Multiple Carrier Power Amplifiers

Model: MCPA1900 & MCPA850

Operation Instruction

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Version. 1.0
Ref# RE: FCC ID S8L-100254MCPA &
RE: FCC ID S8L-100270MCPA

Introduction

This document presents description of the Andrew Corporation 850/1900 Band MCPA (Multi-Carrier Power Amplifier) amplifiers. The MCPA amplifier is a high power, mixed-mode RF amplifier intended to provide signal amplification and conditioning. The MCPA amplifier is compatible with GSM/EDGE and WCDMA air interfaces operating in U.S. domestic cell sites where FCC compliance is mandatory.

The Cell band (869 MHz to 894 MHz) MCPA and PCS band (1.93 GHz to 1.99 GHz) RF power amplifier capable of amplifying multiple signals of different modulation types to a composite power level of 135 Watts.

MCPA Specifications

The MCPA1900-135 and MCPA850-135 provide linear amplification of multi-carrier, mixed-mode signals in the cellular and PCS frequency bands, respectively. The 850 Band and 1900 Band MCPA, have the following specifications:

Parameter	Specification
Operating RF Band	869-894MHz for MSA850-135 1930-1990MHz for MSA1900-135
Instantaneous BW	❑ 25MHz for MSA850-135 ❑ > 45MHz for MSA1900-135
Input DC Power	+27 VDC, nominal
DC voltage input range	+21VDC to +30VDC
Rated Output Power @ ≥ +26 to 30 VDC input	135W average
Rated Output Power @ ≥ +24.0 to < +26.0 VDC @ ≥ +21.0 to < +24.0 VDC	120W average 105W average
DC-RF Efficiency	14%, rated output power, nominal input voltage
Input signal types	GSM/EDGE, WCDMA,CDMA,TDMA (simultaneous)
Physical dimensions	15” x 17.25” x 3.8”
Weight	< 35lbs
Cooling technique	Integral Fan Tray, removable while unit is operational
Temperature Range	-40°C to +50°C operational, -20°C to +50°C meeting specifications.

Table 1 MCPA Specifications

The cell amplifier has been designed to support an instantaneous bandwidth of 25 MHz. Multiple carriers may be placed within a continuous 25 MHz span and the product shall meet specified performance marks. The PCS amplifier has been designed to support an instantaneous bandwidth of 45 MHz. Multiple carriers may be placed within a continuous 45 MHz span in the PCS band and the product shall meet specified performance marks.

Each amplifier has a nominal gain of 56 dB and is phase matched at room temperatures. The MCPA is designed to track amplitude and phase over all environmental conditions such that the units may be used in a parallel configuration

Functional Blocks:

The Andrew MCPA is comprised of the following functional areas:

- Preamplifier with unit gain and phase control
- Feed-Forward amplifier circuit
- Main amplifier stage
- Pre-distortion circuit
- FICA (Filter, Isolator, Combiner Assembly)
- Power conversion and conditioning circuit
- Controller circuit
- Communications circuit

Inputs and Outputs:

The amplifier is powered from a DC supply voltage, which can range from 21V to 30V. The DC power is brought into the amplifier through a D-Sub connector located on the rear side of the amplifier. The D-Sub connector also contains an RS-485 communications bus.

A second D-Sub connector located on the amplifier front panel is used for RS-232 communication. This connector is only used during factory tests and field maintenance procedures.

Alarms and operating state are communicated to the outside world through the RS-485 communications bus, the RS-232 communications bus, and visible LEDs located on the amplifier front panel.

The RF signal is brought into the amplifier through a female PkZ type connector located on the rear of the amplifier. The amplifier RF signal is brought out of the amplifier through a N type connector located on the rear of the amplifier.

Control System:

A microprocessor controller is used to control the amplifier alarm system, control environmental compensation of the amplifier, and to maintain a linearization solution for the pre-distortion circuit and the feed-forward circuit.

Figure 1 MSA1900-135 MCPA Front Panel

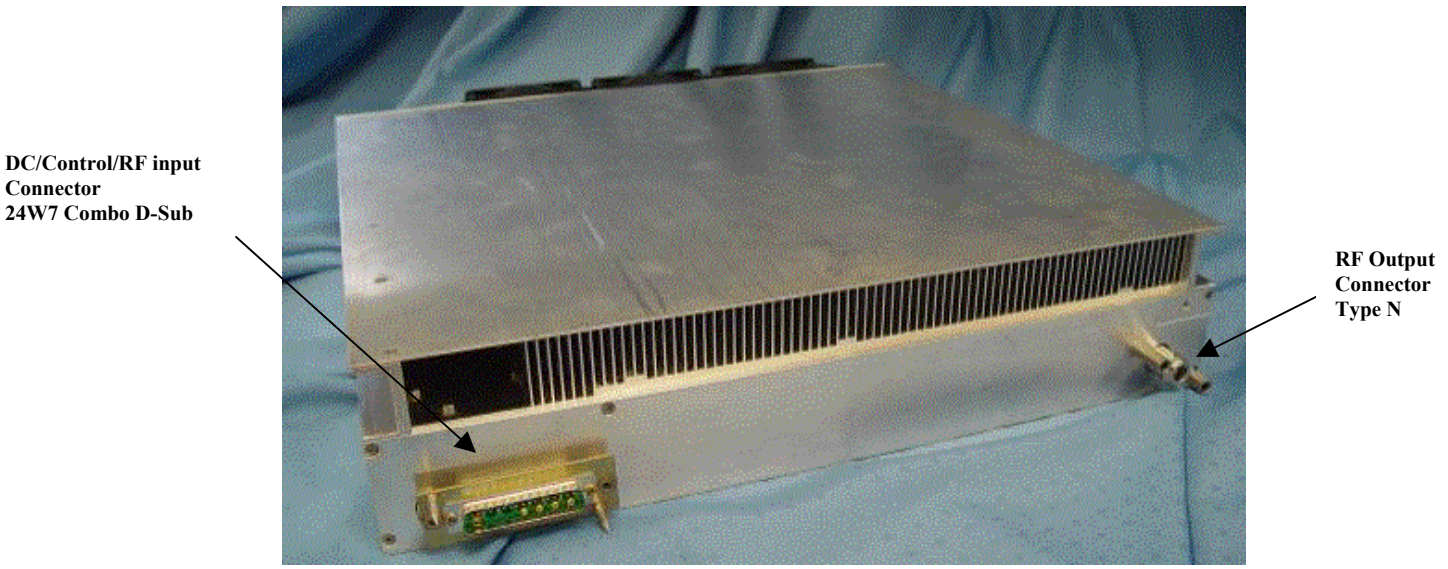

Figure 2 MSA1900-135 Rear Panel

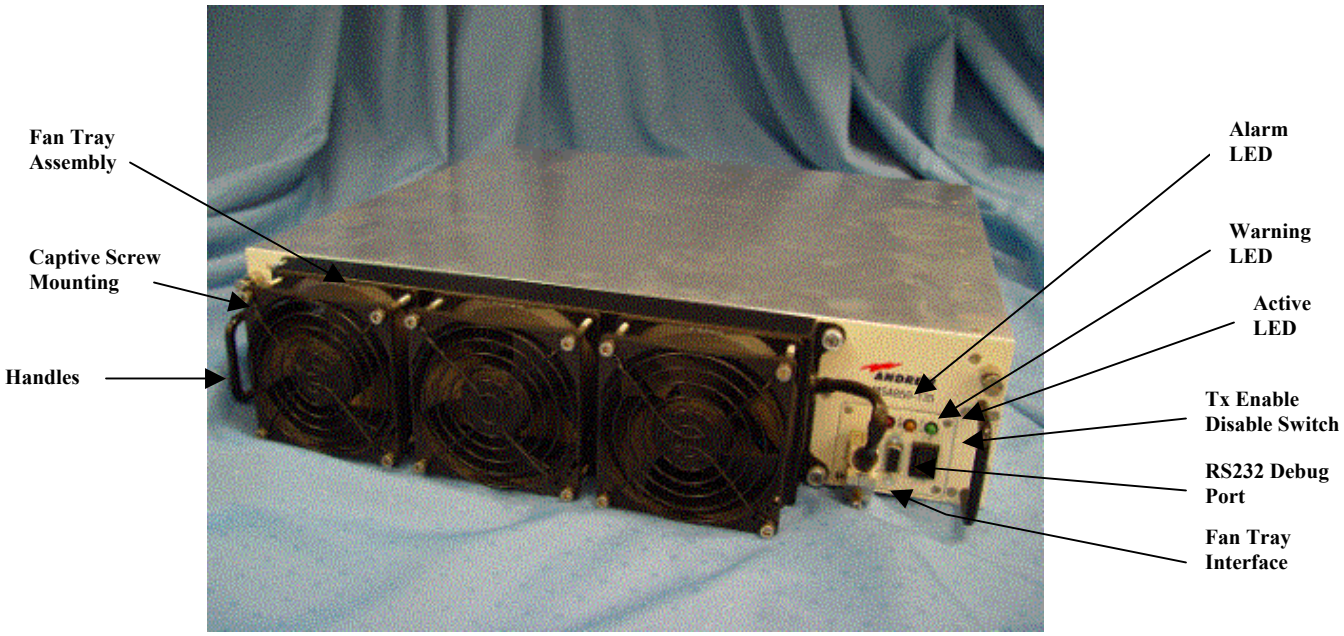

Figure 3 MSA850-135 MCPA Front Panel

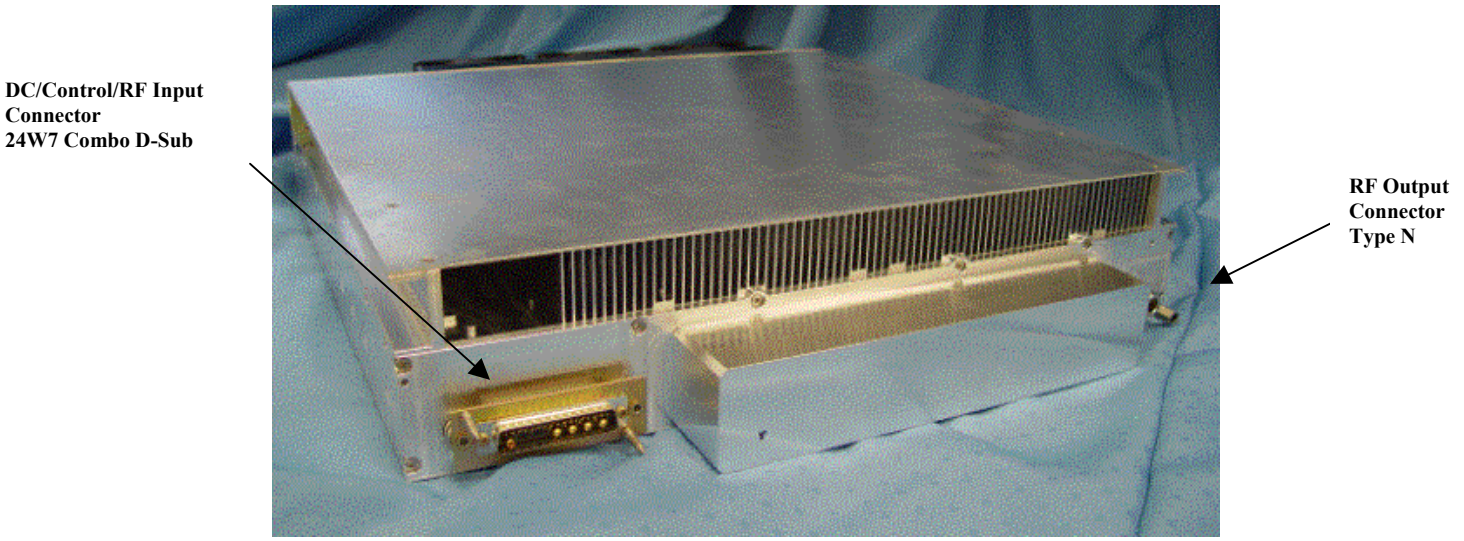

Figure 4 MSA850-135 Rear Panel

The following table is a summary of detailed alarms within the PA Module. The alarms are mapped to front panel LED behavior, as indicated. Additionally, the alarms are mapped to the discrete line relays and available at the D-Sub connector at the rear of the PA Module.

Condition (Shading shows grouping)	Alarm Type	(Minor Alarms are shown by Green and Yellow at the same time)			Comments	Retry
		Green LED Normal	Yellow LED Major	Red LED Critical		
Initial Power On, no alarms	-	On	On	On	On for ½ - 1½ secs	-
Self Test fail	Critical			On		-
Normal Operation – RF enabled	-	On	-	-	-	-
Normal Operation – RF disabled	-	Fast Flash	-	-	1 Hz complete cycle	-
Fans (see note 1)	Minor	On	On	-	No action	
High temp, Minor	Minor	On	On	-	Auto-recover	Y
High temp, Critical (see note 2)	Critical	-	-	On	Shut down	Y
RF overdrive Major (see note 3)	Major	-	On	-	Gain reduced, Auto-recover	Y
RF Overdrive Critical (see note 4)	Critical	-	-	On	Shut down	Y
Linearizer (see note 5)	Critical	-	--	On	Shut down	-
Device health and Internal Voltages	Critical	-	-	On	Shut down	-
Sensor fault (see note 6)	Critical	-	-	On	Shut down	-
Device current (see note 7)	Critical	-	-	On	Shut down	-
VSWR minor (see note 8)	Minor	On	On	-	No action. 4 sec delay to turn on the LEDs	Y
VSWR critical (see note 9)	Critical	-	-	On	Shut down	Y
Low input voltage (<26V)	Major	-	On	-	Gain reduced, Auto-recover	Y
Bias fault (factory only) (see note 10)	Critical	-	-	On	Shut down	-
Self-test fail (see note 11)	Critical	-	-	On	Shut down	-
Configuration fault (EEPROM checksum)	Critical	-	-	On	Shut down	-

Table 2 Alarm mapping for PA Module

Note 1: Fan failure is considered a minor alarm since there is no immediate impact on unit operation, the seriousness depends on ambient temperature, and the high temperature critical alarm will eventually protect the unit from damage.

Note 2: High temp: will retry when the temperature drops by a hysteresis amount, if there is no fan alarm.

Note 3: Whenever the overdrive protection mechanism (see above) requires added attenuation for a sustained period equal to the alarm hysteresis time, an overdrive major alarm is declared. This condition indicates that firmware has reduced amplifier gain, but the amplifier output is not being overdriven. This threshold is typically 0.5 dB above rated output power.

Note 4: This alarm indicates that the input level is of a value which cannot be attenuated enough by the input attenuator. Shut down must happen fairly quickly (20-100 mS tentative) to avoid tripping the circuit breakers and to avoid RF device failure. This

threshold is typically 10.5 dB above rated input power (51.3 dBm output – 56 dB nominal gain).

Note 5: Whenever a linearizer alarm occurs, the amplifier is shut down. Each actively tuned gain and phase adjuster has a factory nominal setting with leash limits around it. Whenever the tuning algorithm persistently requires an adjustment beyond the leash limits, a linearizer alarm is declared.

Note 6: Some sensors allow fault detection because they give readings that are out of range (e.g. temperature sensor).

Note 7: Under current or overcurrent depending on the hardware.

Note 8: Typically 10 dB to set the alarm, with 3 dB of hysteresis (alarm resets at -13 dB). When operated with other amplifiers in parallel, each amplifier performs its own VSWR diagnostics and shut down independently. The shutdown process is coordinated with the RFIM and Switch Combiner Module, eliminating chain reaction scenarios.

Note 9: A VSWR critical alarm is declared when the reflected power is 80W or more and indicates that the unit may be damaged if not shut down. Since the amplifier cannot detect that this condition has cleared while shut down, an RF enable command, restart command, or power cycle is required to clear this condition. Since there are circulators on the amplifier, a delay of about 1 second is acceptable before shutting down.

Note 10: A bias fault is declared during the factory bias setting algorithm (see above) if firmware is unable to set the bias correctly. This is typically a hard failure; however, the bias setting command can be repeated.

Note 11: Self test: Whenever the amplifier is powered on or reset (whether from the front panel or otherwise), firmware performs a self-test. Included in the test are processor RAM, boot image checksum, NVM image checksum, temperature sensors, power supplies, and pilot/receiver operation. If any one of these tests fails, a self-test failure critical alarm is declared and the unit does not start up. There is no recovery short of a reset or power cycle. This is typically a hard failure; however, self-test will be repeated on the next restart command or power cycle.

Installation and Operation Set-Up

The MCPA is easy to operate and use, requiring no special cabling since the main input/output and +27V DC @ 30A, power connections are all blind mated into a backplane. The input signals are also distributed to the amplifiers via the sub rack wiring from a front RF connector.

FCC Statements:

FCC ID S8L-100270MCPA & RE: FCC ID S8L-100254MCPA

This devise complies with Part 2, 15 & 24 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Warning
Changes of modifications not expressly approved by the manufacturer could void the user's authority to operate the equipments.