



## USB Motion Control Card Manual

Ver1.09



### Features:

- ✔ Support all the Mach3 version, including the latest edition :Mach3 R3.042.040.
- ✔ Support all the Windows version, Including the latest edition :Windows7.
- ✔ No Driver needed for USB, All the Windows version can be used as soon you insert in it.
- ✔ Fully support USB hot swapping , to monitor USB attachment state any time. While Mach3 are working ,if you uproot USB cable, then plug it also can make it work at once.
- ✔ Support: Automatic tool-setting, electronic hand wheel, software limit, software backlash.
- ✔ Speed: 48M. No need to use PC. The signal is independently processed by the Movement Control Card, Ensuring that you get really real-time information and reliability.
- ✔ 200KHz output for stepping motors and servo motors.
- ✔ Status indicators. Indicating Mach3 and USB connecting statement all the time.
- ✔ 16 input indicators, clearly indicates the status of signal-input.
- ✔ Speed-Test function, the spindle actual speed is displayed on the Mach3 interface in real time. And innovatively provide real-time speed graph, Making the speed variations clear and lively.
- ✔ Onboard isolated power and optional external power source as well.
- ✔ 10 super-speed 10MHz light-couplers, 24 general light-couplers, so the total amounts of light-couplers are up to 34. Isolate all the input/output. High cost design provides you a complete anti-jamming function and perfect security protection.
- ✔ Designed multiplying power button input, so that you can easily maintain the Supplying Rate(F), Main Shaft Speed (S), Jog Speed (Jog).



## **Manual Guide**

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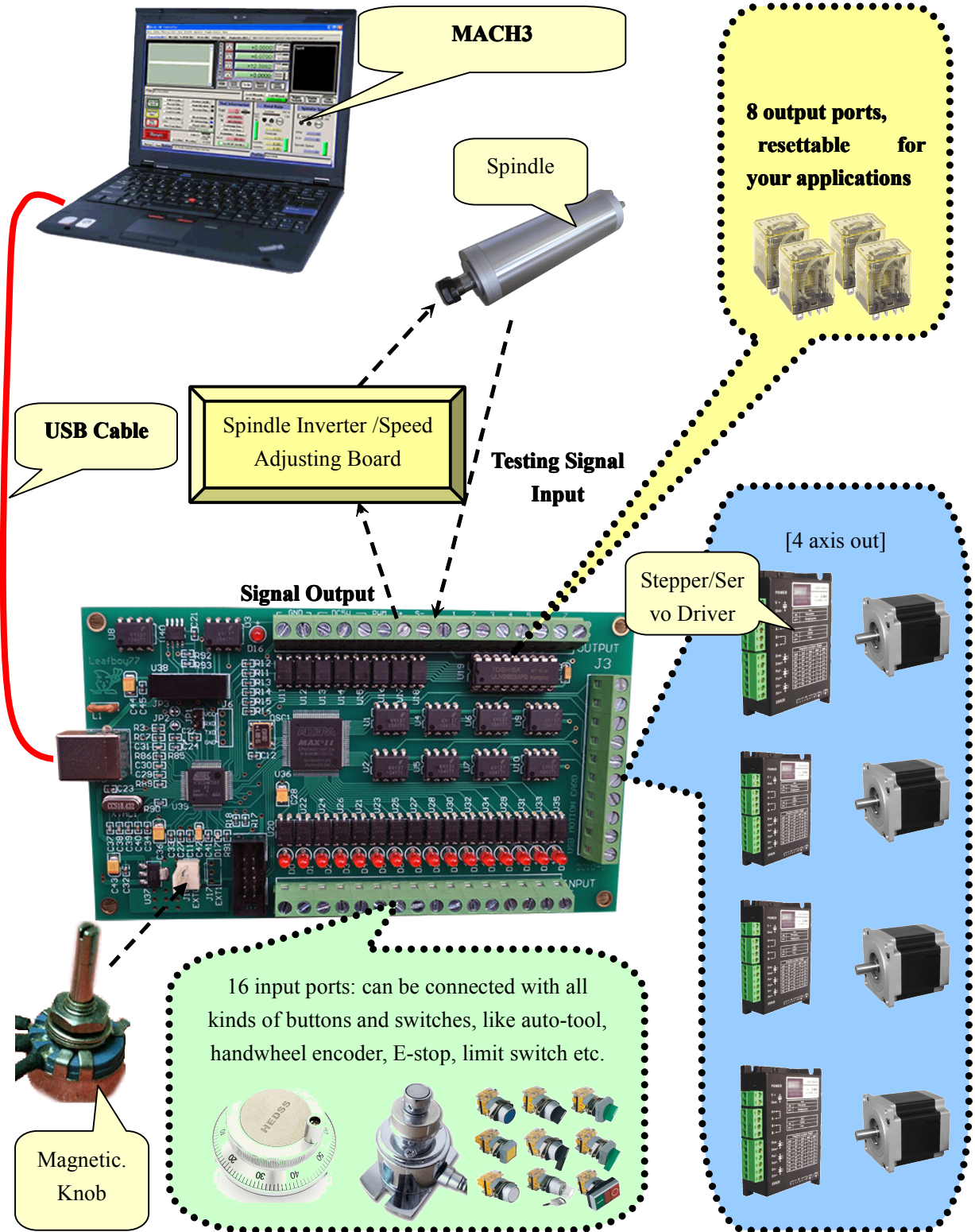
I. Auto Tool Installation

J. Encoder Setting

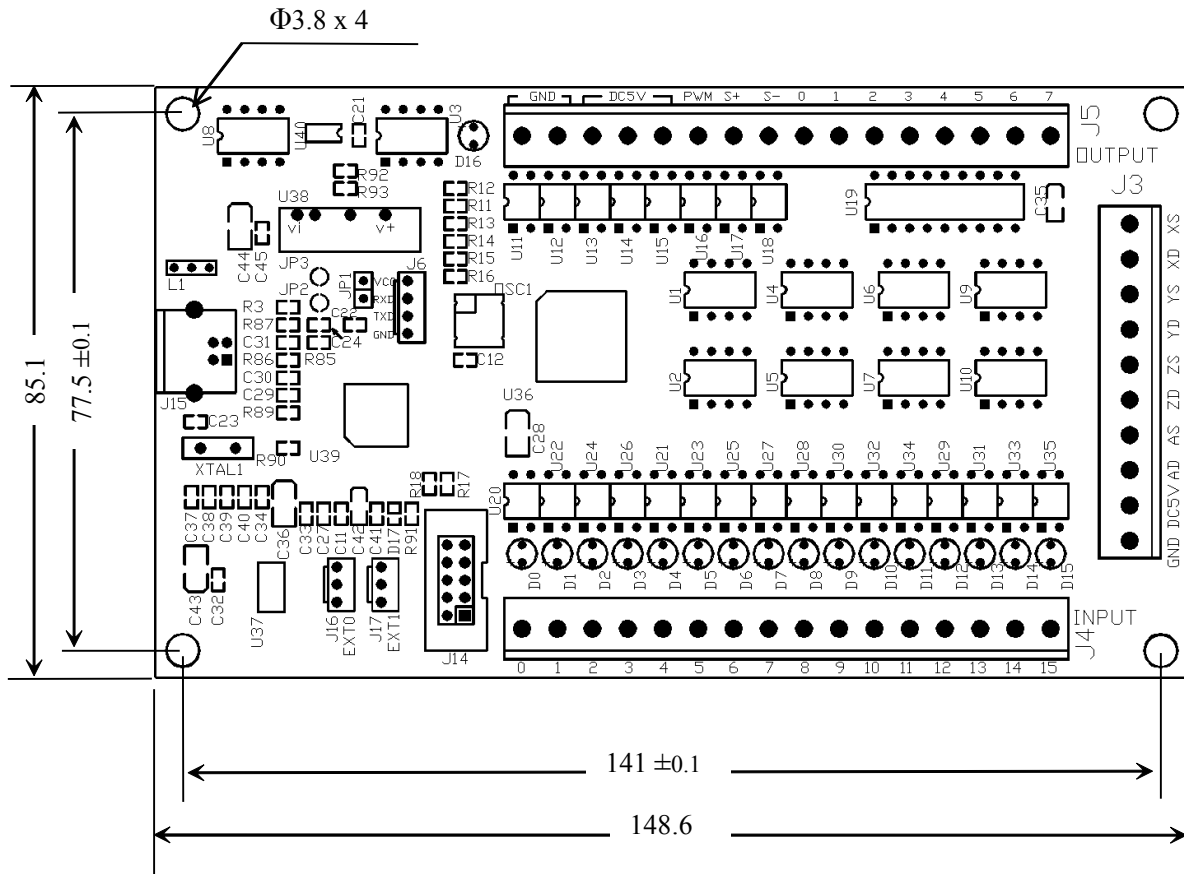
K. PlugIn Control and Activation



# System Diagram



 **Dimensions**





## A. Preparation before installation of this card

### Mach3 software



Mach3 homepage download address: <http://www.machsupport.com/downloads.php>



[Home](#) | [Downloads](#) ▾ | [Purchase](#) | [Support](#) ▾ | [Resources](#) ▾

### Downloads

For previous versions of Mach and LazyCam, XML's, and other Extra Information: [Click Here](#)

(Some of the older files are linked directly from the FTP server in order to avoid redundancy. If your download does not start immediately, please give it a few seconds - it's probably trying to contact/login to the FTP server.)

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### Mach

Mach3 is the flagship of the ArtSoft products. It is released in two versions: a Lockdown version, and a Development version. The Lockdown is a stable, static release recommended for new users, or people trialing the software. The Development version contains developing features and is released quite often so people can obtain new (but untested) features and capabilities. Both releases are limited to 500 lines of Gcode until licensed. Mach3 has a limit of 10,000,000 lines of Gcode even after licensing.

**\*You must use a Desktop PC running a 32-bit version of Windows if you are using the Mach3 Parallel Port Driver. Laptops are not supported because the power saving features of the chipsets disrupt the pulse stream. Mach3 will only be supported on laptops running an external motion controller, such as one of those found on the [Plugins](#) page.\***

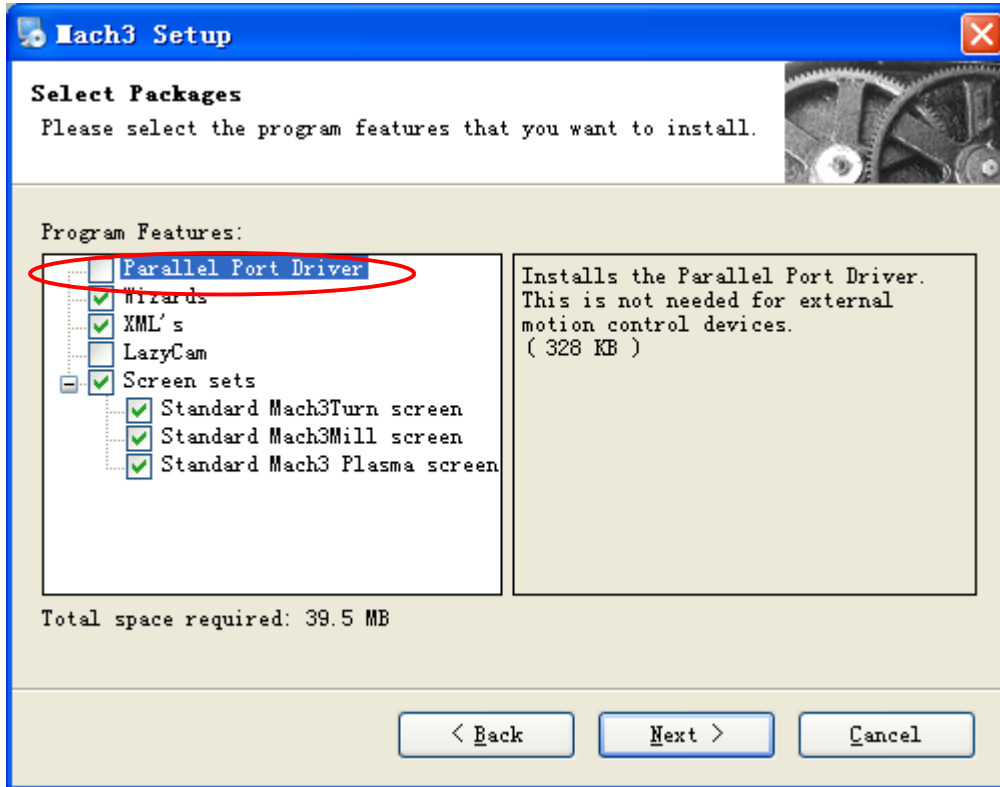
*Lockdown:*

[Mach3 R3.042.040](#)

[Mach3 Changelog](#)



You can choose not install Parallel Port Driver when installing the Mach3.



## USB cable

Please fix the magnetic cages on both ends of the USB cable (provided with the board)



## USB Drive:

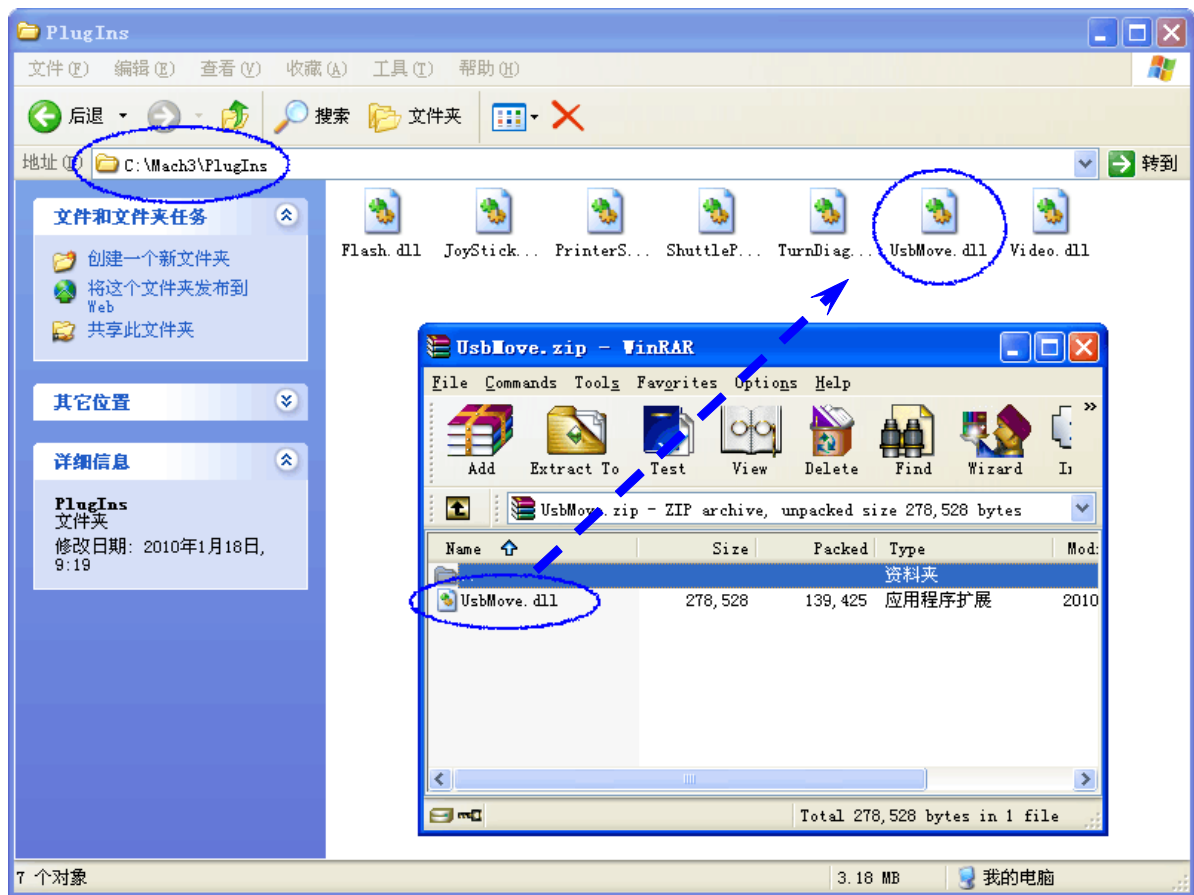
This board doesn't need a USB drive, plug-n-play in [Windows2000/Xp/Vista/Windows7](#).

1. When using this board, connect your PC with the USB cable first.





2. Unzip the "usbmove.zip" in the CD, move the "**usbmove.dll**" to "**Mach3\PlugIns**". For example: if your Mach3 software installed on " C:\Mach3", then move the "usbmove.dll" to " **C:\Mach3\PlugIns**".



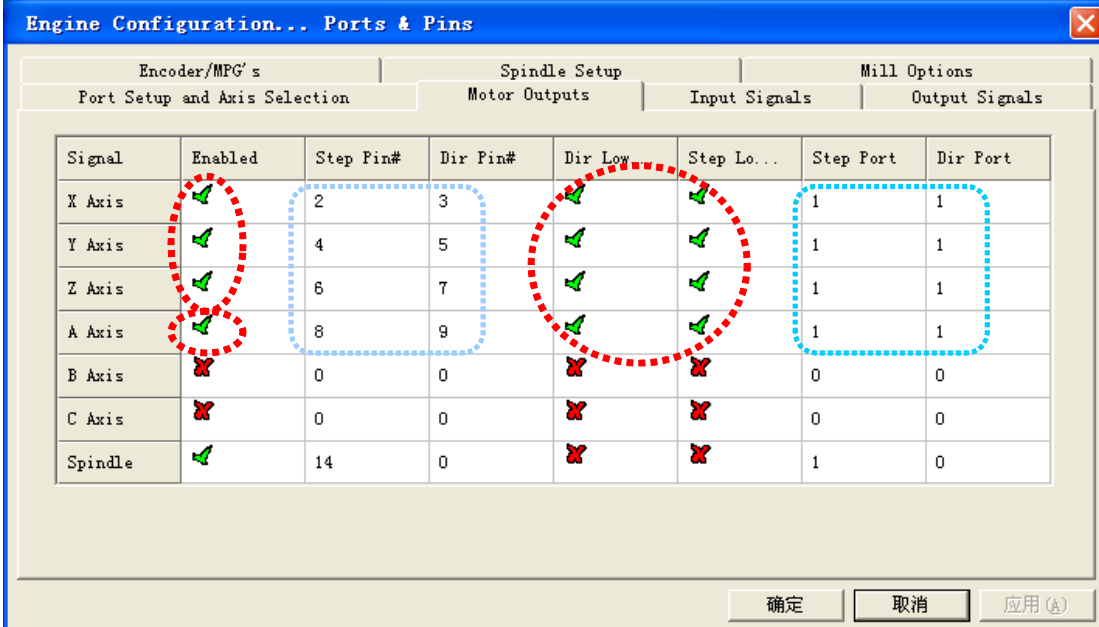
3. Run your Mach3 software, and choose "Xulifeng-Mach3-USB-Motion-Card" (you can click on the "Don't ask me this again" as well)





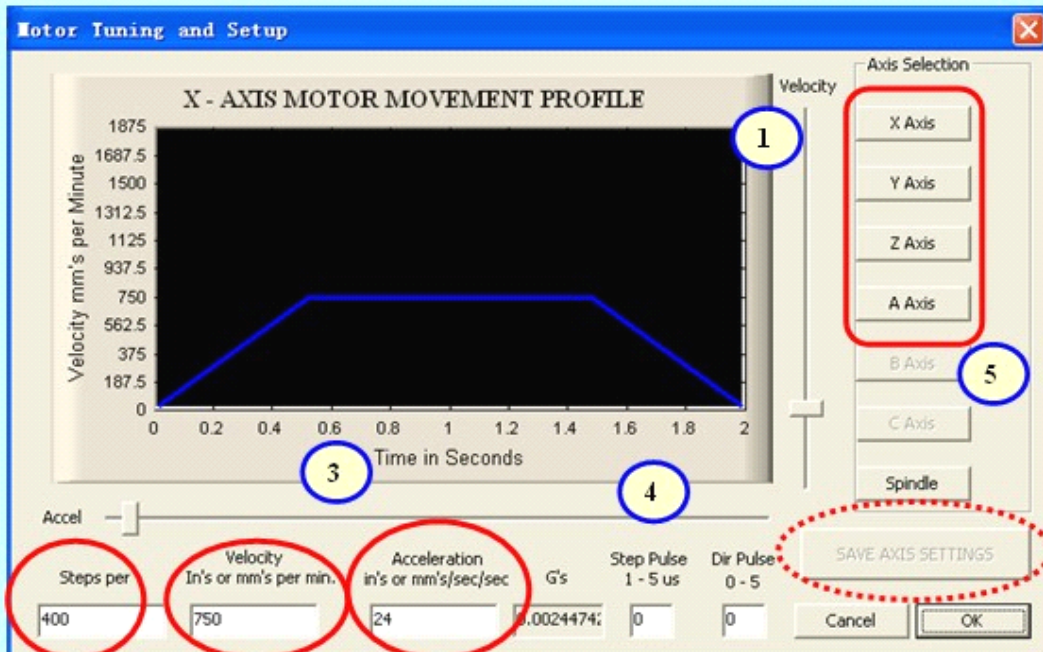
## B. Mach3 software setting

### 1. Axis setting: Mach3 => Config => Ports and Pins



Signal	Enabled	Step Pin#	Dir Pin#	Dir Low	Step Lo...	Step Port	Dir Port
X Axis		2	3			1	1
Y Axis		4	5			1	1
Z Axis		6	7			1	1
A Axis		8	9			1	1
B Axis		0	0			0	0
C Axis		0	0			0	0
Spindle		14	0			1	0

### Config => Motor Tuning and Setup



2

Motor Pulse per Unit :

Take 2-phase stepper motor as an example: Steps per = 200 \* Microsteps/ Screw lead.

Such as microsteps = 8, screw lead = 4, steps per = 200\*8/4 = 400

**Axis running direction setting:**  
**Mach3=> Config => Homing/Limits**

Motor Home/SoftLimits ✕

Entries are in setup units.

Axis	Revers...	Soft Max	Soft Min	Slow Z...	Home ...	Home ...	Auto Z...	Speed %
X	✗	100.00	-100.00	1.00	0.0000	✓	✓	40
Y	✓	100.00	-100.00	1.00	0.0000	✓	✓	40
Z	✓	100.00	-100.00	1.00	0.0000	✗	✓	20
A	✗	100.00	-100.00	1.00	0.0000	✗	✓	20
B	✗				0.0000	✗	✓	20
C	✗				0.0000	✗	✓	20

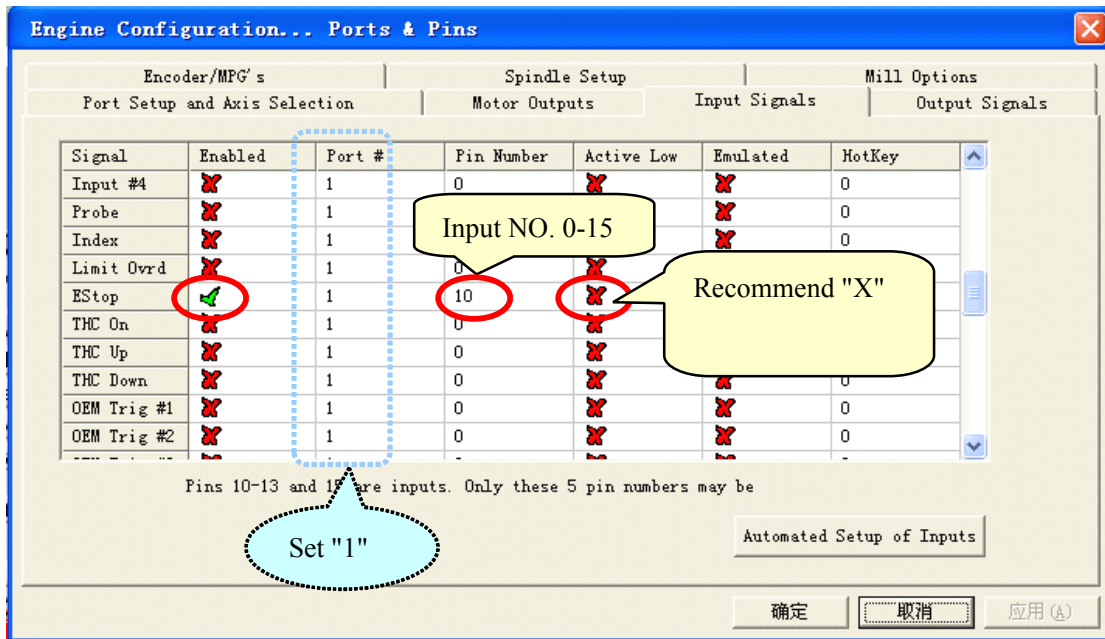
Choose "✓" or "✗" for your need.

G28 home location c

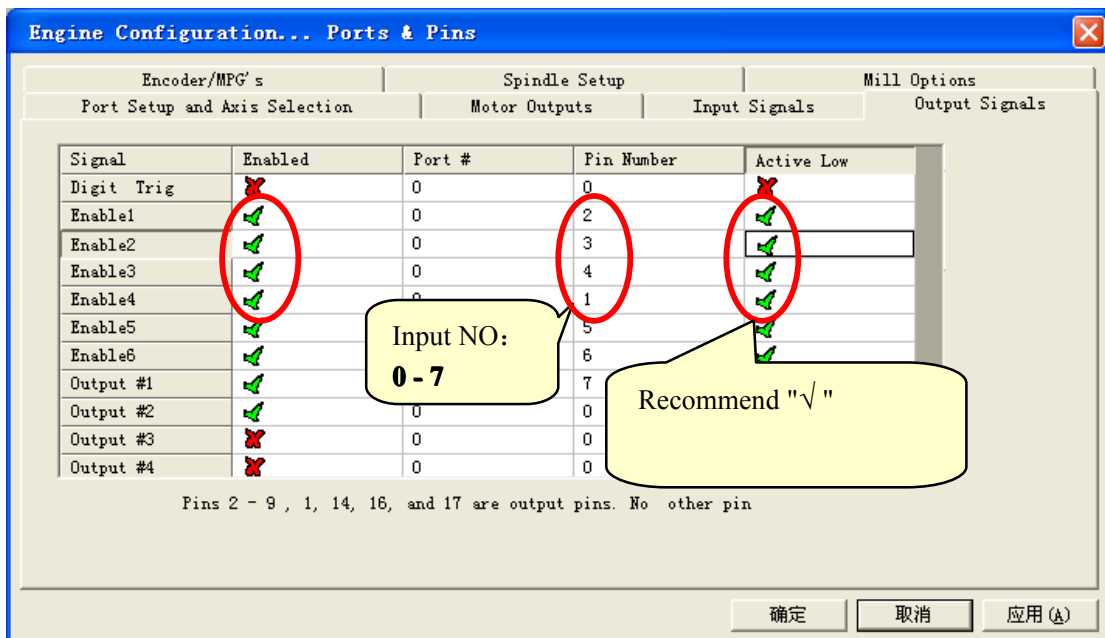
X	<input type="text" value="0"/>	A	<input type="text" value="0"/>
Y	<input type="text" value="0"/>	B	<input type="text" value="0"/>
Z	<input type="text" value="0"/>	C	<input type="text" value="0"/>

OK

**2. Mach3 input signals setting. There are 16 ports on this, from 0-15, on J4 inputs part. Advise: all inputs in Mach3 can be set of negative Active Low.**



**3. Mach3 output signals Setting. There are 8port on J5 output part. Advise: all inputs in Mach3 can be set of Active Low.**

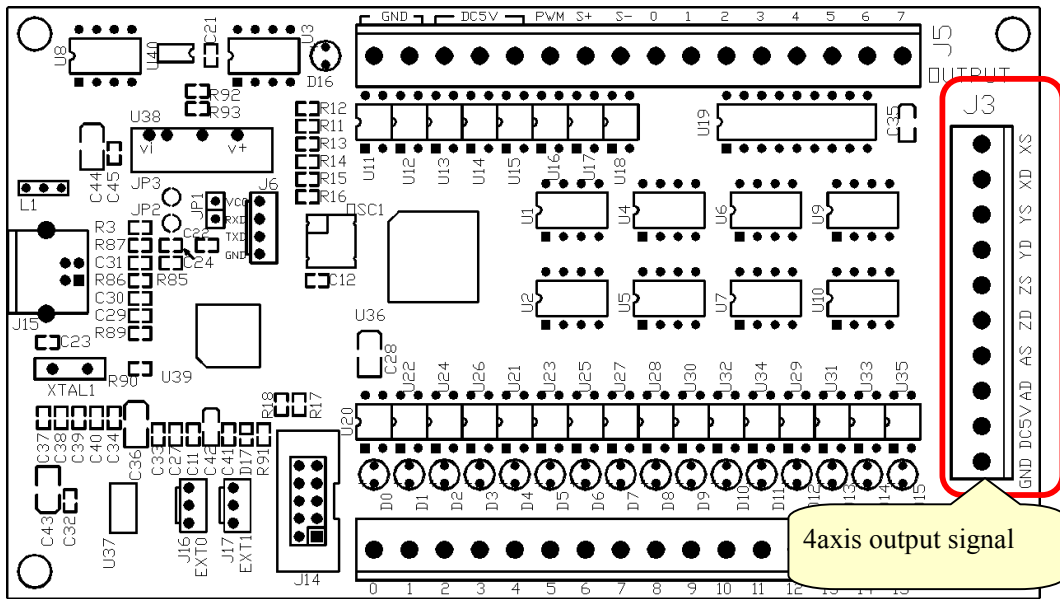


**C. Hardware Connection Instruction**

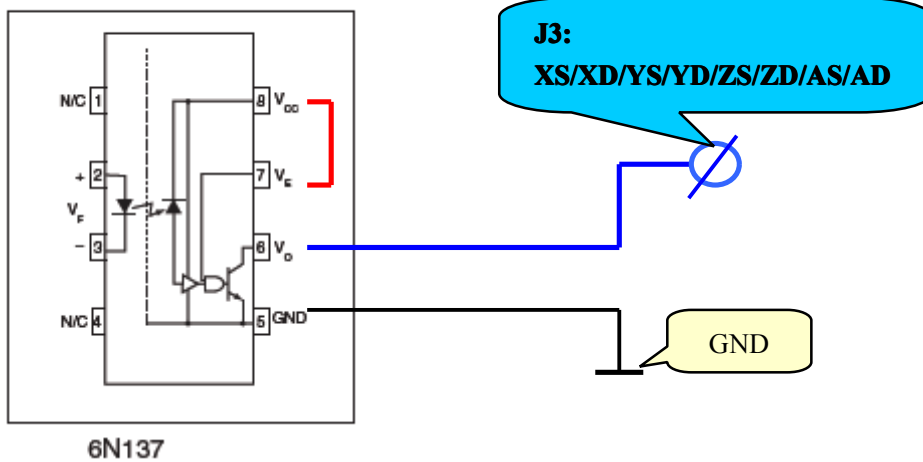
The board is used USB power source, with isolated power source module, don't need external power source.

All outputs, including 4 axis pulse/DIR/8 output controls/main axis speed-adjusted output, are set to be output high resistance when USB is connected. When running Mach3, Level is controlled by Mach3. Advise: all output signals in Mach3 can be set to be Active Low.

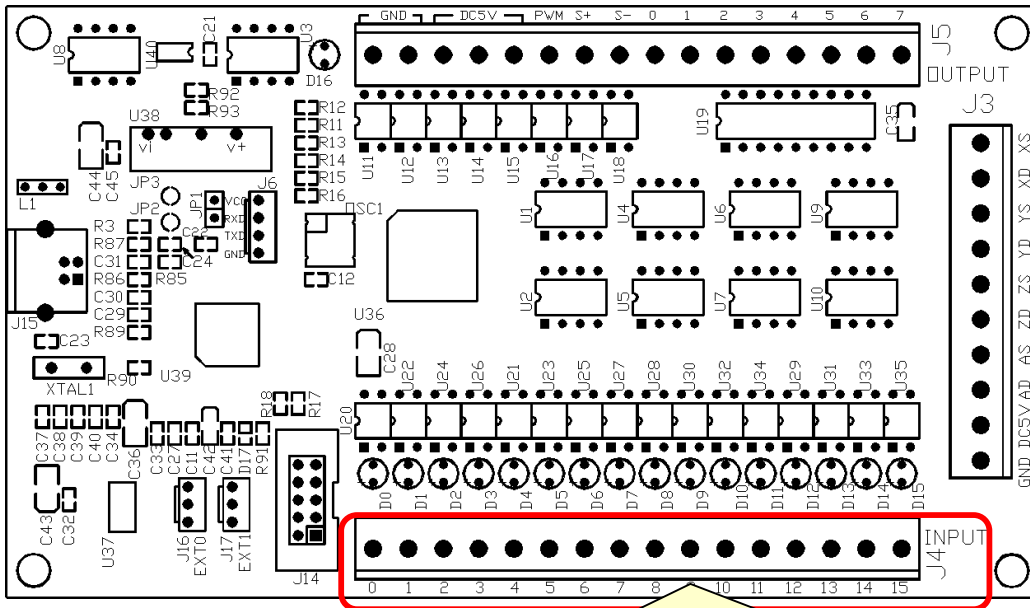
**1. 4axis output signals please refer to J3 signals indicating.**



**Schematic**



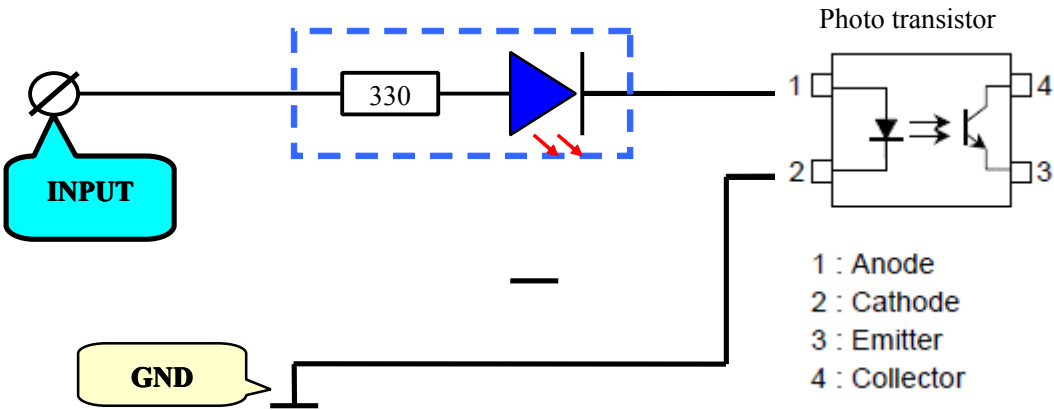
**2. 16input ports, input voltage 5v (current: 7mA). Wired on J4 input ports.**



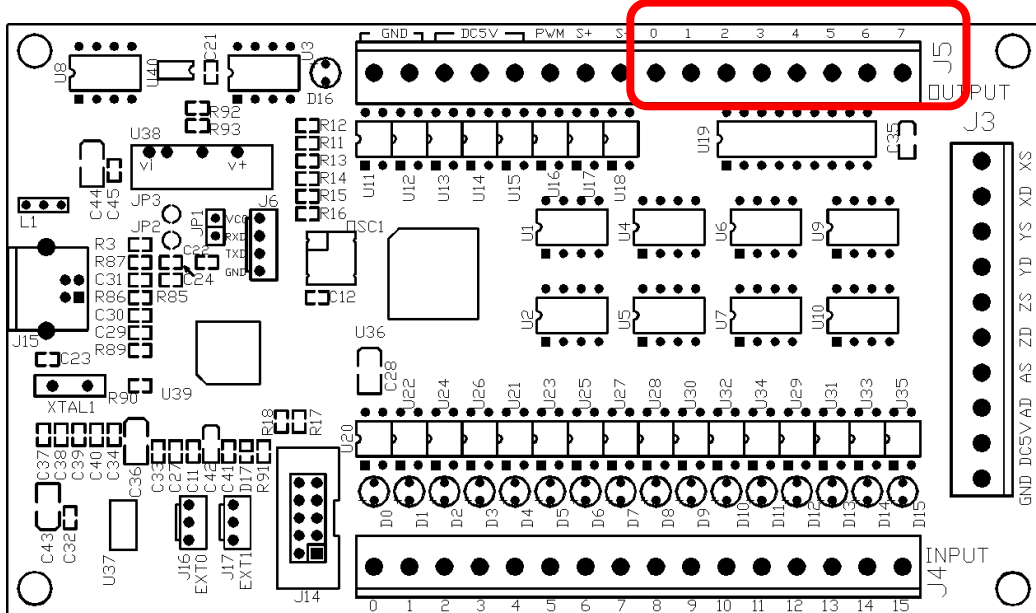
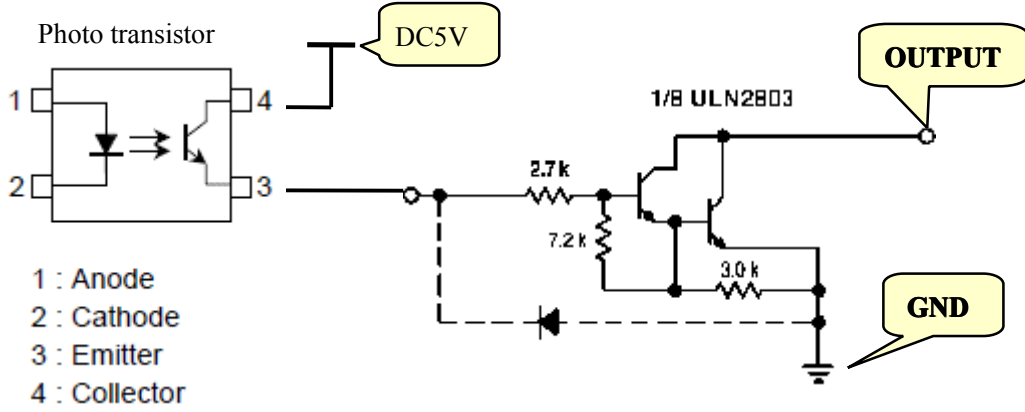
16 input ports, 330Ω resistor onboard connected with input optocouplers.



Interface Diagram:



**3. 8outputs, wiring of the ports (0, 1, 2, 3, 4, 5, 6, 7) on J5 ports.**  
**Max. Voltage:24V, max. drive current is 500mA on Active Low, otherwise output high resistance.**



## D. Ports indicating.

1. **Driver ports:**

**J3**

GND	DC5V	AD	AS	ZD	ZS	YD	YS	XD	XS
-----	------	----	----	----	----	----	----	----	----

Ports	Function	Electrical	Indicating
GND	GND	GND	GND
DC5V	5V DC output	Max:120mA	Isolated power source module output
AD	Adir	OC, 12V/13mA	Connected with A Driver
AS	Astep	OC, 12V/13mA	Connected with A Driver
ZD	Zdir	OC, 12V/13mA	Connected with Z Driver
ZS	Zstep	OC, 12V/13mA	Connected with Z Driver
YD	Ydir	OC, 12V/13mA	Connected with Y Driver
YS	Ystep	OC, 12V/13mA	Connected with Y Driver
XD	Xdir	OC, 12V/13mA	Connected with X Driver
XS	Xstep	OC, 12V/13mA	Connected with X Driver

2. **Inputs ports:**

**J4**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----

Ports	Function	Electrical	Indicating
0	Universal/ Encoder	5V、7mA	Universal input "0", "1", or encoder input "A", "B"
1			
2	Universal		Functions are set in Mach3
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

### 3. Output ports

#### J5

GND	GND	DC5V	DC5V	PWM	S+	S-	0	1	2	3	4	5	6	7
-----	-----	------	------	-----	----	----	---	---	---	---	---	---	---	---

Ports	Function	Electrical	Indicating
GND	GND	GND	GND
GND			
DC5V	5V DC output	Max:120mA	Isolated power source module output
DC5V			
DC5V			
PWM	PWM	OC, 12V/13mA	Main axis speed-adjusted output
S+	Main axis speed test input +	6mA	LED+
S-	Main axis speed test input -	6mA	LED-
0	Universal output	OC, Max.24V /500mA	Functions are set in Mach3
1			
2			
3			
4			
5			
6			
7			



**Note:**

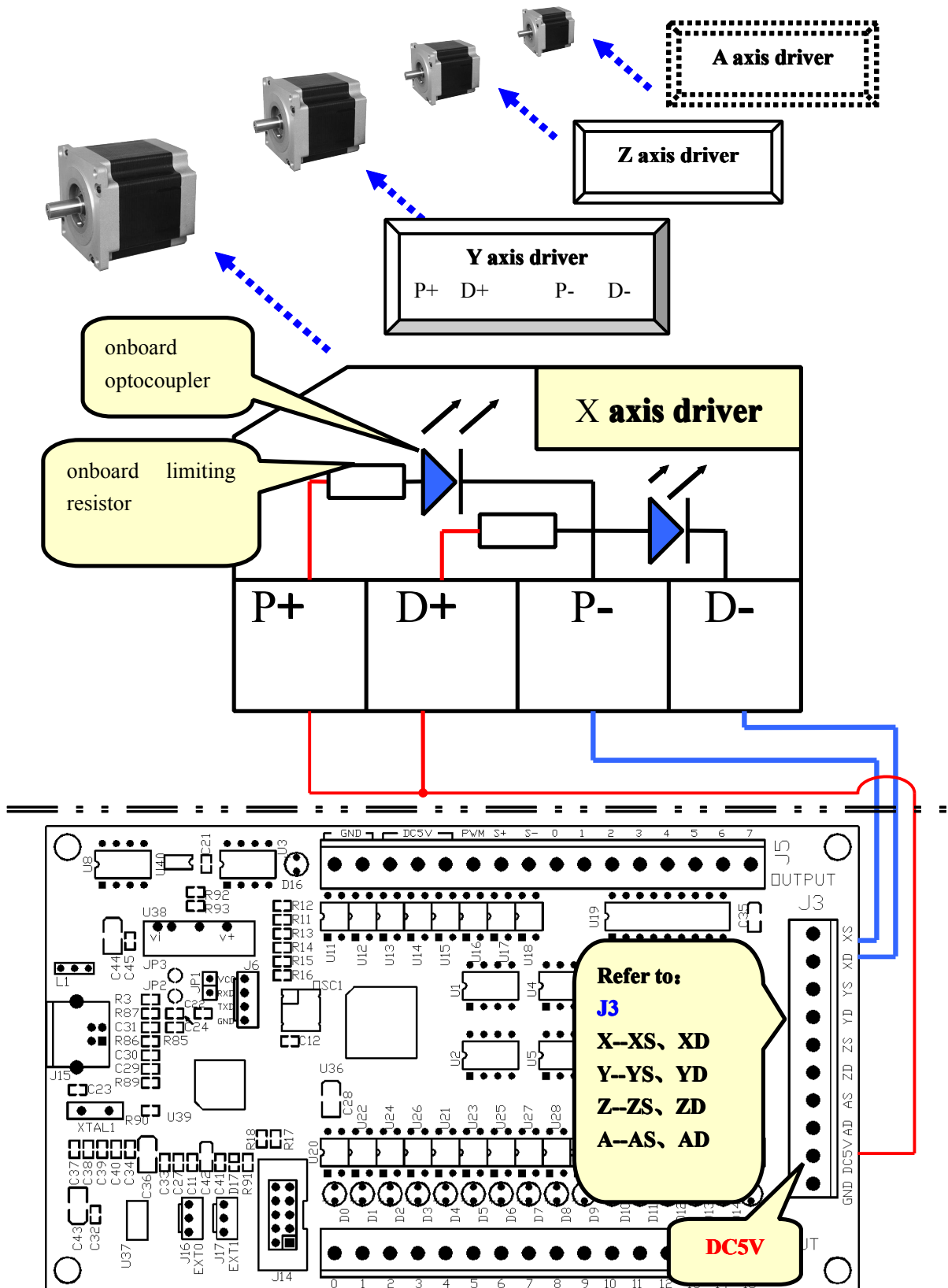
1. "DC5V" is onboard isolated power source output. Voltage:5v, max output current: 120mA.
2. "OC": Open Collector.



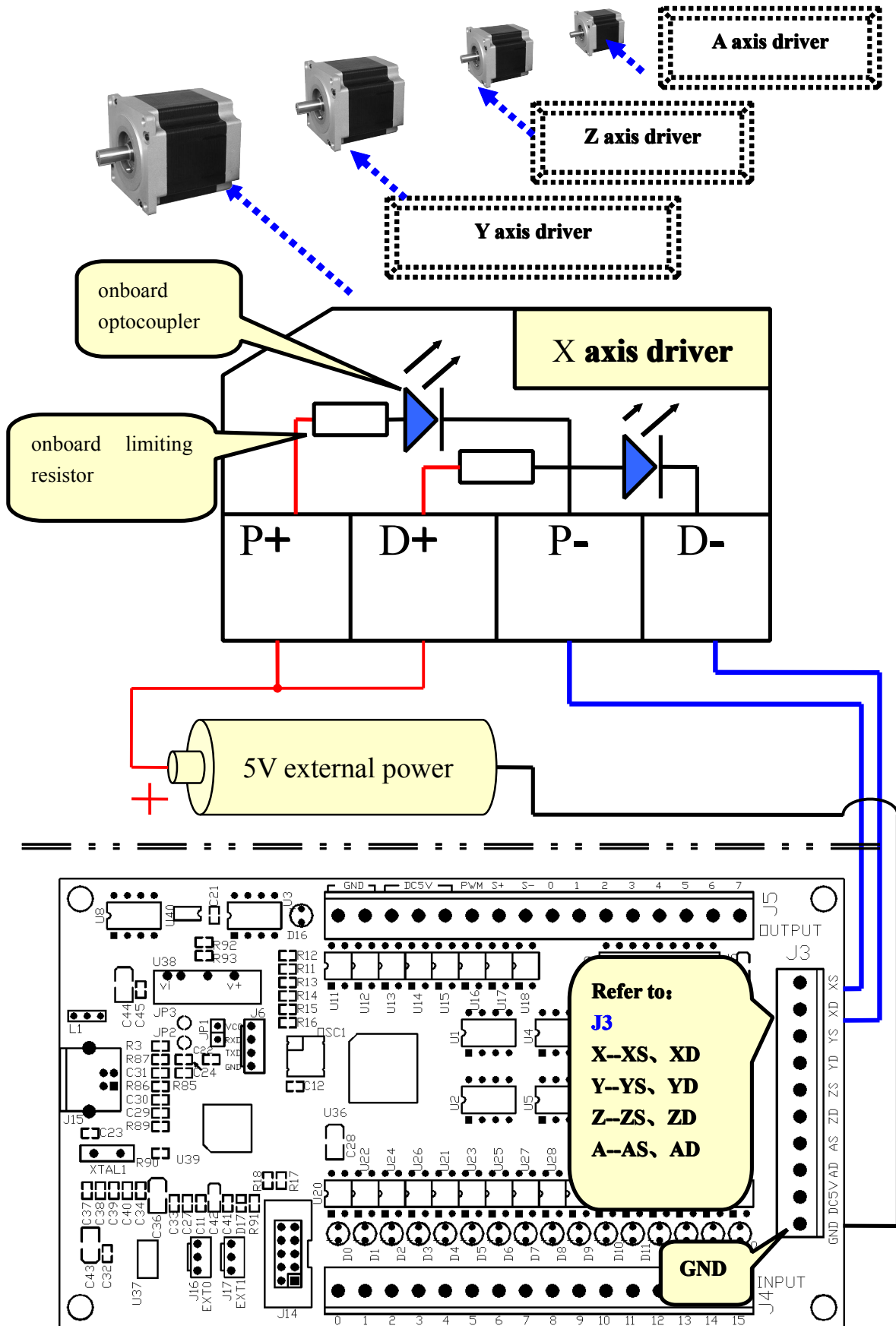
## E. Axis Diagram

**1. X、Y、Z、A axis output. Optical power source: onboard or external.**

**I. Using onboard power source, drive, please install suitable limit resistance according to your need.**

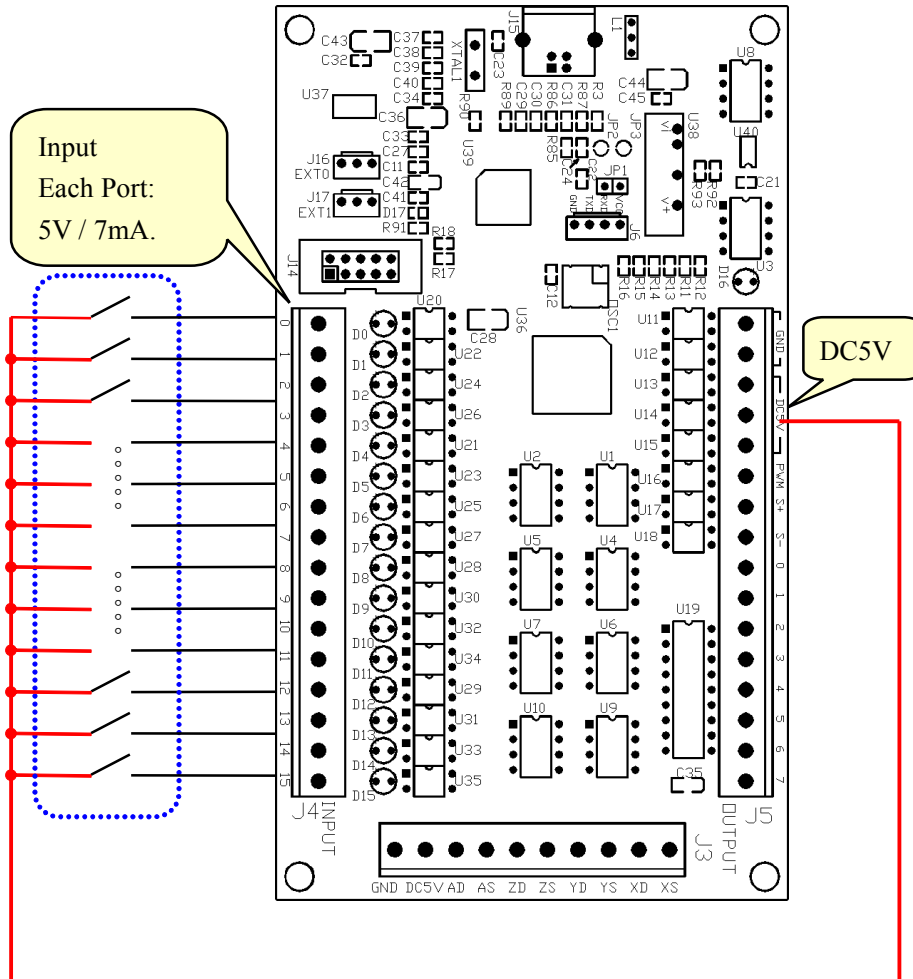


II. **Using external power source, drive, please install suitable limit resistance according to your need.**

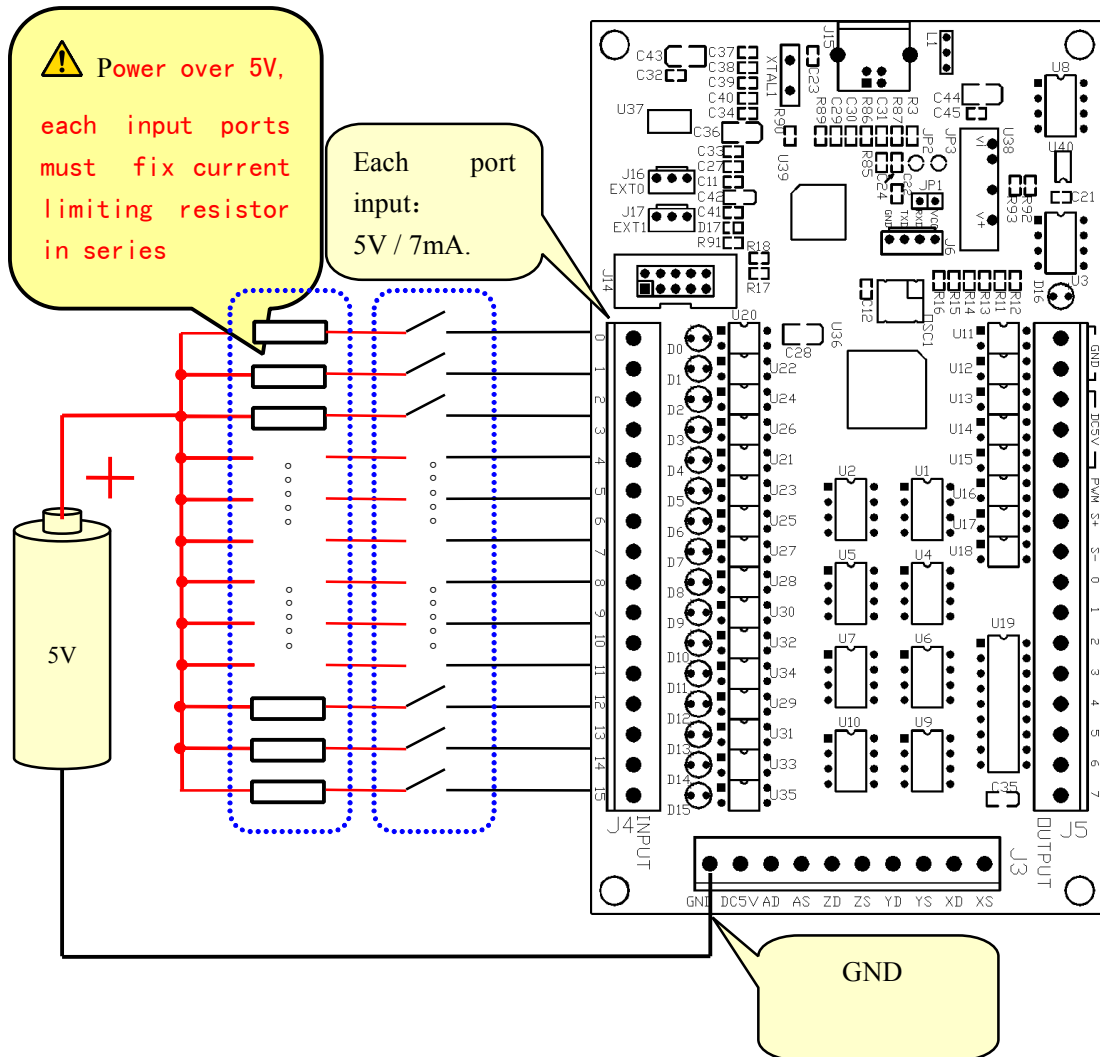


**2. Input: 5V. Optical power source: onboard or external.**

**III. Using onboard power, drive input ports.**



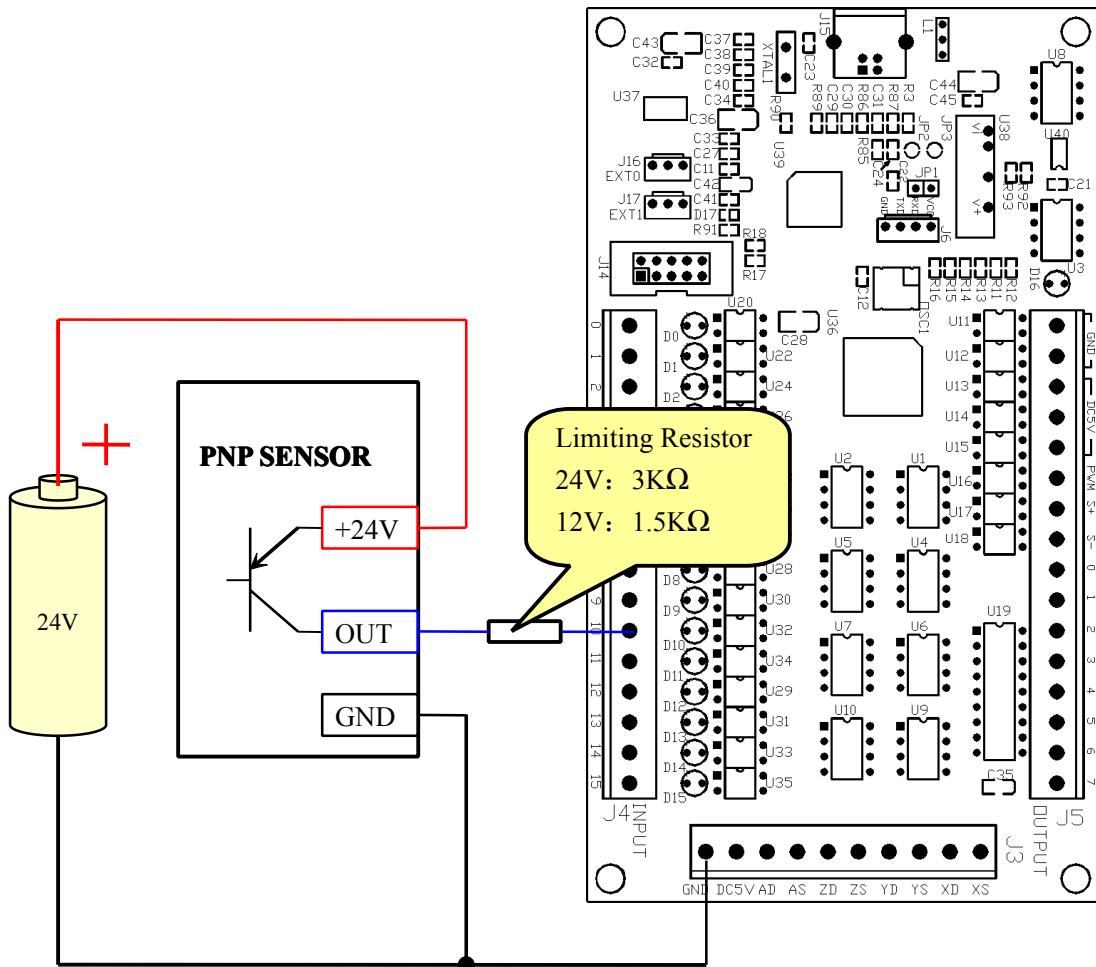
**IV. Using 5v external power, drive input ports.**



**⚠️ Note:** If external power over 5V, each input ports must fix current limiting resistor in series (Limit resistor onboard is 330ohm). Resistor Value:24V---3K, 12V---1.5K.

**3. Sensor's wiring and setting**

**I. PNP sensor, driver input port.**



**Mach3 Input Signals Setting**

Encoder/MPG's		Spindle Setup			Mill Options	
Setup and Axis Selection		Motor Outputs		Input Signals	Output Signals	
Enabled	Port #	Pin Number	Active Low	Emulated	HotKey	
	1	10			0	

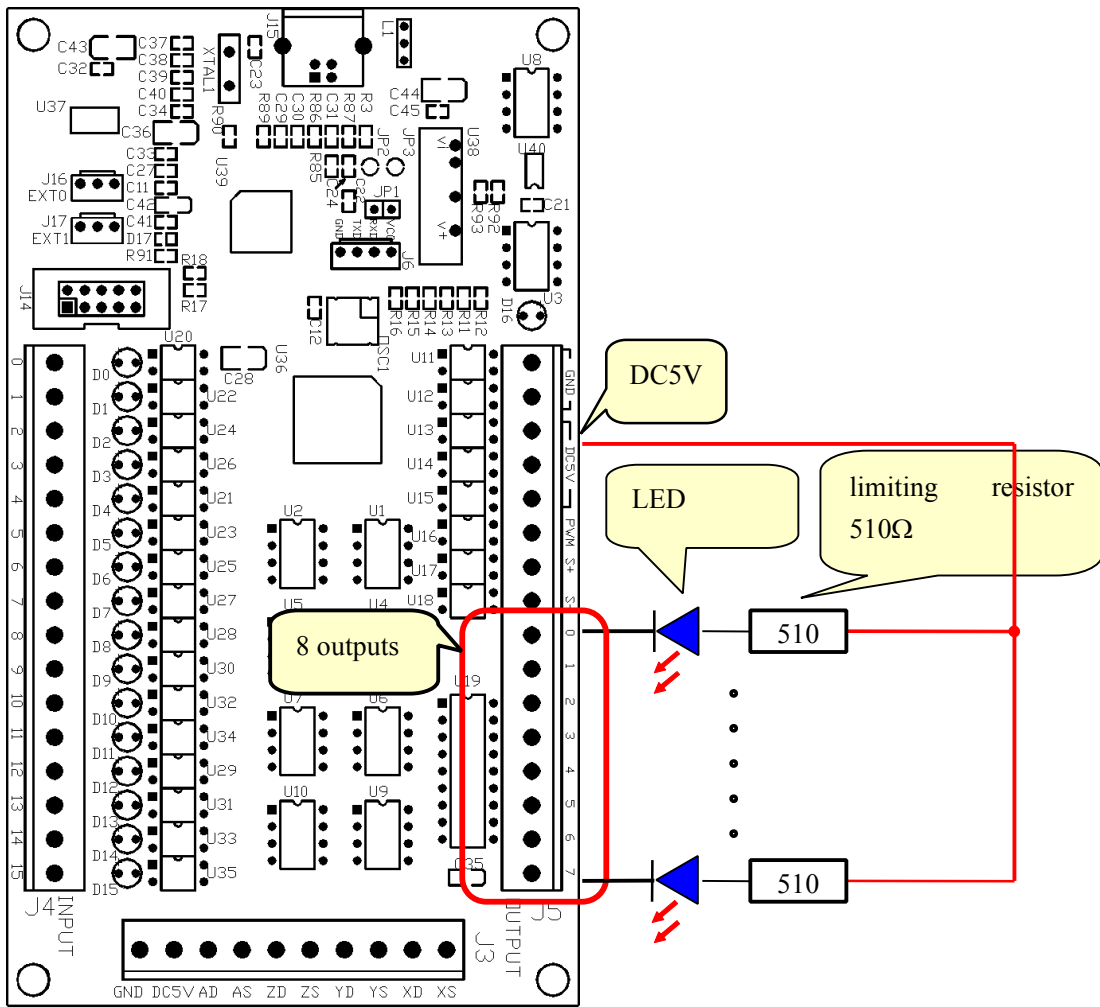
Input port number

According to your need, Usually set to be "X" for PNP sensor.

4. **Output: 8output ports, max. control voltage: 24v, when Active Low, max. drive current is 500mA, otherwise is high resistance output.**

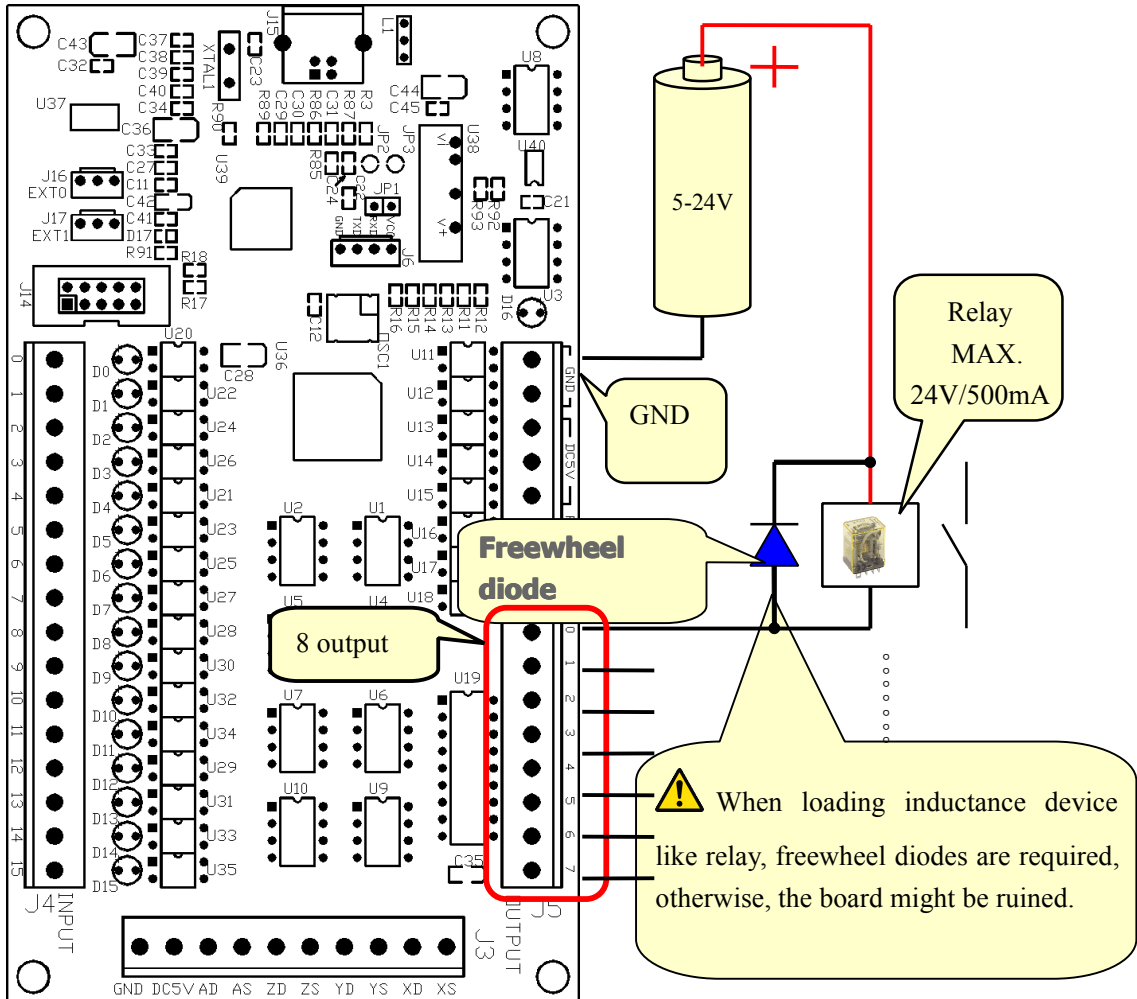
**I. Drive LED with onboard power.**

When drive small current loads like LED, driver test etc, onboard power can be used directly.



**II. Drive 500mA relay with 5-24v external power source.**

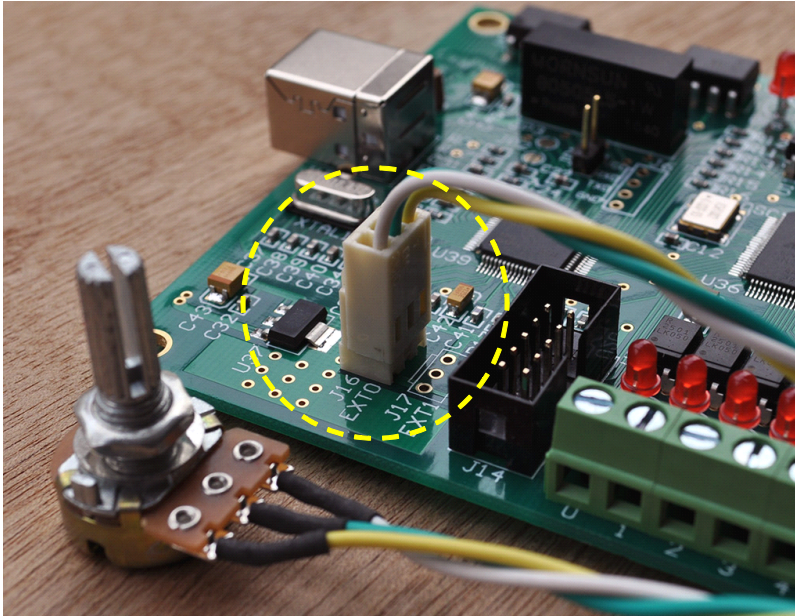
When driver high current loads, like relay, external power source is needed.



## F. External Mag. Knob Installation

**First finish the installation of Mach3 software.**

**Hook up the knob with its port on the board, EXT0(J16).**



**Mach3 setting: Config=>Config Plugins=>PlugIn Control and Activation**

**PlugIn Control and Activation** X

Enabled	PlugIn Name	Config
✔	Flash-FlashScreen-SWF-PlugIn-A. Fenerty-B.-B...	CONFIG
✘	JoyStick-JoyStick-PlugIn--Art-Fenerty-Ver-1.0a	CONFIG
✘	PrinterScope-Port-Scope-1.00.046	CONFIG
✔	ShuttlePro-Contour-Shuttle-Pendants---A. Fene...	CONFIG
✘	TurnDiags-Turn-Diags-1.00.1	CONFIG
✔	Xulifeng-Mach3-USB-Motion-Card	CONFIG
✔	Video - B. Barber-Ver-1.0	CONFIG

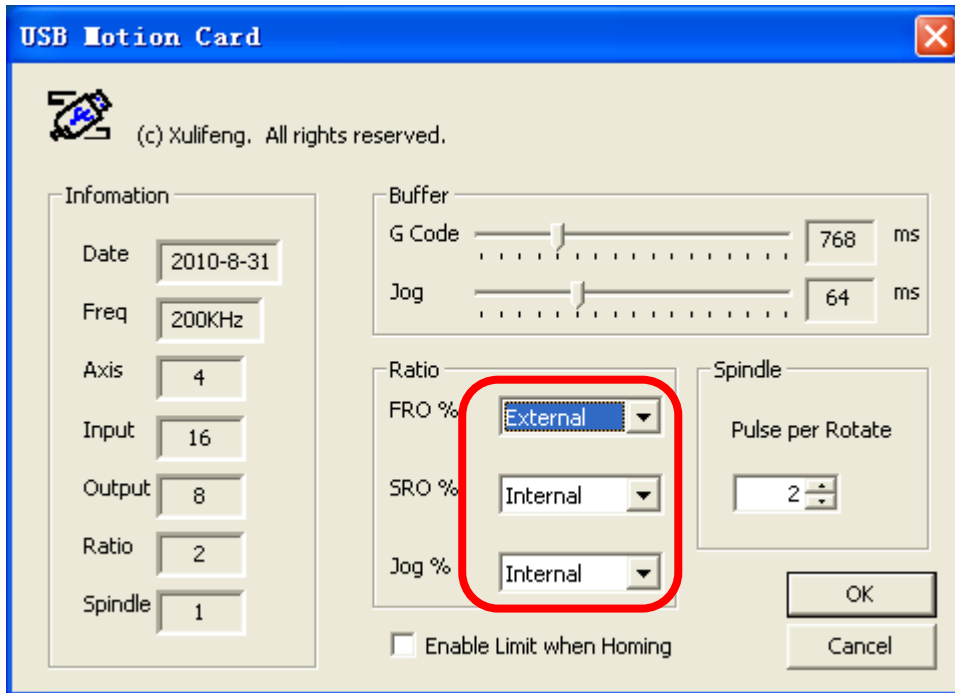
No need to set, it must be a "✔", if not, check the board's connection and if it has been chosen or not when running Mach3.

Click on "Config"

OK

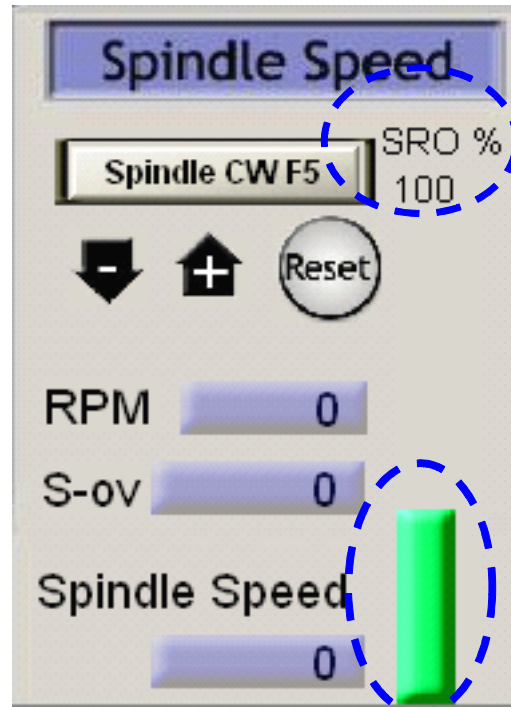
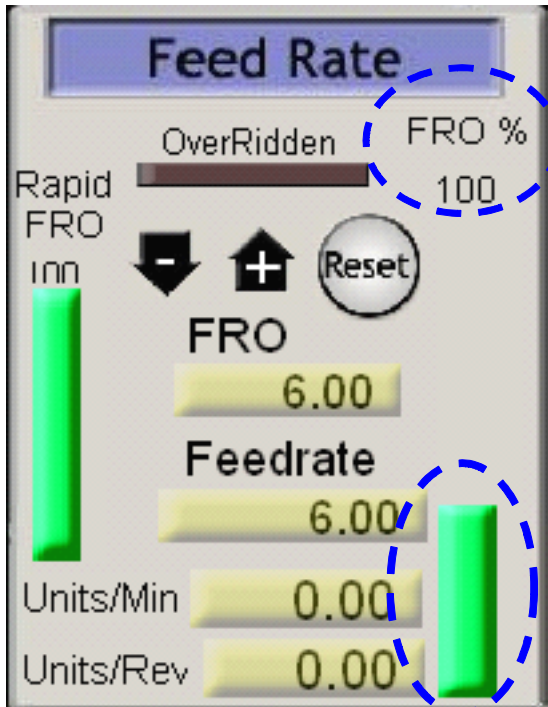


**Click on "Config", comes up the setting dialogue:  
Set the FR0%, SR0% & Jog% to be "External".**



**After setting, click on "OK".**

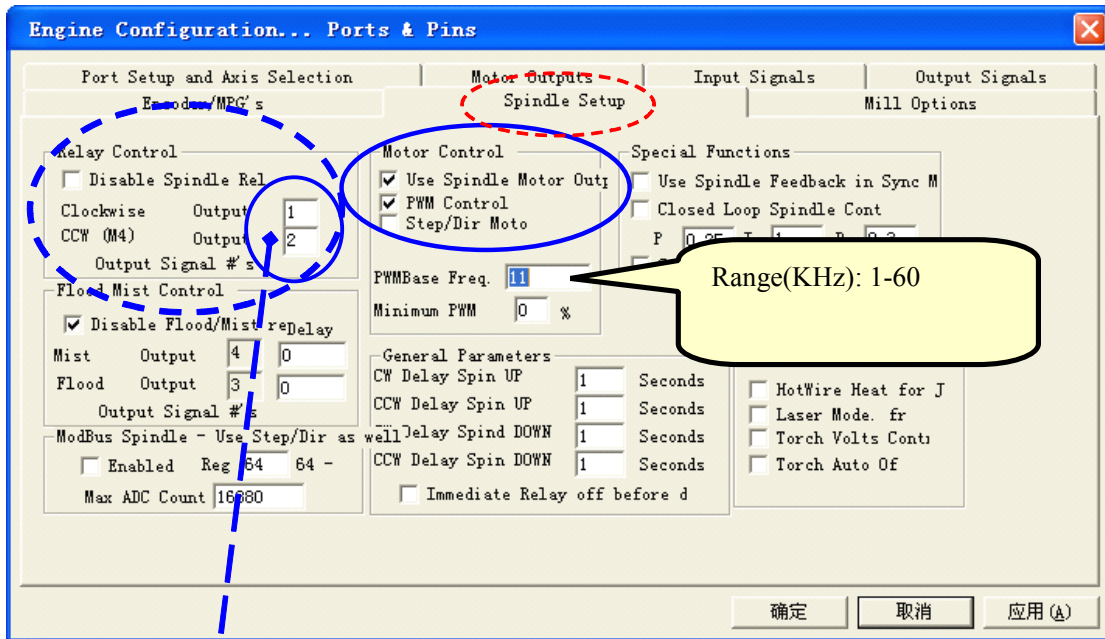
**Turn the knob, you will see the value of FR0%, SR0% & Jog% changing on Mach3.**



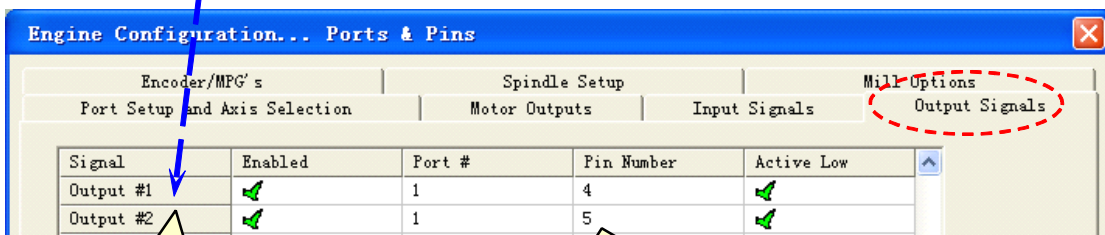
## G. Spindle Setup

### Software setting

**On "Spindle Setup", choose "Use Spindle Motor Output" and "PWM Control".**  
**On "PWMBase Freq", input the frequency value that you need, from 1-60KHz.**

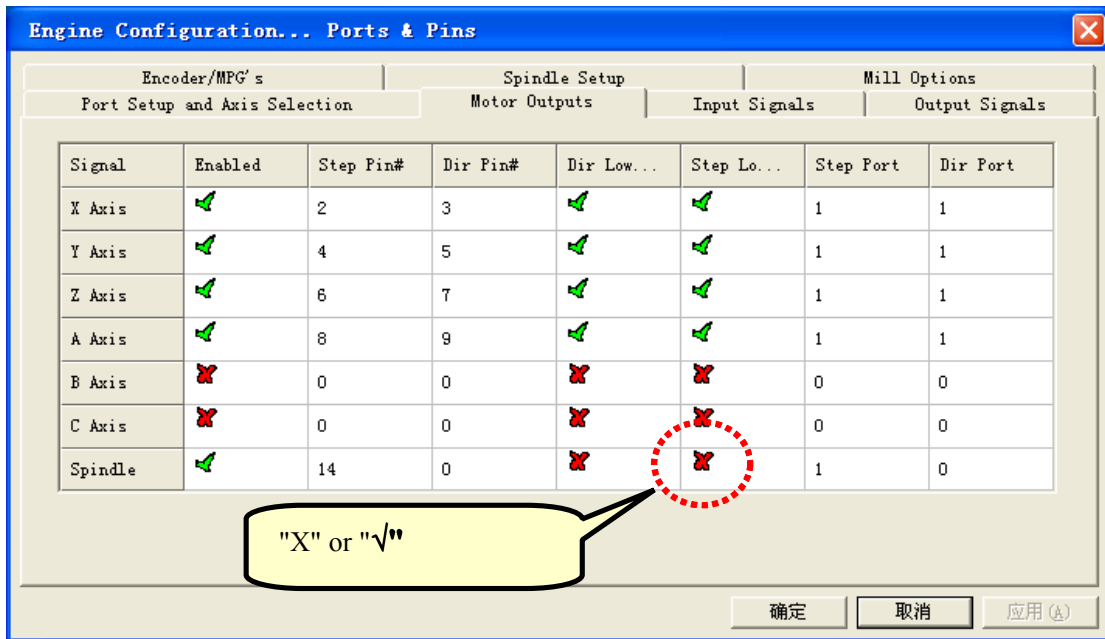


"Output Signals" setting:  
 "Output #1—Output #2"

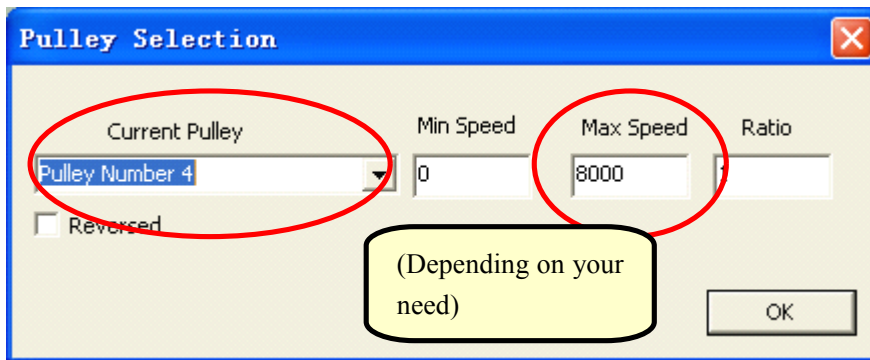


Output #1  
 Output #2

**PWM Phase Position Setting**



**Mach3:Config=>Spindle Pulleys=>Pulley Selection**



**Test**

**Input data:**

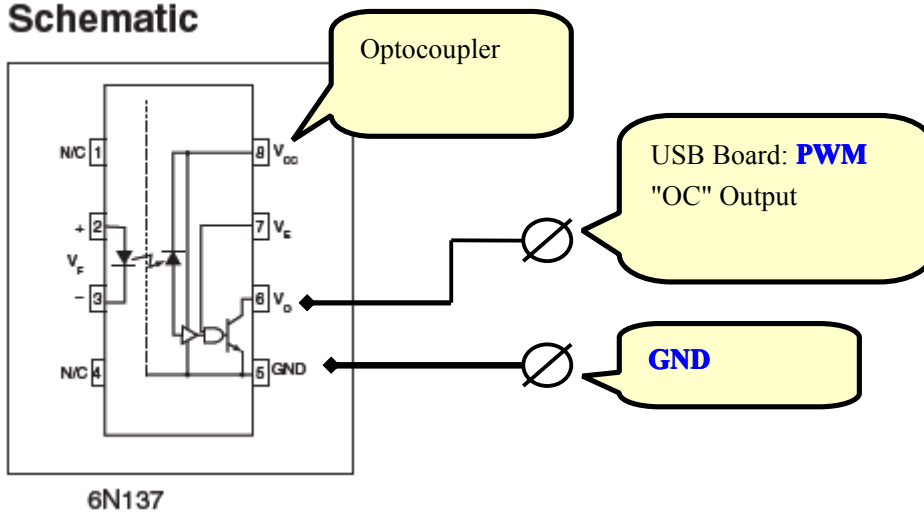
**Input "M3": Relay works.**

**Input "S10000": Spindle runs.**

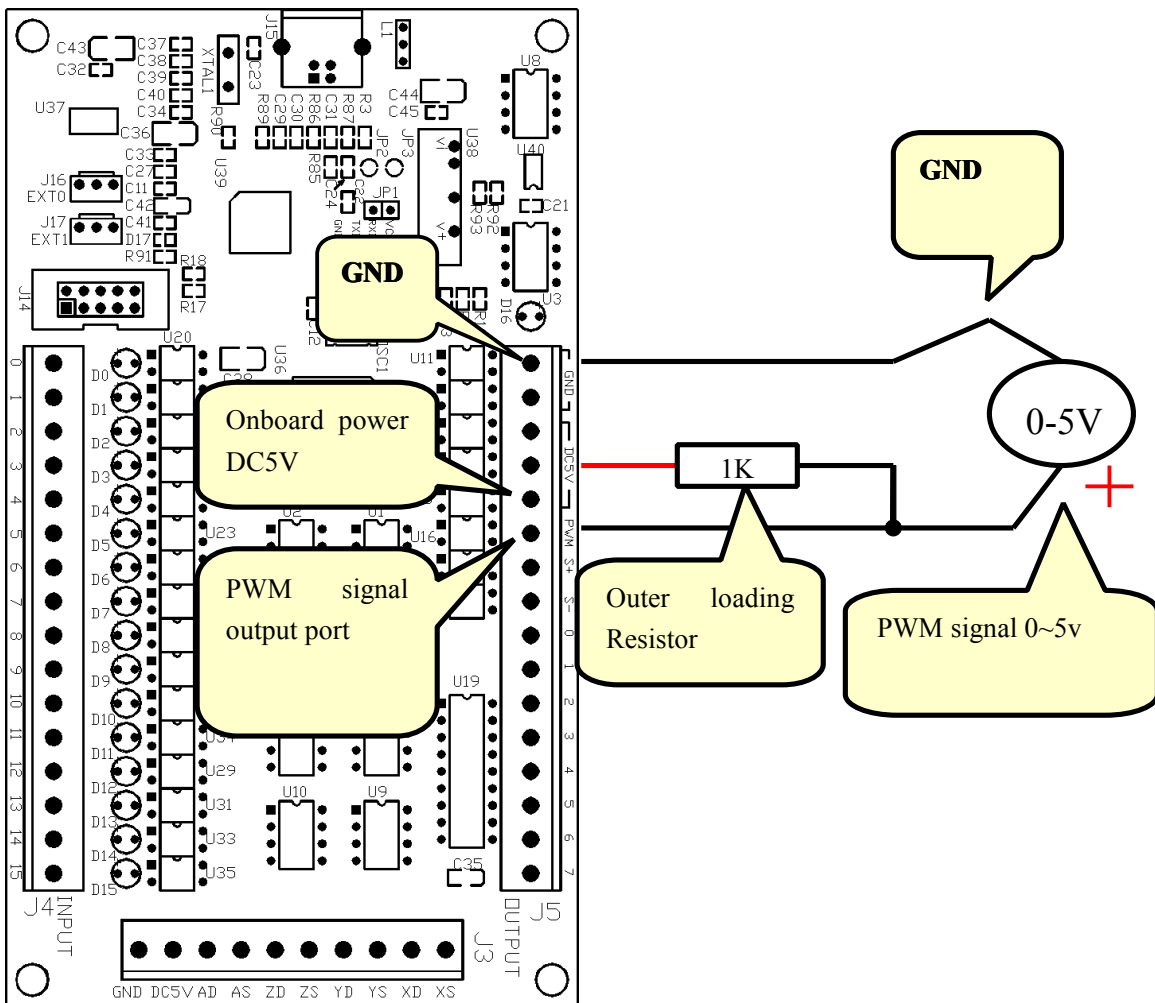
**Input "M5": Spindle stops running.**



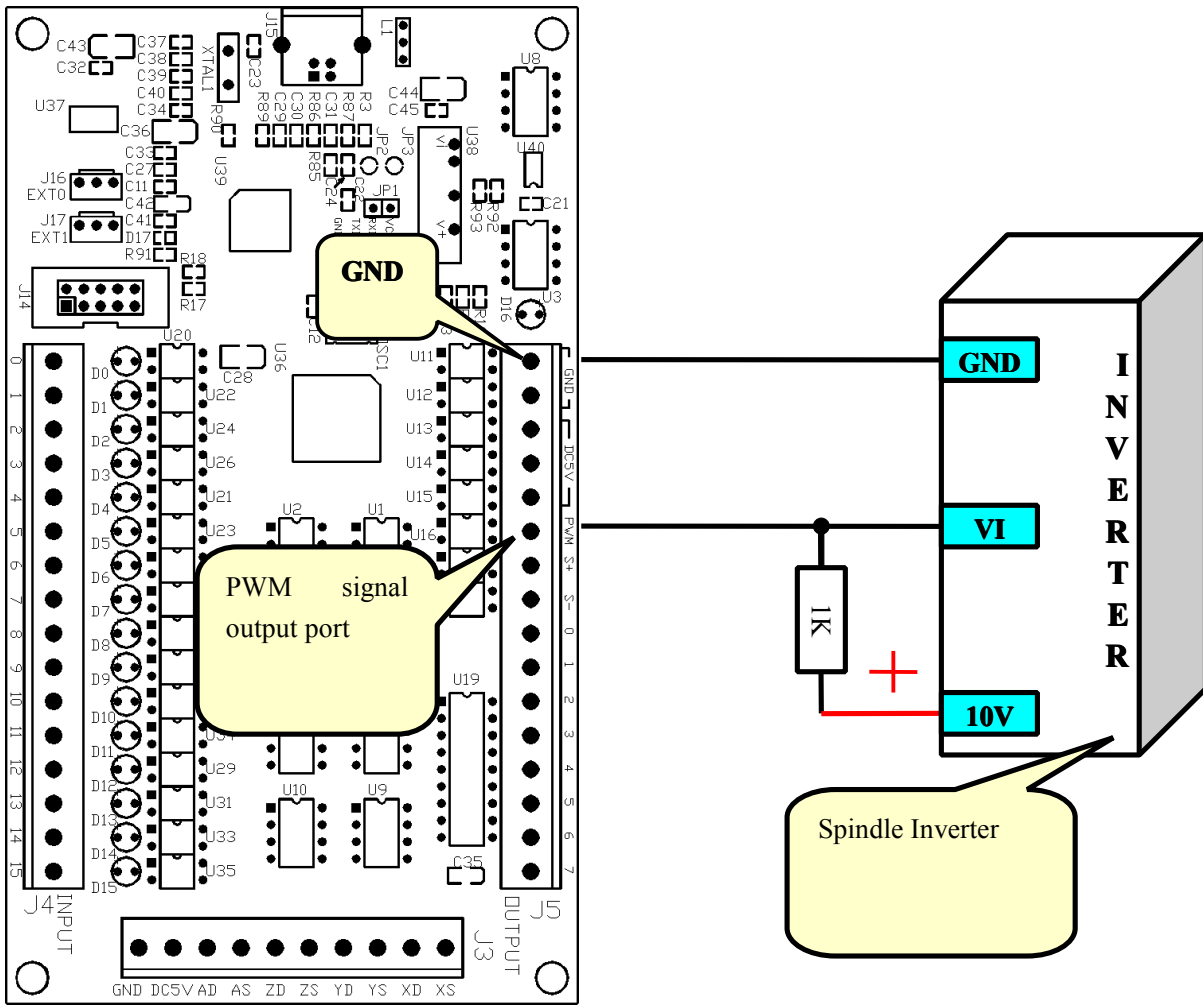
### Schematic



### Using onboard power (0~5V output)



**Using external power (0~10v output)**



**H. Main Axis Speed Test**

**Mach3:Config=>Config Plugins=>PlugIn Control and Activation**

Enabled	PlugIn Name	Config
	Flash-FlashScreen-SWF-PlugIn-A. Fenerty--B. -B. . .	CONFIG
	JoyStick-JoyStick-PlugIn--Art-Fenerty-Ver-1.0a	CONFIG
	PrinterScope-Port-Scope-1.00.046	CONFIG
	ShuttlePro-Contour-Shuttle-Pendants---A. Fene. . .	CONFIG
	TurnDiags-Turn-Diags-1.00.1	CONFIG
	Xulifeng-Mach3-USB-Motion-Card	CONFIG
	Video---B. Barker-Ver-1.0	CONFIG

Click on "Config"

OK

**Click on "Config", comes up the setting dialogue:**

USB Motion Card

(c) Xulifeng. All rights reserved.

Information

Date: 2010-8-31

Freq: 200KHz

Axis: 4

Input: 16

Output: 8

Ratio: 2

Spindle: 1

Buffer

G Code: 768 ms

Jog: 64 ms

Ratio

FRO %: External

SRO %: Internal

Jog %: Internal

Spindle

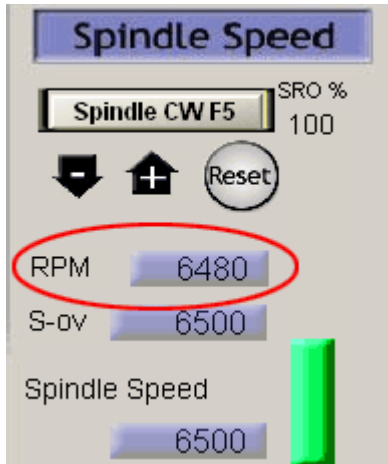
Pulse per Rotate: 2

Enable Limit when Homing

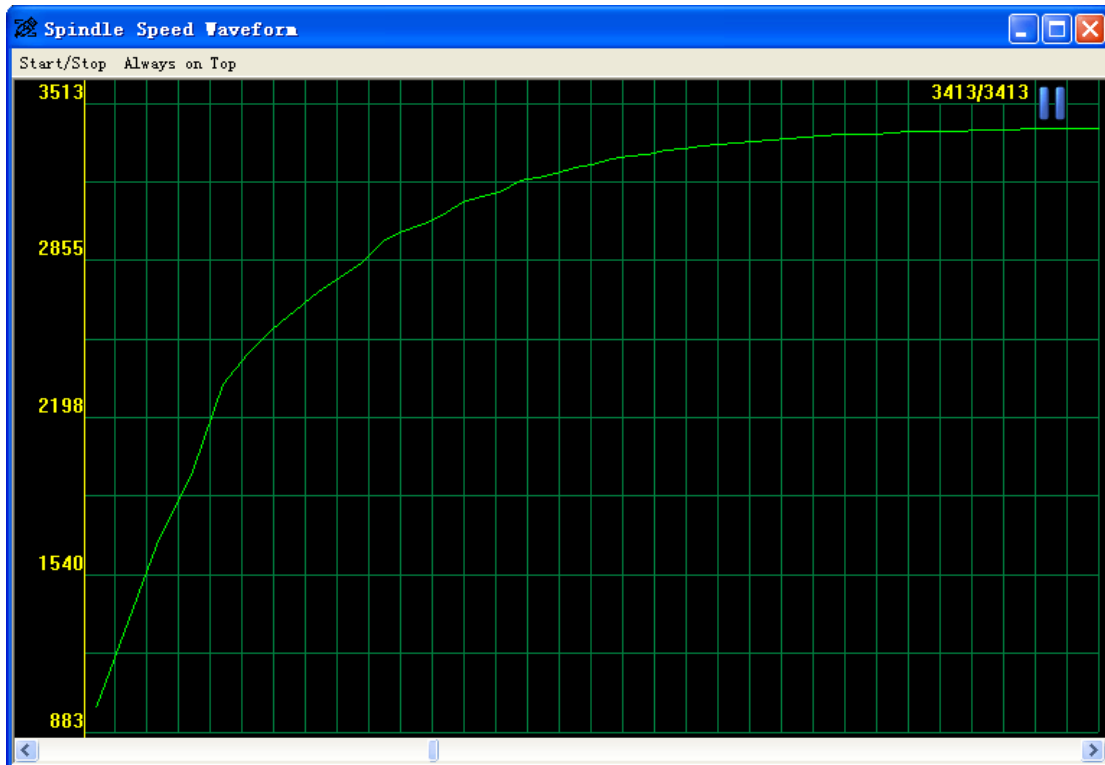
OK

Cancel

**Speed Display on Mach3**

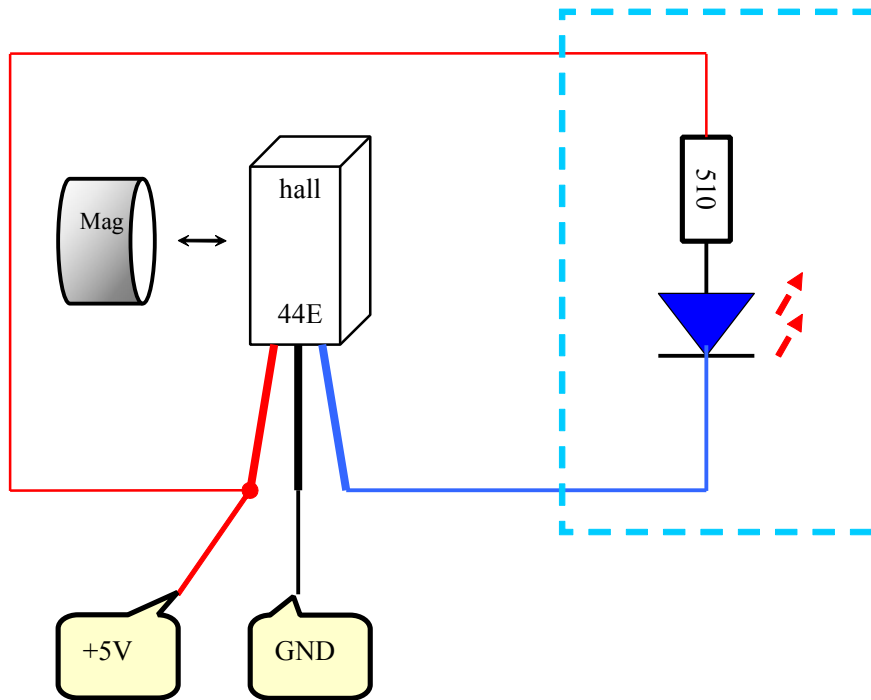


**Real time spindle waveform can be checked:**



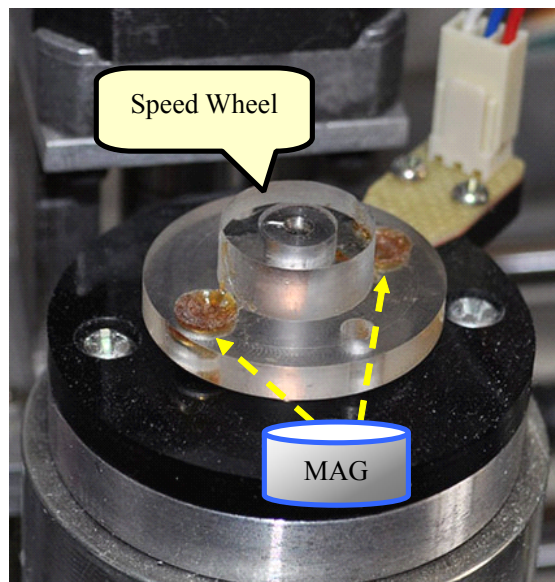
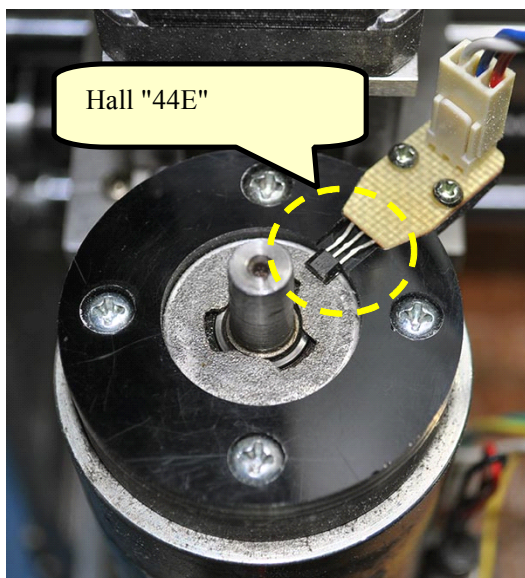
**Hall Element Working Diagram:**

**"44E": OC output.**



**Hall setting**

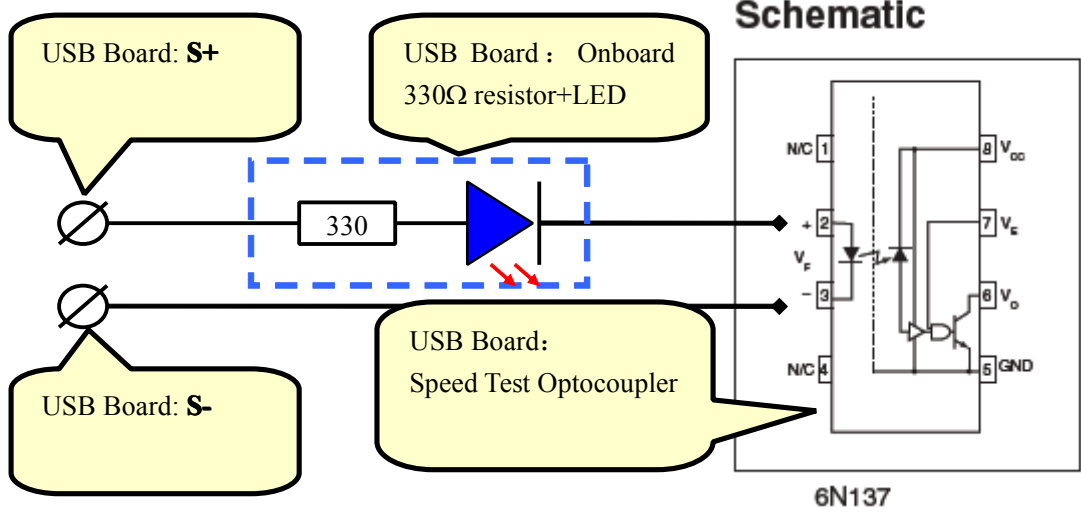
**Note: Identify the MAG's SN pole.**



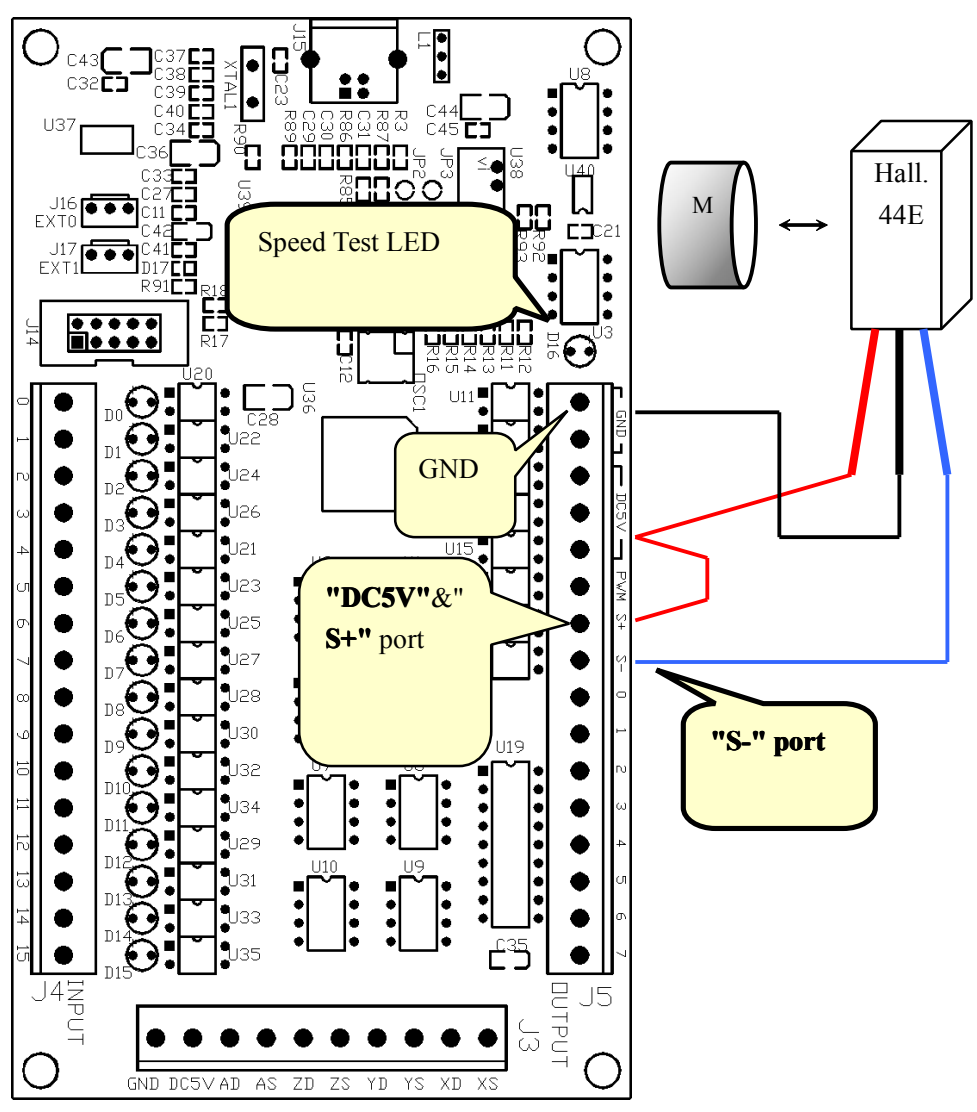




**Speed Test Schematic Diagram**



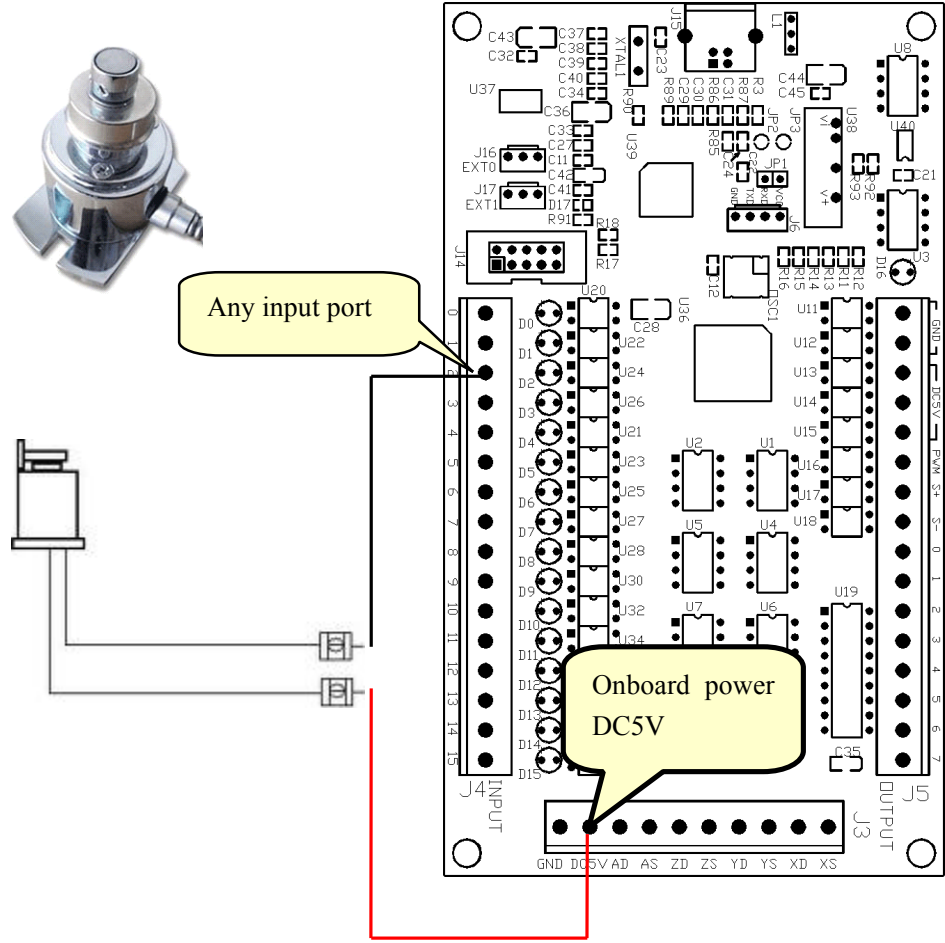
**Hall element diagram**





# I. Auto Tool Installation

## Diagram



### Mach3 Encoder Setting:(Config => Ports and Pins)

Engine Configuration... Ports & Pins

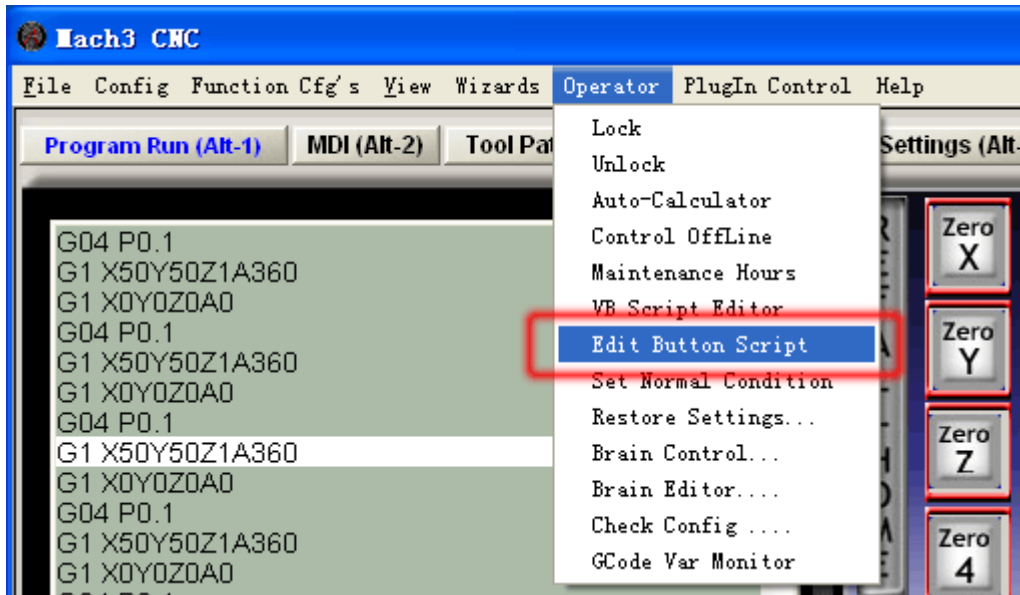
Signal	Enabled	Port #	Pin Number	Active Low	Emulated	HotKey
Input #2	<input checked="" type="checkbox"/>	1	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Input #3	<input checked="" type="checkbox"/>	1	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Input #4	<input checked="" type="checkbox"/>	1	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Probe	<input checked="" type="checkbox"/>	1	2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Index	<input checked="" type="checkbox"/>	1	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
Limit Ovrd	<input checked="" type="checkbox"/>	1	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
EStop	<input checked="" type="checkbox"/>	1	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
THC On	<input checked="" type="checkbox"/>	1	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
THC Up	<input checked="" type="checkbox"/>	1	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
THC Down	<input checked="" type="checkbox"/>	1	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0

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

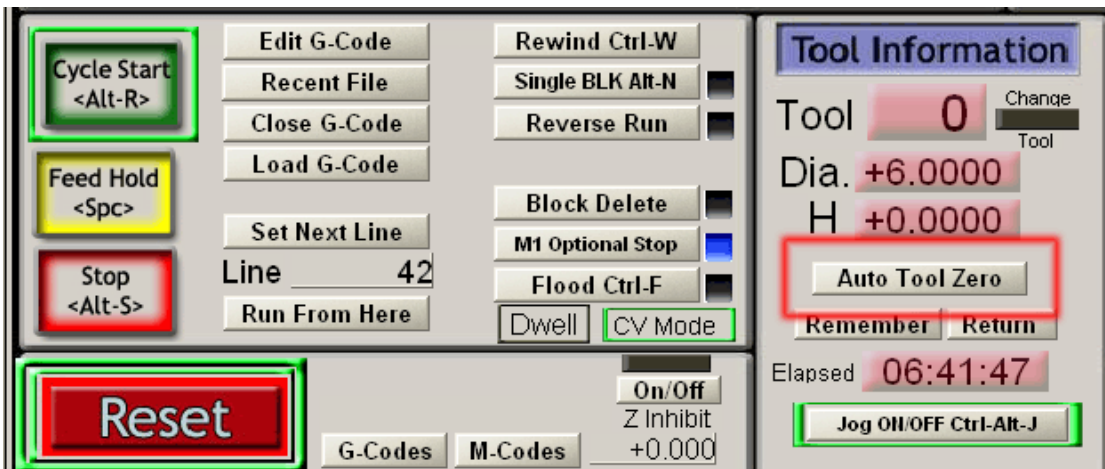
Automated Setup of Inputs

**Auto Tool Software Setting**

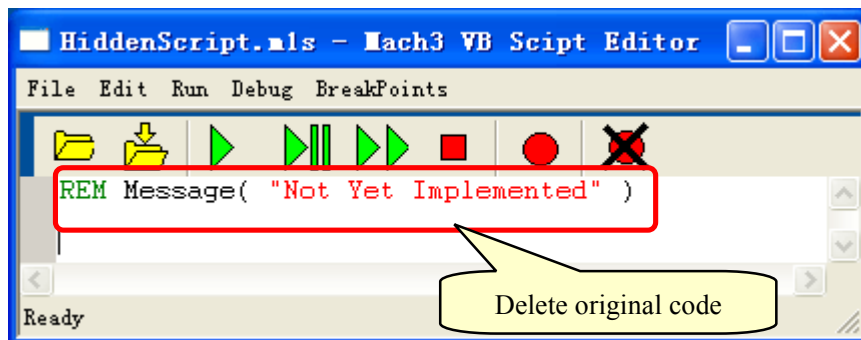
**1. Mach3: (Operator => Edit Button Script)**



**2. Click on "Auto Tool Zero"**

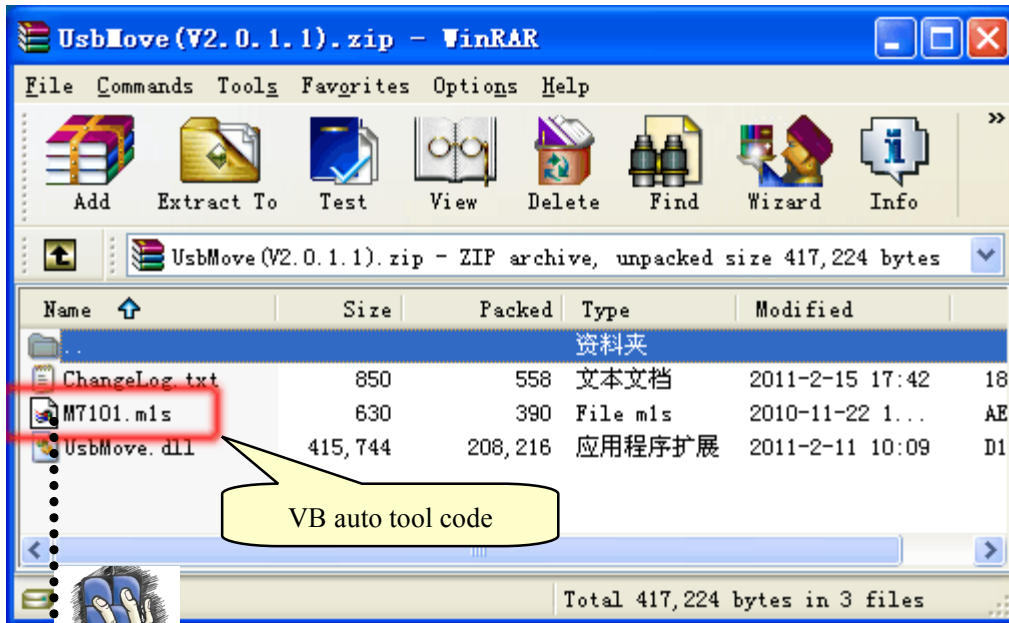


**3. Delete Code on VB Editor**

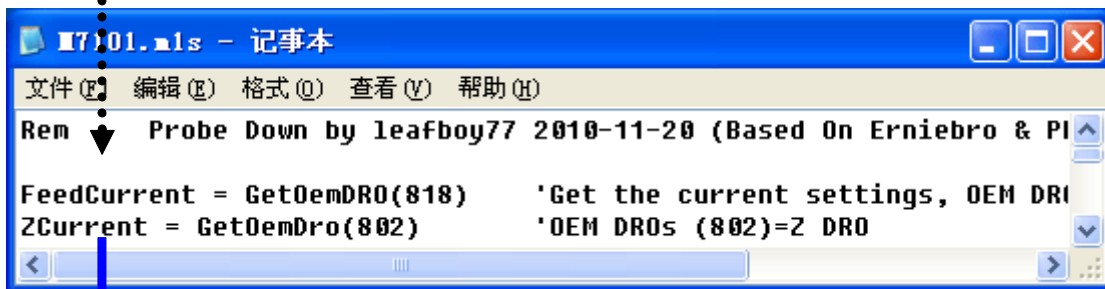


#### 4. Input VB auto tool code in the Editor.

Open "M7101.mls" with NotePad (you can find the file in "usbmove.zip" in the CD).



Drag "M7101.mls" to the NotePad



Copy the code to the VB Editor in Mach3.

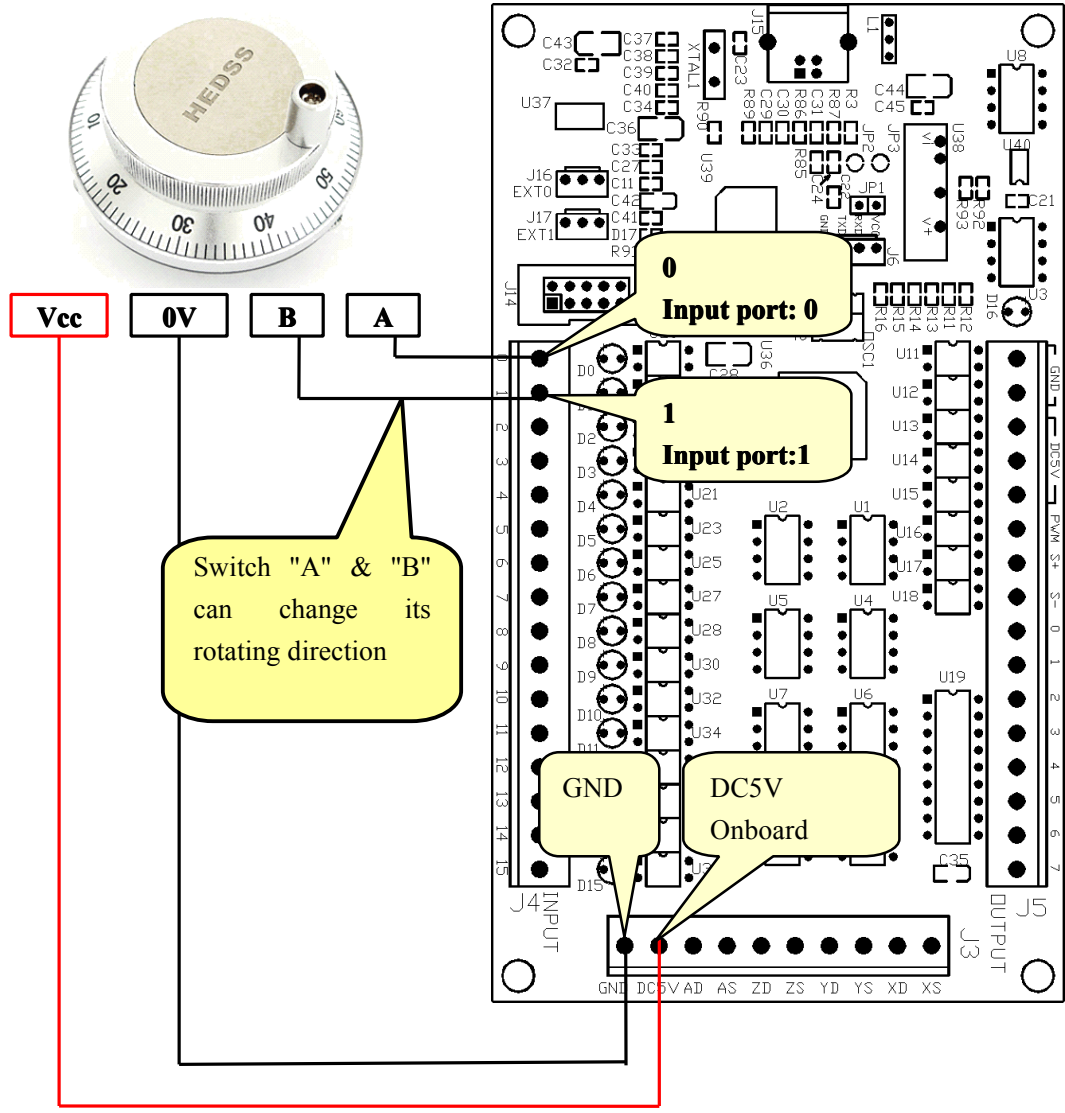


#### 5. Test: Click on "Auto Tool Zero".

Change the VB test code according to your need.

## J. Encoder Setting

### Using onboard Power Source

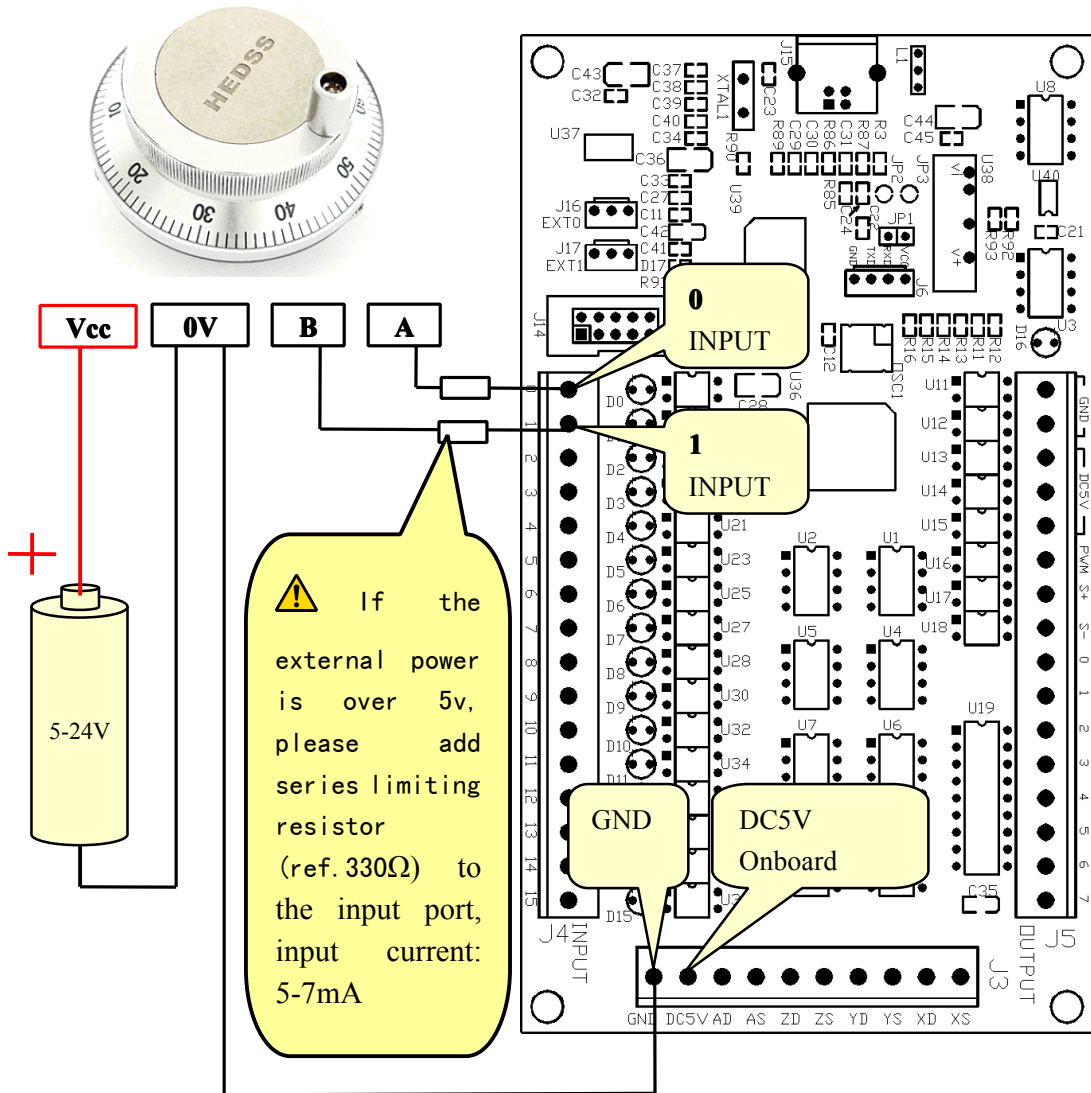


**Note:**

1. "DC5V" is onboard isolated power source output. Voltage:5v, max output: 120mA.
2. If the encoder needs 12v/24v power, or the total current is over the board's loading capacity, please using external power source.

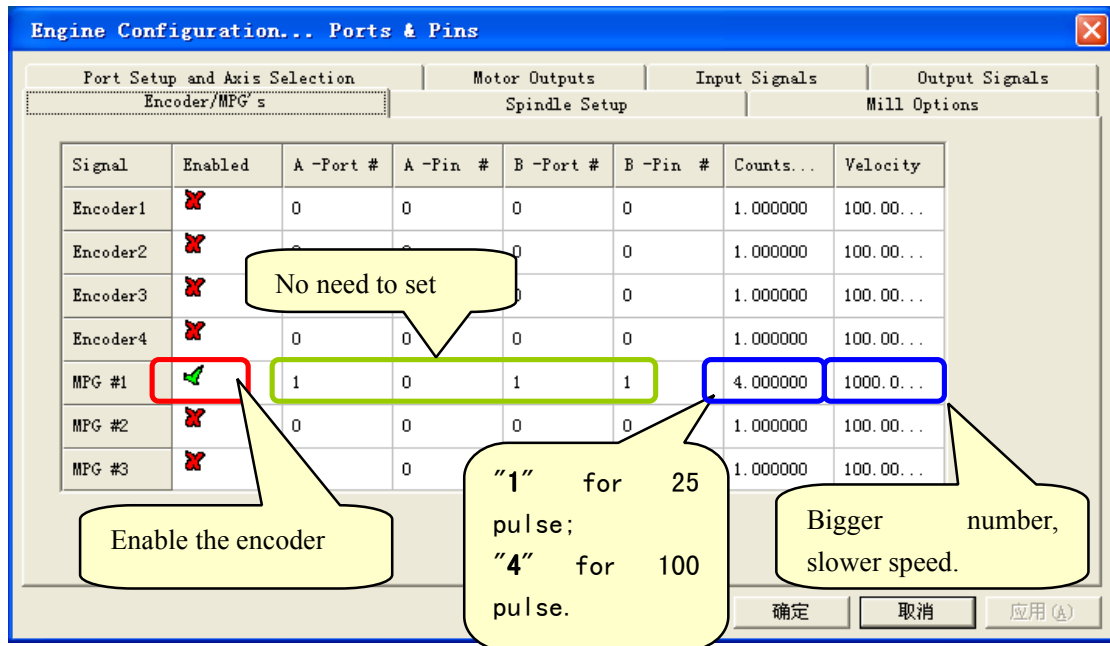


**Using external power source**



**Software setting**

Encoder Mach3 setting:(Config => Ports and Pins)

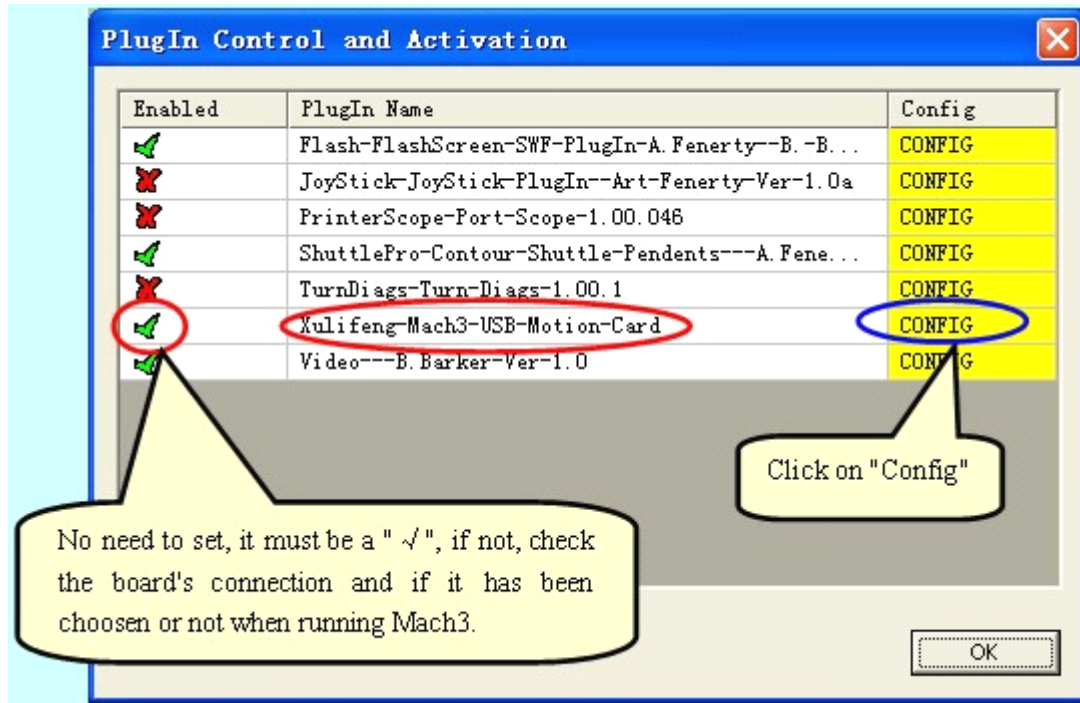


The screenshot shows the 'Engine Configuration... Ports & Pins' dialog box. The 'Encoder/MPG's' section is active, displaying a table with columns for Signal, Enabled, A-Port #, A-Pin #, B-Port #, B-Pin #, Counts..., and Velocity. The MPG #1 row is highlighted with a green border, and its 'Enabled' checkbox is checked with a green checkmark. A red box highlights the 'Enabled' checkbox, with a callout bubble saying 'Enable the encoder'. A yellow callout bubble points to the 'Counts...' field (set to 4.000000) and says 'Bigger number, slower speed.' Another yellow callout bubble points to the 'A-Pin #' and 'B-Pin #' fields (both set to 1) and says '"1" for 25 pulse; "4" for 100 pulse.' A third yellow callout bubble points to the 'A-Port #' and 'B-Port #' fields (both set to 0) and says 'No need to set'. The dialog has buttons for '确定' (OK), '取消' (Cancel), and '应用(A)' (Apply).

Signal	Enabled	A -Port #	A -Pin #	B -Port #	B -Pin #	Counts...	Velocity
Encoder1	<input type="checkbox"/>	0	0	0	0	1.000000	100.00...
Encoder2	<input type="checkbox"/>	0	0	0	0	1.000000	100.00...
Encoder3	<input type="checkbox"/>	0	0	0	0	1.000000	100.00...
Encoder4	<input type="checkbox"/>	0	0	0	0	1.000000	100.00...
MPG #1	<input checked="" type="checkbox"/>	1	0	1	1	4.000000	1000.0...
MPG #2	<input type="checkbox"/>	0	0	0	0	1.000000	100.00...
MPG #3	<input type="checkbox"/>	0	0	0	0	1.000000	100.00...

## K. PlugIn Control and Activation

Mach3=>Config=>Config Plugins=>PlugIn Control and Activation



Do the setting according to your PC's condition so that your system can run smoothly.

