

PICK&PLACE MACHINE

Operation Manual

(Model: S-320)



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Caution

Thank you for purchasing our products, for using our LED mounter safely, please read thoroughly and understand fully before operating the machine. Keep the manual in good condition for any further reference.

- (1) Without permission, anyone is strictly prohibited to copy or duplicate arbitrarily for parts of or the whole content of this manual (including software and program)
- (2) The contents of this book are subject to change without prior notice.
- (3) We strived to make it 100% when we were writing this manual. In case there is some error, omission or doubtful content, please contact with the distributor or our company.
- (4) Declaration: Our company is no responsible for any accidents caused by faulty operation, no matter it is misled by article (3) or not

In order not to get injured, any operator who is actually operating this SMT machine and its supporting device (hereafter referred to as machine) or any maintenance personnel who to maintain and repair this machine should read below safety precautions thoroughly and fully before operating the machine. In the "safety precautions" of the manual, there is some other information not just the specification of the product purchased by the customer.

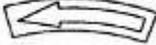
In addition, in order to make you understand the warning sign of the manual and product fully, we classify them as below. Please understand them fully and comply with them.

1)The degree of warning

 Danger	It means if the operator or a third party doesn't stop such faulty operation or keep operating such operation, there is a major hazard to cause death or serious injury.
 Warning	It means if the operator or a third party doesn't stop such faulty operation or keep operating such operation, there is a potential hazard to cause death or serious injury.
 Attention	It means if the operator or a third party doesn't stop such faulty operation or keep operating such operation, there is a hazard to cause moderate or mild injury.

2)Warning sign and indication sign

Warning sign			
	Hands or clothes would be enmeshed.		Get injured when touch the running part.
	High voltage Electric shocking risk		High temperature Scalding risk
	Get injured when touch the driving part.		Put heavy object or hand on would cause damage

Indication sign			
	Earth wire		The right direction as arrows

Safety precautions



Attention

The basic precautions:

1. Do read this manual and the instruction or other explanatory materials for this machine or the function before operating the machine. And keep the operation instruction in good condition in case you need any reference.
2. Not only the specifications for the machine but also other content is included in this article.
3. It is highly advised only the one who knows well the operations of this machine can operate this machine.
4. The daily repair and maintenance for this machine (not including the basic maintenance repair or other specific matters described in the manual) should be commissioned by our company or agency.
5. For general maintenance and repair (the specific matters in the manual) should be undertaken by the full-time service technician who should have been trained by our company. The parts used for maintenance (the specific matters in the manual) should be from our company.

Protector and warning sign

1. Make sure the protector is well installed in the right position before you operate the machine.
2. When remove the protector, make sure it is placed in the original position and the machine is in normal operation.
3. Make sure the warning signs on the machine is pasted correctly and eye-catchingly. If any of them is come off or stained, please contact our company for replacement.
4. Cannot operate the machine without protector. If you do that, it would cause accident.

Application

1. Do NOT use this machine for other purpose. Our company would not take any responsibility for the accidents thus caused.
2. Do NOT reform this machine. Our company would not take any responsibility for the accidents thus caused.

Training

1. To prevent accidents caused by unskilled operation, it is required that only the operators who are received specific operation training from our company and have appropriate knowledge can operate this machine.



Danger

If you have to open electrical equipment box, in order not to have electric shock accident, please cut off the power. For caution's sake, waiting for 2 minutes then open the box.



Attention

Power cut: It is referred to cut off the power switch and unplug the attaching plug or remove the power cable from the supply side. Similarly hereinafter.

Precautions when cut off the power:

1. When there is an abnormality, breakdown or power cut, please cut off the power.
2. In order to prevent accidents happening by starting the machine by accident, when overhauling, repairing and cleaning, make sure to cut off power before doing these.
3. When unplugging the attaching plug, please hold the plug then unplug, not the cable.

Precautions in all aspects:**Transportation:**

1. Make sure to take necessary security countermeasures to prevent the machine from invert or dropping when it is lifted or transported.

Unsealing:

1. Please read the all instruction on the transportation container
2. It is forbidden to cut the packing string with a knife.
3. Please take care of the shipping equipment.

Setting up:

1. In order not to cause any accident when moving the machine, please use a height adjusting device to hang the rolling wheel.
2. Please set up the machine at a horizontal place.
3. To prevent electric shock, electricity leakage and fire, the cable should be as accessory and connect to specified place.
4. To prevent electric shock, electricity leakage and fire, do NOT pull the cable with excessive force during running.
5. Set the attaching plug at the fixed place, when unplug it, hold the connector then unplug.

Before starting the machine

1. To prevent any human injury, before plugging in, make sure there is no damage, drop and loose for the connector or cable.
2. To prevent any human injury, do NOT put hands into the running part.
3. Make sure there is no any tool or other articles on the platform, or when the platform is moving, not only it would damage the articles; also it would deform the platform and cause failure.



Attention

Lubricating:

1. Use lithium base grease as lubricating grease
2. To prevent from inflammation and hypersensitivity, when the lubricating grease splashing into eyes or onto body, wash it immediately.
3. To avoid diarrhea and vomiting, when accidental ingestion, please go to see a doctor immediately.

Maintenance:

1. To prevent accidents from unskilled operation, repairing and debugging job should be undertaken by maintenance personnel who are familiar with the machine. Use our company part when replacing. Our company is not responsible for any accident by using parts not from us.
2. To prevent accidents or electric shock from unskilled operation, please appoint some personnel who have electrical expertise or the Technical staff from our company or distributor to repair or maintain the machine (including the wiring).
3. To avoid the accidents caused by pneumatic accident, before maintaining, make sure to remove the air source tube, let out the remaining air.
4. To avoid human injury, after repairing, debugging or replacing some parts, make sure the screws, nut don't loose.

Work environment:

1. To avoid the accidents by faulty operation, do NOT use in an environment affected by noise sources such as high-frequency welding machine (electromagnetic waves).
2. To avoid the accidents by faulty operation, do NOT use the machine when the power supply voltage is more than $\pm 10\%$.
3. To avoid the accidents by faulty operation, Please use the supply pressure of 0.6-- 1.0 Mpa.
4. For safe use, please operate the machine under the circumstances as below:

Operating environment temperature : $+10^{\circ}\text{C} \sim +35^{\circ}\text{C}$

Operating relative humidity 50% below (35°C)

90% below (20°C)

5. To avoid the accidents because of electric components breakage, when move the machine from high temperature place to warm place suddenly, there would be condensation. Please sweep away the water drop before turning on the power supply.
6. To avoid the accidents because of electric components breakage, unplug the attaching plug when it is thundering.

Precautions for safe use the S series SMT machine

Danger

1. To avoid the accidents by electric snock, do NOT open source the electrical equipment box when the power supply is on.
2. To avoid electric shock, do NOT run the machine when the earth wire is removed.



Danger

1. To prevent from human injury, do NOT run the machine when the protector is removed.
2. To prevent from human injury, please be careful, in order to avoid hair or clothes being enmeshed into the conveyor belt. In addition, do NOT wear glove.
3. To prevent from human injury, when maintaining (lubricating, debugging or daily maintenance), cut off the power supply.
4. To prevent from human injury, please use a residual-current circuit breaker on the power cable.



Attention

The operation system for this machine is Windows XP. If there is some other software installed which is not used because thus machine, our company would not guarantee for its normal operation. Similarly, if transfer ,rename or copy the document in the hard disc drive, we cannot guarantee its normal operation. Sorry for the inconvenience.

- Just in case it happens, it is required to replace a new HDD, which would lead data loss, therefore, this point should be paid special attention.

Chapter One

1-1 Preface

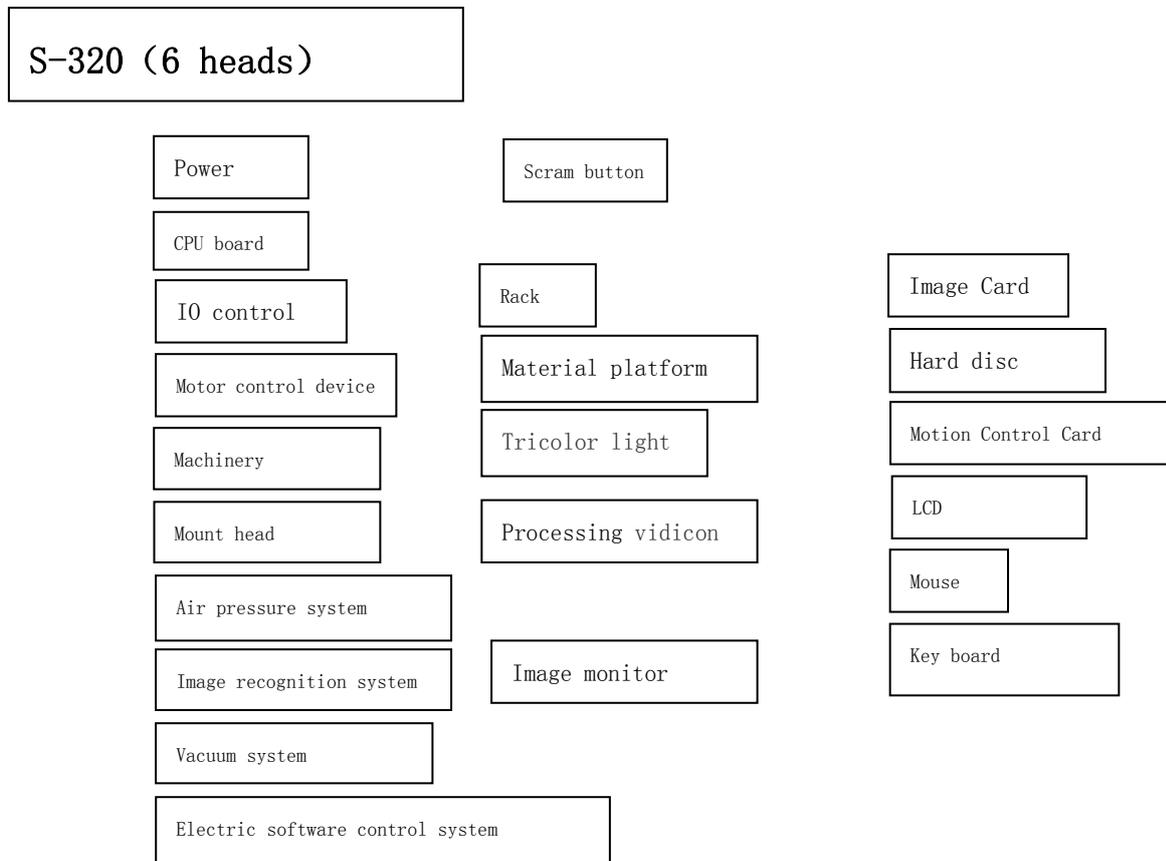
Southern Machinery LED mounter series is with economy, versatility, reliability, and relatively strong maintenance and safety. Its interface with Windows XP as the operating system software (functional software), easy operation, mainly applicable to LED lamp assembly, but also can be used for thin chip shape element QFP, CSP and BGA assembly.

The following instructions for S-320;

1-2 Feature

- 1): Use Windows XP, easy to operate
- 2): Nozzle XY using high precision ball screw to support, less abrasion and noisy, higher accuracy, longer life
- 3): Use processing vidicon function, easier, more convenient and faster, increase the production efficiency.
- 4): With the component position angular deflection and auto correction identifiable function, ensure the paster accuracy.
- 5): With negative pressure detector, can prompt the null in production process.

1-3 System constitution



1-4 Technical parameters

- 1):Max mounting circuit board size :1200mm (L) × 310mm(W)
- 2):Max component height: 5mm
- 3):Production capacity: 30000 CPH (Not including the manual feeding and blanking time)
- 4):Component Centering method: Vision system+ processing vidicon
- 5):Mounting accuracy: $\pm 0.1\text{mm}$
- 6):Component scope : 0603~7474, some special component IC/QFP/CSP
- 7):Dimensions: 2000(L)×970(W)×1350(H) mm
- 8):Power supply: 220V, 50Hz
- 9): Air supply Pressure: 0.7Mpa
- 10):Feeder(s) : 14 pcs (Maximum)
- 11):Power: 2000W
- 12):Placement head: 6 heads
- 13): Rotor angle: Self-synchronizing rotor angle
- 14):X/Y run mode: Linear linkage
- 15):Operation system: WINDOWS XP
- 16):Machinery accuracy: 0.01mm
- 17):Component shortage warning: KITA negative pressure detective system
- 18):Weight: approx 550KG

1-5 Equipment overview

1) Dimensions as FIGURE 1、FIGURE 2

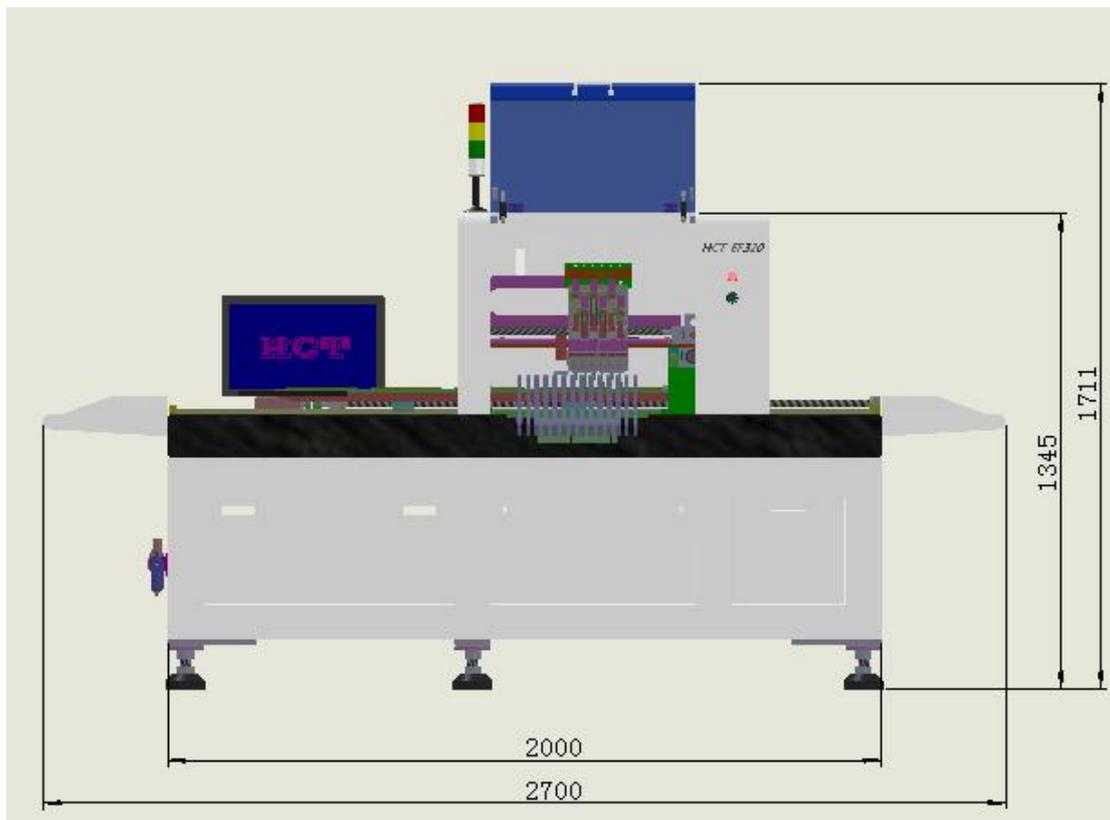
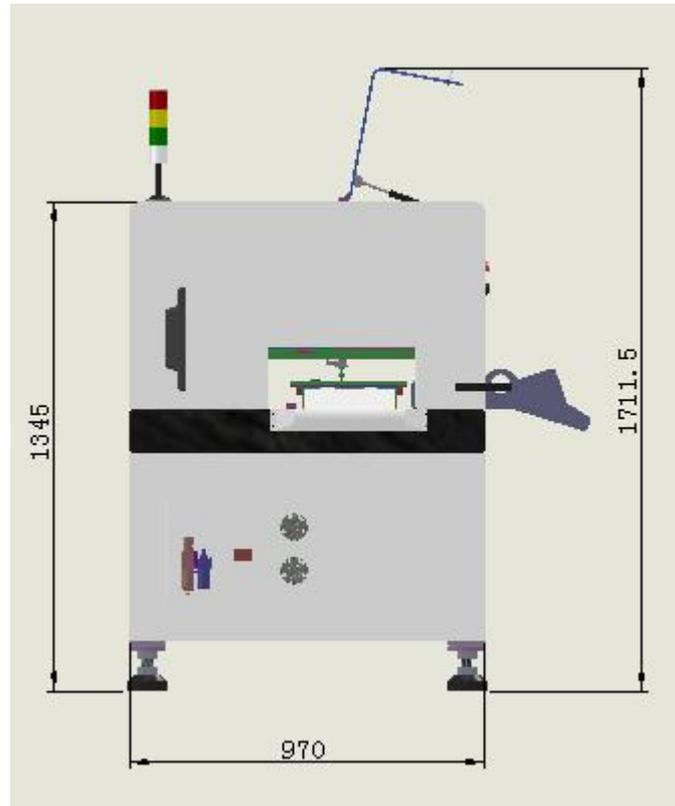
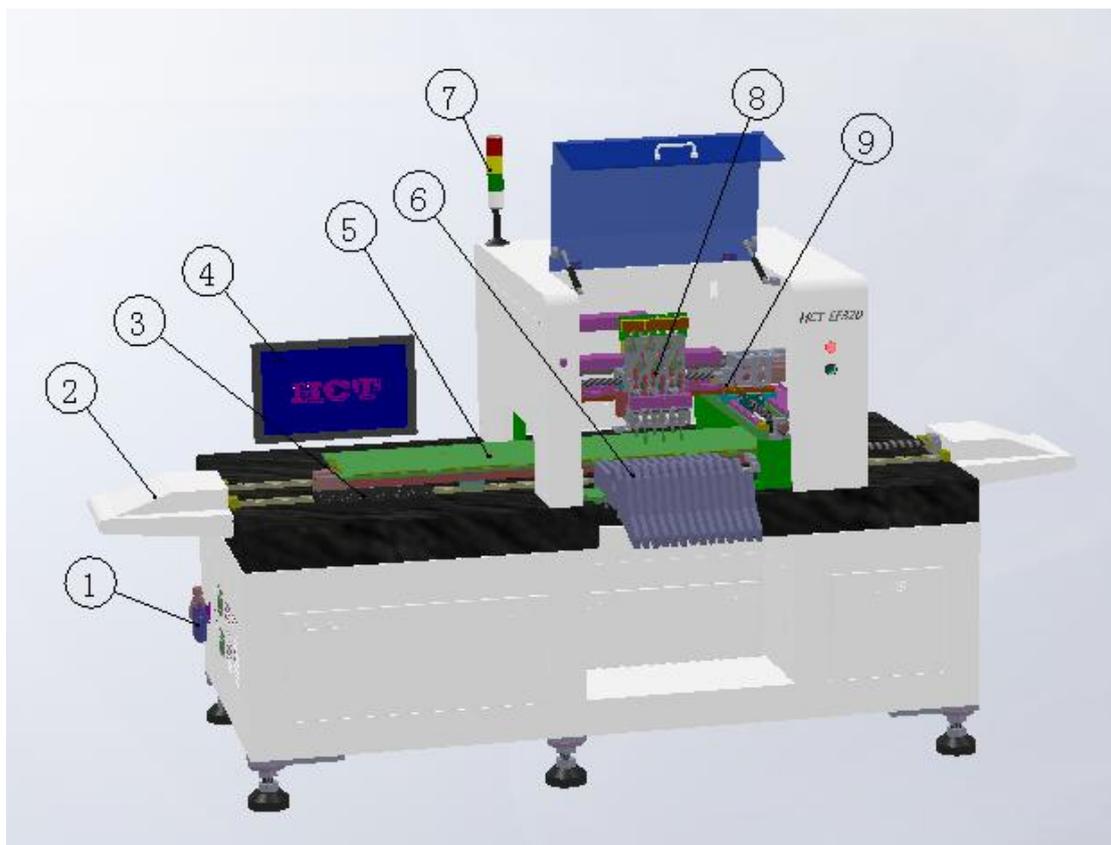


FIGURE 1: Front view


FIGURE 2: Side view
2) Equipment composition


- | | | |
|--------------------|---------------------|------------------------|
| 1 Pneumatic filter | 2 Protective device | 3 Key board |
| 4 Displayer | 5 Platform for PCB | 6 Feeder |
| 7 Signal light | 8 Nozzle subgroup | 9 XY suction structure |

3) Emptying platform brief introduction

In order to have a high mounting accuracy, the platform is to adopt servomotor to drive the high precision ball screw, with theoretical accuracy 0.002mm and real accuracy 0.01mm, also make the whole platform planeness is within 0.5mm.

Its specific construction is as FIGURE 4.

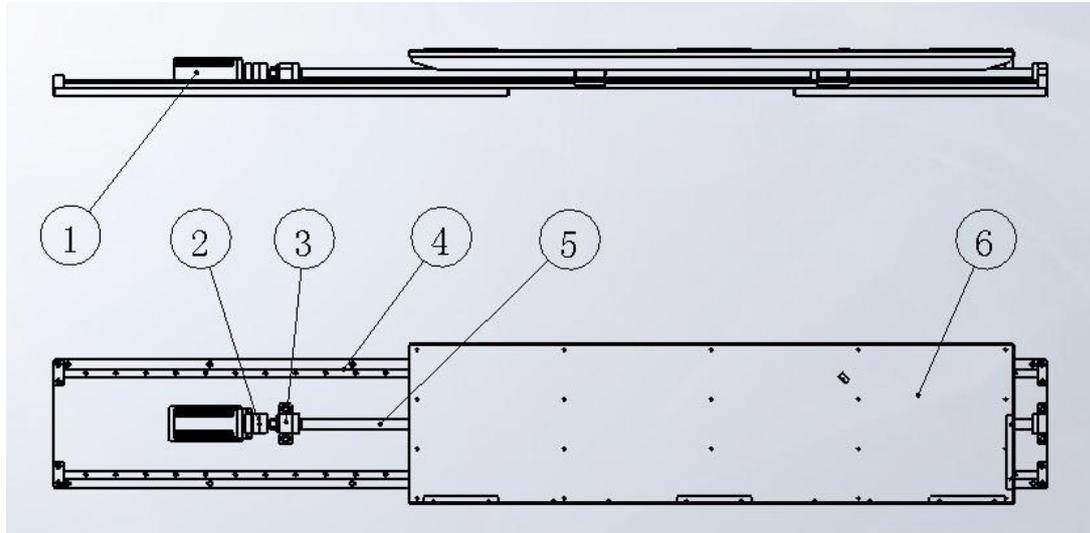


FIGURE 4: Emptying platform diagrammatic drawing

1 Servomotor

2 Shaft coupling

3 Ball screw block

4 Linear guide

5 Ball bearing lead screw

6 Platform

4) Nozzle XY axis brief introduction

X&Y axis are using the servomotor to drive the high precision ball screw, its theoretical accuracy is up to 0.002mm, and with a linear guide rail supporting, guarantee higher accuracy, less noisy and less attrition, and longer service life. Its general construction is as FIGURE 5.

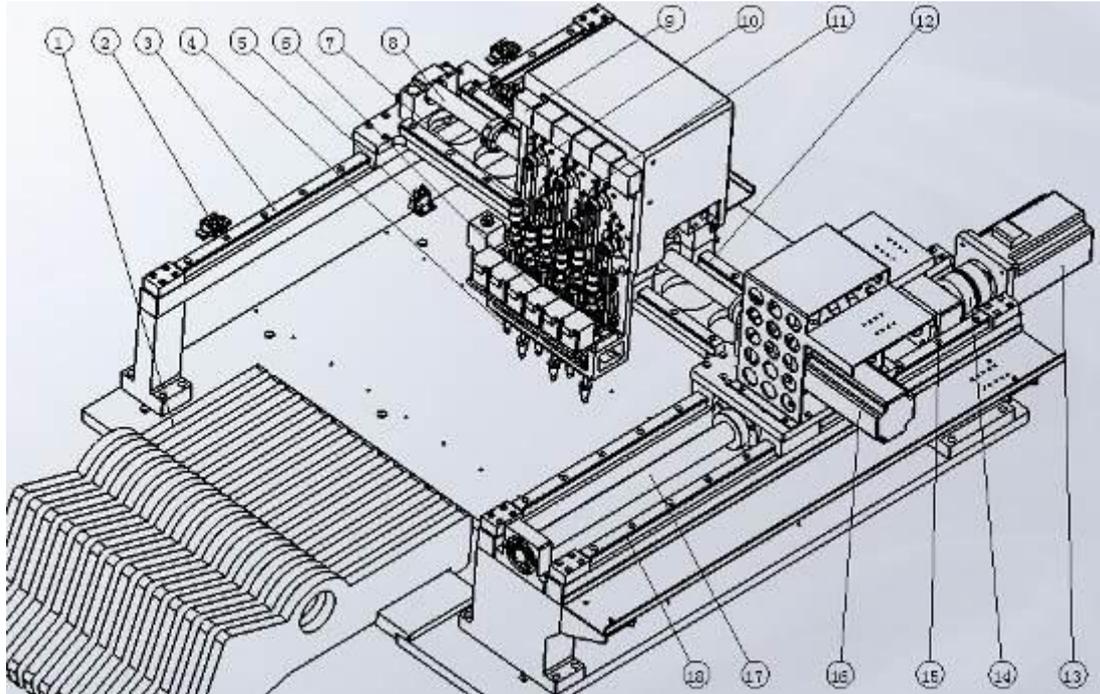


FIGURE 5: XY shafts construction diagrammatic drawing

- | | | |
|-----------------------------|------------------------------------|-------------------------------------|
| 1 Feeder | 2 Y shaft limitation | 3 Y shaft linear guide |
| 4 Nozzle | 5 Platform base point | 6 Rotary motor |
| 7 Rotary joint | 8 X shaft Ball bearing lead screw | 9 Negative pressure detector switch |
| 10 Z shaft synchronous belt | 11 Z shaft base point | 12 X shaft linear guide |
| 13 Y shaft servomotor | 14 Shaft coupling | 15 Ball screw block |
| 16 X shaft servomotor | 17 Y shaft ball bearing lead screw | 18 Y shaft linear guider |

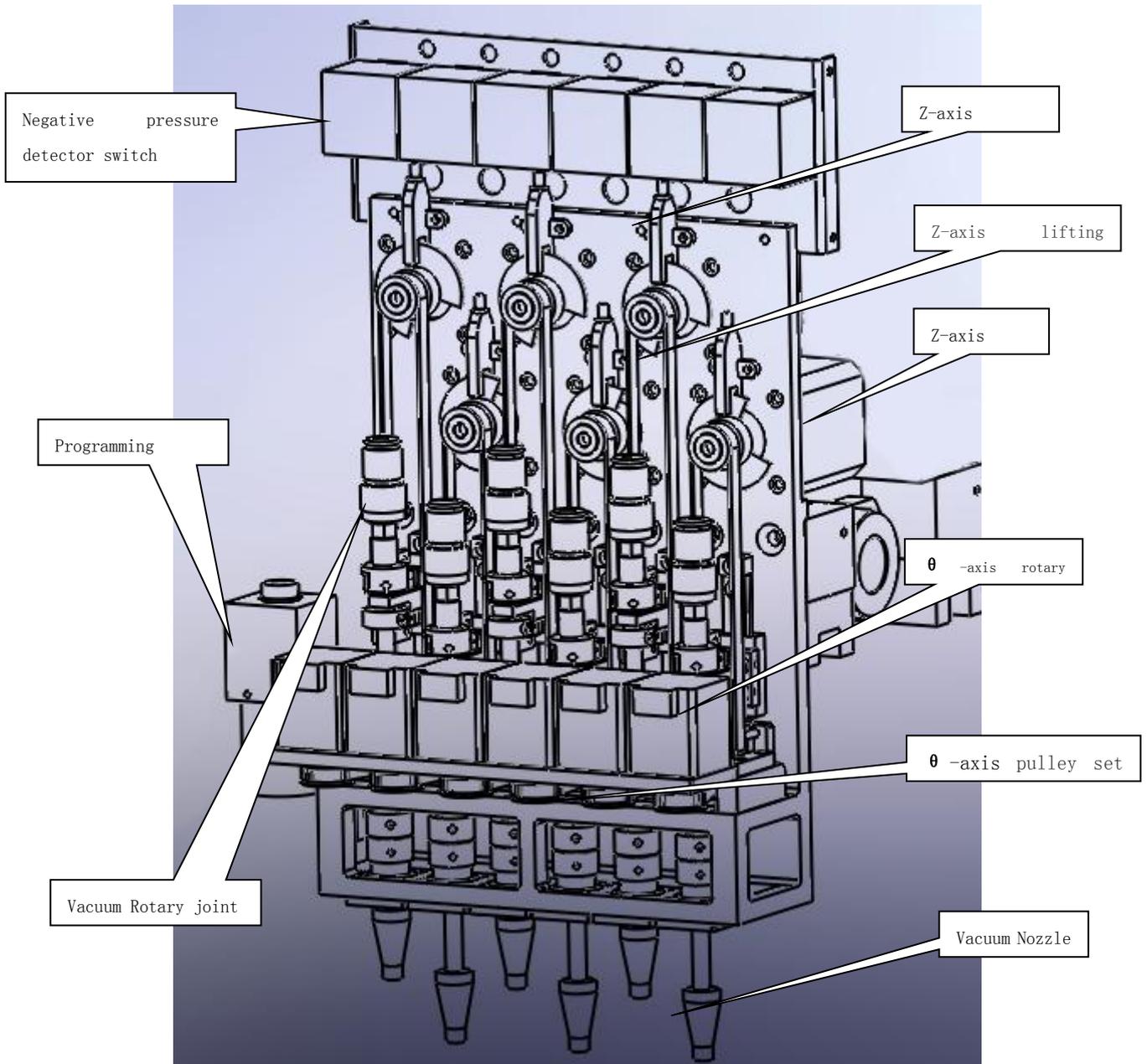
5) Nozzle Z axis and angle θ axis brief introduction


FIGURE 6: Z- Axis construction diagrammatic drawing

The up and down movement of the vacuum nozzle is driving by the Z shaft motor pulley, when the motor drives the pulley counterclockwise rotating, the nozzles go down, when the motor drives the pulley clockwise rotating, the nozzles go up. The nozzles are using a linear guideway which can guarantee the up and down accuracy and the stability for mounting.

The suction rod is hollow, vacuum can go through it to the nozzle to suck the material.

6)Air-operated system overview

Our mounter don't provide air source, the air source would be prepared by the buyer's own. The minimum pressure of the air source should be 0.55MP—0.7MP. One would go through slide switch (a switch of the machine air source), water separation filter (filtering the fluid oil in the air, condensate water and impurity, filtering accuracy is $20\ \mu\text{m}$), and solenoid valve(controlling on-off), to the cylinder of feeder, another one would go through the vacuum generator to generate vacuum, the vacuum would go through a rotary joint the suction nozzles.

See Annex 2 (air circuit schematic)

7) Vacuum system overview

The mounter is provided air by air source. Passing through solenoid valve(controlling on-off of vacuum), going into the vacuum generator and make the vacuum happen. The degree of vacuum could be as high as 80 KP. It would come through a high-speed rotary joint and a hollow rotary motor to the suction nozzle. There is a vacuum pressure switch, when there is no material or wrong position for the suction nozzle, the vacuum degree would be lower that set value. The switch would send signal to the controller, and set a warning.

See Annex 2 (air circuit schematic)

Chapter Two Brief Introduction & Installation of Operation System

2-1 Brief introduction of the software function

1) This is a bundled software for the HCT-E20000 automatic LED mounter which is developed and manufactured by Shenzhen HANCHENG TONG Technology Co.,Ltd. Its operation interface is English/Chinese, very easy to use, suitable for majority of LED SMT factory.

2) Software operating environment

Hardware environment:

CPU: Pentium 2.4 or above

RAM: 512M or above

Hard disk: 5.6G at least

Power: 350W

Software environment:

Windows XP

2-2 Brief introduction of installation interface

1) Driver installation:

Copy the HC-setup file which is provided by us to Disc F, as FIGURE 1

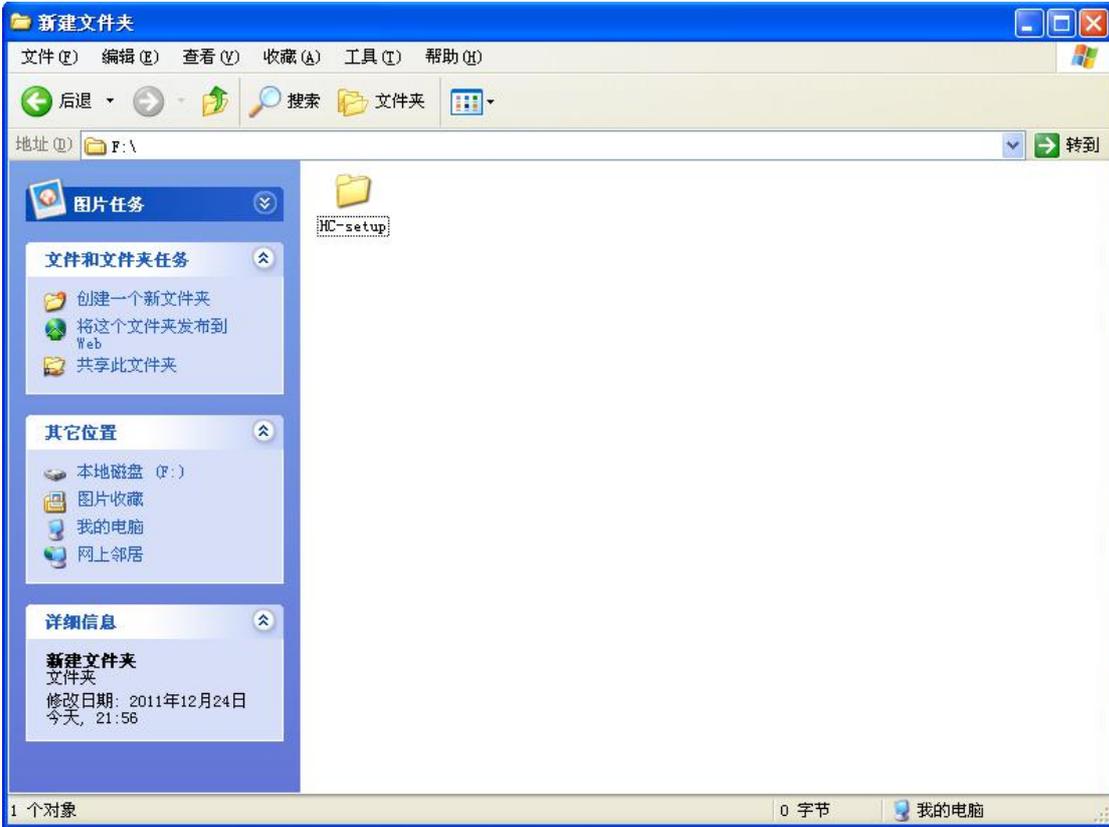


FIGURE 1

Extract and open HC-setup folder, as shown in FIGURE 2 , 5 files and install the driver according to directions, can be installed directly.

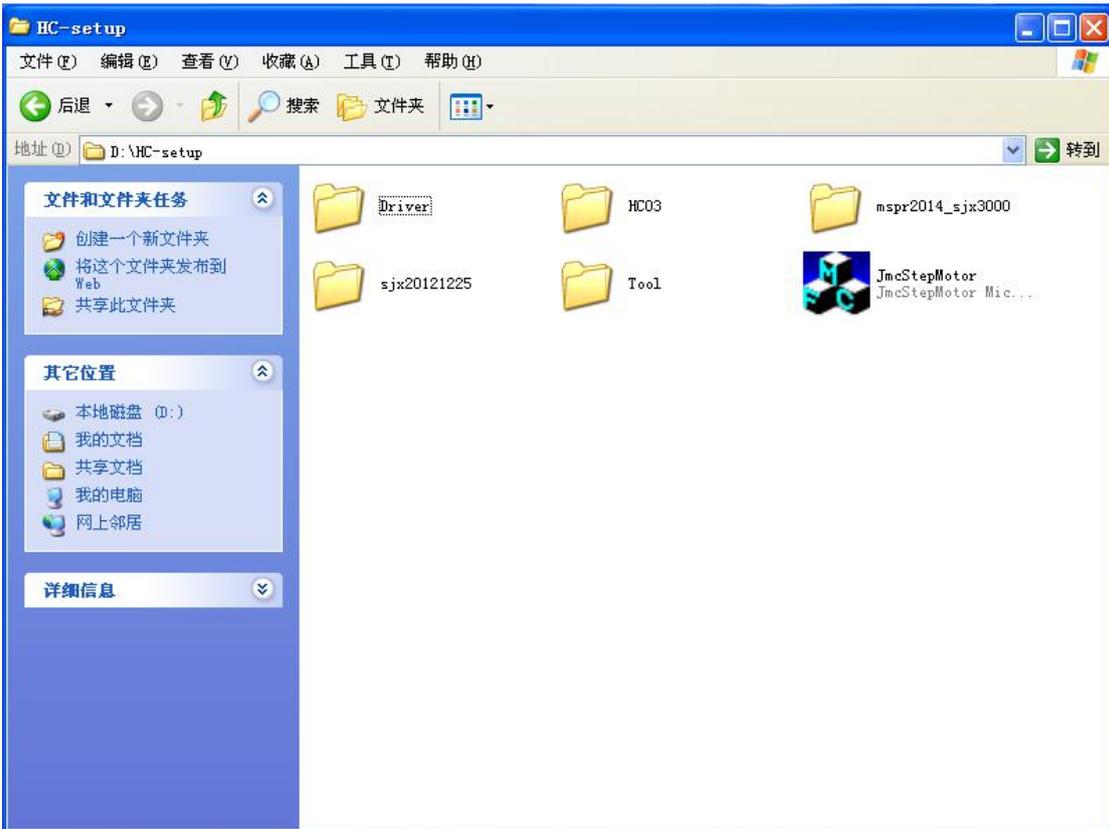


FIGURE 2

After a successful driver installation, the device manager would show as FIGURE 3:

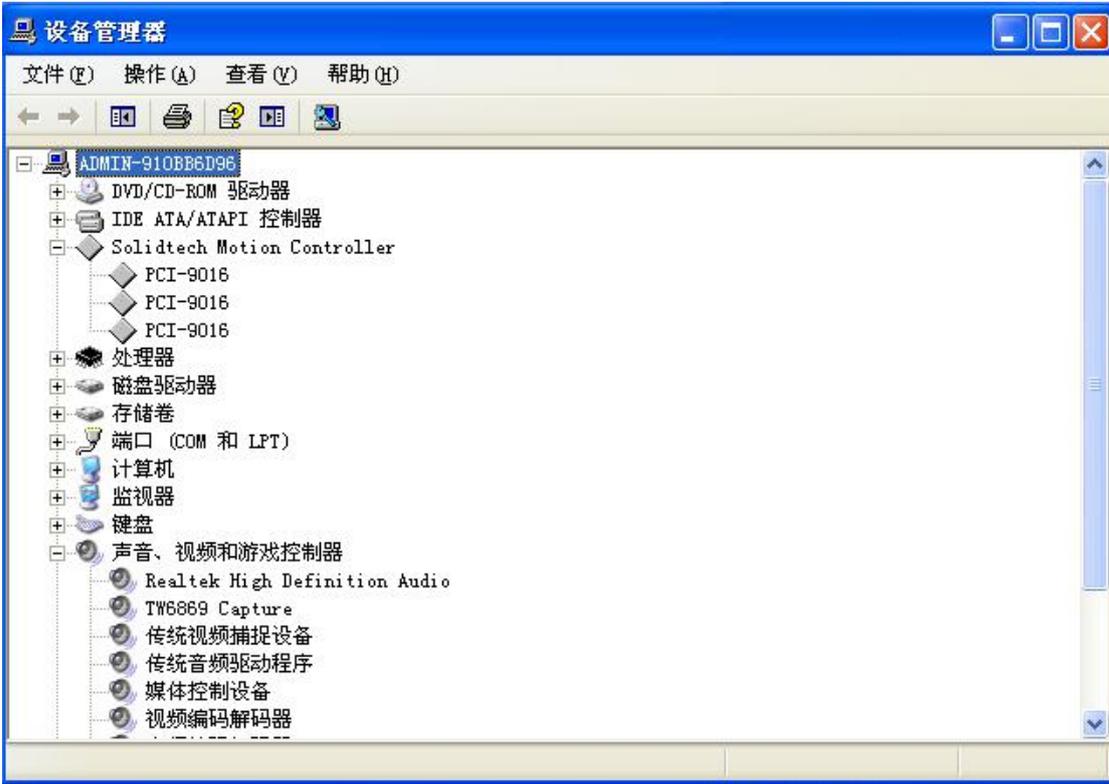


FIGURE 3

2) Operation software installation

This operation software is green software, no need to install. Copy the HC03 folder in the HC-setup folder to D:\ root directory, as FIGURE 4.

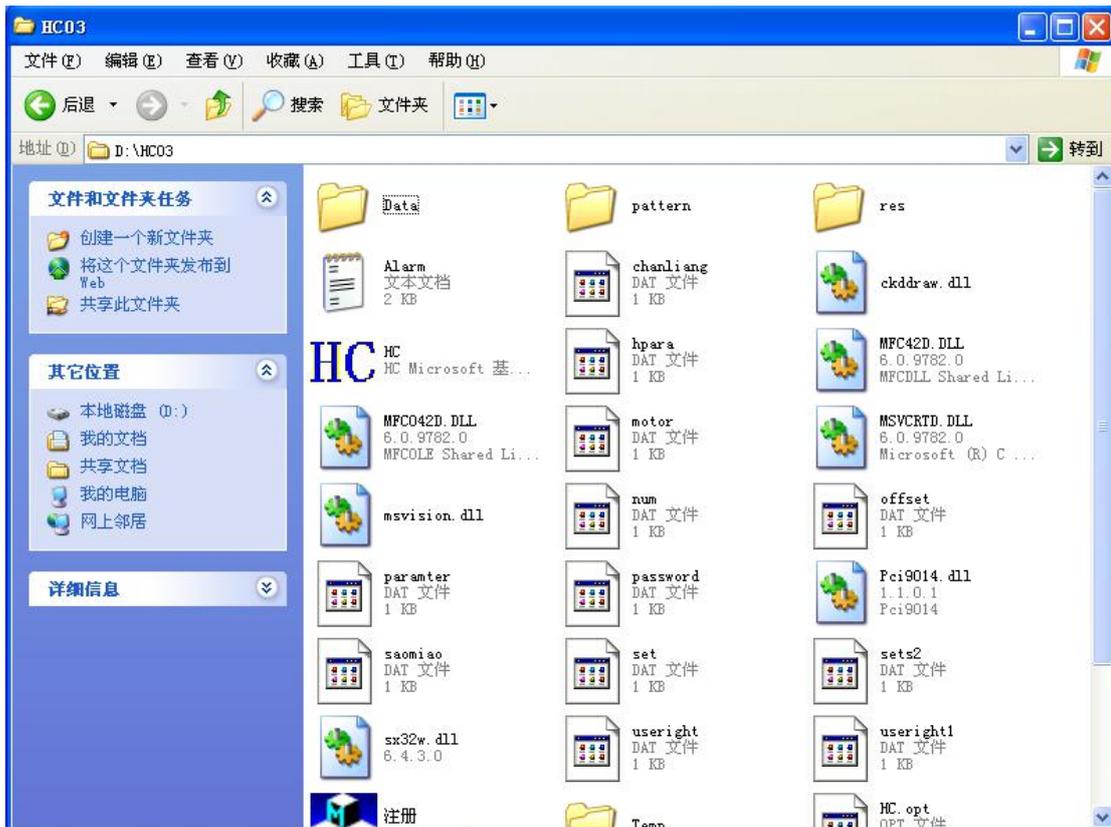


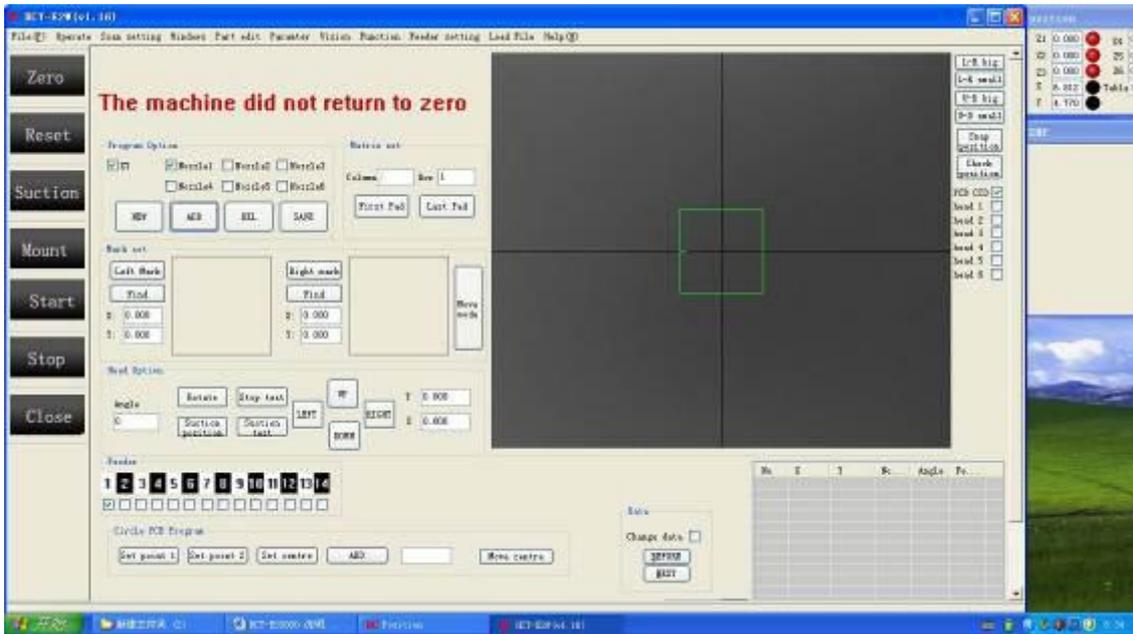
FIGURE 4.

Open HC03 file, run HC program document then you can run the operation software.

Chapter Three Manufacturing & Production Procedure

3-1 Run debugging and Brief introduction of software interface

1) Software running main interface



① Left column Main Button introduction

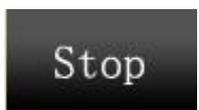
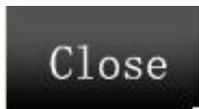
	Control motors find zero-point
	Control motors back to zero-point
	Adjust suction parameters & Pin set
	Adjust mounting parameters
	Start production
	Stop/Pause production
	Exit operation software

FIGURE 1 Programming options for normal PCB

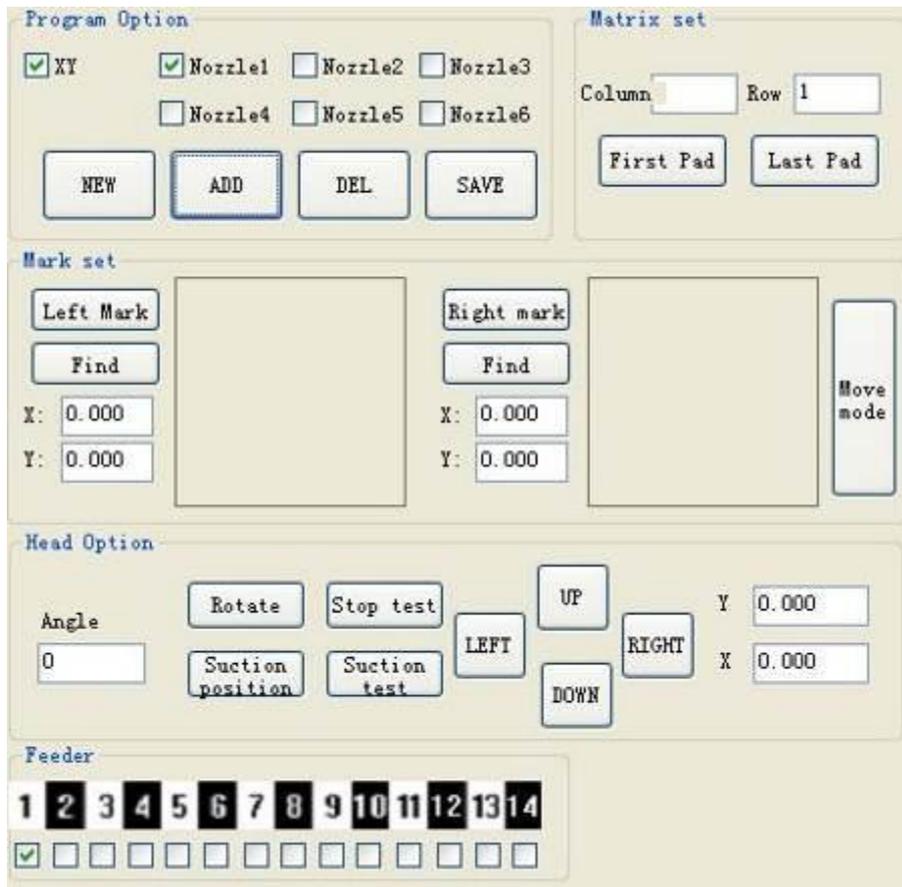
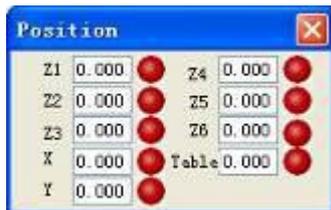


FIGURE 1

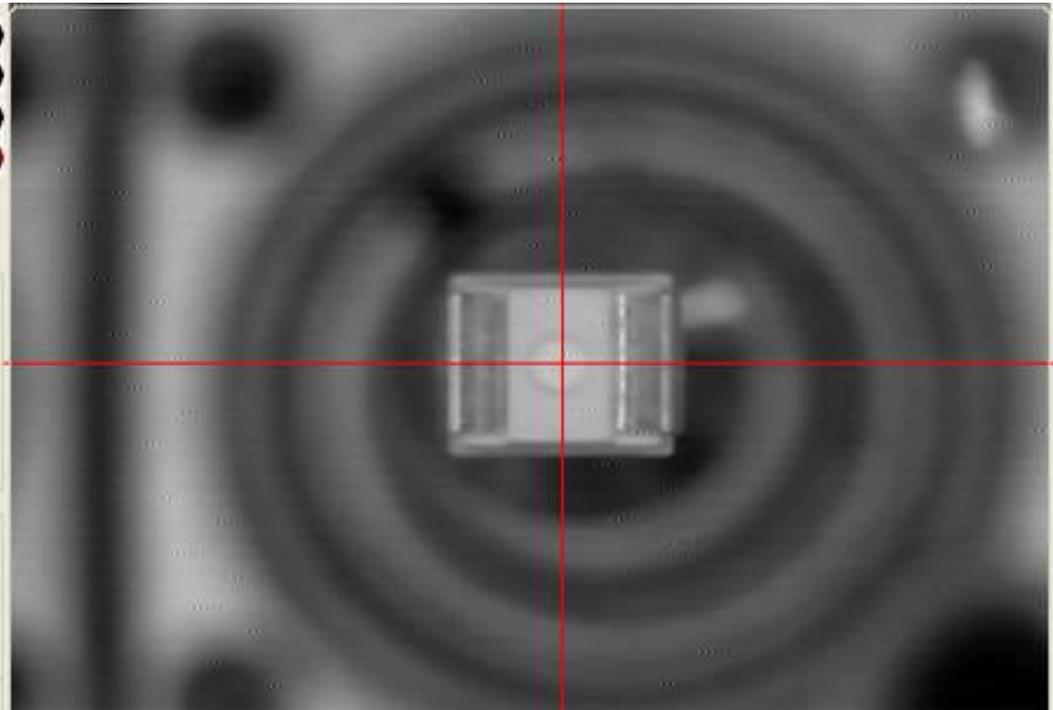


Motor position display and motor corresponding to the origin sensor signal

No.	X	Y	No...	Angle	Fe...
1	371...	244...	0	0	1
2	366...	254...	1	300	2
3	355...	254...	2	240	3
4	349...	244...	3	180	4
5	355...	234...	4	120	5
6	366...	235...	5	60	6
7	383...	244...	0	0	1
8	382...	253...	1	336	2
9	376...	261...	2	312	3
10	368...	266...	3	288	4
11	358...	267...	4	264	5
12	349...	264...	5	240	6
13	342...	258...	0	216	1
14	338...	249...	1	192	2
15	338...	240...	2	168	3
16	341...	231...	3	144	4
17	348...	224...	4	120	5
18	357	221	5	96	6

Programming data display area

Image display area & Camera switching operation options



3-2 Software operation

1) Shortcut key

- 1) Keyboard ‘<’ and ‘>’ is to move the platform left and right
- 2) Keyboard ‘←’ and ‘→’ is to move the nozzle components in X axis direction
- 3) Keyboard ‘↑’ and ‘↓’ is to move the nozzle components in Y axis direction
- 4) Right mouse click on the camera image position, it would move this position to the image center.
- 5) ‘-’ ‘+’ key can change the speed of Shortcut moving.

2) Parameter setting

This software can control 6 pcs of suction nozzle and can program & operate 14 pcs of feeder, so it is required to set the pick position and suction height for each feeder.

Parameter setting method:

“**Suction position (XY)**” : The position coordinates of corresponding feeder

“**Suction height**” : The height of suction nozzle go down to suck the components from the feeder

Setting Method: Select Nozzle1 (as example), click “Suction position” to make the suction nozzle to move to the feeder position. Go to Operate drop-down menu, click “I/O test”, check the corresponding feeder to open the cover. Then press the ‘↓’ key till the suction nozzle just touch the LED chip surface, check the motor position of suction nozzle, fill in the parameter settings interface.

Mount height: Move the suction head with led to the aluminum substract position, choose Nozzle1, then press the ‘↓’ key on the keyboard until the led just touch the aluminum substract ,next check the motor positions of nozzle , the absolute value of +0.5 of motor position ,and fill in the parameter setting interface.

Head1 and camera X direction shift :

The distance of Nozzle 1 and the photo center of camera in the X direction

Head1 and camera Y direction shift :

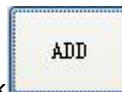
The distance of Nozzle 1 and the photo center of camera in the Y direction

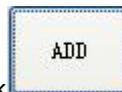
3) Programming operating:



① Firstly, select  to clear the file in the list area and build a new file.

Add point location: Move the platform or nozzle components to locate **the first point** of the PCB in the center of the image, adjust the positioning frame size to match. If there is an angel, just input the angel degree. Then select the suction nozzle and the corresponding feeding station (feeder). As below screen-shot.



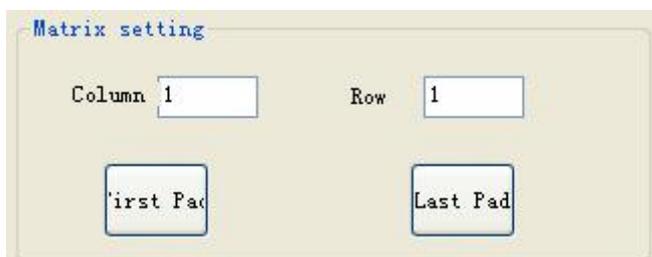
After selecting the suction nozzle and feeder, click  to add this point location into the file list.

Shown as below:

NO.	X	Y	No...	Angle	Fe...
1	160...	557...	0	0	1
2	160...	557...	1	0	2

② Finish the setting of first point, the suction nozzle and feeder would automatically shift to next ones. Repeat the operation as previous, move the suction nozzle to locate the second point of the PCB, add the data into the file list.

③ The points on the PCB are always regular, choose equidistant unit as matrix permutation. Firstly, it is required to add all points of the first unit, and then proceed a matrix setting as below:



Input the amount of equidistant unit into Matrix setting.

① Set **Row** firstly (Column sets 1, Row sets the amount of units), locate one point in the first unit, set it as **“First Pad”**. And then locate the corresponding point in the last unit of matrix, set it as **“Last Pad”**.

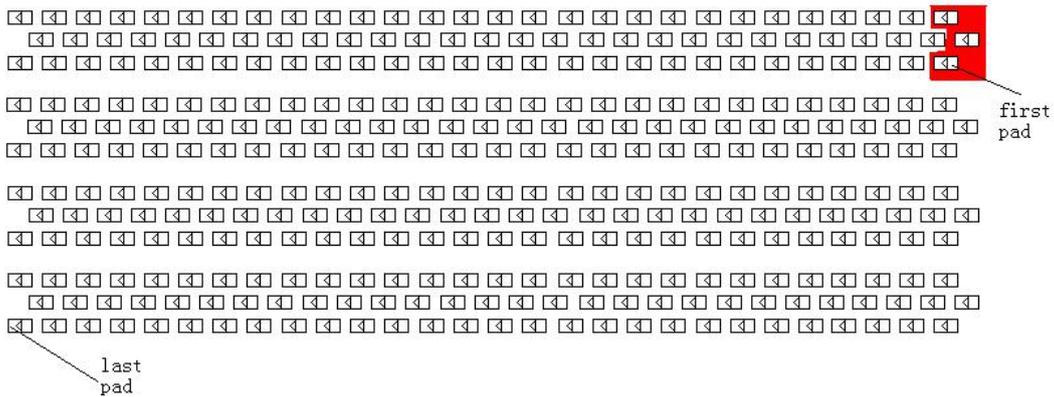
② Then set **Column** (Row resets to 1, Column sets the amount of units), follow the setting step of Row. After setting, all the points location in the whole matrix permutation would be shown in the list. Shown as below:

NO.	X	Y	No...	Angle	Fe...
1	160...	557...	0	0	1
2	160...	557...	1	0	3
3	161...	557...	2	0	5
4	161...	557...	3	0	7
5	161...	557...	0	0	1
6	161...	557...	1	0	3
7	161...	557...	2	0	5
8	161...	557...	3	0	7
9	161...	557...	0	0	1
10	161...	557...	1	0	3
11	161...	557...	2	0	5
12	161...	557...	3	0	7
13	161...	557...	0	0	1
14	161...	557...	1	0	3
15	161...	557...	2	0	5
16	161...	557...	3	0	7

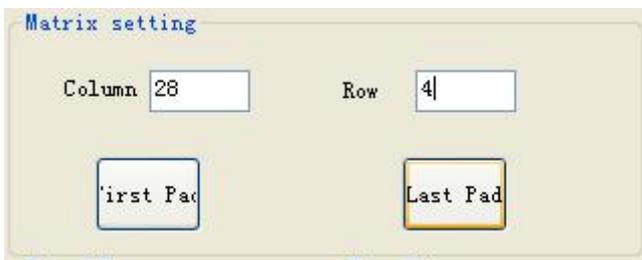


Click , save all the data.

Example:



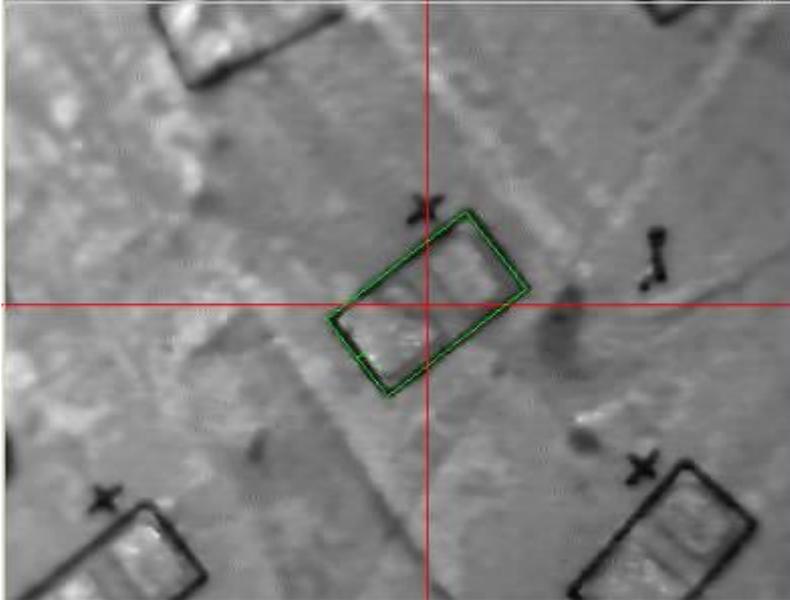
This is a four pin board, there are 84 LED chips each single board. It can be programmed as a unit for the 3 LED chips (like in the red area), add first 3 points location from top to bottom. Then take the undermost point as the “**First Pad**” of the matrix setting. 84 LED chips each single board would be 28 units in Column and 4 units in Row when setting. The setting for matrix is as below:



After setting the “**First Pad**” (the undermost point of the first unit), move the platform or suction nozzle to locate the corresponding point of the last unit and set “**Last Pad**” . Save the data after finish the setting. The program procedure is finished.

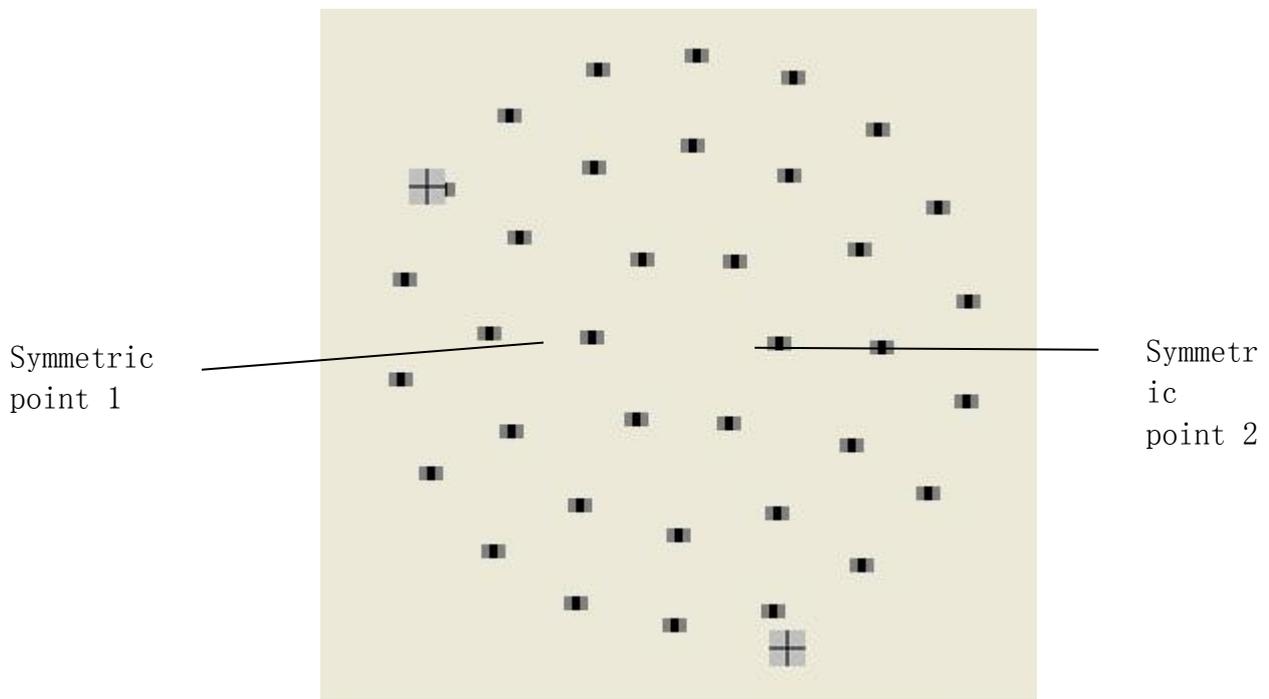
4) Programming for the irregular PCB

Because the LED chip or components on an irregular PCB are not regularly arranged, so it is required to add every point location.



As shown above, locate the point on the bonding pad, check the image display area to make sure the image on the center, adjust the positioning frame (green box) size to match the pad of component. Drag the green box with the mouse to have the minus sign of the box to match the negative direction of the pad, select the suction nozzle and feeder and then add this point location.

5) Round board program operation



Like picture above ,the circular board programming should first calculate the every lap pad points, to find two symmetric points in the center point of the circular board, and then framed symmetry point 1 , then click “symmetry point 1 setting” ; Next move suction head XY to position of symmetry point 2 , click “symmetry point 2 setting” , then click “setting center” “Moving to center position” in order ; Then move suction head XY to any one welding point of first lap, after angel and position’ s correct frame selection,(this moment can’ t move platform coordinate, can only move suction XY coordinate) , then input the welding points number of this lap , click “Add” : 6 , after finishing adding ,move again the suction head XY to the any one welding point of the second lap, input the corresponding lap’ s