Matt’s Project Q

- Design Goals -

One of my good friends approached me about a year ago and mentioned that he was looking for a set of studio monitors, and wanted me to consider building a set for him. I got to thinking about what driver combo’s I’d like to use and what the objectives of the project would be. Obviously there were some size requirements, so they couldn’t stand 5’ tall like my other speakers. Also, unlike my other speakers (Matts Traps here in the project showcase…which I dearly love the sound of but are anything but flat), they needed to be as flat as possible when it came to frequency response, and also be listenable from about 1 meter away (nearfield). I wanted the efficiency around 90db, and overall super accurate sound. Since these were most likely going to also need some custom amps, I wasn’t worried about any low impedence dips.

- Driver Selection -

After thinking for a while, well, a real long while, my mind settled upon the driver combo. WWMT config, 2x Dayton 7” aluminums for the low end, audax am130z2 mid, and vifa xt tweet. The daytons were chosen b/c of their ruggedness and their low frequency extension. I didn’t need to be anywhere under 30 hz, b/c a sub will take care of that eventually. The audax, so I’ve heard, had nice mids, and wasn’t nearly as expensive as a seas excel, nor as difficult to work with. The xt, well, I chose it for the $ and for the completely transparent highs that it produces.

- Enclosure Construction & Assembly -

Now onto the box. One of pitfalls of this project was my lack of free time. As a dental student, I have little to no free time. So when I heard of Erik Francey’s custom MDF cutting service, I recommended to my friend to shell out the cash to get it done. Erik made the box up in CAD, and then CNC milled all the pieces I needed. When it shipped a few weeks later, I was super impressed. There were a few mods to make to the box to get everything to fit perfectly (ie, a dremel tool) because everything was so tight, but it all went together nicely. He cut the mid and tweet cutouts for flushmount. Boy was that handy b/c it would have taken me

a long time to do on my own. One mod I made to the box was I added an extra piece of MDF for a space for the crossover (see the pics). This was done easily w/ my router at about 3 AM during our Thanksgiving break.

- Crossover Design -

Once the boxes were together and all the drivers were temporarily mounted, crossover work began. My friend, per my recommendation, had bought $250-300 in xo parts. When the preliminary xo was hooked up, we both thought …"dang, that doesn't sound so good". I didn't worry too much though, because I knew it'd be about 6 months before the crossover would be finalized. Since Thanksgiving, I've been working with Soundeasy v8.0 in my free time to get the crossover correct. I've had to learn how to use Soundeasy as well as figure out what we needed for crossover parts. Enter John K. I've known John existed for a while now, and only recently did I figure out he lived in Connecticut. Turns out he's 30 minutes away from me. After telling me about how I did half a dozen things wrong w/ the crossover, and then making some of his own modifications, the crossover is finalized. Here is the final frequency response.

- Conclusion -

I've spent months listening, and honestly this is one of the best speakers I've ever heard. I've been to many DIY meets, and heard a LOT of speakers. I think this one would definitely stand out among the best. The soundstage, balance, and accuracy is stunning. They really show some flaws in recordings….which is exactly what they were designed to do. If anyone is interested in a super accurate speaker, this is it.

What to do if you want to build these:

1. Email Erik Francey efrancey@yahoo.com buy the boxes from him…it saves so much time and you still get to put everything together and finish the boxes etc.
2. Email me if you have any questions mattyo5@aol.com
3. Tools: drill and drill bits, screws, glue of choice, egg crate foam, router (possibly), dremel (oh yeah), soldering iron, silver solder (silver is best, I used WBT 4%)
4. Total cost - well, that's a good question…drivers cost about $300, I recommend you spend about $250 on xo components, though you can go cheaper, boxes (talk to Erik about $…its well worth it) miscellanous stuff $200-300 depending on if you use super duper wire or mahogany veneer etc. so about $1k to do it right for the whole shebang, maybe $500 if you do it on the cheap, its up to the builder

Additional notes:

1. These speakers were finished with duplicolor truck bed coating to make them rugged….though feel free to put a veneer on them
2. Buy the audax mids asap b/c audax is not going to be available much longer
3. Don't ask to substitute drivers….why? because the crossover is optimized for these drivers specifically, any other driver substitution will make this design your own, not mine and might compromise sound quality
4. I put a bevel on the front baffle…the speaker doesn't need it to test flat, though I like the look of it and the bevel might help w/ diffraction as well

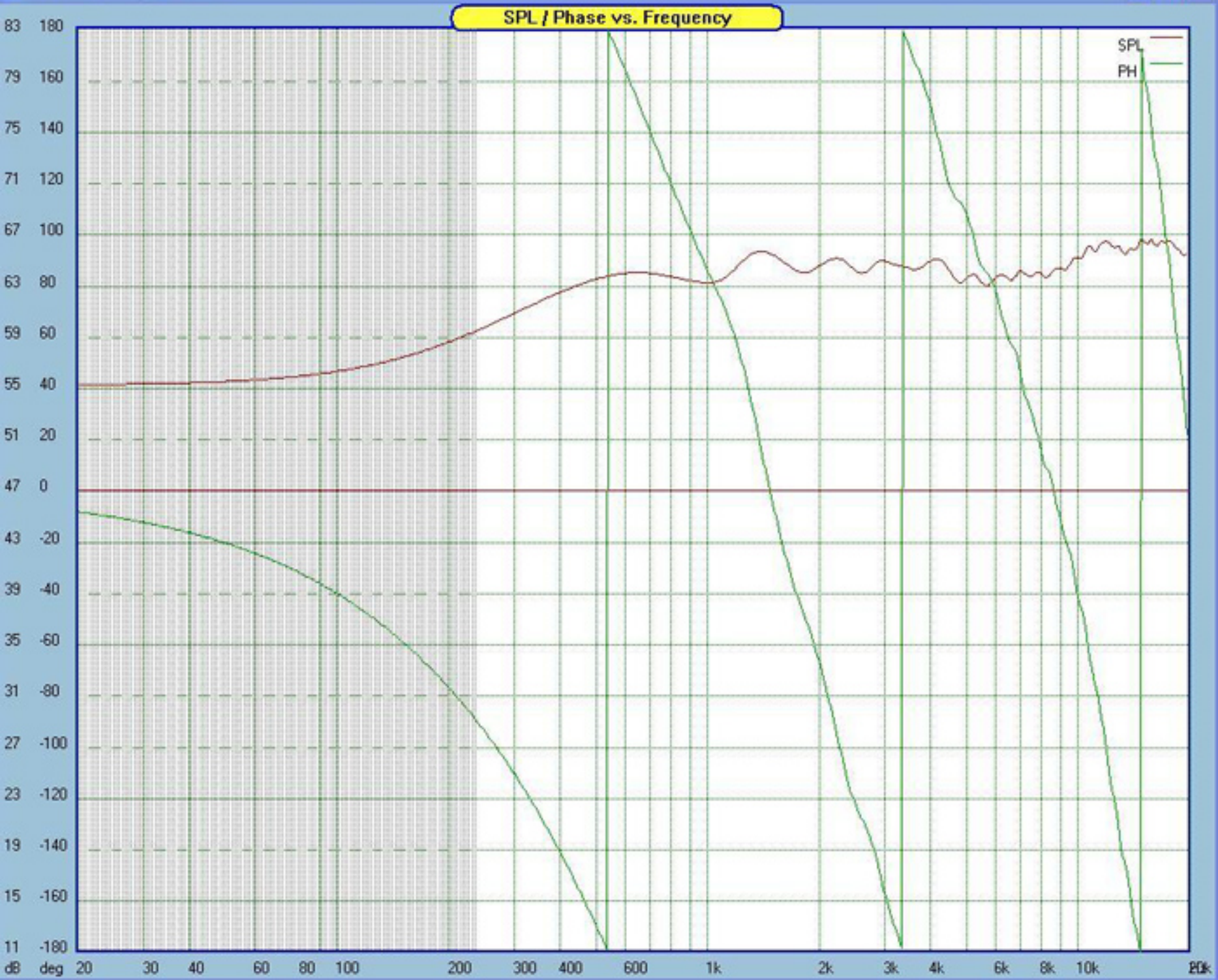
Special thanks to:

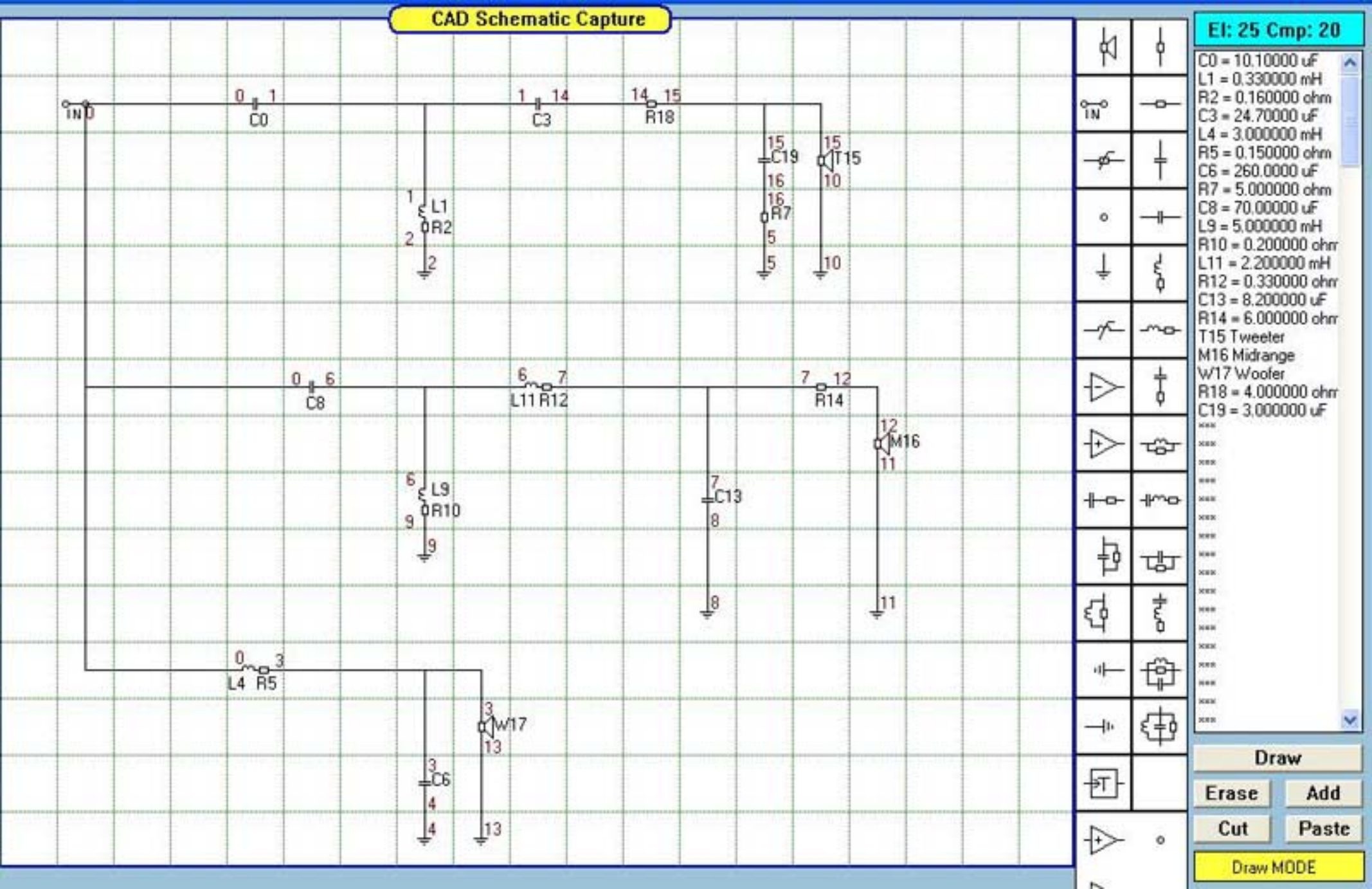
- Mike Q. – for the idea and the $ and the inspiration to keep this project going, and for the good home these will go to, and for buying Soundeasy for me to use, we would have been toast without it
- My wife Katrina – for putting up with me during this project, I love you.
- Jeff K and Dave K – for moral support and help with the boxes
- Erik Francey – those boxes rock buddy, just what we needed
- John K. – you da man! Thanks for helping finalize the crossover and your contructive comments on the sound!
- Mike Q's family – for putting up with us in the garage using the router all night long
- Bill C. – for the constructive comments on the sound
- Partsexpress – for a great forum and a great project showcase to show these off and a one stop shop for these speakers.
- Wil, Aaron, and many other board members who have helped over the years make this project possible
- Bohdan at Bodzio software – Soundeasy ROCKS

- Parts List-

4x Dayton 7" aluminum woofers pe# 295-335
2x audax am130z2 mids pe# 296-064
2x vifa xt tweetspe# 264-55
2x 2.2mH air core 14 aug
2x 5.0mH iron core erse super Q
2x 3.0mH iron core erse super Q
2x .33mH 15 aug Jenzten air core
4x 10uF Dayton 250v polypro cap
2x 24.7uF Dayton 250v polypro caps
10x .1uF 400v Dayton polypro caps (optional)
2x 100uF 100v bipolars + 4x 80uF 100v Bipolars (solens or large daytons ok to substitute…but expensive) + 1uF bypass also optional …total 260uF
2x 60uF solen or Dayton 250v caps + 10uFs (already in list) + 1uF bypass (optional)

3.0uF Dayton 250v polypro caps
8.2uF Dayton 250v polypro caps
2x Mills 4 ohm resistors
2x Mills 6 ohm resistors
2x Dayton 5ohm resistors
terminals, solder, speakerwire, cascade quite kote dampening spray etc. up to the builder


SPL / Phase vs. Frequency
SPL
PH
83 180
79 160
75 140
71 120
67 100
63 80
59 60
55 40
51 20
47 0
43 -20
39 -40
35 -60
31 -80
27 -100
23 -120
19 -140
15 -160
11 -180
dB deg
20 30 40 60 80 100 200 300 400 600 1k 2k 3k 4k 6k 8k 10k 20k


CAD Schematic Capture
IN
C0
C3
R18
C19
T15
L1
R2
R7
C8
L11
R12
R14
M16
L9
R10
C13
L4
R5
W17
C6
EI: 25 Cmp: 20
C0 = 10.10000 uF
L1 = 0.330000 mH
R2 = 0.160000 ohm
C3 = 24.70000 uF
L4 = 3.000000 mH
R5 = 0.150000 ohm
C6 = 260.0000 uF
R7 = 5.000000 ohm
C8 = 70.00000 uF
L9 = 5.000000 mH
R10 = 0.200000 ohm
L11 = 2.200000 mH
R12 = 0.330000 ohm
C13 = 8.200000 uF
R14 = 6.000000 ohm
T15 Tweeter
M16 Midrange
W17 Woofer
R18 = 4.000000 ohm
C19 = 3.000000 uF
Draw
Erase
Add
Cut
Paste
Draw MODE