

**Broadband VHF Power Module, 13 W and 64 W
30 - 400 MHz**

**PHA4000-1, PHA4000-2
V1**

Features

- Broadband Operation 30 to 400 MHz
- Thousands of Sets in Use Worldwide
- Optimized for Airborne Environment
- Built to MIL Standards
- PHA4000-1 60 dB Gain Control Range
- PHA4000-2 - High Saturated Output Power - Greater than 54 Watts

Description and Applications

One miniature amplifier chain now combines the capability of producing high power output and broadband performance over the 30 MHz to 400 MHz band and full temperature range of -55 °C to +100 °C.

The PHA4000-1 preamplifier and PHA4000-2 power amplifier can be applied to a multitude of radio applications as individual broadband gain blocks to custom fit your requirements, or they can be combined to achieve higher power.

In a standard 10 W airborne transceiver radio application, the PHA4000-1 and PHA4000-2 provide the needed design margin. The modules are series connected to amplify a +13 dBm signal to 24 watts CW/FM over the 30 to 88 MHz, 116 to 174 MHz and 225 to 400 MHz bands, and to 64 W PEP from 116 to 174 MHz, and 225 to 400 MHz.

The modules are constructed in hybrid format with the circuitry distributed among metalized ceramic carriers and interconnected with microstrip and coaxial transmission lines. Each module is constructed in a compact housing measuring 1" x 2 1/8" x 1/2". DC and RF connections are made through hermetic feed-thru pins along the 2 1/8" dimension. The PHA4000-1 utilizes a nickel plated aluminum package (30 grams) and the PHA4000-2 is housed in a nickel plated copper package (75 grams).

Each module is internally compensated for gain variation of the transistors over frequency through the use of amplitude equalization networks. In a typical radio transmitter system, gain of the pre-amplifier is adjusted through the automatic leveling control (ALC) input which can be programmed for flat gain across all bands. The ALC pin can also be used as a modulation input for AM transmission. Under this type of operation, an external envelope detector

is used to sense the output envelope of the power amplifier, and supply a feedback signal to the ALC loop to linearize modulation. The units are capable of being modulated from DC to over 1 MHz which makes them useful for voice, data, or even video transmission.

The PHA4000-1 and PHA4000-2 are designed and tested to withstand a tactical military radio environment and will provide the specified performance from -55 °C to +100 °C.

**Absolute Maximum Ratings @ 25 °C
(Unless Otherwise Noted) ¹**

Parameter	Absolute Maximum	
	PHA4000-1	PHA4000-2
Supply Voltage	30 V	30 V
Input Power	0.025 W	16 W
Output Power	16 W	80 W
ALC Voltage	-4.0 to +10 V	-
Bias Voltage	-	150 mA
Operating Case Temperature	-30 °C to +100 °C	-30 °C to +100 °C
Storage Temperature	-40 °C to +125 °C	-40 °C to +125 °C

1. Operation of this device above any one of these parameters may cause permanent damage.

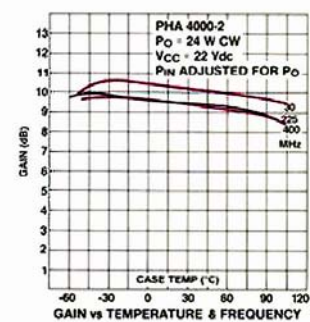
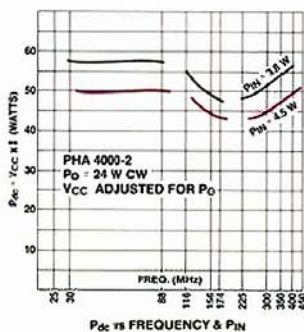
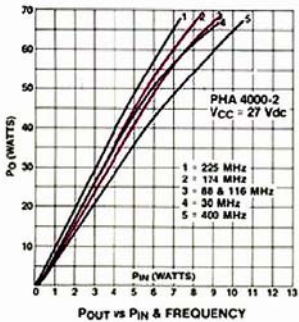
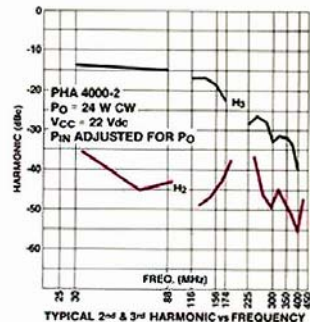
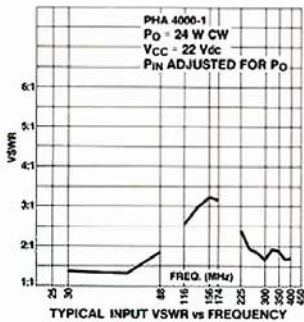
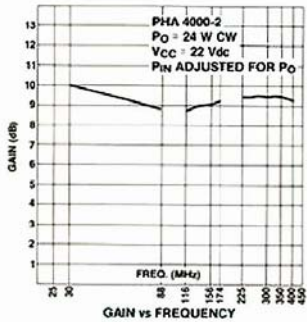
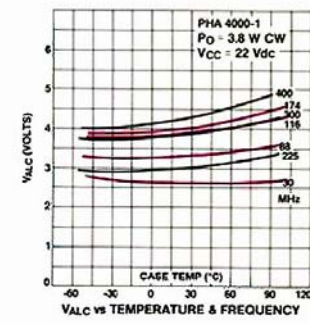
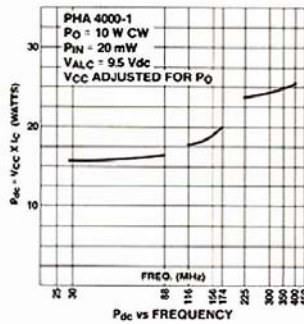
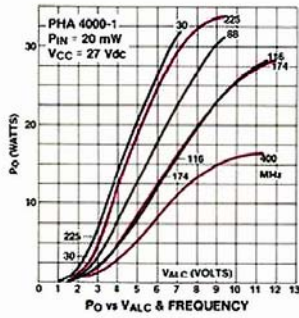
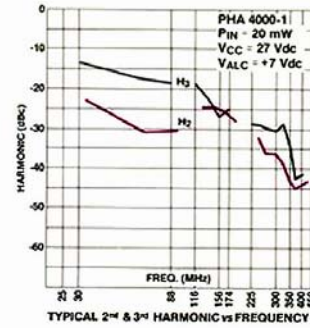
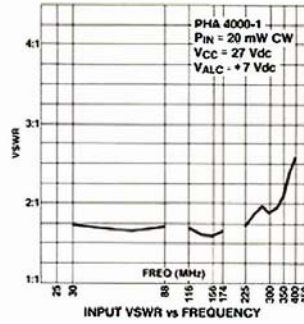
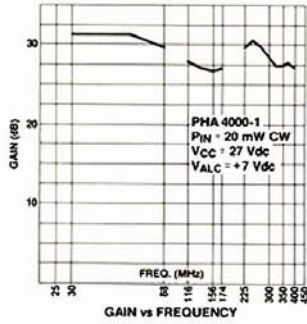
Amplifier Specification

Parameter Electrical	PHA4000-1 (Pre Amplifier)	PHA4000-2 (Power Amplifier)
P_{IN}	20 mW (+13 dBm)	13 W (+41.1 dBm)
P_O	13 W (+41.1 dBm)	64 W (+48.1 dBm)
V_{CC}	+18 to +27 Vdc	+18 to +27 Vdc
V_{alc}	-4 to +10 Vdc	N/A
V_{bias}	N/A	5.1 V at 150 mA typ.
Gain Control Range	60 dB min.	N/A
VSWR (in)	3:1 typ.	Compatible with PHA4000-1
VSWR (load)	2.5:1	2.5:1
VSWR (load-10 μ S)	∞	∞
Gain Variation with Freq.	± 3 dB	± 1.5 dB
Even Harmonics	-25 dBc typ.	-25 dBc typ.
Odd Harmonics	-15 dBc typ.	-15 dBc typ.
Spurious Output	-80 dB min.	-80 dBc min.
$P_{dc} (V_{cc} \times I_c - P_O)$	N/A	39 W for $P_{OUT} = 24$ W
Mechanical		
Size	1" x 2 1/8" x 1/2"	1" x 2 1/8" x 1/2"
Weight	30 grams	75 grams
Housing	Ni plate Al	Ni plate Cu

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Typical Amplifier Performance Characteristics (25 °C Unless Otherwise Noted)



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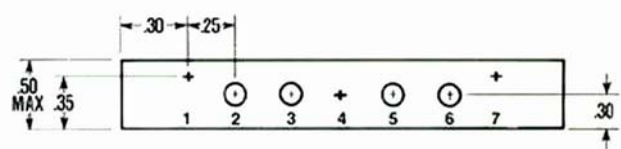
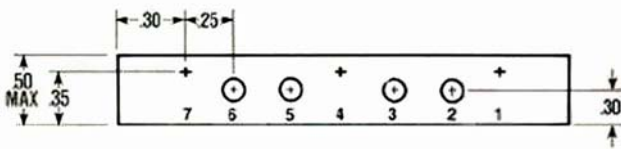
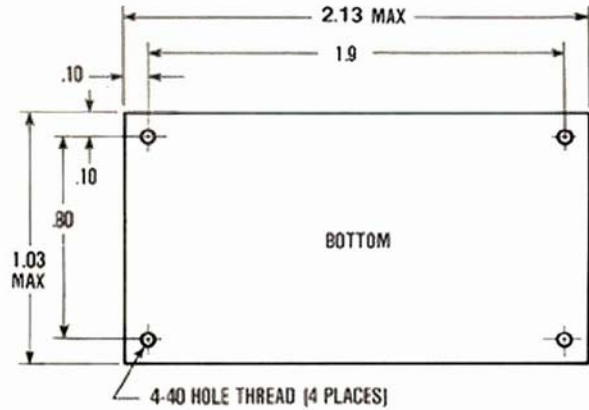
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Outline

PHA4000-1
Aluminum
Nickel Plate
Mil C 26047B

PHA4000-2
Copper
Nickel Plate
Mil C 26047B

Overall Finish
63 μ inch



Pre Amplifier (PHA4000-1)			
PIN(S)	Function	PIN(S)	Function
1, 4, 7	Ground	5	Vdc Input
2	RF Input	6	RF Output
3	V _{ALC} Input		

Power Amplifier (PHA4000-2)			
PIN(S)	Function	PIN(S)	Function
1, 4, 7	Ground	5	Vdc Input
2	RF Input	6	RF Output
3	V _{BIAS} (5.1 Volts)		

Functional Diagram

