

# BRIDGED T PAD ATTENUATOR DESIGN

The "BRIDGE T" attenuator is a very useful tool to use whenever you need to reduce the level of a signal without changing the impedance of the circuit. First note that two of the four resistors (R3 and R4) are always equal to the input and output impedance. In the case of an attenuator for 75 Ohm cables, R3 and R4 are 75 Ohms! This is also the Characteristic Impedance of the circuit (See figure 1).

Select the desired attenuation voltage ratio. Subtract one (1) from the voltage ratio. That becomes the Factor to derive the resistance value of R1 and R2.

**FORMULA FOR VOLTAGE RATIO VR1: VOLTAGE RATIO = dB/20 ANTILOG**

The value for R1 is VR 1 divided into R3 the Characteristic Impedance value. The value for R2 is VR 1 multiplied by R3 the Characteristic Impedance value. In practice, the closest 1% value is sufficiently accurate for all the resistors.

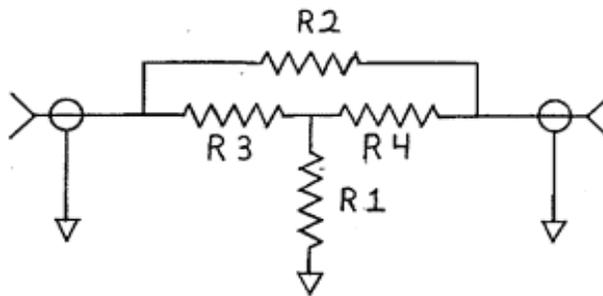


Figure 1

This table is for 75 OHM IMPEDANCE UNBALANCED ATTENUATORS

FORMULA:  $(R3) / VR - 1 = R1$ ,  $VR - 1 \times R3 = R2$ .

| dB REDUCTION | VOLTAGE RATIO | VR-1      | R1 (Ohms) | R2 (Ohms) |
|--------------|---------------|-----------|-----------|-----------|
| 1            | 1.122018      | .122018   | 614.66    | 9.15      |
| 2            | 1.258925      | .258925   | 289.66    | 19.42     |
| 3            | 1.412538      | .412538   | 181.80    | 30.94     |
| 4            | 1.584893      | .584893   | 128.23    | 43.87     |
| 5            | 1.778279      | .778275   | 96.37     | 58.37     |
| 6            | 1.995262      | .995262   | 75.36     | 74.64     |
| 7            | 2.238721      | 1.238721  | 60.55     | 92.90     |
| 8            | 2.511886      | 1.511886  | 49.61     | 113.39    |
| 9            | 2.818383      | 1.818383  | 41.25     | 136.38    |
| 10           | 3.162278      | 2.162278  | 34.69     | 162.17    |
| 20           | 10.000000     | 9.000000  | 8.333     | 675.00    |
| 30           | 31.622777     | 30.622777 | 2.449     | 2296.71   |
| 40           | 100.000000    | 99.000000 | 0.7576    | 7425.00   |

## WHAT ABOUT OTHER IMPEDANCES AND BALANCED ATTENUATORS:

This attenuator is very versatile and may be converted to any impedance by multiplying the impedance by VR1 to obtain the bridging resistance (R2) and dividing VR1 into the desired impedance to obtain the shunt resistance (R1).

A balanced pad, such as a 600 Ohm balanced audio pad can be similarly designed, by first assigning the two sets of R3 and R4 resistances to 300 Ohms (1/2 the value of the desired characteristic impedance of the network), then calculating the R1 resistance by dividing VR-1 into 600 Ohms (the full characteristic value of the balanced pad), and then calculating the R2 resistance by multiplying VR-1 times 300 Ohms (1/2 the characteristic impedance of the network).

This is by far the easiest design for a matching impedance pad (either balanced or unbalanced), because it is only necessary to choose the desired voltage reduction ratio and subtract one to determine the factor to be used to compute the remaining resistance values. Remember to treat balanced pads as though they were two identical pads, split down the middle (thus 1/2 half the characteristic impedance for each half), then reassemble the two halves to reconstitute the balance pad.

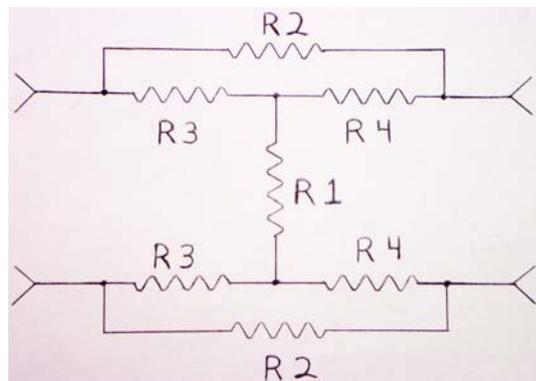


Figure 2



BALANCED AUDIO T-PAD



UNBALANCED VIDEO T-PAD

These types of Balanced and Unbalanced T-Pad attenuators are available from FM SYSTEMS, INC. Santa Ana, CA. Call 800-235-6960.