Subject: Protection caps
Posted by Wayne Parham on Tue, 11 Mar 2003 03:57:31 GMT
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If the crossover (including driver reactance) is underdamped in or near the passband of the device, you will hear it. An underdamped crossover filter causes a peak that can range anywhere from a mild lift to a huge 10dB peak. Rarely will you find a voice coil driver peaking so bad that it oscillates, but some piezo tweeters can interact with inductances in the speaker circuit at this level. For voice coil drivers, it is common to find 2dB to 4dB peaks in the passband, and sometimes even worse.If you have an active crossover and also a protection cap, then you still have a passive filter in the speaker circuit. Protection capacitors are first-order filters. There are reactive components in the loudspeaker circuit, so care must be taken to ensure you don't reduce the benefits afforded by bi-amplification.There are a couple of things that can be done, and both amount to the same thing - Check for peaking and remove it.One thing you can do is to put a very large protection capacitor in series, so that the peaking would be at a very low frequency, far below the useful range of the transducer. But this has a couple of downsides. First is that this will move the peaking down to a low frequency, where a power-on "burp" might be the most harmful. And second is that the larger value capacitors get expensive, especially in the good film/foil technologies. Still, these are things that can be resolved and the use of a large protection capacitor is a good solution to the peaking issue.The second thing that can be done is to use a damper resistor across the capacitor. This has the advantage of potentially allowing the use of a smaller capacitor. This, in turn, gives more confidence that a power-on surge will be removed or at least presented at a frequency that the transducer can handle. You can even use a protection capacitor configured as a crossover filter at the same frequency as the active crossover, effectively making another node.Probably the best thing to do is to make a quick Spice analysis of your speaker circuit to find out how much effect there will be from peaking. You may find that your best solution is one that has a damper and a fairly large capacitor, or you may find peaking is so minimal that it almost doesn't matter. But to know for sure, you'll want to run the numbers and see.