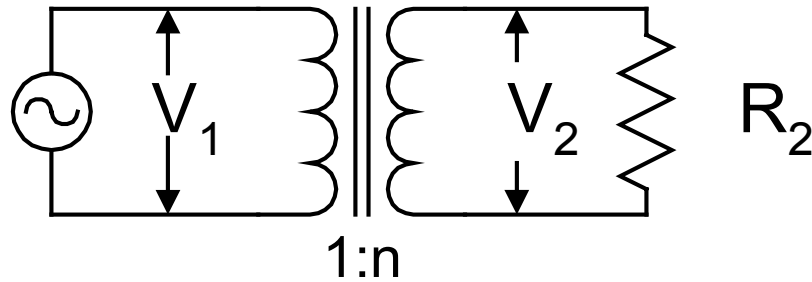


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Transformer Derivation [for voltage step-UP transformer]



For a perfect [lossless] transformer, the power in the primary will equal the power in the secondary. Therefore:

$$V_1 I_1 = V_2 I_2$$

substituting for the current, where  $R_1$  = the secondary resistance as reflected to the primary:

$$V_1 \frac{V_1}{R_1} = V_2 \frac{V_2}{R_2}$$

$$\frac{V_1^2}{R_1} = \frac{V_2^2}{R_2}$$

$$R_1 = \frac{V_1^2 R_2}{V_2^2}$$

but  $V_2 = nV_1$

$$R_1 = \frac{V_1^2 R_2}{(nV_1)^2} = \frac{V_1^2 R_2}{n^2 V_1^2}$$

so

$$R_1 = \frac{R_2}{n^2}$$