User Manual

For

3rd Generation

5 Axis Standard & Professional Breakout Board Set

Attention: Please read the manual carefully before using the products!

ECG Safety Statement

Easy Commercial Global is not liable or responsible for any accidents, injuries, equipment damage, property damage, loss of money or loss of time resulting from improper use of electrical, mechanical or software products sold on this website or other Easy Commercial Global sales resources.

Since Easy Commercial Global basically provides OEM machine assembly components to build their machines for their own use or third party use, it is their responsibilities to maintain certify and comply with the end user products built base on our components sold at this website or other Easy Commercial Global sales resources.

Assembling electrical CNC machine component like power supplies, motors, drivers or other electrical components involves dealing with high voltage like AC alternative current or DC direct current that is extremely dangerous. Thus, more attention & essential experience and knowledge of software, electricity, electro-mechanics & or mechanics must be necessary.

For technical questions please contact us at ebay@savebase.com before purchase.

1. Introduction, Features and Applications

I. Introduction

The latest 3rd generation breakout board has been upgraded to the intelligent, professional and industrial-level interface board set by re-designing the PCB board, embedding intelligent memory chip(professional version) and upgrading the external manual control tools (display panel and control pad).

Actually, the 3rd generation breakout board has two types of version, one is the standard version, and another is the professional version. Compare to the standard version, the professional version mainly has two more functions than the standard version, one is the "computer G-code recording function", and another is the "manual programing function". Except these two functions, these two types of versions have no other differences.

Firstly, both of these two types of versions have upgraded their PCB boards, the re-designing the PCB board will make the breakout board control the microstep drivers more smoothly with lower noise.

With the embedded intelligent memory chip, the professional version of this 3rd generation 5 Axis breakout board can easily record MAX 4 Axis'(X, Y, Z, A Axis) G-code running on the CNC software (e.g. Mach3, EMC2, KCAM4, etc..) of the computer, and then rerun the recorded G-code to make the stepper motor work without the computer any more.

Furthermore, the upgraded external manual control tools (display panel and control pad) on the professional version can be not only used for manually controlling the stepper motor, but also manually programming the G-code. All the manually Programmed G-code will also be recorded in to the embedded intelligent memory chip, and then we also can easily run the recorded G-code to control the stepper motor. Considering that the computer G-code recording function is enough for all the four axis working without computer, to avoid repeated function, the manual programming function is mainly designed for one axis to make linear motion, therefore, the four axis cannot be manually programmed simultaneously. This function is widely used on working which just need one Axis, such as RBI machine, Conveyor etc.

In short, the qualities and functions of the new 3rd generation advanced 5 axis breakout board are revolutionized from the previous version. So, we believe that these two types of versions must satisfy different users for microstep drivers on CNC DIY.

II. Features

- High performance, cost-effective.
- To manually control the stepper motor, both of the standard and professional drivers have been equipped with the display panel and control pad.
- Automatically identify both of the computer and control pad, functions of the computer and control pad can be switched intelligently for each other without any interference.
- Display panel can real-time trail the running path of G-Code on the computer or input by the control pad, and then completely and synchronously display the changing of MAX FOUR axis'(X, Y, Z A axis etc.) values on its screen, it is completely synchronous with the values' changing on the FOUR coordinates of Mach3.
- Both of the standard version and professional version are compatible with the Mach2, Mach3(Default Software), LinuxCNC(EMC2), KCAM4 CNC Software, etc.. Besides, the professional version can automatically trail the path running path of G-Code from the CNC software (e.g. Mach3, EMC2, KCAM4, etc...) of the computer and record the G-code into the memory chip; Easy to repeatedly run the G-code to control the stepper motors without computer.
- The professional version also supports manual programming via the control pad, as long as input the required values on one axis and record them in the memory chip of the driver, and then run these recorded values to drive the axis to make linear motion, widely used on RBI machine, Conveyor and so on.
- Automatically finish Tool-settings on X, Y, Z Axis via the control pad, without the support of the computer.
- Compatible with all the 2 phase, 3 phase and 4 phase microstep drivers in the market.
- Automatic circuit protections function when the wirings between the breakout board and microstep drivers are incorrect.
- 5 types of input control in manual control interface, to set limit, estop, midpoint-Setting, cutter-presetting/tool-setting etc.
- With relay output control interface, available to control the spindle motor, air pump, water pump, etc.

- The 5th Axis(B Axis) on the breakout board can be used as a PWM signal output interface for the control of frequency inverter and spindle via software(E.g. Mach3...), to make spindle's speed adjustable.

III. Applications

Suitable for a wide range of 2-phase and 3-phase microstep drivers in the market, such as M542, M542H, MA860H, 2MA2278, 2M542, 2M860, 2M982, DM542, DM860, 3M565, 3MA860, 3MA2290 etc.. It can be used in various kinds of machines, such as X-Y tables, labeling machines, laser cutters, engraving machines, pick-place devices, and so on.

2. Specifications

I. Electrical Specifications (T_j = 25℃/77℉)

Input Voltage	5V DC power supply or USB port to directly get power from PC
Version Type	Standard version & Professional version
Drive Type	Pulse + Direction + Enable Signal Control
Suitable Microstep Driver	2/3 Phase Microstep Driver: M542, M542H, MA860H, 2MA2278, 3M565, 3MA860, 3MA2290 etc.
Net Weight	170g (Breakout Board + Display Panel)
Dimensions	110*100*25mm

II. Operating Environment and other Specifications

Cooling	Natural Cooling or Fan Forced cooling	
Operating Environment	Environment	Avoid dust, oil fog and corrosive gases
	Ambient Temperature	0 ℃— 50℃ (32℉ — 122℉)
	Humidity	40%RH — 90%RH
	Operating Temperature	70℃ (158℉) Max
Storage Temperature	-20 ℃ — 65℃ (-4℉ — 149℉)	
Total Weight	Approx. 275g (Breakout Board + Control Pad + Display Panel)	

III. PCB Instructions & Specifications

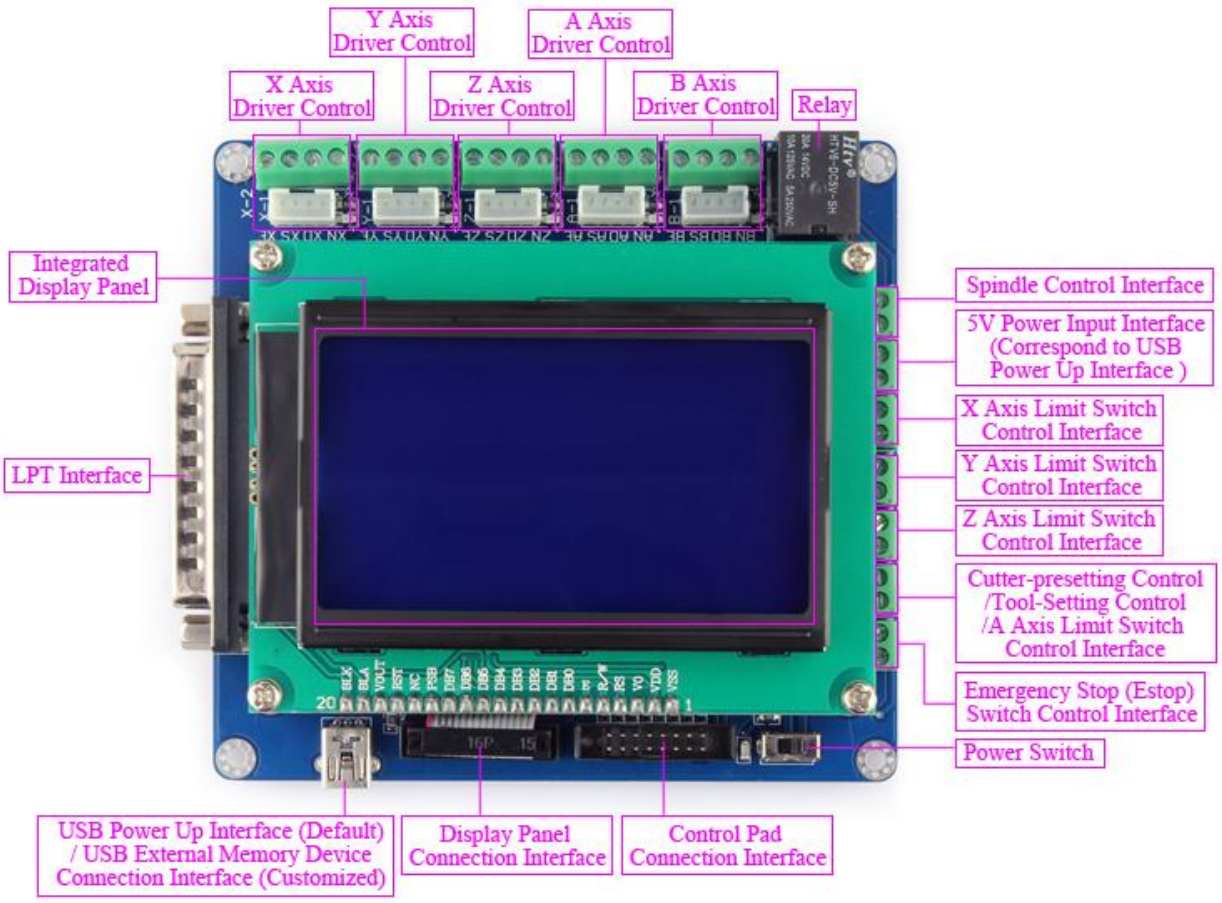
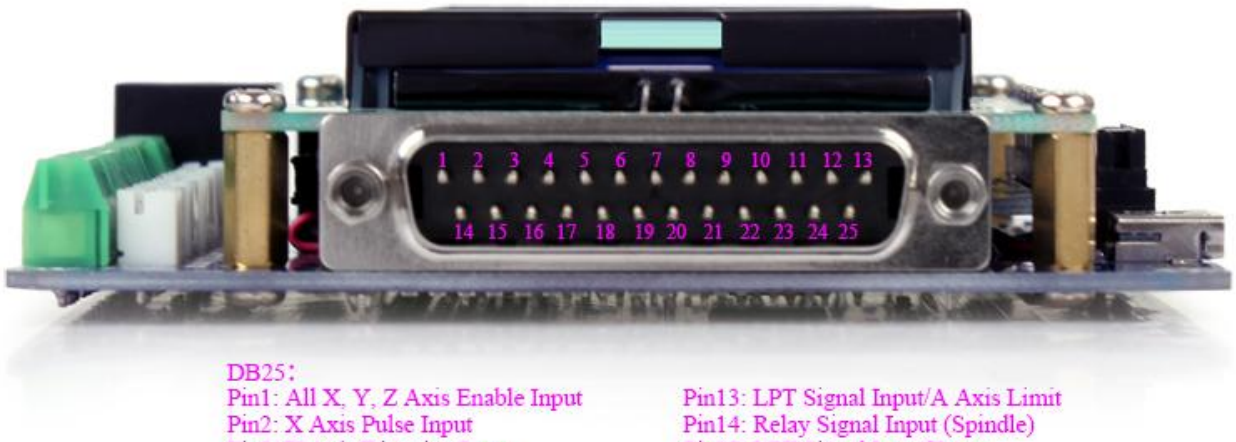


Figure 1: PCB Instructions & Specifications

3. Pin Assignment & Connectors Definitions

I. DB25 & DB15 pin assignment



DB25:

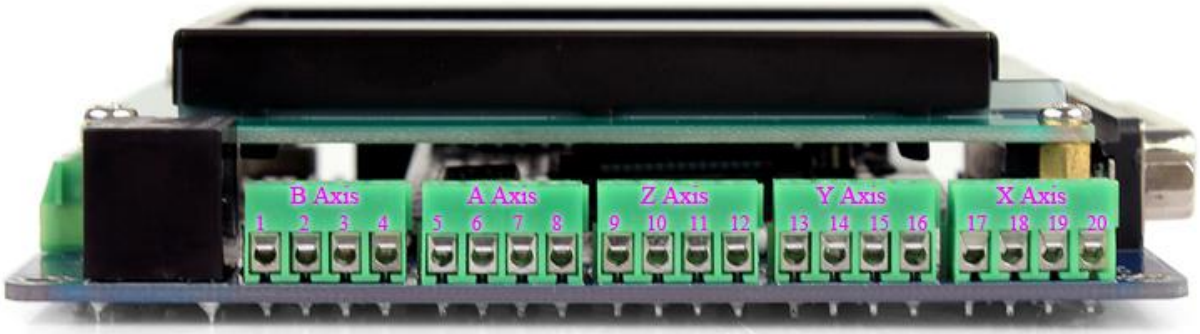
Pin1: All X, Y, Z Axis Enable Input
Pin2: X Axis Pulse Input
Pin3: X Axis Direction Input
Pin4: Y Axis Direction Input
Pin5: Z Axis Direction Input
Pin6: A Axis Pulse Input
Pin7: A Axis Direction Input
Pin8: B Axis Pulse Input
Pin9: B Axis Direction Input
Pin10: LPT Signal Input/X Axis Limit
Pin11: LPT Signal Input/Y Axis Limit
Pin12: LPT Signal Input/Z Axis Limit
Pin13: LPT Signal Input/A Axis Limit
Pin14: Relay Signal Input (Spindle)
Pin15: LPT Signal Input/Estop
Pin16: Y Axis Pulse Input
Pin17: Z Axis Pulse Input
Pin18: GND
Pin19: GND
Pin20: GND
Pin21: GND
Pin22: GND
Pin23: GND
Pin24: GND
Pin25: GND

DB15:

1. B-Step/Pulse
2. B-Direction
3. A-Direction
4. Z-Step/Pulse
5. Y-Step/Pulse
6. X-Step/Pulse
7. X-Direction
8. Enable
9. +5V
10. GND
11. A-Step/Pulse
12. Z-Direction
13. Y-Direction
14. Enable
15. Enable

Figure 2: DB25 & DB15 definitions

II. Connectors Definitions:



B Axis: 1. GND
2. B Axis Direction Input (Correspond to Pin9)
3. B Axis Pulse Input (Correspond to Pin8)
4. B Axis Enable Input (Correspond to Pin1)
A Axis: 5. GND
6. A Axis Direction Input (Correspond to Pin7)
7. A Axis Pulse Input (Correspond to Pin6)
8. A Axis Enable Input (Correspond to Pin1)
Z Axis: 9. GND
10. Z Axis Direction Input (Correspond to Pin5)
11. Z Axis Pulse Input (Correspond to Pin17)
12. Z Axis Enable Input (Correspond to Pin1)
Y Axis: 13. GND
14. Y Axis Direction Input (Correspond to Pin4)
15. Y Axis Pulse Input (Correspond to Pin16)
16. Y Axis Enable Input (Correspond to Pin1)
X Axis: 17. GND
18. X Axis Direction Input (Correspond to Pin3)
19. X Axis Pulse Input (Correspond to Pin2)
20. X Axis Enable Input (Correspond to Pin1)

P1. Estop(Correspond to Pin15)
P2. COM
P3. A Axis Limit (Correspond to Pin13)
P4. COM
P5. Z Axis Limit (Correspond to Pin12)
P6. COM
P7. Y Axis Limit (Correspond to Pin11)
P8. COM
P9. X Axis Limit (Correspond to Pin10)
P10. COM
P11. 5V + (Correspond to USB Power Up Interface)
P12. 5V - (Correspond to USB Power Up Interface)
P13. R1 (External Relay/Spindle Control Interface)
P14. R2 (External Relay/Spindle Control Interface)

Figure 3: Connections Definitions

4. Working Principle

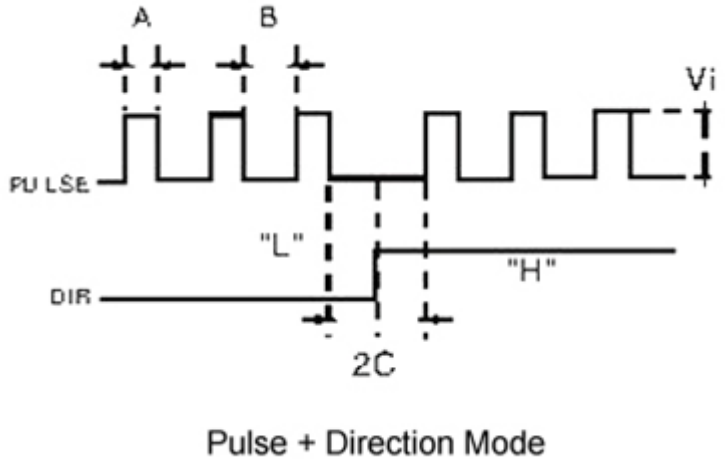


Figure 4: Working Principle

5. Wiring Diagram for Reference

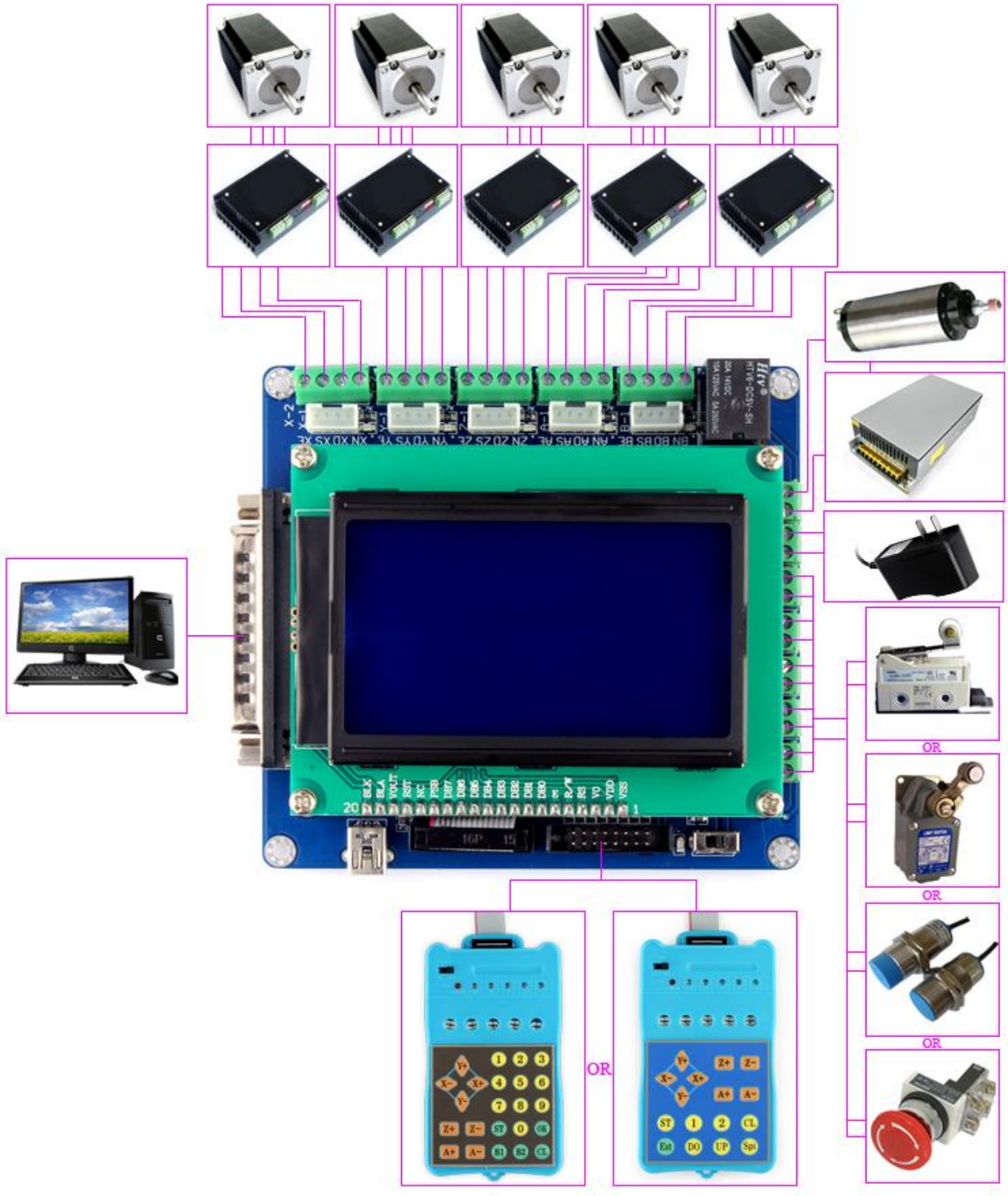


Figure 12: Wiring Diagram

6. Wiring Notes

- In order to improve anti-interference performance, it is recommended to use twisted pair shield cable.
- Please shut down the power before plugging or unplugging the connectors among the breakout board, microstep drivers and stepper motors.

7. Operation：

I. Hardware Operation (See “Hardware_Operation. PDF” in CD)

II. Software Operation

Mach3 Usage:

Figure 13: After installing Mach3 software, run “**MACH3.exe**” file, choose “**Mach3mill**”, and click “**OK**”.

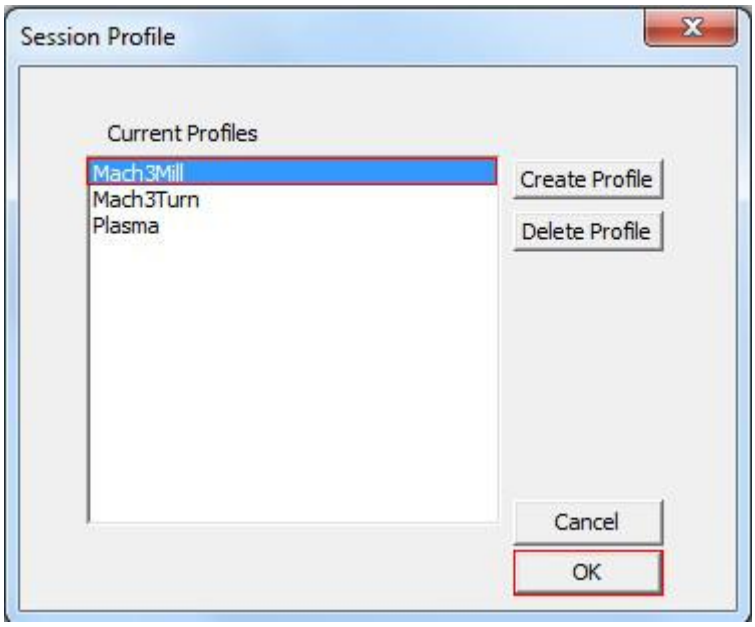


Figure 13

Figure 14: After clicking “**OK**”, Mach3 Main Interface shows as below.

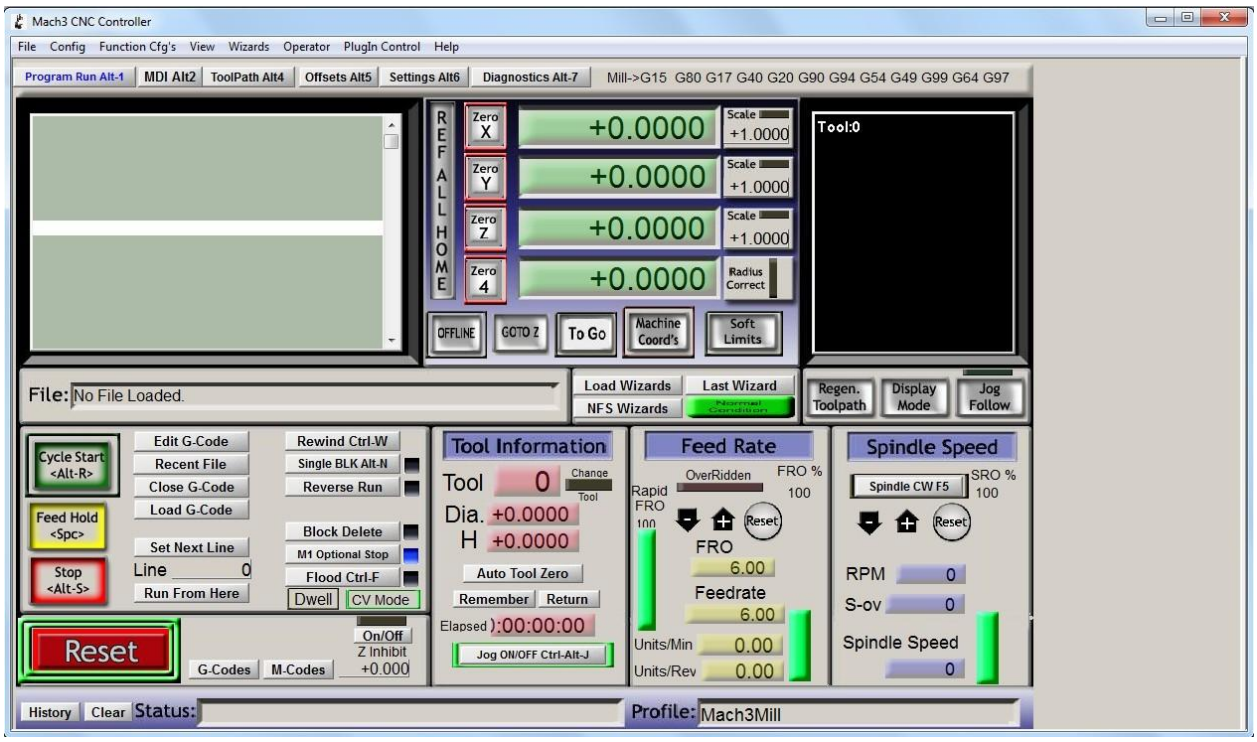


Figure 14

Figure 15: Click "**Config**" ----- "**Ports and Pins**" on Main Interface.

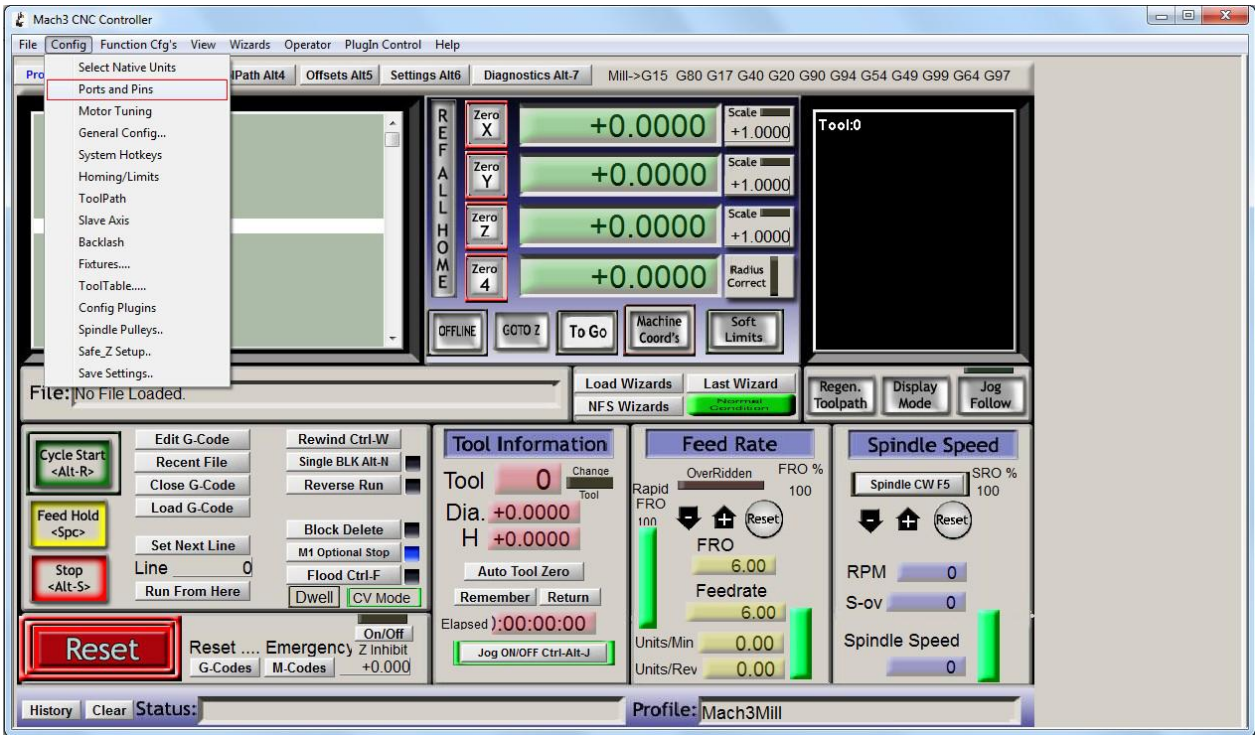


Figure 15

Figure 16: Enter in "**Port Setup and Axis Selection**" to set "**Port #1**" and "**Kernel Speed**" shown as below. Please make sure the Port Address in PC System Bios is the same as that in the following Figure 4 (e.g. 0x378).

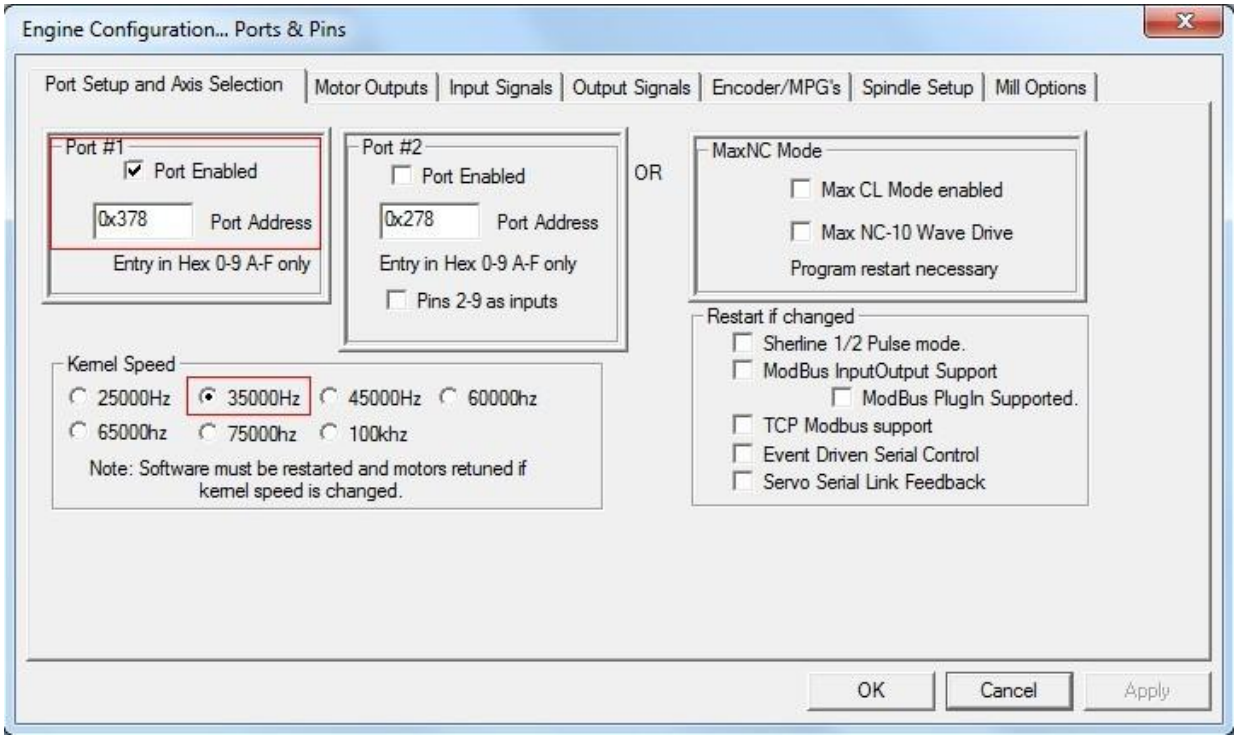


Figure 16

Figure 17: Click "**Motor Outputs**" to set it shown as below.

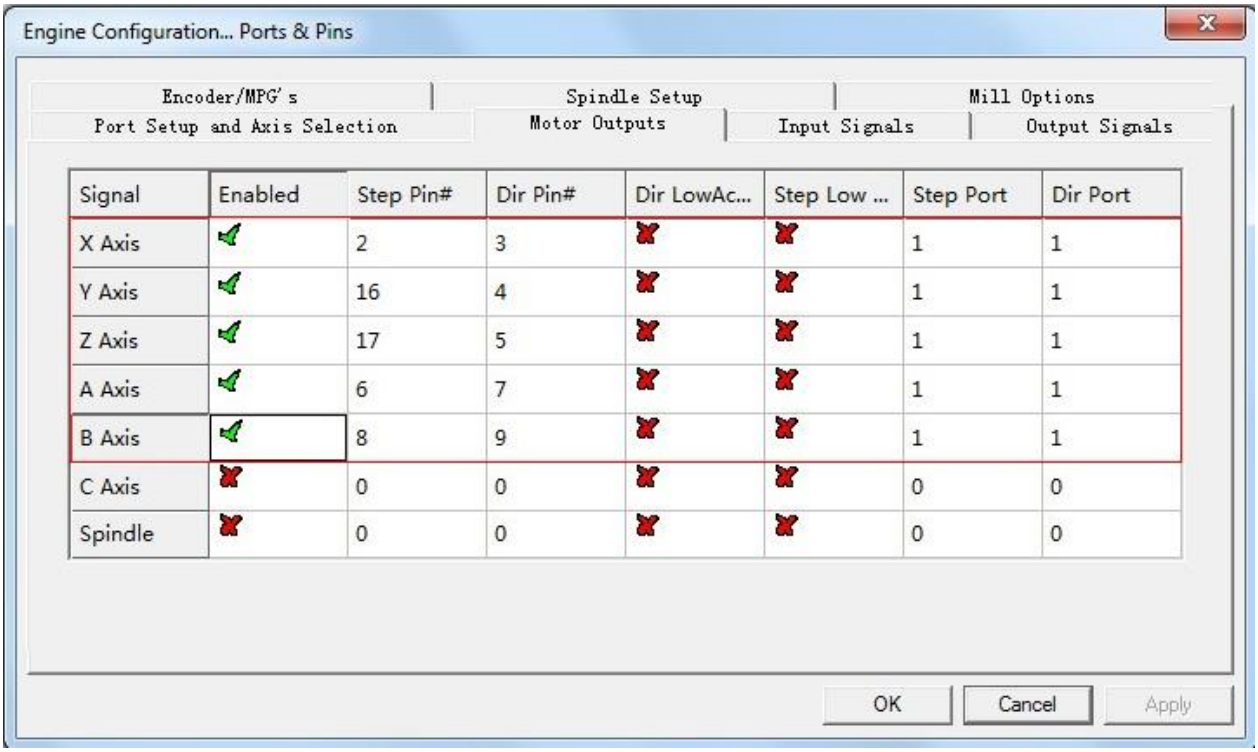


Figure 17

Figure 18: Click "**Output Signals**" to set it shown as below.

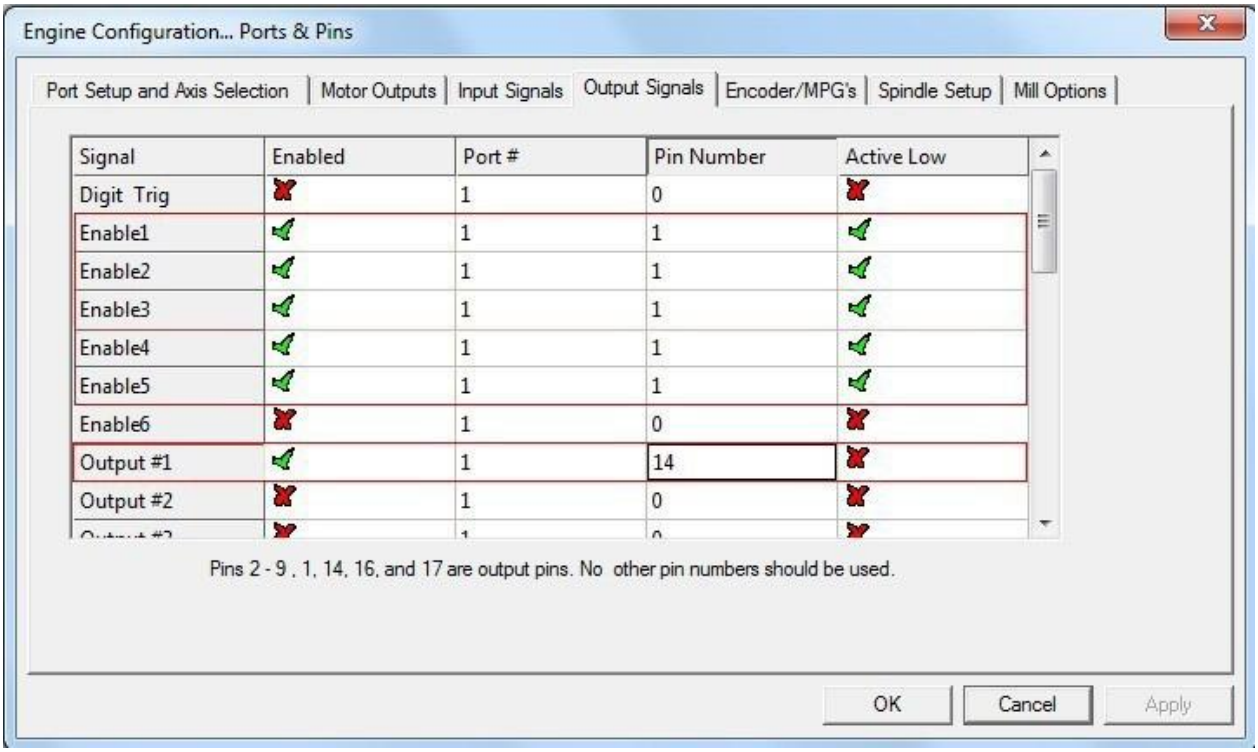


Figure 18

Figure 19: Click "**File**" to select "**Load G-code**" on Menu to enter in "**GCode**" file in Mach3 folder's root directory.

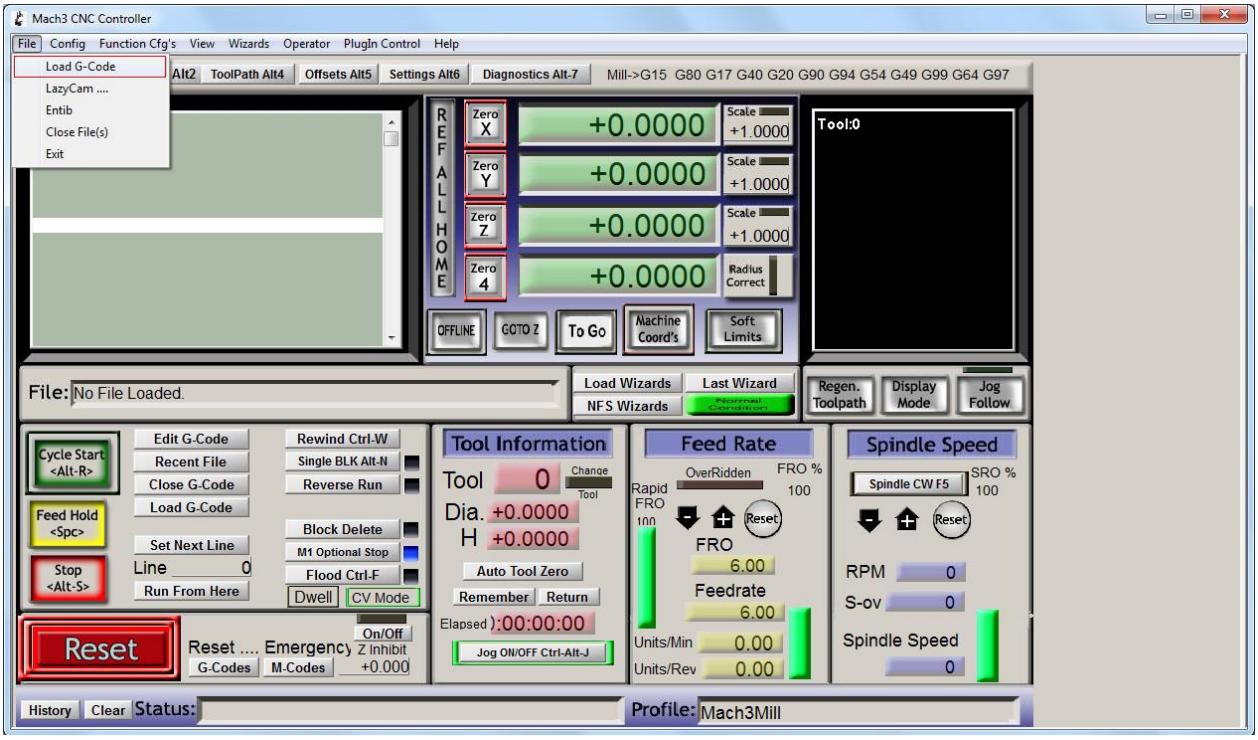


Figure 19

Figure 20: Select the "**roadrunner.tap**" and "**Open**" it.

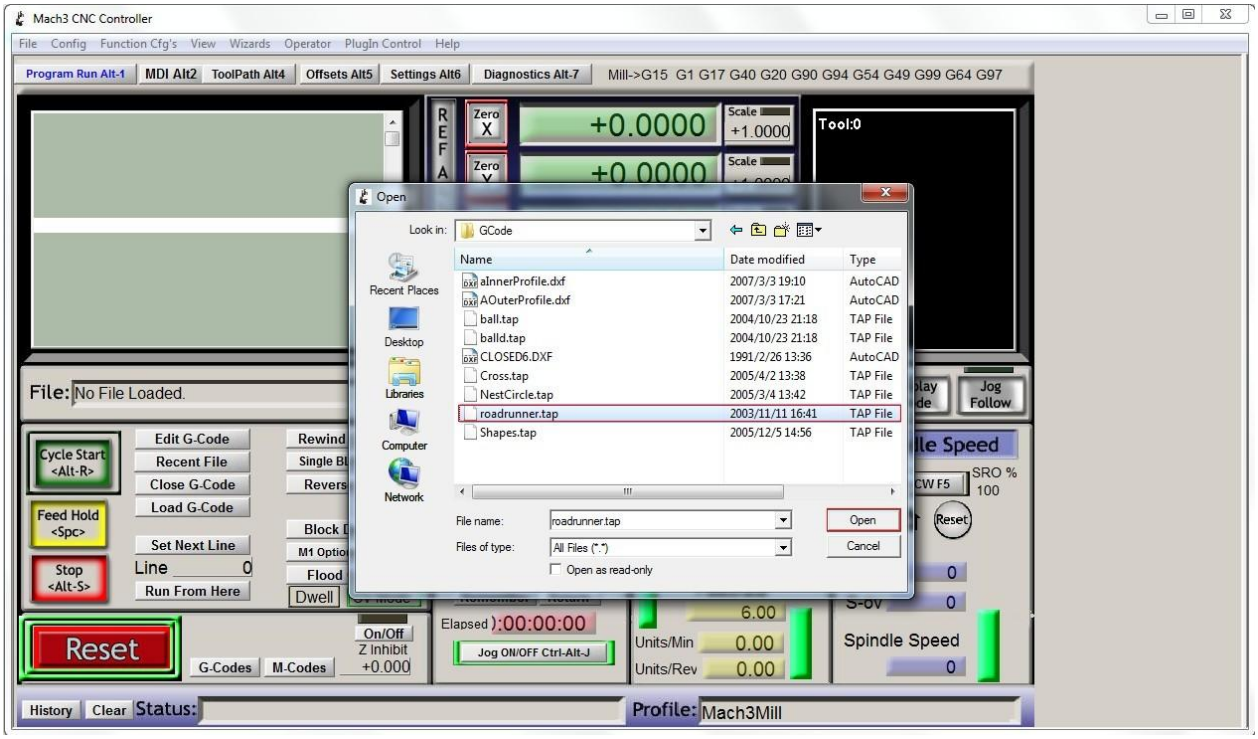


Figure 20

Figure 21: After opening the G-Code, if the "**Reset**" button below flashes, please press the "**Reset**" button, it will stop flashing, and then press the "**Cycle Start**" to rerun the G-Code to test the TB6560 stepper drivers and motors.

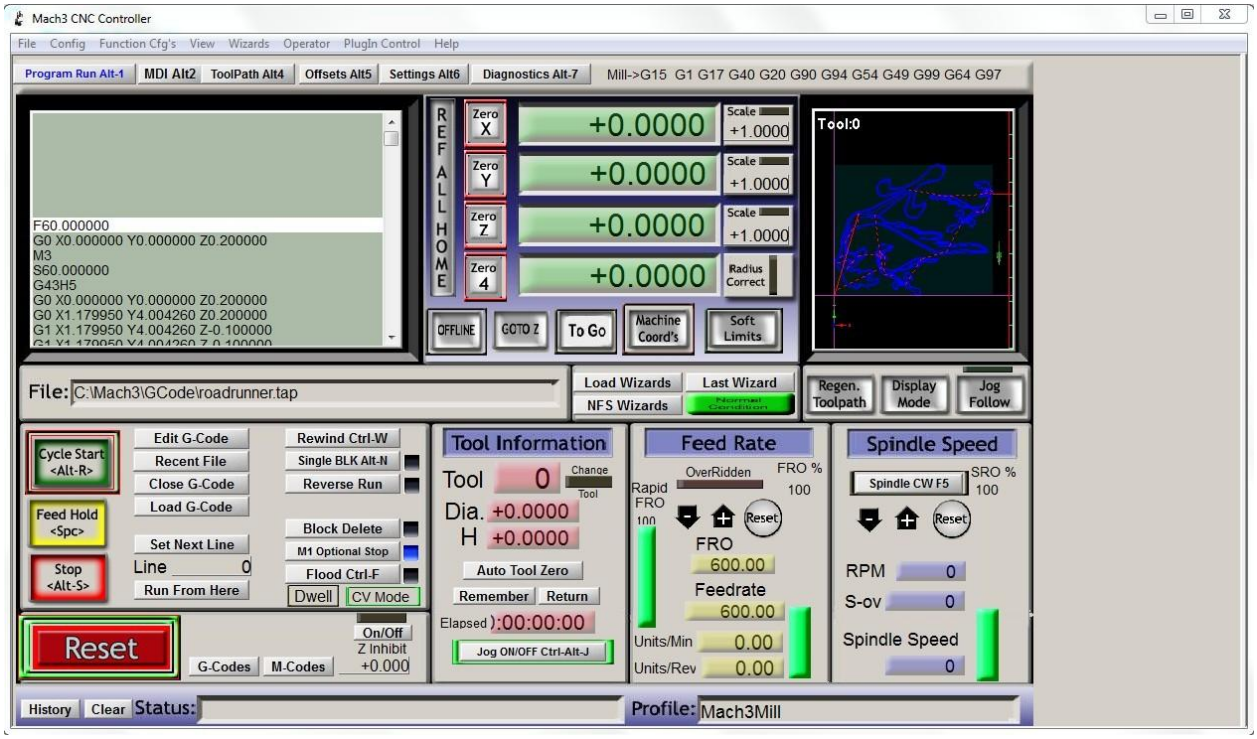


Figure 21

8. Appendix

I. The 3rd Generation 5 Axis Breakout Board Sets Categories

3rd Generation 5 Axis Breakout Board	Models	Contains	Main Functions
Standard Model	BCD-S	Breakout Board Ⓢ + Control Pad Ⓢ + Display Panel	➢ Intelligently Control Drivers & Motors Via PC ➢ Manually Control Motors Via Control Pad ➢ Intelligently Switch PC & Control Pad ➢ Synchronously display the Moving coordinate in software ➢ Real-time Display the moving path of motors
Professional Model	BCD-P	Breakout Board Ⓟ + Control Pad Ⓟ + Display Panel	➢ Intelligently Control Drivers & Motors Via PC ➢ Manually Control Motors Via Control Pad ➢ Intelligently Switch PC & Control Pad ➢ Synchronously display the Moving coordinate in software ➢ Real-time Display the moving path of motors ➢ Record G-Code from PC and run it without PC ➢ Manually Program and run it to control Motors

II. The 3rd Generation TB6560 Driver Set Details

3rd Generation 5 Axis Breakout Board	Models	Contains & Pictures
Standard Models	BCD-S	
Professional Models	BCD-P