

POWER/AUDIO AMPLIFIER



Utility “Infielder” for the Lab

It's good to have a workhorse power audio amplifier around the teaching lab. TeachSpin believes it particularly useful to have the PAA1-A in your lab because of its design and characteristics. This compact unit has a response all the way from DC to past 20 kHz and is capable of output currents of one

ampere. This is a true bipolar amplifier, able to drive its output above or below ground potential, and to hold it at the desired potential.

This unit was originally designed to support the Signal Processor/Lock-In Amplifier (SPLIA1-A) for experiments requiring large modulating currents.

Instruments Designed For Teaching

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For example, consider measuring a small Verdet constant with the Faraday Rotation apparatus (FR1-A). Since the angle of rotation of the polarization depends linearly on the solenoidal magnetic field, the larger the solenoid current, the greater the angle of rotation. Typical lock-in amplifiers produce only milliamperes of modulation current (SPLIA1-A produces 35 mA) so the amplitude of the modulating magnetic field it can produce is very small. With its one ampere output current, the PAA1-A can produce a significant modulated magnetic field. For the solenoid used in FR1-A, the peak-to-peak magnetic field is about 22 mT. For some large inductive loads, the maximum output voltage may be somewhat reduced at the higher frequencies.

Large modulating currents can also be useful in other experiments that use lock-in detection. Measurements of very small Hall effect voltage can be enhanced by using large Hall currents. The measurement of extremely small resistance using four terminal connection is another. Suppose the student is asked to measure the resistance of a one centimeter diameter, ten centimeter long, rod of pure copper. The resistance of such a bar is about 13 microohms. In even an expensive multimeter, the ohmmeter will not make such a measurement; it will read zero. But a four terminal AC lock-in amplifier system, with one ampere modulating current, easily measures the 13 microvolts ac signal.

The low output impedance of the unit makes it ideal for driving acoustic speakers. TeachSpin is not recommending students use this in place of their "boom boxes," but it is appropriate for various acoustic experiments in the lab. The unit can be used to boost a low-current power supply. It finds a useful application in the temperature control circuit to operate a Peltier cooler, which typically needs a bipolar supply to be able either to heat or cool the sample.

This unit has a continuously adjustable input attenuator, both ac-coupled and dc-coupled inputs on separate BNC connectors, and output banana terminals. The input and output ground are common. On the rear panel is a 4 volt, 100 mA, regulated DC power source from two female banana jacks. This supply is intended to power the diode laser used in the Faraday Rotation, (FR1-A) apparatus, but can be used for any other application. The unit is powered by a universal power supply, with a universal AC power entry connector that can be used with AC power from 100-230 VAC and 50-60 Hz frequency. Thus, this unit can be used with AC power sources anywhere in the world!

SPECIFICATIONS

Response: Bipolar DC - 20 KHz
Frequency Range: 0-20 KHz (useable to 100 KHz
with some frequency distortion)
AC-Coupled Input Low-Frequency
3 db point @ 15 Hz
Voltage Gain: 10
Output Current: $\pm 1.0A$
Output Voltage 10 V peak-to-peak
Input Impedance 10 k Ω
Dimensions: 6" x 4" x 5"

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