Crossovers – Passive and Active Types – Notes / Information

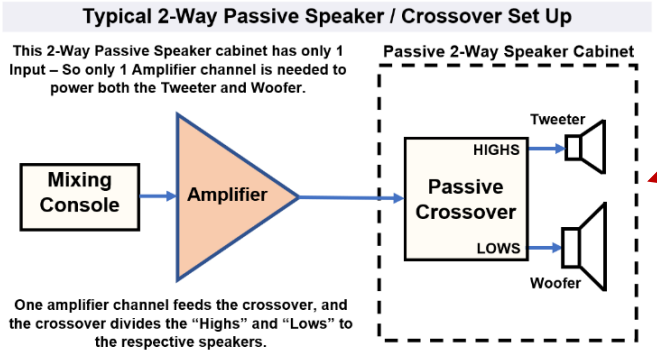
There are two categories of Crossovers – Passive and Active. The main difference is that Passive Crossovers filter audio signals without power, and there are usually no adjustments that can be made. Active crossovers are powered and need an experienced technician to make the required adjustments to "Calibrate the System" in order to get optimal performance from the loudspeakers.

Passive Crossovers

Video Clip!

- **Basically "Plug and Play" and found in most 2-way or 3-Way "Passive" speaker cabinets / monitors.**
- **Fewer Amplifiers are needed – Example: One amplifier channel can power one passive speaker cabinet.**
- **Not 100% efficient as components can fail due to heat buildup, clipping, and overdriving the speaker.**

2-Way Passive Speaker Handout!



Electro-Voice ELX115

Passive 2-Way, Full Range Speaker

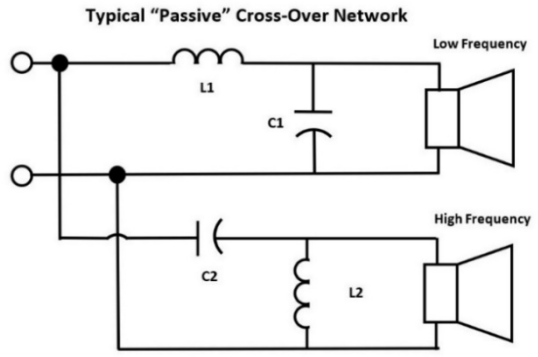
Parts of a Passive Crossover – What do they do?

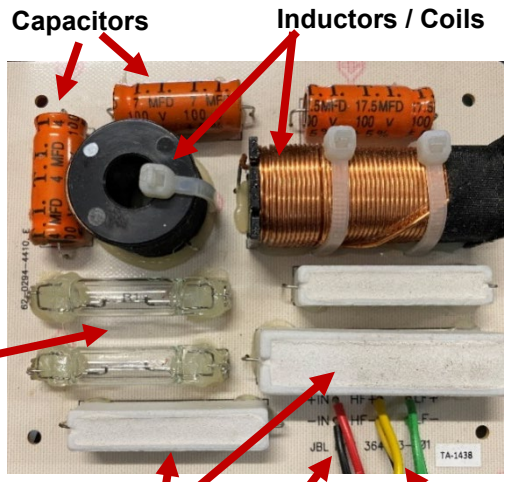
Passive crossovers consist of LCR components. The three main components are Inductors, Capacitors, and Resistors. This combination of components is referred to as LCR components. These LCR components do not need a power supply to operate. They are basically used for "separating" the audio signal so the desired frequencies can feed the correct speaker component.

- **L = Inductor – Inductors pass Low Frequencies and filter out High Frequencies. Inductors are also referred to as Low Pass Filters, and Coils.**
- **C = Capacitor – Capacitors pass High Frequencies and filter out Low Frequencies.**
- **R = Resistor – Resistors are basically used for attenuation. Extra power gets shunted (diverted) through the resistor, and helps with maintaining a constant "load" for the amplifier.**
- **Protection Components – Over-Power protection lamps are basically a type of "fuse" that helps to protect the tweeters. They do not affect the sound quality. There are other types of Tweeter protection "fuses" used with passive crossovers as well (not shown).**

Typical Passive Crossover

The diagram below is a typical "schematic" diagram of a passive crossover network (protection lamps/resistors not shown). The image (right) shows a typical passive crossover for a 2-way full-range speaker cabinet. One amplifier input is "divided" through the crossover network circuit, then distributed to the correct speaker components through the High-Frequency and Low-Frequency Outputs.





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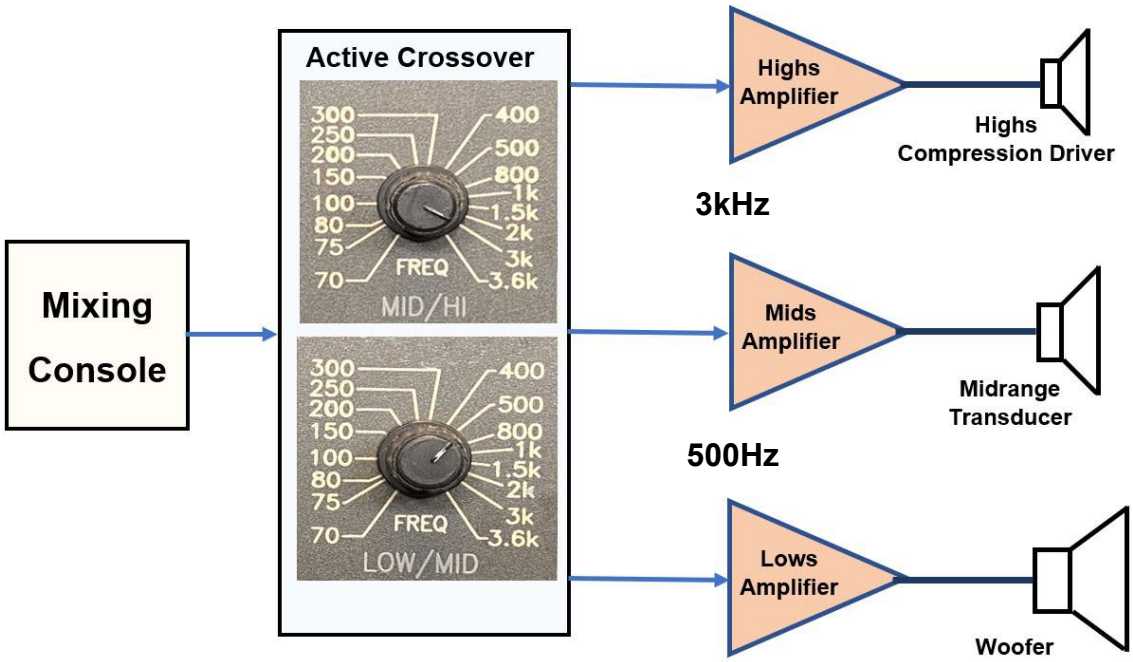
Active Crossovers

Basic Notes / Information:

- **Unlike Passive Crossovers, Active Crossovers must be powered to operate.**
- **You can get maximum loudspeaker performance due to having more control over calibration during sound system set-up. This allows for cleaner, clearer, high fidelity sound quality.**
- **Active crossovers are more expensive and require an experienced Audio Technician to set-up the crossover accurately. If a crossover is not set-up correctly, the system can experience quality issues.**
- **Actual settings depend on what the speaker components "crossover points" are rated at.**

3-Way Active Crossover Example



Typical 3-way speaker systems Crossover Set points

500Hz (Woofer/Mid) and 3kHz (Mid/Highs)

In the example above, the Active Crossover is set up with the "crossover points" at 500Hz and 3kHz. The mixer outputs a signal to the crossover, and the crossover outputs specified signals (frequencies) to the amplifiers – which are 500Hz and lower to the Woofer, 500Hz up to 3kHz to the Midrange Transducer, and frequencies 3kHz and above to the Highs Compression Driver. The crossover set points rely on the specifications provided by the speaker manufacturers. Slight adjustments can be made by a "Trained Ear" as well. Manufacturers are adding DSPs (Digital Sound Processing) to their "Active" Speaker Cabinets to allow for fine-tuning of the crossover set points. As a reminder regarding passive speaker cabinets, crossover set-points rely on the "components" of the crossover and cannot be adjusted. Below are some typical crossover settings.

Typical Crossover Settings for a 2-Way system.

- **Highs 3k and above**
- **Lows 3kHz**

There would only be one crossover point, anything below 3kHz going to the Lows, and anything above 3kHz going to the Highs. Limited sound quality.

Typical Crossover Settings for a 4-Way system.

- **Highs 3k and above**
- **High Mids 500-3k**
- **Low Mids 150-500**
- **Subs 150 and below**

Very high sound quality if fine-tuned correctly.

Active Crossovers vs Passive Crossovers

Other than the fact that most "Passive" crossovers used in speaker cabinets cannot be adjusted and fine-tuned like "Active" Crossovers. The main advantage of Active over Passive crossovers is the quality of sound. Passive Crossovers can significantly "degrade" the sound quality of signals that pass through them and can create higher levels of distortion in the signal. Active Crossovers provide very low levels of distortion.