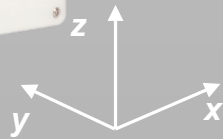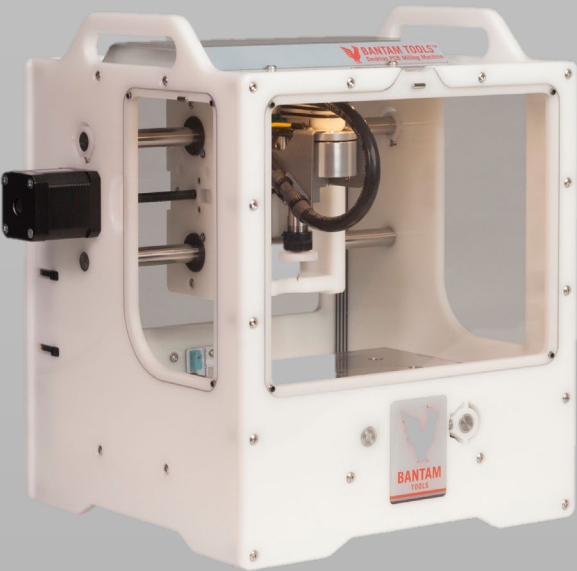# Bantam PCB Mill

- CNC Mill
- Work Area:
  139,7 x 114,3 x 40,64 mm
- Single or double sided PCBs

z
y   x

Safety

- Do not use the machine without the covers closed
- Wear safety goggles
- Wear gloves when handling the alcohol
- The tools may have sharp edges, be careful not to cut yourself
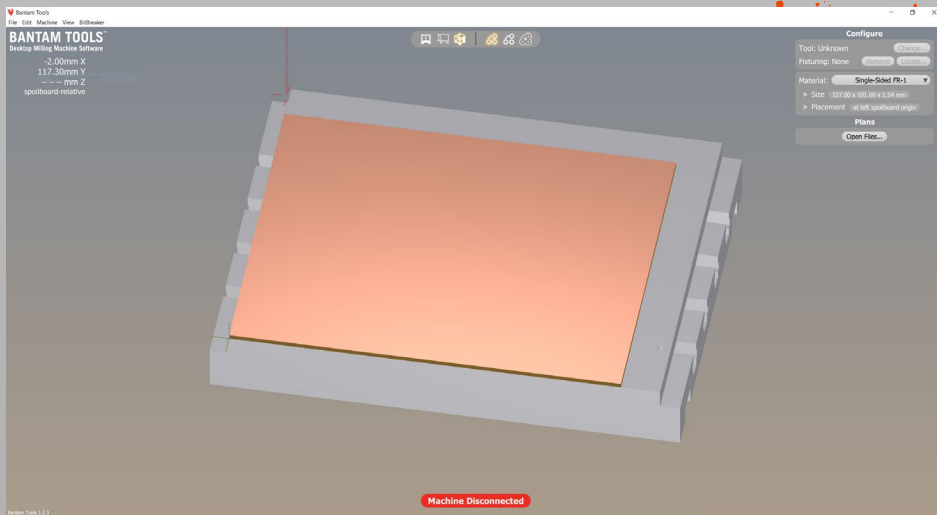- In doubt? Ask a Makerspace Manager

Bantam Software

When designing your PCB make sure to check out the design rule files (DRC) that you can find at the end of this Introduction.

When opening the Bantam Tools software you will be promted with this view.

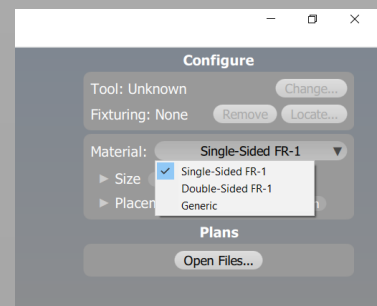Using the buttons on the top you can change between views.
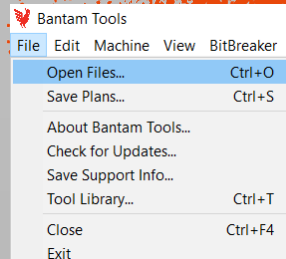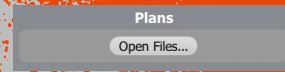

Or let the software show you more less.

The first thing you want to do is to choose your material on the right. The Single / Double-Sided FR-1 are the ones sold in the Makerspace.
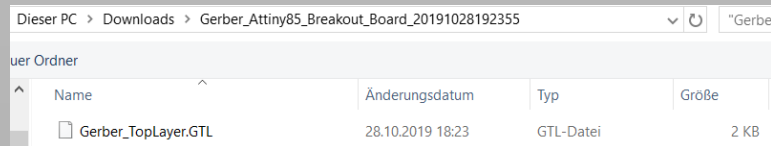
Bantam Software

By either selecting "File – Open Files" or using the "Open Files…" button on the right you can select your Gerber file.
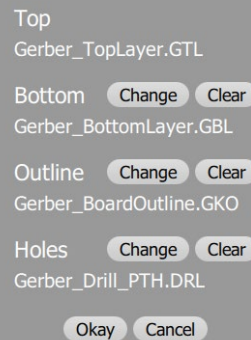
Plans
Open Files...

Bantam Tools
File Edit Machine View BitBreaker
Open Files...	Ctrl+O
Save Plans...	Ctrl+S
About Bantam Tools...	
Check for Updates...	
Save Support Info...	
Tool Library...	Ctrl+T
Close	Ctrl+F4
Exit	

Navigate to your file and open the top layer file (.GTL).

Dieser PC > Downloads > Gerber_Attiny85_Breakout_Board_20191028192355

uer Ordner

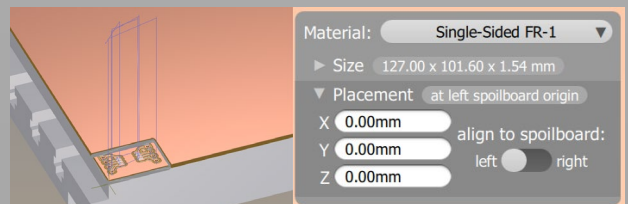| Name	Änderungsdatum	Typ	Größe
Gerber_TopLayer.GTL	28.10.2019 18:23	GTL-Datei	2 KB

The software will then automatically load all other files. Check if the files are correct. If needed use the "Change" button to adjust.

Choose Gerber Files

Top
Gerber_TopLayer.GTL

Bottom   Change   Clear
Gerber_BottomLayer.GBL

Outline   Change   Clear
Gerber_BoardOutline.GKO

Holes   Change   Clear
Gerber_Drill_PTH.DRL

Okay   Cancel

After pressing "Okay" the file should be shown on the preview. If needed use the "Placement" tool to adjust the location on the material.

Material: Single-Sided FR-1 ▼
▶ Size   127.00 x 101.60 x 1.54 mm
▼ Placement   at left spoilboard origin
X 0.00mm   align to spoilboard:
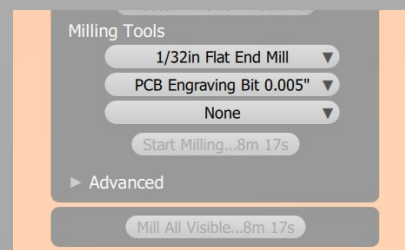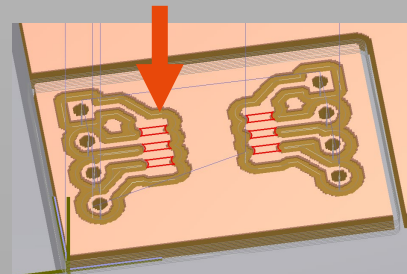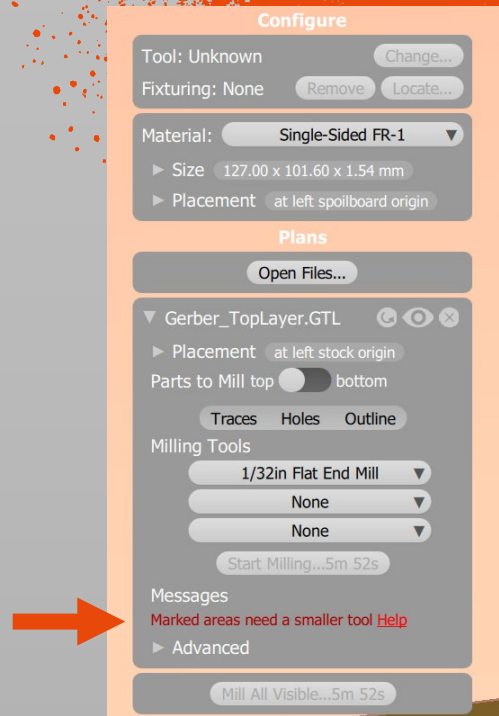Y 0.00mm   left ⬤ right
Z 0.00mm

Bantam Software

The software by default will try to mill everything with a 1/32" endmill, since this is the fastest.

Unfortunately not every part of the PCB can be done with this tool, as it says in the Messages area.

Configure

Tool: Unknown   Change...
Fixturing: None   Remove   Locate...

Material: Single-Sided FR-1 ▼
▶ Size   127.00 x 101.60 x 1.54 mm
▶ Placement   at left spoilboard origin

Plans

Open Files...

▼ Gerber_TopLayer.GTL   ↻ ◉ ✕
▶ Placement   at left stock origin
Parts to Mill top ⬤ bottom

Traces   Holes   Outline
Milling Tools
   1/32in Flat End Mill ▼
   None ▼
   None ▼
Start Milling...5m 52s

Messages
Marked areas need a smaller tool Help
▶ Advanced

Mill All Visible...5m 52s

This can also be seen as red areas on the PCB in the preview window.
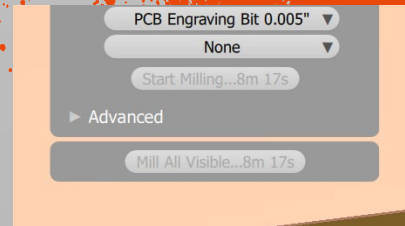
*We therefore need to add a second smaller tool on the right. Try different ones so that everything is milled.*

Milling Tools
   1/32in Flat End Mill ▼
   PCB Engraving Bit 0.005" ▼
   None ▼
Start Milling...8m 17s
▶ Advanced

Mill All Visible...8m 17s

ETH STUDENT PROJECT HOUSE

Bantam Software

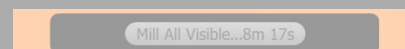*After adding the second tool the error message underneath the tools diapers.*

Also we can see all the areas being machined in the preview.
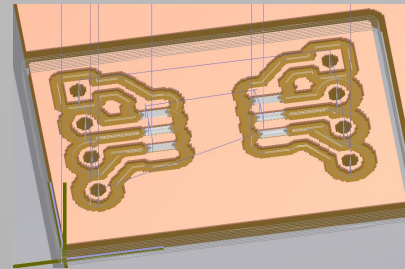
NOTE: It is important to keep your available tools in mind when designing you PCB. Using bigger tools will always end with smaller machining times.

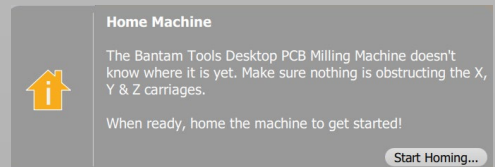*The total machining time can be found on the bottom of the tool selection window.*

When you are happy with the preview of your PCB it's time to get started with the machine.
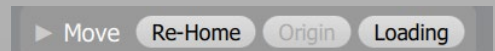
Milling your PCB

Log in to the machine to turn it on. The lights in the machine should turn on.

The software will recognize the machine and ask you to home it. Make sure nothing is located on the table and press "Start Homing…"

Home Machine

The Bantam Tools Desktop PCB Milling Machine doesn't know where it is yet. Make sure nothing is obstructing the X, Y & Z carriages.

When ready, home the machine to get started!

Start Homing…

Using the toolbar on the right press the "Loading" button to bring the table to the front.
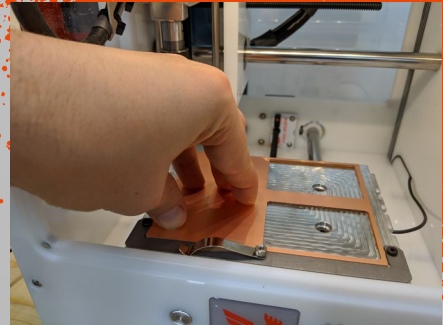

▶ Move   Re-Home   Origin   Loading

Clean both the bottom side of the PCB as well as the table using isopropanol. Then apply the double sided tape to the bottom side of the material.
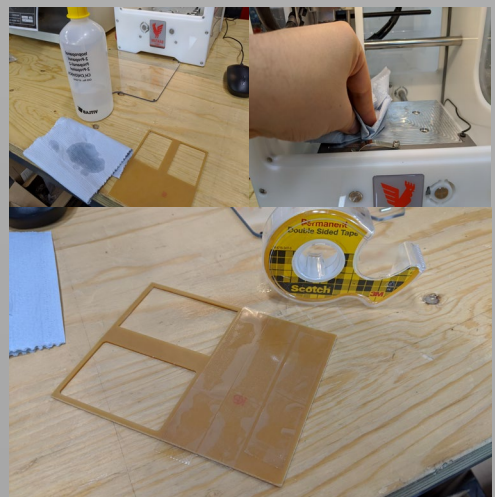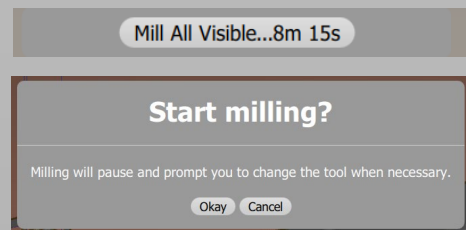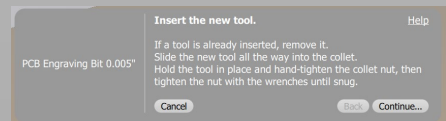
Milling your PCB

Place your material on the table. Make sure it is aligned with the front left corner of the bracket.

Insert all the window on the machine and press the "Mill all Visible" button. The software will ask you to confirm.

Mill All Visible...8m 15s

Start milling?

Milling will pause and prompt you to change the tool when necessary.

Okay   Cancel

Every time the machine needs you to change a tool, it will tell you. Make sure you are inserting the correct tool.

Insert the new tool.   Help

PCB Engraving Bit 0.005"

If a tool is already inserted, remove it.
Slide the new tool all the way into the collet.
Hold the tool in place and hand-tighten the collet nut, then tighten the nut with the wrenches until snug.

Cancel   Back   Continue...

The tools for the tool change can be found on top of the machine. Make sure to always put them back so they do not get lost.

The total machining time

Milling your PCB

When changing the tool make sure to support it, so it can not fall out and hit the table. Use the two wrenches at the indicated positions. Hold the top wrench and turn to bottom one to left to losen and to the right to secure a tool.
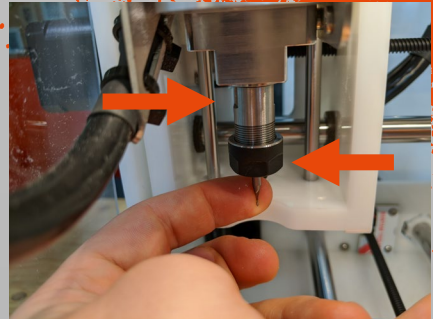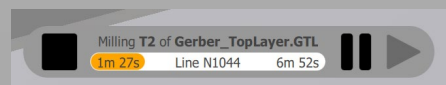

To make sure that the machine will not mill to deep it will measure each tool. To do so make sure everything on the right is correct and press "Locate Tool".
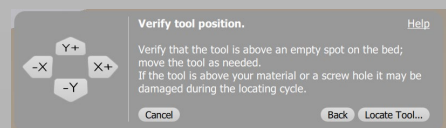
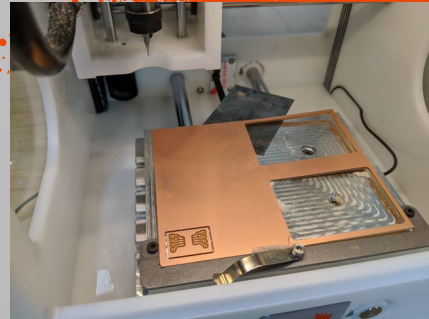*After the measurement the machine will start milling.*

Using the bar at the bottom of the software you can check the progress on your job.
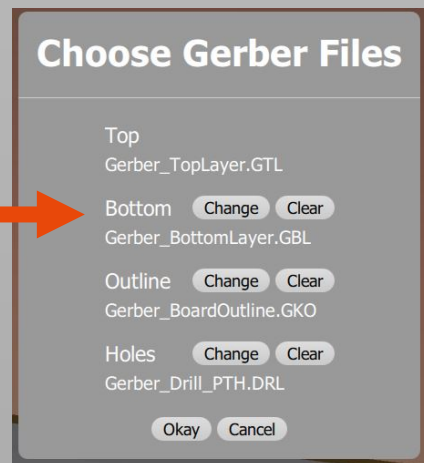
Milling your PCB

After your job is done, check the result, then take out your PCB using a spatula and clean the machine using a vacuum cleaner. Don't forget to put back all the tools in their package.
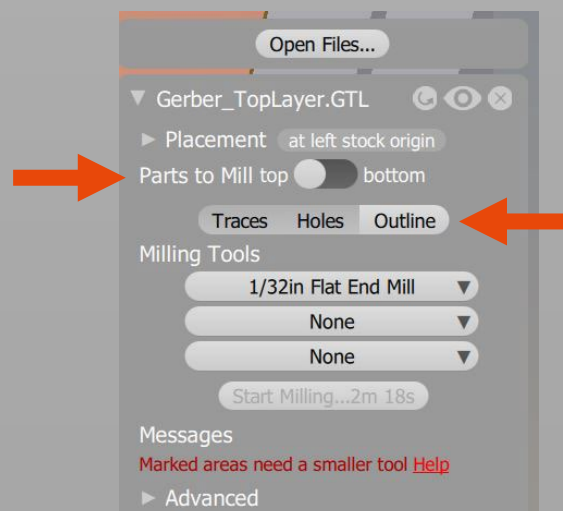

Milling double sided PCBs

In case of double sided PCBs the process is the similar. First make sure that the bottom layer is chosen correctly while importing.


Choose Gerber Files

Top
Gerber_TopLayer.GTL

Bottom   Change   Clear
Gerber_BottomLayer.GBL

Outline   Change   Clear
Gerber_BoardOutline.GKO

Holes   Change   Clear
Gerber_Drill_PTH.DRL

Okay   Cancel

Next in the setting ensure that "Parts to Mill" is set to top and that the outline is turned of. You can verify using the preview

Open Files...

▼ Gerber_TopLayer.GTL

► Placement   at left stock origin

Parts to Mill top ⬤ bottom

Traces   Holes   Outline

Milling Tools

1/32in Flat End Mill ▼
None ▼
None ▼

Start Milling...2m 18s

Messages
Marked areas need a smaller tool Help

► Advanced

Milling double sided PCBs

After the front side is done adjust the settings. This time you want "Parts to Mill" to be set to bottom. In addition you want to turn on the outline but not the holes. Again verify with the preview.
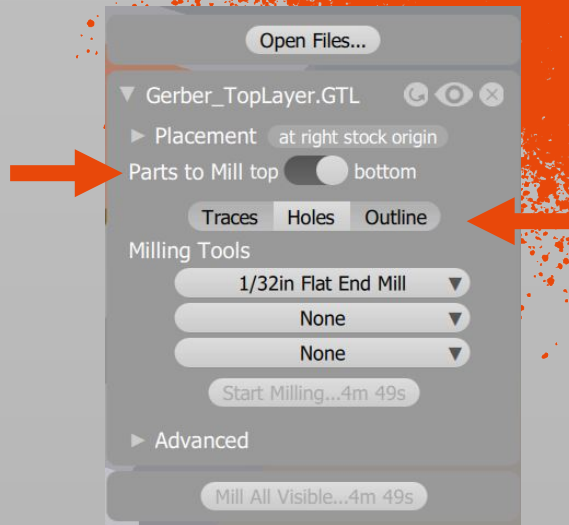
This is what the preview for the top could look like. The PCB is aligned with the front left corner and there is milling of the outside.
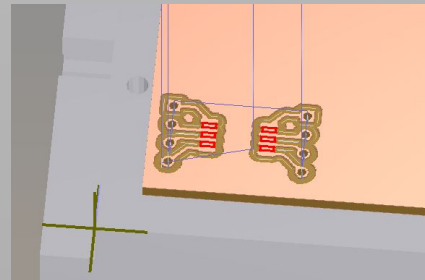
The preview for the bottom shows the PCB aligned with the front right. Also you can see that the wholes are not drilled but the outline is.
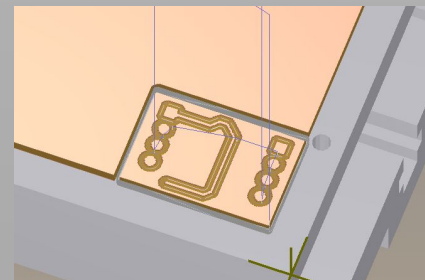
If you have any questions or are unsure at please make sure to consult one of our Makerspace Managers.

PCB Design Rules

- *Minimum trace width: 6 mil for Othermill Pro*
- *Minimum trace spacing: 6 mil for Othermill Pro*
- *Minimum via/pad annular ring thickness: 6 mil for Othermill Pro*
- *Minimum drill size: 16 mil (or smaller with non-standard bits)*
- *Minimum SMD pad size: 6 mil for Othermill Pro*
- *Polygon isolation value: 1 mil larger than the largest tool you want to use*
- *Route traces to through-hole pins on the bottom side only (holes are not plated)*
- *Slotted/oval holes are not supported*