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**Subject: Building a Pro Sound Speaker Pair**  
Posted by [AudioFred](#) on Sun, 12 Sep 2010 12:14:30 GMT  
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We host house concerts, and I need a pair of good sounding pro-type speakers. I've auditioned some lower priced commercially available speakers such as the Peavey PR-12 (\$169 street price) and they don't sound very good to my ears. I've also auditioned some expensive speakers such as the JBL MRX512M (\$650) and they do sound good, but they're out of my price range. Sound quality is far more important in a house concert setting than it is in the typical noisy bar gig situation.

So I'm considering diy speakers using a 12" woofer with a compression horn. I would like something that sounds as good as the Three Pi speakers I once owned, but in a much smaller ported cabinet (about 1.5 cu ft) for light weight and portability. The speakers will be stand mounted for the concerts. Sound levels at these concerts are typically in the 100-105dB maximum range, and bass response below about 60hz isn't important in this project. The speakers will be driven by a 600w/ch powered mixer.

I was thinking of something along the lines of the Smithereens in the PE project showcase, but with the Eminence H290 horn substituted for the LT250 used in this project (I prefer a bi-radial horn to a CD type). I plan to use the PE #245-325 birch cabinets.  
<http://www.parts-express.com/projects/showcase/indexn.cfm?project=Smithereens>

I'm wondering how I could adapt the Smithereen crossover for use with the 290 horn, or better, to adapt the Three Pi crossover for use with the Selenium 12WS600 woofer. Any suggestions?

For the curious, here's a link to our facebook house concert page:  
<http://www.facebook.com/pages/The-Thompsons-House-Concerts/262719984449?v=wall&ref=nf>

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**Subject: Re: Building a Pro Sound Speaker Pair**  
Posted by [Wayne Parham](#) on Mon, 13 Sep 2010 02:38:23 GMT  
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In my experience, when building two-way speakers, small ones are much easier to design than larger ones. The smaller boxes don't have standing waves in the lower midrange like the bigger ones do, so you don't have to concern yourself where the woofer and port goes. Smaller cabinets have internal standing waves too, but they line up higher in frequency where the insulation can effectively damp them. The only thing is you'll trade off bass extension or efficiency. I'd probably opt for the former - trading off extension - and employ subs.

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**Subject: Re: Building a Pro Sound Speaker Pair**  
Posted by [AudioFred](#) on Mon, 13 Sep 2010 13:07:57 GMT

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Wayne Parham wrote on Sun, 12 September 2010 21:38

...I'd probably opt for the former - trading off extension - and employ subs.

The smaller cabinet is a requirement because these things need to be portable, and fortunately deep bass isn't needed in this application. These speakers will reproduce voice and acoustic guitar only - if a performer is playing an electric guitar or a bass I'll borrow a separate combo amp. So the problems are 1) to select a 12" driver that will work in a 1.4 cu ft ported enclosure, and 2) build a crossover that will work with that woofer plus the Eminence PSD2002 compression tweeter and H290 horn.

The two best candidates for the woofer seem to be the new Dayton 12" pro woofer and the Selenium 12WS600 woofer. The Selenium is twice the price of the Dayton, but with its cast frame, larger voice coil dia, heavier magnet weight, greater power handling capacity, etc, it appears to be a much higher quality driver than the Parts Express. For the tweeter the Eminence 2002 with the 290 horn is a no-brainer for me because I used to own a three Pi and remember how good that tweeter sounded using good quality crossover parts and wiring. The 2002 costs a bit more than some others but it seems to have better high frequency extension.

If I can trust my Xover three pro software, a woofer crossover that's much like the three Pi should work, with some different values for the woofer shunt cap and compensation network resistor and cap. I believe I'll go with that, and I expect to end up with a pair of speakers that are comparable in sound quality to the JBL MRX512M, and maybe even better since JBL uses iron core inductors and cheap caps even in their premium speakers. A musician friend owns the JBL's, so we'll be able to do a side-by-side comparison.

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**Subject: Re: Building a Pro Sound Speaker Pair**

Posted by [Wayne Parham](#) on Mon, 13 Sep 2010 14:42:20 GMT

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You can generally swap woofers having similar frequency response and impedance curves up high. The crossovers need rework if the upper end of the woofer is too different, because acoustic phase is off. But in general, I've found that if the response and impedance curves near upper cutoff are pretty similar, the crossover will need little adjustment. The Zobel is sometimes the only thing that needs to be tweaked. Obviously, you'll have to match sensitivity but that's just a matter of picking the right R1/R2 values.

What can throw you off is when swapping a midwoofer without a shorting ring with one that has one. Sometimes, the swap works with just a Zobel change but more often than not, you'll need more modification than that. Another is if moving mass is so much different that the rolloff curves don't match. Of course, too much mass can make the woofer unsuitable for the crossover point, so that's easier to spot. But either way, the point is things that change the phase require

modification of the crossover to dial it in. You can usually get an idea how much modification is necessary looking at the raw impedance and response curves.

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Subject: Re: Building a Pro Sound Speaker Pair  
Posted by [Bill Wassilak](#) on Fri, 18 Feb 2011 19:07:53 GMT  
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To bad it's been so long since I've been on the board, and this is an old post. But I would of recommend your pi4's, only with Eminence with Kappalite 3015LF's. The Pi4's are a potent little box for clear mids and highs, mounted (permant install) or on sticks (speaker stands). It's a small box and would of been capable of a variety type of music that Fred's doing.

I'm Back  
Bill

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Subject: Re: Building a Pro Sound Speaker Pair  
Posted by [Wayne Parham](#) on Fri, 18 Feb 2011 19:55:59 GMT  
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Wow, cool to see you back, Bill!

You still in Tulsa?

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Subject: Re: Building a Pro Sound Speaker Pair  
Posted by [Bill Wassilak](#) on Fri, 18 Feb 2011 20:40:41 GMT  
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Not right now, I'm in Farnborough England.

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Subject: Re: Building a Pro Sound Speaker Pair  
Posted by [Wayne Parham](#) on Fri, 18 Feb 2011 20:48:59 GMT  
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On a simulator job? When will you be back?

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Subject: Re: Building a Pro Sound Speaker Pair  
Posted by [Bill Wassilak](#) on Fri, 18 Feb 2011 20:55:53 GMT  
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I'll be back in T-Town the begining the first part of March.

Sorry it's been so long since I've been on the board. I had problems logging on till now since you changed it, till now.

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