

How to Calculate How Much Equipment Can Go on One Circuit

Do you really need to know how to calculate current?

The answer to this question is that if you don't care about safety, breakers tripping during performances, or possible fire hazards, you should go ahead and plug in whatever you want. But if you want to follow standard safety protocols and ensure that your shows/performances don't experience "avoidable" electrical issues, you should read this! Here are a few real-life examples:

1. Technicians were told to plug in as many light fixtures as possible until the breaker trips, then take off one light fixture at a time until the breaker no longer trips – a very unsafe procedure.
2. We were given 2–20 Amp circuits to handle a sizeable musical group. I asked for additional circuits but was told that there weren't any available and to go ahead and get the system up and running – it would be fine. The sound check went well, but once the performance started, the breakers tripped, and the show had to be delayed (mid-song). It was pretty embarrassing for myself and the band. The person in charge asked what was going on, and once I told him, he magically found a few extra circuits to use.

The US standard for electrical circuits is 15A (amps). Yes, there are also 20A and 30A circuits but the majority of circuits you will use in audio will be mainly 15A. The following calculations can be used for any circuits.

First, you need to know how to calculate Ohm's Law for Watts

Ohm's Law Formulas are used to calculate Voltage, Current, Resistance, Wattage, Impedance, and Power to name a few. For our purposes here, we will be using the formulas to calculate Wattage / Current / Voltages. Let's work a couple examples:

Ohm's Law – Wattage Formulas

$$V \times I = W \quad (\text{Voltage times Amps} = \text{Watts})$$

$$W / V = I \quad (\text{Watts divided by Voltage} = \text{Amps})$$

$$W / I = V \quad (\text{Watts divided by Amps} = \text{Voltage})$$

V = Voltage
I = Amps
W = Watts

First step – A standard household circuit is 120V at 15 Amps. So, to find the Wattage using Ohm's Law
 V (voltage) times I (current / amps) = Watts $120 \times 15 = \underline{1800 \text{ Watts}}$

Second step – You should not use more than 80% of the maximum continuous load of the circuit.
Calculate the Max Continuous load that you can use safely. $1800 \times .8 = \underline{1440 \text{ Watts}}$

Third step – What is the wattage of the equipment you are using (for this example we will use an amplifier spec of 700W at 4ohms, and 500W at 8ohms per Channel. At 4ohms using both channels $700W + 700W = 1400 \text{ Watts}$. This falls under the Max Continuous load of 1440. At 8ohms using both channels $500W + 500W = 1000W$ this also falls below, and you have room for 440 Watts of additional equipment.

Notes → Wattages add whether they are in series or parallel (easy, convenient formula for wattage calculations).

→ Lighting Fixtures – The important thing to remember regarding lighting wattage calculations is that if the "fixture" is rated at 100W, and the lamp is rated at 75W – you should always use the "fixture" rating for calculations, not the lamp rating. You should never use a higher-wattage lamp in a lower-rated fixture.

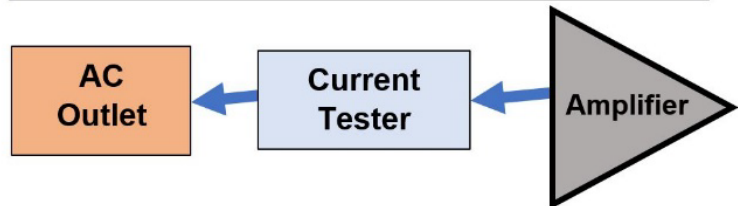
Using a Current Tester

There may be times when you will need an “accurate” current or wattage reading. Maybe you need to understand why equipment is “popping breakers” or need to know how much current you are drawing on a single circuit. This simple but accurate meter can assist. The AmWatt meter (shown below) is simple, inexpensive, and provides instant readings—a handy piece of test equipment to have in your tool kit.

AmWatt Current Tester



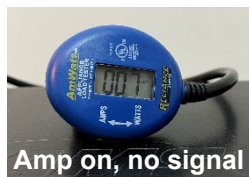
Current Tester – Quick Test Set-Up



Plug the Current Tester into an AC Outlet, then plug the Amplifier (or other equipment) into the Current Tester. Test the amplifier with a load (Ex: with music playing thru a speaker).

The first image (below left) shows the AmWatt tester hooked up to a power amplifier (no load reading of 7 amps). Once we connected a “load” (a few speakers), and ran some music through the amplifier (at normal levels) – We got a reading of 13 amps.

[Video Clip!](#)



As with all testing of Electrical components or circuits – Extreme Caution must be taken at all times!



Important Note: Never use a multimeter to test Current! This is very dangerous and is not the correct tool for testing Current! The tester pictured above will be accurate enough for most audio technical fieldwork.

If you're uncomfortable or don't want to deal with electrical circuits or tests – STOP! Call an experienced electrician to assist!