

# CNSI Innovation Workshop

## Form 2 3D Printer Users Outline

Revised January 2020

This guide may be found online through the Innovation Workshop GauchoSpace page.

### Location

The Form 2 printers are located in 2448 Elings Hall in Fume Hood #2.

### Safety Issues

- Nitrile or neoprene gloves (not latex), safety glasses, and a lab coat must be worn when working with liquid resin printers. Safety glasses and a lab coat are required for working around IPA (isopropyl alcohol) when the Form Wash is open.
- Avoid eye contact with laser. Do not remove the front or back panels of the printer.
- Care must be taken to prevent contaminating other areas with liquid resin - use containers to transport build platforms or parts that still have liquid resin on them.
- Dispose of resin contaminated gloves and other objects in the yellow hazardous waste bin in 2442.

### Training

Attend the in-person training and consult the Form 2 manual. Both documents are found on the Innovation Workshop GauchoSpace page.

### Overview

The system consists of the following main components.

#### Form 2 3D Printer:

The Form 2 is a 3D printer that uses SLA (stereolithography) to make a part. In SLA, a laser beam is directed into a tank of photoreactive resin, which hardens to form a layer of the part. The first layer adheres to the build platform, and each following layer adheres to the previous one. The finished part will be suspended upside-down above the resin tank. It has a build volume of 145 × 145 × 175 mm (5.7 × 5.7 × 6.9 in).

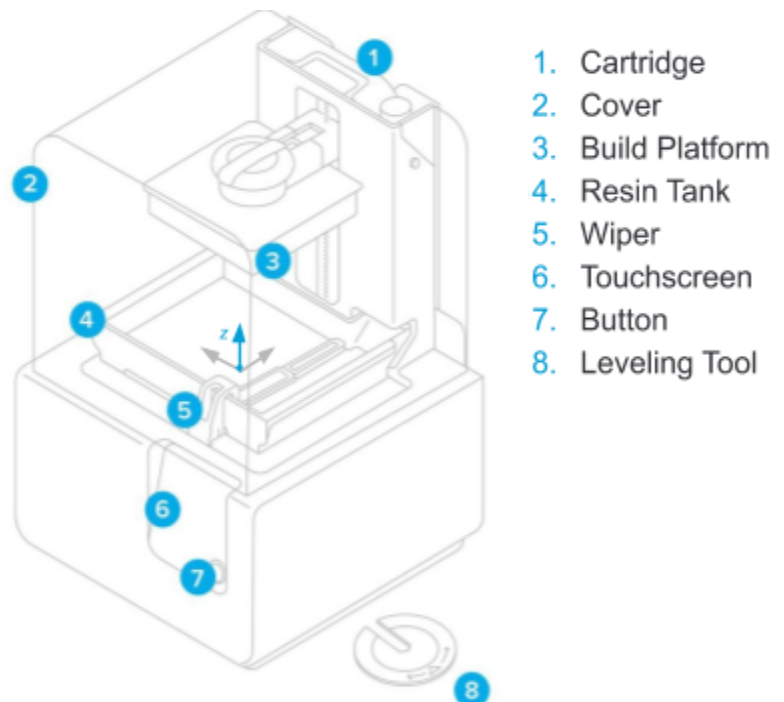


Figure 1: Form 2 visual glossary

### **Form Wash:**

The Form Wash is an automated washer that bathes the printed part in IPA (isopropyl alcohol) to wash off residual resin.

### **Form Cure:**

The Form Cure is a chamber that exposes a printed part to UV light to finish the curing process. This is referred to as 'post-curing.'

## **User Guide**

### **Sequence of operation:**



#### **Software:**

1. On the desktop computer near the Form 2 printers, open the PreForm software from the start menu .
2. To start a new print, click File > New.
3. File > Open, select the .STL or .OBJ file you want to print.
4. Set the scale, orientation, supports, and layout.
  - a. Important notes:
    - i. Formlabs recommends orienting flat surfaces at an incline of at least 20°.
    - ii. Avoid printing tall, thin features when using flexible resin as it tends to flex during printing, resulting in print failure.
    - iii. While PreForm may indicate that a part is printable, it is not an indication the print will be successful. Care must be taken to ensure the part is supported properly and that the material choice is suitable.
  - b. Refer to the "[Model Orientation](#)" webpage through the Formlabs website for information on orienting flat surfaces, reducing print time, avoiding overhangs and suction cups.
  - c. Refer to the "[Supporting a Model](#)" webpage through the Formlabs website for information on manual supports, touchpoints, internal supports, and using a raft.
5. If there is an X next to printability, add manual supports, change support density and touchpoint size as needed until it becomes a ✓ .
6. Save the print job in your group folder.
7. Record the resin volume and print time in the **3D Printer Logbook**, which can be accessed by a desktop shortcut: *Print Log*.
8. To start the upload, press the orange 'Print' button.

9. Make sure the selected material and version match the resin type loaded in the desired printer. Choose a layer thickness—thicker layers correspond to a faster print but reduce vertical resolution.

**On the printer:**

10. Press the button on the Form 2 to confirm the print
11. After the print is completed, slide out the build platform with the part attached and place it into a plastic bin with absorbent pad to catch any resin spill.
12. Close the orange cover

**Using the Form Wash:**

13. Transport the part and build platform in the container to Fume Hood #4 in Elings 2442.
14. Wear a lab coat and safety goggles, as the Form Wash contains IPA.
15. Press 'Open'
16. Slide the build platform into place
17. Adjust the wash time to 10 minutes. For times for resins other than flexible and clear, consult the webpage "[Form Wash Time Settings](#)" through the Formlabs website.
18. Press 'Start'
19. After the washing is over, press 'Open' and remove the build platform. Place it in the container.
20. Press 'Sleep' to close the Form Wash.
21. Allow 30 minutes to pass for the remaining IPA on the part to evaporate.

**Using the Form Cure:**

22. Release the part from the build platform:
  - a. Place build platform on the removal jig. Tools are in the Fume Hood #4 in Elings 2442.
  - b. Slide a removal tool under the angled edge of the part's base to separate it from the build platform.
23. Lift the cover of the Form Cure. Place the part in the center of the turntable.
24. Select the curing time and temperature. Curing settings are dependent on which resin is used.

Flexible V2	15 min	60° C
Clear V4	15 min	60° C

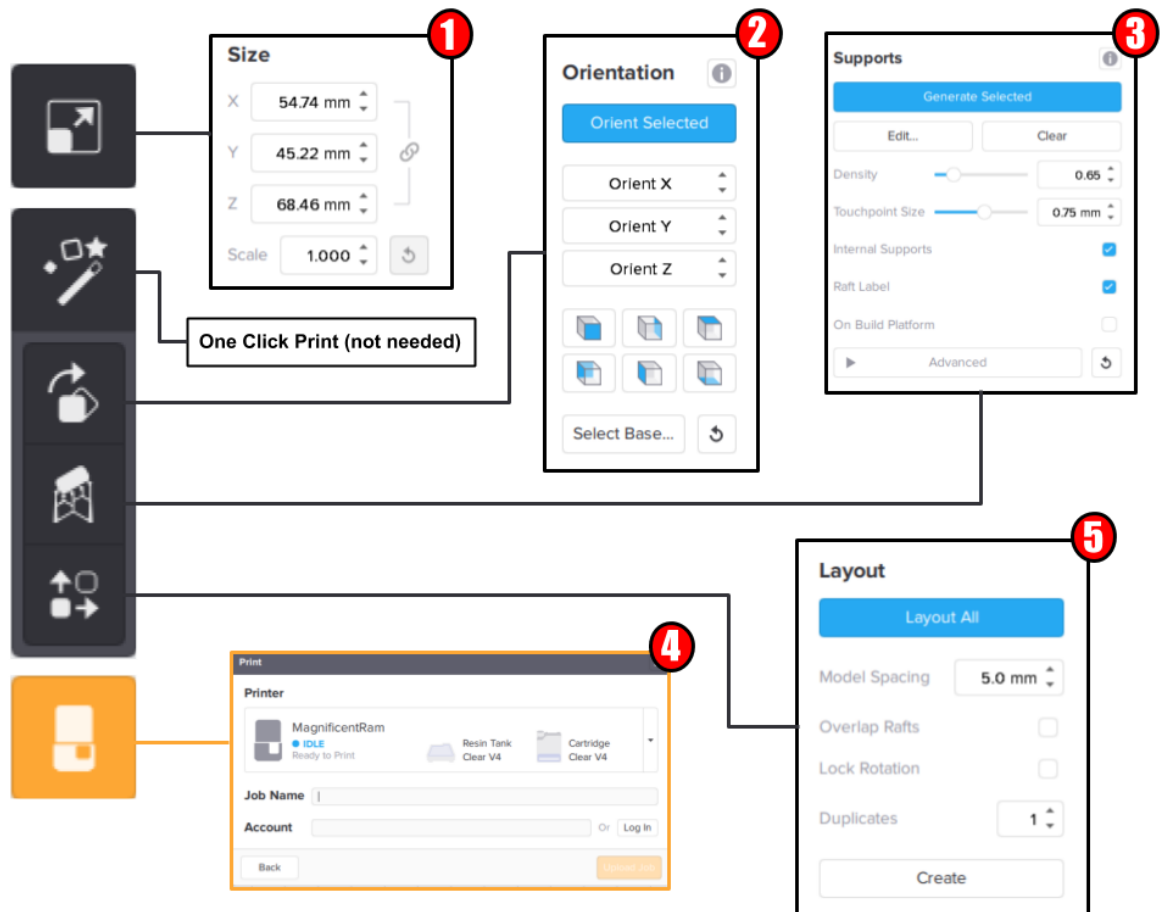
Refer to the webpage "[Form Cure Time and Temperature Settings](#)" through the Formlabs website for resin specific information. A longer cure time (up to an hour) will slightly increase the tensile strength of the part.

25. Press 'Start'
26. Lift the cover and remove the part once the post-curing has completed.

## Post Processing:

27. Use snips or tweezers to break support material off of the part. Be careful when finishing delicate parts to avoid breaking off small features.
28. Use abrasives such as sandpaper and files to remove marks left by touchpoints until the surface is satisfactory.

## PreForm software visual glossary:



## Replacing an empty resin cartridge with a full one of the same type:

More information on the resin system and changing a cartridge can be found on the webpage ["Formlabs Resin Tank Information"](#) through the Formlabs website.

1. Remove the empty resin cartridge:
  - a. Close the vent cap at the top right of the resin cartridge to prevent resin from spilling out once removed.
  - b. Hold the cartridge handle and lift to remove from the Form 2. Store the cartridge upright with the valve cover installed to protect storage surfaces from resin.
2. Insert a new resin cartridge:

- a. Shake and rotate the new resin cartridge to ensure that the resin is mixed thoroughly.
- b. Remove the protective valve cover from the underside of the cartridge. Use the cover to protect the bite valve during storage.
- c. Align the cartridge with the opening at the back of the printer. Push down on the cartridge handle until the top of the cartridge is level with the printer.
- d. Press open the vent cap to ensure the resin tank can fill correctly.

### **Switching a printer from one type of resin to another.**

More information on the resin system and changing a cartridge can be found on the webpage [“Formlabs Resin Tank Information”](#) through the Formlabs website. This includes videos and animations.

1. Remove the build platform - this prevents resin from dripping onto the glass
2. Remove resin cartridge:
  - a. Close the vent cap at the top right of the resin cartridge to prevent resin from spilling out once removed.
  - b. Hold the cartridge handle and lift to remove from the Form 2. Store the cartridge upright with the valve cover installed to protect storage surfaces from resin.
3. Remove the resin tank
  - a. 1. Hold the front tabs of the resin tank.
  - b. 2. Gently pull the front tabs of the resin tank to release the tank feet from the tank carrier. The Resin Tank LT wiper ejects during removal.
4. Cover the resin tank and store on the left side of the fume hood



5. Insert the resin tank for the resin that you plan to use
  - a. Lift the Form 2 orange cover. Use the tank grips to hold the Resin Tank LT, with the wiper resting inside the tank. If the tank contains resin, cover the tank with the plastic lid to align the wiper and minimize the risk of spills during insertion.
  - b. Align and insert the four small feet of the resin tank into the corresponding slots in the tank carrier on the printer.

- c. Hold the front tabs and carefully push the tank until the tank feet lock into the slots on the tank carrier. Check the touchscreen display to confirm that the Form 2 detects the tank. The Form 2 will only detect the tank when the tank is fully inserted.
6. Lock the wiper blade
  - a. Align and insert the wiper foot into the wiper mount.
  - b. Push the wiper toward the tank.
  - c. Ensure the wiper foot is securely locked into the wiper mount.
7. Insert resin cartridge:
  - a. Shake and rotate the new resin cartridge to ensure that the resin is mixed thoroughly.
  - b. Remove the protective valve cover from the underside of the cartridge. Use the cover to protect the bite valve during storage.
  - c. Align the cartridge with the opening at the back of the printer. Push down on the cartridge handle until the top of the cartridge is level with the printer.
  - d. Press open the vent cap to ensure the resin tank can fill correctly.
8. Replace build platform
9. Make sure that all of the resin tanks are correctly labeled.