Operating Manual

For Screw Fastening Robot

Catalog

Chapter 1 Overview

There are 4 controlling axis in the Automatic Screw Machine control system called HK-4D2Y, which can support for automatic locking screw control of gantry structure with two worktables. The teach box of the machine HK-4D2Y adopt the 5 inch true-color LCD screen to make the operation menu and boot screen more abundant. To make the transmission speed faster and signal Anti-Interference,it adopts the Industrial field bus for connecting between main board and teach box. The teach box can not only storage processing file,system configure file,but also copying file each other when using multiple machines(or using the U Disk to copy). HK-4D2Y using ARM + DSP + FPGA control program, with a strong computing power, short refresh time, excellent acceleration and deceleration performance in motion control, HK-4D2Y can support high-speed high-precision 3D-line, three-dimensional circular motion. HK-4D2Y motion control board has 256M of storage space, can store 1000 processing files, each file can store 4000 programmed point, HK-4D2Y can support work without teach box connection, processing files available digital number display and button Options to select.

1.1 Hardware

1. Motor axis number : 4 axis output.
2. Acceleration and deceleration performance : S-curve acceleration and deceleration mode, acceleration and deceleration acceleration set independently; 10K speed refresh rate, make the mechanical response better performance, less noise.
3. Pulse output frequency : 4MHz linear interpolation, 2MHz circular interpolation(including 3 axis space circular interpolation), Using a motor which has 20000 pulses each turn as an example, sufficient to meet the existing high-speed servo motor 5000 rpm/min requirements.
4. Home, Limit Input : Each motor has its own home-input, positive and negative limit-input, no need to take up the general input of programmable hardware resources.
5. Programmable input/output : it has 6 ways independent and dedicated programmable input and output, all used optical isolation and each output current up to 500mA.
6. Supporting 3 bits digital number tube interface, can change and switch 1000 files range 0-999 quickly.
7. Using the small key to adjust, In the absence of a teach box can also facilitate the realization of the error due to the changing an electric screwdriver head correction.
8. Owning CAN bus, RS-232, Ethernet, can be customized to the special needs of special programs
9. Read/Write in U Disk : Use the FAT32 file system, no longer than 2G capacity U disk can not be formatted to limit the FAT format.
10. Storage space : main board 256MV, can store 1000 processing files, each with 4000 program points; teach box 16MB, can store the boot screen, file, copy the file to each other in multiple machines is especially useful.
11. Screen of teach box : Use 480 X 272 pixels, 16 million true color 5-inch LCD screen, allowing the

operator menu interface and boot screen is much more abundant.

12. Work Voltage : DC 24V, current 2A.
13. Work environment : degree 0℃--45℃, humidity 40%--80%
14. Storage environment : degree -40℃--60℃, humidity 0%--95%

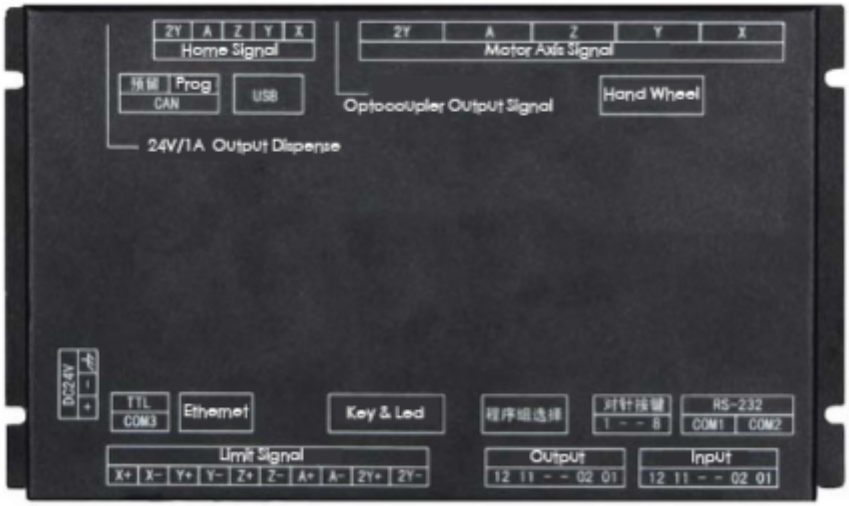
1.2 Software

1. Three-dimensional linear interpolation, circular interpolation space (real hardware three-dimensional instead of line fitting).
2. Programming point of the editor can be 30 times the "undo" "redo", to prevent misuse effectively .
3. Machining parameter setting is set up in the programming point, which can be realized in the same process when different areas have different parameters.
4. In the return to the origin of the action when the axis back to the origin of the XYZ three axis at the same time the origin of the capture action
5. With Quanpin IME to input Chinese.

1.3 Accessory

1. Main board(224mm X 130mm X 42mm)

2. Teach box(242mm X 142mm X 26mm)

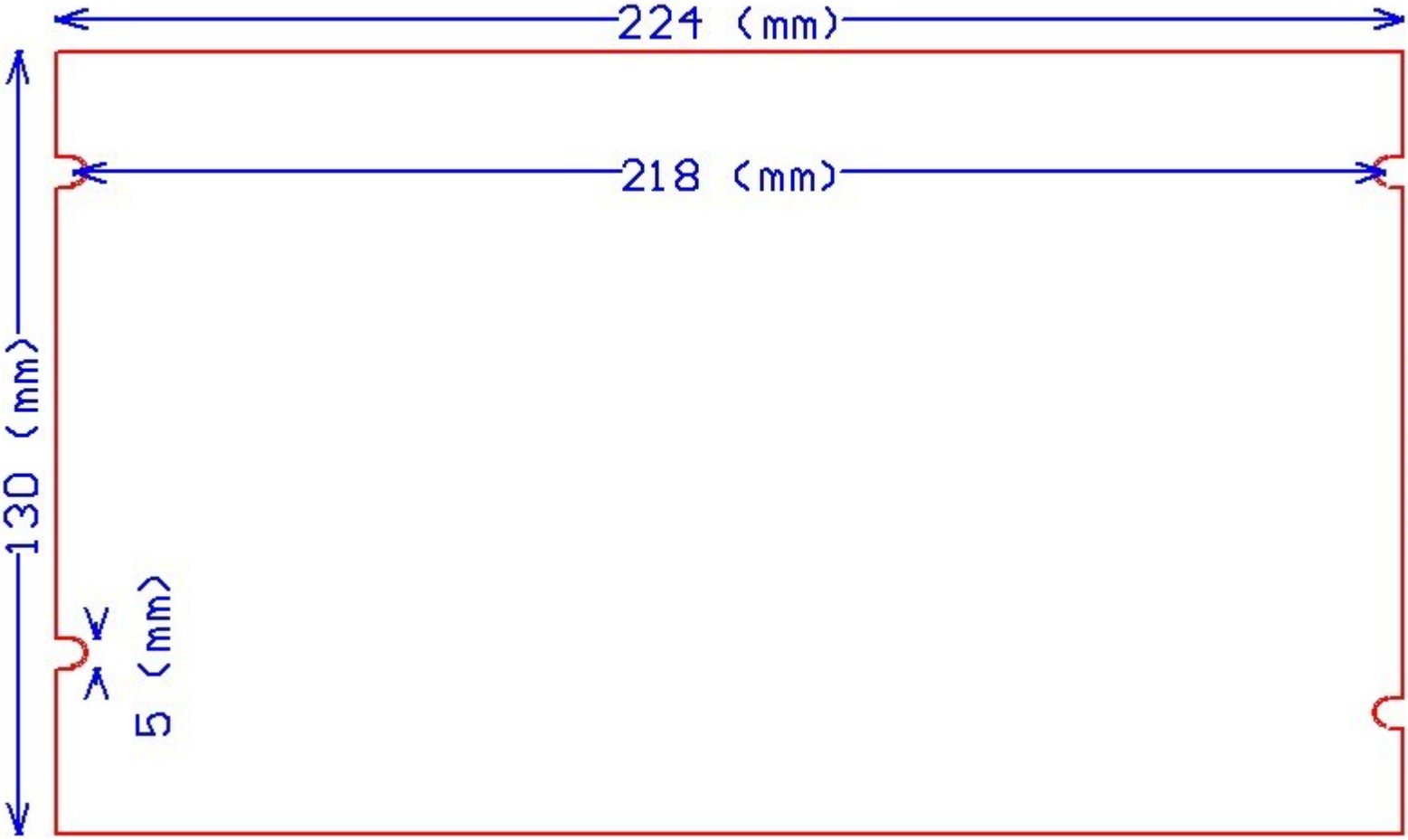



电源
通信
A
Z
Z
A
Y
X
X
速 度
Y
取 消
退 出
切 换
除 错
帮 助
预 览
撤 消
重 做
插 入
删 除
上一页
光标跳转
线开始点
线中间点
线结束点
下一页
菜单1
单点点胶
圆 弧 点
圆形点胶
向 上
菜单2
空 点
单点参数
线段参数
向 下
菜单3
点胶速度
Z轴提高
移到光标
回原点
单 步
运 行
暂 停
停 止
确 定

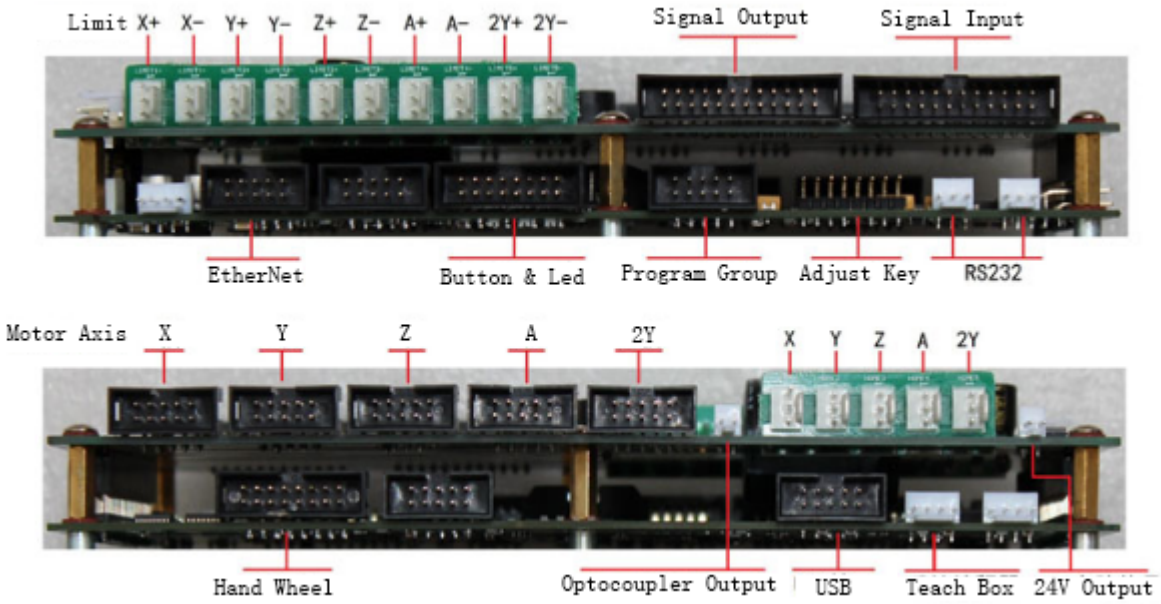
3. Program group selection and calibration panel(107mm X 40mm), Circuit board(70mm X 40mm)

4. Connecting line(Length can be developed)

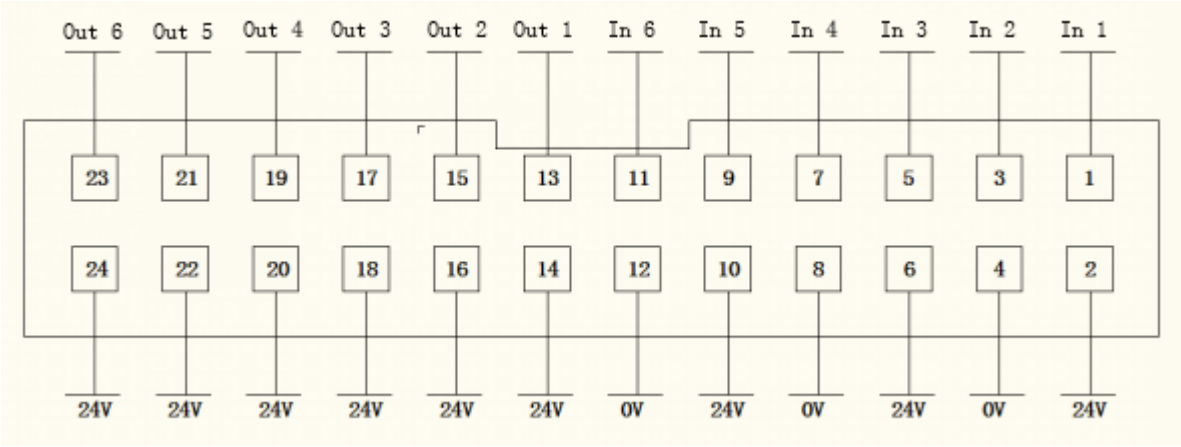
1.4 Main board floor mounting dimensions(Height : 42mm)



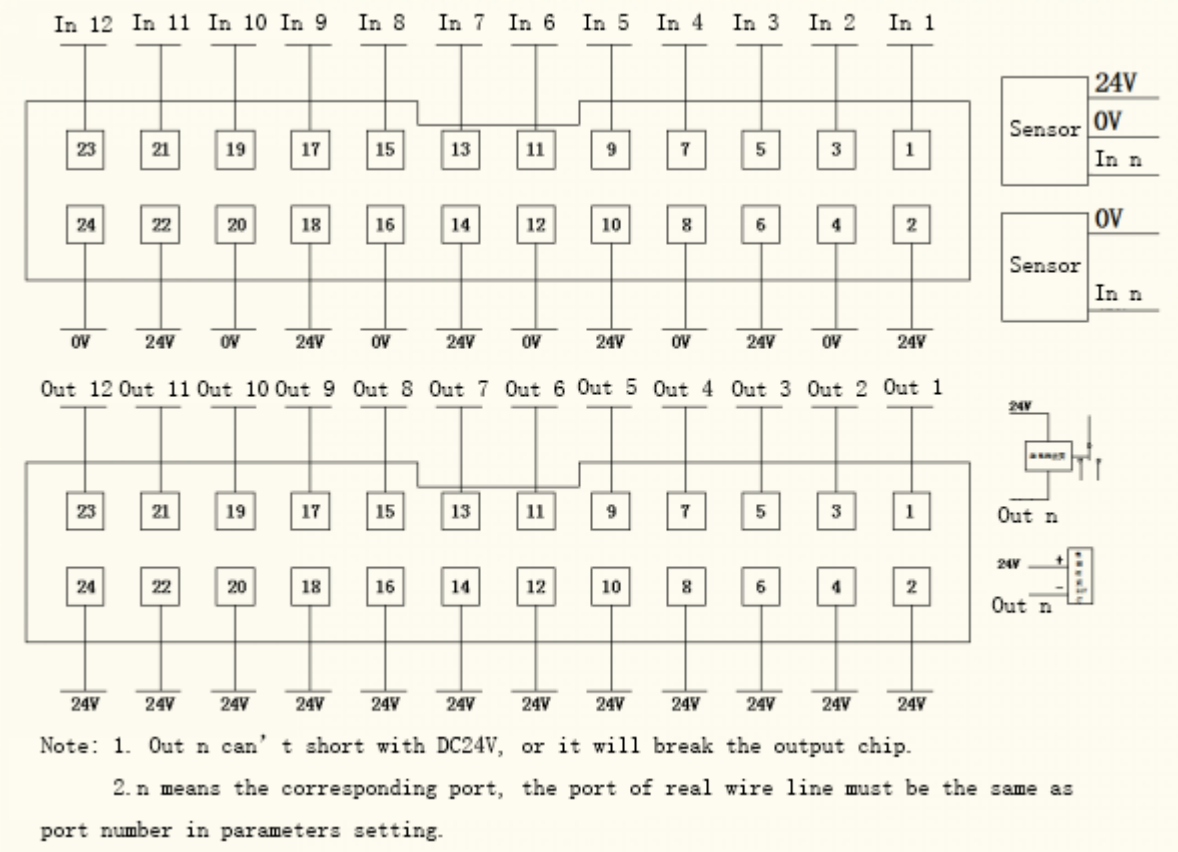
1.5 Interface Schematic



1.6 Programmable input and output interface description

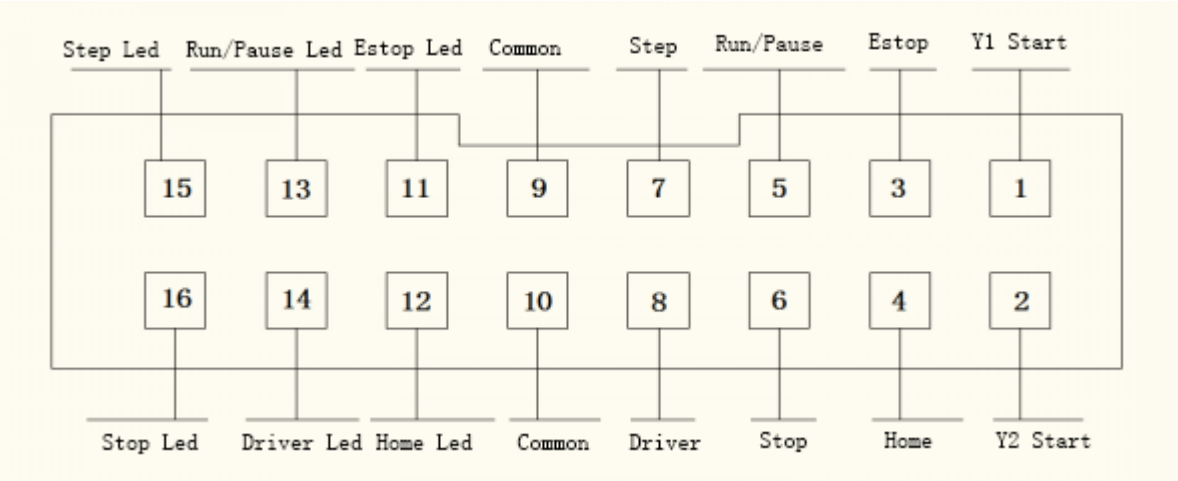


HK-3D-F00 programmable input and output interface



4D2Y programmable input and output interface

1.7 Button and LED interface description



Note : Enable drive indicator LED, connected to the positive terminal (+ 5V), common negative pole.

Y1 Start, Y2 Start : Dual boot mode, start Y1 and Y2 workpiece respectively, can enter the running state without the run key.

Emergency : When the machine is out of control, or want to immediately stop the machine when running, press the emergency key, can occur an emergency alarm.

Back to the origin: the machine back to the origin after the reset operation.

Run/Pause : Press the operation, the machine into automatic operation, press again, machine in operation switching run state and the suspended state

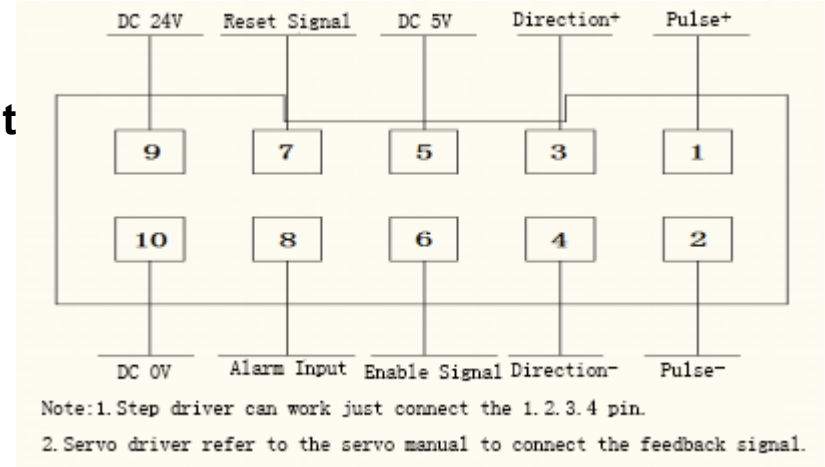
Stop : Stop the machine running .

Step : After homing is completed within 10s of the press, automatic needle. After homing is completed 10s, control of the workpiece clamping cylinders release and engage.

Screwdriver : Start the screwdriver and suction at the same time.

1.8 Motor axis signal interface description

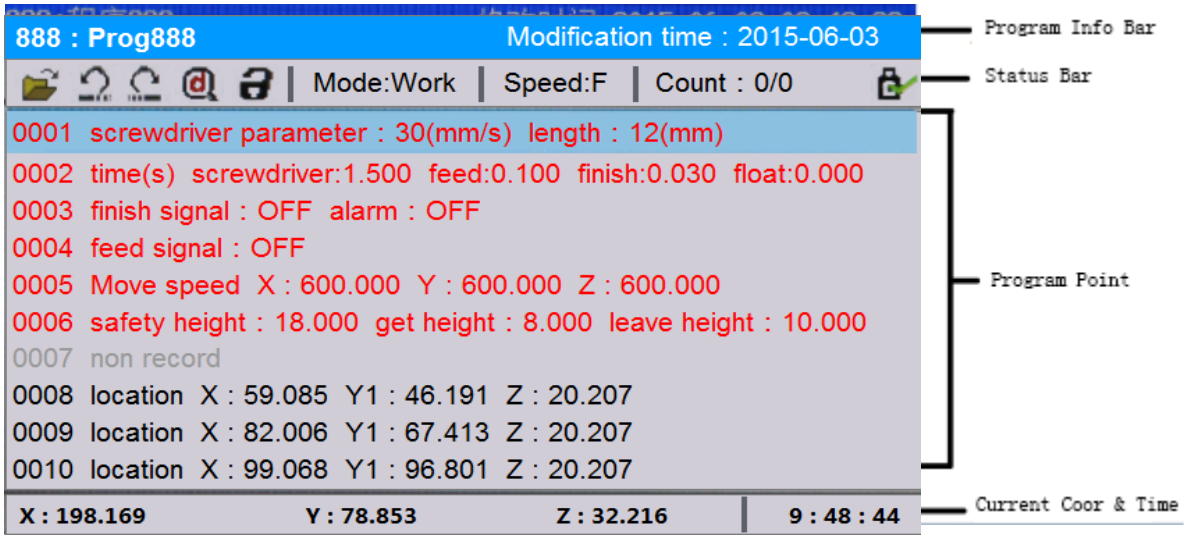
1.9 Limit signal and home signal interface description



Chapter 2 Main interface and key description

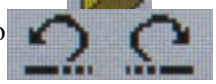
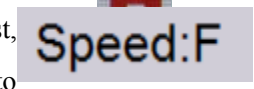
2.1 Main interface description

1. Main interface description of content distribution.



1. File No. And File name, “001” is 

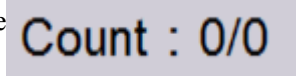
No., “程序 001” is file name.
2. Latest modified time 

of the file.
3. Icon of open processing file, can use “切换” key  move the cursor to this icon.
4. “undo” “redo” state indication icon, up to 
30 times to “undo”, “redo”, but can’t use
when icon is gray.
5. Means the processing file is edited, need  “debug” operation, when already debugged , the icon becomes gray.
6. File is not locked, file is locked, machine is  locked.
7. Move speed by manual, part of “fast, 

middle, slow”, press the "speed" key to

switch.

8. Workpiece counter, in front of the value is the count value of the workpiece, behind



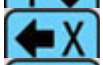
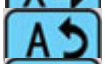
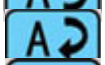
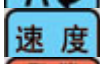
the value set the number of workpieces to be processed. If the work count reach the number of set to be processed, it will prompt that the workpiece counter is full.

9. Insert U Disk, No U Disk.

10. Pinyin input, number input, lower-case letter input, capital letter input,

Press “#” can change the IME when in the character input state.

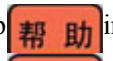
2.2 Teach box key description

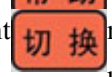
1. Z axis up by manual 
2. Z axis down by manual 
3. Y axis front by manual 
4. Y axis back by manual 
5. X axis left by manual 
6. X axis right by manual 
7. Switch to Y1 axis 
8. Switch to Y2 axis 
9. Switch manual speed “slow, middle, fast” 

10. Operation of exiting the menu or canceling the  input dialog

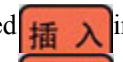
11. Cursor switch between “machining  programming point” area and “short menu bar” area, or transform plane when previewing.

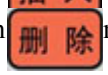
12. Analysis of the current file whether its  programmed point accord with the programming rules, if yes,then the icon will become gray.

13. Press this key can pop up some help  information of the current page, press any key to exit

14. Preview the screw holes graphic in current  machining program file in XY, XZ, YZ plane position,press to change plane, press other any key to exit. When screwdriver in limit using, press “preview” can clean the count of the current screwdriver.

15. Undo and redo to the edition of  programming points, up to 30 times, for preventing misuse effectively.

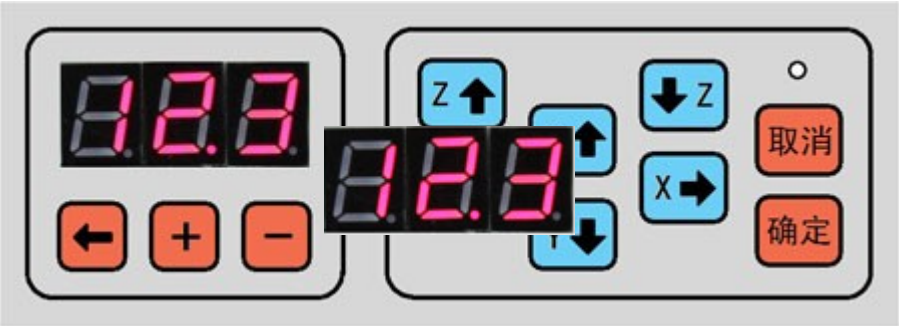
16. In front of the cursor point of the selected  insert a blank program point

17. Delete the programming point of selected in  main page, or in the menu state use for “delete” key.

18. Jump to the special programming point address 光标跳转 by manual input.
19. Into Menu 1, for the point of action, displaying 菜单1 as black.
20. Into Menu 2, for point of parameters setting, 菜单2 displaying as red.
21. Into Menu3, for device of parameters setting 菜单3 and some application operation
22. Perform to home. 回原点
23. Perform step test. 单 步
24. Work run or pause. 运 行 暂 停
25. Work stop. 停 止
26. Cursor up a page in main page state, or up a 上一页 page in menu state.
27. Cursor down a page in main page state, or 下一页 down a page in menu state.
28. Cursor up a line in main page state, or up a line 向 上 in menu state, or up a line in input dialog.
29. Cursor down a line in main page state, or down 向 下 a line in menu state, or down a line in input dialog.
30. Screw hole program in main page, or input 螺丝孔位 @ 1 '1' ,characters in input dialog.
31. Set feeder position in main page , or input '2', 取料位置 abc 2 'abc' in input dialog.
32. Set the speed and length of the screw 跟进参数 def 3 parameters in main page , or input '3','def' in input dialog.
33. Set the time parameters of screw controlling, 时间参数 ghi 4 or input '4','ghi' in input dialog.
34. Set the parameters of the screwdriver in main 电批设置 jkl 5 page, or input '5','jkl' in input dialog.
35. Set array of screw point in main page, or input 供料信号 mno 6 '6','mno' in input dialog.
36. Set move speed of XYZ axis when working in 空移速度 * 7 main page, or input '7','pqrs' in input dialog.
37. Set safe height of Z axis when working in main 提起高度 tuv 8 page, or input '8','tuv' in input dialog
38. Input '9','wxyz' in input dialog. 掉料检测 wxyz 9
39. Input '0' in input dialog. 孔位校正 Pqrs 0
40. Input blank or decimal point in input dialog. 参数浏览
41. Move to the programming point of cursor 移到光标 # − selected in main page, or switch IME or input negative value symbol in input dialog.
42. ＋ Change Y axis between Y1 and Y2 then 取 消 退 出 display when in double Y mode.
43. ＋ Into menu 4, for bottom layer parameters 菜单1 of the device, suggested not open to users.
44. ＋ Into menu 5, for system default 菜单2 parameters, set the initial value of the menu one "Generate the default parameters"

2.3 Program selection and adjustment key description

1. The



current file selected if file 123

2. Move the decimal point bit of the current file No., there is '+','-' operation follow with the decimal point bit.
3. Plus 1 on the bit of decimal point in the File No.
4. Minus 1 on the bit of decimal point in the File No.
5. Z axis move up by manual when adjusting.
6. Z axis move down by manual when adjusting.
7. Y axis move front by manual when adjusting.
8. Y axis move back by manual when adjusting.
9. X axis move left by manual when adjusting.
10. X axis move right by manual when adjusting.
11. Enter or confirm the adjustment operation, when enter the adjustment to the screw hole position, LED on the back of the film began flashing, press manual key then press confirm key to finish the operation. When the current cursor on the screw hole, then change the coordinate value by manual. When the current cursor on the parameter of point, then edit the parameters by manual.
12. Cancel the adjustment operation.

Chapter 3 Shortcut menu description

3.1 Set the follow parameters of screw working

Driver speed : Means after go to a screw hole, turn on the screwdriver and begin to screw, the speed of Z axis followed down with the screw.

Driver length: Means after go to a screw hole, turn on the screwdriver and begin to screw, the length of Z axis followed down with the screw, generally set a slightly longer than the length of the screw.

3.2 Set the delay time parameters

Driver keep : 1. Torque mode: At this point, the power of the torque signal is turned on, and the screwdriver is worked by the follow-up length. If check no torque signal when the length is over, then the working screw delay is start, check the torque signal within the delay time, if no torque signal neither, display warning “screw loose”. 2. Time mode : At this point, the power of the torque signal is turned off, working screw delay is start and the screwdriver is worked by the follow-up length, when the time is over, then turn off the screwdriver signal, keep going until the length finish. When the length finish, waiting for the working screw delay is over, then the screw work finish.

Get delay : Time for delaying after turn on the vacuum valve when going to the feeder to get a screw, to ensure the stability of screw.

Finish delay : Delay when screw finish, mainly to allow the screwdriver own a stable time to put it up, can also set to ‘0’.

Floating time : Set ‘0’ to turn off floating alarm. In torque mode, when checked the torque, if screw time less than floating lock time, then alarm “floating lock”. There will display the screw time in the main page, to set the floating lock time conveniently.

3.3 Set the parameters of screwdriver

Finish signal “ON”,”OFF” : 1.set to ”ON”, then worked in torque mode, refer to “working screw delay”. 2.set to “OFF”,then worked in time mode, refer to “working screw delay”.

Alarm “ON”,”OFF” : 1.set to “ON”, alarm “screw loose”,”floating lock” warning . 2. Set to “OFF”, ignore alarm.

3.4 Set the feeder parameters

Feeder signal “ON”,”OFF” : 1.set to ”ON”, then every time when feeding will check the feeding signal, if

yes, go to feed, and the signal will disappear. If signal is not disappear, means the screw is not taken, then take it again, until get a screw. 2. Set to “OFF”, go directly to the material, not feeding signal detection.

3.5 Set the move speed

Move speed of each axis at work. Reference value:600-1000 (mm/s).

3.6 Set safety height parameter

Safety height : Z axis height above the screw hole when go to or left the screw hole. To prevent the collision between the screwdriver and work piece on the product.

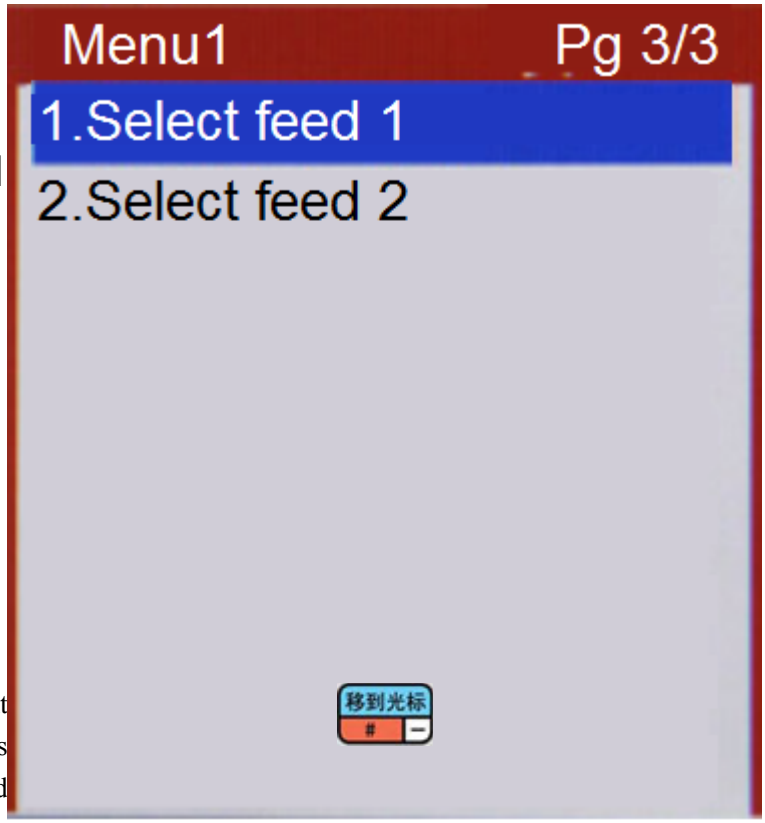
Get height: the safety height when take the screw above the feeder, usually set slightly larger than the nut.

Leave height: the safety height after take a screw in the feeder, usually set slightly larger than the length of screw.

Chapter 4 Menu 1

Menu 1 is programming action and frequently-used file operation, Menu 1 generated by the programming point is usually the type of operation, with a black display. Menu 1 contains:

4.1 Page 1

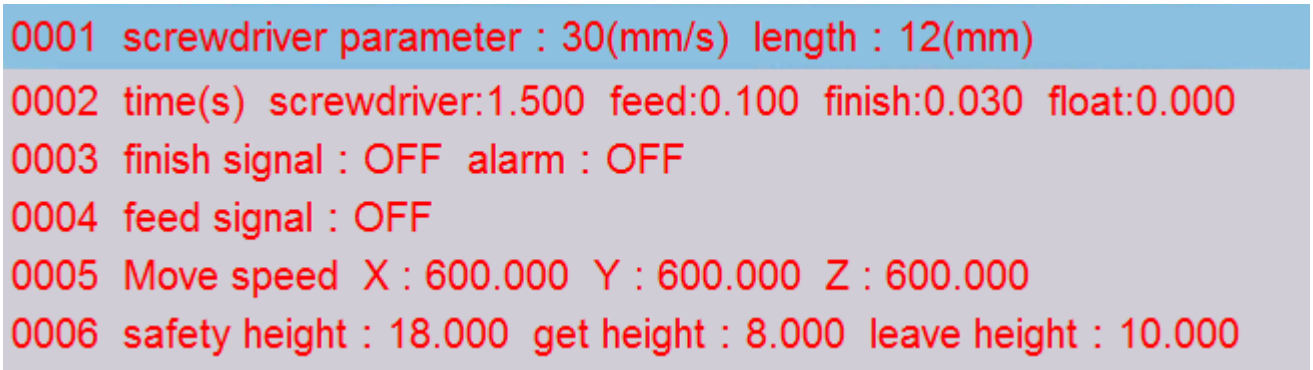


1.File's name edit

Name the current processing file, press to switch IME, and display the IME type on the upper right corner of the screen.

4.2 Page 1 2.Default parameters

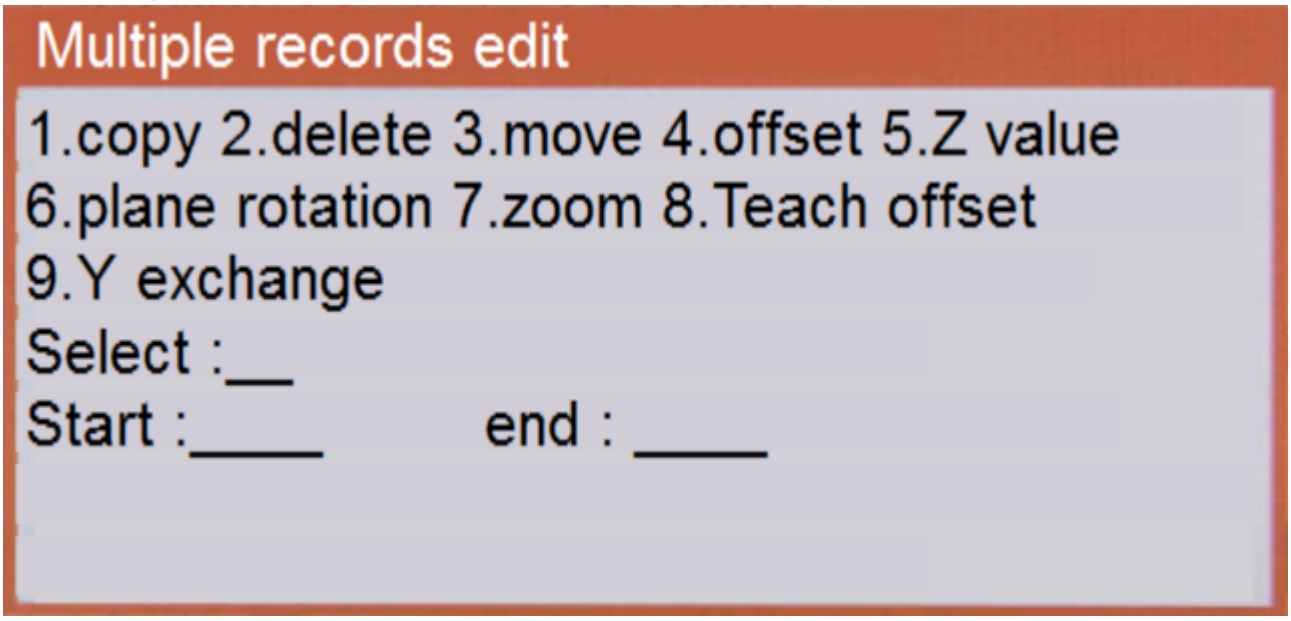
Generate the default parameters before the file: 1.Follow-up parameters: follow-up speed and length; 2.Time parameters: work screw delay, feed screw delay, finish delay, floating lock time; 3.screwdriver parameters: torque check "ON","OFF", alarm "ON","OFF"; 4. Feeder parameters: material check "ON","OFF"; 5.Move speed: move speed of XYZ axis; 6.Safety height : Safety height above the screw hole, Screw feeder safety height, Feeder left safety height. The value of default parameters can be set in Menu 5(stop + menu2).



4.3 Page 1 3.Multiple programming

1. **Copy**, Copy the programming point in the edit range to the specified programming point address.
2. **Delete**, delete the programming point in the edit range.

3. **Move**, move the programming point in the edit range to the specified programming point address. This function mainly used for adjusting the process order of all screws.
4. **Offset**, Offset the coordinate of the programming point in the edit range.
5. **Z value** , set the Z axis value of the programming point to the same in the edit range.
6. **Plane rotation**, Rotating the programming point in the edit range, mainly used for correcting when the clamp tool is rotated without programming again.
7. **Zoom** : Zoom the graphic of programming point in or out in the edit range, mainly used for correcting when DXF file generating processing file due to the accuracy of the machine caused the deviation by the processing size and the actual size.
8. **Teach offset**, Generally used in the CAD map, the CAD on a point and the corresponding point on the work table to teach offset. The coordinates of the hole of the screw hole in the edit range are carried out accordingly.
9. **Y exchange,** Switch the Y axis of the screw hole to another in edit range.



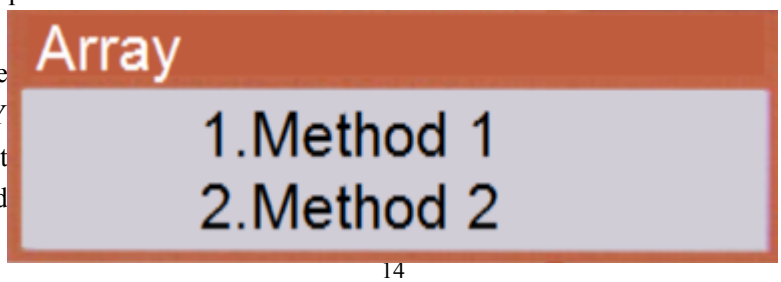
4.4 Page 1 4. Label set

Labels can not only used to called with array, loop, sub, jump, general input programming, etc, but also be used to program comments to improve the readability of the program.

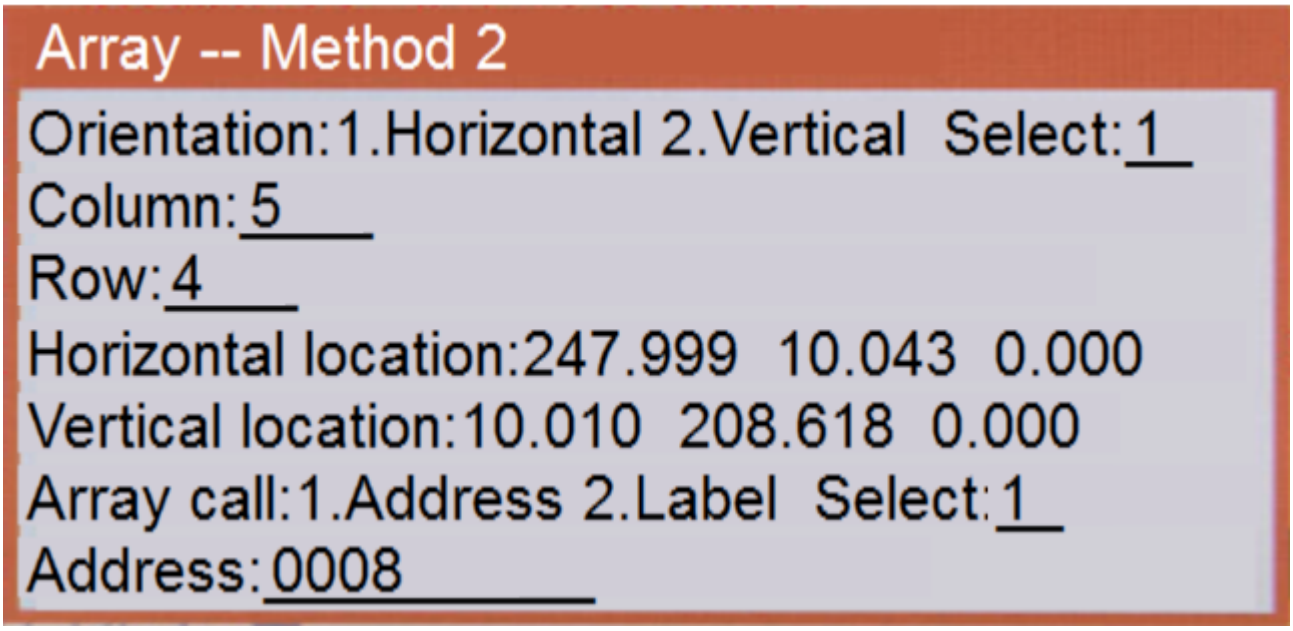
4.5 Page 1 5. Array

If processing fixture plate placed multiple horizontal and vertical arrangement of the work piece, and horizontal and vertical respectively spacing is consistent then can use array, as long as the series good machining of one work piece, and then use the array can achieve full disk work piece machining, so that programming efficiency is greatly improved.

If the fixture plane with the XY plane is consistent with the plane, and



horizontal and vertical with the X, Y axis parallel to the direction then can use the first array , also the second ways. If the fixture plane is not consistent with the XY plane, or horizontal, vertical and X, Y axis direction is not parallel to the direction,then can only use the second array methods.



4.6 Page 1 6. Array expand

Selected the array programming point of the cursor in the main page, performing array deployment can generate programming points with the same effect as the array. It can modify each screw hole when the tool disc is not regular.

4.7 Page 1 7. Call subroutine

If processing fixture plate placed multiple direction, But there is no rule of the work piece. it is only necessary to programming and machining of one work piece then call the subroutine in each part of the first screw position. It can call the address or the label of the subroutine.

4.8 Page 1 8. Call file

The way to call file is the same to call subroutine, as long as change the called subroutine to a file No., and change the processing programming point from the subroutine to the file.

4.9 Page 1 9. Program jump

Program jump to special address or label to run when run to the current programming point, usually used to loop.

4.10 Page 2 1. Limited loop

It is similar to the “program jump”, just the “program jump” is no limit counts when loop.

4.11 Page 2 2.Program end

When in a subroutine execution to the programming, the subroutine returns, when not in a subroutine execution to the programming is processing the end of the program, If there are more than two lines of "no programming point" means the end of the program.

4.12 Page 2 3. Delay

If the program execution to the delay programming point is processed to stop the time delay a certain period of time and then continue to execute the processing point.

4.13 Page 2 4. Pause

If the program execution to the pause programming point, waiting for the run key then continue to execute the processing point. It achieves the “run key to loop”. When programming , add pause after the programming point of Y1, add pause after the programming point of Y2, then add jump instruction.

4.14 Page 2 5. Input program

Programming input signal is when the program execution to the programming of the point, if the values of the input state accord with the specified input signals then program jump to the specified address or label, if not then program continue to execute. Use this function can be achieved with other devices with the work or as a pause key input, etc (Signal definition: if has the input signal then the signal is defined as the amount of 1, no input signal is defined as the amount of the signal 0).

4.15 Page 2 6. Output program

When the program is executed to the output signal programming point, then the output signal will output specified value, 1 as DC24V output, 0 as DC0V output. When debugging , we can testing the corresponding output, such as starting the screwdriver, controlling solenoid valve suction, clamping cylinder, etc.

4.16 Page 2 7. Counter

When the program is executed, the work piece counter increases the corresponding set value and then compares the value of the counting value to overflow limit, if overflow then stoped. This function usually used to count loop work pieces.

4.17 Page 2 8. Go to the Location ‘0’

When execute this command, then the XYZ axis will go back to ‘0’ position as empty move speed, without the action of searching the origin.

4.18 Page 2 9. Home

This current programming point makes the machine back to the origin

4.19 Page 3 1. Select feeder 1

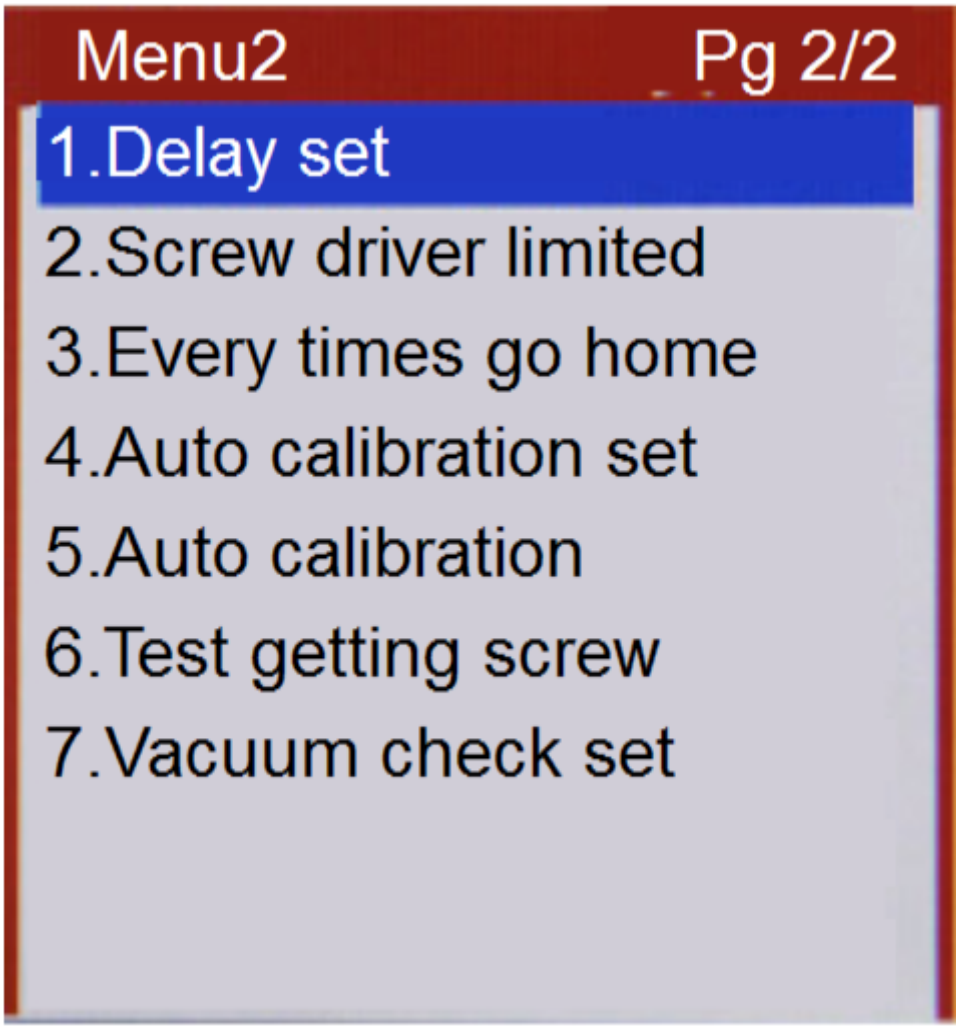
Select feeder 1 when set “set feeder number” as 2 in menu 4.

4.20 Page 3 2.select feeder 2

Select feeder 2 when set “set feeder number” as 2 in menu 4.

Chapter 5 Menu 2

Menu 2 is mainly for the parameter settings of the programming point, Menu 2 generated by the programming point is usually display black. Menu 2 contains:



5.1 Page 1 1.Calibration set

Adjustment point , when there is some processing offset cased by the deviation of screwdriver or fixture, we can use the adjustment point to correct it. There are two ways to set the adjustment point, one is take the first screw hole's coordinate as the adjustment point, the other is set the coordinate by manual, if choose the second one, move the screwdriver to the specified position, then press confirm.

5.2 Page 1 2. Calibration

When into the calibration menu , the screwdriver move to the adjustment point automatically, then move the screwdriver to the specified coordinate to calibrate, pressing confirm to finish this calibration operation. Then all the processing point will compensate the deviation from the offset of screwdriver to ensure machining accuracy unchanged.

This function can also use the special calibration on the keyboard to operate while no teachbox available, as long as the machine in an idle state, we can press "confirm" key into the calibration operation, at the same time the keyboard mask on the LED will flash, then move the screwdriver to the specified coordinate by manual, press "confirm" again to complete the calibration of the operation, then the LED will extinguish and exit.

5.3 Page 1 3.Limited Value of Z

Set this value to limit Z axis down to prevent the screwdriver down to the number of collision work piece or the tool by manual, Each processing file has its own Z axis value.

5.4 Page 1 4. Output when emergency

Set the general output signal when emergency occurrence , ‘1’ means 24V, ‘0’ means 0V.

5.5 Page 1 5. Output initialization

Set the general output signal when turn on the machine, ‘1’ means 24V, ‘0’ means 0V.

5.6 Page 1 6. Counter set

We can set the count value and limit count value in the work piece counter, as running, the count value will add the set number when execute to the programming point, if the count value larger than the count limit value, prompt that count overflow, and stop processing, until set the count again. If not use the work piece count limit, please set the count limit value as 0.

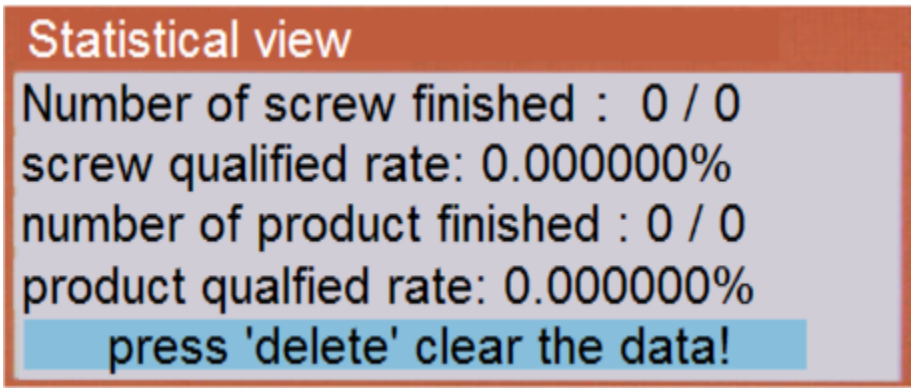
5.7 Page 1 7. Processing result view

View production status, number of completed screws, qualified rate of screw hole, number of completed products, qualified rate of product.

Screw qualified rate = number of screw finished / number of all screws

Product qualified rate = number of product finished / number of all products

5.8



Page 1 8. Get out’s Location

When the product process finished, then get out the position of product.

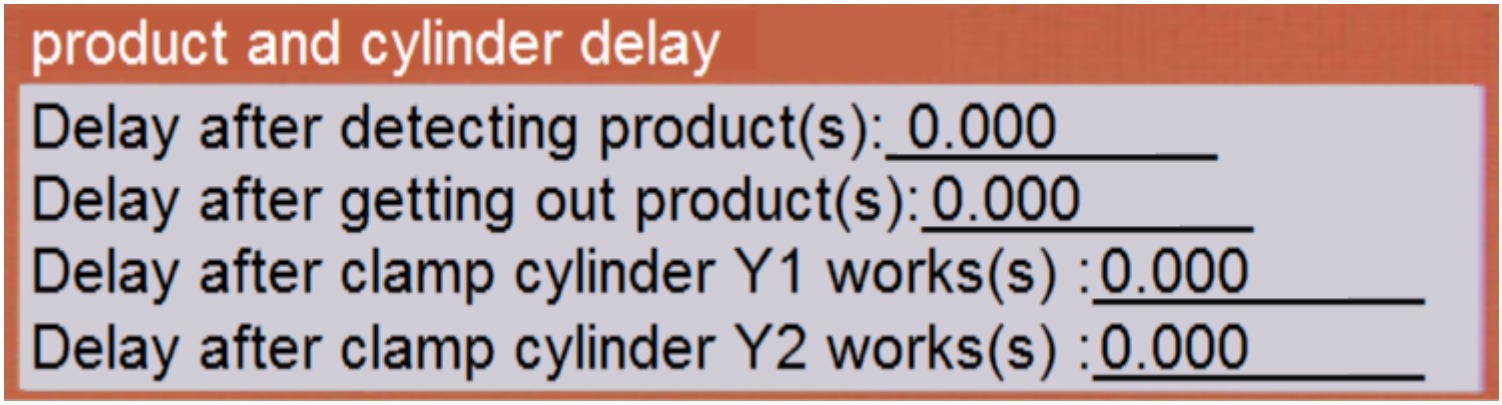
Front of the workbench: set Y axis end as the get product position;

Behind the workbench: set Y axis start as the get product position.

5.9 Page 1 9. Stop set

When press the stop in product processing
keep: next time start , continue to process at the stop position last time;
clear : next time start, process at the first screw hole.

5.10 Page 2 1.Delay set



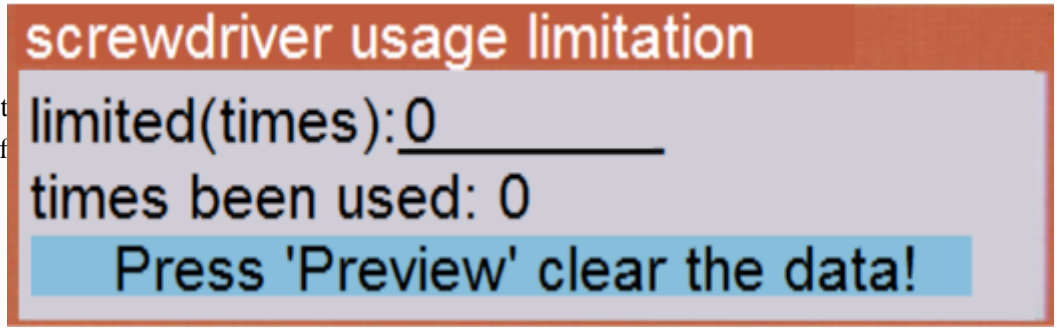
Delay after detecting product(s): after check the product, delay a period of time ,then perform next action

Delay after getting out product(s): perform the next action after the product removed at the location of product and delay a period of time.

Delay after clamp cylinder Y1 works(s) :After driving Y1 axis clamping the work piece cylinder solenoid valve and delay a period of time, then perform the next action.

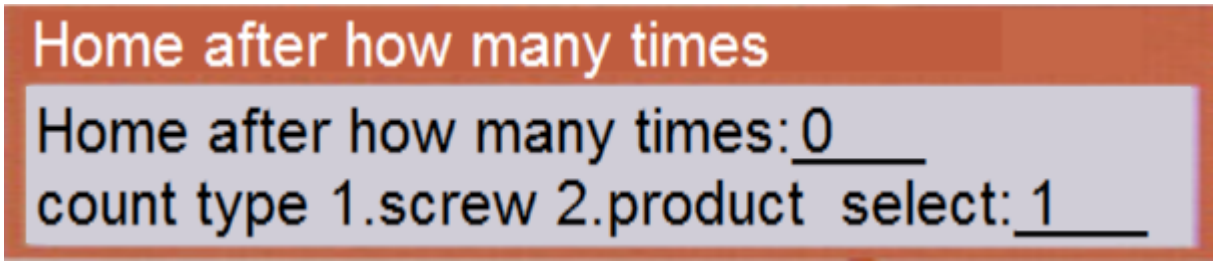
Delay after clamp cylinder Y2 works(s) : After driving Y2 axis clamping the work piece cylinder solenoid valve and delay a period of time, then perform the next action.

5.11 Page 2 2. Screw driver limited



Set the limit count of screwdriver, each finish a screw, the number of screw driver using count will add 1, when the using count reach the number of limit count, then prompt changing the head of screwdriver. If no limit count, set the limit count as 0.

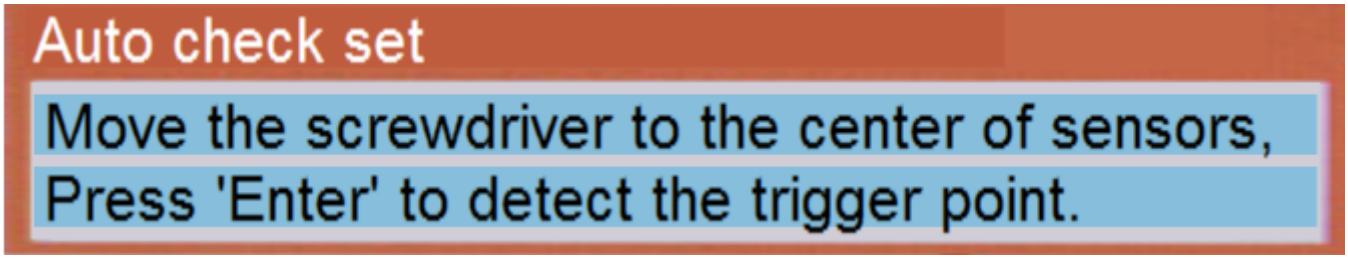
5.12 Page 2 3.Every times go home



Count type ： 1. Screw， if the number of processing reach to the number of screw hole ever been set, go back to the origin, then continue.

2. Product ,if the number of processing reach to the number of product ever been set, go back to the origin, if in the loop mode, then continue.

5.13 Page 2 4. Auto calibration set



Move the screwdriver to the center of automatic check sensor, with a moderate height. After press the “confirm”, the screwdriver will search the XYZ axis sensor trigger point from all directions, then get the coordinate of the screwdriver check point.

5.14 Page 2 5.Auto calibration

Check the adjustment point automatically, move the screwdriver to the last adjustment point, then search the XYZ axis sensor trigger point from all directions, to get the new adjustment point. By comparing the last and the new coordinates of the adjustment point, generating the coordinate offset of XYZ axis. Then all the screw hole’s coordinates move a distance according to the offset to get the new coordinate of programming point.

5.20 Page 2 6. Test getting screw

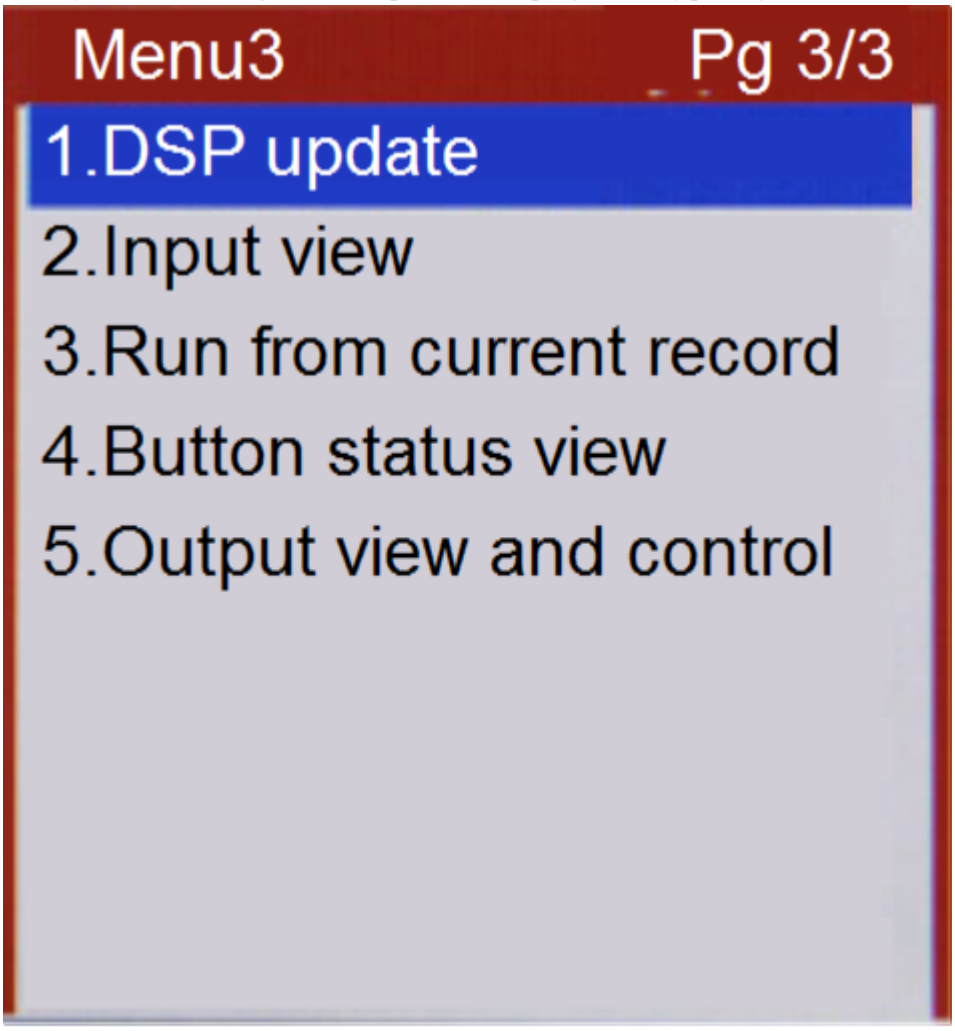
Test getting screw, turn on suction, screwdriver , go to the position of feeder, stop at the top of the feeder, press stop, then turn off the suction and screwdriver.

5.21 Page 2 7. Vacuum check set

Choose whether to open the vacuum detection.

Chapter 6 Menu 3

Menu 3 is mainly machine setting or menu operation, no programming point generated. Menu 3 contains:



6.1 Page 1 1.Move to specified record

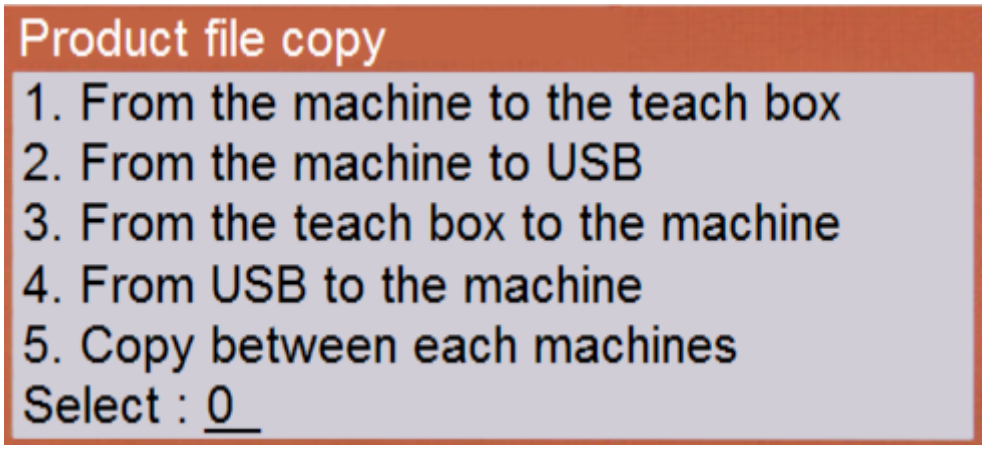
When input the specific coordinate and press “confirm” key after enter the menu, the machine will move to the coordinate just inputted.

6.2 Page 1 2. Product file copy

This function can storage in U Disk or teach box and copy files between each machine, when there are several machines process the same file, we can just program in one screw machine and copy it to others. The teach box copying applies to the field using, and the U Disk copying can not only between screw machines, but also storage in the computer as backup. File copying operation contains:

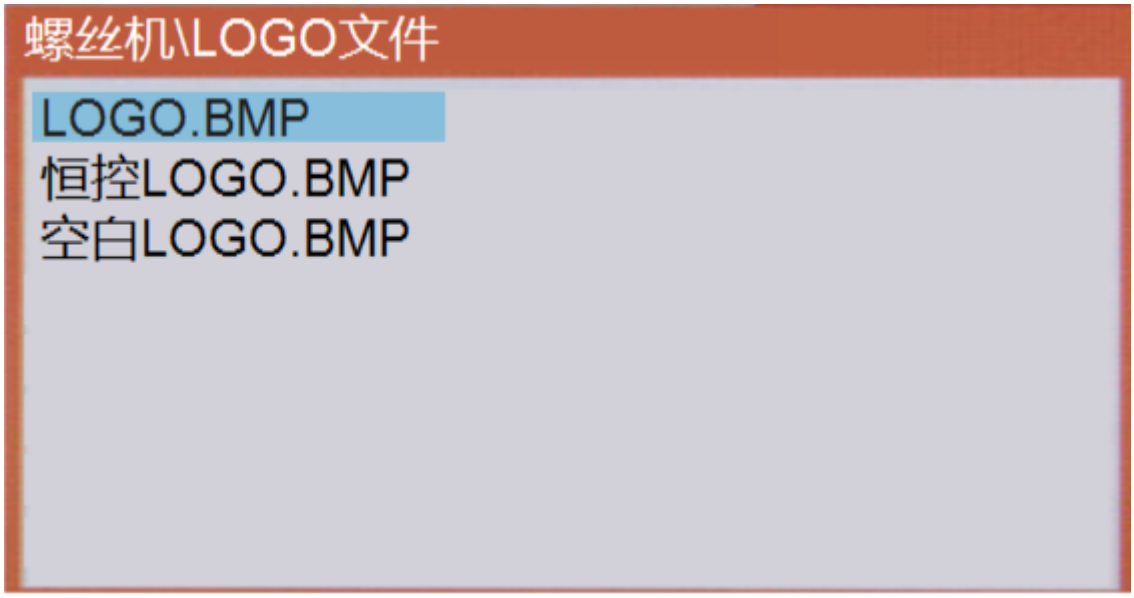
1. Form machine to teach box
   This operation copy the current processing file to the teach box.
2. From machine to U Disk
   This function reserve.
3. From teach box to screw machine
   This operation copy the storage file in the teach box to replace the current processing file in the screw machine.
4. From U Disk to screw machine
   This function reserve.
5. Copy between each machines
   This operation copy files with different file No. to replace, mainly used to processing files backup.

6.3



Page 1 3. DXF file convert

Save the AtuoCAD graphics file as AutoCAD 2010 DXF format file to “螺丝机\DXF 文件” folder, then operating this menu to convert graphics files into processing files.



6.4 Page 1 4.File locked

When the file unlock, icon display in the status bar, meanwhile the parameters of current file and machine all can be modified; when the file lock, icon display in the status bar, meanwhile the current file can't be modified , but not the parameters of the machine.

6.5 Page 1 5. Machine locked

When in unlock states, the parameters of machine can be modified, whether the file is locked is up to the file lock/unlock setting; when in lock states, icon display in the status bar, meanwhile all the parameters of file and machine are locked.

6.6 Page 1 6. Menu 4 locked

When in unlock states, the content of menu 4 can be view or modify; but when in lock states, the function of menu 4 is forbidden.

6.7 Page 1 7. File password set

This menu is used to set the password for the "Page 1 4.lock/unlock for current file"

6.8 Page 1 8. Machine password set

This menu is used to set the password for the "Page 1 5. Advanced lock/unlock machine"

6.9 Page 1 9. Menu 4 password set

This menu is used to set the password for the “Page 1 6. Menu 4 lock/unlock machine”

6.10 Page 2 1. Input name edit

The default name of programmable universal input port is “通用输入 01”--”通用输入 12”, to improve the readability of the program, each programmable universal input port can be named according to the function of the application, so that the programming is more convenient.

6.11 Page 2 2. Output name edit

The default name of programmable universal output port is “通用输出 01”--”通用输出 12”, to improve the readability of the program, each programmable universal output port can be named according to the function of the application, so that the programming is more convenient.

6.12 Page 2 3. Buzzer of key

This menu can set whether the key voice of teach box is on or off.

6.13 Page 2 4. Small key locked

Small keyboard means special keyboard for the check adjustment point, this menu usually used to prevent misuse with locking this keyboard and taking the teach box away.

6.14 Page 2 5. File view and edit

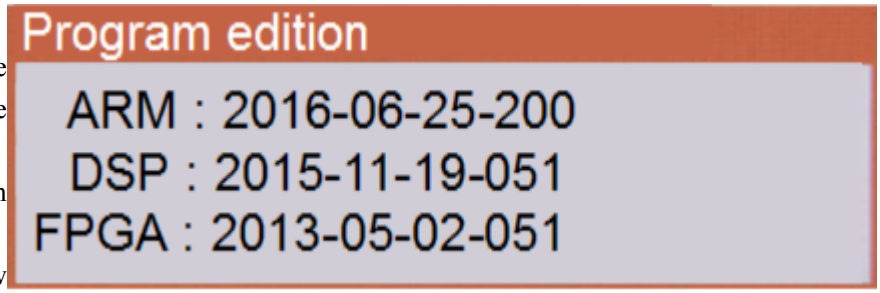
Because the processing file is so many (1000 files), it’s terrible to open and search file one by one, so we can use this function for tabbed browsing, find the number of file we wanted then open it, also can press “delete” key to delete the selected file.

6.15 Page 2 6. Machine’s information

Display the device information, such as machine number ,etc.

6.16 Page 2 7. Program edition

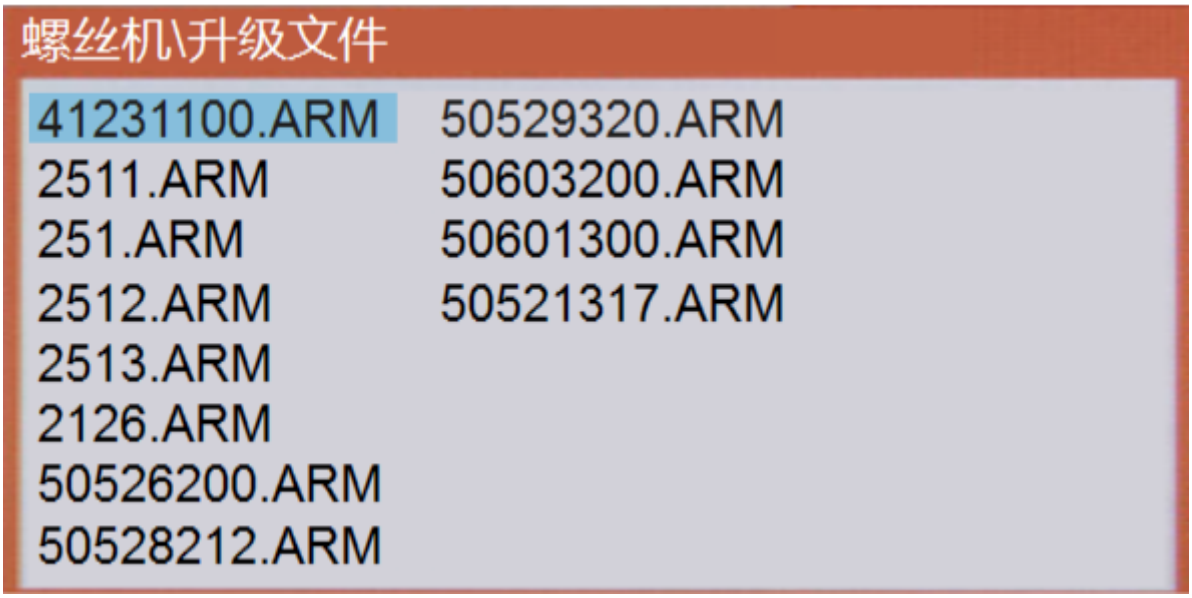
Display the program version information.



The picture shows the application program, version Year-month-day. Before the new version update, we will use it frequently to ensure the version of program of current device.

6.17 Page 2 8.Program update

As long as put the application program file into U Disk of FAT32 format with folder called “螺丝机/升级文件’， enter the menu and update the program after insert the U Disk. If the U Disk can identify correct, icon will display at the right in status bar.



6.18 Page 2 9. FPGA update

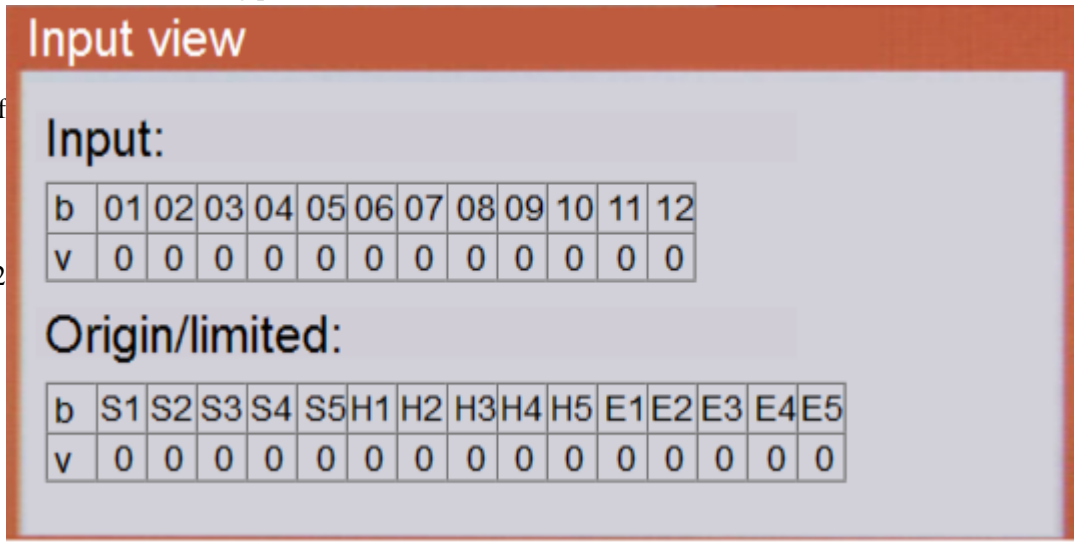
As long as put the driver program file into U Disk of FAT32 format with folder called “螺丝机/升级文件’， enter the menu and update the program after insert the U Disk. If the U Disk can identify correct, icon will display at the right in status bar.

6.19 Page 3 1. DSP update

As long as put the DSP program file into U Disk of FAT32 format with folder called "螺丝机/升级文件", enter the menu and update the program after insert the U Disk. If the U Disk can identify correct, icon will display at the right in status bar.

6.20 Page 3 2. Input view

As shown in the following picture:



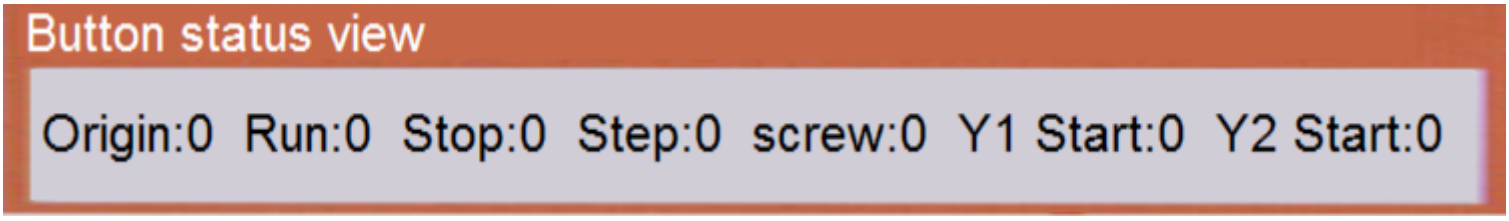
0-12 of "general input" is 12 input states for programmable input port, when check input signal for '1', no input signal for '0'

"origin limit" is input state of origin signal and limit signal, S1-S5 for 1-5 axis negative direction limit signal, H1-H5 for 1-5 axis origin signal, E1-E5 for positive limit signal, when check input signal for '1', no input signal for '0'

6.21 Page 3 3. Run from current record

This function usually used to work the leftover screw at the specified screw hole when there are some little errors in the process midway.

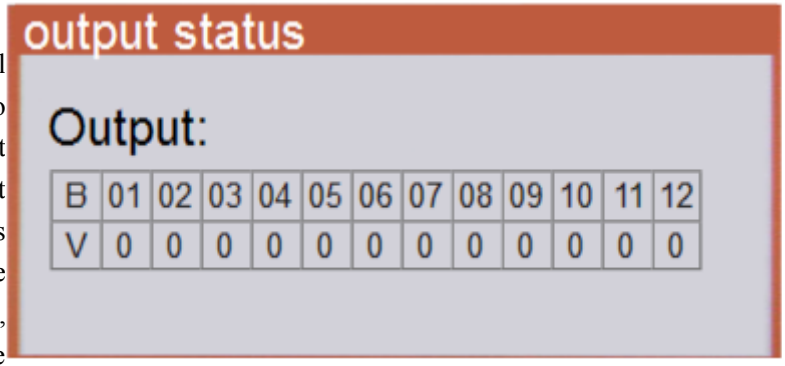
6.22 Page 3 4. Button status view



View the input state of function key, when no key means states is 0, when check key down means states is 1.

6.23 Page 3 5. Output view and control

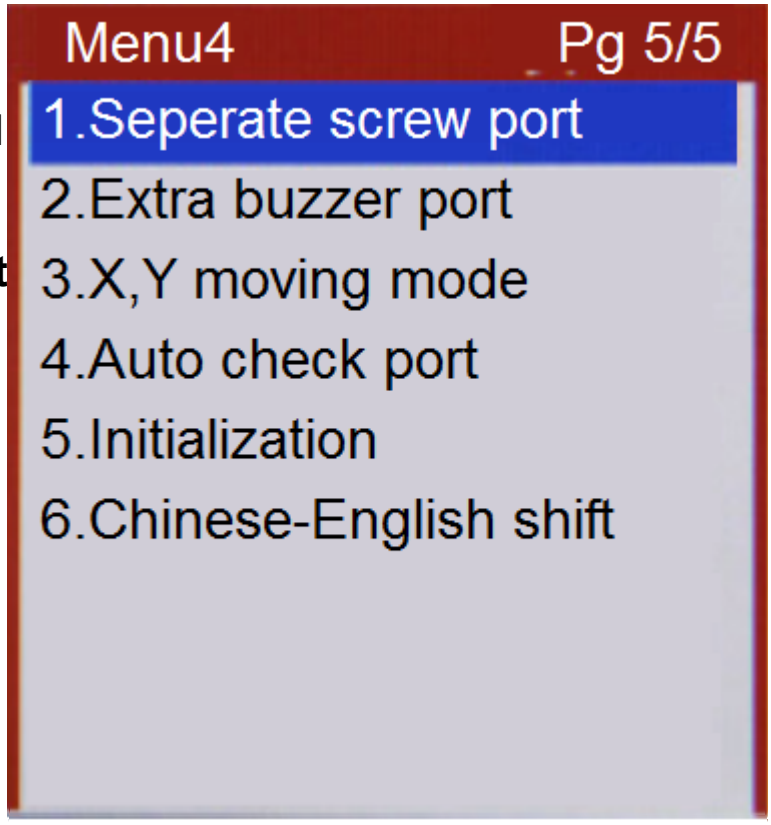
View general output state, also control the output state of general output port. Set 1 means open the corresponding port, set 0 means close the corresponding port.



Chapter 7 Menu 4

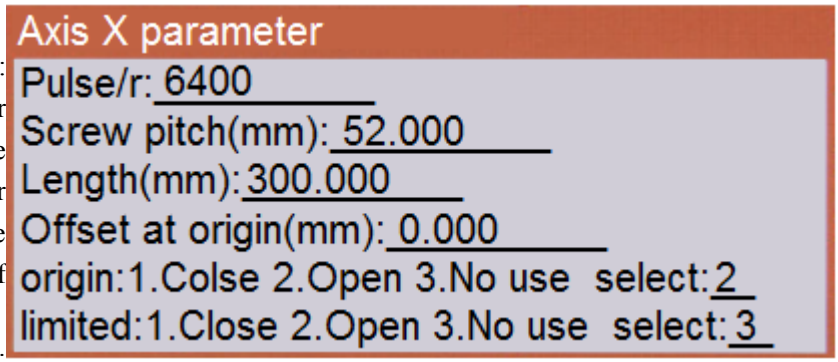
Press “Stop” + “Menu1” into Menu 4, Menu 4 is the menu for manufactor to set parameters of machine, not recommend opening for users. Menu 4 contains:

7.1 Page 1



1-3. Set parameters of XYZ axis

The motor shaft parameter setting options are shown below:



Pulse/r : means the number of pulses for the driver motor per revolution, or the fine fraction of driver motor.

Screw pitch : means the run distance for the driver motor per revolution, or the circumference of the belt pulley or the pitch of lead screw.

Offset at origin : Home offset can be 0 or others, as well as offset the error value as coordinate 0 after capture the home position.

Origin : close if capture sensor output low voltage when motor shaft don't trigger the origin, and the opposite is open.

limited : if select shielding, then the current axis has no use of function for back to the origin or limit.

7.2 Page 1 4. Password set

Before set the use limit time, set the password first.

7.3 Page 1 5. Data/time set

Set the date or time of the system.

7.4 Page 1 6. Limited used time

Prompt input 16 bit password. The format of password reference appendix 1. But set the password first before use this function.

7.5 Page 1 7. Machine's name edit

The name of device edited will display at "menu 3, page 2, 4.device information"

7.6 Page 1 8. Company's name edit

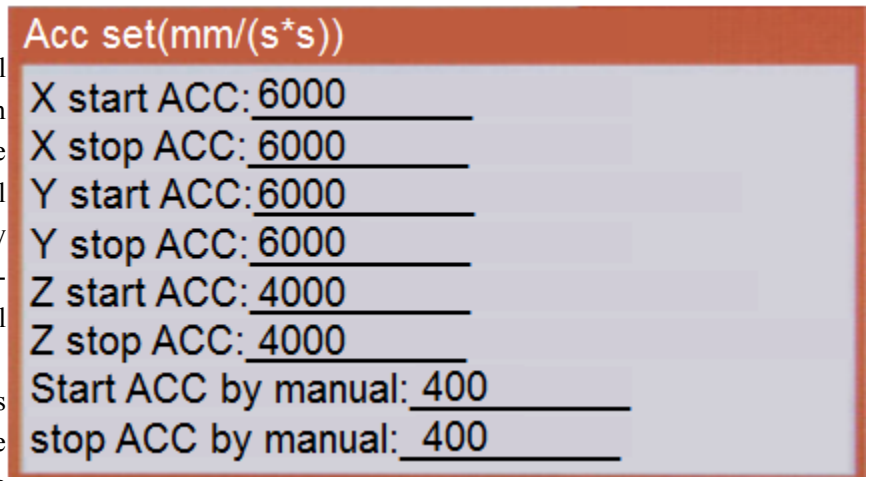
The name of company edited will display at "menu 3, page 2, 4.device information"

7.7 Page 1 9. Start/Stop speed

The motor has a process of acceleration and deceleration in motor control applications when running, to improve work efficiency, start/stop speed can set neither 0 nor too large, the greater the load, the smaller the start/stop speed, or it will cause the loss of step or mechanical noise, general recommendations in 20 mm/s.

7.8 Page 2 1. Acceleration set

Various acceleration contains:



The manual move speed can set a little smaller in actual use, generally between 100-500, manual moving acceleration is set a little smaller to have

an obvious start acceleration process in manual operation, it is easy to move a short distance when it is moving at a high speed, satisfied the speed and short distance requirements.

The control card support asymmetric acceleration and deceleration, start acceleration and stop acceleration can be set to different values, the actual application of the general will be set larger to stop the acceleration than the start acceleration. The acceleration of the size of the setting must be according to the motor drive capacity, load size, mechanical properties, etc, taking not lose step, shaking not big as the standard.

7.9 Page 2 2.Maximum speed set

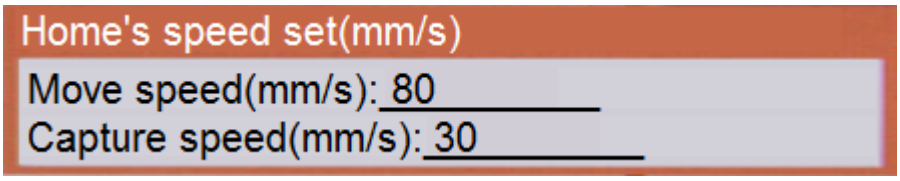
Setting the maximum value allowed by each axis speed in user programming, this will prevent the user from setting a speed that is greater than the speed of the machine design requirements, so that prevent the lose of step.

7.10 Page 2 3.Home's speed set

Origin capture is record the position of motor shaft when it trigger the origin signal, in order to be in the same position every time, it must be triggered in the same direction every time, so we must move to the correct direction first then perform origin capture when the position of motor shaft is not at the direction of origin capture direction.

"move speed" is the speed that the motor shaft move from error direction to the direction of origin capture, this speed can be upper, generally set range as 50-150mm/s, "capture speed" is the speed that motor shaft move to trigger the origin signal, to improve the accuracy, this speed should not be too high, generally set range as 20-60mm/s.

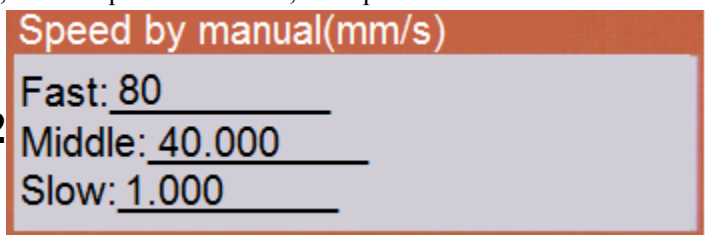
7.11



Page 2 4. Speed by manual

Manual movement speed is high, medium and low speed of three, press "speed" can cycle switch. Generally set high speed as 80mm/s, middle speed as 40mm/s, low speed as 1mm/s.

7.12 Page 2



5. Pinyin

method update

Pinyin IME use the GB2312 library, almost 7000 commonly used Chinese characters, usually the factor has

been updated the Pinyin IME, so it's no need to perform this action.

7.13 Page 2 6. Boot screen update

Make the required boot logo to a 480X272 pixels,24 bit color bitmap file with PhotoShop, then save it to the folder called "螺丝机/LOGO" of the U Disk, insert the U Disk and perform the update operation. (Note: The U Disk must be formatted as FAT32)

7.14 Page 2 7. Program select mode

We can use two ways to select the processing file, dial switch and digital tube, if using the dial switch , we can have 1 bit, 2 bit, 3 bit, and the high bit will default as 0 if not use. As well as there is no conflict between the opened file number and the value of the dial, the function which opening file of the teach box will be shield.

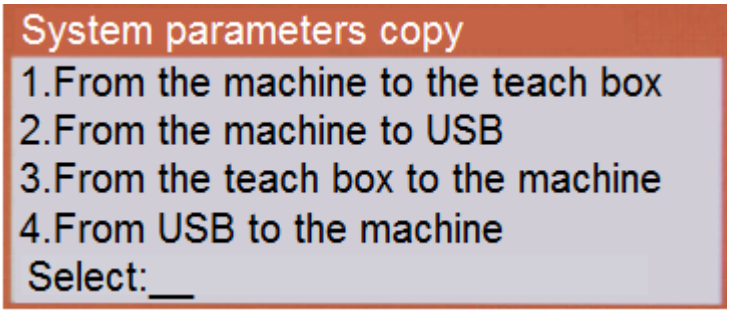
7.15 Page 2 8. System parameters copy

The function of this menu is copying the system parameters from one machine to teach box or U Disk and then copy it from teach box or U Disk to other same size machines, no need to set them one by one.

If save to the U Disk, must create the folder called "螺丝机-配置文件" first, and the suffix of this file must be "CFG". (Note : U Disk must be formatted as FAT32)

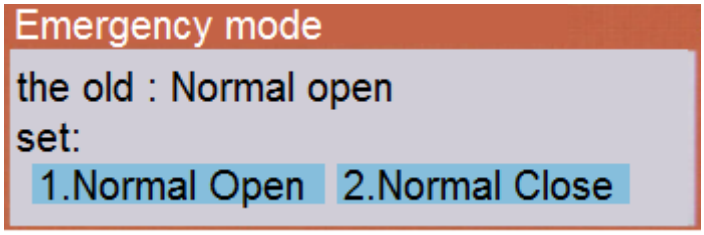
The contents of the copy include the machine parameters and the default values of the factory settings.

7.16 Page 2 9.



Emergency mode

When prompt "emergency" press "cancel" to enter the menu of set emergency mode, so we can modify it quickly if the emergency stop switch damaged or need to modify the emergency mode.



7.17 Page 3 1. Home way when boot

1. Prompt home when boot : prompt to go back to the origin when the machine power on, press “home” to perform this action.
2. Home when boot : go directly to the origin when the machine power on.
3. No prompt and no home when boot : must press “home” to perform this action after the machine power on.

7.18 Page 3 2.

```
Home way boot
1.Prompt home when boot
2.Home when boot
3.No prompt and no home when boot
Select:3
```

Input/output set 1

Screwdriver finish signal (input) : A port of screwdriver stalling, corresponding to the actual wiring

Type 1. ON 2 OFF : the type of stall signal.

Detect type 1. Capture 2. Scanning : the style of main board checking stall signal, capture, means to catch a rising edge or falling edge. Scanning, means to check a signal ON or OFF. Setting according to the type of stall output signal. If the stall signal is an instantaneous signal, then set to capture, if it is to maintain the signal, then set to scan. Some of the screwdriver will have a very short interfering signal, the use of scanning mode can filter out the interference signal.

Feeder 1 signal(input) : feeder, the port of response the signal of screw, corresponding to the actual wiring.

type 1. ON 2.OFF : the type of material feeding signal.

Screwdriver output(output) : set the screwdriver control port, corresponding to the actual wiring.

Suction output(output) : set the port of suction solenoid, corresponding to the actual wiring.

Suction delay (s) : Starting from the screw working to start the time, after the setting time, the suction closed. If the setting time is larger than the screw process time, then screw finished and the suction is closed. If set as 0, then close the suction after screw finished.

```
Screwdriver Port 1
screwdriver finish signal(input):0
type  1.normal open  2.normal close  select:1
detect type  1.capture 2.scan  select:1
Feeder 1 signal(input):0
type  1.normal open  2.normal close  select 1
screwdriver output(output):0
suction output(output):0
suction delay(s):0.000
```

7.19 Page 3 3. Input/output set 2

Up/Down cylinder signal (output) : the port of down cylinder, when the cylinder is at the top of Z axis, corresponding to the actual wiring. If there is no cylinder , set as 0.

Vacuum check (input) : set the port of screwdriver vacuum check, corresponding to the actual wiring. If not use ,set as 0. When turn on the vacuum check, the screwdriver will check vacuum signal at the top of screw hole, if it is not normal, it will produce a vacuum alarm.

type 1.ON 2. OFF : the type of vacuum signal.

Clear(Output): Set the port of clear, corresponding to the actual wiring. If not use ,set as 0.

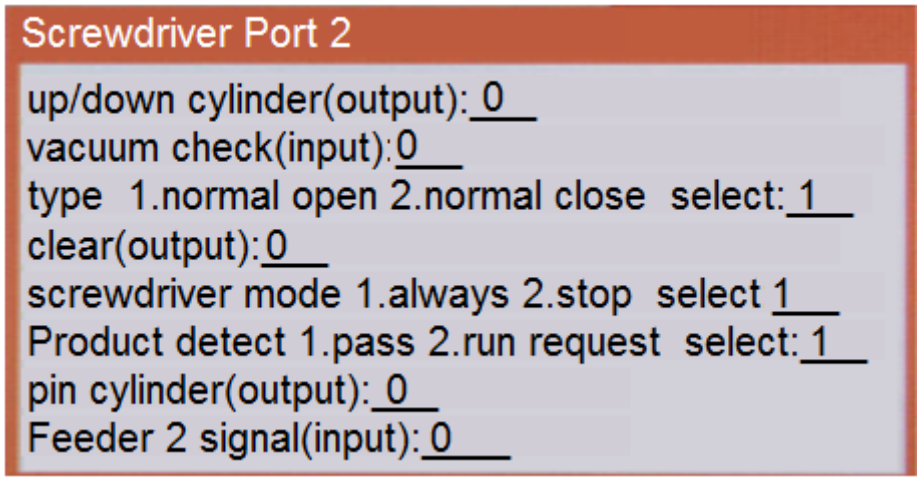
Screwdriver mode 1.always 2.stop: set as 1, then the screwdriver will turn on always, if set as 2 ,then the screwdriver only turn in at getting screw and working screw, but not moving the screwdriver.

Product detect 1. Pass 2.run request : set as 1, then the machine will work if check the product put OK signal, if set as 2, then after check the product put OK signal, press Run button to start.

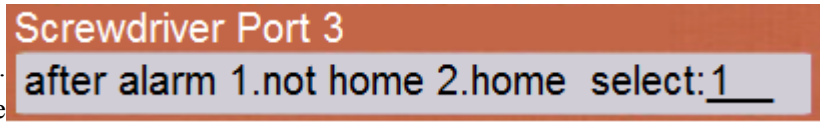
Pin cylinder(Output): Set the port of pin cylinder, corresponding to the actual wiring. If not use ,set as 0.

Feeder 2 signal (input) : only when the number of feeder is 2, this menu will be showed. Feeder 2, the port of response the signal of screw, corresponding to the actual wiring.

7.20

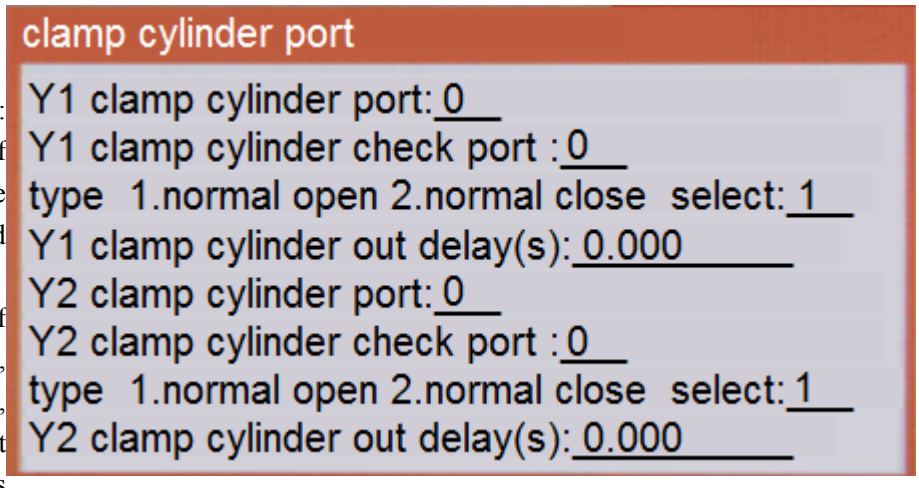


Page 3 4. Input/output set 3



After alarm 1. Don't go to home 2. Go to home : set as 1, then if check the warning of screw lock or loose, don't go to home , if set as 2, then go to home after check the warning.

7.21 Page 3 5.Clamp cylinder port



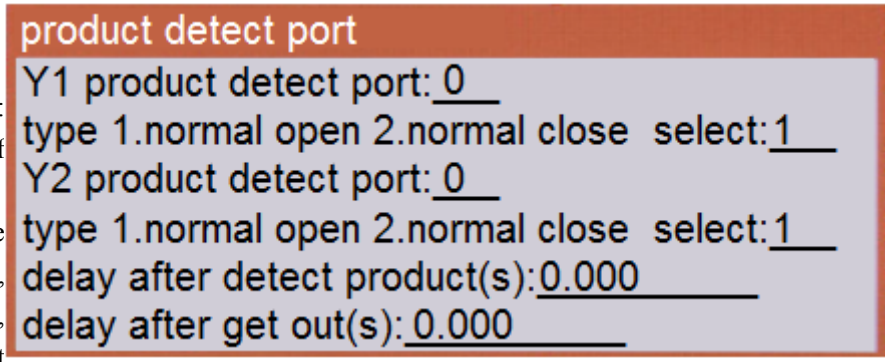
Clamp cylinder port : output port of solenoid valve for driving and clamping cylinder of work piece, when set as 0 , then the port function is shield.

Clamp cylinder check port: input port of checking the clamping cylinder, when set as 0 , then the port function is shield. When the cylinder is clamped by the input signal, if not checked the input signal after clamp the cylinder, it will release the cylinder and clamp again, until check the input signal.

Signal type : Signal type of clamping cylinder in sensor

Clamp cylinder out delay : Drive clamping work piece cylinder solenoid valve after a period of time delay and then perform the next action, can also be set as ‘0’.

7.22 Page 3 6. Product check port



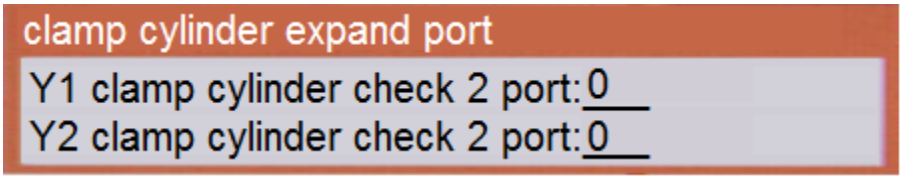
Product detect port : input port of checking whether the product is OK, when set as 0 , then the port function is shield.

Signal type : signal type of checking the work piece.

Delay after detect product: checked the product after a period of time delay and then perform the next action, can also be set as ‘0’.

Delay after get out : processing finish and get out the product when check the signal after a period of time delay and then perform the next action, can also be set as ‘0’.

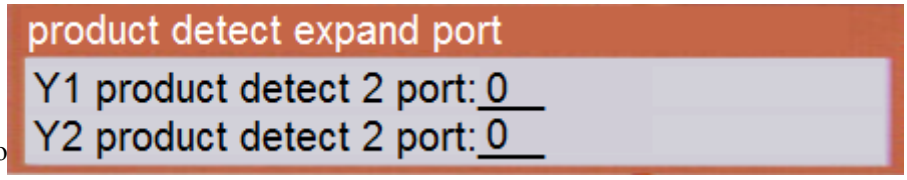
7.23 Page 3 7. Clamp cylinder expand



Some

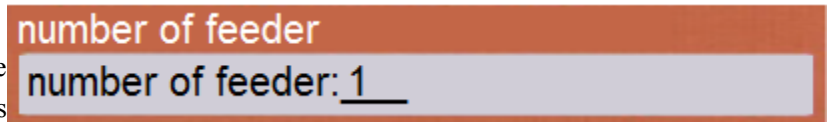
occasions, there are two products in one workbench, and they all have the controlling of clamping cylinder with input signal check. Only the two cylinder clamp the product at the same time, then the product clamped OK and perform the next step. The two sensors are respectively corresponding to the clamping input port and the clamping input expansion port.

7.24 Page 3 8.Product check expand



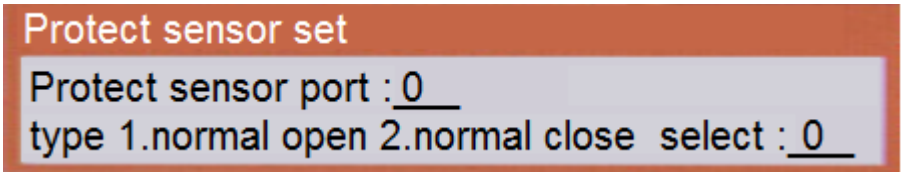
Some occasions, there are two products in one workbench, and they all have the sensor check. Only the two sensors capture the product at the same time, then the product put OK and perform the next step. The two sensors are respectively corresponding to the work piece checking port and the work piece checking expansion port.

7.25 Page 3 9. Feeder number



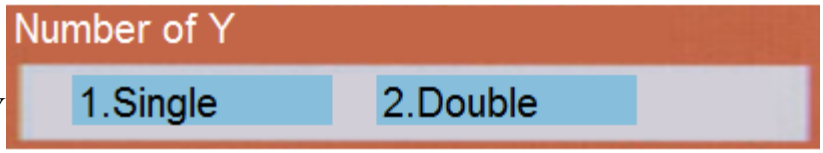
We can set the number of feeder as one or two, when set as two ,we can feed screw at the special feeder in the program point. This operation can not only meet the two kinds of the same size of the different length of the screw processing, but also be processed in the short path.

7.26 Page 4 1. Protect sensor set



This function protects objects and people in the process of screw working. If the grating protect has induction, then it will stop running and alarming in the running or back to the origin state. In standby mode, there are grating protection, will prompt the grating sensor, but will not generate the alarm, at this time, the machine can not be returned to the origin and operation until the grating sensor disappears.

7.27 Page 4 2. Number of Y axis



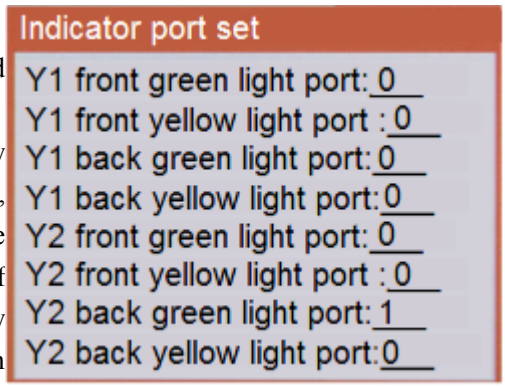
Set single/double Y

axis, single Y as 1, double Y as 2.

7.28 Page 4 3. Indicator port

Port setting of the before and after led.

Wait for feeding, front yellow led flashes. After the material OK, front green light. After the completion of the processing, if there is NG hole, then back yellow light, if the product is OK, then the green light both front and back.

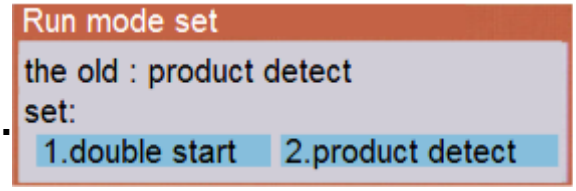


7.29 Page 4 4. Run mode when double Y

Double start: press the total running key, put the product OK, press Y1 to start and Y1clamping cylinder begin to work, when clamping finished , waiting for processing after the screwdriver is free. Press Y2 to start, and Y2 clamping cylinder begin to work, when clamping finished , waiting for processing after the screwdriver is free.

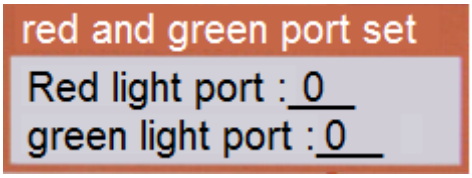
Product detect: press the total running key, put the product OK, Y1 work piece checking OK and Y1clamping cylinder begin to work, when clamping finished , waiting for processing after the screwdriver is free. Y2 work piece checking OK and Y2 clamping cylinder begin to work, when clamping finished , waiting for processing after the screwdriver is free.

7.30 Page 4 5.

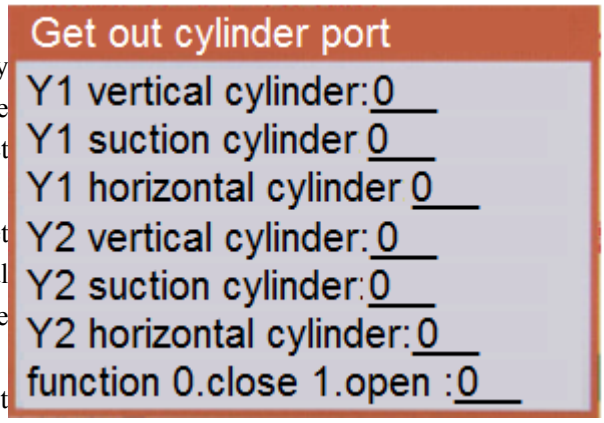


Red and green lights

Set port of machine indicator led, when the machine works, the green light is bright, when the machine is screwing with alarm, the red light flashes, the green light goes out, and when the operation is run again, the green light is bright, and the red light is turned off. When stop, the lights all go out.



7.31 Page 4 6. Get out cylinder port



This function is mainly used for getting out the finished product automatically.

Y1 vertical cylinder : set the port of Y1 vertical cylinder, corresponding to the actual wiring.

Y1 suction cylinder : set the port of Y1 suction cylinder, corresponding to the actual wiring.

Y1 horizontal cylinder : set the port of Y1 horizontal cylinder, corresponding to the actual wiring.

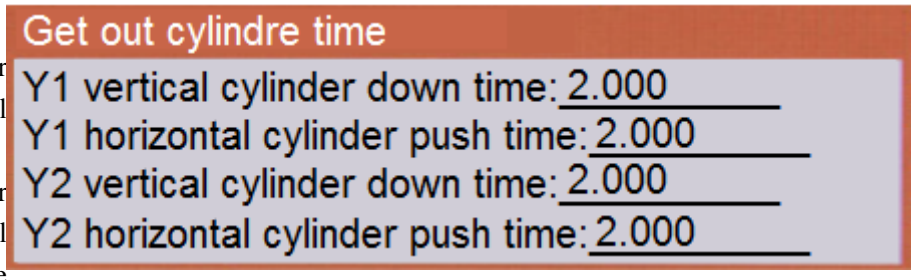
Y2 vertical cylinder : set the port of Y2 vertical cylinder, corresponding to the actual wiring.

Y2 suction cylinder : set the port of Y2 suction cylinder, corresponding to the actual wiring.

Y2 horizontal cylinder : set the port of Y2 horizontal cylinder, corresponding to the actual wiring.

When the product processing finished , Y axis go to the position, vertical cylinder down, suction cylinder open, vertical cylinder up, horizontal cylinder push, suction cylinder release, product fall into the product line, horizontal cylinder retract.

7.32 Page 4 7. Get out cylinder time



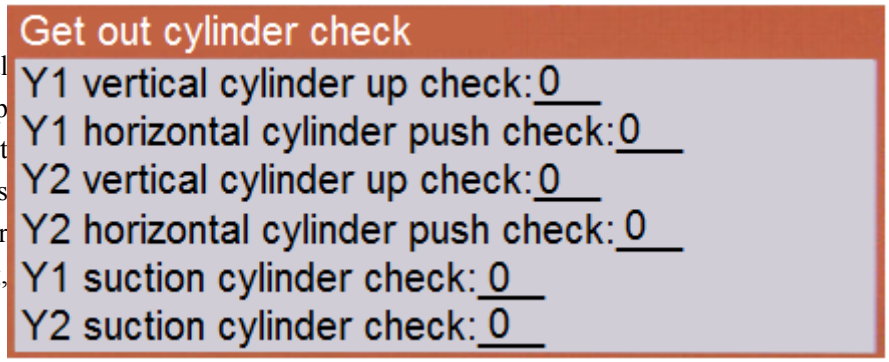
Time for Y1 vertical cylinder down: time for Y1 vertical solenoid valve output.

Time for Y1 horizontal cylinder push: time for Y1 horizontal solenoid valve output.

Time for Y2 vertical cylinder down: time for Y2 vertical solenoid valve output.

Time for Y2 horizontal cylinder push: time for Y2 horizontal solenoid valve output.

7.33 Page 4 8. Get out cylinder check



Y1 vertical cylinder up check : set port for Y1 axis vertical cylinder up checking,

Corresponding to the actual wiring.

Y1 horizontal cylinder push check : set port for Y1 axis horizontal cylinder push checking, Corresponding to the actual wiring.

Y2 vertical cylinder up check : set port for Y2 axis vertical cylinder up checking, Corresponding to the actual wiring.

Y2 horizontal cylinder push check : set port for Y2 axis horizontal cylinder push checking, Corresponding to the actual wiring.

Y1 suction cylinder check : set port for Y1 axis suction cylinder checking, Corresponding to the actual wiring.

Y2 suction cylinder check : set port for Y2 axis suction cylinder checking, Corresponding to the actual wiring.

7.34 Page 4 9. Servo or step

X axis 0.step 1.servo : set X axis as step or servo.

Y1 axis 0.step 1.servo : set Y1 axis as step or servo.

Z axis 0.step 1.servo : set Z axis as step or servo.

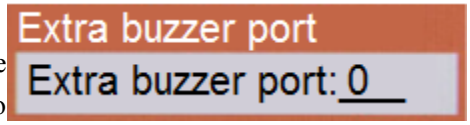
Y2 axis 0.step 1.servo : set Y2 axis as step or servo.

Servo 0.close 1.open : the total switch, when select 1, the above four settings are valid, otherwise closed, the above four is no effect. When select servo, it will check servo alarm, when back to the origin, it will output the clean signal of servo alarm. Connection reference the definition of motor shaft connection .

7.35 Page 5 1. Separate screw port

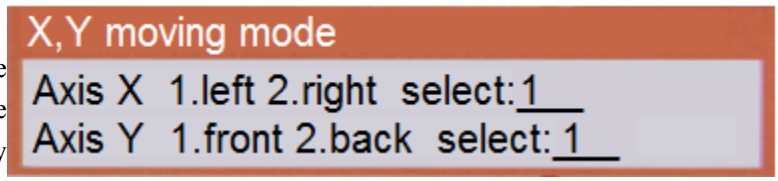
When the cylinder is separated from the screw, please set the port according to the connection. There are few customs using this feeding mode.

7.36 Page 5 2. Extra buzzer port



There is one buzz on the main board, but if the sound is too small , we can add a buzz outside, connecting to the output port for extra buzz.

7.37 Page 5 3. X,Y moving mode



If X,Y move directions are opposite of the key when move the workbench by manual, we can set these parameters below:

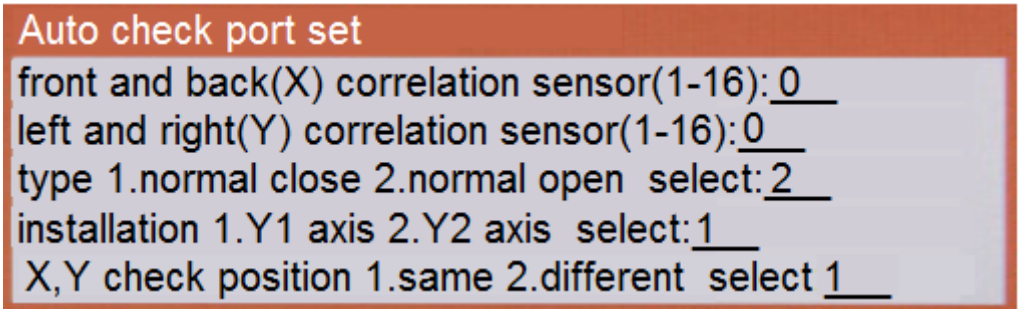
Left, front: coordinate reduce ,

coordinate increase。 coordinate reduce， coordinate increase.

Right, back： coordinate reduce， coordinate increase。 coordinate reduce， coordinate increase。

7.38 Page 5 4. Auto check port set

Set needle sensor



automatically: Can not only in a position at the same time to search for X,Y detection. But also X,Y were detected at different locations.

7.39 Page 5 5. Initialization

Initialize the parameters of system, all the parameters will revert to initialization settings after initialized. Before this operation, please remember all port settings, parameters of screwdriver, some import parameters, etc. After initialization, set them one by one.

7.40 Page 5 6. Chinese-English shift

This function mainly to switch the display between Chinese and English.

Appendix 1

Method for setting the use time limit

Use the time limit setting method is no longer a password, but the way to use the authorization. We can achieve any change in the use of the period, the use of the time limit is the way to use the date, not the number of days.

To set or modify the restriction of the use of date, as long as input the 16 bit number, which in front of the 8-bit said year, month, day (YYYYMMDD). Low 8 bit is to verify the legitimacy of eight former date character verification code, encryption using XOR mode. The following is the use of the method:

1. Set or modify the password in Menu 4-1-5.

   This 8-bit password used for achieving the XOR algorithm or modifying system time after setting the use limit. (Because the use of the time limit is based on the system time to judge, so set the use of restrictions on the clock can not be arbitrarily modified, Once you have set the use of restrictions, the machine will be locked if customer destroy the clock power or chip)

2. Set use time limit in Menu 4-1-7.

   Enter the 16bit setting characters , the former 8 are the use of the period of years, months, days. Latter 8 are used for verification code.

   The generation of verification code is as follows:

Such as the password of the machine is 12345678, to authorize the machine to use in August 11, 2013, then the verification code of manufacture if 20130811 XOR 1234578 equals 26167989, then get the legal authorization code 2013081126167989, This license code allows the machine to be used to the machine clock in August 11, 2013. We can continue to authorize delay when expired. If you want to unlock the permanent use of a time, then use a legal authorization code with “3” at the first character of time to unlock.

Note:

Use method of XOR:

1. Use computer to open the calculator.
2. Select view/science mode.

3. 2013081112345678 then got the result Xor 26167989.