

JY5300 CNC CONTROLLER & MHC2 HANDWHEEL USER GUIDE V3.0

*For JY5300-V2 released July 2013



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CNC Machine Controller JY5300-OPTO-ISOLATED

Special Features:

- 1) Auto-check and output relay terminals
- 2) Handwheel pendant and MACH3 can communicate by serial Modbus.
- 3) PWM DC Spindle control board, support MACH3 gcode control (M3 command) to set the spindle speed. Also user can switch to manual control spindle speed
- 4) Support CNC to 3D Printer extruder (Can check our website for detail)
- 5) New features board with parallel port input and output high speed opto-isolation (New version of JY5300 with USB power at the back panel)
- 6) With digital hand wheel controller
- 7) Motion memory function. Can record the motion from Computer (e.g. Mach3), or hand wheel controller. Can play back the whole motion without computer controller.
- 8) Hand wheel controller with LCD display, can show X, Y, Z and A position up to 0.01mm
- 9) Hand wheel control motion smoothing function. Embedded acceleration and deceleration in hand controlling.
- 10) Can stand alone control up to 5 axis stepper motor (standard package is 4 axis) without Computer connected
- 11) Constant speed spindle motor function. Can detect spindle motor speed and provide more power automatically once the speed is dropped down. Fulfill low speed high power usage.
- 12) Spindle motor overcurrent protection, prevent motor board and motor damage
- 13) PWM spindle motor control with electronic acceleration and deceleration, extent the life of motor.
- 14) X, Y, Z axis Limit switches anti-crash function, once limit switch is triggered, the machine will automatically drive back 5 mm, prevent crash accident.
- 15) Independent control board. 1 pcs main board, 4 or 5 pcs stepper controller board and 1 pcs Spindle motor controller board. Easy to maintenance, repairing and replacement.
- 16) High velocity performance, velocity can drive up to 3500mm / minute, acceleration up to 400mm/s²
- 17) Extension function can connect to 800W or above water cooling type AC spindle Motor controller **Detail can consult sales*

Specification:

Item		Description	Parameter	Remark
Socket	Number of Slot	Stepper Driver Board	5	*Standard package with 4 Stepper Driver Board
		DC Spindle Motor Driver Board	1	
		Water Cooling system	1	*support 12V water pump
		Limit Switch X Y Z	1	
		External Controller	1	*support handwheel
		PC Parallel Port	1	
		USB to Serial Modbus	1	*must connected for opto- isolation power 19200 baudrate Mach3 modbus
		Auto check terminal	2	
		Relay Output (3A 110 to 220V)	2	
Stepper Motor Driver Board		Operating Voltage	24DCV	
		Maximum Current	3DCA	
		Micro-Stepping divider	1:8	
	Hand Wheel Control	Maximum Acceleration	200mm/s ²	320 Steps per mm
		Maximum Deceleration	200mm/s ²	
		Maximum Speed	3500mm/min	
	MACH3 Computer Control	Maximum Acceleration	300 mm/s ²	
		Maximum Deceleration	300 mm/s ²	
		Maximum Speed	3500mm/min	
Stepper Motion Memory		Number of Memory Region	4	
		One Region Max Record Time	30minutes	
		Maximum Memory Speed	3500mm/min	
DC Spindle Motor Driver Board		MACH3 PWM / Manual PWM control	Rotary switch selection	
		Operating Voltage	48DCV	
		Maximum Current	7DCA	Auto-shutdown protection
		PWM Speed Control	0 to 100% 1KHz	
		Constant Speed Tolerance	5 to 15%	Tested in 300W 12000RPM DC Motor
		Maximum Acceleration	~3000RPM/s	
		Maximum Deceleration	~3000RPM/s	
Input Electricity		110/220VAC 50/60Hz		
Hand Wheel LCD		Dot Matrix 128X64 with backlight		

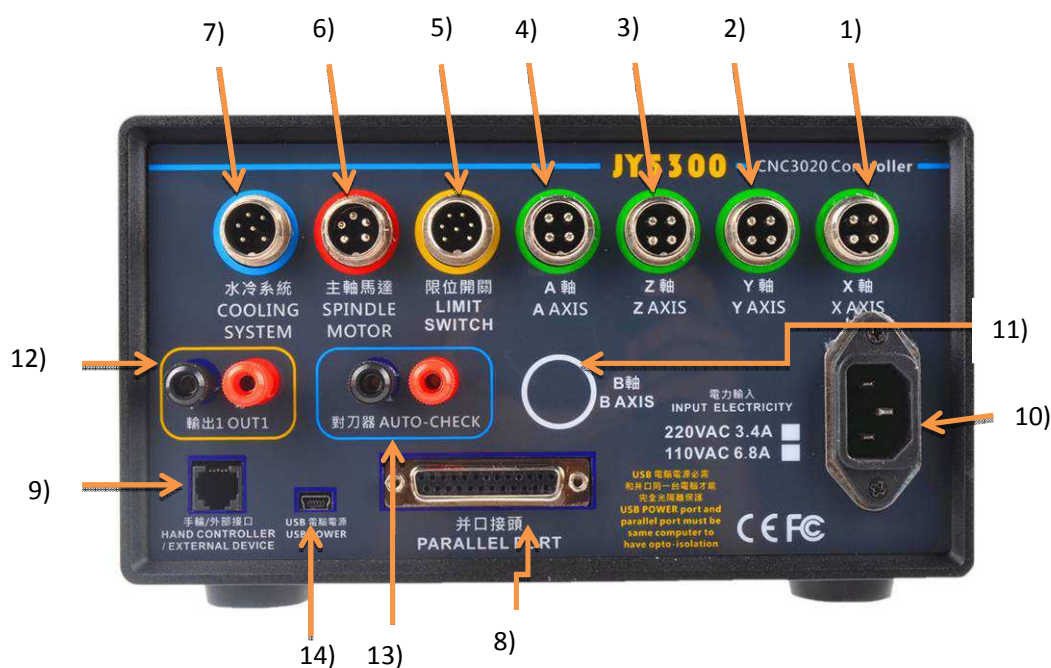
Display		16 button		
		Inch or mm mode		
		Support Mach3 Modbus communication		
		Cable Length	3m	
		Hand Wheel Encoder	100 PPR	
		Number of Axis	4 Axis	
Size	Controller Box	(LXWXH)mm	330X220X120	
Weight		net weight (kg)	4.3	

Control Box Structure



Controller Box Button:

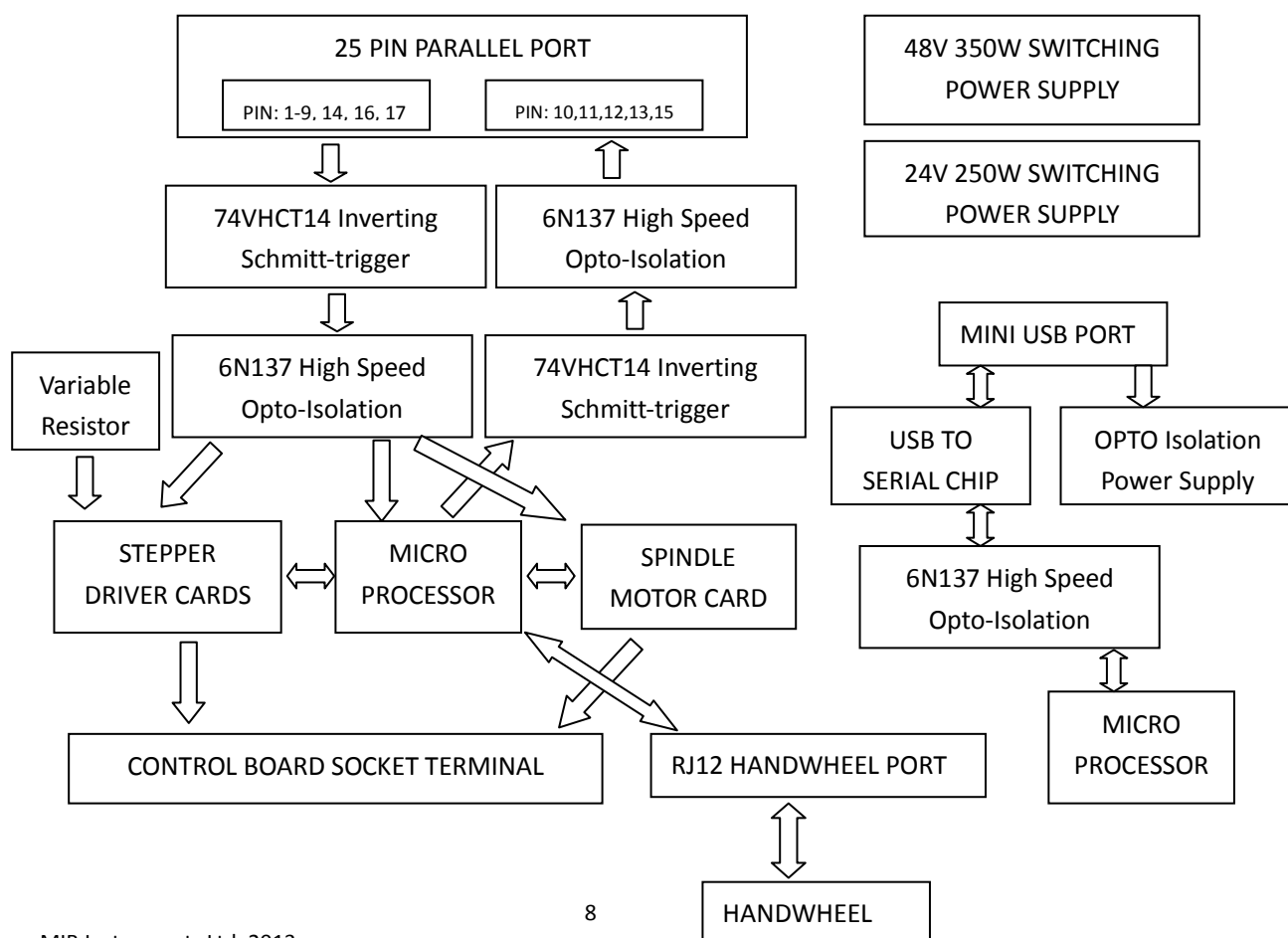
- 1) **Main Switch:** Power ON/ OFF the whole controller
- 2) **Emergency Stop:** Power off the whole controller, don't use it as power on off switch; it is just for emergency situation.
- 3) **Spindle Motor Speed:** Rotary knob to control the speed of spindle motor
- 4) **PC/ Hand Controller:** Switch to PC/ Hand wheel mode, pressed is Hand Controller mode
- 5) **PC PWM Mode:** Tune to hear you will "TAK" sound, enter MACH3 PC pwm spindle controlling mode



Socket:

- 1) **X Axis:** Connect to X stepper motor
- 2) **Y Axis:** Connect to Y stepper motor
- 3) **Z Axis:** Connect to Z stepper motor
- 4) **A Axis:** Connect to A stepper motor
- 5) **Limit Switch:** Connect to machine limit switch
- 6) **Spindle Motor:** Connect to spindle motor
- 7) **Cooling System:** Connect to water cooling system (if exist)
- 8) **Parallel Port:** Connect to Computer parallel port
- 9) **Hand Controller / External Device:** Connect to hand wheel controller, or other controller
- 10) **Input Electricity:** 110V or 220V AC (Fixed rating, marked on the controller box)
- 11) **B Axis:** Connect to B stepper motor (* reserved connector port)
- 12) **OUT 1:** Relay output port
- 13) **AUTO CHECK:** For AutoCheck device
- 14) **USB Power:** Connect to USB port of the computer; don't use other power source like USB adapter. And will create a USB serial com port for Modbus control

Mainboard

Block Diagram:

With high speed 10Mb/s opto-isolation between PC and control box. Prevent the ground loop damage.

Total 17 pcs 6N137 high speed opto isolation ic for all inputs and outputs, at all parallel port pin with level shifter to enhance the signal.

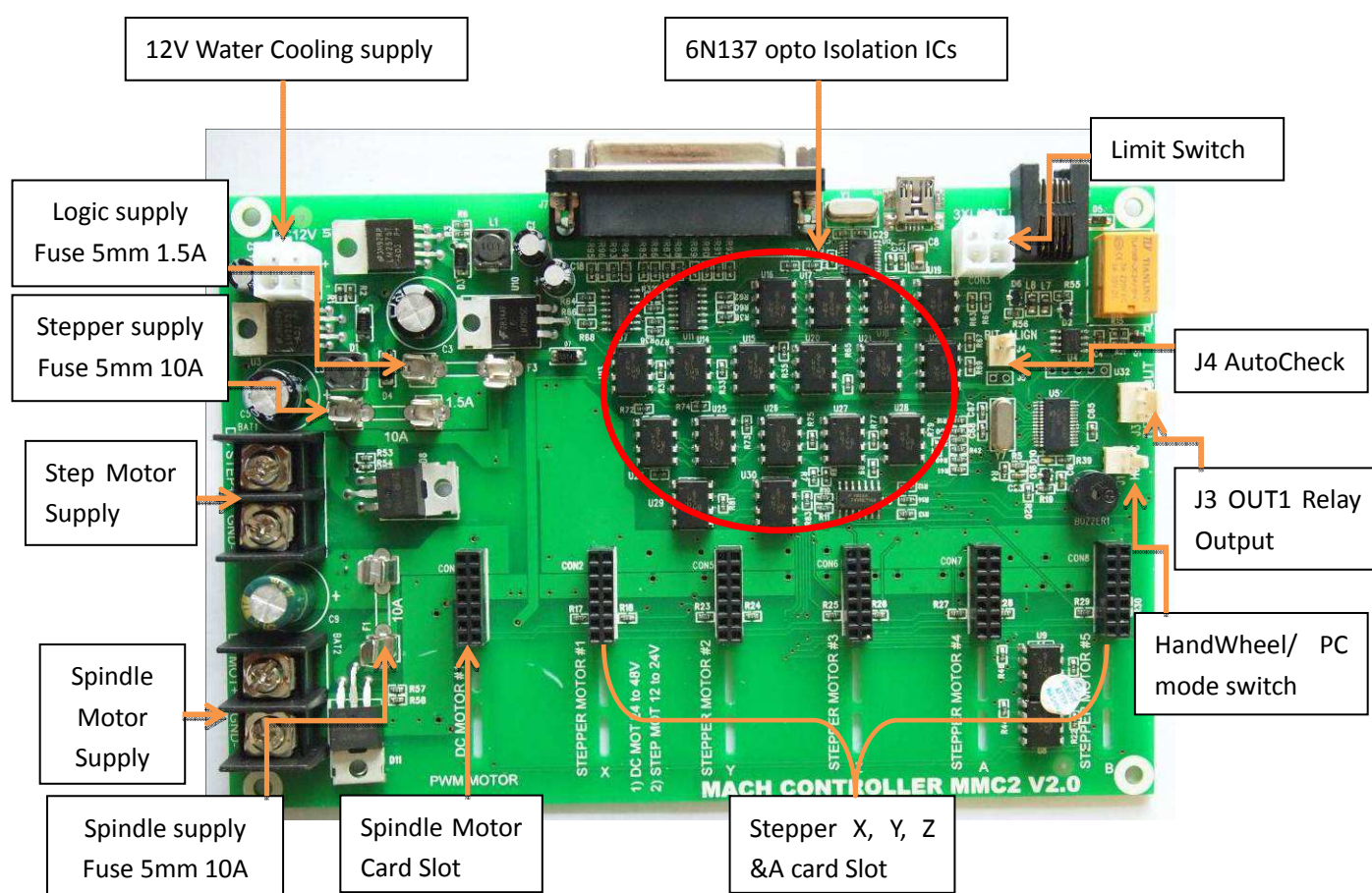
Card slot design, support up to 5 stepper driver cards and one spindle motor card. Can replace or add new card easily

Dual power supply input, one for spindle motor up to 48V, separate 24V power for stepper motor driving.

Support handwheel, limit switch, and relay output, auto check function, water cooling system and system fan cooling.

USB port to provide Modbus communication to MACH3

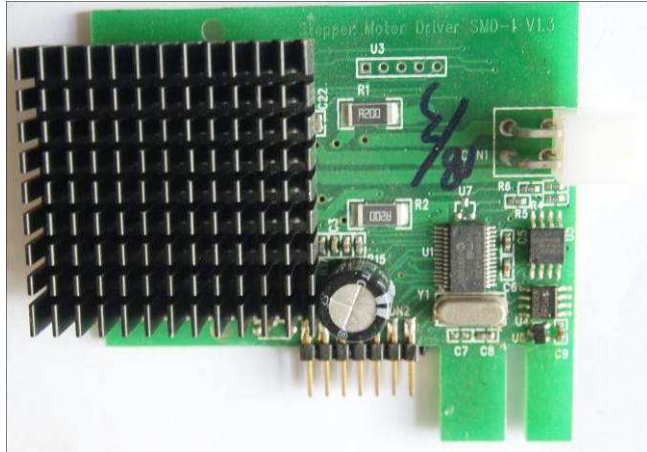
Power plug with EMI filter to prevent AC noise



Stepper Driver Card

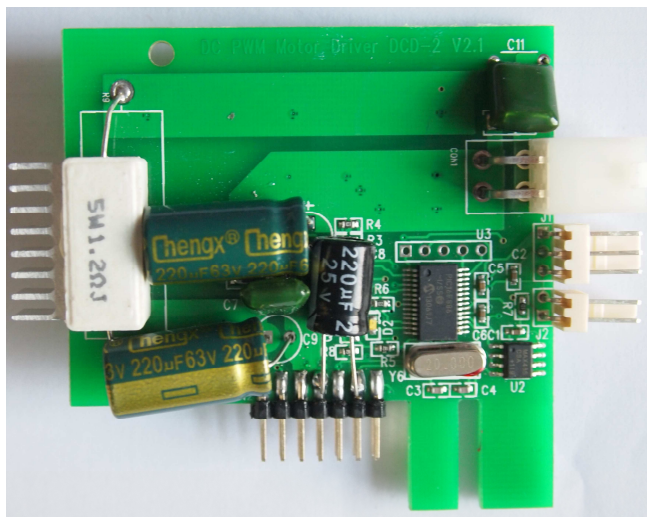
Using Toshiba TB6560 3A high current stepper motor card, with independent microprocessor control.

With 32Mb flash memory to record the motion up to 30 minutes, can record simple motion by handwheel and repeat the simple work.



DC Spindle Driver Card

Constant speed PWM control, with high speed microprocessor to calculate the software acceleration and deceleration. Real time monitor the spindle current and spindle motor speed.



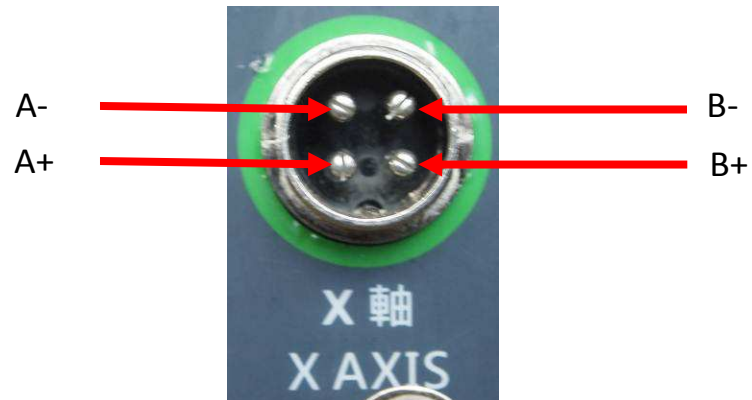
AC Spindle Driver Card

Can connect to external AC spindle control box JY800W and use higher power spindle motor up to 800W or more.



Socket Pin Diagram

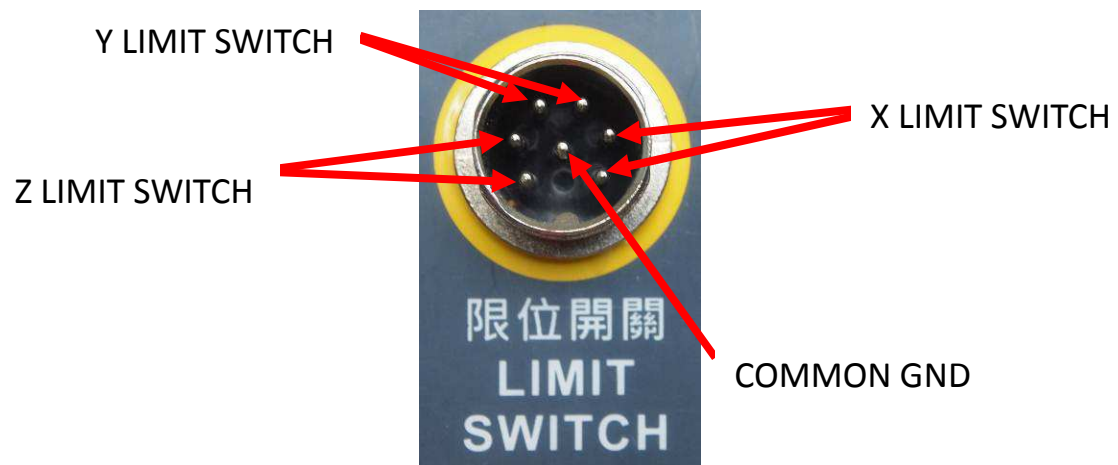
Stepper Motor:



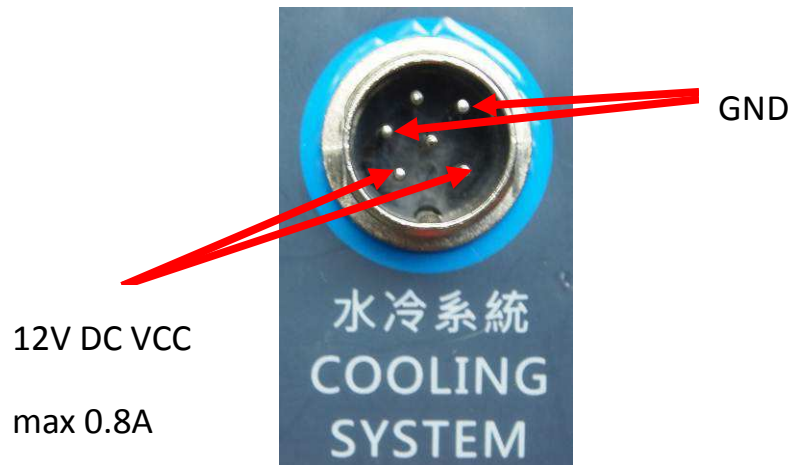
Spindle Motor:



Limit Switch:



Water Cooling:



First Installation

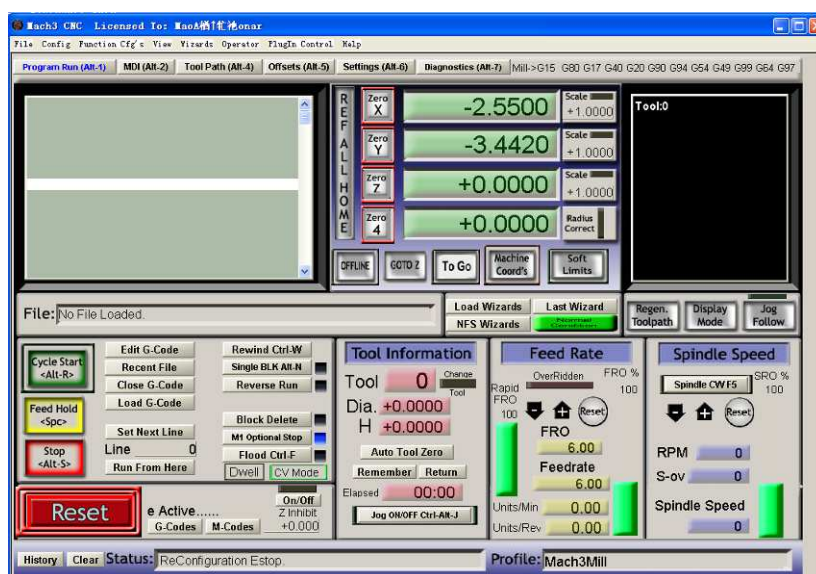
- 1) Switch to Power Off before installation
- 2) Connect all cable according to the marking on the cable. Follow the marking: "X" to X axis, 'Y' to Y axis, etc. Connect X, Y, Z, A and B stepper motor, spindle motor, electricity input, hand wheel controller (A, B stepper motor and water cooling is optional order) and USB cable, *please connect to the same computer USB's port to have opto-isolation function.
- 3) Double check the cable connection.
- 4) Tune the spindle motor speed's rotary knob to 0% (When you tune the rotary knob to turn off mode (Tick sound heard) will need Gcode command M3 to start the motor on off)
- 5) Inspect the whole machine without abnormal situation, like missing parts, obstacle, etc.
- 6) Release the emergency stop and then power on
- 7) "Beep" sound is heard once the main board is ready
- 8) Check the hand wheel controller, the LCD is on
- 9) Press "Speed" to X10 on hand controller, select "X" motor (*detail can see the hand controller instruction)
- 10) Try to move X, Y, Z, stepper motor by handwheel or arrow key on keyboard (make sure you turn on the jog mode and set to cont or step). Check that it is working or not
- 11) Tune the spindle motor speed rotary knob to 100%, spindle motor should start to work
- 12) Tune back the spindle speed to 0%
- 13) Connect the parallel cable to computer (if not connected)
- 14) Follow the instruction of " MACH3 Setup" section
- 15) Press direction key in keyboard to check the motor is working
*make sure to clear the Emergency Stop status, (external emergency stop can be cleared in hand wheel controller's "ESTOP" button, soft emergency stop can be cleared in MACH3 left bottom's "EMERGENCY" button).
- 14) If there is any problem, please contact the sales' representative

MACH3 Basic Setup:

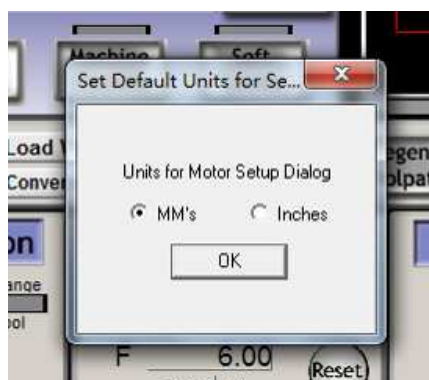
You should purchase the MACH3 or try the demo version from

<http://www.machsupport.com/>

- 1) Setup hardware according section “First Installation”
- 2) Connect Parallel port cable to PC
- 3) Connect USB cable (It is must to power on the control board)
- 4) Go to computer BIOS setup, set parallel port to ECP mode
- 5) Make sure you are using 32Bit XP, Win2000, 32 Bit Win7 OS with 25 pin printer parallel port. (USB to Parallel port convertor is not worked).
If you don't have a printer port, then you can purchase PCI parallel port card with ECP mode
- 6) Install MACH3 software
- 7) Install USB driver for Modbus handwheel control (If you don't need handwheel work with Mach3 then you can ignore it)
- 8) Open Mach3 -> Mill



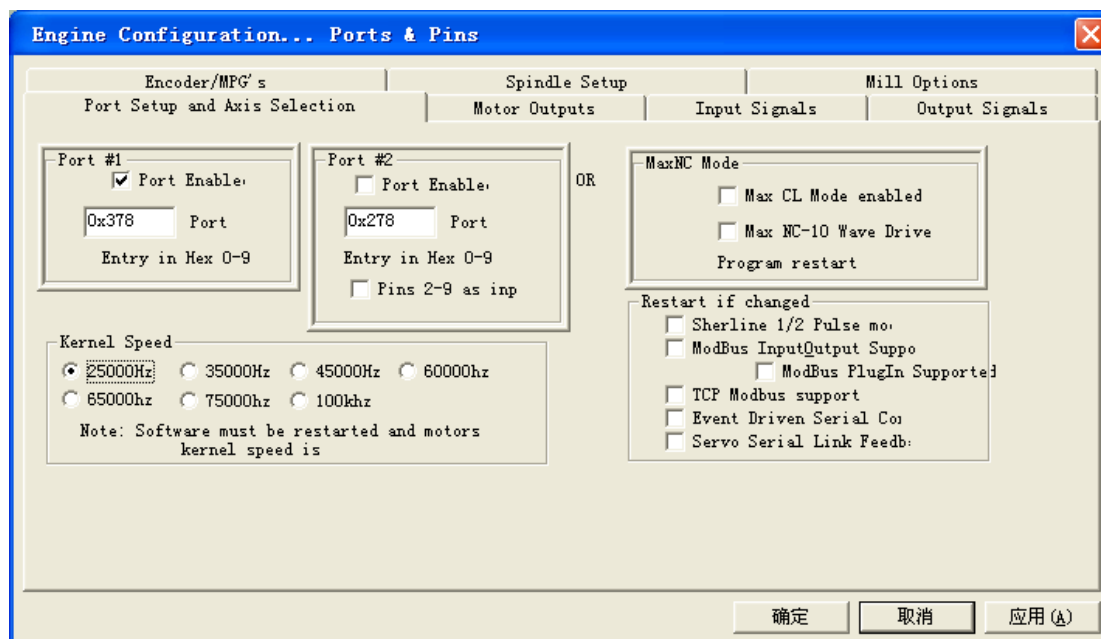
- 9) Select “Config”, click “Select Native Units”, and then select mm or inch
Better to choose “mm” as follow



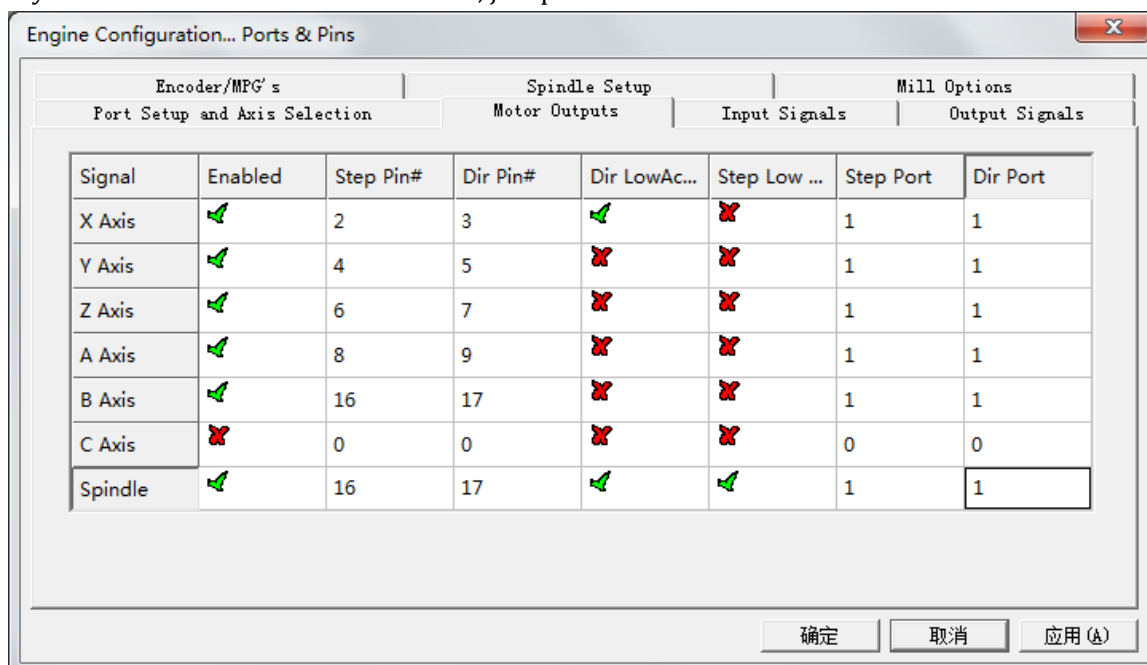
6) Select "Config", "Ports and Pins", choose 25000Hz for stepping motor

Set the correct parallel port number, normally default is 0X378, if you are using PCI card type parallel port, then it may be different, you can check your correct port address in hardware device-> ports & LPT.

Follow the below photo's pinout setting



If you want to invert the axis's direction, just press the Dir Low Active.



Engine Configuration... Ports & Pins

Encoder/MPG's		Spindle Setup		Mill Options		
Port Setup and Axis Selection		Motor Outputs		Input Signals	Output Signals	
Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey
X ++		1	15			0
X --		1	15			0
X Home		1	15			0
Y ++		1	11			0
Y --		1	11			0
Y Home		1	11			0
Z ++		1	12			0
Z --		1	12			0
Z Home		1	12			0
A ++		1	0			0

Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be

Automated Setup of Inputs

确定 取消 应用 (A)

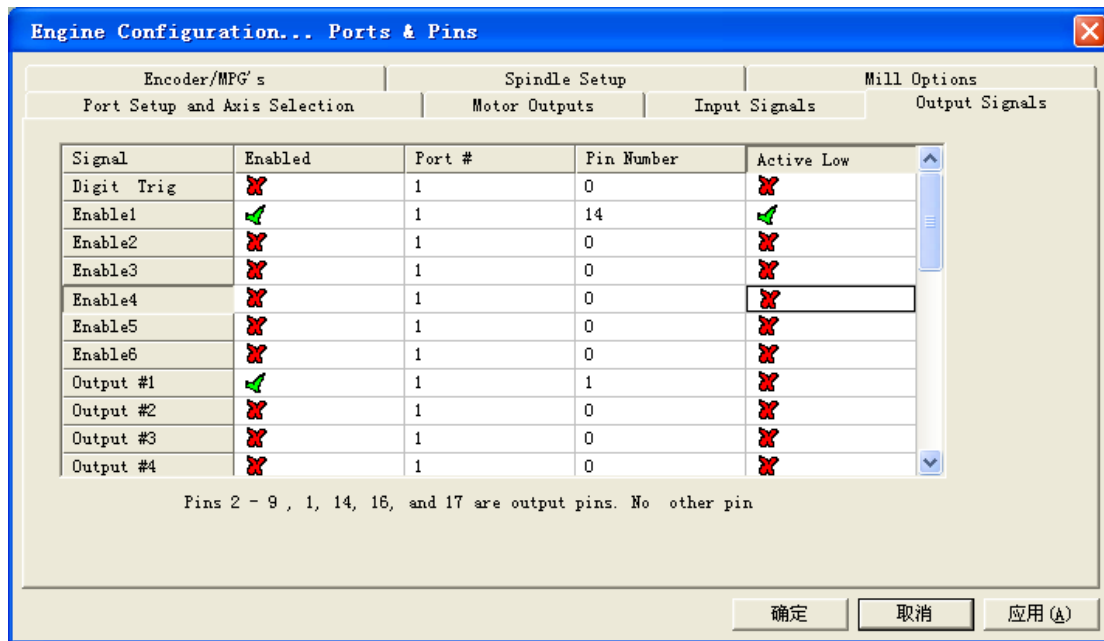
Engine Configuration... Ports & Pins

Encoder/MPG's		Spindle Setup		Mill Options		
Port Setup and Axis Selection		Motor Outputs		Input Signals	Output Signals	
Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey
Index		1	0			0
Limit Ovrd		1	0			0
EStop		1	10			0
THC On		1	0			0
THC Up		1	0			0
THC Down		1	0			0
OEM Trig #1		1	13			0
OEM Trig #2		1	0			0
OEM Trig #3		1	0			0
OEM Trig #4		1	0			0

Pins 10-13 and 15 are inputs. Only these 5 pin numbers may be

Automated Setup of Inputs

确定 取消 应用 (A)



- 7) Select "Config", click "Motor tuning", select X Axis firstly and set as below photo. Remember to press "SAVE AXIS SETTINGS" after you modify each axis as below. REMEMBER to press SAVE AXIS SETTINGS Button
- And then press Axis-> Selection on the right hand side, select Y, Z, A and B. Follow the same steps as X setting.

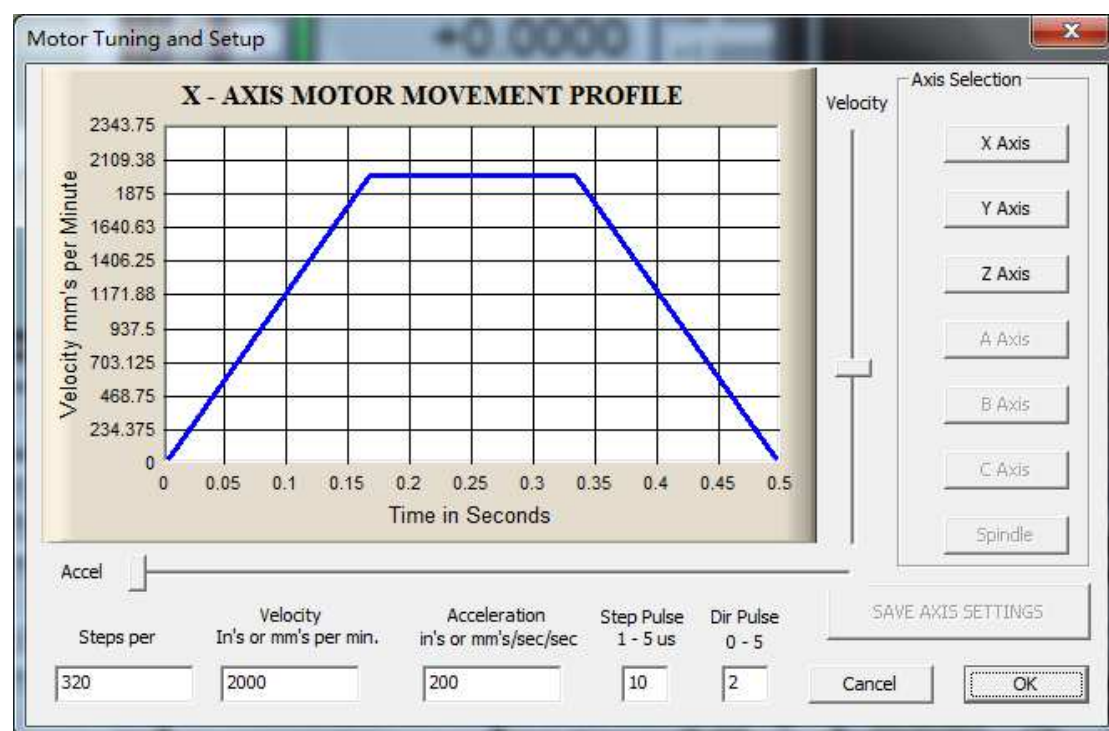
Steps per mm must be 320, (For MIB Instruments' CNC3020, CNC3040 CNC6040 model)

For inch is 8128

Velocity can be 0 to 3500 mm per minutes or 137 inch per minutes

Acceleration can be 20 to 400 mm/s or 1 to 16 inch per minutes

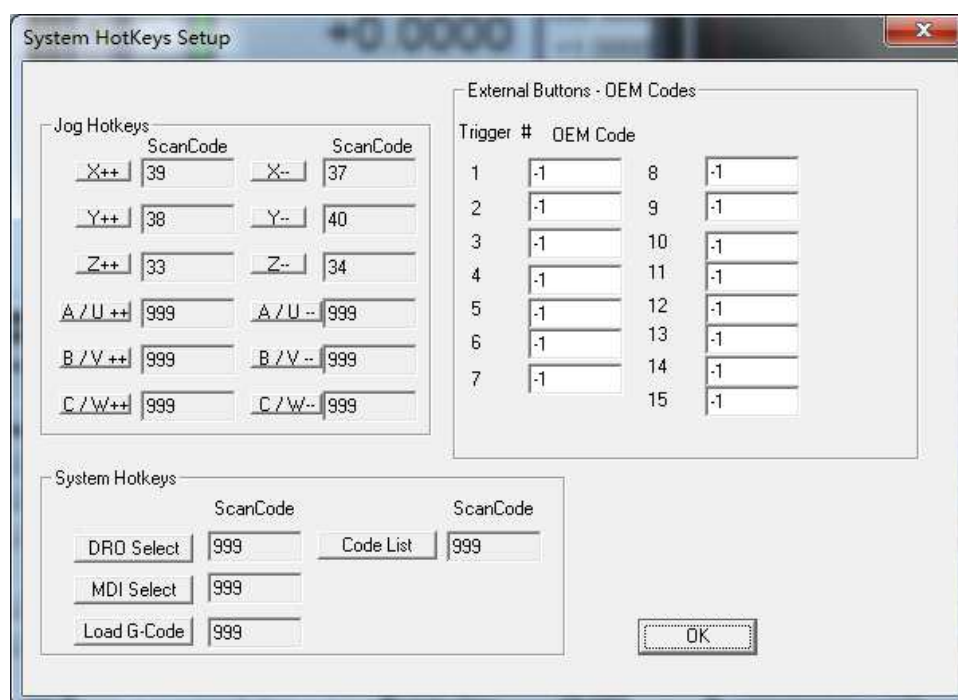
Step Pulse better to be 10us, or 5us, too low will lose step. Dir Pulse is 2us



Continue for Y, Z, A axis setting

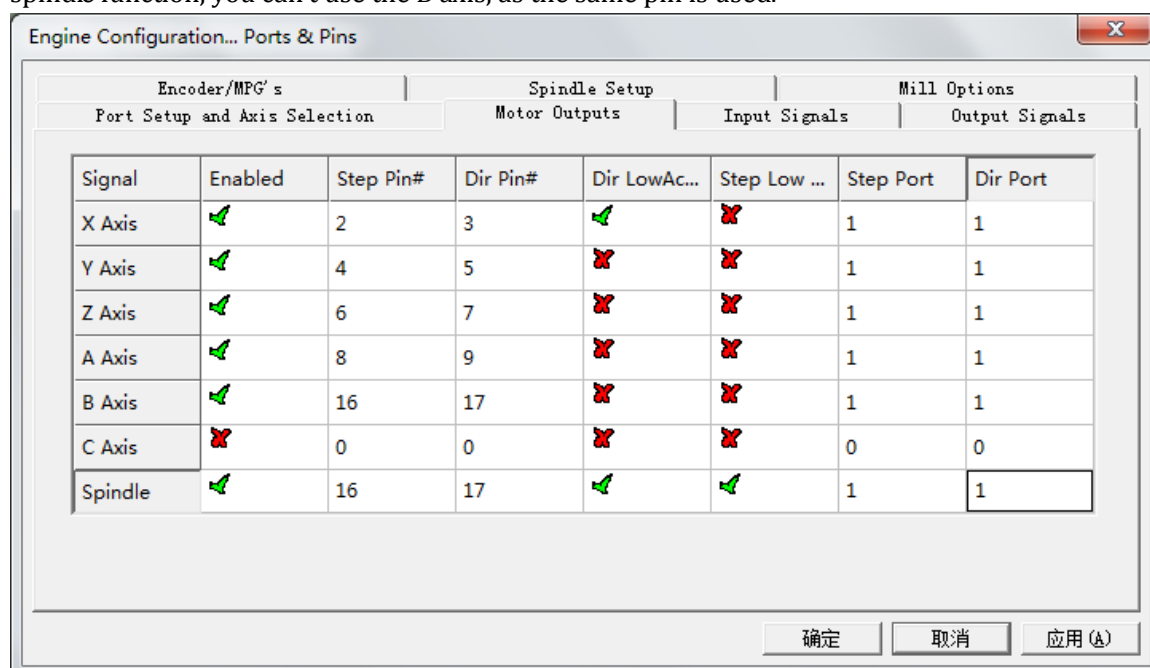
- 8) And then go to Config-> System Hotkeys. You can set the control button of your keyboard. Default X, Y and Z are set as direction UP, DOWN, LEFT, RIGHT, PAGE UP and PAGE DOWN key. You can then press A/U++ and then press keyboard's "<", press B/U-- and then press keyboard's ">", press B/V++ and then press keyboard's "M", press B/V-- and then press keyboard's "N".

Then you can use keyboard to control axis's motor.

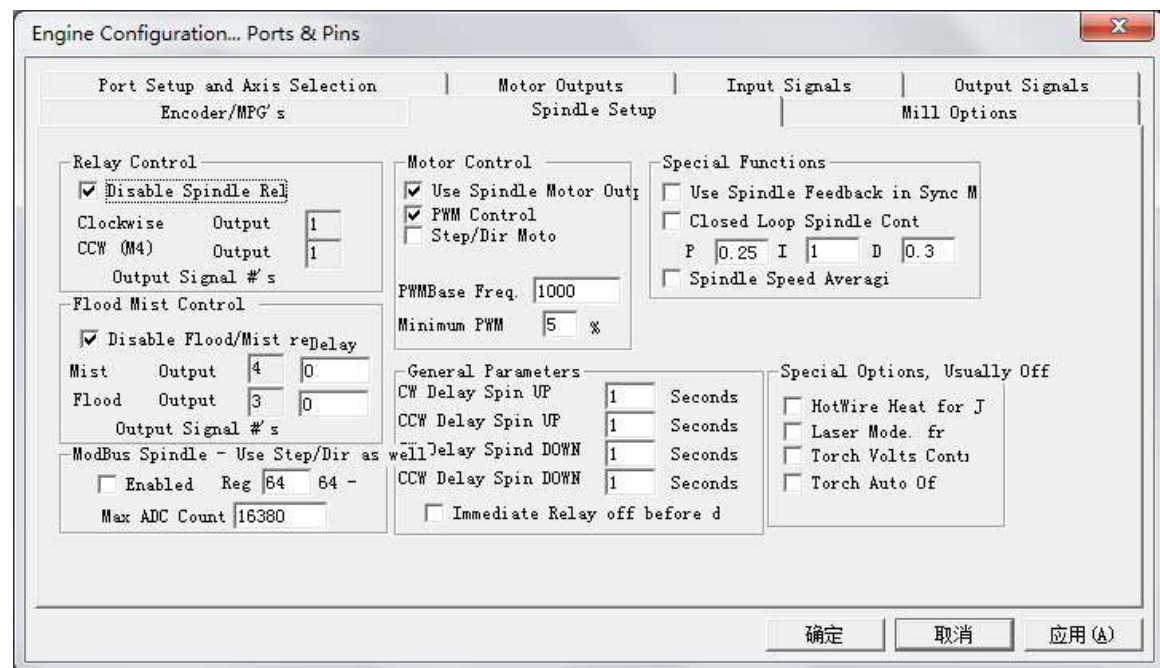


- 9) And then we can set the SPINDLE motor setting, this will allow g code M3 command to turn the spindle on and M5 to turn it off

Make sure you have check the SPINDLE to Pin 16, 17 and once you use MACH3 PWM spindle function, you can't use the B axis, as the same pin is used:



- 10) Inside Config-> Ports & Pin -> Spindle Setup follow the below setting in Motor Setup:



1000Hz is recommended.

11) You can turn the spindle on off by adding command inside G code:
Insert " M3 S1000" to start spindle with speed 1000, "M5" to stop

Run a demo G Code

Inside the CD the G code example has a Chinese word example_gcode_chinese_word.ncc 雕.
I have put the M3 S1000, to start spindle motor and control the speed to 1000.

In this demo G code can then test the X, Y, Z and spindle motor.

- 1) Turn the rotary switch to PC PWM zone ("Tak" sound is heard)
- 2) Follow the step in Application Tutorial-> Basic Control in MACH3

HandWheel Controller



LCD Display:

Axis Position display: +/-000.00mm to +/-999.99mm

Or in inch mode +/-00.000 to +/-99.999 inch

Button:

X/ESC:

- Press and release to set as X axis control
- Press and release to escape or back to normal
- Press and hold to set X ROLLING mode

Y/<:

- Press and release to set as Y axis control
- Left direction button at Memory mode
- Press and hold to set Y ROLLING mode

Z/>:

- Press and release to set as Z axis control
- Right direction button at Memory mode
- Press and hold to set Z ROLLING mode

A/Ent:

- Press and release to set as A axis control
- Confirm button in Memory mode
- Press and hold to set A ROLLING mode

Zero:

- Press and release to set current position as zero

Back to Zero:

- Press and release and all axis motor will move back to zero position

Divide to half: (HC mode only)

- Motor will move to the current position/2, for example now is 10.00mm position of X. then X axis will then move to 5.00 mm position



Speed:

- a) Press and release to set speed to X1->X2->X5->X10->X20

Spindle On Off:

- a) Press and release to switch the spindle on off (if you tune rotary switch to MACH3 PWM mode, need the M3 Mach3 code enable the spindle firstly)

Auto Check:

- a) Press and release to switch the AutoCheck function, PC mode will use the marco inside MACH3, in HC mode, it will use the embedded program inside microprocessor

Macro: (PC mode only)

- a) Reserved for user development by brain and Modbus to trigger a macro inside MACH3

Out1: (PC mode only)

- a) Can trigger the Output 1 relay J4 on mainboard,

Play/ Pause: (PC mode only)

- a) Start the G-Code and press again to pause, press again to play.

G-Code Restart: (PC mode only)

- b) Press and release and restarted the G code to first line

Memory:

- a) Press and release and go to memory mode

Estop:

- a) Press and release to set or clear Emergency stop
- b) Long press for 3 seconds can switch mm or inch mode (restart the controlling box power after setting)

Hand Wheel Controller Function:

Standard Motion Control:

Select the axis you want to control by press and release the “X”, “Y”, “Z” or “A” button. Control the selected axis’ stepper motor by rotate the hand wheel encoder. Direction is controlled by hand wheel rotational direction.

Speed can be set by “Speed” button,
X1 move 0.01mm or 0.001inch for 1 step,
X2 move 0.02mm or 0.002inch for 1 step
X5 move 0.05mm or 0.005inch for 1 step
X10 move 0.1mm or 0.01inch for 1 step

X20 move 0.2mm or 0.02inch for 1 step

Position will be displayed in LCD, showing 000.00mm to +/-999.99mm

Or 00.000inch to +/-99.999inch

You can set the current axis's position as zero by press and release "Zero" button.

Position will be memorized and will be recalled on power on.

PC/ HC mode:

PC is computer controlling; HC is Hand wheel Controller mode.

LCD will display "PC Mode" or "HC Mode".

During "PC Mode" hand wheel control axis stepper motor function will be prohibited.

Memory and Emergency Stop function is allowed in both controlling mode.

Memory:

a) SAVE:

In normal operating mode, press and release "Mem" button to Memory mode.

Use "Y/<" and "Z/>" button to scroll the mode to SAVE -> MANUAL -> LOAD -> LOOP, and choose SAVE mode, press "A/Ent" to confirm the SAVE mode.

And then scroll the M0, M1, M2 or M3, this is 4 memory region, choose the target memory region and press "A/Ent" to start recording the motion

b) LOAD:

Looping mode will repeat to load the selected memory region.

In normal operating mode, press and release "Mem" button to Memory mode.

Use "Y/<" and "Z/>" button to scroll the mode to SAVE -> MANUAL -> LOAD -> LOOP, and choose LOAD mode, press "A/Ent" to confirm the LOAD mode.

And then scroll the M0, M1, M2 or M3, this is 4 memory region, choose the target memory region and press "A/Ent" to load the recorded region.

c) LOOP:

Looping mode will repeat to load the selected memory region.

In normal operating mode, press and release "Mem" button to Memory mode.

Use "Y/<" and "Z/>" button to scroll the mode to SAVE -> MANUAL -> LOAD -> LOOP, and choose LOOP mode, press "A/Ent" to confirm the LOOP mode.

And then scroll the M0, M1, M2 or M3, this is 4 memory region, choose the target memory region and press "A/Ent" to start looping the recorded region.

Can press "X/Esc" and go back to normal operating mode.

d) MANUAL:

Can press "X/Esc" and go back to normal manual operating mode.

Emergency Stop:

Will enter emergency stop mode:

- 1) Press "EMERGENCY" in MACH3
- 2) Press "ESTOP" in hand wheel controller
- 3) Spindle motor overcurrent or abnormal situation is detected
- 4) Limit switch is triggered

LCD will show "ESTOP" once it is triggered.

While emergency stop, spindle motor, all stepper motors will be stopped.

Buzzer inside the main controller box will beep.

**not recommend to use emergency as stop function; motor will be stopped without normal deceleration. This will reduce the life of motors and mechanical structure.*

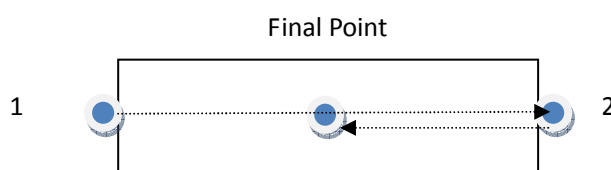
Can press again the ESTOP button in hand wheel controller and back to normal

Divide to half:

It is usually to use for finding the center of the material,

Go to point 1 press zero and then go to point2, press divide to half, and then the bit will go to center.

Be careful that you will need to move the Z axis up by yourself to avoid crash.



Back to Zero:

Press and hold the "SPEED" button for 3 seconds.

All axis motor will move back to the zero point according the hand wheel's zero display

**Position on hand wheel and Mach3 is not correlated. If you need to move back according MACH3 position, you need to press back to zero in MACH3*

Rolling:

Press and hold the "X", "Y", "Z", "A" button for 3 second, LCD will display "R" in corresponding axis.

The axis stepper motor will move forever in constant speed. There are 4 speed selections by press and release the "Speed" button.

Can control clockwise, counter-clockwise or stop by rotate the hand wheel, rotate counter-clockwise 1 step to have counter-clockwise rotation, rotate hand wheel one step clockwise to stop, etc.

Limit Switch:

At X, Y, Z axis, are installed 2 mechanical limit switch on both side. Once it is triggered, controller will send out limit switch triggered signal to PC and whole system.

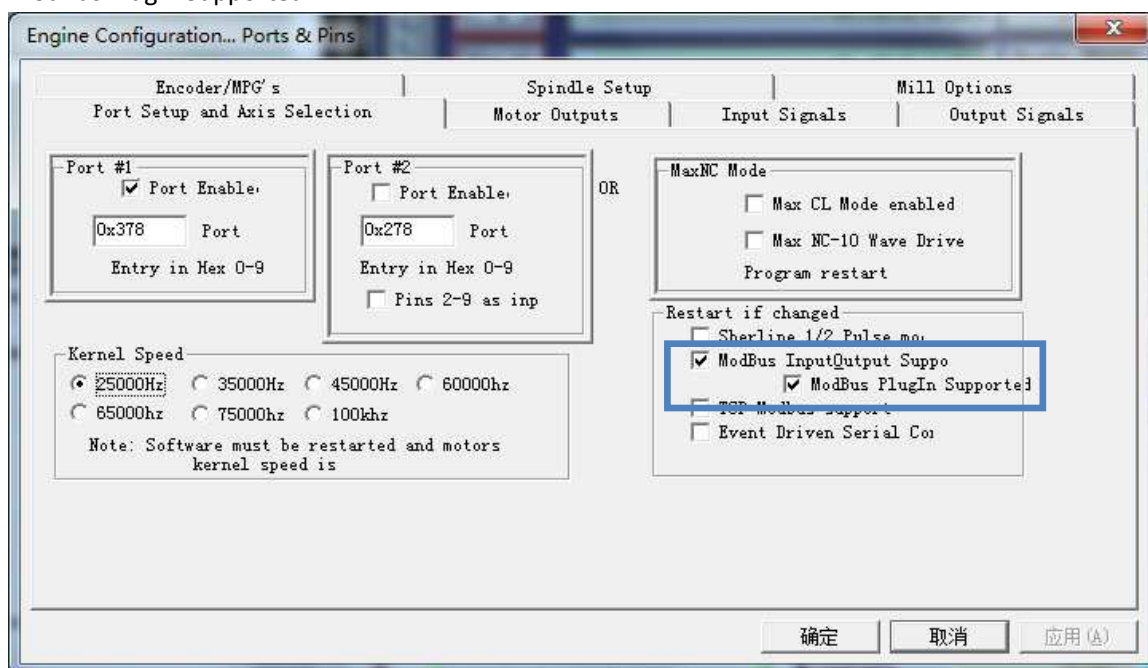
The triggered axis will drive back around 5mm immediately; this action can prevent crash, accident on human and release the limit switch.

*Reset the zero position is necessary once limit switch is triggered.

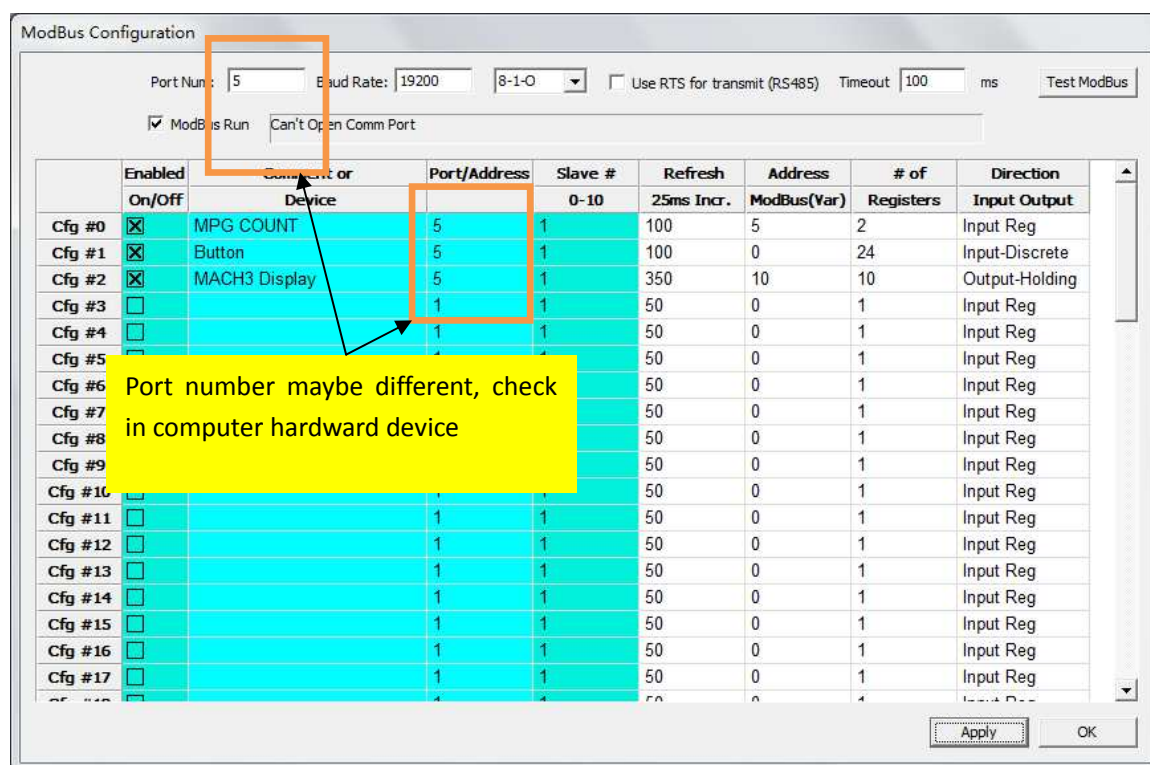
MHC2 Handwheel pendant MACH3 setup

Modbus communication and Mach3 brain control

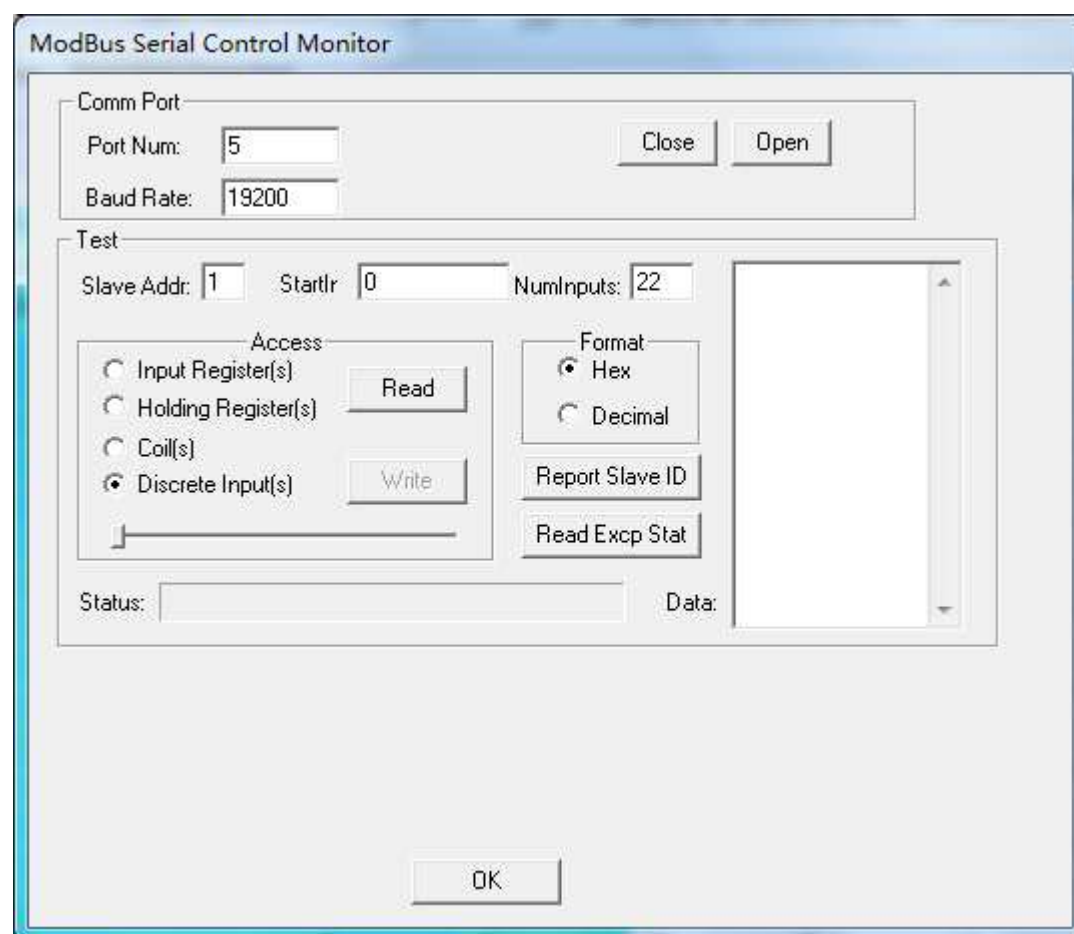
- 1) Install the control box USB driver, you can install the driver CH340 exe file inside CD
- 2) And then plug USB cable to control box
- 3) You will then find a serial COM port at My Computer->hardware device you will see a COM & LPT, a com port is marked CH340. Remember the port number.
The port number usually won't change if you always use the same USB port
- 4) Copy and paste the MHC2_Brain file from CD to C:\Mach3\Brains, if no Brains folder is found, you need to create one
- 5) Open MACH3 and you can go to PORTS & PINS and check ModBus InputOutput Support and ModBus PlugIn Supported



- 6) Close MACH3 and open again
- 7) Function Configurations-> Setup Modbus Serial Control:
Fill in all the parameter as below, ***FOR COM PORT NUMBER*** please enter the number you found in hardware device at step 3)

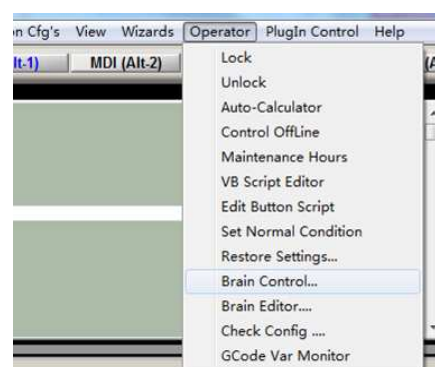


- 8) Press TEST MODBUS and fill as below (COM number use what you found) and then press OPEN to open port, press Read to check the modbus is normal or not. If ok, It will show NO ERROR and you will get number from modbus. Once you lost the connection between MACH3 and handwheel, you can enter this TEST MODBUS mode to reconnect.

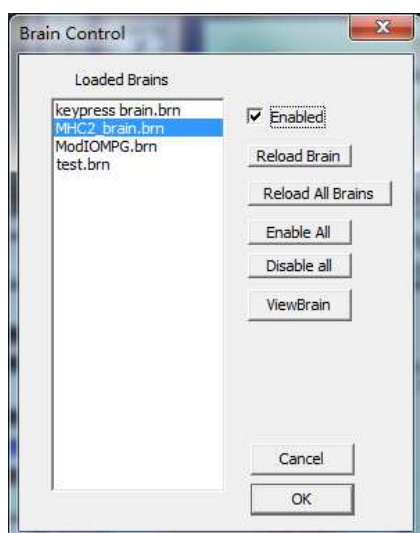


9) Press OK, and then press Apply and OK again. The serial Modbus is ready, then we will go to MACH3 brain control, brain control will then link all handwheel button to relevant MACH3 function

10) Go to Operator-> Brain Control

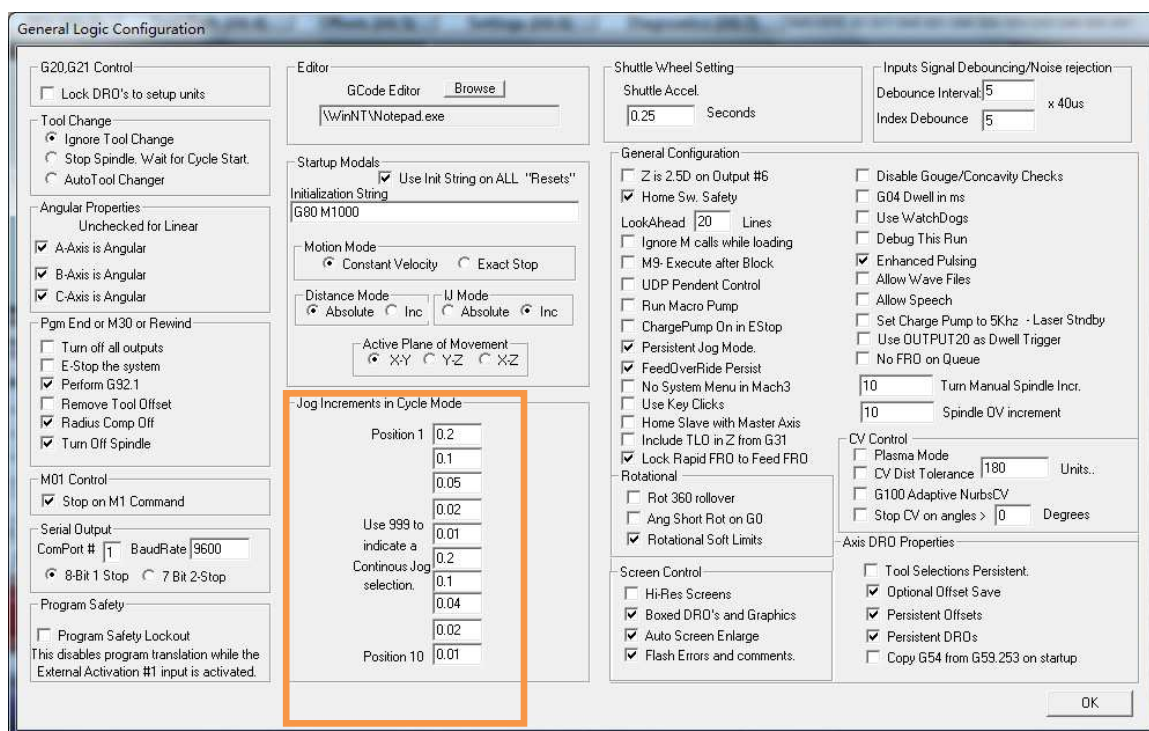


11) Enable the MHC2_brain and then press Reload ALL Brains



12) You can try to ViewBrain if you are interesting on the modbus commuication

13) Set the step speed for Multi-step or single step mpg mode:



14) Press OK and then you can use HandWheel with MACH3

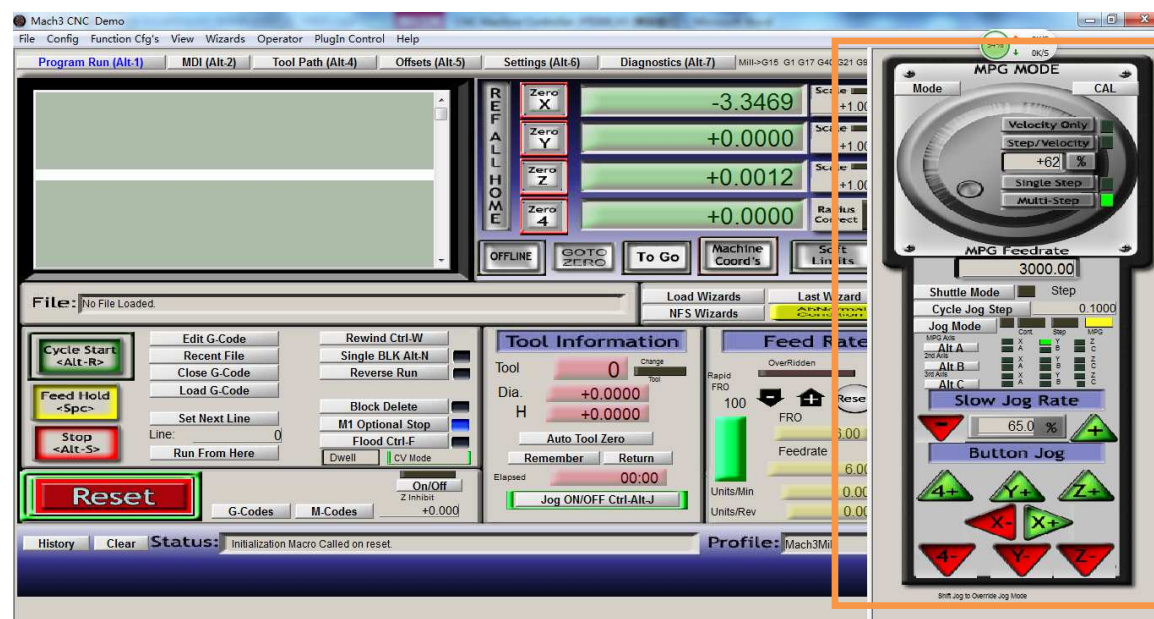
15) Make sure that HC/PC button on the control box selected to PC

16) And you will see that handwheel in PC mode, the X, Y, Z and A position will sync with MACH3

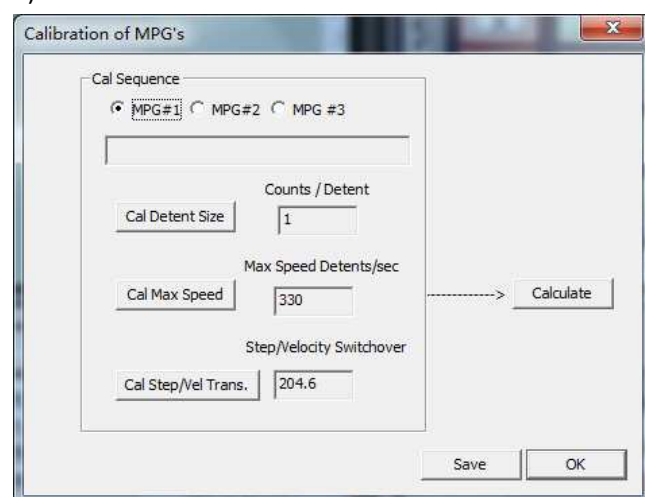
17) Select X and try to move handwheel, if motor and MACH3 Xposition number moves, then means the whole communication is ready.

MACH3 MPG setup and calibration

1) Press the TAB on key board you can switch on the handwheel in MACH3, press tab again to hide.



2) Select CAL and follow the instruction to set the MPG



3) You can then press OK, at MACH3 handwheel you can select Velocity or Multistep mode.

Suggest to Velocity mode for smooth control, for precision control you can choose multistep, but it doesn't provide acceleration or deceleration in MACH3. Multistep may cause lose step.

6) You can then enter MPG Feedrate to 3000 and then press enter

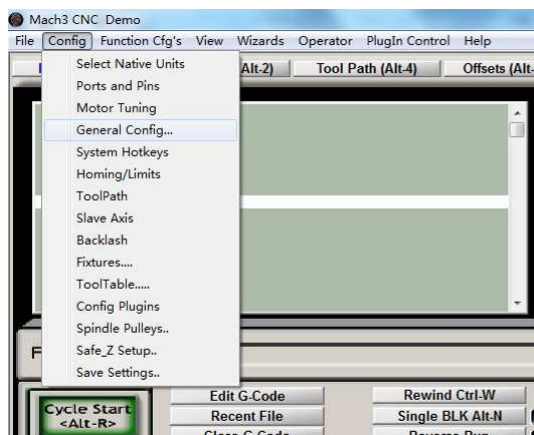
7) Try to move your handwheel and see check the motion is smooth or not.

8) After that you can press TAB button to hide the mach3 handwheel

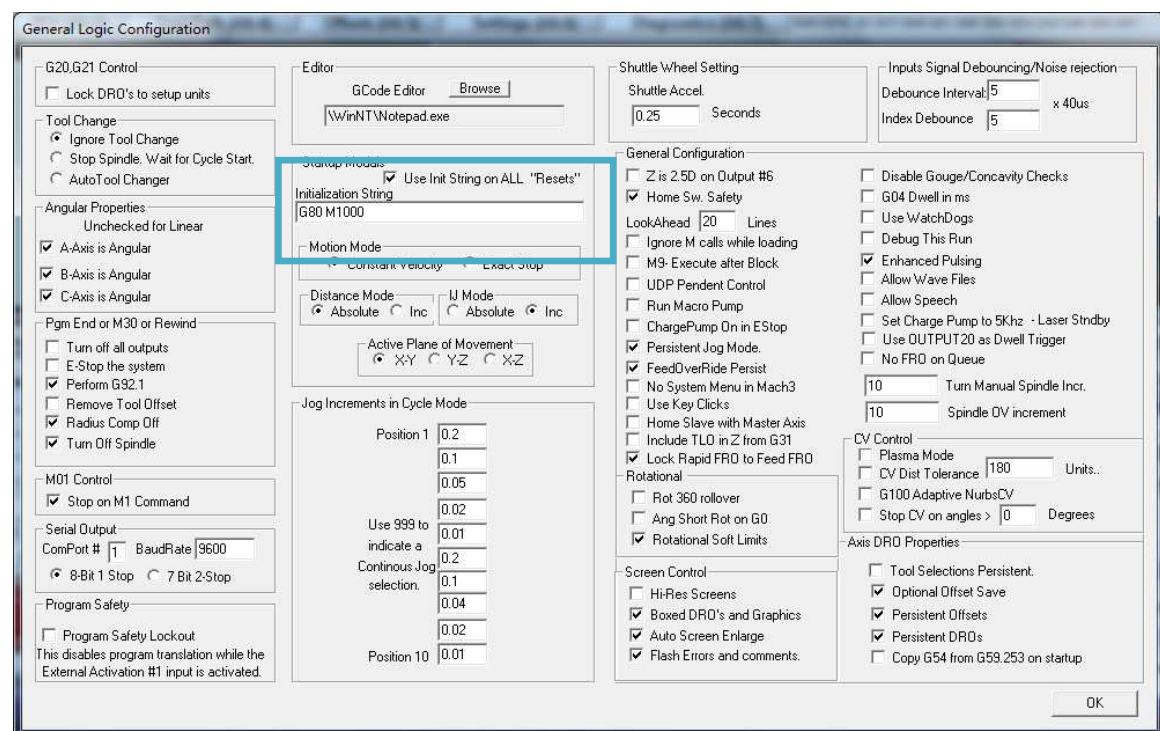
9) You can then use handwheel to work

AutoCheck Mach3 Setup:

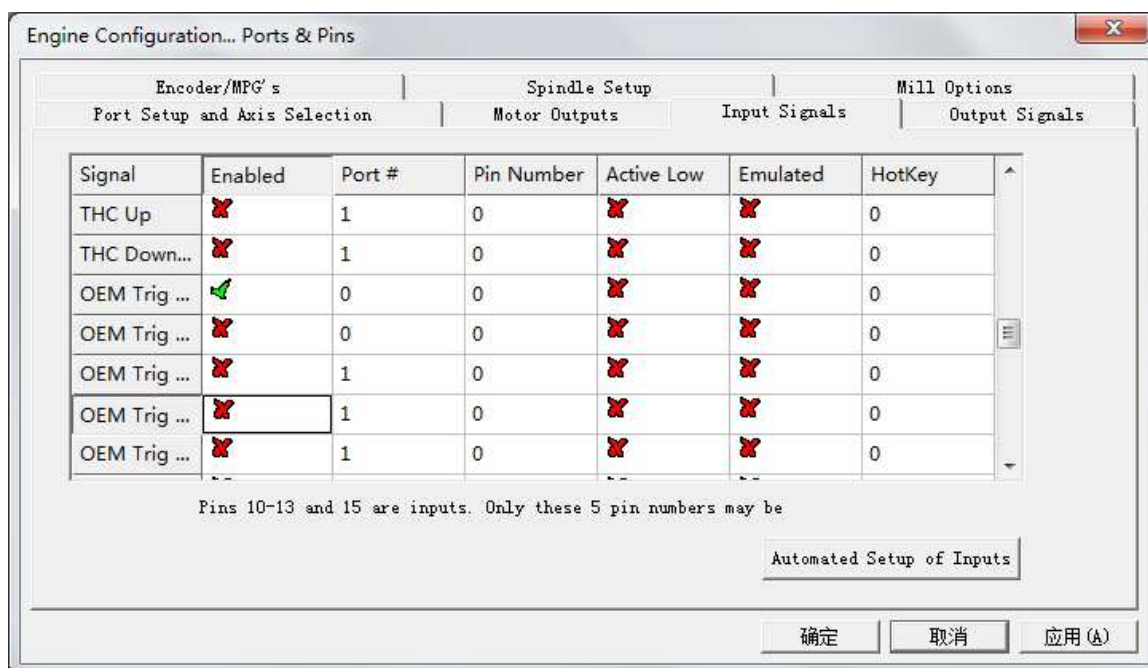
- 1) Copy the M1000 and M1001 macro file to MACH3 file path: C:\Mach3\macros\Mach3Mill
- 2) Select General Config in Config



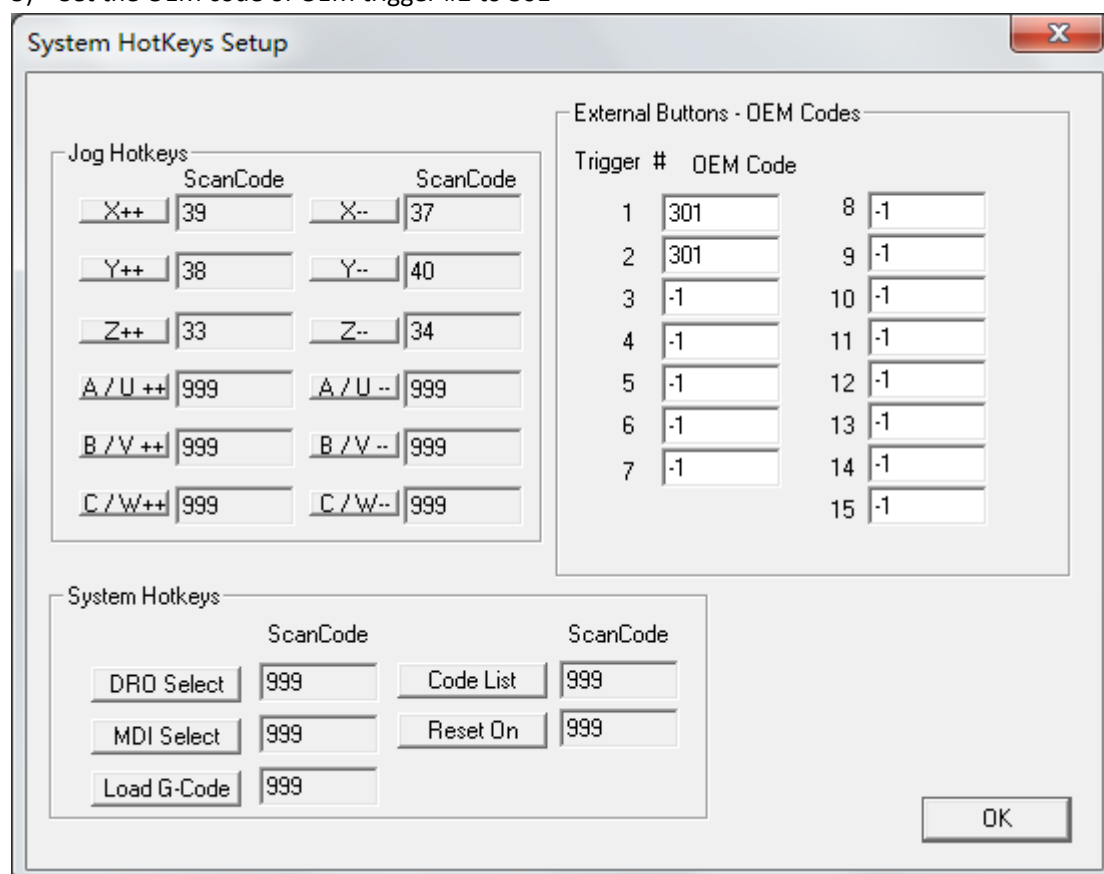
- 3) At "Initiation String" add M1000 to run M1000 macro at beginning



- 4) Inside Config-> Ports & Pins -> set the OEM TRIGGER 1 as below



5) Set the OEM code of OEM trigger #2 to 301



6) Make sure you have put the brain control file and setup Modbus (detail at Modbus setup)

How to use AutoCheck:

Handwheel control only Mode:

- 1) Switch the control box Handcontrol button
- 2) Clip the crocodile clips to the engraving bit
- 3) Place the autocheck under the engraving bit
- 4) Press autocheck button
- 5) Z axis will go down slowly and then stop once the bit touch the autocheck
- 6) And then will go up 10mm or 0.5inch
- 7) LCD will display 10mm or 0.5inch

Use mach3 macro

- 1) Switch the control box HC/PC button to PC mode
- 2) Clip the crocodile clips to the engraving bit
- 3) Place the autocheck under the engraving bit
- 4) Press autocheck button to trigger the script of auto check stored at M1001 file
- 5) Z axis will go down slowly and then stop once the bit touch the autocheck
- 6) And then will go up 20mm
- 7) MACH3 will display 20mm

Spindle Motor Controlling:

- i) Software Acceleration and Deceleration
Spindle motor card provide acceleration and deceleration, increase the motor life and reduce the rush current from suddenly stop or start.
- ii) PWM driving constant speed:
Motor will try to keep the same speed by checking the back EMF of the spindle motor. Once it is spinning without load and suddenly with load, the motor will keep the same speed by provide more duty on PWM.
This will allow the user to engrave in slower spinning speed and keep the spinning speed in constant.
- iii) Manual PWM Control:
Tune the rotary switch to variable moving range, and then rotate the VR to set the target speed
- iv) MACH3 PWM Control by G-Code
Tune the rotary switch to switch off mode, you will hear "TAK" sound, and then you enter MACH3 spindle control mode.
If you use this mode, you must sure that the G-code include M3 to start spinning the spindle motor: Example:
M3 S1000 "M3 start spinning and S1000 set the speed
Spindle card will read the PWM from Mach3 and regenerate the PWM with

acceleration, deceleration and overdrive protection.

v) Overdrive protection:

There is two protection for the spindle control card, one is overcurrent another is overpower, once it is triggered, it will stop the motor and go to emergency stop mode

This will protect the spindle from crash and protect the control card.

vi) AC 800W or higher watering cooling spindle motor:

You will need AC motor driver card to replace the DC motor driver card, and also need the other control box to drive the high power AC spindle motor up to 800W or more

Stepper Motor controlling

Stepper Motor card is using Toshiba TB6560 3A high power stepper IC, each card is marked X, Y, Z or A.

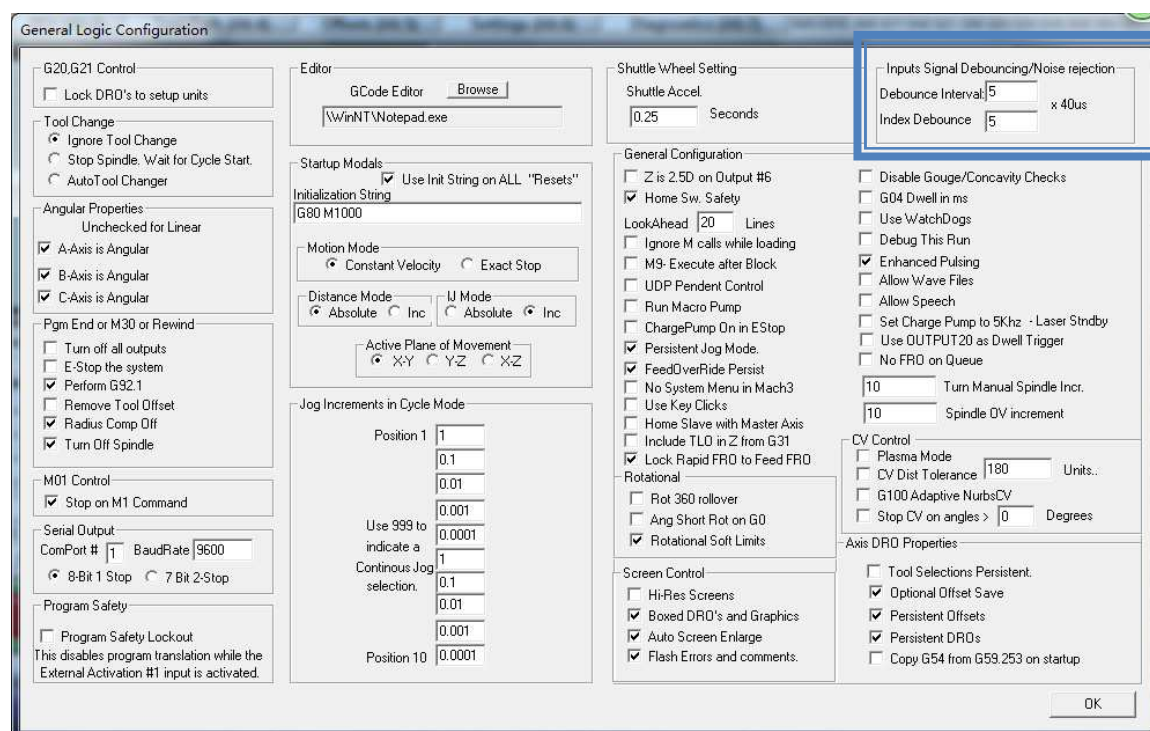
Microstepping is set to 1:8

This combination can provide high torque and high speed controlling.

Limit switch Protection

X, Y, Z axis Limit switches anti-crash function, once limit switch is triggered, the machine will automatically drive back 5 mm and enter emergency stop mode, prevent crash accident. You can press ESTOP button on Handwheel or switch HC/PC button on control box to back to normal.

If you find there is noise come out to trigger limit switch, you can setup debouncing/ noise rejection inside the general configuration:



Water cooling terminal

The water cooling terminal provides 12VDC 0.8A power to drive the water pump and fan. Connection as follow:

Output Relay (OUT 1)

Output relay is a 3A 110/220V AC relay.

On the main board there is a 3PIN socket JX

1st pin and 2nd pin is relay NC normal close and 2nd pin to 3rd pin is NO normal open.

Default factory will plug to NO.

Related parallel port is pin number is PIN 1

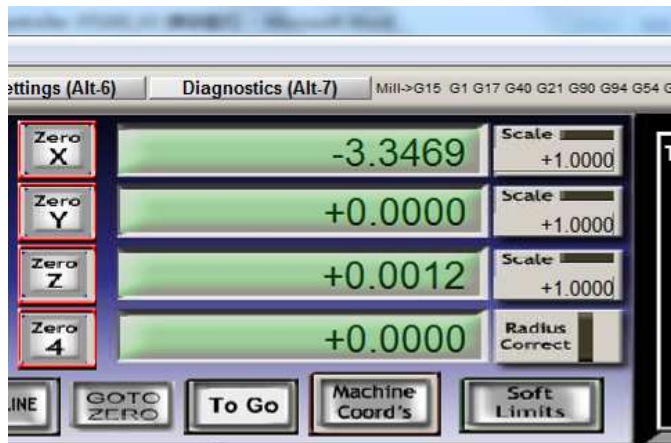
Signal is active high to trigger the relay

Application Tutorial

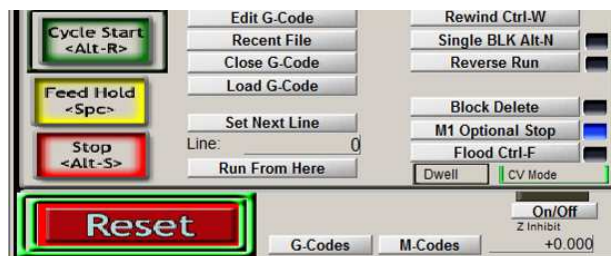
Basic control in MACH3

Gcode import:

- 1) At file-> Load Gcode
- 2) Make sure that the machine is in origin position; you can use handwheel or keyboard to move the unit to correct X, Y, Z position. And then press ZERO to zero the X, Y, Z and 4 position



- 3) Press Cycle Start button to start the G code



- 4) If you find there is any problem, you can then press Stop, and then press GOTO ZERO button. Press Rewind, and press Cycle Start to restart again
- 5) In between engraving procedure, you can set the feed rate to control the machine speed



- 6) If you find that there is some losing step, you can set lower feed rate or lower acceleration in Motor tuning.

How To generate G Code From 3D graphics

There is lot of software can do this. (Below software as tutorial reference only)

- MASTERCAM <http://www.mastercam.com/>
- LAZYCAM <http://www.machsupport.com/>
- CAMBAM <http://www.cambam.info/>
- Skeinforge <http://fabmetheus.crsndoo.com/>

How To generate G Code From photo

There is some software to do this: (Below software as tutorial reference only)

- PhotoVcarve <http://www.vectric.com/products/photovcarve.html>

Reference graph from PhotoVcarve:

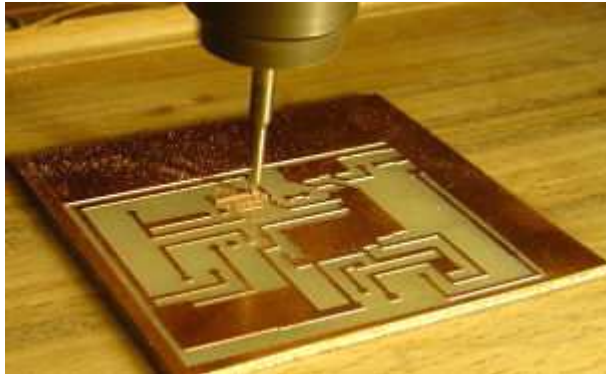


How To make prototype PCB

There is some software to do this: (Below software as tutorial reference only)

- CopperCam <http://www.galaad.net/coppercam-eng.html>

Reference graph from Copper Cam:



You will need a gerber file then you can route a prototype PCB

How To convert CNC to 3D printer



- 1) You will need to purchase a 3D printer extruder and 3D printer heating controlling M3D from us.
- 2) Replace the spindle motor by extruder
- 3) Use skeinforge to convert 3d graphic to g code
- 4) Import G code to MACH3
- 5) And then you can build like this:



You can download or check the detail in our website www.mib-tech.com

Frequency Asked Question

Limit Switch is triggered in noise:

You can setup the debouncing and noise rejection in general configuration of MACH3
Please check the topic "Limit Switch Protection"

Stepper motor is not moving:

- 1) Check the cable of the stepper motor
- 2) Check the parallel port
- 3) Power off
- 4) Plug and unplug the cable for few times to remove eroded particle.

Machine X, Y, Z will move without controlling:

- 1) For 800W AC spindle motor type, please check all cable connector nut is screw tightly.
We used shielding cable for critical part, if not screw the nut tightly, shielding will lose it's usage
- 2) Electricity must have ground line

Stepper motor move wobbling:

- 1) Engraving material is too hard or too depth on each engraving step
- 2) Check the cable of the stepper motor
- 3) Check the parallel port
- 4) Power off
- 5) Plug and unplug the cable for few times to remove eroded particle.

Spindle motor is not moving:

- 1) Check the cable of the spindle motor
- 2) If you are authorized electronic engineer or technician, you can follow the below instruction:
 - a) Unplug the electricity cable
 - b) Open the controller case
 - c) Check that there are 3 fuses on the main board, 1.5A, and 2 pcs 10A.
 - d) Replace the melted fuse
 - e) Double check is there obstacle or loosing socket and cable inside the controller box.
 - f) Follow the FIRST INSTALLATION instruction and try again.
- 3) Spindle motor is consuming part; there is a carbon brush replacement. Power off, Remove the spindle motor, unscrew the spindle motor, and replace the carbon brush.

Mach3 can't control the machine:

- 1) Follow the instruction of MACH3 setup again.
- 2) Your parallel port setting is not in ECP mode, please set the parallel port to ECP mode in BIOS setup
- 3) You are using USB to parallel port adapter: It is not supported to use USB converter, or you can try to purchase "smoothstepper" converter from third party
- 4) The parallel port socket is eroded, plug and unplug few times and try.
- 5) Can change a new parallel port cable and try again
- 6) Uninstall the MACH3 and install again

*Detail can check the forum of MACH at www.machsupport.com

How to convert CAD drawing to G code?

There is lot of software can do that, MASTERCAM, LAZYCAM, VCARVE, etc.

Detail can check <http://www.machsupport.com/> there is a detail support video tutorial.

Using Mach3, the stepper motor direction reversed and move wobbling:

- 1) Follow the instruction of MACH3 setup again.
- 2) Don't power the computer during the MACH3 software is not closed, non-properly close the MACH3 software may lose the setup in MACH3

Memory is missing:

- 1) Try again save and load instruction
- 2) User may press save to the memory region accidently, and deleted the original memory

Hand controller can't power on:

- 1) Make sure you have plugged the cable to main controller box
- 2) Follow the step on "Can't power on the controller box"

Routing dimension and scale is not right

- 1) Please check that you are choosing "MM" or "INCH" in MACH3

- 2) Check the cable of X, Y, Z and parallel port.
- 3) Power off
- 4) Plug and unplug the cable for few times to remove eroded particle.

Always show ESTOP or Emergency Stop

- 1) Please check the limit switch is triggered or always pressed, if yes, please move the machine to non-pressing mode.
- 2) If you are using PC mode, please check that hand controller is showing "ESTOP", if yes, press "ESTOP" to cancel. And in MACH software press "EMERGENCY" back to normal
- 3) If you are using Hand Controller mode, please check that hand controller is showing "ESTOP", if yes, press "ESTOP" to cancel.

Can't power on the controller box

- 1) Please check the electricity is plugged
If you are authorized electronic engineer or technician, you can follow the below instruction:
 - 1) Unplug the electricity cable
 - 2) Open the controller case
 - 3) Check that there are 3 fuses on the main board, 1.5A, and 2 pcs 10A.
 - 4) Replace the melted fuse
 - 5) Double check is there obstacle or losing socket and cable inside the controller box.
 - 6) Follow the FIRST INSTALLATION instruction and try again.

Can use third-party hand wheel or use this hand wheel on other machine?

No. This system is self-developed, and not compatible with other branch of machine,

Why memory load time will be more than the actual saving time?

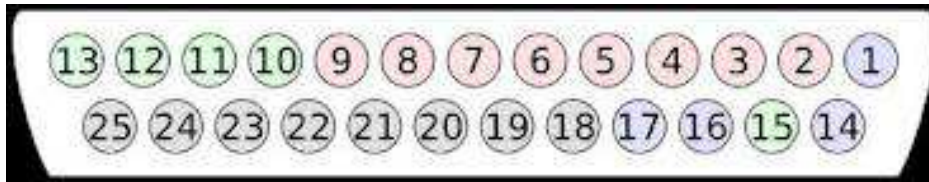
The system will re-calculate the motion, so normally will take 5% to 8% time more than actual. For example, a 100s motion saving, loading may need around 108s.

Appendix

Third Party Development Information:

Parallel Port Pin Assignment:

Step and Pulse should be 5us width or more



Pin	Function	Input /Output
1	Main Motor Enable (Reserved)	Input
2	X Stepper Motor Pulse	Input
3	X Stepper Motor Direction	Input
4	Y Stepper Motor Pulse	Input
5	Y Stepper Motor Direction	Input
6	Z Stepper Motor Pulse	Input
7	Z Stepper Motor Direction	Input
8	A/4th Stepper Motor Pulse	Input
9	A/4th Stepper Motor Direction	Input
10	Emergency Stop	Output
11	Y Limit Switch	Output
12	Z Limit Switch	Output
13	Auto Check	Input
14	Enable	Input
15	X Limit Switch	Output
16	B/5th Stepper Motor Pulse	Input
17	B/5th Stepper Motor Direction	Input
18 to 25	Ground	-