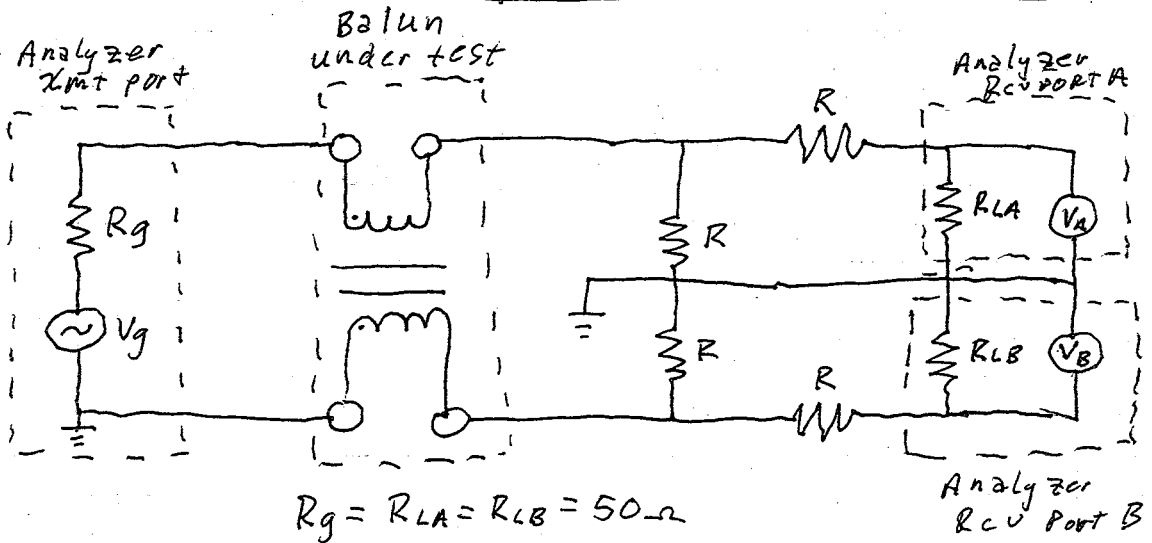
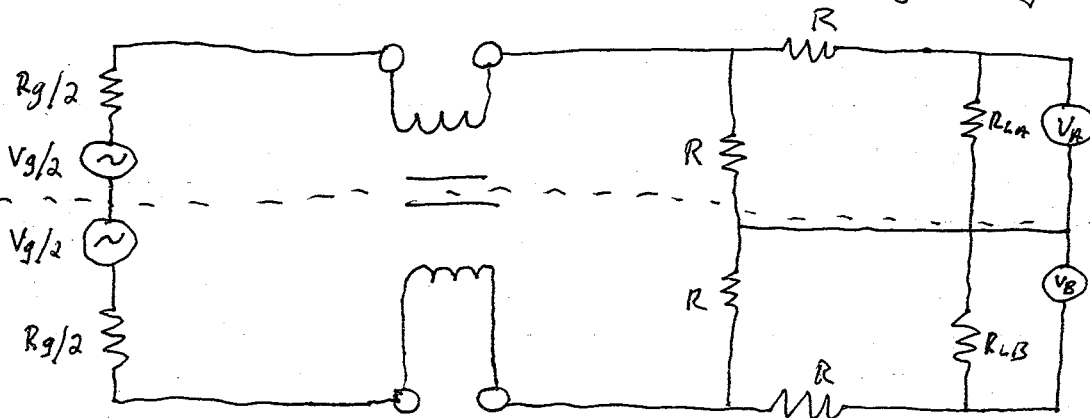


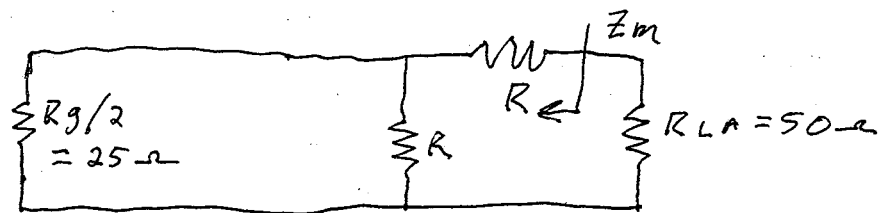
### Balun amplitude and phase imbalance measurements



Divide the fixture into two halves along the ground line



Analyze the upper half: (assume balun is lossless)



Solve for the value of  $R$  needed to match  $25\ \Omega$  to  $50\ \Omega$

$$Z_m = 50 = R + 25 \parallel R \quad \text{with } 25 \parallel R = \frac{25R}{25+R}$$

$$\text{then } 50 = R + \frac{25R}{25+R}, \quad \frac{25R}{25+R} = 50 - R, \quad 25R = 25+R(50-R)$$

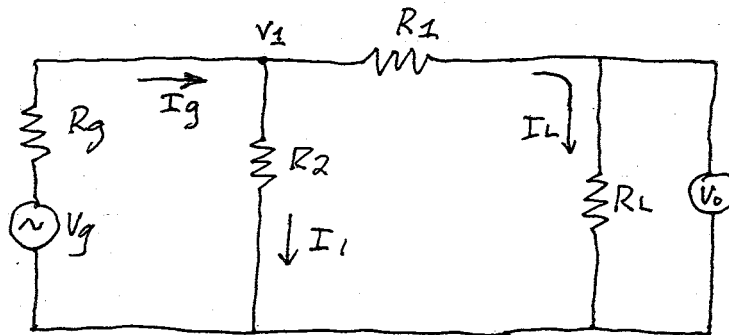
$$25R = 1250 + 50R - R^2 - 25R$$

$$R^2 = 1250 + 50R - 50R$$

$$R^2 = 1250 \therefore R = \sqrt{1250} \approx \underline{\underline{35.355\ \Omega}}$$

*DL*  
15-MAR-2021

Calculate fixture loss



Assume  
 $V_0 = 1.0 \angle 0^\circ \text{ V}$   
 $R_L = 50 \Omega$

$$R_1 = R_2 = 35.355 \Omega \quad (= \sqrt{1250})$$

With  $V_0$  assumed to be 1.0V

$$I_L = \frac{V_0}{R_L} = \frac{1}{50} = 20 \text{ mA} = 0.02 \text{ A}$$

$$V_1 = V_0 + I_L (R_1)$$

$$= 1.0 + 20 \text{ mA} (35.355) = 1 + 0.7071 = 1.7071 \text{ V}$$

$$I_1 = \frac{V_1}{R_2} = \frac{1.7071 \text{ V}}{35.355} = 0.04828 \text{ A}$$

$$I_g = I_1 + I_L = 0.04828 + 0.02 \text{ A} = 0.06828 \text{ A}$$

$$\begin{aligned} V_g &= V_1 + I_g R_g = 1.7071 + 0.06828 (25) \\ &= 1.7071 + 1.7071 \\ &= 3.4142 \text{ V} \end{aligned}$$

$$\begin{aligned} \text{Attenuation} &= 20 \log_{10} \left( \frac{V_0}{V_g} \right) = 20 \log_{10} \left( \frac{1.0}{3.4142} \right) \text{ dB} \\ &= \underline{\underline{-10.666 \text{ dB}}} \end{aligned}$$

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15-MAR-2021