Subject: Planar DIY
Posted by Wayne Parham on Fri, 03 Jul 2009 21:17:12 GMT
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Those planar speakers you had at LSAF were really nice sounding. Good looking too! What impressed me most though was they were DIY. I'd like to see a write-up, with photos if possible, showing the build process. Do you sell them as a kit?

Subject: Re: Planar DIY
Posted by beun on Sun, 05 Jul 2009 05:34:50 GMT
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I don't have a kit and since they are custom made that would not make much sense either. Unfortunately I also do not have any pictures of the built proces of the ones that everyone saw at the show. What I do have is the following:

I am designing and building a new pair of ESL's that are going be a bit smaller than the ones from the show, the size is going to be 24" wide and 60" high. The whole built process will take me at least 6 month and possibly even longer and I will fully document it on this forum. As a start here is the link to a CAD drawing how they are supposed to look when they are finished.

http://www.crescendo-systems.com/ESL/ESL0.5.pdf

The high voltage supply and even a direct drive high voltage amplifier will be discussed and described as well. The amplifier is still in design and will not be for the faint of heart.

Subject: Re: Planar DIY
Posted by Wayne Parham on Sun, 05 Jul 2009 14:59:10 GMT
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Oh, now that's cool! I know everyone will be excited to see that!

Subject: Re: Planar DIY
Posted by beun on Tue, 07 Jul 2009 02:55:43 GMT
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I now have a preliminary design for the high voltage direct drive amplifier ready. It looks good in simulation but I will have to see the prototype to be absolutely sure.

This amplifier will be able to drive up to 2400V peak to peak into at least 5nF with should be enough for a ESL of almost any size.

I am currently working on the printed circuit board but it will be some time before I have the prototype finished.

Subject: Re: Planar DIY
Posted by Wayne Parham on Tue, 07 Jul 2009 15:10:05 GMT
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Very cool. I never really thought about that before, I just hadn't considered it. But now that you mention it, it couldn't be any other way. Those electrostats need super high voltage swings to work. We with voice coil driven speakers need current drive, so we step down the voltage to boost the current when driving from tube amps. But in your case, I would guess even a tube amp doesn't have the voltage swing, you have to even step that up. Have you ever run a tube amp on your speakers?

Subject: Re: Planar DIY
Posted by beun on Tue, 07 Jul 2009 23:31:02 GMT
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I have never used or built a tube amp to drive ESL's. I am not a tube designer, so the ones that are could pipe in, but to my understanding most tube amps are biased at around 300V. With an inductive load you could get 600V signal out of it, and using two in anti-phase would get you 1200Vpp, which is still half of what I should be able to get.

Kim

Subject: Re: Planar DIY
Posted by Wayne Parham on Wed, 08 Jul 2009 03:17:03 GMT
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Do you transformer couple to the speaker plates? I assume you use a step up transformer, yes?

Subject: Re: Planar DIY
Posted by beun on Wed, 08 Jul 2009 11:03:01 GMT
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On the current system there is indeed a transformer, with the high voltage amp it will be direct coupled, no transformer.

Subject: Re: Planar DIY
Posted by Wayne Parham on Wed, 08 Jul 2009 14:50:24 GMT
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I see, very interesting. Please keep us informed about your progress!

Subject: Re: Planar DIY
Posted by beun on Fri, 24 Jul 2009 18:22:48 GMT
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Finally bought a sheet of Baltic Birch to built the frames. I really like to use cherry but I figured it would be cheaper to first ruin a $40 piece of wood than a $130 piece.

I will keep you guys informed on the progress.

Subject: Re: Planar DIY
Posted by Wayne Parham on Fri, 24 Jul 2009 20:48:33 GMT
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Please do. I don't know of any other planar DIY projects, certainly none on the scale you're doing. There was some talk on the Planar forum, people asking about electrostatic speaker kits, and nobody knew of any. So you really have a unique product here. The model I heard at LSAF sounded nice too, so I'd like to see some exposure. Gotta get the word out!

Subject: Re: Planar DIY

Posted by beun on Fri, 11 Dec 2009 20:59:01 GMT
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Finally some progress, I have been busy with the woodworking and I am about to order the perforated steel. Attached a picture of the basic looks and another one to show the finish.

There is still an incredible amount of sanding to do, edge banding, cut out support pieces and of cause the top.

File Attachments
1) setup_unfinished.jpg, downloaded 2406 times
2) finish.jpg, downloaded 2396 times

Subject: Re: Planar DIY
Posted by Wayne Parham on Fri, 11 Dec 2009 22:15:17 GMT
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That's awesome! Keep us posted.

A few weeks ago, someone was asking about DIY planars. I don't remember who it was but I did direct them here to your forum. Hopefully, they've kept monitoring and will see your progress notes.

Subject: Re: Planar DIY
Posted by beun on Mon, 25 Jan 2010 00:27:49 GMT
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New pictures will follow later but there is progress again. I have ordered the perforated metal two weeks ago and I have finished a bunch more of the wood puzzle pieces. Next weekend, weather permitting, I will be able to start to assemble the frames. I never realized until now that building ESL speakers is more about cabinetry and fine woodworking than electronics.

Subject: Re: Planar DIY
Posted by Wayne Parham on Mon, 25 Jan 2010 14:06:37 GMT
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Very cool, anxious to see those pics!

Subject: Re: Planar DIY
Posted by beun on Thu, 04 Feb 2010 01:30:55 GMT
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No pictures yet considering the weather, but I received my custom perforated stainless steel panels today. Next I need to get them to the powder coater. These will be finished transparent in order to show off the stainless.

Subject: Re: Planar DIY
Posted by Wayne Parham on Thu, 04 Feb 2010 05:29:46 GMT
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Very good. Will you have them done and ready to run at LSAF this year?

Subject: Re: Planar DIY
Posted by beun on Thu, 04 Feb 2010 15:50:25 GMT
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That's the whole idea, I guess I need to get cracking!

Subject: Re: Planar DIY
Posted by beun on Sun, 07 Feb 2010 00:29:18 GMT
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Some more pictures, the first one is of the vertical supports that are going to hold up the side panels. They will consist of two strips glued together, one of which has the T-nuts as can be seen on the photo. The T-nuts will end up inside.

The second picture is showing the base, nicely doubled up and under a bit of pressure to glue everything together. A router will take care of the wood sticking out.

File Attachments

1) Support.jpg, downloaded 2394 times
2) Double_base.jpg, downloaded 2346 times

Subject: Re: Planar DIY
Posted by beun on Mon, 08 Feb 2010 03:06:00 GMT
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I noticed today that I had cut the side panel supports a bit too narrow. I had forgotten that I had to angle them in order to take the curvature of the stators into consideration, That made them even more narrow. One more thing learned, luckily I had enough wood left.

Subject: Re: Planar DIY
Posted by Wayne Parham on Mon, 08 Feb 2010 04:36:21 GMT
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I really liked those curved panels you had at the show last year. Are these going to be something like those were?

Subject: Re: Planar DIY
Posted by beun on Mon, 08 Feb 2010 16:11:47 GMT
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Wayne,

Yes, they are going to be curved again, only not so ridiculously big.

Subject: Re: Planar DIY
Posted by beun on Mon, 15 Feb 2010 19:10:37 GMT
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Two more pictures today, the first is of the new wider support beams, with T-nuts already in place.

The second is clamping the two halves together so when the glue is dry the pieces are together nice and flat. And yes that is on the bathroom counter top, the only flat surface in the house I was allowed to use.

File Attachments
1) Support_wide.jpg, downloaded 2503 times
2) clamping.jpg, downloaded 2511 times

Subject: Re: Planar DIY
Posted by beun on Sun, 21 Feb 2010 20:24:21 GMT
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More progress and pictures. After redoing the support beams plus T-nuts like I showed in the previous post I now have them beveled at a 20 degree angle and the slots for the biscuits cut.

I also cut slots for the biscuits into the side panels

and then glued and clamped everything together.

File Attachments

1) Support_biscuit.jpg, downloaded 2513 times
2) Side_biscuit.jpg, downloaded 2506 times
3) Side_support_clamped.jpg, downloaded 2507 times

Subject: Re: Planar DIY
Posted by beun on Sun, 21 Feb 2010 22:30:07 GMT
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By the way, the pallet visible in the background contains the custom perforated stainless steel sheets.

Subject: Re: Planar DIY
Posted by beun on Sun, 14 Mar 2010 00:01:20 GMT
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Some more photo's. The first is of the finished base with brushed aluminum front strip and edge banding. The biscuit cuts to mount the side panels into can also be seen.

The second picture is of a finished side panel, again nicely edge banded.

Tomorrow I hope to be able to put one complete frame together

File Attachments

1) Base_finished.jpg, downloaded 2489 times
2) Side_finished.jpg, downloaded 2484 times

Subject: Re: Planar DIY
Posted by Wayne Parham on Sun, 14 Mar 2010 16:19:59 GMT
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Those are very attractive!

The aluminum must have set you back a bit, a few bucks at least.

From the looks of it, it'll be worth it!

Subject: Re: Planar DIY
Posted by beun on Mon, 15 Mar 2010 02:27:39 GMT
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Well, I didn't have time to put them together today but I did manage to cut all the remaining biscuit slots.

The aluminum is actually not too expensive, but it is some serious work to make the nice brushed look. It is amazing how persistent finger prints are.

Subject: Re: Planar DIY
Posted by beun on Sun, 21 Mar 2010 19:58:35 GMT
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I finally managed to put one of the frames together. Here are a few pictures.

Next steps are some more sanding, varnishing and get the stators powerder coated.

File Attachments
1) Together1.jpg, downloaded 2475 times
2) Together2.jpg, downloaded 2460 times

Subject: Re: Planar DIY
Posted by beun on Sun, 11 Apr 2010 22:12:19 GMT
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And then there were two.

File Attachments
1) Two.jpg, downloaded 2467 times

Subject: Re: Planar DIY
Posted by Wayne Parham on Mon, 12 Apr 2010 02:46:02 GMT
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Lookin' good!

Subject: Re: Planar DIY
Posted by beun on Mon, 12 Apr 2010 03:18:55 GMT
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And a picture of a small test panel to prove the membrane and coating.

File Attachments
1) Panel_test.jpg, downloaded 2850 times

Subject: Re: Planar DIY
Posted by Wayne Parham on Tue, 18 May 2010 15:39:54 GMT
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Your system looked awesome! Very impressive! I am sorry I couldn't make it by - couldn't get out of my room at all this year - but Melissa went around and got photos. I've also seen a lot of good reports on your setup around the internet. I expect when the ezines publish show reports, you'll have some very favorable mentions. Good show!

I love how you've documented the build here too. Most interesting!

Subject: Re: Planar DIY
Posted by jimdgoulding on Wed, 19 May 2010 04:19:37 GMT
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And here I thought Beun was from fabulous Fart Worth, my old stompin grounds, home of Robert Ealey and His Five Careless Lovers at the Bluebird Nitespot. That was quite some time ago, actually. A strong wind blew the joint down, I think. Your speakers at LSAF were lovely sounding, Beun. Look forward to your latest next year.

Subject: Re: Planar DIY
Posted by beun on Wed, 19 May 2010 15:36:23 GMT
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Wayne,

I still have a few more pictures to post of how the stators and membrane are put together. When I get my camera back I will post them.

Jim,

Thanks for the praise, I am hoping to have a direct drive amplifier ready for next year.

Subject: Re: Planar DIY
Posted by 3dfreak on Wed, 22 Sep 2010 04:15:51 GMT
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I am amazed by the patience you have in building the speakers. Definitely inspires me to try to do it one day.

Just one question: how did you design this thing? I'm curious about how you ended up with its shape and dimensions.

Subject: Re: Planar DIY
Posted by beun on Wed, 22 Sep 2010 17:37:59 GMT
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There was really no real science involved. I wanted dimensions that were pleasing to the eye and not something that big like my first ones that would have a low WAF (Wife Acceptance Factor). I tried it out on my wife by first making one out of a large piece of cardboard and asking her if that would be acceptable in our own house. She wanted as small as possible and I complained that would not give enough low frequency extension. So we settled.

Originally I thought I would buy the perforated steel plates locally at McNichols so I chose the dimensions such that I could get 4 stators out of one big plate. Although ultimately I had the stators custom made I did not change the size.

I drew up the wood frame in some CAD software and again the wife consulted me on the color of the finish and the use of the brushed aluminum to give the speaker a high-tech look.

Ultimately ESL's are not that sensitive to size, the only downside being that you need big ones to get the low frequency extension. The new ones (24" x 60") need subwoofer support below 80Hz. The old ones as shown on the http://www.crescendo-systems.com home page are a lot bigger (3'3" x 6'6") and only need sub support below 60Hz.

Subject: Re: Planar DIY
Posted by 3dfreak on Fri, 24 Sep 2010 08:07:46 GMT
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Thanks Beun! It seems to me like you feel your way through it. I'm glad you're taking into account the Wife Acceptance Factor, because I can relate well with that. My wife is not keen on having a big box no matter how stylish, if all of it are speakers. So, I'm thinking hard about having speaker systems that are built into a shelf or something decorative so that it will look invisible. Definitely something I couldn't possibly buy from a store.

What tools do you have? I appreciate a list, so I can start building up my shop :)

Subject: Re: Planar DIY
Posted by beun on Fri, 24 Sep 2010 15:24:26 GMT
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Thanks for the kind words, size wise I indeed do feel my way around since the exact dimensions of the frame are not that critical. I do have a philosophy for building the panels themselves that is probably less conventional.

For tools I used the following:

1) Relatively cheapo Delta table saw, next time I would get something a little bit better as it is not very accurate.
2) DeWalt compound miter saw, needed for nice mitered seams. This was a big ticket item that I already had in order to install crown and baseboard molding.
3) Bosch router, for copying curved and otherwise non 90deg panels. Next time I would probable get a router table as well to ease the routing of smaller pieces.
4) Biscuit cutter, I think it is an Ryobi.
5) Drill
6) Lots and lots of sanding paper.
7) And the usual assorted lot of other stuff, like hammers, screwdrivers, straightedge, clamps...

If you are good with the router or have a good table saw you could do without the miter saw but as I already had it I made use of it.

Subject: Re: Planar DIY
Posted by 3dfreak on Thu, 30 Sep 2010 12:20:02 GMT
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Thanks for the list Beun. They look like a serious investment :) But I understand that the alternative is to cut wood using manual saw. That would make the project prone to a lot of imperfect fits.

Did you buy those equipment in one sweep? Would you recommend second hand units?

Just one more question: what's the biscuit cutter for? Or maybe I'm simply looking at the wrong images in Google Images :)

Subject: Re: Planar DIY
Posted by beun on Thu, 30 Sep 2010 16:06:17 GMT
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Doing it by hand would be almost impossible, there is no way to get a perfectly straight cut. Heck, even with the table saw I have to pay close attention.

I did not buy everything in one sweep, and a number of things I already had like the table saw and miter saw. I did buy the router and biscuit cutter (official name is joiner I think) specifically for this project. The slots and biscuits can be seen in post #61918, this whole thing has no screws to hold everything together, only biscuits and dowels. The joiner cuts slots in the wood and oval looking

biscuits http://en.wikipedia.org/wiki/Biscuit_joiner are then used to glue everything together.

I would be careful if you want to buy used, most of the tools can be tricky and it might be difficult to find flaws. I already did some serious research before I bought a new router as the quality and usability of even new equipment seems to vary greatly. I still haven't quite figured out if and which new table saw I am going to buy. Good stuff gets expensive quickly and cheap stuff is dissatisfying and ultimately a waste of money.

Subject: Re: Planar DIY
Posted by 3dfreak on Sun, 03 Oct 2010 12:46:57 GMT
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Thanks for the tips Beun :)

I remember doing woodworking when I was a kid. My brother and I created our own toys using designs from a Reader's Digest "Things to Make and Do" book. We had lots of fun. But that was where we learned patience.

We had to look for the right materials for the plane. Then we had to sharpen the tools. Glue had to dry first before we could play with the model planes and boats, and things like that. With tools of my own I look forward to go through that again.

One of the virtues required in woodworking is patience. I can see that you have lots of that, based on the dates of your previous posts.

Subject: Re: Planar DIY
Posted by johngps on Sat, 26 May 2012 13:41:19 GMT
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I don't have a kit and since they are custom made that would not make much sense either. Unfortunately I also do not have any pictures of the built proces of the ones that everyone saw at the show. What I do have is the following:

Subject: Re: Planar DIY
Posted by johngps on Sat, 26 May 2012 13:43:16 GMT
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I am designing and building a new pair of ESL's that are going be a bit smaller than the ones from the show, the size is going to be 24" wide and 60" high. The whole built process will take me at least 6 month and possibly even longer and I will fully document it on this forum. As a start here is the link to a CAD drawing how they are supposed to look when they are finished.

Subject: Re: Planar DIY
Posted by beun on Sat, 26 May 2012 16:55:33 GMT
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Huh?