Printing Guide 1.3

This printing guide is meant to help beginners understand the kind of settings which are optimal for printing 2nd Dynasty 3D-printable objects.

What Printer Am I Using?

I use two Prusa i3 Mk3s FDM printers using a 0.4mm nozzle. Whilst it is capable of higher resolution prints, I design my print parts to be optimised for 150 microns (0.15 millimetres). The optimal resolution for you will depend on your step size. For example, on Creality printers you want to print at 120 or 160 microns (0.16 or .12 mm).

I have printed in both PLA and ABS, and both materials work great, although I prefer PLA. Other backers have had equal success in harder materials such as PETG.

General Tips (Ship Parts)

- Print by default at 150 microns (0.15 mm), or 160 microns (0.16 mm) if you have a Creality printer such as an Ender 3.
- Control panels have tiny details and will look better at 100 microns (0.1 mm, or 120 microns with a Creality printer, 0.12 mm).
- All parts should print on SLA printers, but you will have to add drainage points and supports. Some items will be too large for your print bed.
- **Prusaslicer** is a free slicer available from Prusa (https://www.prusa3d.com/prusaslicer/). This slicer has NETFAB built in, and now supports quite a few non-Prusa printers, such as the Ender series. This is my primary testing slicer for FDM prints.
- **Print Bed Size** is an issue. Smaller printers will not be able to handle the largest ship parts, and you will have to manually slice and glue parts together. To avoid this issue, we recommend a bed no smaller than the Ender 3's 220×220 mm print bed. Some items can be fit more comfortably by rotating them 25-45 degrees.
- Print the **OpenLOCK clips** at low (0.3 mm/300 microns) settings for quick and accurate prints. I also scale them down to 98% so that they are not quite as tight fitting. If you can't find the OpenLOCK clips, they are found here. You may also try these variants if you find them too tight.
- I use a tiny bit of 3DLAC on my pad before printing, which helps with bed adhesion. Bed adhesion is the number one issue with printing in my country because the ambient temperatures can be quite low and the humidity varies. This ensures the first layer sticks well and the rest of the print does not curl or come loose. Using this has resulted in reducing the number of print failures drastically.
- Almost all parts are pre-oriented in the optimal printing rotation, requiring minimal supports. You will need supports where there are overhangs.
- Tune your printer. Yes, this is a pain in the arse, but you will be guaranteed to get a better result. Consult your printer model for details on how to properly tune your printer.

Slicer Software

I use **Prusaslicer** for my prints. It is completely free here, as mentioned above. I have previously used Simplify 3D.

Important Slicer Settings

The following features should help get a better print out of your slicer.

- Ensure bridge detection is turned on. Especially with newer parts that don't necessarily have built-in supports.
- In advanced settings, set the external perimeters to 0.42 mm (if possible in your slicer). This will keep detail levels high.
- Infill should be between 8-15%
- I use 5 bottom layers, 2 outside layers and 7 top layers. This ensures a beautiful, if slightly heavier part.

Printer Profiles

Our community manager Zoromer on our Discord (see end of document) has kindly provided free profiles for 2nd Dynasty parts for both Cura and Prusaslicer.

Cura

Prusaslicer

We highly recommend them, and they will have most of the above settings already applied.

Supports

I have used a combination of the built in OpenLOCK 7.x supports and custom supports as needed. The built-in supports are found at the base of the tiles. If you find that the OpenLOCK clips will not go in because there is an obstruction, that is because you need to remove these supports.

Most objects without doorways can be printed without additional supports. Look out for overhangs where there is no support from the print bed (in Prusaslicer, by default these areas are marked with a blue colour once you run slice now).

Usually, the main issue of supports is again, bed adhesion. If you live in a temperate to cold climate like I do, I highly recommend not only a heated bed, but also using 3DLAC or another adhesive to guarantee bed adhesion.

For doorways and control panels, I strongly recommend using custom supports in the gaps. For non-tile objects like miniatures, custom supports are necessary.

Preparing Models

OpenLOCK has built-in supports that need to be removed in order for the locks to fit. A pen knife can be used to sever the supports, or you could use a pair of tweezers to pry them apart. If you are having trouble fitting the OpenLOCK clips, use a penknife to make sure you have cleared away all the rough edges.

You can file down rough surfaces with model files if you want a smoother finish.

Painting

I have used Citadel paints available from Games Workshop, but most paints designed for plastic models or miniatures will work just fine.

I have not done very much in the way of fancy painting for the most part; each piece consists of a base coating, shade brushing, and dry brushing. That's all.

Base Coating

Start with a base coat. You can accomplish this either using spray paint or by hand brushing. You want a wider but thinner brush that is going to quickly cover your model but distribute the paint evenly.

Basically, you want one solid base colour, although if for example, you want control panel screens to be a different colour, you can paint them in this phase as well.

I have used Mechanicus Standard Grey base paint in a spray can to coat the surfaces of each piece.

Once the base coat is dry, see if the first coat will suffice, or if it needs a second coat.

Shading

Shading is the process of using water-diluted paint to get deep lines. You want a roundish brush with a pointed tip that can hold a decent amount of water. You can mix your own shade paints, but I recommend picking one up that does not require mixing.

The shade paint should be darker than your base coat, perhaps even a diluted black.

If you are mixing manually, basically, you want to take a bit of paint on the brush, and then dip it in water so that you get more of a dilution. Test it on paper a few times – you want something close to a watercolour mix.

Work the brush over the model, depositing the diluted paint into the crevices of your model. You don't want to use too much at once, and it is okay to build in layers. If you have the mix right, the paint should settle in all the nooks and crannies of the models, giving you some definition.

Dry Brushing

The last phase, once the shade layer has dried (and allow a good amount of time, since dry brushing and shading do not mix well together) you can paint the drybrush layer. The principle behind dry brushing is to use very fine specs of paint of a lighter colour which catches on surface edges, acting as a sort of specular layer, creating highlights.

You want a large, thick brush for drybrushing – something that can take a good bit of punishment. Dip the tip of the brush in the paint, and then brush it out on paper repeatedly until almost no paint remains – it should be barely visible specs by this stage.

Then, choose an angle (usually left to right) and brush lightly against a corner of the print. Test to see how much paint is sticking. If you see nothing, you probably are either not brushing hard enough, or there is not enough paint on the brush.

If you see something resembling normal painting, you have too much paint still in the brush, and may have to wait until it dies and patch up with the base colour.

So here, less is more.

Once you see that you are achieving a good amount, repeatedly stroke in the direction you have decided upon (i.e. left to right) so that the brush only makes contact in one direction. You need to get a bit rough with the brush, so be careful with fine details that might easily snap off.

Follow these three techniques, and you should be able to get a similar quality as to what was shown in my Kickstarter film.

Get Involved in the Community

If you need printing help, check out the channels in our discord, or otherwise get involved our other social media: