

W2IHY

PASSIVE

FIXED OR VARIABLE

ATTENUATOR KIT

The W2IHY Passive Fixed / Variable Attenuator is designed to be a versatile accessory that is a necessity for the serious amateur interested in connecting commercial audio equipment to amateur radio equipment. This attenuator can be used to not only provide the proper audio levels between pieces of equipment in your audio chain or to your amateur radio equipment but it may be also used to eliminate ground loops that usually show up in the form of hum. The attenuator uses extensive RF decoupling such that RF will not effect the attenuator or what the attenuator is connected to. . Additional provision has been made on the PC board to add additional optional RF decoupling for commercial environments where greater than 5 KW is used and extreme RF fields are present.

Page 7 shows a schematic of the Fixed / Variable Attenuator. The value of R2 determines the amount of attenuation that is obtained. R3 is used to help limit the changes of load that both the output transformer (T1) and what ever the output of the attenuator is connected to.

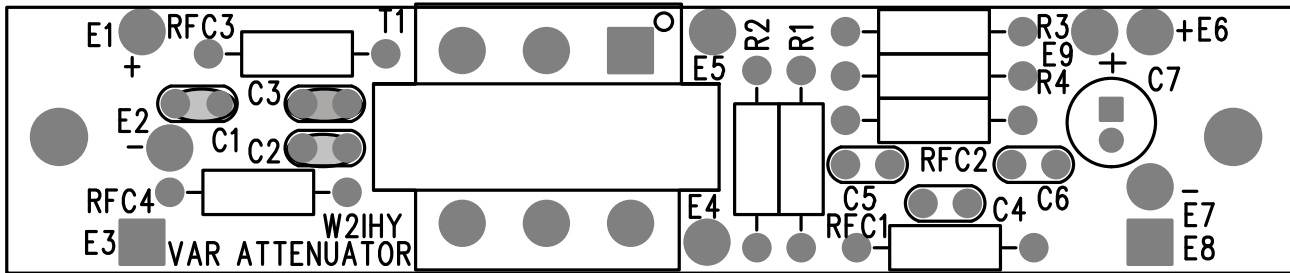
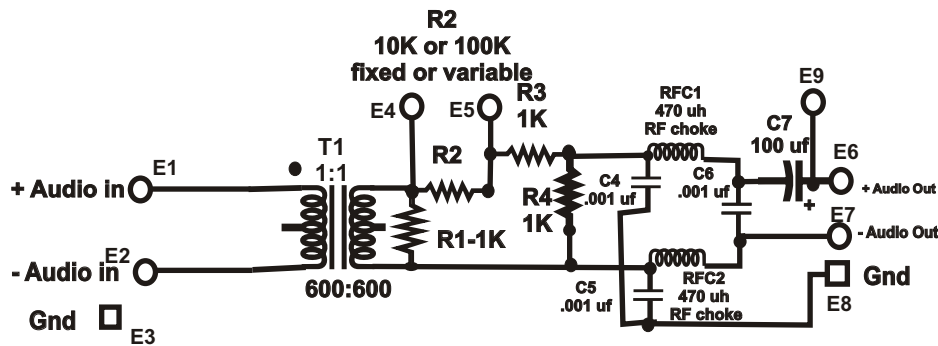
On Page 8 there is a schematic of the Fixed / Variable Attenuator that is designed for extreme commercial environments. There is also a table below the schematic that shows the effects of varying R2 (the fixed or variable resistor) and R3 (the load limiting resistor). **For a nominal charge you can obtain the parts to updated your attenuator to be extreme enabled.**

So what values should you use for R2 (the fixed or variable resistor) and R3 (the fixed resistor)? The answer to this question depends on how much attenuation you require. On Page 7 there are a set of graphs that show for various values of R2 (the fixed or variable resistor) and for specific values of R3 the amount of attenuation you can expect relative to the input signal. So how do you use these graphs. If you have a Kenwood or Yaesu radio you should try to provide an audio signal level of about 10 to 20 millivolts (mv) to your radio. If the you are trying to drive a radio that normally expects audio signals levels of about 10 and 20 mv with an audio source that provides line level audio signals (1 volt p-p) the radio will be severely over driven. You will need a value of R2 of about 25K ohms. If you have a ICOM 775/756/781 etc. Class radio and wish to drive the balanced modulator you will need audio signal levels of about 100 mv RMS (which is a little less that 300 mv on voice peaks). You will need a value of R2 of about 1K ohms.

When using line level input into the attenuator using a 100K variable resistor for R2 and a 1K ohm fixed resistor for R3 should allow you to dial in the proper level for most amateur radio equipment and for other units in your audio chain. In those rare cases when the aforementioned configuration does not provide enough audio level change R3 from a 1k ohm resistor to a piece of wire.

Have fun building the attenuator.

Fixed or Variable Attenuator Board Assembly Instructions (Attenuator with an output LC network)



C1,C2 and C3, colored in grey, are not installed.
Wire instaled for RFC3 and RFC4.

-----Parts List-----

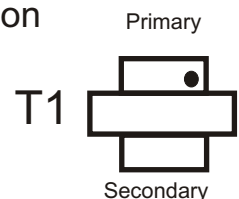
- | | |
|--|--|
| C4-C6 - .001 uf mylar | R2 - fixed resistor or variable potentiometer |
| C7 - 100 uf radial electrolytic | RFC1,RFC2 - put a piece of wire in place of the RF choke |
| C8 - .1 uf monolithic ceramic capacitors | RFC3,RFC4 - 470 uh miniature r.f. Choke |
| R1,R3,R4 - 1K ohm ¼ watt resistor | T1 - 1:1 600 ohm Audio Transformer |

Install the following parts on the PC board

- () Install RFC 1 - 470 uh RF choke: yellow-brown-brown
- () Install RFC 2 - 470 uh RF choke: yellow-brown-brown
- () Install a piece of wire in RFC3
- () Install a piece of wire in RFC4
- () Install C4 - .001 uf mylar (102K) green capacitor
- () Install C5 - .001 uf mylar (102K) green capacitor
- () Install C6 - .001 uf mylar (102K) green capacitor
- () Install C7 - 100 uf radial electrolytic (polarized) longest lead to positive

- () Install R1 - 1K ohm ¼ watt resistor brown-black- red
- () Install R3 - 1K ohm ¼ watt resistor brown-black- red
- () Install R4 - 1K ohm ¼ watt resistor brown-black- red
- () Install R2 if you want to build a fixed attenuator. If you wish to build a variable attenuator then skip to the next step:
 - For a 20 dB fixed attenuator install a 10K ohm ¼ watt resistor brown-black- orange
 - For a 40 dB fixed attenuator install a 100K ohm ¼ watt resistor brown-black- Yellow
- () Install T1 the 1:1 audio transformer . Please note transformer orientation
Dot on transformer aligns with dot on PC board

YOU HAVE COMPLETED WIRING THE PC BOARD



Variable Attenuator Wiring with a Balanced Input (Attenuator with an input and output LC network)

Wiring The Attenuator Board to The Rest of The components

It is recommended that the attenuator unit be fabricated in a plastic case. A case similar to Radio Shack part number 270-1802 works very nicely. If a metal case is used the ground connection should not be connected to the sleeve of the plug that goes into J1.

It is recommended that the unit be wired per figure 1. The TRS plug, that is connected into the 1/4" jack J1 (shown in figure 1), should be wired for your particular configuration (see the table below.)

Making a Cable to the Attenuator

If the attenuator is wired per figure 1 using the supplied parts the attenuator is wired to accept a balanced input. The attenuator can be used with balanced and unbalanced inputs. The table below shows how to make up a Tip Ring Sleeve (T.R.S.) Plug to work with the attenuator for various audio inputs.

<== Audio Plug from Source to Attenuator ==>			
AUDIO CONFIGURATION	TIP	RING	Sleeve
Source: Balanced Output Wire Input Plug: Balanced Input	+ MIC	- MIC	Ground
Source: Balanced Output Wire Input Plug: Unbalanced Input	+ MIC	- MIC and Ground	- MIC and Ground
Source: Unbalance Output Wire Input Plug: Unbalanced Input	+ MIC	Ground	Ground

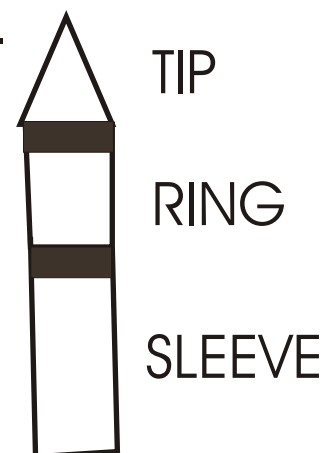
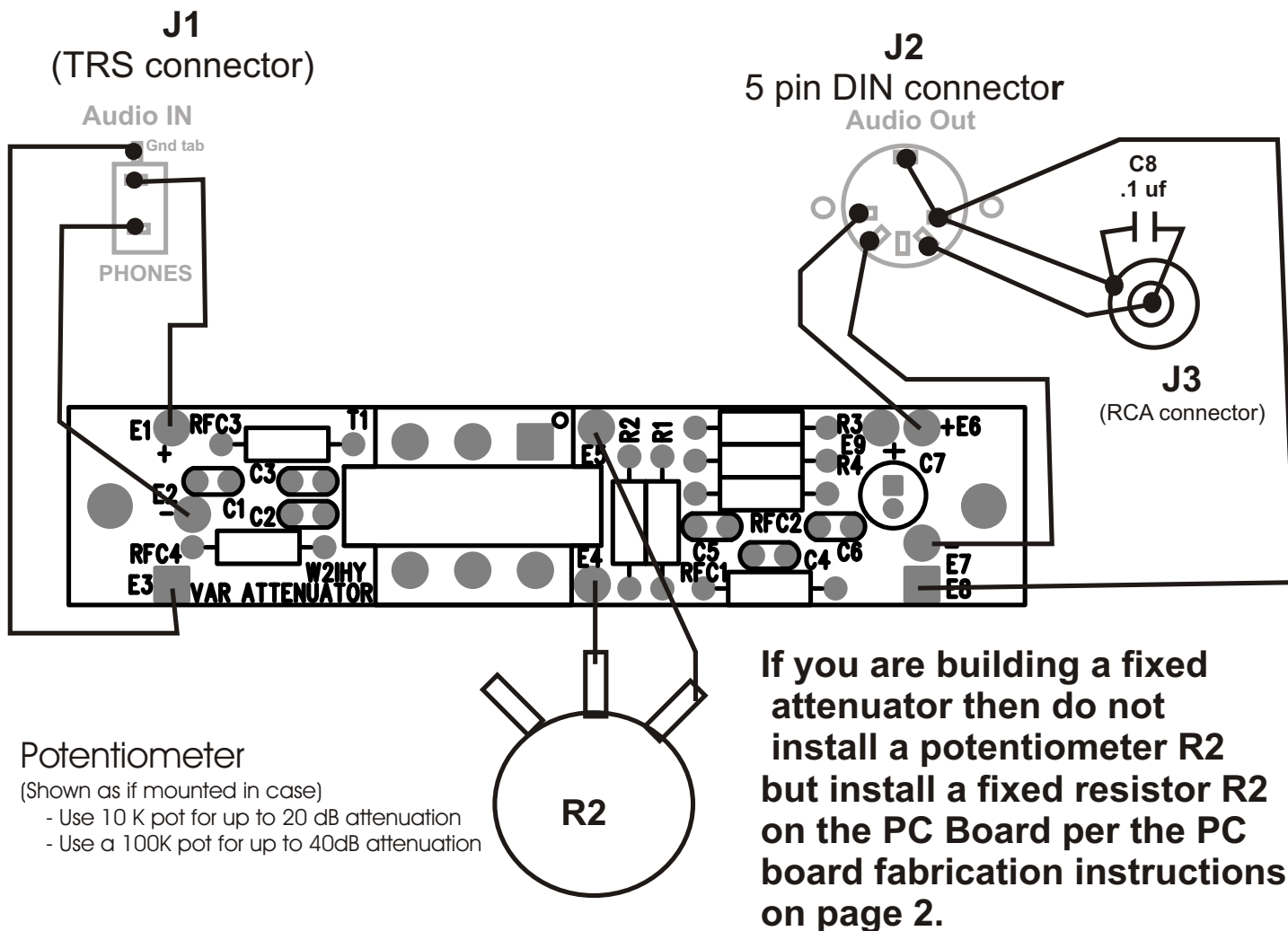


Figure 2 shows some common cable configurations for amateur radio transmitters. Various already built cables may be purchased from W2IHY Technologies.

WIRING PICTORIAL DIAGRAM

FIGURE 1



J1, J2, J3 and R2 shown as mounted inside the case

AUDIO OUT CABLE WIRING

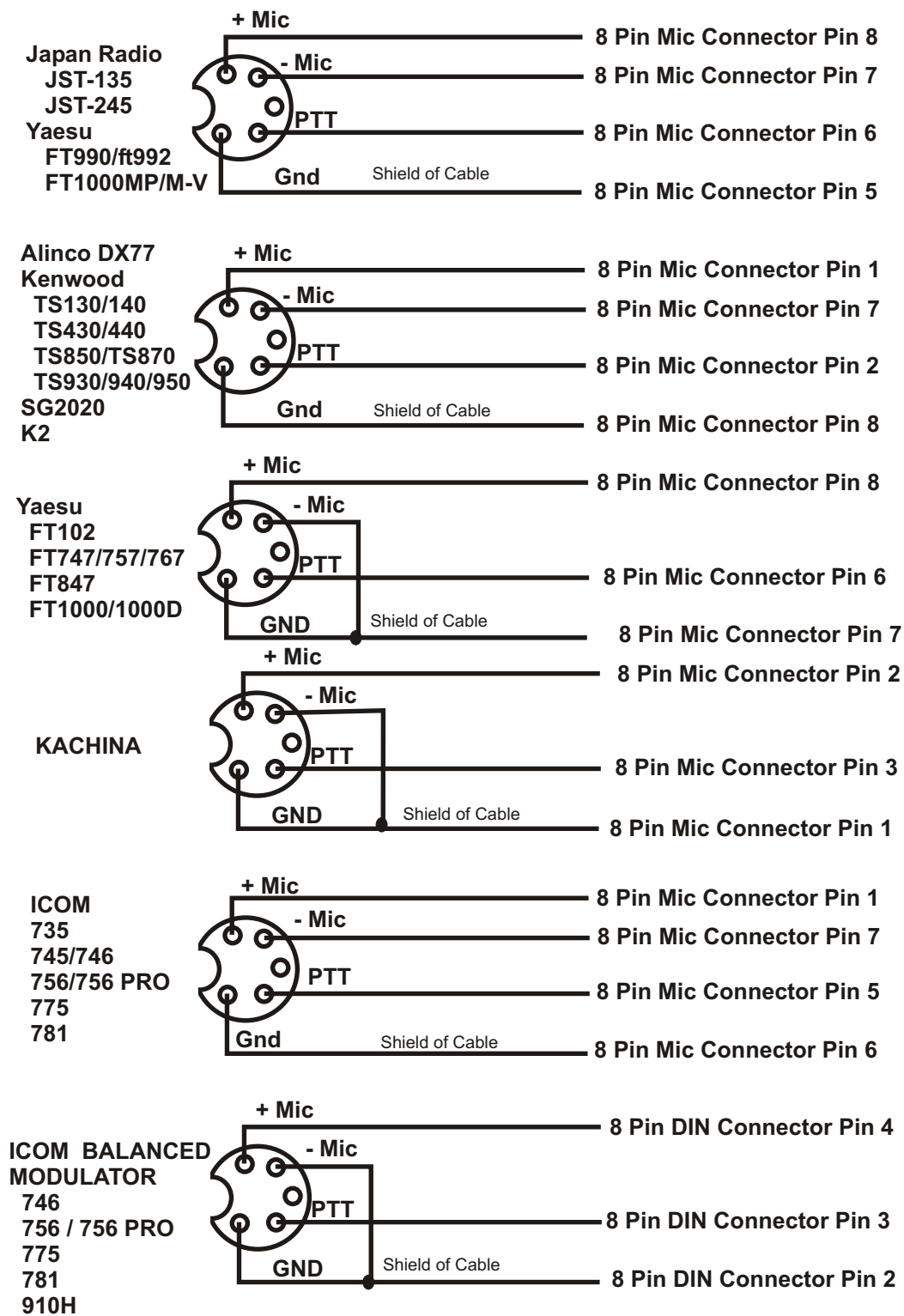
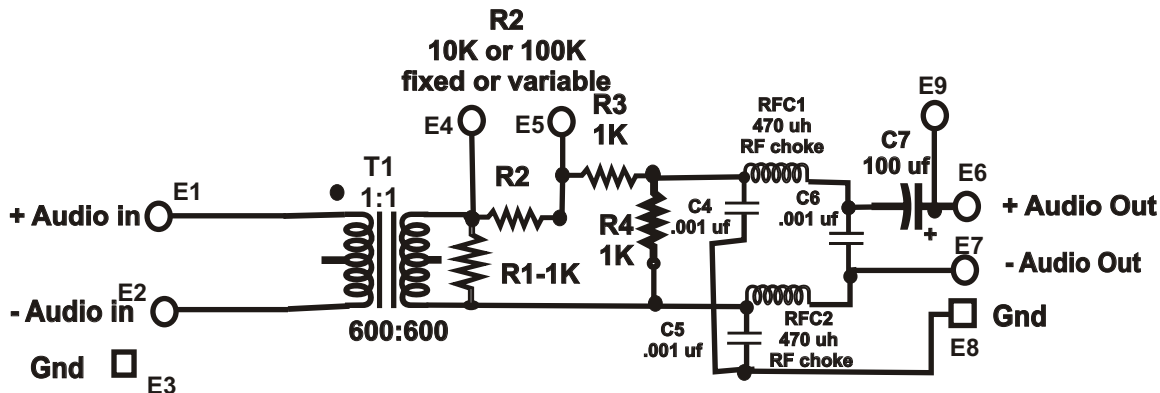


FIGURE 2

DIN connectors shown on the side to be soldered
DO NOT SOLDER TO SHIELD OF DIN

ATTENUATOR RESPONSE CHARACTERISTICS



ATTENUATION OF AUDIO INPUT AS R2 CHANGES WHERE R3=1K Ohms

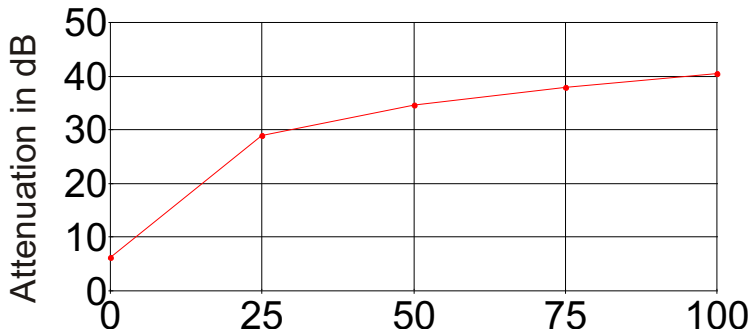


Figure 3A

ATTENUATION OF AUDIO INPUT AS R2 CHANGES WHERE R3=0 Ohms

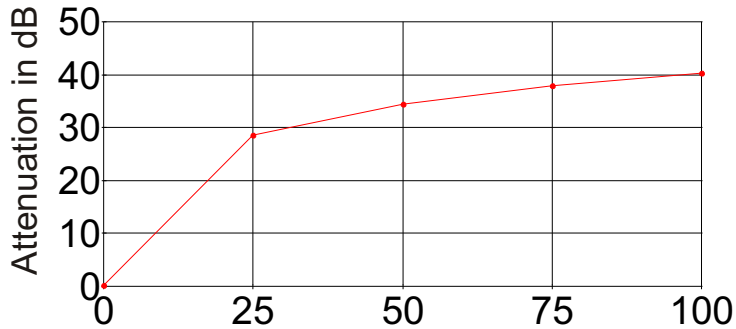


Figure 3C

MILLIVOLTS OF AUDIO OUTPUT AS R2 CHANGES WHERE R3=1K Ohms AND 1 VOLT OF AUDIO IS APPLIED TO THE INPUT

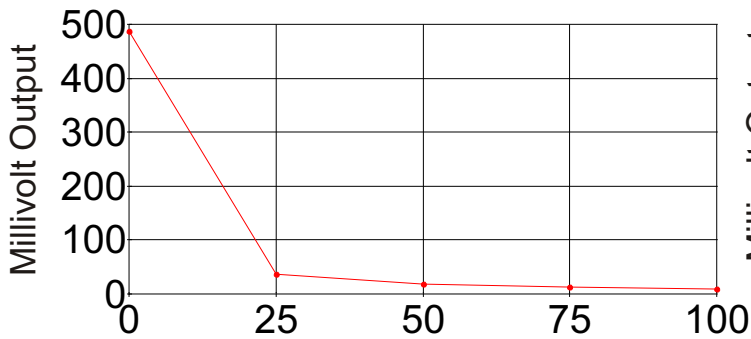


Figure 3B

MILLIVOLTS OF AUDIO OUTPUT AS R2 CHANGES WHERE R3=1K Ohms AND 1 VOLT OF AUDIO IS APPLIED TO THE INPUT

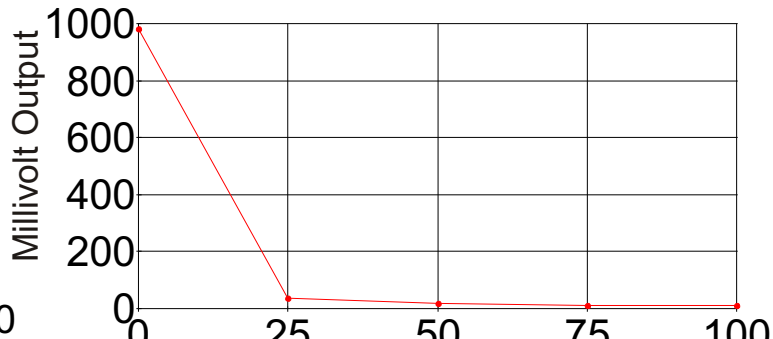
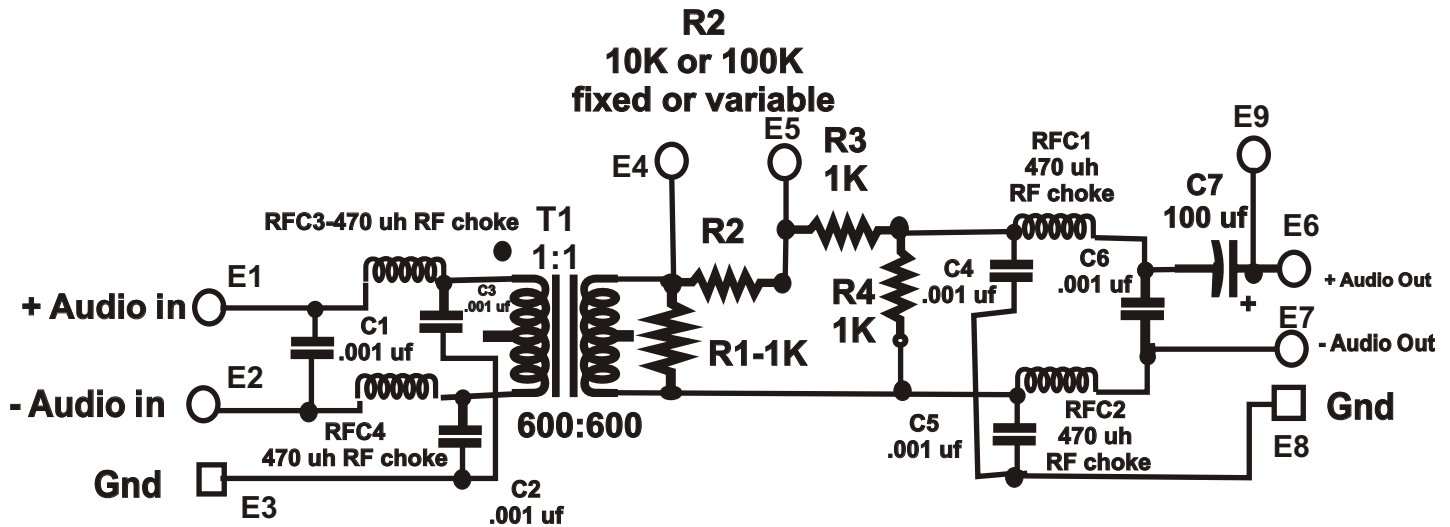
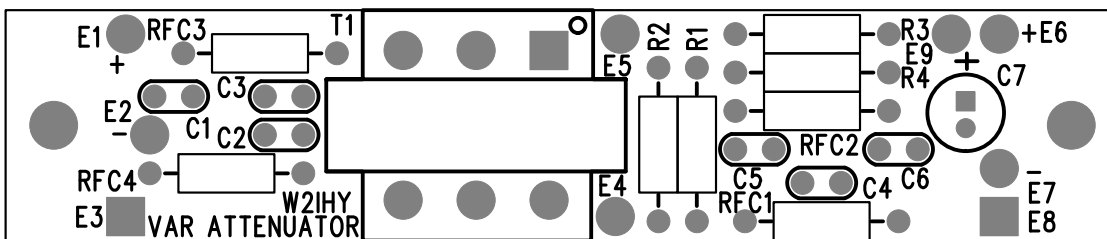


Figure 3D

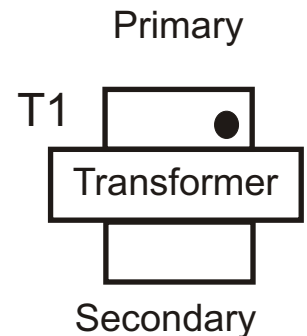
Fixed or Variable Attenuator



R1	R2	R3	R4	Attenuation* R2=0 to R2=Max	Impedance to radio R2=0 to R2=Max	Impedance on Xfmr "T1" R2=0 to R2=Max
1000	10000	1000	1000	-6.2 to -21.8 dB	598 to 925	580 to 919
1000	10000	0	1000	-.1 to -21.1 dB	293 to 918	275 to 912
1000	100000	1000	1000	-6.2 to -40.4 dB	598 to 993	580 to 990
1000	100000	0	1000	-.1 to -40.3 dB	293 to 993	275 to 990



Actual size .6" x 2.9"



Hints.

Connecting audio to the input of the variable attenuator

1.) Connecting Grounds:

- The ground from the audio input should be connected to E3 but must be isolated from the output ground E8.
- The ground from where the attenuator is driving should be connected to E8 but must be isolated from the input ground E3.

2.) If the audio source is from a balanced output (+ audio, - audio and ground) connect + audio and - audio to the transformer as shown. If you are using a metal case to enclose the attenuator please review the comments above concerning connecting grounds.

3.) If the audio source is from an unbalanced output (audio and ground) connect the audio to the + audio side of the transformer (E1) and connect ground to the - audio side of the transformer (E2) and to ground (E3). If you are using a metal case to enclose the attenuator please review the comments above concerning connecting grounds.