



CriticalPoint Public Safety BDA

UHF PUBLIC SAFETY BI-DIRECTIONAL AMPLIFIER

USER MANUAL

**Public Safety BDA RX-4122 Class A & Class B
QE: 1-0-1**

Comba Telecom Ltd.

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0.3 HISTORY

Change No.	ENU	Details Of Change
1	1-0-0	This manual first created and issued in Jan. 2018.
2	1-0-1	Update to add the part for Class B in .

0.4 GLOSSARY OF TERMS

Abbreviation	Definition
ALC	Automatic Level Control
ATT	Attenuator
BTS	Base Transceiver Station
CH	Channel
CSA	Cross Sectional Area
dB	Decibel
dBm	Decibels relative to 1 milliwatt
DL	Downlink
DT	Donor Terminal
DPX	Duplexer
FS	Frequency Selection
Hz	Hertz
ID	Identification
IF	Intermediate Frequency
LNA	Low Noise Amplifier
LOS	Line-of-Sight
MCU	Main Control Unit
MHz	Megahertz
MT	Mobile Terminal
MTBF	Mean Time Between Failures
NF	Noise Figure
OMC	Operation & Maintenance Center
OMT	Operation & Maintenance Terminal
PA	Power Amplifier
PLL	Phase Locked Loop
PSU	Power Supply Unit
RF	Radio Frequency
SMA	Sub-Miniature A Connector
UL	Uplink
VAC	Volts Alternating Current
VDC	Volts Direct Current
VSWR	Voltage Standing Wave Ratio

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 colored 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.

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.

For compliance with the general population RF exposure limits, each individual antenna used for this transmitter must be installed to provide a separation distance greater than 60.62cm or more from all persons during normal operation and must not be co-located with any other antenna for meeting RF exposure requirements.

Warning Notices:

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.

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. The PS BDA can be configured as Class A or Class B Signal Booster. You MUST register Class B signal boosters (as defined in 47 CFR 90.219) online at www.fcc.gov/signal-boosters/registration. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.

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

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.

Disconnection of the 2 RF connectors may cause damage to the equipment when power is on. The application antenna and RF cable are not provided.

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 fine.

End of Section

1 GENERAL INFORMATION

The RX-4122 is a new digital public safety Bi-Directional repeater (hereafter referred to as PS BDA) designed to protect the lives of first responders and building occupants. Through the use of digital filtering technology, the RX-4122 helps eliminate adjacent channel interference to allow band selectivity and support 400MHz rebanding.

Main Features

- PS UHF 400MHz.
- Support 32 channels total (Class A) or dual sub-bands(Class B).
- Channel selective or band selective, software programmable.
- Auto diagnostic.
- Uplink squelch, per channel (Class A).
- User adjustable gain control (AGC), UL and DL independent per channel.
- Built in isolation testing (Mandatory prior to commissioning the PS BDA).
- Easy commissioning and setup via Web-based GUI.
- Weatherproof enclosure, IP65/NEMA4X.
- Fully compliant with the 2016 NFPA 1221 Code, FCC and UL standard.
- Low power consumption: less than 85W
- Weight: 77 lbs (not including mounting bracket and duplexers)
- Alarming output to supervised circuits for: antenna failure, signal booster failure, and etc.

The following figure shows the enclosure of the PS BDA.

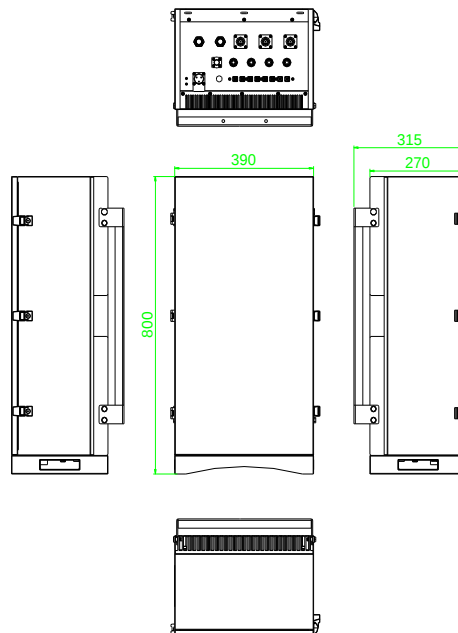


Figure 1: Front, Side and Bottom Views of the PS BDA Enclosure

2 EQUIPMENT DESCRIPTION

2.1 FUNCTIONAL BLOCK DIAGRAM

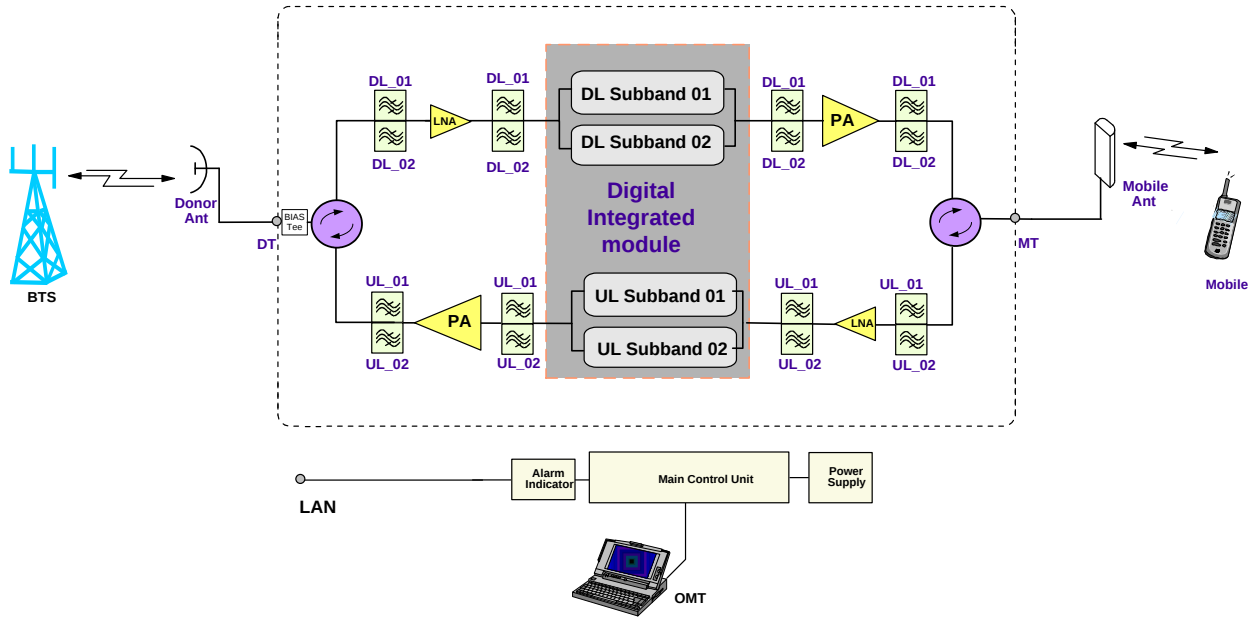


Figure 2: PS BDA Functional Block Diagram

In the downlink path, the BTS signals are received by the donor antenna of the repeater. After the circulator, the signals are sent to downlink filter and then the LNA module for pre-amplification and to the digital RF integrated module for digital filtering and frequency conversion. Then the DL signals will be sent to the downlink PA to amplify power, and filter via downlink filter, the circulator, and last, the signals are transmitted at the MT port to the service antenna.

In the uplink path, the mobile signals are received by the service antenna. After the circulator, the signals are sent to uplink filter, and then to LNA, digital integrated module for digital filtering, then to the PA for power amplification and to the uplink filter, the circulator, after that, the uplink signals are sent to the donor antenna for transmission back to the BTS.

2.2 EQUIPMENT LAYOUT

Shown below is the internal layout of the PS BDA.

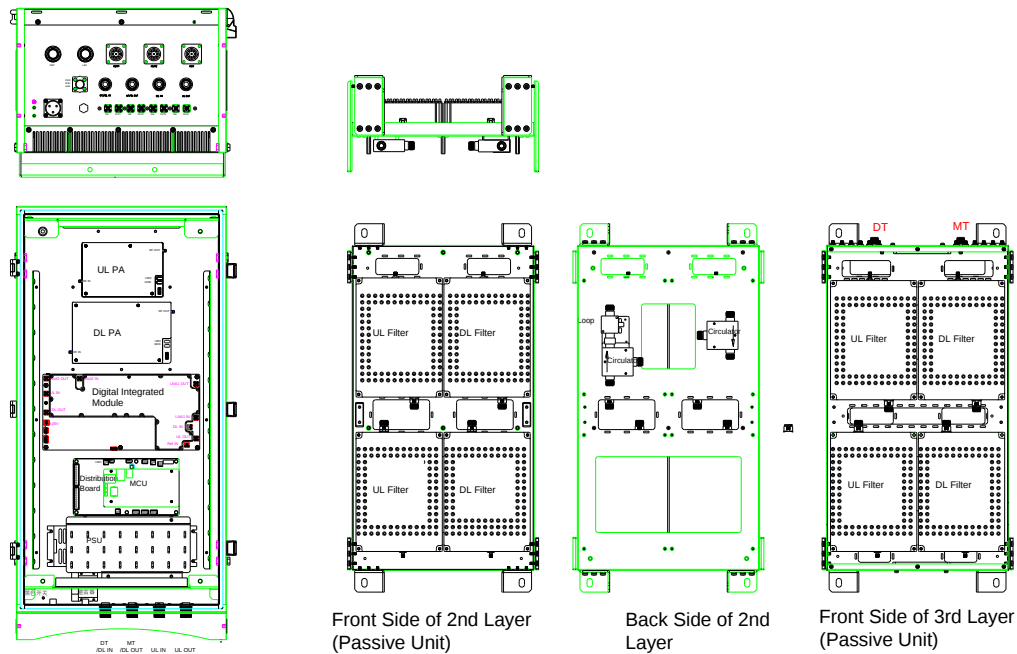


Figure 3: Layout of the PS BDA

2.3 EQUIPMENT CONSTITUTION

The typical PS BDA unit consists of the following components:

Downlink Power Amplifier (DPA): It provides power amplification for DL branches.

Uplink Power Amplifier (UPA): It provides power amplification for UL branches.

Main Control Unit (MCU): The MCU is used to monitor and control the operation of the repeater. It also provides the communication interface for remote control and status indication. LED indicators provide the operation status of the MCU.

Downlink Filter: The filter is used to restrain the uplink signals to achieve a better isolation between downlink path and uplink path, to make sure the device can work in a normal duplex mode.

Uplink Filter: The filter is used to restrain the downlink signals to achieve a better isolation between downlink path and uplink path, to make sure the device can work in a normal duplex mode.

Digital Integrated Module: Consists of RF module, digital process module and monitoring modules. The RF module amplifies and converts the RF signal to IF signal. The Digital process module converts the IF signal into baseband signal via AD conversion and extraction, and filtering. After that, the IF signal will be amplified and converted to an RF signal by the RF module for RF filtering and amplification. The Monitoring module monitors and controls the system parameters and it is the interface for both remote monitoring and local commissioning, and at the same time control the charge and discharge of the backup battery.

Power Supply Unit (PSU): The PSU converts the input voltage into a stable DC supply to provide power for the internal functional modules.

3 INSTALLATION

3.1 WARNINGS AND ALERTS

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, as far as reasonably practicable danger. Any work activity on or near equipment involving installation, operation or maintenance must be, as far as reasonable, free from danger.

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, animal or person from the equipment. It also covers activities that require the use of force or effort, such as pulling a lever, or operating power tools.

Where some of the abovementioned activities are required, the equipment must be handled with care to avoid being damaged.

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.

3.2 SITE PLANNING CONSIDERATIONS

3.2.1 SITE PLANNING

Site Considerations

Outdoor equipment are designed to be waterproof, rainproof, and with snow protection. Temporary protection should be taken when the equipment enclosure is opened for installation or maintenance in an outdoor environment. The equipment must not be opened for installation or maintenance in bad weather (e.g. gale, storm rainfall, extreme temperatures and high humidity)

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

Direct sun light exposure to the equipment should be avoided. Provide additional shelter if necessary.

Power Supply

The power supply unit (PSU) provides power to all modules within the equipment. Depending on the product variant, it is recommended that the PSU be operated on a dedicated 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 required. Where applicable, ensure cables are properly routed and secured so that they are not damaged.

Manual Handling

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

3.2.2 INSTALLATION CHECKLIST

- Working space available for installation and maintenance for each mounting arrangement. Ensure unrestricted airflow.
- Ensure earth ground point is within reach of the ground wire.
- 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.
- 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 VSWR of antennas system $< 1.5:1$.
- Ensure equipment will be operated within the stated environment (see datasheet)
- Observe handling of all cables to prevent damage. Donor antenna should have a narrow beamwidth and positioned in line-of-sight (LOS) to the donor BTS site so that the donor signal level is maximized. This allows the use of minimum gain to achieve the maximum DL output power. The UL gain is typically set lower than or equal to the DL gain to minimize noise interference to the donor BTS
- Service antennas should be selected based on the type of service area, e.g., indoor antenna for indoor application, and panel antenna for outdoor application.

3.3 INSTALLATION PROCEDURES

3.3.1 GOODS INWARDS INSPECTION

- Verify the number of packages received against the packing list.
- Check all packages for external damage; report any external damage to the shipping courier. If there is damage, a shipping agent should be present before unpacking and inspecting the contents because damage during transit is the responsibility of the agent.
- Open and check each package against the packing list. If any items are missing, contact Comba.
- Do not remove items from anti-static packing until ready for installation. If damage is discovered at the time of installation, contact the shipping agent.

3.3.2 TOOLS

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

3.3.3 PREPARATION

- Wall mounting with the masonry bolts supplied, which make use of the outer holes.

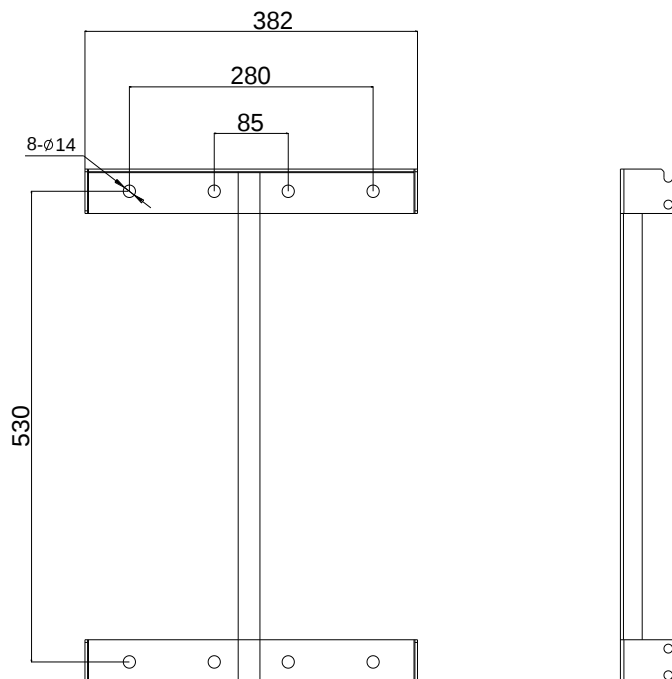


Figure 4: Mounting Rack Overview

3.3.4 WALL MOUNTING

- Drill four holes on the wall using the position of four holes on the mounting rack as a guide. Fix the mounting rack to the wall using four masonry bolts (M10x110mm).
- Install the Mounting Rack to the wall.
- Hang the equipment and secure the enclosure to the mounting rack.

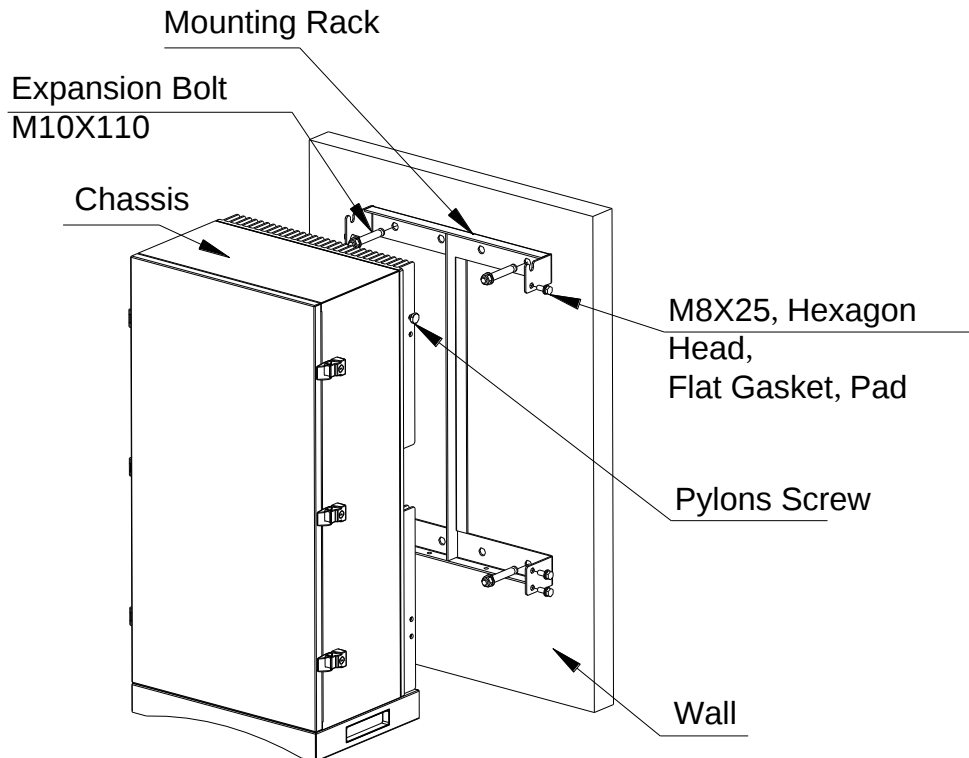


Figure 5: PS BDA Wall Mounting

3.3.5 DRIP-LOOP

Comba recommends that every horizontal cable entry to the equipment forms a 'U' before its entry to the equipment. Water on the cable will drip down at the bottom of the loop and will not accumulate at the equipment connectors.

3.4 EQUIPMENT CONNECTORS

3.4.1 PS BDA CONNECTORS

The PS BDA is designed for all cable entries from the right or left of the enclosure, as shown in the following figure.

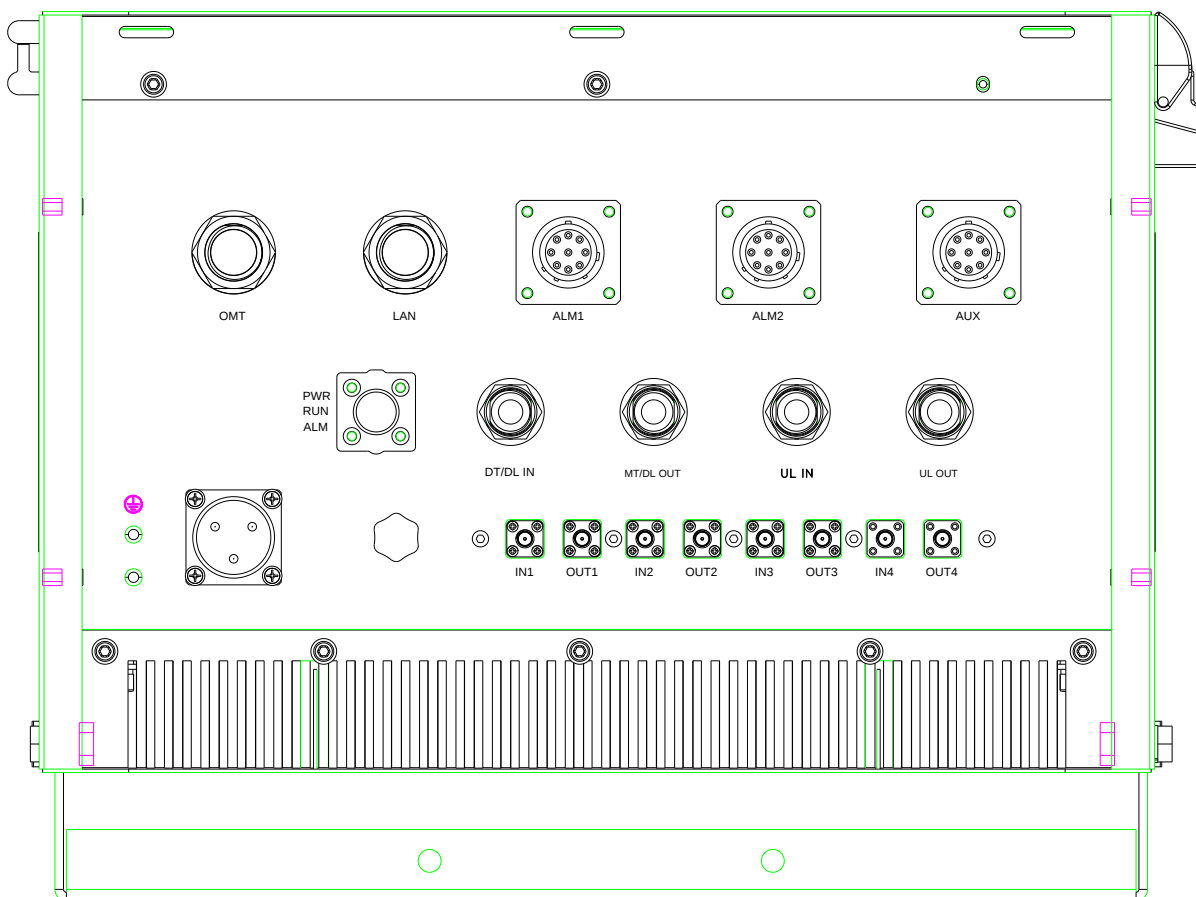


Figure 6: Equipment Connectors

Table 1: Equipment Connectors

Identifier	Descriptions
Power ¹	Power cable connector for a pre-installed power cord for connection to AC (e.g. AC 100-240V 50Hz/60Hz).
DT /DL IN	N-Female connector, It is downlink input port and uplink output port for Duplex mode; It is downlink input port only for Simplex mode.
MT/DL OUT	N-Female connector, It is downlink output port and uplink input port for Duplex mode; It is downlink output port only for Simplex mode.
UL IN	N-Female connector, It is uplink input port for Simplex mode; It is useless for Duplex mode.
UL OUT	N-Female connector, It is uplink output port for Simplex mode; It is useless for Duplex mode.
INxx/OUTxx	Reserved for extension
ALM1	Connector for connection to dry contact alarm 1, 2 and 3
ALM2	Connector for connection to dry contact alarm 4, 5 and 6.
AUX	External alarm 1, 2, 3 and 4.
LAN	RJ45 connector for internet connection (Ethernet type only).
OMT	RJ45 connector for local connection by WEBOMT

¹ The voltage identification is a variant due to electricity system diversity of global regions. The power cable connector might be identified for AC 110V, AC 220V, AC 110V/220V, or DC -48V respectively. Please refer to specific product or contact local sales if any doubt.

3.4.2 PS BDA LED Indicators

The LED indicators help user to check the equipment status easily.

Table 2: LED Indicators

Identifier	Colour	Indication
PWR	Green	Power indicator. ON = power on; OFF = power off.
RUN	Green	Operation indicator, flashes every second to indicate normal operation.
ALM	Red	Alarm indicator. ON = alarm; OFF = no alarm.

3.4.3 GROUNDING CONNECTION

Ground Connection

To ensure safe operation of the product, a ground (earth) connection is required. For single phase AC power source, the product must be grounded by connecting the “earth wire” of the power cord to the ground terminal of the AC supply. For operating this product with DC power system (such as rectifiers), the product should not be connected to power systems that switch open the return lead because the return lead could function as the ground (earth) connection for the equipment.

Protective Ground Connection

The enclosure must be grounded securely by connecting a copper wire (CSA 16mm²) to the grounding terminal on the equipment/rack, and the other end to a protective ground (i.e. building earth point). An internationally acceptable color code of the ground connection wire is green/yellow.

Such a ground connection implements the “Protective Ground Connection”, and must be connected to the equipment at the designated ground point. In general, do not connect the supply before establishing an adequate ground (earth) connection.

Construct the ground wire, and use appropriate crimp connectors where necessary. Locate and connect the equipment grounding terminal to a protective ground (i.e. building earth point).

3.4.4 RF CABLE CONNECTION

Single band PS BDA RF cables connection is as follows:

- PS BDA MT port → Connects to the feeder cable from service antennas.
- PS BDA DT port → Connects to the feeder cable from donor antennas.

3.4.5 ETHERNET CONNECTION

Connect Ethernet with ‘LAN’ port in the panel, Ethernet type only.

3.4.6 DRY CONTACT CABLE CONNECTION

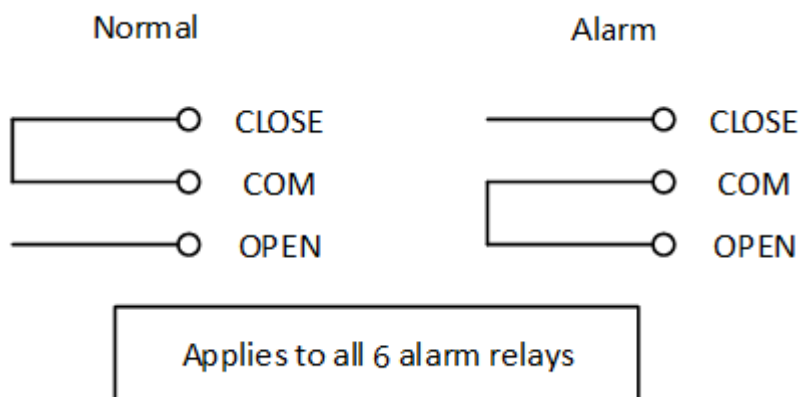
Below please find the pin definitions of dry contact cables.

Table 3: Pin Definition of Dry Contact Cable

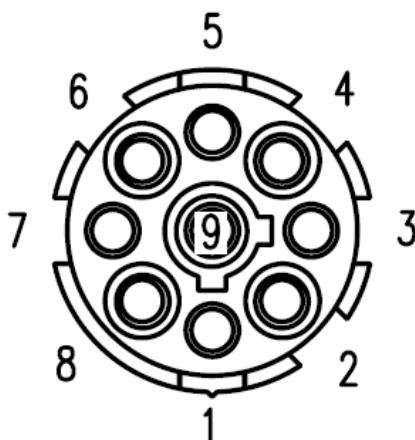
Pin NO.	Pin	Input
ALM1		
1	CLOSE1	1
2	COM1	2
3	OPEN1	3
4	CLOSE2	4
5	COM2	5
6	OPEN2	6
7	CLOSE3	7
8	COM3	8
9	OPEN3	9
ALM2		
1	CLOSE4	1
2	COM4	2
3	OPEN4	3
4	CLOSE5	4
5	COM5	5
6	OPEN5	6
7	CLOSE5	7
8	COM5	8
9	OPEN5	9
AUX		
1	EXT ALM1	1
2	EXT ALM2	2
3	EXT ALM3	3
4	EXT ALM4	4
5	GND	5
6	GND	6
7	GND	7
8	GND	8
9	NC	9

Dry contact status:

Main Power Normal/Lost dry contact status:



Pin definition of ALM and AUX connectors:



End of Section

4 COMMISSIONING

4.1 PRE-COMMISSIONING TASKS

After equipment installation, perform the following steps before equipment powering and commissioning:

- Verify that the expected voltage, current and power levels do not violate any ratings.
- Visually inspect the power connection within the equipment. Ensure that the power cable is correctly and securely connected, including the grounding wire, RF cable and other cables.
- Check the grounding connection and verify that the ground resistance is less than 5Ω .
- Test the antenna system and ensure that the echo loss within working frequency is less than -14dB (VSWR<1.5).

4.2 COMMISSIONING PROCEDURE

Perform the following procedures for system commissioning.

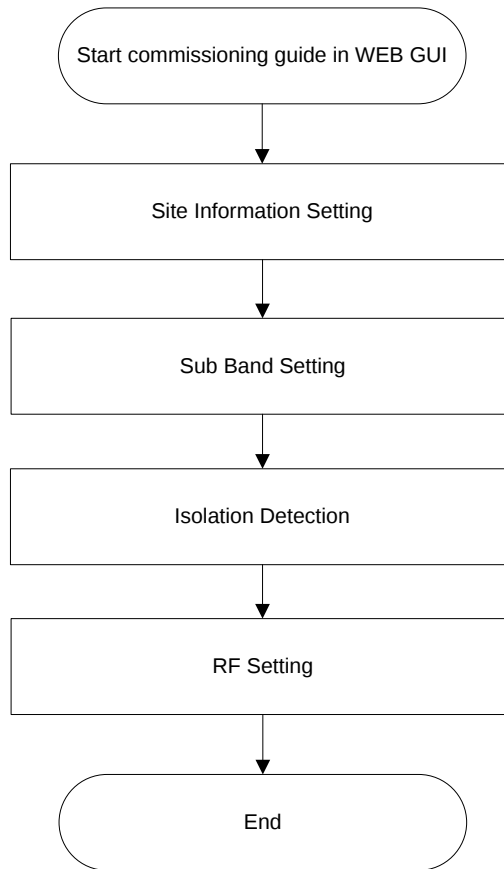


Figure 7: Commissioning Procedure

Table 4: Commissioning Task Explanation

Commissioning Tasks	Observation
1. Site Information Setting	● Site ID, Dev ID, Dev Info, Longitude , Latitude, Date/time setting
2. Sub Band Setting	● Sub Band Frequency setting.
3. Isolation detection	● Detect isolation of service antenna and donor antenna.
4. RF Setting	● DL_Target and the DL frequency center, the filter bandwidth setting and the switch setting.
5. Recommended DL and UL gain parameters	● The commissioning guide will provide recommended DL/UL gain settings. ● Users will still need to set all the gains manually in the “Device” pages, and the frequencies for all the independent channels in the same “Device” pages after the commissioning process is finished.

End of Section

5 WEB GUI

The PS BDA can be monitored and controlled via the WEB GUI; use the following guide to finish system parameter setting and commissioning.

5.1 WEB GUI CONNECTION

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

Step 2: Open a browser (browser IE7.0, IE8.0, Chrome or Firefox, suggested display resolution is 1024×768), input Web GUI **IP address: 192.168.8.101**, click [Enter].

NOTE:

- DHCP and DNS are also available to login to the Web GUI. The domain name is: www.combaomt.com.
- Advise to clear all the history record of Browse before connecting BDA every time.

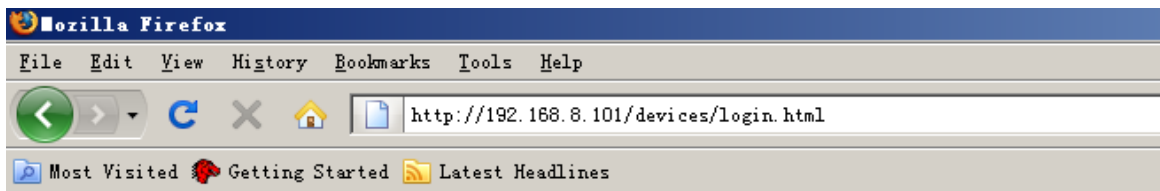


Figure 8: Input IP Address

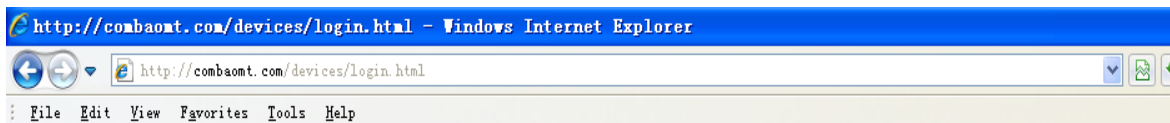


Figure 9: Input Domain Name

Step 3: Input **User Name: admin**; **Password** (default password: **admin**). Click [Log in].



Figure 10: Input User Name and Password

5.2 WEB GUI INTRODUCTION

After log in, the Web GUI main screen will appear.

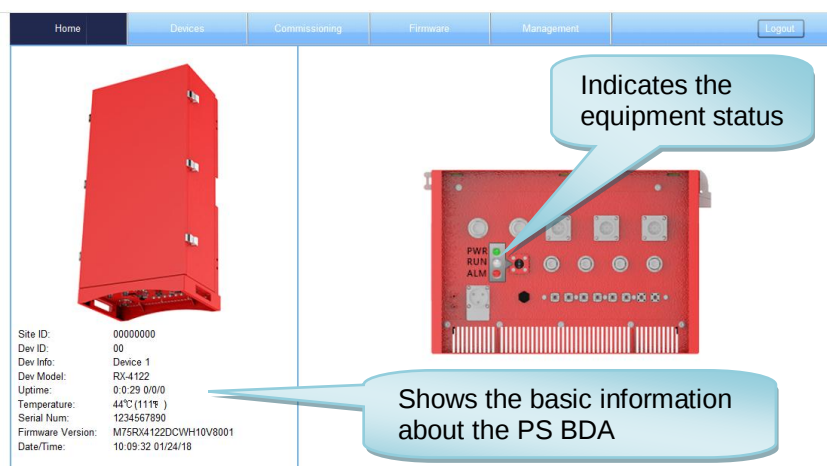


Figure 11: Web GUI Main Screen

On Comba Web GUI Home Screen, there are four Menu bars: **[Devices]**, **[Commissioning]**, **[Firmware]** and **[Management]**.

5.2.1 [DEVICES]

The [Devices] Screen shows the equipment status, such as PA status, alarm information, etc.

Overview Screen

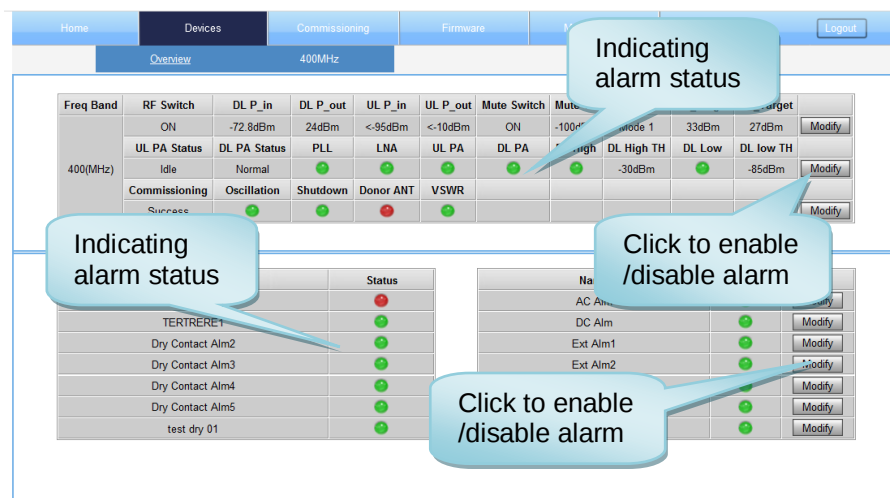


Figure 12: Overview Screen

400MHz Screen-Class A

This screen is only available for 400MHz PS BDA Class A

Sub Band	DL Freq Low	DL Freq High	Switch
1	450MHz	453.5MHz	ON
2	480MHz	482MHz	ON
3	507MHz	509MHz	OFF
4	470MHz	472MHz	OFF

Tips: Please turn on the subband switch in order of 1-4, then turn off in order of 4-1.

Figure 13: 400MHz Screen 1

CH	DL Freq	Filter	DL P_in	DL P_out	UL P_in	UL P_out	UL Att	UL Gam	UL Sat	Switch	Batch
09	460306.25kHz	6.25kHz	NA	NA	NA	NA	65dB	65dB	65dB	OFF	Modify
10	450003.5kHz	6.25kHz	NA	NA	NA	NA	65dB	65dB	65dB	OFF	Modify
11	468693.75kHz	6.25kHz	NA	NA	NA	NA	65dB	65dB	65dB	OFF	Modify
12	468843.75kHz	6.25kHz	NA	NA	NA	NA	65dB	65dB	65dB	OFF	Modify
13	452006.25kHz	6.25kHz	<-95dBm	<-2dBm	<-95dBm	<-10dBm	75dB	72dB	72dB	ON	Modify
14	453006.25kHz	6.25kHz	<-95dBm	<-2dBm	<-95dBm	<-10dBm	75dB	72dB	72dB	ON	Modify
15	454006.25kHz	12.5kHz	NA	NA	NA	NA	65dB	65dB	65dB	OFF	Modify
16	5006.25kHz	12.5kHz	NA	NA	NA	NA	65dB	65dB	65dB	OFF	Modify

Figure 14: 400MHz Screen 2

400MHz Screen-Class B

Click to set Freq Low and High, DL/UL Gain, Enable/disable RF switch.

Sub Band	DL Freq Low	DL Freq High	DL P_in	DL P_out	UL P_in	UL P_out	DL Gain	UL Gain	Switch	Modify
1	450MHz	453.5MHz	<-95dBm	<-2dBm	<-95dBm	<0dBm	95dB	95dB	ON	Modify
2	480MHz	482MHz	<-95dBm	<-2dBm	<-95dBm	<0dBm	95dB	95dB	ON	Modify
3	470MHz	473MHz	NA	NA	NA	NA	95dB	95dB	OFF	Modify
4	507MHz	509MHz	NA	NA	NA	NA	95dB	95dB	OFF	Modify

DL Freq Low and High of sub-bands

RF parameters of sub-bands

Sub-bands switch status

Tips: Please turn on the subband switch in order of 1-4, then turn off it

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Figure 15: 400MHz Screen

5.2.2 [COMMISSIONING]

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

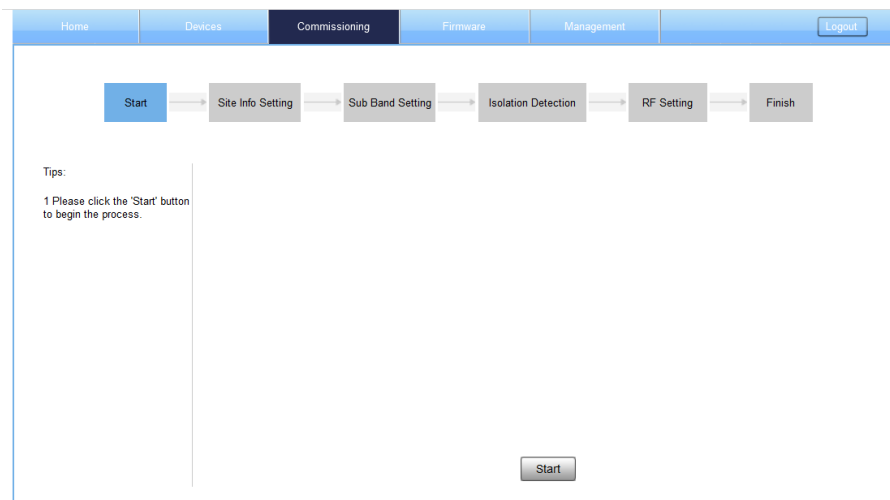


Figure 16: [Commissioning] Screen

5.2.3 [FIRMWARE]

There are two functions on the [Firmware] bar: [upgrade] and [swap]. [Upgrade] is used to upgrade software, and [Swap] is to replace the current firmware version with the previous one.

Follow the steps shown below figure to upgrade the firmware.

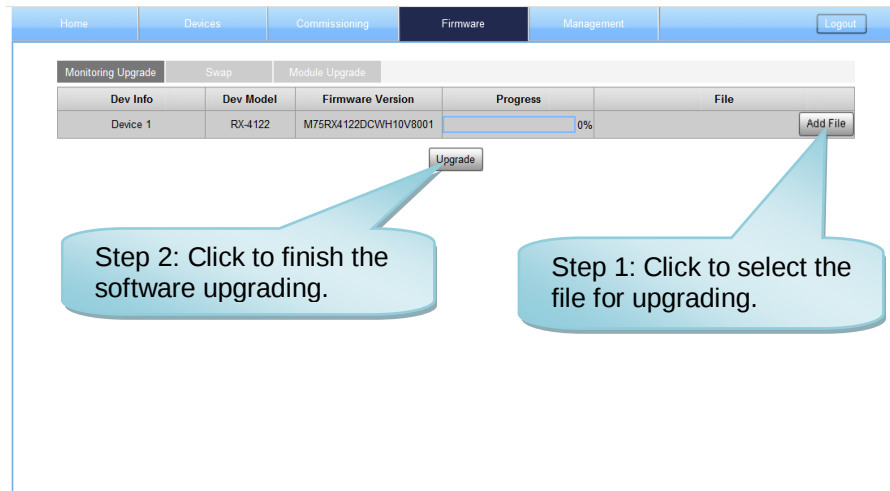


Figure 17: [Firmware] Screen – MCU Firmware Upgrade



Figure 18: [Firmware] Screen – Firmware Swap

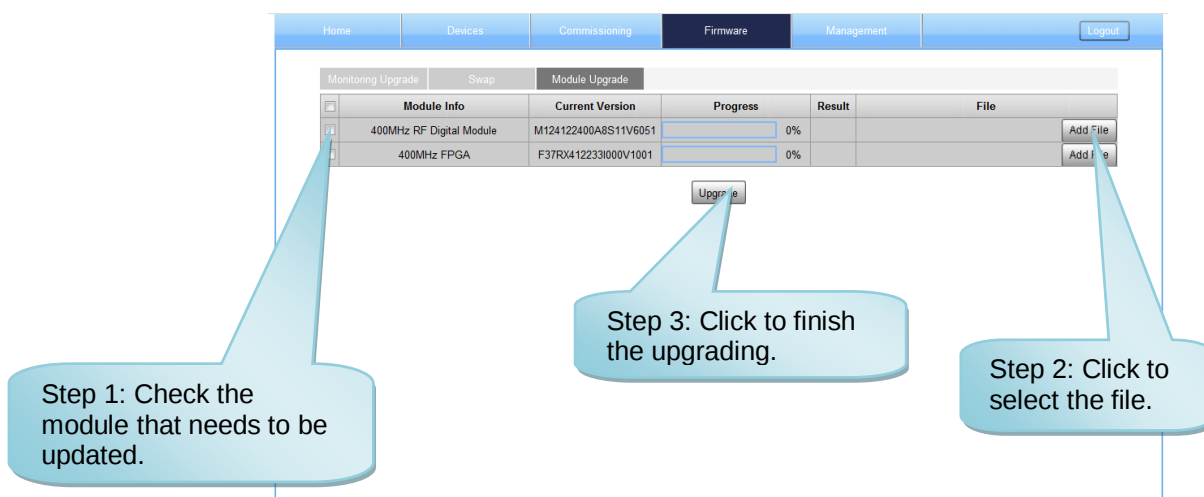


Figure 19: [Firmware] Screen – Module Update

5.2.4 [MANAGEMENT]

Other parameters can be configured on the [Management] Screen.

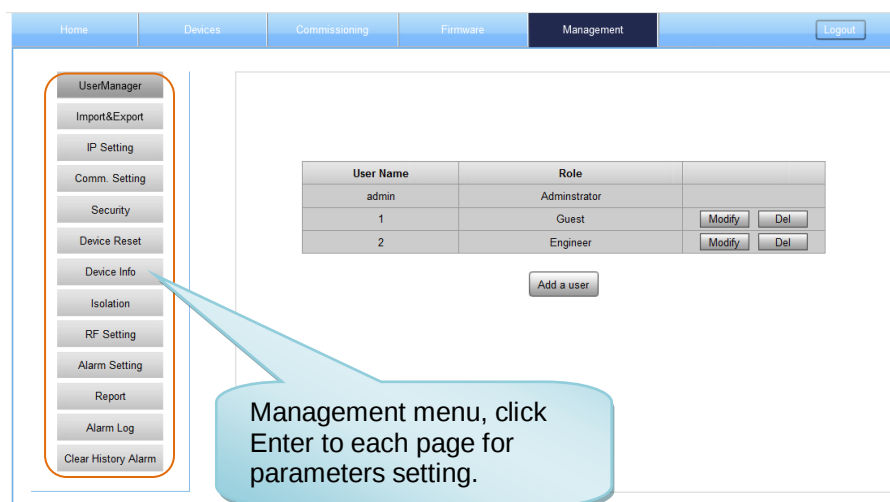


Figure 20: [Management] Screen

There are nine function bars list on the left side of the [Mangement] Screen.

➤ **Inport&Export**

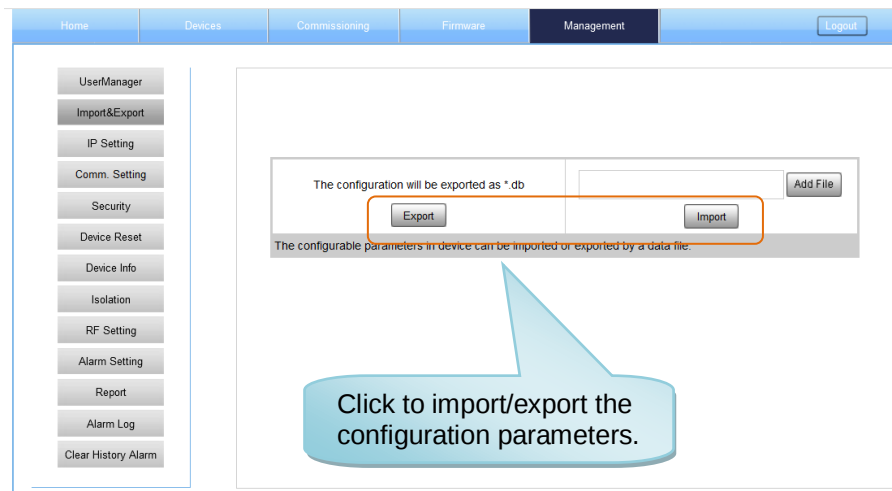


Figure 21: Management – Import & Export

The parameters that can be imported / exported include sub band, alarm enable, ATT value, RF switch, and DL output power.

This function can help users quickly configure PS BDA parameters. For example, if one PS BDA is finished configuration, users can export the parameters and save it as a file on the PC, and then import this file to other PS BDAs for faster set up of additional PS BDAs.

➤ IP Setting

Name	Current Value	Config Value
MAC Address	00-00-00-00-00-00	
IP Address	192.168.0.100	
Default GateWay	192.168.0.101	
SubNet Mask	255.255.255.1	

Submit

Configure the IP address for remote monitoring.

Figure 22: Management – IP Setting

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

➤ **Comm. Setting**

Home Devices Commissioning Firmware **Management** Logout

UserManager
Import&Export
IP Setting
Comm. Setting
Security
Device Reset
Device Info
Isolation
RF Setting
Alarm Setting
Report
Alarm Log
Clear History Alarm

Communication Types: ☒ SNMP ☐ ETHERNET
Snmp Version: ☐ V2C ☒ V3

	Name	Current Value	Config Value
☐	Trap Des: IP1	0.0.0.1	
☐	Trap Des: IP2	0.0.0.2	
☐	Trap Des: IP3	0.0.0.3	
☐	Port Num	160	
☐	User Name	admin	
☐	User Pwd	123456789	
☐	Encry Algorithm	AES	NONE
☐	Authentication Algorithm	SHA	NONE
☐	Authentication Pwd	12345678	

Submit

Figure 23: Management – Comm. Setting

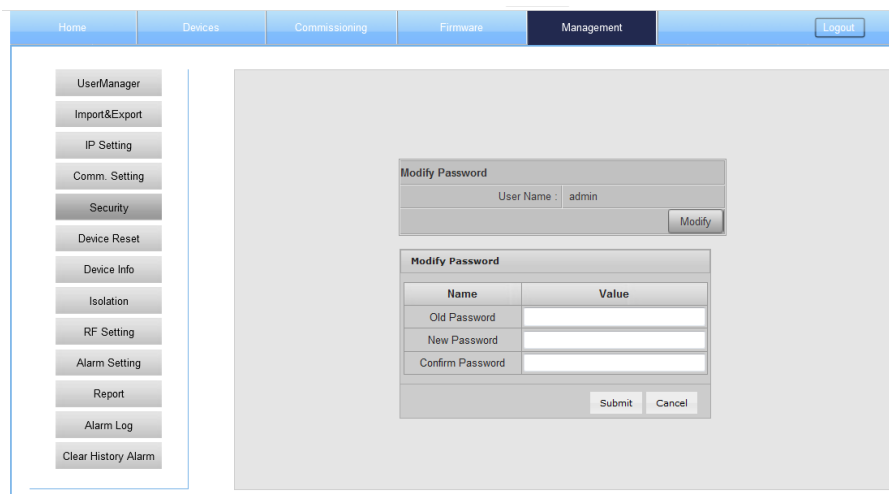
Note: There are 4 available communication types: SMS, PS, SNMP and ETHERNET. You can choose a suitable type for remote monitoring.

➤ Security

The screenshot shows the 'Management' section of the Comba RX-4122 web interface. The 'Security' option in the left sidebar is selected. The main content area displays a 'Modify Password' form. The form has a title 'Modify Password' and a 'User Name' field with the value 'admin'. A 'Modify' button is located to the right of the 'User Name' field.

Figure 24: Management – Security

Click , [Modify Password] window will pop-up.

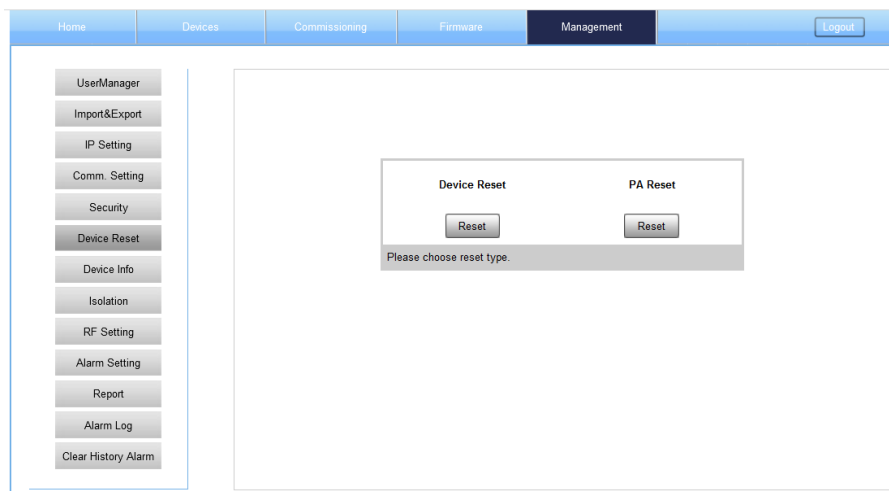


The screenshot shows the Comba RX-4122 Management web interface. The top navigation bar includes Home, Devices, Commissioning, Firmware, and Management (selected), with a Logout button on the right. A left sidebar contains a list of management functions: UserManager, Import&Export, IP Setting, Comm. Setting, Security, Device Reset, Device Info, Isolation, RF Setting, Alarm Setting, Report, Alarm Log, and Clear History Alarm. The main content area displays the 'Modify Password' window. This window has a 'User Name' field with 'admin' and a 'Modify' button. Below it is a form with three input fields: 'Old Password', 'New Password', and 'Confirm Password', with 'Submit' and 'Cancel' buttons at the bottom.

Figure 25: Modify Password

Note: Username cannot be modified.

➤ Device Reset



The screenshot shows the Comba RX-4122 Management web interface with the 'Device Reset' window open. The navigation and sidebar are identical to Figure 25. The main content area displays the 'Device Reset' window, which has two tabs: 'Device Reset' and 'PA Reset'. Each tab has a 'Reset' button. Below the buttons is a message: 'Please choose reset type.'

Figure 26: Management – Device Reset

Note: Click , all the parameters and alarms will be reset to factory default value. The Device Reset process will last about 2~4 minutes. For PMU monitor reset, users need to re-login to the WEB GUI.

➤ **Device Info**

The screenshot shows the 'Management' tab selected in the top navigation bar. The sidebar on the left contains the following options: UserManager, Import&Export, IP Setting, Comm. Setting, Security, Device Reset, Device Info, Isolation, RF Setting, Alarm Setting, Report, Alarm Log, and Clear History Alarm. The main content area displays the following device information:

Site ID:	00000000
Dev ID:	00
Dev Info:	Device 1
Dev Model:	RX-4122
Serial Num:	1234567890
Firmware Version:	M75RX4122DCWH10V8001
Longitude:	E33
Latitude:	N65
Date/Time:	10:46:54 01/24/18

Below the information is a table for configuration values:

Name	Config Value
Site ID	
Dev Info	
Dev Model	
Longitude	
Latitude	
Date/Time	

Callouts indicate: 'Input device information.' pointing to the 'Dev Info' field, and 'Click here to get PC time.' pointing to the 'Date/Time' field.

Figure 27: Management – Device Info

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

➤ **Isolation**

The screenshot shows the 'Management' tab selected in the top navigation bar. The sidebar on the left contains the following options: UserManager, Import&Export, IP Setting, Comm. Setting, Security, Device Reset, Device Info, Isolation, RF Setting, Alarm Setting, Report, Alarm Log, and Clear History Alarm. The main content area displays a table for isolation settings:

Freq Band	Isolation
400(MHz)	115 dB

A 'Check' button is located next to the 'Isolation' value.

Figure 28: Management – Isolation

Note: This Step is the same as step 5 of [Commissioning]. Users can check isolation again by clicking the Check button, the detection range is from 65dB to 125dB.

➤ RF setting

	Name	Current Value	Config Value
☐	DL PA Temperature Protection Switch	ON	ON
☐	UL PA Mute Switch	ON	ON

Submit

Tips:

i. DL PA Temperature Protection Switch:
 ON - The Power Amplifier will shut down if the operating temperature exceeds 90°C (194 °F).
 OFF - The Power Amplifier will not be shut down due to high temperature.

ii. UL PA Mute Switch:
 ON - The Uplink Power Amplifier will idle if the uplink squelch is triggered.
 OFF - The Uplink Power Amplifier will not idle if the uplink squelch is triggered, only the digital filters will shutdown.

Figure 29: Management – RF Setting

➤ Alarm Setting

Item	Status	Name	
Dry Contact Alm1	●	TERTRE1	Setting
Dry Contact Alm2	●	Dry Contact Alm2	Setting
Dry Contact Alm3	●	Dry Contact Alm3	Setting
Dry Contact Alm4	●	Dry Contact Alm4	Setting
Dry Contact Alm5	●	Dry Contact Alm5	Setting
Dry Contact Alm6	●	test dry 01	Setting

Ext Alm.	Status	Name	Trigger Level	
Ext Alm1	●	Ext Alm1	Low Level	Setting
Ext Alm2	●	Ext Alm2	Low Level	Setting
Ext Alm3	●	Ext Alm3	Low Level	Setting
Ext Alm4	●	Ext Alm4	Low Level	Setting

Alarm detection duration

Duration(10s) : 1

Submit

Click to start the alarm test.

Figure 30: Management – Alarm Setting

➤ **Report**

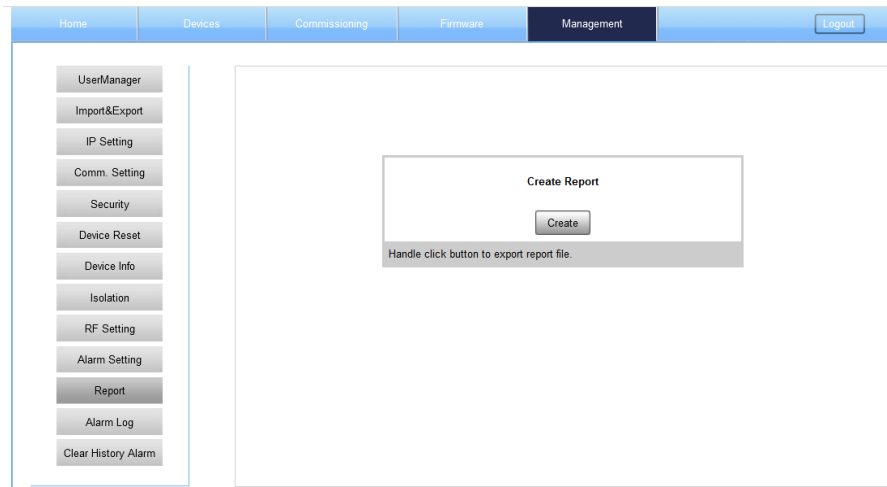


Figure 31: Management – Report

Note: Click Create to create the report (the report can't be created in IE browser) and make sure that PDF Reader software is installed on the computer. If not, the report will not be visible.

The device basic information, an overview of RF information and sub-band RF information are included in this report. Please refer to appendix D for an example of device report.

➤ **Alarm Log**

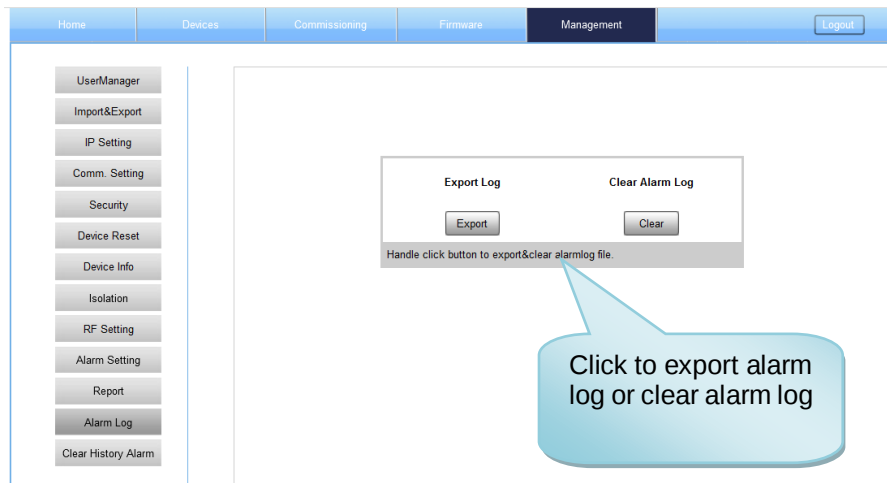


Figure 32: Management – Alarm Log

➤ **Clear History Alarm**

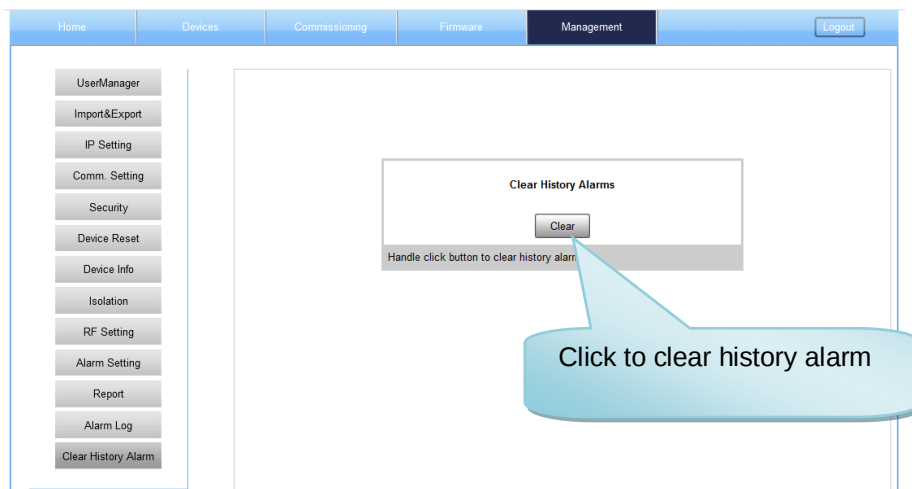


Figure 33: Management – Clear History Alarm

5.3 COMMISSIONING PROCEDURE

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

Step 1: Click the Menu bar [Commissioning] on home screen, a work flow will be displayed.

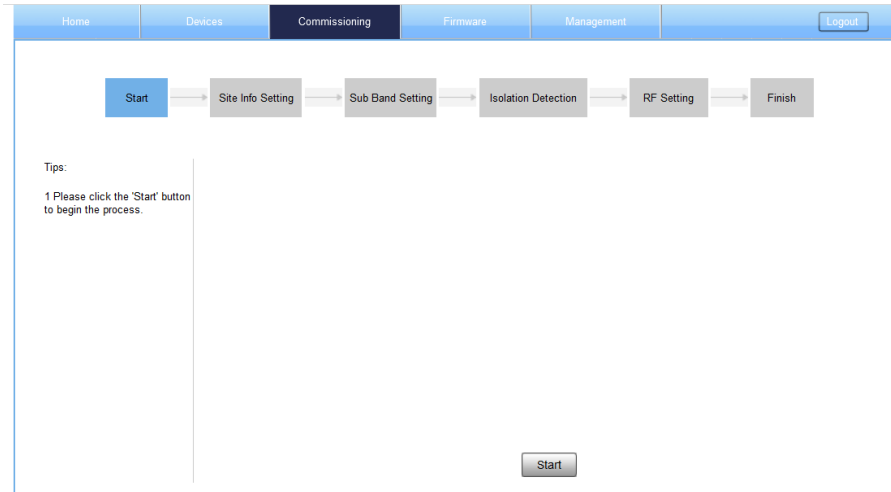


Figure 34: Commissioning Procedure – Start

Step 2: Click  to start the process.

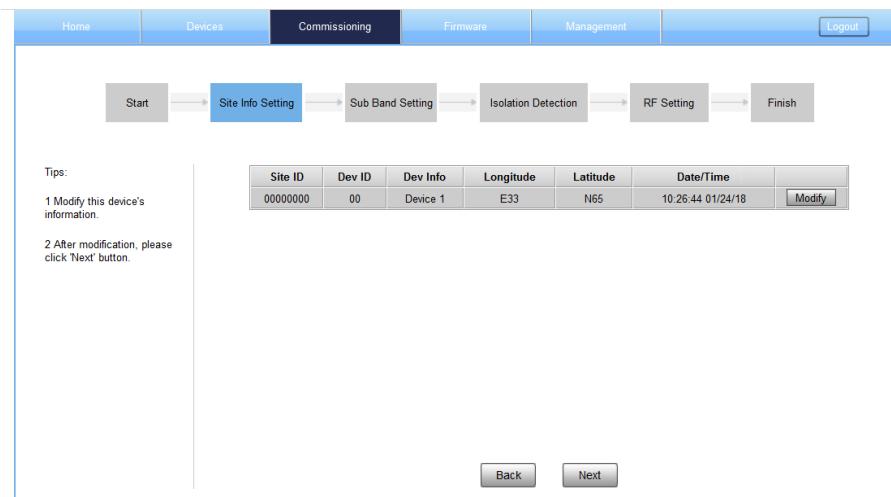


Figure 35: Commissioning Procedure – Site Info. Setting

Step 3: Click , to set the site information.

Home Devices **Commissioning** Firmware Management Logout

Start → Site Info Setting → Sub Band Setting → Isolation Detection → RF Setting → Finish

Tips:

- 1 Modify this device's information.
- 2 After modification, please click 'Next' button.

Site ID	Dev ID	Dev Info	Longitude	Latitude	Date/Time	
00000000	00	Device 1	E33	N65	10 26:44 01/24/18	Modify

Setting

	Name	Current Value	Config Value
☐	Site ID	00000000	
☐	Dev Info	Device 1	
☐	Longitude	E33	
☐	Latitude	N65	
☐	Date/Time	10 26:44 01/24/18	

Submit Cancel

Back Next

Figure 36: Device Information Setting

It is mainly used to record device location and Date/Time provides a time reference. Clicking the Config Value of Date/Time will update the Date/Time automatically.

Step 4 :

- a. Click  to enter to Sub Band Setting/Channel parameters setting-Class A

Home Devices **Commissioning** Firmware Management Logout

Start → Site Info Setting → Sub Band Setting → Isolation Detection → RF Setting → Finish

Tips:

- 1 Modify this device's sub band info.
- 2 After modification, please click 'Next' button.
- 3 Please turn on the subband switch in order of 1-4, then turn off in order of 4-1.

Sub Band	DL Freq Low	DL Freq High	Switch	
1	450MHz	453.5MHz	ON	Modify
2	480MHz	482MHz	ON	Modify
3	507MHz	509MHz	OFF	Modify
4	470MHz	472MHz	OFF	Modify

Back Next

Figure 37: Device Sub Band Setting-Class A

CH	DL Freq	Filter	DL P_in	DL P_out	UL P_in	UL P_out	DL Gain	UL Gain	Switch	Batch
09	460306 25kHz	6.25kHz	NA	NA	NA	NA	65dB	65dB	OFF	Modify
10	450003 5kHz	6.25kHz	NA	NA	NA	NA	65dB	65dB	OFF	Modify
11	468693 75kHz	6.25kHz	NA	NA	NA	NA	65dB	65dB	OFF	Modify
12	468843 75kHz	6.25kHz	NA	NA	NA	NA	65dB	65dB	OFF	Modify
13	452006 25kHz	6.25kHz	<-95dBm	<-2dBm	<-95dBm	<-10dBm	75dB	72dB	ON	Modify
14	453006 25kHz	6.25kHz	<-95dBm	<-2dBm	<-95dBm	<-10dBm	75dB	72dB	ON	Modify
15	454006 25kHz	12.5kHz	NA	NA	NA	NA	65dB	65dB	OFF	Modify
16	455006 25kHz	12.5kHz	NA	NA	NA	NA	65dB	65dB	OFF	Modify

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Figure 38: Channel parameters setting-Class A

Reminder:

- Make sure the frequency of sub-bands match the actual frequency of filters, or BDA cannot work normally.
- If the frequency is within [450MHz,470MHz], the bandwidth between DL Freq Low and DL Freq High can be adjusted from 0.2 to 5MHz only. If the frequency is within [470,512], the bandwidth between DL Freq Low and DL Freq High can be adjusted from 0.2-3MHz.
- The frequency edges of two sub bands can be overlap, but they cannot be cross-contained.
- The total channel quantity is 32CH within 4 sub-bands.
- The channel center frequency must be within the frequency range of its relative sub-band, if it is not within the range, the system will show a reminder window to show the setting unsuccessful.
- If the sub band is off, all the channels belong to the sub band are auto set to off.
- The procedure of sub band switch on: sub band 1 is first, and then 2, 3, 4. The procedure of sub band switch off: sub band 4 is first, and then 3, 2, 1. And the isolation use sub band 1 to test, so make sure sub band 1 is always on when BDA is working.

- b. Click  to enter to Sub Band Setting/Channel parameters setting-Class B

Tips:

1. Modify this device's sub band info.
2. After modification, please click 'Next' button.
3. Please turn on the subband switch in order of 1-4, then turn off in order of 4-1.

Sub Band	DL Freq Low	DL Freq High	DL P_in	DL P_out	UL P_in	UL P_out	DL Gain	UL Gain	Switch	
1	450MHz	453.5MHz	<-95dBm	<-2dBm	<-95dBm	<0dBm	95dB	95dB	ON	Modify
2	480MHz	482MHz	<-95dBm	<-2dBm	<-95dBm	<0dBm	95dB	95dB	ON	Modify
3	470MHz	473MHz	NA	NA	NA	NA	95dB	95dB	OFF	Modify
4	507MHz	509MHz	NA	NA	NA	NA	95dB	95dB	OFF	Modify

Back Next

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Figure 39: Device sub-band setting-Class B

Reminder:

- Make sure the frequency of sub-bands match the actual frequency of filters, or BDA cannot work normally.
- If the frequency is within [450MHz,470MHz], the bandwidth between DL Freq Low and DL Freq High can be adjusted from 0.2 to 5MHz only. If the frequency is within [470,512], the bandwidth between DL Freq Low and DL Freq High can be adjusted from 0.2-3MHz.
- The frequency edges of two sub bands can be overlap, but they cannot be cross-contained.

NOTE: Make sure the device is connected with appropriate donor and service antennas before proceeding to step 5.

Step 5: Click  to enter to Isolation Detection Screen.

Tips:

- 1 If you want to detect isolation, please click the 'Check' button to start isolation detection.
- 2 Otherwise click the 'Skip' button.

Freq Band	Isolation
400MHz	115 dB

Isolation check is under process, please wait.

Back Skip Check

Figure 40: Commissioning Procedure – Isolation Detection

- Click  to start Isolation Detecting, then a [Confirm] window will pop-up.

- Click  to continue. If isolation detection passes, the process will go to Isolation Detection Finish shown as Figure 43. If failed, a Tips window will pop-up, users need to check whether the system isolation is adequate.

NOTE: At the end of the first frequency band commissioning, users can start other frequency band commissioning.

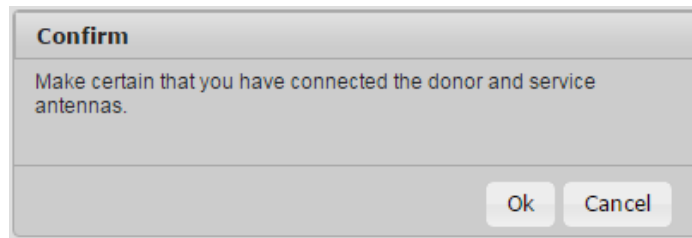


Figure 41: Commissioning Procedure – Isolation Detection Confirm

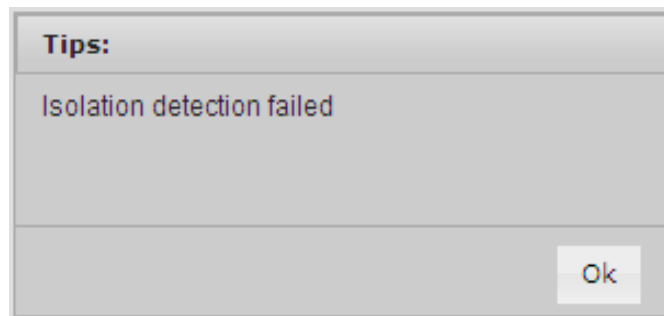


Figure 42: Commissioning Procedure – Isolation Detection Failed

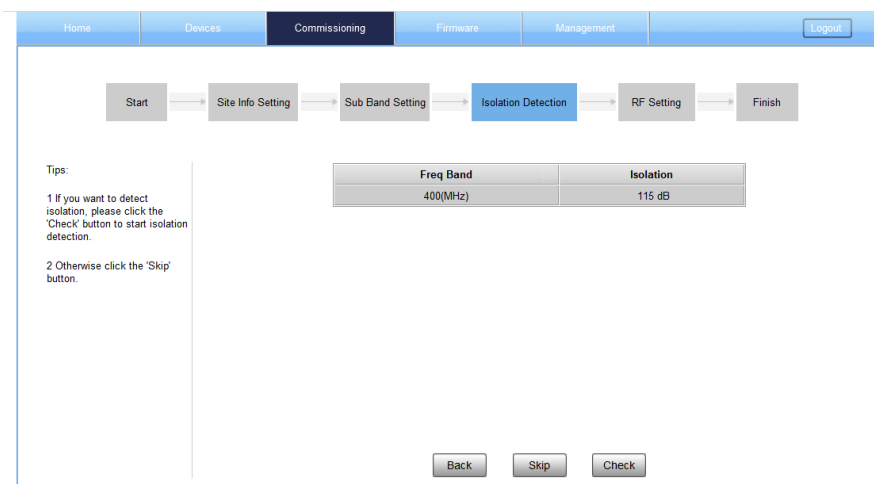


Figure 43: Commissioning Procedure – Isolation Detection Finish

Step 6: RF Setting Screen for setting the center frequency.

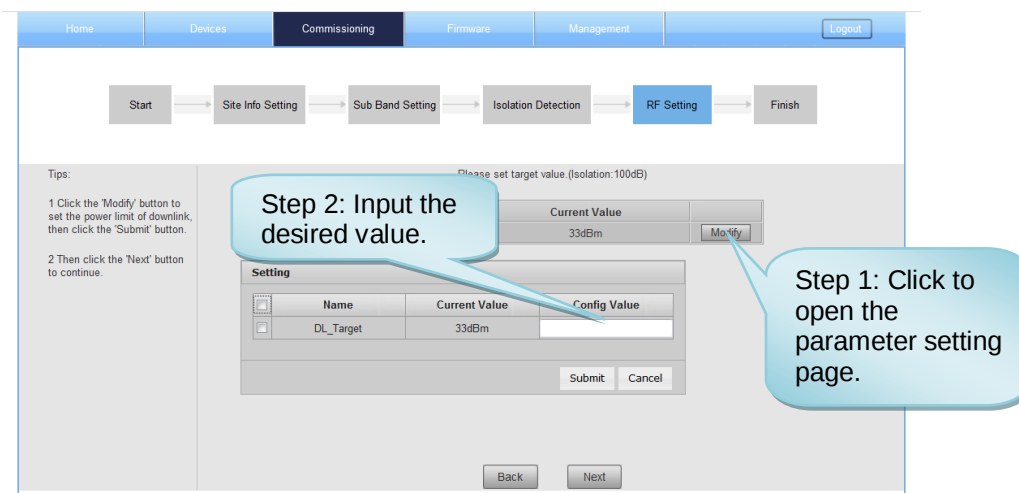


Figure 44: Commissioning Procedure – Center Frequency Setting

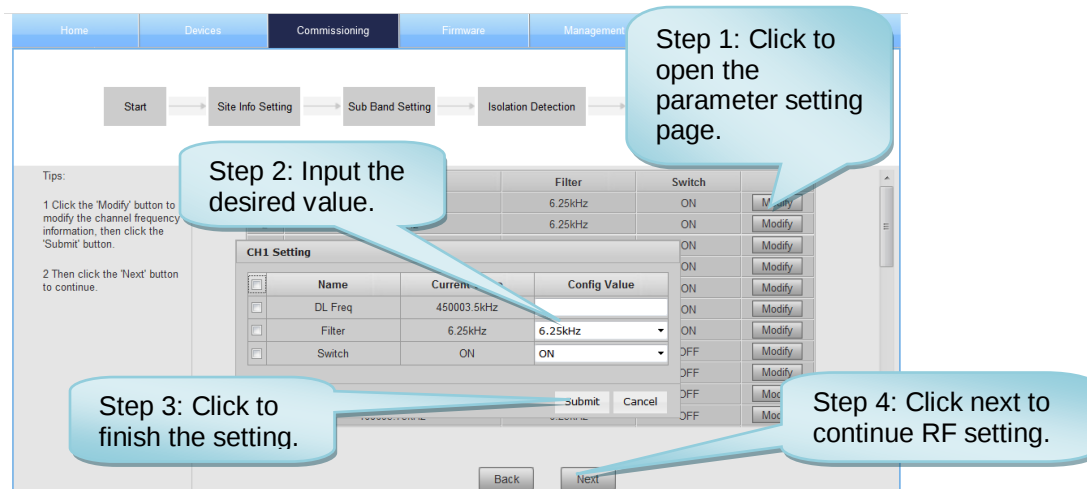
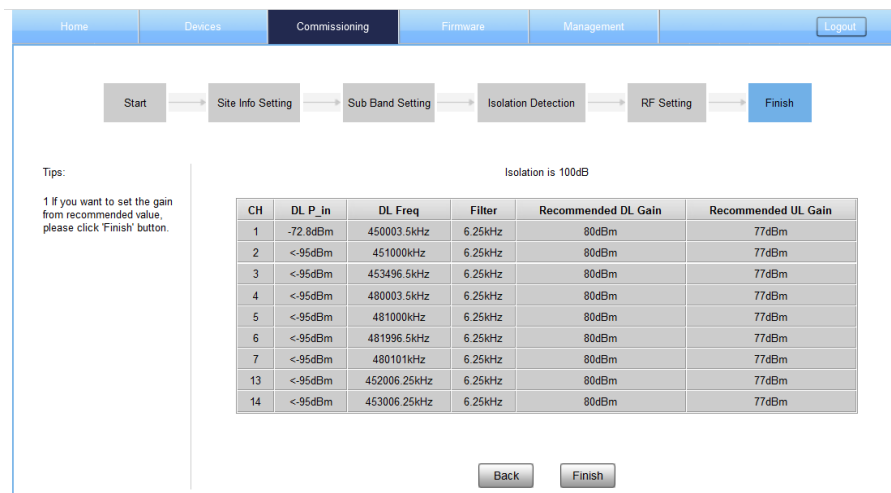


Figure 45: Commissioning Procedure – Channel Number Setting

Step 7: Click  to finish the commissioning. In this window, a summary of device setting is shown.



Home Devices **Commissioning** Firmware Management Logout

Start → Site Info Setting → Sub Band Setting → Isolation Detection → RF Setting → **Finish**

Tips:
1 If you want to set the gain from recommended value, please click 'Finish' button.

Isolation is 100dB

CH	DL P. In	DL Freq	Filter	Recommended DL Gain	Recommended UL Gain
1	-72.8dBm	450003.5kHz	6.25kHz	80dBm	77dBm
2	<-95dBm	451000kHz	6.25kHz	80dBm	77dBm
3	<-95dBm	453496.5kHz	6.25kHz	80dBm	77dBm
4	<-95dBm	480003.5kHz	6.25kHz	80dBm	77dBm
5	<-95dBm	481000kHz	6.25kHz	80dBm	77dBm
6	<-95dBm	481996.5kHz	6.25kHz	80dBm	77dBm
7	<-95dBm	480101kHz	6.25kHz	80dBm	77dBm
13	<-95dBm	452006.25kHz	6.25kHz	80dBm	77dBm
14	<-95dBm	453006.25kHz	6.25kHz	80dBm	77dBm

Back Finish

Figure 46: Commissioning Procedure – Finish

End of Section

6 MAINTENANCE

The PS BDA is designed for trouble-free operation and generally does not need maintenance. Maintenance activities should only be carried out by trained personnel.

Periodic inspection of the repeater equipment(s) is recommended, the recommended tasks includes:

- Verify the direction and position of antennas. Re-align if necessary.
- Make sure the cable connector and sealing on the RF cable connectors are not damaged.
- Verify lightning and grounding protection is in good condition.

End of Section

7 APPENDICES

7.1 APPENDIX A:

Antenna installation:

Installation of an antenna must comply with the FCC RF exposure requirements. The antenna used for this transmitter must be mounted on permanent structures.

The FCC regulations mandate that the ERP of type B signal boosters should not exceed 5W, this is equivalent to 8.2W EIRP (39.1dBm).

Therefore the max antenna gain allowed for this type of signal booster should be limited to the values given by equation 1 (below) for the service antenna.

Equation (1) – Max Service antenna gain
 Max Service antenna gain (dBi) = $39.1 - (36\text{dBm} - \# \text{ of antennas in dB} - \text{cable losses in dB})$.

For example:

No. of Antennas	Cable losses	Max Allowed Antenna Gain
4	3	$39.1 - (36 - 6 - 3) = 12.1\text{dBi}$
1	3	$39.1 - (36 - 0 - 3) = 6.1\text{dBi}$
10	3	$39.1 - (36 - 10 - 3) = 15.1\text{dBi}$

Compliance with FCC deployment rule regarding the radiation of noise

Good engineering practice must be used in regard to the signal booster's noise radiation. Thus, the gain of the signal booster should be set so that the ERP of the output noise from PS BDA should not exceed the level of -43 dBm in 10 kHz measurement bandwidth.

In the event that the noise level measured exceeds the aforementioned value, the PS BDA gain should be decreased accordingly.

In general, the ERP of noise on a spectrum more than 1 MHz outside of the pass band should not exceed -70 dBm in a 10 kHz measurement bandwidth.

RX-4122 PS BDA has a noise level of -21 dBm in 100 kHz (equals to -31dBm in 10kHz) measurement at 1 MHz spectrum outside the pass band of BDA and an in-band noise level at around -50 dBm in a 10 kHz bandwidth. Therefore, the noise at the antenna input port should be calculated based on equation (2).

Equation (2) – Input Noise to service antenna
 Input Noise to service antenna:
 $-31\text{dBm} - \text{antenna splitter losses in dB} - \text{out of band rejection of filters} - \text{cable loss in dB}$

For example: in band noise

RX-4122 PS BDA connected to 10 service antennas with a 100m long ½ inch cable.

Losses of such a cable with the connectors = ~ 12dB

Assuming 10 service antennas: antenna splitter losses = 11 dB

Based on equation (2) Input antenna noise (to the antenna) = $-51 - 12 - 0 - 11 = -74\text{ dBm ERP}$

The in-band input noise to the antenna should be $-51 - 12 - 0 - 11 = -63\text{dBm ERP}$

For example: Out of band noise

RX-4122 PS BDA connected to 10 service antennas with a 100m long ½ inch cable.

Losses of such a cable with the connectors = ~ 12dB

Assuming 10 service antennas: antenna splitter losses = 11 dB

Out of band rejection of filters: more than 45dBc

Based on equation (3) Input antenna noise (to the antenna) = $-31 - 12 - 45 - 11 = -99\text{dBm ERP}$

The Out of-band input noise to the antenna should be $-31 - 12 - 45 - 11 = -99\text{dBm ERP}$

Conclusion:

Good engineering practice requires that in general when the out of band noise measured at the service antenna input is more than -70 dBm per 10 kHz measurement bandwidth, an external band pass filter should be added to attenuate the out of band noise level.

All Comba BDAs include high selectivity duplexers and filters to attenuate the out of band noise.

Compliance with FCC Part 90.219 (d)(6)(i)

The deployment rules require that the ERP of intermodulation products should in general not exceed -30dbm. This is not a formidable task since in the vast majority of the passive DAS installations; the signal loss in the DAS due to splitting to multiple antenna and cable losses is significant.

As well as the above RX-4122 PS BDA is more likely to be used in a multicarrier environment (more than 2 carriers), which in turn will reduce the intermodulation products produced by the device.

The following statement is already in the user manual to highlight the requirement to the installer for the instances where the above does not reduce the ERP of the intermodulation products to -30dBm.

'The installation procedure must result in RX-4122 PS BDA complying with FCC requirements 90.219(d). In order to meet FCC requirements 90.219(d), it may be necessary for the installer to reduce the UL and/or DL output power for certain installations.'

7.2 APPENDIX B: TOOLS

The following are the recommended list of tools for new installation and routine maintenance.

- Slotted Screwdriver
- Philips Screwdriver
- Ring Spanner (Assorted size: 12~20mm)
- Electrically operated drill and masonry drill bits Ø12mm
- Anti-static Wrist Strap
- Side Cutter
- Frequency Counter (e.g. FLUKE PM6685R)
- RF Power Meter (e.g. Bird 5000)

7.3 APPENDIX C: DECLARATION OF HARMFUL SUBSTANCES AND CONTENT

Product Name: Public Safety BDA

Model: RX-4122

Harmful substance and content of this product as below table shown:

Part Name	Harmful Substance					
	Pb	Hg	Cd	Cr (VI)	PBB	PBDE
A	×	○	○	○	○	○
B	×	○	○	○	○	○
Note: Above table complies with SJ/T 11364. ○: Indicates that the harmful substance content in all homogeneous materials for corresponding part is under the limited requirement of GB/T 26572. ×: Indicates that the harmful substance content in at least one single homogeneous material for the corresponding part exceeds the limited requirement of GB/T 26572. Remark: The content of the parts marked with “×”above exceeds the requirement as there is still no mature alternative technologies to achieve the replacement of poisonous and harmful materials or elements.						

7.4 APPENDIX D: 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



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