Subject: P.Audio SD-450 N on JBL 2370 Bi-Radial Horn with Wayne Parhams compensation circuit
Posted by Adrian Mack on Sun, 23 Feb 2003 03:02:26 GMT
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Hey everyone. I'm thinking of using either the P.Audio SD-450 N or BM-D440 compression driver on a JBL 2370 Bi-Radial Horn. I would use Wayne Parham's compensation circuit after reading a lot of posts from him it looks like it works pretty good. Just wondering if I will recieve any troubles with this, or if the P.Audio's are really the ones to use or not. P.Audio stuff is pretty expensive in the USA, but here in Australia it is priced a lot better :) and theres not really any range available in australia and I would like to steer clear of orderering from the US because of high shipping prices. I can get the JBL 2370 bi-radial horns for AU$50 a piece (so about US$25 each) which is pretty good to me. My goal is a smooth response, high efficieny, with wide dispersion and good clarity. I've also considered building a bi-radial horn myself from wood after reading an article found here http://www.woodhorn.com/horn.htm that describes how. When making the horn, how do I construct it fr say 90 x 40 degree dispersion? Is it that the angles have to be 90 and 40 degrees, or is there more to it than that?Are radial and bi-radial horns the same thing? Thanks in advance for any type of feedback.... even if you dont know what your talking about anything would be cool :)

Subject: Radial horns
Posted by Wayne Parham on Sun, 23 Feb 2003 05:50:16 GMT
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Radial horns are those that are extruded along the horizontal axis to form a "pie slice" shape with straight side walls. Their purpose is to provide wider horizontal coverage and their straight side walls generate a uniform dispersion pattern in that dimension, but with narrowing directivity in the vertical plane.Bi-Radial® is a registered trademark of JBL and it is similar, but has a more complex flare shape. The popular 2370 acts very much like a radial horn, having greater horizontal dispersion and narrowing directivity in the vertical plane. Below 1.6kHz, its vertical directivity begins to widen rapidly because of mouth diffraction, and JBL recommends vertical arrays to lower the frequency where vertical dispersion control is maintained. This is true, of course, for all mixed-dispersion horn shapes.For more information, see JBL's 2370 product literature.As for the crossover, both JBL's Bi-Radial® and their older radial horns work very well

This crossover has the additional benefit of damping resonance to prevent peaking near the crossover frequency.

Subject: Re: Radial horns

Posted by Alex on Sun, 23 Feb 2003 06:43:46 GMT
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Hey Wayne. Thanks for the info. I read in the JBL documentation file as well that these horns should be stacked on top of each other. Should they be turned upright though? Or just leave them the same position as normal but have more of them on top of each other. I dont understand how this can lower the freq where vertical dispersion is controlled, I would think it just gives wider vertical dispersion?I think it was you before in another post mentioned something that 2" compression drivers should be used to do up to 20KHz. Is this true? I would like to go for a 2", but if 1" is better.... Oh yea, would you reccomend ANY radial horn? (assuming its the right size) or is JBL for example a lot better than others? (I'm thinking of some P Audio horns, but they dont state weather they are radial, conical etc. How can you tell if a horn is a radial one?). Have you used or heard wood horns before? If so, what do ya think of them? Do they sound "nicer", or in particular, have less of a ringing, horn sound to them? If I do decide to build a horn myself, where can I buy the flange that the horn mounts to? (one that takes bolts, not screw on driver). Cant find them anywhere!Thanks again for any help! Alex :)

Subject: Re: Radial horns
Posted by Adrian Mack on Sun, 23 Feb 2003 06:57:26 GMT
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Forgot to ask is the JBL 2370 the same as the 2370A ?

Subject: Re: Radial horns
Posted by Wayne Parham on Sun, 23 Feb 2003 07:58:38 GMT
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You can array these horns vertically, in fact, I believe they publish polar charts of a vertical array of 2370's. That would help to improve vertical pattern control at low frequencies. The reason it does this is off-axis interference nulls form because of interaction from adjacent horns.Don't rotate the horns because that would give tall vertical coverage and narrow horizontal coverage above through most of the passband, above about 2kHz. Below that, the pattern changes because of mouth diffraction. Essentially what is happening is that the horn's mouth forms a diffraction slot, so pattern widens at low frequencies. Since the vertical dimension is short, directivity control is lost along this axis first. Below about 1kHz, vertical dispersion of a single horn is actually wider than the horizontal pattern.

Subject: Re: Radial horns
Posted by Adrian Mack on Sun, 23 Feb 2003 09:18:19 GMT
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Hey Wayne. Since a dual throat adapter will need to be used if stacking, the one compression driver will be used for two horns (I think). I've heard that this can increase distortion? On radial horns where the horizontal and vertical dispersion pattern is the same (like 60 x 60 degrees etc) are these suitable for the compensation circuit of yours? As radial horns dont add any garbage to the response (or something!) so your circuit will work good with them, I am wondering if a horn like this will suit it as well (its still radial). That way I wouldn't need to stack them, or spend money on extra horns and a dual throat adapter. But I've also seen that 90 x 40 degree are the best dispersion pattern. Just another note on the 2" compression driver, the response curve shows the high end response to be similar to comparable 1" compression drivers I've seen, with the compensation circuit making even better (like duh!). This is all on paper though, I dont have any experience with sorts of drivers, I actually want them to cover 500Hz to 20KHz (the JBL 2370 is 630Hz lowest I think which is close enough :) I've found graphs of 1" compression drivers that shows it going flat down to 500Hz, but the manufacture still states a resopnse from like 1.5K to 20KHz! Why's this? I'm thinking it might be best to go with a 2" driver, but I'd like to hear what you have to say on this! For the graph example this page here http://www.paudio-europe.com/products/db_product.htm?v_tipo=2&v_tipo_desc=DRIVERS&v_num_series=6&v_des_series=BM-SERIES&v_id_art=42 As you can see the specs say 1.5KHz-18KHz but the graph shows it going to 500Hz!Thanks! Adrian

Subject: Re: Radial horns
Posted by Wayne Parham on Sun, 23 Feb 2003 10:57:45 GMT
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The compensation circuit augments the top octave so it is suitable for any purpose where this sort of response curve is desired. Constant directivity horns need this kind of EQ circuit to compensate for the power response of the driver.Also, don't run the driver too low because even though it may be capable of producing sound, diaphragm excursion goes up as frequency goes down, even if properly horn loaded. Modern compression drivers aren't designed to be used down deep in the midrange band.

Subject: Re: P.Audio SD-450 N on JBL 2370 Bi-Radial Horn with Wayne Parhams compensation circuit
Posted by Kramer on Sun, 23 Feb 2003 19:07:04 GMT
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I've got a pair of BMD-450S (screw-on model) -- I thought they sounded great with a pair of 100

x 60 P.Audio horn lenses. The drivers will go down to 1200Hz at 12db/oct. I don't think you can go wrong, if they're reasonably priced.

Subject: Re: Radial horns
Posted by Adrian Mack on Sun, 23 Feb 2003 20:23:07 GMT
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Hey Wayne, thanks for your help so far, just have a couple of last questions.I'm thinking that the 1" compression driver may indeed be the way to go so I dont loose out on HF performance. But the reason I wanted the horn to go to ~500Hz and up is that the vocals are supposed to sound a lot better when coming from the one speaker. I know there are vocals below 500Hz but this is meant to be the best way to do reproduce them. Also, I didn't want half the vocals coming from a direct radiator (like a 12" or 15" to cover down to 70Hz or so with the horn) and the other coming from a wide dispersion horn, might make it sound a bit funny off-axis? Have you got any comments on this matter?Cheers! Adrian

Subject: Re: Radial horns
Posted by Wayne Parham on Sun, 23 Feb 2003 20:37:14 GMT
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500Hz is smack dab in the middle of the vocal fundamental region. It's rather high actually, around the tenor to alto range. If you don't want to split the vocal region in two, better crossover below 200Hz and/or above 2kHz if you can. The lower crossover will get you below vocal fundamentals and the upper crossover will get you above the fundamentals and into the overtone or harmonics region.

Subject: Re: Radial horns
Posted by bmar on Sun, 23 Feb 2003 22:24:09 GMT
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Hi Alex,I think it's great your going to make some wood horns. There are a few devices you can use for connecting a driver to the wodd flare that you built. Fane makes some adaptors and Selenium makes adaptors also. These could be used in some fashion for a fit up of the compression driver to the horn flare. There are also some older JBL adaptors that are 1" to 2". I find the JBL models a little long and for that matter, adaptors and mounting flanges by any of

these companies have not been to my liking. So, I have my own design and specifications made. They are available, and you can see pricing and detials on the pricing page of the www.woodhorn.com web page.You may also find it rather difficult to get a compression driver to perform well in the lower range your looking for. Although some models will spec out to 300 or 400 hz. Its also possible to build a horn that will give you that cut off. What you may find is that even though a combination of horn and driver will spec out or test to give you suitible results. The sound you hear may not be desirable. I have had fantastic results using 2" drivers on larger horns with a crossover point of 700hz (give or take 50hz). This is a very dynamic combination. I like to use 1500-2000hz crossover point for 1" compression drivers. You could built a larger horn that is about 400 x 400mm. use an 8" cone driver and have a great range of use from 200hz - 2000hz.Bill

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Subject: two cents from a 2370 user
Posted by ToFo on Mon, 24 Feb 2003 03:23:11 GMT
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Adrian,if you decide to go with JBL I can say the sound is superb for hi-fi or pro use. Since you make dispersion a priority I think you would like it as the dispersion is incredible(diffraction slot). I built my Pi speakers using 2370's and I love em. You can certainly find more attractive horns, but they look better than other plastic horns they even look better than a lot of metal horns. For the price you mentioned they are a steal. You will not find a better horn(your subjective mileage may vary). *note in my experience 2370's need less compensation than many other horns. A .33 or .22mF should work fine, but that depends on the compression driver. I remember thinking the P Audio had good top end when I considered it a while back. It should do great.Have fun!Thomas

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Subject: Re: Radial horns
Posted by Adrian Mack on Mon, 24 Feb 2003 05:33:02 GMT
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Hey Bill. Just figured out your the Martinelli Sound guy, lol, nice work on the horns! They look very nice, I bet they sound great also. I've just been looking at the price list and it seems what I need to attach the compression driver to the horn is a throat flange (is this all I need?). And by the looks of it the AT-1 and AT-2 models you have are both for 1" drivers, and the AT-3 is for 2". Out of the 1" models, which would you reccomend? Are the prices in US dollars? Each flange for 1"ers is US$135... a bit high for me, I'm in australia so converted around AU$270 or something + postage. But I cant resist the look of the wood horns! So many decisions.....I've seen your main speakers on the site using the 15" 2226H, and the 8" horn loaded speaker (oh yea what brand/model are these?) and 1" compression driver. Awesome! But how did you horn load the 8", do you need throat flanges etc? From the pic, it looks like the whole cone is visible, I dont understand how the

horn does anything for it!Do you think a scanspeak 8" would work well horn loaded? They make some pretty powerful drivers I hear, plus I can get them locally. BTW: The insturctions on making the horn on your site, I believe it goes to 800Hz or something, what dispersion pattern is this? (90x40 degrees?). I also noticed there were no measurements for the wood there! Makes it a bit difficult for me to build! Thought it might just be you dont want to give away your ideas, etc, thats ok i understand!

Subject: Re: Radial horns
Posted by Adrian Mack on Mon, 24 Feb 2003 05:40:24 GMT
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Hey Wayne. Would you say then I should use a 1" driver crossed like 2Khz then, and use a horn loaded 8" that bmar (Bill/Martinelli Sound guy) suggested in the other post? Or do ya think it is not really necessary? > better crossover below 200Hz I'd assume not with the compression driver ?? !!!!!!!Is there any sonic differences between plastic/ABS and metal horns? Probably said this a million times, I'll say it again though lol you've been a big help so far and thanks for your time. Adrian

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Subject: Re: two cents from a 2370 user and compensation circuit!!!!
Posted by Adrian Mack on Mon, 24 Feb 2003 05:51:50 GMT
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Hey Thomas, thanks for your input. I'm glad to see you've had success with the P.Audio stuff. >*note in my experience 2370's need less compensation than many > other horns. A .33 or .22mF should work fine, but that depends on > the compression driver. I remember thinking the P Audio had good > top end when I considered it a while back. It should do great.Hmmm, I've just went back to Waynes compensation figures, it says use a 0.47uF bypass cap to remove attenuation on the top octave with a resistor picked from the chart below:Ohms Decibels Power==========0.0 0dB 100%2.5 2.4dB 58%5.0 4.2dB 38%7.5 5.4dB 27%10.0 7.0dB 20%15.0 9.2dB 12%25.0 12.3dB 5.9%34.0 14.4dB 3.6%37.5 15.1dB 3.1%41.0 15.7dB 2.6%50.0 17.2dB 1.9%You've told me 33 or .22mF should be fine with this horn/driver combo, is this for the bypass cap? How do I convert mF to uF? Oh yea, what sort of caps should I use? (greencaps, MKT's, electrolics or however you spell it lol). I just realized I dont know how to pick what resistor to use from the chart above lol. Although wayne said a 25 or 50ohm in most cases should work well. How can I determine from the above what is needed?Thanks! Adrian

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Subject: Re: P.Audio SD-450 N on JBL 2370 Bi-Radial Horn with Wayne Parhams compensation circuit
Posted by Adrian Mack on Mon, 24 Feb 2003 05:53:02 GMT
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Thanks for the feedback! Am interested to know why you used 100 x 60 horns instead of 90 x 40? I suppose its not that much of a deal though!Adrian

Subject: You've got mail!
Posted by Wayne Parham on Mon, 24 Feb 2003 06:17:15 GMT
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Series resistance of 25 to 50 ohms works well for driver padding, in some cases. But this is for a series attenuator, and it really only works if the load is purely resistive. I suggest you use Spice to evaluate your particular configuration.The attenuator value chart you posted works very well in many cases and it is simple. But it is perhaps an oversimplification, and you would probably be better served to work from one of my existing crossover designs than to use this simplified chart.

circuit will do exactly what you want and provide the response curve you need.

Subject: Re: Radial horns
Posted by Wayne Parham on Mon, 24 Feb 2003 06:27:47 GMT
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You can run a midrange horn with an 8" to 12" cone driver from 100Hz or 200Hz up to the compression driver crossover point. That's an excellent system.As for horn material, that will determine how it sounds when the mouth rings like a bell. If braced and damped properly, it doesn't matter much. But some metal horns ring when struck, and this can become audible when excited by music content.

Subject: Re: You've got mail!
Posted by Adrian Mack on Mon, 24 Feb 2003 06:31:20 GMT
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Hey Wayne, I havn't recieved the email yet, is it a large file? Maybe its just taking a while, if you

decide to send it again the address is macky888@wasp.net.au in case its mucked up anywhere but I dont think so :P :)Thanks!Adrian

Subject: Re: Got it!
Posted by Adrian Mack on Mon, 24 Feb 2003 06:46:06 GMT
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Thanks! I've recieved it now and am reading over it, I'll post back if I have any problems :)Adrian

Subject: Re: Hey the file you sent is great, I have a few questions though.....
Posted by Adrian Mack on Mon, 24 Feb 2003 07:55:10 GMT
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Hey again! The schematics you sent me are GREAT! Just what I was looking for. Just have a couple of quick questions....Since compression drivers are high efficiency (although it should be lowered with HF compensation circuit I think), can I still install a simple attenuation circuit (if I find I need one) like the one here at the compression drivers terminals http://www.loudspeakers101.com/Lpad.htmHow should I decide how many db of HF attenuation to use in the circuit? I know it involves looking at the graph of the response of the compression driver on the horn, then summing the compensation circuit with it to get final response. So I think what I do is see how many db down at 20KHz it is, then pick the db attenuation values in the chart you sent me by email? On the very last page of the file, it says "Note: Components R3, C4 and C5 are not used with woofers listed on this page. In all other respects, the 800aLxxdB crossover is the same as the standard 800a0xxdB 800Hz crossover, and the 1K6aLxxdB crossover is the same as the standard 1K6a0xxdB 1600Hz crossover." And the woofers listed are the JBL 2205H, 2226H and 2227H. Why are these components left out of the design with these woofers? I think though the file said this is only when using it as a pseudo first order filter. By the way, whats the difference between a pseudo first order and normal first order filters?On the schematic, where it shows the symbol of the woofer, right behind it is the symbol for an inductor (the curely line) but no marking for it like L4 etc. I believe though that it is just part of the speaker symbol (because speakers themselves are kind of like inductors?). Thanks! Adrian

Subject: 2370 caps
Posted by ToFo on Mon, 24 Feb 2003 13:19:25 GMT

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Yes the .33 0r .22 is for the bypass, and the standard value works ok too, but with 2370 when you play loud it sounds splashy with .47. The mF uF thing was just a typo on my part, oops. The best thing would be to get all three of the cap values and then see which one you like with your compression driver, as it can be a matter of taste as well as science. As for cap types, I like any film and foil caps. the Auricap is nice, but any audio grade film and foil type would do fine. If you have trouble getting them, go for metalized film caps as a second choice. The brand is no big deal so long as they are made well and accurate.Thomas

Subject: A few answers
Posted by Wayne Parham on Mon, 24 Feb 2003 16:49:21 GMT
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section2. Augments the top octave to compensate for rolloff3. Damps the peak at resonanceSo to use a simple L-Pad will accomplish one of these things, but you'll still need to find solutions for the other two.On some of my speaker designs, I use a midwoofer up to the point where it begins to rolloff. Most of these have some amount of series inductance, but it is used for response shaping rather than as a crossover. In that case, the Zobel is often omitted, and without it, the coil will not act as a first-order crossover. I call this arrangement a pseudo-first-order filter.

Subject: Re: Radial horns
Posted by bmar on Mon, 24 Feb 2003 17:39:54 GMT
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Hi Adrian,If you are planning to make an 800hz horn I would recommend the larger 1.750/1" flange. If you are planning on a smaller version similar to the 12" horn, then the 1.500/1" flange is better. If you decide to turn your own. you can use a 1" to 2" conical flange and that will give you a 2db gain. Yes, prices are USD. expensive but the best there are. shipping is included if you can wait for surface shipping. You can easily turn your own or if you know a friend who has a lathe perhaps you can buy him dinner. The dimensions on the site are all you need for correct angle format. The AT-3 is for 2" format and you dont want that.The dimensions for the wood horns are whatever you want to make them. The overall dimensions for the horns are on the website along with the flange dimensions. You'll have to reverse engineer it and make any changes to meet your own requirements. I would think the 800hz size to best suit your needs.Bill

Subject: Re: P.Audio SD-450 N on JBL 2370 Bi-Radial Horn with Wayne Parhams compensation circuit
Posted by Kramer on Mon, 24 Feb 2003 20:09:05 GMT
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I bought the horns from the same person who sold me the drivers (used). I had no specific reason for going with the wider dispersion horn; it was just happenstance that he was selling them cheaply with the drivers.

Subject: Thanks!!!!!!
Posted by Adrian Mack on Tue, 25 Feb 2003 08:34:58 GMT
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Hey thanks for all the info man, you've been very helpful. I'll be sure to send ya some piccies of the project once its been built! and some of the construction process of course :) Also like to say thanks to everyone else who has responded to this post as well! Adrian

Subject: Flanges
Posted by Adrian Mack on Tue, 25 Feb 2003 08:36:48 GMT
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Hey thanks for the tips. I actually have access to a complete workshop where I can use wood lathes, do wood turning, etc. Any pointers on making flanges? Thanks! Adrian

Subject: Re: Flanges
Posted by bmar on Tue, 25 Feb 2003 12:09:40 GMT
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Hi Adrian,If you decide to make the throat's from wood. I suggest using baltic birch plywood glued up to make 1.750 thickness. You will need the very thin laminates for flange strength. I believe making the flange itself 5/16 (8mm) thick will be good. Bill