

**NEO DEN**®

---

# Desktop Pick and Place Machine with Vision System

## NeoDen 3V

### User Manual



# Content

1. NeoDen 3V Introduction.....	1
1.1. Brief Introduction.....	1
1.2. Structure of NeoDen 3V .....	2
1.3. Operation Flow Chart.....	3
1.4. Procedure for Making a Programming File.....	4
2. Edit on the Operation Interface.....	5
2.1. PCB Information Interface.....	5
2.1.1. PCB Feed Setting.....	5
2.1.2. Panelized First Chip Setup.....	6
2.1.2.1. Single Board.....	6
2.1.2.2. Panelized Board.....	8
2.1.2.3. Mirror Board.....	9
2.1.2.4. PCB Angle Correction.....	11
2.1.2.5. Bad Board Detection.....	11
2.1.3. Component Setting.....	12
2.1.3.1. PCB Mark Setting.....	12
2.1.3.2. Manual Programming.....	14
2.1.3.3. Re-Edit.....	15
2.1.3.4. Import PCB Coordinate File.....	16
2.1.4 Feeder Settings.....	17
2.1.4.1. Feeder Arrangement.....	17
2.1.4.2. Feeder Configuration.....	17
2.2. File Mount.....	21
2.3. Manual Test.....	22
2.3.1. Placement Head.....	223
2.3.2. Host Control.....	23
2.3.3. Feeder Test.....	24
2.4. Factory Settings.....	25
2.4.1. Feeder Configuration.....	26
2.4.2. System Configuration.....	27
2.4.2.1 Default Parameters 1 Setting.....	27
2.4.2.2. Nozzle Alignment.....	28
2.4.2.3. Nozzle 1 and Camera Relative Position.....	28
2.5. First Trial and Test.....	29
2.5.1. First Dry Run.....	29
2.5.2. Production Test.....	29
2.5.3. Component Inspection.....	29
2.5.3.1. Inspection Items.....	29
2.5.3.2. Inspection Methods.....	29

---

2.5.3.3. Inspection Standard.....	30
2.6. Continuous SMT Production.....	30
3. Structure and maintenance instruction.....	31
3.1. Structure Chart.....	31
3.1.1. Peel Box.....	31
3.1.2. Tape Reel Loading.....	32
3.1.3. Nozzle.....	32
3.1.3.1. Size of Nozzle.....	32
3.1.3.2. Reference of Nozzle Selection.....	33
3.2. Maintenance.....	34
3.2.1. Reinforce Daily Maintenance.....	34
3.2.2. Requirement for Operator.....	34
3.2.3. Formulate Measures to Reduce/ Avoid Mistake.....	34
3.2.4. Maintenance of Device.....	35
3.2.4.1. Check Below Points Daily.....	35
3.2.4.2. Check Below Points Monthly.....	35
3.2.5. Related Issues During Solder Paste Printing Process.....	36
3.2.5.1. Stencil Printer Technology.....	36
3.2.5.2. Inspecting of Solder Paste Printing.....	36
3.2.5.3. Instruction about Soldering Printing.....	37



## IMPORTANT

IN ORDER TO USE THE PICK AND PLACE MACHINE SAFELY, PLEASE READ THIS USER MANUAL COMPLETELY AND UNDERSTAND IT THOROUGHLY BEFORE OPERATING THIS UNIT AND RETAIN THIS BOOKLET FOR FUTURE REFERENCE

## Notes

1. Please read this user manual completely before operating this unit and retain this booklet for future reference.
2. The contents include all features of NeoDen 3V, some of which may not be equipped on your machine.
3. Basic training and basic SMT knowledge is required for an operator.
4. For routine inspection and repair, please contact sales for operating instruction. During the repairing process, please use the spare parts provided by Neoden.

## Safety Device, Warning Label

1. Before operation, please ensure the presence of adequate guarding and safety devices to avoid accident.
2. When tear down the safety device, please keep it in the original position, and make sure it works in good condition.
3. Please make sure the warning label can be seen clearly. If peeled off or stained, please contact us freely for a new one. When safety device malfunctions, no running of the machine after removing safety device. Or it will cause severe injuries and casualty accidents.

## Usage

1. You agree that you will solely be responsible for your using of any products and services provided to you and that you will use our products and services legally and only for the purposes that they are intended to be used for.
2. You agree that you will not misuse the products and/or services supplied and that you will abide by any laws applicable to this agreement or the operation of it.

## Training

In case of any accidents that caused by improper operation, only those who have the training designated by Neoden, equipped with proper knowledge and operation skills can operate this machine.

## **CAUTION**

Power off: After cut off main power supply, pull the plug or disconnect the power cable from the power supply.

1. When an exception or failure happens, or power failure, please terminate the operation of Windows, and power it off.
2. Power off prior to cleaning and repairing in case of any accidents.

When pull the plug, please hold the head instead of wire.

## **Attention Should be Paid to During the Procedure**

### **Transport**

Please take necessary security measures to prevent upside down or fall when lifting or moving.

### **Open**

1. Please read all instruction in the wooden box.
2. Do not cut the packing tape by knife to avoid scratch the machine.
3. Keep all packing material.

### **Installation**

1. Please put the machine in a horizontal place.
2. Please keep the floor clean and dry, and the machine should be grounded, to prevent electric shock or leakage.

### **Prepare Work**

1. Make sure the power cable no damage, no shedding and no loose.
2. Keep hands off the working area.

### **Maintenance**

1. Repair and calibration should be operated by skilled mechanical technician. When replacing parts, please use the part which are supplied by NeoDen. We are not responsible for any accident result from using nonstandard part.
2. In order to prevent electric shock caused by unskilled operation, the electrical repairs, maintenance (including wiring), should be operated by professional electrician or the technical staff from NeoDen or our distributors.
3. Make sure Bolts - Nuts are tighten after repair, calibration or replacing any part.

### **Working Environment**

1. Do not use machine in a noisy environment, such as high frequency welding machine.
2. Do not use machine if the power supply voltage exceed the rated voltage  $\pm 10\%$ . Do not use machine and pull the plug when thunder to avoid any accident caused by damaged electrical component.

# 1. NeoDen 3V Introduction

## 1.1. Brief Introduction

Compared with the previous version TM245P, NeoDen 3V adopts a high-definition camera that could mount most kinds of components including micro chips like 0402, fine-pitch ICs like QFN and so on; and with high speed and accuracy, small volume, low power, stable performance and easy operation, NeoDen 3V committed to create the greatest value and try to fulfill all demands for customers in the actual production.

Number Of Heads	2
Placement Accuracy	0.02mm
Placement Rotation	0~360°
Placement Rate	5000CPH (vision off); 3500CPH (vision on)
Placement Area	320*390 (X、Y) (feed from the left side and back side)
Vision System	yes
Nozzle Type	CN040/CN065/CN100/CN140/CN220/CN400/CN750
Applicable Components	0402-5050, SOP, TQFP and so on
IC Tray feeder	10
Vibration Feeder	5 ( customization supported)
Feeder Type	8mm、12mm、16mm、24mm
Feeder Capacity	46( all 8mm in width)
Position Accuracy	0.02mm
Power	160~200W
Electricity Supply	AC 220V/110V
Machine Size	820(I)*680(W)*410(H)mm
Weight	60KG

## 1.2. Structure of NeoDen 3V



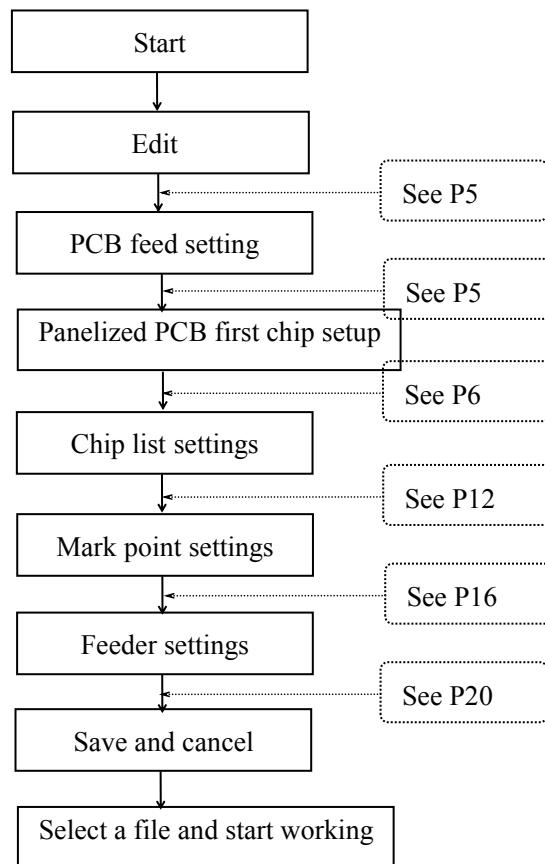
- ①:Start/Pause Button
- ②:On/off Button
- ③:Emergency Button
- ④:USB Connector
- ⑤:Fixation Holder
- ⑥:Head
- ⑦:Needle
- ⑧:Nozzle
- ⑨:Backward Fixed Block
- ⑩:Feed Chute
- ⑪:Peel Box
- ⑫:Vibration Feeder
- ⑬:Reel Holder

Each part mentioned above can be disassembled and maintained. Please find more details on Chapter 3.

### 1.3. Operation Flow Chart

NO.	Flow Chart	Remark
1	Preparation	Checking the working area whether it is safe or not
2	Turn on	
3	Initialization	Machine will start a 1-2 mins self-inspection process after boot-up. The head will travel along in X&Y axis. It will enter the operation page once finished.
4	Operation page	
5	Edit	Plz refer to the detailed programming tutorial in Page5
6	Modify	
7	Test	After making a programming file, there may exist several programming issue, such as rotation issues of components, thus a production testing is necessary for solving issues.
8	Yes	
9	Mounting	Start to pick and place.
10	Exit	Production finish, exit.
11	System power off	Shut down the system via computer, then power off the machine.
12	Power off	Disconnect the electricity supply after the system being powered off.
13	Cleaning and maintenance	Keep the machine clean, daily maintenance of the nozzles to assures its high utility.

## 1.4. Procedure for Making a Programming File



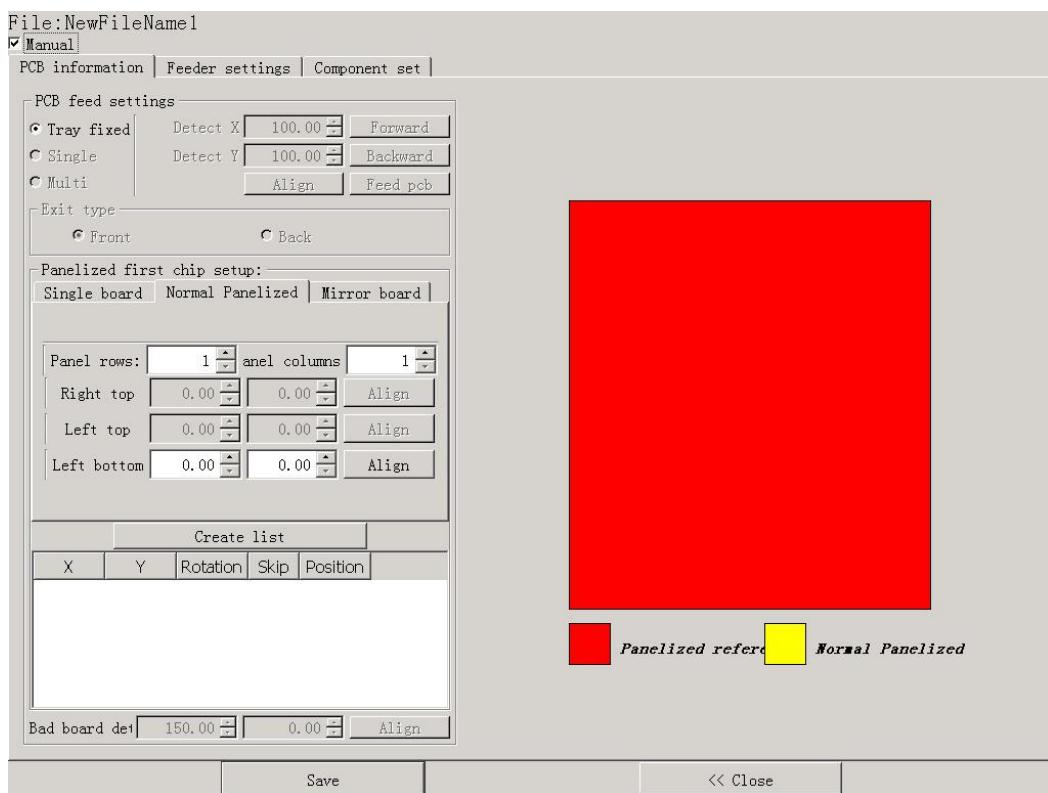
Note: Above the procedure for making a programming file, the basic procedure of manual programming and importing coordinates file directly are similar. Please find the detailed operation steps of the differences on relative page.

## 2. Edit on the Operation Interface

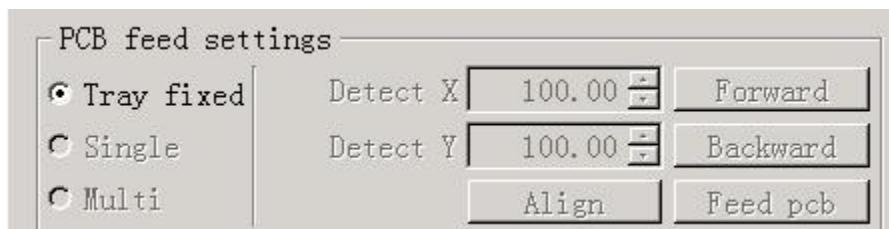
### 2.1. PCB Information Interface

See below Fig.: Edit Interface

Create a new file or choose a file and enter the edit page

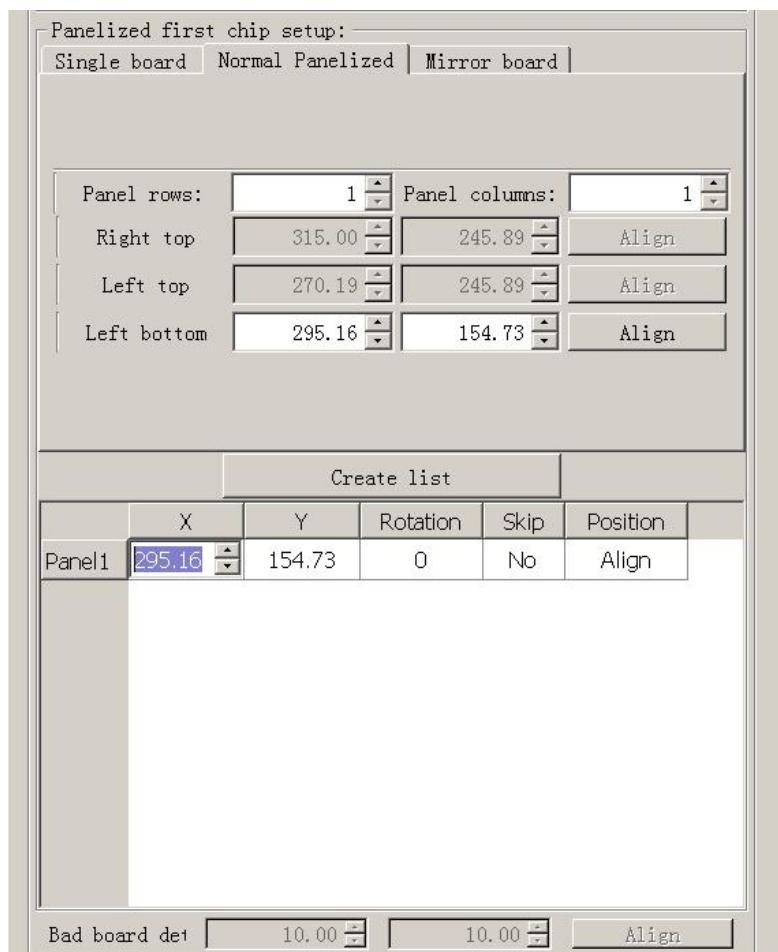


#### 2.1.1. PCB Feed Setting



Function: This part is used to confirm the feeding place, the first edit item in manual program. Feed the PCB to the estimated position and adjust it by click "Align"

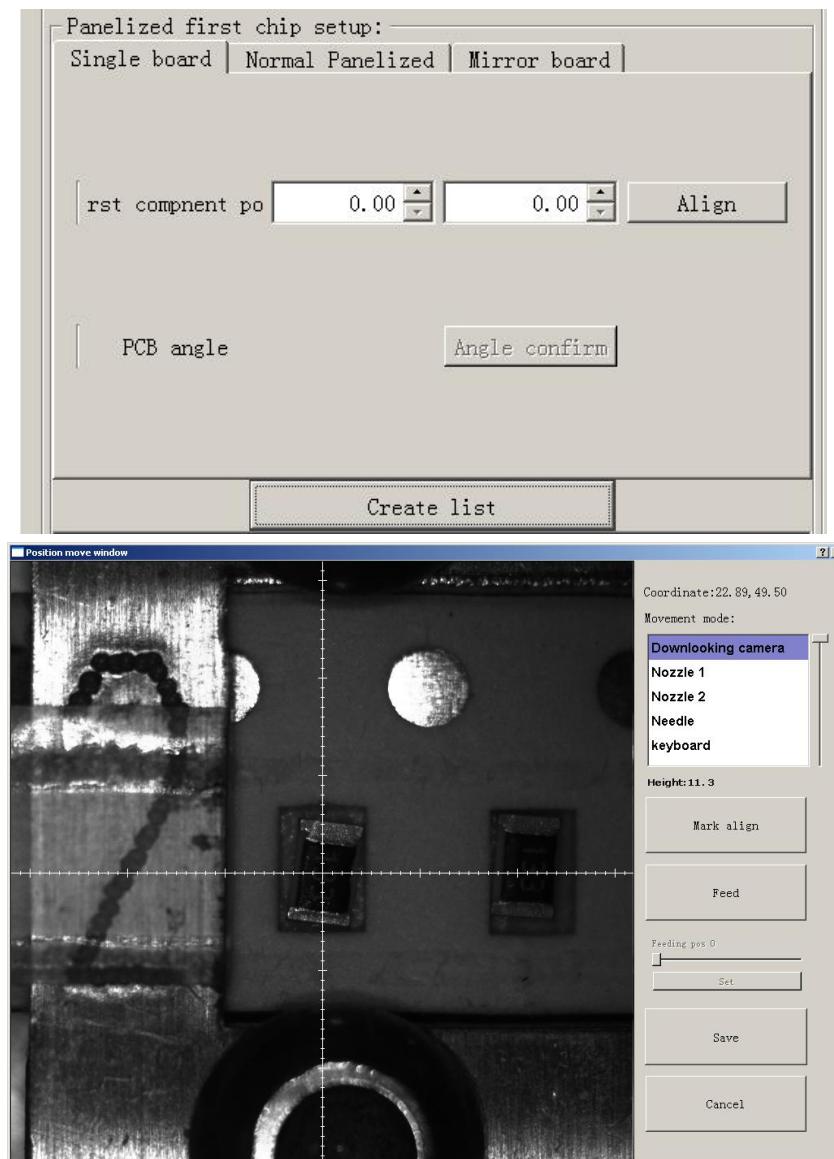
## 2.1.2. Panelized First Chip Setup



Function: This is mainly to determine the first component position on single or panelized PCB. The principle is to collect and calculate the data of each board's relative spacing, in order to achieve the effect of the actual placing.

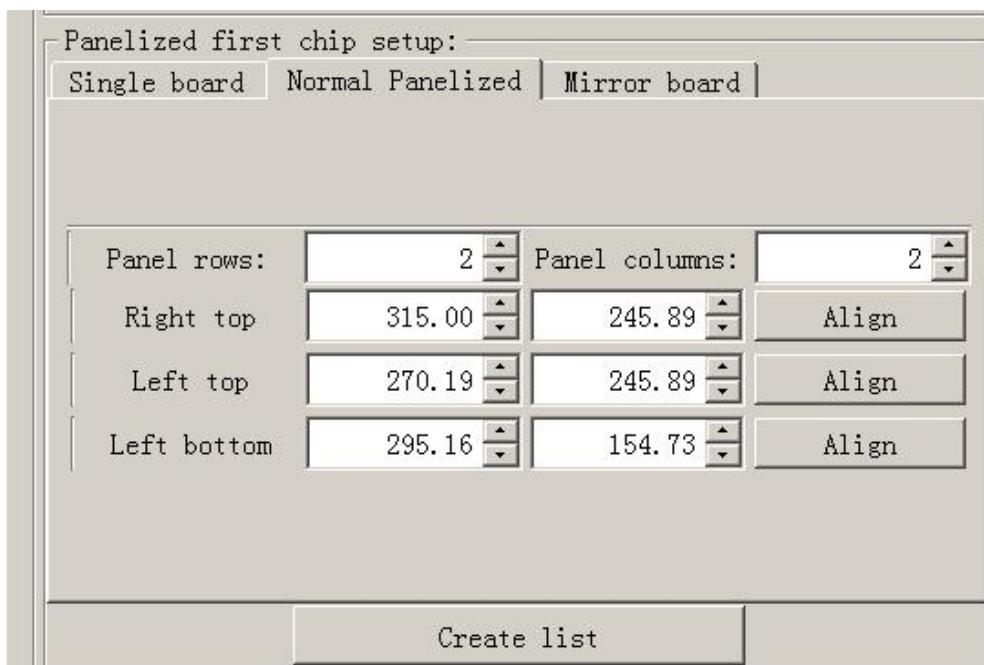
### 2.1.2.1. Single Board

Single board: Just need to find the first component (in chip list) actual position on board by clicking "Align" button, it will skip into below screen under vision. Make sure the cross hair is in the center of bonding pad, this component will be locked, then save.



After saving the coordinate, the screen will automatically turn back to “PCB information” . Click “Create panelized list” to get the information of this board. Now we’ve finished setting of first component of Single board.

### 2.1.2.2. Panelized Board



The sequence is same to single PCB, but please pay some attention to several points below.

- The row and column is determined by the positioning of PCB on working area. The horizontal direction is the column. Enter data in the row and column.
- About the data collection of “left bottom”, “left top” and “right top”, we should take the “left bottom” as the basic, and then go to set “left top” and “right top”. Once all the data is collected, the machine can calculate and process the information of panelized PCB.

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 programming file. Press “align” find the left bottom panel which is nearest to the feeding entrance, after saving the data, it will return to the “PCB information” automatically.
- The data of “left top” is collected according to component (the component is same to that on “left bottom”). Press “align” find the left top panel which is furthest to the feeding entrance, after saving the data, it will return to the “PCB information” automatically.
- The data of “right top” is collected according to component (the component is same to that on “left bottom”). Press “align” find the right top panel which is furthest to the feeding entrance, after saving the data, it will return to the “PCB information” automatically.

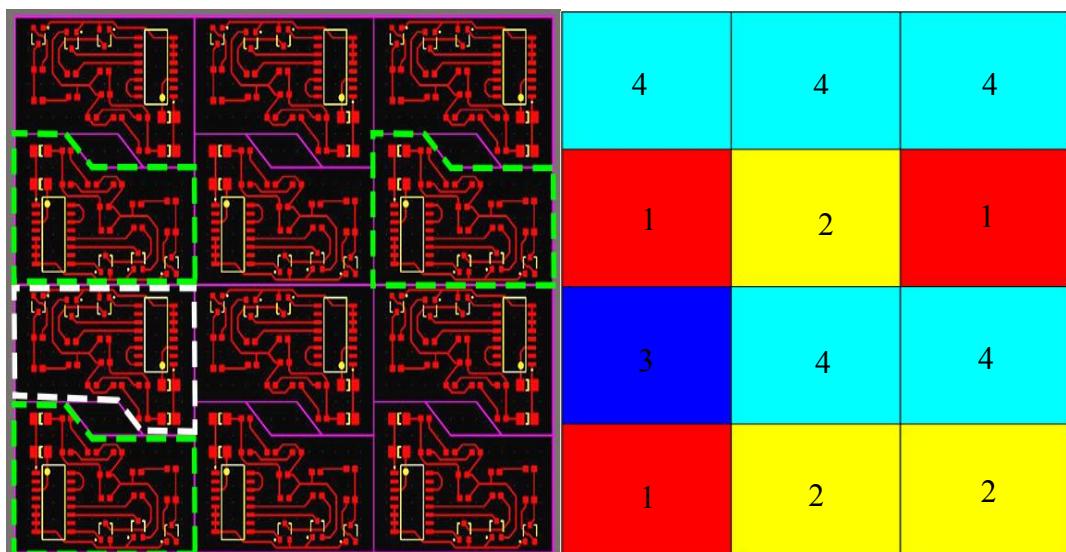
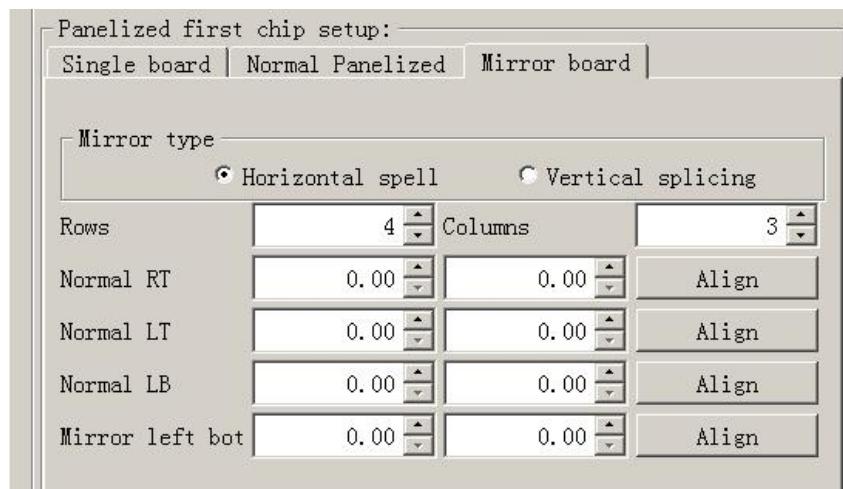
After setup, click “create panelized list”, the data will be generated accordingly in the blank. You can also double-confirm each position by clicking “Align”. ( Note, the three positions must be the same component from different panelized board)

### 2.1.2.3. Mirror Board

Mirror board includes row panelized PCB and column panelized PCB

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

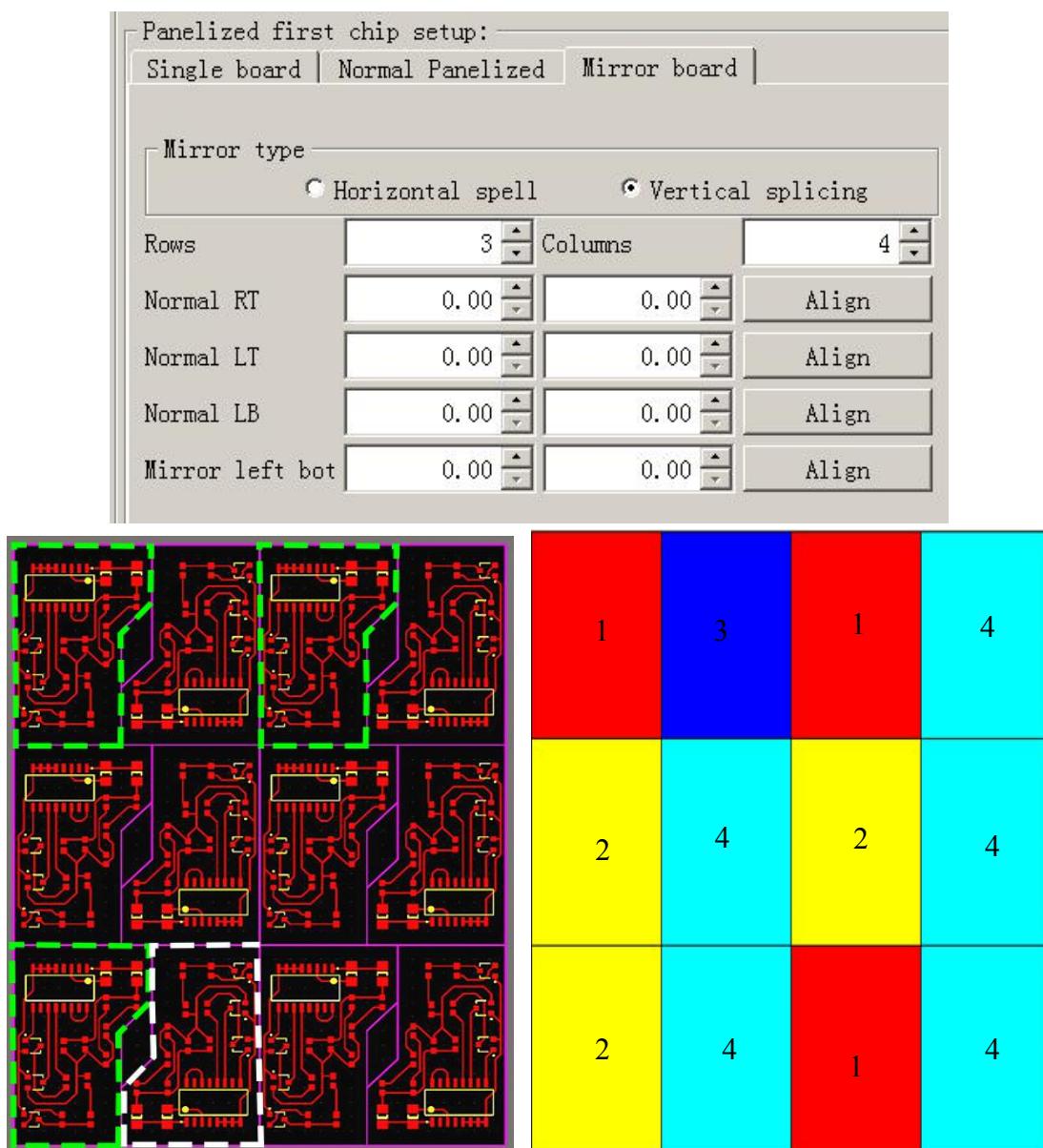


No.1 red areas are original ref

No.2 yellow areas are original boards

No.3 blue area is mirror ref

No.4 light blue areas are mirror boards



No.1 red areas are original ref  
 No.2 yellow areas are original boards  
 No.3 blue area is mirror ref  
 No.4 light blue areas are mirror boards

Based on actual board to choose an applicable model of panelized mode. Image left side is the arrangement way of mirror board and right side is the mirror board showing on computer.

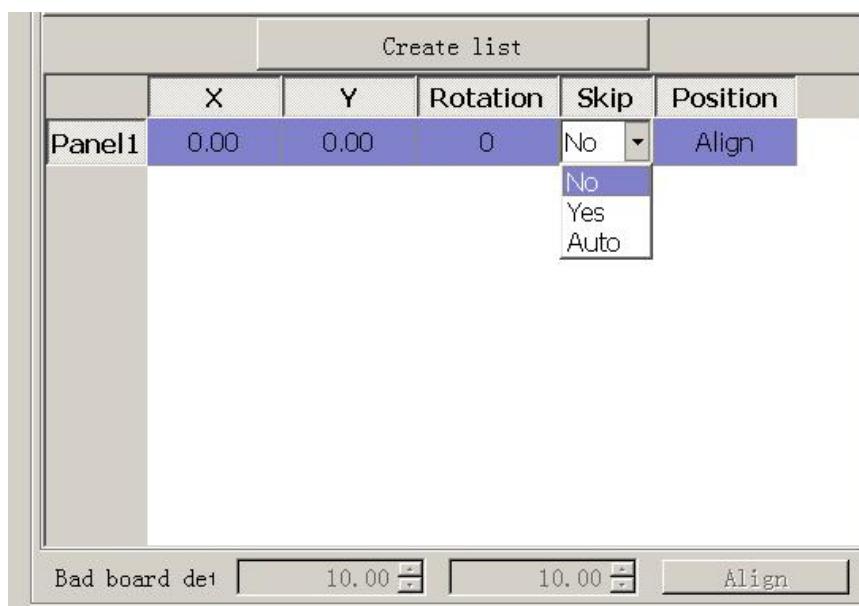
#### 2.1.2.4. PCB Angle Correction

PCB angle will influence the accuracy of mounting. The angle more 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 coordinates, but we can also adjust the angle by manual. Click "PCB angle" 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 in one vertical or horizontal line)

Under panelized PCB mode, "PCB angle" is locked. You need to correct from panelized PCB to single PCB( 1\*1), after confirm the PCB angle, you can change back to panelized PCB model.

#### 2.1.2.5. Bad Board Detection



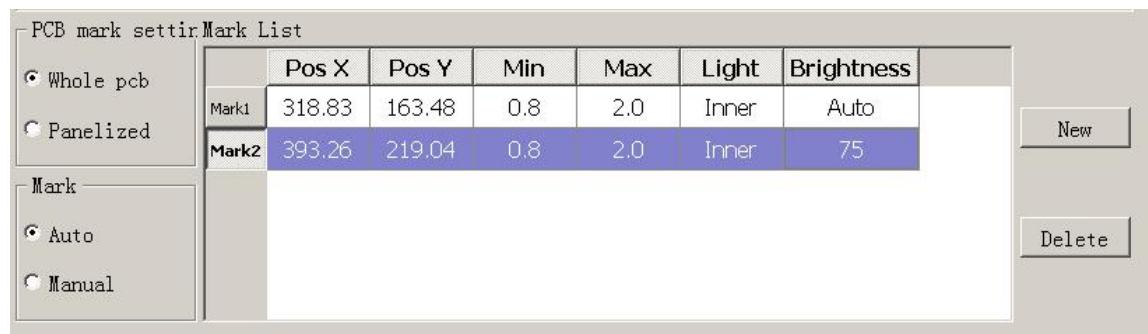
In actual work,bad boards no need to be mounted, then, you can activate this function to skip these boards automatically.

Processes of detecting bad boards,

- 1) According to panelized PCB to generate panelized list
- 2) Choose "Auto" from "Skip" options of panelized list
- 3) Click "Align" button to choose one fixed position and mark it, thus every time when machine scans this mark, it will skip this bad board.( One common guideline is stick another colorful tag on the bad board, if stick with this tag the machine will skip the bad board, otherwise it will go on mounting)

## 2.1.3. Component Setting

### 2.1.3.1. PCB Mark Setting



Function: After completing setup of the mark points, with which the machine can locate the position of PCB and identify the set up mark points, so that the next step can be followed

- **Mark Point on Single PCB**

This mainly applies on single PCB or a whole board that consists of a few same boards (take them as a single board). Generally we need to set 2-3 mark points.

- **Mark Point on Panelized PCB**

This mainly applies on multiple, identical PCBs, that is to say when mount each small panelized PCB, machine will scan mark points of each small panelized PCB.

The biggest advantage is, if each small panelized PCB has a little angle deviation, use panelized PCB mark point, it will reduce the deviation during pick and place.

- **Alignment of Mark Point**

Alignment includes: align automatically and align manually.

- 1) Align automatically, find two mark points from PCB, during the mounting, it will know the position of PCB from aligning the two mark points
- 2) Manually align, if there is no mark point on PCB, you can use some positioning holes or some other referential points as subsidies to locate the PCB.

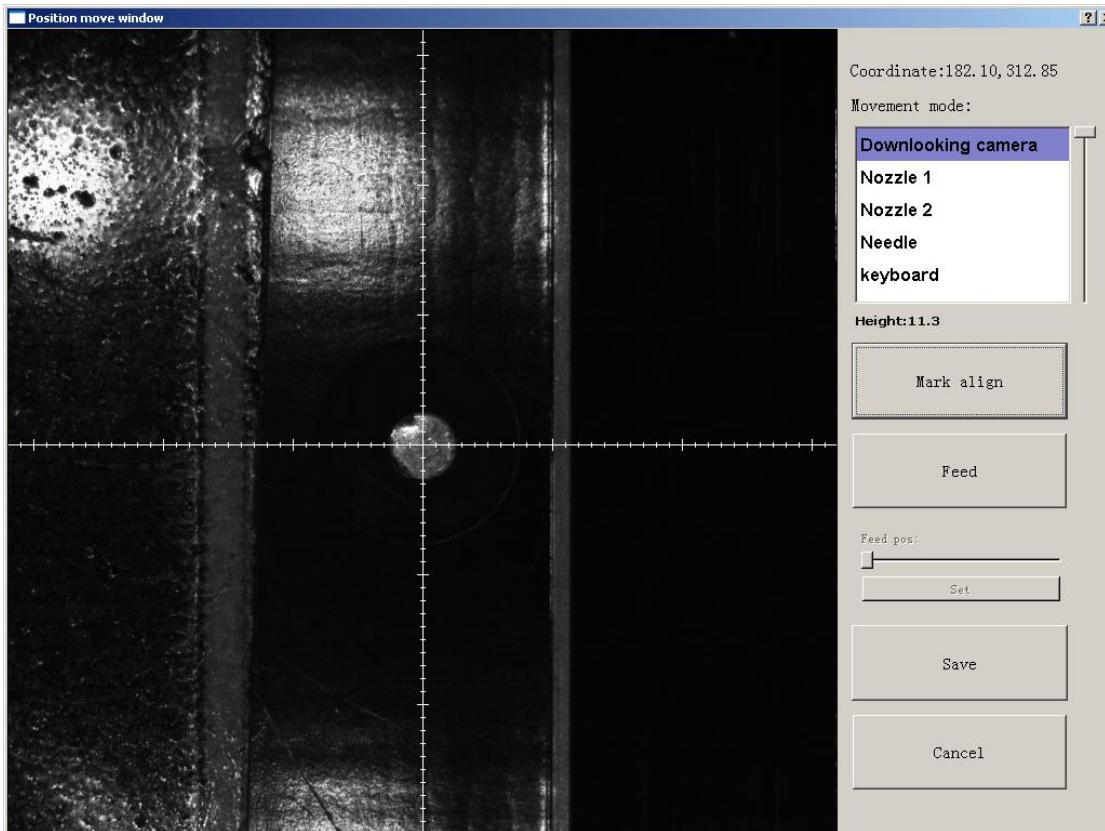
- **Import Coordinate**

According to the PCB schematic, you can get the coordinates of mark and write down manually. Moreover, you can see "Min", "Max", "Light", "Brightness" from Mark point list.

- 1) "Min", "Max" are the minimum and maximum size of mark point, a floating value to make sure you can get the correct mark points
- 2) "Light" includes inner circle and outer circle. If use one hole as mark point need to choose inner circle of light source, if use bright spot as mark point need to choose outer circle of light source
- 3) 'Brightness', in general, use the default value( You can change the value when necessary)

### ● Manual Programming

When it's in Manual Programming status, the function "Alignment" of Mark will be effective. Click on it, the camera will go and collect the coordinate of mark, save it and go back. (Note: if the mark point is far away, please use Overall movement to find it)



Align by manual:if there is no mark point on PCB, you can choose this mode.Note:Select two components,the first one and the other one which can be recognized easily and far from the first component as Mark point.After start mount,have to confirm Mark by manually.

"Min", "Max" are the minimum and maximum size of mark point, a floating value to make sure you can get the correct mark points

"Light " includes inner circle and outer circle. If use one hole as mark point need to choose inner circle of light source, if use bright spot as mark point need to choose outer circle of light source

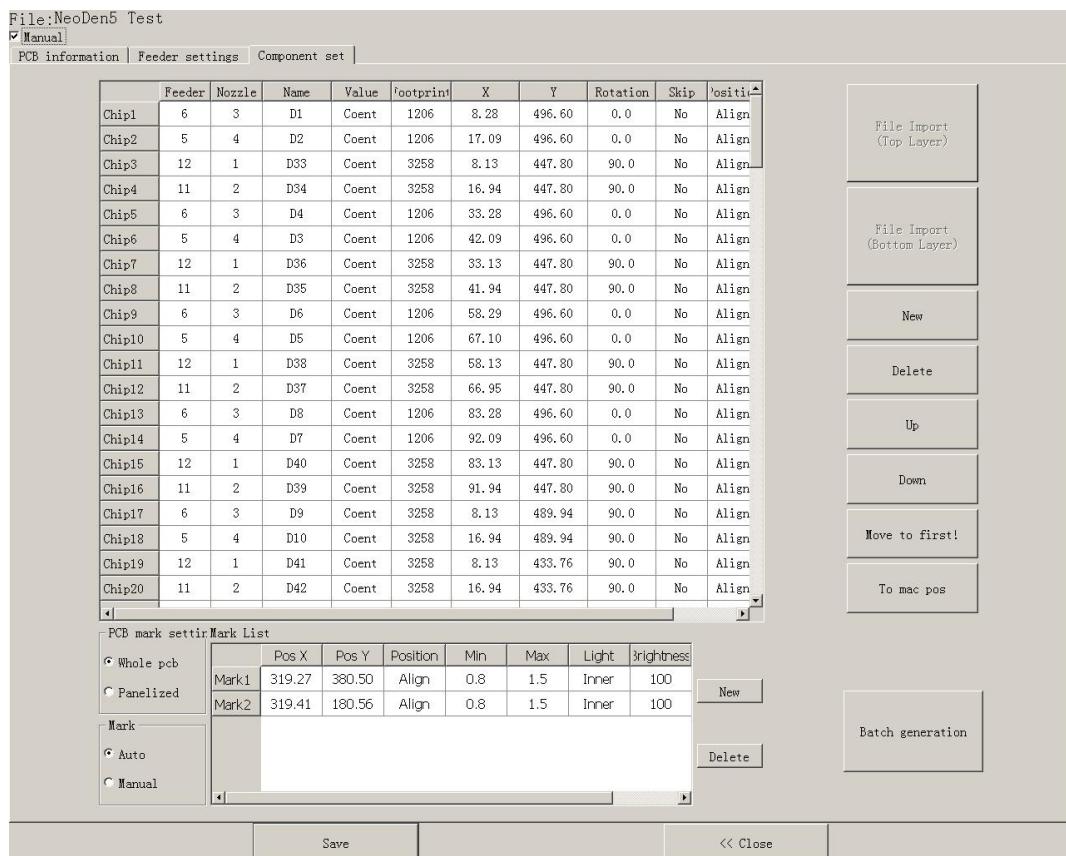
### New or Delete

- New:add the quantity of mark points
- Delete :delete error or useless mark point

### 2.1.3.2. Manual Programming

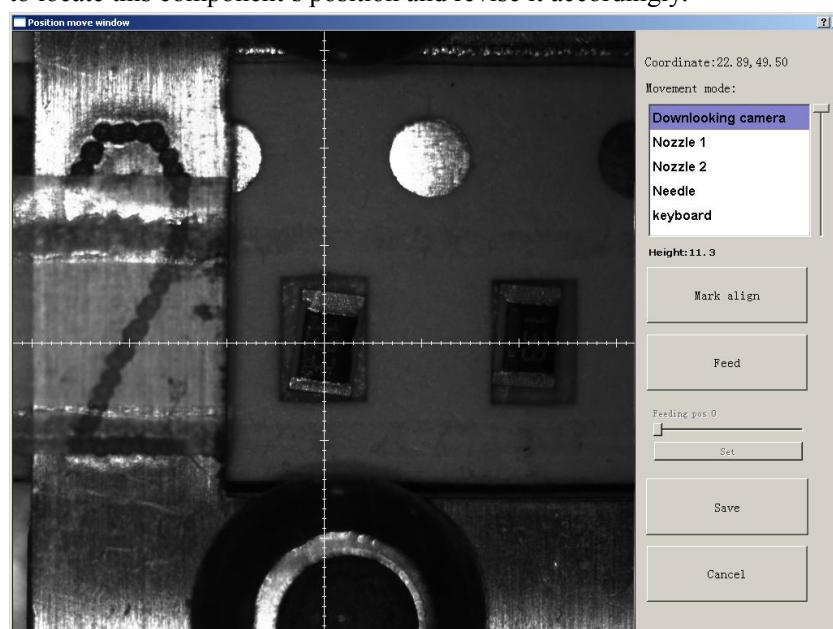
Select “Chip list” to start manual programming.

Function: it's used to display footprints, coordinates, angles and sequences of components. You can choose to manually add these information or import coordinates file directly.



#### ● Chip List Setup

First, tick the box in front of “Manual”, you will see an example of component in chip list. You can click ”Align” to locate this component’s position and revise it accordingly.



You can use Nozzle 1, Nozzle 2, needle to for workbench movement. Or you can use down-looking camera for visual minor adjustment.

Locate the component's center as coordinates, click "Save" and return to Chip list. Then you can fill the left information of components(note: designator, package, foot print and angel. The angel of horizontal component is 0°or 180°, the angel of vertical component can be different from +90°to -90°according to its polarity(Active Components) . All the angel value should be integer.

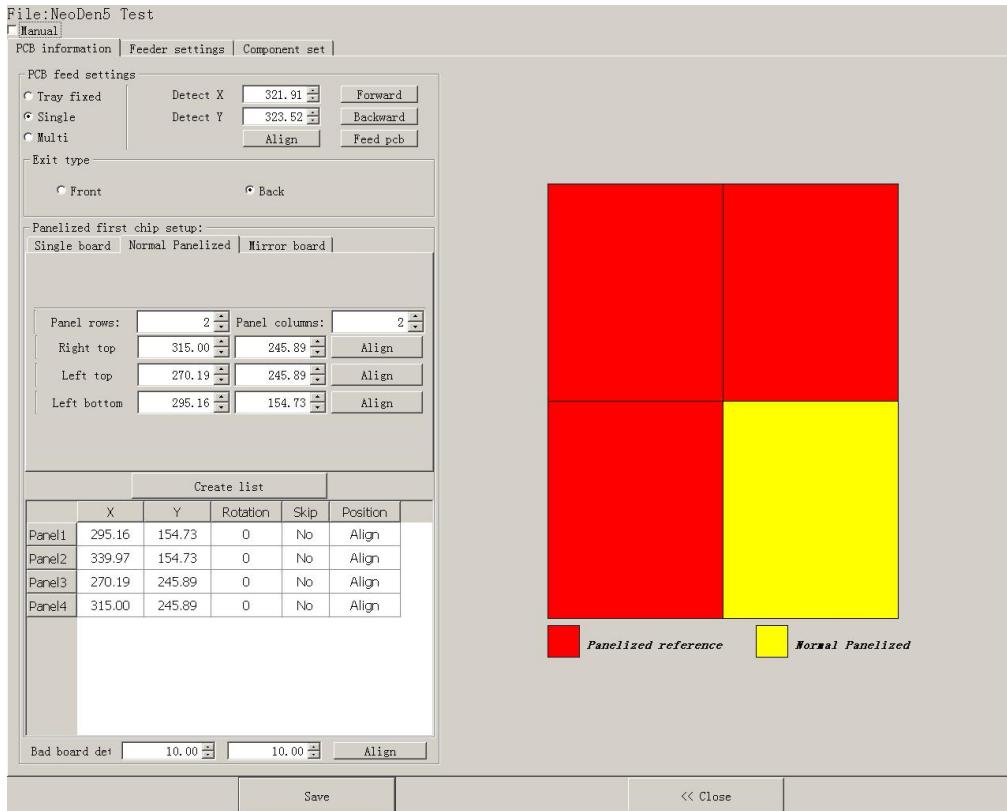
After completed all information for the first component, you can click "New" to create a new component. Its default coordinates will be same to previous one, you just need to click "align" and relocate its correct position, save the data and back to fill the left information.

### ● Sequence of Components

You may have to rearrange the sequence of components after programming, here are 3 ways available.

- 1) Move up: select the component and click "up" to move it up.
- 2) Move down: select the component and click "down" to move it down.
- 3) Move to first place: select the component and click this button to move it up to the first place.

#### 2.1.3.3. Re-Edit



Function: it's used to edit the file after you have find there is an offset due to the board twisting.  
Either import coordinate file or manually programming, you can edit the file by using this button.

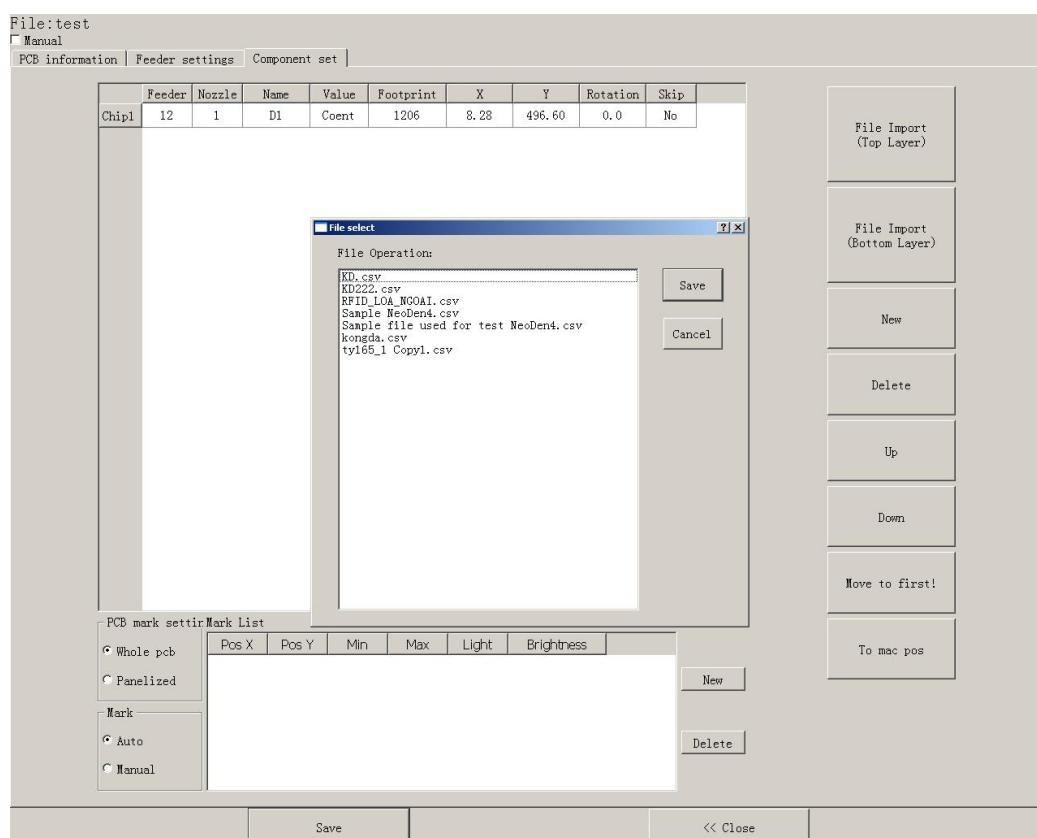
- 1) Please advance the board to the setup position, then click "Feed" in PCB feed settings.

- 2) After the board arrives to its destination, click “change to current position” button, it will pop up a message(refer to the image as below), click “Yes”, then the down-looking camera will start to recognize fiducial marks.
- 3) After that, coordinates will be automatically converted to absolute values(machine coordinate) according to the location and angle of board.

Then you can click align to adjust coordinates accordingly.



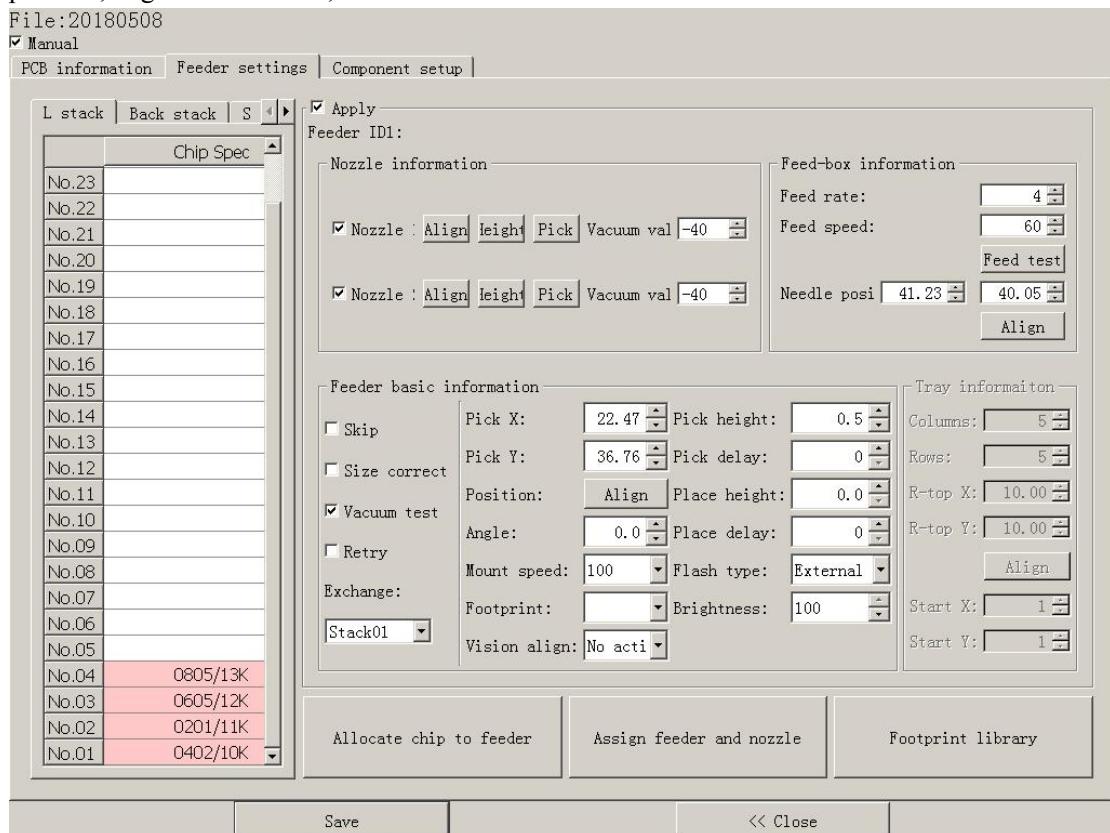
#### 2.1.3.4. Import PCB Coordinate File



- Generate the coordinate file from PCB layout, make sure the unit is metric and the format is .csv. After re-arrange the sequence of coordinate information that NeoDen3V could read, save and copy the file into flash drive, connect it with the machine.
- Go to the programming file screen, unselect “Manual”, click “Import Top file” button (refer to Illus.2.1.3.4), select the coordinate file in the pop up. All the data will be imported automatically.

## 2.1.4 Feeder Settings

All component's allocation should be operated in this interface, such as selection of nozzles and feeders, pick-up position, alignment methods, etc.



### 2.1.4.1. Feeder Arrangement

Left feeders (Feeder 1-25; Right feeders (Feeder 26-45). Special feeders (Feeder 46-55).

There are two ways to setup feeders.

1) Before installing tape& reels.

Press “Allocate chip to feeder”, it will calculate how many different components according to chip list, and automatically allocate them to each feeder in sequence.

2) After installed tape& reels.

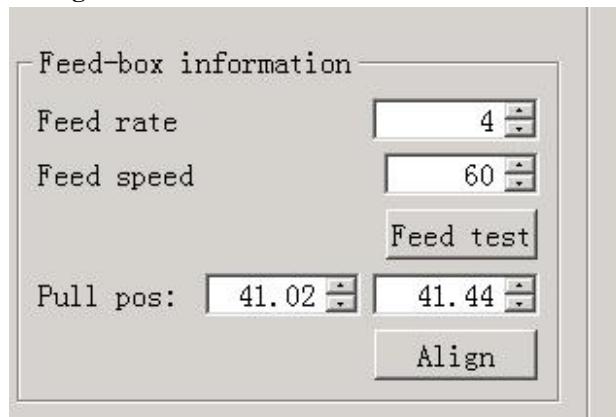
Click on each feeder, it will pop out a drop-down list with all components' specification, select one by one according to actual allocation.

### 2.1.4.2. Feeder Configuration

Select one feeder and tick the item “Apply”, all configuration will be active under this feeder, now user can do amendment. There're 3 items: Nozzle information, Feed-box information, Feeder basic information.

One item will be always locked for Feed-box information(Tray feeder information),according to the differences of components. Operation sequence: Feed-box information(Tray feeder information)---Feeder basic information---Nozzle information. “Exchange” in Feeder basic information could be used if wrong tape was placed.

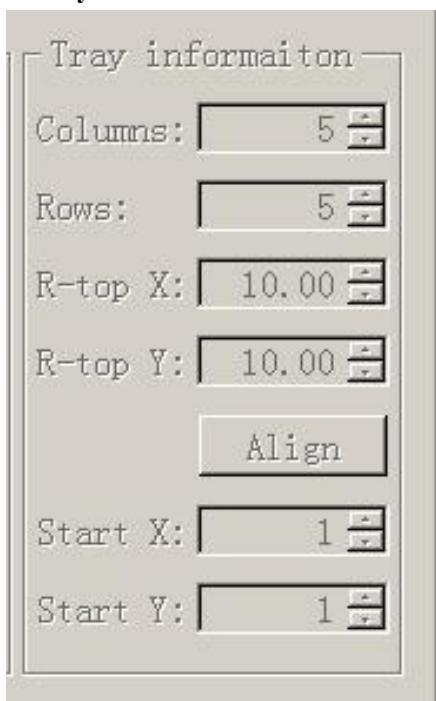
- Feed-box Information Setting



Function: Adjust the feed rate of needle.

- 1) Feed rate: It's the distance between two adjacent holes' centers on tape. You can change the needle feeding rate by change this value
- 2) Feed speed: Adjust speed by changing its value against different components. Default value is 1.
- 3) Feed test: After finishing above steps, user can click this item to test component feeding location.

- Tray Feeder Information

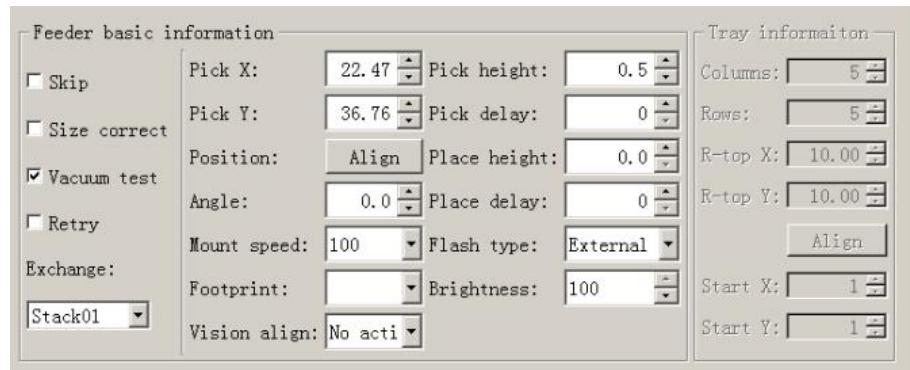


Function: Use to set the component's info from tray and tube package. Complete picking up operation under special feeders by changing the values.

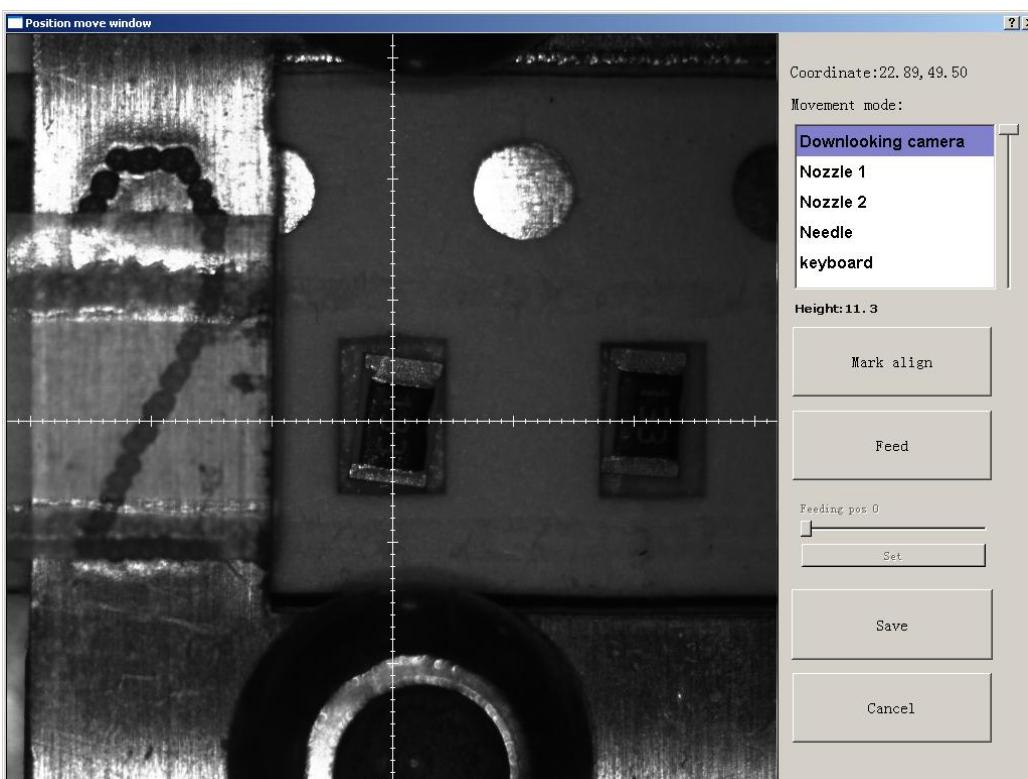
- 1) **Rows:** Component qty in each row (X-direction).
- 2) **Columns:** Component qty in each column (Y-direction).
- 3) **Right top X/Y:** Find the position of right top component by align. Generally it is the last component in IC tray, and left bottom side is the first component in IC tray.
- 4) **Start X/Y:** This is used to define the position of 1<sup>st</sup> component, its default setting is X1, Y1 (that is to say 1<sup>st</sup> row, 1<sup>st</sup> column ). If some IC on the tray has been used, you can directly setting the start X/Y as actual

situation, such as the actual 1<sup>st</sup> component is in 2<sup>nd</sup> row, 1<sup>st</sup> column, then type into X2, Y1.

### ● Feeder Basic Information:



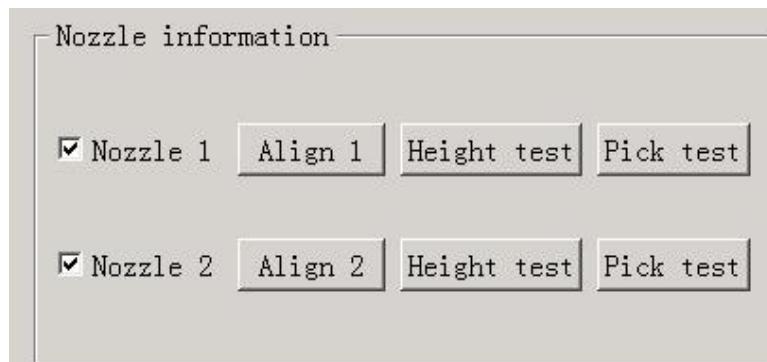
- 1) Firstly click the “Align” under “Position” function, camera will lock the component position on the feeder, once the modification saved, Pick X/Y data will automatically change to the ones after alignment.



- 2) Angle: default is 0 degree, support to modify the value to change the mounting angles for wholly feeder.
- 3) Placement speed: Control the placement speed under this feeder.
- 4) Footprint: Select corresponding footprint, and in vision alignment, system will take reference of the values in Footprint Library.
- 5) Vision: 2 ways as choice against actual need---No action, Jointly .
- 6) Pick height: control the placement height by dragging the sideward slider.
- 7) Place height: Set the value according to the exact component thickness.
- 8) Placement/Pick delay: set a little or 0 both ok.

- 9) Vacuum value: used for vacuum test, value can be set against actual need.
- 10) Flash type: outside light
- 11) Skip: Once select this item, will skip all placement under this feeder.
- 12) Test way: there're two test methods, Vacuum test /Vision test.
- 13) Vacuum test : Once “Vacuum test” was selected, the sensor of air pressure will be turned on. So if actual vacuum hasn't reached the default value during picking process, machine will drop it and re-pick a component.
- 14) Exchange: This may be used in actual situation, if exchange needed between two feeders, you can choose one feeder, and go to find the exact feeder you need replacement in drop-down box, select, then done.

### ● Nozzle Information



Function: Select corresponding nozzle according to actual component size, and it will automatically assign to each feeder to meet the requirements of single head or multi heads working. Also with below function as Pic.(2.1.5.2-5)

- 1) Align: Nozzle will align to component's upside on corresponding feeders after clicking this item ( can be adjusted manually) .
- 2) Height test: After clicking this item, nozzle will do down and check whether the pick height is ok. Support do adjustment of pick height on feeder information item if needed.
- 3) Pick test: After clicking this item, the corresponding nozzle will pick one component and check whether pick position is ok. Support do adjustment of pick position on feeder information item if needed.



After finish setting of all above feeder information, you can click “assign feeder and nozzle ”, then chip list will automatically to be changed correspondingly.

## 2.2. File Mount



First select one file, click "mount", then you will enter into mounting interface, above picture is an example of one file in mounting.

- 1) On the top-left corner shows mounting process, chip list---by the variation of white line, you can track process of mounting constantly.
- 2) On the bottom-left corner shows some feedback during mounting process.
- 3) On the top-right corner shows the status of picking and picking alignment
- 4) On the top-right corner shows some control information:
- 5) Real-time air pressure of 2 nozzles
- 6) Placement speed, can be changed by manual during mounting
- 7) Continuous, this is used in one-stop smt production line, add conveyors in front and behind,
- 8) Auto-eject PCB once finished, when select this option, after finished mounting task, PCB will eject its working area automatically
- 9) Other control information, Start&Continuous/Step/Pause(stop)/Eject PCB front/Stop
- 10) The machine will execute command and work constantly

**Step:** The machine will work one single step

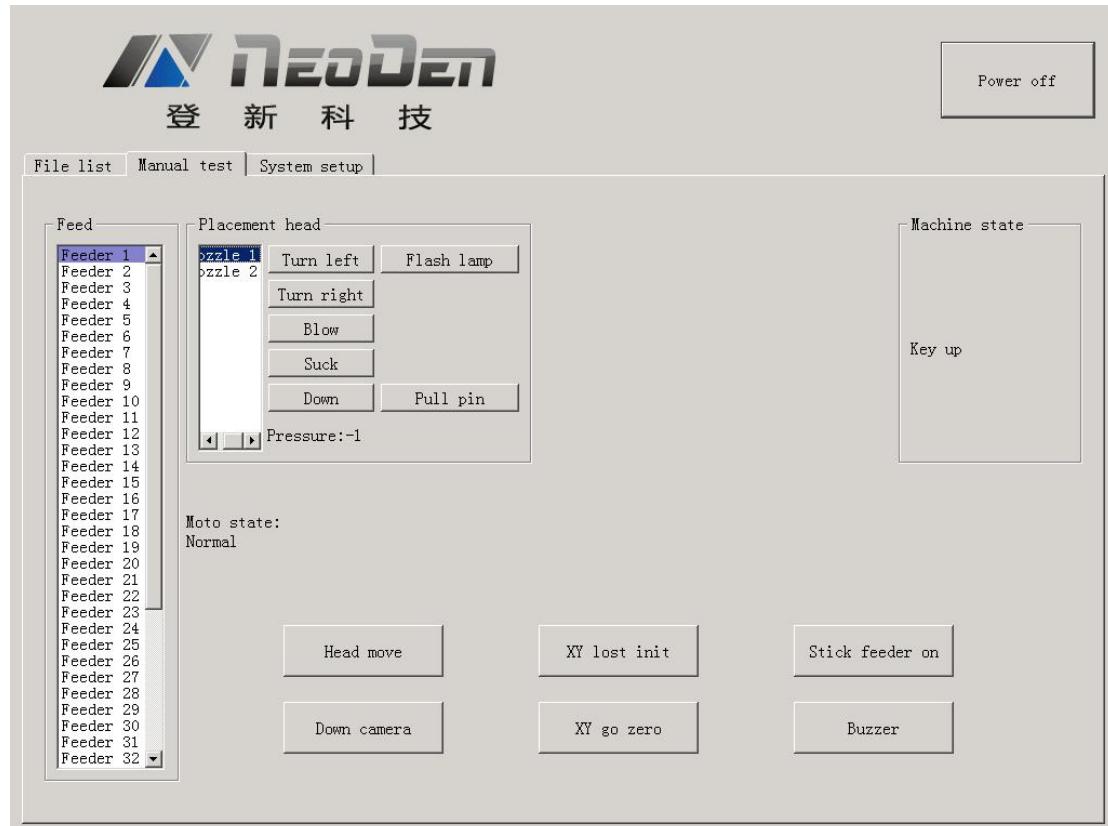
**Pause:** The machine will stop its work instantly

**Eject PCB Front:** In order to catch the PCB, after PCB assembly, click this option, PCB will eject from its feeding position. Kindly notice: After pause the machine then you can execute required command.

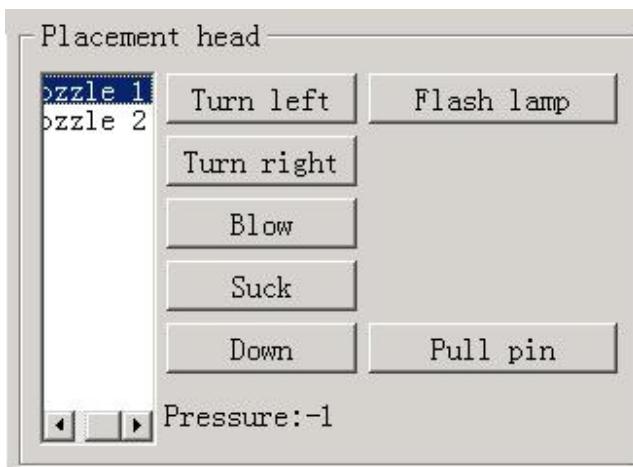
**Exit:** before click this option, you need to click "stop" first

## 2.3. Manual Test

Function: Used for testing the basic functions, connection between software and hardware , details about testing as below:



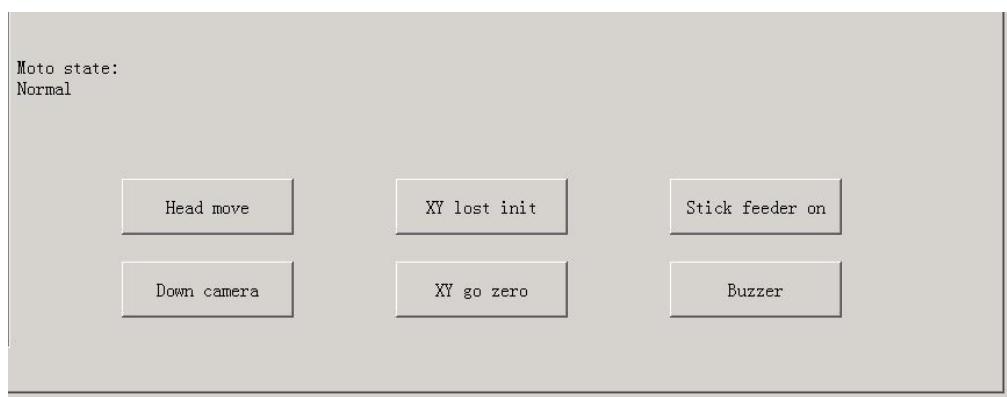
### 2.3.1. Placement Head



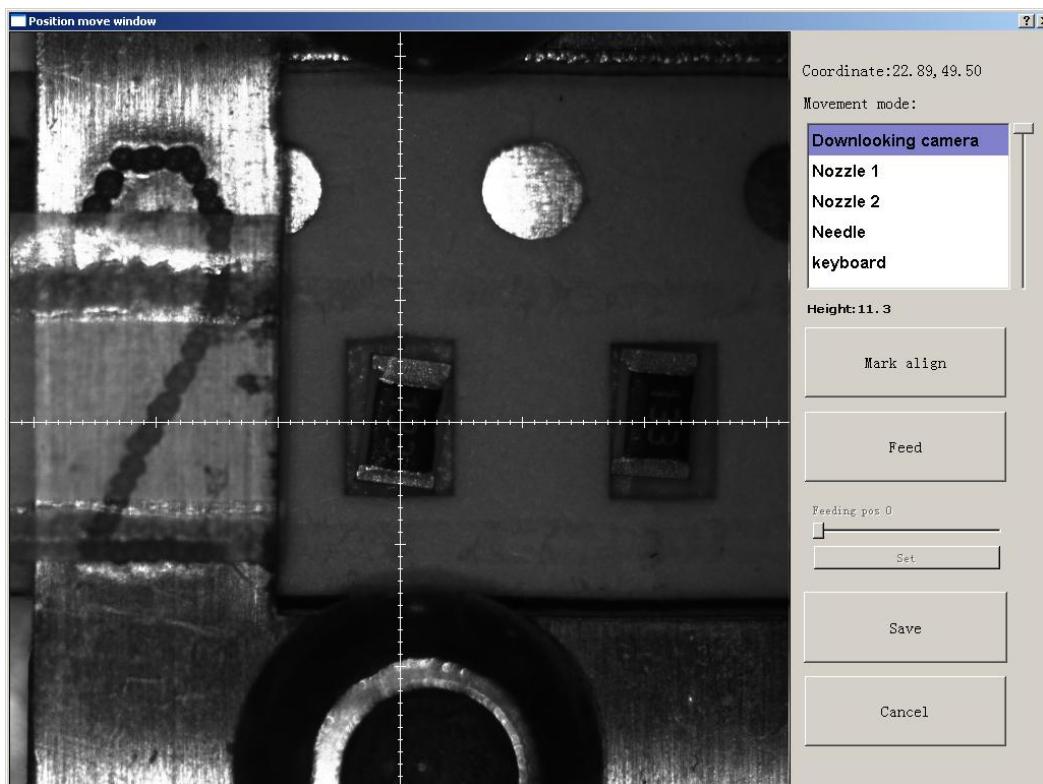
Choose nozzle 1, nozzle 2, nozzle 3, nozzle 4 to test separately

- Turn left& Turn right, selected nozzles will rotate
- Blow, after click this option, air will blow-off from selected nozzle
- Suck, after click this option, suction action will appear from selected nozzle
- Down, after click this option, selected nozzle will descend slowly
- Down Looking Camera light, after click this option, Led light besides the camera will turn on
- Needle, selected it and it will go down
- Air pressure 1, 2, 3, 4,Based on the testing of nozzles, you can see pressure value of each nozzle.

### 2.3.2. Host Control

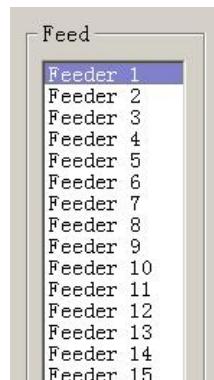


- Function, test each function key
- Head move, after click this option, you will enter into "head move" page, click to move



- Up Looking Camera Photograph, after click this option will take a picture
- X Y step out recover&X Y Initialize, after click this, machine will recover to its original position and coordinates in system will initialize.
- Vibration feeder on, after select this option, vibration tray will vibrate
- Buzzer, after click this option some sound will appear

### 2.3.3. Feeder Test

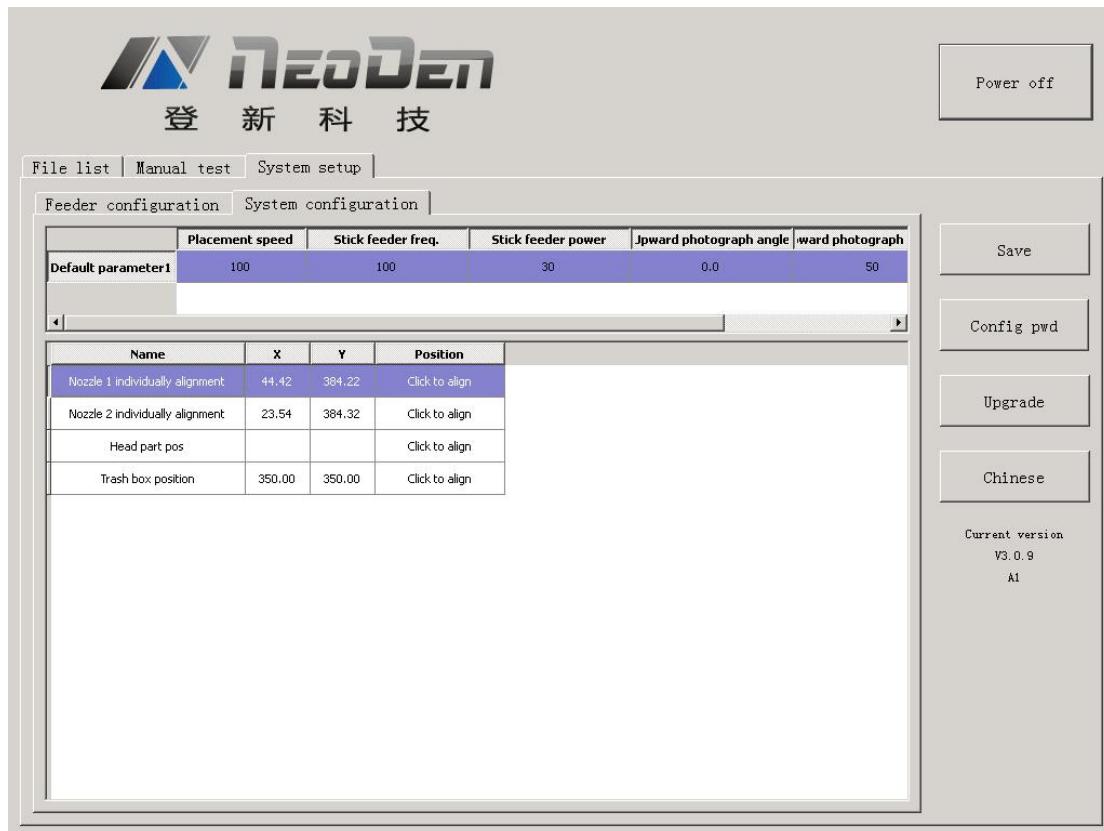


Function: Test each feeder's matching and feed box & peel box's function. First, select "Feed-box and peel-box linkage", then test function of feed box and peel box.

Click any feeder randomly, feed box and peel box will appear corresponding actions

## 2.4. Factory Settings

Function, this part is for machine' global parameter settings, any modified parameter will influence all mounting files, when modify this part please consider seriously. Especially the last page system settings, we suggest after using a period of time or under the guidance of our engineers then change its parameter.(Notice, before our machines leave factory, all parameter already be set and no need to change). This user manual just introduce all setting functions briefly, more details about parameter modification please refer to comments from our engineers.



As pic show, function description of button on right side

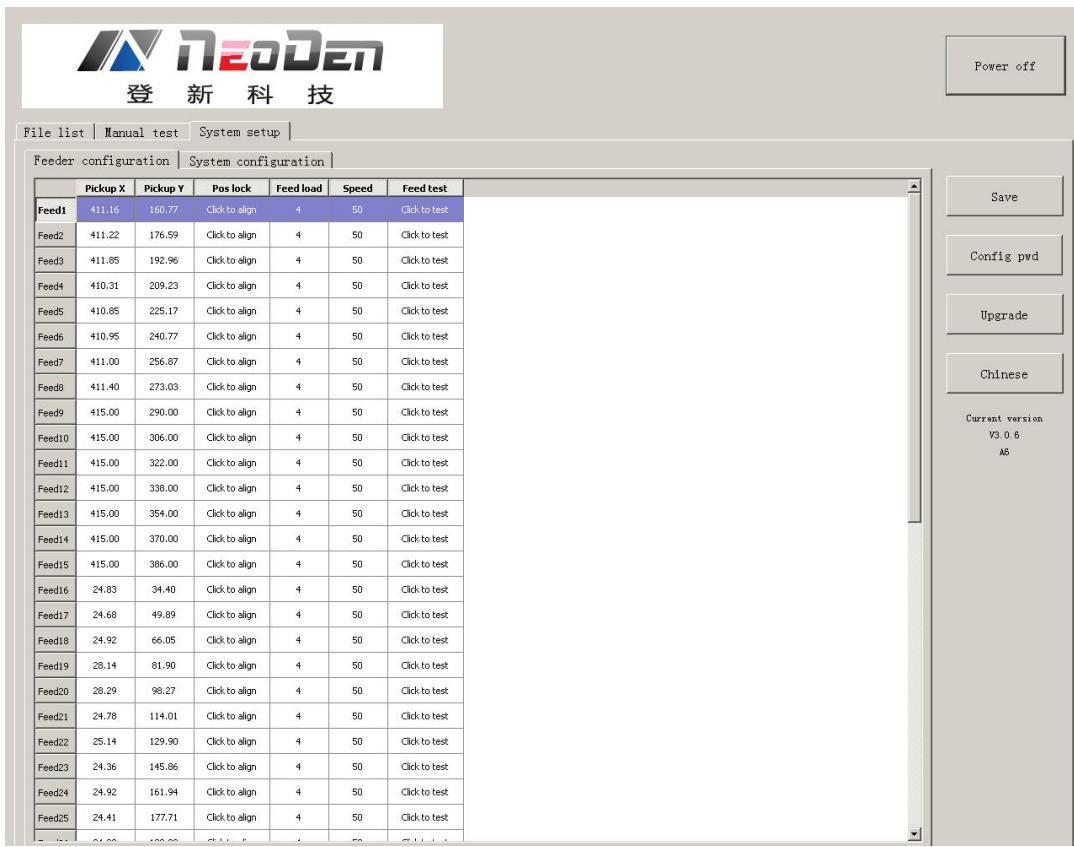
Save configuration: click it for saving after modify the parameters

Modify password: click it, put into the password, then finish change the fourth page which is also the System interface.

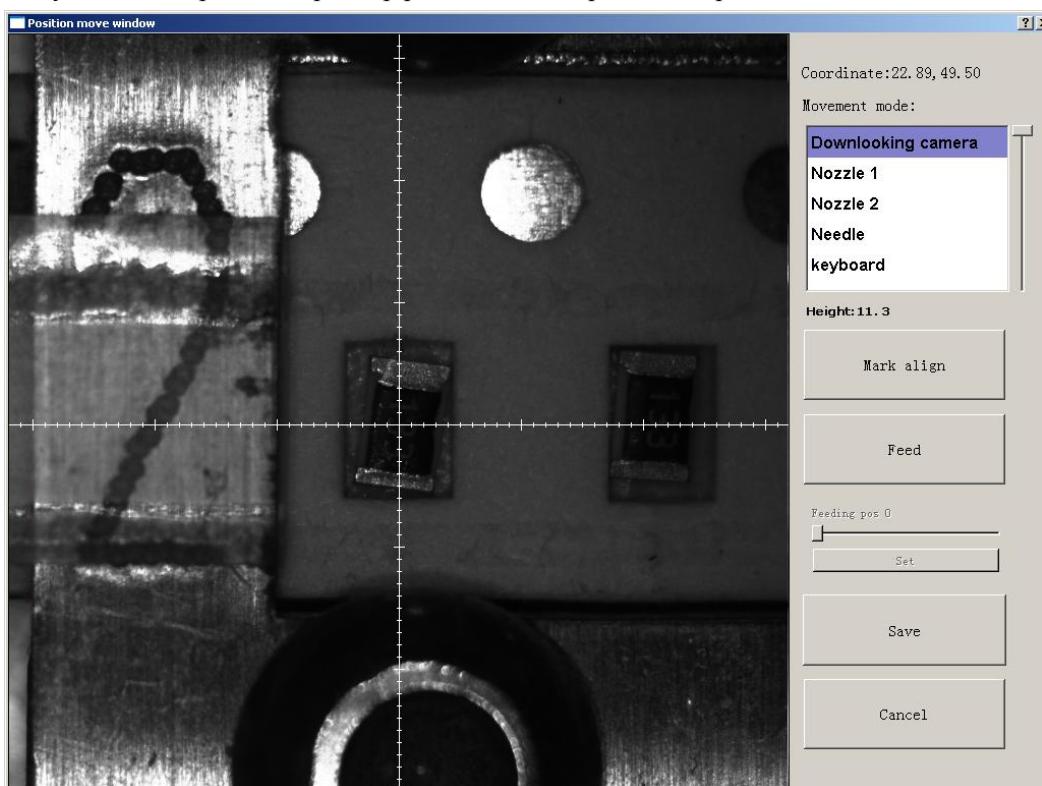
Version upgrade: After receiving our new version file, you can upload it with clicking “version upgrade” to finish.

ENGLISH: Change to the English version.

### 2.4.1. Feeder Configuration



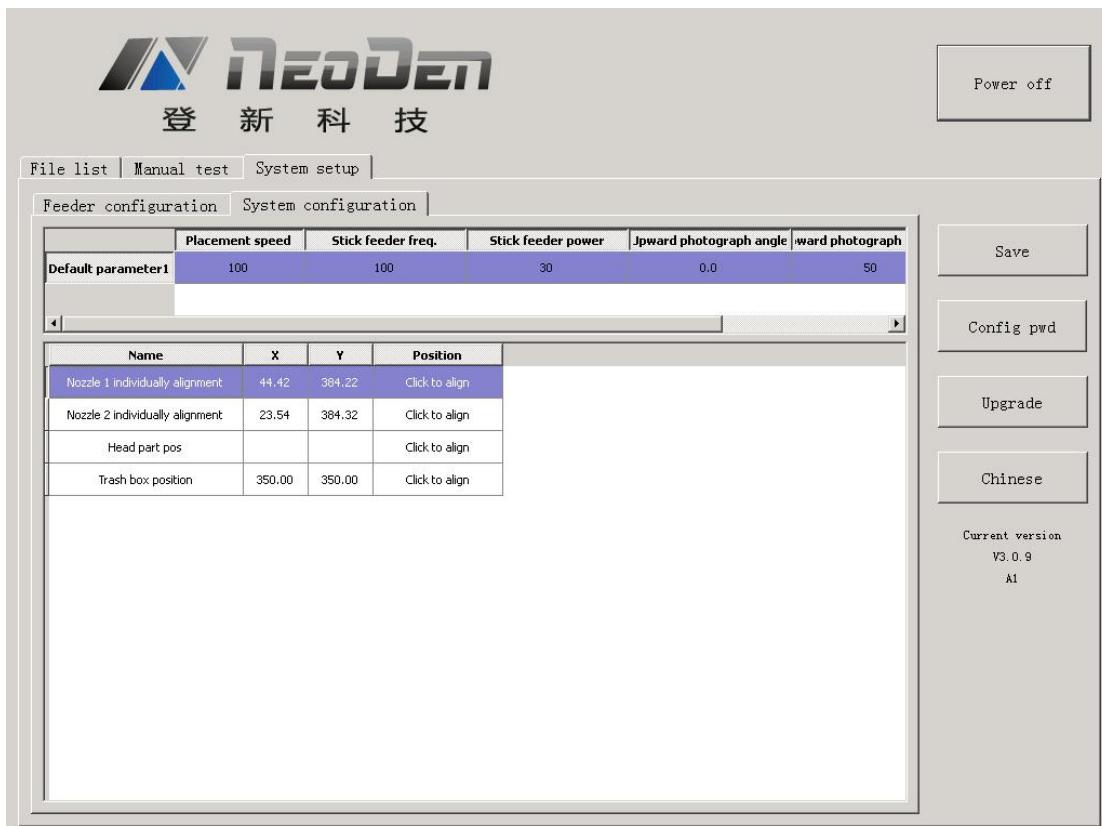
- Function: you can set up and test pick up position, needle position as pictures



- Position X, position Y: The coordinate position of nozzle

- Align the pick up position: Click to enter the visual lock interface, select the center as best location, it automatically generate the XY coordinates after confirmation.
- Feed Value: Set the forward value of each feeder, default value is 4(Unit:mm),but for special components, 0402,should correct to 2
- Feed speed: The feeder forwarding speed (Normally default value is ok, no need to change)
- Needle Test: Press to test.
- Needle X, Needle Y: the coordinate of Needle
- Needle Position: Align the needle position, it will generate XY coordinates

## 2.4.2. System Configuration



Function: Setting of Nozzle Alignment

(Note: This page has been locked to avoid any misoperation. It will be active only after enter password.)

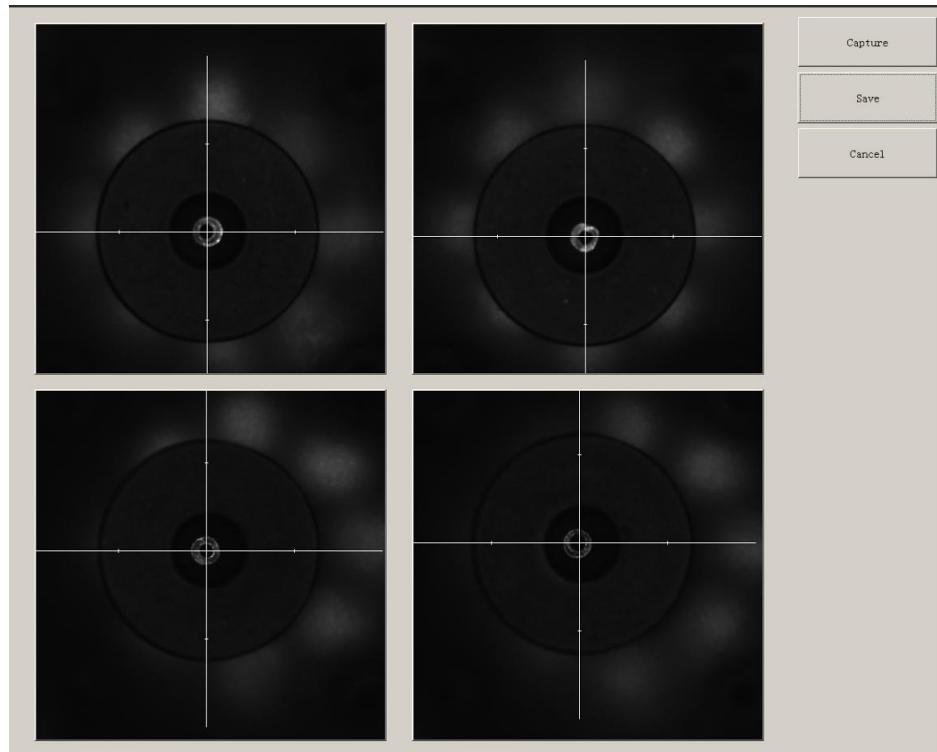
### 2.4.2.1. Default Parameter 1 Setting

- Placement Speed: Normal Placement speed of whole working file, the actual mounting speed is subject to the speed in feeder setting)
- Vibration feeder Frequency: Setting frequency of vibration feeder, higher value can ensure chip come out from tube more stable
- Vibration feeder Strength: For small chip, it will jump out easily if set high value. For big chip, it is difficult to come out if set low value.

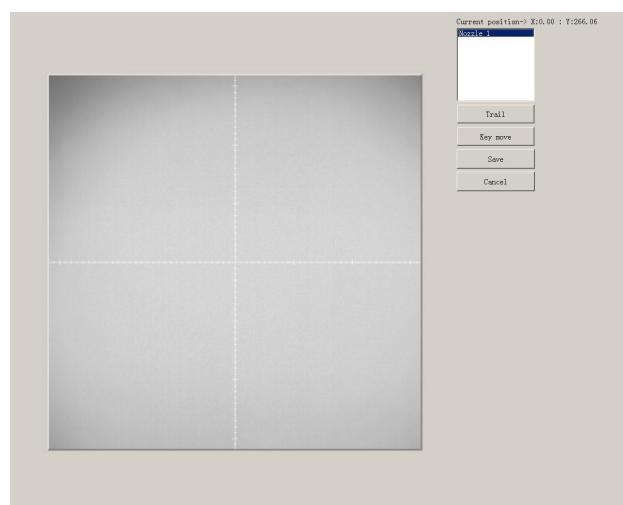
- Upward Photograph Angle: If find all chip have same angle problem during the placement, can adjust value here(Temporary can't use)
- Upward Photograph Exposure: Adjust the brightness of the up-looking camera

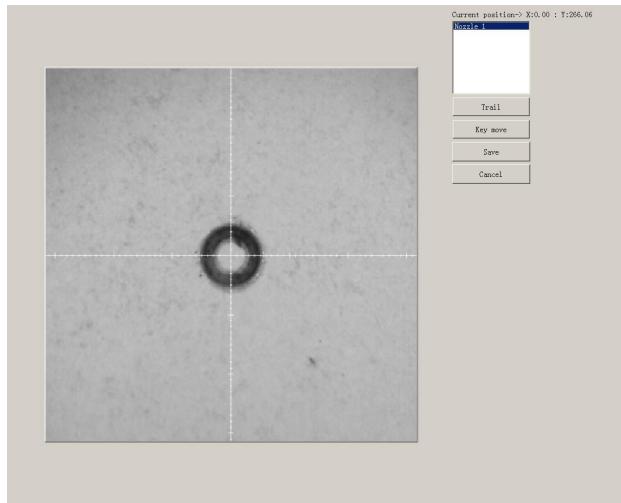
#### 2.4.2.2. Nozzle Alignment

Find the "Align" button of each nozzle, click "Align" and choose nozzle center pos and then click "Lens rotation", up-looking camera will shine for many times, finally "Save" the values. Also you can use the mouse to adjust the cross-line to the center of each nozzle by manual.



#### 2.4.2.3. Nozzle 1 and Camera Relative Position





Click “align” to enter following interface:

Operation Step: Move the nozzle to any position above a PCB, stick one carbon paper on the PCB, click “Trail”, the nozzle and needle will go down to leave each trails automatically , then click “nozzle1”, use the camera to match the cross line to the trails center of nozzle 1 and needle, finally “save” the values.

Trash Box Position: Setting “throw components” position as you like.

## 2.5. First Trial and Test

### 2.5.1. 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.

### 2.5.2. Production Test

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

### 2.5.3. Component Inspection

#### 2.5.3.1. Inspection Items

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

#### 2.5.3.2. Inspection Method

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.

#### 2.5.3.3. Inspection Standard

- 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.
  - 1) Frequent pickup failure. Some suggestions are listed below,
  - 2) The pick height is inappropriate, please revise the value after an inspection or a pick-test;
  - 3) The pick offset needs an adjustment, it should be aligned with the center of component reel slot rather than that of component.
  - 4) Due to peel strength or installation issue of wasted film, the film on tape won't be peeled completely
  - 5) The nozzle was blocked
  - 6) The nozzle is damaged or has a crack
  - 7) The size issue of nozzle would cause air leakage or insufficient suction.
  - 8) 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

## 2.6. Continuous SMT Production

Follow the SOP to start production

Notes:

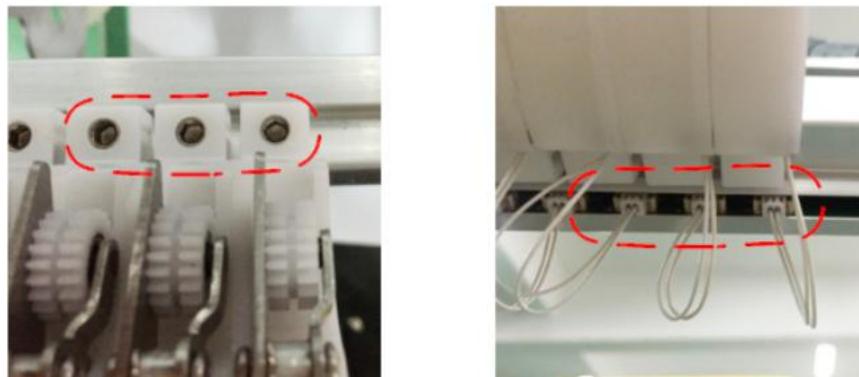
- Do not touch the surface to board to avoid damaging the printed solder paste.
- When the error message occurs, please checkout and solve it a.s.a.p.
- Once reloading the component during production, pay attention to the model,specification,polarity and direction of components.
- Clear the trash box timely to avoid wasted materials stacked too high to damage the mount head.

### 3. Structure and maintenance instruction

#### 3.1. Structure Chart

##### 3.1.1. Peel Box

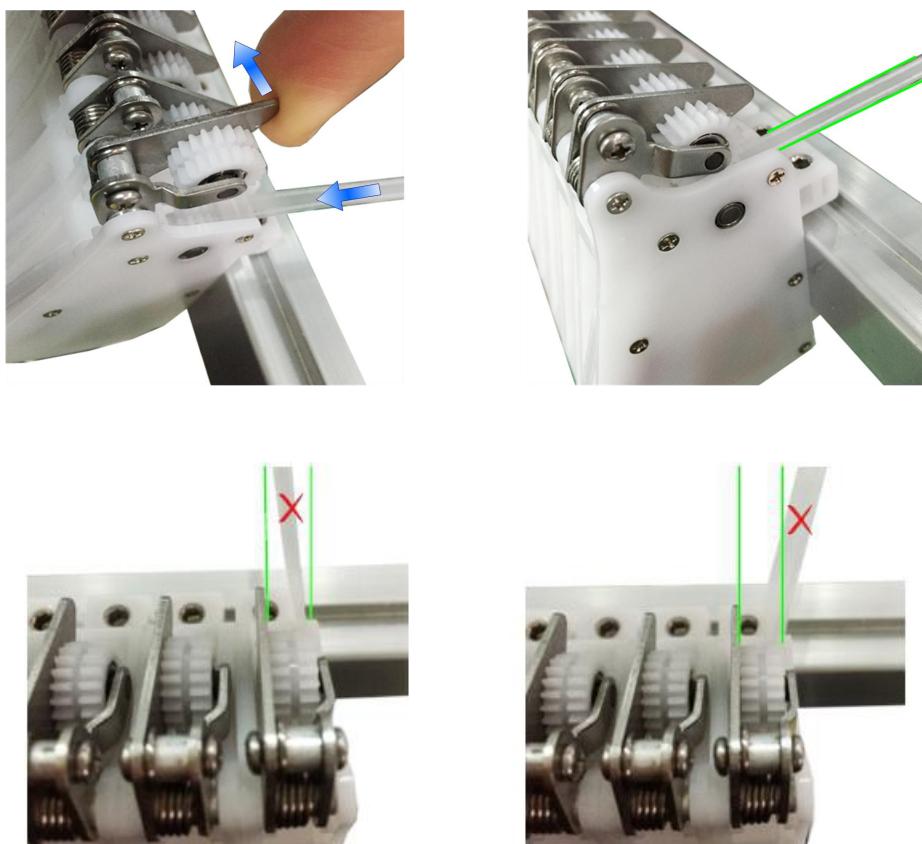
- 1) Fixation of Peel box



Fix the peel boxes on support bar and plug wires into connectors one by one.

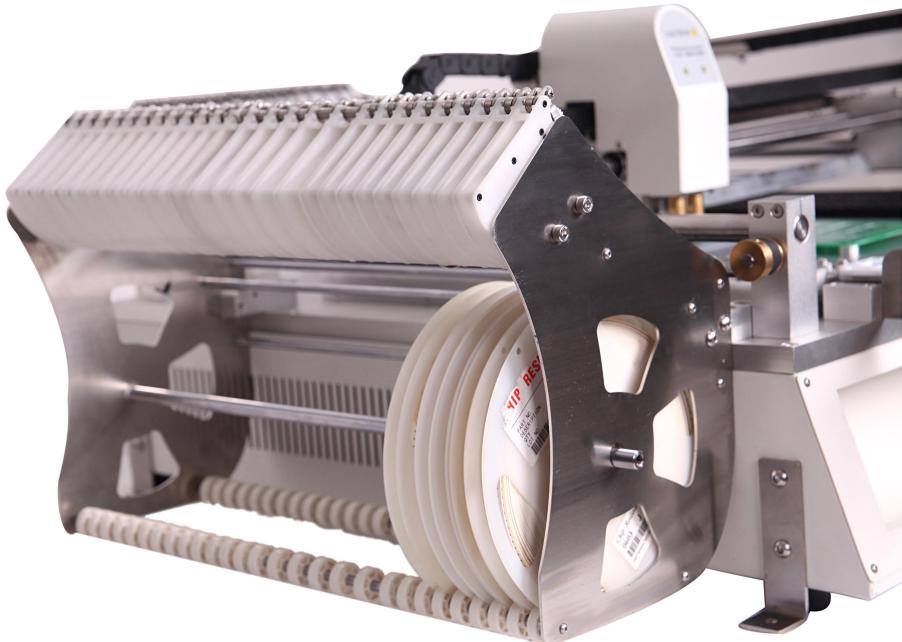
And the ID of each peel box can be changed accordingly.

- 2) Load Cover Tape

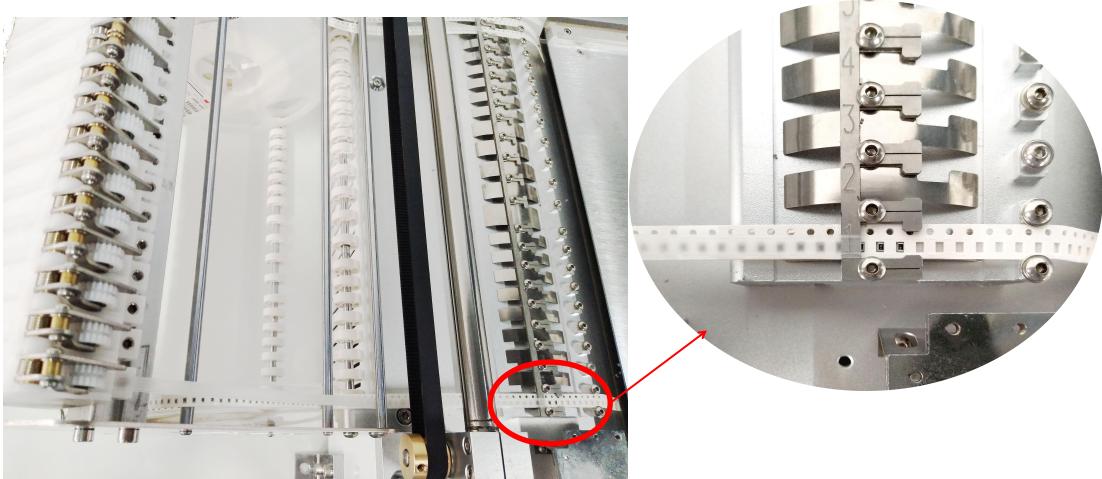


Uplift the gear, while insert the cover tape into it and make sure the cover tape is flat but not kinked.

### 3.1.2. Tape Reel Loading



While loading tape reels on reel rack, the position of each tape reel should be aligned with its peel-box and feeder.



Methods of Tape loading: ①Load the tape reel on reel rack; ②Insert the tape into feeder; ③Pull back the cover tape from feed outlet; ④ Pass the cover tape through pressure rod, then insert the cover tape into gear of peel box.

### 3.1.3. Nozzle

#### 3.1.3.1. Size of Nozzle

Please choose nozzles from the size CN040 to CN750 according to the shape and size of components.

Table 1-1 Nozzle

Size	CN040	CN065	CN100	CN140	CN220	CN400	CN750
Illustration							
Outer Diameter	0.8mm	1.0mm	1.8mm	2.0mm	3.6mm	5.0mm	9.0mm
Inner Diameter	0.4mm	0.7mm	1.0mm	1.4mm	2.2mm	4mm	7.5mm

### 3.1.3.2. Reference of Nozzle Selection

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

Table 1-2 Size Comparison of Nozzles

Model	Recommendation (Imperial System)
CN040	0402
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

Table 1-3 Size Comparison of Components

Component	Size	Component	Size
0603	1.6*0.8	0402	1.0*0.5
1206	3.2*1.6	0805	2.0*1.2
1812	4.5*3.2	1210	3.2*2.5
SMA	4.0*2.5	2010	5.0*2.5
SMC	6.6*5.6	SMB	4.0*3.3
SOT89	4.5*2.5	SOT23	3*1.4
TO252	6.5*6.3	SOT223	6.4*3.7

## 3.2. Maintenance

### 3.2.1. Reinforce Daily Maintenance

P&P machine is a relatively complex, high-tech and high-accuracy device that requires a extremely clean working environment with constant temperature and humidity. Thus, it's must to be strictly in accordance with regulations of the equipment to have a routine maintenance.

### 3.2.2. Requirement for Operator

- Operator should get the basic training which covers all the skills and knowledge needed to safely operate this 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 during the process.

Observation—to observe whether there is abnormal situation. For example peel-box can't work, plastic tape is broken etc.

Listening—to hear whether strange sounds appears during operation, such as noise of placement head, sound of loss component, strange noise of conveyor etc.

Handwork—solve small problems in time, such as install feeder, correction placement position etc. If anything wrong with the main machine body or circuit, please consult after-sales staff.

### 3.2.3. Formulate Measures to Reduce/ Avoid Mistake

The most easily appeared problem during mounting are components placement incorrectly and placement misaligned. Refer to below measures for precaution.

- 1) It needs to check whether the components' package is matched with related feeder. If not, please correct them.
- 2) As for tape reel feeder, after one is ran out, operator must check whether another newly changed tape reel is correct or not.
- 3) After import the SMD file or edit chip list manually, please recheck each component's No., nozzle's rotation angle and placement position to ensure they're correct.
- 4) Operator must check the first finished PCB of each file. If any problem happens, please find solutions such as revise program to solve it.
- 5) Check placement position's alignment, component loss problem during regular work from time to time. Find the reason in time and come up with solutions.
- 6) Detect position before soldering(manually or using AOI)
- 7) To sum up, P&P machine's running speed and placement accuracy still has limitations. Human plays an important role in running well of the machine. So it's necessary to comply with effective measures to ensure machine's well working, high placement quality and efficiency.

### 3.2.4. Maintenance of Device

Routine check and maintenance policy should be established.

#### 3.2.4.1. Check Below Points Daily

	Inspection Items
Please check below before turn on the machine	<ul style="list-style-type: none"> <li>1) Temperature and humidity: temperature range from 20°C to 26°C, humidity range from 45% to 70%.</li> <li>2) No stuff on dual rails or the whole placement area.</li> <li>3) No stuff on the fix camera lens. Make it clean and tidy.</li> <li>4) No stuff around the head nozzles.</li> <li>5) Check if nozzle is dirty or out of shape. Clean it or change it into a new one.</li> <li>6) No stuff on the feeders, and make sure they're well installed.</li> <li>7) Check if the air hose is well connected with the machine.</li> </ul>
Please check below after turn on the machine	<ul style="list-style-type: none"> <li>1) Check if the monitor's screen could display well after system starting working.</li> <li>2) Check if emergency switch could work well.</li> <li>3) Check if the placement head could return to the original place correctly.</li> <li>4) Check if noise happens when placement head moving.</li> <li>5) Check if negative pressure could under a normal range.</li> <li>6) Check the PCB's transmission on dual rails to see if the sensor still works well.</li> <li>7) Check the positioning column and holes are correct and fastened.</li> </ul>

#### 3.2.4.2. Check Below Points Monthly

Checking Points	Checking List
X、Y axis	Make sure no abnormal noise when placement head move.
X、Y motor	Make sure motors working well, no abnormal heating appearance.
Nozzle	Check if nozzles stretch well with no bending and check if the suction surface is horizontal.
Air hose	Check the air hose and connector, make sure hose is fine without broken, abrasion or air-leak etc.
Step Motor	Make sure no dust on the step motor, synchronous belt and synchronous wheel; the Z axis motor can rotate and fluctuate without obstacles.
Z axis Motor	Check if the placement head could move up and down smoothly. Push up the nozzle by hand to see whether it can move smoothly. Move the placement head up and down in the proper range.
Negative pressure	check all nozzles' negative pressure. If abnormal, please clean nozzles.
Positive pressure	check whether they're normal.
Optical axis	please check whether it is covered dusk. Please keep it clean and lubricated.
Operation button	check each button to make sure they are well-worked
Connector	check if well-connected of the air connector and air hose.

### 3.2.5. Related Issues During Solder Paste Printing Process

#### 3.2.5.1. Stencil Printer Technology

Screen printing technology refer to using ready-made stencil, directly contact 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 corresponding, thus complete the solder paste printing on the PCB.

#### 3.2.5.2. Inspecting of Solder Paste Printing

Printing process is one of the key working procedure 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:

- 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.
- In general, keep unit area amount of solder paste about  $0.8 \text{ mg/mm}^2$ . For fine pitch components, should be  $0.5 \text{ mg/mm}^2$  (using stencil thickness and hole size to control in the actual operation).
- 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%.
- 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.

### 3.2.5.3. Instruction about Soldering Printing

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.

Defects	Reasons	Issues	Solutions
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's pressure is too large; Rubber scraper's hardness is not enough; Holes are too big in the stencil	Solder paste's 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
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.