# ST-V3 USB Motion Control Card

# Quick Start Manual

# Version 1.0

Address: 15-4, #799 Hushan Road, Jiangning, Nanjing, China
Tel: 0086-2587156578
Web: www.omc-stepperonline.com
Sales: sales@stepperonline.com
Support: technical@stepperonline.com

# Preparations

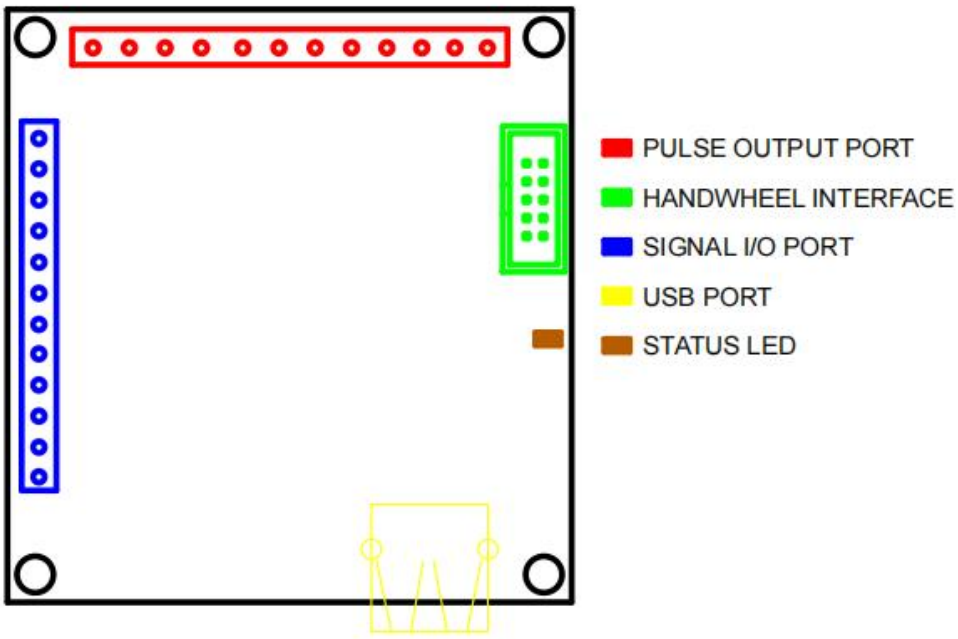
1. Computer Requirements: Prepare a computer with a USB interface. The MACH3 Motion Control Card uses a driver-free USB design and is compatible with XP, WIN7, WIN8 systems (32-bit or 64-bit).

2. Additional Materials:

- Wiring terminal diagrams for your machine's motor driver modules.
- If using a frequency converter, prepare its wiring terminal diagram.

For emergency stop switches, limit switches, or homing switches:

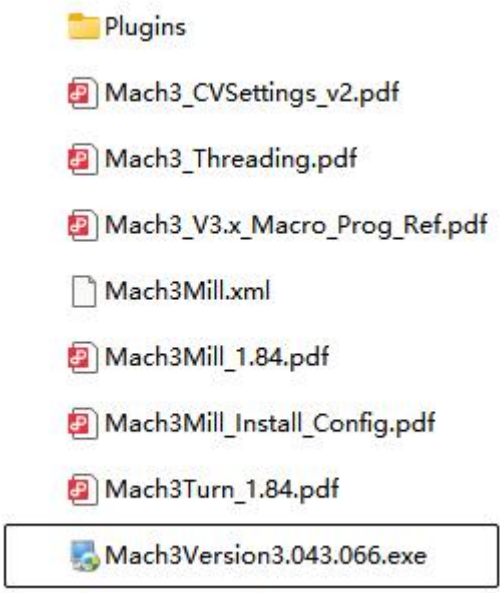
- Emergency Stop Switch: Typically a mushroom-head switch.
- Limit/Homing Switches: Choose between mechanical switches (no specific requirements) or electronic switches (photoelectric, inductive, electromagnetic). For electronic switches, select NPN Normally Open (NO) type for simplified wiring.



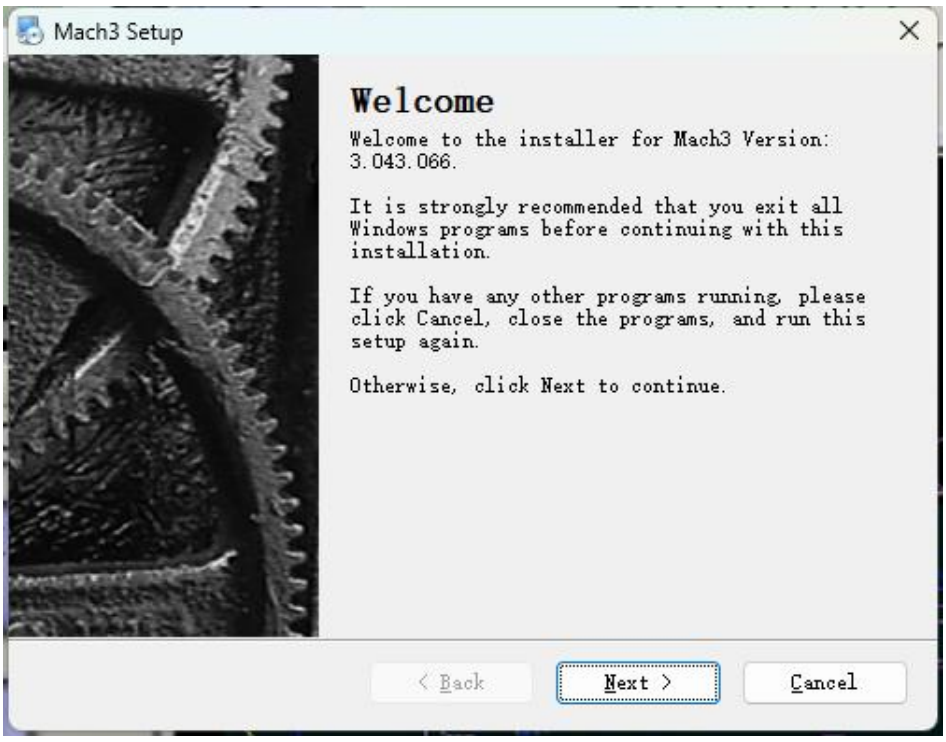
# 1. Software Installation

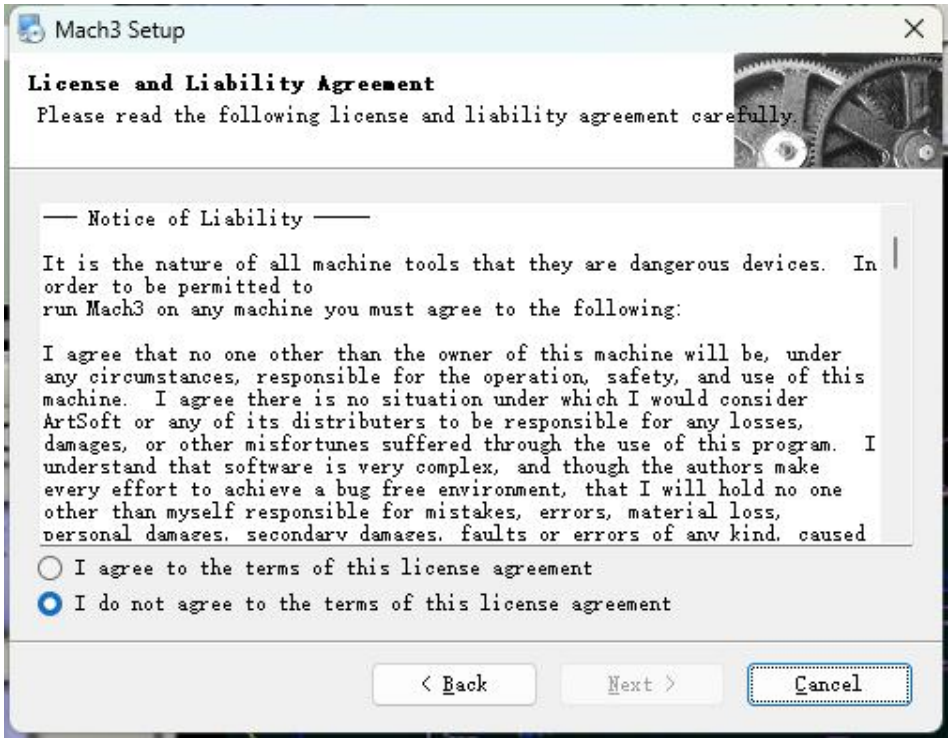
## 1. Install Mach3 Software

Download the Mach3 software from the provided resources and run the Mach3Version3.043.066 installer.



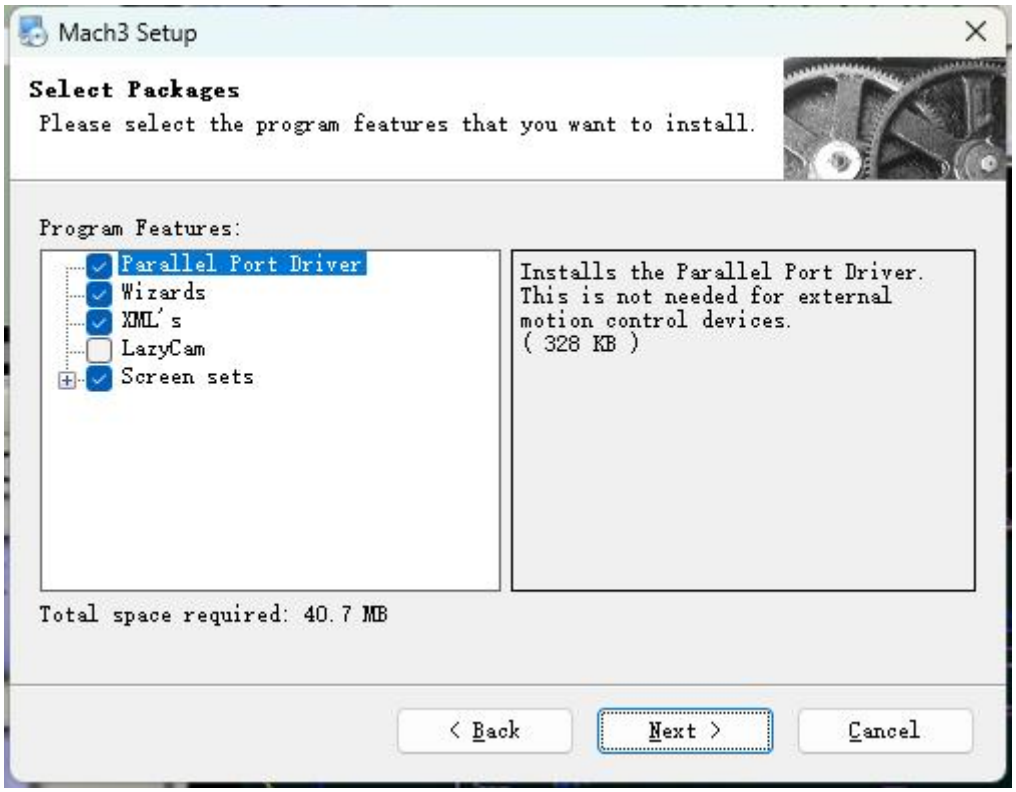

Mach3 installation is straightforward. Simply click Next (or Yes) throughout the process.

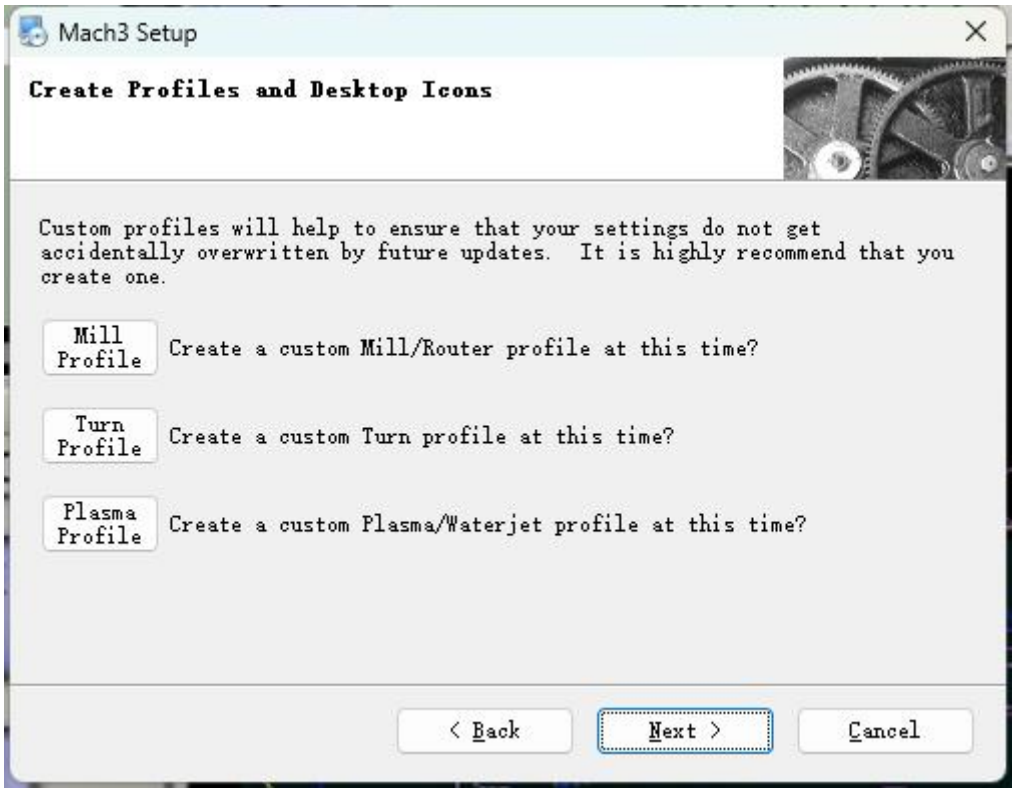


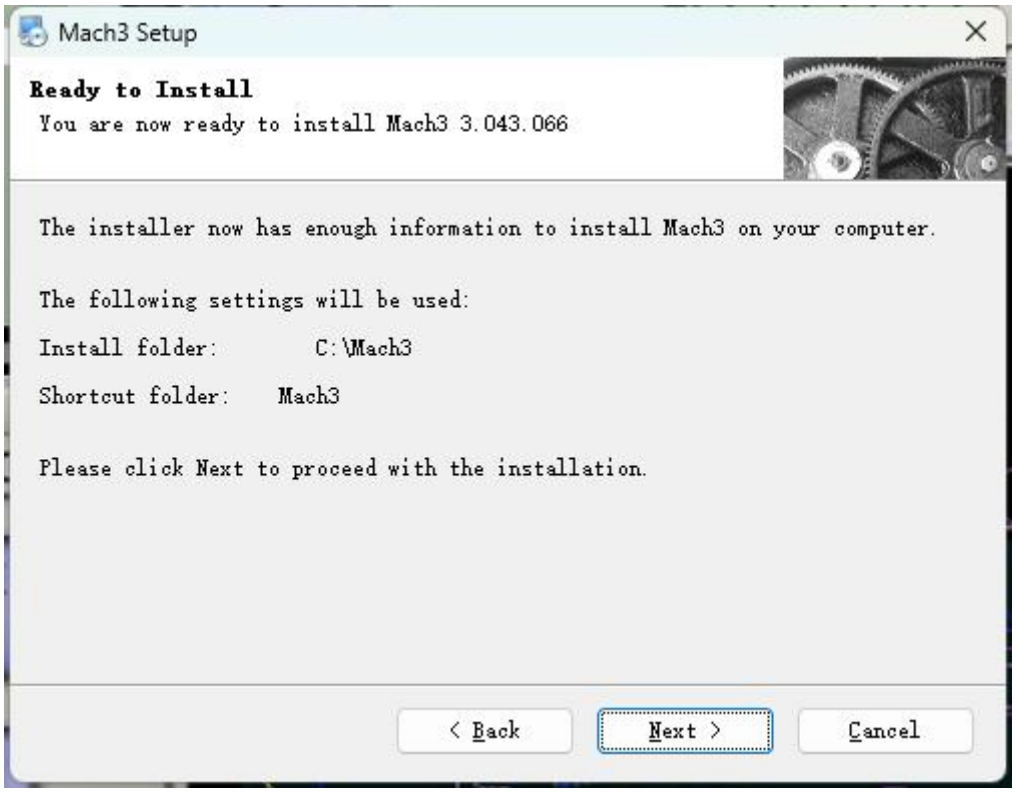


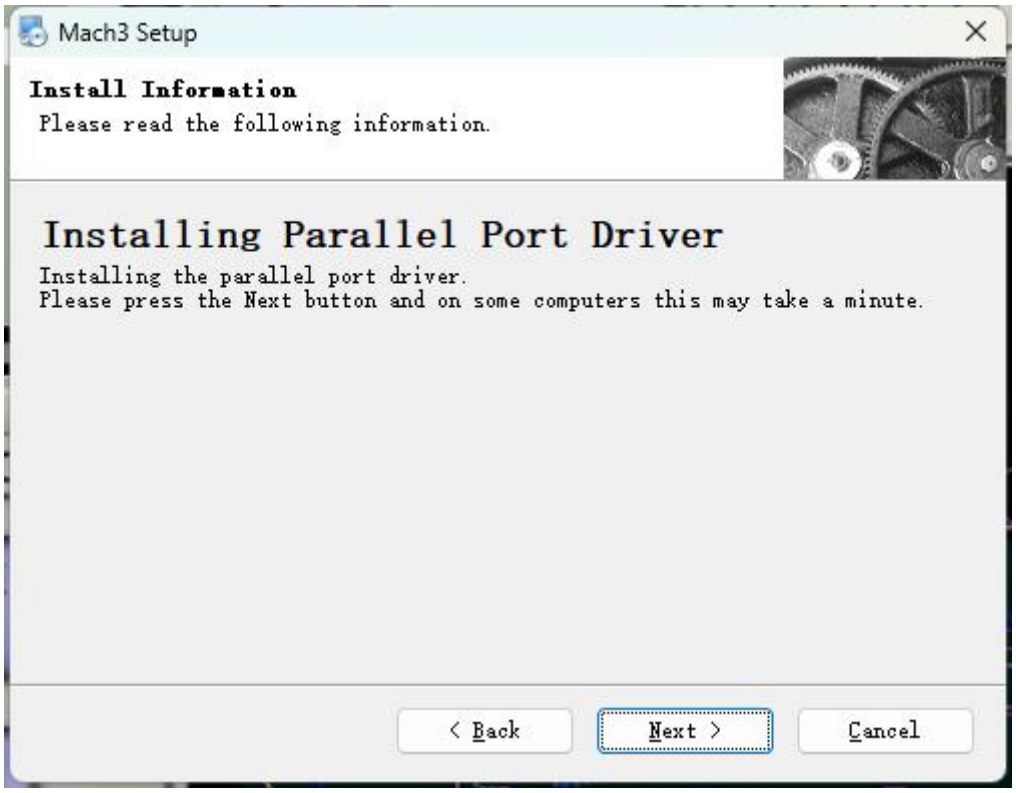

**Select Mach3 Installation Location**

The default installation location is the Mach3 folder on the C drive.

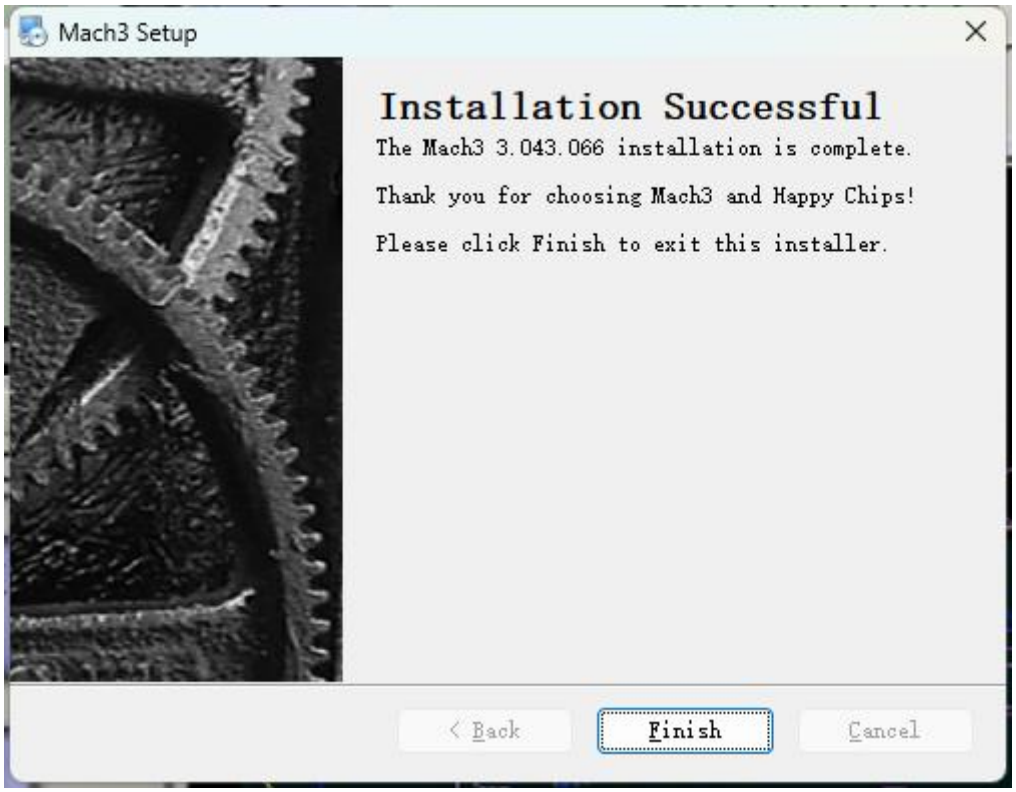

Mach3 Setup
Select Packages
Please select the program features that you want to install.
Program Features:
Parallel Port Driver
Wizards
XML's
LazyCam
Screen sets
Installs the Parallel Port Driver.
This is not needed for external
motion control devices.
( 328 KB )
Total space required: 40.7 MB
< Back
Next >
Cancel


Mach3 Setup
Create Profiles and Desktop Icons
Custom profiles will help to ensure that your settings do not get
accidentally overwritten by future updates. It is highly recommend that you
create one.
Mill Profile
Create a custom Mill/Router profile at this time?
Turn Profile
Create a custom Turn profile at this time?
Plasma Profile
Create a custom Plasma/Waterjet profile at this time?
< Back
Next >
Cancel


Mach3 Setup
Ready to Install
You are now ready to install Mach3 3.043.066
The installer now has enough information to install Mach3 on your computer.
The following settings will be used:
Install folder: C:\Mach3
Shortcut folder: Mach3
Please click Next to proceed with the installation.
< Back
Next >
Cancel


Mach3 Setup
Install Information
Please read the following information.
Installing Parallel Port Driver
Installing the parallel port driver.
Please press the Next button and on some computers this may take a minute.
< Back
Next >
Cancel

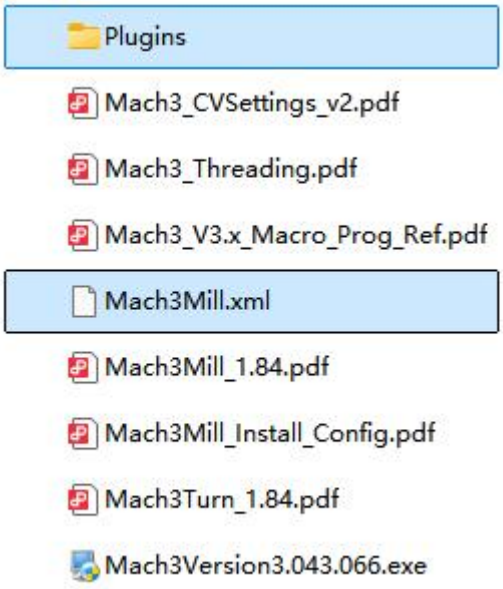
Click "Finish" to complete the Mach3 installation.




## 2. Copy Plugins and Configuration Files

The final step is to copy configuration files and plugins. For users new to Mach3 software, configuring Mach3 can be complex. Therefore, we have prepared a typical configuration file, Mach3Mill.xml, in the download resources. Simply copy this file to the Mach3 folder, overwriting the existing file, to save time on configuration.

The motion control card requires corresponding plugins to run in Mach3. Copy the Plugins folder to the Mach3 installation folder.

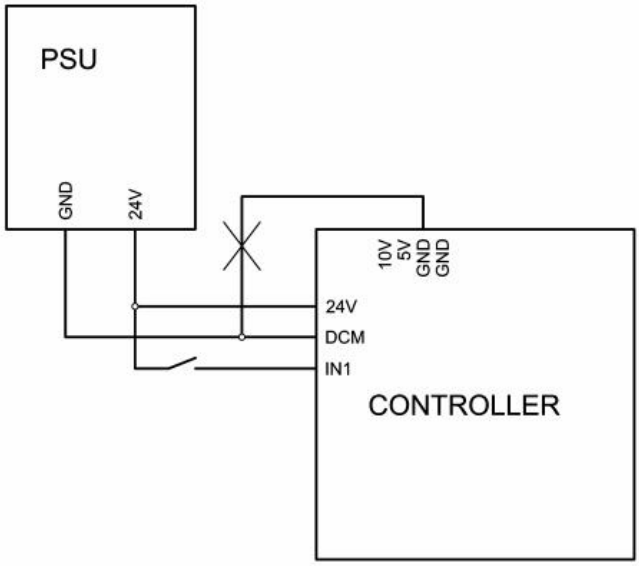



After the installation of Mach3 is completed, several icons will appear on the desktop. The one we will use is “Mach3Mill”, which is for “Mach3 milling machine control”. Additionally, “Plasma” (for plasma cutting machines) can control plasma cutting or laser cutting, and is also commonly used. “Mach3Turn” is for “Mach3 lathe control”, which is not applicable to this series of control cards.

# 2. Hardware Connection

Connect the computer to the control card via a USB cable, and connect the control card to the motor driver module via signal cables. Refer to the "Typical Wiring Examples for Motion Control Card" and the terminal descriptions of the motor drivers you purchased for specific wiring.

**Note:** The control card has two rows of terminals. These two rows are completely physically isolated, with no connection between them. Ensure that the signal wires connected to these two rows are not related to each other. Otherwise, external interference signals may enter the control board and the computer's motherboard, reducing the system's anti-interference capability.

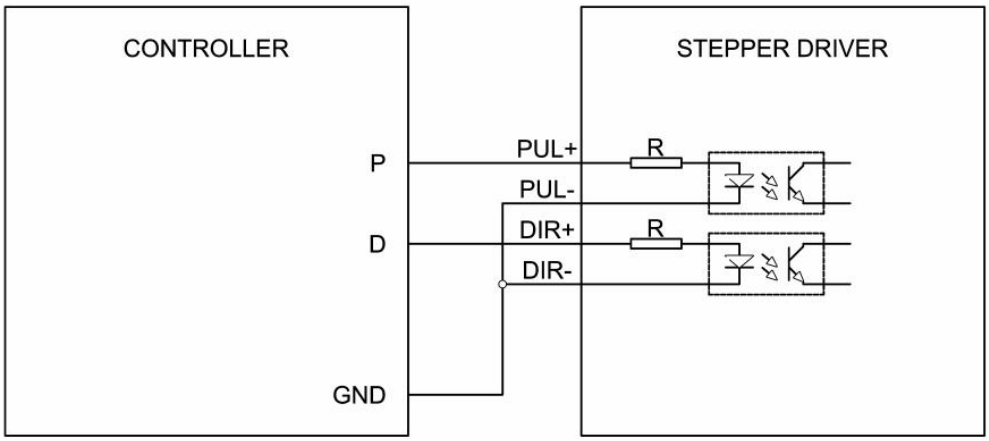



Connect one end of the USB cable to the ST-V3 Motion Control Card and the other end to the computer. This product adopts a driver-free design, and the Windows system can automatically detect the ST-V3 Motion Control Card without requiring users to install additional device drivers.

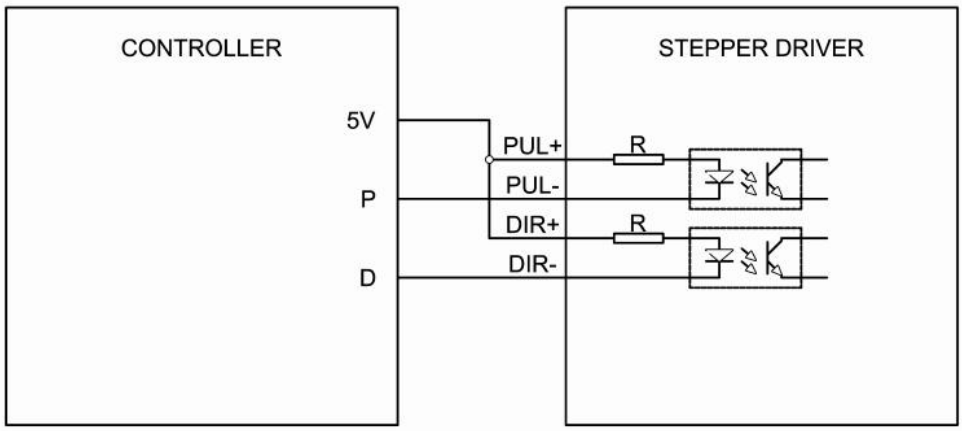
When testing the software, there is no need to connect the wiring between the control card and the motor driver, as this will not affect the software testing. You can connect the control card and the motor driver when performing the operational test.

There are two wiring methods between the control card and the motor driver: common anode wiring and common cathode wiring. Below is an example of both wiring methods:

**Common Cathode Wiring:**

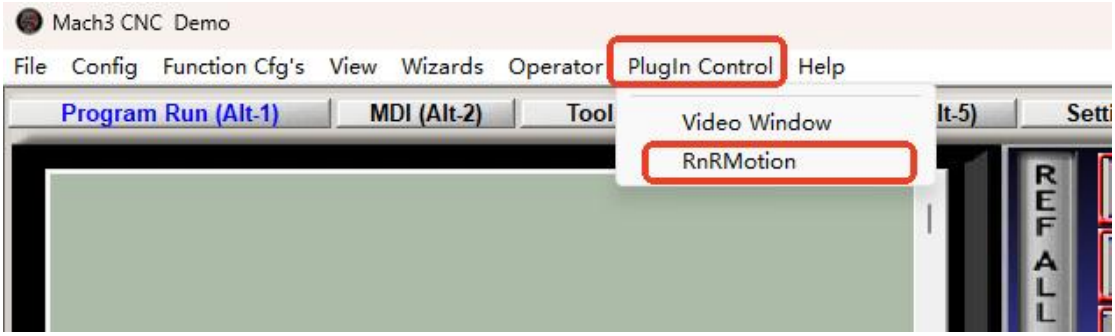



**Common Anode Wiring:**

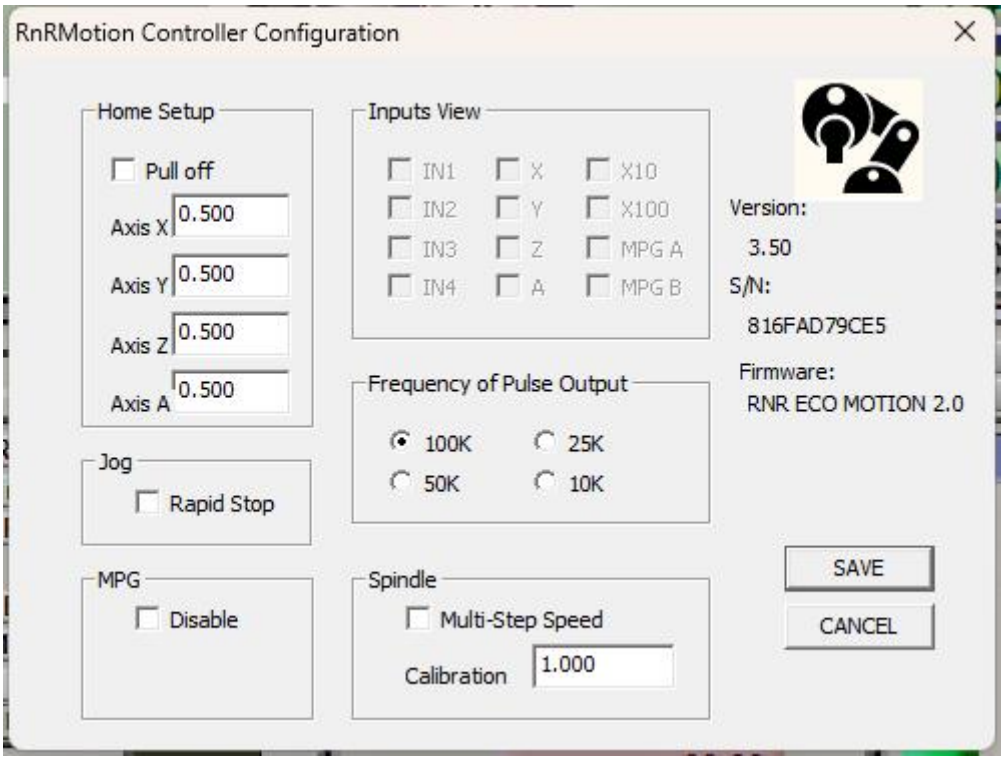



Note: For common anode wiring, you need to modify the level configuration in Mach3; otherwise, the motor may not operate correctly.

Start the Mach3 software. Locate the menu "Plugin Control". Under this menu item, there should be an option named "RnRMotion". If this menu item is not present, it indicates that the previous step of "Copy Plugins and Configuration Files" was not performed correctly.



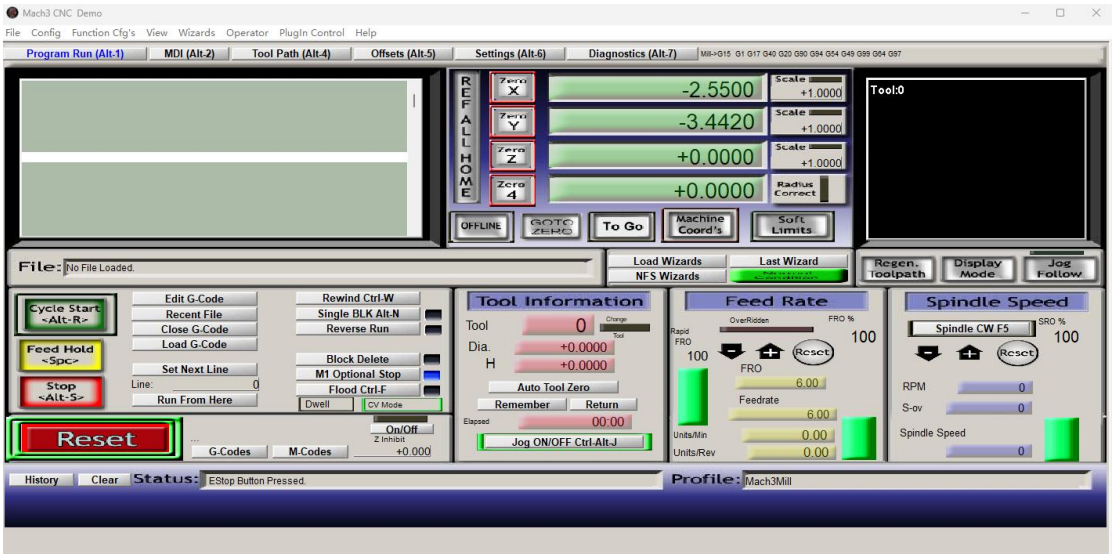
Execute this menu item ("RnRMotion"). You should see the following dialog box:




Close the dialog box. At this point, both the software and hardware installations are complete.

# 3. Configuration & Testing

The Mach3 interface is as shown in the figure below:



The most basic operations you need to master are manual control and running G-code. When Mach3 starts, it is in an emergency stop state for safety reasons. In this state, neither manual control nor G-code can be executed. Therefore, the first thing to do after starting is to release the emergency stop state. To do this, press the "Emergency Stop Reset" button. The machine can only operate when the "Emergency Stop Reset" button is not blinking. The emergency reset button is shown in the figure below:


## 1. Manual Control

In the Mach3 interface, press the TAB key on the keyboard to bring up the manual control panel, as shown in the figure below:


You can click the control keys for each axis to move the machine. The jog speed can be adjusted using the "Slow Jog Rate" setting. The commonly used jog modes are "ConL" and "Step".

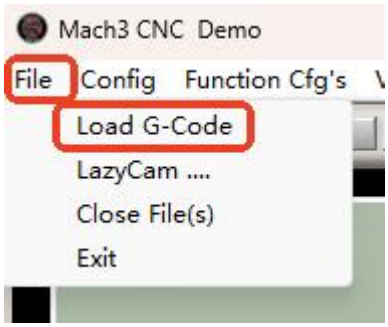
- In ConL Mode, the machine moves as long as you hold down the control key and stops when you release it.

- In Step Mode, each press of the control key moves the machine by a specified unit distance (the distance displayed in the "Cycle Jog Step").

For example, in the settings shown in the figure below, each press moves the machine by 0.1 millimeters.


## 2. Running G-Code

In the Mach3 menu, select "File" -> "Load G-Code" to open the G-code loading dialog box:

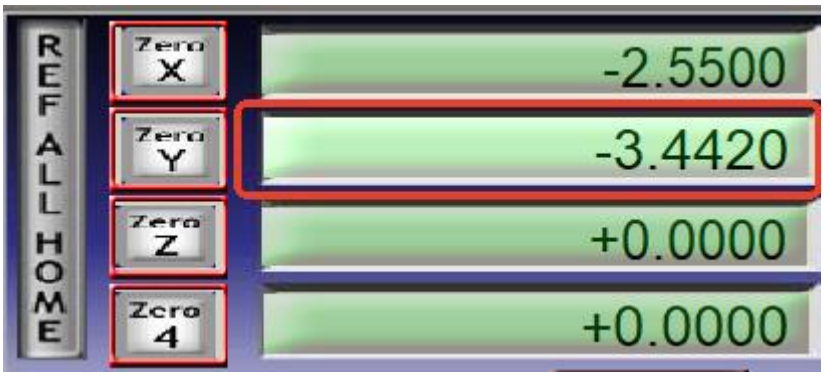



You can load the G-code from the "G-code" folder in the download materials. We have prepared a simple G-code example. If the G-code files are not visible, change the file type to "*.ncc".

After loading the G-code, you can press the "Cycle Start" button to run it. During execution, you can press "Feed Hold" to pause. After pausing, you can manually move the machine. Pressing "Cycle Start" again will automatically return the machine to the paused position and continue running. Pressing "Stop" or "Reset" will interrupt the G-code execution. After the run is complete, you can press "Rewind Ctrl-W" to repeat the G-code.

Additionally, it's important to know that the coordinate display boxes in Mach3 allow manual coordinate input. For example, if you want to start running G-code at the coordinates (0,0,0) but the displayed coordinates are not (0,0,0), you can click the coordinate display box, enter 0, and press Enter. This will set the coordinates to 0.

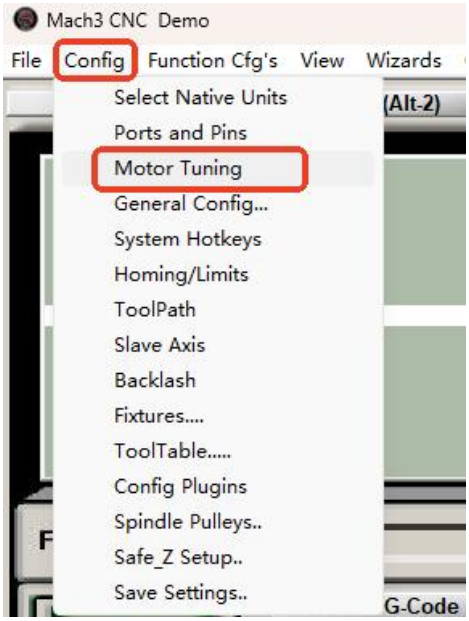
As shown in the figure below: Clicking the box will slightly change its color:

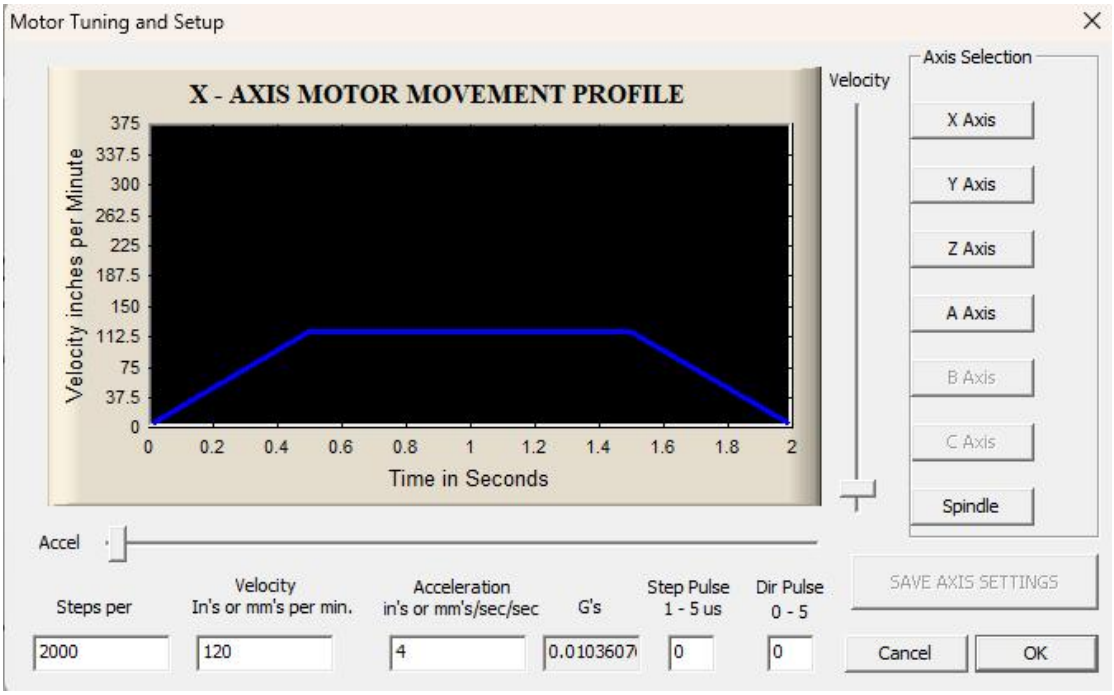



After entering the new coordinates and pressing Enter:


## 3. Motor Parameter Settings

Each user's machine specifications are different, so the motor parameters in Mach3 need to be set according to the machine's specifications. To configure these parameters, go to the menu "Config" -> "Motor Tuning". A dialog box will appear as shown in the figure below:






In the dialog box, the first parameter is the number of pulses required for the machine to move one unit (millimeter). The specific calculation formula is:

Steps Per = (360 / Degrees per Step of Stepper Motor) * Microstepping Multiplier / Screw Lead.

For example, if your stepper motor has a step angle of 1.8 degrees, a microstepping multiplier of 16, and a screw lead of 5mm, the calculation would be:

Steps Per = (360 / 1.8) * 16 / 5 = 640.

For servo motors, the calculation is similar, and you can derive it accordingly.

The second parameter is the maximum velocity, which corresponds to the movement speed of the G0 command. The calculation method is as follows:

Maximum Velocity = 60 * 100,000 / Steps Per.

This is the theoretical maximum speed. In practice, it should be reduced appropriately based on the performance of the stepper motor (due to torque decay at higher speeds, stepper motors typically achieve only about 40% of this theoretical speed).

The third parameter is acceleration, which is usually set to a value between 100 and 1000. You should experiment repeatedly to find the appropriate acceleration value. If the acceleration is too high, the machine may jerk or stutter. If it is too low, the processing time will increase, and the quality of the machining may degrade.

After setting the parameters, remember to click the "Save" button. The parameters for the X-axis, Y-axis, Z-axis, and A-axis must be configured separately, and each must be saved individually.