Novusun CNC

MACH3 LPT port 4 axis Stepper motor Driver Card NV8727T4V4

Manual

Manual of NV8727T4V4

Contects

Chapter 1. Introduction

1.1 Product Introduction

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This manual introduces operation,connection and usage schedule of our professional motion controller for engraving machine.Through a lot of the drawing the users can learn quickly how to use this motion controller.

1.2 Products specification

- ◆ Support LPT;

- ◆ 5 ports photoelectric isolated input interface；

- ◆ 1 ports photoelectric isolated output interface；

- ◆ 1 port 0-10V spindle speed analog output interface(can change to PWM output)；

- ◆ 2 relay output.

- ◆ can support 4 axis stepper systems,100KHz pulse output for every axis；

- ◆ ARM motion control chip；

● main device is 12V-32VDC power supply input,current should higher than 10A；

1.3 Products Appearance and size

NV8727T4V4 motion controller is with the sealed open structure, there are 2pcs setting holes at the bottom. We can fix 2pcs 4mm diameter holes at the cabinet, and install the controller into the cabinet.The controller appearance as the Figure 1-1 and Figure 1-2 show:

The products overall size is 150mm*105mm*25mm；
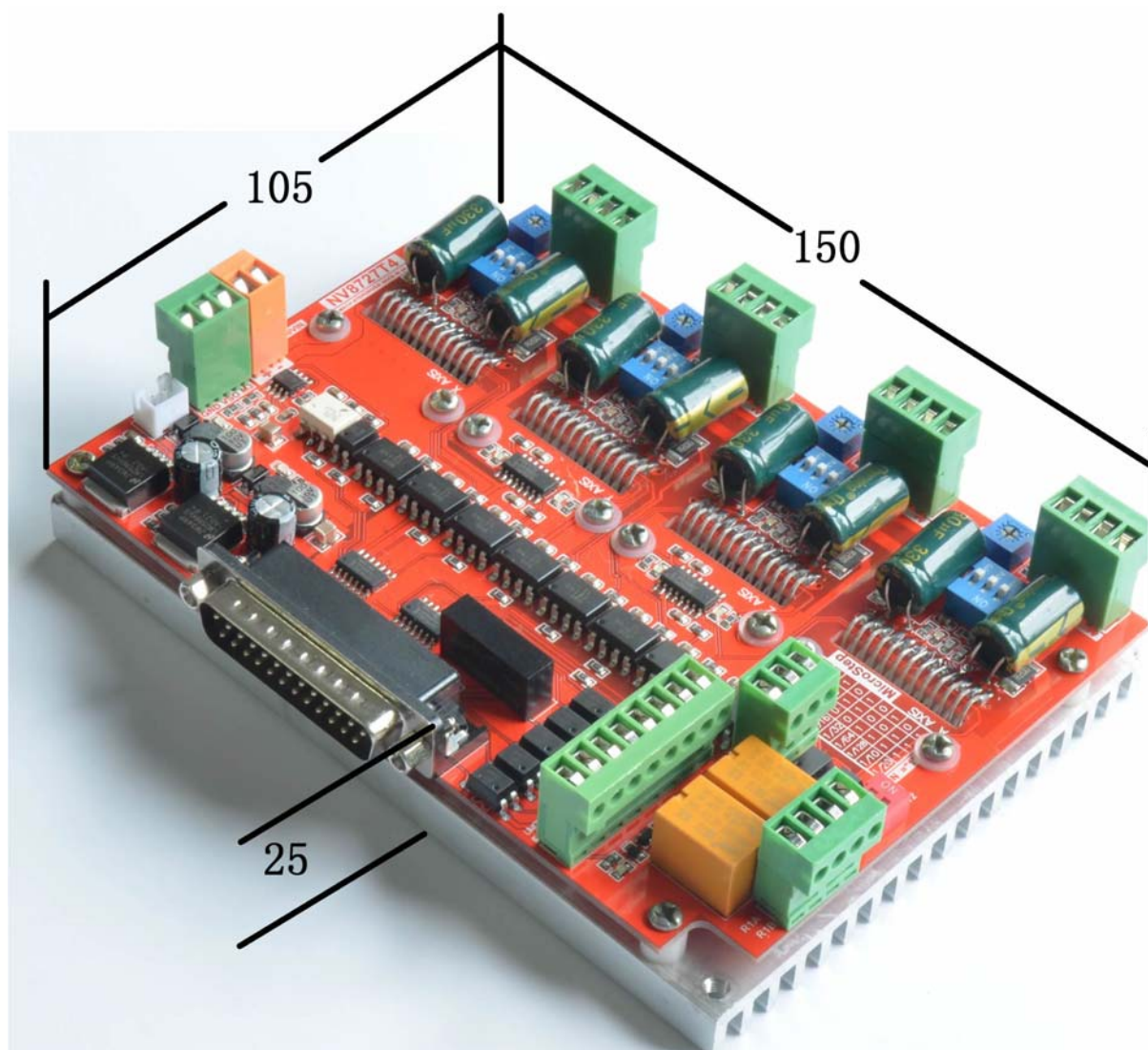
The bottom install size is 142.6mm*96mm。

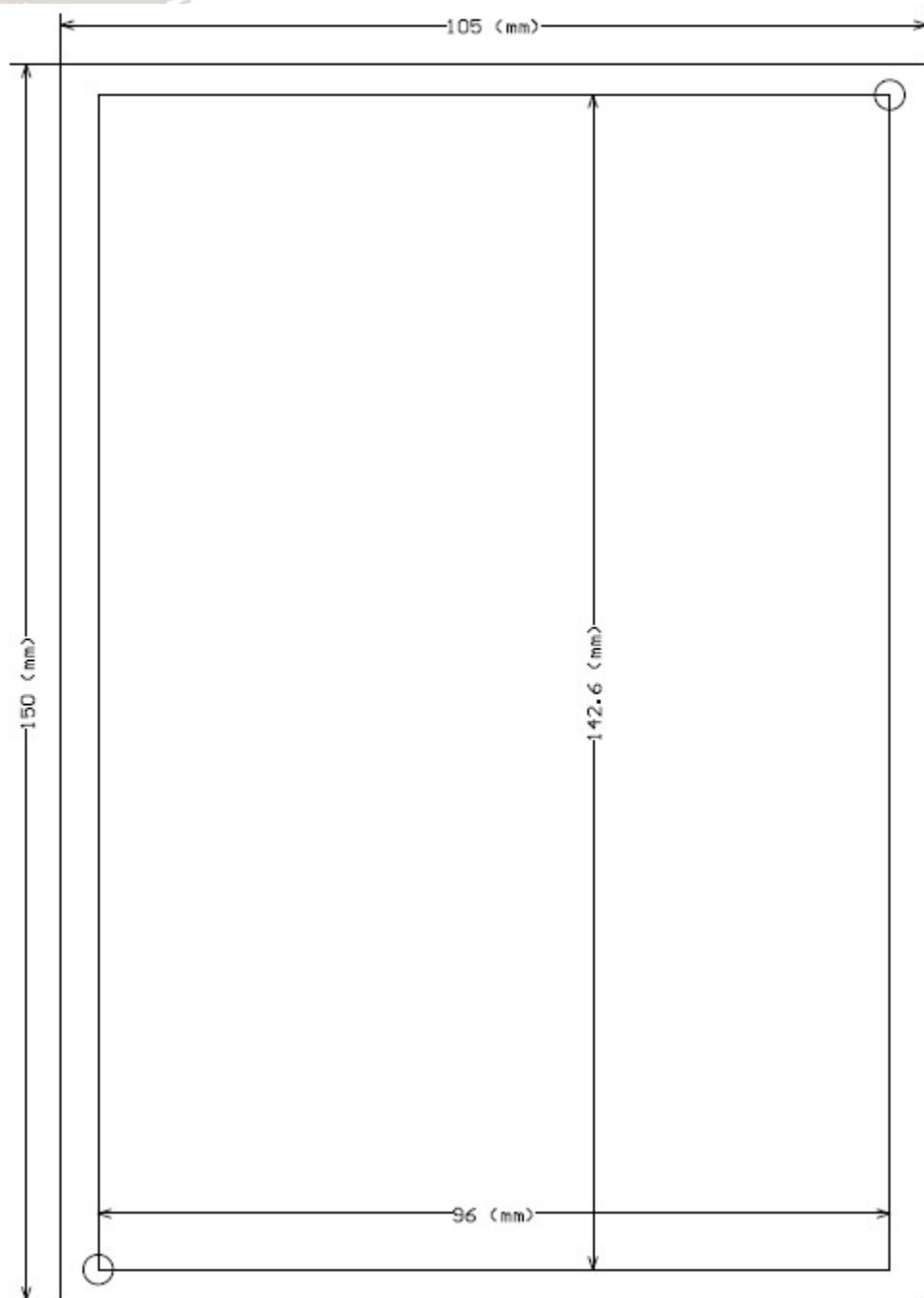Figure1-1.   NV8727T4V4 front appearance and size

Figure1-2.　　The other side of NV8727T4V4and installation dimensions

1.4　substantival explanation

When operate the NV8727T4V4, where will be a lot of English abbreviation, now we list all of them for your kindly references:

FRO: Feeding adjust: During the operating process, the F value already set, and need to adjust the current feeding speed, then we can adjust FRO value to realize it.

SRO: Spindle speed adjust: During the operating process, the S value already set, and need to adjust the current spindle speed, then we can adjust SRO value to realize it :

Current Speed S#=setting S*SRO.

SRJ: speed adjust manually

During the operating process,as the manual speed already set,and we need to adjust the current speed,and impossible to fix the value during it is working,then we can revise the SRJ value to realize it.

Current manual speed FS#=Setting manual speed*SRJ.

F:Feedingspeed,the unit is mm/min.For example F=200,means every minute feeding 2000mm.

S: Spindle Speed. Unit is rad/min.For example S=20000,means 20000 revolution/Minute.

X axis Coordinate

Y axis Coordinate

Z axis Coordinate

A axis Coordinate

B axis Coordinate

C axis Coordinate

Ready:ReadyMode.In the mode we can do any operation,include processing or values modification or starting 2nd mode.

Reset: Reset mode.In this mode,it should stop every operation.

"Step":Manual Step Mode. Every axis candonduct the manual step operation at this mode.

MPG: MPG mode.Every axis can conduct the MPG operation at this mode.

1.5 Noting and Waring

Free from exposure to the electronics without waterproof function.Please environment as dry as possible. This is the icon.

Wiring warning, the IO input terminal of this equipment support the equipment with source switch (such as Inductive proximity switch.)When using such kind of switch, attention please: avoid the +terminal and –terminal of power supply to connect with GND.This equipment's analogy quantity output terminal of spindlecontrolalos have a certain   load capacity. Please avoid this   terminal connect with GND.in case   that   the   interior components and parts be brokendown.

Operation warning, Please do the security measures well when connecting with the machine tools.The   ESTOP, limit and other things must be perfected.When   comes   across   the emergancy, please press   the ESTOP key at once or cut off   the power directly,   thus avoiding the equipment damage and casualty.

High voltage danger, the primary device is 18-32VDC power supply.Voltage equipment.Pls pay attention to the electricity, safety when conducting the operation

Chapter 2.   Connection

2.1 Device Power supply Solution

The power supply solution in the field of the Industrial automation is always very complicated,there is a lot of the GND,now we descript the structure of the power supply as below:

The power supply structure as the Figure 2-1,main power supply input and MPG module and stepper control output module are common GND,Limited and Estop input module and Spindle speed adjust M3/M8/M1 module are common GND,between main power supply and output module there are photoelectric isolation.The inputs of limited switch and Estop and so on are Common anode, inside of the device, there is +12VDC   as common+,no need to connect external power supply. Based on the reference of output GND interface, output a 0-10V adjustable voltage to adjust the the   spindle speed,M3/M8/M10 digital output interface is open-GND. If connect an external relay,need to output GND to refer to,and give the relay an external power supply.
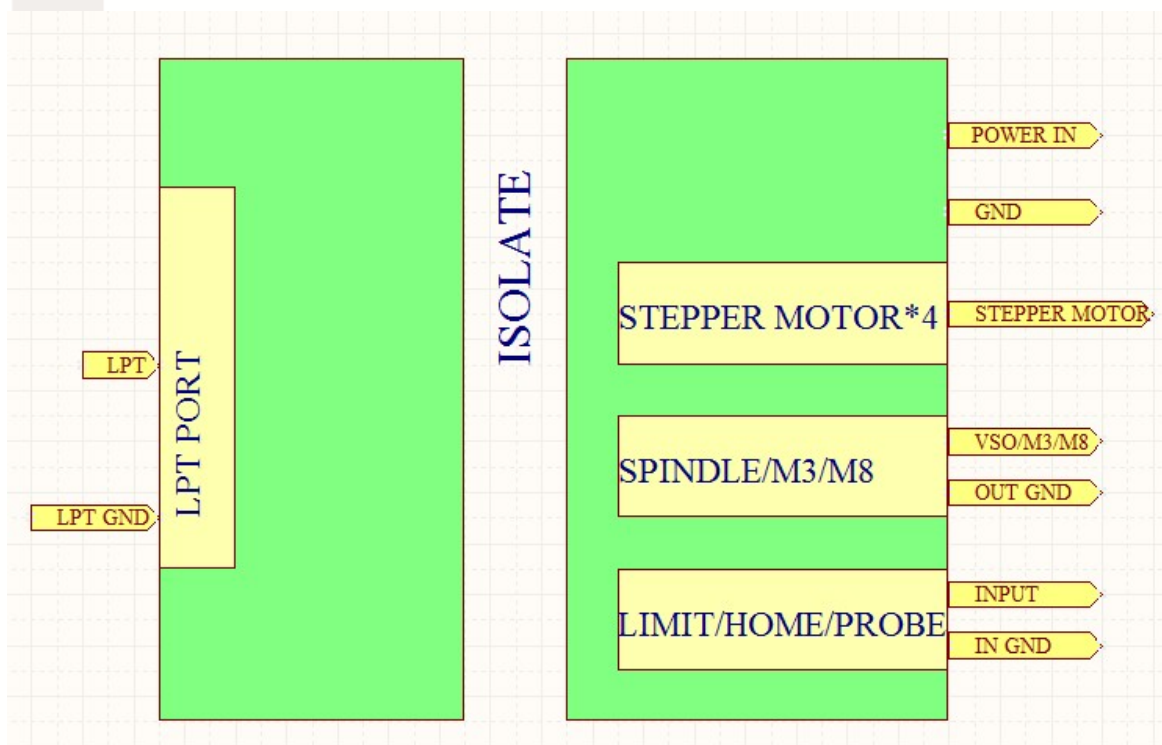

Figure2-1.   Power supply structure of NVUM

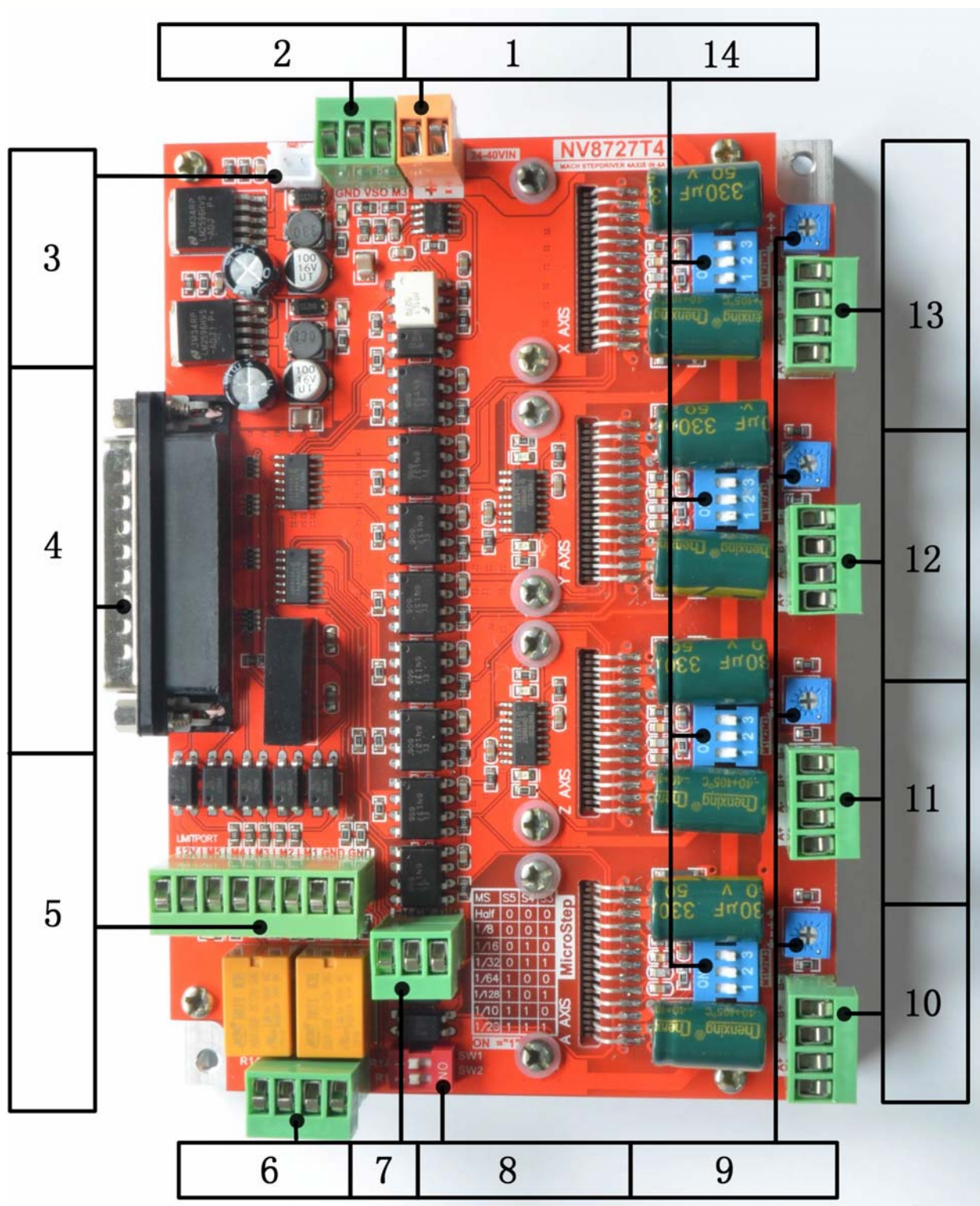## 2.2 Product connection define and method

Figure2-2.   Product wiring section and interface summary

As the Figure 2-2 showed,the connection of the controller includes power supply interface,

LPT connection interface, Stepper/Servo control output interface, spindle control output interface, Estop and limited switch and tool setting input interface and so on. Now we descript them in details as below.

2.2.1 Main power input

As Figure 2-2 showed,No.1 terminal block is Main power input interface, need input 12-40V/above 200W. There is silkprint "+" and "-",See as figure2-2,left terminal is "+" and right terminal is "-".

2.2.2 Spindle control output

We define the interface from left are: GND1(Output GND),VSO(0-10V adjustable speed output),M3(Spindle run or stop).

Take Nowforeuer inverter as the example. Spindle control output and the inverter connection showed as Figure 2-3.If ACM and DCM are closed,only need to connect one port.
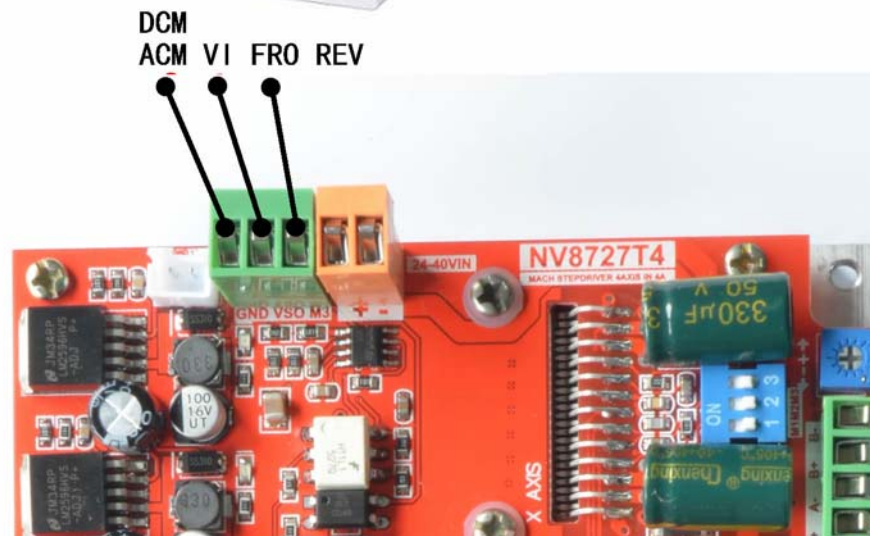
Figure2-3.　　spindle control output and inverter connection

　　VSO real output voltage=10V*s spindle setting speed/max spindle speed.Forexample,if max spindle speed is 24000,current spindle speed is S=18000,so the VSO output voltage=10*18000/24000=7.5V.

　　Max. spindle speed setting ports as showed sa Figure 2-4,open it from Pulley from Menu config. The current spindle speed can be set by S directive or Mach 3 spindle setting speed module.
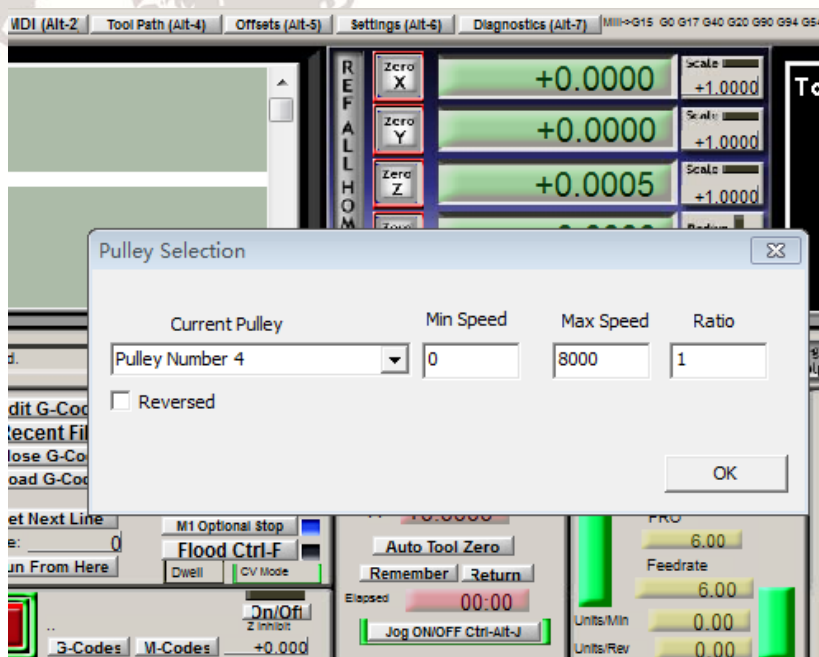
Figure2-4.　Max spindle speed setting position

2.2.3 12V fan's power port

As the Figure 2-2 showed. the marked No. 3 is Fan's power port. It can supply 12V

100mA.　The terminal type is XH2-54-2P, left is "+",right is "-".

2.2.4 LPT port

As the Figure 2-2 showed, the marked No.4 position interface is LPT port . The pin order
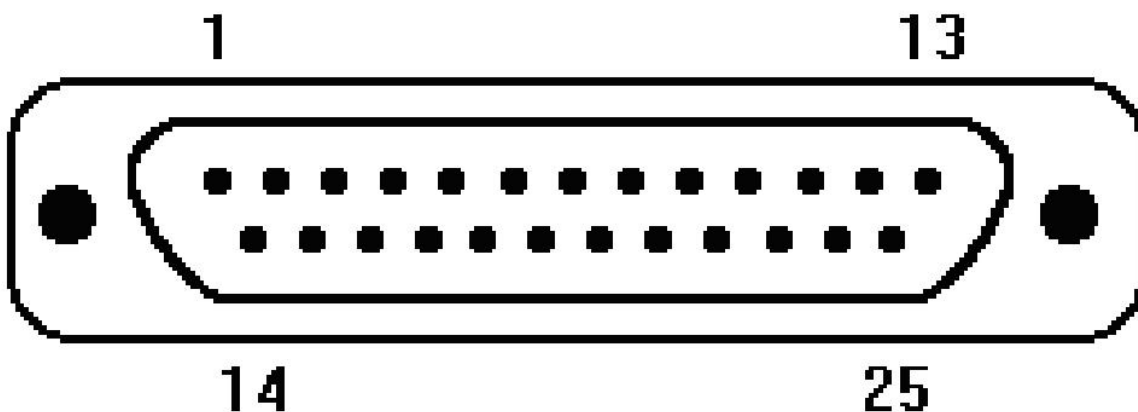
see as Figure 2-5.

Figure2-5.　LPT Pin order

This card connect with computer by this LPT port. The LPT port definition see as table 2-1

No.	Mark	Definition
1	VS0	Spindle speed regulation signal

2	STEPX	Pulse signal of X axis
3	DIRX	Direction signal of X axis
4	STEPY	Pulse signal of Y axis
5	DIRY	Direction signal of Y axis
6	STEPZ	Pulse signal of Z axis
7	DIRZ	Direction signal of Z axis
8	STEPA	Pulse signal of A axis
9	DIRA	Direction signal of A axis
10	LM5	General input LM5
11	LM4	General input LM4
12	LM3	General input LM3
13	LM2	General input LM2
14	M3	Spindle switch
15	LM1	General input LM1
16	STEPB/RELAY1	Pulse signal of Y axis/Relay 1
17	DIRB/RELAY2	Direction signal of Y axis/Relay2
18-25	GND	LPT Ground

Table 2-1. LPT port definition

2.2.5 Estop/Limit/Probe input port

As the Figure 2-2 showed, Marked No. 5 position is the Estop limited ect. they are the optical isolated Input interface. Reference Table 2-1, The silkprint LM1-LM5 on the board connect to PIN15/PIN13/PIN12/PIN11/PIN10 of the LPT port. Internal structure see as Figure2-6. lines Proximity Switch/ordinary fretting switch /Estop switch/Probe drawing see as Figure2-7.
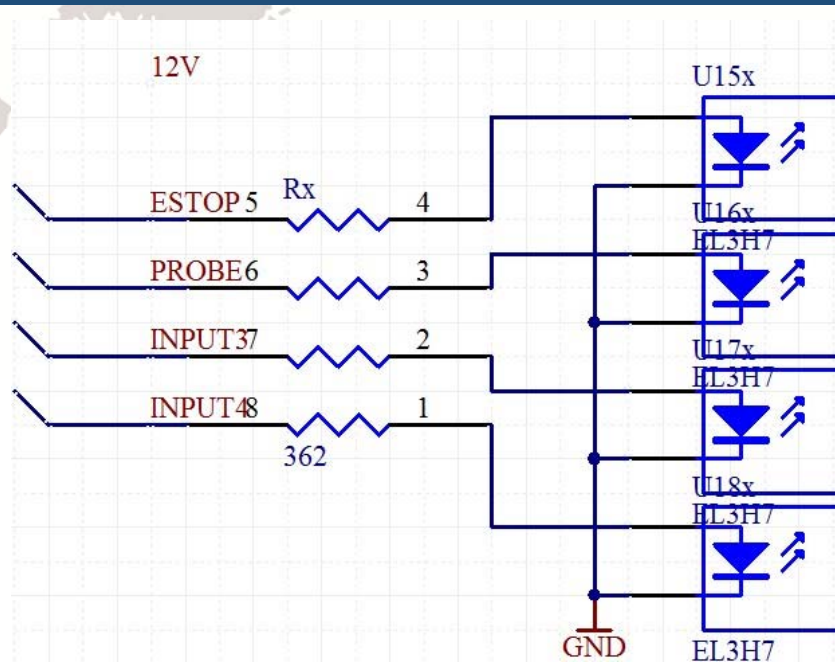
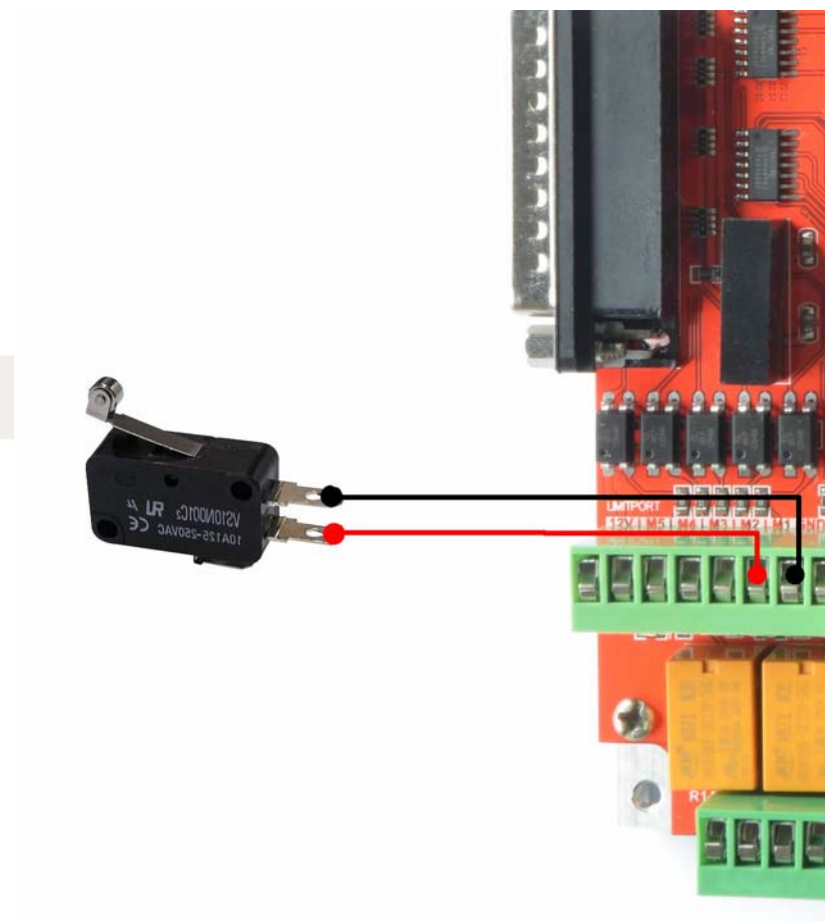Figure2-6.   Internal structure drawing of Input interface

Figure2-7.   Probe/Estop/ ordinary fretting switch input connection

3 lines Proximity Switch connection Figure 2-18,brown cable for Proximity switch connect

with 12V,Black cable connect channel,blue cable connect with GND1.
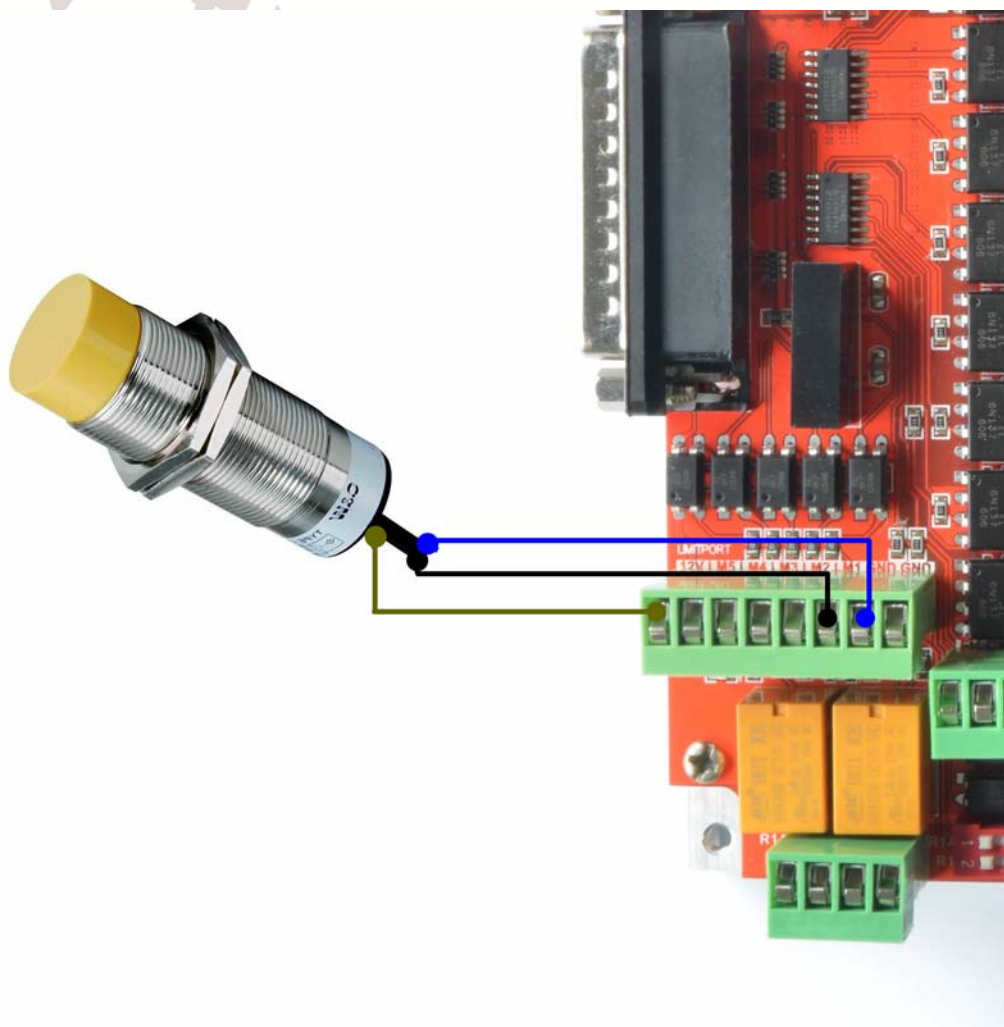
Only support NPN 3lines proximity switch.

Figure2-8.　　NPN 3 lines Proximity Switch connection drawing

2.2.6 2 Relay output

As the Figure 2-2 showed, Marked No. 5 position is 2 relay output port . You can used as

mist and flood control port. The relay support 250V3A electric equipment. If the current or the

voltage exceed 250V or 3A. You should use a larger relay. Relay1 and relay2 are controlled by

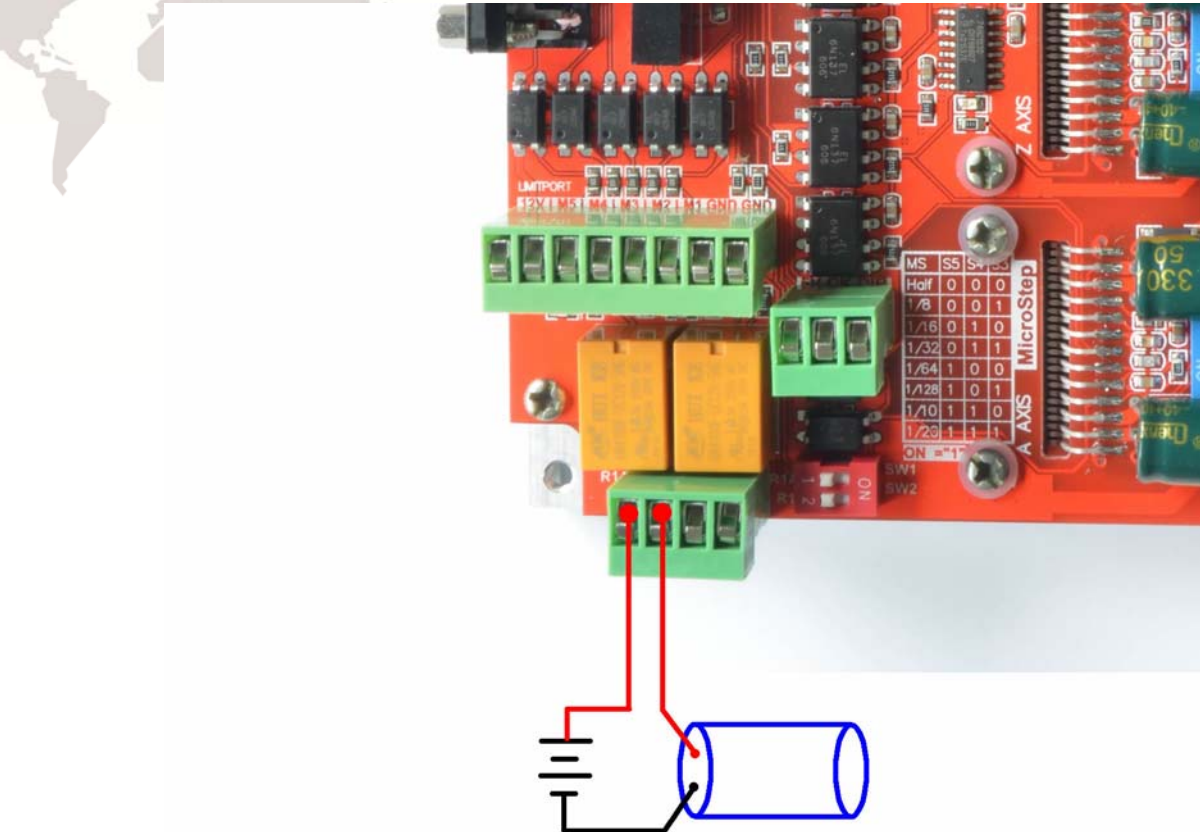PIN16 and PIN17 of the LPT port. Wire method　see as Figure 2-9.

Figure2-9.   Relay wire method

2.2.7   5th axis extend port

As the Figure 2-2 show, The marked No. 7 port is 5th axis extend port. These port and 2

Relay co occupancy PIN16 and PIN17 of LPT port. PIN16 set as STEPB, PIN17 se as DIRB.

There is a switch can choose 2 RELAY or 5th axis extend port. This port is defined as

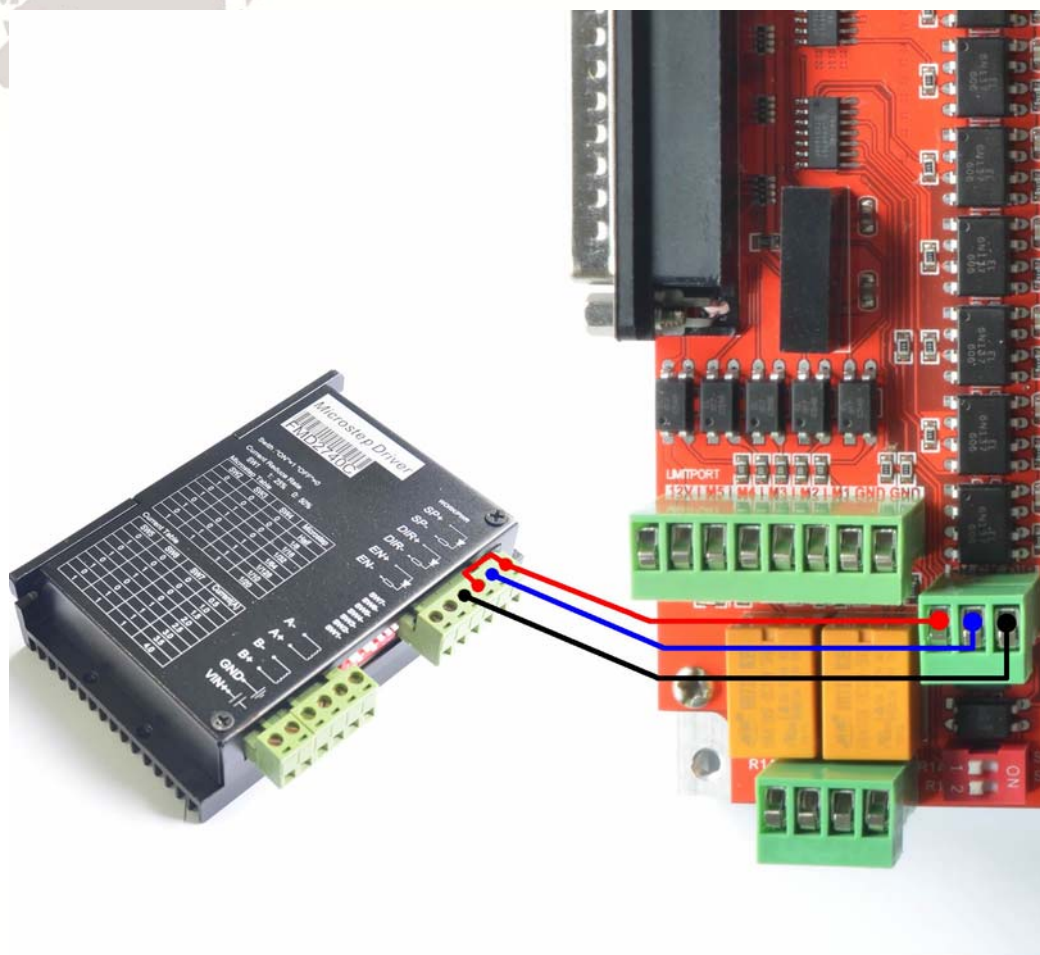+5V/STEPB/DIRB from left to right. Wire method see as Figure 2-10.

Figure2-10.　　5th axis extend port connect with a stepper motor driver

2.2.8　Function selector switch

As the Figure 2-2 show, The marked No. 8 is PIN16 and PIN17's function selector switch.

When switch put to ON, these pins control 2 relay; When switch put to number 1/2, these pins

are STEPB and DIRB.

2.2.9　4 axis motor current adjust potentiometer

As the Figure 2-2 show, The marked No. 9 are 4 axis motor current adjust potentiometer .

Near by the potentiometer, there are marked "←− +→", it means clockwise turning, the current

increase, and counterclockwise turning, the current decrease.　And the regulating range is
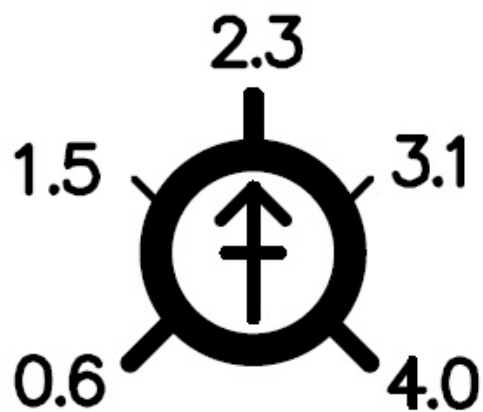
0.6A-4A. See as Figure 2-11.

Figure2-11.　4 axis motor current adjust potentiometer

2.2.10　Stepper motor port.

As the Figure 2-2 show, The marked No. 10-13 are 4 axis stepper motor port. They are

A/Z/Y/X from down to up. Each axis's pin is defined as A+/A-/B+/B- from down to up.

2.2.11　Micro step setting switch.

As the Figure 2-2 show, The marked No. 4 are 4 axis stepper motor micro step setting

switch. Each switch is marked M1/M2/M3. micro step setting see as table 2-2.

Micro step	M1	M2	M3	step/cycle
2	OFF	OFF	OFF	400
8	ON	OFF	OFF	1600
16	OFF	ON	OFF	3200
32	ON	ON	OFF	6400
64	OFF	OFF	ON	12800
128	ON	OFF	ON	25600
10	OFF	ON	ON	2000
20	ON	ON	ON	4000

Table 2-2.　Micro step setting table

Chapter 3. | Software Installation

3.1 MACH3 Install

When you purchase our product, we will supply a CD-ROM, which contains the MACH3

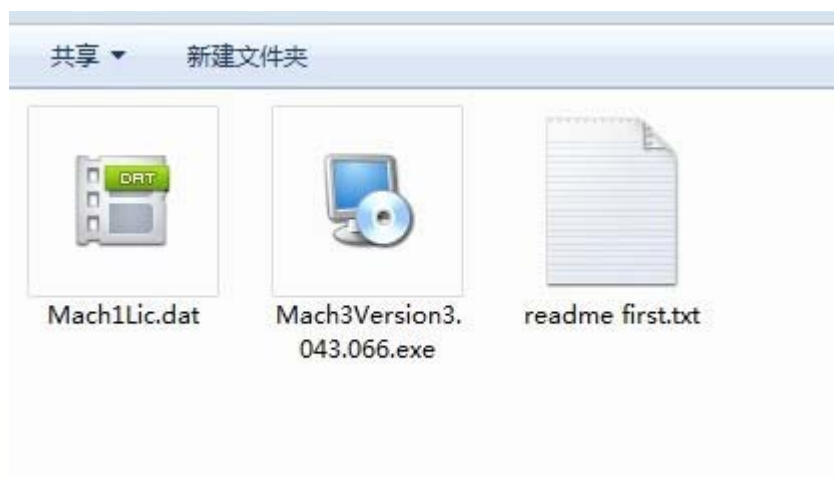installation, registration, and USB plug-ins. See as Figure 3-1

Figure3-1.   MACH3 soft installation

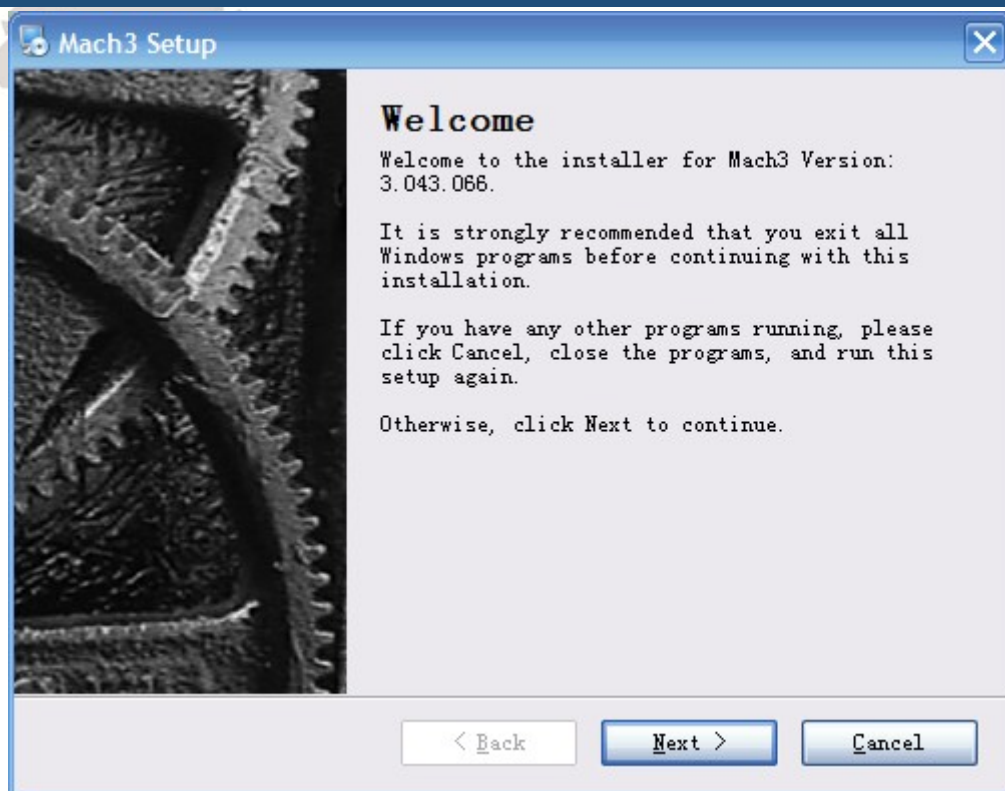First run the installation Mach3Version3.043.066 .Into the first

page. See as Figure 3-2.

Figure3-2.　　MACH3 installation process 1
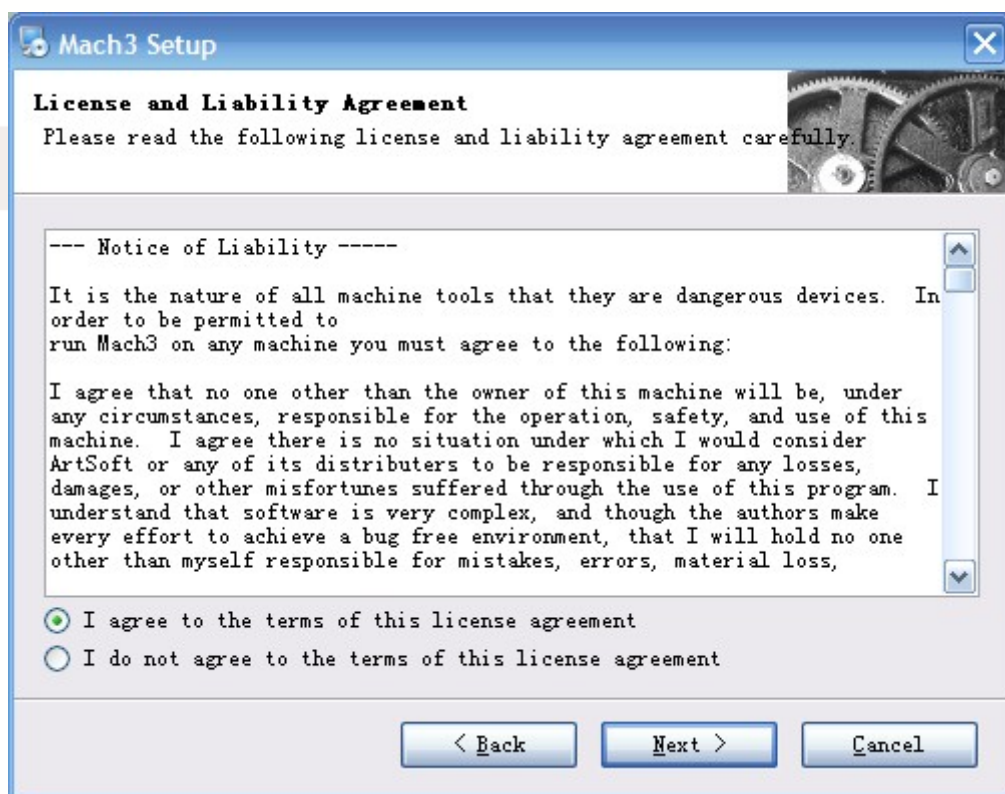
Click Next and then enter the page shown in Figure 3-3

Figure3-3.　　installation process 2

Select I agree and click Next，See as Figure 3-4.

Figure3-4.　　MACH3 installation process 3

Select the installation path, click Next (it can be installed on any disk, and recommended

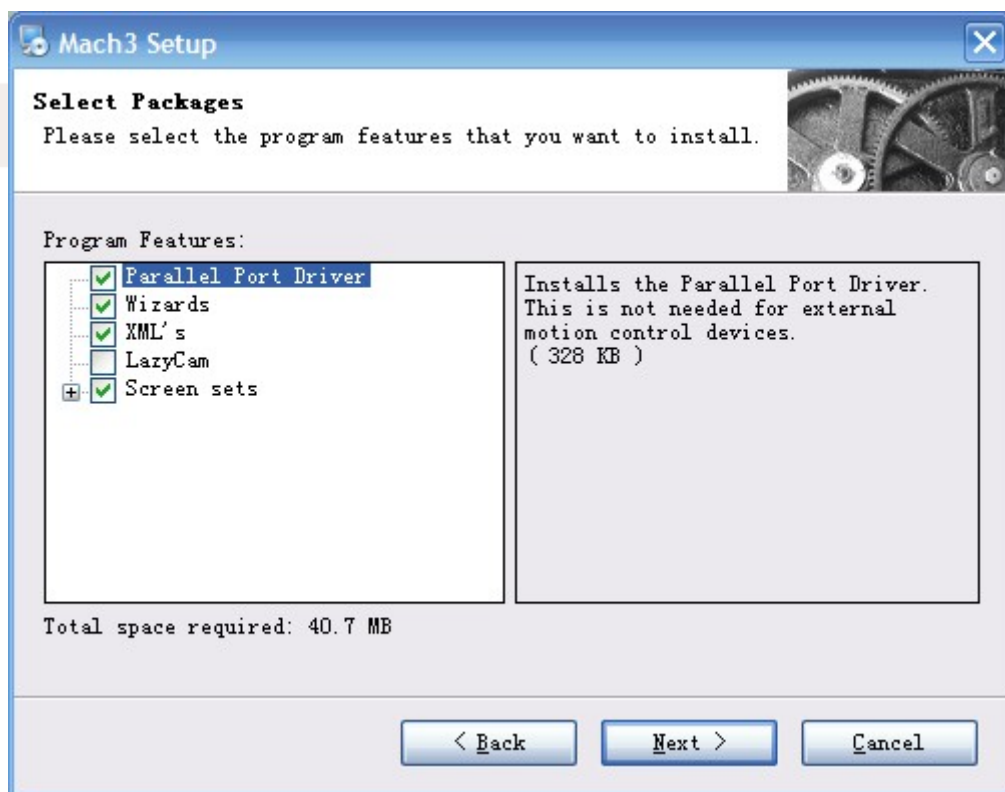to install the C drive or the D drive) See as Figure 3-5

Figure3-5.　　MACH3 installation process 4

Click Next until completion. Then restart the computer.

Chapter 4. | Setting of software

4.1 Open software

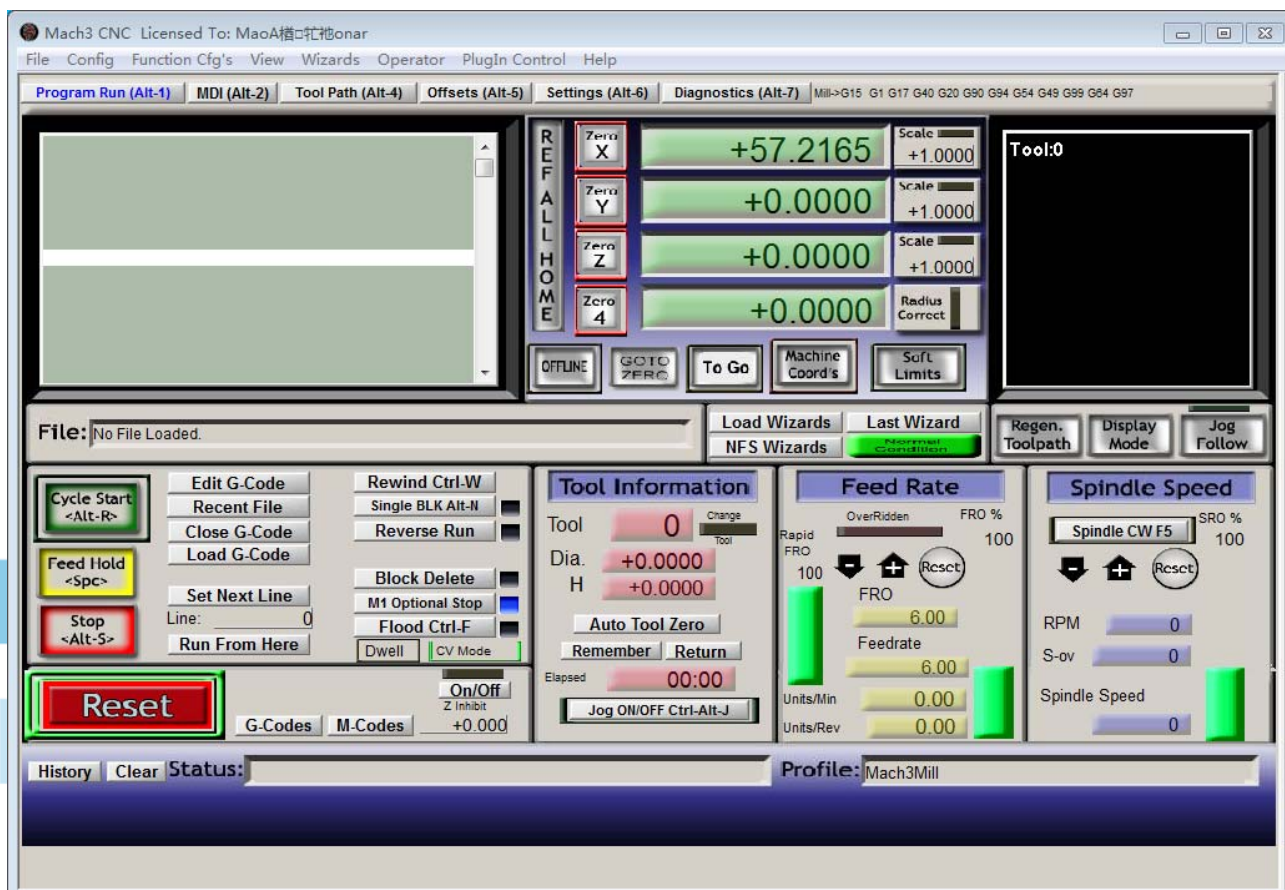Double-click the mach3mill   [icon: Mill 快捷方式 1 KB]   .See as Figure 4-1.

Figure4-1.   Open mach3 software

4.2 Software Common settings

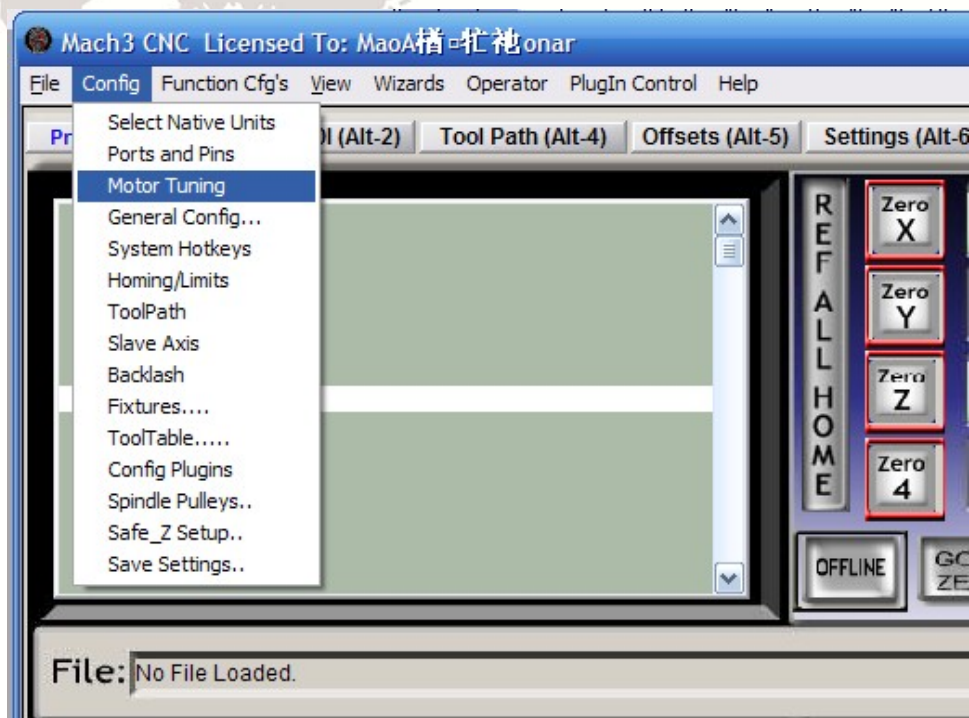### 4.2.1 Motor operating parameters setting

Figure4-2.　　Motor operating parameter setting menu entry

See as Figure 4-2.From submenu "motor tuning" of the menu "config" into the motor

parameter settings dialog. See as Figure 4-3

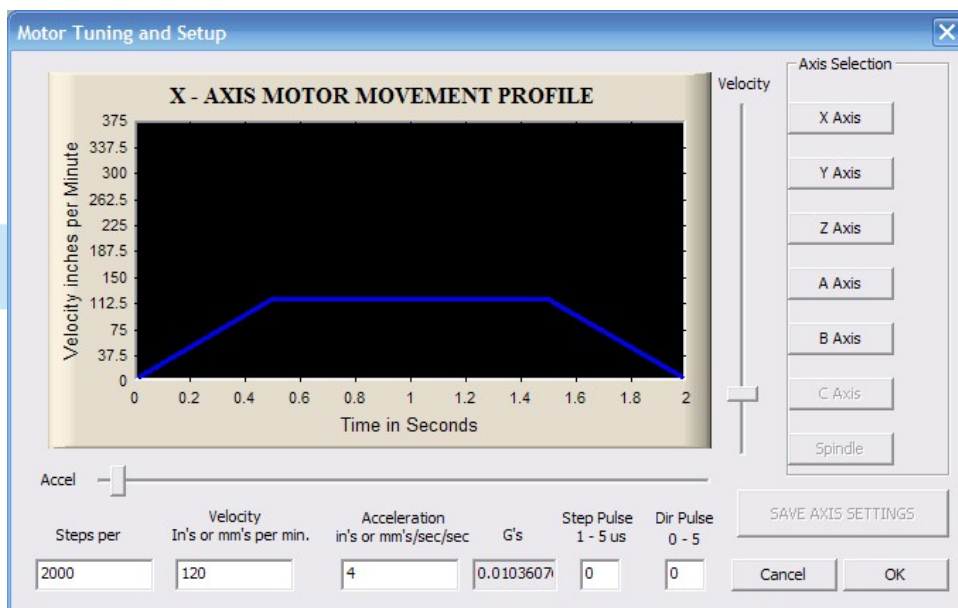Figure4-3.　　Motor operating parameter settings dialog

The parameters are defined as follows:

Steps per：Pulse equivalent ,it is number of pulses required with axial movement 1mm, This

can be calculated by lead screw pitch and motor drive segment. Such as pitch 2.5mm,2-phase

motor 8 segments, Calculation method is 8*200/2.5=640。

Velocity：The speed is the axial velocity, Units is mm/s，Recommended settings 1500.

Acceleration：Units is mm/s2，Recommended settings 200.

Step Pulse：Step Pulse Cannot be set, it's 2.5us in default.

Dir Pulse：. Dir Pulse Cannot be set, it's 2.5us in default.

Attention: The parameters for each axis is not necessarily the same，To select the axis,

and then set parameters. You should click "SAVE AXIS SETTINGS" After setting.
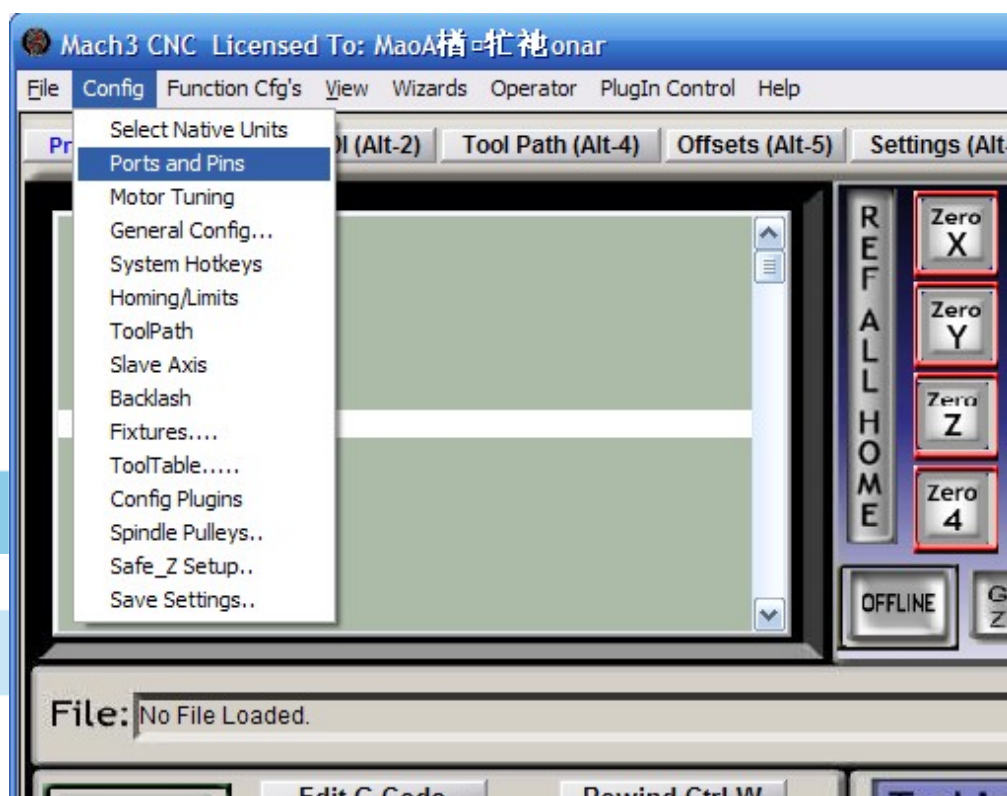
4.2.3 Port Settings

Figure4-4.　　Port setting intry

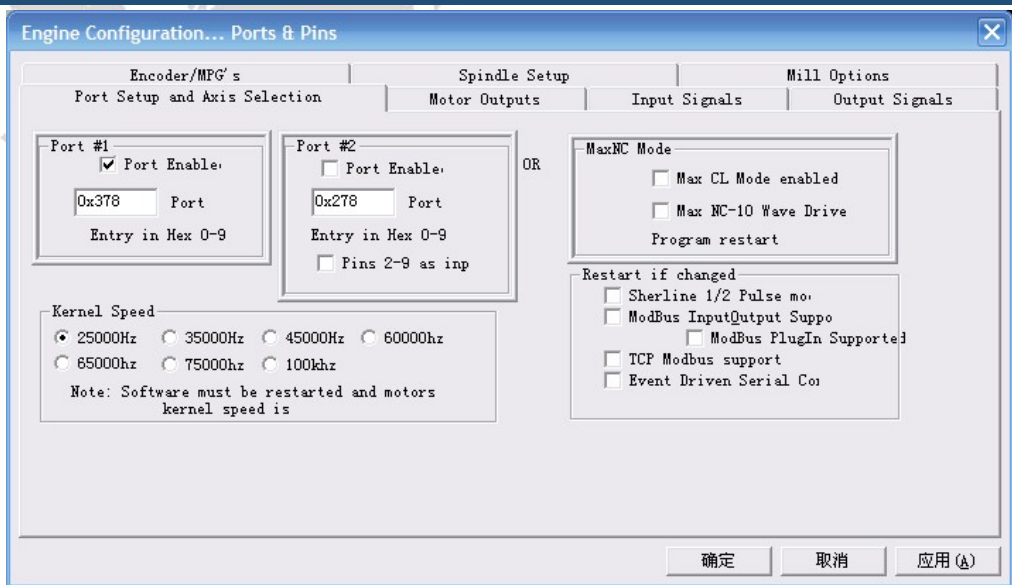See as Figure 4-4，Click the sub-menu "ports and pins" of menu "Config" into Port Settings

dialog box.

Figure4-5.   Pin&Port Dialog

The sub-pages you need to set include "Motor Outputs", "Input Signals", "Output Signals" and "Spindle Setup".First Click to enter "Motor Outputs". This page is to select the stepper motor control pin. Because our usbmach3 interface board stepper motor signals are fixed, So here only need to Select, no need to select the specific pin. See as Figure4-6

To make the Z axis to the same direction, Z axis's "Dir low" should be set to"√".Other axes's should be set as system need.
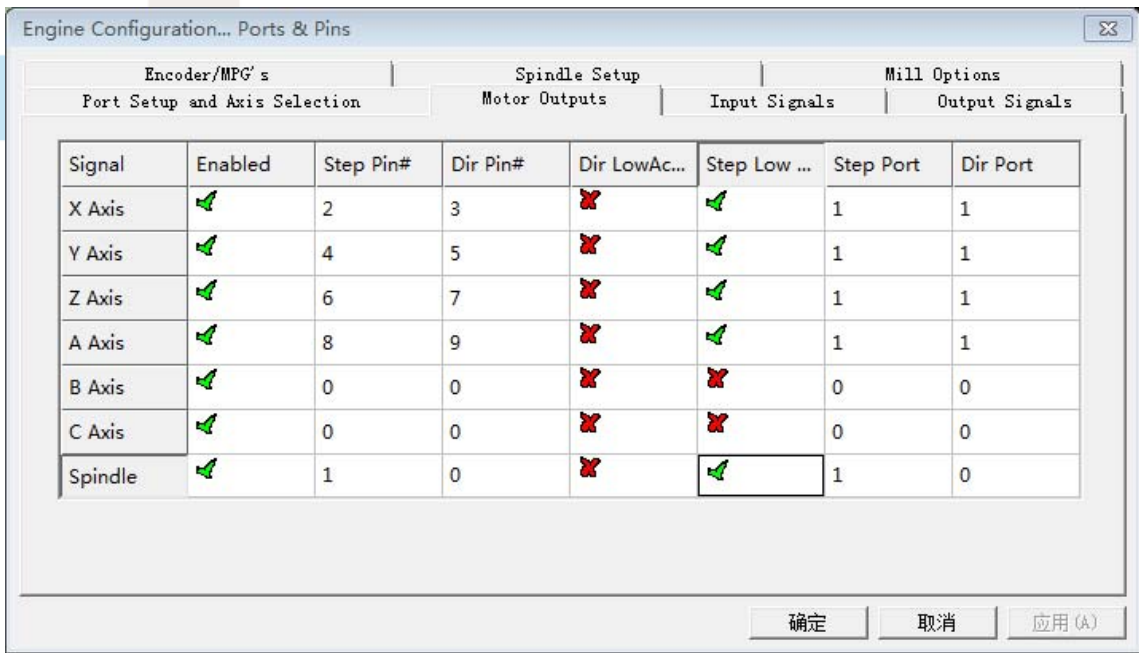

Figure4-6.   Stepper motor port settings dialog

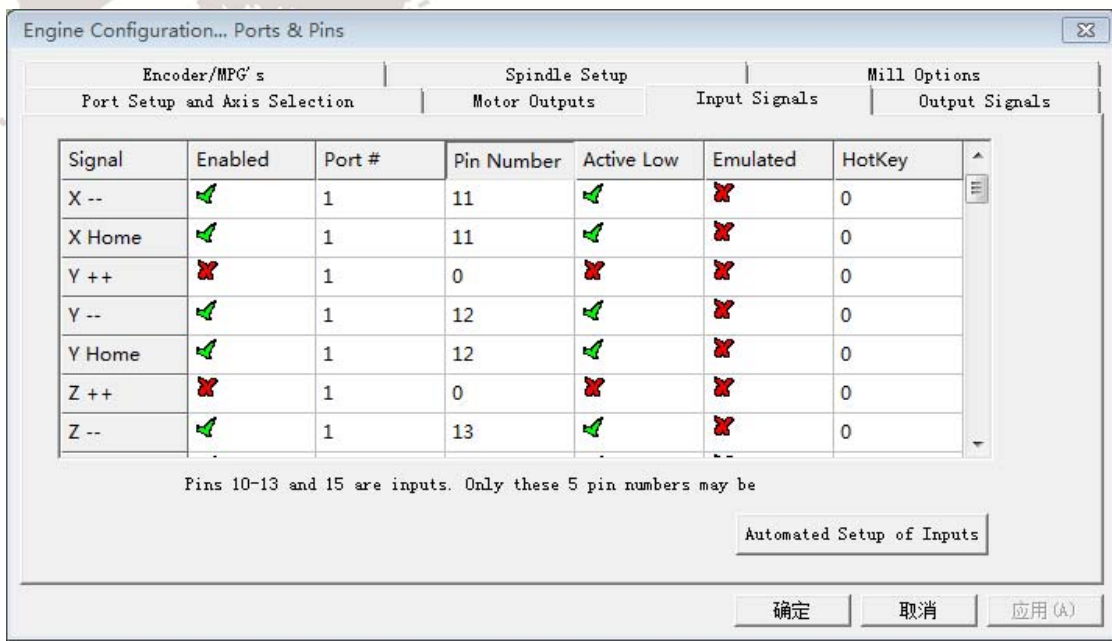Click "Input Signals" Into the input signal settings page. See as Figure4-17

Figure4-7.　　limited Input Settings dialog

Here you can configure according to your actual needs the corresponding function. Optional

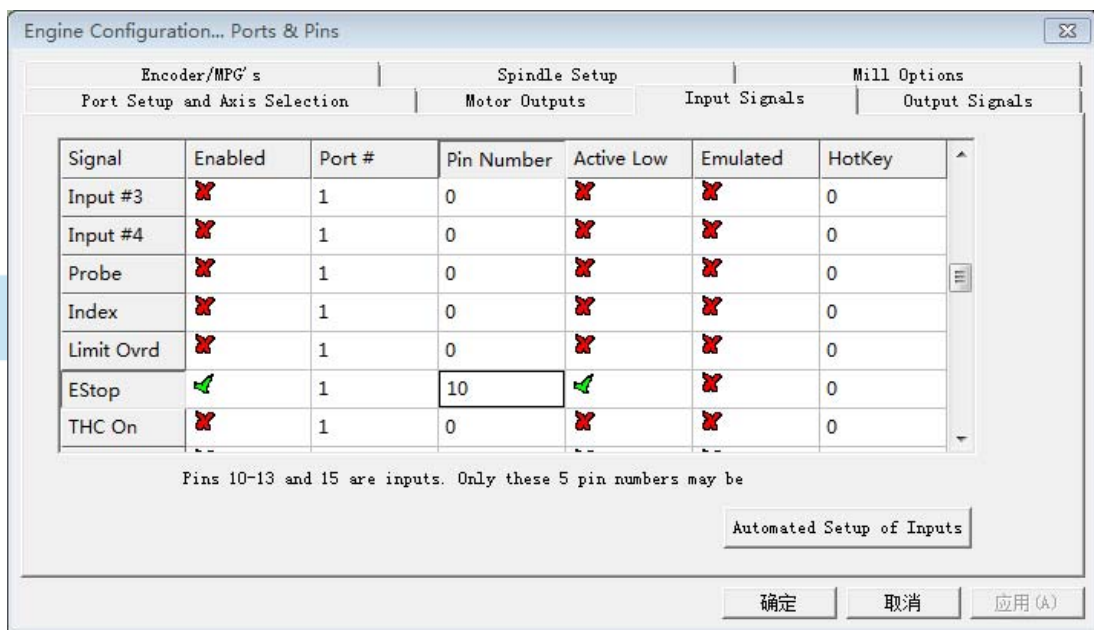Function include XYZABC6axis's Upper and lower limit、XYZABC6axis's HOME point.

Figure4-8.　　Estop Probe and index Setting dialog

ESTOP Setting see as Figure 4-8，estop's pin number　is 10.

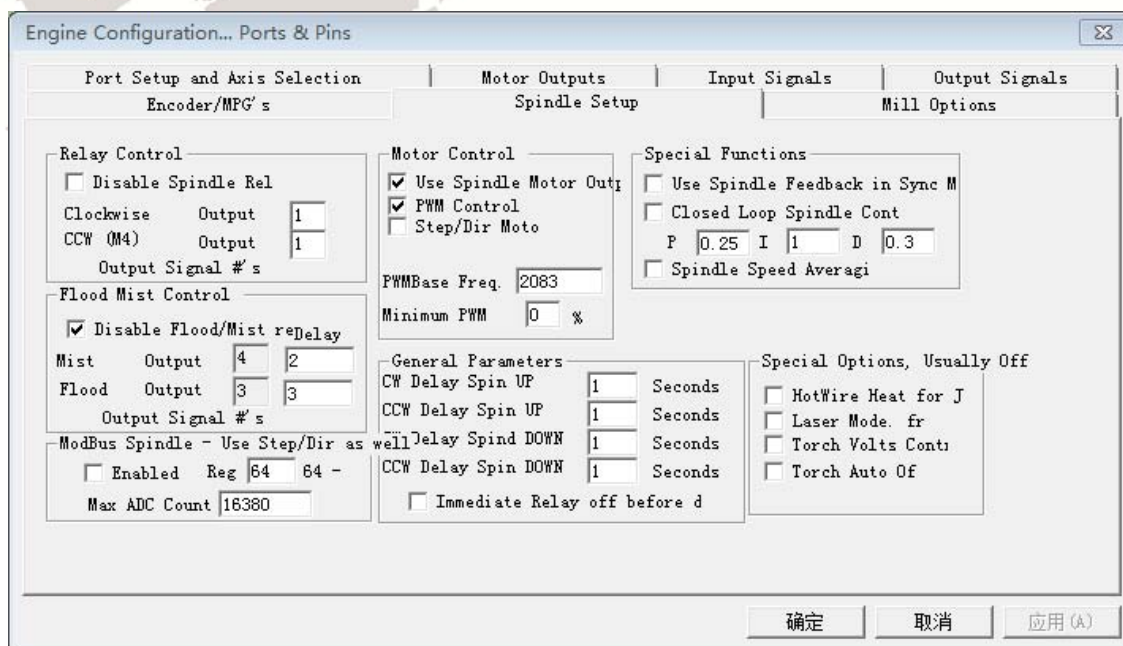Click "Spindle Setup" switch to the spindle settings page. See as Figure4-9.

Figure4-9.　Spindle Settings dialog

Here we can configure the spindle rotates CW、Reverse CCW、Mist、Flood pin, See as

Figure4-9，They have been configured as 1、2、3、4. Corresponding to output#1~output#4 in

Figure4-10.output#1~output#6 in Output Signal Setup dialog can be Configured into these 4

signals. Here we only configure CW/MIST/FLOOD. CW is controlled by OUT1. MIST is

controlled by OUT2. Flood is controlled by OUT3.　Here we note correspondence between 2

page. Please select "use spindle motor output" if required PWM speed spindle. And select " PWM

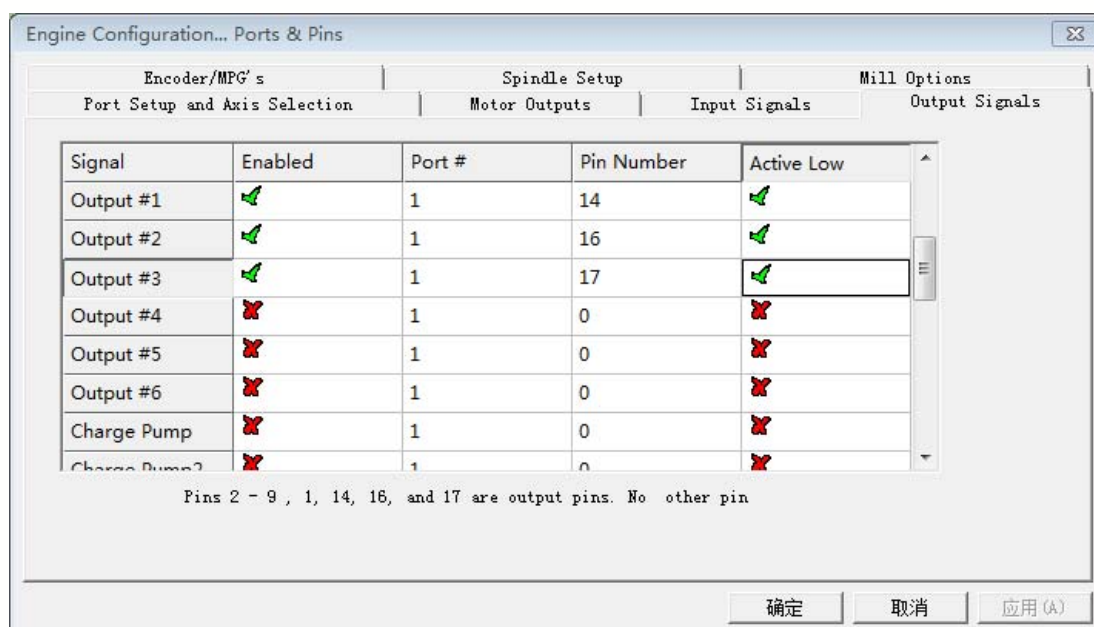Control". Our PWM pin fixedly arranged on a special pin on Stepper motor setting dialog.

Figure4-10. Spindle setting corresponds to the output configuration

Chapter 5. Using of software

5.1 Set Machine Coordinate system

Firstly Open the software,as the drawing 5-1 shows,at this time,the software can operate the machine movements,but before the setting machine coordinate system,there is no connection between the software and machine.So first step is to set the machine coordinate system.
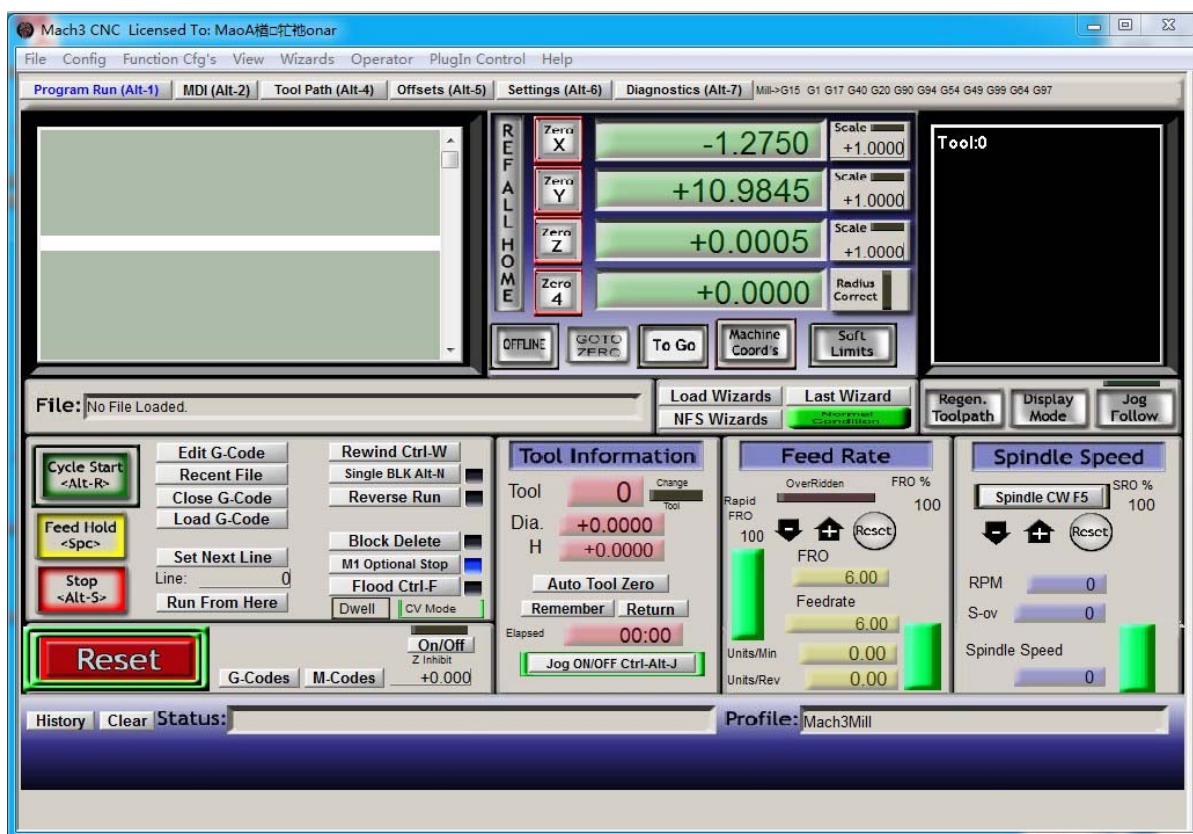

Figure5-1.　　Main Screen of mach3

1、Set the machine original position switch

As our request,some machine set the original point at the coordinate positive direction,some machines set the original point at the coordinate negative direction.Mach 3 can search out the machine original point direction by the software setting.As the pic 5-2 shows,open Homing on the config menu.Then as pic 5-3 shows.On this page,Home Neg is for searching for the machine

orginal point direction, × means searching original point at negative direction; √ means searching

original points at the positive direction.As the pincture 5-3 shows,X axis's original position is at

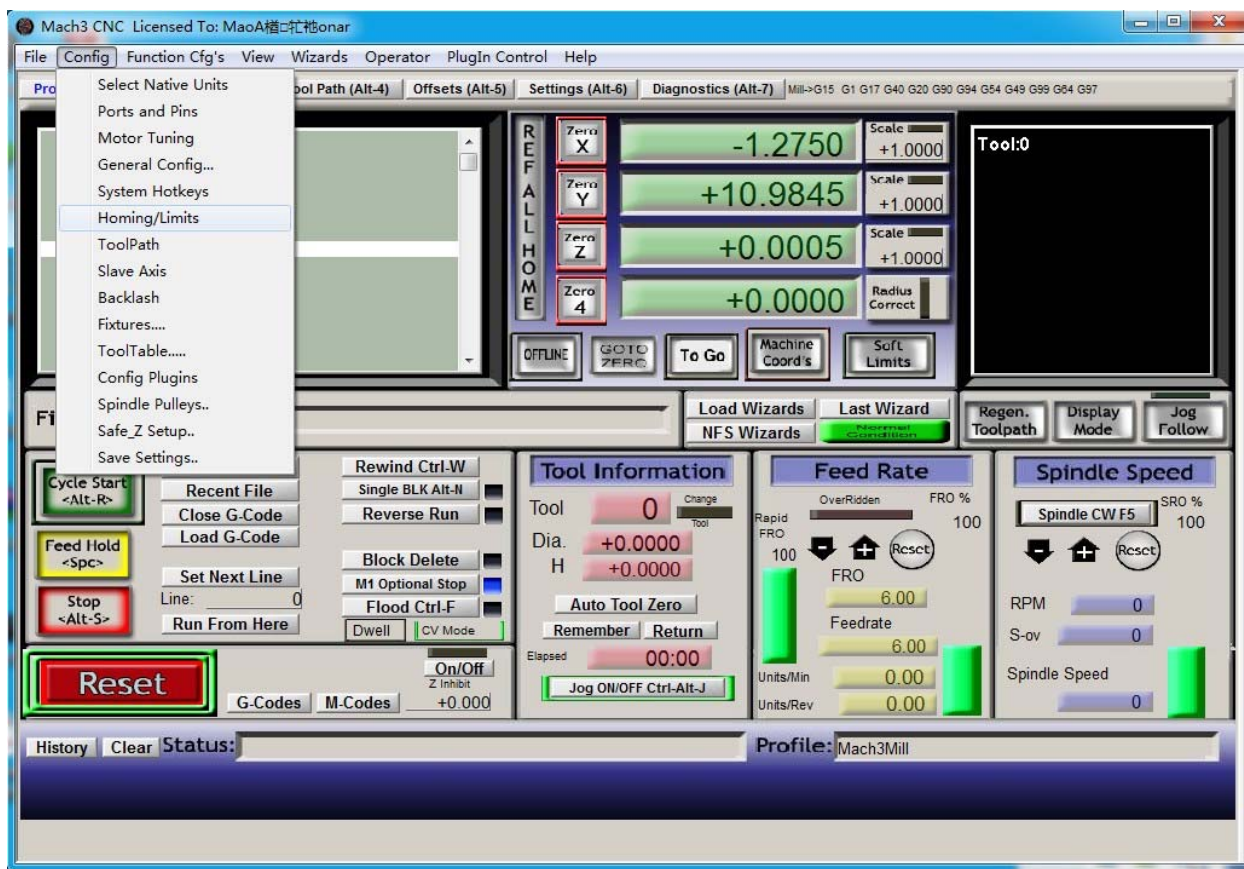the negative direction,Y and Z's original points are at the positive direction.
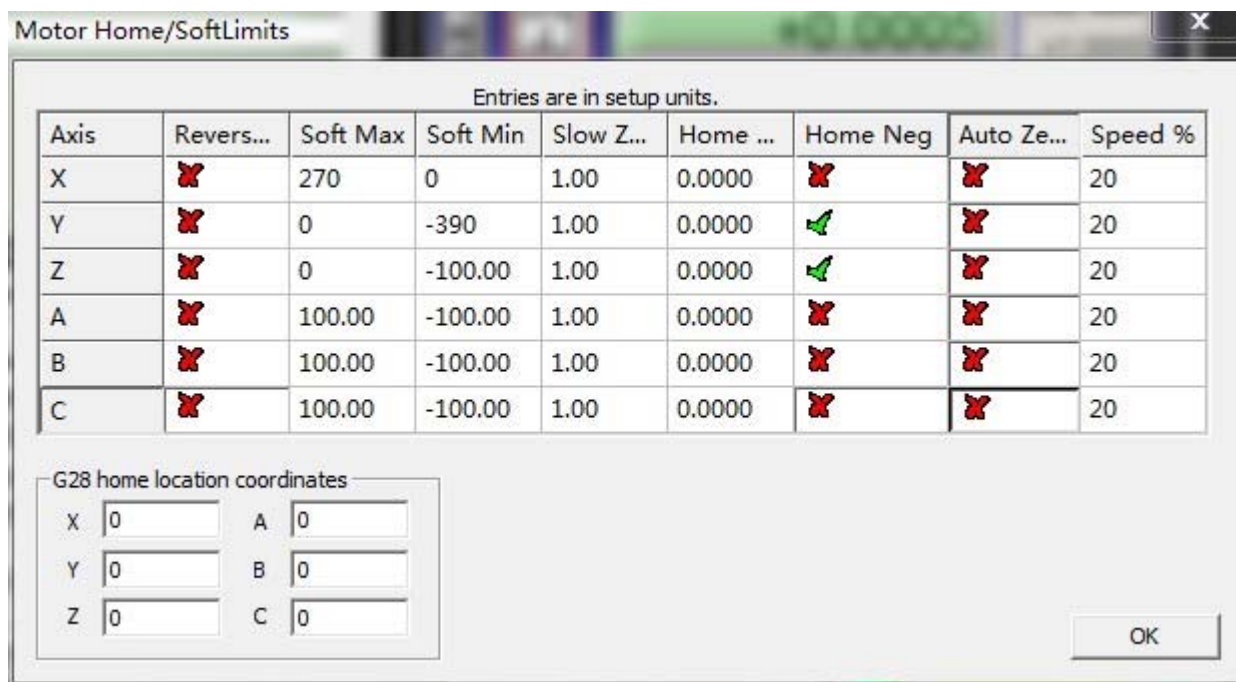

Figure5-2.　　Click homing of Config

Figure5-3.　　Motor Home and Softlimits dialog

2、Set soft limits

As Figure 5-3 shows,this page also can set machine soft limit points,Soft Max is positive direction soft limited points,soft Min is negative direction soft limited points.The soft limited points values is according the references to the machine coordinate system,so as this example shows,Y and Z axis's max value is 0,all the effective coordinate data is less than 0.As the Figure shows,according to our current request,we set our XYZ axis soft limited points area as [0,270] [-390,0] [-100,0].
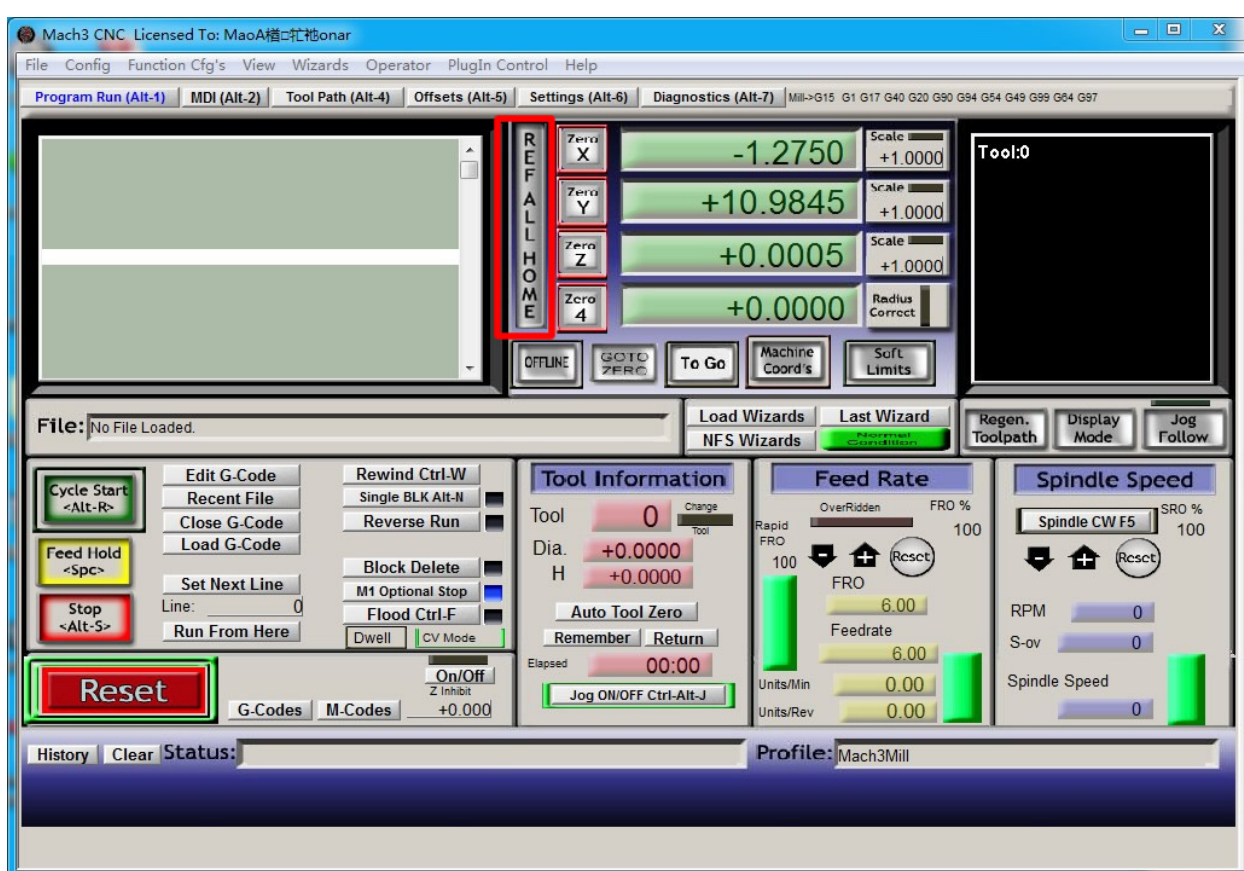
3、Searching for machine original points

Figure5-4.　　Click REF ALL HOME to HOME all axis

As Figure 5-4 shows,press REF ALL HOME at main display page,then XYZ A4 start to search for the original points,if you need more axis's operation,edit macro command,or press Alt+7 into Diagnostics display page,you can search original point for every axis. Diagnostics

5.2 Set workpiece coordinate system

Because every working material is hold in different position on the machine,we need to set

one or more workpiece coordinate system.

1、Move to current working piece 0 point

Firstly hold down the material,use keyboard or pendant to move tool tip at the 0 point,so this

0 point is the working piece 0 point,it related with the working G code file,so the user must be very

familiar to his own working G code.As our example shows,the 0 point is on the center of the

working piece surface,so we just move the tool tip to this position.

2、clear Coordinate

As 5-5 shows,press Zero button on each axis, then clear to 0 for each axis.After operation,the
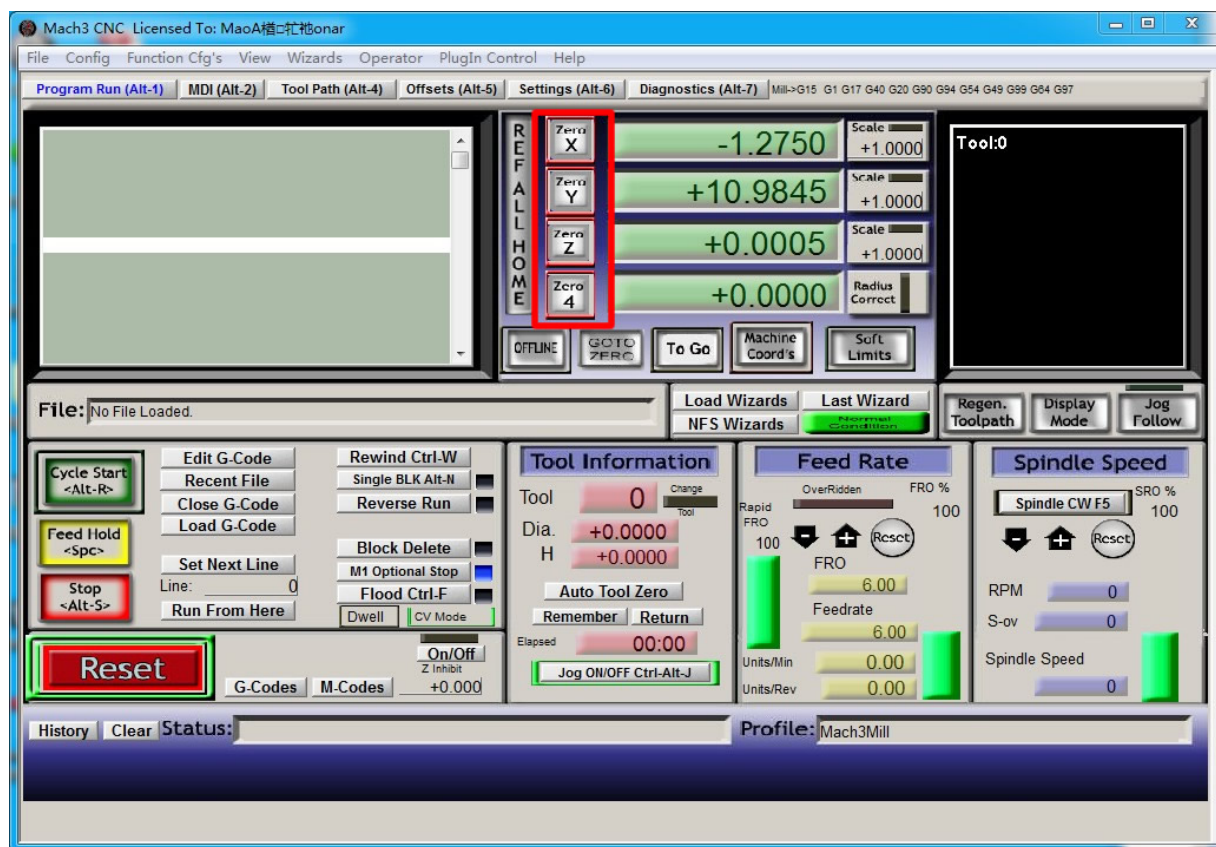
result shows as Figure 5-6.
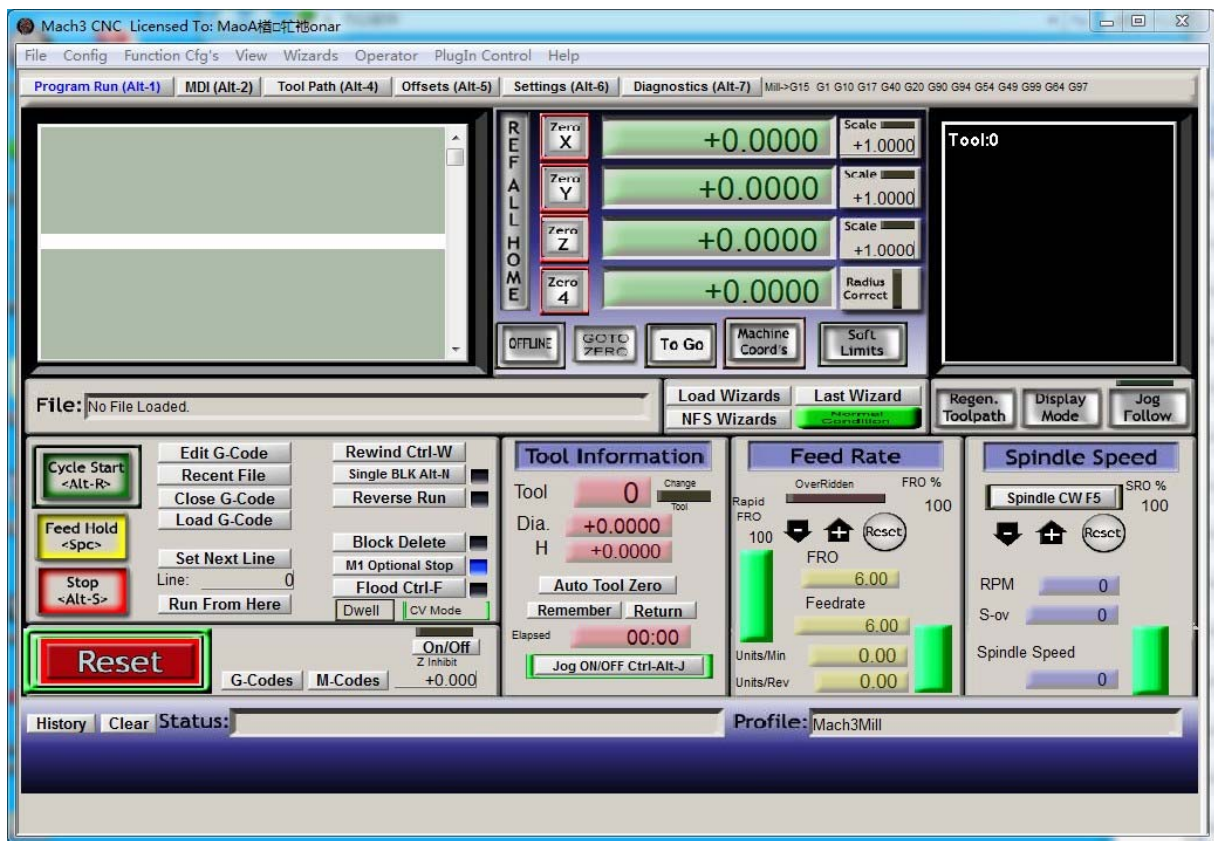

Figure5-5.　　Press Zero on each axis,all clear to 0

Figure5-6.　　Main Screen after ZERO all axis

5.3 Open G code file and run

As Figure 5-7 shows,press "load G code" botton at the main page or open "Load G code" at main menu "File",open your G code.It displayed as Figure 5-8 showing,then press button "cycle start" then machine start to work.
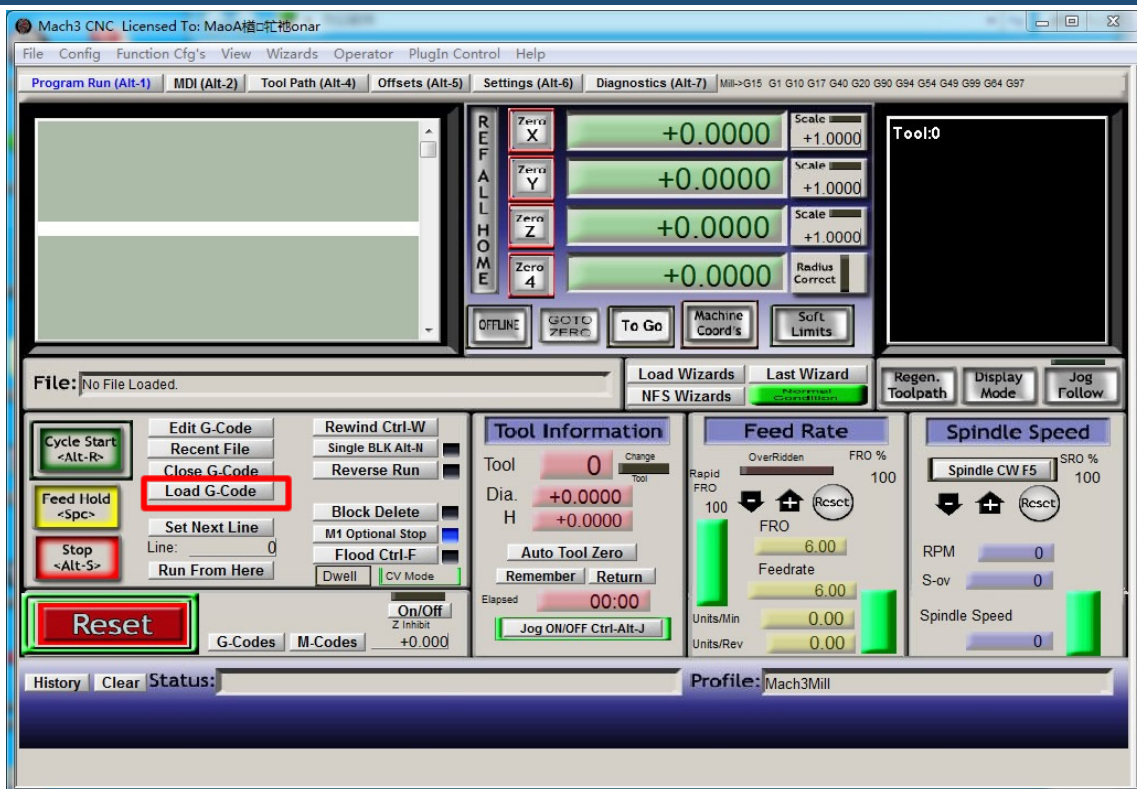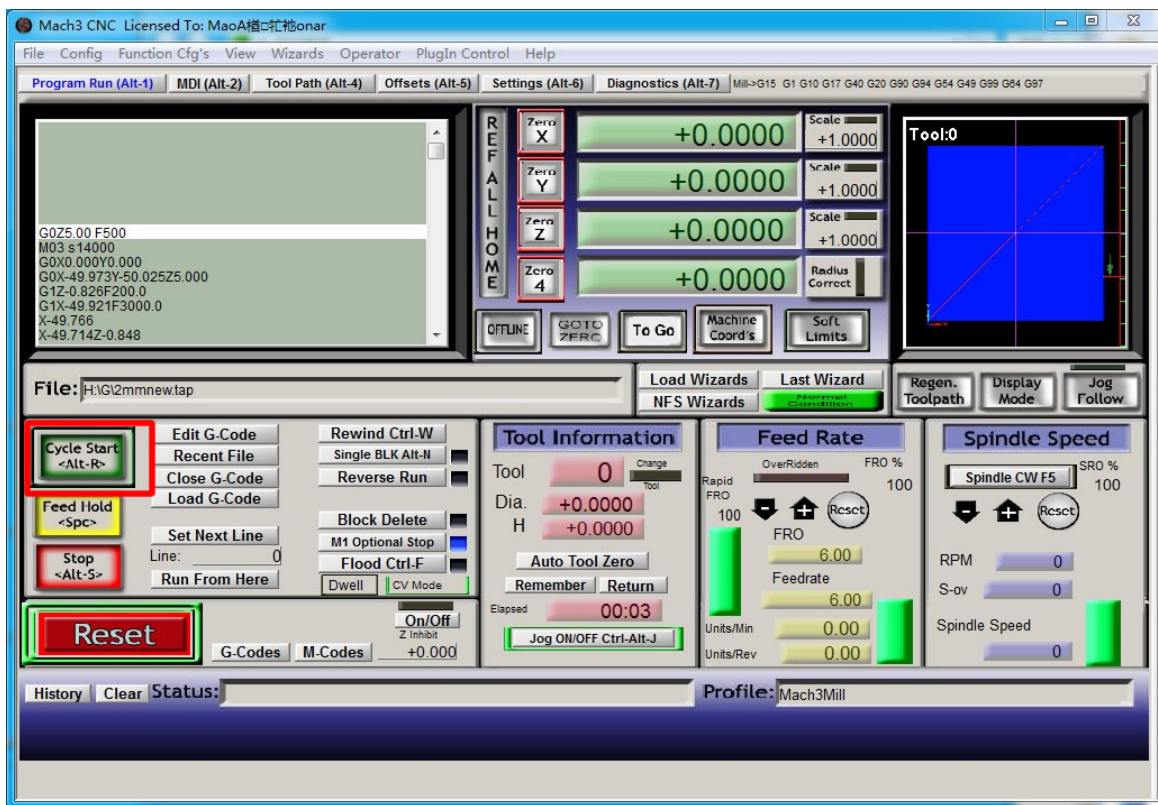
Figure5-7.　　Press Load G-Code and open your G code

Figure5-8.　　After opening G code,press "Cycle Start" and start to work

Chapter 6. Question & Answer

6.1 Q&A for Hardware

6.2 Q&A for Software

Chapter 7.　　　Contract us

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⊠　　　　: