

FounderTop CNC Machine User's Manual

FOR MODELS: FD1212G, FD1224G, FD1530G, FD2030G

WITHOUT ATC

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Content

Important Safety Instructions	2
CNC system elements	3
CNC Router Architecture	4
Inverter of spindle	5
CNC Controller:	6
Electric Wiring	8
Parallel Port 1 [<i>Label: LPT1:</i>].....	8
Parallel Porter 2 [<i>Label: LPT2:</i>].....	12
MACH2 OEM Switch [<i>Label: OEM key 1~5</i>]	15
Emergency Stop [<i>Label: E-Stop</i>]	16
Emergency Stop/DC12v [<i>Label: E-Stop/DC12v</i>]	16
Limit and Home signals: [<i>Label: X,Y,Z' Limit/Home</i>].....	17
Spindle Control Signal: [<i>Label: Spindle</i>]	17
Cooling Equipment Control Signal: [<i>Label: Relay</i>].....	18
Motor [<i>Label: X,Y,Z' Motor</i>].....	19
Shipping/moving and Installation	19
Ready to use	19
Checklist before Starting the CNC Application	20
CNC machine operation	20
Configure MACH2 (We already configure the parameter as default, user don't need input it when you use).....	20
CNC machine operation steps.....	30
Usage of the Z-axis height reference	31
Maintenance:	32
Routine maintenance:	32
Periodical maintenance.....	32
Other Maintenance Items.....	33

Important Safety Instructions

1. Do not disassemble, fix or modify the CNC Router.
2. Do not install the CNC Router near water or humidity area, to avoid rust and possible short circuit.
3. The CNC Router should be installed 1.2 meters away from walls or other big equipment.
4. Make sure all electric outlets have proper ground.
5. Do not use damaged power supply cord or plug, or when the plug is loose.
6. Please do not push or pull XY axes to avoid potential damage to the controller.
7. Turn all power off, including controller power, spindle power, cooling pump power and the dust collector power off when the CNC router is not used or when there is a power outage.
8. Always turn the Inverter of spindle power off before manual change the tool.
9. While the vacuum pump is running, do not open the vacuum valves that are not used to hold parts.
10. Check the spindle motors and the vacuum pump cooling system on a regular basis, to make sure there is sufficient cooling water.
11. The CNC controller requires AC 220V single phase power.
12. Spindle cooling pump requires AC 220V single phase power.
13. The power of spindle is option, with different power of spindle, the power supply of VFD may 220V single phase or 380V (or 460V) three phase. Please make sure your power supply is same as which indicated on the VFD before plug power supply.
14. Vacuum pump (option) and dust collector (options) require 220V AC single phase power.
15. When controller software Mach2 start, default tool status is T0, make sure there is no tool on spindle.
16. Make sure the router frame connect to earth well.

FD1212G



FD1224G

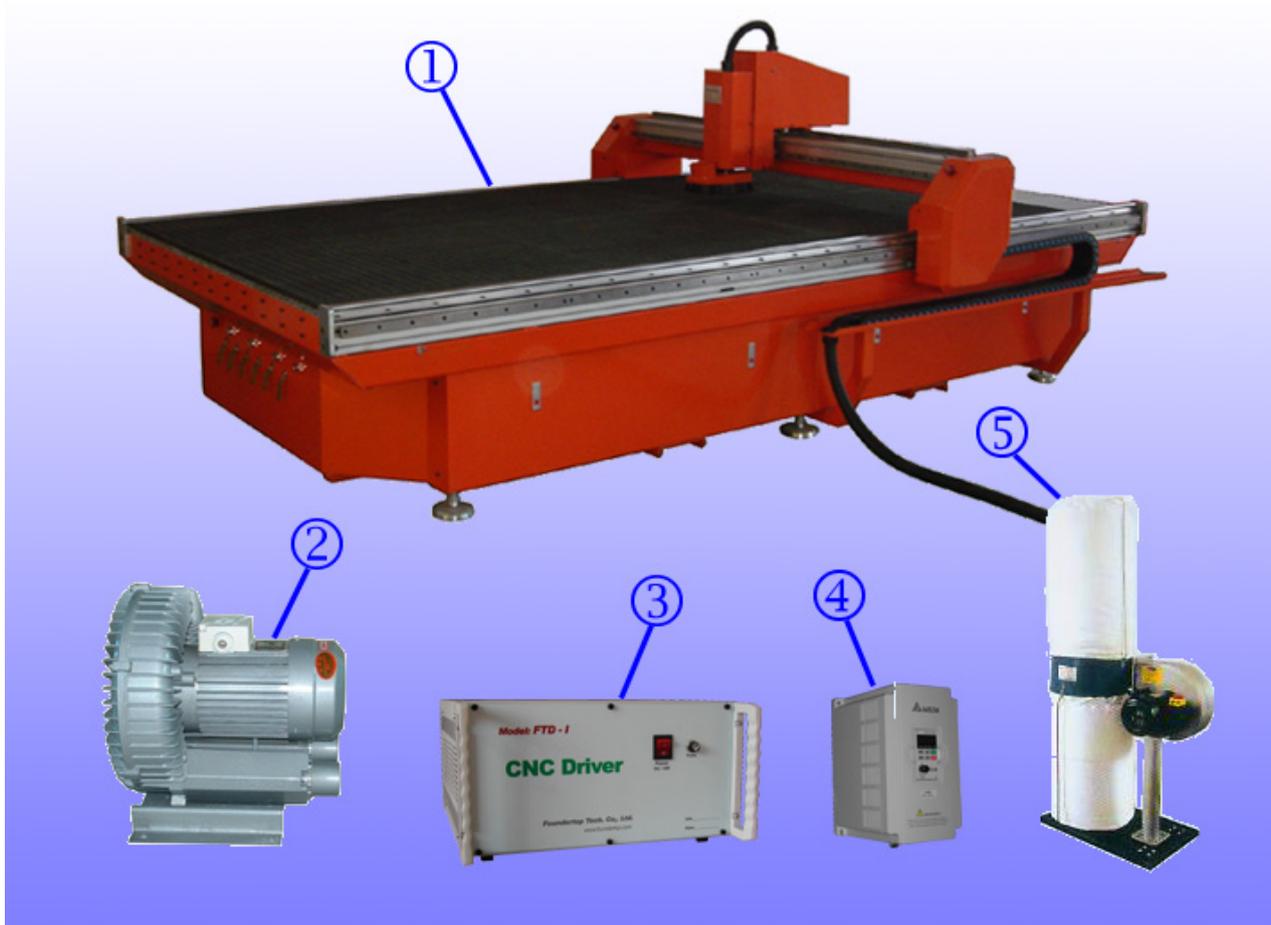


FD1530G



CNC system elements

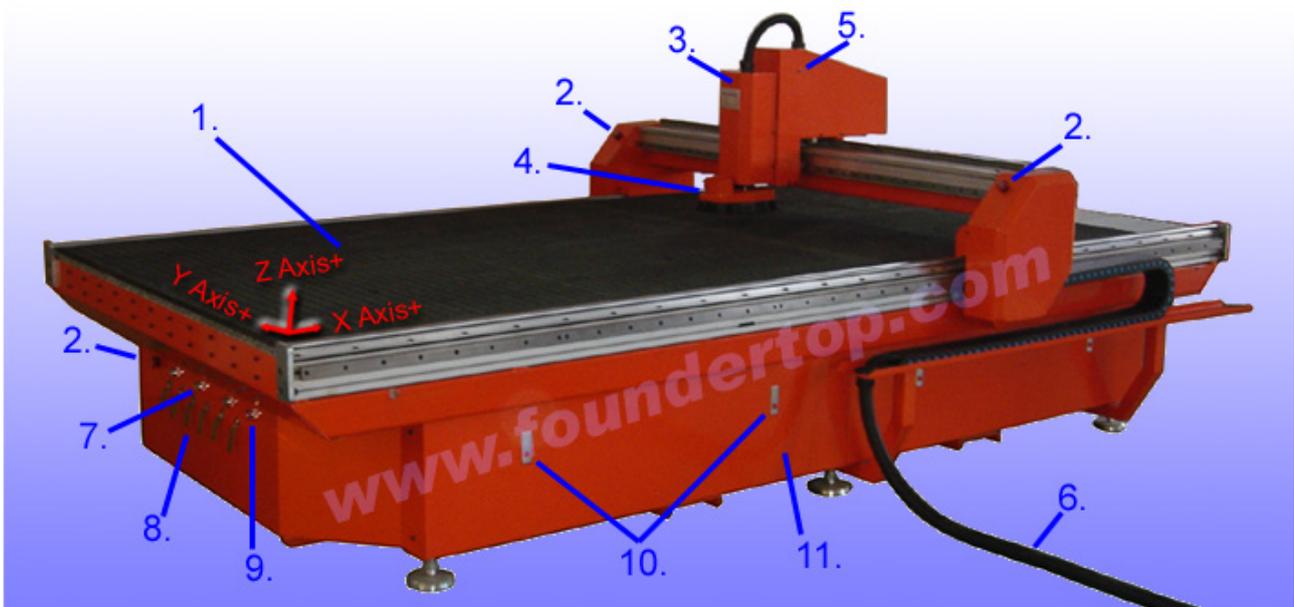
This figure shows the CNC system elements.



1.	Main CNC Router
2.	Vacuum table pump, power supply AC 220v single phase. 1 pump for FD1212; 2 pumps for FD1224G, 3 pumps for FD1530G and FD2030G. (option)
3.	CNC controller, power supply AC 220v single phase
4.	Inverter of spindle, power supply AC 220v single phase or AC 380v three phase. (it is option with spindle)
5.	Dust collector, power supply AC220v single phase. (option)

CNC Router Architecture

CNC Router architecture is below:



1.	CNC vacuum table															
2.	Emergency stop button. Push this button to stop all of the moving axis and spindle in case emergency situation or unexpected things happen. Turn clockwise will release the emergency.															
3.	Indoor is spindle is inside. The tool chuck of standard router is BT20. (it can be option).															
4.	Dust collector cover, it connect to the dust collector by bellows to take the cutting dust away.															
5.	"Z" height reference plate.															
6.	CNC cable to controller and power supply Cable list:															
	<table border="1"> <thead> <tr> <th>CONNECTOR TYPE</th> <th>Quantity</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>RS765</td> <td>5</td> <td>X-axis limited and home switch; Y-axis limited and home switch; Z-axis limited and home switch; Emergency stop switch. DC12v</td> </tr> <tr> <td>GX-16</td> <td>3</td> <td>X-axis stepper motor; Y-axis stepper motor; Z-axis stepper motor.</td> </tr> <tr> <td>3pins power plug</td> <td>1</td> <td>Power cord for spindle cooling water pump and vacuum pump power supply (AC 220V single phase)</td> </tr> <tr> <td>Y type contact</td> <td>1</td> <td>Spindle power supply (three colored wires with black cover).</td> </tr> </tbody> </table>	CONNECTOR TYPE	Quantity	Description	RS765	5	X-axis limited and home switch; Y-axis limited and home switch; Z-axis limited and home switch; Emergency stop switch. DC12v	GX-16	3	X-axis stepper motor; Y-axis stepper motor; Z-axis stepper motor.	3pins power plug	1	Power cord for spindle cooling water pump and vacuum pump power supply (AC 220V single phase)	Y type contact	1	Spindle power supply (three colored wires with black cover).
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Y type contact	1	Spindle power supply (three colored wires with black cover).														
7.	Switch for vacuum table pump (AC 220V single phase)															
8.	Valves to control different working area of vacuum table															
9.	Switch for spindle cooling pump (AC 220V single phase)															
10.	Locker of the cover. You can move the cover by push the locker.															
11.	Indoor is the water cooling pump and water container. Should be filled with enough cooling water when first use. And make sure it has enough liquid when you use the router every time.															

Inverter of spindle (VFD)

Inverter of spindle is shown below. Power supply of it is AC380v 3 phases.



Wire connection of the inverter is as below. You need move the cover of the inverter when you wiring.



1.	Inverter power supply. Power of inverter is AC380V 3 phase.
2.	RS485 interface. Another port connect with the RS485 of CNC controller
3.	Cord to spindle. Please follow the order of wires color when you connecting.
4.	Spindle ground wire (yellow)

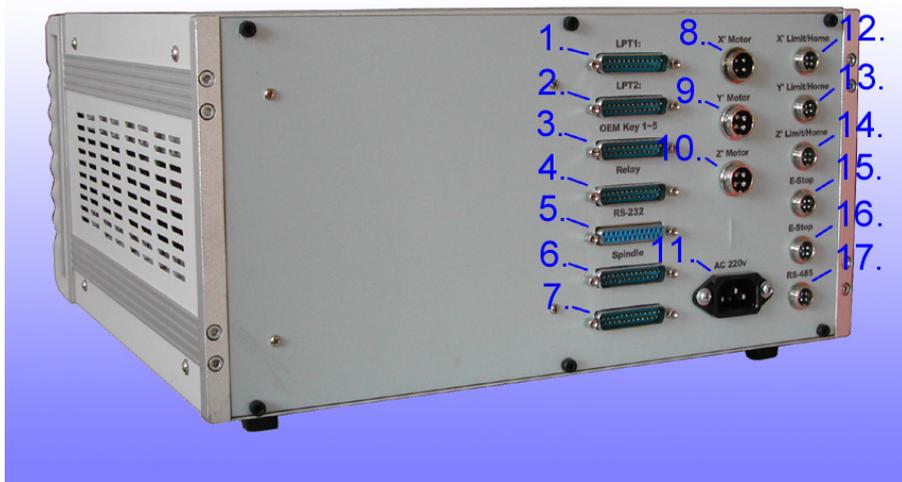
CNC Controller:

Power supply of controller is AC220V single phase.



1.	CNC controller power switch.
2.	Fuse

Back of CNC controller:



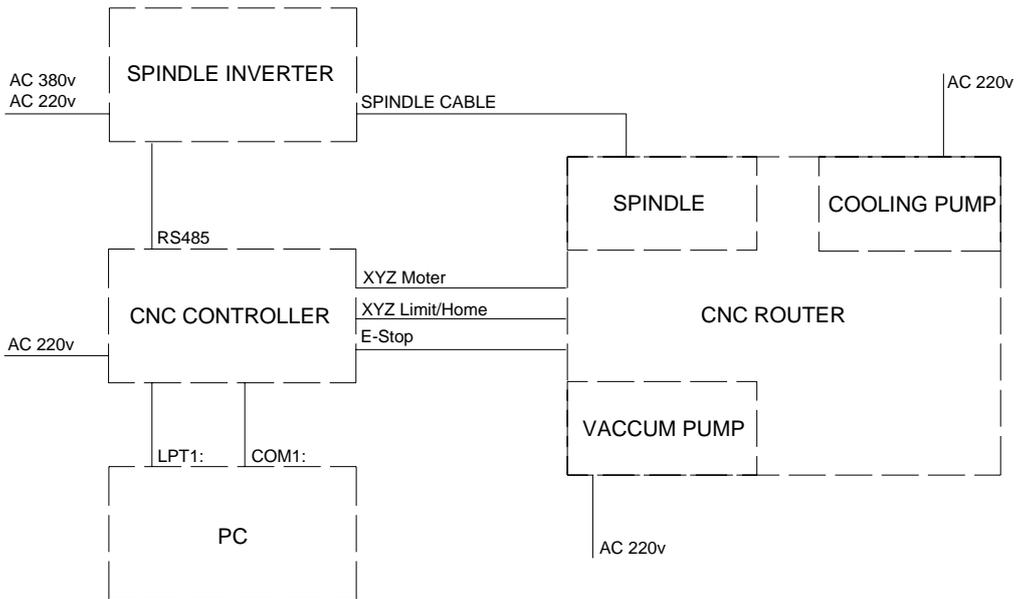
1.	LPT1 (parallel Port 1), Connect to LPT1 of PC
2.	Connect to LPT2 of PC, Can be select ed to make the special needs, for example 4 th axis.
3.	Extra control signal interface. Can be used to meet the especial needs.
4.	External relay control interface. Can be used to meet the special needs.
5.	RS232 interface.
6.	Spindle control signal interface
7.	Auto tool change system control signal interface.
8.	X axis stepper motor interface
9.	Y axis stepper motor interface.
10.	Z axis stepper motor interface.
11.	CNC controller power input. Power is AC220V single phase.
12.	X axis limit and home switch interface.
13.	Y axis limit and home switch interface.
14.	Z axis limit and home switch interface.
15.	<u>E-Stop</u> , Emergency stop switch interface.
16.	<u>E-Stop/DC12v</u> , Emergency stop switch interface. It is optional for user. DC12v for home switch.
17.	<u>RS485</u> , RS485 interface. This interface will be connected to inverter of spindle, and used to control the work of spindle (speed, turn on, turn off).

Figure below show the connection of CNC controller.



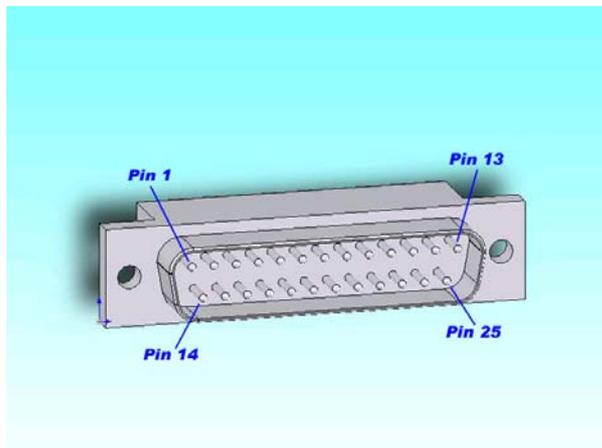
Electric Wiring

CNC Machine main electric wiring:



Parallel Port 1 [Label: LPT1:]

DB25, Pin signal definition:



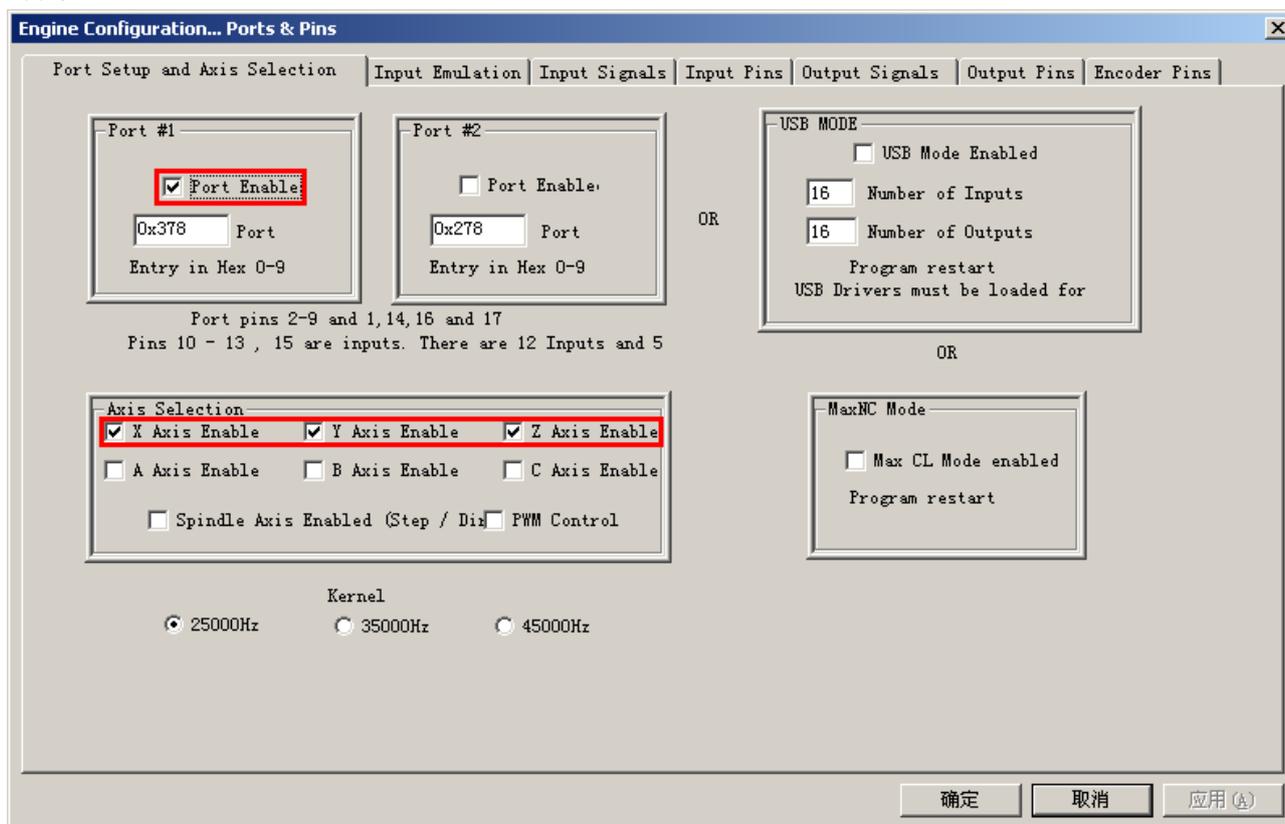
Pin No.	Description
1	XYZA axis step motor free(-)
2	X axis step pulse(+)
3	X axis direction
4	Y axis step pulse(+)
5	Y axis direction
6	Z axis step pulse(+)
7	Z axis direction
8	Spindle step pulse(+)
9	Spindle direction
10	X axis home signal(-)
11	Y axis home signal(-)

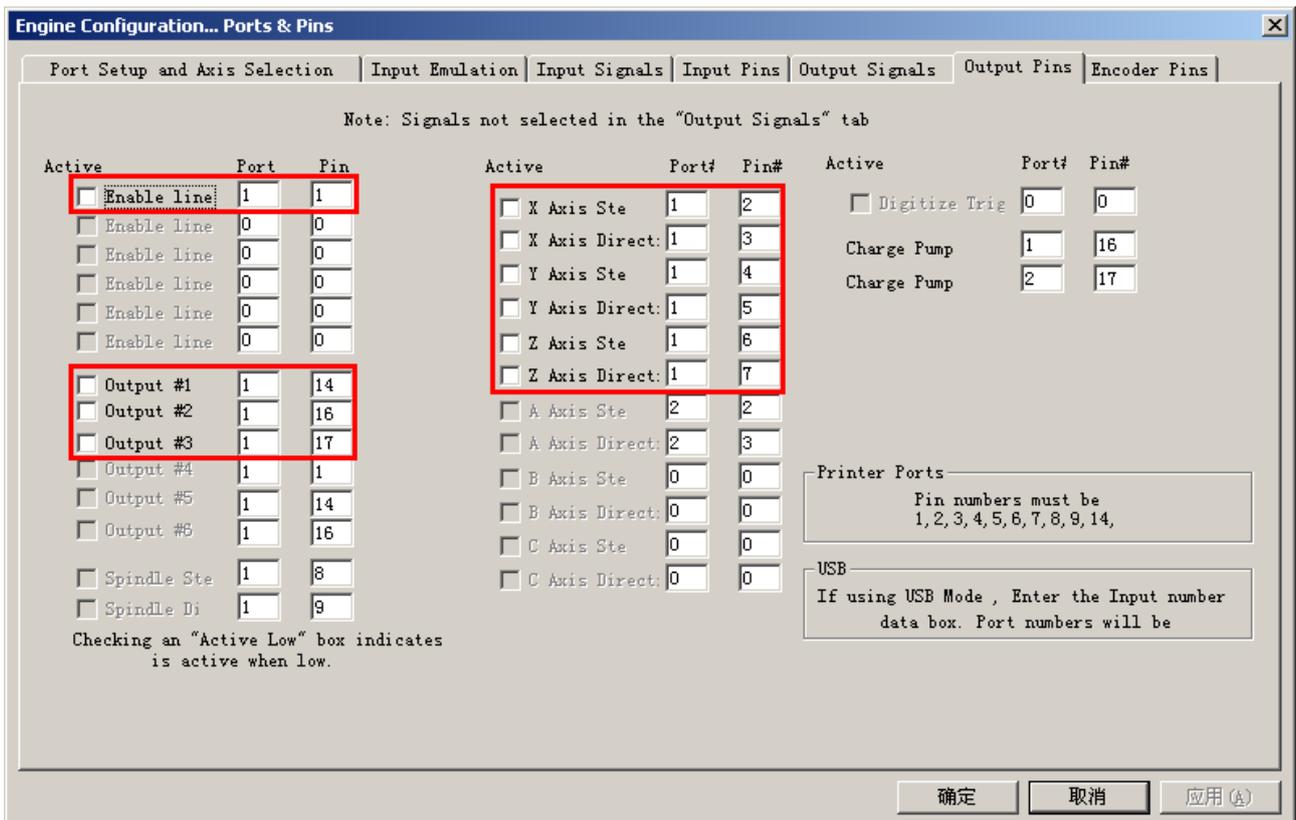
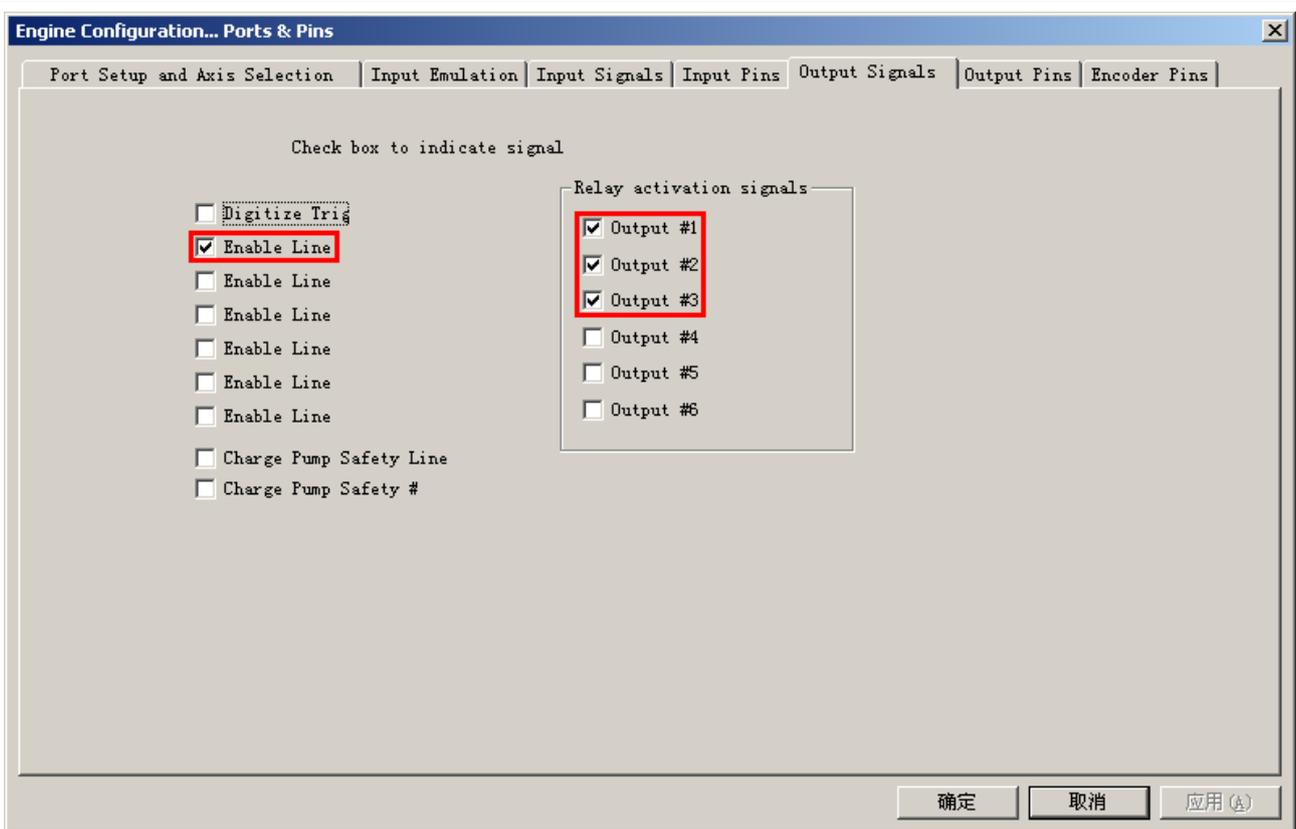
12	Z axis home signal(-)
13	XYZA axis limit signal(-)
14	Spindle run/stop signal(+)
15	Emergency stop signal(-)
16	1# Cooling equipment on/off signal(+)
17	2# Cooling equipment on/off signal(+)
18~25	Earth

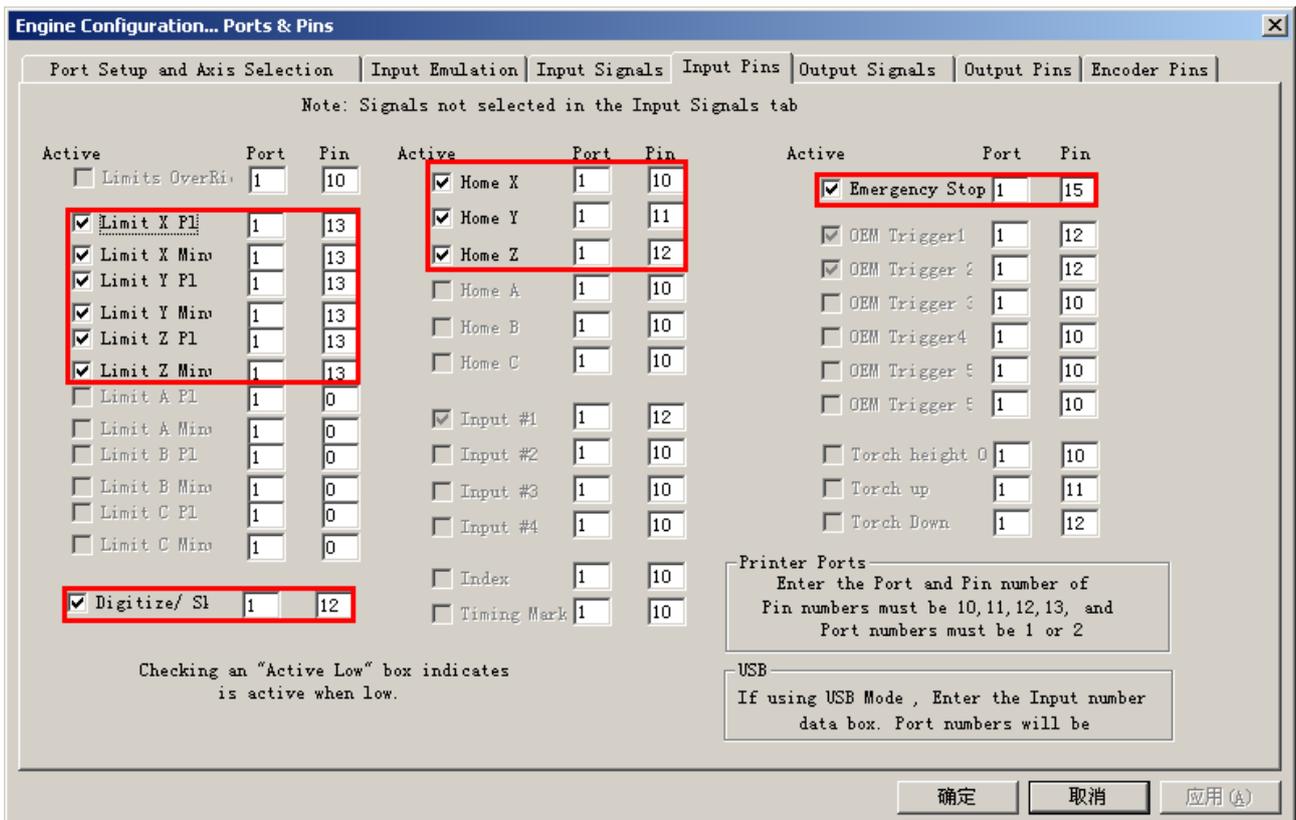
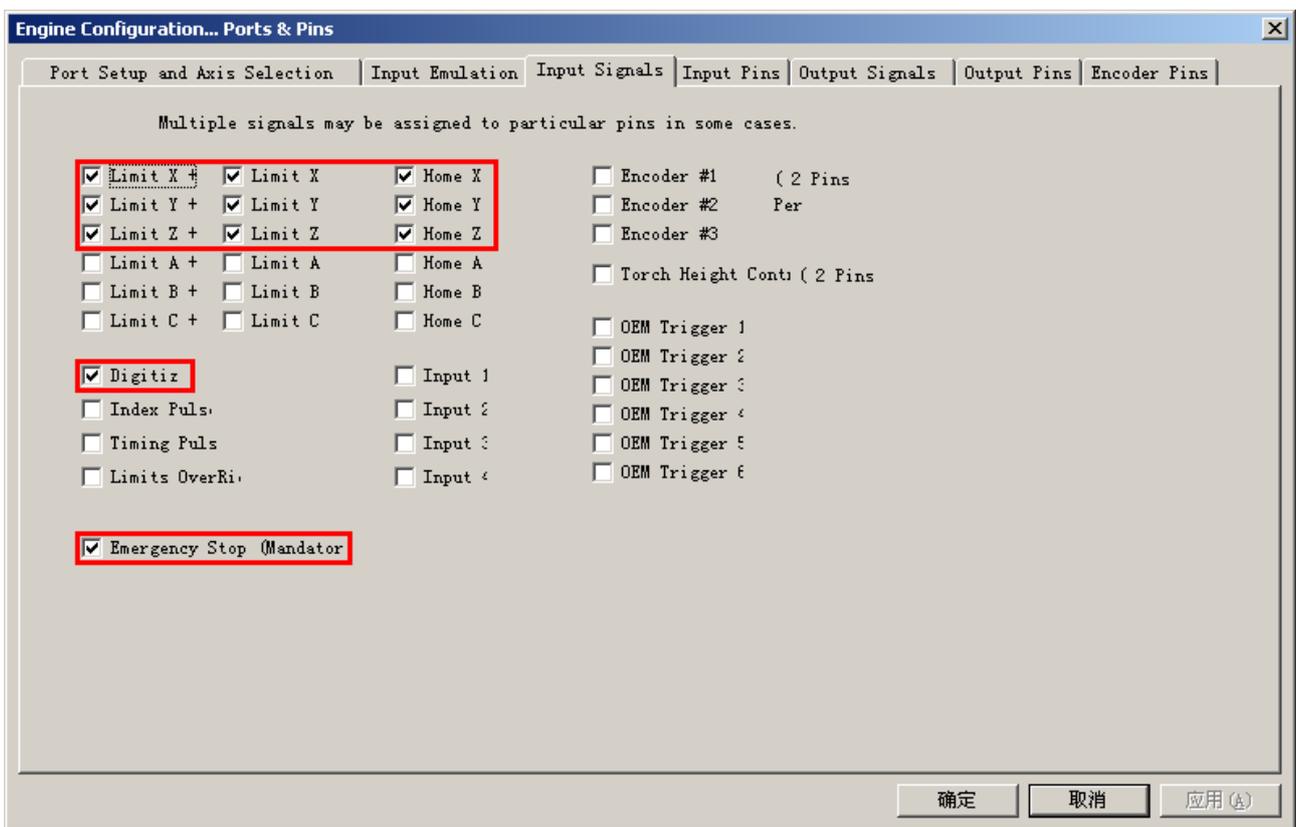
Please configure the PLT1 in MACH2 as following figure:

MACH2 Menu: Configure>Ports and Pins

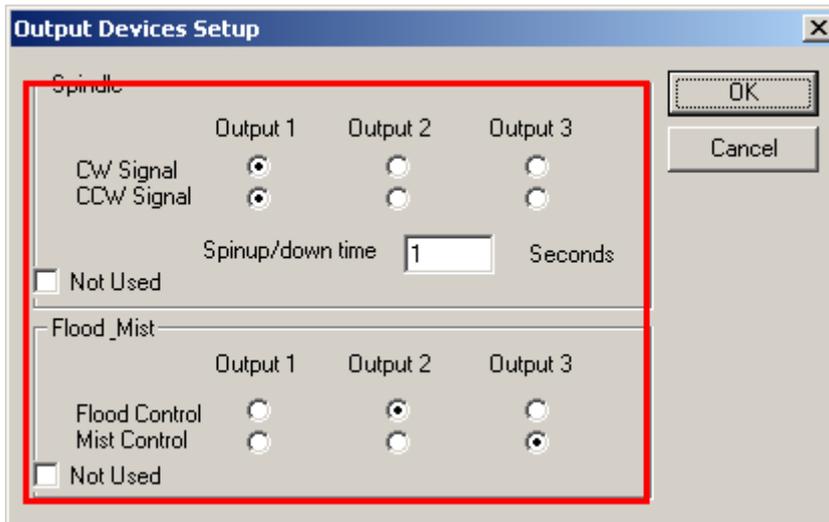
Mack2 will not remember the when you change from tab to tab or close the Ports and Pins dialog unless you Apply.







MACH2 Manu: Configure > Output Devices



CW signal is controlled by M3 command.

CCW signal is controlled by M4 command.

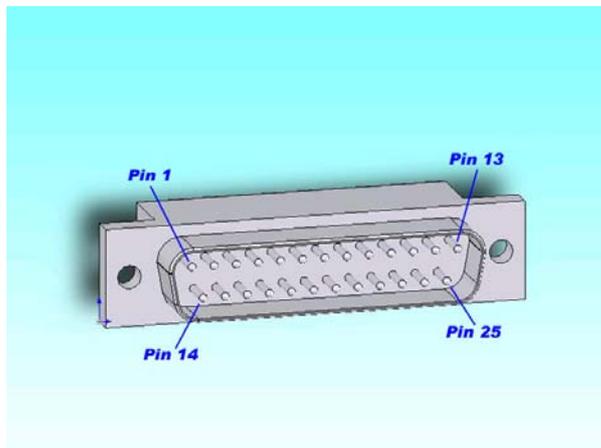
Flood Control signal is controlled by M6 command.

Mist Control signal is controlled by M7 command.

Parallel Porter 2 [Label: LPT2:]

This interface is for extending the Mach2 feature if PC has 2 parallel ports.

DB25, Signal definition:



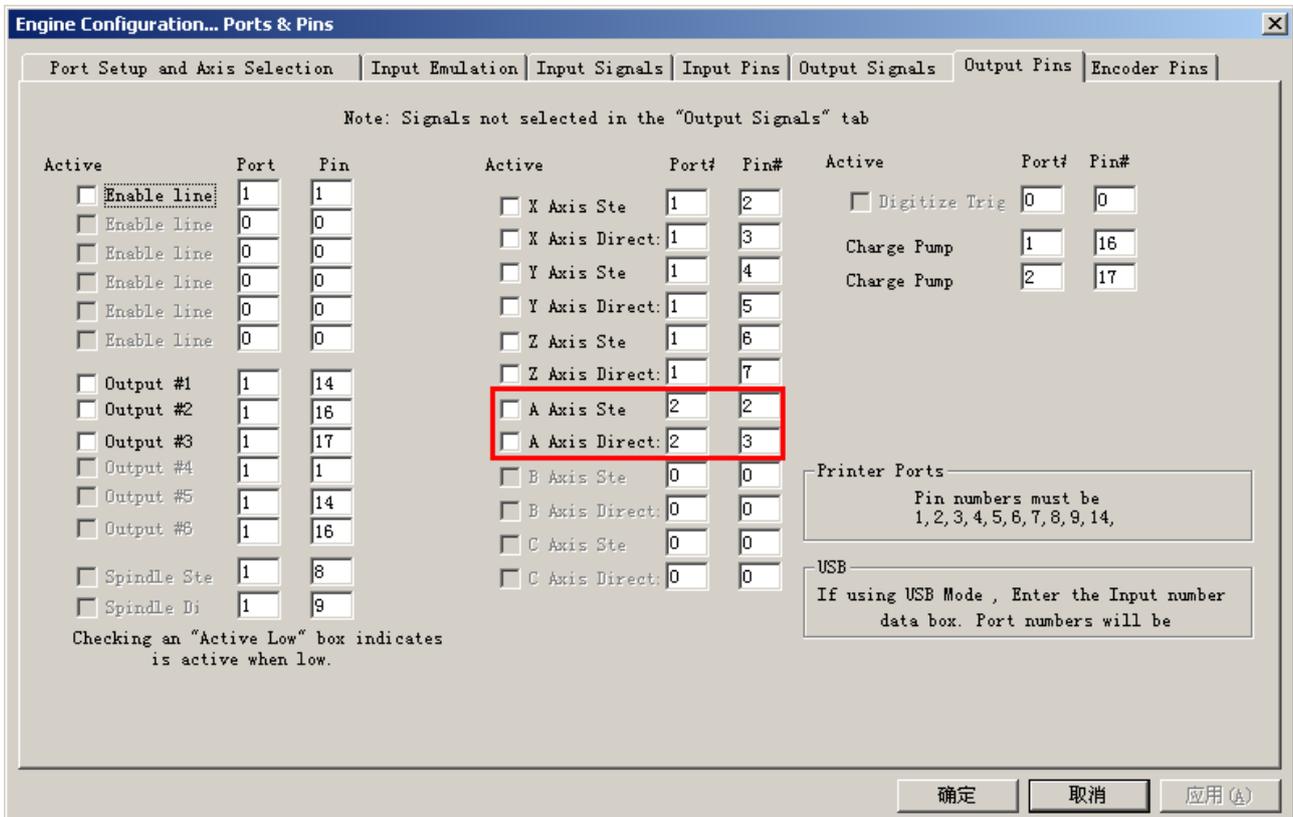
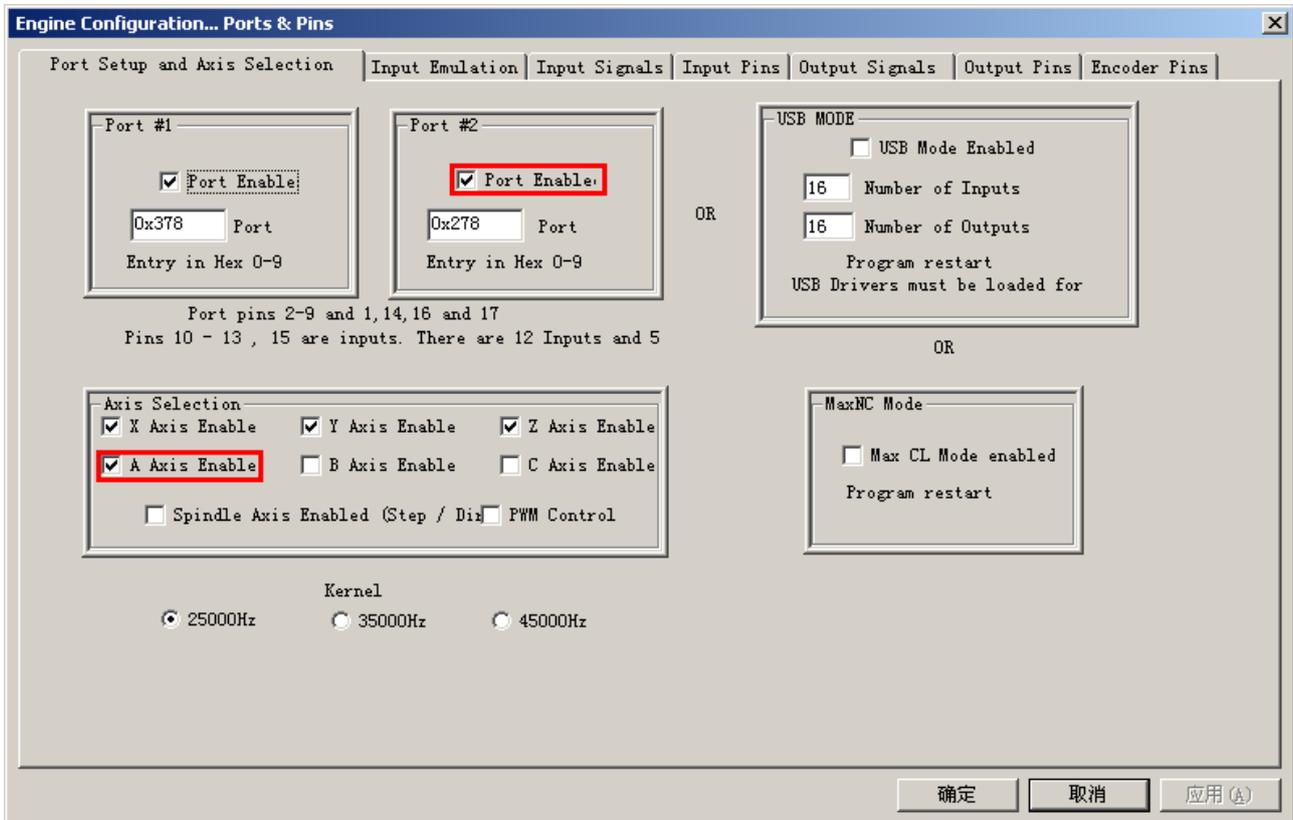
Pin No.	Description
1	Not used
2	A axis step pulse(+)
3	A axis direction
4~9	Not used
10	OEM1 trigger signal / A axis home signal(-)
11	OEM2 trigger signal(-)
12	OEM3 trigger signal(-)
13	OEM4 trigger signal(-)
14	Not used
15	OEM5 trigger signal(-)
16~17	Not used
18~25	Earth

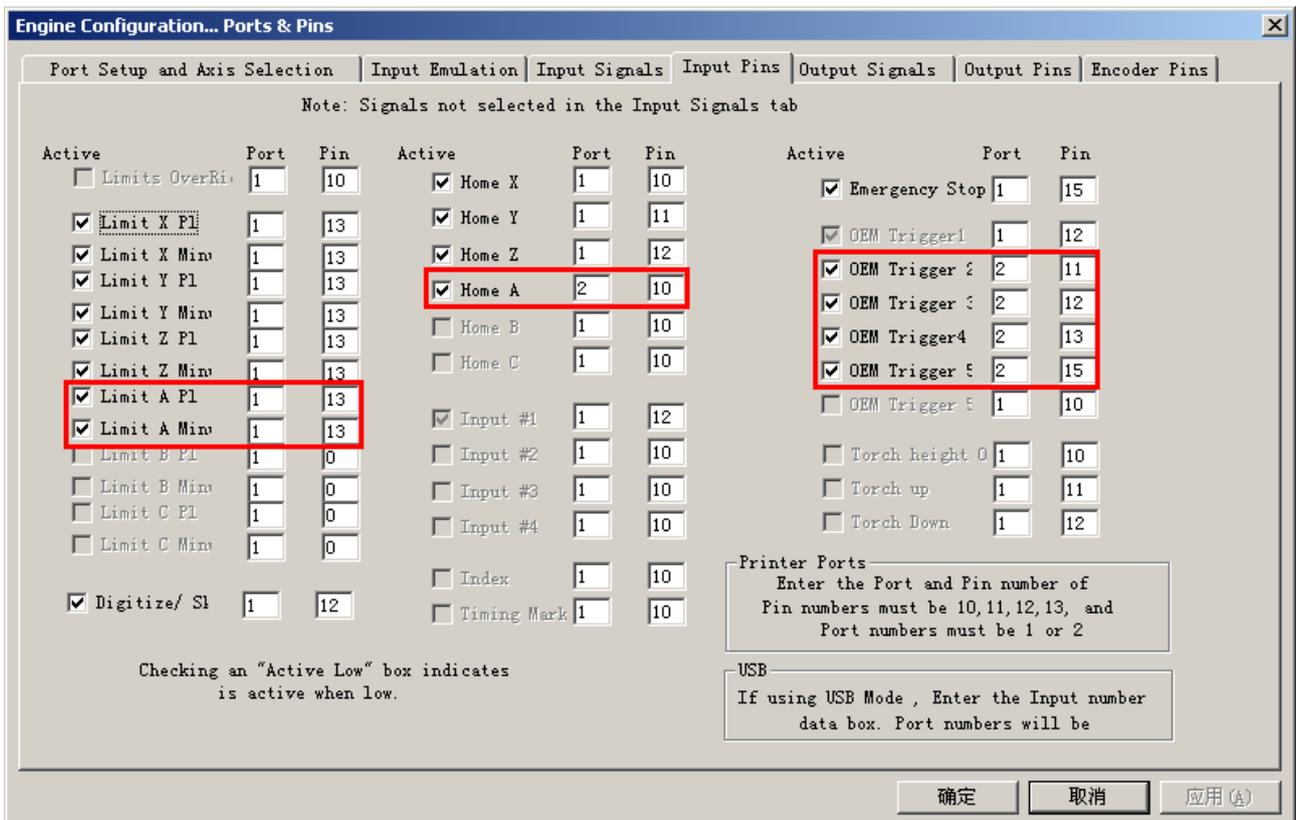
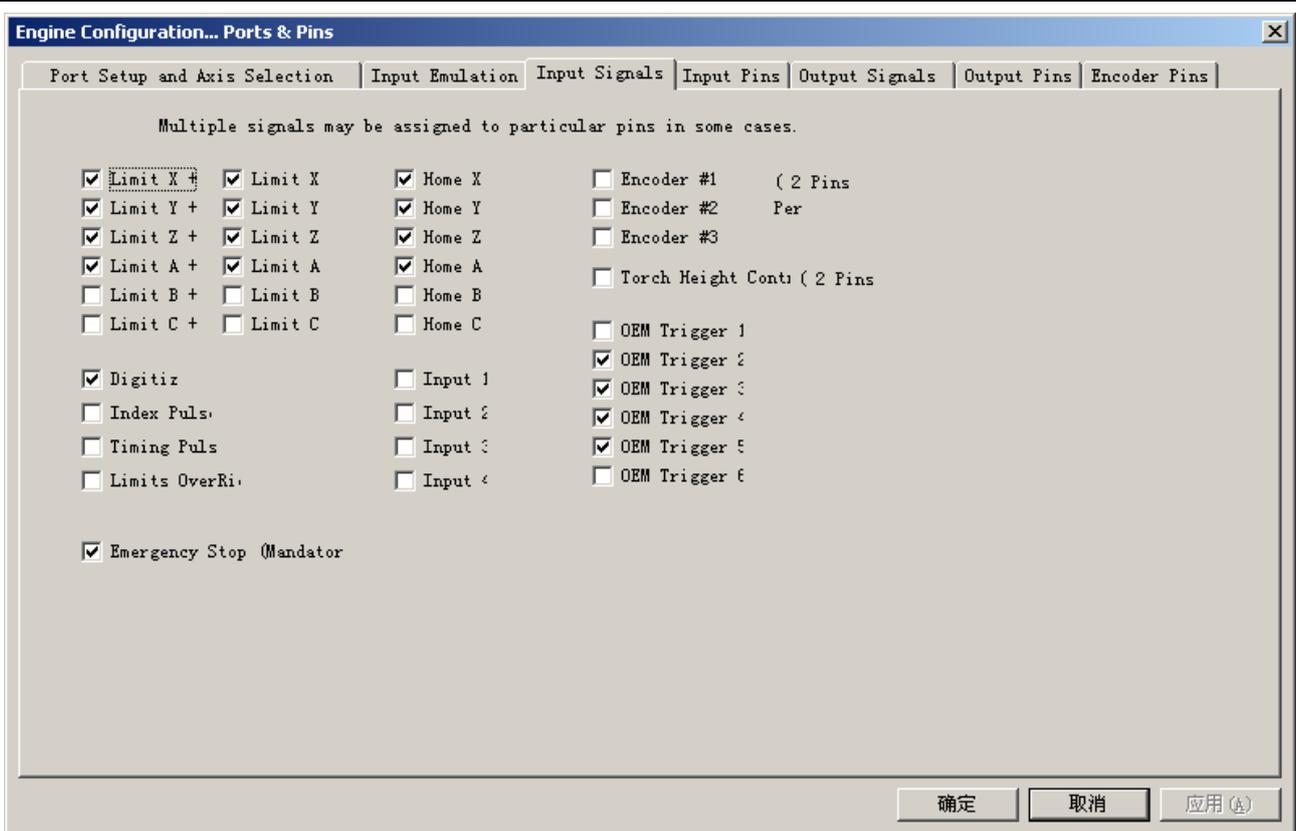
Please configure the PLT2 in MACH2 as below:

(MACH2 Configure / Ports and Pins)

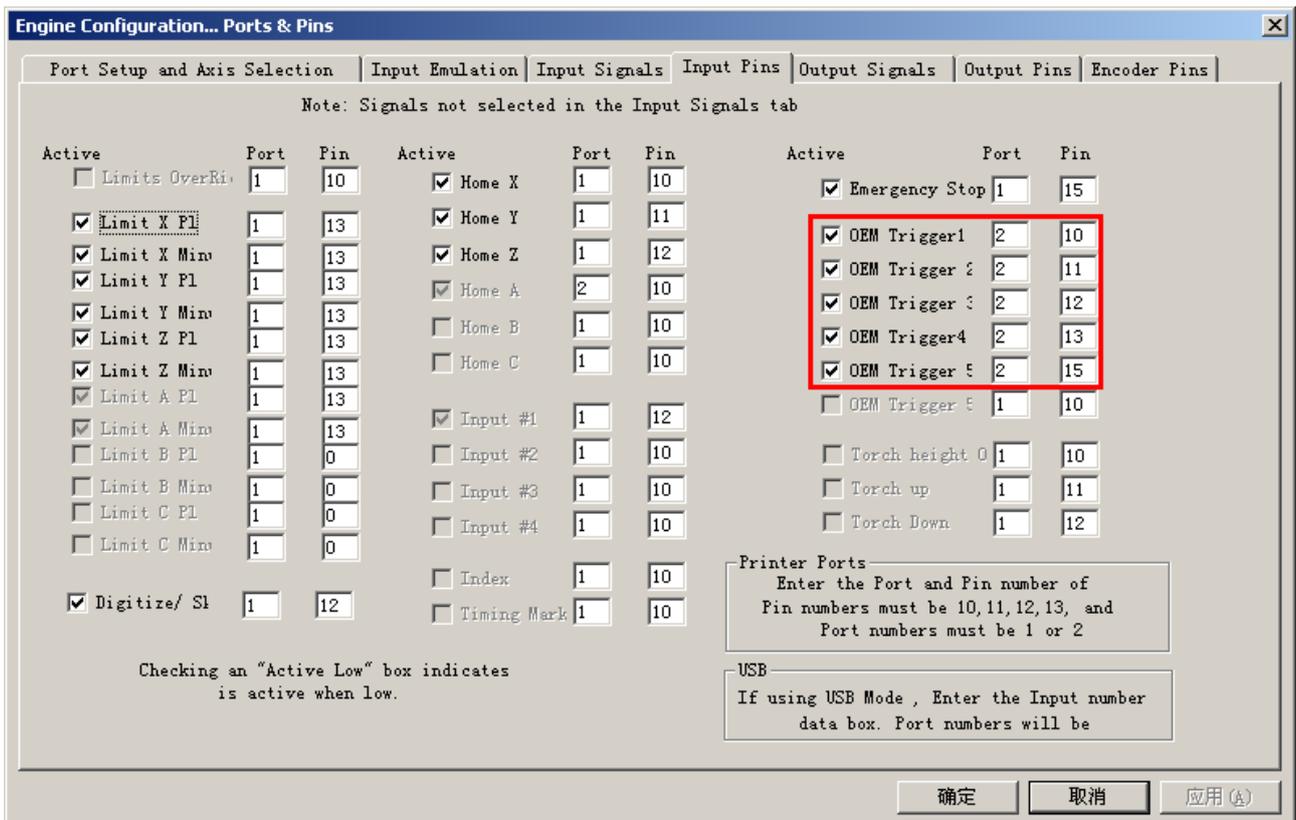
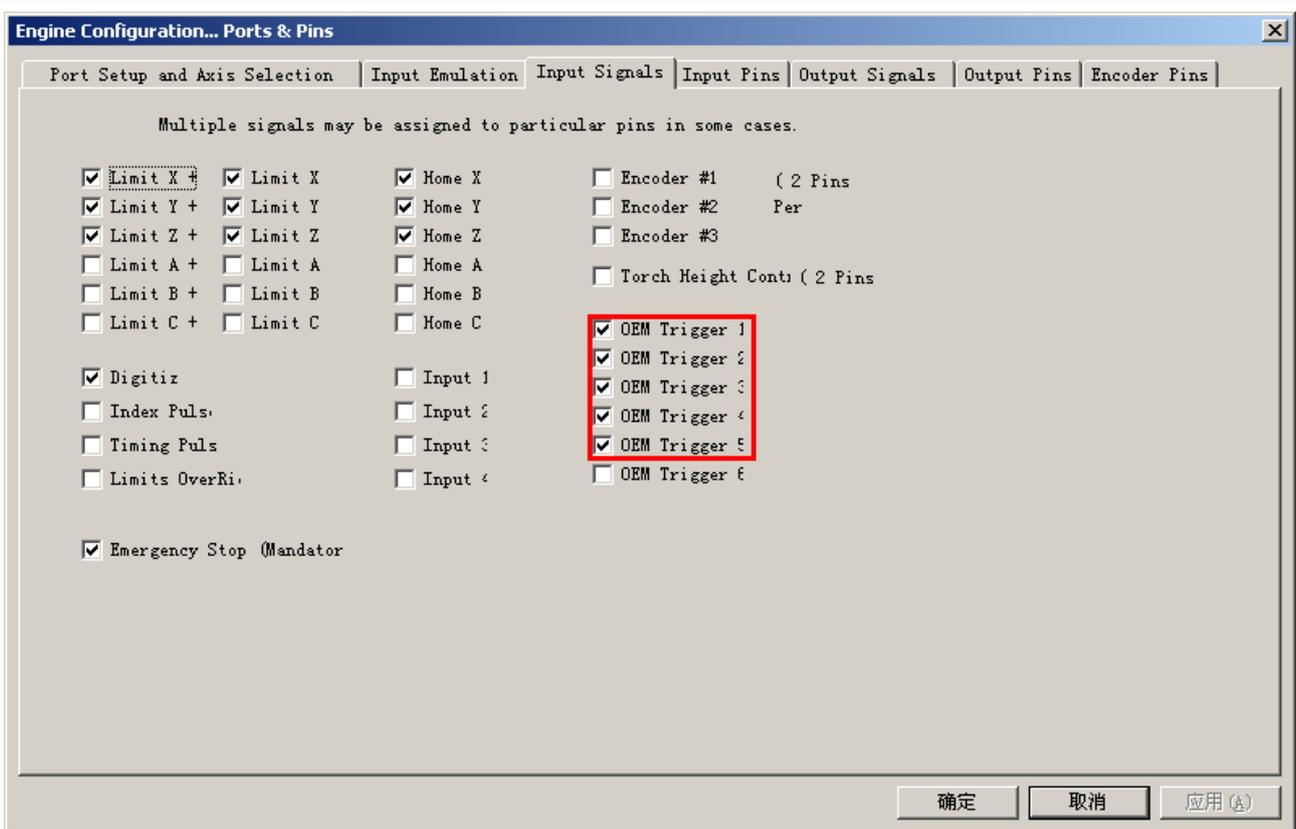
Please click "apply" for keep the setting.

Configure1 (Extend A axis and 4 OEM switches):





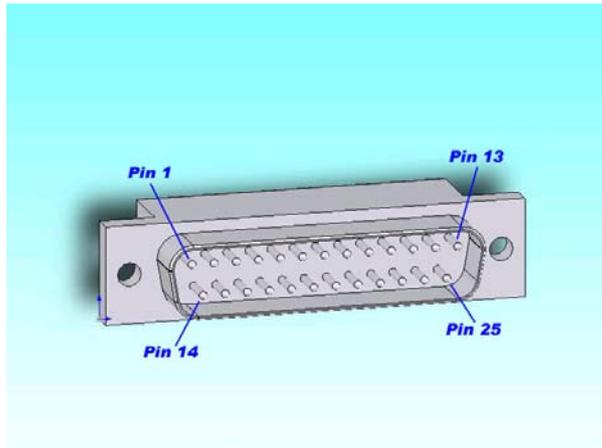
Configure 2: (extend 5 OEM switches)



Familiar with the configuration of Mach2, you can define the 5 OEM key as other feature. Please take reference of the Mach2 user manual.

MACH2 OEM Switch [Label: OEM key 1~5]

DB25, Pin definition is below:

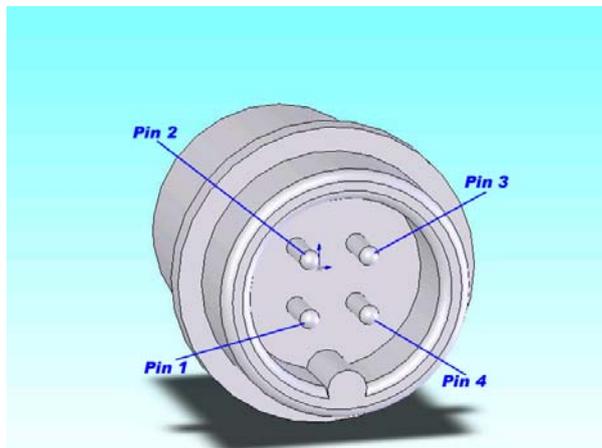


OEM keyswitch function can be used after pins are connected with keyswitch.

- Pin1-Pin14 connected with a keyswitch, OEM Key1.
- Pin2-Pin15 connected with a keyswitch, OEM Key2.
- Pin3-Pin16 connected with a keyswitch, OEM Key3.
- Pin4-Pin17 connected with a keyswitch, OEM Key4.
- Pin5-Pin18 connected with a keyswitch, OEM Key5.

Emergency Stop [Label: E-Stop]

RS765, Pin definition is below:

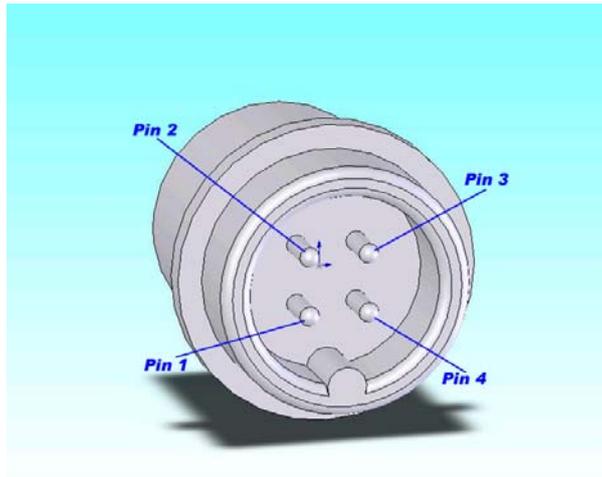


Emergency Stop function can be set after pins are connected with keyswitch. E-stop switches could be connected.

- Pin1-Pin2 connected with a keyswitch.
- Pin3-Pin4 connected with a keyswitch.

Emergency Stop/DC12v [Label: E-Stop/DC12v]

RS765, Pin definition is below:



Emergency Stop function can be set after pins are connected with keyswitch. E-stop switches could be connected.

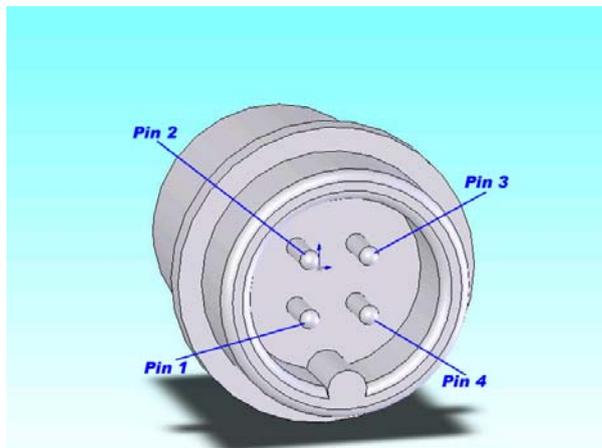
Pin1-Pin2 connected with a keyswitch.

Pin3 is DC12v for home switch power supply.

Pin4 unused.

Limit and Home signals: [Label: X,Y,Z' Limit/Home]

RS765, Pin definition is below:



This is limit and home switch interface for XYZA axis. The up and down limited signals for each axis is parallel connection. Reference the electric wiring figure(Fig.07). The limited signal input to LPT1 pin 13.

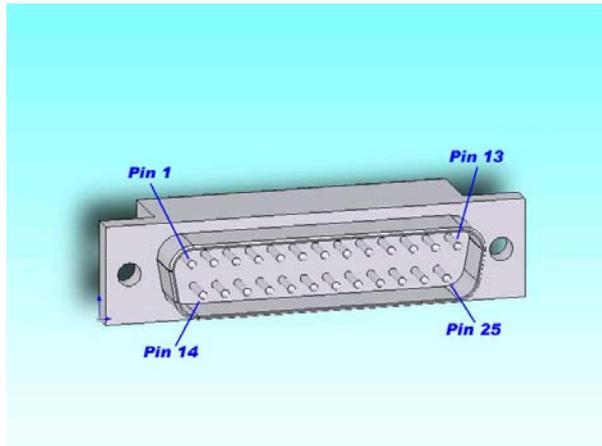
Home switch for XY-axis are near each down limit switch. Z-axis home switch is near it's up limit switch. XYZ home signal is input of pin 10, pin11 and pin12, LPT12. Z-axis home signal is output of pin10,LPT2.

Pin 1-2 Limit switch.

Pin 3-4 Home switch.

Spindle Control Signal: [Label: Spindle]

DB25, Pin definition is below:



This interface provide signal for spindle, controlling speed or director.

Pin1-14, connected with a keyswitch. Additional relay control switches are used as the control of the external relay. They can also been used as the control signal of other equipment.

Pin2-Pin15 spindle on/off, controlled by M3,M4 and M5 command.

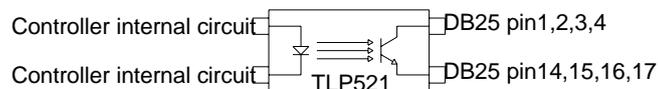
Pin3-Pin16 spindle run clockwise, controlled by M3 command.

Pin4-Pin17 spindle run counterclockwise, controlled by M4 command.

Pin5-Pin18 spindle speed controlled by PWM, controlled by S command.

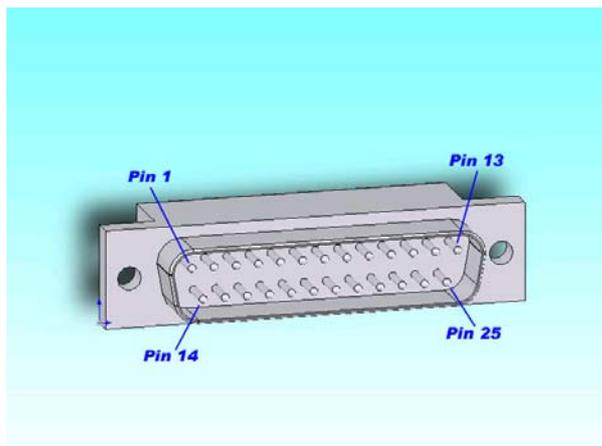
Pin6-Pin19 spindle speed control, DC,0~10V, controlled by S command.

Connecting of spindle with controller



Cooling Equipment Control Signal: [Label: Relay]

DB25, Pin definition is below:



This Interface if for the relay of cooling equipment , DC12V.

Pin1-14: Signal to relay for Spindle cooling pump controlling.

Pin2-15: Signal to relay for Spindle cooling pump controlling.

Pin3-16: No.1 backup cooling pump relay control signal.

Pin4-17: No.1 backup cooling pump relay control signal.

Pin5-18: No.2 backup cooling pump relay control signal.

Pin6-19: No.2 backup cooling pump relay control signal.

Pin7-20: External relay control signal.

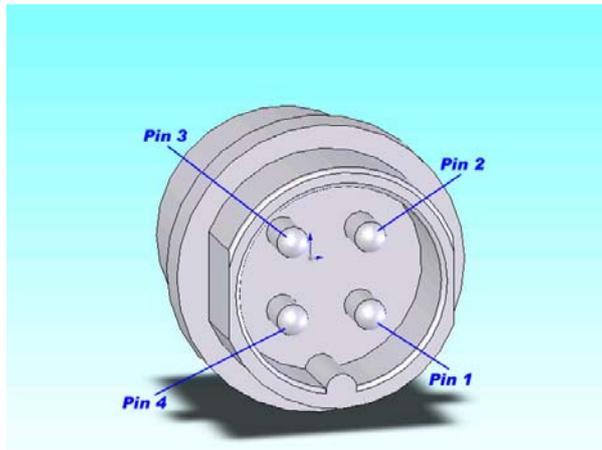
Spindle cooling pump relay is triggered by M3,M4 and M5. M3 and M4 can turn on the pump and M5 can turn off the pump.

No1 backup cooling pump relay is triggered by M8 command. M8 can turn on the pump and M9 can turn off the pump.

No 2 backup cooling pump relay is triggered by M7 command. M7 can turn on the pump and M9 can turn off the pump.

Motor [Label: X,Y,Z' Motor]

GX-16, Pin definition is below:



Connect to stepper motors

Pin1-2, connect to a set of coil of stepper motor (wires with red color and green color).

Pin3-4, connect to a set of coil of stepper motor (wires with yellow color and blue color)

Shipping/moving and Installation

1. The X-axis and Y-axis must be locked during shipping or installation to avoid potential damage to the mechanical and electrical sub-systems.
2. Please use the fork-lift slot at the bottom of the CNC to move the machine.
3. While moving, please try to keep the CNC level, move slow and steady. Do not knock or drop the CNC machine.
4. The CNC should be installed on a solid and leveled surface. There should be no gaps between the mounting legs and installation surface.
5. The CNC router should be installed 1.2 meters away from walls or other big equipment.

Ready to use

1. Plug the Z height reference plate on to the 4-pin socket at the right site of Z axis.
2. Open the first cover at the right side of CNC router, fill in cooling liquid to the water container for spindle cooling.
3. Plug the power cable of spindle cooling pump and vacuum pump to power AC220V/240V.
4. Connect stepper motors, limitation and home switch, emergency stop switch and auto tool exchange control to CNC controller with correspondense connectors.
5. Connect wires of spindle to inverter of spindle. Connect RS485 of Inverter to RS485 on CNC controller. Connect power supply of inverter with AC380V three phases or AC220V single phase.
6. Connect parallel port of PC with LPT1 of CNC controller. Connect COM1 of PC with RS232 interface

of CNC controller. Connect CNC controller power supply to AC220V single phase.

7. Make sure the CNC frame connect to ground well.

Checklist before Starting the CNC Application

1. CNC Controller uses AC220V single phase. Check power supply, check ground connection.
2. Dust collector uses AC220 single phase. Check power source, check ground.
3. Main power for vacuum pump and spindle cooling pump uses AC220V single phase.
4. Inverter of spindle power:AC380V 3-phases or AC220V single phase. Check power supply, check ground.
5. Check spindle cooling water system. Make sure it has enough water. And the cooling pipes are installed correctly.
6. Check to make sure the following switch is OFF:
 - a) CNC controller power switch
 - b) Inverter of spindle power switch
 - c) Cooling pump (for Spindle) power switch
 - d) Vacuum pump power switch.
7. Plug the dust collector to the to the AC 220v single phase power source. Turn on the dust collector. Check to make sure the dust collector motor turns in the direction indicated on the Machine.
8. Make sure that there is enough cooling liquid in spindle cooling water container. Main power cables to the power supply, AC 220v single phase. Switch on the cooling pump, checking working of cooling cycle.

Warning:

The CNC controller, spindle cooling pump, vacuum and the dust collector may seem to work correctly with incorrect grounding. Please consult a professional electrician for the proper grounding.

CNC machine operation

For PC configure, OP and installation related with Mach2, please reference the Mach2 user manual

This manual deals with basic usage of FounderTop CNC machine

You should set up the software according to the way in the red frame ,

Configure MACH2 (We already configure the parameter as default, user don't need input it when you use)

1. Defining the setup units

MACH2 menu: Configure / Setup Units

<Set Default Units for Setup>:

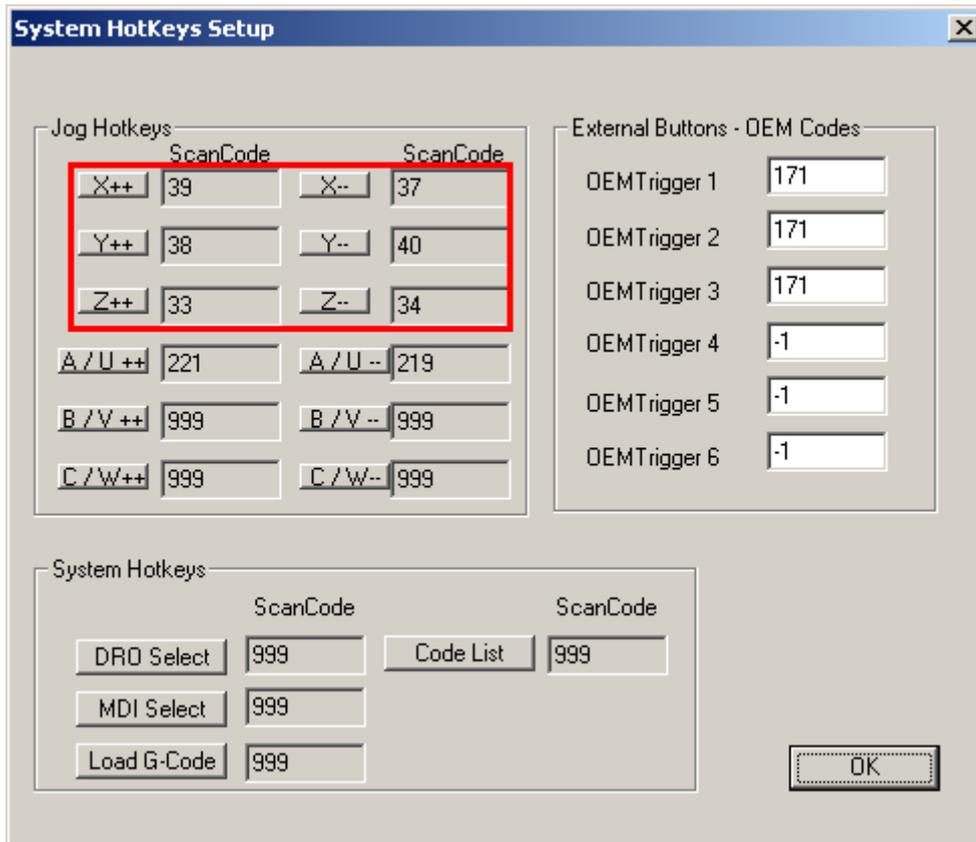


You can set Units as mm or inch.(Units for Foundertop CNCmachine is mm)

2. Define Axis Hotkeys

MACH2 menu: Configure / Set Axis Hotkeys

Setup System HotKeys as below:



User can configure XYZ-axis movement key as his(her) habit. We gave a default as follow

Move direction	Function key
X--	←
X++	→
Y--	↑
Y++	↓
Z--	Page up
Z++	Page down

Click <SetHotKey>,display the following window:



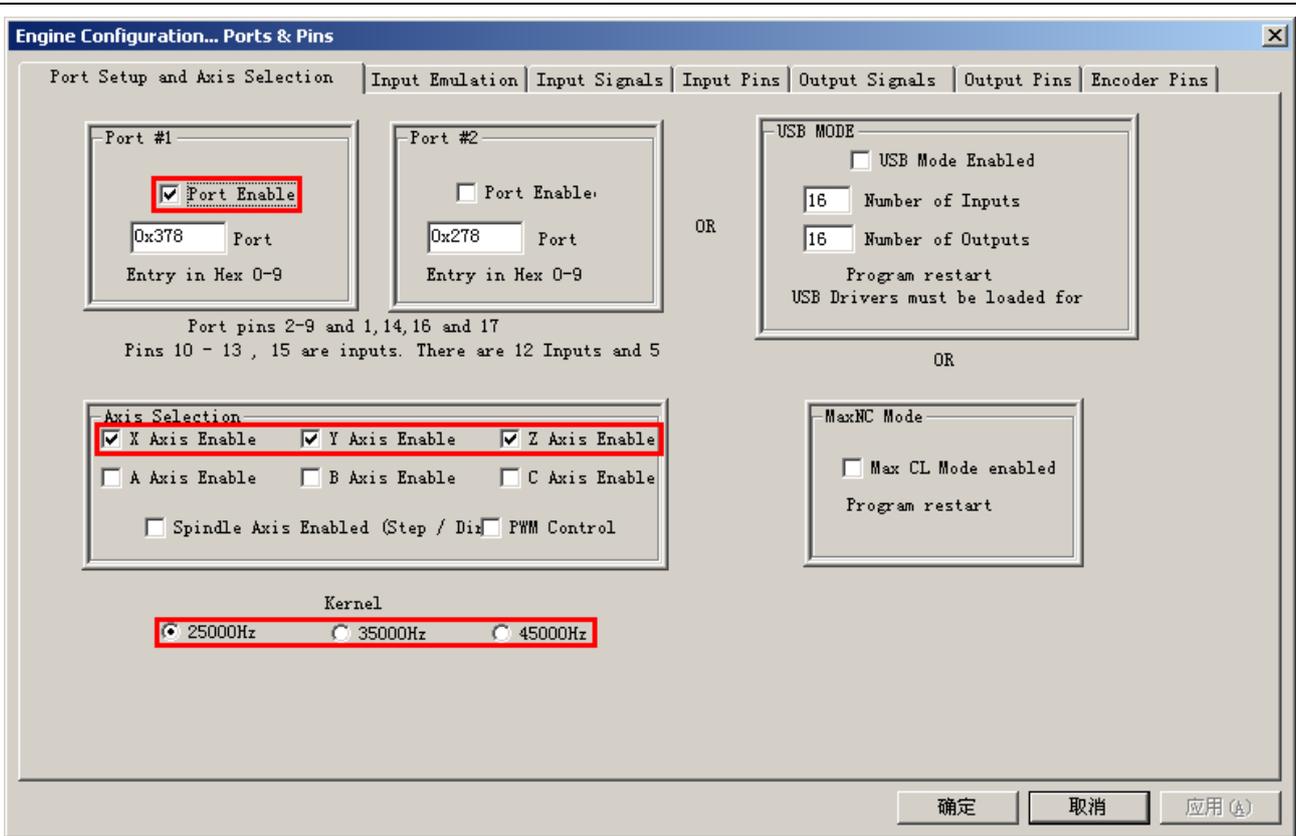
Incase user want to use other hot key, after you click it, the <SetHotKey> window will close, the <Setup System HotKeys> window will show the code of the key on the key board.

3. Set parallel port 1 pins:

Mach 2 Menu: Configure / Ports and Pins

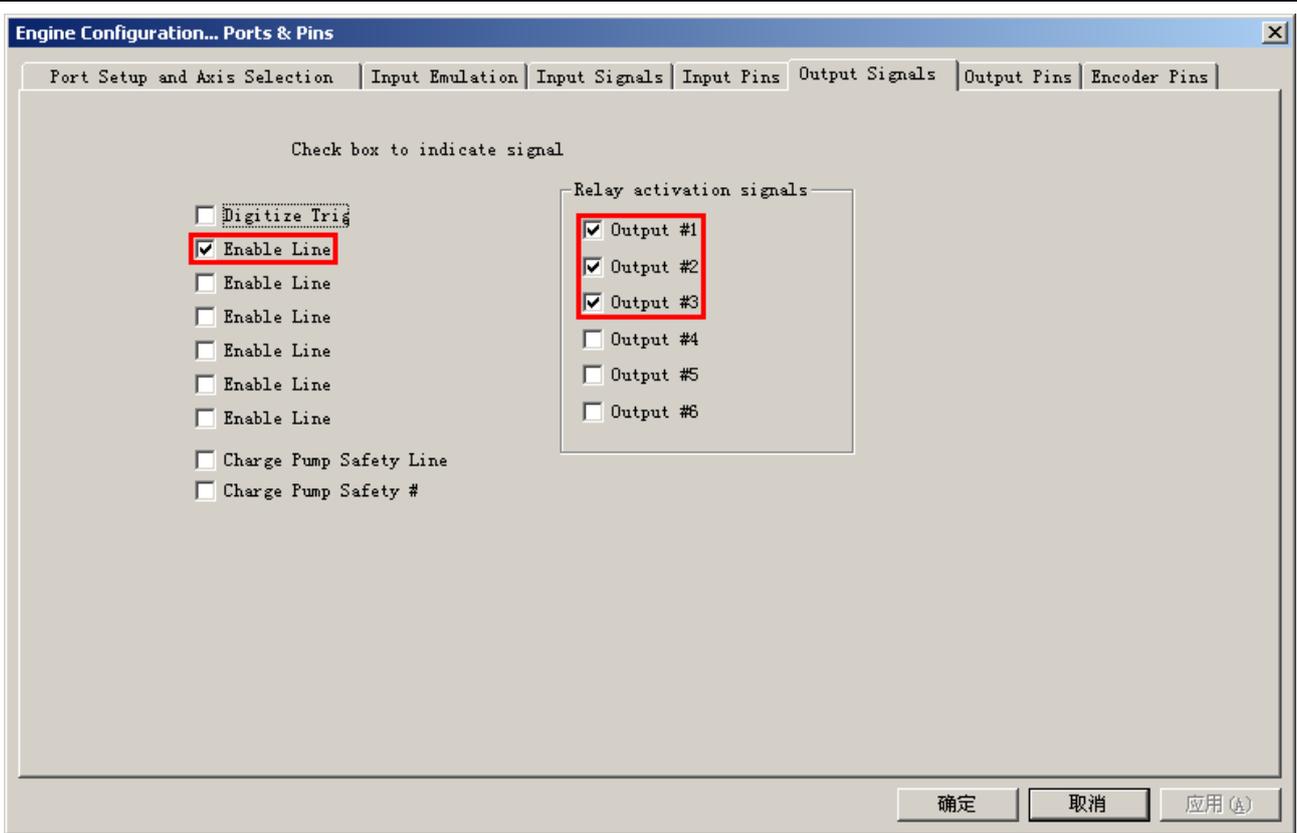
Engine Configuration... Ports & Pins as below:

- a. Setup Printer port , Axis and kernel frequency.



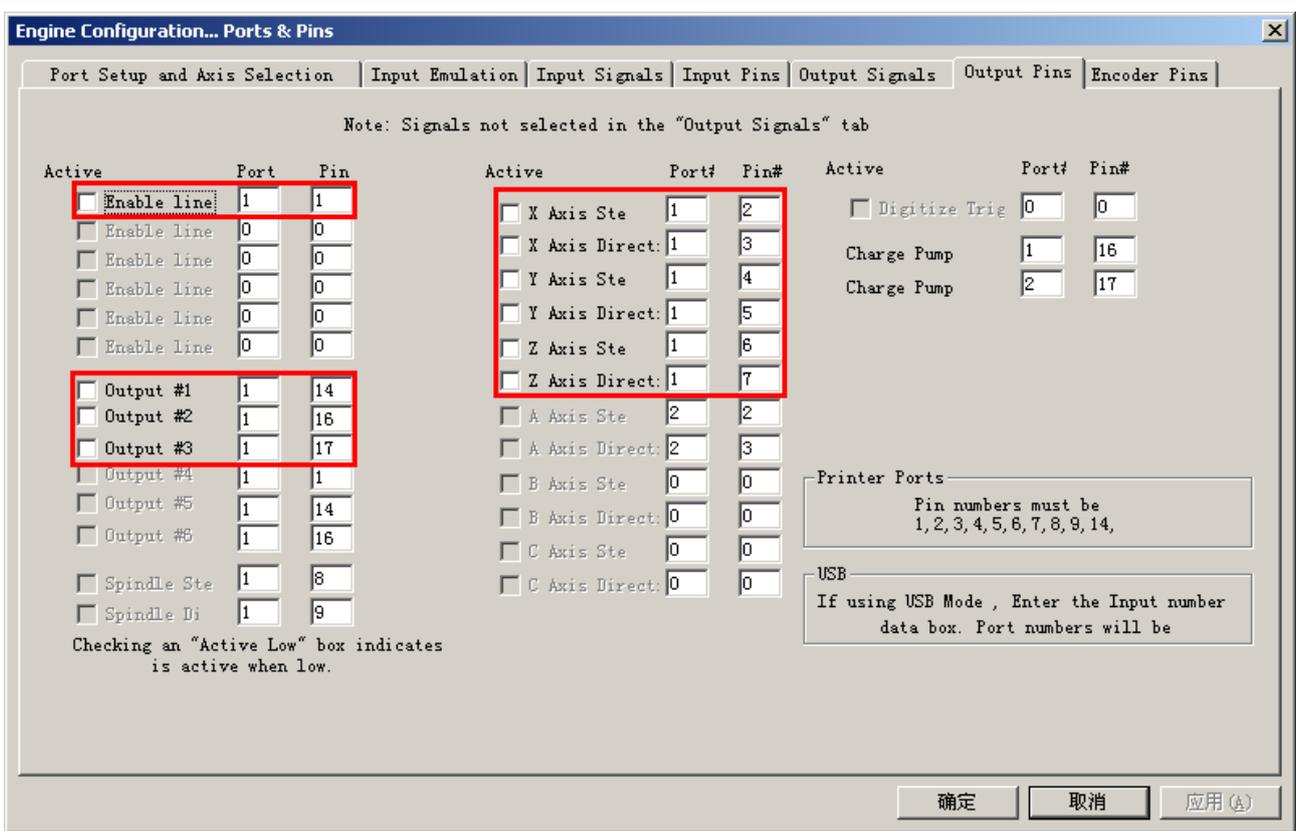
Printer Port #1	Select Prt1 port as the interface to CNC Machine. Default address of Prt1 is 378H. You can configure your computer in case the address is different.
X-axis Enabled Y-axis Enabled Z-axis Enabled	XYZ-axis and spindle must be enabled
Kernel	Mach2 default kernel is 2500Hz, it depends on the speed of the PC you use. In case your computer main frequency over 1 GHz, you can select 35000 Hz or 45000 Hz.

b. Setting output signal



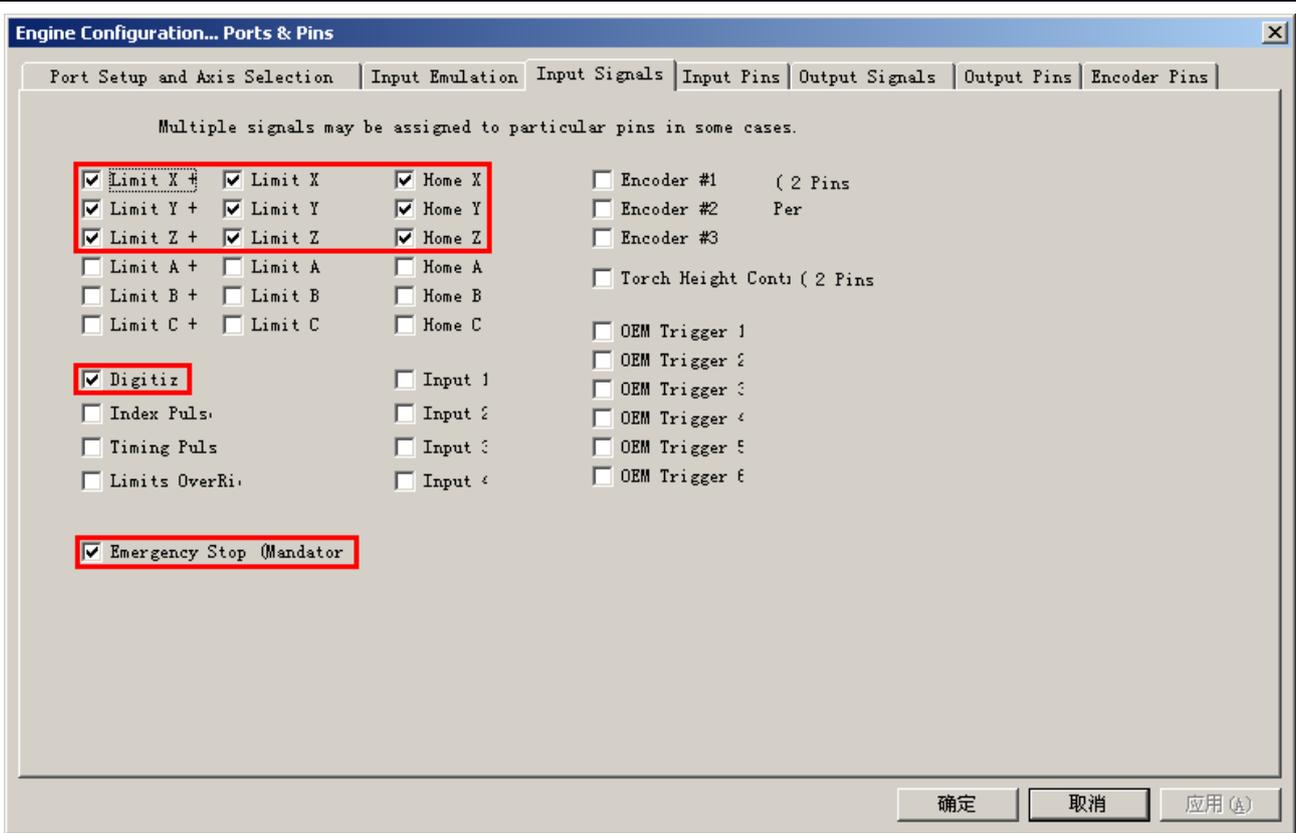
Enable Line	Enable for XYZ motor.
Output #1 Output #2 Output #3	<p>Relay activation signals enable.</p> <p>Output #1 for spindle cooling pump relay. Controlled by M3、M4 and M5 command. M3 and M4 command turn on the pump, M5 command turn off the pump.</p> <p>Output #2 for 1# backup cooling pump relay, controlled by M8 command. M8 command turn the 1# backup pump, M9 command turn off the 1# pump. (Basic models of Foundertop CNC machine does not install this relay, user can add it in case need.)</p> <p>Output #3 for 2# backup cooling pump relay, controlled by M7 command. M7 command turn on the 2# backup pump, M9 command turn off the 2# pump. (Foundertop CNC machine does not install this relay, user can add it in case need.)</p>

c. Setting printer port pins of output signal.



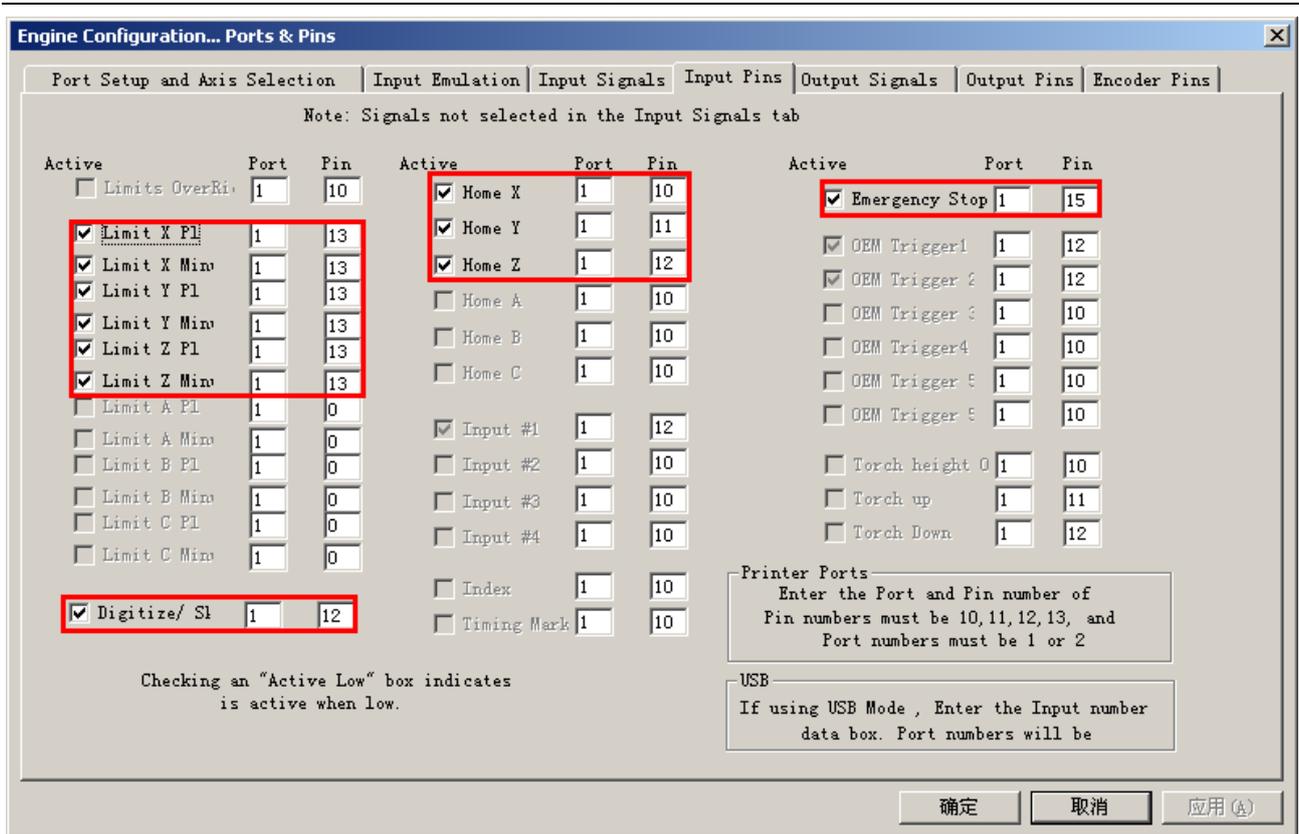
Enable Line	Port and pin of XYZ-axis motor enable signal
Output #1 Output #2 Output #3	Port and pin of external relay control signal.
X-axis Step Y-axis Step Z-axis Step	Port and pin of XYZ-axis enable.
X-axis Direction Y-axis Direction Z-axis Direction	Port and pin of XYZ-axis direction.
Active Low	If select low, control signal is "LOW " enable.(FounderTop CNC router is "high" enable)

d. Input signal:



Limit X ++ Limit Y ++ Limit Z ++	XYZ up limit
Limit X -- Limit Y -- Limit Z --	XYZ down limit
Home X Home Y Home Z	XYZ home signal
Digitiz	Sensor signal, used for Z-axis height reference
Emergency Stop	Emergency Stop signal

e. Setting printer Port pins of input signal:



Limit X Plus Limit Y Plus Limit Z Plus	Printer port and input pin for XYZ-axis up Limit position signal.
Limit X Minus Limit Y Minus Limit Z Minus	Printer port and input pin for XYZ-axis up Limit position signal.
Home X Home Y Home Z	Printer port and input pin for XYZ-axis Home.
Digitiz	Sensor signal, used for Z-axis height reference
Emergency Stop	Printer port and input pin for Emergency Stop
Active Low	Input low effective if select "low"(Foundertop CNC machine select "low" effective).

4. Setting XYZ-axis and spindle running parameter.

MACH2 menu: Configure / Motor Tuning

MACH2 XYZ <Motor Setup Velocity/Acceleration>:Parameter setting of XYZ-axis and spindle.
<Motor Setup Velocity/Acceleration>

Motors Setup Velocity/Acceleration [X]

Current Units = MM's

Velocity: 160 Units/Sec

Spindle

X-Axis

Y-Axis

Z-Axis

A / U -Axis

B / V -Axis

C / W -Axis

Steps per Unit: 110.5

Accel: 160 Units/Sec²

Current Axis = X

SAVE AXIS TUNING

Use sliders to adjust for optimum Maximum speed performance
During Tuning use the UP and DOWN arrows keys to move axis.

Minimum Pulse Width: 14 uSec (Danger of Lockup)

Direction PreChange: 0 uSec (If set greater than 15)

OK

Cancel

Motors Setup Velocity/Acceleration [X]

Current Units = MM's

Velocity: 160 Units/Sec

Spindle

X-Axis

Y-Axis

Z-Axis

A / U -Axis

B / V -Axis

C / W -Axis

Steps per Unit: 110.5

Accel: 160 Units/Sec²

Current Axis = Y

SAVE AXIS TUNING

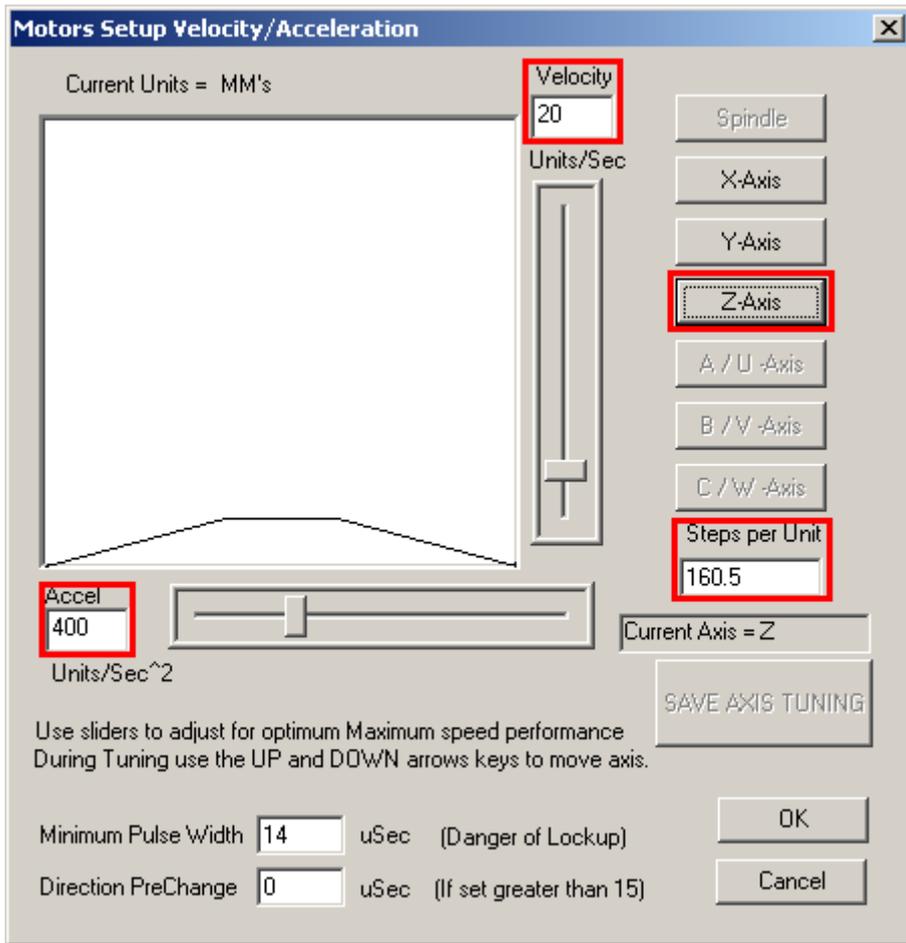
Use sliders to adjust for optimum Maximum speed performance
During Tuning use the UP and DOWN arrows keys to move axis.

Minimum Pulse Width: 14 uSec (Danger of Lockup)

Direction PreChange: 0 uSec (If set greater than 15)

OK

Cancel

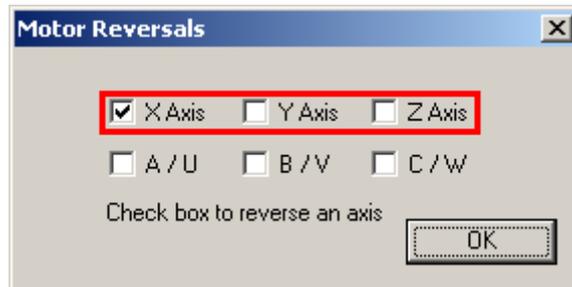


X-Axis Y-Axis Z-Axis	Setting XYZ-axis running parameter
Steps per Unit	Steps needed for move each unit. If you found real data is not match the parameter, you can adjust it
Vel	Maximum speed for XYZ-axis.
Accel	Acceleration for moving axis.
Minimum Pulse Width	Minimum pulse width needed for motor running

5. Adjust XYZ moving direction.

MACH2 menu: Configure / Motor Reversals

MACH2 setting for XYZ-axis moving direction menu <Motor Reversals>::

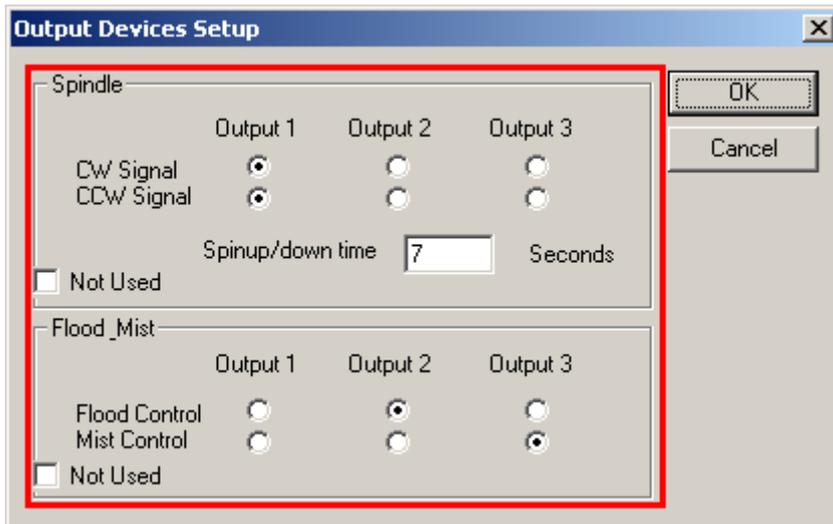


User can set moving direction for his (her) usage.

6. Define external equipment Relay control signal:

MACH2 : Configure / Output Devices

MACH2 external equipment relay control signal setting window:<Output Devices Setup>:

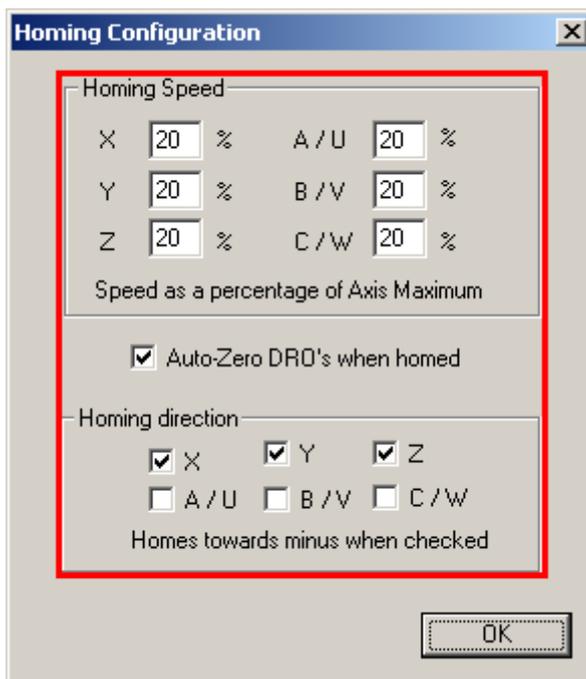


Output 1 Output 2 Output 3	Control signal for 3 external relay control.
CW Signal	CW Signal controlled by command M3. M5 command will stop the CW signal.
CCW Signal	CCW Signal controlled by command M4. M5 command will stop the CW signal.
Spindle Up/Down Time	The delay time when spindle start/stop
Flood Control	Flood Control signal controlled by command M8. M9 command can stop the signal.
Mist Control	Mist Control signal controlled by command M7. M9command will stop the signal.

7. Setup XYZ Home

MACH2 mune: Configure / Config Referencing

XYZ reference configuration window< Reference Configuration >



Referencing Speeds	Speed to home, It's as a percentage of Max.
Auto-Zero DRO's when homed	The DRO to 'zero' when received home signal.

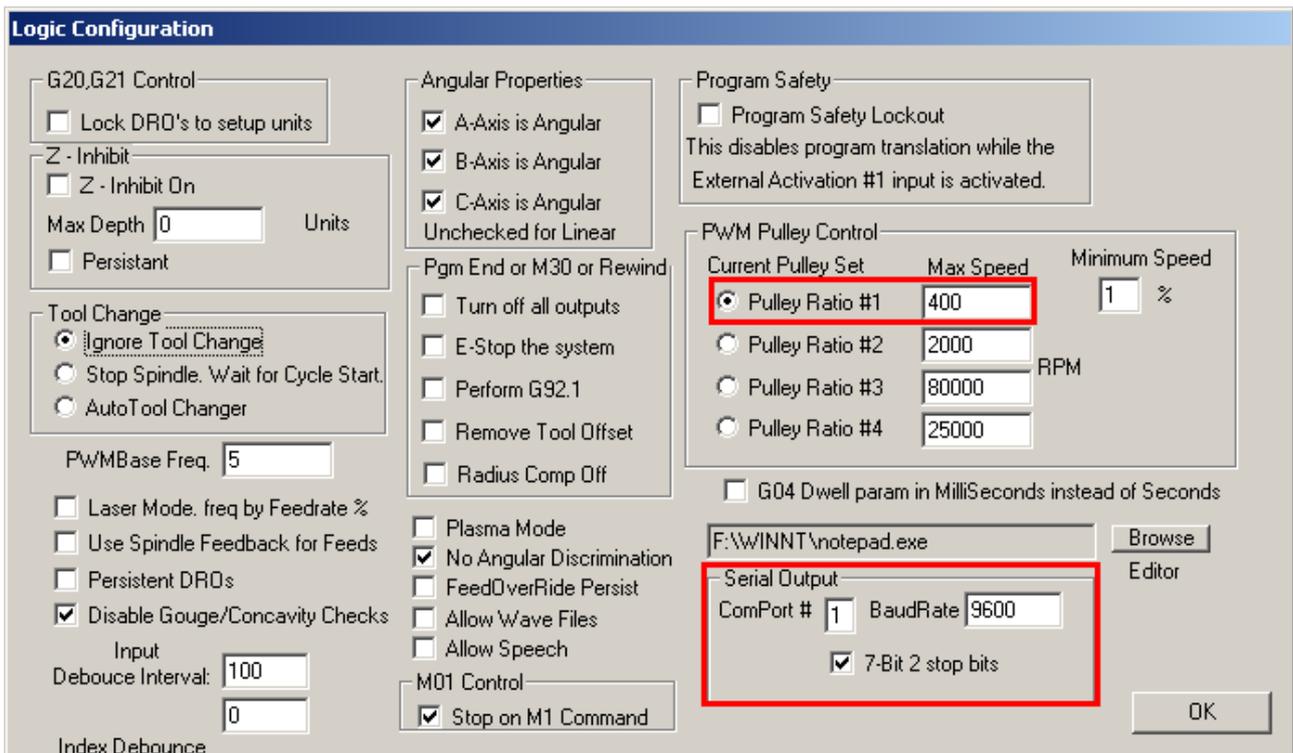
Reference direction	Reference direction to home.
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Foundertop CNC Machine home definition

MoveAxis	Home position	Direction to home
X-axis	Near X-axis up limit switch	X --
Y-axis	Near Y-axis down limit switch.	Y --
Z-axis	Z-axis down.	Z --
Z height reference	Near down limit switch.	Z --

8. Setting spindle speed.

MACH2 mune: Configure / Logic



Serial Output	In Foundertop CNC system, the command for tool exchange is given by COM1 of PC. Above figure show the setting of serial port.
Pulley Ratio #1	The spindle we installed is Max. 24000rpm, it is correspondence to frequency 400 Hz on inverter (Some of spindles with different Max. rpm, ig. A type of 3.2KW spindle with Max 18000rpm, it is correspondence to frequency 300 Hz), this parameter will limited the max. value of 'S' command. For example, When you run command S200, the inverter will accept frequency 200 Hz and show it on the indicator of inverter, meantime, it will control the spindle turning on around 12000 rpm; When you run command S550, the data is over than the limited 400, the inverter will still work on the max. 400 Hz, and spindle turning on the max. 24000 rpm

CNC machine operation steps

1. Make sure parallel and serial port of PC have good connection with CNC controller.
2. Make sure RS485 of inverter of and CNC controller have good connection.
3. Make sure CNC's motors, limitation/ home and emergency signal have correct connection.

4. Make sure the spindle and inverter have good connection.
5. Turn on PC.
6. Turn on CNC controller power switch, spindle power (inverter) switch, cooling pump power switch and the dust collector.
7. Start Mach2.
8. Push the button "RESET" of MACH2.
9. Using CNC router.

Finish to use the CNC machine

1. Turn off the power switch of spindle and dust collector.
2. Turn off the power switch of cooling pump and vacuum pump.
3. Turn off the power switch of CNC controller.
4. Quit Mach2 software.
5. Turn off PC.

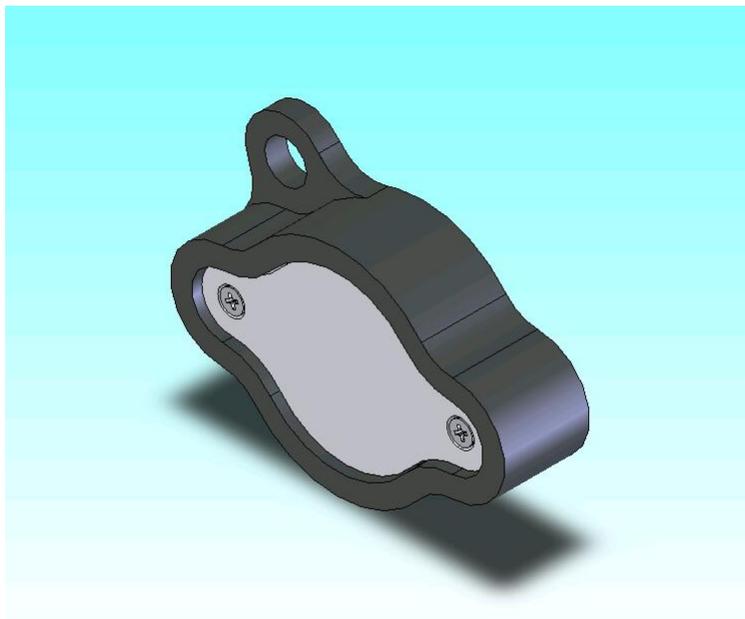
Printer port on PC is shared port, besides Mach2, it will be driven by the other software, but CNC will work depend on the signal on this port. So it is forbidden turning on the main power of CNC when PC don't not run Mach2.

Warning: Don't change the cutter when CNC main power is on. It will be harmful to operator.

We strongly propose you don't use the PC for other software when the PC is controlling the CNC machine, otherwise it may have the machine working abnormal.

Usage of the Z-axis height reference (option)

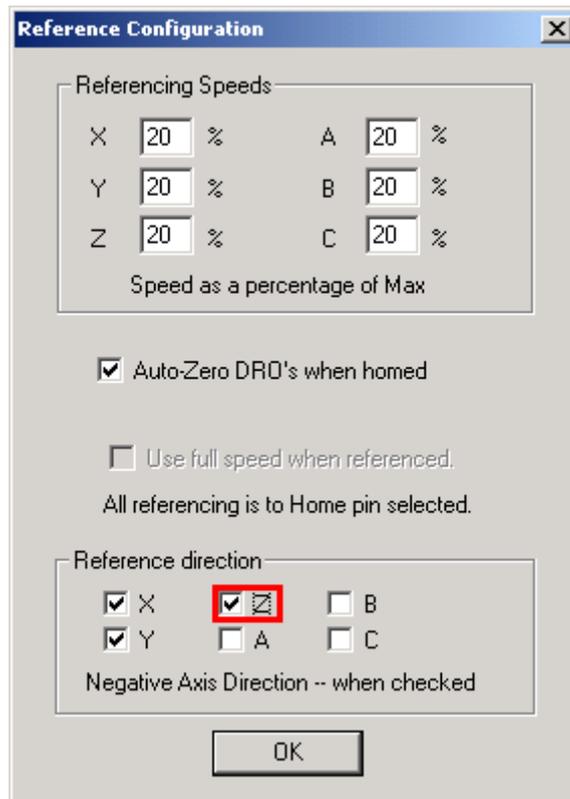
Z-axis height reference is used to fix the distance of bit to the surface of product. Below is it's detail information:



Be sure that direction to home for Z-axis is Z-- before use Z-axis height reference.

MACH2 menu:: Configure / Config Referencing

MDefine the home for XYZ-axis in window:



When use Z-axis height reference, put the height reference under bit, click key “Z-axis home key”, Z-axis will down slowly stop when it touches Z-axis height reference. Z-axis indicator will be set “0”.you defined Z-axis home.

Detail information for defining XYZ-axis reference, please take reference of Mach2 user manual.

Warning: Don't put Z-axis height reference device on the CNC Machine body directly when you using it to define Z-axis home. Z-axis height reference is logic high, but CNC router is grounded.

Maintenance:

To keep any mechanism with moving parts adequately lubricated, it is important to perform routine and scheduled maintenance. CNC routers are no exceptions.

Routine maintenance:

1. Clean the dust and remains on the CNC Machine surface and guiding grill with a vacuum cleaner.
2. Clean the bit and its holder daily.
3. Don't touch the slider with bare hands to prevent rust.
4. Use distilled water as cooling water. Do not use tap water.

Periodical maintenance

For frequently used CNC routers, the monthly scheduled maintenance is highly recommended.

1. Clean the rack and slide of X-axis and working surface. Check wiring of X-axis limit switch and home switch to make sure the connections are solid. Check the bolt connection. Unpack the gantry and check the synchronization belt. (Push in the middle of the belt with your thumb or index finger and you should be able to easily push it down about 5mm). If the synchronization belt has too much slack, it should be adjusted by moving the position of the wheel. When finished, add lubricant to the gear and slide contacting surfaces and move the gantry back and forth a few times.
2. Clean the rack and slide of Y-axis and working surface. Check wiring of the Y-axis limit switch and home switch to make sure the connections are solid. Check the bolt connection. Unpack the gantry and check the synchronization belt. (Push in the middle of the belt with your thumb or index finger

- and you should be able to easily push it down about 5mm). If the synchronization belt has too much slack, it should be adjusted by moving position of the wheel. When finished, add lubricant to the gear and slide contacting surfaces and move the Z-axis base back and forth a few times.
3. Take out the protection cover for the Z-axis. Clean out dust and remains. Check for loose screw and nut. Check wiring of the Z-axis limit switch and home switch to make sure the connections are solid. Check the bolt connection. When finished, add lubricant to the slide screw and Z-axis surfaces; move the Z-axis up and down a few times.
 4. Check the gantry for loose bolt and nut. Tight it up if it's loose.
 5. For the electrical components, check connections; check for bent or damaged pins; check each connector and wiring.
 6. Open the controller cabinet and clean the dust. Check the wiring and electric connections. Check switches and push buttons.
 7. After the above mentioned maintenance tasks are performed, the CNC router can now be tested with the software (i.e. MACH2). Check homing of each axis (X, Y and Z axes); check limit switches; check moving direction of the axes. You may now run a test application for about 10 minutes. If all is well without losing steps, then the maintenance tasks are successfully completed
 8. For the maintenance of the dust collector and vacuum pump, please refer to the corresponding user's manuals.

For CNC routers that are not used often, the above listed maintenance may be performed once every six months.

Other Maintenance Items

1. Install virus protection software and update virus definitions automatically or whenever the system is connected to the network. Defragment the hard disk on a regular basis.
2. Do not run any programs that are infected with virus.
3. If the CNC router is going to be left unused for a long period of time, please add antirust oil to the slide and make it air tight. Keep CNC router covered so it is protected from dust.
4. Replace the cooling water of spindle and vacuum pump periodically.
5. Please install the CNC router where humidity and temperature are within the specifications defined in this manual.