Subject: Re: The subwoofer volume and crossover
Posted by Wayne Parham on Mon, 06 Nov 2017 16:51:07 GMT
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I was generalizing the concepts and using "round numbers" in my earlier post above.

Flanking subs are setup to blend generally in the 100-200Hz region, but in practice the blending region is shifted a little lower than that. Distributed multisubs are always used below 100Hz but usually below 80Hz and sometimes even lower, in the 50Hz to 60Hz range.

In many system setups, mains are blended with flanking subs deeper than 100Hz. They're often blended down to 60Hz to 80Hz or so, depending on the cutoff of the mains. Mains shouldn't be high-passed when running flanking subs, or if they are, it should just be for over-excursion protection. The mains should be run as low as they'll go. This pushes the bottom of the blending region downward in frequency, giving a wider blending band.

In practice, flanking sub blending rarely is accomplished above 150Hz because crossover frequency and slope usually prohibits it. If you tried to crossover higher, you'd create an unnatural sounding localization problem. The flanking sub would call attention to itself if crossed too high. But the most troublesome anomalies are usually around 120Hz, so blending there is most important.

To do this, I prefer a gentle second-order slope with low-pass "cutoff frequency" between 80Hz and 120Hz for the flanking subs. I put "cutoff frequency" in quotes because having a second-order slope, there is still plenty of energy a half-octave above "cutoff" and that's what I'm counting on for blending. I've even used first-order with great success, but second-order seems to work best.

Some people use third-order, and it can be made to work with a higher cutoff frequency in the 120Hz to 150Hz range. But I don't find it as natural sounding as using a more gradual slope. Fourth-order slopes are too steep to allow for blending without setting the crossover too high.

The goal is to have each main speaker and its flanking sub blended in the 80Hz-120Hz region without having localization problems. You don't want to be able to detect the subs as being separate from the mains. You shouldn't be able to distinctly hear the flanking subs. They should be very subtle, and the only way you should be able to even tell that they're on is the bass extension is deeper. But the wider the blending band you can create seamlessly, the better.

As an aside, the reason for the anomaly that flanking subs correct is that people almost always place their speakers a few feet from the wall behind them, due to room layout and space constraints. This results in self-interference around 120Hz. Flanking subs smooth this out using multiple sound sources. Where one source has a self-interference notch, the other sound source doesn't because it's in a different position.

Distributed multisubs are easier to setup. What I'm calling "distributed multisubs" are just those placed more than a few feet from the mains. They can usually be run with the LFE channel driving all of them. All you really need for the distributed multisubs is an all-channel summed

signal that's low-passed somewhere between 50Hz and 80Hz. Steep slopes are generally preferred, which is why so many plate amps have fourth-order filters built-in.

I generally setup distributed subs to simultaneously accomplish modal smoothing and extension. It's a bit of a balancing act, but it's usually pretty easy to do. Setting too low a crossover can create a hole in response, but setting too high can create a localization problem. In practice, setting the distributed sub crossover is usually almost trivially easy. Setting their low-pass roughly equal to the cutoff of the mains is generally a pretty good starting point.

The flanking subs' extension spans the range down to and past the distributed subs' crossover point. That makes it easy to set them up, and makes their crossover point almost arbitrarily low. You just want to make sure the distributed subs cover the lowest room modes, which are usually between 30Hz and 60Hz.

This is a common solution using two mains, two flanking subs and two distributed subs: Set the distributed subs for low-pass where the mains run out of steam. Say the mains run to 60Hz, then set the LFE crossover to 60Hz. By doing this, you have the same number of sound sources below 60Hz as you do above 60Hz. Two mains and two flanking subs above, and two flanking subs and two distributed subs below. What's really cool is when the flanking subs' upper cutoff coincides with the mains' baffle step, which is the case for large high-efficiency mains. It all comes together very nicely.

But in any case, the crossover frequency for distributed subs isn't terribly critical, provided they aren't run too high. Usually you won't be able to hear much difference between low-pass at 50Hz and low-pass at 80Hz, provided all other things are equal. Just don't go too high with them.

Just like flanking subs, you don't want to set crossover high enough that you can localize them. You don't want to be able to detect that the subs are playing. The impression should be that all sound comes from the mains. Actually, the deepest bass should sound like it's coming from all around you. It just shouldn't sound like it's coming from one of the subs. If it does, then the sub is either crossed-over too high or its volume level is too loud.