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Subject: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Fri, 15 May 2020 18:39:27 GMT  
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Hey guys,

I've been interested in audio equipment for the last 15 years and with this new found time at home, I'd like to take foray into building a large set of horn loaded speakers.

I've always been partial to the heritage behemoths of Klipsch but could never get the cash together to justify the large purchase.

I love live music and would love to bring that dynamic sound into my home.

Getting the DIY bug and making sure I'm not biting off more than I can chew, I bought a Parts Express kit for the blast box and it's been going pretty well.

I am handy, but I don't have extensive wood working tools. I am curious if a table saw and router will be needed, or if I can get by with a circular saw and a jig saw and drill.

I'm also debating between the 4 Pi and the 8 Pi. I still have a lot more to read in the FAQ section. Any guidance is appreciated.

If it's not a problem, could you send me the plans for 4 Pi and 8 Pi.

Thank you.

dawiipgh

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Subject: Re: Horn loaded Corona Build  
Posted by [Wayne Parham](#) on Fri, 15 May 2020 18:50:32 GMT  
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Please choose which model you prefer and let me know. I'd be happy to send plans once you decide.

The four Pi is our top-of-the-line free-standing loudspeaker. It sounds great as-is, but sounds best when used with flanking subs.

The eight Pi is our entry-level constant-directivity cornerhorn. It can be positioned in places other than corners, but performance suffers.

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Subject: Re: Horn loaded Corona Build

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Posted by [dawiipgh](#) on Fri, 15 May 2020 18:55:53 GMT

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Thanks Wayne.

I've decided to forward with the 4 Pi.

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Subject: Re: Horn loaded Corona Build

Posted by [Wayne Parham](#) on Fri, 15 May 2020 19:01:07 GMT

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You've got mail!

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Subject: Re: Horn loaded Corona Build

Posted by [Rusty](#) on Sat, 16 May 2020 13:54:30 GMT

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You'll never regret going the diy route. The savings and satisfaction from it enables an exponential boost in high quality audio for modest budgets. A circular saw is ok, I'd get a decent blade with high carbide tooth count. Look into some diy jig's for more accurate rip and crosscut cutting. A tip if you don't know for cutting large sheets of mdf or ply, buy a sacrificial 4 x8 sheet of foam insulation to go under the building material and cut laying flat on the floor. You'd do well to invest in a router. You can get one, even a plunge router for a reasonable outlay. They help a lot getting a better fit and finish to your project. For inspiration, dig around here for some examples of project builds. There's some fabulous examples of the model you chose. Be prepared for being impressed.

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Subject: Re: Horn loaded Corona Build

Posted by [dawiipgh](#) on Sat, 16 May 2020 18:16:51 GMT

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Thanks guys. This is truly a great forum with stellar members.

Do you guys have a favorite build thread that shows how to position bracing and supporting the horn and driver from the baffle? I'm truly interested in the order of operations of the build. For example, I don't want to build a sealed baffle and then have to figure how I am going to wire it up, when I should have ran the wires and bracing first.

With this quarantine, I've been getting a bunch of boxes in the mail, so I figure I'll mock up a scale model out of cardboard first before I spring for the baltic birch.

Regarding the 3 Pi Subwoofer, has anyone included an inboard amplifier on one of these? Or is it

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typical to use the only the power from the amp that drives the 4 Pi speakers? Has anyone looked into passive radiators for this? Or does that create too much tuning complexity with the port.

The reason that I ask is that I have a current set up with a 500 Watt 10" woofer pointed at the ground and 2 passive 10" radiators pointed away from each other on the sides of the cube. It looks to be 12" x 12" x 12". The box is sealed. It delivers balanced low end for music, but if I feel the need to rattle the coffee mugs in the cupboard two rooms away, I can make that happen as well.

Wayne, at your convenience, I'd like to peruse the 3 Pi Subwoofer plans as well.

Thanks again!

dawiipgh

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**Subject: Re: Horn loaded Corona Build**  
Posted by [Rusty](#) on Sat, 16 May 2020 19:10:57 GMT  
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Your baffle will have a cutout for the woofer, so there's your access for wiring. There's all kinds of images on the web for doing bracing. Some of it so intricate and precise it seems a shame to close it all up inside the box. Then, there's simple 2x4 placement. Your horn lens and driver just screws into the baffle. Many double up the thickness of the front baffle and flush mount the woofer and horn lens to the outer surface of the baffle. And use t-nuts or hurricane nuts mounted inside the baffle screw holes to accept heavy duty hex screws.

<https://www.parts-express.com/cat/nuts-t-nuts/313>

Here's a build post. Not the 4 pi but showing some images of bracing.

[https://audioroundtable.com/forum/index.php?t=msg&goto=88075&&srch=4+pi+build+pictures#msg\\_88075](https://audioroundtable.com/forum/index.php?t=msg&goto=88075&&srch=4+pi+build+pictures#msg_88075)

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**Subject: Re: Horn loaded Corona Build**  
Posted by [Wayne Parham](#) on Sat, 16 May 2020 19:36:03 GMT  
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There are lots of other great build threads too. Some people have built some really great looking home theaters. Some have made super nice dinner theater installations. And there are plenty of great finishes from various builders too. Almost too many to list, so just do some searching.

As for the braces, Rusty showed a nice link with a good example. That probably tells you everything you need to know. It's not really hard - Just put a cross-brace between the woofer and the waveguide. Build the cabinet and then cut a couple pieces of wood to span front-to-back and side-to-side. Make 'em long enough to fit snug. We want a smidge of preloading on the panels. Then set a sheet of insulation across the braces.

I'll send plans for the three Pi subs. They work great for flanking subs, but pretty much any other subwoofer will too. The only requirement is that it sounds good up to 200Hz. You can use a plate amp, but the thing is you need crossover at 100Hz second-order. Most plate amps have third-order or fourth-order slopes - which is perfect for distributed multisubs - but too steep for flanking subs. So keep that in mind when you choose amplifiers for your subs. You might do a search here for flanking sub amps. We've discussed that on various threads.

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Subject: Re: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Mon, 18 May 2020 12:41:41 GMT  
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Thanks for the guidance, I have come across some great builds. You lot are a talented bunch.

Are there any components that require to be mounted prior to finishing the cabinet? For instance, does the compression driver driver need to be mounted before the front face of the cabinet is glued in place. I am working on the cabinet build first and then will purchase the drivers, waveguide, crossovers, wiring etc.

The cabinet looks large enough to easily install all of the components in a completed box.

Thanks again.

dawiipgh

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Subject: Re: Horn loaded Corona Build  
Posted by [Rusty](#) on Mon, 18 May 2020 14:13:26 GMT  
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You have to mount the compression driver to the horn lens first before mounting on the baffle. That's all. If you want to flush mount the woofer and the horn lens to the baffle. It's good to have them on hand to test fit them in the baffle. Looking at the builds you can probably see that having a router makes for a precision cutout for the drivers on the baffle. Build your cabinet with or without cutouts for the driver's, horn lens and glue it up with the bracing affixed inside. You can do driver cutouts after glue up as well. Then you can concentrate on the finish to the outside of the cabinet. Painted, veneered, whatever you choose. Mount your woofer and horn lens with compression driver the last part of the build after you've carefully wired up drivers polarity to the crossover, lined the cabinet with insulation. Polarity is crucial. From experience, I'd miss-wired woofer polarity to my crossover. My first listen was bass shy. The JBL 2226h specifications say, black terminal is + positive.

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Subject: Re: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Tue, 19 May 2020 20:43:16 GMT

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I have a question based on interchanging components.

If I start the build with the base model components (Eminence) and later upgrade to the higher end components (JBL and B&C), will the existing cabinet and crossovers still work?

Will the screw holes for the woofer and mounting location for the compression driver be the same?

Are the resistors and capacitors the same on the crossover board?

And most importantly, will I be able to install the needed upgrades through the existing openings for the woofer and waveguide?

If anyone has gone through an upgrade, I'd love to hear about it!

Thanks,

dawiipgh

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Subject: Re: Horn loaded Corona Build  
Posted by [Wayne Parham](#) on Tue, 19 May 2020 20:59:07 GMT  
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The woofer and tweeter are direct replacements, and they can be exchanged through the front of the baffle. The cabinet stays the same.

There are some crossover changes required, but they are inexpensive and pretty easy to do. Some resistor values are different for the DE250 because it has slightly higher voltage sensitivity than the PSD2002. You can see the components used for each option in the "Notes" section of the crossover document.

Here are some of my thoughts about the upgrades available:

Options in a nutshell

Upgrades

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Subject: Re: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Sun, 24 May 2020 13:45:19 GMT  
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Hi Wayne,

I've been searching through the FAQ, threads and other website locations. I found the performance data of the 4 Pi speakers:

<https://www.pispeakers.com/Measurements/fourPi.html>

Your note at the bottom states that "Measurements were taken at a distance of 10 feet from the baffle and drive voltage was 8.62vrms. This is equivalent to 2.83v/M and 1W/1M values since

Interpreting the graph, it looks like the 4 Pi speakers clock in around 98-99 dB/W/1M. This is incredibly efficient!

I was considering purchasing an integrated Amp from Yamaha to power the 4 Pi speakers.

[https://usa.yamaha.com/products/audio\\_visual/hifi\\_components/a-s301/](https://usa.yamaha.com/products/audio_visual/hifi_components/a-s301/)

60 watts x 2 channels into 8 ohms (20-20,000 Hz) at 0.019% THD

This should be able to provide ample power to drive these speakers. A quick calculation taking into account 99 dB/W/1M efficient speakers and 60 Watts of Power at 8 feet listening distance in a room with speakers positioned ~2 ft from the walls gives a an estimated SPL of 115 dB. This is more than enough.

My question comes to what plate amp to use for the flanking sub. I believe I read that the driver for the sub is the Eminence Lab 12 in a large ported box tuned to 20Hz

[https://www.eminence.com/speakers/speaker-detail/?model=LAB\\_12](https://www.eminence.com/speakers/speaker-detail/?model=LAB_12)

I was considering the Bash 300S or the Bash 500S.

<https://www.parts-express.com/bash-300s-digital-subwoofer-plate-amplifier-300w-rms--300-750>  
or

<https://www.parts-express.com/bash-500s-digital-subwoofer-plate-amplifier-500w-rms--300-752>

I can't seem to find an amp that the second order roll off that is discussed here.

Any plate amp suggestions or guidance is much appreciated.

Thanks!

dawiipgh

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Subject: Re: Horn loaded Corona Build

Posted by [Wayne Parham](#) on Sun, 24 May 2020 15:59:30 GMT

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If you search here for "flanking sub crossover" you'll find lots of threads where we discuss different crossovers and amps. Some are plate amps and some are separate crossovers and amps. But the truth is, you're right, that most plate amps offer only a fourth-order slope.

One of the exceptions is miniDSP. Not only do they provide stand-alone crossovers but they also

offer plate amps. So that makes it really easy - just set it for "100Hz BW2" and you're done. Naturally, the subs need 10dB more gain than the mains too, which can be done either by attenuating the mains or boosting the subs.

Don't make 'em loud enough that you can hear them distinctly - They should be very subtle. You should be able to turn on or off the subs and notice very little difference except for more bass extension. The lower midrange will be smoother too, but that's subtle. So basically, the SPL should be set so the subs aren't noticeable. Each side becomes like a three-way speaker that sounds like a single seamless sound source.

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Subject: Re: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Wed, 03 Jun 2020 19:32:15 GMT  
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A pair of JBL Woofers were just delivered today!

Off to Lowe's for some 3/4" baltic birch and wood glue.

I'm looking forward to covering the back porch in sawdust this weekend!

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Subject: Re: Horn loaded Corona Build  
Posted by [Rusty](#) on Wed, 03 Jun 2020 20:34:03 GMT  
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I hope you haven't bought it yet. But I don't think Lowes carries true Baltic Birch ply. They have 4x8 sheets of birch ply. But it's not the same. It will have voids within the ply layers. As Wayne states many times. It can cause issues with trapped wood particles buzzing or rattling. If not immediate, then possibly later. Not sure if you knew about that.  
<https://www.woodworkerssource.com/blog/woodworking-101/tips-tricks/your-ultimate-guide-to-baltic-birch-plywood-why-its-better-when-to-use-it/>  
This can be found at better lumberyards.

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Subject: Re: Horn loaded Corona Build  
Posted by [Wayne Parham](#) on Wed, 03 Jun 2020 22:48:06 GMT  
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Awesome news you got your JBLs! But Rusty's right - Do check the quality of the wood. Lowe's is an excellent retailer, but the ones in Tulsa and Northwest Arkansas definitely do not carry Baltic Birch or even a good grade of MDF. They provide sheets of stuff that's probably good for some kinds of home projects and other similar structures like sheds, shops and garages. But it isn't suitable for loudspeaker enclosures.

Your local Lowe's might be different, but I doubt it. You can easily identify true Baltic Birch - It is sold in metric values of thickness, like 18mm. That's 0.7" which is pretty close to 3/4" and it will have 13 plies. What you'll probably find at Lowe's will be plywoods with much fewer plies than that, like 5. That's the sure indicator it's not Baltic Birch. Another way to tell is it's usually sold in 1.525M square sheets, which is 5' x 5'. It will also usually have a Cyrillic letter on it. Seems like

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Subject: Re: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Thu, 04 Jun 2020 14:05:21 GMT  
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Thank you Wayne and Rusty for the sound advice (pun intended). Unfortunately, I did purchase 3 sheets of 8x4' birch. It's good stuff but definitely not Baltic Birch or Russian Birch.

I did locate a high end lumber yard in Pittsburgh and I'll be picking up a few sheets of the good stuff. In other news, I'll be building a work bench, a couple new boxes to house my vinyl records, and a step stool for my son.

I most certainly have a use for this wood. I'll be practicing my dado and rabbet cuts and gluing. That way when I start formal construction, it won't be my first time on a table saw.

Keep the advice coming!

dawiipgh

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Subject: Re: Horn loaded Corona Build  
Posted by [Rusty](#) on Thu, 04 Jun 2020 14:57:42 GMT  
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Good idea. Hone your skills on some other projects before you crack your knuckles and go for the big pay off project. That birch ply will make some attractive record storage and work bench. Did you buy a table saw? Only ask because you mentioned circular saw initially.

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Subject: Re: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Thu, 04 Jun 2020 15:22:29 GMT  
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I got a small job site table saw which I'll use for small cuts, rabbets, and dados.

The table saw is too small to make long rips, so I got a corded circular saw. I bought finishing

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blades for each. I also picked up a router and I'm looking into circle jigs for recessed cut outs.

I got started on this building the Parts Express Blast Box:

<https://www.parts-express.com/blast-box-200-watt-portable-bluetooth-speaker-kit--300-7162>  
shown here:

<https://www.youtube.com/watch?v=XgAn3-kQjNQ>

The project was a success and I have a laundry list of lessons learned:

Use the correct glue

Make your enclosure absolutely air tight

How to solder

How to read wiring diagrams

How to bondo

How to spray paint

How to sand 220grit through 1200 grit

How to polish

Dialing in the amplifier settings

General trouble shooting

The blast box was a great learning experience but it has me craving more. So here I am.

.... Actually I was thinking about building a pair of 1Pi speakers with a subwoofer and having a lithium battery back and 2.1 bluetooth amplifier (50W x 50W x 100 W) for an even better bluetooth (semi-mobile) speaker.

dawiipgh

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Subject: Re: Horn loaded Corona Build

Posted by [Rusty](#) on Fri, 05 Jun 2020 12:36:44 GMT

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Have a ball building. Like I'd first mentioned, making your own hifi from great designers gives the best satisfaction possible. You'll of course show us what you did.

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Subject: Re: Horn loaded Corona Build

Posted by [Barryso](#) on Fri, 05 Jun 2020 21:59:00 GMT

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Nelson Pass has, in several interviews, said that the DIY crowd is cheap and the happiest of all the audiophiles he knows.

It's the second part that's important.

:)

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Subject: Re: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Wed, 12 May 2021 13:48:19 GMT  
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Hey guys!

It has been a long time but life kind of comes at you from all sides. When lockdown began around March 2020, I knew that I wanted to build a set of large efficient speakers. Four Pi speakers were well reviewed and recommended in a lot of the forums. So, I started poking around and eventually got the plans, crossover, and wave guide from Wayne. Compression drivers from Parts-Express and a set of preowned lightly used JBL2226 woofers from Ebay.

I was unloading several sheets of 3/4" Baltic Birch in May and it started raining so I started unloading faster. Instead of holding the sheets in front of me and walking down the grass hill to the basement entrance, I started walking backwards while sliding the wood on the grass. This shouldn't matter because I was going to true up the factory edge. Anyways, I tripped over my retaining wall and fell backwards with my hand outstretched. I ended up with a compound fracture on my radius at the wrist and a broken ulna at the elbow. So my wife 7.5 months pregnant gets me to the local hospital....

We arrive and my forearm looks like a sine curve and the bone is sticking out the bottom. The triage doctor takes a look at me and says, this might be above our paygrade here so let's get you downtown to where the real carpenters are. They set the bone that night and, in the morning, I have surgery and get external fixators put in.

This recovery with the external fixators goes on for about 6 weeks, then they remove them and open up my wrist again and screw in some plates and put me in a cast. Summer is gone and we have our second kid!

Cast comes off and I start physical therapy. I can't lift more than 3-5 pounds with very little grip strength so running a circular saw or a plunge router are last on my list of priorities. I have a buddy come over to help me manage the uncut sheets of wood and we get some rough circular saw cuts done and I decide to invest into a clamping straight edge.

So, I'm feeling better around February March 2021 (about a year from when this all started) and I start making my cuts in the back yard with full snow gear on. I learned a ton about wood working and clamping glued joints and the unruliness of routers.

After the boxes were built, I settled in on the front baffle and went with the recessed woofer and horn. Then I start on the cutouts for the port. It is an uphill battle, but at every point I'm learning more from the forums here and woodworking You Tube videos.

After the baffle is glued in, I complete an electrical hook up and it is so fascinating how much the enclosure shapes the tone and response of the woofer. I opted for a recessed baffle in order to incorporate a fabric grill in the future. I saw a great inspiration from vintage KLH, Klipsch, etc. and from a forum user here: Jensen. I opted for General Finishes Java Gel Stain and I am experimenting with mixing my own shellac and doing a final top coat with Deft spray Lacquer.

I wanted to push to get this done for my Birthday in April. We now have functional and stained speakers. A few punch list items include installing the fiberglass insulation, installing the gaskets around the horn and woofer (shower pan liner), final shellac / sanding / lacquer finishing, and a stand or feet with a 5-10 degree incline. Future projects include two flanking subwoofers. I currently hooked up a 10" subwoofer with a passive radiator which really changes the depth and heft of the sound. I can only imagine what 2 ported 12's or 2 sealed 15's will sound like! The current subwoofer is an Aperion Audio Bravus 10D. It rolls off around 40 Hz but still provides quite the depth of sound.

I am currently driving the speakers with a PS Audio Sprout 100 and even at 50 watts @ 8 ohms (100 watts @ 4 ohm), this system provides concert level SPLs with enough chest slam to have your HOA contact you.

So now we are a family of four who really enjoy Living Room dance parties. I even got on Ebay to pick up a fog machine, DJ Chauvet Kinta FX and a Scorpion dual laser aerial lights. Quarantine really came at us, but I think we are doing just fine.

Thanks to all the forum members and Wayne for all of the guidance and brainpower in this forum.

-David

## File Attachments

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- 1) [IMG\\_20210509\\_121147\\_193.jpg](#), downloaded 794 times
- 2) [IMG\\_20210509\\_121147\\_312.jpg](#), downloaded 784 times
- 3) [IMG\\_20210509\\_121147\\_340.jpg](#), downloaded 817 times

- 4) [IMG\\_20210509\\_121147\\_447.jpg](#), downloaded 762 times
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Subject: Re: Horn loaded Corona Build  
Posted by [Rusty](#) on Wed, 12 May 2021 14:59:48 GMT  
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I think from that ordeal you'll be forever bonded with your 4 Pi's. Bet that smart a bit. Better check your ports after your parties for errant beer soldiers left there. Nice work. I like the proverbial monkey coffin shape of the Pi 4. Those skinny tower speakers are sissy in comparison

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Subject: Re: Horn loaded Corona Build  
Posted by [Wayne Parham](#) on Wed, 12 May 2021 17:12:08 GMT  
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Your speakers look great! But - man - what a journey to get them there!

Thanks for the write-up!

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Subject: Re: Horn loaded Corona Build  
Posted by [Jetpump](#) on Sat, 15 May 2021 15:31:16 GMT  
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Nice job with the speakers! It always feels good to build something you appreciate. Sorry to hear about the accident.

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Subject: Re: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Fri, 16 Sep 2022 15:13:14 GMT  
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Hey guys! I just wanted to weigh in on how impressed and happy I am with the 4 Pi speakers. I started with them in a small room of an open plan house. Wow. Even with a 50 WPC PS Audio Sprout amplifier, these pressurize the room. At reasonable listening volumes, everything is balanced and really feels like a live performance. I enjoy concerts (small venues and bars as well as large pavilions and arenas). During quarantine, that was missing.

I have since moved them down to the basement and they really shine in a larger room. It was interesting, since the drivers were so large, you could actually hear separation of the highs mids and low (port) because the speakers were too near field in my upstairs room. In the basement, you can experience the constant directivity. It's like you can walk around and the sweet spot is very large compared to typical dome tweeters.

4 pi's are really well balanced and the mid range is extremely lifelike. What it doesn't have is a strong low end <40 Hz. You will hear rock music bass guitar and full range of drums, low strings, and piano, but where it lacks is explosions in movies and synth bass / drum machines in EDM, House, Rap, etc. I actually messed around playing test tones (you can find them on spotify) to see where the speakers rolled off. I'm sure a calibrated mic will be in my future soon.

I had an Aperion Audio 10" subwoofer with 2 passive radiators and a 500 watt amp. It held up pretty well. But from what I've read hear and other forums / books / articles that multiple subs are the way to go. Walking around the room, you can hear noticeable volume differences in the bass response.

So since I have a 15" midwoofer, I can't reasonably be OK with a single 10" sub. so I'm back to the shop to build two 15" ported subwoofers.

It's roughly based on the 4 pi design but uses the Dayton Audio 15" subwoofer RSS390HO-4 instead of the Lab12c. Dimensions are 20" x 20" x 20" but instead of a single 4" port, I am considering two 3" flared ports from precision port 17" long each. I played around with WinISD looking at several drivers, and tons of box volumes, port arrangements and even passive radiator designs. This hit the sweet spot compromise of low end extension, port velocity, excursion, SPL and box size.

The amplifier that I bought used is a Crown Amplifier XTI 2002 to power both subs.

Admittedly, I currently do have the 4Pis hooked up to the crown and holy bananas, it's powerful. You can't beat the efficiency of these drivers. When these hit down around 50Hz it can literally pull the air out of your lungs.

So long story short, I'm really happy with my build and thanks to all in the forum for the support.

David

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Subject: Re: Horn loaded Corona Build  
Posted by [Wayne Parham](#) on Fri, 16 Sep 2022 16:47:40 GMT  
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Truly excellent.

I hear you about subs that are smaller than the midwoofer in the mains. It just seems "wrong."

And you can get higher efficiency from a larger sub, so there's definitely an advantage in using a larger subwoofer.

But there is one place that I think having a smaller subwoofer makes sense, and that's in the flanking subs. Using a smaller cabinet there is sometimes easier to place, giving more placement options. A flanking sub can offer extension but its main purpose is blending in the upper midbass and lower midrange.

The 20" square cabinets you've described sound like they'll be perfect for this purpose. They'll likely trade a little bit of extension for midbass efficiency. That's an excellent flanking sub.

If you're also running a distant multisub or two, that's where you can really take advantage of large, powerful subs. Might be able to use the same drivers you've chosen for your flanking subs in a larger box, perhaps tuned in an EBS alignment, giving deeper extension. Or maybe choose a different driver that'll get you down into the teens. Or stay with the same cabinet - which probably offers ample extension as it is - and just run one or two more for modal smoothing.

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Subject: Re: Horn loaded Corona Build  
Posted by [dawiipgh](#) on Sat, 17 Sep 2022 18:50:06 GMT  
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Thanks for the wisdom Wayne. I'll let you know how things progress.

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