

Tok Tech

Simplifying the technical jargon about music and sound!

Have you ever “blown up” a speaker or an amplifier? Unfortunately, most of us have at one time or another, usually as a result of a misunderstanding of *load matching*.

In order to successfully operate a professional sound system it is necessary to match your amplifier’s output with the *load* provided by the speakers you connect to it.

Amplifiers are designed to work with a comfortable *load* provided by the *impedance* (measured in Ohms) of the speakers connected to that amplifier. Most professional amplifiers are happy to work with an 8 ohm or even a 4 ohm speaker *load*. This load rating is usually written on your speaker; generally either 8 ohm or 4 ohm depending on the manufacturer and the model of speaker.

For example – say we have a stereo power amplifier (eg. Rated at 200 watts per channel at 8 ohms) and we connect one 200 watt, 8 ohm speaker to each output channel of the amplifier we will have a *load matched* system.

However, if we decide that this sound system is not LOUD enough and want to connect another pair of speakers (again a pair of 200 watt, 8 ohm speakers) by plugging them into the back of the first pair of speakers we are going to get a very different result!

We now have 2 x 200 watt, 8 ohm speakers connected to each side of the stereo amplifier in a **parallel connection** (most speaker connections are wired this way by the manufacturer). We have now halved the *impedance load* on our amplifier to 4 ohms on each channel (see Ohms Law section). This means that our amplifier now produces TWICE the power (eg. 400 watts per channel at 4 ohms load). Your system should still work fine, but your amplifier will start to develop more HEAT.

If we then decide that our music is still not LOUD enough, of course we just find another set of speakers to plug into the back of the other two pairs. **BAD IDEA!**

This reduces the *impedance load* on your amplifier outputs down to about 2 ohms, which means you have again DOUBLED the output power of that amp (eg. 800 watts per channel at 2 ohms). Now your amp will start to run REALLY HOT and without much encouragement will either **cook itself or your speakers... or BOTH!**

Imagine if the amplifier still worked OK with this 2 ohm load but we decided that the sound still wasn’t LOUD enough and plugged in another set of speakers... we would get a good fireworks show, but very little sound. Time to take you cooked amplifier to your

friendly technician and complain that it doesn't work properly and it should be fixed under warranty! Wrong – you didn't operate it properly!

Always check the speaker ohms rating and the amplifier rating first before connecting more than one speaker to each channel of an amplifier.

Of course you can connect the speakers in a **series connection** to the amplifier outputs, but every time you add a pair of speakers you double the *impedance load* on the amp (see Ohms Law section) and eventually you will overload the amp to the point where the fireworks come out again. Just like driving in your car and putting the brakes on harder and harder without taking your foot off the accelerator – eventually something will give.

Ohms' Law

These parallel and series speaker connections can be worked out using Ohm's Law. This was invented by a guy called Ohm and can be expressed by two formulas:

(1) $1/\text{total resistance (load) measured in ohms} = 1/\text{Resistance 1} + 1/\text{Resistance 2} + 1/\text{Resistance 3 etc}$

*This applies to loads connected in a parallel connection.

So ... $1/\text{total load on your amplifier} = 1/\text{speaker 1 (ohms)} + 1/\text{speaker 2 (ohms)} + 1/\text{speaker 3 (ohms) etc}$.

This is called an inverse law – you'll just have to trust me on the maths. **This means that as you add more speakers in parallel connection, the load on your amplifier becomes much smaller causing the amplifier to run hotter.**

(2) $\text{Total resistance (load) in ohms} = \text{Resistance 1} + \text{Resistance 2} + \text{Resistance 3 etc}$

*This applies to resistances (or loads) connected via a series connection.

So the total load on you amplifier = speaker 1 (ohms) + speaker 2 (ohms) + speaker 3 (ohms) etc. **As you add more speakers in series, the load on your amplifier increases, again causing your amplifier to run hotter.**

Match your speaker load to your amplifier's output capability so that the amp is driving a comfortable 8 or 4 ohm load of speakers and it should give you trouble free performance.

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