



**KU-BAND HUBMOUNT SSPA
with full microprocessor based
Monitor & Control**

Medium Power (40 W to 60 W)

AWMA-K40; AWMA-K50;
AWMA-K60

INTRODUCTION

The AWMA-K series described in this section are Advantech's line of medium power solid state power amplifiers (SSPAs) with full microprocessor based Monitor & Control and output power ranging from 40 watts to 60 watts. Other Ku-Band hubmount SSPAs are available for output powers up to 250 watts.

Advantech's hubmount SSPAs are designed for outdoor operation in hard environmental conditions and are particularly suited to flyaway or mobile applications as SNG, where efficiency and size considerations are critical. Advantech's hubmount SSPAs set the industry standard for operating efficiency and feature compact and lightweight construction.

STANDARD FEATURES

- Microprocessor based Monitor & Control
- High gain, linearity and efficiency
- Gain control (local)
- Remote gain control adjustment
- Remote RF mute capability
- Temperature gain compensation
- Automatic over-temperature shutdown
- Automatic high reflected power shutdown
- Output sample monitor ports
- Form-C contacts for fault/alarm conditions
- Infinite VSWR protection
- Serial port interface (RS232 or RS422/485)
- Redundancy operation without external controllers
- CE Marking

OPTIONS

- Extreme temperature operation
- Power factor correction

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APPLICATION

The AWMA-K series medium power amplifiers are designed for satellite up-link applications in ground station terminals. With the addition of the appropriate waveguide and switch kit, these amplifiers can be easily converted for the operation in a redundant configuration with full remote monitor and control capability of the redundant system via serial interface.

DESCRIPTION

Advantech's hubmount SSPAs are constructed in a compact, air-cooled housing for outdoor operation. The amplifiers are weatherproof, thus a special equipment shelter is not required. They are the smallest fully integrated units on the market today.

The design of these amplifiers is based on Advantech's industry proven reliable solid state high power amplifiers. Built-in design features and assembly methods incorporated with effective combining techniques result in an amplifier with exceptional linearity and operating efficiency. The use of high efficiency power supply and conservative thermal designs contributes to the trouble free operation of the amplifier. The AWMA-K series amplifiers offer full monitor and control functions, including gain adjustment, which are accessible via the RS232 or RS422/485 serial interface.

Additional standard features comprise the automatic over-temperature shutdown and the soft failure features that contribute to the smooth operation and greatly improve the life of the product. The AWMA-K series amplifiers also incorporate a microprocessor-controlled system that allows remote monitoring and control of the power amplifier.

The AWMA-K series amplifiers contain the following subsystems:

- RF amplifier module
- RF output arm
- Power supply system
- Monitor and control system

RF AMPLIFIER MODULE

The RF amplifier module includes circuitry for amplification, temperature compensation and gain adjustment. A conservative design approach combined with proprietary techniques for the design and assembly, result in a product of exceptional stability, linearity, performance and the highest reliability.

The gain adjustment has a typical range of 20 dB. The amplifier module provides its status and accepts commands via the Monitor and Control system. The current drawn by each transistor in the amplifier is continuously monitored and an alarm is activated when the current in any of the transistors falls outside of a present window. The activation of the alarm does not depend on the presence or absence of an RF signal.

RF OUTPUT ARM

The RF output arm connects the output of the amplifier module to the output waveguide flange of the amplifier hubmount assembly. The RF output arm contains the output isolator and all the couplers for the RF output sample port, the RF incident power detector and the RF reflected power detector.

POWER SUPPLY

The power supply system consists of three high efficiency modules. The main power supply provides a single output DC high current necessary to the drains of the GaAs FETs and a low current DC to the second and the third power supplies. The secondary power supply has multiple outputs for operation of the Monitor and Control System. The third power supply delivers a variable DC voltage to allow for a temperature dependent variable rotation speed of the cooling fans.

MONITOR & CONTROL SYSTEM

The Monitor and Control system is driven by the Monitor and Control (MAC) module. The MAC module contains a microprocessor that monitors all key operating parameters and status of the amplifier (i.e. output power, baseplate temperature, power consumption and switch position). For gain adjustment, the 12 bit DAC provides a 0.1 dB step increment across the full 20 dB range of the attenuator. Through a menu driven interface, all key operating parameters and status can be verified remotely via the RS232, or RS422/485 serial interface. The built-in test facilities (i.e. output RF detector, reflected power detector) when combined with other monitored parameters provide an effective means for troubleshooting. The calibrated output sample port provides a convenient means to locally verify the operation during service.

Parameters Measured	Parameters Controlled	Status Monitored
Output Power Baseplate Temperature Enclosure Temperature Drain Voltage Power Supply Voltage (V) Power Supply Current (A) Gain (attenuator setting) Reflected power	RF ON/OFF (mute) Gain adjustment (attenuator setting) Switch position for redundant operation (optional)	Power ON RF ON/OFF Summary alarm Thermal Alarm

SAFETY FEATURES

Thermal Alarms and Faults

A thermal shutdown feature is incorporated into the system in order to protect the amplifier from permanent damage. The thermal shutdown feature operates at a baseplate temperature of 85° C and is self-healing. When the baseplate temperature drops to below 65° C, the amplifier re-starts automatically. A thermal shutdown is always preceded by a thermal alarm, which is activated at a baseplate temperature of approximately 75° C.

High Reflected Power

The output isolator in the output arm of the AWMA-K amplifiers are designed to withstand high reflected RF power. The amplifier will shutdown when the reflected power is more than 25% of the rated output power. An amplifier that has been shutdown due to high load VSWR must be restarted manually.

Redundant Operation

The AWMA-K medium power SSPAs may be configured to operate in 1:1 or 1:2 redundancy mode. No extra controller is required for redundancy operation, as the built-in controller in each amplifier provides this function. For 1:1 redundancy operation, in addition to the two amplifiers (operating and standby) a special redundancy kit (P/N WMR-K200A) is required. For 1:2 operation, another redundancy kit (WMT-K200A) is required in addition to the three amplifiers (two operating and one standby). The kits include waveguide switches, terminations, RF splitter and interconnecting cable assemblies. Access for full remote monitoring and control of the system is provided via serial port of the system.

ORDERING INFORMATION

A complete model number for ordering consists of a basic number followed by a three-field option code, as follows:

Basic number [1st field] [2nd field] [3rd field]

Basic numbers

AWMA-K40	40 W (saturated power) SSPA
AWMA-K50	50 W (saturated power) SSPA
AWMA-K60	60 W (saturated power) SSPA

[1st field]

A - operating voltage 110 VAC (47 - 63 Hz)
 B - operating voltage 220 VAC (47 - 63 Hz)
 C - autoranging 110/220 VAC (47 - 63 Hz)

[2nd field]

S - standalone
 R - redundant ready 1:1
 T - redundant ready 1:2

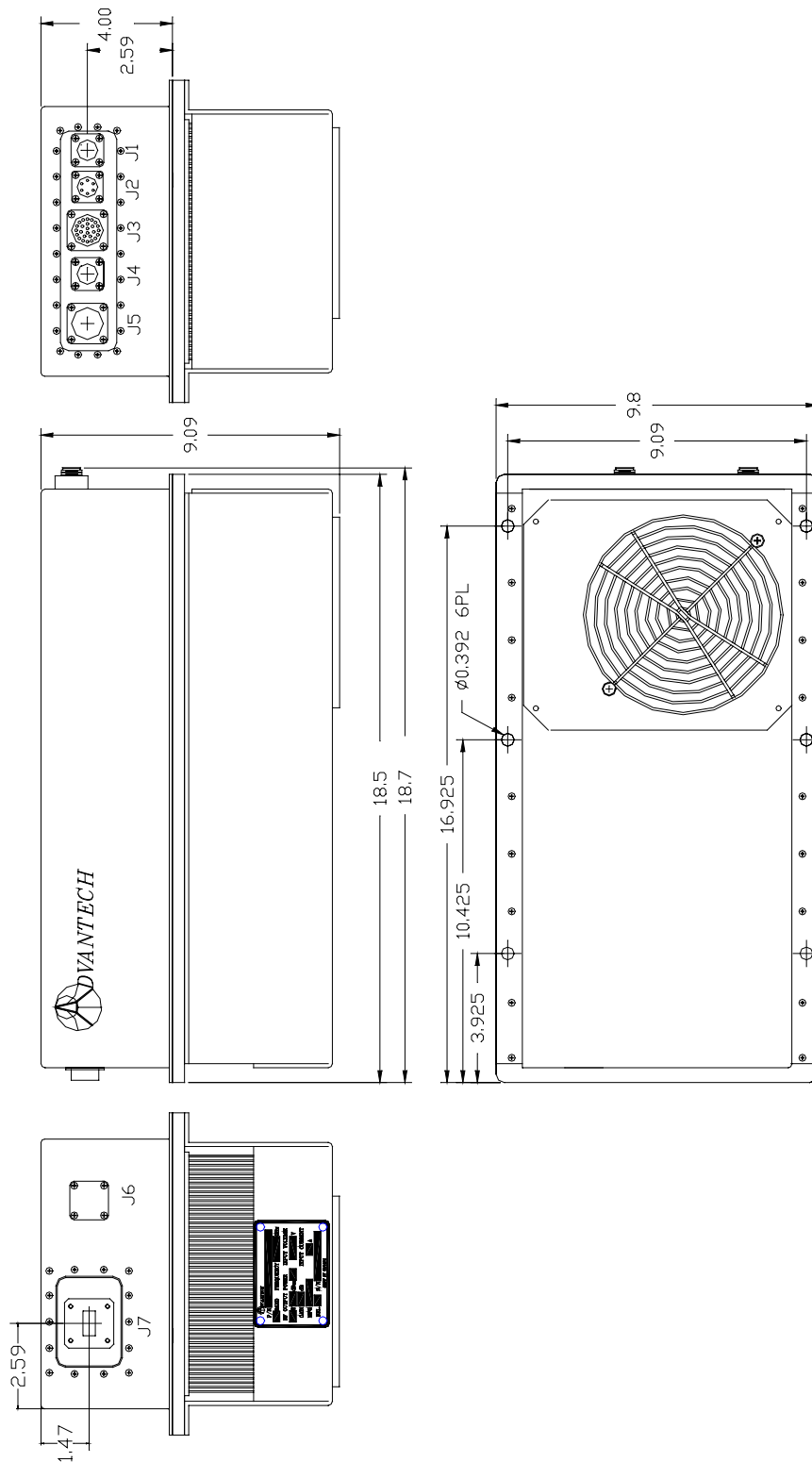
[3rd field]

E - -30°C...+55°C
 F - -40°C...+55°C
 G - -50°C...+50°C

Example

To order a 40 W Ku-Band hubmount SSPA ready for 1:1 redundancy and operating from 110 VAC and operating temperature of -30°C...+55°C, specify: AWMA-K40-ARE.

TECHNICAL SPECIFICATIONS		40 W	50 W	60 W
Electrical Characteristics				
Frequency ranges	14.00 – 14.50 GHz (KS series);		13.75 – 14.50 GHz (KX series);	
Saturated output power nominal	+46 dBm	+47 dBm	+48 dBm	
Output power (P1dB)	+45 dBm	+46 dBm	+47 dBm	
Gain minimum ($G_{max} = G_{min} + 5$ dB)	57 dB	57 dB	57 dB	
Gain flatness over 500 MHz	±1 dB max.			
Gain slope	0.6 dB/40 MHz max.			
Gain variation	±1.5 dB over operating temperature range			
Gain adjustment range	20 dB min.			
Input VSWR	1.3:1 max.			
Output VSWR	1.25:1 max.			
Noise Figure	10 dB at max. gain			
Spurious at rated power	-65 dBc, max.			
Harmonics at rated power	-60 dBc, max			
AM/PM conversion at rated power	2.5 ⁰ /dB max. at P1dB, 1 ⁰ /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+log F*) dBc		
	500 kHz - 1 MHz	-80 dBc		
Power Requirements				
Operating voltage	110/220 V (47 - 63 Hz)			
Power consumption, nominal	580 W	700 W	870 W	
Mechanical Characteristics				
Dimensions (W x H x L)	10" x 9" x 18.5"			
Weight	19 kg (42 lbs)			
Interfaces	RF input	Type-N female		
	Output sample port	Type-N female		
	RF output	WR-75 (grooved)		
	Serial port	MS3112E10-6P		
	Discrete port	MS3112E16-26P		
	Redundancy	MS3112E14-12P		
	Power	MS3102R16-10P		
Environmental Conditions				
Temperature	Operating	-30°C to +55°C option 2: -40°C to +55°C; option 3: -50°C to +50°C		
	Storage	-55°C to +85°C		
Humidity	100% condensing, up to 2"/hour rain			
	10,000' AMSL, 2°C/1000' from AMSL			



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