

10kW S-Band Solid State Pulse Amplifier

Second Generation GaN Technology

MODEL APRA-S10000B

Second Generation GaN Technology

Features

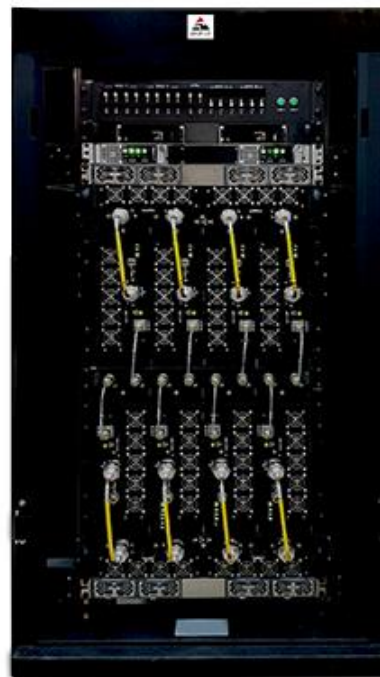
- Modular architecture with built in redundancy for high reliability
- Fast pulse rise/fall times (<100 ns)
- Duty cycle up to 10%
- Minimal pulse droop (<1% @ 100 μ s)
- High stability (phase and amplitude)
- Gain compensation over temperature
- Remote monitor and control capability via RS485 (Ethernet port optional).
- Input and output sample monitor ports
- Power factor correction
- Hot swappable elements
- No rear access required for operation or maintenance

Overview

The Advantech Wireless Model APRA-S10000B, Second Generation GaN based S-Band solid-state pulse amplifier operates over the band of 2.9 – 3.1 GHz and it is designed for Military Grade Radar Systems. The peak power at the output connector is 10,000W.

The APRA-S10000B is a fully modular system with built in redundancy. The design of the product is based on Advantech's tradition of high power and high efficiency line of amplifiers.

Built-in features such as duty cycle monitor and pulse width monitor ensure trouble free operation.



Description

The design of the APRA pulse amplifier is based on Advantech Wireless' industry proven reliable solid state power amplifiers. The following is a description of the system elements and their salient features.

The APRA pulse amplifier contains the following elements:

- Redundant Input/Driver Module
- Splitter panel, one per amplifier chassis
- RF chassis each containing four 1.5 kW pulse amplifier modules
- Power supply modular package, one per amplifier chassis
- Two High-power 4:1 Combiners
- High Power waveguide combiner.

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Redundant Input/Driver Module

This 1 RU unit contains hot-swappable 1:1 redundant driver modules and provides the M&C interface for the entire system.

The interface panel provides for:

- Input DB9 connector for the pulse enabling
- Input / Output RS485 DB9 connector for the serial port interface

The Interface panel is connected to each amplifier module via the blind-mate connectors and also to the power supply shelves.

Input Splitter panel

The output of the Driver module passes through a 1:2 splitter and then to the 1 RU Input Splitter panel which is a 1:4 splitter. One is associated with each RF chassis. The output ports are accessible from the front. Each output port is connected to the input of each amplifier module.

Amplifier module

The individual amplifier module provides 1.5 kW of output power. Each amplifier module is pre-adjusted for a normalized phase and gain. The units are hot-swappable. The input and output connectors are on the front of the module and all other connections are via a blind-mate connector at the back of the module. A micro-controller is included in each amplifier module to specify the timing specs and provide an RS485 interface. The amplifier module reports on fault conditions and internal temperature.

Due to the modular system architecture, a failed RF module may be removed safely and without service interruption. Furthermore, a single failed RF amplifier will cause only a 1.16 dB drop in the total output power of the system.

RF Chassis

The RF chassis contains four (4) pulse amplifier modules. Each chassis is 5U high. The 10kW system contains two chassis.

Power supply shelf

A Power Supply shelf is associated with each chassis. The 1U high power supply shelf is modular, containing 3 individual power supplies. Failure of a single power module will have no impact on the operation of the system as they operate in a load-sharing configuration with two power supplies being sufficient to power the associated RF Chassis. The power supply modules are hot-swappable. The output of the power supply is connected to each amplifier module in the RF chassis via the blind-mate connector. The power supply shelf has an RS485 serial port for M&C.

High-Power 4:1 Combiner

The high power combiner is contained in a 2U chassis having four (4) inputs and a single output. The special design of the combiner emphasizes low insertion loss and high power handling capability. The input connectors are special N-type and the output is 7/16 type specially modified to avoid voltage breakdown and to ensure good thermal flow.

Monitor & Control System

The M&C system operates at the module level via RS485. The amplifier module reports on fault conditions and internal temperature. The power supply shelf also provides an RS485 serial port interface. The complete system may be monitored via the RS485 interface port on the Driver Module. A laptop may also be used with appropriate adapter. ETHERNET port can be provided by request.

NORTH AMERICA

USA

info.usa@advantechwireless.com

CANADA

Info.canada@advantechwireless.com

EUROPE

UNITED KINGDOM

info.uk@advantechwireless.com

SOUTH AMERICA

info.latam@advantechwireless.com

BRAZIL

info.brazil@advantechwireless.com

ASIA

info.asia@advantechwireless.com

INDIA

info.india@advantechwireless.com

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Technical Specifications				
	Full system		Amplifier Module	
Operating Frequency Range	2.9 – 3.1 GHz			
Peak Output Power	10,000W min (70 dBm)		1,500W typical (61.7 dBm)	
Input Drive Level	0 dBm		+30 dBm	
Gain Variation	2dB p-p over frequency range			
Duty Cycle	10% max			
Pulse Width	1 – 100 μs			
Pulse Repetition Rate	500 – 1150 pulses/s			
Pulse droop	<1% max at 100 μs			
T-rise/T-fall	<100ns			
Harmonics	-45 dBc max			
Non-Harmonic Spur	- 75 dBc			
Input Impedance	50 Ohms			
Input Return Loss	18 dB			
Input Connector	N-type /Female/			
Output Impedance	50 Ohms			
Output Return Loss	18 dB		18 dB	
Output Connector	WR 284		N-Type	
Gain variation over frequency	2 dB p-p			
Gating Signal	TTL to precede RF pulse by 5 μs			
Decay Interval	Amplifier output will cease 150μs after loss of gating signal			
Monitor Output (optional)			Calibrated output sample loop with 48dB attenuation. SMA connector	
Dimensions	19" rackmount 26U high (45.5") 36" deep		H D W	5U (8.75") 17" 4"
Combiner 4:1 (Qty 2/system)				
Insertion loss	0.8 dB typical			
Power handling capacity	> 6,000W @ 12% duty ratio			
Input connector	Qty.=4 N-type			
Output connector	7/16 type			
Power Supply shelf (Qty 2/system)				
Operating Input Voltage	220V nominal (180 – 164V) AC 47-63 Hz or 3phase			
Power factor	0.97			
Total capacity (N+1)	4.8 kW			
Dimensions	19" rackmount, 1U high, 17" deep			

NORTH AMERICA

USA
info.usa@advantechwireless.com

CANADA
Info.canada@advantechwireless.com

EUROPE

UNITED KINGDOM
info.uk@advantechwireless.com

SOUTH AMERICA

info.latam@advantechwireless.com

BRAZIL
info.brazil@advantechwireless.com

ASIA

info.asia@advantechwireless.com

INDIA
info.india@advantechwireless.com

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Splitter Panel (Qty 2/system)	
Output ports	4
Input/Output connectors	SMA (F)
Dimensions	19" rackmount 1U high
Interface Panel (Qty 1/system)	
Gating signal connector	DB9 P
Serial port Interface	RS485 DB9S
Total power consumption	4.5kW max
Cooling system	Forced air
Environmental Conditions	
Operating temperature range	0°C to +50°C
Non-operating	-55°C to +85°C
Humidity	5% to 95%, non-condensing
Altitude	10,000' AMSL, derated 2°C/1000' from AMSL

SAFETY FEATURES

To protect the amplifier from permanent damage, the following features are incorporated in the amplifier modules:

- Automatic shutdown in the event of pulse width exceeding 120 μ s
- Automatic shutdown with excessive duty cycle
- Amplifier output will cease 150 μ s after loss of gating signal

Ref.: PB-APRA-2G-S10000B-001-18243

NORTH AMERICA

USA
info.usa@advantechwireless.com

CANADA
Info.canada@advantechwireless.com

EUROPE

UNITED KINGDOM
info.uk@advantechwireless.com

RUSSIA & CIS
info.russia@advantechwireless.com

SOUTH AMERICA

info.latam@advantechwireless.com

BRAZIL
info.brazil@advantechwireless.com

ASIA

info.asia@advantechwireless.com

INDIA
info.india@advantechwireless.com