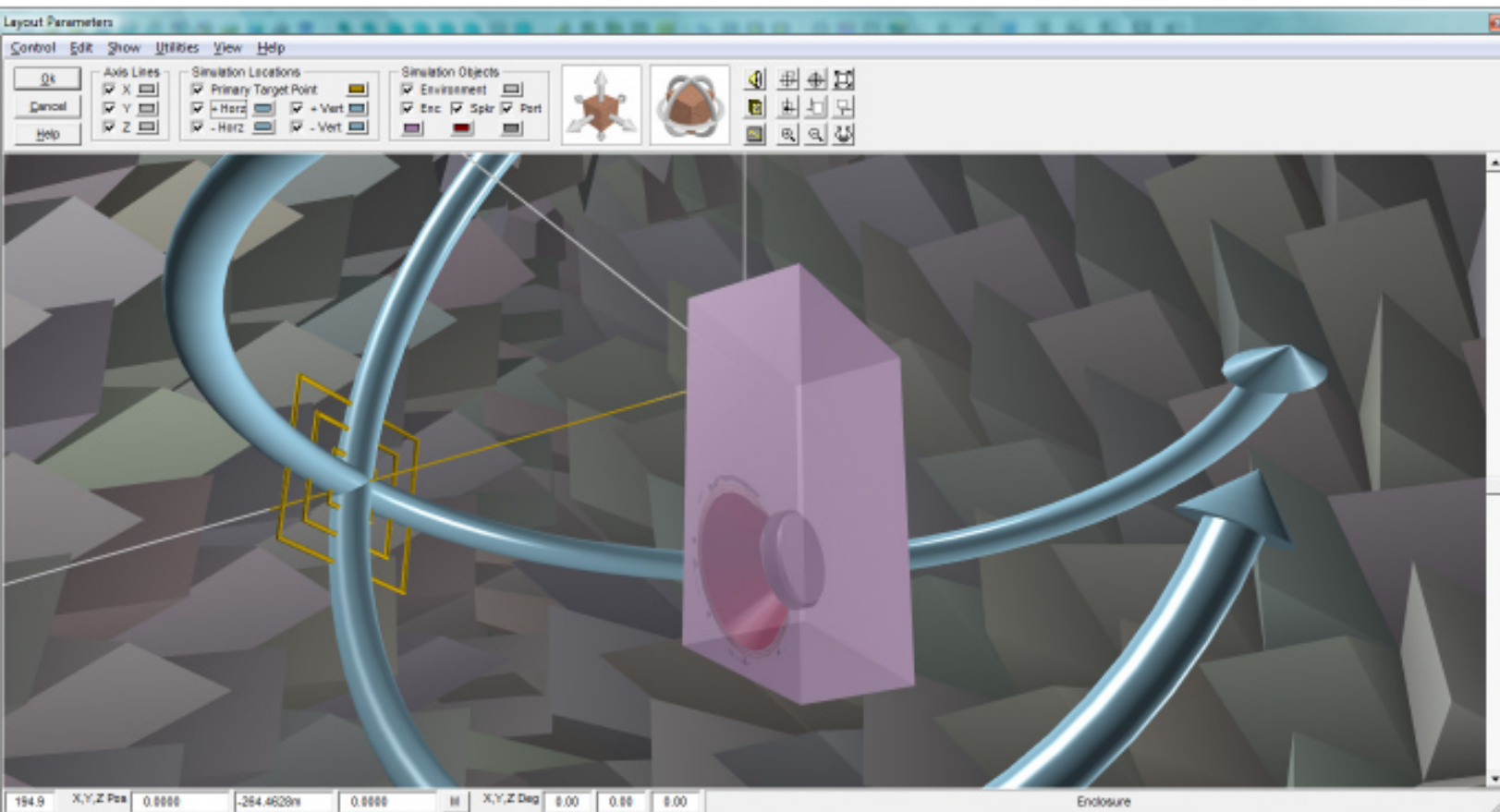


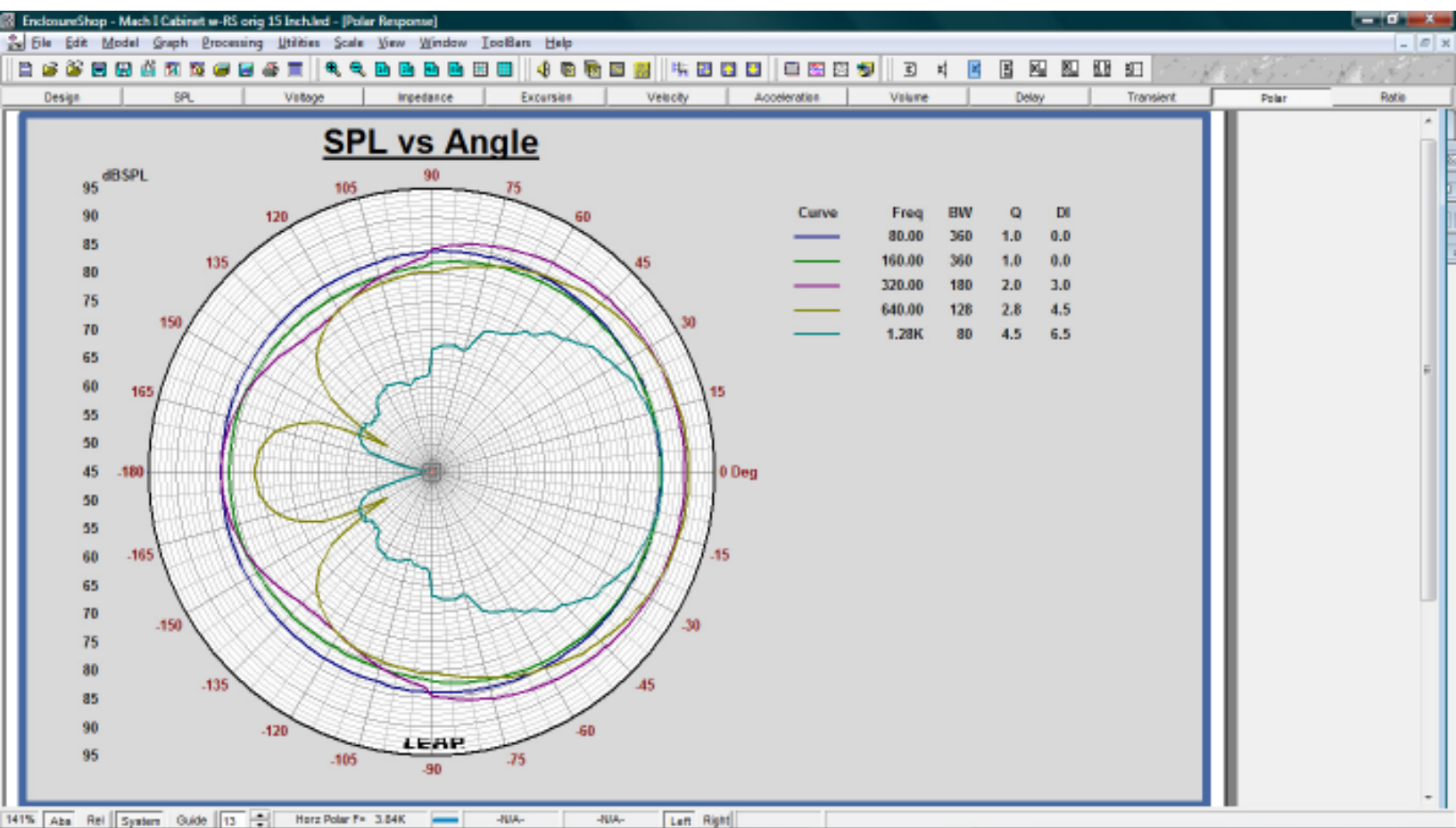
Realistic Mach 1, Model 4029 Level 1 Upgrade

It is advised that you only make these mods if you feel your skill level is adequate and you understand fully from the text and images what is to be done and why. I assume no responsibility for any mishaps you may incur during these mods. This information is posted as a DIY document and is completely up to you whether you decide to alter you speakers. No Warranty of Any Kind is Implied or provided.



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The Realistic Mach 1 speaker both the 4024 & 4029 are one of the most impressive speakers ever built in the mid 1970s. It is amazing how well they did on these models decades ago with very limited design instruments compared to today. Our goal here is to fix a few issues that we have learned exist in the Mach 1s today. This paper is focused on the model 4029 unit. As we all know the foam on these older units goes bad. What most don't know, is that the midrange unit has foam in it that damps the midrange dome. It damps the FS of the mid driver and reduces distortion. It also smooths the frequency response. If you desire the best results, everything listed in this document should be done, however the choice is yours to do as much or as little as you choose.



If we look at the polar graph above we can see that above 640hz the woofer's power response starts to really close in. If we could choose any frequency we wanted to crossover, it would be best to pick a frequency below 640hz. 500hz would be a good choice. However we can not, as the mid horn is limited to around 1.1khz on it's low end output. So 1.2khz is our selected crossover frequency for the low end of our bandpass filter. These drivers as I have stated before are not optimal choices to work together but this upgrade will address those issues, while keeping all the drivers in stock format.

Without the foam damping ring in good shape in the mid driver, the mid range response becomes very peaky and harsh. You need to confirm that it is in good shape, and preferably just replace it. You can use a 1/16" piece of foam tape that is self stick on one side. Use an open cell foam that compresses easy. A weather strip tape for doors or windows work great and is designed to withstand weather and moisture. Cut the strips about 1/8" wide. Clean the old off the mid dome and the horn housing using rubbing alcohol and Q-Tips. See the images on the next page.



Before Cleaning



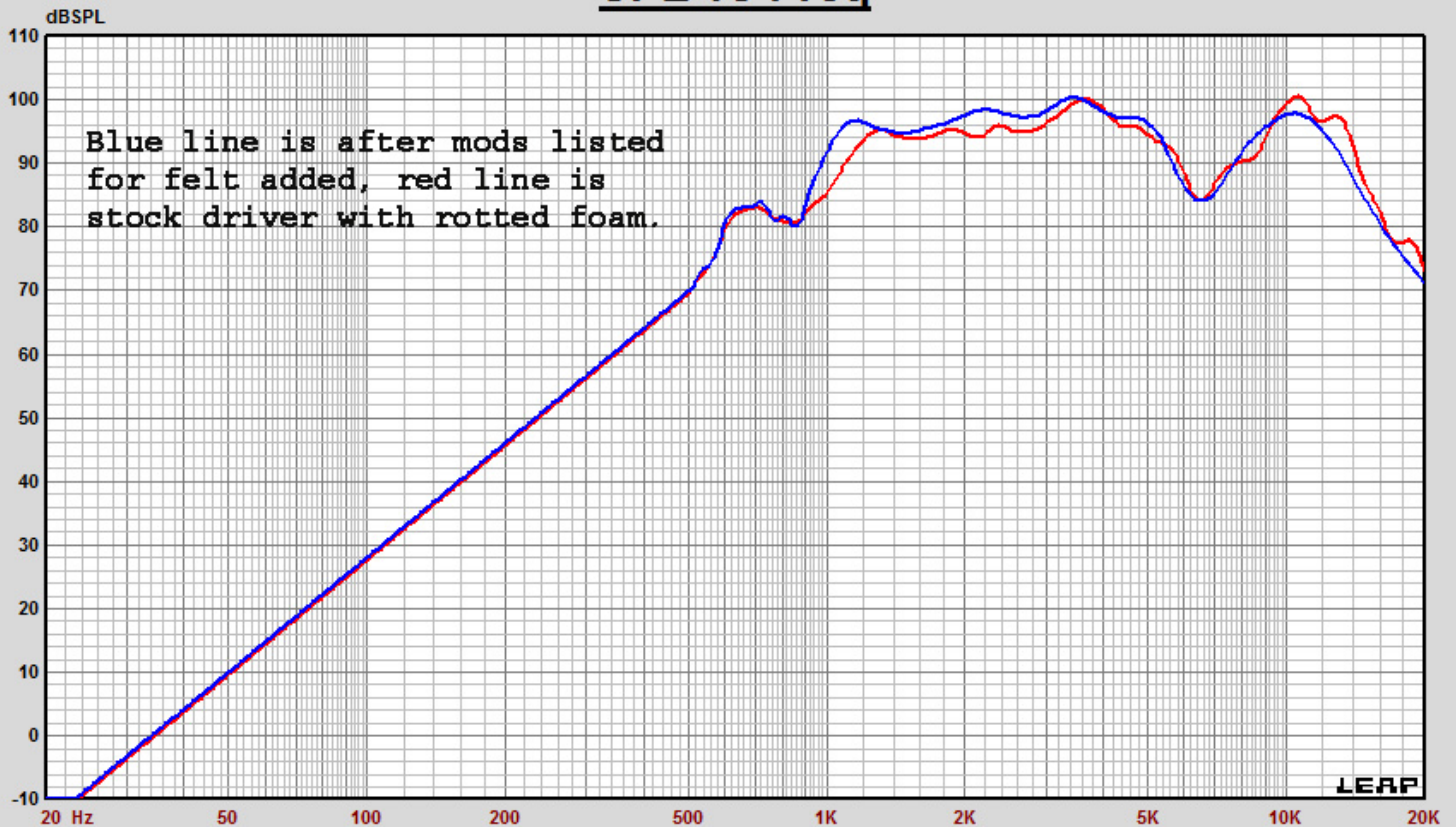
After Cleaning

It is also advised that you add felt dampers to the pole piece of the midrange magnet. These can be cut from 1/8" felt sheeting. Cut three pieces, each about 1/8" smaller than the first and glue them to the pole piece. See following images:



Be sure that the felt does not overhang and get in the voice coil gap and that it does not touch the inside of the dome of the midrange, as pictured above. Small stands of a few fibers from the felt touching is not a problem. These mods on the mid driver smooths the response as it absorbs reflections that cause nodes to otherwise develop and extends the low end response. This makes the sound of midrange horn more transparent. See the before and after sweeps on the next page.

SPL vs Freq



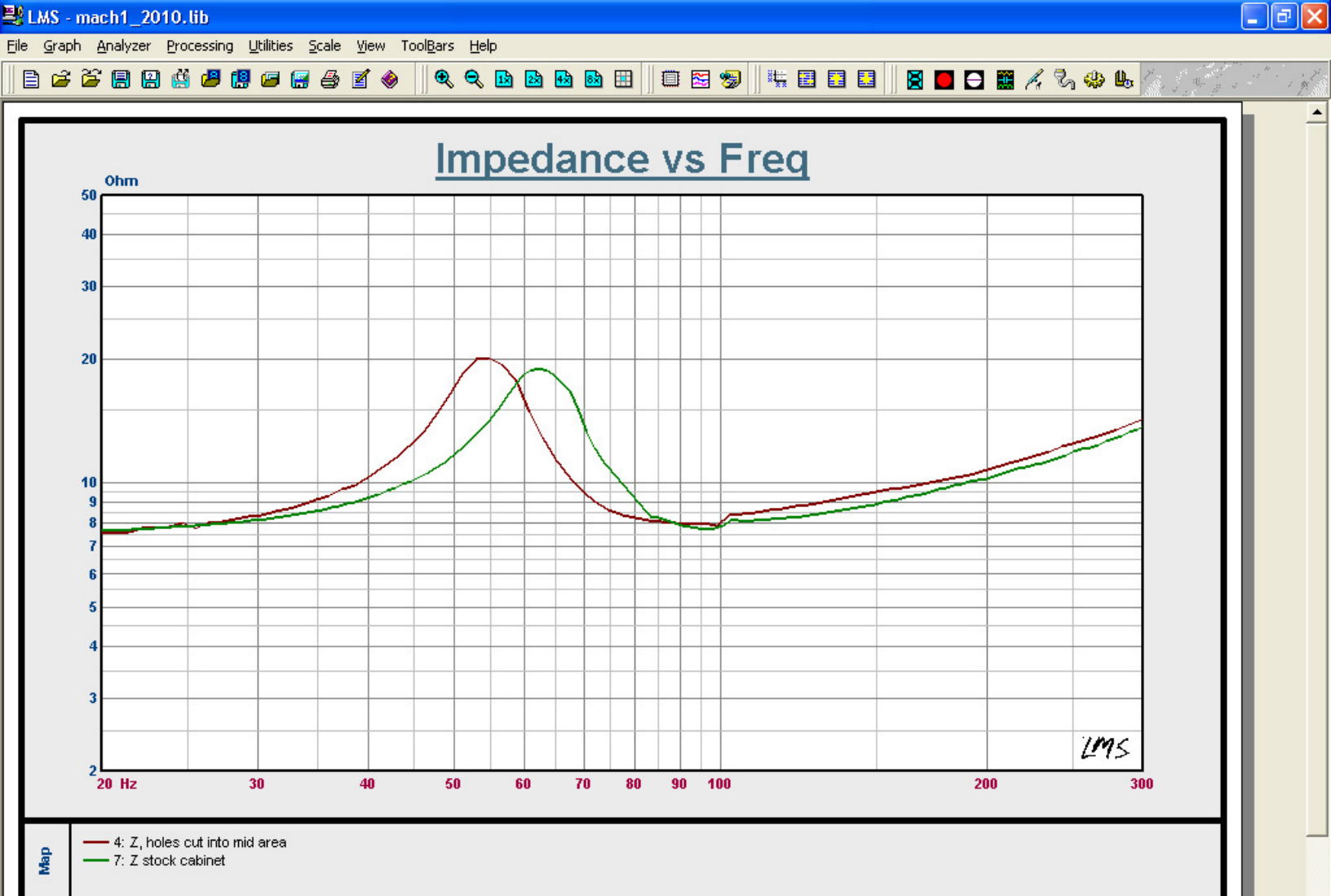
Map

- 3: Midrange Before Mods
- 16: Mid After Mods

The next step should be to enlarge the woofer cabinet volume. The driver has a very high QTS and results in an overall hi system's Q. You can add around 3/4 foot of enclosure area using the space around the midrange horn! To do this you must seal the midrange horn. Radio Shack screwed and glued the horn assembly to prevent vibrations but not for air leaks. You can take the nuts off the back of the midrange horn housing through the back opening. Remove the complete horn out the front of the cabinet and seal all the seams with any type of flexible glue. The glue used to redo the surrounds is a perfect glue for this. Now is a perfect time to cut the openings between the woofer cabinet and the midrange area. Use a hole saw and a drill to cut these holes. The hole saw size should be 3 1/2". Drill 3 holes with the hole saw. Once done, clean up the saw dust and reinstall the horn and seal the midrange opening with foam tape. It will help if you put some insulation in the midrange area before you put the back cover on. See picture on the next page.



The results of the enlarged cabinet area drops the systems FS (FC) by 10hz! The bass is much deeper and smoother with a lack of the boomy bass, as some have called it. You will be shocked how much stronger the low notes will be!



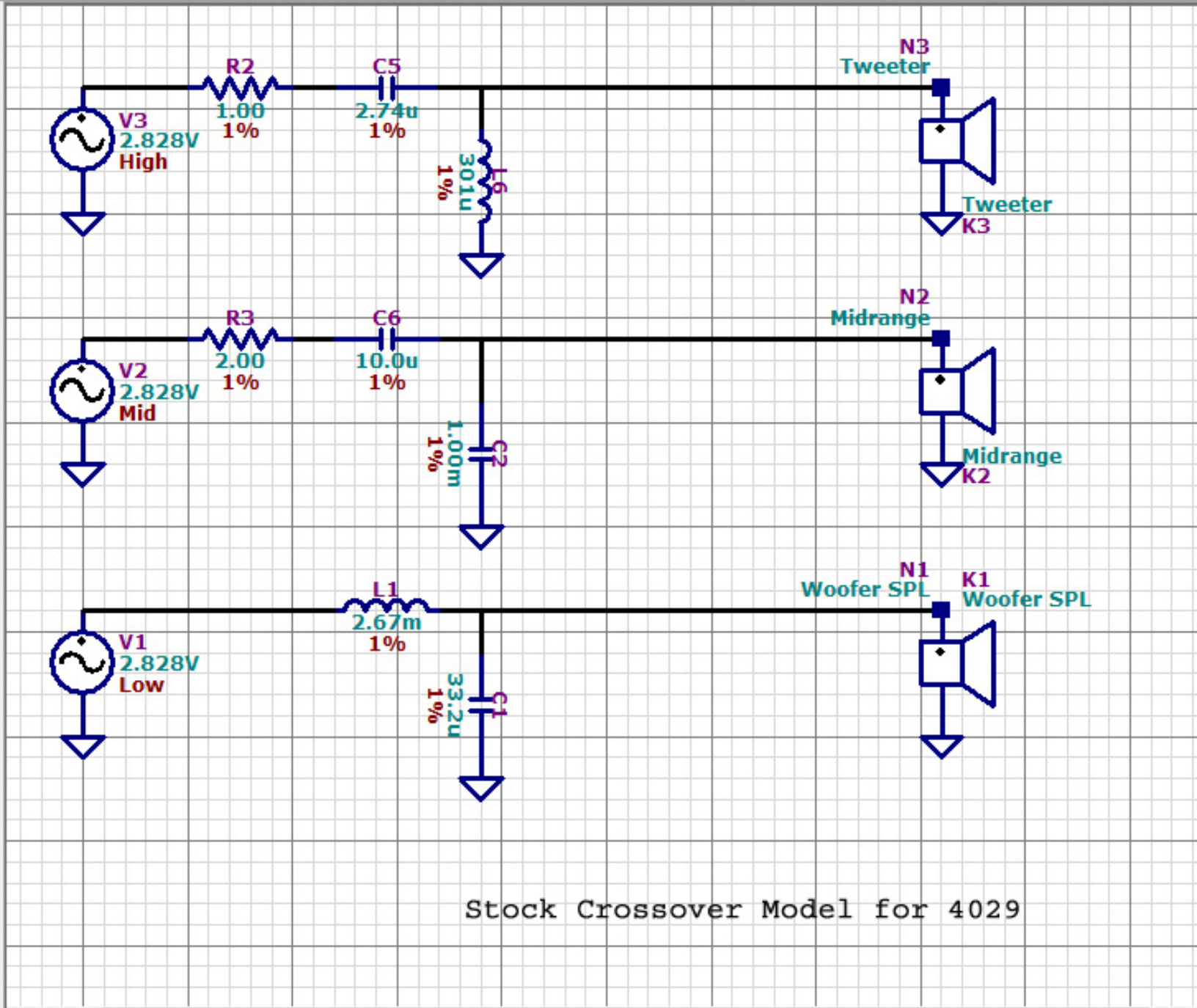
Now you have done all the hard part. You can now reassemble the speakers but leave the woofers and the insulation from the woofer area out. We will now change the crossover parts to there new values. You can do this with the connector/crossover board in the cabinet or unscrew it so you can work on it easier. The stock crossover diagram is listed on the next page as a reference if you should choose to return your system to the standard crossover.

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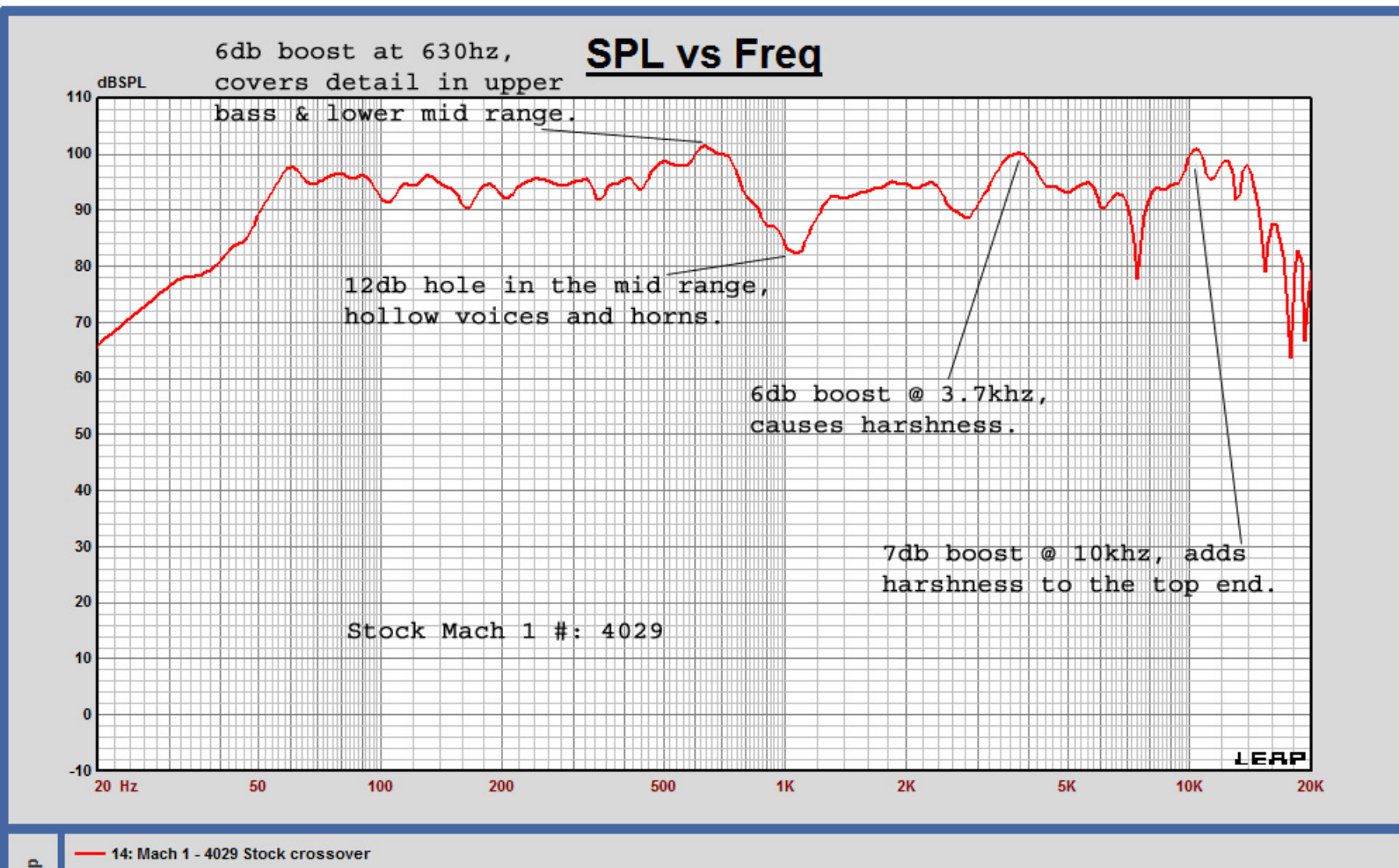
Analog Passive | Analog Active | Digital IIR | Digital FIR

Allpole Elliptic Equalizers Conjugates

Components Schematic SPL Voltage Impedance



The graph below notes the issues with the stock crossover in the Mach 1 4029 model. The new crossover addresses these problems using the stock drivers other than the repair and mods listed for the midrange driver on the previous pages. The new crossover will flatten out the SPL curve as well as smooth out the phase curve. The graph below shows a few major peaks and dips in the SPL of the speaker. These contribute to the opinion some have had of the Mach 1 as being dark, harsh, etc. With these changes that all changes!! PLEASE NOTE THAT WITH THE CROSSOVER CHANGES MADE, THE NEW POSITION ON THE MID AND TWEETER CONTROL PANEL WILL BE AT THE SETTING OF -3DB FOR EACH KNOB. The reason is the new transfer voltage is higher now. We could of replaced the resistors as well but did not to keep the parts count and cost down. In the level 2 upgrade that will be changed and 0db will become the neutral position again.



The new parts required for this mod is listed below. All parts can be purchased at www.partsexpress.com, mcmelectronics.com and many other supply houses.

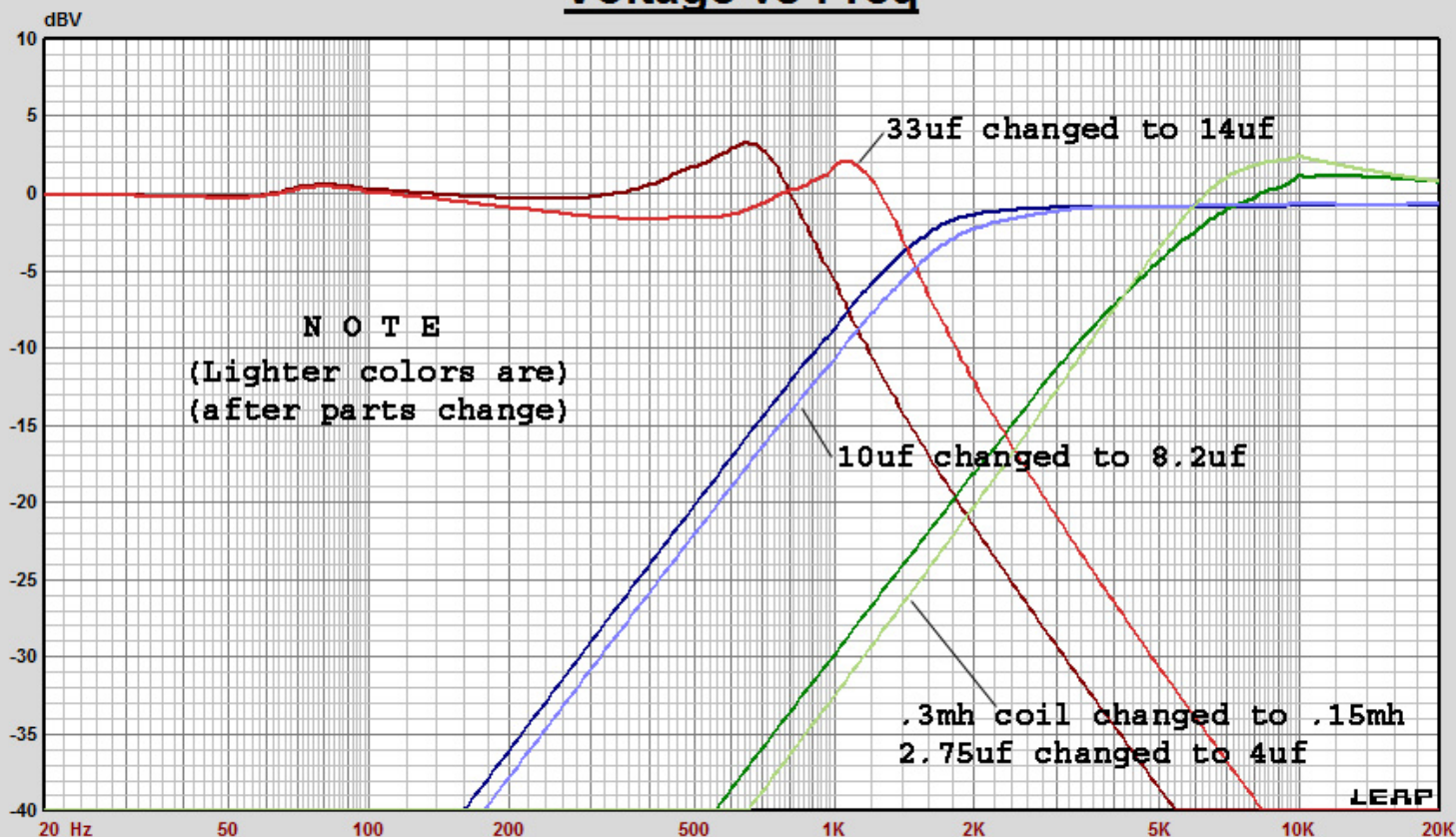
- 14uf Capacitor non-polar 50 Volt or greater
- 8.2uf Capacitor non-polar 50 Volt or greater
- 4uf Capacitor non-polar 50 Volt or greater
- .15 mh Inductor Coil 22ga or larger wire

I have provided a stock crossover diagram but also recommend that you take a photo of the stock crossover before you start to modify it, just for your reference.

- 1..Replace the 33uf with the 14uf.
- 2..Replace the 10uf with the 8.2uf
- 3..Replace the 2.75uf (bright yellow) with the 4uf
- 4..Replace the .3mh with the .15mh

Here is a graph of the transfer functions of each crossover branch, both new and old. You can see the difference of the voltage that is feed to each transducer. Note that the voltage now cuts off quicker to the mid and hi frequency drivers. This helps with power handling and lowers distortion!

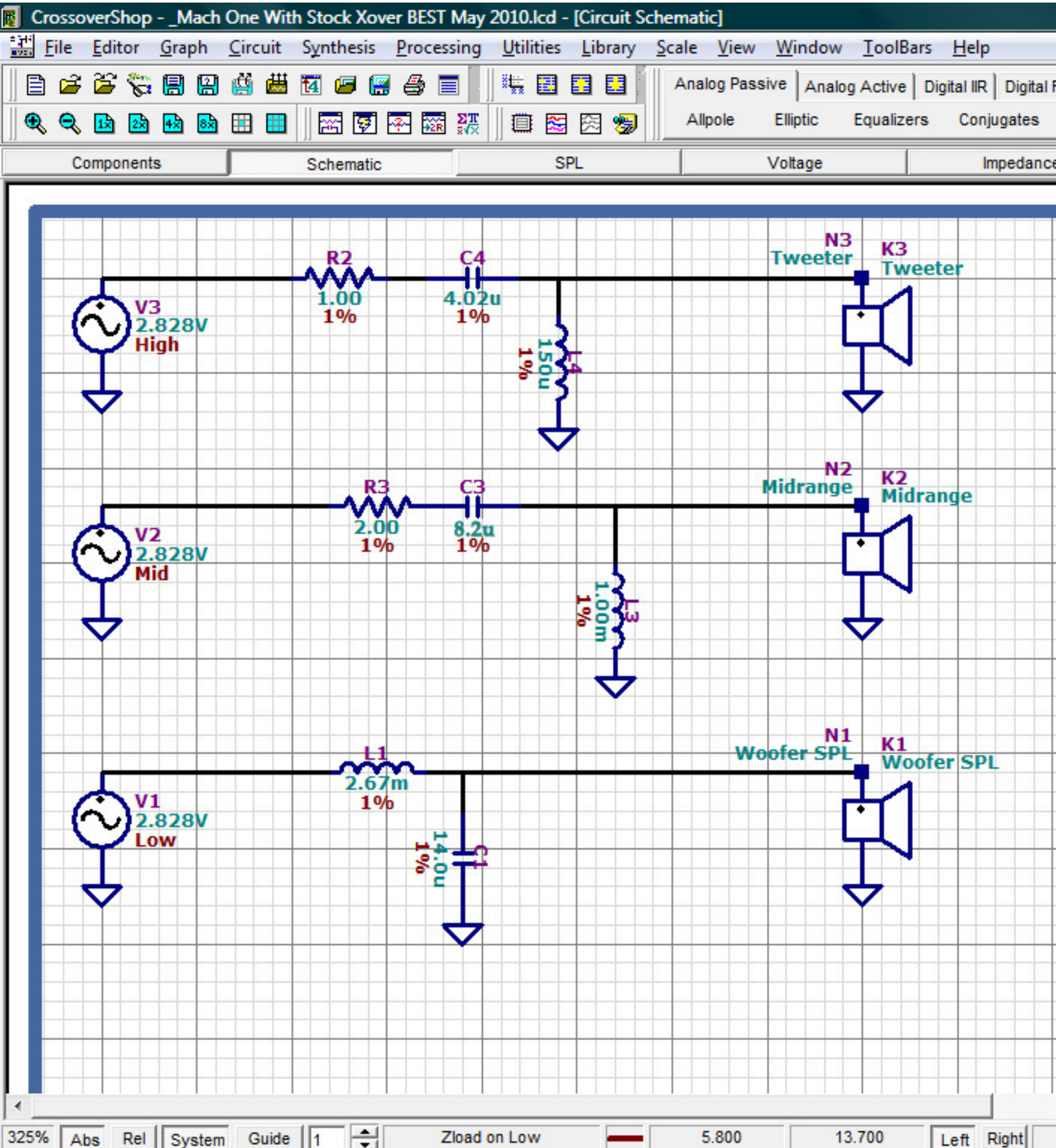
Voltage vs Freq



Map

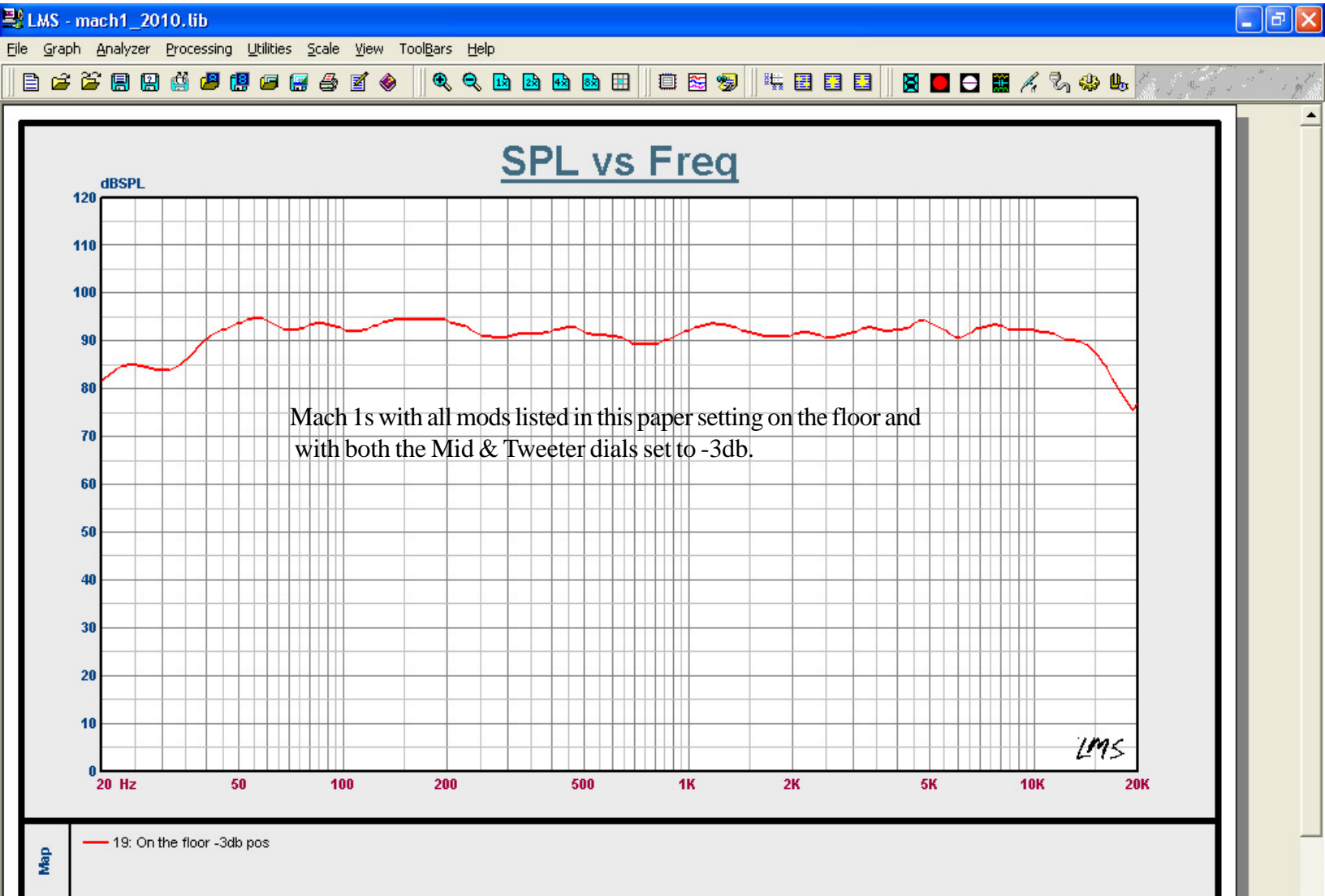
- | | |
|-------------------------|-------------------------|
| — 25: VoltTF Woofer SPL | — 28: VoltTF Woofer SPL |
| — 26: VoltTF Midrange | — 29: VoltTF Midrange |
| — 27: VoltTF Tweeter | — 30: VoltTF Tweeter |

Here is a circuit diagram of the Mach 1 4029 crossover with the new parts installed for reference.



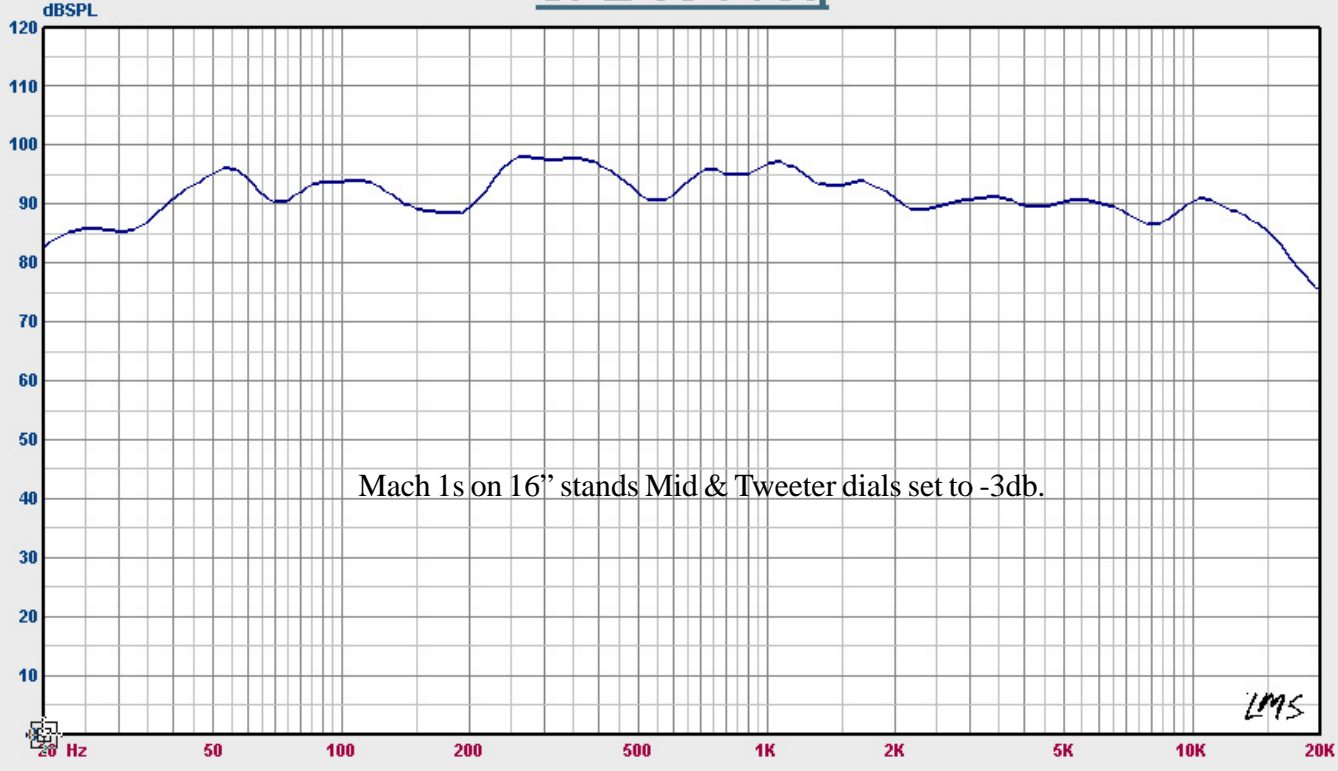
Now it's time to reinstall the crossover if you removed it for the mods. Now put the insulation back into the cabinet and reinstall the woofer. Be sure to check the polarity on all connections. Once the cabinets are back together and you have doubled checked everything, connect an ohm meter to the speaker wire terminals on the speaker system to confirm there are no shorts. It should read around 6.5ohms. If it reads below 6 or above 7ohms, please recheck all the connections and that the parts you changed in the crossover are in the correct place. It should read right at 6.5 or 6.6 ohms. If all checks out you are ready to hook them up and listen! NOW A FEW NOTES ABOUT PLACEMENT.

This design is with the Mach 1s placed on the floor. Diffraction effects do a lot of damage to the SPL response if they are on stands or lifted off the floor. You can still place them anywhere you like, I just want you to understand the effect it will have on your speakers. The graphs below show the difference with them on the floor and on stands. Please note how much smoother and more linear the SPL is when they are on the floor. Because of the narrowing of the woofer response off axis, it is important that the speakers be toed in toward the listener. We have taken a speaker that was +/-10db and converted it to a speaker that is now +/-2.5db, 75% more linear response! See graphs below:





SPL vs Freq

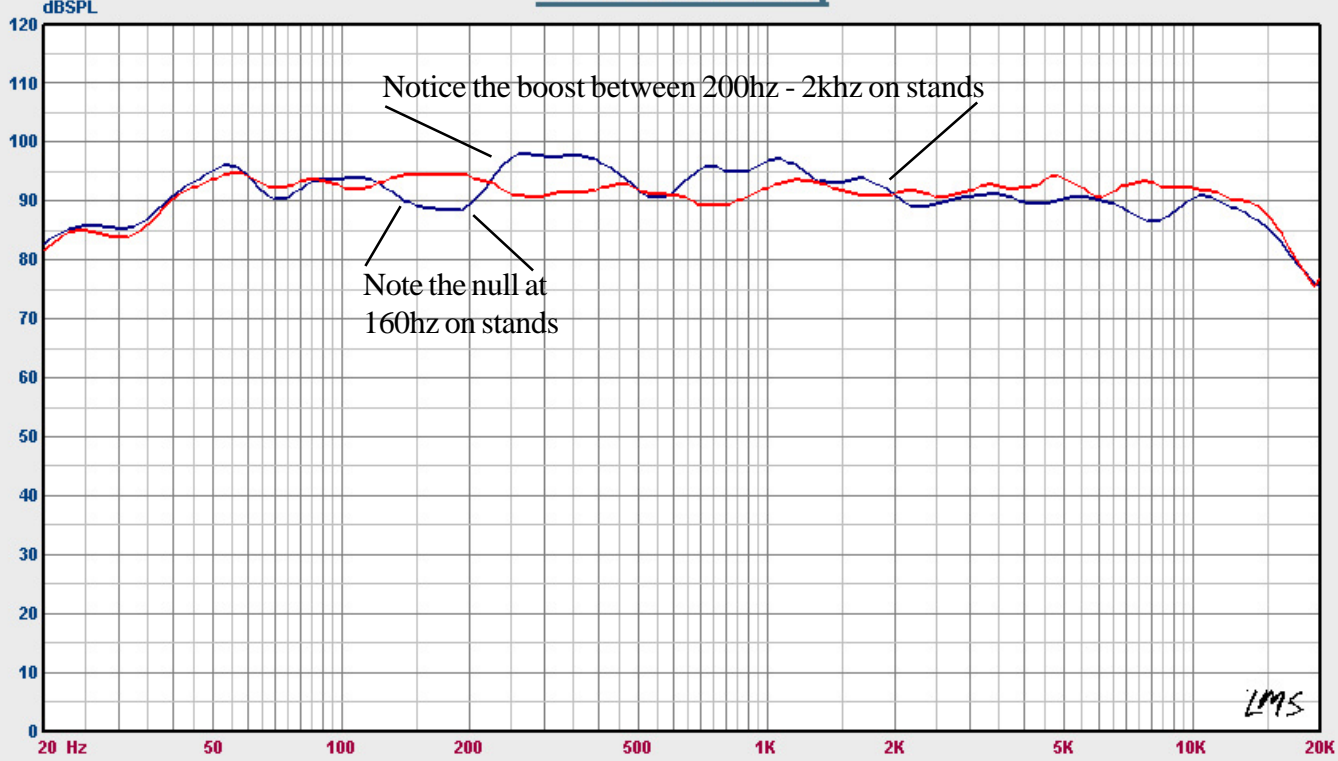


Map

15: 16" off ground on stand



SPL vs Freq



Map

15: 16" off ground on stand
19: On the floor -3db pos

Please feel free to contact me with questions at:
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