WCDMA Multi-Carrier High Power Booster User Manual

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WCDMA Multi-Carrier High Power Booster
User Manual

1. Introduction

This manual contains information and procedures for installation, operation, and maintenance of the WCDMA Multi-Carrier High Power Booster.

2. General Description

The WCDMA Multi-Carrier High Power Booster, shown as Figure 1 and Figure 2, is a feed-forward; in-line power amplifier operating in UMTS band for a coverage enhancement application. This multi-carrier based product platform provides higher downlink power and improved the uplink sensitivity at the same time. The WCDMA booster can also work with customized BTS to extend capacity of original BTS with a low system total cost. The WCDMA booster is designed for outdoor application with IP65 environmental protection and outdoor fans.

The WCDMA booster system topically needs 220Vac power supply

Figure 1 WCDMA Outdoor Booster System

The enclosure contains up to a RF MCPA, an AC power supply module, duplexer assembly, a combiner, a monitor and gain setting module, four bypass relays, two LNA modules, a modem, a control board, five cooling fans.

Table 1 Composing of WCDMA Booster

Item	Description	Quantity
1	Multi-carrier Power Amplifier (MCPA) Module	1
2	AC Power Supply Module	1
3	LNA Module	2
4	Duplex Module	3
5	Modem (Remote control and Alarm Monitoring)	1
6	Control Board	1
7	Combiner Module	1
8	Bypass Switch	4
9	Fan	5

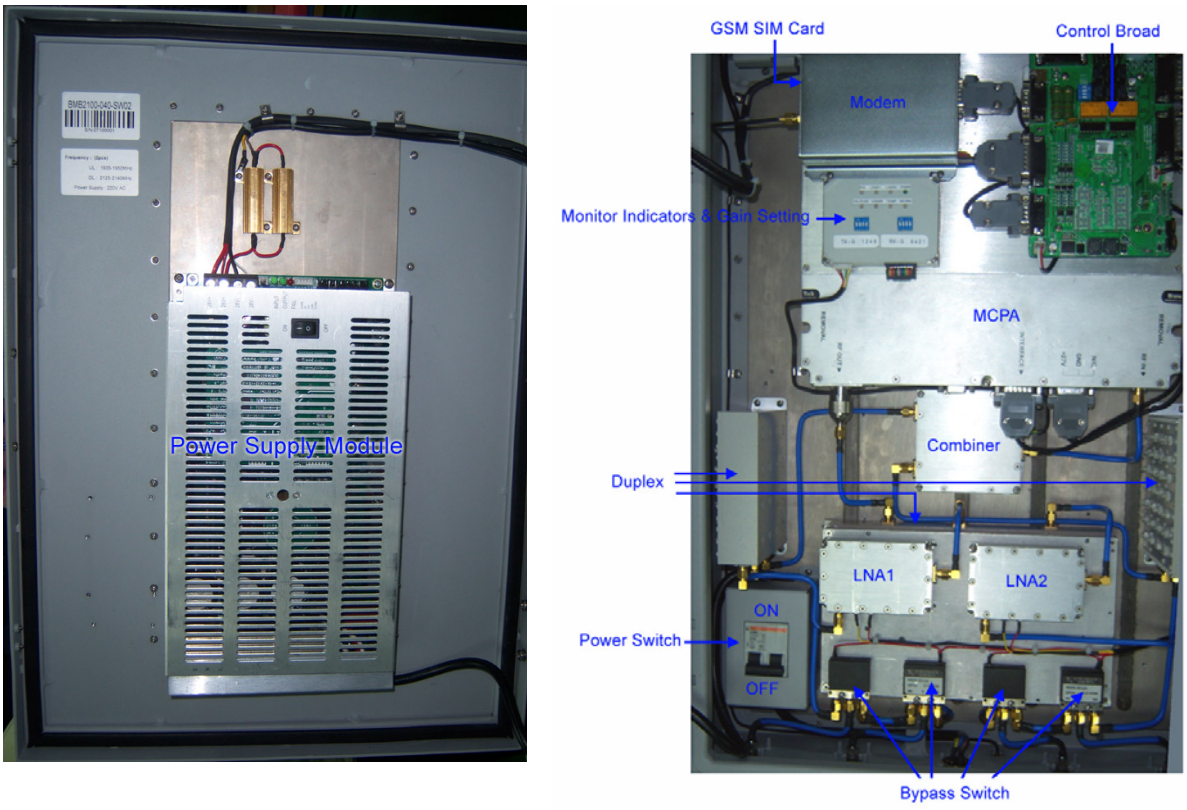

Figure 2 WCDMA Booster Inside View

3. WCDMA Booster Block Diagram

The following figure shows the system block diagram of the WCDMA Booster.

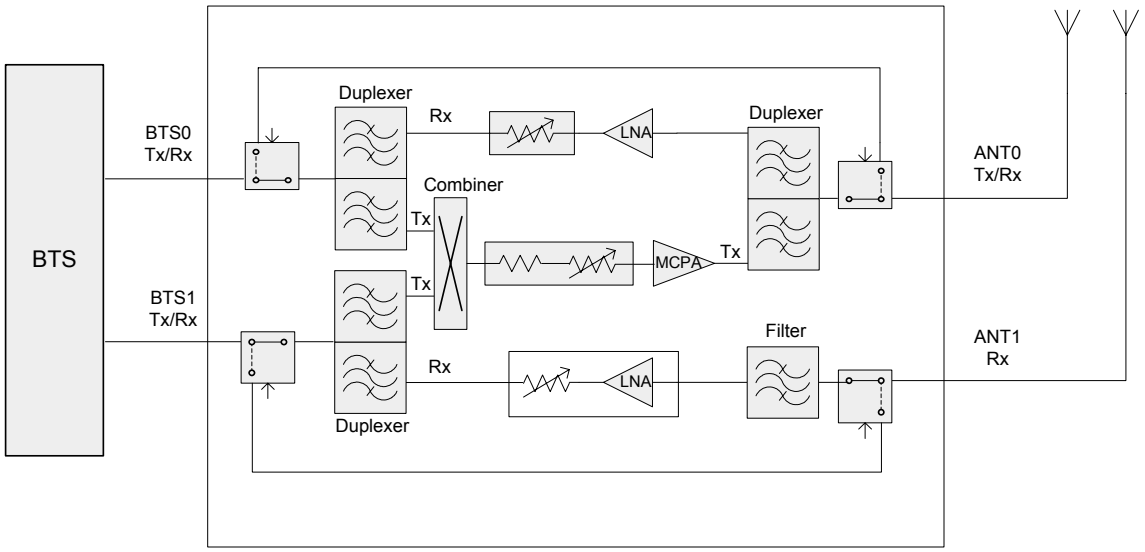

Figure 3 Configuration Of WCDMA Booster

4. WCDMA Booster Connection

This product has the following functions:

- Downlink output maximum power 40W, support multi-carriers amplify.
- Support flexible downlink Input either duplexed or unduplexed
- Support system full diversity
- Downlink and uplink gain adjustable with wide dynamic range
- Wide uplink input dynamic range
- 2.0dB uplink noise figure
- Very high system efficiency
- Extensive product monitoring and control (local and remote)
- Centralized system control/display/alarms
- IP65 environmental protection. Designed for indoor or outdoor installations.
- Extensive protection for lightning, voltage surge, and any high failure rate assemblies

5. WCDMA Booster Connection

WCDMA Booster connects with BTS and antenna, shown as Figure 4.

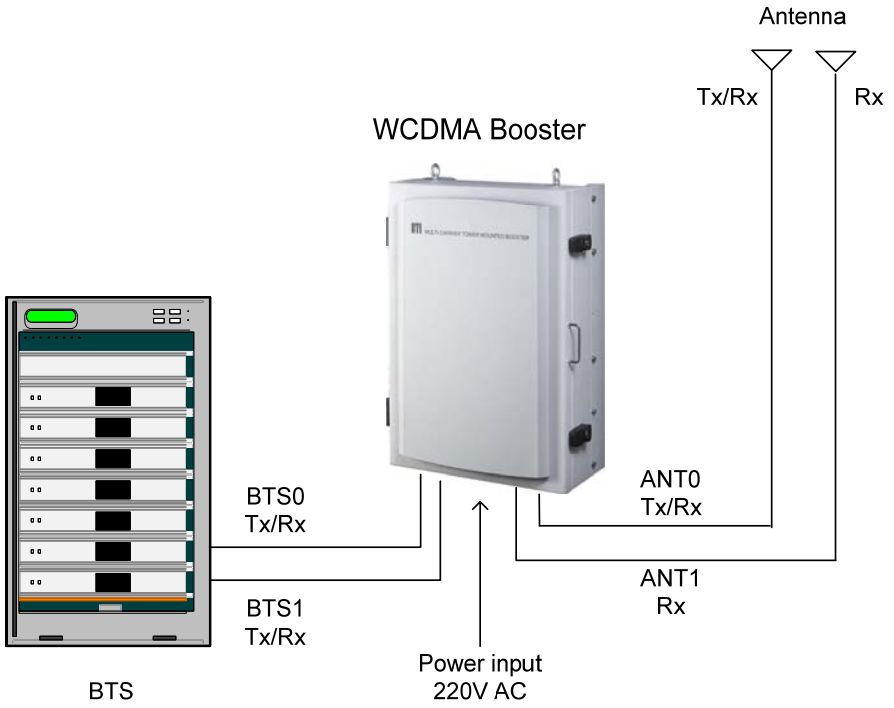

Figure 4 WCDMA Booster Connection

6. Outline Drawing

Figure 5 shows the outline drawing of WCDMA booster. Dimensions of WCDMA booster are 600mm x 430mm x 242mm（H x W x D）

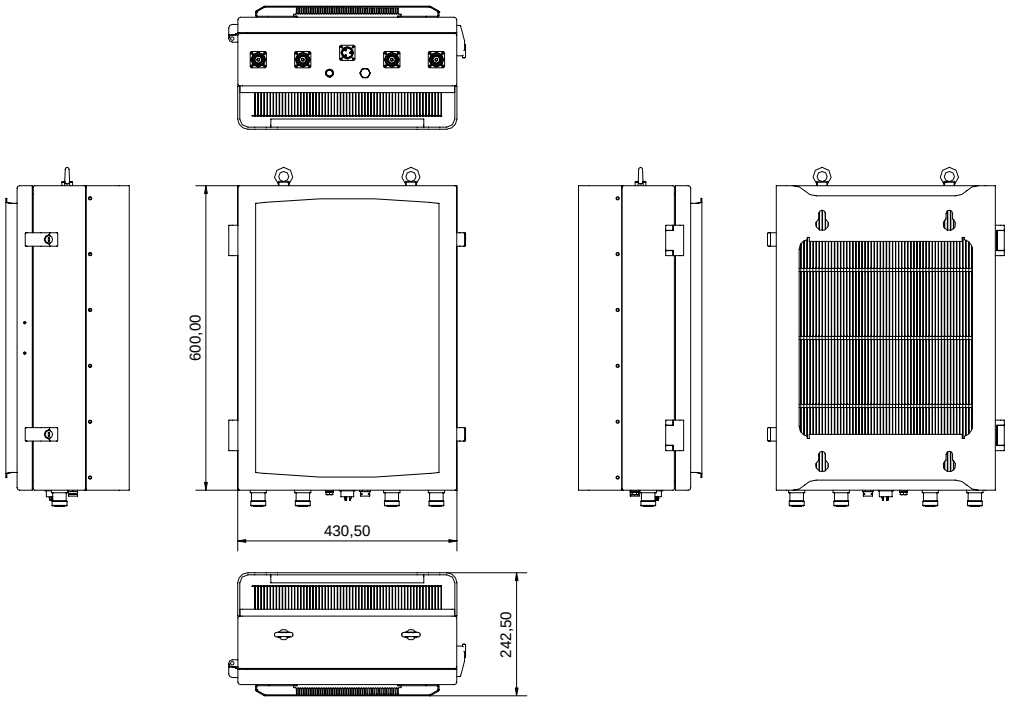

Figure 5 Outline Drawing

7. Interface

The interface of the WCDMA booster is shown in Figure 6. The specification of the interface is shown in Table 2.

Figure 6 WCDMA Booster Interface

Table 2 WCDMA booster Interface Specification

Interface	Specification
AC220V	Input power interface for AC220V
BTS0	Connect to BTS main TX/RX port
BTS1	Connect to BTS diversity TX/RX port
ANT0	Connect to main antenna (TX/RX)
ANT1	Connect to diversity antenna (RX)
GND	Grounding Terminal
---	GSM Modem Antenna

8. System Installation

The supporting frames and screws are installed as Figure 7.

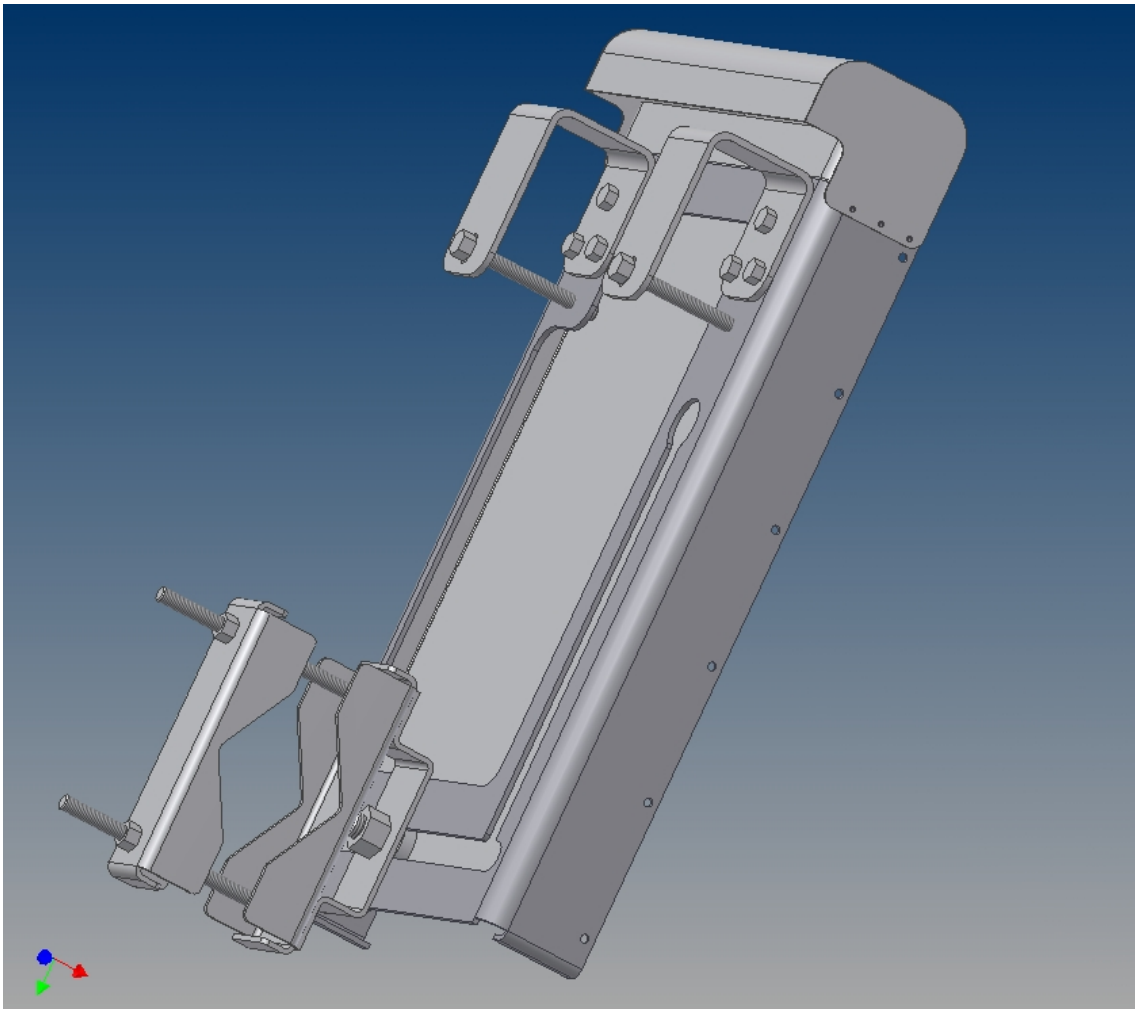

Figure 7 WCDMA Booster Installation

9. Maintenances and Managements

This chapter describes the operation and maintenance of the WCDMA booster.

9.1 System maintenance

9.1.1 Routine maintenance

The booster provides the following protection functions: LNA protection, overpower protection, VSWR protection, over-temp protection. In protection statements, the WCDMA booster works in by-pass statement and sends out alarm signal by GSM modem.

9.1.2 Indicator lights

1.The WCDMA booster has 8 indicator lights for monitoring and alarm, as shown in the following figure:

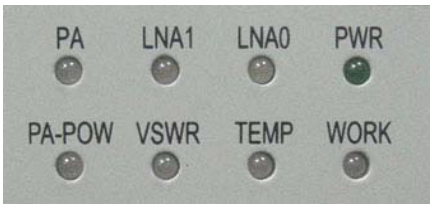

Figure 8 Monitoring And Alarm Indicator Lights

The specification of indicator lights is shown in Table 3

Table 3 Specification of indicator light

Item	Label	Color	State	Specification
1	PA -Power amplifier indicator light	Green	Light	Power amplifier works normally
		Red	Light	Power amplifier failure
2	LNA0/LNA1 -Low noise amplifier indicator light	Green	Light	Low noise amplifier works normally
		Red	Light	Low noise amplifier failure
3	PWR -Power indicator light	Green	Light	Power supply works normally
		-	Dark	No power supply
4	PA-POW -Power amplifier overpower indicator light	Green	Light	PA power is normal
		Red	Light	PA is overpower
5	VSWR -VSWR indicator light	Green	Light	VSWR is normal
		Red	Light	VSWR is failure
6	TEMP -Power amplifier temperature indicator light	Green	Light	PA temperature is normal
		Red	Light	PA is over-temperature
7	WORK -System working indicator light	Green	Spark	System working normally
		Red	Spark	System working failure

9.2 System management

9.2.1 Alarm range setting

Generally, the manufacturer has finished alarm range settings. User needn't to reset the range. Alarm range reference is shown in Table 4:

Table 4 Alarm Range Setting

Item	Indicator light	Alarm	Range
1	LNA0/LNA1	Over current	Upper limit:200mA Down limit:42mA Referential current:100mA
2	PA-POW	Over power	Power amplifier shut down power value: 47dBm
3	VSWR	Over VSWR	Over VSWR alarm and shut down: 5.0 Over VSWR restart :3.0
4	TEMP	Over temperature	Over temperature alarm and shut down power amplifier: ≥95□ Over temperature restart: 75□

9.2.2 Power amplifier and Low noise amplifier gain setting and calculation

1.Gain setting

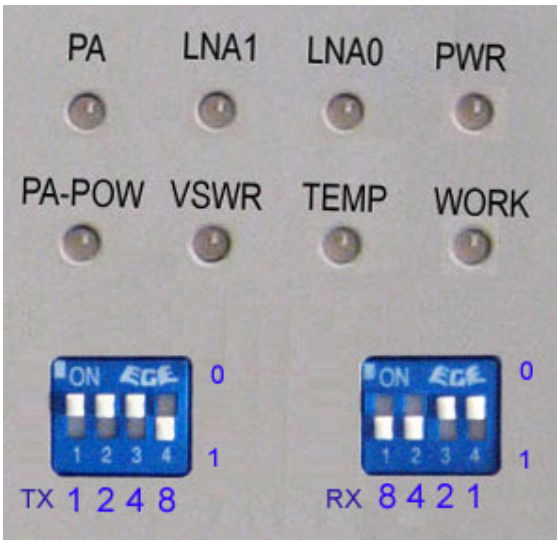

Figure 9 Downlink And Uplink Gain Setting

Shown as Figure 9, 'TX' and 'RX' switch are 4 bits code switch, '0' for switch up and '1' for down. The TX numbers are 1 - 2 - 4 – 8 in turn. The RX numbers are 8 - 4 - 2 – 1 in turn.

Table 5 Power amplifier and low noise amplifier gain setting

Item	Label	Description	Number	Range
1	TX	Downlink PA gain setting	0~15	Adjust range:0~15dB
2	RX	Uplink LNA gain setting	0~15	Adjust range:0~12dB

For example, the setting numbers of Figure 16 are shown in Table 6:

Table 6 A example of power amplifier and low noise amplifier gain setting

Item	Label	Switch number	Description
1	TX	8	PA Gain:8dB
2	RX	12	LNA Gain:12dB

2.Gain calculation

Below descript the calculation of the gain of downlink PA and uplink LNA.

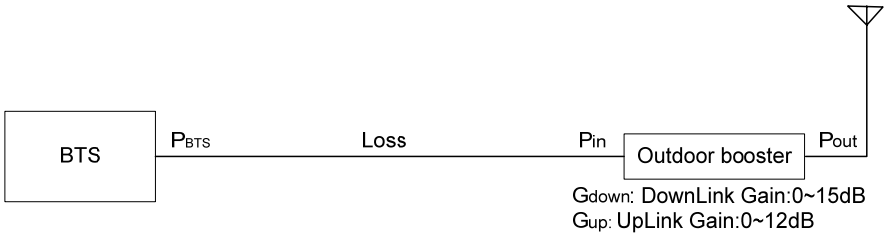

Table 7 Symbol Description

Item	Symbol	Description
1	P_{BTS}	BTS output power
2	P_{in}	Booster input power
3	Loss	Gable loss
4	G_{down}	Downlink PA gain
5	P_{out}	PA output power
6	G_{up}	Uplink LNA gain

The max output power of PA is 40W (46dBm), the gain of PA is calculated as the following formula:

$$G_{down}=P_{out}-P_{in}= P_{out}-(P_{BTS}-Loss) = 46dBm-(P_{BTS}-Loss)$$

On the assumption that the output power of BTS is 20W (43dBm), the cable loss is 3dB, than the gain is:

$$G_{down}=P_{out}-(P_{BTS}-Loss) =46dBm-(43dBm-3dB) =6dB$$

To avoid the over-power alarm of the booster, set 1dB redundancy, and adjustable step is 1dB, so the PA gain is set 5dB.

G_{up} compensates the insertion loss of feeder and booster. For engineering experience, G_{up} = 8~12dB is recommended.

10. System Specification

Table 8 System Specification

RX Characteristics	**Specification**
Frequency Range	1920-1980MHz
Instantaneous Bandwidth	60MHz
Max Gain over frequency and temperature	12±1 dB
Adjustable Gain Range	0~12dB

Flatness over Frequency	≤±1dB
Noise Figure	≤1.8dB (typical) ≤2.0dB (maximum)
Insertion Loss (Bypass Mode)	≤2.6dB
Output 1dB Compression (max. Gain)	+12dBm
Output IP3 (max. Gain)	+25dBm
Return loss(VSWR)	18dB active(1.29:1) 14dB bypass(1.5:1)
RX to TX Rejection	>80dB

TX Characteristics	**Specification**
Frequency Range	2110-2170MHz
Instantaneous Bandwidth	60MHz
Number of Carriers	Support multi-carriers
Output Power	40W
Maximum Input Power	43dBm
Gain	0 - 15dB(+/-0.5dB) Adjustable in 1dB step
Gain Flatness	+/-1dB
Gain Variation Over Temp	+/-1dB
Spectrum Masks and Spurious Emissions	Meeting WCDMA 3GPP requirements

System Characteristics	**Specification**
Return loss(VSWR)	
BTS Ports	14dB (1.5:1)
Antenna Ports	14dB (1.5:1)
Bypass Insert Loss	<0.5dB
Monitor & Control (LCD and Keypad)	Forward Power, Reverse Power, Temp, LNA Conditions (for both), PA Conditions, TX Gain Setting, RX Gain Setting, DC Voltage
Alarm & Protection (Form C type)	Overpower Shutdown, Over Temp Shutdown, Loop Fail Shutdown, Reverse Power Shutdown, DC Fail Shutdown
Power Input	220V AC

Environmental Characteristics	**Specification**
Operating Temperature Range	-20˚C to +55˚C

Cold Start Temperature	-40˚C
Storage Temperature	-40˚C to +85˚C
Waterproof	IP65 (Except Fans)
Humidity	5%～95%
EMC	ETS 300 342-3

Mechanical Characteristics	**Specification**
Material	Steel& Aluminum Frame
Weight	58Kg
Dimensions（H x W x D）	600mm x 430mm x 242mm
Connectors	
BTS Ports	7/16 DIN female
ANT Ports	7/16 DIN female
Fan	Fans support outdoor working

Reliability Characteristics	**Specification**
MTBF	
MCPA	100,000 hours
Rectifier	70,000 hours
Other Parts	150,000 hours