Subject: Woofer crossover strategies
Posted by Wayne Parham on Tue, 29 Jan 2002 12:10:58 GMT
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In my view, there are two different kinds of woofers. One is a single purpose woofer that won't be used above a couple hundred Hertz. Some would call that a subwoofer. It can be that, but it can also be used in a traditional three-way loudspeaker with crossover somewhere below about 500Hz. The second kind of woofer is what I usually call a midwoofer, in that it must work through the midrange band, with crossover somewhere between 1kHz and 5kHz. These are usually used in two-way loudspeakers. Large ones are usually crossed over somewhere between 1kHz and 2kHz, smaller ones maybe as high as 5kHz.Shorting rings offer several advantages due to the fact that they counter flux modulatuon, the most significant one in my opinion being the reduction of distortion. Another benefit is the reduction of voice coil inductance. Reduced voice coil inductance makes the speaker act more like a pure resistance, which has it's own set of benefits. But my point is that shorting rings can be incorporated in woofers that aren't designed to be used as midwoofers. They aren't used solely to decrease inductance.That said, voice coil inductance in series with crossover inductance makes a (frequency insensitive) voltage divider. This tends to make the crossover inductance less effective as a low-pass filter. That's why some crossovers use a Zobel conjugate filter, to counteract voice coil inductance. Without it, a series coil will create a stepped response. Sometimes, that's useful too.Some of my designs have a series coil without a Zobel to get this stepped response on purpose. The idea is to decrease output at the upper end of the response curve and then let the mechanical and electrical characteristics of the woofer roll it off. When a midwoofer is used at high frequency, it become more and more directional, which tends to increase on-axis output. A series coil can be used to create a reduced step to attenuate this rising response to make it level, on-axis. The tweeter horn is brought in at the point where its directivity matches that of the midwoofer, which then begins to rolloff because of its electro-mechanical characteristics. If everything is balanced just right, this makes a DI matched system using a minimum of crossover components, just a small coil in series with the midwoofer.