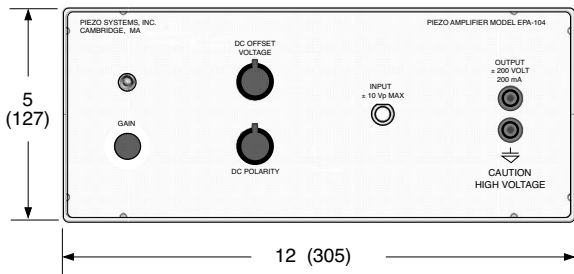
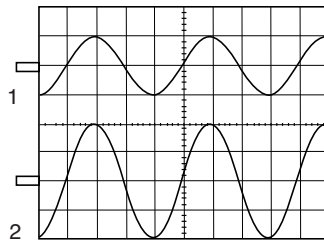


**PIEZO LINEAR AMPLIFIER**  
**LOW ELECTRICAL NOISE - NO FAN**

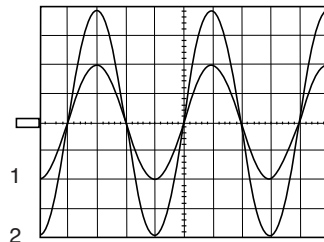


**SAMPLE SCOPE OUTPUTS**

Load: 0.1  $\mu$ F Capacitor @ 1KHz  
 Channel 1: Input  
 Scale = 0.5 Vp / div  
 Time Base = 250  $\mu$ sec/ div  
 Channel 2: Output  
 Scale = 5 Vp / div  
 Time Base = 250  $\mu$ sec/ div



Load: 0.1  $\mu$ F Capacitor @ 1KHz  
 Channel 1: Input  
 Scale = 5.0 Vp / div  
 Time Base = 250  $\mu$ sec/ div  
 Channel 2: Output  
 Scale = 50 Vp / div  
 Time Base = 250  $\mu$ sec/ div



**DESCRIPTION**

Piezo Systems offers a general purpose, single channel, high voltage ( $\pm 200$  Vp), high current ( $\pm 200$  mA), and high frequency (DC to 300 KHz) amplifier designed to drive any load including piezo stacks, benders, and single sheets.

Low Electrical Noise, Low Distortion: The EPA-104 is made with a high quality Apex® High Voltage Hybrid Operational Amplifier, and utilizes low noise linear power supplies. It is housed in a heavy high conductivity aluminum case which provides an excellent shield from external electromagnetic interference.

Input and Output Protection: Piezo loads present special problems to electronic drivers. The EPA-104 provides heavy input and output protection to take care of all shorting, turn-on, turn-off, and load generated voltage occurrences which can damage either the amp or your actuator.

Manual Bias Controls (Polarity and DC offset): For making manual adjustments of drive voltage or for applying DC bias to dynamically driven piezo actuators such as piezo stacks.

Input (via analog signal to the BNC input connector): Accepts up to  $\pm 10$  Vp signal waveforms from external signal generators, computer controllers, or feedback networks from DC to rated frequency. The combined AC plus DC offset voltage is adjustable from zero to the maximum rated voltage.

Gain Control: Convenient front panel adjustment of amplifier gain from 0 to 20X.

Output (via 4mm diameter safety sockets): High-voltage output terminals meet IEC1010 safety standard. Red and black insulated banana plugs with retractable sheath may be purchased separately. Wire connection to plugs is made with recessed screw.

**NOTE ON PIEZO LOADS**

To estimate the peak current requirement of a piezo actuator, solve the following equation:

$$I_p = 2 \pi F C V_p \quad (\text{in Amperes})$$

where F is the maximum operating frequency in Hertz, C is the capacitance of the piezo device in Farads, and Vp is maximum peak voltage required by the piezo actuator. The amplifier must be able to supply both Vp and Ip.

**ORDERING INFORMATION**

Piezo Linear Amplifier,  $\pm 200$  Vp/200mA (115VAC, 60Hz)  
 Piezo Linear Amplifier,  $\pm 200$  Vp/200mA (230VAC, 50Hz)  
 Insulated Banana Plugs, Red & Black

**PART NO.**

EPA-104-115  
 EPA-104-230  
 EPA-104-BPRB

**PRICE**

\$2,399  
 \$2,399  
 \$49



SPECIFICATIONS

EPA-104 PIEZO LINEAR AMPLIFIER

ELECTRICAL

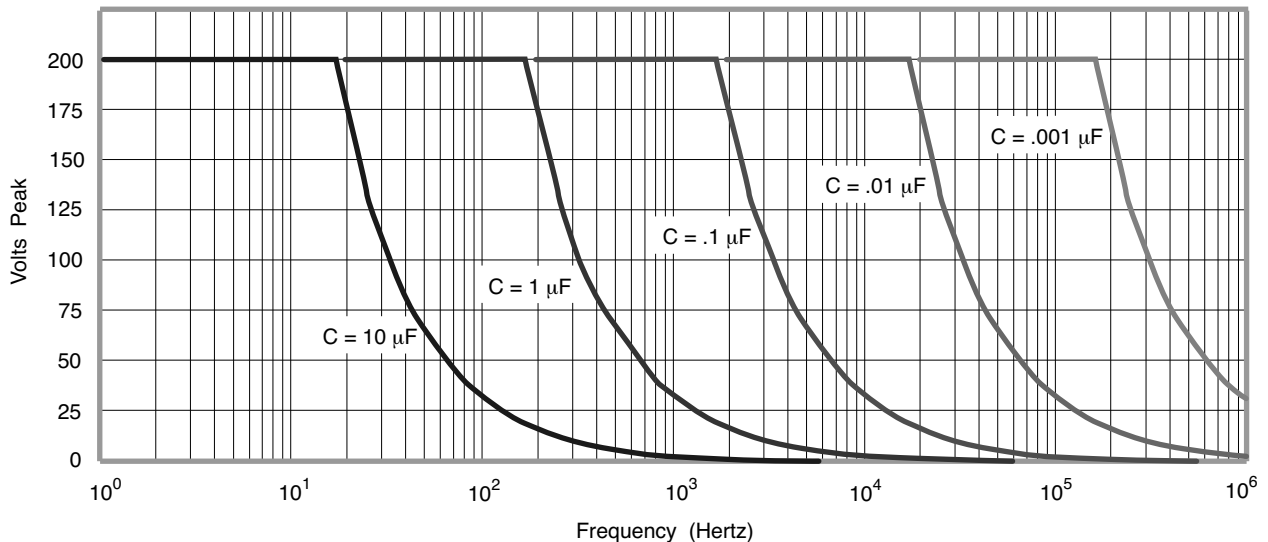
Maximum Voltage	±200 volts peak
Maximum Current	±200 mA peak
Output Power	40.0 watts peak
Frequency Range	DC to 300 KHz
Full Power Bandwidth	
(Into 1 K   resistive load)	Flat (to within ±0.5 dB): DC to 250 KHz 3db roll-off: 400 KHz
(Into capacitive load)	See chart below
Voltage Gain	Variable gain, adjustable from 0 to 20X
Phase Shift	-.083° per KHz, typical
Slew Rate (No Load)	380 volts / μsec
Maximum Input Voltage	±10 volts peak
Maximum DC Component	±10 volts DC
Input Coupling	Direct DC coupling only
Input Impedance	10K ohm
Output Coupling	DC coupling
Variable DC Offset	Normally zero volts. Adjustable to ±200 volts peak
Load Impedance	Capable of driving any load within the voltage and current limitations of the amplifier.
Output Noise (300KHz bandwidth)	2 mV <sub>rms</sub> typical with input shorted
AC Power Source	User settable (fuse change required): 100 - 130 VAC, 50/60 Hz 200 - 250 VAC, 50/60 Hz
Circuit Protection	Overload, short circuit, and thermal protection

MECHANICAL

Front Panel Controls	Gain adjust; DC Polarity selector (+,0,-); DC Offset adjust
Rear Panel Controls	On/off switch; Line voltage selector
Terminals	BNC for input (ground referenced); Safety shrouded banana jacks for high voltage output terminals (ground referenced)
Weight	6.4 kg (14 lbs.)
Dimensions	305mm L x 305mm D x 127mm H (12" L x 12" D x 5" H)

ROHS

Compliant except for one component



Peak Voltage Delivered to Capacitive Load at Peak Current Rating as a Function of Operating Frequency (Steady State Sinusoidal Waveforms; Temperature = 25 °C)