3D·UP FITTERS

CR-10 Max Enclosure Kit

Installation Manual 1.4

September, 2021

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You Really Do Want to Read the Directions

Hey, we get it. You just got your new enclosure kit and want to start using it as fast as possible. How hard can assembling a few plastic panels possibly be? It's not really that hard, assuming you're following the directions, but try to use brute force and you'll end up working your way through your vocabulary of swear words. While the acrylic pieces in the kit are strong and difficult to harm accidentally, they are still plastic and will break if bent far enough. The ghosts of the broken panels that have gone before you have become much stronger than you could ever imagine, and are whispering into your ear, "please be careful".

Before you Start

Is This Manual for *Your* Kit?

This installation manual covers the R1 enclosure design for the Creality CR-10 Max enclosure. If you have a different version of the enclosure please read previous versions of the manual available on the website.

Is your Printer Customized?

If your printer is stock then no customization is needed. If you have customized the printer, you should examine any modifications to make sure they don't block the panels. If part of one of the panels is blocked, you can use a laser or drill to customize one or more panels. **This should be done before removing the plastic or paper covers on the acrylic panels. Cutting acrylic requires great care as the plastic is prone to crack if mishandled.**

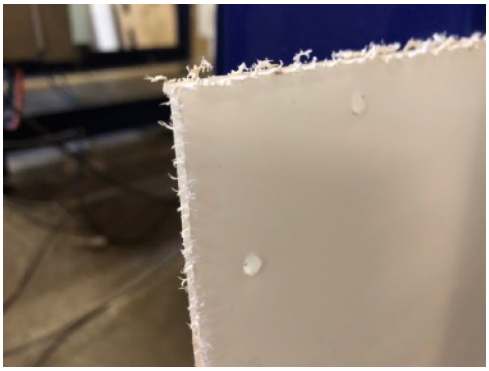
Preparing the Printer

Remove any filament from the hot end (will require heating the hot end) and remove the filament spool from the spool holder.

Turn the printer off and unplug the power cable from the printer's power supply.

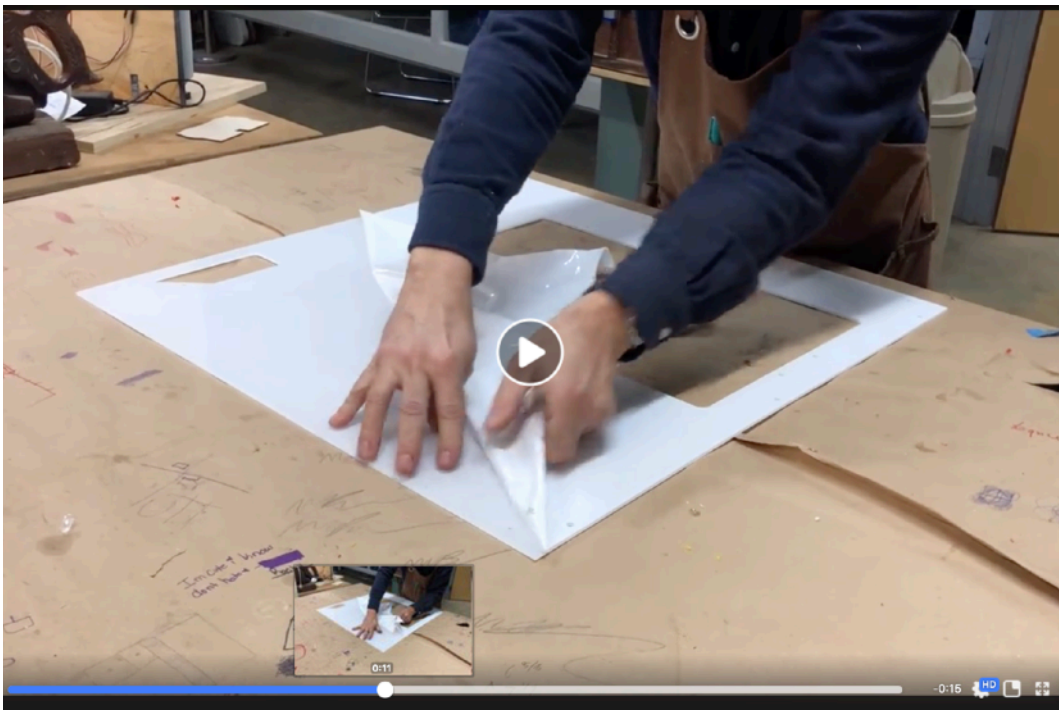
Don’t Panic If You See This!

If you can’t see through the plastic, please don’t panic! What you’re seeing is just the plastic or paper protective covering. You, dear customer, are way too smart to think the plastic is flawed and then call and email us over and over again.



When plastic sheets are manufactured they are covered by either a paper (brown colored) or plastic (white) covering to protect against scratches. Follow the directions below to remove the cover and discover the beautiful plastic underneath.

To remove the covering from an acrylic panel, lay the panel flat on a table. Then peel up a corner of the covering and **CAREFULLY and SLOWLY** pull horizontally to the sheet to reduce the lateral forces that would bend the acrylic. This video shows just what to do.



https://www.3dupfitters.com/blogs/news/acrylic

WARNING

Once you've assembled the enclosure and its on your printer…

DO NOT MOVE THE ENCLOSURE while the printer is INSIDE

If you want to move the printer and enclosure you'll need to detach the vents and cables and remove the enclosure first.

Among the other things you should worry about:

- Don't let children climb on top of the enclosure.
- Don't use windex or chemical cleaners. Just plain water works better with a micro fiber cloth.
- Don't use a lighter on the enclosure to see if it will melt.
- Don't use sandpaper on the acrylic
- Don't see how far you can bend the acrylic panels before they break.

Everything You Wanted to Know About Screwing But Were Afraid to Ask

Screw	Tool Needed	Usage	Relative Size
30-50mm Hex Cap Head	3mm Hex Wrench	Attach fan/filter, attach large front latch mounts	 30mm Hex Cap
12mm Hex Cap Head	3mm Hex Wrench	Connectors, hinges	 12mm Hex Cap
16mm Hex Cap Head	3mm Hex Wrench	Knobs, small latch mounts on some models	 16mm Hex Cap
#6 3/4” Wood Screw	Philips Head Screwdriver	Attach magnetic latch to mount	 3/4 #6 Wood Screw

Probably the most confusing thing about assembling this enclosure will be which fastener or screw to use. Luckily it's pretty easy to figure out once you know the system. While the exact screw to use will be detailed in each section of the manual, you probably won't need to refer to it once you know the secrets.

The most common screw is the 12mm hex cap head screws. The 12mm screws are long enough to attach things to the acrylic front, top, sides and back. Each section will describe exactly which screw to use, to read carefully and use the specified screw for the best results.

The actual length of the "long" screws to attach the fan and or filter will vary depending on the depth of the particular shipment of fans we happen to get that month. They won't be hard to spot since they'll be the longest thing in the bags.

Note that you’ll need a 3mm hex wrench for most of the screws. We don’t include one in the kit since they invariably end up in a drawer or landfill. Anyone with a 3D printer should invest in a nice metric hex wrench set, since there will be many adjustments to be made along the way.

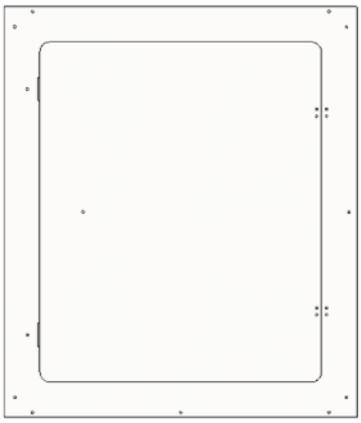
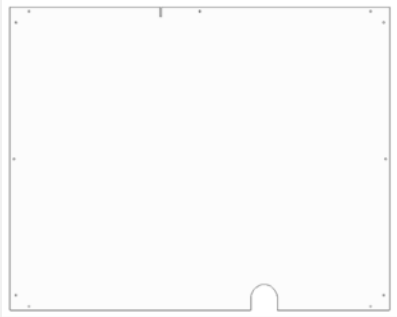
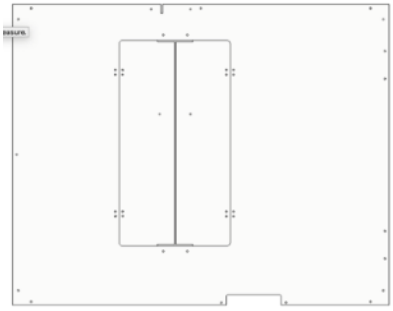
Finally, and we can’t stress this enough:

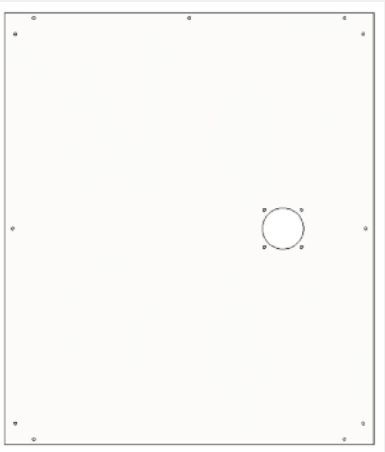
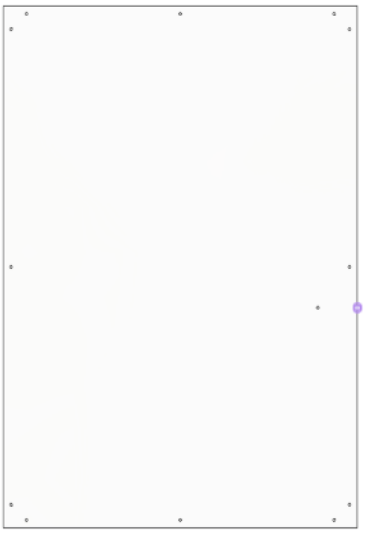
D O N ’T O V E R T I G H T E N T H E S C R E W S

Leave the screws a little loose until the end adjustment phase. During that process you’ll be hand-tightening until the screws are snug, but you can easily use so much force the plastic pieces or the acrylic crack. Please don’t be *that guy*.

Identify Panels

Before you start to assemble the kit, lay out all of the panels and identify which panel corresponds to the front, left, right, back, and top. Although the panels are labeled, it's easy to get them mixed up once the covering is removed, and very rarely a panel can be mislabeled. This chart will help you keep them straight. Note the panels are shown as they appear if you are located on their corresponding sides, i.e. the right side is pictured as if you were standing on the right side of the enclosure, etc.

PANEL	PICTURE	HEIGHT	WIDTH
FRONT		32”	27.44”
RIGHT		32”	40”
LEFT		32”	40”

PANEL	PICTURE	HEIGHT	WIDTH
BACK		32”	27.44”
TOP		40.44”	27.44”

Assemble Panels

1. Attach The Front Door Frame Corners

Each of the corners on the enclosure will be held together by the connectors pictured below. There are only two versions L and R, which can be identified by the letters stamped on the inside. The opposite connectors are identical, i.e. Bottom Right is the same as Top Left. In all cases the surface of the connector with the cutout pattern faces front or back.

The front door is designed so that the latches are on the left. Attach the corner connectors on the **back side** of the door frame using the provided cap head 12mm screws. See the photos below. The top of the connector should be flush with the top of the acrylic.

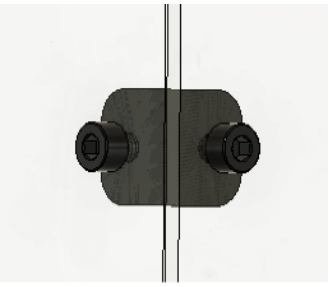
Top Left

Top Right

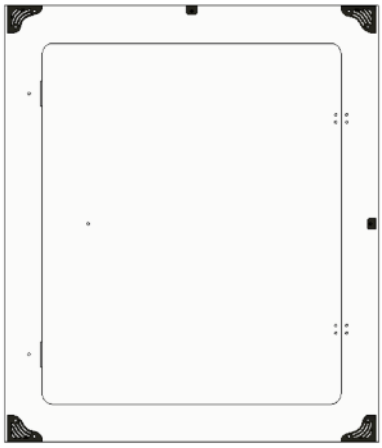
Bottom Left

Bottom Right

The CR-10 Max version also has smaller connectors at the top and right side when viewed from the front.

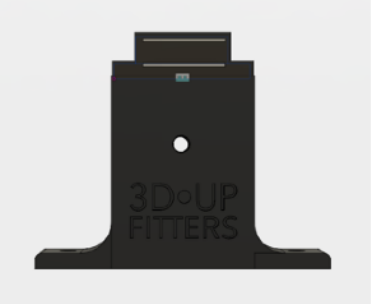


The front should look like the picture to the right.



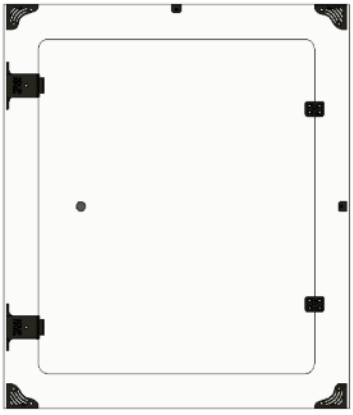
2. Assemble Front Door

Locate the magnetic latches and use the **wood screws** to attach them to the latch mounts. Hand tighten and make sure they're secure, but do not over tighten or they may strip. The latch can be later adjusted front-to-back to make sure the door is flush with the door frame.



Each latch mount is attached via three screws. Two M4 10mm cap heads are used to attach the latch mount to the side, while a 30mm cap head secures the latch mount to the door frame.

Attach the hinges to the door and door frame using M4 12mm screws and nuts. There will be some play in the hole size so that you can adjust the door to swing freely.

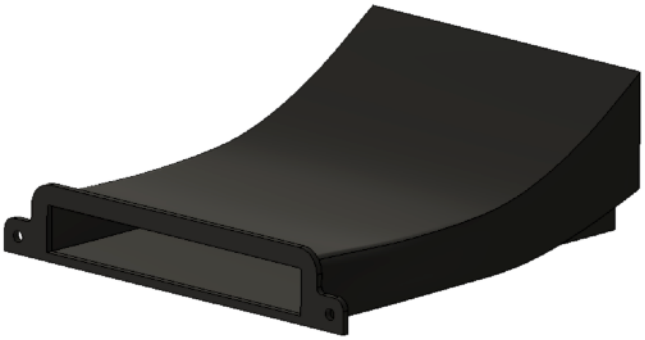


Attach the door knob by first inserting the square M4 nut into the slot. Use a 16mm cap head screw to attach the door.

Now that the latches are mounted it is time to connect the strike plates. Each plate comes with a squishy adhesive covering the same size of the plate. Carefully attach the adhesive side to the acrylic at the location of each latch. Then, **adjust the width of the metal strike plate so that it is held on by the pressure of the two sides of the plate**. The adhesive covering will keep the metal strike plate from scratching the acrylic.

3. Attach Left Side

Before attaching the left side you need to place the left-side air intake vent under your printer. It should line up with the slits on the left-side of the electronics case.

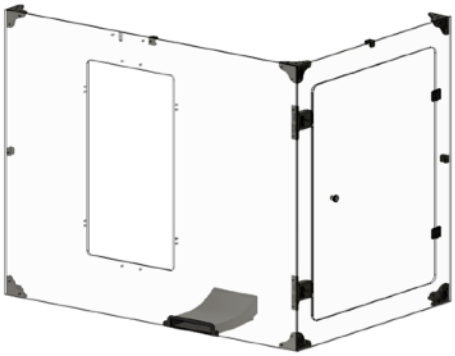


Lift up the printer and slide the vent loosely into place. It will rest on the table, and from there it curves upward to meet the slit position exactly.

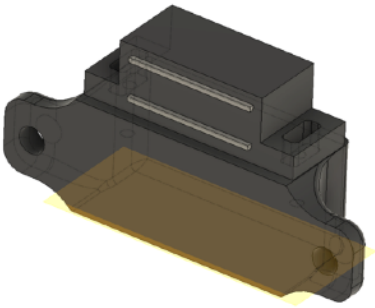
This vent will be the main port to bring in cool air during a print.

The one tricky bit is the vent will attach on the outside of the panel, so you'll want to slip the panel over the vent.

Attach the left side to the front forming an L-shape that will stand up on its own, then attach one L and one R connector at the back. Remember to slip the panel over the vent, and attach the vent with the lip on the outside of the panel.

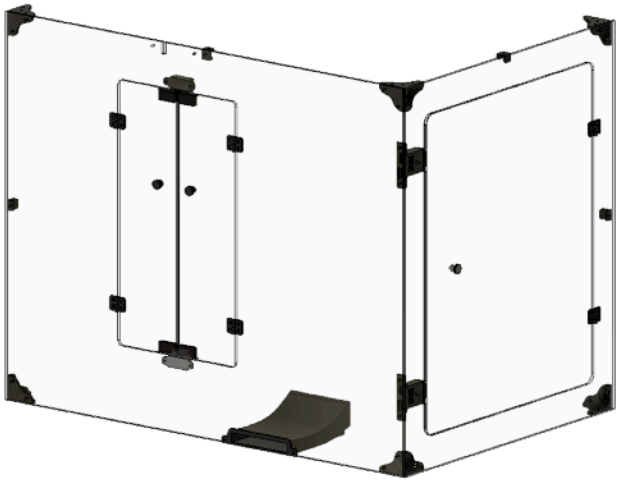


The CR-10 Max design adds a side door for easy access to the extruder. The latch mounts are smaller than the front, although the magnetic latch attaches in the same way with wood screws. The parts for the side door will be in a separate packet.



Attach the door hinges, latch mounts, strike plates, and the knob, and the assembly will look like the illustration to the right. Don't forget the mid-panel connectors at the back left and top.

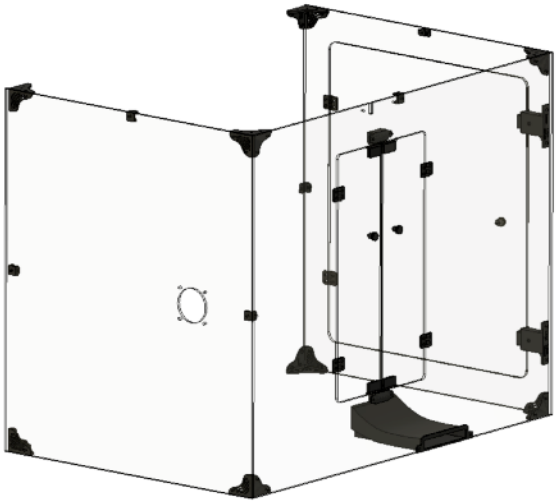
As with the front door, adjust how the door hangs by loosening the hinge screws, using the strike plates to hold the door to the latches, and then tightening the hinge screws.



The doors do not meet in the middle!
This is because this is where the filament will feed into the extruder.

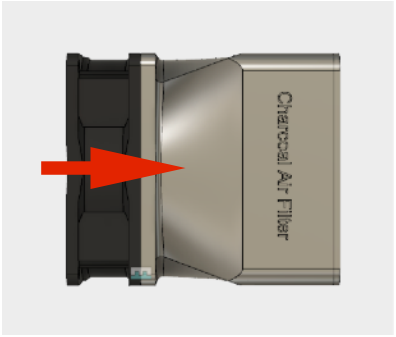
4. Assemble Back

The back of the enclosure when viewed from the back is shown to the right. The four corner connectors are mirror images of the front. The large hole is either for an air filter (purchased separately) or can be covered up 3D printing a cover using M4 10mm screws. (There's a link to the cover on the product page.)



On the top and on each side are "mid panel corner connectors", which are basically simple L-shapes.

If assembling the Charcoal Air Filter, confirm the direction of the fan's air filter by plugging it into a USB power supply before attaching to the filter and back of the enclosure using M4 cap head 30mm or 40mm screws depending on the depth of the particular fan.

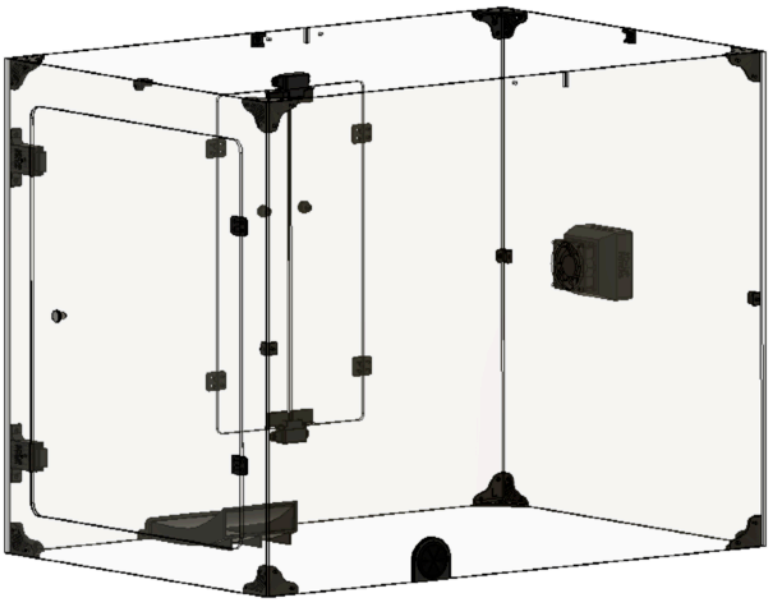


The air filter should look like this after being attached. Note that its easier to insert the screws from the inside, and put the nuts next to the filter housing.

5. Attach Right Side

The right side has a grommet and slide-in grommet holder so you can remove the enclosure without having to take off the power cord.

The right side is tricky to attach because of the large size of the enclosure. Although attaching it consists of simply screwing it to existing connectors, unless you have exceedingly long arms you will need a buddy to help hold the nuts in place. Customers have done everything from having a child climb into the enclosure to placing the entire enclosure on the side of a table to access the nuts.

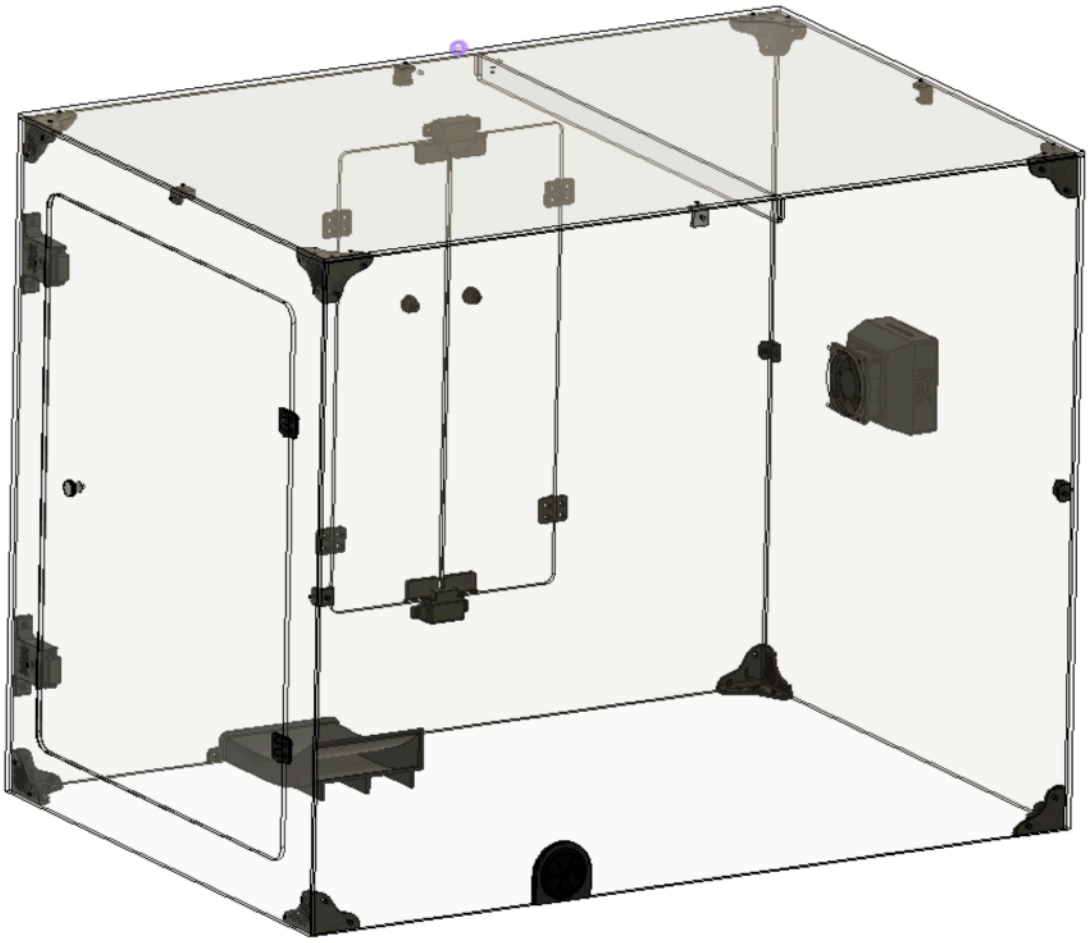


6. Attach Top

Before attaching the top locate the top support beam:

This will be placed in the slits at the top of the and right panels.

Once the beam is in place, use access through the doors to attach the top of the enclosure using M4 12mm screws.



7. Sealing Gaps

Once the enclosure is completely put together, it is time to make sure that each of the panels is held tightly to each adjoining panel. The connectors are designed with a small amount of play that allows you to make small adjustments for the perfect fit.

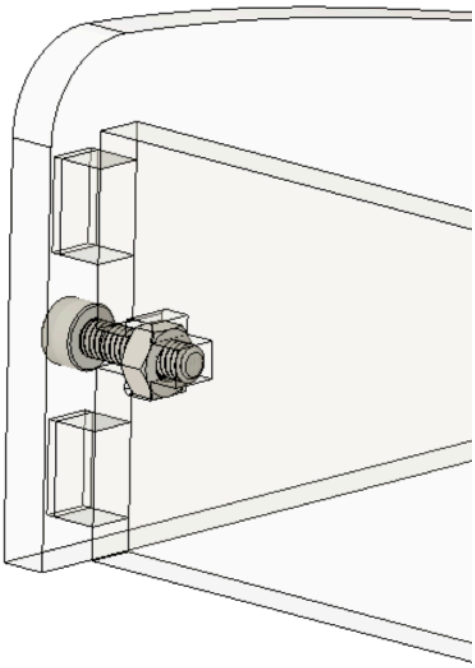
1. Loosen screws on the panel to move.
2. Push that panel into place. You may need a friend to hold it tightly in the right spot.
3. Re-tighten the screws to hold the panel. Only tighten enough to hold the pieces snuggly. **DO NOT OVER-TIGHTEN!** These parts are sturdy, but they're still all made out of plastic..

Repeat the product, going around the enclosure looking to make sure all of the panels are flush to each other.

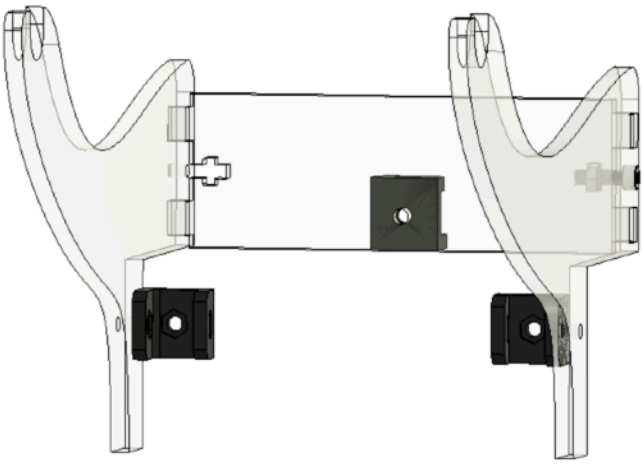
8. Spool Holder

Filament is fed into the enclosure from the included top/side mounted spool holder. You are of course, welcome and encouraged to DIY your own solutions if this doesn't fit your needs. Creating new spool holder designs seems to be a favorite pastime of 3D printer owners.

First assemble the cross piece using the included M4 14mm screws and M4 nuts.

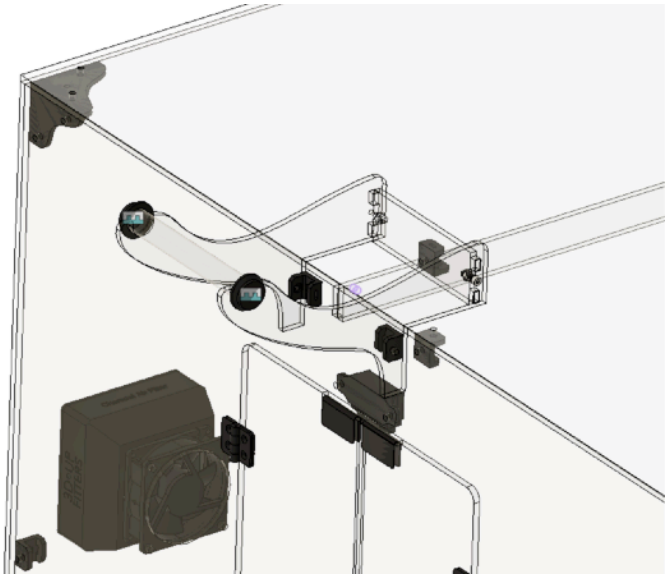


Next attach the L-shaped connectors you will be familiar with in the middle of the panels.

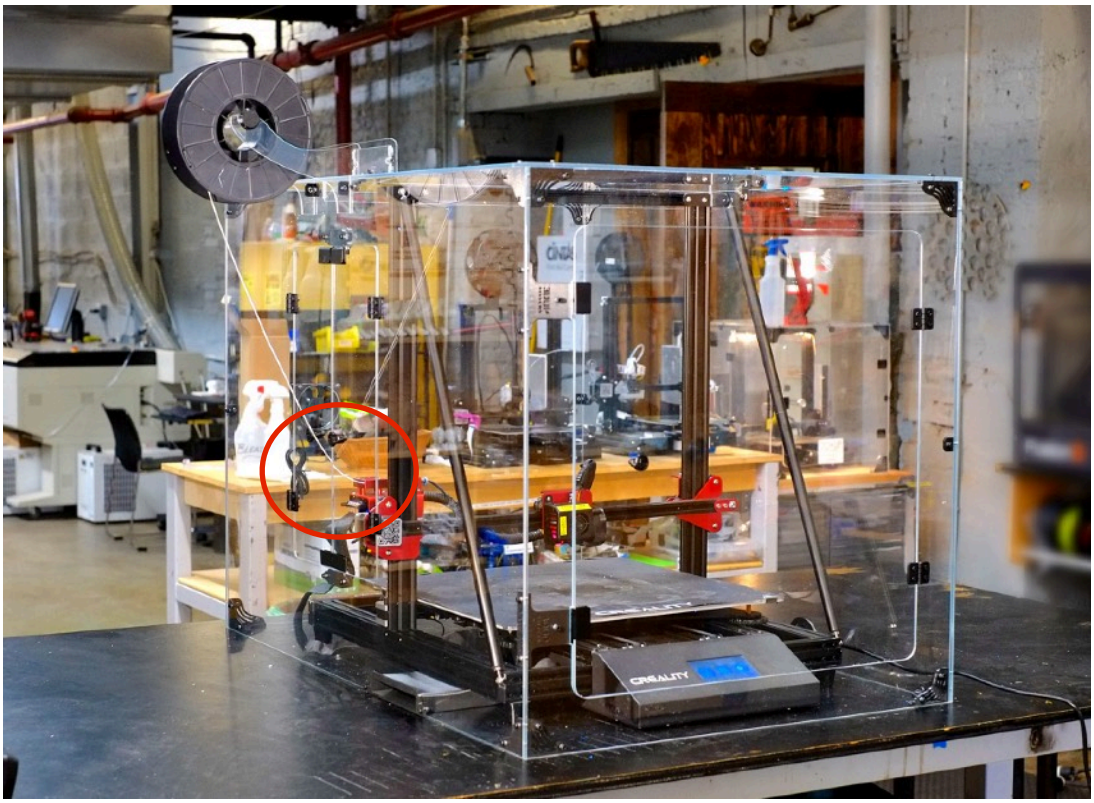


Although the end caps should fit snugly, you should glue them on with superglue just to be safe.

Place the spool holder on the top left of the enclosure. It should be obvious from the hole placement where to attach it.



The filament feeds into the extruder through the gaps in the side doors. Position the enclosure from front to back so that the slit lines up with the extruder's filament input hole.



9. Attach Air Vents and Filter

The CR-10 Max has an 80mm filter hole and will match the standard charcoal air filter from 3D UP Fitters or any 80mm vent to hose adapter.

The instructions to attach the air filter are on the air filter product page. If you wish to print your own hose adapter you will find that on our Thingiverse page. You have two options: 80mm to 3 inches and 80mm to 4 inches. The larger hoses are easier to find but can be cumbersome. The 3 inch size is plenty big for adequate airflow.

10. Managing Enclosure Temperatures

WARNING: Printing PLA without the fan turned on may cause clogging

There's not much to a 3D printer enclosure. Although ours look fancy, functionally they're not much different than putting a cardboard box over the printers since both designs are passively heated by the beds. How complicated can they be? This section will explain a little about how they work, and how to manage the temperatures to get quality prints while protecting your lungs.

We generally get two types of customers:

1. Those interested mostly in air quality.
2. Those interested mostly in print quality.

Think Airflow, Not Fishtank

The problem is those two goals use two different techniques in terms of airflow. For the best air quality, we use the same design as industrial equipment, which uses airflow to manage air quality. Because of physics, the amount of air moving into the enclosure has to be equal to the air moving out of the enclosure. When the air moves out of the enclosure carrying volatile organic compounds it can then be vented to the outside or run through an air filter.

People often ask us if the enclosures are airtight and have a bottom. If your main concern is air quality then being airtight doesn't buy you anything since the particles will just float out when you open the door. It's only by maintaining a negative air pressure that the particles are reliably kept away from human operators, which means having openings for air to both enter and exit the enclosure.

If the maximum internal temperature is the goal, then being airtight also doesn't help since the main cause of heat loss is through conduction through the sides of the enclosure, not through small amounts of air loss. A bottom doesn't help either since while heat doesn't rise, hot air does, and thus almost all of the heat of an enclosure is at the top. A bottom is helpful, however, if your table is too small for the enclosure.

Since airflow is key, all of our enclosures come with fans chosen for CFM ratings to match the cubic size of the enclosures. This ensures that for cool-loving filament types like PLA there's enough airflow to keep the temperatures in the safe zone.

Room Temperature

Passively heated enclosures are completely dependent on the room temperature as a starting point. If you're trying to print ABS in an unheated garage in the winter the temperature inside the enclosure is never going to get hot enough. The reason is the bed heater has only enough energy to increase temps from the baseline. If that baseline is 22C, then you've got a good chance of getting into the sweet spot. If the baseline is 13C, then you'll be lucky to warm the interior of the enclosure hot enough to print materials such as ABS.

ABS and Nylon

You want the internal temperatures higher for filaments like ABS, which happens naturally because the recommended bed temperatures are much higher. With the fans turned on we shoot for internal temps between 35C and 40C for 3D printers that use E3D hot ends because E3D recommends that temp range to avoid clogging. Keeping the temperatures in that range it puts the least stress on the equipment and follows the manufacturer's guidelines.

This works great for people either interested mostly in air quality or those who are risk-averse and don't want to take a chance of clogging their hot ends or decreasing the useful life of their printers.

More experienced 3D printer owners though, those for whom a clogged nozzle is a known risk, might want to run the temperatures higher for less chance warping of ABS parts or to print nylon. In those cases, you can turn off the fans or even print one of the vent covers and just not vent at all. For our internal print farm, we do the later on a couple of machines where the temperature when printing ABS gets as high as 46C. They've been running like that for years with no filament clogging. Even with no venting of the power supplies, we've never had a power supply fail either. Obviously, your mileage may vary, as it depends on a lot of variables such as filament quality and the quality of the power supply in that particular printer.

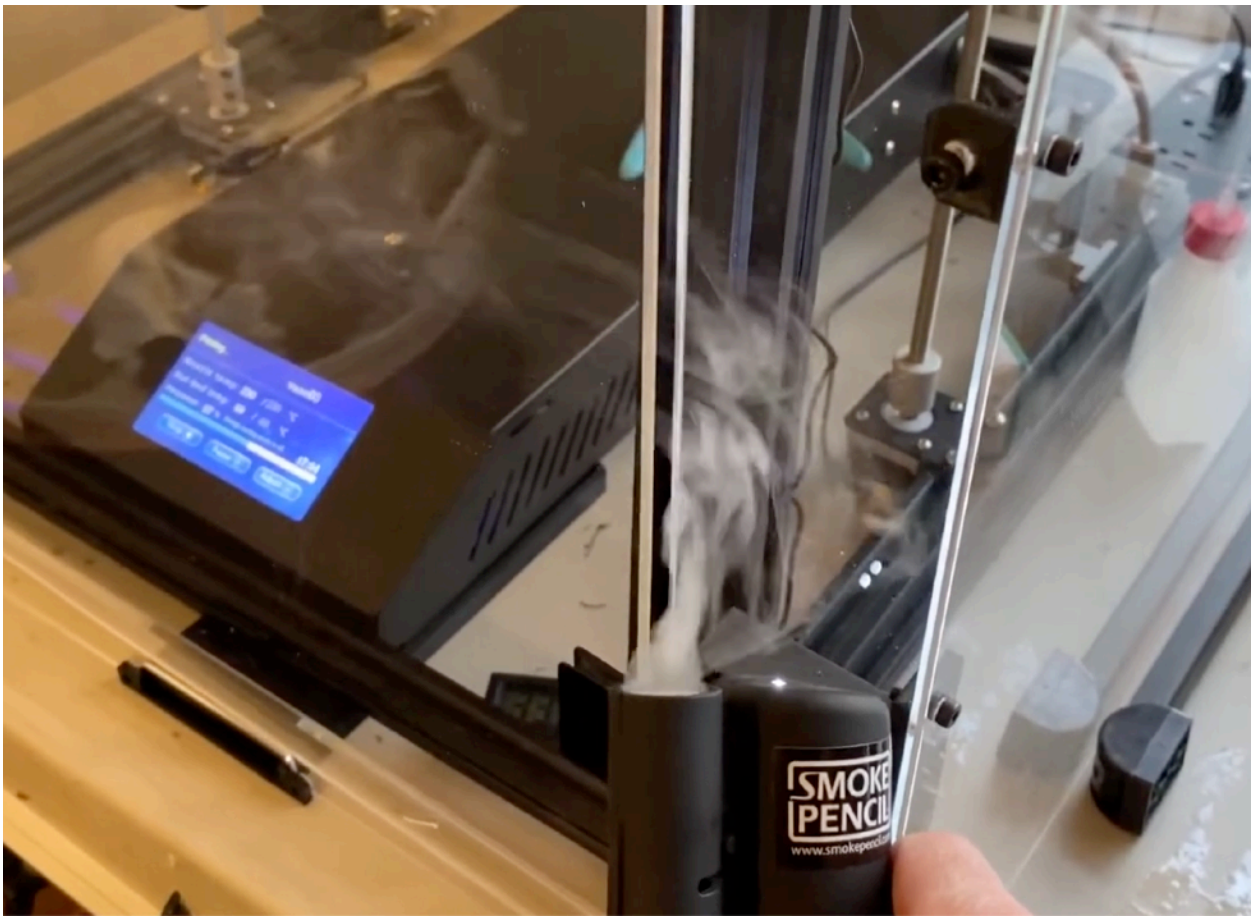
If you're looking for the highest temperature's possible, try turning the bed heater on for an hour before you print.

Perfect Enclosure Printing with PLA

Since PLA is perfectly happy at room temperature, the only reason to enclose it is for improved indoor air quality. PLA typically prints with a bed temperature of 60C, so it's going to heat the enclosure less than ABS right off the bat. **Always make sure to print with an enclosure fan and monitor the internal temperature**, which ideally should be in the 30-35C range or lower if you can get it.

If you'd like to lower the temperature further you can always buy a more powerful fan, but the easiest thing to do is just crack the front door a little to increase airflow. But won't that let out all of the volatile organic compounds coming off the hot end? The key is the negative pressure combined with the fact that the particles are extremely small and light.

As you can see, the fan keeps the air flowing in and the harmful particles flowing into the vent or filter.



3D Printer Design Matters

The other part of the equation is the printer design. Those printers where the hot end is at the top of the enclosure make it easier to achieve higher temperatures because the hot air rises to the top, and the vertical hot end position is fixed. Those printers with the hot ends at the bottom are always going to have more problems managing temperature simply because the temperature is more likely to vary as the hot end goes from the bottom to the top of the enclosure.

Let Us Help

If you're looking to achieve a particular temperature with your enclosure, let us know and we'll give some advice on how to manage, but it's really not that hard:

Lower Temperature = More Cold Air

Higher Temperature = Less Cold Air

Pro Tip: measure your current temperatures before attempting to make any changes. We get support calls saying "my enclosure is too hot" or "too cold" but they didn't actually measure the temperature. Without measurements, it's impossible to say if a printing problem is temperature related or not.

11. Tips and Tricks

On some surfaces the enclosure can slide around a bit. In those cases try using thin double sided tape on the corners to hold it in place.

Another issue is the magnets in the door are strong. You can either use two hands to open the door, one holding the enclosure and another to open the door, or reduce the affects of the magnet by adding a piece of black electrical tape to the side of the strike plate that contacts the magnet. You'll need to adjust the location of the magnetic latch by loosening the wood screws, moving the latch, and retightening.