

# Engineer's Notebook

## A special pull-out from **Radio**



THE RADIO TECHNOLOGY LEADER

RadioMagOnline.com

part two in a series

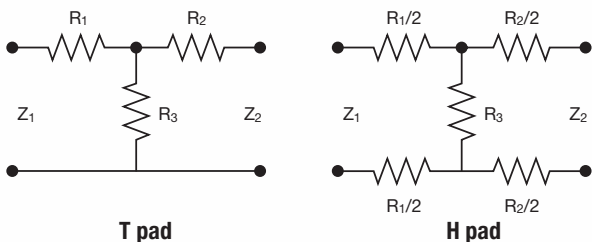
### Passive Attenuators

To calculate the values for a pad, you must know the desired input impedance, output impedance and loss in decibels (dB).

To calculate the values for an H pad, first calculate the values for a T pad, and then divide the values of the input and output resistors (R1 and R2) in half to equally divide the load.

The value of loss in decibels must be converted to a ratio of current, voltage or power. The formula to determine K is

$$K = 10^{(\text{desired attenuation in dB}/20)}$$



The value of R3 can be used to determine the values of R1 and R2, so it is easier to calculate it first. The equation for R3 can be substituted in the equations for R1 and R2 if you prefer to repeat the calculation.

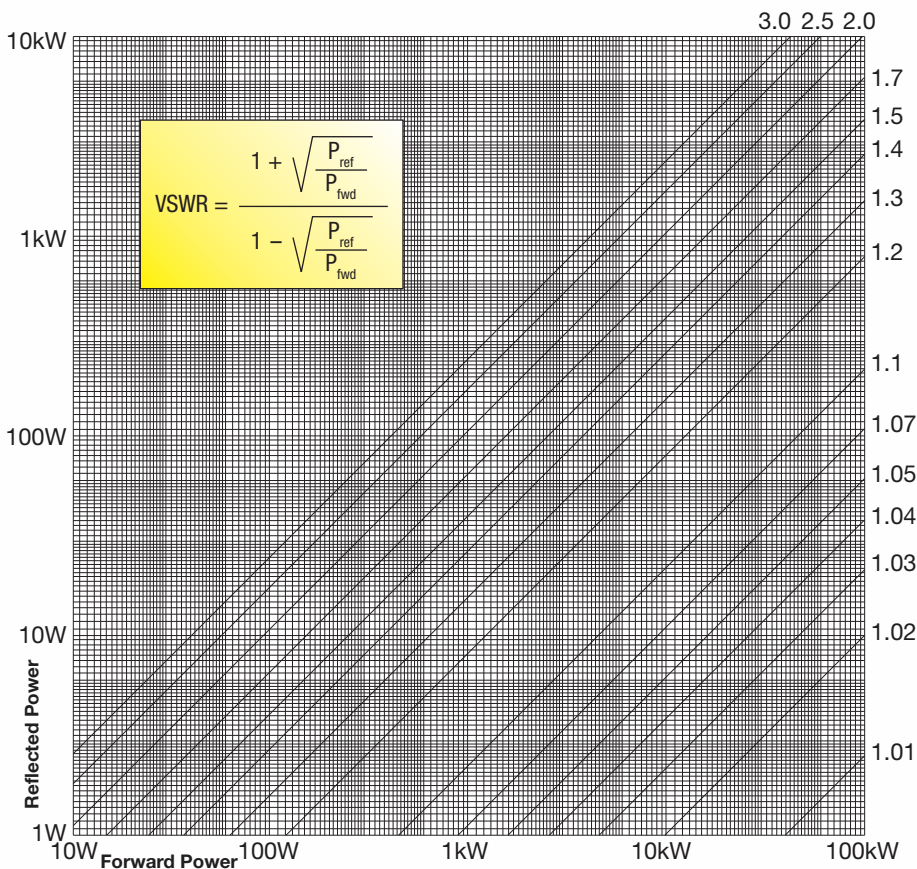
T and H pads are bidirectional, so either side can be used as the input. When calculating the values for a pad with unequal impedances, the value of Z<sub>1</sub> must be greater than the value of Z<sub>2</sub>.

$$R_1 = Z_1 \left( \frac{K^2 + 1}{K^2 - 1} \right) - R_3$$

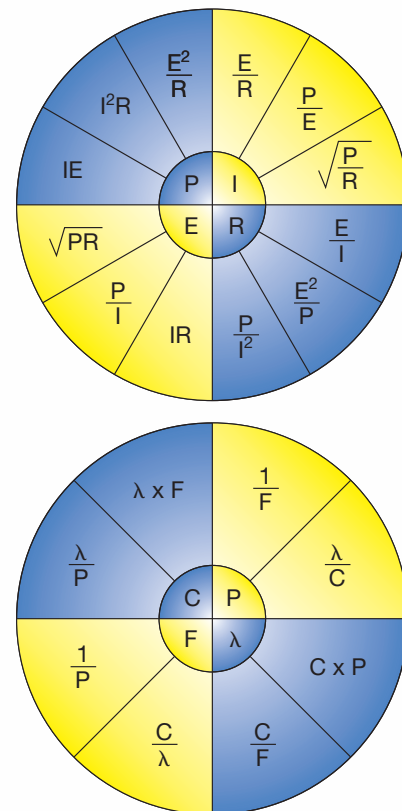
$$R_2 = Z_2 \left( \frac{K^2 + 1}{K^2 - 1} \right) - R_3$$

$$R_3 = 2\sqrt{Z_1 Z_2} \left( \frac{K}{K^2 - 1} \right)$$

### VSWR



### Common Equations



Speed of sound = 343 m/s = 1,125.33 ft/s  
 Speed of light = 299,792,458 m/s = 983,559,096 ft/s