Multiple-Load Circuit

Power in Multiple-Load Circuit

The total power taken from a source, such as a battery, is equal to the sum of the powers used by the individual loads. As a formula, this statement is written

$$P_t = P_{r1} + P_{r2} + P_{r3} + \cdots$$

Series Circuits

Current in Series Circuit

In Fig.1, the battery current I_t flows through the first load R_1, the second load R_2, and the third load R_3. In symbolic form, the current relationship in a series circuit is

$$I_t = I_{R1} = I_{R2} = I_{R3}$$

Resistance in Series Circuit

The total resistance in a series circuit is equal to the sum of the individual resistances around the series circuit. This statement can be written as

$$R_t = R_1 + R_2 + R_3$$

The relationship is very logical.

(1) Resistance is opposition to current.

(2) All of the current has to be forced through all the resistances in a circuit.

Using Ohm's law, the total resistance is

$$R_t = \frac{V_t}{I_t}\ [\Omega]$$

Voltage in Series Circuit

The battery voltage in Fig.1 divides up across the three load resistors. It always divides up so that the sum of the individual load voltages equals the source voltage. That is

$$V_t = V_{R1} + V_{R2} + V_{R3}$$

This relationship is often referred to as *Kirchhoff's voltage law*. Kirchhoff's law states that "the sum of the voltage drops around a circuit equals the applied voltage."

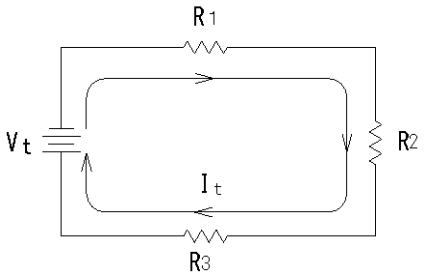

Fig.1 Example of a series circuit. There is only one path for current.