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## DIY Bluetooth Boombox Speaker | HOW TO



by Donny Terek

Hi! Thank you for checking this project out, this one is on my favorites list! I'm super happy to have accomplished this amazing project. Many new techniques have been used throughout the project to improve the overall quality and finish of the speaker. As always, the parts and materials list, wiring diagram, build plans and many detailed pictures are included so let's go grab our tools and start building!



[https://youtu.be/v-\\_GFRLRDCw](https://youtu.be/v-_GFRLRDCw)





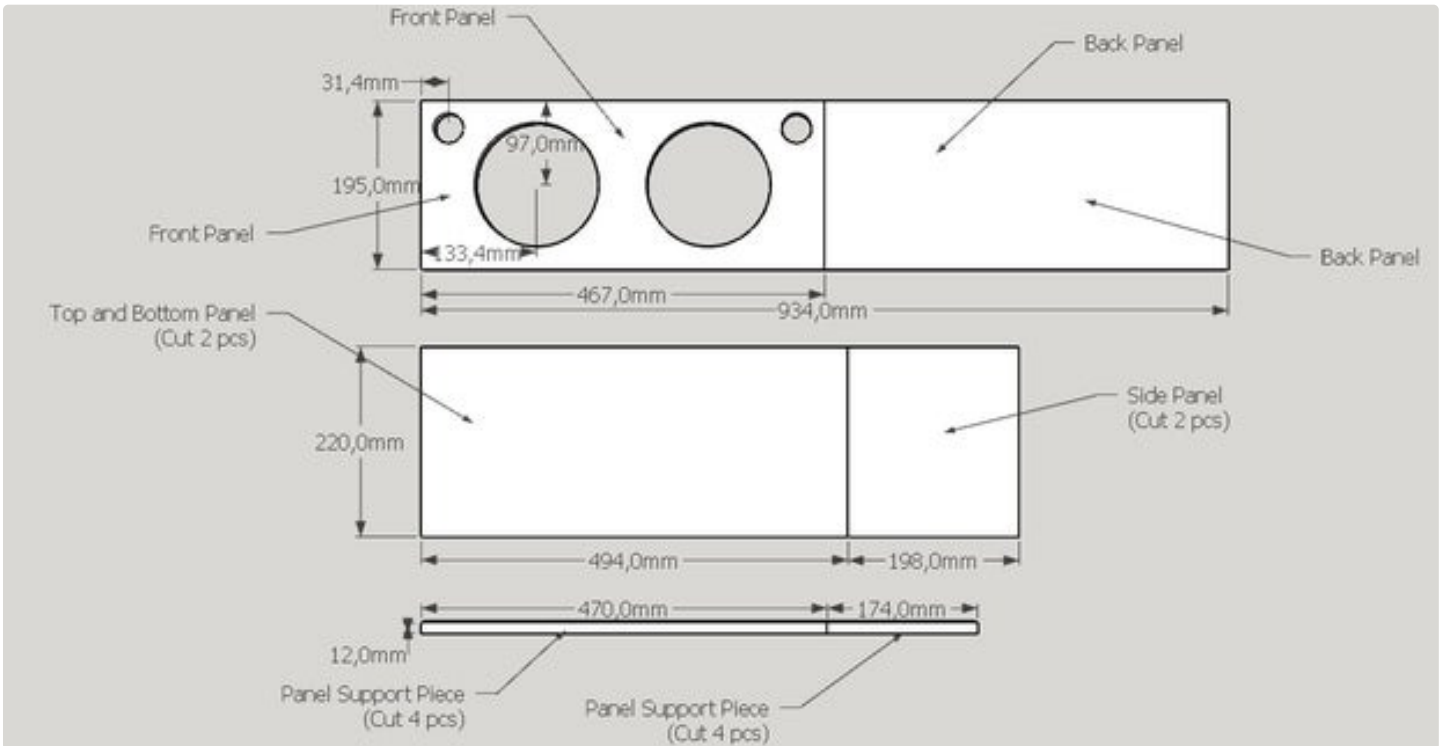
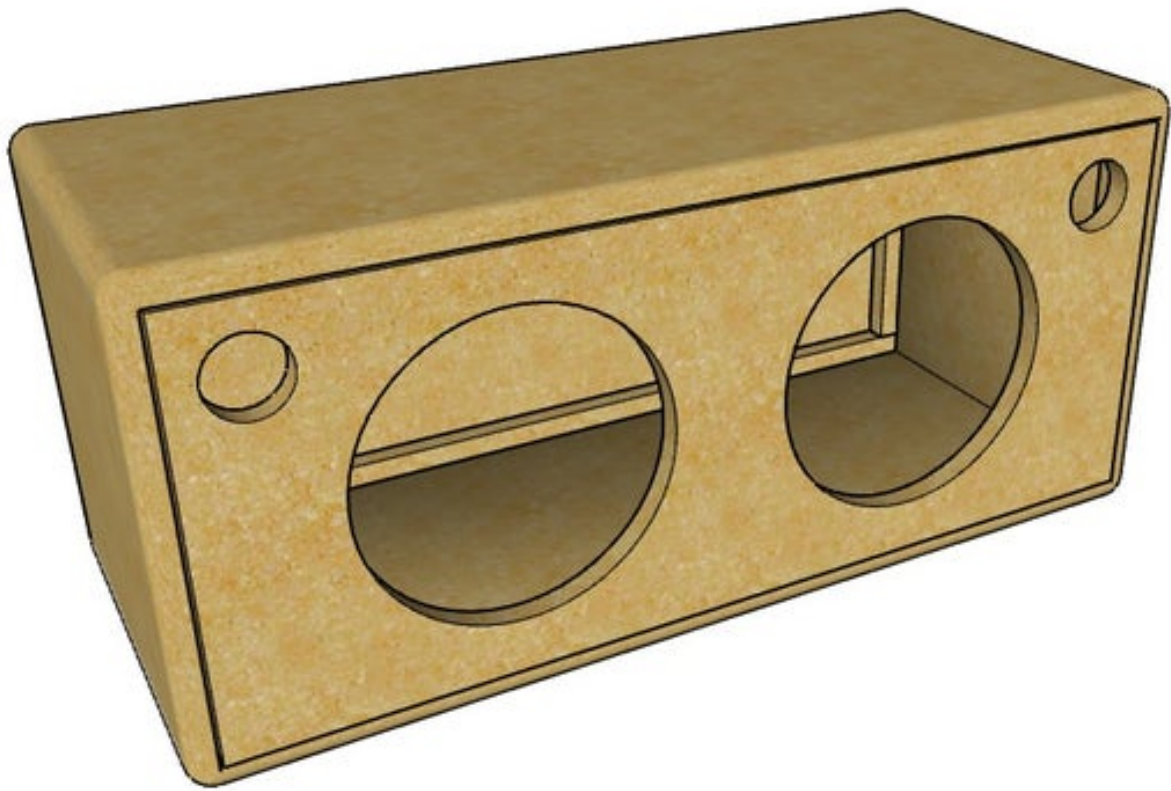
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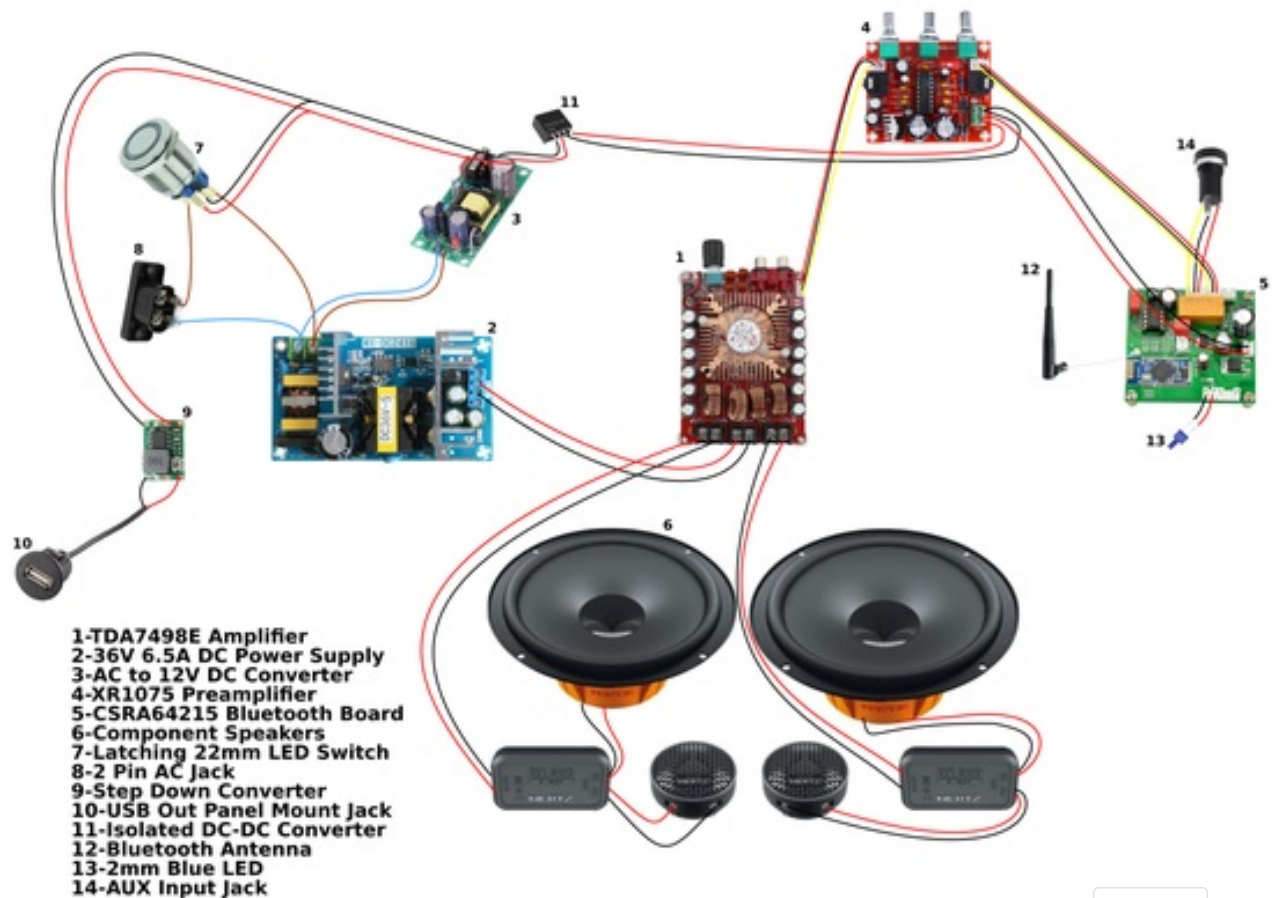
## Step 1: Plans and Design

The main objective of this project for me was to build a decent looking, not too much volume-occupying Bluetooth speaker that would provide plenty of power into the speakers. Therefore for this speaker I chose a pair of Hertz DSK 165 2-way speakers, which can take up to 80W RMS of power each. They provide crisp and boomy sound, without overwhelming bass and yet they are super affordable. I also dig the look of these drivers too.

**Important to note:** I do not state that this is the best sounding speaker in the entire universe, rather it is a passion and a hobby of building speakers, acquiring knowledge as I go. Therefore I am unable to provide a great sound test or SPL graphs for true audiophiles but I am trying my best and learning to achieve satisfying results.

I designed my speaker on Sketchup, which is a free program for designing - simple to use and can create great results. I also needed to use Autocad for sketching out the laser-cut parts. The materials that were used were 12mm MDF board, 4mm plywood and leather vinyl.





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## Step 2: Components, Materials and Tools

I have made sure to include every little bit and piece that I have used to build this speaker. Of course, not every part or tool is necessary but it is always good to know what you will need.

As mentioned before, I used 12mm MDF for the enclosure and 4mm plywood for panels and logos. Feel free to use any set of speakers that are 165mm (6.5 inch) and are able to receive at least 60W RMS for best results.

The speaker has been designed for European and American use, therefore once built, the speaker will be able to accept AC voltages ranging from 85 to 230 Volts, suitable for many countries around the world.

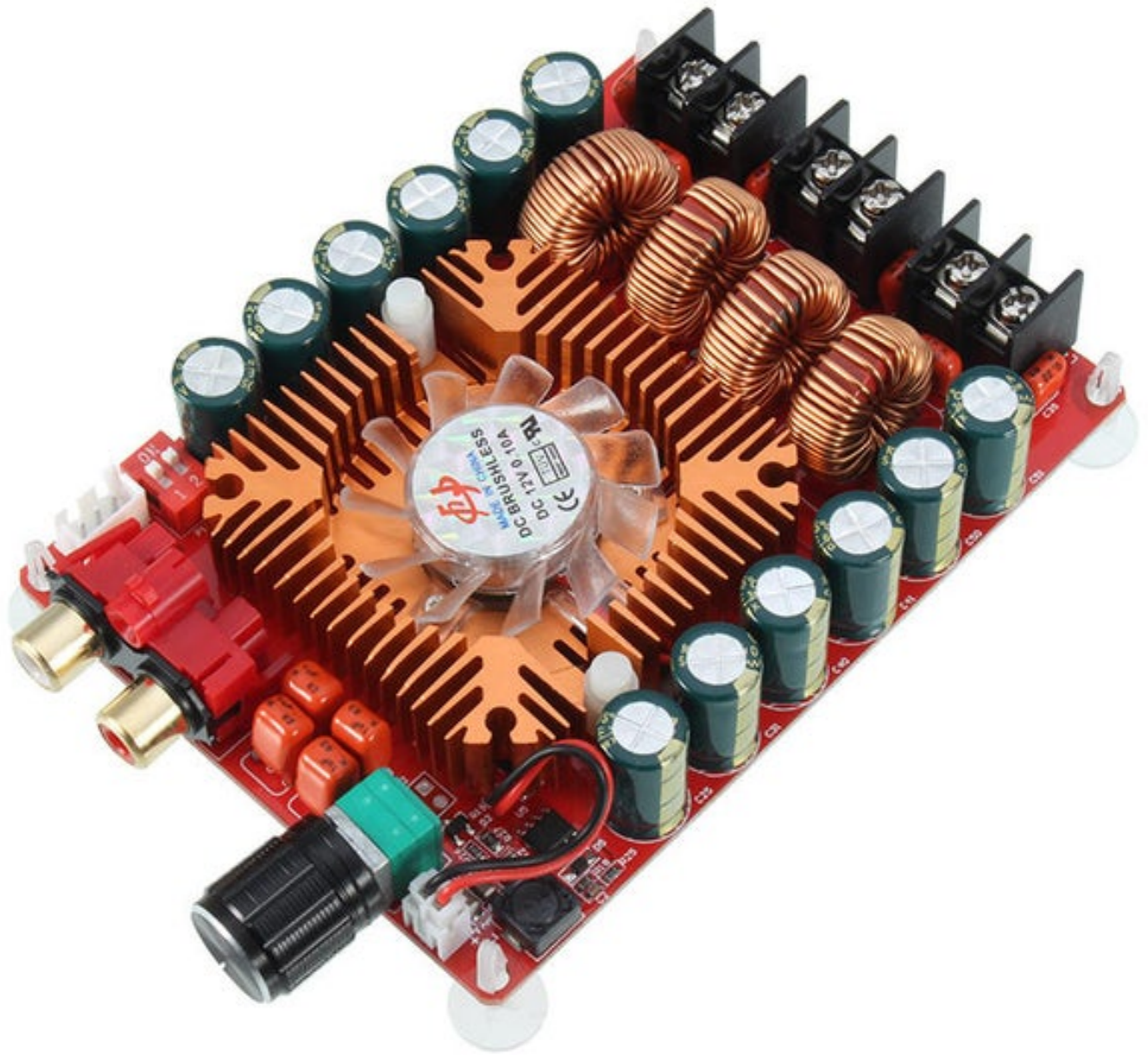
**COMPONENTS:** (\$18 OFF your first App order ☒ [https://a.aliexpress.com/\\_mNHt1sn](https://a.aliexpress.com/_mNHt1sn))

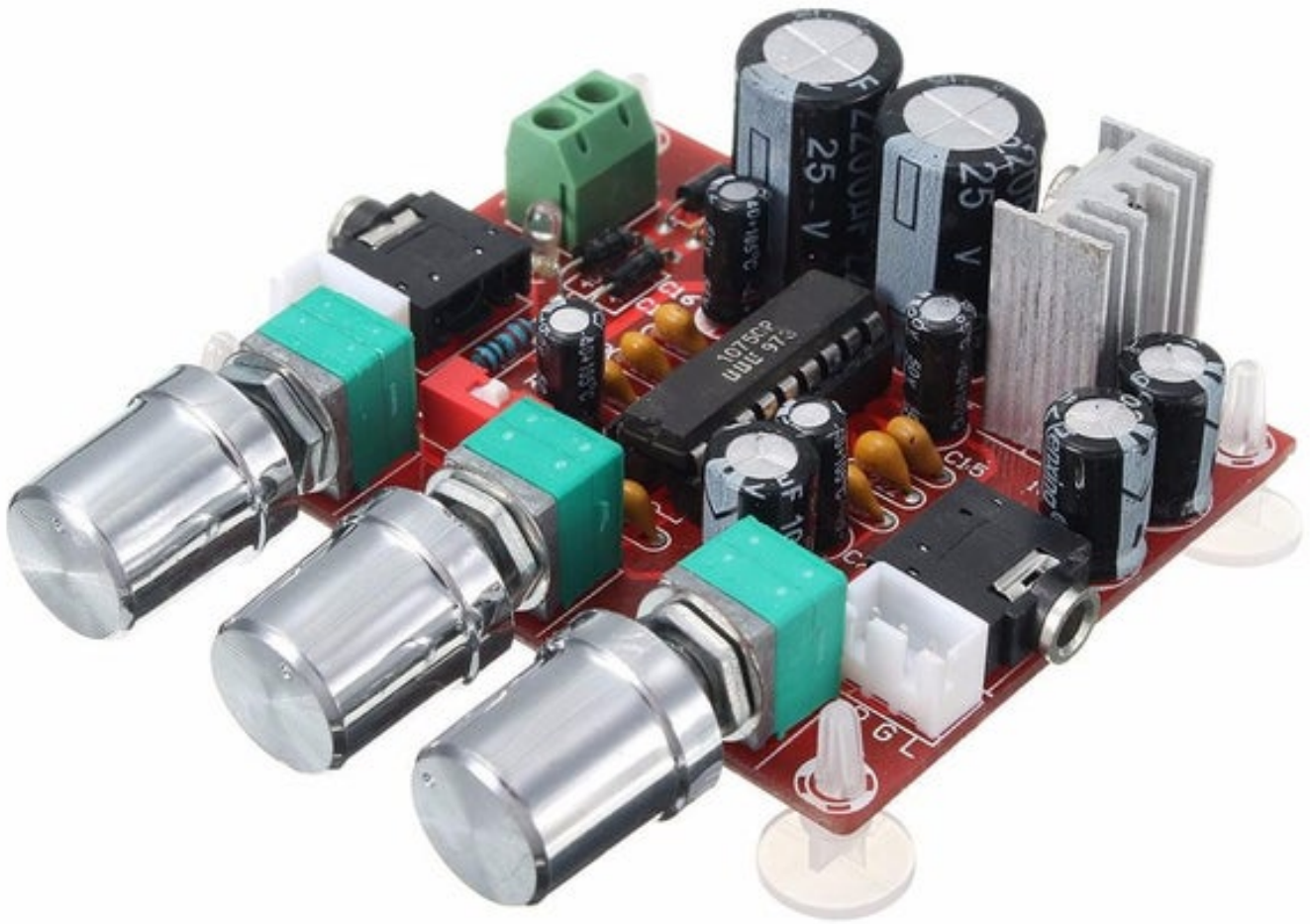
- TDA7498E Amplifier - <https://bit.ly/3eNomsV>
- 36V 6.5A Power Supply - <https://bit.ly/32yGkuh>
- AC to DC 12V 1A Converter - <https://bit.ly/37WQMgZ>
- XR1075 Preamplifier Board - <https://bit.ly/37YZqdU>
- CSR64215 Bluetooth Receiver- <https://bit.ly/2Ueg9Vc>

- Component Speakers - <https://bit.ly/3qf3rn6>
- 22mm 12V Latching LED Switch - <https://bit.ly/35Vty8a>
- 2 Pin AC Socket - <https://bit.ly/2Y7eXnz>
- Step Down Converter - <https://bit.ly/33AyloQ>
- USB Panel Mount Socket - <https://bit.ly/35WpXHk>
- B0505S-1W Isolated Converter - <https://bit.ly/3nefFLb>
- Bluetooth Antenna - <https://bit.ly/2r8n07F>
- 2mm LED - <https://bit.ly/3piQZTr>
- 3.5mm Panel Mount Audio Socket - <https://bit.ly/34F8eDZ>
- Spade Connector - <https://bit.ly/2OBL2kg>
- AC Cord - <https://bit.ly/2P1GByo>
- Acoustic Foam - <https://bit.ly/34GucGG>
- 3.5mm AUX Cable - <https://bit.ly/2rFtSch>
- Amplifier Knobs - <https://bit.ly/2ObkmGP>
- Adhesive Foam Tape - <https://bit.ly/2SRV1nM>
- M2.3X10 Screws - <https://bit.ly/2rmLkCj>
- Rubber Feet - <https://bit.ly/2rkXvQo>
- M3X4 Threaded Insert - <https://bit.ly/35LA6X0>
- M3X4 Nylon Screws- <https://bit.ly/2RaOTq5>
- Brass Standoffs - <https://bit.ly/2ss6dvw>
- MDF sealer - <https://ebay.to/31ledZj>

## **TOOLS and MATERIALS:**

- Multimeter - <https://bit.ly/35QJQPN>
- Hot Glue Gun - <https://bit.ly/37U9CVh>
- Soldering Iron - <https://bit.ly/3kndDam>
- Wire Stripper - <https://bit.ly/2XZ9kl8>
- Cordless Drill - <https://bit.ly/2UiMSbL>
- Jig Saw - <https://bit.ly/35msihg>
- Drill Bits - <https://bit.ly/3kgSG0V>
- Step Drill Bits - <https://bit.ly/3eM5GtB>
- Forstner Bits - <https://bit.ly/35snpjW>
- Hole Saw Set - <https://bit.ly/35IQkso>
- Wood Router - <https://bit.ly/3aPdISq>
- Roundover Bits - <https://bit.ly/3kkQXYo>
- Center Punch - <https://bit.ly/2FWc3xu>
- Solder - <https://bit.ly/2XNOUSt>
- Flux - <https://bit.ly/33eXs5l>
- Soldering Stand - <https://bit.ly/2P4OOk7>











### Step 3: Let's Start the Build!

To begin with, I have used a table saw to cut up all of the panels - front, back, bottom, top and two side pieces. You can also see that I cut out the circles for the speaker drivers, the slot for the control and back panels, also the slots for handles. To cut the slots out I simply stuck the laser-cut templates centered to the piece, traced around the inside and roughly cut it out using a jigsaw.



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## Step 4: Router Work

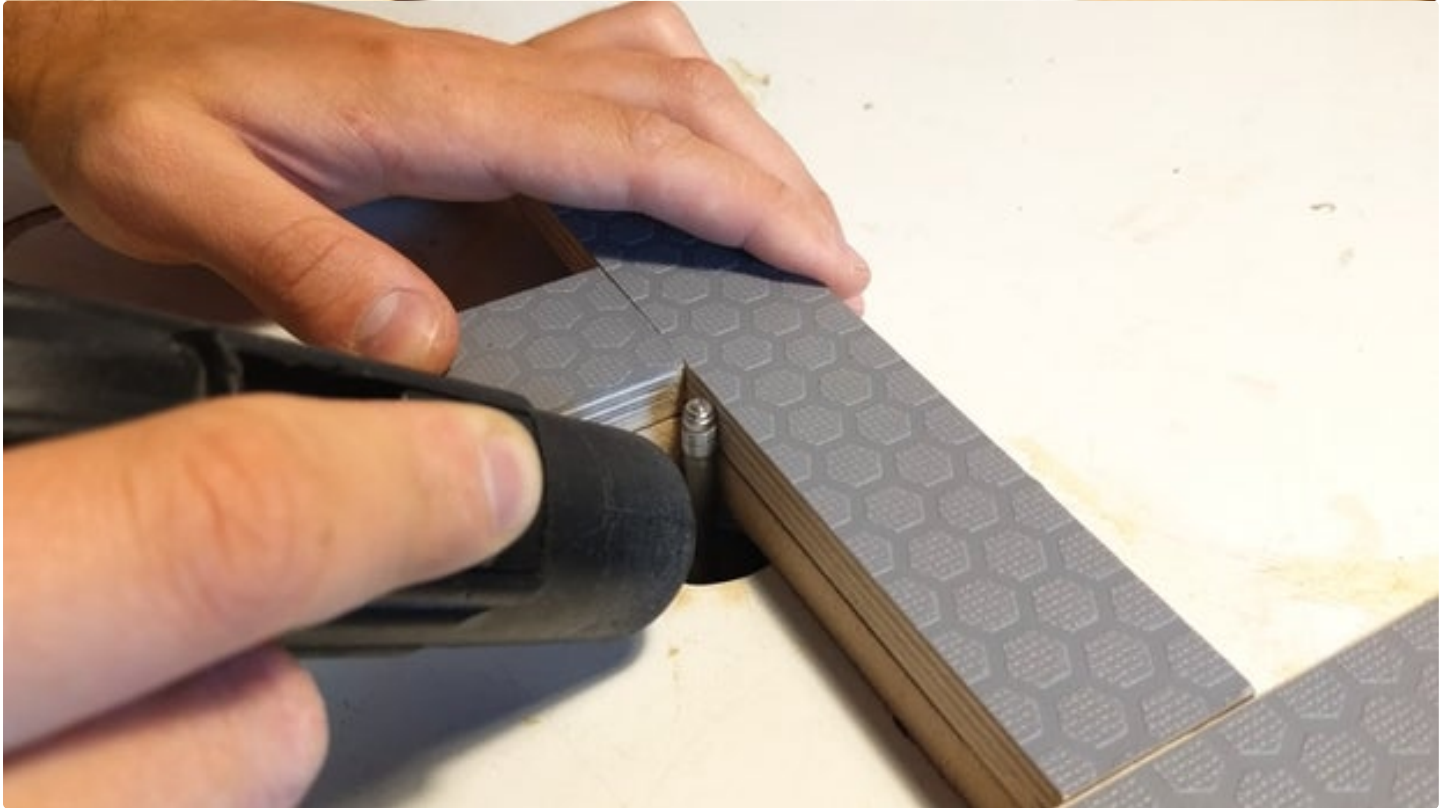
In my opinion this step is necessary for a nice finish when making slots for a control and back panel for the speaker. For that you will need a wood trimming router combined with a flush trim bit, preferably a spiral bit which cuts nicer and is safer to use.

Feel free to take my uploaded laser-cut plans to your local company which could cut out the pieces for you. In the plans you will find a template for the front and the back panel. Find the centers of your top and back pieces and stick the templates on the pieces nicely in the center. Then using the flush trim router bit, cut along the edge of the template.

For the slots for the handles I stuck four straight plywood pieces along the edge, creating a template which the router bit could trim along.

Then using the rabbeting bit I cut out a notch to flush mount the plywood back panel. You can also see that I have made a shallow notch around the inside of the top panel so that the vinyl leather can rest against without protruding too much therefore the control panel can be mounted flush, leaving almost no gaps.

**Keep your hands away from the spinning bit, wear a dust mask and use dust collection!**





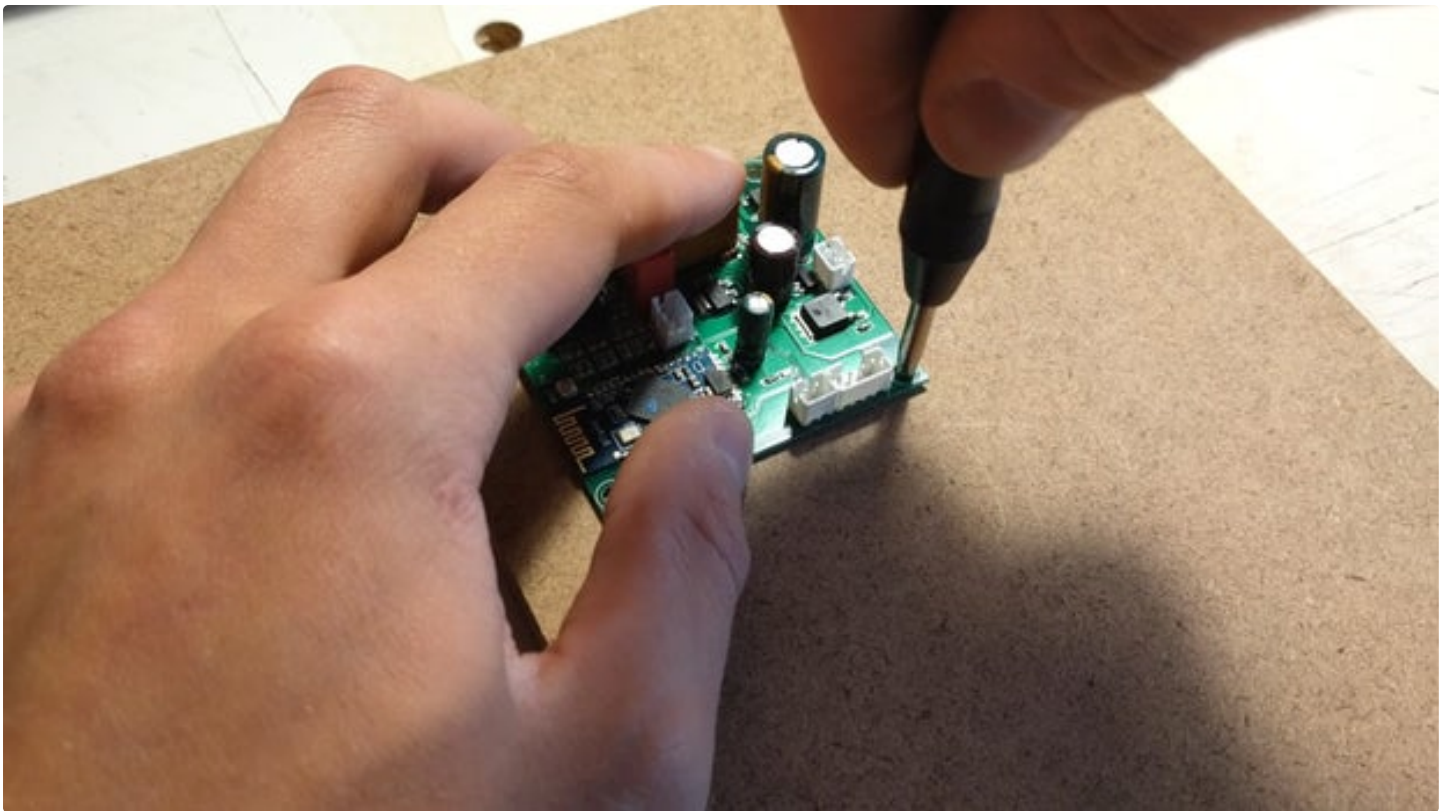
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## Step 5: My Method for Mounting the Electronics

Lately I have been using hot glue for mounting the speaker parts inside of it but is not a reliable method of securing parts, especially the heavier ones like the amplifier or the power supply which can move out of place over time when glued down.

Therefore I have come up with a much nicer and easier method by using threaded inserts. Using a center punch I marked the holes of a component, and using a drill bit that is a bit smaller in diameter than the threaded insert, drilled out holes for the insert to sit in. It is a bit fiddly to press the inserts in place, but using a steady hand and in my case a flat aluminum piece to mount the threaded inserts flush, I tapped them in place with a hammer with not much effort. You can see the result in the pictures with the threaded inserts sitting flush in the MDF panel.

It is also a good practice to apply a bit of wood or CA glue inside the hole to keep the threaded inserts more securely. Just make sure not to apply glue inside the threads!





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## Step 6: Glue Up and Edge Rounding

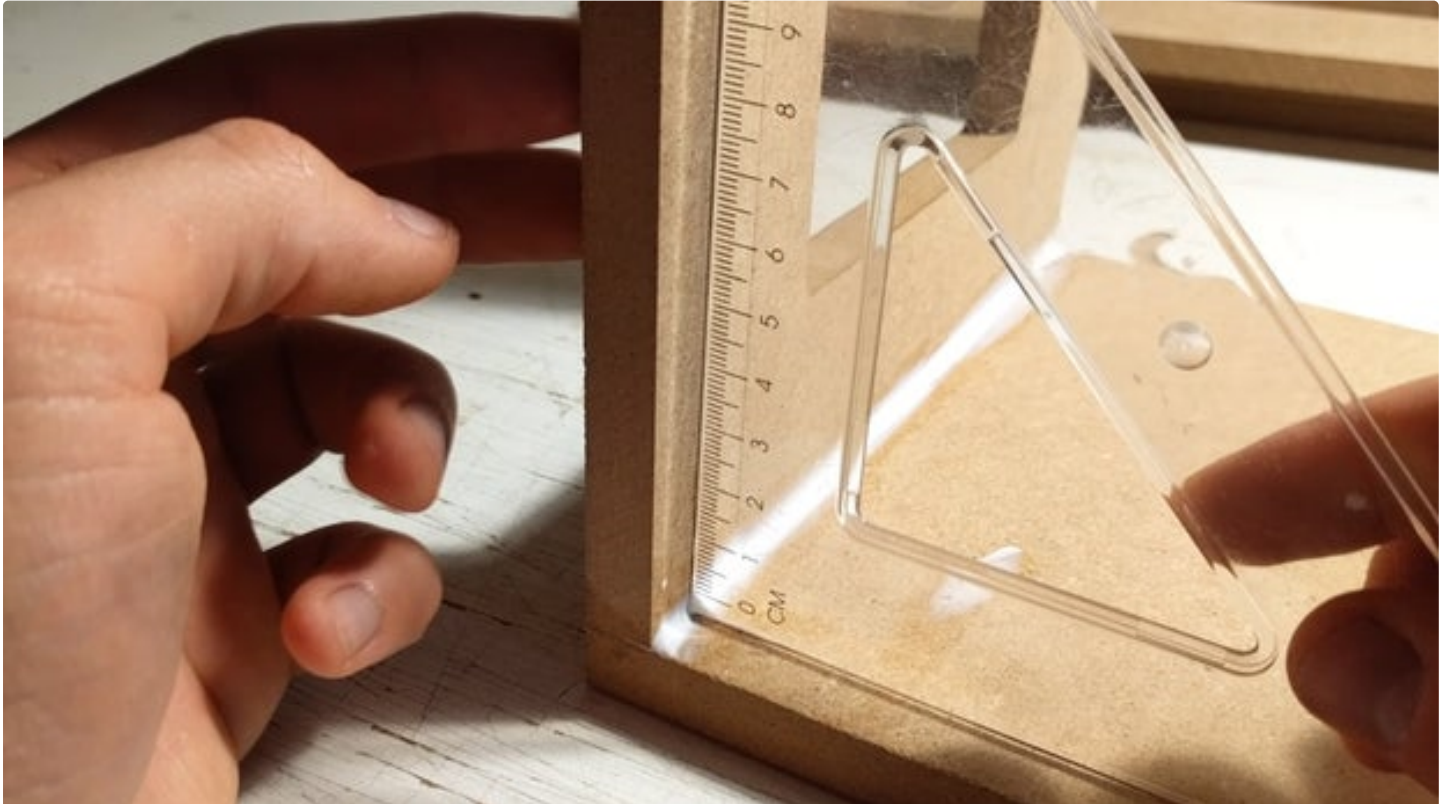
Time for one of the more satisfying parts of the build - the glue up! I always find this part pleasing then the enclosure comes together and finally takes shape. I used PVA wood glue for that, making sure to use plenty of it on the sides and on the inside seams, spreading the glue with my finger for a nicer finish and better bond.

I made sure to check if the panels sit square and came back every few minutes to check if they are still square until the glue was firm enough to accept the top panel. I did not use clamps because I do not have them on hand - a few dumbbell weights work just fine and require much less hassle to keep the enclosure straight while the glue dries.

Off camera I glued the panel support pieces in place, making sure the panels sit just a bit shallow when placed on top of the support pieces.

I then left the enclosure for a good few hours for the glue to fully cure and I drilled the holes for the screws that will keep the handles in place and I also drilled the holes for the rubber feet, using a caliper to get equal distances from the edges.

I then took out the roundover bit to smooth up the edges of the enclosure and also around the inside of the top control panel. **Be aware**, this process makes loads of nasty dust!







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## Step 7: Applying the Leather Vinyl

I would consider this step as one of the most frustrating, time and patience consuming since it is really fiddly and requires some practice and experience to achieve nice results. Since this is not the first time I have done this, I felt safe doing this and I knew what to expect.

I made to cut a piece of the vinyl that is a bit longer than the perimeter of the box with the edges of the vinyl protruding a little bit so that it is easier to wrap the edges around the rounded corners.

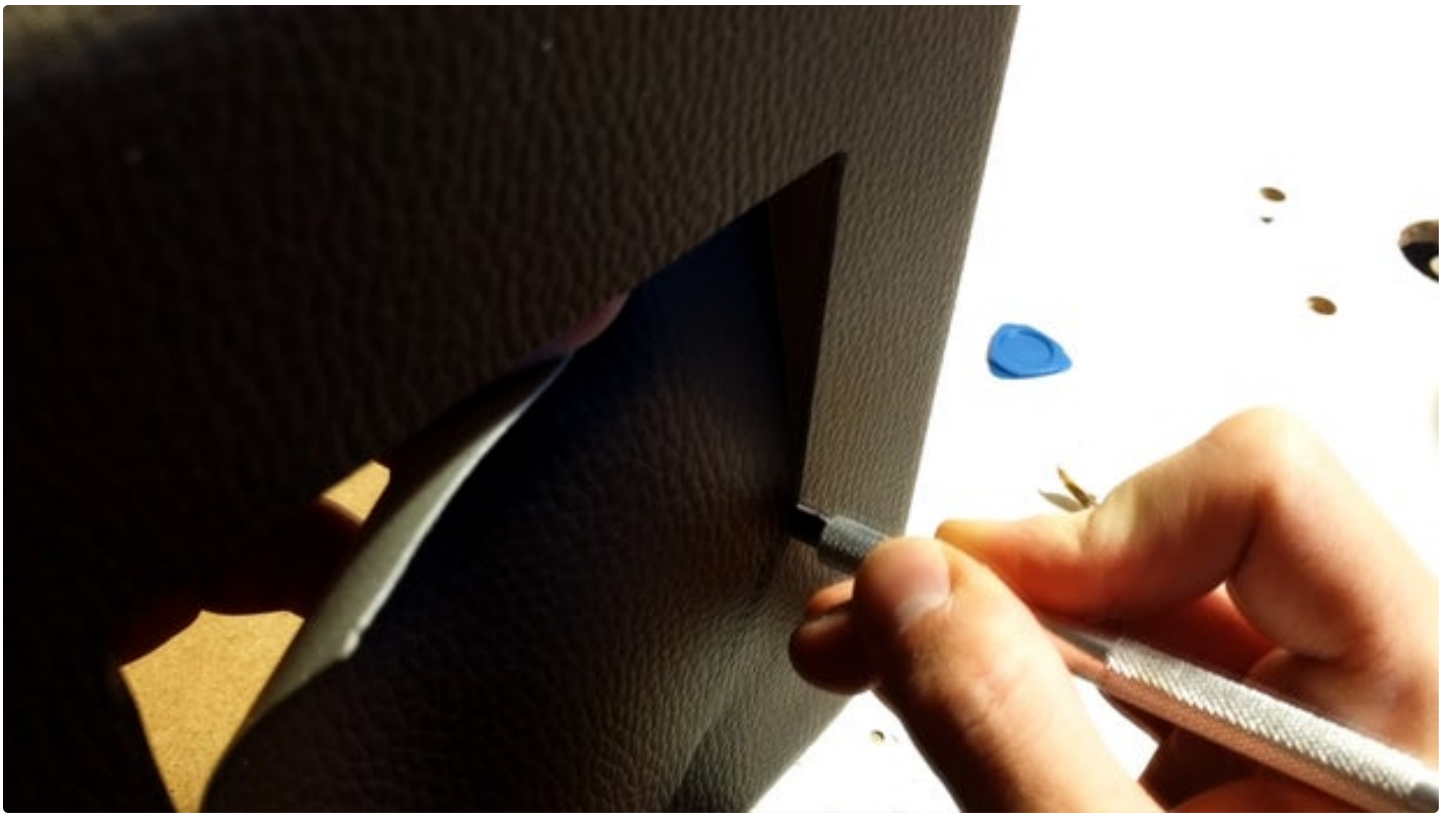
I used contact cement, making sure to apply a healthy amount on both the MDF and the vinyl leather and leaving them both for a few minutes aside so that the solvent evaporates from the glue and leaves somewhat tacky glue. I then carefully took the vinyl on the edges making sure to touch the glue as less as possible, stretched it out a bit and using my fingers pushed on the MDF panel sticking the two together. While the glue is still kind of wet, the vinyl can be moved and adjusted for a few minutes but after that it is stuck in place for good. As you can see in the picture I have succeeded in making a somewhat invisible seam where the vinyl ends meet when wrapped all around the box. A good tip is to cover one side with tape so that no glue gets on the vinyl when sticking the two ends together.

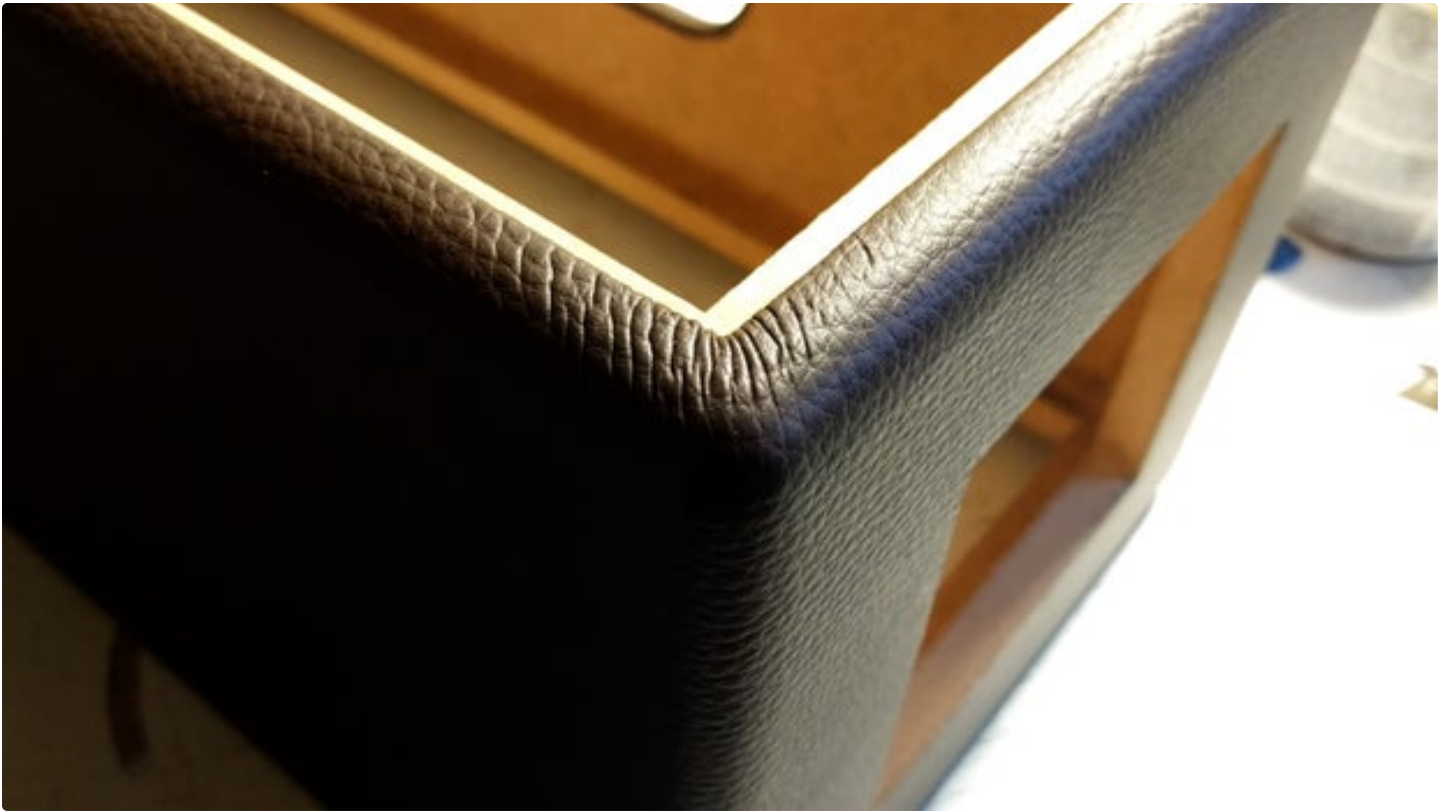
Getting around the round edges requires most patience and practice. I simply try pulling the vinyl with a bit of force to smooth out most of the wrinkles. I go like that at a 45 degree angle pulling the vinyl until it smooths out itself. I then use a plastic card or a scraper to tuck the edges of the vinyl inside the enclosure and once the glue is set, using a sharp knife trim the edges making sure not to cut the vinyl where it will be visible.

A good tip is to make many incisions to relieve the tension on the vinyl so that it is easier to wrap around tight curves and rounded edges.









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## Step 8: Painting the Panels

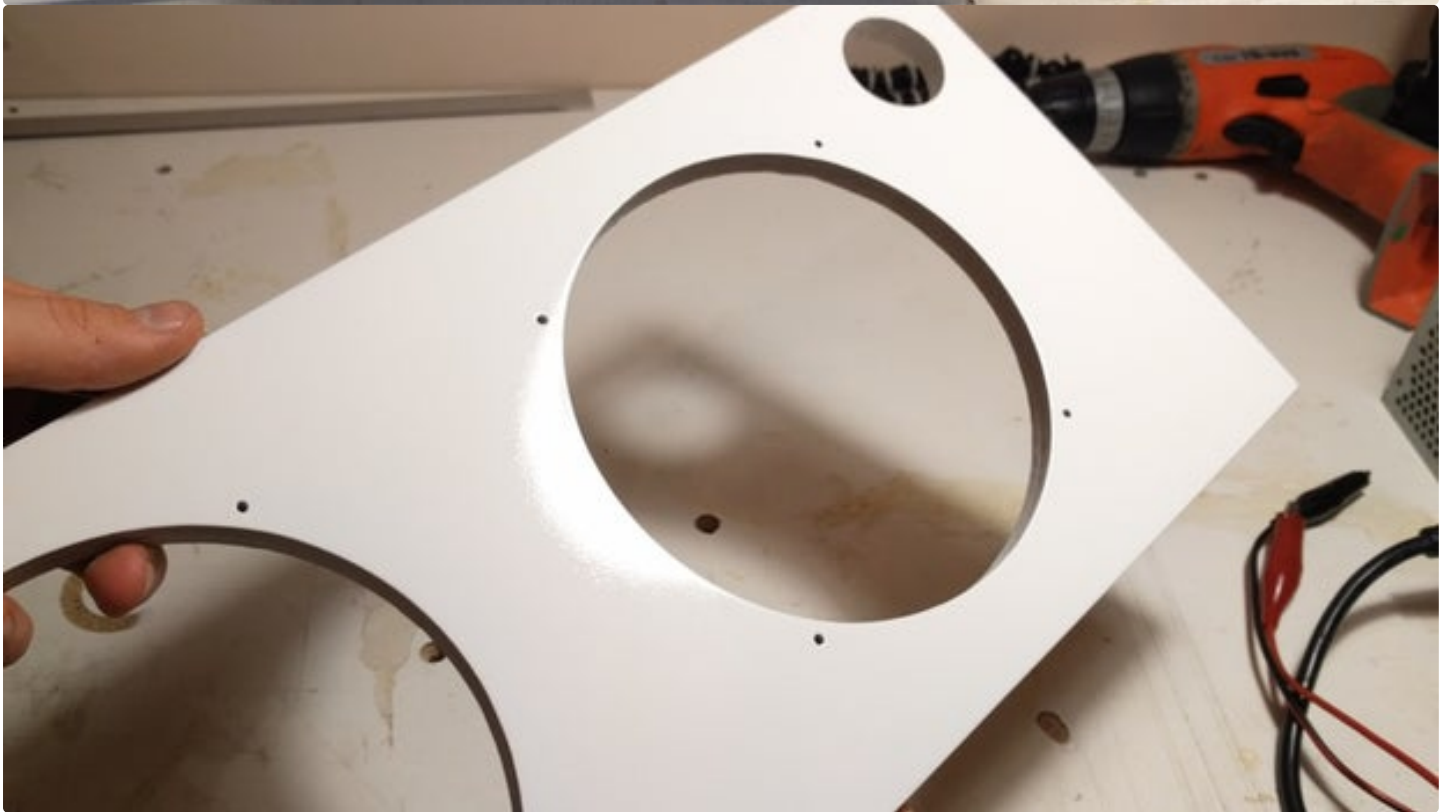
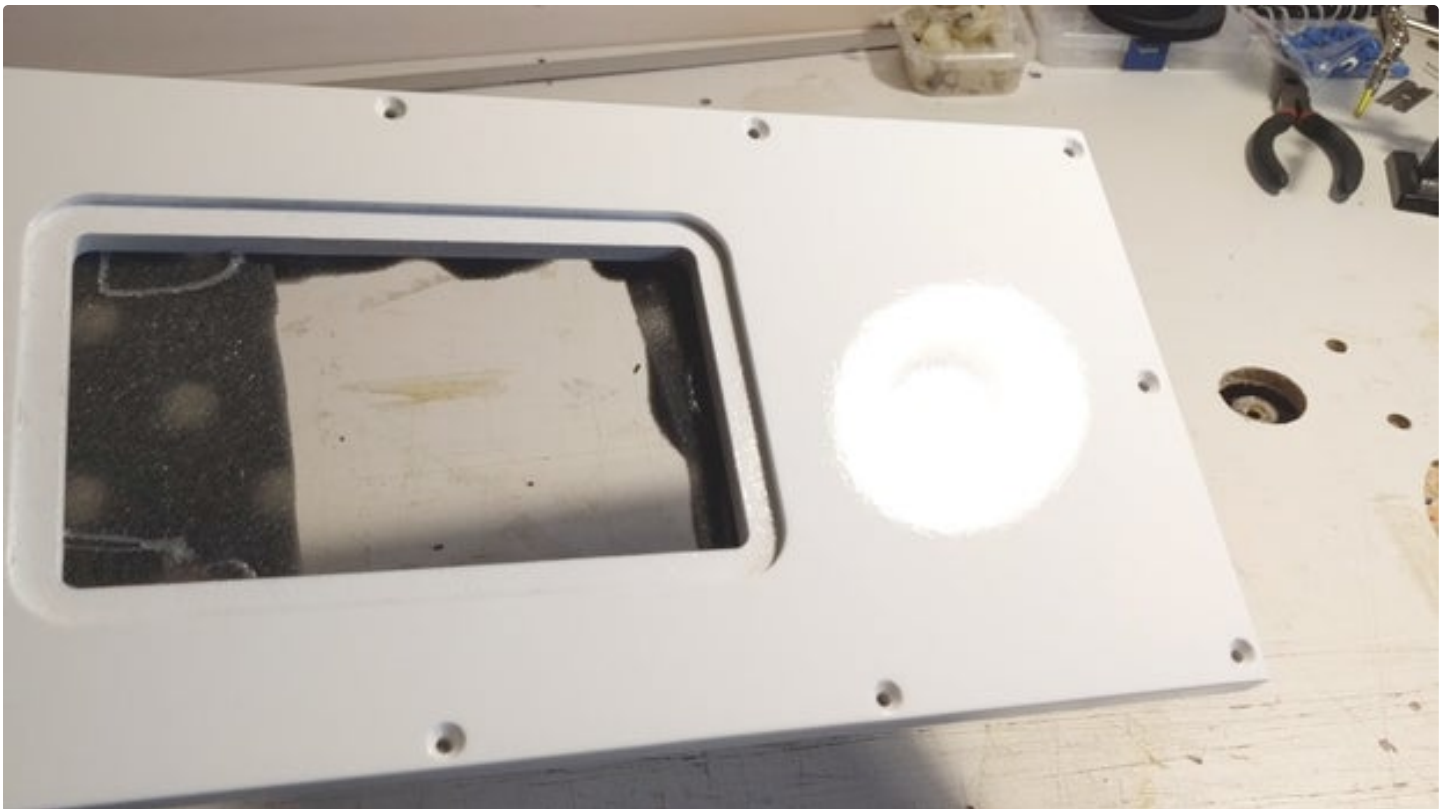
I do have to be honest - this is my first time spray painting MDF but I am quite satisfied with the finish. There is much to improve, of course, so I sure will!

My objective was to achieve a gloss white finish. So first of all smoothed out the MDF panels using an orbital sander with 220 grit sandpaper. I then applied a few coats of a 50/50 Titebond III - water mixture to the panels and letting them dry overnight. I then scuffed the surface with the sandpaper again and sprayed a few coats of grey primer to smooth out the surface. Once the primer coats have dried, I used a coarse sanding sponge and a spray bottle to wet-sand the panels. I wiped the panels with isopropyl alcohol to remove any oils and residue and sprayed them with the gloss white paint. It did require 3-4 coats for a nice finish. Once the color coat has dried, I sprayed the clear lacquer and let it dry for a few days making sure not to touch the surface. I also sprayed the plywood panels and my logo while at it.

You can see the shine on the panels which is what I was aiming for.







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## Step 9: Moving Towards Final Assembly!

Only a few bits and pieces left to do, such as:

- Gluing in the plywood control panel from the inside of the enclosure, making sure to spread a healthy amount of glue around the edges make an airtight seal.



- Pre-drilling the holes for the logo using masking tape to mark the exact location of the screw holes.
- Screwing in the screws from the inside of the speaker which will hold the front panel in place. For that I left the ends of the screws poking just a tiny bit out so that I can mark the panel where holes need to be drilled to accept the screw. I lightly tapped the front panel to make the dents on the inside of the front panel. I made sure to use a piece of foam to cushion the blows from the hammer and leave the finish intact.
- Applying the adhesive foam tape to the support pieces from the both sides of the enclosure to make sure an airtight seal is obtained once the front and back panels are screwed in place.
- Mounting the carrying handles and applying hot glue from the inside of the speakers to eliminate any gaps.
- Screwing in the brass standoffs. Screwing them in by hand is enough since they will be tightened in place when the nylon screws will be used to secure the electronics.
- Gluing in the acoustic foam using hot glue and making sure that the brass standoffs protrude through it. As you can see I applied the foam on the inside of all panels.
- Sticking the speaker driver rings on the front panel using clear silicone to prevent any air leaks.
- Screwing the rubber feet in place.











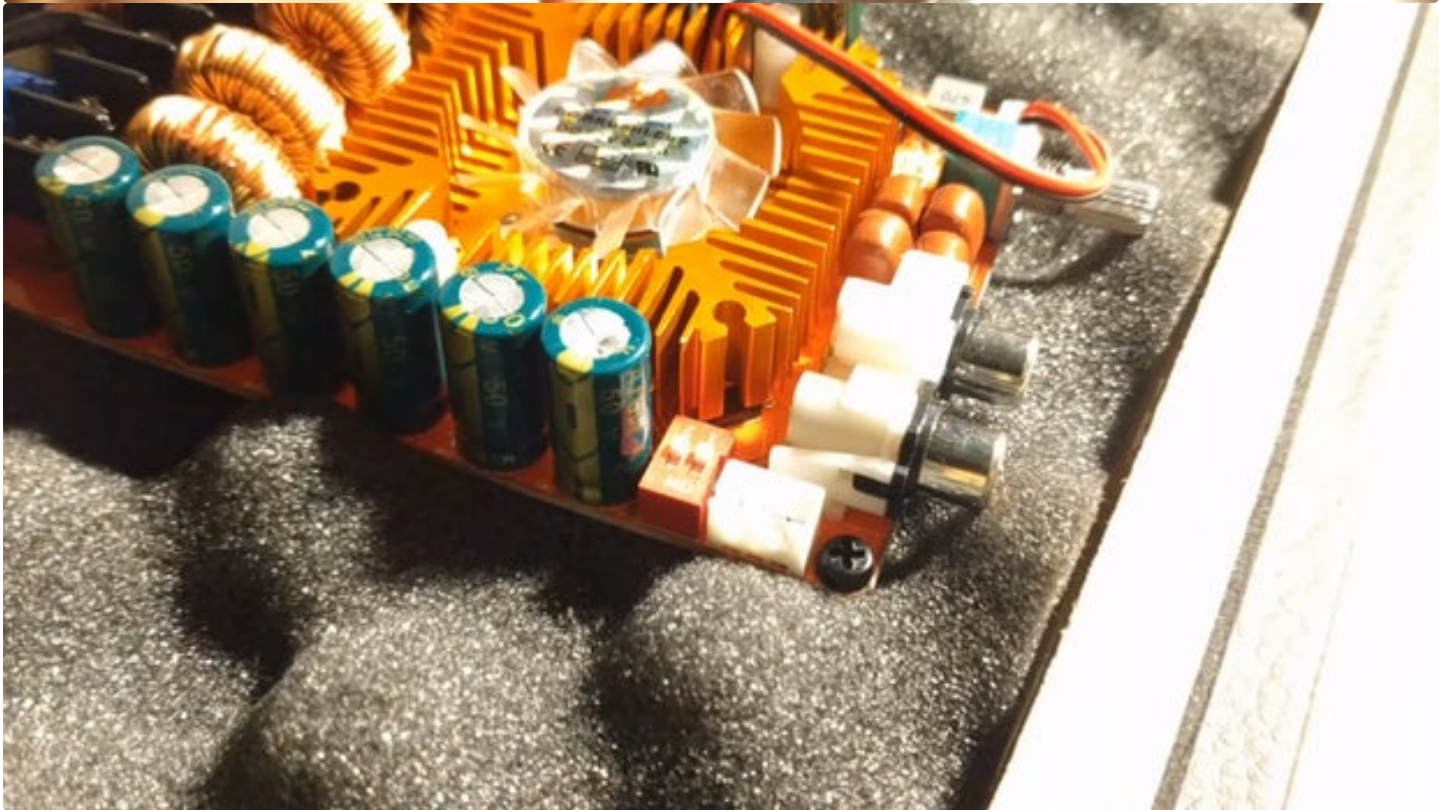
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## Step 10: Electronics

Time to place the guts of the speaker! I was really happy with the way I decided to mount the electronic components inside the speaker, it was really easy to do and resulted in the components staying in place really well.

I used spade connectors for most of the connections to ensure a good connection. I also tied wires together where I could to eliminate any rattling once they are inside the speaker. I also made sure to keep the audio signal wires separated from the power source wires.

Make sure to check my wiring diagram for a more detailed explanation.



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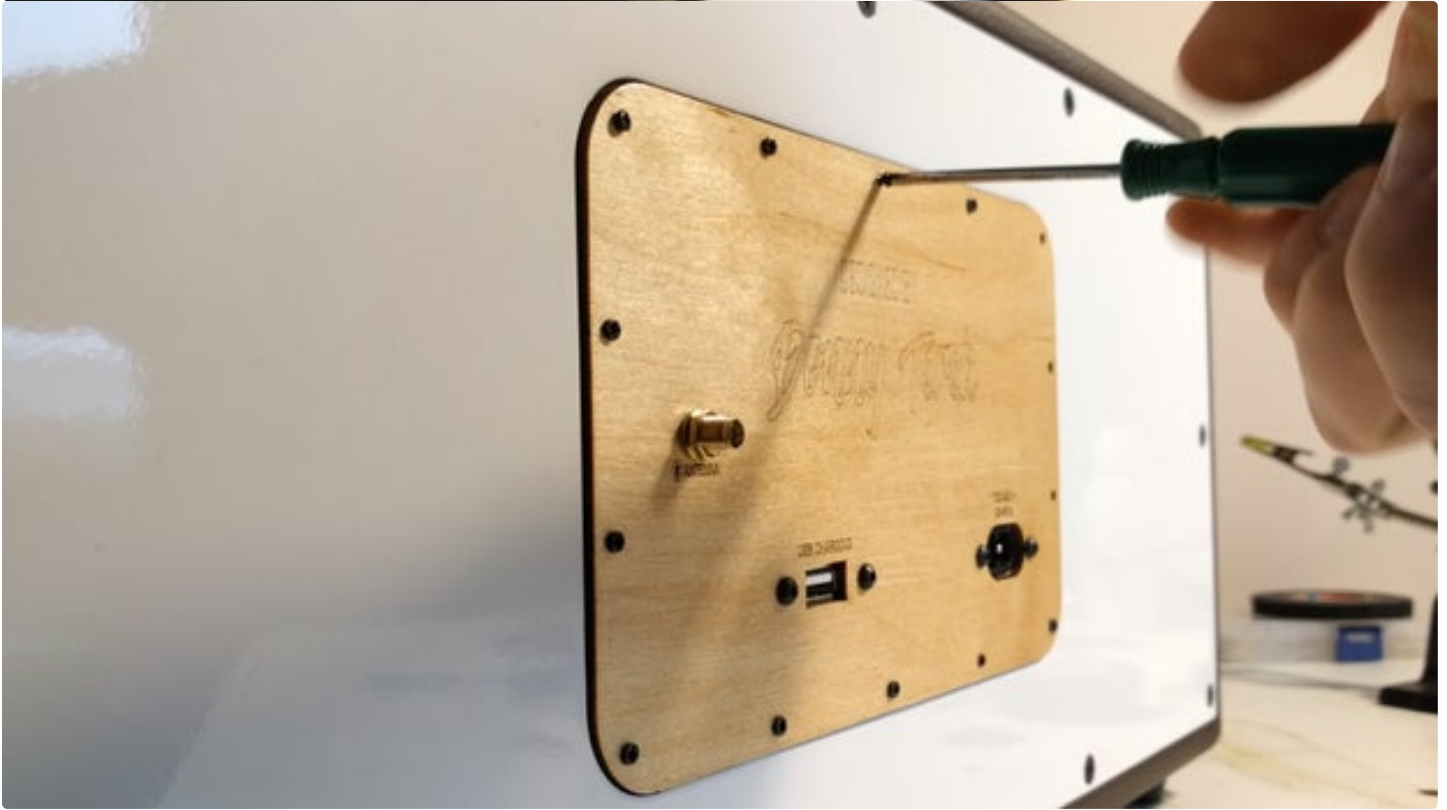
## Step 11: Final Touches

So nice to see the speaker come together! Looks great so far!

I proceeded by screwing the back panel in place. You can see that I have used a countersink bit before spray painting the panels so that the screws can sit nice and flush. I then followed up with the back plywood panel, using many small screws to secure it in place.

Then it was time to screw the speaker drivers in place and putting the grills on for protection. I then screwed the logo in place which is always so satisfying! And I also screwed the amplifier knobs in place, leaving a small gap between the plywood panel so that the knobs can turn easily without scratching the surface.











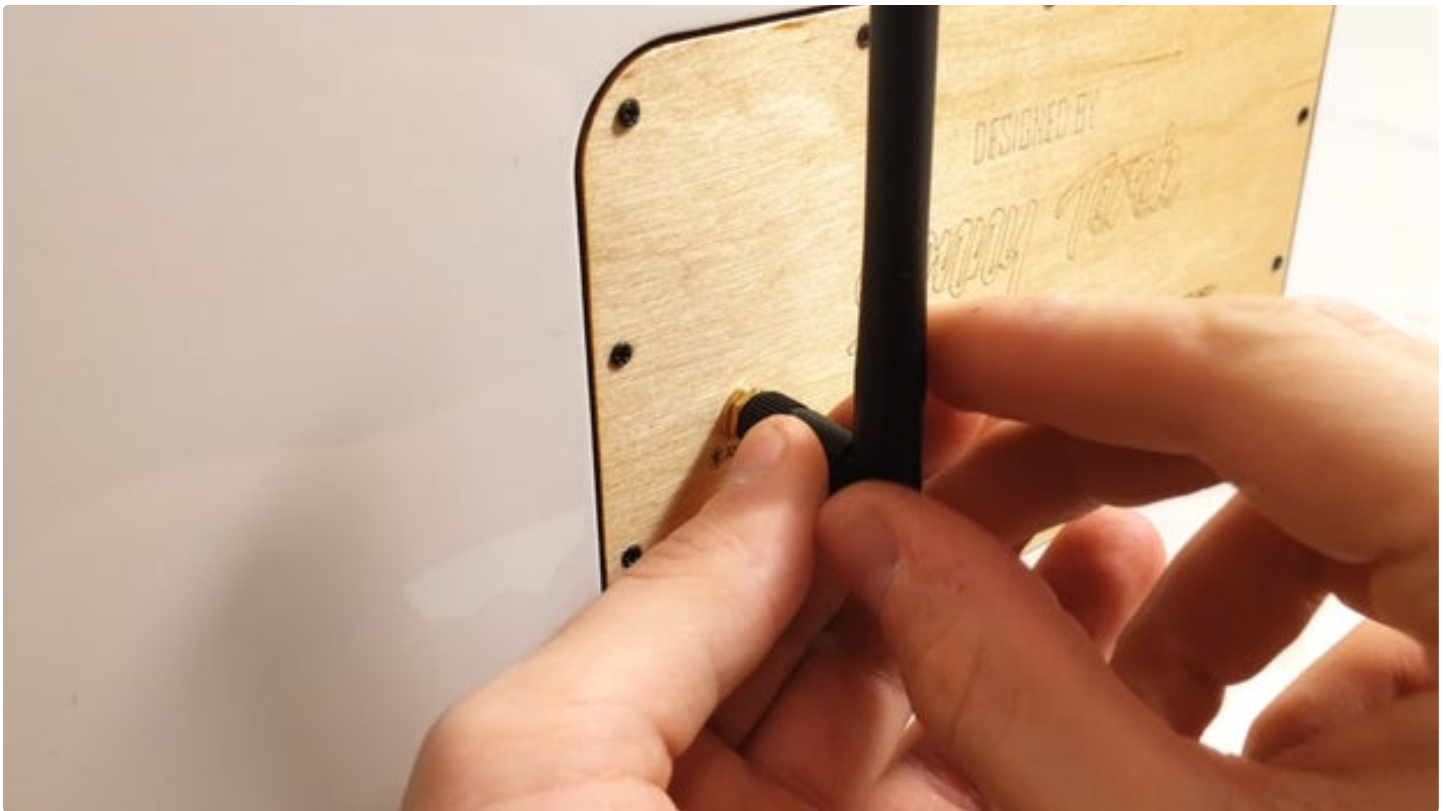


## Step 12: Finished!

The speaker is finally finished! Many hours have been spent on this project but I am super happy how it turned out. It is powered by an AC outlet, in my case a 220V one. I really like the option to charge your device with the USB port on the back. I also included a Bluetooth antenna on the back panel which highly increases the Bluetooth range, it has no

problem streaming through a few walls and doors. Also, the Bluetooth connectivity is really quick.





### Step 13: Final Thoughts

I would like to consider this project a success, it looks great, sounds great and I learned a lot building it. I hope you learned something new reading my article on this build and I hope I inspired you to build one yourself! I can guarantee - it is loads of fun building something like this!

See you in another project, thanks!

- Donny



















GREAT WORK , well done. Looks amazing!



Thank you! I appreciate that!



I've been looking at your speakers the last few days and I'm very impressed.. Almost ready to jump in with both feet. I have a couple of questions though. 1) I see in this design you're using a 12v DC-DC isolator in front of the preamp, whereas in your 150w Insanely loud box you used a 5v isolator in front of the Bluetooth board - could you explain this a little and let me know what the better way to do that is? 2) I see you're using a different Bluetooth board in this design that uses BT 4.2 and runs on 12v instead of 5v - have you noticed improvements using this board? After typing out these questions I'd have to imagine one has to do with the other since the BT board and preamp are both being powered by the same 12v converter, and if I switch my design to use the 4.2 board I'd do it the same way. I appreciate any pointers/advice you might be able to share! Thanks!

Edit: Thought of 2 more questions.. 3) On the Insanely Loud box you were using the Bluetooth Power Button's LED as the Bluetooth board's LED, and you recommended a push button switch with a 5v LED. In this build, you're recommending an LED that's prewired for a 12v connection. Is VIN coming out of LED+? i.e. will i need a push button switch with a 12v LED for this bt board? 4) In this build you're putting Aux In to the Bluetooth board rather than the preamp like you did previously - any positives or negatives to either configuration?



really amazing work



Thank You!!



I notice there is a cooling fan mounted on the power amp board. I guess I missed the ventilation opening in your box design. Should there not be some ways to get rid of the PA power dissipation? Also, in other designs I have observed, the blue tooth boards are powered by 5 V, not the 12 V your diagram shows. Where do you see the voltage required for this BT board since this does not show on the board itself?

Overall, a very nice looking design.



Thank you for the comment! Since the amplifier is running at around 60% of its full power, the amplifier becomes warm at most at rough use, therefore the inner air volume is enough to cool the amplifier. The CSRA64215 Bluetooth board that I have used runs of DC / AC voltage of 10V-30V because the board itself has its own voltage regulator which steps down the voltage to the necessary amount.



Thanks! I plan to use a similar construction for a folk dance group that will need more than "moderate" volume when performing so I will construct my box with a separate compartment for the electronics so it can be vented!

Just curious, where do you obtain the information on the voltage requirement for these boards? Some have the numbers marked on them when I look at them on the e-bay - Amazon - what have you website, but a lot of these boards do not and I have not found any place to ask questions!



Simply look through the description of the products! It may take a while to understand the Chinese English language but it is well worth it rather than frying a board with voltage that is too high!



Cool



Thanks!



Do you have a cost for building this speaker?



Around \$120 USD with the speaker drivers that I have used. This does not include the tool prices.



That is just awesome! Excellent Work!!



Thank you so much!



Excellent job! Congratulations



Thank you!



Looks amazing!



Thank you!