Here's a paean to the Nelson Pass designed First Watt B4. This is a superb active two-way crossover. I refer you to a Pdf of the owner's manual from the First Watt web page for design details: http://www.firstwatt.com/pdf/prod_b4_man.pdf

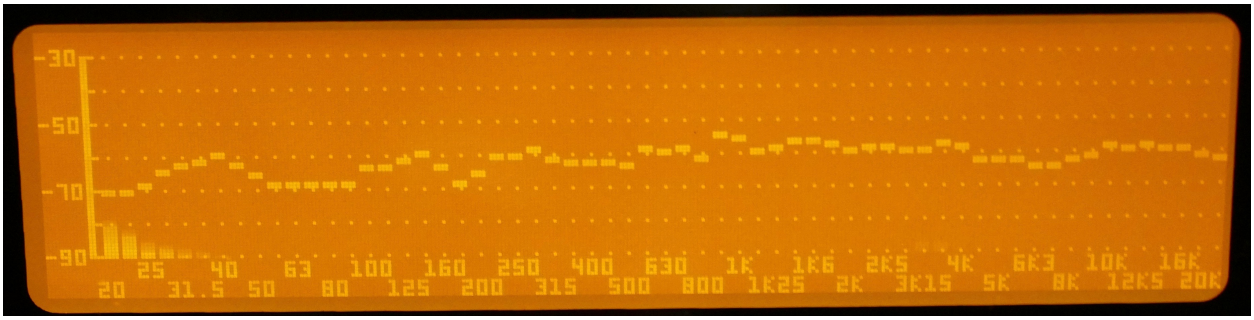
Basically, this little box (MSRP $1200) is a dead quiet, squeaky clean device that allows the user to set up a 1st, 2nd, 3rd or 4th order crossover at a range of frequencies from 25Hz to 6275 Hz at 6, 8, 12 or 24 db/octave using Salen-Key values, or from 34 to 4366 Hz using the 24db/octave Linkwiz-Riley parameters. This thing is a speaker designer's dream.

Having played with this for a few weeks, I'm ready to share some results. The woofer is a 5.7" Dynaudio, as used in their Excite 12, and in Dynaudio's stock enclosure. I like this driver/cabinet's punchiness and warmth. The woofer is directly wired to an LFD Zero MK IV integrated. The tweeter is an Aurum Cantus "folded ribbon" (Heil AMT-like) model with its felt backing removed, so that it functions as a dipole. These go for around $100 each from Parts Express; the Dynaudio Excite 12s are ~$1200/pr.. The Excites have a very nice soft dome tweeter, but the folded ribbon is even sweeter, more extended, less grainy, and when used as a dipole they lend an openness and un-boxiness to the mix. The Dynaudio's tweeter is disconnected, and the Aurum Cantos tweeter is directly wired to a Rega Brio integrated. The use of integrated amps for both drivers has the disadvantage of adding unnecessary volume pots to the chain, but the advantage of allowing extremely fine level adjustments of each driver, In the case of the tweeter this can be done from the listening position by remote control. An added benefit of the free-air tweeter mounting is that it allows for time-alignment with the woofer. Here's what the result looks like:

A pair of old AR3s, with the midrange and tweeters disconnected and the woofers re-foamed, essentially making them AR1Ws, are used as subwoofers. The crossover between the ARs and the Dyanuaudios is accomplished by the internal bass management system in the Parasound P-5 preamp. The tweeters are screwed onto mini cutting boards to keep them upright, and the boards are covered with pieces of velvet bags from old whiskey bottles to minimize reflections. A rubber floor mat, which has a nice bevelled front edge, isolates the tweeters from the Dynaudios and minimizes front reflections. Necessity is a mother….

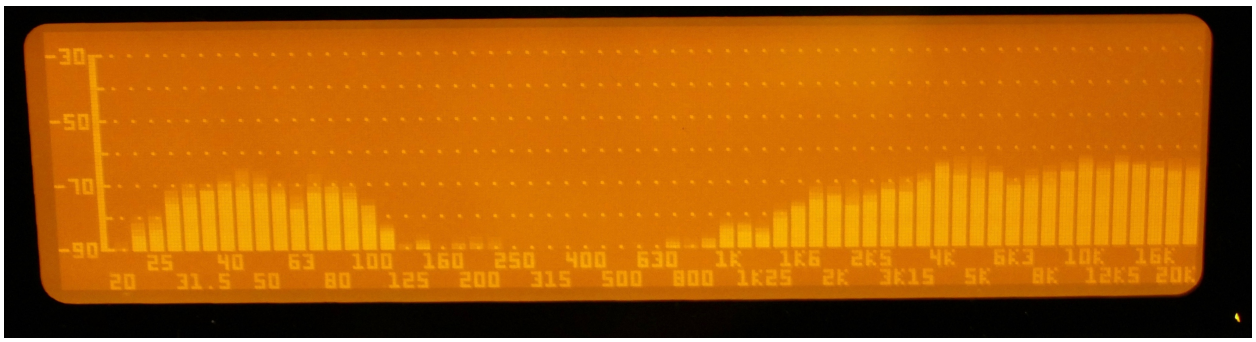
Before disconnecting the Dynaudio tweeters, I tried leaving them and their internal crossovers intact, rolling the whole speaker off at various points from 3200 to 6275Hz at 6-24db/octave to the AMTs. This gave smooth sound and curves, and was an improvement over the stock Excite 12s, mainly in terms of image depth and airiness, but I was after still more transparency and liveliness. I was particularly interested to see if a good result could be achieved using first-order 6db/octave) settings. These have the theoretical advantage of zero phase shift between the drivers, as well as minimizing the parts count in the chain. Initially, while the curves looked pretty smooth, I noticed an edginess on massed strings not present with the intact E12/AMT setup. I suspected that this was due to some nastiness on the woofer's part above my crossover point of 3200Hz, said nasties having been limited by the stock E12's internal crossover. Going back to direct coupled drivers, a 4th-order LWR (24db/octave) cured this edginess, but at the expense of some life and air. I haven't experimented yet with 2nd or 3rd order settings, as they have their own phase shift problems, perhaps more theoretical than audible.

So, I tried 6db/octave, rolling the woofers off at 2400 Hz, sticking with 3200 Hz high pass for the tweeters. The concern was that going down to a 2400 Hz high pass might damage the tweeters in a first-order setting. Voila! A lively, energetic sound, reminiscent of Klipschorns without the colorations, and string tone to die for. Here is the resulting curve, measured at 3ft, on-axis, with the microphone's height midway between that of the woofer and tweeter. Pink noise as measured with a Boehringer Ultracurve Pro and its calibrated microphone:

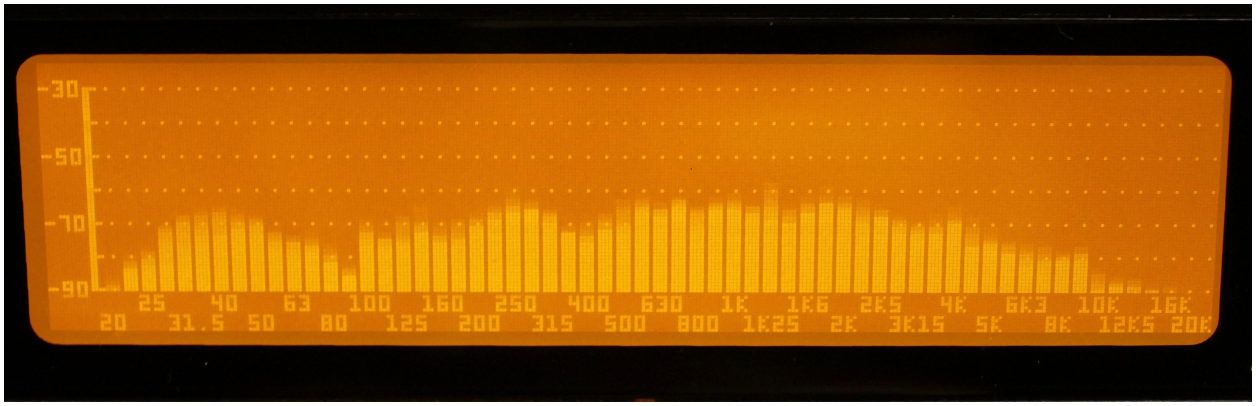


The bass irregularities are likely to be mostly due to the measurement technique.

The slight dip at around 6000Hz is apparently inherent in the AMT tweeter, or the microphone, as it is present in every crossover setting tried, and appears in the tweeter's curve with the woofer's output removed by turning off the LFD:

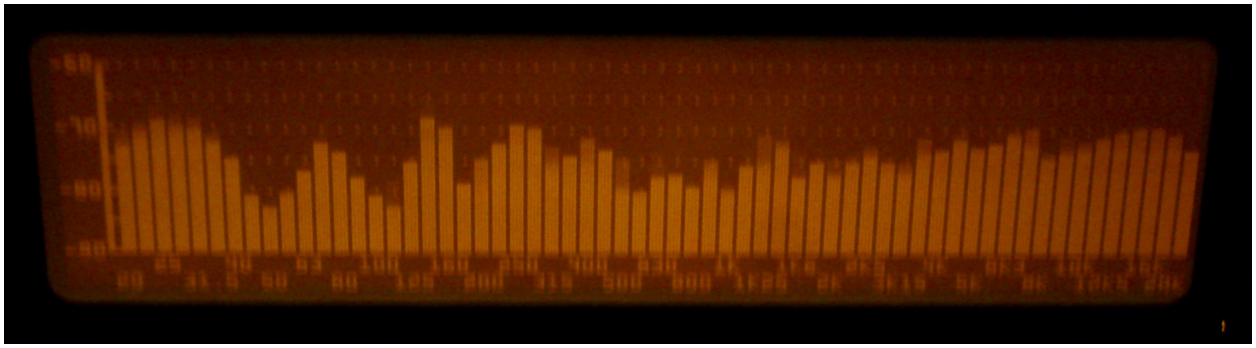


Conversely, here is the curve with the tweeter's output removed:



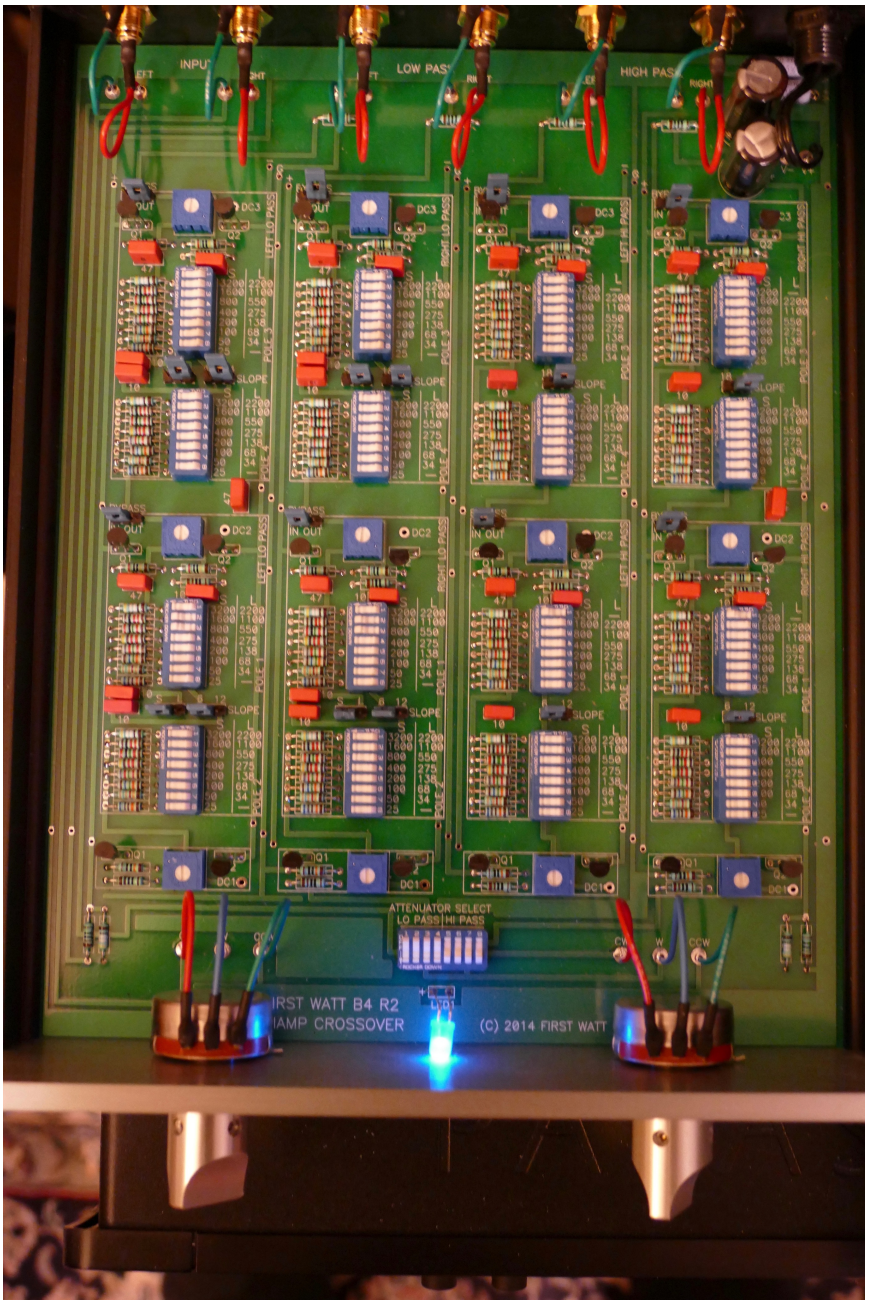
So far, no problems with the Aurum Cantus tweeter, even with only 6db/octave protection. and I've played the little buggers LOUD.

For comparison, here is the considerably less smooth curve of a stock Martin-Loagan Motion 15 measured in the same manner:



I neglected to photograph the curve of a stock Excite 12, and I don't feel like putting them back together just to do so. They measured much like the first curve, but less extended on top.

Here's what the B4's innards look like with the settings described:



The point of all this is not that this is the best that can be done with these drivers, but rather how easy it is to try virtually limitless crossover combinations with the B4. Doing this with passive components would take more time, patience and parts than this old audiophile can muster. Once a favorite slope and crossover point have been determined with the B4, a passive crossover could be built using parts selected and wiring derived from fairly simple equations. Would the same level of transparency be achieved by putting a crossover between amps and drivers, as opposed to between preamp and amps? I doubt it.

Happy listening!

TC