



Pick and Place SMT Machine

User Guide

Version:	2.0
State:	Calibration
Date:	2020.05.20



SAFETY WARNING

- Please read the terms and conditions in this manual carefully before installing and using this product!
 - It is strictly prohibited to start the product before you have a detailed understanding of the specific contents of this manual!
 - Confirm that the current operating personnel are technicians who have been trained and qualified to skillfully operate the current equipment!
-
1. It is strictly prohibited for any part of the human body (including hands, feet and hair) to contact the parts of the machine during the operation of the equipment, including the rotating shaft of the equipment and fans.
 2. Before the delivery of the equipment, any foreign matter that may be brought into the unit during the installation of the equipment has been removed. Therefore, during the installation of the unit at the customer's site, please blind the equipment interface, and remove any foreign matter outside the interface boundary area (such as welding slag, welding balls, dust, particles, etc.) before conducting the unit.
 3. There is high voltage in the operation of the equipment, and any wrong operation may lead to personal injury and property loss.
 4. Under the condition of repair and maintenance of vacuum units, it is strictly prohibited for the equipment to send electricity or operate the equipment, so as to avoid damage to the equipment and injuries to personnel.
 5. This chapter and the instructions on the product label must be strictly followed.
 6. Maintenance must be performed by qualified personnel.



NOTIFICATION

1. Basic precautions

- (1) The operation of the machine is limited to the operators who have mastered the operation of the machine.
- (2) Please do not use this machine for other purposes. Otherwise, the company is not responsible for the consequences.
- (3) Do not modify the machine. The company is not responsible for the accident caused by unauthorized modification.
- (4) In order to prevent accidents caused by accidental start-up, please cut off the power for maintenance, repair and cleaning before handling
- (5) When pulling the power plug, please hold the wire plug to pull it out.
- (6) To fully comply with the maintenance cycle and replacement of parts and components.

2. Application of preventive measures

- (1) please pay attention to carefully shipped equipment.
- (2) Please install the machine in a stable place.
- (3) In order to prevent personal accidents, please make sure that the cable is not damaged, falling off or loose before connecting to the power supply.
- (4) In order to prevent personal accidents, please make sure the power supply is safely grounded before switching on the power.
- (5) In order to prevent accidents caused by unskilled operation, skilled technicians should be employed to repair and debug. When replacing parts, please use the original parts of our company. The company is not responsible for accidents caused by the use of non-authentic parts.
- (6) In order to prevent electric shock caused by unskilled operation, professional personnel should be entrusted to carry out electrical repair.
- (7) In order to prevent personal injury, after repair, adjustment or replacement of spare parts, please confirm that the screws and nuts are not loose.

3. Matters needing attention in working environment

To prevent accidents caused by improper operation, please avoid using the machine in the following environments:

- (1) do not use the machine in the high frequency welding machine and other noise sources.
- (2) do not use the machine when the supply voltage exceeds $\pm 10\%$ of the rated voltage.
- (3) when it thunders, stop using the machine and cut off the power supply.

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1. Overview

1.1 Scope

The current version operation manual of HWGC TECHNOLOGY CO.,LTD Is applicable to all models of smart version software after 2018. Operators should read the user's manual carefully before using the equipment, and really understand the instructions and precautions in it to ensure safe production. Wish you a pleasant work!



2. Equipment acceptance

2.1 Introduction

After receiving the equipment, please check whether there is any abnormality in the appearance of the equipment, such as paint loss, deformation and other special cases. If there is any abnormality, please contact the manufacturer in time and take photos to keep it.

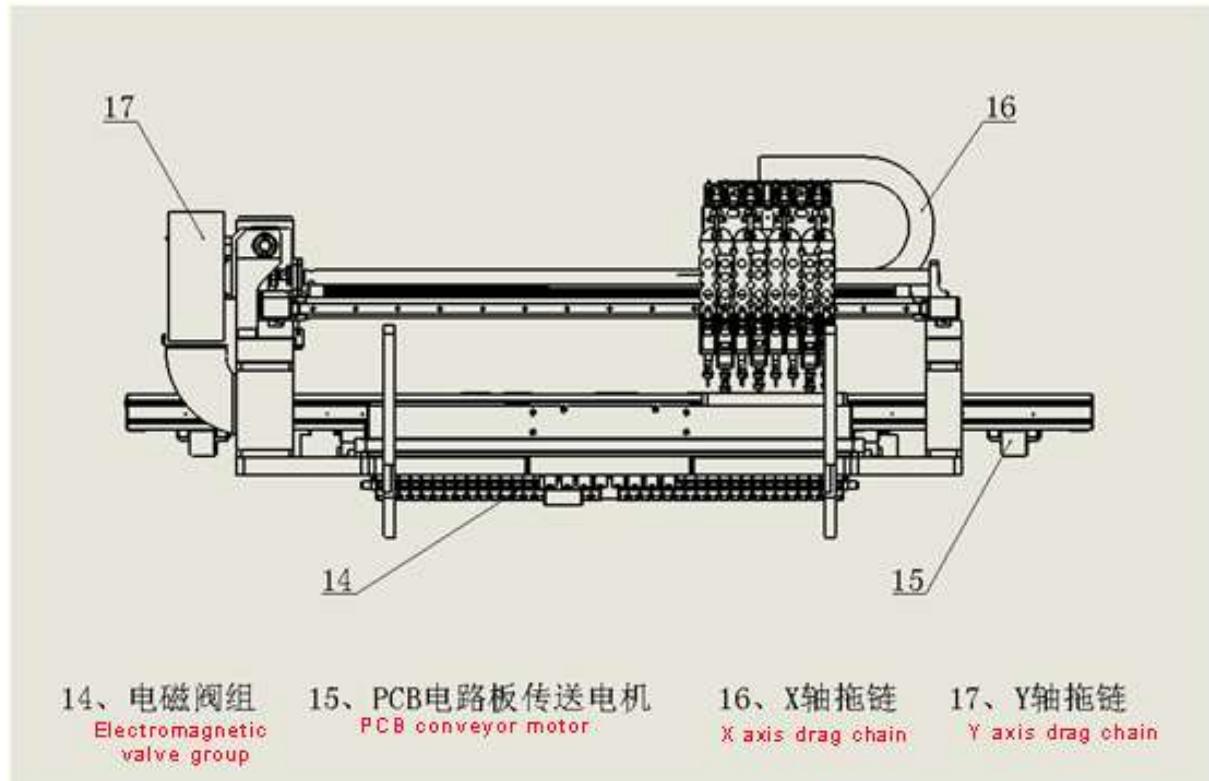
2.2 Preparation

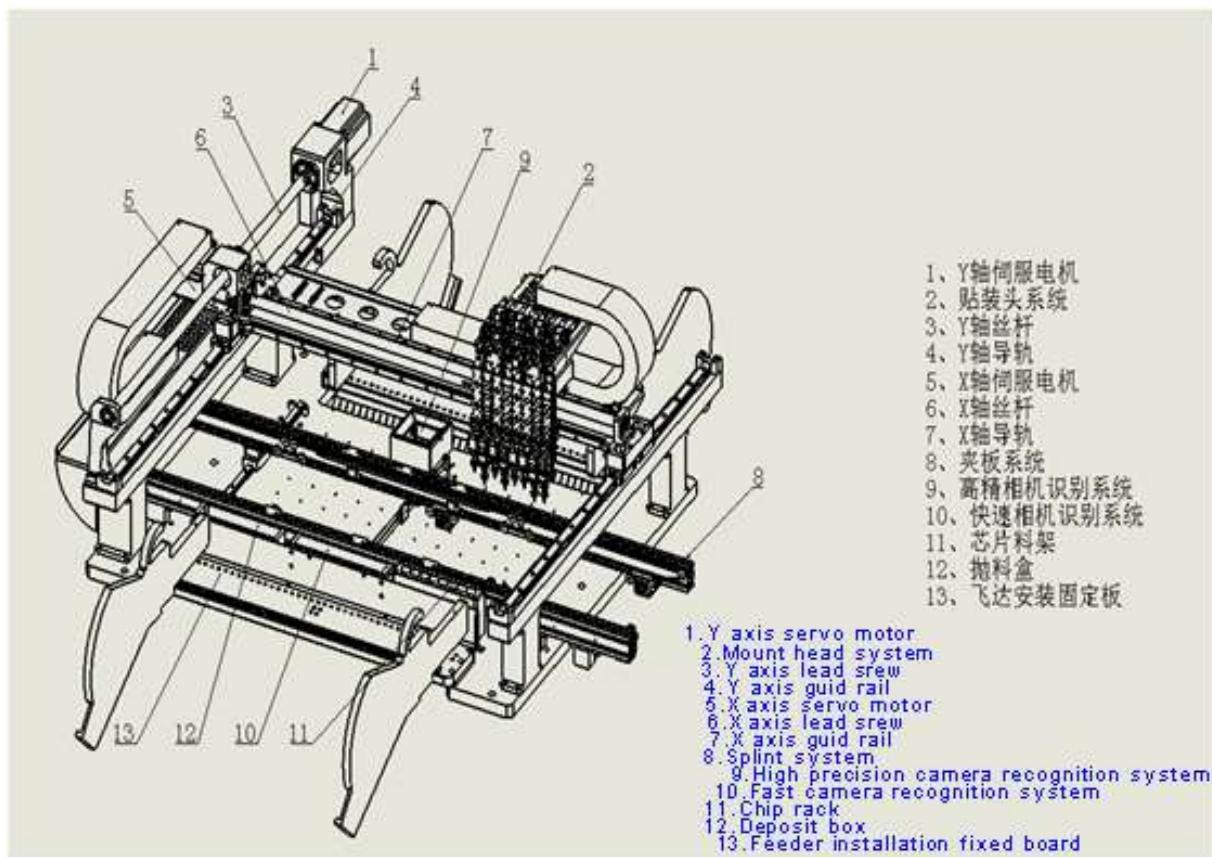
open the package, install the alarm lamp, adjust the floor, install the cover, front and rear handles, computer support, keyboard support (screws are in the device installation hole), find the power line from the accessory box to access the device /220V AC power (must be reliably grounded).

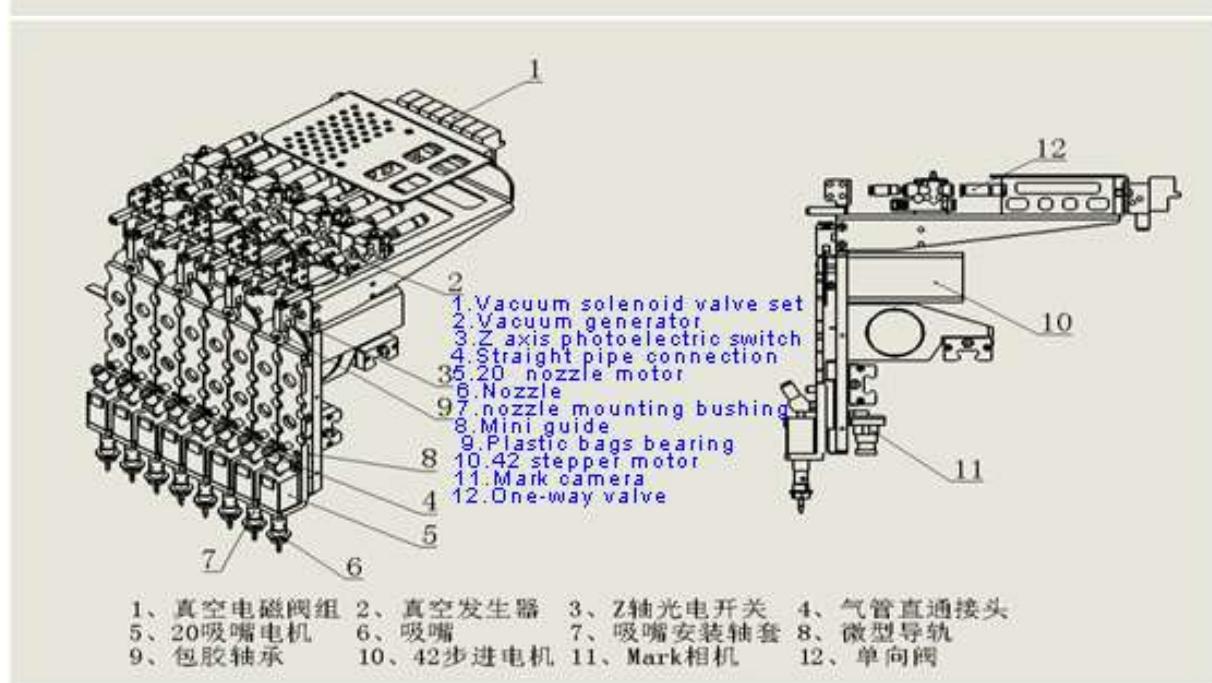
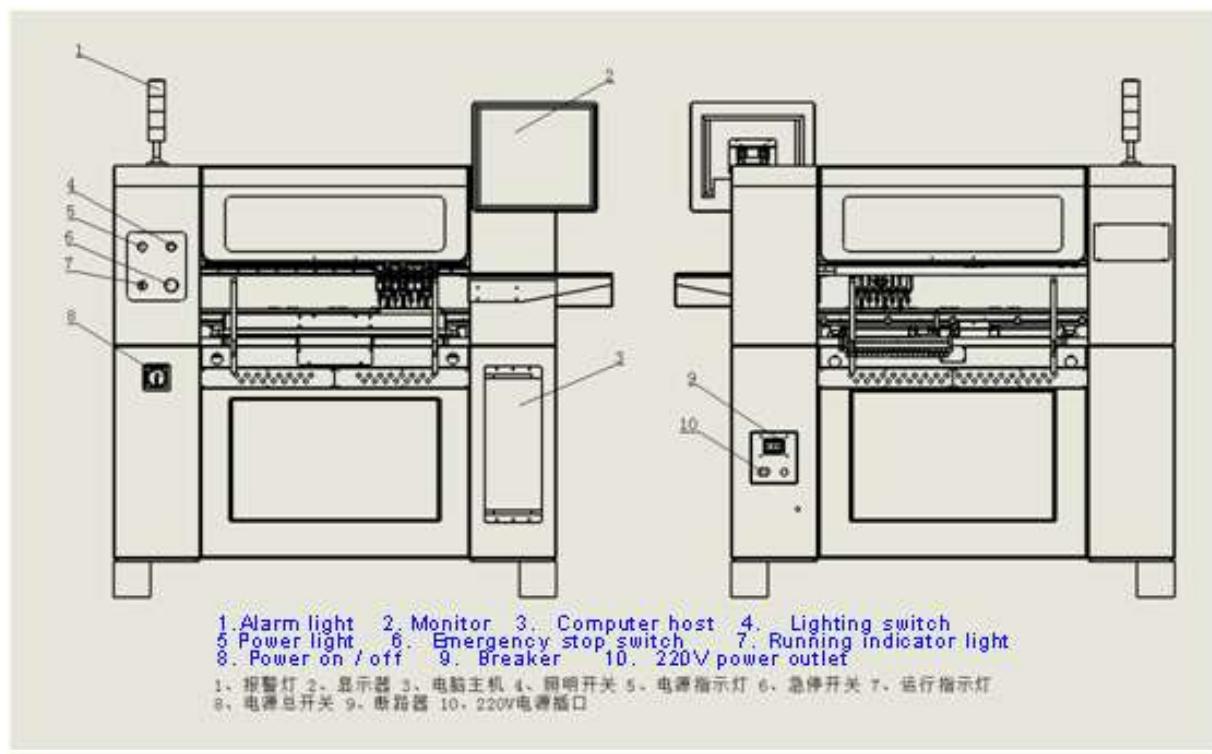
The air inlet of the mounter is equipped with an oil and water separator with the air pressure of 0.6mpa. The factory default is 0.6mpa (generally, the factory has been adjusted and adjusted).

The air inlet of our placement machine is 10mm trachea, semi-automatic screen printing machine, Magazine Loader and Magazine Unloader are all 8mm trachea. If you need to share the same air source, please prepare trachea, adaptor, air storage tank and other accessories.

2.3 Outline of external structure







3. Accessory Introduction

3.1 Nozzle Introduction

NO.	Outer Dia.	Inner Dia.	Appearance	Suitable for pick up components
501	Φ0.4mm	Φ0.2mm		0201
502	Φ0.7mm	Φ0.4mm		0402
503	Φ1.0mm	Φ0.6mm		0603
504	Φ1.5mm	Φ1.0mm		0805, 1206, 1210, SOT23
505	Φ3.5mm	Φ1.7mm		SOP8, SOP14, 1812, 2220 15*15mm IC with less than 64 pins
506	Φ5.0mm	Φ3.2mm		QFN, TQFP, BGA above 10*10mm size

3.2 Feeder description

3.2.1 Feeder Specifications

Type	Brand	Spec.	Occupy the installation hole	Total number of installation
Feeder	Yamaha	8mm	1	42-80
		12mm	2	
		16mm	2	
		24mm	3	
Vibrating Feeder		3-5 tube	7	



Note: according to the width of the feeder, the range of installation holes on the feeding rack is different. Take the eight-head 80-bit feeder as an example, so the 8mm feeder can be installed up to 80, and the 12mm feeder can be loaded up to 40.



图 1-7 带状供料器（飞达）

3.2.2 Feeder Install

Serial	Content	PIC.
1	Put the feeder on the platform	
2	Pull open the hand shank	
3	Loosen pawl and open feeding lid	
4	Step 3 results after correct operation	
5	Load it into the material tray and peel the tape to a suitable length. Put it in the guidance slot.	
6	Guide sequence of Feeding lid	

7 Top view of Feeding lid



8 Finish photo after installation

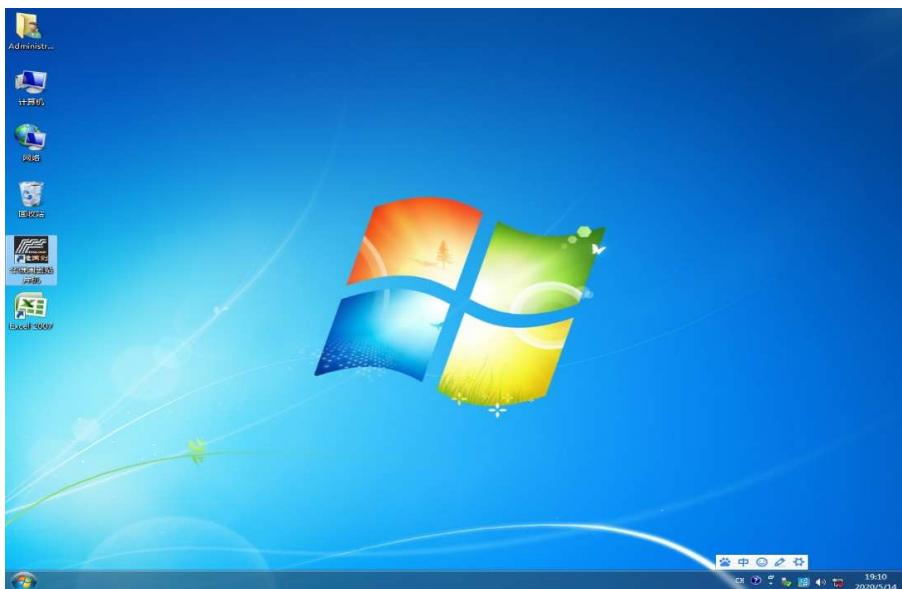


9 Pull up the handle, align the device with two installation holes, press to the bottom, and press down the handle



4. Program description

4.1 Create New Project



Double click to open software on desktop.

Note: except for double-clicking when opening the software, all the buttons in the software are clicked. Double-clicking or multiple clicks may cause the software to crash.



Click “Connect” Button.

While waiting for the device to return to zero, the XY axis will move to the upper left corner at the same time. The device will return to zero after hearing the device buzzer drip.

After the success of the device to connect.

Create the project or open the required project

4.2 Generate the Coordinates of Device

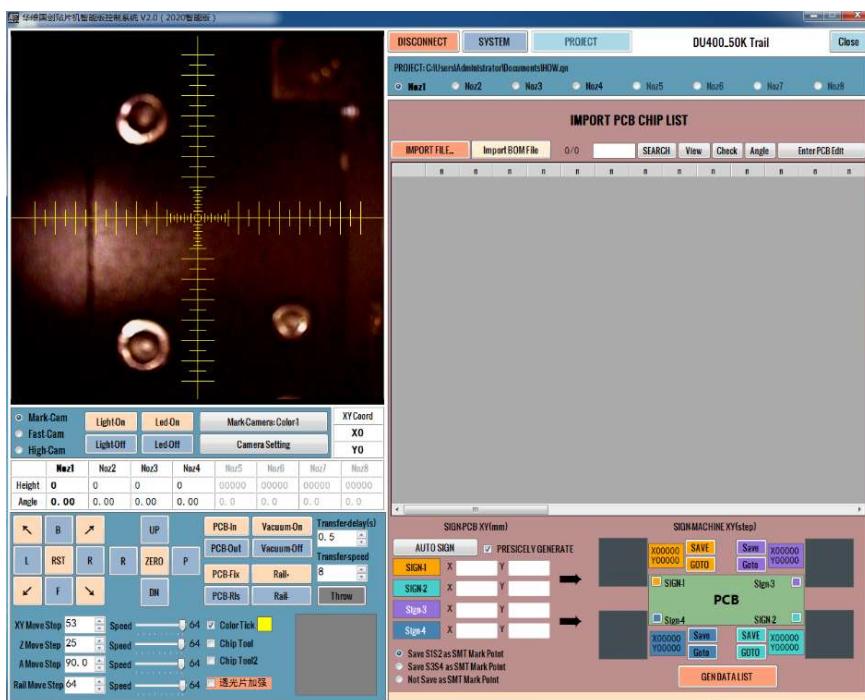
There are two method to create a new project: import from PCB file and Manual Edit:

4.2.1 Import from PCB data file Method



Select add coordinates manually or import component coordinates.

According to the size of the PCB board into the board track width, PCB into the track, click into the board. The board track is divided into three sections from left to right.



Select import file or import BOM file according to the actual situation

Mapping is mainly based on importing files.



Select import required files, support TXT text documents, CSV documents.

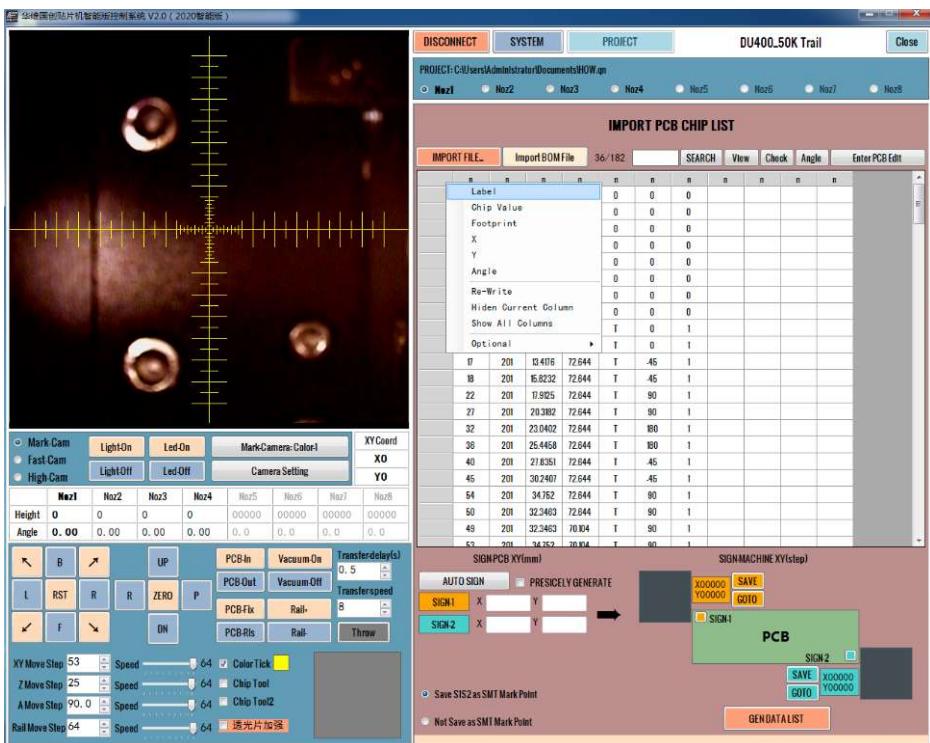
The import file need compiled in Excel form.

Coordinate file arrangement instructions:

If the circuit board is front and back, the file should be divided into front and back two files.

Create two engineering into these two files, respectively.

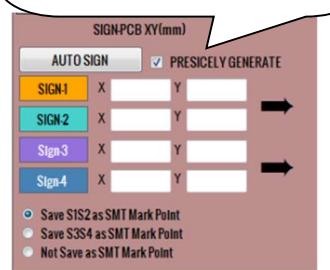
If the diagram software is Altium Designer, the reverse side needs to do mirroring and then export coordinates, or the X-axis coordinates take the reverse processing.

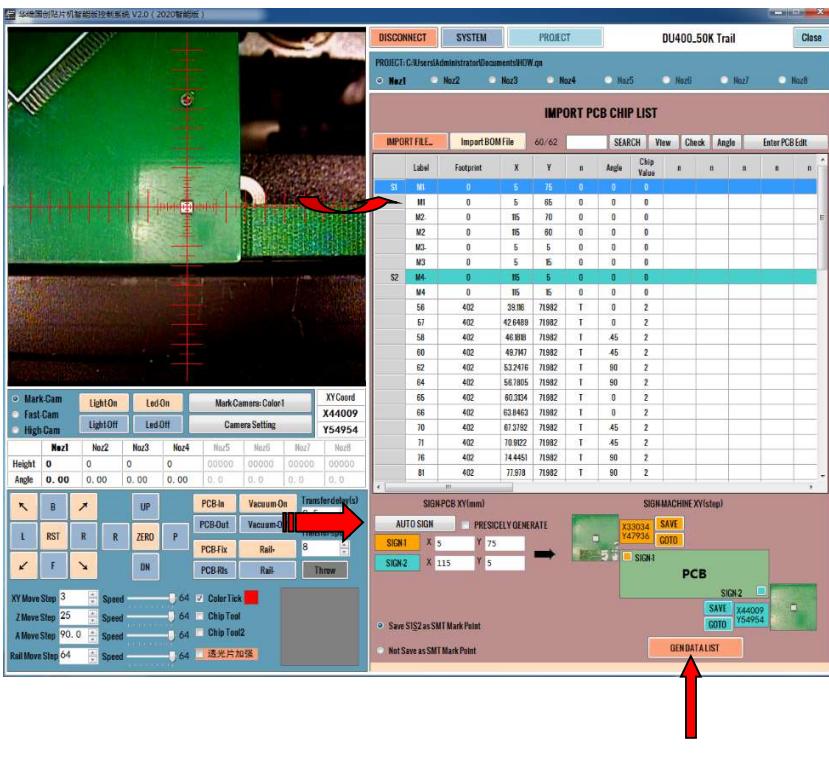


Click the right button of the mouse to "Sn" and select the corresponding package, bit number, Angle, etc.

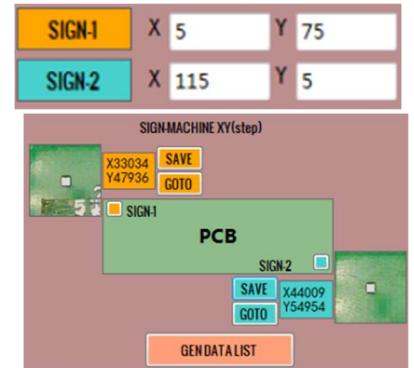
Precision generation is mainly used to enable 4 marker points when PCB board is too large or there are too many precision devices.

Common PCB does not need to be generated accurately, just remove “✓”





Click “Auto Sign”, Function will assign two components as Sign 1 and 2. Click S1,S2, and move Mark camera to the S1 and S2 position, then “SAVE”XY coordinate.



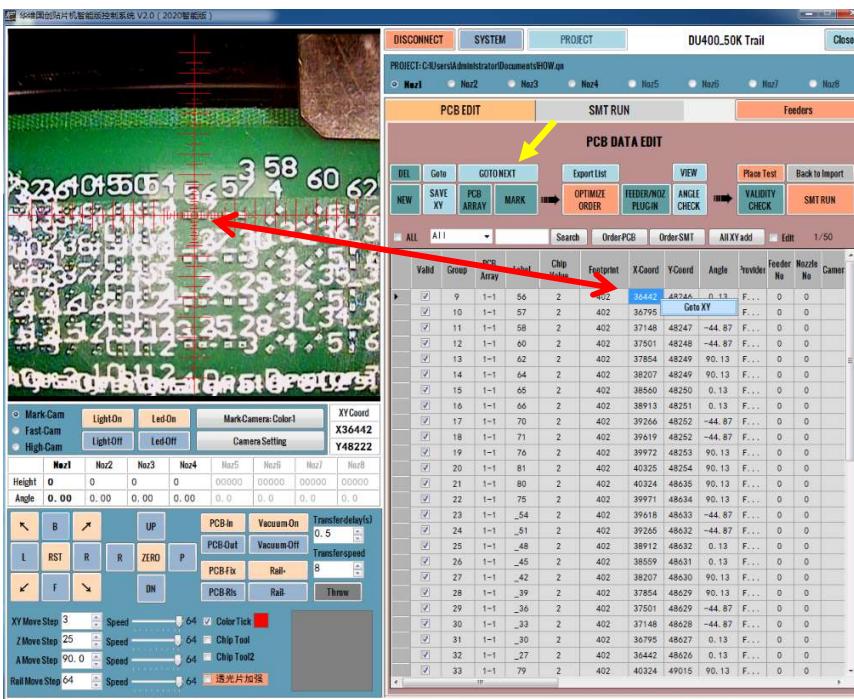
Note that the Sign points should be the corner of the PCB board.

Next step is “Gen Data list” to generate the coordinate list.



PCB direction is same as imported file!

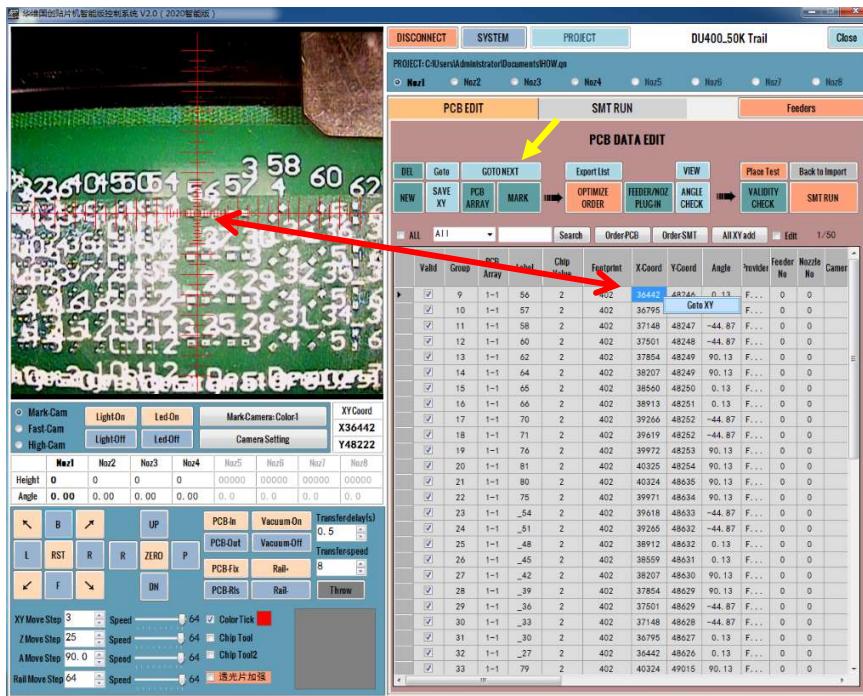
Continue



After Generated the data list, user should manual confirm the XY position and angle. Select one line, and click “Goto” or “Goto Next” to check the position and angle.

GOTO NEXT

4.2.2 Manual Edit Method



Manual Edit:

Select Manual Edit in 4.2.1 first step

Move Mark camera center to one component pad center, and click “NEW”. Double click the line to complete the information, that is, Label, Value, Footprint and is low speed move, etc.

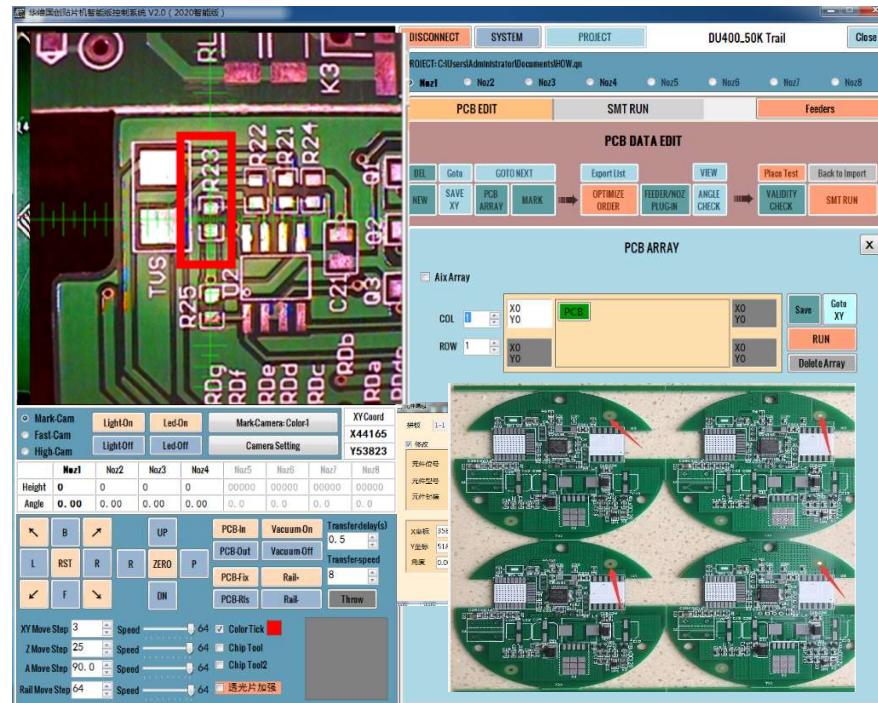
DEL	Goto	GOTO NEXT
NEW	SAVE XY	PCB ARRAY

Update the XY position:

If you find that the XY position of one chip is not correct, you can move mark camera to the real center of the chip, and right click, select ”update XY”.

4.3 PCB Array

4.3.1 Standard PCB Array



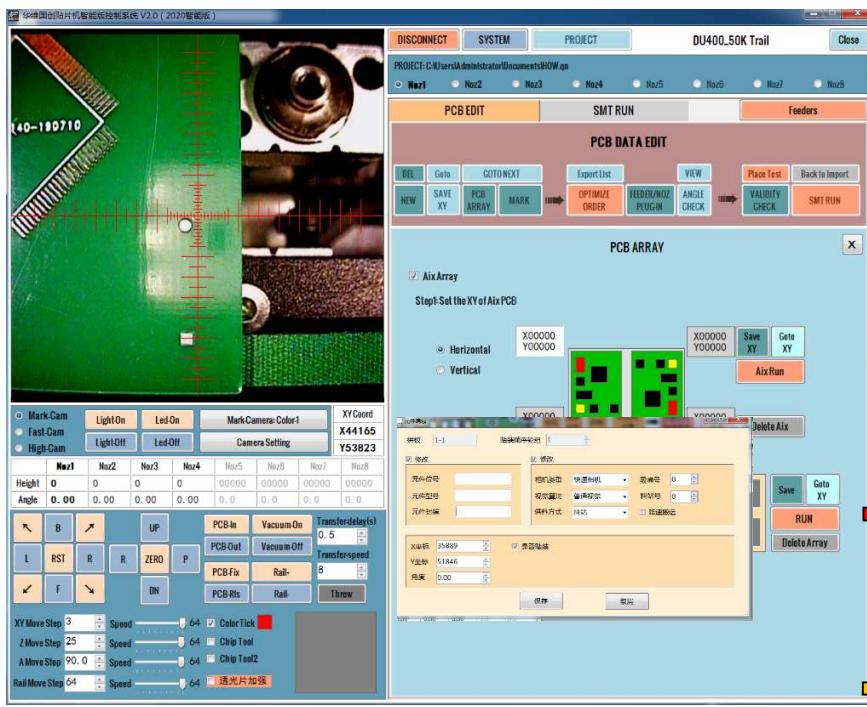
Standard PCB Array:

After generated data list, if you want to duplicate the data to same PCB array, you can click “PCB Array” Button. Input the row counts, column counts, and the XY position of one same component (such as R23) in four different corner PCB board. Next Click “RUN”.

If the array only has one row or one column, there will have same XY position in same column or row.

You can skip this step, if you don't have PCB array.

4.3.2 Aix PCB Array (180 degree PCB array)



Aix PCB Array:

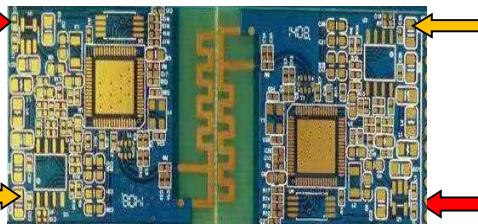
Please select “Aix Array”, and confirm whether it is horizontal or vertical.

Take horizontal for example, see the picture on the left.

Firstly, find the red and yellow point XY position in the Aix PCB couple, save these four XY coordinates. And confirm the “Aix Run”

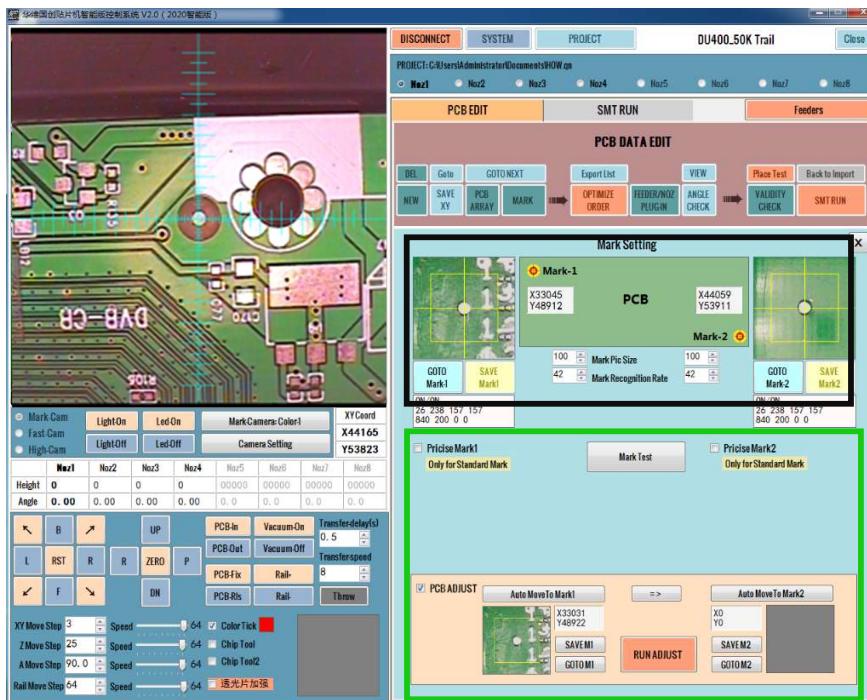
Secondly, Aix PCB couple array.

Now you can take the Aix PCB couple as a single PCB board, and take the array as 4.3.1.



4.4 MARK Point Setting

4.4.1 MARK XY Coordinates Setting



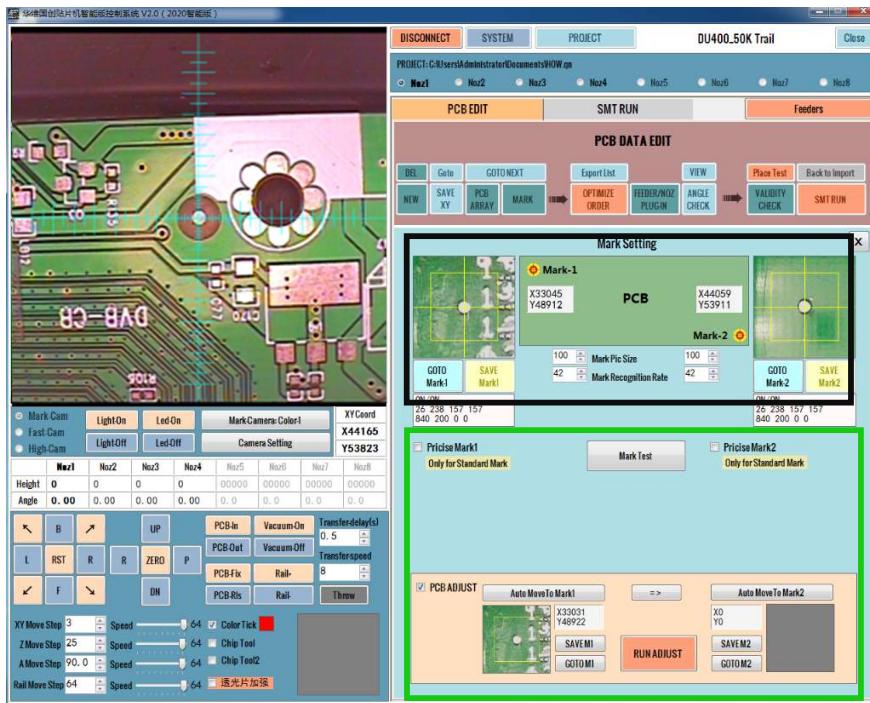
MARK XY Coordinates Setting:

- After time import, mark point is already done, but this is just for single board. If user want to change Mark point (most time you need to re-set the mark point), please move mark camera center to the object mark center, and adjust the mark camera parameters, and click “Save”.

- Adjust the mark picture size and mark recognition rate.

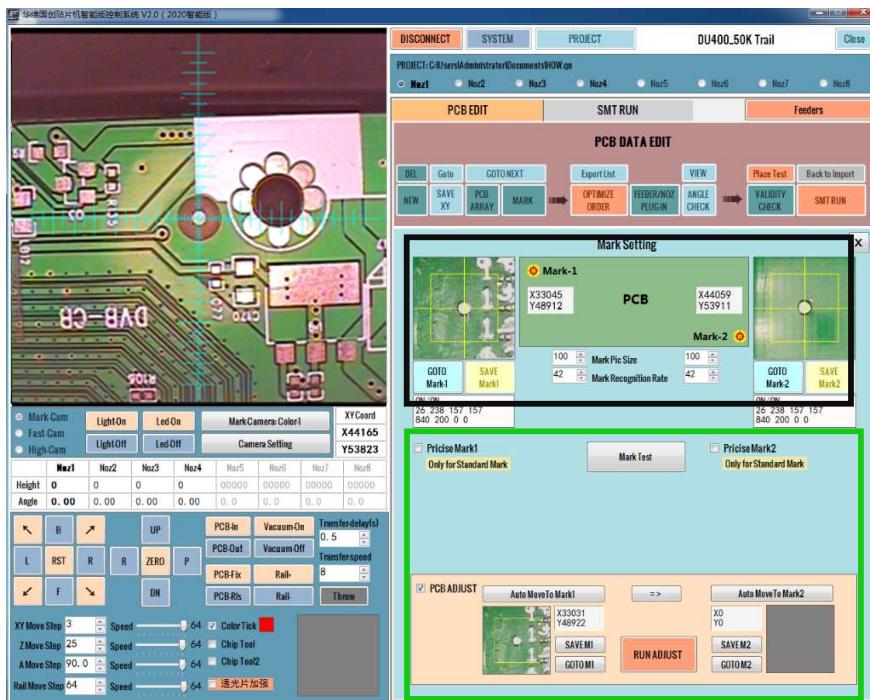
- If PCB mark you selected is not standard point, or not clear picture, the SMT precise will be reduced, even causes the “Mark recognition Fail”

4.4.2 Precise Mark



Precise Mark is used for the high precise requirement components and PCB boards.

4.4.3 PCB Adjust



PCB Adjust, is for second or more times change mark points.

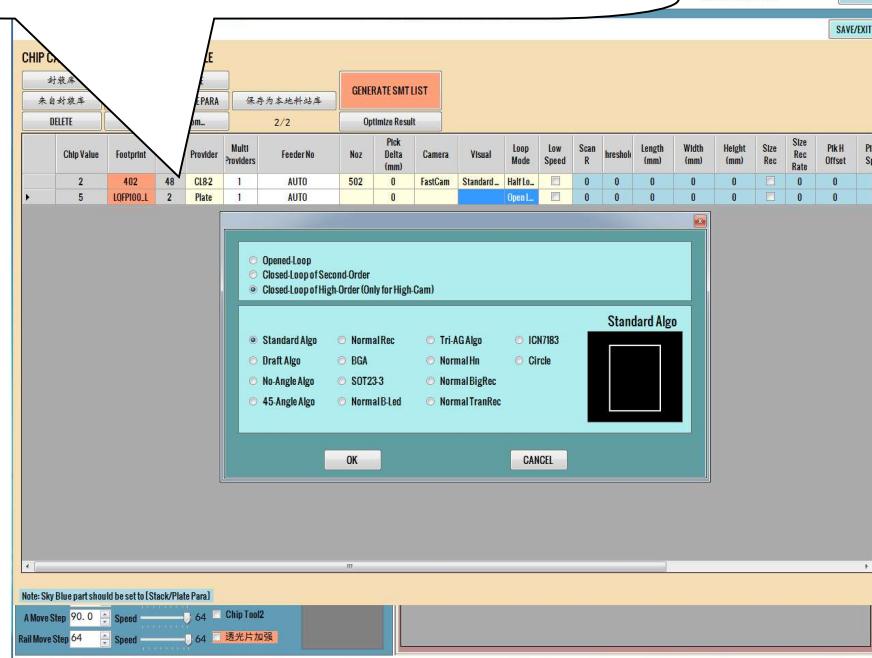
First time program please skip this step.

Please check PCB option, and move Mark camera to the place around original mark point, and click "Auto Adjust", Save M1 and M2.

4.5 “One Key Optimize”Generate SMT List

4.5.1 Optimize by Classification

This button is used to disable feeder slots and nozzle slots



Optimize by classification

1. Please input the following information in classification table for each kinds of components: Feeder type, Nozzle type, pick together rate, camera type, visual algorithms type, is low speed, multi-feeders.

2. click “Generate SMT List”

PS： If you did change or add new components, you can click “Optimize unassigned items”. If you click “Optimize all items”, all the installed feeder No. will be changed.

Visual Algorithms:

SOT23-3:

Open-loop

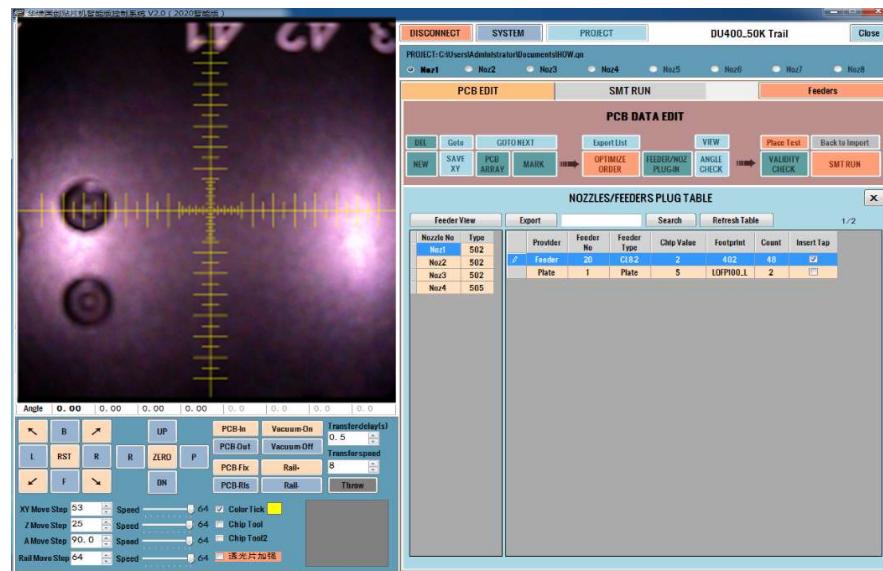
Big IC:

Standard Algo & Closed-Loop of High-Order

Most small components:

Standard Algo & Closed-Loop of Second-Order

4.5.2 Feeder and Nozzle Install Table

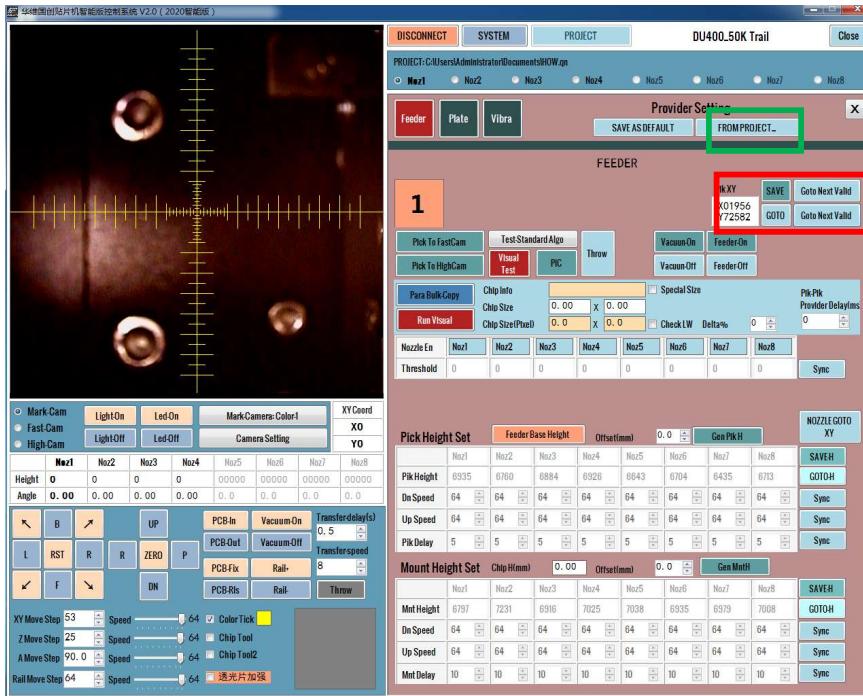


Feeder and Nozzle Install Table

Please follow the Table to install feeders and nozzles.

4.6 Provider Parameters Setting

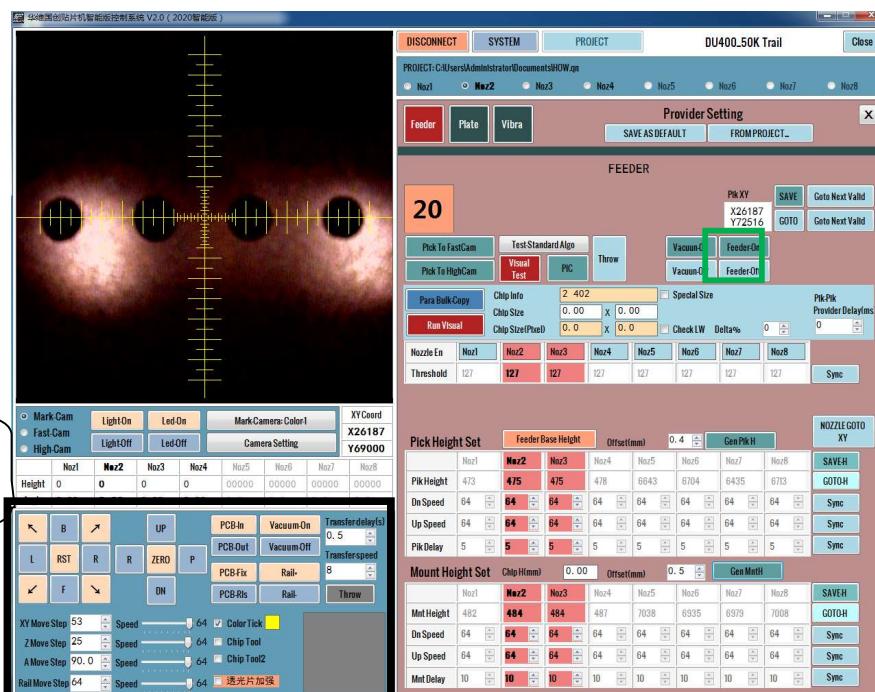
4.6.1 Standard Feeder and Vibrating Feeder Setting



Click “Feeders”Button enter feeder setting page.

There is a button “Goto Next Valid” to move mark camera to first valid feeder position.

Feeder parameter can be imported from other project of this pick and place machine, which can save your time to set the same thing once more. See green box.



Pick XY coordinate, Pick Z Height, Mount Z Height Setting:

Click “Open Feeder”, move mark camera to the center of feeder slot, and click “Save”.

Pick height offset suggest 0.3-0.6, and click “Generate Pick Height” to get the pick height easily. You can also set height directly.

Offset(mm) 0.0 Gen Pk H

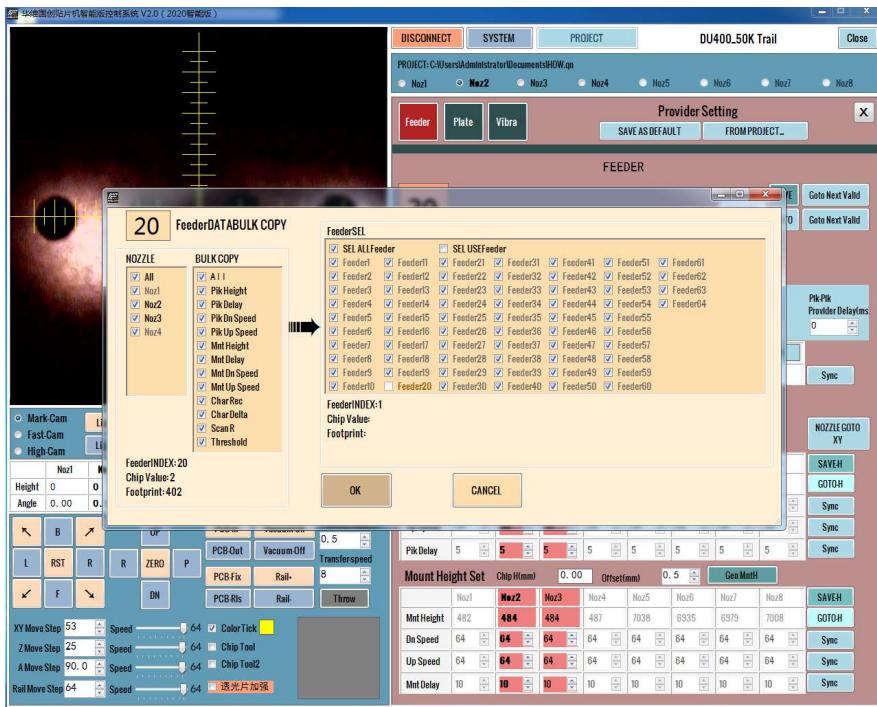
Mount height offset suggest 0.3-0.6, and chip height is still required. And then click “Generate Mount Height”

Pick delay of most small components is 10ms, while SOT, small IC should set pick delay between 20~30;

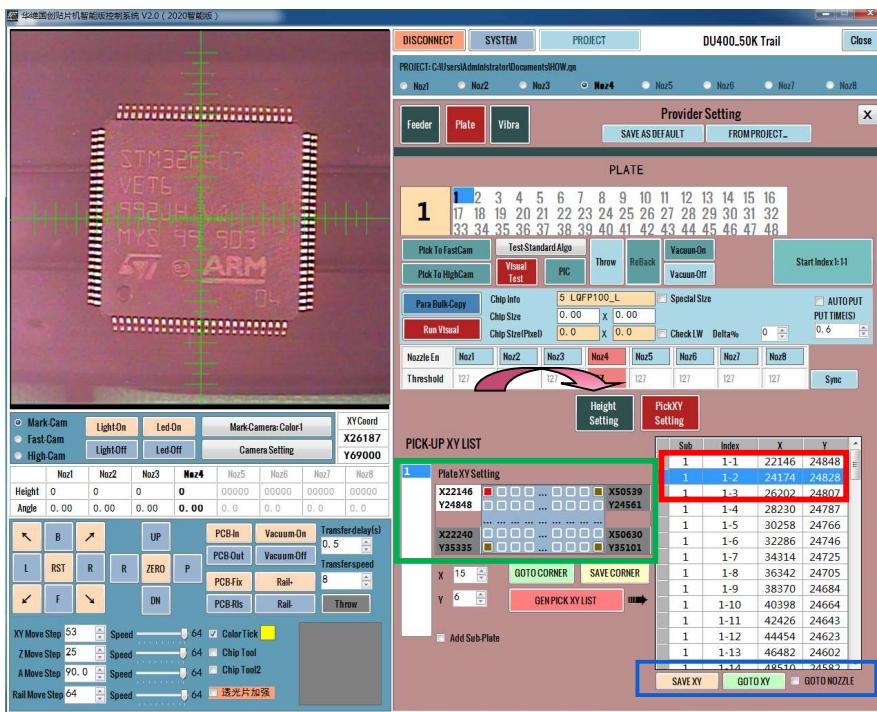
Z mount speed should adjust as current occasion.

Character Recognition (Check LW)

Please click “PIC”to get chip length and width, and select “Check LW”, use this function can make sure the chip is picked correctly.



4.6.2 Chip Plate Parameters



Parameter bulk copy

There are many feeders which using similar parameters, in order to save user's time, this function can be used.

How to use:

Firstly, to set all nozzles parameters of one feeder, and then click the “Para bulk-copy” button to copy wanted parameters to wanted feeders.

However, the special chip needs to set the special parameters.

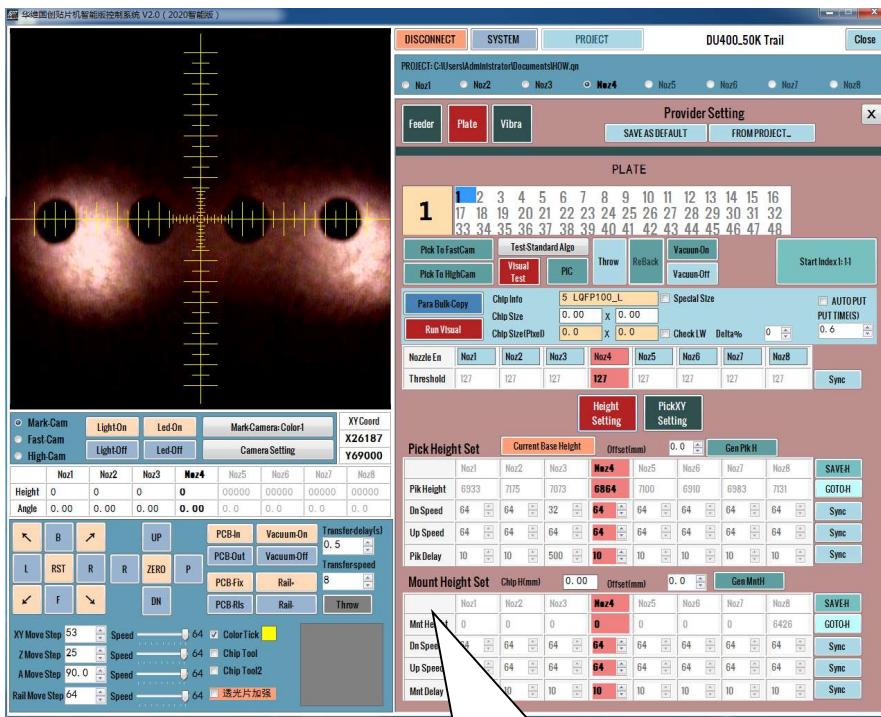
Plate Parameters Setting

PickXY Setting

Since plate has variable pick XY, so we need to set the XY array for plates. Click “Pick XY Setting”, move XY to the four corners of the plate, save the corresponded XY, input the rows columns, and Generating.

And selected “Goto Nozzle”, and select one line of the table, and check.

If your PCB does not have plate chips, please skip this step.



Pick and Place parameters

Plate Height setting

**Height
Setting**

Move Z of one nozzle to touch chip, and save “Pick Height”

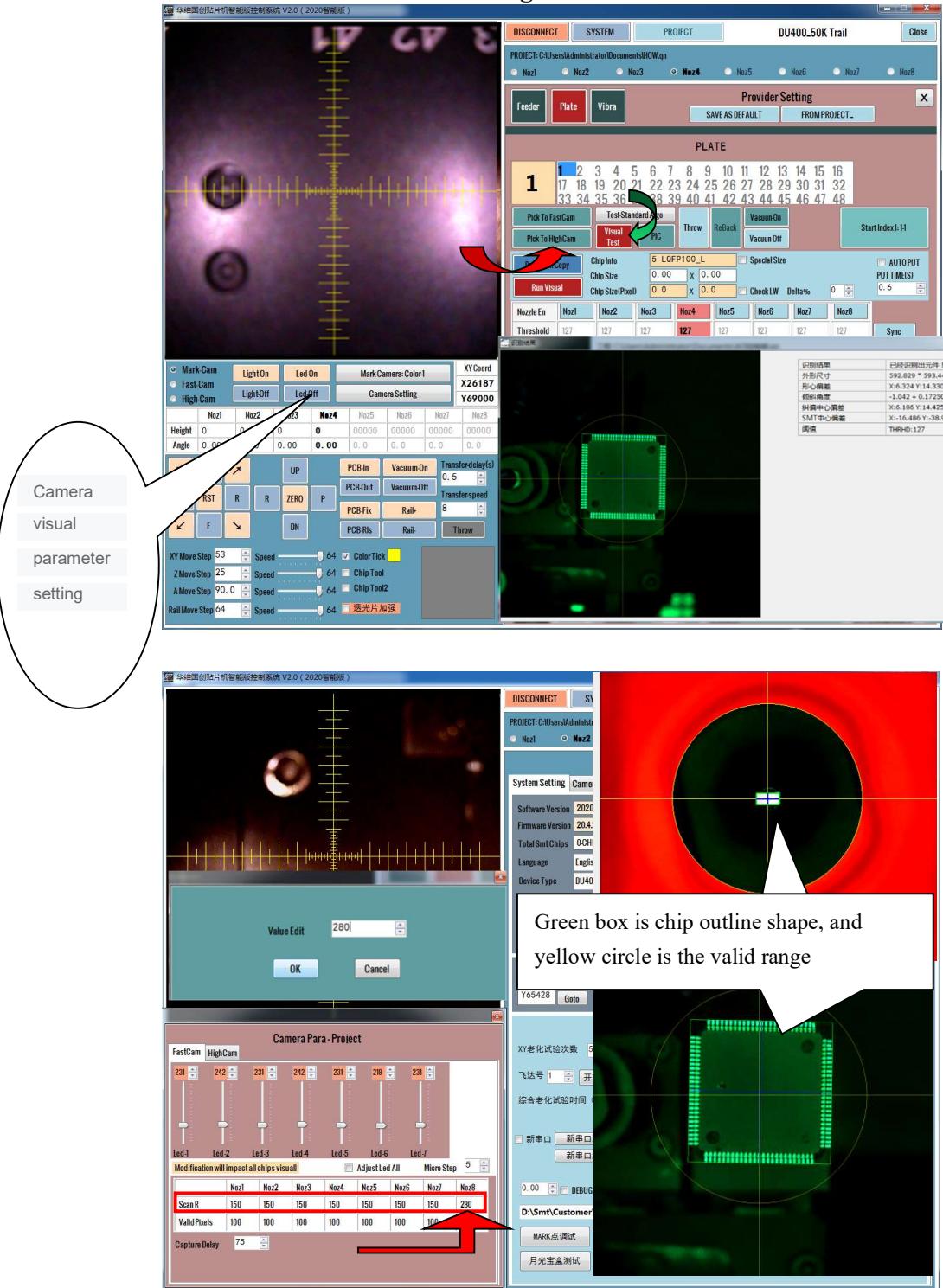
SAVEH

Mount Height is the same method. Move Z of one nozzle to PCB, and save the “Mount Height”. You can also generate mount height by click “Gen-Height”



Up-speed, Down-speed suggest setting as 30~50, Pick and Mount delay set as 150ms. Adjust according to the actual situation.

4.6.3 Visual Parameters Setting



After setting complete the XY, Height and operation parameters, user need to adjust camera related parameters. Firstly, check whether the light value is correct.

If it is IC, please “pick to high camera” and “visual test” for reference to adjust the light value and algorithms type and threshold. (the IC pins should be seen much clearly through high camera)

Visual Test:
The picked chip should be seen in the correct range. If the range is not correct, please adjust the value.

Camera Setting

Visual algorithms Setting

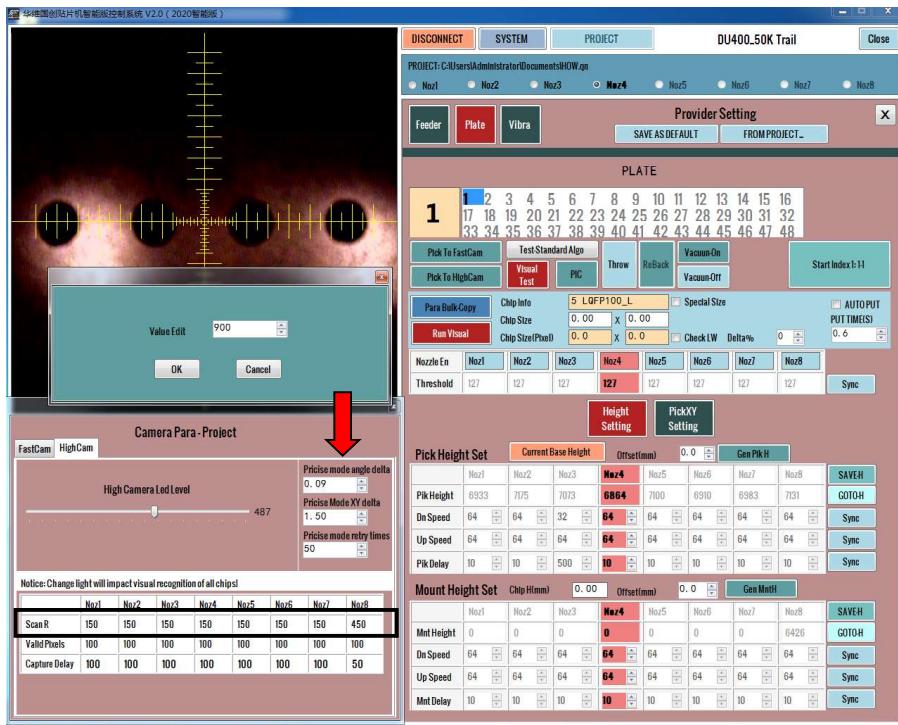
1. Light and range-R of fast and high camera.

2. Pick to Fast camera or High camera, to check the light and threshold value.

Double click the threshold value to change.

(light value set suggested 80-160 for fast camera reference value 0402-1206, and suggested 250-350 for high camera)

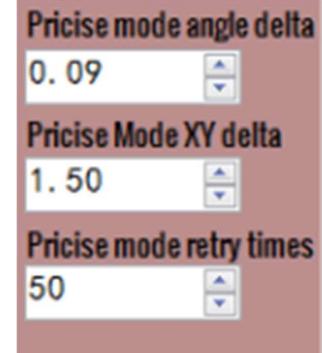
Note that, light and scan-range can be adjusted in actually situation, all the other value set default value. All these changes should be guided by professional people.



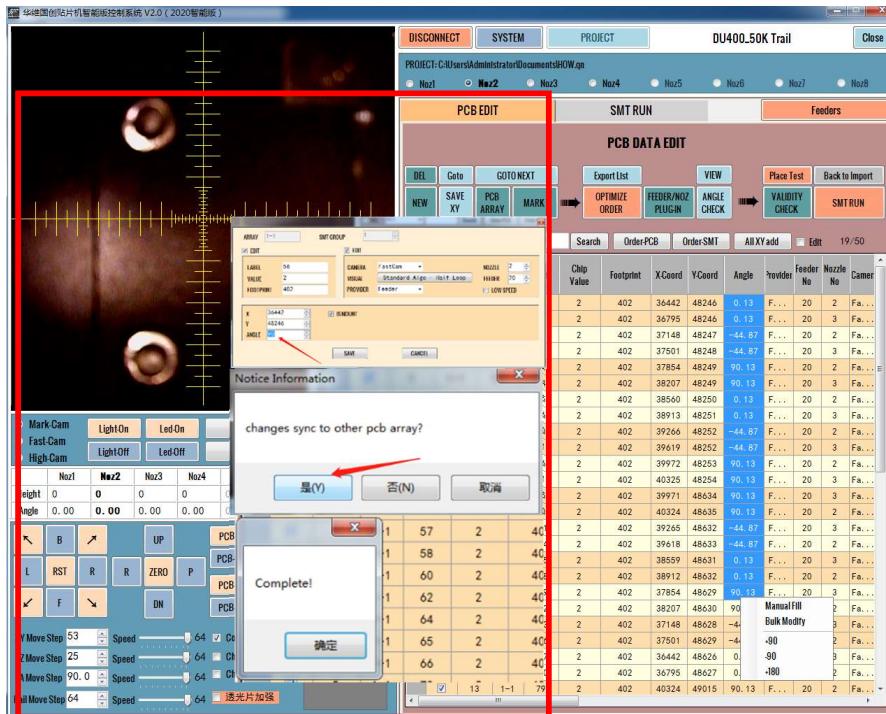
This picture is reference parameters for high camera.

High camera scan-range can be set maximum as 900.

Precise mode angle delta set suggested as 0.2



4.7 Angle Confirm and Validity Check



Angle Confirm:

After all the parameter setting completed, user should confirm the angle of each chips.

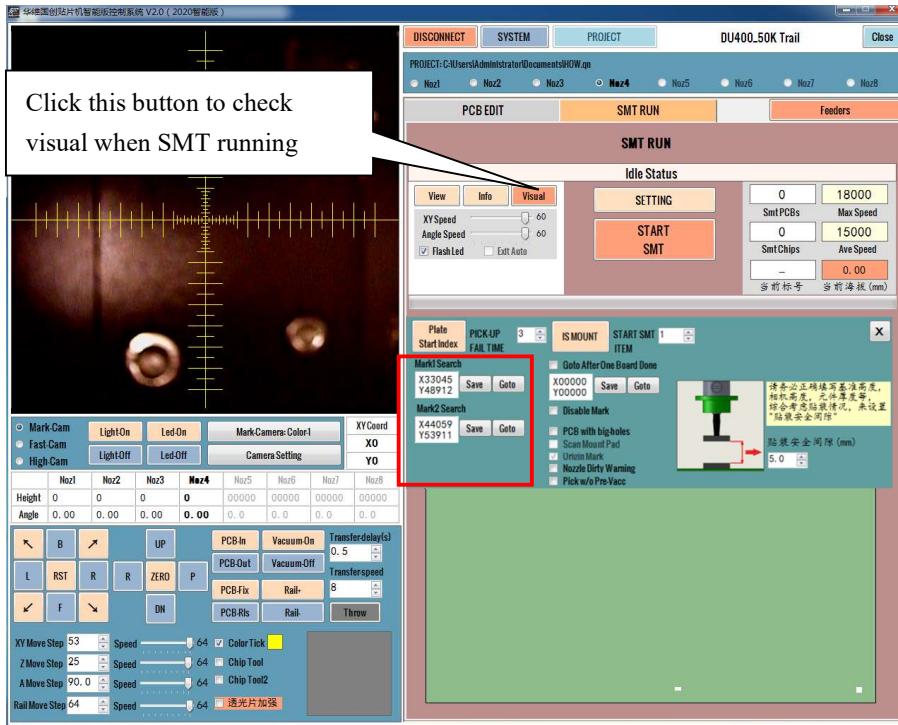
The angle can be adjusted by bulk or single.

Double click or right click, according to the real situation.

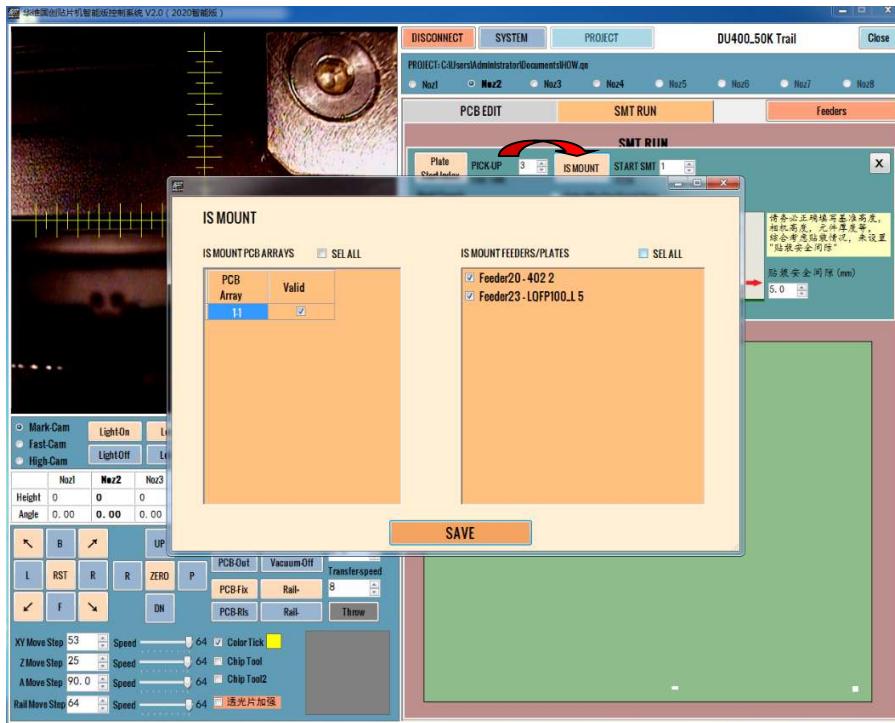
Validity Check:

Click the “Validity check” to scan all the setting, if there is any setting is not valid, it will notice you.

4.8 SMT Running



When run SMT, transfer delay reference value is 0.8~1.5. if less than 0.8s, inboard failure or out board failure may happen.



SMT Running

Click “Setting” to set mark point search XY, to make sure mark points be searched in most effective place.

Plate start index is needed for first plate chip index.

Start SMT index is set for the first SMT item in data list.

If all the parameters setting done and all materials install done, use can click SMT Run.

Select: Manual mode or Auto mode

Is Mount: If there are any kinds of chips no need to SMT, you can disable this chip kind.

User can also disable one PCB array.

5. Maintenance

Full automatic Pick & Place equipment belongs to the high degree of automation of high precision equipment, daily maintenance, can make the machine run more smoothly, longer life, significantly reduce the equipment may occur in the fault.

Maintenance, maintenance project details are as below:

5.1 Daily inspection and cleaning

- A) The operator should keep the external equipment clean, pay attention to whether there is any foreign body, especially the air vent, and clean it in time.
- B) Keep the surface of the high-speed camera cover and the precision camera cover clean, free from foreign matters, oil stains and dust, and ensure that the camera can take pictures clearly; When cleaning the camera cover for plexiglass, please be careful not to wipe it with organic solvents or corrosive reagents to prevent the damaged surface from blurring the camera's vision. It is recommended to wipe it with cotton cloth.
- C) Pay attention to clean and check whether there is any foreign matter on the linear guide rail of X axis and Y axis and the driving lead screw/synchronous belt, especially the small resistance capacitance or other hard objects, to ensure smooth operation of the guide rail.
- D) The operator should always pay attention to whether the sound of the equipment is normal or not. If there is any abnormal sound, it should stop the machine immediately for inspection. Generally, it should manually locate the sound site and mainly check whether the screws nearby are loose.

5.2 Electrical inspection

All electrical parts are not allowed to be dismantled or assembled without permission. If maintenance is required, turn off all power before opening the case cover. Chassis internal wiring is more complex, as a foreign body or dust, use wet cloth to wipe brush cleaning or also can use a vacuum cleaner.

5.3 Maintenance of guide rail

The guide rail belongs to the important moving parts, and the movement is frequent, must guarantee to replace the new special lubricating oil every month (the special guide rail oil of linear guide rail had better be the kind of high and low temperature oil of white).

Before all guide come on with a clean cloth to remove the old oil dirties, and oil in the oil gun nozzle inserted into the guide rail slider

After the mouth is fixed, the lubricating oil is injected into the slider until the oil overflows from the slider, and then the slider is extended to the guide rail

Slide back and forth a few times, then wipe the black grease clean again, re-oil the nozzle of the oil gun into the slider until it overflows. As shown in figure A - B



油枪油嘴插入滑块注油嘴并完全结合

Figure-A



Figure-B

If existing conditions can not meet, there is no special grease gun can use clean cloth first original black oil is wiped clean, and then in the guide rail surface coated with a thin layer of guide rail oil, gently starting production for about an hour after stopping repeat to wipe off just contaminated black grease try new coated with a thin layer of guide rail oil production can be completed.

5.4 Maintenance of vacuum generator

Vacuum generator is complete all pasted on the very important link, therefore not three months should check whether there is inside a vacuum generator filter cotton dust or other foreign material, operation method, now connect the vacuum generator with white trachea partial pressure force, another hand will filter down to pull at the same time, and then use the other side of the eight filters under the same way. Blow with air gun in the opposite direction, if there is more solder paste can be used to clean the board with ultrasonic water or alcohol, and then blow dry with air gun.

6. Failure analysis and troubleshooting

In the production process of the mounter, due to unreasonable parameter setting or other abnormal reasons, the protection function in the software will automatically start to make relevant error reporting, which requires operator to handle. Common faults and troubleshooting methods are shown in below table:

Troubleshooting Phenomenon	
Mark point recognition error	<p>Solution:</p> <ol style="list-style-type: none">1. Remove foreign bodies or manually confirm Mark points.2. Manually replace the Mark point. It is required that there is no foreign body in the 3-5mm meter near the center of the Mark point.3. If the PCB board is rough, the Mark point recognition rate in the Mark setting can be reduced.4. Light source and lighting shall be turned on when Mark point is collected.5. Put the PCB board backward and put it in the right direction.6. There is a welding pad with high similarity to the MARK point near the MARK point (or the screen printing layer is different from the collected picture near the MARK point)

Feeder feeding abnormal or nozzle failed to take material	<p>Solution:</p> <ol style="list-style-type: none"> 1. Check whether the air pressure is normal and make sure the air pressure is between 0.55 mp-0.7 Mp. 2. If the feeder reel is stuck, remove the waste and reinstall the reel. 3. If it is more than 12mm, please check whether the step space is normal. 4. Check whether the feeding coordinate of nozzle is accurate, and save the feeding coordinate again. 5. If the feeding height is not enough, reset the feeding height. 6. If there is any foreign body blocking inside the nozzle, remove the foreign body or replace the nozzle. 7. The vacuum generator is abnormal and there are sundries inside. Replace the vacuum generator.
Deviation of mounting position	<p>Solution:</p> <ol style="list-style-type: none"> 1. Check whether the current light source is reasonable. It may be too bright. If it's too dark, adjust the light source. 2. Whether there is interference from other light sources, such as ultraviolet light, ceiling light, etc., the cover must be closed when mounting. 3. If it is the overall deviation of components, the Mark point is not set when the components are imported. If it is only the deviation of some components, the coordinates can be corrected and updated manually. 4. Check whether the mount height, mount delay and mount speed are reasonable according to the size of components. 5. The PCB board is too large or rough, with deformation, so it should be adjusted to the normal flat state. 6. Check the recognition range of the camera, and check whether the image mounting components are within the camera's recognition range during the process of mounting. Pick up the attached components to the camera in the visual algorithm setting for viewing, and modify the recognition range for the suction nozzle used in the scanning radius of the algorithm. 7. The first piece of Mosaic is normal, and the mounting position of the remaining collage is deviated and the deviation is regular. Reset the array to ensure the standard point of the array. 8. Big board, the first few pieces are normal, and the deviation of the latter is different. Reset the Mark point, and the diagonal of PCB board is the best
Castoff rate is high	<p>Solution:</p> <ol style="list-style-type: none"> 1. Classification optimization visual algorithm is consistent with the current element. 2. If the feeding height is not enough, reset the feeding height. 3. Adjust the feeder with the stuck material.