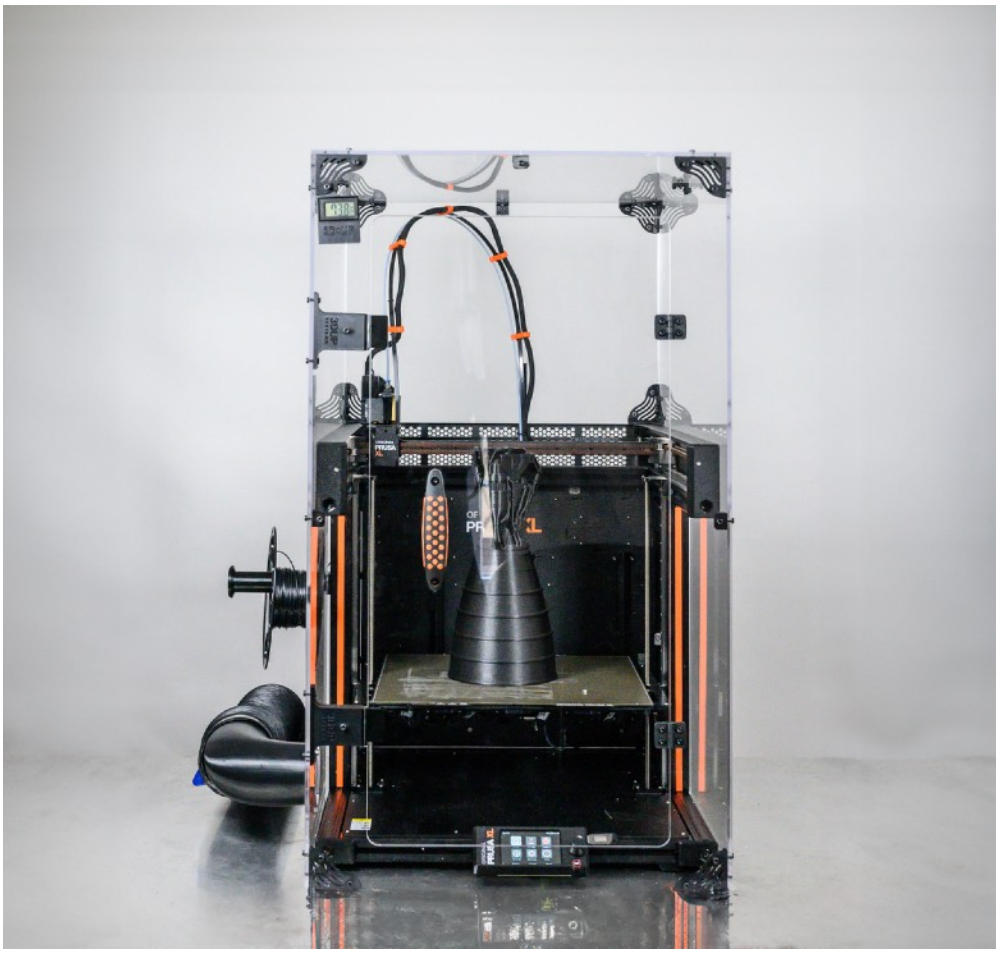
# Prusa XL
# Enclosure Kit

Installation Manual 1.4

February 2024



We forgot to put something on this page.

# 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 be? Assuming you're following the directions, it's not really that hard, but try to use brute force, and you'll end up working through your vocabulary of swear words. While the acrylic pieces in the kit are solid and difficult to harm if handled correctly, they are still plastic and will break if bent far enough.

## Is This Manual for *Your* Kit?

This installation manual covers the R3 enclosure design for the **Prusa XL enclosure**. If you have the Prusa MMU or Prusa Mini enclosures, this is NOT the right manual.

## Do you have a second person handy?

The enclosure is very deep and will require someone to stand on a short stool (depending on height) to insert the screws and nuts for the back.

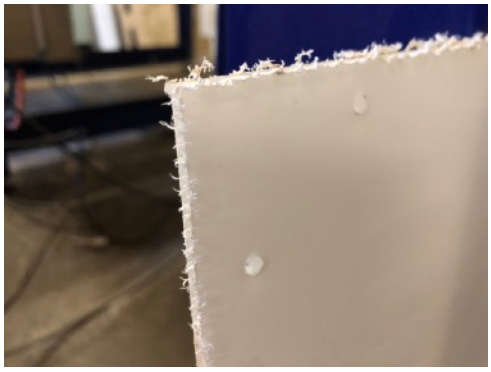
## Is your Prusa Customized?

If your printer is stock, then no customization is needed. If you have customized the printer, you should examine any modifications to ensure they don't block the panels. If part 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 can crack if mishandled.**

## Preparing the Printer

1. Remove any filament from the hot end (which will require heating the hot end) and remove the filament spool from the spool holder.
2. Turn the printer off and unplug the power cable from the printer's power supply.
3. **Remove the spool holders from the sides. Later, the base pieces will be replaced with slight modifications to accommodate the side panels.**

# Don’t Panic If You See This!

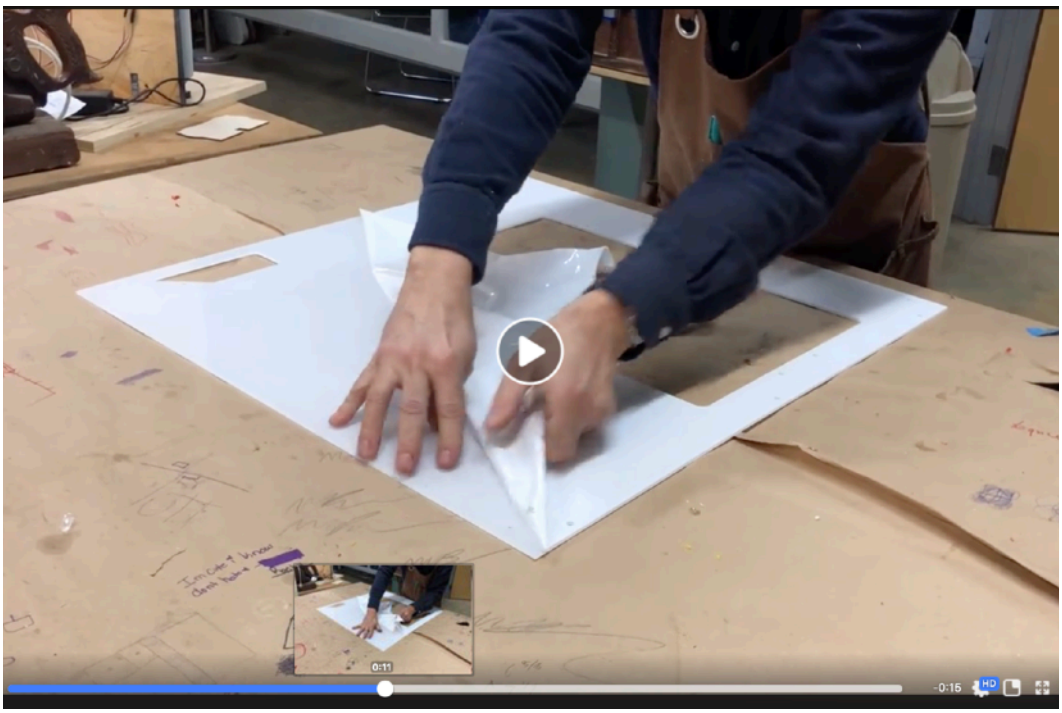


**If you can’t see through the plastic, please don’t panic!** What you’re seeing is just the plastic or paper protective covering. You, dear customer, are way too bright to think the plastic is flawed and then call and email us repeatedly, leaving increasingly irate messages on Christmas Day.

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. But if, in some rare instance, the plastic arrives with a crack or scratch, either from manufacturing or shipping, we’ll, of course, replace it for free.

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. Watch the Video!

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



How to Remove Protective Covering from Acrylic Video

# Everything You Wanted to Know About Screws 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 |

The most confusing thing about assembling this enclosure will be which fastener or screw to use. Luckily, it's easy to figure out once you know the system. While the same 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 screw. 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; 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 will be easy to spot since they'll be the longest thing in the bags.

Finally, and we can’t stress this enough:

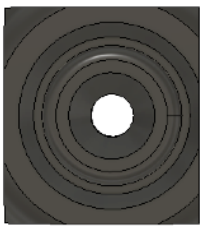
**DON’T OVERTIGHTEN THE SCREWS**
**DON’T USE A POWER SCREWDRIVER**

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 on the plastic pieces or the acrylic crack over time. Please don’t be *that guy*.

# 3D Printed Connectors

If you ordered your enclosure kit with 3D printed parts, you could skip ahead to Assemble Panels on the next page.  The STLs for the 3D printed details are automatically emailed when you purchase, so check your spam filter and contact support if you can't find them.

For detailed printing tips, please read the Blog article Printing Tips for 3D Upfitters Parts.

| Part | | Quantity |
|---|---|---|
| L-Corner Connector |  | 4 |
| R-Corner Connector |  | 4 |
| Mid-Panel Connector |  | 7 |
| Large Latch Mount |  | 1 |
| Updated Prusa XL Spool Holder Base |  | 1 |

# Assemble Panels

## 1. The Front Door

The connectors pictured below will hold each corner of the enclosure. Use the larger connectors stamped with L and R, which can be identified by the letters stamped inside. The diagonally opposite connectors are identical, i.e., the Bottom Right is the same as the Top Left. In all cases, the wavy surface of the connector with the cutout pattern faces the panel, and the rest points inward. The pictures below *show the front panel from both the inside and outside.*

***If the holes don't line up, check!***

*https://www.3dupfitters.com/blogs/news/how-to-attach-corner-connectors*

*R-Connector From **Inside***

Top Left (L)

Top Right (R)

Bottom Left (Labeled R)

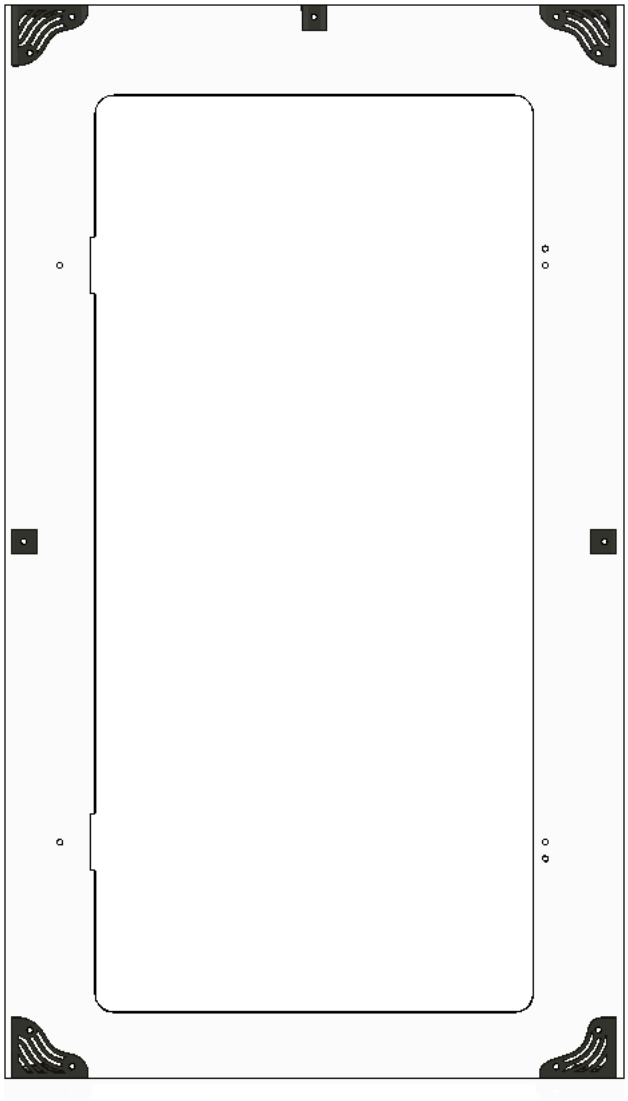
Bottom Right (Labeled L)

View from **Outside** the Front

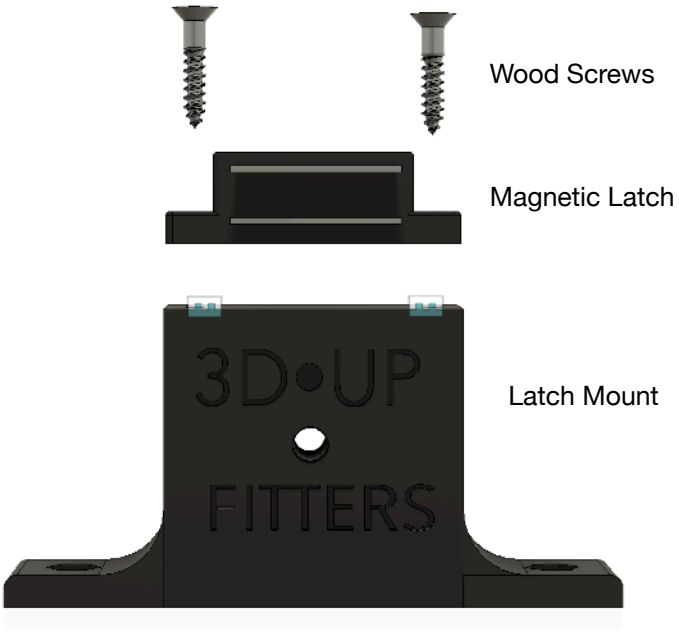
The front door is designed so that the latch is on the left. Attach the corner connectors on the ***inside*** of the door frame using the provided cap head 12mm screws. The top of the connector should be flush with the acrylic top. Adjust the screws snugly but not tight, as you'll adjust them later.

**When removing the front door, remember the orientation**, i.e., which part of the door is the inside and which is the outside. You'll want to attach the door the same way it was taped. ***The laser cuts at a slight angle, so inserting the door backward can create interference, making it difficult for the door to swing correctly***.

There are also three mid-panel corner connectors to attach. Use 12mm M4 screws.



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

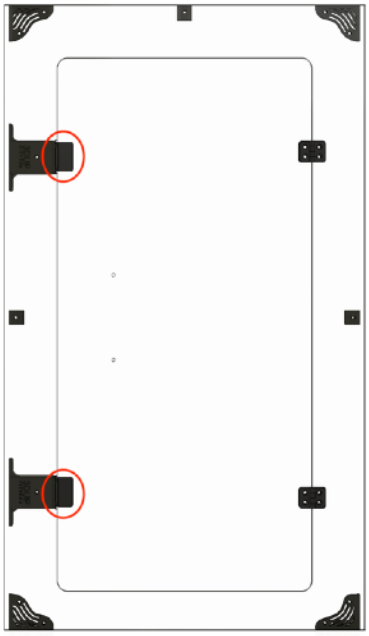



Each latch mount is attached via three screws.  Two M4 12mm cap heads attach the latch mount to the side, while a 30mm cap head secures the latch mount to the door frame.  When installed, it will look something like this.  (Note: illustration is reversed.)


Attach the door and door frame hinges **outside** 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. It's OK if the door doesn't fit exactly, as that will be adjusted later.

If you are assembling the enclosure around the printer, you can now attach the door handle using the two 30mm cap head screws to attach to the door.  If you're assembling it with the front face down, the handle can be left until last.

Now that the latches are mounted, it is time to connect the strike plates.  Each plate comes with a squishy adhesive covering the exact 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 strike plate from scratching the acrylic.



**PRO TIPS!**

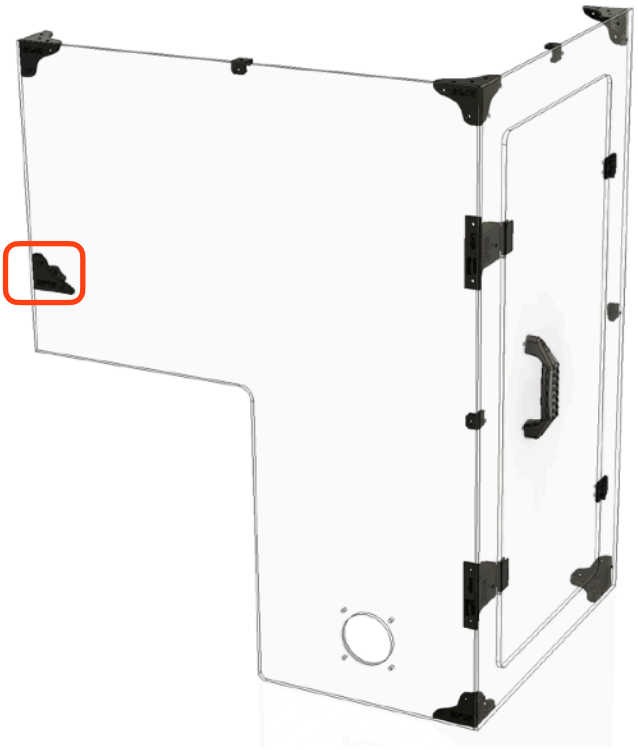
You can adjust the way the door swings by using the magnetic latch to hold the side of the door in place and then placing the front on its side so the hinges are at the top and the latch at the bottom.  Loosen the screws and adjust the position of the hinges so that there's an even gap on all sides of the door.  The door should open and close

freely.  If you have trouble fitting the door correctly, confirm that the door was attached in the same orientation before removing the tape.

## 2. Attach Left Side

The left panel is distinguishable by its vent hole and having “left side” written on it.  The venting options will be discussed in a later section.  Attach the left panel to the front panel and lean them against your Prusa XL.  If you assemble the enclosure *around* the printer, you can avoid scratching the acrylic.  Other people may prefer to assemble the enclosure separately and then lift it over the printer. Please put a towel underneath where the acrylic touches the table.

Note that, unfortunately, the left side will now interfere with the calibration screw, which will need to be stored somewhere else.



**The back and bottom connectors, shown above in red, are smaller than the rest.** This is to reduce the chance of interference with the docking mechanisms.

By default, the enclosure kit comes with an 80mm fan that fits onto the left side. This solution allows you to print ABS by turning the fan off, PLA, PETG, etc, by turning the fan out. Air quality solutions such as air filters or venting hoses are sold separately.

Remember to remove the spool holders on both the left and right sides. For the acrylic to overlap with the aluminum extrusion, install a slightly modified spool holder part later in the assembly process.

**Without that modification, the sides won't be able to slide far enough to the rear to attach the back. If you aren't using spool holders, there should be 3mm of overlap of the panel over the vertical aluminum extrusion.**

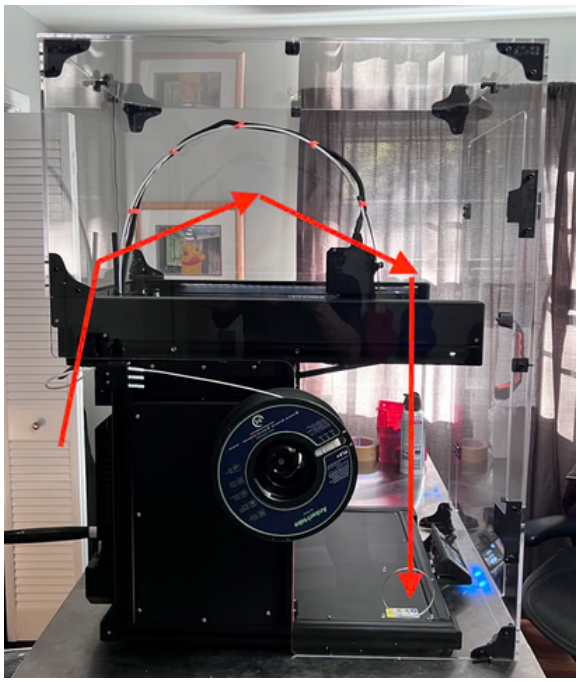
## 3. Attach the Right Side

The right side is identical to the left except for the absence of the air vent hole. The three sides should now be surrounding the front of the Prusa XL. The two corner connectors in the back will be resting on the top of the printer in the back.

**Remember, the connector circled in red is smaller than the rest.**

4. Attach Back

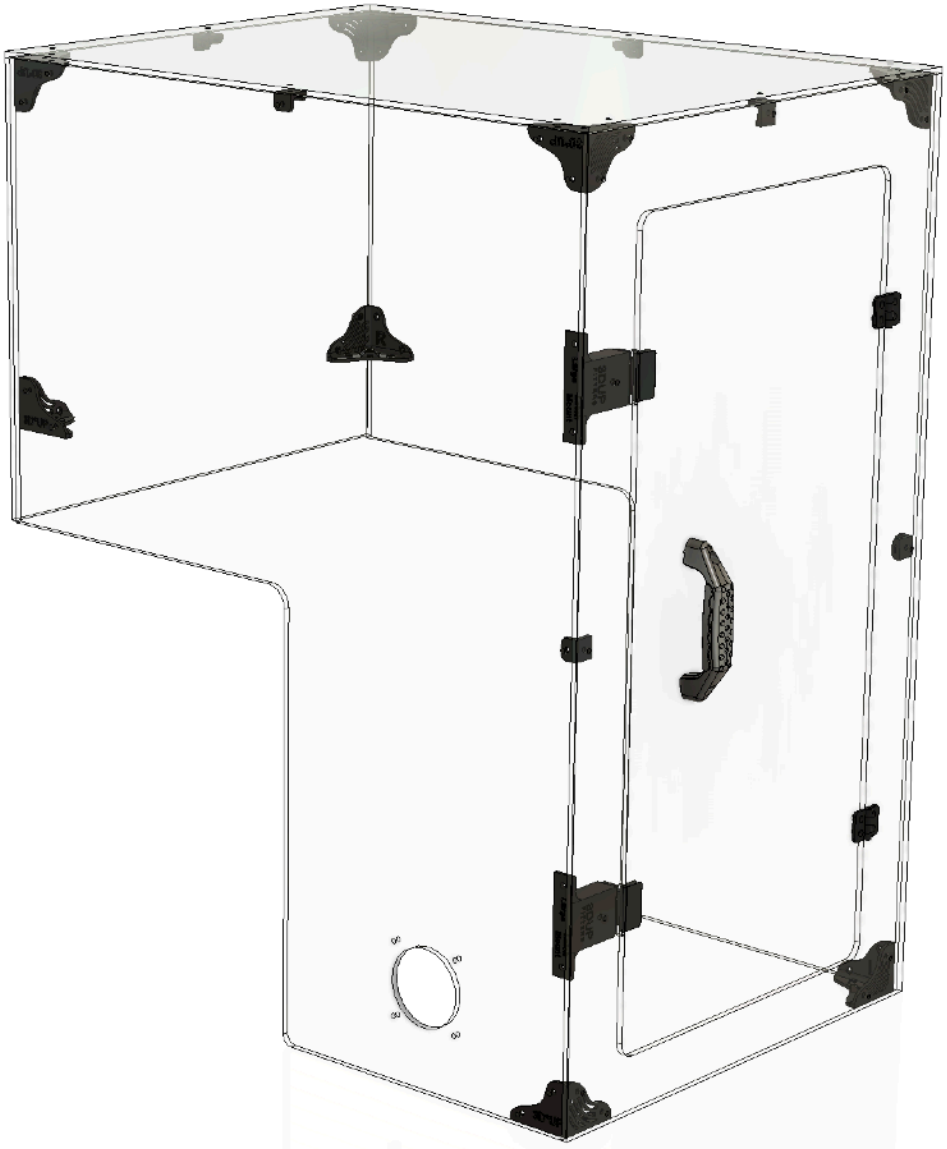
The back covers the top half of the Prusa XL but leaves the overhang open.  This doesn't need to be closed since hot air rises, so there won't be a heat loss.  It also has a natural air intake, which is needed when venting is being used.



With the clearance needed in the back, the position of the Wifi antenna is restricted to the “down” position.

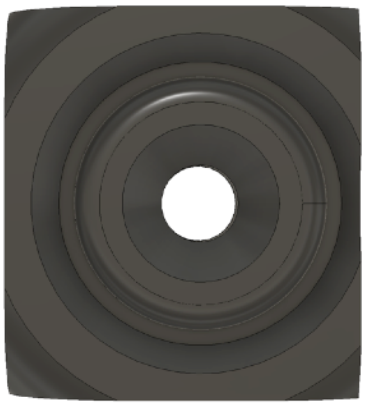
## 5. Attach Top

The top is the last to attach, which can be tricky because of the size of the enclosure. This is an excellent time to get a buddy to help.



## 6. Spool Holders

Since we started shipping the enclosure, Prusa has included injection-molded spool holders with the XL.  These, unfortunately, bump up against the acrylic, and there's no way to make it work without cutting semi-circles in the acrylic, which would give you no flexibility in where you wanted the spool holders.



Instead, please 3D print the original spool holders, and pair them with the included base.

Note that a slight modification to the spool holder base was required to give enough clearance for the acrylic to overlap the aluminum extrusion.  One edge of the spool holder base has been slightly cropped to accommodate the acrylic.

Once the new spool holder bases are installed, the acrylic will fit snugly:

## 7. Sealing Gaps

Once the enclosure is completely put together, it is time to ensure that each panel is held tightly to each adjoining panel.  The connectors are designed with a small amount of play, allowing you to make minor 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 of plastic.

Repeat the process, going around the enclosure to ensure all panels are flush with each other.

You'll also want to make sure the front door swings smoothly. The easiest way is to lay the enclosure on a towel on its side so the hinges are at the top.  Loosen the screws attaching the hinges to the door and frame, and use the magnetic latch to hold the door in the middle of the hole.  Now tighten the screws again, and the door should swing freely.

## 8. Plugging Things In

There are a couple of things to the plugin:  the Prusa XL itself and the fan.

We recommend getting a combination USB power supply strip, available anywhere.  You can power the printer and accessories from the same strip AND turn everything off and on from outside the enclosure.

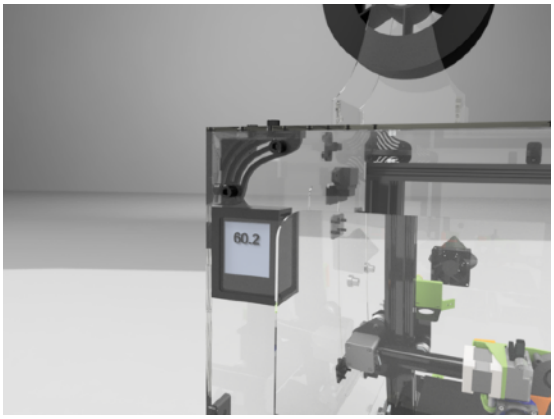
## 9. Cleaning

**Acrylic does not like microfiber cloth**, as some can be pretty abrasive. Instead, use an old T-shirt or similarly soft cloth for cleaning.

**Do NOT use chemicals such as Windex** or other glass cleaners, which can also damage the acrylic. Instead, start with plain water, and if that doesn't do the trick, try adding a very diluted, mild hand soap with no abrasives.

## 10. Thermometer

The optional thermometer will tell you the temperature inside the enclosure. It attaches to the left side of the doorpiece using the same hole as the topmost corner connector, as shown. It comes with a longer screw to fit through everything.




## 11. Managing Enclosure Temperatures

There's little to a 3D printer enclosure. How complicated can they be? This section will explain 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 primarily in air quality.
2. Those interested mostly in print quality.

**Think Airflow, Not Fishtank**

The problem is that those two goals use two different techniques in terms of airflow. We use the same design as industrial equipment for the best air quality, which uses airflow to manage air quality. Because of physics, the amount of air moving into the enclosure must be equal to the air moving out. When the air carrying volatile organic compounds moves out of the enclosure, it can 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 primary concern is air quality, being airtight doesn't buy you anything since the particles will float out when you open the door. By maintaining a negative air pressure, the particles are reliably kept away from human operators, which means having openings for air to enter *and* exit the enclosure.

If the maximum internal temperature is the goal, being airtight also doesn't help since the leading cause of heat loss is 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; thus, almost all of the heat of an enclosure is at the top. However, a bottom is helpful if your table is too small for the enclosure.

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

**Room Temperature**

Passively heated enclosures depend entirely 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 will never get hot enough. The bed heater has only enough energy to increase temps from the baseline. If that baseline is 72F, you've got a good chance of getting into the sweet spot. If the baseline is 50F, you'll be lucky to break 72F in the enclosure.

**ABS and Nylon**

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

This works great for people interested primarily in air quality or risk-averse people who want to avoid clogging their hot ends or decreasing the useful life of their printers.

More experienced 3D printer owners, though, for whom a clogged nozzle is a known risk, might want to run higher temperatures for less chance of warping ABS parts or printing nylon. In those cases, you can turn off the fans or even print one of the vent covers and not vent at all. We do the latter on our internal print farm 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. We've never had a power

supply fail with no venting of the power supplies. Your mileage may vary as it depends on many variables, such as filament quality and the quality of the power supply in that particular printer.

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

**Perfect Enclosure Printing with PLA**

**Warning:  Printing PLA without turning on the fan may cause clogging.**

Since PLA is happy at room temperature, the only reason to enclose it is for improved indoor air quality.  PLA prints with a bed temperature of 60C to heat the enclosure less than ABS immediately. Make sure to print with an enclosure fan and monitor the internal temperature, ideally 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 to crack the front door a little to increase airflow.  But won't that eliminate all the volatile organic compounds coming off the hot end?  The key is the negative pressure combined with the particles' minimal and light.

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

### 3D Printer Design Matters

The other part of the equation is the printer design. Those printers with the hot end 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 will always 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 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 measure the temperature.  Without measurements, it's impossible to tell whether a printing problem is temperature-related.