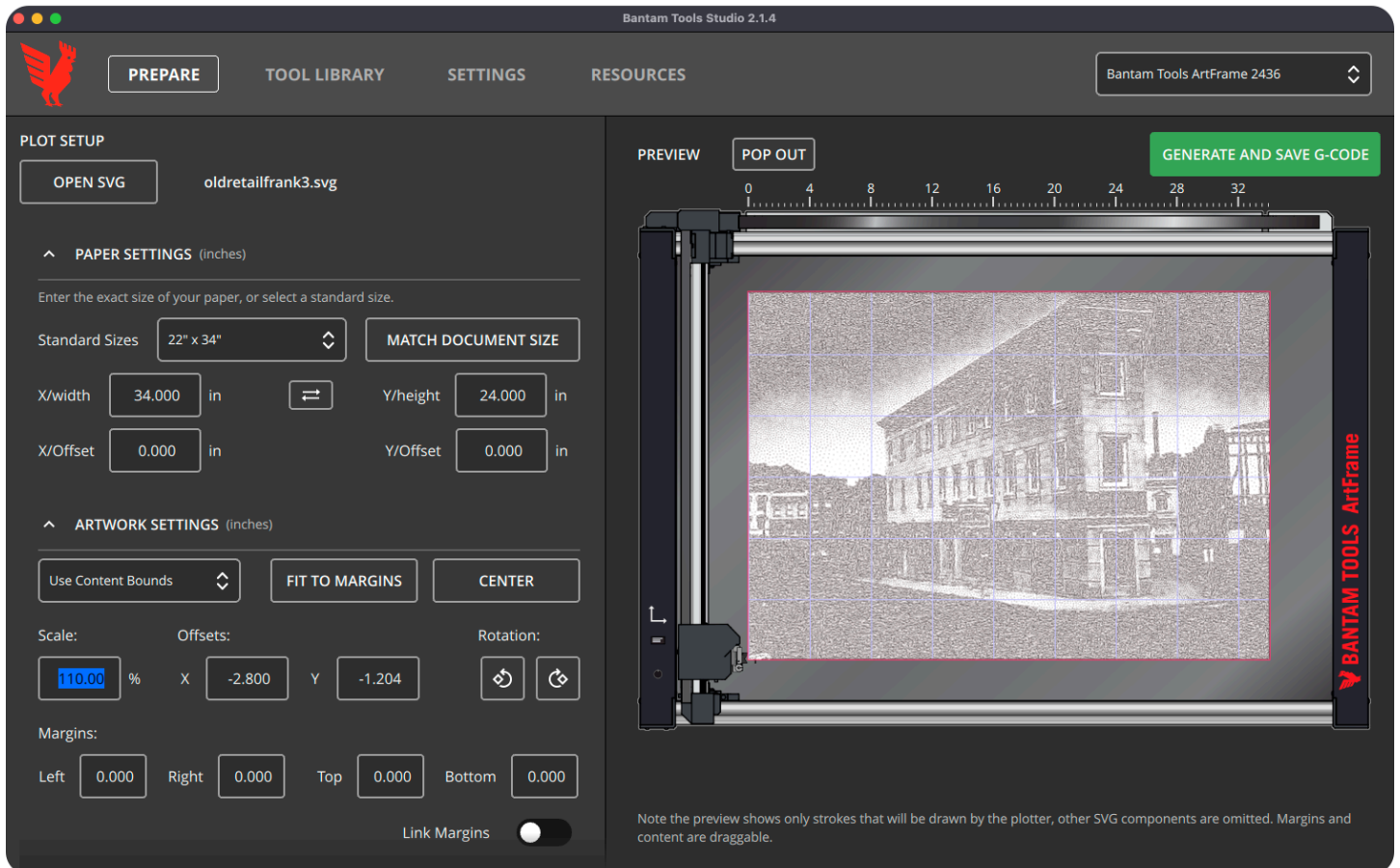


Bantam Tools Studio™ User Guide



0. Preliminaries

0.1 About This User Guide

This is the user guide for Bantam Tools Studio™ software, a powerful tool designed to streamline your plotting workflow. This guide will help you understand how to use the software effectively and make the most of its features.

0.2 Quick Start

If you're new to Bantam Tools Studio™, and want to get up and running *as quickly as possible*, here are the most important steps to get started:

1. To download, install, and activate Bantam Tools Studio™, check your inbox for an email sent at the time of purchase containing your download link and license code, then follow instructions found in section [1.2 Downloading Software](#).
2. To read a basic use case of processing an SVG document into ready-to-plot G-Code, see section [2. Basic Usage](#).

0.3 Support resources

If you need assistance or have questions, we're happy to help. Please reach out to us through any of these channels:

- Inside Bantam Tools Studio, the Resources link will open our support site in your web browser
- Contact our support team at : <https://bantam.tools/afcontact>
- Our discord support chat: bantam.tools/chat (staff respond during business hours, community members may also respond)
- Email us at support@bantamtools.com (response time is generally within one business day)
- Call us at +1-347-422-6826 (during regular business hours: Monday - Friday between 9 am and 5 pm Eastern time. No holidays.)
- Online documentation and resources: <https://bantam.tools/afdocs>

0.4 Updates

You can download the latest version of this guide at <https://bantam.tools/btsguide>. We encourage you to check back occasionally for the latest version. .

The software will automatically check for updates upon launch if an internet connection is available, and provide a link to the latest download when available.

To check that you have the latest version of the Bantam Tools Studio™ software, use the **Settings** panel of the Bantam Tools Studio™ software to check online for updates.

1. Introduction and Installation

1.1 About Bantam Tools Studio™

Bantam Tools Studio™ is designed to streamline drawing and painting workflows by converting SVG files into G Code that controls a physical machine. It allows you to define work area, precision, tool behavior, feedrates, acceleration, and path optimization, then generate G Code files that can be saved and transferred to Bantam Tools machines such as ArtFrame™, EggBot™, or other compatible G Code plotters.

At its core, Bantam Tools Studio™ is software for controlling how a physical tool moves through space. It defines where a mark making implement goes, how fast it moves, when it contacts the surface, and how it interacts with the material it is using. This applies equally to pens, brushes, and other supported tools. The software does not simulate marks or visual outcomes. What appears on the surface emerges during execution from real tools, real materials, and real motion.

Artwork itself is defined upstream as SVG files. These SVGs can be created using a wide range of external tools, including vector design applications such as Adobe Illustrator, generative environments like Processing or p5.js, and pen plotter focused tools such as vsketch. As long as the output is a valid SVG, Bantam Tools Studio™ can execute it reliably on a supported machine.

For painting workflows, Bantam Tools Image Processor™ exists to address a gap in current software offerings. It provides an entry point for generating generative, paint ready SVGs that are structured specifically for brush based mark making, with attention to stroke direction, spacing, and color structure. Other tools, such as DrawingBotV3, focus instead on converting raster images into vector based SVG artwork and are often better suited for drawing oriented workflows.

1.2 Downloading Software

Go to the [Bantam Tools Software Page](#) to download the software. There are versions available for Mac and Windows.

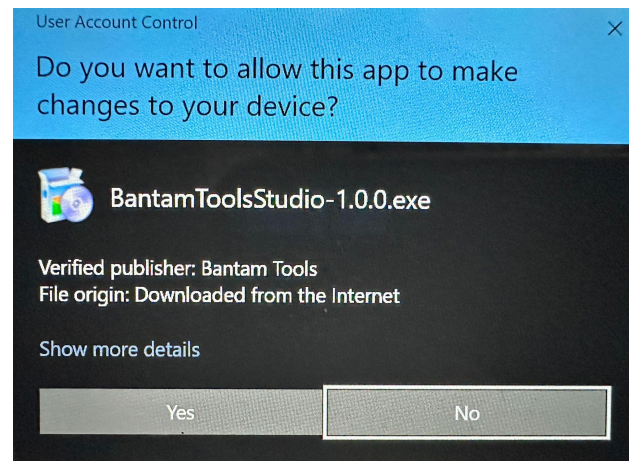
1.3 Install and activate the software (Mac OS)

1. Locate the downloaded software and open the .dmg.
2. Double-click the DMG file to open it. You will be presented with an End User License Agreement. Once you agree to the terms. The DMG will verify and mount.
3. Once mounted, double-click the icon on your desktop. A Finder window will appear. Drag BantamToolsStudio into the Applications folder.
4. Eject the Disk Image. The software will now be installed in the Applications folder.

1.4 Install and activate the software (Windows OS)

Locate the downloaded software and run the .exe installer.

1. Begin the process by clicking **Next**.
2. Choose an installation folder.
3. Accept the End User License Agreement.
4. Accept 'Bantam Tools Studio' as the Start Menu shortcut name by clicking **Next**.
5. Click **Install**.
6. Click **Yes** when you reach the window to the right. This allows the installer to finish the installation process.
7. Once the installation is complete, click **Finish**.



1.5 Help with installation

If you run into any difficulty while following along with the installation or activation steps, please contact us for support at support@bantamtools.com.

1.6 License Activation

If you purchased a Bantam Tools ArtFrame™ or the Bantam Tools Studio™ software on its own, you should have already received a license key by email. If you have any issues locating this email please contact support@bantamtools.com and include your **order number** or **machine serial number**.

Select the Settings tab and click License Manager to activate your license or to check how many days are remaining in your trial.

If you have a license, select Activate License and input your License ID and Password.

From the License Manager, you can check to activate a new license, and deactivate a current license so that it can be used on a new computer.

2. Basic Usage

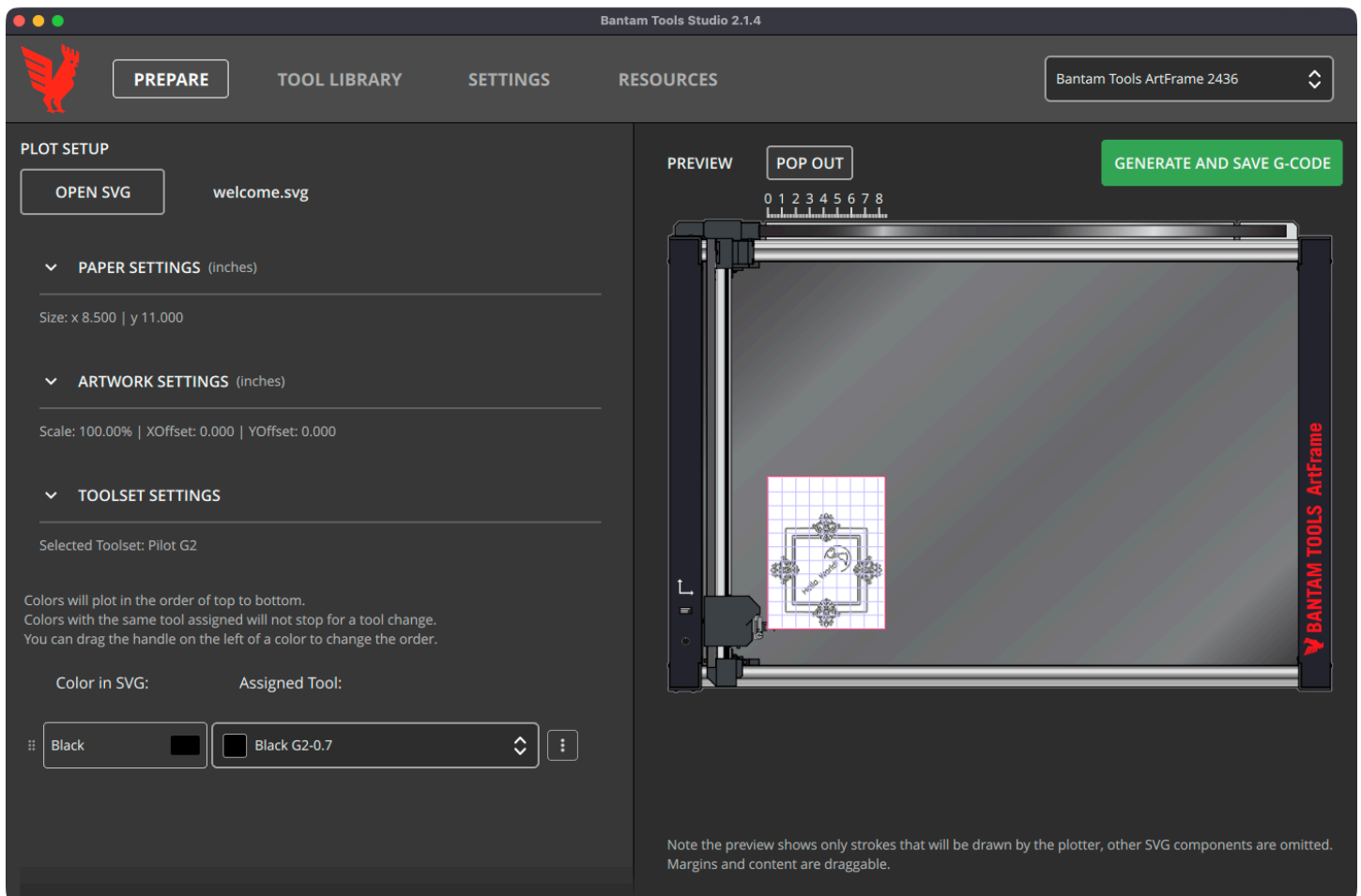
2.1 Selecting Your Machine Type

When you first begin using Bantam Tools Studio™, select your machine type in the top right drop-down menu. This choice sets the basic size of plot area that will be available, and also configures certain G-code features that are applicable to specific machines.

If you are generating G-Code for a machine other than a Bantam Tools plotter, machine settings can be overridden under Settings -> Machine options

2.2 Opening and Preparing an SVG file

In order to begin you will need an SVG document to open.



Before Loading SVG

1. Click the 'Open SVG' button to import an SVG you would like to convert to G-code.
2. The SVG will appear in the Preview area. You will notice the Plot Setup panel populate.

3. Bantam Tools Studio™ Reference

This section of the user guide provides a **description** of each option and setting in the software.

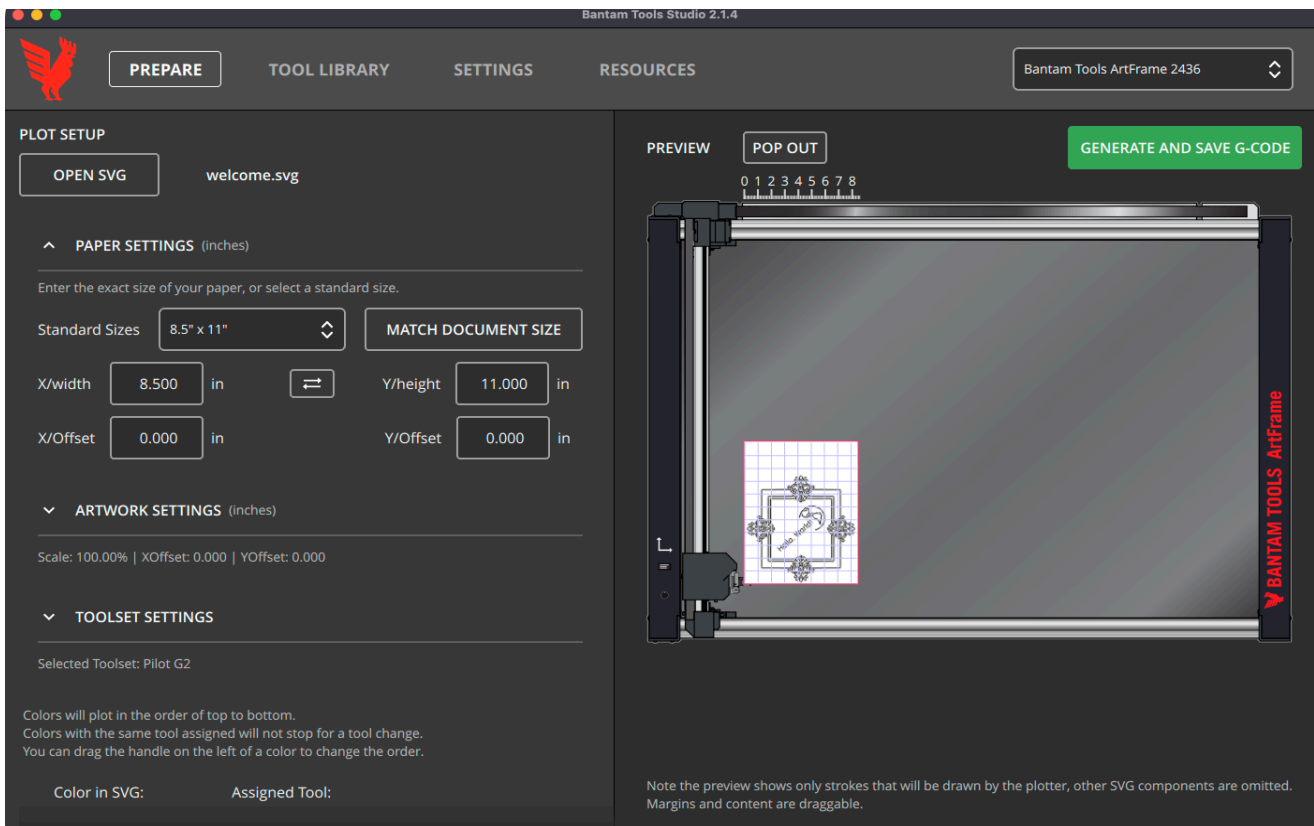
TIP: Hovering your cursor over most settings in Bantam Tools Studio™ will display a pop-up "Tooltip" description of the feature.

3.1 The Plot Setup Panel

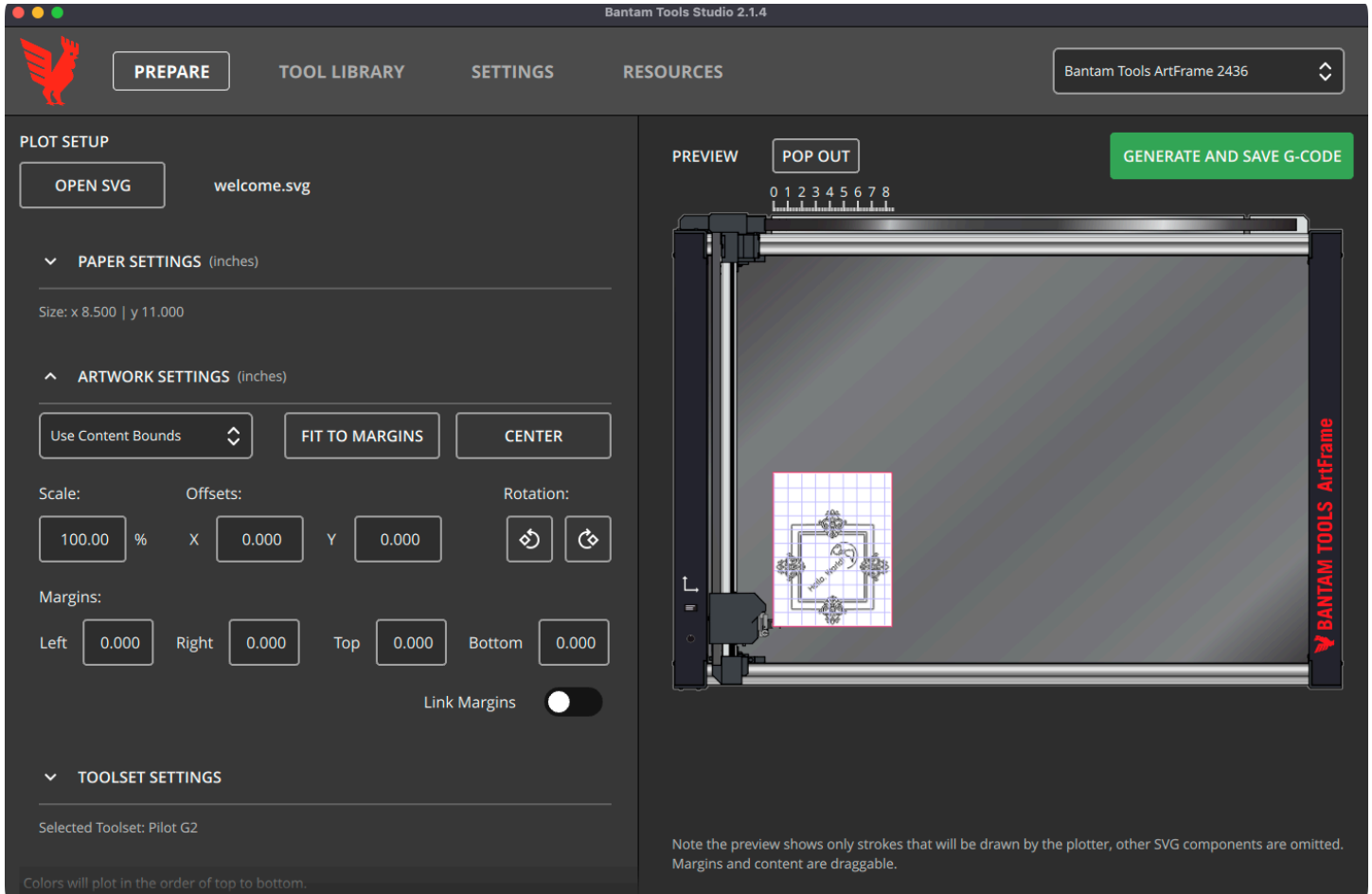
3.1.1 Paper Settings

- **Standard Sizes:** A list of standard sized papers to quickly select your width and height, in both US paper standards and ISO A-series standards.
- **Match Document Size:** Change paper size to match currently loaded document's original size, and set scale to 100%
- **Width and Height settings:**
 - X: the width of the paper along the X axis
 - Y: the height of the paper along the Y axis
 - Switch Axis Button (arrows): quickly switches the X and Y values

TIP: Units of millimeters or inches can be selected in "Settings", but you can also use the keyboard shortcut "⌘ and u" (Mac) or "Control and u" (Windows) to switch your display units settings between millimeters to inches at any time. Switching back and forth can be useful if you like to use US paper sizes but prefer to configure your Tool Settings in metric.



3.1.2 Artwork Settings



- **Content Bounds vs. Document Bounds**
 - When **Use Content Bounds** is selected, the software calculates the **edges of your artwork** based on the **objects within** your document, ignoring any extra space defined by the document's canvas size or viewbox.
 - When **Use Document Bounds** is selected, original canvas and viewbox dimensions are used to position and scale content.

This allows you to align and size your work depending on whether you're focusing on the content itself or the entire document area. This affects the rest of the parameters in the Artwork Settings section.

- **Fit to Margins:** Press the Fit To Margins button to automatically scale your document or contents to fit the paper size and margins that you have specified. is determined by the Content Bounds vs. Document Bounds selection as described above.
- **Center:** Press this button to center the content within your margins. is determined by the Content Bounds vs. Document Bounds selection as described above.

TIP: Double-click the artwork in the Preview Panel to automatically center it and fit to margins.

- **Scale:** This control displays the scaling factor applied to your artwork, as a percentage. You can input a number value to override the calculated or default scale.

- **Offsets:** The X and Y Offsets show the shift in position of your artwork along the X (horizontal) and Y (vertical) axes. You can move the artwork by dragging it in the preview window, or enter new values in the Offset Controls to reposition the artwork.
- **Rotation:** The two rotation buttons will rotate your artwork counter-clockwise by 90° or clockwise by 90°, respectively.

TIP: Hovering your cursor over the rotation buttons will display a pop-up tool tip that shows the current rotation angle.

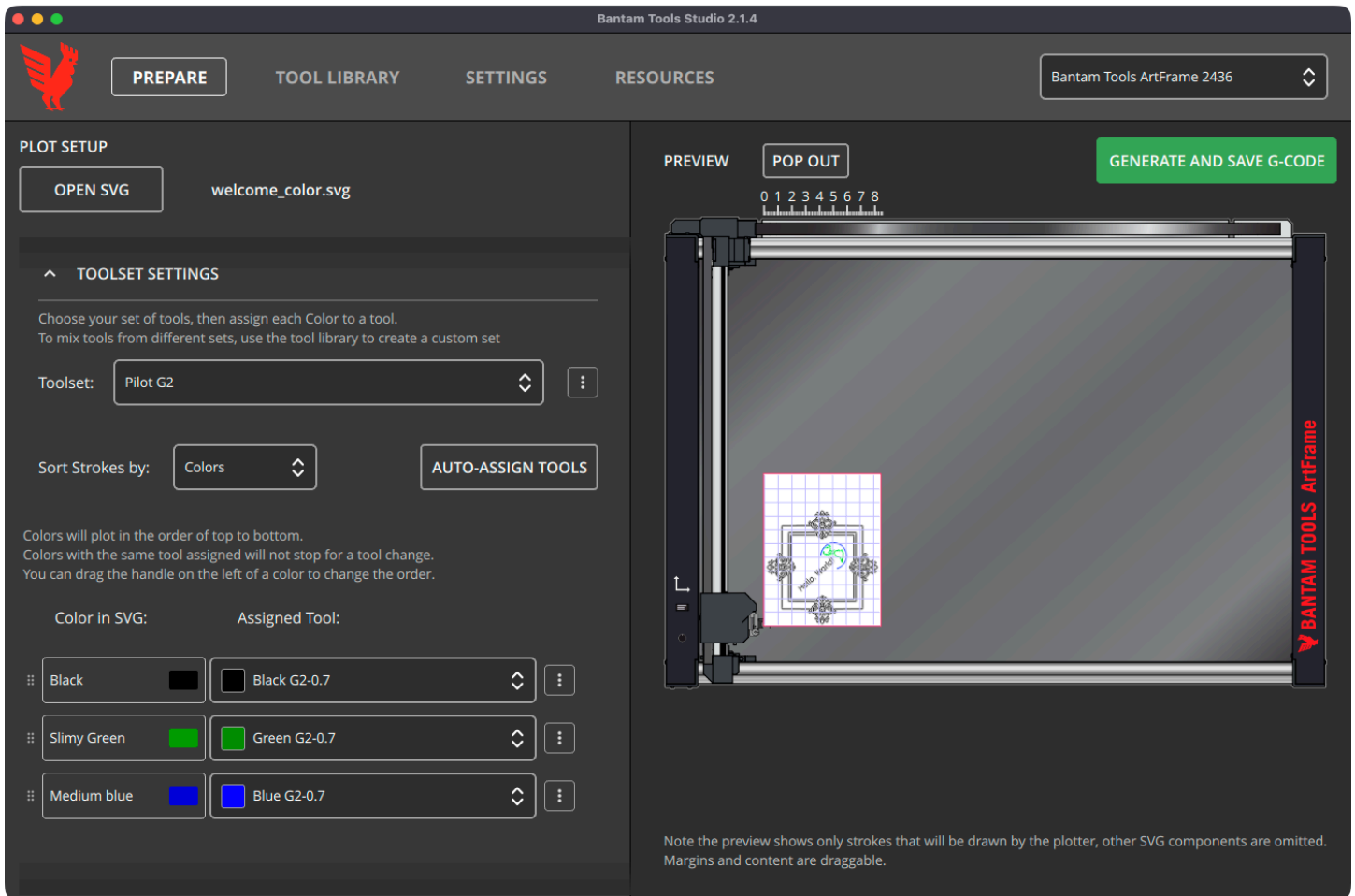
- **Margins:** These four inputs can be used to set the margins on the page. Page margins are areas at the edges of your defined paper size where nothing will be drawn. Artwork that falls outside of the margins is shown **in red** on the preview panel, and will automatically be cropped (removed) when you generate and save your G-Code.

TIP: You can drag the margins on the Preview Panel in order to change them.

- **Link Margins:** When the Link Margins control is activated, changing any of the margins values changes all four of them.

Tip: The Bantam Tools EggBot™ transforms 2D SVG designs onto a spherical or ovoid surface. Parallel lines in your 2D rendering will appear to get closer to each other on a spherical surface, just as longitude lines on a globe meet at the poles of the earth.

3.1.3 Tool Settings



Bantam Tools Studio™ automatically detects the **Colors**, **Layers**, or **Groups** in your SVG file and lists them here for assignment.

Start by selecting a **Toolset**. A Toolset determines the available tools and their feedrate, lift, and offset settings.

For example, the **Pilot G2** set is preloaded with settings for the included pen. You can also mix tools from different sets by creating a custom toolset in the Tool Library.

Next, choose how to **Sort Strokes**. You can sort by:

- **Colors**: Groups strokes based on stroke color. This works best for most projects.
- **Layers**: Uses the layer structure from your design software.
- **Groups**: Uses structural groupings from the SVG file.

Note: Different vector design programs handle layers and groups differently. Layers may be exported as groups, depending on the software and export settings.

Once sorted, each detected **color, layer, or group** can be assigned a specific Tool from your selected set. You can click **Auto-Assign Tools** to automatically match pens to detected colors, or manually choose tools using the dropdown menus.

Drag the handles on the left to reorder plotting order.

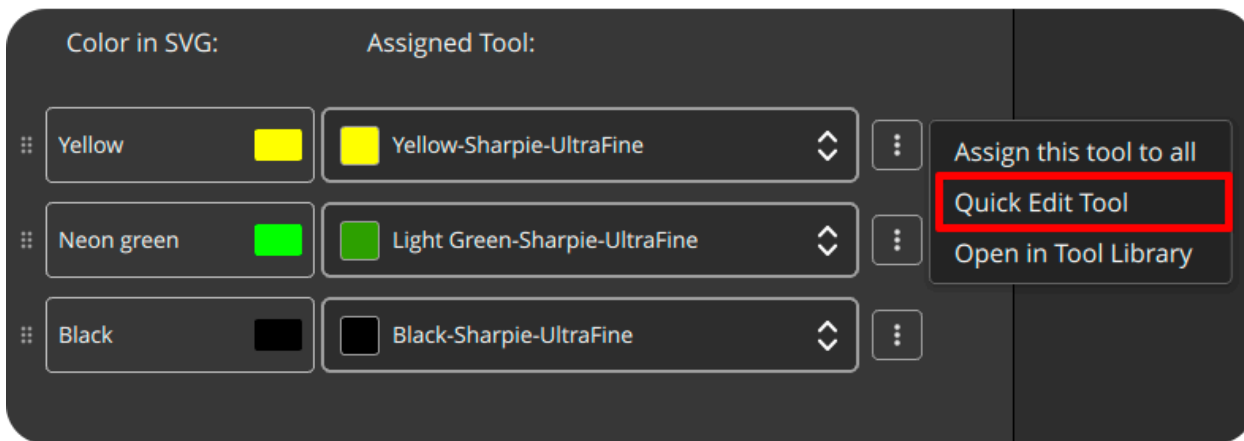
Colors or groups with the same tool assigned will plot together without pausing for a tool change.

Tip: Colors may appear slightly different than in your design software. To confirm assignments, toggle visibility of individual colors or layers in the preview.

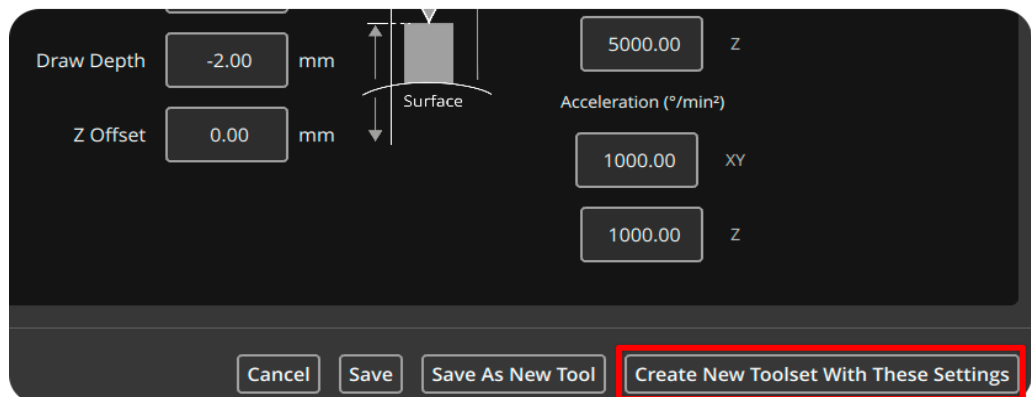
3.1.4 Quick Edit

The quickest way to change your settings is to edit an existing toolset.

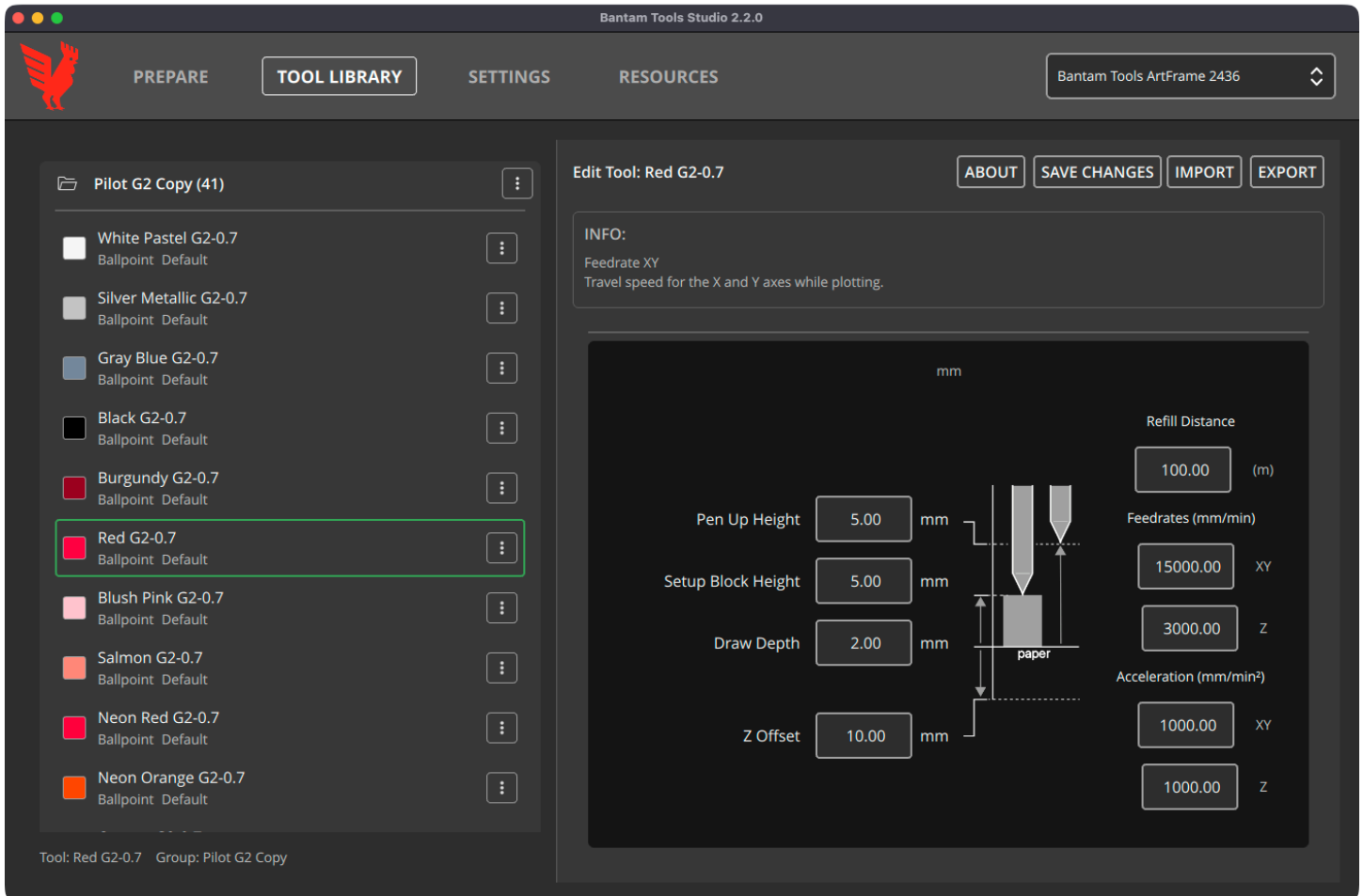
From the **Prepare** tab, in the **Tool Settings** section, select the three dots next to one of the pens, then click **Quick Edit Tool**.



From here, you can adjust the tool's parameters. A common change might be increasing or decreasing the XY feedrate for greater precision or faster plot times. After entering your new value, select **Create New Toolset With These Settings**.



3.1.5 Pen Height Settings



TIP: We usually talk about Pen Settings in units of millimeters because millimeters are used in the generated G-Code. If your units are currently displaying in inches, you can also use the keyboard shortcut “⌘ and u” (Mac) or “control and u” (Windows) to switch your display units settings to millimeters.

- **Pen Up Height:** This refers to the height of the pen tip from the paper to the tip while executing rapid moves (G0/Tool Up).
- **Setup Block Height:** Typically, when you install a tool such as a pen or a brush in the plotter, you use a "setup block" with a known height, which sets the initial spacing between the paper and the pen tip.

Note: The Bantam Tools [Pen Height Setup Tool](#) – as included with the ArtFrame – provides a 3.5 mm surface at its center. As such, 3.5 mm is the default Setup Block Height in the software.

Note: The Bantam Tools EggBot™ Pen Height Setup Tool - as included with the EggBot, provides a consistent loading depth for pens, Setup Block Height is not configurable for EggBot™

- **Draw Depth:** Tool tip distance past paper contact. This value is how far the z-axis will push the tool into the paper.

When using a pen in the ArtFrame with the vertical slide and a spring for pressure, adding vertical travel distance "into the page" controls how much the spring compresses, affecting the pressure applied to the pen while drawing.

Using a depth of exactly zero may result in inconsistent contact between the pen and paper, so it is typical to have some distance "into the page", where the amount of distance depends on the particulars of the setup that you are using.

Aside: Ball point and gel pens require pressure on the paper so that the ball turns as it travels and distributes ink. The balls in ball point pens and gel pens are made of tungsten carbide. The ball itself won't wear out, but the metal around the ball can.

- **Z Offset:** When using writing surfaces of some thickness, setting a Z Offset allows you to elegantly support canvases of varying thickness.

Note: there is a total of 60 mm of travel in the toolhead, that means that the Pen Up, Draw Depth and Shift Everything Up values should not be set such that the addition of those values exceeds 60.

Speed Settings

- **Refill Distance:** The distance the plotter will draw before returning to the home position for refilling ink or replacing the pen within a given tool number.
- **Feedrates**
 - XY: Travel speed for the X and Y axes while plotting. Maximum value: 15,000 mm/min.
 - Z: Travel down speed for the Z axis. Maximum value: 40,000 mm/min.
- **Acceleration:** Acceleration during drawing for the X and Y axes. Maximum value: 4,000 mm/min².
 - Presets: select from precision, default or speed to help you get acquainted with these values.
 - For more precise motion, lower acceleration will help to improve machine accuracy. Where precision is less of a concern, higher acceleration values can help to drastically reduce plot time.

3.1.6 Preview

The preview shows only strokes that will be drawn by the plotter; other SVG components (such as images) are omitted. Margins and content are draggable. The Pop Out button will open the preview in a separate window, which can be helpful for enlarging smaller drawings. You can press the Close button to return to the main view.

3.1.6 Generate and Save G-Code

Pressing the Generate and Save G-Code button will prompt you to name your g-code file and select a location to save it to. Once saved, the setup sheet will appear on the left hand side of the screen. The setup sheet lists:

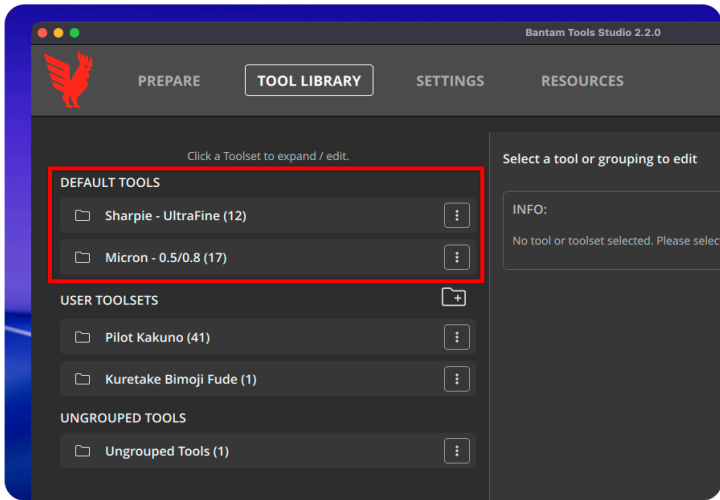
- File location
- Generation date
- Plotter type
- Number of tools
- Draw distance
- Media size
- Setup block height
- Tools list
- Operations list
- G-code generation settings

You can save and print your setup sheet as a reference using the Save Sheet button. You can also press the Open File Location button to go to your g-code file for moving it to your microSD card. The Done button returns you to the Plot Setup screen. If you have configured the split by toolset switch to ON in your settings, a file will be created with separate gcode files for each tool or color or layer.

4. Tool Library

4.1 Tool Library Overview

The Tool Library organizes your pen collection with individual speed, lift, and pressure profiles. In the top-left corner, the **Default Tools** section provides a reference for how the Tool Library functions. It is recommended that you set up each new tool you add to your workflow. Once configured, tool settings can be recalled with a single click.



4.2 Default Tools

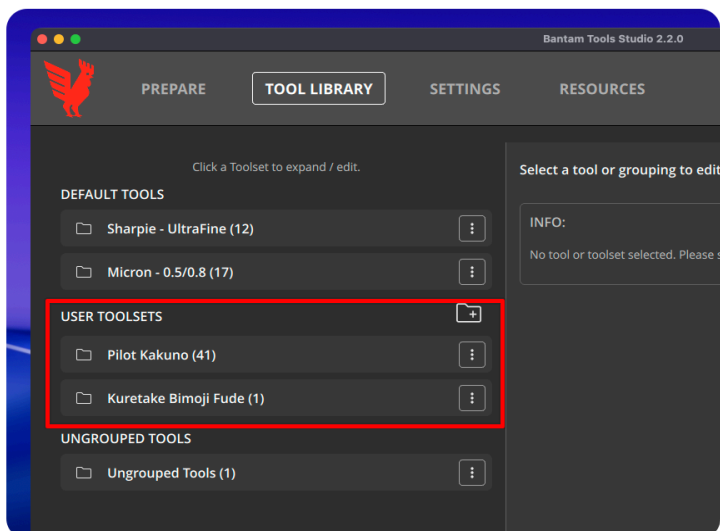
The **Default Tools** section includes predefined toolsets for your machine.

- Use these as starting points for creating custom toolsets.
- Click on a toolset to view its tools.

Note: Default tools can be edited within the current file, but any changes will revert when the file is closed. To preserve your adjustments, select click the three dots to duplicate a default so that you can edit and save permanently.

To duplicate a toolset or tool, click the three-dot menu to the right of its name.

- Duplicated toolsets appear under **User Toolsets**.
- When duplicating an individual tool, you will be prompted to select a user toolset or send it to **Ungrouped Tools**



4.3 User Toolsets

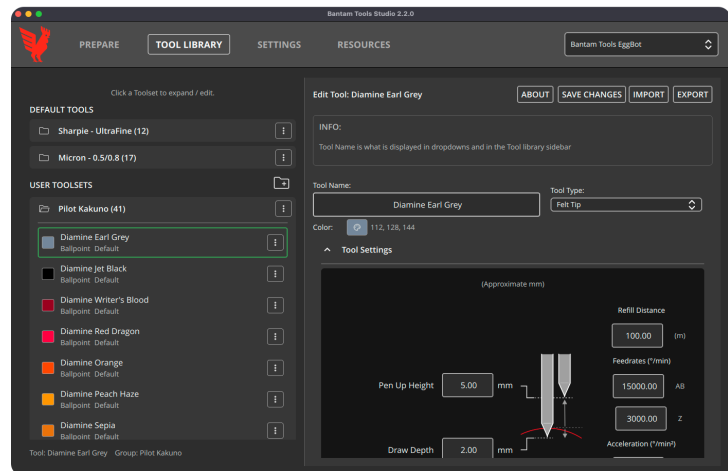
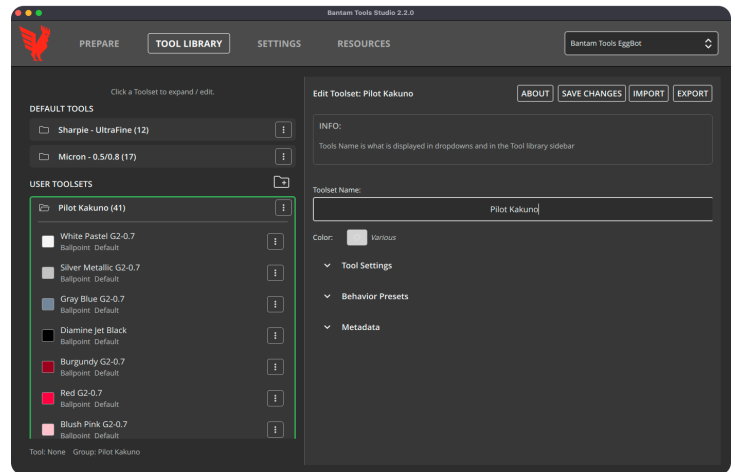
The **User Toolsets** section allows you to create and manage custom toolsets for your specific pens or markers.

- Click the **+ Folder** icon to create a new empty toolset and assign it a name.
- Alternatively, duplicate a default toolset to use as a base for customization.

4.4 Editing User Toolsets

Selecting the top layer of a user toolset enables global edits to all tools in that set.

- You may adjust a single parameter across all tools (for example, modify all **Feedrates** while preserving individual **Pen Up Heights**).
- After making adjustments, click **Save Changes** in the top-right corner before navigating away.
- A confirmation prompt will summarize the changes to be applied across the toolset.



4.5 Editing Individual Tools

Select a specific tool from the list to edit its individual parameters.

- Modify only the desired settings for that tool.
- Click **Save Changes** before leaving the page to confirm updates.

4. 6 Tips and Troubleshooting when Testing and Calibrating New Pens

- **Run a Simple & Short Test Pattern**

- Use a small vector file such as a square, circle, or cross-hatch pattern.
- Observe line consistency and coverage.

- **Adjust Pen Up Height**

- If the pen lifts too high between strokes, reduce the **Pen Up Height**.
- If it drags when moving between lines, increase the **Pen Up Height** slightly.
- If clearance on uneven surfaces is limited, increase the **Pen Up Height** further until movement is smooth and consistent.

- **Refine Draw Depth Settings**

If you are not getting solid contact between your pen and surface, consider increasing the draw depth; that is, to lower the pen a little bit more. This is especially important when drawing on eggs that, by nature, are not perfectly spherical. If you are using ink or paint in an ArtFrame and the paper is bubbling or buckling, you may consider increasing the Pen Up Height so that when the pen lifts, it travels over the bubbled paper.

- Increase **Draw Depth** until the line is solid without oversaturating the paper.
 - On **ArtFrame** using the **Vertical Slide Stage**, start with 2–3 mm and increase as needed. The spring kit will absorb excess downward travel.
 - On **ArtFrame** with tools mounted directly to the tool-mounting block, start with 0.5 mm and increase gradually.

- **Set Feedrates**

- Begin with a moderate **Feedrate** (for example, 1000–1500 mm/min).
- Increase speed until line quality begins to degrade, then reduce slightly.
- Record this setting under **Speed** in the Tool Library.

Note: our machines are capable of insanely fast speeds with the understanding that it may compromise line quality. Ultra fast speeds will result in lower quality in corners and sharp turns and it is possible that the machine may move faster than the pen can deploy ink resulting in spotty line quality.

- **Save as a New Tool**

- Create a new entry in your **User Toolset** with the tested settings.
- Include the pen name, color, and tip size in the tool name for easy identification.

- **Perform a Repeatability Check**

- Run the same test pattern again after re-loading the pen to confirm consistent results.

Pro Tip:

Create multiple toolsets with different settings, export them to your microSD card, and run tests for each. Compare the output directly and select the one that performs best. To remove unwanted toolsets, click the three-dot menu next to the toolset name and select **Delete Toolset**.

5. The Settings Panel



5.1 Program Options

- **Display Units:** Toggle between millimeter or inch units. You can also press $\text{⌘}+u$ (mac) or $\text{control}+u$ (pc) at any time to swap between these units.
- **Show Plotter:** *(Enabled by Default)* Toggle a visualization of the plotter and the paper placement within it. Disable this setting to maximize the size of the visualization.
- **Show Grid:** *(Enabled by Default)* Toggle the display of a set of grid lines within the preview area. These lines will not plot as part of your document.
- **Show Axes Label:** *(Enabled by Default)* Toggles an icon demarcating the X axis and Y axis orientations in the preview area.
- **Fit To Margins On Load:** *(Disabled by default)* Toggles behavior to automatically scale SVG to the available drawing space (selected paper size with margins applied) upon loading.
- **Center On Load:** *(Disabled by default)* Toggles behavior to place SVG in the center of the available drawing space (selected paper size with margins applied) upon loading.
- **License manager:** See section 1.6 License Activation for more about this function.
- **Auto Assign On Toolset Change:** When enabled, this option automatically updates the active tool colors to match the default colors assigned to the selected toolset. For example, if you switch from the “Sharpie Ultra Fine” set to the “Pilot G2” set, the system will automatically map that set’s default pen colors to the detected colors in your SVG file.

5.2 Path Generation Options

- **Path Reordering:** *(Enabled by default)* Toggle to enable path optimization when generating G-Code. Path Reordering uses multi-threading to quickly optimize large SVGs.
- **Group by Color:** *(Enabled by default)* When enabled, the plotter will complete all strokes of one color before moving to the next. Disabling this option retains the original stroke order but may result in

frequent pen changes. The option to disable this is available for advanced users who require precise stroke sequencing. Generally it should be left on, as toggling it off can drastically increase the number of pen changes.

- **Use Curves:** (*Enabled by default*) Toggles generation of G2/3 moves (Clockwise and Counter Clockwise Arc's). Curves defined in the SVG will be approximated with Arcs where appropriate.
Aside: Turning this off can be useful if you plan to use the output of Bantam Tools Studio for custom post-processing, such as breaking curves into small line segments provides more control and flexibility for precise adjustments or modifications. If you are planning to run this G-Code on third-party or vintage machines, it may be necessary to disable this setting to ensure compatibility and proper execution.
- **Split by Toolset:** (*Disabled by default*) If enabled, this option generates a separate folder containing individual G-Code files split by color, layer, or groups, based on your configuration in Tool Settings. Alongside these, a master G-Code file is also created. These files can be loaded onto your microSD card, allowing you to choose the order in which to plot manually if necessary.
- **Split long moves:** (*Disabled by default*) Divides longer linear motion into smaller linear motion in order to improve pause resume response time. May slightly increase file size.
- **Preserve path orientation:** (*Disabled by default*) Turn this on to ensure all paths are drawn in the directions specified in the original file.
- **Disable rapids:** By default, pen-up motions always use machine maximum Rapid speed (G0). This option, which is off by default, can be enabled to use the (slower, more gentle) feedrate speeds (G1) for all motion.
- **Disable rapids in Z:** This option, enabled by default, disables rapid (machine maximum G0 speed) motion when lifting and lowering your pen or other tool towards or away from the media surface. Turn it off to enable rapid motion in the vertical direction. This option can be overruled by the **Disable rapids** setting. If Disable rapids is enabled, all rapid motion, including in the vertical direction is disabled.
- **Precision:** This value gives the allowed deviation from generated paths from the original given paths in the SVG document. Using looser (larger) values can reduce precision of drawing but increase smoothness of drawing. Using tighter (smaller) values can slow down drawing and increase noise, but improve precision.

5.3 Machine Options

- **Tool Settings:** This panel is the same as the Pen Settings
- **Maximum paper size:** Allows you to override the maximum paper size for the current machine which normally ensures G-Code does not generate outside of your drawing space.
- **Restore machine defaults:** You can select the machine type you are planning to generate G-Code for in the top right hand corner. If you want to restore default settings for the current machine type you can click Restore Machine Defaults. This resets the maximum paper size and the tool speed and acceleration values to the recommended values for your machine.
- **Check for Updates:** Press this button to check online for updates to Bantam Tools Studio.

5.4 The Resources Link

The **Resources** link, at the top of the Bantam Tools Studio software, will open your default web browser to the Bantam Tools Studio section of the Bantam Tools Support site.

4. Advanced Features and Techniques

4.1 Working with Multiple Colors

When working with multiple colors or pens in your design, there are several approaches you can take depending on your specific needs:

4.1.1 Using the Multi-Pen Mode

As covered in section 3.1.3, Multi-Pen Mode allows you to assign different pens to different elements of your design based on colors, layers, or groups. This is the most straightforward approach for multi-color plotting.

4.1.2 Optimizing for Multi-Color Workflows

When creating designs for multi-color plotting, consider these best practices:

- Organize your design with clear color separation or layer structure
- Use distinct, easily distinguishable colors for different elements
- Test your color separations using the preview function before plotting
- Consider using layers for more complex color organization
- In settings turn on “Split by Toolset” to output separate files for each color, layer, or group to give you maximum flexibility to work with different colors independently.

4.1.3 Using the Setup Sheet

When you click the “Generate and Save G-Code” button, the setup sheet will display to the left of the preview. The setup sheet lists the number of tools, the draw distance, media size, and setup block height. It also gives the tools list, operations list, and g-code generation settings. You can save and print your setup sheet as a reference to use, especially for long plots or plots with many tools. It may be helpful for estimating time and ink management.

4.2 Advanced Path Optimization

The Path Generation Options in Settings (section 3.2.2) offer several ways to optimize your plots:

4.2.1 Custom Optimization Strategies

Depending on your specific needs, you might want to:

- Disable Path Reordering for precise artistic control over stroke order
- Adjust Precision values for the optimal balance between speed and detail
- Enable Split by Grouping for complex multi-part projects
- Experiment with different combinations of these settings for your specific artwork

4.3 Working with Different Media Types

4.3.1 Setting Up for Different Media

Bantam Tools ArtFrame™

- For thicker materials, adjust the Z Offset as described in section 3.1.4
- For non-standard sizes, set custom paper dimensions in Paper Settings
- For delicate materials, consider reducing acceleration and speed settings
- For textured materials, you may need to increase the Draw Depth

Bantam Tools EggBot™

- For **medium-sized round objects** such as the included 2 5/8" (67 mm) ornaments or larger, use a **360° × 120°** canvas size. You will create your SVG files in mm, but you will notice in Bantam Tools Studio we refer to these sizes as Degrees.
- For **smaller objects** like standard eggs or mini ornaments, use a **360° × 90°** canvas size. You will create your SVG files in mm, but you will notice in Bantam Tools Studio we refer to these sizes as Degrees.
- For **irregular or not perfectly round items**—such as golf balls or small pumpkins—increase your **Pen Up Height** and **Draw Depth** to accommodate variations in surface height.

Bantam Tools WaterColorBot™

- For working with Paint please see section 6. *Painting with Bantam Tools Studio™* on the next page.

5. *Painting with Bantam Tools Studio*™

5.1 *Painting with Bantam Tools Studio*™ **What Painting Means**

Painting with Bantam Tools Studio™ is different from digital painting and different from traditional pen plotting. Bantam Tools Studio™ does not simulate brushes, pigments, or watercolor effects on screen. Instead, it controls a real machine moving real brushes through real paint onto real paper.

At its core, Bantam Tools Studio™ is a motion and process engine. It translates vector paths into precise, repeatable movements that control where a brush goes, how fast it moves, and how often it returns to the palette to reload paint. What it does not attempt to control is the final appearance of the paint itself.

The painting itself is shaped by physical materials that behave organically. Paint flows, water spreads, paper absorbs, and brushes change character as they move. The same file can produce similar results across runs, but never identical ones, and that variability is intentional.

Artwork is still defined by SVG paths. These paths describe where the brush will travel, not how the paint will appear. There are no fills, no simulated blending, and no on screen preview of watercolor behavior or flow. The preview shows motion only. The painting emerges during execution.

Bantam Tools Studio™ is designed to give you reliable structure rather than simulated outcomes. You define paths, stroke order, speed, and refill behavior, then allow real paint to respond to those conditions. The goal is not perfect repeatability, but a consistent process. When the process is stable, variation becomes expressive instead of accidental.

This balance is what allows paintings to feel alive while remaining understandable and repeatable. You design the system, the materials complete the work.

When painting, several concepts become more important than they are in pen plotting:

- **Stroke and sort order matter.** Earlier strokes can wet the paper or deposit pigment that later strokes interact with. The order of colors, layers, or groups matters not only on the paper, but also on the brush itself. Small amounts of pigment can remain on the brush between strokes and refills. For this reason, painting from lighter to darker pigments often produces more predictable results, especially in fully automated workflows where the machine is not paused for tool changes. Thoughtful stroke and sort order helps manage both paper interaction and residual pigment on the brush.
- **Speed affects saturation.** Slower motion allows the brush to remain in contact with the paper for longer, which generally deposits more paint and produces darker, more saturated strokes. Faster motion reduces contact time, resulting in lighter strokes with less pigment transfer. Changes in speed also influence how water and pigment spread on the paper. Slower strokes can encourage pooling, blending, and softer edges, while faster strokes tend to produce drier marks with sharper transitions. Because speed is controlled at the tool level, it becomes an important part of defining how a painting develops over time rather than a simple performance setting.

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- **Refilling is intentional.** Returning to the palette is part of the painting process, not an interruption. How and when a tool refills has a direct impact on saturation, consistency, and how a layer develops over time. Bringing in more water during every Pre-Refill can gradually dilute the pigment source, while allowing the pan to dry out halfway through a layer can cause strokes to become increasingly saturated in an unnatural way. Different preset toolsets manage this balance in different ways, for example by tempering pigment with a Post-Refill water dip or by scraping excess paint at specific points in the refill cycle. These behaviors are not universal. They will change depending on the brush you use, how much compression is set by how the brush is mounted, and the specific paint and paper combination. Understanding refilling as a deliberate, repeatable action rather than a side effect is key to achieving predictable and expressive painting results.

In this workflow, **toolsets represent collections of tools and how they behave**, not just colors. A toolset defines motion parameters, lift behavior, and refill distance that together describe how a specific tool paints, refills, and cleans itself. **Palettes define where paint comes from**, including their position and geometry, which directly affects consistency and repeatability.

Bantam Tools Studio™ provides structure and repeatability. The variation, softness, saturation and other organic qualities come from the materials and setup you choose. Painting with Bantam Tools Studio™ is about designing conditions for expression, then letting the physical process do the rest.

5.2 Painting with Bantam Tools Studio™ Basic Usage

5.2.1 Getting Started

Selecting Your Machine Type

When you first begin using the software, select your machine type from the dropdown menu in the upper right corner of the screen. This choice sets the available plot area and configures G Code features specific to the selected machine.

Opening and Preparing an SVG File

To begin, you will need an SVG document.

1. Click the Open SVG button to import an SVG file.
2. The SVG will appear in the Preview area and the P/panel will become active.

Tip: *Hovering over most settings in Bantam Tools Studio™ will display a tooltip describing that feature.*

5.2.2 The Plot Setup Panel

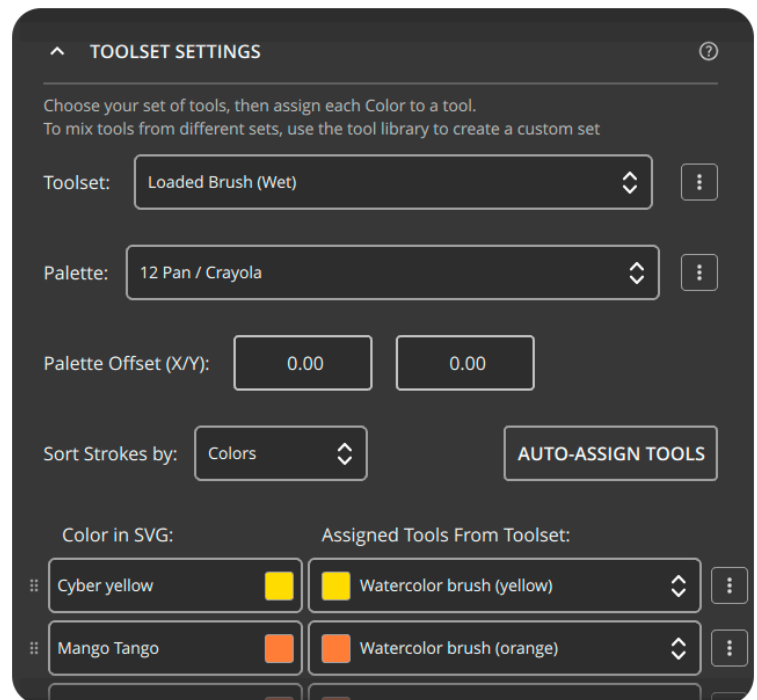
Paper Settings & Artwork Settings

Paper & Artwork Settings follow the same process and offer the same parameters as non painting workflows. This includes selecting standard paper sizes, setting custom dimensions, margins, and orientation. For detailed information, see the Bantam Tools Studio™ User Guide.

Tool Settings

In painting workflows, you still begin by selecting a **Toolset**. The toolset defines the available tools and their behavior, including motion settings and macro sequences.

Painting behavior is enabled only when you select a palette layout from the palette dropdown. Once a palette layout is selected, each tool will use the macro behavior defined for that palette.



5.3 Painting with Bantam Tools Studio™ Toolsets for Painting

5.3.1 Preset Painting Tools

Bantam Tools Studio™ includes a set of preset painting tools designed to cover some common watercolor workflows. These presets are intended as reliable starting points. Each one defines a specific sequence of palette interaction, brush handling, and stroke behavior. You can use them as provided, or duplicate and modify them to suit your materials and preferences.

These presets are designed to let you start painting immediately. You can move straight to the Prepare tab and begin working without building a toolset from scratch. Out of the box, these toolsets are extremely capable and work well with both our Crayola palettes and custom 12 pan palettes. As you gain familiarity, you can refine and extend them without needing to rethink the underlying structure.

Each preset represents a complete painting behavior, not just a color choice. Through the Tool Macro Setup, these presets are highly customizable and can be adapted to support extremely complex painting workflows, including controlled mixing, gradients, layered washes, and evolving stroke behavior over time. For most workflows, the recommended approach is to start with the preset closest to your goal, duplicate it, and then adjust parameters to match your brush, paint, paper, and palette layout.

For the majority of users, the preset tools and their macro based customization provide more than enough flexibility to create sophisticated, expressive paintings. For advanced customization beyond the Tool Macro Setup, see our separate guide on editing JSON files for Bantam Tools Studio™.

There are two main concepts used throughout the painting presets: Loaded vs Balanced and Wet vs Scraped.

Loaded vs Balanced

A loaded brush is one that goes directly from the paint to the paper, carrying the maximum amount of pigment. A balanced brush returns to water after loading with paint, adjusting the pigment to water ratio before painting. Balancing is used to control saturation, consistency, and repeatability across strokes.

Wet vs Scraped

A wet brush goes straight to the paper after being loaded or balanced, retaining excess moisture and pigment. A scraped brush is lightly wiped on the edge of the palette to remove excess paint and water, helping prevent drips, pooling, or unintended bleed on the paper.

See the next page for detailed descriptions of each Preset Toolset.

5.3.2 Preset Toolset Template Descriptions

Loaded Brush (Wet)

This preset uses a full wash cycle. The brush first balances itself with water, then pulls paint from a designated basin before painting. It produces wetter, more fluid strokes and is well suited for washes, soft fills, and expressive lines where variation is desirable.

Loaded Brush (Scrape at Paint)

This preset loads the brush with paint, then scrapes excess pigment before painting. The scraping step reduces drips and helps control saturation. It is useful when working with thicker paints or when you want more consistent stroke weight without excessive wetness.

Balance Pigment (Wet)

This preset balances pigment with a water dip but does not scrape to reduce wetness. It sits between a full wash and a dry approach, offering softer strokes with more control than the Loaded Brush (Wet) preset.

Balance Pigment (Scrape at Basin)

This preset balances pigment using a water basin, then scrapes the brush to reduce moisture before painting. It produces more controlled strokes than a fully wet workflow and helps limit pooling or bleeding on lighter paper.

Brush Pen (No Palette)

This preset is intended for soft brush pens or pre-inked brush tools. It does not use a paint palette or refill cycle. The brush moves directly from stroke to stroke, making it ideal for outlines, calligraphic marks, or any tool that carries its own ink or pigment.

12 Pan Custom (Loaded Brush - Wet)

This preset provides a customizable twelve-position palette template using a basic painting technique. It is designed for users who want to define their own color layout and paint sources along with our 12 Pan Palette Accessory. Each pan can be configured to pull from a specific location, making it suitable for custom palettes, mixed color sets, or experimental layouts.

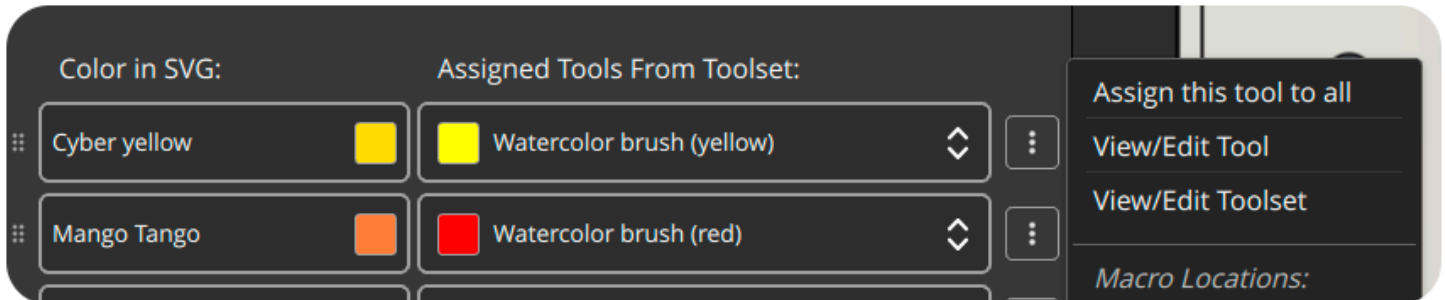
A note on Wet on Wet:

Most preset toolsets include a tool named *WaterColor Brush (Water)*. This tool is configured to paint using water only and is intended for **wet on wet effects**. We recommend leaving **Hold Position on Tool Change** enabled for this tool and confirming that your water is clean before starting a new color, layer, or group.

5.3.3 Quick Edit Tool Settings

The quickest way to change your settings is to edit an existing toolset.

From the **Prepare** tab, in the **Tool Settings** section, select the three dots next to one of the pens, then click **View/Edit Toolset**.



This will take you to your currently selected toolset in the new Tool Library, you can adjust the toolsets parameters. Changes made to preset toolsets will be saved for this session, however, when you restart Bantam Tools Studio these will be reset to the factory preset settings.

You can duplicate the Factory Preset Toolsets and save changes as a User Toolset. These will be saved across sessions.

Some Common Quick Edits:

To slow the whole toolset down, change the XY Feedrate from 5000 to 3000. (Pro tip: ⌘U on mac or ctrlU on pc toggles metric and imperial units).

Adjust your Refill Distance. Click **Save Changes** after each edit.

- **Refill Mode:**
 - *Refill by Distance* gives consistent paint load but may refill mid stroke.
 - *Refill by Stroke* produces a more human feel, since long lines thin out but complete before returning to refill.
- **Refill Distance / Refill After Strokes:**

This sets how far or how many strokes occur between refill macros.
- **Hold Position on Tool Change:**

When enabled, the machine pauses at each color change so layers can dry and you can clear water basins. Disabling it runs all colors without returning home. Click **Save Changes** after each adjustment.

5.4 Painting with Bantam Tools Studio™ Tool Library

5.4.1 What a Tool Represents

A **Tool** represents a complete painting behavior, not a single physical brush or pan. A tool defines how the machine behaves when painting a specific color, layer, or group it's assigned to in the prepare tab, including how it moves, how it interacts with the palette and paper.

In a painting workflow, a tool is not just a brush size, a color, or a stroke parameter. It is a full description of everything that happens before, during, and after a stroke.

A painting tool describes an entire travel and interaction cycle. This can include how the brush primes or washes itself, how it approaches one or more palette locations, how it loads or mixes paint, how it transitions from the palette to the paper, how it draws, and how it lifts and moves away after a stroke. Tools may pull from multiple palette locations, allowing for mixing, balancing, or blending behavior within a single tool.

Because of this, a single tool may involve multiple distinct motions and interactions that together define how paint is delivered to the paper. Two tools may use the same physical brush and the same paints, yet behave very differently depending on refill paths, palette usage, and speeds settings.

Thinking of a tool as a complete behavioral script rather than a physical brush or color assignment is essential for painting with Bantam Tools Studio™. This is what allows complex, repeatable painting behavior to emerge from simple vector paths, while still supporting expressive and mixed-color workflows.

5.4.2 What a Toolset Represents

A **Toolset** represents a reusable painting system. It is a coordinated collection of tools that share a common approach to motion, refill behavior, palette interaction, and painting intent.

A toolset is not tied to a single SVG file. Instead, it is designed to be reused across many files that share similar materials, palette layouts, and painting goals. Once created, a toolset can be applied to any compatible artwork without redefining how paint is loaded or managed.

A toolset can contain **multiple palette layouts**, such as Crayola, 8-pan, 12-pan, or 16-pan palettes. Each palette layout stores its own macro definitions, allowing the same tools to behave correctly even when pigment positions or palette geometry change.

Within a toolset:

- Each tool defines a complete painting behavior for a color, layer, or group
- Tools are designed to work together under shared assumptions
- Palette specific macro behavior is stored per tool, per palette layout

When preparing an SVG file, you select one toolset and work within a single palette layout for that job. The software then uses the appropriate macro definitions from the toolset based on the selected palette.

Thinking of a toolset as a **portable, reusable painting framework** rather than a file specific configuration makes it easier to build consistent workflows, experiment safely, and scale painting projects without reconfiguration.

5.4.3 Tool Editor Structure

The Tool Editor is divided into four sections:

- **3.2.1 Main Variables** define the tool's identity and how it behaves at tool boundaries.
- **3.2.2 Tool Settings** define how the tool moves and interacts with the paper and palette.
- **3.2.3 Tool Macro Setup** defines how the tool loads, balances, and manages paint over time.
- **3.2.4 Metadata** stores descriptive information and notes for organization and reference.

5.4.4 Main Variables

Main Variables control the identity of the tool and how it behaves when transitioning between tools.

In the Toolset Editor you will find four main variables that define how a tool behaves.

Toolset Name

This is where you give the toolset a unique, descriptive name. Naming toolsets clearly is important, especially once you begin duplicating and customizing presets.

Color

This assigns a color to the tool for visual reference only. This color is human-readable and does not affect painting behavior, brush motion, or paint selection in any way.

Hold Position on Tool Change

This setting controls whether the machine pauses before beginning the strokes assigned to this tool.

- **Toggled On (default)**
When enabled, the machine inserts a programmed pause into the G-Code before running the color, layer, or group assigned to this tool. You must press the encoder knob to continue painting.
This pause allows you to intervene in the process. For example, you may want to clean water basins, allow a previous layer to dry, or switch brush sizes or brush types.
- **Toggled Off**
When disabled, the machine continues directly into the strokes assigned to this tool with no human intervention. This is useful for programs that are intended to run start to finish without stopping.

This setting is especially powerful when mixed across tools. For example, in wet-on-wet techniques you might enable holds for clear water application tools, and disable holds for color application tools. This allows the machine to immediately apply color after laying down water, preventing the water layer from drying before painting continues.

5.4.5 Tool Settings

Movement and Clearance

Travel Height determines how high the brush lifts when moving between strokes, palette locations, and the paper. Higher values increase clearance and reduce the risk of dragging a wet brush across the surface.

Feedrates and Acceleration control how quickly the brush moves in the XY plane and along the Z axis. Painting tools typically use slower, more controlled speeds than plotting tools to allow paint to transfer evenly.

Palette Interaction Heights

Paint Pan Height controls how deeply the brush enters a paint pan.

Water Height controls how deeply the brush enters a water basin.

Refill Behavior

Refill Mode determines how and when the brush returns to the palette to reload paint.

- **Refill by Distance:** The brush reloads after traveling a fixed distance. This produces consistent, evenly sized strokes with a more mechanical feel and requires little consideration at the SVG level.
- **Refill by Stroke:** The brush reloads after completing a defined number of strokes. This enables more intentional, stroke-based painting with a more human feel and requires planning during SVG creation.

Refill Distance

Controls how far the brush paints before reloading when using distance-based refills, or how many strokes are completed before reloading when using stroke-based refills.

5.4.6 Tool Macro Setup

Tool Macros define how a tool interacts with the palette before, during, and after painting. This is where Bantam Tools Studio™ describes the sequence of palette actions that make painting possible.

Each tool can have its own set of macros. These macros run automatically as part of the painting process and can pull from one or more palette locations. Together, they define how paint and water are managed over time.

The Tool Macro Setup is divided into five parts:

5.4.6.1 Palette Selection Defines which palette layout's macros are being viewed and edited for the tool.

5.4.6.2 Prime/Wash Runs at the start of a tool change. It is used to clean the brush and reset its state before beginning a new color, layer, or group.

5.4.6.3 Pre-Refill Runs before the main refill action. It is commonly used to add water before paint pickup, mix paints, or create gradients by controlling how often this step runs within the refill cycle.

5.4.6.4 Refill The main paint pickup action. It defines where paint comes from and how the tool loads pigment.

5.4.6.5 Post-Refill Runs after the main refill action. It is used to modify the state of the brush after paint has been picked up and before painting resumes.

5.4.6.1 Palette Selection

In the Tool Macro Setup, the palette chooser on the left is a **view and editing context**, not a global setting. It lets you switch between palette layouts (for example, Crayola vs 12-pan vs 16-pan) so you can **view and edit the macro instructions that are saved for each palette**.

When you switch the view from the 12-pan palette to the 16-pan palette, the 12-pan macros do not go away. Both sets can exist at the same time, saved on the same tool. This is useful because the location of a particular pigment, water basin, or mixing area may be different on each palette, and each layout may require different refill or wash instructions.

Key idea:

- You are not choosing the one palette for your job here.
- You are editing the tool's saved macro behaviors for each palette layout.

Later, when you prepare an SVG file, **only one toolset and one palette are used for that job**. In the Prepare view you select a single toolset, and the job runs using a single palette layout. At that point, the software will use the macros that were configured for that palette.



Understanding the Tool Macro Behaviors as a Whole

This section of the Tool Macro Setup shows the **complete refill cycle** for a tool. Rather than individual, disconnected settings, these controls describe a single repeating sequence that governs how paint and water are managed over time.

Think of this section as a timeline that runs every time the tool is used.

Think of this section as defining two phases of behavior: an **entry phase** and a **refill loop**.

Phase 1: **Entry Phase**

- **Prime/Wash** runs once when the tool is activated, for example when switching to a new color, layer, or group.
- It establishes the starting condition of the tool before painting begins.

Phase 2: **Refill Loop**

Once painting starts, the tool enters a repeating cycle that continues until the tool is changed.

That cycle is:

1. **Pre-Refill**
2. **Refill**
3. **Post-Refill**
4. Return to painting
5. Repeat from **Pre-Refill** when the next refill is triggered

The tool does **not** return to Prime/Wash during this loop. Prime/Wash only runs again when a new tool is selected.

Some tools may rely heavily on all four stages. Others may only use a subset. The behavior of the tool emerges from how these stages are combined and how often they run.

Reading the Interface

Each row in this section represents one stage in the sequence. The text shown is not descriptive prose, it is a literal statement of what the machine will do.

If two tools differ only by a single value in this section, they may still behave very differently over the course of a painting.

Why This Matters

This section is where painterly behavior is actually defined. It controls:

- How wet or dry the tool is over time
- How consistent or variable paint loading becomes
- Whether colors remain clean, mix intentionally, or evolve gradually
- How predictable the painting feels from run to run

Rather than thinking in terms of individual dips or palette locations, it is more useful to think in terms of **cycles and rhythm**. The Tool Macro Setup defines that rhythm, and the painting emerges from it.

Once you understand this section as a single repeating system, adjusting tool behavior becomes far more intuitive and intentional.

A Note About Thinking in Sequences

Each tool's macros form a sequence of actions that repeat throughout a painting. By adjusting palette locations, repeat counts, and intervals, you can fine-tune how wet, dry, consistent, or variable a tool behaves.

Rather than thinking of these settings as individual switches, think of them as choreography. The order and frequency of these steps define the character of the paint marks that appear on the page.

5.4.6.2 Prime/Wash runs at the start of a tool change. It is used to clean the brush and reset its state before beginning a new color, layer, or group.

Prime/Wash is expressed as a simple instruction:

Dip **X** times in locations **A, B** at **Water, Paint, or Other** depth, after a tool change and before any other actions.

“Dip **X** times..”

- Repeat Count (**X**)
The number of dips performed at each palette location.

“...in locations **A, B**...”

- Locations (A, B)
A comma-separated list of palette locations to visit, for example 12, 11 or 1, 3, 4, 1.
Locations are visited in order, and the repeat count applies to each location.

“...at **Water, Paint, or Other** depth...”

- Z-Height Source (Water, Paint, Other)
Defines how deep the brush dips at each location.
 - Water uses the Water Height defined in the tool settings.
 - Paint uses the Paint Pan Height defined in the tool settings.
 - Other allows you to specify a custom Z height for this macro only.

“after a tool change and before any other actions.”

- Prime/Wash always runs immediately after a tool change and before any Pre-Refill, Refill, or Post-Refill actions. Its role is to establish a consistent starting state for the tool before painting begins.

5.4.6.3 Pre-Refill runs before the main refill action. It can be used to bring more water to your pigment. It can also be used to mix paints and create gradients leveraging the refill cycle to control how often this occurs before refills.

It is expressed as a simple instruction:

Dip **X** times in location(s) **A, B** at **Water, Paint, or Other** depth, after every **N** refill cycle(s), before the main refill action.

Each part of this instruction maps directly to a setting.

“Dip X times...”

Repeat Count (X)

The number of dips performed each time Pre-Refill runs.

“...In location(s) A, B...”

Locations (A, B)

A comma-separated list of palette locations to visit, for example **10** or **12, 10**.

Locations are visited in order, and the repeat count applies to each location in the list.

“...At Water, Paint, or Other depth...”

Z-Height Source (Water, Paint, Other)

Defines how deep the brush dips at each palette location.

- **Water** uses the Water Height defined in the tool settings.
- **Paint** uses the Paint Pan Height defined in the tool settings.
- **Other** uses a custom depth set for this macro.

“...After every N refill cycle(s)...”

Refill Cycle Interval (N)

Controls how often Pre-Refill runs relative to refill events.

- **1** means Pre-Refill runs before every refill.
- **2** means it runs before every other refill.
- Higher values run it less frequently.

“...Before the main refill action”

Pre-Refill always runs immediately before **Refill** (the main paint pickup). It does not replace Prime/Wash, and it does not run after the refill.

5.4.6.3 Refill is the main paint pickup action. It defines where paint comes from and how the tool loads pigment.

It is expressed as a simple instruction:

Dip **X** times in location(s) **A** at **Water, Paint, or Other** depth, as the main refill action.

“Dip **X** times...”

Repeat Count (X)

The number of dips performed each time a refill occurs. Increasing this value loads more pigment during each refill event.

“...in location(s) **A**...”

Locations (A)

A comma-separated list of palette locations to visit, for example **1** or **3, 4**.

Locations are visited in order, and the repeat count applies to each location in the list.

These locations define the primary paint source for the tool.

“...at **Water, Paint, or Other** depth...”

Z-Height Source (Water, Paint, Other)

Defines how deep the brush dips at each palette location. *In most painting workflows, Refill uses Paint depth to load pigment directly from a paint pan.*

- **Water** uses the Water Height defined in the tool settings.
- **Paint** uses the Paint Pan Height defined in the tool settings.
- **Other** uses a custom depth set for this macro.

“...As the main refill action”

Refill is the central paint loading step in the refill cycle. It is the point at which pigment is introduced and is typically followed by Post-Refill actions if configured.

Refill defines the baseline color intensity and consistency for a tool. Changes to its locations, repeat count, or depth have an immediate and visible impact on how paint appears on the paper.

5.4.6.4 Post-Refill runs after the main refill action. It is used to modify the state of the brush after paint has been picked up and before painting resumes.

It is expressed as a simple instruction:

Dip **X** times in location(s) **A, B** at **Water, Paint, or Other** depth, after every **N** refill cycle(s), after the main refill action.

“Dip **X** times...”

Repeat Count (X)

The number of dips performed each time Post-Refill runs.

“...in location(s) **A, B**...”

Locations (A, B)

A comma-separated list of palette locations to visit, for example **9** or **9, 10**.

Locations are visited in order, and the repeat count applies to each location in the list.

These locations are commonly used to temper, balance, or adjust paint after pickup.

“...at **Water, Paint, or Other** depth...”

Z-Height Source (Water, Paint, Other)

Defines how deep the brush dips at each palette location. *Post-Refill commonly uses Water depth to reduce excess pigment, though other behaviors are possible.*

- **Water** uses the Water Height defined in the tool settings.
- **Paint** uses the Paint Pan Height defined in the tool settings.
- **Other** uses a custom depth set for this macro.

“...after every **N** refill cycle(s)...”

Refill Cycle Interval (N)

Controls how often Post-Refill runs relative to refill events. *This allows fine control over how often paint is moderated after pickup.*

- 1 means Post-Refill runs after every refill.
- 2 means it runs after every other refill.
- Higher values run it less frequently.

“...after the main refill action”

Post-Refill always runs immediately after Refill and never before it. It does not replace Prime/Wash or Pre-Refill.

Post-Refill is often used to balance pigment load, prevent over saturation, or introduce controlled variation across strokes as the refill cycle progresses.

5.5 *Painting with Bantam Tools Studio™*

Tips for Testing and Calibrating Painting Tools

When setting up and learning a new painting workflow, small tests and deliberate adjustments go a long way. Painting tools behave differently than pens, and results emerge from how motion, palette interaction, refill behavior, and mechanical setup work together over time.

Run a Simple and Short Test Pattern

- Start with a small SVG containing simple paths such as lines, arcs, or a loose spiral.
- Favor strokes with enough length to pull the brush and drag the bristles across the paper, rather than very short segments that only dab the brush, unless that effect is intentional.
- Observe how paint loads, how strokes evolve over time, and how refills affect consistency.

Short tests make it easier to see how refill cycles and macro behavior influence the painting.

Adjust Travel Height

- If the tool drags across the paper between strokes, increase the Travel Height.
- If the tool lifts higher than necessary and feels inefficient, reduce the Travel Height slightly.
- On uneven or warped paper, higher travel heights help prevent unintended contact with wet areas.

Travel Height affects cleanliness and reliability rather than the appearance of individual strokes.

Adjust Brush Compression

Brush contact with the paper is controlled mechanically, not in software. If strokes appear too light, uneven, or fail to make consistent contact, adjust brush compression by physically lowering the brush in the tool holder.

Lowering the brush slightly increases how much the brush flexes when it contacts the paper. This affects stroke width, paint transfer, and overall consistency. Make small adjustments and test frequently.

If strokes appear overly wet, spread too much, or cause paper buckling, raise the brush slightly to reduce compression. Always make mechanical adjustments before compensating with refill or macro settings.

For repeatability, it can be helpful to mark the brush shaft with a Sharpie at your preferred mounting position so you can return to the same setup in future sessions.

Tune Refill Behavior First

- Start by adjusting Refill Mode and Refill Distance or stroke count.
- Shorter refill distances produce more consistent, evenly loaded strokes.

- Longer refill distances allow paint to evolve, dry out, or vary across strokes.

Refill behavior defines the rhythm of the painting and should be tuned before refining individual macro steps.

Refine Macro Behavior

- Adjust Repeat Count and Interval values in Pre-Refill and Post-Refill macros.
- Increasing repeat counts adds more water or pigment per cycle.
- Increasing intervals reduces how often a macro runs, allowing gradual change over time.

Use these controls to balance consistency against variation.

Watch for Paper Response

- If paper buckles, pooling occurs, or edges bleed excessively, reduce overall wetness by increasing refill intervals, reducing repeat counts, or using Post-Refill to temper pigment.
- If strokes appear dry or inconsistent, decrease refill intervals or increase repeat counts.

Paper feedback is one of the most important signals when calibrating painting tools.

Save as a New Tool or Toolset

- Duplicate an existing tool or toolset before making changes.
- Name tools clearly to reflect behavior, palette layout, or paint characteristics.
- Preserve known good configurations so you can return to them easily.

Perform a Repeatability Check

- Run the same test file again using the same setup.
- Confirm that refill timing, stroke evolution, and overall behavior are consistent between runs.
- Minor variation is expected, large differences usually indicate a setup change.

Pro Tip: Create multiple toolsets or tool variations that explore different refill strategies or macro sequences. Run the same SVG with each configuration and compare the results side by side. This is one of the fastest ways to understand how small changes in tool behavior affect the final painting.

6. Troubleshooting

6.1 Common Issues and Solutions

6.1.1 SVG Import Problems

- Issue: SVG doesn't appear correctly in preview
 - Solution: Check that your SVG uses standard formatting. Export from your design software using "Plain SVG" if available.
- Issue: Elements are missing from the imported SVG
 - Solution: Ensure all elements are properly grouped or converted to paths in your design software before exporting.

6.1.2 Plotting Quality Issues

- Issue: Lines are too light or inconsistent
 - Solution: Increase the Draw Depth to apply more pressure to the pen.
- Issue: Lines are too heavy or the pen is catching on the paper
 - Solution: Decrease the Draw Depth and/or reduce the plotting speed.
- Issue: Curves appear jagged
 - Solution: Ensure "Use Curves" is enabled in Path Generation Options and decrease the Precision value for smoother curves.

6.1.3 Machine Problems

- Issue: Machine won't home correctly:
 - Solution: Check that all areas are clear of items that might block movement, including inside the rails.
- Issue: Plotter starts but then pauses unexpectedly
 - Solution: Check that your G-Code file isn't corrupted and that the microSD card is properly formatted.

6.2 Getting Help

If you encounter an issue not covered in this troubleshooting section, please refer to the support resources listed in section 0.3.

7. Glossary & Reference material

7.1 Glossary

- G-Code: A language used to tell computerized machine tools how to move
- SVG (Scalable Vector Graphics): A vector image format based on XML
- Feedrate: The speed at which the tool moves along the programmed path
- Acceleration: How quickly the tool reaches its target feedrate
- Draw Depth: The distance the pen travels past the point of contact with the paper

7.2 G-Code Reference

The G-Code generated by Bantam Tools Studio™ uses standard commands compatible with the Bantam Tools ArtFrame™, Bantam Tools EggBot™, and many other plotting devices. Here are some of the most commonly used commands:

- G0: Rapid positioning (pen up)
- G1: Linear interpolation (pen down)
- G2/G3: Clockwise/Counterclockwise circular interpolation
- M3/M5: Tool on/off (pen down/up)
- ⌘+u / Control+u: Toggle between inches and millimeters
- ⌘+o / Control+o: Open an SVG file
- ⌘+s / Control+s: Save current settings

7.4 File Format Compatibility

Bantam Tools Studio™ works primarily with SVG files. The following SVG export settings are recommended for optimal compatibility:

- Plain SVG format (not SVG with CSS or compressed SVG)
- Convert text to paths before export if using uncommon fonts
- Use "Preserve Illustrator Editing Capabilities" if exporting from Adobe Illustrator

This guide should help you make the most of Bantam Tools Studio™. Remember to check for updates regularly, as we continue to improve the software with new features and refinements. If you have any questions, please reach out to us through one of the support resources listed in section 0.3.