Subject: Re: Adjusting the capacitor value on the tweeter attenuator
Posted by Wayne Parham on Mon, 18 Aug 2003 03:06:52 GMT
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Even if the cable assembly were wired correctly (which we now see that it is), you may simply not notice the slight difference that the 0.47uF capacitor makes, and even less from a smaller part. There is some augmentation in the top octave just from the voice coil's inductive reactance rise at higher frequencies. This represents a few decibels over the top couple of octaves. Then there is an additional few decibels provided by capacitor C1. So the combined effects create the overall response curve.

If you were to just have either of these two properties - voice coil inductance or bypass capacitance - you would still have rising response, just not as fast or as much. The amounts, of course, depend on the values. Capacitor C1 sets both the frequency where augmentation begins and the overall amount available, up to whatever attenuation the R1/R2 network provides.

Larger values of capacitance bring in augmentation sooner and it is made louder too. But as the capacitor value grows, augmentation begins at a lower frequency. As the C1 capacitance grows and bypass frequency drops, you get to a point where the R1/R2 network is completely bypassed and acts like it isn't even there at all.

Smaller capacitance values bring in compensation later, but also reduce the total amount of augmentation provided in the audio range. Below a certain capacitance value, the circuit acts as though there were no bypass capacitor. But even at this point, you still have an amount of HF rise set by the values of voice coil inductance and R1/R2.

All this to say that you might just not be hearing the difference. I've got a little circuit that I used in the "Crossover Electronics 101" seminar at the Midwest Audiofest. This circuit is the exact same as is used on your crossover, except that there is a switch to cut capacitor C1 in or out. There is also a switch that substitutes the R1/R2 network for a single series resistor that provides the same amount of overall attenuation. This allows a person to easily demonstrate the sound of each and to compare it with the response curves. Sort of like a picture being worth a thousand words, and a sound being worth a thousand pictures - at least where response graphs are concerned.

Anyway, the point is that while the removal of C1 is definitely audible, it is not a huge thing by itself. When the total network is removed, now that's a big change. Not just because of level-matching, but also the EQ provided by the network. And again, some of this is done by capacitor C1 and some of it is done by voltage division between voice-coil inductance and the attenuator resistors R1 and R2. This voltage division forms a filter, and the total filter function is provided by all these parts acting together.

So while you're experimenting, put a switch in the circuit to be able to switch C1 in and out of the circuit easily. That way you'll be able to make A/B comparisons immediately. When you do this, I think you'll be able to hear capacitor C1's participation in overall response. And try the system without a compensation cable at all, just so you get a feel for how that sounds. In my opinion, this part of the circuit is where you really set the character of the speaker. I think it's probably the most important part of the design. So your work on "voicing" the speaker with these components

is very productive and interesting. It's a lot of fun, isn't it?!!

Wayne

P.S. If you want, you can borrow those little demonstration circuits from the seminar. Sounds like you'll be wanting to go a step beyond - To be able to switch in different values of R1, R2 and C1. But the circuits I have are already built, so that makes some of this easier. And they're really handy for being able to demonstrate the different influences of all these parts.