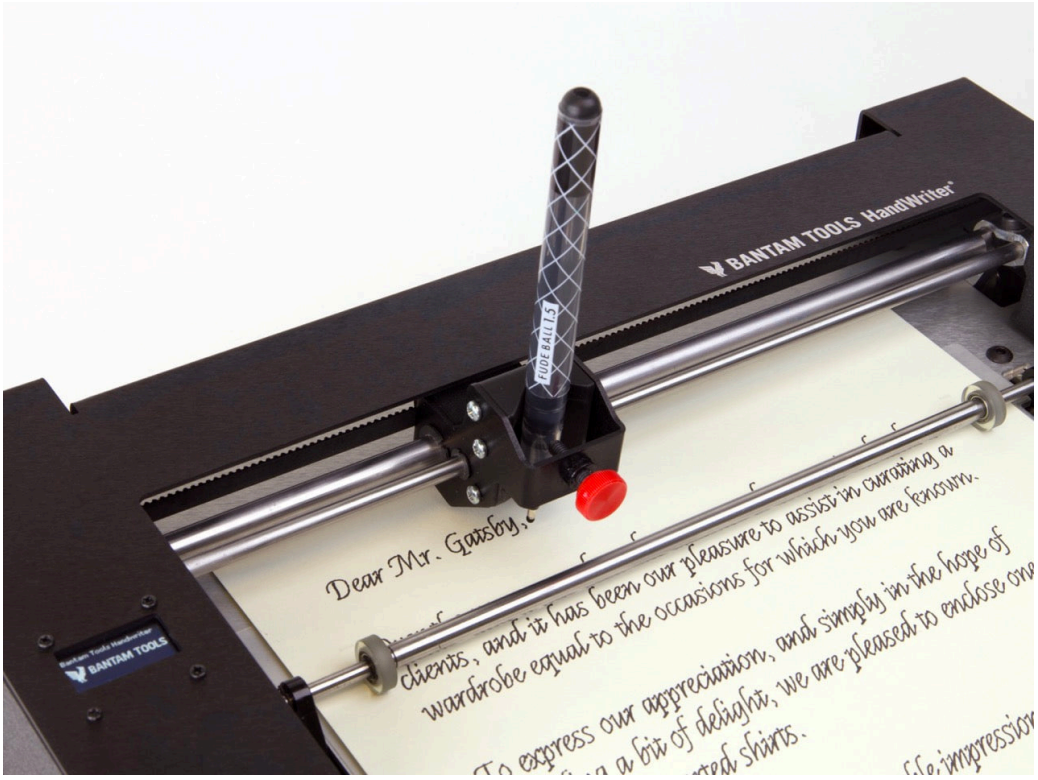
Bantam Tools HandWriter®

User Guide

Set up, operate, and maintain your HandWriter, then turn digital letters into real pen-written pages.



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Part I: Getting Started

0. Preliminaries

This chapter covers what this guide contains, where to start if you want to be writing quickly, and how to reach us.

0.1 About this guide

This guide covers the Bantam Tools HandWriter® hardware, from safe setup and first use through paper handling, pen selection, operation, and maintenance. It also introduces the Bantam Tools Studio™ workflows used to prepare letters and other writing jobs.

0.1.1 Before you begin

1. Read §2. Safety and safe operation before powering on the machine.
2. Check the included parts in §4. Included parts and accessories.
3. Follow §3. Unboxing the HandWriter through §6. Writing the Welcome Letter to unbox the HandWriter and write the included Welcome Letter.

> ***Note:*** The Studio chapters in this guide cover Bantam Tools Studio as the HandWriter uses it. The separate Bantam Tools Studio guide (bantam.tools/btsguide) also covers painting and the Image Processor.

0.2 Support and online resources

If you run into a problem, have a question, or are not sure whether your Bantam Tools HandWriter® is behaving as expected, please reach out. We're glad to help with any question, whether you're troubleshooting setup, software, files, paper loading, pen loading, writing quality, or machine operation, or working out how to do something this guide doesn't cover.

0.2.1 Contacting support

Email: support@bantamtools.com

Phone: +1-347-422-6826

Support hours: Monday through Friday, 9 am to 5 pm Eastern time, excluding holidays.

Support contact form: https://support.bantamtools.com/hc/en-us/requests/new

Discord support chat: https://bantam.tools/chat

0.2.2 What to include when contacting support

Please include:

- Your name and order number, if available.
- Your machine serial number, if available.
- The version of Bantam Tools Studio™ you are using.
- What you're trying to accomplish.

If something isn't working as expected, these also help:

- What happened, and what you expected instead.
- Whether you are using USB, WiFi, or the microSD card.
- The firmware version, from **Settings → Version** on the machine's display or, with the machine connected, from Studio's **Check for Updates** window; see §10.11 The Settings menu and §22.8.3 Check for Updates.
- Photos or a short video of the issue.
- Any error message shown on the machine screen or in Bantam Tools Studio™.
- Diagnostic information from Bantam Tools Studio™, which includes none of your documents. Studio offers it two ways: **Copy Diagnostics**, beside a connection error on the **MACHINE** tab, copies a short version to paste into your message; **Save Support Bundle** on the **SETTINGS** tab (⇧⌘D / Ctrl+Shift+D) saves a fuller version as a file to attach, at any time.
- If you're comfortable sharing it, your Bantam Tools Studio™ project file (`.btsp`). It holds your documents and settings along with the same diagnostic information; see §25.4 Project files.
- If the problem happens while running a G-Code file, such as from the microSD card, that file as well; project files don't include exported G-Code.

A clear photo or short video is often the fastest way for us to understand what is happening, especially for paper loading, pen loading, writing quality, or motion issues.

0.2.3 Software and documentation

Bantam Tools Studio™ is updated from time to time. The software will check for updates when an internet connection is available, and you can also check for updates from the Settings tab.

The latest documentation and support resources are available online.

Online resources:

- Website: https://bantamtools.com
- Documentation and resources: https://bantam.tools/hwdocs
- Support chat: https://bantam.tools/chat
- Contact support: support@bantamtools.com

0.2.4 Sharing your work

Once you have completed a letter, drawing, or campaign with the HandWriter, we would love to see it.

If you are using your HandWriter to make artwork and would like to share it with others, PlotterFiles (plotterfiles.com) is the Bantam Tools community site for pen plotter artwork. There, you can upload the SVG or other source file so that others can plot it too, along with a photo of the finished piece.

If you post your work on Instagram or another social media platform, please consider tagging @bantamtools so that we can see what you made.

1. Introducing the HandWriter

The Bantam Tools HandWriter® writes letters with a real pen. This chapter covers what it does, what it works with, and how the rest of this guide is laid out.

1.1 What the HandWriter does

The HandWriter is a pen plotter built for writing. It turns the text of a document into pen strokes that look handwritten.

That makes it a good fit for correspondence that should feel personal: letters, customer follow-ups, donor letters, and direct mail inserts, as well as invitations, cards, and other personalized pieces.

1.2 Software and connections

You prepare writing jobs in Bantam Tools Studio™, the software that runs on your computer. The Studio license that comes with the HandWriter includes the Bantam Tools Studio Text Add-On, so the full writing workflow is available as soon as the license is active. See §26.5 About the Text Add-On for what the add-on adds.

There are three ways to get a file onto the HandWriter:

- On the included microSD card, which lets the HandWriter run files with no computer connected. We recommend it while you are learning the machine, because it needs no connection setup.
- Over USB, a direct cable connection to your computer.
- Over WiFi, once Studio has connected the machine to your network.

§15. Sending files to your machine compares the three.

1.3 Pens and paper

The HandWriter comes with a Pilot G2 gel pen, which writes a smooth line with very little pressure. We also recommend the BIC Bold 1.6 mm pen for a bolder line, and the machine can work with many other common pens (see §11. Pen loading and pen compatibility).

The most common paper sizes are 8.5" × 11" (US Letter) and A4, and the HandWriter also accepts 8.5" × 14" (US Legal). Smaller formats such as 8.5" × 5.5" (Half Letter) and A5 work well for cards and invitations. §13. Paper handling covers sizes, margins, and loading.

1.4 How this guide is organized

Getting Started, the part you are reading, takes you from unboxing to your first written letter through three walkthroughs. In the first, the HandWriter writes the Welcome Letter from the microSD card, with no computer involved (§6. Writing the Welcome Letter). Next, you install Studio and write your first letter in it (§8. Writing your first letter). Finally, you send that letter to the machine (§9. Sending your letter to the HandWriter).

Working with your machine covers everyday operation in more depth: pens, paper, connections, sending files, batches, signatures, and maintenance. Reference collects specifications and the Studio chapters that matter for writing. The Appendices hold SVG templates, a glossary, and troubleshooting.

2. Safety and safe operation

Before using your Bantam Tools HandWriter®, take a moment to review these safety guidelines. The HandWriter is designed to be approachable and easy to use, but it is still a computer-controlled machine with moving parts, a powered carriage, a paper path, and a pen holder.

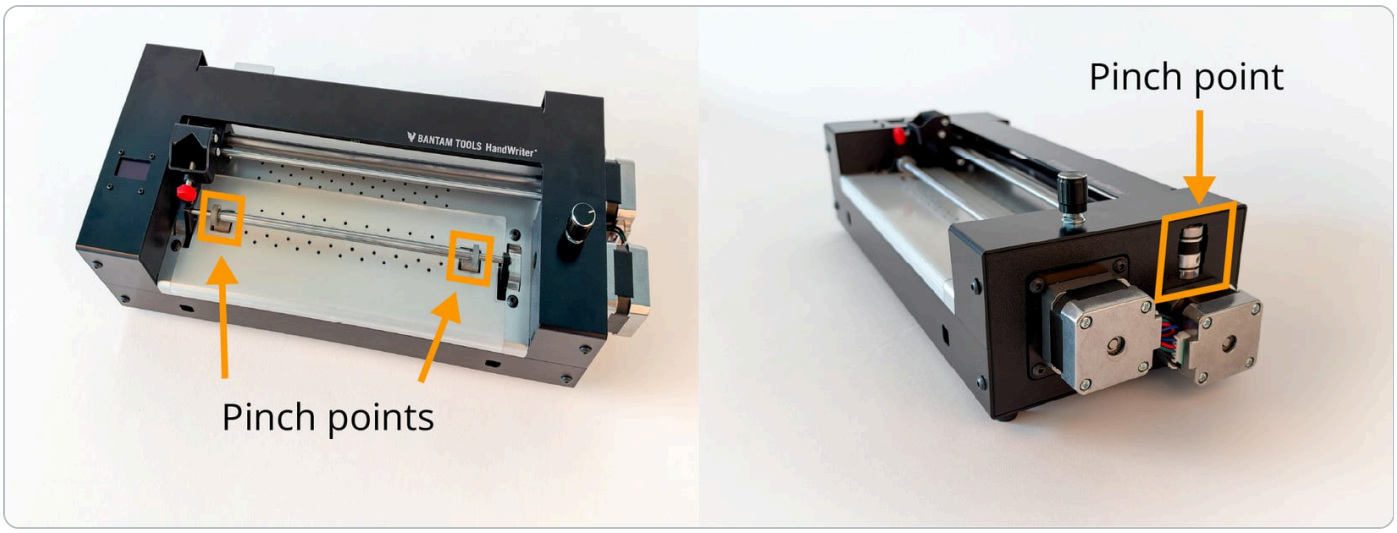
Use care whenever the machine is powered on, moving, or waiting for you to load paper or a pen.

2.1 Moving parts and pinch points

The HandWriter contains moving parts that can pinch, catch, or pull in loose objects during operation.

There are three primary pinch points on the machine:

- Two grit rollers, which drive the paper, located beneath the pinch rollers
- One belt pulley located on the right side of the machine



The HandWriter's three pinch points: the two grit rollers beneath the pinch rollers (left), and the belt pulley on the right side of the machine (right).

Keep fingers, hair, clothing, jewelry, tools, and other loose objects away from the moving carriage, the rollers, and the paper path whenever the machine is powered on.

Never reach into the machine while it is writing, homing, feeding paper, or moving to the pen loading position.

If you need to stop the machine during a job, use the control knob to pause or cancel the file and wait for all motion to stop before reaching into the machine.

2.2 Paper loading safety

The HandWriter is designed to pause so you can safely load paper and install the pen before writing begins.

Keep your fingers clear when lowering the pinch rollers onto the sheet.

Do not force paper into the machine. If the paper does not sit flat or does not feed correctly, remove it and reload it.

See §13. Paper handling for paper-loading instructions.

2.3 Electrical safety

Use only the power supply provided with your HandWriter, or a replacement supplied or approved by Bantam Tools. Do not use the machine if the power supply, its cable, or its plug appears damaged. Do not pull on the cable to unplug the machine. Hold the plug or connector when disconnecting power. Keep power and USB cables away from the paper path and moving parts. Do not use the HandWriter in wet or damp conditions. Turn the machine off before unplugging power or moving the machine.

2.4 Safe handling and placement

Place the HandWriter on a stable, flat surface with clear space in front of and behind the machine, since the sheet moves both ways through it while writing. Do not place the machine near the edge of a table or desk. Make sure cables are routed so they will not be pulled, tripped over, or caught by the moving parts of the machine. Do not place objects on top of the machine or inside the paper path.

2.5 Children, pets, and small parts

The HandWriter includes small parts and accessories, including pens, screws, cables, and a microSD card. These may pose a choking hazard to small children. Keep small parts, pens, and accessories away from children and pets. Do not allow children to operate the machine without adult supervision.

2.6 Modifications and repairs

Do not modify your HandWriter or attempt unsupported repairs. Unsupported modifications can cause abnormal operation, damage the machine, or create a safety hazard. They may also void the warranty. If your HandWriter needs service, contact Bantam Tools support. We will help you troubleshoot the issue and determine the best next step.

2.7 General operating guidelines

Before starting a file, check that:

- The machine is on a stable surface.
- The paper is loaded correctly.
- The pen is installed securely.
- The paper path is clear.
- Your hands and any loose objects are away from the moving parts.

Stay nearby while the HandWriter is running, especially during your first few jobs.

When the job is complete, remove the finished sheet before starting the next file.

3. Unboxing the HandWriter

This chapter walks you through removing the Bantam Tools HandWriter® from its packaging and getting the machine ready for first setup.

3.1 Opening the box

Place the box on a stable surface with enough room to remove the machine safely.

Open the box carefully and remove any loose accessories or packing material from the top of the machine.

Set the accessories aside somewhere close by so you can find them easily during setup.

3.2 Removing the HandWriter

Lift the HandWriter out of the box carefully.

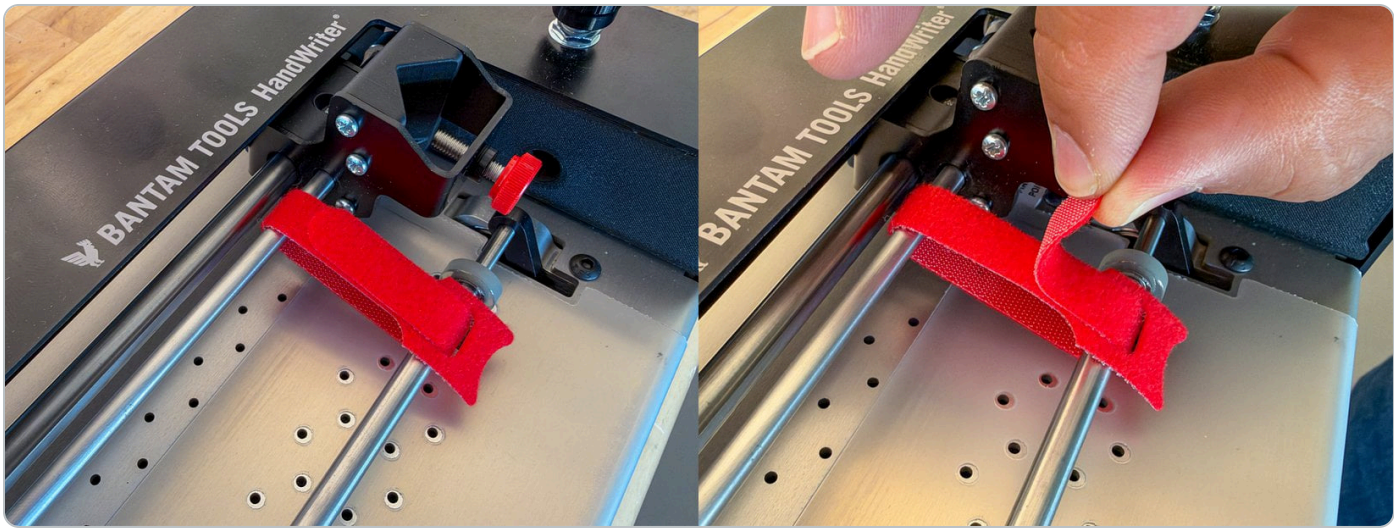
Use both hands and support the machine from the base. Do not lift the machine by the carriage, pinch rollers, cables, or any moving parts.

Place the HandWriter on a stable, flat surface.

3.3 Removing packing material

Remove the foam and packing material from around the machine.

A hook-and-loop strap secures the carriage in place for shipping. Open the strap and remove it.



The strap that secures the carriage for shipping (left), and opening it (right).

Check the paper path, carriage area, and accessory area for any remaining packing material before powering on the machine.

Do not power on the HandWriter until all packing material has been removed.

3.4 Choosing a setup location

Place the HandWriter on a stable, flat table or desk.

Make sure there is clear space in front of and behind the machine, since the sheet moves forward and back through it while writing.

Route the cable from the power supply, and a USB cable if you connect one, so they will not cross the paper path, catch on the moving carriage, or create a tripping hazard.

3.5 Keeping the packaging

We recommend keeping the original packaging, at least while you are getting started.

The packaging lets you store the machine or move it safely, and it is on hand if you contact Bantam Tools support about shipping or service.

4. Included parts and accessories

Your Bantam Tools HandWriter® ships with the parts and accessories needed to get started. Before setting up the machine, take a moment to remove everything from the box and confirm that you have the included items.

4.1 Included items

Included items:

- Bantam Tools HandWriter® machine
- 9 V, 2.5 A power supply
- USB A-to-B cable
- microSD card
- Pilot G2 gel pen, blue, 0.7 mm tip

The International Edition includes a multi-plug power adapter with region-specific plug options.

Your digital delivery email also includes:

- Bantam Tools Studio™ license with the Text Add-On

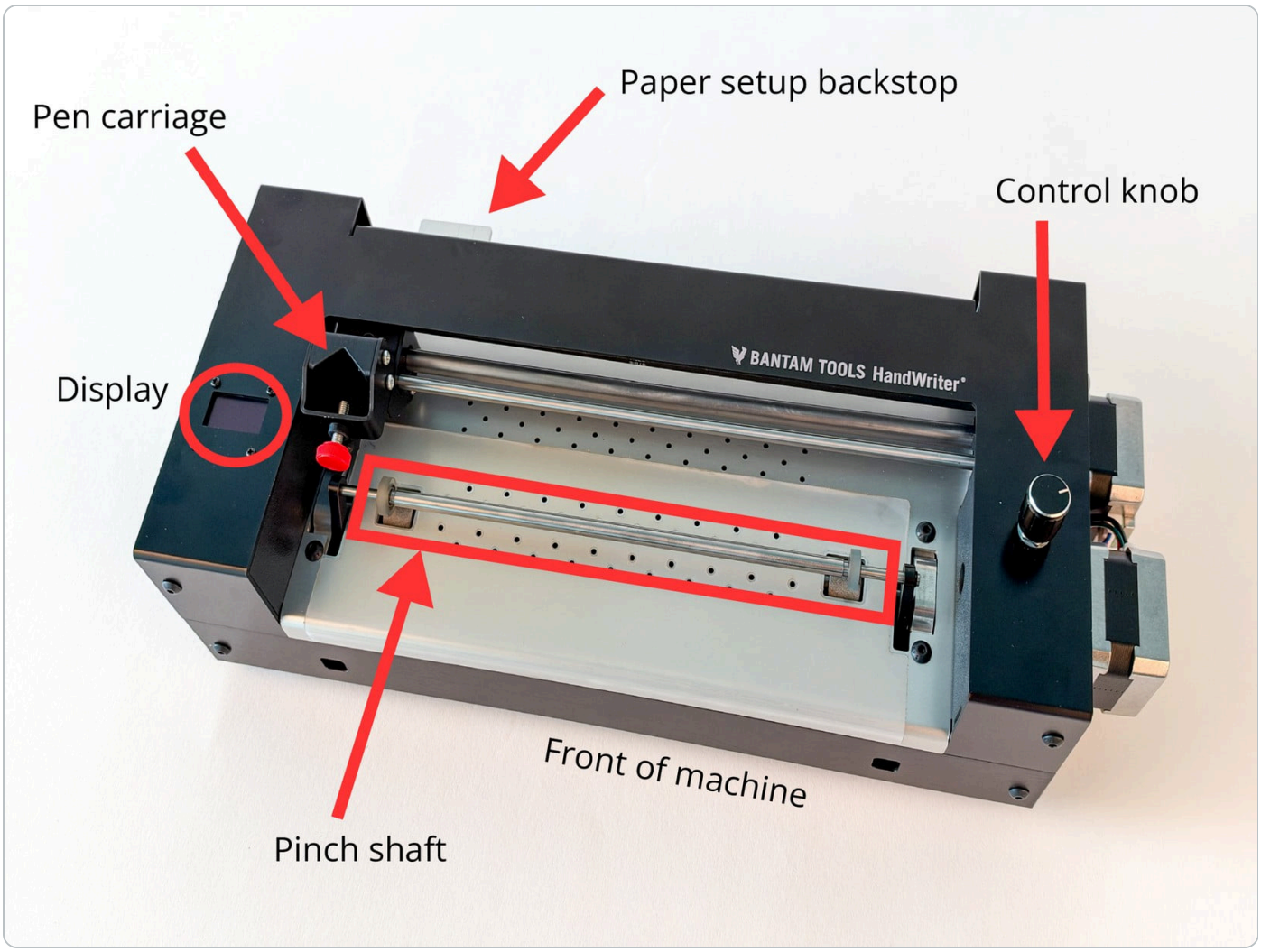
Set the accessories aside somewhere close by while you work through the first setup. You will need the power supply to turn on the machine, the microSD card to run the included Welcome Letter, the pen to complete your first written sheet, and the USB cable when you connect the HandWriter to a computer.

> ***Note:*** The included microSD card contains the Welcome Letter file used in the first setup walkthrough. Keep this card with your HandWriter accessories so you can use it again later if needed.

5. HandWriter anatomy

This chapter provides reference documentation for the main parts of the Bantam Tools HandWriter® and where they are on the machine.

5.1 Front view

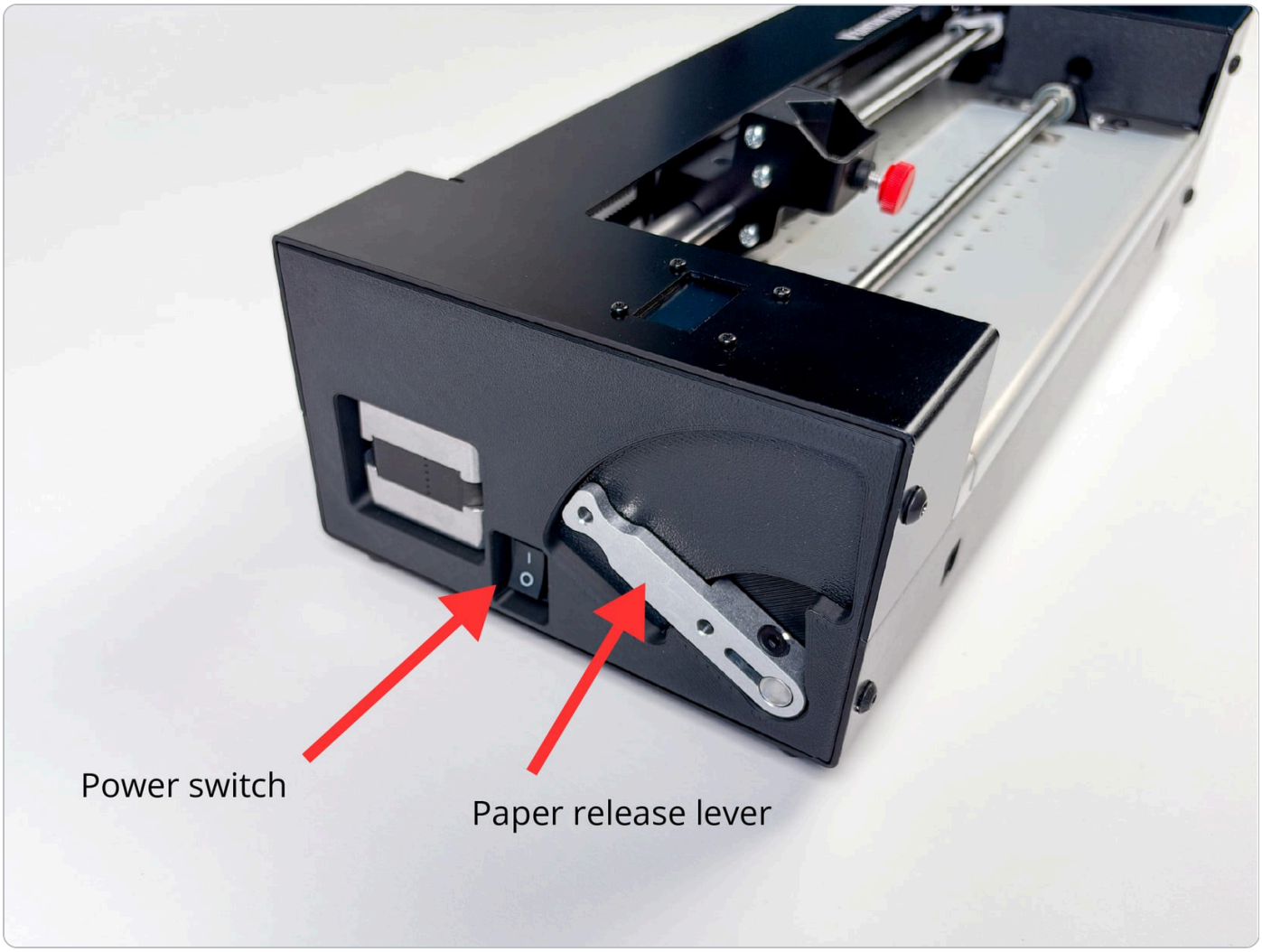


The HandWriter from the front, with its main controls and moving parts labeled.

- **Pen carriage** — holds the pen in its pen clip and carries it across the paper. See §11. Pen loading and pen compatibility.
- **Display** — the small screen on the left end of the machine, which shows its menus and the progress of a file.
- **Control knob** — the knob on the right end of the machine, and its only control: turn it to move through the menus, and press it to select. See §10. The HandWriter interface.
- **Paper setup backstop** — the edge at the back of the machine that a sheet seats against while you load it. It is raised while you load paper and lowered before writing. See §13. Paper handling.

- **Pinch rollers** — the two rollers across the paper path that press the sheet against the **grit rollers** beneath them, which drive the paper. Raise and lower them with the paper release lever.

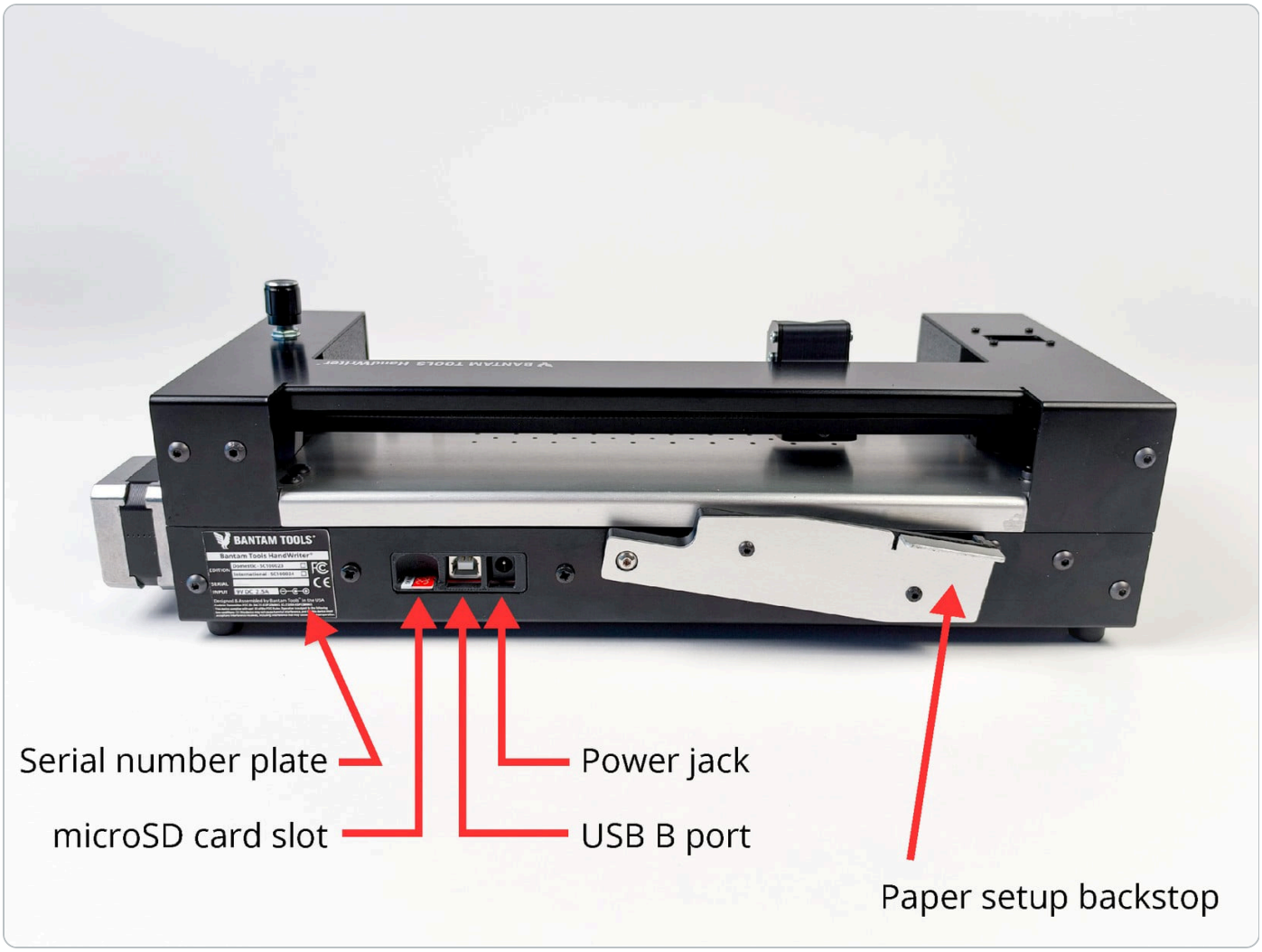
5.2 Left side



The left side of the HandWriter, with the power switch and the paper release lever labeled.

- **Power switch** — turns the HandWriter on and off. See §6.4 Turning the machine on.
- **Paper release lever** — raises and lowers the pinch rollers. Push it back, away from you, to raise them, and pull it toward you to lower them. See §13. Paper handling.

5.3 Back view



The back of the HandWriter, with its connectors, serial number plate, and paper setup backstop labeled.

- **Serial number plate** — shows the machine's serial number and its power input rating. Include the serial number when you contact support.
- **microSD card slot** — holds the microSD card, inserted with its label up. See §6.3 Inserting the microSD card.
- **USB B port** — takes a USB B cable, which connects the HandWriter to a computer. See §14. Power, USB, and microSD details.
- **Power jack** — takes the plug from the included 9 V, 2.5 A, center-positive power supply.
- **Paper setup backstop** — the same backstop shown in the front view, seen from behind.

6. Writing the Welcome Letter

The microSD card that comes with the Bantam Tools HandWriter® holds a ready-to-run file, the Welcome Letter. It is the first of three walkthroughs in this part of the guide. The HandWriter writes it on its own, with no computer involved, which confirms that the machine arrived in good working order.

Before the HandWriter can write anything, it needs a place to sit, power, and the included microSD card. This chapter sets up all three, turns the machine on, and then writes the letter. Keep the included Pilot G2 gel pen and a sheet of 8.5" × 11" (US Letter) or A4 paper at hand.

6.1 Placing the machine

Set the HandWriter on a stable, flat surface, away from the edge of the table or desk. Leave clear space in front of and behind the machine: the sheet moves forward and back through it while the HandWriter writes.

Keep the area on top of the machine and inside the paper path clear. (See §2. Safety and safe operation for the complete placement and electrical safety guidelines.)

6.2 Connecting the power supply

> ⚠ **Warning:** Use only the power supply provided with your HandWriter, or a replacement supplied or approved by Bantam Tools. Do not use the machine if the power supply, its cable, or its plug appears damaged.



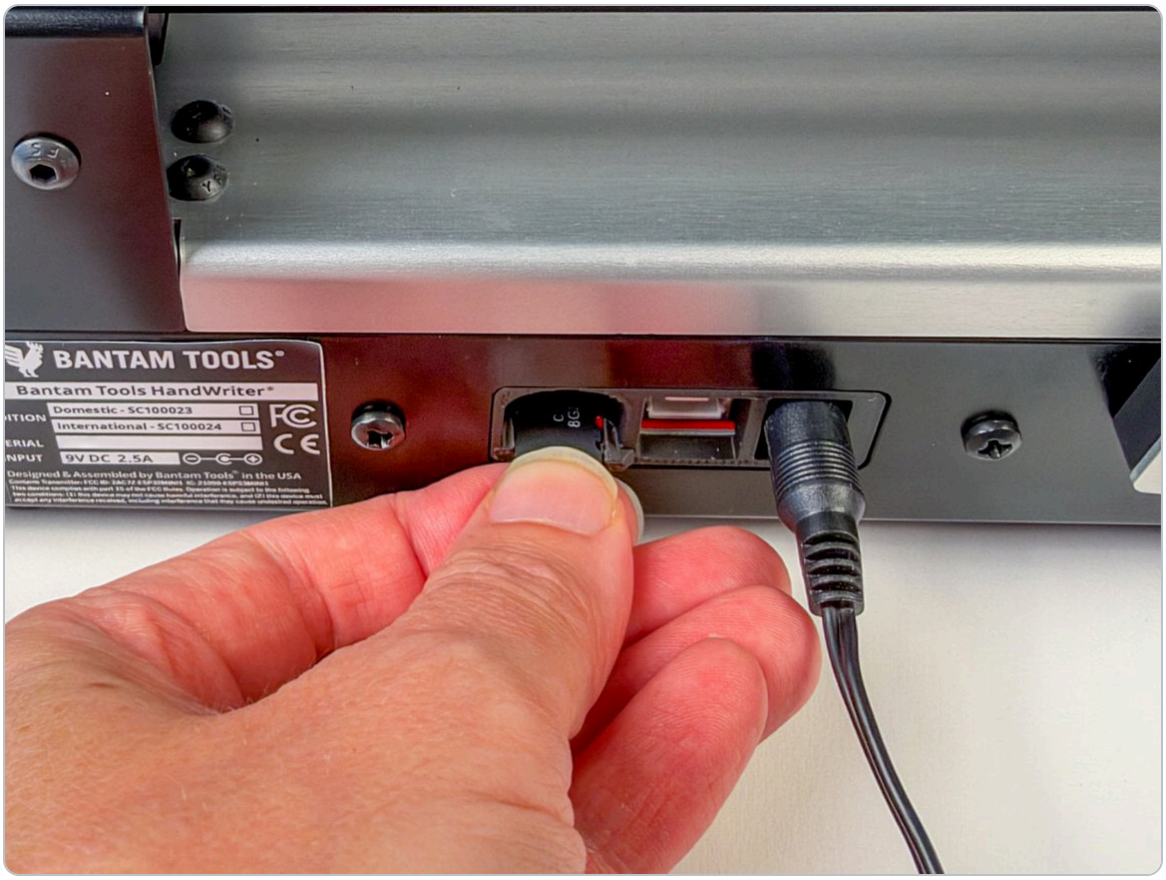
The power supply's plug in the power jack, at the right of the connector panel on the back of the HandWriter.

Plug the included 9 V, 2.5 A, center-positive power supply into the power jack on the back of the HandWriter. Seen from behind, it is the rightmost of the three connectors.

Plug the power supply into a wall outlet. Route the cable from the power supply so that it will not be pulled, tripped over, or caught by the moving parts of the machine, and keep it away from the paper path.

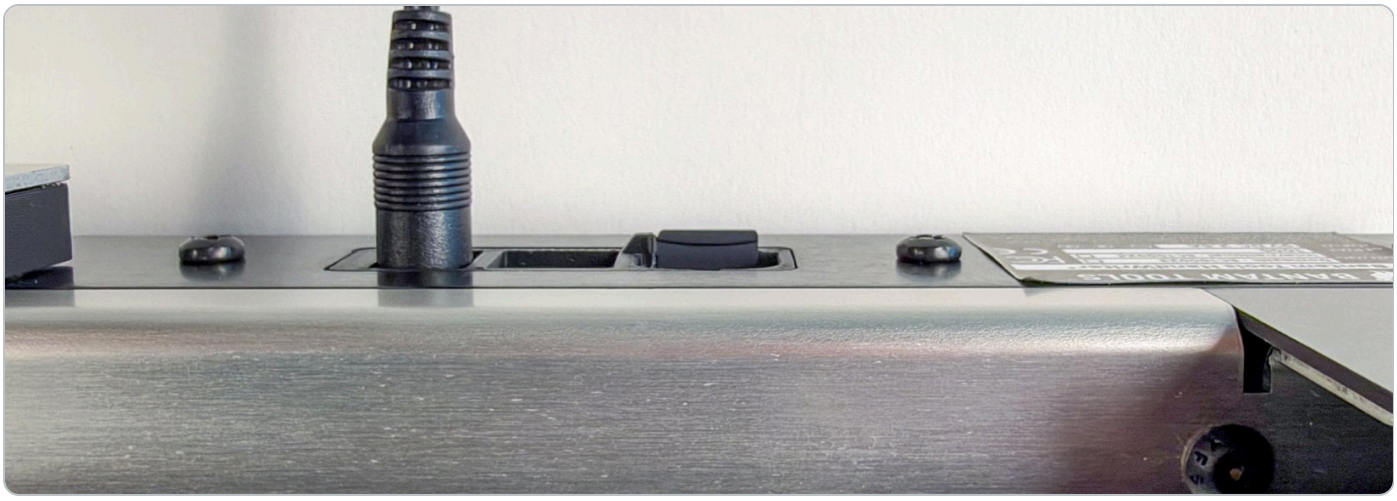
6.3 Inserting the microSD card

The included microSD card holds the Welcome Letter. It ships separately from the machine, so insert it now. The microSD card slot is on the back of the HandWriter. Seen from behind, it is the leftmost of the three connectors.



Inserting the microSD card into its slot on the back of the HandWriter.

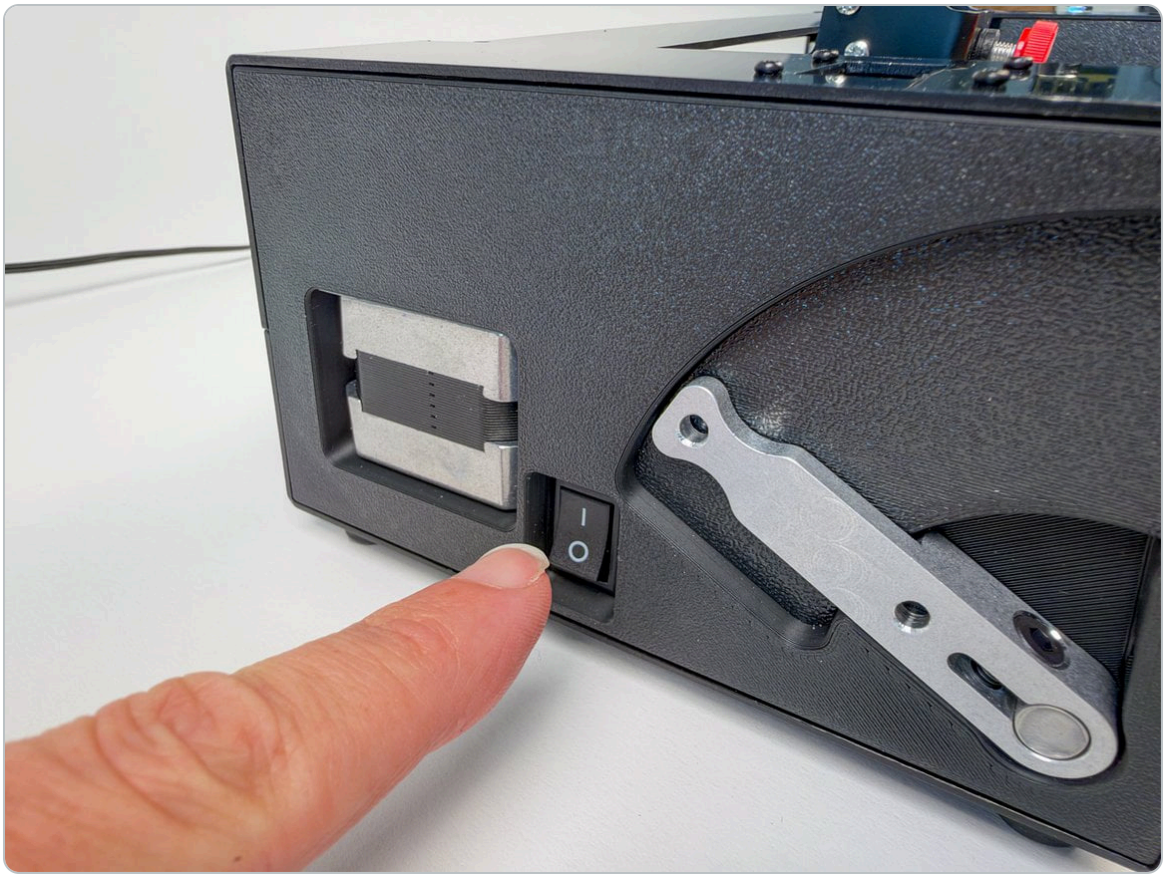
Hold the card with its label up and its gold contacts down, and push it into the slot until it is fully seated.



An inserted microSD card, seen from above the machine: the end of the card shows in its slot.

Looking down from above the machine is the easiest way to check that the card is in place. This is the view you will usually have of it.

6.4 Turning the machine on

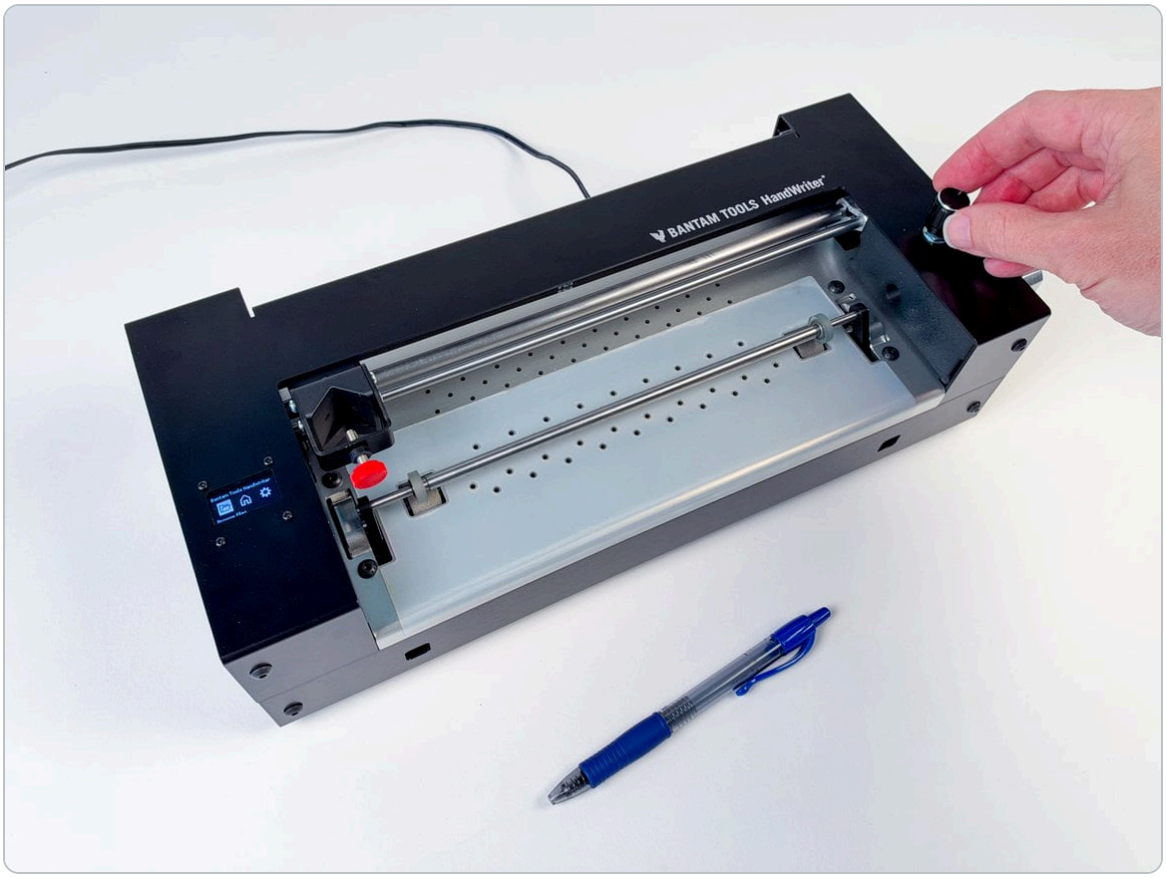


The power switch, on the left side of the HandWriter.

Turn on the HandWriter with the power switch on its left side. Once the machine has started, the display shows the main menu.

Turn the machine off before unplugging power or moving the machine.

6.5 Selecting the Welcome Letter



Turning the control knob, with the main menu on the display.

Leave the pen and paper aside for now. You start the file first, and the HandWriter pauses and asks for them once it is ready.

Turn the control knob until **Browse Files** is highlighted, then press the knob to open the file browser.



*The main menu, with **Browse Files** highlighted.*

The file browser lists the files and folders on the microSD card. Turn the knob to highlight `Hello_HandWriter.gcode`, the Welcome Letter. It mixes handwriting and drawing to show what the machine does.

Press the knob to start the file. The HandWriter begins with its automatic homing sequence, which it runs before the first file of each session; it does not start writing yet. Keep your hands off the machine while it homes, and mind the pinch points described in §2. Safety and safe operation.



The file browser, with `Hello_HandWriter.gcode` highlighted.

Once homing finishes, the HandWriter moves to its pen loading position and pauses. The display names the pen to install: **Install Blue G2-0.7**. Nothing more happens until you press the knob again, so take your time with the pen and paper.



The Welcome Letter paused, asking for the blue G2 pen.

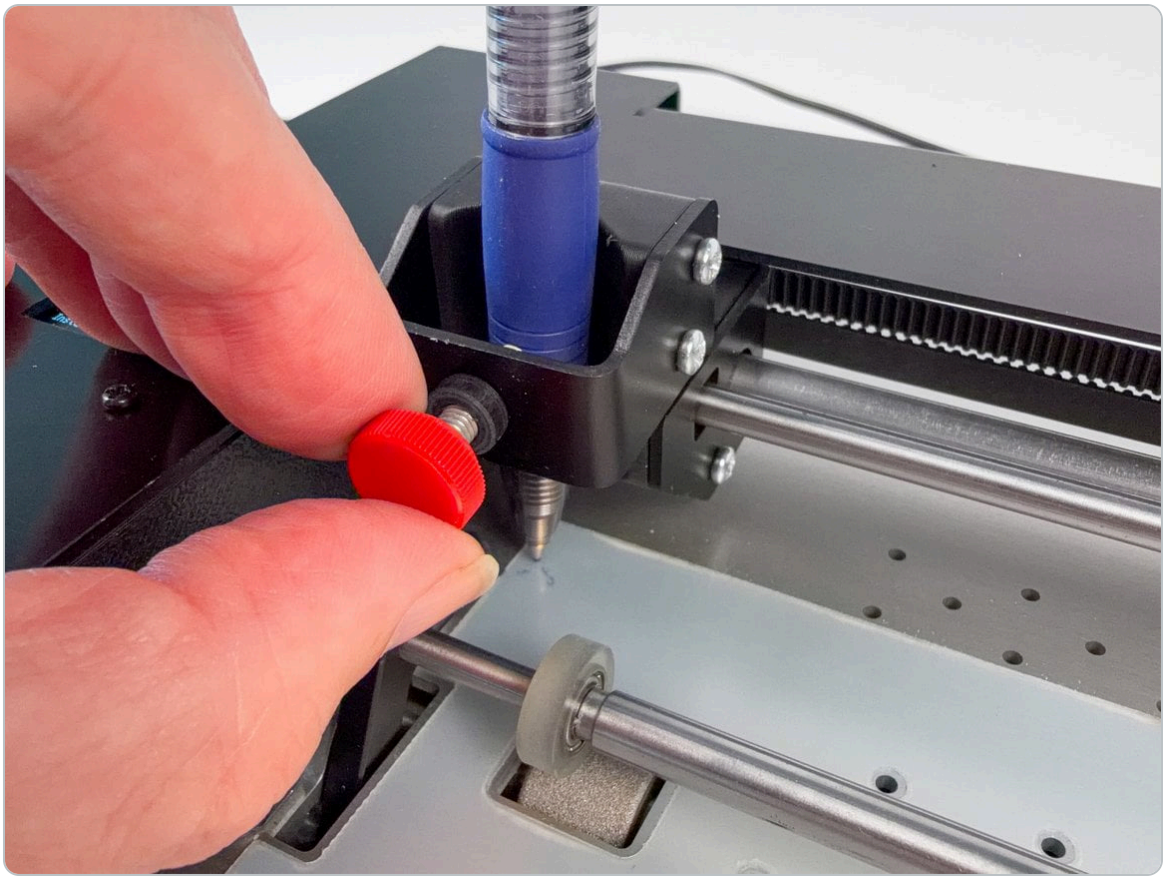
6.6 Installing the pen



The included Pilot G2 gel pen, with its point extended.

Press the button on the end of the included Pilot G2 gel pen to extend its point. The pen is new, so draw a few lines on a scrap of paper first to start the ink flowing.

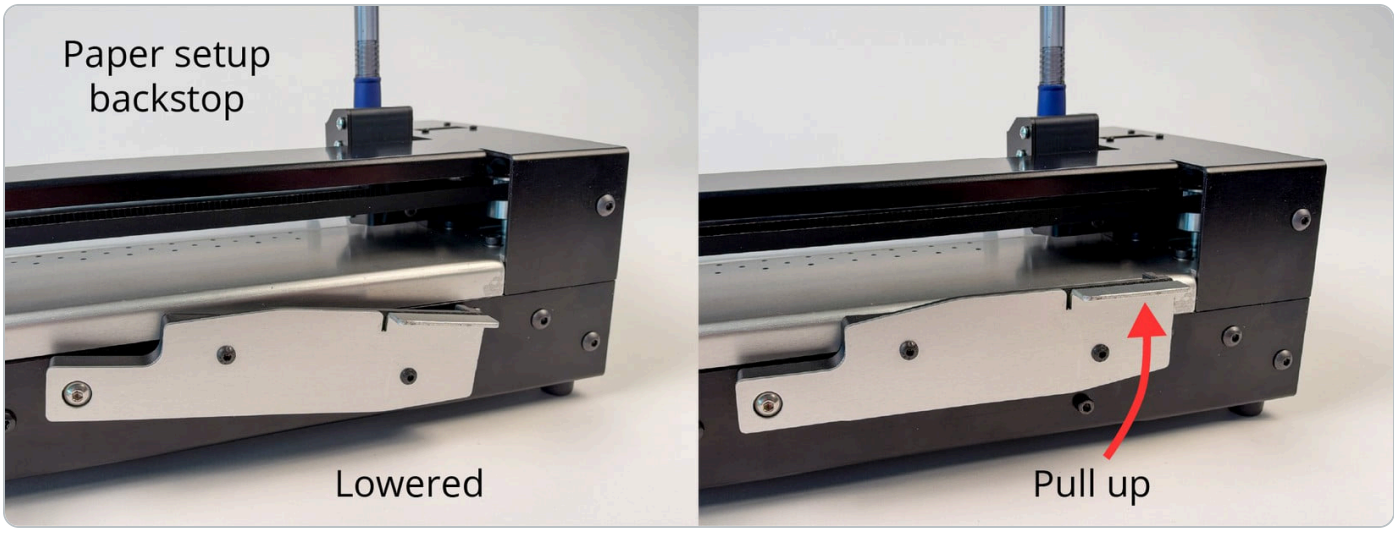
Insert the pen into the pen clip until its tip rests directly on the writing surface. Let the pen sit naturally and vertically in the clip; do not lean it back while inserting it.



Tightening the red thumbscrew, with the pen tip resting on the writing surface.

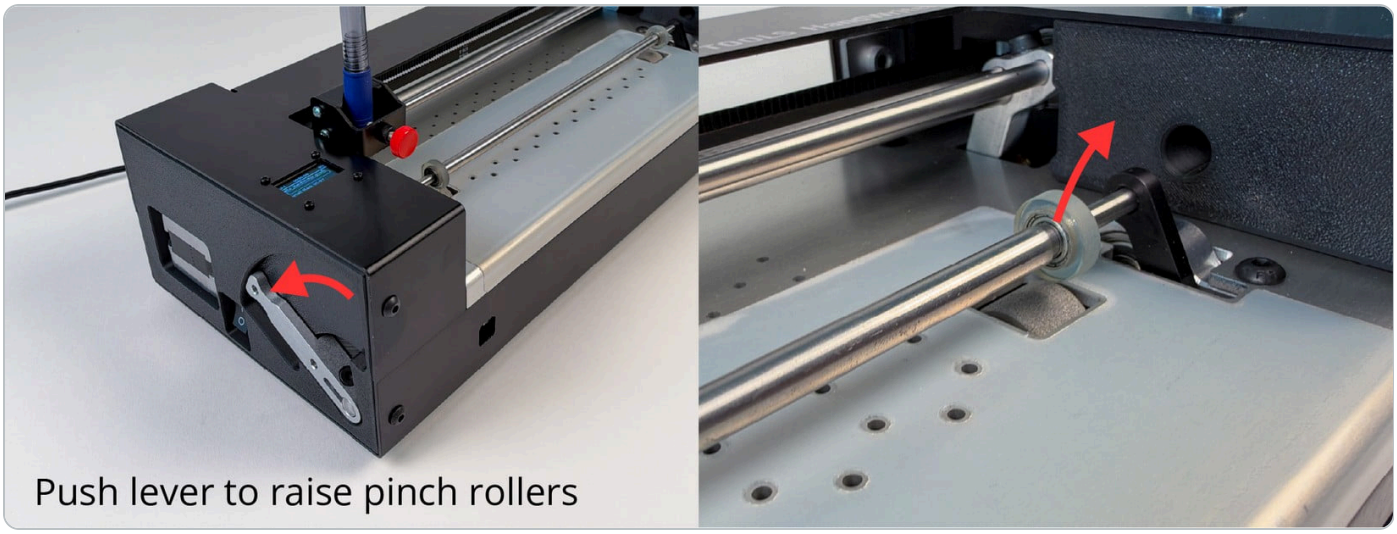
Tighten the red thumbscrew only enough to hold the pen securely. (Overtightening can damage the pen body.)

6.7 Loading the paper



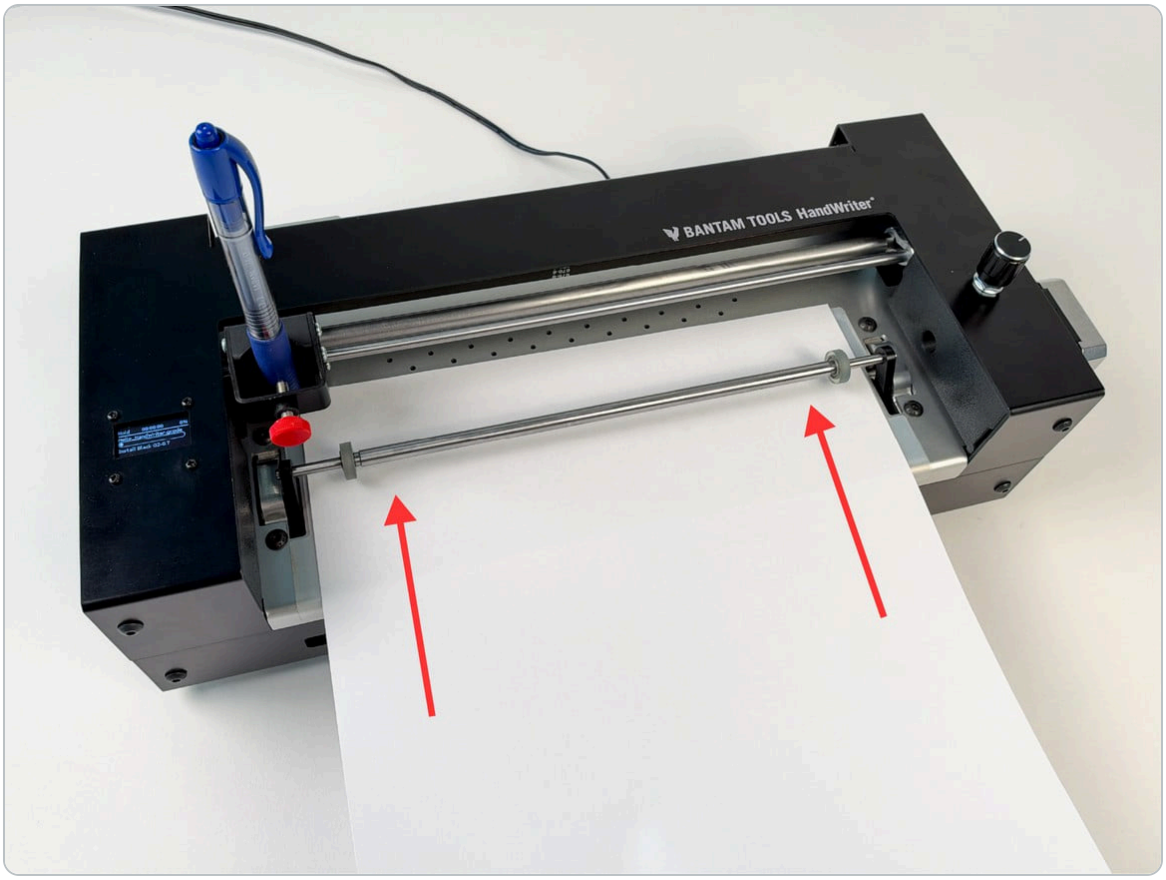
The paper setup backstop, lowered (left) and raised (right).

At the back of the machine, lift the paper setup backstop into its raised position. A sheet you load seats against it.



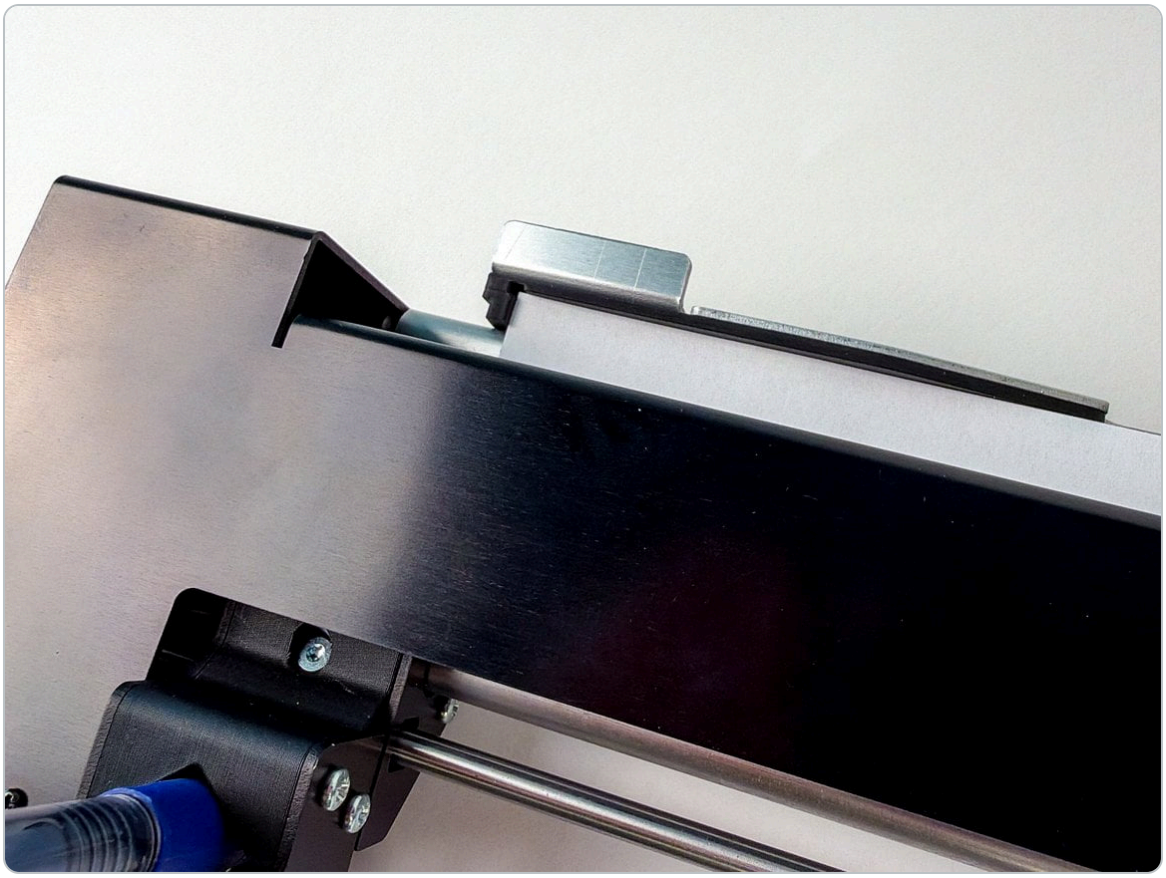
Pushing the paper release lever back raises the pinch rollers off the paper path.

On the left side of the machine, push the paper release lever back, away from you. This raises the pinch rollers so the sheet can slide under them.



Sliding the sheet in from the front, under the raised pinch rollers.

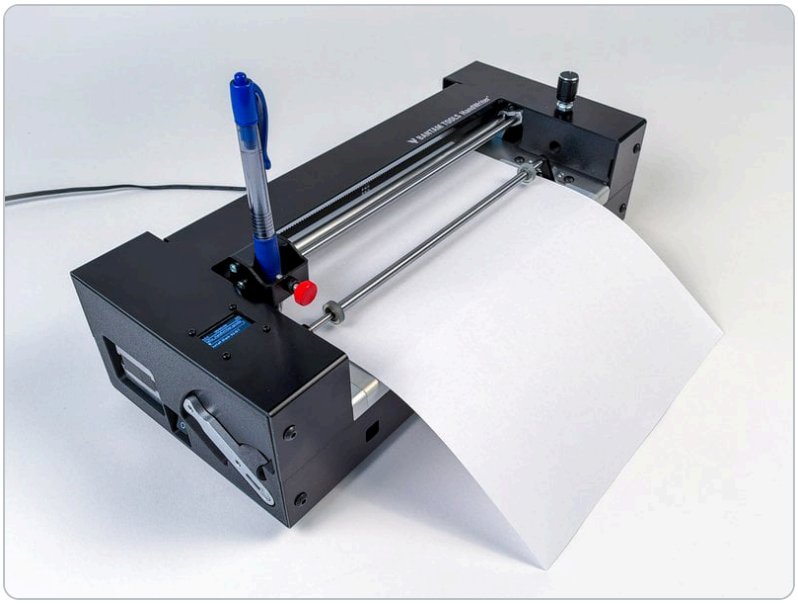
Slide the sheet in from the front of the machine, under the raised pinch rollers, until it meets the paper setup backstop.



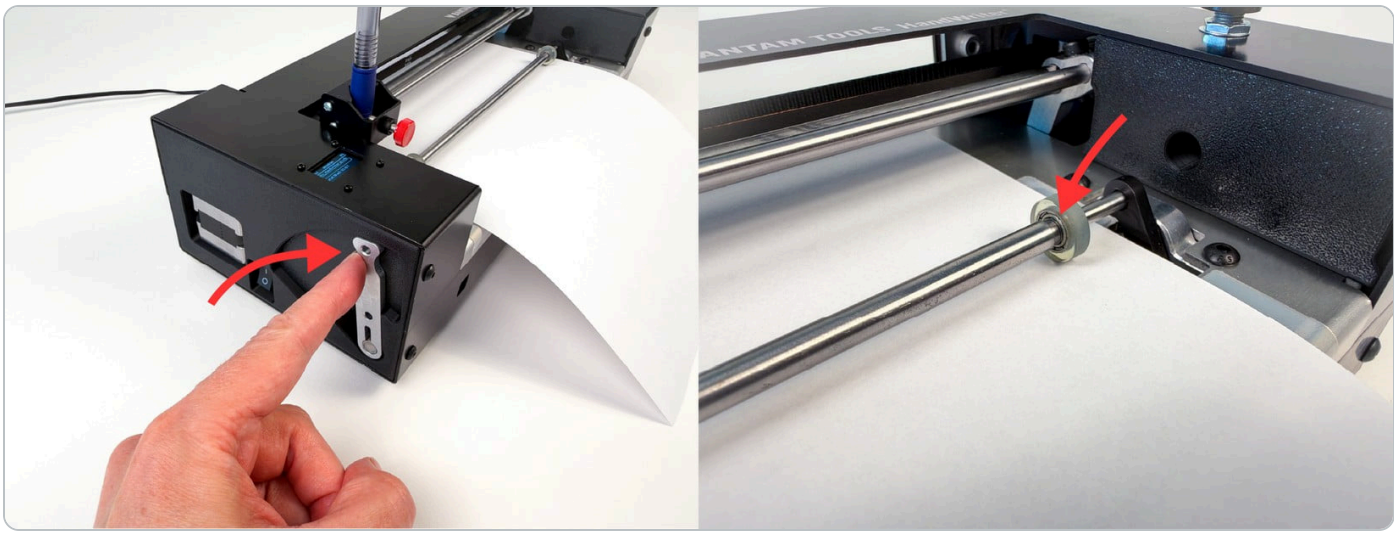
The sheet seated in the corner at the left end of the raised paper setup backstop.

Seat the sheet in the corner at the left end of the backstop, so that its back edge and its left edge both rest against the backstop.

A fan inside the HandWriter, which runs whenever the machine is on, holds the sheet gently against the writing surface. It keeps the sheet in place while you lower the pinch rollers, and helps control the paper while the HandWriter writes.



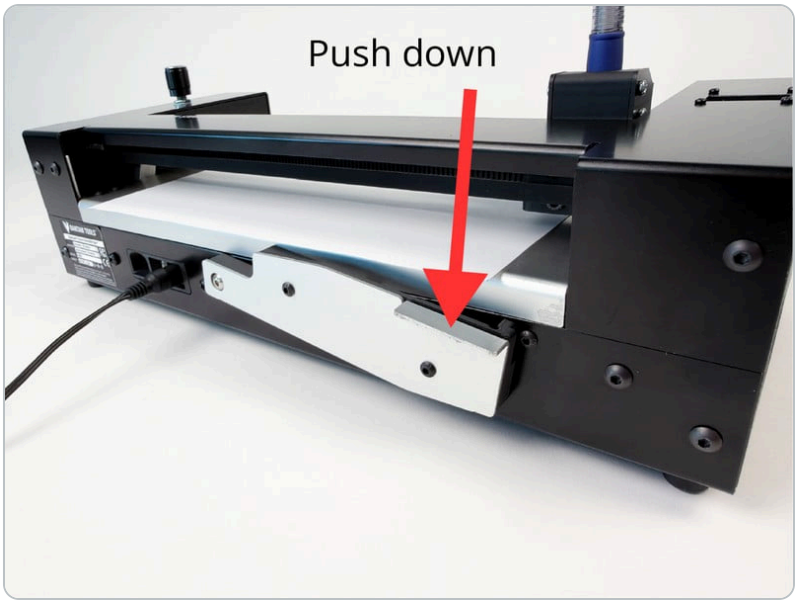
The sheet seated, with the pinch rollers still raised.



Pulling the paper release lever toward you lowers the pinch rollers onto the sheet.

Hold the sheet steady and pull the release lever all the way toward you. This lowers the pinch rollers, which now hold the paper in place.

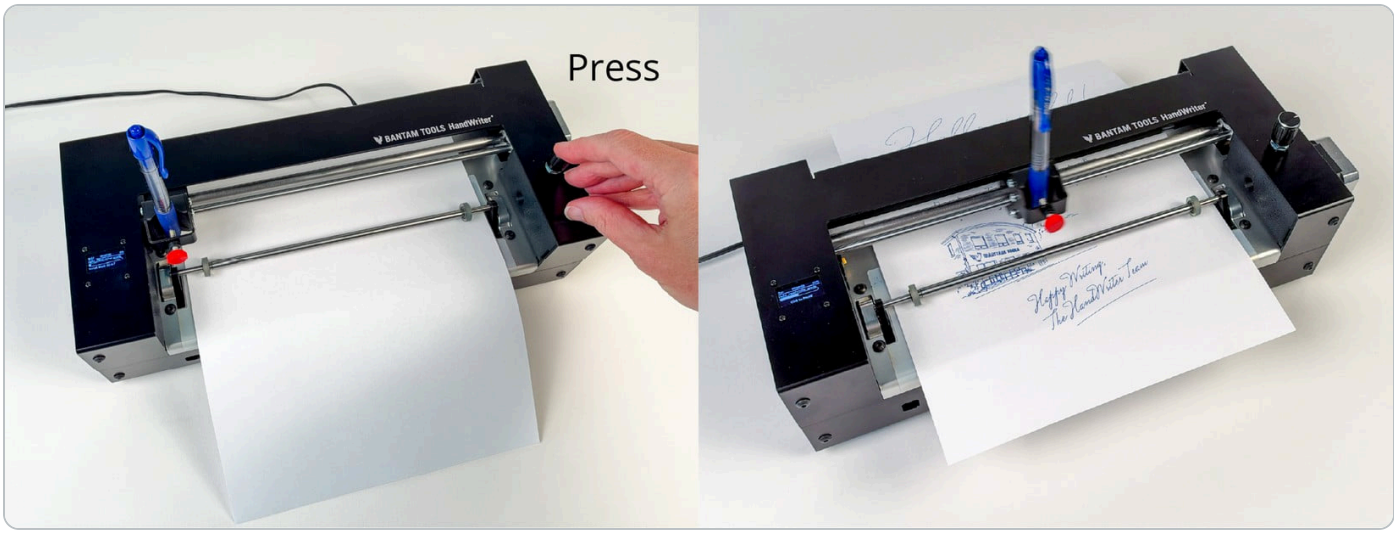
At the back of the machine, push the paper setup backstop down into its lowered position. The backstop sets where the sheet starts, but while writing, the HandWriter moves the sheet farther back than the backstop allows, so make sure it is down before you start.



Pushing the paper setup backstop down, after the pinch rollers hold the sheet.

The sheet should sit flat and square in the corner. If it is crooked, curled, wrinkled, or not fully seated, raise the pinch rollers, remove the sheet, and load it again from the first step.

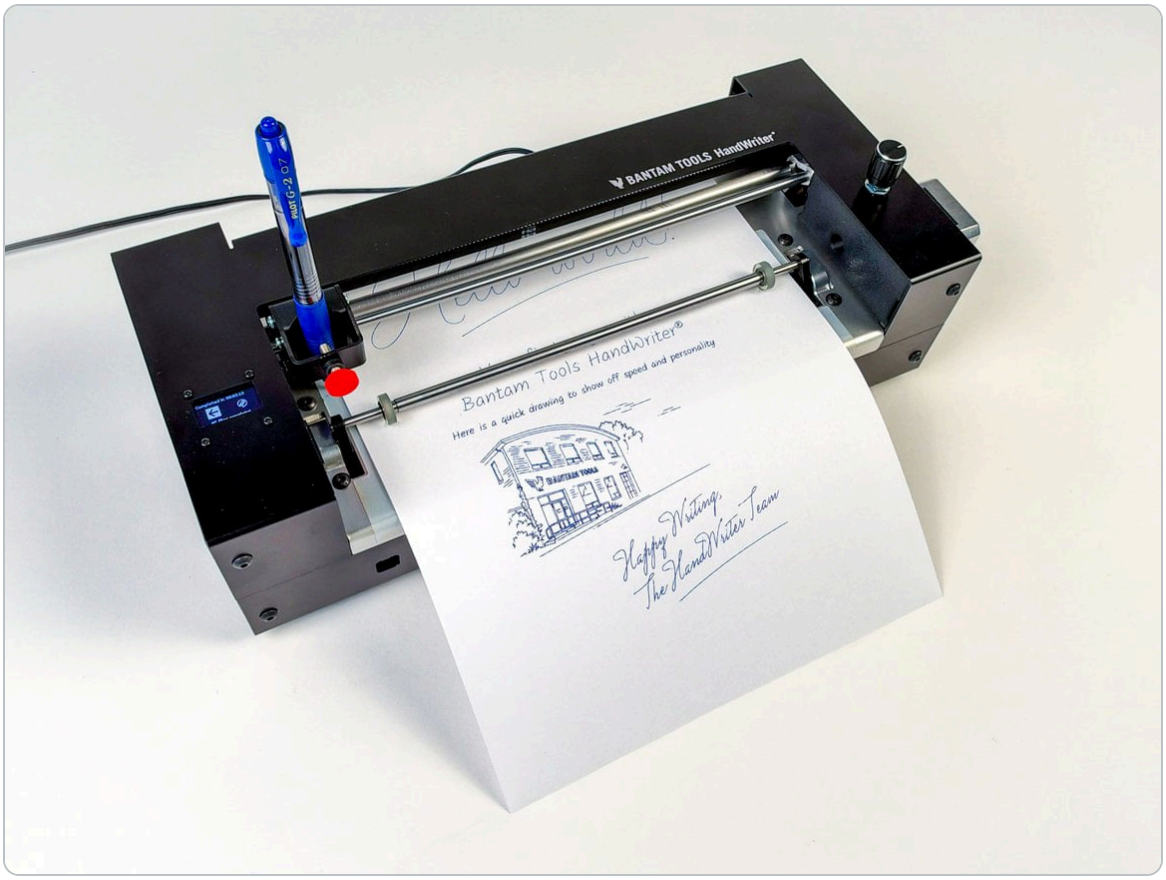
6.8 Starting to write



Pressing the control knob to continue the file (left), and the HandWriter writing the Welcome Letter (right).

Press the control knob to continue the file. The HandWriter writes the Welcome Letter, moving the sheet back and forth as it goes.

When the letter is finished, it should look something like the following:



The finished Welcome Letter, still in the HandWriter.

To take the sheet out, push the release lever back. This raises the pinch rollers to release the sheet, and it also readies the machine for the next sheet.

A clean, complete Welcome Letter confirms that the HandWriter is working correctly. In the next walkthrough, §8. Writing your first letter, you make a letter of your own in Bantam Tools Studio™.

7. Installing Studio

Bantam Tools Studio™ is the application you use to prepare a job and send it to your HandWriter®. This chapter covers finding your license details, downloading and installing Studio on macOS and Windows, and activating your license. You do this once, before your first job, and again whenever you move Studio to a new computer.

7.1 Finding your license details

Your Bantam Tools HandWriter® includes a license for Bantam Tools Studio.

When you purchased your HandWriter, or purchased Studio on its own, you received an email with a download link and a license key. Find that email before you begin: activation asks for the License ID and Password it contains.

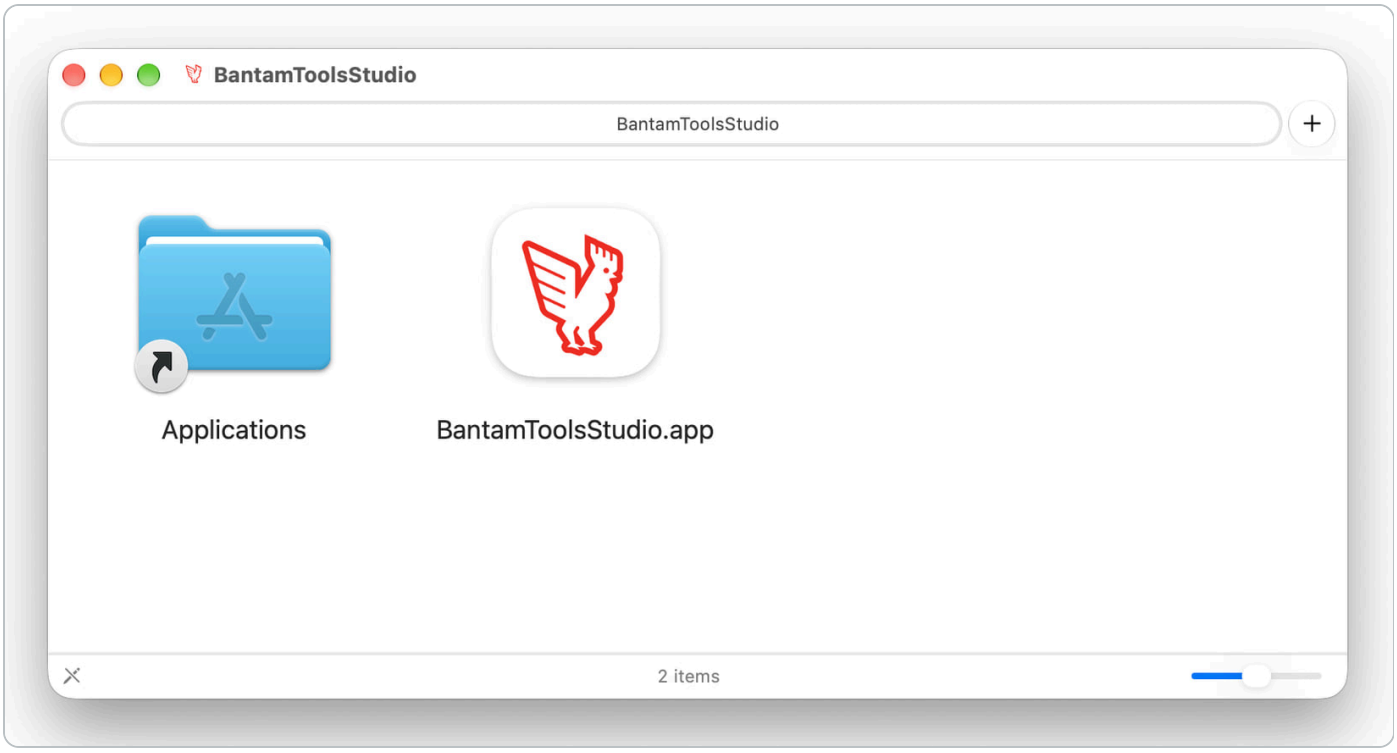
If you cannot locate that email, contact support@bantamtools.com and include your order number or machine serial number, and we can send your license details again.

7.2 Downloading Studio

Visit bantam.tools/sd to download Bantam Tools Studio. The download page offers a macOS disk image (a `.dmg` file) and a Windows installer (an `.exe` file); take the one for the computer you will be working on.

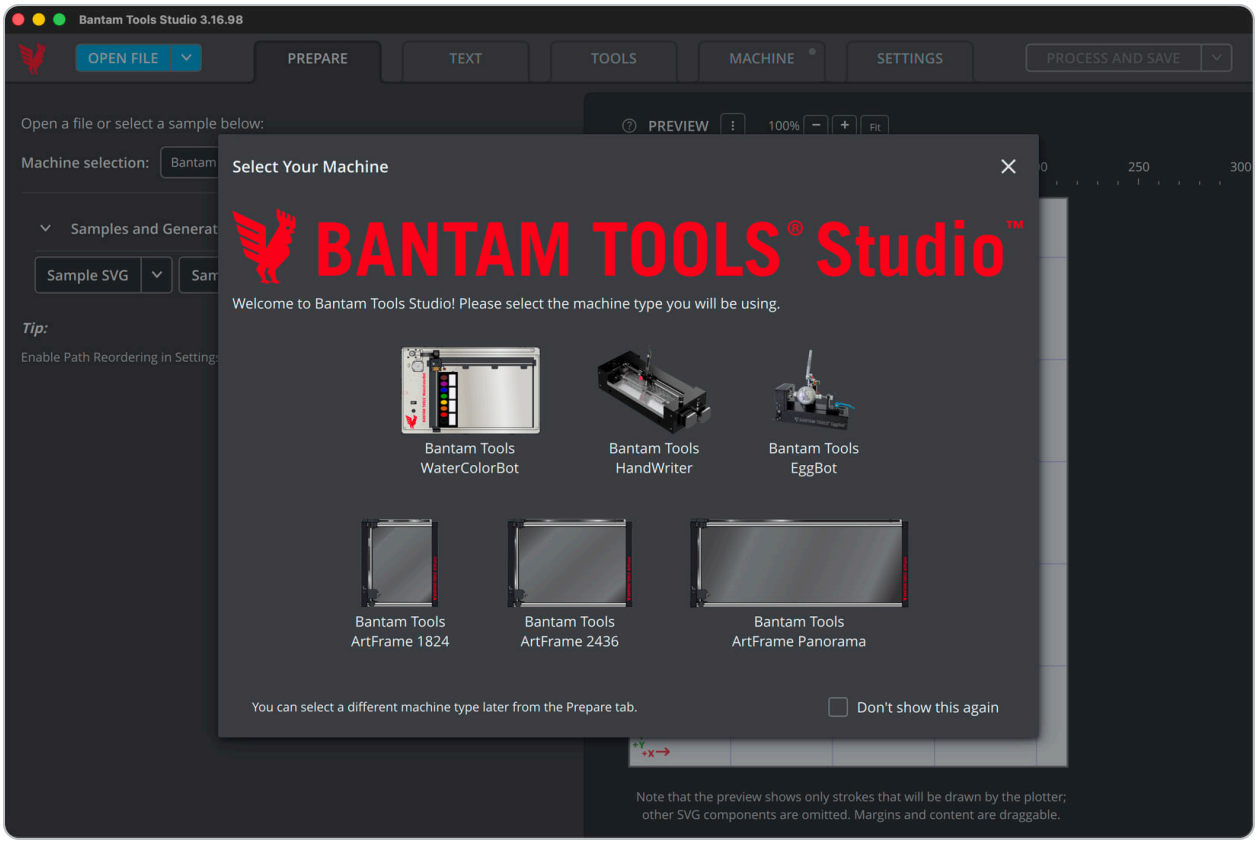
7.3 Installing on macOS

1. Locate the downloaded `.dmg` file and double-click it to mount the disk image.
2. Review and accept the End User License Agreement.
3. Drag **BantamToolsStudio** into the **Applications** folder.
4. Eject the disk image.
5. Open Bantam Tools Studio from the **Applications** folder.



*The mounted disk image: drag **BantamToolsStudio** into the **Applications** folder.*

Studio opens to the **Select Your Machine** splash screen. Choose your machine and Studio continues to its main window, with no license active yet. The splash screen has a **Don't show this again** check box; with it checked, later launches open straight to the machine you used last.



***Select Your Machine** window at startup*

7.4 Installing on Windows

1. Locate the downloaded `.exe` installer and run it.
2. Click **Next** to begin.
3. Choose an installation folder.
4. Review and accept the End User License Agreement.
5. Accept **Bantam Tools Studio** as the Start Menu shortcut name.
6. Click **Install**.
7. Click **Yes** when Windows asks whether to allow the installer to make changes, so that it can finish.
8. Click **Finish**.

The installer closes and Bantam Tools Studio appears in your Start Menu. The first time you open it, it shows the **Select Your Machine** splash screen before its main window.

To update Studio later, close it and run the newer installer, choosing the same folder. The installer asks whether to upgrade, and keeps your license and settings. When you click **Yes** to upgrade, Windows asks right away whether to allow the installer to make changes, before the **Install** step; click **Yes** there as well.

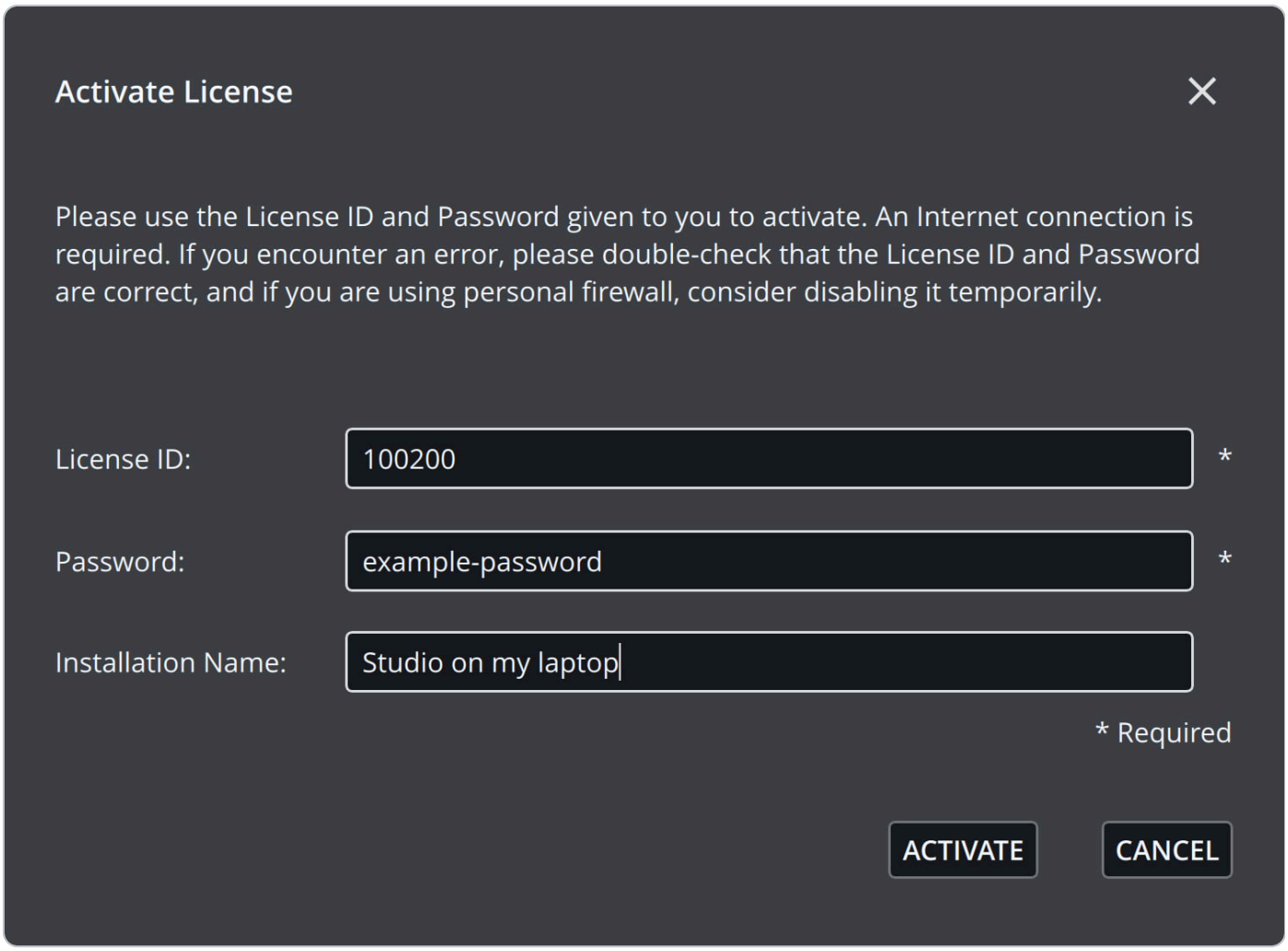
7.5 Activating your license

Studio keeps license tools in the License Manager, which you reach from the **SETTINGS** tab. Activation is per computer, so you repeat these steps on each computer you install Studio on.

1. Open Bantam Tools Studio, choosing a machine at the splash screen if it appears.

2. Select the **SETTINGS** tab.
3. Click **License Manager**.
4. Select **Activate License**.
5. Enter the License ID and Password from your license email. **Installation Name** is optional; Studio sends it to the licensing server along with the activation, as a name for this computer.

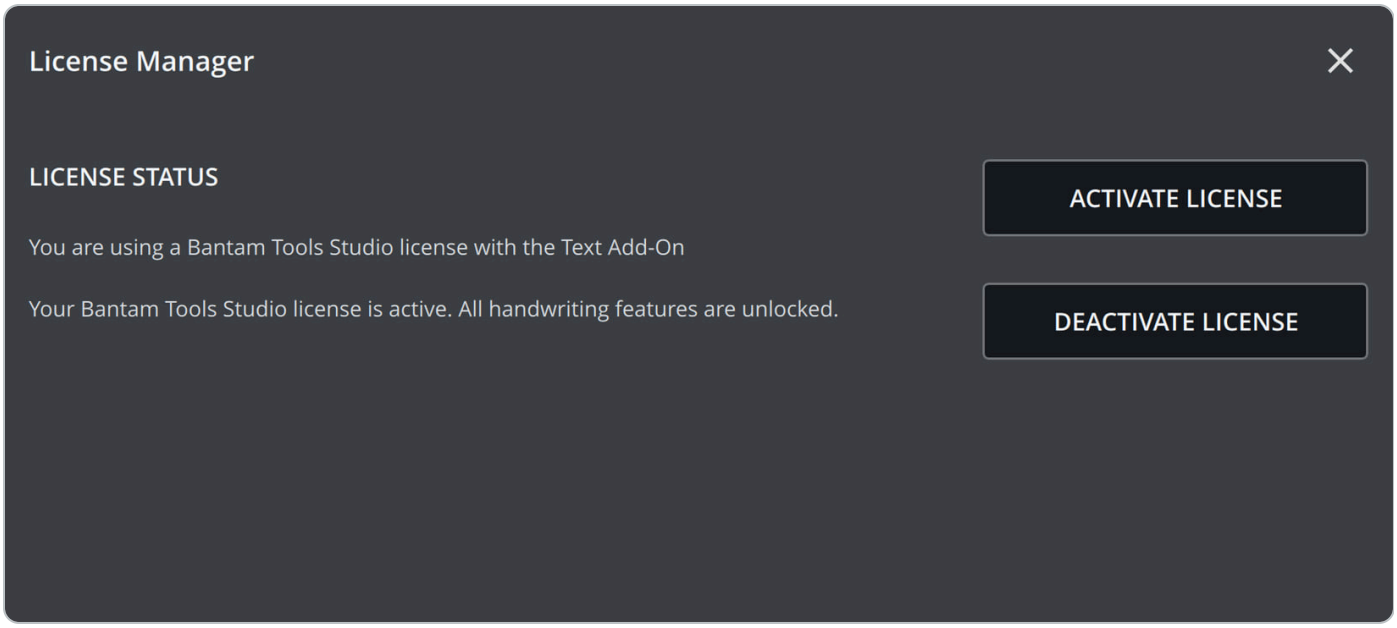
Studio confirms the activation, and the features your license includes become available. The license that comes with a Bantam Tools HandWriter® includes the Bantam Tools Studio Text Add-On, so on a HandWriter the full writing workflow is active as soon as the license is.



*The **Activate License** form, with a License ID, Password, and Installation Name filled in*

> ***Note:*** Activation contacts the Bantam Tools licensing server, so a live internet connection is required. It is needed only for the initial activation; once the license is active, Studio runs without one.

From the License Manager you can also deactivate the current license, which frees it to be activated on another computer. Deactivate before you retire or hand on a computer, so that the license is available where you need it next.



License Manager *with a license active*

7.6 Help with installation

If you run into difficulty installing or activating Bantam Tools Studio, email our support team at support@bantamtools.com and we can walk you through it. Include your order number or machine serial number when the trouble is with a license.

8. Writing your first letter

This is the second of the three Getting Started walkthroughs: a short letter, brought into Bantam Tools Studio™ and saved as a file for the Bantam Tools HandWriter®. Studio's default settings are all a first letter needs, so the only setting this walkthrough changes is the font.

8.1 Opening Studio

Open Bantam Tools Studio on your computer.

On first launch, Studio shows the **Select Your Machine** splash screen; choose **HandWriter** there. Afterward, the **Machine selection** drop-down menu at the top of the **SETUP** sub-tab, on the **PREPARE** tab, shows the current choice.

Selecting HandWriter loads its default margins and motion settings, so this walkthrough leaves them alone. On the **PREPARE** tab, check that **Standard Sizes** matches the paper you plan to load: US Letter or A4.

8.2 Bringing in the text

Keep your first letter short. A short file writes quickly and makes it easy to confirm that the pen, paper, and settings are working together.

Write the letter in any application you like (a notes app, a word processor, or an email), then copy it. For example:

```
Dear Friend,

This is my first letter written with the Bantam Tools HandWriter.

Warmly,
Bantam Tools
```

In Studio, open the chevron menu beside **OPEN FILE** and choose Open from Clipboard:
OPEN FILE → Open from Clipboard

The text appears in the **Preview** area, laid out on the sheet inside the page margins.

8.3 Choosing a font

Go to the **TEXT** tab and confirm that **Enable Text Rendering** is on (Default: on).

In the **FONT** section, choose a handwriting font from the **Font face** menu. The **Preview** redraws in the new font, so you can compare faces on screen before committing one to paper.

For a first letter, choose a simple, legible face. There is time to experiment once you have seen the machine write.

> *Tip:* The **Font face** menu accepts typing as well as clicking, so a few letters narrow the list to the face you want.

You can also write in a font of your own; see §27.4 Font selection.

8.4 Checking the fit

Look over the **Preview** before saving. It shows where the pen strokes will land on the sheet, margins included.

If the letter is too long for one page, Studio shrinks the text to fit, and the size label in the **FONT** section reads **Font size (auto)**. If the writing looks too small, shorten the letter until the size looks right.

8.5 Saving the file

Once the **Preview** looks right, click **PROCESS AND SAVE** and save the G-Code file. Studio then opens a Setup Sheet summarizing the job.

The next walkthrough, §9. Sending your letter to the HandWriter, copies the file to the microSD card and writes it.

9. Sending your letter to the HandWriter

This is the last of the three Getting Started walkthroughs. Here you copy the file you made in §8. Writing your first letter to the microSD card, take it to the Bantam Tools HandWriter®, and write it. The steps at the machine are the ones you followed for the Welcome Letter; only the file is new.

9.1 Copying the file to the microSD card

Turn off the HandWriter, then remove the microSD card from its slot.

Put the card in your computer's card reader and copy the saved G-Code file onto it. Eject the card from your computer.

Insert the card back into the HandWriter, then turn the machine on.

> ***Aside:*** The HandWriter can also receive files from Studio over a USB cable or over WiFi. The Getting Started walkthroughs use the card because it works everywhere, with nothing to connect or configure. See §15. Sending files to your machine for all three routes.

9.2 Starting the file

Turn the control knob to highlight **Browse Files**, then press the knob. Turn the knob to highlight the file you saved.

Keep your hands clear of the machine, then press the knob to start the file. The HandWriter homes if needed, moves to its pen loading position, and pauses so you can load the pen and paper.

9.3 Loading the pen and paper

If the pen from the Welcome Letter is still installed, leave it in place; the pen does not need to come out between files. Otherwise, install it as described in §6. Writing the Welcome Letter.

Load a fresh sheet, the same size you chose in Studio, as described in §6. Writing the Welcome Letter.

9.4 Writing the letter

Press the control knob to continue the file. The HandWriter writes your letter, feeding the sheet as it goes.

Stay nearby while the letter writes, so you can see that the paper feeds straight and the pen writes cleanly. If something goes wrong, press the control knob to pause.

When the letter is finished, the display shows how long the job took, with the back arrow highlighted. Press the knob to return to the file list. Remove the sheet from the machine.

9.5 Checking the result

Look over the finished letter. It should have:

- Clean, consistent ink lines, neither faint nor skipping
- Writing placed where the **Preview** showed it
- No sign that the sheet shifted or fed crooked

If the lines are faint or skip, check that the pen tip rested directly on the writing surface before you tightened the thumbscrew. For smearing and other pen problems, see §11. Pen loading and pen compatibility.

If the writing is misplaced on the sheet, check that the paper size in Studio matches the sheet you loaded, and that the sheet was seated in the back-left corner.

That completes Getting Started. The next part of this guide builds on these walkthroughs. It covers other pens and paper, batches of letters, and sending files over USB or WiFi instead of the card.

Part II: Working with your machine

10. The HandWriter interface

The Bantam Tools HandWriter® has a small display and an control knob, which together let you run files from the microSD card with no computer attached. This chapter describes every screen on that display and what the knob does on each one. The Getting Started walkthroughs used a few of these screens already; this is the complete reference.

The display and Bantam Tools Studio™ reach the same machine by different routes. At the machine, you browse the card, start and pause files, move through a folder of files, and change the machine's own settings. From Studio's **MACHINE** tab, over a USB cable or WiFi, you upload files and start, pause, and cancel jobs from your computer (see §24. Studio: the MACHINE tab). The display also covers two tasks that Studio does not: jogging one axis at a time, and resetting the machine's settings. Firmware is updated with an updater program or from the card (see §10.11.6 Updating the firmware). Which route suits a given job is covered in §15. Sending files to your machine.

The chapter follows the order in which you meet the screens. It begins with the knob, the startup screen, and the main menu, then covers running a file: pausing, tool changes, and what happens when a file ends. It ends with each item in the **Settings** menu, including firmware and configuration updates and the factory reset.

10.1 Control knob and display

The control knob is the only control on the display. It does three things:

- **Turn** — moves the highlight through the items on the screen.
- **Press** — selects the highlighted item. While a file runs, a press pauses it.
- **Press and hold** — cancels a paused file, and skips a file on the **Run Next** screen. Hold the knob down for about a second before releasing it.

A short message sometimes appears over the current screen, such as **Homing before file run...** or **WiFi off**. Most of these clear on their own. A press of the knob dismisses any message still showing and does nothing else. Press again to act on the screen beneath it.

After the machine has been left alone for a while, the display dims and then shows a screensaver. Once the screensaver is showing, the first turn or press of the knob only wakes the display (see §10.11.5 Screensaver).

While Studio is sending the machine a command, the display shows **External command in progress**. While Studio uploads a file, the display shows the upload's progress. In both cases the knob does nothing until Studio finishes.

If the machine stops with an alarm, pressing the knob clears the alarm and returns the machine to its menus.

10.2 Startup screen

When you turn on the HandWriter, the display shows the startup screen for about a second: the machine's name at the top, the Bantam Tools logo, and the installed firmware version on the bottom line (for example, **Firmware: 2.10.11**). The main menu follows.

The firmware version is also shown on the **Version** screen in **Settings**, so there is no need to catch it at startup.



Startup screen, with the firmware version on the bottom line.

10.3 Main menu

The main menu shows the machine's name at the top and three items as a row of icons, with the name of the highlighted item beneath them. Turn the knob to move between the icons, and press it to select one.

- **Browse Files** — opens the file browser, which lists the files and folders on the microSD card.



*Main menu with **Browse Files** highlighted.*

- **Home** — homes the machine. While **Home** is highlighted, **(homed)** or **(unhomed)** at the bottom right shows the machine's current state.



*Main menu with **Home** highlighted; the HandWriter is homed.*

- **Settings** — opens the **Settings** menu of machine settings, system information, and updates.

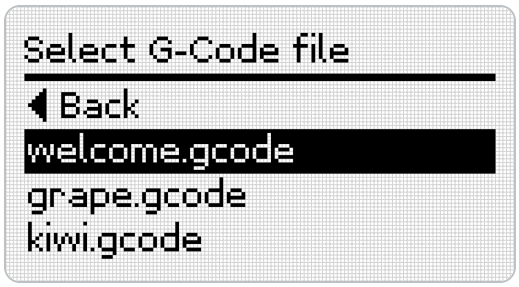


*Main menu with **Settings** highlighted.*

Running files from the microSD card starts in **Browse Files**, so that is where you spend most of your time at the machine.

10.4 Browsing and starting files

Select **Browse Files** in the main menu to open the file browser. Its screen is headed **Select G-Code file** and lists the G-Code files (`.gcode` and `.nc`) and folders on the microSD card, with ◀ **Back** at the top of the list. The first file or folder is highlighted when the list opens.



File browser with `welcome.gcode` highlighted.

Turn the knob to scroll through the list. Press the knob on a folder to open it; the heading changes to the folder's name, and ◀ **Back** in the folder returns to the folder above it. ◀ **Back** at the top level returns to the main menu.

Files and folders are listed in the order set by **"Next File" Ordering** in **Settings** (Default: **Oldest**). A file that has run to completion carries a check mark before its name; see §10.9 Completed file check marks.

If the card holds no G-Code files, the display shows **No G-Code files on microSD Card** and returns to the main menu. With no card in the slot, it shows **No microSD Card**. If the card is removed while the machine is reading it, or cannot be read, the display shows **microSD removed or unreadable** and **Reinsert and restart**: reinsert the card, then turn the machine off and on again.

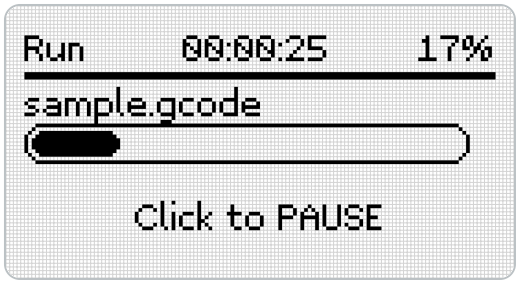
To start a file, highlight it and press the knob.

If the machine has not been homed since it was turned on, or since a file was canceled, it shows **Homing before file run...** and homes first. The file then begins. Files made in Studio begin by moving to the pen loading position and pausing, so that you can load the pen and paper. Once everything is loaded, press the knob to continue the file.

> ⚠ **Warning:** Keep hands, paper, pens, and loose objects clear of the moving parts before you start a file, since the machine may home as soon as you press the knob.

10.5 The run screen

While a file runs, the display shows the file's name, the elapsed time and percentage complete along the top, a progress bar, and **Click to PAUSE** at the bottom. The menus are hidden until the file ends, and turning the knob does nothing.



*The run screen, with the elapsed time and percentage complete above the file name, and **Click to PAUSE** below the progress bar.*

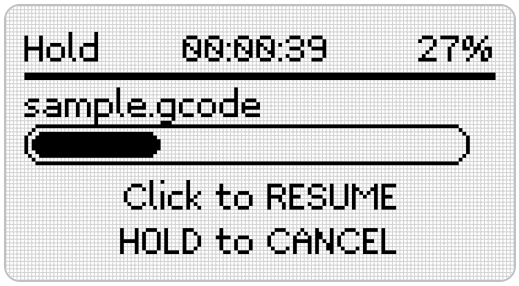
When the last move of a file is still finishing, the display may briefly show **Finishing motion queue** before the post-run screen appears (see §10.8 The post-run screen).

10.6 Pausing, resuming, and canceling

Pause the machine before you reach into it, check the paper, or deal with a pen problem.

Press the knob while a file runs to pause it. The display shows **Pause requested...** and then **Pausing, please wait...** while the machine stops and lifts the pen clear. Wait for the next screen before pressing the knob again.

Once the machine has stopped, the display shows **Click to RESUME** and **HOLD to CANCEL**, and the elapsed time stops counting.



*A paused file, offering **Click to RESUME** and **HOLD to CANCEL** below the progress bar.*

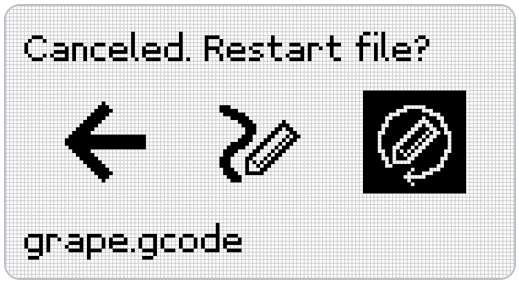
To resume, press the knob. The display shows **Resuming...**, and the file continues from where it paused.

To cancel, press and hold the knob for about a second, then release it. The file stops for good. Canceling also clears the machine's homed state, since the abrupt stop may have lost its position. The next file you start therefore homes first.

The same **Click to RESUME** and **HOLD to CANCEL** screen appears whenever a file pauses itself, such as at the pen loading position. A file can instead supply its own instruction for a pause (see §10.7 Tool-change prompts). The knob works the same way at every pause.

After a cancel, the display shows the post-run screen with the restart icon highlighted. Its heading reads **Canceled. Restart file?**, and the canceled file's name is on the bottom line. Press the knob to run the file again *from the beginning*, not from where it stopped. Turn the knob to the back arrow instead to return to the file list.

A canceled file does not get a check mark.



After a cancel, the display offers to restart the file.

10.7 Tool-change prompts

A file can pause for a tool change and put the instruction for that change on the display, in place of **Click to RESUME** and **HOLD to CANCEL**. A multi-pen file from Studio, for example, pauses with **Install** followed by the name of the next pen from the tool library, and later changes may first pause with **Remove this pen**. Studio's **MACHINE** tab shows the same instruction while the machine waits.



*A tool-change pause, with the file's instruction — here **Install Black G2-0.7** — in place of **Click to RESUME**.*

Follow the instruction, then press the knob to continue. Press and hold to cancel, as at any pause.

> ***Aside:*** If you write or edit G-Code by hand, a comment placed before an `M0` pause sets the text shown during that pause:
>
> - `(## message)` — shows `message` at the next pause.
> - `( Install Tool: message )` — shows the whole comment text, beginning with `Install Tool`, at the next pause. The colon is optional.
> - `( Toolchange message )` — shows the whole comment text, beginning with `Toolchange`, at the next pause.
>
> An instruction longer than 64 characters is cut off and ends with "...". The instruction clears on its own when the file resumes.

10.8 The post-run screen

When a file ends, remove the finished sheet from the machine. The display shows the post-run screen, a row of up to three icons. The heading above them and the line of text below them change with the highlighted icon.

- **Back arrow** — returns to the file list, in the folder the file ran from. Its heading shows how the file ended and how long it took: **Completed in**, **Canceled at**, or **Elapsed time**, followed by the time.
- **Run Next** — starts the next file in the same folder. Its heading reads **Run Next (HOLD to skip)**, and the line below names the next file. This icon appears only when the folder holds another file without a check mark, and only while ✓ **Completed files** is on.

- **Run Again** — runs the file that just ended again, from the beginning. Its heading reads **Run Again** (or **Canceled. Restart file?** after a cancel), and the line below names the file.

Which icon is highlighted when the screen appears depends on how the file ended:

- The file completed and the folder holds another file to run: **Run Next**.
- The file completed and no other file is waiting: the back arrow.
- The file was canceled, or stopped because of a G-Code error: **Run Again**. A file stopped by a G-Code error also shows the **Canceled. Restart file?** heading.
- The file ended unexpectedly (described below): **Run Next** if it is offered, otherwise the back arrow.

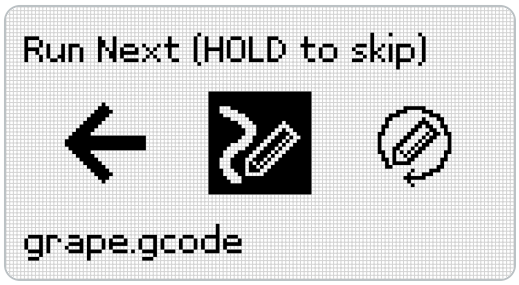
If a file ends partway through a line, as happens when a copy to the card or a USB upload was cut short, the display shows **File ended unexpectedly** until you press the knob. **Run Again** is not offered for that file, and the file is not marked complete.

A file that ends cleanly but has no end-of-program command (`M2` or `M30`) shows **File ended without end marker** until you press the knob. That file is still marked complete.

10.8.1 Running files from a folder

When you run a folder of files, the machine offers to continue to the next file as each one finishes. A batch of individual letters, or a Stack generated from Data Merge, runs this way.

The post-run screen opens with **Run Next** highlighted, and the name of the file it will run is on the bottom line.



***Run Next** highlighted after a file finishes, naming the next file.*

Load the next sheet, then press the knob to choose **Run Next**.

The machine homes if it needs to, then moves to the pen loading position and pauses. Press the knob again to start the next file.

Run Next chooses the first file in the folder, in the order set by **"Next File" Ordering**, that has no check mark, skipping the file that just ran. It never leaves the folder, so files in other folders, including folders inside this one, are not run.

To skip the upcoming file without running it, press and hold the knob on **Run Next** for about a second. The machine marks that file complete and shows **Skipping (marking ✓)** with its name for a few seconds. **Run Next** then names the file after it, or disappears if none are left.

> *Important note:* Choosing **Run Next** also marks the file that just ended as complete, if it is not marked already. This happens however that file ended: after a cancel, a G-Code error, or an unexpected end, **Run Next** marks the file complete even though it did not finish. **Run Next** then never runs that file again, so a batch can finish with that piece missing. To leave the file unmarked, return to the file list and start the next file from there instead.

If you turn to the back arrow while other files remain, the bottom line reads **Return to file list**, and the heading shows how long the file took.



*The back arrow while other files remain, with **Return to file list** on the bottom line and the time the file took above.*

When every file in the folder carries a check mark, the post-run screen opens with the back arrow highlighted, and the bottom line reads **All files complete!**.

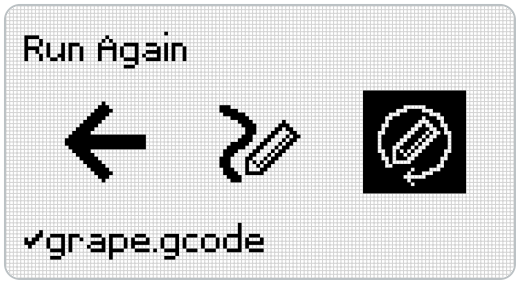


*The back arrow once every file in the folder is complete, with **All files complete!** on the bottom line.*

10.8.2 Running a file again

To run the same file again, turn the knob to **Run Again** and press it.

Run Again is useful when a pen runs out of ink partway through, when the wrong paper was loaded, or when you want another copy.



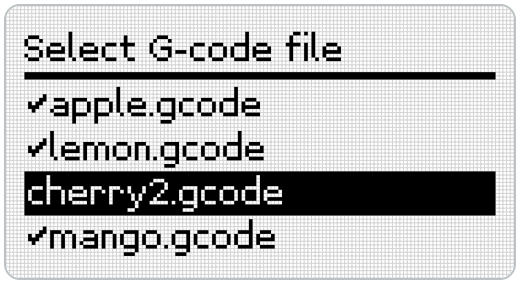
***Run Again** highlighted, naming the file it will run.*

As with any file, the machine homes first if it needs to, then moves to the pen loading position and pauses.

10.9 Completed file check marks

The HandWriter keeps track of which files have run to completion by adding a check mark to the start of each completed file's name on the microSD card. The setting that controls this is **✓ Completed files** in **Settings** (Default: on).

A completed file carries a small check mark before its name in the file list. The marks show at a glance which files are done, so you can pick up where you left off. In a batch of individual letters or a Stack generated from Data Merge, they show which letters in the set are written.



Completed files marked with check marks in the file list.

The mark is part of the file's name, so it stays with the card and survives turning the machine off. The same marks appear in Studio's file list and on your computer, as a ✓ at the start of the name.

When you start a file that carries a mark, the machine removes the mark before the file begins and adds it again only if the file completes. A file canceled partway through is left unmarked.

To clear a mark by hand, rename the file on your computer and delete the ✓ from the start of its name.

10.9.1 Turning check marks off

Select **✓ Completed files: ON** in **Settings** to turn marking off; the row then reads **✓ Completed files: OFF**. Select it again to turn marking back on. The change takes effect at once and is kept when the machine is turned off.

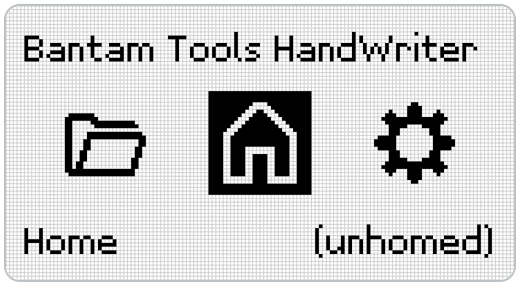
While marking is off, the machine adds no new marks and removes none, so marks already on the card stay where they are. **Run Next** is not offered while marking is off, since it depends on the marks to know which files remain.

10.10 Homing from the main menu

Home is the machine's starting place, the position every move is measured from. Homing is how the machine finds it: the machine moves the toolhead until it reaches a position it can sense, and from then on it knows where the toolhead is.

Select **Home** in the main menu to home the machine. The top line of the display reads **Homing...** until homing finishes.

The HandWriter also homes on its own when it needs to, such as when you start a file after power-up or after a canceled file. **Home** lets you home whenever you choose, such as before jogging.



*Main menu with **Home** highlighted; the HandWriter is unhomed.*

> ⚠ **Warning:** Before the machine homes, whether from **Home**, from **Jog mode**, or at the start of a file, keep hands, paper, pens, and loose objects clear of the moving parts.

10.11 The Settings menu

Select **Settings** in the main menu to open machine settings, system information, and updates. You do not need to change any settings before running your first file. If you are troubleshooting, support may ask you to read information from this menu.



*The **Settings** menu.*

The menu shows four rows at a time; turn the knob to scroll. Its rows, in on-screen order:

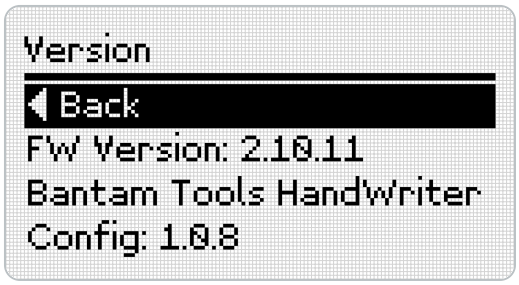
- **◀ Back** — returns to the main menu.
- **Version** — shows the firmware version, the machine's name, the configuration version, and other system information.
- **Jog mode** — moves the machine one axis at a time.
- **WiFi Status** — shows the machine's network connection. This row appears only while WiFi is on.
- **Turn WiFi ON** or **Turn WiFi OFF** — turns the machine's WiFi on or off.
- **✓ Completed files: ON** or **✓ Completed files: OFF** — turns completed-file check marks on or off.
- **"Next File" Ordering** — sets the order of the file list and of **Run Next**.
- **Screensaver** — sets how long the machine waits before it dims the display and shows a screensaver.
- **Update Config File** — installs a configuration file from the microSD card.
- **Update Firmware** — installs firmware from the microSD card.
- **Reset Factory Settings** — returns the machine's stored settings to their defaults.

✓ Completed files is described in §10.9 Completed file check marks. The other rows each have a section below.

10.11.1 Version

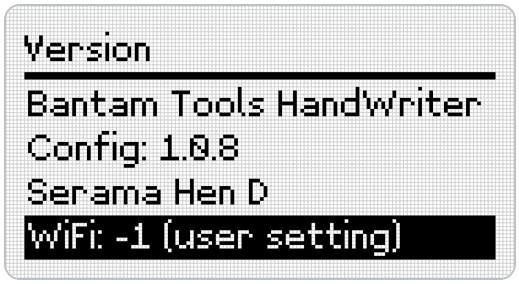
Version opens a list of system information:

- **FW Version:** the installed firmware version.
- The machine's name, as set by its configuration file.
- **Config:** the version of the installed configuration file.
- The name of the machine's controller board.
- **WiFi:** the WiFi mode set by the configuration file, such as **WiFi: -1 (user setting)**.



*The **Version** screen.*

Scroll down for the board and WiFi rows, which are below the first screen. Select ◀ **Back** to return to **Settings**.



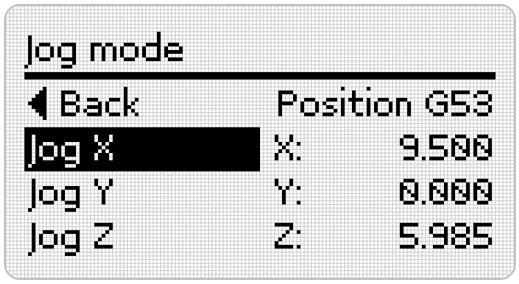
*The **Version** screen scrolled down to the **WiFi** row.*

These are the numbers to have at hand when you contact support, and to check after updating the firmware or the configuration file.

10.11.2 Jog mode

Jog mode moves one axis of the machine at a time with the knob, which is to say it "jogs" the machine. Use it to move the carriage to a position by hand without a file, for example to check alignment. Studio has no jog controls, so the display is the only place to do this.

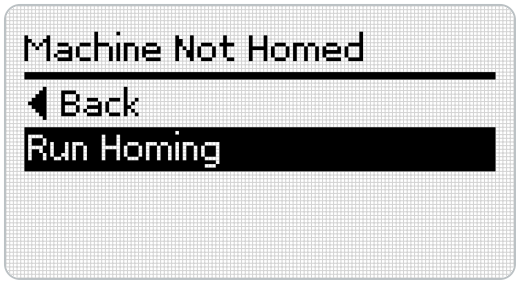
Select **Jog mode** in **Settings**. The screen is headed **Jog mode** and lists ◀ **Back** and one row for each axis: **Jog X**, **Jog Y**, and **Jog Z**. Beside the list, **Position G53** shows where each axis is, in machine coordinates.



***Jog mode**, with the position readout beside the axis list.*

Turn the knob to an axis row, then press the knob to start jogging that axis.

If the machine has not been homed, the display shows **Machine Not Homed** instead, with ◀ **Back** and **Run Homing**. Select **Run Homing** to home the machine and return to **Jog mode**, or ◀ **Back** to return without homing. Jogging needs a homed machine, so that it knows where the ends of travel are.



***Jog mode** asks to home an unhomed machine first.*

Turn the knob to move the axis. Each step of the knob moves X or Y by 1 mm and Z by 0.5 mm, and the heading reads **Jog mode - moving -** while the machine moves. The axis stops at the end of its travel.

Press the knob again to stop jogging. The knob then scrolls the list again. Choose another axis, or select ◀ **Back** to return to **Settings**.

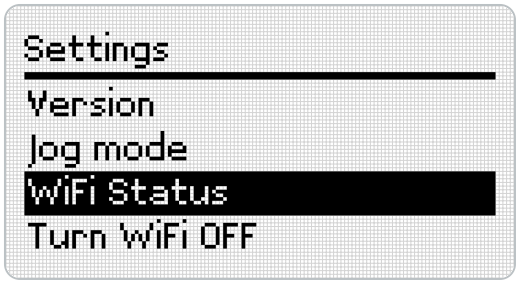
Jogging also stops on its own when a file starts (one sent from Studio, for example) or when another screen takes over the display. Any turn of the knob that the machine had not yet acted on is dropped, so the machine does not move afterward.

> ⚠ **Warning:** The machine moves as soon as you turn the knob while jogging. Keep hands and loose objects clear of the moving parts.

10.11.3 WiFi on and off

The WiFi rows control the machine's WiFi radio from the display. Putting the machine on a network in the first place is done from Studio; see §15.6 Putting your machine on a network.

Select **Turn WiFi OFF** to turn WiFi off. The display shows **WiFi off**, and the machine leaves the network at once. It stays off, including after the machine is turned off and on, until you turn it back on.



*While WiFi is on, **Settings** shows **WiFi Status** and **Turn WiFi OFF**.*

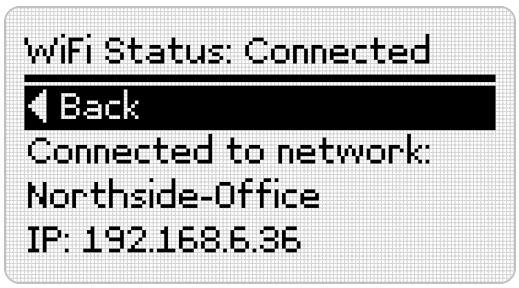
Select **Turn WiFi ON** to turn WiFi back on. The display shows **Restarting to enable WiFi**, and the machine restarts and rejoins the network it was set up for.



*While WiFi is off, **Settings** shows **Turn WiFi ON**.*

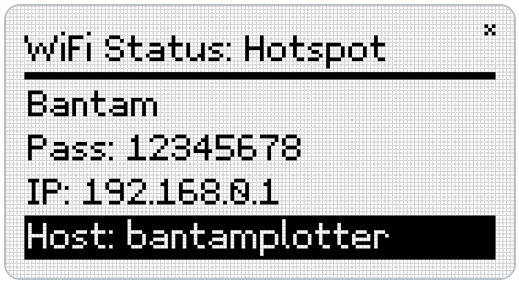
While WiFi is on, **WiFi Status** shows the connection:

- When connected to a network, the screen is headed **WiFi Status: Connected** and shows the network's name, the machine's IP address (**IP**), and its host name (**Host**).



***WiFi Status** while connected to a network.*

- When the machine is running its own hotspot, the screen is headed **WiFi Status: Hotspot** and shows the hotspot's name, its password (**Pass**), the machine's IP address, and its host name.
- When the machine is not connected, the screen is headed **WiFi: Not connected** and shows the network it is trying to join.



WiFi Status *in hotspot mode, scrolled down to the IP address and host name.*

The IP address shown here is the one to enter with **Enter IP** in Studio when a scan does not find the machine.



WiFi Status *scrolled down, with the IP address above the host name.*

When the machine is set up to join a WiFi network but has not joined it, or has lost its connection, a small **x** appears at the top right of the display. This includes when it falls back to running its own hotspot.

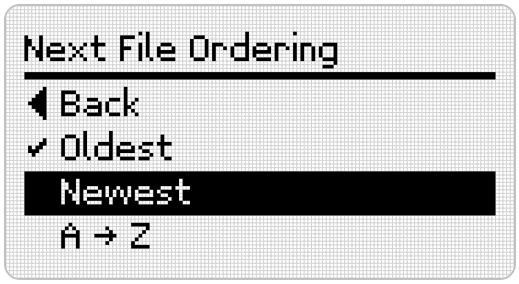


The ***x*** *at the top right of the main menu while WiFi is not connected.*

10.11.4 "Next File" Ordering

"Next File" Ordering sets the order in which **Run Next** works through a folder, and the order of files and folders in the file browser. The screen is headed **Next File Ordering**. The current choice carries a check mark:

- **Oldest** — oldest file first, by the date the file was last changed. (Default)
- **Newest** — newest file first.
- **A → Z** — alphabetical by name.
- **Z → A** — reverse alphabetical by name.



"Next File" Ordering*, with* ***Oldest*** *chosen.*

Turn the knob to an order and press the knob to choose it. The check mark moves to your choice, which takes effect at once and is kept when the machine is turned off. Select ◀ **Back** to return to **Settings**.

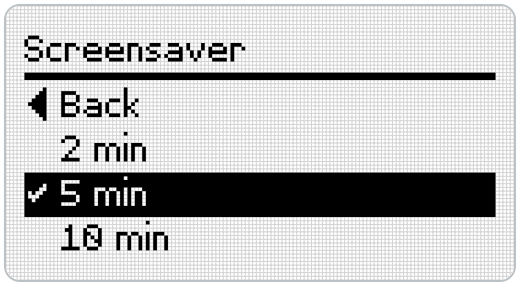
The date orders use each file's modification date as the card records it. If your file names are numbered in the order you want, **A → Z** follows the names instead. Name order compares character by character, with capital letters before lowercase, so number files with leading zeros: `file02` sorts before `file10`, where `file2` would sort after it.

10.11.5 Screensaver

When the machine is left alone, the display dims and then shows a screensaver: a small pattern that drifts across an otherwise dark screen. This protects the display, which can wear unevenly if it shows the same screen for a long time.

Screensaver sets how long the machine waits before the screensaver appears. The screen is headed **Screensaver**. The current choice carries a check mark:

- **2 min**
- **5 min** (Default)
- **10 min**
- **15 min**
- **30 min**
- **60 min**
- **Never** — the display does not dim, and the screensaver does not appear.



***Screensaver**, with **5 min** chosen.*

Turn the knob to a time and press the knob to choose it. The check mark moves to your choice, which is kept when the machine is turned off. Select **◀ Back** to return to **Settings**.

The time counts from the last time you used the knob. The display dims in two steps on the way to the screensaver: slightly at half the chosen time, and deeply one minute before the screensaver appears. (At **2 min** the two steps fall together, so the display dims deeply after one minute.)

Turn or press the knob to bring the display back to full brightness. While the display is only dimmed, that turn or press also does what it normally does. Once the screensaver is showing, the first turn or press only wakes the display; turn or press again to act on the screen beneath it. Inserting a microSD card wakes the display too, as does any message that appears on it.

The display stays at full brightness while a file runs. While a file is paused, the display dims, but the screensaver does not appear.

10.11.6 Updating the firmware

The firmware is the software that runs on the machine's controller. Updates fix problems and add features, so it is worth keeping it current.

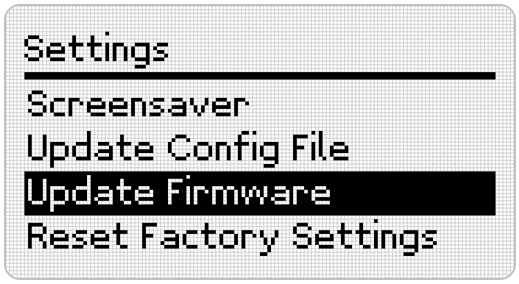
The usual way to update is with a firmware updater program, which runs on your computer and updates the machine over a USB cable. The updater program is available online (bantam.tools/fw). Download the updater on your computer, connect the machine to the computer with a USB cable, and run the updater. The updater has separate controls for installing firmware and for updating the configuration file. Installing firmware takes a single button press, because the firmware is the same for every machine. The configuration file is covered in §10.11.7 Updating the configuration file; when you update both, update the firmware first.

Firmware can instead be installed at the display, from a file on the microSD card, using **Update Firmware** in **Settings**. The rest of this section describes that route. The firmware file is a single file whose name ends in `.bin`. It is on the same download page as the updater programs (bantam.tools/fw).

Copy the file to the microSD card, at the top level or in a folder. You can also upload the file from Studio's **MACHINE** tab with **Upload File** (see §24. Studio: the MACHINE tab), then install it at the display.

Put the card in the machine, and turn the machine on if it is off.

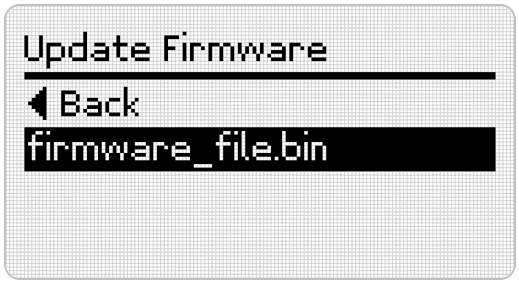
Select **Update Firmware** in **Settings**.



Update Firmware *highlighted in* ***Settings****.*

The screen is headed **Update Firmware** and lists the firmware files and folders on the card, with ◀ **Back** highlighted. If there are none, the display shows **No firmware files on microSD Card** and returns to **Settings**.

Turn the knob to the firmware file and press the knob. There is no confirmation step: the update starts at once, and the display shows **Updating Firmware** and **Plotter will restart...**.



Update Firmware *with a firmware file highlighted.*

When the update is complete, the machine restarts on its own. Do not turn it off or remove the card during the update.

If the file cannot be installed, the display shows **Update failed** and the reason, such as **File too large** or **Not a valid firmware file**. The message clears after a few seconds, and the machine keeps its current firmware.

An update usually takes less than a minute. If **Updating Firmware** is still on the display after several minutes, the update has not completed: turn the machine off and on again, then repeat the update.

If updating from the microSD card still does not work, the firmware updater program for macOS or Windows (bantam.tools/fw) installs the same firmware over a USB cable, and usually resolves the problem.

After the restart, the startup screen shows the new firmware version, which you can also check under **Version**. The update replaces the firmware only; the configuration file and the machine's settings are unchanged.

Important note: Install only firmware that Bantam Tools has released for your machine. Flashing firmware other than a released version for your machine may leave the machine non-functional. If an update does not complete or the machine does not restart normally, please contact technical support and we can walk you through the recovery.

Some files record the latest firmware version. If you start one on a machine with older firmware, the display shows **Firmware update available now at: bantam.tools/fw** for about two seconds, and the file runs normally.

10.11.7 Updating the configuration file

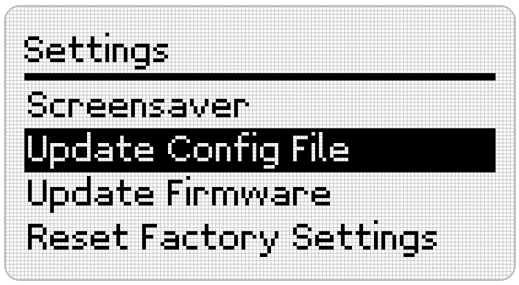
The configuration file describes the machine to its firmware, including the model name, motor configuration, networking details, as well as speed and travel limits. The usual way to update it is with a firmware updater program on your computer (see §10.11.6 Updating the firmware). In the updater, select your machine type from the menu, then use the control for updating the configuration file. When you are installing firmware as well, install it first, whichever route you use.

A configuration file can instead be installed from the microSD card, using **Update Config File** in **Settings**. The new file replaces the machine's current configuration, whatever the new file is named. The file for your machine and model is a single file whose name ends in `.yaml`, also on that download page (bantam.tools/fw).

Copy the file to the microSD card, at the top level or in a folder. You can also upload the file from Studio's **MACHINE** tab with **Upload File** (see §24. Studio: the MACHINE tab), then install it at the display.

Put the card in the machine, and turn the machine on if it is off.

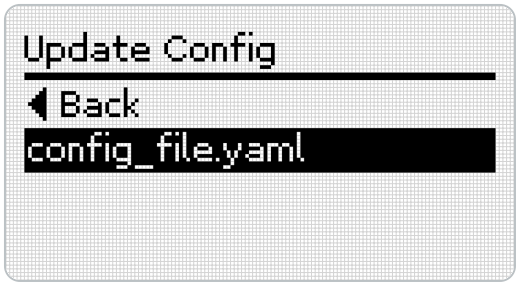
Select **Update Config File** in **Settings**.



Update Config File *highlighted in* ***Settings****.*

The screen is headed **Update Config** and lists the configuration files and folders on the card, with **◀ Back** highlighted. If there are none, the display shows **No config files on microSD Card** and returns to **Settings**.

Turn the knob to the configuration file and press the knob. There is no confirmation step: the display shows **Updating Config File** and **Plotter will restart...**, and the machine restarts with the new configuration.



Update Config *with a configuration file highlighted.*

If the file cannot be installed, the display shows **Update failed** and the reason, such as **Cannot open file** or **File is empty**, and the machine keeps its current configuration. The exception is **Config may be incomplete**, which stays on the display until you press the knob: the update stopped partway through writing the new configuration, so the current one is no longer whole. Repeat the update, or install the configuration file with the firmware updater program (bantam.tools/fw).

A configuration update usually takes a few seconds. If **Updating Config File** is still on the display after a minute, the update has not completed: turn the machine off and on again, then repeat the update.

If updating from the microSD card still does not work, the firmware updater program for macOS or Windows (bantam.tools/fw) updates the configuration file over a USB cable, and usually resolves the problem.

After the restart, check the configuration version on the **Version** screen, next to **Config**.

> *Important note:* Install only a configuration file that Bantam Tools has released for your machine and model. A configuration file for a different machine, or an edited one, can make the machine move incorrectly or stop working.

10.11.8 Factory reset

Reset Factory Settings returns the settings stored on the machine to their defaults. It is rarely needed. Use it when support suggests it, or when the machine's stored settings are in a state you cannot otherwise undo.

A factory reset changes:

- **Network settings** — the WiFi network name and password, and whether WiFi is on. A machine that was on your network leaves it, and has to be set up again from Studio (see §15.6 Putting your machine on a network).
- **Display settings** — **✓ Completed files** returns to on, **"Next File" Ordering** returns to **Oldest**, and **Screensaver** returns to **5 min**.
- **Every other setting the firmware stores**, including stored coordinate offsets, which return to their defaults.

A factory reset does not change the firmware, the configuration file, or anything on the microSD card, including the check marks on completed files.

Select **Reset Factory Settings** in **Settings**. The screen is headed **Confirm** and offers **Cancel Factory Reset**, which is highlighted, and **Confirm Factory Reset**.

To back out, press the knob on **Cancel Factory Reset**, which returns to **Settings**.

To reset, turn the knob to **Confirm Factory Reset** and press the knob. The machine resets its settings and restarts.

11. Pen loading and pen compatibility

The Bantam Tools HandWriter® is designed to write with common pens, with the included Pilot G2 gel pen as the default starting point. For your first run, use the included pen so you can confirm that the machine, paper loading, and file setup are working correctly before experimenting with other pens.

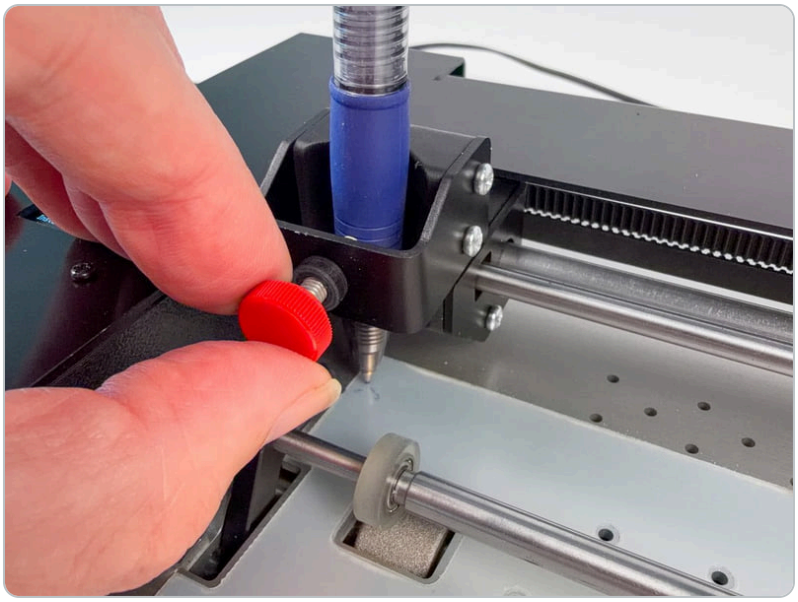
11.1 Loading the pen

When you start a file, the HandWriter will home and move to the pen loading position. The machine will pause there so you can install the pen before writing begins.

Insert the pen into the pen clip until its tip rests directly on the writing surface.

Tighten the thumbscrew to lock the pen in place.

Do not lean back on the pen while inserting it into the pen clip. The pen should sit naturally in the holder, with the tip touching the surface, before you tighten the thumbscrew.



Tightening the red thumbscrew, with the pen tip resting on the writing surface.

Tighten the thumbscrew only enough to hold the pen securely. Overtightening can damage the pen body or make it harder to remove.

Once the pen is loaded and the paper is in place, press down on the control knob to continue the file.

11.2 Leaving the pen installed

Once your pen is installed, you do not need to remove it between plots.

Leave the pen in place unless:

- You are changing to a different pen.
- You are running a multi-pen file and the screen prompts you to load the next pen.
- The pen runs out of ink.
- The pen begins skipping, writing lightly, or producing inconsistent lines.

When you replace the pen, load it the same way: insert the pen until its tip rests directly on the writing surface, then tighten the thumbscrew to lock it in place.

11.3 Recommended pens

We recommend two pens for the HandWriter, and Studio's preset toolsets for the HandWriter are organized around them:

- **Pilot G2 gel pen** — the pen included with the machine. It writes a smooth line with very little pressure, and it is the pen to use for the Welcome Letter and your first written sheet.
- **BIC Bold 1.6 mm pen** — a ballpoint that lays down a bold line with firm pressure.

Using the included pen first gives you a known starting point. If the Welcome Letter writes correctly with it, the machine is set up properly and you can go on to try other pens. For how the presets for each recommended pen differ, see §12.6 Pen pressure and pen type.

11.4 Trying other pens

The HandWriter writes with many common pens. Ink type, pen diameter, tip shape, grip material, and ink flow each affect the finished line.

Try a new pen on scrap paper first. To tune it from the closest preset, see §12.10 Tuning a pen.

A good pen for the HandWriter should:

- Fit securely in the pen clip.
- Touch the writing surface cleanly when loaded.
- Write consistently without requiring excessive pressure.
- Not leak, smear heavily, or dry out quickly.
- Have a body shape that can be held straight and stable.

What matters for a secure fit is the barrel where the clip grips it. A very wide barrel, an irregular body shape, or a loose cap can prevent one. A molded rubber grip is not a problem in itself — the included Pilot G2 has one. Markers that need priming, fountain pens and other pens that need a particular writing angle, and pens that leak when held point-down are not a good fit.

11.5 Ink flow and writing quality

Different pens have different ink flow limits. Some pens write well at higher speeds, and others skip if they move faster than their ink can keep up. To match each writing problem to the setting that fixes it, see §12.10 Tuning a pen.

The pen and paper matter as much as the settings. Some pens, like traditional ballpoints, collect ink on the tip as they write, and it can drip off as a blob. For other problems, a fresh pen, a smoother paper for a pen that skips, or a more absorbent one for a pen that smears often does more than any adjustment.

11.6 Multi-pen files

A file can use more than one pen. When a file needs a pen change, the HandWriter pauses and prompts you on the display. Remove the current pen, load the next pen, and tighten the thumbscrew to lock it in place. Press down on the control knob when you are ready to continue. The machine continues the file with the next pen.

12. Setting up pens

You set how the Bantam Tools HandWriter® handles the pen: how high it lifts between strokes, how hard it presses on the paper, how fast it moves, and what it does at a pen change. These settings belong to each tool, in the Tool Library of Bantam Tools Studio™.

The preset toolsets are tuned for the HandWriter; choose the one that matches your pen, and use it as it is. This chapter explains their settings, and how to tune a pen of your own.

For how the pen is physically installed, see §11. Pen loading and pen compatibility.

12.1 Setting up a new pen

1. Choose the preset toolset for the pen type closest to yours, and its tier: **Normal**, **High Speed**, or **Graphics**; see §12.3 Preset toolsets and §12.6 Pen pressure and pen type. If it suits your pen, use it as it is. To change a setting, first duplicate the toolset, so your changes are kept; see §23.2 Creating and duplicating toolsets.
2. Make a short test in the size and font you plan to use, and send it to the HandWriter; see §9. Sending your letter to the HandWriter.
3. Start the file. At the pen loading position, load the pen with its tip resting on the writing surface, load scrap paper, and press the control knob to continue; see §11.1 Loading the pen and §13.4 Loading paper.
4. If the writing needs work, tune the pen, most often its **Pressure Depth**; see §12.10 Tuning a pen.

A toolset of your own keeps its settings for every future letter.

12.2 Pen settings for long batches

Preparing and running a batch is covered in §16. Writing a batch of letters. These pen settings matter most when it runs long:

- With **Hold Position on Tool Change** on, as in every preset, the HandWriter stops at each pen change and names the next pen on the display; see §11.6 Multi-pen files.
- Each letter in a batch is its own file, and each file pauses at the pen loading position, where you can swap a worn pen; see §10.8.1 Running files from a folder. To swap partway through a long letter, set **Refill Mode** to **Refill by Distance** on your own copy of the toolset, and enter a **Refill Distance**; see §12.9 Pen changes and pauses.
- Leave **Pen Parking Height** at **Pen-up travel**, so that a paused file holds the pen clear of the paper.

12.3 Preset toolsets

The HandWriter has six preset toolsets, three for each of two pens:

- For Pilot G2 0.7 mm gel pens: **Pilot G2 — Normal**, **Pilot G2 — High Speed**, and **Pilot G2 — Graphics**.
- For bold 1.6 mm ballpoint pens: **1.6mm Ballpoint Bold — Normal**, **1.6mm Ballpoint Bold — High Speed**, and **1.6mm Ballpoint Bold — Graphics**.

Normal balances speed and quality. **High Speed** moves faster, for quicker writing, and **Graphics** moves more gently, for precise detail. **Pilot G2 — Normal** is selected to start with.

12.4 Where the settings live

Open the Tool Library from the **TOOLS** tab in Studio, and select a tool to see its settings in the **Tool Settings** section. Select a toolset instead to change a setting for every pen in it at once.

You can change a preset pen's settings and write with them, but those changes can't be saved to the preset; they last only until you quit Studio. To keep them, copy the pen with **Copy to**, or duplicate its toolset, and tune the copy. The original preset stays available as a known-good starting point. §23. Studio: the Tool Library covers toolsets, editing them, and saving your changes.

> *Tip:* Click or hover over any field in the **Tool Settings** section to see a short description of it at the top of the panel.

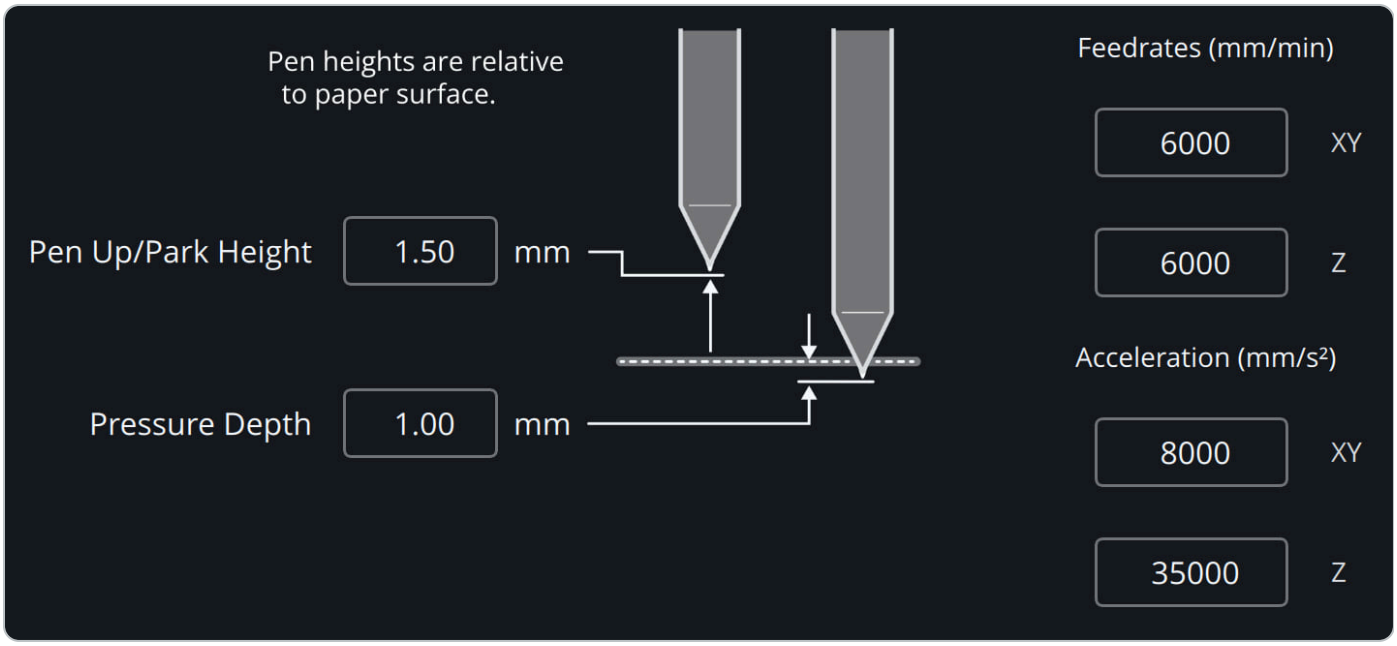
12.5 Pen heights

The HandWriter's pen heights are measured from the point where the pen tip meets the paper. You set that point when you load the pen with its tip touching the paper, so there is no separate setup height to enter.

Each tool has two heights:

- **Pen Up/Park Height** — how far above the paper the pen tip lifts for travel between strokes. The pen also waits at this height when you pause a job. A lower value saves time on every lift; too low, and the pen can drag across the paper or leave marks during travel.
- **Pressure Depth** — how firmly the pen presses on the paper. The pen rides on a spring. A higher value has the HandWriter hold the pen higher while you install it, so the spring compresses further, and presses harder, when the pen comes down to write.

The two heights share the machine's range of travel. If a tool asks for more than fits, its pressure is reduced to fit, and a warning appears beside **Pressure Depth**, headed **Z ceiling**, that names the pressure it will use. Lower **Pressure Depth** or **Pen Up/Park Height** to clear it.



Tool Settings *for a HandWriter pen:* ***Pen Up/Park Height*** *and* ***Pressure Depth***

12.6 Pen pressure and pen type

The right amount of pressure depends on the pen, and the two preset pens sit at opposite ends:

- **Sharp, free-flowing pens**, such as the Pilot G2 gel pen that comes with the HandWriter, need very little pressure. Pressing hard lets the tip bite into the paper, which can make lines wobble or catch. The **Pilot G2** presets use a low **Pressure Depth**.
- **Ballpoint pens that need pressure**, such as the BIC Bold 1.6 mm pen, need firm contact to lay down an even line. The **1.6mm Ballpoint Bold** presets, built around that pen, use a higher **Pressure Depth**.

When you try a pen that isn't covered by a preset, start from the preset for the pen type it most resembles. Open its toolset on the **TOOLS** tab to see the current values.

12.7 Speed and acceleration

- **Feedrates (mm/min): XY** is how fast the pen moves across the paper while writing. **Z** is how fast it lifts and lowers.
- **Acceleration (mm/s²): XY** controls how quickly the pen speeds up and slows down while writing; lower values give crisper motion, and higher values shorten the job. **Z** controls how quickly the pen lifts and lowers; lower values set the pen down more gently.

Speed and ink flow are linked. A pen that writes cleanly at a moderate speed may skip when it moves too fast for its ink to keep up. These are the values that differ most between a pen's three preset tiers; see §12.3 Preset toolsets.

If an orange warning icon appears beside the **Z** feedrate or acceleration, that combination is fast enough that long pen lifts can lose steps (the motor slips and loses track of its position) and leave the pen short of a full lift. Hover over the icon to see which values to lower.

12.8 How the pen meets and leaves the paper

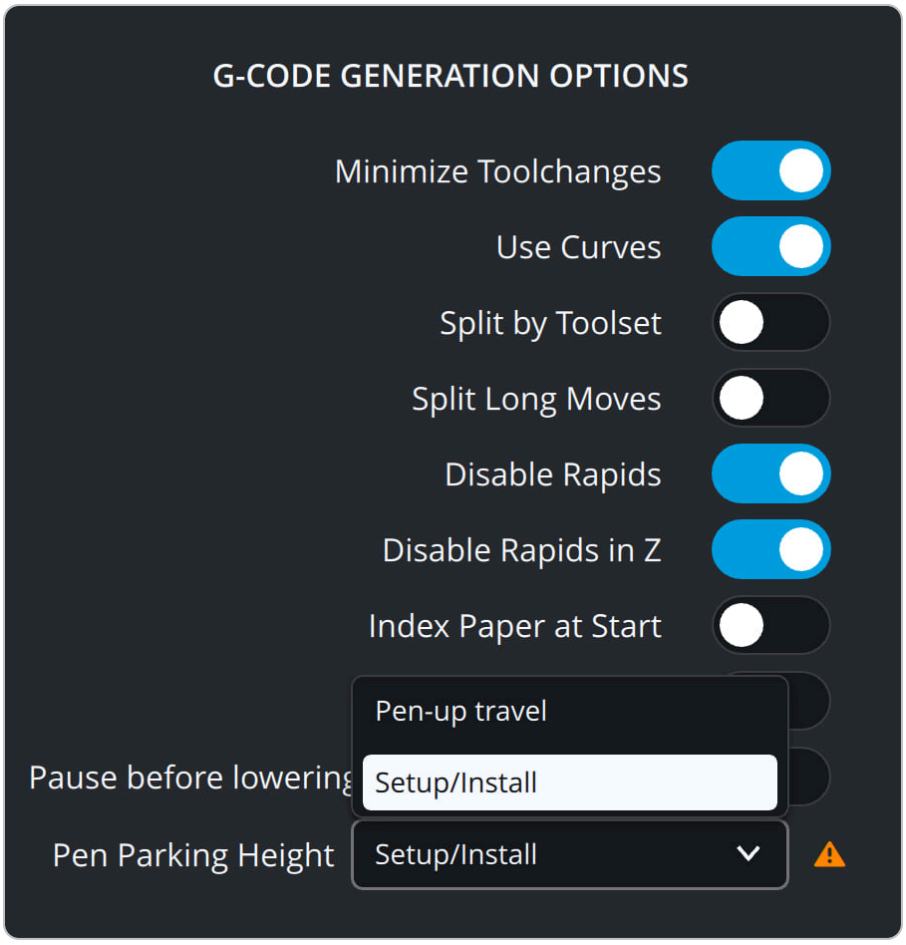
Each pen preset sets how the pen meets and leaves the paper, so most writing never needs these settings changed. They work together like this:

- Some presets have the pen enter and leave each stroke at a slight angle (**Lead Angle**) rather than straight down and up, which keeps ink from pooling at the ends of strokes.
- The pen drops quickly until it is just above the paper (**Approach Above Paper**), slows to **Touchdown Speed** as it makes contact, and speeds up again once it is past contact (**Slow Past Contact**). The slow part is short, so the pen lands without bouncing and the job loses little time.
- With **Soft Lift** on, the pen leaves the paper slowly and slows again at the top of its travel, so it does not bounce off the lift mechanism.

These settings are in the tool editor's **Pen Landing & Lift** section; see §23.7 Pen Landing & Lift.

12.9 Pen changes and pauses

- **Hold Position on Tool Change**, on each tool, makes the HandWriter stop at the pen loading position and prompt you on the display when a job switches to that pen. Every preset tool has it on; a tool you create from scratch starts with it off. See §11. Pen loading and pen compatibility for loading the next pen.
- **Pause before lowering pen to install height**, in **G-CODE GENERATION OPTIONS** on the **PREPARE** tab's **OPTIONS** sub-tab, adds a stop to each pen change after the first. The HandWriter pauses with the pen raised, before lowering to install height, and continues when you resume. This keeps the pen tip off the paper, where it could leak, while you get ready. (Default: off)
- **Pen Parking Height**, in the same section, sets where the pen waits when you pause a job. **Pen-up travel** parks the pen at its **Pen Up/Park Height**. (Default: Pen-up travel) Because the pen is installed with its tip on the paper, **Setup/Install** would park it on the page, where it could mark the paper. Studio shows a warning beside the menu if you choose it.



Pen Parking Height *menu with* ***Setup/Install*** *chosen, and the warning beside it*

Refills are rarely needed on the HandWriter, so the presets are set to **No Refills**. They can come in handy, for example to swap in a fresh pen partway through a long batch of letters: set a **Refill Distance**, and when the pen has written that far, the HandWriter lifts it, moves to the pen loading position, and pauses so you can put in a fresh pen, then continues where it stopped.

12.10 Tuning a pen

Tune a pen on scrap paper, starting from the preset closest to it:

1. Copy the tool into a toolset of your own, or duplicate its toolset.
2. Write a short test: a few lines of text in the size and font you plan to use.
3. Change one setting at a time, and write the test again after each change.
4. When the result looks right, save your changes. Export the toolset to keep a backup.

Match what you see to the setting most likely to fix it:

- **Light, skipping, or broken lines:** increase **Pressure Depth** a little, or reduce the **XY** feedrate so the ink can keep up.
- **Wobbly lines, or a tip that catches the paper:** reduce **Pressure Depth**.
- **Blobs at the start or end of strokes:** try a slightly lower **Lead Angle**, or reduce **Pressure Depth**.
- **The pen bounces or taps when it touches down:** make sure the tool started from the preset for its pen type. If it still bounces, lower **Touchdown Speed**.
- **Marks or smudges between words:** increase **Pen Up/Park Height**.
- **Jobs feel slow, with long pen lifts:** reduce **Pen Up/Park Height**, as long as the pen still clears the paper.

For complete Tool Library details, see §23. Studio: the Tool Library.

13. Paper handling

The Bantam Tools HandWriter® is designed for standard sheets of paper, with simple loading and repeatable alignment. The most common paper sizes are US Letter and A4, but smaller formats can also be used for invitations, cards, and other personalized pieces.

13.1 Standard paper sizes

The HandWriter is designed around standard sheet sizes.

Common supported formats include:

- 8.5" × 11" (US Letter)
- 8.5" × 14" (US Legal)
- A4

These are the best sizes to use when writing full letters, customer follow-ups, donor letters, direct mail inserts, and other standard correspondence.

When preparing your file in Bantam Tools Studio™, choose the paper size that matches the sheet you plan to load. The preview will show how your text or artwork fits on that sheet before you generate the file.

13.2 Page margins

The HandWriter writes to within 3 mm of the left, right, and top edges of the sheet. It holds a wider margin at the bottom, at least 25.5 mm, which is the space it needs to grip, feed, and present the sheet reliably.

When working with copied and pasted text, or text opened from a text file, Bantam Tools Studio™ will account for these margins as it lays out the page.

When developing SVG templates, keep artwork and text inside these margins.

> ***Tip:*** Pay special attention to the bottom of the page when designing SVG templates. Keep important text, artwork, borders, and signatures clear of the bottom margin, which is 28 mm unless you change it.

13.3 Smaller paper formats

The HandWriter also writes on smaller sheets:

- 8.5" × 5.5" (Half Letter)
- A5

On these smaller formats you can create invitations, short letters, personalized inserts, or folded cards.

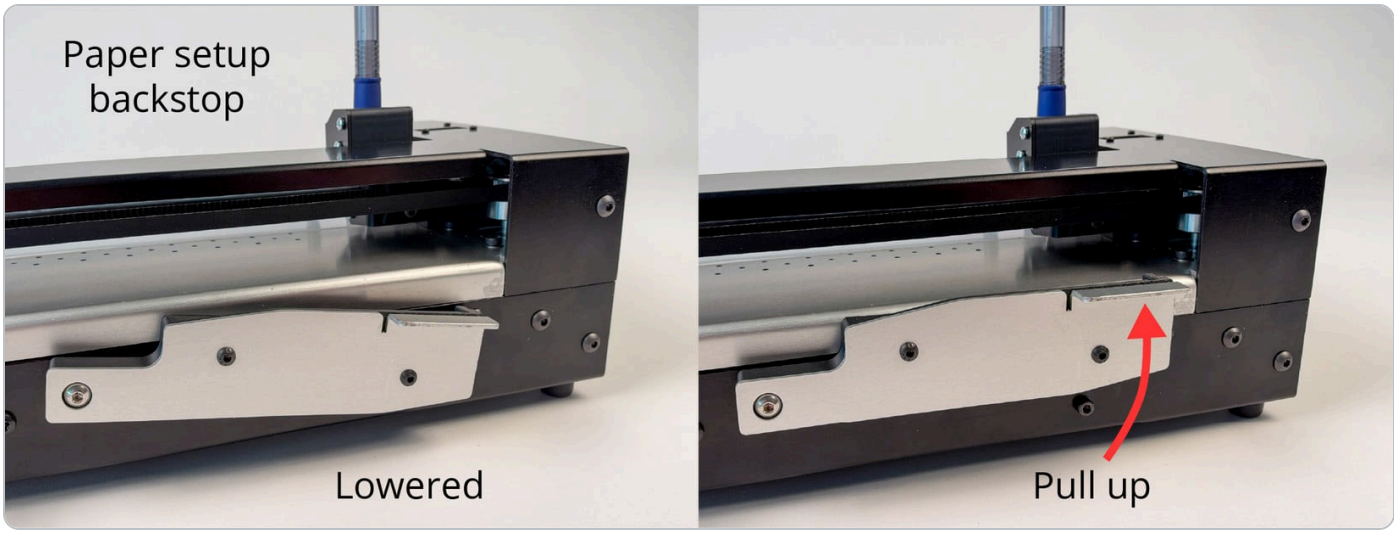
The Half Letter format is especially useful because it can be folded in half to make a small greeting card, gift card, or seating place card. When oriented horizontally before folding, you can place a personalized note on the inside of the folded card.

Half Letter and A5 sheets can also be paired with A9 invitation envelopes to create wonderful invitations or smaller letters.

13.4 Loading paper

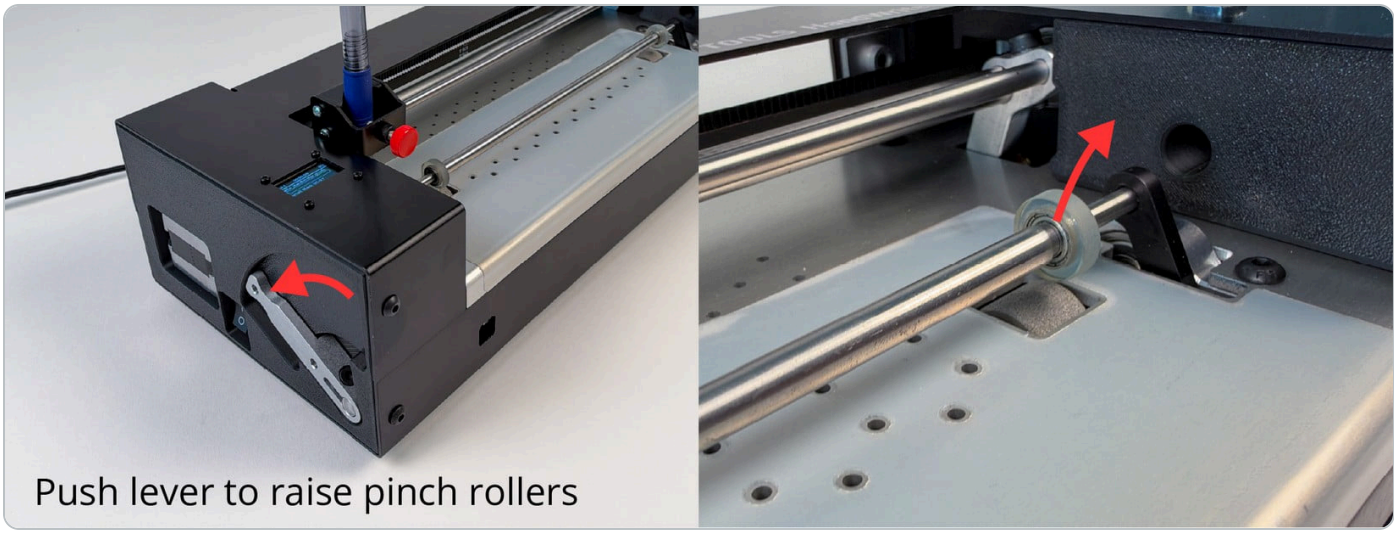
Load paper using the standard paper loading sequence:

1. Raise the paper setup backstop.



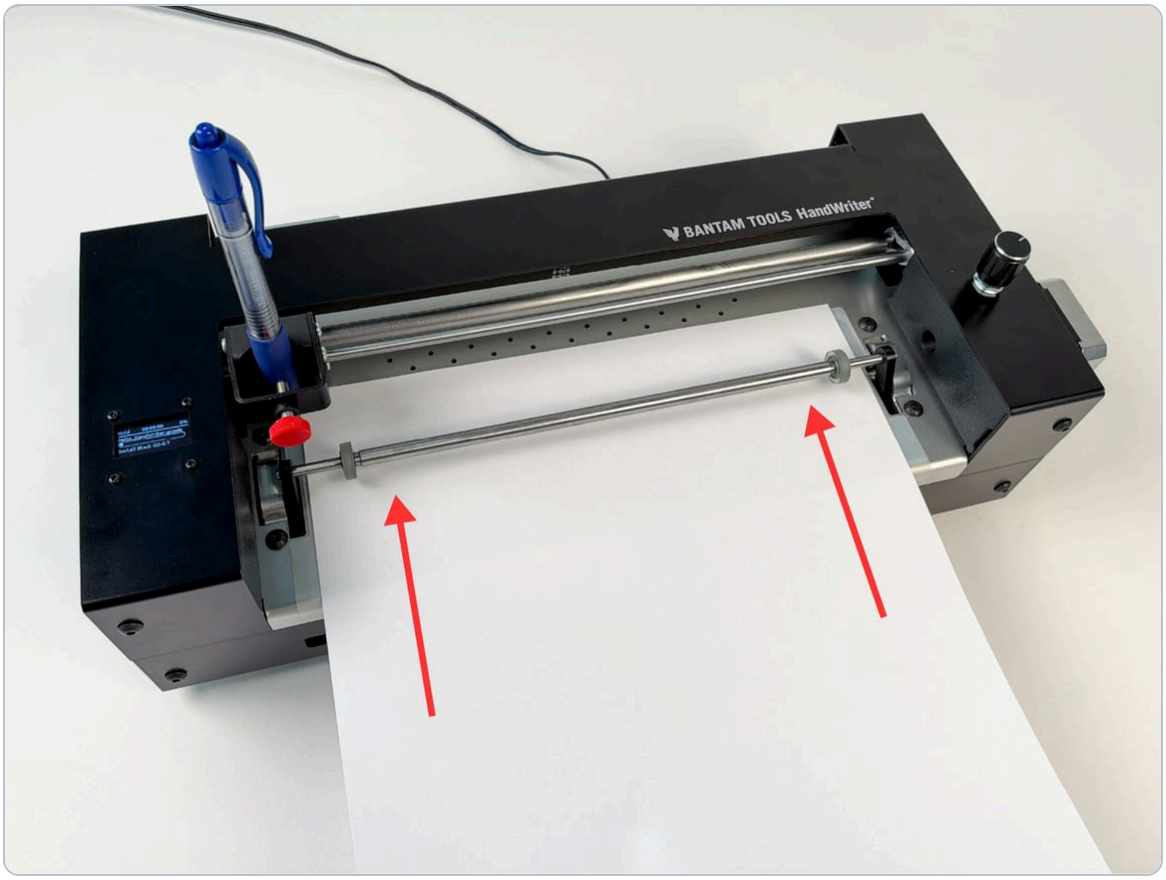
The paper setup backstop, lowered (left) and raised (right).

2. Raise the pinch rollers: push the paper release lever, on the left side of the machine, back and away from you.

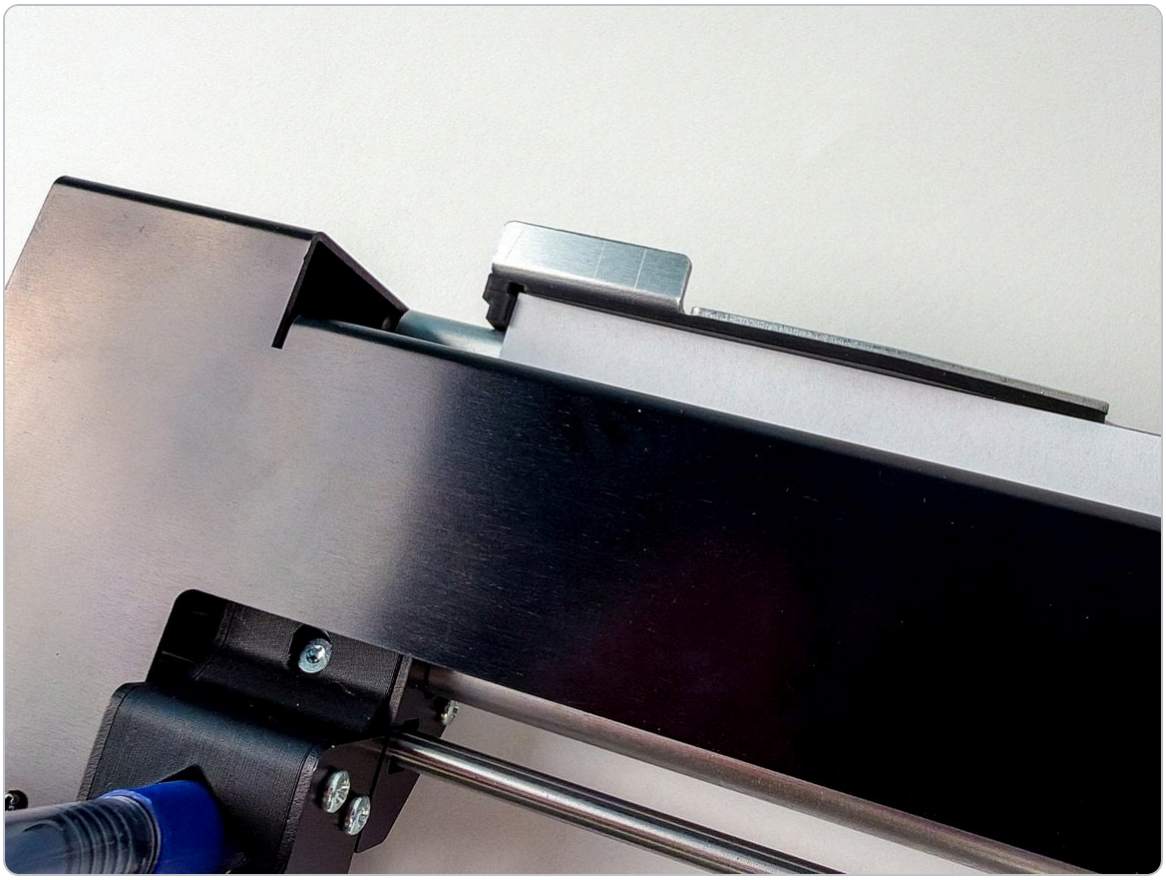


Pushing the paper release lever back raises the pinch rollers off the paper path.

3. Insert the paper into the back left corner.

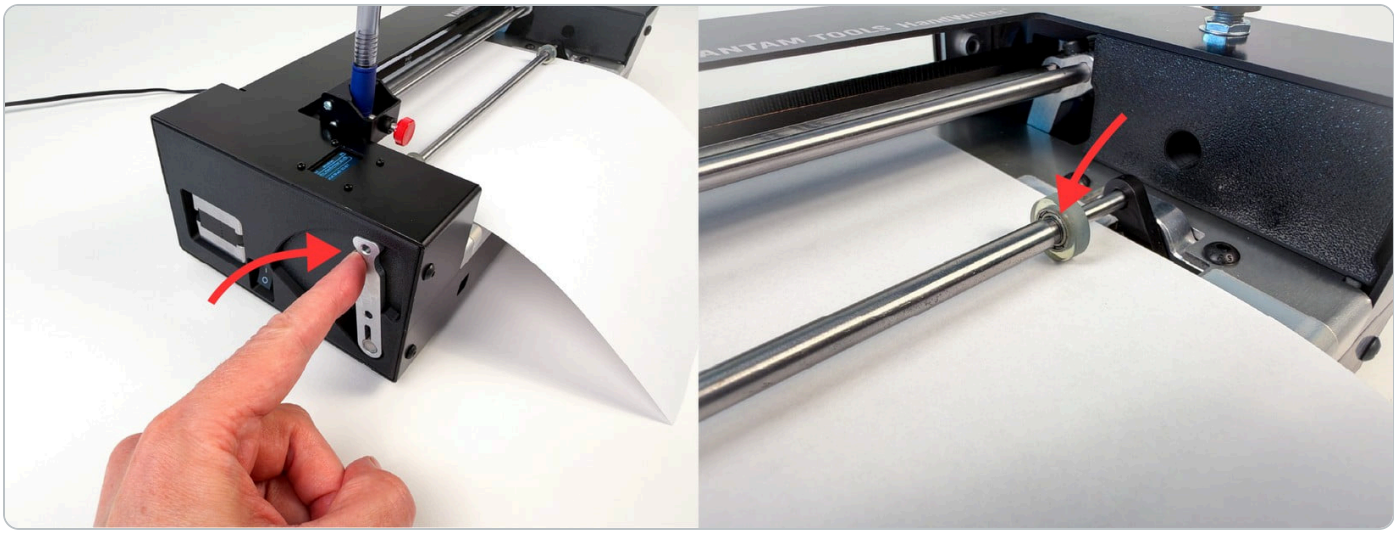


Sliding the sheet in from the front, under the raised pinch rollers.



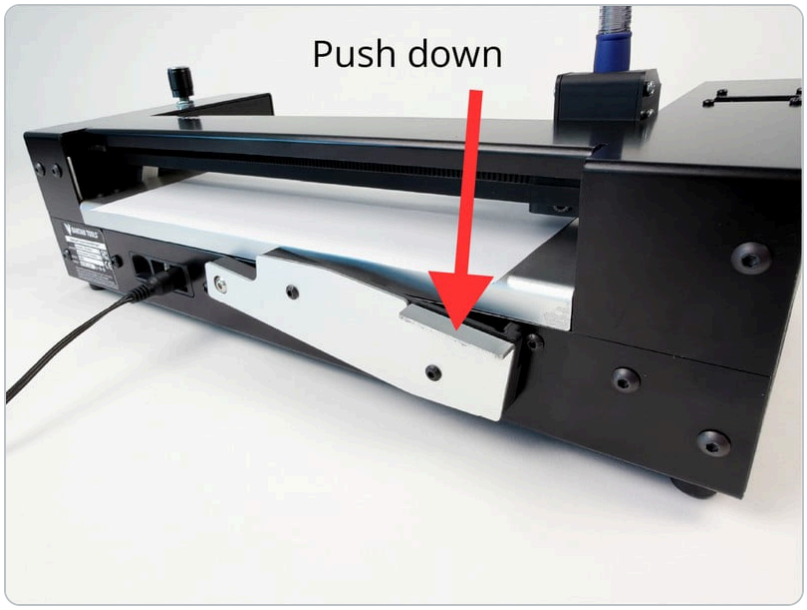
The sheet seated in the corner at the left end of the raised paper setup backstop.

4. Lower the pinch rollers to lock the paper in place: hold the paper steady and pull the release lever all the way toward you.



Pulling the paper release lever toward you lowers the pinch rollers onto the sheet.

5. Lower the paper setup backstop. The sheet travels farther back than the backstop while writing, so it must be down before you start.



Pushing the paper setup backstop down, after the pinch rollers hold the sheet.

The paper should sit flat and index cleanly against the paper setup backstop. If the sheet is crooked, wrinkled, curled, or not seated fully into the corner, remove it and load it again.

13.5 Paper orientation

The orientation you choose in Bantam Tools Studio™ should match how the paper is loaded into the machine.

For a standard letter, you will usually use a portrait layout.

> ***Tip:*** The writing does not have to start at the top of the sheet. To write on the lower part only, such as the inside of a card that folds in half, set a large top margin on the **PREPARE** tab, and the writing starts below it.

13.6 Paper quality and feed reliability

Use paper that is flat, clean, and free of curled edges, and not warped, torn, damp, or creased.

14. Power, USB, and microSD details

The Bantam Tools HandWriter® can run files from the included microSD card, or receive files directly from Bantam Tools Studio™ over USB or WiFi. This chapter provides reference documentation for the physical connections on the machine and when each one applies.

14.1 Power

For the steps to connect power and turn the machine on, see §6.2 Connecting the power supply and §6.4 Turning the machine on.

The HandWriter uses a 9 V, 2.5 A, center-positive power supply.

Use only the power supply provided with your HandWriter, or a replacement supplied or approved by Bantam Tools.

Do not use the machine if the power supply, its cable, or its plug appears damaged.

Turn the machine off before unplugging power or moving the machine.

14.2 USB

The USB connection allows Bantam Tools Studio™ to communicate directly with the HandWriter.

The HandWriter uses a USB-B connection on the machine, sometimes called a printer-style USB cable.

A USB cable is included, with USB-A on the computer end and USB-B on the machine end. If your computer has only USB-C ports, use a USB-C adapter, or a USB-C-to-USB-B cable in its place.

Use USB when you want to:

- Connect the HandWriter to your computer.
- Upload files directly from Bantam Tools Studio™.
- Avoid moving the microSD card back and forth.
- Use the most direct connection method during setup or troubleshooting.

To connect over USB, plug the USB-B end of the cable into the HandWriter, then connect the other end to your computer.

Once connected, Bantam Tools Studio™ can detect the machine and send files directly.

14.3 WiFi

WiFi lets you send files to the HandWriter without a USB cable.

WiFi setup is handled through Bantam Tools Studio™. Once the machine is connected to your network, Studio can upload files to the HandWriter over WiFi.

Use WiFi when the HandWriter is near your workspace but not right next to your computer.

WiFi is optional. The HandWriter sets up, runs, and writes entirely from the microSD card, with no network or computer connection, so you can confirm that it works before connecting it to anything. With the card in the machine, Studio also uploads files over USB, so you can work primarily over a USB cable without setting up WiFi

at all. When you want WiFi, Studio sets it up over USB, or with a setup file copied to the card; §15. Sending files to your machine walks through both.

14.4 microSD card

The microSD card lets the HandWriter run files without being connected to a computer. The included card holds the Welcome Letter file used during first setup; to insert it, see §6.3 Inserting the microSD card. Your own G-Code files from Bantam Tools Studio™ go on the same card.

With files on the microSD card, the HandWriter can operate untethered, and you can prepare files on one computer and run them later from the machine.

See §15. Sending files to your machine for copying files to the card and running them, including folders of files, and §15.3 About microSD cards for formatting, choosing, and caring for a card.

15. Sending files to your machine

Whatever you prepare in Bantam Tools Studio™ leaves the computer as a G-Code file: a plain text file holding the moves the machine will make. There are three ways to get that file onto the machine, and they differ only in how the file travels. Once it arrives, the machine runs it the same way in all three cases.

- **microSD card** — copy the file to the card at your computer, then put the card in the machine.
- **USB cable** — connect the machine to your computer and upload the file from Studio.
- **WiFi** — put the machine on your network and upload the file from Studio without a USB cable.

This chapter compares the three, then covers each one in turn, and ends with how to put your machine on a network. For every control on the **MACHINE** tab that the USB and WiFi routes use, see §24. Studio: the MACHINE tab.

15.1 Which route to use

We recommend learning the microSD card route first. It gets your machine running on day one with nothing to configure, so you can confirm the machine itself is set up and working before adding a network or a cable to the picture. A card reader and a card are the whole dependency. When a file is on the card, the file is on the machine.

WiFi can be the most convenient route once your machine is settled in place. The machine joins a 2.4 GHz network, Studio finds it there, and files travel with no USB cable and no card handling — the machine can live across the room, and several people on the network can send to it.

USB sits between the two. It depends on nothing but a cable, the same as the card, and it lets Studio upload, start, pause, and cancel a job without your leaving the computer. The machine has to sit within a cable's length of the computer, and the cable has to stay put while the job runs.

Each route at a glance:

- **microSD card:** Works anywhere, with no connection to configure. You walk a card between the computer and the machine.
- **USB:** Direct and fast, with full control of the machine from Studio. Ties the machine to one computer, within cable reach.
- **WiFi:** No cable and no card to carry. Needs a network that lets your computer and the machine reach each other.

Which route suits you depends on where the machine sits and what your network allows. Most owners end up using more than one — a card for a machine set up away from the desk, USB when tuning a job and re-running it repeatedly. You can change routes at any time; nothing about a job is specific to how it traveled.

15.2 Sending files on a microSD card

The machine reads G-Code files from a microSD card and runs them with no computer attached. The card that shipped with the machine already holds the welcome file, and it is also where your own work goes.

1. In Studio, generate and save the G-Code file for your job.
2. Turn the machine off, then remove the card. (You can also swap the card with the machine on, once it is idle: no file running, and no upload or file change under way from Studio.)
3. Put the card in your computer's card reader and copy the file onto it.
4. Eject the card from your computer and put it back in the machine.
5. At the machine, open the file browser, scroll to the file, and press the control knob to start it.



Putting the microSD card back in its slot, label up.

The machine moves to its pen loading position and waits for you to load the tool and the media.

Browsing the card at the machine — opening folders, running a folder of files one after another, Run Again, and the check marks that mark completed files — is covered in §10. The HandWriter interface, which documents every menu on the machine itself.

15.2.1 Keeping files in folders

A folder groups related files so the machine can run them in sequence: a batch of individual letters, or a Stack produced by Data Merge. Copy the whole folder onto the card and the machine treats it as a set, offering to continue to the next file as each one finishes.

15.3 About microSD cards

The machine reads microSD cards formatted with the FAT32 file system, sometimes called MS-DOS (FAT). The card that ships with the machine is ready to use as it comes, and so are new cards of 32 GB and smaller; a larger card works once you reformat it as FAT32. Formatting erases everything on the card, so move anything you want to keep off it first.

Buy microSD cards from a seller you trust. Counterfeit cards, sold under the names of reputable brands, hold far less than their labels say; they appear to work normally, then lose or corrupt files as they fill. Reformatting clears ordinary file errors, but a counterfeit card fails again as it fills, so replace a card that loses or corrupts files.

Keep the card with the machine's accessories when it is not in the machine. Avoid bending it, touching its metal contacts, or leaving it loose on a work surface.

15.4 Sending files over USB

A USB cable connects the machine directly to your computer, and Studio then uploads files and drives the machine without anything in between.

Your machine uses a USB-B connection — the squarish connector sometimes called printer-style. Use a USB cable with USB-B at the machine and USB-A at the computer, or a USB-B to USB-C cable if your computer has only USB-C ports.

To send a job over USB, connect the cable at both ends, open the **MACHINE** tab in Studio, and click **Connect**. Studio favors USB automatically when your machine is available on it. Once the connection row reads **USB Serial**, upload the file with **Upload File** and start it with **Begin Selected**, or send the job straight from the Setup Sheet after processing it. The full set of controls is in §24. Studio: the MACHINE tab.

Files uploaded over USB land on the machine's microSD card, exactly as if you had copied them there yourself, so they stay on the machine after the job and after a power cycle.

15.5 Sending files over WiFi

To send over WiFi, the machine has to be on the same network as your computer; see §15.6 Putting your machine on a network. After that, connect from the **MACHINE** tab with **Scan for Plotters**, or with **Enter IP** if the scan finds nothing, and upload as you would over USB.

The machine joins 2.4 GHz networks. Most routers broadcast 2.4 GHz and 5 GHz under a single name, and the machine uses the band it supports; where a router names the two separately, give the machine the 2.4 GHz name.

Studio checks every WiFi upload against the size it sent. If the machine's microSD card is full, Studio reports that there is not enough free space for the file: delete files from the card and try again. If the file arrives incomplete, the machine rejects it and Studio says so; send the file again.

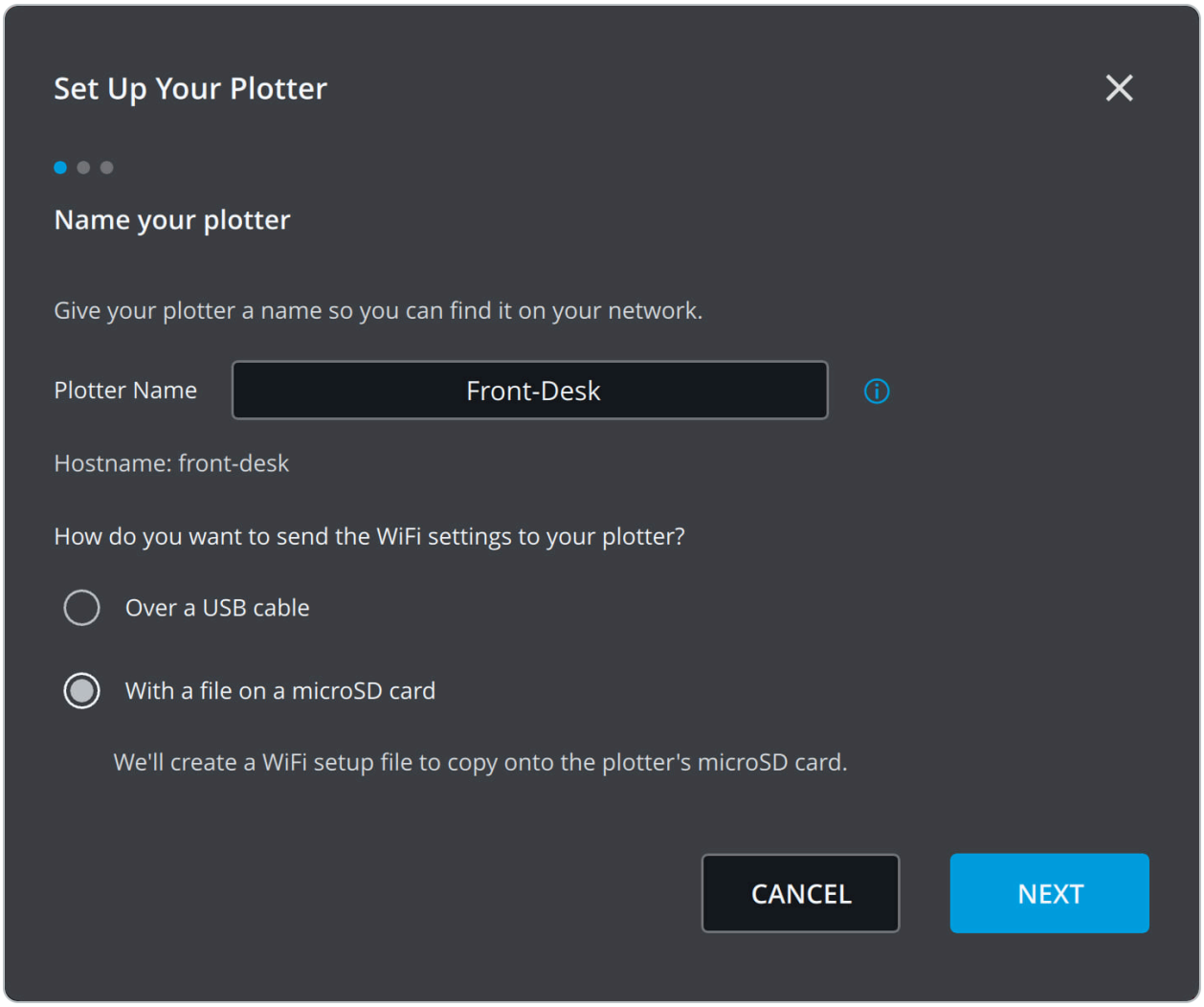
Some networks cannot carry your machine at all. The machine needs a network with a password; networks without one, or that ask for a user name, are not supported. A network that asks you to sign in, whether on a browser page or with your own user name and password, has no way to ask a machine for either. Many networks at businesses, academic institutions, and secure facilities are also set up to keep devices like these off them. On those networks, send files over a USB cable or on the microSD card.

15.6 Putting your machine on a network

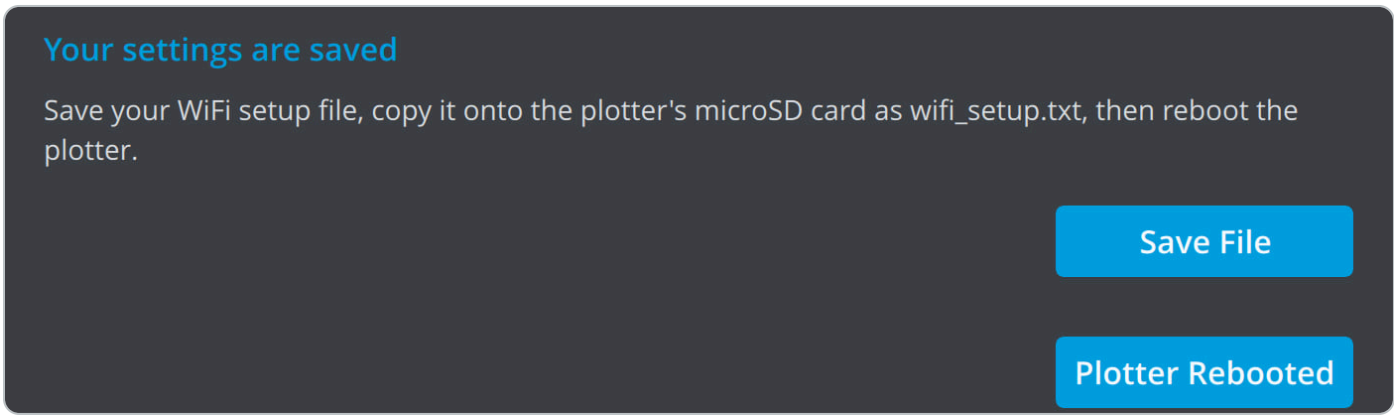
A machine joins a network once it knows the network's name and password. Studio's **Set Up Your Plotter** dialog collects both and delivers them to the machine, either over a USB cable or in a file on the machine's microSD card.

1. Open the **MACHINE** tab, click **Connect**, and choose **Setup New Plotter**.
2. Enter a **Plotter Name** you will recognize later, especially if you own more than one machine.
3. Choose how to send the WiFi settings: **Over a USB cable** or **With a file on a microSD card**. Over USB, connect the machine with a USB cable; **NEXT** appears once Studio finds it.
4. Enter the **WiFi Name (SSID)** and **WiFi Password** for the network the machine should join, and continue.
5. Over USB, Studio writes the settings to the machine directly. Click **Reboot Plotter** to restart the machine on your network.
6. With a microSD card, click **Save File** and save the setup file, then copy it onto the machine's microSD card as `wifi_setup.txt`. Put the card back, restart the machine, and click **Plotter Rebooted**.

If the machine's firmware is too old to receive WiFi settings over USB, the first page reads **Firmware update required.** Update the firmware, then reconnect the machine.



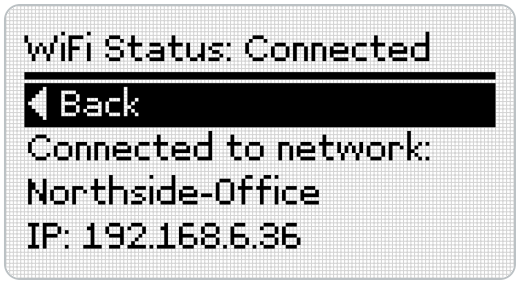
*The first page of the **Set Up Your Plotter** dialog, with **With a file on a microSD card** chosen*



*The card route's last step: **Save File**, then **Plotter Rebooted** once the machine has restarted*

Studio then looks for the machine on your network, and the machine appears the next time you **Scan for Plotters**. If it does not, choose **Enter IP address manually** and enter the machine's address.

The machine shows its own address on its display, under **WiFi Status**; see §10. The HandWriter interface. Studio also shows it beside each machine in the **Plotters on network** list, and beside the name of a machine it is already connected to over WiFi.



WiFi Status *on the machine's display, showing its IP address.*

> ***Note:*** Network settings live on the machine, not in Studio, and they survive a power cycle. When the network's name or password changes, run setup again — the machine has no way to learn the new password on its own.

For a description of every control in the dialog, see §24.4 Setting up a new plotter.

16. Writing a batch of letters

Batch Editing lets you open and prepare multiple text files at the same time, so a folder of individual letters, each saved as its own text file, can be prepared together rather than one by one.

Use Batch Editing when the letters are already written.

Use Data Merge when you want Bantam Tools Studio™ to generate personalized letters from one template and a spreadsheet.

16.1 When to use Batch Editing

Use Batch Editing when you have multiple separate text files, such as:

- Individual customer letters
- Donor letters
- Invitations
- Thank-you letters
- Follow-up letters
- Letters prepared by another person or system

Each file should contain the full text of one letter.

For example, you might have a folder with files like:

- `letter_001.txt`
- `letter_002.txt`
- `letter_003.txt`

Here is one such file, `letter_001.txt`, in full:

```
Dear Margaret,

Thank you for your very first order from Cedar & Wick. Your Lavender & Bergamot Pillar
Candle left the studio this morning, wrapped in tissue and ready for its new home.

We pour every candle by hand in small batches, so it means a great deal when someone
new decides to give us a try. For the cleanest burn, let the first lighting run until
the wax melts all the way to the edge.

We hope it brings a little calm to your evenings.

With thanks,
{{sig}}
Founder, Cedar & Wick
```

The `{{sig}}` line tells Studio to write your signature there; see §26.4 Signatures. A CSV file is never required for `{{sig}}`.

Each file can be opened, previewed, adjusted, and generated from Bantam Tools Studio™.

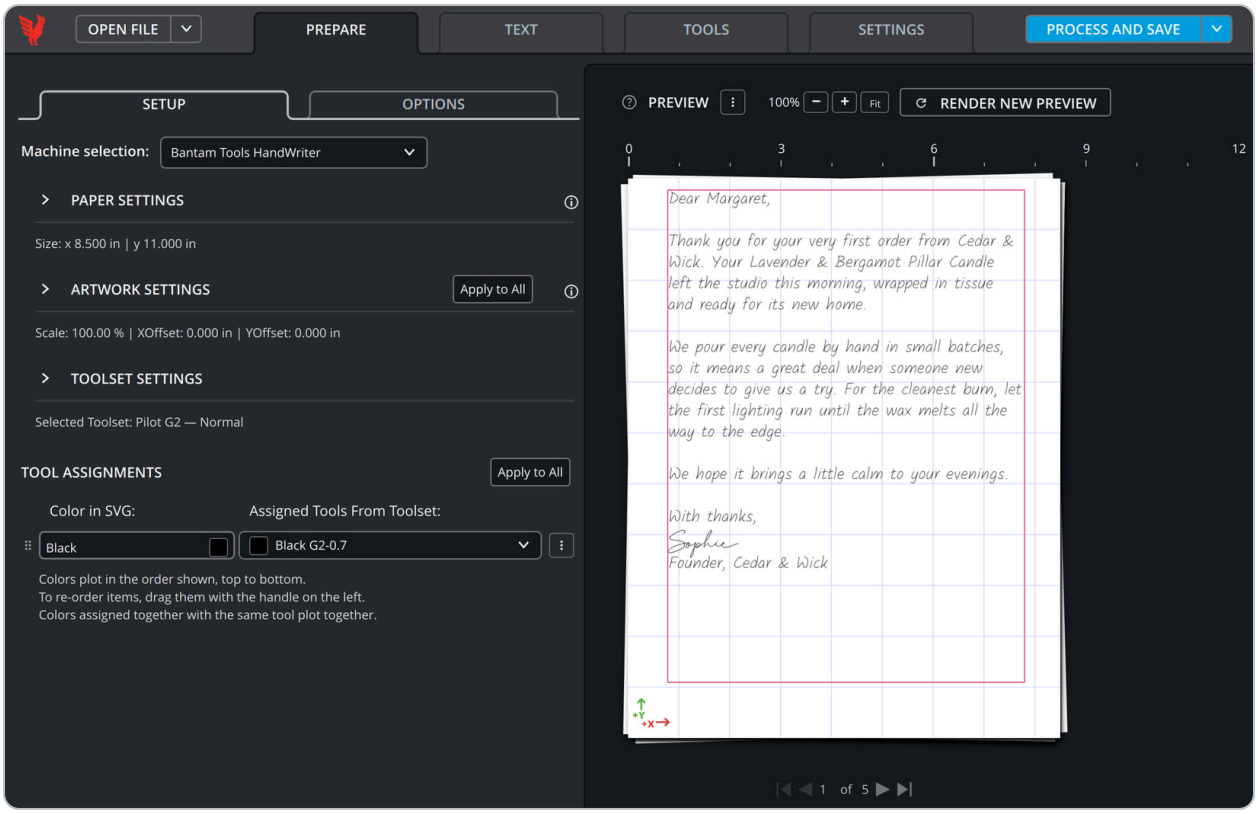
16.2 Opening multiple text files

Open Bantam Tools Studio™.

Make sure HandWriter is selected as your machine.

Click **OPEN FILE** and select all the text files you want to prepare. Choose only text files: a batch is all text files or all SVG files, not a mix.

Each text file becomes one page in the batch, and the page navigator below the **Preview** steps between them.

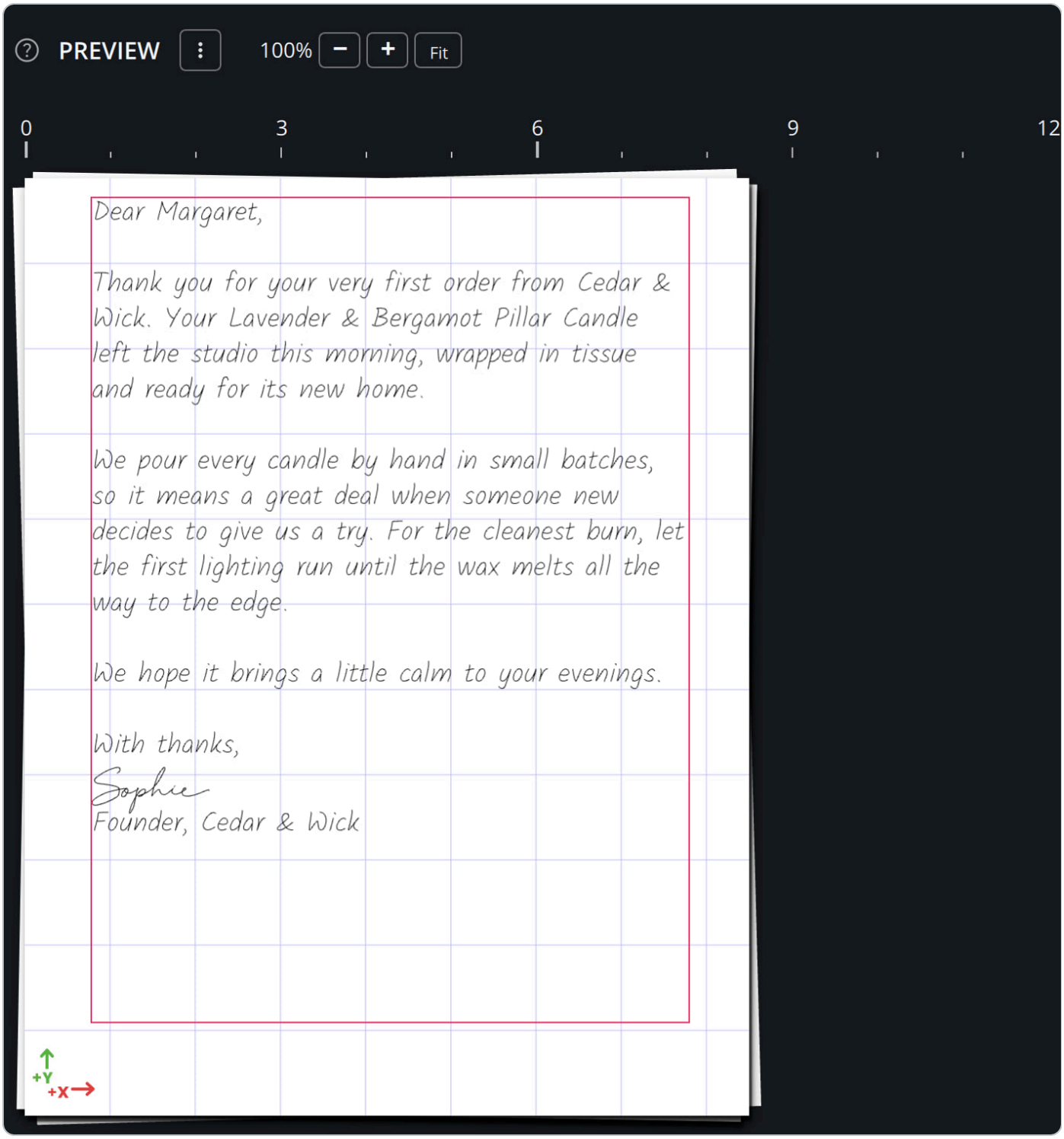


*Five letters open as a batch, with letter 1 of 5 in the **Preview***

16.3 Reviewing each letter

Click through the files in the batch and review each letter in the preview area.

Check that each letter opens correctly, fits on the selected paper size, and appears inside the margins.



*One letter in the **Preview**. The red rectangle marks the margins, and the signature is drawn where `{{sig}}` sits.*

If a letter is too long, reduce the text size, adjust the spacing, or edit the text until it fits comfortably on the page.

16.4 Choosing a font for the batch

Open the **FONT** section and choose the handwriting font you want to use. The font applies to every file in the batch, so the letters share a consistent style.

16.5 Adjusting size and layout

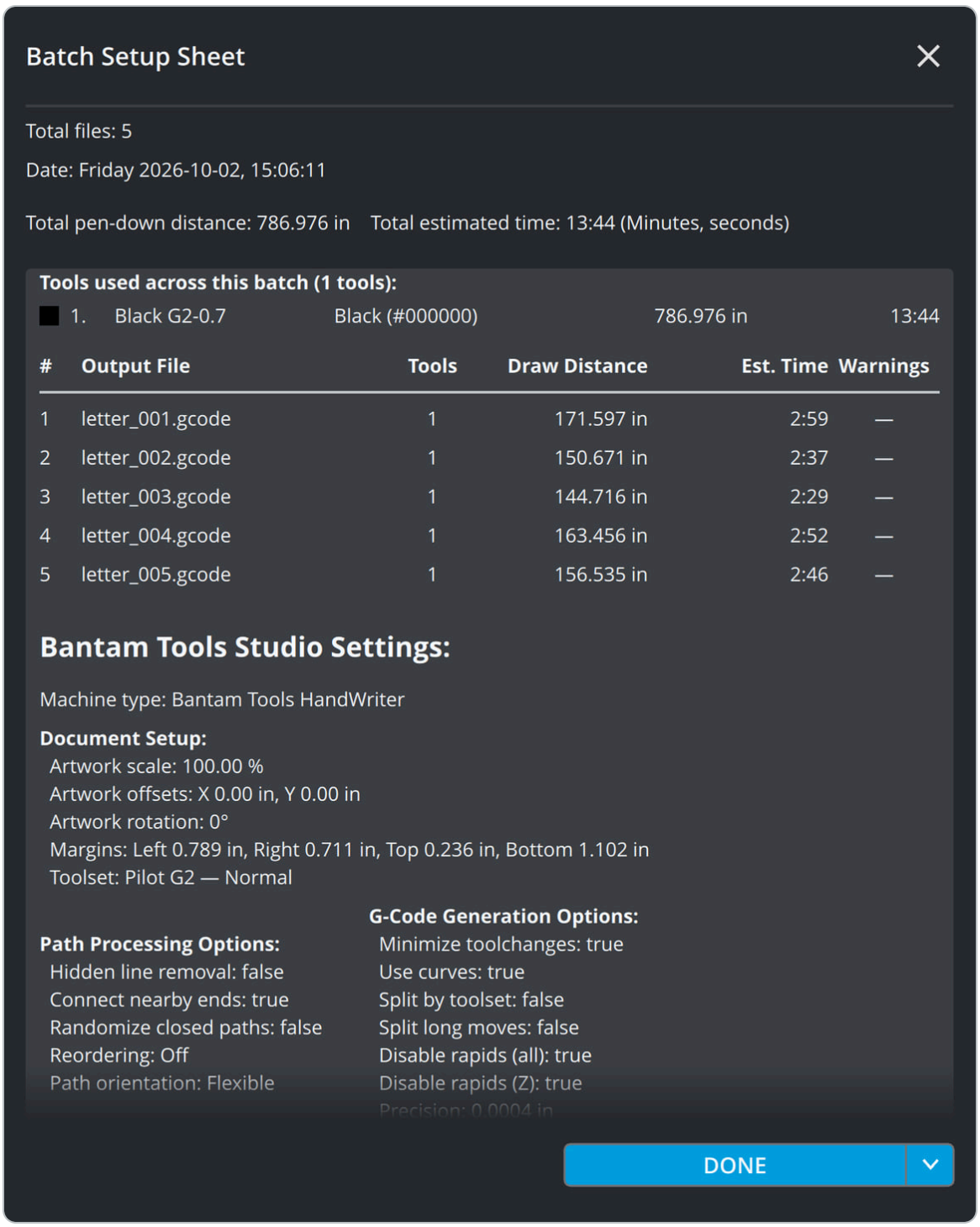
Use the text size controls to set the size of the writing.

Font size applies to the whole batch. If one letter is much longer than the others, shorten its text, or open it on its own and generate it separately.

Watch the preview as you work. The preview shows where the pen strokes will land on the actual sheet, including the page margins.

16.6 Generating the batch

Once the letters look correct, generate the files for the HandWriter.



*The **Batch Setup Sheet** lists one output file per letter, with its draw distance and estimated time*

If you are connected over USB or WiFi, you can upload the files directly to the machine.

If you are using the microSD card, click **PROCESS AND SAVE**, then save the generated files and copy them to the microSD card.

16.7 Writing the batch

Load the pen and paper before starting the first file.

To load paper:

- Raise the paper setup backstop.
- Raise the pinch rollers with the paper release lever.
- Insert the paper into the back left corner.
- Lower the pinch rollers with the release lever to lock the paper in place.
- Lower the paper setup backstop.

To load the pen, insert the pen into the pen clip until its tip rests directly on the writing surface, then tighten the thumbscrew to lock it in place.

For a more thorough walkthrough, see §11. Pen loading and pen compatibility and §13. Paper handling.

Start the first file from the machine screen or upload it from Bantam Tools Studio™.

The HandWriter will write the first letter with the loaded pen. When the sheet is complete, remove the finished letter.

When a file from a folder finishes, the machine opens its post-run screen with **Run Next** highlighted.

Press down on the control knob to choose Run Next. The machine will home as normal, then pause for you to insert the next sheet.

Load the next sheet using the same paper loading sequence, then press down on the control knob when you are ready to run the next letter.

If you need to restart the same letter for any reason, the machine will also present options to Run Again or return to the file list.

The HandWriter keeps track of which files have been fully completed. Completed files are marked with a small check mark before the file name in the file list. This makes it easier to see what has already been written and start where you left off.

Continue this process until the batch is complete.

17. Writing letters with Data Merge

Data Merge lets you turn one letter template into a Stack of personalized files. Instead of writing each letter by hand, you create one text file with merge fields, load a spreadsheet of recipient information, and Bantam Tools Studio™ generates a separate file for each row.

One template and spreadsheet can then produce donor letters, customer follow-ups, invitations, thank-you letters, outreach campaigns, or any other project where the same basic letter needs to be personalized for different people.

17.1 Creating your text file template

Start by writing your letter in a plain text file.

You can use any basic text editor, such as TextEdit on Mac, Notepad on Windows, or another writing app that can save a `.txt` file.

Write the letter the way you want it to appear, but use merge fields anywhere you want information from your spreadsheet to appear.

Merge fields use double curly brackets:

```
{{first_name}}
```

For example:

```
Dear {{first_name}},
```

When Bantam Tools Studio™ runs the Data Merge, it will replace {{first_name}} with the value from the matching column in your spreadsheet.

A simple template might look like this:

```
Dear {{first_name}},

Thank you for your recent order of {{product_name}}. We hope you love it.

As a thank-you, here is a discount code for your next order: {{discount_code}}

Warmly,
{{sender_name}}
```

17.2 Preparing your spreadsheet

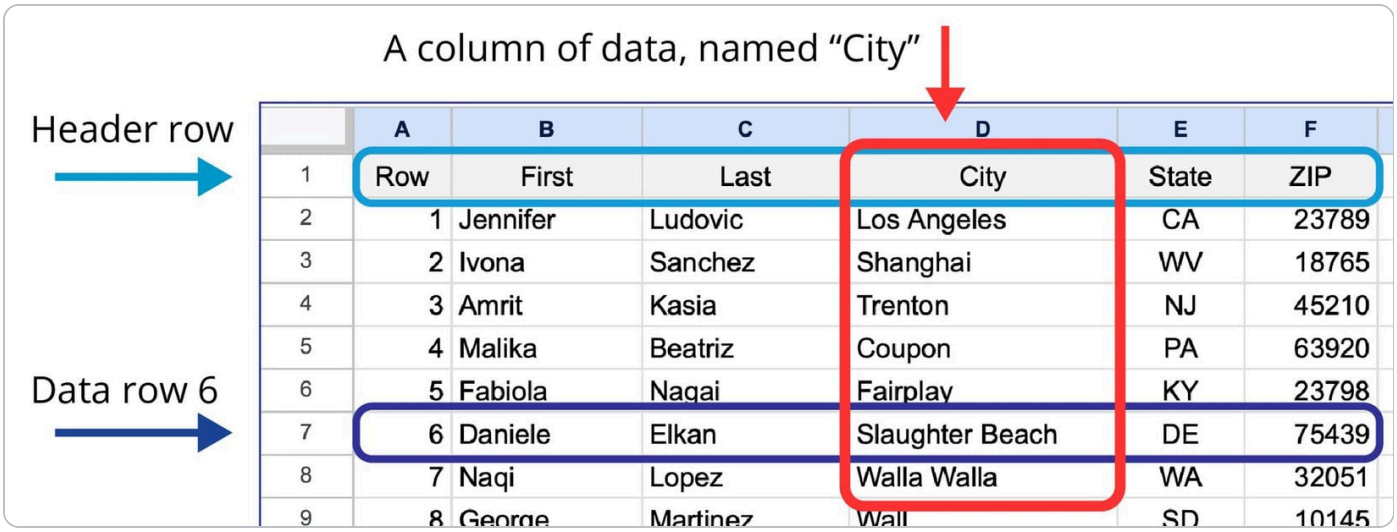
Next, create a spreadsheet with the information you want to merge into the letter.

The first row of the spreadsheet must be a header row. Each header becomes a field name that can be used in your template.

For example, your spreadsheet might include columns named:

- first_name
- product_name
- discount_code
- sender_name

Each row below the header represents one finished letter.



A spreadsheet's header row, a column of data, and a data row. Data rows are counted from the first row under the header, so spreadsheet row 7 is data row 6.

Each merge field in your text file must match a column header in your spreadsheet. For example, to use `{{first_name}}` in your template, your spreadsheet must have a column named `first_name`. (Matching ignores letter case and any spaces around the name.)

When the spreadsheet is ready, export or save it as a CSV file.

17.3 Opening the template in Studio

Open Bantam Tools Studio™.

Make sure HandWriter is selected as your machine.

Open your text file template: click **OPEN FILE**, then select the `.txt` file.

The template appears in the preview area with its merge fields showing. They are replaced with data once you load the CSV file in Data Merge and turn on **Preview merge result**.

17.4 Loading the CSV file

Open the Data Merge tab.

Enable Data Merge, then load your CSV file.

Bantam Tools Studio™ will read the header row and show the available fields from your spreadsheet.

If a merge field names a column your CSV file does not have, Studio reports it as a missing column below the **CSV DATA PREVIEW** section, and does not generate the Stack until the merge field or the header is corrected.

17.5 Previewing the merged letters

Use the Data Merge preview to check your letters before generating the Stack.

Review the detected columns, row count, and matched fields.

Preview a few rows to make sure names, products, discount codes, addresses, or other personalized fields are appearing where you expect them.

17.6 Choosing a row range

Before generating the full Stack, you can choose which rows to include.

For a first test, it is a good idea to generate only the first few rows. This lets you confirm that the layout, font, sizing, and merge fields are correct before running the full list.

After the test looks right, return to Data Merge and select the full row range for your Stack.

17.7 The Merge File Naming setting

Choose how Bantam Tools Studio™ should name the generated files.

You can name files in one of three ways:

- **Sequential: 1, 2, 3...** — numbers the files in order. (Default)
- **Data row number** — names each file by its row number in the CSV.
- **First CSV column** — names each file from the first column in the CSV.

For small Stacks, sequential names are simple and easy to manage.

For larger Stacks, using the first column can make files easier to identify, especially if the first column contains a name, order number, donor ID, or customer ID.

17.8 Choosing a font and layout

After your template and CSV are loaded, choose the handwriting font you want to use.

Open the **FONT** section and select a font. The preview will update so you can see how the merged letter will look on the page.

Adjust the text size until the letter fits comfortably inside the margins.

If the letter is too long, reduce the size, shorten the template, or adjust the spacing controls until the full message fits.

17.9 Generating the Stack

Once the preview looks correct, generate the merged output.

Bantam Tools Studio™ will create a Stack of personalized files, with one file for each selected row in the CSV.

A Stack is the exported output from Data Merge: a folder of generated files that all come from the same template and spreadsheet. Each file contains the merged text for one row of your CSV.

If you are connected over USB or WiFi, you can upload the generated files directly to the HandWriter.

If you are using the microSD card, save the Stack and copy the generated G-Code files to the microSD card.

17.10 Writing the Stack

Load the pen and paper before starting the first file.

To load paper:

- Raise the paper setup backstop.
- Raise the pinch rollers with the paper release lever.
- Insert the paper into the back left corner.
- Lower the pinch rollers with the release lever to lock the paper in place.
- Lower the paper setup backstop.

To load the pen, insert the pen into the pen clip until its tip rests directly on the writing surface, then tighten the thumbscrew to lock it in place.

For a more thorough walkthrough, see §11. Pen loading and pen compatibility and §13. Paper handling.

Start the first file from the machine screen or upload it from Bantam Tools Studio™.

The HandWriter will write the first personalized letter with the loaded pen. When the sheet is complete, remove the finished letter.

When a file from a folder finishes, the machine opens its post-run screen with **Run Next** highlighted.

Press down on the control knob to choose Run Next. The machine will home as normal, then pause for you to insert the next sheet.

Load the next sheet using the same paper loading sequence, then press down on the control knob when you are ready to run the next letter.

If you need to restart the same letter for any reason, the machine will also present options to Run Again or return to the file list.

The HandWriter keeps track of which files have been fully completed. Completed files are marked with a small check mark before the file name in the file list. This makes it easier to see what has already been written and start where you left off.

Continue this process until the Stack is complete.

18. Adding a signature

A signature is one of the most effective ways to make a letter feel complete and personal. With the Bantam Tools Studio™ Text Add-On, you can load a signature file and place it in your letters with the signature command `{{sig}}`.

In customer follow-ups, donor outreach, thank-you letters, invitations, fundraising campaigns, and other personalized communications, a signature helps create the impression that the letter was personally prepared and signed, even when the body of the letter is generated automatically.

18.1 What a signature does

The signature feature allows you to load a signature file and place it anywhere within your letter.

Signatures are placed with a signature command:

```
{{sig}}
```

Wherever `{{sig}}` appears in your text, Bantam Tools Studio™ will place the loaded signature when the file is generated.

For example:

```
Warmly,
{{sig}}
```

In the finished letter, the signature appears below the closing line, similar to a traditionally signed letter.

If your font includes a signature, an alternate signature, or initials, `{{sig}}`, `{{sigalt}}`, and `{{siginit}}` draw them with no signature file loaded. See §26.4 Signatures.

18.2 Preparing your signature file

Before using a signature in Bantam Tools Studio™, you will need a signature file.

Signature files should be saved as SVG files. The best signatures are clean, single-color vector drawings that can be plotted efficiently.

One common workflow is:

- Sign a piece of paper.
- Scan or photograph the signature.
- Convert the signature to vector paths using a vector design application.
- Clean up the artwork.
- Save the result as an SVG file.

For best results:

- Use a clean signature with strong contrast.
- Convert the signature to simple vector paths.
- Remove stray marks, dust, or background elements.

- Avoid filled artwork whenever possible.
- Save the final version as an SVG.

> ***Tip:*** Start with a clean signature rather than worrying about its size. You can scale the signature later inside Bantam Tools Studio™.

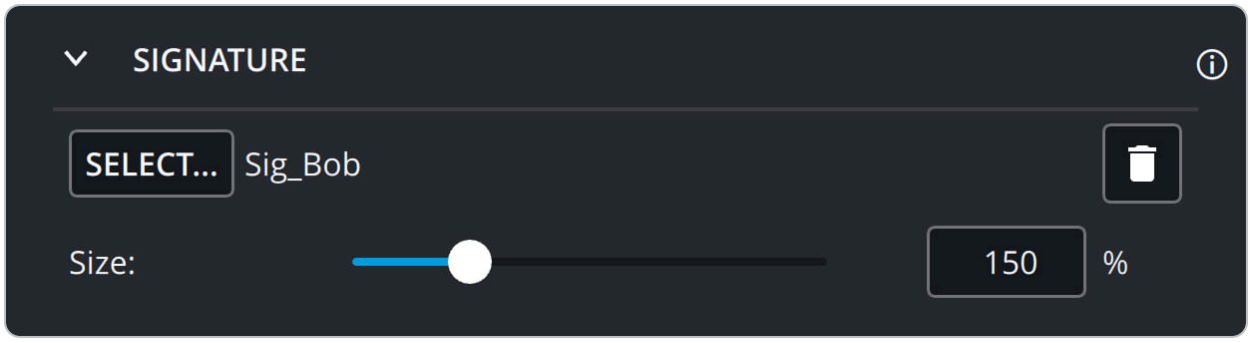
18.3 Loading the signature

Open Bantam Tools Studio™ and make sure your HandWriter project is loaded.

Open the **TEXT** tab and confirm that **Enable Text Rendering** is on.

In the **SIGNATURE** section, click **SELECT** and choose your SVG signature file.

Once loaded, the signature becomes available anywhere you use `{{sig}}`.



*The **SIGNATURE** section with a signature file loaded*

18.4 Placing the signature in your letter

Bring your letter into Studio as usual.

Where you want the signature to appear, insert:

```
{{sig}}
```

A typical closing might look like:

```
Thank you again,
{{sig}}
```

You can place the signature on its own line, below a closing phrase, or anywhere else within the document.

> ***Tip:*** Treat `{{sig}}` like a word within your letter. Add blank lines before or after it to control the spacing around the signature.

18.5 Adjusting the signature size

Use **Size** in the **SIGNATURE** section to scale the loaded signature.

As you make adjustments, watch the preview area to see how the signature will appear relative to the surrounding text.

A signature generally looks most natural when it is slightly larger than the body text but not so large that it dominates the page.

If the signature feels oversized or crowded, adjust the scale until it looks balanced with the rest of the letter.



The signature drawn in place of `{{sig}}`

18.6 Previewing the letter

Before generating the file, review the preview carefully.

Check that:

- The signature appears in the correct location.
- The size looks natural.
- The signature does not overlap nearby text.
- The signature remains within the printable area of the page.

If necessary, adjust spacing, scale, or placement before continuing.

18.7 Generating the file

Once the letter and signature look correct, generate the file for the HandWriter.

If you are connected over USB or WiFi, you can upload the file directly to the machine.

If you are using the microSD card workflow, click **PROCESS AND SAVE**, save the file, and copy it to the microSD card.

18.8 Writing the letter

Load the pen and paper before starting the file.

To load paper:

- Raise the paper setup backstop.

- Raise the pinch rollers with the paper release lever.
- Insert the paper into the back left corner.
- Lower the pinch rollers with the release lever to lock the paper in place.
- Lower the paper setup backstop.

To load the pen, insert the pen into the pen clip until its tip rests directly on the writing surface, then tighten the thumbscrew.

For a more detailed walkthrough, see §11. Pen loading and pen compatibility and §13. Paper handling.

Start the file from the machine screen or upload it from Bantam Tools Studio™.

The HandWriter will write the letter and signature using the loaded pen.

18.9 Signatures in Data Merge

Signatures can also be used with Data Merge. `{{sig}}` is not a merge field, though it is written like one: Studio fills it from your signature file or your font, not from the CSV file, and a CSV file is never required for it.

If your template contains `{{sig}}`, Bantam Tools Studio™ will insert the loaded signature into every generated letter.

For example:

```
Dear {{first_name}},

Thank you for your support.

Warmly,
{{sig}}
```

When Data Merge generates a Stack of personalized letters, each letter will contain the same signature while still receiving its own personalized data. One signature file therefore signs every letter in a fundraising campaign, customer outreach, membership renewal, event invitation, or other large-scale personalized mailing. For more information about creating personalized letters from spreadsheets, see §17. Writing letters with Data Merge.

19. Maintenance

The Bantam Tools HandWriter® is designed to require very little routine maintenance. For best results, keep the machine clean, keep the paper path clear, and inspect the pen, rollers, cables, and moving areas regularly. This chapter provides reference documentation for caring for each part of the machine.

Turn the machine off before cleaning, inspecting, or moving it.

19.1 General care

Place the HandWriter on a stable, flat surface when in use.

Keep the area around the machine clear of loose paper, tools, pens, cables, dust, and other objects that could interfere with the carriage or paper path.

Do not place objects on top of the machine or inside the paper path.

When the machine is not in use, keep it in a clean, dry location.

19.2 Cleaning the machine

Dust, paper fibers, and ink residue can build up over time.

To clean the machine:

- Turn the HandWriter off.
- Unplug power from the machine.
- Remove any paper from the paper path.
- Remove the pen from the pen clip.
- Wipe exposed surfaces with a clean, dry, lint-free cloth.

Do not spray cleaners directly onto the machine.

Do not use solvents, abrasive cleaners, or compressed air near the machine electronics, rollers, or display.

If needed, lightly dampen a cloth with water, then wipe the surface gently. The cloth should be damp, not wet.

Allow the machine to dry fully before reconnecting power.

19.3 Cleaning the pen indexing area

When you load a pen, the HandWriter uses the far left side of the machine as the pen indexing area. Over time, a small amount of ink builds up where the pen tip touches down during setup. This is normal.

If ink builds up, turn the machine off and wipe the area gently with a tissue or clean, dry cloth.

Do not scrape the surface with sharp tools, and do not spray cleaner directly onto the machine.

19.4 Cleaning the paper path

A clean paper path helps the HandWriter feed sheets consistently.

Check the paper path for:

- Loose paper scraps

- Torn edges
- Dust or paper fibers
- Ink marks
- Objects that may have fallen into the machine

Remove any debris carefully by hand while the machine is powered off.

Do not use sharp tools to scrape the rollers or reach into tight areas. If something is stuck and cannot be removed easily, contact Bantam Tools support.

19.5 Checking the rollers

The rollers help hold and feed the sheet during operation.

Over time, rollers may collect paper dust or light residue from handling.

If the rollers look dusty, gently wipe them with a clean, dry, lint-free cloth.

If paper begins slipping, feeding crookedly, or failing to stay in position, check that:

- The paper is flat and clean.
- The pinch rollers are lowered fully.
- The sheet is seated against the paper setup backstop.
- The rollers are clean.
- The paper path is clear.

19.6 Pen clip care

The pen clip should hold the pen securely without needing excessive force.

Before starting a job, check that the pen is seated correctly and the thumbscrew is tightened enough to hold the pen in place.

Do not overtighten the pen screw. Overtightening can damage the pen body or make the pen harder to remove.

If ink builds up around the pen tip or pen clip, remove the pen and wipe the area with a clean, dry cloth.

19.7 Pen and ink maintenance

Pens can dry out, skip, smear, or run out of ink during use.

Before running an important letter or a larger Stack, check that the pen writes cleanly on scrap paper.

Replace the pen if:

- The ink is running low.
- The pen skips or writes inconsistently.
- The line becomes too light.
- The pen leaks, blobs, or smears excessively.
- The tip is damaged.

For long runs, keep extra pens nearby so you can replace a pen quickly if the machine pauses or the writing quality changes.

19.8 microSD card care

Keep the microSD card with your HandWriter accessories when it is not installed in the machine. For formatting, choosing, and caring for a card, see §15.3 About microSD cards.

19.9 Cable and connector care

Inspect the power supply and its cable, any USB cable, and the connectors periodically.

Do not use the machine if a cable, plug, or connector appears damaged.

Route cables so they do not cross the paper path, catch on the moving carriage, or create a tripping hazard.

When unplugging the machine, hold the plug or connector. Do not pull on the cable itself.

19.10 Storage

Before storing the HandWriter:

- Turn the machine off.
- Remove paper from the paper path.
- Remove the pen if the machine will not be used for an extended period.
- Keep the microSD card with the machine accessories.
- Store the machine in a clean, dry location.

If possible, cover the machine or keep it in its original packaging to protect it from dust.

19.11 Service and repairs

Do not modify the HandWriter or attempt unsupported repairs.

Unsupported modifications can cause abnormal operation, damage the machine, or create a safety hazard. They may also void the warranty.

If your HandWriter needs service, contact Bantam Tools support. We can help you troubleshoot the issue and determine the best next step.

Part III: Reference

20. Hardware specifications

This chapter collects the HandWriter's physical, electrical, and performance specifications in one place. Figures are given in millimeters with inches in parentheses, except for paper sizes, which lead with their US designations.

20.1 Physical dimensions

Width, depth, and height: 381 × 168 × 109 mm (15" × 6.6" × 4.3")

Weight: 2.83 kg (6.25 lb)

20.2 Media

Sheet sizes: 8.5" × 11" (US Letter), A4, and 8.5" × 14" (US Legal), Studio's standard sizes for the HandWriter. Custom sizes can be 192 – 216 mm (7.56" – 8.5") wide and 45 – 356 mm (1.77" – 14") long.

Writing area: up to 3 mm from the left, right, and top edges of the sheet, and 25.5 mm from the bottom edge, where the rollers grip the sheet. On a US Letter sheet, that is 209.9 × 250.9 mm (8.26" × 9.88"); on A4, 204.0 × 268.5 mm (8.03" × 10.57").

See §13. Paper handling for how sheets are loaded and registered.

20.3 Pens and tools

Included pen: Pilot G2 gel pen, blue, 0.7 mm tip

Pen barrel diameter: 7.5 – 16 mm (0.30" – 0.63")

See §11. Pen loading and pen compatibility for pen compatibility and installation.

20.4 Performance

Writing speed: set by the pen's settings in Studio. The HandWriter's pen presets write at 3,000 – 8,000 mm/min (50 – 133 mm/s), and the default Pilot G2 preset at 6,000 mm/min (100 mm/s).

Maximum travel speed: 10,000 mm/min on X and Y.

Basic motor step size: 0.025 mm on X, 0.032 mm on Y.

20.5 Electrical

Power supply: 9 V DC, 2.5 A, center-positive, with a barrel plug of 5.5 mm outer and 2.1 mm inner diameter. The supply is universal-input, so it works on mains power in any country. The international version comes with interchangeable wall plugs (see bantam.tools/9vint).

Use only the supplied power supply.

20.6 Connectivity

USB: USB-B port on the machine.

WiFi: 2.4 GHz networks, using WPA2 or WPA3 security. Enterprise networks that sign you in with a user name and password are not supported.

microSD: FAT32-formatted cards.

See §14. Power, USB, and microSD details for how each connection is used.

20.7 Environment

Operating environment: indoors, at normal office temperature and humidity.

20.8 Controller and firmware

Controller: Bantam Tools Serama Hen™.

Firmware: Bantam Tools Serama firmware, based on FluidNC. Update it with the firmware updater program for macOS or Windows (bantam.tools/fw); see §10.11.6 Updating the firmware.

21. Studio: the PREPARE tab

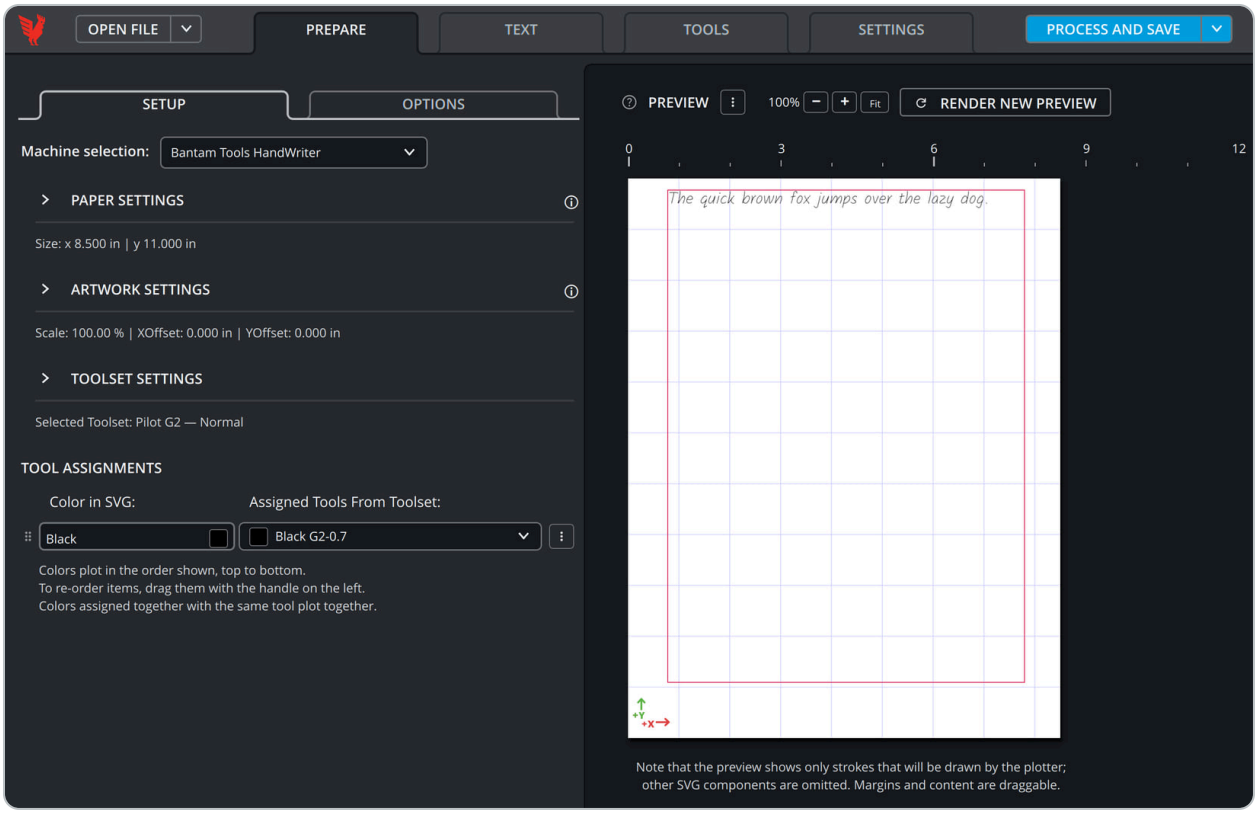
This chapter documents every control on the tab: what each one does and when to change it.

The **PREPARE** tab is where you set up a job before processing, saving, or sending it to a machine. It is the main workspace for choosing the machine, defining the paper or work area, placing the artwork, assigning tools, setting path processing and G-Code behavior, and checking the result in the **Preview**.

The tab is divided into four areas:

- **SETUP:** Machine selection, paper settings, artwork settings, toolset settings, and tool assignments.
- **OPTIONS:** Path processing options and G-Code generation options.
- **Preview:** A visual representation of the strokes that will be written.
- **PROCESS AND SAVE:** The button that generates output from the prepared job.

This section is reference material: it describes every control on the tab, in the order the tab presents them, rather than walking a job from start to finish.



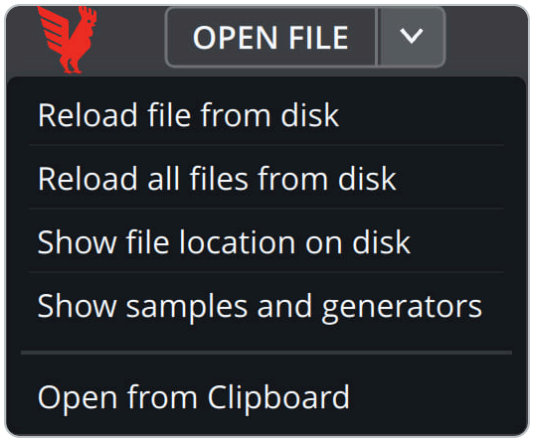
*The **PREPARE** tab: **SETUP**, **OPTIONS**, the **Preview**, and **PROCESS AND SAVE***

Tip: Hover over any setting in Bantam Tools Studio™ to see a short description of what it does.

21.1 Opening files and file actions

The **OPEN FILE** button sits in the upper-left corner of the Studio window. Click **OPEN FILE** and choose the source file you want to prepare.

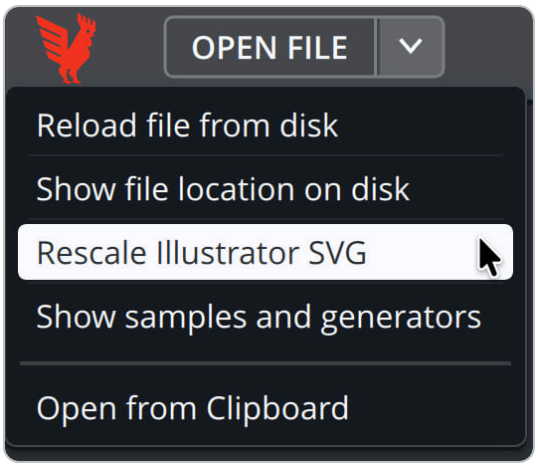
You can also choose more than one. Select several SVG files in the dialog and Studio opens them together: each becomes a page you step through in the **Preview** area's page navigator, and one **PROCESS AND SAVE** writes output for every one of them. A batch is all SVG files or all text files (`.txt` or `.rtf`), and an image file opens on its own. Some of the Setup controls then belong to the page in front of you and the rest to the whole job — see §21.2 What belongs to one document and what belongs to all. Opening several text files together is part of the Bantam Tools Studio Text Add-On; see §27. Studio: writing text.



*With several files open, the menu adds **Reload all files from disk***

The chevron beside **OPEN FILE** opens a menu of additional file actions. Some items appear only when they apply, as noted below:

- **Reload file from disk:** Reloads the currently open file from its saved location, and keeps your tool assignments, plotting order, placement, and handwriting variation. Colors and layers that are new in the file get tools automatically. Use this after editing the source file in another program.
- **Reload all files from disk:** Rereads every file at once when you have opened several. The item appears only then — not for a Data Merge batch, whose documents come from one file — and with a single file open, **Reload file from disk** is the one to use.
- **Show file location on disk:** Opens the folder containing the current file.
- **Rescale Illustrator SVG:** Some Adobe Illustrator files do not correctly encode the document size, and open in Studio at three-quarters of their intended size. If that happens, choose this command to correct it; in a multipage document it applies to every page. A saved project keeps the correction, but opening the file again on its own does not. To have Studio correct such files automatically as they open, see §22.1 Program options.
- **Show samples and generators:** Opens Studio's included samples and generator resources.
- **Open from Clipboard:** Creates a new job from supported clipboard content, such as SVG, PNG, text, or RTF, depending on what is available.



***OPEN FILE** menu with **Rescale Illustrator SVG** available*

Tip: If you are iterating between Studio and another design program, **Reload file from disk** updates the Preview without your reopening the file each time.

21.1.1 File types Studio opens

OPEN FILE opens these kinds of file:

- **SVG artwork** (`.svg`): opens on the **PREPARE** tab, ready to write. Several SVG files open together as a batch.
- **Images** (`.png`, `.jpg`, `.jpeg`, `.bmp`, `.gif`): open in the Image Processor, which turns a picture into strokes, one image at a time.
- **Bantam Tools Studio project files** (`.btsp`): restore a saved session, with its documents, tool assignments, and settings, one project at a time. See §25.4.1 Opening a project.
- **Text documents** (`.txt`, `.rtf`): open on the **TEXT** tab as words to write. Several text files open together as a batch. See §27.2 Working with text documents.
- **CSV data** (`.csv`): opens on the **TEXT** tab as the data for a Data Merge, one file at a time. See §17. Writing letters with Data Merge.

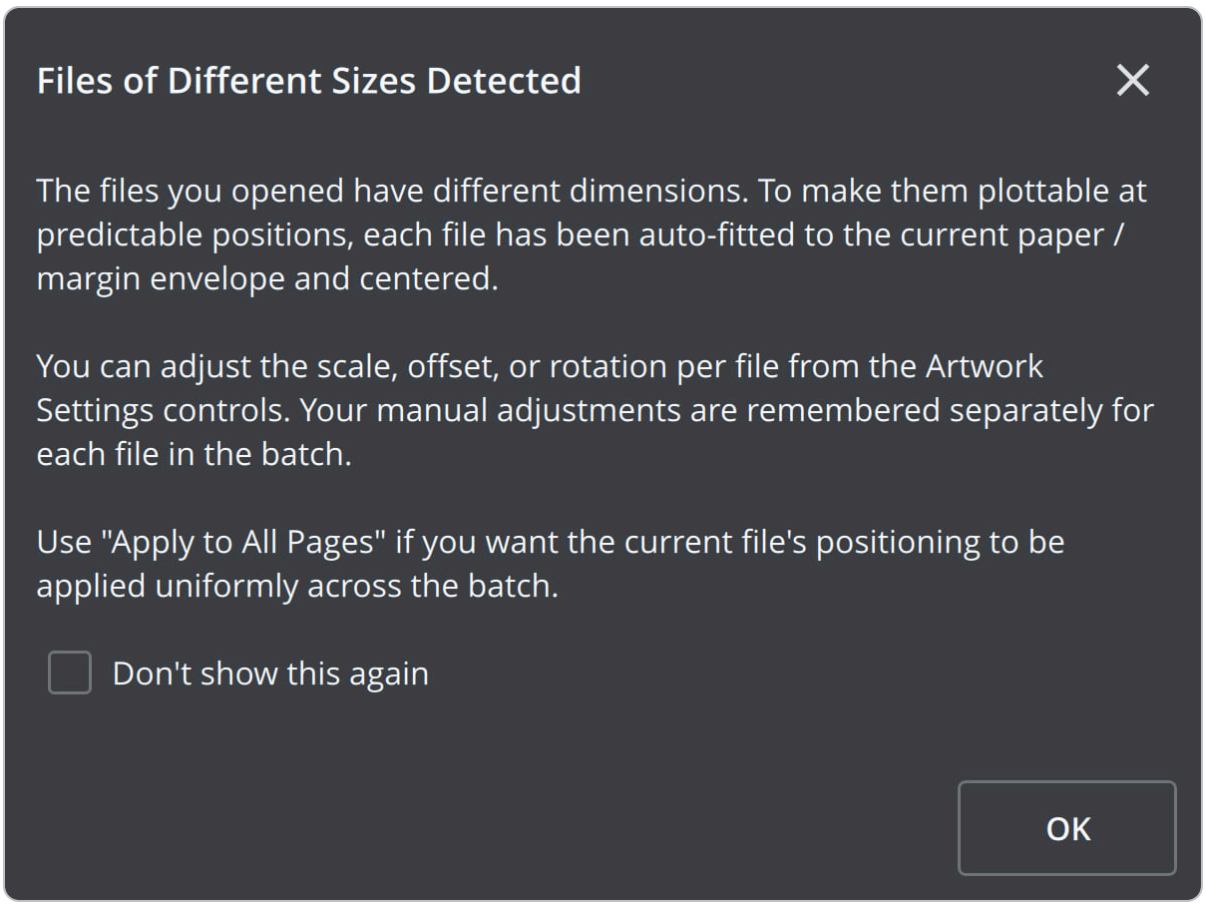
One open takes one kind of file: SVG files, text files, one CSV file, one image, or one project. Choosing a mix brings up a **Mixed File Types** message, and nothing opens.

Content copied from another program, such as SVG artwork, an image, or text (including formatted text copied from a web page or Google Docs), opens with **Open from Clipboard** instead.

21.1.2 When files have different sizes

The files you open together need not share a size. When they do not, Studio fits each one to the current paper and margins on its own and centers it there, so that every page starts somewhere predictable rather than wherever its own coordinates happen to put it. Rotation returns to 0° for each file as part of that fit.

A **Files of Different Sizes Detected** dialog tells you this has happened. It appears once for the whole batch, and dismissing it with **OK** is all it asks of you. The fit is a starting point, not a lock: adjust the scale, offsets, or rotation of any page afterward and Studio remembers the change for that file alone. See §21.2 What belongs to one document and what belongs to all.



*The **Files of Different Sizes Detected** dialog*

Select **Don't show this again** in the dialog to stop it appearing on later opens.

21.2 What belongs to one document and what belongs to all

You can open several documents at once, and Studio shows them as pages you step through in the Preview. When you do, some Setup controls belong to the page you are looking at and the rest belong to the whole job. The division is fixed; it does not change as you switch pages.



The page navigator steps between open documents

These belong to this page alone, and every open document keeps its own:

- **Scale**, **X Offset**, and **Y Offset**
- Rotation
- The **Rescale Illustrator SVG** correction
- The list of colors, layers, or groups Studio detected
- The plotting order of that list

These are shared, and changing one changes it for every open document at once:

- Paper size, including the result of **Use Document Size**

- The paper offsets, **X Offset** and **Y Offset**
- Margins
- The selected toolset
- The tool assigned to each color, layer, or group

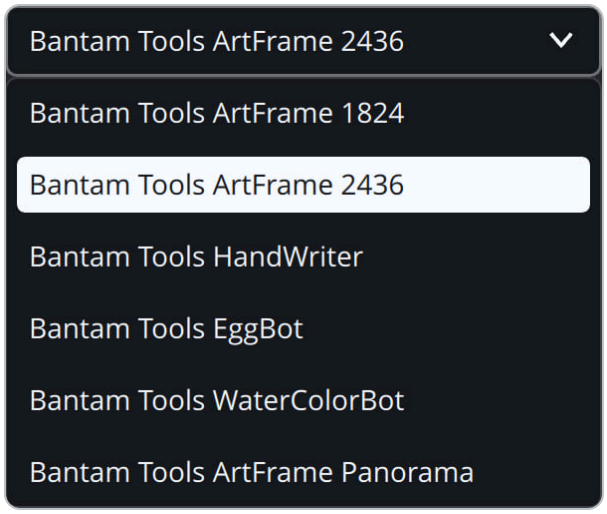
Switching pages therefore changes what Artwork Settings and Tool Assignments show you, and leaves Paper Settings, the margins, and the toolset exactly as they were.

Two commands, both called **Apply to All**, copy settings across every page: §21.6 Applying positioning to every document copies placement, and §21.9 Applying tool assignments to every document copies tool assignments.

21.3 Machine selection

The **Machine selection** drop-down menu, at the top of the **SETUP** sub-tab, sets the machine target for the current job. The choice affects the available work area, the default settings, machine-specific behavior, and the way Studio generates motion, so make it before you set up the rest of the job.

Select **Bantam Tools HandWriter** from the menu.



*The **Machine selection** menu*

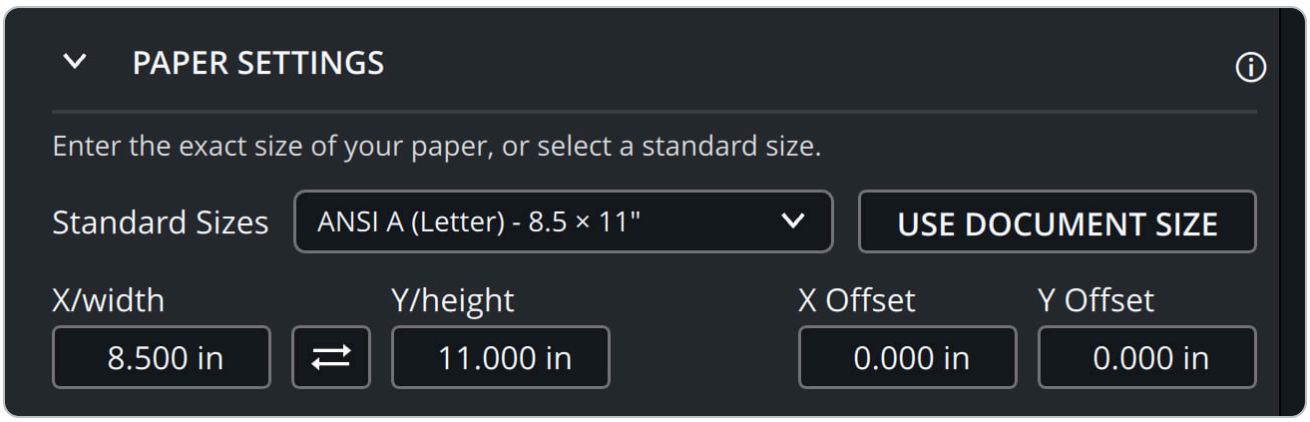
21.4 Paper settings

The **Paper Settings** section defines the work area for the job. There is one work area, shared by every open document; see §21.2 What belongs to one document and what belongs to all.

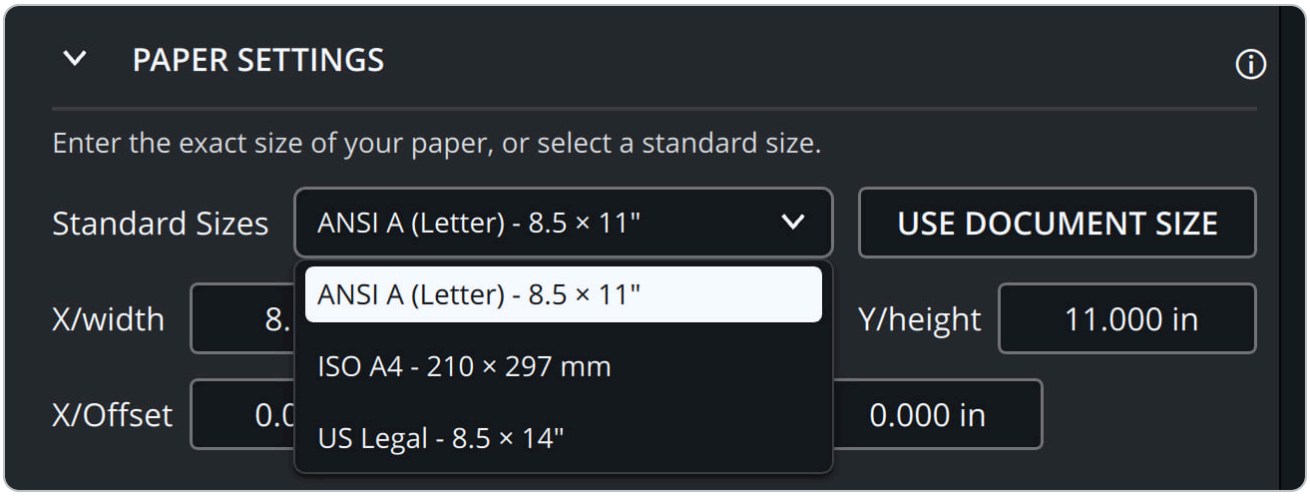
On your machine this represents the sheet of paper you load.

The controls are:

- **Standard Sizes:** Choose from the standard US and ISO paper sizes your machine can take. The list is filtered to the sizes that fit its work area in either orientation, so it changes with the machine. The HandWriter's list runs up to 8.5" × 14" (US Legal), and 8.5" × 11" (US Letter) and A4 are the two most common choices.
- **Use Document Size:** Set the paper size to match this page's original document size.
- **X/width and Y/height:** Set the X and Y dimensions of the work area. Studio brings a size outside your machine's range to the nearest size it can take, and shows a message saying so.
- **Switch Axis:** Swap the X and Y values.
- **X Offset and Y Offset:** Set where the paper sits relative to the machine's origin.



*The **PAPER SETTINGS** section*



***Standard Sizes** lists only sizes the machine can take*

Use Document Size reads the size of the document on the page you are viewing, but the paper size it produces is the shared one, so that page's size becomes the paper size for every open document. It also returns the scale to 100% and the artwork offsets to zero for that page alone; the other pages keep the scale and offsets they had.

X Offset and **Y Offset** move the paper, and everything drawn on it, relative to the machine. A larger **X Offset** moves the paper to the right in the Preview, and a larger **Y Offset** moves it up; the plotted output moves by the same distance on the machine. Neither value can be negative. Like the paper size, the paper offsets are shared by every open document.

The paper offsets do not move artwork on the paper. For that, use the **Offsets** fields in Artwork Settings, which belong to each page separately and can be negative; see §21.5 Artwork settings.

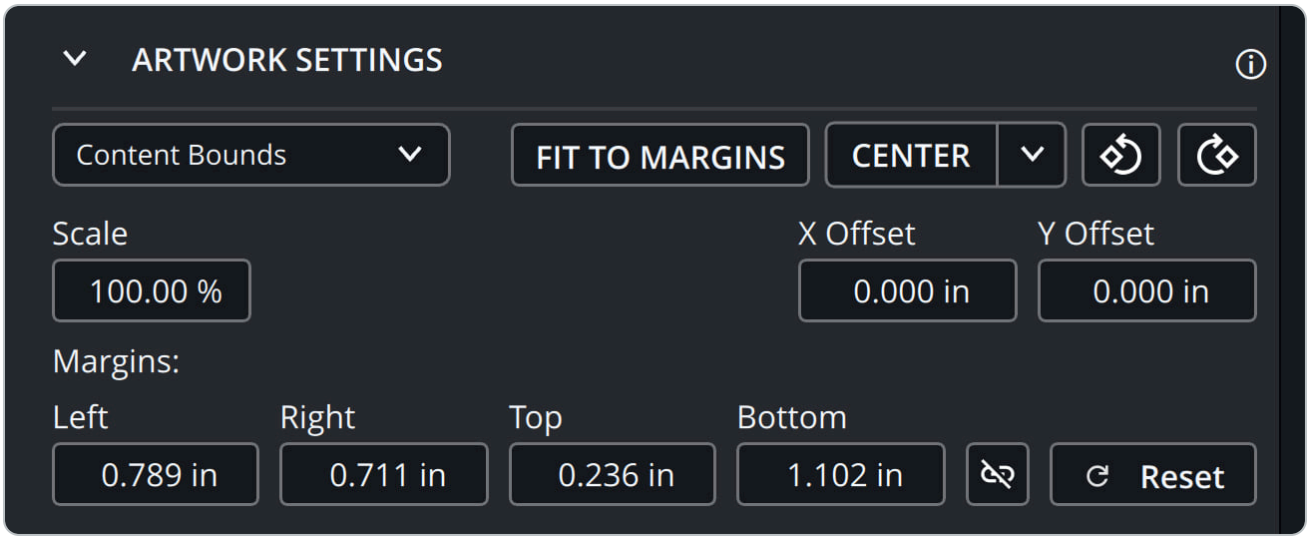
Both paper offsets start at zero. Once you enter an **X Offset** or **Y Offset** value yourself, Studio stops adjusting it until you select a different machine or restart Studio.

The width, height, and offset fields accept arithmetic and unit suffixes, such as `8 1/2` or `6 in + 3 mm`. See §21.5 Artwork settings, under Entering dimensions.

> ***Tip:*** Units can be selected on the **SETTINGS** tab, but you can also press ⌘U (Ctrl+U on Windows) to switch between millimeters and inches at any time.

21.5 Artwork settings

The **Artwork Settings** section controls how Studio interprets, scales, and positions the loaded artwork.



*The **ARTWORK SETTINGS** section for an SVG document*

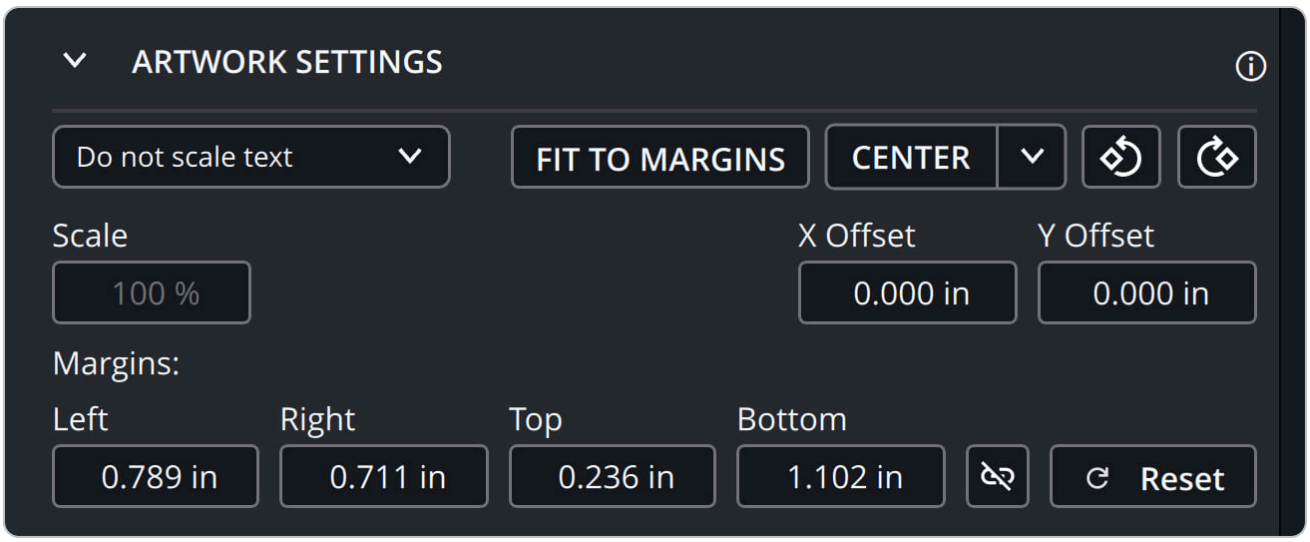
21.5.1 Content bounds and document bounds

When **Content Bounds** is selected, Studio calculates the edges of the artwork from the objects in the file. Extra empty space in the document canvas or viewBox is ignored. (Default)

When **Document Bounds** is selected, Studio uses the original canvas or viewBox dimensions to position and scale the content.

This choice affects fitting, centering, scaling, and offsets.

> ***Note:*** With a text document open, this control is the **Text overflow** menu instead. A text document has no artwork whose edges could be measured, so the bounds choice does not apply and the overflow menu takes the control's place. **Scale** goes read-only at the same time, reporting the scale the margins produced rather than accepting one you type. See §27.6 Font size, spacing, and overflow.



*With a text document, **Text overflow** replaces the bounds choice*

21.5.2 Fit to Margins

Click **FIT TO MARGINS** to scale the document or its contents to fit inside the paper size and margins.

The command changes the scale and, depending on your settings, the offsets. It does not change the paper size or the margins themselves.

21.5.3 Setting an exact size

An SVG document carries a page size of its own along with its contents, and Studio scales that drawing onto your paper. **Scale** works in percent, so an exact width or height comes from setting up the space the artwork fills, or from a ratio. There are several ways, and the one to use depends on what you start with:

- **Fit to the margins.** Set the margins so the space between them is the size you want, then click **FIT TO MARGINS**. The artwork keeps its proportions and grows or shrinks until it meets the nearer pair of margins. For a design 150 mm wide on US Letter paper (215.9 mm wide), enter `(215.9 - 150) / 2` in the left and right margin fields; they accept arithmetic, as described in §21.5.10 Entering dimensions. Keep the top and bottom margins far enough apart that the width is what limits the fit.
- **Draw it at size.** If the document was made at its final size in a design program, click **Use Document Size**: the paper takes the document's size and the scale returns to 100%, so the artwork plots at the size it was drawn.
- **Size the page, not the drawing.** Set the paper to exact dimensions and select **Document Bounds**: fitting then scales the document's whole canvas, empty space included, so artwork lands where the design file placed it on that page.
- **Scale by a ratio. Scale** is the factor applied to the artwork, and it accepts arithmetic, so a known ratio goes straight in: to take a drawing 120 mm wide to 150 mm, enter `(150 / 120) * 100%`.

Whichever method you use, the bounds choice decides what is measured: **Content Bounds** sizes the drawn objects, and **Document Bounds** sizes the canvas. See §21.5.1 Content bounds and document bounds.

> ***Note:*** A text document works differently, because it has no page size of its own. Studio lays the text out between the margins. Its size comes from the font size, the spacing, and the **Text overflow** setting, which can scale the text to fit. The methods above apply only to SVG documents. See §27.6 Font size, spacing, and overflow.

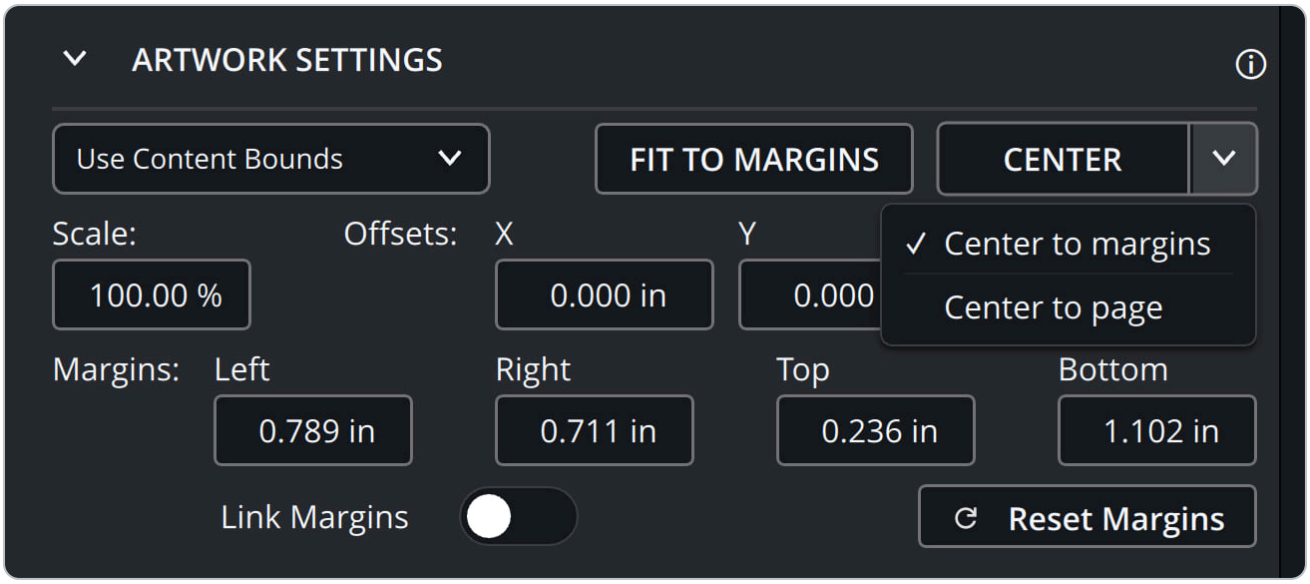
21.5.4 Center

Click **CENTER** to center the content inside the margins.

CENTER is a split button. Its chevron opens a menu with two choices:

- **Center to margins** — centers the content within the margins, the same as clicking the button.
- **Center to page** — centers the content on the whole sheet, ignoring the margins.

Studio remembers the choice and uses it when it re-centers artwork for you, such as after you change the paper size. Clicking the **CENTER** button itself switches back to centering within the margins.



*The **CENTER** menu*

> ***Tip:*** Double-click the artwork in the Preview area to center it and fit it to the margins in one step.

21.5.5 Scale

The **Scale** control displays the scaling factor applied to the artwork as a percentage. For an SVG document you can enter a value to override the calculated or default scale. For a text document the field is read-only: it reports the scale Studio applied to fit the text to the margins.

To set an exact width or height instead of a percentage, see §21.5.3 Setting an exact size.

21.5.6 Offsets

The **X Offset** and **Y Offset** controls shift the artwork horizontally and vertically. You can move artwork by dragging it in the Preview area or by entering values directly.

21.5.7 Rotation

The two rotation buttons, at the right end of the first row of **ARTWORK SETTINGS** after **CENTER**, rotate artwork counterclockwise or clockwise by 90°.

21.5.8 Margins

Margins define areas at the edges of the paper or work area where nothing is drawn. Artwork outside the margins is shown in red and is cropped when the job is processed.

You can enter margin values or drag margins in the Preview area. Drag a corner of the margin outline to move the two margins that meet there at once; corners can't be dragged while the margins are linked. Margins are shared in the same way paper size is: one set of four values, applied to every open document.

The HandWriter's default margins are not the same on all four sides: about 20 mm at the left, 18 mm at the right, 6 mm at the top, and 28 mm at the bottom. They are a good starting point for most letters. The larger bottom margin is the space the rollers need to grip the sheet, so keep closing lines, signatures, and borders clear of it. The side and top margins can go as narrow as 3 mm, much closer to the edge than the defaults, and the bottom margin as narrow as 25.5 mm.

Reset, to the right of the margin fields, returns all four margins to the defaults for your machine. It does not change the paper size, the scale, or the artwork offsets.

21.5.9 Linking margins

The chain-link button between the margin fields and **Reset** links the four margins. Linking sets all four to the largest of them, and from then on, changing one margin changes all four. The chain is whole while the margins are linked and broken while they are not; click it again to unlink them.

21.5.10 Entering dimensions

Every dimension field in Artwork Settings and Paper Settings accepts arithmetic. Type an expression and press Return or Enter, or click elsewhere, and Studio replaces it with the result. Only the result is kept.

- Add, subtract, multiply, divide, and group with parentheses: `(2 + 3) * 10`.
- Mixed numbers, with a space between the whole number and the fraction: `8 1/2`.
- A number with no unit takes the unit shown in the box. A unit after a number converts it: `1 in` in a millimeter field becomes 25.4 mm, and `25.4 mm` in an inch field becomes 1 in.
- Units can be mixed in one expression: `6 in + 3 mm`.

Length fields accept `mm`, `cm`, `in`, `ft`, and `pt`. Percent fields, such as Scale, accept `%`, and a bare number is read as a percent, so `4/3` means 1.33% rather than 133%; write `(4/3) * 100%` for a ratio.

Put a space before a unit, and it applies to everything before it: `10 / 2 mm` is 5 mm, and `1/8 in` is an eighth of an inch.

The Up and Down arrow keys step the value by 1 mm or 1/16 in, and by 10 mm or 1 in with Shift held. The first press lands on a round value. Escape abandons an edit and restores the previous value.

A rejected entry outlines the field in tangerine and keeps what you typed so that you can correct it. Hover over the field, or leave the cursor in it, to read the reason, for example "Value is out of range."

For the accepted units and worked examples, see §32.2 Dimension entry reference.

21.5.11 Undoing layout changes

Undo (⌘Z / Ctrl+Z) and **Redo** (⇧⌘Z / Ctrl+Shift+Z or Ctrl+Y) step back and forth through layout changes in the Preview. They are also the first two items in the **Edit** menu, which names the step each will reverse, such as **Undo Fit and Center**. Each of these is one step:

- Double-clicking the artwork to fit and center it.
- Dragging the artwork, or changing **Scale**, **X Offset**, or **Y Offset**.
- Rotating, **Fit to Margins**, **Center**, and the choice of bounds.
- **Text overflow** on the **TEXT** tab.

- Paper size, orientation, and **Use Document Size**.
- Margins: a typed value, a dragged margin, linking or unlinking the margins, and **Reset**.

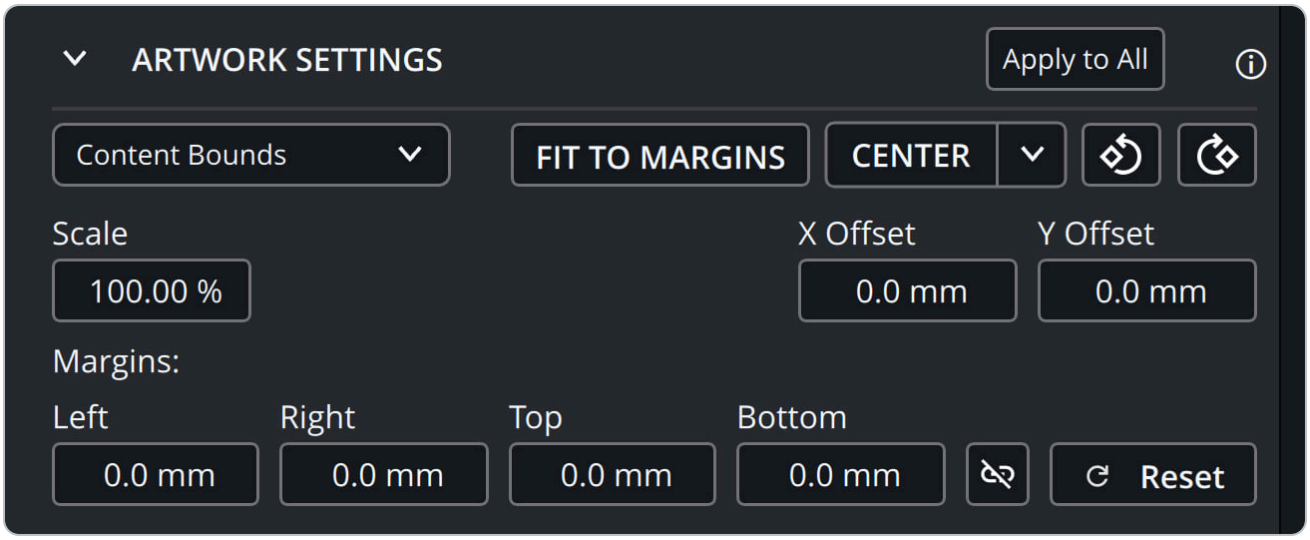
Each page keeps its own history of up to 50 steps. Paper and margin changes apply to every page, and **Undo** reverses whichever change came last. While a field still holds your typing, ⌘Z / Ctrl+Z undoes the typing; after Return or Enter, it undoes the layout change. Deleting a tool or toolset, and other changes outside the layout, cannot be undone.

The history clears when you open a document or project, apply a profile, change machine, or use **Apply to All** for positioning (see §21.6 Applying positioning to every document) or **Reset All** in **SETTINGS**.

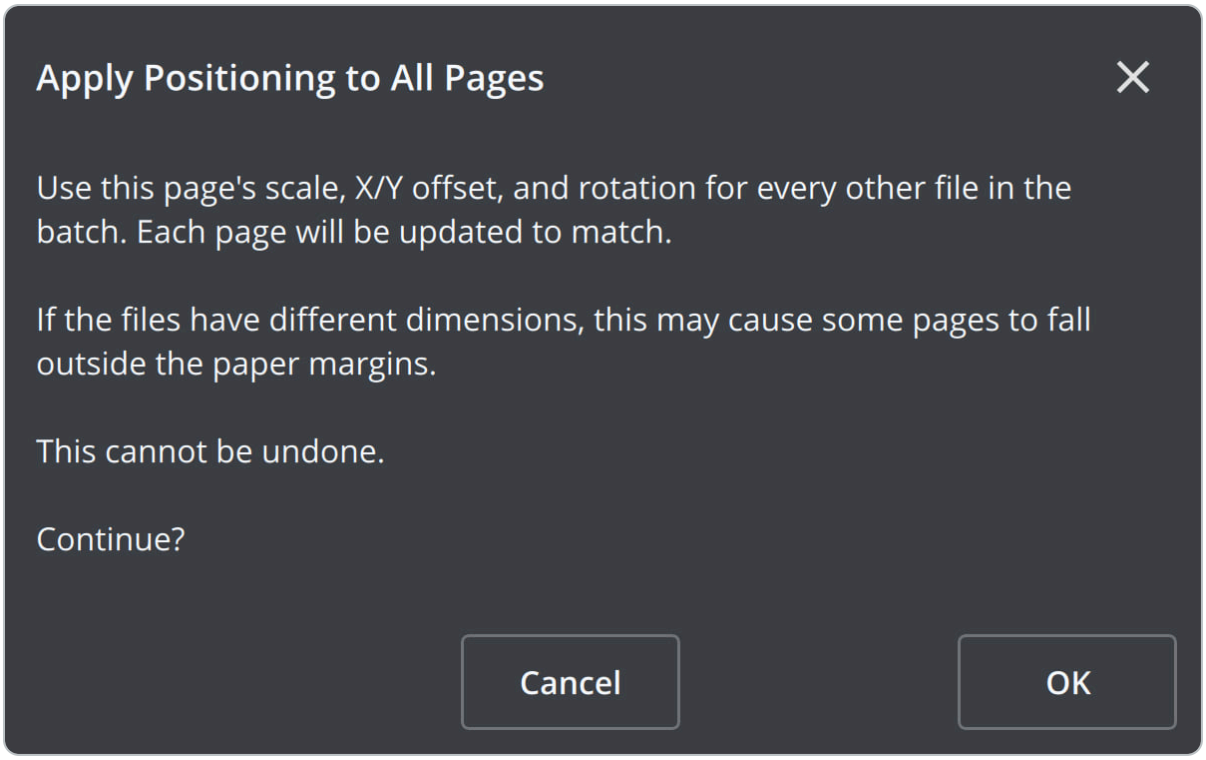
21.6 Applying positioning to every document

Scale, offsets, and rotation belong to the page you are looking at, so setting them once does not set them everywhere. **Apply to All**, at the right of the **ARTWORK SETTINGS** header, is how you make one page's placement the placement for all of them. The button appears only while more than one document is open.

Click **Apply to All** to copy this page's scale, X offset, Y offset, and rotation onto every other open document, replacing the values those pages had. This cannot be undone, and it clears the undo history. Tool assignments and plotting order are left alone.



***Apply to All** appears when several documents are open*



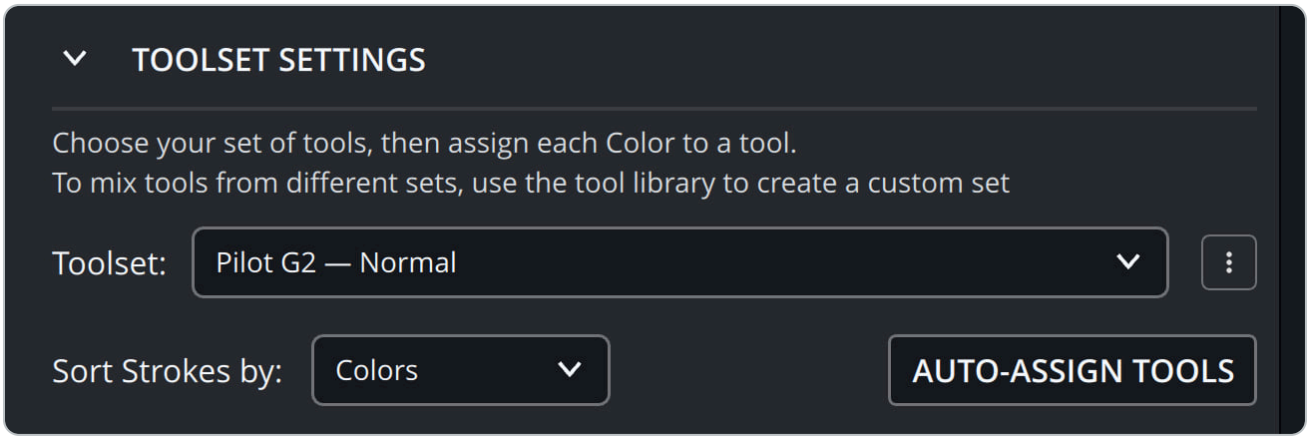
The confirmation before positioning is copied

One scale and one pair of offsets suit pages of the same size. On a page of a different size, the copied placement can carry artwork past the margins, where the Preview draws it in red and processing crops it.

21.7 Toolset settings

The **Toolset Settings** section, lower in the **SETUP** sub-tab, determines which group of tools is available for the job.

A **toolset** is a saved collection of tools and their settings. Every job draws its tools from the toolset selected here, so a job that uses several pens needs a toolset that holds all of them; see §23. Studio: the Tool Library.



*The **TOOLSET SETTINGS** section*

21.8 Tool assignments

The **Tool Assignments** section shows the colors, layers, or groups Studio detected in the page shown in the Preview and lets you assign a tool to each one.

The **Sort Strokes by** menu offers:

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

Once sorted, each detected color, layer, or group can be assigned a tool from the selected toolset.

A layer whose name begins with `%` is a **documentation layer**, and Studio leaves it out of the file it works with: its contents are never read, so the layer is not listed here, takes no tool, and is not drawn. That is the place to put a safe area box, fold lines, crop guides, or notes to yourself, which you want to see in your editor and never want on the page. It applies however you are sorting — a documentation layer is dropped before Studio looks for colors or groups, so nothing inside one appears under any sorting method. Setting a template up this way is covered in §30. SVG templates.

When a file has more than 100 colors, layers, or groups of the kind you are sorting by, a **Large Number of Groupings Detected** dialog asks how many to load:

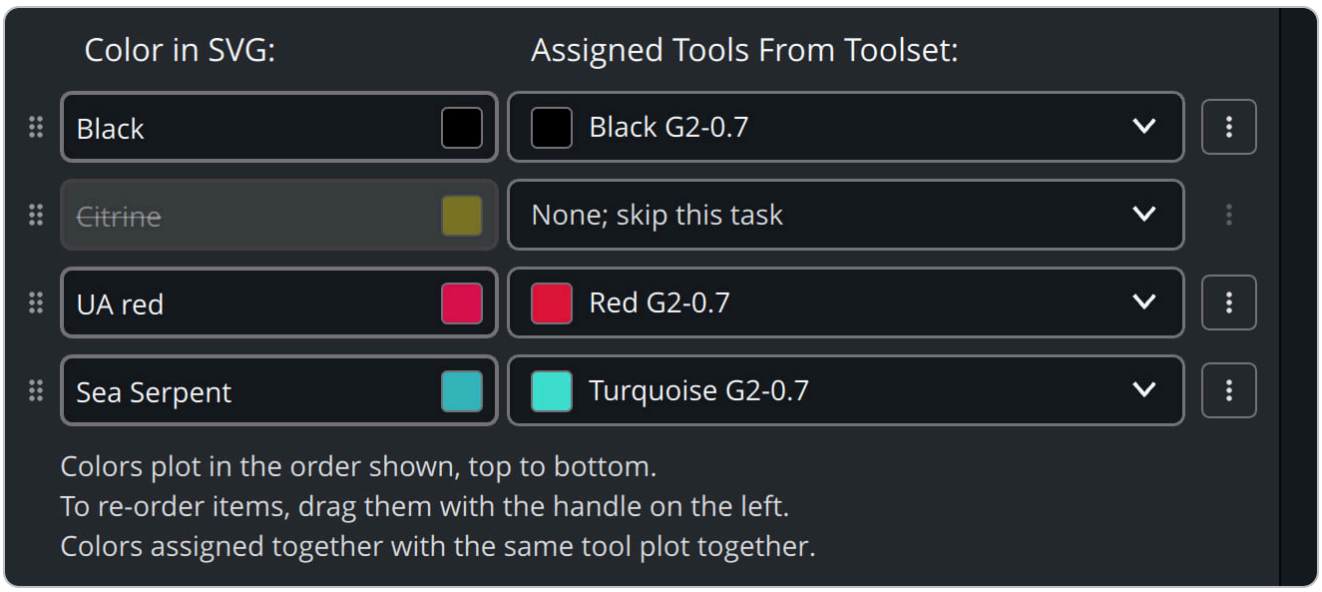
- **Limit to 100** — keeps the first 100 and merges the rest into a single entry named Other.
- **Load All** — loads up to 512, the most Studio supports. Past that, the rest are merged into Other, and a **Grouping Limit Reached** message tells you so.

When several files are opened together, Studio limits each one to 100 without asking.

You can assign tools with the drop-down menus, or use **AUTO-ASSIGN TOOLS** when it is available. Each drop-down menu also offers **None; skip this task**, which leaves that color, layer, or group out of the plot.

Click the name of a row to hide it. The name is struck through, its strokes disappear from the Preview, and its tool changes to **None; skip this task**. Click the name again to show it and bring back the tool it had.

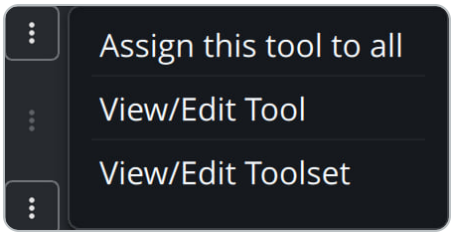
A row set to **None; skip this task** or hidden stays that way when you reload the file, change toolsets, or save and reopen a project. Assigning a tool to the row brings it back, and **AUTO-ASSIGN TOOLS** brings back every row.



*The **TOOL ASSIGNMENTS** list, with one row hidden*

Once a row has a tool, the gear button at the end of the row opens a **Tool Options** menu:

- **Assign this tool to all** — assigns the row's tool to every color, layer, or group in the list.
- **View/Edit Tool** — opens the tool in the Tool Library.
- **View/Edit Toolset** — opens the tool's toolset in the Tool Library.



*The **Tool Options** menu*

Drag the handles on the left side of the tool assignment list to change plotting order. The order belongs to this page alone.

Colors, layers, or groups assigned to the same tool plot together without stopping for a tool change.

Tool assignments are shared by name: assigning a pen to “black” assigns it to “black” in every open document. To draw the same color with two different pens, prepare and process those documents separately. See §21.2 What belongs to one document and what belongs to all.

For more about creating, editing, duplicating, and saving tools and toolsets, see §23. Studio: the Tool Library.

21.9 Applying tool assignments to every document

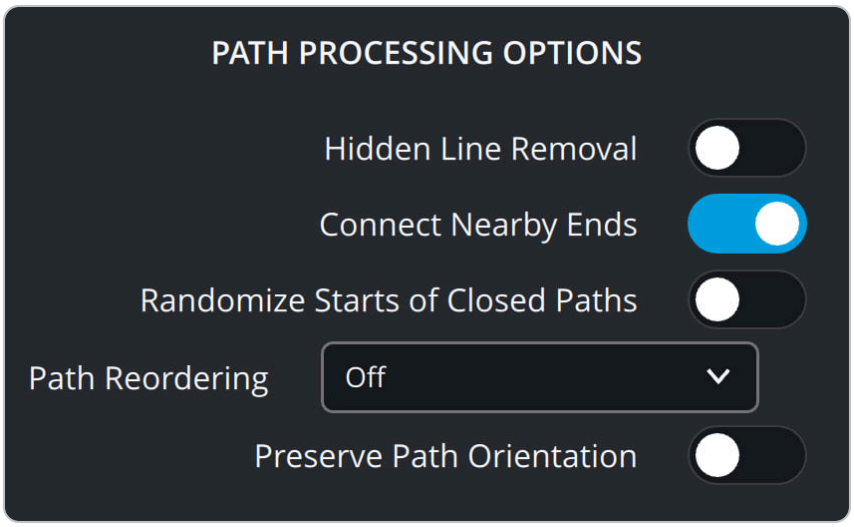
Apply to All, at the right of the **TOOL ASSIGNMENTS** header, brings the rest of the job into line with the page you are looking at. The button appears only while more than one document is open.

Click **Apply to All**. Studio asks you to confirm in an **Apply Tool Assignments to All Pages** dialog, and on **OK** it sets every color, layer, or group that appears on some other page but not on the page shown in the Preview to **None; skip this task**, then gives every other page this page's plotting order. Names that this page does not have keep their existing relative order and fall to the end of the list. This cannot be undone.

Apply from the page with the richest set of colors, so that the fewest assignments are lost.

21.10 Path processing options

The **OPTIONS** sub-tab controls how Studio processes paths and generates G-Code, and it is divided into two sections. **PATH PROCESSING OPTIONS**, the first of them, affect how Studio prepares the source geometry before it generates machine motion.



PATH PROCESSING OPTIONS *on the* ***OPTIONS*** *sub-tab*

21.10.1 Hidden Line Removal

Hidden Line Removal plots only what is visible. (Default: off) When it is on, Studio processes the paths that have a stroke applied and are not hidden behind filled objects, so overlapping shapes, filled areas, and construction geometry covered by another object are left out of the plot rather than drawn through the shapes on top of them.

With it off, Studio processes every path in the file as plottable motion, treating each as stroked and unfilled whatever its appearance in a design program.

For example, with Hidden Line Removal off, a line behind a filled shape still plots, because the underlying path exists in the SVG. With it on, Studio removes the hidden portion, so the output matches the visual appearance of the artwork more closely.

Hidden Line Removal adds processing time, most noticeably on files with many objects, and it can change the direction individual paths are drawn in. Leave it off for artwork with no overlaps, and for calligraphic work, or any application where the path direction should be preserved.

21.10.2 Connect Nearby Ends

Connect Nearby Ends joins path endpoints that are close together. (Default: on)

It closes tiny gaps where paths nearly meet, which saves pen lifts and keeps lines continuous. Each path is drawn from its start to its finish. Two paths join most simply where one path's finish meets the next path's start. Where two paths finish at the same point, or start at the same point, Studio can still join them by reversing one of the two, so the joined path is drawn in a single direction. It does this automatically unless **Preserve Path Orientation** is on.

21.10.3 Randomize Starts of Closed Paths

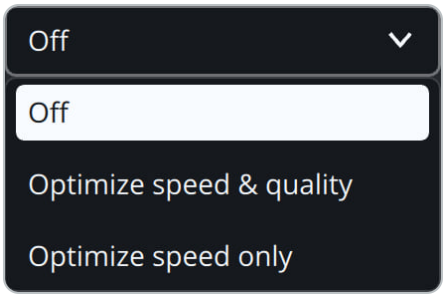
Randomize Starts of Closed Paths changes the start position of closed shapes. (Default: off)

This spreads the start marks of closed paths around, so they do not stack in one place in repeated patterns, circles, or generative artwork.

21.10.4 Path Reordering

Path Reordering controls how Studio optimizes stroke order. Reordering paths can reduce travel moves and shorten plotting time.

- **Off** — keeps the path order from the SVG file. (Default)
- **Optimize speed & quality** — balances pen-up travel distance against how evenly strokes are spread across the work area, which reduces visible artifacts from strokes clustering in one region.
- **Optimize speed only** — chooses the order with the least total pen-up travel, however the strokes are distributed.



*The **Path Reordering** menu*

Path Reordering starts at **Off**, so text is written in typing order:

- In a text file, the text is written in the order it was typed.
- In an SVG document, the text in any given text block is written in the order it was typed. However, the blocks are written in the order they appear in the file, which is not necessarily top to bottom or left to right.

Many people prefer letters written in typing order. To shorten the writing time instead, choose **Optimize speed & quality** or **Optimize speed only**, which reorder the paths to cut travel between them.

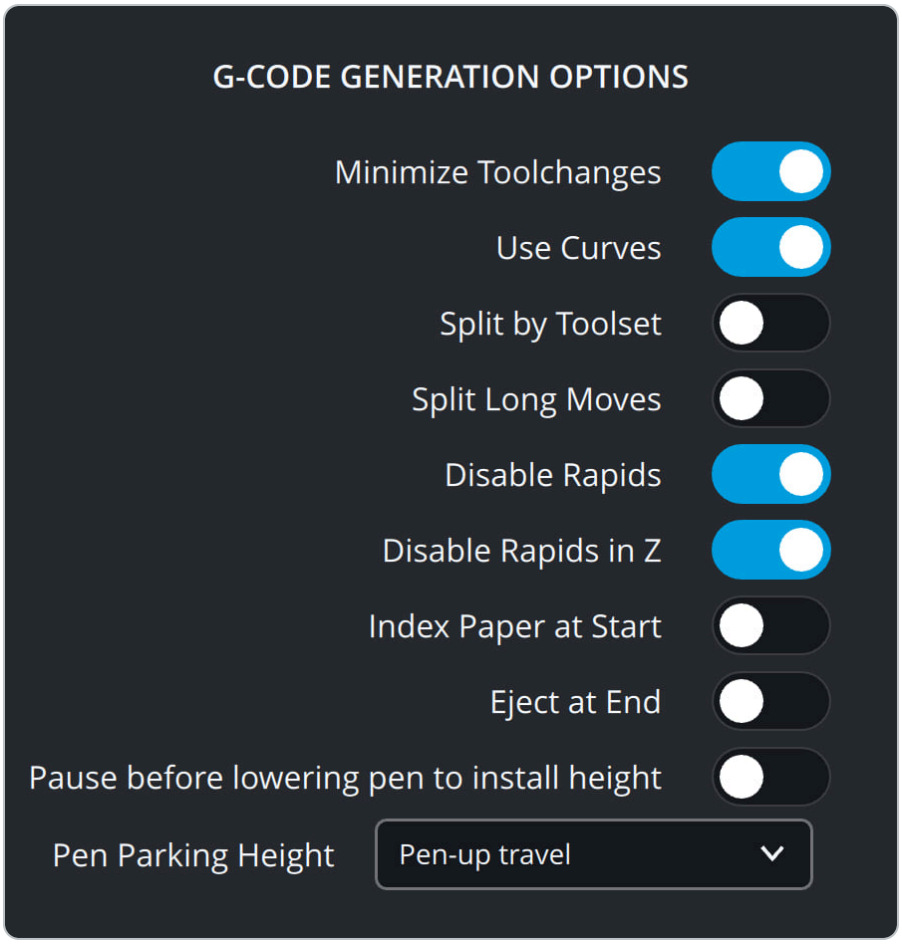
21.10.5 Preserve Path Orientation

Preserve Path Orientation keeps paths moving in the direction defined by the source file. (Default: off) It is unavailable while **Hidden Line Removal** is on.

Turn it on for calligraphic strokes, and for any work where the direction of drawing changes how a stroke looks. With it off, Studio is free to reverse a path to shorten the pen-up travel before it, or to connect it to a nearby end. With it on, **Connect Nearby Ends** joins only paths whose directions already line up, so some nearby ends may stay unconnected.

21.11 G-Code generation options

G-CODE GENERATION OPTIONS, the second half of the **OPTIONS** sub-tab, affect how Studio writes the final machine instructions.



G-CODE GENERATION OPTIONS

21.11.1 Minimize Toolchanges

Minimize Toolchanges groups operations to reduce the number of times the machine stops for a tool change. (Default: on)

This is most useful on multi-color and multi-tool jobs, where it cuts the number of stops. Leave it off when the original order of operations is what you want.

21.11.2 Use Curves

Use Curves allows Studio to generate arc moves where appropriate. (Default: on)

When it is on, Studio fits arcs to the curves in the SVG and writes them as G2 or G3 arc commands, rather than as many short line segments.

> ***Aside:*** Turn this off when the G-Code goes to a machine or post-processing tool that does not handle arc commands, since every curve is then written as short line segments it can read.

21.11.3 Split by Toolset

Split by Toolset creates separate output files for each color, layer, or group, depending on the selected sorting method. (Default: off)

Turn it on to run separate files by hand, to control tool order yourself, or to prepare multi-tool jobs for microSD.

The setting applies to the whole job rather than to one page, so with several documents open every page is split. Three documents that each use four pens produce twelve per-tool files, alongside the main output file for each document. For how Studio names the files it writes, see §25.7 Output file names.

21.11.4 Split Long Moves

Split Long Moves divides long moves into smaller segments. (Default: off)

Shorter moves let the machine respond sooner when you pause it. Artwork with many long moves produces a larger G-Code file.

21.11.5 Disable Rapids

Disable Rapids replaces rapid pen-up travel moves with controlled feedrate moves. (Default: on)

Travel moves then run at a controlled feedrate rather than the machine's fastest speed, so they are slower but more predictable.

21.11.6 Disable Rapids in Z

Disable Rapids in Z disables rapid vertical movement when lifting and lowering the pen or tool. (Default: on)

Tool-up and tool-down moves then run at a controlled feedrate. **Disable Rapids** already includes them, since it turns off rapid moves on every axis.

21.11.7 Index Paper at Start

Index Paper at Start feeds the paper forward and back across the drawing area before writing starts, seating the sheet snugly on the grit rollers that drive it. (Default: off)

This is a mechanical priming step. It does not change the drawn content, and it helps most on a fresh sheet, which has not yet been seated in the rollers.

21.11.8 Eject at End

Eject at End feeds the finished page out at the end of a job, releasing it from the grit rollers. With it off, the page stays in place and the pen returns to the pen loading position. (Default: off)

21.11.9 Pause before lowering pen to install height

Pause before lowering pen to install height adds a stop to each tool change. (Default: off) When it is on, a tool change pauses with the pen still raised, before it lowers to the install height; resume to lower the pen and install the tool. This keeps a pen from resting on the work surface, where it can leak, while you get ready. The first tool in a job goes straight to its install height without this pause.

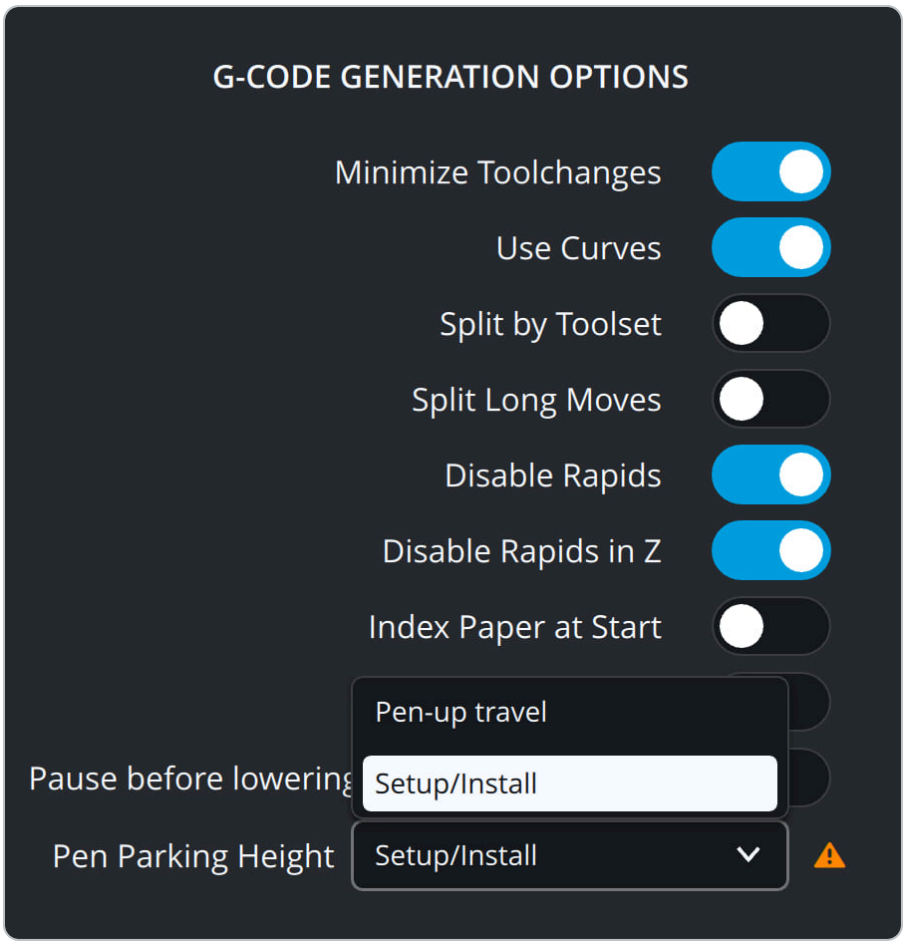
21.11.10 Pen Parking Height

Pen Parking Height controls how high the pen retracts when a plot is paused.

- **Pen-up travel:** Parks the pen at the normal travel height, for quicker resumes.

- **Setup/Install:** Parks the pen at the height used to install the tool, which makes the tool easier to adjust, replace, or inspect during a pause.

On HandWriter the pen is installed on the writing surface, so **Setup/Install** parks the pen on the page, where it can mark the paper during a pause. A warning icon beside the menu says so. Use **Pen-up travel** on HandWriter.



*On HandWriter, **Setup/Install** shows a warning*

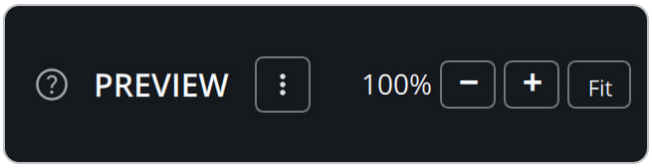
21.12 Preview

The **Preview** shows the strokes that will be written. It does not show unsupported SVG elements, such as raster images that cannot be plotted as paths.

The Preview includes rulers, zoom controls, the work area, margins, and a visual representation of the generated strokes. Click in the Preview to give it keyboard focus, then zoom and pan from the keyboard. §32.1 Keyboard shortcuts lists the keys and mouse gestures.

The Preview controls are:

- **Zoom percentage:** Shows the current zoom level.
- **Zoom out / Zoom in:** Changes the preview zoom.
- **Fit:** Fits the visible work area into the Preview.
- **RENDER NEW PREVIEW:** Draws the writing again from a fresh random pattern, for the page or document you are looking at. It appears to the right of **Fit** only when the document contains text and no error is blocking it. See §27.5 Handwriting Defects.
- **?:** Opens a window listing the Preview's keyboard shortcuts and mouse controls.
- **Preview menu:** Opens additional rendering options.
- **Page navigator:** Appears below the Preview whenever the job runs to more than one page, whether those pages come from several files opened at once, from the documents of a Data Merge, or from one document flowed across several. The inner arrows step a page at a time, the outer arrows jump to the first or last, and typing a number goes straight there.



*The **Preview** toolbar*



*The Preview's keyboard and mouse controls, from **?***

While a page is still being drawn, a line above the page navigator reports **Rendering…** or **Updating…**.

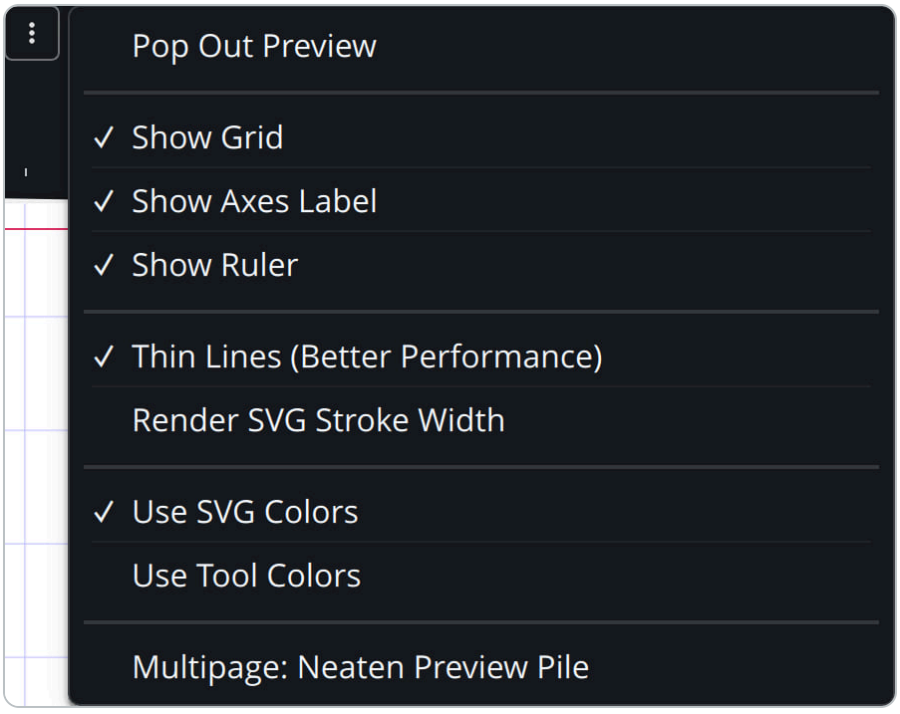
A status line in the Preview's toolbar, to the right of **Fit**, reports on the job as a whole. It shows an error that stops the job from being prepared, such as a missing font, a Data Merge problem, or a document that runs past the page limit; otherwise how many pages have rendered so far; otherwise a warning that the document contains text or bitmap elements Studio does not draw. When there is nothing to report, the line is hidden.



The status line reports on the job as a whole

The **Preview menu**, the three-dot button beside the **Preview** title, controls how the preview is displayed:

- **Pop Out Preview:** Opens the preview in a separate window. While it is open, the main window shows a **DOCK PREVIEW** button that returns the Preview to the main window; closing the separate window does the same.
- **Show Grid:** Shows or hides the grid. (Default: on)
- **Show Axes Label:** Shows or hides the X/Y axis label. (Default: on)
- **Show Ruler:** Shows or hides the ruler. (Default: on)
- **Thin Lines (Better Performance):** Displays paths with thin preview lines for better performance. (Default: on)
- **Render SVG Stroke Width:** Displays SVG stroke widths in the preview. (Default: off)
- **Use SVG Colors:** Displays colors from the original SVG. (Default: on)
- **Use Tool Colors:** Displays colors from the assigned tools when available. (Default: off)
- **Re-render all pages:** Rerolls every page or document in the job at once. It appears with **RENDER NEW PREVIEW** when the job runs to more than one page, except for a single document flowed across several pages, which **RENDER NEW PREVIEW** already rerolls as a whole.
- **Multipage: Neaten Preview Pile:** Squares up the stack of pages drawn behind the current one, which otherwise sits at a slight angle. The item appears only while a document runs to more than one page, and it changes the preview alone, never the output. (Default: off)

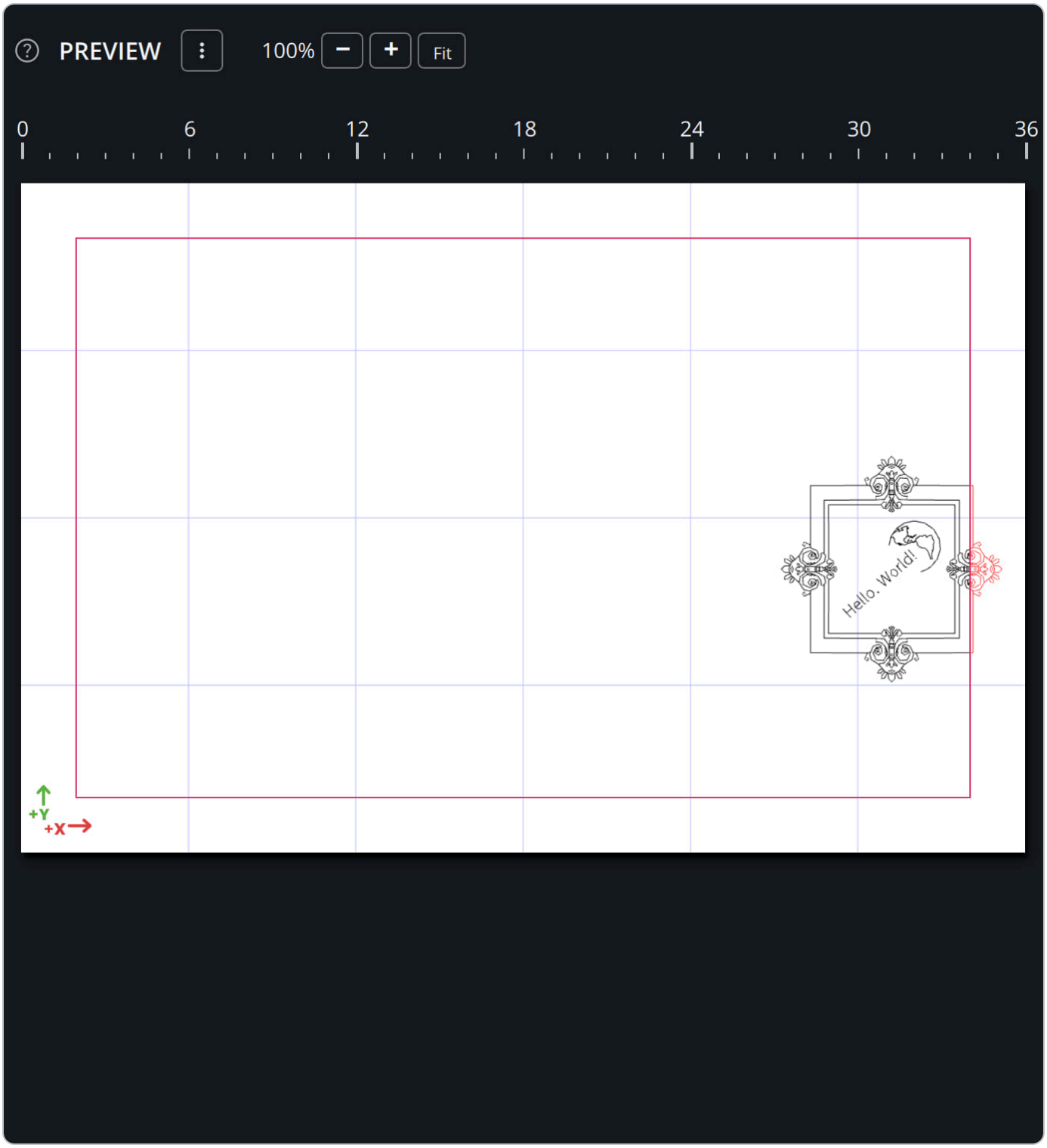


*The **Preview** menu*



DOCK PREVIEW *returns a popped-out Preview to the main window*

Margins and content are draggable in the Preview. Artwork outside the margins is shown in red and is cropped when processed.



Strokes outside the margins are drawn in red and cropped

The Preview shows the motion the machine will make: each stroke it will draw, and the travel between strokes. It leaves out anything the machine does not draw, such as fills, and it shows paths rather than how the ink will look on the paper.

21.13 The PROCESS AND SAVE button

When the job is ready, click **PROCESS AND SAVE** to generate output from the current Setup and Options.

The **PROCESS AND SAVE** button sits in the upper-right corner of the Studio window. Clicking the button itself processes the current job using the default output behavior; its chevron opens a menu of other save formats.

Processing creates output from the current machine selection, the **SETUP** sub-tab, the **OPTIONS** sub-tab, the tool assignments, and the previewed paths. It does not send anything to a machine: the output is written to disk, and uploading is a separate step.

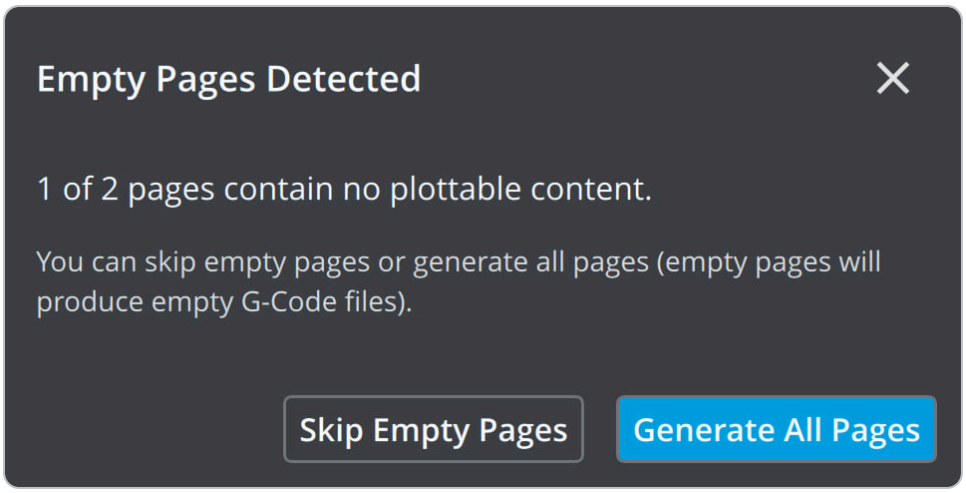
For everything **PROCESS AND SAVE** can produce — G-Code, SVG, Plob, the Setup Sheet that follows a G-Code export, and the Split by Toolset option — see §25. Studio: exporting output.

For connection and upload workflows, see §15. Sending files to your machine.

21.13.1 Empty pages in a batch

With more than one document open, Studio checks the pages for plottable strokes before it asks you where to put the output. When it finds pages that have none, an **Empty Pages Detected** dialog reports how many of how many, and warns that empty pages produce empty G-Code files. Two buttons carry you forward from it, and both go on to the folder picker:

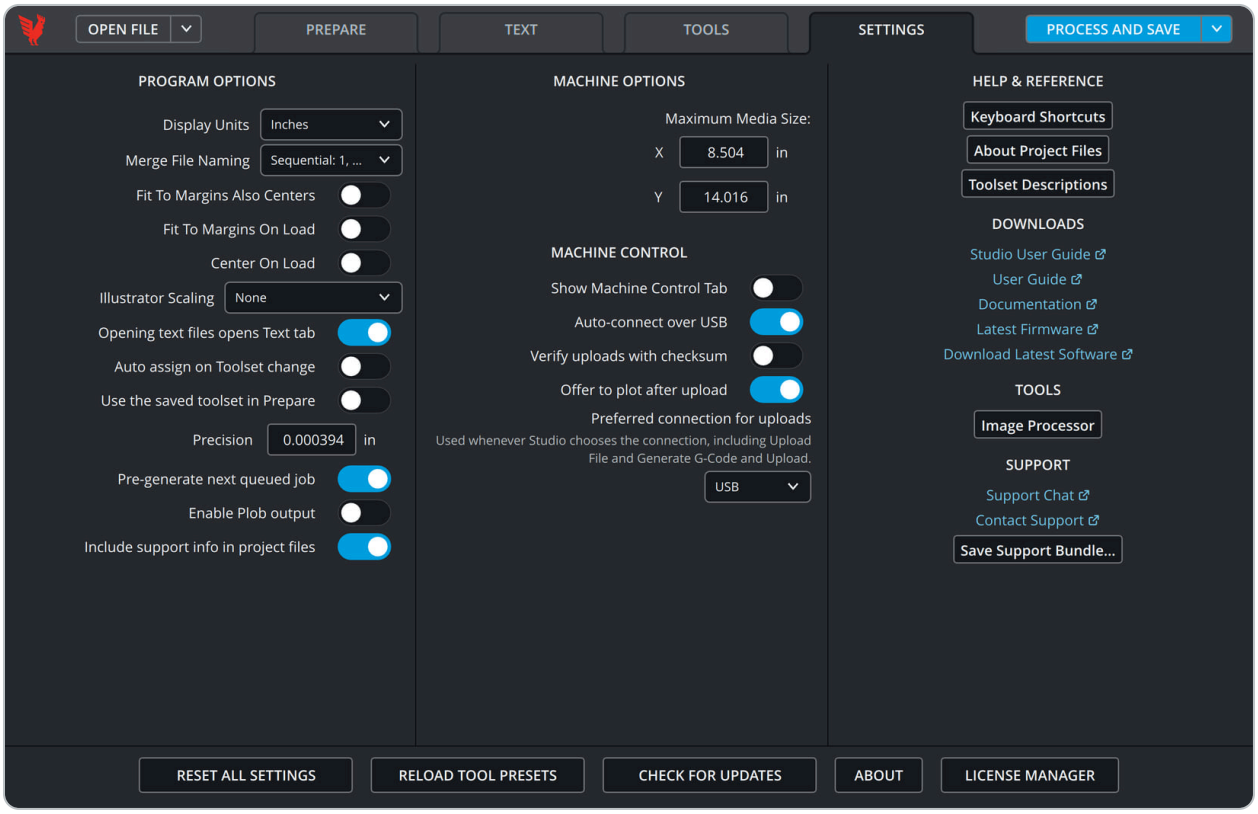
- **Skip Empty Pages** — writes nothing for those pages. The batch produces fewer files than you have documents, and the ones it produces keep their own names.
- **Generate All Pages** — writes a file for every page, empty ones included. Each empty page's file is valid and contains no motion.



*The **Empty Pages Detected** dialog*

22. Studio: the SETTINGS tab

The **SETTINGS** tab holds global Bantam Tools Studio™ preferences, machine limits, machine-control preferences, help links, downloads, support links, and license tools. Studio keeps its settings between sessions, and most you set once and rarely revisit. This chapter documents each of them, in the order the tab presents them.



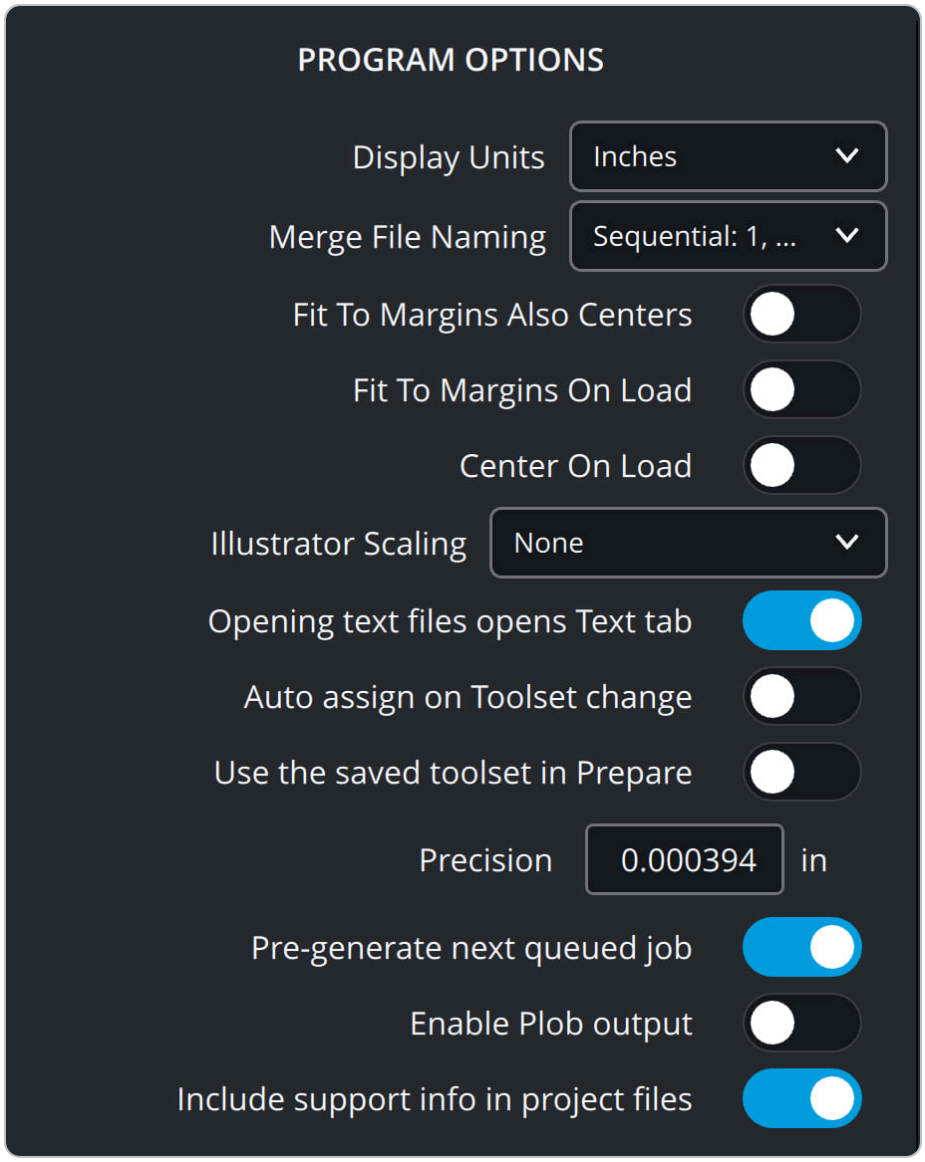
*The **SETTINGS** tab*

The **SETTINGS** tab is organized into several areas:

- **PROGRAM OPTIONS:** General Studio behavior and workflow preferences.
- **MACHINE OPTIONS:** Machine-specific size limits.
- **MACHINE CONTROL:** Connection and upload behavior.
- **HELP & REFERENCE:** Documentation, downloads, tools, and support links.
- **Bottom controls:** Reset, reload presets, update check, About, and License Manager.

22.1 Program options

The **PROGRAM OPTIONS** section holds general Studio behavior settings.



***PROGRAM OPTIONS** with the Text Add-On*

22.1.1 Display Units

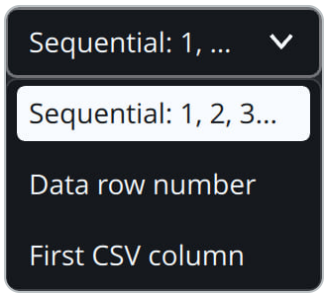
Display Units toggles Studio between inches and millimeters. (Default: Inches)

Pressing ⌘U (Ctrl+U on Windows) switches units at any time.

22.1.2 Merge File Naming

Merge File Naming sets how Studio names the files a Data Merge produces, so that you can tell which document came from which row of the CSV file. Data Merge is part of the Bantam Tools Studio Text Add-On, and this setting appears only when your license includes text features.

- **Sequential: 1, 2, 3…** — numbered in the order the files were produced. (Default)
- **Data row number** — numbered by the first CSV row each document uses.
- **First CSV column** — named from the value in that row's first column.



*The **Merge File Naming** menu*

The setting changes only the suffix Studio adds to each file name, not where the files are saved. For the full naming rules, including page suffixes and what happens when no data is substituted, see §25.7 Output file names.

22.1.3 Fit To Margins Also Centers

Fit To Margins Also Centers centers the artwork after fitting it to the available margin area. (Default: off)

22.1.4 Fit To Margins On Load

Fit To Margins On Load scales newly opened artwork to fit within the available margin area. (Default: off)

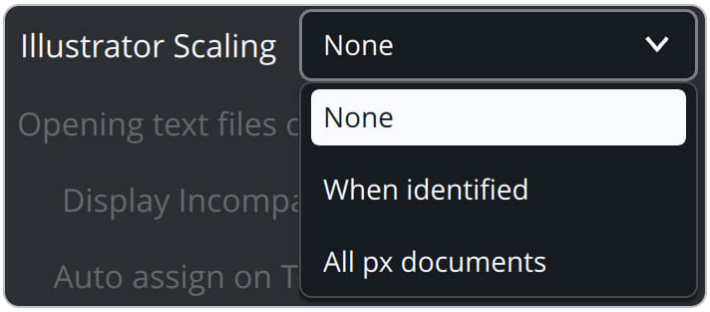
22.1.5 Center On Load

Center On Load centers newly opened artwork in the available work area. (Default: off)

22.1.6 Illustrator Scaling

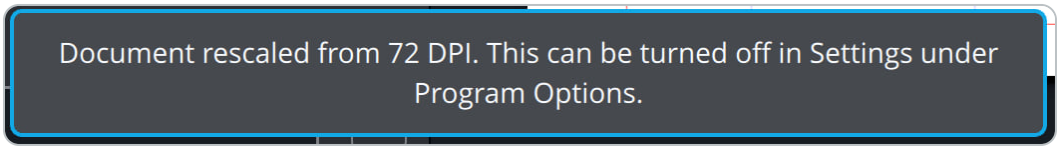
Some Adobe Illustrator files do not correctly encode the document size, and open in Studio at three-quarters of their intended size. **Illustrator Scaling** sets when Studio corrects those files automatically as they open.

- **None** — corrects nothing automatically. Any open document can still be corrected by hand; see §21.1 Opening files and file actions. (Default)
- **When identified** — corrects files that identify themselves as Illustrator exports.
- **All px documents** — also corrects files that carry no such identification. This can misscale correctly sized files from other programs, so it suits a workflow that is almost entirely Illustrator files.



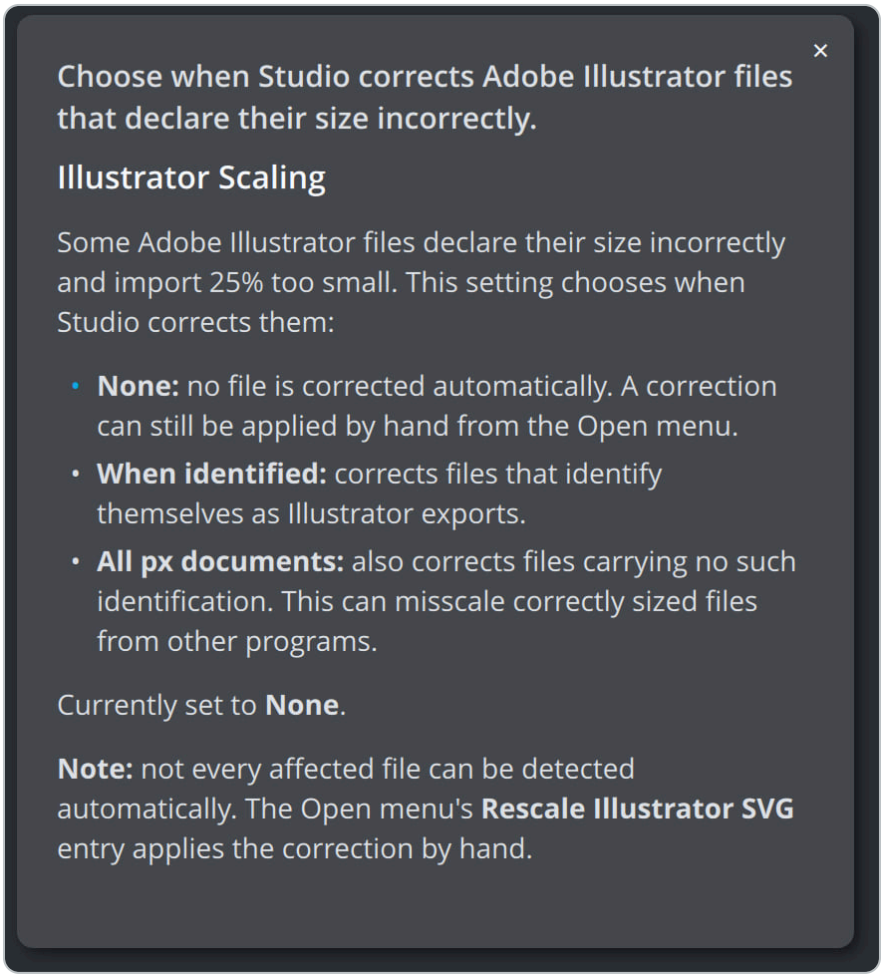
***Illustrator Scaling** menu open*

When Studio corrects a file as it opens, a notification says so and names this setting, where the automatic correction can be turned off. Opening several files at once gives one notification, with a count.



Notification after Studio corrects a file as it opens

To keep a file at its intended size from the start, set up the Illustrator document in physical units such as inches or millimeters, and export it with **File → Export → Export As** rather than **Save As**: choose the SVG format, check **Use Artboards**, and under **Styling** choose **Presentation Attributes**.



*Hover help for the **Illustrator Scaling** setting*

22.1.7 Opening text files opens Text tab

Opening text files opens Text tab switches Studio to the **TEXT** tab whenever you open a supported text file. (Default: on)

The supported text files are `.txt` and `.rtf` files.

22.1.8 Auto assign on Toolset change

Auto assign on Toolset change updates tool assignments when you switch toolsets. (Default: off)

Switching from one pen toolset to another, for instance, maps the detected colors to the default tools in the new toolset, apart from rows you have set to **None; skip this task** or hidden.

22.1.9 Use the saved toolset in Prepare

Use the saved toolset in Prepare also selects a toolset on the **PREPARE** tab when you save it in the Tool Library. (Default: off) Checking **Use this toolset in Prepare** in the save confirmation turns this on.

22.1.10 Precision

Precision controls how closely generated paths follow the source geometry. (Default: 0.05 mm)

A smaller value preserves more detail, at the cost of larger files and longer processing. A larger value simplifies and smooths paths and processes faster, at the cost of detail.

22.1.11 Pre-generate next queued job

Pre-generate next queued job lets Studio prepare the next queued job in advance. (Default: on)

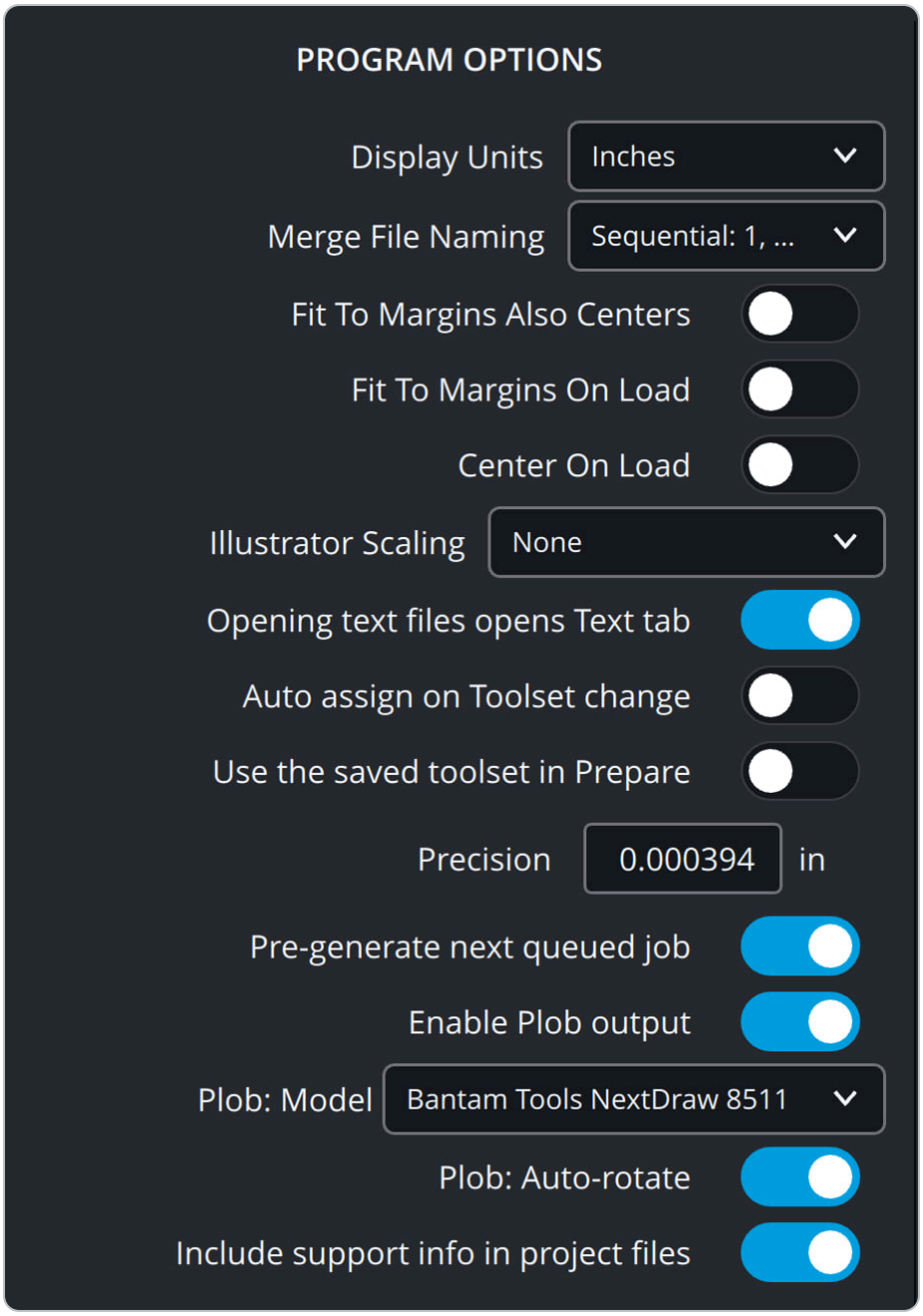
This helps automated or high-volume queues move more smoothly.

22.1.12 Enable Plob output

Enable Plob output adds a **Save as Plob** option to Studio. (Default: off)

Plob, short for "Plot Object," is a highly specialized kind of SVG file, processed in advance for fast plotting workflows. Turning this setting on reveals a **Plob** sub-group with two additional options:

- **Plob: Model** — the AxiDraw or NextDraw model the Plob file is prepared for, recorded in the file. (Default: Bantam Tools NextDraw 8511)
- **Plob: Auto-rotate** — rotates the artwork to best fit the target machine's work area. (Default: on)



PROGRAM OPTIONS *with* ***Enable Plob output*** *on, showing the* ***Plob*** *rows*

For more about Plob and how to export one, see §25. Studio: exporting output.

22.1.13 Include support info in project files

Include support info in project files saves a small, redacted diagnostic record inside every project file, so Bantam Tools support can diagnose a problem from a project file you send. (Default: on) The record holds app and system versions, recent activity, and recent log lines; passwords, Wi-Fi network names, and your user name are removed. Projects you save after turning it off don't carry the record. See §25.4 Project files.

22.2 Machine options

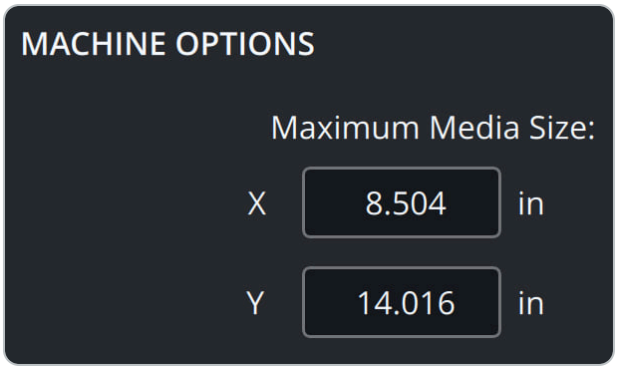
The **MACHINE OPTIONS** section holds machine-specific limits.

22.2.1 Maximum Media Size

Maximum Media Size defines the maximum X and Y work area for your machine.

It keeps Studio from generating output beyond the safe drawing area, so a job that would run past the edge is caught before it reaches the machine. It does not change the document size or the margins; those live on the **PREPARE** tab.

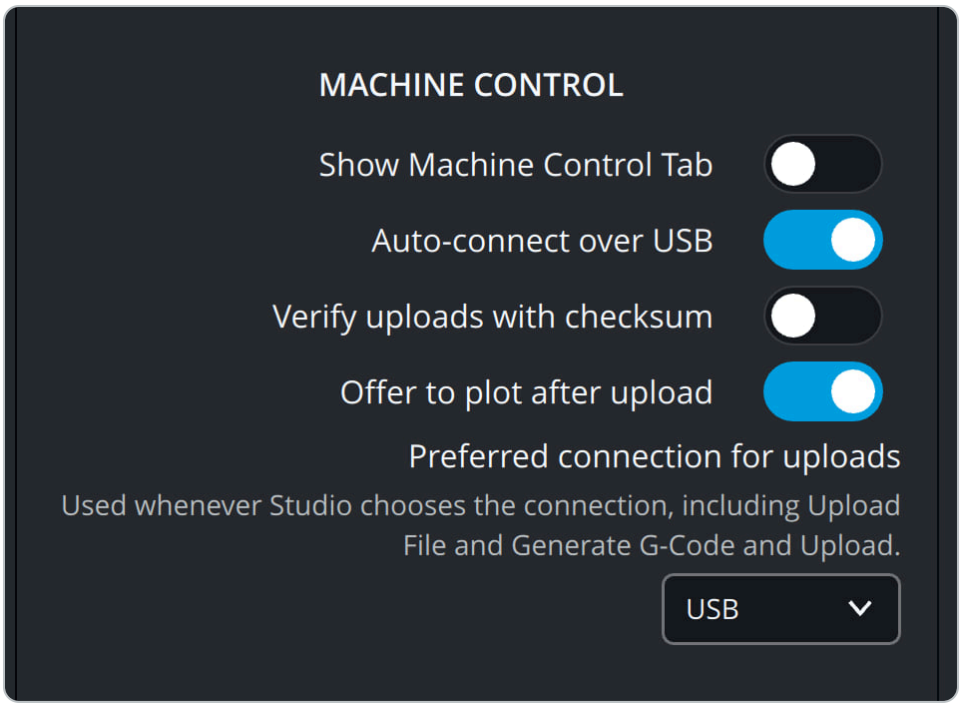
Change these values only for a special setup.



***Maximum Media Size** fields*

22.3 Machine control

The **MACHINE CONTROL** section holds the settings for connecting to a machine and uploading files to it.



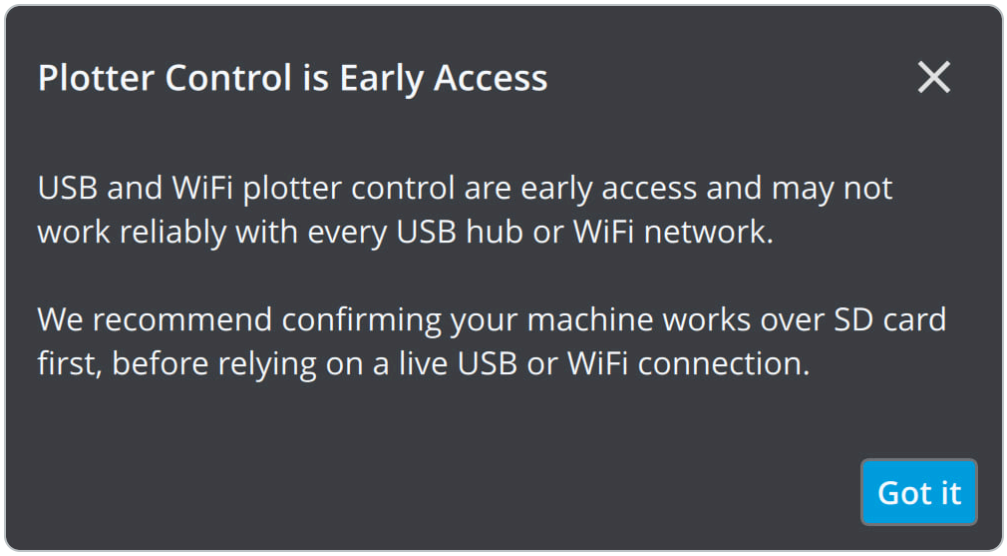
*The **MACHINE CONTROL** settings*

22.3.1 Show Machine Control Tab

Show Machine Control Tab shows or hides the **MACHINE** tab, where you connect to a machine, control it directly, browse the files stored on it, and manage the upload queue. (Default: off) §24. Studio: the MACHINE tab covers the tab itself.

The setting governs more than the tab. With it off, the actions that send a job straight to a machine are unavailable as well: **Generate G-Code and Upload** on the **File** menu is grayed out, and the Setup Sheet omits its upload actions. Moving G-Code to your machine on a microSD card needs none of this, so the setting can stay off.

Turn this setting on once your machine is up and running from the microSD card. A USB or WiFi connection then adds convenience to a machine you already know works. Studio gives the same advice the first time you turn the setting on, in a dialog titled **Plotter Control is Early Access**.



*The advice Studio shows the first time you turn on **Show Machine Control Tab***

22.3.2 Auto-connect over USB

Auto-connect over USB has Studio connect to a machine over USB as soon as one is detected. (Default: on)

With it off, connecting is a deliberate act: the **Connect** button on the **MACHINE** tab.

22.3.3 Verify uploads with checksum

Verify uploads with checksum has Studio confirm, after each upload over USB, that the file on the machine matches the file Studio sent. (Default: off) Uploads over WiFi are always checked against the size Studio sent, whether or not this is on.

It adds a brief verification step after each USB upload completes.

22.3.4 Offer to plot after upload

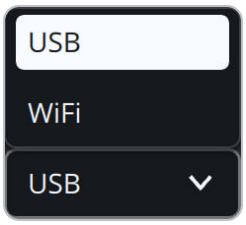
Offer to plot after upload keeps the upload dialog open when a G-Code file finishes uploading, with a **Plot Now** button. (Default: on) With it off, the dialog closes with an "Upload complete" message. Checking **Don't show this again** in the dialog turns this off.

22.3.5 Preferred connection for uploads

Preferred connection for uploads sets which connection **Upload File** and **Generate G-Code and Upload** use:

- **USB** (Default)

- **WiFi**

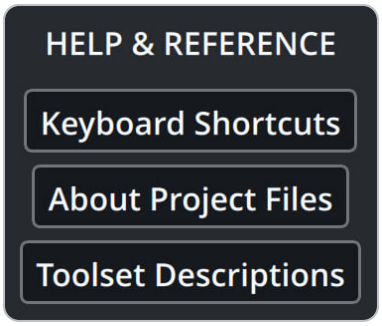


*The **Preferred connection for uploads** menu*

If that connection isn't available, Studio uses the other one and says so, as in **Upload falling back to USB — plotter unreachable on WiFi.** For connection and upload workflows, see §24. Studio: the MACHINE tab.

22.4 Help and reference

The **HELP & REFERENCE** section links to built-in help, documentation, downloads, tools, and support resources.



***HELP & REFERENCE** buttons*

22.4.1 Keyboard Shortcuts

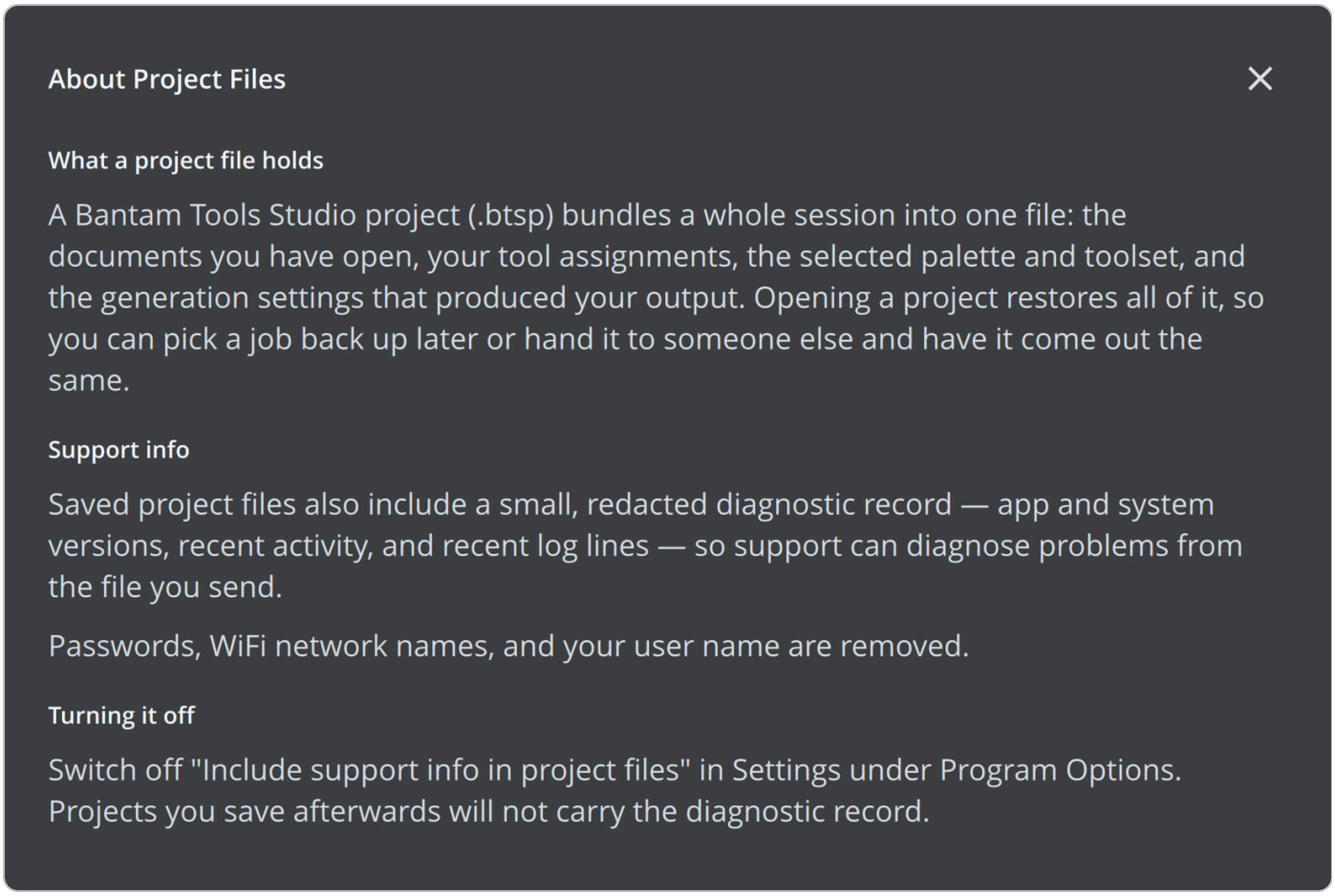
Keyboard Shortcuts shows common keyboard shortcuts for Studio. The same list, with the macOS and Windows forms side by side, is in §32.1 Keyboard shortcuts.



***Keyboard Shortcuts** window*

22.4.2 About Project Files

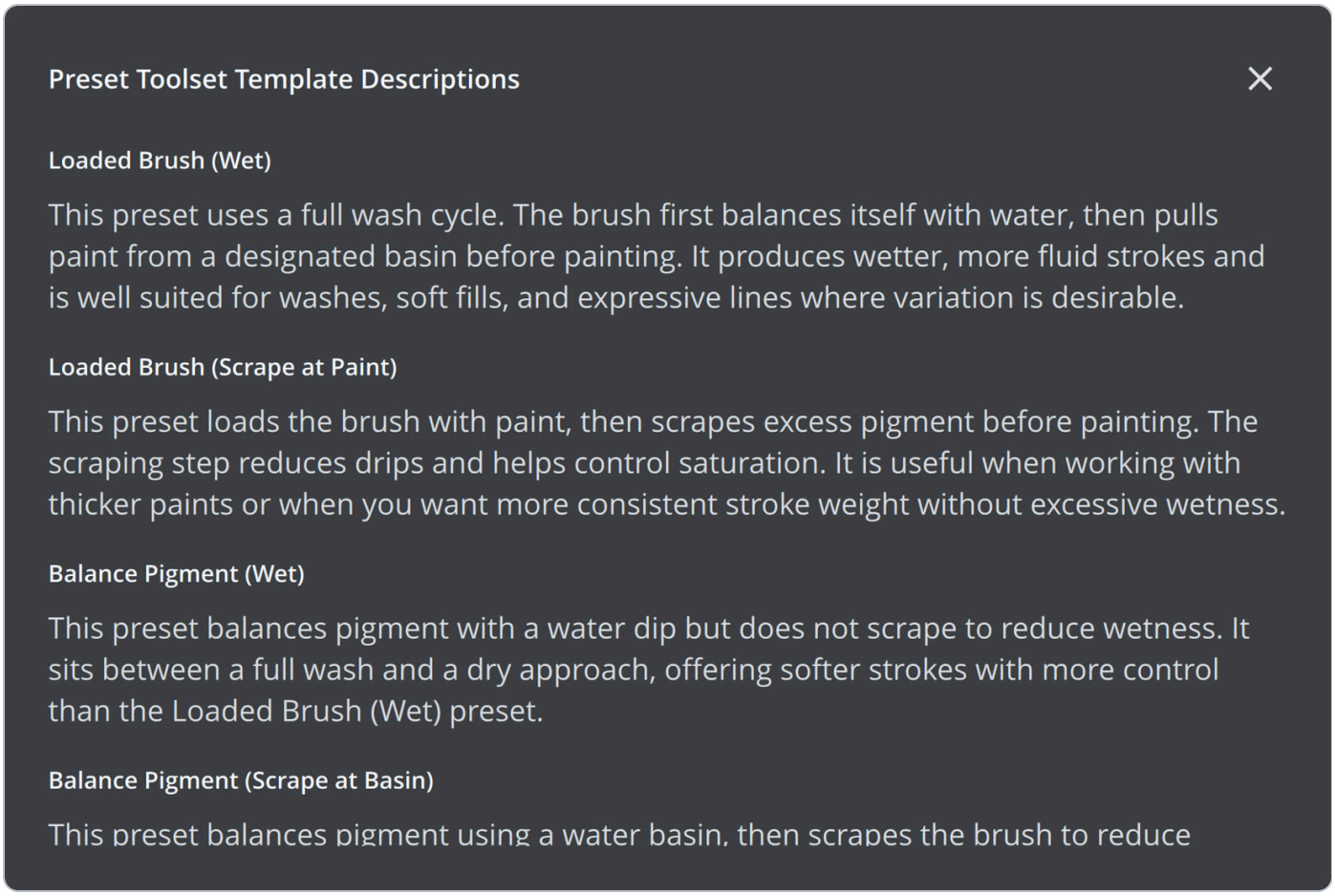
About Project Files explains what a project file (`.btsp`) holds, the support information saved inside it, and how to turn that off. See §25.4 Project files.



About Project Files *window*

22.4.3 Toolset Descriptions

Toolset Descriptions provides reference information about the included toolsets.



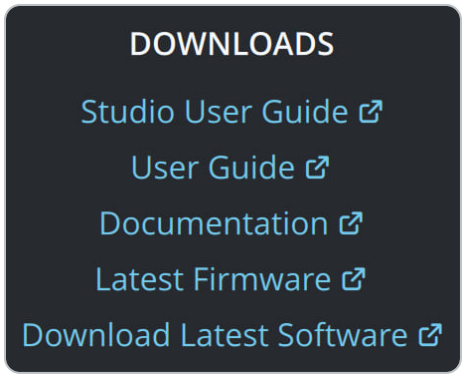
Preset Toolset Template Descriptions *window*

22.5 Downloads

The **DOWNLOADS** section links to documentation and software resources. Each label ends in ↗ because the link opens a web page in your browser.

The links are:

- **Studio User Guide** ↗ — the Bantam Tools Studio guide.
- **User Guide** ↗ — this guide.
- **Documentation** ↗ — the documentation page for your machine.
- **Latest Firmware** ↗
- **Download Latest Software** ↗



DOWNLOADS *links on HandWriter*

These links reach the current documentation, the current firmware, and the latest Studio download.

22.6 Tools

The **TOOLS** section links to related Bantam Tools utilities.

22.6.1 Image Processor

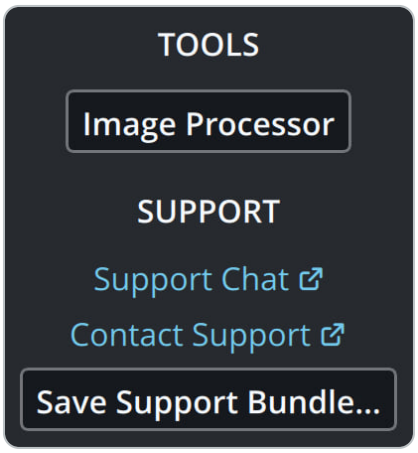
Image Processor opens the Bantam Tools Image Processor™ in its own window. It converts a photograph or other raster image into an SVG file of strokes, ready to write. With no image loaded yet, the window opens with a sample image.

22.7 Support

The **SUPPORT** section links to the routes for getting help.

The links are:

- **Support Chat** — the Bantam Tools community chat (bantam.tools/chat).
- **Contact Support** — the Bantam Tools support site (bantamtools.com/support).
- **Save Support Bundle...** — saves a diagnostic bundle to send to support (⇧⌘D / Ctrl+Shift+D).



***TOOLS** and **SUPPORT** sections*

Please use these links for help with installation, licensing, machine setup, connection issues, or output quality.

22.8 Bottom controls

The bottom of the **SETTINGS** tab holds additional global controls.



*Bottom controls of the **SETTINGS** tab*

22.8.1 Reset All Settings

RESET ALL SETTINGS restores Studio settings to their defaults: program options, path generation options, layout, and machine settings, which take the defaults for the machine currently selected. Your Tool Library is not affected. Studio asks you to confirm before it resets anything.

It is the way back to a clean configuration when preferences have drifted into a confusing state.

Holding **Option** (Mac) or **Alt** (Windows) while clicking **RESET ALL SETTINGS** performs a factory reset, which returns Studio to its on-install state. It clears everything Studio stores except your license activation:

- Every setting and program option

- Every custom tool and toolset, leaving only the built-in presets
- Every saved settings profile, leaving only the built-in defaults
- Custom colors

Studio then restarts to the machine-selection splash screen.

> ***Important note:*** A factory reset cannot be undone. Export any custom toolsets you want to keep before you use it; see §23. Studio: the Tool Library.

22.8.2 Reload Tool Presets

RELOAD TOOL PRESETS reloads the factory tool presets, and leaves your own tools and toolsets alone. Use it to return the built-in presets to their factory values.

22.8.3 Check for Updates

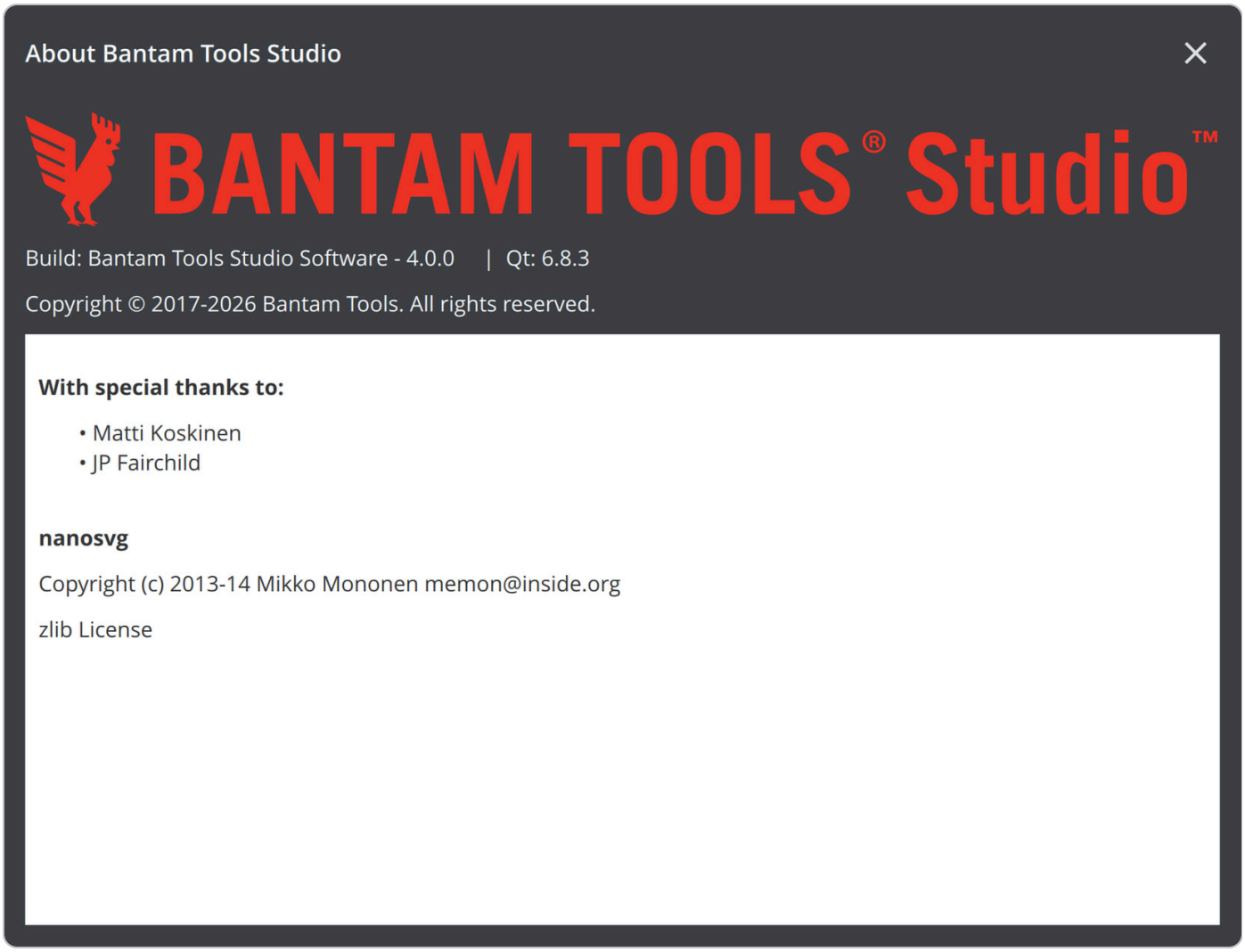
CHECK FOR UPDATES checks online for the latest version of Studio and opens the **Update Bantam Tools Studio** window. The window shows **Your version** and, when a newer version is available, **Newest version** along with links to its release notes and its download.

Below that, the **Plotter Firmware** section shows **Latest firmware**, the newest machine firmware this version of Studio knows of, and **Your plotter**, the firmware version of the machine you are connected to, marked **(via USB)** or **(via WiFi)**. With no machine connected, it reads **Connect a plotter to see its firmware version**. When the connected machine's firmware is older than the latest, the section adds **Firmware update available**, with a link to the firmware download page (bantam.tools/fw); see §10.11.6 Updating the firmware.

Studio also checks once shortly after it starts, and opens this window on its own when a newer version is available.

22.8.4 About

ABOUT shows version and application information.

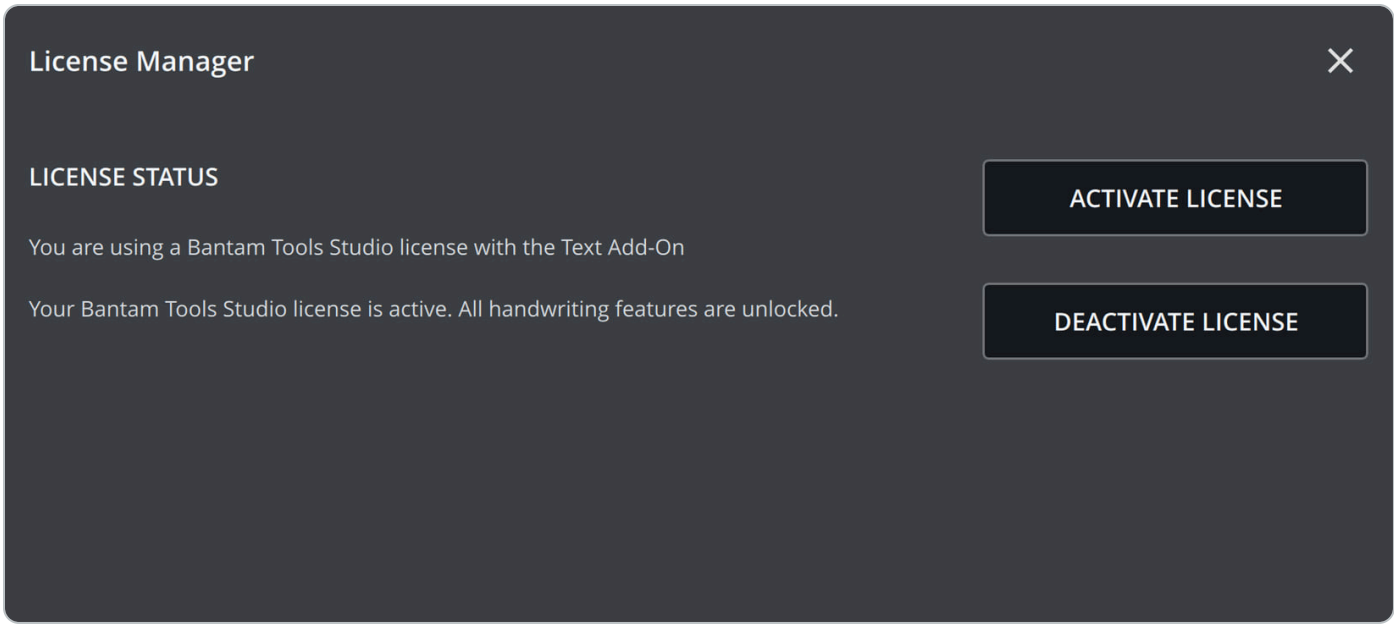


About Bantam Tools Studio *window*

22.8.5 License Manager

LICENSE MANAGER opens the license tools for activating, deactivating, or checking your Studio license.

It is where a new computer is activated, and where access to licensed features is managed.



License Manager *window with an active license*

23. Studio: the Tool Library

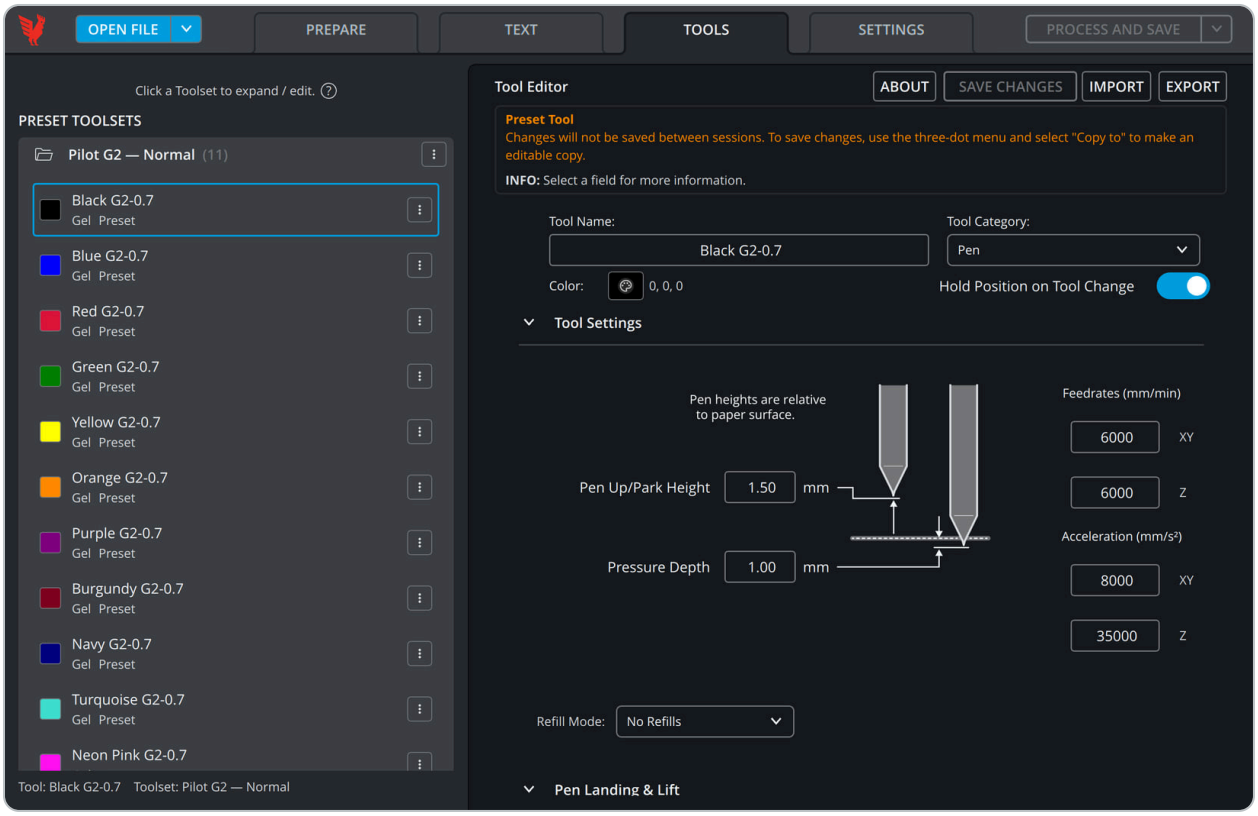
The **Tool Library**, in Bantam Tools Studio™, is where you look through your tools, choose them, and create your own — the pens your machine holds — along with the settings for drawing with each one. Open it from the **TOOLS** tab (⌘3 / Ctrl+3), or from the **View** menu.

- A **tool** is one physical pen, plus its settings: how high it lifts, how it reaches the paper, how fast it moves, and what it does when it needs a refill or a change.
- A **toolset** is a named collection of tools. Every job draws its tools from the toolset that is selected when you process and save it, both in a project file and in every export. A job that uses several pens needs a toolset that holds all of them.

The preset toolsets are tuned for your machine and for the tools we recommend, and are ready to use as they are. To change one, copy it into a toolset of your own.

Editing a tool changes what it does the next time it is used. Choosing which tool draws which part of your artwork happens on the **PREPARE** tab.

A small line at the top of the tool list — "Click a Toolset to expand / edit." — is your reminder that toolsets are collapsible; click one to reveal the tools inside it. A status line at the bottom of the tool list also shows which tool and toolset are currently selected.



***TOOLS** tab with the HandWriter **Pilot G2 — Normal** toolset selected*

23.1 Preset and user toolsets

The tool list is organized into three sections:

- **PRESET TOOLSETS** — toolsets Bantam Tools built and tuned for you.
- **USER TOOLSETS** — toolsets you have created or duplicated.
- **UNGROUPED TOOLS** — tools that are not currently filed into any toolset.

UNGROUPED TOOLS is also a catch-all: put tools there and you can use them together, if you want every one of your tools available all the time. Toolsets keep each job's choices clear, though. For example, you might keep one toolset of gel pens in different colors and another of fiber-tip markers.

You can change a preset tool's fields and plot with the result, but changes to preset toolsets and their tools are not saved: the values revert when you quit Studio. Selecting one shows a banner reading "Preset Tool" or "Preset Toolset" that says so. To keep your changes, use **Copy to**, in the three-dot menu, to make an editable copy.



The banner on a preset tool

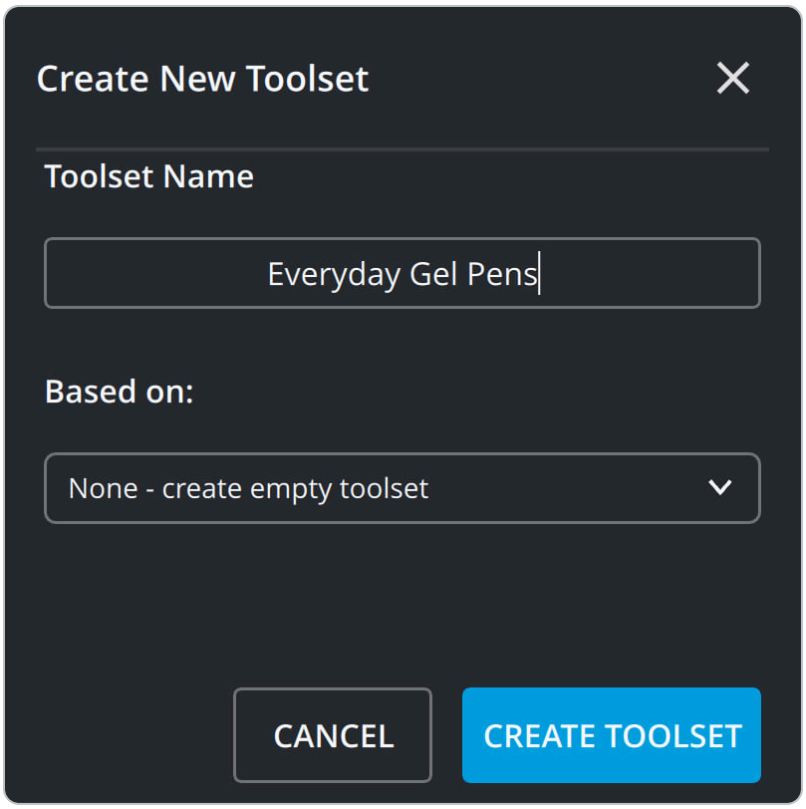
The HandWriter's preset toolsets are listed with its other pen settings; see §12.3 Preset toolsets.

23.2 Creating and duplicating toolsets

To start a new toolset, click **Create new toolset** under User Toolsets. The **Create New Toolset** dialog asks for:

- **Toolset Name**
- **Based on:** Choose **None - create empty toolset**, or pick any existing user or preset toolset to start from a copy of it.

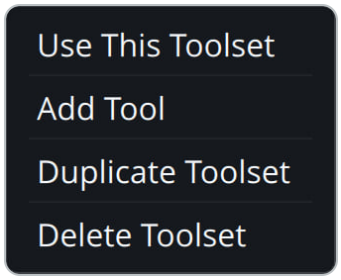
Click **CREATE TOOLSET** to finish, or **CANCEL** to back out. The new toolset appears under USER TOOLSETS, selected and ready to edit.



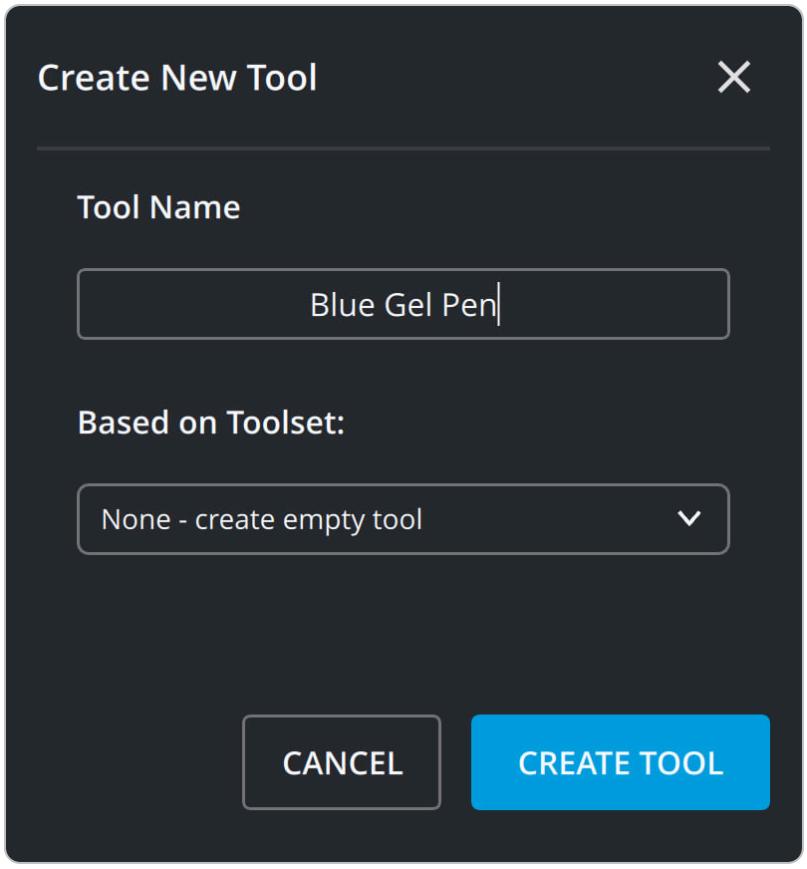
*The **Create New Toolset** dialog*

Clicking the menu button on a toolset gives you:

- **Use This Toolset** — makes it the active toolset for the current job.
- **Add Tool** — adds a new tool to that toolset. A small dialog lets you name the new tool and optionally base its starting settings on another toolset.
- **Duplicate Toolset** — copies the toolset, including preset toolsets.
- **Delete Toolset** — available for user toolsets only.



The menu on a user toolset



Add Tool *opens the* ***Create New Tool*** *dialog*

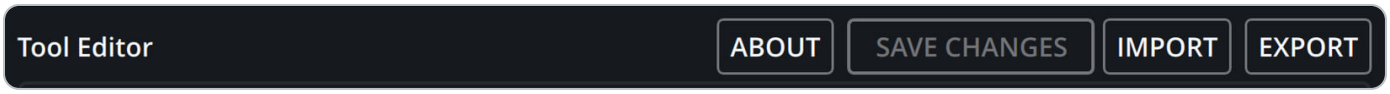
We recommend duplicating a preset rather than building a toolset from scratch, since the preset's heights and feedrates are already close to correct for the tool it was tuned around; start empty only when your tool has nothing in common with any preset.

Name new toolsets clearly so they are easy to identify later. Useful names might include the tool type, material, machine, or workflow.

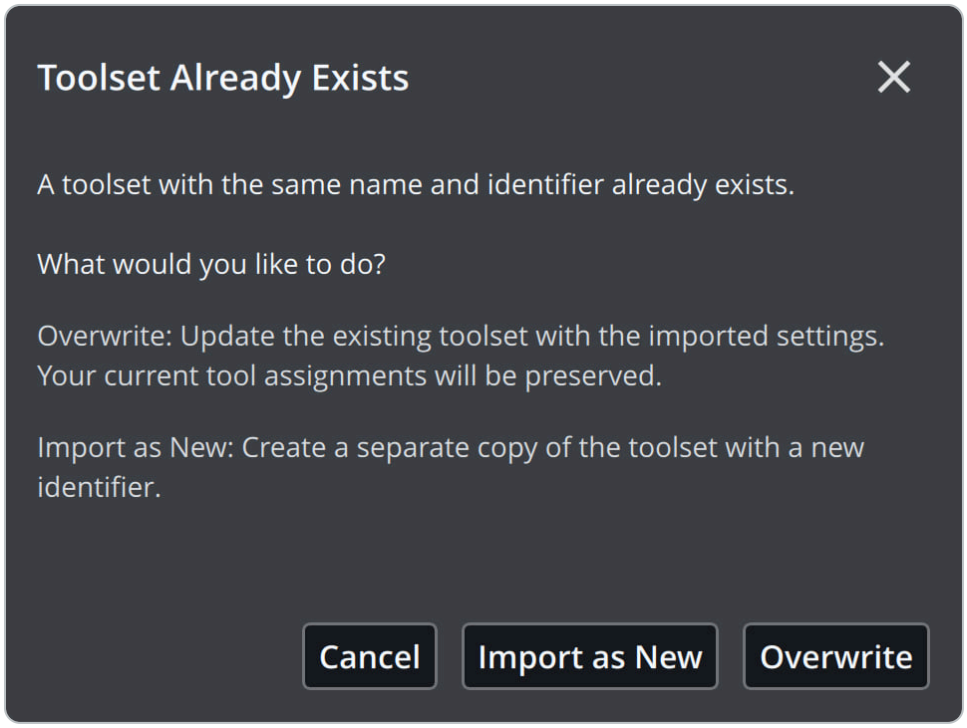
23.3 Importing and exporting toolsets

The editor header shows four buttons: **ABOUT**, **SAVE CHANGES**, **IMPORT**, and **EXPORT**. **SAVE CHANGES** and **EXPORT** stay grayed out until a tool or toolset is selected.

- **IMPORT** brings in a JSON file containing a previously exported tool or toolset. An **Import from JSON** dialog first asks what the file holds: click **TOOL** or **TOOLSET**, then choose the file.
    - **For a tool,** an **Import Tool** dialog asks where to store it. Choose **Main Library (No Toolset)** or a toolset from the list, then click **IMPORT**.
    - **For a toolset,** if a toolset with the same name and identifier already exists, Studio asks whether to **Overwrite** it (keeping your current tool assignments) or **Import as New** (create a separate copy with a new identifier).
- **EXPORT** becomes available once you select a tool or toolset, and saves it as a JSON file. When the export finishes, **Open File Location** shows the saved file.



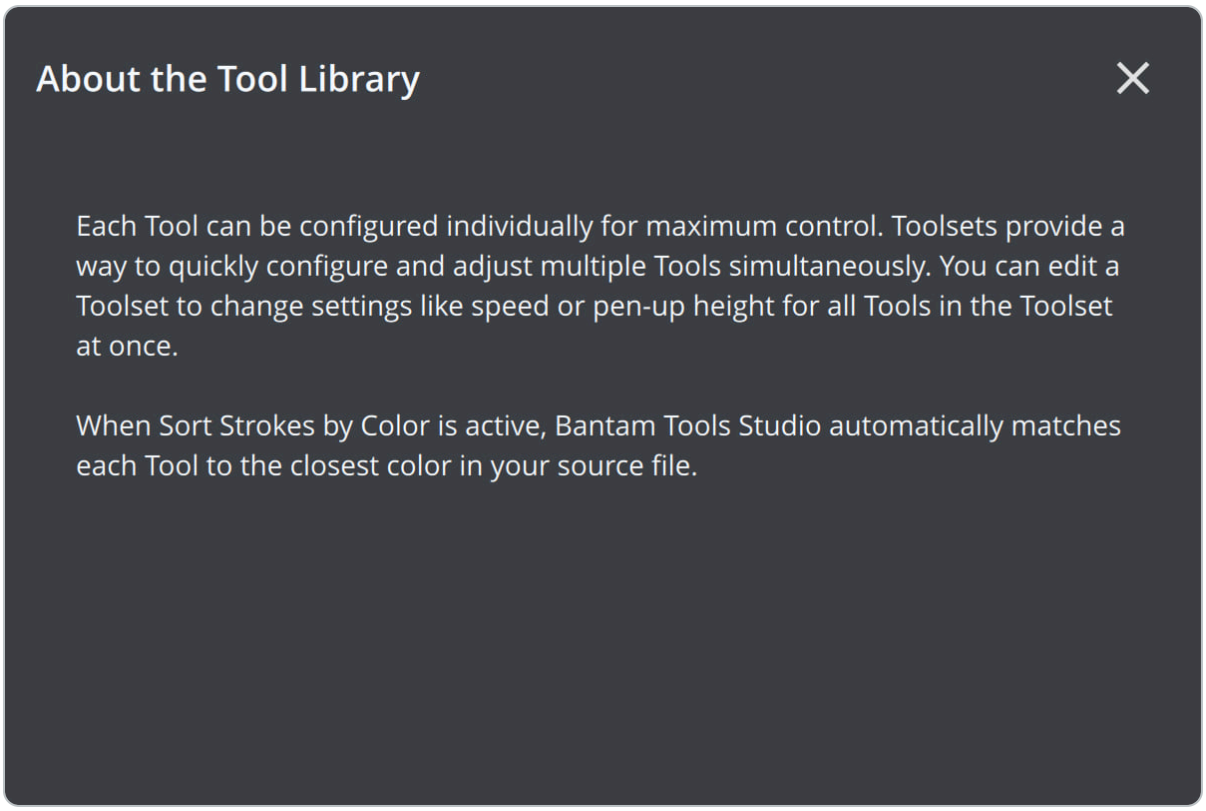
The editor header buttons



*Importing a toolset that already exists: **Overwrite** or **Import as New***

An exported JSON file holds a toolset's tuned settings outside Studio, so it can back up a custom toolset before a software update, move your pens to another computer, or give a teammate the same calibration.

ABOUT opens a short explainer covering how tools and toolsets relate: toolsets let you adjust settings like feedrate or pen up height across every tool in the set at once, and when Sort Strokes by Color is active, Studio automatically matches each tool to the closest color in your source file.



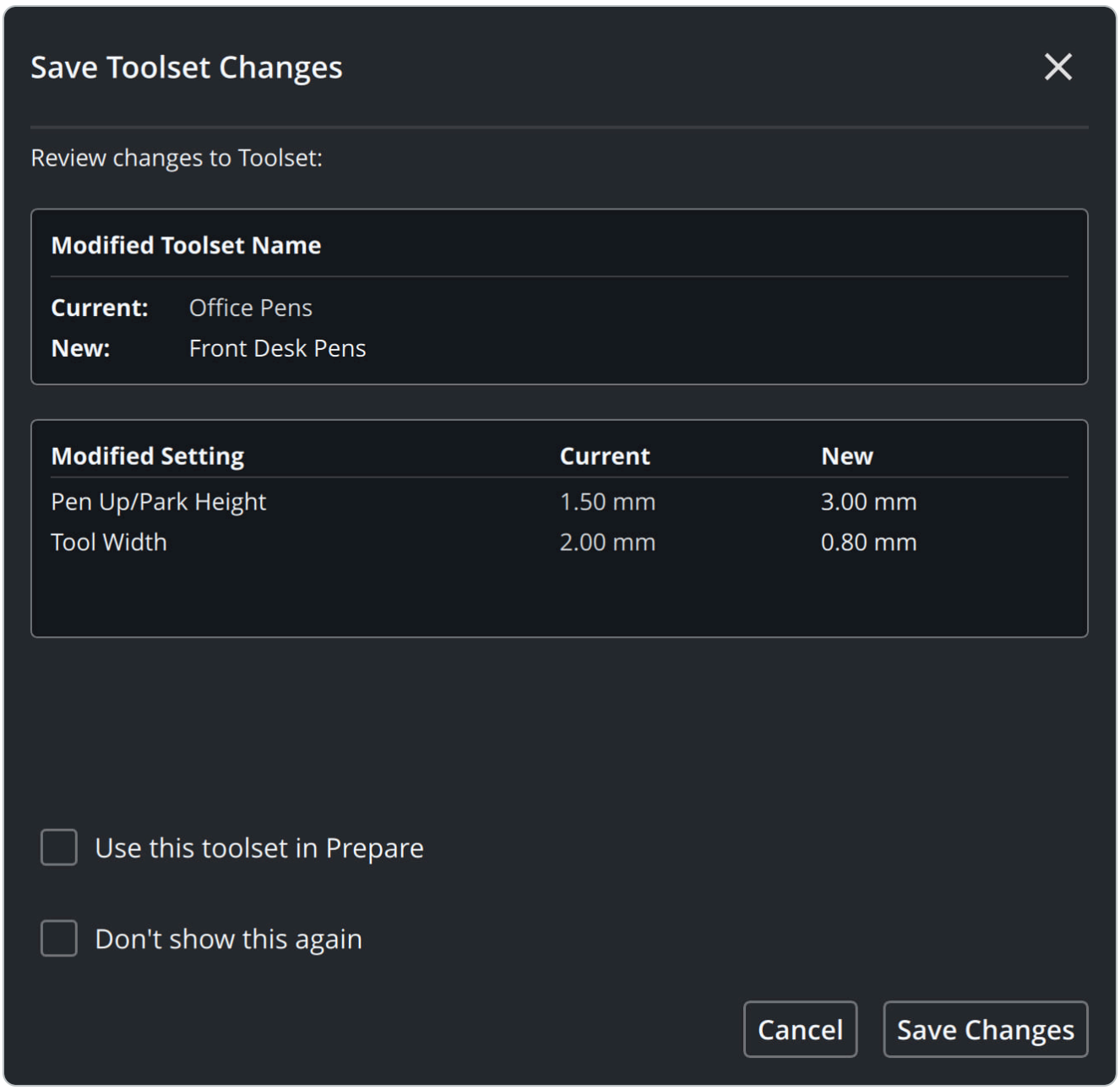
*The **About the Tool Library** dialog*

23.4 Editing a whole toolset

Select the toolset itself, rather than a tool inside it, to edit settings shared across every tool in that set. For example, you can raise every tool's feedrate at once while leaving each tool's individual pen heights untouched.

If the tools in a toolset currently have different values for a field, that field shows "Various" until you enter a new value — at which point the new value applies to every tool in the set. Leaving a "Various" field alone is safe: it is not a value, and nothing is written to the tools underneath it.

Click **SAVE CHANGES** before leaving the page. A confirmation lists each changed setting's current and new value before the changes are applied. Checking **Don't show this again** in it saves later changes without the list. If the toolset is not the one selected on the **PREPARE** tab, the confirmation also offers **Use this toolset in Prepare**, which selects the toolset there once it is saved. Your choice is remembered for later saves. Hold ⌥ (Option) while your pointer is over the button (Alt on Windows) to change it to **REVERT**, which discards your pending edits instead of saving them.



The confirmation before a toolset's changes are saved, listing each setting's current and new value

If you leave a tool or toolset with unsaved edits, a separate **Unsaved Changes** prompt asks what to do with them. Checking **Don't show this again (always discard)** in that prompt discards unsaved edits without asking from then on.

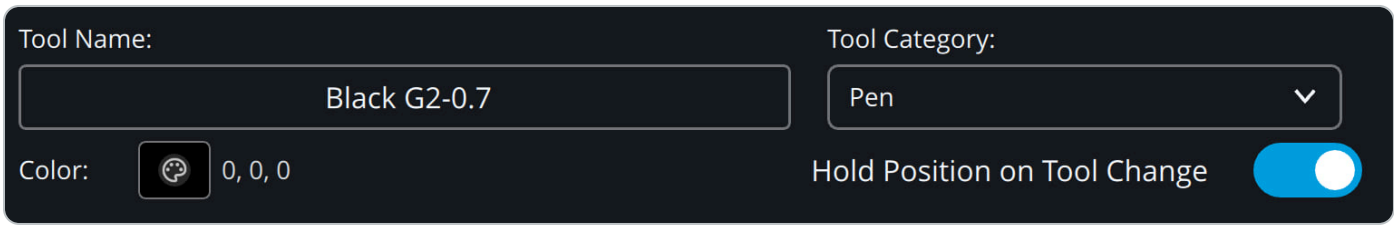
23.5 Editing an individual tool

Select a tool to edit its settings. For example, you can rename the tool, change its color, or have the machine pause for it at a tool change:

- **Tool Name:** The name shown in the tool list and on the **PREPARE** tab.
- **Color:** Used to match colors in your source file for automatic tool assignment; otherwise, it is informational only. Changing it does not change the ink in the pen, and it does not restrict which strokes

the tool can draw.

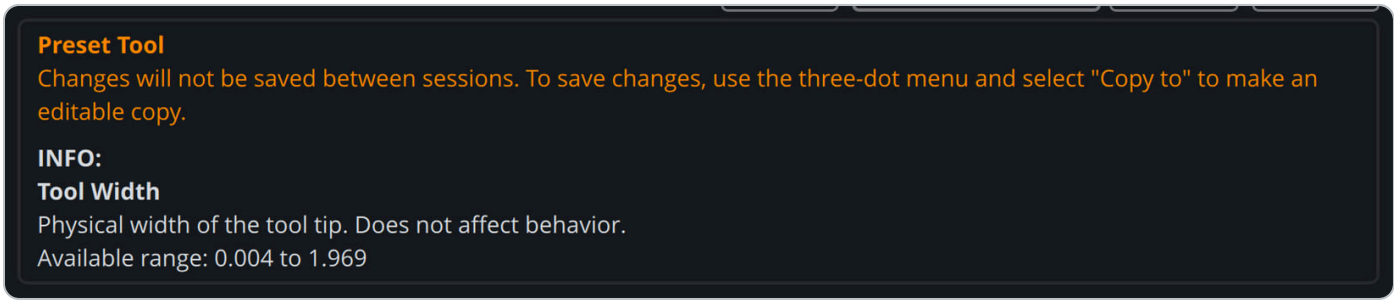
- **Tool Category: Pen** or **Brush**. Every HandWriter tool is a pen; leave it set to **Pen**.
- **Hold Position on Tool Change:** When enabled, the machine stops at a tool change so you can install or swap the tool by hand. See §12.9 Pen changes and pauses.



*A tool's **Tool Name**, **Tool Category**, **Color**, and **Hold Position on Tool Change***

The rest of a pen's settings, including its heights, speeds, and refills, are in its **Tool Settings** section. The heights and speeds are covered with the HandWriter's other pen settings; see §12. Setting up pens.

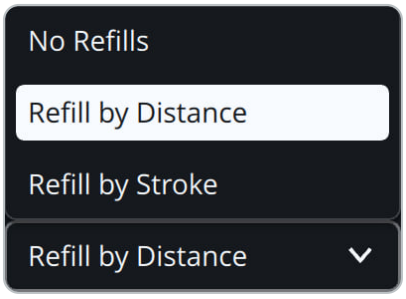
Tip: Click or hover over any field to see a short description of what it does at the top of the panel.



Clicking a field describes it at the top of the panel

Refill Mode, also in **Tool Settings**, sets whether and how often the tool stops to refill:

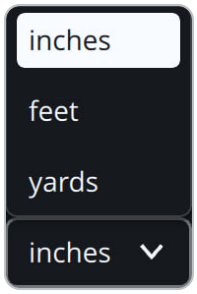
- **No Refills**
- **Refill by Distance** — the field reads **Refill Distance**: how far the tool draws before it refills, where 0 turns refills off. The refill comes at that exact distance, wherever it falls: at the start, the middle, or the end of a stroke. Afterward, the tool returns to the point where it stopped and continues the stroke.
- **Refill by Stroke** — the field reads **Refill After Strokes**: how many strokes the tool draws between refills. Refills come only between strokes, so a stroke is never interrupted, however long it is.



*The **Refill Mode** menu*

A units menu beside **Refill Distance** chooses whether the distance is shown in mm or m, or in inches, feet, or yards. The menu changes only how the distance is displayed, not the distance itself.

What a refill does, and when it is useful, depends on the machine; see §12.9 Pen changes and pauses. A tool you create with **Add Tool** starts at **Refill by Distance**, with a distance of 600 m.



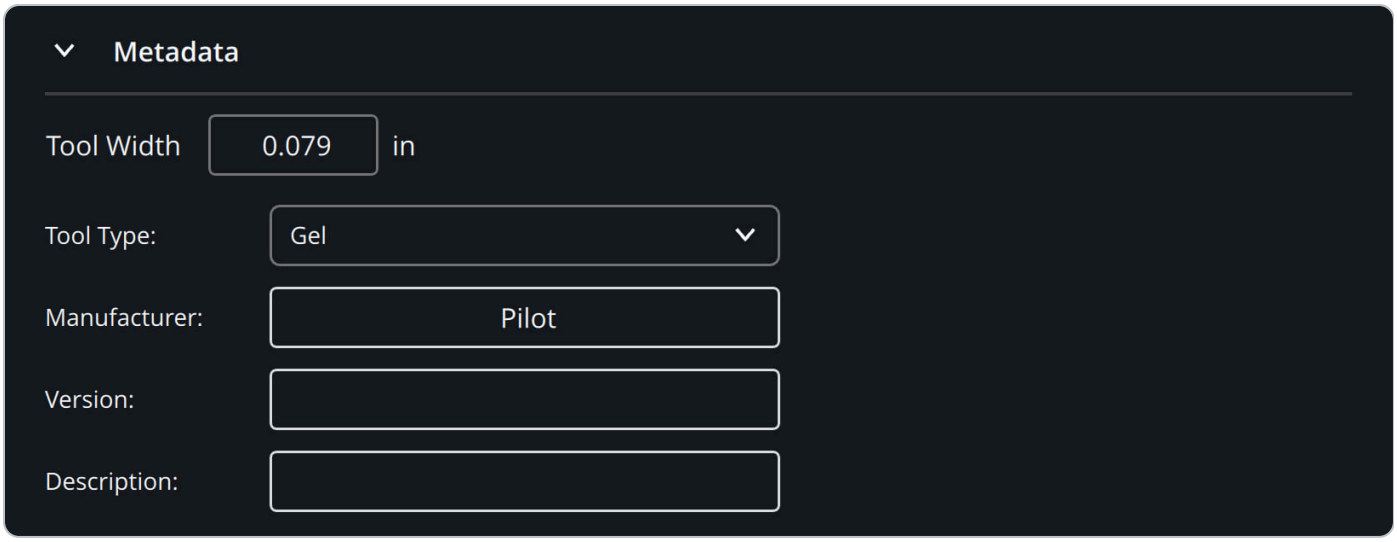
*The units menu beside **Refill Distance***

23.6 The Metadata section

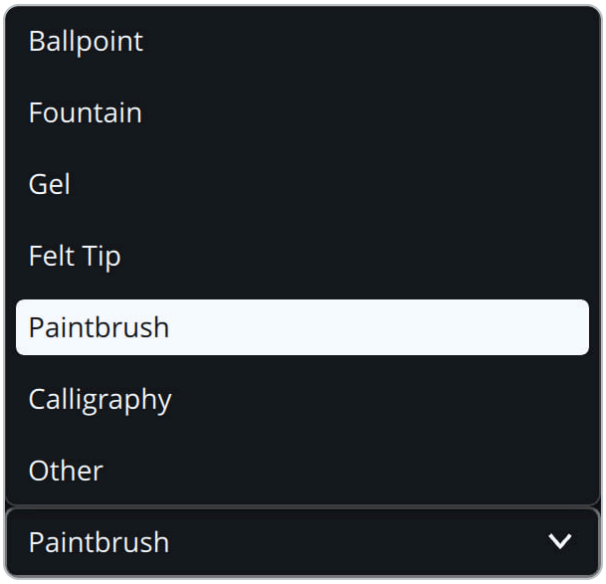
The **Metadata** section starts collapsed. Click it to expand a few descriptive fields:

- **Tool Width**
- **Tool Type:**
  - **Ballpoint**
  - **Fountain**
  - **Gel**
  - **Felt Tip**
  - **Paintbrush**
  - **Calligraphy**
  - **Other**
- **Manufacturer:**
- **Version:**
- **Description:**

Apart from **Tool Type**, these fields do not change how a tool plots. **Tool Type** also sets **Tool Category**: **Paintbrush** makes the tool a brush, and the other types, apart from **Other**, make it a pen. Tool Width and Tool Type help you sort and identify tools at a glance; Manufacturer, Version, and Description are notes for your own reference.



*The **Metadata** section, expanded*



*The **Tool Type** menu*

23.7 Pen Landing & Lift

The **Pen Landing & Lift** section, below **Tool Settings**, shapes how the tool meets and leaves the paper:

- **Lead Angle:** Controls the approach angle as the pen enters and exits a stroke, from 30° to 90°. A value of 90° means the pen drops straight down (off); lower values create a shallower approach that can reduce ink blobs at the start and end of a stroke.
- **Approach Above Paper**, **Slow Past Contact**, and **Touchdown Speed** control **soft touchdown**. The pen drops quickly to the **Approach Above Paper** height, moves at the slower **Touchdown Speed** through contact to **Slow Past Contact** below the paper, then goes quickly the rest of the way to its drawing position. The machine limits how far the slow zone reaches below the paper. Slowing only around contact reduces bounce without slowing the whole move. An **Approach Above Paper** of 0 turns soft touchdown off. Touchdown Speed must be below the tool's fast feed to have any effect, and a warning appears beside it when it is not.

- **Soft Lift:** slows the pen at the top of the lift, away from the paper. With soft touchdown on, it also lifts the pen off the paper at Touchdown Speed. Some presets turn it on.



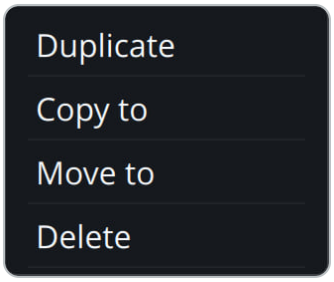
*The **Pen Landing & Lift** section*

Start from the preset values. Make the move gentler — a higher **Approach Above Paper**, a slower **Touchdown Speed**, or turning on **Soft Lift** — when you see blobbed stroke ends, a visible bounce, or noise at the top of the lift. Each step costs a little plotting time.

23.8 Copying and moving tools

Open the menu button on a tool row for:

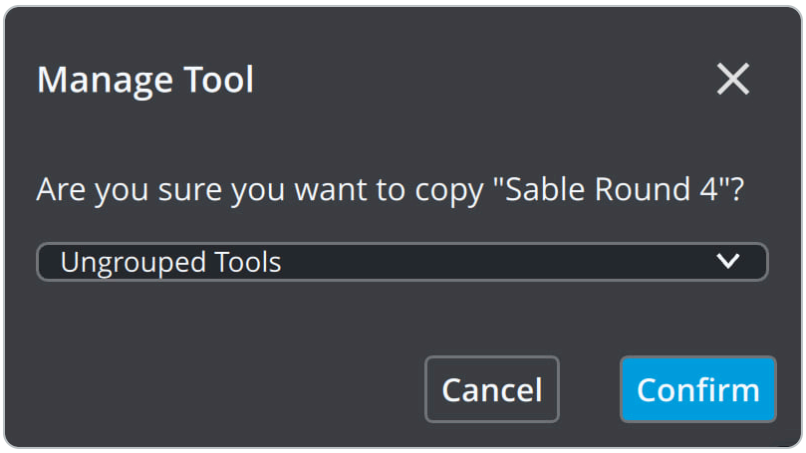
- **Duplicate**
- **Copy to**
- **Move to**
- **Delete**



The menu on a tool row

Duplicate, **Move to**, and **Delete** are available only for custom (user-created) tools. **Copy to** works on any tool, including presets — it is how you make an editable copy of a preset tool without disturbing the original.

Choosing **Copy to** or **Move to** opens the **Manage Tool** dialog, where you pick a destination from a list of your toolsets. **Ungrouped Tools** is always listed, if you just need a place for the tool.



*The **Manage Tool** dialog, with the destination selector*

Copying leaves the original tool in place and adds a copy at the destination; moving removes the tool from its current toolset and files it under the destination instead. Neither one changes the tool's settings, and neither affects a job you have already processed.

23.9 Testing tool settings

Two features make testing settings quicker:

- **Change every tool at once.** Select a toolset, rather than a tool inside it, and a setting you change applies to every tool in the set: to slow every tool down together, for example. See §23.4 Editing a whole toolset.
- **Compare settings in one job.** Tools in the same toolset can have different settings. In a toolset of your own, duplicate a tool a few times and give each copy a different value, such as a different speed. Make a test drawing with a few rows of short lines, each row in its own color, and assign each copy to one of the colors. A single job then draws them side by side for comparison. See §23.8 Copying and moving tools and §21.9 Applying tool assignments to every document.

To match what you see to the setting most likely to fix it, see §12.10 Tuning a pen.

24. Studio: the MACHINE tab

The **MACHINE** tab (⌘4 / Ctrl+4) is where you connect Bantam Tools Studio™ to a machine, control it directly, browse the files stored on it, and manage the jobs Studio has queued for it. This chapter documents every control on the tab, in the order the tab presents them. For the practical question of which of the three routes — microSD card, USB, or WiFi — to use for a given job, see §15. Sending files to your machine.

The tab is hidden by default, so turn it on before you connect a machine for the first time:

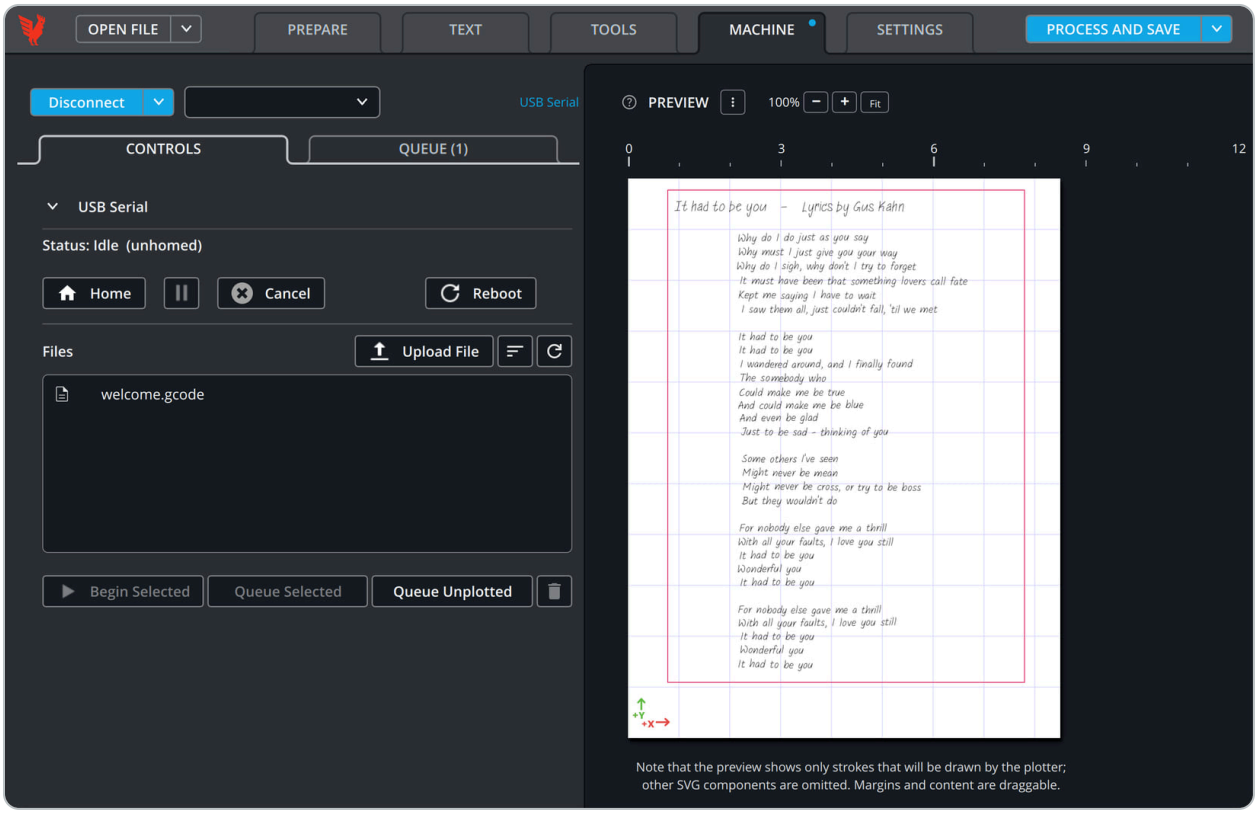
Settings → Machine Control → Show Machine Control Tab

A small colored dot overlays the **MACHINE** tab label itself: blue means a machine is connected, tangerine means Studio is connecting, and gray means no machine is connected. The dot stays visible no matter which tab you're viewing, so you always know your connection status at a glance.

Below the connection row, the tab splits into two sub-tabs:

- **CONTROLS:** Connection status, machine controls, and the files stored on the machine.
- **QUEUE:** Jobs waiting to be generated, uploaded, or plotted, plus any that failed and need attention. Once at least one job is queued, the label becomes **QUEUE (*n*)**.

The Preview stays visible on the right side of the window in either sub-tab, so you can still see the current job while you connect, upload, or manage the queue.



***MACHINE** tab with a plotter connected over USB*

24.1 Connecting to a machine

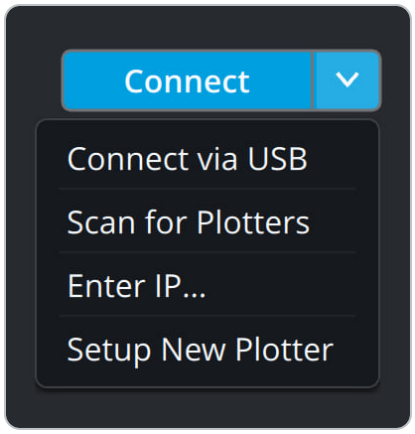
At the top of the **MACHINE** tab, a **Connect** split button offers four ways to reach a machine:

- **Connect via USB** — connects to a machine attached directly to your computer with a USB cable.
- **Scan for Plotters** — searches your WiFi network and opens a small results popup. While scanning, it reads **Scanning for plotters…**; if nothing turns up, it reads **No plotters found. Make sure your plotter is powered on and connected to the same network.** Click a discovered machine in the popup to connect to it.
- **Enter IP…** — reveals a manual IP address field (placeholder `192.168.1.100`) so you can connect by address directly.
- **Setup New Plotter** — opens the **Set Up Your Plotter** dialog, which adds a new machine to your WiFi network; see §24.4 Setting up a new plotter.

Clicking the **Connect** button itself, rather than opening its menu, favors USB: if a machine is available over USB, Studio connects to it directly; otherwise it falls back to WiFi, using the manual IP field if you've entered one. While Studio is connecting, the button area shows a spinner and a **Cancel** button so you can back out.

Once connected, **Connect** is replaced by a **Disconnect** split button, whose own menu still offers **Setup New Plotter** so you can add another machine without disconnecting first. Beside it, Studio shows the connection type — **USB Serial** or **WiFi** — and a drop-down menu listing any other machines discovered on your network.

If Studio can't reach a machine, or a connection problem persists, an error line reading **BT-<*code*> — <*summary*>** appears beneath the connection row, with **Try Again** and **Copy Diagnostics** buttons. **Try Again** repeats the attempt without changing anything; for an error that needs a step at the machine first, such as **BT-205**, the message says what to do. **Copy Diagnostics** puts the full error text on the clipboard, which is what Bantam Tools support will ask you for. When one of these errors closes the connection, the line moves to the top of the **CONTROLS** sub-tab, above **Plotters on network**.



***Connect** menu on the **MACHINE** tab*

24.2 Connecting over USB

To connect over USB:

1. Connect the machine to your computer with a USB cable.
2. Open the **MACHINE** tab.
3. Click **Connect**, then choose **Connect via USB** — or click **Connect** alone, since USB is favored automatically when available.

The connection row then shows **USB Serial** and the machine's status, and the machine controls become active.

24.3 Connecting over WiFi

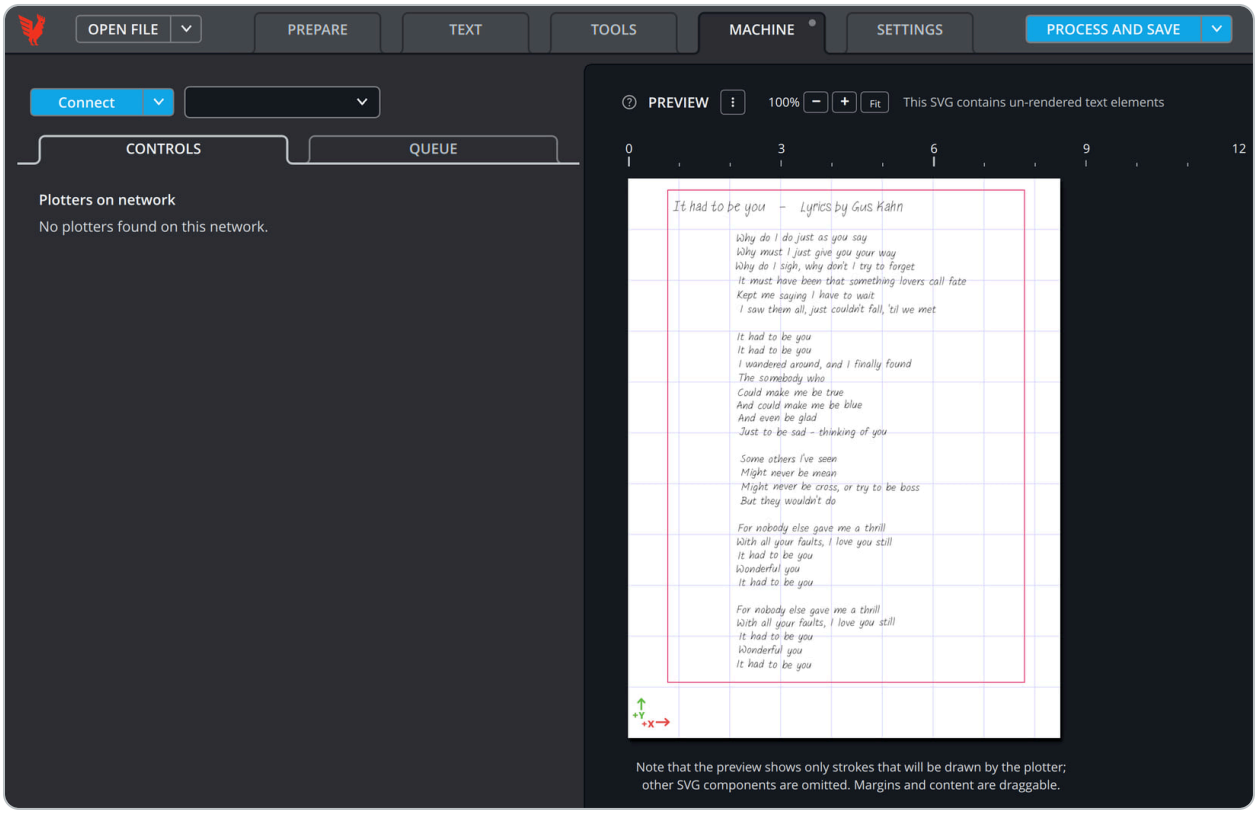
To connect over WiFi:

1. Open the **MACHINE** tab.
2. Click **Connect**, then choose **Scan for Plotters**.
3. Select the machine from the results.

The popup closes and the connection row shows **WiFi** with the machine's status.

If no machine is connected yet, the **CONTROLS** sub-tab shows a **Plotters on network** list of every machine Studio has discovered, each with its own **Connect** button — a quicker path than opening the scan popup. If nothing turns up, it reads **No plotters found on this network.** Confirm the computer and the machine are on the same WiFi network, then try again.

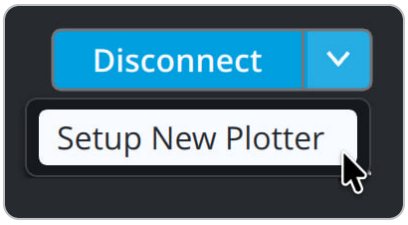
You can also skip discovery entirely and choose **Enter IP** from the **Connect** menu to connect by address. That is the route to use on a network whose devices cannot see each other's discovery traffic, since the address works even where the scan finds nothing.



***MACHINE** tab with no plotter connected*

24.4 Setting up a new plotter

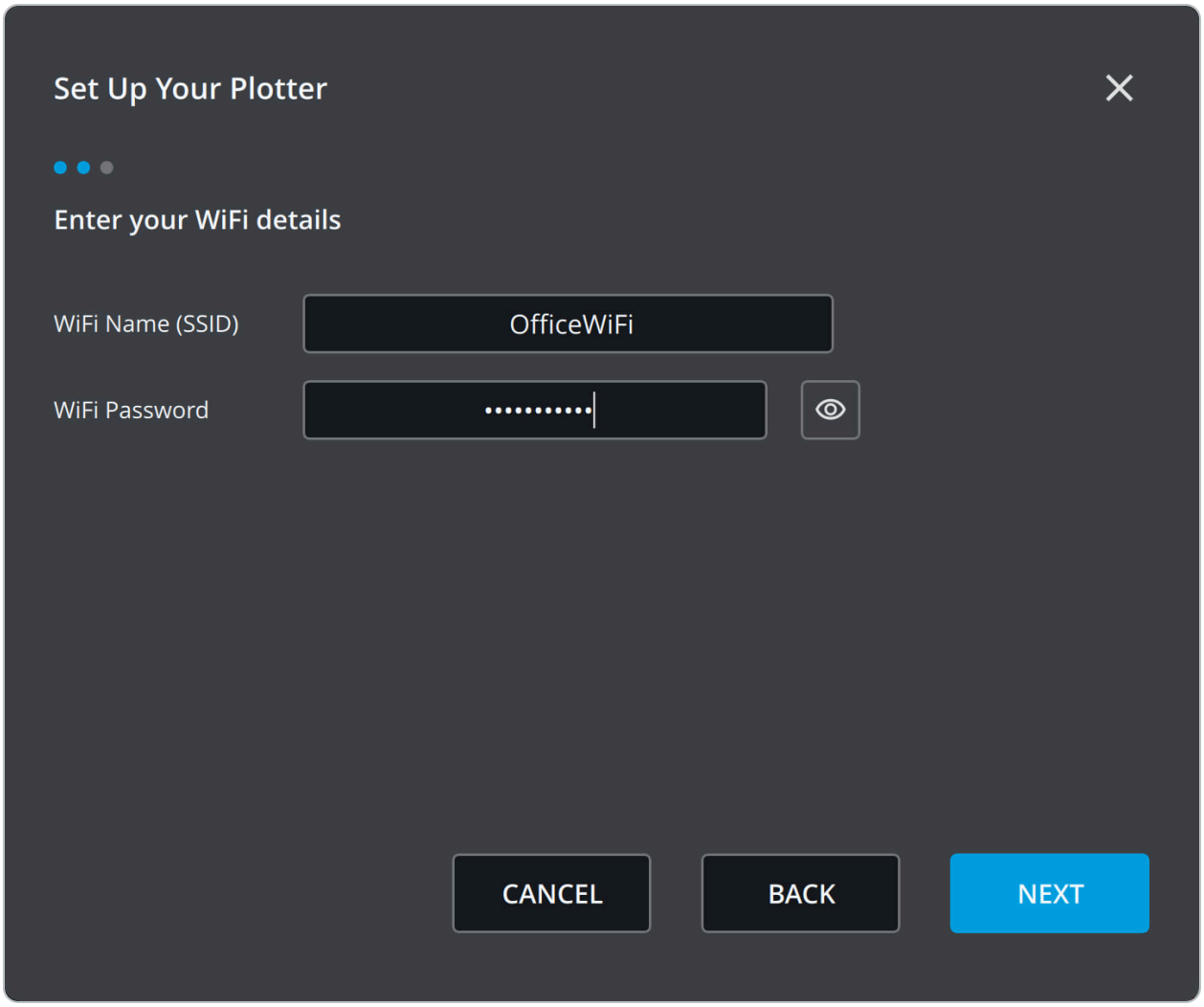
Setup New Plotter, on both the **Connect** and **Disconnect** menus, opens the **Set Up Your Plotter** dialog, which gives a machine the settings it needs to join a WiFi network. For the walkthrough, and for choosing between delivering the settings over USB or on a microSD card, see §15.6 Putting your machine on a network. The dialog's controls:



Setup New Plotter *on the* ***Disconnect*** *menu*

- **Plotter Name** — a name to recognize the machine by later, especially if you own more than one.
- **WiFi Name (SSID)** and **WiFi Password** — the network the machine joins.
- **Over a USB cable** and **With a file on a microSD card** — on the first page, how Studio delivers the settings: over USB, or in a setup file for the machine's microSD card.
- **Reboot Plotter** — restarts the machine so it picks up the WiFi settings just written to it, and waits while it comes back. Offered when the machine is connected over USB.
- **Switch to USB** — offered when Studio cannot find the machine on the network after setup. It closes the dialog and returns you to connecting over USB.
- **Enter IP address manually** and **Use This Address** — connect to the machine by address when discovery does not find it.

Note: Setup configures the machine's network settings; it does not move any of your work onto the machine. Files still travel by microSD card, USB, or WiFi upload afterward.



*WiFi step of the **Set Up Your Plotter** dialog*

24.5 Machine controls

Once connected, the **CONTROLS** sub-tab shows a status line reading **Status** followed by the machine's current state, such as **Idle**, **Plotting**, **Paused**, or **Alarm**. The status line adds **(homed)** or **(unhomed)** while the machine is Idle or in an Alarm state, so you know whether to home it before the next plot.

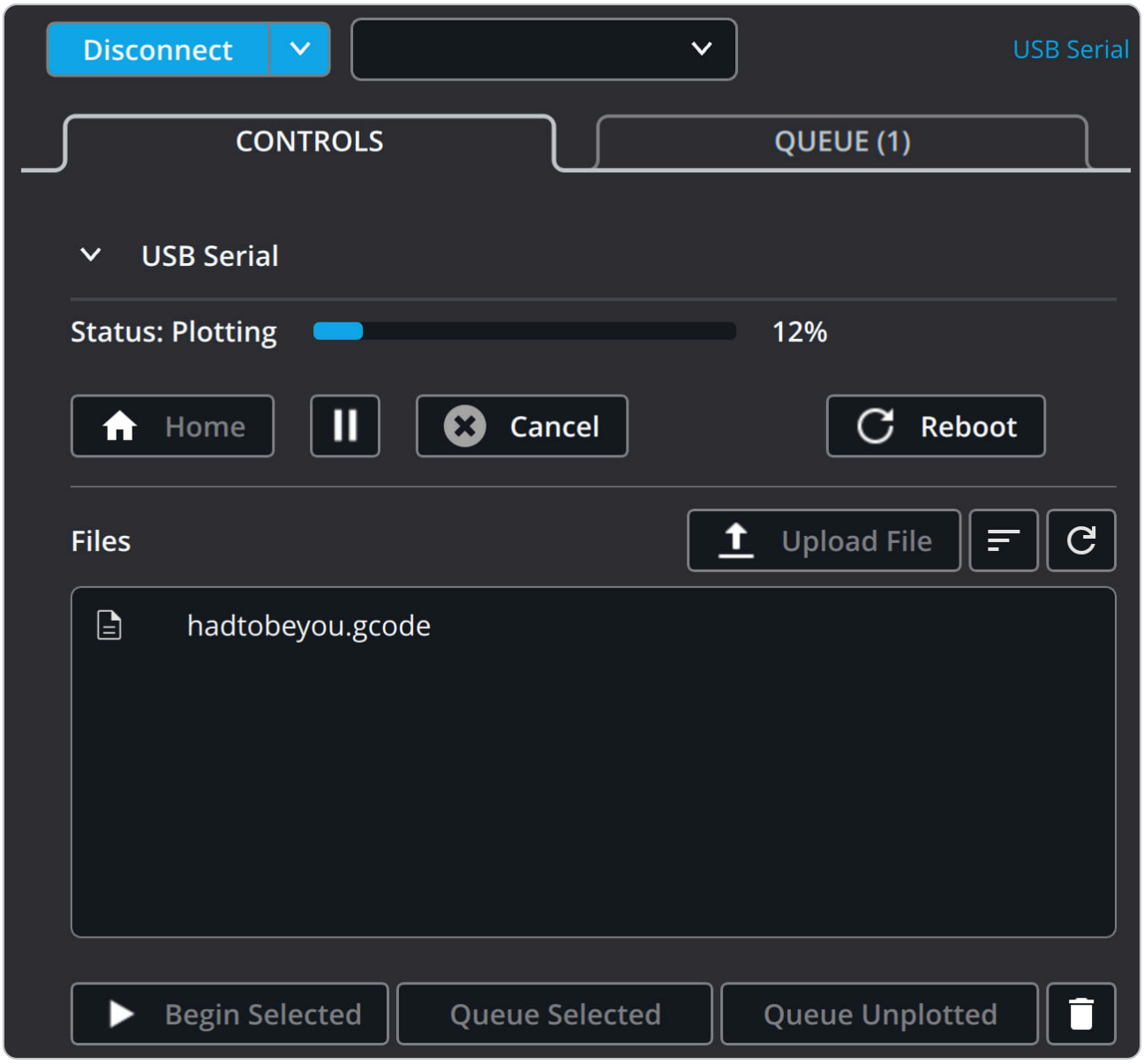
The available machine controls are:

- **Home** — moves the machine to its home position to establish a reference point. Enabled only when the machine is Idle and has no upload in progress.
- The pause button (a pause icon) — pauses the plot in progress. Enabled only while the machine is plotting.
- **Continue** — takes the pause button's place while a plot is paused, and resumes plotting from the paused position.
- **Cancel** — cancels the current job and returns the machine to Idle.
- **Reboot** — restarts the machine's controller board.
- **CLEAR ALARM** — appears beside the status line only while the machine is in an Alarm state. Resolve whatever triggered the alarm, then click **CLEAR ALARM** to return the machine to Idle.

Studio has no jog controls — it does not drive the machine's motors manually, one step at a time.

While a job is plotting, a progress bar and percentage appear beside the status line. When the machine goes a few seconds without reporting its progress, a short segment sweeps along the bar in place of the fill, and the percentage gives way to the time elapsed since the plot began, such as **12:05**. While a plot is paused, the bar holds its last position and the percentage is hidden.

If the machine pauses mid-job for a pen or tool change — a multi-tool job, for example — the instruction the machine itself is showing (such as which pen to install next) appears in orange beneath the status line, marked with a pen glyph. It stays there until you make the change and click **Continue**.



***CONTROLS** sub-tab during a plot, with its progress bar*

24.6 Files stored on the machine

Below the machine controls, the **Files** section lists what's stored on the machine's microSD card — G-Code files and folders, including any Studio has organized into subfolders. A check mark next to a file means the machine

has already plotted it. This is the same list, and the same set of check marks, that the machine's own display shows; §10. The HandWriter interface covers browsing and running those files at the machine.

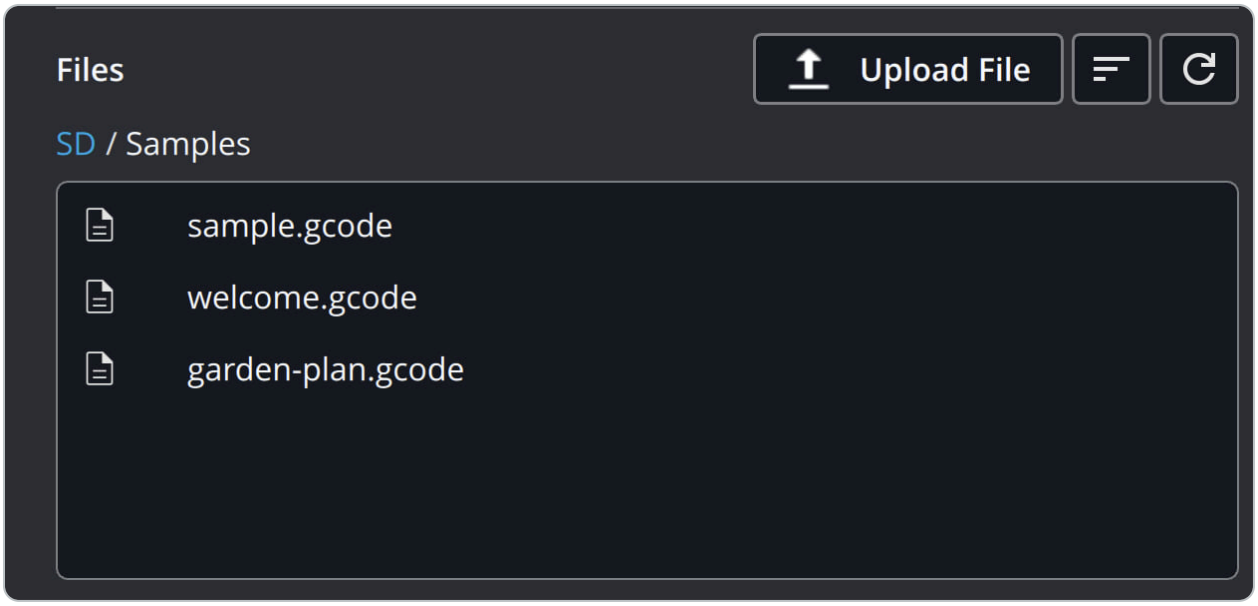
In the **Files** header:

- **Upload File** — uploads a file from your computer to the machine's microSD card. Studio supports G-Code, configuration, firmware, and other file types here.
- The sort button sorts the list **A → Z**, **Z → A**, or in **Firmware Order** (the order the machine itself reports). Its menu also has **Show Plotted Files**: turn it off to hide files you have already plotted. (Default: on)
- The refresh button reloads the list.

A check mark beside a file's icon shows that the machine has already plotted it. Hidden files, whose names start with a period, and the system folders `System Volume Information` and `$RECYCLE.BIN` are not listed.

Click a file to select it. Shift-click selects a range of files, and ⌘-click (Ctrl-click on Windows) selects or deselects a single item. Right-click a file for **Begin Plot** or **Delete**; right-click a folder for **Delete Folder**.

Click a folder to open it. Inside a folder, its path, such as **SD / Samples**, appears above the list; click **SD**, or any folder in the path, to go back up.



*The **Files** list inside a folder, with its path above*

Along the bottom of the file list:

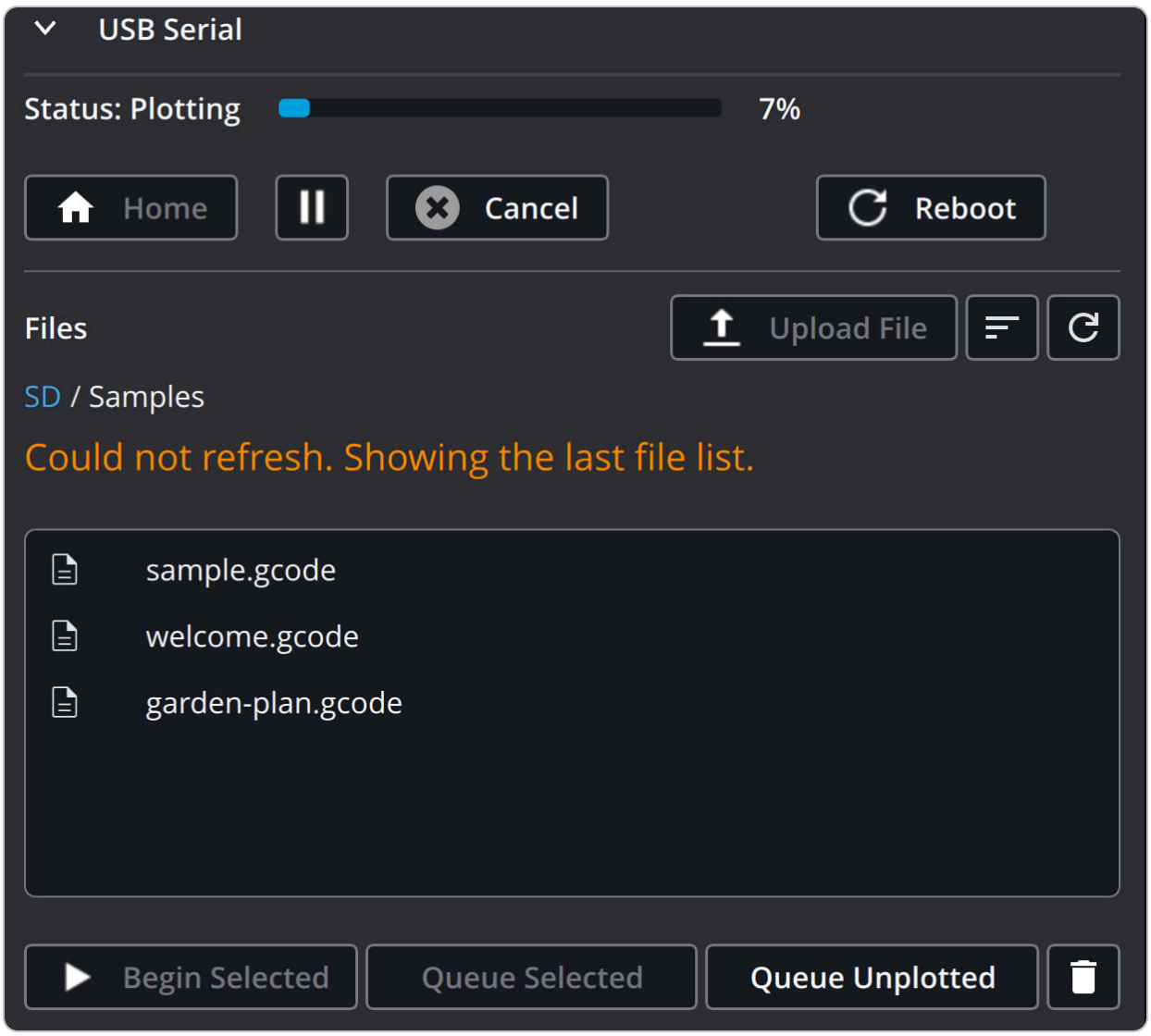
- **Begin Selected** — starts plotting the selected G-Code file directly from the machine's microSD card, one file at a time.
- **Queue Selected** — adds the selected files to the queue (see §24.8 The queue). It works on files at the top level of the card.
- **Queue Unplotted** — adds every file on the microSD card that hasn't been plotted yet to the queue (see §24.8 The queue). Available only when connected over USB. The files plot in the order shown in the **Files** list.
- A trash-icon button deletes the selected files or folder.

While a job is plotting, **Home**, **Upload File**, **Begin Selected**, the trash-icon button, the right-click **Delete** and **Delete Folder** items, and the refresh button are unavailable. **Queue Selected** and **Queue Unplotted** stay

available, so you can add files to the queue while the machine plots.

A note above the file list reports on the listing itself, and shows nothing while the list on screen is current. It reads:

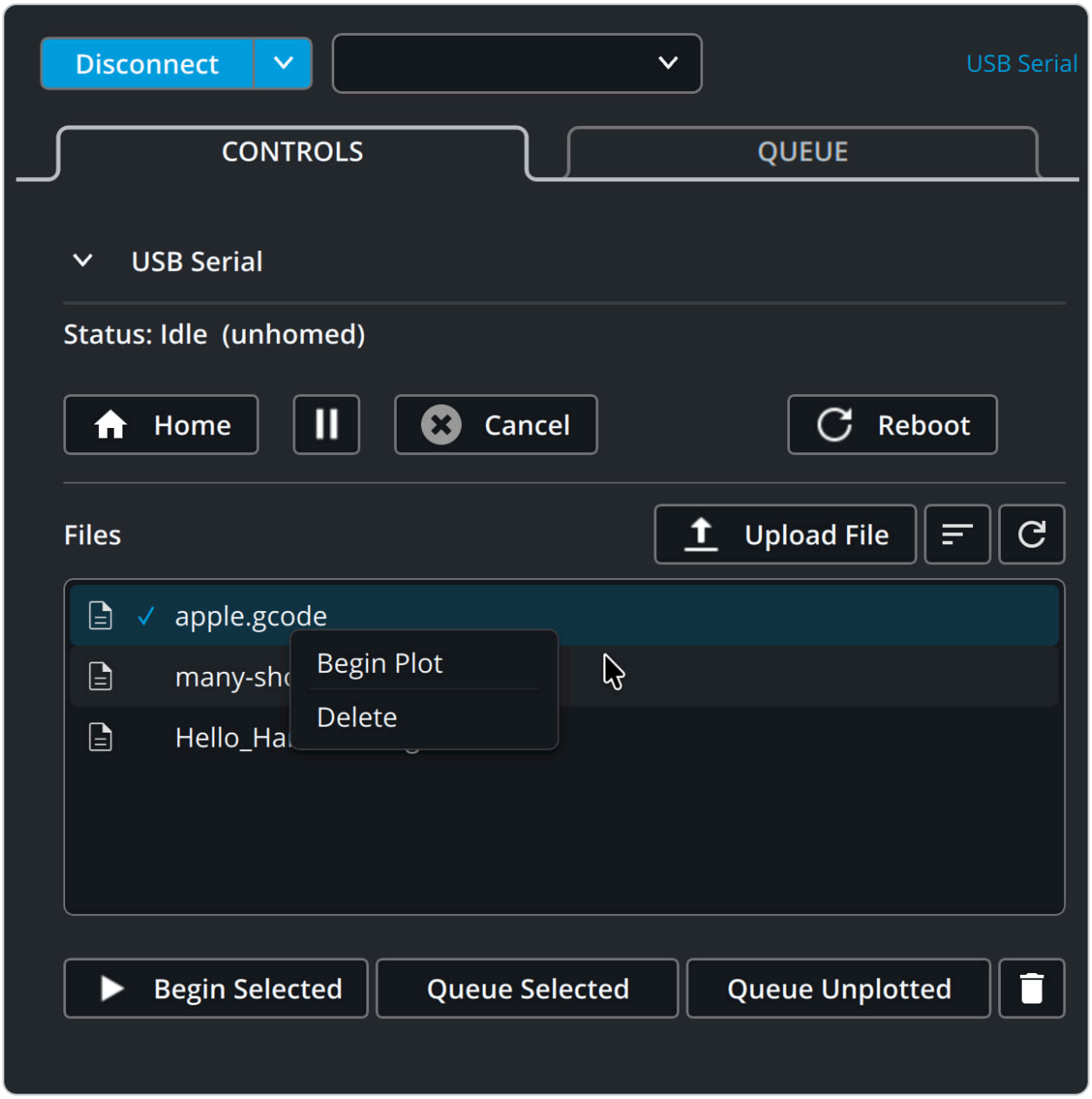
- **File list not loaded yet.** — after connecting, before Studio has listed the card for the first time.
- **Loading the file list...** — while a listing is under way and there is nothing to show yet. A refresh of a list already on screen keeps the rows in place and shows no message.
- **The card is empty.** — the listing finished and the card holds no files.
- **All files here are plotted. Turn on Show Plotted Files to see them.** — when **Show Plotted Files** is off and every file in the folder is plotted.
- **Could not load the file list.** — in orange, when a listing fails and there is no earlier list to show.
- **Could not refresh. Showing the last file list.** — in orange, when a refresh cannot complete. The rows from the last successful listing stay in the list, and the next successful refresh replaces them and clears the note.
- **The file list refreshes when the plotter is idle.** — when Studio tries to list the card while the machine is plotting. The list refreshes on its own when the plot ends.
- **Folder contents are unavailable. This plotter's firmware can only list the top level of the card.** — in orange, inside a folder, when the machine's firmware lists only the top level of the card. With that firmware, a separate orange line above the note reads **This file listing may be incomplete.**



***Files** section inside a folder, showing the last file list after a refresh could not complete*

If no machine is connected, this area reads **Connect to a plotter to manage files.**

> ***Note:*** Completed plots stay on the machine, so you can review or re-plot them from the **MACHINE** tab without removing the microSD card.



*Right-click menu for a file in the **Files** list*

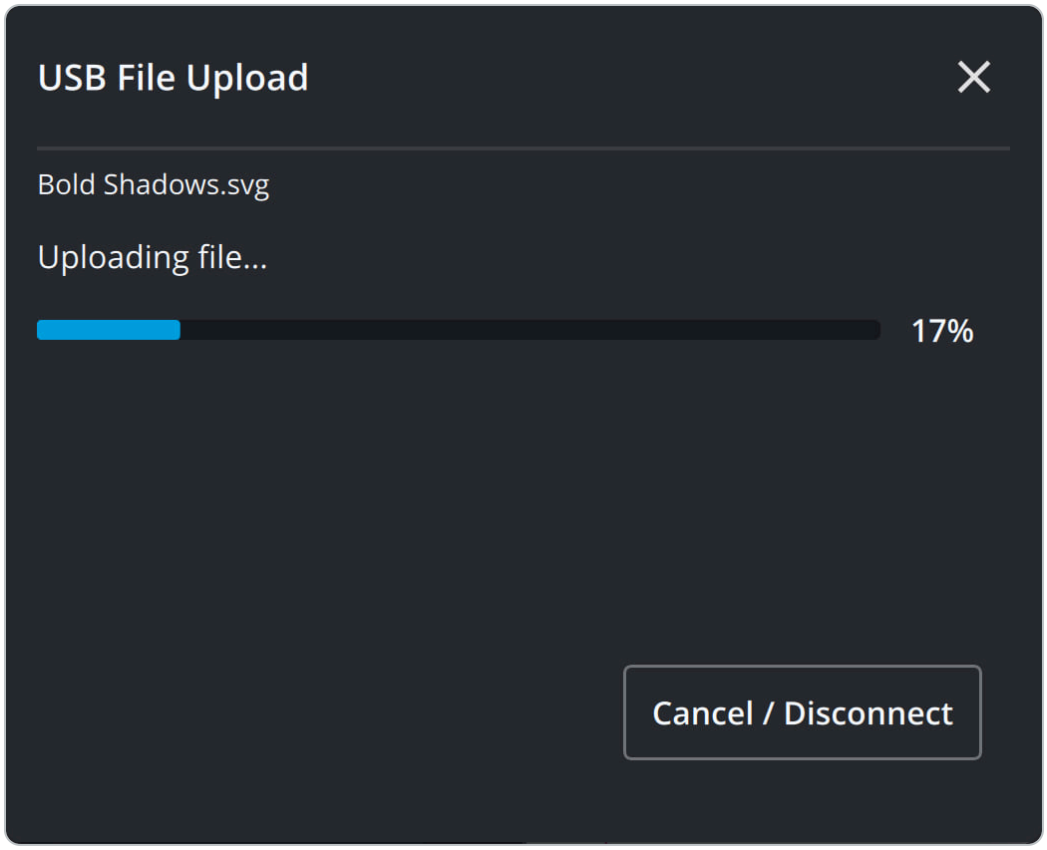
24.7 Uploading a generated job

There are a few ways to get a job onto a connected machine:

- From the **MACHINE** tab's Files section, click **Upload File** to send an existing file from your computer.
- After processing a job from the **PREPARE** tab, use the chevron menu on the Setup Sheet's button for **UPLOAD VIA USB** or **UPLOAD VIA WIFI**.
- Choosing **Generate G-Code and Upload** from the **File** menu generates the G-Code and uploads it over the connection you have, USB or WiFi, without a separate upload dialog. The job then waits on the plotter as **On plotter — press Plot to start**. With no connection available, it waits in the **STUDIO QUEUE** as **Ready to upload**; send it later with the row's **USB** or **WiFi** button. With several files open it generates all

of them but queues only the first for upload; the Setup Sheet's **UPLOAD ALL VIA USB** and **UPLOAD ALL VIA WIFI** send the rest.

Once you choose a file, **Upload File** opens a **USB File Upload** or **WiFi File Upload** dialog, using the connection set by **Preferred connection for uploads** (see §22.3.5 Preferred connection for uploads). The dialog shows the file's name, a message such as **Uploading file…**, and a progress bar with a percentage. Its **Cancel** button stops the upload. During a USB upload the button reads **Cancel / Disconnect**, since stopping a USB transfer also disconnects the machine. When a G-Code file finishes uploading, the dialog reads **Upload complete.** and offers **Plot Now**, which starts the file right away, and **Close**. Other files close the dialog with an "Upload complete" message. If the upload could not be verified, the dialog says so. See §22.3.4 Offer to plot after upload.



***USB File Upload** dialog partway through an upload*

A **WiFi** upload option is available when the machine is reachable over WiFi. **USB** upload stays available without an active connection: the queue holds the job and sends it once the machine is connected, which **Auto-connect over USB** (on by default) does as soon as the machine comes online. Both depend on **Show Machine Control Tab**; with it off, Studio does not look for a machine at all.

24.8 The queue

The **QUEUE** sub-tab, headed **STUDIO QUEUE**, tracks every job Studio is generating, uploading, or waiting to plot — jobs you've queued yourself and jobs Studio received automatically. A **Clear All Failed** button appears whenever there are failed jobs to clean up.

Just below the header is the **Auto Start Plot** toggle. When on, Setup Sheet and queue uploads that finish and are verified start plotting automatically, and so do files queued from the machine's microSD card. When off, they wait on the plotter until you press **Plot**. (Default: off) **Upload File** never starts a plot on its own; its dialog offers **Plot Now** instead. An upload that finishes as **On plotter — not verified** waits for you to press **Plot**. The line beneath the toggle is a reminder of that: **Applies to Setup Sheet and queue uploads, not Upload File.**

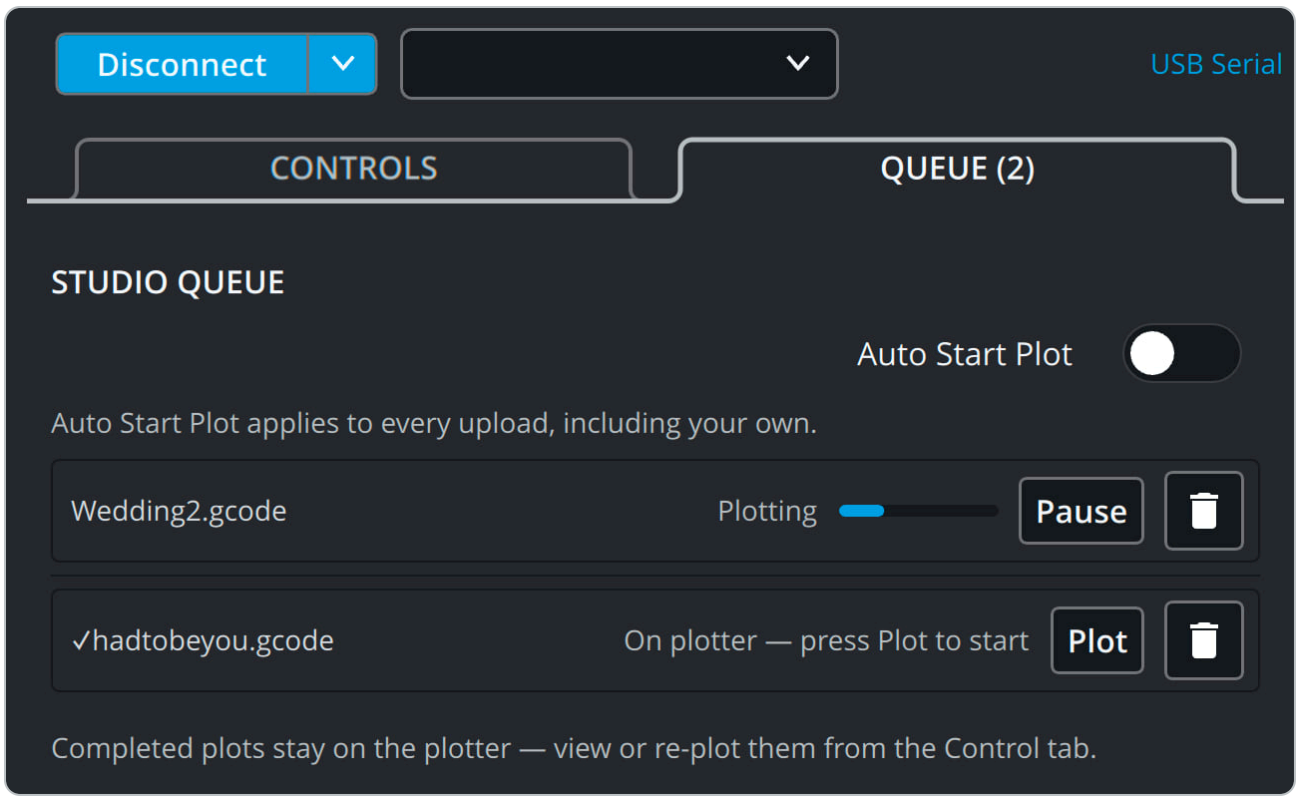
When one or more jobs are ready to upload, **Upload All Ready via USB** and **Upload All Ready via WiFi** buttons appear so you can send every ready job over a connection at once instead of one at a time.

24.8.1 Job rows

If the queue is empty, it reads **No jobs queued. Send work from Studio to start.** Otherwise, the active job appears first, followed by any pending jobs, then a **FAILED** section for jobs that need attention.

Each row shows the job's name and its status:

- **Queued**
- **Waiting — Studio busy**
- **Generating G-Code…**
- **Ready to upload**
- **Connecting to plotter**
- **Uploading…**
- **Sent to plotter — finalizing…**
- **On plotter — press Plot to start**
- **On plotter — not verified; press Plot to start**
- **Plotting**, or **Plotting — <*machine status*>** when the machine reports a state other than plotting or idle, such as **Plotting — Paused** or **Plotting — Homing**
- **Done**
- **Cancelled**
- **Failed**



*Active job plotting, with **Pause** on its row*

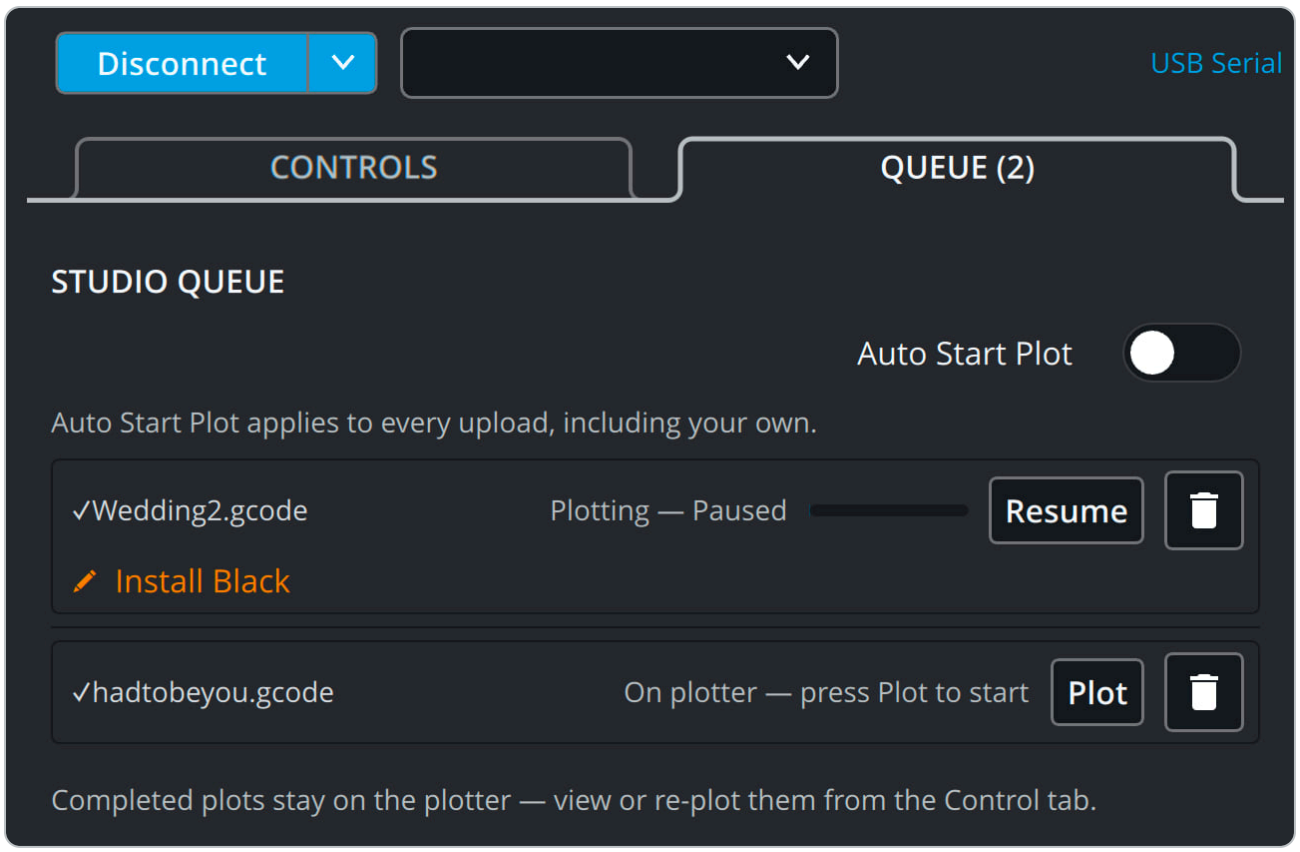
Depending on a row's state, you may see:

- **USB** / **WiFi** buttons to upload a ready job over a specific connection.
- **Plot Now** for a queued job waiting its turn, or **Plot** for a job already sitting on the machine, waiting for you to start it.
- **Pause** while the active job is plotting, **Resume** while it is paused, or **Clear Alarm** while the machine is in an Alarm state. These do the same as the matching controls in the **CONTROLS** sub-tab.
- **Retry** and **Dismiss** for a failed job.
- A trash-icon button to cancel a job and remove it from the queue.

A failed row says why beneath the job name, and what to check before you try again. Studio never sends a plot to the machine a second time on its own. When it cannot confirm that a plot started, the row reads **Could not confirm whether this plot ran. Check the plotter and the card before retrying.** Look at the sheet before you click **Retry**, so the same page is not plotted twice.

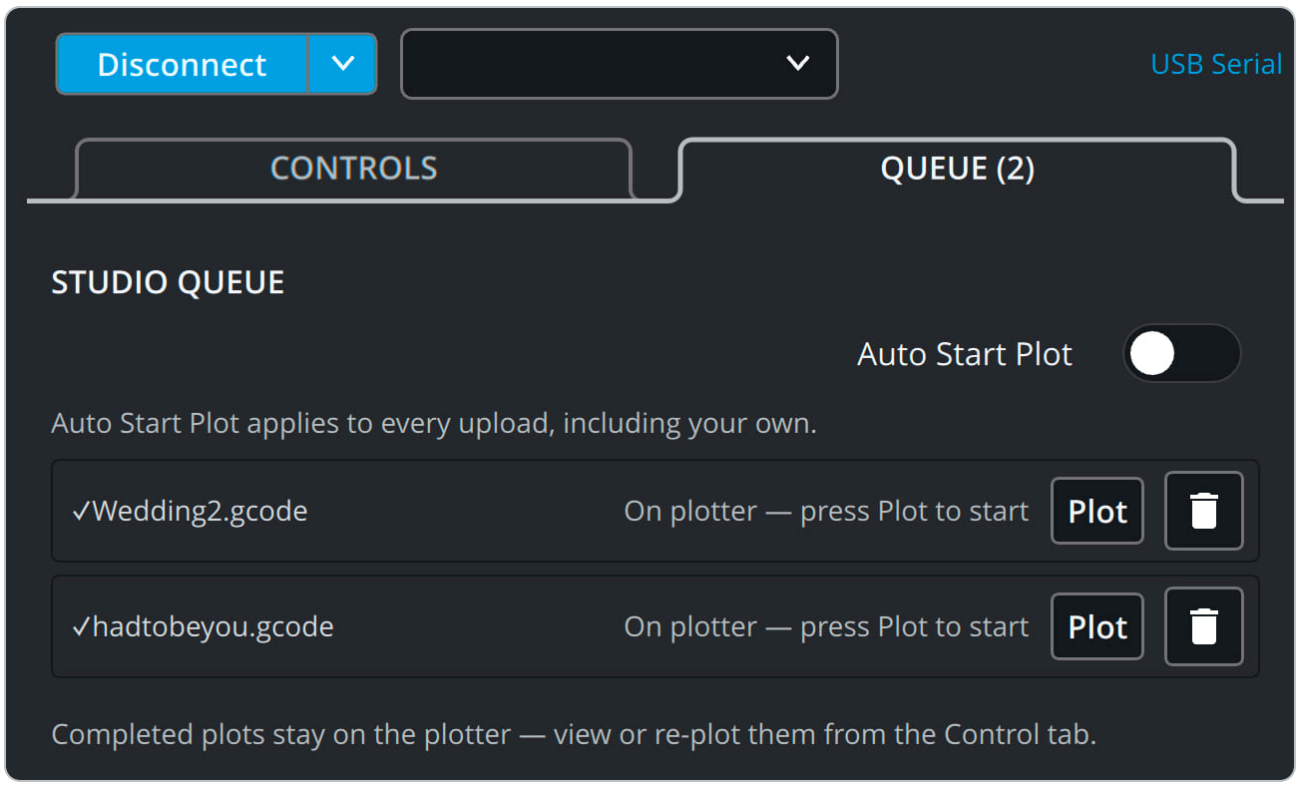
If you quit Studio while a job is plotting, Studio does not plot it again when you reopen it. The row is checked against the machine when Studio reconnects, and if the outcome is unclear, it asks you to check the sheet before retrying.

When the machine pauses for a pen or tool change, the active row shows the machine's instruction in orange beneath the job name, marked with a pen glyph. Make the change, then click **Resume**.



Active job paused for a pen change, with its instruction beneath the row

A hint below the active and pending rows reminds you: **Completed plots stay on the plotter — view or re-plot them from the Control tab.**



QUEUE** sub-tab with two jobs reading **On plotter — press Plot to start

24.8.2 Queue warnings

An orange, outlined banner can appear at the top of the **MACHINE** tab — above both the CONTROLS and QUEUE sub-tabs — whenever the queue hits a condition that needs your attention: a full queue, an unusually large backlog, jobs waiting on a machine connection, or saved jobs that couldn't be restored. Resolve the condition it describes — connect a machine, clear some jobs, and so on — and the banner clears on its own.

25. Studio: exporting output

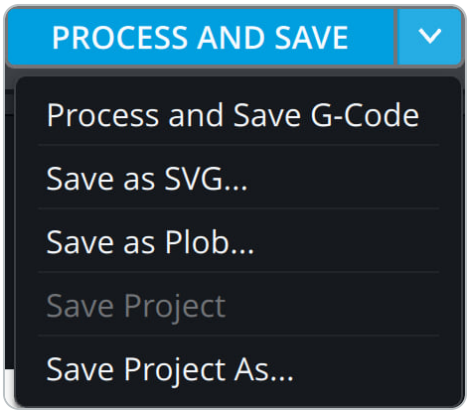
Use this chapter when you need a file other than G-Code for a machine, or want to know what a Setup Sheet or a project file records.

Every export in Bantam Tools Studio™ starts from the **PROCESS AND SAVE** button in the upper-right corner of the window. Click the button itself to run its default action, or open its chevron menu to choose another format. This chapter covers everything that button and its menu produce — G-Code, SVG, and Plob, plus **Save Project** and **Save Project As** — along with the Setup Sheet that follows a G-Code export and the **Split by Toolset** option that can turn one job into many files.

25.1 Process and Save G-Code

Process and Save G-Code is the default action of the **PROCESS AND SAVE** button. Click the button, or choose **Process and Save G-Code** from its chevron menu, and Studio processes the current job and saves a machine-ready `.gcode` file.

This is the output path you will use most, and the right choice when you want to copy a file to a microSD card, upload it to a connected machine, or keep a machine-ready copy for later.



*The **PROCESS AND SAVE** chevron menu*

Processing uses the current machine selection, the Setup and Options panels, your tool assignments, and the paths shown in the Preview, so the file reflects the job exactly as you have arranged it — see §21. Studio: the PREPARE tab for how those are set up.

The same G-Code output is available from the **File** menu, as **Save G-Code File** (⌘↩ / Ctrl+Enter), and you can generate and upload in one step with **Generate G-Code and Upload** — see §24. Studio: the MACHINE tab.

Once the file is written, Studio opens a Setup Sheet summarizing the job; see §25.5 Setup Sheet, below.

25.2 Save as SVG

Choose **Save as SVG** from the **PROCESS AND SAVE** chevron menu to save the processed artwork as an SVG file rather than as G-Code.

The file carries the job as you arranged, scaled, and processed it, which makes it the format to reach for when the artwork is going back into a drawing program, or to someone who has no use for a machine-ready file.

Save as SVG is available whenever Studio can process the job.

25.3 Plob

Plob, short for "Plot Object," is a highly specialized kind of SVG file. The processing work is already done inside the file, so Studio can send a Plob straight to a machine with no further preparation. Use it when you want a file prepared in advance for one specific machine, ready to go with no extra processing step. A Plob is saved as an ordinary SVG file, with `_plob` before the extension (`card_plob.svg`), so it opens anywhere an SVG does, such as Inkscape.

Save as Plob appears in the **PROCESS AND SAVE** chevron menu only after you turn on **Enable Plob output** in Settings. See §22.1 Program options.

Because a Plob is prepared for a particular machine, two settings in Settings' Plob group shape the export:

- **Plob: Model** — the target machine model the file is prepared for.
- **Plob: Auto-rotate** — rotates the artwork to best fit that machine's work area.

25.4 Project files

A project file (`.btsp`) bundles a whole session into one file: the documents you have open, your tool assignments, the selected toolset, and the generation settings that produced your output. Opening a project restores all of it, so you can pick a job back up weeks later, or hand it to a colleague and have it come out the same.

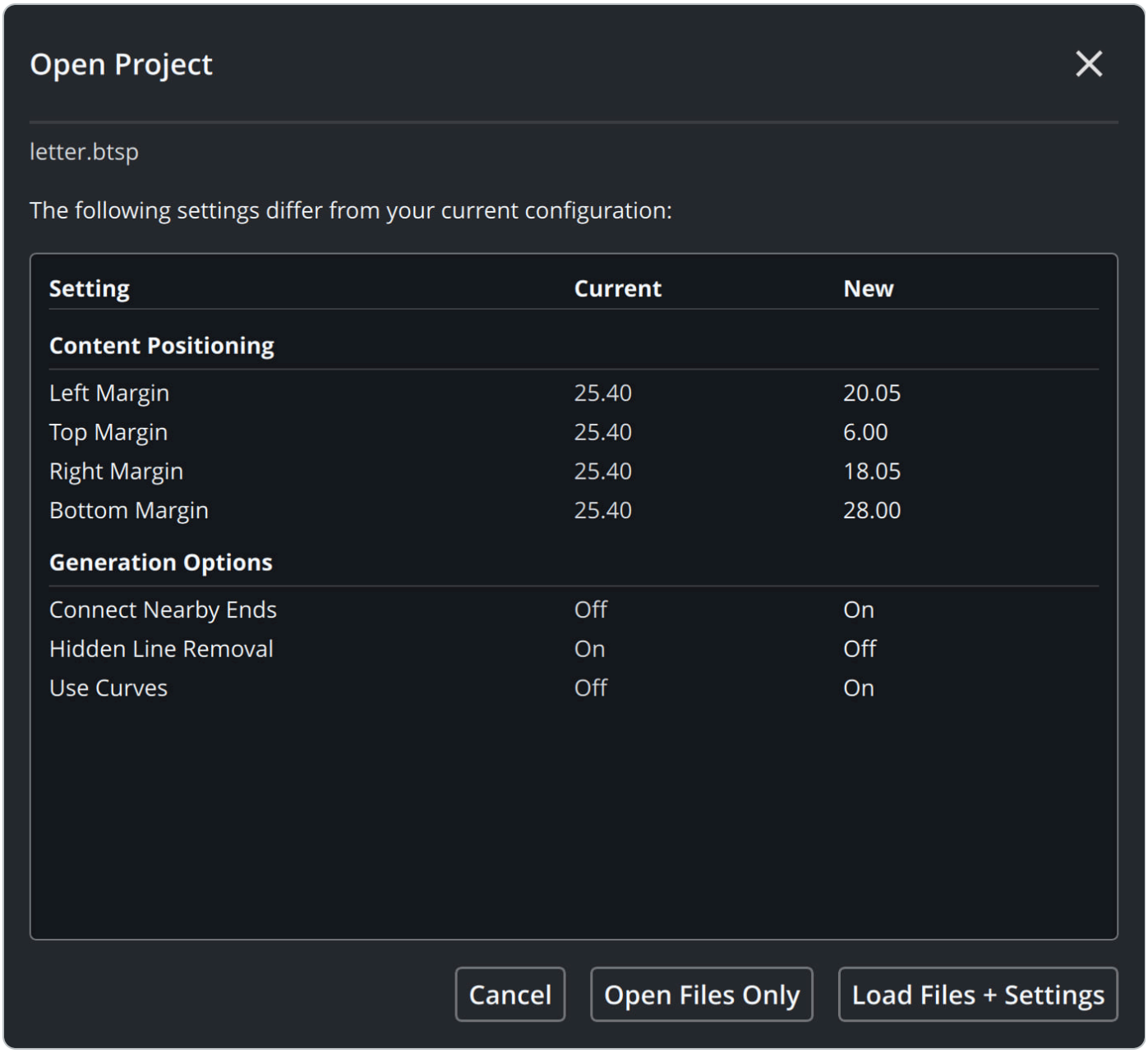
Save a project from the **PROCESS AND SAVE** chevron menu or the **File** menu, and open one from the **File** menu:

- **Save Project As...** (⇧⌘S (Shift-Command-S) / Ctrl+Shift+S) — saves the session to a new project file.
- **Save Project** (⌘S / Ctrl+S) — saves your changes to the project you opened or last saved.
- **Open Project...** (⇧⌘O / Ctrl+Shift+O) — opens a project file.

25.4.1 Opening a project

If the project's settings match your current ones, it opens without asking. If they differ, an **Open Project** dialog lists each setting that differs, with your value beside the project's value, and offers three choices:

- **Load Files + Settings** — opens the project's documents and applies its settings.
- **Open Files Only** — opens the documents and keeps your current settings.
- **Cancel** — leaves everything as it was.



Open Project *dialog listing the settings that differ*

If the project was saved for a different machine than the one you have selected, a **Machine Type Mismatch** dialog appears first:

- **Switch Machine** — switches to the project's machine, then continues as above.
- **Open Files Only** — opens the documents on the machine you have selected, without the project's settings.
- **Cancel** — leaves everything as it was.

Studio opens projects saved by earlier versions. Each project also records the file format it was saved in, and a version of Studio older than that format does not open it: it reports "This project requires Bantam Tools Studio X or later", naming the version that saved the project.

When some of a project's documents cannot be loaded, the rest open anyway and a **Some files failed to load** message lists the ones that did not; those appear as placeholders.

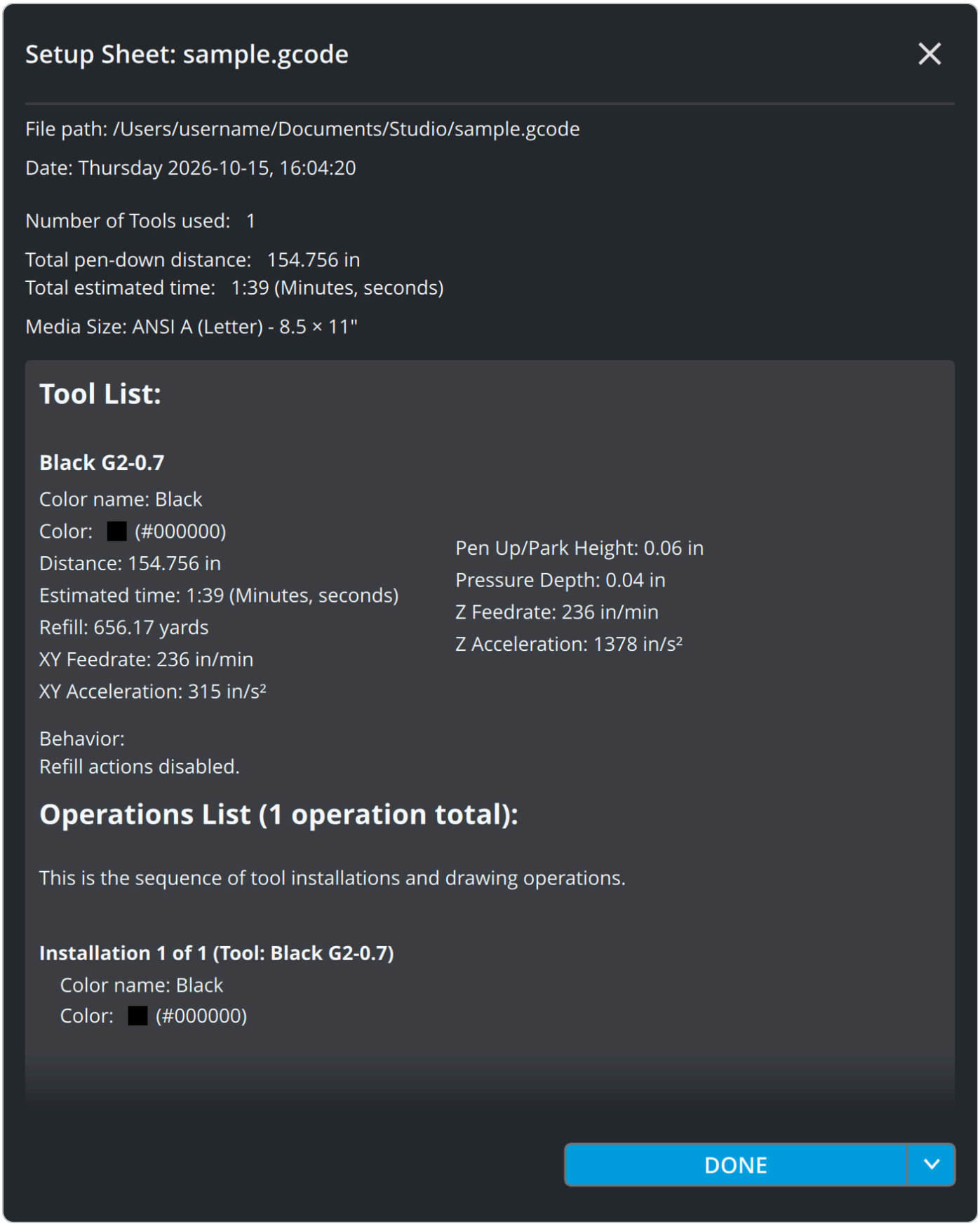
25.4.2 Support info in project files

Saved project files include a small, redacted diagnostic record. It holds your app and system versions, a list of recent activity, and recent lines from the log, so that Bantam Tools support can diagnose a problem from a project file you send. Passwords, Wi-Fi network names, and your user name are removed before the record is written.

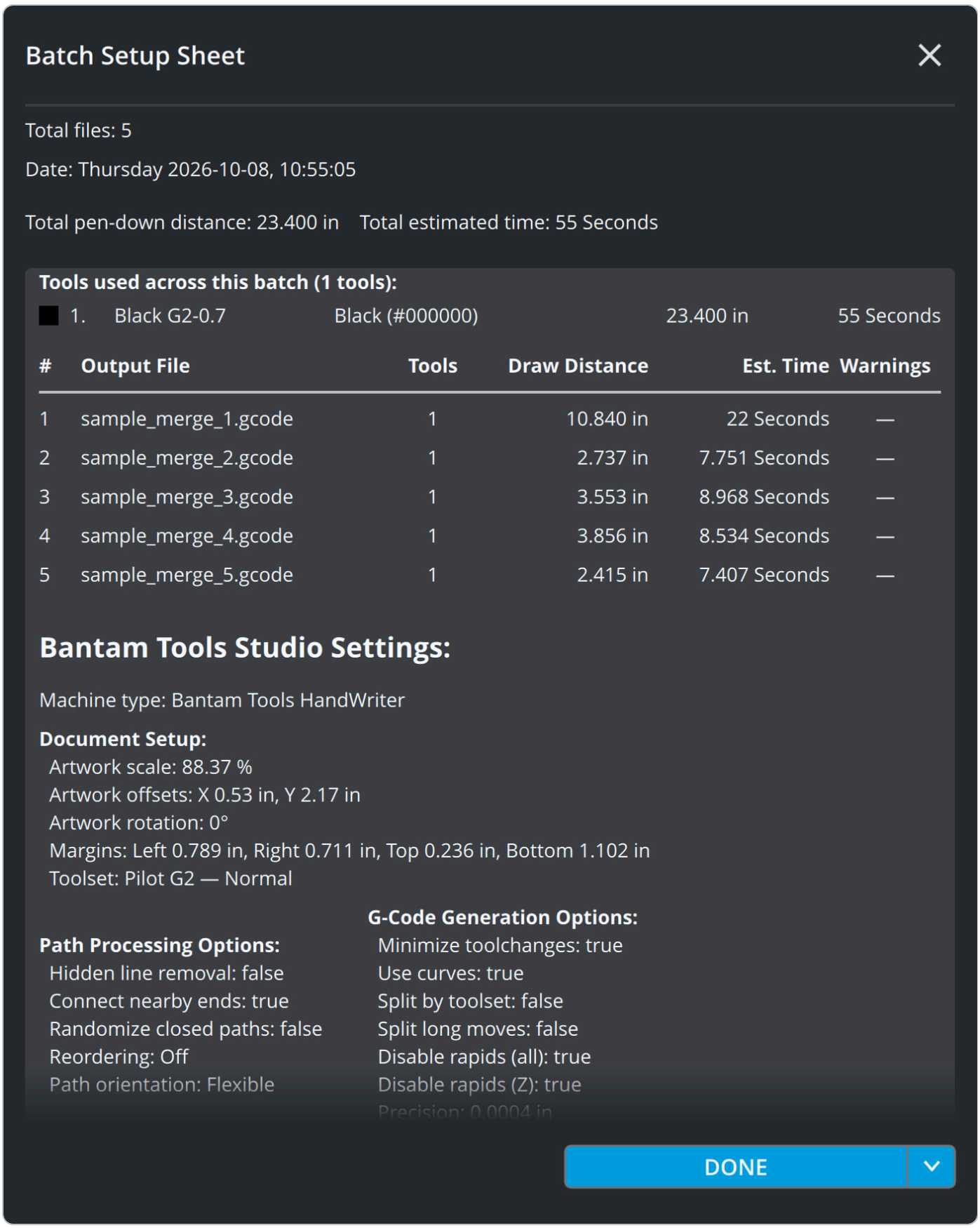
To leave the record out of the projects you save from now on, turn off **Include support info in project files**; see §22.1 Program options. Turning it off changes nothing in project files you have already saved. **About Project Files**, on the **SETTINGS** tab, summarizes the same information.

25.5 Setup Sheet

After you process a G-Code job, Studio opens a Setup Sheet: an on-screen summary of the job that you can review before you start, and save as a PDF to print or keep with the job. When the job produced more than one output file, the window is titled **Batch Setup Sheet** and summarizes the whole run.



The Setup Sheet for a single job

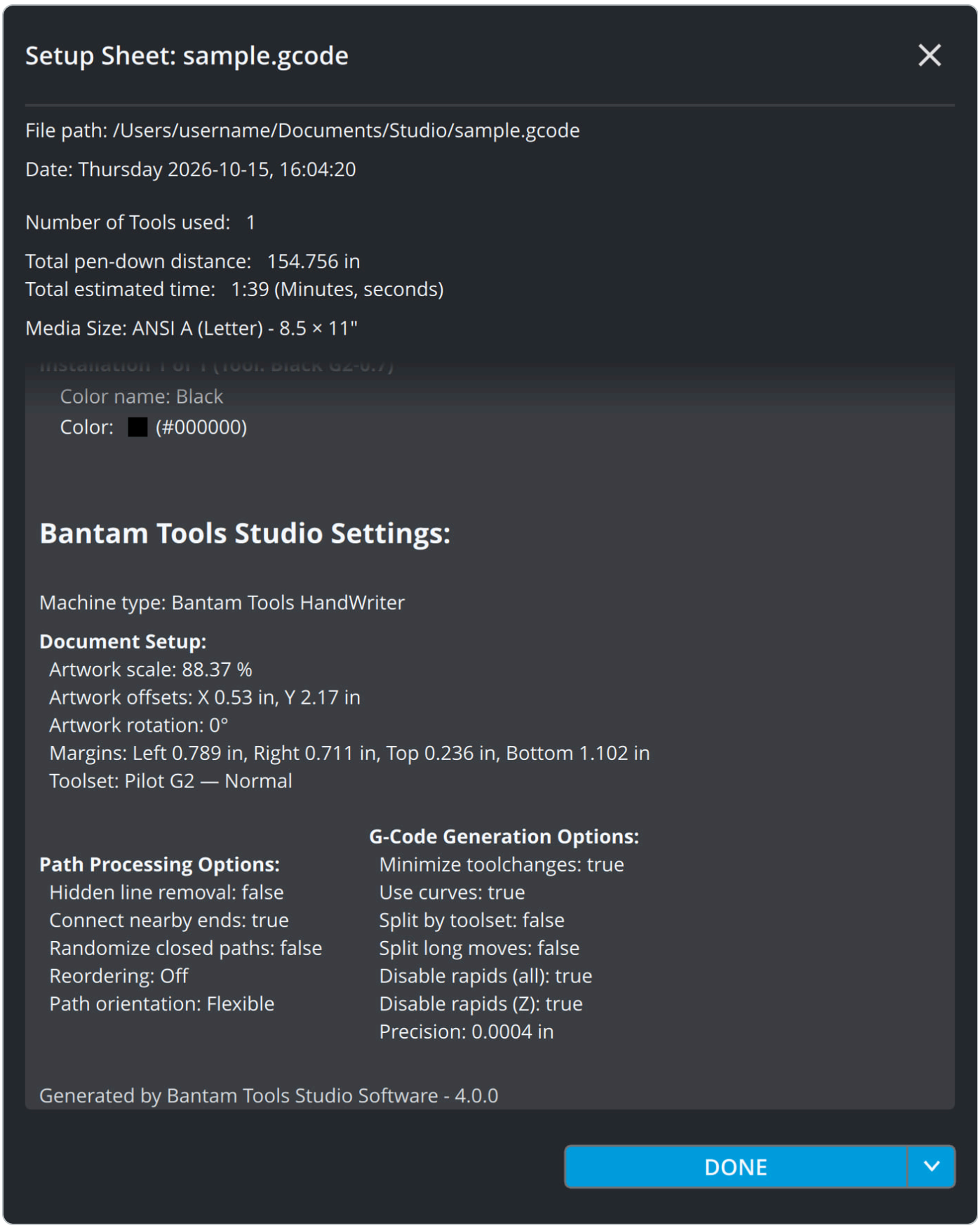


*A **Batch Setup Sheet** for a Data Merge, with one row per output file*

The Setup Sheet can include:

- File path
- Date
- Number of tools used, and the number of tool installations when a tool is installed more than once
- Total pen-down distance
- Total estimated time
- Media size — its standard size name or, for a custom size, its dimensions and whether it is landscape or portrait
- Tool list
- Tool colors
- Each tool's height settings, under the names its Tool Settings uses
- Each tool's feedrates and acceleration
- Each tool's refill settings
- Operations list
- **Bantam Tools Studio Settings:** — a read-only summary of the settings behind the job: machine type, artwork scale, offsets, and rotation, margins, toolset, and the path processing and G-Code generation options

The total pen down distance and the estimated time are the two figures worth reading every time: together they tell you how long the job will take before you commit to writing it.



The lower part of the Setup Sheet: the operations list and the settings behind the job

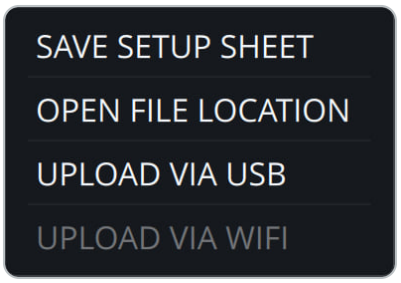
If Studio finds a problem while generating the job — a move outside the machine's acceptable bounds, say, or a job with almost nothing to draw — the sheet lists it under **WARNINGS**. Click **Copy** to copy the warning text, which is the quickest way to paste it into a message to support.

The button at the bottom of the Setup Sheet is a split button. It shows one action, **DONE** at first, and keeps the rest in its chevron menu. Choosing an action from the menu also makes it the button's action until you quit Studio, so a step you repeat on every job, such as uploading over USB, becomes a single click.



***DONE** button on the Setup Sheet, with its menu chevron*

The actions are:



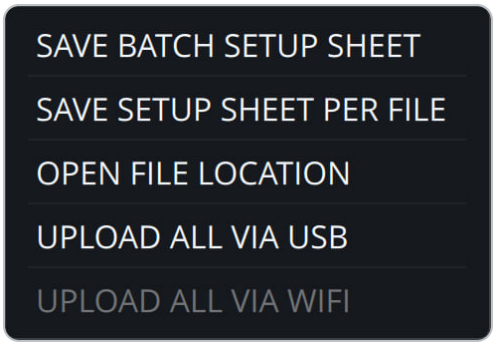
Setup Sheet menu for a single file

- **DONE** — closes the Setup Sheet. Nothing is saved, and nothing is lost: the G-Code file was written when the job was processed.
- **SAVE SETUP SHEET** — for a single document, saves the sheet on screen as a PDF. The suggested file name matches the G-Code file, with a `.pdf` extension.
- **SAVE BATCH SETUP SHEET** — takes the place of **SAVE SETUP SHEET** when the job produced more than one file. It saves the batch summary as a PDF: the date, the number of files, the total pen down distance and estimated time, the tools used across the batch, and a table with one row per file. The suggested file name is `batch_setup_sheet.pdf`, in the G-Code output folder. It does not save a sheet for each individual file.
- **SAVE SETUP SHEET PER FILE** — appears only for a batch. Choose a folder, and Studio writes one setup sheet PDF into it for each G-Code file in the batch, named like that file with `_setup` added: `Envelopes_3.gcode` gets `Envelopes_3_setup.pdf`. (As a special case, a Data Merge whose documents flow onto more than one page gets one sheet per document rather than one per page.)
- **OPEN FILE LOCATION** — reveals the generated G-Code file, selected in a Finder window on Mac or an Explorer window on Windows.
- **UPLOAD VIA USB**, or **UPLOAD ALL VIA USB** for a batch — uploads the generated file or files to the connected machine over USB. It is always available: if no machine is connected yet, the Queue holds the upload and sends it once a machine comes online over USB.
- **UPLOAD VIA WIFI**, or **UPLOAD ALL VIA WIFI** for a batch — uploads over WiFi. It is available when a machine is reachable over WiFi.

The two upload actions appear only when **Show Machine Control Tab** is enabled:

Settings → Machine Control → Show Machine Control Tab

With it disabled, the menu holds the save and open actions alone. For more on connecting and uploading, see §15. Sending files to your machine.



Setup Sheet menu for a batch of files

25.6 Split by Toolset

When **Split by Toolset** is enabled in the **PREPARE** tab's Options panel, Studio writes a separate G-Code file for each color, layer, or group, alongside the main output file. Reach for it on a multi-tool job when you want manual control over the order of work — running each pen color as its own pass rather than letting Studio interleave tool changes.

The setting applies to the whole job rather than to one page, so with several documents open every page is split and the file count multiplies quickly. See §21.11.3 Split by Toolset for the detail, and §25.7 Output file names, below, for how the split files are named.

25.7 Output file names

When a job produces one output file, the file takes the name you enter in the save dialog. When it produces several from one source — a Data Merge, or a document flowed across pages — Studio names each file for you: the source document's name, an underscore, and a suffix that tells the files apart. The same rule applies to every batch format, G-Code, SVG, or Plob alike, and the files go into the folder you choose when the batch starts.

Files opened together are the exception: each output keeps its own source file's name, with no suffix, because the names already differ. Two files with the same name, opened from different folders, produce a single output file, and the second replaces the first.

For a Data Merge, the suffix comes from the **Merge File Naming** setting:

Settings → Program Options → Merge File Naming

- **Sequential: 1, 2, 3…** — numbers the files in the order they were produced, starting at 1, regardless of which CSV rows were used. A sheet of three envelopes merged from row 3 onward uses rows 3, 6, 9, and 12 as the first row of each sheet, and produces `Envelopes_1`, `Envelopes_2`, `Envelopes_3`, and `Envelopes_4`.
- **Data row number** — uses the first CSV row each document uses. The same envelope sheets produce `Envelopes_3`, `Envelopes_6`, `Envelopes_9`, and `Envelopes_12`. Row 1 is the first row of data: the first row below the header row of the CSV file.
- **First CSV column** — uses the value in that row's first column, so a first column of names produces `Letter_Alice`, `Letter_Bob`, and `Letter_Charlie`. Characters that are not allowed in file names (`/ \`

`: * ? " < > |`) become underscores, and an empty value becomes `row` followed by the row number. Use a column whose values are unique: two rows with the same value produce the same file name, and the second file replaces the first.

A multipage document adds a page suffix: `Letter_p1`, `Letter_p2`. A Data Merge document that flows onto more than one page adds the page suffix after the document suffix: `Letter_Alice_p1`, `Letter_Alice_p2`. The document suffix tells documents apart; the page suffix tells the pages of one document apart. A document comes to have pages by way of the **Use multiple pages** overflow setting, described in §27.7 Multipage layout.

A Plob's name ends in `_plob.svg`, after any document or page suffix: `card_plob.svg`, `card_p2_plob.svg`.

Split by Toolset uses neither suffix. Studio puts the per-tool files in a folder of their own, created beside the main output file and named for it without the extension, and names each one for the color, layer, or group it holds, numbered in the order it is written: `1-Black.gcode`, `2-Red.gcode`. Where the tool's name differs from the grouping's, it follows after an underscore. In a batch, each document gets its own folder, named for that document's output file.

> ***Note:*** When a document has no merge fields — a row range used only to set how many copies to produce, for instance — the files are numbered sequentially from 1 whichever naming mode is selected, because there is no row or column value to name them from.

26. Studio: the TEXT tab

This chapter documents the TEXT tab section by section. Your HandWriter includes the Text Add-On, so every control here is available, and the chapter ends with a section about what the add-on adds.

The **TEXT** tab is where Bantam Tools Studio™ turns words into strokes a pen can draw. You need it for nearly every job, since writing is what the machine is for: a letter, a signed note, or a batch of notes personalized from a spreadsheet. What follows is reference documentation for each card on the tab; the steps of writing a document are in §27. Studio: writing text.

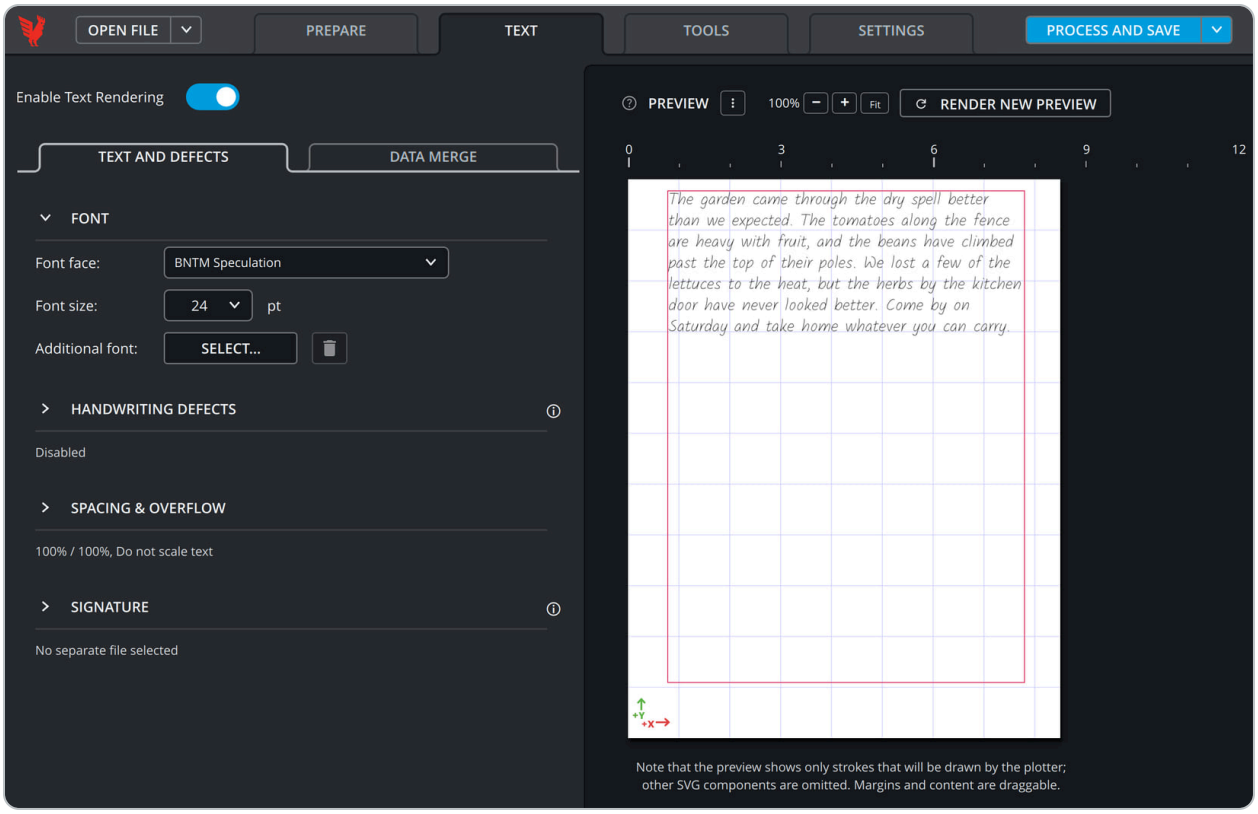
26.1 The TEXT tab at a glance

At the top left of the tab, the **Enable Text Rendering** toggle turns text rendering on and off. (Default: on) To draw the writing again from a fresh random pattern, use **RENDER NEW PREVIEW** in the Preview's header; see §21.12 Preview.

Below the toggle, two sub-tabs divide the controls. **TEXT AND DEFECTS** holds everything about how the writing looks, and **DATA MERGE** holds the tools that fill a template from a CSV file. **TEXT AND DEFECTS** is selected the first time you open the tab, and Studio remembers which of the two you were last on.

TEXT AND DEFECTS carries four collapsible sections, in this order down the tab:

- **FONT** — chooses the font face and, for a text document, the font size. Its header summarizes the current selection.
- **HANDWRITING DEFECTS** — adds controlled, deliberate irregularity to the writing so it reads as a hand rather than a machine. Its header reads **Disabled**, or **Enabled** with the overall level, as in **Enabled, 20%**.
- **SPACING & OVERFLOW** — sets letter and word spacing, and what happens when the text does not fit the space it has.
- **SIGNATURE** — loads a signature file and sets the size it is drawn at. Its header names the loaded file without its extension, or reads "No separate file selected".



***TEXT** tab with a text file loaded*

26.2 What text rendering does

A pen has no way to set type. When text rendering is on, Studio replaces the text in your document with the paths a pen draws to write it, and those paths are what the machine follows.

The fonts Studio writes with are single-stroke fonts. They are not regular computer fonts, such as the TrueType (`.ttf`) and OpenType (`.otf`) fonts installed on your computer.

It is easy to assume otherwise, because on screen even a handwriting-style TrueType or OpenType font looks like it is made of strokes. A **t** and an **x** each look like two strokes crossing, and an **O** looks like one loop. They are not. In a regular computer font, the **t** and the **x** are each a single complicated closed outline, and the **O** is two closed outlines, one inside the other. The shape you see is the space between the edges, filled in, which is why these are also called **outline fonts**. There is nothing in the file that describes the line down the middle of a letter, which is the one thing a pen needs.

A single-stroke font stores that centerline instead. The pen travels each letter once rather than tracing its edge and filling the inside, which is what makes writing practical on a plotter, and why the letters come out as line work rather than as solid shapes.

The **Preview** area shows those strokes, which is why text on the **TEXT** tab looks thinner and plainer than the same words in a design program or a word processor. Studio is showing you machine motion, not a picture of finished ink. The pen and the paper decide how heavy the finished line looks.

The HandWriter's license includes the Text Add-On, so the full font library is available, and a document's own font names select from it; see §27.4 Font selection.



*A title written in **Hershey Sans 1-stroke***

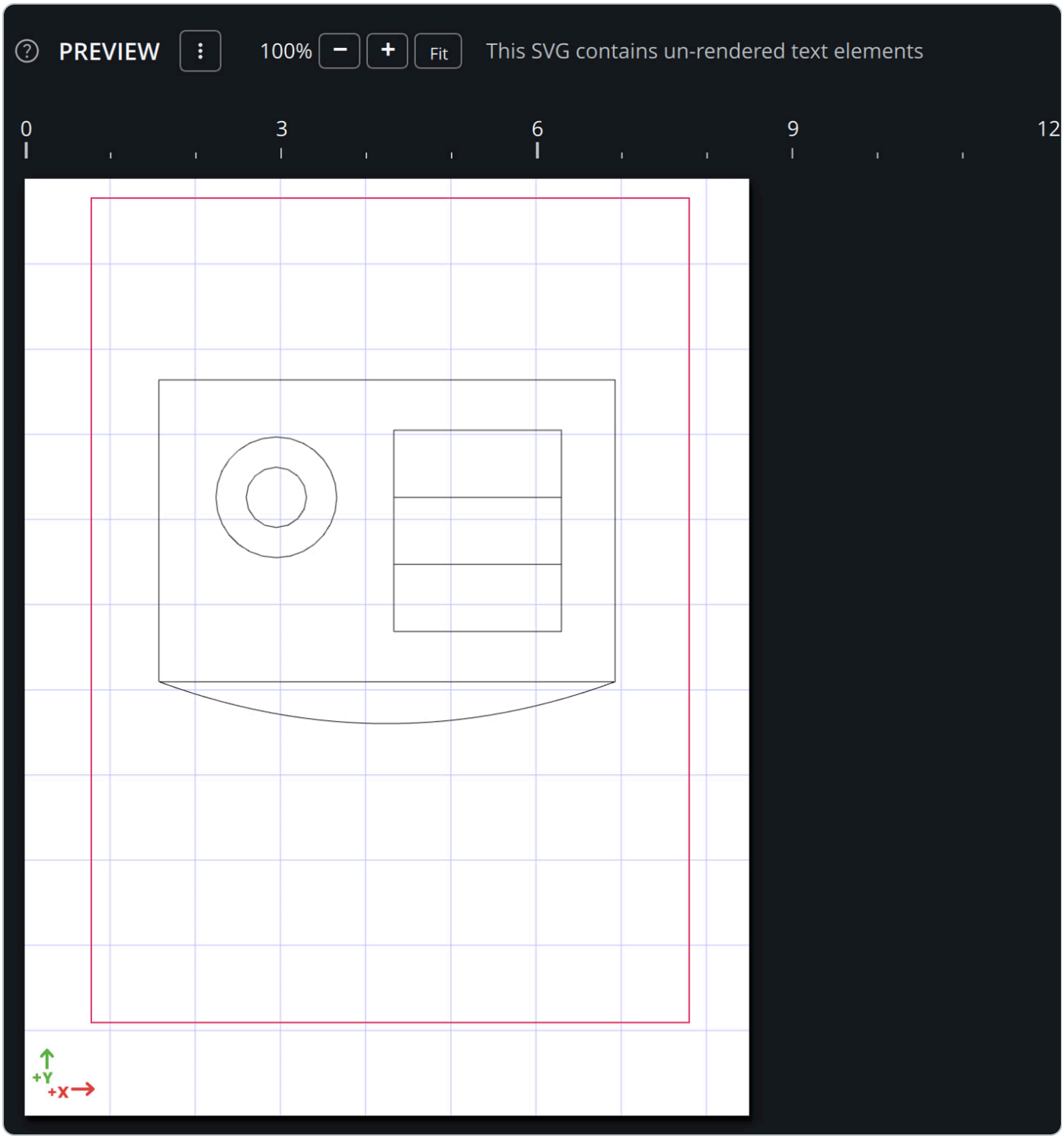


*The same title in **Hershey Script 1-stroke***

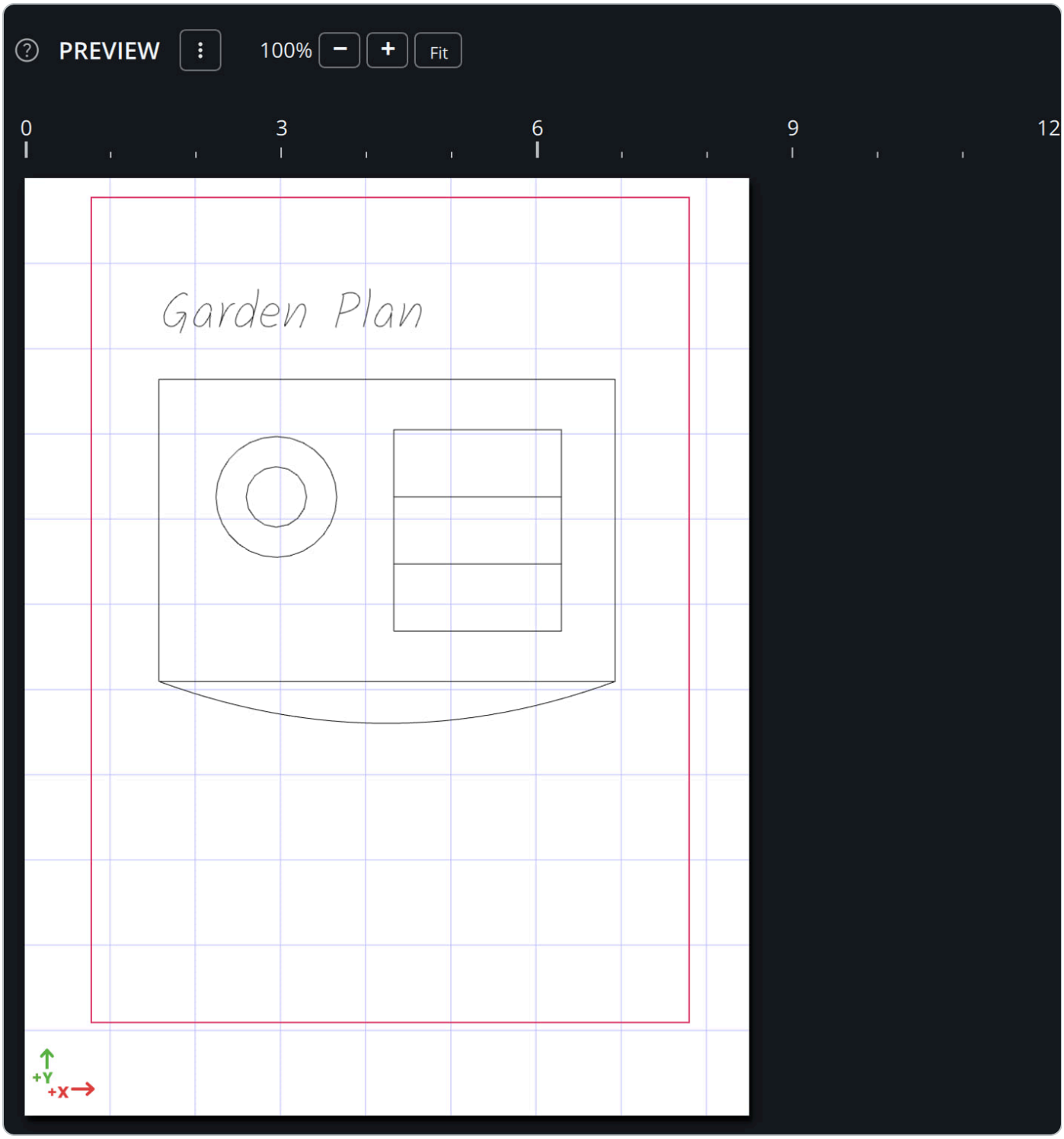
The words themselves reach Studio in the document you open: text placed in an SVG file by an editor such as Inkscape or Adobe Illustrator, a `.txt` or `.rtf` file, or text pasted from the clipboard.

Text rendering sets how the words are drawn, not what they say. Nothing on the **TEXT** tab edits the text itself — to change the wording, change the document and open it again.

With the toggle off, Studio passes the document through untouched. Nothing converts the words into strokes, so the job carries the rest of the artwork and none of the writing. That is the setting to check first if a drawing plots correctly but arrives with its title missing.



Enable Text Rendering *off: the drawing's title is missing from the* ***Preview***



*The same drawing with **Enable Text Rendering** on*

Turning **Enable Text Rendering** off does not discard your setup. Studio leaves your spacing, overflow, and merge settings exactly as you left them, so turning the toggle back on restores the document without a second pass through the sections. You can use it freely to compare a drawing with and without its writing.

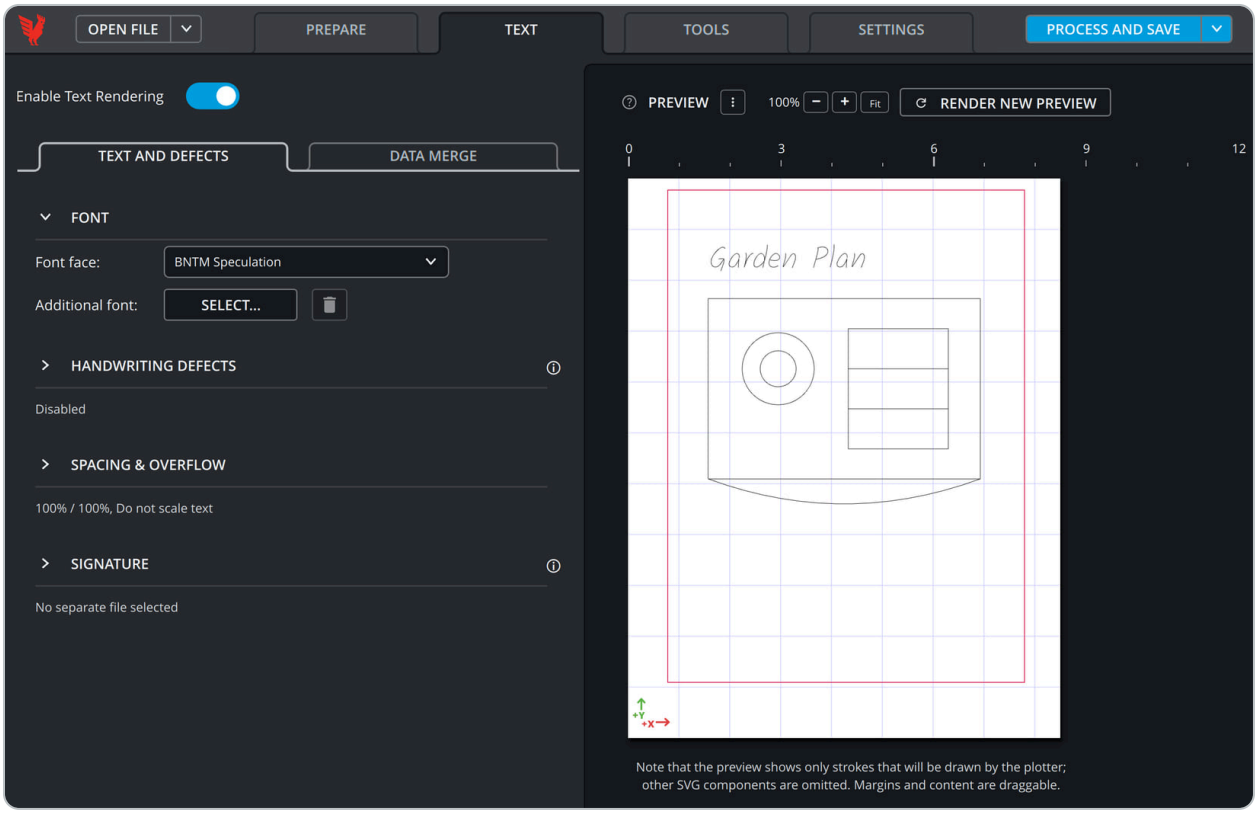
26.3 Writing text in an SVG file

In an SVG file, the writing is one part of a larger drawing: a title, a date in the corner, a caption, an edition number on a print in a series, a label on a diagram, a short quote. It is also how you see what Studio does with text, and how the two included Hershey fonts look on paper.

Place the text in your artwork in an SVG editor such as Inkscape or Adobe Illustrator, save or export the file as an SVG, and then:

1. Open the SVG file in Bantam Tools Studio.
2. Go to the **TEXT** tab and turn on **Enable Text Rendering**.
3. Confirm the font in the **FONT** section header.
4. Go to the **PREPARE** tab and confirm the page setup, along with the scale and position of the artwork on the page.
5. Confirm the toolset and the tool assignments, so the writing is drawn with the pen you mean it to be drawn with.
6. Check the **Preview**. The writing appears as the strokes the pen will follow.
7. Click **PROCESS AND SAVE**.

Studio generates the job from the document as the **Preview** showed it, writing and artwork together.



*An SVG document's text on the **TEXT** tab: the **FONT** section offers no font size*

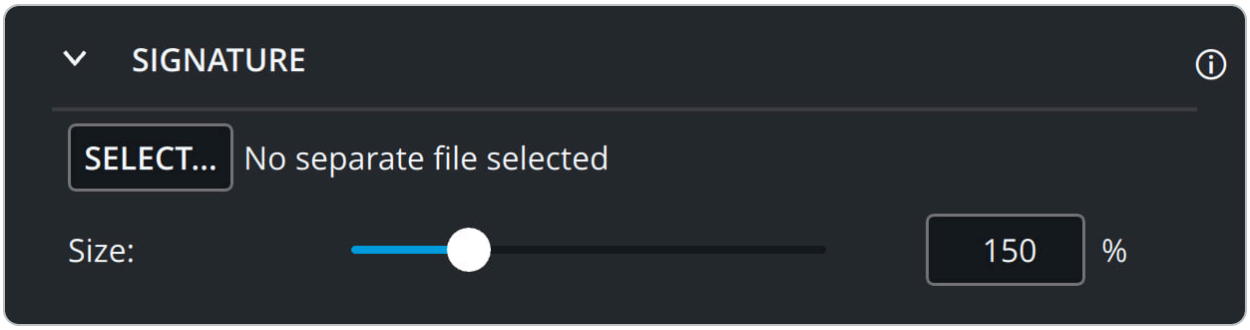
A document whose text arrives from the clipboard or from a `.txt` or `.rtf` file is handled the same way once it is open, and it can run longer than a single page. Bringing text in by those routes, and what Studio does when the words outrun the space they have, are covered in §27. Studio: writing text.

26.4 Signatures

A signature is real handwriting that Studio draws wherever you ask for it. It can come from a signature file you load, or from the font you write in.

To sign a document:

1. Open the **SIGNATURE** section.
2. Click **SELECT** and choose your signature file. Studio accepts `.svg` and `.zip` files.
3. Set **Size** with the slider or the field beside it. The range is 50% to 500%, measured against normal text height, so 100% draws the signature at the size of the surrounding writing.
4. In the text of your document, put `{{sig}}` where the signature belongs.



*The **SIGNATURE** section before a file is loaded*

Studio draws the signature in place of `{{sig}}`, at the size you set, and the section header changes from "No separate file selected" to the name of the file you loaded, with the extension dropped: `MySignature.svg` reads as `MySignature`. If the file cannot be used, Studio says so and leaves the section empty rather than accepting a signature it cannot draw.

The usual place for `{{sig}}` is on its own line after a closing:

```
Warmly,
{{sig}}
```

`{{sig}}` is not limited to one document. Set it up in a letter template and every personalized letter generated from that template is signed, with no per-letter step. `{{sig}}`, `{{sigalt}}`, and `{{siginit}}` are built-in names, so a CSV column named `sig`, `sigalt`, or `siginit` is ignored, and Studio tells you when it sees one.

Size is measured against the writing, not against the page, so a signature keeps its proportions when the rest of the document is scaled to fit. Set it a little larger than 100% if you want the signature to read as a signature rather than as another line of text, and check the result in the **Preview** before committing a batch to paper.



The signature drawn in place of `{{sig}}`

Use the trash button beside the file name to clear a loaded signature. The section returns to "No separate file selected", and `{{sig}}` falls back to the font's signature. If the font has none, Studio reports a **Signature issue**.

26.4.1 Signatures included in a font

Some fonts include a signature, and some also include an alternate signature and initials. Fonts made in Bantam Tools Font Maker for iPad include whichever of these you wrote. A signature command draws each one:

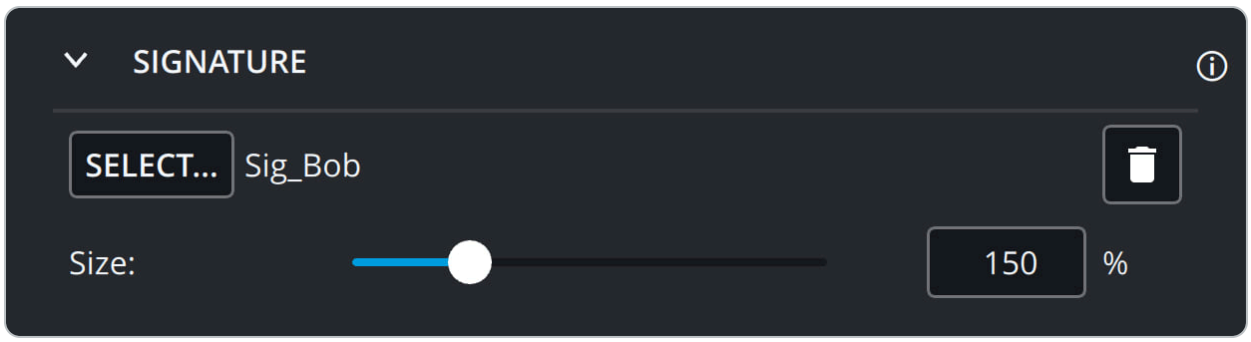
- `{{sig}}` draws the loaded signature file, or the font's signature when no file is loaded.
- `{{sigalt}}` draws the font's alternate signature.
- `{{siginit}}` draws the font's initials.

`{{sig}}`, `{{sigalt}}`, and `{{siginit}}` are not merge fields, though they are written like them. A merge field such as `{{first_name}}` is filled from a CSV file. A signature command is not: a CSV file is *never* required for `{{sig}}`, `{{sigalt}}`, or `{{siginit}}`, and they work in any document, with or without Data Merge.

`{{sigalt}}` and `{{siginit}}` always come from the font; a loaded signature file replaces `{{sig}}` only. **Size** applies to all three.

If the font cannot supply what a signature command asks for, such as `{{siginit}}` in a font without initials, Studio does not generate the job. **PROCESS AND SAVE** reads **Signature issue**, and the **CSV DATA PREVIEW** section on the **DATA MERGE** sub-tab names the command and the font; the section appears for this even when Data Merge is off. Choose a font that includes it, load a signature file (for `{{sig}}`), or remove the command.

> ***Tip:*** For the best result, use a clean `.svg` made from a real signature rather than a traced photograph of one. Bantam Tools Font Maker for iPad produces this kind of file, and the support article on capturing handwriting and signatures, in the Bantam Tools support section online, covers the process end to end.



***SIGNATURE** section with a signature file loaded*

26.5 About the Text Add-On

Every Bantam Tools HandWriter® includes the Bantam Tools Studio Text Add-On, which is a separate purchase for other Studio users. Without it, Studio writes only the text an SVG document already carries, in the two included Hershey fonts. The add-on unlocks the whole **TEXT** tab, and each of its pieces answers a job that writing letters depends on:

- **Text files** — opens `.txt` and `.rtf` files, the route to take when the words come from a word processor, an email, or a notes app rather than from a drawing. Text copied from another application opens the same way, from the clipboard.
- **The full font library** — gives you faces beyond the two Hershey fonts, for when the document's tone matters as much as its content.
- **Custom SVG font support** — writes in a single-stroke SVG font you supply, such as your own handwriting made into a font with Bantam Tools Font Maker for iPad, or a commercial face from Quantum Enterprises. Studio has built-in support for the Quantum Enterprises Scriptalizer service, which varies the letterforms of compatible fonts as Studio writes. See §27.4.2 Some sources of stroke fonts.
- **Signatures** — draws your signature, from a signature file or a font that includes one, wherever your document calls for it. See §26.4 Signatures.
- **Handwriting-like defects** — adds small random variations of the kinds found in real handwriting: rows that are not quite level, letters that sit a little high or low, spacing that opens and closes. Use them when a page should read as written rather than as typeset, and reroll the variation for a fresh draw before committing a page to paper.
- **Multipage documents** — flows a long document onto as many pages as it needs, which turns a multi-page letter into one job rather than a manual split. Letter and word spacing and the overflow controls decide how the text fits each page.
- **Data Merge** — fills one template from a CSV file and produces one document per row, which is the difference between writing 200 notes and setting up one. Merge fields also work in a designed `.svg` template, so a personalized batch can carry letterhead and artwork.

§27. Studio: writing text takes those controls in the order they appear down the tab, from bringing text in through font, defects, spacing, and multipage flow. §17. Writing letters with Data Merge covers filling one document from a CSV file to produce a batch.

27. Studio: writing text

This chapter covers the two halves of writing with Bantam Tools Studio™: getting words into Studio, and then selecting fonts and setting the options that control your layout. §26. Studio: the TEXT tab describes the **TEXT** tab and its four sections control by control; what follows is the workflow that runs through them, in the order the sections appear down the tab.

Data Merge, which fills one document from a CSV file to produce a personalized batch, has a chapter of its own. See §17. Writing letters with Data Merge.

27.1 SVG documents that contain text

When the writing is one part of a larger drawing — a title, a caption, a label on a diagram — the text belongs in the SVG file, placed there in an editor such as Inkscape or Adobe Illustrator. §26. Studio: the TEXT tab walks that job end to end, and §30. SVG templates covers building a reusable `.svg` template with letterhead, logos, or other fixed artwork around the text.

Once the file is open, the **Font face** menu in the **FONT** section lets you write the document in any font in the library rather than in the one the file names. Handwriting Defects, letter spacing, and word spacing all apply to an SVG document's text exactly as they apply to a text document.

One control does not appear: the **Font size** field is shown only for a text document. An SVG file carries its own type sizes, and Studio writes the text at the size the file specifies, scaled with the rest of the artwork.

27.2 Working with text documents

A text document is one whose entire content is the words — a `.txt` file, an `.rtf` file, or text pasted from the clipboard, whether that clipboard content arrives as plain text, as RTF, or as HTML copied from a browser or an online word processor. There is no template to build and no editor to open first. Most of this text is written somewhere else and brought in finished: a notes app, a word processor, a CRM, an email tool, or a plain text editor.

Word processors such as Microsoft Word and Apple Pages save in their own formats by default (`.docx` and `.pages`), and Studio does not open those. Keep writing in the program you know, and save a copy of the finished document in Rich Text Format (`.rtf`) or as plain text (`.txt`) for Studio:

- **Microsoft Word: File → Save As** (or **File → Save a Copy**, for a document stored in OneDrive), then choose Rich Text Format or Plain Text as the file format.
- **Apple Pages: File → Export To**, then choose Rich Text Format or Plain Text.
- **Google Docs: File → Download → Rich Text Format (.rtf)** or **Plain Text (.txt)**. You can also copy the text in Google Docs and use **Open from Clipboard**.

Choose `.rtf` when the document's formatting matters. An `.rtf` file keeps its type sizes, so a heading stays larger than the body text, and the two scale together when you change **Font size** (see §27.6 Font size, spacing, and overflow). Underlining is kept too, whether it comes from an `.rtf` file, from rich text you paste, or from an SVG document, and is drawn by hand in the same pen as the words. A `.txt` file carries the words alone.

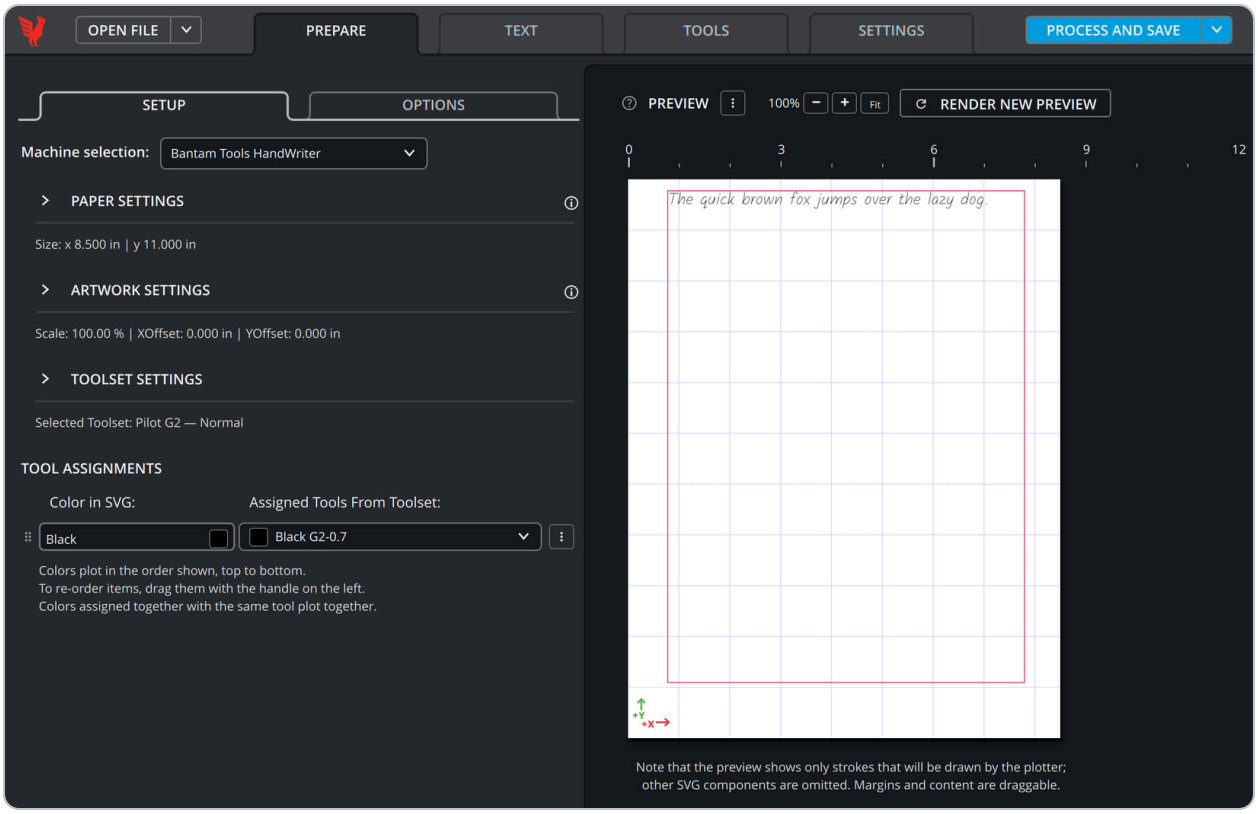
Because there is no SVG template setting the type on the page, the layout is yours to set on the **PREPARE** tab once the text is in. Studio flows the words into the writing area your margins define, and the **Artwork Settings** controls place that writing area on the sheet.

A `.txt` or `.rtf` file is worth keeping when the same words will be written more than once: a source file is a document, a campaign, or a template you can edit and reopen, rather than something you reassemble from a paste buffer each time. Use the clipboard when the text is finished somewhere else and this is the only time you will write it.

To write a text document:

1. Bring the text in. For a file, click **OPEN FILE** and choose the `.txt` or `.rtf` file. For text in another application, copy it there, then choose Open from Clipboard in the chevron menu beside **OPEN FILE**: **OPEN FILE → Open from Clipboard**
2. Go to the **TEXT** tab and confirm that **Enable Text Rendering** is on.
3. Choose a font in the **FONT** section, and set **Font size** below it. Add Handwriting Defects in the card beneath if the document calls for them.
4. In the **SPACING & OVERFLOW** section, set **Letter spacing**, **Word spacing**, and **Text overflow**, which sets what happens to text that does not fit. Load a signature in the **SIGNATURE** section if the document needs one.
5. Go to the **PREPARE** tab and set the paper size and the margins. The margins are the writing area, so they decide how much text fits on the page.
6. Lay the document out on the page with the **Artwork Settings** controls: **FIT TO MARGINS**, **CENTER**, the scale and the offsets, and the overflow behavior. You can also drag the writing in the **Preview** area to position it by hand.
7. Confirm the toolset and the tool assignments, so the writing is drawn with the pen you mean it to be drawn with.
8. Use the **Preview** to confirm that the document fits within the page size and the margins you set, then click **PROCESS AND SAVE**.

Studio generates the job from the text as the **Preview** showed it, laid out inside the margins you set.



A text document laid out inside the margins

> *Note:* With **Opening text files opens Text tab** turned on in Settings, Studio switches to the **TEXT** tab by itself when you open a supported text file.

Nothing on the **TEXT** tab edits the words. To change the wording, change the source — edit the file and open it again, or copy the revised text and use **Open from Clipboard**.

27.3 Working with batches of text files

Studio can open several text files at once. A batch holds text files only; SVG files open as a batch of their own (see §21.1 Opening files and file actions). Choose more than one file in the **OPEN FILE** dialog and Studio loads them as a batch: each file becomes one page in the **Preview** area's page navigator, and the navigator steps between them.



The page navigator steps between the files in a batch

The settings on the **TEXT** tab belong to the batch rather than to any one file, so the font, the spacing, the defects, and the signature you set apply to every file in it. Generating the batch writes one output file per source file, each keeping its own base name, along with one Setup Sheet apiece. §25.7 Output file names gives the naming rule in full.

Reload all files from disk, in the **OPEN FILE** button's chevron menu, rereads every file in the batch at once. Edit the text of several documents in an external editor, click it, and the whole batch comes back current, with the same placement and handwriting variation.

The handwriting variation is per file, and **RENDER NEW PREVIEW** rerolls the page you are looking at and leaves the rest of the batch as it is. That is what lets you redraw one file whose variation you dislike without disturbing the files you have already approved. As soon as a batch is open, **Re-render all pages** in the **Preview menu** rerolls every file in one go.

Data Merge behaves differently with a batch open: the row range collapses to a single **Data row** field, and every file is merged against that one row. To produce a document per row instead, open a single template file.

Use multiple pages is not offered while a batch is open. If **Text overflow** is set to **Use multiple pages** when you open a batch that includes a text file, Studio switches it to **Scale text down only** and reports **Opened file batch. Text overflow is set to: Scale text down only.** The setting stays there after the batch closes.

27.4 Font selection

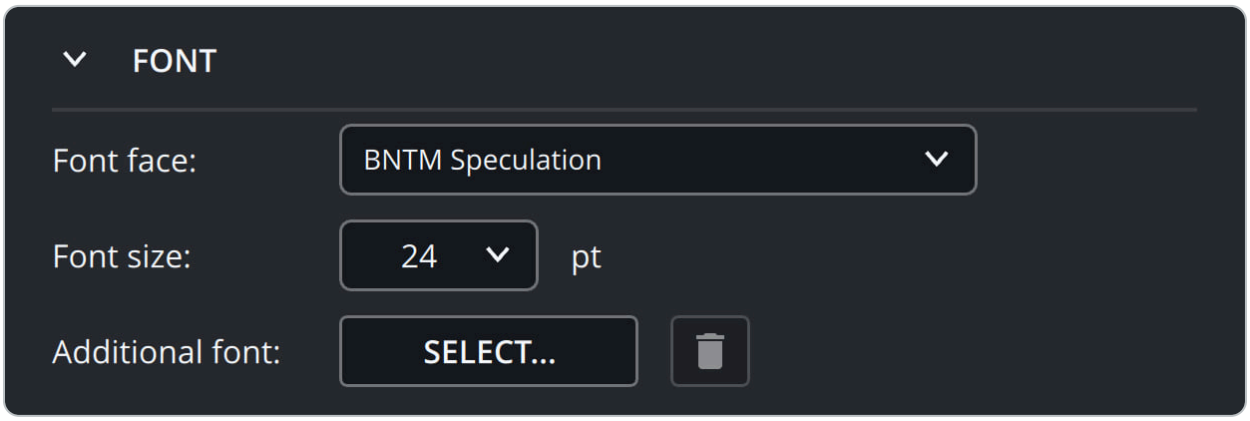
The **FONT** section holds the choice of font. Open it and use the **Font face** menu to browse the library; the menu accepts typing as well as clicking, so a few letters narrow a long list to the face you want. The section's header names the current selection, which is enough to check the font on a document you set up last week without expanding the section. Choosing a face redraws the **Preview** area in it, so styles can be compared on screen before any of them is committed to paper.



*Typing in **Font face** narrows the list*

The fonts in the library are designed for writing and plotting workflows, and are intended to be drawn as paths rather than filled the way a screen or printer font is.

To install a font of your own, click **SELECT** beside **Additional font** and choose an SVG font file — a digitized version of your own hand, or a face specific to your brand. Studio also makes every other SVG font file in that same folder available, so a folder of faces is installed by picking any one of them. The file name appears beside the button, with a trash button to clear the selection. Clearing it removes those fonts from the list; the files themselves are not changed.



*The **FONT** section*

For writing, a single-stroke font is the efficient choice: the pen travels each letter once rather than tracing its edge, which means less motion and less time on every page. A regular computer font, such as a TrueType or OpenType font, is an outline font, and a pen writes each of its letters as a hollow shape.

The **Preview** helps you decide which face you like the look of. Faces also differ in how compact they are and how readable they stay at small sizes, and a short sample on paper shows both.

27.4.1 Letting the document choose the font

The font you choose applies to the whole document. A document can instead name its own fonts, and Studio will honor them: where a piece of text asks for a font by name, and the library holds a stroke font that matches that name, Studio writes that text in the matching stroke font rather than in the font selected in Studio.

This is how a document gets more than one font. One font choice cannot give a heading one face and the body another; naming the fonts in the document can. Set the heading in one face and the body in another in your editor, and both survive into the writing.

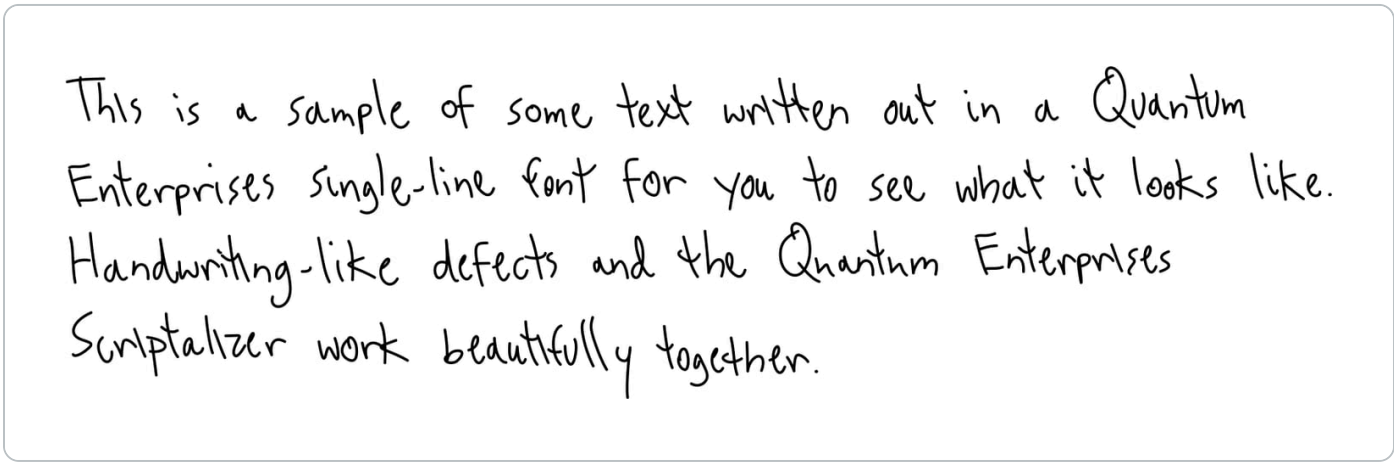
It also settles a mixed batch. When you open several documents at once, each one brings its own fonts, so a batch of letters that are not all in the same hand needs no per-file adjustment. See §21.1 Opening files and file actions.

Text that names no font, or names a font that is not in the library, is written in the font currently selected in Studio.

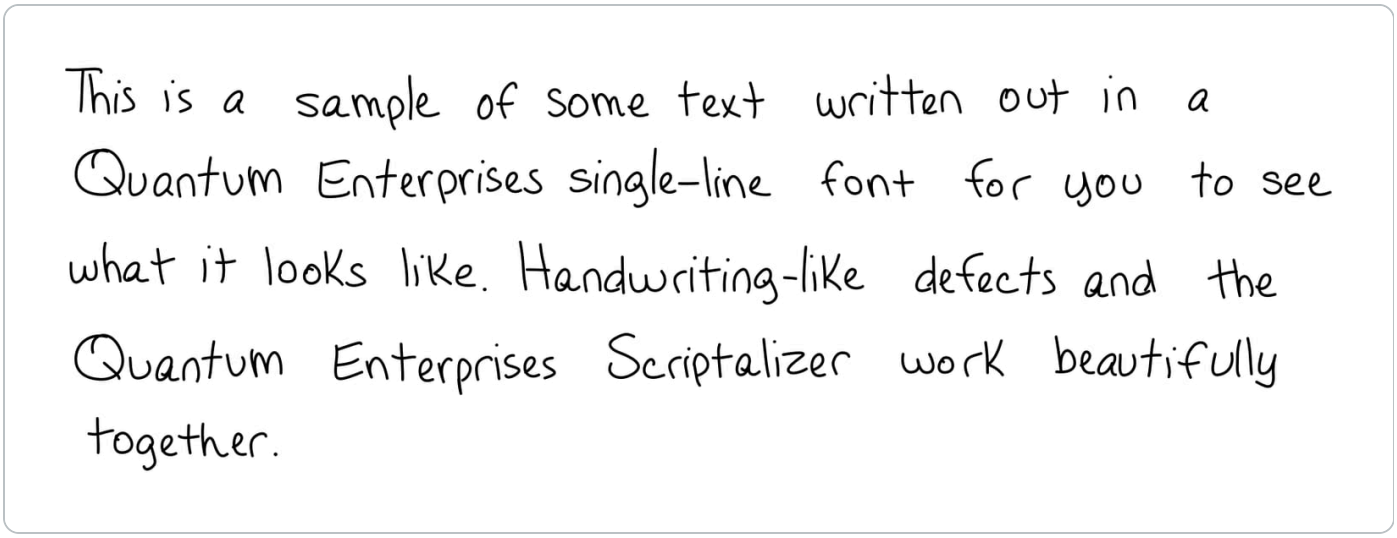
27.4.2 Some sources of stroke fonts

The library that ships with Studio is not the whole supply. Two sources add to it, and they solve different problems: one sells faces drawn by a type designer, the other turns your own handwriting into a font.

Quantum Enterprises sells commercial stroke fonts, as stock faces and as custom work, at https://quantumenterprises.co.uk/slf. They are a third party; Bantam Tools does not sell or support their fonts.



A line of text written in Premium Ultra 25SL, from Quantum Enterprises



The same text in Premium Ultra 79SL

Their faces come as matched pairs, a TrueType file and an SVG file of the same name. That pairing is what makes the document-chosen font behavior above useful in practice: install the TrueType file on your computer, set type in it in your editor, and Studio writes that text in the matching stroke font without any further setup. Custom work includes fonts drawn from a sample of your own handwriting.

Most of their faces also carry several drawings of each letter. Studio picks among those as it writes, so a letter repeated in a word is not repeated identically — which is a different kind of variation from the Handwriting Defects sliders, and the two combine.

That substitution is done by a service Quantum Enterprises runs, called the **Scriptalizer**. A font declares itself compatible, and Studio then sends the document's text to that service as part of rendering and writes what comes back. It needs an internet connection: without one, the text is still written, just without the substitution. Nothing turns it on — a compatible font uses it, and the fonts that ship with Studio are not compatible.

The second source is Bantam Tools Font Maker, an iPad app that builds a font from your own handwriting, written with an Apple Pencil. It is at https://bantam.tools/fontmaker, and it has a user guide of its own.

You write each character, edit and preview the result in the app, and export an SVG single-stroke font, the format Studio writes with. Writing, editing, and previewing are free; exporting is a one-time in-app purchase.

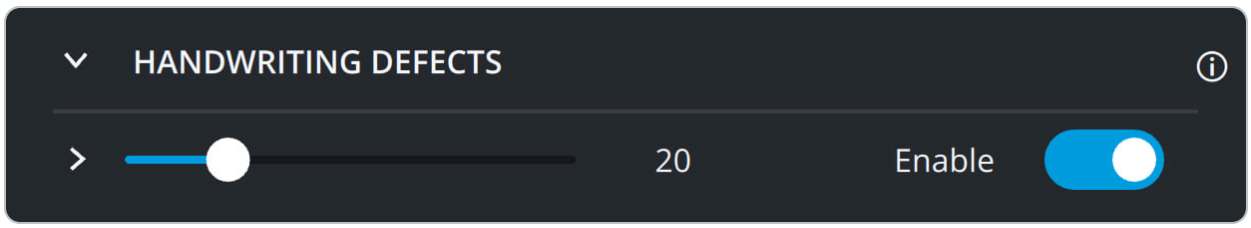
A commercial face gives you a type designer's hand; Font Maker gives you your own.

27.5 Handwriting Defects

Writing that comes out perfectly even reads as a machine: straight rows, evenly spaced, every letter the same size as the last. Plotted carefully with a good pen it is still handsome, but the layout suggests a printer rather than a hand.

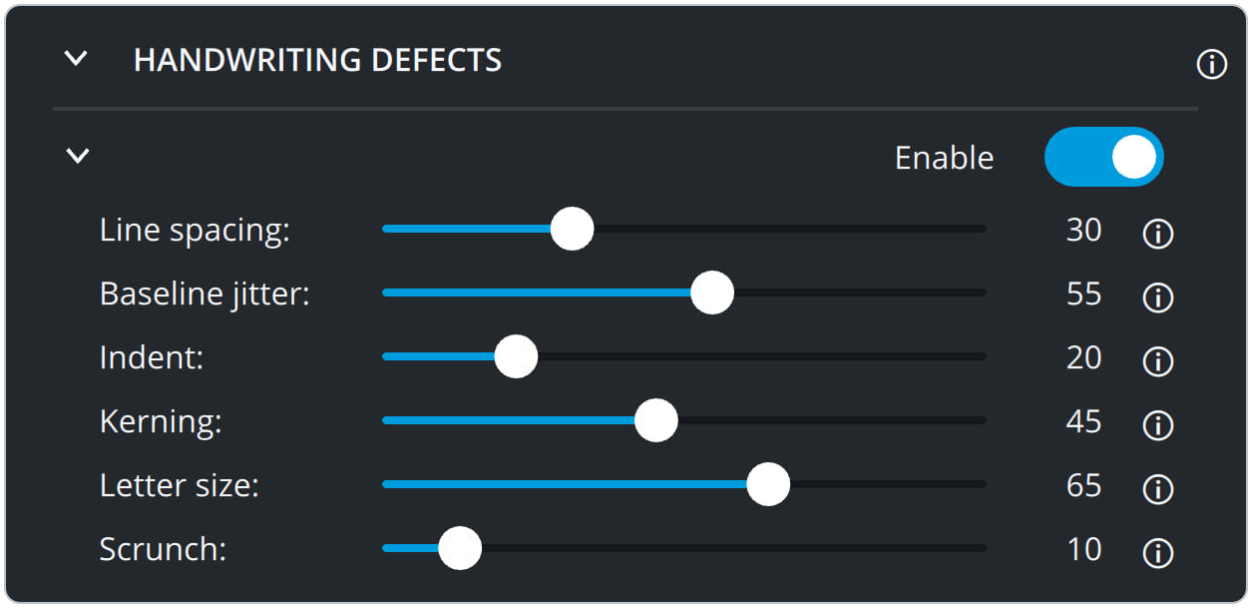
Handwriting Defects counters that. With **Enable** on, Studio adds intentional random variations to the text as it renders it, of the kinds that turn up in real handwriting — rows that are not quite level, letters that sit a little high or low, spacing that opens and closes. The result stays neater than most people write, and stops announcing that a machine laid it out.

The toggle is off until you turn it on, so a document is written plainly unless you ask for otherwise. (Default: off) The slider beside it sets how much variation the writing gets, from 0 to 100. (Default: 20)



*The **HANDWRITING DEFECTS** section, with its single slider*

To adjust each kind of variation separately, click the arrow at the left of the slider. Six sliders take its place, one for each defect. Click the arrow again to return to the single slider, which then moves all six together and keeps the differences between them.



The six sliders, shown by clicking the arrow. Each is set differently here.

Every sample in this section is the same block of text, so the sliders can be compared against one another and against the writing with Handwriting Defects off, shown here.

Each sample that follows sets one slider to 100, its maximum, with the others off.

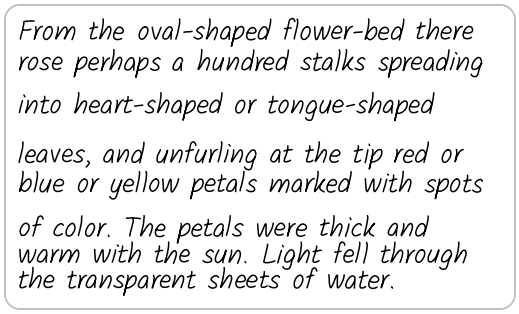
From the oval-shaped flower-bed there rose perhaps a hundred stalks spreading into heart-shaped or tongue-shaped leaves, and unfurling at the tip red or blue or yellow petals marked with spots of color. The petals were thick and warm with the sun. Light fell through the transparent sheets of water.

Handwriting Defects off

Each of the six sliders sets one kind of variation:

- **Line spacing:** Varies the vertical gap between lines, so they do not sit on a perfect grid.

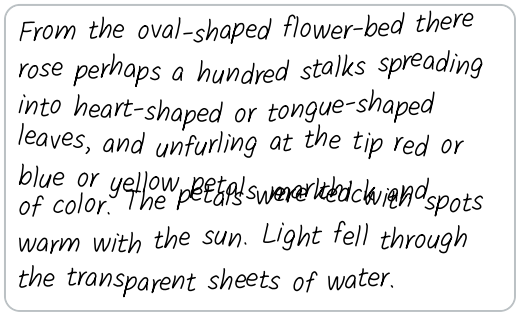
The sample shows the **Line spacing** slider at 100, exaggerated to make its effect easy to see. In most documents, 15 to 20 works well.



Line spacing *at 100 (exaggerated)*

- **Baseline jitter:** Nudges each letter a little above or below the baseline.

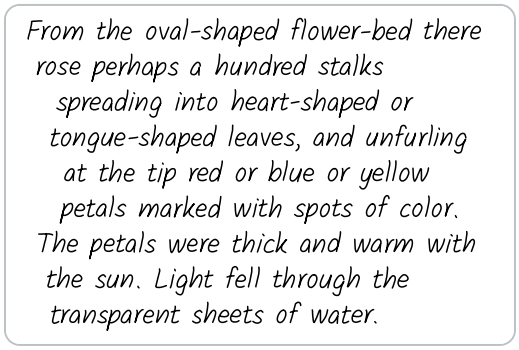
The sample shows the **Baseline jitter** slider at 100, exaggerated to make its effect easy to see. In most documents, 15 to 20 works well.



Baseline jitter *at 100 (exaggerated)*

- **Indent:** Varies where each line begins along the left margin.

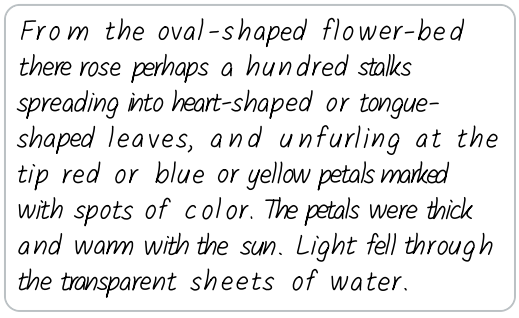
The sample shows the **Indent** slider at 100, exaggerated to make its effect easy to see. In most documents, 15 to 20 works well.



Indent *at 100 (exaggerated)*

- **Kerning:** Loosens and tightens the gaps between neighboring letters.

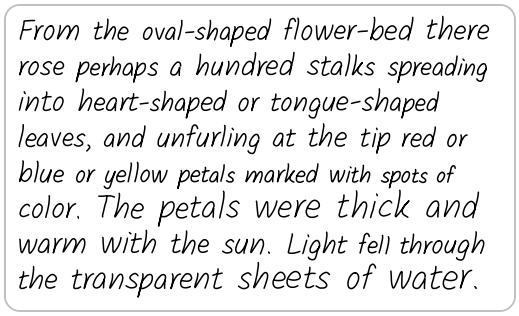
The sample shows the **Kerning** slider at 100, exaggerated to make its effect easy to see. In most documents, 15 to 20 works well.



Kerning *at 100 (exaggerated)*

- **Letter size:** Makes each letter a little larger or smaller than its neighbors.

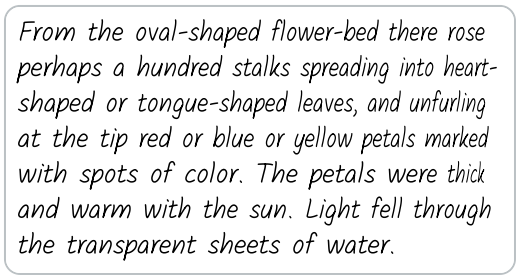
The sample shows the **Letter size** slider at 100, exaggerated to make its effect easy to see. In most documents, 15 to 20 works well.



Letter size *at 100 (exaggerated)*

- **Scrunch:** Where a line ends just short of fitting the next word, it leaves an awkward gap. Writing by hand, you might squeeze that word in anyway, narrowing the letters as you run out of room. **Scrunch** does the same: it tightens letters and spaces progressively toward the end of a line, more and more as the space runs out, to fit one more word.

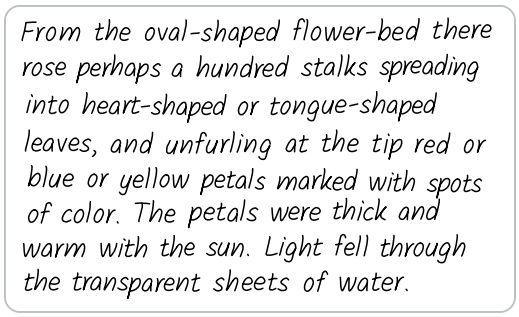
The sample shows the **Scrunch** slider at 100, exaggerated to make its effect easy to see. In most documents, 15 to 20 works well.



Scrunch *at 100 (exaggerated)*

Start small. A little variation reads as a hand; a lot reads as an unsteady one, and the sliders reach well past the point where writing stays comfortable to read. The single slider starts at 20, which is a good place to begin. Raise or lower it a little at a time and see what changes in the Preview. For finer control, open the six sliders with the arrow and change one at a time.

The variation comes from a random pattern rather than from a fixed rule, so two renders of the same text differ. **RENDER NEW PREVIEW**, in the Preview's header, rerolls that pattern and draws the writing again, which is how you look at several versions of a document and keep the one you like.



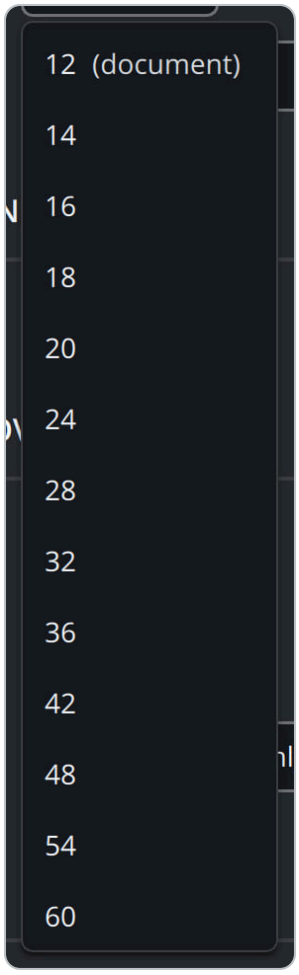
The same text with every defect at its default strength

None of the six sliders is a size control, and none of them changes the writing area. They do change how much text fits on a page, though, which is why a document's page count can move when you raise them; see §27.7 Multipage layout.

27.6 Font size, spacing, and overflow

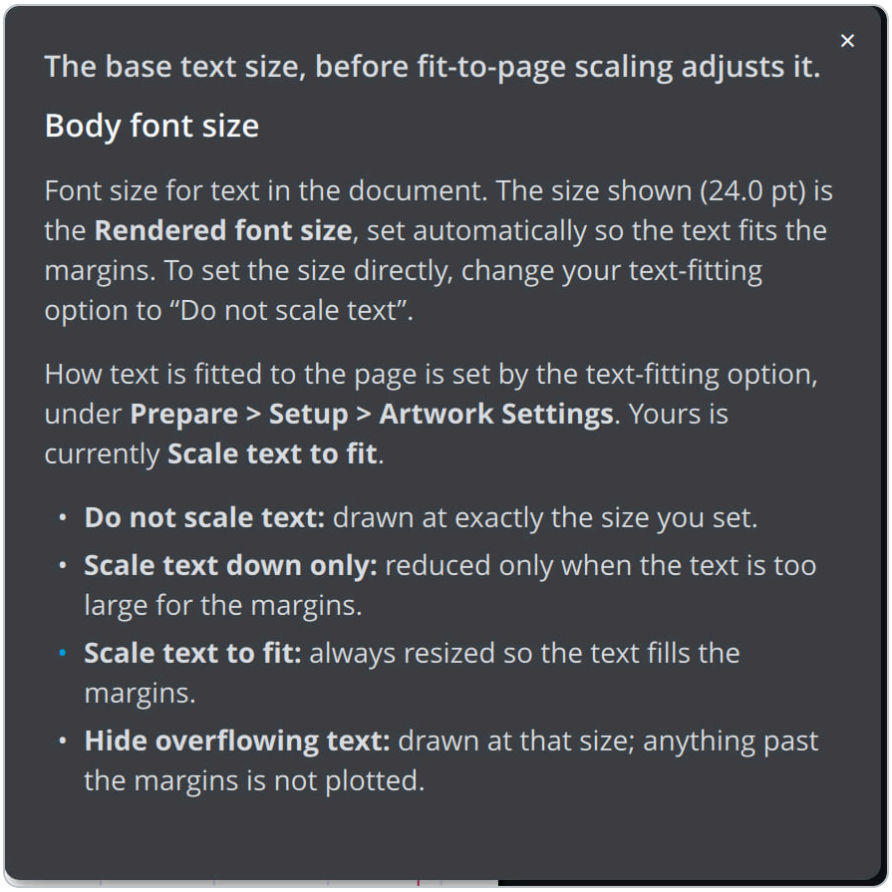
Three things together decide whether a document fits the page it has: the size of the type, the spacing between letters and words, and what you choose for text that runs past the margins.

Font size sits in the **FONT** section, below the font face, and appears for a text document only. It is a text field with a menu of common sizes beside it, from 14 pt up to 60 pt, and it accepts any size you type. (Default: 24 pt) When an `.rtf` file or HTML from the clipboard brings a size of its own, opening it sets the field to that size, and the size joins the menu marked `(document)`, so the size the document was written at is one click away and is not mistaken for a preset. The field sets the document's base size, usually its body text. If the document came in with styling that sets some parts in different sizes, text in the whole document is scaled proportionally when you change the text size setting in Studio. For example, in a document with 12 pt body text and an 18 pt heading, setting the field to 24 pt draws the heading at 36 pt.

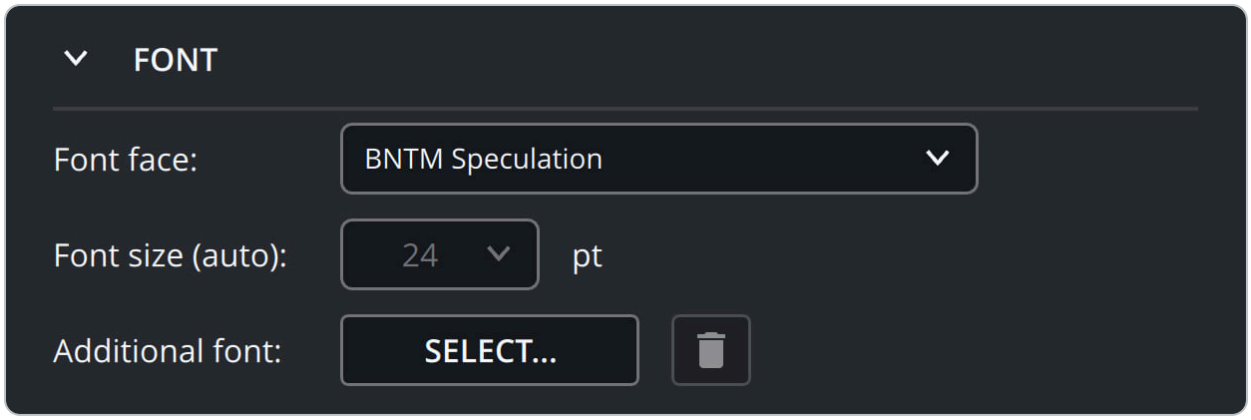


*The **Font size** menu, with an `.rtf` file's own size marked `(document)`*

The size in the field is the size the body text is actually drawn at. That is usually the size you entered, but when an overflow setting shrinks the text to fit, the field shows the smaller size the writing is rendered at rather than the larger one you requested, and the label above it changes from **Font size** to **Font size (auto)**. That relabeling is the reliable way to tell at a glance whether you are choosing the size or Studio is. Hovering the field explains which of the two is happening and, when Studio has scaled the text down, what it scaled it down from.



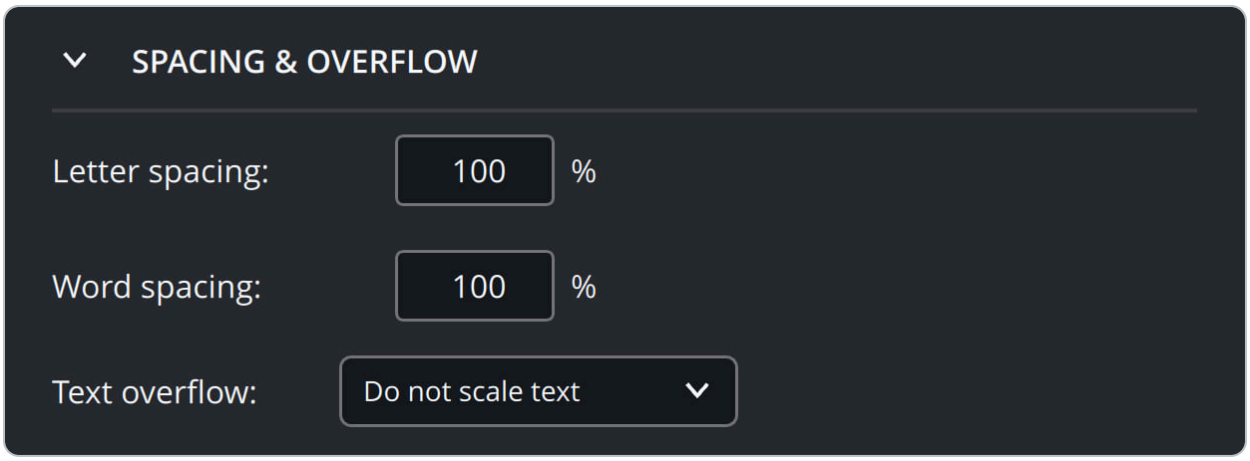
*Hovering **Font size (auto)** explains how the size was chosen*



***Font size (auto)** shows Studio chose the size*

The **SPACING & OVERFLOW** section holds the rest. Both spacing controls are percentages of the font's own spacing, so 100% is the font as its designer drew it:

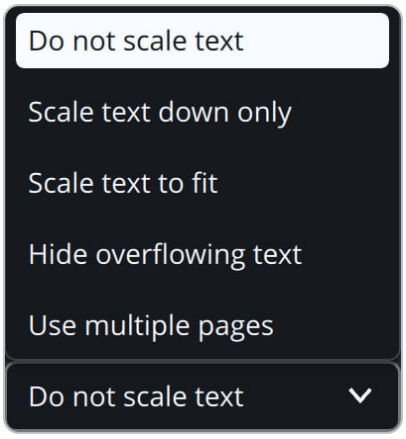
- **Letter spacing:** Sets the space between letters, from 1% to 400%. (Default: 100%)
- **Word spacing:** Sets the space between words, from 1% to 600%. (Default: 100%)



*The **SPACING & OVERFLOW** section*

The **Text overflow** menu sets what happens when the text does not fit the writing area:

- **Do not scale text:** Draws the text at exactly the size you set, even where that runs past the margins. (Default)
- **Scale text down only:** Shrinks text that is too large, and leaves text that already fits at the size you set.
- **Scale text to fit:** Resizes the text up or down so that it fills the writing area, whether the text was too large or too small to begin with. The size is Studio's to choose, and the field goes read-only and is relabeled **Font size (auto)**.
- **Hide overflowing text:** Draws the text at the size you set and does not plot anything past the margins.
- **Use multiple pages:** Keeps the size you set and continues the document onto as many pages as it needs. Offered only when a single document is open. See §27.7 Multipage layout.



*The **Text overflow** menu*

Scale text down only never makes text larger, so a short note set at 18 pt stays at 18 pt on a big sheet; **Scale text to fit** would grow the same note until it filled the writing area, which is the right behavior for a quotation on a poster and the wrong one for a letter.

Example: a note set at 24 pt whose last two lines fall below the bottom margin. Under **Do not scale text**, those two lines are drawn past the bottom margin. Under **Scale text down only**, Studio shrinks the whole document until it fits — to something like 21 pt — and the label reads **Font size (auto): 21 pt**. Under **Hide overflowing**

text, they are not drawn at all, though they are still in the document. Under **Use multiple pages**, they begin a second page, still at 24 pt.

The same menu appears on the **PREPARE** tab, in **Artwork Settings**, where the two are one setting shown twice — changing either changes both. For an SVG document that position in **Artwork Settings** holds the **Content Bounds** and **Document Bounds** choice instead; a text document has no artwork whose edges could be measured, so the overflow menu takes the control's place. The **Scale** field beside it goes read-only for the same reason, reporting the scale the margins produced rather than accepting one.

> *Note:* Studio fits the text to the writing area your margins define. To give a document more room, change the paper size or the margins on the **PREPARE** tab. The bottom margin is larger than the other three, which shortens the writing area.

27.7 Multipage layout

Use multiple pages is the fifth choice in the **Text overflow** menu when a single document is open, and the only one that lets a document run past a single page. The other four fit the text to the page it has — by shrinking it, letting it run past the margins, or hiding what is left over. This one keeps the text at the size you chose and continues the document onto a second page, a third, and so on, until every word has been drawn.

The margins you set on the **PREPARE** tab apply to every page just as they do to a single one, and nothing else about the layout changes from page to page.

Select **Use multiple pages** and Studio lays out the first page and shows it in the **Preview** area, with the rest of the pile drawn behind it so you can see at a glance that the document runs long. By default the pile sits at a slight angle, as a stack of paper would; **Multipage: Neaten Preview Pile**, in the **Preview** menu, squares it up.

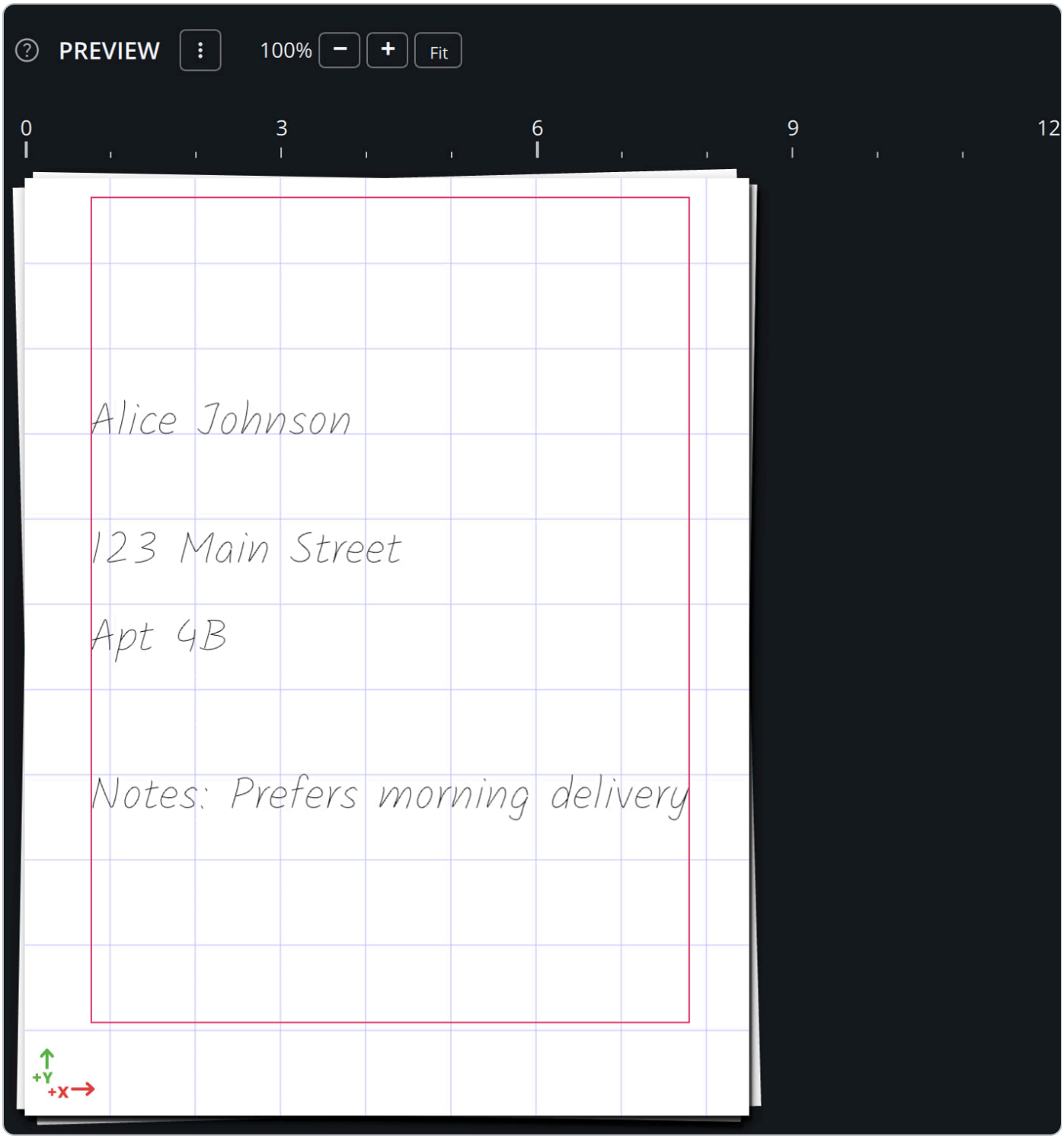
The remaining pages fill in the background while you keep working, and the status line above the preview counts them as they arrive. The total carries a tilde while it is still an estimate, and loses it once every page has been laid out.

A page navigator appears below the preview as soon as the document runs to more than one page. The inner arrows step one page at a time, the outer arrows jump to the first or last page, and typing a page number into the field goes straight there. You can jump past the pages Studio has laid out so far — the navigator shows **Rendering…** and waits for the background pass to reach the page you asked for.

> *Note:* In a multipage document, **RENDER NEW PREVIEW** rerolls the whole document rather than the page you are looking at, so every page is redrawn from one fresh random pattern and the handwriting stays consistent throughout.

Each document is limited to 100 pages. Past that, Studio reports `Text layout error: each document is limited to 100 pages` beside the **Preview** and does not generate output; see §34. Troubleshooting.

Generating a multipage document writes one G-Code file per page into the folder you choose when the batch starts, each name carrying a page suffix: `Letter_p1`, `Letter_p2`, and so on. A document that fits on one page takes the name you entered, with no suffix. Studio writes one Setup Sheet per page as well. For the naming rule in full, see §25.7 Output file names.

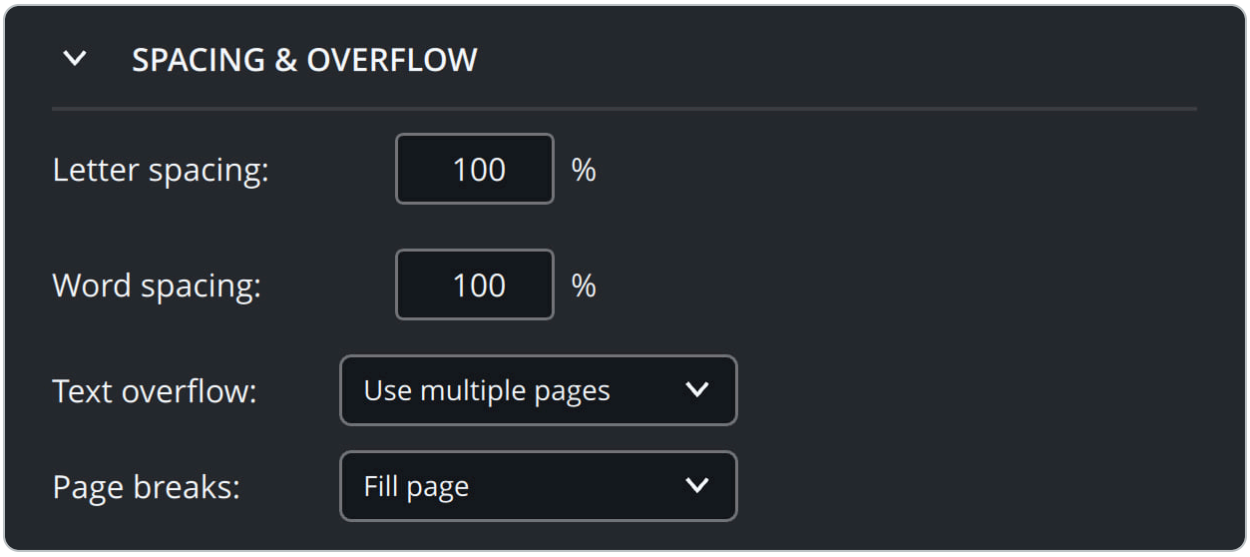


A document flowing onto several pages

27.7.1 Page breaks

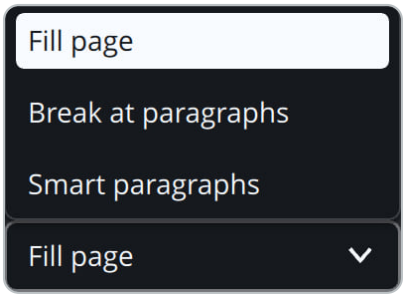
Choosing **Use multiple pages** reveals a **Page breaks** menu beneath it, which decides where one page ends and the next begins:

- **Fill page:** Fits as much text on each page as it will hold, breaking wherever the page runs out of room, even part-way through a paragraph. (Default)
- **Break at paragraphs:** Never splits a paragraph across a page break. A paragraph that does not fit moves whole to the next page, which can leave a conspicuous gap at the bottom of the page it left.
- **Smart paragraphs:** Prefers to break between paragraphs, as **Break at paragraphs** does, but splits a long one when keeping it whole would waste most of a page. When it does split a paragraph, it avoids stranding a single line at the top or the bottom of a page.



Page breaks** appears with **Use multiple pages

Fill page uses the fewest sheets, and suits continuous prose, where a paragraph carrying over a page break reads naturally. **Break at paragraphs** suits a document whose paragraphs are meant to be taken in together — recipe steps, numbered terms, short entries in a list — and it will spend paper to keep them that way. **Smart paragraphs** sits between the two, and is the one to reach for on a long document: it keeps paragraphs whole where that costs little, and splits them where the alternative is half an empty page.



*The **Page breaks** menu*

None of the three changes the type size or the page count on its own account; they change only where the breaks fall, and the page count moves as a consequence.

> ***Note:*** Changing the page break setting re-flows the document from the first page. Text moves between pages, and the page count may change with it, so it is worth settling the setting before you review individual pages.

27.7.2 How text size is determined

Your **Font size** setting is used as entered, which is the whole point of this mode and what separates it from the other four. They hold the document to one page and let the text size give way; this one holds the text size and lets the page count give way.

The field stays editable here, and its label stays **Font size**. Only **Scale text to fit** takes the size out of your hands, and it says so by relabeling the field **Font size (auto)**.

Four things together decide how much text a page holds, and so how many pages a document runs to:

- **Font size** — the largest effect, and the one to reach for first.
- **Margins** — set on the **PREPARE** tab, they define the writing area on every page.
- **Letter spacing** and **Word spacing** — they change how much fits on a line.
- **Handwriting Defects** — when enabled, **Line spacing**, **Letter size**, and **Scrunch** all change how much fits on a page, though none of them is a size control.

Example: a letter of about 1,500 words in **BNTM Speculation** on 8.5" × 11" (Letter) paper with 25 mm (1") side and top marginsand the HandWriter's 28 mm bottom margin runs to about 11 pages at 24 pt. At 16 pt, often a better fit for a letter, the same text runs to about 5 pages, with no other setting touched. Another font at the same size can run longer or shorter.

> ***Note:*** Studio places at least one line on every page, so a font size too large for the writing area produces many pages of one line each.

If text comes out at the wrong size, wraps unexpectedly, or a font or signature does not appear, see §34. Troubleshooting.

28. Studio: Data Merge

Data Merge turns one document and one spreadsheet into a batch of personalized documents — a thank-you note per donor, a place card per guest, a certificate per graduate. This chapter describes everything the feature does, from merge fields through the techniques that let one sheet carry several records. Data Merge lives on the **DATA MERGE** sub-tab of the **TEXT** tab, described in §26. Studio: the TEXT tab.

28.1 What Data Merge does

If you have run a mail merge in a word processor, the idea is the same: write the document once, mark the places where the personal details go, load a spreadsheet saved as a CSV (comma-separated values) file, and let the software produce one copy per row.

The marks are called **merge fields**: field names wrapped in double curly braces. A document might read:

```
Dear {{first_name}},

Thank you for your recent order of {{product}}.

Warmly,
{{sig}}
```

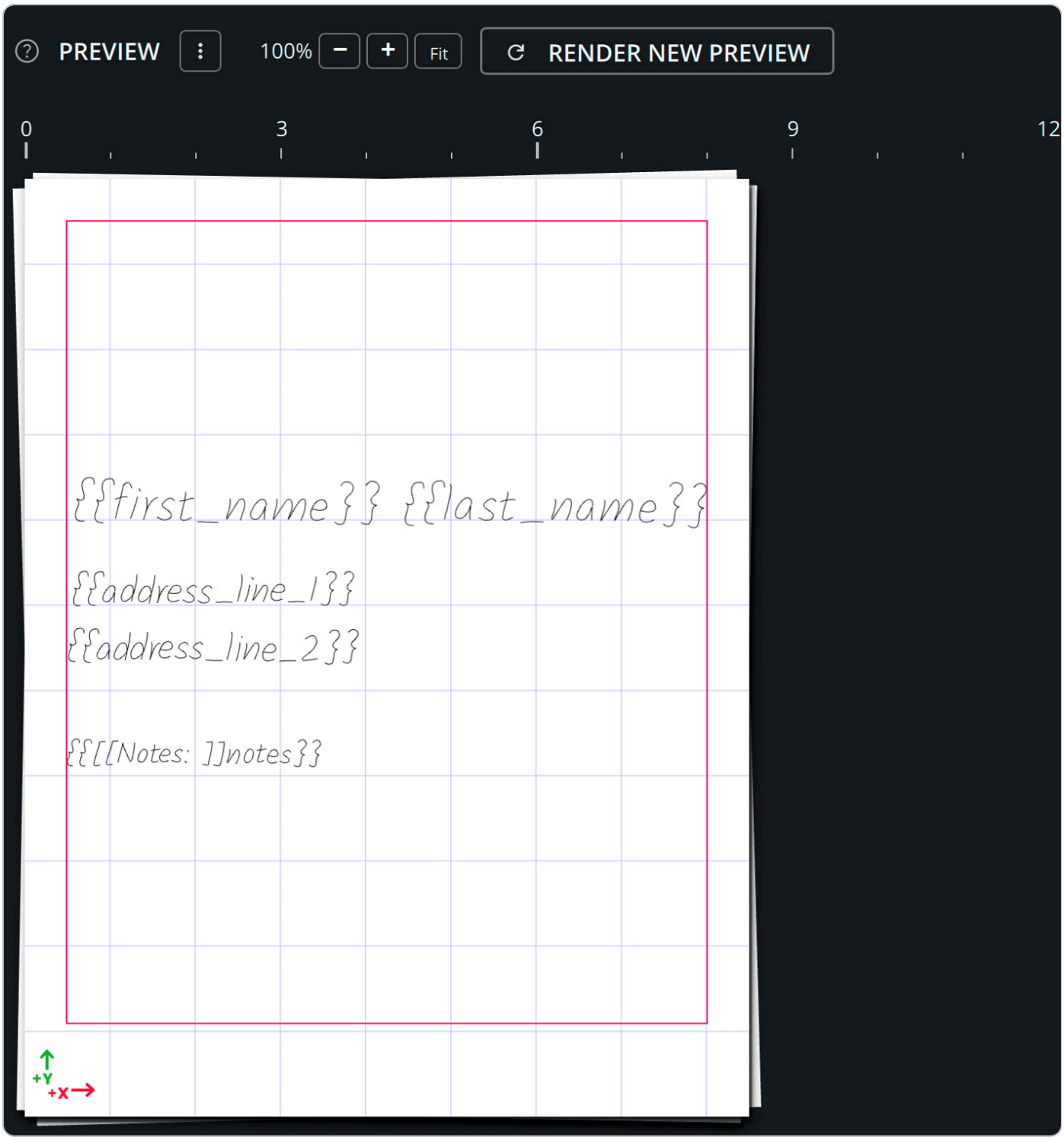
With a CSV file whose columns are `first_name` and `product`, that document becomes one written page per row, each carrying its own name and its own product, and each signed. `{{sig}}` is not a merge field, though it is written like one: it is a signature command, which Studio fills from the signature file or the font, never from the CSV file. See §26.4 Signatures.

The names `sig`, `sigalt`, and `siginit` are reserved for the signature commands, so they cannot be used as CSV column names. Studio ignores a column with one of those names, in any capitalization; give it another name to use it as a merge field.

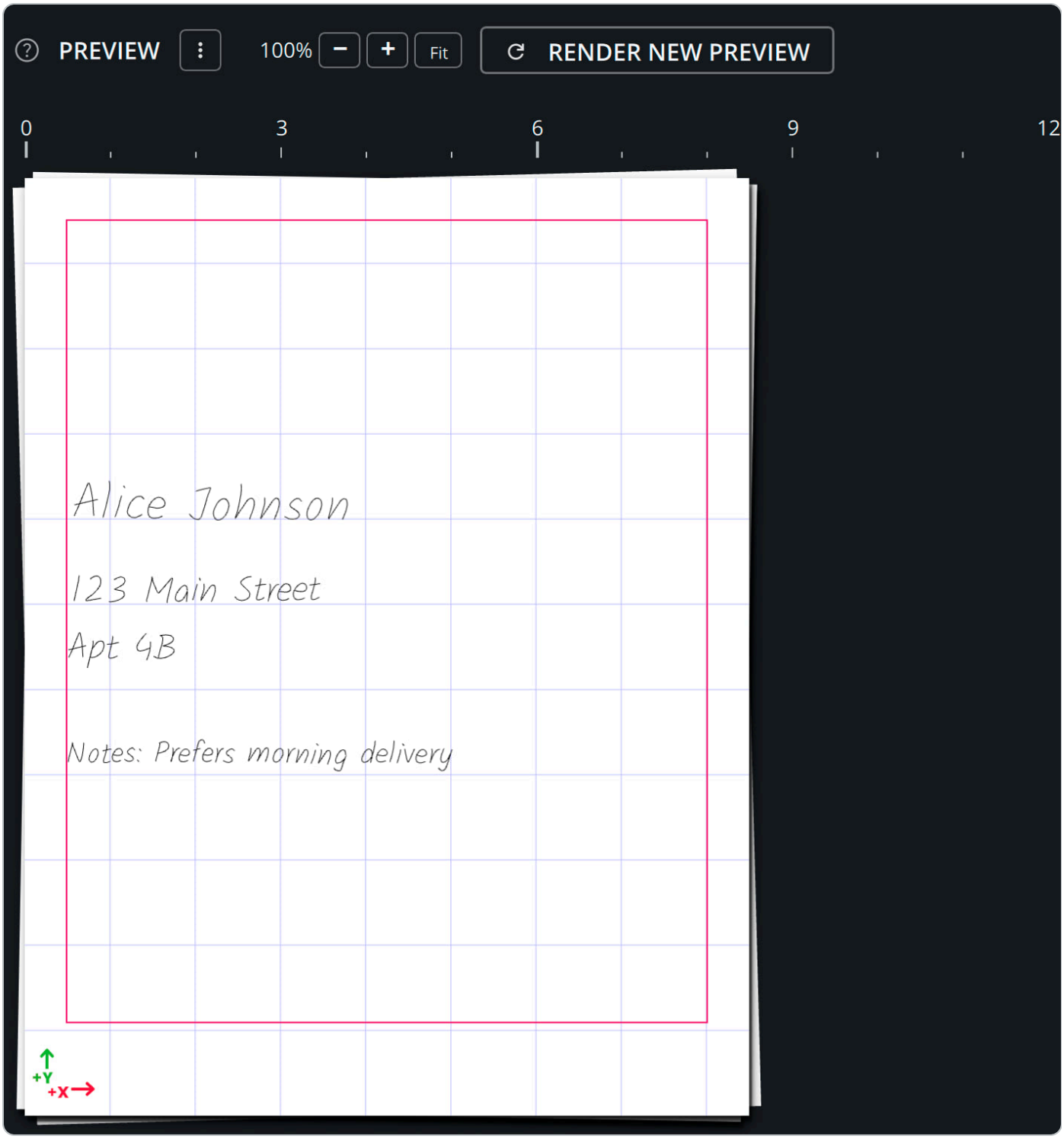
To set up a merge:

1. Write the document with merge fields where the personal details belong, and bring it into Studio. A `.txt` file, an `.rtf` file, text from the clipboard, or a designed `.svg` template all work; §27. Studio: writing text covers the first three and §30. SVG templates covers the fourth.
2. On the **TEXT** tab, confirm that **Enable Text Rendering** is on, then open the **DATA MERGE** sub-tab and turn on **Enable Data Merge**. (Default: off)
3. Click **SELECT** beside **CSV data file** and choose your CSV file. The file name appears beside the button, with a trash button to clear it.
4. Open the **CSV DATA PREVIEW** section and read its summary. It reports how many rows and columns Studio found, how many of your merge fields it matched to columns, and how many documents the batch will build.
5. Turn on **Preview merge result** to see real data in the **Preview** area instead of the raw merge fields. (Default: off)
6. Set **Start row** and **End row** to choose which rows of the CSV file to use.

The **CSV DATA PREVIEW** section now names the number of documents the batch will build, and the **Preview** area shows the first of them with real data in place of the merge fields. That count is the checkpoint: if it is not the number you expected, correct the row range or the CSV file before going on.



The template before merging, its merge fields visible



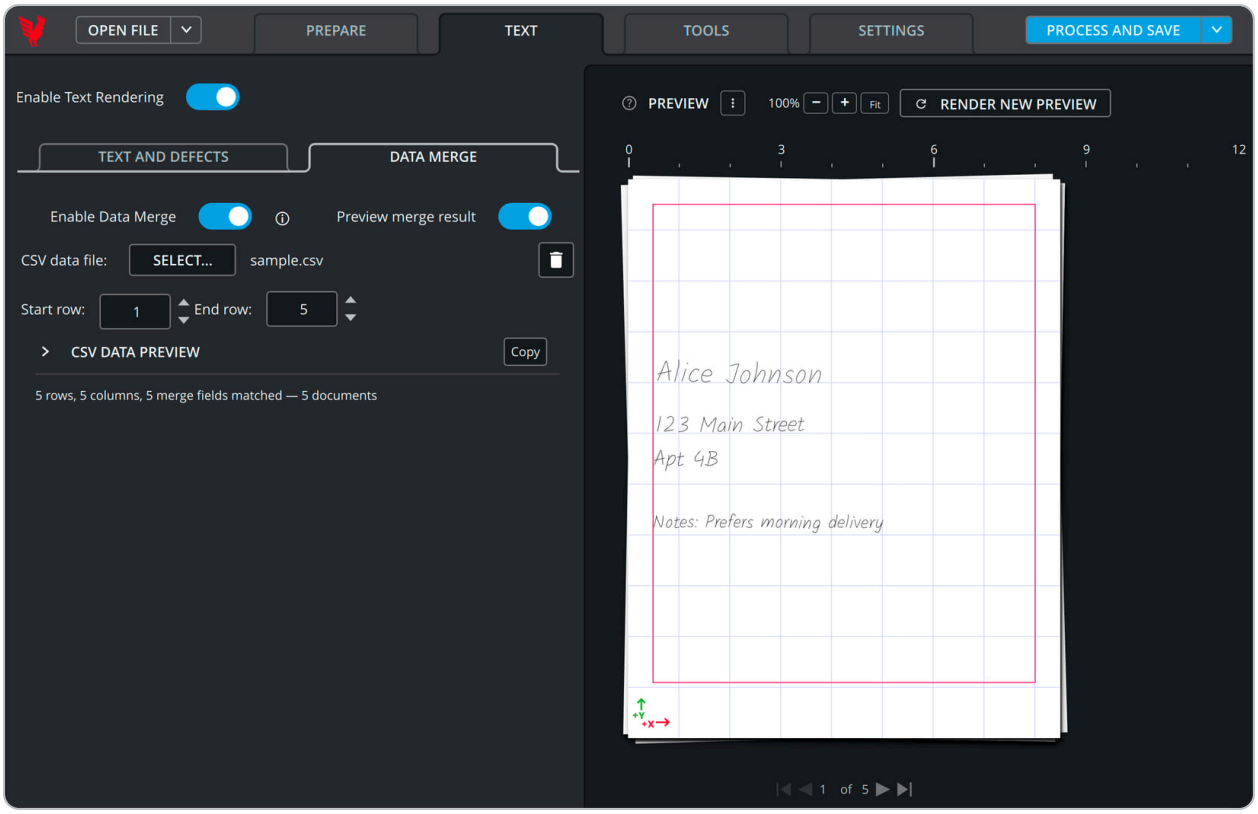
*The same document with **Preview merge result** on*

Handwriting variation is drawn separately for each merged document, so no two come out identical even where the text is. **RENDER NEW PREVIEW**, in the Preview's header, rerolls the document you are looking at and leaves the others alone. Once the batch runs to more than one document, **Re-render all pages** in the **Preview menu** rerolls every document in the merge at once.

To generate the batch:

1. Go to the **PREPARE** tab and set the paper size, the margins, the layout, the toolset, and the tool assignments, exactly as you would for any other document. See §21. Studio: the PREPARE tab.
2. Optionally, choose how the output files are named with the **Merge File Naming** setting; by default they are numbered in sequence. See §25.7 Output file names.
3. Click **PROCESS AND SAVE** and choose a folder.

Studio writes one output file per document into that folder, named according to the mode you chose.



***DATA MERGE** sub-tab with a CSV file loaded*

For a first merge, try the included sample: with no file open, click **Sample CSV** under **Samples and Generators** on the **PREPARE** tab. (If those buttons are not showing, choose **Show samples and generators** from the menu beside **Open File**.) Studio opens an address template, loads a five-row CSV file to fill it, and turns on Data Merge, so you can step through the finished documents in the Preview. A template of your own with a handful of merge fields and a few rows of data works the same way, and conditional text and future rows, described below, build on that sequence.

28.2 CSV files and merge fields

The first row of the CSV file must be a header row: a row that holds not data, but a unique name for each column. Those header names become the field names you write in merge fields. A column headed `first_name` is written in the document as `{{first_name}}`.

The columns can be in any order, which need not match the order the fields appear in your document, and you don't need to use every column. The file needs at least two columns.

> ***Tip:*** If you plan to use only one column, add a second column that numbers the rows: 1, 2, 3, and so on.

For a labeled example of a header row, a column, and a data row, see §17.2 Preparing your spreadsheet.

#	first_name	last_name	address_line_1	address_line_2	notes
1	Alice	Johnson	123 Main Street	Apt 4B	Prefers morning delivery
2	Bob	Smith	456 Oak Avenue		Regular customer
3	Carol	Williams	789 Pine Road	Suite 200	Handle with care
4	David	Brown	321 Elm Boulevard	Unit 12	Leave at front desk
5	Eve	Davis	654 Maple Lane		Birthday on March 15

*The **CSV DATA PREVIEW** table, its columns named by the CSV file's header row*

Matching ignores letter case and surrounding spaces, so a header of `First_Name` or `first_name` still fills `{{first_name}}`. It does not ignore anything else — `address2` and `address 2` are two different names, and a merge field that names a column the file does not have is reported below the **CSV DATA PREVIEW** section as a missing column (for example, `Data merge error: CSV file missing column: frist_name`) rather than filled with nothing. The signature commands `{{sig}}`, `{{sigalt}}`, and `{{siginit}}` are never reported this way, since they do not read the CSV file.

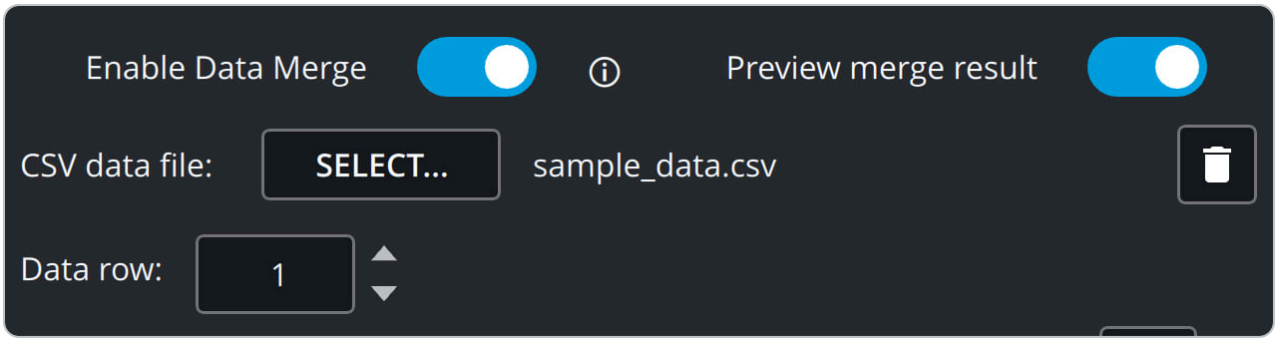
Studio also trims leading and trailing spaces from the merged values themselves. There is no toggle for this; it always runs, so a stray space at the front of a spreadsheet cell does not travel into the writing.

You can create and edit a CSV file in almost any spreadsheet application; Microsoft Excel, Numbers, Google Sheets, and LibreOffice all export CSV files. CSV is also one of the most common formats for moving data between databases and other applications, so an export from an online store or a donor database works as well. Studio reads CSV files saved in UTF-8 encoding, as most spreadsheet applications export them. A cell holding a stand-in value such as `N/A` is written out literally, as "N/A"; leave the cell empty to leave its field blank.

> ***Tip:*** Short, lowercase header names — `first_name`, `last_name`, `address1`, `address2`, `city`, `state`, `zip` — are easier to type into a template and easier to read back when a field comes out blank.

28.3 Choosing which rows to use

Start row and **End row** decide which part of the CSV file the batch draws on. They appear when one file is open; with several open at once the pair collapses to a single **Data row** field and every file merges against that one row, as §27. Studio: writing text describes. Both count data rows rather than spreadsheet rows: the header row is not row 1, the first record is. Both fields start at 1 and will not go below it, so a fresh merge begins at the first record, and you set **End row** to the last record you want. Only rows from the start row through the end row are merged, and everything outside that range is ignored.



*With more than one file open, the row range collapses to a single **Data row** field*

A template does not have to contain merge fields at all. With none, every document in the range carries the same text, and the range becomes a copy count: **Start row** 1 and **End row** 25 produce 25 copies of the same page.

This is a common way to write a batch of nearly identical pages. With Handwriting Defects on, or in a font that carries several drawings of each letter, each copy is written a little differently, as a hand would; see §27.5 Handwriting Defects and §27.4.2 Some sources of stroke fonts.

The range also lets you pick up where a run left off, or write a single record again: set **Start row** and **End row** to the rows you want.

A batch holds up to 250 documents. When a range asks for more, Studio builds the first 250, and the **CSV DATA PREVIEW** summary shows it: "250 documents (limited to 250)". For larger jobs, see §34. Troubleshooting.

28.4 Referencing future rows

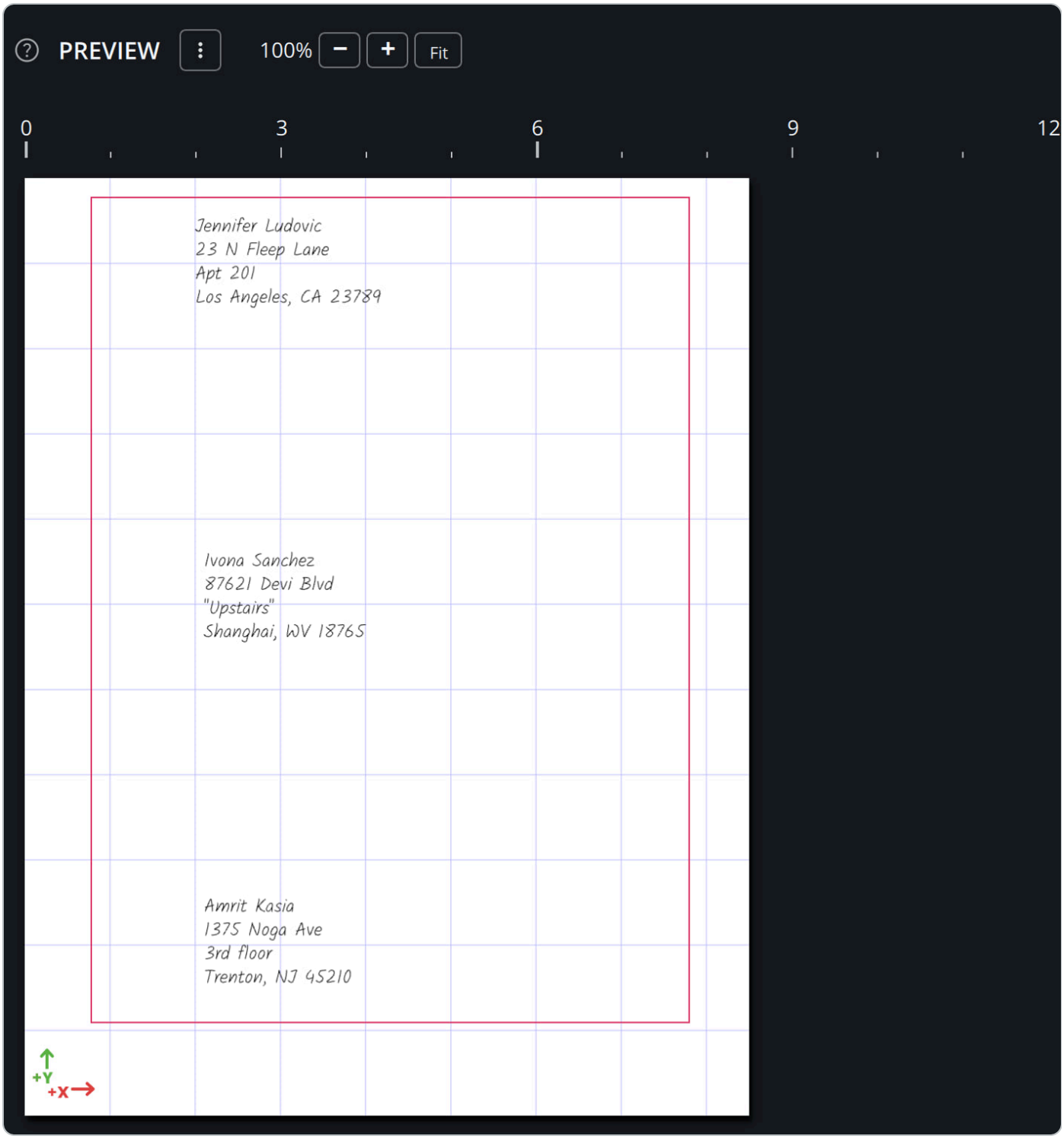
An ordinary merge uses one CSV row per generated page. Studio can also let one page draw on several rows at once, which is what a sheet holding more than one finished piece needs: two foldable 5" × 8" greeting cards on a US Letter or A4 sheet written on Bantam Tools HandWriter®, or several 4" × 6" cards on a 24" × 36" sheet drawn on an ArtFrame™. Each card wants a different recipient, and all of them are one generated page.

There are two ways to say so, and they suit different templates.

The `++` method names a row offset inside the merge field. `{{first_name}}` reads the current row, `{{first_name++1}}` reads the next row, and `{{first_name++2}}` the row after that. Three cards on one sheet, each in its own text area, begin:

```
Dear {{first_name}},
Dear {{first_name++1}},
Dear {{first_name++2}},
```

Starting at row 1, the first sheet draws on rows 1, 2 and 3; the next sheet begins at row 4 and draws on 4, 5 and 6. Each merge field states which row it reads, which makes a grid of fixed positions straightforward to check and straightforward to fix when one card comes out wrong.



One generated page holding three addresses, each merge field naming its own row

The `{{nextrow}}` method advances the row instead of naming it. Every merge field after a `{{nextrow}}` reads one row later than the merge fields before it:

```
Dear {{first_name}},
Thank you for your support.
{{nextrow}}
Dear {{first_name}},
Thank you for your support.
```

The first greeting takes the current row, `{{nextrow}}` steps forward, and the second greeting takes the next one. The template reads top to bottom as ordinary text, with no offsets to keep in your head, which is why a two-card folded layout or any sequence of identical repeated items is usually easier to maintain this way.

A sheet of address labels is the case this suits best. Every label carries the same block, ending in `{{nextrow}}`, so each one steps to the following record and a page of labels comes out of a page of the CSV file. Keep each label's fields in one text area, ending in `{{nextrow}}`: Studio steps through merge fields in the order the SVG file stores them, which can differ from their order on the page.



Four labels from a label-sheet template. Each block is identical and ends in `{{nextrow}}`, so each label takes the next record.

The label outlines in that template are ordinary artwork, so they would be drawn along with the addresses. Put guides like those on a documentation layer, named with a leading `%`, and Studio leaves them out. See §30. SVG templates.

`{{nextrow}}` is the simpler choice for most templates. Use `++` when the layout is a grid of fixed positions and you want each field to name its own row, and use one method or the other within a template.

A page is built only when all the rows it draws on exist, so leftover rows at the end of the file are skipped. With a sheet of three labels per page and a CSV file of five addresses, Studio builds one page holding the first three

addresses, and skips the last two. The summary under the **CSV DATA PREVIEW** section names them: **Rows 4–5 are not used; each document uses 3 rows.** The same summary gives the document count, where each sheet is one document, and the last document in the **Preview** shows the final addresses the batch will write.

28.5 Conditional text

Some fields are filled for some records and empty for others: a company name, a second address line, a suite number, an attention line, a membership year, a donation amount, a custom note. Conditional text lets you attach words to such a field so that the words appear only when the field has data.

The pattern puts the extra text in double square brackets, inside the merge field, before or after the field name:

```
{{[[text before]]field_name[[text after]]}}
```

So `{{[[Dear ]]First}}` writes `Dear Abigail` when `First` holds `Abigail`, and writes nothing at all — not even the word `Dear` — when `First` is empty. Text after the field works the same way: `{{memberyears[[ years as a member]]}}` writes `5 years as a member` when the field holds `5`, and stays silent when it does not.

The brackets and the field name share one pair of double braces, so write `{{[[Dear ]]First}}`, not `{{[[Dear ]]{{First}}}}`. A merge field inside another is reported as a missing column, with a reminder of how to write it.

The same brackets can carry a line break. `\r` stands for a return, and it can appear in fixed template text as well as in conditional text. It is how a field inserts a line break without the CSV cell having to visibly contain multiple lines — the break lives in the template, where you can see and edit it, rather than inside a spreadsheet cell:

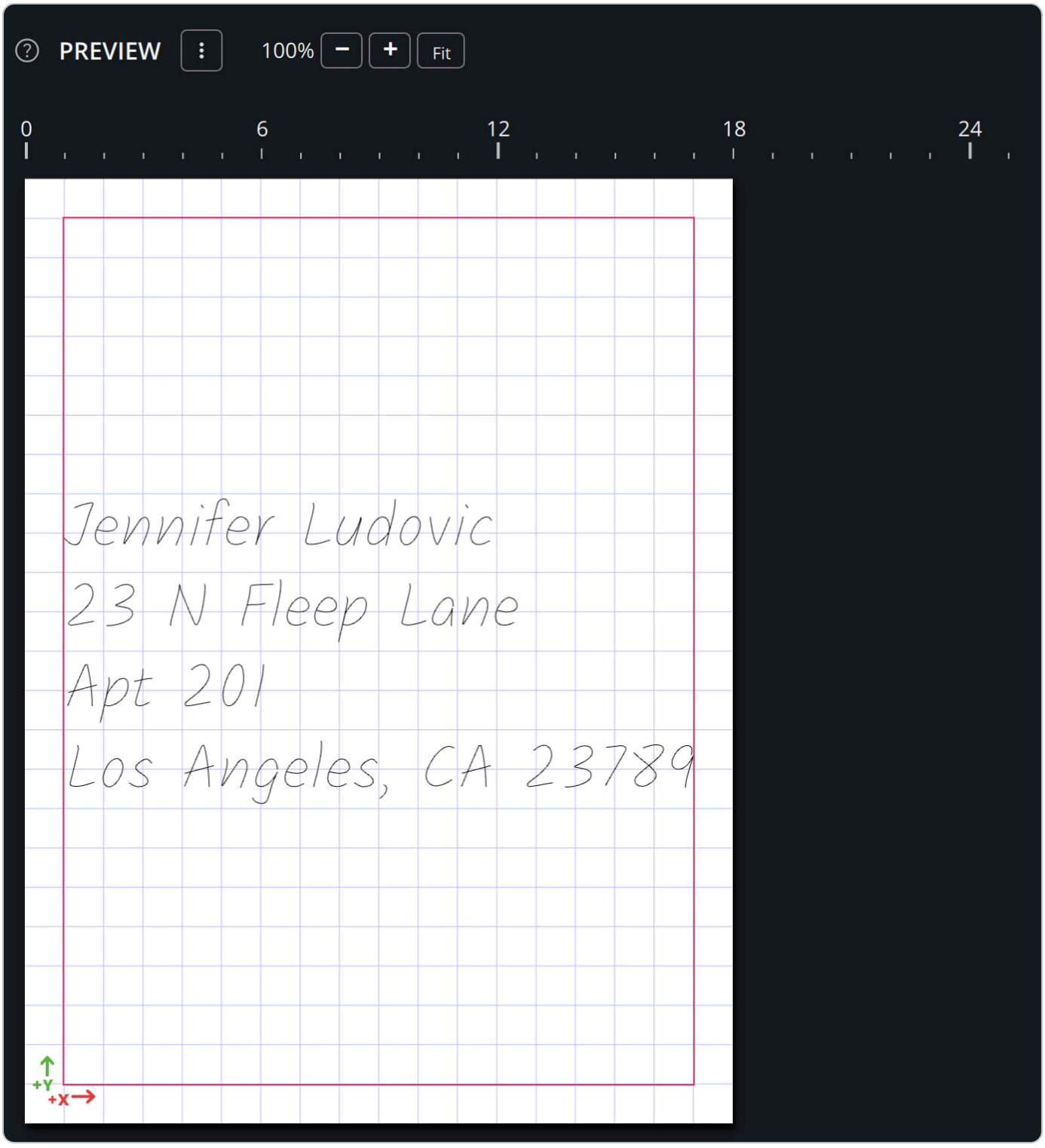
```
{{First}} {{Last}}\r{{Address1}}\r{{City}}, {{State}} {{zip}}
```

> ***Note:*** To write a literal `\r`, for example in `C:\reports`, put the backslash in double curly braces: `C:{{\}}reports`. This special case keeps the backslash from turning into a return. `{{\}}` is not a merge field, since a lone backslash can't be a column name, so it needs nothing in the CSV file.

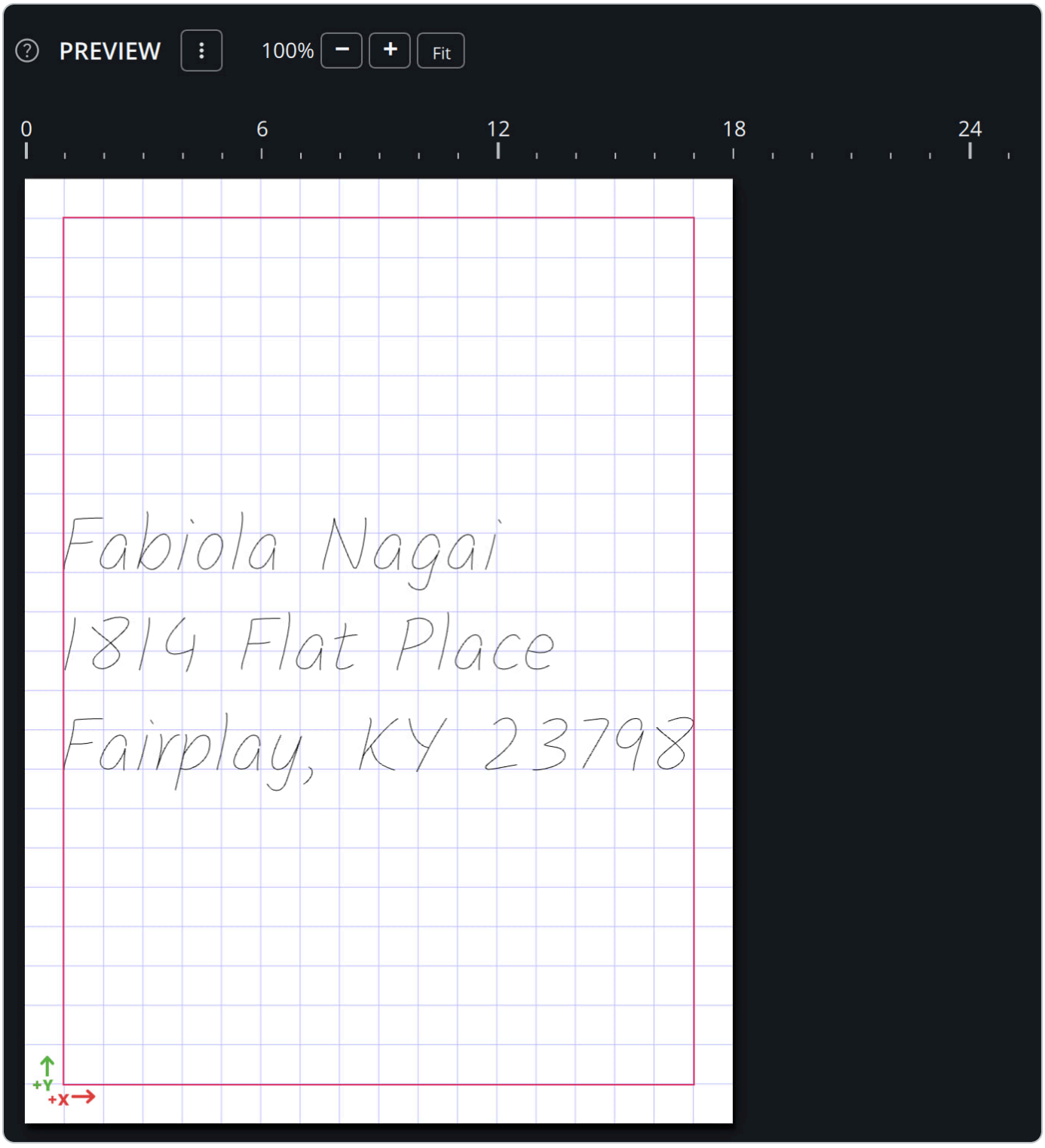
Combining the two solves the classic address-block problem. An optional second address line written plainly leaves an empty line whenever it is blank. Attach the return to the field instead:

```
{{Address1}}{{[[\r]]Address2}}
{{City}}, {{State}} {{zip}}
```

Now the return and the value arrive together or not at all, and a record with no second address line closes up cleanly. A block that handles both personal and company addresses extends the same idea:



One address template, drawn for a record that has a second address line



The same template for a record with none: the line and its return are both absent

```
{{company[[\rAttn: ]]}}{{First}} {{Last}}
{{Address1}}{{[[\r]]Address2}}
{{City}}, {{State}} {{zip}}
```

Two conditional elements are at work. The first puts a return and `Attn:` after a company name, but only when there is a company name. The second puts a return before the second address line, but only when there is one, so a record without it does not leave a blank line behind.

The same three lines of template can therefore come out as different as these:

```
Ruth Okonkwo                    Harbor Line Supply
1140 Ferry Street               Attn: Ruth Okonkwo
Portland, ME 04101              1140 Ferry Street
                                Building 4
                                Portland, ME 04101
```

28.6 Data Merge with multipage documents

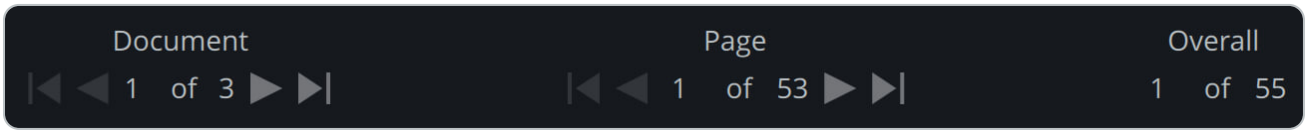
Data Merge produces one document per CSV row, and **Use multiple pages** runs one document across as many pages as its text needs. Turn on both and they combine: each merged document flows onto its own run of pages, and the job becomes a grid of documents and pages rather than a single stack of sheets. Overflow behavior is set in §27.6 Font size, spacing, and overflow, and flowing is described in §27.7 Multipage layout.

Studio paginates each document separately, so they will rarely come out the same length. A row whose text runs long produces a four-page document; the row after it may produce one page. Nothing pads a short document out to match a long one.

> *Note:* The **CSV DATA PREVIEW** section's summary counts documents, not sheets of paper. If your documents flow onto multiple pages, refer to the page count in the page navigator below the **Preview**.

The preview navigator gains a second axis for this combination, and shows three controls instead of one:

- **Document** — moves between merged documents, one CSV row each.
- **Page** — moves between the pages of the document you are on. Stepping past the last page carries you into the next document rather than stopping, so the two controls together walk the whole job in order.
- **Overall** — shows where you are in the job as a whole. While Studio is still flowing the documents, the total is an estimate, and it settles when flowing finishes.



*The navigator's **Document**, **Page**, and **Overall** controls*

Both counts carry a tilde while Studio is still flowing. The **Page** count settles first, for the document you are on, and the **Overall** count settles once every document has been flowed to its end.

RENDER NEW PREVIEW rerolls the document you are looking at and leaves the rest alone, so you can redraw a document whose variation you dislike without disturbing a batch you have already approved. **Re-render all pages**, in the **Preview menu**, rerolls every document in the job.

The 100-page limit applies to each document separately rather than to the job as a whole. One over-long row stops that document at page 100 and blocks generation until it fits; the other documents are unaffected. The job carries its own limit of 2,500 pages in total, and that one behaves differently: Studio builds as many whole

documents as the budget allows, drops the rest, and reports how many it built, rather than refusing to generate. (If your work runs up against either limit, contact us at support@bantamtools.com.)

Output is named document first, then page: a merge of `Letter` over a column of names produces `Letter_Alice_p1`, `Letter_Alice_p2`, `Letter_Bob_p1`, and so on. The document suffix follows the **Merge File Naming** setting, and the page suffix is always `_p` and the page number. Setup Sheets come one per document, from its first page, rather than one per page — the sheets for the pages of a single document would otherwise be near-identical. See §25.7 Output file names.

28.7 Generating a batch

A merge batch generates the same way any other job does, through **PROCESS AND SAVE** and the folder you choose when it starts.

Before you generate, step through the documents in the Preview with **Preview merge result** on. Look at a record with its optional fields filled and one with them empty, and at the one with the longest name or address. Then generate the batch, and write the first sheet on the machine before you write the rest: it shows the fit and spacing with the pen and paper you will use.

For sending the finished files to a machine over microSD, USB, or WiFi, see §15. Sending files to your machine. For the export formats **PROCESS AND SAVE** can produce and the Setup Sheets that come with them, see §25. Studio: exporting output.

> ***Tip:*** Save a production merge as a project. The project keeps the template, the CSV file, and the settings together, so the next run of the same job starts where this one left off; see §25.4 Project files.

29. Using your own G-Code

The Bantam Tools HandWriter® runs G-Code, and it does not care which program wrote it. Bantam Tools Studio™ is one source of G-Code; a text editor, a script, or a third-party tool is another. This chapter is the reference for that second case: what the firmware accepts, what it ignores, what it rejects, and what a file has to contain to run.

Keeping every move inside the machine's working area is your file's responsibility. Studio does that for its own output; the travel figures for each axis are under Limits and common errors, below.

> ***Tip:*** Generate a file for a job in Studio, then open it in a text editor. It is the fastest way to see which commands the machine is given in practice, in what order, and with what values.

29.1 What the machine reads

A G-Code file is a plain text file, one command per line. The machine runs files whose names end in `.gcode` or `.nc`, and it lists no other file in its browser.

How the file reaches the machine — a microSD card, a USB cable, or WiFi — makes no difference to how it runs; see §15. Sending files to your machine. Browsing the card and starting a file at the display are covered in §10. The HandWriter interface.

29.2 Units

The firmware works internally in millimeters and in millimeters per minute, whatever a file says. `G21` selects millimeters for the numbers in the file and `G20` selects inches. Millimeters are the default at power-up, and a `G20` stays in force after its file ends, so a file should state its units with `G21` or `G20` rather than rely on the default.

An `F` word sets the feed rate in current units per minute. `G94`, the default, reads `F` that way; `G93` reads it as inverse time. A `G1`, `G2`, or `G3` move made before any feed rate has been set fails with an undefined-feed-rate error and stops the file, so set `F` before the first move at feed rate. Once set, the rate carries forward, and a later move needs an `F` word only to change it.

An `F` larger than the machine's configured maximum rate is quietly clamped to that maximum rather than refused, and `F0` is not applied: the log records it, and the previous rate stays in force.

29.3 The coordinate system

The machine uses a right-handed coordinate system, with Z pointing up away from the work surface. Z 0 is the bottom of the pen lift's travel and larger Z values raise the pen. Where the pen actually touches the paper depends on how far down you install it, not on a fixed Z value.

The axes are:

- **X** — the pen's position across the work area, in millimeters.
- **Y** — paper travel, in millimeters. The writing advances down the page as the paper moves.
- **Z** — the pen lift, in millimeters.

The ranges of travel are:

- **X** — about 0 – 216 mm.
- **Y** — about 297 mm of paper travel. The Y axis has no limit switch and does not home, so its zero is set by the file once the paper is loaded rather than found by homing. See "Setting the origin", below.
- **Z** — 0 – 6 mm, with 6 mm at the top of the lift's travel.

Y increases up the page from the bottom left corner of the sheet, with 0 at the bottom edge and the height of the paper at the top. Keep writing at least 25.5 mm above the bottom edge, where the rollers hold the sheet, and 3 mm inside the other three edges.

These figures come from the machine's configuration file; the **Version** screen shows which configuration is installed (see §10.11 The Settings menu).

Coordinates are machine coordinates unless you change them. The machine starts in `G54`, whose offsets are zero by default, so a plain `G0 X0 Y0` goes to the machine's own zero. `G53` uses machine coordinates for the one line it appears on. `G92` sets a temporary offset, which lasts until `G92.1` clears it or the machine restarts. `G10 L2` stores an offset in flash memory, where it survives a restart; see §29.5 Setting the origin.

`G90` selects absolute positions and `G91` selects positions relative to the last one. `G90` is the default, and it is the safer of the two in a file written by hand, since one bad relative move shifts everything after it.

29.4 Homing and where a file starts

The machine homes when it needs to, either because you selected **Home** at the display or because you started a file on an unhomed machine. A file therefore does not need to home itself, and a file that begins with `$H` will home a second time.

Homing runs the Z axis first, raising the pen away from the paper, then X. The paper axis does not home at all: the machine takes the paper's position at power-up as its zero. Z homes away from the paper so that the pen cannot draw a line across your page while the machine finds its position.

Homing leaves the machine knowing where it is, and nothing else: it does not move to the start of your artwork. The first move in your file decides that.

29.5 Setting the origin

Two commands set where a file's coordinates start, and both work on your machine.

`G28.3` tells the machine where it is without moving it. Give it an axis and a value, as in `G28.3 Y0`, and the machine takes its present position on that axis to be that value. It is how a file declares an origin that no limit switch can find.

`G10 L2` stores a work coordinate offset, and `P1` chooses the first one, which is `G54`. `G10 L2 P1 X0 Y-193.4 Z0` puts the G54 origin at that point in machine coordinates, and every move after a bare `G54` is measured from there. This is how the work area is placed without moving the machine, and it is used widely: it is what puts a file's origin at the corner of the paper.

Use `G53` on any single line that should ignore the offset and move in machine coordinates instead. A stored offset outlives the file that set it, so a later file that assumes `G54` is zero will be wrong unless it sets the offset itself.

Each `G10 L2` that changes an offset writes the new value to the machine's flash memory, and flash wears with repeated writes. Set the origin with `G10 L2` once, at the top of the file, with the same value on every run, as

Studio's files do; a repeated `G10 L2` with an unchanged value writes nothing. For an offset that changes while a file runs, use `G92`, which is held in working memory and never written to flash.

This is what makes the HandWriter's page coordinates work. Each file sets the origin from where the paper is loaded. Paper is loaded with its top edge against the paper setup backstop, which puts the pen 86 mm below that edge. `G28.3 Y0` names that position machine Y 0. The bottom left corner of the sheet is then at minus (paper height − 86) in machine Y, and `G10 L2 P1` puts the G54 origin there. Write the number, worked out in advance:

```
; US Letter, 279.4 mm tall: 279.4 - 86 = 193.4
G28.3 Y0
G10 L2 P1 X0 Y-193.4 Z0
G54
```

```
; A4, 297 mm tall: 297 - 86 = 211
G28.3 Y0
G10 L2 P1 X0 Y-211 Z0
G54
```

After these lines, X and Y are both 0 at the bottom left corner of the sheet, with X increasing across the page, Y increasing up it, and Z up away from the paper. `G1 X20 Y50` is 20 mm from the left edge and 50 mm up from the bottom edge. Studio's own files set the origin this way. For another paper size, find the `G10 L2 P1` line under "Paper-load coordinate setup" in a file Studio made for it.

We recommend ending a file by returning to where it began:

```
G53 G0 X0 Y0
```

This rolls the sheet back to where it was when `G28.3 Y0` ran. The paper is in its loaded position again, so the same file can run a second time without reloading. Studio's files end this way by default.

29.6 Commands the firmware accepts

The firmware is a Bantam Tools fork of FluidNC, the open-source controller firmware, and it inherits FluidNC's parser. Unmodified FluidNC is not supported on the HandWriter.

Commands fall into two groups. The recommended commands are the ones Studio itself writes, so every job generated in Studio runs them. Machine-years of use, in many different circumstances, are what build our confidence in this group. The second group is the rest of what the firmware accepts. We expect these to work well, but they are not part of Studio's output, so they do not have the same machine-years of testing behind them.

29.6.1 Recommended commands

- `G0` — move at the rapid rate, for pen-up travel.
- `G1` — move at the feed rate set by `F`.
- `G2` and `G3` — clockwise and counterclockwise arcs, with `R` giving the radius.
- `G4` — dwell, for the time in seconds given as `P`.
- `G20` and `G21` — units, inches and millimeters.

- `G10 L2` — store a work coordinate offset, with `P` choosing which one. See "Setting the origin", below.
- `G28.3` — set the machine's idea of where it is, without moving. See "Setting the origin", below.
- `G53` — machine coordinates, for the one line it sits on.
- `G54` through `G59` — select a stored work offset. Studio uses `G54` for the work area.
- `G90` and `G91` — absolute and relative positions.
- `G92` — set a coordinate offset.
- `M0` — pause (see Pausing a file, below).
- `M2` and `M30` — end of program.
- `F` — feed rate.
- `N` — a line number, which the firmware accepts and ignores.

Arcs are cut into short straight segments before they reach the motors. Studio writes them with `R`, the radius form. Arc centers, where you give them, are always relative to the arc's start point, which is the `G91.1` convention; `G90.1`, absolute arc centers, is rejected, and G-Code written with absolute arc centers will not run.

Studio's output is always in millimeters, whichever units the interface is displaying, and the file says so: the preamble writes `G21` alongside `G90`. State your own file's units the same way, with `G21` for millimeters or `G20` for inches.

29.6.2 Other commands the firmware accepts

Several of these refer to hardware your machine does not have, such as spindles, coolant, probes, and tool length offsets, and have nothing to act on here.

- `G2` and `G3` with `I`, `J`, or `K` — arcs given by their center rather than a radius.
- `G17`, `G18`, `G19` — plane selection, for arcs.
- `G28`, `G28.1`, `G30`, `G30.1` — go to and record a predefined position.
- `G38.2` through `G38.5` — probing, and only where a probe pin is configured.
- `G40`, `G43.1`, `G49` — cutter compensation and tool length offset.
- `G61` — exact path mode, which is the only mode, so it does nothing.
- `G80` — cancel motion mode.
- `G91.1` — relative arc centers.
- `G92.1` — clear a coordinate offset.
- `G93` and `G94` — inverse-time and units-per-minute feed modes.
- `M1` — optional stop. The firmware parses it and does not stop.
- `M3`, `M4`, `M5` — spindle control, with `S` for speed.
- `M6` — tool change, with `T` for the tool number. Nothing moves and nothing pauses: the tool-change prompts you see on the display come from comments instead, not from `M6`.
- `M7`, `M8`, `M9` — coolant control.
- `M56` — restore parking motion.
- `M62` through `M65` — digital output control, with `E` for the pin number.
- `M67` and `M68` — analog output, with `E` and `Q`.

Canned cycles, cutter radius compensation, subroutines, variables, and expressions are not implemented, nor is the `%` program delimiter. A file that relies on any of them will not run.

> ***Aside:*** Studio writes `M5` (spindle stop) before `M2` at the end of every file. It has no practical effect on your machine, but it is a normal part of the end-of-job boilerplate on CNC machines.

29.6.3 Anything else

A G or M word the parser does not recognize is an unsupported-command error. The firmware logs it, naming the file and the line, and then carries on with the next line, because a file that stops dead on one stray command is worse than one that skips it. Every other kind of error stops the file where it stands; see Limits and common errors, below.

29.6.4 Dollar commands

The firmware's own commands begin with `$` and are normally typed into a terminal over USB rather than put in a file. A line beginning with `$` inside a G-Code file is run as a `$` command all the same. The useful ones:

- `$H` — home every axis that has a homing cycle. `$HX`, `$HY`, and `$HZ` home one axis, where that axis homes at all.
- `$X` — clear an alarm.
- `$$` and `$S` — list the machine's settings.
- `$#` — report the stored coordinate offsets.
- `$G` — report the parser's current modes.
- `$I` — report the firmware version and the machine's name. It answers even while a file runs.
- `$Limits` — report each axis's limits.
- `$J=` — jog, as a one-off move that does not disturb the parser's modes.
- `$C` — toggle check mode, which parses a file without moving.
- `$E` and `$A` — list the error and alarm codes the firmware can report.
- `$SD/List` and `$SD/Run=` — list the microSD card and start a file on it.
- `$Help` — list every command.

`$RST=` restores settings and `$NVX` erases them. Both are recovery tools, and the display's **Reset Factory Settings** is the route we document for owners; see §10.11.8 Factory reset.

29.7 Comment-syntax commands

A comment is text in parentheses: `( like this )`. Comments are stripped before the line is parsed, so a comment may sit on a line of its own or follow a command on the same line. A semicolon also begins a comment, which runs to the end of the line.

A handful of comments are commands. The firmware reads the start of each parenthesized comment and acts on the ones it recognizes; every other comment is ignored, with no error. These commands exist only in the Bantam Tools fork of FluidNC.

Three rules govern all of them:

- They are case-sensitive. `( CLEAR )` works and `( clear )` does not.
- They must be in parentheses. The semicolon form is a comment to the parser but is never read as a command, so `; Install Tool: 1` does nothing at all.
- Where the form includes a colon, the colon is required. `( Park Height 5 )` is an ordinary comment.

Leading and trailing spaces inside the parentheses are fine, and are how our own output is written.

29.7.1 Display and pause instructions

These set the text the display shows. Tool-change prompts and what you do with them are described in §10.7 Tool-change prompts; the syntax is here.

- `( ## text )` — holds `text` and shows it at the next `M0`.
- `( Install Tool: text )` — shows the whole comment, beginning with `Install Tool`, at the next `M0`. The colon is optional in this one form, and any text may follow.
- `( Toolchange text )` — shows the whole comment, beginning with `Toolchange`, at the next `M0`.
- `( CLEAR )` — clears the display's instruction. This one must be exact: nothing may follow `CLEAR` inside the parentheses.
- `( !! text )` — shows `text` at once rather than waiting for a pause, for about ten seconds.
- `( MSG text )` — writes `text` to the machine's log and shows nothing. A colon may replace the space.

An instruction longer than 64 characters is cut off and ends with an ellipsis, and only about 40 characters fit on the display at once. The instruction Studio puts in front of each tool change is also sent to Studio's **MACHINE** tab, which shows it while the machine waits.

The usual order is the instruction, then `M0`, then `( CLEAR )` once the pause is over.

29.7.2 Park height

`( Park Height: 5.25 )` sets how far the pen lift retracts when a job is paused, in millimeters above the bottom of Z travel. This is the same setting as **Pen Parking Height** in Studio's G-Code generation options; see §21.11 G-Code generation options.

The value must be at least zero and no more than the Z axis's travel, which is 6 mm. A value outside that range is not applied, and neither is a value the firmware cannot read as a number; the log records a warning, and the previous value stays in force.

`( Install Height: )` is accepted as a synonym.

29.7.3 Acceleration

`( Accel: 2000 )` sets the acceleration of the X and Y axes, in mm/sec^2. A single axis takes a letter: `( AccelX: 2000 )`, `( AccelY: 2000 )`, or `( AccelZ: 2000 )`.

A file may only lower acceleration. The value must be at least 10, and it may not exceed the ceiling the machine's configuration sets for that axis; a request above the ceiling is refused rather than trimmed to fit, and the refusal is logged with the value, the axis, and the ceiling. The two-axis form is all or nothing, so `( Accel: )` either applies to both axes or to neither, and never leaves the two mismatched.

An acceleration a file sets lasts until the end of that job. `M2` or `M30` restores the configured values, so the next file starts from the machine's own settings whatever the last one did.

29.7.4 Firmware version notice

`( FW: 2.10.13 available )` names the newest firmware Studio knew of when it wrote the file. If the machine's firmware is older than that version, the display briefly shows that a newer version is available (at bantam.tools/fw) at most once per power cycle; the file then runs as usual, delayed only by a couple of seconds.

> ***Tip:*** This guide describes the firmware as it was when the guide was written. If your firmware is older, particularly if it is older than 2.10, you may find quite a few features missing, including the firmware version check, and we highly encourage you to update (bantam.tools/fw).

29.8 Pausing a file

`M0` pauses the file. Buffered moves finish first, so the machine comes to rest where the file last told it to go, and the pen lift is left where it is rather than retracting. That is what makes `M0` usable for a tool change: put the pen lift at the height you want to work at, then pause.

The display shows **Click to RESUME** and **HOLD to CANCEL**, or the instruction a comment supplied in place of them. A press of the knob resumes; a press and hold cancels. This is the same pause the knob produces, and §10.6 Pausing, resuming, and canceling covers both.

A pause you request at the display, by contrast, does retract the pen lift to its park height, so that the pen is clear of the work while you attend to it.

`M1`, the optional stop, is parsed and ignored. It does not pause anything.

29.9 A typical startup routine

A file's first few lines put the machine in a known state and give you a chance to install the pen. A minimal version reads:

```
G21
G90
G0 Z3
( Install Tool: 1. Layer: Neutral Gray )
G0 X0 Y0
M0
( CLEAR )
```

Line by line:

- `G21` sets millimeters, so the file does not depend on what ran before it.
- `G90` sets absolute positions, so every coordinate that follows is measured from the machine's zero. Studio's files set both `G21` and `G90` in their first few lines.
- `G0 Z3` raises the pen lift to 3 mm, clear enough of the paper to install a pen without dragging it.
- The `Install Tool` comment supplies the text the display will show at the pause. Edit it to say whatever is useful.
- `G0 X0 Y0` moves to the machine's zero. Z stays at 3 mm, since the line does not mention it.
- `M0` pauses. Install the pen and press the knob to go on.
- `( CLEAR )` clears the instruction from the display now that the pause is over.

From there, set a feed rate and start writing. Lower the pen with a `G1` Z move, run the strokes, raise it again, and close the file with `M2` or `M30`.

29.10 File requirements

A file the machine will run through to the end has four properties.

It ends with `M2` or `M30`. The end-of-program marker is how the firmware knows the file is complete rather than truncated, and it is also what restores the machine's configured acceleration and park height after a job

that changed them. A file that ends cleanly without a marker still runs to the end and is still marked complete, but the display holds **File ended without end marker** until you press the knob.

Its last line ends with a line break. A file whose final line is cut off mid-command is treated as truncated: that partial line is not run, the display shows **File ended unexpectedly**, and the file is not marked complete. This is usually the sign of an interrupted copy rather than a mistake in the file. See §10.8 The post-run screen.

Its lines are under 255 characters. The firmware reads each line into a fixed buffer, and a longer line stops the file with a line-length error. Ordinary G-Code lines are nowhere near this, but a long comment, or a single line holding a whole path, can reach it.

Its line endings are `LF` or `CRLF`. These are the line endings every modern operating system writes, so a file saved on Windows, macOS, or Linux runs as it is.

Its text is ASCII or UTF-8. Plain ASCII is recommended. UTF-8 characters in comments are passed to the display as written, and a file saved as UTF-8 runs the same as an ASCII one.

File names and where files live on the card are covered in §15. Sending files to your machine, and browsing them at the machine in §10. The HandWriter interface.

29.11 What Studio writes

Reading a generated file beside your own is the quickest way to see what a working file looks like on your machine.

Every generated file opens the same way, whatever the job. A block of `;` comment lines records the Studio version, the file name, the date, the target machine, the media size, and the work offset in use, and the setup lines follow:

```
G10 L2 P1 X0 Y0 Z0
G90
G21
G54
```

For each tool, a HandWriter file also records `Pressure depth:`, the tool's setting; `Install base Z:`, the height the pen is installed at when Pressure Depth is 0; and `Escape margin:`, how far below the paper the pen's lift drops while writing, so that only the spring presses the pen. Studio sets the last two for the machine and shows them nowhere else, and you do not need to change them.

`G10 L2 P1` places the G54 work origin and `G54` selects it, both covered in §29.5 Setting the origin. `G90` selects absolute positions and `G21` selects millimeters. The first tool's instruction comment and its park-height raise come next, and the strokes after that.

The rest of the output reflects the settings in the **PREPARE** tab's G-Code generation options, so the same job can produce quite different G-Code:

- **Use Curves** decides whether curves become `G2` and `G3` arcs or many short `G1` segments.
- **Disable Rapids** and **Disable Rapids in Z** replace `G0` moves with `G1` moves at a controlled feed rate.
- **Split Long Moves** breaks a long move into shorter ones.
- **Pen Parking Height** sets the `( Park Height: )` value.
- Each tool change becomes an instruction comment, an `M0`, and a `( CLEAR )`.

Those options are described in §21.11 G-Code generation options, and what each export format holds in §25. Studio: exporting output. The Setup Sheet that follows a G-Code export lists the feed rates, accelerations, and heights the file was built with, which makes it a useful crib when writing your own; see §25.5 Setup Sheet.

29.12 Limits and common errors

Three outcomes are worth knowing:

- **An unsupported G or M word** is logged and skipped, and the file keeps running. It is the one error that does not stop a job.
- **Any other error** — an undefined feed rate, a line too long, two commands from one modal group on a line, an arc whose geometry does not close — stops the file at that line. The display offers **Run Again**, which starts the file from the beginning rather than from where it stopped.
- **A value a comment command cannot use** is not applied. The machine's log records a warning, and the file keeps running with the previous value.

The machine's log is where every one of these is recorded, with the file name and the line number. Studio's **MACHINE** tab shows the log for a connected machine; see §24. Studio: the MACHINE tab.

If a file of your own does something you cannot account for, please contact technical support. Send us the file along with what the machine did, and we can read it with you.

Part IV: Appendices

30. SVG templates

Read this appendix before designing a template in Inkscape or another vector editor.

30.1 Deciding whether you need a template

An SVG template is a reusable page layout — fixed artwork, branding, and text areas already in position — that you build in a vector editor and then open in Bantam Tools Studio™. Studio is not a design tool, so a template is how a designed page reaches it.

Most documents do not need one. Opening a `.txt` or `.rtf` file with **OPEN FILE**, or bringing copied text in with **Open from Clipboard**, is the fastest way to write a page: you bring the text in, choose a handwriting font, and use the **PREPARE** tab to lay the document out with margins, **FIT TO MARGINS**, **CENTER**, scale, offsets, overflow behavior, and manual dragging in the Preview. When the text is a single block on the page, as it is in most notes and letters, this is an excellent workflow. If that describes your document, you can skip this appendix and go to §27. Studio: writing text instead.

The short version of the distinction: use a text document when you are composing, and use a template when you are designing a finished page. A template moves the layout decisions ahead of Studio — you choose where the text sits, where the artwork goes, and how the page is structured — which is more control and, in exchange, more preparation.

Reach for a template when any of these is true:

- The page carries a logo, letterhead, border, or other fixed artwork on every copy.
- The text must sit in a particular place on the page, such as an address block positioned for a window envelope.
- The design is finished and has to come out the same from one document to the next, including for other people on your team.
- The piece is an invitation, certificate, award, form, or card whose layout is the point.
- The page has several independent text areas rather than one block of copy.

Templates also work with Data Merge — putting merge fields such as `{{first_name}}` in the template and producing a batch of personalized documents from a CSV file. See §17. Writing letters with Data Merge.

30.2 Choosing an editor

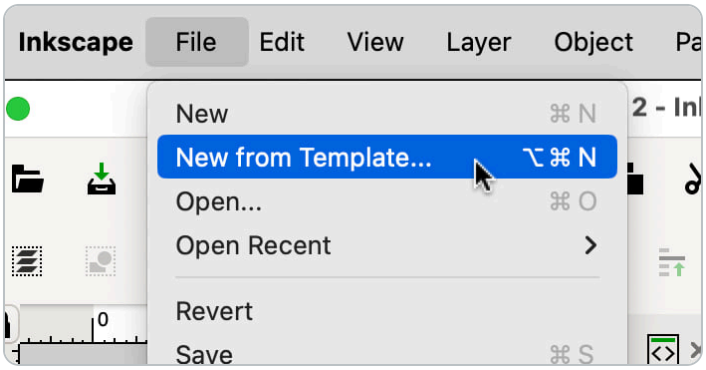
We recommend Inkscape. It is free to use, it runs on macOS, Windows, and Linux, and its text tools, simple as they are, match the kind of text formatting that works well in a Data Merge template. Adobe Illustrator and other vector editors work too.

30.3 Setting the document size

Set the document size before you design the layout, so the page in your editor matches the page you will write on. Positioning text, logos, and signatures against the wrong page size is work you will do twice.

In Inkscape, open the template chooser and pick the paper size that matches your intended output:

File → New from Template



New from Template *on Inkscape's* ***File*** *menu*

Use US Letter or A4.

Leave enough margin around the design for the machine to feed and write safely. The bottom of the page needs particular attention: keep important text, artwork, borders, and signatures clear of the 28 mm bottom margin, which is larger than the other three and is the space the Bantam Tools HandWriter® needs to hold, feed, and present the sheet.

> *Tip:* In Inkscape, **View → Zoom → Zoom Page** fits the whole page in the window while you work.

30.4 Creating text areas

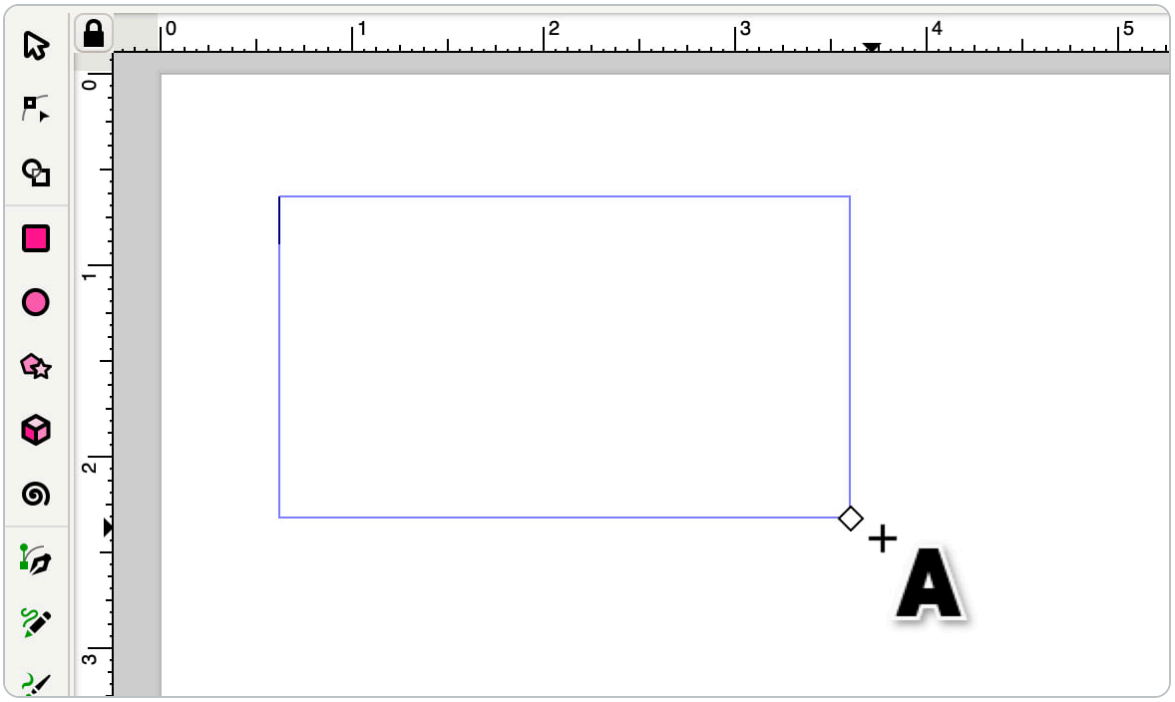
Text areas are made with Inkscape's Text tool. Click the Text tool icon in the toolbar, press `T`, or press `F8`; when the tool is active, the cursor changes from an arrow to a text-entry cursor. A text area created this way can hold ordinary text, merge fields, or both.

Inkscape makes two kinds, and the difference is simply this: flowed text wraps onto the next line by itself when a line gets too long, and regular text does not. Flowed text suits anything made of sentences, and anything you want to be certain will not run off the edge of the sheet. Regular text suits anything whose shape you are setting yourself.

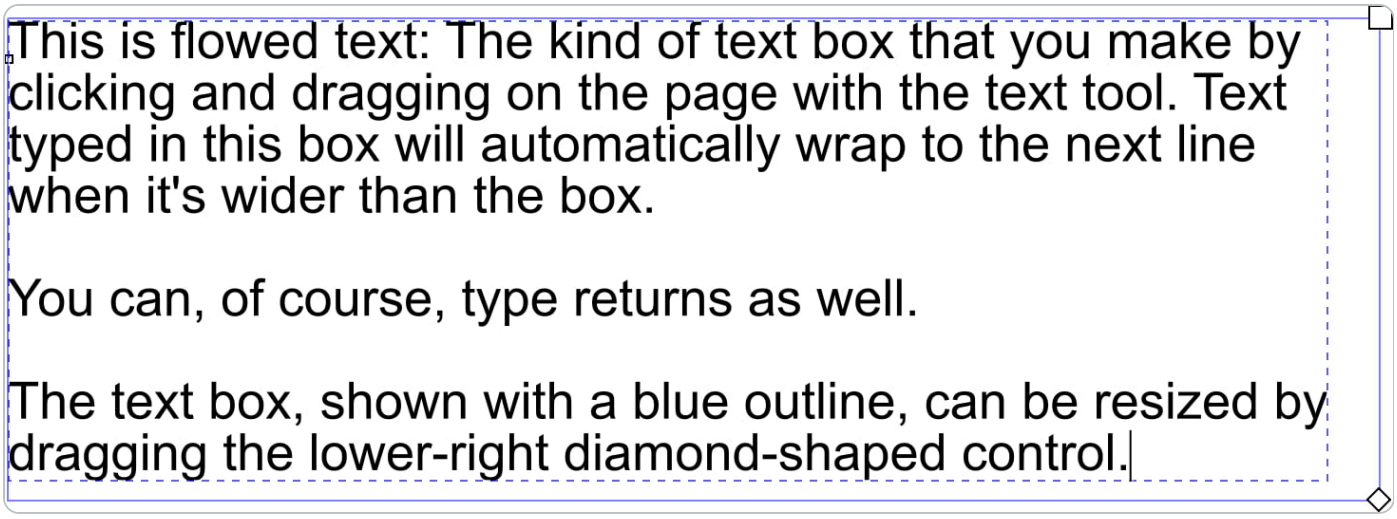
30.4.1 Flowed text

Flowed text wraps inside a rectangle you define, so a line that grows too long moves to the next line. With the Text tool active, click and drag on the page to draw the rectangle, release, and type or paste the text into it. Selecting the area with the Text tool lets you drag its resize handle or move it anywhere on the page.

Use flowed text for document bodies, paragraphs, notes, and anything else that should wrap inside a defined area. Its real value is control of paragraph width, which keeps body copy from running the full width of the sheet.



A flowed text area just after the drag: the blue outline, the diamond resize handle at its lower right, and the cursor ready to type

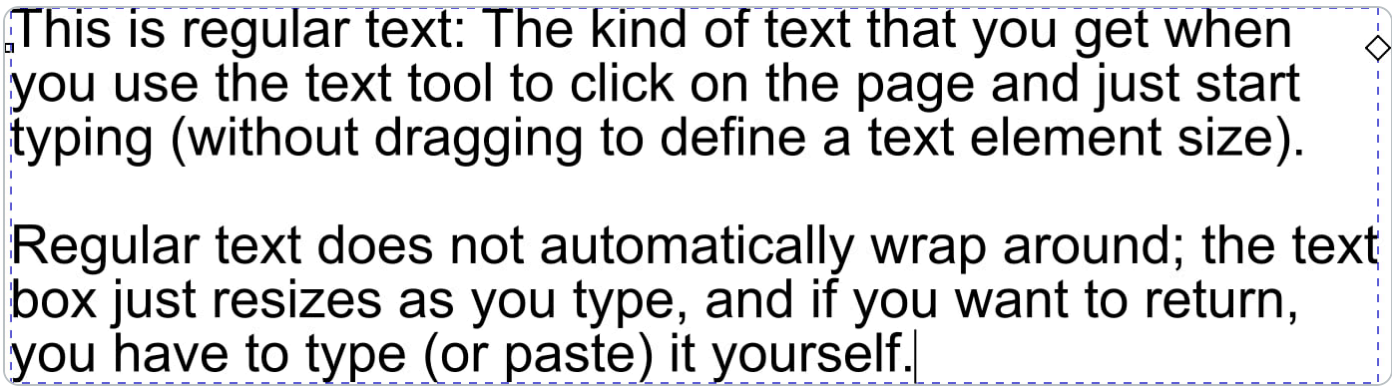


Text typed into that area wraps at the edge of the box

30.4.2 Regular text

Regular text does not wrap. Select the Text tool, click once on the page, and type; the line continues until you add a return yourself.

Use regular text for names, dates, labels, short headings, address lines, fixed text blocks, and single-line merge fields. A certificate template is the clear case: the recipient's name belongs in one specific spot on the page, not inside a wrapping box.



Regular text runs on until you type a return yourself

30.4.3 Which one reflows

Studio writes in a stroke font rather than the font your editor used, so flowed text wraps in different places than it did in Inkscape, exactly as it would if you changed the font there. A paragraph may run to a different number of lines.

Regular text does not move: its line breaks are the ones you typed, so an address block keeps the shape you gave it. That is another reason to reach for regular text where the arrangement matters and flowed text where the wrapping should look after itself.

Leave a little room in a flowed area rather than fitting text to the millimeter, and use the **Preview** to see where the lines actually fall.

30.4.4 Multiple text areas

A template may hold as many text areas as the layout needs, each positioned independently and each holding fixed text, merge fields, or both. A letter might carry a recipient address block, a greeting, a body area, a donation amount line, a signature line, and a return address or footer.

Separate areas help most when one part of the page needs its own placement, such as an address block positioned for a window envelope, and when the page repeats one item, such as a sheet of labels or several envelopes side by side. To fill each repeated item from a different CSV row, see §17. Writing letters with Data Merge.

A layout that reads naturally as one block is simpler as one text area. Do not force a whole page into one large box when the layout would be easier to manage in pieces — and do not split a plain letter into six boxes because you can.

30.5 Adding merge fields

If the template will be used with Data Merge, type the merge fields directly into the text areas, the same way you would in any other text field.

The first row of the CSV file holds the column headers, and those headers become the field names Studio matches against the merge fields. Keep the names short: `first_name`, `last_name`, `address1`, `city`, and `zip` are easier to troubleshoot than long spreadsheet headers.

30.6 Adding logos and graphics

Carrying more than text is the main reason to use a template at all, and fixed SVG elements appear on every document generated from it:

- Logos and letterhead, when the page needs to carry brand identity
- Borders and decorative rules, to frame the writing area or separate sections
- Icons and illustrations, where a drawn element belongs alongside the text
- Signature artwork, when the same signature appears on every copy rather than being placed with `{{sig}}`
- Setup guides or alignment marks, to position the sheet consistently between runs

These elements should be SVG paths or shapes that Studio can process as plottable motion. A raster image is not motion and will not be drawn, so convert anything of that kind to vector artwork first.

If a logo or graphic should be drawn with a particular pen, give it a distinct stroke color, layer, or group. That is what Studio lists for tool assignment when the file opens.

30.7 Keeping text editable

Do not convert text to paths before opening the file in Studio. Editable text is what lets Studio recognize the text content and render it with a handwriting font; text already converted to paths behaves like ordinary artwork, and handwriting fonts, Data Merge, signatures, spacing controls, and Handwriting Defects no longer apply to it.

> ***Tip:*** Save a master editable version before making production changes. A name like `document_template_editable.svg` makes it clear which file to come back to when the layout or the text needs work.

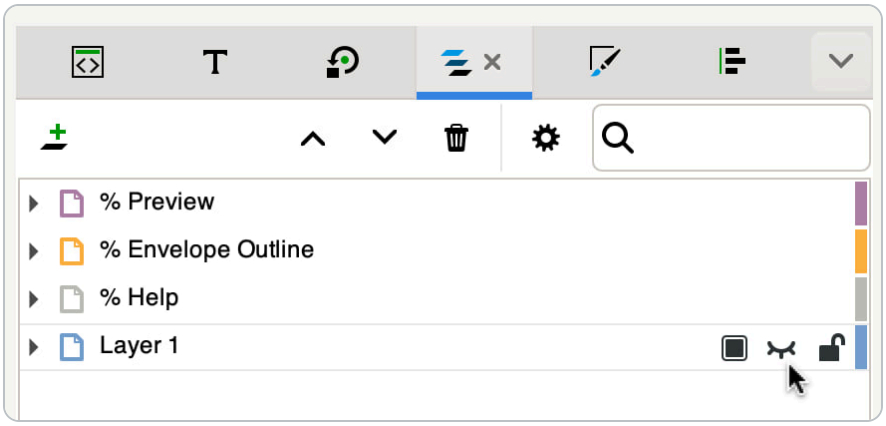
30.8 Guides and documentation layers

A template often wants marks that are meant for you rather than for the pen:

- Safe area boxes, marking where the writing must stay to survive trimming
- Fold lines and envelope outlines, for pieces that are folded or inserted
- Crop guides, where the finished piece is cut from a larger sheet
- Notes to yourself and setup instructions, kept with the file rather than in a separate document
- Media placement guides, showing where the sheet sits on the machine

Keep these separate from the artwork you intend to draw, on a layer of their own, and give that layer a name beginning with `%`. Studio treats such a layer as a **documentation layer** and leaves it out of everything it produces: it is not drawn, its text is not rendered, and a Data Merge does not fill merge fields inside it.

Name the layer in your editor — in Inkscape, rename it in the Layers panel, or edit its label in the XML editor. `%Guides`, `%Notes`, and `%Fold lines` all work; only the leading `%` matters.



Three documentation layers above an ordinary one, in Inkscape's Layers panel

A documentation layer can stay visible while you work, which is the point of it: you can see your safe area and fold lines on screen without hiding them each time you process the file, and without deleting work you will want again when you revise the template.

Color does the same job without renaming anything. Draw layout guides in a color the finished piece does not use, such as blue, and on the **PREPARE** tab, with **Sort Strokes By** set to **Colors**, assign that color to **None; skip this task**. A pen assigned only to black then never draws the blue guides.

> ***Note:*** Everything on a documentation layer is left out of the output, including text or artwork placed there by mistake. If something you expect to see is missing from the **Preview**, check which layer it is on in your editor.

30.9 Saving the template

Save the finished layout as an SVG. That file is your reusable template: reopen it later to update the text, adjust the layout, change the merge fields, or pair it with a different CSV file.

Keep the editable template apart from generated output. A workable project folder holds the editable `.svg` template, a test CSV, a production CSV, notes about paper, pens, margins, and tool assignments, and any generated G-Code files.

30.10 Opening the template in Studio

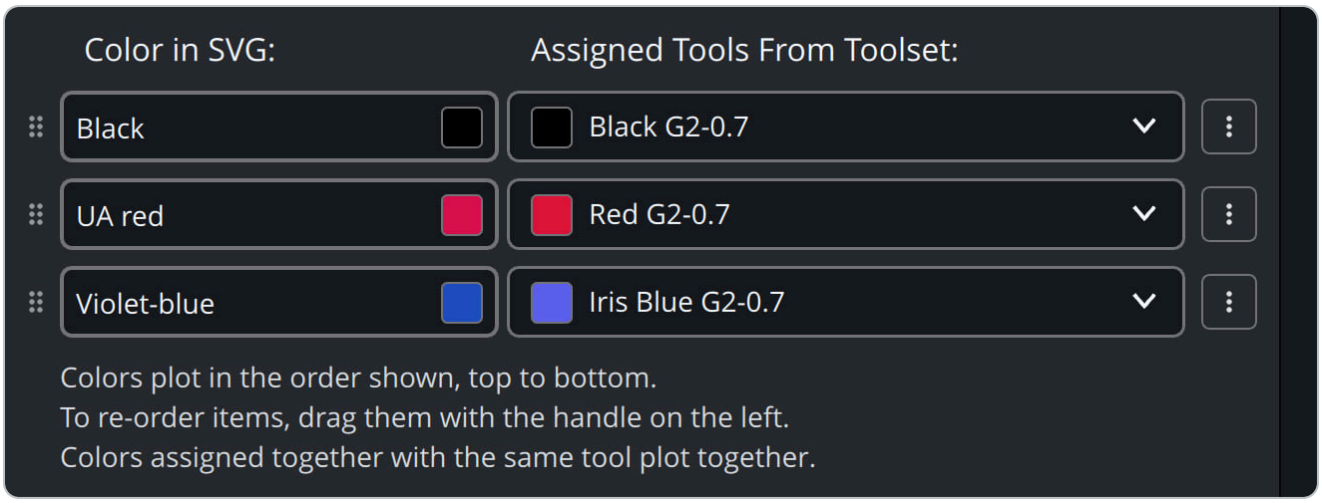
Open Bantam Tools Studio, click **OPEN FILE**, and select the template. Studio reads the text and SVG elements from the file, and the template's text areas and artwork appear in the Preview as plottable paths.

From there, the **TEXT** tab sets fonts, spacing, Handwriting Defects, overflow behavior, signatures, and Data Merge options when they are available. The **PREPARE** tab is where you confirm machine selection, paper size, margins, artwork position, toolset, and tool assignments.

30.10.1 Assigning tools

Studio detects the colors, layers, and groups in the file and lists them under **TOOL ASSIGNMENTS**. Each one gets a tool, which is how you decide what draws which part of the page: a black pen for the body text, blue for a signature, red for a decorative mark, a separate tool for a logo or border. If the whole template uses a single pen, assign that tool to every visible part.

Organizing the file by color, layer, or group before it reaches Studio makes this step much shorter, which is the practical reason to bother with layers in the editor.



TOOL ASSIGNMENTS *for a template, with each color assigned a tool*

30.10.2 Checking the Preview

Review the Preview before generating anything. Confirm that what you intend to write fits within the margins, that fixed artwork and text land where you expect, and that nothing meant as a guide is about to be drawn. The Preview draws anything outside the margins in red, and processing crops it.

If something sits too close to an edge, the fix is in the design file, not in Studio: adjust the layout there, save the SVG again, and reopen it.

For a Data Merge template, look through several records in the Preview, including the one with the longest content if length is a concern.

30.11 Generating and writing a template job

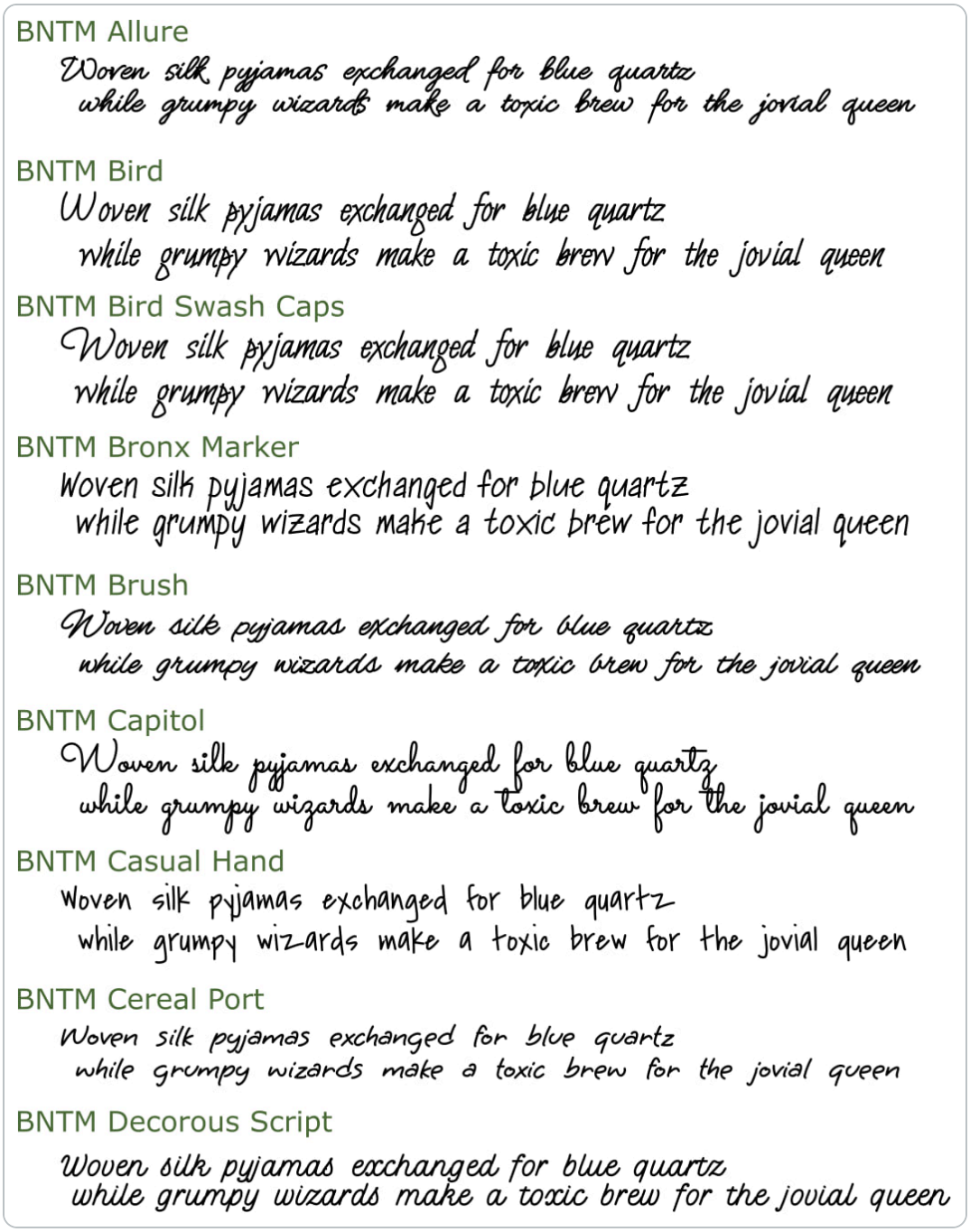
With the Preview correct, generate the job the same way you would for any other document. Over USB or WiFi you can upload the file straight to the machine; for microSD, click **PROCESS AND SAVE**, save the file, and copy it to the card.

Load the tool and the media before starting the file, then start it from the machine's display or send it from Studio. The machine writes the template with the loaded pen, or with each assigned one in turn. For the full procedure, see §11. Pen loading and pen compatibility and §13. Paper handling.

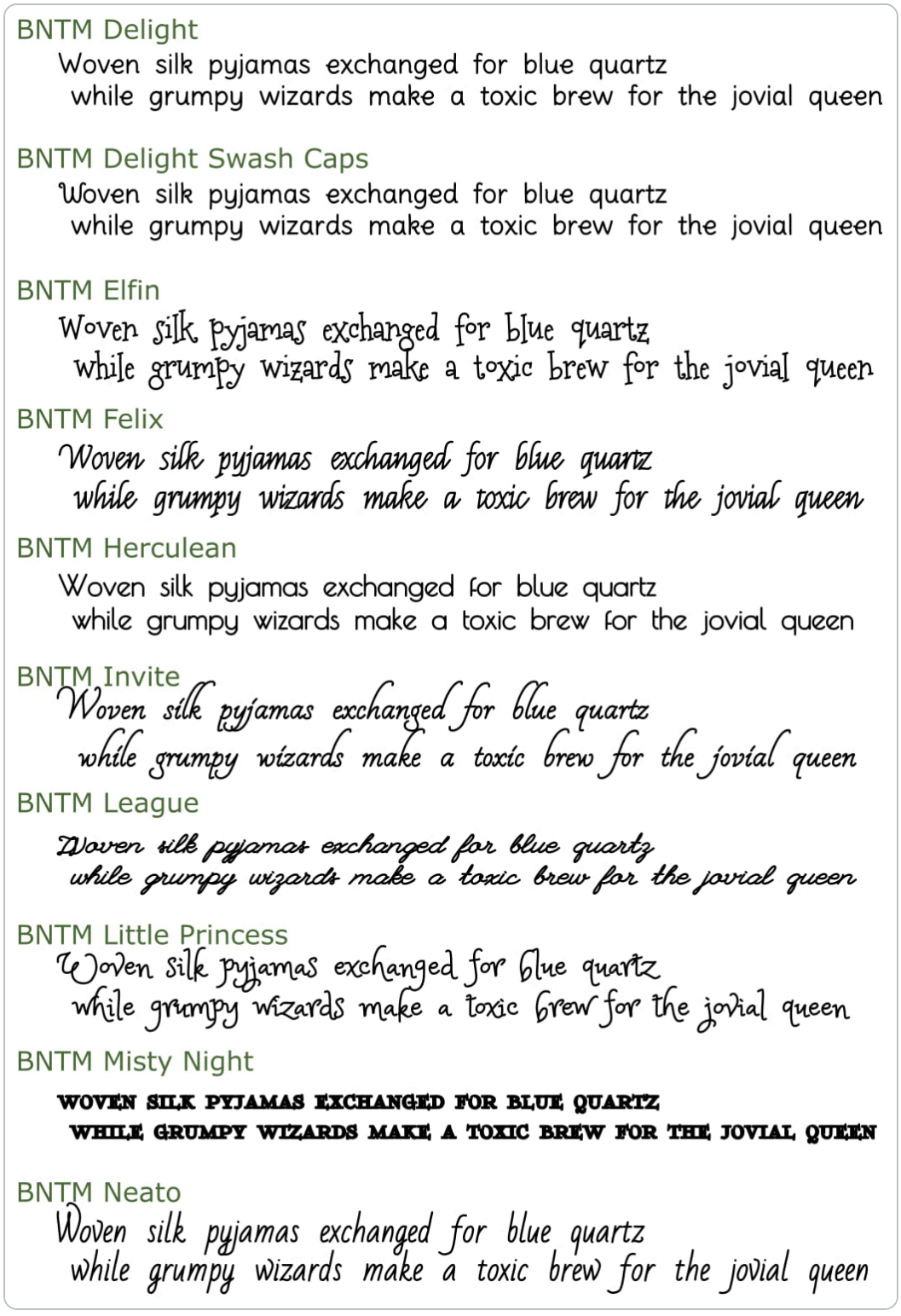
31. Stroke font samples

These are the stroke fonts included with the Bantam Tools Studio™ Text Add-On, each writing the same two lines so the faces can be compared against one another. Choose one in the **FONT** section; see §27.4 Font selection.

The samples are drawn at a single size; each face looks somewhat different larger or smaller. Where to find more, and how to add your own, are in §27.4 Font selection as well.



BNTM Allure through BNTM Decorous Script



BNTM Delight through BNTM Neato

BNTM Nixish

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

BNTM Nixish Italic

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

BNTM Orange Soda

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

BNTM Osmotron

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

BNTM Pancakes

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

BNTM Pepita

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

BNTM Qwandry

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

BNTM Readability

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

BNTM Readability Italic

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

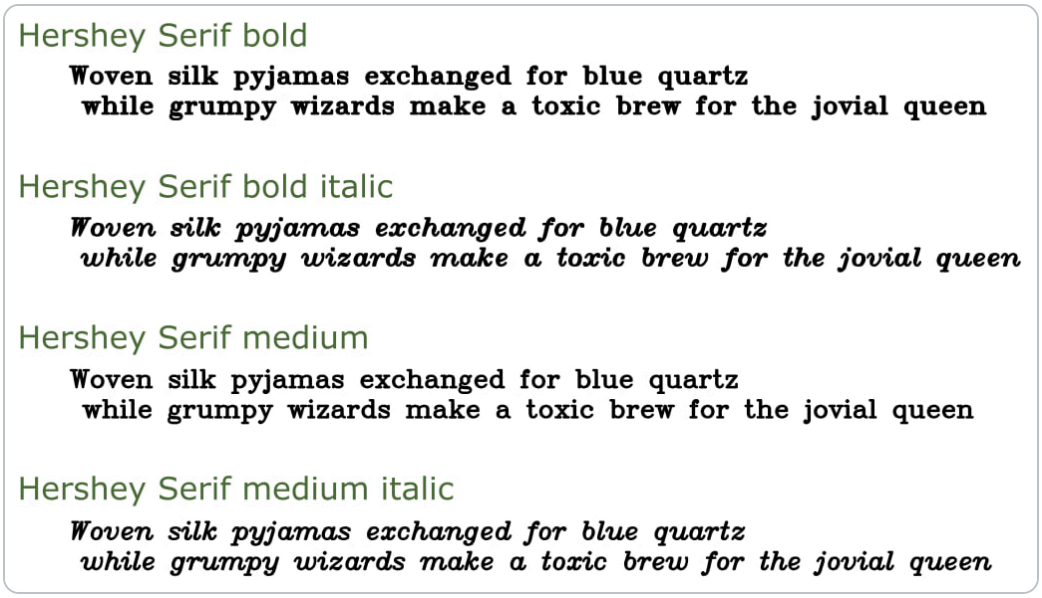
BNTM Society

Woven silk pyjamas exchanged for blue quartz
while grumpy wizards make a toxic brew for the jovial queen

BNTM Nixish through BNTM Society



BNTM Speculation through Hershey Script medium



The Hershey Serif faces

Of the Hershey faces, **Hershey Sans 1-stroke** and **Hershey Script 1-stroke** are the two that every copy of Studio carries, with or without the Text Add-On.

32. Studio: keyboard shortcuts and dimension entry

This chapter collects Studio's keyboard shortcuts and the rules for entering dimensions.

32.1 Keyboard shortcuts

These are Studio's keyboard shortcuts and mouse gestures. The **Keyboard Shortcuts** window lists most of them:

SETTINGS → HELP & REFERENCE → Keyboard Shortcuts



*The **Keyboard Shortcuts** window*

On macOS, ⇧ is Shift, ⌥ is Option, and ↩ is Return.

32.1.1 File

Action	macOS	Windows
Open File	⌘O	Ctrl+O
Open from Clipboard	⇧⌘V	Ctrl+Shift+V
Open Project	⇧⌘O	Ctrl+Shift+O
Save Project	⌘S	Ctrl+S
Save Project As	⇧⌘S	Ctrl+Shift+S

See §21.1 Opening files and file actions and §25.4 Project files.

32.1.2 Navigation

Action	macOS	Windows
Switch to the PREPARE tab	⌘1	Ctrl+1
Switch to the TEXT tab	⌘2	Ctrl+2
Switch to the TOOLS tab (Tool Library)	⌘3	Ctrl+3
Switch to the MACHINE tab	⌘4	Ctrl+4
Switch to the SETTINGS tab	⌘5	Ctrl+5

The MACHINE tab shortcut works only when the tab is shown.

32.1.3 Actions

Action	macOS	Windows
Save G-Code File	⌘↩	Ctrl+Enter
Open License Manager	⇧⌘L	Ctrl+Shift+L
Undo a layout change	⌘Z	Ctrl+Z
Redo a layout change	⇧⌘Z	Ctrl+Shift+Z or Ctrl+Y

See §21.13 The PROCESS AND SAVE button.

32.1.4 View

Action	macOS	Windows
Toggle full-screen mode	⌘F	Ctrl+F
Toggle units (millimeters/inches)	⌘U	Ctrl+U
Dock the Preview window	⌘W	Ctrl+W

Docking applies when the Preview is open in a separate window, and that window is the one in front. See §22.1 Program options.

32.1.5 Preview shortcuts

Action	macOS	Windows
Fit to view	⌘0	Ctrl+0
Actual size (1:1)	⌥⌘1	Ctrl+Alt+1
Zoom in	⌘+ or ⌘=	Ctrl+Plus (+) or Ctrl+=
Zoom out	⌘-	Ctrl+Minus (-)
Pan view	Arrow keys	Arrow keys
Pan view five times faster	⇧ with arrow keys	Shift with arrow keys

These shortcuts act on the Preview only after you click in it. See §21.12 Preview.

32.1.6 Mouse and trackpad

Action	macOS	Windows
Pan view	Scroll, two-finger swipe, or middle-button drag	Scroll, two-finger swipe, or middle-button drag
Zoom at the cursor	Hold ⌘ and scroll	Hold Ctrl and scroll
Zoom in or out	Trackpad pinch	Trackpad pinch
Move the artwork	Drag the artwork	Drag the artwork
Adjust a margin	Drag the margin edge	Drag the margin edge

32.2 Dimension entry reference

The dimension fields on the **PREPARE** tab evaluate arithmetic with unit suffixes. §21.5 Artwork settings explains the rules. The tables below list the units each kind of field accepts, worked examples, and the syntax errors Studio reports.

Field type	Accepted units	Bare number means
Length (margins, offsets, width, height)	`mm`, `cm`, `in`, `ft`, `pt`	The unit shown in the box
Percent (Scale)	`%`	Percent

Results below are for a length field displaying millimeters unless noted.

Typed	Result
`8 1/2`	8.5 mm
`1 in`	25.4 mm
`2.54 cm`	25.4 mm
`1 ft`	304.8 mm
`72 pt`	25.4 mm
`4/3 in`	33.867 mm
`6 in + 3 mm`	155.4 mm
`10 / 2 mm`	5 mm
`10 mm / 2`	5 mm
`(2 + 3) * 10`	50 mm
`8 1/2 in`	215.9 mm
`1/16`, field displaying inches	0.0625 in
`25.4 mm`, field displaying inches	1 in
`4/3`, percent field	1.333%
`(4/3) * 100%`, percent field	133.33%

You can use either a period or a comma as your decimal point, as is common in many regions: `1.5` and `1,5` both enter 1.5. Because a comma is always read as a decimal point, it never separates thousands, so `1,000` means 1. To enter one thousand, type `1000`.

Studio checks each entry as you type and reports what it could not read. The entries below are the ones that come up most often, with the message shown and what to type instead.

Typed	Message	Type this instead
`1/8in`	Syntax: Don't divide by a unit	`1/8 in` — put a space before the unit, so the unit applies to the whole fraction
`2 in * 3 in`	That value already has a unit.	`2 * 3 in` — give the unit once; this evaluates to 6 in (152.4 mm)
`10 km`	This field does not accept the unit "km".	Use `mm`, `cm`, `in`, `ft`, or `pt`
`10 mm` in a percent field	This field does not accept the unit "mm".	Percent fields take `%` or a bare number
`5 ft 6 in`	Unexpected input after the expression.	`5 ft + 6 in` — join the two with `+`
`abc`	A unit needs a number before it.	Enter a number, optionally followed by a unit
`1/0`	Division by zero.	Use a nonzero divisor — the expression has no value as written

A value outside the field's allowed range is rejected with "Value is out of range."

33. Glossary

Terms used throughout this guide.

Acceleration: How quickly the machine builds up to its target feedrate, and how quickly it slows again at the end of a move.

Alarm: A machine fault state that stops all motion until it is cleared. While the machine is in an alarm state, the **MACHINE** tab offers **Clear Alarm**: resolve whatever triggered the alarm, then clear it to return the machine to Idle.

Bantam Tools HandWriter®: A Bantam Tools machine that writes on sheet paper with a pen, in sizes from US Letter and A4 up to US Legal.

Bantam Tools Studio™ Text Add-On: The part of Bantam Tools Studio™ that adds the full font library, custom SVG fonts, signatures, Handwriting Defects, letter and word spacing, overflow controls, clipboard and text-file import, and Data Merge. It is included with every HandWriter, as part of its Studio license.

Baseline: The line the letters sit on. The **Baseline jitter** defect lets written lines drift slightly above and below it.

Batch: A set of documents open together. A file batch comes from opening several files at once; a merge batch is the set of documents Data Merge produces from one CSV file.

Centerline: The line running down the middle of a drawn stroke. Single-stroke fonts are built from centerlines, so the pen follows the middle of each letter rather than tracing its outline.

Chevron: The small arrow beside a button that opens a menu of related actions.

Conditional text: Data Merge syntax, written in double square brackets inside a merge field, that changes what is written depending on whether a CSV cell holds a value.

Data Merge: A feature that creates personalized documents from a CSV file, replacing each merge field with the value from that row.

Document: One unit of input content. Opening several files at once gives as many documents as files, and Data Merge produces one document per merged unit, the template plus its data; a document may run to one page or several.

Feedrate: The speed at which the tool moves along a programmed path, set per tool in the Tool Library.

Fill: The SVG property that colors the inside of a shape. Studio processes artwork as though paths have a stroke and no fill, so a filled shape does not come out solid; the pen draws the outline it finds.

G-Code: A machine instruction language that tells a computerized tool how to move.

Handwriting Defects: A group of controls that introduce measured natural imperfection into writing, so that it reads as handwritten rather than typeset.

Hershey Sans 1-stroke: A single-stroke sans-serif font included with Bantam Tools Studio™.

Hershey Script 1-stroke: A single-stroke script font included with Bantam Tools Studio™.

Hidden Line Removal: A processing option that draws only the paths that have a stroke and are not hidden behind filled objects, so overlapping artwork does not show lines that should be covered.

Home: The machine's starting place: a known reference position that every later move is measured from. As a verb, to move the machine there; see **Homing**.

Homing: The procedure by which a machine finds home. It moves the toolhead until it reaches a position the machine can sense, so that afterward it knows where the toolhead is.

Image Processor: A window in Studio that converts a photograph or other raster image into an SVG file of brush strokes in a chosen set of paint colors.

Job: The set of things open at a given time, which Studio turns into one or more output files. A job may hold one document or many.

Jog: Moving the machine's axes by hand, one step at a time. You jog the machine from its display with **Jog mode**; see §10.11.2 Jog mode.

JSON: A plain-text file format. Tools and toolsets are exported and imported as JSON files, so you can back them up, move them to another computer, or share them; see §23.3 Importing and exporting toolsets.

Kerning: The spacing between neighboring letters. As a Handwriting Defect, the **Kerning** control varies that spacing rather than setting it.

Letter size: A Handwriting Defect that varies the size of individual written characters, making each one a little larger or smaller than its neighbors. The size of the type itself is set by **Font size**.

Media: Whatever the machine draws on.

Merge field: A field name in double curly braces, such as `{{first_name}}`, that Data Merge replaces with a value from the CSV file.

On-Machine Files: Files stored on the machine's microSD card, listed in Studio's **Files** section while the machine is connected.

Outline font: A regular computer font, such as a TrueType (`.ttf`) or OpenType (`.otf`) font. Each letter is stored as closed outlines that are filled in on screen, so a pen can trace only its edges; compare **Single-stroke font**.

Page: One sheet of a document. A document runs to more than one page only when text flow is set to use multiple pages.

Path: A shape in an SVG file, described as a line or curve rather than as pixels. Paths are what Studio turns into machine motion.

Plob: Short for "Plot Object": a highly specialized kind of SVG file, already processed for one machine model, that the machine draws without reprocessing it. **Save as Plob** appears only after **Enable Plob output** is turned on in Settings.

Plot: To draw with a machine, and the run that does so. A plotted page is drawn with a pen rather than printed.

Precision: A setting controlling how closely generated paths follow the source geometry. It is a tolerance, so a smaller value preserves more detail and a larger one simplifies.

Preset: A tool or toolset supplied with Studio and marked read-only. Duplicate a preset to get a version you can edit.

Pressure Depth: The spring pressure that holds the pen on the paper, set through the height at which the pen is installed.

Rapids: Fast positioning moves that run at the machine's own rate rather than at a set feedrate. **Disable Rapids** replaces them with controlled feedrate moves.

Raster image: An image stored as a grid of colored pixels, such as a PNG or JPEG photograph. A machine cannot follow pixels, so Studio converts a raster image to strokes in the Image Processor.

Render mode: The method the Image Processor uses to build a picture out of strokes: **Paint Stripes**, **Paint Shapes**, or **Paint Shades**.

Render New Preview: A button in the Preview's header that rerolls the random seed for a fresh preview of the writing, Handwriting Defects included. It rerolls the page or merged document on screen and leaves the rest of a batch alone; **Re-render all pages**, in the **Preview menu**, rerolls the rest. A single document flowed across several pages is the exception, and rerolls as a whole.

Scrunch: A Handwriting Defect that compresses letters for a quicker, more casual feel, which also changes how much text fits on a page.

Section: A titled, collapsible group of controls in the Studio window, such as the **FONT** section or the **PAPER SETTINGS** section. Click its header, or the chevron in it, to expand or collapse it.

Setup Sheet: An on-screen summary of a processed job, which can be saved as a PDF. When a job produced more than one output file, the summary is titled **Batch Setup Sheet**.

Signature: A feature that signs documents by placing a loaded signature file into the text workflow through the signature command `{{sig}}`.

Signature command: `{{sig}}`, `{{sigalt}}`, or `{{siginit}}`, written in a document where Studio draws a signature, an alternate signature, or initials. A signature command is not a merge field, and a CSV file is never required for it.

Single-stroke font: A font whose letters are drawn as single paths along the centerline of each stroke, rather than as outlines to be filled in. Letters come out as drawn lines, at pen width.

Soft Lift: A slower lift as the pen leaves the paper and at the top of its travel, set in the tool editor's **Pen Landing & Lift** section.

Soft Touchdown: A gentler final approach before the tool contacts the surface. The pen drops quickly to the **Approach Above Paper** height, then passes through contact at the slower **Touchdown Speed**.

Split button: A button whose face performs its usual action and whose chevron opens the other choices.

Stroke: The SVG property that draws a shape's outline, and the mark the pen makes. Studio plots the paths that have a stroke.

SVG: Scalable Vector Graphics, a vector image format based on XML.

Toast: A brief on-screen notification that clears on its own.

Tool: A single physical pen or marker. Each tool has a name and attributes such as its color, its speed settings, and any refill behavior defined for it.

Toolset: A saved, named collection of tools and their settings. A setting such as feedrate can be edited across every tool in the set at once.

Tooltip: A short description of a control that appears when you hover over it.

Transport: The connection method used to send a job to the machine, either USB or WiFi. The **Preferred connection for uploads** setting chooses which one Studio uses for an upload.

Travel move: A move made with the pen up, repositioning between drawn strokes rather than drawing.

US Letter: The 8.5" × 11" paper size.

34. Troubleshooting

Problems that belong to no single chapter, with what to try.

34.1 Connection problems

Issue: Studio does not connect to the HandWriter over USB.
Solution: Remove as many adapters, hubs, and docks as you can from between the computer and the machine; a direct cable is best. If a USB-C connection still fails, unplug the USB-C end, turn it over, and plug it back in. If Studio shows **BT-205**, unplug the USB cable, switch the HandWriter off and back on, then reconnect.

Issue: A small **x** appears at the top right of the display.
Solution: The machine is set up to join a WiFi network but has not joined it, or has lost its connection. Work through the entries below. See §10.11.3 WiFi on and off.

Issue: Scan for Plotters in Studio does not find the machine.
Solution: Connect with **Enter IP**, using the IP address shown on the display's **WiFi Status** screen. See §10.11.3 WiFi on and off.

Issue: The machine never joins the WiFi network.
Solution: The machine joins 2.4 GHz networks only. If your router gives its 2.4 GHz and 5 GHz bands separate names, set up the machine with the 2.4 GHz name. See §15.5 Sending files over WiFi.

Issue: WiFi stopped working after the network's name or password changed.
Solution: Run setup again from Studio's **Set Up Your Plotter** dialog; the machine keeps its old network settings until you do. See §15.6 Putting your machine on a network.

Issue: The display shows **WiFi off**.
Solution: WiFi has been turned off at the machine. Select **Turn WiFi ON** under **Settings**. See §10.11.3 WiFi on and off.

Issue: The machine cannot join a network at work or school, one that asks you to sign in, or one without a password.
Solution: Networks like these often cannot carry the machine at all. Send files over a USB cable or on the microSD card instead. See §15.5 Sending files over WiFi.

Issue: Studio has trouble connecting to the machine over WiFi.
Solution: Check that the machine's firmware is up to date. Studio's **Check for Updates** window shows the latest firmware and the version on a connected machine, and the display's **Version** screen shows the version installed. If a newer release is available, update the firmware. See §22.8.3 Check for Updates, §10.11.1 Version, and §10.11.6 Updating the firmware.

34.2 Paper feed issues

Issue: The sheet jams or crumples while the HandWriter is writing.
Solution: Press the control knob to pause the file. Once the machine stops, press and hold the knob to cancel it. Then push the paper release lever back to release the paper, and remove the sheet. See §10.6 Pausing, resuming, and canceling.

Issue: Sheets crumple repeatedly.
Solution: Check how each sheet goes in: it should sit flat and square in the back left corner against the raised

backstop before you lower the pinch rollers; see §13.4 Loading paper. Paper much thinner than ordinary copy paper, or a sheet that is already creased or crumpled, does not feed reliably; see §13.6 Paper quality and feed reliability. A pen that presses down too hard, or one with a very sharp tip, can also crumple the paper; see §12.6 Pen pressure and pen type.

Issue: The HandWriter lets go of the sheet partway through writing.
Solution: Check that the paper size selected in Studio matches the sheet you loaded. If Studio is set up for a longer sheet than the one in the machine, such as A4 when the sheet is US Letter, the machine runs off the end of the page. See §21.4 Paper settings.

Issue: The sheet slips or shifts while the HandWriter is writing.
Solution: Pause and cancel the file as above, then check that the pinch rollers are fully lowered, the rollers are clean, and the paper path is clear before loading the sheet again; see §19.5 Checking the rollers.

Issue: The writing runs crooked on the page.
Solution: The sheet was not seated squarely. Load it again, pressed into the back left corner against the raised backstop; see §13.4 Loading paper.

34.3 Files and the microSD card

Issue: The machine shows no files, or does not see the card.
Solution: Check that the card is fully seated in its slot, that your files finished copying to it, and that a card of your own is formatted as FAT32. See §15.3 About microSD cards.

Issue: Files on the microSD card go missing or will not open, especially as the card fills.
Solution: The card may be a counterfeit that holds less than its label says. Copy off what you can and use a different card, bought from a seller you trust. See §15.3 About microSD cards.

34.4 SVG template problems

Issue: Text or artwork in the SVG file is missing from the Preview.
Solution: Check whether it sits on a documentation layer, one whose name begins with `%`; Studio leaves those layers out. See §30.8 Guides and documentation layers.

34.5 Long documents and batches

Issue: Studio reports `Text layout error: each document is limited to 100 pages`.
Solution: Shorten the text or reduce the font size to bring the document under 100 pages. If your work needs longer documents, please contact support at support@bantamtools.com so that we can hear about your use case.

Issue: A Data Merge builds only the first 250 documents.
Solution: A batch holds up to 250 documents, and the **CSV DATA PREVIEW** summary reads "250 documents (limited to 250)" when a row range asks for more. Run the rest as a second batch by setting **Start row** past the last row of the first. If your work needs larger batches, please contact support at support@bantamtools.com so that we can hear about your use case.