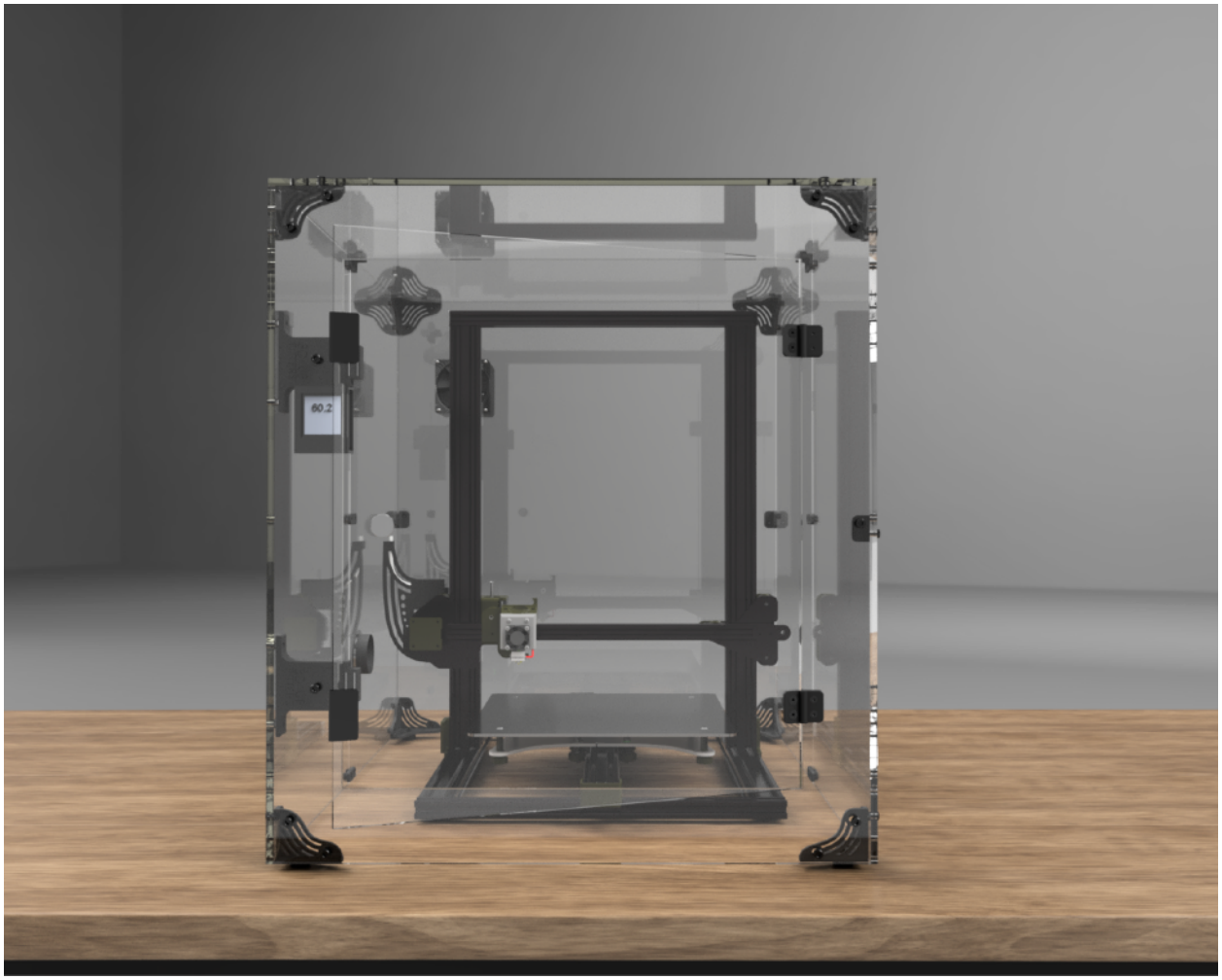
CR-10/10S V1/V2/V3 Enclosure Kit

Installation Manual 2.0

December 2020



This page intentionally left blank.

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, "just be a little careful".

Before you Start

Is This Manual for *Your* Kit?

This installation manual covers the enclosure design for the Creality CR-10S (300x300x400mm print size) enclosure in versions V1, V2, or V3. If you have a different version of the enclosure please read previous versions of the manual available on the website.

Is your Printer Customized?

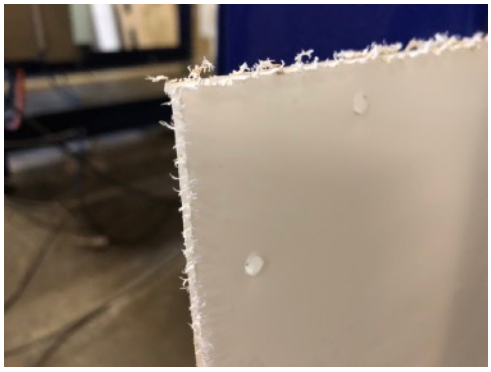
If your printer is stock then no customization is needed. If you have customized the printer, you should examine any modifications to make sure they don't block the panels. If part of one of the panels is blocked, you can use a laser or drill to customize one or more panels. **This should be done before 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.

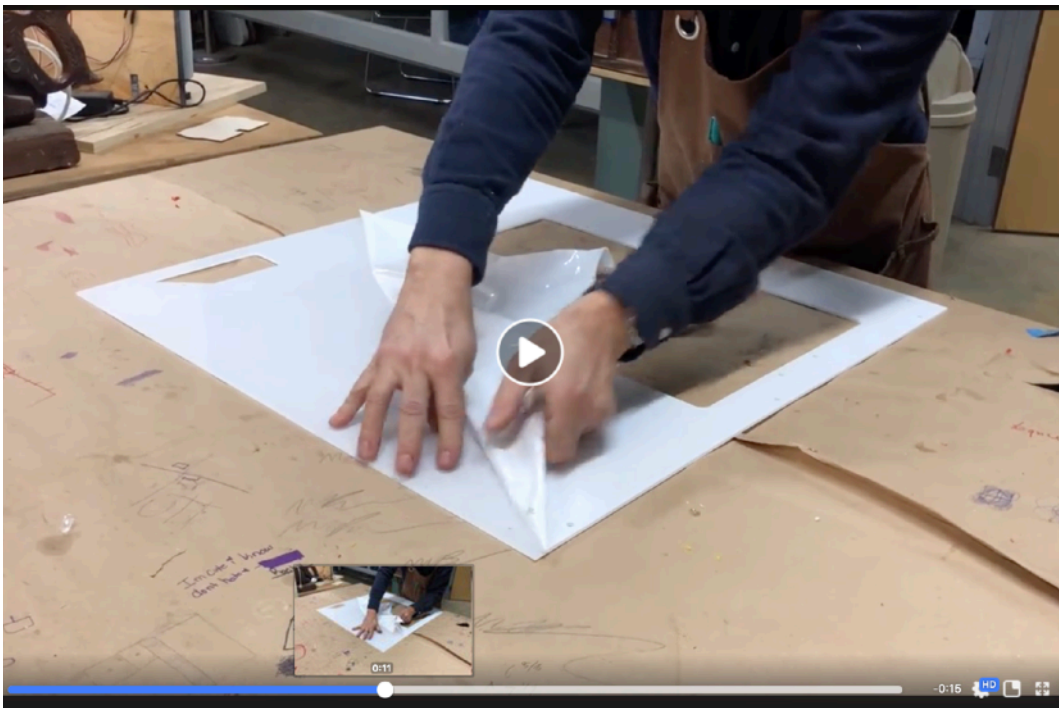
Don’t Panic If You See This!



If you can’t see through the plastic, please don’t panic! What you’re seeing is just the plastic or paper protective covering.

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.



How to Remove Plastic Covering from Acrylic

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.

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*.

Assemble Panels

The front panels are made from thicker 1/4" acrylic to provide more structural rigidity where its needed: the door. Do not try to bend the 1/4” acrylic! The remaining panels are all 1/8”.

1. The Front Panel

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.

Top Left

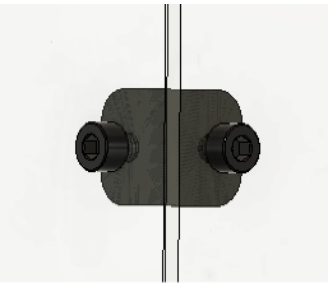
Top Right

Bottom Left

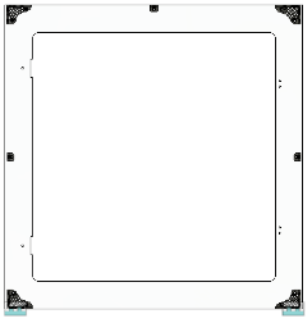
Bottom Right

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 cap head screws. See the photos below. The top of the connector should be flush with the top of the acrylic.

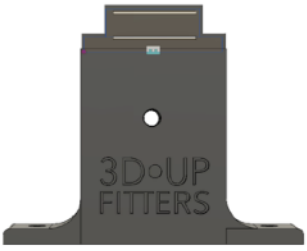
There are also smaller connectors at the top and right side when viewed from the front.



The front should look like the picture to the right.



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.



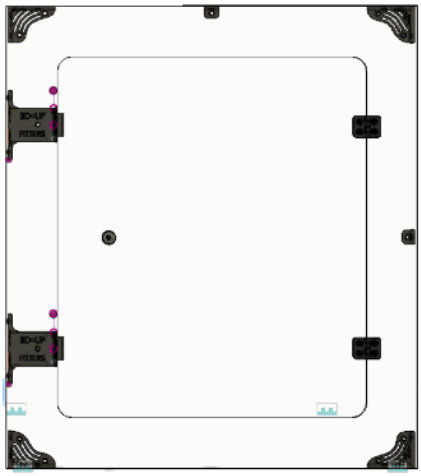
Each latch mount is attached via three screws. Two M4 12mm cap heads are used to attach the latch mount to the side, while an M4 30mm cap head secures the latch mount to the door frame.

At this time attach the latch mount to the front door frame using the included 30mm M4 screw. You will attach the latch mounts to the left-hand side after the left side is attached.

Attach the hinges to the door and door frame using M4 cap head 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.

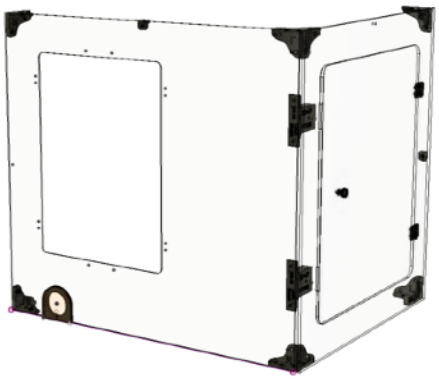
Now that the latches are mounted it is time to connect the strike plates. Each plate comes with a squishy adhesive covering the same size of the plate. Carefully attach the adhesive side to the acrylic at the location of each latch. Then, adjust the width of the metal strike plate so that it is held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



This is a good time to use the metal strike plates to hold the left side of the door in place while you adjust the screws on the right hand side hinges so that the door swings freely.

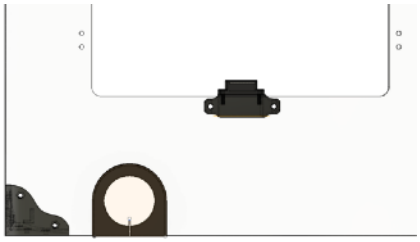
3. Left Side Panel

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 as well as the mid panel connectors on the back left and top.

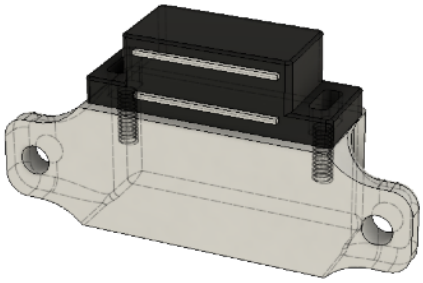


Attach the latch mounts to the left side using 12mm M4 screws and nuts.

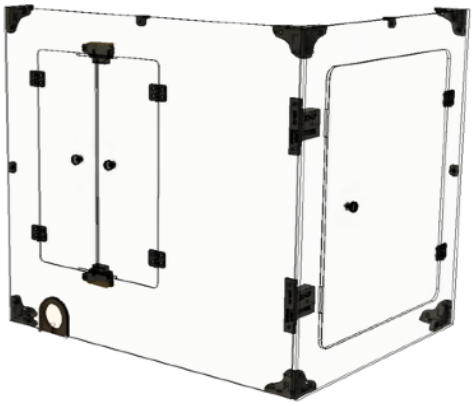
On the bottom left side is the cable/grommet holder. Insert the grommet into the round hole, and the whole piece goes into the U-shaped slit in the left side. Later, when putting the enclosure over the printer, a slit can be cut with a pair of scissors into the rubber grommet, and cables slide through the slit in the plastic grommet holder and then the grommet itself. After that the enclosure can easily be removed without touching the cables.



The left side also has double doors which require hinges and magnetic latches. The small latch is attached to the mount using small wood screws as with the front latch. The latch/mount assembly is then attached to the top and bottom of the door area using M4 12mm screws.

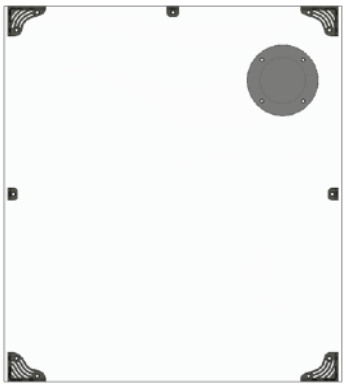


After assembling the door hinges and strike plates as on the front the enclosure should will look like the picture to the right.

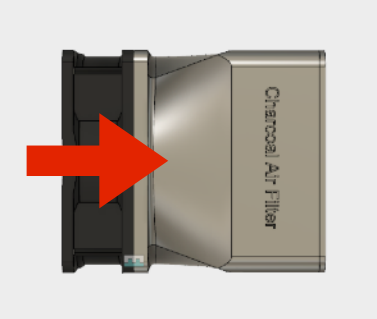


4. Back Panel

The view to the right is the back of the enclosure when viewed from the back. 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 by a plastic disc using M4 12mm screws. On the top and on each side are “mid panel corner connectors”, which are basically simple L-shapes.

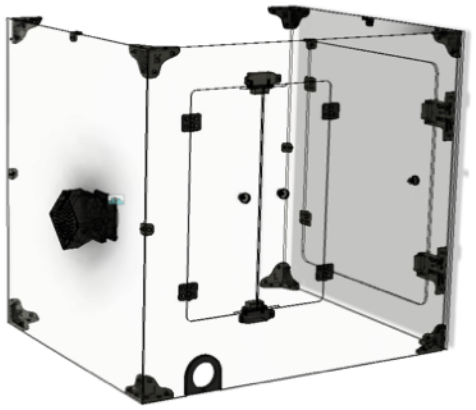


If assembling the Charcoal Air Filter, confirm the direction of the fan’s air filter by plugging it into a USB power supply before attaching to the filter and back of the enclosure using M4 cap head 30mm or 40mm screws depending on the depth of the particular fan.



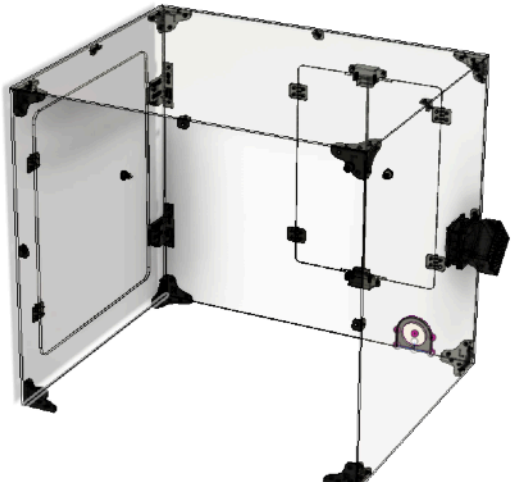
The air filter should look like this after being attached. Note that its easier to insert the screws from the inside, and put the nuts next to the filter housing.

Now attach the back to the assembled left and front panels, which should look like the illustration to the right.



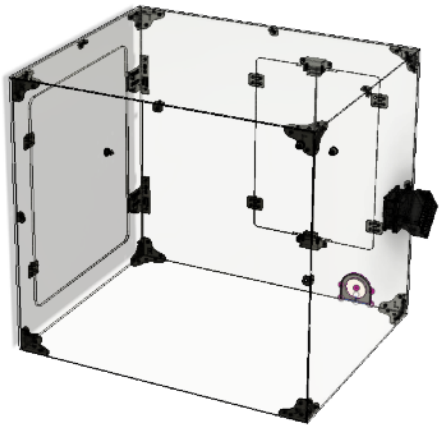
5. Top Panel

Use access through the doors to attach the top of the enclosure using M4 12mm screws.



6. Right Panel

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 might 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.

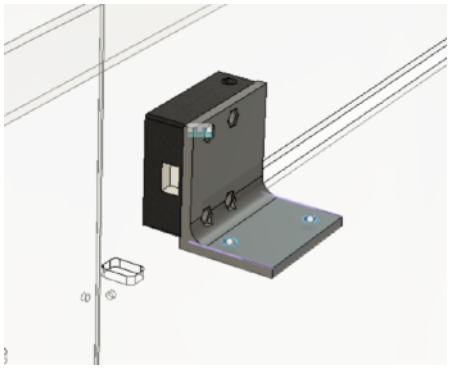


Before tightening the bolts on the right side slip the top support bar into place. The side will bow out a little so you can get the support bar into the slot.

7. Filament Sensor

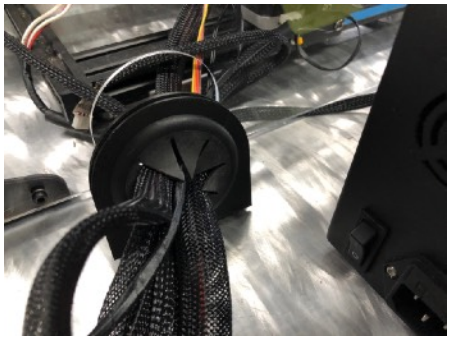
The V3 release of the CR10 features a direct drive hot-end with a filament sensor. Note the sensor by design has to be located on the left-side of the printer. Creality designed it that way for some unknown reason, making the cable to the sensor only long enough for this placement. Unfortunately this makes it impossible to use the sensor if you intend to print something 375mm or so and higher. The enclosure is designed to work for the full height of the printer, BUT you'll need to remove the filament from the sensor for that.

To attach the sensor first unattach it from the metal stand that comes with the printer. You'll want to use the included M3 20mm screws to then attach the sensor to the holder as shown. Be sure that the cable socket is close to the hole in the top for the cable. There is plenty of cable to fit through that hole and attach to the sensor. Then use the M4 12mm screws to attach the bracket to the top.

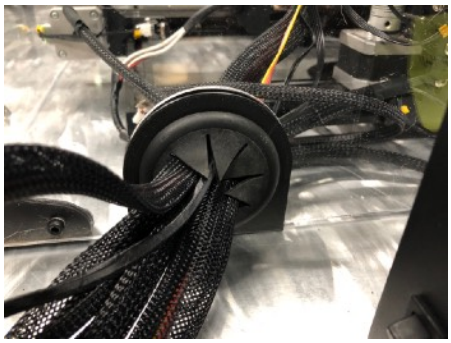


8. Attach Cables

Because of the large size of the enclosure and the printer, getting the full vertical range and flexibility in control box placement will require purchase of cable extenders. These are easily available on eBay and Amazon. If you don't wish to remove the existing cables, you can cut a slit in the grommet, slide the wires in, then use the slit in the grommet holder to insert the wires.



The entire grommet/grommet holder combination then slips into the half-circle cutout in the left side acrylic.



9. Seal 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.

10. Managing Enclosure Temperatures

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 72F, then you've got a good chance of getting into the sweet spot. If the baseline is 50F, then you'll be lucky to break 72F in the enclosure itself.

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.

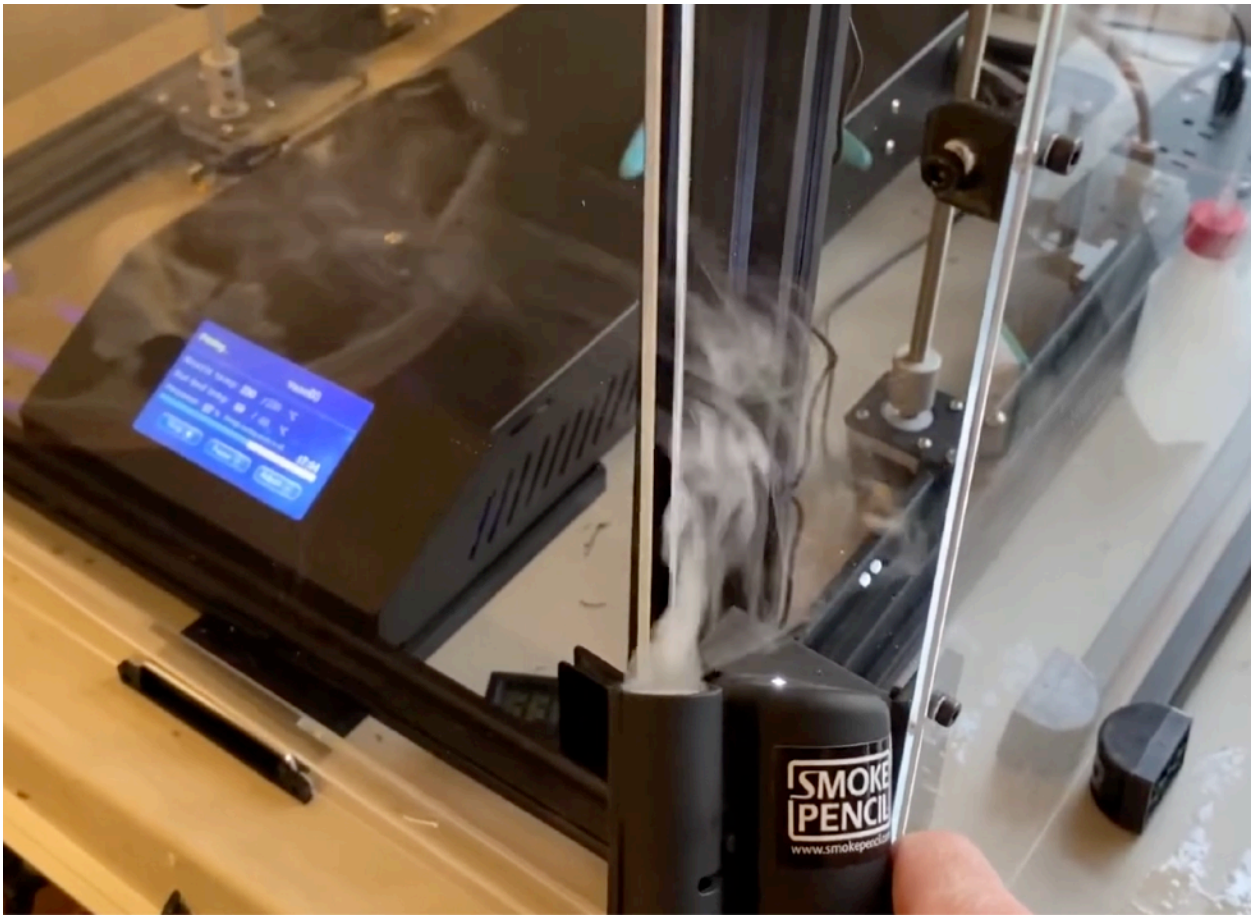
Perfect Enclosure Printing with PLA

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

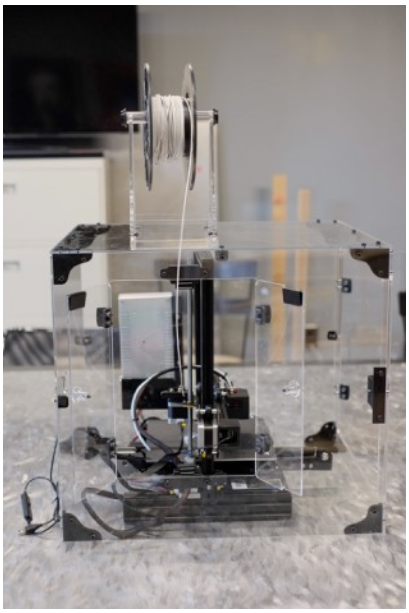
Higher Temperature = Less Cold Air

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.

Accessories

Spool Holder

Instructions to assemble the spool holder are available online. It should sit on top of the enclosure on the end approximately where the filament spool would have been oriented without an enclosure. Of course, if you don't like this spool holder you are free to use whatever type of freestanding spool holder you wish; there are hundreds of designs available on Thingiverse.



For the stock V1 and V2 versions the filament feeds into the extruder through the gaps in the side doors.

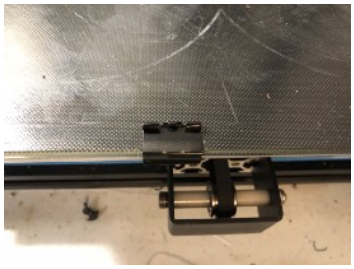
For the V3 release and direct drive conversions filament is fed through the top slit.

Drilling Holes

There are lots of reasons to customize your enclosure. Those of you who want to change how filament is brought into the enclosure should feel free to drill holes as appropriate. **With acrylic, be very careful to tape on both the inside and outside, and use very little pressure when drilling to gradually remove the plastic.** If you do not follow these instructions the plastic is liable to chip or crack the enclosure. Its not hard to do, but if you simply force the bit into the plastic with no tape it can crack and chip.

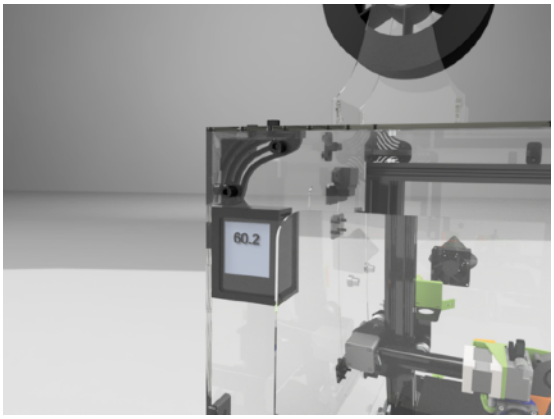
Bed Clips

In order to make the size of the enclosure as small as possible, there may be little room on the front of the bed for clips that stick out. If you find the enclosure needs a little more room, attach the clips to the bed, and then use needle-nose pliers to remove the clips.



Temperature Gauge

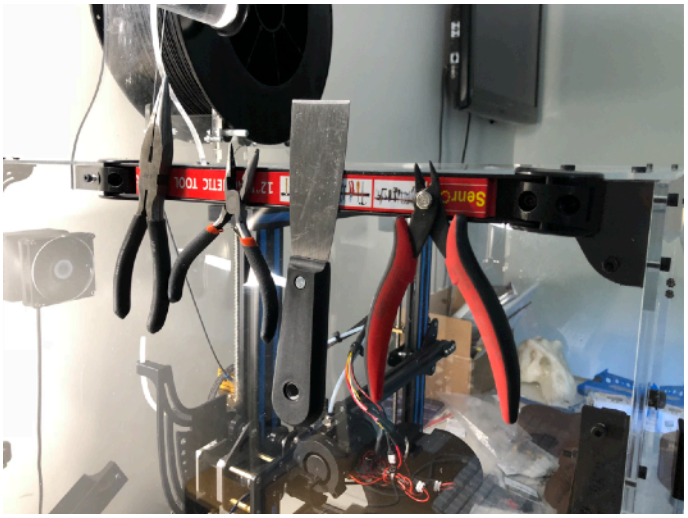
The optional thermometer will let you know approximately what temperature it is inside the enclosure. It attaches to the left side of the door piece using the same hole as the top-most corner connector as shown. It comes with a longer screw to fit through everything.



Tool Holder

Our favorite customization is to add magnetic tool holders to the side. One end can be attached via the same hole as the corner connectors, but the other end will require drilling a single hole.

Upgraded Bed Heaters



The next most common modification is a better heater bed, including the 120V bed. Not only does the 120V version heat up faster than the hot end, it will go up to 120C so you can print ABS. The key to doing this mod with an enclosure, is to make sure you adjust any cable holders for the bed heater to not stick out the rear as on the stock heater. We have ours adjusted to completely fit under the bed, giving the maximum front to back room in the enclosure.