Step Attenuator for Input Signals

AUDIO MEASUREMENTS ARE USUALLY made at specific output levels. For power amplifiers, often at full power, −3 dB, −10 dB, and −20 dB. The simplest way to make such measurements rapidly is to insert a step attenuator in series with the input signal. With the attenuator in its bypass position (all resistive elements out of circuit) the amplifier's full output can be measured. Then sequential attentuation of the input signal in steps permits evaluating distortion at the various lower output levels. Details for such a step attenuator are shown in Figs. 7 and 8.

The unit provides up to 41 dB of attenuation for low-power signals in six steps. It can be built into any type of shielded metal box, using DPDT toggle or rocker switches. Binding posts, BNC's, or phono jacks are used for input and output connectors. The uses of the device extend beyond testing of power amplifiers. It is equally valuable for evaluating tape recorder and loudspeaker performance.

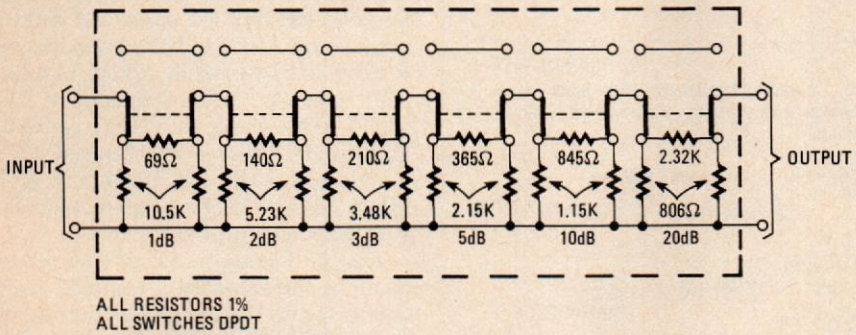


FIG. 7—STEP ATTENUATOR schematic. This device permits evaluation of output signals at predetermined input levels. DPDT switches may be either toggle or rocker type.

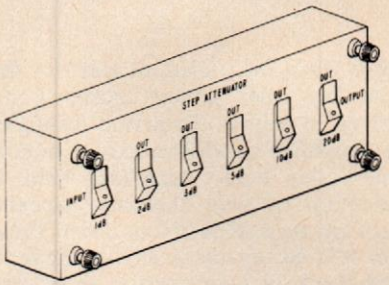


FIG. 8—POSSIBLE LAYOUT for an input signal step attenuator.

RIAA-Equalization Inverter

ALL CONVENTIONAL RECORDS ARE CUT with an equalization curve that reduces the bass and increases the treble. A complementary bass-boost, treble-cut equalization is applied during playback by the phono preamplifier. The exact shape of this curve, is called the RIAA curve, after the organization—the Recording Industry Association of America—that standardized it.

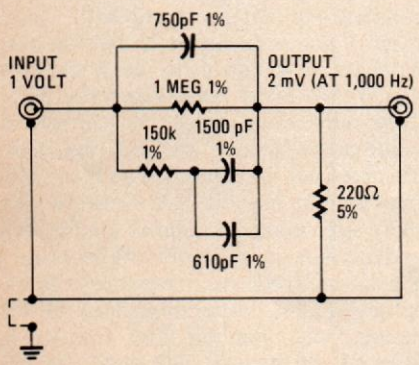


FIG. 9—RIAA EQUALIZATION inverter. Component values and tolerances are very important.

One important specification when measuring a phono-preamp stage is the accuracy of the equalization, since any deviation from the standard curve in effect introduces an error in frequency response. For many years, ±1 dB was considered an acceptable figure. Improvements throughout the record-playback chain and greater interest in the sonic colorations of different preamplifiers, have convinced many reviewers and design engineers that a good preamp section should be accurate to within 0.25 dB or even better.

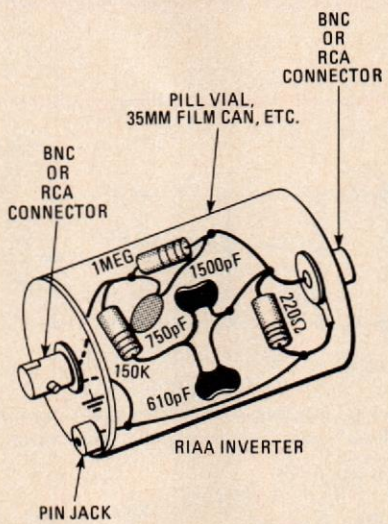
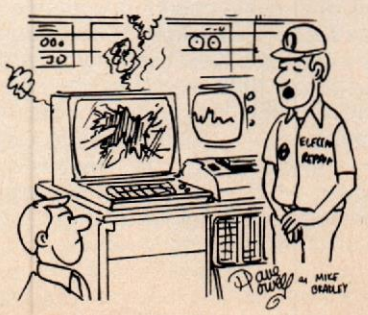


FIG. 10—CONSTRUCTION OF INVERTER using in-line enclosure. Pin jack permits separate ground.

The simplest method of evaluating the RIAA-equalization accuracy of a preamplifier is to insert an inverting filter, which precisely matches the standard curve, in series with the input test signal. The preamp section's output, as monitored with a precision voltmeter or strip chart recorder, should be constant at all frequencies in the audio range. Any meter deviation or wiggles in the chart recorder's graph indicate equalization errors.

Details for the construction of an RIAA-inverter are shown in Figs. 9 and 10. Note that the inverter circuit also attenuates the input signal considerably, to match the sensitivity of most preamp sections (typically 2mV or less for full output).

As you can see, the component tolerances necessary to deliver the required degree of accuracy are quite tight. You may have to individually measure and pre-select or trim the component values to obtain the tolerances needed. The inverter can be built up on a perforated circuit board, and housed in a chassis box. Use RCA or BNC connectors for input and output. It's a good idea, by the way, to make provisions for isolating the connector shields from chassis grounds. Different preamplifiers react in varying ways to phono-grounding arrangements, and maximum flexibility is desirable here. **R-E**



"I'm afraid your computer has a terminal illness."