



Understanding Watts and Volt-Amperes

Calculations of power requirements for CCTV circuits can be confusing due to power ratings in specification sheets are sometimes listed in watts and/or also in volt-amperes. The purpose of this Tech Tip is to remove some of that confusion.

Watts and volt-amperes are both the product of multiplying Voltage times Current, so why do we have two different results? The simple answer is: AC circuits contain more variables than DC circuits.

A DC circuit has three factors: *Voltage*, *Current*, and *Resistance*. The formula is: Power is equal to Current times Voltage ($P = I \times E$) and is expressed in *Watts*. Watts are the true power delivered to a resistive load.

In an AC circuit, *Impedance* is the term used to describe opposition to current flow. Impedance consists of *Resistance* and also *Reactance*, which can be *Capacitive* or *Inductive*, or a combination of both.

Reactive components, capacitors or inductors, can store power. The amount of stored power, plus the True Power, is called Apparent Power. Apparent Power is measured in Volt-Amperes. Thus, the Volt-Ampere rating of a power source will always be greater than the True Power rating.

The actual formulas used to compute Volt-Ampere ratings are more complicated and cannot be described in a short document such as this. The ratio of Watts to VA rating is called the Power Factor. To simplify calculations, use the following as a guide:

Volt-Amperes are equal to approximately 1.67 times the Wattage rating

Watts are equal to approximately 0.7 or 70% of the Volt-Ampere rating

Any power calculations should always contain a safety margin of 15% to 20%.

When considering the power requirements of the intended load, do not forget to include the resistance of the power wire. Excessively long runs, or too small of a gauge wire, can add to the power requirement. If the resistance is too high, a voltage drop in the wire will deliver less than the intended voltage to the load, possibly exceeding the design tolerance of the equipment and causing system malfunctions.