

# The Computer Deconstruction Lab Presents 3D Printing Tutorial



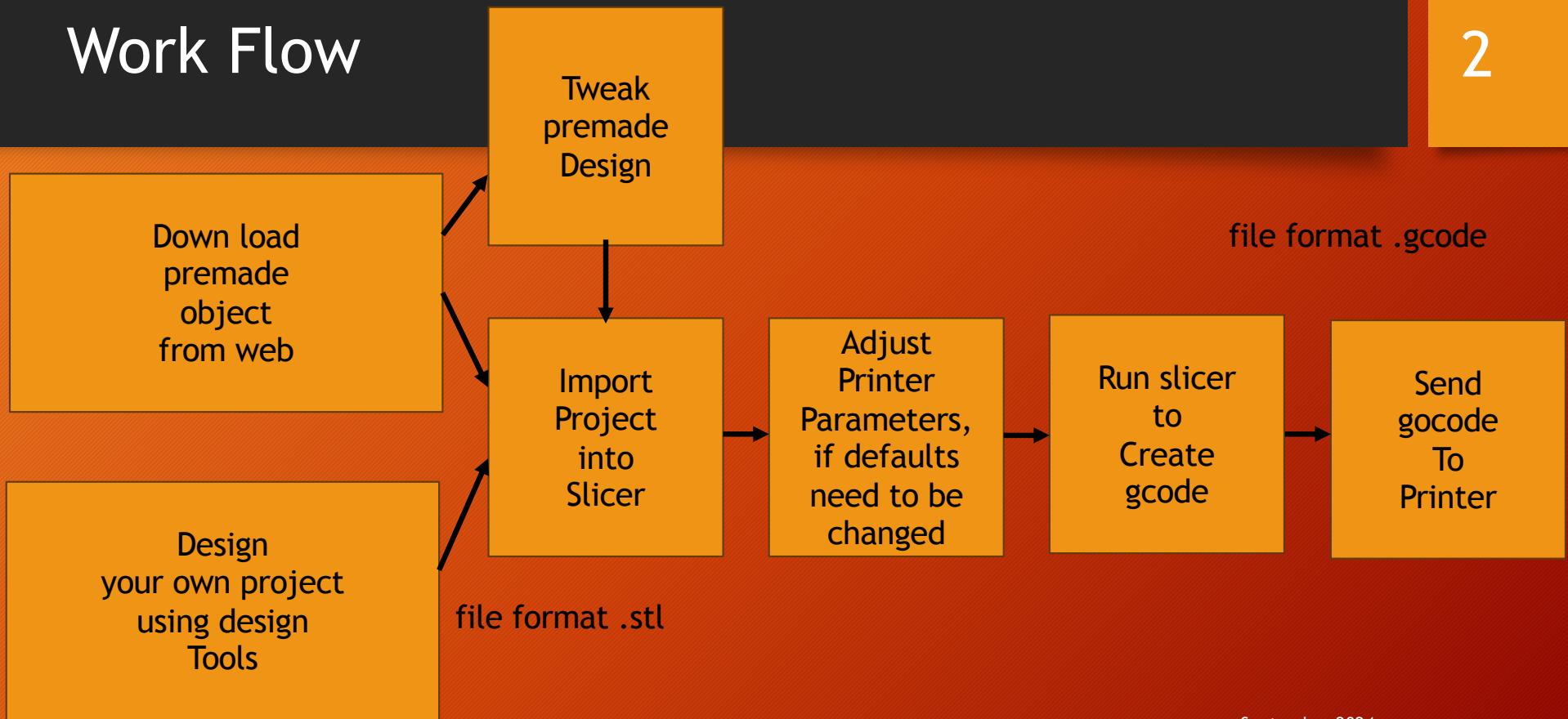
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# Work Flow

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# Download Premade Objects from Web

- Many people design objects and upload them to sites
  - for free (or optional donations)
  - for a one time cost
- Sites for Free Projects
  - <https://www.thingiverse.com/>
  - <https://www.printables.com/>
  - <https://makerworld.com/en> (has pre-sliced files for bambu printers)
  - <https://pinshape.com/>
  - <https://cults3d.com/>
  - <https://www.3devo.com/blog/top-10-sites-for-free-3d-stl-files>

# Tweak Pre-made Design

- Sometimes you may want to make changes to an existing design
- Change its size
- Separate multiple objects in an .stl file into individual .stl files
- Add additions to the design
- Other things
- You may need other tools to do these design changes
- Need list of tools!!!

# Tools to Design Your Own Project

- <https://www.tinkercad.com/>
  - on line only but can download project into your computer
- <https://www.freecad.org/>
  - for windows, Mac and Linux
  - Bug in saving files on Windows 11
- <https://www.blender.org/download/>
  - for windows, Mac and Linux
- <https://www.sketchup.com/en>
  - Not Free
- <https://www.youtube.com/watch?v=J--QVhGheP4>
  - "BEST FREE CAD / 3D Modelling software 2024 - I tested them all!"

# Getting ready for the slicer

- Each design tool will create and thus save files in their own format
- The interchange file must be in an .stl format
- If the project is downloaded from the web, you need to download the set of stl files
- If you created your own project and saved it, you then need to "export" the project in the .stl format
- Each program will have its own way of "exporting."
- If you download your project from the web, read carefully the notes that come with the project
- Some projects are customized for specific 3D printers and may not build correctly on other printers.

# Slicers

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- Slicers take the .stl file and reformat into the specific .gcode file that each 3D printer needs
- gcode for one printer may not print correctly for another printer
- In the slicer you must select your printer
  - Similar to selecting a printer when you print a document
- Most 3D printers companies have their own slicer customized for their product line.
- You can use your own slicer, if your printer is supported in the slicer
- In general, it is best to use the slicer that comes with the 3D printer

# Slicer Software

- Cura
  - <https://ultimaker.com/software/ultimaker-cura/>
- Slic3r
  - <https://slic3r.org/download/>
- Bambu Studio for Bambu 3D Printers
  - <https://bambulab.com/en-us/download/studio>
- For Pura 3D Printers
  - [https://www.prusa3d.com/page/prusaslicer\\_424/](https://www.prusa3d.com/page/prusaslicer_424/)
- For Creality 3D Printers
  - <https://www.creality.com/pages/download-software>

# Using Bambu Studio

- CDL's printer is the Bambu P1S with optional capability to support 4 different filaments
- Each time the printer needs to switch filaments, it must pause
  - cut off a length of filament
  - purge the filament out the garbage slot in the back
  - feed the new filament
- Printing a multi-color object takes a long time and is very wasteful of filament since the filament must be changed multiple times for each layer in the print
- Only print multiple color objects if you really need them, not just for fun, or consider buying CDL some filament





Example waste by  
Printer

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# Types of Filament

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- PLA - polylactic acid (most commonly used)
- PETG HF - Polyethylene terephthalate glycol-modified
- ABS - Acrylonitrile Butadiene Styrene
- ABS-GF
- ASA
- Multi Colors
- Wood Pulp infused
- Metal

<https://bambulab.com/en-us/filament/guide>

<https://www.xometry.com/resources/3d-printing/types-of-3d-printer-filaments/>

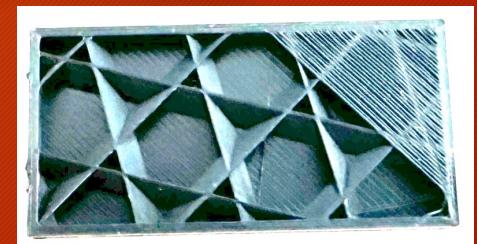
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# Recommended Settings for PLA

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- nozzle size
- layer thickness
- bed temperature
- nozzle temperature
- head speed
- infill percent
- top and bottom layer thickness
- 0.4 mm, range 0.2-0.8
- 0.2 mm (changes with nozzle size)
- 55° C
- 220° C
- 500 mm/sec (max)
- 10%, range: 10-100%
- 2-3, range: as high as you want

- Most prints are not completely solid
- First a solid base is printed
- Then a mostly open frame is printed around the sides
- The fraction of the inside that is printed is called the "infill"
  - The infill is typically from 10% to 100%, depending on the strength that the object needs
- Less than 10 % causes problems with the solid layer sagging
- Finally the solid layer is printed



# Supports

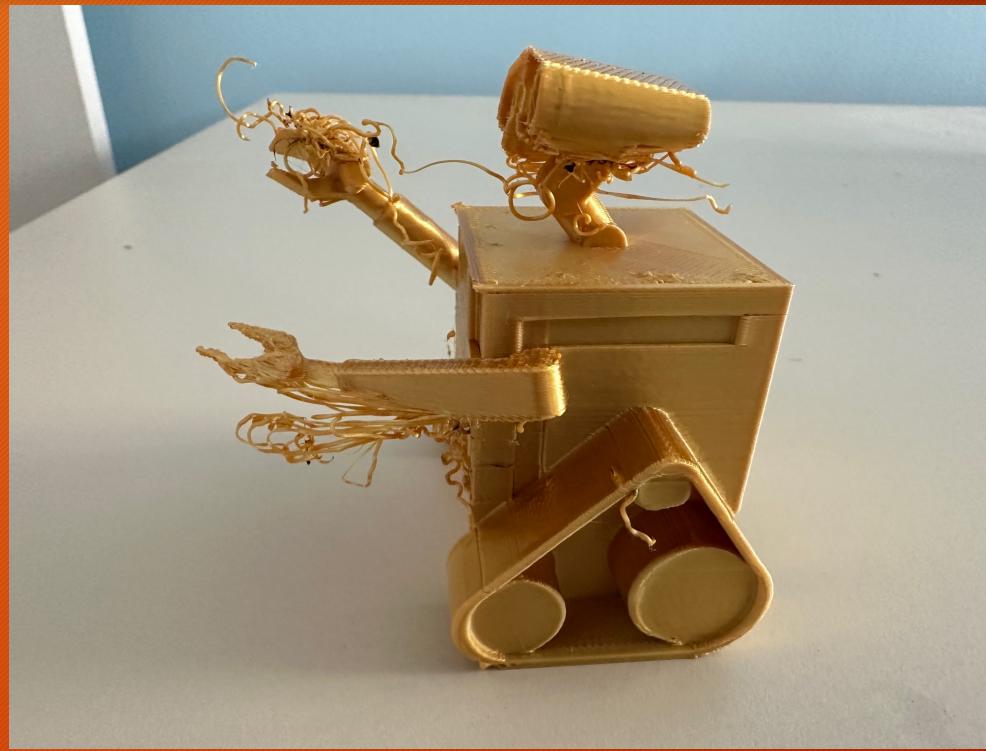
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- When 3D objects are printed, often the printer must print over air
- Clearly, when this is done, the print may sag or fall
- Thus, there is an option to add supports to the object to prevent sagging
- After the print is finished, the supports need to be carefully removed with a sharp knife or blade
- Since cutting the supports away often damages the print, multi-filament printers (like CDL's) can use water soluble filaments.
- Then, after the print is finished, it is immersed in water and the supports dissolve away

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# Failed Print - Lack of Supports

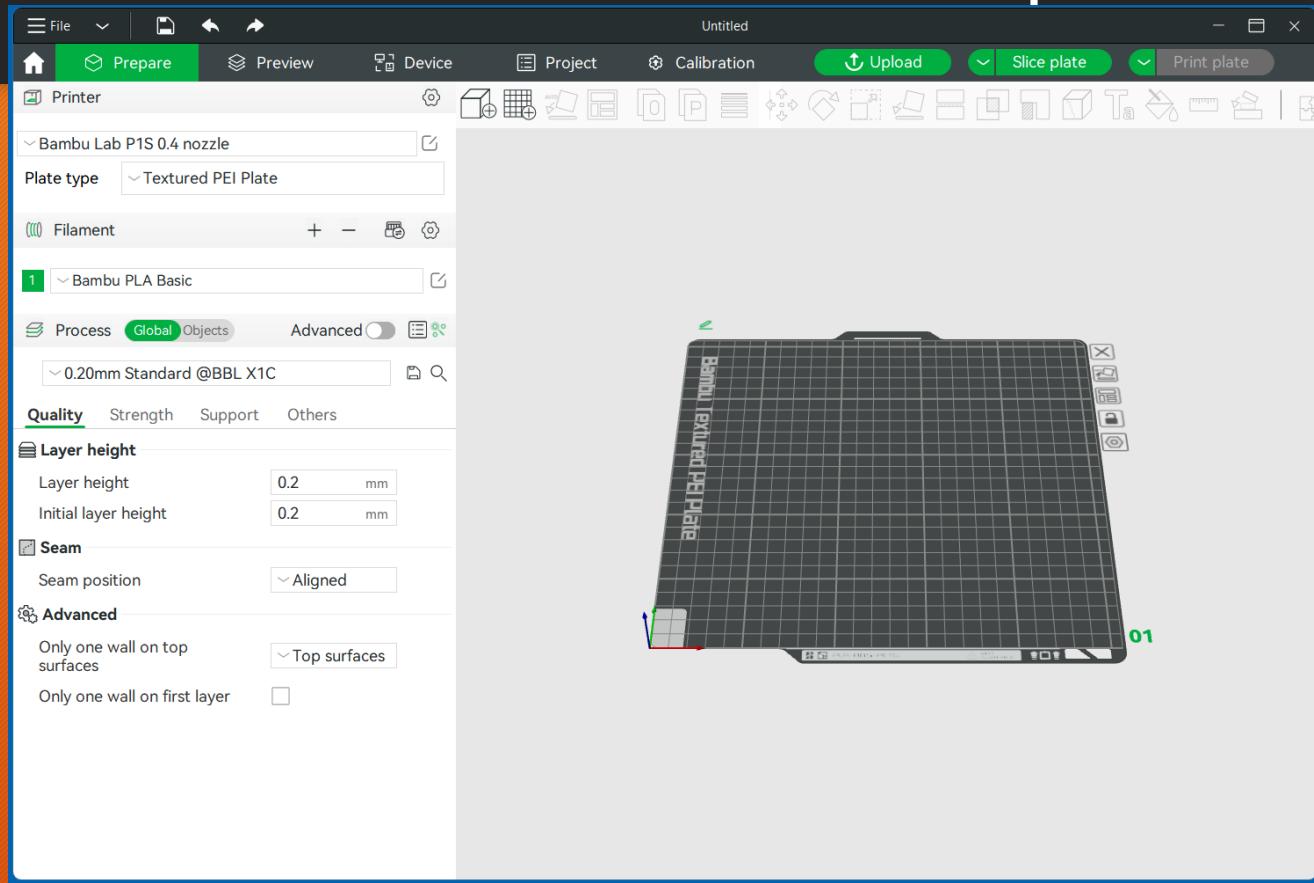
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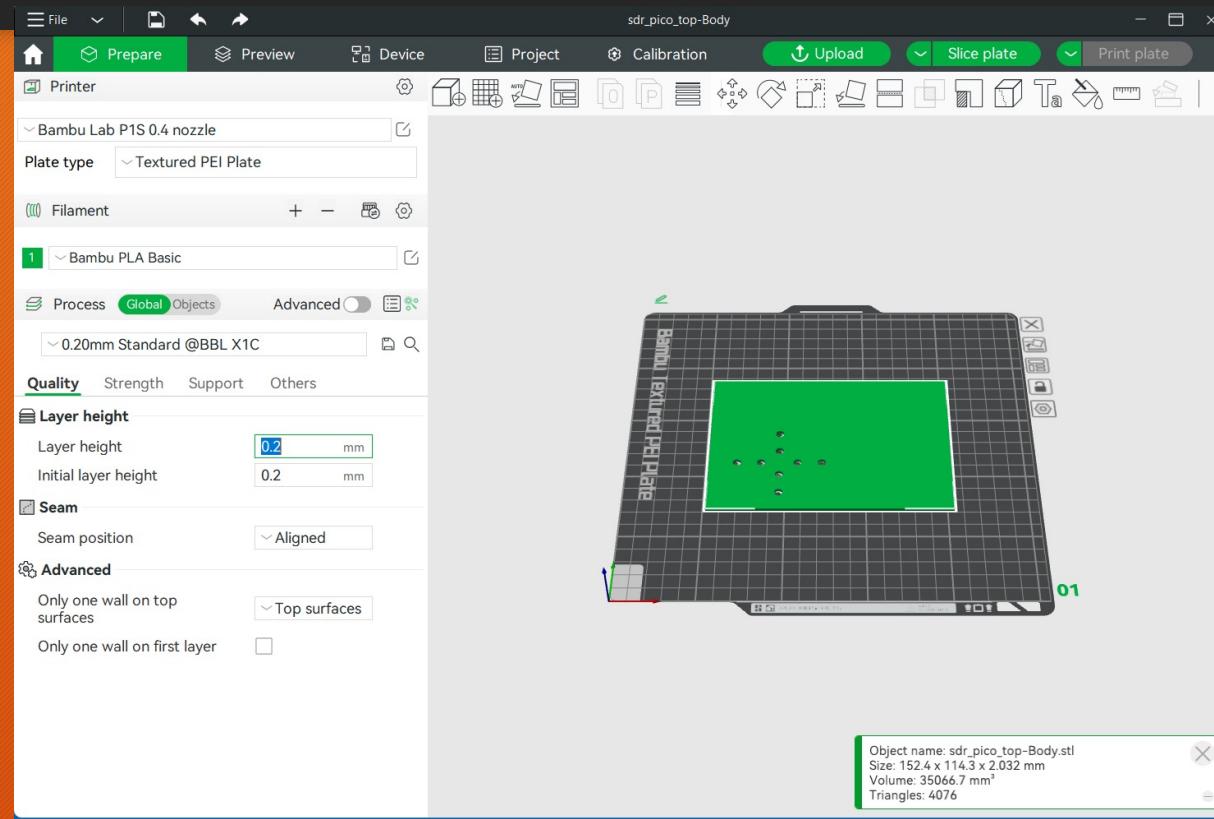
# Bambu Studio Software Setup



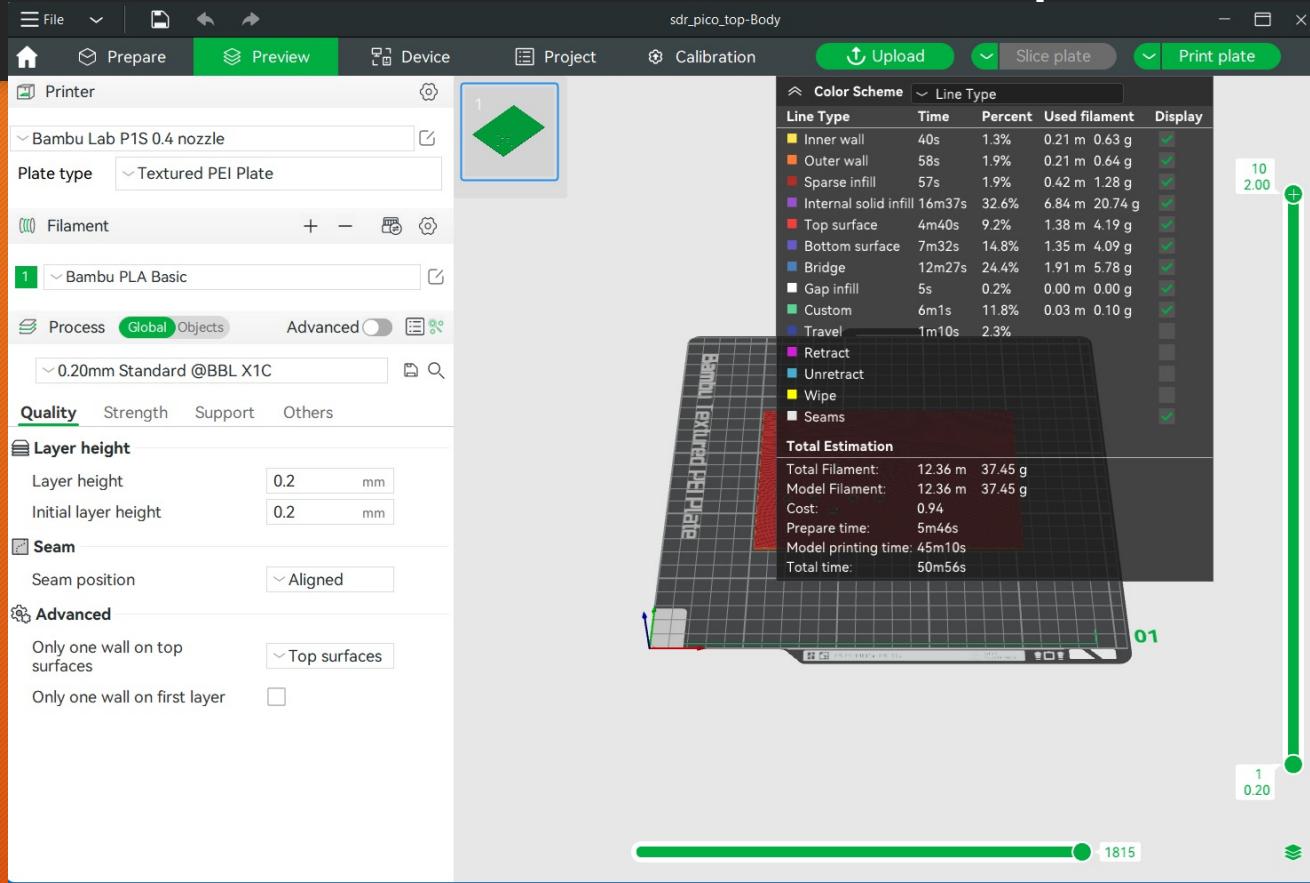
This will be presented live

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# Bambu Studio Software Setup



# Bambu Studio Software Setup

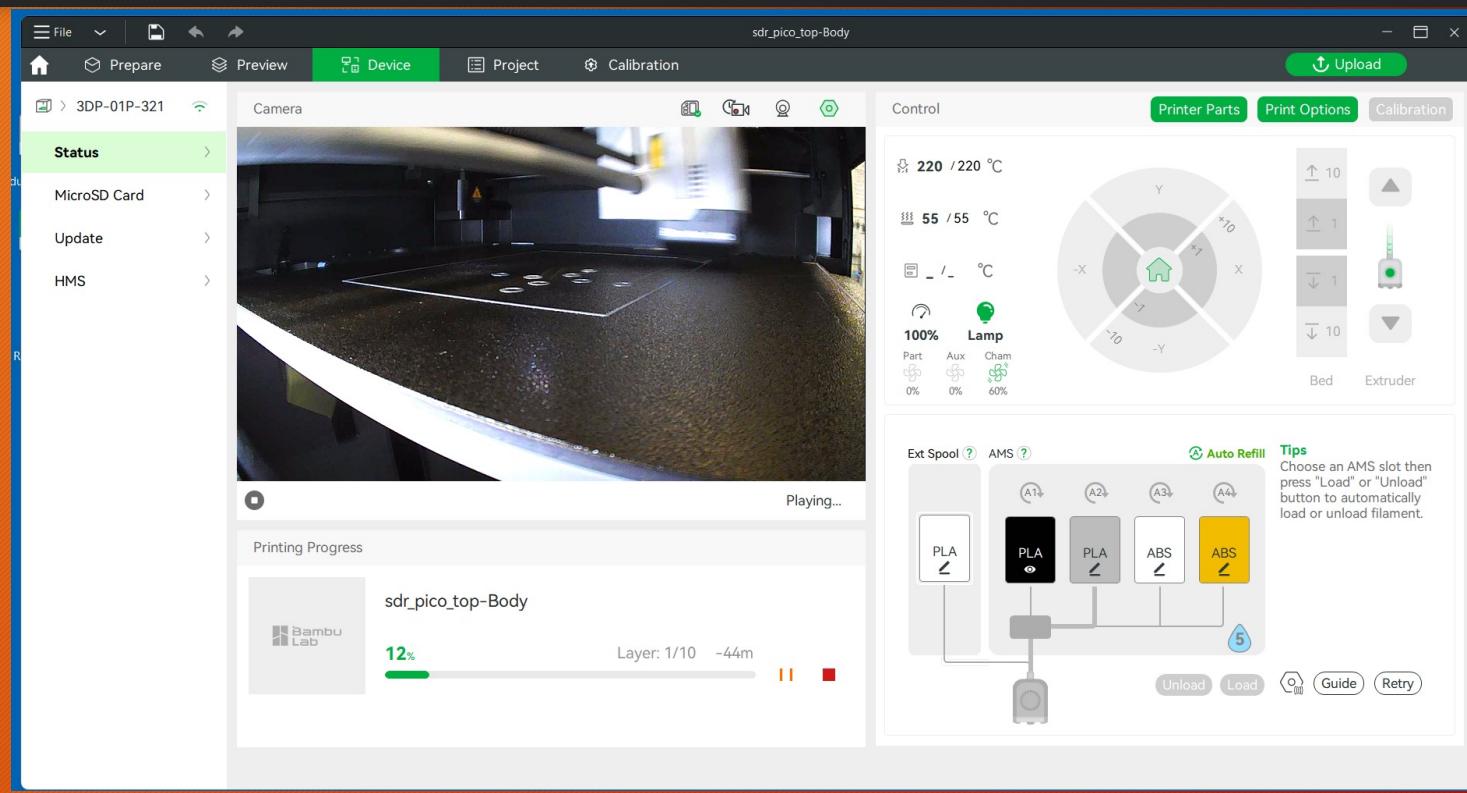


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# Bambu Studio Software Setup

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# Bambu Security Risks

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- The default setup of the Bambu 3D printer and the Bambu Studio Software is to send all files to a Mainland China server and then the server sends the file to the 3D printer
- Since Bambu realizes that some users/companies may not want to release their designs to Bambu, they offer an option to directly send the file to the printer on the local wireless network.
- CDL has implemented this option.
- It is recommended that anyone using a Bambu printer use this option
- But the down side it that the tablet/phone remote control and viewing of the printer is now not available.

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# How to Replace Filament in Printer

- Quick video on loading the AMS:  
<https://www.youtube.com/watch?v=kRar9oBuCKk>
- Quick video on changing the filament on the AMS  
<https://www.youtube.com/watch?v=go5LY8e0E-c>
- Matt or Neil to provide more info here

# gcode editing

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- Sometimes it is necessary to modify the generated gcode
- It can be done in a text editor
- But there are other programs that will do it also and help with make the changes
- <https://www.crealitycloud.com/blog/reviews/the-5-best-gcode-editors-for-3d-printing>

# Print your project

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- Once you have sliced the project, you should save the gcode file so you can print without slicing again
- Two Options:
  - Store gcode file on an SD card and put it in the printer to be printed
  - Send the gcode to the printer over the InfoAge guest network
- Reminder, the gcode will only work on the printer that was selected in the slicer program
- With the Bambu Studio Software you can see the printer status in a window (snap shots every few seconds)

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# Remove it from the Bed when Finished

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- After the printer is finished you can remove it from the bed.
- The bed is magnetically attached to the print plate
- Remove it and let is cool down
- Then flex the plate in both directions and the project should pop off the plate
- Return the plate to the printer bed and make sure it is correctly placed
- In some cases the object will stick to the plate and will need a scraper to lift it off the plate
- Do not use a knife or razor blade as that will destroy the plate and it will need to be replaced at a cost of about \$40.00

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# Replacement Plate

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## Bambu Textured PEI Plate

\$37.99 USD

 [PayPal](#) Pay in 4 interest-free payments of \$9.50. [Learn more](#)

Shop now. Pay with Klarna. [Learn more](#) 

### Select a Compatibility

For X1 Series/P1 Series/A1  For A1 mini

### Quantity:

- 1 +

### Discover More Discounts Here!

Both main product and add-ons must be added to the cart for extra discount to apply.

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# Other Thoughts

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- Here is where Matt, Neil, Pat and others can chime in with more information

# Questions???

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# References

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- Free Projects:
  - <https://www.thingiverse.com/>
  - <https://www.printables.com/>
  - <https://pinshape.com/>
  - <https://cults3d.com/>
  - <https://www.3devo.com/blog/top-10-sites-for-free-3d-stl-files>
- Filaments:
  - <https://bambulab.com/en-us/filament/guide>
  - <https://www.xometry.com/resources/3d-printing/types-of-3d-printer-filaments/>
- Slicers:
  - Cura
  - <https://ultimaker.com/software/ultimaker-cura/>
  - Slic3r
  - <https://slic3r.org/download/>
- Bambu Specific:
  - <https://bambulab.com/en-us>
  - <https://makerworld.com/en>
    - has pre-sliced files for bambu printers
  - <https://bambulab.com/en-us/download/studio>

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