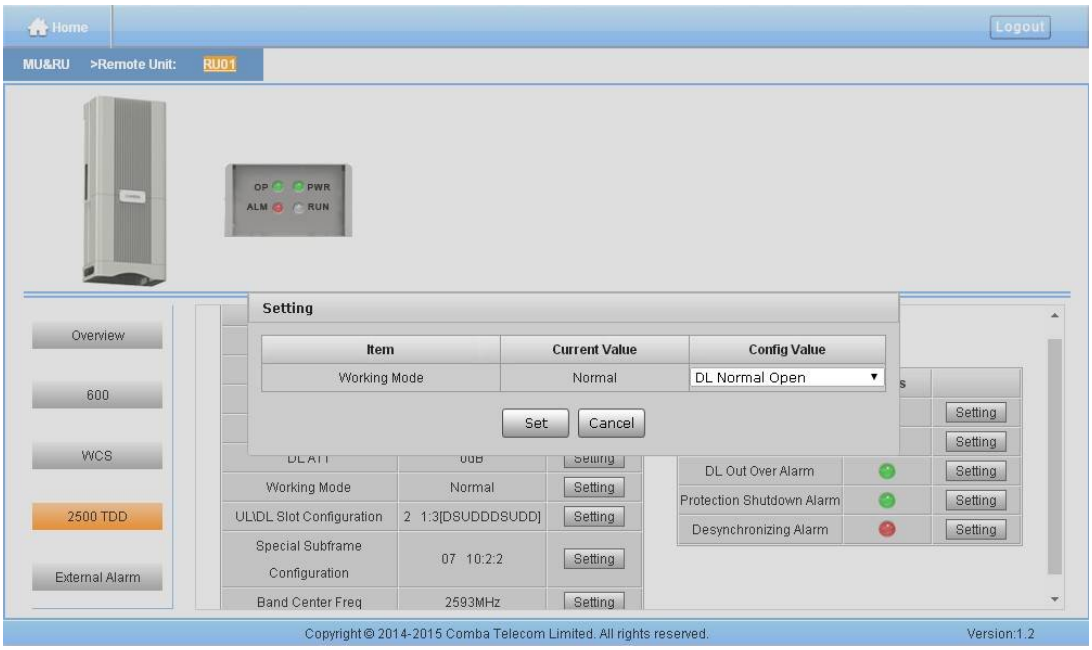


Figure 66: Commissioning Procedure – 2500 TDD working mode setting

Step 4 Repeat Step 1 & 2, click Next to enter to Params Setting page. Click Setting, users can set the device information and system time.

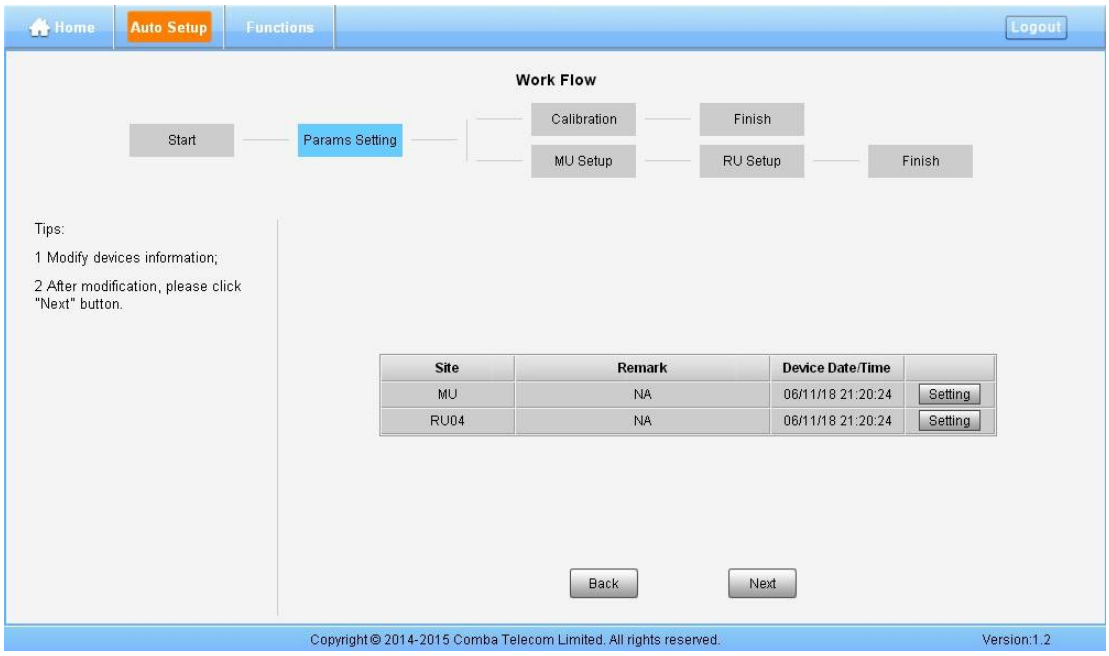


Figure 67: Commissioning Procedure - Params Setting

Dev Info mainly used to record device location and Date/Time provid a time reference. Mouse clicks the Config Value of Date/Time to auto receive the computer time.

Step 5: Click Next to enter to the page to select folw to continue. There are three flows to select: Calibration, Setup and Finish.

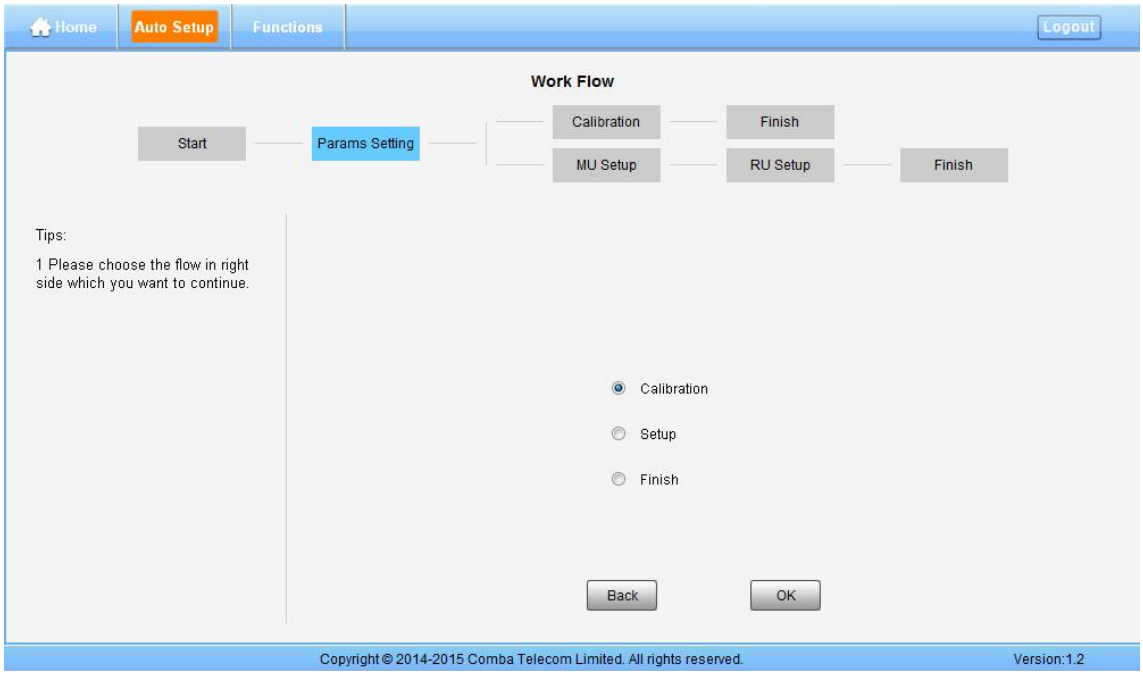


Figure 68: Flow to select

Note: Calibration is to adjust MU and RU gain to make sure system gain is normal, if the band have been calibrated, users can click Skip to skip the process; if the band never been calibrated, users click Skip in the step of Calibration, software can still procede to the next step of MU and RU setup, but the system gain will be a little deviation with normal valuer, so the final output power will be not same with the target DL output power.

NOTE: Make sure all the ANT ports of RUs are connected with dummy load or antenna system before proceeding to step 6.

Step 6: Select Calibration, shown as Figure 70, set the right synchronous carrier center frequency point for 2500 TDD in the poped out window, minimum scale is 100KHz, then select “Automatic Calibration” or “Manual Calibration”.

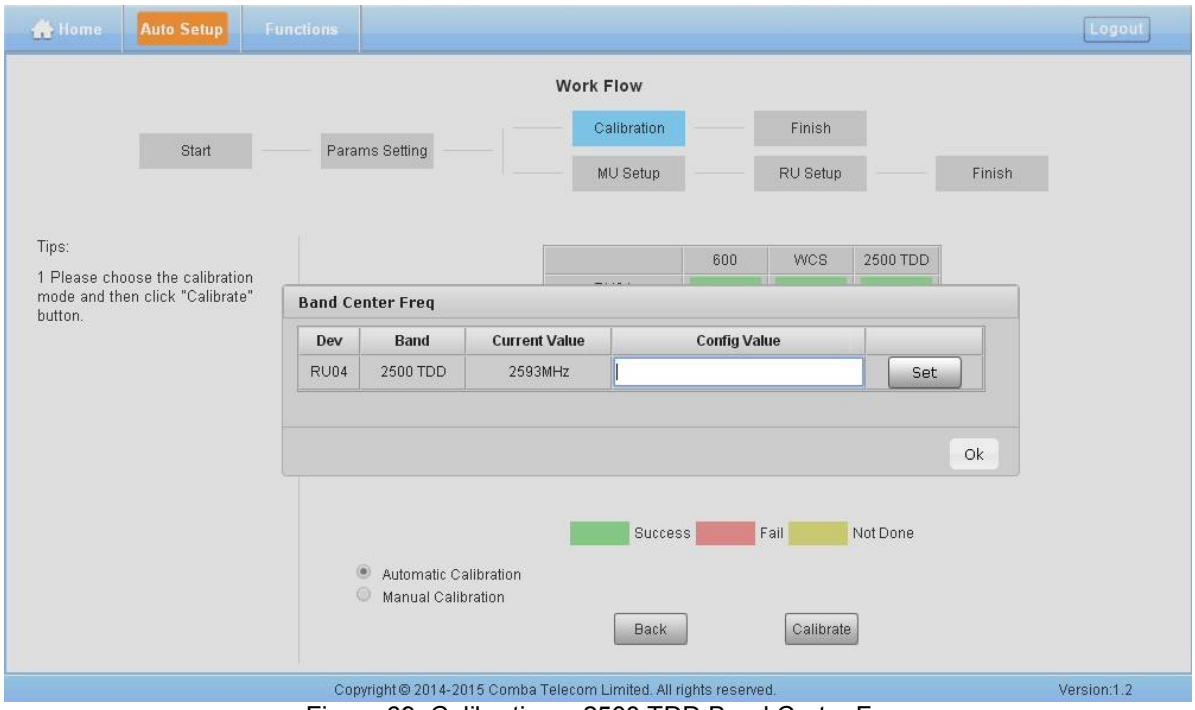


Figure 69: Calibration – 2500 TDD Band Certer Freq

Step 7: Click "Calibrate" and click “OK” to start the Calibratiion procedure, Figure 71.

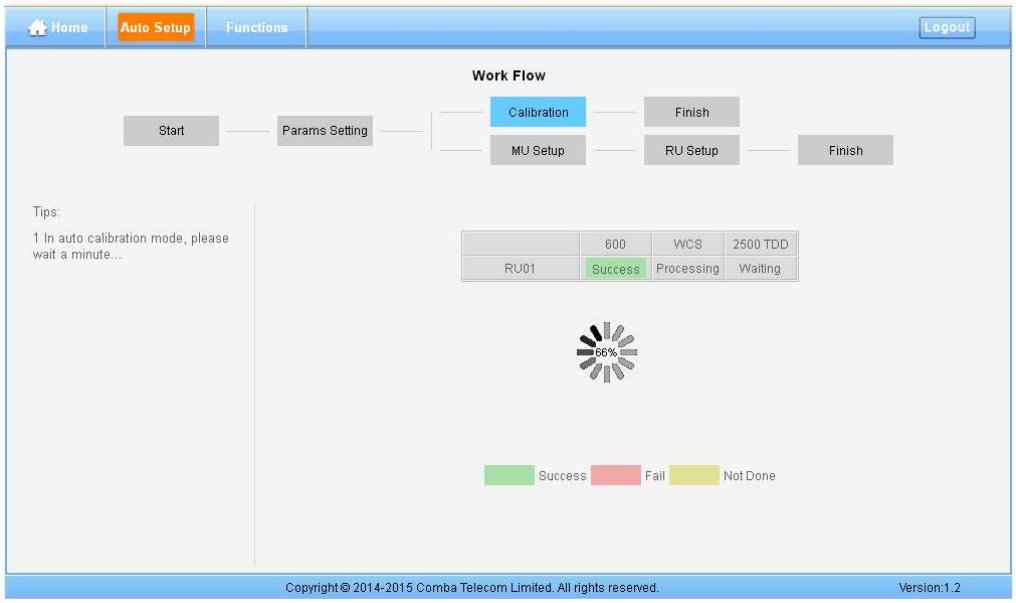


Figure 70: Commissioning Procedure - Calibration

- Automatic calibration no needs to select frequency band, the system will calibration all the band automatically.
- If users choose Manual calibration, then go to next page to select frequency band to calibrate.

Note: Make sure the ANT port of RU is connected with dummy load or antennas before Calibration. Several RU can be calibrated simultaneously.

Step 8: After Calibration is finished, go to MU Setup as in Figure 72, then RU Setup shown in Figure 73

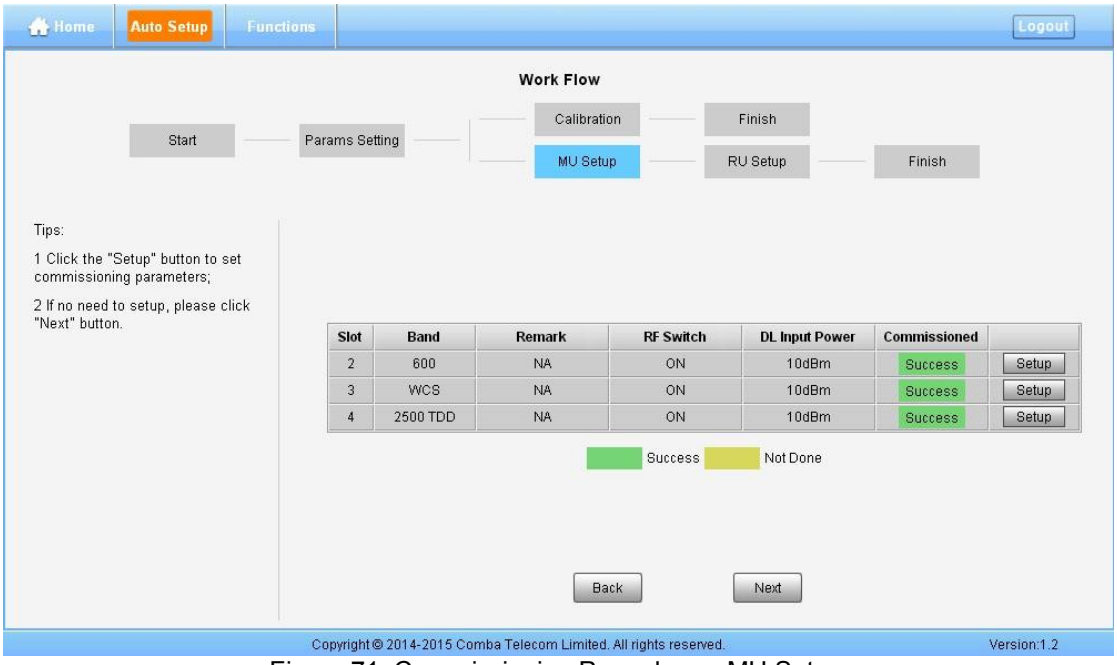


Figure 71: Commissioning Procedure – MU Setup

Note: RU Setup includes “Remark”, “RF Switch”, “DL Input Power”.

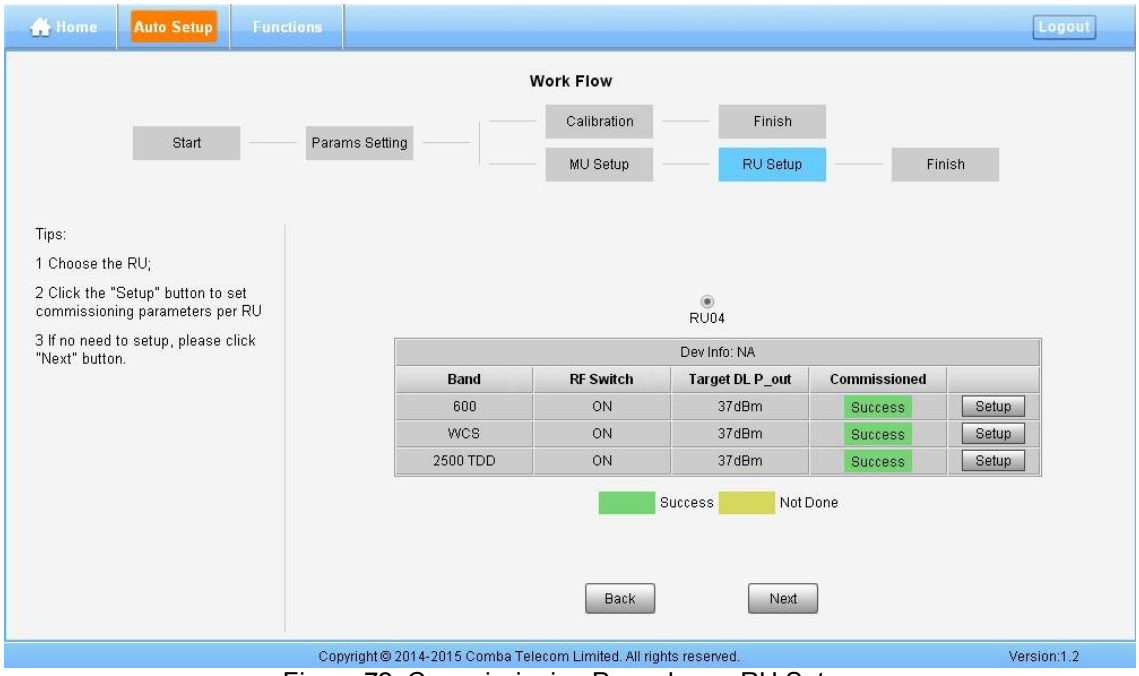


Figure 72: Commissioning Procedure – RU Setup

Note: RU Setup includes “RF Switch”, “Target DL P_out”

Step 9: Back to [Home] page, set all 2500 TDD channel Working Mode to “Normal”, and set the right TD-LTE “DL/UL Slot Configuration” and “Special Subframe Configuration”, as in Figure 67.

Note:
As the system calibration process is calibrated for single channel, so if there is more than one same band input, because of the power superposition, the band total output power will higer than target DL output power after the calibration is complete.

The calibration work is mainly to set device to reach it's theoretical gain, so when there are two or more same bands access into and they have the same input power level, each channel will reach it's rated power, so the total output power will be (input A+gain) + (inputB+gain)+…+(inputN+gain). For example, if there are two 1900MHz bands acess to MU, each has 10dBm input power, the total output power of RU 1900MHz will be 30dBm+30dBm=33dBm.

Refer to the method below for the gain adjustment:
Suppose a band with N independent inputs, each input signal power are all X dBm. Apparently, there exists the following relationship between input and output after finished auto communication on WEB GUI: X dBm + Gain = 30dBm, then the total output power for N channels access is X dBm + Gain + 10*Log(N) = 30 + 10*Log(N), so Users need to set 10*Log(N) RFU ATT on WEB GUI for each channel.

End of Section

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6 ALARMS AND TROUBLESHOOTING

6.1 ALARMS

Table 14: MU Alarm List

Alarm List	Alarm Condition
Over-Temperature Alarm	• Alarm when equipment temperature is higher than the threshold, otherwise normal; • Alarm judgment period: 3 minutes by default; • Alarm threshold : 80℃ by default.
Optical Tx Alarm	• Alarm when Optical Transmiting power is lower than the threshold, otherwise normal; • Alarm judgment period: 3 minutes by default; • Alarm threshold: -7dBm by default.
Optical Rx Alarm	• Alarm when Optical received power is lower than the threshold, otherwise normal; • Alarm judgment period: 3 minutes by default; • Alarm threshold: -10dBm by default.
DL Input Power Overload Alarm	• Alarm when DL input power is higher than the threshold, otherwise normal; • Alarm judgment period: 3 minutes by default; • Alarm threshold: 32dBm by default.

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Table 15: RU Alarm List

Alarm List	Alarm Condition
External Alarm	• Alarm status when the external terminals have different H/L level with alarm level, otherwise normal; • Alarm period: 10s by default.
Over-Temperature Alarm	• Alarm when equipment temperature is higher than the threshold, otherwise normal; • Alarm judgment period: 3 minutes by default; • Alarm threshold : 80℃ by default.
Optical Tx Alarm	• Alarm When optical transmiting power is lower than the threshold, otherwise normal; • Alarm judgment period: 3 minutes by default; • Alarm threshold: 0dBm by default.
Optical Rx Alarm	• Alarm When optical receiving power is lower than the threshold, otherwise normal; • Alarm judgment period: 3 minutes by default; • Alarm threshold: -14dBm by default.
PA Alarm	• Alarm when any one of the PA Current Alarm,PA Over-temperature Alarm, PA DL output power overload Alarm, Reflection Power Alarm happens, otherwise normal; • Alarm judgment period: 3 minutes by default.
DL Output Overload Alarm	• Alarm when the DL output power is higher than the threshold, otherwise normal; • Alarm judgment period: 3 minutes by default; • Alarm threshold: 39dBm for MRU.
Shutdown Alarm	• Alarm when the PA status is off, otherwise normal; • Alarm judgment period: 10s by default.
LNA Alarm	• Alarm when LNA have problems, otherwise normal; • Alarm judgment period: 3 minutes by default.

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6.2 TROUBLESHOOTING

Following installation and commissioning, occasional operation tasks to handle alarms may be required:

Table 16: MU Alarms Diagnosis

Alarm condition	Diagnosis
Over-Temperature alarm	• Check temperature on WEB GUI • If device temperature is over threshold, make sure environment temperature is within the envireonment temperature range that MU supported (0~40℃). Apply climatic protection to the system under severe environment.
Optical TX Alarm	• Test MU transmit optical power • Replace FOU if transmit optical power is less than -7dBm
Optical RX Alarm	• Clean optical cable connector with pure alcohol first , reconnect and see if alarm disappears • Use Optical Power Meter to test received optical power • If received optical power is lower than -10dBm, test whether RU transmit optical power is normal (3~5dBm) • Check if optical loss of fiber link is higher than 6.5dBo
DL Input Power Overload Alarm	Test DL input power of MU, if it is higher than +32dBm, by decreasing source output power or adding an external attenuator with proper attenuating value.

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Table 17: RU Alarms Diagnosis

Alarm condition	Diagnosis
External Alarm	Check to make sure if the external device connected is working normally
Over-Temperature alarm	• Check device temperature on WEB GUI • If device temperature e is over threshold, make sure environment temperature is within the envireonment temperature range that RU supported (-20~50℃). Apply climatic protection to the system under severe environment.
Optical TX Alarm	• Test RU transmit optical power • Replace FOU if transit optical power is less than 0dBm
Optical RX Alarm	• Clean optical cable connector with pure alcohol first, reconnect and see if alarm disappears • Use Optical Power Meter to test received optical power • If received optical power is lower than -14dBm, test whether MU transmit optical power is normal (-4~-2dBm) • Check if optical loss of fiber link is higher than 6.5dBo
DL PA alarms	• Check PA Service Status on WEB GUI RU page, • If it is [Recovery], reset PA on WEB GUI Management page, then read RU output power: If output power is exceed threshold, need to reduce gain or input power; if output power is normall, check whether antenna port VSWR is too high. • If it is [Shutdown], Refer to PA Shutdown Alram
DL Output Power Overload Alarm	• Check if output power is exceed the threshold (39dBm for MRU) • Decrease the gain to reduce the output power
PA Shutdown Alarm	• Make Sure the environment temperature is -20~50℃ • Reset PA, if PA service status turns to [Recovery], and then refer to DL PA Alarms. If PA still shutdown, the PA module maybe damaged, please contact with Comba to replace the RU.
LNA Alarm	Uplink LNA modual damaged, please contact with Comba to replace the RU.

End of Section

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7 APPENDICES

7.1 APPENDIX A: TOOLS FOR INSTALLATION AND MAINTENANCE

The following tools (not included in package) are required for installation or routine maintenance:

- Power Drill (for wall mount)
- Adjustable Wrench (0.31 inch~0.79 inch)
- Philips Screwdriver
- Allen wrench (M6)
- Signal generator support output power 10dB.
- Site Master

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7.2 APPENDIX B: RMA (RETURN MATERIAL AUTHORIZATION)

Comba Telecom Ltd.

611 East Wing, No. 8 Science Park West Avenue, Hong Kong Science Park,Tai Po, Hong Kong
Tel: +852 2636 6861 Fax: +852 2637 0966

RMA Request Form

Date: _____

From: _____
Address: _____
Tel: _____ Fax: _____
E-Mail: _____
ATTN: _____

Product Information:

Item	Model	Serial Number	Return Category	Qty	Problem Description
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Notes:

1. For 'Return Category' column, please select from **A**: Return of Defective Product, **B**: Return of Trial Sample, or **C**: Return of New and Unused Product.
2. If **A** or **C** category of return product is chosen, please give short description of the problem or reason for returning.

Transportation Information:

Location of Product: _____
Transportation Method: _____
Shipping Forwarder: _____

Note: **Location of Product'** must be stated, while '**Transportation Method'** or '**Shipping Forwarder'** can be left blank if not determined.

Signature:

_____

For Comba Use (Only)
Return Merchandise Authorization Number (RMA#):
Recommended Action:
Shipment and Handling Cost to be paid by:

Approved by:

_____ **Date:** _____

End of Section

End of Document

FOR NAM OFFICE EMAIL, PLEASE INSERT: support.us@comba-telecom.com

Comba

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