

BI-WIRE – HOW IT IMPROVES THE SOUND

by GEORGE MERRILL

A speaker is usually composed of two or more transducers (hence the name two-way, three-way) that convert electrical energy to mechanical energy, then to acoustic energy.

Let us examine the operation of a two-way speaker. Each transducer (also called driver) covers a specific frequency range. The small transducer (tweeter) is for reproducing high frequency. The large transducer (woofer) is for reproducing low frequency.

This small high frequency transducer (tweeter) cannot be sent low frequency energy without damaging it. The speaker contains an electrical circuit called a crossover network. This electrical network is like a traffic cop. It directs the high frequency signals to the tweeter (high frequency transducer) and the low frequency signals to the woofer (low frequency transducer).

Each transducer (driver) has its own crossover. The high frequency transducers have a crossover network that will shun low frequency signals and only pass high frequency signals. The low frequency transducers have a crossover that will shun high frequency signals and only pass low frequency signals.

A pair (+ and -) of connectors are mounted on the back of the speaker for each set of transducers. They are marked high and low. These high and low input connectors can be tied together (most speakers come with jumpers installed) and connected with one pair (+ and -) of wires connected to them and to the amp. This is called mono-wire.

If the jumpers are removed and two sets of speaker wires are connected to the respective high and low speaker connector (one set to the high terminals and one set to the low terminals) and then both sets of wires connected together to the amplifier's out terminal, then the speaker is bi-wired. The benefit from this bi-wiring is: The low frequency transducer requires much more power than high frequency transducer to reproduce sound. The low frequency transducer has to move more air. This equals to more electric current used to reproduce low frequencies. When the large low frequency transducer is fed this current, it will move from center either in or out. As the current stops, the transducer re-centers itself. During this centering process, the low frequency transducer generates a voltage. This voltage called reverse electromotive force (emf) is shunted (killed) by the amplifier's output resistance (called the damping factor).

The mono wire speakers whose high and low frequency input are connected together will suffer in sound quality because the reverse emf generated by the low frequency transducer will couple directly into the high frequency input.

The bi-wired speakers low frequency reverse emf will be sent all the way back to the amplifier where the damping factor can more effectively shunt (kill) this current before it can return to contaminate the high frequency transducers.

WHAT TYPE OF WIRES ARE NEEDED

One pair (one plus & one minus) of wires is needed to operate all speakers. This is called mono wiring.

Two pairs of wires are needed to bi-wire: one pair for the high frequencies and one pair for the low frequencies.

WHAT QUALITY OF SPEAKER WIRE IS NEEDED

The amplifiers – the speakers – are components with varying levels of quality. **Speaker wires are also a component** with varying levels of quality. The quality of wiring should match the quality of the other components in the system. The speaker wiring is the longest signal path in the chain. The **MIT company** has developed a series of speaker and interconnect cables tuned for the best performance of all levels of component quality. These cables contain a network housed in a box integrated in the cable. This network compensates for cable length and helps control a phenomena called group delay. Contact me for more information about cables

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