Subject: Journal of a First-time Builder - Pt 4: Functioning Speakers x2!
Posted by GarMan on Wed, 19 Nov 2003 14:36:59 GMT
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The weather over the weekend was good and I was able to complete the first speaker to be fully functional. The first thing I did on Saturday was take the fiberglass insulation back. My wife gets itchy just looking at it and certainly does not want the stuff in a semi-opened cabinet in the living room. So I dropped by Audio Hardware Inc, a local shop in Toronto, and got a sheet of acoustic "egg-crate" foam for $30 (Cdn). I didn't measure it but it was very large, approx 5x10 and ranged from 1" to 2" in thickness. We talked about speaker building for a bit and he gave a twenty bolts and T-nuts for free. Sez it's the best way to install woofers. He also recommended I get some adhesive-backed foam weather stripping from Home Depot for use as gasket for the woofer.Photos of the foam and T-nuts are posted in the link below.The acoustic foam was very easy to work with. Measure and cut to size. Holds it shape extremely well so holes and slots can be cut directly from the sheet to go around bracing. Also, no need to wear a mask and glove to handle it. The front of the cabinet (up to the woofer), one side and bottom was lined with this stuff. Cut a 4 3/4" port through the 1" back baffle, woofer installed with the t-nuts, tweeter with wood screws, back panel clamped on, and there you have it, functioning speaker.How did it sound? I didn't want to make any comments until I could listen to them as a pair.As a first time builder, it took me two and a half weekends to complete one functional speaker. I had to figure out a lot of things on my own along the way. I also went a little overboard on the build, using 1" MFD, dowel joints, and extra bracing. I was interested in seeing what experience will bring to the second cabinet.Sunday morning, I went back to the Building Box to get another sheet of 1" MFD cut for the second Tower. Give them a cutting plan and the first five cuts are free, $1 for each additional cut. If you don't have a table saw, this is the service to use.What have the past two and a half weekends taught me? How to build a functioning 2Pi Tower speaker in four and a half hours. That's right. Over 20 hours for the first speaker, and only 4 1/2 for the second one. And no cutting corners. Talk about learning curve. In fact, I think the second cabinet is even better built than the first, with only one edge that not completely flushed.LISTENING IMPRESSIONSWith two functioning speakers in place, how did it sound? Before I go on, I'd like to put some disclaimers in place:- The speakers were not built "exactly" to Wayne's plans. 1" MFD instead of 5/8", although internal dimensions were kept to spec by increasing external dimensions. Port size was increased to 4 3/4" due to the 1" baffle and additional bracing was added. "Egg-crate" foam was used instead of R13 fiberglass, and the bottom was lined instead of the top.- Listening impressions are based on using the speakers on my system. CDP is an old Sony unit. There are certainly flaws with it, but I've never found it "objectionable" in its music presentation. Integrated amp is an ASL 1001, using 4 KT88 in push-pull, with outputs of 25W in triode mode and 50W in ultralinear. I always keep the amp in triode mode.- My living/dining room is open concept and measures over 20'x15', with ceiling height over 12'.- The drivers are still relatively new with only 10 hours on them.- The back panels are not sealed. However, all edges and joints have been planed and sand to fit flushed and the panel is clamped very tightly in place.So on with my impressions:You are going to have to invest in a very expensive subwoofer to improve the bass on these speakers. WOW! Bass is not just about the thump-da-thump in dance music. In fact, I think deep bass is more important for jazz and classical than dance. These speakers give the upright bass the presence it deserves in jazz trios and percussions jump out in classical.Dynamics is excellent. The efficiency of these speakers gives music a presence that you only find in live performances. Live recordings like Diane Krall in Paris, Jazz at the Pawn Shop, Nirvana Unplugged, Clapton Unplugged are especially good with the Pi towers. The speakers are so

effortless in delivering volume that it?s easy to get it up there without realizing it.Imaging and soundstage are quite good. I've read from some owners that this not an area where the Towers excel, but in my living room, it does a pretty good job. Image is not pinpoint, but it makes up for it with a very wide soundstage. Soundstage is not football field deep, but enough to make music interesting. The midrange is okay, but I wish is could be better. To me, it sounds too clean, almost sterile. It's lacking a level of richness that's needed for truly accurate presentation, and is most noticeable in vocals. I have not decided on whether this is an issue with the midrange, or the lack of midbass, but it is a little too lean for my taste.(WARNING: Negative comments about Pi Speaker in Pi forum) If there is one weakness about these speakers to complain about, I would say it's the highs. The speakers are too bright. I had this impression when I did my quick-n-dirty listening session last week but ignored it because the cabinet was not full completed. But with the port and insulation in place, the speakers are still too hot, especially with vocals. This weakness is more noticeable in some recordings than others. Recordings with vocal that sound good but too bright include: Mel Torme, Diana Krall, Clash, Tony Bennet, some Green Day, and the Unplugged recordings. Recordings with vocal that I find objectionable with these speakers include: Oasis, some Green Day, Collective Soul, and Kylie. You see the pattern, don't you? The speakers don't like recordings with synthesized or processed vocals. Sure, you can argue that the recordings are crap to begin with and the speakers are only revealing what's on the CD. But these recordings have never been objectionable to me in other systems (some being very high end). My CDP is far from perfect, but have never presented these recordings in this manner.FINAL THOUGHTSSomeone once said that there's about a dozen things that a speaker needs to do well to become the ideal speaker, and that even if you spend a million dollars, you'll still not fulfill everything on the list. To my ears, the Pi Towers do a couple of things extremely well (bass and dynamics) and is very competent in other areas such as imaging and soundstaging. The upperbass and midrange is acceptable, although there is room to improve, while the highs are definitely its weakest link.Price-to-performance is always a factor, and considering the kits only cost $120 USD, you do get a lot for the money. I haven't tallied up the costs of material, but it should come in between $150 to $175 CDN, veneer included. For $250 USD total and a weekend's worth of time (for an experienced builder), it's still a bargain. But I'm not sure I'm willing to be happy with a set of speakers that has its flaws but is a great value for the money. If I had purchased the speakers, it would be another matter. But after spending my own time and effort in building these, it's very difficult to accept anything less than excellence. Besides, these speakers demand quite a bit of real estate in my house, so it's got to perform extremely well to deserve the space.I know Wayne has never endorsed tweaking the Tower or the KSN1038 tweeter. But I need to find a way of cooling it down. After going this far, I would even consider paying the extra money and going to a PDS2002 with cross-over. I'll keep y'all up to date on my tweaking.More to come.....

http://f1.pg.photos.yahoo.com/lowgc

Subject: Re: Journal of a First-time Builder - Pt 4: Functioning Speakers x2!
Posted by Matts on Wed, 19 Nov 2003 15:08:21 GMT
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Congratulations on your project! Always nice to have a feeling of accomplishment. On your

midrange, not what you wanna hear, but I think you would be much happier with the R13 in there on three sides, if you can get your wife to try it. I have the regular 2Pi's, with a smaller port, but have never had any problems with it coming out. You can use spray adhesive to hold it in, it's really not a big deal to install but it does smooth out the midrange to one of the speakers strong points. I personally don't think that egg crate stuff does anything, just my opinion. Somethings worth doing, etc.p.s. I've removed & installed installation in hot attic, so if anyone has a complex about it, I do. My son installed it in the Pi's :)

Subject: Re: Foam Insulation
Posted by GarMan on Wed, 19 Nov 2003 16:39:53 GMT
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Matt,I think the foam I used is doing its job. My understanding is that you're suppose to stuff the cabinet to the point where only low bass is coming out of the port. I've experimented with padding on zero to five sides of the cabinet and the three-sided padding that I have now seem best. With no padding, both bass and midrange comes out of the port, while five-sided padding reduces too much of the bass.Maybe my cabinet's over-dampened?gar.

Subject: Re: Foam Insulation
Posted by Matts on Wed, 19 Nov 2003 17:34:47 GMT
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Might be, if your midranges aren't there the way you want them to be. It should be fairly bright and accurate in the mids.

Subject: Re: Hats off to Garman!
Posted by BillEpstein on Wed, 19 Nov 2003 19:43:43 GMT
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The Piezo tweeter is a strange beast. I hated it firing up at an angle on the Pi variation I built, I thought the treble was outstanding in Wayne's room at MAF, and others have found it "hot" or just right. Go figure. There are alternatives but most are inefficient and have colorations of their own. A very good alternative is what "Godzilla" posted on the single driver forum for a Radio Shack version of the KSN. He removed the "cone" from the basket and coated it with varnish, damped

the basket with Mortite and put a ressitor in series. Some or all of that may work for you. Creating is more like performing than listening

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Subject: Re: Journal of a First-time Builder - Pt 4: Functioning Speakers x2!
Posted by R.wood on Wed, 19 Nov 2003 20:18:00 GMT
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I just finished a pair of studio two speakers, I listened to them before I put r13 in them. and they did sound bright, after the r13 was installed they sounded a lot smoother. I was suprised by the difference. before the r13 I had the treble turned way down, and was thinking oh no this is not good. After r13 was in place I was am quite happy with them. TRY THE R13 IT MAKES A LOT OF DIFFERENCE.

Subject: Re: Journal of a First-time Builder - Pt 4: Functioning Speakers x2!
Posted by R.wood on Wed, 19 Nov 2003 20:36:27 GMT
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You might try pillow stuffing (polyfill) or quilt batting. The quilt batting comes rolled up in a bag just unroll the lengths you need. You may have to double or tripple the layers to get the desired effect. Hope this helps.

Subject: Re: Journal of a First-time Builder - Pt 4: Functioning Speakers x2!
Posted by Tightwad on Wed, 19 Nov 2003 20:48:09 GMT
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Polyester batting might be a decent compromise between the foam and the R13.You can get it cheap at most fabric stores.

Subject: Tweeter Update - Much Better Now! :-)
Posted by GarMan on Thu, 20 Nov 2003 12:23:31 GMT

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I was browsing through some old post here, at diyaudio.com, and at CTS's website and found some information on different applications of piezo tweeters.Let me tell you, putting a resistor across the binding posts went a long way to taming the tweeter. My wife came into the room and asked "What happened? It doesn't sound screechy any more." 22 ohms seems to do a good job, but I want to do some experiments this weekend on other values (lower the value, the more it mellows the sound). Putting a cap in series with the tweeter also knocked it down a few dB's. According to my research, 0.33uF attenuates by 3 dB's.I'm sure the best sound will come from a combination of "mellowing" with resistor and attenuation from capacitor. Just need to find the right combo that sounds right to me.Look for Journal Pt 5 - Tweeter Tweaking next week.Gar.

Subject: Re: Tweeter Update - Much Better Now! :-)
Posted by Manualblock on Thu, 20 Nov 2003 13:43:32 GMT
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Garman no such thing as a decent sounding piezo tweeter they don't exist. If you are building a pi speaker you have to bite the bullet and go with one of the horn designs.

Subject: Re: Recom for Horn?
Posted by GarMan on Thu, 20 Nov 2003 13:58:28 GMT
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Manualblock, would you recommend I try to integrate the PSD2002 with the Alpha10's or go with something like the APT50, which is more similar to the KSN1038 (and less expensive than the PSD2002)?gar

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Subject: Re: Recom for Horn?
Posted by Manualblock on Thu, 20 Nov 2003 14:50:08 GMT
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It may work since the alpha 10 goes pretty high and the 50 has 2500 fs an octave below xover but you would have to run the numbers through some xover design program to be better informed. I would first ask Wayne since he is most knowledgeable and I would imagine you are not the first to be disatisfied with the piezo. I would think that the 2002 would sound great and you would be half

way to a theater 4pi for the future as a thought. The apt 50 is 102 db eff. so there would need to be serious padding. Its hard to recommend without having heard that combination. Good luck and keep us posted.

Subject: 2 Pi mods and thoughts
Posted by jlharden on Thu, 20 Nov 2003 15:57:32 GMT
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Hi Garman, I've been down this road, and considered an APT series driver as well as the Morel MTS-37. The Morel is a horn loaded soft dome tweeter and is supposed to be an excellent device. I haven't changed parts, but found improvement with the piezo after damping the whole rear of the tweeter with mortite. It seemed to smooth them out a bit and could be attributed to lowering the resonant frequency of the plastic horn, or the increase in mass could have just made it less excitable by the woofer interaction. Or, I'm just crazy. There are certain people around who claim to have tamed the piezo tweeters in other designs with a coat of Dammar varnish. I can't comment on the effectiveness of this, and don't intend to find out. I'd still be interested in trying the APT or Morel out. As you've heard, the Alpha 10 woofer does pretty amazing things in that cabinet. Some of the magic of this design is in it's simplicity though. When going to a different tweeter, this will be lost as either way will require a 2nd or 3rd order network, and varying degrees of attenuation. Still, at the 2 Pi's price point, Wayne has a very unique product. I know of nothing else that will "get it done" like the 2 Pi for the money. Good luck and good listening! Jerrod

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Subject: One of my favorite little two-way speakers
Posted by Wayne Parham on Thu, 20 Nov 2003 17:49:44 GMT
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Some people like piezo tweeters, and some don't. I suggest that one should listen to the KSN 1038 before they decide though. It is a distinctly different product than the KSN 1005 "lemon squeezer," which is the model that is most popular in low-cost PA speakers. I don't care for the

said, I think the KSN 1038 tweeter is a good sounding device, particularly for their cost. It has flat response and low distortion, whereas the annoying KSN 1005 peaks in the vocal overtone region very badly, giving it a "spitty" sound which I suspect is the single biggest thing that people don't like.I would not pair a high-efficiency 8" or 10" midwoofer with a 1" compression horn because this is to essentially have two midrange devices. If building a four-way, then a transition from 8" or 10" midrange to 1" compression horn is perfect. But if building a two-way system, I'd rather have a tweeter that is tuned a bit higher because that allows the system to deliver greater bandwidth. After all, a 1" compression horn shares over three octaves of operating range with high-efficiency

8" or 10" speaker, so pairing them together wastes a lot of bandwidth.One of my favorite little bookshelf speakers of all time used a JBL Profesional Series 2115 - which is an 8" full range midwoofer - paired with a KSN 1038 tweeter. The only parts used were a 0.5mH coil in series with the (8 ohm) woofer and a 0.33uF capacitor in series with the tweeter. The coil tamed some rising response in the 8" driver and the capacitor attenuated the tweeter to match. Functionally,

speaker, and it combined a $200.00 JBL driver with a $10.00 piezoelectric tweeter, and it was probably my most popular model in the 80's. Sounded fantastic, and there are still many, many units out there, with happy, long-term owners.

Subject: Maybe this (Peerless horn tweeter)?
Posted by mollecon on Thu, 20 Nov 2003 18:57:37 GMT
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Hi! Great you got the piezo tamed, Garman. If you're still looking for possible alternatives, the Peerless horn tweeter might be a solution - I haven't heard it, though. But the price is reasonable at least.Link to price & specs at Parts Express:

Peerless Horn Tweeter

Subject: Re: One of my favorite little two-way speakers
Posted by GarMan on Thu, 20 Nov 2003 19:06:34 GMT
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Wayne, I hope you didn't take my review of the Towers as a knock against your speakers. I made it clear that it does many things very well and is a great value for the money. If I hadn't built it myself, I'd probably leave it alone. But it's so hard to settle when it contains your own sweat and tears.The 0.33uF cap I put in series with the tweeter last night did help a lot (And I came up with it without even know about the One-Pi Professional!). I will certainly explore other insulation material as well. BTW, going through the archives, you use to recommend the 22ohms across the speaker terminals for tube amps, but have not mentioned it in a couple of years. Is this still valid? When I did it, it did tone down the tweeter.Thanks for the advice on the 1" compression. But just to play devil's avocate, the 12" and 15" Eminence drivers have pretty good SPL up to 3.5KHz as well. How is using a 1" compression with these guys different from the 10"?gar.

Subject: Re: One of my favorite little two-way speakers
Posted by Wayne Parham on Thu, 20 Nov 2003 21:14:38 GMT
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I've rather enjoyed your comments here, and certainly didn't consider them to be negative, either about the loudspeaker system or the components that made it up, including the tweeter. I just wanted to mention my observations about tweeters in this price range, and of the Motorola (now CTS) piezoelectric product offerings in particular.About attenuation of the KSN 1038, this was required for matching with the JBL 2115 because the JBL part wasn't nearly as loud as the Eminence Alpha 8 or Alpha 10. The situation is reversed with the Eminence midwoofers though,

Eminence Alpha 8 or 10, you'll see that the tweeter isn't as loud as the midwoofer. There is a slight shelf, caused by the tweeter's output being less loud than the midwoofer. This is followed by a rise in output from the Alpha's, which is subdued by the coil. But the point is that the tweeter is already generating less output than the midwoofer, and adding series capacitance attenuates it further.If your room is a bit bright or you simply prefer relaxed tone, then additional attenuation of the tweeter may be perfectly suited to your tastes. But the area that is hottest in the current model is actually the 1kHz to 4kHz vocal overtone range, which is covered by the midwoofer and not the tweeter. That's what the series coil is installed to subdue.In regards to addition of a 22 ohm shunt resistor across the speaker terminals, there is absolutely no harm and I still like the idea. My

capacitive load at high frequencies, this may cause come amplifiers a problem, and some might even oscillate.Some SET amps are known to be pretty sensitive to their loads, and I expected that perhaps the output transformer might interact with tweeter capacitance in a peculiar way, again, possibly even setting up an oscillation. So the 22 ohm swamping resistor was suggested to damp the circuit, just in case. There certainly is no harm in doing so.I haven't found a single case where it was needed though, and I personally cannot hear the difference on any amplifier I ever used

would be the first thing I would suggest, if one were to find high-frequency oscillations in the circuit.

Subject: High-end horns and ribbons
Posted by Wayne Parham on Thu, 20 Nov 2003 21:36:38 GMT
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When cost becomes less a factor, there are lots of good products based on technologies having a domed diaphragm driving a compression horn. Your suggestion may also be a good medium-cost alternative.I'm not sure I'd be happy with response limited to 16kHz in a tweeter of this class though. I used to use a device that generated good response out to 40kHz and I loved the way they sounded. Then again, I quickly stopped using them because they were too fragile and easily blown.Another direction I'd look at would be the ribbon devices. The old Infinity EMIT tweeters were really something, and now days there are several manufacturers that provide robust high-efficiency models.

Subject: Re: Foolin' around with the KSN-1038
Posted by BillEpstein on Fri, 21 Nov 2003 00:25:02 GMT
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Having a pair on hand, as well as some 15 Ohm Mills, I've been listening all evening with and w/o. They still have a sound signature too different from the horns but the shunt resistor does change the character enough too enjoy the extra air and sparkle they bring. I had done this back last winter w/o the shunt and that didn't work at all.I'm going to try the varnish over the weekend.I'd have to say that were I building the 2Pi right now I would definitely find a shunt value that worked in my room and never look back.Creating is more like performing than listening

Subject: Re: One of my favorite little two-way speakers
Posted by Manualblock on Fri, 21 Nov 2003 00:32:06 GMT
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Wayne; Glad you have found the time to accomadate with good information on the ksn 1038. Quick question, what is it about certain amplifiers that would cause them to oscilate with the piezo? And does phase shift due to capacitive load account for that shattered sound they somtimes exhibit? This type of discussion is invaluable with knowledgable people please keep indulging us as time permits. Does the 22mic. resistor eat up ampower. My poor experience with them may be due to years of listening to solid state pro-amps.Thanks J.R.

Subject: Re: One of my favorite little two-way speakers
Posted by Wayne Parham on Fri, 21 Nov 2003 02:01:34 GMT
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I've used this particular model of tweeter since 1977 - literally tens of thousands of them - and I've incorporated them with every conceivable electrical network from none to third order to contoured response-shaping filters. I've also tried many of the other piezoelectric tweeter models in this family, and this one was the hand-down winner for me, although I've not seriously investigated the newer larger, more powerful units. As for the family of Motorola tweeters that were introduced in the 70's, the KSN 1038/1041/1056 is by far the best, in my opinion.Since the tweeter acts like a capacitor, inductance in the output stage of an amplifier can set up an oscillation. I've also had more than one experience where certain speaker motors generated back-EMF that chirped the tweeter. It is always a result of speakers with high mass and extremely low Qes - Woofers that

require amplifier damping for "motor braking" control of the cone. If these are connected directly to the piezo, they'll make 'em chirp. So the bottom line is that this device presents a high impedance, capacitive load and if the output circuit requires a low impedance resistive and/or inductive load - as is expected of a motor circuit - then it may become sensitive to such a load. This isn't a problem in most cases, but it is something that an engineer would consider.As for the acoustics of the KSN 1038 device, I find it to be quite pleasant. The KSN 1005, as I mentioned before, is the one that sounds like shattered glass. This isn't a result of the capacitive nature of the device at all, otherwise they would all do it. That sound is due to the shape of the KSN 1005 horn - specific to that horn - which creates a nasty peak in the upper vocal range and overemphasizes the overtones. The KSN 1038 uses a different horn, and so does not share this characteristic.

Subject: Piezos...
Posted by Magnus on Fri, 21 Nov 2003 08:44:03 GMT
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I could not agree more with Wayne on this one. The KSN-1005 is a nasty little fellow, you think your head is going to implode when somebody hits the cymbal. I did a not too scientific measurement on the unit and it had quite a big output peak at around 5 kHz if I remember correctly. I have not used the KSN-1038 but KSN-1141 which I find quite a nice sounding unit. For the price you could probably not find better tweeters. But I replaced it with a titanium compression driver and horn and I am not going back...Now a question to you Wayne, and others of course. What about horn-loaded ribbon tweeters? I know one unit (the Gamma VLD13) which uses this design, but are there others? Seems to me like a good way of combining the best of two worlds, at least at low SPL:s. I am too young to know much about all the weird acoustical devices developed in the 70's and 80's but it would be nice to know more about it./Magnus

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