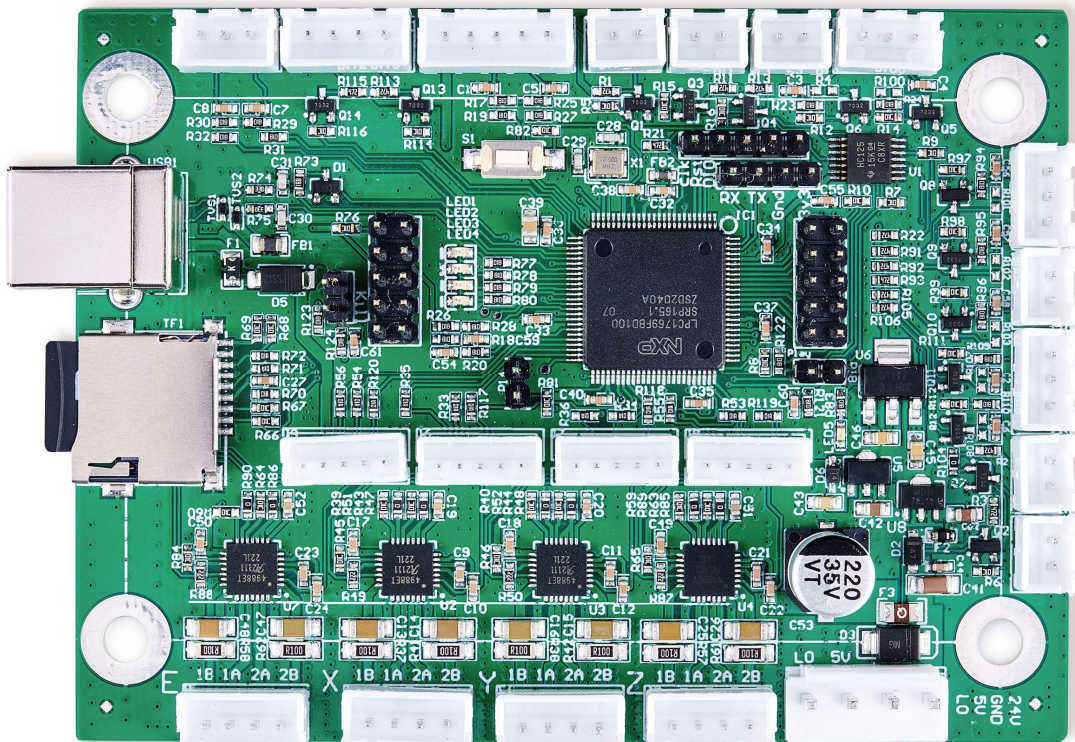


# K40+

## Laser Engraver Control Card User Manual



Read Carefully Before Use  
Keep for Future Reference

# PREFACE

Thank you for choosing this laser control board.

Read this manual carefully before operation. It covers the details of correct installation, adjustment, and safe operation of your laser's new control board. It is intended to be used in conjunction with the manuals for your laser engraver and its engraving software. You and any other users of your laser should thoroughly understand **ALL** these manuals before attempting to install this control system or operate the laser. When correctly installed and used in accordance with these instructions, your laser should operate safely but some components remain extremely dangerous. Be sure that you have correctly connected your laser's preinstalled safety devices. Never disable or deactivate them. Always use your laser safely and responsibly.

This manual should be included with the others if your engraver is given or sold to a third party. If you have any questions or require more information after reading this manual, please contact us and our support department will address your concerns as soon as possible.

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# **1. Introduction**

## **1.1 Overview**

Once you have fully connected this control board to your engraver, you will be able to operate your laser directly from its control panel or through a direct connection with your computer. Designs can also be stored directly on the board's microSD card, although it is usually impossible to run them directly from standard K40 control panels. For details on safe use of your laser, see its separate manual. For details on operating your engraving software, see its separate manual.

## **1.2 Symbol Guide**

The following symbols are used on this machine's labeling or in this manual:



These items present a risk of serious property damage or personal injury.



These items address similarly serious concerns with regard to electrical components.



This product is sold in conformity with applicable EU regulations.



This product contains electrical components that should not be disposed of with regular garbage.

## **1.3 Designated Use**

This control board is intended for use with OMTech's low-wattage laser engravers and cutters using glass (DC) or metal (RF) carbon dioxide (CO<sub>2</sub>) tubes. Its firmware and ports can also be used to control similar engravers from other manufacturers and some CNC machines, although such configurations are outside the scope of this manual and must be done at the user's own risk. This board must be installed, operated, maintained, and repaired by personnel familiar with its field of use and the dangers both of the machine and its components.

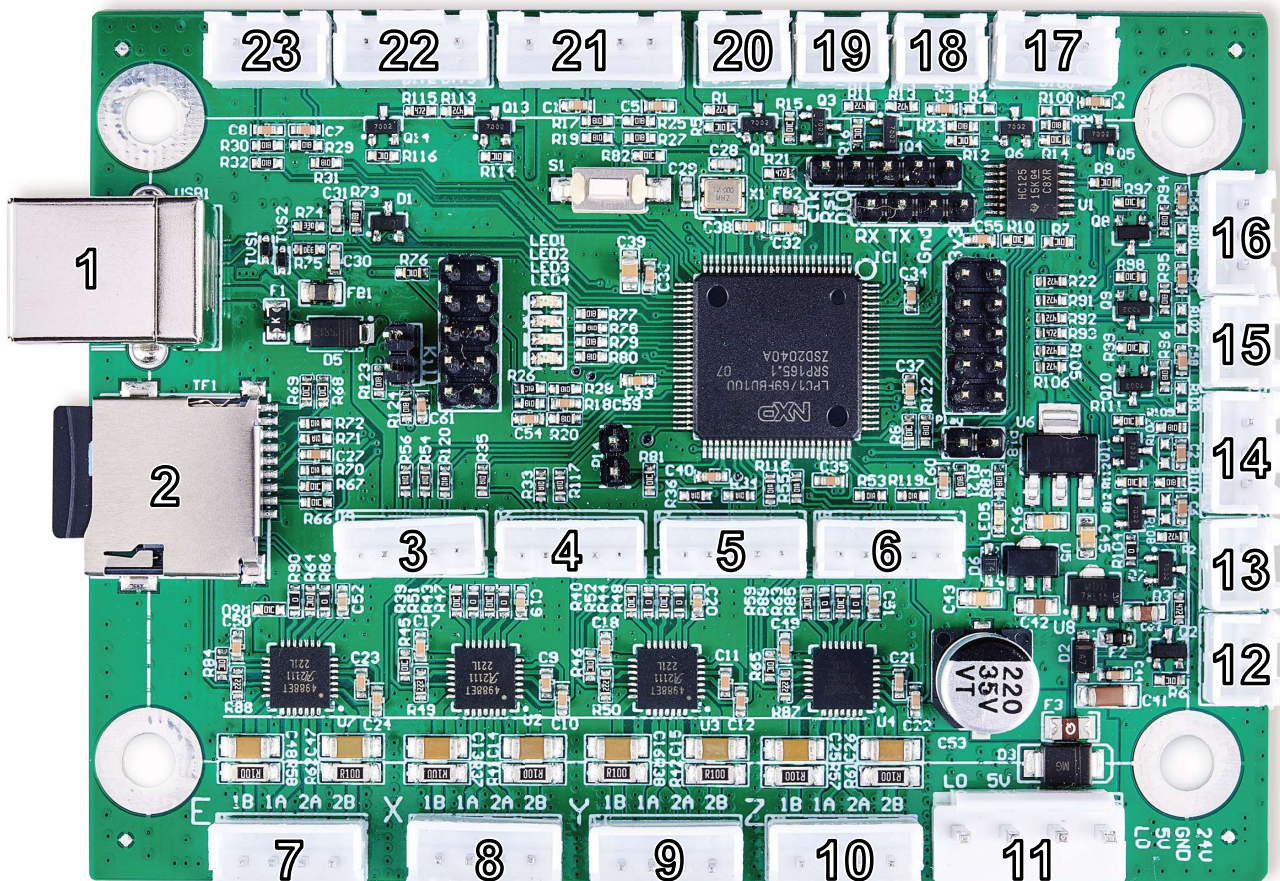
Laser engravers and CNC machines are dangerous. The manufacturer and/or seller bear(s) no responsibility and assume(s) no liability for any improper use of this device or for any damage or injury arising from such use. The operator is obliged to use this control system only in accordance with its designated use and to use its engraver only in accordance with the instructions in all its manuals and all applicable local and national laws and regulations.

## 1.4 Technical Specifications

Model	K40+
CPU Type	32-Bit Arm Cortex-M3
Board Dimensions	3.8×2.8×0.5 in. (9.8×7.3×1.2 cm)
Input Power	24V DC
Output Power	5V DC
Max. Clock Frequency	120 MHz
Firmware	Smoothie
Compatible Software	LightBurn (Windows/Linux/macOS)
System Memory	512 MB
Compatible File Systems	FAT16, FAT32
Maximum USB Speed	USB 2.0 (480 Mbit/sec.)

## 1.5 Product Diagram

### Control Board



No.	Label	Pins	Use
1	—	4	USB Type B Computer Connection
2	—	8	MicroSD Card Firmware & Config File Storage
3	E	5	Multiphase U Axis Driver Signal
4	X	5	Multiphase X Axis Driver Signal
5	Y	5	Multiphase Y Axis Driver Signal
6	Z	5	Multiphase Z Axis Driver Signal
7	E	4	OMTech or Bipolar U Axis Driver Signal
8	X	4	OMTech or Bipolar X Axis Driver Signal
9	Y	4	OMTech or Bipolar Y Axis Driver Signal
10	Z	4	OMTech or Bipolar Z Axis Driver Signal
11	PWR	4	Main Power Connection
12	BLOW	2	Air Assist Signal (5V)
13	5V	2	5V Power Output
14	IN1 & IN2	3	5V Input Connections
15	TH5	2	5V Temp. Sensor Connection
16	TH3 & TH4	3	5V Temp. Sensor Connections
17	TH1 & TH2	3	5V Temp. Sensor Connections
18	HE1	2	5V Temp. Controller Signal
19	HE2	2	5V Temp. Controller Signal
20	FAN	2	5V Add-On Exhaust Signal
21	X & Y	5	X & Y Axis Limit Switches
22	Out1 & Out2	4	5V Output Signals
23	Z	3	Z Axis Limit Switch

## **2. Safety Information**

### **2.1 Disclaimer**

Your control board may differ somewhat from those shown in this manual due to options, updates, etc. Please contact us if your device came with an outdated manual or if you have any other questions.

### **2.2 General Safety Instructions**

Use this device only in accordance with this instruction manual, the manuals for your laser engraver and its engraving software, and all applicable local and national laws and regulations. Only allow this device to be installed, operated, maintained, repaired, etc. by others who are familiar with these manuals and have read and understood all their warnings and safety information. Ensure that this manual is also included with your engraver if it is ever given or sold to a third party.

- **DO NOT** install this control board if it arrives or becomes damaged. Contact customer service for help with repair or replacement.
- **DO NOT** leave this device separate from your engraver or loosely housed within it. Make all connections securely and then firmly secure the device to your engraver's casing.
- Generally leave the microSD card unmounted except as necessary to update its firmware or to store your designs. If the card is left mounted during engraving, miscellaneous communication between it and your control computer can cause pauses or glitches in your work.
- After any adjustment of this device's electrical connections with your engraver and its accessories, carefully test that the connections have been made correctly and the engraver and accessories are responding properly to your commands. Be especially careful of any connections to the water cooling system, heat sensors, and other safety equipment. If your engraver did not come with an interlock sensor that automatically cuts power to the laser when the work bay's protective cover is opened, it is highly recommended that you get and install one.

### **2.3 Electrical Safety Instructions**

- **ONLY** use this device with a compatible and stable power supply with less than 5% fluctuation in its voltage. If your engraver's power supply is unable to maintain such consistency, replace the power supply before further use.
- Adjustment, maintenance, and repair of this device and other electrical components of your engraver must be done **ONLY** by trained and skilled professionals to avoid fires and other malfunctions, including potential radiation exposure from damage to the laser components. Because specialized techniques are required for testing the electrical components of your engraver, it is recommended such testing only be done by the manufacturer, the seller, or a specialized repair service.



Unless otherwise specified, **ONLY** undertake adjustment, maintenance, and repair of this device and its electrical connections when it, your engraver, and any connected accessories are turned off and disconnected from their power supplies.

- **ALWAYS** check that the electrical polarities are correct at every stage of installation. Reversing the polarity of power inputs can damage or destroy your board and other components. Use of a multimeter to ensure correct installation is recommended, especially for use with custom projects. Also ensure that new connections are properly grounded.
- **DO NOT** allow anything metallic to come into contact with this device while it is powered. Allowing a metal tool or fastener to fall against the board during use can cause short circuits, damaging or destroying the board.

## 2.4 Fire Safety

- **NEVER** leave your engraver alone during use.
- Always keep a fire extinguisher, water hose, or other flame retardant system nearby in case of accidents. Ensure the local fire department's phone number is clearly displayed nearby. In the case of a fire, cut electrical power before dousing the flame. Familiarize yourself with the correct range of your extinguisher before use, as its high pressure can produce blowback.
- If installing this board on a CNC machine or other device using thermistors and heating elements, consult [www.smoothieware.org](http://www.smoothieware.org) and other sources to ensure that your system and its computer code include appropriate safety measures to avoid excessive or uncontrolled heating, with fallbacks and automatic shutoffs in case of errors.

## 3 Installation

### 3.1 Unpacking Your Control Board

Your control board and its microSD card should arrive protected by an antistatic bag and insulating foam. If you find any damage during unboxing or installation, please contact us immediately. Do not continue with installation until customer service can confirm the devices' safety or provide safe replacement(s).

You may keep the packaging in case of future return but, if you dispose of it or any part of these devices, be sure to do so in compliance with applicable waste disposal regulations.

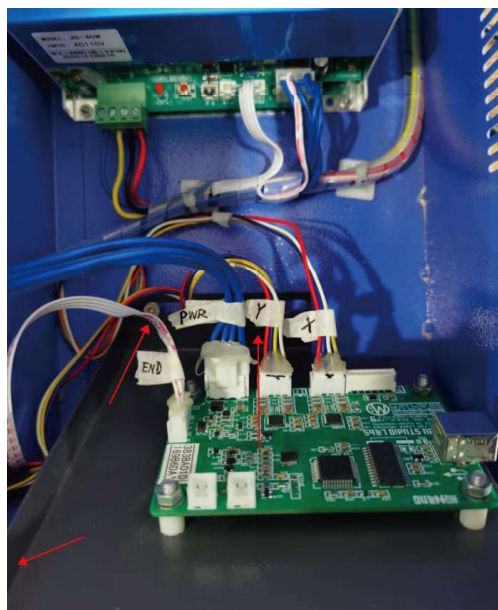
### 3.2 Preparation



**DO NOT** install this device while your engraver is connected to its power supply.

Turn off your laser engraver and fully disconnect it from its power supply. Open the part of your engraver's casing that holds its control panel. Place the cover to the side while taking care not to pull or damage its wiring.

It is recommended that you use a few pieces of tape to join the various sets of wires connected to your engraver's current control board. Add labels similar to those shown in the picture below.

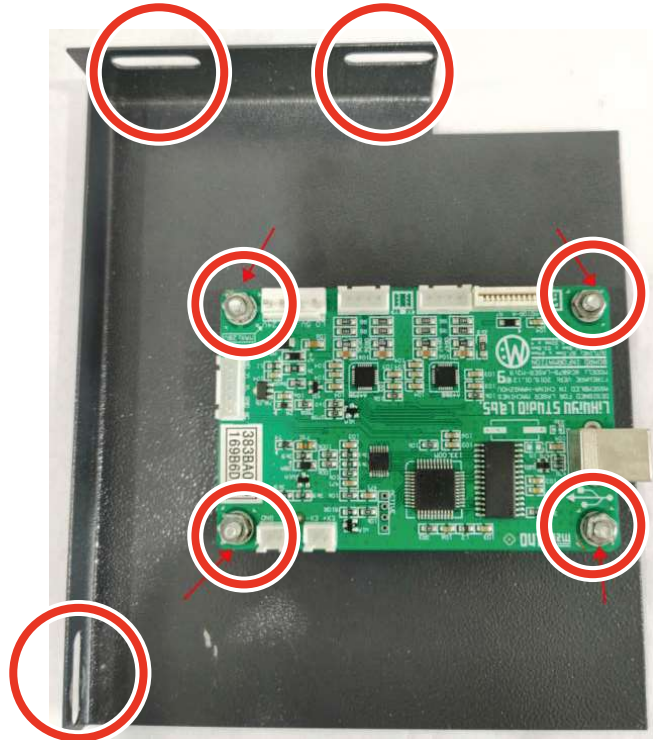




Here, “PWR” is used for the main power input, “Y” and “X” for the motor drivers, and “END” for the limit switches. Any clear phrasing is fine. If your old board already has other connections in addition to these, use its manual or the board’s markings and the diagram in §1.5 to label those wires as well. Once all connected wires are clearly labeled, disconnect them from the old board.

### 3.3 Replacing the Old Control Board

Remove the three bolts holding the control board plate to your engraver. Remove the plate and remove the four bolts at the corners of the old control board.



You can mount the new control board into place now (being careful to position its USB port beside your casing’s access hole) or make all the necessary electrical connections first before bolting it into place.

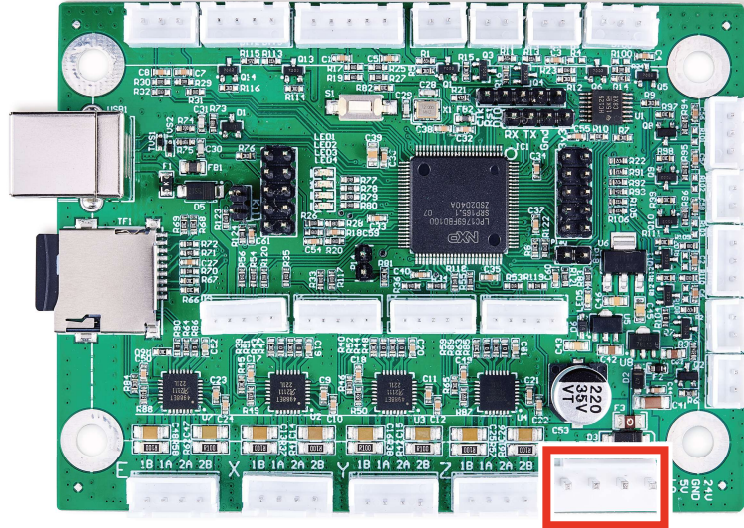
### 3.4 Electrical Connections



Only install this board while your engraver and all components are turned off and disconnected from power. Always check that the polarities of your connections are correct, with a multimeter if needed.

### 3.4.1 Control Board Power

On the control board, find the largest 4 pin terminal. Connect the “PWR” terminal block previously removed from your old board to this terminal. If you are connecting the wires individually for a new or different system, connect the pin marked “24V” to your engraver’s 24V power supply and the pin marked “GND” to the power supply’s ground port, sometimes marked “0V”.

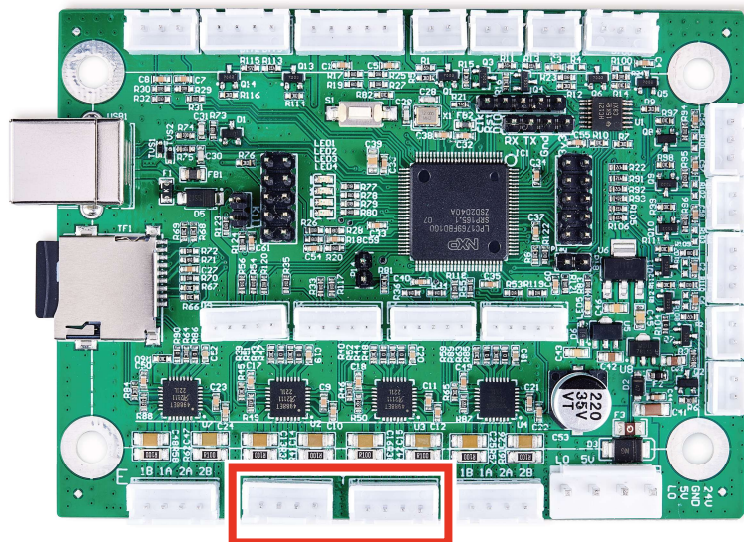


### 3.4.2 Laser Tube Connection

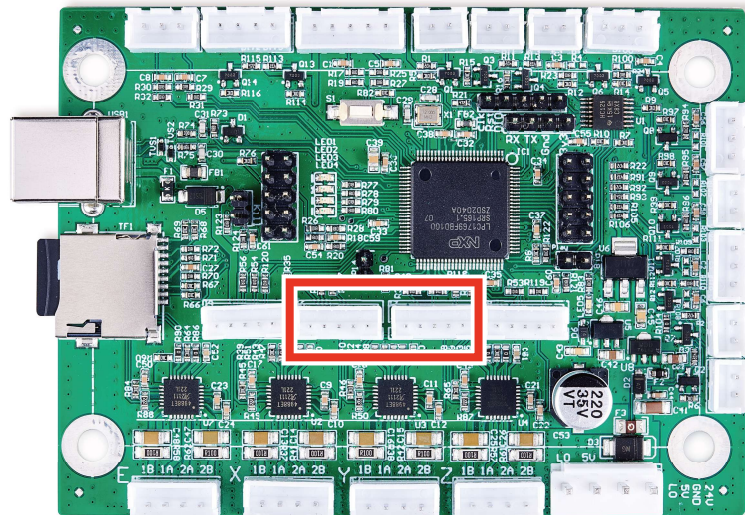
This control board does not directly connect to your laser tube.

### 3.4.3 Laser Head Connections

On the control board, find the 4 pin terminals marked “X” and “Y” beside the power terminal just connected. Connect the “X” and “Y” terminal blocks previously removed from your old board to these terminals. If you are connecting the wires individually for a new or different system, bipolar stepper motors will use the same four pin terminals. Connect the two wires coming from either coil to the pins marked “1A” and “1B”. Connect the two wires from the other coil to the pins marked “2A” and “2B”.

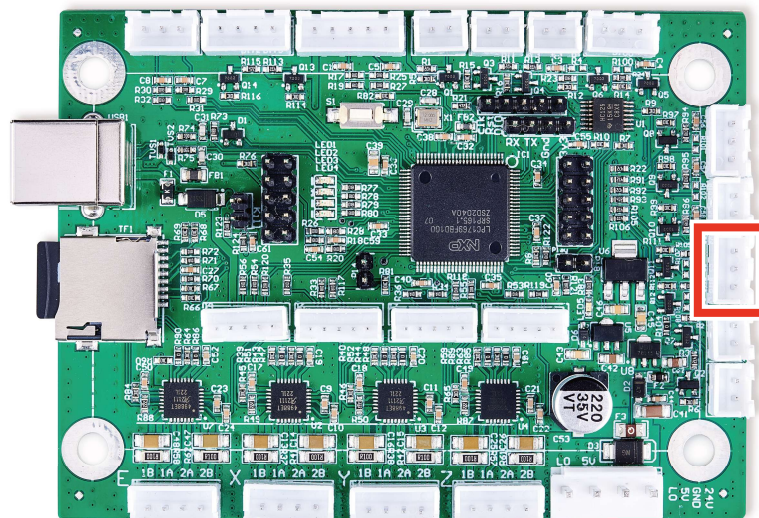


The 5 pin terminals marked “X” and “Y” in the center of the board might be necessary for some upgraded stepper motors. You can connect them directly to a preassembled terminal or wire them separately. Connect each pin marked “5V” to the positive pins (“PUL+”, “DIR+”, and “EN+”) for the corresponding axis. Connect each pin marked “GND” to the corresponding ground (“GND” or “0V”) pin. Connect the pins marked “STP”, “DIR”, and “EN” to the corresponding negative pulse (“PUL-”), direction (“DIR-”), and enable (“EN-”) pins respectively.

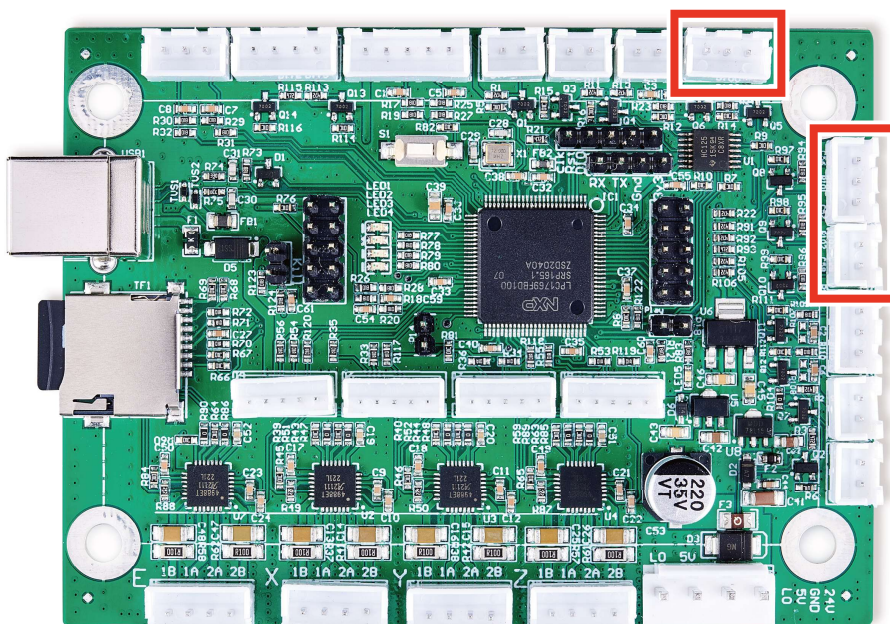


### **3.4.4 Device Input Connections**

This circuit board can accept two separate 5V input signals from devices such as an interlock open cover sensor or a foot-controlled power switch. (If your engraver did not come with an interlock sensor, it is strongly recommended that you install such a sensor.) You can connect preassembled 3 pin terminal blocks to the central terminal across from the USB and microSD card ports or wire them separately. Connect the live wire to either of the outer pins (“IN1” or “IN2”) and connect the grounds to the central pin (“GND”).

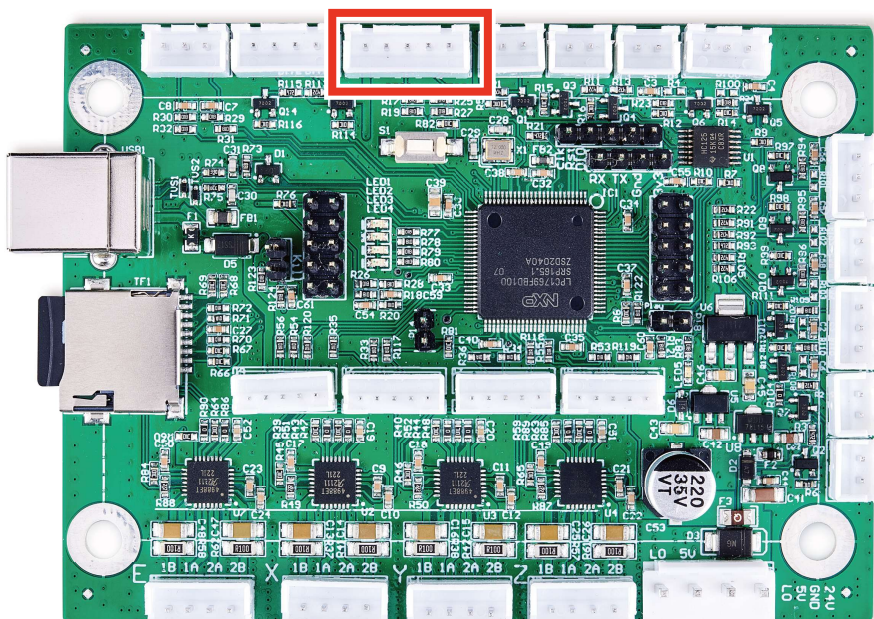


The 2 and 3 pin thermistor terminals (“TH1”–“TH5”) can provide similar 5V inputs from CNC thermistors or other sensors. Each accepts one or two input lines and a ground line (“GND”) between or to the right.



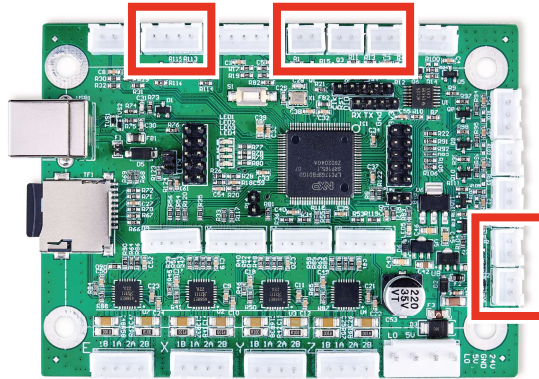
### 3.4.5 Limit Switch Connections

On the control board, find the 5 pin terminal along the side next to the USB port. Connect the “END” or “LMT” terminal block previously removed from your old board to this terminal. If you are connecting the wires individually for a new or different system, connect the pin marked “Y–” to your Y axis limit switch. Connect the pin marked “X–” to your X axis limit switch. Connect the “GND” pins to the ground connections for the corresponding limit switch.



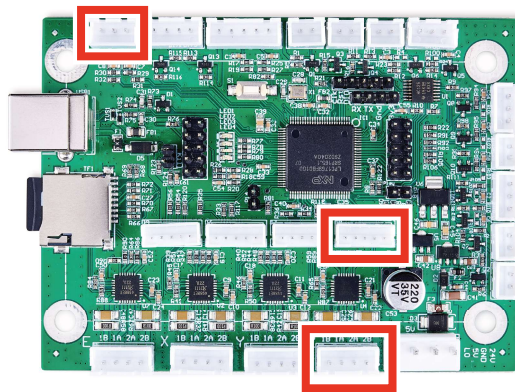
### **3.4.6 Device Output Connections**

This circuit board can provide a 5V power feed and up to nine 5V output signals to control various ancillary devices such as external exhaust fans, pressurized air assists, and CNC heating elements. The power feed terminal has 2 pins for the current (“5V”) and the ground (“GND”). The output signal terminals accept 2, 3, or 4 pin terminal blocks and are variously labelled “FAN”, “BLOW”, “HE1” and “HE2”, and “OUT1” and “OUT2”. Each has a line pin and a shared or separate ground pin (“GND”).



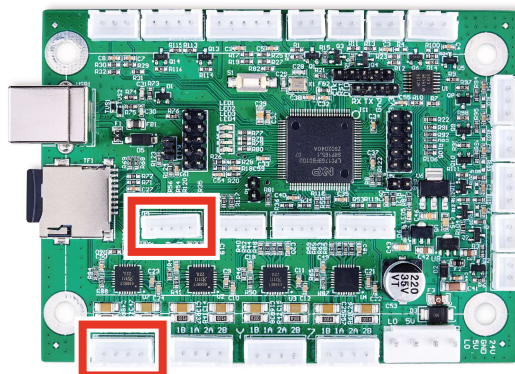
### **3.4.7 Workbed Connections**

To install an automatically adjustable workbed for your engraver, follow the instructions in §3.4.3 to connect its stepper motor to either the outer 4 pin terminal or the inner 5 pin terminal marked “Z”. Connect its limit switches to the “Z+”, “GND”, and “Z-” pins in the corner terminal next to the USB port.



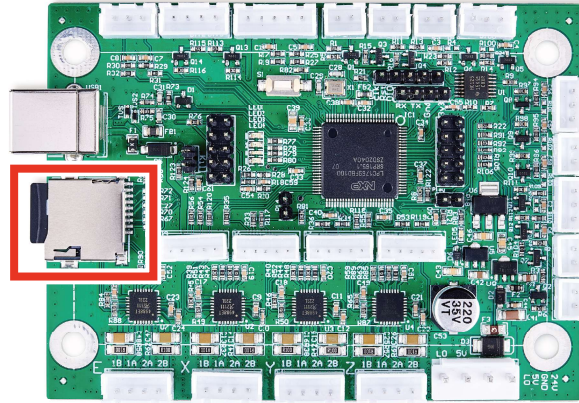
### **3.4.8 Rotary Axis Connections**

To install a rotary axis, follow the instructions in §3.4.3 to connect its stepper motor to either the outer 4 pin terminal or the inner 5 pin terminal marked “E”.

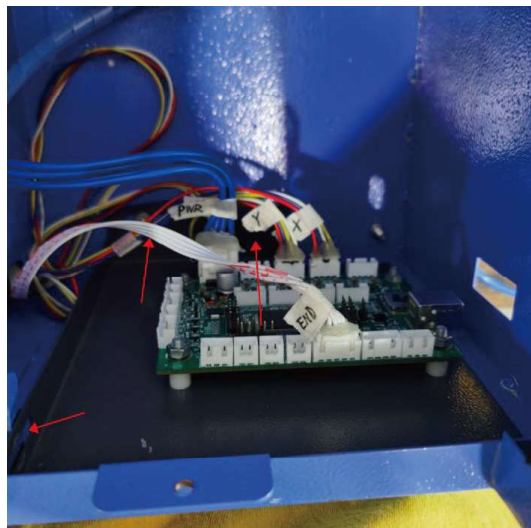


## 3.5 Data Connections

The microSD card goes into its port on the side of the card. The pins on the card should face down and go in first. The slightly raised handle should face up and protrude slightly after insertion. Do not force the card into place.



If you did not already do so, bolt your new control board to its holding plate, making sure that the USB port will face the casing's access hole. Slide it back into your engraver and bolt the holding plate into place inside the casing.



Use your type-B USB cord to connect the card to your control computer. It is recommended that you configure your machine not to automount the control board's microSD card. Again, leaving it mounted during engraving can lead to unexpected pauses and glitches when the control computer periodically reads and writes to it.

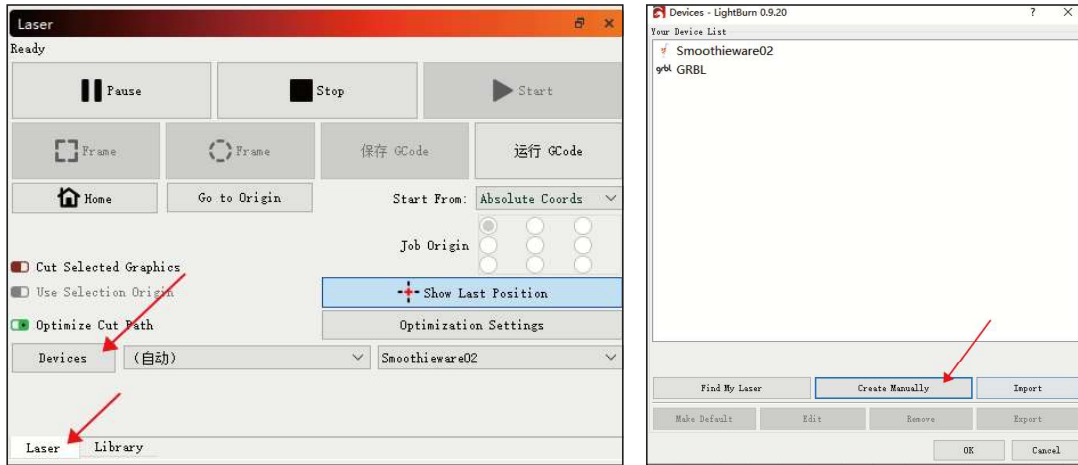
## 3.6 Software Configuration

### 3.6.1 Device Drivers

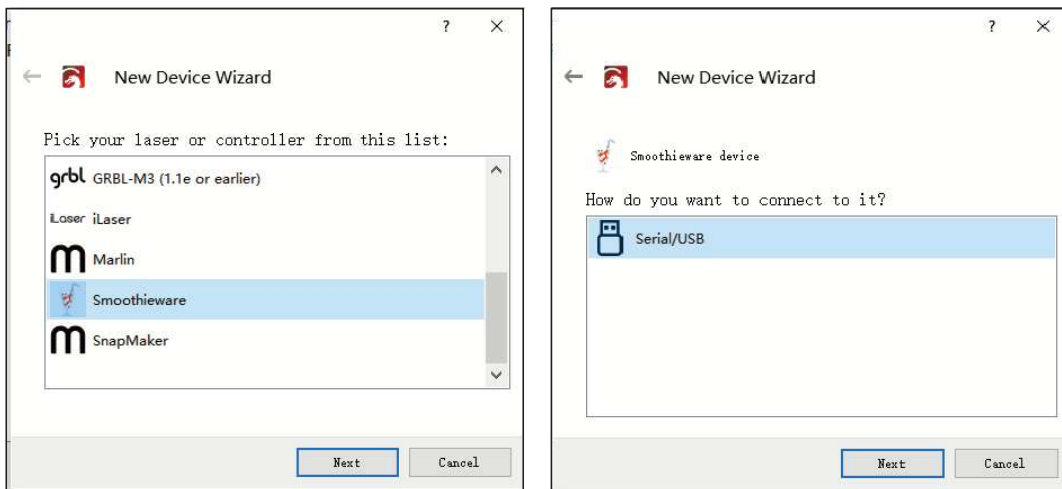
For most editions of Windows, you will need to download device drivers to allow control computer to recognize and communicate with your new motherboard. Go to [www.smoothieware.org/windows-drivers](http://www.smoothieware.org/windows-drivers) and follow the instructions there. For Linux and MacOS systems, no drivers are required but if you experience problems or excessive lag when using your control board, the “Linux Drivers” and “Mac Drivers” pages at [www.smoothieware.org](http://www.smoothieware.org) provide guidance on improving your system's configuration.

### 3.6.2 LightBurn Setup

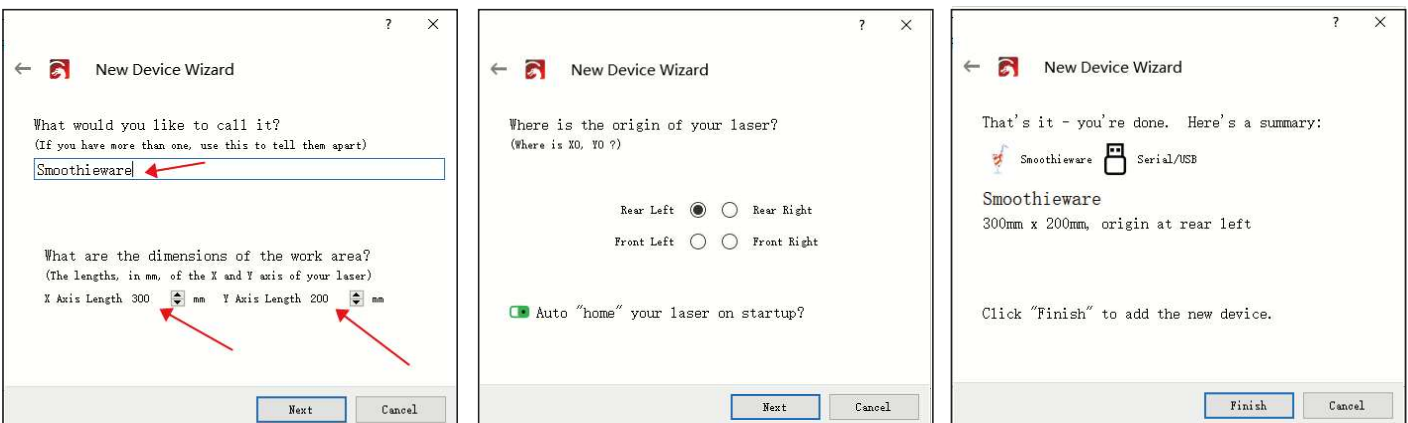
To use your new control board with LightBurn, go to the **Laser** menu and select **Devices**. Select **Create Manually** in the submenu that will pop up.



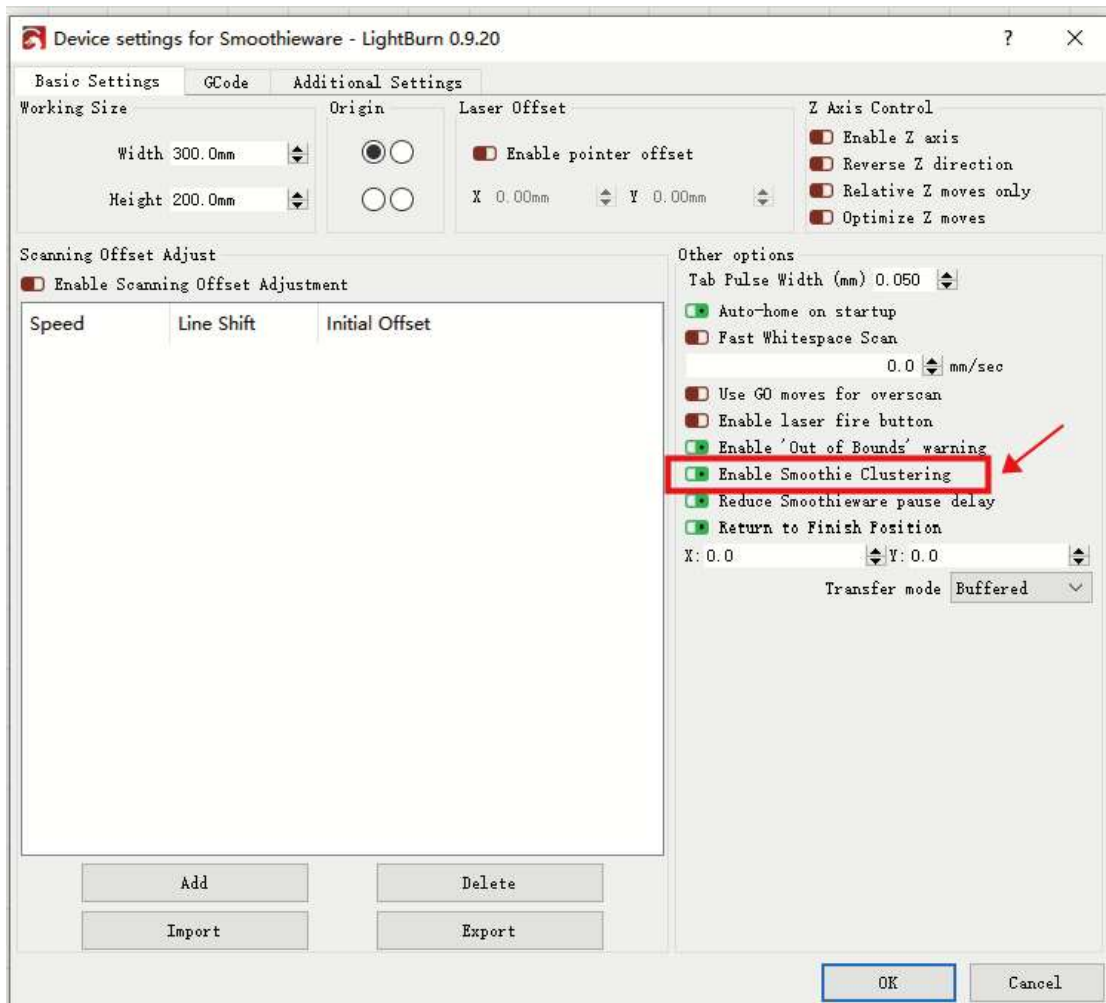
Scroll down the pull down menu that will appear and select “Smoothieware”. In the next menu, select that you will connect to it using “Serial/USB”.



Choose a name for your engraver (“Smoothieware” in the example picture) and enter the length of your laser engraver’s X and Y axes in millimeters. Enter the origin for your machine (select “Rear Left” for OMTech engravers) and select whether you want LightBurn to return the laser head to the origin at startup. Review the information that you have entered. Select **Cancel** and correct any misinformation or select **Finish**.



After LightBurn finishes installing its connection to your engraver's new control card, go to the **Edit** menu and select **Device Setting**. Under the **Basic Settings** tab, find the **Other Options** section and activate **Enable Smoothie Clustering**.



### 3.7 Testing

Restore power to your engraver and test that all of its safety features remain fully functioning. Test that the control panel and control computer are able to move the engraver's laser head and fire the laser correctly. Correct any problems before further use, making sure to fully disconnect the engraver from its power supply before making any adjustments. Contact technical support or customer service if any problems remain or arise after installation.



## 4 Maintenance

Always disconnect your engraver from its power source before any adjustment, cleaning, or other maintenance of these devices.

You can remove dust from these devices with a soft cloth. Do not use harsh chemicals or allow any electrical components or connections to become wet. If they accidentally become wet, immediately use your engraver's emergency stop button, disconnect your engraver from its power source, and leave it disconnected until all water has completely dried.

If there is ever a need to replace the provided microSD card, format it to use the FAT32 file system.

For maximum safety and best results, leave all other adjustment, maintenance, and repair to trained and skilled professionals. If this control system is ever damaged or malfunctions during use, immediately use your engraver's emergency stop button, disconnect your engraver from its power source, and leave it disconnected until all damage or malfunctioning equipment has been fully repaired or replaced.

## Contact Us

Thank you for choosing our laser equipment for your home or shop! For a .pdf copy of the latest version of this manual, use the appropriate app on your smartphone or other device to scan the QR code to the right.

Come join the OMTech community at our official laser group on Facebook or visit the company forums at [omtechlaser.com](http://omtechlaser.com)! Check our YouTube channel for helpful hints and instructional videos. If you encounter any problem regarding your engraver, do not hesitate to contact customer service with your order number at [help@cs-supportpro.com](mailto:help@cs-supportpro.com) or [techsupport@omtechlaser.com](mailto:techsupport@omtechlaser.com). Our teams will respond within 24 hours to make things right. You can also reach us Monday to Friday at (949) 539-0458 between 8 am and 4:30 pm PST.

Thank you and we hope you will choose us again for all your laser needs!



