



# Printess Technologies

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# PrintessFlow User Guide

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# 1. Overview

PrintessFlow is a purpose-built slicing application derived from UltiMaker Cura's open-source platform, tailored specifically for the Printessa Series syringe-based gel printer. It translates 3D models into printer-ready G-code that drives the Printessa Series' dual-syringe dispensing system, handling both single-material and dual-material print workflows.

This guide walks through every aspect of PrintessFlow: configuring your machine, selecting syringes and dispense tips, tuning print settings, running post-processing scripts, and executing a complete print from first slice to Pronterface upload.

**Note:** PrintessFlow is pre-configured for the Printessa Series. Most machine-level parameters are pre-set. Avoid changing settings you do not recognize without first consulting Printess Technologies support.

# 2. Machine Settings

Machine Settings control the physical dimensions of your build plate, printhead offsets, and extruder geometry. These values are pre-configured for the Printessa Series. You will typically only need to visit this dialog to adjust the build plate origin or the X/Y offset between the two extruders.

## Accessing Machine Settings

1. Open PrintessFlow. In the top-left corner, click the printer's name to open the printer drop-down.
2. Select "Manage Printers..." from the drop-down menu.

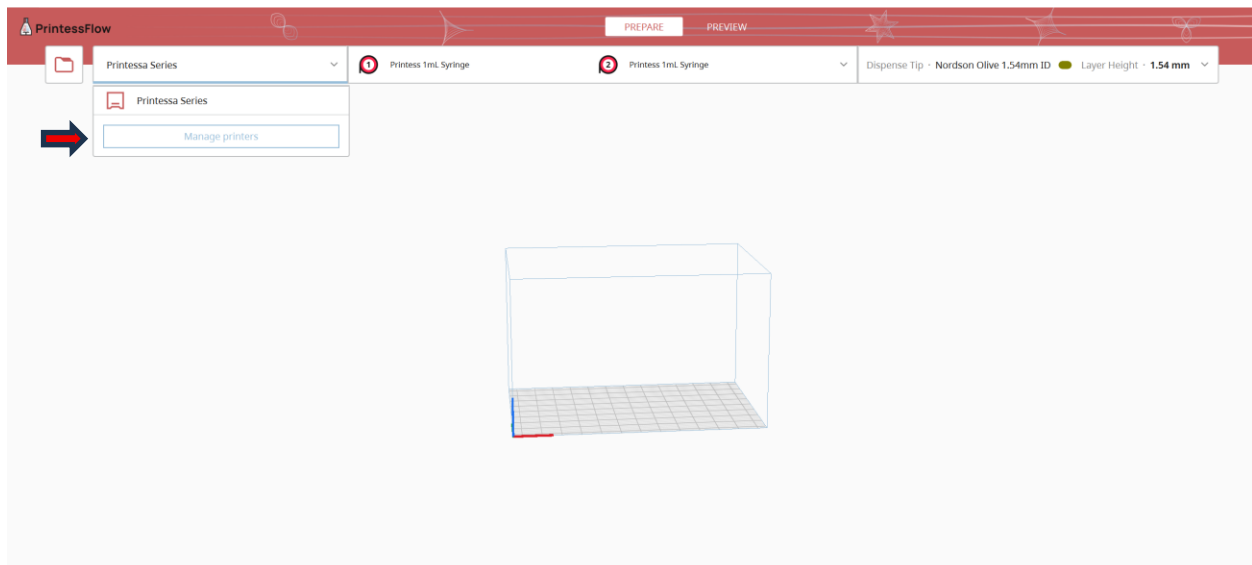


Figure 1: Printer drop-down, select "Manage Printers"

3. In the Printers dialog, click "Machine Settings."

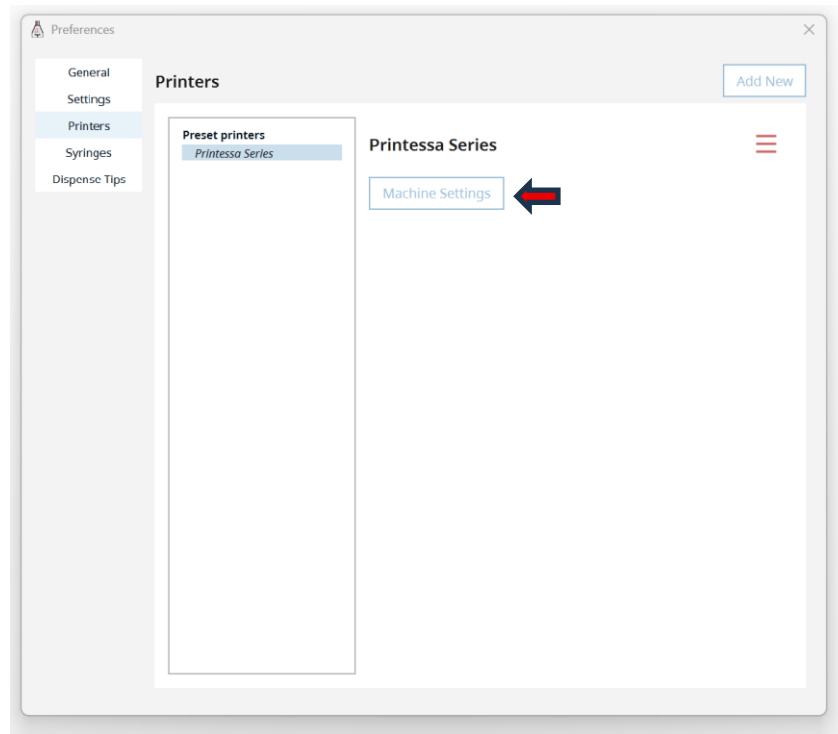


Figure 2: "Machine Settings" button in the Printers dialog

## Build Plate Dimensions

The "Printer" tab lets you set the build plate width, depth, and height, along with the Printhead settings. The Printessa Series is pre-configured with a build volume of 129 mm wide (X) by 87 mm deep (Y) by 80 mm tall (Z), and the origin (0, 0) sits at the front-left corner of the build plate. Keep your models within this volume so the full print is captured in the output G-code. The Printhead settings have no direct effect on G-code generation; aside from the build plate dimensions and the extruder offsets, the fields on this tab are pre-set for the Printessa Series and generally do not need to be changed.

## Extruder Settings

PrintessFlow sets its origin at the midpoint between the two extruders. As you position objects on the build plate, it works out the required G-code offsets for you so each part prints correctly.

Both the Nozzle Size and Compatible Material Diameter fields are read-only; they are automatically populated from your active syringe and dispense tip selection. The label "(auto)" indicates this value is managed automatically.

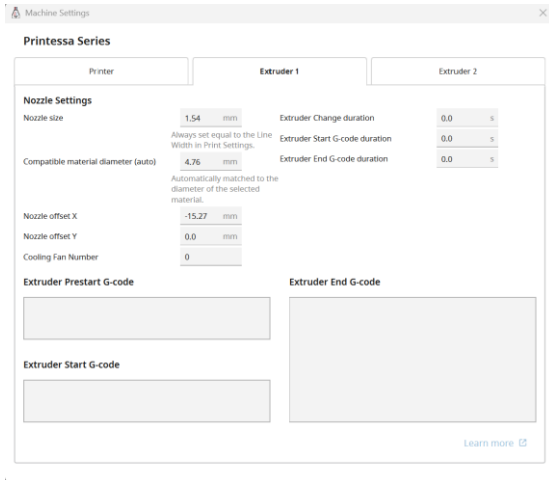


Figure 3: Extruder 1, Nozzle Size and Compatible Diameter are read-only (auto-set)

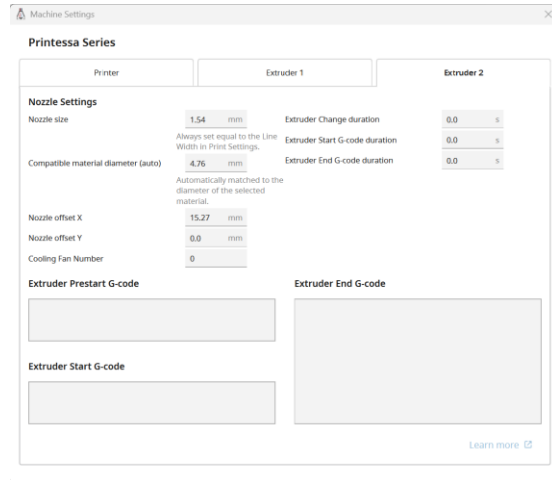


Figure 4: Extruder 2, offset values define its position relative to middle

### 3. Syringe Selector

The Syringe Selector determines which syringe, and by extension which material, is loaded in each extruder. PrintessFlow ships with pre-configured profiles for 1 mL, 3 mL, and 5 mL syringes. Custom syringe sizes can be created and saved.

#### Selecting a Syringe

Click the syringe icon or the material name beneath each extruder tab to open the material selector. Available syringes are listed under the Printess category.

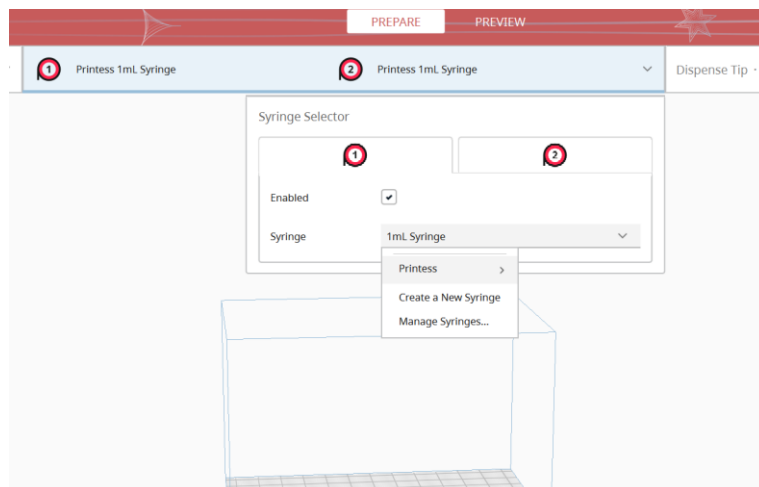


Figure 5: Syringe material selector, Printess syringe profiles by volume

A different syringe can be configured for each extruder, enabling dual-material prints with different syringe sizes.

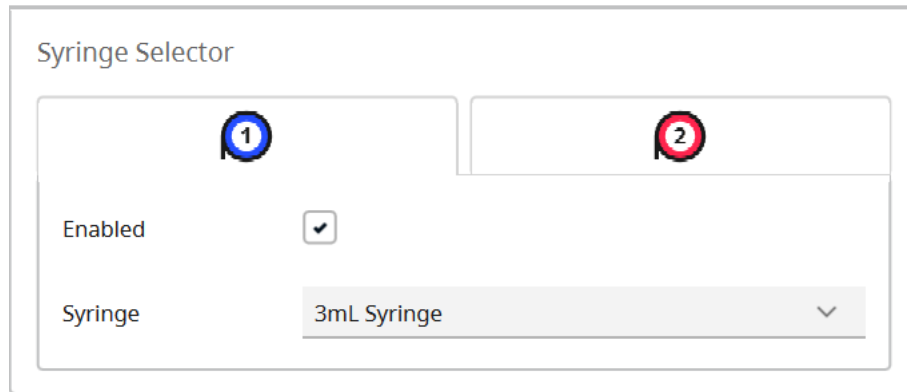


Figure 6: Dual-extruder configuration, each extruder assigned independently

## Creating a Custom Syringe

To add a custom syringe, first click the toggle arrow next to "Custom" in the Syringe Selector to expand the category. Once expanded, click "Create a New Syringe." You will be prompted for two values:

- **Syringe Size** The total volume of the syringe barrel (e.g., 10 mL).
- **Inner Diameter (ID)** The inner barrel diameter in millimeters. This directly controls the compatible material diameter setting and is used for flow calculations.

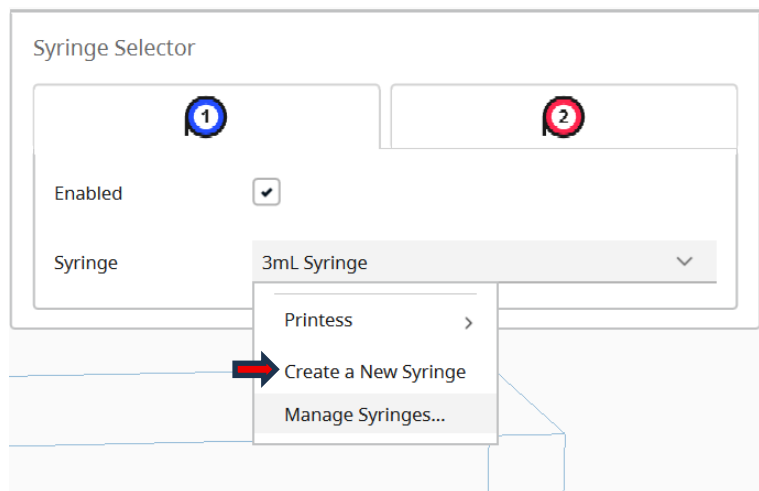


Figure 7: "Create a New Syringe", enter volume and inner diameter

### Configure New Syringe

Enter the details for your new syringe. Both fields are optional — you can edit them later in the Syringes panel.

#### Syringe Size

Names the syringe "#mL Syringe" where # is the number you enter.

mL

#### Inner Barrel Diameter

Sets the material's diameter field, which controls extrusion volume calculations.

mm



Figure 8: Syringe size entry field

**Note:** The inner diameter you enter automatically propagates to the Compatible Material Diameter field in Machine Settings, keeping the two values in sync.

## 4. Dispense Tip Selector

PrintessFlow includes eleven pre-configured Nordson dispense tip profiles, covering inner diameters from 0.10 mm to 1.54 mm. Each profile is color-coded with an oval indicator that appears in the tip drop-down, the print settings header, and the Manage Dispense Tips dialog.

| Color Name | Inner Diameter | Indicator Color       |
|------------|----------------|-----------------------|
| Olive      | 1.54 mm        | #808000               |
| Amber      | 1.36 mm        | #FFBF00               |
| Green      | 0.84 mm        | #00A550               |
| Pink       | 0.61 mm        | #FF69B4               |
| Purple     | 0.51 mm        | #800080               |
| Blue       | 0.41 mm        | #0057A8               |
| Orange     | 0.33 mm        | #FF8C00               |
| Red        | 0.25 mm        | #CC0000               |
| Clear      | 0.20 mm        | #FFFFFF / gray border |
| Lavender   | 0.15 mm        | #B57EDC               |
| Yellow     | 0.10 mm        | #FFD700               |

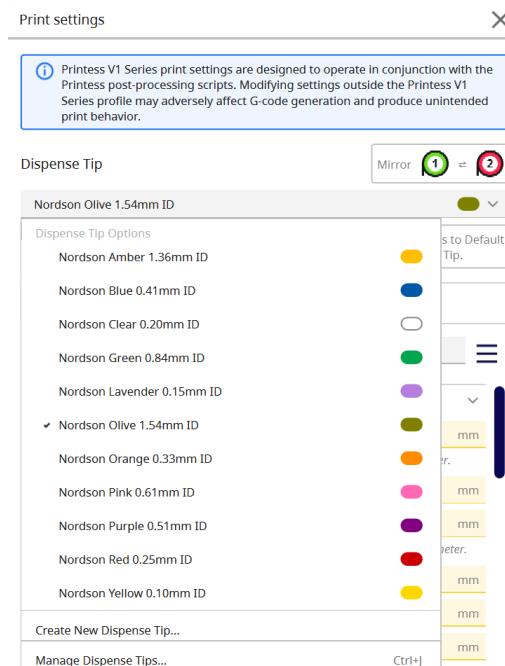


Figure 9: Dispense Tip selector, Nordson profiles with color-coded indicators

### Creating a Custom Dispense Tip

To create a tip not in the standard list, click "Create a New Dispense Tip." Enter a name and the inner diameter in millimeters.

- Line Width is set to the entered nozzle diameter.
- Layer Height is set to equal the value of Line Width. You can change this if desired.

Create New Dispense Tip

×

Name

e.g. My 0.5mm Custom Tip

Nozzle Diameter (mm)

e.g. 0.5 (leave blank to copy from current tip)

Color

 (enter a name above)

Create Dispense Tip

Figure 10: "Create New Dispense Tip", enter name and nozzle inner diameter

**Note:** Custom tip profiles are saved permanently. Use Preferences → Dispense Tips to rename, duplicate, or delete saved profiles.

## 5. Well Plate Arranger

The Well Plate Arranger tool automatically positions all objects on the build plate into a standard well plate grid. It is useful when printing into multi-well plates where identical objects must be deposited at precise, evenly-spaced intervals. **Well plate printing only works with the OneAtATime post-processing script.**

### Finding the Button

The Well Plate Arranger button is in the action bar at the bottom of the screen, directly to the left of the Printess G-Code Formation Scripts button. A part must be on the build plate in order to see the action bar.

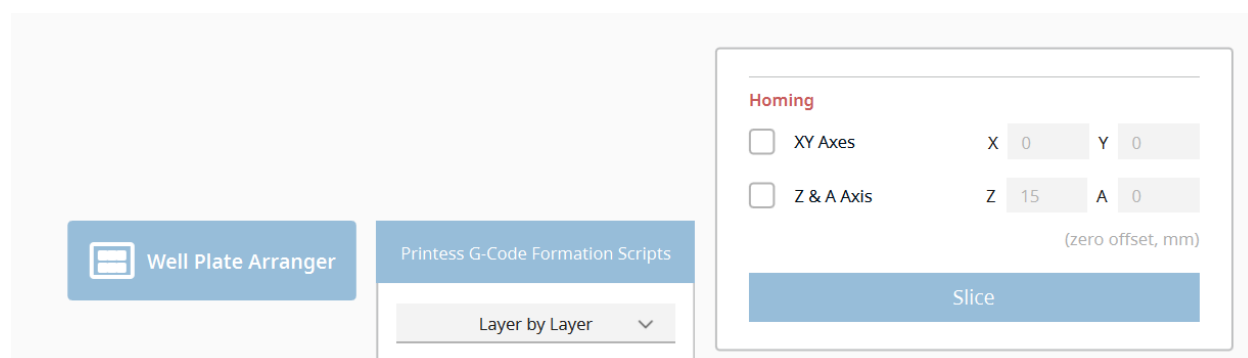


Figure 11: Well Plate Arranger button (solid blue, left), Printess G-Code Formation Scripts button (center), and Slice button and Homing (right) in the PrintessFlow action bar

Clicking the button opens a configuration panel directly above it.

### Selecting a Preset

The panel includes four ANSI/SLAS standard well plate presets:

- **6-Well** 2 rows × 3 columns, 39.12 mm center-to-center spacing
- **12-Well** 3 rows × 4 columns, 26.01 mm spacing
- **24-Well** 4 rows × 6 columns, 19.30 mm spacing
- **48-Well** 6 rows × 8 columns, 13.08 mm spacing

Clicking a pre-set immediately applies its rows, columns, and spacing values. The active pre-set is highlighted in solid blue. When you edit a standard well-plate, you will automatically be moved to "custom."

Each preset is calibrated to the physical dimensions of the matching plate. When you Arrange, PrintessFlow places the grid at the plate's true location on the build plate and automatically centers it between the two extruder nozzles, so the deposited grid lines up with the wells of a plate seated in the standard position.

### Custom Configuration

To use a non-standard plate, enter Rows, Columns, X Spacing (mm), and Y Spacing (mm) manually in the Grid Configuration fields. These values are saved across sessions.

Custom grids have no calibrated plate location, so their objects are arranged outward from the center of the build plate rather than at a fixed physical position. Rows and Columns are whole numbers, and X Spacing and Y Spacing are the center-to-center distance between wells in millimeters.

If the number of objects on the build plate exceeds the total number of wells in the current grid, a warning is displayed at the bottom of the panel. Extra objects will be placed outside the defined grid. If you would like to place multiple objects in the same well, use the "group" feature beforehand, which is explained more in Section 7.

## Arranging Objects

Click Arrange to move all objects into the grid. Objects are positioned from the origin outward, filling columns left to right and rows top to bottom. The operation can be undone with Ctrl+Z.

**Note:** Set Print Level Clearance (Section 6) to a value high enough that the nozzle clears the well plate walls during XY travel moves between wells.

## 6. Crucial Print Settings

All applicable print settings for the Printessa Series are found under "Printessa Series" in the Print Settings panel. Changes are saved directly to the active dispense tip profile and persist the next time that profile is selected.

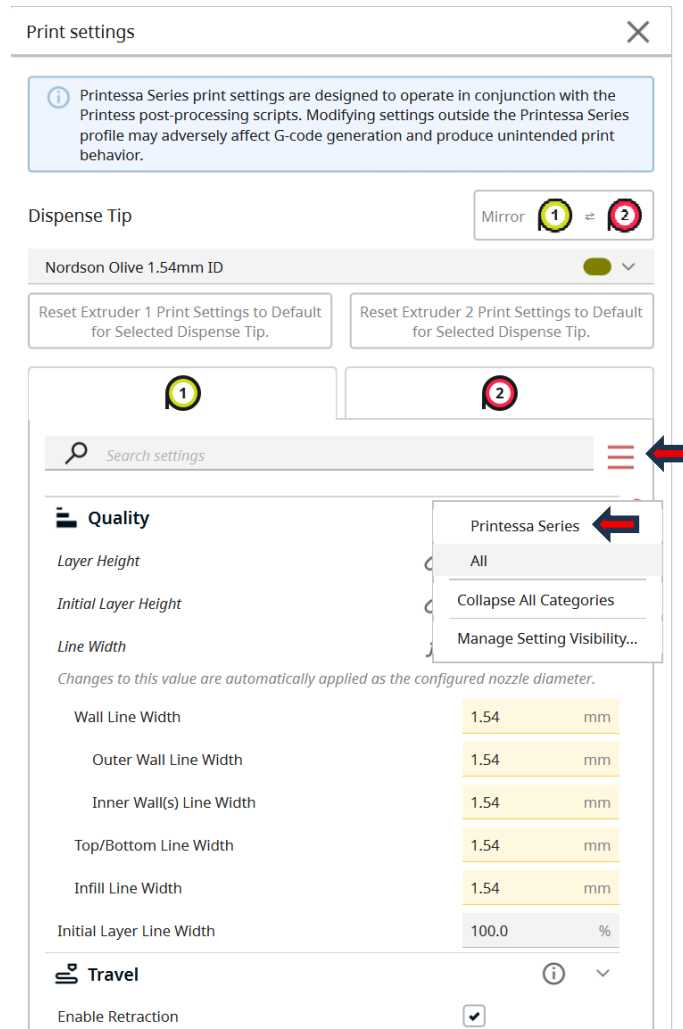


Figure 12: Print Settings panel, settings organized by category

### Flow

Flow controls the volume of material extruded per mm of XY movement, expressed as a percentage of the theoretical value. It is the most critical setting for print quality: too high causes overextrusion (excess material, blobbing, smeared features); too low causes underextrusion (gaps, weak layers, incomplete paths). Because syringe-based dispensing is sensitive to material viscosity, temperature, and tip gauge, the correct Flow value must be determined empirically for each material. Always run calibration lines before printing your actual specimen.

## Line Width and Layer Height

Line Width equals the nozzle inner diameter of the active dispense tip. Layer Height is pre-calculated as equal to Line Width. Both values update automatically when you switch tips; no manual adjustment is needed.

## Retraction

- **Enable Retraction** Controls whether the syringe plunger retracts at the end of a print segment to stop material flow and minimize stringing or oozing.
- **Retraction Distance** How far the plunger retracts (mm). Larger values stop flow more aggressively but may introduce priming inconsistencies.
- **Retraction Speed / Prime Speed** Speed of plunger retraction and re-priming. Higher speeds are snappier but can cause air entrainment in viscous materials.

## Travel Settings

These settings control whether the active extruder retracts before a pure XY travel move (a move with no extrusion). They are independent for each extruder. Click the chain icon to unlink E1 and E2 so they can be set separately.

- **Retract Before Travel** When enabled, the extruder retracts before each XY travel move to reduce stringing. Only visible when "Enable Retraction" is on for that extruder. Default: disabled.
- **Minimum Distance for Activation** A distance threshold (straight-line  $\sqrt{\Delta X^2 + \Delta Y^2}$ ) below which travel retraction is skipped. Short hops unlikely to cause stringing are ignored, reducing unnecessary plunger cycling. Unit: mm, default 3.0 mm, minimum 0 (retract before every travel move). Visible only when "Retract Before Travel" is enabled.

**Note:** Retract Before Travel and Minimum Distance for Activation are per-extruder settings. Each extruder reads its own values independently at slice time, in both the OneAtATime and LayerByLayer post-processing scripts.

## Print Level Clearance

Additional vertical clearance above the highest printed layer when an idle extruder is parked. Increase this if you observe the parked tip dragging through deposited material during dual-material prints.

## Infill

- **Infill Line Directions** Direction of printed lines in vector form (e.g., [0, 45]). Adjusting this can improve adhesion on anisotropic geometries.
- **Infill Pattern** "Lines" is recommended for most gel printing applications. Other patterns (Grid, Gyroid, etc.) are available for specialized geometries.

## Speeds

All speed settings are in mm/s. In the generated G-code, feed-rate  $F = \text{speed} \times 60$ .

- **Print Speed** Speed during active extrusion (G1 with extrusion axis).

- **Travel Speed** Speed during XY moves with no extrusion.
- **Z Hop Speed** Speed of Z/A axis motion during height changes.
- **Retraction / Prime Speed** Speed for plunger retraction and priming.

## Mirroring Extruder Settings

"Mirror Extruder Settings" copies all current Extruder 1 settings to Extruder 2, and vice versa. Use this as a starting point when both extruders are loaded with the same material and tip, then fine-tune each independently.

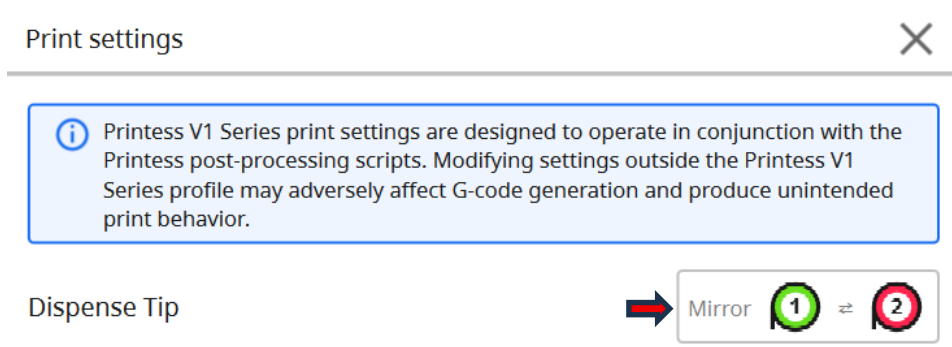


Figure 13: "Mirror Extruder Settings", copies E1 settings to E2

## Resetting to Defaults

"Reset to Default Values" reverts all settings on both extruders to the defaults defined in the active dispense tip profile for the Nordson dispense tips. Use this to undo accidental changes or return to a known-good baseline.

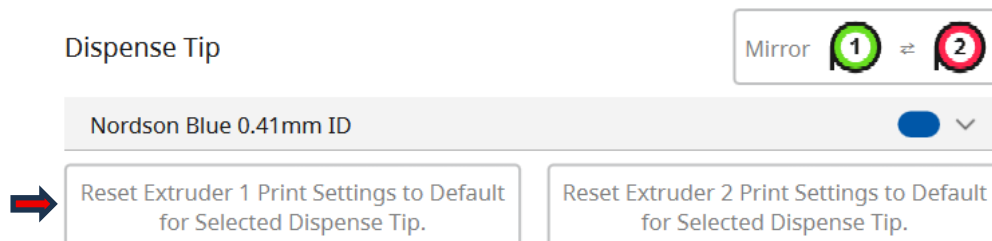


Figure 14: "Reset to Default Values" in the print settings bar

## 7. Post-Processing Scripts

PrintessFlow includes two custom post-processing scripts that translate standard Cura G-code into the axis naming convention used by the Printessa Series. The scripts also handle material-specific logic such as travel retraction and parking moves when switching between extruders.

Scripts are managed via Extensions → Post Processing → Modify G-Code. The correct script is pre-activated for new installations.

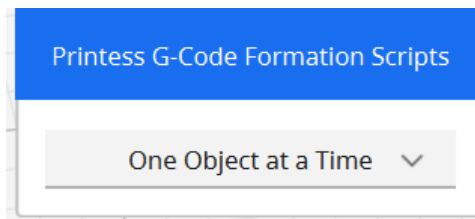


Figure 15: Extensions → Post Processing → Modify G-Code

### Axis Renaming

Both scripts remap the default Cura axes to the Printessa Series naming convention:

| Extruder        | Cura Axis     | Printessa Series Axis |
|-----------------|---------------|-----------------------|
| T0 (Extruder 1) | E (extrusion) | B                     |
| T0 (Extruder 1) | Z (height)    | Z (unchanged)         |
| T1 (Extruder 2) | Z (height)    | A                     |
| T1 (Extruder 2) | E (extrusion) | C                     |

### OneAtATime

Prints each object on the build plate to completion before moving to the next. Minimizes tool changes and can improve surface quality on single-material prints. Ensure that each part is properly spaced out (recommended > 5 mm apart).

### Grouping Objects in OneAtATime

When two or more objects are interlocked or must be deposited together as a single unit, they can be grouped in PrintessFlow. The OneAtATime script treats a group as one part: every layer of the group is printed in full before the printer moves to the next object or group on the build plate.

### How to Group Objects

Select the objects on the build plate and group them:

- **Step 1** Hold Shift and click each object to multi-select.
- **Step 2** Right-click the selection and choose "Group Models," or use the top menu Model → Group Models.
- **Result** The objects now appear as a single entry in the Object List panel on the left.

**Note:** Assign each object to its extruder before grouping. Per-object extruder assignments are preserved inside a group. Verify them in the per-object settings panel before slicing.

## Expected Printing Behavior

Once grouped, the OneAtATime script prints the group as a single, continuous part:

- **Full group before next part** All layers of the group are printed before the script moves to the next object or group. The printhead does not travel away from the group mid-print unless it is changing tools.
- **Dual-extruder layers** Within each layer, Extruder 1 content is deposited first, then Extruder 2. The idle extruder is parked above the print at the Global Max Layer Height + Print Level Clearance height while the other is active.
- **Multiple groups** If multiple identical groups are on the build plate (e.g., three copies of the same interlocked pair), each copy is treated as its own independent part and printed fully before the next begins. Print order is determined by proximity to the build plate origin, nearest first.

**Note:** If all objects in a group are assigned to the same extruder, the group prints as a single-material part with no tool changes.

## LayerByLayer

Prints one layer across all objects before stepping up to the next layer height. Change moves (parking and priming) are inserted automatically at each layer transition.

**Note:** Only one post-processing script should be active at a time. Select the correct script before slicing.

# 8. Pre-Print Checklist

Before executing a print on Pronterface, complete the following steps in order. The Printessa Series assumes a specific starting state, and skipping any step may result in a failed or misaligned print.

If you enabled Homing in the Slice panel, PrintessFlow establishes the datum for you at the start of the print: each homed axis is driven to its endstop and that position, adjusted by any Zero Offset you entered, is set as zero. Skip the manual step below for any axis you homed, and follow the manual steps only for axes you left unhomed (for example, on a machine without endstops).

## Step 1: Move to the XY Start Position

Jog the build plate to your desired XY starting position using the Pronterface console:

```
G91          ; Relative positioning mode
G1 X## Y## F250 ; Move to XY start position (replace ## with values)
```

**Note:** On first startup, always specify a feed rate (F value). The printer defaults to an extremely high value that can damage the mechanism. F250 (250 mm/min) is safe for manual positioning.

Note that PrintessFlow will assume this position to be (0,0) at extruder 1 (B).

## Step 2: Zero the Extruders

Lower both dispense tips until they just barely contact the build plate surface:

```
G91          ; Relative positioning mode
G1 Z-## A-## F250 ; Lower both tips to surface (replace ## with
distance)
```

**Note:** If using both extruders, both tips must touch the build plate. The post-processing scripts calculate all layer heights relative to  $Z = 0$ ,  $A = 0$ . Incorrect zeroing will produce inaccurate layer heights for one or both extruders.

## Step 3: Set Positions

```
G90          ; Absolute positioning mode
G92 X## Y## Z## A## B0 C0 ; Set X, Y, Z, A positions to desired value
(if manually setting Z and A, we recommend zeroing them). Set B and C
positions to 0.
Ensure B and C are set to 0!
```

Ensure syringes are primed and ready to print beforehand. Your printer is now ready to begin the print.

**One important thing to mention: If the printer is fully unplugged, you can turn the motor screws by hand to move to the start position and zero the printer instead of using G-code commands!**

## 9. Slice & Print Walk-Through

This walk-through demonstrates a complete dual-material print using two cylinders: Cylinder 1 on Extruder 1 (3 mL syringe) and Cylinder 2 on Extruder 2 (5 mL syringe).

### Step 1: Import Models

Open PrintessFlow and import both cylinder models (File → Open File(s)...). Both objects appear on the build plate.



Figure 16: Build plate with both cylinder models imported

### Step 2: Assign Extruders

Click each object to select it, then use the per-object settings panel to assign it to the correct extruder: Cylinder 1 → Extruder 1, Cylinder 2 → Extruder 2.

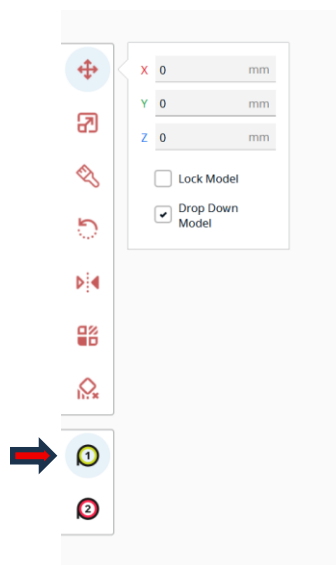


Figure 17: Assigning each cylinder to its extruder via the object settings panel

### Step 3: Verify Settings and Slice

Review key settings (Flow, speeds, retraction, etc.) to make sure they are correct. **Set Print Level Clearance to maximum height on build plate, including any well plate/objects used during print.** Ensure you have the desired post processing script activated. Enable homing for all axes, and apply an offset for the Z and A axes (this means that the real zero will be 2mm above the build plate/where the tip was zeroed) as we are printing on a well plate. Click "Slice" in the lower-right corner.

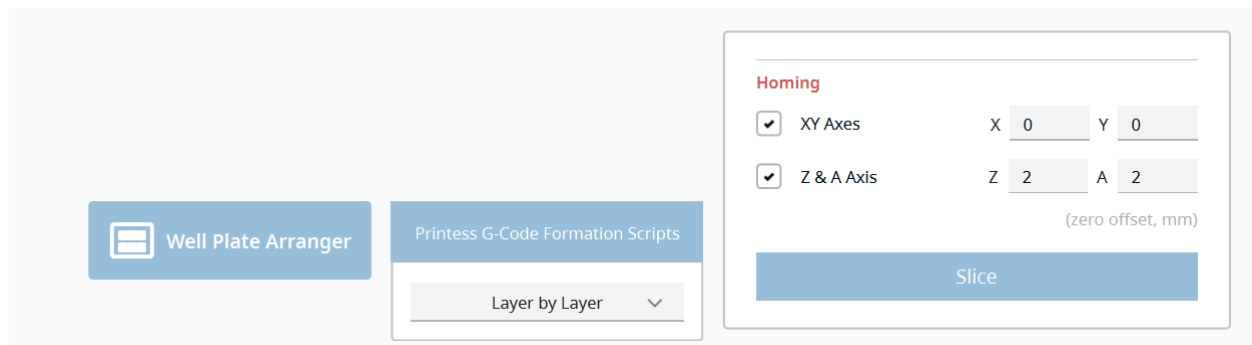


Figure 18: "Slice" button, initiates slicing with current settings

## Step 4: Preview the Toolpath

Switch to the "Preview" tab and use the layer slider to inspect the toolpath layer by layer. Verify extrusion paths are correct.

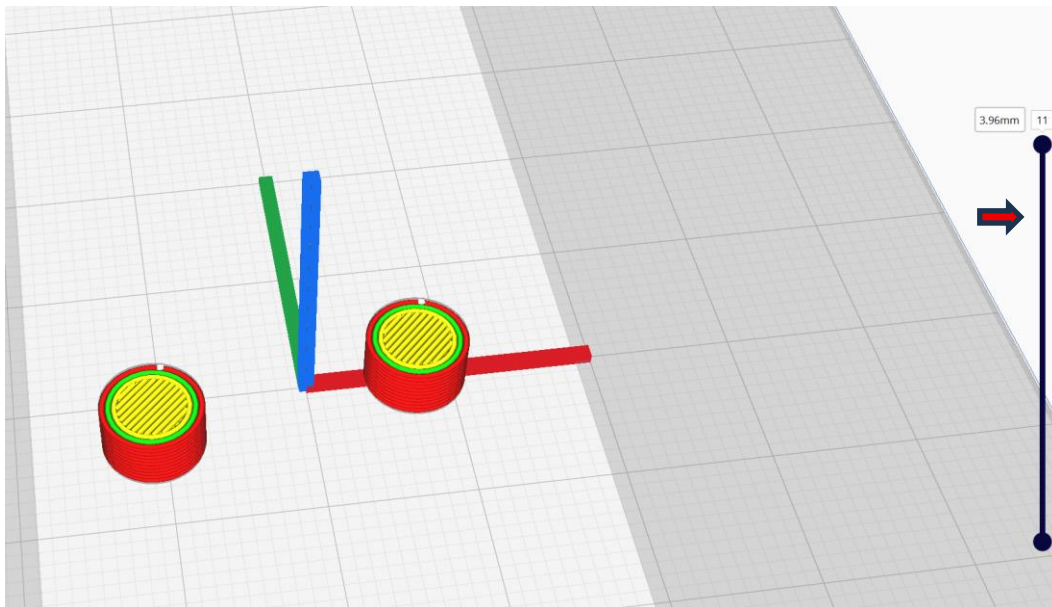


Figure 19: Preview tab, layer-by-layer toolpath with layer slider

## Step 5: Export and Print

Click "Save to Disk" to export the G-code as a .txt file. Open Pronterface, click "Load File," and select the exported file. Complete the Pre-Print Checklist (Section 8) if not already done, then click Print.

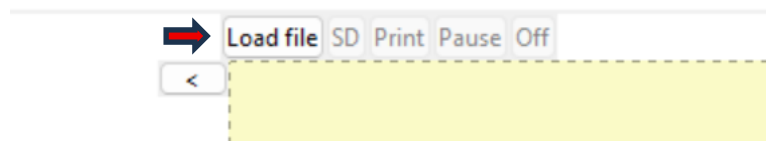


Figure 20: Upload to Pronterface

**Note:** Always complete the Pre-Print Checklist (Section 8) before clicking Print in Pronterface. Incorrectly zeroed extruders are the most common cause of failure.

# Happy Printing!

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