DIGITALDREAM

MACH3 ETHERNET CONTROLLER

EC300V5

Manual

Contects

Chapter 1. Introduction

1.1 Product Introduction

Digitaldream CNC has engaged in the Numerical control industry for 10years, specialized in the research, development and production of various CNC controller systems with high quality and high reliability. We produce the Brushless DC motor, Stepper motor driver, and also 1 to 6 aixs CNC motion controllers.。

EC300V5 is the 6 axis motion controller spend 4 years to design.This controller's control cycle is 2ms. The maximum pulse frequency of each axis is 300KHz. The highest division is 256.The highest current is 6A.

EC300V5 support Mach3 software and serial port MPG, through ethernet to communicate with computer.

EC300V5 motion controller adopts the ARM design framework. The ARM design includes communication,codeanalytic, underlying algorithm and pulse gerneration. Rational design, reliablecontrol, convenient operation.

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 EtherNET;

◆ 12ports input interface for ordinary digital data；

◆ 10 ports output interface for ordinary digital data；

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

- can support 4 axis stepper systems,300KHz pulse output for every axis；

- ARM motion control chip；

- Compatible with MPG input, support stardand MPG & the digital display MPG of our company。

1.3Products Appearance and size

　　EC300V5 motion controller is with the plastic shell structure. The controller appearance as the Figure 1-1 show: The products overall size is 171mm*106mm*20.5mm；Install size is 116mm*119mm

Figure1-1.　　EC300V5 front appearance and size
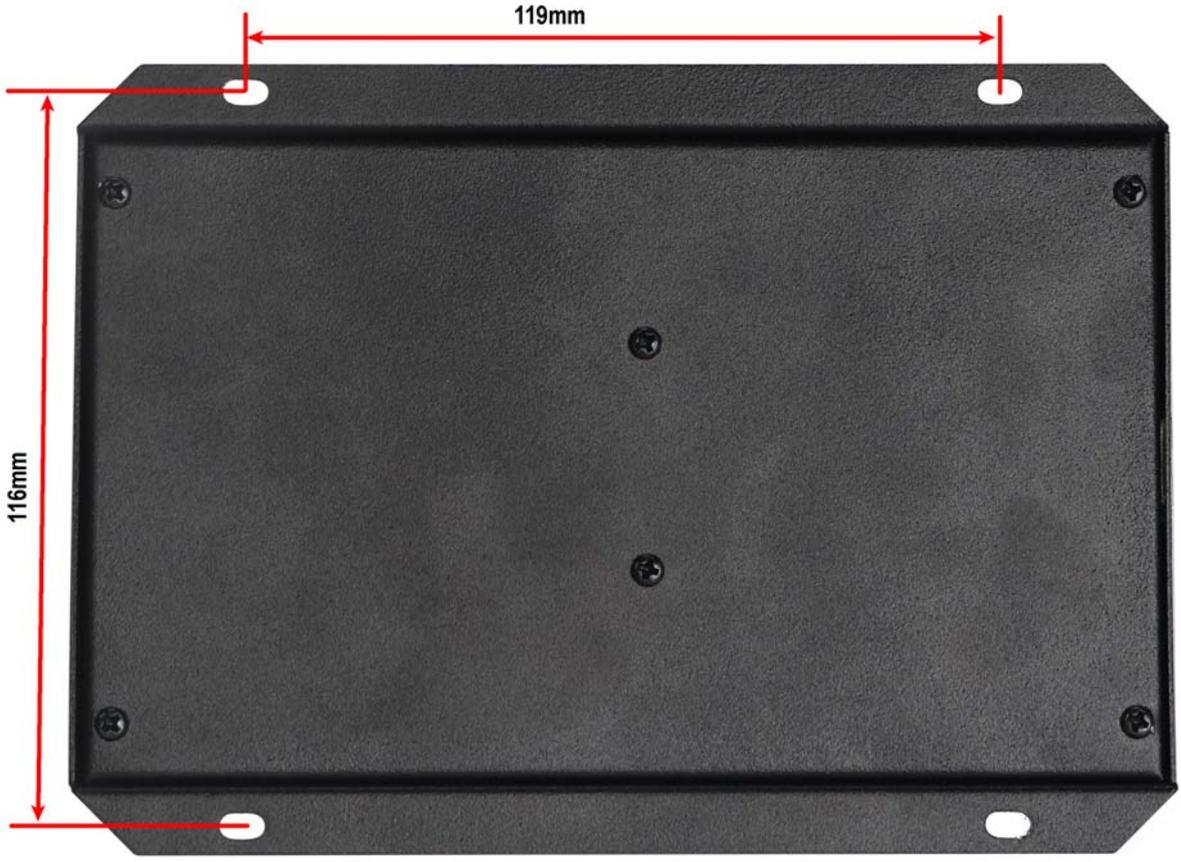
Figure1-2.   Install size

1.4substantival explanation

When operate the EC300V5,where will be a lot of English abbreviation,now we list all of them for your kindly references:

FRO:Feedingadjust: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 : X axis Coordinate,Y :Y axis Coordinate

Z :Z axis Coordinate, A :A axis Coordinate

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 24VDC power supply.Voltage equipment.Pls pay attention to the electricity, safety when conducting the operation

>> Chapter 2.   Connection

2.1 Product connection define and method

Figure2-1.   Product wiring section and interface summary

As the Figure 2-1 showed,the connection of the controller includes Ethernet connection interface, MPG interface and Power input port etc. Now we descript them in details as below.

2.2.1 Ethernet port

As shown in Figure 2-1, the position marked with 1 is the Ethernet interface, through which the controller can be connected to the computer. The controller supports both router mode and network cable direct connection mode. This will be described in detail in later chapters.

2.2.2 Power input port

As shown in Figure 2-2, the port marked with GND/24V/COM -/COM+, where GND/24V is the system power interface and COM -/COM+is the IO power interface. The power supply voltage

range is 24V. The power supply is recommended to be no less than 50W. The system power supply

and IO power supply can share a 24V switching power supply, or they can be powered separately

by two 24V switching power supplies.

2.2.3   FRO/SRO/SJR adjust interface

As shown in Figure 2-1, the interface marked with 3 is the FRO/SRO/SJR quick parameter

adjustment interface. This adjustment interface can adjust the FRO/SRO/SJR 3 parameters by

using 2 gear switches+a digital potentiometer, which is original to our company. For the wiring

method, refer to Figure 2-2. Among them, the potentiometer adjusts the SRO value when SRO and

COM are short circuited, the potentiometer adjusts the SJR value when SJR and COM are short

circuited, and the potentiometer adjusts the FRO value when SRO/SJR are disconnected.
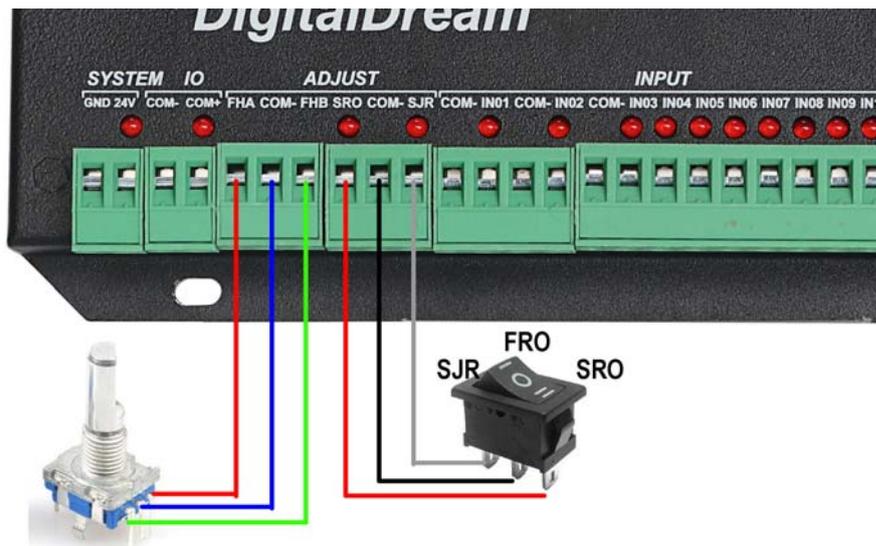
Figure2-2.   Product wiring section and interface summary

2.2.4 Universal input interface

As shown in Figure 2-1, the position marked with 4 is a universal input interface, which is

composed of a 4P2edg terminal and a 12P2edg terminal. The specific definition is printed on the

housing. Now, the detailed definition of the interface is described as follows.

NO.	MARK	Definition
1	COM-	Common terminal-

2	IN01	INPUT PIN1
3	COM-	Common terminal-
4	IN02	INPUT PIN2
5	COM-	Common terminal-
6	IN03	INPUT PIN3
7	IN04	INPUT PIN4
8	IN05	INPUT PIN5
9	IN06	INPUT PIN6
10	IN07	INPUT PIN7
11	IN08	INPUT PIN8
12	IN09	INPUT PIN9
13	IN10	INPUT PIN10
14	IN11	INPUT PIN11
15	IN12	INPUT PIN12
16	COM+	Common+, External supply 24V

Table 2-1.Detailed Description of Definition of General Input Interface
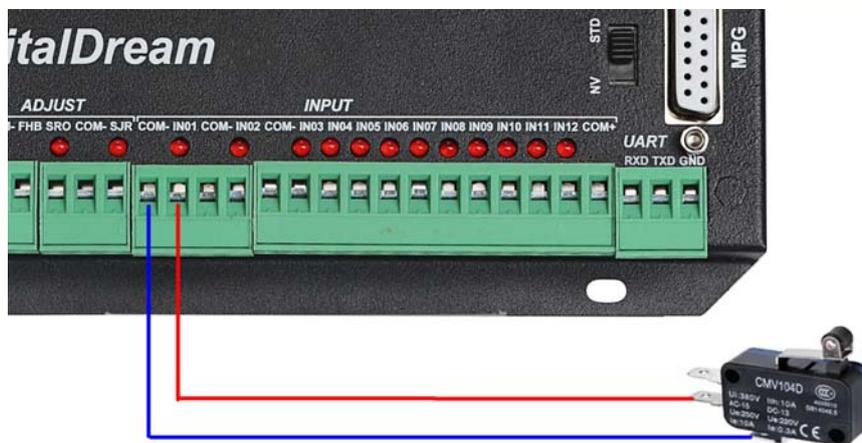
Figure2-3.   Wiring mode of two-wire switch
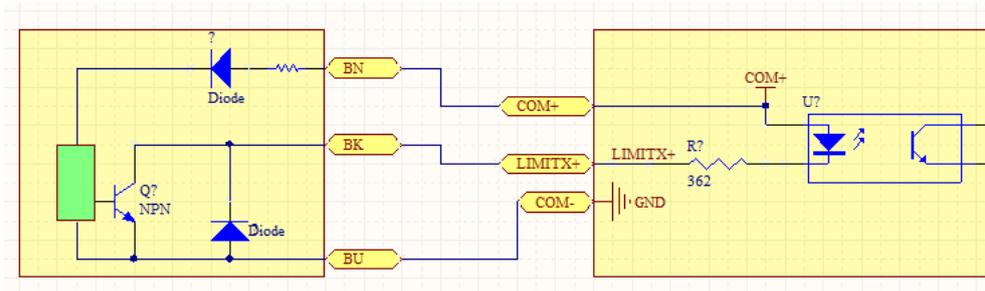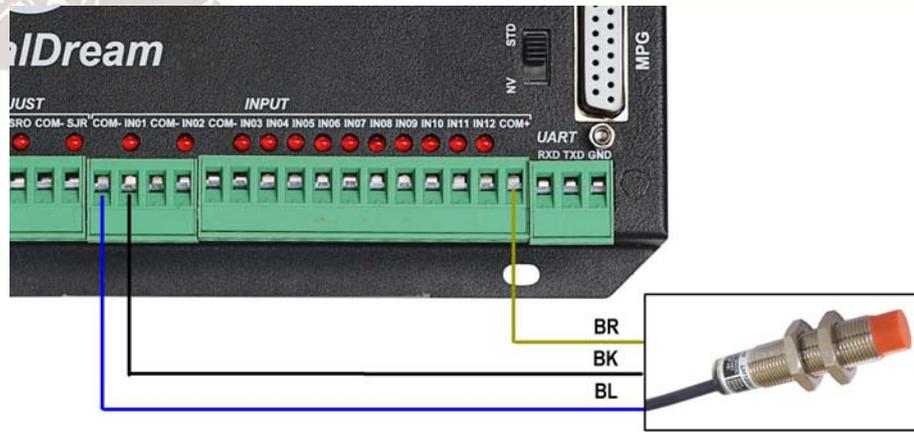
Figure2-4.   Wiring mode of 3-wire NPN proximity switch

2.2.5 Extended serial port

As shown in Figure 2-1, the position marked with 5 is the extended serial port position, and the position marked with RXD/TXD/GND is the serial port receiving/serial port sending/public ground respectively. The extended serial port can be used to extend the HMI coordinate display.

2.2.6   MPG Port

As shown in Figure 2-1, the position marked with 6 is the MPG interface. The MPG interface is a three row DB15 interface. The interface definition is printed on the cover. Now, the detailed definition of the interface is described as follows
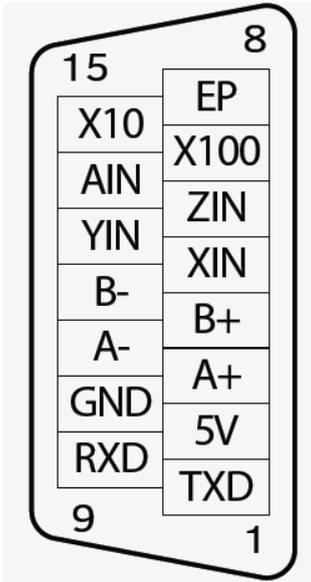
Figure2-5.   sequence of MPG port

No.	Mark	definition
1	TX/BIN	Serial port sending pin / B axis select pin
2	5V	5V power pin
3	A+	encoder A+
4	B+	encoder B+
5	X	X axis select pin
6	Z	Z axis select pin
7	100	X100 rate select pin
8	EP	Estop
9	RX/CIN	Serial port receiving pin/ C axis select pin
10	0V	COM ground
11	A-	encoder A-
12	B-	encoder B-

13	Y	Y axis select pin
14	A	A axis select pin
15	10	X10 rate select pin

Table 2-2. MPG interface define

Note: When the level switch next to the MPG interface is selected to STD, it means that the MPG is connected to the universal MPG. At this time, PIN1 and PIN9 are the B channel selection and C channel selection functions respectively. When the level switch is selected to NV, it means that the MPG interface is connected to the NVMPG serial port hand pulse. At this time, PIN1 and PIN9 are the serial port communication TXD/RXD functions respectively.

2.2.7 Universal output port

As shown in Fig. 2-1, the DB9 interface marked with 7 is a universal output interface. The housing silk screen is marked OUTPUT, and the specific definition is shown in Figure 2-6. In addition, there is an indicator on the right side of the universal output interface, and each channel corresponds to one indicator. When the output is connected, the corresponding indicator is on.
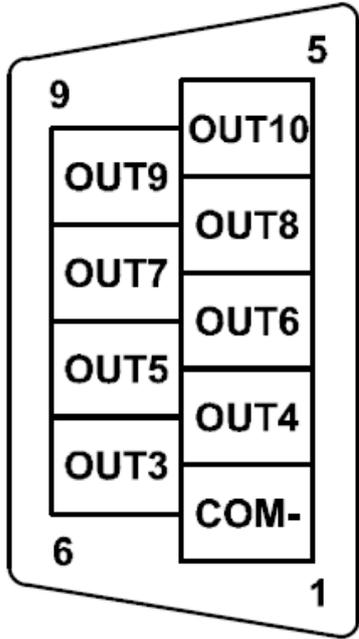
Figure2-6.   sequence of OUTPUT port

2.2.8 stepper motor port

As shown in Figure 2-1, the ports marked 8/9/10/11/12/13 are stepper motor control interfaces, which respectively correspond to XYZABC axis stepper motor control signals. EC300 has a total of 4 3/4/5/6 axis products, which share a set of hardware and are limited to 3/4/5/6 axis only in software. Each axis is a 4PIN terminal, and the maximum output frequency of each channel is 300K. EC300 only supports stepping motor driver with differential input signal. Refer to Table 2-3 for the definition of stepping motor interface

No.	Mark	definition
XP+	X	X axis pulse signal+
XP-	X	X axis pulse signal-
XD+	X	X axis direction signal+
XD-	X	X axis direction signal-
YP+	Y	Y axis pulse signal+
YP-	Y	Y axis pulse signal-
YD+	Y	Y axis direction signal+
YD-	Y	Y axis direction signal-
ZP+	Z	Z axis pulse signal+
ZP-	Z	Z axis pulse signal-
ZD+	Z	Z axis direction signal+
ZD-	Z	Z axis direction signal-
AP+	A	A axis pulse signal+
AP-	A	A axis pulse signal-
AD+	A	A axis direction signal+

AD-	A	A axis direction signal-
BP+	B	B axis pulse signal+
BP-	B	B axis pulse signal-
BD+	B	B axis direction signal+
BD-	B	B axis direction signal-
CP+	C	C axis pulse signal+
CP-	C	C axis pulse signal-
CD+	C	C axis direction signal+
CD-	C	C axis direction signal-

Table 2-3. Stepper driver interface define

2.2.9 Spindle Port

As shown in Figure 2-2, the port marked with 14 is the spindle control interface. The definition of spindle control connection is shown in Table 2-3 .

MARK	definition
GNDS	Spindle common -, shared ACM/DCM
VSO	Spindle speed regulation output, regulating range 0-10V
OT1	Universal output 1, which can be configured as spindle forward rotation
OT2	Universal output 2, which can be configured for spindle inversion
INDEX	Spindle speed feedback signal, one pulse per cycle

Table 2-4. Detailed Description Spindle Interface

OT1 can be used to control the starting and stopping of the spindle forward rotation, OT2 can

control the starting and stopping of the spindle reverse rotation, and VSO can be used to control the

spindle speed. The configuration of the spindle will be described in detail in the following chapters.

For the connection method between the spindle control interface and the frequency converter, refer

to Figure 2-7. GNDS connects the frequency converter ACM/DCM, OT1 connects the frequency

converter FWD, OT2 connects the frequency converter REV, and VSO connects the frequency

converter AVI. INDEX can be connected to ordinary NPN type 2-wire Hall switch. Refer to Figure

2-7 for connection mode of EC300 and frequency converter
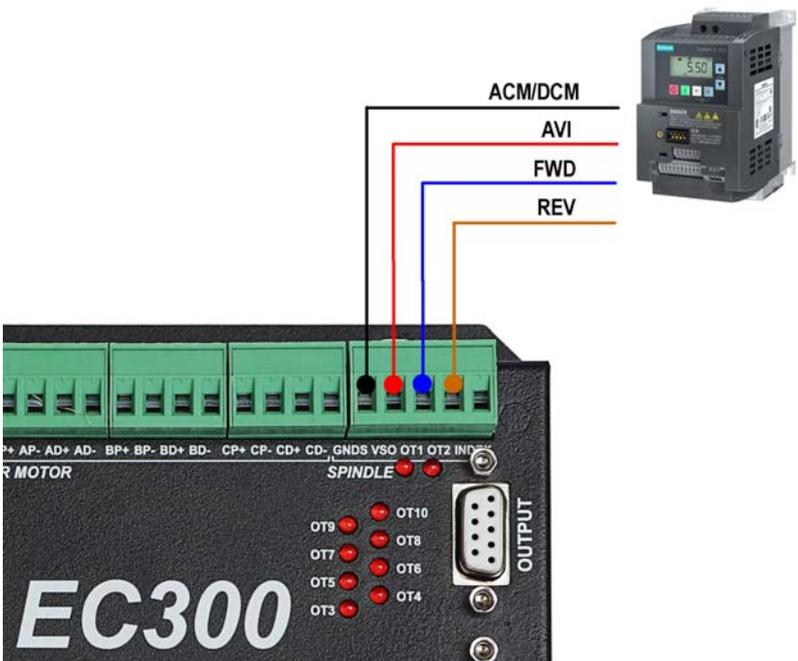
Figure2-7.   Connection between EC300V5 and inverter

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

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Mach1Lic.dat   Mach3Version3.   readme first.txt
                      043.066.exe
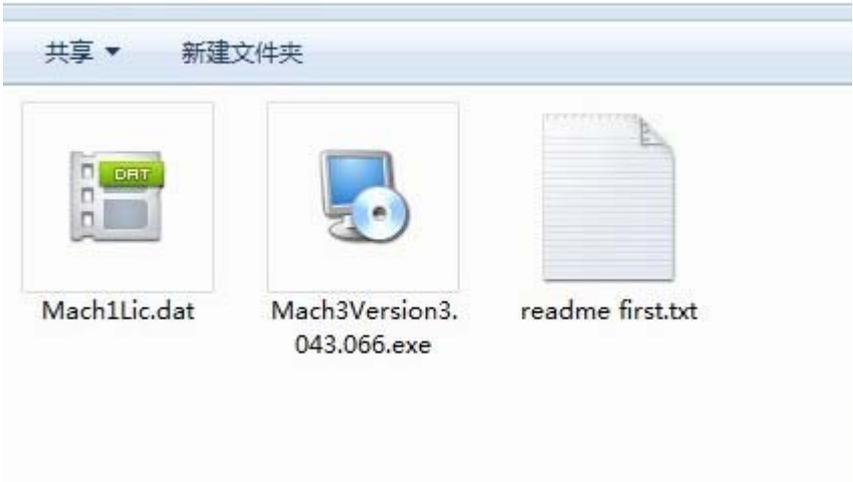
Figure3-1.   MACH3 soft installation

First run the installation Mach3Version3.043.066 .Into the first

page. See as Figure 3-2.
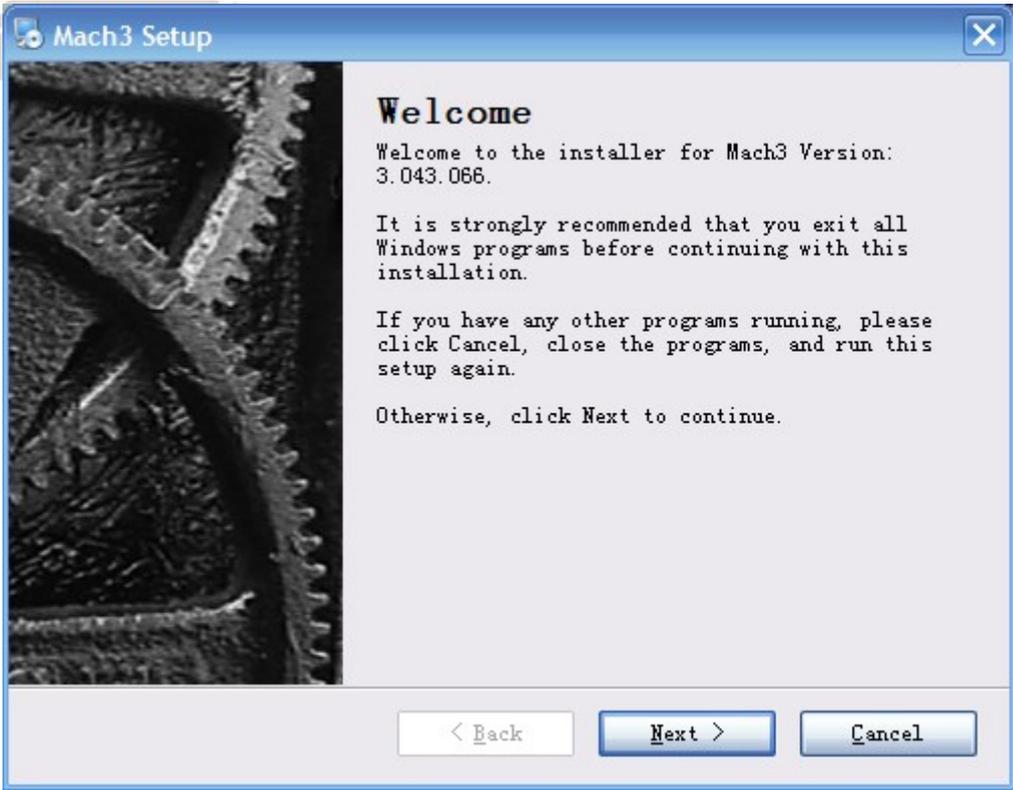
Figure3-2.   MACH3 installation process 1

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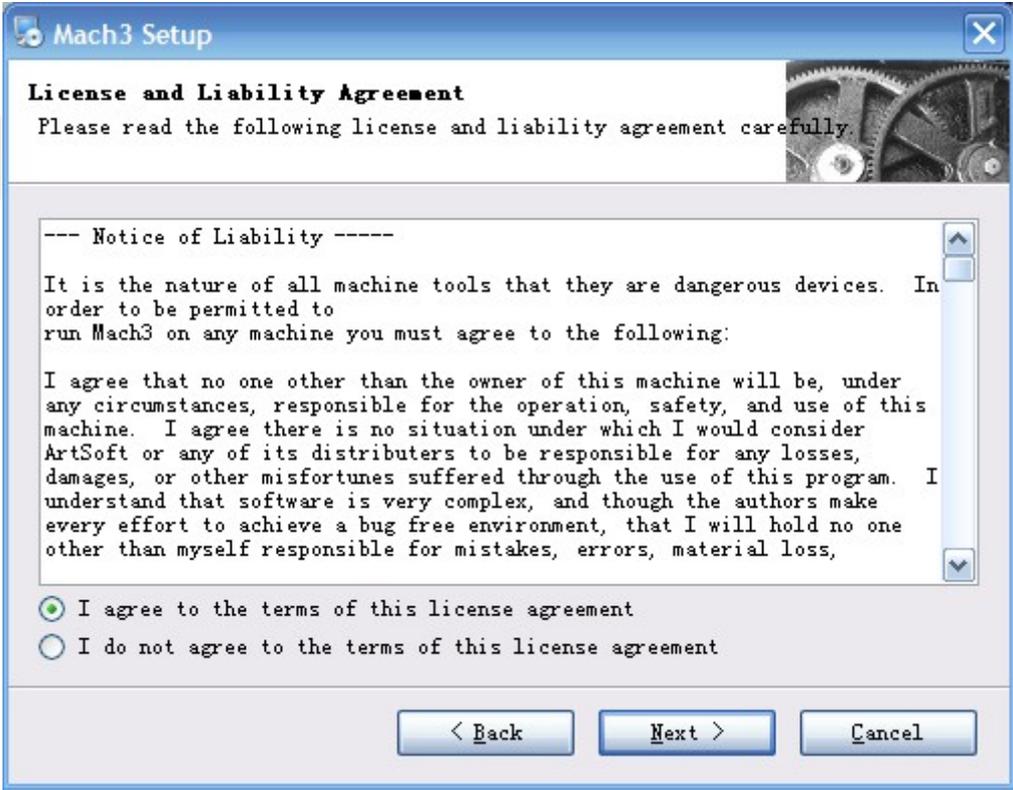
Figure3-3.   installation process 2

Select I agree and click Next，See as Figure 3-4.
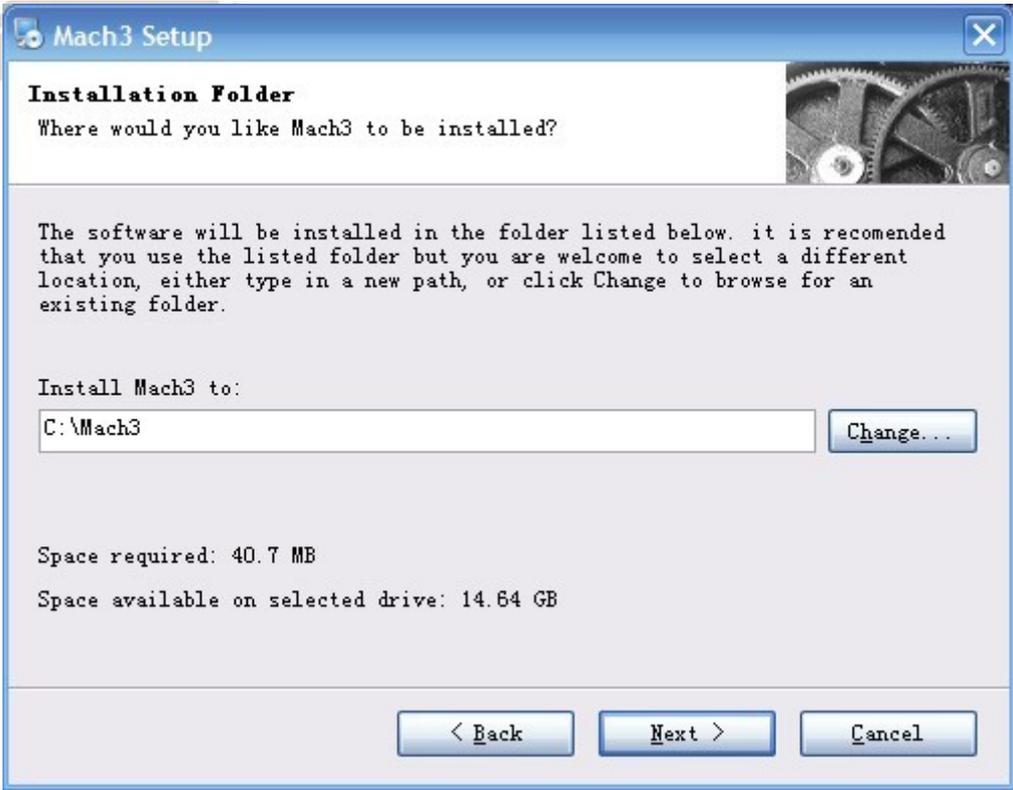
Figure3-4.   MACH3 installation process 3

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
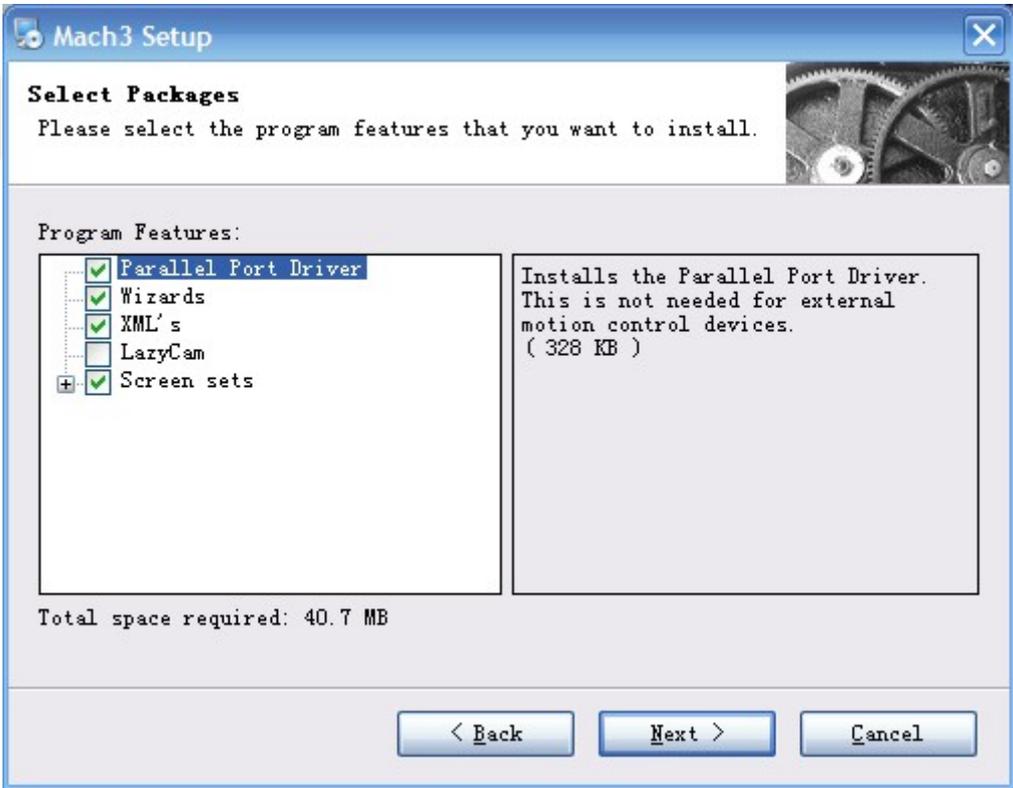
Figure3-5.   MACH3 installation process 4

Click Next until completion. Then restart the computer.

3.2   EC300V5 Plug-in installation

DIGITALDREAM
_20220920.dll

Copy the file DIGITALDREAM.dll   to X:\Mach3\PlugIns，X is the disk

where the soft is installed.

3.3 IP Setting

EC300V5 supports fixed IP and router connection. Under fixed IP, please set the local IP

to 192.168.4. X (X=7~254) and turn off the firewall

In router mode, please set the address of the router to 192.168.4.1

Chapter 4. | Setting of software

4.1 Open software

Double-click the mach3mill 。

Enter mach3 software. Pop-up the plug-in dialog box. See as Figure 4-1.

Figure4-1.   Plugin selection dialog

Choose our plugin DIGITALDREAM。 Then press OK. If you do not want to the dialog box

appear again next time, you can select Don't ask me this again .If the connection is successful, the

connection indicator light (blue light) will be on. On the plugin page, you can see the connection

device (config ->config plugins ->DIGITALDREAM_CONFIG). See as Figure4-2.
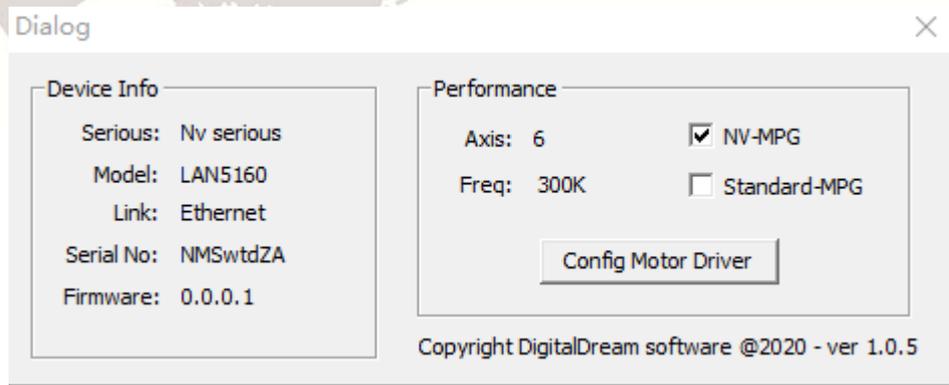
Figure4-2.   connect successfully

4.2 Software Common settings

4.2.1 Check EC300V5 plugin

Click config plugins to input PluginConfig,you can seeEC300V5. See as Figure4-4.
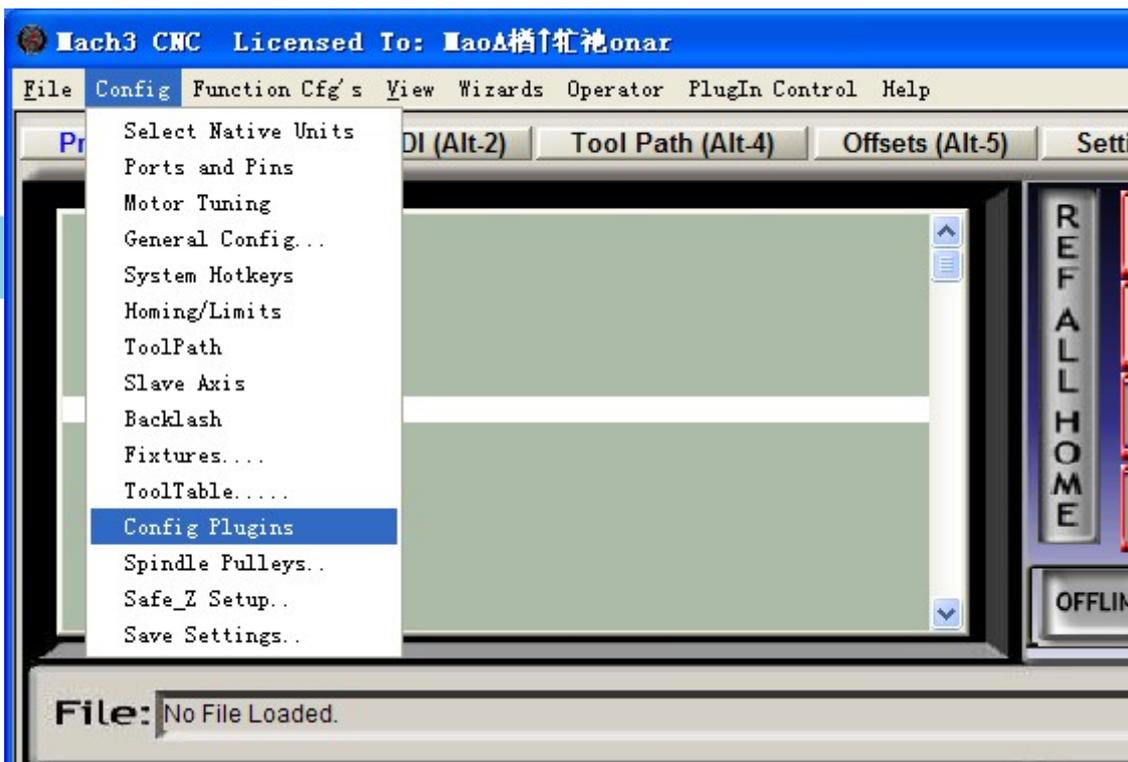
Figure4-3.   Input Config plugins
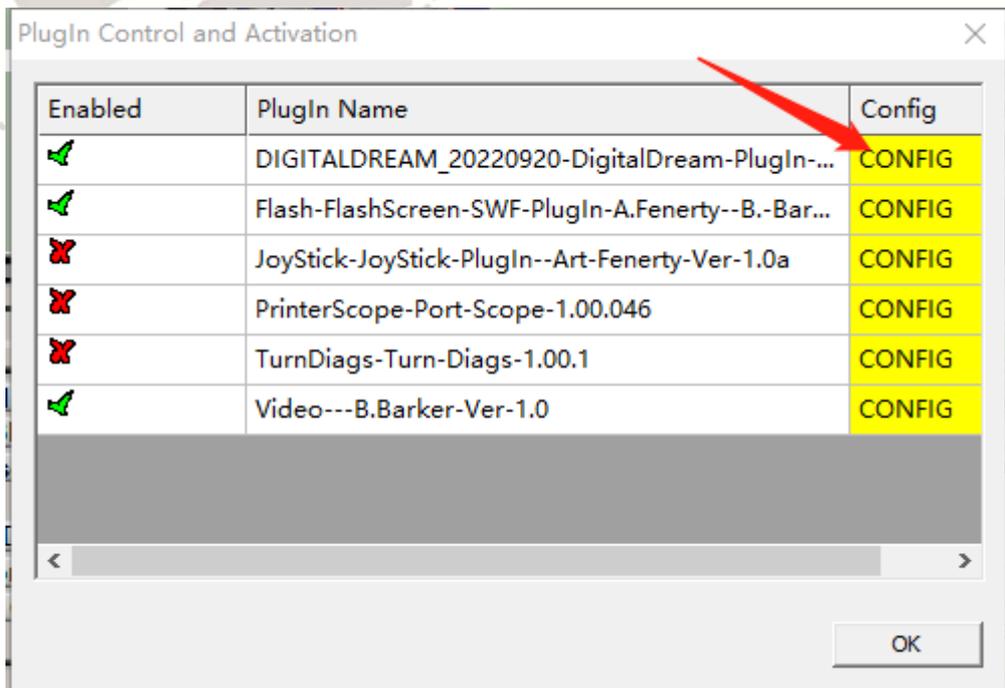
Figure4-4.   LAN5160   Plugin

4.2.2 Motor operating parameters setting
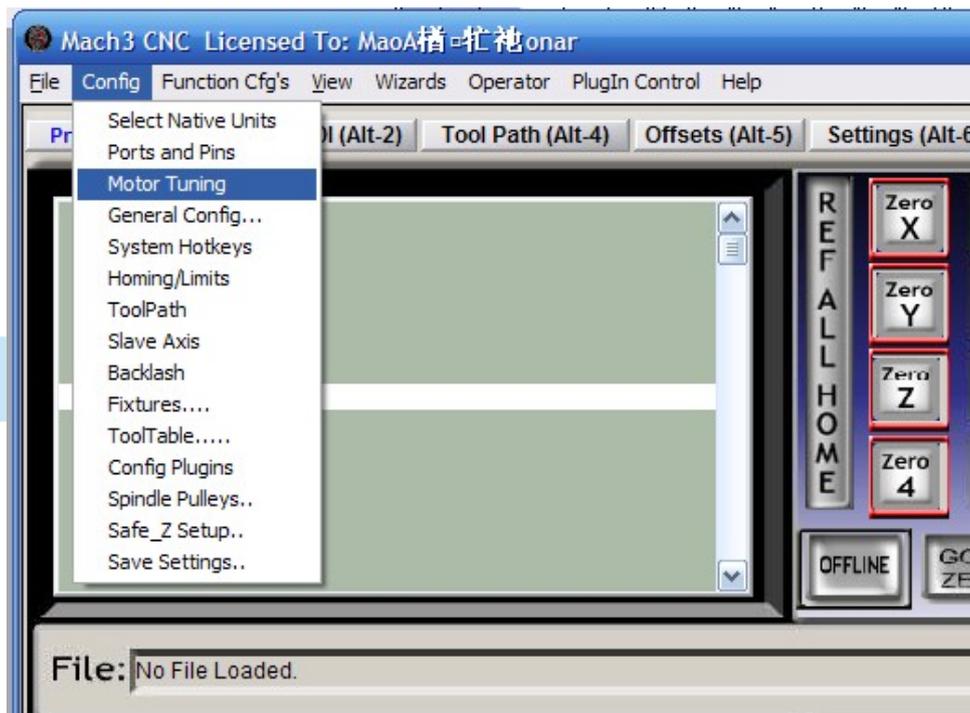
Figure4-5.   Motor operating parameter setting menu entry

See as Figure 4-5.From submenu "motor tuning" of the menu "config" into the motor

parameter settings dialog. See as Figure 4-6
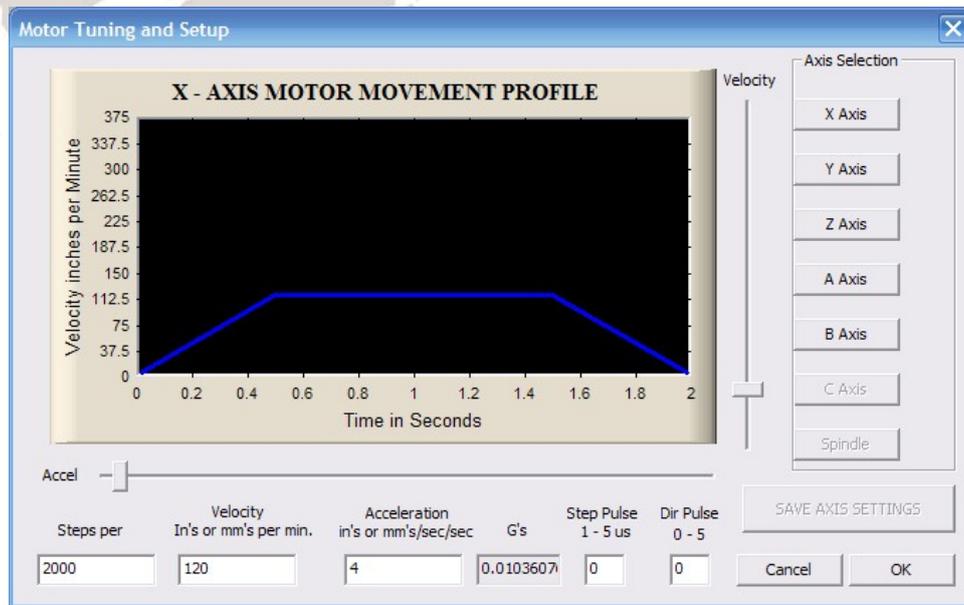
Figure4-6.   Motor operating parameter settings dialog

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
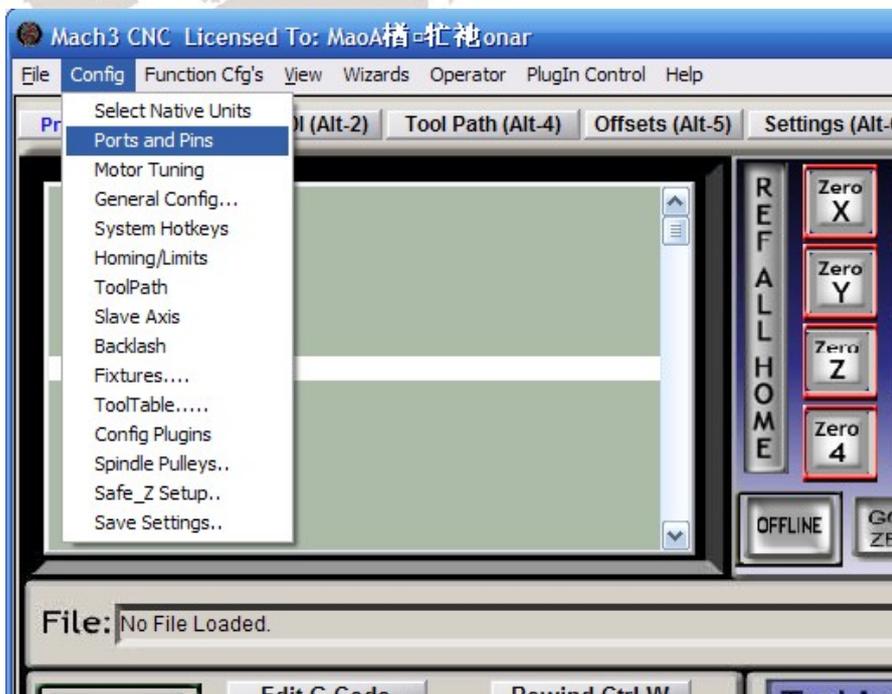
Figure4-7.　Port setting intry

See as Figure 4-7，Click the sub-menu "ports and pins" of menu "Config" into Port Settings

dialog box.
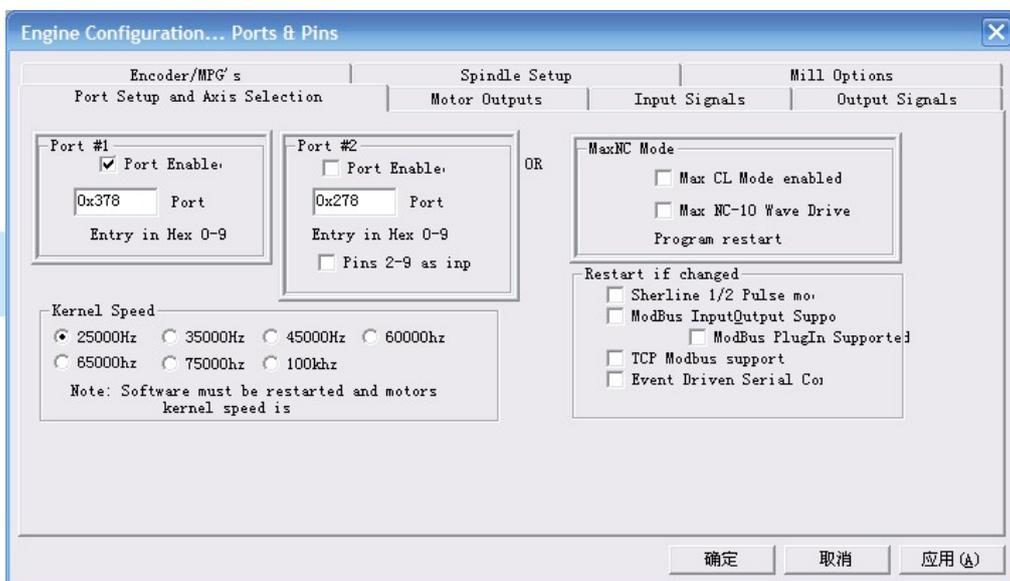
Figure4-8.　Pin&Port Dialog

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. See as Figure4-9. You only need to check Enabled is √ here.

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.
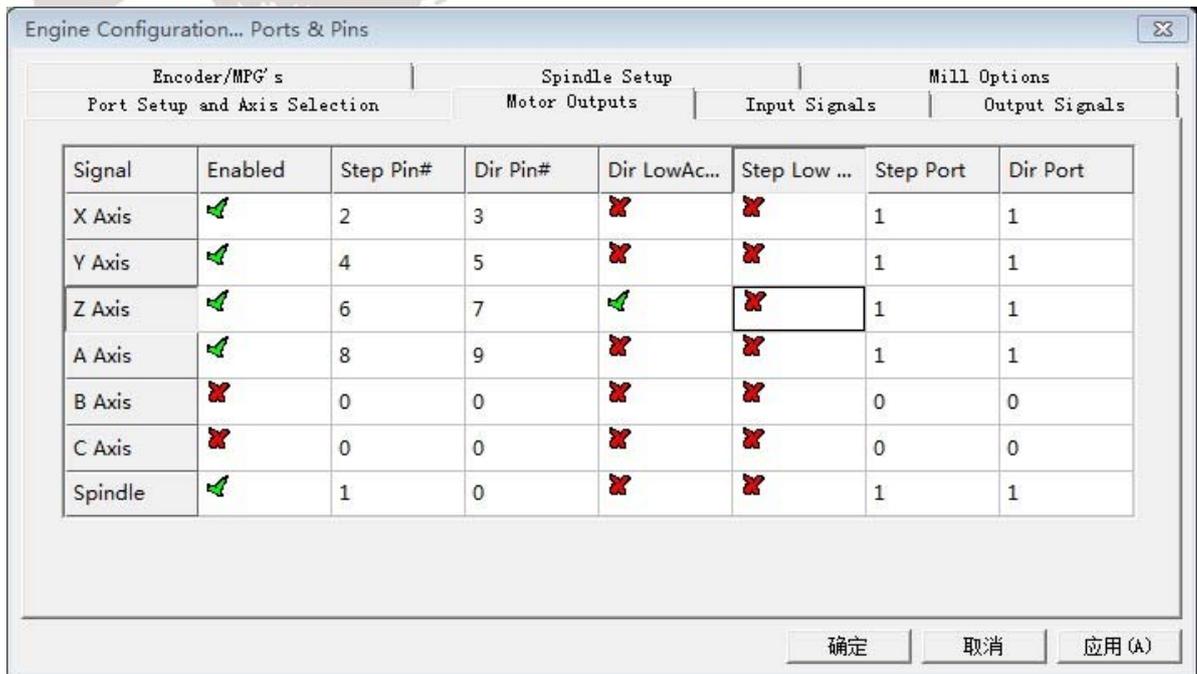
Figure4-9.   Stepper motor port settings dialog

Click Input Signals to enter the input signal setting page. We assume IN1 as the emergency

stop, IN2 as tool setting, and IN3-IN6 as the positive limit and origin of XYZA axis, as shown in

Figure 4-10.
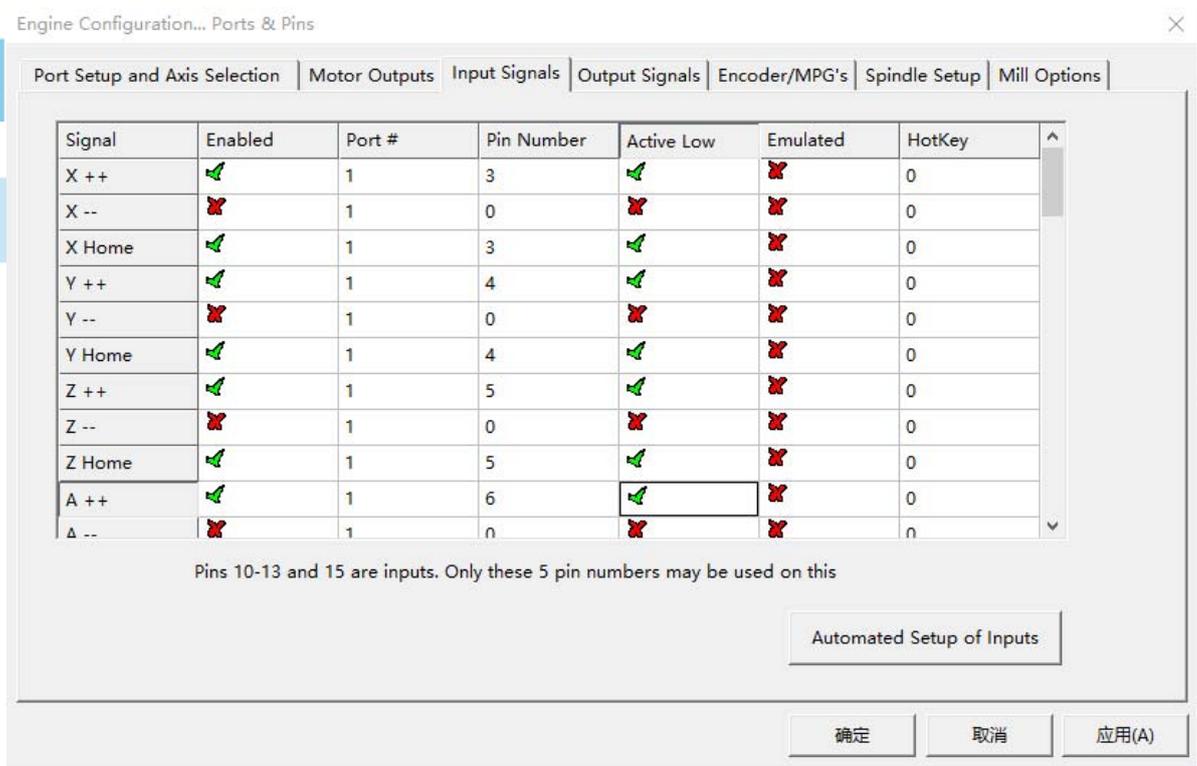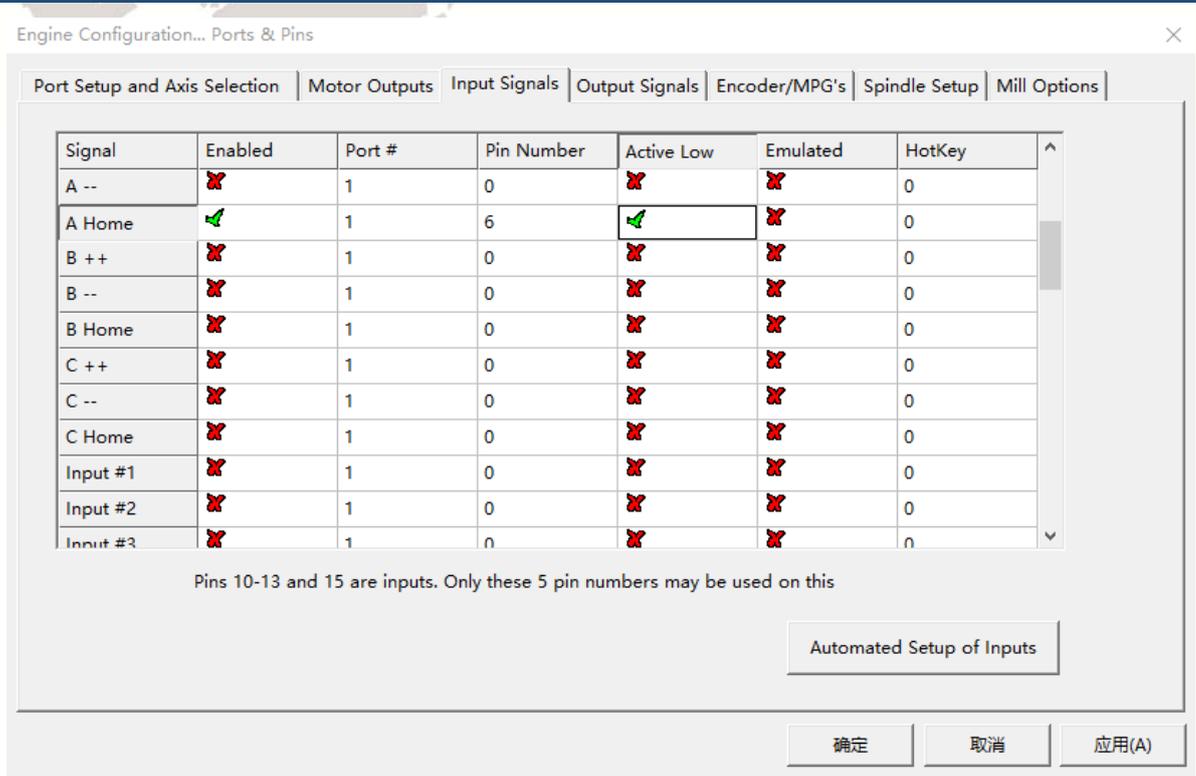
Figure4-10.   Input Settings dialog
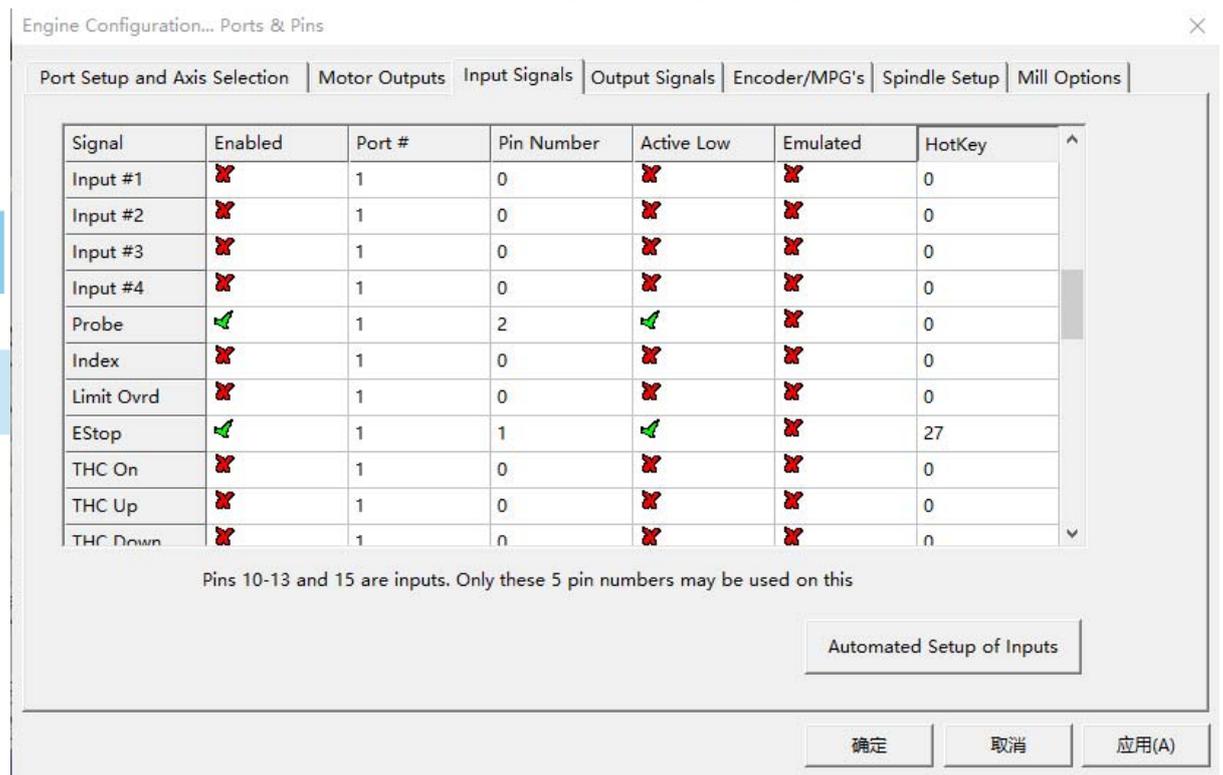
Figure4-11.   Estop Probe and index Setting dialog

PROBE、ESTOP and Spindle speed back index Setting see as Figure 4-11，

Click "Spindle Setup" switch to the spindle settings page. See as Figure4-12.
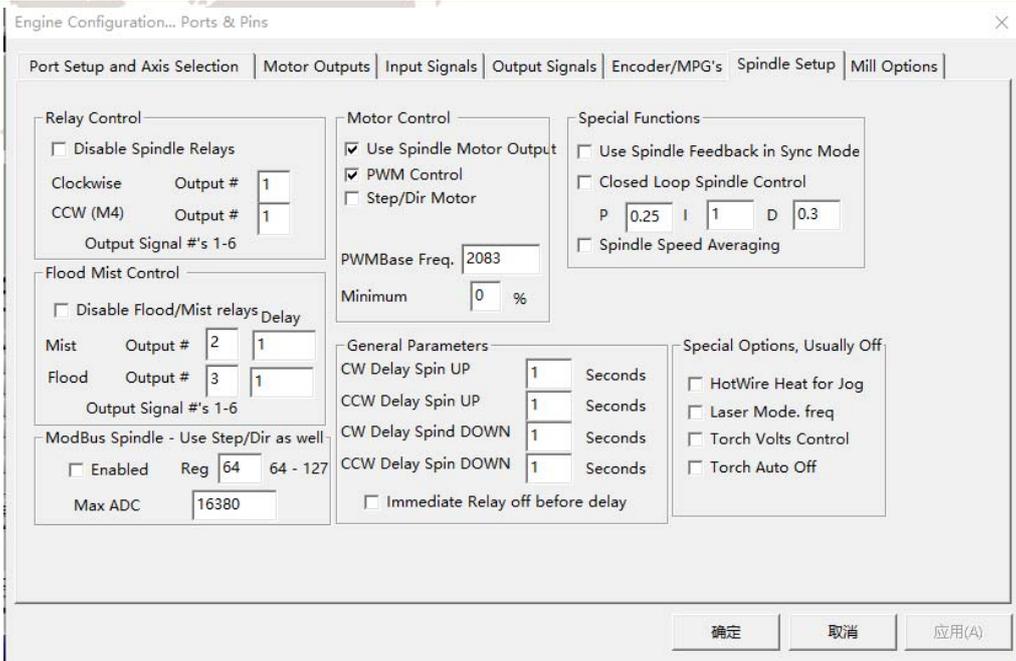
Figure4-12.   Spindle Settings dialog

Here we can configure the spindle rotates CW、Reverse CCW、Mist、Flood pin, See as Figure4-13，They have been configured as 1、2、3、4. Corresponding to output#1~output#4 in Figure4-14.output#1~output#6 in Output Signal Setup dialog can be Configured into these 4 signals. Here we only configure CW \MIST\FLOOD. They are M3\M7 and M8 in G-code file. CW is controlled by OUT1 and MIST is controlled by OUT2 and 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 on stepper motor config page see as figure 4-9.
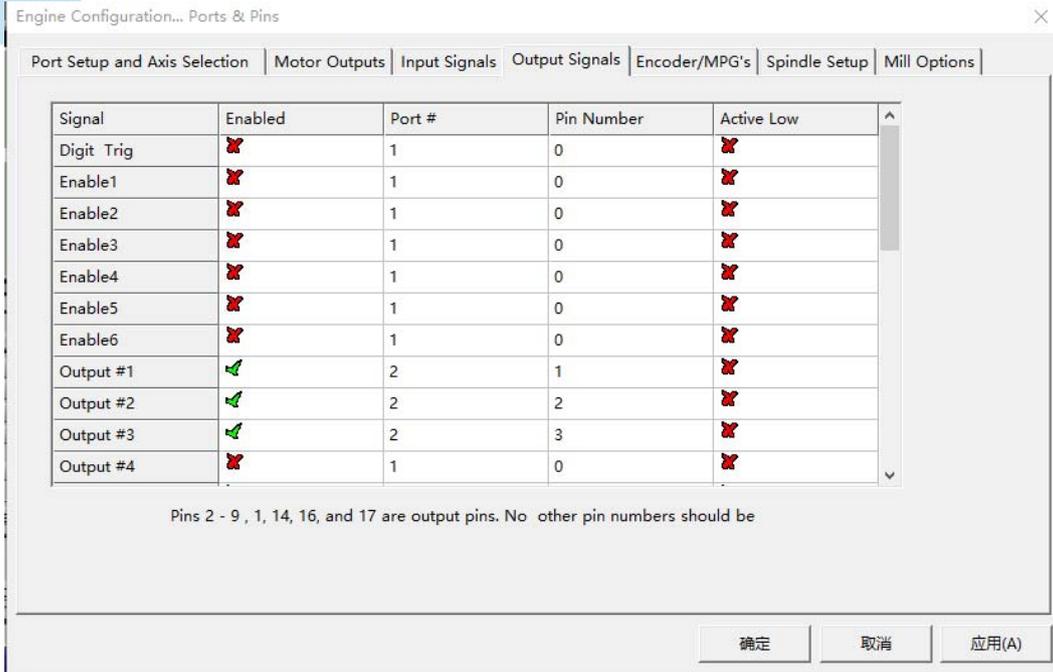
Figure4-13. Spindle setting corresponds to the output configuration

4.2.4 MPG Setting

Open the plug-in page. Path Config ->Config plugin ->DIGITALDREAM_ CONFIG
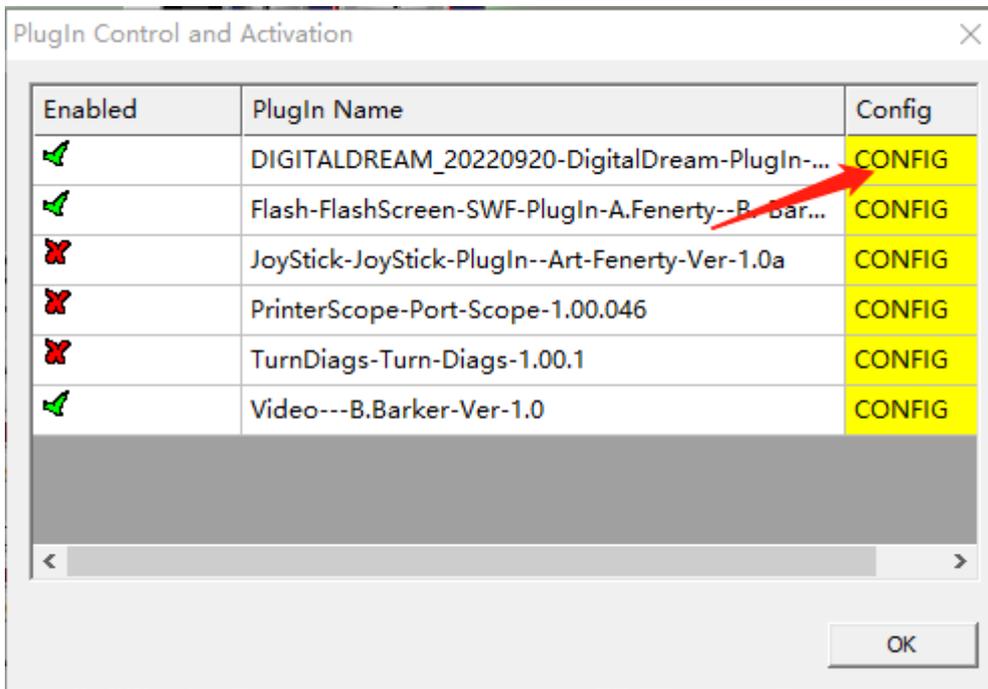
Figure4-14. Open the plug-in page

On the plug-in page, you can select the serial port MPG and the standard MPG.. NV-MPG is the serial port MPG of our company, and Standard MPG is the standard MPG..
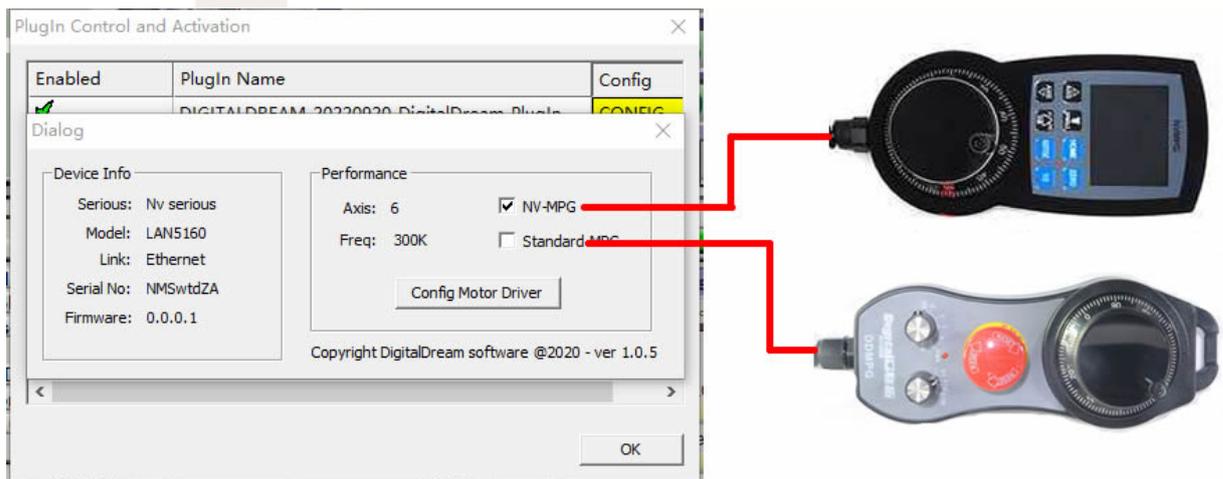
Figure4-15. Select MPG Type

Check the MPG on the MPG configuration page. The path is Port&Pins ->Encoder/MPG's, as shown in Figure 4-19. After configuration, close the window to use the MPG normally

Signal	Enabled	A -Port #	A -Pin #	B -Port #	B -Pin #	Counts/Unit	Velocity
Encoder1	✖	0	0	0	0	1.000000	100.000000
Encoder2	✖	0	0	0	0	1.000000	100.000000
Encoder3	✖	0	0	0	0	1.000000	100.000000
Encoder4	✖	0	0	0	0	1.000000	100.000000
MPG #1	✔	0	0	0	0	1.000000	100.000000
MPG #2	✖	0	0	0	0	1.000000	100.000000
MPG #3	✖	0	0	0	0	1.000000	100.000000

Tabs: Port Setup and Axis Selection | Motor Outputs | Input Signals | Output Signals | Encoder/MPG's | Spindle Setup | Mill Options

Figure4-16. Check MPG

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.
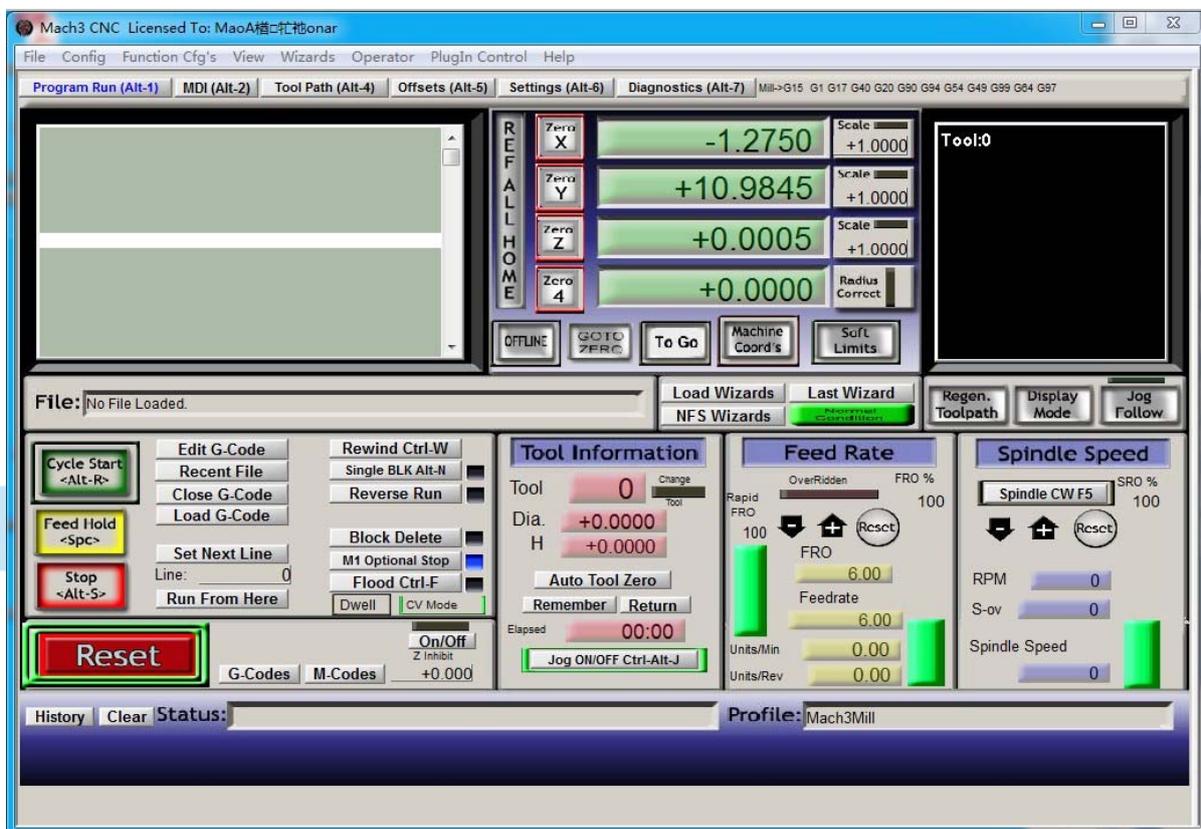
Figure5-1.   Main Screen of mach3

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.
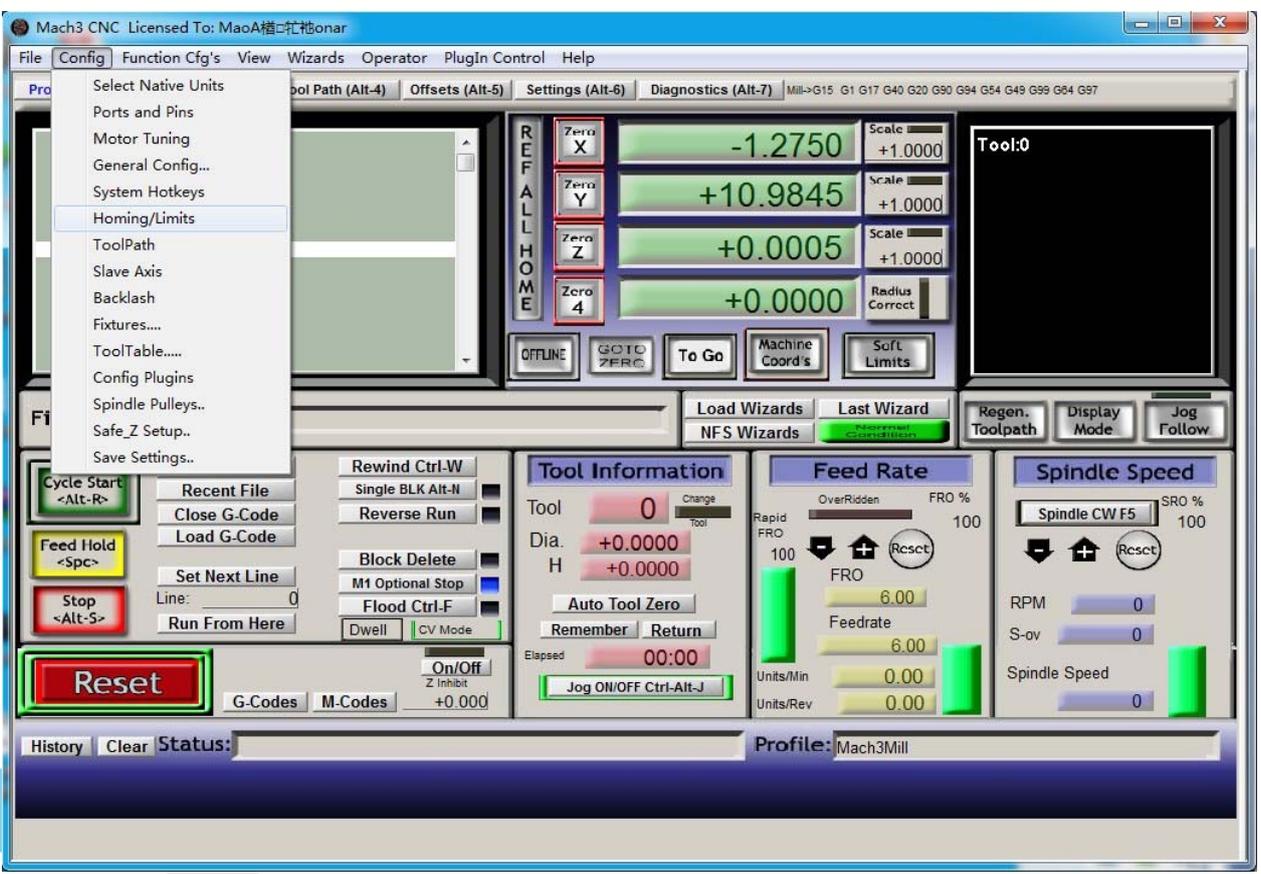
Figure5-2.　　Click homing of Config

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
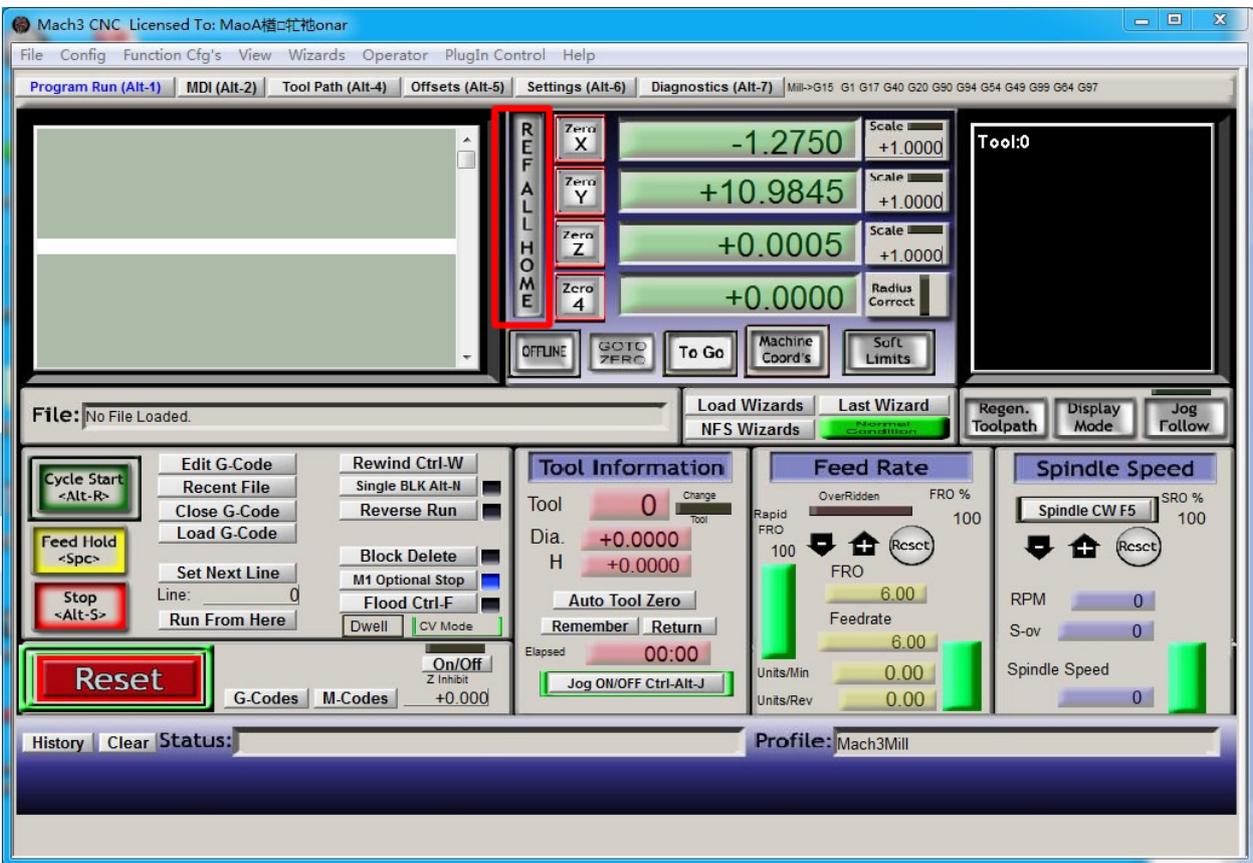
<p align="center">Figure5-4.   Click REF ALL HOME to HOME all axis</p>

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.
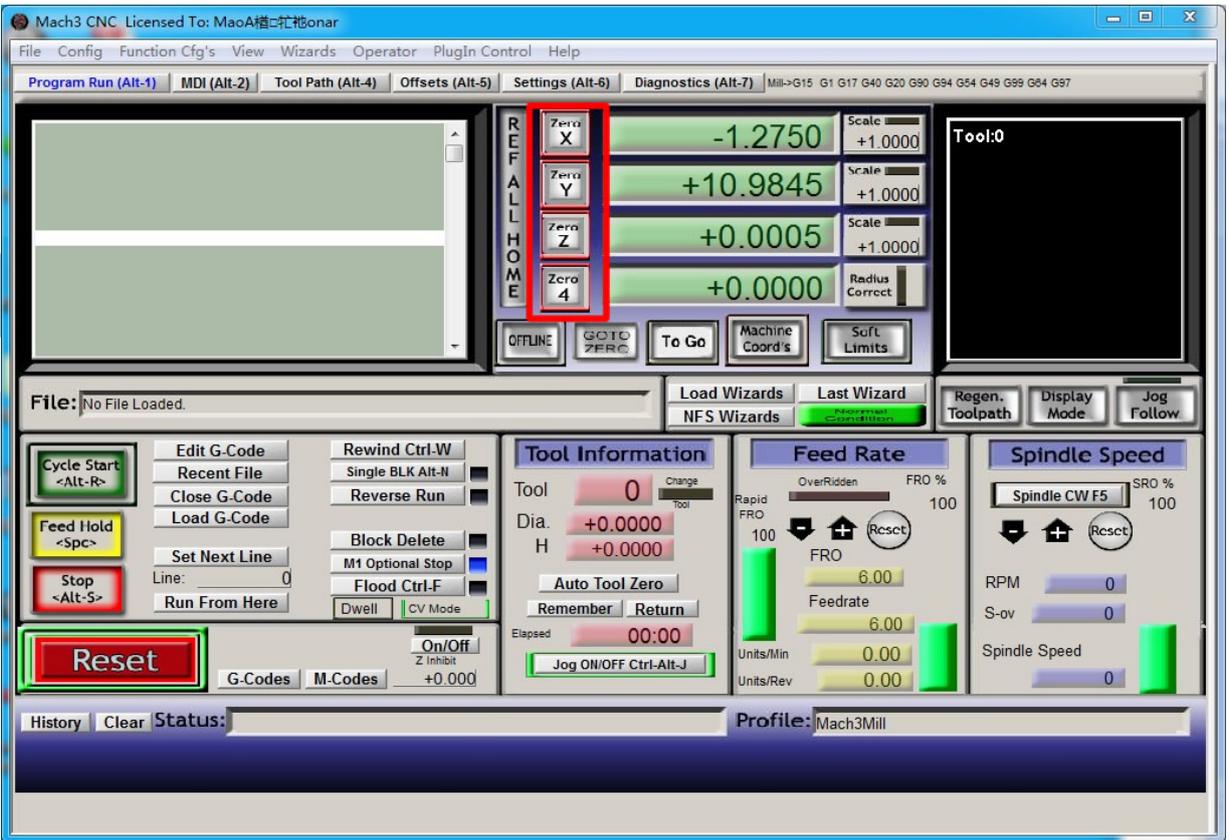
Figure5-5.　　Press Zero on each axis,all clear to 0
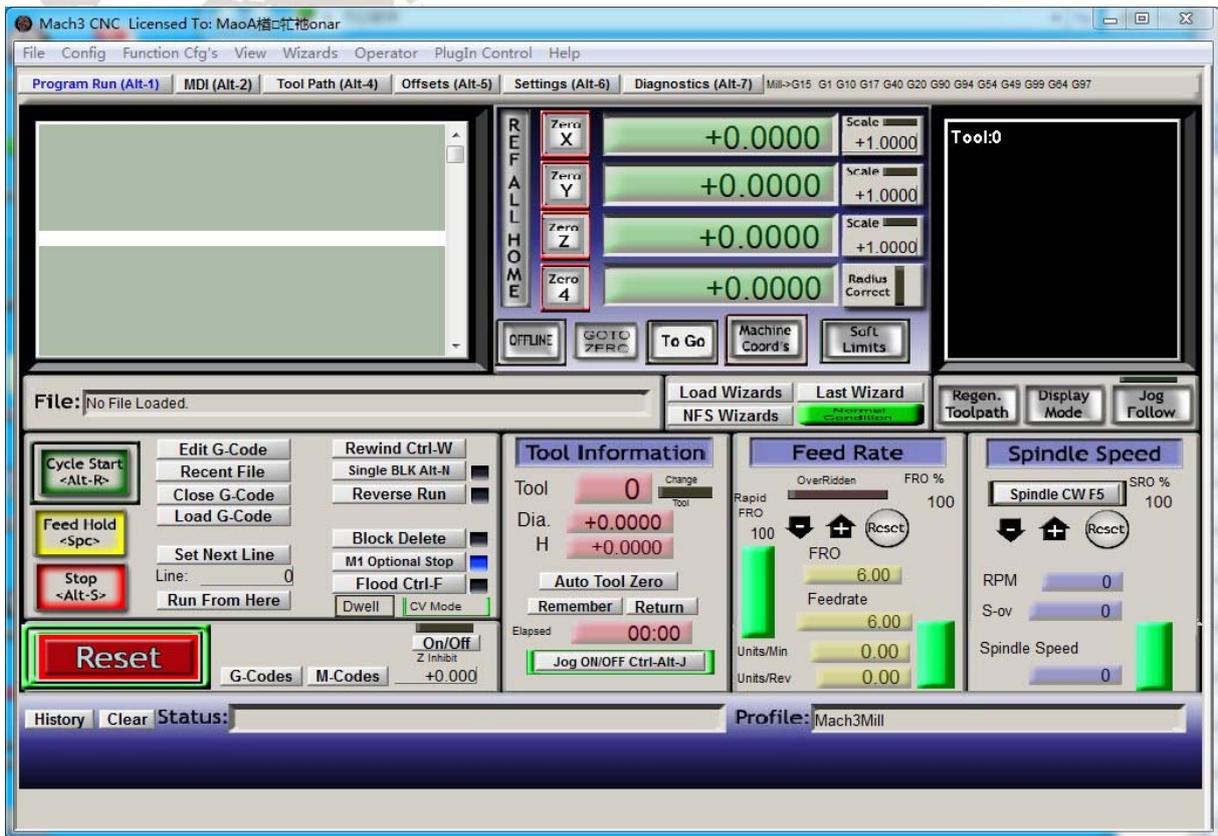
Figure5-6.   Main Screen after ZERO all axis

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.

Chapter7 Contract us
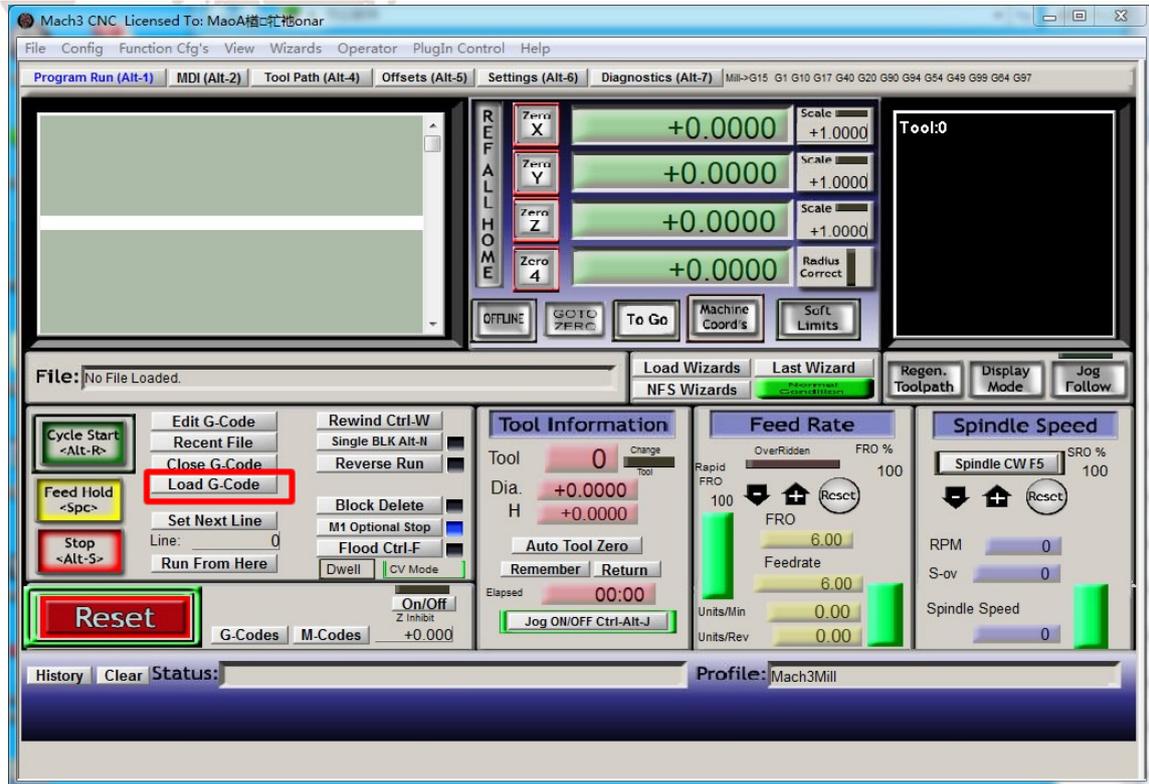
Figure5-7.　　Press Load G-Code and open your G code
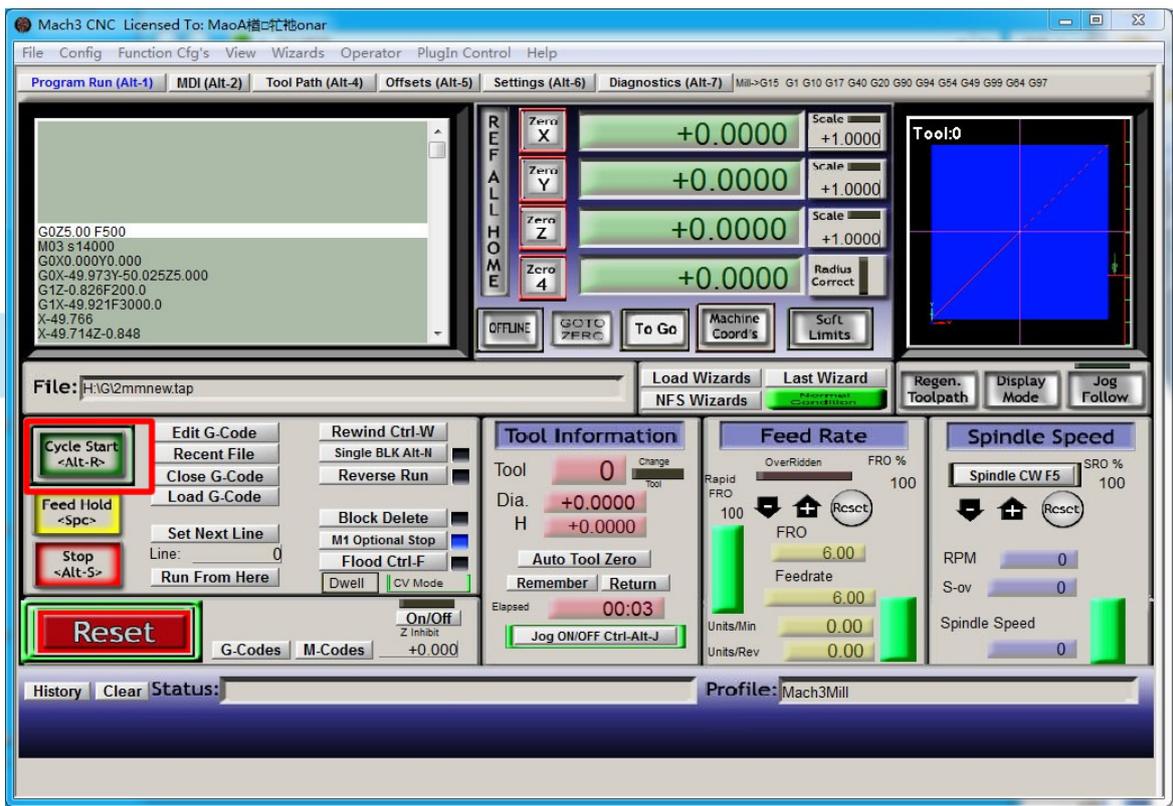
Figure5-8.　　After opening G code,press "Cycle Start" and start to work