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Frequently Asked Questions

Enclosures and Systems -- The Basics

What makes a good vented enclosure? The basic purpose of any loudspeaker enclosure is to partition the front and rear of the driver's cone. This prevents the opposing air pressure changes produced by cone motion from combining and canceling. Vented enclosures allow the compressibility of the air inside the enclosure to work as a more active part of the "system" consisting of driver and enclosure. A low frequency loudspeaker enclosure should do absolutely nothing, that is, it should add no effects of its own -- no vibration, no tonality, no motion -- nothing to interfere with or absorb acoustic energy produced by the driver inside.

Is it possible to get deep, punchy bass from a small enclosure? Only if the driver selected is designed for "deep" bass operation in a small enclosure. Unfortunately, it's usually a relatively small driver that can work properly in a small enclosure. Since a small driver can only move a small amount of air, lower sound pressure levels (output) will result. In general, larger boxes with larger bass drivers produce more bass; smaller boxes produce less bass. "Deep" bass production simply requires that more air be moved.

Will a bigger driver give me more bass from my enclosure? An enclosure will not automatically produce more bass when a larger driver is installed; in fact, the opposite is often the result.

What does "tuning" of an enclosure or port mean? Have you ever blown over the top of a bottle and heard the note it produces? Have you ever changed that note by adding or pouring out liquid? A vented loudspeaker enclosure works under a similar principle. When liquid is added to or poured out of a bottle, its internal air volume is changed and the resonant note is raised or lowered. Enclosure tuning is affected by the ratio of air volume in the duct/port (equivalent to a bottle's bottleneck) to the enclosure's interior volume. Tuning of a loudspeaker enclosure is the result of manipulating the difference in effective air mass between the enclosure interior and the air in the duct. The bottle-like nature of a vented enclosure is known as a "Helmholtz Resonator". The vents/ducts in a vented enclosure work only over a narrow band of frequencies near the chosen tuned frequency, producing the same effect as when blowing across a bottleneck.

What are Balanced and Unbalanced Lines?

- A balanced line is a shielded, three-conductor system in which the two signal wires carry identical signals of opposite polarity. The third conductor (a braided or foil sheath around the two signal wires) acts only as a shield and does not carry an audio signal. Both signal wires will pick up any external electrical noise that gets past the shield. The receiving input will invert the polarity of one of the signals and combine it with the other. When the inverted noise is added to the non-inverted noise it is canceled. This is known as "common mode rejection". Note that both the output of the sending equipment and the input of the receiving equipment must be balanced in order for the line connecting them to be considered balanced.
- An unbalanced line is a two-wire system in which both the shield (ground wire) and the center conductor carry the audio signal. Unbalanced inputs and outputs are typically found in guitar amplification, effects processors and hi-fi and home theater systems. Unbalanced systems will perform acceptably as long as cable length is kept relatively short, the system is not subject to excessive RF noise, and the AC ground of the various system components is at the same potential.

What is a crossover network and what is "bi-amplification"?

A speaker system that uses high and low frequency drivers requires a crossover network. This network is an electronic circuit that acts as a sort of traffic cop, directing the high-frequency signals to the high-frequency drivers and the low-frequency signals to the low-frequency drivers. The crossover network may be placed *after* the amplifier and is usually mounted in the speaker cabinet. This is called a "passive" or "high-level" network (there are also passive "*low*-level" networks but these are uncommon and will mostly be found in older systems). On the other hand, the crossover network may be placed *before* the amplifiers. This is called an "active crossover" or "electronic crossover". Systems with active crossovers will have one amplifier (or amplifier channel) for the lows and a separate amplifier (or amplifier channel) for the highs. A system using an electronic crossover is said to be "bi-amplified" (2 separate amplifier channels) if it is a 2-way system or "tri-amplified" (3 separate amplifier channels) if it is a 3-way system.

What are some advantages of bi-amplification?

- A "high-level" (passive) crossover can degrade the audio signal from the amplifier and can reduce system sensitivity. By eliminating these components from the signal path, system performance can be improved. This statement is less true today than in the past due to improvements in passive crossover design.
- In extremely high-powered systems, a passive crossover can become quite expensive, large, and heavy.
- Subwoofers are intended to handle very low frequencies - usually below 150Hz. The inductors (a coil of wire sometimes wrapped around a metal core) needed to cross-over at these low frequencies are prohibitively large, heavy and expensive, even for moderately powered systems. Bi-amplification of subwoofers is usually a necessity.
- Active crossovers can be less expensive in large systems

consisting of many speaker boxes. If these multi-box systems used passive networks, a separate network would be needed for every enclosure. A single active crossover can feed power amplifiers for many speaker enclosures.

- Contemporary active crossovers (such as the JBL DSC260) can be extremely powerful signal processing devices that may incorporate advanced features, such as equalization, time/phase correction, individual band limiting and signal delays. By precisely tailoring the parameters of these crossover networks to the speaker system, it's possible to get the best possible performance from the speakers.
- Consider what happens when a very strong low-frequency signal such as a kick-drum drives an amplifier into clipping. The clipping creates harmonics. In a passive system, the crossover simply sends these harmonics to the high-frequency driver, where they will be quite audible. This is called "intermodulation distortion". In a bi-amplified system, only the low-frequency amplifier will be driven into clipping with a strong kick drum signal. The high frequency amplifier will continue to produce clean, undistorted power. As a result, the clipping distortion is less audible.

What are some disadvantages of bi-amplification?

- Bi-amplification is generally more expensive and requires more amplifiers. Also, electronic crossovers are typically more costly than the passive networks in the enclosures.
- A bi-amplified system is more complex, although properly fabricated electronics racks and cabling can simplify the set-up of a bi-amp'ed system. Some expertise is required to configure the system.
- There are more things to go wrong -- more components to fail, more connections to be accidentally disconnected or mis-connected and more controls to be incorrectly adjusted. Some improper connections (such as hooking the low-frequency amplifier output to a high-frequency driver) can destroy a driver.

What if I want the best of both worlds? One way to get the best of both worlds is with JBL's EON Series powered speakers. Since EON powered speakers are bi-amplified, they give you all the performance advantages of bi-amplification. On the other hand, since the power amplifiers are built-in, they are perfectly matched to the drivers and the cost is comparable to that of a similar *passive* speaker. EON powered speakers are faster and easier to set-up than a passive speaker and its amplifier.