Subject: Blow Fuse!
Posted by Tuffer on Sun, 21 Jan 2007 14:33:02 GMT
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Hi Guys,I have been borrowing some of your crossover designs to try and improve my speakers which are used for mainly DJ use. I am using a Beyma 15G40 and PSD2002 in a vented box. I am using an Eminence PXB2:1k6 crossover.I have created an lpad using two 15 ohm resistors and a 0.47uf cap for compensation. The resistors are wirewound and so may be inductive. See a pic below.http://www.tuffer.co.uk/cross1.jpgI have also disconnected one end of the 10uf cap on the crossover to give me a pseudo first order filter on the woofer.http://www.tuffer.co.uk/cross2.jpgWas quite happy with the results. Attenuation is perhaps a little strong. 8db might have been better.On their first proper outing however both the fuses on the crossover board blew. They were being powered by a Behringer EP2500 so about 450w max to each cab. I wasn't present when they blew but was told that they weren't being driven particularly hard. I had been using these crossovers without the lpad or mod for some time without any problems.Can anyone tell me if what I have done looks OK ? Could any of these changes increased the likelihood of overload and the fuses blowing or is it just one of those things that happen ? Should I just replace them with stock Eminence fuse or something else ? Obviously while the fuses have done there job and protected the HF drivers I wan't these cabs to be as reliable as possible.Thanks for your help.

Subject: Re: Blow Fuse!
Posted by Wayne Parham on Sun, 21 Jan 2007 18:47:15 GMT
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Are you saying the light bulbs blew? You may have presented a dead short or an open, both of which cause excessive current flow through the lamp. An open causes high current near the crossover frequency because of undamped shunt resonance. A short causes high current because it's a short. If you have am ohmmeter, you can check and see if either of these things is the case for you.

Subject: Re: Blow Fuse!
Posted by Tuffer on Sun, 21 Jan 2007 19:00:54 GMT
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Yes the lamps blew. They worked OK for about 3 hours before they went, which makes me thinks perhaps they were just doing there job. If I replaced them with 3 12v 10w lamps in parallel would this be OK or is there a better way to protect the HF driver ? Excuse my ignorance but where would I check for a dead short or an open ? I have an ohmeter.

Subject: Re: Blow Fuse!
Posted by Wayne Parham on Mon, 22 Jan 2007 03:15:08 GMT
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Check across the tweeter output to see if there is a short or open condition there. You can replace the bulbs using a pair of 211-2 automotive lamps. The 211-2 bulb is designed for 1A at 12V (12 ohms) but cold resistance is only about 2 or 3 ohms, so the pair is about an ohm and a half. When used on the input of the crossover, there is no noticable impact until high current makes the filament glow, increasing resistance and limiting current. It acts like a compressor and protects the tweeter, but the compression effect is very natural sounding, you can hardly even tell. And it doesn't happen until the amplifier is generating about 300 watts. If you want to allow more power, you can change the configuration. But watch the voltage limit of the caps if you jumper around the lamps or use a different type of bulb or number of bulbs.

Subject: Re: Blow Fuse!
Posted by Tuffer on Mon, 22 Jan 2007 08:10:09 GMT
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Thanks for that. Any idea what power would be required for the lamps to pop ? Would adding a polyswitch in parallel with the lamps be a good idea as this seems to be a solution used a lot ? Any idea what rating ?Thanks for your help.

Subject: Re: Blow Fuse!
Posted by Wayne Parham on Mon, 22 Jan 2007 18:34:18 GMT
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The current level that causes the lamps to glow brightly is 2 amps. They begin to compress the signal around half that level and fuse somewhere around twice that level.

Subject: Re: Blow Fuse!
Posted by Tuffer on Mon, 22 Jan 2007 18:50:57 GMT
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So a polyswitch with a trip current of around 2.5a would be a good bet to go in parallel with the stock lamps ?

Subject: Re: Blow Fuse!
Posted by dB on Mon, 22 Jan 2007 19:08:18 GMT
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Hi Tuffer,You said, adding a polyswitch in parallel with the lamps. You mean in series?PolySwitch™ is a theoretic idea, but to design (and some factories do it) a xover you need to test the finished xover over the speakers. So, after you chose one from the tables with the right triger current you have to go to the lab and blow a few PSD2002 to know the right Threshold Current. It comes out very expensive and it might not work if they are not fast enough. You can see the lights from the lamps (xover light bulbs) working and it's a much more gentle process, and your clients don't lose the sound in the process because the speaker doesn't turn off.Best Regards

Subject: Re: Blow Fuse!
Posted by Tuffer on Mon, 22 Jan 2007 19:21:24 GMT
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Thing is the top end was lost as the lamps blew so I'm looking for a solution that is not quite so all or nothing.

Subject: Re: Blow Fuse!
Posted by Wayne Parham on Mon, 22 Jan 2007 21:47:25 GMT
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If you're considering replacing the bulbs with a fuse or breaker, you should know that they're going to have to be de-rated. They aren't very effective for tweeter protection. The reason is that currents in the tweeter circuit are high frequency and the fuse is designed for DC. It isn't designed to respond very quickly. I found that fuses had to be pretty heavily de-rated to be effective.Honestly, bulbs work better for tweeter protection than any fuse or breaker I've seen, as they compress the signal rather than fusing. The bulbs only blow if the signal is much higher than expected or if the load is open or shorted. I suggest that you get out a meter and start quantifying things. Check the voltage level of the amplifier when the bulbs blow. Those bulbs don't cost much, so it isn't any trouble to make a few tests that push them to the point of destruction. Also, check the impedance across the crossover's tweeter output. Check the voltage across the tweeter output. Once you know more about what's happening, you can make a more informed decision how to correct it.

Subject: Re: Blow Fuse!

Posted by dB on Mon, 22 Jan 2007 22:35:07 GMT
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1. Place a RC damper for the woofer (between W+ and W-).R= 7.6ohm (you can use 2 of those 15 ohm in parallel, or one 8 ohm, like the yellow ones you have)C= 40uF (in series with R=7.6), you can use 33uF CAP and up close to 40/44uF (2x22uF in parallel).2. Disconect (take out) the power resistor (15ohm) you have for the tweeter/to ground (between T+ and T-), (the 15 ohm one that is in parallel with cap / leave)3. Use a lamp of at least 7/8 ohm, you can use two lamps in series to duplicate the effect of a resistor, if you use the lamp that Wayne said. Measure the lamp with Meter to have as many lamps to make 7/8 ohm.The speaker at crossover point (-3dBs - 1600/1700 Hz) gives about 92dBs sharp, side of woofer and on the side of HF driver.I think that's about it.Best Regards

Subject: Re: Blow Fuse!
Posted by dB on Mon, 22 Jan 2007 22:45:57 GMT
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BEYMA 15G40 700W/EminencePSD2002

Subject: Re: Blow Fuse! (2)
Posted by dB on Mon, 22 Jan 2007 22:51:38 GMT
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I forgot to say that you must replace (soldering back) the CAP that comes with the woofer network of 10uF, to be used with the xover in this case of points 1. 2. and 3. that I posted a few minutes ago. Best Regards

Subject: Re: Blow Fuse! (3) Non Inductive Resistors
Posted by dB on Tue, 23 Jan 2007 00:22:59 GMT
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When you ask for Power Resistors always specify NON INDUCTIVE.Metal-Mite®Aluminum Housed Axial Lead Wirewound, 5 watt to 50 watts
http://www.ohmite.com/cgi-bin/showpage.cgi?product=89_seriesAudio Gold Resistor Family, specifically designed for high-end loudspeaker, 3 watt to 50 watts
http://www.ohmite.com/cgi-bin/showpage.cgi?product=audiogold

Subject: Re: Blow Fuse!
Posted by Chris R. on Tue, 23 Jan 2007 00:34:47 GMT
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> Thing is the top end was lost as the lamps blew so I'm looking for a solution that is not quite so all or nothing.Turn the power down so the lamps don't light? If its not loud enough, get more horns an drivers, or bi-amp.Chris

Subject: Re: Blow Fuse! (2) Update!
Posted by dB on Tue, 23 Jan 2007 01:44:41 GMT
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BEYMA 15G40 700WEminence/PSD2002 - w.out10uF CAP for pseudo first orderHi, Sory, of course you can leave the 10uF CAP out and you can play with that. If you have it on the bass the sound goes up a little. But you must have the RC damper for the woofer about this values, as I said before.! RC damper for wooferR=7.6C=40uFYou also want to have less resistor on the Lpad, so instead of the 15 ohm you should have a 8 ohm resistor with the 0.47 CAP. The sound goes up a little for the PSD2002.! series/parallel Compensation componentsR=8C=0.47uF(Where you can play is on the lamp) You should have about a 6 ohm across, like a two bulbs in series to give a nice response like this.Best Regards

Subject: Crossover Slopes
Posted by Wayne Parham on Tue, 23 Jan 2007 03:23:04 GMT
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I always put a Zobel RC damper on any woofer that uses a passive crossover, second-order or higher. Sometimes, I'll run a midwoofer "wide open", or maybe with just a series coil. Of course, a woofer with a single series coil does not really have a first-order crossover since the load is not purely resistive. In fact, the woofer's voice coil is highly inductive, so a coil in series acts more like a voltage divider than a filter, making a sort of a shelved response. That's why I like to call them pseudo-first-order filters, to call attention to the fact that HF content is not attenuated with a 6dB/octave slope.On the tweeter circuit, I load the crossover with a higher impedance to make it slightly underdamped. This combined with top-octave compensation provides a couple octaves of flat response before HF augmentation begins. It does this by providing a tiny bit of peaking down near the crosover frequency. The net effect is a response curve that looks like shown below,

which both pads the tweeter down to match the midwoofer and also compensates for the high-frequency rolloff of the compression horn.

Subject: Re: Crossover Slopes
Posted by dB on Tue, 23 Jan 2007 14:25:12 GMT
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Thanks Wayne,the Zobel RC damper makes it behave really nice with a slope maybe bigger than second order/12dB because of natural woofer fall-off after 2K.Tuffer, with patience you will end up with a hell of a speaker.Use filament light bulbs, not leds.Best Regardshttp://www.amazon.com/3A-Racing-47-21122-Bulbs-211-2/dp/B00029J0JGhttp://www.donsbulbs.com/cgi-bin/r/b.pl/211-2%7C12.8v%7C0.97a~usa.html
PXB2 Spare lamps available, Order Code VW79L (UK)

Subject: Re: Blow Fuse!
Posted by Tuffer on Tue, 23 Jan 2007 16:36:04 GMT
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Thanks for all your help and advice guys. I am begining to think that perhaps I should consider bi-amping these boxes and only loaning them out with the associated amps/crossovers/limiters and my supervision. With the expense of all the crossover components, testing and possibilty of frying a few HF drivers I could have bought the other amp required. Should then be able to get the best out of the 15G40 driver also. I will put this one down to just a bit of feedback or a dropped mic and replace the fuses in the meantime. It seems like tweeter protection and passive crossover construction in general is a bit of a mine field. Without lots of equipment ,time , patience and know how it's down to luck if it sounds right. Perhaps that is why so few of the pro audio suppliers get their passive boxes sounding good!

Subject: Re: Blow Fuse!
Posted by Wayne Parham on Tue, 23 Jan 2007 16:41:29 GMT
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Well, that's absolutely right. You can assemble a loudspeaker and it will play music, but to get it optimized takes quite a bit of effort. A crossover has relatively few parts, but it isn't a trivial design exercise.

Subject: Re: Blow Fuse! or to much Heat?
Posted by dB on Wed, 24 Jan 2007 12:27:18 GMT
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Hi, The problem was probably that Tuffer had to much heat from the Power Resistors and not any sound at all.First I said Tuffer could change the PowerResistor from 15 ohm to a 8 ohm (and take out the shunt 15 ohm resistor, he doesn't need it).Second the bulb comes from the factory with a xover for some Eminence speakers (standard; they don't say which) for 250W of power compression 3:1 and Tuffer is using 400W and more. And when the things get hot and Tuffer doesn't get any sound from it (PSD2002), the bulbs are before the network and explode.Nice, but it needs some changes. My speakers have two light bulbs in series (12V 21W). Wayne, maybe Tuffer can use a 24V 21W Truck light bulb, what do you think?Tuffer you can check the lamps from OSRAM. They have a nice catalog for 5W and 10W Festoon Lamps.
Osram lamp cabinet (Check on your right).pdf