

BASICS OF WIRING SPEAKERS:

There are several ways to wire up Speakers, the most common methods are **Series and Parallel** which are discussed here. It is also quite common to wire Speakers in a **Series/Parallel Combination**.

70 V System Wiring is discussed in Leaflet. Tech Tips #4 70 V Wiring, sometimes referred to as "Distributed Audio ".

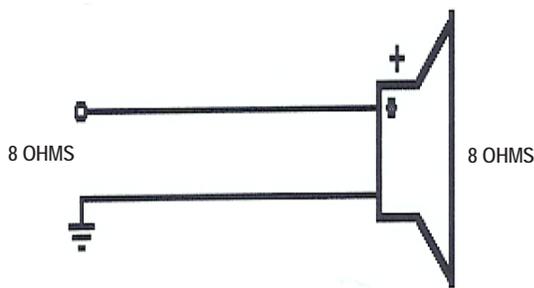
Wiring up Speakers correctly to provide the best possible sound, requires some knowledge of Loading, Phase, and Impedance, while understanding Ohms Law will help you to connect your speakers properly. Although we discuss here two ways to wiring Speakers - **Series and Parallel** , we should mention **Series/Parallel Combination**, so we have included a diagram showing this configuration.

SERIES SPEAKER WIRING

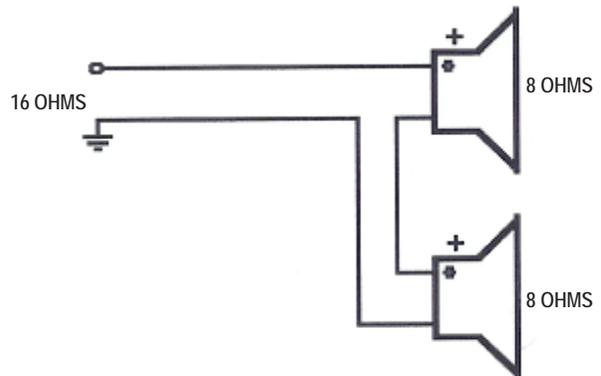
The Amplifier sends an audio signal (+) out through the (+) Speaker output into the first Speaker; then the signal is sent from the first Speaker's (+) and so on until the circuit is complete with the (-) of the last speaker is connected the Amplifier's (-) connection.

Adding Speakers in series **reduces** the overall resistance of the circuit.

Therefore the resistance of each Speaker is added together, For advanced installations with Multiple Speakers, Series Speaker wiring can be used to increase the resistance of the "equivalent" or "overall" resistance that the Amplifier sees. This allows the Amplifier to run cooler and more efficiently. Series Circuits are "voltage dividers", and using Ohms Law, one sees the result as a decrease in amplified voltage audio signal to each Speaker. Since Series Circuits are "voltage dividers" each Speaker sees a percentage of the amplified output from the Amplifier. It is often assumed the Amplifier is producing less output, but it still produces the same output, because each Speaker only gets a percentage of the overall power.



SINGLE SPEAKER PROVIDING AN 8 OHM LOAD



TWO 8 OHM SPEAKERS WIRED IN SERIES

4 Ohm Speakers (unlike Speakers at 8 ohms of resistance) keep the "overall" resistance on the Amplifier at or near 4 ohms. However, increasing the resistance to more than 4 ohms of speaker resistance by adding Speakers in Series, will split the amplified audio output from the Amplifier across all the Speakers in the circuit.

The formular for Series Wiring is: $Z_{net}=Z1+Z2+Z3....$

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PARALLEL SPEAKER WIRING:

Parallel circuits are the simplest electrical circuit to wire.

Adding Speakers **increases** the overall resistance of the circuit

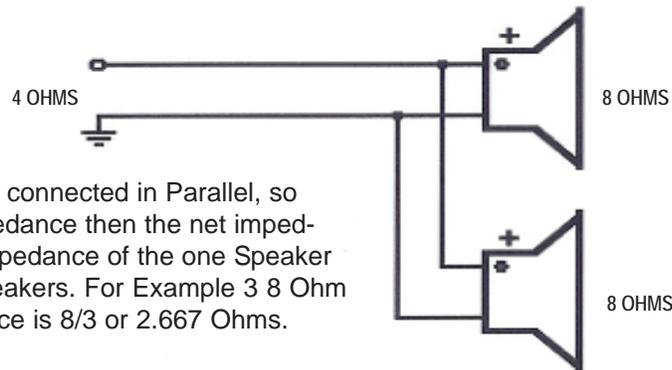
Parallel Speaker Wiring combines all Speakers (+) positive Speaker leads together, and all (-) negative Speaker leads together. Parallel Circuits are the simplest to wire because adding a Speaker is as easy as connecting the new Speakers (+) positive lead to the (+) Speaker wires of the other Speakers and the (-) negative lead to the (-) connection of the other Speakers.

Adding additional Speakers is as easy, however, adding Speakers in Parallel causes the overall resistance of the circuit to drop, as resistance drops, the current must increase according to Ohms Law. So, each time a Speaker with the same resistance is added to the parallel circuit, the current draw on the amp increases. The circuitry of the amp must be able to handle this increase in current at the reduced resistance.

The formula for Parallel Wiring is:

$$\frac{1}{\frac{1}{Z_1} + \frac{1}{Z_2} + \dots + \frac{1}{Z_n}}$$

When n is the number of Elements

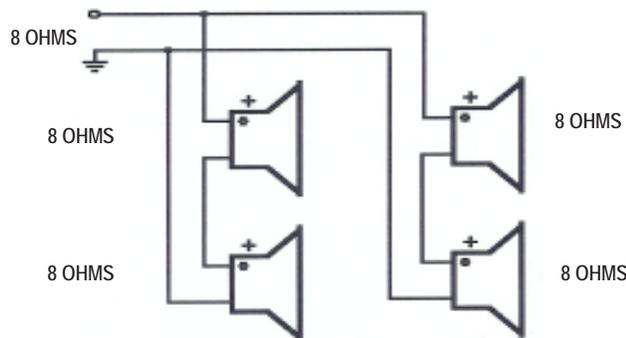


Note: If more than 2 Speakers are connected in Parallel, so long as they are all the same impedance then the net impedance of the load is equal to the impedance of the one Speaker divided by the total number of Speakers. For Example 3 8 Ohm Speakers in Parallel, the Impedance is 8/3 or 2.667 Ohms.

TWO 8 OHM SPEAKERS WIRED IN PARALLEL

A COMBINATION OF SERIES & PARALLEL

In reality this is just two sets of Series Speakers wired in Parallel



FOUR 8 OHM SPEAKERS WIRED IN SERIES/PARALLEL

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