CNC Machine Controller DY5300

Special Features:

1) With digital hand wheel controller
2) 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.
3) Hand wheel controller with LCD display, can show X, Y, Z and A position up to 0.01mm
4) Hand wheel control motion smoothing function. Embedded acceleration and deceleration in hand controlling.
5) Can independently control up to 5 axis stepper motor (standard package is 4 axis) without Computer connected
6) 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.
7) Spindle motor overcurrent protection, prevent motor board and motor damage
8) PWM spindle motor control with electronic acceleration and deceleration, extent the life of motor.
9) 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.
10) 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.
11) High velocity performance, velocity can drive up to 3500mm / minute, acceleration up to 400mm/s^2
12) Extension function can connect to 800W or above water cooling type AC spindle Motor controller **Detail can consult sales*

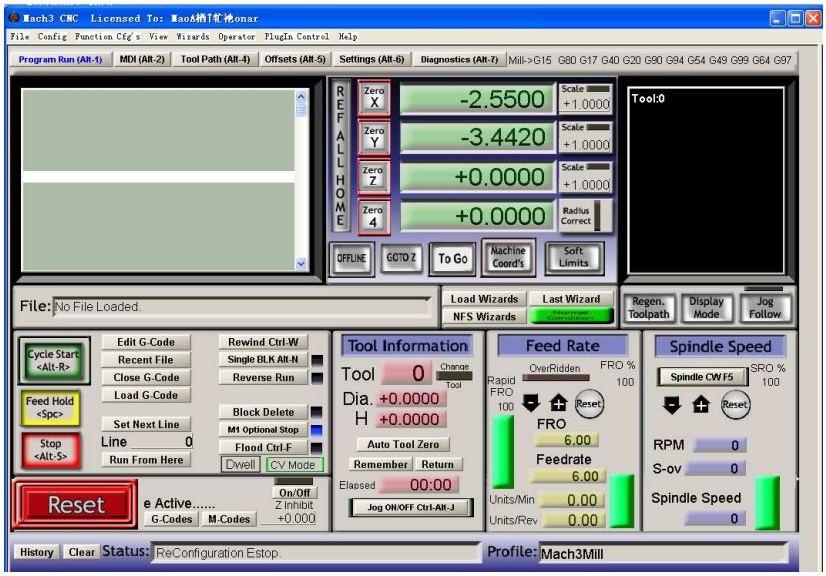
Specification:

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	
		External Controller	1	
		PC Parallel Port	1	
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		Operating Voltage	48DCV	
		Maximum Current	7DCA	
		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 Display		Dot Matrix 128X64 with backlight		
		Hand Wheel Encoder	100 PPR	
		Number of Axis	4 Axis	
Size	Controller Box	(LXWXH)mm	330X220X120	
Weight		net weight (kg)	4.3	

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) Go to computer BIOS setup, set parallel port to ECP mode
4) 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
5) Install MACH3 software
6) Open Mach3 -> Mill

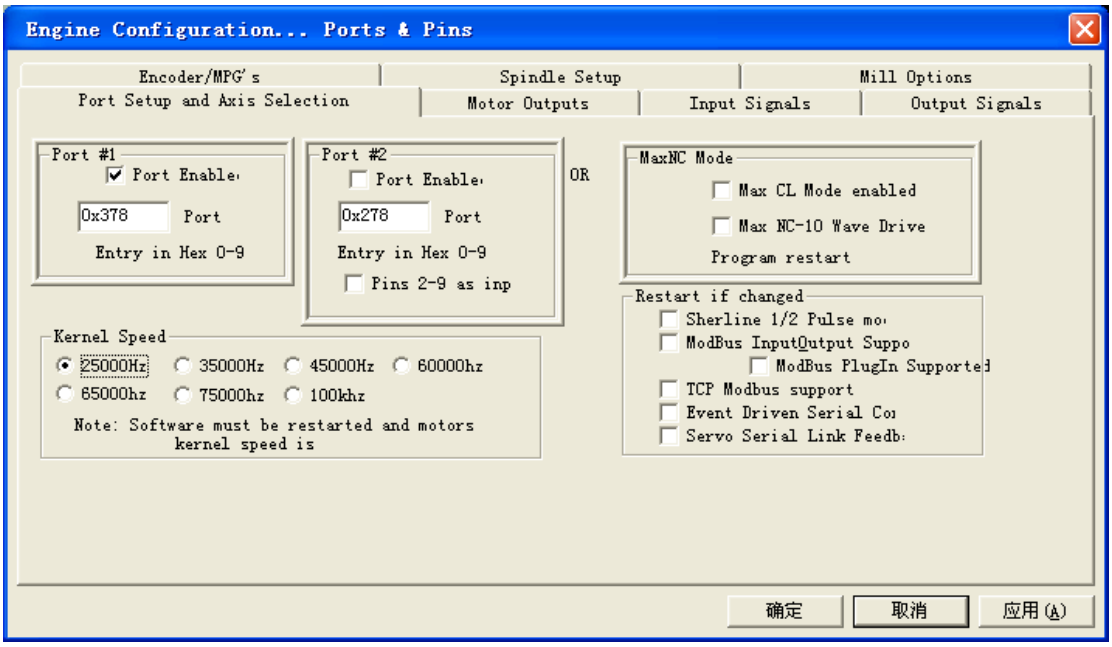


7) Select “Config”, click “Select Native Units”, and then select mm or inch
   Better to choose “mm”!

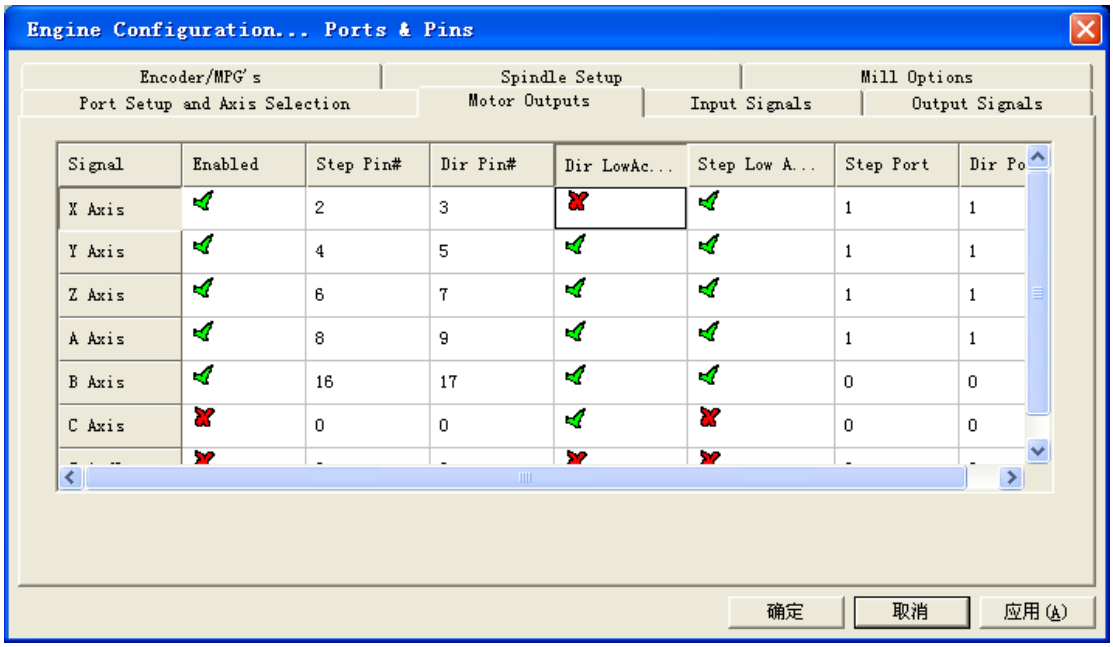
6) Select “Config”, “Ports and Pins”, choose 25000Hz for stepping motor

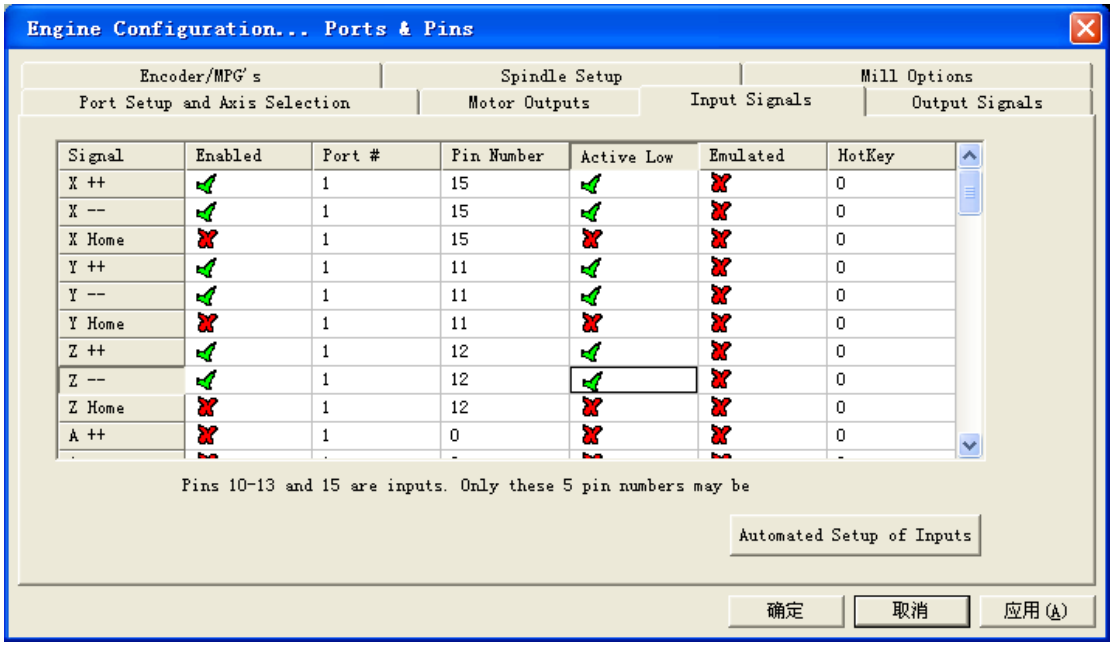
Set the correct parallel port number, normally default is 0X378, if you are using PCI card type parallel port, then it may be different, you can check your correct port address in hardware device, ports & LPT.

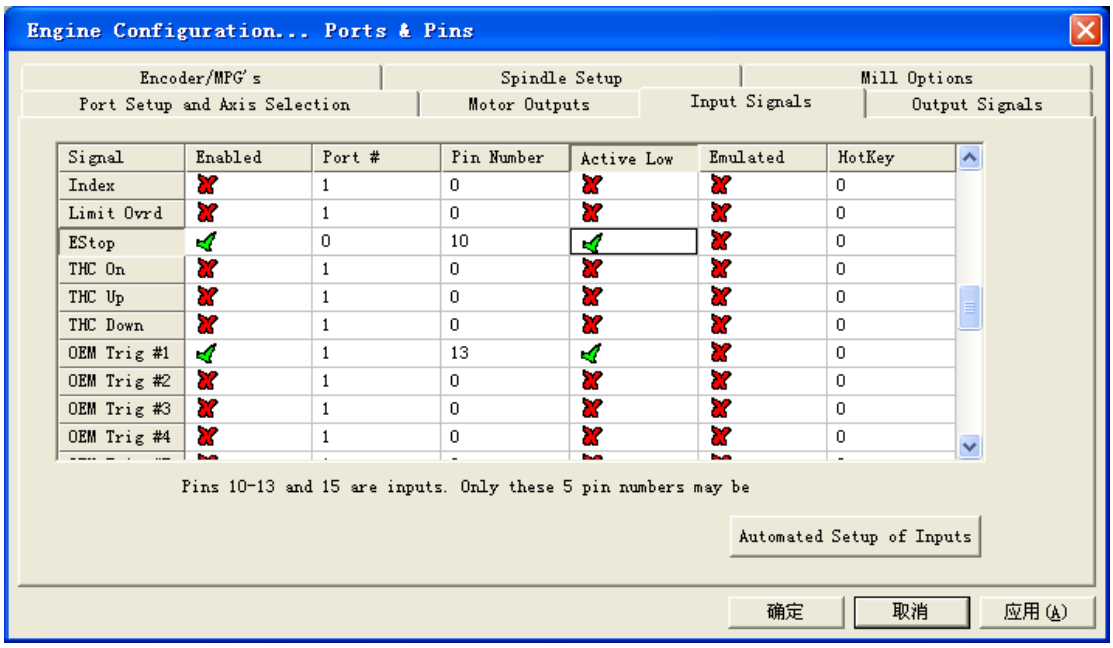
Follow the below photo’s pinout setting

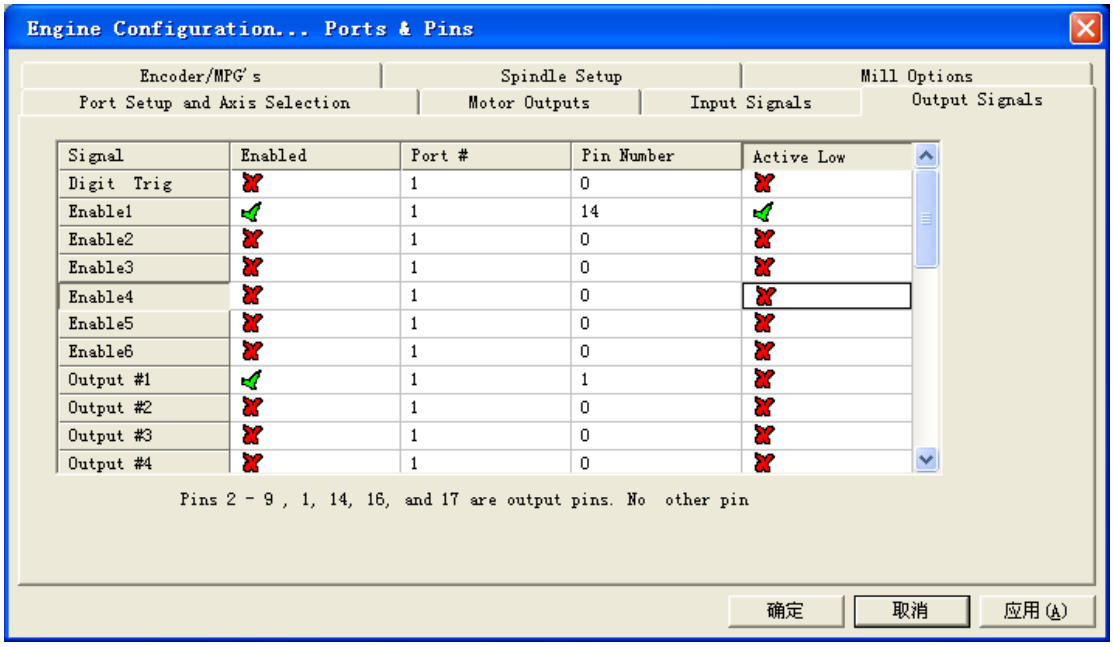


If you want to invert the axis’s direction, Just press the Dir Low Active.




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 | 0 | 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.

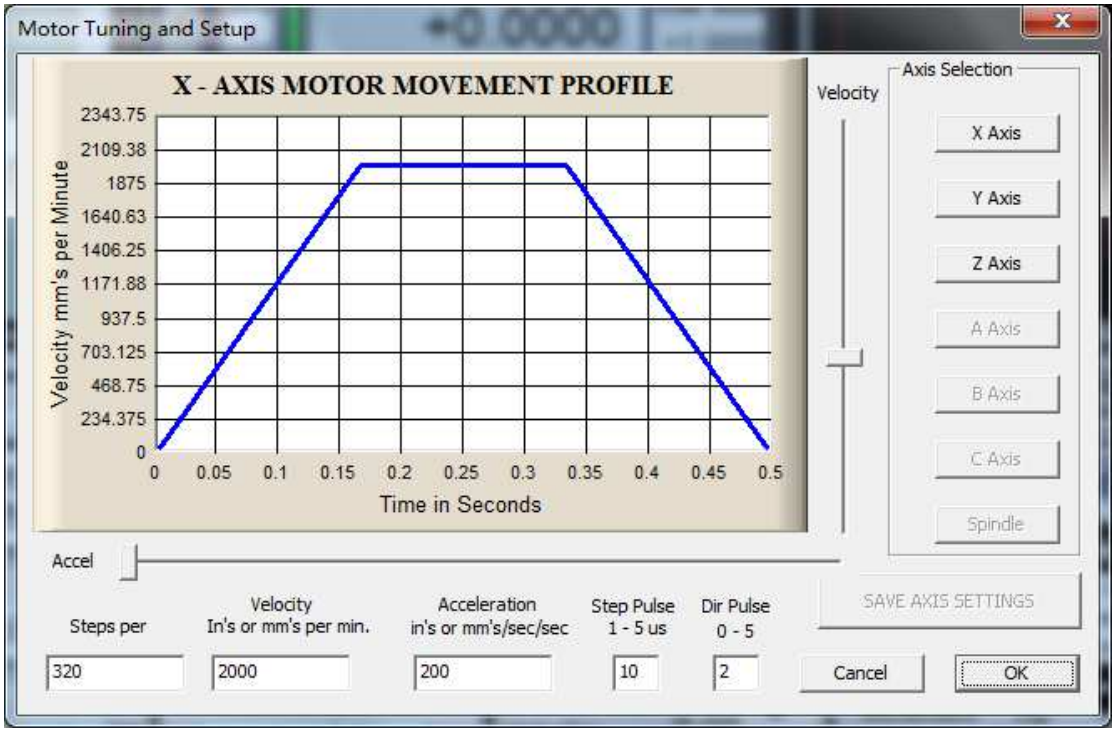
Steps per mm must be 320, (For MIB Instruments' CNC3020, CNC6040 model)

Velocity can be 0 to 3500 mm per minutes

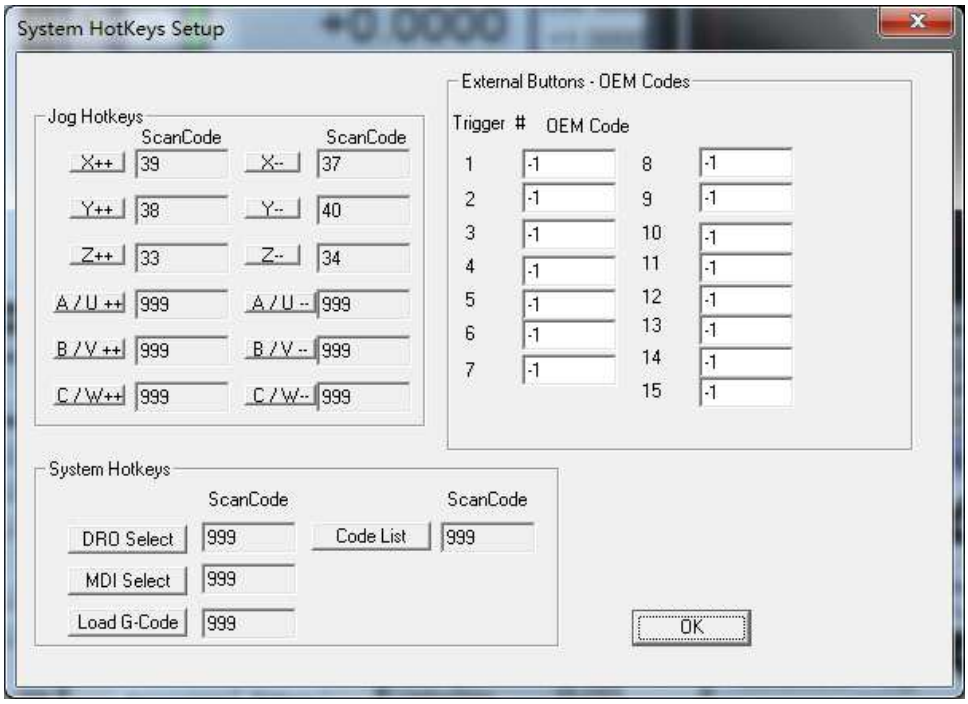
Acceleration can be 20 to 400 mm/s

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

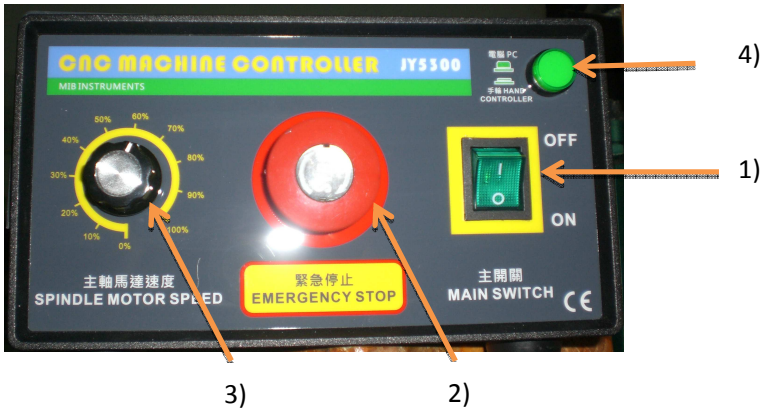
Dir Pulse is 2us



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.

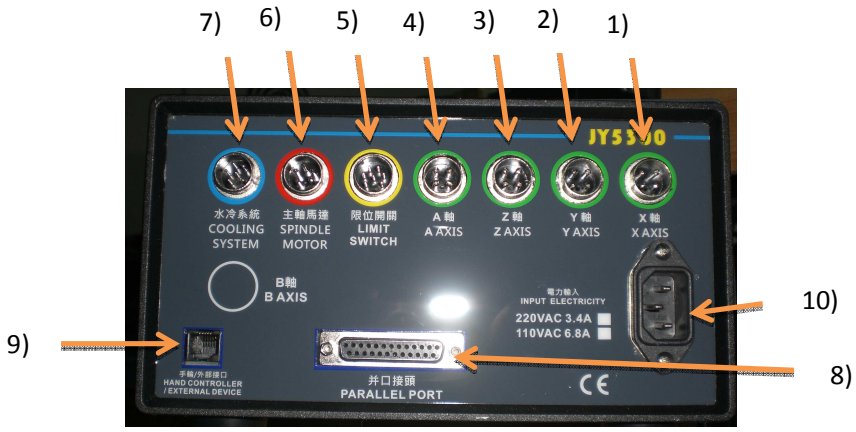


Instruction:



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



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)

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).
3) Double check the cable connection.
4) Tune the spindle motor speed's rotary knob to 0%
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. 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

Hand Wheel Controller:

LCD Display:

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

Button:

X/ESC:

a) Press and release to set as X axis control.
b) Press and release to escape or back to normal
c) Press and hold to set X ROLLING mode

Y/<:

a) Press and release to set as Y axis control.
b) Left direction button at Memory mode
c) Press and hold to set Y ROLLING mode

Z/>:

a) Press and release to set as Z axis control.
b) Right direction button at Memory mode
c) Press and hold to set Z ROLLING mode

A/Ent:

a) Press and release to set as A axis control.
b) Confirm button in Memory mode
c) Press and hold to set A ROLLING mode

Speed:

a) Press and release to set speed to X1->X2->X5->X10->X20
b) Press and hold for 3s and all axis will move back to zero position

Zero:

a) Press and release to set current position as zero

Mem:

a) Press and release and go to memory mode

Estop:

a) Press and release to set Emergency stop

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 for 1 step,
X2 move 0.02mm for 1 step
X5 move 0.05mm for 1 step
X10 move 0.1mm for 1 step
X20 move 0.2mm for 1 step

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

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.

Frequency Asked Question

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 loosing 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?

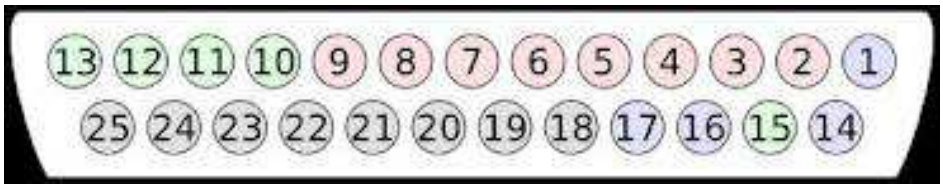
The system will re-calculate the motion, so normally will take 5% to 8% time more than actual. For example, a 100s motion saving, loading may need around 108s.

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	Spare Input (Reserved)	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	-