Zhejiang NeoDen Technology Co.Ltd

User Manual

NeoDen4

Content

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

Note

1. The contents include all features of NeoDen4, some of which may not be equipped on your machine.
2. Basic training and basic SMT knowledge are required for an operator.
3. For routine inspection and repair, please contact sales for operating instruction.

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. When failures happen on safety device, cannot run the machine after remove safety device. In case any injuries or casualty accident.

Usage

1. You agree that you will solely be responsible for your use 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.

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.

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

Transport

1. 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. Do not put hand in 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 exceeds the rated voltage ± 10%.

3. Do not use machine and pull the plug when thunder to avoid any accident caused by damaged electrical component.

1.Brief Introduction

1.1 Product Introduction

The fourth-generation model NeoDen4 is NeoDen Tech's independent product, with completely independent intellectual property. Its high precision vision system made it stand out in desktop pick and place machine area.

Vision system pick and place machine NeoDen4, with high speed and accuracy, compact in body, low power, stable quality and easy operation. It adopts our newly developed feeding system which can help to replace the tape easily and install smoothly, together with its vision system and rails feeding system, committed to create the great value for customers in actual PCB production.

NeoDen4, the 4th generation pick and place machine of NeoDen Tech, was independently designed and developed with patents and CE certificate.

This machine is adopted dual cameras, four heads, auto rails, electronic feeder, two conveyor ports, which achieves high accuracy, simple structure, stable performance and easy operation.

This manual cover installation, setup, customization and operation of the NeoDen4 pick and place machine. Please read this manual in its entirety before working on the machine.

Populating PCBs with surface mount technology (SMT) can be as challenging as the circuit design itself, and the NeoDen4 provides the user with all the tools necessary to work with a wide variety of components in a wide variety of packaging. The NeoDen4 is not a knock-off. It is an original design that has been engineered from the ground-up to provide simple, precise and flexible pick-and-place functionality. It is ideal for prototyping and small runs, but is equally up to the task of producing large quantities of boards: the PCBs in all NeoDen machines are made using a single NeoDen4. At NeoDen own factory, NeoDen mills own precision metal parts, winds own motors for the feeders and peelers, writes own proprietary software and assembles machines covered by over 50 patents. With ISO 9001 certification in pick-and-place quality control, NeoDen rigorously tests each machine for days before shipping.

1	Number of Heads with	4
2	Placement Rate (under factory test condition)	WITH VISION:5000/WITHOUT VISION:10000
3	Feeder capacity	TAPE REEL FEEDERS:48（all 8mm)
		VIBRATING FEEDERS:5
4	IC tray capacity	5
5	Component sizes with vision	Smallest Component　　size:0201
		Largest Component size: TQFP240
6	Component Max Height	5MM
7	Resolution	X/Y axis:0.01MM　　　　Z axis:0.1MM
8	Rotation	+/-180°(360°)
9	Positioning Accuracy	+/-0.02MM
10	X-Y repeatability	+/-0.02MM
11	Placement Area	Without waffle Tray:290*1500MM
		With 1 waffle Tray:140*1500MM
12	Main Control	GUI
13	Power Supply	110V/220V
14	Power	180W

1.2 Structure of NeoDen4

Design principles:

At the core, the NeoDen4 is a 4-axis Windows- controlled CNC with four separate vacuum nozzles, each connected to its own vacuum pump. The machine employs a single X-Y coordinate system covering the entire movement range of the head, which is 310x500mm. With resolution of .01mm (10μm) and repeatability of .02mm (20μm), any X -Y coordinate can be identified as the location of a feeder, the start of an array of components in a tray or short tape, a fiducial or the location at which a component is to be placed on a circuit board.

Feeders and Nozzles:

Electric tape-and-reel feeders, vibration feeders and virtual tray feeders are all supported. Because of the flexibility of the architecture, and the need to work with affordable quantities of parts, short tapes can also be configured on the machine's bed. Any size nozzle can be installed in any of the four locations in the head, so a single machine can handle all of the necessary components without the need for nozzle changes. The spring-loaded nozzles simply snap in and pull out of the head. Any nozzle can be installed in any of the four locations on the head.

Number of Feeders:

The NeoDen4 can accommodate up to 48 8mm tape-and-reel feeders on its left and right rails, and any size feeder (8, 12, 16 and 24mm) can be installed in any combination or order on the left and right sides of the machine. The electric feeders are inexpensive but sophisticated microprocessor-controlled units paired will tape peelers. In addition, the vibration feeder (included) can handle up to 5 separate tubes. The amount of space available for tray-fed components and short tapes depends on the available real estate on the table. Any area of the table may be used for components awaiting placement, or for the board under manufacture.

Component Thickness Limitations:

When using tray-fed and short-tape components, the maximum allowable component height is 5mm. When using tape-and-reel components, we recommend a maximum thickness of 1.8mm for reliable operation.

Rail system:

Machines equipped with the auto-loading rail system can accommodate boards from to in width, and in length. Even when the rail system is installed, any space left over on the table is still available for trays and short tapes. (The left rail can be moved to accommodate wide boards by removing the left table extension. In this case, a block of material should be affixed to the table base to raise the tray or short tape to the approximate height of the extension). The rail system allows automatic feeding of PCBs, automatic alignment of the board with the camera, and automatic ejection from the front of the machine or the rear. Rear-ejection is useful when the machine is connected to an optional conveyor that can deliver the finished board directly to the reflow oven or to another NeoDen4.

Vision System:

The NeoDen4 features a high-precision, two-camera vision system. The cameras are made by Micron Technology and are precisely aligned to the nozzles using the single unified configuration/operation application that loads on power-on.

The downward-looking camera:

On the head is used for precision location of feeders and PCB placement points. The downward-looking camera also verifies proper board placement (and compensates for minor board-position inaccuracies) by auto-aligning the nozzles to multiple fiducials on the board before beginning actual pick-and-place operations. Once the coordinates are established, the semi-closed-loop stepper motors are able to repeat these locations to 20μm accuracy without further need for this camera.

The upward-looking camera：

located on the right side of the machine. When enabled, this camera first ensures that a component is attached to the proper nozzle. If the camera detects the absence of a component, the machine will make up to two additional attempts to pick a component before asking the user for further instructions. Once a component has been verified as "picked", the camera verifies its position relative to the nozzle. Because SMDs are small and light, and are held only loosely in their packaging, there can be a great deal of variation in the actual position of the component when it arrives in "pick" position and is lifted by the nozzle. The vision system computes the difference between the ideal and actual position (both X-Y and rotational), and then corrects for any error before precisely placing the component. Because the vision system continually corrects for even small errors in component

position on the nozzle, very fine-pitch components (down to 0201) can be placed with repeatable accuracy once the correct coordinates are identified. With these basic understandings, the following images reveal the basic components of the Neoden4, see Figure 1.1, Figure 1.2 and Figure 1.3.
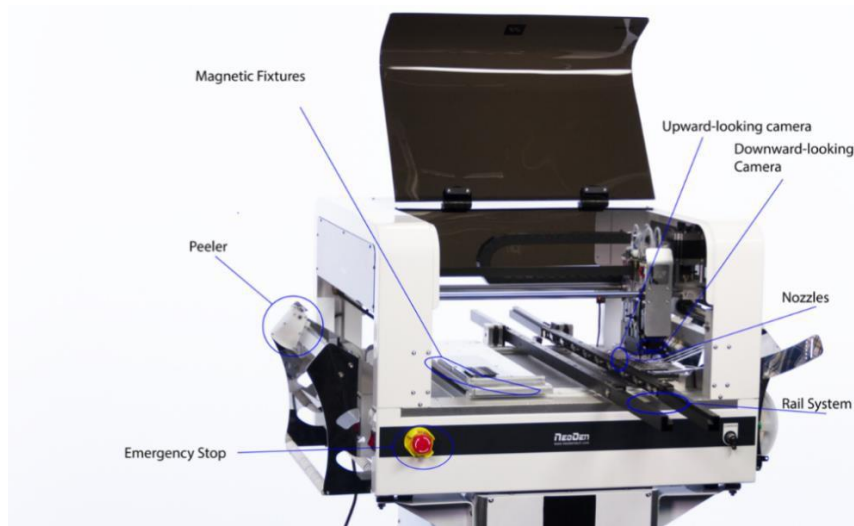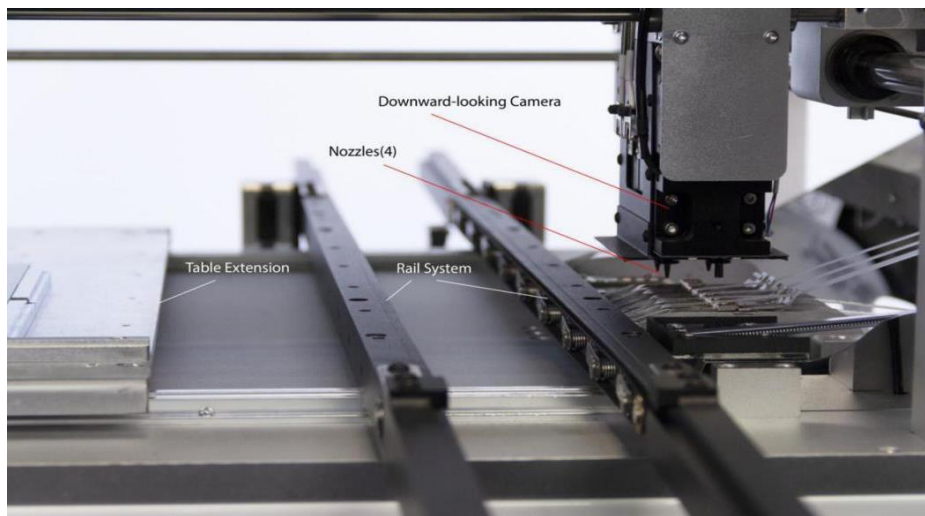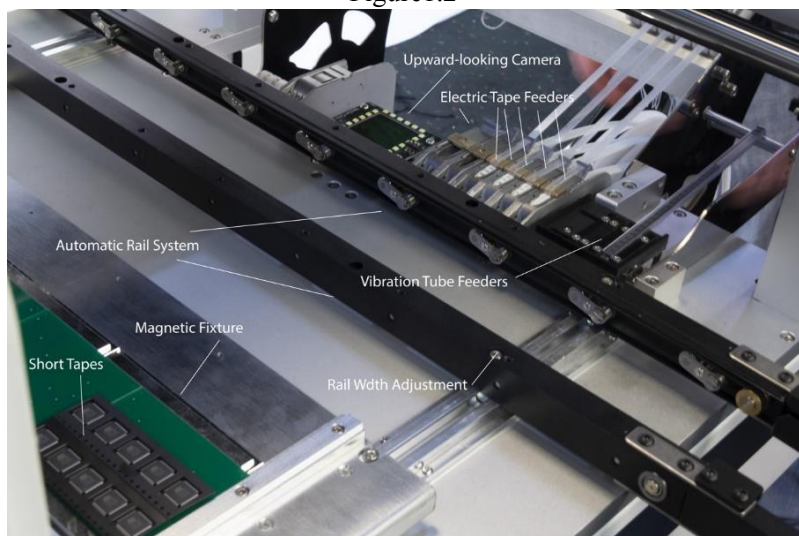

Figure1.1

Figure1.2
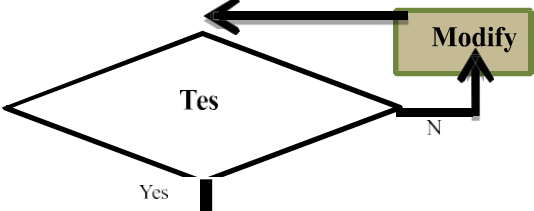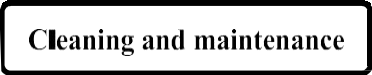
Figure1.3

2. Operation Flow Chart

NO.	Flow chart	Note
1	**Preparation**	Check the working environment whether it is safe or not
2	**Turn on**	
3	**Initialization**	The machine will start a 1-2 mins self-inspection after boot-up. It enters the operation page once finished. Need to wait 1-2 minutes after turn on the machine, mounting head will move diagonally and then enter into operation page
4	**Operation page**	
5	**Edit**	Please refer to the following pages about detailed programming tutorial
6	**Tes** / **Modify** / N / Yes	After making a programming file, there may exist several unpredictable problems, such as rotation issues of components, so a production testing is necessary for solving issues.
7	**Mounting**	Start to pick and place
8	**Exit**	
9	**System power off**	Power off software
10	**Power off**	Power off after the software being turned off, which decrease the damage to the software
11	**Cleaning and maintenance**	Keep the machine clean and nozzles need to be washed regularly Keep daily maintenance of nozzle assures high utility.

3.Procedure for making a programming file

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Edit the file                    1. PCB feed              See P13

                                 2. Chip list            See P16

                                 3. Panelized PCB first   See P14
Add a new file                      chip setting

                                 4. fiducial Setting     See P15

Start                            5. Feeder setting       See P19
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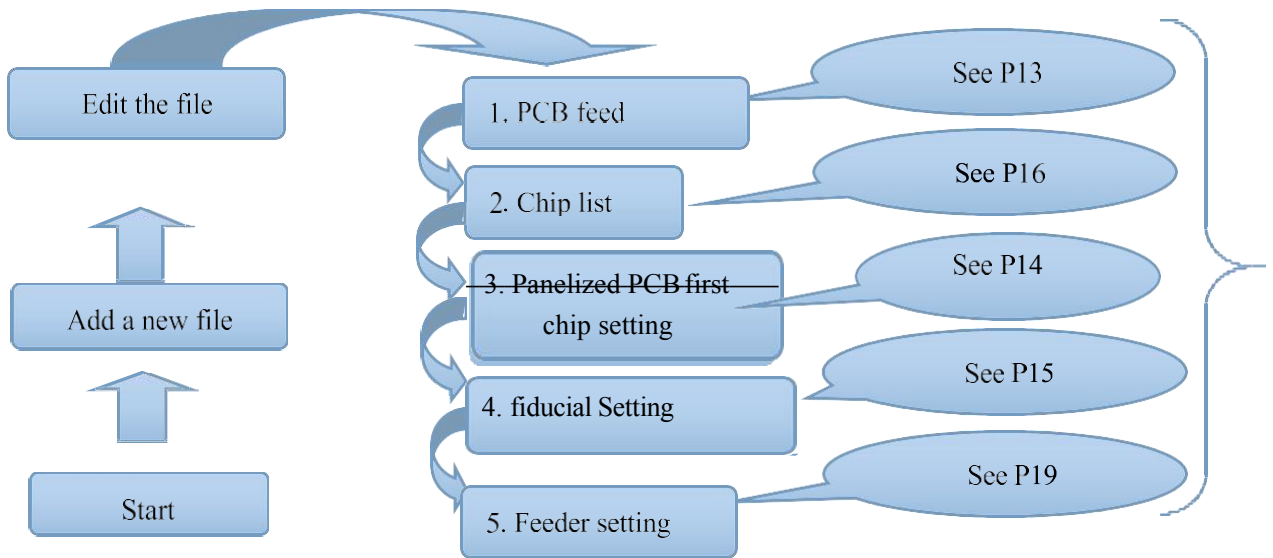
Note: The basic procedure of making a programming file for manual programming or direct PCB file is similar, but there are two different parts: chip list and fiducial setting. Please find the detailed operation steps of the differences on relative page.

4. Edit on the Operation Interface
4.1 Edit on the Interface

The entire operation of the NeoDen4 is controlled by a single application that runs automatically after the operating system boots. Despite the enormous flexibility of the machine, only 7 basic screens are needed to set up feeders, calibrate the vision system and program pick-and-place operations. This section contains a brief description of the various commands and parameters in the screens. Section contains a recommended workflow to set up, program and operate the machine.

This screen is the heart of the programming interface. It has two tabs: "PCB Information" and "Feeder Settings." In the following sections, this manual will describe each of the functions on the two pages. Finally, it will recommend some basic procedures for programming the machine to manufacture finished boards.

4.2 PCB Information
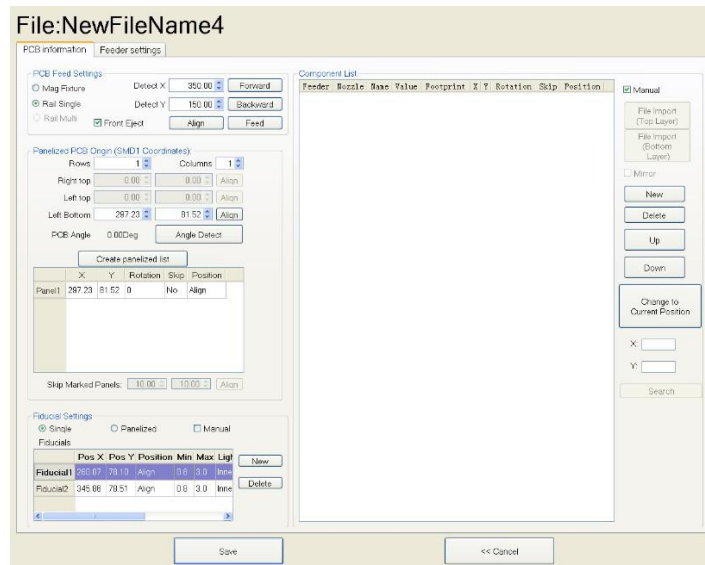
Figure 4.1

Function: Used to confirm the feeding place, first edit item in manual program, see the Figure 4.1.

4.2.1 PCB Feed Settings.
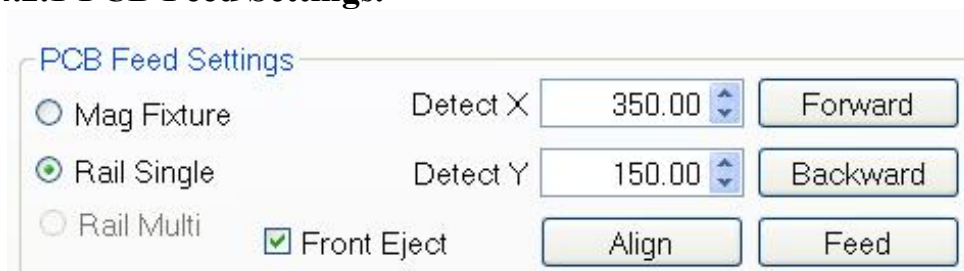
Figure 4.2

This section determines the manner in which the PCBs will be sent to the machine for pick and place operations. On machines with the rail system installed, the "Mag fixture", "Rail Single", and "Rail Multi" are available. On machines without the rail system, always select "Mag Fixture". See the Figure 4.2.

Mag Fixture: This option assumes that the user will place the board in a location determined by

the placement of the magnetic fixture blocks (supplied) on the table. This is a simple and reliable system, but the accuracy of a program depends upon the magnetic fixtures being installed to ensure that the placement of the board is essentially the exact placement that existed at the time the program was created.

(TIP: Users relying on the magnetic fixtures for several different boards should place fixtures on the table to ensure that the lower left corner remains in the same place for all boards. This will ensure that the origin of each board remains constant with respect to the machine coordinates. The remaining fixtures can then be varied to ensure stable placement of different-size boards.)

Rail Single: This option is the most frequently used on machines equipped with the rail system. Checking this box will cause the machine to feed a single board (or panelized board) to the appropriate location and then commence fiducial recognition and component placement.

Rail Multi: This option is used when boards (or panels) longer than the machine table are to be populated. In this mode, the machine will place components between the first set of fiducials, then advance the board automatically to place components between the next set of fiducials, and so on.

Eject front: When this box is ticked, the rail system will eject the PCB from the machine toward the front when the program has completed running.

"Forward" and "Backward": These buttons manually move the PCB within the rail system. When setting up a new program, use these buttons to move the PCB to a suitable position for placement operations. Follow the instructions to complete the program without moving the board until the program is completed, verified and saved.

"Align": This button activates the camera. Once a board has been placed in the desired location using the "Forward" and "Backward" buttons, press "Align". Move the head so that the crosshairs are centered on the leading edge of the board. The X and Y coordinates of the aligned location will be displayed in the "Detect X" and "Detect Y" fields. Though the user can enter values manually to change the feed location, this should rarely be necessary. See the Figure 4.3.
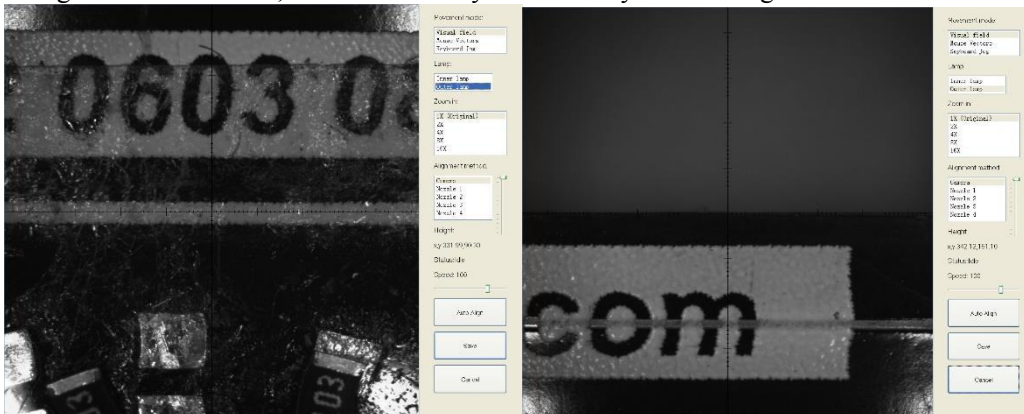
Figure 4.3

(TIP: When running a program, the board will advance slightly farther than the edge identified with the "Align" command. This is normal, and the machine will proceed to recognize fiducials to properly place components.)

"Feed": Unlike the "Forward" button, "Feed" will automatically advance the board to the position identified with the "Align" command. It is not necessary to use this feature in normal operations. However, if a PCB is moved before programming is completed, verified and saved, this feature can be useful in restoring the board to its proper position.

4.2.2 Setting Panelized PCB & first chip

(manual is the same as automatic download), see the Figure 4.4.

Figure 4.4

Panelized PCB Origin (SMD1 Coordinate):

Single PCB: Only need to enter "1" in the row and column, some other useless function will turn grey. The "left bottom" is functional, which means the first PCB. Then you can press "align" to go to the screen of vision and get the coordinate of first component. See the Figure 4.5.
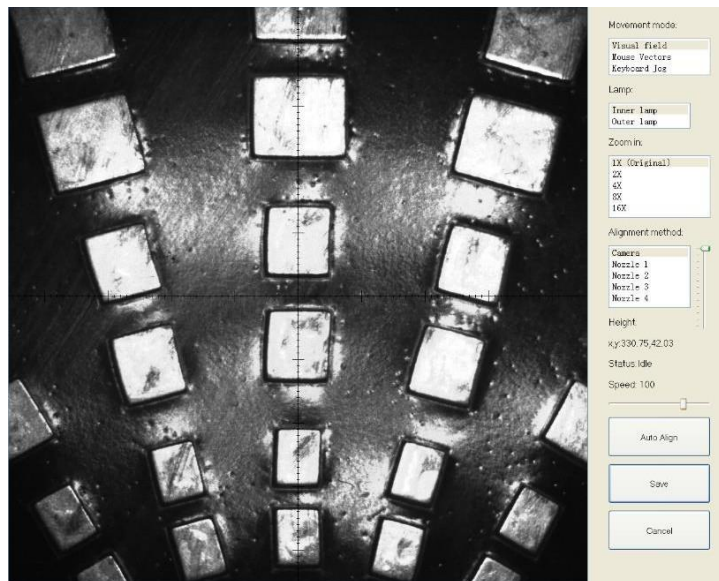
Figure 4.5

After saving the coordinate, the screen will automatically turn back to "PCB information". Click "Create panelized list" to get the information of "Panel 1". Now we've finished setting of first component of PCB.

Panelized PCB: the sequence is same to single PCB, but please 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. 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 position, after saving the data, it will return to the "PCB information" automatically.

The data of "left top" is collected according to component (its position is same to that on "left bottom"). Press "align" find the left top panel which is furthest to the feeding position, after saving the data, it will return to the "PCB information" automatically.

The data of "right top" is collected according to component (its position is same to that on "left bottom"). Press "align" find the right top panel which is furthest to the feeding position, 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.

Create Panelized List: This button automatically creates component lists and their coordinates for each board in a panel (or for a single board) based upon the number of columns and rows entered for the panel in the Panelized PCB Origin field(s).

Function: This is mainly to determine the first component on single or panelized PCB of manual programmed or imported file. 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.

PCB angle correction: angle deviation of PCB board compares to rails

Skip marked panels: used for find the bad PCB board and skip

4.2.3 PCB fiducial setting
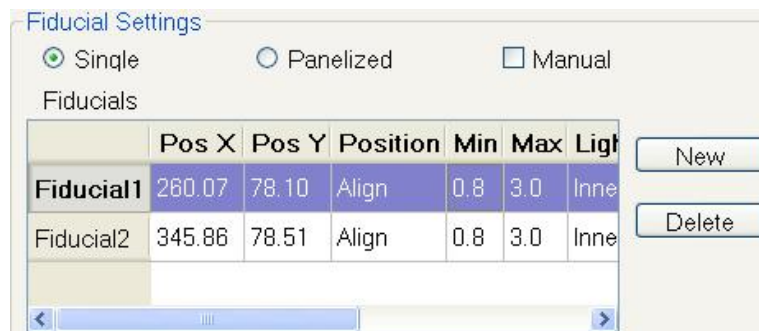
Figure 4.6

Function: After completing setup of the fiducials, with which the machine can locate the position of PCB and identify the set-up fiducials, so that the next step can be followed, see the Figure 4.6.

Operation method:

Fiducial on single PCB: this mainly applies on single PCB or a whole board that consists of a few boards (take them as a single board). General we need to set 2 fiducials.

Penalized PCB: this mainly applies on multiple PCB (we need to set fiducials on each PCB)

Manual alignment: if there is no fiducial on PCB, you can use some positioning holes or some other referential points as subsidies to locate the PCB. See the Figure 4.7.
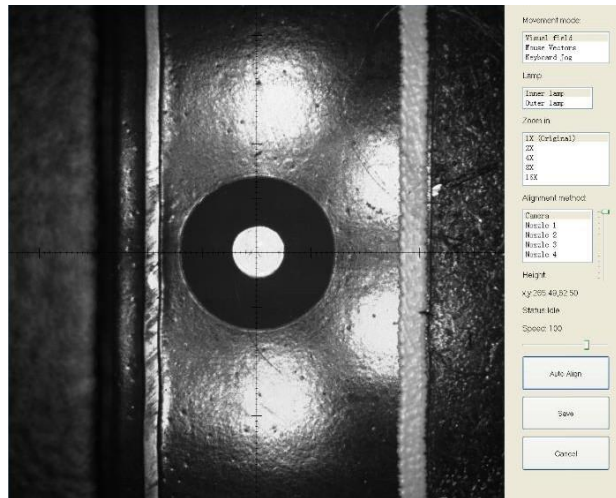
Figure 4.7

Import coordinate: according to the PCB schematic, we get the coordinate of fiducial and write down manually.

Fiducial information;

Min-Max: Based on different size of fiducial to find the correct position in case of any confusion.

Light source: inner ring and outer ring. Use inner ring if the board holes work as fiducials, use outer ring if light-spots work as fiducials.

Brightness: Default value

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

No fiducial exists: Generally, we will choose a component that is far away from the first component as a fiducial, which will make placement effect better.

Add fiducial: the function of adding fiducial

Delete fiducial: the function of deleting fiducial can be used when there is needless fiducial or error point.

4.2.4 Component list settings

Function: The component list is the heart of the pick and place program. It contains the location and rotation of every component, along with other identifying information about the components. There are two ways to add this information: manual programming and import mounting file.

Operation：

(Import PCB coordinate File)

　　First generate the coordinates from PCB diagram and put the PCB file on the USB Flash Disk, then insert it to the machine (There are many kinds of PCB designer software, the only request is can generate the coordinates from them, file format(.csv)-support use Excel to edit

　　Remove tick mark before the item "Manual Program" and then click "File Import" button, will pop up one small dialog, select the required PCB file and then click "Save" item, all data will be automatic imported to Chip List. (Turn to the "Feeder configuration" interface to do next operation).

Re-edit of Coordinates on finished programming working file

In edit mode, click "feed "button and let PCB forward until stop, then click "change to current position", the machine will align the fiducial automatically and transfer all original coordinates to new ones according to current PCB location, finally support do re-edit work.

If want to check component coordinates info, insert X/Y value, click search then will pop out all corresponding coordinates you want

(1) If you want to find all coordinates which X value is 342.17, then insert 342.17 and click search.

(2) If want to skip one component, choose "Yes"; if want to skip components in column or raw on PCB, choose anyone component and select "row skip "or "column Skip"-normally use in long led strip programming work. See the Figure 4.8.
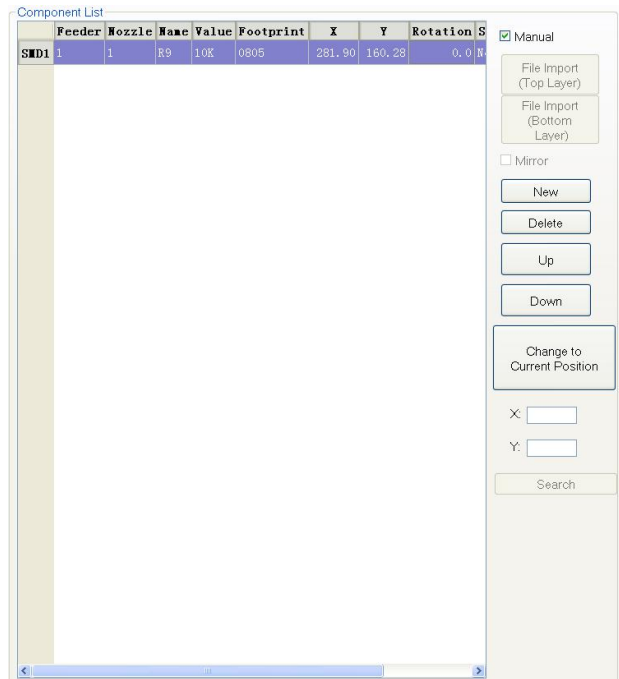
Figure 4.8

File Import:

First generate the coordinates from PCB diagram and put the PCB file on the USB Flash Disk, then insert it to the machine (There are many kinds of PCB designer software, the only request is can generate the coordinates from them, file format(.csv)-support use Excel to edit

Remove tick mark before the item "Manual program" and then click "File Import", will pop up one small dialog, select the required PCB file and then click "Save" item, all data will be automatic imported to Chip List. (Turn to the "Feeder configuration" interface to do next operation). See the Figure 4.9.

Figure 4.9

Manual programming:

Manual programming: firstly, check the box of manual programming. There is a sample line of the

first component, please modify this line firstly. See the Figure 4.10

Figure 4.10

Find and confirm one component's coordinate by using the function of "Movement Mode"-Click to move (Visual field/Overall Workbench).Once clicked the "Save" item, the interface will automatic back to main page, then input the corresponding values(Designator refer to the location, Specification refer t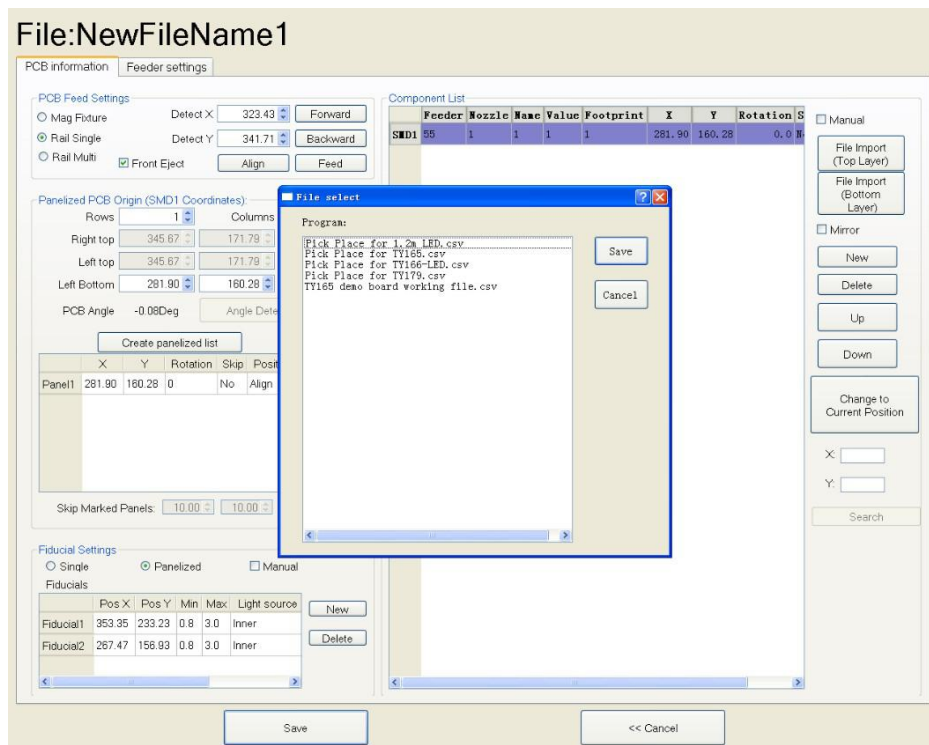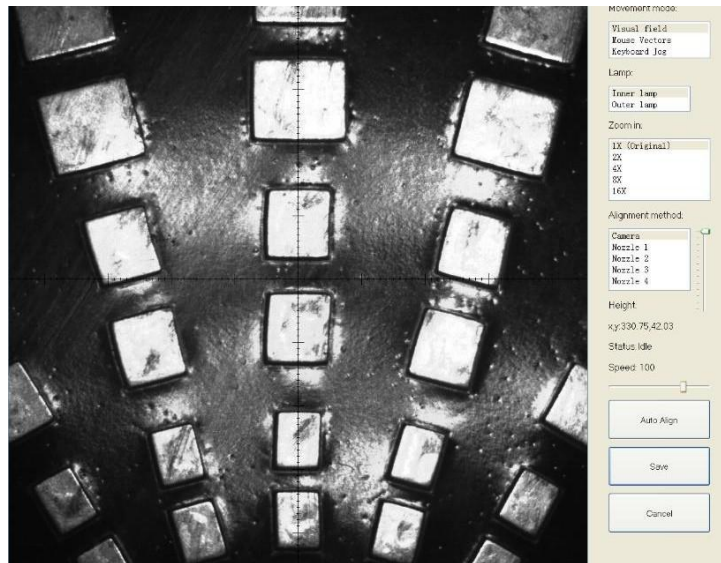o the value of resistance, Footprint refer to the normal package info,I.e.0603,0805,1206,Etc.Angle value should be set according to the required direction on the PCB and polarity ,horizontal direction(0 or 180 degree),vertical direction(90 or -90 degree).the value should be integer. The first component has been completely created after set all above values. The next step is click "New" item and will pop up one line (completely copy the previous line), then click "Align" to find and confirm second component (same operation as before)

Change to current position: This is a powerful feature that will change the coordinates of the entire component list if the board is placed in a different position on the table than the position that was used to compute the original origin. To use this feature, locate the first fiducial with the camera. Press "Cancel", and press "Change to current position".

The machine will locate both fiducials and compute the offset from the original program. It will then change the values in the component list to conform to the new board location. After this process is complete, it is necessary to ensure that the new coordinates for the first component are entered in the "Left Bottom" location, and that the "Create Panelized List" button is pressed so that the XY coordinates of the first component appear in all three locations on the screen.

4.3 Feeder settings screen

(1) Feeders Arrangement: Left Feeders (Feeder20-48), Right Feeders (Feeder1-19), Special Feeders (Feeder49-98). Above feeders' setting is under the ideal situation. According to the Required Tape's width from customers, the quantities maybe be cut down. For example, if there are a lot of components' information under the "Chip List" item, choose the feeder number and you will find the drop-down symbol, will display all components' specifications by click it. Select one specification and one less in drop-down list, can do same operation in every feeder.

(2) Feeder Configuration: Select one feeder, tick the item "Apply", all configurations will be unlocked for this feeder, then can-do amendment. Total have five items: Nozzle information, Feed-box information, Feeder basic information, Tray feeder information, Feeder exchange. One item will be always locked for Feed-box information and Tray feeder information according to the differences of components. Operation sequence: Feed-box information (Tray feeder information)—Feeder basic information—Nozzle information—Feeder exchange (used if placed wrong tape). See the Figure 4.11.
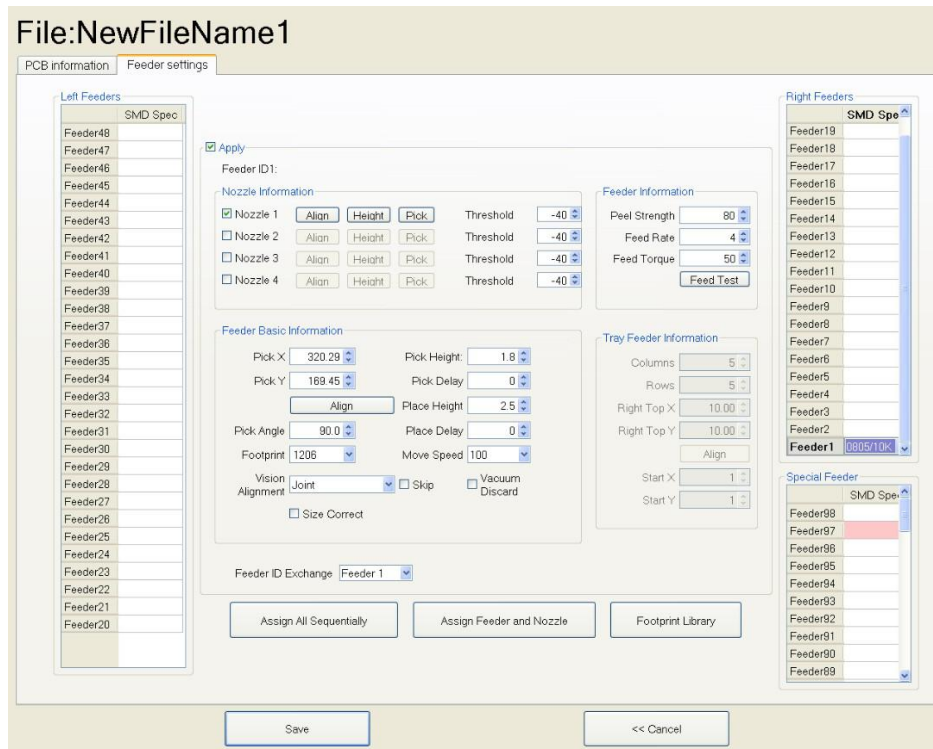
Figure 4.11

4.3.1 Nozzle information

Figure 4.12

(1) Function: Select corresponding nozzles (one or more than one all acceptable) according to the components and the nozzle have set on the machine, then the machine will automatic assign to each feeder in order to meet the requirements of single head work or multi heads working together. Also, have detect functions on this item. See the Figure 4.12.

(2) Align: The nozzle will align to the component's upside on corresponding feeders when click this item

(3) Height: After clicking this item, the nozzle will go down and check whether the pick height is ok. Support do adjustment of pick height on feeder information item if needed.

(4) Pick: 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 this feature is activated, the part should be removed from the nozzle with a finger or tweezers.

(5) Threshold For each feeder, check the nozzle(s) that are sized appropriately for the component installed in the feeder. We recommend leaving the threshold settings at their default values, because the vacuum detection feature to which these settings relate is rarely needed or used when
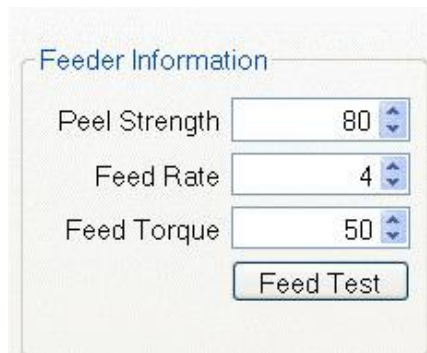
13

Feeder information

Figure 4.13

Function: Adjust the value for feeder and peeler, see the Figure 4.13

Peel Strength: Support do adjustment according to different components' required strength, default value 100
Feed rate: Adjust the feed & peel distance by changing the value

Feed torque: Adjust the feed strength by changing the value, default value 60
Feed test: After finishing above steps, can click this item to test the feed status
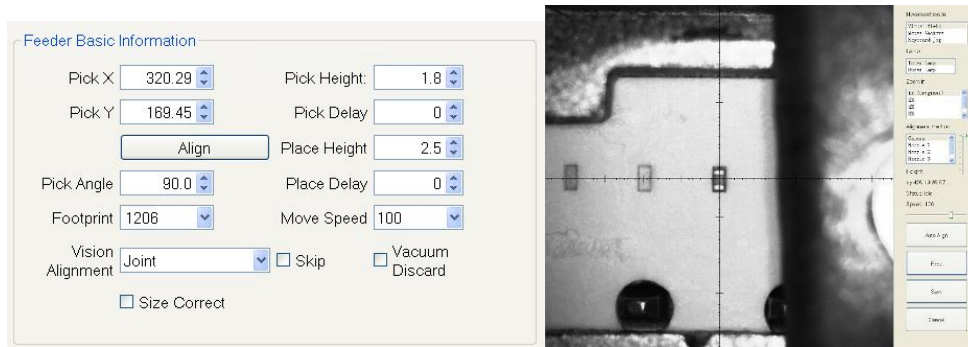
4.3.2 Feeder Basic information

Figure 4.14

(1) Pick X/Y: First have to lock the position of component on the feeder, once saved the modification, the XY date will automatically change to the ones after alignment. See the Figure 4.14.

NOTE: For feeders installed in the far back of the machine (often feeders 18 and 19 on the left side) the camera, which is mounted on the front of the head, will not be able to be moved far enough to view the necessary location. For these feeders, after clicking "Align", select the desired nozzle as the "Alignment method" on the right side of the screen. Then use the mouse to move the nozzle to the desired pick location, and slowly pull the vertical slider down to lower the nozzle. Continue to fine-tune the location of the nozzle until it is centered in the hole in the tape. Click save.

(2) Pick Angle: The initial default angle of the right-side feeders is 90 degrees, the initial default angle of the left side feeders is -90 degrees, normally does not need to be changed because the machine automatically sets this value based on the feeder's location on the left or right rail. For trays and sort tapes, however, this value may need to be changed to 0 or 180.

(3) Footprint: Select corresponding footprint, when use the function "Vision Alignment", will refer to the values in date base. If the correct size is not in the menu, it is possible to create new footprints by entering the footprint library.

(4) Vision Alignment: The Vision Alignment setting is normally set at "Individual." This setting directs the NeoDen4 to transport each "picked" component to the upward-looking camera to ensure

that a component is attached to the nozzle and analyze its position to compensate for X-Y and rotational errors before traveling to place the component on the board. For large ICs, choose "large component" in this field.

(5) The Pick Height setting is critical to reliable operation. The nozzles offer 12 mm of total downward travel from their resting position in the head. The value entered in this field represents the distance in millimeters from the maximum extension. Therefore, smaller values indicate greater downward travel. The best way to choose this value is to press "Align," ensure the camera is properly centered over a component, and then select an appropriate nozzle as the alignment method. Drag the vertical slider down until the nozzle gently touches the component, and note the value shown – this is the value to be entered in the "pick height" field. Should you notice repeated failures to pick a part, the pick height may need to be reduced.

(6) The Place Height setting determines the extension of the nozzle when the component is released into the solder paste. Proper setting of this parameter is important to protect components and nozzles, and to ensure accurate placement. We recommend the following procedure:

Mount a PCB in the rails or magnetic fixtures;

In the "Nozzle information" area, check the nozzle (or nozzles) appropriate for the component in the feeder.

Press "Pick." The Head will move to the feeder and the designated nozzle will pick up a part. Verify visually that a part is attached to the nozzle.

Go to the PCB Information page, and click "Align" on any component. Select the nozzle holding the picked component as the Alignment Method. The component should now be held by the nozzle, suspended above the PCB.

Slide the vertical slider down slowly until the component barely contacts the PCB – usually, you will hear a small click when the component touches down.

Note the value shown by the slider display and enter it in the Place Height field.
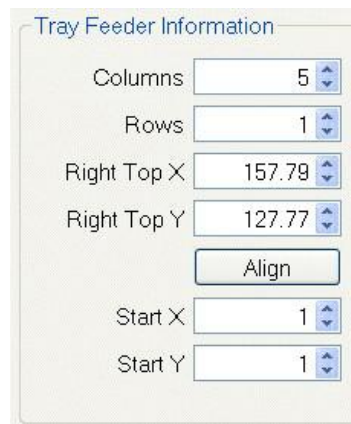
The Pick Delay and Place Delay settings allow a short pause after a nozzle comes into contact with a part, and before it leaves contact. This small pause allows for stable vacuum and cessation of any vibration from the rapid movement of the head that might cause imprecise placement. We recommend entering a value from 100-300 in these two fields for every feeder.

The Move Speed setting has a default value of 100. This is a very fast setting, and users are advised to start with a slower setting, e.g. 70 for each feeder to verify proper operation of a program. Once satisfied with the program and its accuracy, faster settings may be attempted. For very large components, start with a much slower setting, e.g. 30.

Vacuum Discard: Once set one vacuum value which help judge if qualified or not before placement. Once the actual vacuum won't reach this range, the machine will drop away this components and re-pick one. We therefore do not recommend its use except in special circumstances.

Skip: Once select this item, will skip all placement for this feeder.

4.3.3 Tray feeder information (available for feeder 54-98)

Figure 4.15

Function: Use to set the components' information from tray and tube packages, complete picking up operation for special feeders by changing the values, see the Figure 4.15.

(1) Column: Quantity of components on each column

(2) Row: Quantity of components on each row

(3) Right top X/Y: Find the position of right top component, this component is usually the last component in IC tray, and left bottom side is the first component in IC tray.

(4) Start X/Y: This setting is used to define the position of 1st component, its default setting is X1, Y1 (in 1st column, 1st row). If the 1st component is on 2nd column, 1st row, you can enter X2, Y1.

After finish setting of all above feeders' information, then click "assign feeder and nozzle to Chip list", the NeoDen4 will automatically select the appropriate feeder and nozzle for each component in the Component List.

4.4 Running the program

On the P&P Programming page, select the program you wish to run and press "Mount".

If the vibration feeders are needed, activate them with the checkbox.

Place a PCB on the magnetic fixtures or load one into the rail system so that the PCB is in snug contact with the guide belts.

There are two ways to run a program: Step Mode and Continuous Mode. Pressing step will cause the NeoDen4 to execute the program one move at a time. This can be helpful in troubleshooting or double- checking the integrity of a program before letting the machine run free. Pressing Continuous will cause the program to run on its own. The NeoDen4 will first check each nozzle called for by the program. It will the locate the fiducials on the board and begin placement operations.

File Mounting：

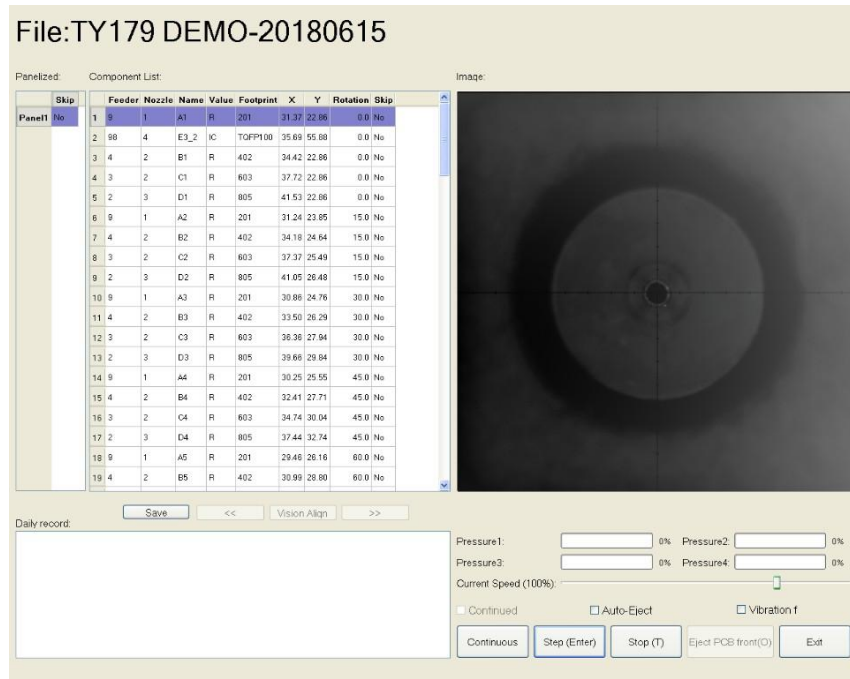
Figure 4.16

1.Method to mount one file:

First select one file, click "mount", then you will enter into one mounting page, above picture is an example of one file in mounting. See the Figure 4.16

(1) On the top-left corner shows mounting process, chip list---by the variation of blue 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 bottom-right corner shows some control information

    a. Air pressure of 4 nozzles

    b. Placement speed, can be changed by manual during mounting

    c. Non-stop mount, this is used in one-stop SMT production line, add conveyors in front and behind,

    d. Auto-eject PCB once finished, when select this option, after finished mounting task, PCB will eject its working area automatically

    e. Another control information, Continuous/Step/Pause/Eject PCB front-side manually/Stop Continuous, the machine will obey its order and work constantly

    f. Step, the machine will work one single step Pause, the machine will stop its work instantly

    g. Eject PCB front-side manually, 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 carry out this order.

    h. Stop, before click this option, you need to click "pause" first

    i. Vibration Feeder: Tick this item and then the vibration motor will be on.

4.5 Manual Test

The second tab at the top of the interface opens the manual test screen. This screen contains a convenient selection of tools to verify the operational status of most components of the NeoDen4. Most functions of the manual test screen can also be accessed from other areas of the interface.
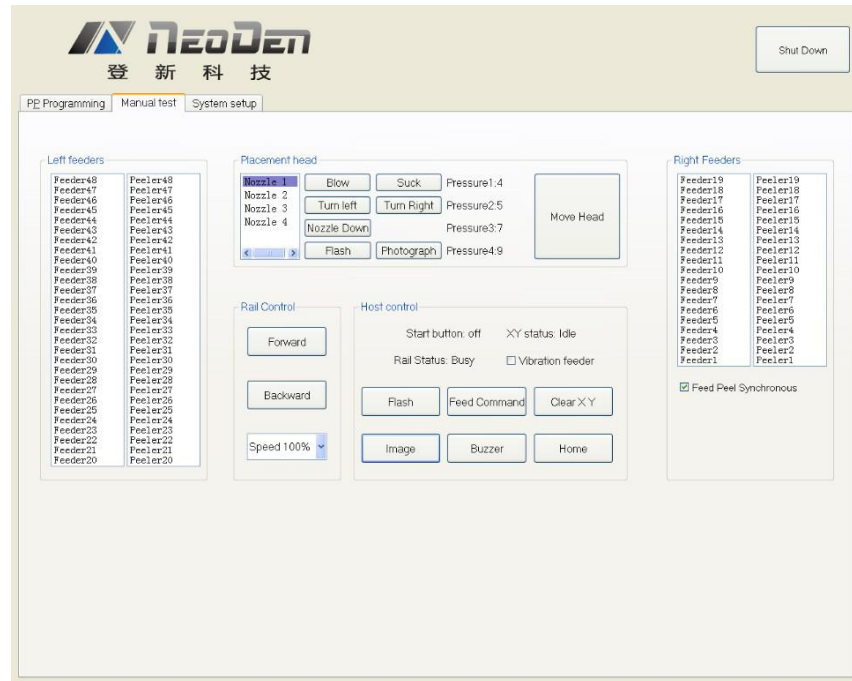
Figure 4.17

Function: Used for testing the basic functions, connection between software and hardware is the mainly function, details about testing as below, see the Figure 4.17.

4.5.1 Placement head

Figure 4.18

Choose nozzle 1, nozzle 2, nozzle 3, nozzle 4 to test separately, see the Figure 4.18.

(1) The "Blow" button will release a brief jet of air from the selected nozzle. Place a finger under the nozzle to verify operation. A small increase in positive value should appear on the screen.

(2) The "Suck" button will engage vacuum for the selected nozzle. Place a finger over the nozzle to block airflow, and press the button. If the unit is operating correctly, you will feel the vacuum, and the "pressure" indicator will change from a positive to a significant negative value while vacuum is present.

(3) The "Turn left" and "Turn right" buttons activate the rotational axis of the selected nozzle. Because rotation of the smooth black nozzles is difficult to observe, it is easiest to verify function by watching the motion of the vacuum tubes at the top of the head.

(4) Down, after click this option, selected nozzle will descend slowly. Releasing the button causes the nozzle to return to its upper position.

(5) The "Flash" button activates the lighting for the downward-looking •camera. Press once for the inner lights, again for the outer lights, again for both, and a fourth press will turn the lights off.

(6) The "Photograph" button verifies operation of the downward- looking camera by moving the head back and displaying a photograph of the table.

18

(7) Vacuum value 1, 2, 3, 4, Based on the testing of nozzles, you can see pressure value of each nozzle.

The "Move Head" button allows repositioning of the head in three ways.

By using the "Visual field" method, the head can be moved precisely by clicking on the portion of the screen relative to the center crosshairs, which indicate the current position of the camera. Because of the extreme closeup vision of the camera, only small moves are possible with each click.

With the "Mouse Vectors" setting, the screen turns grey, and represents the entire area of movement possible over the table. Clicking in any region of the screen allows rapid, coarse movement of the head. This can be convenient for speeding alignment, as well as for moving the head to a more convenient general location for the task being performed.

The "Keyboard Jog" method allows movement in of the head along the X and Y axes in .1 mm increments. Additional keyboard controls are noted on the screen. To exit this mode, press the Escape key.

Z Axis: When in an alignment screen, the default "camera" setting allows the visual check of X and Y coordinates. But the selection of one of the nozzles as an alignment method allows the manual extension of the nozzle along its 12 mm Z-axis travel. This feature is useful not only to verify operation of the Z-axis motor, but to determine the best values for "pick height" and "place height" in the feeder settings of a P&P program.

4.5.2 Rail control

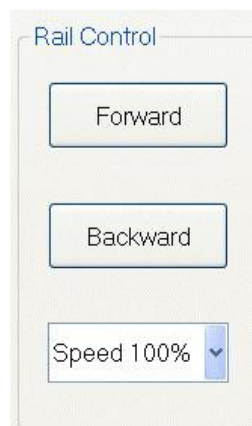Figure 4.19

Function, test rail PCB feeding, forward PCB feeding, backward PCB feeding and feeding speed, see the Figure 4.19.

4.5.3 Host control
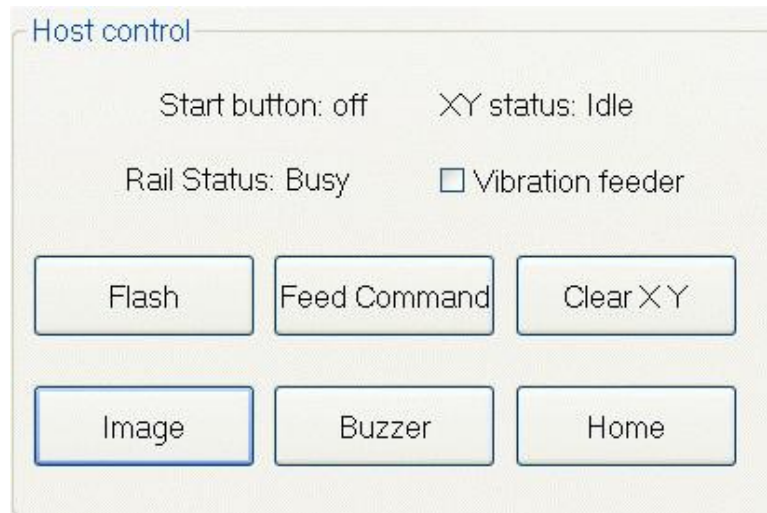

Figure 4.20

In the "**Host Control**" section, seven controls complete the manual test interface. See the Figure 4.20.

Start button status, on the left side of machine, it has one start button, press this button the status will change

The "**Flash**" button activates the lighting system for the upward- looking camera. A second press turns off the lights.

The "**Image**" button verifies operation of the upward-looking camera by displaying an image on the screen. Because the camera focus is set to take very sharp pictures of the nozzles and any components they are carrying, pressing this button may produce only a blurry image unless an object (like the head) is present over the camera at the correct height. Pressing "Cancel" returns the user to the main screen. (The Lens Rotation and Save buttons are used for nozzle alignment purposes, and perform no valuable function in the Manual Test context).

The "**Feed Command**" activates the rail system for those units so equipped.

The "**Buzzer**" button sounds the internal warning tone for as long as it is pressed.

The "**Clear X Y**" button should only be used to correct an error condition displayed in the "XX Status" annunciator position. When the status reads "Idle," the system is functioning normally and there is no need to use this button.

The "**Home**" button causes the X and Y drives to return the head to the machine's home position, and reset the X-Y geometry based on the physical limit switches in the unit. Use this button to verify operation of the limit switches, and also to restore the home position in the event of an accidental head crash into an object inadvertently left on the table.

The "**Vibration feeder**" check-box will activate the vibration feeder motor when checked. Leave the box unchecked except for this brief test.
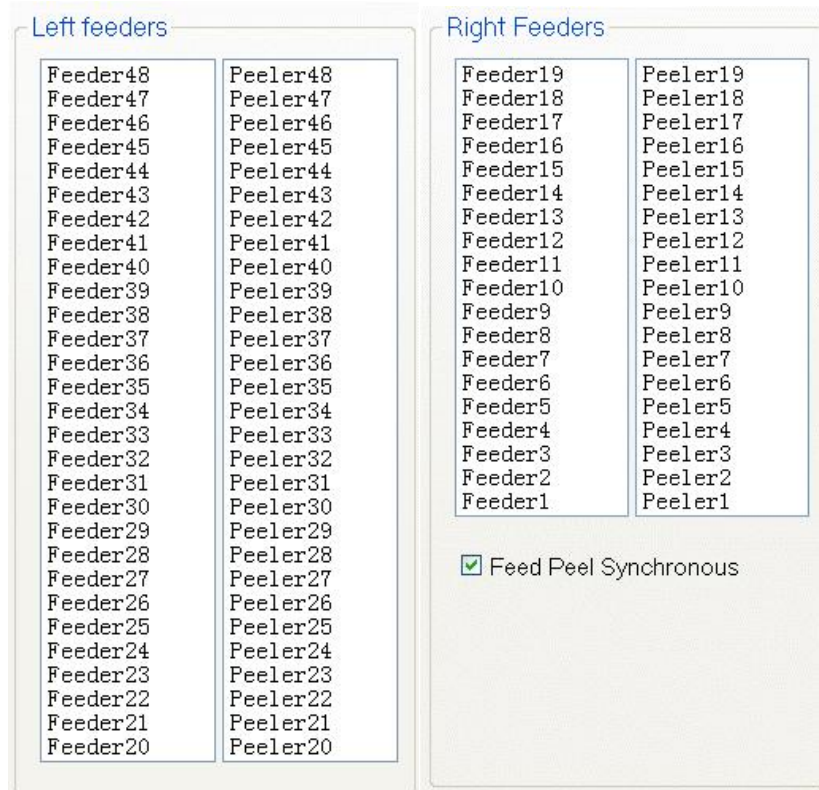
4.5.4 Feeder test

Figure 4.21

Function, test each feeder's matching and feeder& peeler function. See the Figure 4.21.

1. Select "Feed Peel synchronous", then test function of feeder and peeler.

2. Click any feeder randomly, feeder and peeler will appear corresponding actions.

Use these tests conservatively when parts are loaded, because the feeder will advance and a component will be ejected from the tape.

4.6 System setup

Function, this part arm at 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 introduces all setting functions briefly, more details about parameter modification please refer to comments from our engineers.
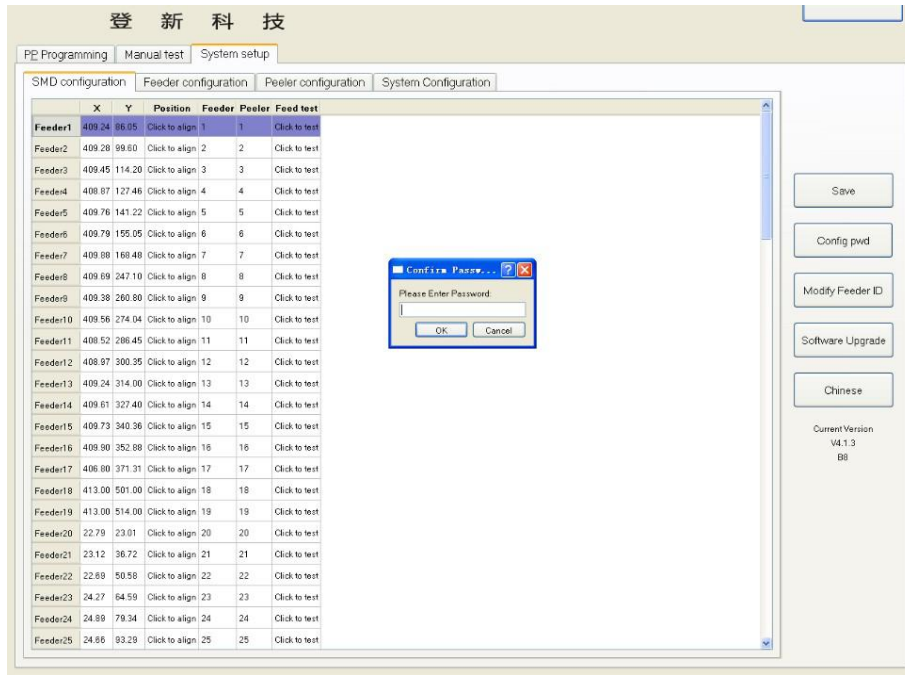
Figure   4.22

function description of button on right side, see the Figure 4.22

(1) "Save": click it for saving after modify the parameters, saves any changes to configuration to the internal SSD.

(2) "Config pwd" is only used on the "System configuration" tab. Pressing this Button and then pressing "OK" (with no password entered) allows access to the nozzle alignment functions and other settings. Normally, there is no need for a user to enter these functions. See the Figure 4.23

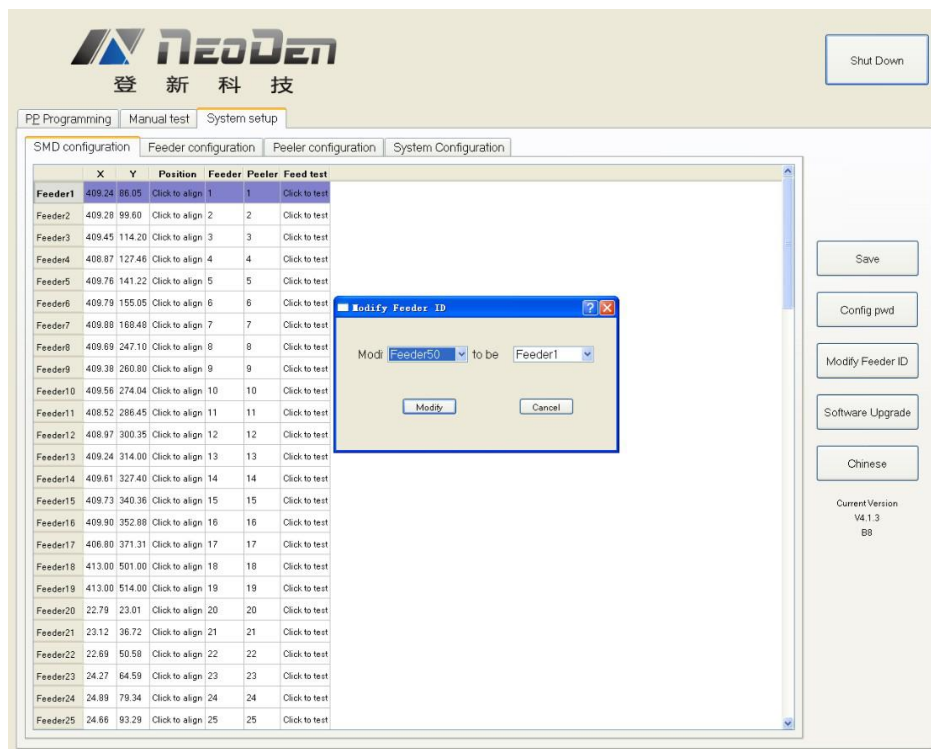

Figure 4.23

(3) "Modify Feeder ID" allows the user to change any feeder's software ID to any value.

(4) "Software Upgrade" will enable the user to upgrade the system software to the newest version when a new file is available on the USB drive.

(5) "Chinese" changes the system language to Chinese. DO NOT PRESS THIS BUTTON.

To restore the language to English, a unique password must be generated at the factory for each unique motherboard.

4.7 Feeder and peeler installation

(1) Feeders and peelers are easy to install, but working in the area of the feeder reels becomes difficult when components are installed in adjacent feeders. Machines purchased from NeoDen come equipped with all feeders in the owner's order pre-installed. But if additional feeders are selected before setup we strongly recommend installing them according to the procedures below before attempting any configuration. The process of installing new feeders is easier when there are no reels loaded nearby.

(2) The feeders are installed on the lower rails, and the peelers are installed on the upper rails. Each is attached with a single Allen screw, and connected with a single cable. The feeders are connected with 4-pin cables, and are addressed digitally over a data bus. It therefore does not matter which feeder is plugged into which port – the feeder ID code determines which feeder will be activated. On the other hand, peelers are addressed with analog power signals. Therefore, activation of a peeler depends entirely on the two-pin port to which it is connected. The software interface allows the user to assign different combinations of peeler and feeder IDs when it is desired to use a feeder with a certain ID in a position that corresponds to a different peeler ID.See the Figure 4.24
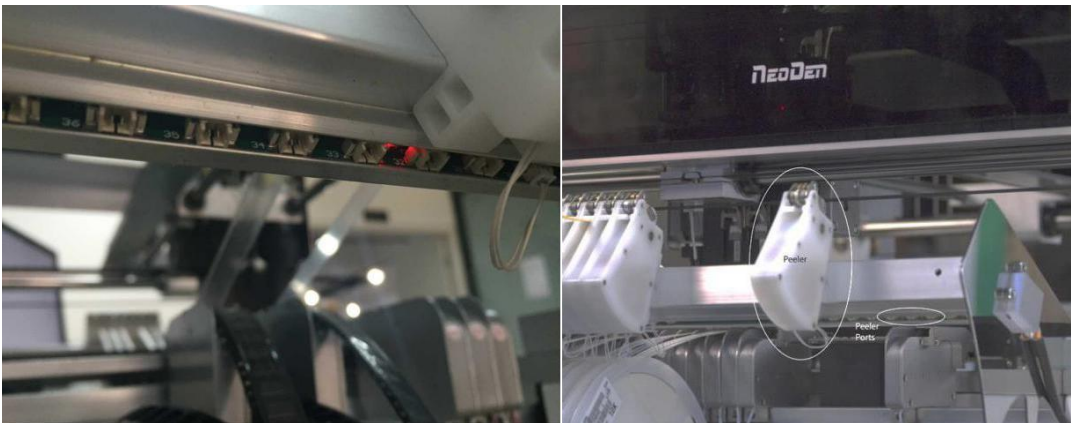

Figure 4.24

(3) When installing new feeders, it is necessary to assign it an ID using the "Modify Feed ID" button. New feeders come with an assigned ID of 50, which cannot be used in pick and place operations. By using the "Modify Feed ID" button, any feeder ID can be changed to any other ID. This is a powerful tool, and can quickly create confusion if not used carefully. For this reason, we recommend the following steps be followed without variation or exception:

a. Install a single feeder;

b. Change its ID (usually from 50) to the intended value;

c. Calibrate the feeder and verify its intended operation;

d. Install the related peeler;

e. Test the peeler;

f. Test the feeder-peeler in combination;

g. Proceed to the next feeder.

Important: Install feeders and set their ID codes one at a time. Please do not attempt to set ID codes with more than one unassigned feeder plugged into the machine!

4.7.1 Physical installation of feeders:

(1) Using a short 3mm Allen wrench (supplied in the toolkit included with every machine), loosen the bolt in back of the feeder a few turns.

(2) Select a data port for the feeder. Plug the 4-pin connector into the port (the side of the connector with visible pin detents faces up).

(3) Place the feeder on the lower rail (feeders can be placed touching each other).

(4) Tighten the Allen screw until snug (do not overtighten).

(5) In the System Setup Interface (on any of the four screens), press the Modify Feed ID button. Using the menus, change Feeder ID 50 to the desired ID. The interface should report that the ID was successfully changed.

(6) If the interface reports that the change failed, check for the following:

(7) Feeder is not plugged in correctly.

(8) Feeder ID was not set to 50 when installed. Proceed to the Feeder Configuration page, and test various feeder IDs to activate the feeder. If the feeder was installed so that it inadvertently shares an ID with another feeder, both will activate.

(9) If the feeder has a unique ID other than 50, change it to the desired value.

(10) If the feeder shares an ID, unplug one of the feeders. This will enable the change of ID on a single feeder.

(11) Once satisfied that the new feeder has been assigned the correct ID, go to the Feeder Configuration page, and press "calibrate feeder". The feeder should run continuously for several seconds. Repeat this step to verify smooth operation of the feeder.

4.7.2 Physical installation of peelers:

Using a short 3mm Allen wrench, loosen the bolt in back of the peeler a few turns.

Plug the 2-pin connector into a numbered power port (the side of the connector with visible pin detents faces up).

Place the peeler on the upper rail (peelers can be placed touching each other).

Line up the peeler so that it is parallel with the tape path in the feeder.

Tighten the Allen screw until snug (do not overtighten).

Go to the Peeler Configuration page, and press "Click to Test". The peeler gears should turn, and the peeler motor should be audible.

If both feeder and peeler tests are successful, proceed to the SMD Configuration page.

4.7.3 SMD configuration page

(1) This page contains the master configuration settings for the feeder/peeler combinations. Use this page for the electric feeders (1- 48). It is not necessary for the special feeders (49-98). Following is a description of the data displays and functions of the screen:

(2) For each feeder, the X-Y coordinates of the component location are listed. These coordinates should be set by pressing the "Click to align" button to center the crosshairs in the pocket in the tape, not necessarily the center of the component. This is because components shift significantly in the tape, and any errors in component positioning can be corrected by the upward-looking camera during pick and place operations.

(3) The "Feeder" and "Peeler" columns contain dropdown menus that allow the user to assign any combination of feeder and peeler to serve as the numbered feeder indicated in the leftmost column. By default, the Feeder and Peeler numbers are set to the same values.

(4) The "Click to test" button activates both the feeder and peeler assigned to the numbered feeder, and each will advance according to the parameters defined in the Feeder Configuration and Peeler Configuration pages.
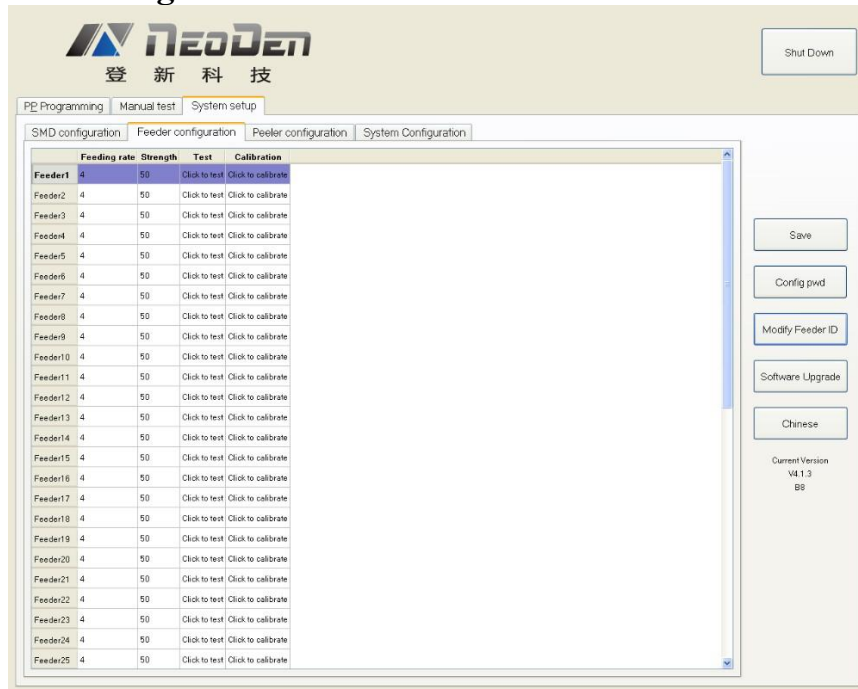
4.7.4 Feeder configuration

Figure 4.25

Feeding Rate. For each feeder, this dropdown menu allows the user to set the distance in mm that the feeder advances. For 0402 and 0201 components, this value is normally set at 2. For components including 0603, 0805 and 1206, the value is normally set at 4. Certain larger components will require larger values. See the Figure 4.25.

Strength. Determines the torque applied to the component tape. Values from 50-80 are common, but the value should be adjusted so that the tape feeds consistently and smoothly.

Test. Clicking "Test" for any feeder on this screen will advance the feeder (but not the peeler) by the distance set in the Feeding rate column.

Calibration. "Click to calibrate" advances the feeder continuously for several seconds. This function verifies the smooth operation of the feeder motor and transmission. Because the feeder advances quite far, it is best to avoid clicking this button when components are present in the feeder. The button can be useful if needed to exhaust a long section of leader that contains no components.
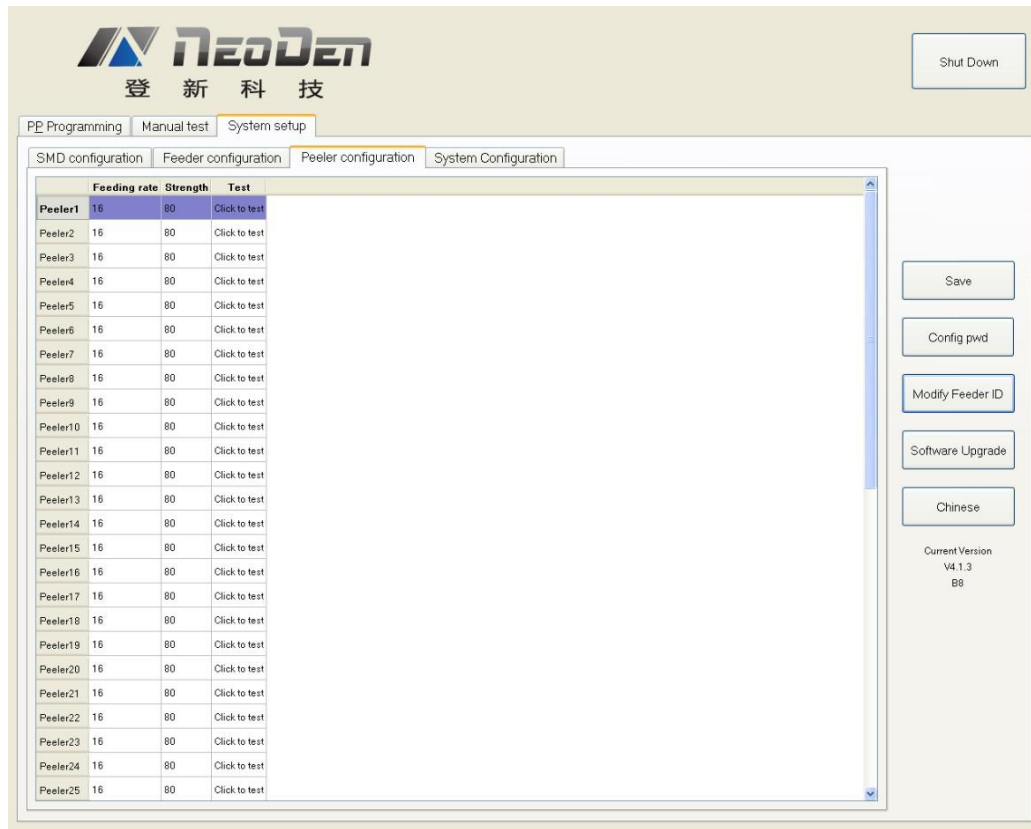
4.7.5 Peeler configuration page

Figure 4.26

Function: Peeler configuration as above figure show, used to set the values for all peel boxes, see the Figure 4.26.

Feeding rate: Similar meaning in Feeder, mean length of rotation each time. It determines the approximate distance that the peeler will attempt to peel the cover tape. The default value for this setting is 16, and there is often no need to reduce it the distance. The cover tape normally can slip inside the moving gears of the peeler, and a larger peeling distance helps keep the cover tape taut and out of the way of the components that have advanced into the pick position inside the feeder.

Strength: Torque setting of Peeler (Plastic tape will be difficult strip away in the case of being affected with damp, can adjust bigger values of torque here). Smaller values (e.g. 50) result in quieter operation, and are often adequate for smooth peeling.

Test: activates the peeler (but not its associated feeder). This function, when activated, should leave the cover tape stretched tightly between the feeder and peeler, with no loose tape slop over the components to be fed. If the cover tape does not advance when the peeler is activated, check the installation. For proper operation, the tape must lie flat between the peeler gears; it must not be wrinkled, stretched to deformity or twisted. The tape also must not be installed so that any part lies outside the width of the gears. Tapes with long leaders make peeler installation much easier.
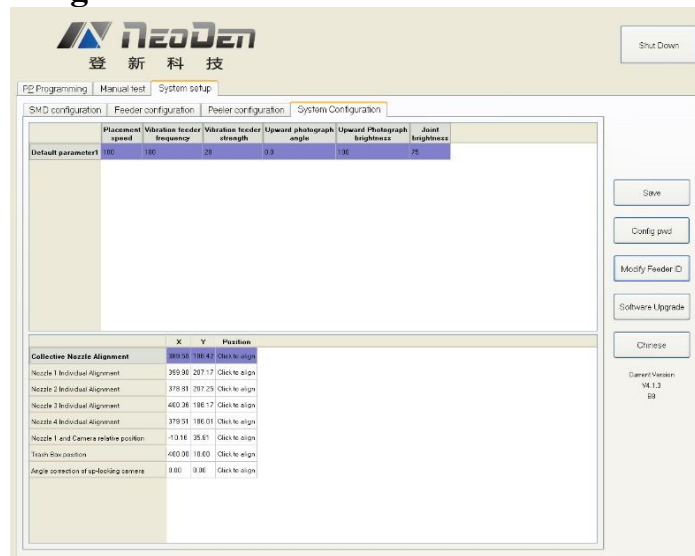
4.7.6 System configuration

Figure 4.27

When used in combination with the "Config pwd" button, this page allows the user to set the machine's default placement speed, the vibration feeder frequency and vibration feeder strength, and brightness of the camera lighting systems. Default values normally require no change. The interface also contains sophisticated nozzle alignment routines. Because these are set at the factory, there is normally no need to access them and any use of these functions should be done in cooperation with NeoDen tech support. See the Figure 4.27.

Function: it is mainly for correction the position of suction nozzle. (Notice: In case change by mistake, we've locked it. It can be changed by clicking the button of "Config pwd" and then click "ok" button. Strongly recommend operating it under our engineer's guidance).

Default parameters 1 setting:

(1) Placement speed: placement head movement speed under overall situation, priority is not as fast as speed set in stacks.

(2) Vibration feeder frequency: setting the frequency of vibration feeder. Discharge state will be more stable if frequency high.

(3) Vibration feeder strength: it depends on the component, if component too small and strength set high it will shake out the component easily, of course if strength small, the discharging speed will be slower.

Collective nozzle Alignment setting:

Click the "Click to align" and go into interface below, see the Figure 4.28.

Figure 4.28

(4) Click the central point among four nozzles under the shot can set the central point.

(5) Another way is pressing CTRL button then click the mouse to make each nozzle to identify their own central point in the four quadrants.

(Notice: Please click the LENS ROTATION before setting the suction nozzle, then PnP machine will collect nozzle's 360-degree rotation photos to synthesize. After that, press CTRL button to set each nozzle's identification of central point.)

(6) Save it after finishing the setting.

Correct nozzle 1~nozzle 4 separately.

Click "click to align" and go into interface below, see the Figure 4.29.
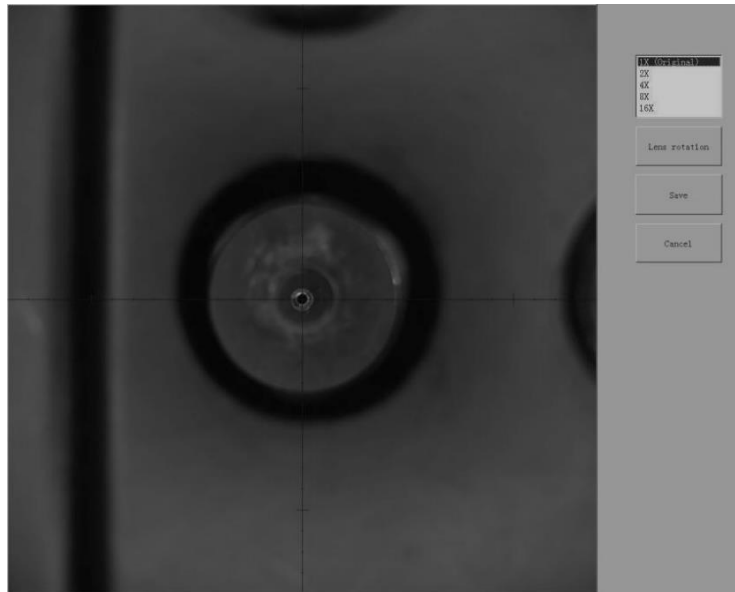

Figure 4.29

(7) Operation steps:

a. Click the button of "LENS ROTATION" to let machine take photos of nozzle's 360-degree rotation.

b. Click the central point of nozzle

c. Click the save button.

d.Nozzle1 and camera relative position: it is for the synchronism of nozzle and camera, setting it when placement position does not match with the camera position.

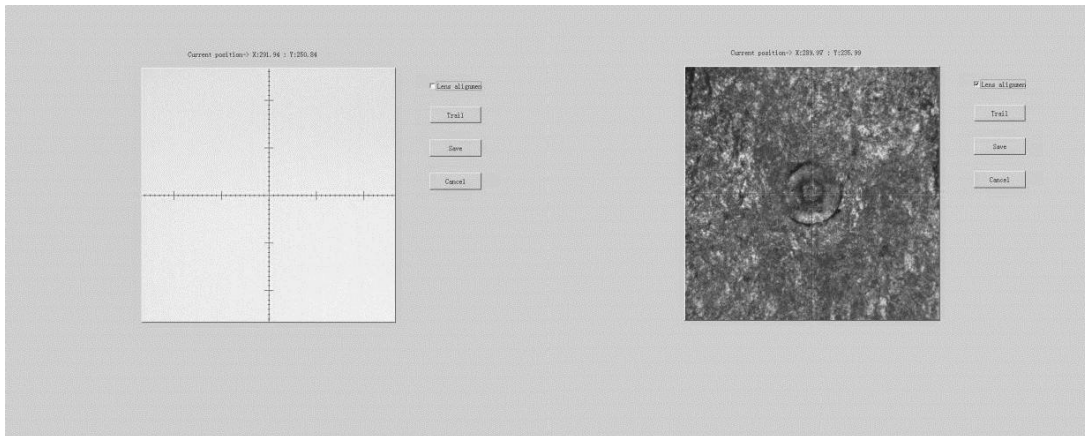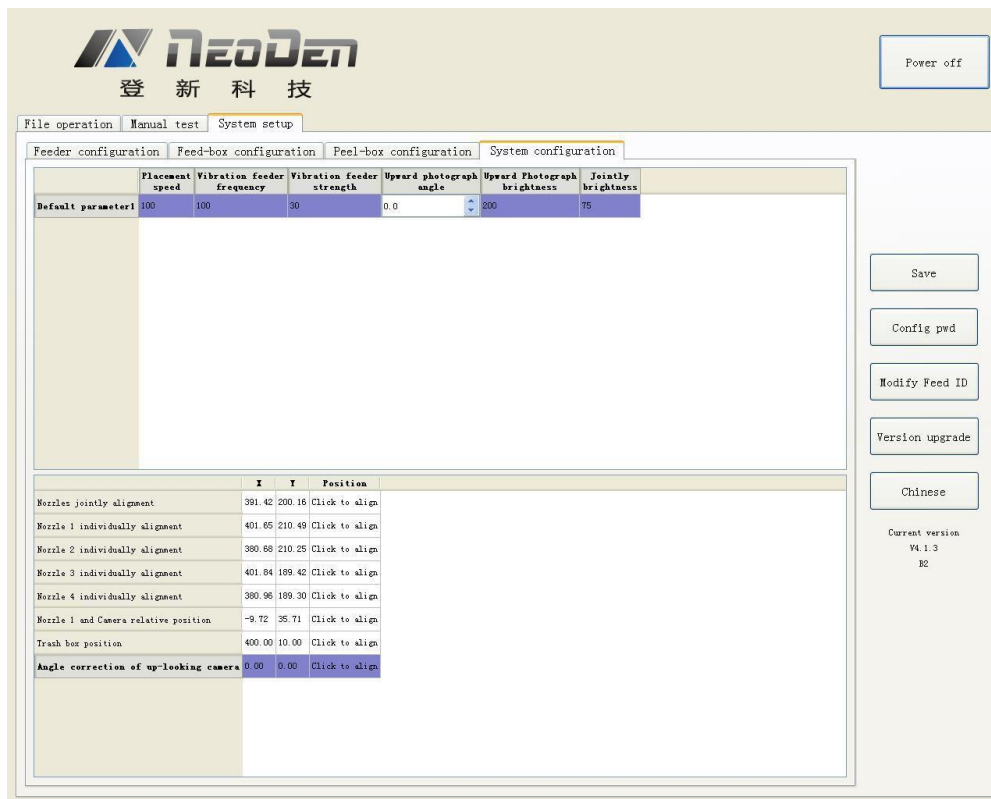Click "click to align" then go into interface below, see the Figure 4.30.

Figure 4.30

e. Move the nozzle to any place of PCB board, put one piece of carbon paper, then click "Trail", nozzle will rotate and leave a dot on the carbon, after that click the "Lens alignment", Focus that dot and save, it will be done (show as photo above).

(8) Trash box position: setting the position of dropping component, it depends.

(9) Angel Correction of upward-looking camera

Click "Click to align" and enter into upward-looking cameras angle correction interface.

The vision interface will lock at 3rd nozzle
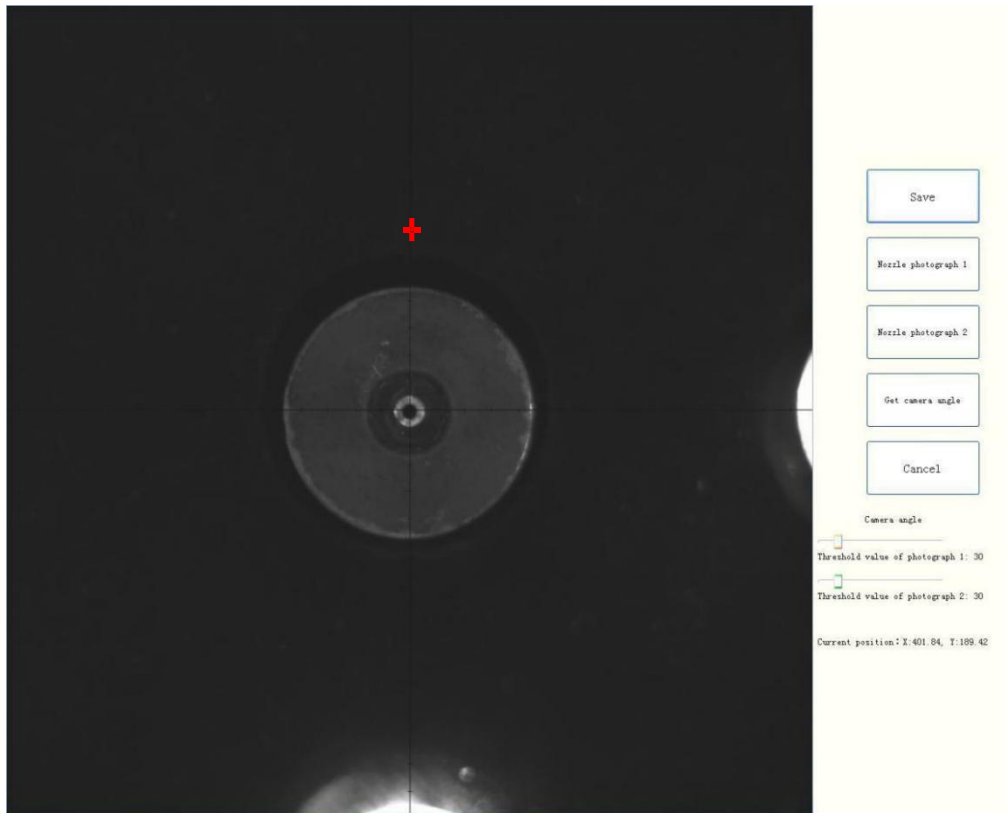
Move down the nozzles with 7mm and make sure in the vision interface it can shows with 2 nozzles pictures.

Click button to take pictures of nozzles and adjust the threshold until the cross is at the center of nozzles.
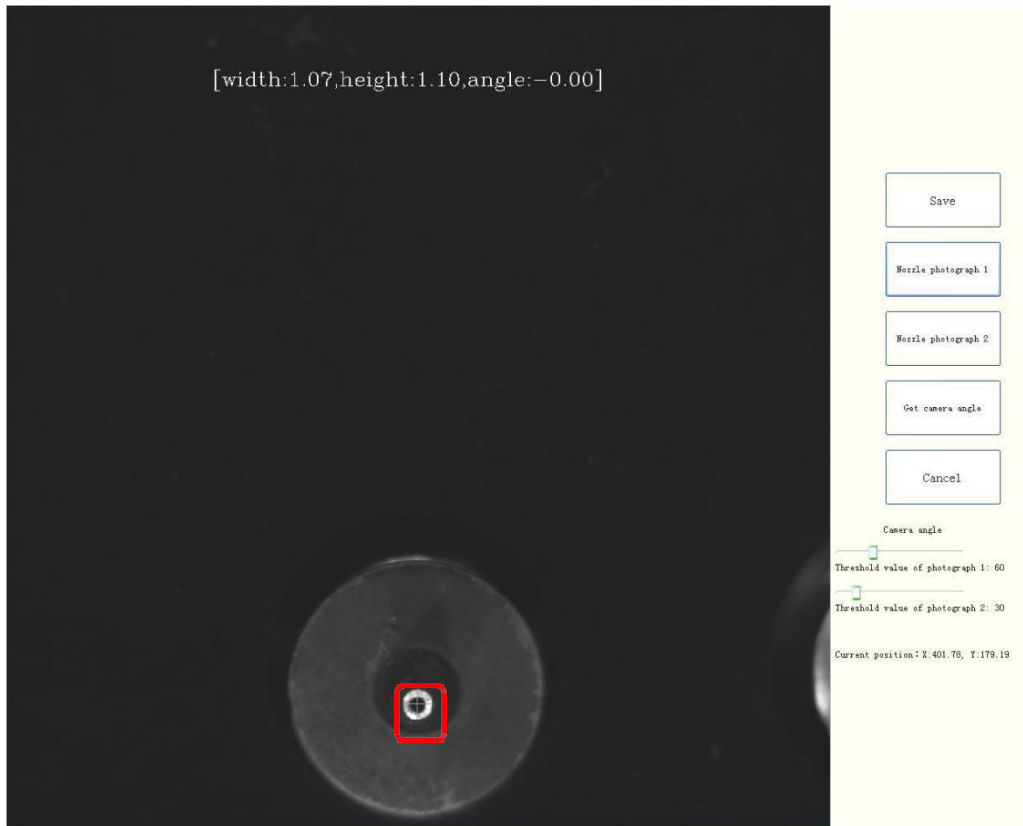
Click the button to take a picture for nozzle No.2.Using the same method above to adjust the threshold until the angle is -0.00 degree.

After finished the steps above, click "Get Camera Angle" to get the number.

Round the angle number off to 1 decimal place, then fill it into "Upgrade photograph angle" and save the data, see the Figure 4.31.
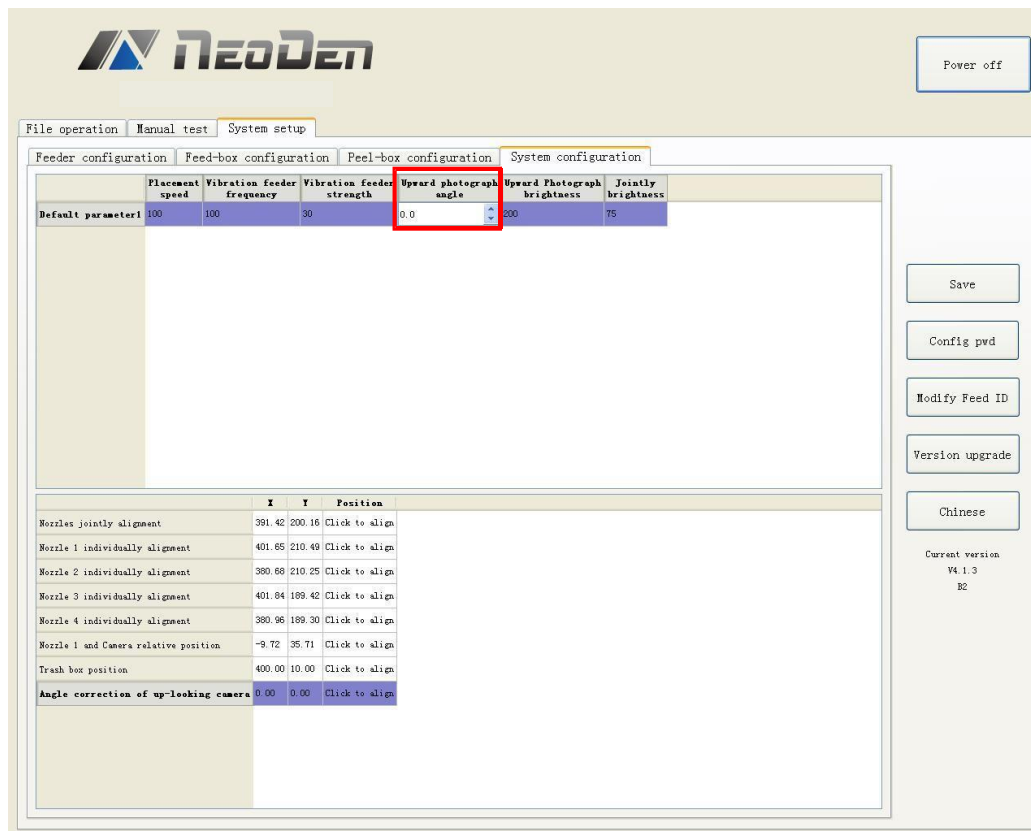
Figure 4.31

4.7.7 First trial and testing

（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）Production test

a. Make a programming file

b. Test the file to pick and place components.

（3）Inspection

a. 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.

b. Inspection Methods

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.

c. Inspection Standard

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.

d. If the components are off, please adjust the file by following two methods

e. 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.

f. If there are several components off beyond allowance, you'd better adjust their coordinates on working file with downward-looking camera.

g. If there are couple of issues occur during test, some other points need to be considered.

h. Frequent pickup failure. Some suggestions are listed below,

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

The pick offset needs an adjustment, it should be aligned with the center of component reel slot rather than that of component.

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

The nozzle was blocked

The nozzle is damaged or has a crack

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

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

i. Frequently throwing components. Some suggestions are listed below,

upward-looking camera can't take a clear picture of component due to brightness issue for example.

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

The size of nozzle is inappropriate or insufficient suction.

The nozzle is damaged or blocked, and even has a crack

4.7.8 P&P programming page

This screen contains a list of available programs stored in the internal SSD, and is the screen from which production operations are launched. The NeoDen4 is shipped with several factory test programs installed, and these can either be kept, deleted or stored separately on an external USB drive for later use. Available commands on this screen include:

Export to U Disk: This command will copy the program file selected on the main screen to a USB drive inserted into any of the four USB ports on the machine. It is recommended that files on the SSD be backed up to a USB drive.

Import from U Disk: This command will copy a program from an external USB drive to the NeoDen4 and store it on the internal SSD. Programs are run from the internal SSD only.

Delete: This command will permanently delete the selected program file from the internal SSD.

Copy: This command will copy the selected program file, allow the entry of a name for the copied file, and store it on the internal SSD. The command is useful for creating alternative versions of programs.

New: Creates a new, blank program file.

Edit: This command opens the main programming interface for the machine. All parameters needed to complete a finished board are entered in the two screens of this interface. A detailed discussion is contained in section.

Mount: This command loads a program from the internal SSD in preparation for automatic or stepped operation.

Continuous SMT production:

Follow the SOP to start production Notes

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.

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

5. Structure and maintenance instruction
5.1 Structure chart
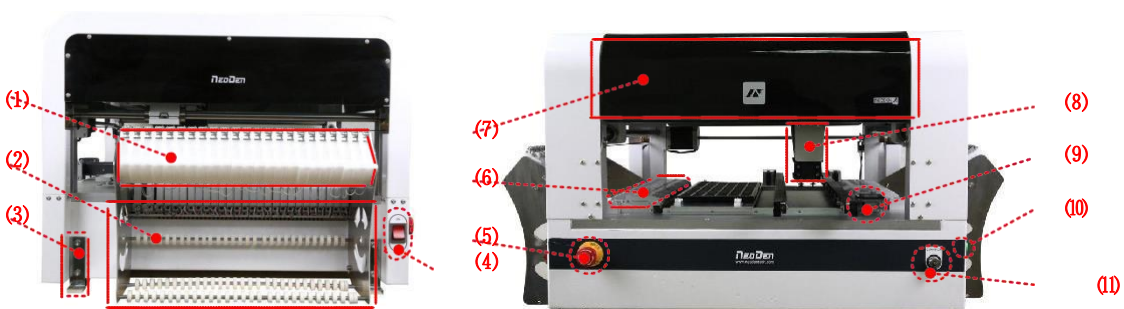
1-1 Side view		1-2 Front view	
⑴Peeler	⑵Tape & Reel holder		⑶fixed support
⑷Power switch	⑸Emergency stop		⑹Feeder
⑺Cover	⑻Placement head		⑼Vibration feeder
⑽ Pause button	⑾ Conveyor port		
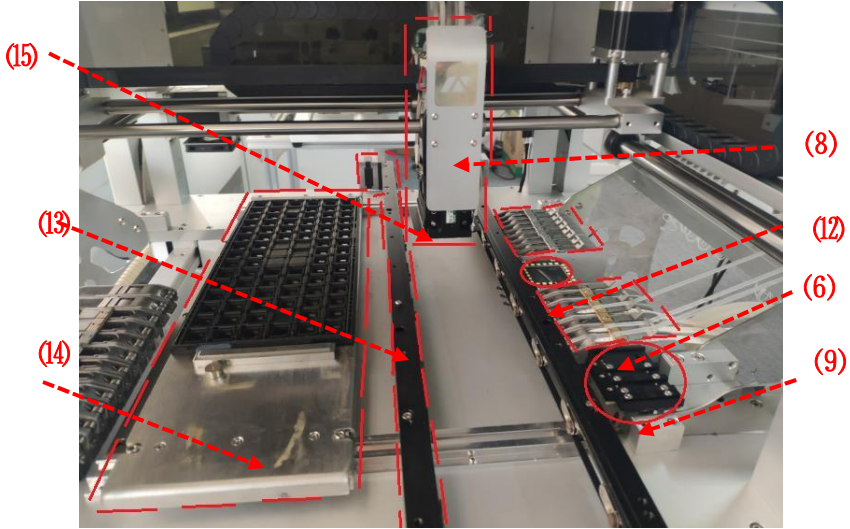
⑫ Upward-looking camera   ⑬ Auto-rails   ⑭ PCB support board

⑮ Nozzles

5.1.1 Peeler

Fix the peeler
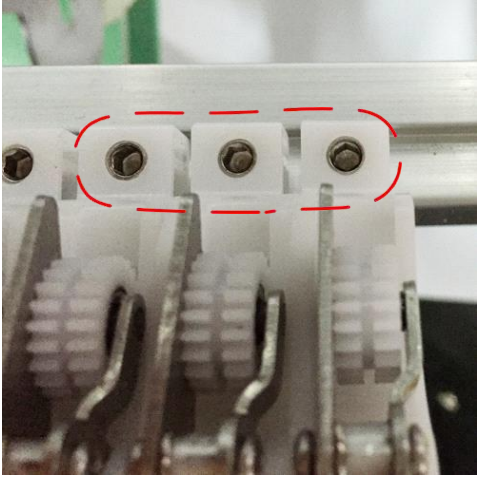
Installation of peeler
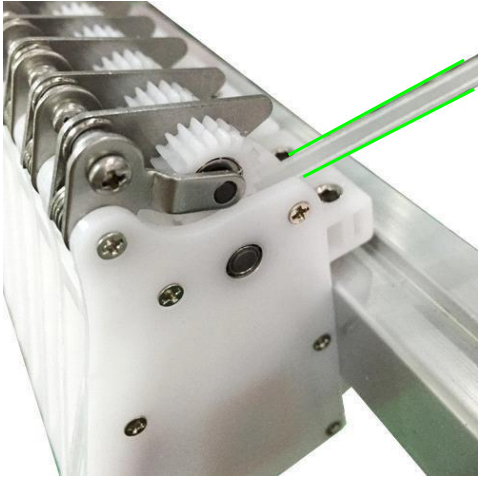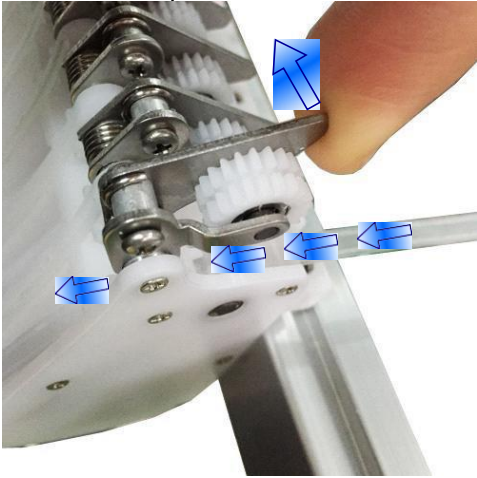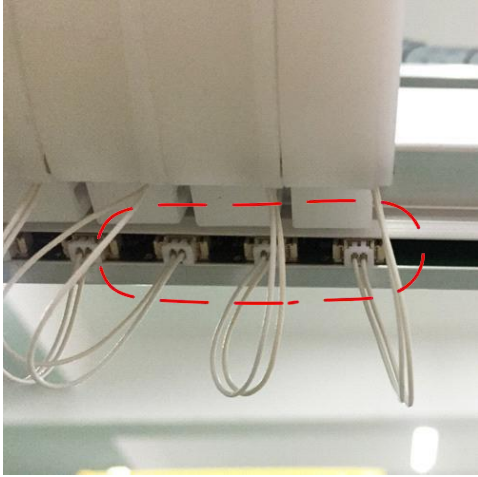
5.1.2 Tape & Reel holder
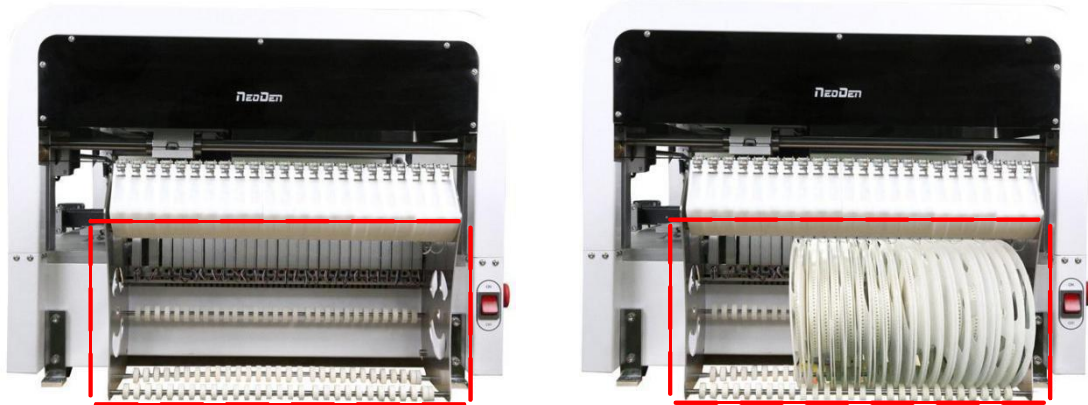
5.1.3 Fixation support

5.1.4 Vibration feeder
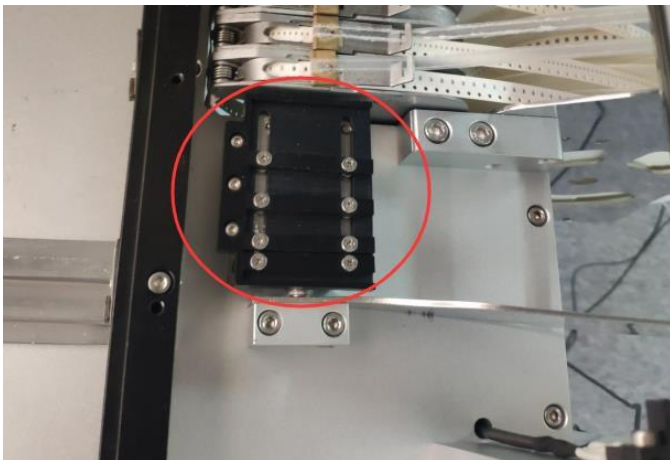
5.2 Installing SMT components

Three basic component setups are possible:

(1) Electric tape and reel feeding,

(2) Tube feeding and tray/short tape feeding. This section will cover the physical setup of each type of component. Software setup of the various feeder types is covered in Section 4.

5.2.1 Installing tape and reel components

(1) Lift the angled tab on the feeder, and insert the tape so the sprocket holes rest on the tooth of the gear. See the Figure 5.1.

(2) Pull the end of the cover tape through the large feeding slot in the feeder, over the brass block.

(3) Allow the spring to pull the feeder cover over the tape.

(4) Lift the silver tab on the peeler to separate the gears.

(5) Thread the cover tape through the slot on the angled tab, and through the gears on the peeler until the tape extends through the back slot of the peeler. If the tape does not extend through the whole peeler before the gears are closed, it will likely jam.

(6) Allow the spring in the peeler to close the plastic feeding gears.

Illustrates the proper installation of tape feeders.

1. Pick up position
2. Gear
3. Plastic film fold back
4. Block
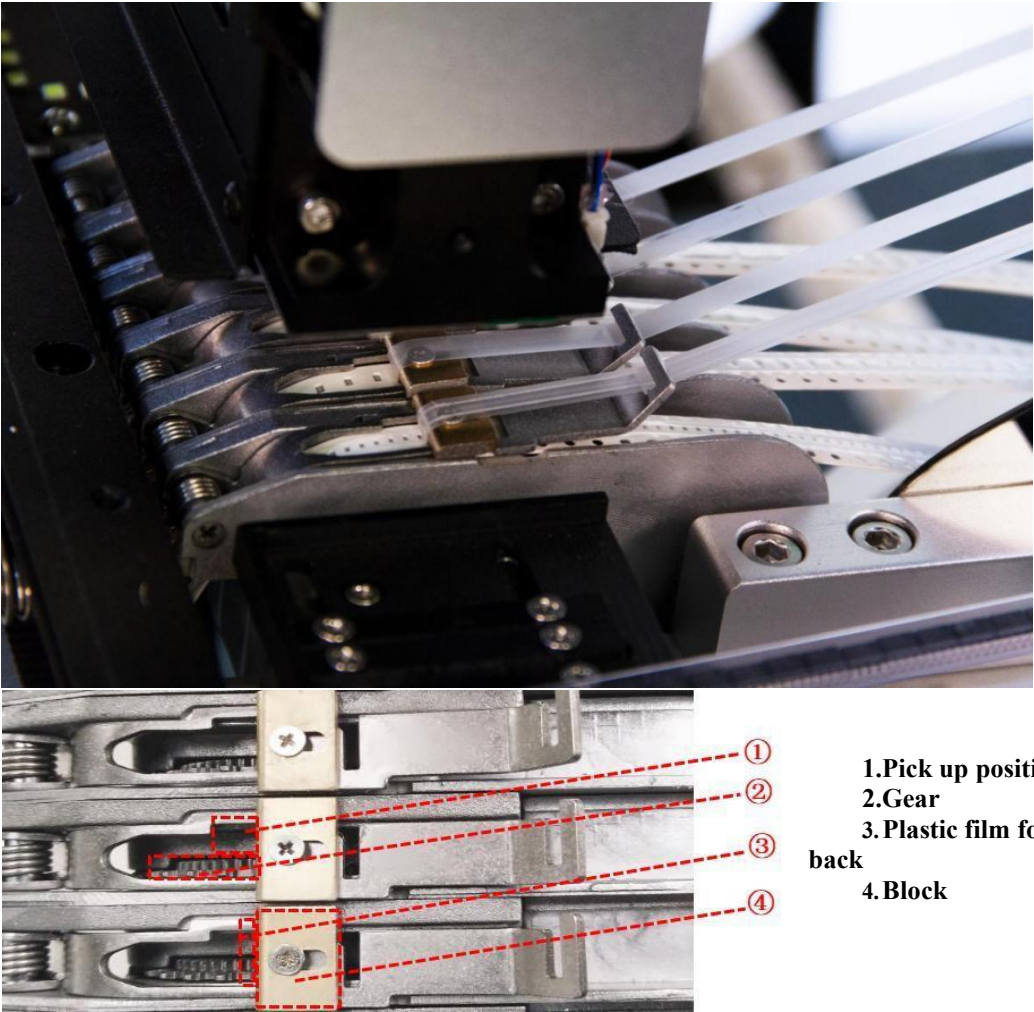
Figure5.1

5.2.2 Installing tube-fed components

Install the Tube feeder guide. This polished steel guide is included with the machine and bolts to the table with two Allen screws (included) as shown in Figure 5.2.

Figure 5.2

Screw the round horizontal tube guides into the plate as shown. These round guides will hold pressure on the tube to maintain a good feeding angle and prevent movement.

Adjust the width of the black vibration feeder guides as necessary for each tube. If the tubes hold very small components, it may be beneficial to use tape to cover the front slots between the black guides.

Installing trays and short tapes. Trays and short tapes can be placed anywhere on the table that is not in the space or path required by the board. If the width of the rail setting necessitates removal of the left steel table extension (See Figure 2), first install a piece of metal or plastic

sufficient to raise the height of the table to roughly the height of the extension. If the table extension is installed, simply affix the tray or tape to the extension using double-sided tape or any other suitable method. It is important that the components be placed in a reasonably straight horizontal or vertical orientation, and that the tray or tape is placed flat to avoid variations in pick height. Figure 3 shows an example of a simple short tape/tray configuration.

5.2.3 Auto-rails

Adjustment of auto-rails

Figure 5.3

Loosen screws on A and B, then the left rail can be moved arbitrarily.

Put PCB on the groove of rails and tighten and screws A and B once confirmed the width.

Once finished width adjustment, put the board into rails. See the Figure 5.3.

Adjustment of belt tightness

Loose the screw, move the motor up and down to adjust the tightness. Loose the screw, to adjust the tightness, see the Figure 5.4.

Figure 5.4

Flash board of the upward-looking Camera:
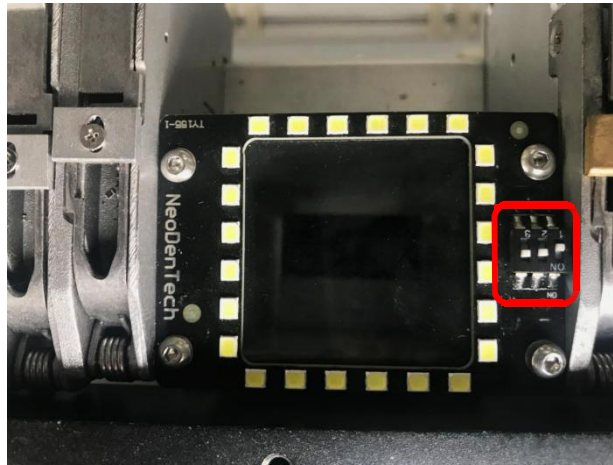
Figure 5.5

Adjust the brightness of the camera by gear switch, to work with different components. See the Figure 5.5.

High magnetic positioning plate

Figure 5.6

Use high magnetic positioning plate to fix PCB and IC tray. See the Figure 5.6.

5.3 Nozzle

The size of nozzle

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

Table 1-1   Nozzle

Model	CN030	CN065	CN140	CN220	CN400	CN750
Illustration						
Inner diameter	0.3mm	0.65mm	1.4mm	2.2mm	4mm	7.5mm

Reference of nozzle selection

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

Table 1-2   Size comparison of nozzles

Size	Minimum diameter	Recommendation
CN030	0.2mm	0201,0402
CN065	0.5mm	0402,0603,0805, diode
CN140	1.2mm	1206,1210,1812,2010, SOT23,5050
CN220	2.0mm	SOP series ICs, SOT89, SOT223, SOT252
CN400	4.0mm	ICs from 5 to 12mm
CN750	7.5mm	ICs bigger than 12mm

	size		size
0201	0.6*0.3	0402	1.0*0.5
0603	1.6*0.8	0805	2.0*1.2
1206	3.2*1.6	1210	3.2*2.5
1812	4.5*3.2	2010	5.0*2.5
SMA	4.0*2.5	SMB	4.0*3.3
SMC	6.6*5.6	SOT23	3*1.4
SOT89	4.5*2.5	SOT223	6.4*3.7
TO252	6.5*6.3		

5.4 Maintenance

5.4.1 Take effective measures to reduce/ avoid malfunction

(1) Reinforce daily maintenance

(2) 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.

(3) Requirements for operator

(4) 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.

(5) 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.

(6) Operator should be concentrated.

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

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

(9) 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.

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

(11) It needs to check whether the components' package is matched with related feeder. If not, please correct them.

(12) As to tape reel feeder, when ran out of one reel, operator must check whether newly changed tape reel is correct or not.

(13) After import the SMD file or edit chip list manually, please recheck each component's No., nozzle rotation angle and placement position to make sure correct.

(14) Operator must check the first finished PCB of each file. If any problem, please find solutions such as revise program to solve it.

(15) To check the placement position misaligned or not, component loss problem in regular work. Find reason in time and solve it.

(16) In sum, P&P machine's running speed and placement accuracy still has limit. People's 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.

5.4.2 Maintenance of device

Check below points daily

(1) Please check below before turn on the machine

a. Temperature and humidity: temperature range 20℃～26℃, humidity range 45～70％.

b. Working environment: please keep air fresh to avoid corrosive air in.

c. Make sure there's no obstacle on dual rails or the whole working area.

d. Make sure camera lens is clean, no dirty things.

e. Make sure no obstacles around the head nozzles.

f. Please check whether nozzle is dirty or out of shape and adopt relevant cleaning measure or change new nozzle.

g. Please check whether feeders are well installed, and keep feeders clean.

h. Please check whether the air hose is well connected with machine.

(2) Please check listed below after turn on the machine.

Error tips will show on the monitor if the machine work abnormality.

a. Check the monitor screen whether display normally after system starting working. Check emergency switch whether could work normal.

b. Check the placement head whether could return to the original place.

c. Whether have abnormal noise when placement head move.

d. Check negative pressure whether in normal range or not.

e.by the way checking PCB's transmission on dual rails to know whether sensor is still work fine.

Check below points monthly

a. X, Y axis--please make sure no abnormal noise when placement head move.

b. X, Y motor--please make sure motors working well, no abnormal heating appearance.

c. Nozzle--please check nozzle whether up down flexibly, not bent, check the suck surface whether level.

d. Air hose--check the air hose and connector, make sure hose is fine without broken, abrasion or air-leak etc.

e. Negative pressure--check all nozzles' negative pressure. If abnormal, please clean nozzles.

f. Positive pressure--check   whether they're normal.

g. Optical axis--please check whether it is covered dusk. Please keep it clean and lubricated.

h. Operation button--check each button to make sure they are well-worked

i. Connector--check if well-connected of the air connector and air hose.

5.5 Placement failure analysis and troubleshooting

Placement failure analysis

Whether Pick and Place machine can run normally or not, which will directly impact on production quality and volume. To make the machine run properly, we must fully understand the structure and characteristics of the machine, master every kinds of failure patterns of manifestation, reason and troubleshooting methods. Finding problems and reasons in time and timely troubleshooting can help ensure efficiency of the machine during working.

（1）Common failures

a. not start boot failure

b. head doesn't move

c. fail to feed forward a board

d. Pick failure

e. Place failure

（2）Main reasons of failure

a. transmission systems-driven PCB and head movement transmission system and the

corresponding sensors.

b. Air Route-Air pipe, nozzle

c. Nozzle size not suit to the component

d. No info in Footprint library

e. Irregular component

f. Incorrect values setting of component's heights or pick height

（3）placement troubleshooting

Failure patterns of manifestation, Reasons, troubleshooting methods

head doesn't move

Solutions:

a. Sensor is poor connected or short-circuited. Please wipe off the dust or lubrication   on sensor or even exchange a sensor

b. Longitudinal sensor or sensor poor connect or short circuit, check and repair the transmitter or add too much lubricating oil on sensor-clean the sensor

c. Rails fail to advance the board feed forward after uploading the PCB

Solutions:

a. The rails belt gets loose or broken, need to be adjusted or exchanged.

b. The rails drive motor doesn't work.

c. Nozzle can't pick up component

d. Pick up position offset

e. Components fall down during moving

Solutions:

a. Nozzle had been wearing or become aging, the crack causes leakage. - replace with a new nozzle

b. The nozzle's bottom surface is uneven or get suck by solder paste or other dirt Please wipe it off and use cleaning needle to clean the nozzle

c. Current nozzle size is not suit to component, change another one

d. Surface uneven on the component, replace with a qualified one

e. Component is sticking to the bottom tape;

f. Burrs on tape hole stuck component;

g. Component's pin gets stuck in the corner of the den;

h. Gap between components and tape package hole is not big enough, uncover the plastic tape and upside down to check if the components can fall down or not.

i. Plastic adhesive tape is too sticky or flimsy and then cannot be unfolded. Or plastic adhesive tape has been tearing down from edge side.

j. Pick up position offset. Actual Feed box is offset from Feeding center, check X, Y, Z data and do reprogram.
Placement offset

Solutions:

a. Programming issue (some components' positions are inaccurate), amend the coordinates; If all components are offset, please modify fiducials.

b. The components' thickness setting errors, modify components information on Footprint Library

c. Pick height is too high that causes components being dropped. Please reset the Pick Height value

d. Pick height is too low that causes slide problem during placement

e. High speed issue. Lower the speed to achieve a more accurate rotation and placement effect.

5.6 Related issues during solder paste printing process

（1）Stencil Printing 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.

（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:

a. 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.

b. 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).

c. 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%.

d. 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) 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.

a. Solder paste graphics dislocation

Reasons: Holes on the stencil not good match with solder pad; No enough precision of the Printing machine

Issues: easily cause bridge connection

Solutions: Adjust the stencil position; Adjust the printing machine.

b. Solder paste graphics have icicles and dents

Reasons: Scraper's pressure is too large; Rubber scraper's hardness is not enough; Holes are too big in the stencil

Issues: Solder paste's required volume is not enough, easy to appear faulty soldering; solder joint strength is not enough.

Solutions: Adjust the printing pressure; Use metal scraper; Improved holes designing in the stencil.

c.Too much solder paste

Reasons: Holes are too big in the stencil; The gap is too big between stencil and PCB. Issues: easily cause bridge connection

Solutions: Check the holes size in stencil; Adjust the parameters of printing, especially the gap between PCB and stencil

d. Graphic uneven (have breakpoints)

Reasons: Holes' wall are not smoothness enough; not wipe residual solder paste in using for many times; Solder paste's thixotropy is bad.

Issues: Easy cause no enough solder paste, lead to the problem such as faulty soldering. Solutions: Wipe the stencil

e. Contamination of the graphics

Reasons: Not wipe residual solder paste in stencil after using for many times; Poor quality of solder paste; Shake problem when getting the stencil way

Issues: easily cause bridge connection

Solutions: Wipe and clean stencil; replace solder paste; adjust the machine.

EC Declaration of Conformity

The manufacturer/seller

Hangzhou NeoDen Technology Co., Ltd.

Building 3, Diaoyu Industrial and Technology Park, No.8-2, Keji Avenue,

Yuhang District, Hangzhou, China

Hereby declares that the following product:

Model: **NeoDen4**

Product: Automatic Pick & Place Machine, intended to use for electronics assembly

Is in compliance with the following EU Directives:

● Electromagnetic Compatibility Directive 2014/30/EC

● Machinery Directive 2006/42/EC

● RoHS Directive 2011/65/EC

The following harmonized standards were applied:

● EN61000-6-2:2005

● EN61000-6-4:2007+A1:2011

● Annex 1 of 2006/42/EC

● EN ISO 12100:2010

● EN 60204-1:2006+A1:2009+AC:2010

All applicable tests were carried out in cooperation with TÜV NORD (Hangzhou) Co., Ltd.
In case of making any modification to the machine, not authorized by the manufacturer, the declaration for this unit shall become void.
Place: Hangzhou, China
Date: December 12, 2016

Jianyong Weng
(Chairman of the Board of Directors)