

Speedster TMM

Not long after I finished the original [Speedster](#), people began asking for larger versions of it... usually an MTM, bookshelf and/or tower. And I resisted again and again. I was perfectly happy with the Speedsters as they were. The fact that they were petite speakers with powerful drivers sort of embodied the whole spirit of a

speedster. To put more drivers in there and make the speaker bigger... well, what is it then? A speedster limo? I dug my heels in as good as I could to not design a larger Speedster, but eventually I was worn down. Little did I know how complex of an ordeal I was in for.



A bit of back story on the TMM design

Long before I even began this project, everyone assumed that--when and if it did happen--this "Speedster limo" would need to be an MTM, and the woofers would need to be wired in series. This assumption was made based on the fact that the Tang Bang W4-1720 is sold as a "4 Ohm" woofer, and running two of them in parallel would be too difficult a load for most home amplifiers. So when I finally did get around to mocking up a cabinet, measuring, and designing a crossover, I found myself disappointed at several logistical problems with this series MTM arrangement.

First, I didn't like the way it looked. As a bookshelf, the proportions never felt right to me because the cabinet needed to be either very tall or very deep, in order to keep the 6" width. As a floor stander, well, a Speedster MTM just looked ridiculous. Way too tall and gangly.

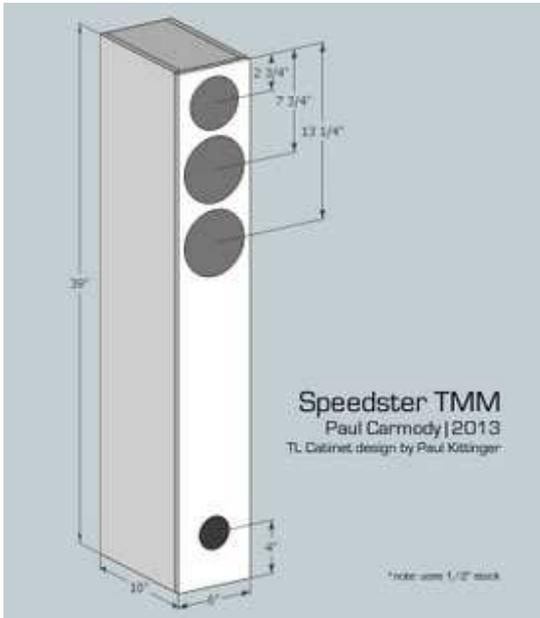
Second, it turns out that the W4-1720 isn't really a 4 Ohm woofer. I'd call it more of a 6 Ohm, and as such, running two of them in series was making the total impedance of the speaker unnecessarily high, never going below 11 Ohms or so. Due to this high impedance, the speaker was also extremely inefficient.

Last, and perhaps most important: it just didn't sound all that great. Sure, the dual woofers gave it more power handling (assuming you had enough power on-tap to push the low-sensitivity slugs), but this Speedster MTM didn't offer any other advantage over the TM. The TM was still clearly more enjoyable to listen to.

So I began playing with wiring configurations... maybe a 2.5-way TMM? How bad of an impedance load could it really be? Not that bad, it turns out. The impedance of the Speedster TMM dips down to 4 Ohms, but that's about on-par with most MTM designs out there. So it was definitely within the realm of possibility. Next up was to sketch up some cabinets... floor standers... ahh, with the tweeter at the top, the tower could be shortened, and thus didn't look quite so awkwardly tall. Now I had something to get excited about!

Enclosure Design

As I pondered this floor standing TMM tower concept, I thought that it might be a good candidate for a Transmission Line enclosure. I proposed the idea to Paul Kittinger, a man who has designed more TLs than anyone I'll ever know. I supplied Paul with the TS parameters of the woofers and my cabinet designs, and he supplied me with a mass-loaded TL and a boatload of graphs (which, unfortunately, Gmail seems to have deleted on me).



According to Mr. Kittinger, this TL has a vent 2.5" diameter by 4" long. The top 25" of the cabinet is stuffed at a uniform density, requiring a total of ~10 oz of polyfil stuffing. This, combined with the internal height and volume, tunes the enclosure to 41 Hz. It will achieve an F3 in the upper 30 Hz range.

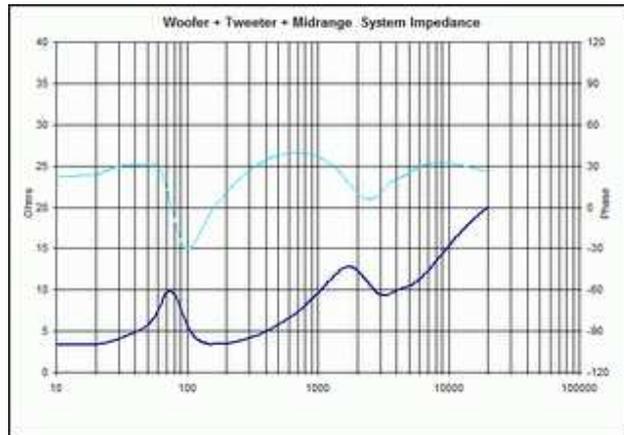
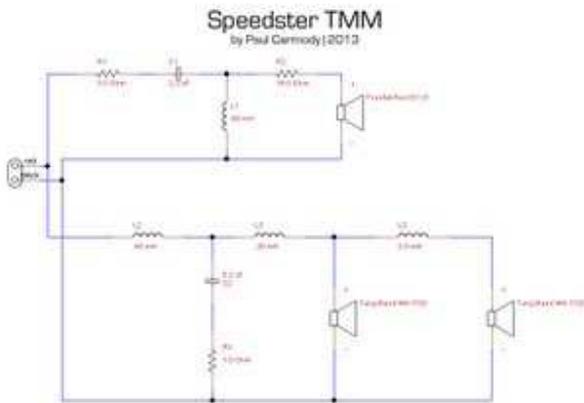
The design you see to the left uses 1/2" stock, because that's what I used in mine. I know that some people will insist on using 3/4" stock, and in that case, the dimensions would be 6"W x 39.5"H x 11.5"D.

Crossover Design

As a general rule, if you see a TMM speaker, its crossover probably uses a 2.5-way topology. This is usually achieved by using a traditional-looking 2-way crossover, but with an additional woofer in parallel, and between the two woofers, an inductor to provide additional roll-off (in this case, inductor L1). The goal of the 2.5-way topology is twofold. First, since the bottom woofer doesn't have to play so high, it won't have interference problems with the tweeter. Second, since the bottom woofer is now intended to assist with lower frequencies, it can help make up for lost bass from baffle-step losses.

It seems pretty simple on-paper, but in reality, getting a TMM 2.5-way to sound effortless is tough. It takes quite a bit of patience fiddling with the overall balance of both the woofer and tweeter filter to properly integrate that bottom woofer. After all, the goal of the second woofer should be to increase sensitivity of the speaker as a whole, but unfortunately, I've heard a lot of designs that use that lower woofer to simply pump in more bass. The result of these is a speaker that tends to sound "tubby," and overly bassy. Don't get me wrong, I like bass as much as the next person, but at the end of the day what matters to me is **balance**.

Enough rhetoric. The crossover here is not too complicated. The woofer filter is basically a 3rd order electrical (with the resistor R3 used to contour the response a bit), and Inductor L4 used to push the roll-off frequency of the second woofer nice and low. The tweeter filter is basically just a 2nd order electrical, with padding resistors in series on either side.



As mentioned previously, although the [Tang Band W4-1720](#) is billed as a "4 Ohm" woofer, its impedance really doesn't dip much below 6 Ohms. As a result, using them in a parallel doesn't create as tough of a load for an amp as one might expect. What you see in the impedance curve above isn't anything different than you'd see from the average MTM with paralleled 8 Ohm woofers. Bottom line: the Speedster TMM should be no problem to drive with any mid-fi amp or better (eg: if it's rated for "6 Ohms," you're golden).

Closing Thoughts

Maybe it's just as well that this project took so long to come together. After dragging my feet, eventually giving in, trying out different cabinets and topologies, and finally ending up at a place no one expected, it all seemed to come together so neatly. It's a killer little speaker that delivers well on many fronts: high WAF, deep bass, good sensitivity, and even some exotic drivers thrown in for good measure. Way better than any sort of "Speedster Limo."