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Gemini Aero Cutter

A versatile, portable and user-friendly grbl / grblHAL interface

All in one in the same software to drive your favorite CNC : hot wire cutting, laser and milling

User manual

v1.0.2.0

Update : 2025.12.30

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Main features :

- Ultra light, versatile and portable grbl / grblHAL controler for Windows 7 to 11, 32 and 64 bits
- Reliable and professional made, digitally signed by certified organization (Certera Code Signing CA)
- Handle CNC 3 axis milling (XYZ) / laser (XY or XYZ) and 2+2 axis (XYZA) hot wire foam cutting
- Designed for grbl 1.1 & 1.2 (firmwares provided for Arduino and MKS Gen V1.0) and grblHAL (firmware provided for BTT SKR Pico V1.0)
- Compatible with grbl 0.9 (but 1.1/1.2 recommended)
- Supports all common GCode commands (G0, G1, G2, G3, G4, G10, G28, G90, G91, etc., M0, M2, M3, M4, M5, etc.)
- Dual synchronized drawings (X/Y and A/Z or X/Z)
- Machine & Work origins and coordinates (with user defined offset)
- Automatic machine axis and working area identification on connection
- Automatic drawings autoscale on machine boundaries
- Software hold if machine limits reached
- Advanced grbl settings interface
- Automatic Gcode format recognition and translation (U->A, V->Z)
- Keep trace function
- Macro recorder
- grbl firmware uploading tool
- Syntax-highlighted GCode editor and creator

Gemini Aero Cutter is natively multi-language
If you need a new language and can help us in translation, please send a [request form](#)

Recommended GCode generators :

- Gemini Aero Foam (4 axis hot wire foam cutting) : <https://www.geminaerotoools.com/geminaerofoam.html>
- DesKAM2000 (milling and laser, abandonware but very well made and easy to use, works perfect in WinXP compatibility mode) : <https://icedrive.net/s/NTRjxtTNtZf8aYw55wF7D7ARFV2B>
- Estlcam (milling and laser, very similar to DesKam with great modern UI) : <https://www.estlcam.de>
- KrabsCAM (milling, freeware, very great) : <https://github.com/mkrabset/krabzcam>

Installation

Prerequisite : Windows 7 to 11 with .NET framework 4.5 or higher.

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Create a folder (preferably at the root of the disk) on a physical drive (HDD, SSD or USB key) of your choice .

Extract the zip on these folder : C:\GeminiAeroCutter

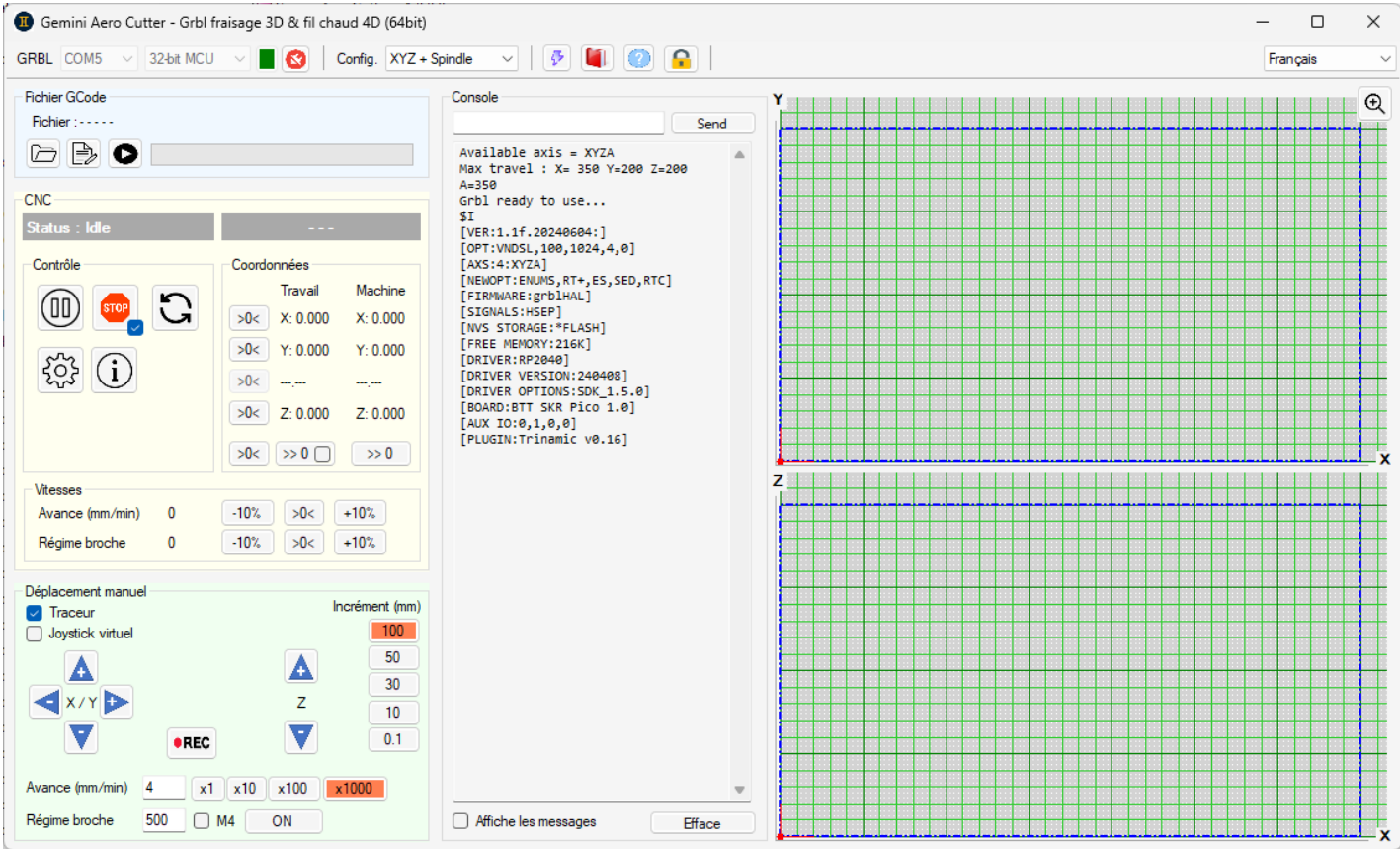
- Documentation
- Firmware
- Settings
- Toolpath
- GeminiAeroCutter_x32.exe
- GeminiAeroCutter_x64.exe

Some anti-virus can make a false virus detection, please ignore it !

Launch GeminiAeroCutter.exe :

In demo mode :

- all functions are available except saving modified GCode
- a reminder message appears regularly



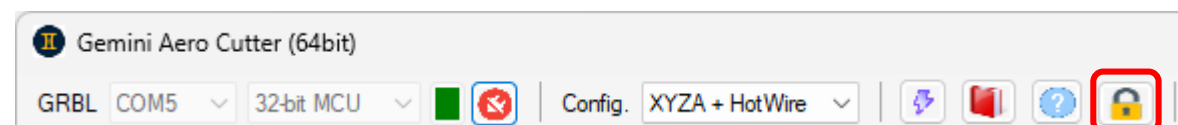
Go to <https://www.geminiaerotools.com/geminiaerocutter.html>

At the end of this page, you will find a PayPal button to buy a licence (credit card or PayPal)

You will received your licence by mail (as it is generated manually, it can take up to 1-2 working days)

Launch Gemini Aero Cutter

Click « Register » to open the registering form :



Copy and paste all the informations of the licence in the registering form :

www.geminiaerotools.com'."/>

Click « Unlock application »

Enjoy 😊

Main interface (hot wire mode)

Most menus and buttons are self-explanatory 😊

Configure user interface for CNC

User text commands interface.
Motion mode (G90 = absolute, G91 = relative) and feed rate (F) must be specified, separately or in the same line of order.
Example : G90 G01 X30 F500
(go to absolute coordinate X = 30 mm at 500 mm/min)

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Stop motion

Pause / resume motion

Hold current position on Stop (otherwise, by default, grbl cuts motor power and current position can be lost)

Configure grbl board

Values can be changed via keyboard or mouse scroll

Toolpath

Language

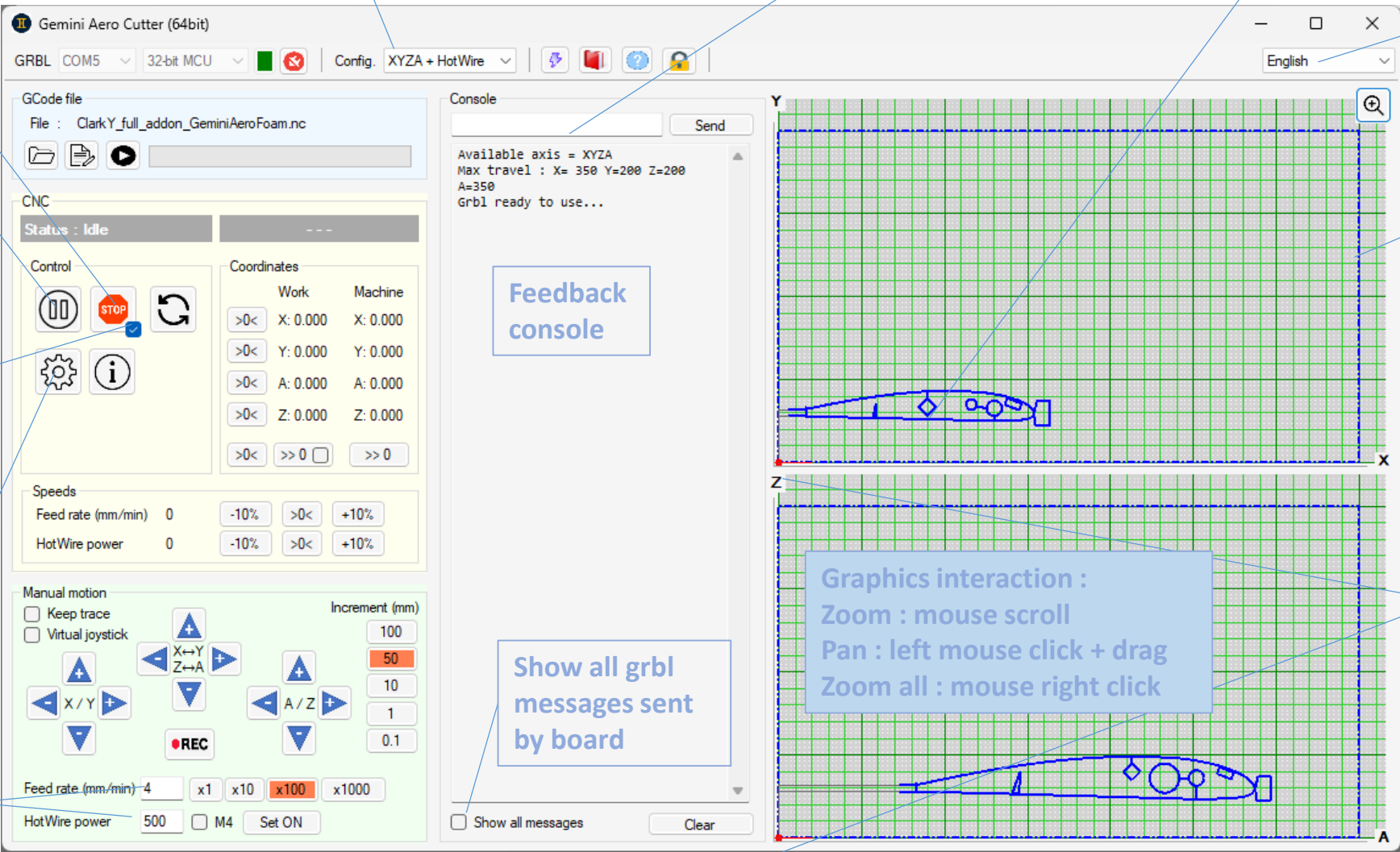
Machine boundaries (use "grbl settings" to change values according to your CNC)

Work origin (= machine origin at startup)
To set new work origin : manual move axis, then click « >0< »)

Feedback console

Graphics interaction :
Zoom : mouse scroll
Pan : left mouse click + drag
Zoom all : mouse right click

Show all grbl messages sent by board



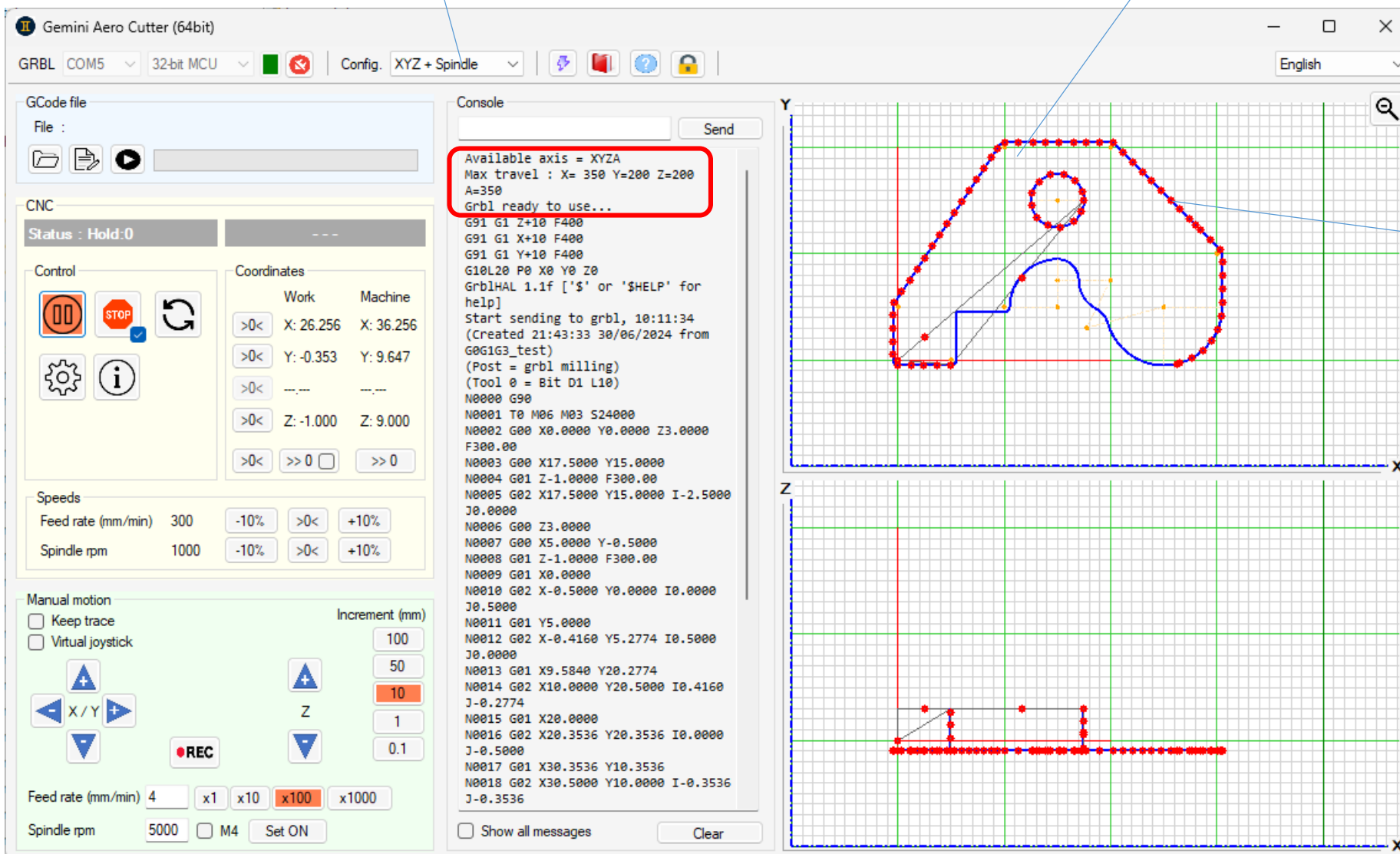
Main interface (milling and laser mode)

A 4 axis CNC board can be used to 3 axis milling, by selecting the appropriate configuration

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G1,G2 and G3 toolpath demonstration

Tool trajectory during operation.
The distance between points is a function of the speed of movement.



Jogging (all modes)

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Keyboard can be used for jogging :

- CTRL + arrows for X/Y (laser, milling) or X+A and X+Z (hotwire)
- CTRL + PageUp/Dn for Z (milling)
- W (Azerty) or Z (Querty) + arrows for hotwire X/Y
- X + arrows for hotwire A/Z

Tool trajectory during jogging

Macro recorder :

- click on button
- use jog or user text commands to do what you want
- click a second time to save to disk

You can now re-use it as a normal toolpath, for example to cut blocks.

Return to work origin at working (G1) or fast (G0) speed

Set the work origin at the current position

Draw the tool trajectory during jogging

Axis will move as long the button is pressed

Gives the exact speed in simultaneous 4 axis jogging on a hot wire machine

The screenshot displays the Gemini Aero Cutter (64bit) software interface. The top bar shows 'GRBL COM5', '32-bit MCU', and 'Config: XYZ + Spindle'. The main window is divided into several sections:

- GCode file:** Includes a file selection button and a 'Send' button.
- CNC:** Shows 'Status: Idle' and a 'Control' panel with buttons for 'STOP', 'Reset', and 'Settings'.
- Coordinates:** A table showing 'Work' and 'Machine' coordinates for X, Y, and Z axes.
- Speeds:** Controls for 'Feed rate (mm/min)' and 'Spindle rpm' with percentage adjustments.
- Manual motion:** Includes a 'Keep trace' checkbox, a 'Virtual joystick' checkbox, and a 'G93' checkbox. It also features a 'REC' button and a 'Set ON' button.
- Increment (mm):** A dropdown menu for selecting the increment value (100, 50, 30, 10, 0.1).
- Console:** A text area showing the GCode being executed, including commands like 'G28', 'G91 G1 Z+50 F4000', and 'G10L20 P0 X0 Y0 Z0'.
- Tool trajectory:** A 2D grid showing the tool path. A red square indicates the current position, and a blue dashed line shows the trajectory.

Annotations with arrows point to various features:

- 'Return to work origin at working (G1) or fast (G0) speed' points to the 'STOP' button.
- 'Set the work origin at the current position' points to the 'G91' checkbox.
- 'Draw the tool trajectory during jogging' points to the 'Keep trace' checkbox.
- 'Axis will move as long the button is pressed' points to the 'Virtual joystick' checkbox.
- 'Gives the exact speed in simultaneous 4 axis jogging on a hot wire machine' points to the 'G93' checkbox.
- 'Tool trajectory during jogging' points to the blue dashed line in the 2D grid.
- 'Macro recorder : click on button' points to the 'REC' button.
- 'use jog or user text commands to do what you want' points to the 'Set ON' button.
- 'click a second time to save to disk' points to the 'Set ON' button.
- 'You can now re-use it as a normal toolpath, for example to cut blocks.' points to the 2D grid.
- 'Mouse right click on button(s) to edit value(s)' points to the 'Increment (mm)' dropdown menu.

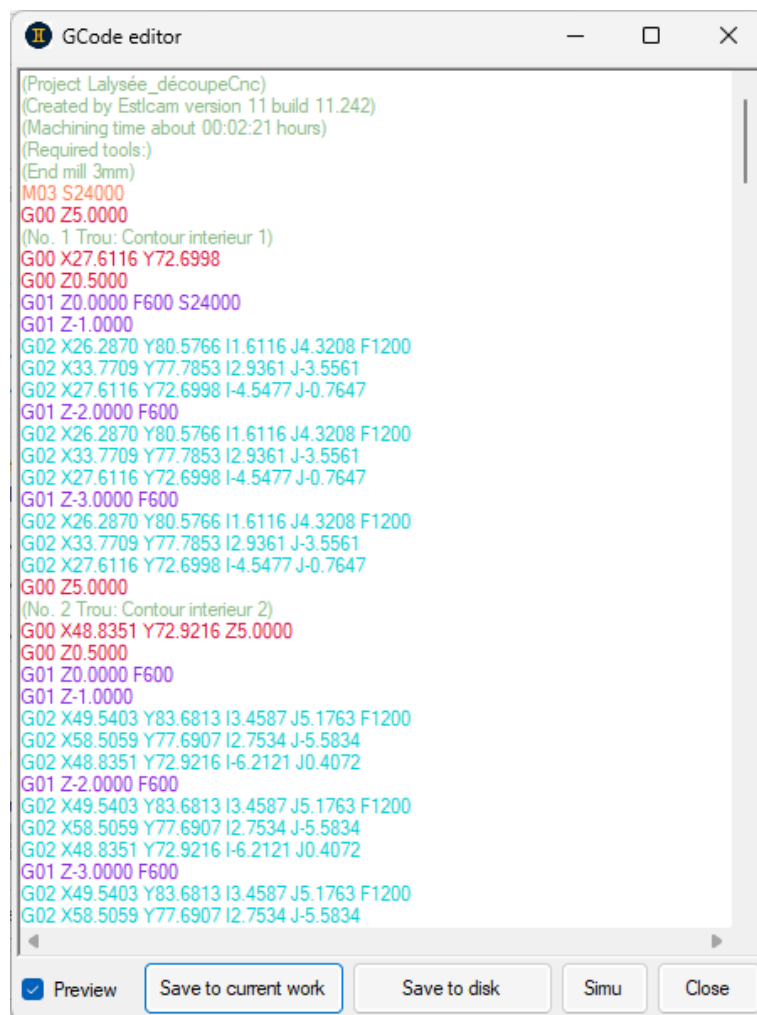
NotePad like text editor with copy / cut / paste abability (ctrl + c / x / v)

Syntax-highlighted text

Instantaneous graphics redraw

Can be use to make a simple GCode program from scratch

Simulate the Gcode with the « Simu » button

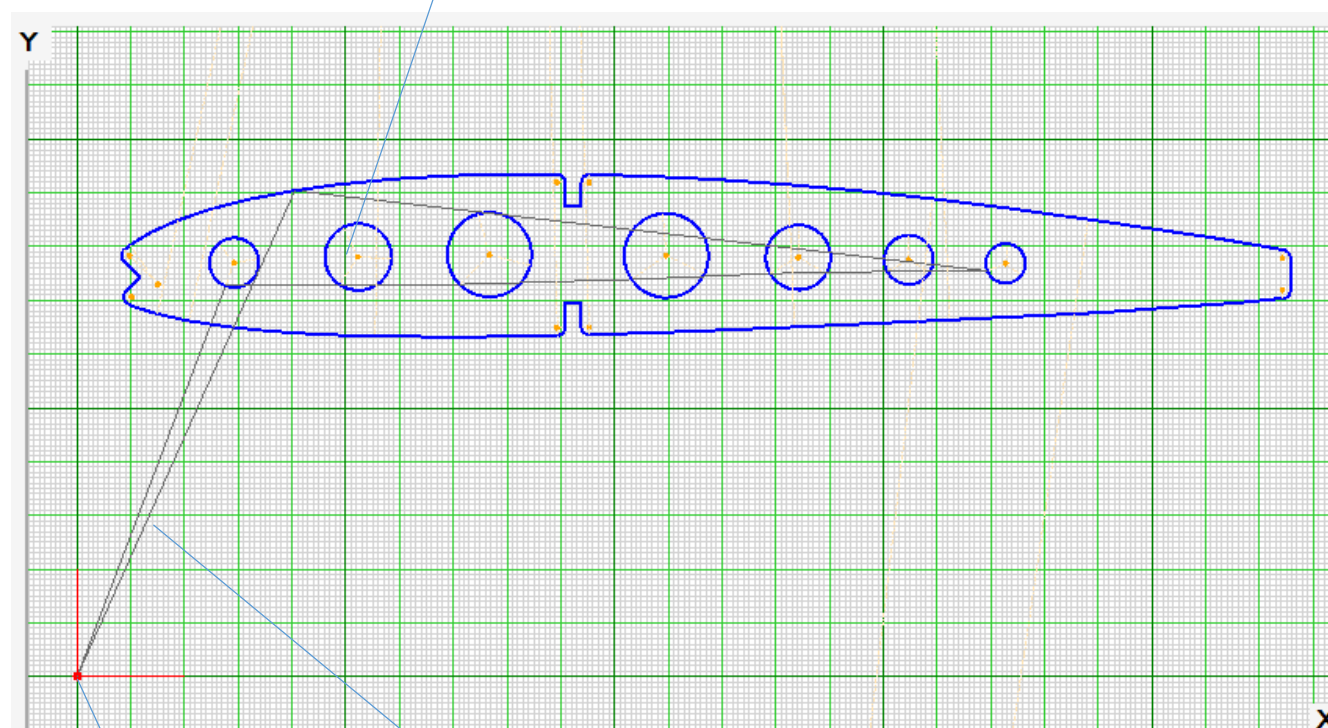


The screenshot shows the GCode editor window with the following content:

```
(Project Lalysée_découpeCnc)
(Created by Estlcam version 11 build 11.242)
(Machining time about 00:02:21 hours)
(Required tools:)
(End mill 3mm)
M03 S24000
G00 Z5.0000
(No. 1 Trou: Contour interieur 1)
G00 X27.6116 Y72.6998
G00 Z0.5000
G01 Z0.0000 F600 S24000
G01 Z-1.0000
G02 X26.2870 Y80.5766 I1.6116 J4.3208 F1200
G02 X33.7709 Y77.7853 I2.9361 J-3.5561
G02 X27.6116 Y72.6998 I-4.5477 J-0.7647
G01 Z-2.0000 F600
G02 X26.2870 Y80.5766 I1.6116 J4.3208 F1200
G02 X33.7709 Y77.7853 I2.9361 J-3.5561
G02 X27.6116 Y72.6998 I-4.5477 J-0.7647
G01 Z-3.0000 F600
G02 X26.2870 Y80.5766 I1.6116 J4.3208 F1200
G02 X33.7709 Y77.7853 I2.9361 J-3.5561
G02 X27.6116 Y72.6998 I-4.5477 J-0.7647
G00 Z5.0000
(No. 2 Trou: Contour interieur 2)
G00 X48.8351 Y72.9216 Z5.0000
G00 Z0.5000
G01 Z0.0000 F600
G01 Z-1.0000
G02 X49.5403 Y83.6813 I3.4587 J5.1763 F1200
G02 X58.5059 Y77.6907 I2.7534 J-5.5834
G02 X48.8351 Y72.9216 I-6.2121 J0.4072
G01 Z-2.0000 F600
G02 X49.5403 Y83.6813 I3.4587 J5.1763 F1200
G02 X58.5059 Y77.6907 I2.7534 J-5.5834
G02 X48.8351 Y72.9216 I-6.2121 J0.4072
G01 Z-3.0000 F600
G02 X49.5403 Y83.6813 I3.4587 J5.1763 F1200
G02 X58.5059 Y77.6907 I2.7534 J-5.5834
```

At the bottom of the window, there are buttons for ☒ Preview, Save to current work, Save to disk, Simu, and Close.

G2 and G3 arc centers
in orange points

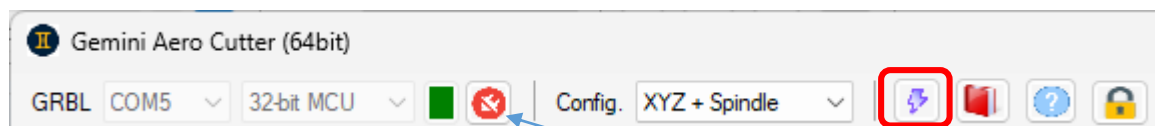


Working origin

G0 rapid motions are
shown in thin grey lines

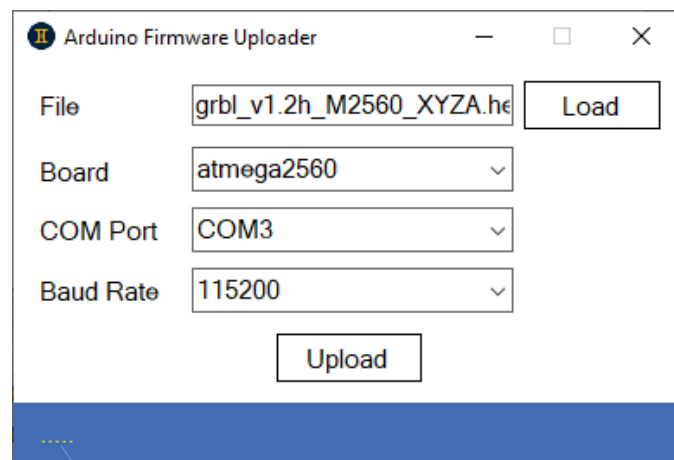
grbl 1.1/1.2 with Arduino UNO (laser and milling) and M2560 (laser, milling, hot wire) boards :

- connect board to USB port
- launch Gemini Aero Cutter
- click on “Flash Arduino” button



- set the appropriate parameters
- Click on “Upload” button
- board is now in working mode

If GRBL port is open, click on the disconnect button before uploading firmware



Status operation

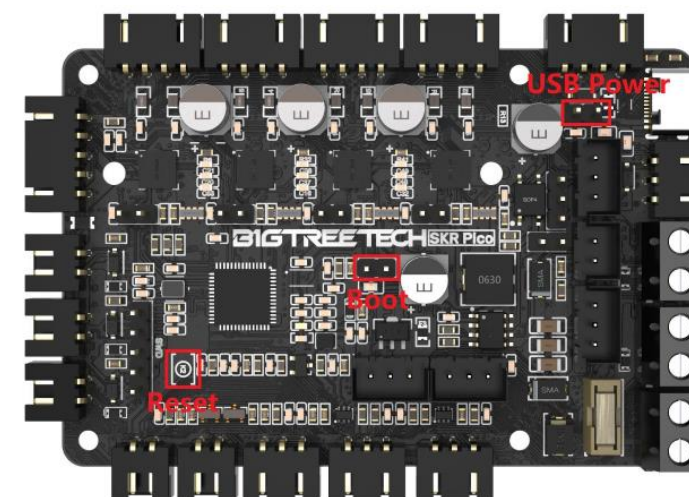
IMPORTANT (for all boards) : always connect the USB port of the board to the PC BEFORE powering the board0

grblHAL with BTT SKR Pico V1.0 board :

- plug jumper caps on Boot and USB Power
- connect the board to USB port
- a new USB flash drive (called RPI-PR2) is added to computer
- copy the pre-built grblHAL.uf2 file on this drive
- the board will automatically reboot
- unplug the Boot and USB caps (USB can temporary stay in place to test the board without powering it by the external power supply, but must be removed for using)
- click the Reset button or unplug / reconnect the board
- board is now in working mode

For who needs a custom grblHAL firmware, you can use this web builder : <http://svn.io-engineering.com:8080/?driver=RP2040>

Driver: RP2040 (Pi Pico & Pi Pico W) [Homepage](#)
Board: BTT SKR Pico 1.0 [i](#) [Homepage](#) [Board map](#)



List of settings is automatically read on the board, and can be saved to (and loaded from) disk.
Each value modification (use enter key to confirm) is automatically sent to board and identified in red.

ID	Value	Unit	Name
\$0	10	microsecond (10 = default)	Step pulse length
\$1	87	millisecond (0-255)	Step idle delay
\$2	1;0;0;0	0 = normal / 1 = reverse	Step pulse mask (X;Y;Z;A)
\$3	0;0;0;0	0 = normal / 1 = reverse	Axis direction mask (X;Y;Z;A)
\$4	0	0 = normal / 1 = reverse	Step enable
\$5	0	0 = normal / 1 = reverse	Limit pins
\$6	0	0 = normal / 1 = reverse	Probe pin
\$10	1	see Grbl documentation	Status report mask
\$11	0.020	mm	Junction deviation
\$12	0.002	mm	Arc tolerance
\$13	0	0 = mm / 1 = inches	Feedback units
\$20	0	0 = disable / 1 = enable	Soft limits (req. homing)
\$21	0	0 = disable / 1 = enable	Hard limits
\$22	0	0 = disable / 1 = enable	Homing cycle (req. lim. sw.)
\$23	0;0;0;0	0 = normal / 1 = reverse	Homing direction mask (X;Y;Z;A)
\$24	25.000	mm/min	Homing feed rate
\$25	250.000	mm/min	Homing seek rate
\$26	250	microsecond	Homing debounce delay
\$27	5.000	mm	Homing pull-off
\$30	12000	% (0-100)	Spindle max rpm
\$31	550	% (0-100)	Spindle min rpm

The configuration of the SKR Pico offers a few additional settings :

\$140	500	mA	X axis current
\$141	500	mA	Y axis current
\$142	500	mA	Z axis current
\$143	500	mA	A axis current
\$150	16	8, 16, 32 or 64	X axis micro-steps
\$151	16	8, 16, 32 or 64	Y axis micro-steps
\$152	16	8, 16, 32 or 64	Z axis micro-steps
\$153	16	8, 16, 32 or 64	A axis micro-steps

- stepper current is set programmatically by the \$140-\$143 parameters (instead of pots like on Pololu drivers).
CAUTION : never leave these values at 0, otherwise the current will not be regulated and can damage board (max continuous current for the TMC2209 drivers is 2 A) and also steppers. A good starting point is 500 mA, then adjust it depending if your CNC loose its position at idle or loose steps during fast motion.
- micro-stepping is also set programmatically, by the \$150-\$153 parameters (instead of jumper caps like on RAMPS or MKS boards).
Default value is 16, but you can go up to 32 or 64 (and even 128 or 256, but not necessary) with the built-in TMC2209 to improve resolution with direct belt drive systems. **NOTE** : this function works only if SKR Pico board is powered by external supply (i.e. drivers are powered) **AND** USB cap is removed (otherwise the board will use the default value of 16 microsteps and will have inappropriate motions !).

NOTE : \$1 must be set to 255 (i.e. motors keep their torque at idle) for belt drive CNC

\$2 is generally set to 0;0;0;0

\$4 must be set to 0 (normal step) for grbl and 7 (3 axis) or 15 (4 axis) for grblHAL

\$10 must be set to 3 for grbl and to 511 for grblHAL

Bug reporting

Despite of your efforts, some bugs or crash can occurs, nobody is perfect... ☹️

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If the case, Gemini Aero Cutter will automatically create a file « errorlog.txt » in the working directory of the application.
You can open submit it via :

- the contact form : <https://www.geminaerotoools.com/contact.html>
- or in the « Bug reports » section the forum : <https://www.geminaerotoools.com/forum/>

Don't forget to give some explanations (context, screenshots, etc.) to help us solving it !

Gemini Aero Tools

geminaerotoools.com/contact.html

HomeDownloadOrderForumContact

Subject :
Other

Name :
Your name

Email :
name@domain.com

Country :

Message :
(please don't forget to provide your full coordinates for a licence key request)

Bug reports !

Your Message :
...

Contents of errorlog.txt file :
....

Security check :
(4+4)/2 =

4

Send

Your data will only be used in order to communicate with you and deleted once no longer needed for this. They will not be shared with any third party.


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Gemini Aero Tools

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geminaerotoools.webboard.org/index.php

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Support for www.geminaerotoools.com

Hi Guest!

As you're not logged in, some features could be unavailable. [Click here](#) to become a member of Gemini Aero Tools.

Username: Gemini

Password: *****

Cookies have to be granted please

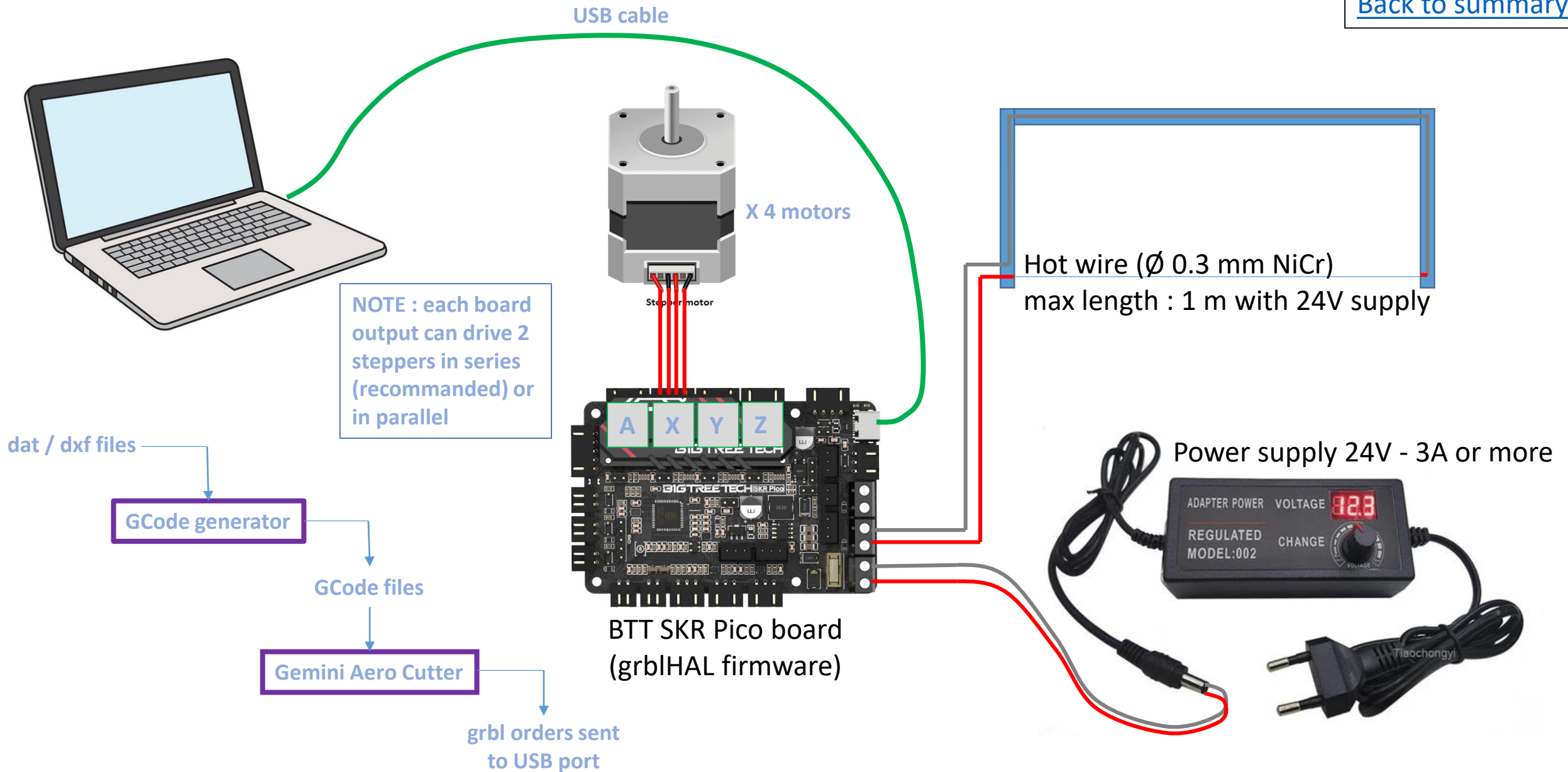
Log in

Help

Unanswered posts

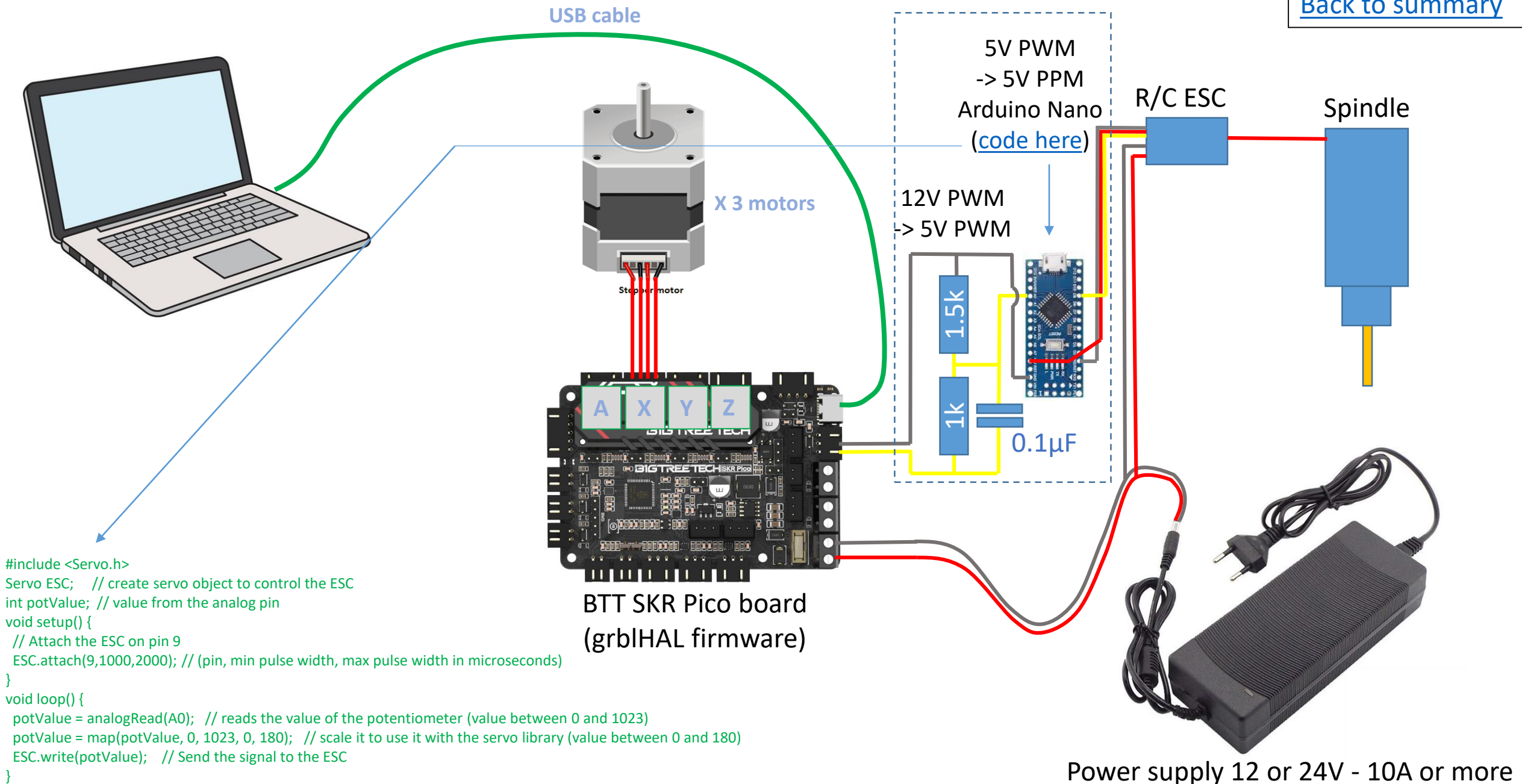
The time now is 01 Mar 2024 09:51

	Forum	Topics	Posts	Last Post
Gemini Aero Designer forum				
	New releases & development announcements Follow this thread to be notified of Gemini updates Moderator Gemini	16	18	14 Feb 2024 18:21 Gemini
	Tutorials How-to, tips & tricks Moderator Gemini	1	1	13 Mar 2023 19:31 Gemini
	Bug reports Submit bugs and others problems Moderator Gemini	9	64	23 Nov 2023 18:23 Gemini
	Improvement proposals You have ideas of improvement or new features ? Moderator Gemini	9	33	28 Dec 2023 20:02 Gemini
	Need help Users mutual aid zone (this is not an after sales service !) Moderator Gemini	7	59	20 Jan 2024 13:12 Nico5934

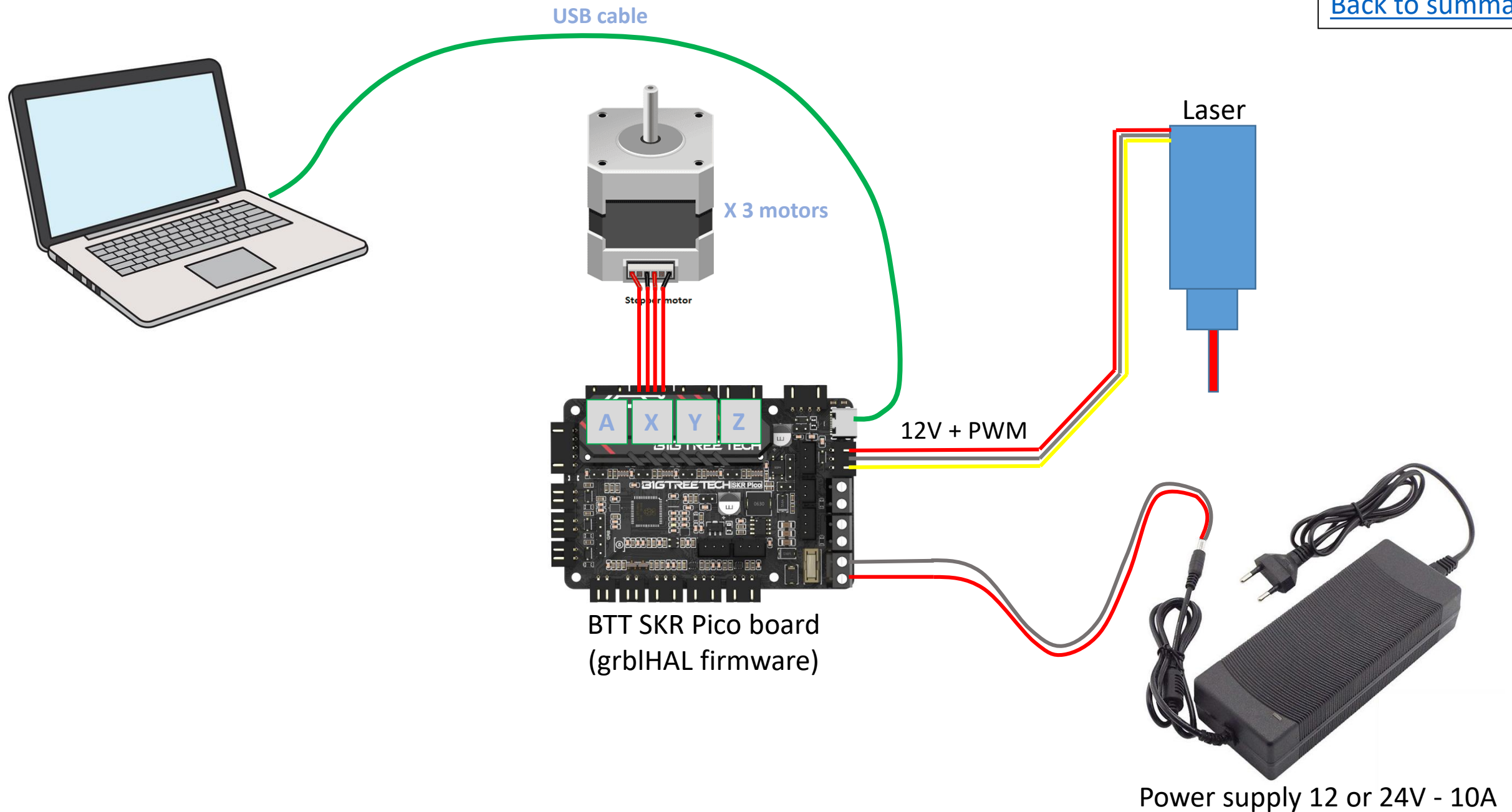


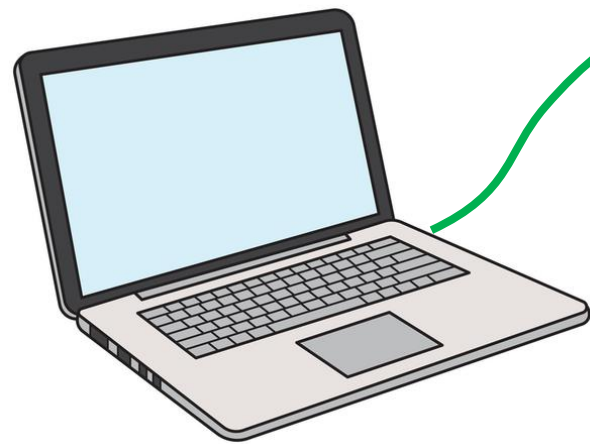
Typical CNC configuration : SKR Pico + milling

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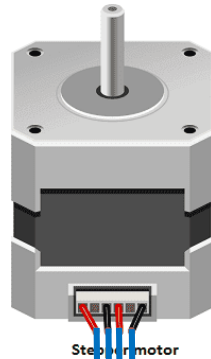


Power supply 12 or 24V - 10A or more

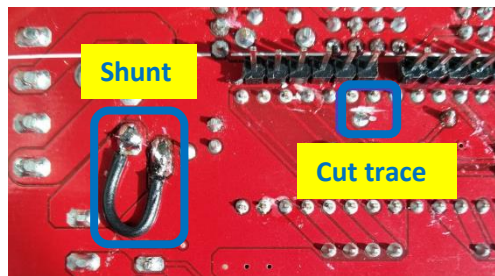




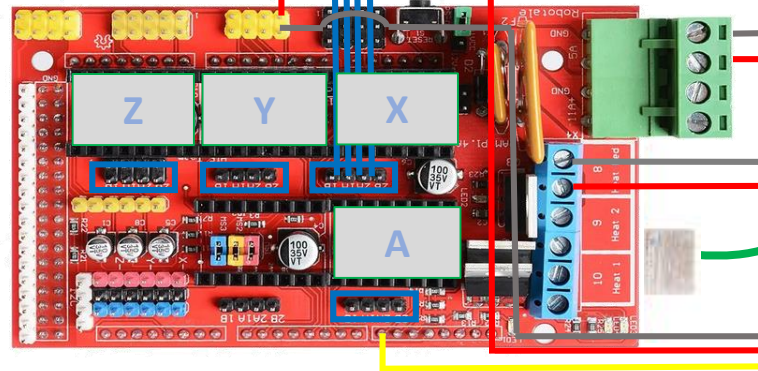
USB cable



X 3 or 4 motors



Ramps 1.4 & 1.5 power supply modification
(one supply for motors and hot wire)



M2560 (Arduino firmware) + Ramps
Recommended motor drivers : TMC2225 (32 μ Steps)



Power supply 12 or 24V

Hot wire

5V PWM

Arduino 5V PWM -> PPM → Spindle

Laser