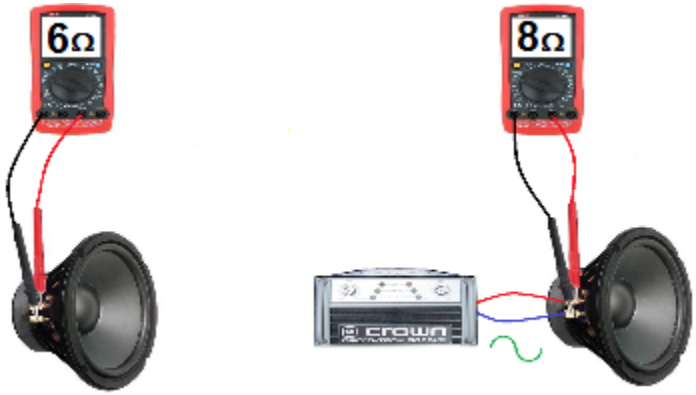
Monitor Matching

✝ Church Audio ✝

When we connect a Loudspeaker to a Power Amplifier there are some things that need to be considered.

Ohms (Ω) are the measurement we use for electrical resistance.

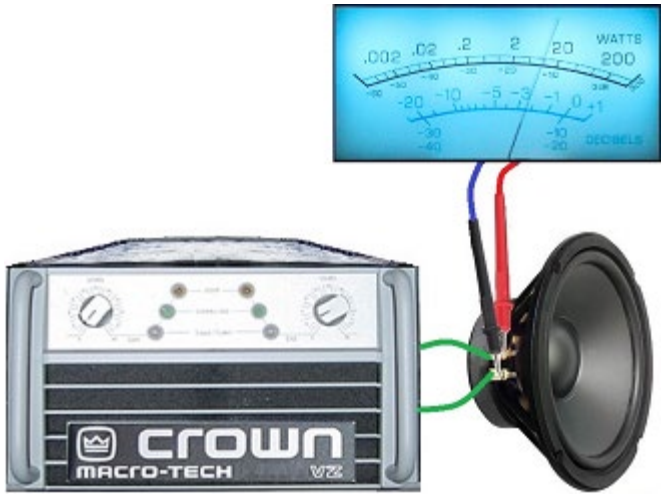
For a Power Amplifier to perform correctly it needs to have the correct resistance (load) on its output. If an Amplifier is designed for an 8 ohm load then the Loudspeaker needs to be an 8 ohm loudspeaker.



In the example above, we disconnected and tested an 8 ohm (8 Ω) loudspeaker with a Multi-meter, and found it to be 6 ohms. This is the internal **Resistance** of the loudspeaker. Once an audio signal starts passing through, the internal resistance will rise to 8 ohms. This extra 2 ohms is called **Reactance** (the extra resistance caused by an audio signal passing through). The resulting 8 ohms is called the **Impedance** of the loudspeaker, which is what we refer to.

Impedance = Resistance + Reactance

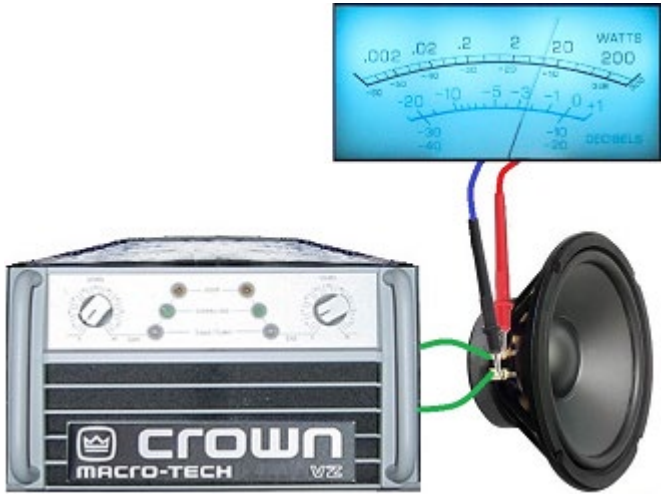
So, if ever you are unsure of the ohms value of a loudspeaker, or loudspeaker cabinet, remember that the resistance you read using a Multi-meter will be approximately 75% of it's Impedance.



What are Watts?

Watts are a measure of Power.

It is the result of Volts and Amps and Ohms working against each other.



The "optimum" transfer of power between two devices:

100w Power Amplifier means the maximum output power it can deliver is 100w.

100w Loudspeaker means the maximum input power it can handle without damage is 100w.

A ***100 watt 8 ohm*** Power Amplifier connected to a ***100 watt 8 ohm*** Loudspeaker should transfer 100 watts of power (in the perfect world).

The same rule applies to a **Loudspeaker Cabinet** as a **single Loudspeaker.** eg 100w 8Ω.

Loudspeaker cabinets, both Floor Monitors and Front-of-House, can be chained together in order to spread the sound further. However, you need to be aware of several parameters.

ACTIVE LOUDSPEAKER CABINETS

With Active Loudspeaker cabinets (the Power Amplifier is inside) we are able to chain a few together without too much problem.

PASSIVE LOUDSPEAKER CABINETS

When the Power Amplifier is external, we need to take more care. For this example, we will say that the Power Amplifier is a standard 8 ohm and the manufacturer says it has a 2 ohm minimum.

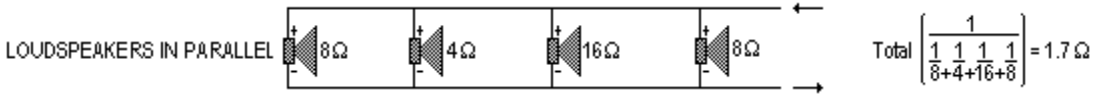
Connect one 8 ohm cabinet and you'll get full power, and the Amplifier will cool itself easily.

Connect two and get half the power in each cabinet, and the Power Amplifier will be slightly warmer.

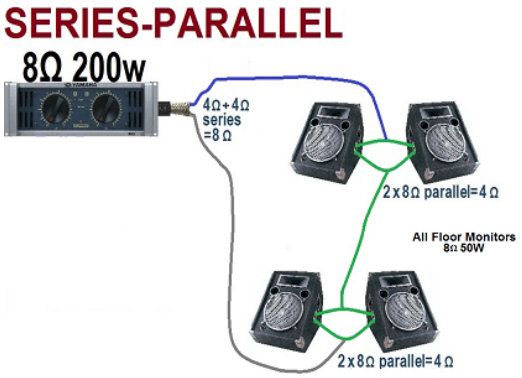
As you connect more, the power will be shared across them all.
The Power Amplifier will get hotter and hotter until you go below what the manufacturer says is the minimum load (2 ohms), at which time your Amplifier will become a Smoke Machine.

PARALLEL VERSUS SERIES

If we connect cabinets using the wiring shown here, then we are making a “parallel” circuit. The wiring inside Loudspeaker Cabinets is usually set up like this. Curiously, as you add cabinets together in parallel, the total ohms resistance falls (instead of increasing). If the cabinets are 8 Ω then connecting two will result in 4 Ω. Three cabinets together will become 2.6 Ω. Connecting a forth will bring the load down to 2 Ω. This is the absolute minimum you can place on most 8 Ω Power Amplifiers. Check the ‘minimum’ on your Power Amplifier so you know how many cabinets you can chain safely. In the example the Cabinets are 16 ohm ones, two connected in parallel, so the load falls to 8 ohms. That suits the specs on the example 8 Ω Power Amplifier and so it will deliver 100 watts. The power will always spread across all cabinets, so each loudspeaker will get 50w.

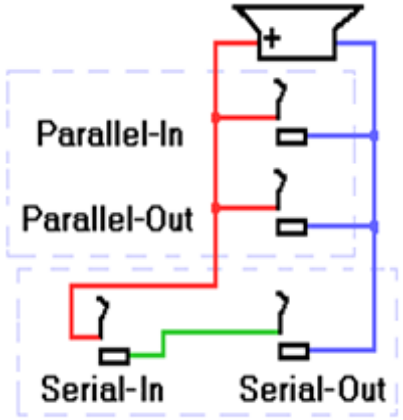


If we connect cabinets using the wiring shown here, then we are making a “series” circuit. With series circuits the resulting ohms becomes the total of all we added. 1=8 Ω 2=16 Ω 3=24 Ω 4=32 Ω. In this example the Loudspeakers are 4 ohm ones so they add to 8 ohms. That suits the specs on the example 8 Ω Power Amplifier and so it will deliver 100 watts. The power will always spread across all cabinets, so each loudspeaker will get 50w.



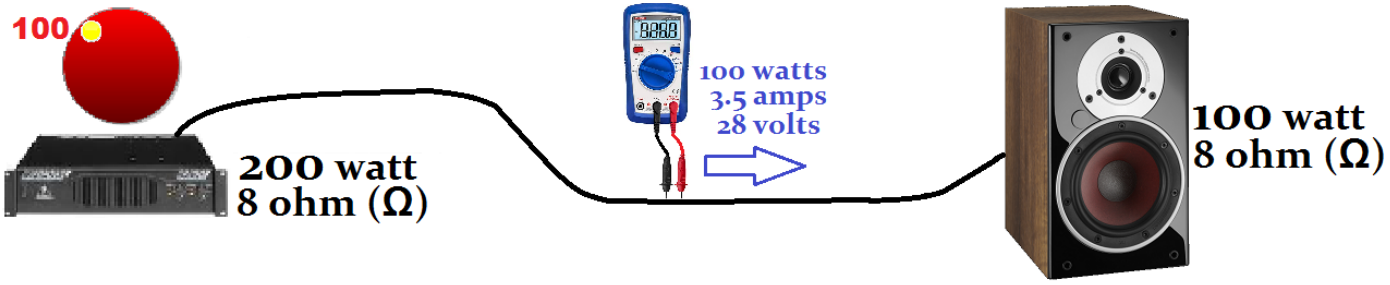
For those who like to play with wires, there is a configuration that involves 2 parallel circuits connected in series. The result is a perfectly balanced 8 Ω load, and the Power Amplifier will give out it’s full 200watts. In this example each cabinet will get 50 watts of power.

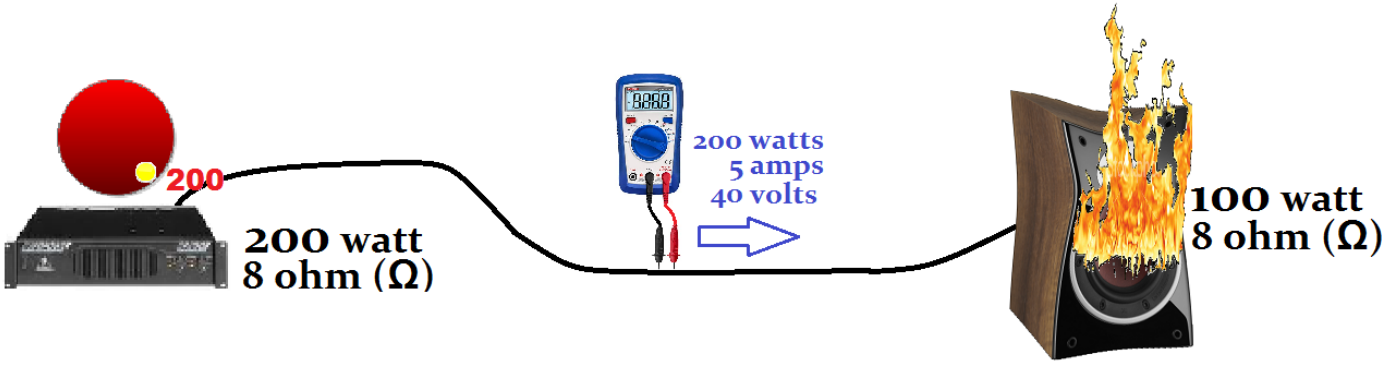
Note: Loudspeakers may be of higher wattage than what you will be using, that doesn’t matter, the wattage figure on a loudspeaker just means the maximum power it can handle.



If you have a lot of Floor Monitor needs, you might consider adding an extra couple of serial input connectors (the two existing input connectors on each Floor Monitor will be parallel wiring).

This example, with it's two extra connectors, will allow you to hook up Floor Monitors in series or parallel so you can add more monitors but still match the load on the Power Amplifier.





If you have a Power Amplifier that is stronger than the maximum power a Loudspeaker Cabinet can manage, you can still use it if you are really careful not to turn the volume up too far.

CREDITS

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Text: *Original, by the Author, a Christian Recording Engineer.*
Images: *Designed by the Author. Some photographs were sourced from the Internet, then re-worked.*

Ever since the creation of the world, God's invisible attributes and divine nature have been evident. They are clearly understood through his workmanship, and all the wonderful things that he has made. Therefore, those who fail to believe and trust in him are without excuse, or defence. **Romans 1:20**

All of us have sinned and fallen short of God's glory, but God treats us much better than we deserve.
Because of Christ Jesus, he freely accepts us and sets us free from our sins. God sent Christ to be our sacrifice. Christ offered his life's blood, so that by faith in him we could come to God. **Romans 3:23**

If you declare with your mouth, "Jesus is lord," and believe in your heart that God raised him from the dead, you will be saved. For it is with your heart that you believe and are justified, and it is with your mouth that you profess your faith and are saved. **Romans 10:9**

For the Scripture (*Isaiah 28:16*) says, "Whoever believes in Him will not be disappointed." **Romans 10:11**

These things have been written so that you may believe that Jesus is the Christ, the son of God; and that by believing, and relying on him, you may have new life in his name. **John 20:31**