

Tip #46 Don't Get Your Wires Crossed

There are times when you may want to hook up more than one speaker to a receiver's speaker terminal. Sometimes, a listener has a large living space and two ceiling speakers just won't cover it. You need four.

Or every once in a while, a person wants to use two center channel speakers (say, one above the TV, one below) for extra output and more sound coverage.

Ok, we'll be the first to tell you that doubling up on speakers for any given channel can introduce all kinds of acoustic interference and strange interaction artifacts between the two speakers. But, on the other hand, people sometimes want it and installers are often asked to do it. So we might as well tell you how to do it right, so you don't blow up your amplifier.

We're going to explain **Series-Parallel** wiring.

As we told you in Tech Tip 45 **Impeding Your Progress**, you have to be careful to make sure your speakers always present your amplifier with a safe impedance load. Most receivers today prefer 6- or 8-ohm loads. When you connect two 8-ohm speakers to the same output terminal on the receiver, the impedance drops to 4-ohms, which is often below the safe operating range of the receiver.

Look at Figure 1. That's what we call Parallel wiring. When connected this way, the two speakers present **half** of the impedance to the amplifier that a single speaker would present. So two 8-ohm speakers connected in parallel present a 4-ohm load to the amp. (Actually, the formula for determining the combined impedance of two paralleled speakers is a little more complicated than that, but for this discussion, one-half of their average impedance is a

very good approximation.) Two 6-ohm speakers are a 3-ohm load. Two 4-ohm speakers are a 2-ohm load. Considering that most receivers don't function well with loads lower than 6 or 8 ohms, you can see that paralleled speakers can be a big problem.

(By the way—with most receivers, their "A + B" speaker switch is a parallel connection, which is why most receiver manufacturers caution against running A + B together if the speakers are 8-ohms or less; instead they tell you to run either "A" *or* "B.")

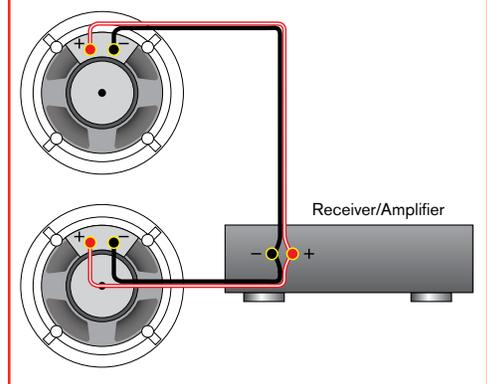
What do you do if you need four ceiling speakers instead of two?

The answer: Use **Series** wiring, not Parallel.

Now look at Figure 2. This is Series wiring, and the difference is this: With Series wiring, the impedances of the two speakers **add** together instead of being cut in half. So two 8-ohm ceiling speakers wired in Series present a 16-ohm load to the receiver, not a 4-ohm load. 16-ohms is a very "safe" load, easy for a receiver to handle. The receiver will deliver less power into 16 ohms than it will into 8 ohms, but you'll make up for this with the acoustic coupling of the two speakers working in tandem. And of course, you always have your receiver's individual channel level controls to balance out the sound.

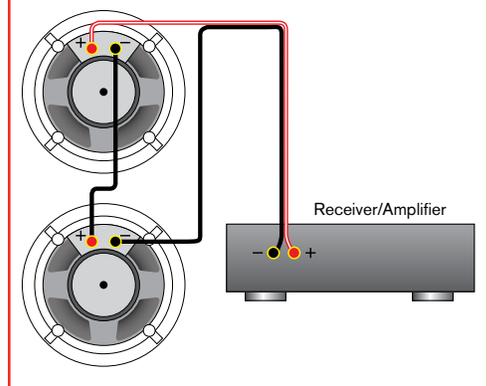
So, remember: We're not advocating that you start doubling up on speakers all over the place. It can be a real Pandora's Box of acoustic complications. But if you must, pay attention to your impedances, and use Series wiring if Parallel wiring would result in a too-low load for your receiver.

Figure 1 Parallel Wiring



Impedance is cut in half with parallel wiring

Figure 2 Series Wiring



Impedance is added together with series wiring

Other Tech Tips:

Tip 42: Center Channel Dispersion

Tip 43: How H-PAS works

Tip 44: Power Response

Tip 45: Impedance