

# **MCPA Outdoor System User Manual**

**May, 2012**

**Version 1.0**

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U.S.A.

**U.S.FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE  
STATEMENT INFORMATION TO THE USER**

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

NOTE: This equipment has been tested and founded to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## 1. SUMMARY

### 1.1 Overview

MCPA System was designed to improve communication coverage/service quality and customer satisfaction for mobile handset users in coverage areas such as metropolis, urban areas, high dense area and BTS Cell are target candidates for installation. MCPA (Multi-Carrier Power Amplifier) Booster system provides high performance network upgrade solution ranging from highly capital-intensive options

### 1.2 Characteristic

- ✓ Compensate Loss of Feeder Line between BTS and Antenna.
- ✓ Expand US-PCS BTS Coverage/ Service Coverage.
- ✓ Continuous Service with no Trouble is available by Bypass. (RF Switch)
- ✓ Be able to amplify output power of up to 200W due to enable to regulate Gain of 5.5 ~14.5dB on the case of TX Signal though low Output power of existing BTS.
- ✓ Enable to Remote Control through communication of SMS using by existing PCS Network, monitor and manage easily for a notebook through Ethernet communication.

### Abbreviation

MCPA : Multi-Carrier Power Amplifier

BTS: Base Transceiver Station

MCA: Multi-Carrier Amplifier

FEU: Front End Unit

MCU: Micro Controller Unit

PSU: Power Supply unit

## **2. System Configuration**

### **2.1 System Description**

#### **2.1.1 Linear Technology**

- ✓ RF Circuit Composition is Simple
- ✓ Feed Forward of Matched Broad-band Quality
- ✓ Feed Forward Linear Technology Increases Efficiency and Reduces Heat

#### **2.1.2 Modular System**

- ✓ If One Sector MCA Module Fails, the Other Sectors Will not be affected Modules
- ✓ Moved In and Out for Easy Replacement, Optimizes Size

#### **2.1.3 Passive Intermodulation**

- ✓ Poor Contact Junctions
- ✓ Components Made with or Plated with Materials that Exhibit Some Level of Hysteresis
- ✓ Low Passive IMD System

#### **2.1.4 Safety Design**

- ✓ Individual FAN Temperature Sensor
- ✓ Automatic Bypass Function

#### **2.1.5 User Friendly**

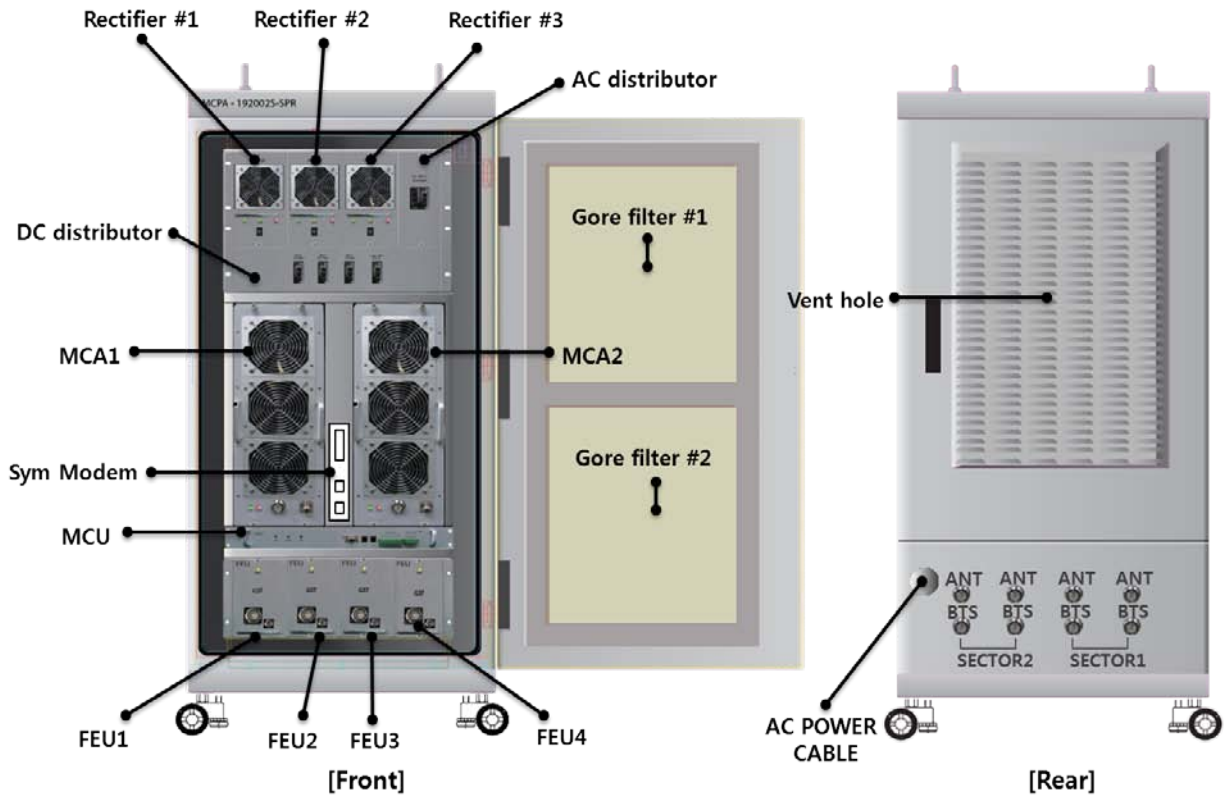
- ✓ Web UI Interface, Easy Check and Control
- ✓ System/Status: Displays current firmware and user controllable configurations.
- ✓ Status/Alarm: Displays the status of all the individual alarm parameters.
- ✓ System/Configuration: Displays and allows modification to system configurations.
- ✓ System/Download - Firmware related interface.
- ✓ Dry Contact Alarm - interface to existing base station alarm reporting circuits.

## 2.2 System Design and Operation

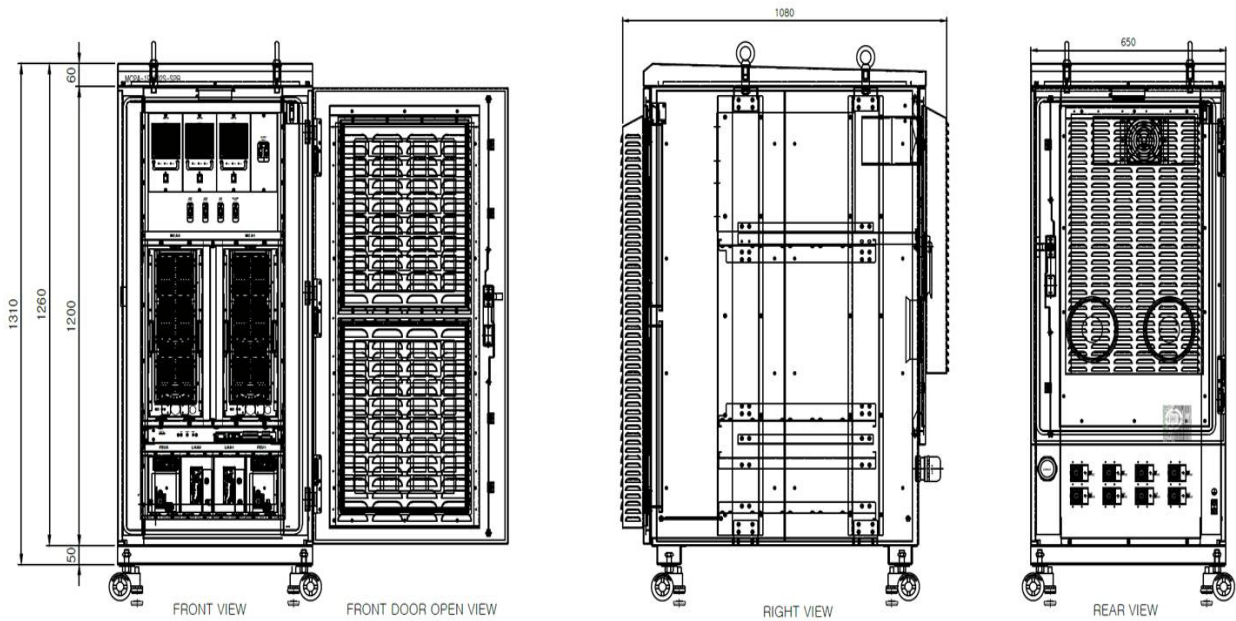
### 2.2.1 System Design



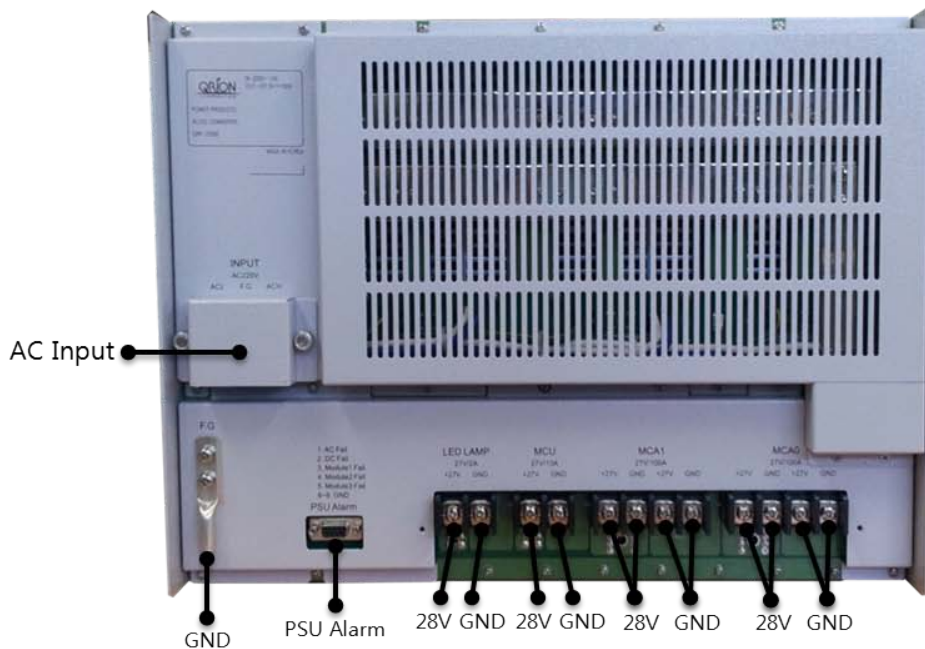
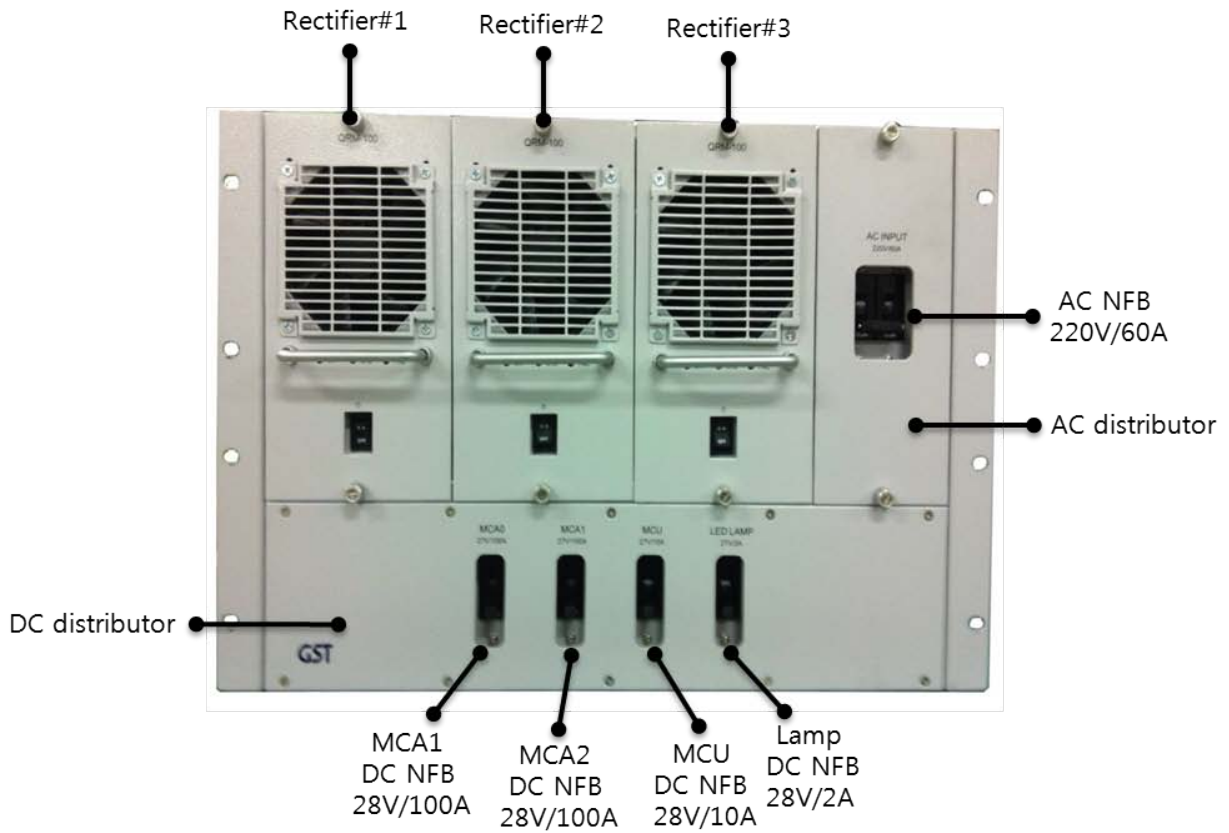
[Figure1 Outdoor System]



[Figure2 Cabinet Front, Rear]

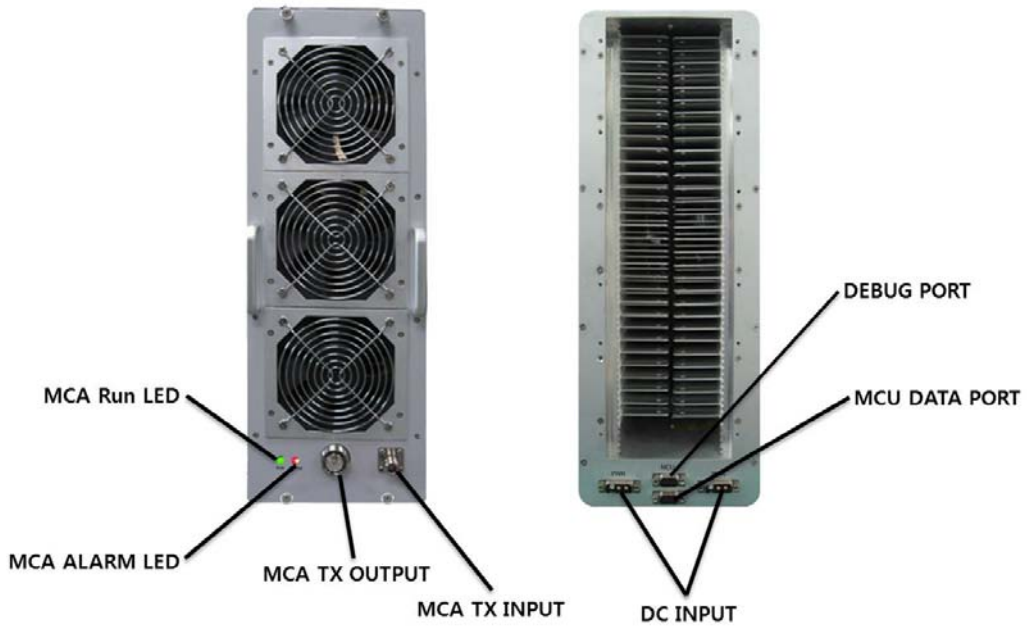


[Figure3 System Dimensions]

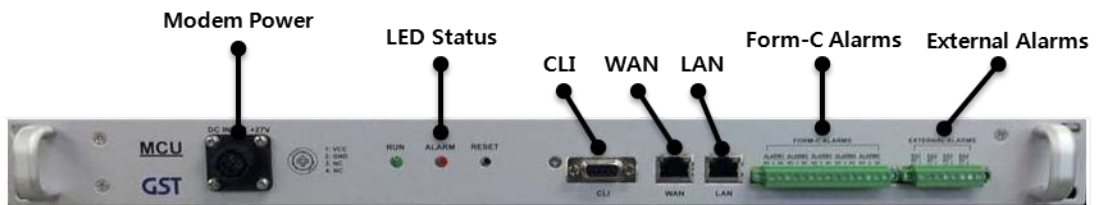


[Figure4 PSU]

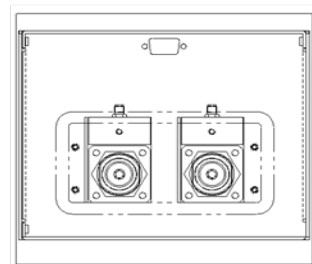
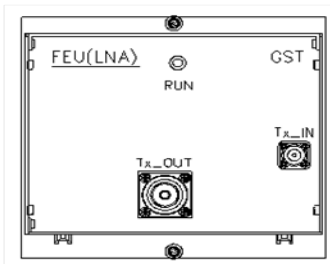
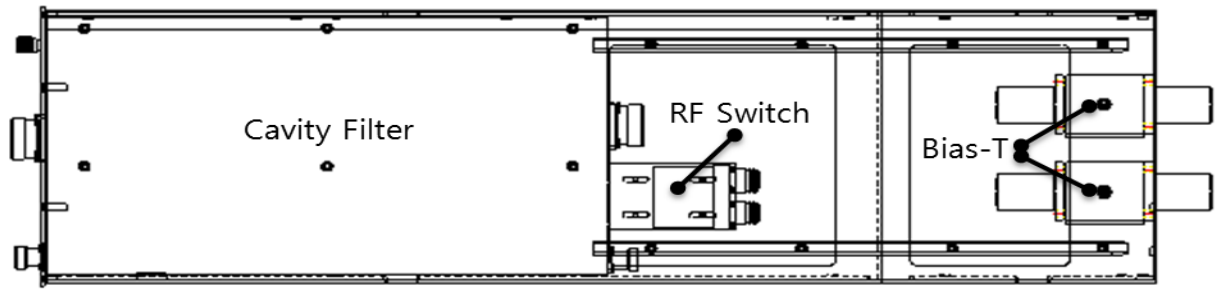




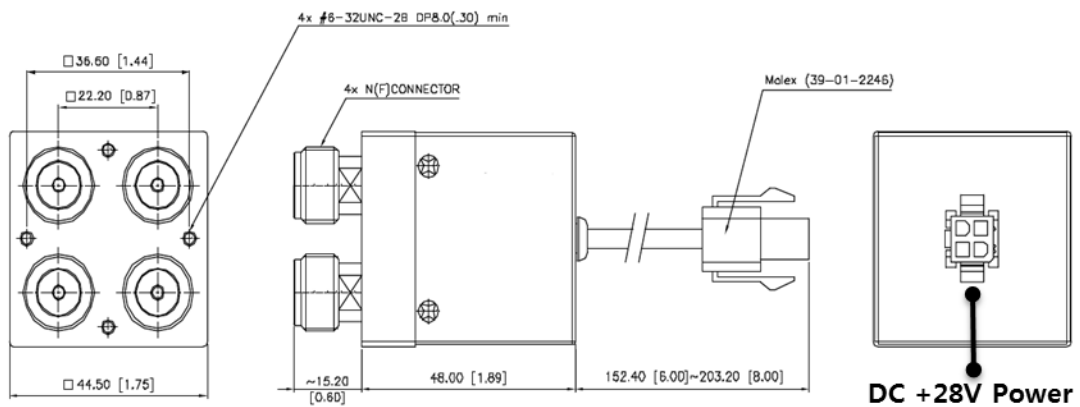
[Figure5 MCPA]



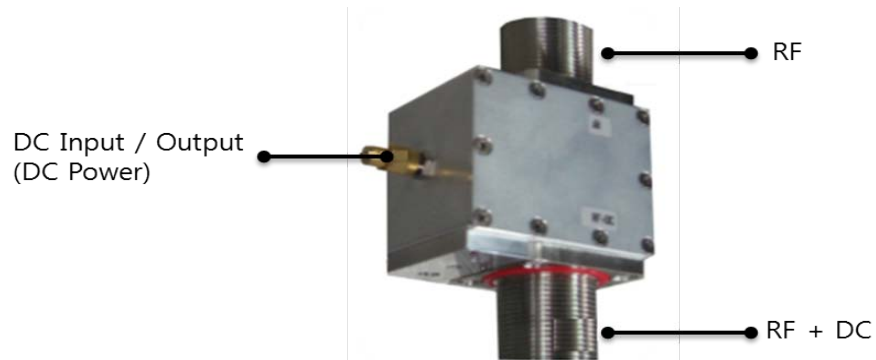
[Figure6 MCU]



[Figure7 FEU]

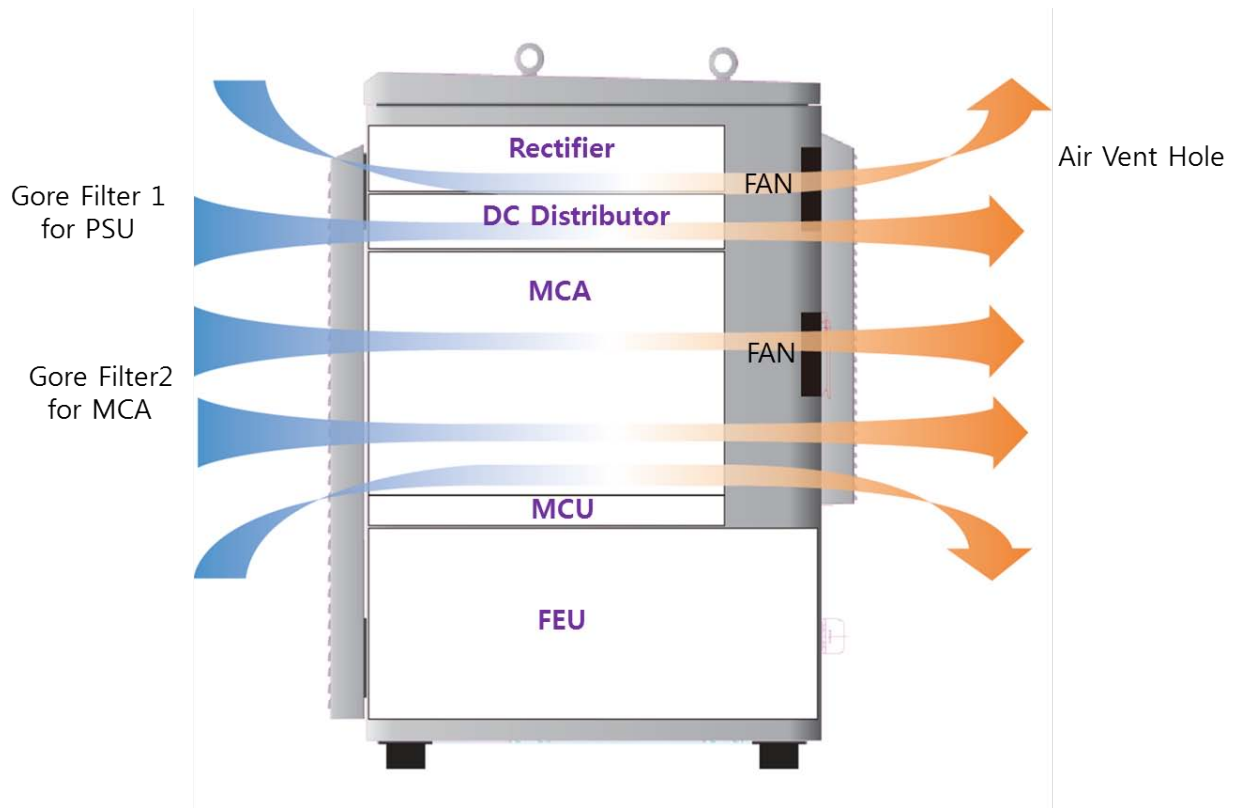


[Figure8 RF Switch]



[Figure9 Bias-T]

### 2.3 Cabinet Flow of Air



[Figure12 Flow of Air]

## &.4 Function

Part	Function	Remark
Major Alarm Generation For MPCA	<ul style="list-style-type: none"> <li>• High Temp Alarm Occurs at 185°F, Shutdown Above 190°F</li> <li>• DC Fail Alarm @ V-sup &lt; +24Vdc or V-sup &gt; +30Vdc</li> <li>• Over Power Output Alarm @ Output Power is Larger than Maximum Power + 0.5dBm±0.5dB</li> <li>• VSWR Alarm 3:1 (6dB±1dB) @ above +40dBm</li> <li>• Major Loop Fail – Error in 1st Loop Level</li> </ul>	Shutdown
Minor Alarm Generation For MPCA	<ul style="list-style-type: none"> <li>• Normal Operation When this Alarm Condition Disappears</li> <li>• Minor Loop Fail – Error in Feed Forward Path</li> </ul>	No Shutdown
Monitor for MCA	<ul style="list-style-type: none"> <li>• Forward Power (MCPA Monitor Ranges From 33dBm to 54dBm)</li> </ul>	
Alarm for LNA	<ul style="list-style-type: none"> <li>• LNA Device Fail Alarm</li> </ul>	
System Alarm	<ul style="list-style-type: none"> <li>• PSU AC, DC Fail Alarm (Rectifier Module#1, Module#2, Module#3 DC Fail Alarm)</li> <li>• FAN Alarm (FAN Individual with Alarm Sensor)</li> <li>Door Open Alarm</li> <li>• Alarm Log Record for the Last 100 Failure Event Records (Include Alarm Event/Time/Date)</li> <li>• Dry Contact Main Remote Alarming Optional</li> <li>• 5 min Alarm Delay</li> </ul>	

## 1. SET UP

### 1.1 System Set up

#### 1) Check points before system set up

- a. Verification of system installation status
  - Electricity, In/out antenna, coaxial cable connection, and equipment mounts status.
- b. Verification of system accessories
  - User should check whole necessary accessories.
- c. Check receipt signal level
  - User should check whether receipt environmental condition is in accordance with system specification, so that system operation will be optimized.

#### 2) Check points after system set up

- a. Check by external LED
  - ① RUN: Green light ON (Off: Green light off)
  - ② ALARM: Green light in normal status, Red light in alarming
  - ③ SHUT DOWN: Green light in normal status, Red light in Shutdown status
- b. Verification of operation status
  - User should verify following status with Output monitoring terminal, which is provided by Spectrum Analyzer
  - Output power generation status, system spurious emission characteristics.
- c. Verification of signal quality and strength in service area
  - User should verify signal strength and quality of in-service coverage area by using cell phone or other measuring device.
- d. Verification of upper-level NMS operation status

## ' .2 Troubleshooting

In case of abnormal operation, technician should diagnose abnormality via remote access or directly connecting to MCPA using Ethernet cable. If technician is required to conduct repairs due to major alarm, MCPA should first be powered off, and then technician should prepare the proper measurement equipment before trying to fix the problem. In most cases of major MCPA, GST will simply replace the unit and conduct repairs at the appropriate facility.

### ' .2.1 Necessary Testing and Measuring Equipment

- 1) Power Attenuator: 30dB(1000Watt) 1EA, 20dB(25Watt) 1EA
- 2) Signal Generator: 3GHz
- 3) Spectrum Analyzer: 3GHz
- 4) Multi-Meter: 1EA
- 5) NoteBook: 1EA

### ' .2.2 Notice

- 1) Troubleshooting should be performed by a trained technician.
- 2) Parts that seem to be not used should not be disassembled.
- 3) While troubleshooting, technician should use attenuator to check RF Signal output.

### ' .2.3 Simple Troubleshooting Method

- 1) Verify LED Status
  - Normal operation: Green light on. Alarming: Red LED on.
- 2) Technician should check external and internal connectors to ensure that all connections are tightly secure. These connectors should be cleaned regularly.
- 3) If technician thinks there is a serious problem, call after sales team for over-the-phone technical support. 1-866-9-GST-USA (1-866-947-8872)

**.2.4 Troubleshooting**

Item	Check Point	Troubleshooting
Check before system operation	System input power range	From BTS (37.8dBm ~ 46.5dBm) : 6Watt ~ 45Watt @ 3Carriers
	System gain range	5.5dB ~ 14.5dB
	Output power at ANT port	52dBm@ ANT output port
	Check points before open for service	<ul style="list-style-type: none"> <li>- Please check quantity of all accessories with specification before you set up</li> <li>- Fit cable length in accordance with field condition</li> </ul>
Check after system operation	Check points after open for service	Check following status; <ul style="list-style-type: none"> <li>- Verify that the antennas are securely mounted and pointed in the correct directions</li> <li>- Connection status between antennas and RF cable</li> <li>- Proper AC power status</li> <li>- Grounding status of electrical circuit</li> <li>- Coaxial cable (RF) construction status</li> <li>- Connectors connection status</li> </ul>

## **' .2.5 Troubleshooting Guide Related to LED**

Status of each individual module can be determined by the status of the LED (MCU, Rectifier, MCA and FEU). All LEDs should illuminate a green; any other indication requires access to the Status / Alarm page. Some common alarms and there remedies are detailed in the following sections.

### **Rectifier Module Red LED or Individual Faults**

Any rectifier module fault is remedied by replacing a known good module with the suspected unit. Reference the Rectifier Module section in Installation Guide for the procedure on Rectifier Module replacement.

### **Rectifier Voltage Fault**

Measure the AC input and/or DC Output (all 3 fused outputs) and validate that the voltage is within the specified range detailed.

### **MCA and FEU Fault**

Disable the MCPA to force the sector into bypass, using external measuring equipment validate the RF passing through the MCPA System. Disable the MCA first then reseal the MCA and FEU modules, enable the MCPA. When equipment fails to operate, replace the MCA and FEU with another module.

### **MCU Fault**

If the communication to the system cannot be established the MCU is not operating. Measure the +28.5Vdc on the MCU. When MCU fails to operate, replace the MCU.



**.2.6 Troubleshooting Guide Related to RF**

Symptom	Check Point	Troubleshooting
When MCPA does not work properly	Check electricity cord connection status	-Re-plug in Adapter cord
When in alarming	DL VSWR alarm	Please Check following status; - Make sure Server Antenna Port is disconnected. - Please reset Adapter upon completing Alarm troubleshooting
	DL over-output alarm	- Make sure output power is operating normally - Please Reset Adapter upon completing Alarm troubleshooting
	Temperature alarm	Check following status; - Setting level of maximum temperature limit - Temperature offset is normal or not - Circumstances of temperature - Please Reset Adapter upon completing Alarm troubleshooting
	RF off	- Verify that the MCA's are On - Please Reset Adapter upon completing Alarm troubleshooting
When output power is no longer problem	Technician should verify category of alarm at the front side of MCPA	- When Red light on the Shutdown LED, technician should troubleshoot the alarm via Notebook computer
	- Technician should connect BTS with ANT port of MCPA - Please make sure all connectors are fastened	- Reconnect the connector - Change it if the connector is defective
	Check the input level	- Increase output power or check input change of BTS side


	Check gain of the unit	- If the Gain is different from normal level, please contact A/S team
	Cable connector loose	- It is possible for connectors to get too tight and damage the equipment or throughput - Please contact installer or service provider upon verification
In case of dropped call or bad signal after set up	Check input signal strength in the service area	- Increase output power level of MCPA by adjusting attenuation level
	Check RSSI signal strength	- Contact network management team or service provider
In case of output Signal wavelength is not shown flat or looks like oscillation	Check connection fastened between antenna and cable (Signal wavelength should be flat and stable if technicians shake CABLE. If not, it is connection problem)	- If connection is not proper, reconnect cable and connector and then check the output power again
	Input level change or module overheating	- Check input level from BTS side. - Check performance of each module (Diagnosed by A/S team)

**' .2.7 Troubleshooting Guide Related to NMS**

Symptom	Check Points	Troubleshooting
Link Fail	Communication problem	-In case of Ethernet, verify IP addressing, DHCP function, and that cookies are deleted -Verify that a crossover Ethernet cable is being used
	CLI connection, cable status check	-Make sure 1:1 connection -Follow instructions in the installation guide for this connection procedure
	CLI connection Check by USB to serial cable	-Please verify port number of PC communication -Please check cable connection status

## MPE Information

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	<p>Warning: Exposure to Radio Frequency Radiation The radiated output power of this device is far below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact during normal operation is minimized. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna should not be less than 1200cm during normal operation. The gain of the antenna is 20 dBi. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.</p>
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