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What speaker cable should I use?

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As for any other piece of ancillary equipment, we do not recommend specific speaker cables. Most have their merits, but each is different in one way or another and it is up to the customer to choose whichever suits best. Always get the dealer to demonstrate several different types with the equipment you are going to use.

What is discussed below is a simple overview of some of the factors influencing performance. One thing remains true throughout - cables can only make the sound worse and the shorter you can make them the better. Never forget the importance of keeping all connections clean and secure. Failure to do this can totally negate the advantages of buying a superior quality cable. It is good practice to check all connections on a regular basis.

In many ways, speaker cables are simpler to deal with than line-level interconnects. There are no characteristic impedances to consider and spurious electromagnetic radiation pick-up is inherently lower in proportion to the average signal level. The characteristics of the cable can be divided into two categories - macro and micro. Macro characteristics comprise the bulk electrical parameters of resistance, inductance and capacitance (in other words the cable impedance), and micro characteristics result from such properties as crystal structure, impurities, insulation materials and cable geometry.

Macro properties

The impedance of resistance is constant with frequency (you *can* have frequency dependent resistance, but that need not concern us here). The impedance of inductance is proportional to frequency and that of capacitance inversely proportional to frequency. Any impedance in series with the speaker has the potential to alter its frequency response. Even pure resistance can do this, because the impedance of the speaker varies significantly with frequency, and the attenuation caused by the external resistance depends on the ratio of the two.

Of particular interest here is the bass region. Closed-box speakers have a peak in the impedance at the fundamental resonance frequency. That is when the mass of the bass driver cone resonates with the stiffness of its mechanical suspension and the air in the enclosure. Vented-box (reflex) speakers have two impedance peaks. The change in response caused by series resistance in the bass region is similar to reducing the strength of the magnet of the bass driver and so are the audible effects. The bass loses its grip and tightness and begins to sound slow. One can, to some degree, acclimatise oneself to changes in response shape at higher frequencies, but the changes in the bass characteristic do not go away with extended listening. We have heard plenty of differences between cables, but whatever the method of construction, in our experience it's always the resistance that controls the bass quality.

The resistance of the cable depends on three factors - the gauge of wire, the length of cable and the conductor material. In this respect, the fatter and shorter the wire the better. Many people ask if it is necessary to make the cable length to all the speakers the same. Systems do not get out of balance if the lengths are different and you should follow the rule of shorter is better to minimise signal degradation. Do, however, allow some spare cable. Don't allow the cable to get stretched tight and, if you use bare wire connections, it is good practice to periodically strip back the insulation to expose fresh conductor.

Excessive inductance in the cable causes a disproportionate loss of extreme high frequencies, making the speaker sound dull and lifeless. In practice, unless you have an extremely long cable, inductance is unlikely to be a problem with any half-decent cable.

Capacitance is not a problem as far as altering the response of the speaker is concerned. Within the audio band, resistance and inductance are more dominant. Excessive capacitance can upset some amplifiers at supersonic frequencies, causing them to send out spurious signals in the audio band, but this is rare with modern amplifiers.

Some speaker cables contain in-line filters. Please refer to the relevant manufacturers' literature to assess the various claims made for this approach.

Micro properties
Here we consider such things as:

- Conductor material
- Crystal structure
- Single strand (solid core) or multi-strand
- Geometry and insulation materials

Conductor material
By far the most common material used is copper. Only silver has lower resistivity and it is considerably more expensive. All other things being equal, silver can give better resolution of detail than copper, but this can be more than negated if the crystal structure of the silver is inferior. Carbon is sometimes offered as a conductor material. It suffers less from crystal structure and impurity problems, but has a relatively high resistivity compared to copper and silver. Whereas this is not a problem with line level interconnects, the resistance of even a large gauge carbon speaker cable is generally too high to maintain proper control of the bass response.

Crystal structure
All metals have some form of crystal structure and the electrons have to flow across the boundaries between adjacent crystals. This can potentially cause distortion, particularly if impurities are allowed to permeate the boundary area. The larger you can make the individual crystals, the fewer boundaries there are to cause trouble and the exclusion of oxygen reduces the development of oxide impurities. These factors are controlled in the manufacture of the metal billet and the way it is drawn into wire.

LC-OFC (linear crystal, oxygen-free copper) is a common term in describing the conductor and is the minimum specification for a good speaker cable. The lack of oxygen inhibits the development of impurities and the linear crystals are long in the direction of drawing. Some manufacturers even claim to be able to draw single crystals to lengths of up to 200 metres. Even if this is exaggerated, one might imagine it should be possible to draw crystals up to the whole length of most cables used. Whether it stays that way after the cable has been flexed repeatedly over a period of time, such as for house cleaning, is debatable. Nevertheless, the fewer the crystal boundaries there are, the smoother the sound, especially in the midrange.

Single versus multi-strand cable
There are devotees of both types of cable. Of course, on an absolute scale both parties cannot be right, but the likelihood is that each type complements different speakers, acknowledging the fact that neither is perfect. One of the usually cited reasons for the difference is skin effect, where the current tends to migrate to the outside of the conductor at high frequencies. Again, opinions differ as to whether skin effect makes any significant difference at audio frequencies.

Geometry and insulation materials
Each of the individual conductors in the cable generates a magnetic field around itself. The individual fields interact with one another, generating forces between the conductors. These forces can cause the conductors to move relative to one another. It's the same mechanism that makes transformers hum, but at a lower level. These movements will not necessarily cause audible noise from the cable, but they will affect how the current flows, with a consequent change in the signal to the speaker. The dielectric properties of the insulation have an influence on these magnetic fields as does the juxtaposition of the individual conductors and how tightly their relative positions are held. These factors affect the cable's ability to preserve low-level detail.