

NeoDen K1830

High Speed Pick and Place Machine

User Manual



Model: **K1830 High Speed Pick and Place Machine**

Version: **V1.0**



DEAR USERS:

PLEASE READ THIS USER MANUAL COMPLETELY BEFORE OPERATING. THIS UNIT AND RETAIN THIS BOOKLET FOR FUTURE REFERENCE.

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1. Equipment installation and precautions

1.1 Machine Dimension

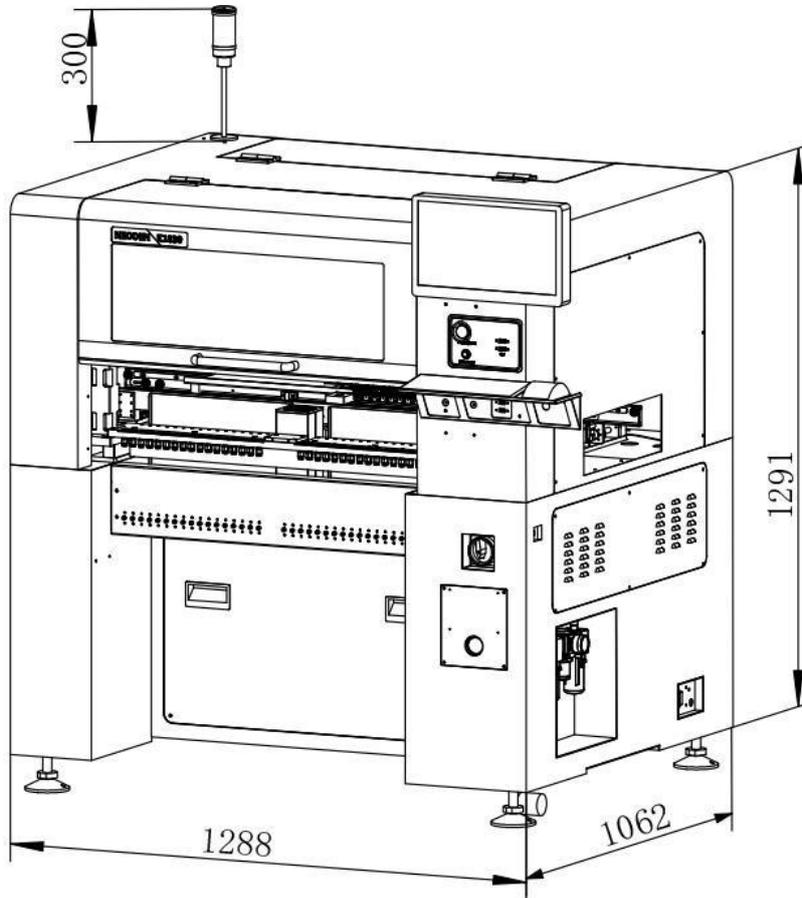


Figure 1- Machine dimension

1.2 Structure of Neoden K1830



Figure 2-Ports and Appearance

- | | |
|---|----------------------------|
| (1) Warning Light (Triple Color) | (7) USB port |
| (2) Safety cover | (8) Pause button |
| (3) Front Feeder Slots 1-33 (Reference val) | (9) Mouse keyboard bracket |
| (4) Electric Feeder Port | (10) Power Switch |
| (5) 12 inch high-definition display | (11) Air source input |
| (6) Emergency Button | (12) Heavy load pedestal |

1.3 Working Area Structure

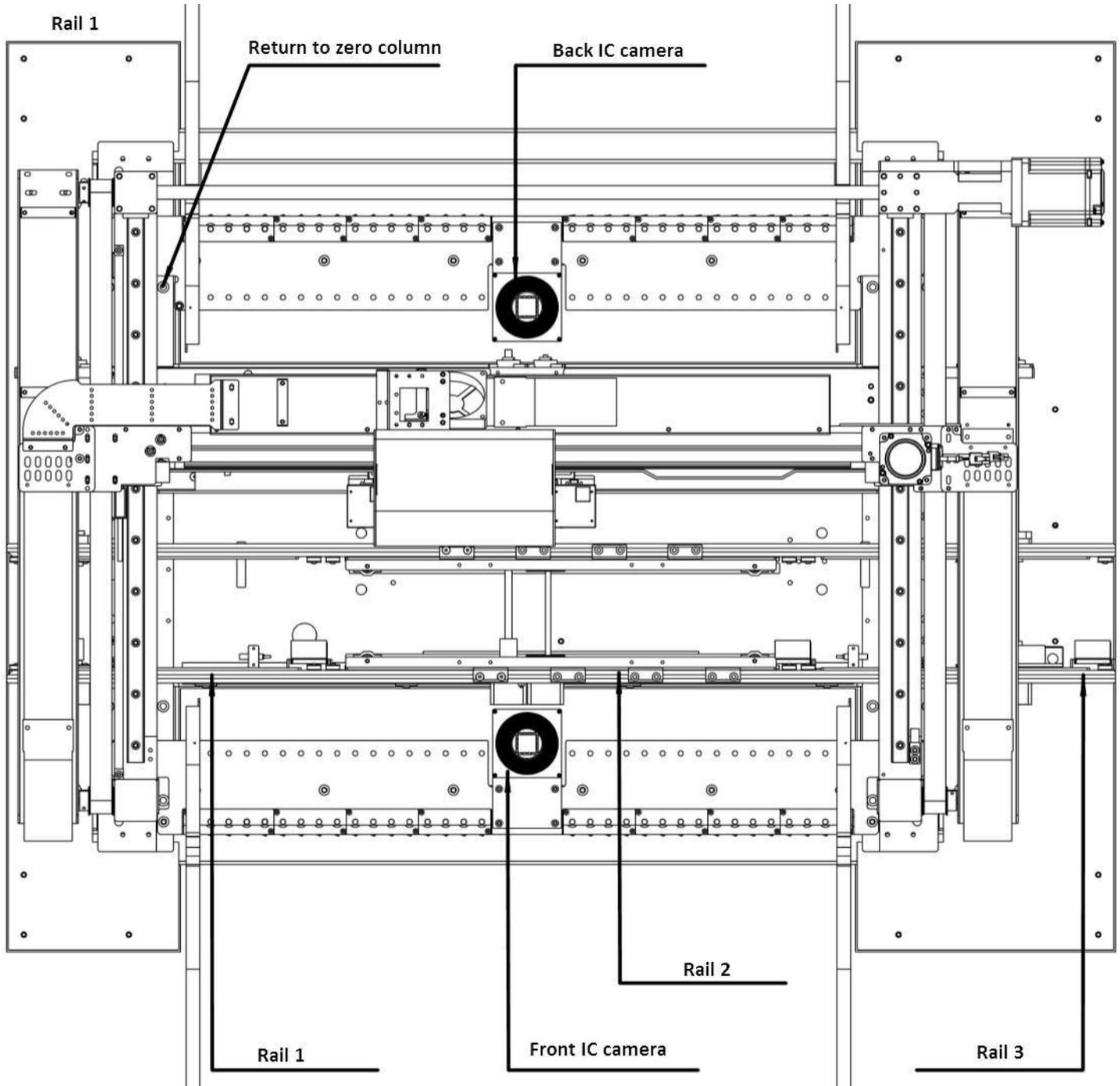


Figure 3- Top view of main mounting area

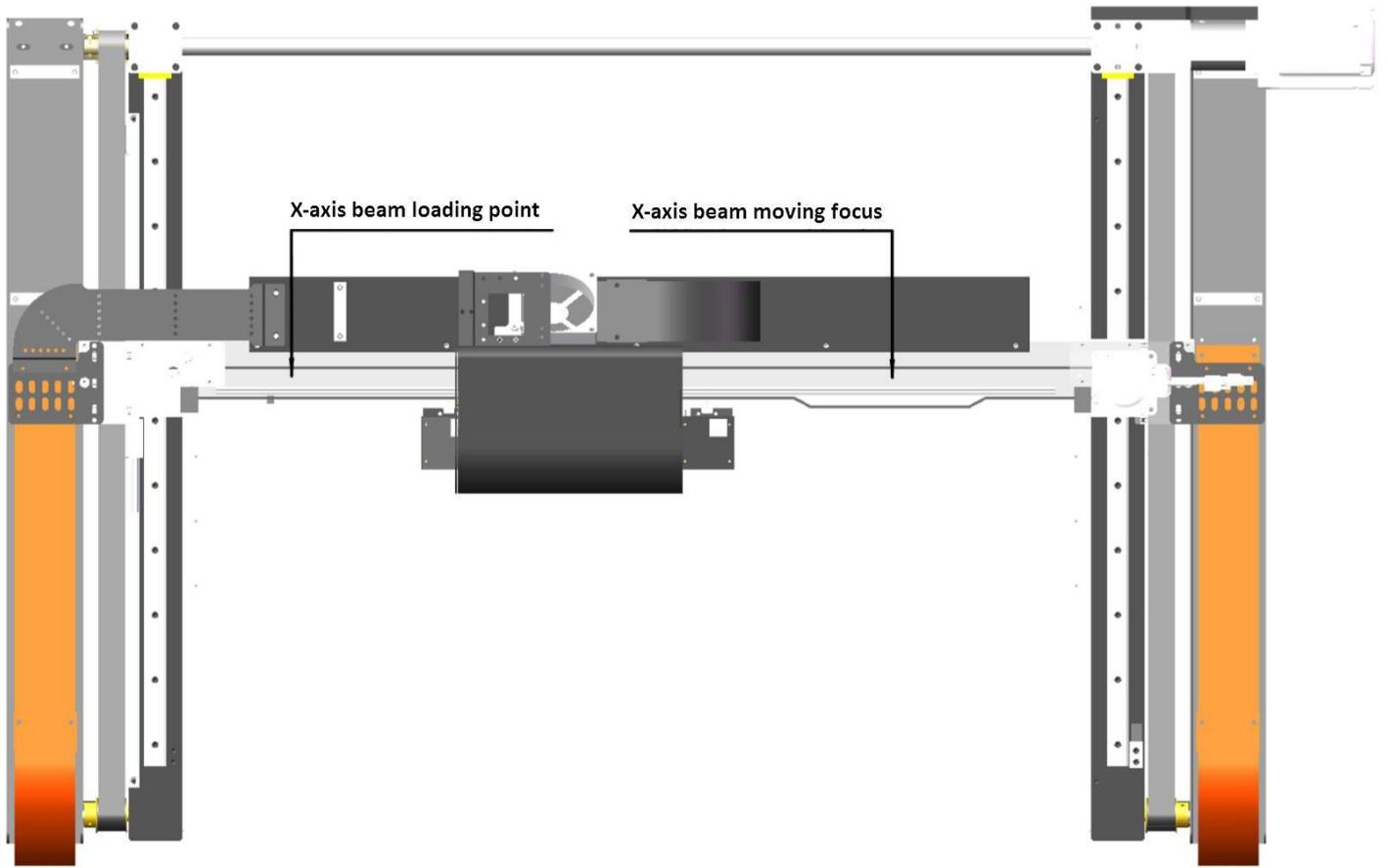


Figure 4-X-axis Beam

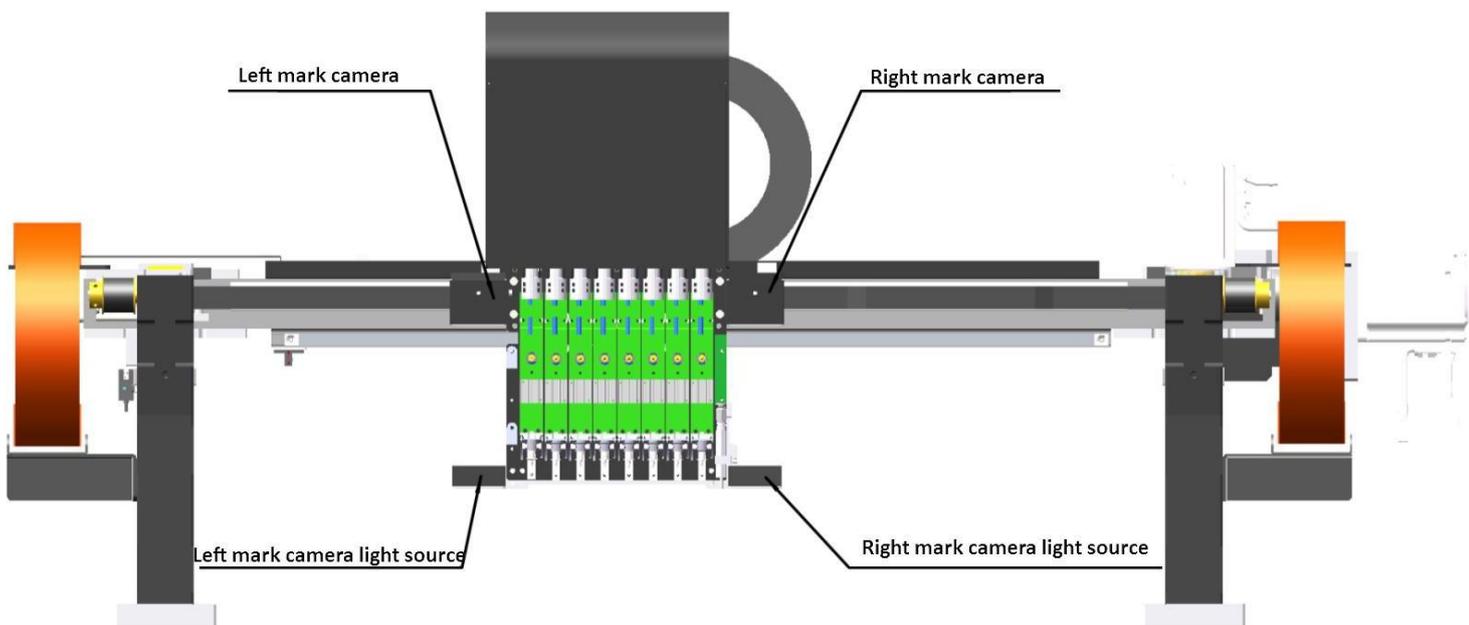


Figure 5-Main Placement Head Camera

1.4 Important Notice



Warning of failure risk of camera identification, please referring to Figure 3 and Figure 5: The following parts are forbidden to touch and impact

◆ Front IC Camera ❖ Back IC camera ◆ Left mark camera ☒ Right mark camera

☒ Left mark camera light source ⚡ Right mark camera light source



Warning of accuracy failure risk, refer to Figure 3: The following components are prohibited from touching and impacting.

◆ Return to zero column

For the risk of accuracy failure, refer to Figure4: When manually moving XY, it must be carried out on the X-axis beam moving point;



Warning of electric shock, be sure to follow the requirements below :

◆ Connect the input power supply that meets the requirements of the equipment, the electrical interface of the machine to the ground must be effectively grounded;

❖ Any time you enter the case and stick to the head for maintenance, you need to shut down the machine properly and cut off the power supply;



Warning of equipment life reduction, be sure to follow the requirements below :

◆ When installing the equipment, the equipment must be leveled;

❖ Correct shutdown: shut down the operating software and the system before turning off the main power switch;



Figure 6-The air supply of the equipment shall not be less than 0.6MP



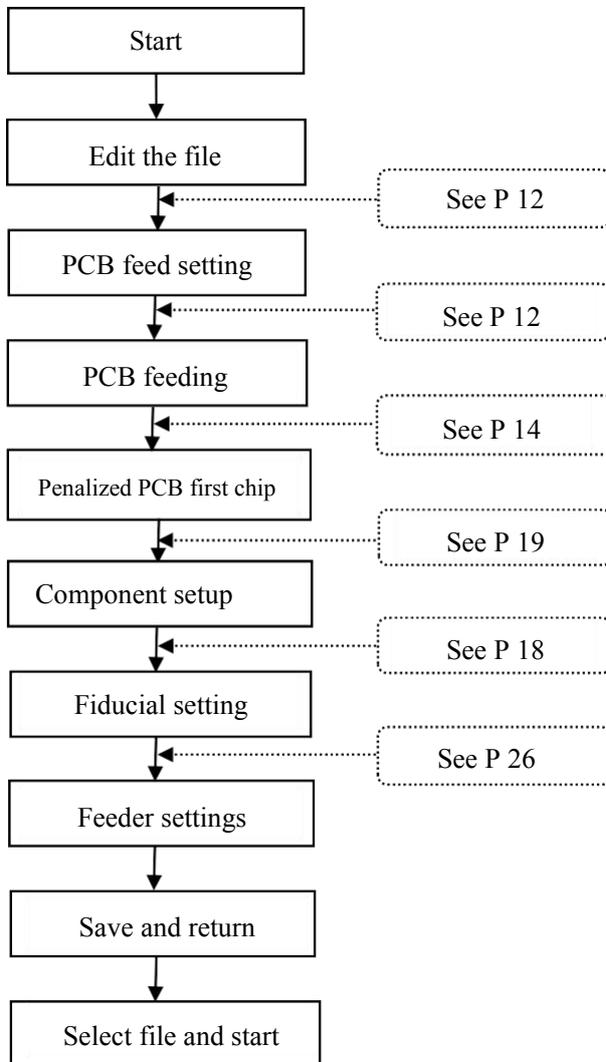
Figure 7- Feeder Pressure 0.55MP

1.5 Operation flow chart

NO.	Flow chart	Note
1	<p style="text-align: center;">Start-up steps</p> <pre> graph TD A[Preparation] --> B[Power ON] B --> C[Automatic Test] C --> D[Power on page] </pre>	<ol style="list-style-type: none"> The pick and place machine is a precision equipment. In the installation position of the machine, it is necessary to carry out horizontal correction before and after the equipment to prevent the uneven operation of the equipment from damaging the service life of the equipment; Connect and fix the equipment interface before and after the equipment, and connect and fix the ground wire; The access power must meet the requirements of power identification; No less than 0.6mp air source input and adjust the pressure value to OK; Check the safety of the working area of the mounting head; The XY transmission parts are not fastened and interfered, and check that the emergency stop switch is in normal state;
2	<pre> graph TD D --> E[Program and Edit; Production] </pre>	<p>Power on and turn the power switch clockwise;</p>
3	<pre> graph TD E --> F[Mounting] F --> G[Modify] G --> F F -- Abnormal --> H[Abnormal] </pre>	<ol style="list-style-type: none"> 1. When the self-test is carried out, the head indicator light of the mounting head and the light source of the IC camera will be on and flash briefly to indicate that the self-test is normal; XY initialization (origin reset) is normal, the software enters the file list interface, and no error report pops up;
4	<p style="text-align: center;">Shutdown steps</p>	<p>After power on, directly enter the file list page;</p>
5	<pre> graph TD F --> I[Production Finished] </pre>	<p>See page 10 for the introduction of machine operation for details;</p>
6	<pre> graph TD I --> J[Exit] J --> K[Software shut down] </pre>	<p>Suggestions on production process:</p> <ol style="list-style-type: none"> First component confirmation: confirm the component angle and polarity, component picking position and mounting position; Start production after confirming solder paste printing and temperature setting;
7	<pre> graph TD K --> L[System shut down] </pre>	<p>Production process;</p>
8	<pre> graph TD L --> M[Power OFF] </pre>	<p>After the production is finished, reset the origin and prepare to shut down;</p>
9		<p>Shut down the system via computer, then power off the machine.</p>
10		<p>Disconnect the electricity supply after the system being powered off.</p>

11	Keep the machine clean, daily maintenance of the nozzles assures high utility.
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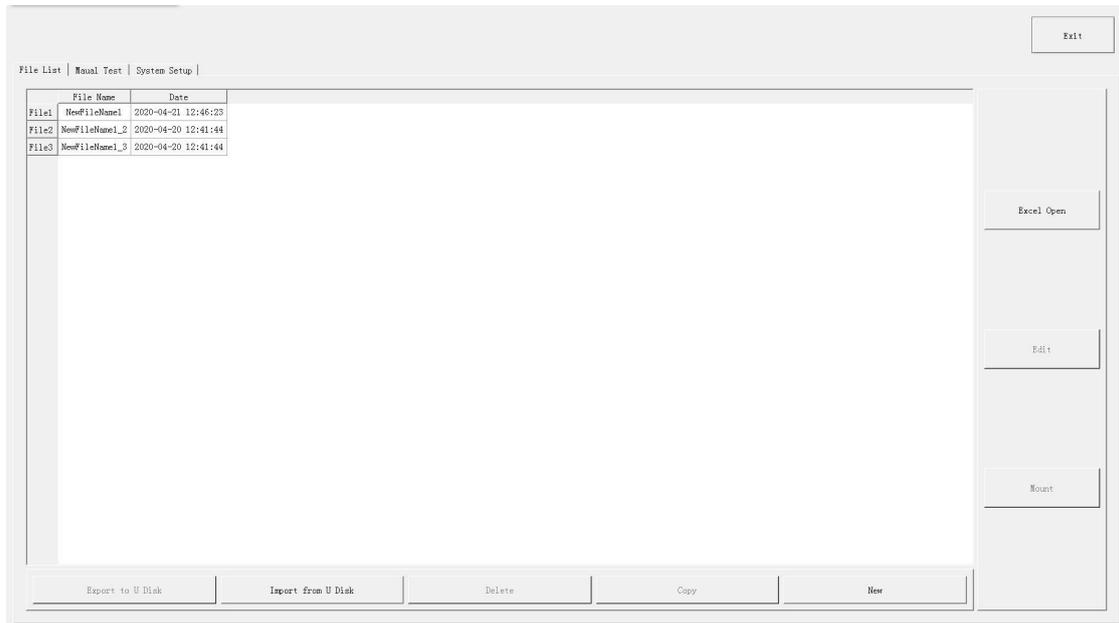
1.6 Flow chart of making a programming file



Note:

- A. The basic procedure of making a programming file by manual programming or import coordinate file is similar, but there are two different parts: component list and fiducial setting.
- B. Please find the detailed operation steps of the differences on relative page.

2.PCB Editing



File list introduction:

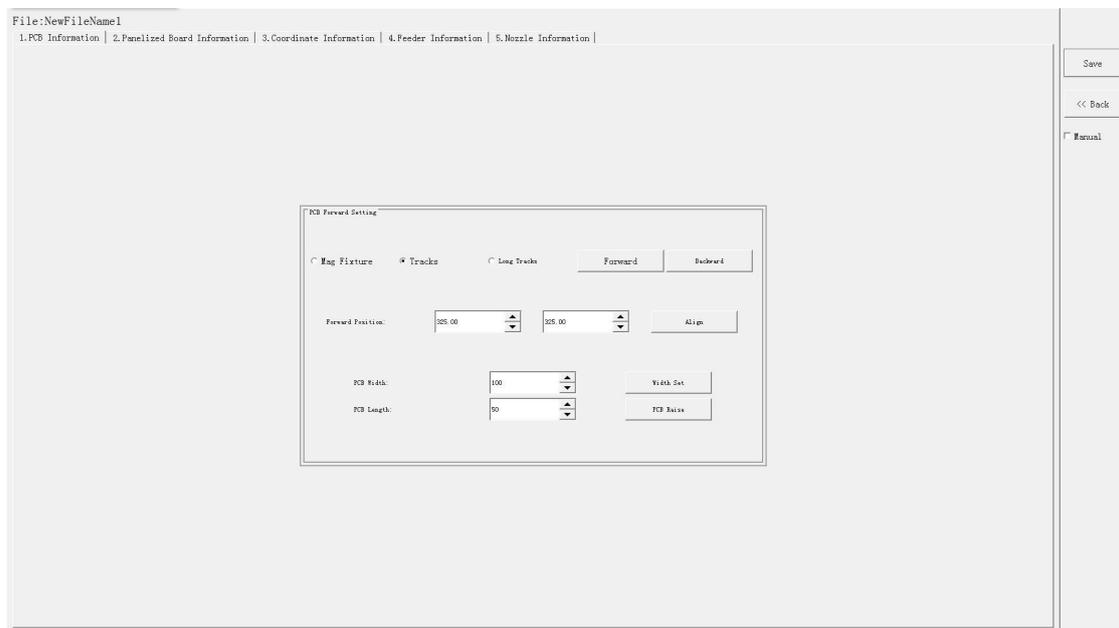
- (1) Excel Open: The Excel table of the file can be modified directly in the table for some routine operations, simplifying the programming operation.
- (2) Edit: select a file and click Edit to enter the corresponding editing interface.
- (3) Processing: after editing the file, after checking the correctness, select the file and click processing to mount.
- (4) Export file: After connecting an U disk, select the file and click Export, after the successful notice pops up, the export is finished.
- (5) Import from U disk: for the files that have been edited offline, they can be directly imported from U disk for mounting. After connecting U disk, click Import from U disk, select the corresponding files in the new window, and click OK. When the imported files are showed in the file list, the operation is finished.
- (6) Delete: select the corresponding file, click delete, a prompt window will pop up, and click Yes.
- (7) Copy: select the corresponding file, click Copy, and the file list will generate a file of xxxcopy1. In order to prevent misoperation, a new file can be copied before operation.
- (8) Add a new file: click Add to open the input window, input the file name, and click OK. At this time, when the file list interface displays new files, the operation is successful.

On the file list page, select an existing file or add a new file and name it, and then select the file for editing. The editing page is shown as follows:



2.1 PCB forward settings

In manual programming, this item is the primary editing item, and the board entry setting is as shown in the figure:



2.1.1 Mag Fixture

Select tray to fix the board feeding mode, place the PCB to be installed in the proper position in the mounting area, and then click "top plate control" to fix the PCB.

2.1.2 Tracks:

Select the “Tracks” on PCB Feed Setting interface:

Tracks width setting: Set correct PCB width value until the PCB can move smoothly

PCB Feed Test: Put PCB to “Tracks Section 1”, Click “forward”, PCB will move to “Tracks section 2” and stop at the cylinder thimble position through the sensor, cylinder will raise the PCB, then thimble will go down, PCB feeding complete.

The adjustment method of the tracks width: Put the PCB on the front conveyor, feed the PCB to the tracks of pick and place machine, gently push the PCB back and forth by hand to leave a tiny gap of about 1mm in the rail (add extra 1mm from PCB width), click “Width set” and follow the prompt window to check whether meet the zero return condition. After zero return, it will be adjusted to setted width.

2.1.3 Long Tracks:

Select the “Long Tracks” on PCB Feed Setting interface, then all track sections start work simultaneously.

Tracks width setting: Set correct PCB width value until the PCB can move smoothly

PCB Feed Test: The long tracks sends feed signal to the front conveyor, and feed PCB to cylinder thimble 1 position, cylinder will raise the PCB, then thimble 1 will go down, PCB feeding phase 1 is completed. After above placement is completed, the PCB in the waiting area is released, feed to cylinder thimble 2 position, cylinder will raise the PCB, then thimble 2 will go down, PCB feeding phase 2 is completed. After above placement is completed, the PCB in the waiting area is released, feed to cylinder thimble 3 position, cylinder will raise the PCB, then thimble 3 will go down, PCB feeding phase 3 is completed.

2.2 PCB Eject setting

After click “Eject” no matter under Mag fixture or Rail mode, the thimble will go down in “track section 2”, “track section 3” begin to work and PCB will feed to back conveyor

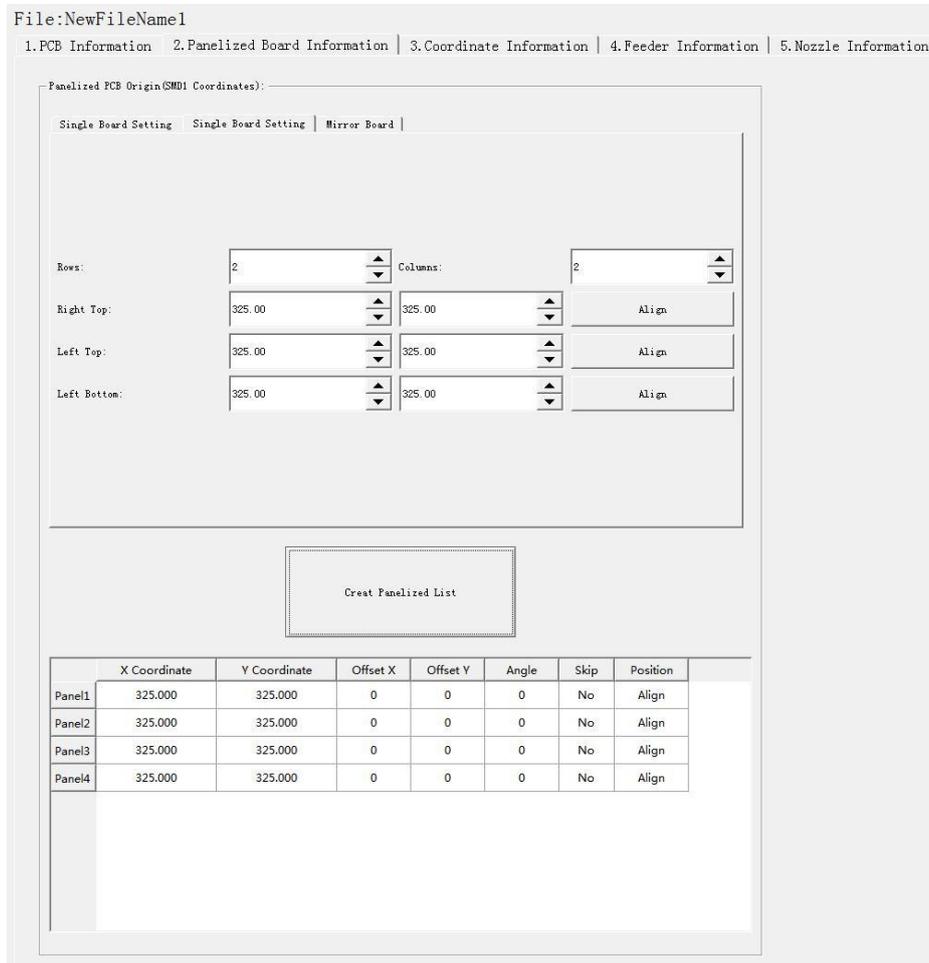
2.3 PCB Forward Position Setting

Need set the PCB forward position before click “forward”

Step: Click “Align” and enter the “align” interface, set the forward position according to the photo took by mark camera, and select “align method-nozzle 1”, then click “save” to save the forward position information.

3. Panelized PCB Edit

3.1 Panelized PCB origin (SMD1 coordinate)

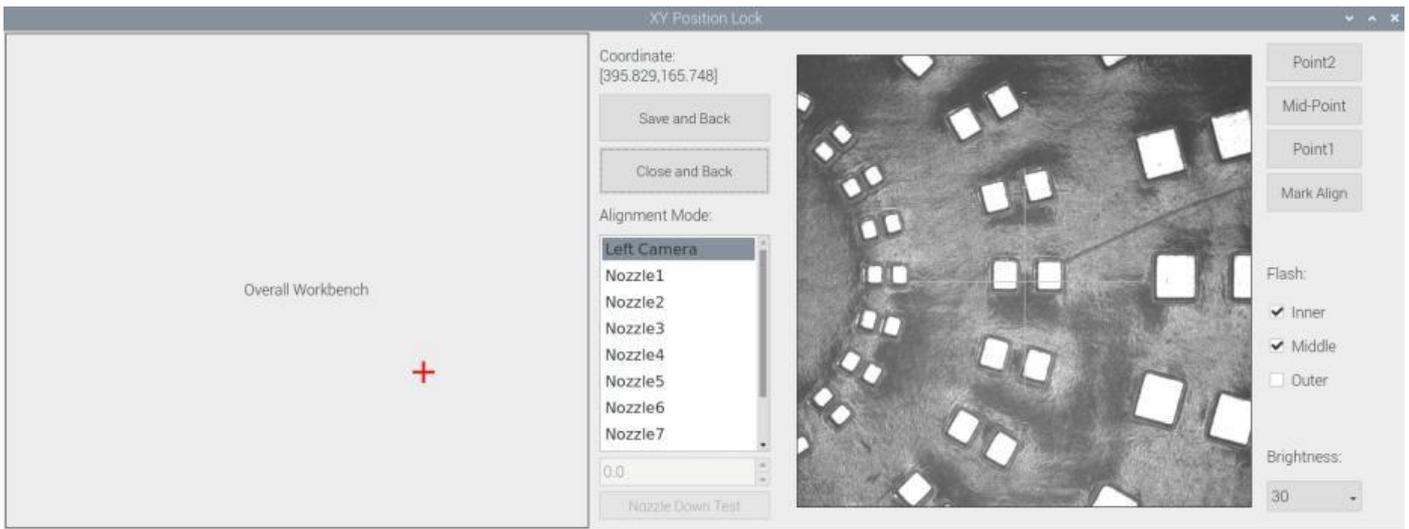


Function: This is mainly to determine the first component on single or panelized PCB of manual program or imported file. The principle is to collect and calculate the data of each board's relative spacing, in order to achieve the calculation of the real coordinate.

Note: the panelized PCB origin (SMD1 coordinate) and panelized list setting of the manual program mode is the same as file import mode.

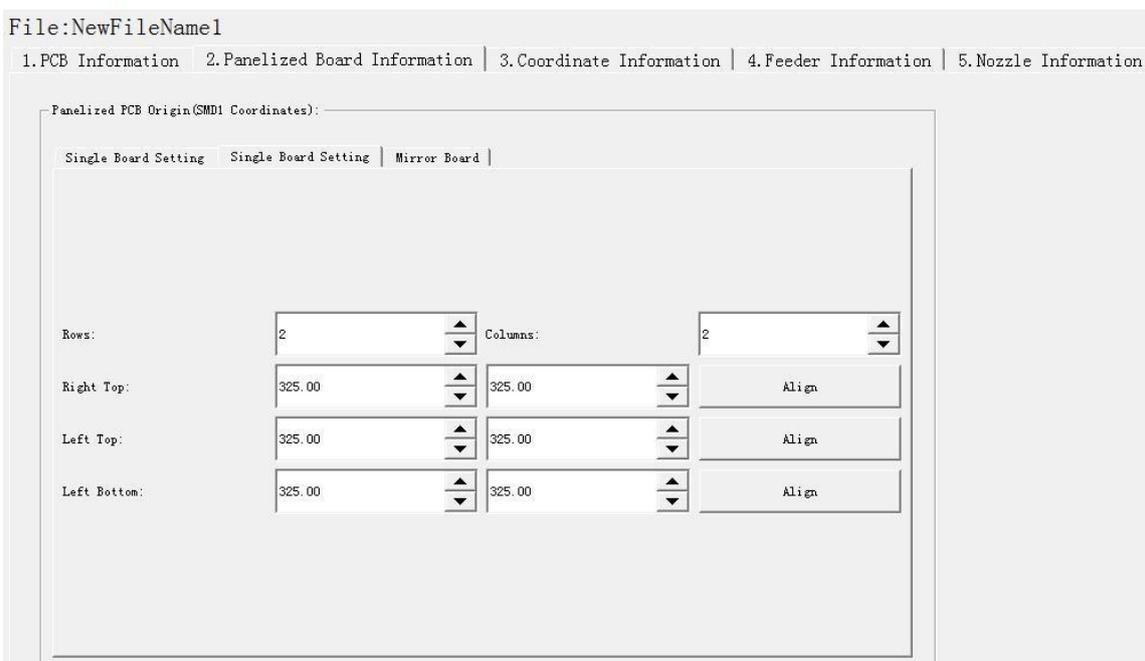
3.1.1 Single board

Click "single board setting", you will see the "align" button of the SMD1 position that means the first component on the component setup. Click "align" to enter the vision align interface, we need find the first component that on the component list,generally we choose the center of the component, see figure



Click “ok”, it will back to the previous interface, click “create panelized list” button, the data which on the panelized list will change. Can see the “SMD1 information” on the list and do double check via “align” button.

3.1.2 Panelized board



The steps of the panelized board programming are similar with the single board, but need pay some attention to several points below

The row and column are determined by the positioning of PCB on working area. The direction along the rails is the column, the direction perpendicular to the rail is row, then please enter data in the row and column.

Please refer to the data collecting method of each position information as following:

- The data of “left bottom” is collected according to first component in the component list of programming file. Press “align” of left bottom, find the left bottom panel that is nearest to the left side and nearest to the feeding position, then find the first component which on the chip list of this panel, align the center of this component. After saving the data, it will return to the “PCB information” automatically.

- The data of “left top”: on the alignment interface, find the left top panel that is nearest to the left side but farthest to the feeding position, then find the component same as the component that aligned on the “left bottom”, align the center of this component. Click save and cancel, it will return to the “PCB information” automatically.
- The data of “right top”: on the alignment interface, find the right top panel that is nearest to the right side but farthest to the feeding position, then find the same component as the component that aligned on the “left bottom”, align the center of this component, click save and cancel, it will return to the “PCB information” automatically.

After setup, click “create panelized list”, the panelized list will be generated accordingly in the blank. You can also double-confirm each position by clicking “Align”.

3.1.3 Mirror board

	X Coordinate	Y Coordinate	Offset X	Offset Y	Angle	Skip	Position
Panel1	325.000	325.000	0	0	0	No	Align
Panel2	325.000	325.000	0	0	0	No	Align
Panel3	325.000	325.000	0	0	180	No	Align
Panel4	325.000	325.000	0	0	180	No	Align

The steps of the Mirror board programming are similar with the Panelized board, but need pay some attention to several points below

- (1) Mirror board includes row panelized and column panelized

Row panelized: several same PCBs are arranged in horizontal direction, and the nearby rows are mirrored

Column panelized: several same PCBs are arranged in vertical direction, and the nearby columns are mirrored

(2) Panelized Board Row and Column

The row and column are determined by the positioning of PCB on working area. The direction along the rails is the column, the direction perpendicular to the rail is row, then please enter data in the row and column.

(3) Please refer to the data collecting method of each position information as following:

After select the corresponding mirror board panelized method(column or row)and data of column&row,may occur the situation of the align interface turn to gray and can't be edited,then no need do position align.

Based on actual mirror board data,right side is showing corresponding images and can find the first component on it.

- The data of “right top” on original board: on the alignment interface, find the right top panel that is nearest to the right side but farthest to the feeding position, then find the first component which on the chip list of this panel, align the center of this component, click save and cancel, it will return to the “PCB information” automatically.

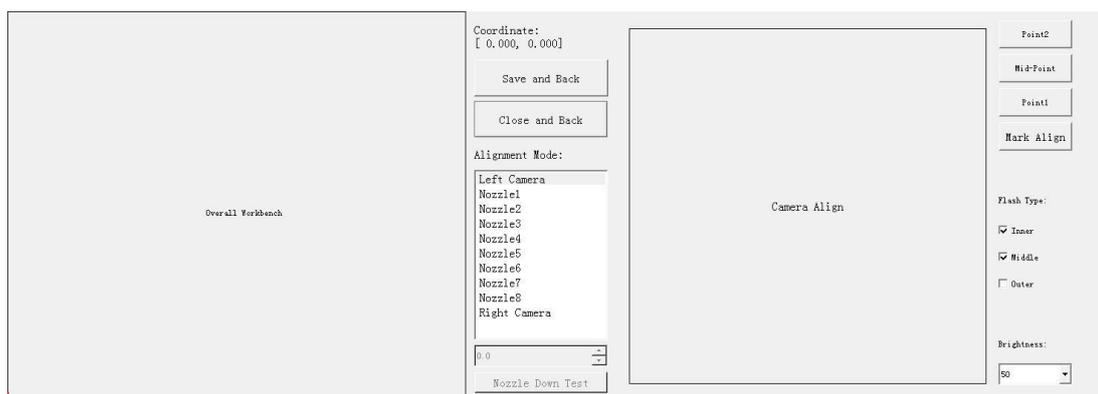
- The data of “left top” on original board: on the alignment interface, find the left top panel, then find the component same as the component that aligned on the “right top”, align the center of this component, click save and cancel, it will return to the “PCB information” automatically.

- The data of “left bottom” on original board: on the alignment interface, find the left bottom panel, then find the component same as the component that aligned on the “right top”, align the center of this component. After saving the data, it will return to the “PCB information” automatically.

- The data of “left bottom” on mirror board: on the alignment interface, find the left bottom panel, then find the component same as the component that aligned on the “right top”, align the center of this component. After saving the data, it will return to the “PCB information” automatically.

After setup, click “create panelized list”, the panelized list will be generated accordingly in the blank. You can also double-confirm each position by clicking “Align”. Note: The angle difference between original and mirror board is 180 degree, original board is 0 degree, mirror is 180 degree.

Introduction of Align interface: See below fig.



Save and Back: After align the center of components, click “save and back” to save the data.

Close and Back: Refer to exit the current interface.

Alignment Method: Include left mark camera, nozzle 1-8, right mark camera, choose the alignment method according to the actual situation, right side will show the real image by mark camera alignment.

Nozzle down test: If choose left or right mark camera alignment method, this function will turn to gray and not available to operate. If choose nozzle 1-8 alignment method, this function will be black and available to operate. Insert a pick height value and then click “nozzle down test” to judge whether the setted pick height is reasonable or not.

Point 1, Point 2, Middle point : Use to confirm the IC center coordinate. For example, if choose alignment method “left mark camera”, first select the first pitch center in left-bottom corner, click point 1, then select the second pitch center in right-top, click point 2, finally click middle point, the machine can calculate out the IC center coordinate.

Light source: outer ring, middle ring, Inner ring, Mark point generally select to use outer or inner ring, select corresponding light source according to PCB kind.

Brightness: Image recognize brightness can be adjusted on the drop-down list

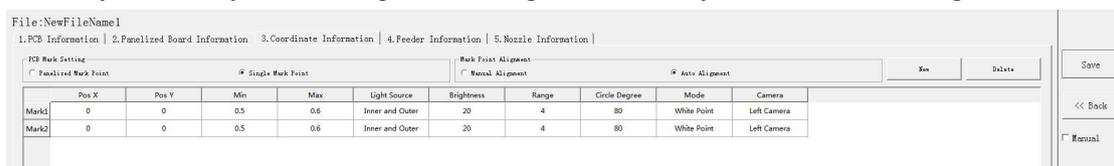
3.2 PCB angle

PCB angle detect should be under the mode of Single board and manual programming, PCB angle will influence the accuracy of mounting. The angle closer to 0 degree the better, and the angel deviation need to be within 1 degree. The angle of PCB is generated according to panelized PCB coordinate, but we can also adjust the angle by manual. Click “Angle Detect” button, according to the index of machine to choose two points, then a new PCB angle will be generated. (Note, the two points need to be paralleled)

4. Coordinate information

4.1 PCB Mark setting

Function: After finishing mark setting, when the machine is working, the specific position and direction of PCB can confirm via setting mark. Only in this way the next step of mounting work can carry out. PCB mark setting interface see below fig.



(1) Panelized mark point

It is mainly used for multiple identical PCB boards consistent of the whole board, when place every panel board, the machine will rescan small panel board’s mark point.

(2) Single mark point

It is mainly used for a single PCB board and multiple identical PCB boards consistent of the whole board (Notice: coordinate programming is done as a single board)

Generally, need to select 2 or 3 mark points.

4.2 Mark point alignment

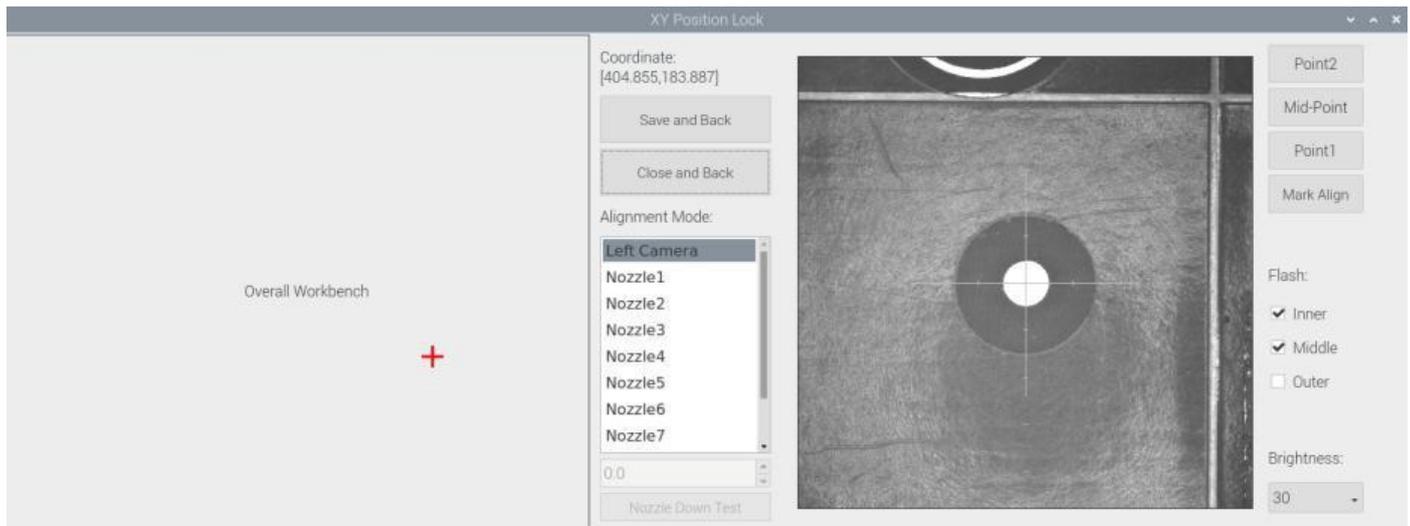
Manual alignment: If there is no mark point on the PCB, which can through some location holes and set up some special reference point manually to replace and confirm reference position. Note: Generally use SMD1 coordinate in chip list and the one that is relatively easy to find far away from SMD1 as mark points, In this way, the relative placement effect will be

better during placement,the reference point is determined manually.

Auto alignment:The machine will scan and align mark points automatically.

4.3 Mark Point information

Mark point Coordinate:Import the coordinate automatically status: the data collection of mark point, which through PCB circuit board to find mark point coordinate information directly, and input directly. Manual programming status:Select mark point on the list and click “align”,enter the image capture page,and then find the center of the mark point via movement, click "Mark align" see below figure, and then click "Save and Back" to go back to main page.



Min, max value: means the size of mark point, it has a floated value, which can prevent recognizing mark point wrongly.

Light source: Dividing into inner and outer, if select the hole as mark point which need to choose the inner of light source; If select bright spot as fiducial which need to choose the outer of light source.

Brightness:The brightness when align the mark point,if select bright spot,generally set 20,can adjust according to actual situation.

Range:If there are interference points near the Mark point, you can input a certain value and ensure identify the Mark point more accurately.

Circle Degree:Input reasonable circle degree value,can avoid interference from other points effectively.

Mode:Dividing into white point and black point, select black point mode if have hole and bright point,select white point mode if have bright point.

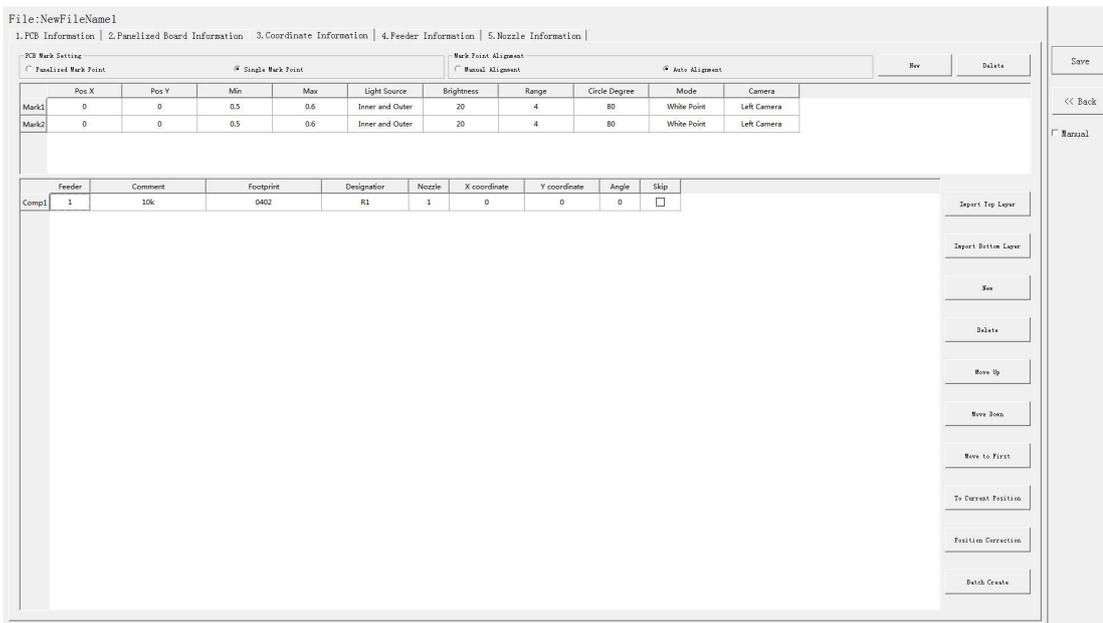
Camera:Support select left camera and right camera(user can select the camera for calibration according to the actual situation),also can select default setting camera,the machine will use corresponding camera during work.

Except for the coordinate of Mark point, the settings of min,max, light source, brightness, range, circle degree, mode, camera are same no matter automatically imported or manually imported.

Mark point add and delete: Click “new”to add the mark point,click “delete”to remove the selected mark point you want.

4.4 Component list setting

Function: display the information and mounting order of components. The components' quantity and mounting information can be added through manual programming or importing files, see below figure:



4.4.1 Manual programming

- (1) Select manual programming;
- (2) Edit the first component: there will be an example component in the component information list, modify the sample component and click position "align", the page will switch to the vision of up-looking camera automatically. Move the camera and find the first component's center coordinate. Click save.
- (3) Fill in the information of component: Stack refers to which stack No. the component located; Nozzle refers to which nozzle used to mounting the component; Specification refers to the component's value; Footprint refers to the common footprint name as 0402,0603,0805 etc; XY coordinate refers to the position of where the component is mounted, align the center position of component, it will display synchronously; The angle is based on the placement direction of components on the circuit board. Transverse is 0 degree or 180 degree, vertical is 90 degree or negative 90 degree, which mainly depends on the polarity of component, degree must be integer degree; Skip setting includes true or false, false means keep mounting, true means skip mounting this component. After finish all parameters' editing, the setting of first component information finish.
- (4) Click 'New' to add one row on the component list. The information will exactly copy from the top row. Click align to find the second component's coordinate. Then click save to edit the other information such as name, value, footprint and angle etc. Keep adding new component until the whole PCB finish. Please note the the stack and nozzle do not need to be edited manually. It can be set through feeder setting interface with 'Assign all sequentially' button to assign the information

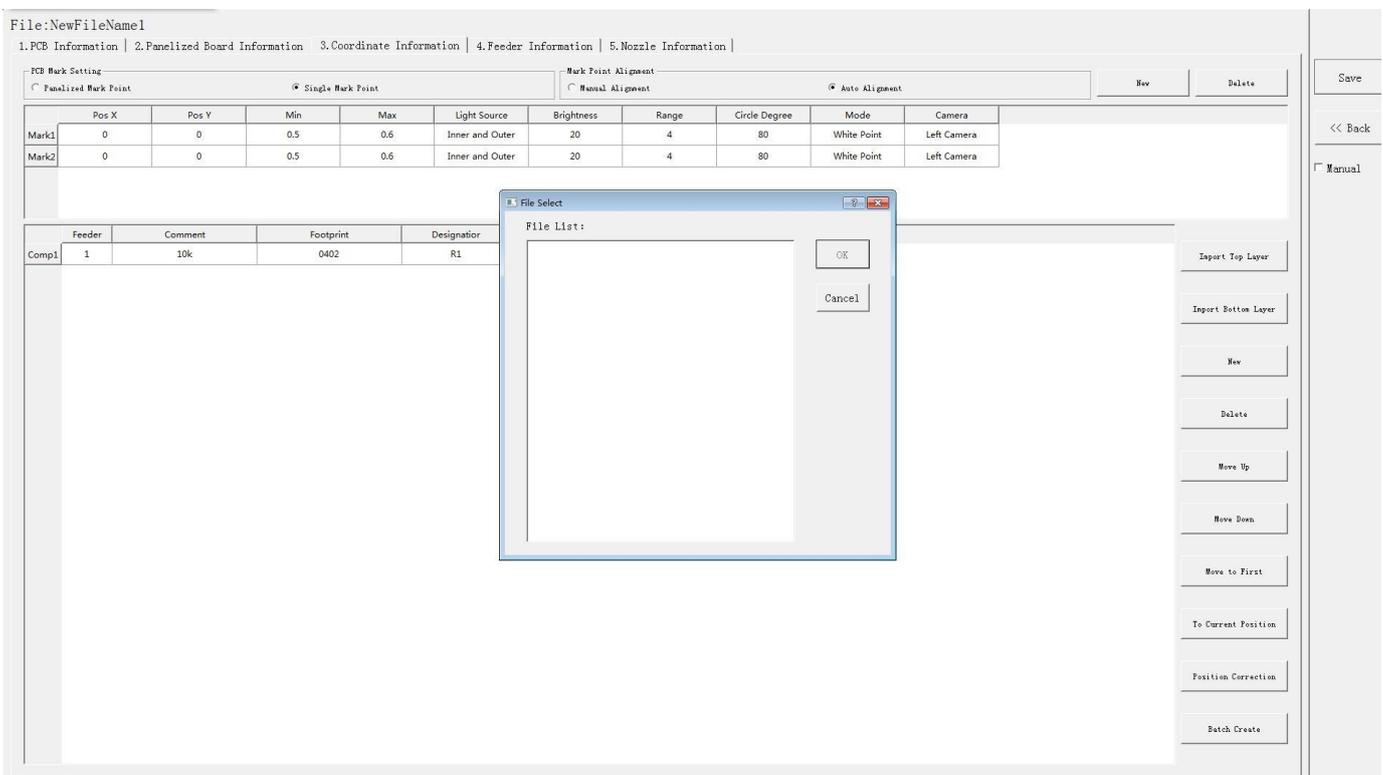
to component list automatically.

4.4.2 Operation introduction of component list

(1) Import the processing file

(2) Export the component coordinate information through computer by choosing metric system CSV format to the USB flash disk.

(3) Plug the USB into the machine, do not choose the manual programming, import the processing file by clicking related layer file import button. The right side click ‘file import top layer’ and the reverse side click ‘file import bottom layer’. It will pop up a selecting window, choose the processing file and click save, the information will be imported to the list. (Note: when import bottom layer, the PCB length, rows and columns of panel board need to be edited before import file)



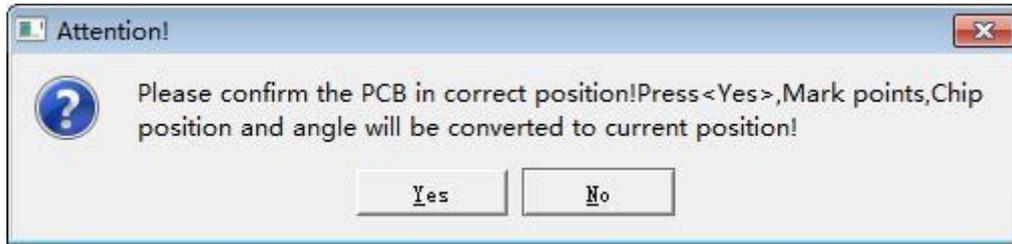
(4) Addition of component: Click ‘New’, the component list will copy one row from the adjacent row, then modify the component information.

Delete component: Select the wrong component row, click delete to remove the component.

(5) Movement of component

When editing, sometimes we need to do a slightly adjustment for the edited file, we have three ways of movement:

- Move up: to move the selected component upward
- Move down: to move the selected component downward
- Move to head position: To move the selected component to the first row. Please notice the first row component must be the same as the first component to place on the PCB.



(6) Convert to current machine coordinate

After finish all editing operation, click convert to current position. It will pop up the above dialogue, click yes, the machine will recognize the fiducials automatically and convert all component coordinate to machine coordinate. After convert successfully, it will pop up a dialogue, click align to check if the components' position are still correct. (Please note: this function only use to inspect the coordinate, cannot be saved)

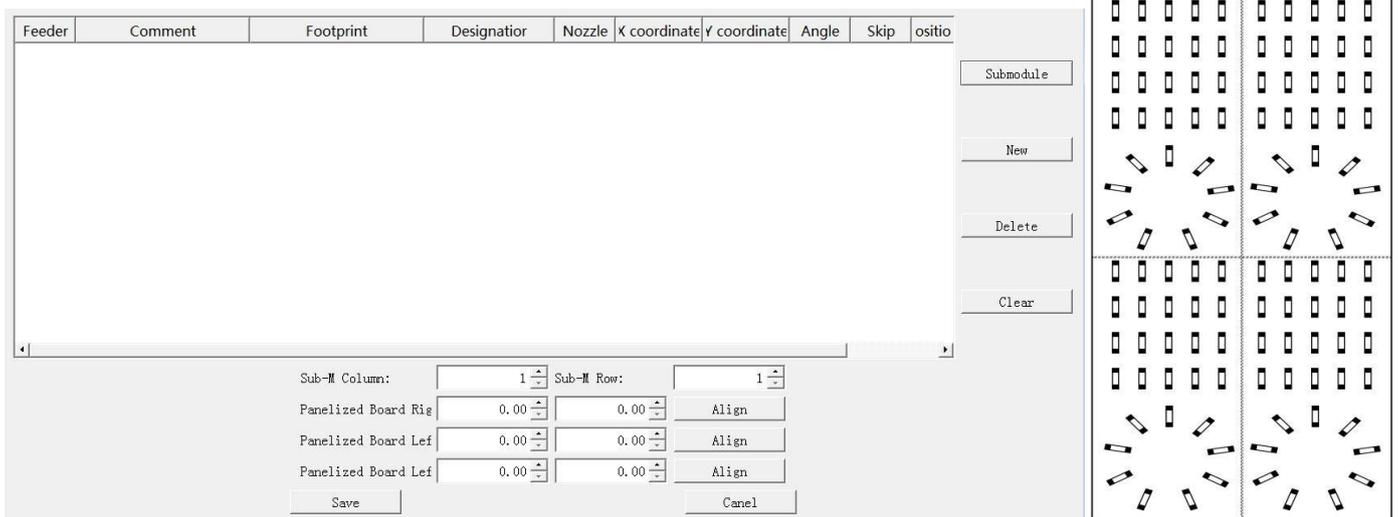
(7) Position correction

After the first mounting, if there is a deviation, please click position correction to enter the new vision page. Click the left mouse button to align the centre of the placed component; Click the right mouse button to align the centre of pad. Then correct next one until finish all component and save. The machine will remember the position after correction. It will fix it automatically at the second placement.



(8) Batch create components

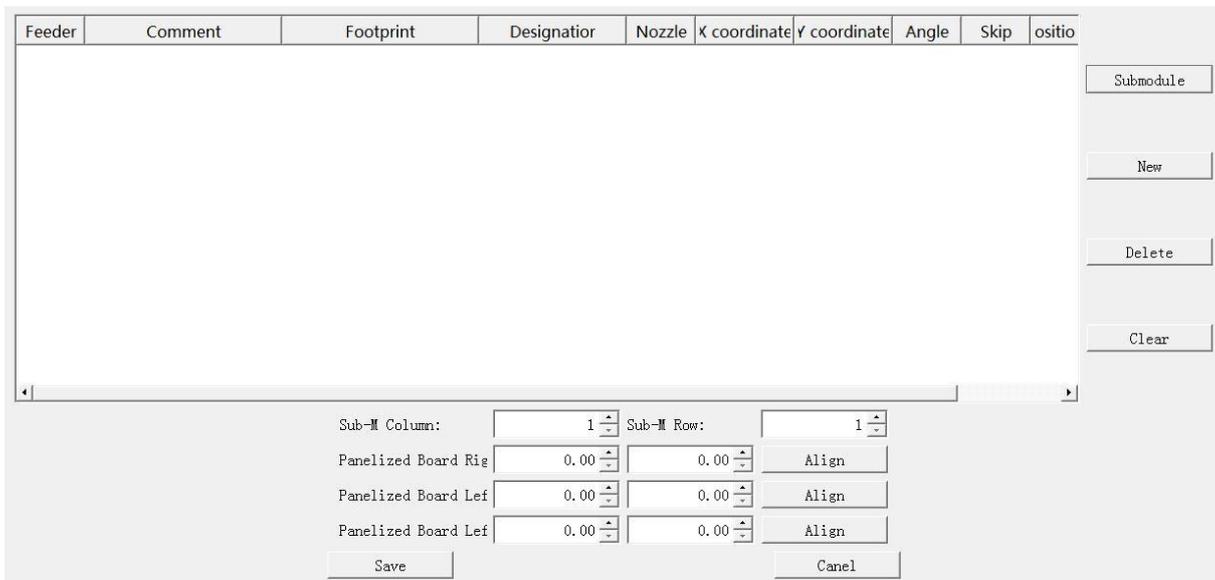
Some circuit boards are relatively regular and easy in real editing situation. For this type of circuit board, we can generate coordinate in batch , the interface as shown in figure:



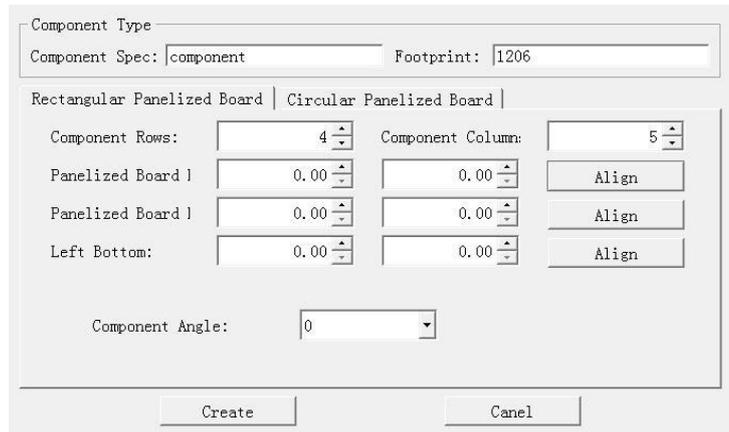
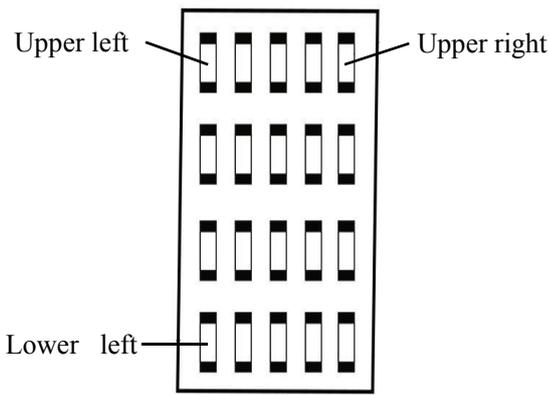
For example: we can see the above picture which has a rectangular block and a circular block to form a small panel. We call such panel as submodule. We can generate the whole panel board through creating a submodule. The whole panel board has 4 panels consisting of 2 rows and 2 columns. Align the 3 head components(right top, left top and left bottom), then generate the submodule, the submodule is shown in the figure.

We also can select stack, nozzle, name, specification and etc. to adjust in this page.

Two ways to generate submodules: rectangle and circle.



①The way to generate rectangle panel: Click: ‘submodule’, below dialogue will pop up. Please fill in specification and footprint of component. We can see the panel has four rows and five columns. Fill in 4 rows and 5 columns in the dialogue, and align the three components(right top, left top, left bottom). The component degree will be based on actual situation. Click ‘create’, the machine will generate all the coordinate automatically.



①The way to generate circle panel

- When the quantity of component is even: Click: “batch create”, below dialogue will pop up. Please fill in specification and footprint of component. Choose circle panel, the component number is 24 as the below picture, the angle is 0. As the quantity of component is even number, we only need to find two symmetry components to align. Click create, the 24 components coordinate will be generate automatically.

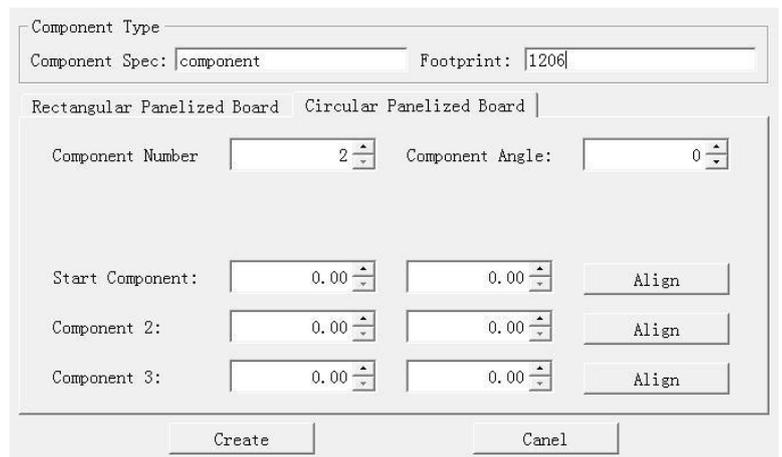
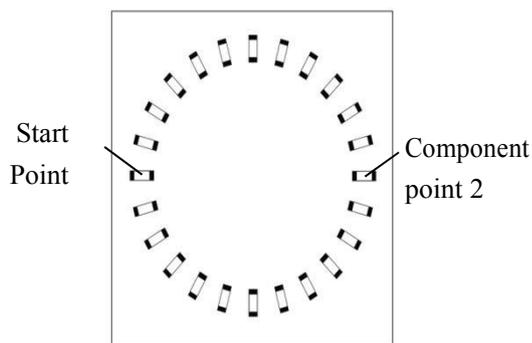
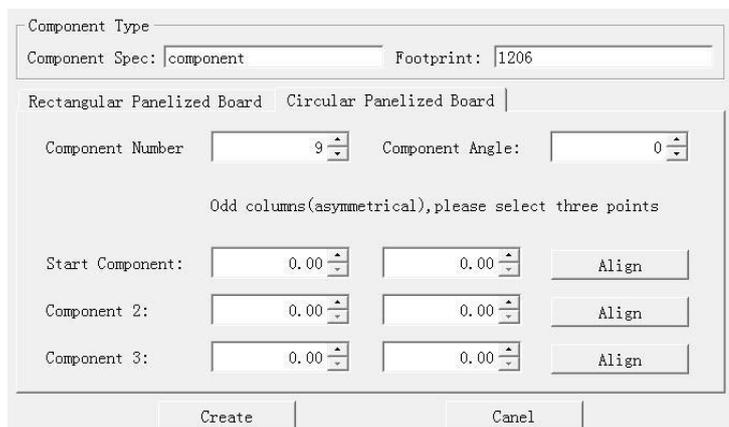
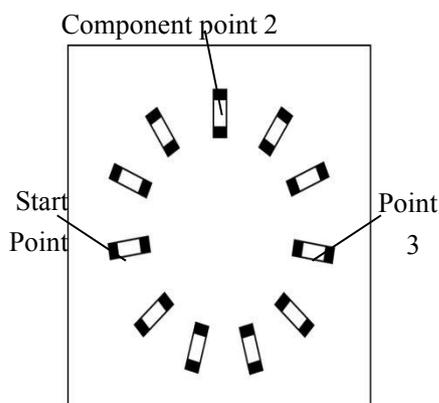


图 (2.1.3.2-6)

- When the quantity of component is odd: the component type will be the same. We can see that the panel has 9 components, as the quantity number is odd, we need to find 3 components that are in isosceles triangle, and then align the coordinates of those three points in turn. Click ‘create’ to generate 9 components’ coordinate in circle panel.



Feeder setting

All components' setting on this files list, like: nozzle selecting, stack setting, the location of pick components, adjustment setting, and others components' setting need to be finished here. We can see that No.1-33 stack on bottom line, No.34-66 stack on top line, No. 67-76 feeders are the tray stack.



5.1 Function of feeder setting interface

- (1) Assign all sequentially: After complete component information setting, click 'Assign all sequentially', the setting information will be assigned to each feeder automatically.
- (2) Assign feeder and nozzle: After complete stack information and nozzle setting, click 'Assign feeder and nozzle', all information will update to the component list automatically.
- (3) Footprint library: The normal component information is saved in the footprint library including name, length, width, height, edge, pitch etc. Please note the detail information for the IC is necessary. The interface of footprint library as below:



Press “Add” button, a new footprint can be edited into the library; For footprints not required, please directly select them and press “Delete” button to move them. Save the setting before exit.

(4)Scale editing for pick position: Press this button, it will show below :



Scale setting for pick position: please select one stack to start setting (default start from the first assigned stack), at the same time, a real-time image will be showed as right side. Please set the red cross to the component center (generally if the feeder is in off condition, red cross will be at the edge of feeder’s tape cover), click “save and next” until all be set well and there will be beep sound as a warning, then click “save and exit” will be OK. After that, you can select any feeder’s pick position as a test.

While setting the pick position, the function of “Feeder open”/ “Feeder close” can help setting the cross position more conveniently.

5.2 Feeder setting

Select one feeder, tick “Apply”, then its related info can be edited such as feeder exchange, feeder, nozzle, IC tray feeder etc.

The setting sequence for them should be: Feeder (or IC tray feeder)→ Feeder basic information→ Nozzle.

P. S.: 1) For feeders 1-66, the IC tray feeder is in disabled condition. 2) Feeder exchange depends on application condition, if the tape reel was installed on wrong feeder, you can directly use feeder exchange to solve it.

(1) IC tray feeder info

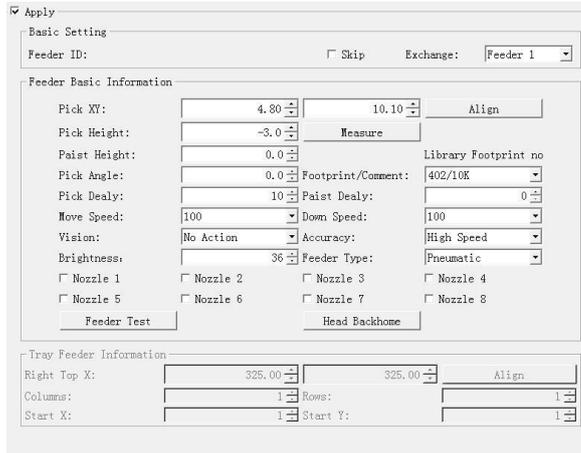
It is used to set tray package component’s pick position.

Tray Feeder Information			
Right Top X:	1.00	1.00	Align
Columns:	1	Rows:	1
Start X:	1	Start Y:	1

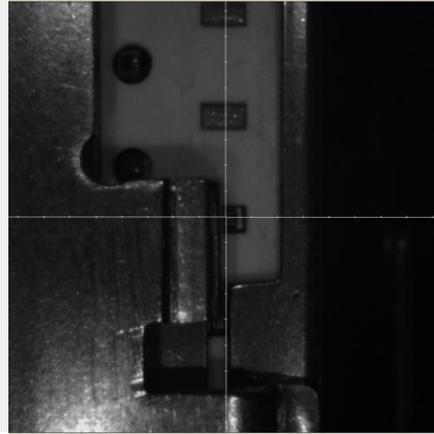
- Right top XY: it refers to align the farthest component on the tray (generally take the component at right top as the final one on the tray, and take the component at left bottom position as the first one)
- X qty: it refers to how many components in X direction
- Y qty: it refers to how many components in Y direction
- Start X, Start Y: It refers to the first IC in X/Y direction if the tray is in full package; If some ICs have been used which cause the tray is not full, you can directly set the exact position as actual situation, start X will be the location of its actual column and start Y will be its actual location of row.

(2) Feeder basic info

- Skip: once selected, all components in this feeder will be skipped.
- Feeder exchange: this function can be used if any reel tape was installed at wrong or inappropriate position. Select the feeder/ IC tray feeder you need to exchange, then the related feeder info will be synchronized to the swapped feeder/ IC tray feeder.
- Pick XY: Align the first component position in the feeder as fig.4.2.2, which is Mark camera align the component central position, then click “save and back”, the well-saved position’s X/Y coordinates will be automatically show up as fig. 4.2.1 (P.S.: pick position can be set one by one or be set by the scale setting, scale setting is more convenient).



(4.2.1)



(4.2.2)

- Initial angle: default is 0°, if any special need, you can modify this angle to change the component's placement direction. Special attention for some chips with direction requirement, such as LED red/green, diode, IC etc.
- Footprint/ Value: Component footprint/ value. Footprint refers to the footprint name like 0603, 0805, 1206 etc., Value refers to component data like 10K, 75Ω etc.
- Pick delay: For special components like large IC and large capacitor, it's better to set some long time on the pick delay to make sure nozzle can pick up them stably.
- Place delay: For special components like large IC and large capacitor, it's better to set some long time on the place delay to make sure nozzle can still suck the component stably during the movement to place on the board.
- Move speed: It is used to control the head movement speed, generally just keep default will be ok. It is need be changed slower while doing some pick test.
- Down speed: It is used to control the nozzle head Z-axis downward speed (Special notice: for lead pitch distance < 0.5mm, please set this to a lower speed).

Vision: Against component to choose applicable vision method. Such as:

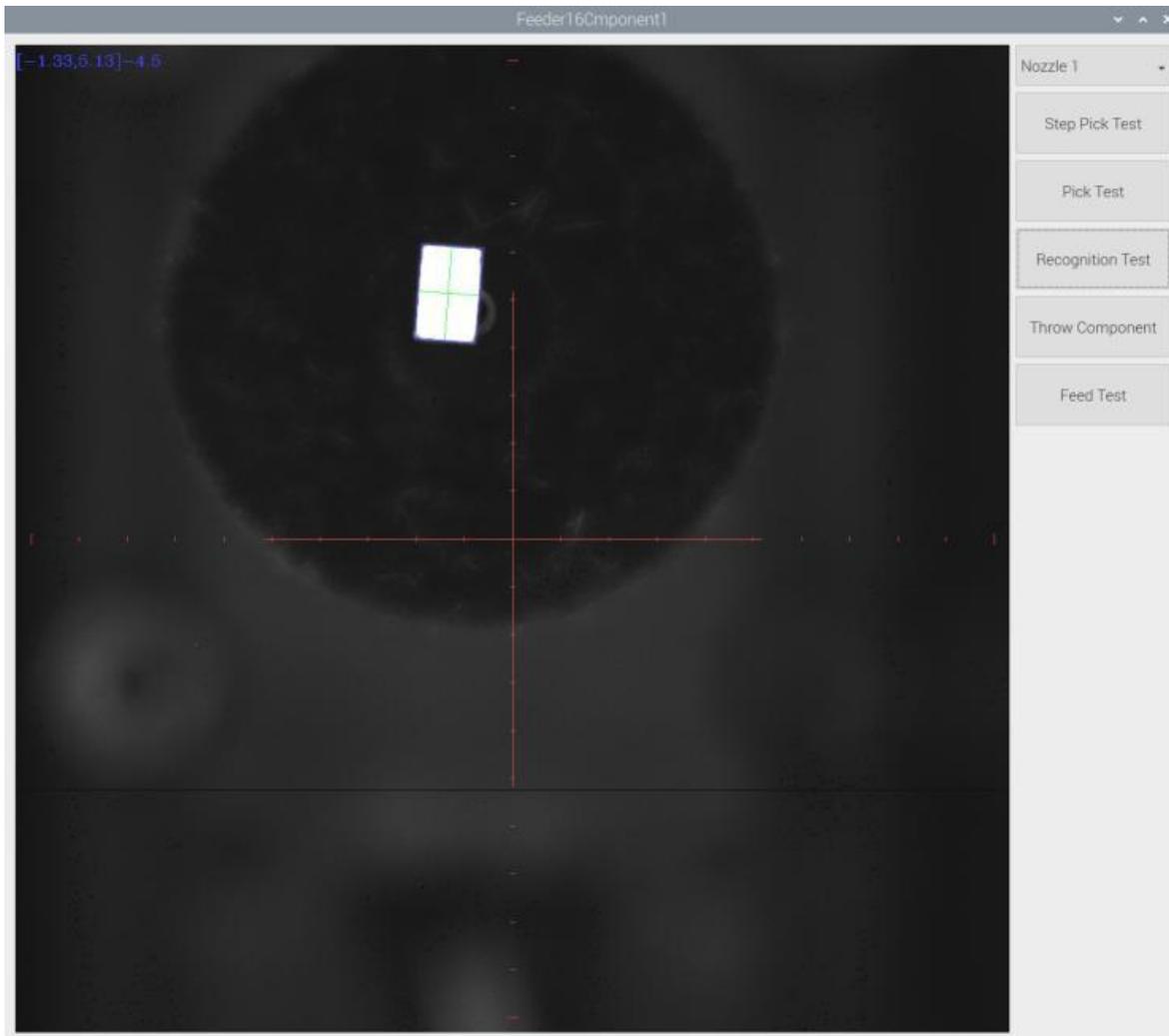
For resistor/ capacitor--- please select Flying calibration

For component which do not require high precision --- you can also select No action

For IC --- you can select IC correction or big IC correction according to different IC sizes. The two methods difference is: IC correction is one shot recognition; big IC correction is separately taking photos for IC's four corners. So, if the IC size more than 35mm, please directly select big IC correction method.

- Accuracy: Generally normal resistor/ capacitor is default as high speed mode, do not need to modify it; For IC, please select high accuracy mode.
- Brightness: it refers to the brightness of component recognition (after be picked up) in assembly procedure.

- Feeder type: Pneumatic and Electric two types for selection.
- Nozzle: You can select single or several nozzle in different cases, once selected, they'll be automatically assigned to each feeder. Notice for edge position feeders, you can just use limited nozzle head to pick up components. If you're not sure, just click "Feeder Test" button under the nozzle selection part. It will pop out below, you can test which nozzle is available to pick up component from this selected feeder. Details for each button:



- Select the nozzle head you need to test
- Step pick test: the operation is, click this button after nozzle selected → the nozzle head will move to this feeder → feeder cover open → the nozzle down to pick up component → taking photo → throw component. This is sing step operation, it can help the operator check if pick position/ pick height correct or not. If with problem, then can be re-set in feeder basic setting.
- Pick test: after nozzle selection, click this button, the head will move to feeder position and finish the pick up step without any pause.
- Recognition test: After the "Pick test" with component be picked up, then click this "Recognition test" to show the

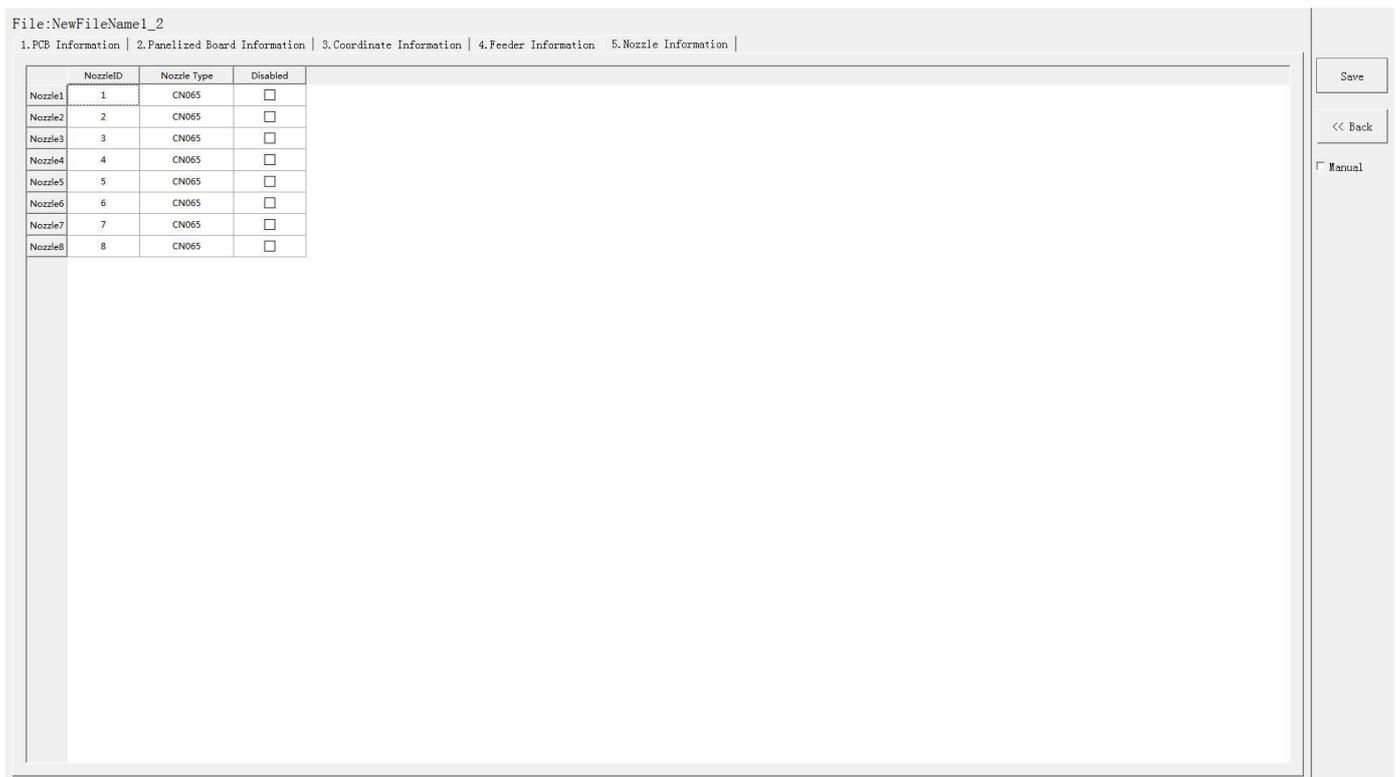
photos taken by flying camera. If the photo showed with problem, you need to do some adjustment for the problematic recognition.

- Feed test: feeding component, this is used to test if the feeder works normally.

After above be set ready, click “component assign to feeder”, then component list will also be updated accordingly. Click save.

6.Nozzle Information

This interface will record which kind nozzle be installed on each nozzle head.



7. Assembly Interface

Choose the programmed file, click “Mount”, it will go into assembly interface as below:

File:NewFileName1 Count1

Section 1 |

Panelize board: Chip list:

Skip	Feeder	Comment	Footprint	Designator	Nozzle	X coordinate	Y coordinate	Angle	Skip
	1	10k	0402	R1	1	0	0	0	<input type="checkbox"/>

Current speed(50%):

Throw: 0 Rate: 0%

Log:

display 1 display 2 display 2 display 4 display 5 display 6 display 7 display 8

- (1) Left part is detailed chip list, and following the highlight blue will get a real-time assembly situation;
- (2) On right top is the current assembly speed, you can drag the scroll bar to change it and the max is 100%;
- (3) Log will show some information like rate of throw component , current average speed and how many pieces components have been assembled under the current file.
- (4) Throw and Rate will make a statistics for threw components and you can also check each feeder's component pick failure rate then get which kind of component is easily pick failure, find solution to solve it.
- (5) The bottom side 8 display windows are real-time feedback for component recognition.
- (6) Right side buttons introduction:
 - Start: Machine starts the current file's assembly procedure.
 - Step: operation for each single assembly procedure.
 - Stop: Stop current assembly work.
 - Config: press this button, a detailed configuration will pop out as below

The screenshot displays a software interface with three main configuration panels and two buttons on the right. The 'Tracks Configuration' panel includes a 'PCB Raise' button, a numeric input field set to '100.0', and a 'Width Set' button. The 'Debug Set' panel contains checkboxes for 'Mark Alignment Debug' and 'Support Step Detailing', a 'Log Level' dropdown menu set to '5', and an 'Open Picture Log' button. The 'Placement Configuration' panel features checkboxes for 'Support Simultaneously Pick', 'Pick-up Height Measure', 'Rail Continuous Mounting', 'Pick Up Position Optimization', and 'Position Optimization After Place'. On the right side, there are 'Save' and 'Back' buttons.

Tracks configuration: PCB Raise and Width Set are totally same as PCB Information interface.

Debug Set: details can be showed once you select the related item.

Support step detailing: once selected, every time you click “Step”, the machine will only execute one command. **This is strongly recommended for the first assembly procedure.**

Log level: the level sequence from low to high is from class1 to class5. Higher level, more information.

Open picture log: press this button, the file for stocking recognition photos will be opened from which recognition details can be checked.

Placement configuration:

(1) Support simultaneously pick: once selected, the nozzle head with same pick height can be downward to pick components at the same time, it will greatly improve placement speed (**It is recommended for component size bigger than 0603**).

(2) Rail continuous mounting: this is for PCB continuously feeding to realize automatic operation.

(3) Pick up position optimization: once selected this function, nozzle head can automatically optimize the pick position (**It is recommended only for small components**).

(4) Position optimization after placement: If this function be selected in the first time, the position will be auto optimized in future placement.

Exit: once assembly finished, please directly click this button and back to home interface.

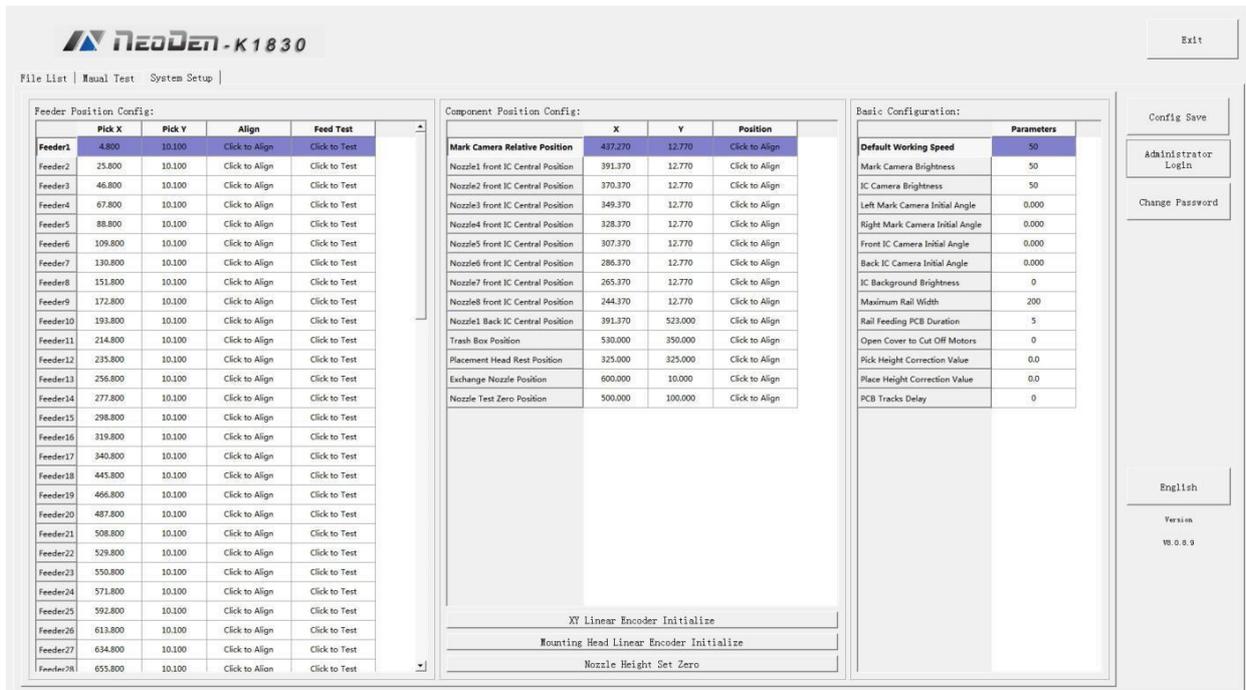
File edit: If there're many times of pick failure or big placement offset, which need to re-edit the file, please directly press this button and it will directly turn to the file edit interface, after edit finished, save and back to the assembly interface will be OK.

8. System Setup



Warning: this part aims at machine's global parameter settings, any modified parameter will influence all working files, when modify this part please consider seriously.

If any revision is required, we suggest you contact our engineer to get detailed instruction first. (P.S. All parameters were set up before shipping, usually no adjustment is required.) This section will provide a brief introduction for all parameters, to get detailed adjustment instruction, please contact our technical engineer.



Right buttons functions:

Config save: to click Save after changing the parameter

Administrator login: to prevent any misoperation, this interface will be inactive and greys out. To make it inactive, Administrator needs to login.

Change password: before Administration login in, this function is not visible.

If the password needs to be changed, please login and click Change password. A window will pop out, enter the original password. Then follow steps to enter the new password. A successful window will pop out when it's finished.

Version: the current software version will be displayed below.

When any software upgrade is required, please copy the upgrade file into the subdirectory of U disk, click “software upgrade” to load it. Then follow instructions to upgrade it.

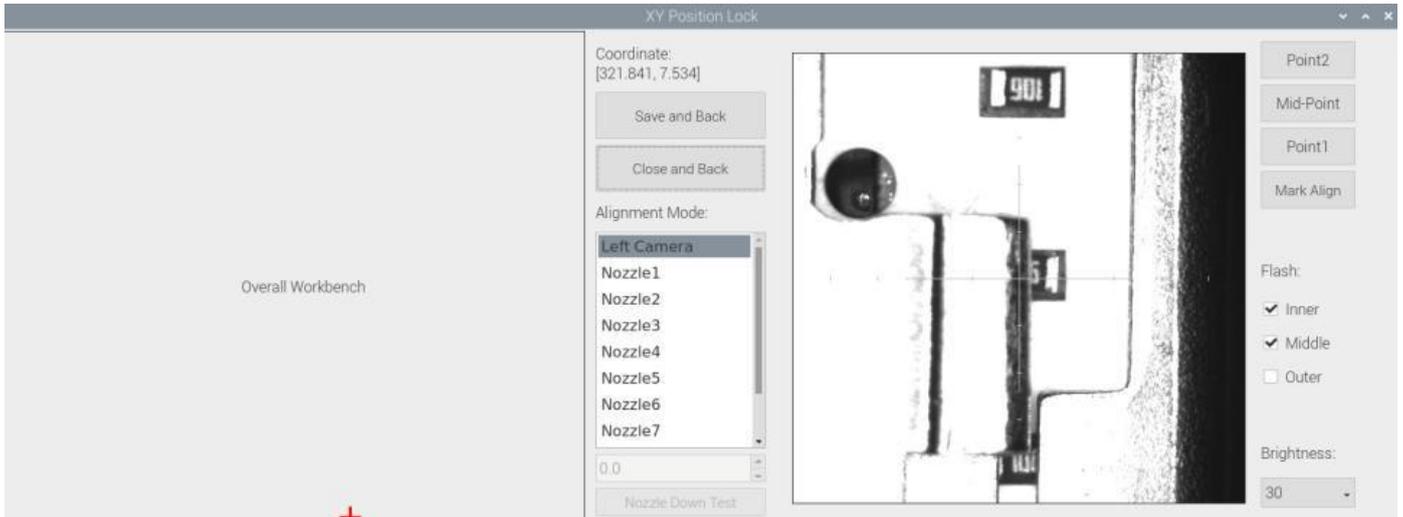
English: this machine supports Chinese and English. To convert it into English, a password is required.

8.1 Feeder Position Config

This interface is used to setup pick offset and test feeding for each feeder.

Feeder Position Config:				
	Pick X	Pick Y	Align	Feed Test
Feeder1	4.800	10.100	Click to Align	Click to Test
Feeder2	25.800	10.100	Click to Align	Click to Test
Feeder3	46.800	10.100	Click to Align	Click to Test
Feeder4	67.800	10.100	Click to Align	Click to Test
Feeder5	88.800	10.100	Click to Align	Click to Test
Feeder6	109.800	10.100	Click to Align	Click to Test
Feeder7	130.800	10.100	Click to Align	Click to Test
Feeder8	151.800	10.100	Click to Align	Click to Test
Feeder9	172.800	10.100	Click to Align	Click to Test
Feeder10	193.800	10.100	Click to Align	Click to Test
Feeder11	214.800	10.100	Click to Align	Click to Test
Feeder12	235.800	10.100	Click to Align	Click to Test
Feeder13	256.800	10.100	Click to Align	Click to Test
Feeder14	277.800	10.100	Click to Align	Click to Test
Feeder15	298.800	10.100	Click to Align	Click to Test
Feeder16	319.800	10.100	Click to Align	Click to Test
Feeder17	340.800	10.100	Click to Align	Click to Test
Feeder18	445.800	10.100	Click to Align	Click to Test
Feeder19	466.800	10.100	Click to Align	Click to Test
Feeder20	487.800	10.100	Click to Align	Click to Test
Feeder21	508.800	10.100	Click to Align	Click to Test
Feeder22	529.800	10.100	Click to Align	Click to Test
Feeder23	550.800	10.100	Click to Align	Click to Test
Feeder24	571.800	10.100	Click to Align	Click to Test
Feeder25	592.800	10.100	Click to Align	Click to Test
Feeder26	613.800	10.100	Click to Align	Click to Test
Feeder27	634.800	10.100	Click to Align	Click to Test
Feeder28	655.800	10.100	Click to Alian	Click to Test

The left column refers to feeder No., Pick X and Pick Y refer to the coordinates of pick offset. After “click to align”, this interface will be displayed. Align the center of component (edge of tablet), then save it.



8.2 Component Positions Setup

Component Position Config:

	X	Y	Position
Mark Camera Relative Position	437.270	12.770	Click to Align
Nozzle1 front IC Central Position	391.370	12.770	Click to Align
Nozzle2 front IC Central Position	370.370	12.770	Click to Align
Nozzle3 front IC Central Position	349.370	12.770	Click to Align
Nozzle4 front IC Central Position	328.370	12.770	Click to Align
Nozzle5 front IC Central Position	307.370	12.770	Click to Align
Nozzle6 front IC Central Position	286.370	12.770	Click to Align
Nozzle7 front IC Central Position	265.370	12.770	Click to Align
Nozzle8 front IC Central Position	244.370	12.770	Click to Align
Nozzle1 Back IC Central Position	391.370	523.000	Click to Align
Trash Box Position	530.000	350.000	Click to Align
Placement Head Rest Position	325.000	325.000	Click to Align
Exchange Nozzle Position	600.000	10.000	Click to Align
Nozzle Test Zero Position	500.000	100.000	Click to Align

XY Linear Encoder Initialize
Mounting Head Linear Encoder Initialize
Nozzle Height Set Zero

Function: this interface is mainly used to calibrate nozzles' positions.

P.S. Password is required to activate the items to avoid misoperation, please contact technical engineer before calibrating.

1.Fiducial Camera Relative Position



Steps:

- Put a cooling pad on PCB, click “Rails 2” and fix the PCB on rails.
- Go to the Manual Test interface, move the head to make the nozzles stay above the cooling pad, then click “Nozzle 1 Trail” and “Back”.
- Go to the System Setup interface, “click to align” on Fiducial Camera Relative Position. A prompt window will pop up, “If continue to leave trace at current position?” After clicking “Yes” to enter this interface (see Figure), then click “Nozzle 1 Trail”, the nozzle will move downwards and rotate until get a round mark. Follow the same steps to get the trail of Nozzle #8 , then check the offset between the round mark and the white crosshair, if it’s within 0.1mm, the trail is done.

P.S. If the offset is overly beyond 0.1mm, please kindly contact NeoDen support team.

Mark Left Position: to use the left camera align the round mark

Mark Right Position: to use the right camera align the round mark

Exit: exit without operation

Save: save the date after operation

Brightness: the brightness of mark camera can be adjusted accordingly.

3.IC Camera Position

- Nozzle 1 front IC Central Position: click to align, nozzle 1 will move to front IC camera and take photos. Once the photo is displayed, to align the central position of nozzle with white crosshair and save the data.(P.S. Once the Nozzle 1 front IC Central Position, nozzle 2-8 central position will be changed based on nozzle 1.) Apply the same operation for Nozzle 2 front IC Central Position and Nozzle 8 front IC Central Position.
- Nozzle 1 back IC Central Position: click to align, nozzle 1 will move to back IC camera and take photos. Once the photo is displayed, to align the central position of nozzle with white crosshair and save the data.

4.Trash Box Position: after Administration Login, click to align the position of trash box accordingly.

Placement Head Reset Position:after Administration Login, click to align the position of Placement Head Reset accordingly.

Exchange Nozzle Position:after Administration Login, click to align the position of exchanging nozzles accordingly.

5.XY Linear Encoder Initialize



Warning: this is only for factory setting. DON'T click before getting any instruction from NeoDen technical engineer.

6.Mounting Head Linear Encoder Initialize



Warning: this is only for factory setting. DON'T click before getting any instruction from NeoDen technical engineer.

7.Flying Photograph Test: click ctrl+t shortcut keys to show this test function. Click to test, the central positions of nozzle 1-8 will be displayed. Select front camera, back camera, direction, speed before clicking photograph, a photo will be displayed after that.

Photo of Nozzle 1	Photo of Nozzle 2	Photo of Nozzle 3	Photo of Nozzle 4
Photo of Nozzle 5	Photo of Nozzle 6	Photo of Nozzle 7	Photo of Nozzle 8

Speed:

Camera: Front Cam Rear Cam

Direction: Left→Right Right→Left

8.Nozzle Height Set Zero



Warning: this is only for factory setting. DON'T click before getting any instruction from NeoDen technical engineer.

8.3 Basic Configuration

Basic Configuration:

	Parameters
Default Working Speed	50
Mark Camera Brightness	50
IC Camera Brightness	50
Left Mark Camera Initial Angle	0.000
Right Mark Camera Initial Angle	0.000
Front IC Camera Initial Angle	0.000
Back IC Camera Initial Angle	0.000
IC Background Brightness	0
Maximum Rail Width	200
Rail Feeding PCB Duration	5
Open Cover to Cut Off Motors	0
Pick Height Correction Value	0.0
Place Height Correction Value	0.0
PCB Tracks Delay	0

Fiducial Camera Brightness and IC Camera Brightness: the brightness of each camera is set before shipping, it can be adjusted during operation.

Fiducial Camera Initial Angle and IC Camera Initial Angle:



Warning: both data are set up before shipping, no extra adjustment is required.

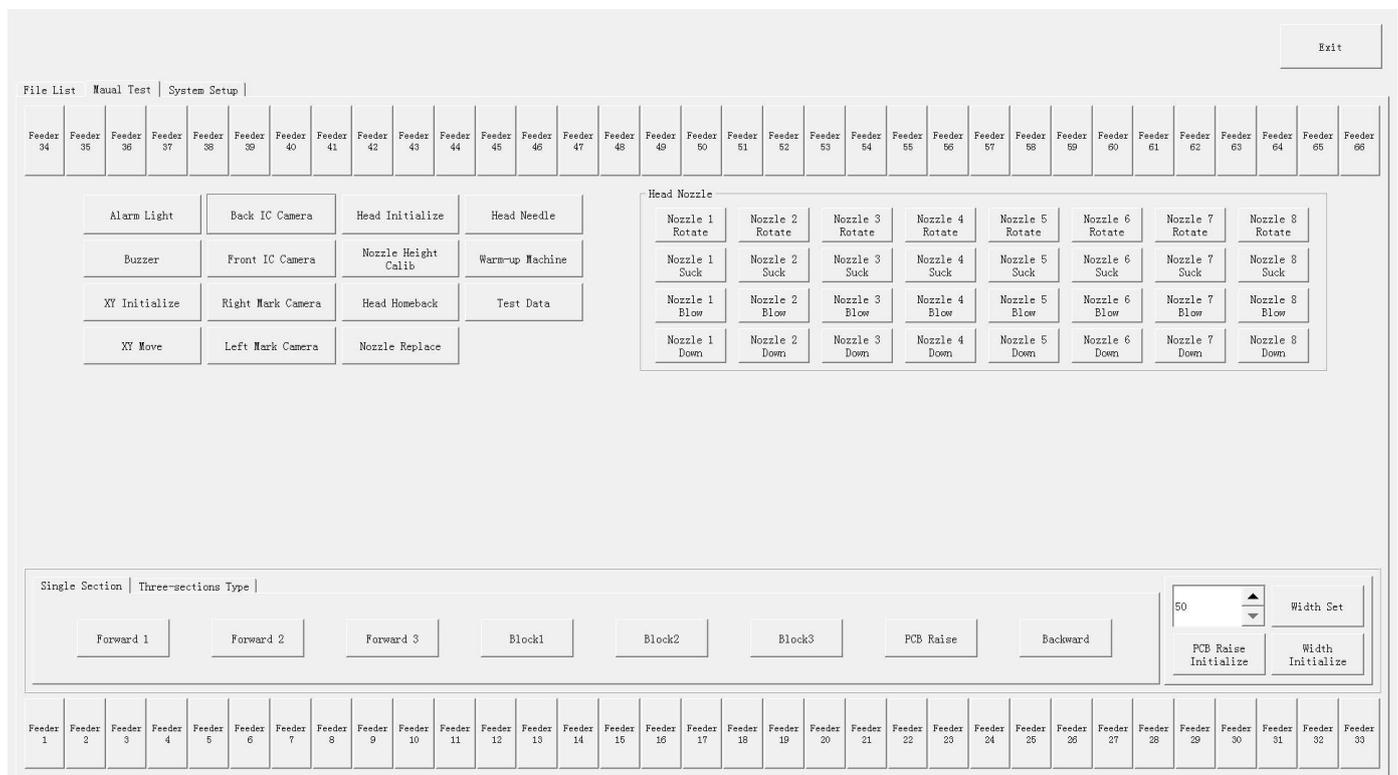
There is a risk to lead to malfunction condition, please kindly contact technical engineer before operation.

Rails Feeding Time: the time it costs to feed a PCB from conveyor to Rail #1 when the machine is in continuous production.

Safety cover: to prevent any body damage during picking and placing, enter value 1 to activate the function of cutting off power for motors when the safety cover is opened.

9. Manual Test

This interface is used to test each part's function.



1. Feeder No.1-No.66: after loading tape reel on feeder, click the feeder to test its feeding function.
2. Alarm light: click it to test if the light could work correctly, the color should change from red, green to yellow by sequence.
3. Buzzer: click it to test if it works
4. XY initialize: click to have XY back to zero
5. XY Move: click this button to enter vision interface, the movement mode are optional, use the crosshair to move the head.
6. Front IC Camera, Back IC Camera: click to test the photograph function.
7. Right Mark Camera, Left Mark Camera: click to test the photograph function.
8. Head initialize: head initialization can be executed before mounting
9. Nozzle Height Calib: click to calibrate 8 nozzles' initial heights
10. Head Home back: click to move the head back to original left top position
11. Nozzle Replace: click to replace nozzles, the head will move to its position for easier replacement.
12. Head Nozzle: click to test rotation, suction, blow and moving down functions of nozzle NO.1-NO.8.
13. Width Set: after the initialization of rails width, enter the expected width, click Width Set, the rails be widened accordingly

14. PCB Raise Initialize: initialize the PCB raise function

15. Width Initialize: initialize the width of rails back to zero.

10. First trial and test

10.1 Program first dry run

Usually we would suggest you to have a dry run (no components are loaded) before production test. After it goes smoothly, you can start to produce few boards.

10.2 First production test

- 1 Make a programming file
- 2 Test the file to pick and place components.

10.3 Component Inspection

Inspection items

- Check if the specification, direction, polarity of components is aligned with what they should be.
- Whether the components are damaged or the pins are distorted.
- Whether the component is off beyond allowance.

The inspection methods vary from the equipment that you have.

Except visual inspection, all of amplifier, microscope, online or offline AOI equipment can be applied if the pitch of IC is quite small to check.

Please follow SOP to do inspection or any other general standards (IPC Standard and SJ /

T10670-1995 SMT

General Technical Requirements). Adjust the programming file according to the placement effect after the first production test.

If there is any issue of specification, direction and polarity, please follow process file to amend. If the components are off, please adjust the file by following two methods

1. If the placement effects of all components are off in the same direction, it would be the fiducial issues. Please resolve this issue by adjusting the coordinate of fiducials according to its value of deviation

2. If there are several components off beyond allowance, you'd better adjust their coordinates on working file with down-looking camera. If there are couple of issues occur during test, some other points need to be considered.

- Frequent pickup failure. Some suggestions are listed below

(1) The pick height is inappropriate, please revise the value after an inspection or a pick-test

(2) The pick offset needs an adjustment, it should be aligned with the center of component reel

slot rather than that of component.

(3) Due to peel strength or installation issue of wasted film, the film on tape won't be peeled completely

(4)The nozzle was blocked

(5) The nozzle is damaged or has a crack

(6) The size issue of nozzle would cause air leakage or insufficient suction.

(7) The air hose is blocked or has a leakage problem, and even the pump has an issue.

●Frequently throwing components. Some suggestions are listed below,

(1) Up-looking camera can't take a clear picture of component due to brightness issue for example.

(2) The pins are distorted

(3) The size or shape isn't aligned with that in "Footprint library"

(4) The size of nozzle is inappropriate or insufficient suction. (5) The nozzle has solder paste or rubbish cause air leakage

(6) The nozzle is damaged or cracked cause air leakage

10.4 Continuous SMT production

Follow the SOP to start production

Notes:

(1) Do not touch the surface to board to avoid damaging the printed solder paste.

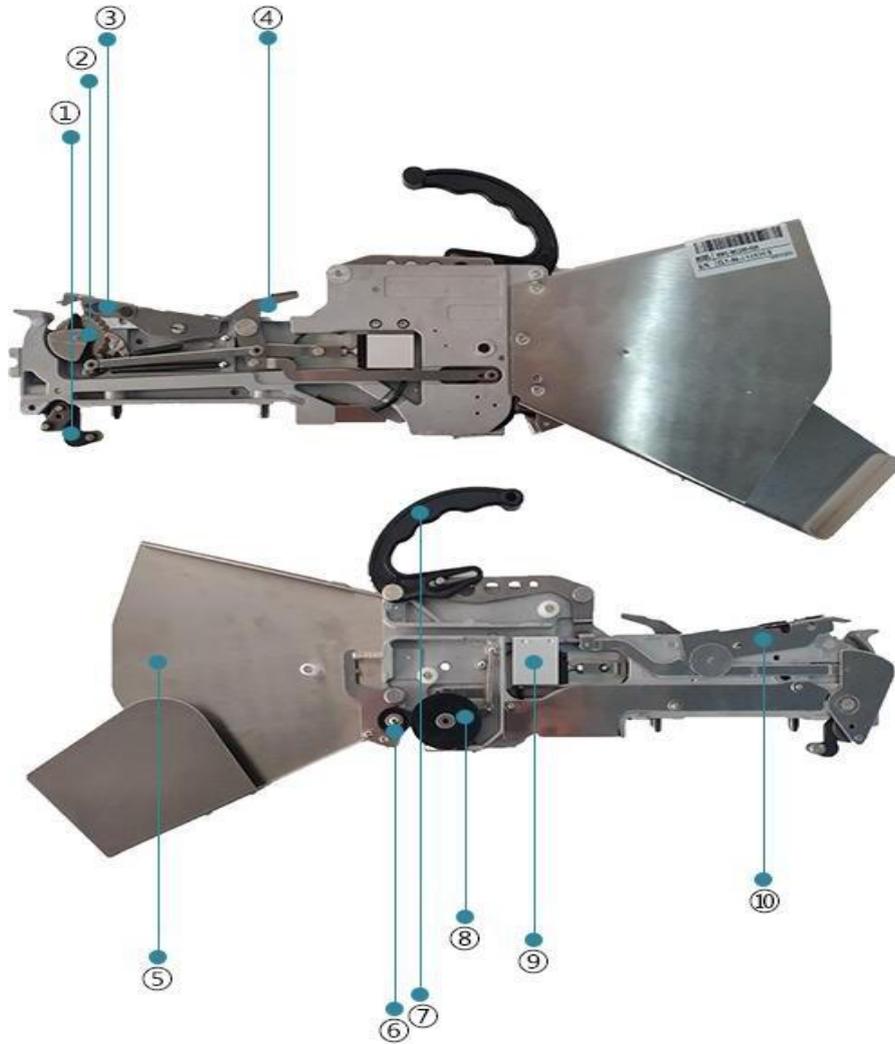
(2) When the error message occurs, please check out and solve it a.s.a.p.

(3) Once reloading the component during production, pay attention to the model, specification, polarity and direction of components.

(4) Clear the reject box timely to avoid wasted materials stacked too high to damage the mount head

11. Structure and maintenance instruction

11.1 Feeder Brief Introduction



- | | |
|------------------------------|---------------------|
| ①Front fixed buckle | ⑥Single-track wheel |
| ②Material-sending wheel gear | ⑦Hand Shank |
| ③Press material cover | ⑧Tape coiling wheel |
| ④Locking Claw | ⑨Cylinder |
| ⑤Tail board | ⑩Snap joint cover |

11.2 Installing tape and reel components



图 1



图 2

1. Making the feeder in open status to wait for installing the tape reel ①Lift up the feeder fixing handle; ②Press the material-sending handle with left hand ③meanwhile press the lamellule at right side of the feeder with your right hand; ④loosen the material-sending handle, ensure the proper wrapped (see figure 1) then loosen the lamellule

2. Installing the tape and reel components: setting the reel on reel storage at the back side of the feeder, pull out approximately 10cm length tape, separate the film and tape, then put into transfer storage (see figure 1). The tape should be closely matched with the gear, and the film should pass through the upper denomination groove (see figure 2) through two white guide wheels and then be sandwiched between two gears.



图 3

1. Finish installing tape and reel components

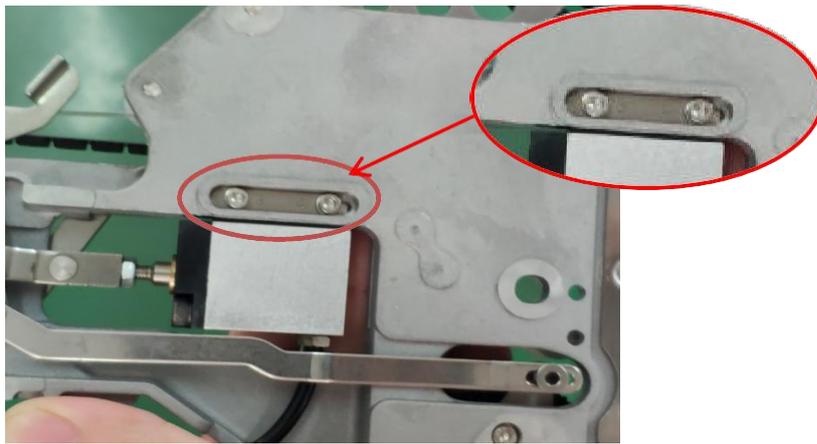


图 4

For 12mm,16mm width feeder, the feed rate can be adjusted by adjusting the parameters of the feed regulator.

11.3 Incorrect installation Samples:

1. Incorrect setting of reel in reel storage (see figure.5)

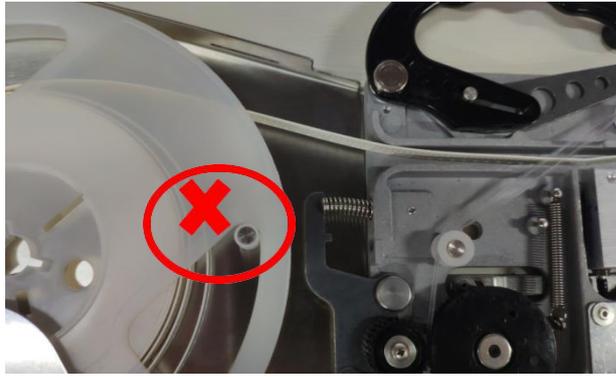
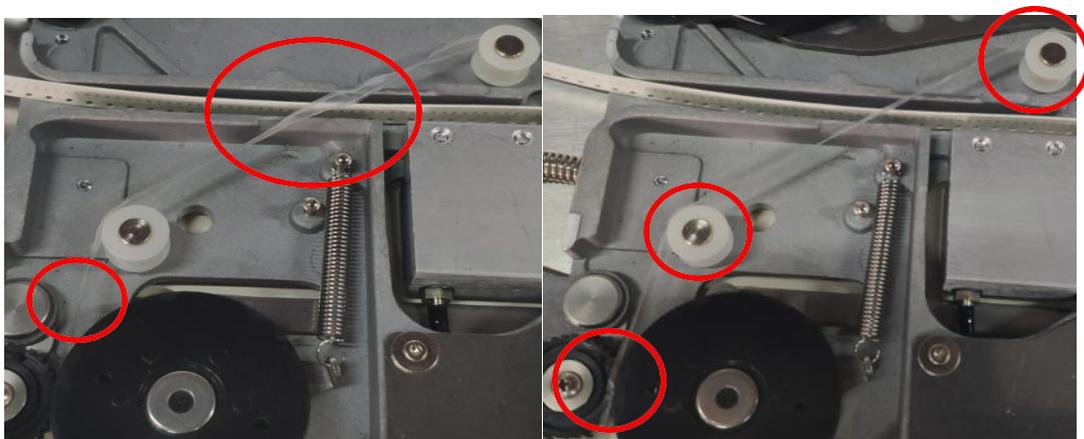


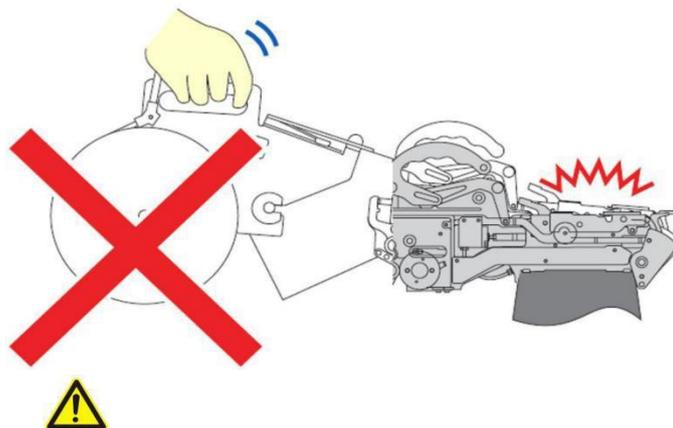
图 5

2. The film is twisted, not tight enough, or the film is not between the white guide wheel and the black gear



3. Cautions: Strictly refer to the instruction manual to use the feeder, and non-standard operation is strictly forbidden

Warning: when installing the feeder, if feel the hand press is not strong, or loose match in place, then it is forbidden to operate. Otherwise will cause feeder floating in the operation and collision problem. In case of this situation, please contact the after-sales department of our company



Warning: when installing the feeder on the equipment, make sure there is no foreign matter on the feeder fixed plate, and make the bottom surface of the feeder fully fit with the fixed plate. The handle is the main way to lock the feeder, so pls pay attention to protect this part. (Note: Don't move the feeder while the equipment is running, or it may cause collision problem.)

11.3.1 Nozzle

The size of the nozzle

Please choose nozzles according to the shape and size of components.

Table1-1 Nozzle

Type	Regular	Regular	Regular	Regular	Regular	Regular	Regular	Regular
Model	CN030	CN040	CN065	CN100	CN140	CN220	CN400	CN750
Illustration								
External Diameter	0.6mm	0.8mm	1.0mm	1.8MM	2.0mm	3.6mm	5.0mm	9.0mm
Inner Diameter	0.3mm	0.4mm	0.7mm	1.0MM	1.4mm	2.2mm	4mm	7.5mm
Type	Special	Special	Special	Special	Special	Special	Special custom	
Model	YX01	YX02	YX03	YX04	YX05	YX06	-	



The reference of nozzles selection

In order to ensure the placement accuracy, please select nozzles according to the shape and size of components

Table 1-2 size comparison of Nozzles

Model	Recommendation (Imperial system)
CN030	0201
CN040	0402 (optimal)
CN065	0402、0603 etc.
CN100	0805、diode、1206、1210 etc.
CN140	1206、1210、1812、2010、SOT23、5050, etc.
CN220	SOP series ICs、SOT89、SOT223、SOT252, etc.
CN400	ICs from 5 to 12mm
CN750	ICs bigger than 12mm
YX01	3528series Soft bead
YX02	High power lamp beads
YX03	Chips and BGA from 11mm to 17mm BGA
YX04	Chips and BGA bigger than 17mm
YX05	4148 circular diode
YX06	3535 ball shape LED(Spherical height 1.4mm,overall height 1.9mm)

12. Maintenance

12.1 Take effective measures to reduce /avoid malfunction

12.1.1 Reinforce daily maintenance

P&P machine is that high-accuracy device which requires a clean working environment with constant temperature and humidity, so it's necessary to have a routine maintenance.

12.1.2 Requirements for operator

- Operator should get a basic operator training, which should cover fully all the skills and knowledge needed to safely operate the type of pick and place machine.

●Operating strictly against equipment's instruction. Don't use machine with problems. Stop the machine once malfunction appears and contact with the after-sales service staff, restart to work after problem solved.

●Operator should be concentrated,

Observation-- to see whether there is abnormal situation, such as peel-box doesn't work, plastic tape is broken etc.

Listening-- whether have strange sound, such as noise from placement head, sound of loss component, strange noise of conveyor etc.

Handwork-- solve some small problems in time, such as install feeder, correction placement position etc. If the main machine body or circuit problem, please consult after-sales staff. Formulate measures to reduce/ avoid big problem.

12.1.3 Formulate the measures to reduce/avoid big problem

The most easily appeared problem during work are placement wrong components and placement misaligned. Supply below measures for ref.

- ①It needs to check whether the components package is matched with related feeder. If not, please correct them.
- ②As to tape reel feeder, when ran out of one reel, operator must check whether newly changed tape reel is correct or not.
- ③After import the SMD file or edit chip list manually, please recheck each components No., nozzle rotation angle and placement position to make sure correct.
- ④Operator must check the first finished PCB of each file. If any problem, please find solutions such as revise program to solve it.
- ⑤To check the placement position misaligned or not, component loss problem in regular work. Find reason in time and solve it.
- ⑥Set pre-welding detection station (manual or AOI)

In sum, P&P machine's running speed and placement accuracy still has limit. Peoples work is important to run machine on its proper role. So, it's necessary to comply with effective measures to keep machine normal work, its placement quality and efficiency.

12.2 Maintenance

Arrange regular inspection and maintenance system.

12.2.1 Daily Inspection

	Items
Items check before power on	<ul style="list-style-type: none"> ①Temperature& Moisture: Temperature 20℃ ~26℃ , humidity 45~70% ②Indoor environment: Air clean without aggregate air. ③No clutters within the placement area and keep rails clean. ④No spots on cameras and keep lens clean. ⑤No obstacles around the head nozzles ⑥ Checking if nozzles are dirty, distorted; If so, please clean or change the nozzle. ⑦Checking if feeders are correctly installed in stacks and confirm no clutters on stack. ⑧Checking the connection of air connector and air hose ⑨Checking air pressure.
Items check after power on	<ul style="list-style-type: none"> ①Checking if the monitor display normally after system start up. ②Checking if emergency button can work normally or not. ③Checking if placement head can move back to the origin. ④Checking if there's abnormal noise while placement head move. ⑤Checking all nozzles vacuum pressure.

- ⑥Checking if PCB moving on rails smoothly or not; Sensor workable or not.
- ⑦Checking if the board has been well fixed by magnetic bar and pins.

12. 2. 2 Monthly Inspection

Items	Detailed Inspection
X/Y axis	Make sure no abnormal noise while placement head moving.
X/Y motor	Make sure X/Y motors no overheating.
Nozzle	Checking if all nozzles are good without bend and nozzle surface is horizontal
Air hose	Checking the connection between air hose and machine, keep sure the hose in good situation without wearing or air leaking.
Step motor	Checking if any dirty on step motor, synchronous belt, Synchronous wheel. Make sure the Z-axis motor can up, down and rotate smoothly.
Z-axis motor	Checking if the placement head can go up and down smoothly. Use your finger to push the nozzle to check if it moves smoothly. Let each nozzle head up and down beyond the normal range.
Vacuum pressure	Checking all nozzles' vacuum pressure. If abnormal, please clean nozzles.
Positive pressure	Checking if the positive pressure normal.
Optical axis	Checking whether it is covered dusk. Please keep it clean and lubricated
Operation button	Checking each button to make sure they are well-worked
Connector	Checking if well-connected the air hose and air connector.
PCB clamp block	check their wear pattern

12. 3 Related issues during solder paste printing process

12. 3. 1 Stencil Printing Technology

Screen printing technology refer to using ready-made stencil, directly connect to the printer in a certain way, make the solder paste evenly flow on the stencil and then leak into the mesh through the holes. When getting the stencil away, solder paste had been covered to the printed circuit board solder graphics, then finish the solder paste printing on the PCB.

12. 3. 2 Inspecting of solder paste printing

Printing process is one of the key working procedures to ensure the quality of surface mounting. According to the statistics, under the premise of guaranteed quality about components and PCB, correctly PCB design, 70% of the surface quality problem caused during printing process. In order to ensure the quality of SMT assembly, it is necessary to strictly control the quality of the solder paste printing.

The amount of solder paste printing requirements are as follows:

- (1) The using amount of solder paste should be uniform, good consistency. Solder paste graphics should be clear, try to avoid adhesion between adjacent graphics. Solder paste graphics and solder graphics should be consistent.
- (2) In general, keep unit area amount of solder paste about 0.8 mg/mm². For fine pitch components, should be 0.5 mg/mm² (using stencil thickness and hole size to control in the actual operation).
- (3) Printed on the substrate of solder paste compared with required value, a certain deviation is permissible, the covering area of the solder paste on each solder pad should be more than 75%.

(4) Should be no seriously collapsing problem and edges neatly after solder paste had been printed, the dislocation shouldn't be larger than 0.2 mm, for solder pad of fine pitch components, dislocation shouldn't be larger than 0.1MM, pollution by solder paste is not permitted to the PCB.

Inspection by 2~5 times magnifier or 3~20 times microscope.

12. 3. 3 The defects of solder paste printing, reasons and solutions

Excellent printing graphics should be uniform in both vertical and horizontal direction, full, clean all round, solder paste fill solder pad. Using above such printing graphics device, after reflow soldering, will get good welding effect then.

Problem	Reason	Issue	Solution
Solder paste graphics dislocation	Holes on the stencil not good match with solder pad; No enough precision of the Printing machine	easily cause bridge connection	Adjust the stencil position; Adjust the printing machine
Solder paste graphics have icicles and dents	Scraper pressure is too large; Rubber scraper hardness is not enough; Holes are too big in the stencil	Solder paste required volume is not enough, easy to appear faulty soldering; solder joint strength is not enough.	Adjust the printing pressure; Use metal scraper; Improved holes designing in the stencil.
Too much solder paste	Holes are too big in the stencil; The gap is too big between stencil and PCB	easily cause bridge connection	Check the holes size in stencil; Adjust the parameters of printing, especially the gap between PCB and stencil
Graphic uneven (have breakpoints)	Holes' wall are not smoothness enough; not wipe residual solder paste in using for many times; Solder paste's thixotropy is bad	Easy cause no enough solder paste, lead to the problem such as faulty soldering.	Wipe the stencil
Contamination of the graphics	Not wipe residual solder paste in stencil after using for many times; Poor quality of solder paste; Shake problem when getting the stencil way	easily cause bridge connection	Wipe and clean stencil; replace solder paste; adjust the machine