PIEZO LINEAR AMPLIFIER MANUAL

EPA-104

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PIEZO LINEAR AMPLIFIER

Part No. EPA-104-115; EPA-104-230

OPERATING MANUAL

Unpacking Instructions

The EPA-104 is a delicate electronic instrument. Be extremely careful when handling the device.

If the amplifier appears to have been damaged in shipment, make a claim with the carrier and notify Piezo Systems within seven (7) business days.

Check that the following items are present:

Piezo Linear Amplifier
Power Cord
Operating Manual

Please read the manual in its entirety before operating the EPA-104.

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GENERAL DESCRIPTION

The EPA-104 Piezo Linear Amplifier is an all solid state, direct coupled amplifier that provides 40 watts peak power, from DC to 250 kHz. The output of the EPA-104 can be offset ±200 volts, by means of a front panel DC Offset Voltage Control.

Both the input and output of the EPA-104 are referenced to earth ground internally.

The amplifier's output is protected from short-circuit or other abnormal load conditions. The output stage is cooled by a heat sink.

A drawing of the front panel is shown in Figure – 1.

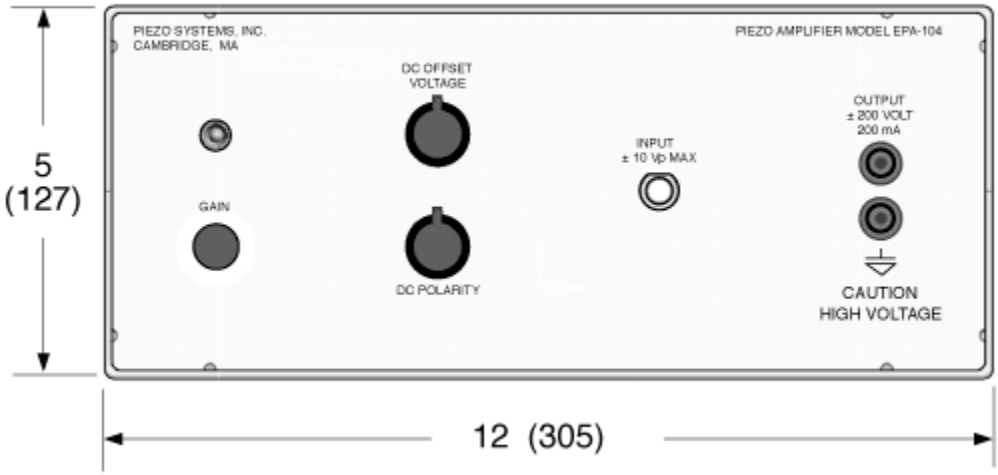

Figure – 1, EPA-104 Front Panel

OPERATION

Power Requirements:

The EPA-104 may be configured for operation from a 100/120/220/240 VAC, 50/60 Hz power source. It has been shipped as initially requested by the customer. However, the power input is user selectable by changing the Input Voltage Selector and 2 fuses in the AC Input Module located on the rear panel.

Operating Controls, Connectors, and Indicators:

Controls:

- Power Switch (rear panel): on/off rocker switch
- DC Polarity Switch (front panel): 3-position rotary switch for selecting (+), (-), or zero.
- DC Offset Voltage Control (front panel): Ten-turn potentiometer for controlling the offset voltage from zero to ±200 volts peak.
- Gain Control (front panel): Single-turn potentiometer for adjusting gain from 0 to 20X.

Connectors:

- BNC for input signal (front panel) *Note: BNC connector is earth ground.*
- Shrouded banana jacks for output signal (front panel) *Note: Black jack is earth ground.*
- AC Input Module with power receptacle, VAC selector, line fuses, and power switch (rear panel)

Indicators:

- Power-on LED (front panel): Green LED lights to indicate a power-on condition

Operation:

Initial Set-Up:

1. Verify correct AC voltage selector setting (100, 120, 220 or 240) in AC Input Module window (rear panel).
2. Make appropriate power connections.
3. Set the DC Offset Voltage control to zero.
4. Connect a voltmeter to the OUTPUT.
5. Make the appropriate connections to the INPUT and OUTPUT connectors.
6. Turn Power Switch on. ***Note: allow a 30-minute warm-up to obtain rated performance specifications.***

CAUTION: The EPA-104 is capable of developing 200 volts peak on its output terminals. To prevent the possibility of electric shock, extreme caution should be used in connecting or disconnecting any cable or load from the amplifier's output terminals, whenever these voltages are present.

Gain Control:

The EPA-104 is a non-inverting variable gain amplifier. Gain is adjustable from 0 to 20X.
Caution: The maximum allowable input voltage is ±10 volts peak.

DC Offset Voltage Control:

The DC Offset Voltage Control consists of a 3-position, rotary switch that selects zero, positive or negative DC offset. The positive or negative offset is controlled by a ten-turn potentiometer and is adjustable from zero to ±200 volts peak. The amplifier's output can be offset plus or minus 200 volts (DC plus AC peak). That is, if the amplifier's AC output is 50 volts peak, then the signal may be offset by 150 volts maximum. The

smaller the AC peak value, the greater the DC offset value. If no AC signal is applied to the amplifier's input, then the DC offset will provide DC voltage on the amplifier's output, adjustable from zero to plus or minus 200 volts. In this condition, the amplifier may be used as an auxiliary DC supply, within the amplifier's specified limitations for voltage and current.

Reactive Loads:

The model EPA-104 is capable of driving capacitive, inductive and resistive loads within its voltage and current limitations. To determine the current requirement of a Piezo actuator (which behaves like a capacitor), solve the following equation:

$$\mathbf{Ip = 2 \pi f C Vp}$$

Where Ip is the peak current required in amps, f is the maximum operating frequency in Hertz, C is the capacitance of the piezo device in Farads, and Vp is maximum peak voltage applied to the piezo actuator.

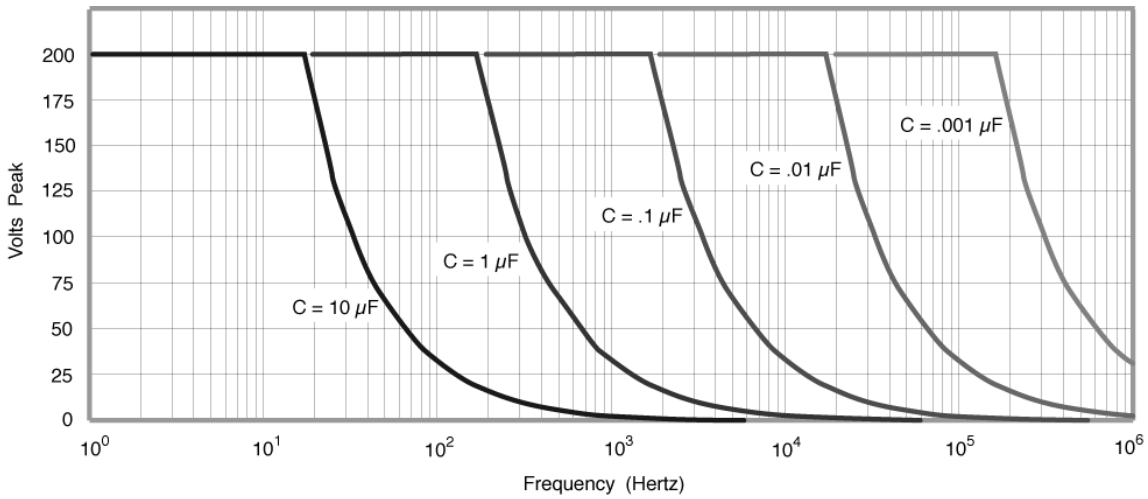

Figure – 2: Peak voltage delivered to capacitive load at 200 mA Peak current rating as a function of operating frequency (steady state sinusoidal waveforms; temperature = 25 °C)

EPA-104 Piezo Linear Amplifier Specifications

Part No.	EPA-104-115; EPA-104-230
Frequency Range:	DC to 300 kHz
Output Power:	40 watts peak
Voltage:	± 200 volts peak
Current:	± 200 mA peak
Full Power Bandwidth:	
Into 1 KΩ resistive load:	Flat (to within ± 0.5 dB): 100 Hz – 250 kHz
3 dB roll off:	400 kHz
Into capacitive load:	See Figure – 2
Voltage Gain:	variable gain, adjustable from 0 to 20X
Phase Shift:	$0^\circ \pm 1^\circ$ at DC $-.083^\circ$ per kHz, typical
Slew Rate (no load):	>400 volts/uSec
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 coupled
DC Offset Level:	Normally zero volts. Adjustable to ±200 volts with DC Offset Control Knob
Load Impedance:	Capable of driving any load within the voltage and current limitations of the amplifier.
Output Noise (300 kHz bandwidth):	2 mV rms with input shorted, typical
Front Panel Controls:	Gain adjust, DC polarity selector (+, -, 0), DC Offset Adjust
Rear Panel Controls:	On/off switch; AC line voltage selector/fuse drawer (100/120/220/ or 240 VAC)
Front Panel Terminals:	BNC for input (ground referenced), safety shrouded banana jacks for output (ground referenced)

Power Requirements:	User settable: 100 – 130 VAC, 50/60 Hz 200 – 250 VAC, 50/60 Hz

Line Fuses (located in AC Input Module):

100/120 VAC fuses:	3A, Slo-Blo, 250 V, 5mm x 20mm
220/240 VAC fuses:	1.5A, Slo-Blo, 250 V, 5mm x 20mm

(Note: A screwdriver is required to access the fuse drawer and voltage selector)

Internal Fuses:

Output fuse terminal:	250 mA, Slo-Blo, 250 V, 5mm x 20mm
Power supply fuse pair for high voltage rails:	½ A, Slo-Blo, 250 V, 5mm x 20mm
Weight:	6.4 kg (14 lbs)
Dimensions:	305mm W x 305mm D x 127mm H (12" x 12" x 5")

SERVICE & WARRANTY

All Piezo Systems products are warranted against defective materials and workmanship. This warranty applies for a period of one year from the date of delivery to the original purchaser. Any instrument that is found within the one-year period not to meet these standards will be repaired or replaced at the discretion of Piezo Systems, Inc.
No other warranty is expressed or implied.