
Subject: Group Build Line Array Project

Posted by [FredT](#) on Thu, 12 Oct 2006 20:41:10 GMT

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Everybody I know who has heard a good line array playing at a room filling level has been impressed by the power and majesty of the sound. The Absolute Sound reviewers were so overcome by the Epiphany 12/12 they bowed in reverence. Then you look at the \$,\$\$\$ or \$,\$\$\$ price tag and realize a pair of line arrays in your listening room is about as likely as a new Mercedes S-series in your driveway and a two carat diamond on the Mrs' finger. Or maybe not. Wayne and I are cooking up plans for a group build line array project. We haven't drawn the plans yet, but we have agreed on some general guidelines. These are oriented toward the objective of designing an array that's easy to build, very affordable, tube friendly, uses readily available drivers (no "buyouts" that won't be available later), reasonably sized, and sounds good. Here are the specifics: Easy to build - can be built by a person with no previous woodworking experience using a circular saw, a jigsaw and an electric drill. Very affordable - Target cost to build is \$300-\$400. This will require the use of inexpensive midwoofers (but better than NSB quality) and a single point source tweeter at the center of the array. (The single tweeter is a compromise, but it's the only option with our target price). The target price also requires that each enclosure can be built from a single 4X8 sheet of mdf or plywood. Tube friendly - Eight ohm or higher nominal impedance, 94dB or greater sensitivity. Readily available drivers - We've already decided on the midwoofers because the Parts Express 5-1/4" classic is on sale for \$11, and I ordered a bunch of them. We're leaning toward the Vifa DX25 tweeter because it's one of the few that will cross over low enough and has the needed sensitivity. Reasonably sized - Not too much over 5' high with a reasonably narrow baffle. Line arrays can't be Bose size, but no 7' monsters either. Sounds good - Of course that's very subjective, but the sound quality should be comparable to or better than some of the single woofer two-way's others have built using PE classic and similar quality drivers and good crossover parts - much better than most of the speakers at the big box stores. We're also planning to use a ported enclosure whose bass extension will make a subwoofer unnecessary/optional. The plan is for me to build the enclosures, install the drivers, and get them to Wayne, who will do the final tuning and design the crossover. I plan to document the enclosure construction on my smugmug photo site for others to use in building their arrays. I've already chosen the Parts Express #295-301 midwoofers based on size and cost limitations. They're regularly \$13.60 in quantities of four, currently on sale for \$11.00, and we hope to negotiate that sale price for others who participate in the group build. I plan to use eight per speaker to achieve the needed sensitivity, 16 ohm impedance, and reasonably small interior volume. Comments and suggestions about any other aspects of this project are welcomed. Now's the time before I start pushing wood through the saw in November.

Subject: Re: Group Build Line Array Project

Posted by [Shane](#) on Fri, 13 Oct 2006 01:02:05 GMT

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Very Cool!! I almost passed out when I heard Jim's arrays at GPAF last year. I'd never heard line arrays before. You're right about the \$\$\$ though for a setup like he had. But just to get a little

inkling of that would be special. I'll have to start pushing this agenda and see how far I get with the Mrs.

Subject: Re: Group Build Line Array Project
Posted by [FredT](#) on Fri, 13 Oct 2006 10:42:39 GMT

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The Jim Griffin line arrays at last year's GPAF were special. Choosing between these arrays and very expensive conventional speakers, like the Wilson Watt Puppies I heard recently, would be a no brainer to me. I believe Jim's were priced at about \$8K with the DEQX electronics, but they would sell for more like \$20K if offered by a mainstream speaker manufacturer. An incredible bargain at \$8K but still outside my budget. Needless to say, the group build arrays will not be in the same league as Jim's, but their sound should offer many of the characteristics of well designed line arrays. I've built a few using budget drivers, including \$25 Vifa woofers and \$15 Silver Flute woofers, with a point source tweeter, and have been pleased with the results. The pair that comes closest to the design Wayne and I are considering used 5.5" Silver Flute woofers with the Vifa DX25 tweeter, and to my ears it sounded the best of all. I might have chosen the Silver Flutes for the group build, but they were \$11.75 last time I bought some and the price has since increased quite a bit. Also, I have had such good experience buying from Parts Express that I wanted to use their Dayton house brand this time. See the link to a picture below. We plan to build and tweak the prototype pair, then to get some feedback from a group of qualified listeners who know how a good speaker should sound. Probably the Tulsa and or Dallas Audio Club members. If the feedback is positive we'll document and post the project.

Silver Flute Line Arrays

Subject: Re: Group Build Line Array Project
Posted by [colinhester](#) on Fri, 13 Oct 2006 19:36:26 GMT

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I'm game. I live one exit from PE; so, if there is anything I can do to help, let me know....C

Subject: Re: Group Build Line Array Project
Posted by [Wayne Parham](#) on Sat, 14 Oct 2006 18:00:03 GMT

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Perfect. We'll probably tap you on the shoulder to ask them for a deal. In fact, if you don't mind, maybe you could approach them about it in advance. I'll try to remember to call and talk to Darren Kuzma as well. I would hope PE would at least give wholesale pricing.

Subject: Re: Group Build Line Array Project
Posted by [FredT](#) on Sat, 14 Oct 2006 22:56:55 GMT
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Darren has moved on to greener pastures outside the audio industry. I have no idea who replaced him.

Subject: Re: Group Build Line Array Project
Posted by [Wayne Parham](#) on Sun, 15 Oct 2006 01:19:39 GMT
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I'll speak to Scott Placke then. He's the wholesale manager. But I'd prefer that Colin speak to him face to face. I'll just tell Scott to expect Colin, and maybe get a feel for how PE stands on this sort of thing. It's not like ART will be making an organized purchase, but I think they'll probably be receptive to treating it like it were.

Subject: Re: Group Build Line Array Project
Posted by [cfranz](#) on Mon, 16 Oct 2006 14:02:05 GMT
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Count me in. I'm in severe need of a project that doesn't strain my eyes. Been working on digital for a while. Small parts, soldering iron with a needle tip. Need lighted magnifier and reading glasses just to see where I'm soldering. After we're done, maybe we can talk to the boys in the Craftsman forum to add a little WAF to them. Make them living room worthy....

Subject: WAF
Posted by [FredT](#) on Mon, 16 Oct 2006 15:01:44 GMT
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That WAF issue is a tough one with speakers in general; with line arrays it's even tougher. But you are so right about good craftsmanship having the potential to raise the factor to a higher level. A nicely veneered and finished speaker enclosure is far more acceptable than one with a poor paint job, and an enclosure with radiused edges is more attractive than one with 90 degree angles. The prototype will be built with an eye toward low cost and ease of construction rather than cosmetics, but other builders are encouraged to build speakers that are also nice to look at. Here's an example of a speaker that isn't a line array, but it's one of the most beautiful examples of fine craftsmanship I've seen.

Subject: Re: WAF

Posted by [cfranz](#) on Mon, 16 Oct 2006 15:14:52 GMT

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My wife is pretty darn understanding of my hobby but I try not to push her too far. My wood working skills are two steps up from beginner but 10 steps down from craftsman. I'm at the mitered edges with biscuits stage and I can use a round-over bit without embarrassing myself (usually) but not beyond that. I was less asking about the 'beauty' of the project then suggesting that those of us who can, or wish to, take it the next step forward. This, assuming that we get a sonic result that is worthy of the living room. Wish I could see the Salk HT3 but I'm at work and so much is blocked here. I'll check them out this evening. Thanks for your response.

Subject: Re: WAF

Posted by [FredT](#) on Tue, 17 Oct 2006 09:27:59 GMT

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This is the kind of thing that can happen if you insist on having low WAF audio equipment in her home.

Ultimatum

Subject: Re: Group Build Line Array Project

Posted by [FredT](#) on Tue, 24 Oct 2006 20:27:22 GMT

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I'm really pumped up after hearing the \$20K IDS line arrays at the RMAF last week. Ours will sound almost as good:)I talked to the guys at the Parts Express exhibit and they seemed very interested in cutting us a deal for us on each order of sixteen DC130BS-8 5.5" midwoofers. Told them to sharpen their pencil twice, and I'll contact them later this week about a discount price. Not much to report yet on the construction, but I'll check back as it progresses. I'm documenting it at the link below:

Building The AudioRoundTable Group Build Line Arrays

Subject: Re: Group Build Line Array Project

Posted by [Wayne Parham](#) on Tue, 24 Oct 2006 21:20:08 GMT

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Super cool Fred! You're the man!

Subject: Re: Group Build Line Array Project

Posted by [Shane](#) on Wed, 25 Oct 2006 02:45:44 GMT

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Oh man, I can hear a giant sucking sound starting --my money sucking out of my wallet. I hope PE runs that special deal for the next six months or so. How am I supposed to build a Darling amp if ya'll keep coming up with outstanding projects like this? Got most of the stuff for the amp except the PS pieces and iron. Still deciding on which power tranny to use. Of course this will end up costing me twice as much as it should since I tend to double up on everything cause I'll screw up the first set of parts! So Fred, wanna offer any deals on routing out the front baffles?

Subject: Routing Out The Front Baffles

Posted by [FredT](#) on Wed, 25 Oct 2006 16:34:06 GMT

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I plan to build the prototype pair with driver cutouts that can be easily done with a skill saw (drivers not recessed). This will greatly simplify building the speakers, and I expect it will make a measurable and audible (but hopefully not objectionable) difference in the sound versus recessed drivers. I recommend recessing the drivers for anybody who has a router. Line array baffles are too hard to ship because they're over 5' long, so everybody is on their own. For anybody within driving distance of Houston, if you will reimburse me for the cost of materials I'll build you a flat pack panel kit with routed driver cutouts for free. But first let's get the prototype pair built and see if they sound good.

Subject: Re: Routing Out The Front Baffles

Posted by [Shane](#) on Wed, 25 Oct 2006 18:12:14 GMT

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Thanks Fred. I agree about getting it going first. I tried to make a homemade router jig for recessing my 2 Pi drivers and it worked OK, but I wouldn't use it on something like this project. I'll just have to break down and buy one of the jigs for doing it right.

Subject: Re: Routing Out The Front Baffles
Posted by [colinhester](#) on Wed, 25 Oct 2006 18:54:14 GMT
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I'm going to try with a hole saw and drill press. I made a wine rack this summer with 13 racks and 9 holes each. The Rigid circle cutters worked like a champ - beat the shit out of a fly-cutter. I'm ready to get this going.....C

Subject: Re: Routing Out The Front Baffles
Posted by [FredT](#) on Wed, 25 Oct 2006 19:25:52 GMT
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For what it's worth, I use a Jasper circle jig on my router to do the cutouts. I make them either 1/2" or 3/8" (depending on the driver) smaller than the overall diameter of the flange, then I use a rabbet bit to make the recesses. If anybody decides they're going to build enough speakers to justify buying a router, be sure to get a plunge router - this type is needed to use the circle jig. You don't need an expensive one. Mine is a \$99 Ryobi.
Jasper Circle Jig

Subject: Jasper jig
Posted by [Shane](#) on Thu, 26 Oct 2006 00:16:11 GMT
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Well, I don't have a plunge router. Mine is a fairly old Craftsman, but works very well. Can you use the Jasper and ease the bit into position? Or I could take a drill and make a hole near the edge first I guess for the router bit to start in.

Subject: Re: Jasper jig
Posted by [FredT](#) on Thu, 26 Oct 2006 15:43:13 GMT
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I suppose you could, but that might be more trouble than cutting them with a skill saw. Remember, since you're not recessing the drivers the cutouts don't have to be perfectly round. I'm beginning to make some progress on the enclosures <http://fredt300b.smugmug.com/gallery/2046580>

Subject: Re: Jasper jig
Posted by [Shane](#) on Thu, 26 Oct 2006 18:10:48 GMT
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Oh, if I'm just gonna cut holes then a jigsaw will work. I really like the recessed look though.

Subject: Re: Jasper jig
Posted by [FredT](#) on Thu, 26 Oct 2006 18:51:40 GMT
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I agree completely that recessed drivers look better, and recessing them (especially the tweeter) also eliminates one source of distortion. But for the majority of people who don't have the tools to do the recesses, an otherwise good speaker with surface mounted drivers is better than a comparably priced speaker from a big box store with recessed drivers. I'm building the prototypes with surface mounted drivers, but I sized the cutouts so I can easily go back after completion and do the recesses with a 1/2" rabbet bit. At some point after somebody else within driving distance has built a pair I plan to recess the drivers in mine and we'll compare the two.

Subject: Re: Routing Out The Front Baffles
Posted by [Fortytwo](#) on Fri, 27 Oct 2006 02:10:09 GMT
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If you are using a drill press, with either a hole saw or fly cutter. Mount a temp say 2'x4' MDF table to your press. Now you can clamp a fence to it, slide your baffle along it and maintain perfect horizontal alignment. My recessed drivers, are very close together. I scribed a vertical line, then walked off the centers with a pair of divider's...John

Subject: Parts Expreess Group Build Discount
Posted by [FredT](#) on Fri, 27 Oct 2006 17:46:38 GMT
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Here's some information about the group build line array that might influence anybody who's considering taking the plunge but still not decided. This news may push you over the edge. I talked to Scott Placke, OEM Business Development Manager of Parts Express, about offering a discount for group build participants who order an entire kit package. The package includes everything needed to build the line arrays except the wood and glue. It includes the following: sixteen #295-301 midwooferstwo #264-578 Vifa DX25 tweeterstwo #260-304 bi wire

speaker terminalsone pkg #081-435 3/4" #6 driver mounting screwsfour #260-411 4" portsone pkg #095-282 solderless terminalsone pkg #095-286 solderless terminalsone roll #260-540 speaker gasketing tapeone 50ft roll #100-116 speaker wirecrossover parts to be determinedThe discount for participants in this group build will be 25% off the regular price. I haven't calculated the total yet because we still need to design the crossover and specify values, but the regular price for everything except the crossover parts would be \$331.43. With the discount it comes to \$248.57. Special thanks to Scott and other members of the management at Parts Express. Good folks to do business with!

Subject: Done!

Posted by [FredT](#) on Mon, 30 Oct 2006 19:43:41 GMT

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Finished them a few minutes ago, with a textbook crossover. Not bad! I'll take them to the Bottlehead meeeing in San Antonio Saturday and get some comments.

Group Build Line Arrays

Subject: Re: Done!

Posted by [colinhester](#) on Mon, 30 Oct 2006 21:01:02 GMT

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Is everything set except for adjusting the XO, if needed?....C

Subject: Re: Done!

Posted by [Shane](#) on Tue, 31 Oct 2006 02:44:14 GMT

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Nice! Now I know what to ask for for Xmas.Fred -- what kind of power would you recommend to run these?

Subject: Re: Done!

Posted by [FredT](#) on Tue, 31 Oct 2006 10:35:06 GMT

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Yes, everything will stay the same except for the crossover and applying a finish to the enclosures.

Subject: Re: Done!

Posted by [FredT](#) on Tue, 31 Oct 2006 10:43:16 GMT

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I'm currently using two bridged Monarchy SM-70 Pro amps, rated at 80 watts into 8 ohms. These were in the system yesterday when I finished the speakers. Over the next few days I plan to try them with three tube amps: Bottlehead Paramours (3.5 watts), a 300B amp (8 watts), and a triode-wired Ella KT88 amp (25 watts). I'll be taking them to the Lone Star Bottlehead meeting Saturday, and there I'm sure we'll hear them with several other low power amps including Wardsweb's two watt SEX amp.

Subject: Power Requirements

Posted by [FredT](#) on Tue, 31 Oct 2006 14:55:09 GMT

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To answer your question more specifically, line arrays are capable of some very impressive dynamics. You can turn the volume up well beyond the point where a point source speaker would begin to sound congested, and a line array will still sound clear and relaxed. If you don't have the power to reach these levels you won't be able to realize one of the most important capabilities of your speakers. The eight watts of my 300B SET amp will power them to levels that begin to realize this potential. I also tried them with the 3.5 watt 2A3 Paramours, and these are fine if you listen only to jazz, acoustic music, and early classical, but they begin to sound congested with highly dynamic music at room filling levels. I haven't tried any higher power tube amps yet, but I expect about 25 tube watts or 50 solid state watts is all the power you would want.

Subject: Re: Power Requirements

Posted by [Shane](#) on Tue, 31 Oct 2006 17:55:42 GMT

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Thanks Fred. I've got a NAD 320Bee 50W amp that should do the trick.

Subject: NAD 320BEE

Posted by [FredT](#) on Tue, 31 Oct 2006 21:17:38 GMT

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I have one too. It's an amazingly good sounding amp for \$399 - makes me wonder why I spent so much money on tubes. I can't try it with the group build arrays because it's loaned out to a friend, but I used it for a while with the Selah XT-8's, and it drove them as loud as you would want to listen. It should be a good match.

Subject: Re: Done!

Posted by [Wayne Parham](#) on Tue, 31 Oct 2006 22:02:47 GMT

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Wow! Excellent work, Fred! Can't wait to check them out!! I have the LMS system ready for crossover work and final testing.

Subject: Re: NAD 320BEE

Posted by [Shane](#) on Wed, 01 Nov 2006 02:14:19 GMT

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I like it! I have the matching 520Bee CDP that I bought with it which is a very nice CDP for the money as well. These actually replaced the tube amp that UPS so kindly broke for me. The BEE will run my Heresy's or Pi Two Towers loud enough to make your dang ears bleed. Especially with the Pi's. I can crank it up till I think the Pi's are gonna explode and the amp never even strains (I've only done this once, Wayne..to break them in for the 12B4...LOL!!!). The Pi's are now the main speakers for my 12B4 amp where they work quite nicely.

Subject: Re: Parts Expreess Group Build Discount

Posted by [Shane](#) on Wed, 01 Nov 2006 02:19:03 GMT

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Cool. I just looked at the mid-woofers and got excited that they're shielded. I had to move my Heresy's back into the bedroom (where they are 2 feet apart) due to the fact that they were making my TV wig out even from 4-5 feet away. I need a good set in the living room and these may do nicely!

Subject: Next Steps

Posted by [FredT](#) on Wed, 01 Nov 2006 14:34:55 GMT

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The prototype enclosures are completed and the speakers are playing with a crossover I improvised using X-ove 3 Pro as a guide. The next steps are for me to document everything you'll need to know to build your own pair, and to get them to Wayne so he can design and test a proper crossover. Since I completed them a couple of days ago I've listened to them with a variety of amps including the solid state Monarchy SM-70 Pros, a 2A3 SET amp, a 300B SET amp, and an EL34 push pull amp. The 300B's eight watts seems to be the minimum for coaxing out their full potential, and they will do everything they're capable of doing with the 40 watt EL34 amp. I'm more than pleased with the way these speakers sound. I've used the Vifa DX25 tweeter before, but I had some reservations about the Dayton midwoofers. Specifically, I was concerned about the quality of the bass and midrange from a \$14 driver. No problems! I don't have accurate measurement equipment, but I used my Radio Shack sound meter with a Stereophile test CD to get an approximation of their in room response. Between 500hz and 8khz, the range where the meter is accurate and room resonances aren't too strong, they are within +/- 2dB except for a very smooth sounding 3dB "BBC dip" at the crossover point (2.5khz). At high volume settings with dynamic music you get that unmistakable line array "you are there" impression. Difficult transients like the hard strike of a full piano chord are clear up to much higher volume levels than with any of my point source speakers. The only downside I can hear is the expected rolloff below 400hz for speakers that have no baffle step compensation, but the low bass is good down to 40hz. They don't sound wimpy in the bass, but nobody is going to say "Wow, listen to that bass!" either. I built the enclosures with Baltic birch veneer plywood because it's lighter and easier to finish than mdf, but for anybody who's building them with a hand saw instead of a highly accurate table saw and a router I recommend using 3/4" mdf. I recommend this because the seams will not fit perfectly, and the easiest way to finish them is to smooth over the rough edges with wood filler, then paint or veneer them. Another suggestion for builders without commercial equipment: I cut 10" wider panels for the front and back, and 13.5" panels for the sides to achieve an attractive width to depth ratio with a relatively narrow profile. Lumber sources often carry mdf in 12" boards (they're really 11-1/4" wide). It will be much easier to use these boards without alteration because you can count on their being perfectly cut. Things will fit together much better than cutting each board with a hand saw, and this will give you a 11-1/4 wide by 12-3/4 deep enclosure. The interior volume will be almost identical to the ones I built. I'll post another message when I complete the documentation.

Subject: 11/9 Status Report

Posted by [FredT](#) on Thu, 09 Nov 2006 12:26:33 GMT

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The speakers are now in Wayne's car in Austin, bound for Tulsa this weekend. He plans to listen to them and possibly test the prototype crossover this weekend, and to do final modifications and testing over the Thanksgiving holidays. I've completed a draft of the documentation needed to build a pair, including an enclosure drawing and detailed construction steps, which I plan to

complete it as soon as the crossover specs and final port tuning are determined. I also talked to Scott Placke of Parts Express, and he plans to give us a price for the full kit as soon as the crossover specs are finalized. As I mentioned in the General forum, these speakers (with a prototype untested crossover) were well received by participants at the Lone Star Bottlehead meeting Saturday, and they sounded especially good in a side-by-side comparison with a pair of Bottlehead Straight 8's. So the bottom line is they sound very promising and we should have everything set to go by the end of November.

Subject: Update please
Posted by [Francois G](#) on Mon, 05 Mar 2007 20:04:21 GMT
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Has there been any further developments?

Subject: Re: Update please
Posted by [FredT](#) on Mon, 05 Mar 2007 20:22:15 GMT
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The plans are available, and as far as I know Parts Express is still offering the complete "kit" (minus the enclosures) for \$275. Click on "Projects" at the top of the Group Build forum and look for the ART arrays.
