Comba

CriticalPoint Public Safety BDA

DIGITAL BAND SELECTIVE REPEATER

USER MANUAL

RXA3748/RXA3792

RXB3748/RXB3792

QE: 1-0-0

编 制：_____

审 核：_____

会 签：_____

标准化：_____

批 准：_____

京信通信系统（中国）有限公司

Comba

CriticalPoint

PUBLIC SAFETY BI-DIRECTIONAL AMPLIFIER

USER MANUAL

RXA3748/RXA3792

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QE: 1-0-0

Comba Telecom Ltd.

The information contained herein is the responsibility of and is approved by the following, to whom all enquiries should be directed:

0.1 CONTENTS

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1.2 INDEX TO FIGURES AND TABLES

1.3 HISTORY

Change No.	ENU	Details Of Change
1	1-0-0	This manual first created and issued in May. 2020.

1.4 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

1.5 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 31.2cm 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 (FCC ID: PX8RXA37) or Class B (FCC ID:PX8RXB37) 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. FCC regulation mandate that the ERP of type B signal boosters should not exceed 5W, this booster has a maximum programmable composite output power of 5W(37dBm) for Downlink, 1W(30dBm) for uplink. Therefore, the gain of the antenna should be of 0dBi or less.

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 RXA3748/RXA3792 (Class A), RXB3748/RXB3792 (Class B) is a new digital dual band public safety 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-7W22 helps eliminate adjacent channel interference to allow band selectivity and support 700MHz and 800MHz rebanding. Up to two non-contiguous frequency bands can be simultaneously supported in each of the 700MHz and 800MHz Public Safety frequencies via a web-based GUI, which provides versatility and total control to the user.

Main Features

- PS 700MHz and 800MHz.
- Class A BDA, 32 channels per band or Class B BDA, 3 sub-bands.
- Channel selective or Band selective, software programmable.
- Auto diagnostic.
- Uplink squelch, per channel for Class A only.
- User adjustable gain control (AGC), UL and DL independent per channel.
- 700MHz and 800MHz band compatible, software adjustable.
- Built in isolation testing (mandatory prior to commissioning the PS BDA).
- Easy commission and setup via Web-based GUI, and SNMP supported
- Weatherproof enclosure, IP65/NEMA4.
- Fully compliant with the 2016 NFPA 72 Code.
- Competitive size and weight.
- Alarming output to supervised circuits for: antenna failure, signal booster failure, and etc.

The following figure shows the enclosure of the PS BDA.

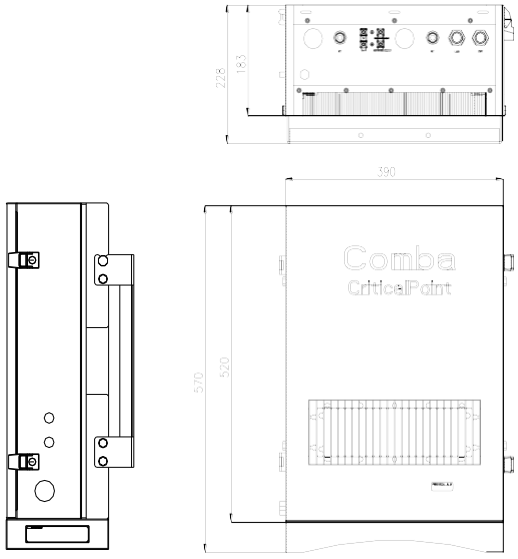


Figure 1: Front, Side and Bottom Views of the PS BDA Enclosure

Specifications-Class A (FCC ID:PX8RXA37)

Electrical			**700MHz**	**800MHz**
Frequency Range, Uplink		MHz	799-805	806-817
Frequency Range, Downlink		MHz	769-775	851-862
Channel Bandwidth		KHz	12.5/25/100	12.5/25/100
Number of Channels			32	32
Total Output Power, Uplink		dBm	30	
Total Output Power, Downlink		dBm	37	37
Maximum System Gain		dB	100	100
Gain Adjustment Range (1dB step)		dB	0-30	0-30
Pass Band Ripple, p-p		dB	≤ 5	≤ 5
Uplink Noise Figure		dB	≤ 5	≤ 5
System Group Delay	Bandwidth: 12.5KHz	μsec	≤ 35	≤ 35
	Bandwidth: 25KHz		≤ 25	≤ 35
Out-of-Band Suppression	Bandwidth: 12.5KHz	dBc	≥ 60 @ filter center + 75KHz	≥ 60 @ filter center + 75KHz
	Bandwidth: 25KHz		≥ 60 @ filter center + 75KHz	≥ 60 @ filter center + 75KHz
	Bandwidth: 100KHz		≥ 60 @ filter center + 200KHz	≥ 60 @ filter center + 200KHz
Intermodulation		dBm	≤ -13	≤ -13
Spurious	9kHz to 1GHz	dBm	FCC Compliance	FCC Compliance
	1GHz to 12.75GHz	dBm		
Maximum RF Input Power without Damage		dBm	-10	-10
Maximum RF Input Power without Overdrive		dBm	-20	-20
Input VSWR			≤ 1.5	≤ 1.5
Impedance		Ω	50	50
Mechanical				
Dimensions, H x W x D		in(mm)	22.4 x 15.4 x 9.0 (570 x 390 x 228)	
Weight (without bracket)		lb(kg)	66.2 (30)	
Power Supply		VAC	100-240/47-63Hz	
		VDC	-40 ~ -58	
Power Consumption	Single band	W	120	
	Dual band	W	200	
Enclosure Cooling			Convection	
RF Connectors			N-Female	
Test Port			SMA, -27dB	
Maximum Input for Dry Contact Port			24VDC, 1A / 110VAC, 0.5A	
Operating Temperature		°F (°C)	-27 to +140 (-33 to +60)	
Operating Humidity			≤ 95%	
Environmental Class			NEMA 4	

Note: Typical specifications at room temperature,

Specifications-Class B (FCC ID: PX8RXB37)

Electrical			**700MHz**	**800MHz**
Frequency Range, Uplink		MHz	788-798,799-805	806-816
Frequency Range, Downlink		MHz	758-768,769-775	851-861
Operating Bandwidth		MHz	0.2-10	0.2-10
Number of Sub Bands			3	3
Total Output Power, Uplink		dBm	30	
Total Output Power, Downlink		dBm	37	37
Maximum System Gain		dB	100	100
Gain Adjustment Range (1dB step)		dB	0-30	0-30
Pass Band Ripple, p-p		dB	≤ 5	≤ 5
Uplink Noise Figure		dB	≤ 5	≤ 5
System Group Delay		μsec	≤ 6.5	≤ 6.5
Out-of-Band Suppression		dBc	≥ 45 @ filter edge + 0.6MHz ≥ 60 @ filter edge + 1MHz	≥ 45 @ filter edge + 0.6MHz ≥ 60 @ filter edge + 1MHz
Intermodulation		dBm	≤ -13	≤ -13
Spurious	9kHz to 1GHz	dBm	FCC Compliance	FCC Compliance
	1GHz to 12.75GHz	dBm		
Maximum RF Input Power without Damage		dBm	-10	-10
Maximum RF Input Power without Overdrive		dBm	-20	-20
Input VSWR			≤ 1.5	≤ 1.5
Impedance		Ω	50	50
Mechanical				
Dimensions, H x W x D		in(mm)	22.4 x 15.4 x 9.0 (570 x 390 x 228)	
Weight (without bracket)		lb(kg)	66.2 (30)	
Power Supply		VAC	100-240/47-63Hz	
		VDC	-40 ~ -58	
Power Consumption	Single band	W	120	
	Dual band	W	200	
Enclosure Cooling			Convection	
RF Connectors			N-Female	
Test Port			SMA, -27dB	
Maximum Input for Dry Contact Port			24VDC, 1A / 110VAC, 0.5A	
Operating Temperature		°F (°C)	-27 to +140 (-33 to +55)	
Operating Humidity			≤ 95%	
Environmental Class			NEMA 4	

Note: Typical specifications at room temperature,

The rated output power of this equipment is for single carrier operation. For situation when multiple carrier signals are present, the rating would have to be reduced by 3.5dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.

2 EQUIPMENT DESCRIPTION

2.1 FUNCTIONAL BLOCK DIAGRAM

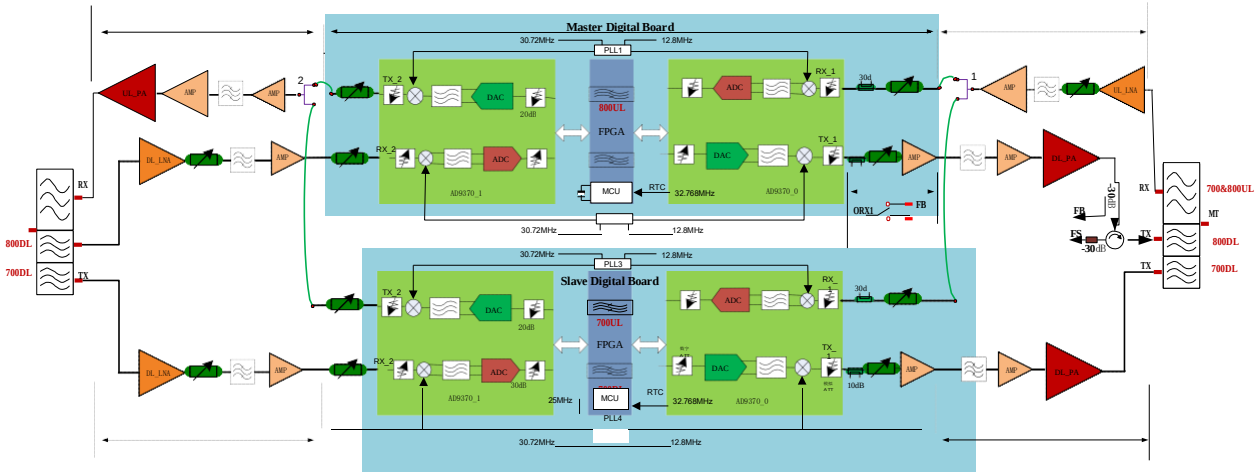


Figure 2: PS BDA Functional Block Diagram

In the downlink path, the BTS signals are received by the donor antenna of the repeater. After the duplexer, the signals are sent to 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 the duplexer. After amplification, 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 MT port integrated duplexer, the signals are sent to the LNA, integrated module for digital filtering, then to the PA for power amplification and to the duplexer. 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.

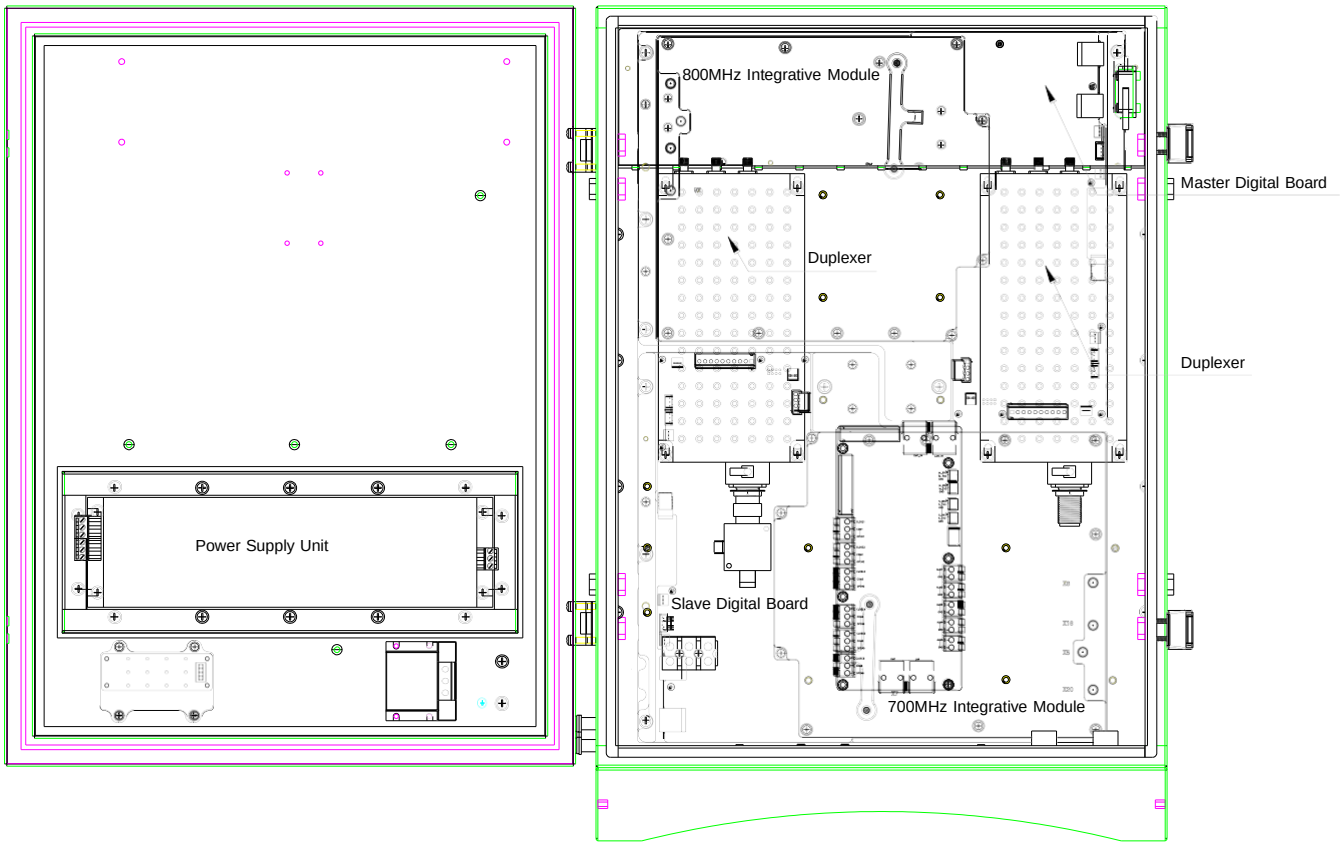


Figure 3: Layout of the PS BDA

2.3 EQUIPMENT CONSTITUTION

The typical PS BDA unit consists of the following components:

Master Digital Board and Slave Digital Board: 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.

Duplexer: The DPX is located near the MT and DT terminals and permits the uplink and downlink signals to share a common antenna.

700MHz /800MHz Digital Integrated Module and Power Amplifier: Consists of the Power Conversion module, RF module, digital process module and monitoring modules. The Power Conversion module converts +28V DC voltage into +9VJK and +9VRF. +9VJK, +9VRF are supplied to the monitoring unit, and the RF unit in the integrated module separately. 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 is the interface for both remote monitoring and local commissioning.

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 is 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.

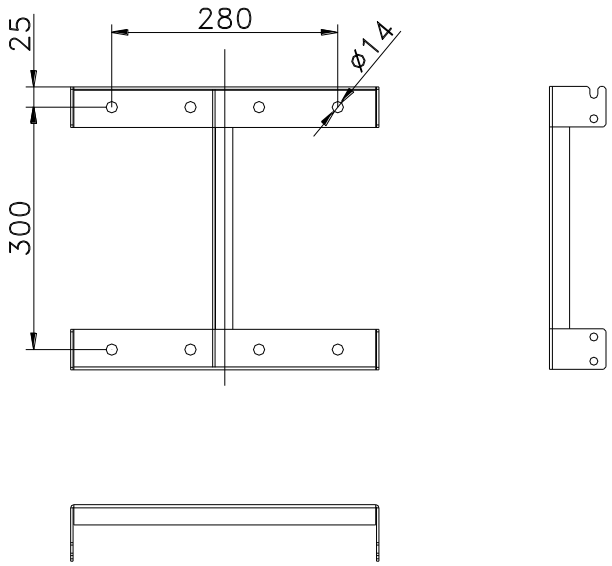


Figure 4: Mounting Rack Overview

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.

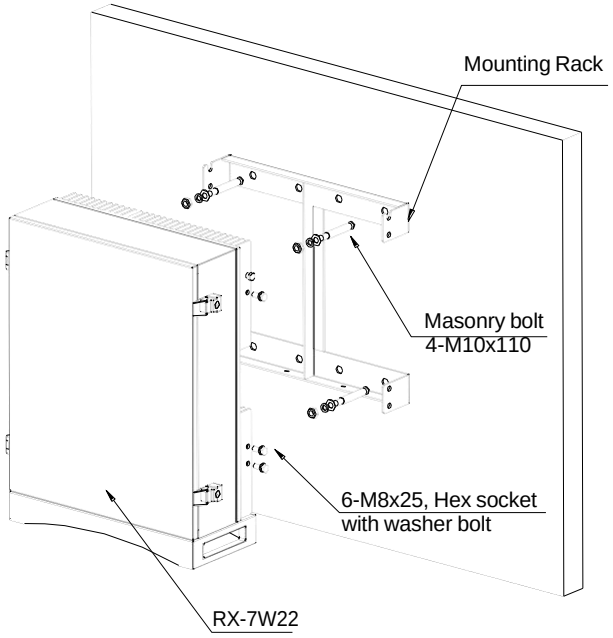


Figure 5: PS BDA Wall Mounting

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.

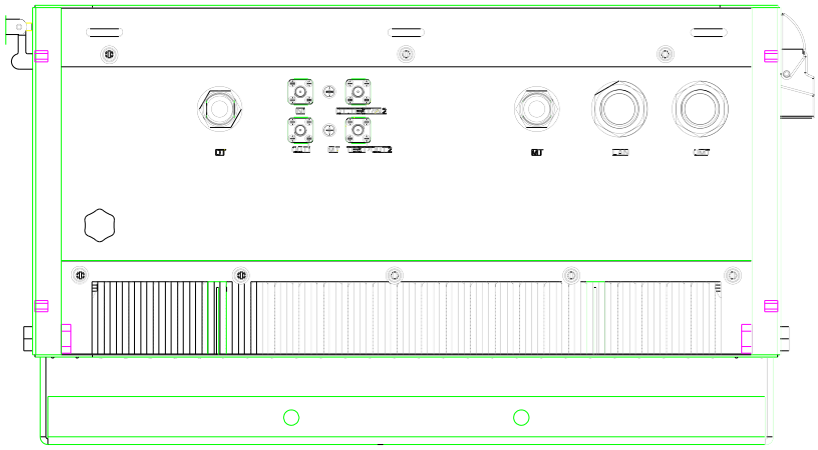


Figure 6: Equipment Connectors

Table 1: Equipment Connectors

Identifier	Descriptions
Power (Knock Out)	Power cable connector for a pre-installed power cord for connection to DC (e.g. DC -48V, Max. current is 8A)
DT Test	SMA connector for DT port test, -27dB coupling to DT port, available for both downlink and uplink test.
MT Test	SMA connector for MT port test, -27dB coupling to MT port, available for both downlink and uplink test.
DT	N-Female connector for connection to donor antenna.
MT	N-Female connector for connection to service antenna.
OMT	RJ45 Connector for local WEB GUI connection.
LAN	RJ45 Connector for internet connection.

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 16mm^2) 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 ❼ Connects to the feeder cable from service antennas.
- PS BDA DT port ❼ Connects to the feeder cable from donor antennas**.**

3.4.5 ETHERNET CONNECTION

Connect Ethernet with ‘LAN’ port in the panel.

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	Output
ALM1			
1	CLOSE1	1(A)	Red
2	COM1	2(B)	White
3	OPEN1	3(C)	Blue
4	CLOSE2	4(D)	Black
5	COM2	5(E)	Brown
6	OPEN2	6(F)	Purple
7	RR_A	7(G)	Green
8	RR_B	8(H)	Orange
9	NC	9(J)	Yellow
10	GND	10(K)	Grey
ALM2			
11	CLOSE3	1(A)	Red
12	COM3	2(B)	White
13	OPEN3	3(C)	Blue
14	CLOSE4	4(D)	Black
15	COM4	5(E)	Brown
16	OPEN4	6(F)	Purple
17	GND	7(G)	Green
18	NC	8(H)	Orange
19	NC	9(J)	Yellow
20	NC	10(K)	Grey
AUX			
21	EXT ALM0	1(A)	Red
22	EXT ALM1	2(B)	White
23	EXT ALM2	3(C)	Blue
24	EXT ALM3	4(D)	Black
25	EXT Li+	5(E)	Brown
26	EXT Li+	6(F)	Purple
27	NC	7(G)	Green
28	GND	8(H)	Orange
29	EXT Li-	9(J)	Yellow
30	EXT Li-	10(K)	Grey

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.

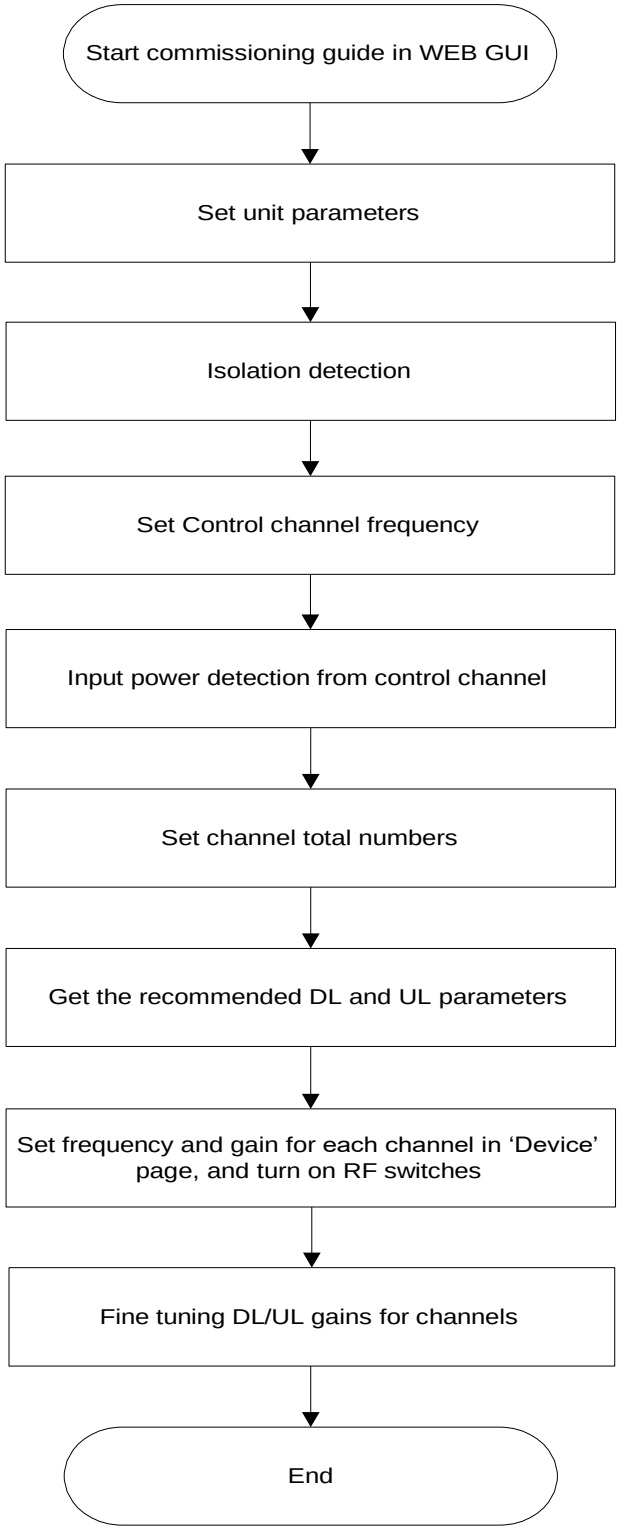


Figure 7: Commissioning Procedure

Table 4: Commissioning Task Explanation

Commissioning Tasks	Observation
1. Isolation detection	• Detect isolation of service antenna and donor antenna.
2. Set control channel frequencies	• Enter the center frequency of the main control channel, the commissioning guide will provide recommended DL/UL gain settings based on main control channel input power and the total channel numbers. • Users can skip this step and directly finish the commissioning guide even if the frequency information or the total channel numbers are unknown. Users can set the DL/UL gain manually any time after the isolation detection has been completed and passed.
3. Set Channel No.	• Enter the total channel numbers
4. 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.

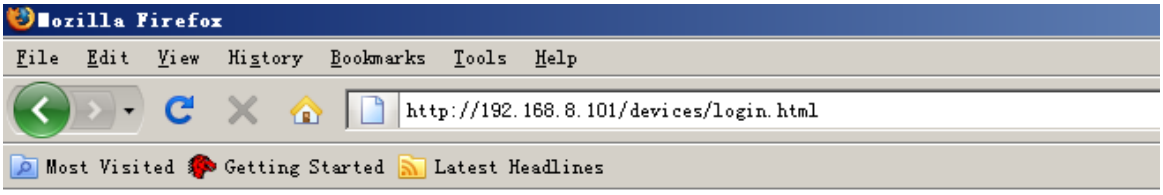


Figure 8: Input IP Address

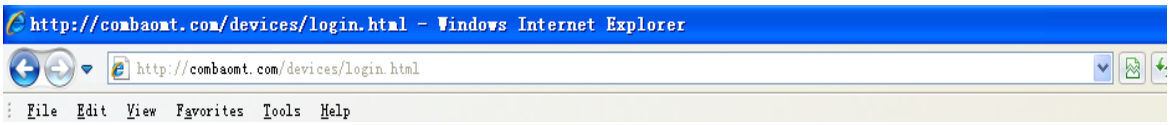


Figure 9: Input Domain Name

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.

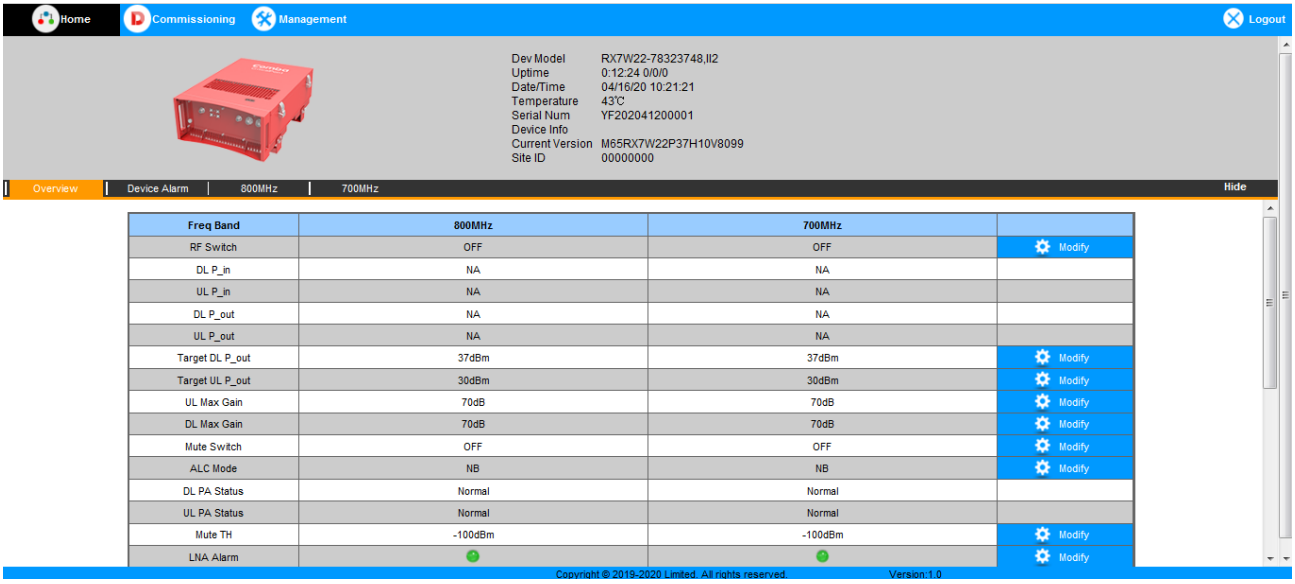


Figure 11: Web GUI Main Screen

On Comba Web GUI Home Screen, there are three Menu bars:
[Home], [Commissioning], and [Management].

5.2.1 [HOME]

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

- **Overview**

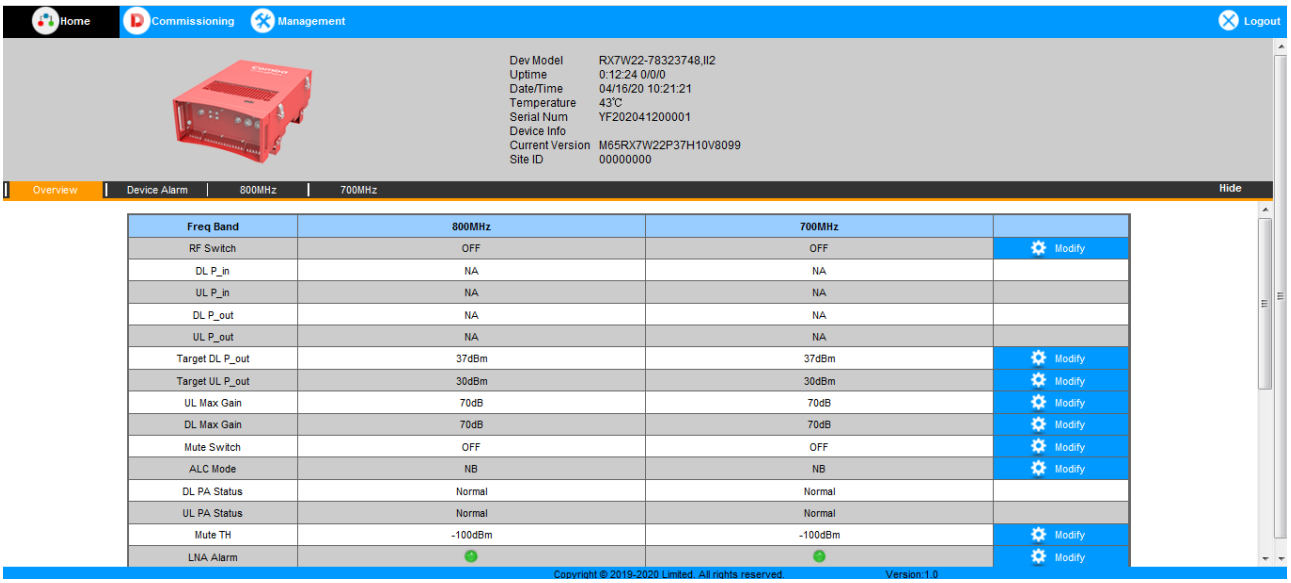


Figure 12: Overview Screen

➢ Device Alarm

This screen shows the alarm status.

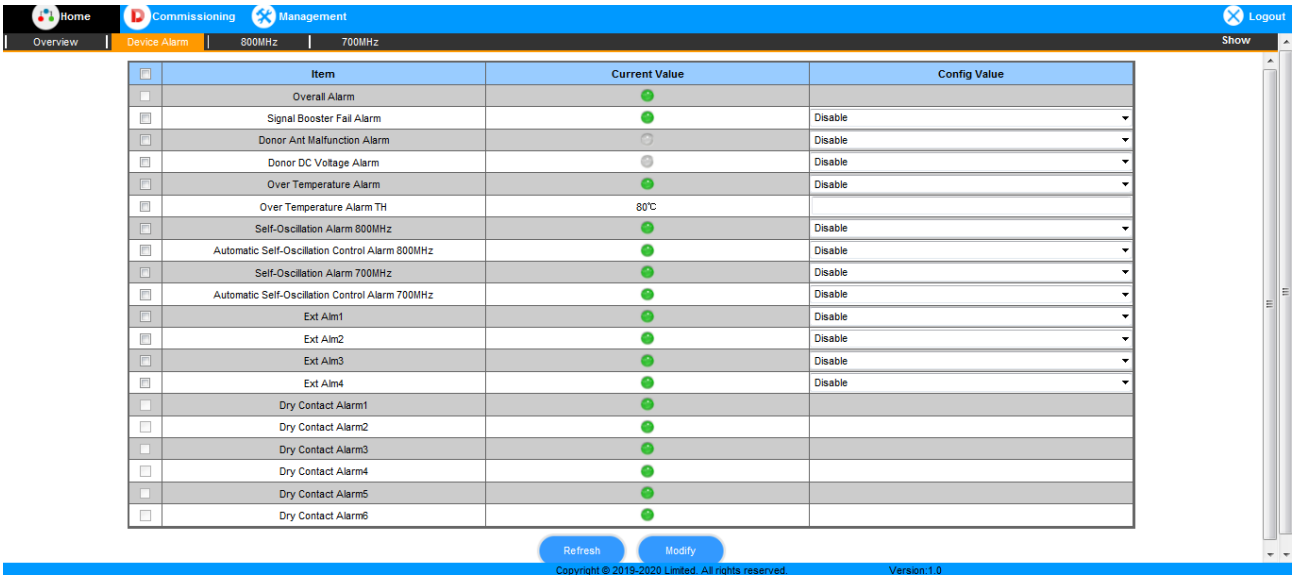


Figure 13: Device Alarm Screen

➢ 800MHz/700MHz

This screen is available for PS BDA to adjust the center frequency and the bandwidth.

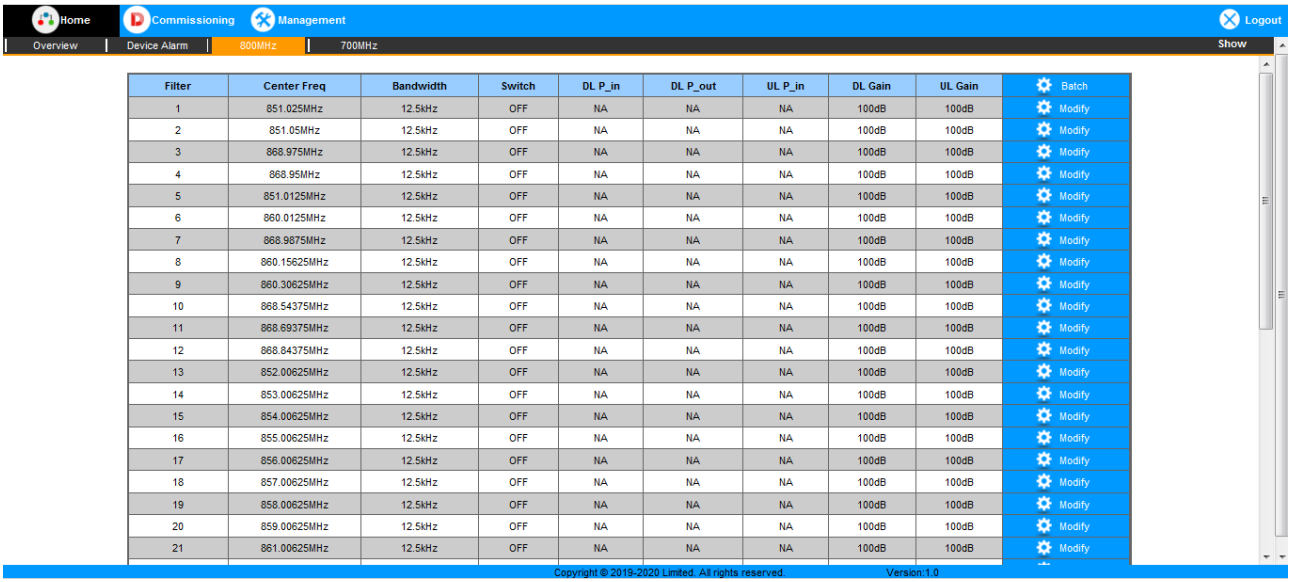


Figure 14: 800MHz Screen

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.

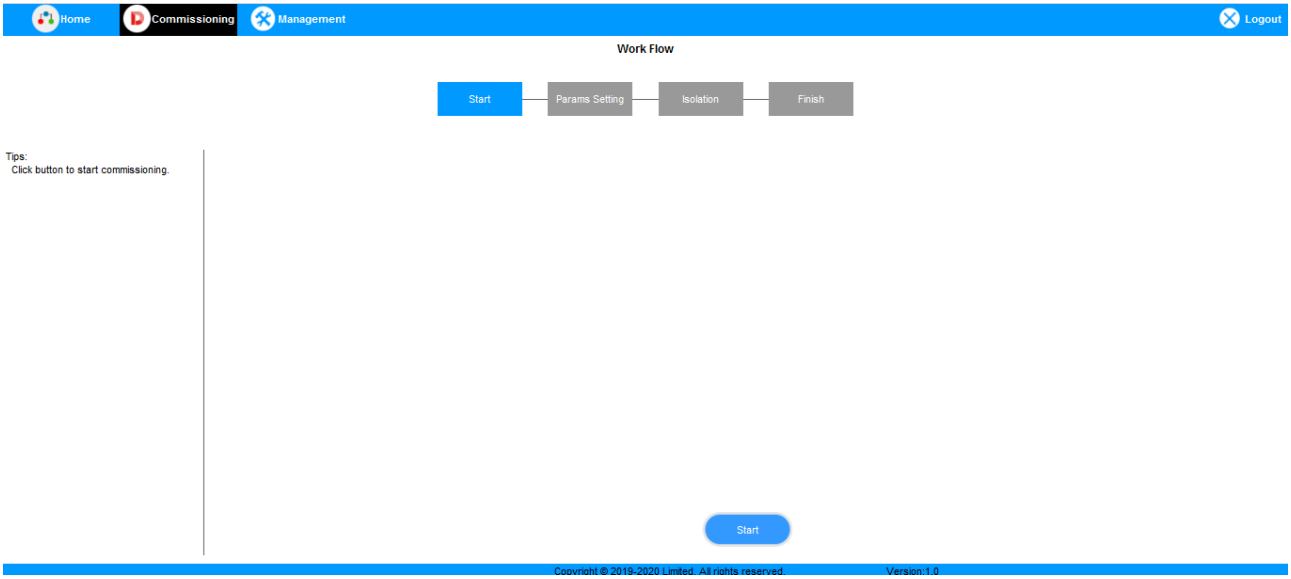


Figure 15: Commissioning Screen

5.2.3 [MANAGEMENT]

Other parameters can be configured on the [Management] Screen. It includes Device Info, Comm. Setting, Alarm Setting, Isolation, Reset, Firmware, Report, Log, License and Security.

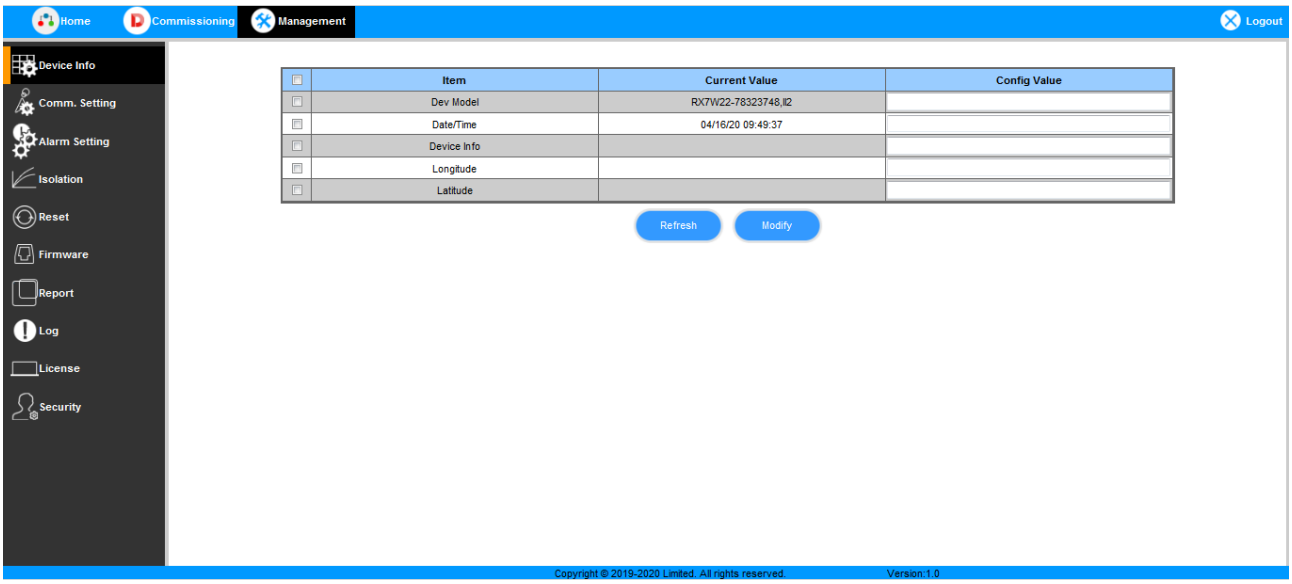


Figure 16: Management Screen

➢ Device Info

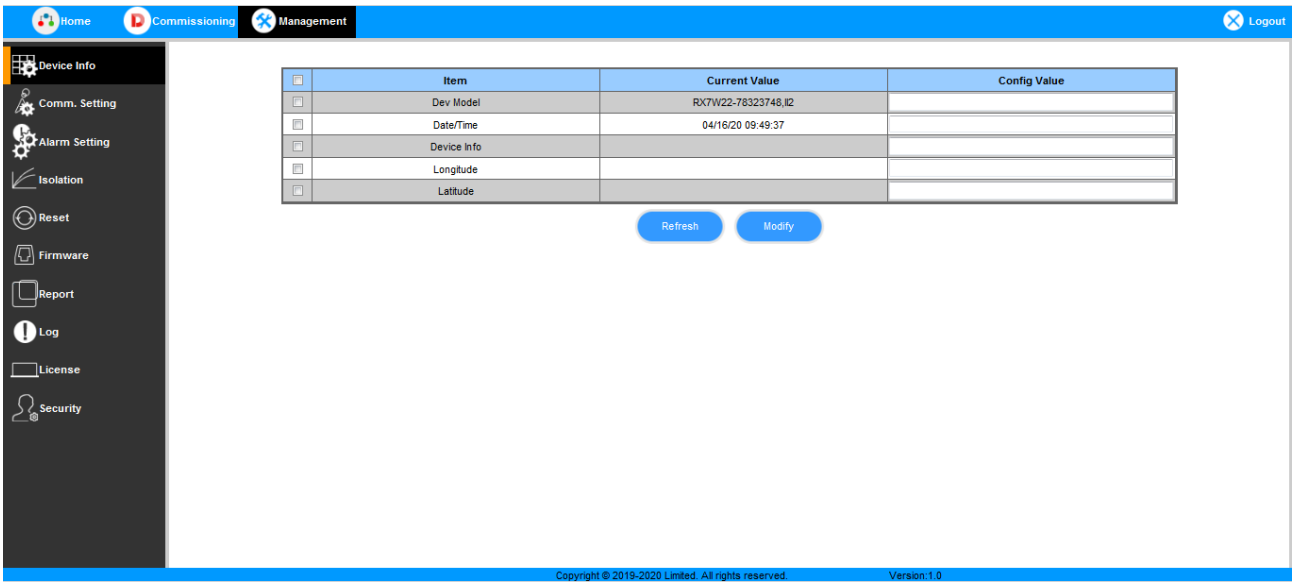


Figure 17: Management – Device Info

➢ Comm. Setting

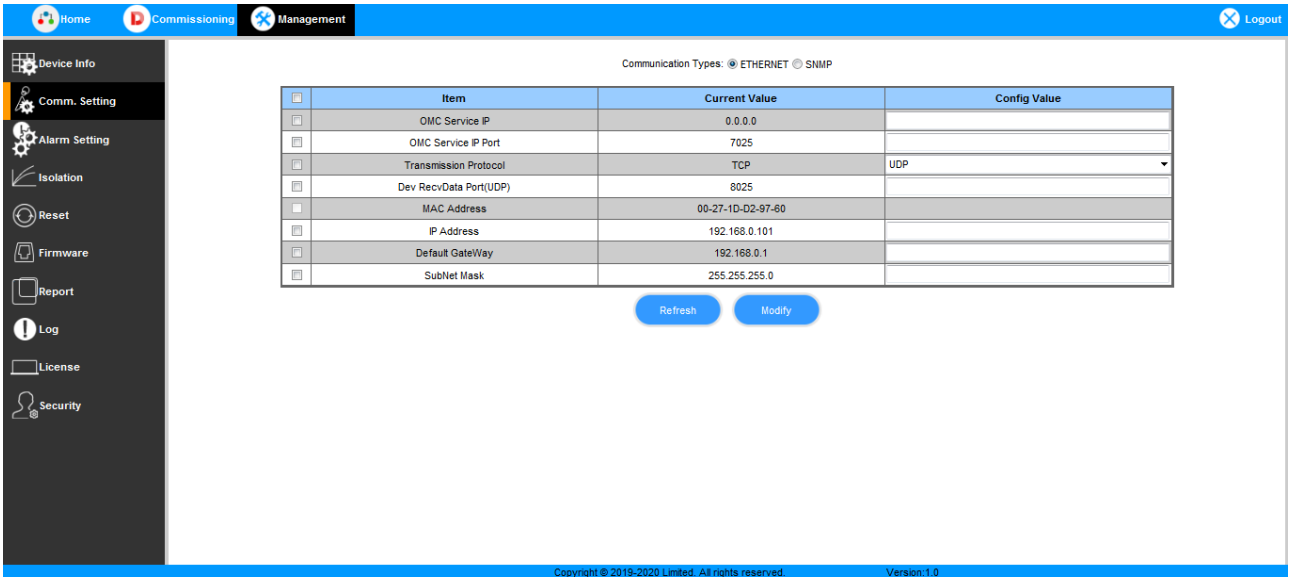


Figure 18: Management – Comm. Setting

Note: There are 2 available communication types: SNMP and ETHERNET. You can choose a suitable type for remote monitoring.

➢ Alarm Setting

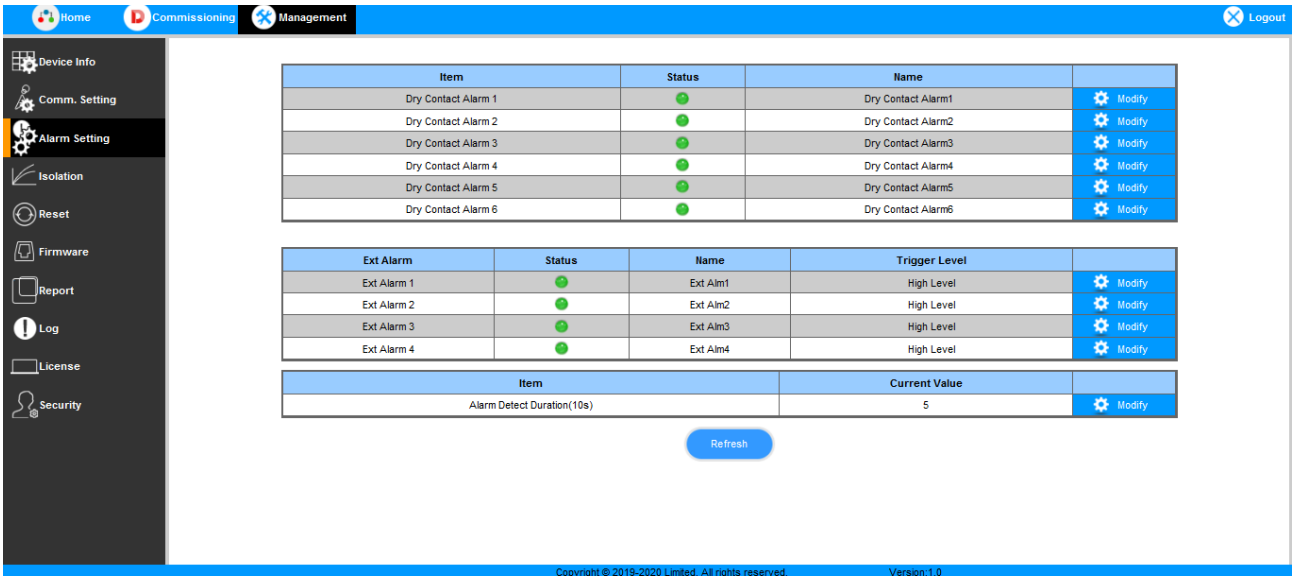


Figure 19: Management-Alarm Setting

Dry Contact Alarm and Ext Alarm can be set to show the target alarm accoridng to the Pre-set. The setting can be done by clicking “Modify”.

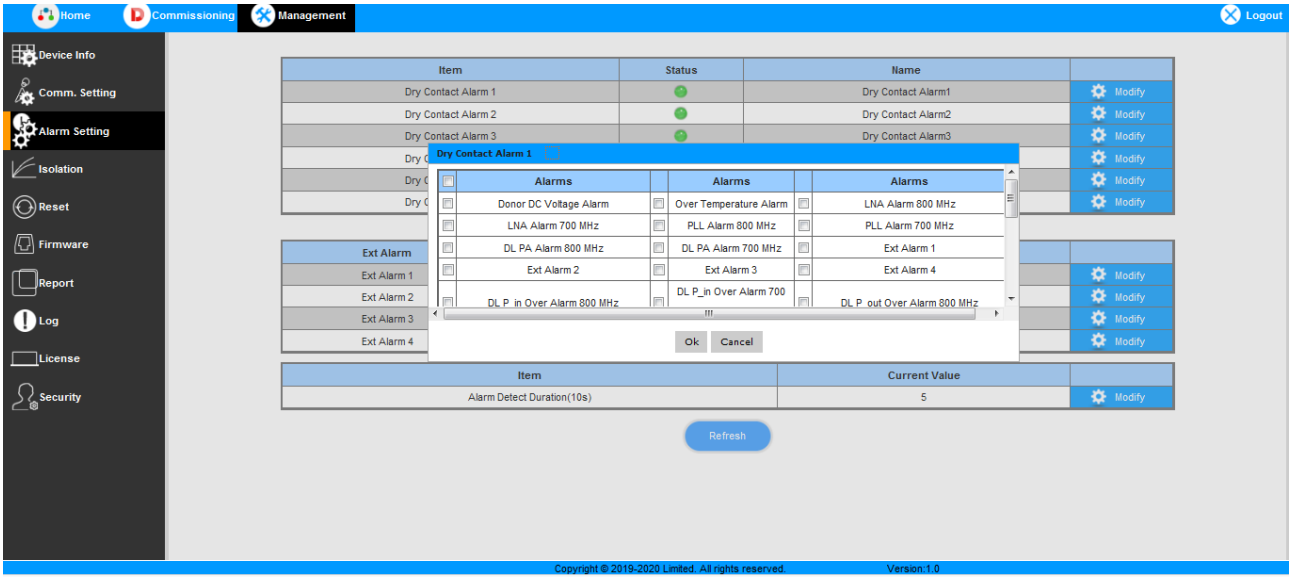


Figure 20: Management-Alarm Setting

➢ Isolation

There are two ways to detect the isolation, manually or Automatic by ICS function.

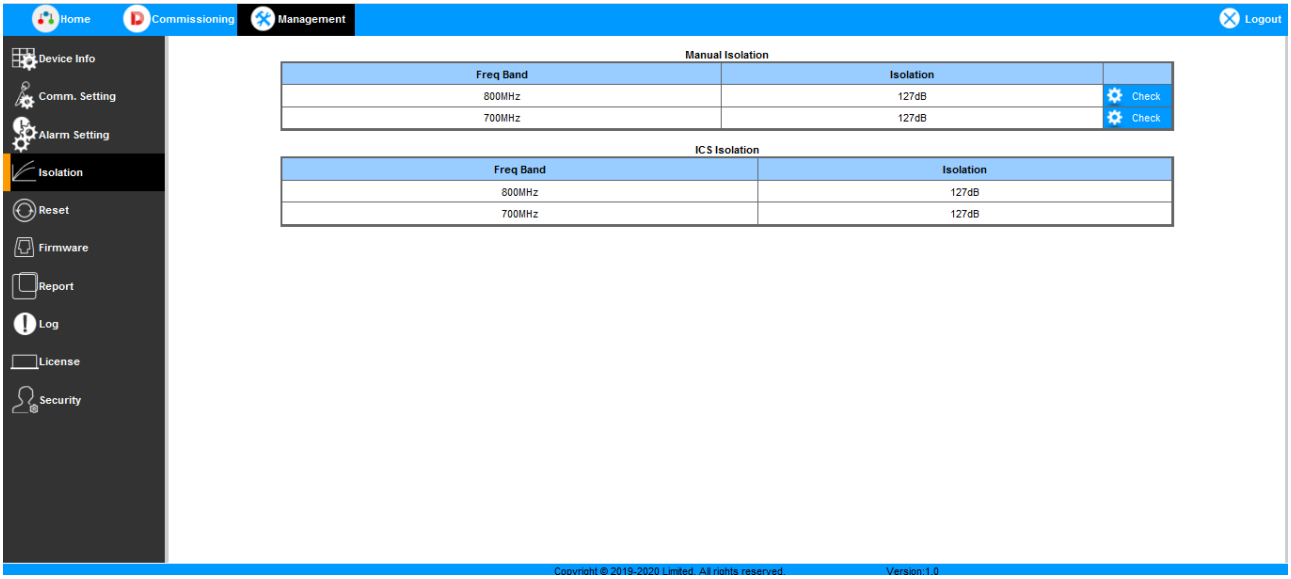


Figure 21: Management – Isolation

➢ Reset

Figure 22: Management – Reset

Note: Click Restore, all the parameters and alarms will be reset to factory default value, or Click Reset to reset Device or PAs.

➢ 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.

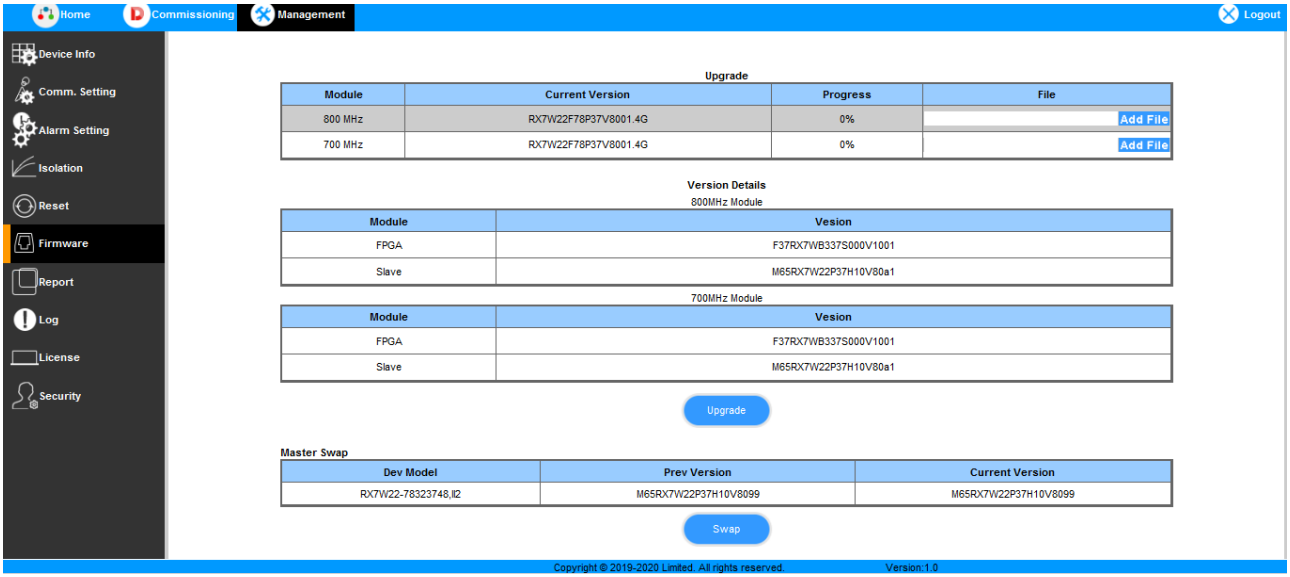


Figure 23: Management – Report

➢ Report

After commissioning, PS BDA can create the summary report about the setting of all the parameters.

Figure 24: Management – Report

➢ Log

PS BDA can export the log file for troubleshooting.

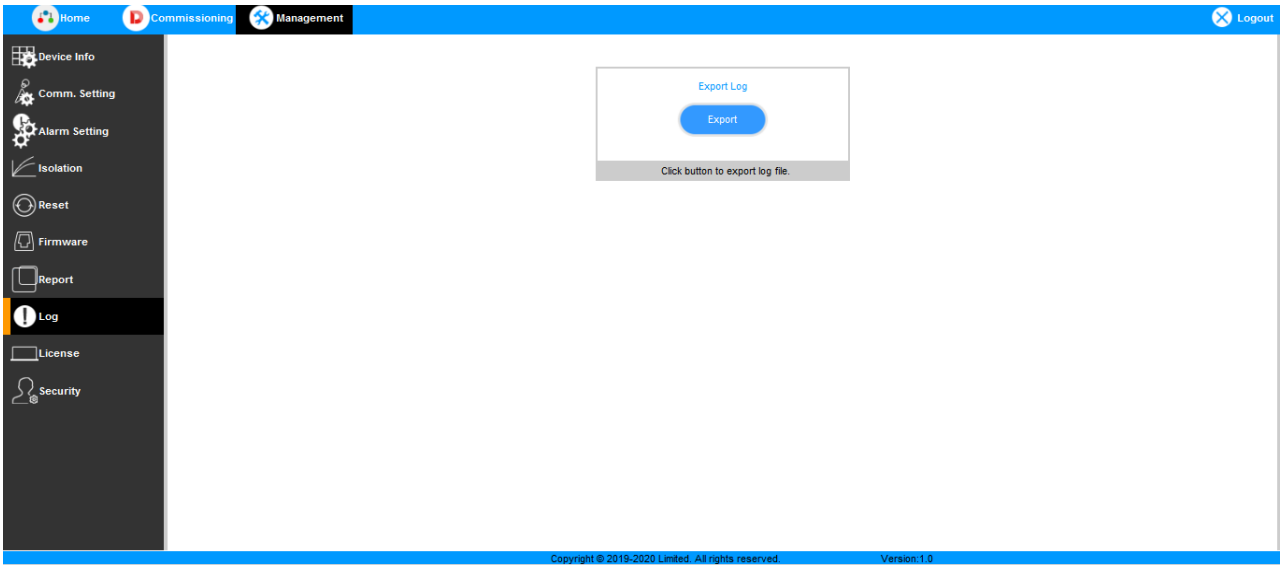


Figure 25: Management – Log

➢ License

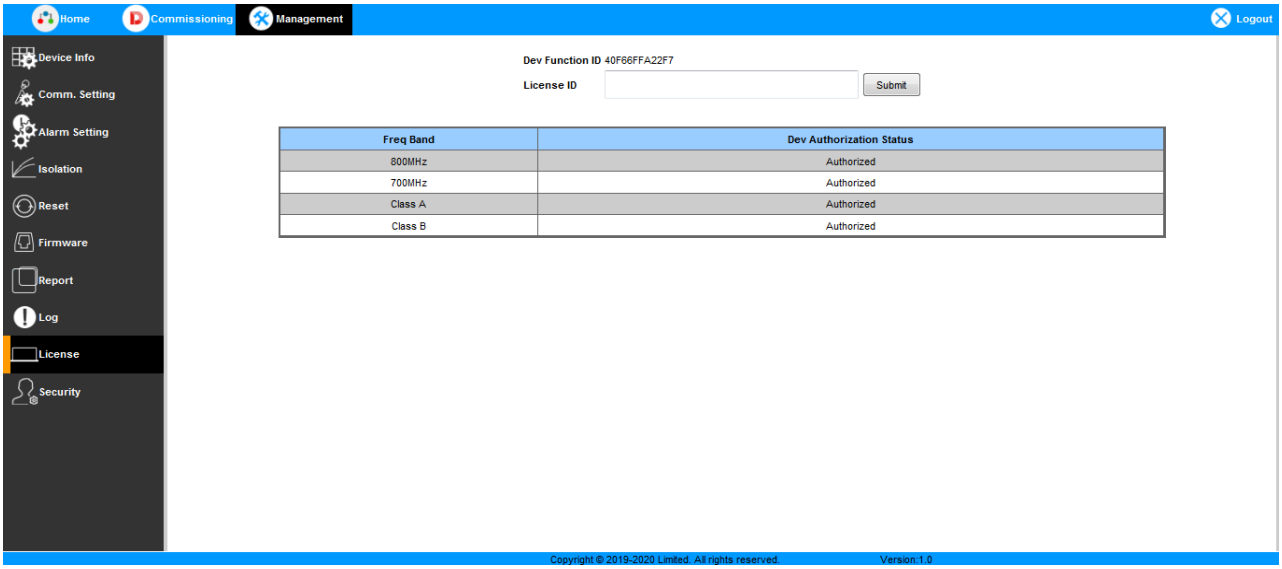


Figure 26: Management – License

For the CriticalPoint BDA, users can switch the configuration anytime by changing the license in the WEBOMT. There are 4 difference licenses: 700MHz single band license, 800MHz single band license, Class A and Class B.
Both 700MHz and 800MHz single band licenses are provided with a single band unit. Users can switch between 700MHz configuration and 800MHz configuration. To upgrade from single band to dual band, users need to purchase the dual band upgrade license.

If the equipment is in dual band originally, no license will be provided, because the equipment already comes with dual band activated.

- **Security**

WEB GUI login password can be changed.

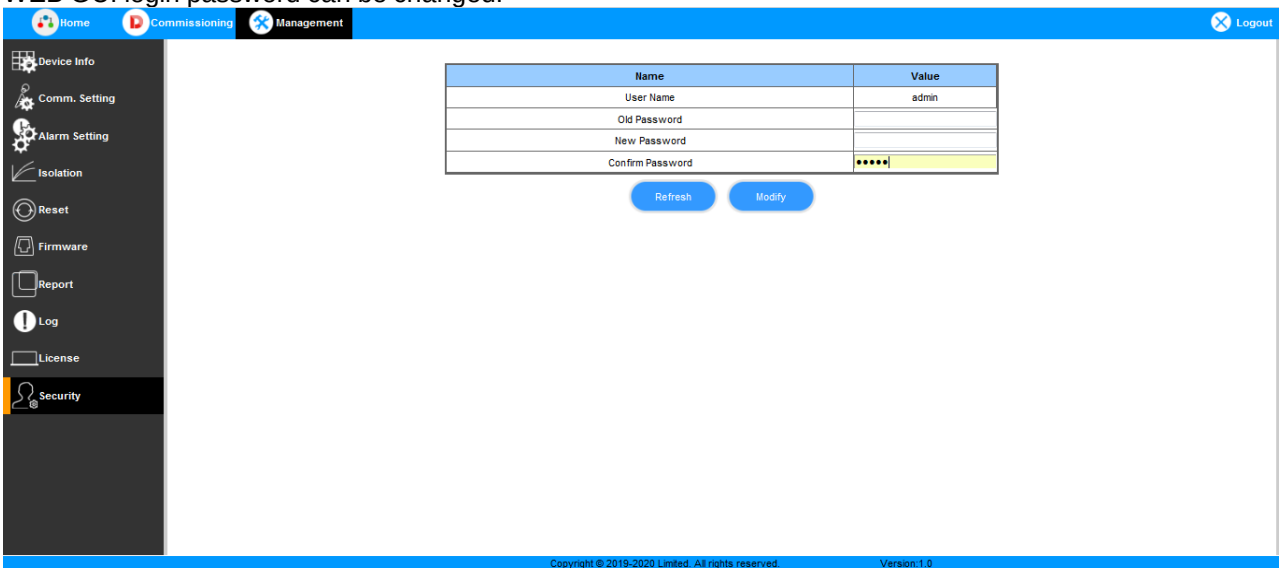


Figure 27: Management – Security

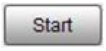
Note: After changing the password, please remember the new password for the next login.

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 28: Commissioning Procedure – Start

Step 2: Click  to start the process.

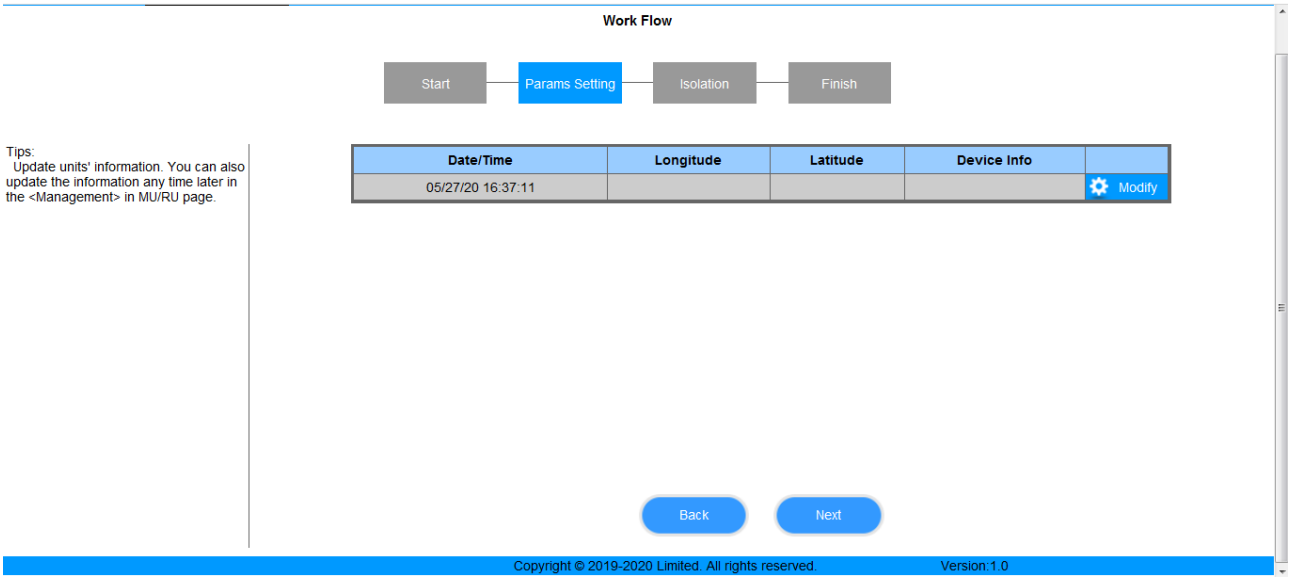


Figure 29: Commissioning Procedure – Site Info. Setting

Step 3: Click  , to set the site information.

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.

NOTE: Make sure the device is connected with appropriate donor and service antennas before proceeding to step 4.

Step 4: Click Next to enter to Isolation Detection Screen.

Figure 30: Commissioning Procedure – Isolation Detection

- Select a frequency band (RFU) that needs to be commissioned.
- Click Next to start Isolation Detecting, then a [Confirm] window will pop-up.
- Click Ok to continue. If isolation detection passes, the process will go to the RF Settiing Screen shown as Figure 38. 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.

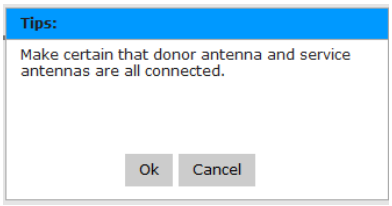


Figure 31: Commissioning Procedure – Isolation Detection Confirm

Step 5: After checking the isolation, Click Next to finish the commissioning. In this window, a summary of device setting is shown.

Figure 32: 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-(37dBm-# of antennas in dB – cable losses in dB).

For example:

No. of Antennas	Cable losses	Max Allowed Antenna Gain
4	3	39.1-(37-6-3)=11.1dBi
1	3	39.1-(37-0-3)=5.1dBi
10	3	39.1-(37-10-3)=15.1dBi

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-7W22 PS BDA has a noise level of -40.55dBm in 10 kHz measurement at 1MHz spectrum outside the pass band of BDA and an in-band noise level at around -23.64 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: -23.64dBm – antenna splitter losses in dB – cable loss in dB

For example: in band noise

RX-7W22 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 = 10 dB
Based on equation (2) Input antenna noise (to the antenna) = – 23.64 – 12 –11=-46.64 dBm ERP

For example: Out of band noise
RX-7W22 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 = 10 dB
Based on equation (2) Input antenna noise (to the antenna) = – 49.8 – 12 – 11= – 72.8dBm 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 or decrease the system gain to low the 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-7W22 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-7W22 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 ∅12mm
- 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-7W22

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: TROUBLESHOOTING QUICK GUIDE

Alarm list:

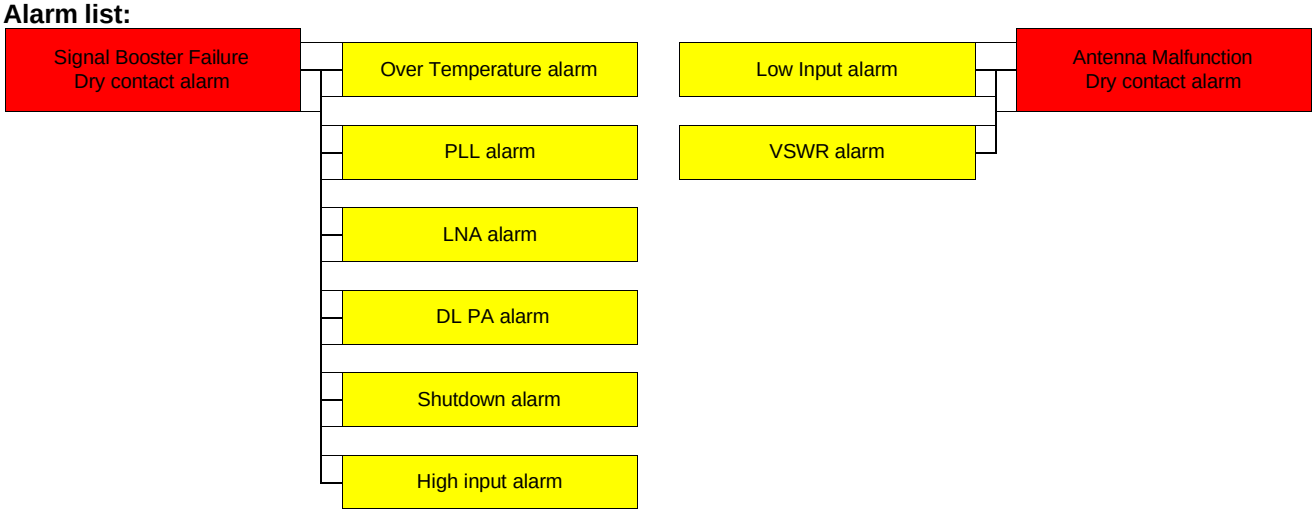


Figure 33: Alarm list

Troubleshooting:

Alarms	Causes and actions
Low input (for DT port)	DT composite input power lower than -80dBm will trigger the alarm 1. Donor antenna/passive system failure 2. Wrong channel frequency setting 3. Site is not commissioned yet
VSWR	Service antenna/passive system failure
Over temperature	Environment temperature shall be lower than 140degF (60degC)
PLL (Phase lock loop)	Hardware failure, RMA the equipment
LNA (Low noise amp.)	Hardware failure, RMA the equipment 1. Handling RF connectors when RF power is ON may damage LNA 2. High power injection to DT/MT port may damage LNA
DL PA (Downlink amp.)	Fix any other existing alarms first, then reset PA (see next page) If alarm still exists, RMA the equipment
Shutdown	Other critical alarm causes the equipment shutdown Follow instructions to fix other alarms first
High input (for DT port)	Check input power to DT port, the power shall be lower than -30dBm 1. Avoid other inference 2. Put attenuator between antenna and PS BDA, if donor signal is high

Reset PA:
The Downlink PA will try to automatically reboot during the first 2 hours after alarms occur and then may shutdown permanently if alarms still exist. Users need to manually reset the PA in WEBOMT after fixing the alarm.

Go to Management -> Device Reset: Click the Reset button at the lower table to reset DL PA for 800MHz or 700MHz

Figure 34: Reset PA

Power detection:

- The power detection can be done from the reading number in WEBOMT, available in:
  - Downlink input power (per channel)
  - Downlink output power (composite)
  - Uplink input power (per channel)
- Or from the test ports for DT/MT, which are 27dB lower than the DT/MT port respectively, the test ports are able to detect both DL and UL signals

Isolation:

The system doesn't allow users to set a gain higher than **isolation-20dB**. The PS BDA has a mandatory process to check the isolation during commissioning, when isolation is not good (lower than 120dB, even though the PS BDA passes the commissioning process), a check on isolation (between donor and service antennas) is always recommended.

The maximum system gain that can be set must be 20dB lower than the isolation. (For example, if the isolation is 110dB, then the maximum gain that can be set is 90dB.) The PS BDA has an automatic process that prevents the gain being set to a value that does not follow this parameter.

If this gain is insufficient, then the isolation situation must be corrected to provide a higher isolation value.

Safety operation to protect the LNA (low noise amplifier):

1. Connect RF cables before powering on.

2. Any changes or handling of the RF connection requires user to switch off RF power (RF switch off in WEBOMT) or power off the unit first.

7.5 APPENDIX E: DEVICE REPORT EXAMPLE

Device Report

Created Time: 10:47:37 08/17/16

Table1 Basic Info

Dev Model	RX-7W22	Dev Info	
Site ID	00000000	Firmware Version	M75RX7W22FH10V8201
Uptime	1:41:44 0/0/0	RF Unit Alm	Normal
Temperature	37	Over Temperature Alm	Normal
Serial Num	T201605190001		

Table2 Overview RF Info

Slave	Freq Band	DL P_out	RF Switch	PLL	LNA	DL PA	VSWR	High Input	Low Input	Shutdown	PA Status	Isolation
1	800(MHz)	-2dBm	ON	Normal	Normal	Normal	Normal	Normal	Disable	Normal	Normal	120dB
2	700(MHz)	26dBm	ON	Normal	Normal	Normal	Normal	Normal	Disable	Normal	Normal	120dB

Table3 Sub Band RF Info

Freq Band	Sub Band	Center Freq	BandWidth	DL P_in	UL P_in	Switch	UL ATT	DL ATT	UL Gain	DL Gain
800(MHz)	1	851.00625MHz	25KHz	-64.8dBm	-112dBm	ON	28dB	28dB	62dB	62dB
	2	860.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	3	868.99375MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	4	851.15625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	5	851.30625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	6	851.45625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	7	859.85625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	8	860.15625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	9	860.30625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	10	868.54375MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	11	868.69375MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	12	868.84375MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	13	852.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	14	853.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	15	854.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	16	855.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	17	856.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	18	857.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	19	858.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	20	859.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	21	861.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	22	862.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	23	863.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	24	864.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	25	865.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	26	866.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	27	867.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	28	868.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	29	864.50625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	30	865.50625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	31	866.50625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
	32	867.50625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB

Current Page:1 (Total Pages:2)

7.6 APPENDIX F: RMA (RETURN MATERIAL AUTHORIZATION)

Comba

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

Comba

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