BASKET CASE

Open-source Turn-key DIY Eurorack Modular Synthesizer Case

xo modular

OVERVIEW

BASKET CASE is an open-source design for a 12u 84hp Eurorack modular synth case. The name refers to the idea that the case can be built by essentially filling an online shopping basket. Despite its all-aluminum construction, it can easily be made without the use of special tools or equipment. The primary goal in designing this case was to create a freely available set of instructions for a turn-key DIY case that can be assembled from a minimal number of parts, obtained from a minimal number of sources. All of the digital files required to build the case, including the open source license information, are hosted at https://github.com/xoxomodular/basketcase

DESIGN NOTES

This design uses symmetry, tolerances where panels meet, a lack of panel-to-panel joinery, and some other tricks to make it hard to screw up.

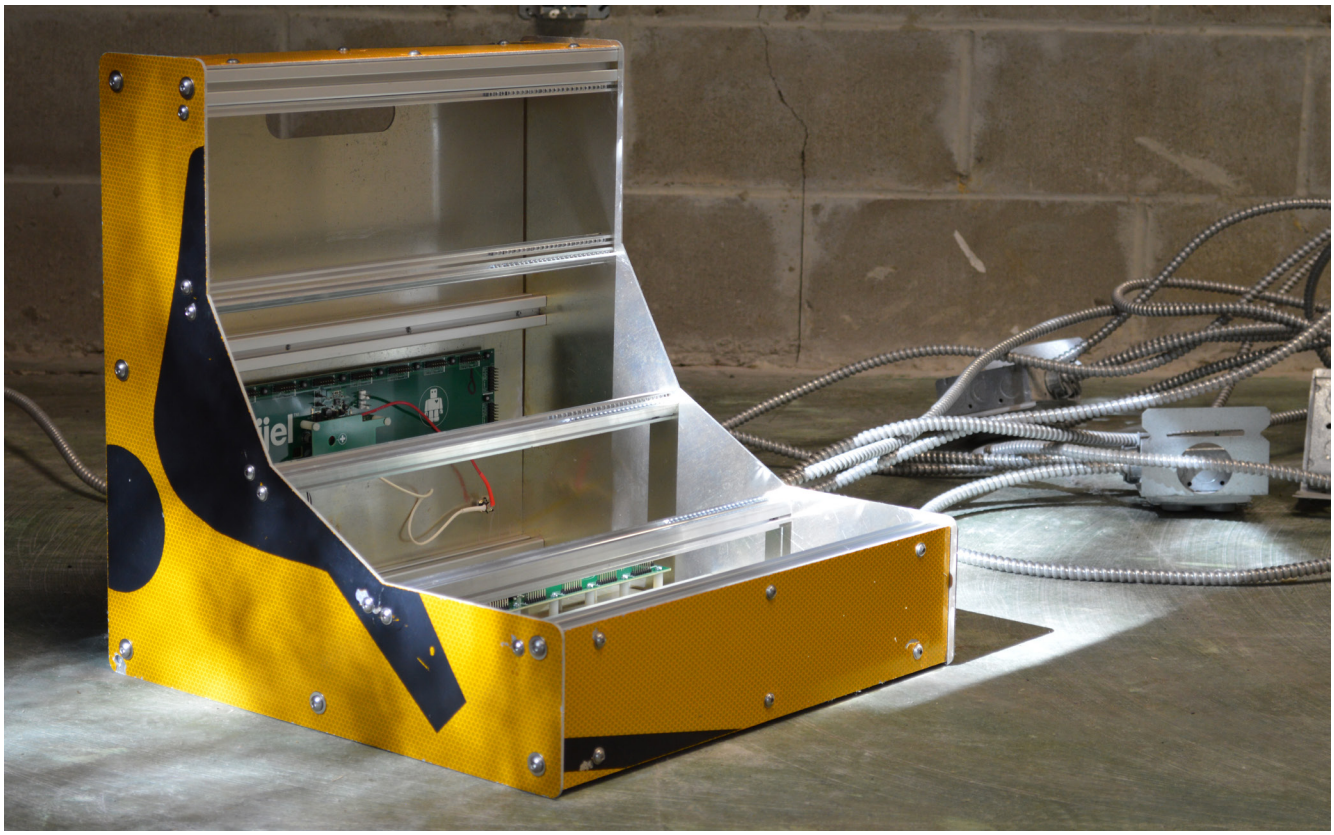
Changes to the design can be made by modifying the Fusion 360 3D model or directly editing the vector drawings in Adobe Illustrator, Inkscape, etc. An example of a change that you might want to make is adding mounting holes for a power supply, a power jack, switch, and any other features that you want to add to the panels. Adding holes to the files that you plan on having laser or water-jet cut will increase that cost. You'll have to decide whether it's worth the higher cost to have all of your holes cut for you or if it makes sense to remove those from the design files and drill them yourself afterward. You might decide that rectangular holes are worth having cut for you, though, since they're harder to do by hand.

The design is for an 84hp case, but it can easily be adapted for a different width by adjusting the size of the rails and aluminum extrusions, resizing the width of all panels except the two sides, and optionally changing the number of fasteners and corresponding holes for those panels. A user parameter called `hp_units` dictates the width of the case. Making the case wider has not been tested and may impact its structural integrity.

The design uses a specific thickness of aluminum for the panels, but since there is no panel-to-panel joinery, changing the panel thickness will ***not*** require adjustments to the vector drawings. The only adjustment would be in the length of the bolts* that fasten the panels to the aluminum extrusions. If you want to see how the case will look with a thicker material, you can open the Fusion 360 design and change the `thickness` user parameter. This will also allow you to see if longer panel bolts would be required.

Likewise, you can try using a material other than aluminum, but you may be making the case heavier (in the case of steel or a thicker wood composite) or less structurally sound (if you try something like acrylic sheet).

* "Bolts" = "machine screws"



GET READY

Here is a list of what you'll need. Look at the BOM (Bill of Materials) that is hosted on the GitHub page for part numbers and suppliers. The **BUILD** section goes into more detail, including how each of these materials is used and what optional tools you might need.

.063" thick aluminum for the 6 panels

Unless you have access to your own laser cutter or water-jet cutter, you'll want to use a service like sendcutsend.com to laser cut these parts from the vector drawings hosted on GitHub. Consider whether you want to modify the vector files before sending them to a service (see **DESIGN NOTES** above).

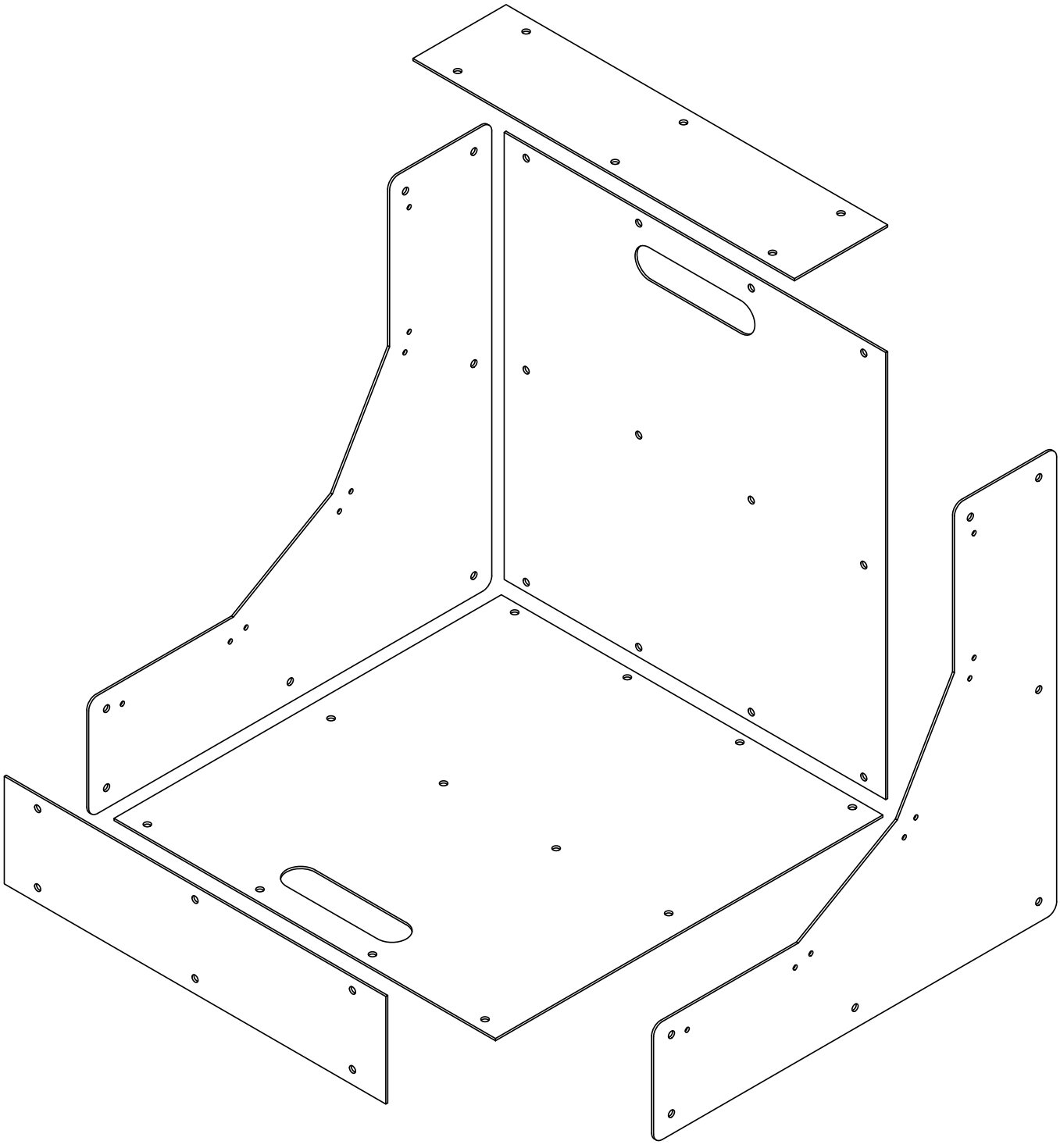


Fig 1. Exploded view of aluminum panels.

7 x aluminum extrusions

The aluminum extrusions should have a 1”x1” profile and be 84hp (426.72mm) long — the same length as the vector rails below. 10-series extrusions from 8020 or Faztek fit the bill. These extrusions are available in different colors and finishes. Either of the profiles shown in Figure 2 will work. Each will result in a different aesthetic, while still having correct number of slots. You can purchase this material cut to length or you can cut it yourself. The extrusions will need to have their holes tapped (threaded). This is something that 8020 or Faztek will do for you, for a small fee, or you can do it yourself.

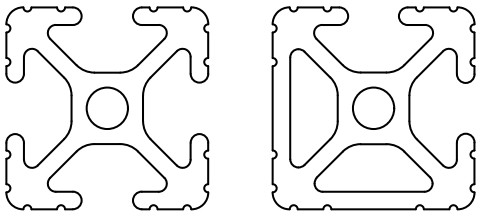


Fig 2: Acceptable profiles

8 x vector rails

The holes in this design are located specifically for vector rails. The rails sold by Synthrotek have a slightly different profile than vector rails, but they will work since the bolt locations are the same. The rails should be 84hp (426.72mm) — the same length as the extrusions above. Again, it will be easiest to purchase them at that length, but you may also purchase them in longer lengths and cut them yourself. If you decide to use a different style of rail (eg: Tiptop), you will need to modify the design and change the location (and possibly the diameter) of the mounting holes.

200 x square nuts
or 8 x threaded strips

Personal preference will determine whether you fill your vector rails with nuts or strips. 25 nuts per 84hp rail is a good amount. Be sure that your nuts or strips match the size of the screws that you have. M3 is typical; M2.5 is less popular. Again, it is easiest to purchase threaded strips precut at 84hp, but you can also purchase them in longer lengths and cut them yourself.

Fasteners

There are only two different bolt sizes in this design. See the BOM for a list of the fasteners with their part numbers. The finish of the bolts can vary depending on the aesthetic you want. I prefer stainless steel, but iron oxide (black) or commonly available zinc-coated fasteners work as well. Likewise, the head style of the bolts is a matter of preference, but I recommend button head, hex drive bolts. If you choose to use washers, it is possible that you may need to increase the length of the bolts.

To attach the panels to the aluminum extrusion, you will use a t-nut designed to fit in the slotted profile. Different styles of these nuts will work, but Faztek’s economy t-nuts are less expensive than the alternatives.

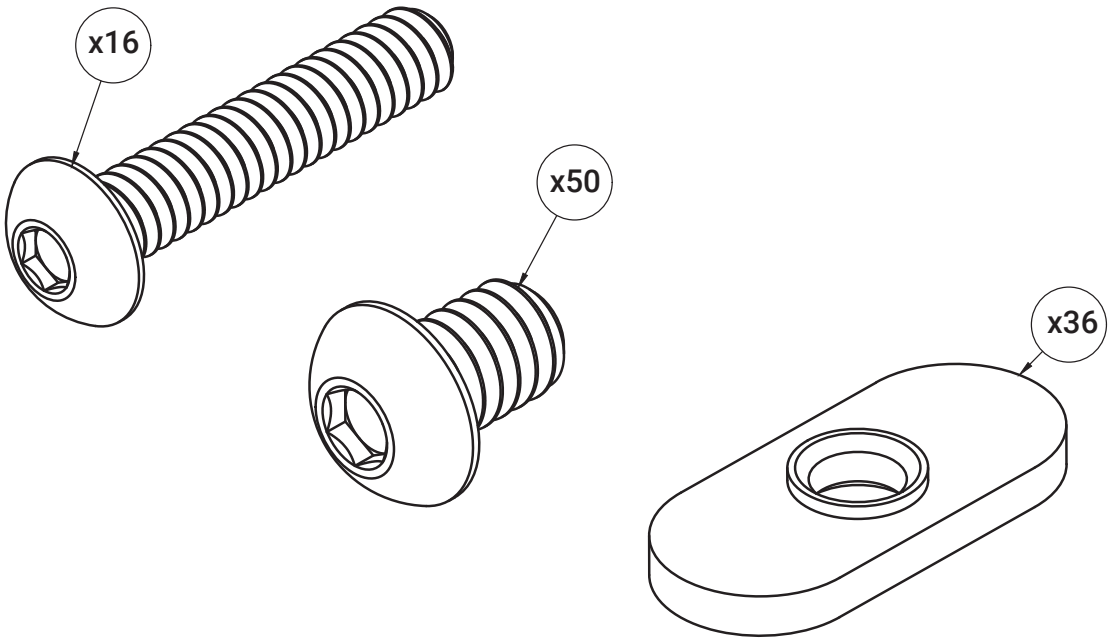


Fig 3. Required fasteners. See BOM for part numbers.

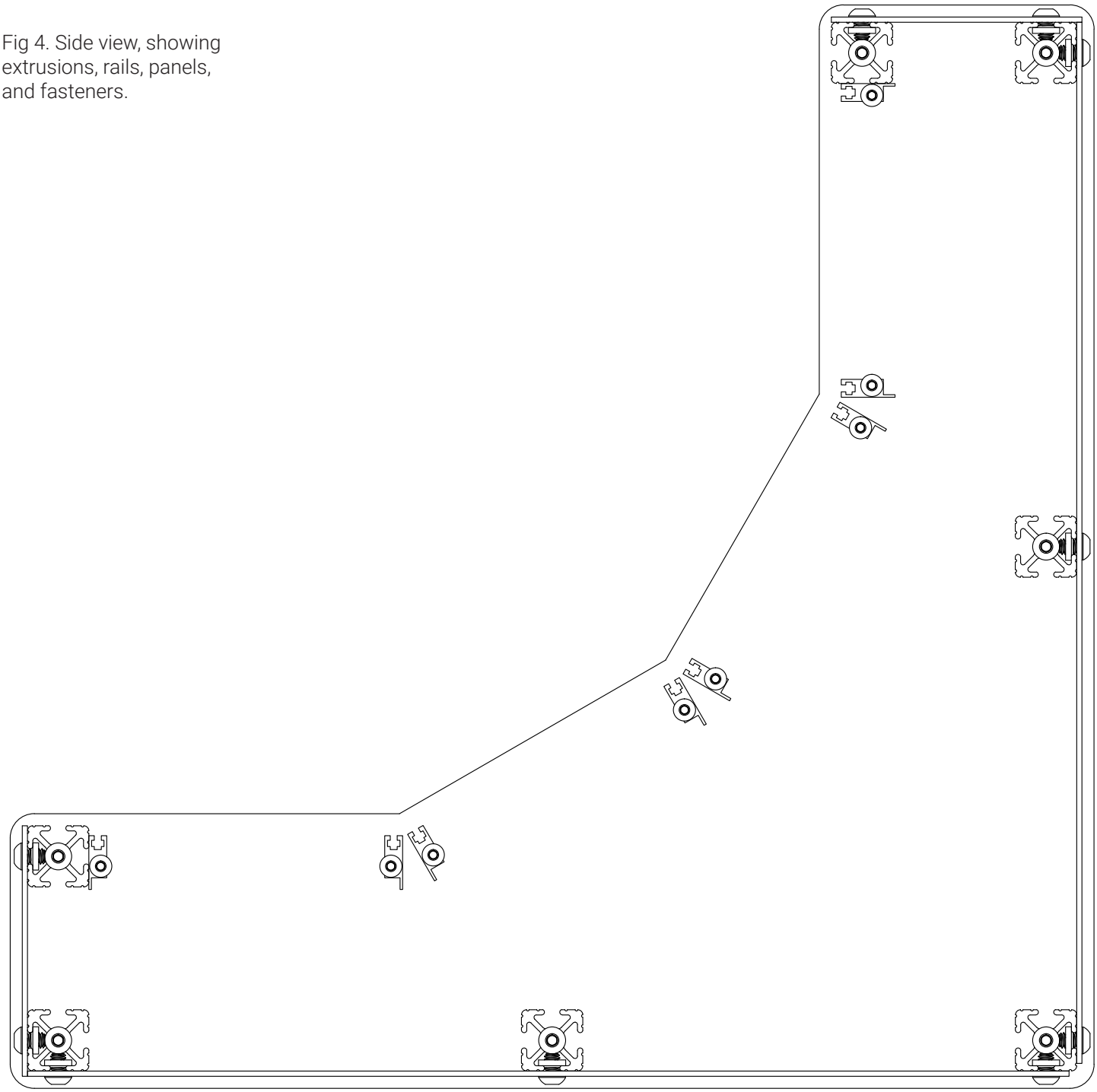
Electronics

Do not consider having mains power enter the case. Solutions that don't involve mains power inside the case range from using a power module and flying bus for each row or pair of rows (eg: Tiptop uZeus, 4ms Row Power, etc.), to mounting power distribution boards (eg: Intellijel TPS30, Befaco Excalibus, etc.) to the inside of the case panels. If you are looking at a solution that requires a "power brick" between the wall outlet and the case then you are thinking safely. Make a plan before you have the panels cut, since you may want to include holes or "windows" for a power switch and/or jack. You can have power supply mounting holes laser cut as well, but that might get expensive. Consider drilling those holes by hand or even using adhesive mounts as supplied with some power distribution boards.

Tools

This design requires only a screwdriver or hex key. If, however, you plan to drill your own holes, cut the extrusions or vector rails, or thread the holes in the ends of the aluminum extrusions yourself, you will require a few more tools. The **BUILD** section makes note of any optional tools at each step of the build process.

Fig 4. Side view, showing extrusions, rails, panels, and fasteners.



BUILD

Step 1 Prepare the aluminum panels

Send the vector drawing files to a service like sendcutsend or similar. Laser cutting will be more accurate than water-jet cutting, but either will work for this design. Again, consider any changes that you want to make to the file before having it cut (see USB ports example at right). Drill any holes that weren't laser cut. Doing this now, as opposed to once the case is assembled, affords the options of using a drill press and drilling two panels at once.

Optional tools: electric drill; twist drill bits (see BOM for diameters) or a step drill

Step 2 Prepare the aluminum extrusion and vector rails

The easiest situation is to have the aluminum extrusions cut to length and threaded by the supplier. If you want to cut them yourself, you might find it difficult to cut them to precisely 426.72mm, but as long as they are close to that measurement ***and all 15 pieces are the same length***, you will be fine. Note, however, that the aluminum panels will not fit if the width of these parts is *shorter* by more than a few millimeters.

If you are threading the ends of the extrusions yourself, be sure to use cutting fluid and the correct technique for tapping the holes. The last thing you want is to break a tap in the end of the extrusion! The easiest type of tap to use is a spiral tap, which allows you to simply drive it in using an electric drill. Do not attempt to force a bolt into the unthreaded hole in the extrusion, unless you are using bolts specifically designed to create their own threads! The vector rails do not need to be threaded.

Optional tools: chop/miter saw or hack saw; 1/4-20 spiral tap, cutting fluid, electric drill

Step 3 Install nuts or threaded strips

Now is the time to do this. Otherwise, you'll have to take everything apart to put them in later. If you're using square nuts, slide them into place and skip to Step 4. If you're using threaded strips, the easiest thing to do is purchase eight of them at 84hp length. You can, instead, purchase them in longer lengths and cut them yourself using a hack saw or large bolt cutters. File the ends so they're free of burrs.

Even if you purchase them at the correct length, consider cutting each strip into three equal segments. This is a good compromise between the flexibility of sliding nuts and the consistency (and quietness) of full-length threaded strips.

Optional tools: Hack saw or large bolt cutters; mill file

Step 4 Install the t-nuts

Slide the correct number of t-nuts into each aluminum extrusion. See Figure 5 at right.

Step 5 Mount the panels

Mount the panels to the aluminum extrusions, as shown in Figures 5 and 6. The panels are symmetrical, so it's not really possible to place a panel in the wrong position or orientation. Finger tighten the bolts, and don't forget the washers if you've decided to include them.

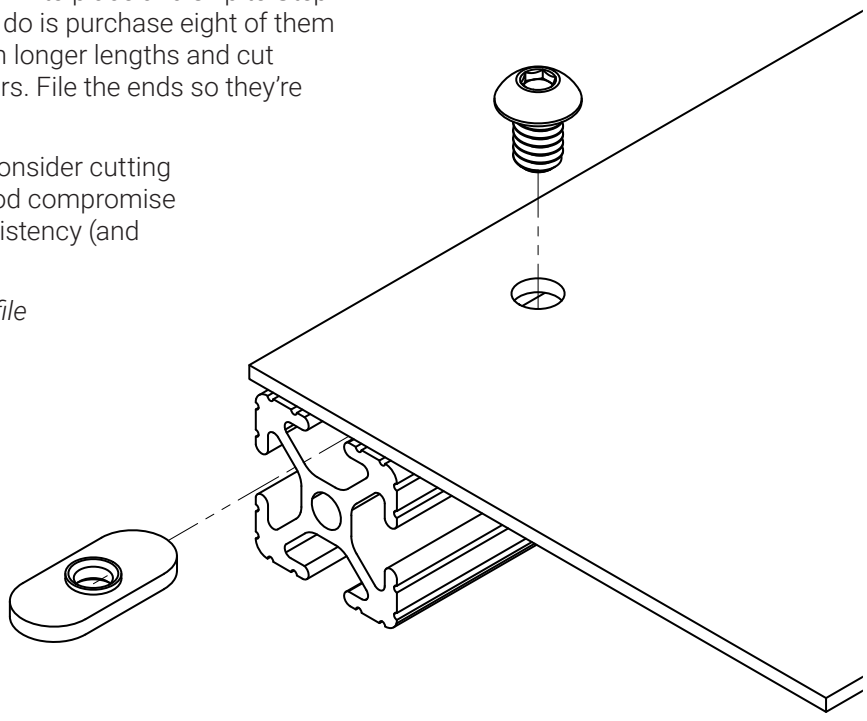


Fig 5: Sliding economy t-nuts into place and mounting top panel

Fig 6: Mounting the side panels

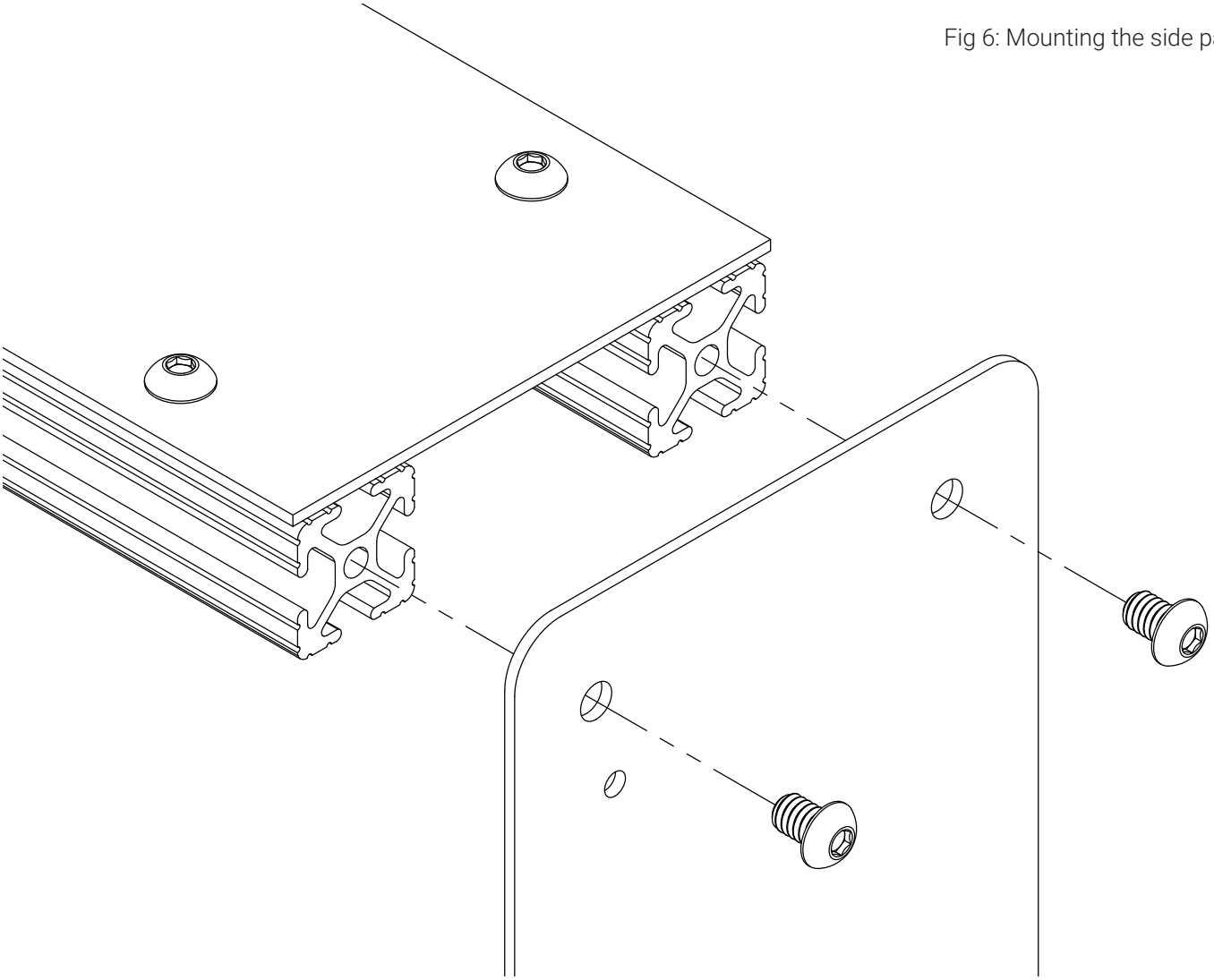


Fig 7: Intentional gaps where panels meet, designed to aid in assembly and provide small tolerances in the length of the aluminum extrusions

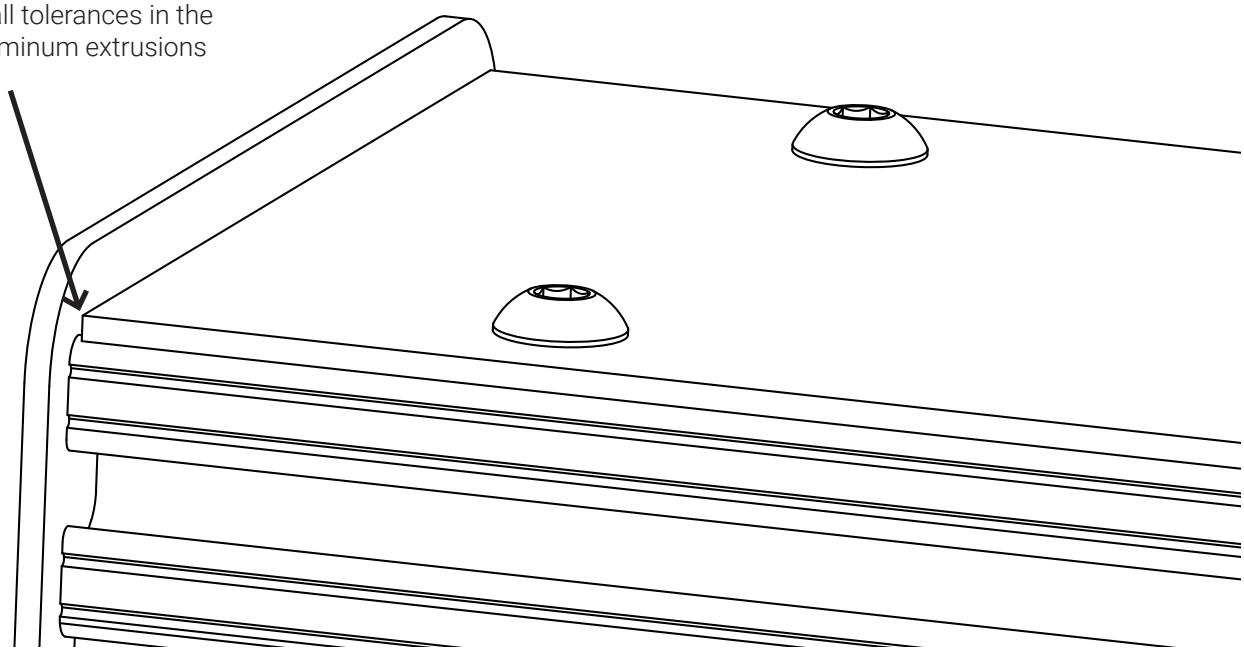
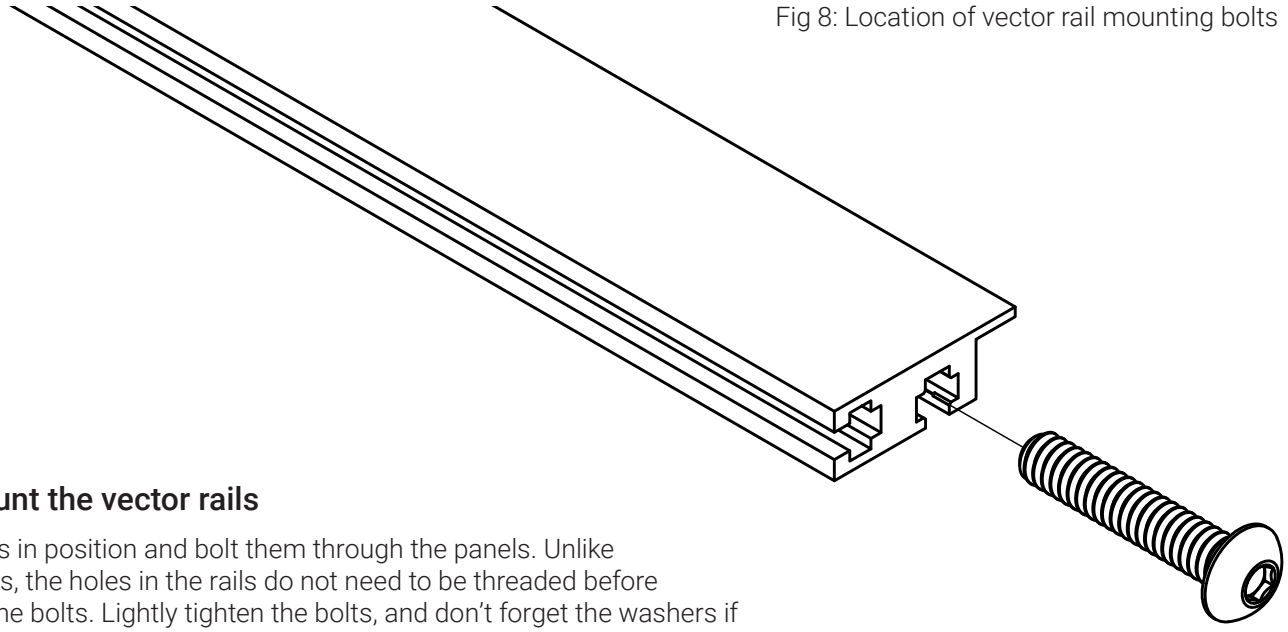


Fig 8: Location of vector rail mounting bolts



Step 6 Mount the vector rails

Place the rails in position and bolt them through the panels. Unlike the extrusions, the holes in the rails do not need to be threaded before screwing in the bolts. Lightly tighten the bolts, and don't forget the washers if you've decided to use them.

Step 7 Tighten all fasteners

The final step is to tighten all of the bolts while simultaneously making sure the structure is square. It will be helpful to mount some modules to the rails to ensure that they are at the correct angle before locking them in place.

That's it! Once you install the power supply or power modules, you can start using the case.

QUESTIONS & ANSWERS

I think I found something wrong in the build guide and/or the digital files. How can I report it?

Please let us know by creating an issue on the GitHub repository.

Can I build and sell cases based on this design?

Yes, the license requires only that you credit XOXO Modular with the original design. A goal of this project is to stop the madness of $10 briefcases with $30 rails and a $30 power supply being sold for $350. Don't use this design to be that guy.

I bought a BASKET CASE online and I have a problem. Can you help?

XOXO Modular is publishing the design for this case, but doesn't sell actual cases. You will need to get in contact with the person who sold you the case. If you think you've found an error in the design itself, please create an issue on GitHub.

I have more skills and time than money. Are there ways to make the design more economical?

It is possible to skip the t-nuts by drilling and tapping the panel mounting holes that go along the length of the aluminum extrusion. This is much more work and you always run the risk of breaking a tap, which will make it more costly than just purchasing the economy t-nuts. If you attempt this, you will need longer panel mounting bolts.

The most expensive part of the case is, of course, having the aluminum panels laser or water-jet cut. Cutting the panels yourself or using other materials may drastically reduce the price of the case. Be sure to send us photos if you do this!

I'm outside the United States. Can you recommend suppliers or laser cutting services in my country.

Unfortunately, my experience is with the suppliers and services that I've mentioned. At the same time, I am not endorsing or recommending any company mentioned in this guide.

Can you build a case for me?

Sorry, no. There are probably lots of people out there who would love to do it, though. Check the DIY Modular Synth Case Builders Facebook group.

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