Subject: Crossover document - Rough draft
Posted by Wayne Parham on Mon, 17 Sep 2001 02:00:12 GMT
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I've uploaded an initial copy of my demonstrative crossover study document. Currently, it shows only first order designs, and it's a rough draft that hasn't been proofread or double-checked. But I can see that I won't be done with this thing for several days, so I've decided to put the first thirty-something pages online and let it be a work in progress. As I add major sections, I'll upload them so check this link periodically.Compensation networks, RC dampers (Zobels) and resonating (notch filter) dampers are discussed in this document. The pseudo-first-order filter is discussed, and there's enough information that you can clearly see its purpose and how it works. It's an often overlooked matter, worth mentioning that a coil in series with a (voice) coil is a voltage divider, not a filter. The part that makes it a filter is the complex reactance of the loudspeaker, but this also makes the voltage division more complex than a simple first-order filter, hence the name "pseudo-first-order".Higher order networks like those used in Pi Speakers with compression drivers will be discussed later, and the models for them are already included in the Spice models distribution on the Pi Speakers website. Be sure to grab a copy, so you can see the circuit analysis for yourselves. With this copy of Spice, you can also run the analysis shown in the document, and try some of your own designs.

Subject: Re: Crossover document - Rough draft
Posted by James W. Johnson on Mon, 17 Sep 2001 22:36:07 GMT
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Nice job on the document Wayne, thanks for putting it together, I look forward to seeing the rest of it.

Subject: Re: Crossover document - Rough draft
Posted by Wayne Parham on Tue, 18 Sep 2001 01:25:26 GMT
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Thanks, James. Let me know if it is helpful or not. I'd like this document to be informative and useful, not just something that techies will read but something truly for hobbyists that want to understand reactive circuits and their interaction with speaker motors in loudspeaker crossovers.

Subject: Re: Crossover document - Rough draft
Posted by Crazy Dave on Thu, 20 Sep 2001 14:19:59 GMT
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This paper is exactly what I've been thinking about. If I understand correctly, you are using a

pointed out, there are driver interaction problems with this much overlap, but I still think there is a lot of potential with this type of system. I think is should be very easy to drive and sound good.I have printed this paper and after I go over it in depth, I will get back to you.Thanks for the excellent analysis!

Subject: Re: Crossover document - Rough draft
Posted by Wayne Parham on Thu, 20 Sep 2001 20:17:34 GMT
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That's exactly what this paper describes. However, it is a "work in progress" and is not intended to promote the first order slope specifically. It was merely intended to be used for illustrative purpose. A discussion of second and third order passive filters will be added to this document in the next few days. This document, and an executable copy of Spice and of the models for these crossover filters will then be added to the Pi Speakers website, similar to the links for PiAlign, BoxPlot and Hornresp.The crossover used within Pi Speakers uses a third order filter for the tweeter and a matching filter for the woofer, with crossover point and slope dependant on the woofer chosen. In addition to the basic crossover frequency-splitting high-pass and low-pass filters, top-octave compensation is employed for compression drivers for response shaping, to make power response flat.I highly encourage you to download a copy of the accompanying executable Spice models, which are currently available and online. That way you can manipulate the models shown in this document yourself - changing crossover components to modify crossover frequency and filter slope. There are models of the sample filters shown in this crossover document, and there are models of the specific crossover designs I recommend for use in Pi Speakers shown as well.Be sure to check periodically for additions to this document. When it's done, it will have second-order and a third-order designs and a discussion of the strengths and weaknesses of each. It will also show the power across each part used in Pi crossovers, so a person can know how to select appropriate components.

Subject: Re: Crossover document - Rough draft
Posted by Crazy Dave on Fri, 21 Sep 2001 11:41:37 GMT
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Hi Wayne,Thanks for the detailed answer. I do plan to play with the Spice model. I'm always lurking around here in the background. I just don't post unless I have something to say.Dave