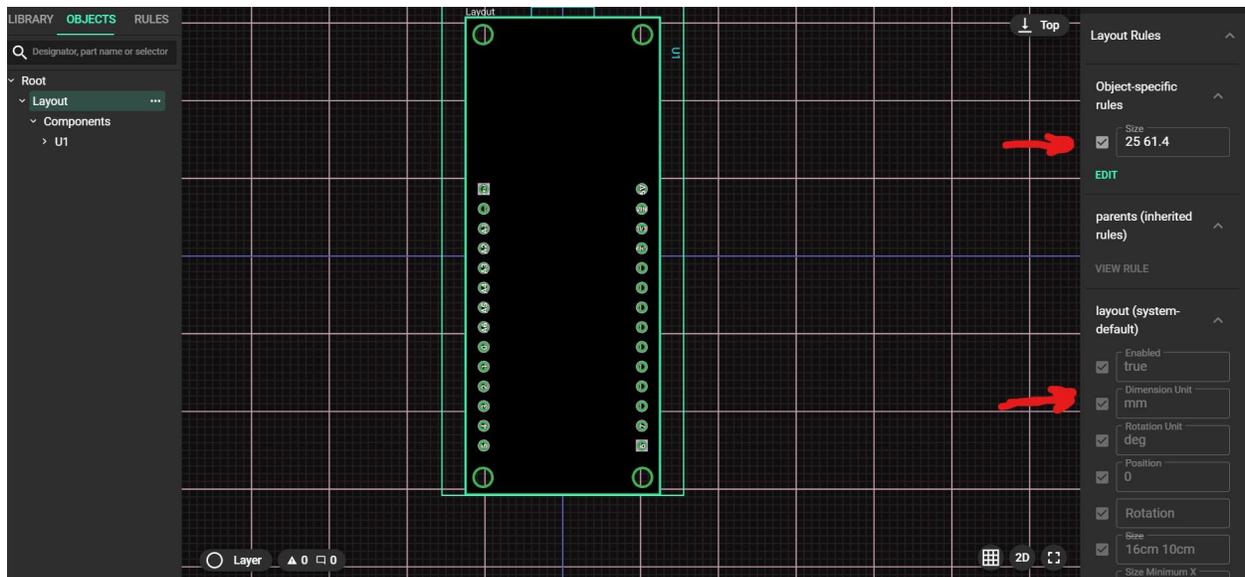


From Flux.ai to CopperCAM to Makera Carvera in **18** Easy Steps!

WARNING: These steps may or may not work for you based on your layout, workflow, or countless other variables. Consider this a template that you will need to tweak for your own purposes.

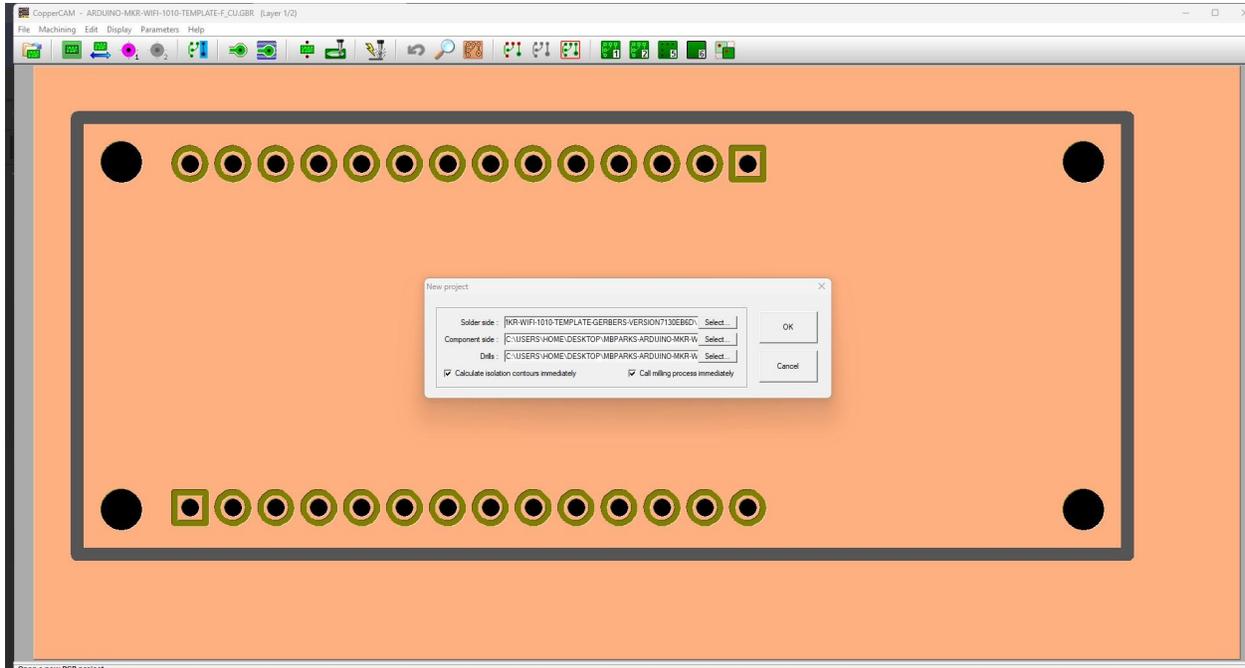
- 1) Make sure your circuit board design in Flux.ai has “Size” and “Dimension Unit” attributes. Millimeters (mm) is a more universal unit measure, so go with that.



3) Open up CopperCam. Select File>Open>New Circuit. Navigate to the folder extracted from the ZIP file.

a) Select the Solder Side, Component Side, and Drill file (.drl) as appropriate.

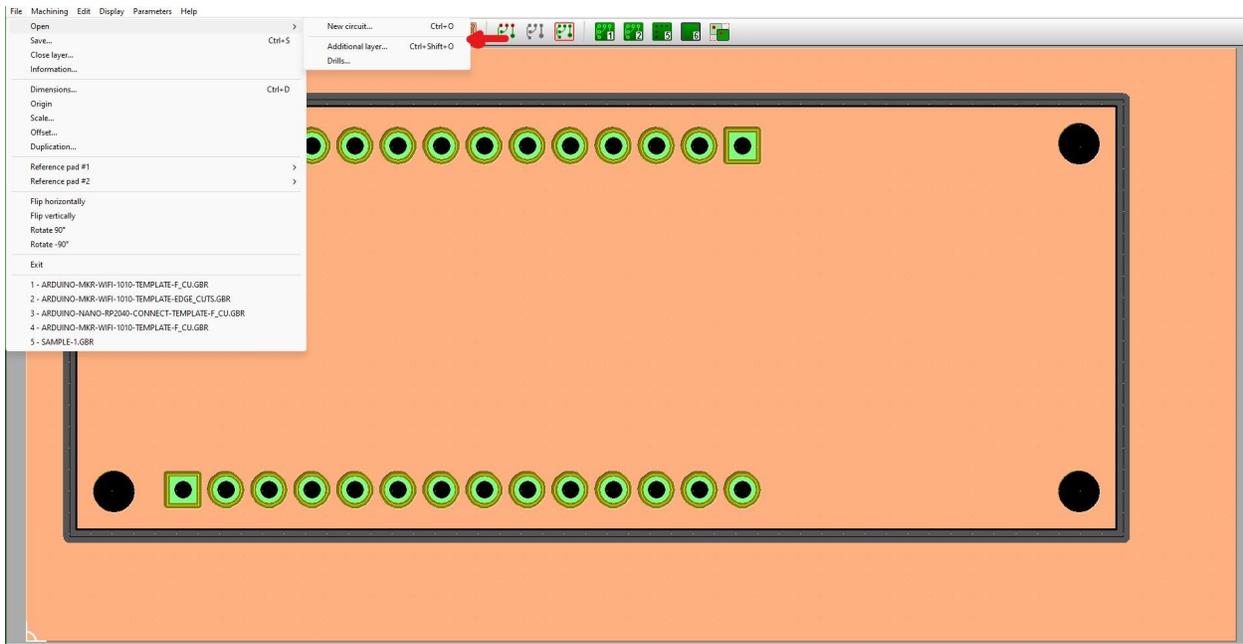
b) The solder side and components side will likely be your copper files (end is *-f_cu.gbr* and *-b_cu.gbr*)



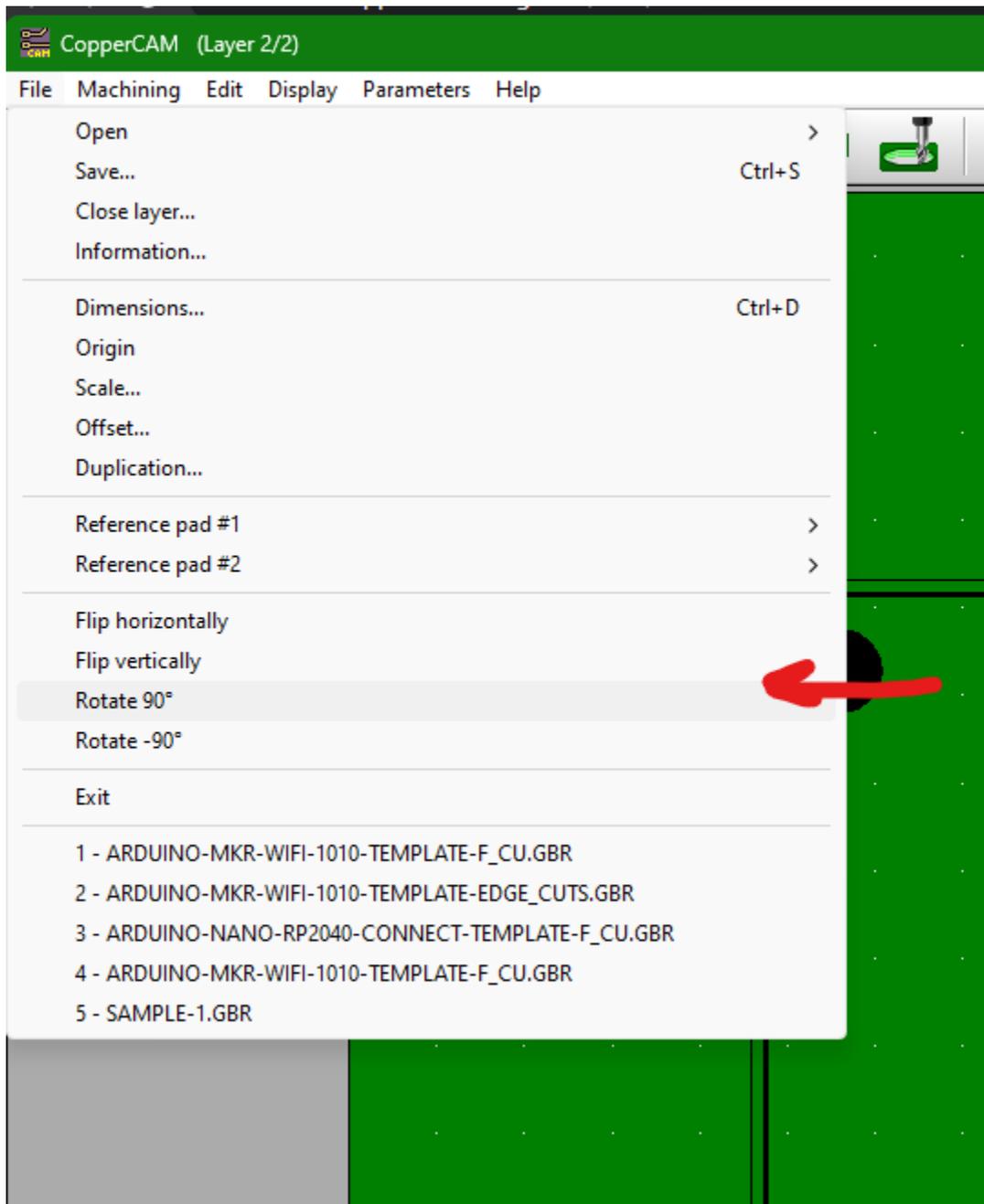
4) If you wish to have the Carvera cut the outline of the board, we need to add an additional layer.

a) Click on File>Additional Layer

b) Select the file ends with *-edge_cuts.gbr*.



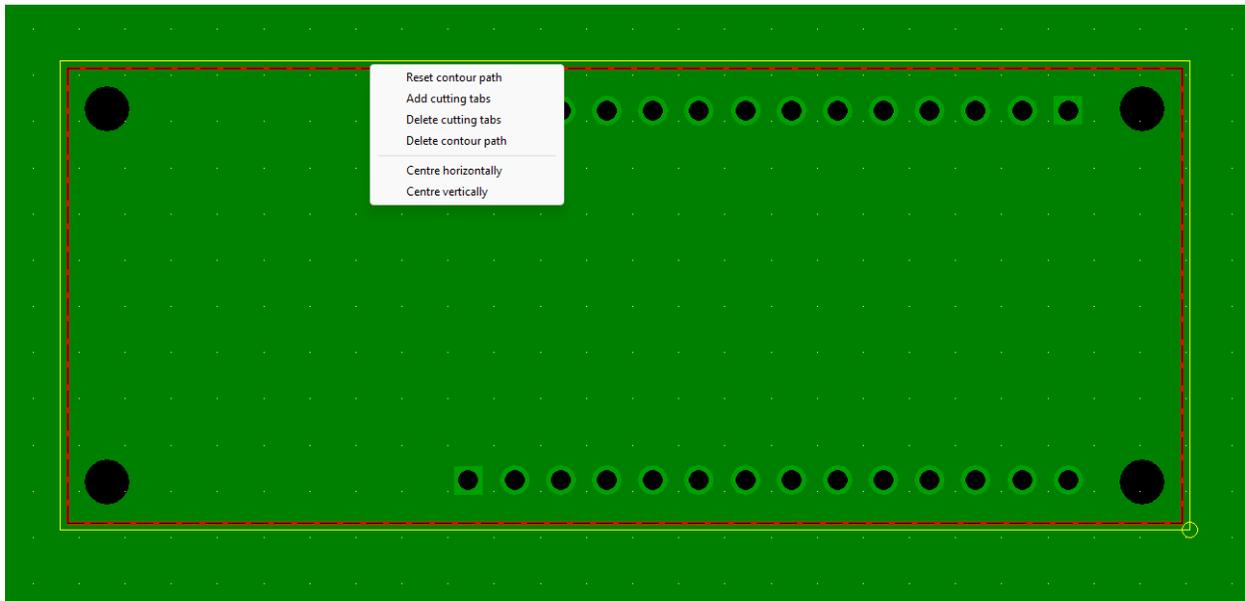
5) Rotate the board, from the toolboard select File>Rotate 90



6) Align the cutout to the center of the layout.



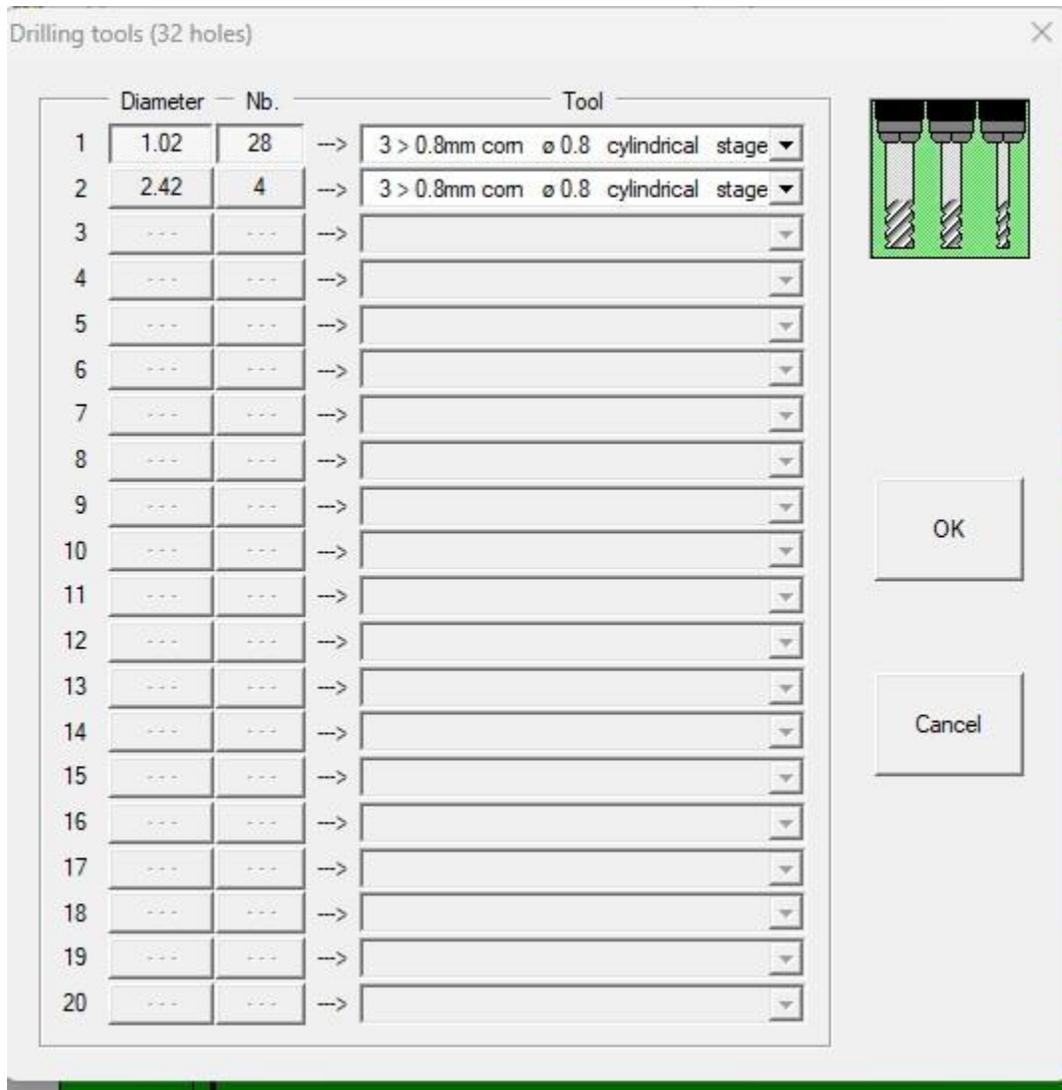
- a) Press  on the toolbar
- b) Right click the outline
- c) Select Centre Horizontally
- d) Select Centre Vertically



7) Verify the holes to be drilled by selecting this icon from the

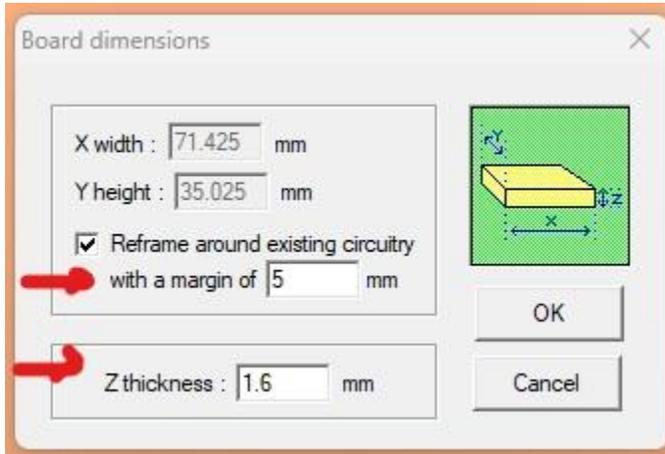


a) Hit cancel if any warning pops-up about hole vs drill size.



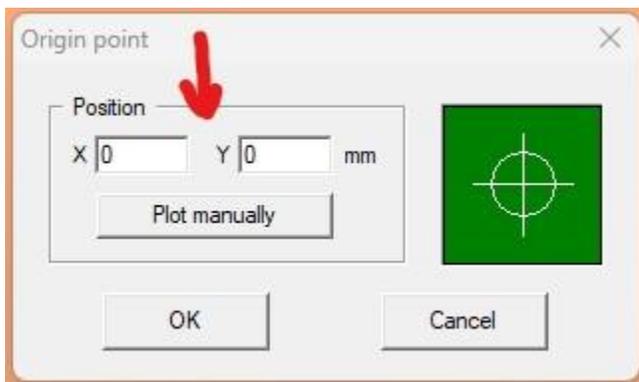
8) To give the machine some clearances whole milling, let's add some margins.

a) Click on File>Dimensions and make the following changes.

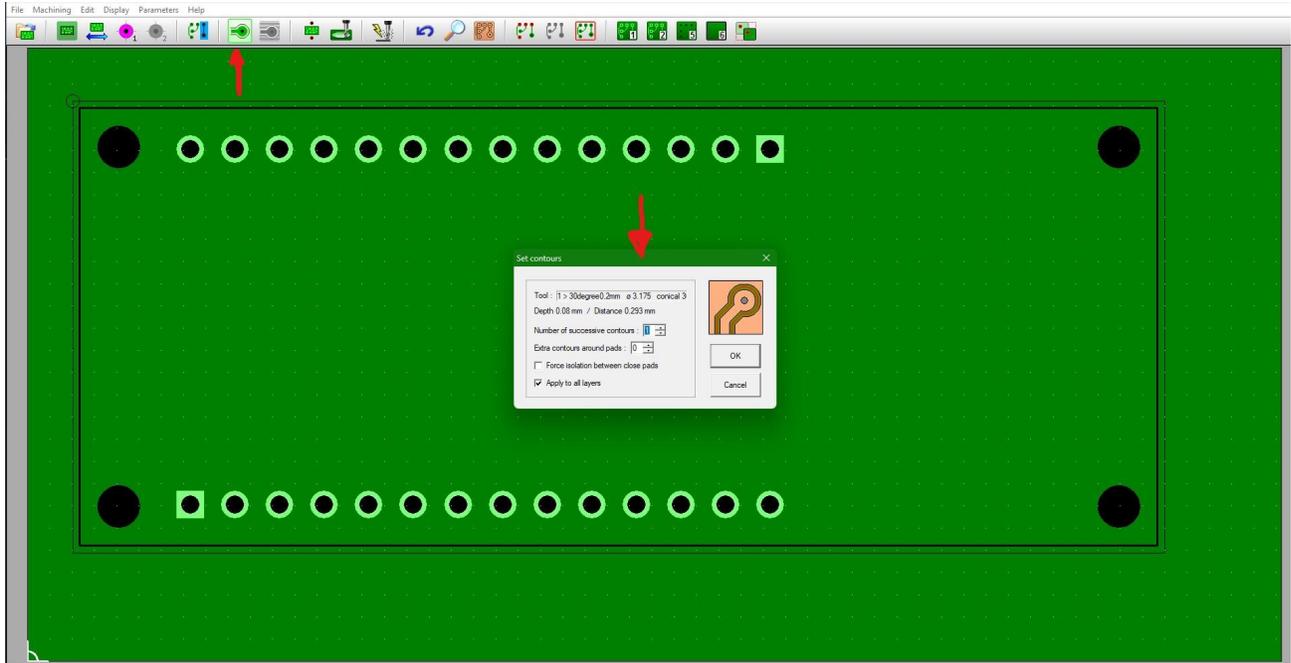


9) Let's set the origin to the bottom-left of the board.

a) Click on File>Origin and make the following changes.



10) Set the contours of the milling by selecting this icon:



11) Now let's set the output file format. From the toolbar, select Parameters>Output Data Format. Make the following changes:

Output data format

Data

Format : G-Code, ISO standard

Use circular interpolation commands

Scales : X 1 Y 1 Z 1

Speed scales : XY 1 Z 1

Begin cycle with a tool-up command

Tool parking height : 2 mm

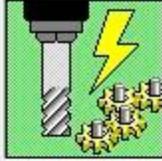
Tool clearance height : 2 mm

Surface contact margin : 0 mm

Cleared tool XY rapid speed : 815.5 mm/s

Rapid Z-down : 407.7 Rapid Z-up : 815.5 mm/s

Coolant : off



OK

Cancel

Output

Create file C:\COPPERCAM\CopperCAM.iso
then execute C:\Windows\notepad.exe

Add section number to file name Add tool number to file name
 Confirm file name

Call printer driver NPI6EE964 (HP Neverstop Laser 1001nw)

Send directly to the machine
Port : PRN Line end : CR

- 12) Let's set up our milling bits. For the Carvera, we have 5 milling bits to set up.
- To do so, from the toolbar, select Parameters>Tool Library.
 - Walkthrough the five milling bits using the Number selection box.
 - Set up each of the 5 bits with the following parameters.

Tool library

Identification

Number : 1 Name : 30degree0.2mm

Specifications

Diameter : 3.175 mm

Profile : conical --> Angle : 30 °

Minimum diameter at bottom of cone : 0.25 mm

Rotation : 12000 rpm Plunge speed : 50 mm/s

Maximum depth per pass : 0.1 mm Laser

OK

Cancel

Tool library ✕

Identification

Number : Name :

Specifications

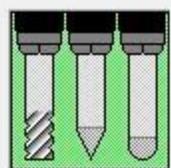
Diameter : mm

Profile : -> Angle : ° 

Minimum diameter at bottom of cone : mm 

Rotation : rpm Plunge speed : mm/s

Maximum depth per pass : mm Laser



Tool library ✕

Identification

Number : Name :

Specifications

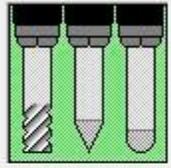
Diameter : mm

Profile : -> Angle : ° 

Minimum diameter at bottom of cone : mm 

Rotation : rpm Plunge speed : mm/s

Maximum depth per pass : mm Laser



Tool library

Identification

Number : 4 Name : 2mm drill

Specifications

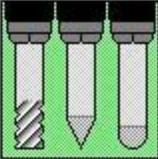
Diameter : 2 mm

Profile : cylindrical -> Angle : °

Minimum diameter at bottom of cone : mm

Rotation : 8000 rpm Plunge speed : 50 mm/s

Maximum depth per pass : 0.5 mm Laser



OK

Cancel

Tool library

Identification

Number : 5 Name : 0.3mm UV remover

Specifications

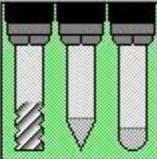
Diameter : 3.175 mm

Profile : conical -> Angle : 30 °

Minimum diameter at bottom of cone : 0.32 mm

Rotation : 6000 rpm Plunge speed : 50 mm/s

Maximum depth per pass : 0.2 mm Laser



OK

Cancel

13) With all the milling bits now in the library. Let's assign the different bits to the different passes.

- a) From the toolbar, select Parameters>Selected Tools
- b) Make the following changes.

Active tools

ENGRAVING TOOL
1 > 30degree0.2mm ø 3.175 conical 30°
Depth : 0.1 mm => Radius 0.152 mm
Margin : 0 mm => Distance 0.152 mm
Engraving speed : 300 mm/s

HATCHING TOOL
1 > 30degree0.2mm ø 3.175 conical 30°
Depth : 0.1 mm => Radius 0.152 mm
Margin : 0 mm => Overlap 50%
Hatching speed : 300 mm/s

CUTTING TOOL
3 > 0.8mm com ø 0.8 cylindrical stages 0
Cutting depth : 1.6 mm
Cutting speed : 300 mm/s
 Invert path direction Helix slope

CENTERING TOOL
4 > 2mm drill ø 2 cylindrical stages 0.5 mn
Hole diameter : 2 mm
Extra depth : 8 mm

DRILLING TOOLS
 Use one single tool for all drills, with circular boring
--> 4 > 2mm drill ø 2 cylindrical stages 0.5 mn
 Use for each drill the closest smaller tool, with circular boring
 Use for each drill the closest greater tool, without circular boring

Selected tools

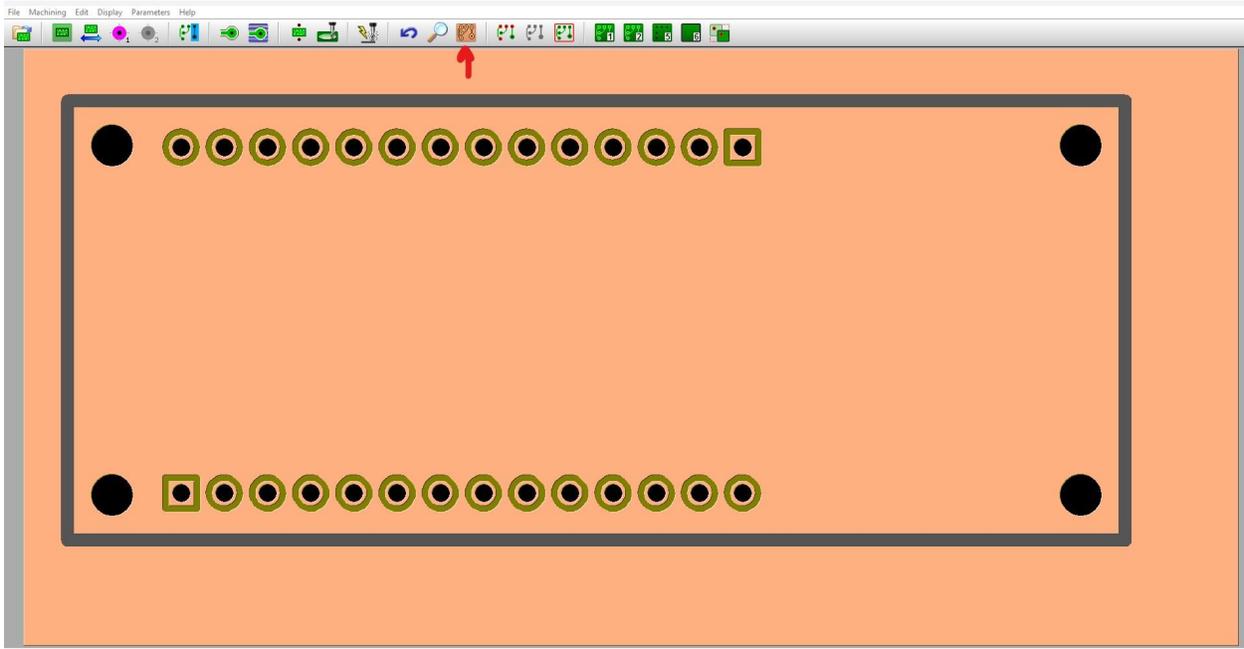
1	2 > 0.5mm drill ø 0.5 cylindrical stages 0.2 mm	X
2	3 > 0.8mm com ø 0.8 cylindrical stages 0.2 mm	X
3		X
4		X
5		X
6		X
7		X
8		X
9		X
10		X

Allow circular boring for all holes over 0.8 mm

Drilling depth : 1.8 mm Boring speed : 300 mm/s
In case of a boring cycle : Drill at centre Lift-up at centre
 Pre-drill holes that have a diameter greater than 0 mm
--> Depth : 0 mm Tool : 1 > 30degree0.2mm ø

OK
Cancel

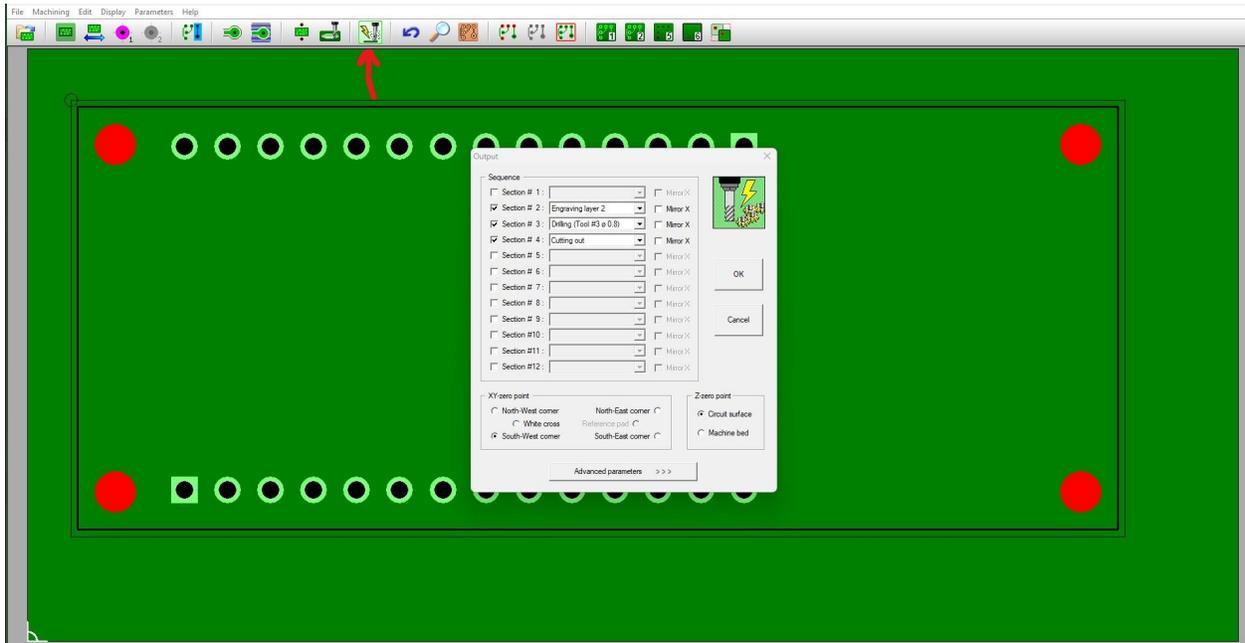
14) Verify that everything looks good by clicking on this icon:



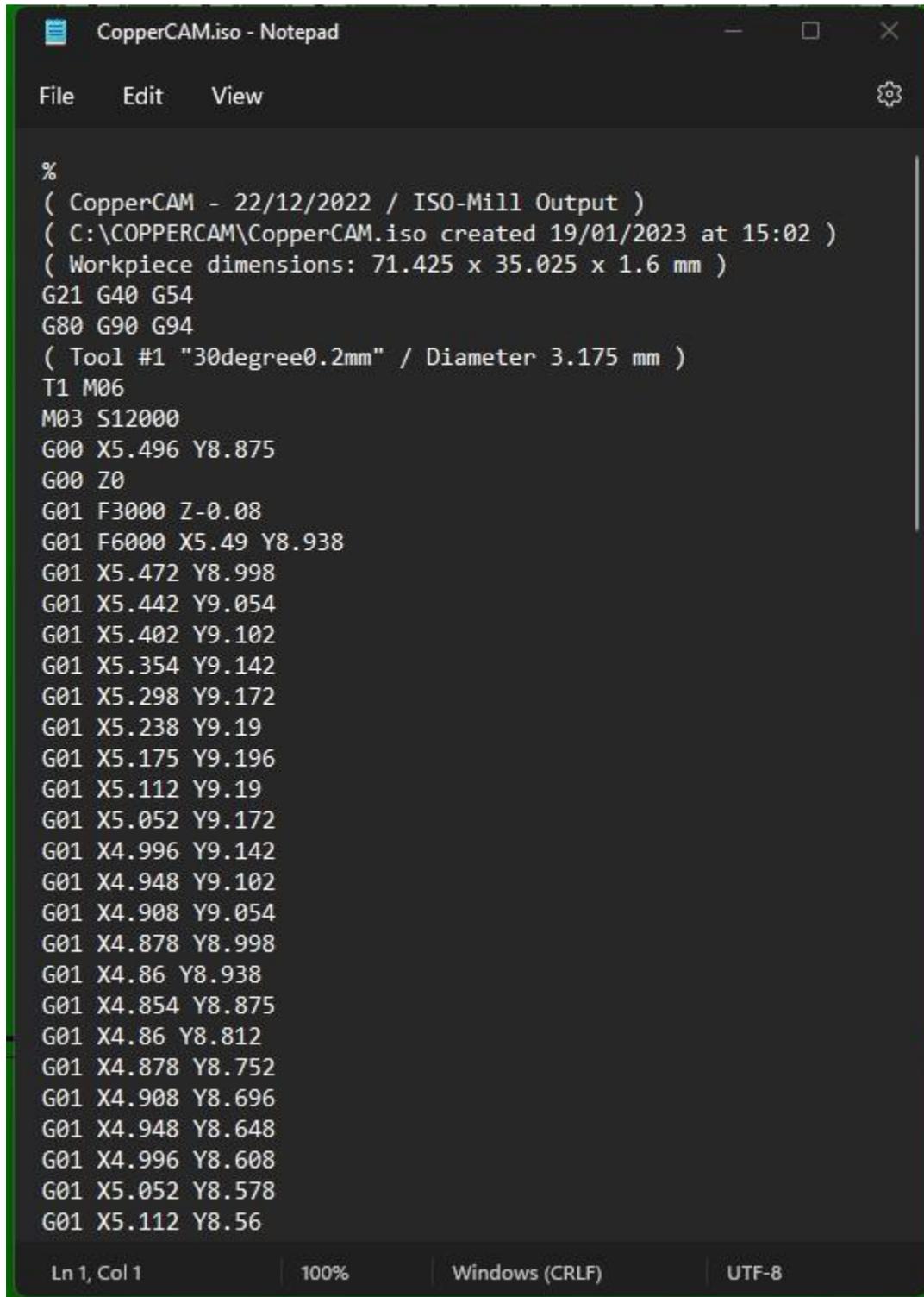
15) Generate the G-Code by selecting this icon:



a) Verify that the correct tool is assigned to each section.



16) Review the G-Code and save the file with the *.nc* filetype.



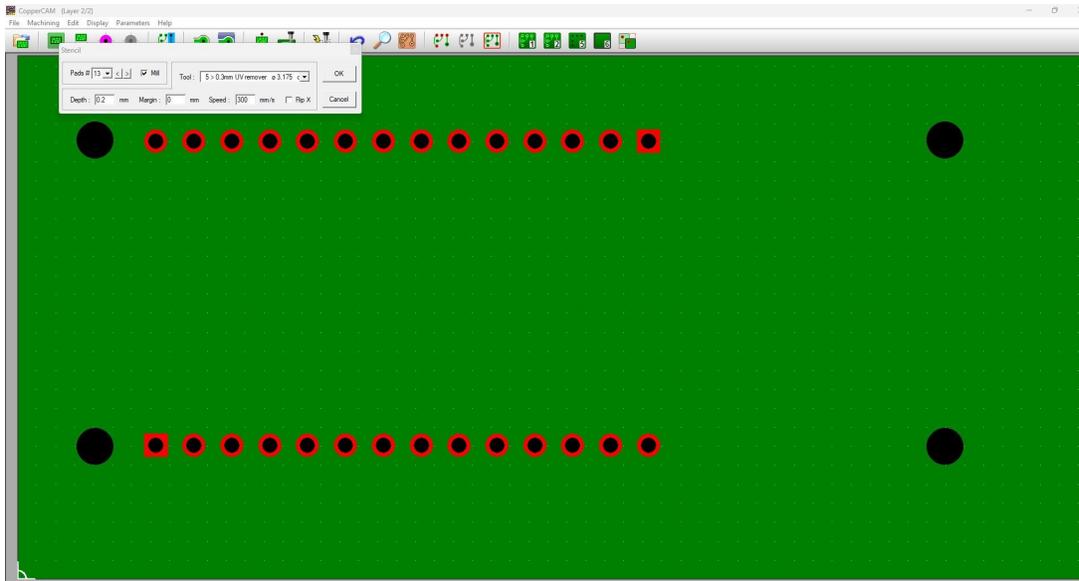
```
CopperCAM.iso - Notepad
File Edit View
%
( CopperCAM - 22/12/2022 / ISO-Mill Output )
( C:\COPPERCAM\CopperCAM.iso created 19/01/2023 at 15:02 )
( Workpiece dimensions: 71.425 x 35.025 x 1.6 mm )
G21 G40 G54
G80 G90 G94
( Tool #1 "30degree0.2mm" / Diameter 3.175 mm )
T1 M06
M03 S12000
G00 X5.496 Y8.875
G00 Z0
G01 F3000 Z-0.08
G01 F6000 X5.49 Y8.938
G01 X5.472 Y8.998
G01 X5.442 Y9.054
G01 X5.402 Y9.102
G01 X5.354 Y9.142
G01 X5.298 Y9.172
G01 X5.238 Y9.19
G01 X5.175 Y9.196
G01 X5.112 Y9.19
G01 X5.052 Y9.172
G01 X4.996 Y9.142
G01 X4.948 Y9.102
G01 X4.908 Y9.054
G01 X4.878 Y8.998
G01 X4.86 Y8.938
G01 X4.854 Y8.875
G01 X4.86 Y8.812
G01 X4.878 Y8.752
G01 X4.908 Y8.696
G01 X4.948 Y8.648
G01 X4.996 Y8.608
G01 X5.052 Y8.578
G01 X5.112 Y8.56
Ln 1, Col 1 | 100% | Windows (CRLF) | UTF-8
```

17) If you wish to use the UV solder mask, it is necessary to generate a toolpath for the UV removal bit.

a) To do so, from the toolbar select Machining>Mill Coating on Pads

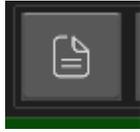
b) Make the changes as shown below.

c) Hit OK to generate the G-Code and save a .nc file.



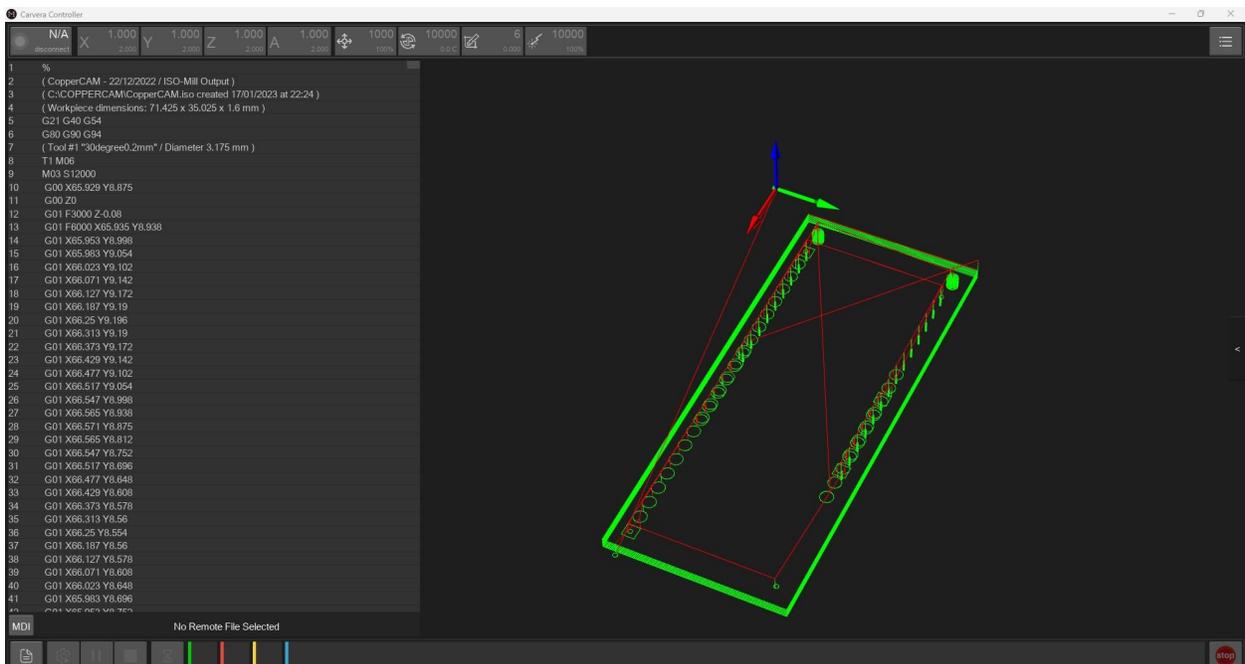
```
CopperCAMsoldermask.txt - Notepad
File Edit View
%
( CopperCAM - 22/12/2022 / ISO-Mill Output )
( C:\COPPERCAM\CopperCAM.iso created 19/01/2023 at 16:17 )
( Workpiece dimensions: 71.425 x 35.025 x 1.6 mm )
G21 G40 G54
G80 G90 G94
( Tool #5 "0.3mm UV remover" / Diameter 3.175 mm )
T5 M06
M03 S6000
G00 X27.05 Y8.965
G00 Z0
G01 F3000 Z-0.2
G01 F18000 X27.053 Y8.975
G01 X27.064 Y8.984
G01 X27.075 Y8.985
G01 X27.088 Y8.982
G01 X27.099 Y8.973
G01 X27.107 Y8.962
G01 X27.112 Y8.948
G01 X27.114 Y8.937
G01 X27.113 Y8.924
G01 X27.11 Y8.911
G01 X27.104 Y8.899
G01 X27.096 Y8.886
G01 X27.085 Y8.875
G01 X27.071 Y8.866
G01 X27.061 Y8.861
G01 X27.05 Y8.856
G01 X27.038 Y8.853
G01 X27.026 Y8.852
G01 X27.013 Y8.852
G01 X27 Y8.853
G01 X26.987 Y8.856
G01 X26.974 Y8.86
G01 X26.961 Y8.866
Ln 1, Col 1 100% Windows (CRLF) UTF-8
```

18) Inside of Makera Controller app, select the file upload by pressing



this icon:

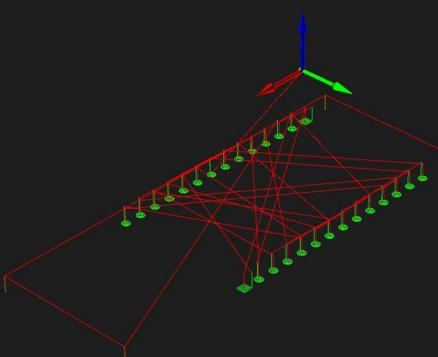
- a) Navigate to the .nc files
- b) Choose the file and press Select.
- c) The milling should proceed in the following sequence:
 - i) Mill pads and traces
 - ii) Apply UV soldermask and cure.
 - iii) Use the UV removal bit to remove the soldermask from the pads
 - iv) Drill the holes
 - v) Cut out the circuit board.



Carvera Controller

N/A X 1.000 Y 1.000 Z 1.000 A 1.000 1000 10000 6 10000
discipline 2.000 2.000 2.000 2.00 100% 80.0 0.000 100%

```
1 %  
2 ( CopperCAM - 22/12/2022 / ISO-Mill Output )  
3 ( C:\COPPERCAM\CopperCAM.iso created 19/01/2023 at 16:17 )  
4 ( Workpiece dimensions: 71.425 x 35.025 x 1.6 mm )  
5 G21 G40 G54  
6 G80 G90 G94  
7 ( Tool #5 "0.3mm UV remover" / Diameter 3.175 mm )  
8 T5 M06  
9 M03 S6000  
10 G00 X27.05 Y8.965  
11 G00 Z0  
12 G01 F3000 Z-0.2  
13 G01 F18000 X27.053 Y8.975  
14 G01 X27.064 Y8.984  
15 G01 X27.075 Y8.985  
16 G01 X27.088 Y8.982  
17 G01 X27.099 Y8.973  
18 G01 X27.107 Y8.962  
19 G01 X27.112 Y8.948  
20 G01 X27.114 Y8.937  
21 G01 X27.113 Y8.924  
22 G01 X27.11 Y8.911  
23 G01 X27.104 Y8.899  
24 G01 X27.096 Y8.886  
25 G01 X27.085 Y8.875  
26 G01 X27.071 Y8.866  
27 G01 X27.061 Y8.861  
28 G01 X27.05 Y8.856  
29 G01 X27.038 Y8.853  
30 G01 X27.026 Y8.852  
31 G01 X27.013 Y8.852  
32 G01 X27 Y8.853  
33 G01 X26.987 Y8.856  
34 G01 X26.974 Y8.86  
35 G01 X26.961 Y8.866  
36 G01 X26.948 Y8.873  
37 G01 X26.936 Y8.882  
38 G01 X26.929 Y8.893  
39 G01 X26.915 Y8.905  
40 G01 X26.906 Y8.918  
41 G01 X26.899 Y8.933
```



MDI No Remote File Selected

stop