

UNDERSTANDING RESISTANCE on SPEAKERS

This is an area that can get really complex. It has to do with wiring your speakers in different ways. This is critical to understand to get the most out of your amplifier, and to save your amplifier from being destroyed by wiring your speakers wrong. Resistance is different than bridging an amp. Many people get these confused.

Bridging an amplifier is the process of wiring the amplifier so that a 2 Channel amplifier will put all of its power out of one channel. You can look in the amplifiers instruction book on how to do this. This will make the amplifier run in what is called "MONO" mode. This is ideal for running all of the power of a 2-channel amp into 1 subwoofer. You can also Bridge a 4-Channel amplifier down to 2-channel. This will make all of the power from the 4-channel amplifier run out of just 2 channels.

Now after you bridge your amplifier, you then have to take into account the impedance that the amp will handle. The impedance is referred in Ohms. Without an extensive understanding of electronics it would be very difficult to explain this in the proper terms, so I will do my best to help you understand what this means.

All speakers come with a rated resistance. Usually 16 Ohm for Concert speakers, 8 Ohm for home audio applications, and 4 Ohm for Car Audio applications.

The lower the number, the more sensitive the speaker is. Car Audio is all 4 Ohm (Most sensitive) because you are dealing with only a 12 Volt Battery to power the speaker, so it needs to be more sensitive. Home Audio and Pro audio speakers can be a higher resistance because the amplifiers can plug into the wall for virtually unlimited power, so therefore the resistance can be higher..

Here are some facts. If the amplifier is playing to speakers that are at 0 (Zero) Ohms the amplifier will shut off instantly. This is considered a dead short. It is the same as touching the two speaker leads from the amp together. This is not good!! Do not do this.

So the way you wire your speakers will allow the resistance to go up or down depending on different wiring configurations. The closer you get to 0 (Zero) the harder the amp will have to run. The further you get away from 0 (Zero) the cooler the amp will run. The problem is that certain amplifiers can handle different resistances. Some amps can handle it, and some can't. When you wire your speakers in let's say a 2-Ohm configuration rather than 4 Ohm, in theory the amplifier will see $\frac{1}{2}$ the resistance so therefore it will in theory be putting out twice the power. Here are some examples.

Let's say we have an amp that says it is rated at 100 Watts @ 4 Ohms

If you wire the speakers to 4 Ohms the amp will play at 100 Watts.
If you wire the speakers to 2 Ohms the amp will play at 200 Watts.
If you wire the speakers to 1 Ohm the amp will play at 400 Watts.

NOTE: If you wire the speakers wrong your amp will DIE!!!

Same goes true the other way

If you wire the speakers to 8 Ohms this amp will have an output equal to 50 Watts
If you wire the speaker to 16 Ohms this amp will have an output equal to 25 Watts.

There are advantages and disadvantages to doing this. You need to know the limits of the amplifiers before attempting this.

The advantages of course are getting more power out of your amp. The disadvantages are linked to the capability of the amp.

Here are some general rules.

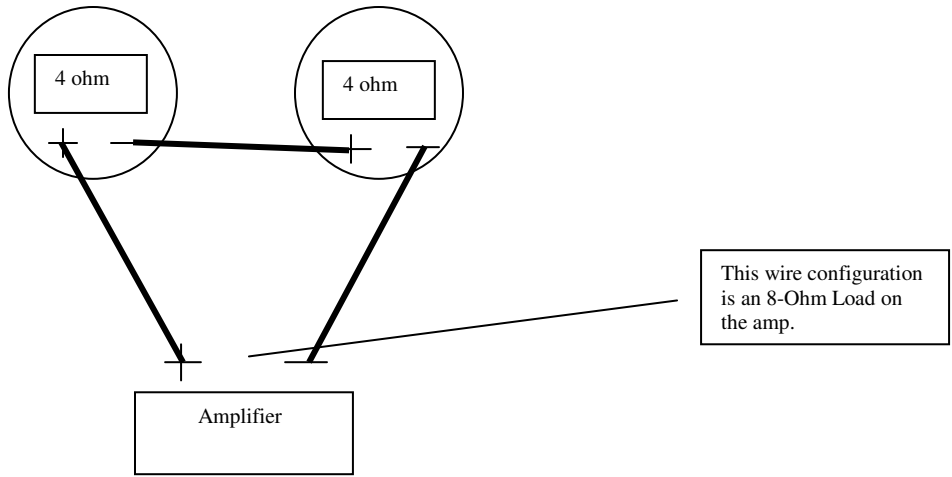
- #1 Cheap amplifiers will run speakers with no problem at 4 Ohms and above.
- #2 Good amplifiers will run speakers with no problem at 2 Ohms or above
- #3 The best amps (MOST EXPENSIVE) will run at 2 Ohms and even go lower!

Update...Over the past 21 years in this business, I have learned something about wiring amps. The best rule of thumb is to stay one notch above the amps lowest rated resistance. If the amp says it will handle 2 Ohms, then wire it 4 Ohm. If the amp says it will handle 1 ohm, then wire it at 2 ohm. Every time I have taken an amp to its limit, it decreases the life of the amp. It is like running your car at RED LINE the entire time....It will work, but for how long? If the amp will not run the speakers adequately at what I just stated, then you need to buy a bigger amp....don't drop the resistance.

IT IS MUCH BETTER TO BUY A BIGGER AMP, THAN TRY TO PUSH A SMALLER AMP TO ITS LIMIT!!!

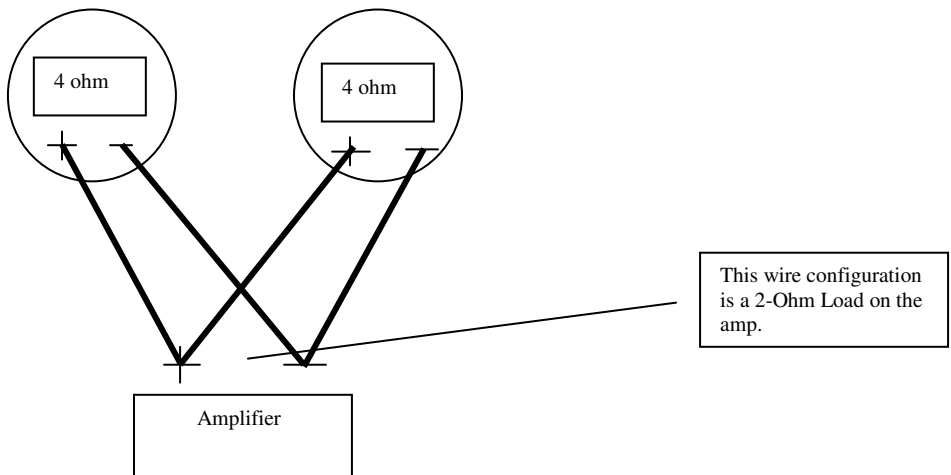
To get the different resistances you must purchase the correct speakers that will wire in the proper configuration. The two different ways to wire speakers are in parallel or series. Here are the examples. Note: this wiring can be done inside or outside the enclosure! Also note that the + and - sign represent positive and negative.

Series Example We will be using two 4-Ohm Speakers



This is a Series configuration that would be running the speakers at 8 Ohms when wired like this. Note that the positive wire from the amp goes up to the first positive on the first sub, and then you take the negative terminal and connect it to the positive on the second sub, then bring the negative from the second sub back to the amp. This creates a loop, which is called series. In this configuration, you take the 2 resistances, which are 4 Ohms each and add them together. You get an 8-Ohm load. This type of configuration would be used on a big amplifier when you want to cut the power in $\frac{1}{2}$ and run it nice and cool! It would also be used on cheap amps that cannot handle any other configurations.

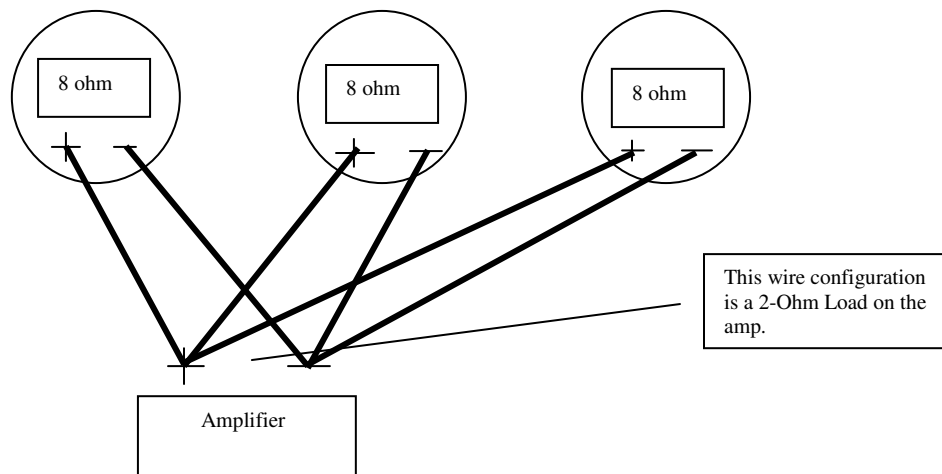
Parallel Example: We will be using two 4-Ohm Speakers



This configuration is parallel wiring of two 4-ohm speakers. Wiring in this configuration will bring the subwoofers to a 2 Ohm wiring configuration. Note that both the positives and negative wires are stacked onto the amp thus wiring it in Parallel. When you wire woofers in this configuration it is the only math equation where $4 + 4 = 2$ Ohms. This can get confusing, but this is how it works. Many cheap amplifiers will not allow this; so make sure you read the book that came with the amp. If your amp heats up and shuts off after 20 minutes of playing, or sooner, your amp cannot handle a 2-Ohm Load.

This next configuration will be with three subwoofers. You can use a combination of the two above wiring configurations to achieve different loads.

This is an example of three 8-Ohm woofers wired in Parallel.



This configuration also equals a 2-Ohm load. All of the wires are stacked onto the amp in the parallel configuration. When we wire the first 2 speakers in parallel it drops the two 8-Ohm Speakers to a 4-Ohm load, then we add the third of the same value, this drops the load to 2 Ohms. If we were to add another sub of the same value, it would drop the resistance in $\frac{1}{2}$ again to 1 Ohm.

UPDATE: As you go lower in resistance, you are risking hurting the amp. The best configurations that I have seen, are running all amps at 4 ohms and above.

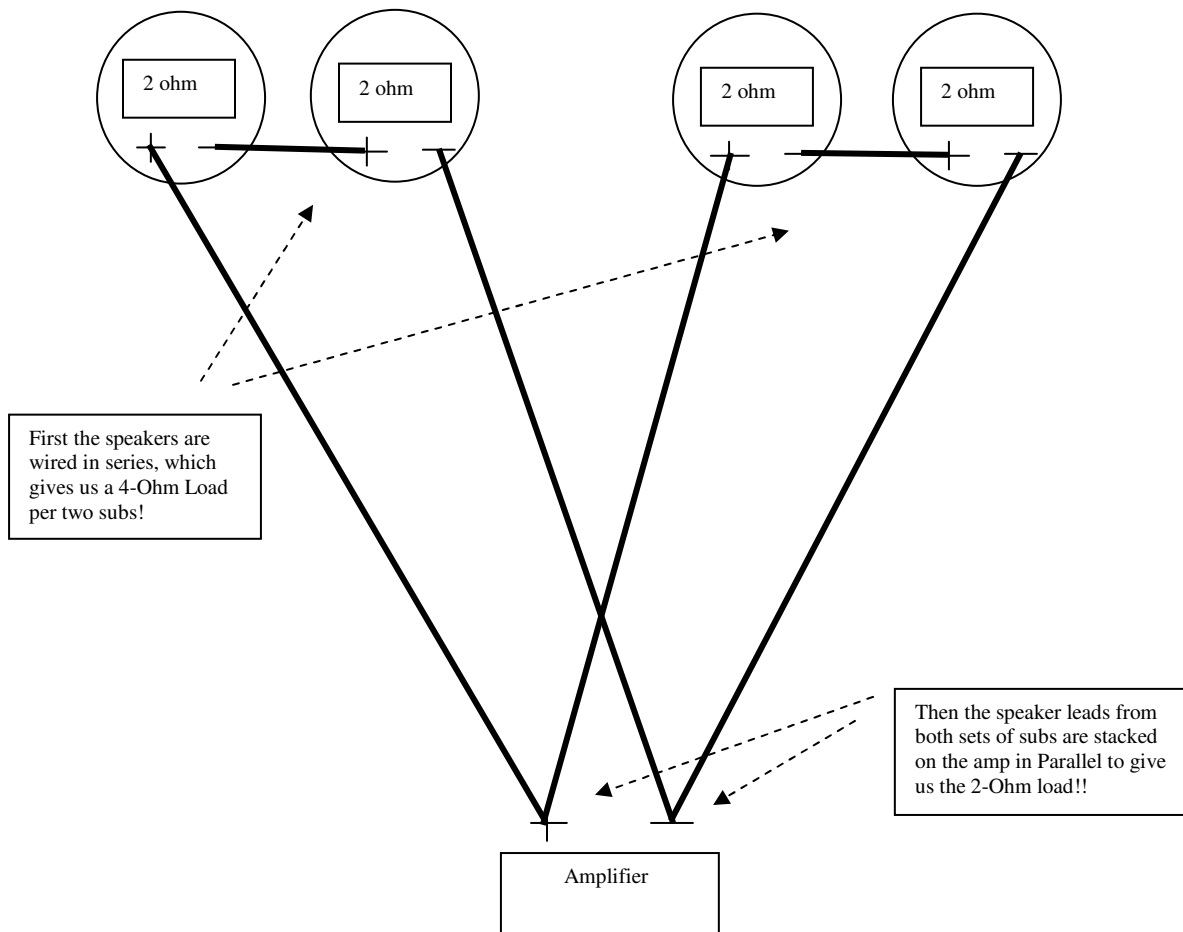
Here is a funny story that always happens.

We get customers insisting they want an amp to run at 2 Ohms or 1 ohm. We sell them the amp that they want in the winter time (We are in Portland Oregon) and warn them that the amp is running at redline at this point. When July or August comes around...and the temperature is higher, the amp shuts off. This is due to overheating. The amp is running too hard, and most amps have an internal thermal protection circuit that shuts them off when they get too hot. The amp is protecting itself from blowing up!

The correct way to purchase an amp...is to buy an amp BIG enough to run at a 4 ohm load and still hit hard. This type of situation will allow for the BASS to hit hard and the amp will last forever. If you buy too small of amp, and run it too hard (2 ohm or 1 ohm) the amp may last for awhile, but you are running it at REDLINE. You are hurting the amp!

At Outrageous Audio, we will always show you the correct amp that will perform in the "HOT" months. We avoid even getting into this type of situation! Always buy a big enough amp that will run your bass at all temperatures.

This next example will show you how you can use these two wiring configurations to get the desired resistance. We will be using four 2-Ohm Subwoofers and we still want to get a 2-Ohm load when we are finished.

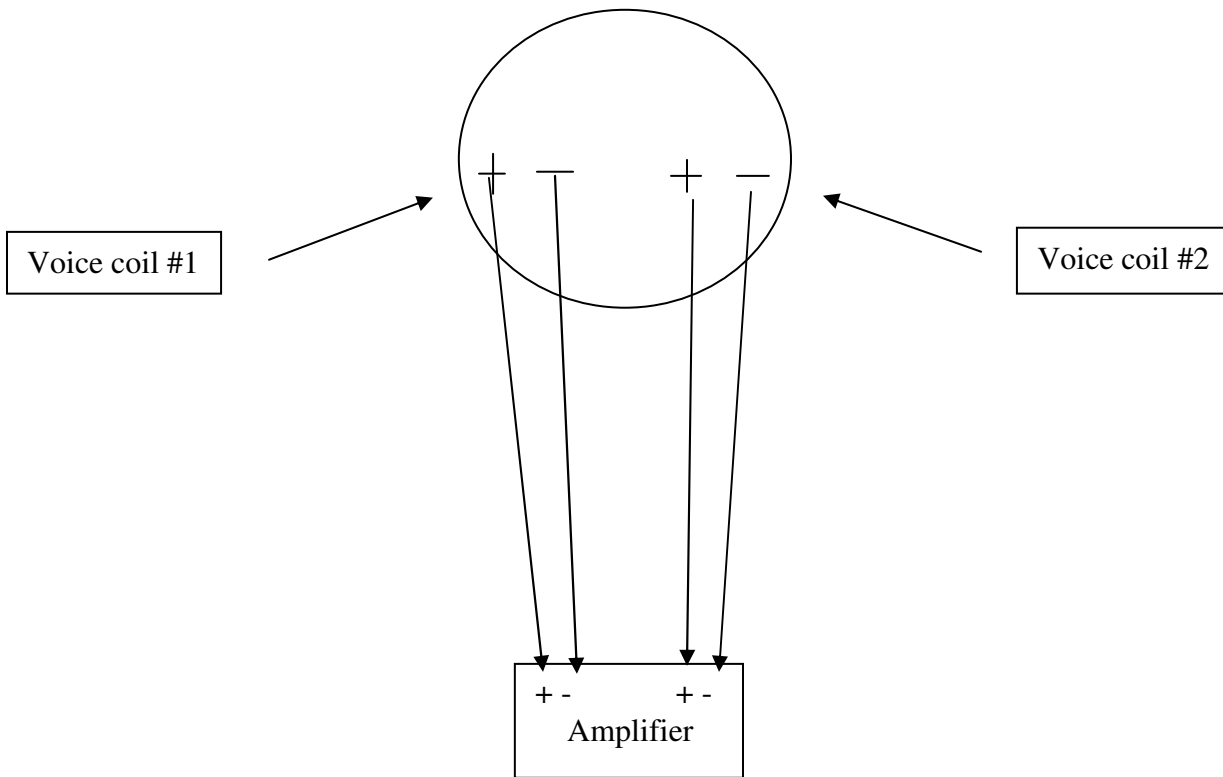


As you can see you can use the different variations to create different type loads. Make sure you buy the correct subwoofers for your configuration. If you don't buy the correct one, it will be impossible to get the correct resistance.

Many of the new speakers out today have what is called DVC or Dual Voice Coils. When you are dealing with a DVC speaker it is like having two speakers in one. Make sure you purchase the correct speaker for the desired wiring configuration for your amp. Usually DVC speakers are

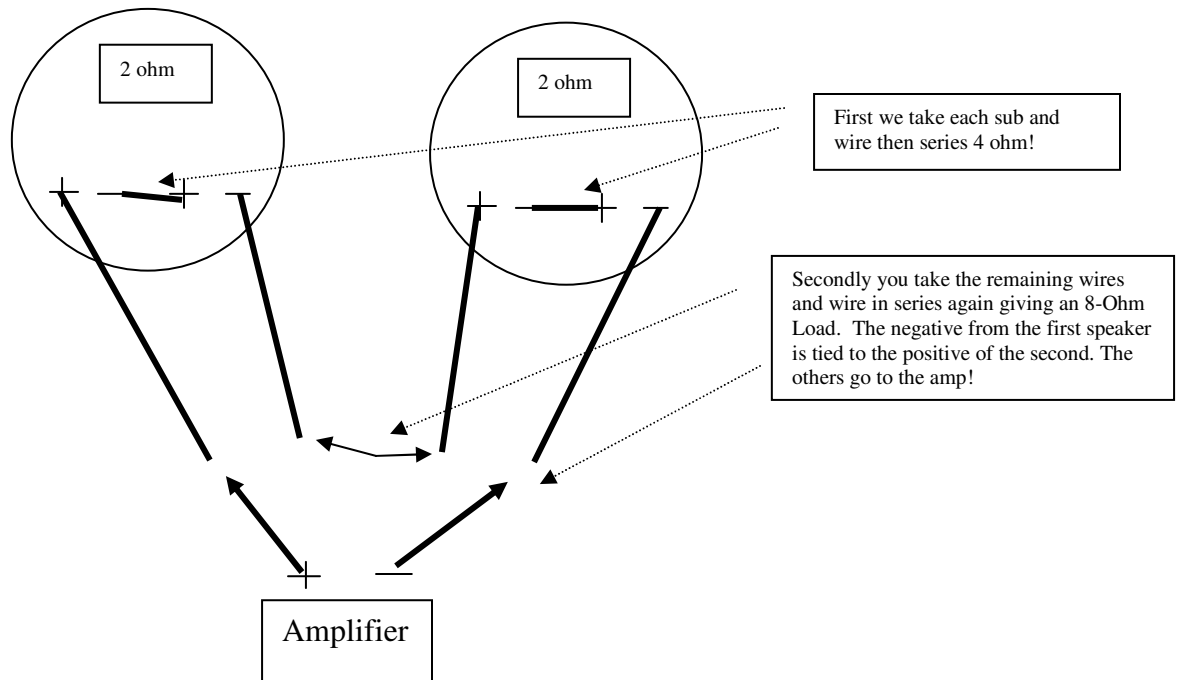
sold in 8,4, or 2-Ohm voice coils. There are many different ways to run a DVC subwoofers. Duel Voice Coil Subwoofers first came out so you could run both left and right channels of a non-bridgeable amplifier to the sub. Like this...

This is the old way to run a DVC, this is not recommended.... the proper way would be to Bridge the amplifier to one channel and then wire in series or parallel.



The New DVC subwoofers leave a lot of options open when it comes to wiring a system.

The last configuration will be wiring up 2 DVC 2 Ohm (each Coil) Subwoofers for an 8-Ohm Load. This will be done by wiring each sub in series, and then wiring the combo in series.



Once you learn all about the different wiring configurations, you will have a much better understanding of how to wire your speakers to get the best performance ever. I tried to make it as clear as possible. If you want more information about this, just **GOOGLE** “understanding resistance” or type in “Speaker resistance” you will be able to pull up plenty of sites that will go into more detail about how resistance works in the audio industry!!