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 RXB3748/RXB3792 QE: 1-0-0

Comba Telecom Ltd.

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## 0.1 CONTENTS

#### **Section**

## Page

1.1 1.2 1.3 1.4 1.5	CONTENTS INDEX TO FIGURES AND TABLES HISTORY GLOSSARY OF TERMS SAFETY NOTICES AND ADMONISHMENTS	6 7 8
1	GENERAL INFORMATION	10
2 2.1 2.2 2.3	EQUIPMENT DESCRIPTION FUNCTIONAL BLOCK DIAGRAM EQUIPMENT LAYOUT EQUIPMENT CONSTITUTION	14 15
3 3.1 3.2 3.2.1 3.2.2 3.3 3.3.1 3.3.2 3.3.3 3.3.4 3.3.5 3.4 3.4.1 3.4.2 3.4.3 3.4.4 3.4.5 3.4.6	INSTALLATION WARNINGS AND ALERTS SITE PLANNING CONSIDERATIONS SITE PLANNING INSTALLATION CHECKLIST INSTALLATION PROCEDURES GOODS INWARDS INSPECTION TOOLS PREPARATION WALL MOUNTING DRIP-LOOP EQUIPMENT CONNECTORS PS BDA CONNECTORS PS BDA LED INDICATORS GROUNDING CONNECTION RF CABLE CONNECTION ETHERNET CONNECTION ETHERNET CONNECTION	17 18 18 19 20 20 20 20 21 21 21 22 23 23 23 23
4 4.1 4.2	COMMISSIONING PRE-COMMISSIONING TASKS COMMISSIONING PROCEDURE	25
5 5.1 5.2 5.2.1 5.2.2 5.2.2 5.2.3 5.3	WEB GUI	28 29 29 31 31
6	MAINTENANCE	41
7 7.1 7.2 7.3	APPENDICES APPENDIX A APPENDIX B: TOOLS APPENDIX C: DECLARATION OF HARMFUL SUBSTANCES AND CONTENT	42 44



## INSTALLATION GUIDE FOR RX-7W22, II2

7.4	APPENDIX D: TROUBLESHOOTING QUICK GUIDE	46
7.5	APPENDIX E: DEVICE REPORT EXAMPLE	49
7.6	APPENDIX F: RMA (RETURN MATERIAL AUTHORIZATION)	50

## 1.2 INDEX TO FIGURES AND TABLES

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Figure 1: Front, Side and Bottom Views of the PS BDA Enclosure	10
Figure 2: PS BDA Functional Block Diagram	
Figure 3: Layout of the PS BDA	
Figure 4: Mounting Rack Overview	20
Figure 5: PS BDA Wall Mounting	21
Figure 6: Equipment Connectors	22
Figure 7: Commissioning Procedure	26
Figure 8: Input IP Address	28
Figure 9: Input Domain Name	28
Figure 10: Input User Name and Password	28
Figure 11: Web GUI Main Screen	29
Figure 12: Overview Screen	
Figure 13: Device Alarm Screen	
Figure 14: 800MHz Screen	30
Figure 15: Commissioning Screen	31
Figure 16: Management Screen	31
Figure 17: Management – Device Info	32
Figure 18: Management – Comm. Setting	32
Figure 19: Management-Alarm Setting	33
Figure 20: Management-Alarm Setting	33
Figure 21: Management – Isolation	
Figure 22: Management – Reset	34
Figure 23: Management – Report	35
Figure 24: Management – Report	
Figure 25: Management – Log	
Figure 26: Management – License	36
Figure 27: Management – Security	
Figure 28: Commissioning Procedure – Start	
Figure 29: Commissioning Procedure – Site Info. Setting	
Figure 30: Commissioning Procedure – Isolation Detection	
Figure 31: Commissioning Procedure – Isolation Detection Confirm	
Figure 32: Commissioning Procedure – Finish	40
Figure 33: Alarm list	46
Figure 34: Reset PA	47
Table 1: Equipment Connectors	
Table 2: LED Indicators	
Table 3: Pin Definition of Dry Contact Cable	
Table 4: Commissioning Task Explanation	27



## 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
СН	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.

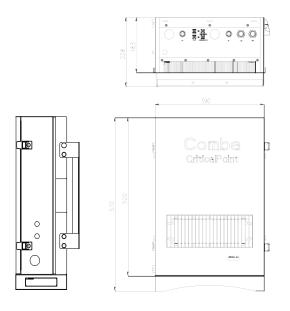


Figure 1: Front, Side and Bottom Views of the PS BDA Enclosure



#### Specifications-Class A (FCC ID: PX8RXA37)

Electrical			700MHz	800MHz
Frequency Range, Uplin	<	MHz	799-805	806-817
Frequency Range, Down	link	MHz	769-775	851-862
Channel Bandwidth		KHz	12.5/25/100	12.5/25/100
Number of Channels			32	32
Total Output Power, Upli	nk	dBm	:	30
Total Output Power, Dow	nlink	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	≤ <b>5</b>	≤ <b>5</b>
Uplink Noise Figure		dB	≤ 5	≤ 5
	Bandwidth: 12.5KHz		≤ 35	≤ 35
System Group Delay	Bandwidth: 25KHz	μsec	≤ 25	≤ 35
	Bandwidth: 12.5KHz		≥ 60 @ filter center + 75KHz	≥ 60 @ filter center + 75KHz
Out-of-Band Suppression	Bandwidth: 25KHz	dBc	≥ 60 @ filter center + 75KHz	≥ 60 @ filter center + 75KHz
	Bandwidth: 100KHz		≥ 60 @ filter center + 200KHz	≥ 60 @ filter center + 200KHz
Intermodulation		dBm	≤ <b>-13</b>	≤ <b>-13</b>
Spurious	9kHz to 1GHz	dBm	FCC Compliance	FCC Compliance
Opunous	1GHz to 12.75GHz	dBm	1 CC Compliance	
Maximum RF Input Powe	er without Damage	dBm	-10	-10
Maximum RF Input Powe	er without Overdrive	dBm	-20	-20
Input VSWR			≤ 1.5	≤ <b>1</b> .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)	
Dewer Cumply		VAC	100-240	)/47-63Hz
Power Supply		VDC	-40 ~ -58	
Dower Consumption	Single band	W	1	20
Power Consumption	Dual band	W	2	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)	
			≤ 95%	
Operating Humidity			$\leq 9$	95%

Note: Typical specifications at room temperature,



### Specifications-Class B (FCC ID: PX8RXB37)

Electrical			700MHz	800MHz
Frequency Range, Uplink			788-798,799-805	806-816
Frequency Range, Downlink			758-768,769-775	851-861
Operating Bandwidth		MHz	0.2-10	0.2-10
Number of Sub Bands			3	3
Total Output Power, Uplin	nk	dBm	3	0
Total Output Power, Dow	nlink	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	≤ <b>5</b>	≤ 5
Uplink Noise Figure		dB	≤ <b>5</b>	≤ 5
System Group Delay		μsec	≤ 6.5	≤ 6.5
Out-of-Band Suppressior	1	dBc	≥ 45 @ filter edge + 0.6MHz ≥ 60 @ filter edge + 1MHz	≥ 45 @ filter edge + 0.6MHz ≥ 60 @ filter edge + 1MHz
Intermodulation		dBm	<b>≤ -13</b>	≤ <b>-1</b> 3
Spurious	9kHz to 1GHz 1GHz to 12.75GHz	dBm dBm	FCC Compliance	FCC Compliance
Maximum RF Input Powe		dBm	-10	-10
Maximum RF Input Power without Overdrive		dBm	-20	-20
Input VSWR		-	≤ <b>1</b> .5	≤ <b>1</b> .5
Impedance		Ω	50	50
Mechanical				
Dimensions, H x W x D		in(m m)	22.4 x 15.4 x 9.0 (570 x 390 x 228)	
Weight (without bracket	)	lb(kg)	66.2 (30)	
Dewer Cumply		VAC	100-240/	47-63Hz
Power Supply		VDC	-40 ~ -58	
Power Concurrention	Single band	W	12	20
Power Consumption	Dual band	W	20	00
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			≤ <b>95%</b>	
Environmental Class			NEN	/IA 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

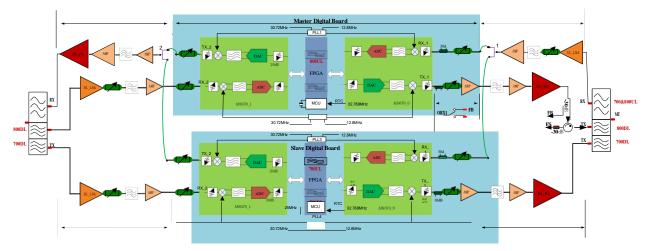


Figure 2: PS BDA Functional Block Diagram

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.

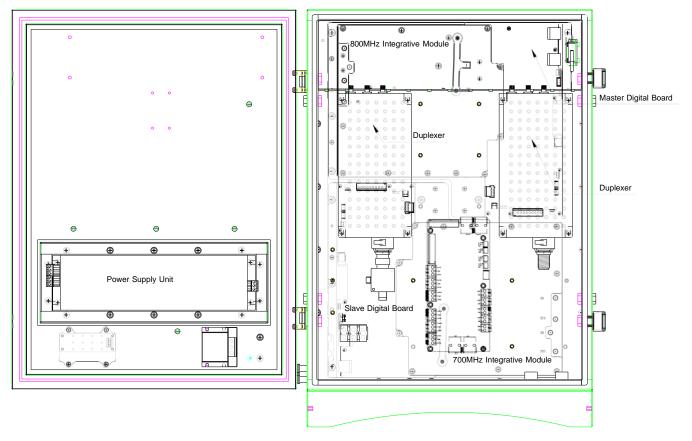


Figure 3: Layout of the PS BDA

## 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.

#### **INSTALLATION GUIDE FOR RX-7W22, II2**

## 3.2.2 INSTALLATION CHECKLIST

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- 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.

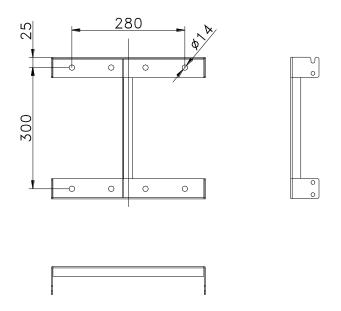


Figure 4: Mounting Rack Overview

## 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.

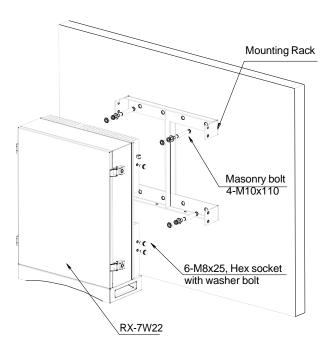


Figure 5: PS BDA Wall Mounting

## 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.

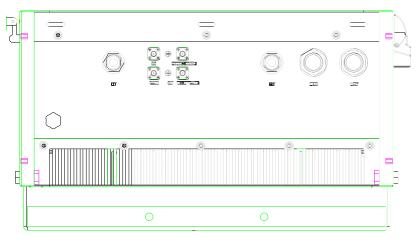


Figure 6: Equipment Connectors

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.		
ОМТ	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.

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.	

Table 2: LED Indicators

## 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<sup>2</sup>) 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 **O** Connects to the feeder cable from service antennas.
- PS BDA DT port **O** 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.

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 ALMO	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

Table 3: Pin Definition of Dr	y Contact Cable
-------------------------------	-----------------

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).</li>

## 4.2 COMMISSIONING PROCEDURE

Perform the following procedures for system commissioning.

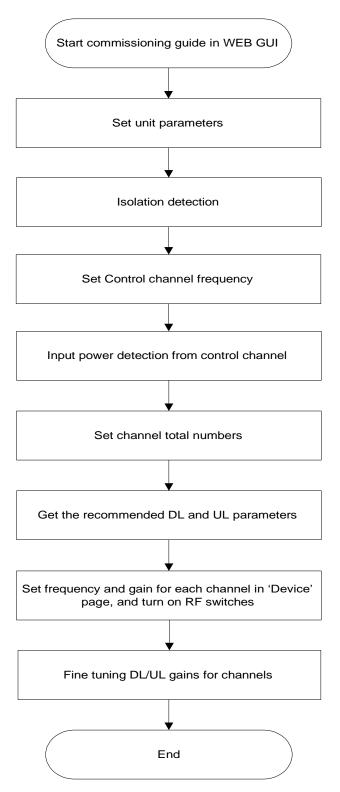


Figure 7: Commissioning Procedure



#### Table 4: Commissioning Task Explanation

Commissioning Tasks	Observation
1. Isolation detection	Detect isolation of service antenna and donor antenna.
2. Set control channel frequencies	<ul> <li>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.</li> <li>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.</li> </ul>
3. Set Channel No.	Enter the total channel numbers
4. Recommended DL and UL gain parameters	<ul> <li>The commissioning guide will provide recommended DL/UL gain settings.</li> <li>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.</li> </ul>

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.



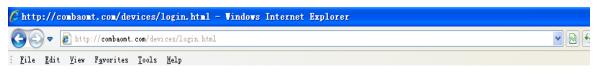


Figure 9: Input Domain Name

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

username: admin password: ●●●●●	System Managen	nent Platform	
password:	username	adain	-

Figure 10: Input User Name and Password

## 5.2 WEB GUI INTRODUCTION

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

Home DCommissioning 🛞 Ma	inagement		🚫 L
Overview Device Alarm 800MH2	Uptime 0:12:24   Date/Time 04/16/20 Temperature 43°C	) 10:21:21 11200001 W22P37H10V8099	Hide
- Freq Band	800MHz	700MHz	
RF Switch	OFF	OFF	🔆 Modify
DL P_in	NA	NA	Nouny
	NA	NA	
DL P_out	NA	NA	
UL P_out	NA	NA	
Target DL P_out	37dBm	37dBm	🔅 Modify
Target UL P_out	30dBm	30dBm	🔅 Modify
UL Max Gain	70dB	70dB	🔅 Modify
DL Max Gain	70dB	70dB	Modify
Mute Switch	OFF	OFF	Modify
ALC Mode	NB	NB	Modify
DL PA Status	Normal	Normal	
UL PA Status	Normal	Normal	
Mute TH	-100dBm	-100dBm	🔅 Modify
LNA Alarm	<b>A</b>	9	Modify

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

Home	DCommissioning 🛞 Mar	agement			🚫 Logout
Overview	Device Alarm 800MHz	Uptime 0:12:24 Date/Time 04/16/20 Temperature 43°C	) 10:21:21 \$1200001 W22P37H10V8099		Hide
					×
	Freq Band	800MHz	700MHz		
	RF Switch	OFF	OFF	🌣 Modify	
	DL P_in	NA	NA		
	UL P_in	NA	NA		_ =
	DL P_out	NA	NA		-
	UL P_out	NA	NA		
	Target DL P_out	37dBm	37dBm	🄅 Modify	
	Target UL P_out	30dBm	30dBm	🌣 Modify	
	UL Max Gain	70dB	70dB	🄅 Modify	
	DL Max Gain	70dB	70dB	🄅 Modify	
	Mute Switch	OFF	OFF	🌣 Modify	
	ALC Mode	NB	NB	🔅 Modify	
	DL PA Status	Normal	Normal		
	UL PA Status	Normal	Normal		
	Mute TH	-100dBm	-100dBm	🄅 Modify	
	LNA Alarm	•	•	🔅 Modify	
		Copyright © 2019-2	020 Limited. All rights reserved. Version:1.0		

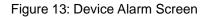
Figure 12: Overview Screen



#### > Device Alarm

This screen shows the alarm status.

	Item	Current Value	Config Value	
	Overall Alarm	•		
	Signal Booster Fail Alarm	•	Disable	•
	Donor Ant Malfunction Alarm	0	Disable	-
	Donor DC Voltage Alarm	0	Disable	-
	Over Temperature Alarm	•	Disable	-
	Over Temperature Alarm TH	80°C		
	Self-Oscillation Alarm 800MHz	<b>e</b>	Disable	-
	Automatic Self-Oscillation Control Alarm 800MHz	6	Disable	•
	Self-Oscillation Alarm 700MHz	<b>e</b>	Disable	-
	Automatic Self-Oscillation Control Alarm 700MHz	•	Disable	-
	Ext Alm1	<b>e</b>	Disable	•
	Ext Alm2	<b></b>	Disable	-
	Ext Alm3	<b>e</b>	Disable	-
	Ext Alm4	<b>e</b>	Disable	•
	Dry Contact Alarm1	<b>e</b>		
	Dry Contact Alarm2	<b>e</b>		
	Dry Contact Alarm3	<b>O</b>		
	Dry Contact Alarm4	•		
	Dry Contact Alarm5	•		
<b>II</b>	Dry Contact Alarm6	0		



#### > 800MHz/700MHz

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

Commissionir	ng 🔗 Management								
Device Alarm	800MHz 7001	MHz							
Filter	Center Freq	Bandwidth	Switch	DL P_in	DL P_out	UL P_in	DL Gain	UL Gain	🔅 Batch
1	851.025MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
2	851.05MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
3	868.975MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🏠 Modify
4	868.95MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🌣 Modify
5	851.0125MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🌺 Modify
6	860.0125MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🏠 Modify
7	868.9875MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
8	860.15625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
9	860.30625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
10	868.54375MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
11	868.69375MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
12	868.84375MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🌣 Modify
13	852.00625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
14	853.00625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
15	854.00625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
16	855.00625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🏠 Modify
17	856.00625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🄅 Modify
18	857.00625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	🔅 Modify
19	858.00625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	Modify
20	859.00625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	Modify
21	861.00625MHz	12.5kHz	OFF	NA	NA	NA	100dB	100dB	Modify
			-		020 Limited. All rights		Versi		<u> </u>

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.

Home DCommissioning	🛠 Management		🚫 L	Logout
	Work Flow	,		
	Start Params Setting	Isolation Finish		
Tips: Click button to start commissioning.				
		_		
	Coovright © 2019-2020 Lir	Start	Version:1.0	

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.

Home DCo	mmissioning 🛞 Manag	jement			🚫 Logout
Device Info					
		Item	Current Value	Config Value	
🖧 Comm. Setting		Dev Model	RX7W22-78323748,II2		
		Date/Time	04/16/20 09:49:37		
Alarm Setting		Device Info			
-		Longitude			
Isolation		Latitude			
Reset			Refresh Modify		
Firmware					
Report					
License					
Security					
		Convright	© 2019-2020 Limited. All rights reserved	Version:1.0	





#### > Device Info

Home DCommissio	ning 🛞 Management				🚫 Log
Device Info					
		Item	Current Value	Config Value	
Comm. Setting		Dev Model	RX7W22-78323748,II2		
Container Softing		Date/Time	04/16/20 09:49:37		
Alarm Setting		Device Info			
Isolation		Longitude			
		Latitude			
Reset			Refresh Modify		
Firmware					
DLog					
License					
Security					

Figure 17: Management – Device Info

Comm. Setting

Home DCommissioning	🛞 Management				
Device Info			Communication Types:		
Comm. Setting		Item	Current Value	Config Value	
		OMC Service IP	0.0.0.0		
Alarm Setting		OMC Service IP Port	7025		
/		Transmission Protocol	TCP	UDP 👻	
Isolation		Dev RecvData Port(UDP)	8025		
Reset		MAC Address	00-27-1D-D2-97-60		
		IP Address	192.168.0.101		
Firmware		Default GateWay	192.168.0.1		
		SubNet Mask	255.255.255.0		
Report		Subiver mask			
☐Report D Log ☐License ?_ Security		Subwei mask	Refresh Modify	1	

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

Item		Status	Name	
Dry Contact Alarm	1	9	 Dry Contact Alarm1	🔅 Modify
Dry Contact Alarm	2	•	Dry Contact Alarm2	🔅 Modify
Dry Contact Alarm	3	9	Dry Contact Alarm3	🔅 Modify
Dry Contact Alarm	4	9	Dry Contact Alarm4	🌣 Modify
Dry Contact Alarm	5	0	Dry Contact Alarm5	🄅 Modify
Dry Contact Alarm	6	0	Dry Contact Alarm6	🄅 Modify
Ext Alarm	Status	Name	Trigger Level	
Ext Alarm 1	9	Ext Alm1	High Level	🔅 Modify
Ext Alarm 2	0	Ext Alm2	High Level	🄅 Modify
Ext Alarm 3	0	Ext Alm3	High Level	🔅 Modify
Ext Alarm 4	9	Ext Alm4	High Level	🔅 Modify
	Item		Current Value	
	n Detect Duration(10s)		5	🌣 Modify
Alam	Detect Duration(10s)		5	See Modify
		Refresh		

Figure 19: Management-Alarm Setting

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

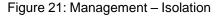
Bry Contact Alarm 1       Dry Contact Alarm 2       Dry Contact Alarm 3       Dry Contact Alarm 1       Dry Contact Alarm 1<			Item	L		Status			Name	
ting Dry Contact Alarm 2 Dry Contact Alarm 2 Dry Contact Alarm 2 Dry Contact Alarm 3 Dry Contact Alarm 4 Dry Contact Alarm 3 Dry Contact Alarm 4 D	ting	Dry Co	intact	Alarm 1		9			Dry Contact Alarm1	🔅 Modify
Oryc       PV Contract Alarm 1       Image: Section 2000 MHz       Image: Sec		Dry Co	intact	Alarm 2		9			Dry Contact Alarm2	🇱 Modify
Oryc       PV Contract Alarm 1       Image: Section 2000 MHz       Image: Sec	ng	Dry Co	ntact	Alarm 3		0			Dry Contact Alarm3	🄅 Modify
Dry       Donor DC Votage Alarm       Over Temperature Alarm       ILNA Alarm 800 MHz       Modely         Ext Alarm       DL PA Alarm 700 MHz       PLL Alarm 700 MHz       PLL Alarm 700 MHz       Ext Alarm 1         Ext Alarm 1       DL PA Alarm 800 MHz       DL PA Alarm 700 MHz       Ext Alarm 1       Image: Construct of the stand st		Dry (	Dry C	ontact Alarm 1						🄅 Modify
Ext Alarm     Other Independent Alarm     Current Value       Ext Alarm     UNA Alarm 700 MHz     PLL Alarm 700 MHz     FLL Alarm 700 MHz       DL PA Alarm 700 MHz     DL PA Alarm 700 MHz     Ext Alarm 1       Ext Alarm     Ext Alarm 2     Ext Alarm 3     Ext Alarm 4       Ext Alarm     DL PA Alarm 700 MHz     DL P out Over Alarm 800 MHz     OL P out Over Alarm 800 MHz       Ext Alarm     DL P in Over Alarm 800 MHz     DL P out Over Alarm 800 MHz     OL P out Over Alarm 800 MHz       Ext Alarm     DL P in Over Alarm 800 MHz     DL P out Over Alarm 800 MHz     Ok       Ext Alarm     Ok     Cancel     Cancel		Dry (		Alarms		Alarm	s		Alarms	🄅 Modify
Ext Alarm       DL PA Alarm 300 MHz       DL PA Alarm 700 MHz       Ext Alarm 1         Ext Alarm       Ext Alarm 2       Ext Alarm 3       Ext Alarm 4       Image: Stress of the stress of t		Dry 0		Donor DC Voltage Alarm		Over Temperatu	ire Alarm		LNA Alarm 800 MHz	🇱 Modify
Ext Alarm 1     Ext Alarm 2     Ext Alarm 3     Ext Alarm 4     Image: Constraint of the second				LNA Alarm 700 MHz		PLL Alarm 80	0 MHz		PLL Alarm 700 MHz	
Ext Alarm 2     DL P in Over Alarm 800 MHz     DL P_in Over Alarm 700     DL P out Over Alarm 800 MHz     W todaty       Ext Alarm 3     Ok     Cancel     Current Value		Ext Alarm		DL PA Alarm 800 MHz		DL PA Alarm 7	'00 MHz		Ext Alarm 1	
Ext Alarm 20       DL P in Over Alarm 800 MHz       DL P_in Over Alarm 700       DL P out Over Alarm 800 MHz       Children Alarm 800 MHz       Ch		Ext Alarm 1		Ext Alarm 2		Ext Alarn	13		Ext Alarm 4	🔅 Modify
Ext Alarm 3         Image: Contract of the second seco		Ext Alarm 2		DL B is Over Alarm 900 MHz		DL P_in Over A	larm 700	_	DL B. out Over Alerm 200 MHz	
Item         Current Value           Alarm Detect Duration(10s)         5         Identify		Ext Alarm 3		DE P IN OVER Alarm doo Minz	10.1					🄅 Modify
Alarm Detect Duration (10s) 5 🌣 Modify		Ext Alarm 4				Ok Cano	el			🔅 Modify
Alarm Detect Duration(10s) 5 🎸 Modely							_			
				Alarm Detect Duration(10s)					5	😒 Modity
						Refresh				

Figure 20: Management-Alarm Setting

#### Isolation

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

Home DCommissioning	Management					
Device Info	Manual Isolation					
	Freq Band	Isolation				
Comm. Setting	800MHz	127dB	🍄 Check			
	700MHz	127dB	🔅 Check			
Alarm Setting	ICS Isolation					
Isolation	Freq Band	Isolation	Isolation			
	800MHz	127dB				
Reset	700MHz	127dB				
Firmware     Freport						
License						
Security						
	Copyright © 2019-2020 Limited. All rig	nts reserved. Version:1.0				



#### > Reset

Home DCommissioning	Management			
Device Info				
Comm. Setting	Restore Default Setting		Clear History Alarm	
Alarm Setting	Restore		Clear	
		Confirm to restore det	ault setting.	
Reset	Device Reset	800MHz PA Re	set	700MHz PA Reset
Firmware	Reset	Reset		Reset
Report	Confirm to reset the device.			
License				
Security				
_~				
	Сору	right © 2019-2020 Limited. All rights rea	served.	Version:1.0

#### 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.

Home	Commissioning Management						
Device Info							
۵.		Upgrade					
Comm. Setting	Module		Current Version	Current Version Progress		File	
Alarm Setting	800 MHz	RX7W22F78P37V8001.4G		0%	0%		Add File
¢F.	700 MHz	RX7W22F78P37V8001.4G		0%	0%		Add File
Isolation							
	Version Details						
Reset	Mod	800MHz Module Vesion					
Firmware				F37RX7WB337S000V1001			
Report	Siav	Siave		M65RX7W22P37H10V80a1			
			700MHz Module				
Log	Mod	Module Vesion					
_	FPG	FPGA		F37RX7WB337S000V1001			
License	Siav	Slave M65RX7W22P37H10V80a1					
$\int_{\mathfrak{G}}$ Security	Upgrade						
	Master Swap	v Model	Prev Version		Current Version		
	RX7W2	2-78323748,112	M65RX7W22P37H10V8099 M65RX7W22		M65RX7W22P37H10V8099		
		Swap					
			Copyright © 2019-2020 Limited, All rights reserv	ed	Version:1	0	

Figure 23: Management – Report

#### > Report

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

Bome DCommissioning 🛠 Management		🗙 Logout
Device Info		
Comm. Setting	Create Summary	
Relation Setting	Create	
Isolation	Click create button to create report.	
() Reset		
Firmware		
Report		
License		
<u></u> security		
Convrinh	t © 2019-2020 Limited. All rights reserved	Version:1.0

#### Figure 24: Management – Report



### Log

PS BDA can export the log file for troubleshooting.

Home D Commissioning 🛠 Management	🗙 Logout
🖧 Comm. Setting	Export Log
Alarm Setting	Export
Isolation	Click button to export log file.
Reset	
C Firmware	
Report	
License	
2 Security	
Copyrigh	© 2019-2020 Limited. All rights reserved. Version:1.0

## Figure 25: Management – Log

#### > License

Home DCommissioning	Management			🚫 Loj			
Device Info	Dev	/ Function ID 40F66FFA22F7					
Comm. Setting	Lic	License ID Submit					
Alarm Setting	Freq Band		ev Authorization Status				
		L					
Isolation	800MHz		Authorized				
	700MHz		Authorized				
Reset	Class A		Authorized				
Firmware	Class B		Authorized				
Report							
Log							
Log							
License							
Security							
		Copyright © 2019-2020 Limited. All rights reserved.	Version:1.0				

### 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.

Home DCommissioning 🛠 Management			🚫 Logi
Device Info		1	1
	Name	Value	
Comm. Setting	User Name	admin	
C.	Old Password		
Alarm Setting	New Password		
Isolation	Confirm Password	•••••	
Reset	Refresh Modify		
Firmware			
Report			
License			
∑ <sub>®</sub> Security			
	Copyright @ 2019-2020 Limited. All rights reserved.	Version:1.0	



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

# Comba

# 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.

Home DCommissioning	🛞 Management	🔀 Logout
	Work Flow	
	Start Params Setting Isolation Finish	
Tips: Click button to start commissioning.	Shat	
	John	
Step 2: Click	Figure 28: Commissioning Procedure – Start	
	Work Flow	*
	Start Params Setting Isolation Finish	
Tips: Update units' information. You can als update the information any time later in the <management> in MU/RU page.</management>	Date/Time         Longitude         Latitude         Device Info         Modify           05/27/20 16:37:11	
		E
	Back Next	
	Copyright © 2019-2020 Limited. All rights reserved. Version:1.0	-
	Figure 29: Commissioning Procedure – Site Info. Setting	
Step 3: Click Mod	ify, 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.		
		Work Flow		
	Start	Params Setting Isolation	Finish	
Tips: Use "Check All" or "Select Units" to		Freq Band	Isolation	
start isolation check, Skip if the isolation has already been checked.	<b>V</b>	800MHz	127dB	
nus aready seen encened.		700MHz	127dB	
	Check All     Select Units	Back	Check	E
		Copyright © 2019-2020 Limited. All rights reserve	d. Version:1.0	

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 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.

Tips:			
Make certain t antennas are			a and service
	Ok	Cancel	

Figure 31: Commissioning Procedure – Isolation Detection Confirm



Step 5: After checking the isolation, Click device setting is shown.

Next to finish the commissioning. In this window, a summary of

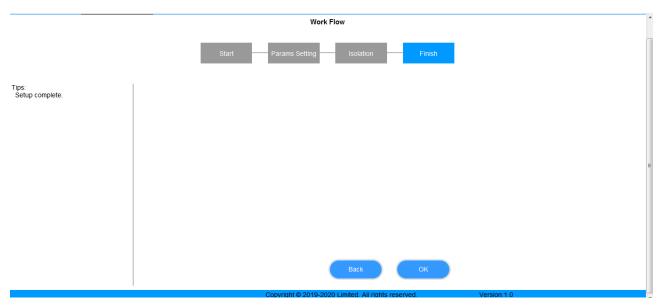


Figure 32: Commissioning Procedure – Finish

End of Section

## INSTALLATION GUIDE FOR RX-7W22, II2

# Comba

# 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

# Comba

# 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  $\frac{1}{2}$  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



### **INSTALLATION GUIDE FOR RX-7W22, II2**

For example: Out of band noise RX-7W22 PS BDA connected to 10 service antennas with a 100m long  $\frac{1}{2}$  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.

## **INSTALLATION GUIDE FOR RX-7W22, II2**

# Comba

# 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)

# Comba

# 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:

Dort Nome	Harmful Substance							
Part Name	Pb	Hg	Cd	Cr (VI)	PBB	PBDE		
А	×	0	0	0	0	0		
В	×	0	0	0	0	0		

Note: Above table complies with SJ/T 11364.

O: Indicates that the harmful substance content in all homogeneous materials for corresponding part is under the limited requirement of GB/T 26572.

X: 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 "x"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

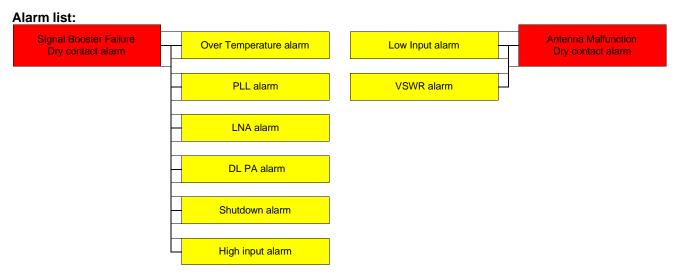


Figure 33: Alarm list

## Troubleshooting:

Alarms	Causes and actions
Low input (for DT port)	<ul> <li>DT composite input power lower than -80dBm will trigger the alarm</li> <li>1. Donor antenna/passive system failure</li> <li>2. Wrong channel frequency setting</li> <li>3. Site is not commissioned yet</li> </ul>
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 <ol> <li>Handling RF connectors when RF power is ON may damage LNA</li> <li>High power injection to DT/MT port may damage LNA</li> </ol>
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)	<ul><li>Check input power to DT port, the power shall be lower than -30dBm</li><li>Avoid other inference</li><li>Put attenuator between antenna and PS BDA, if donor signal is high</li></ul>





## **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

Home I	Commissioning	Management				🚫 Logout
Device Info						
Comm. Setting		Restore Default Setting			Clear History Alarm	
		Restore			Clear	
Alarm Setting			Confirm to restore de	fault setting.		
Isolation						
Reset		Device Reset	800MHz PA R	eset	700MHz PA Reset	
Firmware		Reset	Reset		Reset	
Report			Confirm to reset th	e device.		
 [] Log						
License						
Security						
			rright © 2019-2020 Limited. All rights re	raniad	Version:1.0	

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	0000000	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

т

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											

т

т

1         851.00625MHz         25KHz         -04.8dBm         -112dBm         DN         28dB         20dB         60dB         60dB           3         868.09375MHz         12.5KHz         -100dBm         -112dBm         DFF         30dB         30dB         60dB         60dB           4         851.16625MHz         12.5KHz         -100dBm         -112dBm         DFF         30dB         30dB         60dB         60dB           5         851.30625MHz         12.5KHz         -100dBm         -112dBm         DFF         30dB         30dB         60dB         60dB           6         851.45625MHz         12.5KHz         -100dBm         -112dBm         DFF         30dB         30dB         60dB         60dB           7         859.86625MHz         12.5KHz         -100dBm         -112dBm         DFF         30dB         30dB         60dB	Freq Band	Sub Band	Center Freq	BandWidth	DL P_in	UL P_in	Switch	UL ATT	DL ATT	UL Gain	DL Gain
3         888.98376MHz         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         851.46625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB         60dB           7         859.85625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         60dB		1	851.00625MHz	25KHz	-64.8dBm	-112dBm	ON	28dB	28dB	62dB	62dB
4         851.15025MHz         125KHz         100dBm         112dBm         DFF         30dB         30dB         60dB         60dB           5         851.30625MHz         12.5KHz         106dBm         112dBm         DFF         30dB         30dB         60dB         60dB           6         851.45625MHz         12.5KHz         106dBm         112dBm         DFF         30dB         30dB         60dB         60dB           7         859.85625MHz         12.5KHz         106dBm         112dBm         DFF         30dB         30dB         60dB         60dB           8         800.15625MHz         12.5KHz         106dBm         112dBm         DFF         30dB         30dB         60dB         60dB           9         800.30625MHz         12.5KHz         106dBm         112dBm         DFF         30dB         30dB         60dB         60dB           11         888.64375MHz         12.5KHz         106dBm         112dBm         DFF         30dB         60dB         60dB </td <td>800(MHz)</td> <td>2</td> <td>860.00625MHz</td> <td>12.5KHz</td> <td>-106dBm</td> <td>-112dBm</td> <td>OFF</td> <td>30dB</td> <td>30dB</td> <td>60dB</td> <td>60dB</td>	800(MHz)	2	860.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
5         851.30625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         80dB         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         60dB           8         800.15625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB         60dB         60dB           10         868.54375MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB         60dB           11         868.04375MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB         60dB           12         868.04375MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB         60dB           13         852.00625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB		3	868.99375MHz	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 <t< td=""><td></td><td>4</td><td>851.15625MHz</td><td>12.5KHz</td><td>-106dBm</td><td>-112dBm</td><td>OFF</td><td>30dB</td><td>30dB</td><td>60dB</td><td>60dB</td></t<>		4	851.15625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
7         859.85625MHz         12.5KHz         -106dBm         -112dBm         PFF         30dB         30dB         60dB         60dB           8         860.15625MHz         12.5KHz         -106dBm         -112dBm         PFF         30dB         30dB         60dB         60dB <t< td=""><td></td><td>5</td><td>851.30625MHz</td><td>12.5KHz</td><td>-106dBm</td><td>-112dBm</td><td>OFF</td><td>30dB</td><td>30dB</td><td>60dB</td><td>60dB</td></t<>		5	851.30625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
8         800.15625MHz         12.5KHz         -106dBm         -112dBm         PFF         30dB         30dB         60dB         60dB           9         800.30625MHz         12.5KHz         -106dBm         -112dBm         PFF         30dB         30dB         60dB         60dB           10         868.54375MHz         12.5KHz         -106dBm         -112dBm         PFF         30dB         30dB         60dB         60dB           11         868.69375MHz         12.5KHz         -106dBm         -112dBm         PFF         30dB         30dB         60dB         60dB           12         868.84375MHz         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         60dB		6	851.45625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
9         860.30825MHz         12.5KHz         -106dBm         -112dBm         DFF         30dB         30dB         60dB         60dB           10         868.54375MHz         12.5KHz         -106dBm         -112dBm         DFF         30dB         30dB         60dB         60dB           11         868.09375MHz         12.5KHz         -106dBm         -112dBm         DFF         30dB         30dB         60dB         60dB           12         868.84375MHz         12.5KHz         -106dBm         -112dBm         DFF         30dB         60dB         60dB         60dB           13         852.00625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         60dB         60dB         60dB           14         853.00625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         60dB         <		7	859.85625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
10         868.54375MHz         12.5KHz         106dBm         112dBm         OFF         30dB         60dB         60dB           11         868.09375MHz         12.5KHz         106dBm         112dBm         OFF         30dB         60dB         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           19         858.00625MHz		8	860.15625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
11         868.09375MHz         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         60dB         60dB         60dB           14         853.00625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         60dB         60dB         60dB         60dB           15         854.00625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         60dB         60dB <td></td> <td>9</td> <td>860.30625MHz</td> <td>12.5KHz</td> <td>-106dBm</td> <td>-112dBm</td> <td>OFF</td> <td>30dB</td> <td>30dB</td> <td>60dB</td> <td>60dB</td>		9	860.30625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
12       888.84375MHz       12.5KHz       -106dBm       -112dBm       OFF       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         20       859.00625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       30dB       60dB       60dB         21       861.00625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       30dB       <		10	868.54375MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
13       852.00625MHz       12.5KHz       -106dBm       -112dBm       DFF       30dB       30dB       60dB       60dB         14       853.00625MHz       12.5KHz       -106dBm       -112dBm       DFF       30dB       30dB       60dB       60dB         15       854.00625MHz       12.5KHz       -106dBm       -112dBm       DFF       30dB       30dB       60dB       60dB         16       855.00625MHz       12.5KHz       -106dBm       -112dBm       DFF       30dB       30dB       60dB       60dB         17       856.00625MHz       12.5KHz       -106dBm       -112dBm       DFF       30dB       30dB       60dB       60dB         18       857.00625MHz       12.5KHz       -106dBm       -112dBm       DFF       30dB       30dB       60dB       60dB         20       859.00625MHz       12.5KHz       -106dBm       -112dBm       DFF       30dB       30dB       60dB       60dB         21       861.00625MHz       12.5KHz       -106dBm       -112dBm       DFF       30dB       30dB       60dB       60dB         21       861.00625MHz       12.5KHz       -106dBm       -112dBm       DFF       30dB       <		11	868.69375MHz	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       60dB         17       856.00625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       30dB       60dB       60dB       60dB         18       857.00625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       30dB       60dB       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 <td< td=""><td></td><td>12</td><td>868.84375MHz</td><td>12.5KHz</td><td>-106dBm</td><td>-112dBm</td><td>OFF</td><td>30dB</td><td>30dB</td><td>60dB</td><td>60dB</td></td<>		12	868.84375MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
15         854.00825MHz         12.5KHz         -108dBm         -112dBm         OFF         30dB         30dB         60dB         60dB           16         855.00625MHz         12.5KHz         -108dBm         -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         60dB         60dB           23         8		13	852.00625MHz	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       60dB         19       858.00625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       30dB       60dB       60dB       60dB         20       859.00625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       30dB       60dB       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       60dB         23       863.00625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       30dB       60dB       60dB         24       864.00625MHz       12.5KHz       -1		14	853.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
17       856.00825MHz       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       <		15	854.00625MHz	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       <		16	855.00625MHz	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       <		17	856.00625MHz	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 <td< td=""><td></td><td>18</td><td>857.00625MHz</td><td>12.5KHz</td><td>-106dBm</td><td>-112dBm</td><td>OFF</td><td>30dB</td><td>30dB</td><td>60dB</td><td>60dB</td></td<>		18	857.00625MHz	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         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       <		19	858.00625MHz	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         28       868.00625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       30dB       60dB       60dB         29       864.50625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       <		20	859.00625MHz	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         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       <		21	861.00625MHz	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         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       <		22	862.00625MHz	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         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         30       865.50625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       30dB       60dB       60dB         31       866.50625MHz       12.5KHz       -106dBm       -112dBm       OFF       30dB       <		23	863.00625MHz	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           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           30         865.50625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB         60dB           31         866.50625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB         60dB		24	864.00625MHz	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           30         865.50625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB         60dB           31         866.50625MHz         12.5KHz         -106dBm         -112dBm         OFF         30dB         30dB         60dB         60dB		25	865.00625MHz	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		26	866.00625MHz	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		27	867.00625MHz	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		28	868.00625MHz	12.5KHz	-106dBm	-112dBm	OFF	30dB	30dB	60dB	60dB
31 866.50625MHz 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
32 867.50625MHz 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)

<form><form><form><form></form></form></form></form>		61 Fax: +852 2637 0966		Request Form
Tel:       Fax:         ATTN:    Product Information:          Item Model       Serial Number       Return Category       Qty       Problem Description         1       1       1       1       1       1         2       1       1       1       1       1         3       1       1       1       1       1         3       1       1       1       1       1         4       1       1       1       1       1         3       1       1       1       1       1         4       1       1       1       1       1         4       1       1       1       1       1         4       1       1       1       1       1         5       1       1       1       1       1       1         8       1       1       1       1       1       1       1         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:       Excession of Product:       Excession of Product:       Excession of Product:       Excession of Product:		-	Date:	
ATTN:         Product Information:         Item Model       Serial Number       Return Category       Qty       Problem Description         1       1       1       1       1       1       1         3       1       1       1       1       1       1       1         3       1       1       1       1       1       1       1         3       1 <th>Tel: Fax:</th> <th>3</th> <th></th> <th></th>	Tel: Fax:	3		
Item       Model       Serial Number       Return Category       Qty       Problem Description         1       1       1       1       1       1       1       1         3       1       1       1       1       1       1       1         3       1       1       1       1       1       1       1         4       1       1       1       1       1       1       1         4       1       1       1       1       1       1       1         5       1       1       1       1       1       1       1       1         6       1		-		
Item       Model       Serial Number       Return Category       Qty       Problem Description         1       1       1       1       1       1       1       1         3       1       1       1       1       1       1       1         3       1       1       1       1       1       1       1         4       1       1       1       1       1       1       1         4       1       1       1       1       1       1       1         5       1       1       1       1       1       1       1       1         6       1	Product Information:	_		
2	Item Model Serial Number	Return Category	Qty	Problem Description
3				
5	3			
7	5			
8				
10       Notes:         Note:       I. 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.         For Comba Use (Only)         Return Merchandise Authorization Number (RMA#):         Recommended Action:         Shippment and Handling Cost to be paid by:	8			1
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:         Shippment and Handling Cost to be paid by:				
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.  For Comba Use (Only) Return Merchandise Authorization Number (RMA#): Recommended Action: Shipment and Handling Cost to be paid by:	Notes:			
not determined. Signature: For Comba Use (Only) Return Merchandise Authorization Number (RMA#): Recommended Action: Shipment and Handling Cost to be paid by:	2. If A or C category of return product is chosen, please giv Transportation Information: Location of Product: Transportation Method: Shipping Forwarder:			
For Comba Use (Only) Return Merchandise Authorization Number (RMA#): Recommended Action: Shipment and Handling Cost to be paid by:	Note: Location of Product' must be stated, while 'Trans not determined.		ing Forwa	rder' can be left blank if
Return Merchandise Authorization Number (RMA#): Recommended Action: Shipment and Handling Cost to be paid by:		oignature.		
Return Merchandise Authorization Number (RMA#): Recommended Action: Shipment and Handling Cost to be paid by:				
Return Merchandise Authorization Number (RMA#): Recommended Action: Shipment and Handling Cost to be paid by:				
Approved by:	Return Merchandise Authorization Number (R Recommended Action:	MA#):		
	Approved by:			
Date:			Date:	

End of Section

## End of Document



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