ADT-ZM210/310

Two/three axes brush making machine control system

User's Manual

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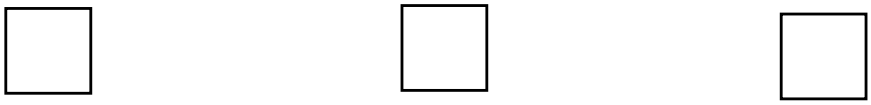
Adtech (Shenzhen) CNC Technology Co., LTD

Version Upgrading Instruction

Program NO.	Version NO.	Modification Date	Instruction
XT20080907 XT20080908	1.0	2008/10/30	The First Version

Note: Meanings of the three numbers in version number are as follows



Bank Main Version Number/ Bank Secondary Version Number/ Reservation

Remark:

1. This user manual is strictly emended and checked by ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD, however, it is not guaranteed that the user manual has no any mistake or error.

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Contents

Chapter I Introduction

I. Brief introduction

This control system is dedicated to 2/3-axis hair-planting or drilling machine, and it is applicable for drilling holes and planting hairs on the moulds of irregular shape. It is capable of machining minimum 500 holes per minute, and storing about 2000 programs. For each program at least 100 thousand data of holes can be input, so that users can easily invoke machining program for any models by serial number. Obtaining coordinate data of points by adjustable mode, it is convenient for users to obtain the machining data of complex work piece, so it is quite easy for common worker to learn. Users can also edit data in table format, and do edition, inserting, or deletion action on datasheet. In addition, it owns the hole-dividing, copy, and transition functions. Users can easily reach the selected hole any carry out the modification by entering the S/N of hole. Machining speed, adjusting speed, back-to-origin speed and single step distance for each axis can be set freely, and hole patching and hole skipping are available. Auto, automatic-manual, and trial modes are provided so that users can stop/start/reset at any time. Controller can be emulated as USB disk, which can be read and written with the purpose of data exchange.

The controller adopts the monochromatic LCD, which has a high contrast and displays clear characters. Chinese and English versions are optional. The keys are of touch-switch type with good touch feeling, high reliability and long service life. There is a relevant Chinese description for each key on the panel. Common 220VAV single phase power supply is used. All inputs and outputs adopt the Optocoupler isolation, achieving a great anti-interference performance.

II. Appearance

III. Accessories

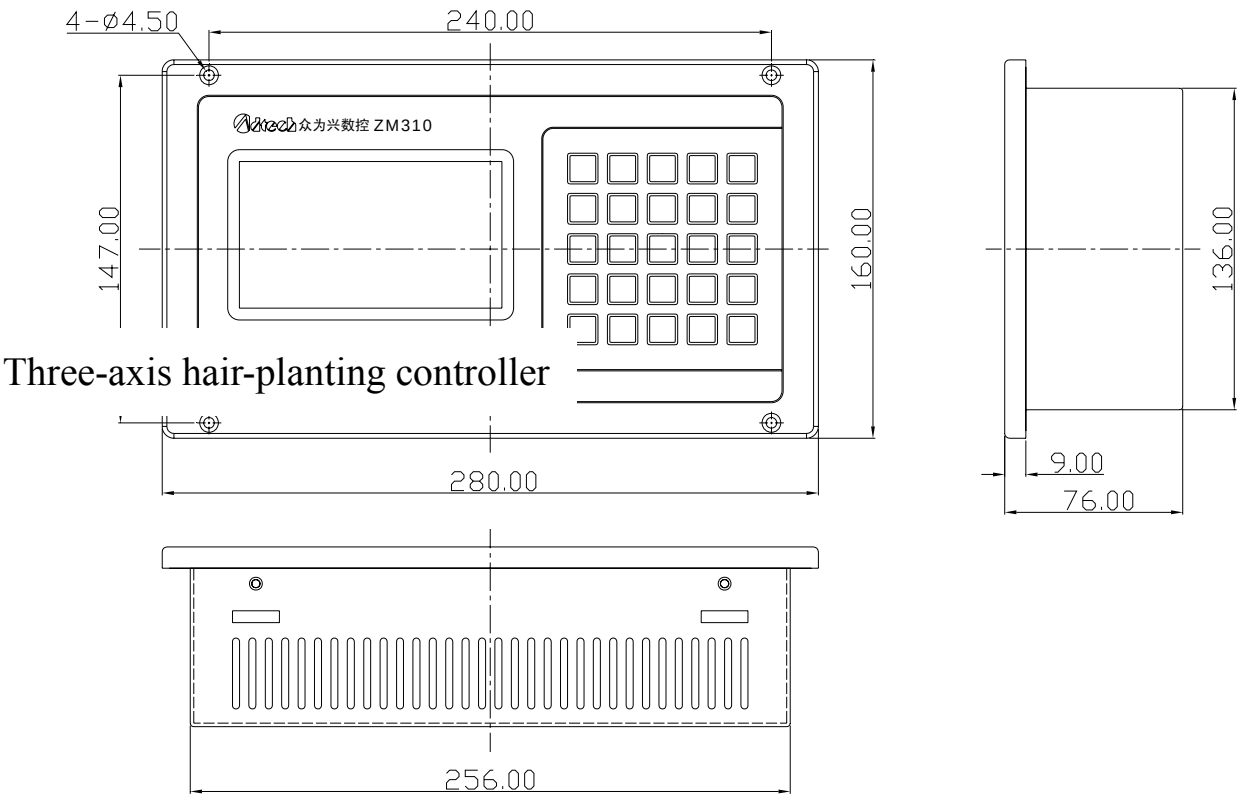
1. ZM210/310 controller, 1 set
2. User manual (with wiring diagram), 1 piece
3. Male-Male cable with 25 pins, 1 piece
4. Terminal board with 25 pins, 1 piece
5. Female header (no need bonding wire) with 15 pins, 1 piece
6. Male header (no need bonding wire) with 9 pins, 1 piece
7. 220 V power line

IV. System selection

Model	Configuration
ZM210	Two-axis hair-planting machine
ZM310	Three-axis hair-planting machine

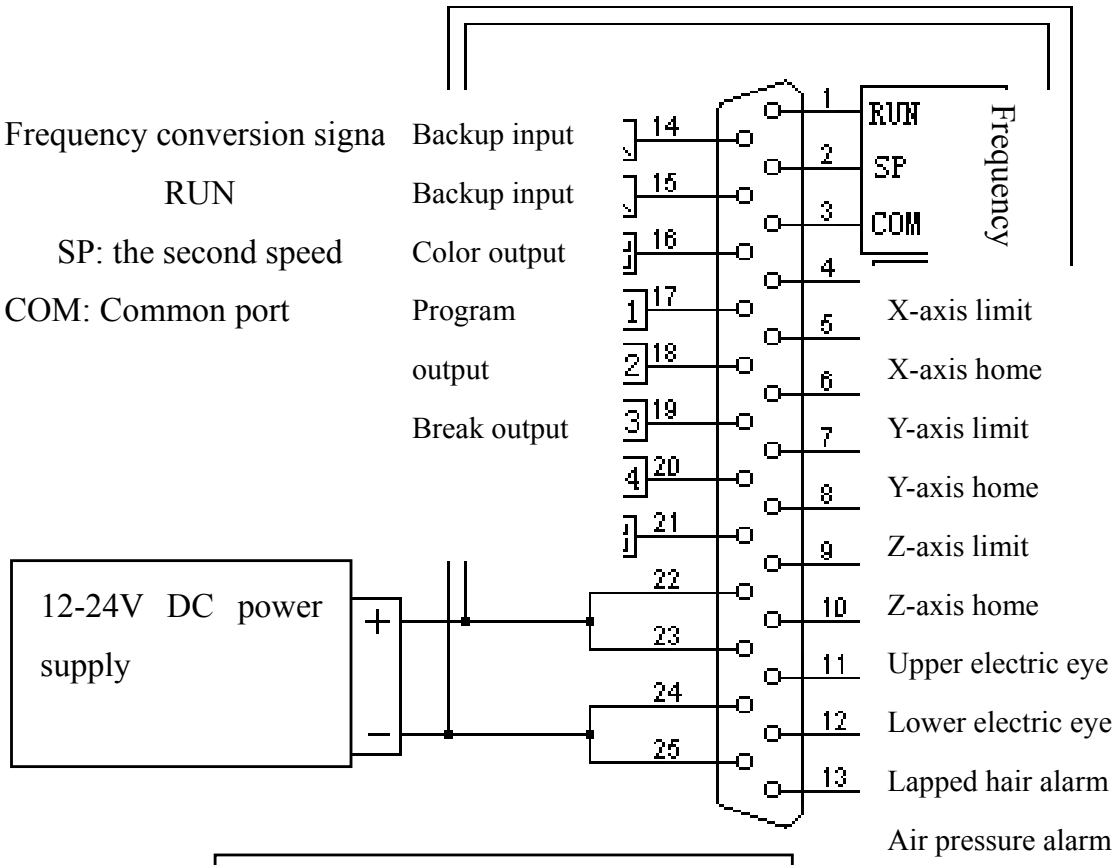
Chapter II Overall dimension & electrical connection

I. Overall dimension



II. Wiring diagram

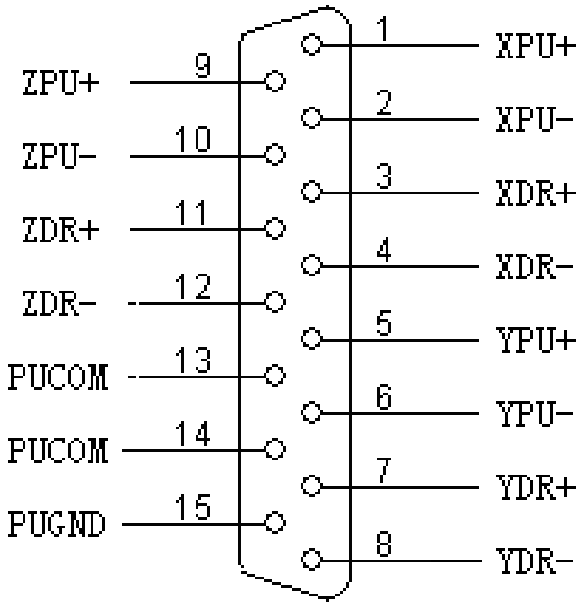
In-out interface with 25 pins



Wiring of 25-pin terminal board

NPN proximity switch should be adopted for the input signal

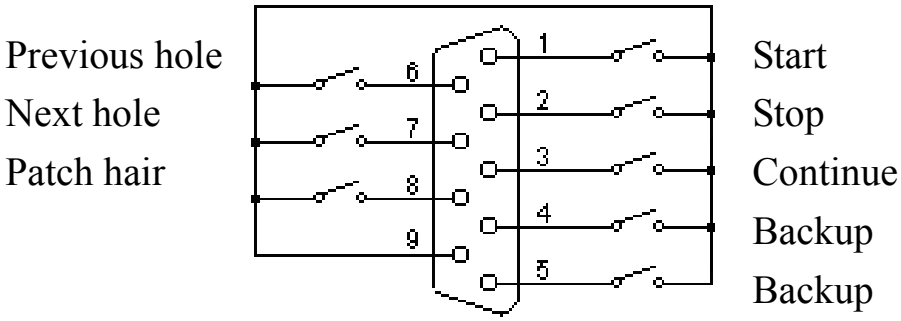
Pulse interface with 15 pins



PUCOM is used in driver with common anode input

PUGND is used in driver with common cathode input

Control box interface (female) with 9 pins



Nine-pin socket is the interface of control box

Note:

This interface works only when connecting to 12-24V power supply with 25 pins or more

III. Notices on assembly

1. Controller is provided with special mounting set. When the controller is placed in the opening of mounting panel, use the mounting set to fix it.
2. It should be mounted in a place with no or little vibration. If impossible, use a rubber shock absorber washer between the controller and mounting panel to cushion the shock.
3. Do not install it in a high temperature, damp, or dusty environment or an environment with corrosive gas.
4. Install it in a place with a temperature of -10℃--+50℃.
5. It is not water-proof structure. Try not to use it outdoor.

V. Trial

Installation and debugging

First, enter the test interface and check whether the input and output signals are normal.

Ensure the parameters are set correctly.

Enter the configuration interface, and move every axis to ensure that when the axis is moving in negative direction, it is moving towards zero direction.

Once the above steps are done, you can then carry on the normal operations.

1） After you have switched on the machine, confirm the products to be processed, and press [Home] key to return to home position. At this time, you can start processing.

2） Set the working mode properly.

3） Press “Start” key on control box to start machining the products.

4） Press “Stop” key on control box to pause.

5） Press “Continue” key on control box to continue machining the products.

6） In pause state, if you want to move to a certain hole, press [Last] or [Next] until it is in your desired hole (should be in high position).

Chapter III Operating instructions

I. Introduction of interface functions

The controller has four main interfaces, which are switched by [Function] key on keyboard.

1. Main interface

Switch on the machine and enter the following main interface. The ordinary processing tasks are operated in this interface.

Detailed description:

1） Product S/N: S/N of current product
2） Output: this number adds 1 after the completion of one product. You can press [9] to clear. If you change the product, it will be reset as 0.
3） Total of hole: Total hole numbers of current product (including the starting point)
4） Current hole: indicate the number of current hole
5） Status: indicate the current processing status (Running/Pause/Stop)

6） Mode: Current operating mode (Auto/Auto-manual/Trial)

7） Info bar: show three columns of info, with the latest at the bottom

Large number represents the current position (relative to outset)

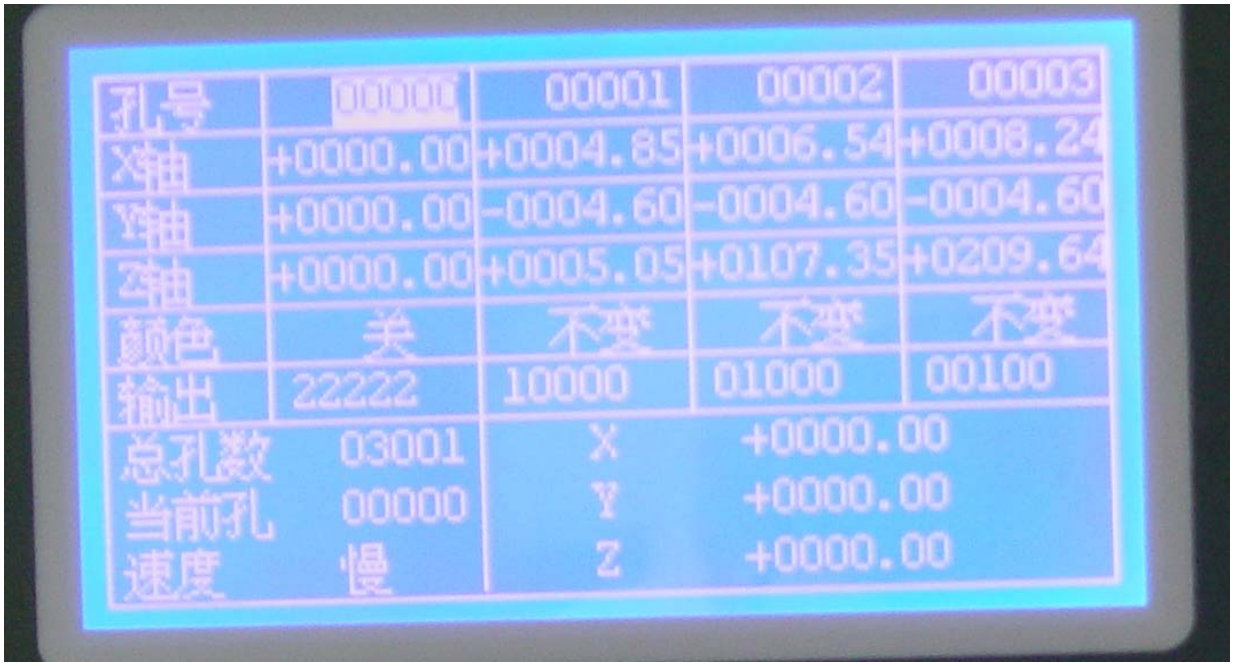
Functions of keys in main interface

Key	Function
3/Patch	Patch the hair, and hit once on the current hole position **For the safety, this should be done only in upper place.**
Mode	Operating mode: press to switch among auto, auto-manual, and trial.
9/Cancel	Clear the output
Product	Select the products to be processed, and create the new product
1/Home	Back to home: usually used to create the starting point of new product. See “Data configuration operation” for details. **For the safety, this should be done only in upper place.**
2/Outset	Back to outset: After the power on or the exchange of product, it is necessary to return to outset to ensure the position is correct. To return to the outset, it is to return to home before returning to outset. **For the safety, this should be done only in upper place.**
Last	If you have not input any number, press this key to move to the last hole position. If a number is input, it will be moved to the required position of hole. **For the safety, this should be done only in upper place.**
Next	If you have not input any number, press this key to move to the next position of hole. If a number is input, it will be moved to the required position of hole. **For the safety, this should be done only in upper place.**
Start	With the same function as [Start] button in control box, used to start processing the products
Stop	With the same function as [Stop] button in control box, used to suspend processing the products

Note: Buttons on control box are available only in main interface.

2. Configuration interface

Press [Function] key once in main interface to enter the following interface.



Detailed description:

1) Hole S/N: indicate which hole the following data belong to, 0 represents the outset

2) n axis: refers to the data of the axis

Note: outset data are the distance relative to the home, therefore the position value is 0 when at the outset, and the data of other points are the positions relative to the outset. Modifying the outset data will offset the position of all holes. Modifying the data of other points will only influence the modified hole, others will not be influenced.

3) Color: Programmable output point

4) Output: 5 programmable output points

5) Total hole: Total hole numbers of current product (including the outset)

6) Current hole: indicate the S/N of current hole

7) Speed: indicate the speed of manual movement

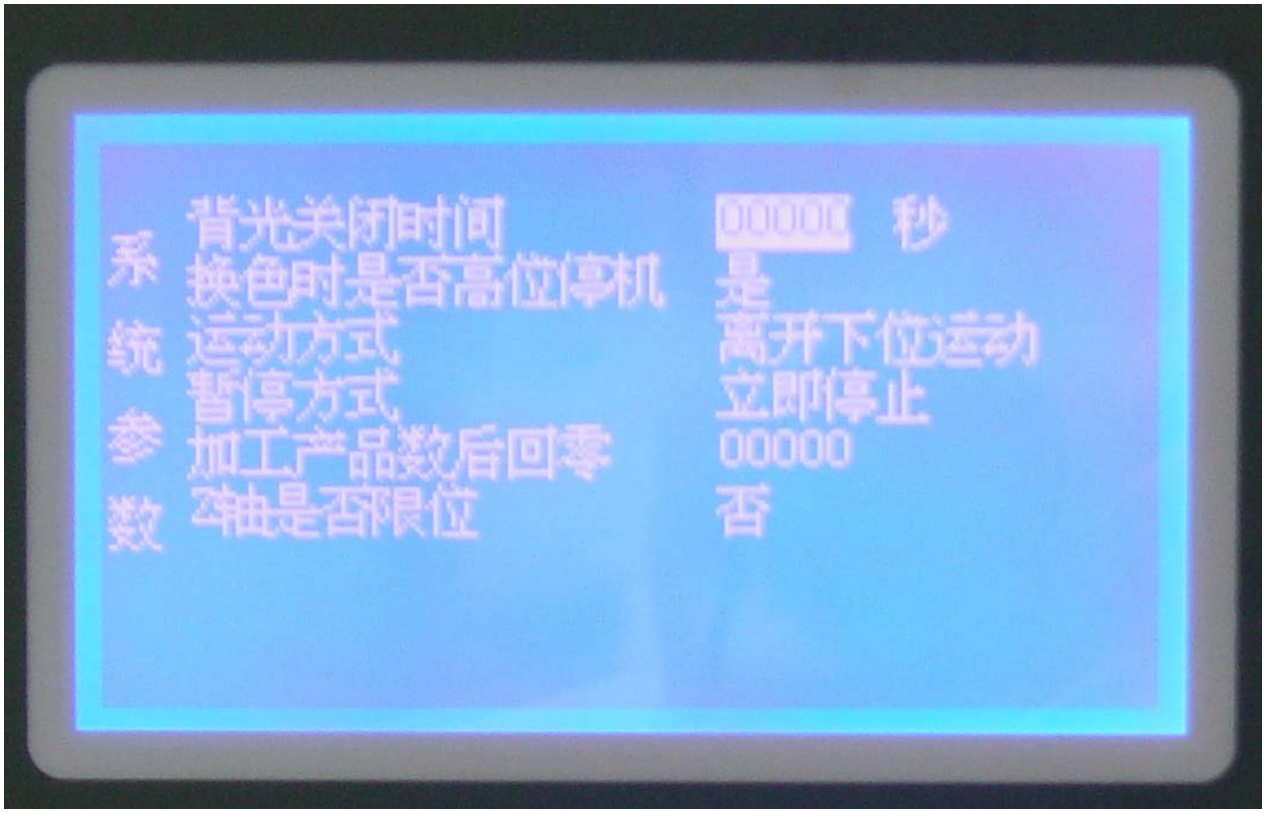
8) X, Y, and Z refer to the position of each axis

Key functions in configuration interface

Key	Function
0/Insert	“Insert”: insert a hole before the current hole
1/Home	**“Hole-dividing”: Add holes evenly between two holes**
2/Outset	**“Copy”: Copy the holes in a specified range**
3/Patch	**“Transition”: horizontally move the holes in a specified range**
4Color	Change the color output
5/Output	Change the 1-5 point output
6/Mood	Make some standard holes
7/Add	“Add”: add a hole
8/Revise	“Revise”: Revise the data of hole
9/Cancel	“Cancel”: Delete the data of current hole
./Edit	“Edit”: edit the hole data with number keys
-/Speed	Revise the speed of manual movement
X+/X- Y+/Y- Z+/Z-	Move the axis, press it quickly to move 0.1mm, and press and hold it to move continuously until you release
Last	Move to the last hole position
Next	Move to the next hole position
Enter	“Positioning”: Select the position number of hole to be moved
Esc	Back to the main interface

3. Parameter interface

Press [Function] key in the main interface twice to enter the following interface.



You can press the up or down arrow key to select the parameters need to be modified, press the number keys and [OK] to finish the modification. Press [ESC] to return to the main interface.

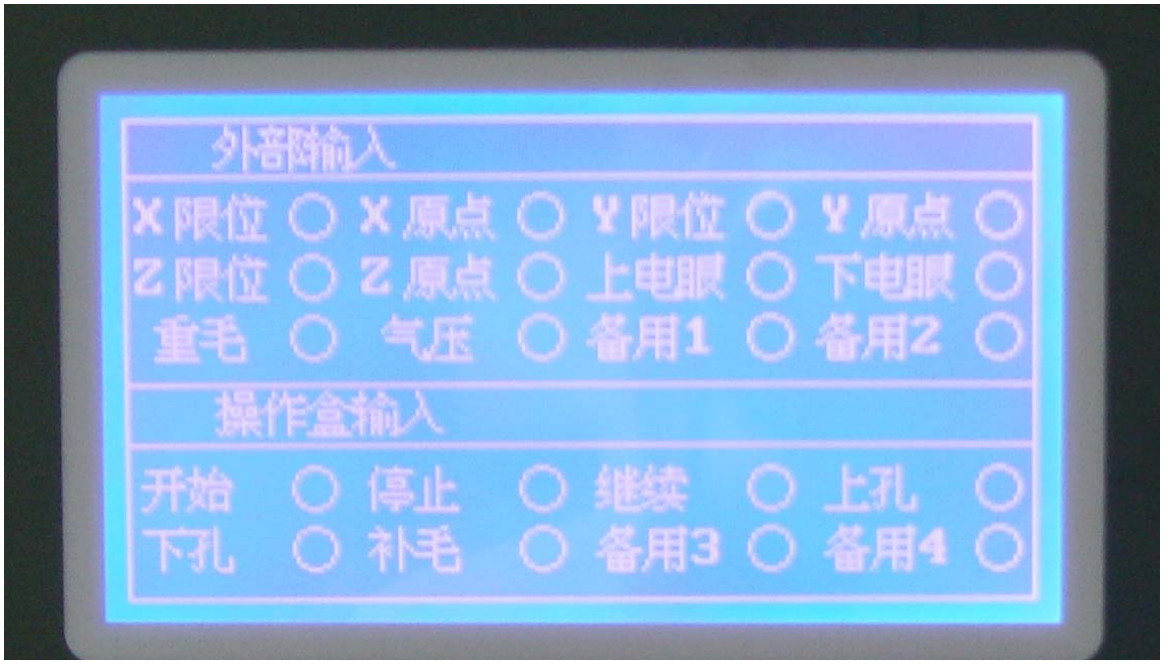
You can press the [Mode] key to select the different axes and the systemic parameters.

To select the non-digital numbers, you can press the [OK] key directly to modify.

For detailed meanings of the parameters, please refer to the following chapters.

4. Diagnosis interface

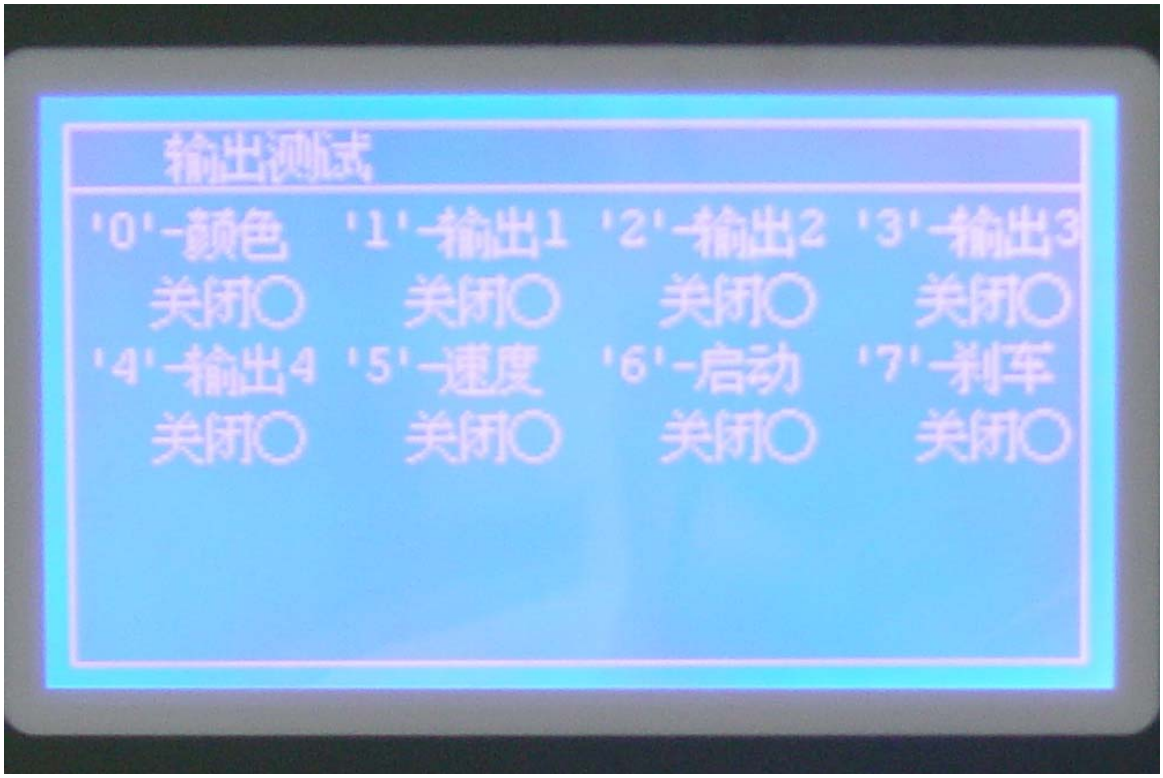
Press [Function] key in the main interface for three times to enter the following interface.



In this interface, it is mainly used to test whether the external input and output are normal.

Press the [Mode] key to select the input or output.

In the following output interface, you can use number key 0-7 to test whether the output is normal.


输出测试
'0'-颜色 '1'-输出1 '2'-输出2 '3'-输出3
关闭○ 关闭○ 关闭○ 关闭○
'4'-输出4 '5'-速度 '6'-启动 '7'-刹车
关闭○ 关闭○ 关闭○ 关闭○

5. Product selection interface

Press the Product] key in the main interface to enter the following interface

Interface description:

1. **Total product: refer to the total numbers of saved products on the controller**
2. **Hole numbers of current product: indicate the hole numbers of the current highlighted product, for reference only**

You can press up/down/left/right key to select the available products, press [OK] key and exit to the main interface.

When the total numbers of products exceed 32, you can press [Last] or [Next] to page up or down.

Press number key 1 to establish a new kind of product

Press number key 2 to delete the current highlighted products

Press number key 3 to copy the current processing file for one piece

Press number key 4 (USB management) to enter the USB disk function

Press number key 5 (USB communication) to simulate the controller as a USB disk

Press number key 6 or Cancel key to exit to the main interface

Note:

1. The first file in the directory is the current processing file.
2. Current processing file cannot be deleted.
3. Copy is not to copy the highlighted product but the current processing file.

II. Operating instructions

Data configuration

1). Basic operating procedures

- Press the [Product] key in main interface to enter the product selection interface, and press number key [1] to input the number of your desired product (1-8 digit numbers are available), and then press the [OK] key to exit to the main interface.
- Press [1/Home] to return to home position. First, make sure it is at the upper place to ensure the safety until the interface shows “Back to home complete”.
- Press the [Function] key to enter the configuration interface, and use the axis-moving key to move the machine to outset point, and press number key [7/Add] to add the outset data to the 0 hole.
- Press [ESC] key to exit to the main interface. Press [2/Outset] and the machine will return to the zero position first and then the outset position, when the positions displayed will all be changed to 0. Note: Check the high-order signal until the interface shows “Back to outset complete”.
- Press [Function] key to enter the configuration interface, and use the axis-moving key to move the machine to the position of first point, and then press [7/Add] key to add the hole data. Data of other holes can be added in this method.
- Data are saved automatically. After all holes are added, you can press [ESC] to exit to the main interface to start processing the products.

2). Advanced functions

Revise: If a certain hole position has a deviation, you can use [Last], [Next] or [OK] key to move to the hole position needs to be revised, and then use the axis-moving key to aim at the hole position, and press [8/Revise] to revise it.

Delete: If you add an unwanted hole during the configuration, you can use the [Last], [Next] or [OK] key to move to the hole and press [9/Delete] key to delete it.

Insert: If you miss a hole during the configuration, you can use the [Last], [Next] or [OK] key to move to the next hole of the one you need to insert, and then use the axis-moving key to aim at the hole position you need to add, and press [0/Insert] to insert it. Note that it is to insert the hole before, not after the current hole.

Positioning: It is usually to use the [Last] and [Next] keys to move

to the required hole position. However, if there are a lot of holes, you can press [OK] key and input the S/N of hole, and then press [OK] to go to the desired position.

Hole-dividing: In some circumstances, the positions of hole are distributed evenly. You can use the hole-dividing function to generate the holes quickly as follows:

Suppose holes from the 4th one to the 14th are evenly distributed. First, move to position of the 4th hole and add a hole (3 holes are added in front), and then move to the position of the 14th hole and add a hole there, which make 5 hole total. After that, press number key [1] and select 9 (because there are 9 holes between the 4th and 14th), and then press [OK] key to confirm. The numbers of current holes will become 14, and the hole-dividing operation is over.

Note: In this operation, it is to add the required numbers of hole between the current hole and the last hole.

Edit: In some circumstances, it is required to revise the data directly. For example, the data of outset point should be revised by this method only. It is usually used to revise the data of outset point.

Transition: If the data are copied from other controller, they should be revised. One way to do this is to revise the outset point with the editing function directly, but it is not so convenient if there is a big offset for the position. Another way is to use the transition function as follows:

First, return to the outset point and then enter the configuration interface, after that, press the [Next] key to move to the first hole. At this time, the current position is different from the actual position of hole. Press the moving key to move the machine head to the actual position of first hole, and then press [3] to input the S/N of the last hole. The S/N number is the total hole numbers minus 1, and then press [OK] to finish.

The above example is the transition of all data. It can also be used for the transition of partial data. To do this, you should [position] to the hole position of outset point of transition, and follow the above operation. Do not input the hole S/N of the last point, instead, input the required hole S/N of terminal point.

Copy: If you want to process more than two products in a platform, you can configure the data of the first product and then generate the data of the second product by copying. The detailed operations are as follows:

1. Configure the data of the first product with the ordinary method
2. Move to the position of the first hole of the second product
3. Press [2], and input 1 as the S/N of outset hole
4. For the final S/N of hole, input the last hole S/N of the first product
5. Complete

The above application is to copy the whole product. If you can use it neatly, it can also be used in other situations.

3). Programmable output

In configuration interface, you can press number key [5] to change the state of 5 programmable outputs. (Note: the state after the change will be saved automatically)

Operating mode:

Auto mode: It continues to process the next product after having finished a product.

Note: In this mode, the machine does not return to the outset point when going to process the next product.

Auto-manual: After finishing a product, the machine will stop at the outset point, waiting for the "Start" again.

Trial mode: It is mainly used for testing platform, in which the main axis motor does not run.

Note: The above operations should be done in the main interface.

III. Parameter descriptions

1) Parameters of all axes

The parameter meanings of the 3 axes are the same.

a） **Pulse per revolution:** refer to how much pulse the motor is required to rotate a circle

For two-phase half-step drive, this value is 400.

For two-phase micro-stepping driver, this value is X200 (number of division)

For other drivers, please refer to the user manual of driver

Please set this parameter in accordance with the actual value

b） Screw pitch: refer to the pitch of screws applied in X and Y platforms. For rotation axis or other axes not moved in straight line, it is default as 20MM.

If the above two parameters are set properly, the position value on the interface represents the actual distance (unit in mm)

For rotation axis, the position value on the interface has no any meaning.

c） **Initial speed:** Generally, it can be set as 1.5 times of the screw pitch, which means the motor is started at 1.5 turns per second. For stepper motor, this is a proper speed, but for the servo motor, it can be increased to 2-3 turns.

d） Driving speed: Generally, it can be set as 10-15 times of the screw pitch, which means the maximum speed of motor can reach 10-15 turns per second. However, this speed can only be achieved when the distance is long. It is not required to set too high.

e） Acceleration: This value is usually set as 50. It has nothing to do with the numbers of division and screw pitch of driver. The suggested range is 30-90. The larger the value is, the greater the acceleration would be. However, too great an acceleration will lead to the out-of-step of motor.

f） Skip distance： When the distance exceeds a certain range, it is unable to finish the motion between these two holes. At this time, it is necessary to stop at upper place, move to the next hole, and then continue to plant the hair. This value is related to the speed of main axis motor.

g） Back-to-home speed: refer to the speed of returning home

h） Configure to fast speed: switch to the fast manual speed during the

configuration; this motion is a uniform motion, and in order to avoid the out-of-step, it cannot be set too high.

ⅰ） **Configure to slow speed:** switch to the slow manual speed during the configuration

2) System parameters

a) Turn-off time of backlight: Set the time duration of non-operation of key before turning off the backlight. It can extend the service life of the liquid crystal display. If it is set as 0, it means the backlight would not be turned off.

b) Whether to stop at upper place when changing color: the speed of some color-changing outputs may be slow, so it is essential to stop at upper place before changing the color.

c) Mode of motion: There are two modes. In one mode, the stepper motor can move once leaving the lower electric eye, and it is able to achieve a quick processing speed. In the other mode, the stepper motor will move once sensing the upper electric eye. This mode is used when the hole is deep.

d) Mode of pause: Some customers require the machine to stop at upper place when pressing the stop key.

e) Back to home when reaching the set numbers of processed product: It is used to set at how many products the machine has processed will it return to the home position once. If the value is 0, it means it is not applicable.

f) Whether Z axis limits position: If Z axis is the rotation axis, it can be rotated arbitrarily, and it can be set as “No”. Home position of Z axis only works when returning to home and it does limit the position.

Chapter IV Notices & Maintenance

I. Notices

1-1 Notice about security:

（1） Do not disassemble the shell without authorization.

（2） Cut the power if keep idle for a long time.

（3） Avoid dust or powder entering the controller.

（4） Be careful when carrying to avoid damage of the controller.

（5） 。

1-2 Notices for proper application:

Improper application method will lead to the abnormal operations, or even damage the controller. Please follow the notices below to use the controllers in a proper way.

(1) If the output relay is non-solid state relay, it is required to connect in parallel a freewheeling diode on relay coil. Do not connect the 220AC directly to the connecting terminal board of controller; otherwise, it will burn out the controller immediately.

(2) The service life of controller has a great relationship with the ambient temperature. If the field temperature is too high, please install the cooling fan. The allowable operating range of temperature for the

controller is -10℃--+50℃.

(3) Avoid using in high temperature, humid, dusty or corrosive air environment.

(4) Use a robber shockproof pad where with intensive shaking.

II. Maintenance

2-1、Attentions when maintenance and inspection

（1） Cut the power of the main loop first.

（2） The operator must make sure the power is cut to avoid accident

2-2 Inspection items and circle

Under normal usage condition (environment condition: average temperature 30℃, load rate 80%, running circle 12 hours/day), make daily and regular inspection of the follows items.

Daily inspection	Daily	● Get the environment temperature, temperature and dust ● Check if there are shakes or noise ● Check if the flow hole is blocked
Regular inspection	Yearly	● Check if the parts are loosen ● Check if there are damages on terminal panel

Chapter V Appendix

Appendix I USB communication

USB communication operation is to stimulate the controller as a USB disk to exchange files via the computer.

Before entering into the USB communication, make sure the computer and the controller are properly connected; otherwise, it is unable to enter into the USB communication state.

After entering into the USB communication state, there will show an icon of removable disk on the computer, in which there are two directories, one is ADT and the other is PRG.

There is only 1 file under the ADT directory, named as ADTROM.BIN. This file is the program file, and please do not delete it.

File of DOT extension name under the PRG directory contains the hole position data of every product. You can copy the file to computer for backup or copy files in computer to controller. The other two files of DAT extension name are system configuration files.

Usually, you can backup the files in USB disk to the computer, especially after an important product configuration.

Appendix II USB management

USB management does not need computer. Only one common USB disk is required. It is much convenient than the USB communication.

The application methods are as follows:

First, press the [Product] key to enter the product interface, press number

key [4] to enter the [USB Management], and then insert the USB disk into the rear USB port. After that, press number key [1] to search. In normal condition, a USB disk would be detected, and at the same time several functions would be added under the following menu.

[Backup] and [Restore] are required, which are controlled by number key [3] and [4] respectively.

Backup is to copy all products from the controller to PRG directory of USB disk, and the restore is to copy all products under the PRG directory of USB disk to the controller.

Note: To avoid the error operation, if there is a file with the same name under the PRG directory of USB disk in case of backup, it will not overwrite the file in the USB disk. Therefore, if you want to backup all files on the controller, you can delete the PRG directory of USB disk. In this way, when you are restoring the files, the files with the same name on the controller would not be overwritten.