BASIC RF ATTENUATORS: PI & T

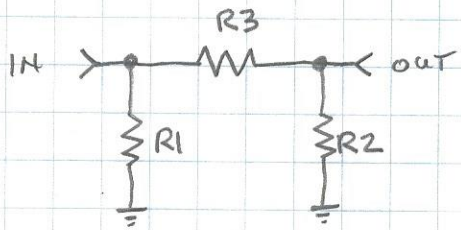
W2AEW

- MOST APPLICATIONS: INPUT & OUTPUT IMPEDANCES MATCH - 50Ω ZØ
- ATTENUATION EXPRESSED AS: XdB = POWER LOSS IN dB 20dB
  N x = VOLTAGE RATIO V_{IN}/V_{OUT} 10x

$$X_{dB} = 20 \cdot LOG_{10}\left(\frac{V_{IN}}{V_{OUT}}\right) = 20 \cdot LOG_{10}(N) = 10 \cdot LOG_{10}\left(\frac{P_{IN}}{P_{OUT}}\right)$$

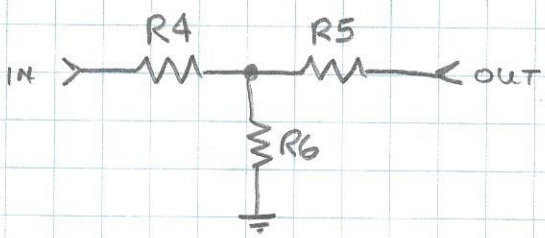
$$N = \frac{V_{IN}}{V_{OUT}} = 10^{\left(\frac{X_{dB}}{20}\right)}$$

PI



FOR
$Z_{IN} = Z_{OUT} = Z\emptyset$

T



$$R1 = R2 = Z\emptyset \cdot \left[\frac{N+1}{N-1}\right]$$

$$R3 = Z\emptyset \cdot \left[\frac{N^2-1}{2N}\right]$$

$$R4 = R5 = Z\emptyset \cdot \left[\frac{N-1}{N+1}\right]$$

$$R6 = Z\emptyset \cdot \left[\frac{2 \cdot N}{N^2-1}\right]$$

EXAMPLE: 20dB 10X PI ATTENUATOR FOR 50Ω

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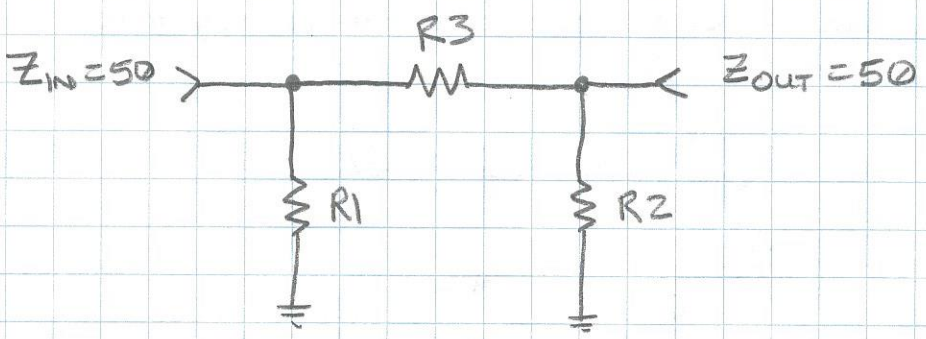


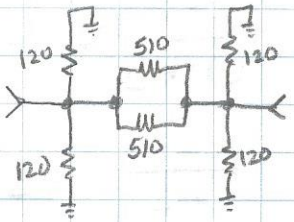
20dB = 10x

N = 10

$$R1 = 50 \cdot \left(\frac{10+1}{10-1}\right) = 50 \cdot \frac{11}{9} = 61.1\,\Omega$$

$$R3 = 50 \cdot \left(\frac{10^2-1}{2N}\right) = 50 \cdot \frac{99}{20} = 247.5\,\Omega$$

ACTUAL IMPLEMENTATION



GOOD RF REFERENCE SITES

WWW.RFCAFE.COM
WWW.MICROWAVES101.COM
WWW.RADIO-ELECTRONICS.COM