



SUMMIT-C series C-BAND
SUMMIT-X series X-BAND
SUMMIT-K series Ku-BAND

Introduction

This Product Bulletin describes Advantech's SUMMIT series SSPA SYSTEM. The SUMMIT system is fully modular and can provide output power of up to 3500W in C-Band, 2800W in X-Band and 1350W in Ku-Band in a single rack. The design of the SUMMIT line is based on Advantech's tradition of high power high linearity and high efficiency line of products.

The SUMMIT systems present distinct advantages over high power TWTA systems in terms of reliability, cost, maintainability and ease of operation.

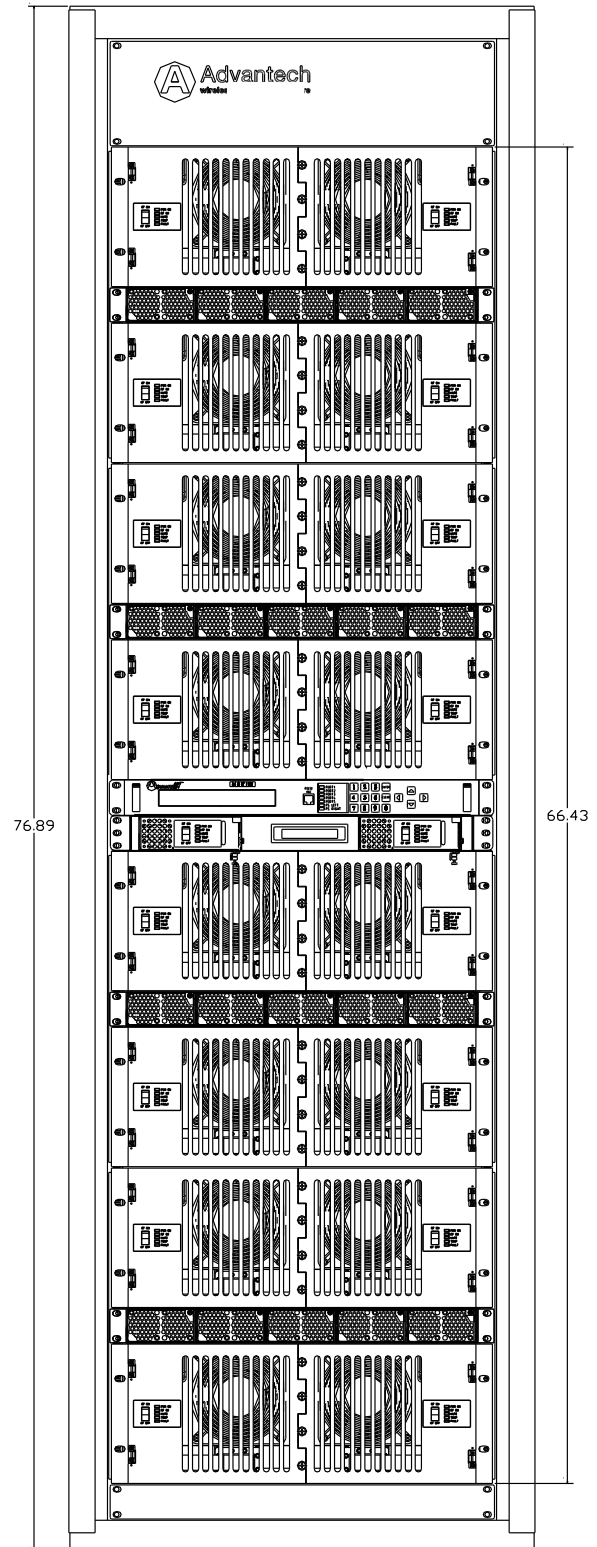
Standard Features

- Completely modular
- Hot swappable elements
- Remote monitor and control capability via RS485 or Ethernet ports
- Input and output sample monitor ports
- Gain adjustment (local or remote)
- Power factor correction
- Temperature gain compensation
- Automatic over-temperature shutdown
- Automatic high reflected power shutdown
- CE Marking

Application

The Advantech SUMMIT lines of SSPA are designed for satellite up-link applications in ground station terminals. The system is expandable from a single to up to four chassis.

Full remote monitor and control capability of the redundant system via serial or Ethernet interface.



DESCRIPTION

The design of the SUMMIT SSPA system is based on Advantech's industry proven reliable solid state power amplifiers. The following is a description of the system elements and their salient features:

RF Chassis

The 9RU RF Chassis contains the following:

a. **RF Amplifier Modules**

The four RF amplifier modules mounted in the chassis are identical high gain fixed gain amplifier units with integral cooling system. Due to the special system architecture, a failed RF module may be removed safely and without service interruption.

b. **Power Supply Modules**

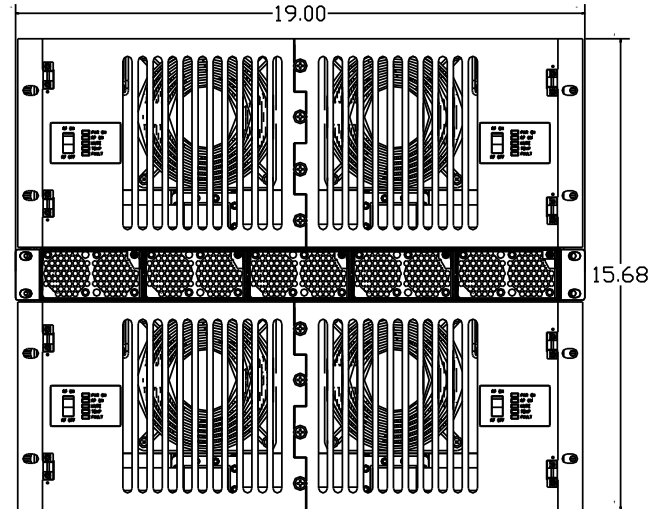
Each chassis of four RF amplifier modules is fed by five power supply modules. Failure of a power supply module will not affect the operation of the system the remaining modules can fully supply the RF modules. The power supply units are hot swappable.

c. **M&C System**

The front panel provides access to monitor the operation of the RF and power supply modules. The M&C system is connected to the system M&C via RS485.

d. **RF Splitting Combining**

The chassis includes the circuitry for splitting and combining the RF signals. The input ports of the combiners are totally isolated.



Redundant Pre-Amplifier

The pre-amplifier shelf operates in 1:1 redundancy mode and provides the following function:

- Adjustable gain**; the gain may be adjusted over a range of 20 dB.
- Automatic gain compensation** for (N-1) operation.
- M&C system interface** including RS485, Ethernet and Discrete.

Depending on the operating conditions of the system the impact of failure of a single module may be compensated by increasing the output from the Driver Amplifier.

Waveguide Combining System

The waveguide passive combiner system is intended to combine the outputs of the chassis. The waveguide combiner system includes the following components:

- Waveguide combiners.
- Interconnecting waveguide components.
- Receive reject filter (where applicable).
- Output couplers for forward and reverse power monitoring.
- Waveguide arc sensor (where applicable).

Monitor & Control System

The M&C system operates on three levels:

a. Amplifier module

The amplifier module M&C system is connected to the M&C system of the chassis via RS485. The following features are provided:

- a. Parameters monitored
 - i. Fault
 - ii. Internal temperature
 - iii. Output power
- b. Parameters controlled: amplifier inhibit

b. Chassis M&C

The chassis M&C monitors and controls all the four modules via the RS485 bus. The chassis M&C is in turn connected to the main system controller in located in the intermediate driver amplifiers. Power supply fault condition will be provided.

c. System M&C

The system M&C is located in the intermediate driver amplifiers. The complete system may be monitored and controlled via this interface. Also provided at this interface is output power and reflected power information. The following controls and status are provided.

The Main Controller Board contains a microprocessor controller that performs all of the monitoring and control, input/output communication and the decision-making. The main controller board provides:

- Fault detection and indication from each module of the unit,
- Mute control and indication
- Forward RF power indication
- Reflected RF power indication
- Current consumption
- All interfaces

The Main Controller Board acts as a slave for the external system, and as a master to control all the internal agents: analog interface, serial interface, discrete interface, terminal interface.

The SNMP Agent Function combines distributed monitor and control functions and provides an Ethernet interface for SNMP management and Control, Monitor and Alarm functions.

Software architecture will be based around a kernel running on a single processor. Each unit offers full RS485 or SNMP features for remote monitoring and control

Modular operation

Failures of a single RF module would affect the output power of the system as follows:

Single Chassis (4-modules)	2.5 dB
Dual Chassis (8-modules)	1.2 dB
Quad Chassis (16-modules)	0.6 dB

SUMMIT Modular SSPA System

Technical Specifications		SUMMIT			
Electrical Characteristics					
Frequency range	C-Band	5.850 – 6.425 GHz (Model SUMMIT-CS)			
	C-Band (extended)	5.850 – 6.725 GHz (Model SUMMIT-CX)			
	X-Band	7.8 – 8.4 GHz (Model SUMMIT-XS)			
	Ku-Band	14.0 – 14.5 GHz (Model SUMMIT-KS)			
	Ku-Band (extended)	13.75 – 14.5 GHz (Model SUMMIT-KX)			
Saturated output power nominal			1-Chassis	2-Chassis	4-Chassis
	C-Band		1000W	1800W	3400W
	C-Band (extended)		800W	1500W	2800W
	X-Band		800W	1500W	2800W
	Ku-Band		400W	700W	1250W
Output Power (P1dB) (note 2)	C-Band		59 dBm	61.5 dBm	64 dBm
	C-Band (extended)		58 dBm	60.5 dBm	63 dBm
	X-Band		58 dBm	60.5 dBm	63 dBm
	Ku-Band		55 dBm	57.5 dBm	61 dBm
	Ku-Band (extended)		55 dBm	57.5 dBm	60 dBm
Minimum Gain @ max. gain setting)	C-Band	72 dB			
	X-Band	71 dB			
	Ku-Band	67 dB			
Maximum Gain @ max. gain setting)	= Gmin + 5dB				
Gain flatness over each band	±1 dB max.				
Gain slope	0.6 dB/40 MHz max.				
Gain variation	±1.0 dB max. over operating temperature range				
Gain control range	20 dB min. in 0.1 dB steps				
Input VSWR	1.3:1 max.				
Output VSWR	1.25:1 max.				
Noise Power Density	C-Band	5.85 – 6.425	-70 dBm/Hz	3.4 – 4.2	-160 dBm/Hz
	X-Band	7.4 – 8.5	-70 dBm/Hz	7.25 – 7.75	-140 dBm/Hz note 1
	Ku-Band	14.14.5	-70 dBm/Hz	10 – 12 GHz	-145 dBm/Hz note 1
Spurious at rated power	-65 dBc, max.				
Harmonics at rated power	-45 dBc (option -60 dBc, max)				
AM/PM conversion at rated power	2.5 ^o /dB max. at P1dB, 1 ^o /dB max. at 3 dB back-off				
Two tone intermodulation (5 MHz apart)	-25 dBc max. at 3 dB total back-off from rated P1dB				
Group Delay	Linear: 0.02 nsec/MHz max. Parabolic: 0.003 nsec/MHz ² max. Ripple 1 nsec p-p max.				
Phase Noise	Exceeds IESS-308/309 by -6 dB				
Residual AM (F* - frequency in kHz)	0-10 kHz	-45 dBc			
	10 kHz - 500 kHz	-20 (1.25+log F*) dBc			
	500 kHz - 1 MHz	-80 dBc			
Power Requirements					
Operating voltage	198 - 264 VAC 47 to 63 Hz				
Power consumption, nominal			1-Chassis	2-Chassis	4-Chassis
	C-Band		4000W	8000W	16000W
	C-Band (extended)		4000W	8000W	16000W
	X-Band		4500W	9000W	18000W
	Ku-Band		4000W	8000W	16000W
	Ku-Band (extended)		4000W	8000W	16000W
Mechanical Characteristics					
Single Chassis	9 RU of 19" rack				
Driver unit	2 RU				
M&C shelf	1RU				
Full system		12 RU	21RU	39RU	
Weight	70 kg/chassis				
	15 kg/RF module				
Interfaces	RF input	Type-N female			
	Output sample port	Type-N female			
	RF output	C-Band CPR137	X-Band CPR112	Ku-Band WR75	
	Serial port	D-sub 9S			
	Discrete port	D-sub 25S			
	Ethernet	RJ45			
Environmental Conditions					
Temperature	Operating	0°C to +50°C			
	Storage	-55°C to +85°C			
Humidity	5% to 95%, non condensing				
Altitude	10,000' AMSL, derated 2°C/1000' from AMSL				

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