Conductance

Instead of considering a resistor's resistance, we could consider a resistor's conductance. Conductance refers to the ability to conduct current. It is symbolized by the letter G.

The base unit for conductance is the siemens, abbreviated S, in honor of the inventor Ernst Werner von Siemens.

Conductance is the exact opposite of resistance. In fact, the two are mathematically defined as reciprocals of each other. That is,

$$\mathrm{G} = \frac{1}{R} \quad \text{and} \quad \mathrm{R} = \frac{1}{G}$$

We can determine total conductance of conductances, in series.

$$R_t = R_1 + R_2 + R_3$$

so

$$\frac{1}{G_t} = \frac{1}{G_1} + \frac{1}{G_2} + \frac{1}{G_3}$$

Taking the reciprocal of both sides yields

$$G_t = \frac{1}{\frac{1}{G_1} + \frac{1}{G_2} + \frac{1}{G_3}}$$

The formula for total conductance of parallel conductances can be found in a like manner.

$$R_t = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

Taking the reciprocal of both sides gives

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

This reduces to

$$G_t = G_1 + G_2 + G_3$$