

# RichAuto—AutoNow B18 motion control system

## User's manual

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Applied in B18-4 axis linkages controller

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**Thank you for choosing RichAuto products!**

This manual helps you be familiar with the company's products, and get information about systems' components、 configuration etc.

This manual contains detailed knowledge of the system characteristics、 operating procedures, installation & commissioning, and safety precautions. Please read this manual carefully before using the system and machine, which will help you to use it better.

**Cautions:**

1. It's strictly prohibited in the strong interference and strong magnetic field environment. Operating ambient temperature: 0-70 °C; Environment humidity: 0-90% (non-condensing).
2. Insert U disk in the correct direction. Do not pull out or insert 50-pin signal transmission cable when system is powered on.
3. During the perform processing in U disk file, do not pull out the U disk to prevent the interruption of data transmission.
4. Strictly prohibited metal, dust, and other conductive substances drop into the handheld controller shell.
5. The machine casing shall be well grounded to ensure work safety and prevent interference.
6. Unauthorized removal is strictly prohibited, no internal user repairable parts.
7. For long time not using, please power off and keep it properly.
8. Be careful to prevent it from water, dust, fire when using.
9. Do not use the corrosive chemical solvents to clean the device.
10. Spindle motor bearing life and its speed is inversely proportional.
11. The tool bit is very sharp. Do not touch when it is running, in order to avoid injury; Do not use handkerchiefs, scarves to approach it to prevent embroiled damage.

**Important statement:**

The Company shall not be responsible for any loss caused by improper using or failure to comply with the rules of operation.

Beijing RichAuto S&T Co., Ltd owns final interpretation of this manual, we reserves the rights to revise all information in this manual, including data, technical details, etc.

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# Foreword

## System introduction

RichAuto CNC motion control systems are independently developed by Beijing RichAuto S&T Co., Ltd. It can be widely applied to machinery, advertisement, woodworking, mold engraving machines, laser, flame, plasma cutting machines, woodworking lathe, dispensing machine and soon in the industry machine control field.

RichAuto make DSP as the core control system, High-speed processing operation which are the microcontroller, PLC systems can't match; Embedded structure, High degree of integration, Strong stability, easy to installation and operation; support U disk, Removable storage card reader, With USB Interface, High speed transfer, Plug and play . Fully offline work.

## Performance characteristics

1. System standard configuration is X, Y, Z axis motion control method, and supports the rotation
1. axis (C axis) control which enables the switch between rotary machining and plane processing .
2. Can be extended to X, Y, Z, C four-axis motion control to realize 4 axes linkages control.
3. Multiple I/O ports control. Standard equipped with I/O signal node which has 8 inputs and 7 output signals.
4. Support the standard G code, PLT format instructions; support domestic and international mainstream CAM software, such as: **Type3, Artcam, UG, Pro/E, MasterCAM, Cimatron, Ucamcnc etc.**
5. Provide with power failed protection. System automatically save the current processing information in the moment of sudden power down (file name, current line number, work speed, spindle state); After powered up and returned HOME position, the system automatically prompts the user to restore the processing before power down which makes processing operations become more humanity.
6. Support breakpoint memory, select file line No. processing. Can save 8 different breakpoint processing information.
7. Multi-coordinate memory function. Provide 9 working coordinate system. The User can switch among the 9 coordinates, each coordinate system can save a process origin information.
8. Support adjusting spindle operating frequency (or spindle rotate speed). The spindle frequency is divided into 8 shifts. During processing, user can adjust shifts directly by keys without suspend processing.
9. Support adjust speed ratio during operation. To adjust the speed ratio so as to change the processing speed and travel speed, speed ratio values from 0.1-1. Increasing or decreasing 0.1 per time.
10. Simple manual operate mode. In manual mode, the system provides 3 kinds of move modes, including continuous, step (crawl), distance, become more simple and convenient.
11. Identifies M code, F code and other extended instructions, and it can also open a special code based on user's needs.

12. Built-in 512 M memory. Adapt USB communication port with high efficiency for file transfer. Can read files in U disk and card reader directly.
13. Unique handheld structure which can be hold with one hand. With LCD display and 24 keys operation keyboard, intuitive and flexible operation, no longer rely on the computer, completely offline operation.
14. Self-detection function. The system comes with I/O ports signal detection function, easy remote maintenance.
15. Multiple languages display. Support English, Russian, France, Traditional Chinese and Simplified Chinese. Other language can be customized.
16. System can automatically update itself, easily remote operation and maintenance.

**Product parameters:**

Model No.	RichAuto-B18		
CPU	DSP	Power protection down	Support
Built in memory	512MB	Breakpoint processing	8
Display screen	128*64Monochrome LCD	External supply voltage	DC 24V
Communication port	U disk	Manual mode	Continuous, step, distance
Linkage axis No.	3to 4axes	Interpolate method	Straight line, arc, spline curve
Control signal	5V common anode	Soft / hard limit	Support
Driving system	Stepper / servo motor	Maximum pulse frequency	1MHz
Minimum input unit	0.001mm	Password protection	Support
Languages	English, Simplified Chinese, Traditional Chinese, other languages can be customized		
Standard layout	Handheld controller with USB adapter 1pc; 50 pins cable 1 pc、I/O interface board 1 pc, USB data cable 1 pc		

**Model List:**

AutoNow- 3 inches Monochrome screen B1X series motion control system	No.	Name
	B11	Standard 3 axis motion control system
	B15	Cylinder multi-spindle motion control system
	B18	4 axis motion control system

# 1 RichAuto system composition

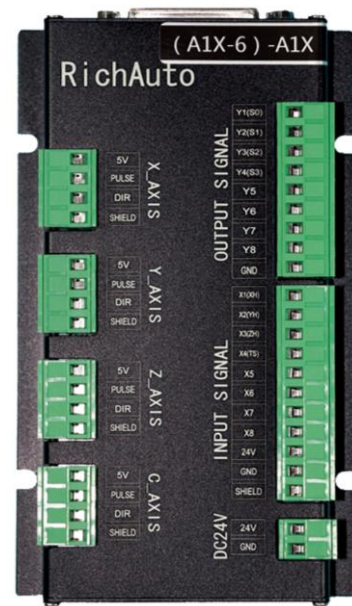
## 1.1 System composition

RichAuto control system contains the following parts: **hand-held controller (Hereinafter called “handle”)**, wiring board, 50-pin data transmission cable, USB communication cable.

*RichAuto schematic diagram of system accessories*



*Handle*



*Wiring board*



*50-pin data transmission cable*



*USB communication cable*



## 1.2 Components description

### 1.2.1 Handle

As shown below, including 6 parts:

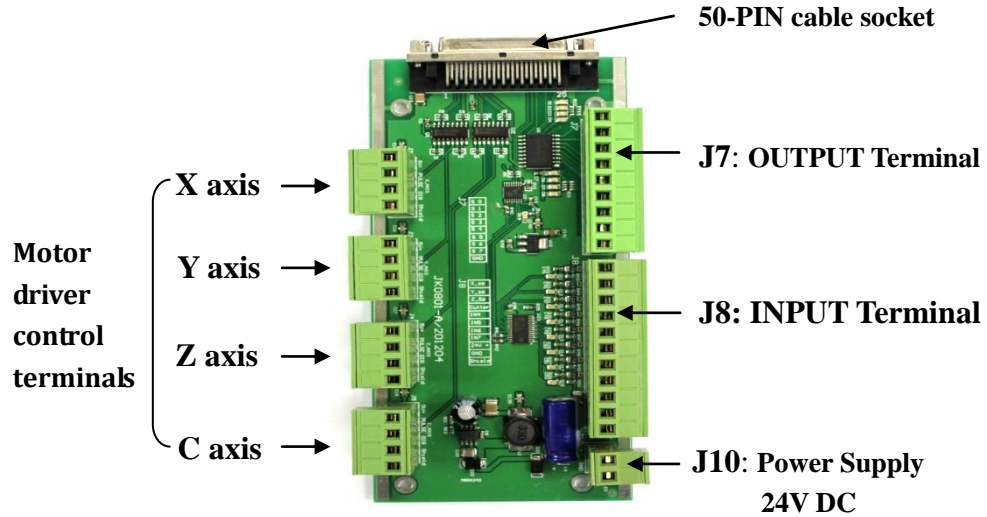


*Handle*

- 1) LCD screen: 128 \* 64 resolution LCD screen, displays the machine motion, system settings and other information.
- 2) Key area: Contains 24 buttons for system parameter settings and machine movement control.
- 3) U disk adapter: External memory, such as U disk, card reader throw-over access port. It can identify the files from external memory; It can be removed separately from the main board if it is damaged, just loosen its screws at the back. System format should be FAT 16/32;
- 4) RichAuto LOGO
- 5) 50-pin cable socket: Be used for connecting & transmitting signals between the handle and the machine tool.
- 6) USB communication interface: The port of USB cable. It is used to connect the handle and computer.

## 1.2.2 Wiring board

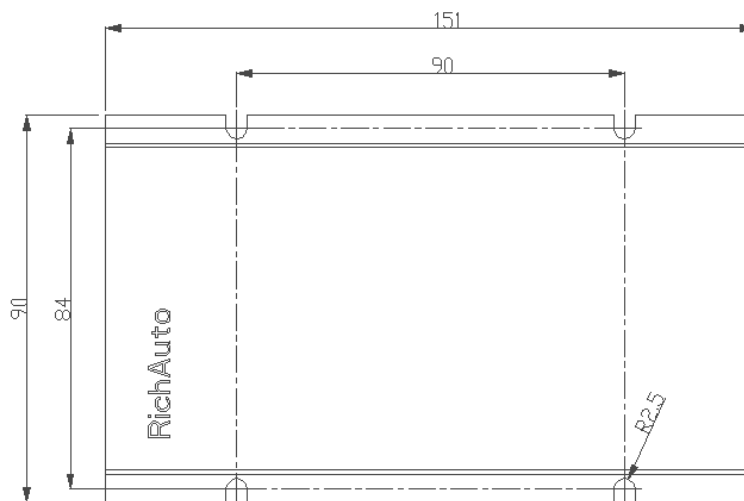
The connection between handle and machine tool rely on the wiring board. As shown below,



**Wiring Board**

- 1) 50-pin cable socket: Be used for connecting the metal end of the 50-pin cable.
- 2) Output terminal: Including Spindle On/Off, Run lamp, Alarm lamp output signal ports etc.
- 3) Input terminal: Including machine HOME switch, tool setter, driver alarm, hard limit, E-stop signal, foot pedal switch input signal ports.
- 4) Power supply terminal: DC 24V, 3A.
- 5) Motor driver control terminals: Contains X, Y, Z axis motor drivers output ports.

## 1.2.3 Board installation dimensions




Scale 1:1, unit mm

## 1.3 System startup methods


**RichAuto-B18** 4 axis motion control system has 2 starting methods:

- ✓ Normal starting: Normal power on the system, after boot it will enter into HOME TYPE interface and manual control interface.
- ✓ Emergency starting: If normal starting cannot show any words or manual interface, emergency starting is required.



Power off the system first, then push “” and keep pressing, power on the controller and

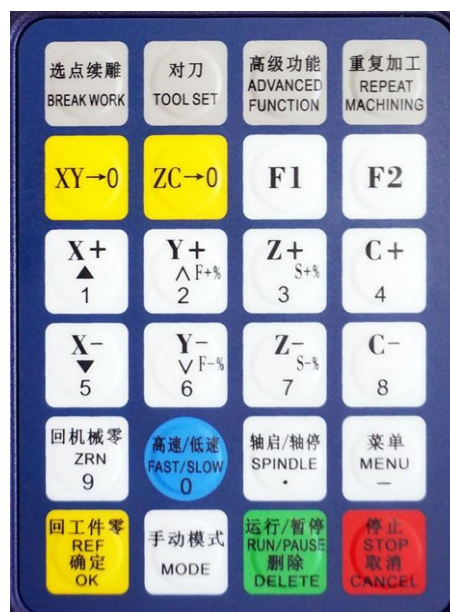


waiting for 3-4 seconds. Release “”, it will get into Emergency State, at that time user could either select System Update or Format System, after that restart the system directly without any selection.

## 2 Handheld controller buttons introduction

### 2.1 Buttons introduction

**RichAuto** handheld control system has defined 24 operation buttons, each one provides one or more functions in different working states:




*Real photograph of pressing keys*

## 2.2 Buttons instructions

**RichAuto** provides 2 modes of button operations, including one-touch key & Combination keys.

- ✓ One-touch key: Press one key on the handheld controller keypad is executing the single key operation.
- ✓ Combination keys: Press two keys at the same time to achieve certain function is executing combination keys operation; The operation steps: press one **main function key** not release it, meanwhile press a second **auxiliary function key**, and then release the two buttons at the same time to realize the combination keys operation.




For instance, work coordinates switching combination keys are “” + “**0-9 numeric key**”.


















When operation, push the main function key “” first, and then push auxiliary function



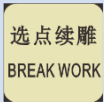







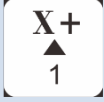
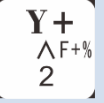
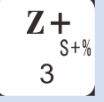
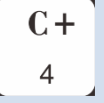
key “” then, at last release both of them at the same time.













### Common used combination keys list:

	Combination keys	Function
1	 “  ” + “ <b>0</b> ” numeric key	mechanical coordinate switching
2	 “  ” + “ <b>1-9</b> ” numeric key	Working coordinate switching
3	  	Switching spindle shifts in manual mode
4	 “  ” + “ <b>8</b> ”	Set the current position to be the stop position
5	 	System upgrade
6	 	Input coordinate values to move the equipment
7	 	Exit keyboard detection interface

**Note:** Users can also find the corresponding combination keys operation list at the back of the handle.

## 2.3 Buttons details

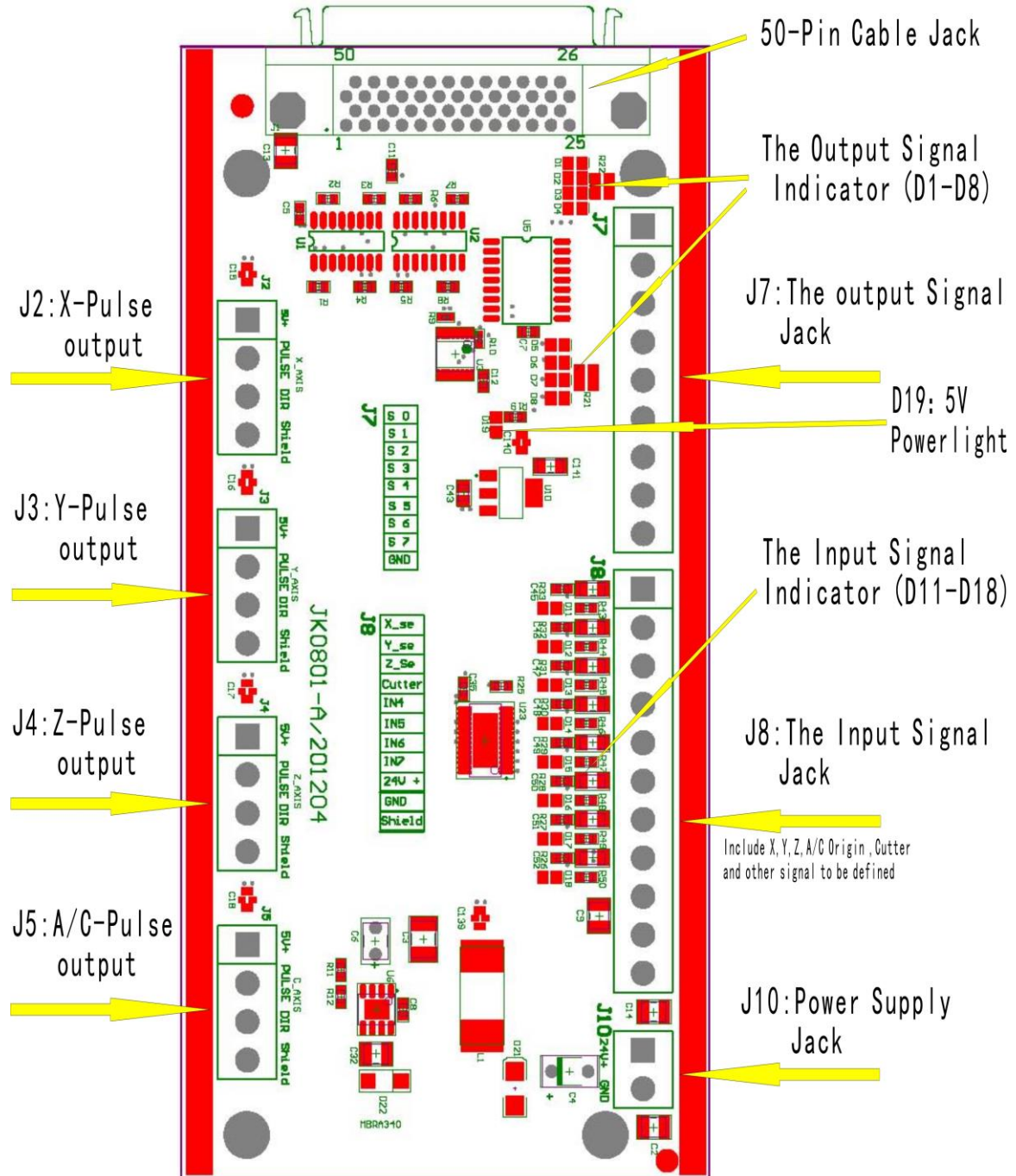
Key Name	Function
	Start “resume work” combination function, will start processing at the position of system automatic searched line number
	Enable Z axis automatic tool setting function
	Enable advanced processing function, such as array work, resume work, mirror work etc.
	The last time processing repeat machining
	Set X axis and Y axis work origin
	Set work origin of Z and C axis
	user-defined function key
	user-defined function key
	X axis positive movement, figure 1 input, Menu move up selection
	Y axis positive movement, figure 2 input, work speed ratio increasing under AUTO mode
	Z axis positive movement, figure 3 input, Spindle speed increasing under AUTO mode
	C axis positive movement, figure 4 input

	X axis negative movement, figure 5 input, Menu move down selection
	Y axis negative movement, figure 6 input, work speed ratio reducing under AUTO mode
	Z axis negative movement, figure 7 input, Spindle speed reducing key under AUTO mode
	C axis negative movement, figure 8 input
	figure 9 input, Return HOME operation in manual mode
	figure 0 input, Manual speed High/Low switching, work/mechanical coordinates switching in AUTO mode
	Decimal point input, control spindle ON/OFF in MANU mode
	Enter into menu settings, minus input, view machining information during processing
	Return reference point(work origin); OK key of all selections, inputs and operations
	Manual motion states; Continuous, step, distance 3 modes switching in MANU mode
	RUN file or PAUSE the processing; DELETE the entered data; selections of different attributes in MENU
	parameters adjustment in MANU mode; Cancellation of various selections, inputs and operations in AUTO mode

## 3 Wiring Instructions

### 3.1 RichAuto Wiring board description

Wiring board sketch map (50-pin upwards):



**JK0801-A Connection Board**



## 3.2 I/O description

### Input ports

Terminal	Name	Pin definition	Pin functions and parameters	Attentions
DC24V	24V+	Input power supply+	Provide 24V operating voltage for the interface board after power up.	Recommend to use DC 24V (current = 3A) current source
	GND	return circuit ground		
X_AXIS	5V	Xaxis common anode signal	X-axis driver common anode power supply terminal, 5V output	Do not impose any other voltage on this pin.
	PULSE	Xaxis pulse signal	Output voltage $\geq 3V$ ; Drive current $\leq 8mA$	
	DIR	Xaxis direction signal	Output voltage $\geq 3V$ ; Drive current $\leq 8mA$	
	SHIELD	Shield signal	X-axis driver signal output shield wire	Do not impose any other voltage on this pin.
Y_AXIS	5V	Yaxis common anode signal	Y-axis driver common anode power supply terminal, 5V output	Do not impose any other voltage on this pin.
	PULSE	Yaxis pulse signal	Output voltage $\geq 3V$ ; Drive current $\leq 8mA$	
	DIR	Yaxis direction signal	Output voltage $\geq 3V$ ; Drive current $\leq 8mA$	
	SHIELD	Shield signal	Y-axis driver signal output shield wire	Do not use this port as a ground port.
Z_AXIS	5V	Zaxis common anode signal	Z-axis driver common anode power supply terminal, 5V output	Do not impose any other voltage on this pin.
	PULSE	Zaxis pulse signal	Output voltage $\geq 3V$ ; Drive current $\leq 8mA$	
	DIR	Zaxis direction signal	Output voltage $\geq 3V$ ; Drive current $\leq 8mA$	
	SHIELD	Shield signal	Z-axis driver signal output shield wire	Do not use this port as a ground port.
C_AXIS	5V	C axis common anode signal	C-axis driver common anode power supply terminal, 5V output	Do not impose any other voltage on this pin.
	PULSE	C axis pulse signal	Output voltage $\geq 3V$ ; Drive current $\leq 8mA$	
	DIR	C axis direction signal	Output voltage $\geq 3V$ ; Drive current $\leq 8mA$	
	SHIELD	Shield signal	C-axis driver signal output shield wire	Do not use this port as a ground port.



**Output ports**

Terminal	Name	Pin definition	Pin functions and parameters	Attentions
OUTPUT SIGNAL	Y01	FWD/REV	Logic low	Connect FWD&DCM, do not connect Y01
	Y02	Multi-Speed 1	Logic low	
	Y03	Multi-Speed 2	Logic low	
	Y04	Multi-Speed 3	Logic low	
	Y05	Alarm indicator	Logic low	
	Y06	Run indicator	Logic low	
	Y07	definable	Logic low	
	Y08	definable	Logic low	
	24V	Output DC 24V	Output 24V	Supply DC24V for indicators
	GND	GND		
	SHIELD	Shielded signal		
INPUT SIGNAL	X01	X Machine zero	Logic low	Support external connection with mechanical, photoelectrical or proximity switch
	X02	Y Machine zero	Logic low	Support external connection with mechanical, photoelectrical or proximity switch
	X03	Z Machine zero	Logic low	Support external connection with mechanical, photoelectrical or proximity switch
	X04	Driver alarm	Logic low	
	X05	Hard limit	Logic low	
	X06	E-stop	Logic low	
	X07	Foot pedal switch	Logic low	Pause during processing & repeat after processing

	X08	Driver alarm	Logic low	
	24V	Output DC 24V		To active sensors
	GND	GND		To active sensors
	SHIELD	Shielded signal		

### 3.3 Hardware wiring

Installation Requirements: Switching mode power supply (24V, 3A) , it's better to add a filter to prevent the electric field interference. If origin detecting switch is different power supply type, the special detecting switch power supply is needed. (Recommend 24V origin detecting switch).

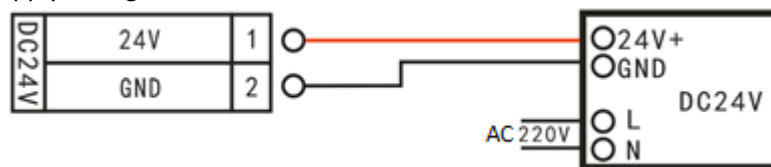
**RichAuto** Interface board terminal can be divided into input terminal and output terminal:

**Input terminal:** INPUT SIGNAL terminal; Main power supply terminal.

**Output terminal:** X,Y,Z,C axis pulse signal output terminal; OUTPUT SIGNAL terminal.

#### 3.3.1 Input terminals

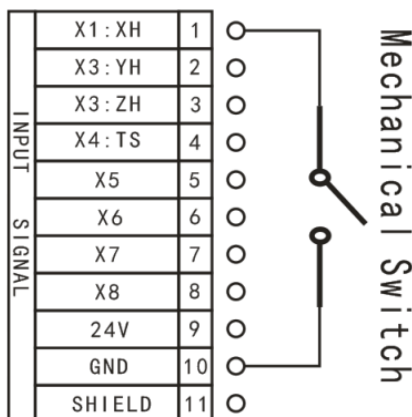
Main power supply wiring:



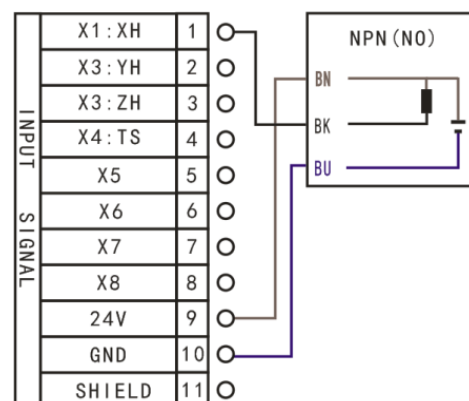
#### INPUT SIGNAL wiring

1) **ZERO point (HOME):** X, Y Z axis wiring methods are the same

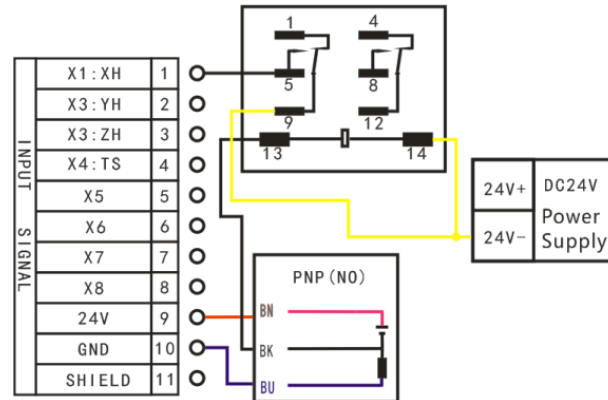
*Mechanical switch*



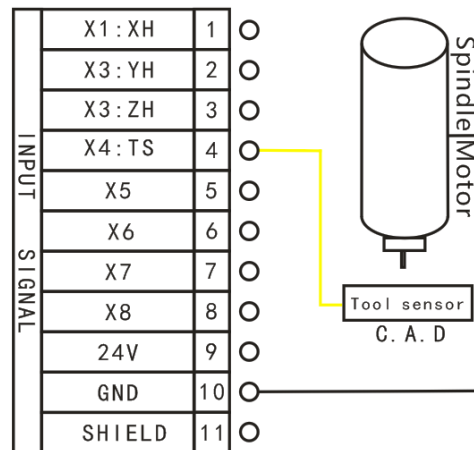
*NPN normally open proximity switch*



**Example of PNP normally open proximity switch:**



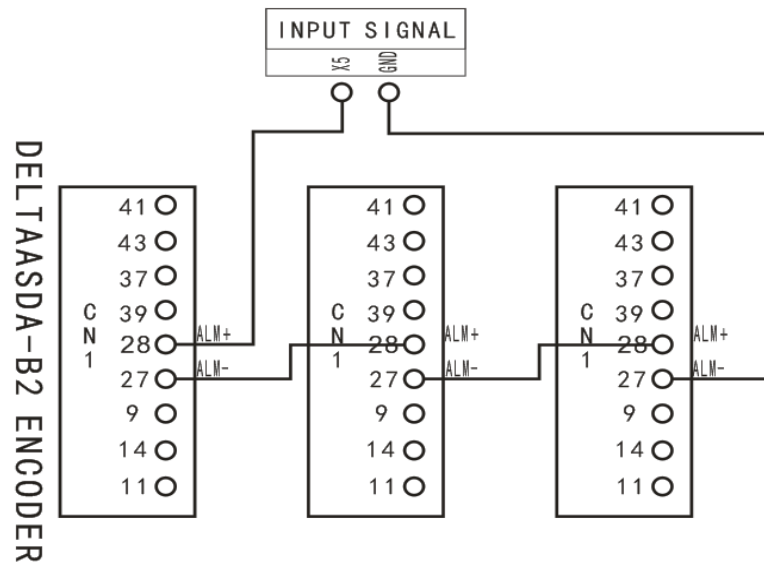
**2) Tool setting: Simple constructed touch-off plate wiring**



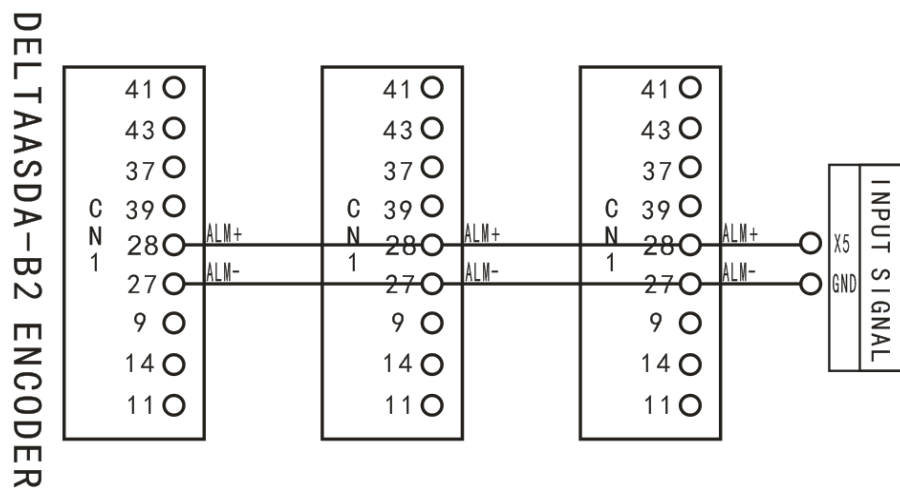
**3) X5-X8: Default low level normally open**

Take the driver alarm as example:

The alarm signal is normally closed, wiring method is series connection. Meanwhile, revise the voltage definition of X5.



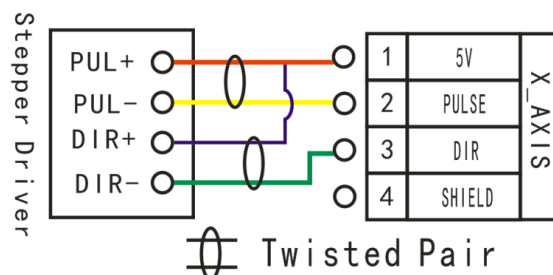
If the alarm signal is normally open, the wiring method is parallel connection. See as below,



### 3.3.2 Output terminals

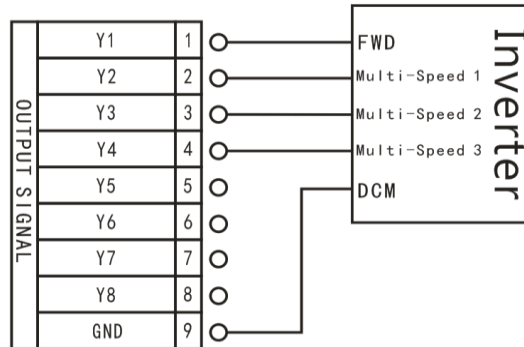
X axis pulse signal wiring (Y, Z axis pulse signal wiring is the same to X axis)

Step drive:

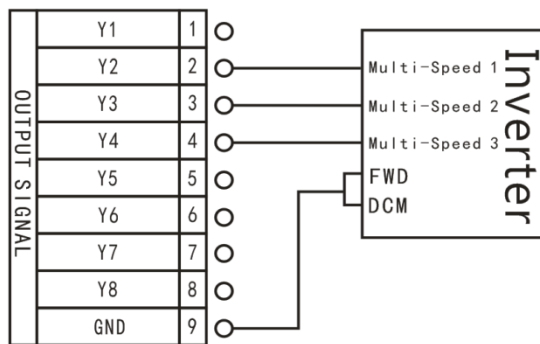


**OUTPUT SIGNAL: Spindle output**

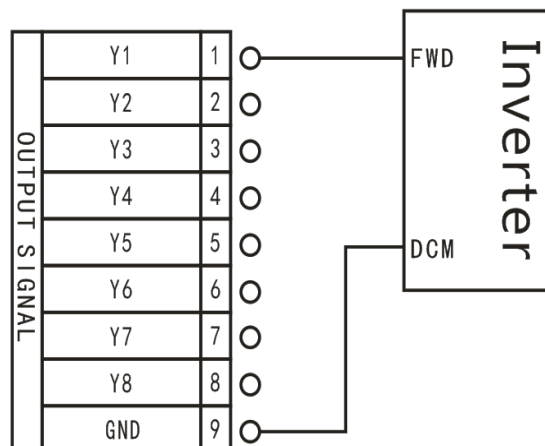
*3 line 8 states-1*



*3 line 8 states-2*



*1 line 2 states (Spindle ON/OFF)*



### Spindle shift

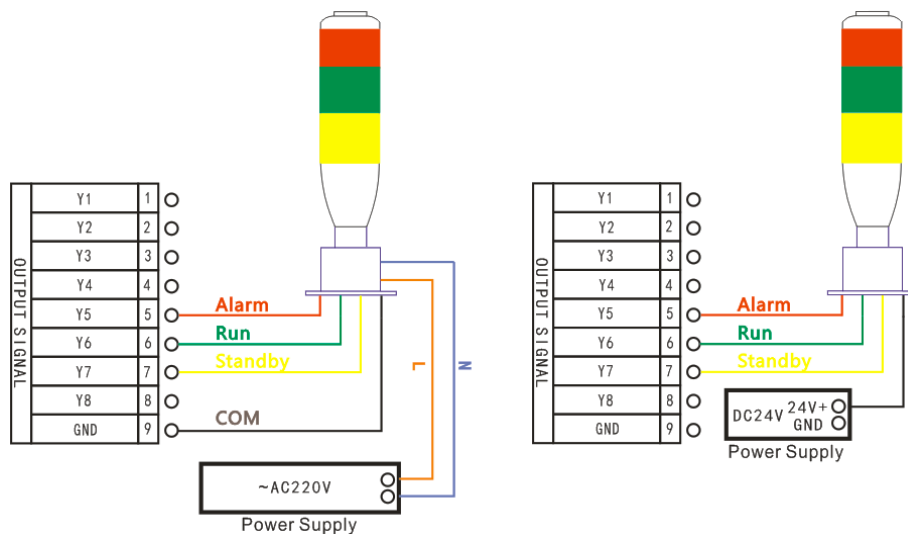
Spindle ON/OFF	
1Shift	↓
2Shift	↑

Spindle Count 3	1Shift	↓	↓	↓
	2Shift	↑	↓	↓
	3Shift	↓	↑	↓
	4Shift	↑	↑	↓
	5Shift	↓	↓	↑
	6Shift	↑	↓	↑
	7Shift	↓	↑	↑
	8Shift	↑	↑	↑

Remind: S1-S8 respective to 1st -8th shifts of spindle speed; When the spindle turns off, the screen shows “Fn”, letter ‘n’ is real number from 1 to 8, refers to the spindle shift number while spindle turns off. The user only needs to input the line number. Because the control system has been defaulted the entire spindle shifts status after that.

### OUTPUT SIGNAL: Y5-Y8 (Take the three-color lamp wiring as example)




The machine and the control system will be connected with each other when the above wirings are completed.

## 3.4 Commissioning of the machine and control system

- 1) Turn on the power, users can manually move each axis and confirm the direction. If the movement direction and definition direction are opposite, users can change the motor phase sequence (A+, A-/B+, B-) or modify servo parameters (Refer to the servo drive manual).

- 2) According to the original location of the machine coordinates, users can enter into menu-machinesetup-home setup- home direction to reset it.



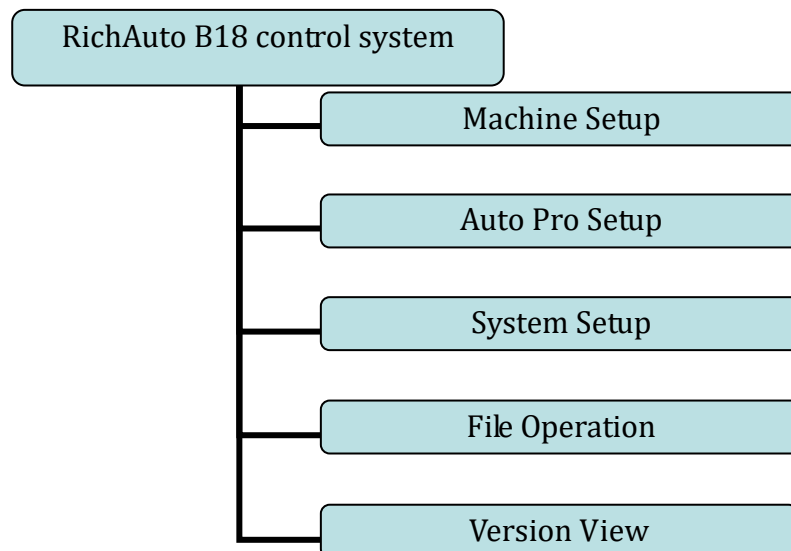
- 3) Double-press “”-manual voltage setup (the upper arrows stand for input voltage) to check whether the home switch is working or not.

The machine is in good connection if all the above setting is ok.

## 4 Menu Description

### 4.1 Menu category

**RichAuto-B1X** motion control system divides its menu according to menu function:

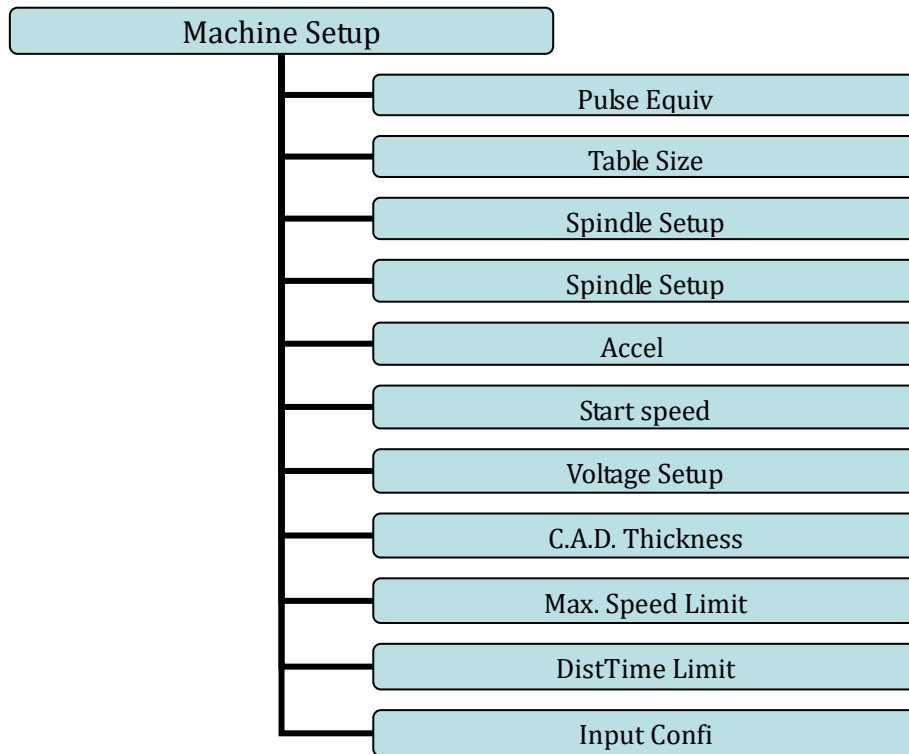


### 4.2 Menu details

#### 4.2.1 Machine setup

The machine parameters which are under “Machine Setup” can be set by machine producers according to their equipment types. Users are required to change the machine parameters under the technician’s guidance of the machine producer.

## Machine setup chart






### Pulse Equivalent


**Linear axis:** The number of pulses required to send from the system when machine moves every 1mm. Unit: pulse / mm;

**Rotating axis:** The number of pulses required to send from the system when machine rotate every 1 degree. Unit: pulse / degree.

**Calculation method please refer to Chapter 10**



Setting mode: Enter "Pulse Equiv", cursor is in the X axis pulse equivalent position,

press " and " to move cursor as required. Press " then, input a new

value, and press " to save. To modify X, Y and Z axis value one by one in the same way. Save all changes and return to the "Pulse Equivalent" menu.

### Table size

RichAuto system makes the table size as the soft limit values, in order to prevent machine over travel. Machine size must be less than or equal to the actual size of machine table.

Setting: Enter "Table Size", press " and " to move cursor as required. Press





“DELETE” and input the new value, press “REF OK” to save the changes. To modify X, Y and Z axis value one by one in the same way. Save all changes and go back to the "Table size" menu.

## Spindle Setup

**Spindle delay:** Including start delay and stop delay(**Unit: ms**).

**Spindle state:** To be used to set multi-speed control or simply spindle on/off signal control parameters. System defaults “3-line8-state”, if user needs “1-line2-state (On/Off)”, just change the number of lines to 1; See detailed settings at **OUTPUT SIGNAL spindle output wiring**.

## Home Setup

**Home speed:** The movement speed of each axis when go mechanical origin (ZERO), the system default X, Y axis home speed: 3000 mm/minute, Z axis home speed: 1800 mm/minute.

**Home order:** Motion sequence of each axis when executing return ZERO (return mechanical origin).

Including:

◆	Z,X and Y	Z,X,Y	Z,Y,X	
◆	Z only	X and Y,Z	X,Y,Z	
◆	Y,X,Z	XY zero	X zero then Y zero	
◆	Y,X zero	None	X zero only	XZ and Y

**Home direction:** Movement direction of each axis when return ZERO. The directions are depend on the real assembly position of HOME switches on the machine tool. If home switch is installed in the positive movement direction, then home direction should set as “**Positive**”, if it is installed in the negative movement direction, the home direction shall set as “**Negative**”.



Setting mode: Enter “**Home direction**”, press “X+ 1” and “X- 5” and move cursor as



required. Press “DELETE” to change home direction, then press “REF OK” to save the changes. Return to “**Home direction**” menu.

## Acceleration (Unit: mm/s<sup>2</sup>)

The maximum acceleration value during acceleration and deceleration movement, improve (including straight and curved motion) processing capabilities. If acceleration value is too big, it may cause the motor losing steps, tremble and even squeak; Setting value too small, will cut down the operating speed of the entire graph.

System default: linear acceleration is 800 mm/s<sup>2</sup>, curve acceleration is 1000mm/s<sup>2</sup>, the proposed curve acceleration is 1-1.5 times of the linear acceleration value.

## Start Speed (Unit: mm/min)

Start speed of motion axis from stationary state. Not starting from 0, but starting directly from a certain speed, so it can shorten the overall processing time, but this speed shouldn't be too high.

Too high, it will cause the motor losing steps, jitter and even whistle; Set too small, it will reduce the operating speed of the entire graph.

If the inertia of motion axes is heavy (shaft very heavy), can set a smaller starts speed; if the inertia of motion axes is light (shaft very light), can increase the start speed value.

### Voltage Setup

Used to set the input, output signal port normally open or normally closed port state, system defines “↓” as normal open; “↑” as normal closed.

Including 2 rows of arrows:

The upper arrows indicate the input level definition: Set input signal terminal status definition.

The first four: **0,1,2,3** are **X** axis HOME, **Y** axis HOME, **Z** axis HOME, **A** axis HOME; The 5 to 8 positions are: **4,5,6,7** correspond tool setting, driver alarm, E-stop signal and foot switch input signals.

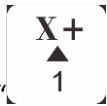


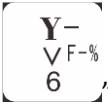

The under arrows indicate the output level definition: Set output signal terminal status definition.

The top four: 0、1、2、3 correspond to **spindle On/Off, multi-speed 1, multi-speed 2, multi-speed 3** output signals; The 5 to 6 positions are: **4, 5** correspond **alarm lamp, run lamp** output signals.

X1 X2 X3 X4 X5 X6 X7 X8

Input level	0	1	2	3	4	5	6	7
	↓	↓	↓	↓	↓	↓	↓	↓
Output level	0	1	2	3	4	5	6	7
	↓	↓	↓	↓	↓	↓	↓	↓

Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8

Setting: Press “” and “” move to left or right in the row. Press “” and “” can jump up and down. Move the cursor to arrow which needs flip, and press “” to flip the arrow.

### C.A.D. Thickness (Unit: mm)

The thickness should input actual value. If the input value is bigger than the actual thickness, Z axis may over cut; if smaller, Z axis tool bit can't reach workpiece surface. This parameter can only take effect when user uses auto tool setting function. Invalid when manual set workpiece origin (press XY→0, ZC→0).

### Max Spd Limit (Unit: mm/min)

Set the maximum movement speed of three axis positive and negative direction, the setting is

only effect during processing, not affect the speed in manual mode;

System defaults max. speed X+/-,Y+/-are 60000000 mm/min, Z+ is 1800mm/min, Z- is 3000 mm/min.

### Distance Time Limit (Unit: s)

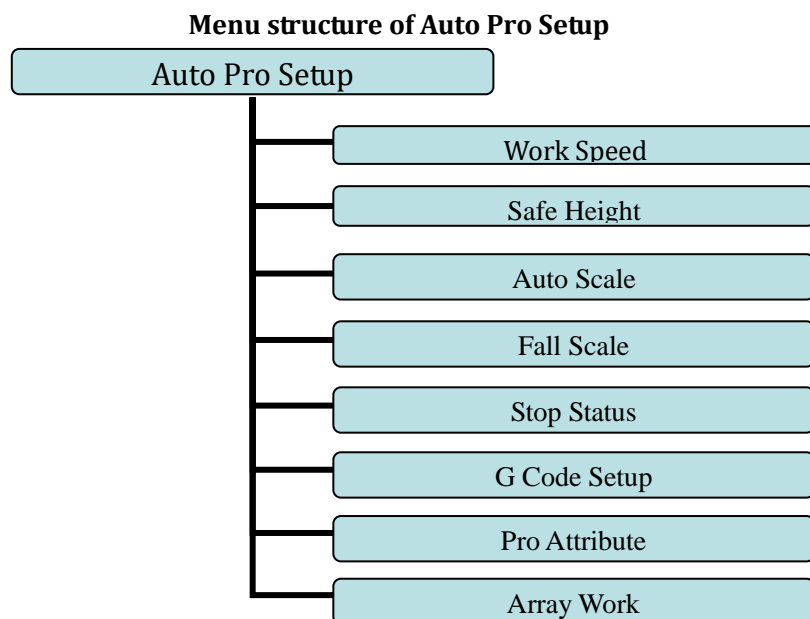
When the Distance mode was selected, it will automatically switch back to Continuous movement mode if there is no action for a certain time of period. To avoid the spindle hits against the machine body (Under this circumstance, such as the user have set a big Distance value and forgot to switch back to Continuous mode). The systems default Distance mode limit time is 30s.

### Input Confi (Input Port Configuration)

Enable or disable the input port. User can disable X5-X8 if there is no signal on these ports.

## 4.2.2 Auto Pro Setup

This menu is used to set processing parameters, G code attributes etc.



### Work Speed (Unit: mm/min)

Including work speed and fast speed, system default is 3000 mm/minute.

### Safe Height (Unit: mm)

Z axis lifting height during processing. System default is 40.000mm.

### Auto Scale

Actual processing speed=work speed\*auto scale. System default the auto scale doesn't affect the fast speed.

### Fall Scale

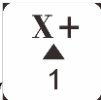

System default the fall down scale is 0.200, Fall speed=fast speed\*fall scale, the maximum fall speed is Z- axis limit speed\*fall scale.



Fall height, system default is 5.000mm. Fall down scale takes effect when the spindle falls to the fall height.


### Stop Statue

Stop position when the processing is finished. You can set either a special location or system specified location.

Work stop state	
FinAct	Pick up Z
YCoordnt	0.000
ZCoordnt	0.000
ACoordnt	0.000



- ✓ Set a special stop position: Press “” and “” move cursor to where user wants


to modify. Press “”, input new coordinate values one by one, then press “” to save the changes.

- ✓ Set system specified location: Move the cursor to the first row, and press “” to enter into system final position list:

FinAct
Pickup Z
Back To Work Org
Back Home
Back Position
None move

(FinAct=Finish Action, Org=Origin)

Press “” and “” to move cursor to where user wants to modify, then press

“” to save the change. Return to the upper menu.




## G Code Setup

Set special G code attribute, according to the actual need to make changes.

Attribute Of G Code	
F Read	Ign F/Read F
AbsCntr	Off/On
T Read	Ign T/ Read T
Spindle	NTLLG/FORCE/INSTR
FilterJD	None/ Adj Z Filter
S Read	Ign S/ Read S
Read G54	Ign G54/ Read G54
Read G49	Ign G49/ Read G49
Read G40	Ign G40/ Read G40
CodeHead	Skip/NoSkip
Input TO	-1

(Ign=Ignore, Adj=Adjt=Adjust, AbsCntr= Absolute center)

PS: Blue parts indicate system default attributes.

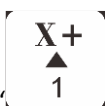


**Setting:** Press “” and “” move cursor to where needs to modify, press “”

and select, then press “” to save. Return to the upper menu.

## Pro Attribute

Set special settings which are required during processing.

Work attribute	
Adj Z	Adj Z/Rev Z
Adjust WP	None/Adjt
Ignore Z	Read Z/ Ign Z
CirLmt	55.556
StepWork	Contns/Single
ATC Spld	Auto/None

**Setting:** Press “” and “” move cursor to where needs to modify, press “”

and select, then press “” to save. Return to the upper menu.

### Array work

Set array work parameters, including **column count**, **Row count**, **Column space**, **Row space**, **Time Interval** (unit: ms)

**Column space**: The space along X axis;

**Row space**: The space along Y axis;


Total Processing times= column count\* Row count

**Time Interval**: System default 0, it means not wait.

During processing, if user wants to change processing materials after completion of each processing, needs to set time interval as a negative number.

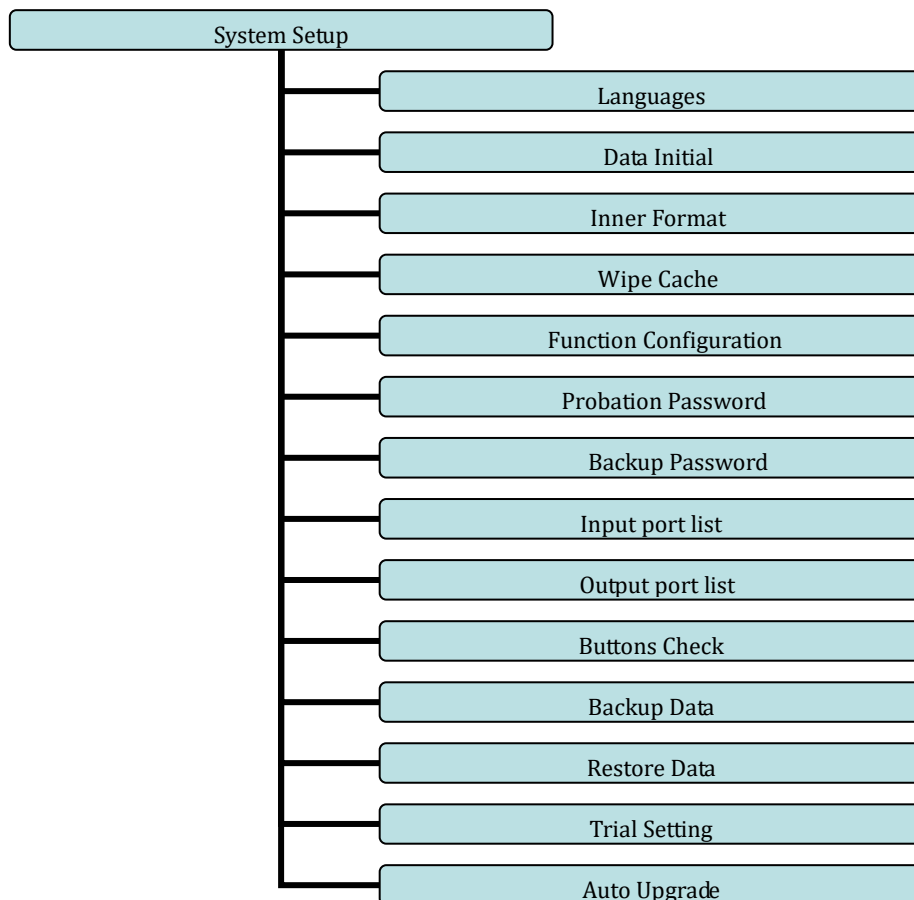
When the first time processing is completed, the screen prompt “Waiting for the next array processing...”, at this moment, user should press any key to start the next array processing, if user doesn’t press any key, the system will keep waiting.



Starting array work, press “” the system prompts advanced processing list, then choose the array work from it.

## 4.2.3 System Setup

Menu structure of System Setup



## Languages

Change system display language, Chinese or English language.

## Data Initial

After data initial system parameters will restore to factory setting

## Inner Format

Wipe the internal files, it will not remove the system parameters after inner format.

## Wipe Cache

The system needs wipe cache when it has been using for a long time or after the system upgrading, it will ask to reboot after “Wipe Cache” operation.



## Function Configuration

Set whether the system retains a function or not, change it in accordance with the practical application of changes. After the operation user needs to restart the handheld controller.

Set function	
PausePkup	NoPick/Pickup
ScaleFast	None/Affect
Manual	Step/Trad
Pretrt	Parse/None
QuryPara	Query/None
StrtHome	Query/Auto/ZOnly/None
CopyWork	Off/On
RetOrgPZ	Pick Z/Z Stop
TolstAct	Pickup/Origin
PauseRstr	All/only Z

*Blue parts indicate system default function*



**Setting:** Press “” and select the function in needs, then press “” to save the change. Return to the upper menu.


## Probation Password

In case of the CNC machine manufacturer has set passwords before delivery (including trial password and backup password) but forget the password when the password expired, the user could inform RichAuto the original 20 digits password which displays on the system screen, and then get new 20 digits from us to input into the controller to unlock all passwords.



**Setting:** Press “” to enter into ‘Probation Password’, input new password directly and




then press “” to save.

### Backup Password

In condition of system parameters are disordered, to avoid incorrect operation such as covering off the correct system parameters or backup parameters. Don't enter any number when it asks



to input password, then press “” if user wants to cancel the backup password.

### Input Port List

To be used to review the current input port configuration.

Number 1-4 respective to **X、Y、Z、A** axis HOME signal; Number 5 is Tool setting signal; Number 6-8 respective to servo driver alarm, E-stop switch and Foot switch (Cycle switch) input signals.

### Output Port List



To be used to review the current output port configuration.

Number 1 is Spindle on/off output signal; Number 2-4 is Spindle shifts output signal; Number 5 is Alarm lamp output signal; Number 6 is Run lamp output signal.

### Buttons Check

Detect the keys are valid or not. Press every button, the screen will highlight it if the key is valid, if



not valid will not highlight. Use combination keys “” + “” to exit.

### Backup Data

Backup the system parameters and send to U disk or inner space. The backup file format is **data.bak**

### Restore Data

Restore the backup system parameters by choosing the “**data.bak**” file from the U disk or internal storage area.


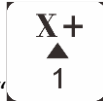





### Trial setting

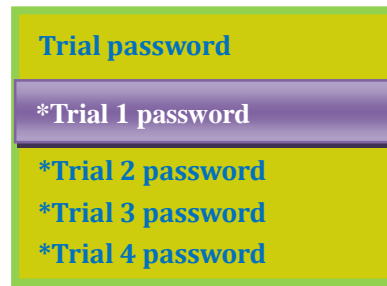
There are 4 grades of password (Level 1, level 2, level 3 and level 4). Each level can be set password and use time. User can set 1-8 digits; Using time unit is Hour and the system defaults use time is 1h.

When the previous password expires, the next level of password will come into effect. **The operation of Data Initial, Inner Format, Wipe cache and system upgrade are unable to remove**

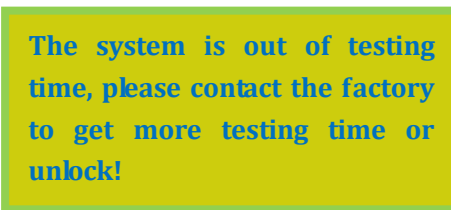




#### 4-grade password.

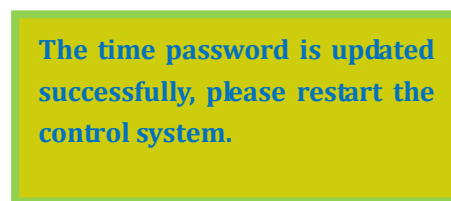
Setting: Press “” to access into “Trial setting” menu, press “” and “” to move the cursor and select different options, then press “” to get into, press “” to input numbers and after finished to press “” to save the change. Then go to the next option...one by one. When completed all settings, press “” to confirm. The screen shows as follow:



Only the punctuation ‘\*’ shows before each level of password indicates trial password has been set successfully. If the level doesn’t have ‘\*’, the password will not work normally. When the password is expires, the screen will display as below,



Contact the manufacturer to obtain the password, and press “” under this interface, then input the new password directly then press “” to confirm. The screen will prompt as below,



Restart the handle, the system will work normally.

**NOTE:** If CNC machine manufacturers forgot all password, you can contact us and tell us 20-digit original password under “**System Setup—Probation pas**” menu, and then obtain new 20-digit





password from us, enter the new numbers and press “**REF**” to remove 4-grade password and reset them.

### Auto Upgrade

If we added new functions, we will offer upgrade file which extension name is **\*\*\*\*\*.PKG** format (File name is **rz-xxxx** or **q13-xxxx**). User could update the system through U disk, for more details please see PS1. System updating doesn’t remove the controller original parameters.

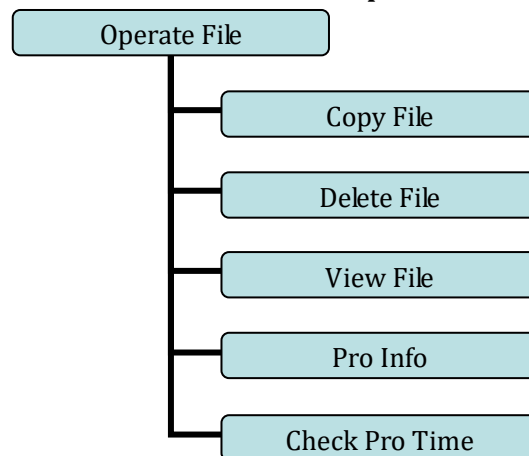
Upgrade package format sample:

 P1\_1025(普通四轴雕刻[3寸单色屏][USB1]).pkg

 **B18 四轴雕刻**[3寸单色屏][USB1](q13-378).pkg。

## 4.2.4 File Operate

Menu structure of Operate File



### Copy file

Copy file from U disk to inner storage space.

### Delete File

Delete inner file.

### View File






View each line G code of the file which is in the U disk or inner storage space.

### Pro Info (Processing Information)


Count the file completely processing number of times and time spent by file name. The record will be cleared when power off.

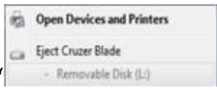
### Check Pro Time (Check Processing Time)

Calculate processing time in accordance with the work speed. After reading G code, the screen will display the processing time.




Operate method: Press “” to enter into “Check Pro Time”, then press “” and “” and select “U disk/ Internal/ Recent file”, press “” and then choose a file, press “”. After reading the G code, the screen will display the processing time.

**Note:** The U disk should be pulled out correctly after copying files from computer, otherwise may lead the handle doesn't recognize U disk.

1) Win7 (32 bit) system: after copying files, press “”, then the lower right corner of the

screen will pop-up a dialog box “”, select Eject the corresponding U disk.

When you see this dialog box “” means the U disk has been removed safely from the computer.

2) Win XP system: after copying files, press “”, and click “”, then click “” to remove U disk successfully.

**Note:** After copying the files into U disk, user should pull out the U disk in correct way to prevent it from damaged or unreadable.

## 4.2.5 Version View

Users can view information about the system hardware and software, including:

- ✧ Update Version e.g.:P1.409/rz-xxxx/q10-802
- ✧ Product ID e.g.:A0020099
- ✧ Soft Version e.g.:A1.1936
- ✧ Emergency Version e.g.:A1.1920
- ✧ Soft type: 4-axis carving
- ✧ Hardware type: Support 3-inch screen Flash Disk Mode

## 5 Machine Operation

### 5.1 Return HOME

It will display “**all axis home**”, “**Z home only**”, “**none axis home**” after starting up the DSP handle. Returning Machine HOME can correct the coordinate system.

In some cases, such as after a normal power off, and then reboot to continue last operation, it is no need to go machine HOME, just choose “**none axis home**” to skip HOME operation. Because system automatically saves coordinate value when it exits normally.

### 5.2 Import processing file

Before processing, generally we should import files. RichAuto system has 2 ways to import files: U disk file processing and inner file processing.

- 1) Directly import the processing file into U disk, and then run with the U disk inserting in the controller.
- 2) Copy the files to handle internal storage area via U disk, and then run the inner file without U disk.

### 5.3 Manual Processing Operation

Manual Processing Operation refers to move the machine tool by pressing the keypad. User can change the running speed and set the grid (step distance) in manual mode. System will enter Manual Operation state after returned home, and the screen displays,

Manual control interface:

Coordinate Number	← 1X	0.000	手动	→ Operation status
Axis	← 1Y	0.000	S2	→ Spindle status
	1Z	0.000	低速	→ Speed Mode
	1A	0.000	连续	→ MAUN mode

#### 5.3.1 Manual speed switching and adjustment

- 1) Speed mode switching

There are 2 speed modes: High speed and low speed. We can switch speed mode by pressing



“ ” key. The speed mode status show on screen determines the actual manual moving speed.

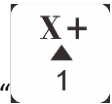

- 2) Speed adjusting





In manual mode, press “ ” enter into the current speed mode settings. For instance, suppose the current speed mode is LOW (screen shows ‘L’), the screen displays:

Manual Param	
X SLOW	1200.000
Y SLOW	1200.000
Z SLOW	1200.000
Z SLOW	1200.000
Slow Grid	0.100





The cursor is on “X SLOW”, Press “ 1” and “ 5” to the one needs to be modified,



and press “” then input new value, and next press “” to confirm; Press




“” to exit the settings. If the input value is wrong, press “” delete the last number and then input new numbers.

To ensure the accuracy of processing and debugging, the system introduces the concept of ‘grid’ which also called ‘minimum feed rate’. Precision can reach to 0.001mm. When user switch to “step” mode, and press the direction keys of X, Y, Z axis, machine will move by grid distance. High speed mode setting is the same to low speed mode.

### 5.3.2 Manual processing mode

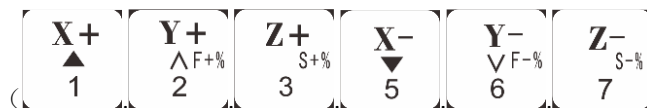
The system provides 3 manual movement modes: Continue, step, distance. User could press



“” under manual mode to switch manual movement mode and view the current movement mode through the screen bottom display status.

#### 1) Continue (Continuous motion mode)

No specific data control, user could press motion direction key of each axis



the machine will move accordingly until the key is released. The motion speed is determined by current manual speed mode.

#### 2) Step motion mode


In step mode, move 1 grid every half second. The grid distance is determined by the current speed mode. It is suitable for precise adjusting the cutter or fine adjusting the location of the mechanical coordinate.

#### 3) Distance motion mode

It runs a certain distance according to the setting. Press motion direction keys

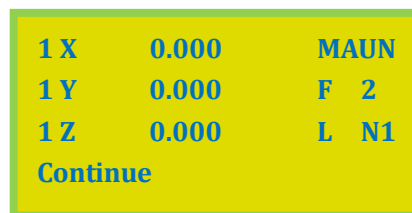
( [ X+ ] [ Y+ ] [ Z+ ] [ X- ] [ Y- ] [ Z- ] ) ,the machine will move accordingly.  
1 2 3 5 6 7


**Note:** The movement will be carried out according to the current speed mode and the set distance, it is not affect by the 'grid', so it will not stop on grid point. To change the distance value,

triple press "  " re-enter the 'Distance' value setting.

### 5.3.3 Manual testing input and output


Under the initial boot interface, that is screen displays as follow,



Double press "  ", the screen, it will displays two rows of arrows which defaults all arrows are downwards "↓".

Upper arrows represent input signals: the former 4 numbers 0, 1, 2, 3 corresponding to X HOME, Y HOME, Z HOME and A HOME. The remaining 4 numbers respective to tool setting, driver alarm, emergency stop and foot switch (cycle switch) input signals.



Manual trigger the signal switch by pressing "  ", the corresponding **arrow flip up** indicates that the signal is normal. If not, user should check its switch, wiring and 50 pins cable.

		X1 X2 X3 X4 X5 X6 X7 X8							
Manual test input ports	0	1	2	3	4	5	6	7	
	↓	↓	↓	↓	↓	↓	↓	↓	
Manual test output ports	0	1	2	3	4	5	6	7	
	↓	↓	↓	↓	↓	↓	↓	↓	
		Y1 Y2 Y3 Y4 Y5 Y6 Y7 Y8							

To trigger X1 (X axis HOME switch), the corresponding arrow will flip, means X1 signal is normal. X2 to X8 detecting is in the same way.

**Note:** Do not confuse with "Voltage setup".

Down arrows represent output signals: the former 4 numbers 0,1,2,3 corresponding to Spindle ON/OFF, Multi-speed 1, Multi-speed 2, Multi-speed 3; The remaining 4 numbers 4,5, 6, 7 respective to alarm lamp, run lamp and user definable output signals.



### 5.3.4 Manual switching coordinate system


Including **machine coordinate system** and **work coordinate system**.

Machine coordinate system is a fixed position, the origin point of machine coordinate is always a fixed position relative to the machine; its coordinate value is called mechanical values, the origin of coordinate is the origin of the machine or called reference point. So, at any time, a point in space can be uniquely determined by a mechanical coordinate system. Because of reference point is the calculation basis of machine coordinates movement, all of those operations such as power on the machine or abnormal release and so on have to return to the reference point which is refers to return machine ZERO.

Work coordinate system used more greatly than other coordinates system in processing. Usually, in processing, we describe a processing position is always relative to a certain point on the workpiece, whereas the workpiece on the machine tool's position relative to the mechanical origin is often change, so it is necessary to introduce a set of more convenient coordinate system during processing, that is work coordinate system. The origin of work coordinate system is a fixed point relative to the workpiece, but it is floating relative to the machine coordinate origin.

**RichAuto-B18** provides 1 machine coordinate system and 9 work coordinate systems. Press

“” + “” can switch the machine coordinate system and work coordinate system;

press “” + “Number button 1-9” can switch among different work coordinate systems.

Schematic diagram of coordinate system:

<table><tr><td>AX</td><td>0.000</td><td>MAUN</td></tr><tr><td>AY</td><td>0.000</td><td>S 2</td></tr><tr><td>AZ</td><td>0.000</td><td>L SP</td></tr><tr><td colspan="3">Continous</td></tr></table>	AX	0.000	MAUN	AY	0.000	S 2	AZ	0.000	L SP	Continous				<table><tr><td>1X</td><td>0.000</td><td>MAUN</td></tr><tr><td>1Y</td><td>0.000</td><td>S 2</td></tr><tr><td>1Z</td><td>0.000</td><td>L SP</td></tr><tr><td colspan="3">Continous</td></tr></table>	1X	0.000	MAUN	1Y	0.000	S 2	1Z	0.000	L SP	Continous		
AX	0.000	MAUN																								
AY	0.000	S 2																								
AZ	0.000	L SP																								
Continous																										
1X	0.000	MAUN																								
1Y	0.000	S 2																								
1Z	0.000	L SP																								
Continous																										
Machine coordinate system		Work coordinate system1																								
<table><tr><td>2X</td><td>0.000</td><td>MAUN</td></tr><tr><td>2Y</td><td>0.000</td><td>S 2</td></tr><tr><td>2Z</td><td>0.000</td><td>L SP</td></tr><tr><td colspan="3">Continous</td></tr></table>	2X	0.000	MAUN	2Y	0.000	S 2	2Z	0.000	L SP	Continous			...	<table><tr><td>8X</td><td>0.000</td><td>MAUN</td></tr><tr><td>8Y</td><td>0.000</td><td>S 2</td></tr><tr><td>8Z</td><td>0.000</td><td>L SP</td></tr><tr><td colspan="3">Continous</td></tr></table>	8X	0.000	MAUN	8Y	0.000	S 2	8Z	0.000	L SP	Continous		
2X	0.000	MAUN																								
2Y	0.000	S 2																								
2Z	0.000	L SP																								
Continous																										
8X	0.000	MAUN																								
8Y	0.000	S 2																								
8Z	0.000	L SP																								
Continous																										
Work coordinate system2	...	Work coordinate system8																								

**Note:** The system cannot set workpiece origin under machine coordinate system. User should switch to work coordinate first, and then set workpiece origin.

## 5.4 Auto processing operation

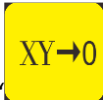
Auto processing refers to the system runs according to the instruction of the file in U disk or inner storage space, it also called “file processing”. Before auto processing, user must set the machine tool parameters and all of the system parameters correctly.


Auto processing steps could refer to the following text.



### 5.4.1 Set workpiece origin

The origin coordinates of X, Y and Z axis in the processing program is workpiece origin. Before processing, we should pay attention to this position as well as the real position. Operation is as follow:


Move X, Y and Z to the position which will start to process the file on workpiece. Afterwards,

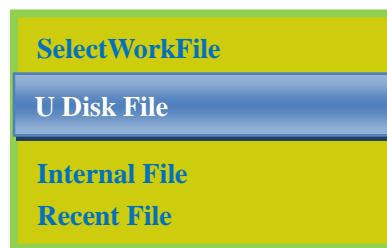
press zero clearing “” can set the workpiece origin of X, Y axis. Press zero clearing




“” can set the origin of Z and A axis. It should be noted that if user have already used the

automatically tool setting function which single key is “” will no need to press “”.

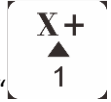


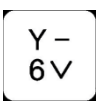

### 5.4.2 Choose processing file

After determined the workpiece origin, press “” will appears a dialog:




Press “” and “” to move the cursor and choose, press “” to enter into the

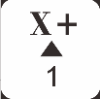





list, the screen will display three file name, choose the file by pressing “ 1” and “ 5”. Press “ 2^” and “ 6v” to open the next page. Press “ ” to exit.


### 5.4.3 Set processing parameters

After choosing the processing file please press “ ”, enter into processing parameters setting, it includes work speed、travel speed (or Fast speed)、speed scale(speed ratio)、fall down speed(or Z down ratio)


Set Work Param	
WorkSpd	3000.000
FastSpd	3000.000
SpdScale	1.000
FallDown	0.200

Press “ 1” and “ 5” to move cursor, press “ ” to set the value (next value

setting is in the same way), then press “ ” to save, the system will check the processing codes and start to run when the reviewing is completed.

The system code checking is auto mode, user can press “ ” to skip the checking and start to run immediately.

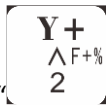
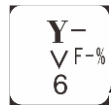


System will remember the checking only when the previous checking is a complete and correct checking. So that the system won't check the same code again next time.

During processing, the screen scrolling display real-time processing speed, operation time and current line number. We can switch these options by pressing “ ”.

## 5.5 Operations during processing


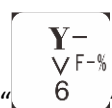
### 5.5.1 Speed ratio & spindle grade Adjusting

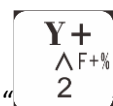
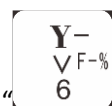
#### Adjust speed ratio

During processing, press “ and “” can directly change speed ratio, current speed= work speed \* ratio, each push on “” or “”, the speed ratio will increase or decrease 0.1, Speed ratio: max 1.0, min 0.1; the displayed speed will change because of the speed ratio, but not affect the display of work time .

#### Adjust spindle shift


If user has set multi-step speed, the DSP handle can change the multi-step speed during

AUTO processing. Press “” and “” to change spindle speed.

Each push on “” or “” will go up or drop 1 shift in the range of S1 to S8.

### 5.5.2 Pause & adjust position



Press “” pause processing. The right upwards of screen will change from “MAUN” to “PAUZ” and machine paused processing except the rotating of spindle. Shown below

1X	7.000	PAUS
1Y	8.000	S2
1Z	-2.000	H SP
1A	0.000	User will start

At this moment, the user is allowed to adjust the position of X, Y , Z and A axis. The system default motion mode is STEP. So that user can fine adjust each axis distance. Machine moves one low or high speed grid distance in every step. Meanwhile, user can change the speed mode to



high mode just press “0”.



When the adjustment is finished, press “DELETE” again, screen shows below,



The system asks the user whether save the modified position. Press “OK” / “DELETE”



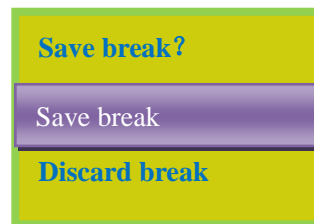
the system will start processing in modified position, press “CANCEL”, system will go back to the previous position where before modifying.

## 5.5.3 Breakpoint processing & power down protection

### Breakpoint processing



If user presses “CANCEL” during process of processing, the screen shows below:



If we want to save breakpoint, press “OK”, the screen displays break list (totally 8), press




“1” and “5” to choose the save position and then press “OK” to save, system auto go to standard interface. If we want to continue processing from the breakpoint, we can



choose the combination button “DELETE” + “1-8”. First press “DELETE” and not release it, at

the same time press number button(1-8), then release together, the system will start processing from the breakpoint.


For example: You want to start processing from the breakpoint 1, then you should use the

combination button “” + “1”, system will restore processing from breakpoint 1. The screen shows below



*Including 6705 lines of G codes.*



Press “” for reviewing, afterwards it shows the break line number:



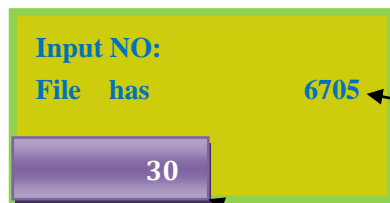
Press “” prompts the processing information list, user can modify according to real



needs, then press “”, the system will restore running at that point. If user needs to go




backwards from the breakpoint, press “”, the screen shows as below:

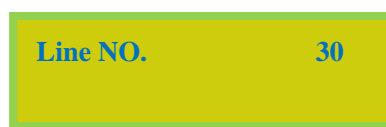


**The total line number of file code**

**Enter the new line number that needs to be rolled back**



Input the line number which need to be go back to, and then press “”, the screen shows as below,





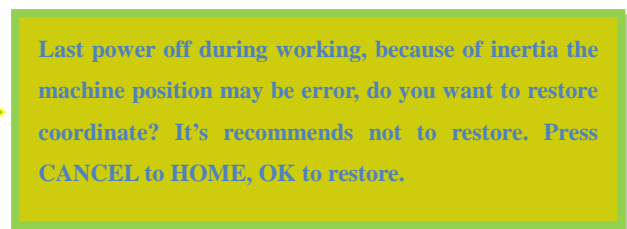
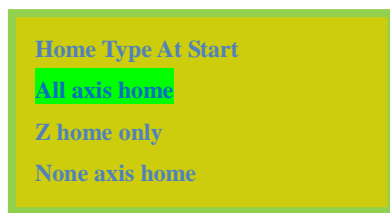
Press“”prompts the processing information list, user can modify according to real



needs, then press“”, the system will start to process from the new line.The machine must go HOME before saving a break point or processing.

### Power off protection

When there is a sudden power shut down during processing, system will save current coordinate and parameters, while power restart, process continue. Before that, system must have go back to machine **HOME**. Shown as below:



Press“”to continue unfinished processing, it will display stop line No, and the line



number can be chosen. Press“”cancel the power off protection. **If user wants to go backwards from the power off position, the operation method is the same way to “Breakpoint processing”.**

## 5.6 Advanced Processing

Advanced processing is designed for some special requests in operation, it contains: Array work, Resume work, Tool changing, Part work, Calculate bound, Mill plane, Calculate work time,






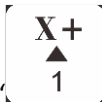
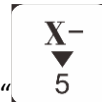




Find break NO and Scale work. The shortcut key is “” shown below,

### Advanced Work

Array work  
 Resume work  
 Tool changing  
 Part work  
 Calc bound  
 Mill plane  
 Calc work time  
 Find break no  
 Scale work

## 5.6.1 Array work




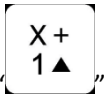




Steps as below:

- Press “”、“”to move cursor to the Array work, press “”, press “” or “”to select different files list.
- Press “” to enter file list, then press “”、“”move the cursor to choose object file.
- Set processing parameters, also can modify the array parameters in this step, or you can go to “AUTO PRO SETUP”, choose “Work Array” and modify the array parameters. The rest steps are similar to the normal processing. System will start to work according to the user’s setting.
- In the processing of array work, you can view real time row number, volume number etc. by pressing “”.



**Note:** Set interval value into a negative value if users want a manual control during array processing.

## 5.6.2 Resume work

Steps as follows:





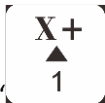
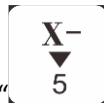

Press “”, “” to move cursor to resume work, press “” to enter, then press “” or “” to select different break points, and then press “”, system will restore processing from the break point. If you want to go backwards from this breakpoint, press “” and input the line No., and then press “”, system will work from the new line number. Specific operation steps are in 5.5.3 breakpoint processing & power failure protection.










## 5.6.3 Tool changing

It achieve manually change the tools at the position you set. Press “” to enter into the setup, and also press “” back to work origin.

## 5.6.4 Part work


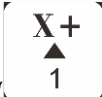





Part work means user can select start line and stop line, so part of the processing file can be processed. Steps as follows:

- 1) Press “” to set, press “” and “” to move the cursor to select different file list;
- 2) Press “” to enter, press “” and “” to select a file, then press “”, system start to read the file.

- 3) After read the file, press “” the screen display line 1 of the code, press “”, prompted “input start number: displays total lines”, input number of start line and press “” to confirm, if input wrong number, just press “” to delete it.
- 4) Press “” again, to set the end line, the screen displays “input end number”, press “” the screen save the changed start line number, press “”, Input end line in cursor, press “” to confirm, press “” to modify.
- 5) Set processing parameters.

### 5.6.5 Calculate bound

Calculate bound means user can check the size of processing, So as to avoid unnecessary waste of materials and processing errors. Steps as below:

- 1) Press “” to enter, then press “” or “” to select file list;
- 2) Press “” get into the file list, and then press “” or “” to choose file.
- 3) Press “”, system start to read the file, after reading the file, the system will calculate the area.






## 5.6.6 Mill plane

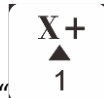
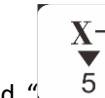
Include two types: scan mill and encircle mill.


✓ Scan mill


Scan mill set	
Scan type	X Scan
Width	100.000
Height	100.000
Diameter	10.000
Depth	0.100
Z Step	0.100
T Ratio	0.800

- 1) Press " or " to move cursr to choose the mill type.

- 2) Press " to enter the scan mill set, it includes: Scan type, Width, Height, Diameter, Depth, Z Step, T Ratio.




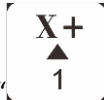



- 3) Press " and " to move cursor on the option which need modify, press

 to choose mill type(X Scan or Y Scan), also press this button to modify the

parameters. Press " after modified all the parameters to save them.

✓ Encircle mill

Scan mill set	
Scan Type	AC
Width	100.000
Height	100.000
Diameter	10.000
Depth	0.100
Z Step	0.100
T Ratio	0.800




- 1) Press " or " to move cursor to choose the mill type.
  - 2) Press " to enter the scan mill set, it includes: Scan type, Width, Height, Diameter, Depth, Z Step, T Ratio.
- Press " and " to move cursor on the option which need modify, press " to choose mill type(AC or C), also press this button to modify the parameters.
- Press " after modified all the parameters to save them.

### 5.6.7 Calculate work time

Calculate the processing time according to the system processing speed. After pre-read processing file, the system will display total processing time. Different processing speed will correspond to different processing time.

### 5.6.8 Find break no



During processing, if accidentally tool damaged and user hasn't saved the break point, stop working and replace cutter tool. After that, user can manually move X, Y axis to the nearest point where the cutter was broken (recommend to move a little further), press

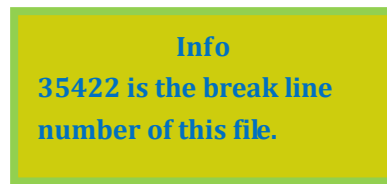
- " + " to start advanced work, move cursor to "Find break no.", then press " to enter in. After guide and reading code, the system prompts:

**Query**

Press enter key to continue  
working from searching position,  
press other key only show the line  
number!



Press “” to start processing, press “” key, the screen shows the current position line number as below,




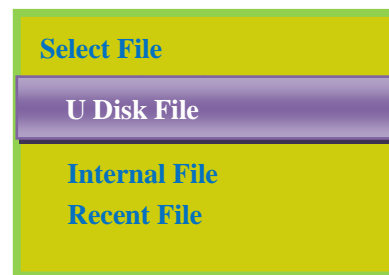
**Note:** When using the “find break no.” function, must at the same work coordinate system.

## 5.6.9 Scale work

If the actual processing requires different sizes of the same file, user can use “scale work”, and enter a zoom in/out ratio.



**Steps:** Press “” to get into “Scale work”.



Choose desired processing file and input correct parameters:

Scale	work	param
X	scale	1.000
Y	scale	1.000
Z	scale	1.000
A	scale	1.000



And then press “” to start processing.

## 5.7 Additional parameters introduction

### 1) Pulse equivalent calculation: (MACHINE SETUP)

Rotary axis (pul/ °), formula = pulses per revolution / angles per revolution (360°)



$$\text{pulse} = \frac{\frac{360^\circ}{\text{Stepper angle}} \times \text{Driver subdivision}}{360^\circ \times \text{transmission ratio}}$$

### 2) Work origin offset: (AUTO PRO SETUP, Unit: mm)

For Z axis work origin which locates in the center of a material or not at the surface of the material, then user can set the Z axis origin offset value. For example: A rectangular wooden pillar, its work origin is at the center, however, the normal work origin can only be set on the material surface, thus we use the “Work origin offset” function. The offset can be a positive value or a negative value. If Z axis moves down, it should be a negative value; If Z axis moves up, it should be a positive value. For X, Y and A axis work origin offset value is set in the same rule.

### 3) Rotary axis mark: (SYSTEM SETUP-Function Confi)

The user can choose a name for the rotary axis, there are 3 options can be selected from this menu: A/B/C, modify as required. After that the system requires a reboot.

## 5.8 Programming example

```
%
G54
G90 G17
T1M6
S1200M3
G0 Z98.500
X-640.000 Y9.369 A0.000
G01 F9000
```

Z29.659

Y9.308 Z29.618 A0.254

Y9.246 Z29.578 A0.508

Y9.183 Z29.539 A0.763

Y9.121 Z29.501 A1.017

Y9.058 Z29.464 A1.271

Y8.996 Z29.428 A1.525

Y8.933 Z29.394 A1.779

Y8.870 Z29.361 A2.033

Y8.807 Z29.330 A2.287

Y8.744 Z29.299 A2.541

Y8.680 Z29.270 A2.795

X-640.000 Y8.617 Z29.241 A3.049

X-640.000 Y8.553 Z29.214 A3.303

Y8.490 Z29.189 A3.557

X-640.000 Y8.426 Z29.164 A3.811

## 6 System upgrade



During using, system software may have updated version which can upgrade the handheld controller, operation as follow:

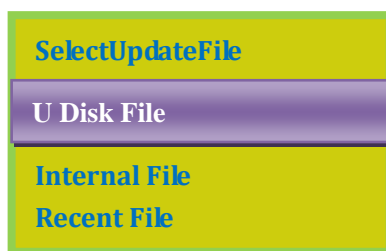
Upgrade with \*\*.PKG file from U disk



### Way 1:

- 1) Store the \*\*.PKG file (Upgrade package) into U disk, and insert the U disk in the top right port on handheld controller. The upgrade pack name in the controller is rz-xxxx or qxx-xxx.



- 2) Press “”, select “System Setup” and press “”. Move the cursor and choose “Auto upgrade”. The screen shows as follow,

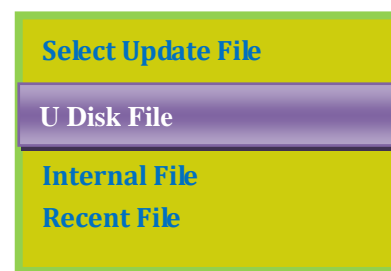




- 3) Choose “U disk file” and press “” to access in U disk storage area and select relative upgrade pack then press “”, the system will complete the updating automatically.
- 4) When the upgrading is successful, user should restart the controller.

### Way 2:

- 1) Store the \*\*.PKG file (Upgrade package) into U disk, and insert the U disk in the top right port on handheld controller. The upgrade pack name in the controller is rz-xxxx or qxx-xxx.

- 2) Press “” + “”, the screen shows:



- 3) Choose “U disk file” and press “” to access in U disk storage area and select relative upgrade pack then press “”, the system will complete the updating automatically.
- 4) When the upgrading is successful, user should restart the controller.

## 7 “U disk mode” function introduction

**RichAuto-B1X** which hardware number start from **A010\*\*\*\*** (E.g.: A0101203), & **Update Version from rz-1967** (the system needs to update if the update version number lower than 1967). Connect handle and computer by USB cable, find portable storage device on the computer, and then copy processing files from computer to handle inner. This function can ensure that if USB port of the handle is broken or there is no U disk, the machine can still work normally.


### Operation step:




- 1) Press any two buttons at the same time ( for example: “回工件零 REF 确定 OK” + “手动模式 MODE” ).
- 2) Connect handle and computer by USB cable, it means that the handle is powered by computer, loosen the buttons after the power supply.
- 3) Handle screen display:



The handle is connected with the computer successfully.

1. Double click “My computer”  : could find a removable storage device

“  A0131482 (G:) 457 MB 可用, 共 464 MB ”, A0131482(G:) is the handle storage space area. User can copy files first and then paste them to A0131482 (G:).

2. Connect handle and machine, Choose internal file to start processing.

**Note:** Users can view the hardware support capability in “version view”, if it supports “U disk mode” means it can realize U disk storage function.

## 8 G code reference list

G code list	
<b>G00</b>	Rapid positioning
<b>G01</b>	Linear interpolation
<b>G02</b>	Circular interpolation CW
<b>G03</b>	Circular interpolation CCW
<b>G04</b>	Dwell (Unit: millisecond)
<b>G17</b>	Selection of XY coordinate plane
<b>G18</b>	Selection of ZX coordinate plane
<b>G19</b>	Selection of YZ coordinate plane
<b>G20</b>	Input in inch
<b>G21</b>	Input in metric
<b>G28</b>	Auto back to reference point
<b>G30</b>	Back to secondary reference point
<b>G40</b>	Cancel tool radius compensation
<b>G41</b>	Left tool compensation(the tool offsets radius distance on the left side of tool moving direction)
<b>G42</b>	Right tool compensation(the tool offsets radius distance on the right side of tool

	moving direction)
<b>G43</b>	Tool length compensation (compensation along positive direction)
<b>G44</b>	Tool length compensation (compensation along negative direction)
<b>G49</b>	Cancel tool length compensation
<b>G54</b>	Work coordinate system 1
<b>G55</b>	Work coordinate system 2
<b>G56</b>	Work coordinate system 3
<b>G57</b>	Work coordinate system 4
<b>G58</b>	Work coordinate system 5
<b>G59</b>	Work coordinate system 6
<b>G73</b>	High-speed peck drilling cycle for deep holes
<b>G80</b>	Canned cycle cancel
<b>G81</b>	Drilling cycle
<b>G82</b>	Drilling cycle of dwell at bottom of hole
<b>G83</b>	Peck drilling cycle for deep holes
<b>G84</b>	Right hand tapping cycle
<b>G90</b>	Absolute programming
<b>G91</b>	Incremental programming
<b>G98</b>	Return to initial point
<b>G99</b>	Return to point R
<b>G101</b>	Move with processing speed until the signal is triggered. Meanwhile Rollback and pinpoint signal edge (similar to backing home)
<b>G102</b>	Move with fast speed until the signal is triggered. Meanwhile Rollback and pinpoint signal edge (similar to backing home)
<b>G103</b>	Move with processing speed until the signal is triggered.
<b>G104</b>	Move with fast speed until the signal is triggered.
<b>M03</b>	Spindle on(CW rotation)
<b>M04</b>	Spindle on(CCW rotation)
<b>M05</b>	Spindle stop
<b>M06</b>	Tool change
<b>M08</b>	Coolant on (Flood)
<b>M09</b>	Coolant off
<b>M30</b>	End of program,and return to program top
<b>M37</b>	Spindle on(CW rotation)
<b>M38</b>	Spindle on(CCW rotation)
<b>M129</b>	4th spindle on
<b>M208</b>	Cycle machining
<b>M210</b>	Set output logic low level
<b>M211</b>	Set output logic high level
<b>M214</b>	Run the next line of G code after waiting for the specified input signal logic low
<b>M215</b>	Run the next line of G code after waiting for the specified input signal logic



	high
<b>M216</b>	Run the next line of G code after waiting until all the specified input signal logic high
<b>M217</b>	Run the next line of G code after waiting until anyone of all the specified input signal logic high
<b>M220</b>	Set Y1 logic low level
<b>M221</b>	Set Y1 logic high level
<b>M222</b>	Set Y2 logic low level
<b>M223</b>	Set Y2 logic high level
<b>M224</b>	Set Y3 logic low level
<b>M225</b>	Set Y3 logic high level
<b>M226</b>	Set Y4 logic low level
<b>M227</b>	Set Y4 logic high level
<b>M350</b>	Set the extension output logic low level
<b>M351</b>	Set the extension output logic high level
<b>T</b>	Tool function
<b>S</b>	Spindle speed
<b>F</b>	Feed rate
<b>H</b>	Tool length offset

## 9 Tool setting methods detailed explanation

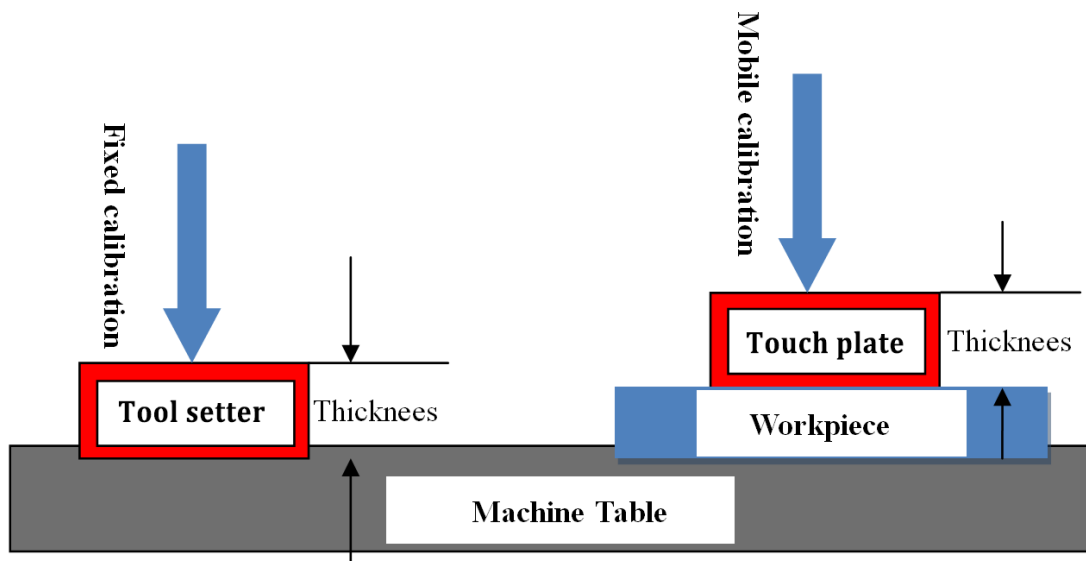
The process of tool setting is process of setting work coordinate system specific location in the machine tool coordinate system.

There are 3 ways for tool setting: **Direct tool setting**, **Fixed calibration** and **Mobile calibration**

### 9.1 Direct Tool Setting

Manually move down Z axis and make sure the tool bit touches the material surface. Of course, user should reduce the motion speed of Z axis when the cutter is the most nearest the plane.

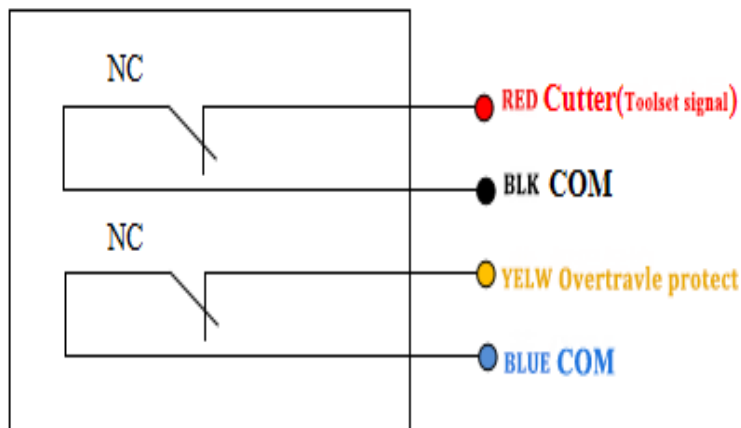
To confirm the contact position between the tool and the workpiece by eye-measurement or tool bit touch the workpiece surface. Then press “Z→0” to finish the tool setting.



*Tool setter, tool touch plate working sketch*

## 9.2 Fixed calibration

Tool setter electrical wiring diagram:



*Wiring diagram*



*Tool setter real picture*

**Tool setter wiring:** The dsp controller tool setting input signal (X5) is normally open state when ex- factory.

**Normally open type:** The Tool setter signal CUTTER should be connected to the wiring board input port –X5, COM connects to GND-INPUT SIGNAL.

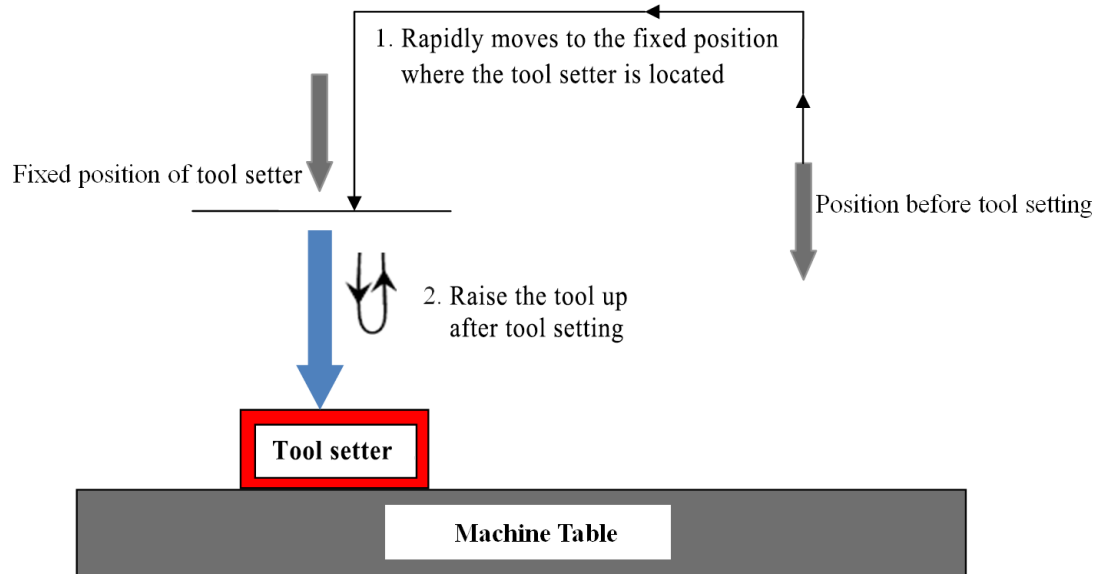
X4: system default normally open.

**Normally closed:** Firstly, modify the input voltage level of X5 to normally closed, then connect CUTTER signal to X5, COM to GND-INPUT SIGNAL.

The Over travel protection signal wiring method is similar to CUTTER signal. It can be connected

to X7-E-stop signal.

#### Fixed calibration diagram:



**Fixed calibration:** Means to execute tool setting operation at a certain fixed position on the machine table.


During machining, the cutter tool wear or fracture that needs replacement. However, the blade length and tool clamping position will change after tool changing. The system can execute “fixed calibration” to re-confirm the tool offset value.

#### Instructions:

##### 1) Set Tool setter position

Get into “MACHINESETUP--C.A.D Position” to set Tool setter position, including “Inplace”&“Inposition”.



In position(positioning): Press “”, screen displays “Press OK key to set point position by manual mode, it’s very simple but not accurate, press cancel to set by number”. Recommend to choose manual mode.




In place: Move X,Y axis to the place where is over the Tool setter, press “”.

##### 2) First time tool setting / Tool setting after tool changing



Manual move Z axis to the surface of workpiece, and set workpiece origin of X, Y, Z, A axis.



Press “”execute the first time tool setting. The system will record value of offset automatically.

Start the processing after first time tool setting.



After the tool changed or tool bit broken, press “”+“” to start second time tool setting, system will automatically restore to current Z axis workpiece coordinate origin.

Second time tool setting completed, start processing.

**Note: After the tool changed or tool bit broken off, the system can automatically calculate Z offset and save it when executes the tool setting command, after tool setting user can start processing directly without press “Z→0”.**

### 9.3 Mobile calibration

Mobile calibration is suitable for materials such as wood working, acrylic, plastic, aluminum, iron, steel etc. material.

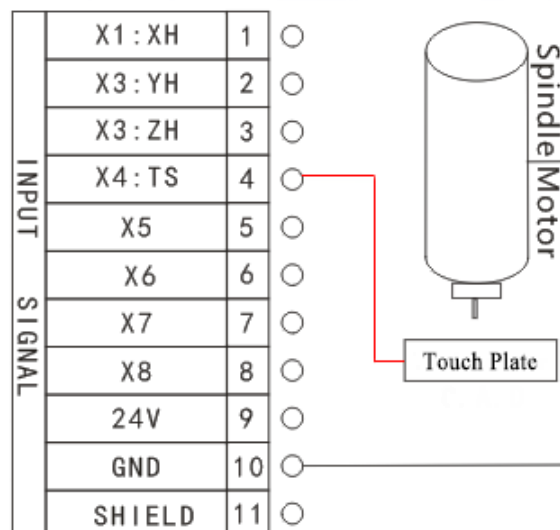
Generally, the tool touch plate can be used to do the mobile calibration, as it is economical, simple and convenient.

#### Tool touch plate wiring:

1. The white wire alligator clip connects to X5(TS) input port on the wiring board.
2. The black wire connects to GND on the input terminal of the wiring board.



*Touch plate real picture*



*Touch plate wiring diagram*


#### Usage method:

Connect the wire to the wiring board(X5 port), and connect the alligator clip to GND port on the

interface board input terminal (or clamp it to the spindle, and ensure the spindle has been connected to earth wire).

Put the tool touch-off plate on the surface of the workpiece, move X Y axis over the tool plate,



press “”, Z axis will move down slowly until touches the plate and feedback its tool setting signal to the controller, then Z axis automatically lift up, tool setting complete.

**Note:**

After connected the tool touch-off plate, start the machine (don't start the spindle). Don't put alligator clip on the spindle immediately, but to start automatically tool setting function first, and then use the alligator clip touch the tool touch-off plate quickly, in order to check whether Z axis has the action of tool setting. To ensure there is no problem with the spindle, and then realize the automatically tool setting.

The system “C.A.D thickness” value is default as 0, so the user should measure the real thickness of the tool touch plate and input the value into the system, under “Machine setup”—“C.A.D thickness”, after that user could use mobile calibration.

## 10 Pulse equivalent calculation

### 10.1 Stepper motor drive

#### 10.1.1 Linear axis

**Unit:** Pul/mm

**Formula =** pulses per revolution / distance per revolution

**Numerator:**

Pulses per revolution formula:  $(360^\circ / \text{stepper angle} * \text{Driver subdivision})$

(Some stepper drivers mark pulse number directly).

**Denominator:**

Distance/revolution formula:

- ▶ Screw drive = screw pitch \* mechanical transmission ratio (reduction ratio)
- ▶ Rack (straight) drive = rack module \* gear teeth number \*  $\pi$  \* mechanical transmission ratio (reduction ratio)
- ▶ Rack (helical) drive = rack module \* gear teeth number \*  $\pi$  \* mechanical transmission ratio (reduction ratio) /  $\cos$  (helical angle)
- ▶ Pulley & belt drive =  $\pi$  \* pulley diameter \* mechanical transmission ratio (reduction ratio)

✓ **Screw drive:**



$$\text{pulse} = \frac{360^\circ}{\text{Stepper angle}} \times \frac{\text{Driver subdivision}}{\text{Screw pitch} \times \text{transmission ratio}}$$

Pulse/rev	SW5	SW6	SW7	SW8	MSTEP	SW5	SW6	SW7	SW8
400	ON	ON	ON	ON	2	ON	ON	ON	ON
800	OFF	ON	ON	ON	4	ON	OFF	ON	ON
1600	ON	OFF	ON	ON	8	ON	ON	OFF	ON
3200	OFF	OFF	ON	ON	16	ON	OFF	OFF	ON
6400	ON	ON	OFF	ON	32	ON	ON	ON	OFF
12800	OFF	ON	OFF	ON	64	ON	OFF	ON	OFF
25600	ON	OFF	OFF	ON	128	ON	ON	OFF	OFF
51200	OFF	OFF	OFF	ON	256	ON	OFF	OFF	OFF
1000	ON	ON	ON	OFF	5	OFF	ON	ON	ON
2000	OFF	ON	ON	OFF	10	OFF	OFF	ON	ON
4000	ON	OFF	ON	OFF	25	OFF	ON	OFF	ON
5000	OFF	OFF	ON	OFF	50	OFF	OFF	OFF	ON
8000	ON	ON	OFF	OFF	125	OFF	ON	ON	OFF
10000	OFF	ON	OFF	OFF	250	OFF	OFF	ON	OFF
20000	ON	OFF	OFF	OFF	DISABLE	OFF	ON	OFF	OFF
40000	OFF	OFF	OFF	OFF	DISABLE	OFF	OFF	OFF	OFF



E.g.1:Driver nameplate 1    E.g.2:Driver nameplate2    Motor nameplate/ stepper angle=1.8°

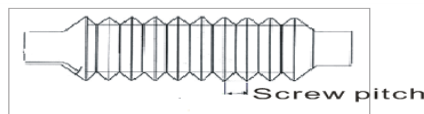
**Explain:** Stepper angle is the data of motor, means the angle of motor rotating for a single step. Driver subdivision is set in the driver.

In E.g.1, Pulse/rev is Pulses per revolution of stepper motor, so that the user only needs to select a relative value according to the actual dial code. For example: If user choose 3200 Pulse/rev, indicates  $(360^\circ / \text{stepper angle}) \times \text{Driver subdivision} = 3200$ .

In E.g.2, the MSTEP means subdivision number. So, if the stepper angle is 1.8°, selected subdivision is 16, then  $(360^\circ / \text{stepper angle}) \times \text{subdivision} = (360^\circ / 1.8) \times 16 = 3200$ .

The use should use correct computational method according to the actual marks of stepper motor driver nameplate.

Screw pitch (above picture): The distance that the nut moves when the ball screw makes one rotation.



Transmission ratio: The reduction rate or angular velocity ratio of the front drive sprocket to the end driven wheel.

✓ **Rack drive:**

► **Straight teeth:**



$$\text{pulse} = \frac{\frac{360^\circ}{\text{Stepper angle}} \times \text{Driver subdivision}}{\text{rack module} \times \text{gear teeth number} \times \pi \times \text{transmission ratio}}$$

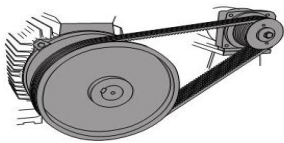
► Helical teeth:



$$\text{pulse} = \frac{\frac{360^\circ}{\text{Stepper angle}} \times \text{Driver subdivision} \times \cos(\text{helical angle})}{\text{rack module} \times \text{gear teeth number} \times \pi \times \text{transmission ratio}}$$

Explain: Rack module and gear teeth number are both the parameters of the rack. Rack module \* gear teeth number \* pi is the pitch circle circumference of the rack.

✓ **Pulley&belt drive:**



$$\text{pulse} = \frac{\frac{360^\circ}{\text{Stepper angle}} \times \text{Driver subdivision}}{\pi d \times \text{transmission ratio}}$$

d: Pulley diameter

## 10.1.2 Linear axis pulse equivalent computing method

For example: the stepper motor driver dialed code is 1600 pulse/rev.

➤ **Screw drive**

$$\text{screw pitch} = 5\text{mm}, \text{ pulse equivalent} = \frac{1600}{5} = 320$$

➤ **Rack drive**

rack module: 1.25, gear teeth number: 23,  $\pi$ : 3.141592654, transmission ratio: 1/5(0.2)

helical angle: 19°31'42" ( $\approx 19.52833333^\circ$ )

**Straight track**

$$\text{Pulse equivalent} = \frac{1600}{1.25 \times 23 \times 3.141592654 \times 0.2} = 88.573$$

Helical rack

$$\text{Pulse equivalent} = \frac{1600}{1.25 \times 23 \times 3.141592654 \times 0.2 \div \cos(19^\circ 31' 42'')} = 83.478$$

$$\frac{1600 \times \cos(19.52833333)}{1.25 \times 23 \times 3.141592654 \times 0.2} = 83.478$$

NOTES:  $1.25 \times 23 \times 3.141592654 \times 0.2 = 18.0641577605$

$$\cos(19.52833333) = 0.94247630504668681677372940102406$$

$$1.25 \times 23 \times 3.141592654 \times 0.2 \div \cos(19.52833333) = 19.1666969915 \approx 19.1667$$

### 10.1.3 Rotary axis (pul/°)

Formula = pulses per revolution / angles per revolution (360°)



$$\text{pulse} = \frac{\frac{360^\circ}{\text{Stepper angle}} \times \text{Driver subdivision}}{360^\circ \times \text{transmission ratio}}$$

### 10.1.4 Rotary axis pulse equivalent computing

E.g.: pulse/rev=1600, transmission ratio = 1/40

$$\text{Pulse equivalent} = \frac{1600}{360 \times 1/40} = 177.778 \text{ (result retains up to 3 decimal places)}$$

### 10.1.5 Calculate electronic gear ratio according to fixed

#### pulse equivalent value

E.g.: Pulse equivalent of handle=1000

#### 1. YASKAWA-Numerator Pn20E

YASKAWAΣ—7: Encoder resolution=16777216 (2<sup>24</sup>) Set **Pn20E**=16777216

YASKAWAΣ—V: Encoder resolution=1048576 (2<sup>20</sup>) Set **Pn20E**=1048576

YASKAWA- numerator Pn20E can set to 1048576

#### YASKAWA-denominator Pn210



➤ Screw drive

screw pitch=5mm,  $Pn210=1000 \times 5=5000$

➤ Rack drive

rack module: 1.25, gear teeth number: 23,  $\pi$ : 3.141592654, transmission ratio:  $1/5(0.2)$

helical angle:  $19^\circ 31' 42''$  ( $\approx 19.52833333^\circ$ )

◆ Straight rack

$Pn210=1000 \times 1.25 \times 23 \times 3.141592654 \times 0.2=18064$

◆ Helical rack

$Pn210=1000 \times 1.25 \times 23 \times 3.141592654 \times 0.2 \div \cos(19.52833333) = 19167$

## 2. DELTA ASDA-B2&A2

B2: Encoder pulses equivalent default-- $N=160000$

A2: Encoder pulses equivalent default-- $N=1280000$

E.g.: B2 series  $N=160000$

➤ Screw drive

screw pitch=5mm, Denominator  $M=1000 \times 5 = 5000$

$$\text{Electronic gear ratio} = \frac{N}{M} = \frac{160000}{5000} = \frac{32}{1}$$

**Set P1-44=32, P1-45=1**

➤ Rack drive

rack module: 1.25, gear teeth number: 23,  $\pi$ : 3.141592654, transmission ratio:  $1/5(0.2)$

helical angle:  $19^\circ 31' 42''$  ( $\approx 19.52833333^\circ$ )

◆ Straight rack

Denominator  $M=1000 \times 1.25 \times 23 \times 3.141592654 \times 0.2=18064$

$$\text{Electronic gear ratio} = \frac{N}{M} = \frac{160000}{18064} = \frac{10000}{1129}$$

**Set P1-44=10000, P1-45=1129**

◆ Helical rack

Denominator  $M=1000 \times 1.25 \times 23 \times 3.141592654 \times 0.2 \div \cos(19.52833333) = 19167$

$$\text{Electronic gear ratio} = \frac{N}{M} = \frac{160000}{19167}$$

Set P1-44=160000, P1-45=19167

## 10.1.6 Calculate pulse equivalent according to fixed electronic gear ratio

DELTA ASDA-B2: Electronic gear ratio default--16/10,

A2: Electronic gear ratio default--N=128/10

E.g. B2: Set P1-44=1, P1-45=1, Encoder pulses equivalent  $2500 \times 4 = 10000$

➤ Screw drive

$$\text{screw pitch} = 5\text{mm}, \text{ pulse equivalent} = \frac{10000}{5} = 2000$$

➤ Rack drive

rack module: 1.25, gear teeth number: 23,  $\pi$ : 3.141592654, transmission ratio: 1/5(0.2)

helical angle:  $19^\circ 31' 42''$  ( $\approx 19.52833333^\circ$ )

◆ Straight rack (results retain up to three decimal places)

$$\text{Pulse equivalent} = \frac{10000}{1.25 \times 23 \times 3.141592654 \times 0.2} = 553.582$$

◆ Helical rack (results retain up to three decimal places)

$$\begin{aligned} \text{Pulse equivalent} &= \frac{10000}{1.25 \times 23 \times 3.141592654 \times 0.2 \div \cos(19^\circ 31' 42'')} \\ &= \frac{10000 \times \cos(19.52833333)}{1.25 \times 23 \times 3.141592654 \times 0.2} \\ &= 521.738 \end{aligned}$$

## 10.1.7 Rotation axis

**Electronic gear ratio denominator:** Pulse equivalent \* 360 \* transmission ratio(reduction ratio)

1) Pulse equivalent of handle fixed to 1000

**YASKAWA** Same to linear axis

YASKAWAΣ—7 electronic gear ratio numerator

**Pn20E**=16777216,

YASKAWAΣ—V electronic gear ratio numerator

**Pn20E**=1048576

transmission ratio =1/40, electronic gear ratio denominator **Pn210**=1000×360×1/40=9000

**DELTA** Same to linear axis

DELTA ASDA--B2 Encoder pulses default--N=160000

A2 Encoder pulses default--N=1280000

**E.g. B2:** Electronic gear ratio numerator N=160000

Electronic gear ratio denominator M=1000×360×1/40=9000,

$$\text{Electronic gear ratio} = \frac{N}{M} = \frac{160000}{9000} = \frac{160}{9}$$

**Set P1-44=160, P1-45=9**


2) Calculate pulse equivalent according to fixed electronic gear ratio, setP1-44=1, P1-45=1

Encoder pulse count per revolution 2500×4=10000

$$\text{Pulse equivalent} = \frac{10000}{360 \times 1/40} = 1111.111 (\text{results retain up to three decimal places})$$

## 10.2 Proportion calculation method

If there is an error when calculate it according to the formula or cannot get relevant data to calculate, it can be calculated according to the proportion method. Suppose handle pulse

equivalent is A, press "" switching to distance mode, set a distance B, measuring the number of actual moving distance C, then the actual pulse equivalent = A × B ÷ C.

For example: Suppose handle pulse equivalent A = 400, distance B = 100, actual distance C = 80, then the actual pulse equivalent = 400 × 100 ÷ 80 = 500  
 Repeat calculation for several times until you get the correct pulse equivalent value.

## 11 Common problems and troubleshooting


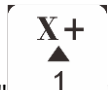
### 11.1 Solutions for screen display faults

#### After powered on the “Screen flicker or automatically restart”

- 1) Switching mode power supply is insufficient. Check power supply if there are problems, and change high-quality power supply to solve the problems.
- 2) The local power grid unstable. Check local grid voltage stability or use the regulator filter device.
- 3) The power chip of the handle is ageing. This phenomenon also appears when the handle is powered through the USB cable to the computer. Please return back the handle to our company.
- 4) Temporary solution. Using standard 5V mobile phone charger, supply power through the USB cable to handle. Duplicate power supply for temporary emergency use.

#### Failed to set work piece origin during normal operation process

- 1) It is under the mechanical coordinate system. Check if the main interface displays AX AY AZ,

AA, if yes, should press " + "

can set work origin. Press " + " is for going to mechanical coordinate system where cannot set work origin in there.

- 2) The buttons are broken. Go to “SYSTEM SETUP”-“Buttons Check” menu to check whether the buttons are normal or not.

#### Assertion error

Assertion error (occurred during the processing or after starting) is generally a software problem. User can boot the controller by entering “emergency state”, or re-upgrade it. If can't be solved either, user should send back it for repairing.

**Unable to read U flash disk or read error occurs**

- 1) Processing by U-disk, screen shows “there is no item in this option”. Format U-disk to FAT32, change allocation unit to the default configuration size. Then re-import processing files, it will read normally.
- 2) U flash disk capacity is too large (16G, 32G or 64G etc.). Recommend replace U disks such as 2G 、4G、 8G.
- 3) There is something wrong with USB communicate port or U-disk interface is broken, change a new USB port or U-disk.
- 4) There is no any reaction while insert into the U-disk. Change a genuine brand of U-disk, such as SanDisk, FOUNDER U-disk etc.
- 5) If the U-disk interface is weak connection, user can copy files into inner memory space of the controller for temporary solution.
- 6) Program contains non-standard G codes, or some illegal characters. The system does not recognize them and interrupt handling. Recommend using professional simulation software to review the program whether there is an illegal character. Delete all illegal characters.

## 11.2 FAQ in practical operation

**After the machining, the cutting size doesn't match the actual size in processing file**

- 1) Pulse equivalent is wrong.
- 2) User has selected the wrong tool bit which is not the same as it set in process file.
- 3) Check if there is any problem with the path processing file.

**The screen displays “exceed limit” during processing**

- 1) The machine hasn't returned ZERO, lead the system is unable to confirm the actual position. Solution is to go machine ZERO.
- 2) The reserved processing range is small than the actual file size after user set work piece origin. Confirm the actual file size and then set a correct working origin.
- 3) Set wrong working origin in the process of creating processing file path. Check the file path,

and then generate the correct one.

#### **Hard limit triggering**

- 1) If the machine has connected with hard limit, the hard limit switch maybe damaged or the voltage setup status on X6 is wrong.
- 2) System has not connected with hard limit signal: Confirm whether connect other signal wire to hard limit X6 port, if not, check voltage setup normal or not. If normal, user could go to "MACHINE SETUP"- "Input Confi" and DISABLE X6 port, then go to "SYSTEM SETUP"- "wipe cache". If still can't solve this problem, user can upgrade the system.

#### **Z axis (spindle) fall down abnormally (too fast) and cause Z feed amount too much during processing**

- 1) Z axis working speed exceed the fastest speed cause Z axis loses its steps when moving up. "MACHINESETUP " - " Max Spd Limit ", set the safe speed.
- 2) The coupling is loosen or transmission mechanism slipping. Re-adjustment the connecting parts.
- 3) The signal wire connected between the interface board and the motor driver has got interference. Adjust the circuit.
- 4) Processing file error. Check processing file, try to download the correct processing file to U disk or handle internal.
- 5) There is something wrong (plug loosen or wire damaged or wire diameter is too slimsy) with the lines connecting Z axis motor and motor driver. Replace the lines.


#### **Repeating the same processing file after returning back to the machine ZERO, Z axis cutting depths are not as same as each other**

- 1) Machining table is uneven or processing object not firmly fixed, re-milling the machine table to adjust the flatness.
- 2) Z-axis origin detection switch repeat positioning accuracy error, causing Z axis homing error each time. Replace a high-quality detection switch.

- 3) Too much interference in the Z-axis homing process to form a false Z origin. Re-adjust the wiring.

**The machine cannot stop after returning ZERO, and cause spindle hit the machine body**



Double press “” to check input signal (Origin detection switch signal). To do self test.

Detect whether the signal is triggered or disconnected.

- 1) The origin detection switch is broken. Replace a new one.
- 2) The distance of the origin detection switch detection sheet beyond the detection range (This problem is common occurs in optoelectronic and proximity switches) of the switch, adjust the position of the test piece.
- 3) The origin detection switch to the interface board wiring aging or loosening. Check the connections again.
- 4) The interface board is broken. Return back to us to repair.
- 5) 50-pin data cable is broken. Replace it with a new data cable.

**The machine uniform moves to the reverse direction when backing to the machine ZERO**

- 1) The origin detection switch types do not match with the definition of the corresponding voltage level. Modify the voltage level in the controller. (Normally open type corresponds to a level defined the direction of the arrow down, normally closed type corresponds to the level defined arrow up).
- 2) The origin detection switch is broken. Replace a new one.
- 3) The origin detection switch connects interface board not well. Refresh the cable to confirm the wiring is correct.
- 4) Too much interference, resulting in the illusion of the detection switch has been triggered. Recalibrated the whole circuit.
- 5) The interface board is broken. Depot Repair.
- 6) 50-pin data cable is broken. Replace the data cable.

**Abnormally running when processing or the actual file is different from theoretical file**

- 1) The system program disorder.
- 2) Too much external interference lead the controller cannot work normally. Re-adjust overall circuit. (The wires of weak current and strong current should be separately binding, the inverter and other components should be separated connected each GND of themselves).
- 3) There is something wrong while converting the file format and the program appears illegal characters or system unrecognized codes. Recommended to use third party simulation software to review the program paths.

**Start automatic tool setting, the tool does not stop after touching C.A.D (Tool sensor).**

- 1) The cutter signal cable connects X5 maybe broken circuit.
- 2) The "GND" signal port on the interface board hasn't been connected with spindle housing or poor connection.
- 3) Go to "MACHINE SETUP"- "Input Confi" to confirm if X4 is enabled.

**Coordinate value changes on screen, but the machine does not move**

- 1) If it is one axis not moving, it maybe wiring problem. Change another normal terminal to this axis wiring terminal, if it moves properly indicating the rear parts of motor driver have no problem. Check if there is something wrong with interface board or 50-pin cable. If it is still not moving, it is necessary to detect the corresponding drive and motor.
- 2) If all axes are not moving, firstly, check if there are problems in the 50-pin cable and interface board,; secondly, if the interface board and 50-pin cable are normal, then user should check the power supply of the motor drivers.
- 3) If debugged all above parts, but the machine still not move, then the mechanical parts should be checked.

**It is normal to the move from one position to another position, but when return from that position to the original position is not normal**

Mechanical assembly problem, guide screw may be not installed well.



**Motor moving direction is wrong**

- 1) Exchange A+&A- or B+&B- cable of the stepper motor
- 2) Change motor direction mask (not recommend)

**The machine vibrates when moves in arc or two-axis linkage movement**

- 1) Check whether the machine is placed horizontally
- 2) Check if the coupling units loose or not.
- 3) Increasing the “start speed”, avoid the resonance point.

## 11.3 Electrical components and wiring problem

**A single axis or multi axis can only in one direction after machine power on**

- 1) There is something wrong with the connecting between the interface board and motor driver common anode end, check the connection.
- 2) Interface board is broken. Replace the interface board.
- 3) The motor driver is broken. Replace the driver.
- 4) Measure the direction voltage of that axis with a multimeter. Check if the direction is correct.

**One axis motor does not move after handle power up**

- 1) Pulse cable and direction cable connect oppositely, adjust connection sequence..
- 2) 5V common anode end of the motor driver disconnected, check the connection.
- 3) The motor driver is broken (Performance as the motor moves when push it by hand), change a new one.
- 4) The interface chip of the interface board is broken, no pulse signal output.
- 5) Switch this terminal with another normal terminal to check interface board abnormal or driver abnormal.

---

**Screen is not bright after power up, but connect the handle to computer with USB cable the screen displays normally**

- 1) The DC24V voltage of the handle is not available. Check if the DC24V power supply voltage output is normal or not. If normal, please check if the cable from the power supply to the interface board is virtual connection.
- 2) The 50-pin cable is broken or 50 pin connecting plug hasn't connected well.

**Screen is not bright neither after power up nor connect to computer by USB cable**

- 1) This phenomenon may due to the handle shocked by external force or fall on the ground, causing the crystal processor broken. Return back to repair.
- 2) Users connect high voltage power supply to the interface board and cause the handle and interface board broken. Return back to repair.

**The screen display“Spindle on”, actually the spindle off; the screen display“Spindle off”, actually the spindle on**

- 1) Line fault. Spindle on signal and COM port is short circuit. Check circuit line.
- 2) The output level definition reversed. Go to the “voltage setup” and modify the output level definition (modify the left first arrow direction in the second row).

**The handle screen doesn't light up and shows nothing after power on**

- 1) The power supply voltage is too large or the + and – short circuit burned the chip. Return to us for repairing.
- 2) The power supply damaged, change a new one.
- 3) 50-pin cable is broken, replace it.
- 4) 50-pin socket broken, send back to us for repairing.


**System always alarm after the alarm signal has been connected**

Change the input level on X5 (normally open, wiring in parallel; normally closed, wiring in series).

**Press “spindle on” button, but spindle does not start**

- 1) Check wiring, if normal, check if the inverter has alarm, if the inverter is normal and its setting is correct, and then check if the spindle motor damaged or not.
- 2) Check if 50-pin cable is loose. Confirm the settings of inverter refer to its manual to debug one by one.



- 3) Check interface board. Press “” to start spindle, use multimeter to measure Y1 and GND to see whether conducting, if not, interface board or 50-pin cable is broken. To replace a new one for trouble clearing one by one.