Subject: Re: ribbon protection with electronic crossover?
Posted by Marlboro on Tue, 03 Apr 2007 02:08:28 GMT
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3.1 - DC ProtectionWith a bi-amped system, the tweeters are protected by the mid-high crossover. Once the loudspeaker is tri-amped, this protection is lost, since the capacitor which is used to determine the crossover frequency is no longer present.With most 'solid-state' amps, this places the tweeter at great risk during the (generally short) switch-on and switch-off periods. As the supply voltage is applied (or removed), most amplifiers will create a DC transient (if such a thing is possible) as the circuitry starts to operate. This causes the all too common speaker thump.This is mildly annoying when applied to the low frequency drivers, but is capable of destroying a tweeter if allowed to persist for more than a few milliseconds.In the case of amplifier failure, the tweeter is almost certain to protect any speaker fuse by blowing first - not exactly the desired effect! The "Poly-Switches" now available might help, but I don't like the idea of a non-linear resistor in series with my speakers.If the direct coupled approach is contemplated, I would suggest the following:Use a relay in series between the tweeter and the amp with a suitable muting circuitInclude a fast acting DC sensor to disconnect the load if amplifier DC is detectedA suitable circuit is available - see Project 33 in my Project Pages, which can be easily be modified to protect tweeters, where its DC detection circuit can be made vary fast indeed.3.2 - Choice of CapacitorA humble capacitor will prevent DC from reaching the tweeter voice coil, but the selection is critical to ensure that the sound is not degraded.Value - The capacitor will almost always have to be at least 20uF, which for an 8 Ohm tweeter, will create a 3dB high pass crossover at about 995Hz. Given that this additional crossover should be ideally 1.5 to 2 octaves from the "real" crossover frequency (even more if possible), the values likely to be needed in real life will tend to get quite large. The reason that the protection cap needs to be so large is that smaller values introduce phase shift, which is significant for all frequencies within 2 octaves of the crossover point.An alternative (I hope your maths are good) is to use a modified high pass section in the electronic crossover, and then use the protection cap to provide the last pole of the filter. This will work (it will work very well), but the mathematical complexities will be such that I expect few constructors to go this way.A further disadvantage is that the electronic crossover cannot simply be swapped for a different type to allow comparisons, and with some filter types the approach will not work at all.Type - When we contemplate high value caps (greater than 20uF) there is an immediate tendency to think about using a bipolar electrolytic. For this application, I do not recommend them, but sometimes you may have little choice. According to some, they are not recommend for any application, since they are (supposedly) sonically disgusting. I have not been able to measure distortion in a bipolar electro, but there are many who claim that they destroy the sound. I shall not continue this debate.The ideal is to use polyester or polypropylene caps, since their stability is so vastly superior to bipolar electrolytics that there is no comparison. They also have a comparatively unlimited life, but bipolar electrolytics gradually lose capacitance (and sometimes not so gradually), thus changing the crossover frequency (or disabling the tweeters completely when they eventually fail.Good caps can cause some degree of financial hardship, but be assured, that is as nothing compared to the utter despair when smoke is seen escaping from your precious tweets.If you are on a budget (decent caps at these values are expensive), one possibility is to use power-factor correction or induction motor start capacitors. These used to be oil-filled paper (some still are), and are much cheaper than "electronics shop" devices. I can vouch for the sound quality, as I use these to protect my tweeters - most are polypropylene are of film and foil construction, although metallised film is probably used as well. The stability and power handling

will certainly be superior to that of bipolar electrolytics, and the high frequency response can be corrected (if necessary) by bypassing with a high grade polyester. I would expect that a 1uF bypass would suffice in most cases.These caps should normally be available from electrical supply outlets, since they are commonly used in electrical (i.e. mains house/ factory/ office) installations.http://sound.westhost.com/bi-amp2.htm

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