NzoDzn®

Automated Optical Inspection System

NeoDen Equipment

NeoDen 800

User Manual

V 3.2

<u> </u>	To ensure the safe use of AOI equipment, please read this Manual carefully before using it.
Warning	Do not operate this equipment without professional training.

Company website: www.neodentech.com Zhejiang Neoden Technology Co., Ltd.

Copying prohibited

© Copyright Reserved 2021 Zhejiang Neoden Technology Co., Ltd.

This Manual and the hardware and software involved in it are protected by Copyright Law. Without permission of the Company, copy of information of this Manual in part or in full is prohibited, with the exception stipulated by the Copyright Law that copy is required by normal use of software.

Neoden is the trademark of Zhejiang Neoden Technology Co., Ltd.

Microsoft EXCEL/Word/PowerPoint, SQL Server, Windows 95/98/2000/NT/XP, and Windows for workgroups are registered trademark of Microsoft Corporation.

As the equipment hardware and software of the Company have been continuously upgraded, the content described in this Manual might be different from real object of the equipment. The Company reserves the right to change the content of this Manual without prior notice to users.

If you have any doubts or problems about error, improvement, wrongly written words / omission words with this Manual and equipment, please contact us according to the contact information at the bottom of this page.

Zhejiang Neoden Technology Co., Ltd.

http://www.neodentech.com

No.18, Tianzihu Avenue, Tianzihu Town, Anji Country, Huzhou City, Zhejiang

Province, China

Tel.: 0571-571-2626626

Please move the equipment with effective packaging materials and power protection. Failure to take appropriate safety measures may result in personal injury. Warning This equipment complies with the wireless interference prevention standards of industrial/commercial area. The use of this equipment in the vicinity of residential regions may cause interference to the signals received by radio or television and may affect the functions of medical equipment. Please use it correctly according to the instructions in this Manual. Do not operate the equipment in a place without protection device, and do not ignore the safety regulations, warnings and precautions. Otherwise, personal injuries may be caused. It is strictly prohibited to operate the equipment with the lid open. Otherwise, personal injuries may be caused. When maintaining the equipment, please disconnect the power supply of the equipment before starting the operation. Otherwise, personal injuries may be caused.

Contents

Chapter I Preface
Chapter II Main Uses and Scope of Application of Equipment2
Chapter III Working Conditions of Products
Chapter IV Main Technical Parameters4
Chapter V Main Working Principle
Chapter VI Installation and Commissioning of Equipment8
Chapter VII Equipment Adjustment9
7.1 Start-up procedure
7.2 Camera focus correction10
7.3 Light source adjustment12
7.4 Camera lens calibration
Chapter VIII Programming and Operation of Equipment15
8.1 Introduction of software operation methods15
8.2 Manual program editing
8.3 CAD data import
8.4 Setting of bad mark skip board55
8.5 Setting of ID mark
8.6 Normal inspection operation60
Chapter IX SPC Database Processing
Chapter X System Parameter Setting
Chapter XI Common Equipment Faults and Troubleshooting Methods76
Chapter XII Repair and Maintenance of Equipment

Chapter I Preface

Thank you for choosing our Automation Optical Inspection (AOI). This professional equipment is mainly used to check the mounting and welding quality, installation status and solder paste printing effect of the components on the SMT production line, and display the unqualified products through display terminal.

When using AOI, please observe the following matters:

- Please read this Manual thoroughly and use it correctly on the basis of full understanding.
- A copy of this Manual is attached. Please keep it for reference at any time.
- This Manual contains relevant information on the mechanical structure, safety maintenance, AOI programming and operation of this equipment, and is formulated for the personnel using this product.
- All information contained herein is subject to change without prior notice. The seller is not responsible for direct or indirect losses caused by manual changes.

Chapter II Main Uses and Scope of Application of Equipment

2.1 Introduction of AOI

2.1.1 What is AOI

AOI (Automatic Optical Inspection) is a new type of testing technology developing rapidly in recent years. It is composed of workbench, CCD camera system, electromechanical control and system software. During inspection, the circuit board to be inspected is first placed on the workbench of AOI machine, and the inspection program of the product to be inspected is called out through positioning. The X/Y workbench will send the circuit board under the lens according to the command of the set program. With the assistance of special light source, the lens will capture the image required by AOI system and carry out analytical processing. Then the processor will move the X/Y workbench to the next position to collect and carry out analytical processing on the next image. Through continuous analytical processing on the image, a higher inspection speed can be obtained. AOI image processing in essence is to digitize the captured images, and then compare them with pre-stored "standards". After analysis and judgment, if defects are found, their position will be prompted, and image characters will be generated for further confirmation by the operator. Or, the circuit board will be sent to the maintenance platform for maintenance.

2.1.2 Implementation goal of AOI

AOI used in SMT production line is mainly for the following two targets:

(1) Final quality: monitoring the final state of the product when it goes down the production line. At this time, AOI is usually placed at the end of the production line. In this position, the equipment can obtain a wide range of process control information.

2 Process tracking: monitoring the production process by using inspection equipment. It is often required to place the inspection equipment at several positions on the production line to monitor the specific production conditions on-line and provide necessary basis for the adjustment of the production process.

2.2 Placement position of AOI

AOI can be arranged at multiple positions of the production line. For its main purposes, three positions are common:

(1) AOI inspection is arranged after solder paste printing: the AOI inspection is arranged after the solder paste printing, which is a typical arrangement because many defects are caused by poor solder paste printing. Insufficient solder paste may lead to component loss or open circuit.

⁽²⁾ Before reflow soldering, the inspection equipment should be placed behind the chip for inspecting the defects caused by the defects of the chip.

③ After reflow soldering, the inspection equipment is placed after reflow soldering, which is the most common AOI placement position. It can inspect the defective products in all previous processes to ensure that the final defective products are not used by customers.

Chapter III Working Conditions of Equipment

To avoid external factors affecting the normal use of this equipment, please follow the following items:

3.1 Operating environment of this equipment:

The environment temperature of the equipment is: 10° C to 35° C; the relative humidity is: 35% to 80%.

The equipment should be placed in a place free from direct sunlight, dew and splashing of chemical liquids such as water and oil.

3.2 When the equipment is in normal use, please reserve a certain space in front of and behind the equipment so as to facilitate the maintenance of the equipment and the emission of internal heat. Do not cover the equipment with cover during its normal operation, so as not to affect the heat emission.

3.3 Please keep the equipment in the following places when the equipment is not used:

Environment temperature: 0°C to 40°C; relative humidity: 35% to 80%

The equipment should be placed in a place free from direct sunlight, dew and splashing of chemical liquids such as water and oil.

To prevent dust, the equipment may be covered.

3.4 Impact or strong vibration should be avoided. Otherwise, the failure of equipment may be caused.

3.5 When cutting off the power supply of the equipment, please perform the system exit/shutdown process in the following order. If the power supply is directly cut off or restarted without performing this process, the data will not be kept intact and the hard disk may also be damaged.

The correct exit procedure is as follows:

Exit application program \rightarrow Exit Windows \rightarrow Cut off power supply

3.6 When the equipment is running, do not open the safety door of the equipment to avoid accidents.

3.7 Repeated ON /OFF of the power supply will cause the failure of the main machine. After the power supply is OFF, please restart the power supply after 20 seconds.

3.8 To prevent the PCB or equipment to be inspected from being damaged, please use the substrate of inspection object conforming to the specifications and dimensions of the equipment. It is necessary to note that the height requirements of the equipment for the parts of PCB are as follows:

Height of front part of PCB inspection surface $\leq 30 \text{ mm}$

Height of back part of PCB inspection surface ≤50mm

Chapter IV Main Technical Parameters

Programming mode: automatic writing, manual writing, CAD data import, automatic component library matching

Inspection mode: optimized inspection technology covering the whole circuit board. Jointed board and multi-mark with Bad Mark function

Inspection type: whether paste printing has parts defects such as offset, lack of tin, excessive tin, open circuit, pollution; whether there are mounting defects such as missing parts, offset, skew, Manhattan effect, side erection, turning over, wrong parts, breakage, reverse, etc; whether there are solder joint defects such as excessive tin, lack of tin, cold soldering and bridging; whether there are PCB defects such as copper foil pollution, black pad, blister, lack of copper foil, oxidation, etc.

Image recognition: automatically setting parameters (such as offset, polarity, short circuit, etc.) according to different inspection requirements.

SPC statistics function: recording the inspection data in the whole process, and making statistics and analysis. Viewing the production status and quality analysis of any area.

PCB size: 50*50mm(Min)-500*400mm(Max)

PCB bend: < 5mm or 3% of PCB diagonal length

Height of PCB parts: above < 30mm, below < 50mm

PCB transmission system: bottom-up fixing, automatic compensation for PCB deformation, automatic board feeding and discharging, automatic adjustment of width

Positioning accuracy: <16um

Movement speed: 800mm/sec

Image processing speed: 0402chip < 12ms

Camera and lighting system: full-color high-speed digital CCD camera, optional lens resolution between 10, 15, 18, 20um available, three-channel RGB light source

Driving system: AC servo motor system, precision grinding ball screw

Minimum part inspection: 01005chip & 0.3pitch IC

Software system: Windows 7

Calculation methods: color operation, color extraction, gray scale operation, image comparison, etc.

Output display: 22-inch widescreen (16:10,1680*1050 resolution) display

Output signal: OK/NG signal, equipment operation status signal, alarm signal

Network communications: supported

Data transmission tool: supporting CAD, Excel, Txt and other commonly used formats

Machine models: NeoDen 800,

Weight of equipment: 550KG

Dimensions of equipment: 980*980*1620mm

Air pressure requirement: compressed air in pipeline is required, ≥0.49MPa

Chapter V Main Working Principles

This equipment performs inspection mainly based on optical principle and comprehensive use of principles color operation, color extraction, gray scale operation, image contrast.

5.1 Optical principle

AOI's light source is composed of red, green and blue LED lamps. The three primary colors are combined into different colors. Combined with the specular reflection, diffuse reflection and oblique reflection in the optical principle, the welding of the patch elements on the PCB is displayed. As shown in the following figure:



5.2 Color operation principle

Through rasterization of a BMP picture, the imaging details, such as the position coordinates of the color distribution of each pixel and the color transition relationship between imaging grids, are analyzed and several functional formulas are listed. Then, data extracted from several similar pictures with the same area size is analyzed and calculated. The calculation results are restored according to the weight relationship set by software and the pixel colors and coordinates of the original BMP image to a virtual and weighted digital image. The main digital information covers the image's graphic outline, color distribution, weight relationships allowing changes, etc.

5.3 Principle of image contrast

During test, the equipment captures the images of the inspected circuit board through the CCD camera system, transfers the images into the computer through digital processing, calculates and compares the images with the standard images (the comparison items include the

size, angle, offset brightness, color and position of the components, etc.) and outputs the images with the comparison results exceeding the rated error threshold through the display, and displays the specific positions of the images on the circuit board.

5.4 Principle of color extraction

Any color can be mixed with red, green and blue in a certain proportion. A three-dimensional color cube is formed with red, green and blue. Color extraction is to cut a small color cube that we need from a set of color cubes. In other words, the color range is selected according to needs. Then, whether the ratio of the color in the inspected image that meets the color in the cube to the total number of colors in the image meets the setting range required. Under the red, green and blue light, this method is most suitable for the inspection of soldering tin such as resistance and capacitance.

5.5 Principle of gray scale operation

The target image is converted into gray scale image according to certain method. Then, a certain brightness threshold is selected for image processing. The image below the threshold is directly turned into black, and the image above the threshold is directly turned into white. In this way, the concerned regions, such as characters and IC short circuits, are directly separated from the original image.

Chapter VI Installation and Commissioning of Equipment

6.1 Equipment installation

This equipment is mainly divided into two parts, namely control system and image acquisition system. The equipment has been installed before leaving the factory. It is only necessary to confirm that all signal lines of the control system and image acquisition system have been correctly connected. Turn on the equipment after adjusting the level. Correct the light source and camera parameters.

6.2 Level adjustment

After the equipment is moved to the destination and the specific placement position of the equipment is determined, the level of the equipment must be adjusted first. Correct adjustment of the level can make the equipment run more smoothly, with less noise and longer service life. The steps for adjusting the equipment level are as follows:

- Suspend the four foot cups of the equipment and push it onto the wire body with casters. Ensure that the front rail of the equipment and the front rail of the front machine are on the same longitudinal line. Then adjust the foot cup downward to make the casters suspended, and raise the rail to make it on the same level as the rail of the front machine.
- Adjust the front, back, left and right levels of the equipment. At the same time, confirm that the reference of the equipment track and that of the front machine track are consistent on the longitudinal line and horizontal plane.
- If tools such as wooden stick are used to pry the equipment to slightly move it, please make sure that the wooden stick is in contact with the steel frame at the bottom of the equipment and is not contacted with the equipment casing. Otherwise, the casing will be damaged and even be deformed by forced pry.
- The track width can be adjusted to the same as that of the front machine track. The PCB sliding on both tracks should be smooth without height drop.
- Lock the fixing nuts of the four foot cups.

6.3 Starting the equipment

Connect the air pressure, connect the power supply according to the standard on the equipment nameplate, and ensure the safe grounding of the equipment. Turn on the red universal change-over switch on the right side of the equipment to start main power supply, check to ensure the emergency stop button has not been pressed. Then, turn on the power of the host. After the system normally enters the Windows interface, double click on the AOI software shortcut on the desktop to open the software.

If there is an emergency during operation, press the emergency button immediately. After eliminating the emergency and ensuring that the equipment and personnel are safe, rotate the emergency button clockwise and release it to reset. Press the RUN button again to turn on the main power of the equipment again.

Chapter VII Equipment Adjustment

First, make sure that there are two small screw handles locked laterally on the side of the lens. The upper side is the aperture locking screw and the lower side is the focus locking screw. The aperture alignment scale is between 4 and 8, and the aperture locking screw is locked.

7.1 Start-up procedure

Make sure that the emergency stop on the panel is not pressed, and the safety light curtains on both sides of the splint are not blocked.

Double-click the shortcut icon of the device main program to start the AOI running program. Enter user: A001 password: 123456 (the default password is 123456).



A dialog box will prompt {Move to the Origin Position, please check whether the equipment is ready \dots }, click [[OK]],

Message No: [6050]
Moving to Origin Position. Please check all Conveyor if there is any PCB on them.

After returning to the Origin Position; the dialog box prompts (move of the position to be operated); and click [[OK]].

Moving to Parking Position.	
OK	

If prompted {Do you want to load previous Program? } Click [Yes] or [No] according to actual needs.



7.2 Camera focus correction (the camera focus correction work will be corrected before leaving the factory, if the height of the mobile camera is different from the fixture height of PCB, it needs to be corrected)

After starting AOI software, open [Working Mode]-[New Mode] in the upper left corner

Make sure that the screw thread between the lens and the camera is locked, select a PCB and put it on the test platform, aim at the components with silk screen printing on the PCB directly below the lens, open [System Configuration]-[Illuminant Setting] in the menu bar, and open [Continuous Acquisition], as shown in the following figure:



illuminant settiing		
Disable 001	Brightness TC 170	Offset
[☐ Disable	R 115	0 ÷
Green 013	G 145 84	0 +
Blue Disable013	B 150 75	
Brightness Ref	Definition Current: 1580	Illum On/Off
Default Led Channels: RGB 🔹	re As Default	efault Close

Then open System Configuration-Illuminant Setting as shown below:

Loosen the focus locking screw, and gently rotate the lower end of the lens in one direction. At this time, the image will display the real-time state of sharpness change, and then rotate the lower end of the lens in the opposite direction. When the [Current Value] is adjusted to the maximum value from left to right, it proves that the focus has been adjusted to the standard value, that is, the best state of sharpness. Lock the focus adjusting screw at this time.

7.3 Illuminant setting (to be adjusted regularly)

Place the randomly distributed standard color card directly under the light source. When the whole inspection window displays the color card part, it is as shown in the following figure.



Open [System Configuration]-[Illuminant Setting] in the menu bar, select the appropriate adjustment reference value (generally select the reference value of 1), adjust the light source scroll bar on the left to set the feedback value of light source brightness to within ± 5 of the reference value, and then click [Save as Default], as shown in the following figure:

illuminant settiing		
T Disable 001	-Brightness TC 170	-Offset
	R 115	
Green	G 145	
Blue 031	B 150 150	□ © <u>⇒</u>
Brightness Ref	Definition Current: 317 Max: 400	Illum On/Off RGB ON OFF
Default Led Channels: RGB 🔹	e As Default Load Def	Close

7.4 Camera lens calibration (the lens calibration will be completed before leaving the factory, and the camera needs to be calibrated again when moving the camera position)

The lens calibration is to measure the vertical and horizontal deviation of the camera lens by specific software, and then compensate and correct it by software. The horizontal deviation of the camera should be within the preset [Inherent Resolution] $\pm 1\%$, and the deviation between X and Y should not be greater than 0.3. the vertical deviation angle of the camera must be within ± 1 degree.

Calibration method: after debugging the camera definition, find a PCB and put it in AOI, then open AOI software and find a single figure (such as screen printing, patch material, through hole, etc.) on the PCB in [Working Mode]-[New Mode]. Note: if it is a unique figure, there cannot be the same figure around it), and move the camera to this position. Then, in the menu bar [System Configuration]-[Camera Calibration], select the selected graphics on the PCB with the left mouse button, click [Set Image], and then click [Calibrate], then the camera will automatically move from right to left and from top to bottom. After completion, the current image scale and angle will be automatically generated. Then click [OK]-[Save Parameters], as shown below:



Chapter VIII Programming and Operation of Equipment

8.1 Introduction of software operation methods

Our AOI uses two categories: image contrast and color extraction, as shown in the following figure:

Category: Body ▼ NG Type: I ▼ Polarity C Top C Bottom C Left © Right □ ReverseStd ♥ Sol Light Channel: Defualt RGB □ Detection angle Color Mode ▼ R ♥ G ♥ B ○ Color ○ Mean ○ Max Algo Brightness: □ -100 ' -50 ' · 0 ' · '50 ' ' '100 C Contrast: □ 0 -100 ' · -50 ' · 0 ' · '50 ' ' '100 C	der follows p offset ┌─ S orithm Region Paste learn	Body Color
Image: R Image: G Image: G	Region Paste learn	Body Color
Brightness/Contrast Brightness: -100 · · -50 · · · 0 Contrast: 0	Paste learn	Learn Set
Contrast: 0 -100 · · -50 · · · 0 · · · 50 · · · 100 C		Learn Dec
Contrast, o	Bridge	Bridge Set
c	Color Extract	Color Set
Search X: 260 Y: 168 C	OCV/OCR	OCV/OCR
Cell X: 184 184 184 184 184 DX: 100	Shape inspection	Shape Set

[Region Method]: the principle of this algorithm is image comparison. [Qualified Reference Value] is similarity, which can be modified according to actual conditions. The higher the qualified reference value is, the higher the inspection standard is. And the false alarm will be relatively difficult to debug. If the image is blurred, check [Mean] or [Maximum] or adjust [Lightness] and [Contrast] until the image is clear, and the inspection effect will be better. If you only compare a certain feature in the image, you can click [Noumenon Extraction], as shown in the figure:

He Noumenon extraction (• Reg Image (Inspect Ima Hue	ge]	
Lower 326 J		
-Lightness(L)		
Lower 17		_
Upper 117]		
Saturation		
Lower 0		
Upper 250		
- Insufficient Solder Ref Value(%) Lower: 0 Upper: 10000		
Corrode: 0 J Expand: 0 J		
Hole Filling Color in Extraction region:		1
Extract Ratio(%): 78.107 Connect Num: 7	Save Exi	t

In this window, the user selects [Noumenon Extraction], and extracts the pixel regions that simultaneously meet the threshold values of three channels, namely the hue, brightness and saturation of pixels in the image interval, by setting their threshold values, and displays them visually in the lower right extraction diagram. Users can also filter out regions with too large and too small regions by setting the extraction area ratio. If there is a hole in the middle of some extracted regions, the user can check [Hole Filling] to fill it. Please refer to color extraction for operation details here. This algorithm is generally used for noumenon inspection.

[OCV]: its principle is the same as that of the region method. It also uses image comparison, but only compares the character part after black and white processing, as shown in the following figure:

1 0.0-2-1 2	Degree	OCV Character segmentation		And Descentions	×
Angle:	Degree	Reg Image		Inspect Image	
☐ ☐ ☐ Skip ♥ Visible	☐ Lead Share ☐ OR	550	07	52	
Cettegory: Silk ▼ NG Type: I ▼	550				- -
Polarity C Top C Botton C Left @ Right T ReverseStd Light Channel: Defualt RGB	□ Sk:	Parameter Area Threshold:	35 6	CR Set	
Color Mode P 6 P 8 O Color © Mean O Max Brightness/Contrast -100 · -50 · · · 0 -50 · · · 100 Contrast: 30 -100 · · -50 · · · 0 -50 · · · 100 Search X: 188 Y. 144 -124 Cell X: 124 124 -124	Algorithm Body Color C Region Body Color C Paste learn Learn Set Bridge Bridge Set C Color Extract Color Set © OCV/OCR OCV/OCR C Shape Shape Set	Deep Threshold: Filter Threshold: Cut Threshold: Fill Threshold Match Rate: Zoom Factor: Threshold Proc: Default	6 15 I 0 0 0 100 I Ico:::0 reshold	U.A. Reversed hotare u itandard character: input character: DCR Set Match Rate+ 5 Range Vaildity he difference between maximum and	minimum:
I/I Delete Delete ALL Apply to all	Grp. Apply Close		Apply	Exit	

Click the "OCV" button to enter the OCV character segmentation window. The user can adjust

the OCV segmentation threshold through the scroll bar and select parameters, so that the image part to be extracted can be clearly identified, which is beneficial to improve the inspection stability. This algorithm is generally used for character inspection.

[IC Short Circuit]: this algorithm divides the IC dense solder legs to calculate the number of IC solder legs and their length and width. This algorithm is generally aimed at short circuit inspection of IC dense solder legs, as shown in the following figure:

Info. Cell No:: B Ref. Value: B B Image State Realt Ang: O Image State Image State Allow angle: O Image State Image State No Type: Image State Image State Image State V Polarity C Top C Bottom C Left C Right Image State State Image State Color Mode Image State Color C Mean O Max C Region Paratelear State Color Mode Image State Color C Mean O Max C Region Body Color Paratelear State Search X: DOB Y; DAO Color Extract Color Set Color Extract Color Set Seg. Threshold: JB JB	No. Location Index	Location: 0'0-3 Part Code: Type: 13:0THER ↓ Cood & angle X: 07.63 mm Y: 77.46 mm Angle: 0 Degree ✓ Skip □ Lead Share ✓ Visible □ OR	I(F1)) Screen Switch Bridge
Color Mode Parameter Prightness/Contrast Parameter Brightness/Contrast Parameter Brightness/Contrast Parameter Brightness/Contrast Parameter Brightness/Contrast Parameter Brightness/Contrast Parameter Contrast: Parameter Search X: POB Y: P40 Cell X: 116 Dispection Shape C inspection Shape C inspection Shape Y: Skip Line Wate (Blue) White (Blue) Contrast: Parameter Parameter Area Area Threshold: Search X: P16 Pin Differst Sa Max Lead Width [1:70] Max Lead Width [1:70] Max Lead Width [1:70] Max Lead Width [1:70] Pin Differst Sa	Info. Cell No.; 3 Ref. Value: ## Result Value: ## Reult Ang: 0 Allow angle: 0 Category: Short ♥ No Type: I ♥ Polarity C Top C Bottom C Left € Rig Light Channel: Defualt RCB ♥		Insufficient Solder Color Edit Hue Lover 0 Upper 600 Lover 105 Upper 200 Saturation Lover 80 Upper 255
result: Set Color Set CReg C Inspect	Color Mode Ø G Ø B Ø Color O Brightness/Contrast	Mean O Max Algorithm Body Color • ''50''' 100 C Paste learn Learn Set • Bridge Bridge Bridge Set • Color Extract • Color Set OCV/OCR OCV/OCR • Shape C inspection Shape Set	Parameter 36 Area Threshold: 36 Seg. Threshold: 63 Zoom Factor: 100 Flood Factor: 100 Com Factor: 100 Flood Factor: 100 Seg. Threshold: 100 Camp Factor: 100 Flood Factor: 100 Seg. Threshold: 100 Seg. Threshold: 100 Flood Factor: 100 Threshold: 100

Click the "Short Circuit Setting" button to enter the parameter setting window. The user can adjust the area threshold and segmentation threshold through the scroll bar and select parameters, and filter out interference parts, so that the pin parts in the template image can be clearly identified. The system will automatically identify the number of pins, the maximum pin width and the average pin width according to the vertical projection of the segmented communication domain. Under normal circumstances, the maximum pin width should be approximately equal to the average pin width.

If the maximum pin width is greater than 1.7 time of the average pin width under the same segmentation conditions during testing, it means that there are pins and their solder widths are beyond the normal range, which is most likely caused by solder short circuit. At this time, an NG error will be reported. If the user has checked the pin number test, the system will inspect the pin number at the same time during the test. If it is inconsistent with the setting, the system will also report NG error.

If the user's PCB itself has a white background with high brightness, and the traditional threshold segmentation cannot accurately isolate the solder from the PCB background color, the user can check the "Whiteboard". At this time, the system will use a specific channel algorithm to filter out the influence of white and increase the stability of segmentation.

In some cases, there are white silk screens perpendicular to the pins on the PCB under the pins, which may also affect the pin division. At this time, the user can check "Ignore Long Straight Line" and open the setting window through the setting button, adjust the parameter division and set the range of that straight line. During inspection, the image within the range of

the straight line will not be included in the range of pin segmentation, so as to achieve the effect of filtering out the influence of the straight line.

The setting interface switches the registered image and the real-time image to be inspected to help users compare and debug. The parameter setting and adjustment is a set, but there are different display results corresponding to the two figures.

If the user needs to test each pin, except for the pin-by-pin frame definition, the user can enter the pin definition window through the "Set Pin" button, set the pin range in the upper part of the right image area of this window by using the normal frame method, select the correct pin direction in the upper left, and then click the "Generate Pin" button. If it is completed normally, these set pins will be generated with some inspection frames whose preset algorithm is color extraction, and will be combined into one component together with the external short-circuit frame. Users can modify the algorithm and adjust the parameters of the pin inspection frame as required.

[Color Extraction]: extracting a certain color in the image to calculate the proportion of a certain color in the whole image and the number of regions of a certain color in the whole image. This algorithm is generally used for solder joints and short circuits of solder joints, as shown in the following figure:

	13	Color Extraction	
No. Location Index Y: 27.1 1 0'0-4-1 4 . . 0	356 mm	Insufficient Solder Color Edit	Reg Image
Angle: 7 Skip Visible Cell No.: 4 Ref. Value: 17522900 Result Value: ## %	Lead Share	Lower 170	
Reult Ang: 0 Allow angle: β Category: IC Paste - NG Type: Ι -		Insufficient Solder Ref Value(%) Lower 55 Upper 100 Result: 59.169 Recove Color Set Color	Inspect Image
□ Polarity © Top © Botton © Left © Right Light Channel: □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	└ Skip	Inspect Item C Solder □ Inspect C False Solder □ Inspect C False Solder □ C False Solder □ C False Solder □ C False C Fals	
Color Mode Image: Color of Mean of Max Brightness/Contrast Image: Color of Mean of Max Brightness: Image: Color of Mean of Max	C Region Body Color C Paste learn Learn Set	Copper Lei Clasect Color in Color in Color Clue Inspect Color in Color in Extraction Extraction	
Contrast: 0	Color Extract Color Set OCV/OCR OCV/OCR OCV/OCR OCV/OCR	CaP □ Inspect Color in region: CAP □ Inspect □ Filter Skip Area □ Nin Area(1/10000): 0.0	Filter Nerge Skip Area Apply to Comp
	C inspection Shape Set	Max Area (1/10000) : 10000 Corrode: 0.00 Connect Num: 1 This Num: 36 Caption:	Apply
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Grp. Apply Close	Remarks: -1 No operation, -2 Short circuit test, Great	er than or equal to 0 test connect num

As a main inspection algorithm, the user enters the color extraction interface by clicking the "Color Extraction" button, and sets and tests the color extraction of the inspection frame

In the image region on the right side of the interface, the upper image is the original image, and the following is the extracted eligible region.

Unlike other algorithms, where each inspection frame only accommodates one standard (different standards can only be extended by grouping), in this system, the inspection frame of color extraction can accommodate eight different items and set eight different inspection standards at the same time. Each algorithm can be selected in combination, and the standards can be set separately.

Users of preset extraction items in the system can modify them through the corresponding item fields under them.

Color extraction sets the threshold values of hue, brightness and saturation of pixels in the image interval, extracts pixels that meet the threshold values of these three channels at the same time, and displays them visually in the extraction map. It takes the ratio of extracted pixels to pixels in the whole interval as the main inspection target, and sets the standard for the normal range around this target.

When setting, besides the color selected by the user in the extraction diagram, the result value will also be displayed. If the calibration is reliable, the system will estimate and display the actual region of the extraction region here at the same time.

During inspection, it is judged whether the pixel extraction value of the image in the inspection frame of the image to be inspected according to the extraction parameters can meet this color standard interval, so as to determine whether it passes or is NG. [Reverse Extraction] in the interface is to reverse the result.

To simplify the extraction of color parameters, double-click the left mouse button on the original image at the top right of the interface, and the system will automatically extract the color channel value of the mouse point and automatically preset the segmentation threshold. The extracted image at the bottom will be displayed correspondingly, and the array and scroll bar at the left will be automatically preset accordingly, so users can adjust and save on this basis.

In addition to the above basic conditions, on the basis of the results of color channel threshold extraction, the system can also set some additional conditions to filter again according to the extracted regions, so that users can realize more flexible application when dealing with the extraction range:

-In the case of multiple extraction regions, the user can filter out the large and small regions by setting the region ratio.

-In the case of multiple extraction regions, the user can set the standard number of regions. If the number of qualified regions is not equal to the standard, the inspection frame is judged as NG. The default standard of the system is -1, which means the number of uninspected regions. This function is more suitable for inspecting short circuit between solder joints.

If the user checks to filter out the shielding region, the intersection of this inspection frame and another set shielding frame will not participate in the extraction calculation, and this shielding will be reflected in the image display region. As a result, the extraction operation can be more precise and flexible.

The "Registered Image" and "Image to be Inspected" in the setting interface are used to switch between the registered image and the real-time image to be inspected, which helps users to compare and debug. The parameter setting and adjustment is a set, but there are different display results corresponding to the two figures.

Usually, grouping is not implemented in the color extraction mode, otherwise it is easy to be confused.

After setting or adjusting the registration information parameters, the user needs to press the "Apply" button to save. If the component is checked in, the result will be stored in the check-in document; otherwise, it will be stored in the registration information of the component itself. If there are multiple groups in the inspection frame, the user can choose to update all groups with

the modified information at the same time.

If there are multiple groups in the inspection frame, the user can switch between different groups by pressing the double-headed arrow in this interface, and press the "Delete" button to delete the current group (basic registration information cannot be deleted)

[Feature Method] This algorithm is generally used to inspect the spherical surface of BGA, and is used to inspect the number, offset, missing, crush, short circuit of balls, as shown in the following figure:

Shape Select		
Insufficient Solder Color Edit	Reg Image	Results Show
- Hue		
Lower 180		
Upper 290		
Lightness 65		
Upper 255		
Saturation		
Lower 50		*********
Upper 255]		
Parameter	BGA Refer Standard:	
Seg. Threshold: 61	Max Area: 1500	Reg Min Area: 337 Inspect Min Area: 337
Min Area 223	Shape Degree: 45	Reg Max Area: 516 Min Blue Percent: 44
Area Erosion:	Blue Percent: 40	Blue Count: 78 Max Red Percent: 12
Zoom: [63	Red Percent: 20	Min Degree: 0.78
	0	Allow in radius offset Offset Count: 0
, box inspect, black and white Reverse Full Up	Foreign size:	FailArea Count: 0
© Reg Image C Inspect Image	or Set Set Color	Evit
Check Result:	□ Only Show Image Info Save	

After entering this interface, first check [BGA Inspection] and then click [Color Set] to enter the following interface:

or Extraction												l	2
Insufficient So	lder Color Edi	t				Re	g Im	age					
Inde													
Lower 290			Carlos a	a		100.1		-	1.00				
Umman 405		1		-	-		е н њ. л			-	a	-	
opper 420 =				ž	2		н н Б. 6		-		ŝ	-00	
-Lightness											-		
Lower 65 -	[88-										
Upper 255 -		F											
		/							۰				
Saturation					۲	٠	•					6	
Lower 50 _	— J		2 9		۲		9.8	1			۲	-	8
Upper 255 -	8	1											
	1000 (0. 100-00-00) ⁽¹	/				Iı	spec	t I	mag	e			
Insufficient So	lder Ref Value	(%)	1										
Lower 55 —													
Upper 100 —		J											
Result: 1.25	2 Recove	Color Set Color					• •	۲					
Inspect Item-							8 9	•		۲		۲	
• Red	🔽 Inspect	🗖 Reverse	1000										
C Blue	✓ Inspect	T All Circle											
C Solder Void	□ Inspect	• Reg Image	in the second										
C Copper Le:	□ Inspect	C Inspect Image			2	2			2		ě		ž
C Glue	🗖 Inspect	Color in											
C DIP	🗖 Inspect	region:											
C Bridge	🗖 Inspect	Color in region:											
C CAP	□ Inspect								14	-			
100		└ Filter Skip Area ┌	Filter	Me	rge	Ski	o Ar	ea	Ap	piy	to	COL	np
Min Area(1/100	0.0	}					-						
Max Area(1/100	00); 10000						-11			A	ppl	v	
Corrode: 0.00		Expand: 0.00			F	ill.	Up	L	_				_
Connect Num: -1	This Nu	um: 99 Caption:		_	_					E	Exit	:	
			5) 										1910
Remember -1 Me	operation -2 C	hart airquit toot Cras	+ar +h-	10		Louro 1	+ - 1	1 + -	-+	0.00	1000		1 1 1 1 1

Set the hue, brightness and saturation of [Red] and [Blue] according to the method of color extraction. The extracted [Red] is the red in the middle of the ball, and the [Blue] is the color of tin on the ball. Then click [Only Apply to Current Inspection Frame]-[Exit] to return to the previous interface.

Divide each ball clearly by [Threshold Division], [Corrosion] and [Expansion], and then set the region range of the ball by maximum size and minimum size. The [Minimum Size of Registration Chart and [Maximum Size of Registration Chart] can be referred. Then set the parameter of shape degree to represent the similarity between each ball and circle. [Blue Ratio] represents the lowest blue ratio of each ball as a good product (lower blue ratio means less tin in the ball); [Red ratio] represents the highest red ratio of each ball as a good product (higher red ratio means larger crushed region of the ball); [Offset Value] is the allowed offset of the ball; [Foreign matter size] refers to the size of the foreign matter on BGA. After completing the setting in this interface, click [Save]-[Exit] to return to the previous interface, as shown in the

following figure:

Cell No.: Ref. Value:	5							
Result Value:	##		00000		000	0 0 0		
Reult Ang:	0							
Allow angle:	5	-				ø		
Category:	Other	•	00000		000	8 94		
NG Type:	I	-					-	1
	1							
Color Mode	т т т	3	⊙ Color O	Mean (D Max	-A1	gorithm Region	Body Color
Color Mode R G Brightness Brightness	Contrast	3 t	⊙ Color O	Mean (O Max		gorithm Region Paste learn	Body Color Learn Set
Color Mode R G Brightness Contrast:	Contrast	3 t	⊙ Color O	Mean (D Max		gorithm Region Paste learn Bridge	Body Color Learn Set Bridge Set
Color Mode R Ø G Brightness/ Brightness: Contrast:	Contrast 0 0	3 t	⊙ Color O	• Mean (D Max		gorithm Region Paste learn Bridge Color Extrac	Body Color Learn Set Bridge Set Color Set
Color Mode R Ø G Brightness/ Brightness: Contrast: Search X:	Contrast 0 - 0 -	3 100 · ·	⊙ Color O -50 · · · 0 Y: 764	• Mean (D Max		gorithm Region Paste learn Bridge Color Extrac OCV/OCR	Body Color Learn Set Bridge Set Color Set OCV/OCR
Color Mode R G Brightness/ Brightness: Contrast: Search X: Cell X:	Contrast 0 0 968 628 6	3 100 · ·	⊙ Color O -50 · · · 0 Y: 764 -Y: 424	• Mean (• • •50• • • • •	D Max		gorithm Region Paste learn Bridge Color Extrac OCV/OCR Shape	Body Color Learn Set Bridge Set Color Set OCV/OCR
Color Mode R R G Brightness/ Brightness: Contrast: Search X: Cell X:	I▼ E Contrast 0 0 0 968 628	3 t	⊙ Color O -50 · · · 0 Y: 764 -Y: 424	9 Mean (•••50• ••••	O Max '''100 '''' 628		gorithm Region Paste learn Bridge Color Extrac OCV/OCR Shape inspection	Body Color Learn Set Bridge Set Color Set OCV/OCR Shape Set

In this interface, the [Qualified Reference Value] is set. This parameter is the number of BGA balls in this algorithm.

[Measurement] is used in this algorithm to measure the height and width of a single image and the distance between two images, as shown in the following figure:

则量宽高		
		注册图
下限 P 上限 255		结果显示
面积阈值:	30 0 0	
 縮放比例: → →<td>100 〇 測量圆直径 </td><td></td>	100 〇 測量圆直径 	
检测结果: 测量结果: 边缘宽度: 1.631 mm 标准宽度范围(W): 1.630 允许误差(±mm 标准高度范围(H): 允许误差(±mm	+主 こ PUH 3 世 国 即日内 : 10): 1	 下 区域填充 「 黒白反向 保存

Firstly, according to the principle of [Color Extraction], the image to be measured is extracted. Then check the measurement options below and enter the allowed error.

All the above algorithms are commonly used.

8.2 Manual program editing

8.2.1 New mode

Open the AOI software according to {7.1 Start-up procedure}. (The following is from left to right)

Click [Work Mode]-[New Mode] in the top menu bar to enter the new mode, as shown in the following figure:



First, click [Track Width Adjustment] in [System Configuration] in the menu bar, as shown in the following figure: (this figure is NeoDen 880)

ail Adjustment		×
-Parameter Max Rail Width:	402	(<=400) mm
Min Rail Width:	55	(>= 55)mm
Park Pos:	100	mm Read Move
PCB Width:	100	mm Read Move
-Rail Move Forward Backwar	d	Jog C 0.1mm C 0.5mm @ 1mm
Motor Cur Pos: 0		mm Save Close

Select the corresponding track in this interface, and adjust the width of the track through [Up] and [Down] on the keyboard. (Note: Track 1 is fixed and not adjustable, and only Track 2 can be adjusted for the lower cover and monorail.) You can select [Jog] and then select the corresponding unit for fine adjustment. Click [Close] after the adjustment is completed

Then put the board on the corresponding track, and check [Front Track] or [Back Track] in the menu bar of the double track machine to switch. Put the PCB on the entry end of the track, and click [Enter Board] at the bottom of the interface. The PCB enters the normal inspection position in the track and is fixed.



in the lower right corner to let the camera automatically

move to the lower left corner of PCB. On the basis of the image collected by the camera, confirm that the cross center point of the current camera is outside the lower right corner of PCB, as shown in the following figure:



Because the position of track 3 is not fixed, the position of the lower right corner should be set for each program. First, after the board enters and is fixed, move the camera reticle position to the lower right corner of the board, as shown above. Then click [System Configuration]-[System Composition] in the menu bar, as shown in the following figure:

A01 Info. Model: VI=800 Model: VI=800 rial No.: 000001 Product data: 2020-03-18 For Visce X : 32538 um Line: SMT-1 Overlap: 10 % Shutter Time: 20 ms PCB Zero Pos. For Track C Back Track Left Offset X : 492440 um Cur. Pos. Y : 378960 um Cur. Pos. Park Pos. Y : 378960 um Park Pos. Y : 197880 um Park Pos. Y : 197880 um Rail/Convey C Left->Righ: Auto Width Control □ In And Out Insi Inspect And Pct □ PCB Out And In On PCB Lead Dist Offset: 50 ms FOB ms PCB Load Dist Offset: 50 ms FOB ms PCB Load Dist Offset: 50 ms Safe sign C Kight ~ Let FOB ms PCB Load Dist Offset: 50 ms FOB ms	System Config.	
C Board1 @ Board2 C High @ Low	System Config. AOI Info. Model: VL=500 rial No.: 000001 Product data: 2020-03-18 Line: SMT-1 PCB Zero Pos. Gront Track C Back Track Left Offset X : 492440 um Y : 378960 um Right Offset X : -3400 um Y : 378960 um Park Pos. Y : Park Pos X : 140740 um Cur. Pos. Y : Y : 197880 um Rail/Convey Gright->Lei G Left->Righ: Auto Width Control □ In And Out Insi □ PCB Remove Delay: 15000 ms (min is 50) Pcb LoadReg Delay: 15000 ms Back Plate Delay: 50 ms PCB Load Dist Offset: 50 ms	Camera/ Illum FOV Size X : 32538 um Res. X: 16.269 Y : 32624 um Y: 16.312 Overlap: 10 % Shutter Time: 20 ms FOV Pixel Size 2000 X:
		C Board1 (* Board2 C High (* Low

Then select [Rear Rail] in [PCB Zero Position] and click [Current Position] behind the right offset. At this time, the coordinates of [Right Offset] will change (right board is left offset). Then click [Save]-[Exit].

The lower right corner of the lower cover is the corner close to the right side of the track 2. As the track 2 is a moving track, it will be debugged according to the size of the board. So, the lower right corner of the lower cover cannot be fixed and needs debugging every time, as shown in the following figure:



Move the camera position to the lower right corner of PCB first, then click [Current Position], and the system will set this position to the lower right corner.

Click the arrow around the image to move the center point of the camera beyond the upper left corner of PCB. It can be moved a little more distance beyond the upper left corner to ensure that the upper left corner has completely covered the whole PCB range.



Then click [Operation]-[Set the upper right corner]. A dialog box will prompt: {Please extract the image of the whole PCB! }, click [Confirm]. Note: the above process of determining the lower right corner and upper left corner of PCB is only applicable to the left board placement direction. If the board is placed on the right side and the track direction is from right to left, it is to determine the lower right corner and upper left corner of PCB.

Before setting the upper right corner, if special PCB needs image pre-processing, it can be adjusted in the lower right corner of the interface, as shown in the following figure:

	FOV Num X: PCB SizeX: Image PreProces	Y: Y: sing
PCB Board	Brightne 0 Contrast 0 F RED 0 F BLUE 0 F GREEN 0	→ F Sharpen1 → F Sharpen2 → F Passivess → F Gamma
PCB Board Comp. List Library NG Result		

Note: If there are special PCB, the brightness and contrast can be adjusted based on each board, and the brightness of a certain channel can be increased as needed until the image is clear.

Next, click [Operation]-[PCB Scan], and a dialog box will prompt for setting the model name and file name of the program. Enter the model name and file name in the lower left box and click [OK].

Save File As File Path : D:\Machine	2_1\1\1	Previet
-Model	File	Preview
Model: 1	File: 1	
✓ Load system light par ✓ Image color pre-prece	Restore previous file	Confirm Exit

A dialog box will prompt for confirming the model name and filing the name information, as shown in the following figure:

Save File As	the second s	8
File Path : D:\Ma	chine_1\1\1	🔽 Preview
-Model 1	AOI AOI Message No: [9061] Do you want to save scanned Information int ? Model : [4] PCB : [4]	to selected Program
Model: 4		
☞ Load system ligh ☞ Image color pre-	t parameter precessing Restore previous file	Confirm Exit

Click [Yes], and the camera starts scanning the whole PCB image. After completion, a dialog box will prompt {Please set Mark Point}. Click [Confirm], and a dialog box for setting Mark point will appear, as shown in the following figure:

Set Mark	
Mark #1	Mark #2
-Mark点1#	
Cente X: mm Ref. Value:	: 0 % Result Value: 0 %
Y: mm	Seach Area: 0
-Brightness/Contrast	
Brightnes	
	7
-100 -50 Contrast:	
Color Mode	Algorithm
⊙ Color O Mean O Max	C Regional Body Color
🔽 R 🗆 G 🗆 B	C Shape Shape Set
Add Attrib Set Ins	pect Auxiliary MARK Close
Add Attrib Set Ins	pect Auxiliary MARA Close

In Mark Point #1, drag the box with the left mouse button to select one of the mark points of PCB bevel angle. Click Set, and adjust brightness/contrast and color mode to make the outline of Mark point image clear. Click Mark Point #2 to switch to the setting of Mark point of another oblique angle, as shown below:

Mark #1	Mark #2
Mark #2 Cente X: 76.569 _{mm} Ref. Value Y: 44.732 _{mm}	e: 65 % Result Value: % Seach Area: 3
Brightness/Contrast Brightnes: -100 -50 Contrast:	0 <u>50</u> <u>100</u> 65
Color Mode O Color O Mean ⊙ Max	Algorithm © Regional Body Color

Note: the operation method of Mark point is region method, and the default value is 65, which can be modified according to the actual situation. Oxidation at Mark point can be inspected by noumenon extraction in region method, so the effect will be more stable. Click [Close] after Mark point setting is completed. The system will prompt {Whether to Enter Editing Mode Immediately}, and click [Yes] to enter editing mode.

8.2.2 Editing mode

ī

Close the Mark setting interface or click [Working Mode]-[Editing Mode] in the menu bar to enter the editing mode and inspect the Mark point. The inspection information will display the offset distance of the current Mark point. After clicking [Confirm], you will enter the editing mode.



According to different components, select the corresponding box selection method:

NPS	S(Rect)	<u>B</u> ridge	R	SRC	D	SOP	020
PS	S (Rnd)	S(Brid)	С	M-Lead	3-Lead	QFP	040

- Non-polar single frame: generally outlining all non-polar capacitance and resistance inspection frames with specifications within 0402. It can also be used as the inspection frame for noumenon labeling of other components.
- Polar single frame: generally outlining all polar capacitors and resistors with specifications within 0402. It can also be used for noumenon labeling of other components.

Resistance: indicating making the inspection frame for resistance.

Capacitance: indicating making the inspection frame for capacitance.

Solder joint square and solder joint circle: indicate making the inspection frame for wave soldering joint.

0201 and 0402: indicating making the inspection frame for 0201 and 0402 component

Diode: indicating making the inspection frame for diodes.

Tripod element: indicating making the inspection frame for triodes.

Unilateral leg: indicating making the inspection frame for IC that cannot be completely displayed on the window-table screen.

SOP: indicating the inspection frame of IC in SOP form. (it can only be used for SOP with

regular solder joints on both sides and complete display on one screen in the same window area)

QFP: indicating the inspection frame of QFP IC. (it can only be used for QFP with regular solder joints on four sides and complete display on one screen in the same window area)

If the component angle is not 45 degrees, check [Angle Registration] and pull the slider to rotate the image angle and then make frame.

After making the frame or left-clicking the corresponding inspection frame, the debugging window of the corresponding component frame will appear to modify the standard of the component frame.



in the upper right corner of the interface. When the mouse moves to the

image, it will switch to the corresponding icon. At this time, when you double-click a certain point on the image with the left mouse button, the center point of the camera will automatically

move to this point. To exit , just right-click.

When dragging to make frame, try to adjust the angle, scale and position of the frame by using the space button, \uparrow button or \downarrow button. Or click the eight directional arrows outside the image frame to move the center point of the camera.

To exit the component box, just right-click.

The image on the right side of the interface is the thumbnail of PCB, and the yellow box above is the position of the camera. Double-click the left mouse button at any position of the thumbnail, and the camera will move to the double-click position.

Do not check [FOV Center] at the bottom of the interface before making the component frame. Adjust the image scale at the top of the interface to make it suitable for editing the component, as shown in the following figure:

┌─ Cross Line ┌─ FOV Center	
	Original 5 - 100

When there are multiple splicing boards on a PCB board, we only need to edit a small splicing board, and the thumbnail on the right side of the interface can also be enlarged and reduced by [Image Display Scale] in the following figure:
Mark Inpsect	Path Optimization(F2)	🔽 View Undistributed Comp.	
Park Position(F3)	Mark Path Reverse	🔽 View UnLinked Library Comp. 🔄	
Path Reverse	A Key To library(F1)	🔽 View Error Comp.	
['ath Chang	🔽 View Path	
PCB Scan	Select All Delete	🗖 View Fov	
PCB Image Zoom: 1	0% Normal	▼ View Pcb Image	

After adjustment, the component frame can be made.

Capacitance and resistance: you can directly click on the capacitance and resistance box below and hold down the left mouse button to make the frame, as shown in the following figure:





The frame is based on the noumenon. After the noumenon is drawn, pad frames on both sides as well as silk screen frames in the middle will automatically generate (the color frame in the middle of the capacitor). If the automatically generating frame is inappropriate in size, you can click on the inappropriate frame to debug the size.

0402 or smaller capacitance resistance can be directly selected from small material frame, as shown in the following figure:



When making a small material frame, frame the bonding pad of the whole component and the body together, and a small frame for color inspection will be automatically generated in the middle. After making the frame, click the right mouse button where there are no components to cancel the selected box.

Each component is directly registered after making frame. The steps are: first select the components to be registered, then right-click and click [Component Register]

Figure:

Type:	13: OTHER	•
irt Code:	123	
Desc.:	[
Size:	(eg	: 1608, Meric,:
Size: 🔽	. (eg co-save into pu	: 1608, Meric,: ublic l
Size:	. (eg :o-save into p	: 1608, Meric,1 ublic l

Select the type, manually enter the item number and remarks, and choose whether to deposit it in the public library (note: you can directly transfer it out from the public library when you execute other programs next time after depositing it in the public library), and then click [OK] to register it.

After registering, if there are the same components in the same spilt, you can select the made component frame, right-click [Single-Point Copy], then move the mouse to the same component and click the left mouse button, and right-click to cancel the copy box. Click [Space Key] to rotate by 45 degrees at a time. You can also double-click and select the component in the component library to copy it. As shown in the following figure:



Note: before copying, the component must be registered. If it is not registered, [Single-Point Copy] cannot be performed.

Diode: [Diode] can be directly selected for making frame based on the noumenon of the diode. As shown in the following figure:



Adjust the size of each frame, and then register the component according to the method of capacitance and resistance. If there are the same components, copy them in the same way.

Triode: [Triangle] can be directly selected for making frame based on the noumenon of triode. As shown in the following figure:



Adjust the size of each frame, and then register the component according to the method of capacitance and resistance. If there are the same components, copy them in the same way.

IC: the SOP frame can be directly selected to make the combined frame. However, because there are many types of IC components, we generally choose our own frame combination. In the following steps, take our own frame combination as an example, first select [Short Circuit Frame] to make the solder leg frames on both sides, as shown in the following figure:

	Info. Cell No.: 2 Ref. Value: % Result Value: ## % % Reult Ang: 0 Allow angle: 0 Category: Short ▼ NG Type: I	
15806	✓ Polarity Grame Top C Bottom C Left C Right Light Channel: Defualt RGB ✓ ✓ <t< th=""><th>□ Skip</th></t<>	□ Skip
	Image: Search X: 320 Y: 144 Color Base Col	Body Color Learn Set Bridge Set Color Set OCV/OCR
mm Ref. Rate: 80 %	C inspection	Close

After that, the property interface of the component box will be displayed at the same time. If it doesn't come out, click the selected box with the left mouse button, and the property interface will also be displayed. Now check the polarity direction in the middle. [Top], [Bottom], [Left] and [Right] represent the position of the small arrow on the component frame. After checking, let the arrow point to the noumenon of IC. Then click [Short Circuit Setting] to enter the setting interface. As shown in the following figure:

idge	X
4	
Hue Lower	
Upper 600	J
Lightness	
Lower 105	
Saturation Lower 50 J	
Parameter	Inspect Result
Area Threshold: ·	35 Lead Num. : 4
Seg. Threshold:	55 Ave. Lead Width: 33
Zoom Factor:	100 Max Lead Width: 35
🗖 Lead num check 🥅 Black and white Reverse	Max Lead Width 1.70 multi
☞ Skip Line	ad Def.
result: Set Color	Set O Reg C Inspect
Save	Exit

Then divide each pin clearly by comparing with the above figure through [Area Threshold] and [Segmentation Threshold], or switch between [Registered Image] and [Image to be inspected]. (Note: If there is white silk screen printing between the white bottom plate and the corners and it is difficult to divide, you can check the [Whiteboard] below for division according to the situation). After the pins are divided, the software will automatically calculate the number and width of pins. Then check [Pin Number Check] (note: if you don't need to check the number of pins, you don't need to check), and then click [Set Pins] to set the pins. As shown in the following figure:

Lead Reg Lead Dir C Body Left C Body Right C Body Top C Body Bottom	
Parameter Width Ratio: Zoom Factor: 100	
	✓ ✓ Lead Reg. OK Cancel

Select a standard pin from the pins in the upper part of this interface. Then select a standard pin frame with the left mouse button, and click [Generate Pin] after making the frame. All pin frames will be automatically generated. As shown in the following figure:

Lead Reg	
C Body Left C Body Right	
🕫 Body Top 🤇 Body Bottom	
-Parameter	
Width Ratio:	
Zoom Factor: 100	
	Contraction of the Contraction of the State Contract Brand (
	•
	Lead Reg. OK Cancel

Then click [OK] to return to the previous interface. Click [Save] to return to the previous interface and click [Apply]-[Close]. Use the same method to make the pin on the other side.

Then, select [Polar Box] (note: for components have no direction, you can select [None-polar Box]) to screen print the characters on the IC body (note that all screen printing is not required, only clear and stable material characters need to be selected in the box), as shown in the following figure:

	- Info. Cell No. : 12 Ref. Value: 80		
	Result Value: ## % Reult Ang: 0		
	Allow angle: 5		
•	Category: Body - NG Type: I -		
	▼ Polarity C Top C Bottom C Left € Right □ ReverseStd F Light Channel: □efualt RGB ▼ □ Detection at	Z Solder follows p ngle offset □ S	pilt Skip
	Color Mode R F G F B O Color O Mean O Max	Algorithm	Body Color
	Brightness/Contrast Brightness:0	C Paste learn	Learn Set
	Contrast: 0	C Bridge C Color Extract	Bridge Set Color Set
ross Line 🦵 FOV Center 🔽 Comp.	Search X: 172 Y: 100 Cell X: 128 128	C OCV/OCR	OCV/OCR
Result Type: GOOD PS	DX: 100 人 % 不检 DY: 100 人 % 不检	C inspection	Shape Set
Ref. Rate: 80 %	/// Delete Delete ALL Apply to all	Grp. Apply	Close
Model : 4			

Then check [OCV/OCR] algorithm in the property interface, which is generally used for characters. Check it and click [OCV/OCR] to enter the setting interface, as shown in the following figure:

OCV Character segmentation	
Reg Image	Inspect Image
<mark>5 6 0 d</mark>	÷
Parameter	 35 − 0CR Set
Deep Threshold:	6
Filter Threshold:	- 15 Standard character:
Cut Threshold:	0 Input character:
Fill Threshold	- 0 0CR Set
Match Rate:]	- 80 Match Rate+ 5 Range Vaildity
Zoom Factor:	- 100
Threshold Proc: Default Ro Co Black and white Reverse Auto threshold	w: 0 10% 1: 0 d Check Result: 10%
CCV Auto-Split	pply Exit

By debugging [Area Threshold], [Segmentation Threshold], [Filtering Threshold], [Corrosion] and [Filling], the characters can be clearly adjusted to the best. If it is black and white, check

[Black and White Reverse] and then debug. When debugging is finished, click Apply-Exit to return to the upper interface, and then click [Apply]-[Close].

Select the noumenon of this IC by using the [Polar Box] (note: if the component has no direction, you can choose the [None-polar Box]) (note: if the IC is too large, you don't need to make the noumenon frame of the IC). As shown in the following figure:

			Info. 13 Ref. Value: 80 Result Value: ## Reult Ang: 0 Allow angle: 5 Category: Body NG Type: I ✓ Polarity C Top C Bottom C Left • Right C ReverseStd ↓ Light Channel: Defualt RGB ✓ Detection at	Solder follows pungle offset $\[Gamma]\]Solder \[Gamma]\]Solder \[Gamma]\]$	osition T Skip
Cross Lir 28 mm Result 27 mm Ref. 1	te FOV Center ♥ ▼ F Type: GOOD Rate: 80 %	Hide istrat S(Re S(Rr	Color Mode Image: Color C	Algorithm © Region C Paste learn C Bridge C Color Extract C OCV/OCR C Shape C inspection	Body Color Learn Set Bridge Set Color Set OCV/OCR Shape Set
de	Model: 4	File	<pre></pre>	Grp. Apply	Close

In the property interface, the [Region Method] is used for noumenon by default. If the noumenon is unclear, check [Mean] or [Maximum]. In addition, the first three light source channels can be matched at will. You can also adjust [Brightness] and [Contrast] to make the image clear, and then click [Apply]-[Close].

After each individual inspection drawing is completed, select all the component boxes, and then click the right mouse button to select [Merge Comp]. As shown in the following figure:



It is to merge components into a combination. After merging into a whole, the component is registered. After registering, select a standard pin from each side pin, click with the left mouse button to select the lead frame, right-click and click [IC Solder Joint Sharing Standard]. Pins on each side will share one pin according to this method. The component IC is manufactured, and the same IC can be copied by Single-Point Copying according to the capacitance method.

QFP: the editing method of QFP is basically the same as that of IC, just drawing the [Short-circuit Boxes] on both sides and merge them together. Other editing methods are the same.

Other special-shaped components: for example (Pentagon, switch, card holder, etc.). Generally, first make each frame that needs to be inspected, and then select the appropriate operation method. After drawing, merge each box of the component into a whole, and then register the component.

Solder leg: [None-polar Frame] can be selected for the solder leg, and the color extraction can be selected as the calculation method (if there is not enough tin on individual components to show blue, the region method can be used.

Noumenon frame: if the noumenon has polarity, choose [Polar Frame]. And choose [None-polar Frame] if it has no polarity. The editing method of the noumenon frame of IC is the same.

Screen printing frame: if the screen printing has polarity, choose [Polar Frame]. And choose [None-polar Frame] if it has no polarity. The editing method of the noumenon frame of IC is the same.

Dense pins: select [Short-circuit Frame] with reference to the same editing method of screen printing frame of IC.

The following are pictures of editing methods for individual special-shaped components. As

shown in the following figure:



According to the above method, edit all the components of this split board and then click [One-click Register] (shortcut key F2), as shown in the following figure:

Mark Inpsect	Path Optimization(F2)	🗖 View Undistributed Comp. 📃
Park Position(F3)	Mark Path Reverse	🔽 View UnLinked Library Comp.
Path Reverse	A Key To library(F1)	🔽 View Error Comp.
	'ath Chang	🔽 View Path
PCB Scan	Select All Delete	🗖 View Fov
PCB Image Zoom, 1	0 - % Normal	View Pch Image

After registering, all the components forgot to be registered when editing the components will be registered. Then the component frame edited by this split editing will be copied to another split board. The specific operation is as follows:

First, select the edited component split board in the left mouse button box on the thumbnail in the right, or directly click [Select All below]



Right-click after selection, as shown in the following figure:

- 14	A State of the second sec	
	Copy (0 Deg.)	
	Copy (180 Deg.)	
	Delete	
	Delete No Seclected Comp	
	Skip	
	Unskip	
	Rotate 90 within Rect	
	Rotate 180 within Rect	
	Rotate 270 within Rect	
	Rot.1 within Rect	Crrl/L
	X Mirror	
	Y Mirror	
	Cancel	
_		

Click [Copy Component] (0 degree indicates no rotation, 180 degree indicates copying by rotation by 180 degree). Move the copied frame to the approximate position of the next spilt, and then click the left key. As shown in the following figure:



Then double-click the mouse to move the position of the camera to the copied spilt, and drag the whole components of the spilt to the correct position with the left mouse button on the diagram on the left side of the interface, and move them to the correct position. As shown in the following figure:



After alignment, click with the left mouse button in the blank place where there are no components, and copy all the spilt according to this method. (When there are many spilts, it is recommended to copy them together)

After copying all the spilts, click [Path Optimization] at the bottom of the interface, so that the running route of the camera will come out, and the camera will inspect according to the digital sequence of the path on FOV during later inspection. As shown in the following figure:



Click [FOV Component Positioning] or [Overall Positioning] if the inspection frame of individual components is found to be incorrect after completion, The former is to position the component frame inside the camera frame only according to the noumenon frame, while the latter is to position the component frame on the whole PCB board according to the noumenon frame, as shown in the following figure:



After positioning, click [File Management]-[Save] in the menu bar to complete the editing mode.

8.2.2 Debugging mode

Enter the inspection mode in [Working Mode]-[Inspection Mode]. As shown in the following figure:



When debugging, check [Debug] and [Not Add Group], and then click [Start], as shown below:



[Space Key] is the shortcut key of the start key. If there is a board at the board entrance end, it will automatically enter for inspection. After the inspection is completed, the false alarm debugging interface will pop up. As shown in the following figure:



The upper left corner of this figure is the whole PCB image with crosshairs and marked positions. The upper right corner is the FOV enlarged image. The lower left corner is the components displayed by false alarm and the frame of each component displayed. The lower right corner is the standard image and the actual inspected image. The lower middle is the information of the component frame. False alarm debugging depends on the information location of the component frame, as shown in the following figure:

False(S)	NG (D)	Move	Refresh
Barcode:	N00010	0000262211B2	
NG Num:	12		
Component:	C^C-1		
Ref.:	80	Result :	74
Algorithm:	Regiona:	Grp Cnt:	0
OffsetX: OffsetY:	0.406	Angle:	184
Proprity	QFP Set	Learn Set	Add Grou
NG	Nove to (Touch Mod

First, check the [Unit Type] of the component frame, that is, the operation method of the component frame.

The calculation methods are [Region Method] and [OCV]: for these two calculation methods, we adjust the false alarm by adding contrast images. That is, for good pictures, click [Add Group] (note: bad pictures and similar bad pictures cannot be added). As shown in the following figure:



If the inspection frame is not on the component, drag it onto the component and click [OK] to finish. Click [Component Properties] if there is an error in adding pictures. As shown in the following figure:

nfo. ell No. : 43		
ef. Value: 80 %		and the second se
esult Value: ## %		
eult Ang: 90		
llow angle: 5	1000	COLUMN T
ategory: Body 💌		and the second
NG Type: I		A local de
Light Channel: Defualt RGB 🛒 🗌 🗖 Detection	angle offset 🛛 🛛	Split
lor Mode ₹ R ↓ G ↓ B Oclor O Mean O Max	Algorithm	Body Color
rightness:0	Algorithm	Body Color Learn Set
lor Mode R	Algorithm © Region C Paste learn © Bridge	Body Color Learn Set Bridge Set
Ior Mode R G G B O Color O Mean O Max rightness/Contrast -100 ··· -50 ··· 0 -··· 50 ··· 100 Contrast: 0 -··· 50 ··· 100	Algorithm © Region © Paste learn © Bridge © Color Extract	Body Color Learn Set Bridge Set Color Set
color Mode R G G B O Color O Mean O Max Brightness/Contrast	Algorithm Region C Paste learn C Bridge C Color Extract C OCV/OCR	Body Color Learn Set Bridge Set Color Set OCV/OCR
Olor Mode Image: Contrast Image: Contrast Brightness: -100 · · -50 · · · 0 · · · 50 · · · · 100 Contrast: 0 -100 · · -50 · · · 0 · · · · · · · · · · · · · · · · · · ·	Algorithm © Region C Paste learn C Bridge C Color Extract C OCV/OCR C Shape C inspection	Body Color Learn Set Bridge Set Color Set OCV/OCR Shape Set
color Mode \overrightarrow{R} \overrightarrow{V} G \overrightarrow{V} B \bigcirc Color \bigcirc Mean \bigcirc Max Brightness/Contrast \bigcirc $-100 \cdot \cdot -50 \cdot \cdot \cdot 0$ \bigcirc $\cdot \cdot \cdot 50 \cdot \cdot \cdot \cdot 100$ Contrast: \bigcirc $-100 \cdot \cdot -50 \cdot \cdot \cdot 0$ $\cdot \cdot \cdot 50 \cdot \cdot \cdot \cdot 100$ Search X: 132 $Y:$ 168 Cell X: 72 $\overrightarrow{72}$ $\overrightarrow{Y}:$ 108 $\overrightarrow{72}$ DX: 100 $\overbrace{100}$ $\overbrace{9\%}$ $\overleftarrow{12}$ 72	Algorithm Region Paste learn Bridge Color Extract OCV/OCR Shape Cinspection CMeasure	Body Color Learn Set Bridge Set Color Set OCV/OCR Shape Set Measure Set

In the lower left corner of this interface, find the wrong picture by turning back and forth and delete it (note: the first image is the registered image of the component, which cannot be deleted. But images from the second image can be deleted). If there are still many false positives after

adding dozens of pictures, you can slightly lower the [Qualified Reference Value] in this interface to achieve the effect of false alarm debugging.

The calculation method is [Color Extraction]: first click [Component Properties]-[Color Extraction] as shown in the following figure:

	Color Extraction
	InsufficientColor Edit Reg Image
Cell Properties	Lower 170
	Upper 270
Cell No.: 38	
Ref Value, (522,100)	10 1
102,1003 %	Lower No
Result Value: ## %	Upper 200
Reult Ang: 0	Saturation
Allow angle: 5	Lower 40 L
Alto diglet 0	linner orr
Category: Chip Pas 🔻	opper 200)
NG Type: I 🗸	InsufficientRef Value(%)
▼ Polarity C Top € Bottom C Left C Right	Lower 62
Light Channel: Defualt RGE -	Upper 100 [
Color Vode	Regult: 56.944 Recove Color Set Color
Brightness/Contrast	G Insufficient I Inspect
Drightness: 0 -100 - 1 -50 - 1 - 10 - 1 - 50 - 1 - 100 - 10	C Fales Solder T James All Circle
Contrast: 0 CBridge Bridge Set	C Solder Void
Color Extract Color Set	C Compar Las
Search X: 100 Y: 64	C Glue Color in
Cell X: 72 72 + Y: 36 36 + 72 COUVOUR OUV/OUR	C DIR Inspect region:
C Shape Shap	C Bridge Color in region:
C inspection	
C Measure Measure Set	Filter Skip Area 🗆 Filter Merge Skip Area Apply to Comp
	Min Area(1/10000): 0.0
(()) 1/1 Delete Delete All Anniv to all Gyp Anniv Close	Max Area(1/10000): 10000
ter in the second second and the second seco	Corrode: 0.00 Emerge 200 Emerge E Fill Up
	Expand, 500) (1111 op
	Connect Num: -1 This Num: 7 Caption: Insufficient Exit
NG Move to Comp. Enter Teach Mode	Remarks: -1 No operation, -2 Short circuit test, Greater than or equal to 0 test connect num

First, check [Image to be Inspected] to switch to the image to be inspected, and then see if the tin color is completely extracted. On the right side of the figure, the specified color will be displayed at the extracted position. If it is not completely extracted, it can be debugged by debugging [Hue], [Brightness] and [Saturation] (note: the color of the empty pad cannot be extracted). If all colors of tin are extracted, the lower limit of [Qualified Value] can only be lowered according to [Inspected Value] to adjust the false alarm. After adjustment, click [Apply to Current Components]-[Exit] and then return to the previous interface and click [Close].

The calculation method is [Short Circuit Inspection]: first click [Component Properties]-[Short Circuit Setting] as shown in the following figure:

	(Bridge	
Info. Cell No.: 79 Ref. Value: ## Reult Value: ## Reult Ang: 270 Allow angle: 0 Category: Short I NG Type: I		Insufficient Solder Color Edit	•
✓ Polarity ∩ Top ♂ Bottom ∩ Left ∩ Right Light Channel: Defualt RCB →	┌─ Skip	Upper 600	J
Color Mode □ □ □ □ □ □ □ ∩ Region ∩ Region ∩ Region □ <th□< th=""> <th□< th="" th<=""><th>Body Color Learn Set Bridge Set Color Set OCW/OCR</th><th>Lightness</th><th></th></th□<></th□<>	Body Color Learn Set Bridge Set Color Set OCW/OCR	Lightness	
C Shape C inspecti C Measure	Shape Set Measure Set	Parameter Area Threshold:	δ Inspect Result Lead Num.: 6
<pre> >> 1/1 Delete Delete All Apply to all Grp.</pre>	Apply Close	Seg. Threshold:	33 Ave. Lead Width: 25 100 Max Lead Width: 40 □ Pin Offset 25
OffsetY: -0.165 == Proprity QPP Set	Angle: 180 Learn Set Add Group	F Lead num check □ Black and white Reverse √ Skip Line □ White(Blue) □ White(Red) result: □ □ Set Color	ad Def. Set GReg C Inspect
NG Move to C	omp. Enter Teach Mode	Save	Exit

First, check [Image to be Inspected] to switch to the image to be inspected. Then check whether each pin in the upper part of this interface is clearly divided and whether there is foreign matter in the middle, and then debug and divide the pins by [Area Threshold] and [Division Threshold] until each pin is clearly divided, then click [Save] to return to the upper interface and click [Close].

Where the component frame is offset, as shown in the following figure:

NG Image	👧 Zoom: ———	 OK Image
	204	

The offset of a single component frame can be realized by the arrow at the top of the picture. If most component frames are offset, you can click [Move to Current Component]-[Enter Editing Mode] in the middle of the lower part of the interface, and then you will enter editing mode. The camera will automatically move to the currently shifted component and then adjust the position. After adjustment, click [Working Mode]-[Inspection Mode] in the menu bar and then click [NG] in the figure to return to the current false alarm interface, as shown below:

Option		Ē
NG Stop Repeat		Complexity of
Repeat Position Correction	compretion	Completion
▼ Debug 〒 NO Wait Confrim ▼ Not add group	\in	
Bar Code: N00010000262211B2	3	6

Debug false alarm according to this method, It is suggested that debugging should not be finished at one time, but be carried out from the new inspection download after several debugging, which is helpful to the efficiency of false alarm debugging. Click [Enter] on the keyboard to return to the start interface of inspection mode, and click [Board Out] at the bottom of the interface to discharge AOI. Debug a few more boards in this way. When the false alarm is reasonable, click [File Management]-[Save] in the initial interface. The debugging mode is completed.

8.3 CAD data import:

Using CAD data import method to edit programs can improve editing speed, reduce wrong links and effectively improve editing efficiency. To use CAD programming, it is necessary to first have the edited PCB CAD data, which includes the following elements: component pin position, component coordinate (X Y coordinate), patch angle, component material code.

The specific operation method is as follows: the file containing the above four kinds of data is exported in the form of TXT text file from the mounter or coordinate machine, and the redundant parameters of the TXT document are removed by EXCEL (only the file of single board cument is needed). The parameters are separated by unified tabs or comma or semicolon or space. The specific format is as follows:

- 52	A	В	С	D	E	F	G	Н
1	位号	X坐标	Y坐标	角度	料号			
2	C34	-51.17	71.76	0	104/C0603			
3	C33	-67.37	71.76	0	104/C0603			
4	C37	-19.09	71.76	0	104/C0603			
5	C8	-56.12	38.86	0	104/C0603			
6	C17	-57.34	54.28	90	104/C0603			
7	C1	-57.62	34.67	90	104/C0603			
8	C36	-35.08	71.76	0	104/C0603			
9	C30	-67.75	23.21	90	104/C0603			
10	C21	-49.26	48.59	0	104/C0603			
11	C6	-21.5	42.29	0	104/C0603			
12	C11	-45.5	32.97	0	104/C0603			
13	C9	-21.75	49.82	0	104/C0603			
14	C4	-3.54	62.95	0	104/C0603			
15	C5	-33.1	58.66	0	104/C0603			
16	C2	-27.43	37.59	90	10UF/C0603			
17	C15	-55, 31	18.03	0	10UF/C0603			
18	C7	-21.42	40.23	0	10UF/C0603			
19	C39	-65.85	18.03	0	10UF/C0603			
20	C13	-62.34	18.03	0	10UF/C0603			
21	C16	-73.98	58.55	0	10UF/C0603			
22	C14	-58.82	18.03	0	10UF/C0603			
23	R3	-3.54	59.42	0	热敏电阻NTC/10K/5%/R0603			
24	R67	-36.63	89.33	0	2.4k/R0603			
25	R55	-10.63	83.26	90	2.4k/R0603			
26	R64	-68.64	89.2	0	2.4k/R0603			
27	R99	-32.08	13.92	90	2.4k/R0603			
28	R96	-22.03	13.92	90	2.4k/R0603			
29	R49	-38.38	13.94	90	2.4k/R0603			
30	R101	-24.04	13.92	90	2.4k/R0603			
31	R4	-25.61	37.52	90	2.4k/R0603			
32	R94	-30.07	13.92	90	2.4k/R0603			
33	R41	-50.76	13.89	90	2.4k/R0603			
34	R40	-45.45	13.92	90	2.4k/R0603			
35	R95	-26.05	13.92	90	2.4k/R0603			
36	R100	-28.06	13.92	90	2.4k/R0603			
37	R75	-20.48	89.15	0	2.4k/R0603			
38	R50	-43.68	13.92	90	2.4k/R0603			
39	R65	-52.69	89.05	0	2.4k/R0603			
40	R102	-20.02	13.92	90	2.4k/R0603			
	4 - F	Sheet1	\oplus	AN A				

After sorting out the coordinates, start editing the program.

The method in the new mode is exactly the same as that in manual editing, so you can refer to the method of manual editing.

After entering edit mode, click [Work Mode] -[CAD Import] in the menu bar, then select the CAD file to be sorted, and click [Open] as shown below:

mp port CAD Step: eep1: No Operate	C 90 degree →
sep3: No Operate	C 180 degree − C 270 degree C 270 degre
ne must "sheet1" or ame+FX Pos+FY Pos+degree+Part Num ame+FX Pos+FY Pos+degree+Part ,"","TAB") 	
	nep4: No Operate me must "sheet1" or ame+FX Pos+FY Pos+degree+Part Num ame+FX Pos+FY Pos+degree+Part ," ", "TAB") 确定 取消

Then select [File Type] and [Unit]. If the first table name of the file is not sheet1, fill in the first table name. Then click [OK] to enter the following interface, as shown in the figure:



Enter this interface and click [Select All]. Click the right mouse button at the coordinate position of thumbnail, as shown below:

Copy (0 Deg.)	
Copy (180 Deg.)	
Delete	
Delete No Seclected Comp	
Skip	
Unskip	
Rotate 90 within Rect	
Rotate 180 within Rect	
Rotate 270 within Rect	
Rot.1 within Rect	Crrl/L
X Mirror	
Y Mirror	
Cancel	

Rotate different angles in the frame, horizontally mirror and vertically mirror to match the position of coordinate points with components on PCB board, and then drag a coordinate point on the left figure to correct it, as shown above.

Then edit the component. The selection of the component frame is the same as manual editing, as shown in the following figure:



This interface will be prompted after the component frame is made. Click [Yes], and the component will be automatically registered and the inspection frame of the components of the same item will be automatically generated. However, after the component frame is registered, its size cannot be modified. Only the property interface of the component frame can be modified. If you need to change the size of the component frame after making the frame, click [No]. At this time, the component frame is not registered and you can change its size. Register it after proper adjustment. When registering, the item number will be automatically generated for this coordinate. After clicking [OK], the inspection frame of the components of the same item

number will be automatically generated at the same time.

To facilitate editing, you can click [Component List] and then check [Show CAD Points Only]. At this time, the coordinates of components that have already been made in the list will not be displayed. Left-click and double-click the camera on the left of any coordinate interface to automatically move to the current coordinate position, which is convenient for editing components. As shown in the following figure:

Switch	Туре	X	Y	Ang	S	ID	L		
	Diode								1
	MELF								
	SOT								
	D-PAK								
	SOP								-
	Array Kesis								
	Other								
	⊡-® Loc.Pt					-			
		16.813	44.518	0	N	2	Y		
	C^C-1	13.990	43.603	0	N	3	Y		
		8.410	45.287	90	N	4	Y		
		16.696	42.778	90	N	5	Y		
	C^C-4	34.599	82.425	180	N	6	γ		11
		36.542	82.461	0	N	7	Y		
	🔞 R^R-3	24.697	80.926	0	N	8	Y		
	🕑 R^R-4	24.746	83.185	0	N	9	Y		
	■ O^O-9	13.708	50.964	0	N	10	Y		
	0^0-10	39.872	77.251	270	N	11	Y		
	C^C-6	49.588	28.863	0	N	12	Y		
	R^R-5	45.947	72.501	0	N	13	Y		
	- R R^R-6	48.606	72,485	0	N	14	Y		
	C^C-7	8.657	49 291	90	N	15	v		
	8-2^2 M	8 560	47 384	90	N	16	v		
	P-2^2	8 576	43 502	90	N	17	v		
	C C C	0.570	45.502	50		1/	1		
	E F		1		G				
	Expand	Collapse	CAD C	ell Number	: 17	CAI	O Numb	er: 16	
	Camp BautCada							Dummete	1
	Comp FartCode	- -			Libi	ary Na	me:	Fropertt	У
	_Operation		Corres	sponding Co	mp. In:	fo. —			
	✓ Only show	CAD pt.		_				Define dist. rela	
	I✔ Panel Test	Comp vis		-	-		C	or Comp:	
	All Visibl	e							
-	₩ Move to Co	mp. Pos		a gament	-		S	td dist. (mm):	
•	D.C. I	1		10					
	Reiresh						R	ange (mm) :	
:10n(F9)	Delete			1.2	- 8		- I r		8
Spec				1				I	
1 0001	All Delete			(CRITICITY)			4	ct dist(mm):	
0201	Delete CAD F	Pt.		1000	and a		n	et arst (mm/ ,	
0402		_		6	10			Def dist pts	
0402	All UnSkip	>		- Aleren					
			1.						
0 Deg.	PCB Board Comp	List Li	brary N	G Result					
	comp.								

The remaining methods and steps of editing components are the same as manual editing.

In the debugging mode, the false alarm debugging is implemented as that in the manual editing.

8.4 Setting of bad mark skip board

After the program editing and false alarm debugging are completed, the skip board can be set.

Enter [Editing Mode] after false alarm debugging. Then click [Base Board Configuration] in the editing mode and open [Set PCB Bad Mark], as shown below:

ad Mark Area	List	1	1.00	×
No. Are	a Name X Co	ood Y Coo	od Skip	Ca
New Arres	Edit Area	Del Area	Move to	Exit
New Area				
New Area	· ·]	
Skip Param	 ater this Area	Cancel Al	l Area	
-Skip Param	l] ater l this Area kip All	Cancel Al] . l Area Skip By Mark	
Skip Param Cance	der ater l this Area kip All	Cancel Al	l Area Skip By Mark	
Skip Param	ater this Area kip All	Cancel Al:	l Area Skip By Mark	

Click on [New Area], as shown in the following figure:

Set Bad-Mark			
	Area Name: SKI Skip Mark Coor X: 36.000 Color Mode Filter O Color Brightness/Cor Brightness: -100 Contrast: Ref Value Ref Value: Result Copy Right: 1	P-1 rd (mm) Y: 36 ▼ G O Mean htrast -50 0 	. 980
No. Skip Sub Area(x1,y1,x2,y2)m		Add area	Define Save Apply To All
		Delete All	Exit

First, select a screen printing or through hole in the lower left spilt of PCB board, box this pattern in the left image of the interface, and then click [Set Image] to finish, as shown in the above figure. Box the single spilt of PCB in the lower left corner on the right thumbnail of the later interface, click [Add Sub Area] after the box is selected, and then click [Save]-[Exit] to finish, as shown in the following picture:

File Work Mode PCB Info. System Para Management Help	
Image: Section Technology #:#: [refuelt] Image: Section Technology Image: Section Te	
New Area Edit Area Del Area Kove to Exit Skip Formator C Gancel All Area C Skip By Mark Exit	Mark Insect Path Optimization(F2) ↓ View Undistributed Comp.
Live Snap 🗆 Jog Move 🗆 Cross Line TOV Center 🔀 🔽 T Hide Cell FOV Comp. Location(F8) Select Comp. Location(F9) 🛃	Park Position(F3) Mark Path Reverse View UnLinked Library Comp.
Inspect Result	A hey to ilorary riv View Error Comp.
Result Eate: 43 % Offset X: 0.301 mm Result Type: Body NPS S(Rect) Bridge R SRC D SOP 0201	PCB Scan Select All Delete View Fox
Angle: 0 Deg. Y: 0.367 mm Ref. Rate: 80 8 PS S(Rnd) S(Brid) C M-Leed 3-Lead QPP 0402	PCB Image Zoom: 10 + 5 Normal View Pcb Image
C Angle Deg.	PCB Board Comp. List Library NG Result

Then you can set to skip directly when NG reaches the set ratio (the system defaults to skip directly when the false alarm ratio of a single spilt reaches 50%)

Set Bad-Iviark		8
	Area Name: SKIP-1 Skip Mark Coord(mm) X: 158.718 Y:	21. 582
	Color Mode	Г В
	Filter © Color O Mean	O Max
	Brightness/Contrast Brightness: -100 -50 Contrast:	0 50 100 0 50 0
	Ref Value Ref value: 60 Result	% Inspect % Body Color
	Copy Right: 1 Top: 0	Сору
No. Skip Sub Area(x1, y1, x2, y	2)mm Add area	Define
1 158.521, 4.186, 180.601, 6	Delate Ar	Save
		Apply To All
	Delete Al	1 Exit

After setting, click [Edit Area], as shown in the following figure:

After entering this interface, check the same image defined in [New Area] on diagonal spilt (i.e., spilt in the upper right corner), and then enter the corresponding numerical value in front of [Copy] at the bottom of the interface according to the spilt arrangement. (Note: the new area shall prevail. Enter the number of areas on the right and the top, and the number of the new area is not counted). Then click [Copy], as shown in the following figure:



Then click [Yes] as shown in the following figure:

d Mari	Area List					
No.	Area Name	X Cood	Y Cood	Skip	Ca	
1	SKIP-1	158.718	21.582	否	否	
2	SKIP-2	113.951	21.713	否	否	The state of the s
3	SKIP-3	69.184	21.844	合	合	
4	5K1P-4	24.417	21.970	8	8	
						and a start of the
	1	1	î.	1		
New A	rea Edit A	Area Del	Area Mo	ve to	Exit	
Skip	'aramater					
1.0	ancel this A:	rea Can	icel All Area	3		
	C Skip All		C Skip	By Mark		

Click [Exit]. After editing, each single spilt will automatically generate a yellow dotted frame on the thumbnail on the right. Then click [Save] in [File Management].

If there are spilts of different angles (yin and yang boards) on the PCB board, the operation of spilts of the same angle should be done first according to the above steps. Then, the operation of spilts of another angle should be started from [New Area] until it is finished.

8.5 Setting of ID mark

This function is used to inspect the front and back sides of PCB board at the same time, and two programs can be adjusted at the same time. When AOI inspects the board, the corresponding programs can be called for inspection by identifying different identification points on the front and back sides of PCB board.

After debugging the program with false positives, enter [Set PCB-ID Mark] from [Base Board Configuration] in the menu bar, as shown below:

l G		
	Set Pcb-Id Mark	×
-2013	Color Image: Color	PCB_ID Mark Center X: mm Y: mm Result: % Ref. Value: 0 % Seach Area: 3 n ▼ Blue ⊙ Colo O Mean O Max 0
E de	Contrast:	Set Inspect Close

Then, select a fixed image from the whole PCB board, box it in the fact image on the left side of the interface, and click [Set], as shown above. (Note: a clear and stable image should be selected, and the same image cannot be found at the same position on the other side of the PCB.) Click [Close] after setting, and then click [Save] in [File Management] in the menu bar.

Then, click [set PCB-ID Mark] for the program on the other side in the same way. The following interface will be prompted when reopening the program with the set ID Mark, as shown in the following figure:

AOI	
0	Message No: [1100]
	Do you want to load another Local PCB ?
	刚打开机种: 4
	刚打开文件: 4
	已打开文件个数:1
	是(Y) 否(N)

- Then click [Yes] to open the program on the other side. When testing, the camera will first inspect the position of two ID Mark points. Upon inspection of that ID Mark, the corresponding program will be called for inspection.
- 8.6 Normal inspection operation
- After entering AOI software, adjust the width of the track corresponding to its board, and then adjust the lower right corner position of PCB board after the back rail and lower cover of double track need to enter the board according to the method of new program. (Note: the position of the lower right corner should be consistent with the position of the lower right corner when editing the program, so that this program can inspect.)

Then click [Open] in [File Management] in the menu bar, as shown below;

File Open	3
File Path : D:\Machine_1\1\1	🔽 Previet
Model File	Preview Contraction of the second sec
Model: 1 File: 1 Load system light parameter Image color pre-precessing Restore previous fil	e Open Exit

Then select the corresponding model and file and click [Open File], as shown below:

选择轨道		23								
选择当前程序的检测轨道,请慎重!!										
前朝程度	后轨程序	通田								

[ID Mark] should be made for double track, which will prompt the track corresponding to this program. After selection, it will prompt to import another program and then select its track.

After opening, select [Inspection Mode] in [Working Mode] in the menu bar, as shown below:



Do not check [Debug Mode] for normal inspection. Click [Start] or press [Space Key] on the keyboard and [Start Key] on the machine to start inspection. When there is a board at the board entrance end, it will automatically enter for inspection. After inspection, it will be automatically discharged. A false alarm interface will pop up after completion of AOI, as shown in the following figure:



- After entering the false alarm interface, a board at the front end will continue to enter for inspection. When inspecting the next board, check the false alarm of this board to ensure the speed.
- As shown above, the top left is a thumbnail of PCB board, which is marked with the position of current false alarm. The spilt selected in the yellow box is the skip area, as shown in the rightmost spilt in the above figure. The upper right part is the FOV enlarged image. The lower left part is the misreported component, which can be viewed with the [Up] and [Down] keys of the keyboard. The lower right part is the actual image and registered image of components. Click the [Enter] key on the keyboard after viewing with the [Up] and [Down] keys to enter the false alarm interface of the next board.

Chapter IX SPC Database Processing

Open [System Configuration]-[System Composition] in the menu bar, check [Use Database], select [MYSQL DB], and click [....] to enter the path setting interface. Ten click [....] behind [NG Image Path] to find the database path, as shown in the following figure;

-Camera/ Illum		
FOV Size X : 32538 um Res. X: 16.269		
Y : 32624 um Y: 16.312	Connecting Information of MySQL DBServer	×
Overlap: 10 % Shutter Time: 20	MySQL Database and File Server Connection info	
FOV Pixel Size	DB Server : 127.0.0.1	
X: 2000	Database name: aoi	浏览文件夹
y } 2000	User: root	20
	Password: ************	
Extern Trigger 🗆 Illum Strobe: 10 ms	File Server 连接信息	-
	Share Server	
Axis	Share ID	🔉 🥵 Administrator 🔹 🔺
X (+, -) Limit: 493000 L -5000 R ur	Share Psd:	▶ 🥶 控制面板
Y (+,-) Limit: 382000 B 0 T u	NG Img Path: C:\Inspector\spc	▲ 1 → 1 401 → 4 本地磁盘 (C:)
W (+,-) Limit: 1000000 un	SPC Front IP:	
Avis V Avis V Avis Rail Convey	Front NG Path(SPC):	▷ (□ 本地磁盘 (0.1) □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □
Pluse/Rev 1000 1000 1600 1600 Vel Set	SPC Back IP:	<u> </u>
Lead (mm) 20 20 16 100	Back NG Path(SPC):	确定 取消
Database		
🔽 Use Database		
C MDB DB File:	0 K Cancle	
	No. On Contraction of	
☐ Write Interfac ☐ Save false record		
Light board Safe sign		
C Board1 @ Board2 C High @ Low		
Save Exit	Mark Inpsed	tt Path Optimization(F2)

After setting, the data tested every day will be saved in SPC database.

Then open [Statistical Report] in [Production Management] in the menu bar to enter SPC setting interface, as shown in the following figure:

-DataBase Set		浏览文件夹
	human and here and he	Select Path
DataBase	MYSQL	A Transitor
User:	admin	library
		LDG
Psd:	*****	DCR
		spc
IP Addr:	127. 0. 0. 1	📕 backup
NC Imago Po	+b	> 📙 NGHistory
NG IMage Ia	C:\Inspector\spc\NGIMAG []	D MGIMAGE
k-	e	
Mode Set		
Mode	Default Mode 🔻	

The login password is: aoisupervisor. NG file path is as shown above. Then click save. General factory settings have been completed.

After setting, you can query all kinds of reports in this SPC software, and query reports according to procedures, time periods and defect types.

Zeibit lie	HOLE I																			
-TERRIT B	1863.011			-																
总元件数	不良元件数 元件2	「良峯」总板数	不良板数	单板	不良案 直通率															
1524	284	19	8	6	75	25														
工由未用		That		1	了自然是			The	计目体体育											
て自由共用	て自然田(本)	「天白云社々	了自動量		Tells	て自動田		RAIR	TTANIAL	(合要		て由未利	1							
信約	55	R-3-2	10	H	0-59	23	H	160624	141410	0-3-1		AD 12	-							
ESERT.C.M	54	C-1-2	9	-	R-2	22		160624	141410	0.2-1		50.0	1							
morter	52	R-5-2	9		R-5	20		160630	105946	0.65	1	AUNT								
設生	49	C-3-1	9		R-4	19	-	160630	105946	0-75-	1		1							
少揚	12	R-2-2	9		R-3	18		160630	105946	0-75-	1		1							
虚焊	10	C-2-1	8		C-7	17		160530	105946	0-70-	1		1							
短路	8,	C-4-2	8		C-1	16		160630	105946	0-65-	1		1							
12/2	2 -	C-5-1	8		C-2	15		160630	105946	0-1-1										
<u> </u>		0.4.1		4	C.8	16	-	1606.30	101046	0.7.1			1							
序列号	机制	þ.	批次		正/反西	ē 检测结果	检	則日期	检测时间	机器名	元件总裁	品約	不良元	井設 确认不良类	生 检测限制	结果值	位置	料号	6lock	
16062414141) Tes		0624-1		正面	NG	201	16-06-24	14:14:10	00009		3	1	2 罷焊	70	83	0-2-1	0-2	0	
16062414141) Test		0624-1		正面	NG	201	16-06-24	14:14:10	00009		3	1	2 虚焊	70	22	0-3-1	0-3	0	
16063010594	5 Test		0628		正面	NG	201	16-06-30	10:59:46	00009	3	22	82	16	0	4	0-65-1	O-59	14	
16063010594	5 Tes		0628		正面	NG	201	16-06-30	10:59:46	00009	3	122	82	16	0	4	O-70-1	O-59	13	
16063010594	5 Test		0628		正面	NG	201	16-06-30	10:59:46	00009	3	22	82	16	26	25	R-2-3	R-4	11	
16063010594	5 Tes		0628		正面	NG	201	16-06-30	10:59:46	00009	3	22	182	16	28	20	0-75-1	0-74	9	
16063010594	5 Test		0628		正面	NG	201	16-06-30	10:59:46	00009	3	122	82	16	28	24	0-75-1	0-74	13	
16063010594	Tes		0628		正面	NG	201	16-06-30	10:59:46	00009	1	122	182	16	28	24	0.75-1	0-74	14	
16063010594	Tes		0628		正的	NG	201	16-06-30	10:59:46	00009		22	182	16	28	24	0-77-1	0-74	6	
16063010594	Tes		0628		正說	NG	201	16-06-30	10:59:46	00009		22	282	16	43	26	0-65-1	0-59	13	
16063010594	Tes		0628		上的	NG	20	16-06-30	10:59:46	00009		22	282	10	43	39	0-1-1	0-59	11	
16063010594	Tes		0628		上面	NC	201	6 06 30	10:59:40	00009		122	1812	10 285#		3/	0.69.1	0-72	9	
16063010394	7 Tes		0628		12.00	ANC .	201	6 06 20	10.39.40	00009		122	19.3	10 301+ 14 535077-m	0	7	0.67.1	0.50	2	
16063010594	Tes		0628		1.10	NG	201	6-06-30	10-50-46	00009		122	82	16 db/9	0	5	0.71.1	0.59	-	
16063010594	Tes		0628		正面	NG	201	16-06-30	10:59:46	00009	3	22	18.2	16 世代	0	13	0-62-1	0-59		
16063010594	Tes		0628		正面	NG	20	16-06-30	10:59:46	00009	3	22	82	16 当出	10	7	R-4-3	R-5	2	
16063010594	Tes		0628		正面	NG	201	16-06-30	10:59:46	00009	1	122	82	16 溢出	40	34	0-72-4	0-72	3	
16063011052	5 Test		0628		正面	NG	201	16-06-30	11:05:25	00009	6	44	574	40	0	12	0-62-1	O-59	9	
16063011052	5 Test		0628		正面	NG	201	16-06-30	11:05:25	00009	6	44	574	40	0	4	0-1-1	O-59	7	
16063011052	5 Tes		0628		正面	NG	201	16-06-30	11:05:25	00009	6	44	574	40	0	4	0-62-1	O-59	4	
16063011052	5 Tes		0628		正面	NG	20:	16-06-30	11:05:25	00009	6	44	574	40	0	4	0-63-1	O-59	1	
16063011052	5 Test		0628		正面	NG	201	16-06-30	11:05:25	00009	6	44	574	40	0	4	0-68-1	O-59	8	
16063011052	5 Tes		0628		正面	NG	203	16-06-30	11:05:25	00009	6	44	574	40	0	4	0-71-1	O-59	0	
16063011052	5 Test		0628		正面	NG	201	16-06-30	11:05:25	00009	6	44	574	40	0	4	0-71-1	O-59	1	
16063011052	5 Test		0628		正面	NG	201	16-06-30	11:05:25	00009	6	44	574	40	0	5	0-1-1	0-59	4	
16063011052	5 Test		0628		正面	NG	201	16-06-30	11:05:25	00009	6	44	574	40	0	5	0-68-1	0-59	1	
16063011052	5 Test		0628		正面	NG	201	16-06-30	11:05:25	00009	6	44	574	40	0	6	0-67-1	O-59	9	
16063011052	5 Tes		0628		正面	NG	201	16-06-30	11:05:25	00009		44	574	40	0	7	0-61-1	O-59	7	
16063011052	Tes		0628		上面	NG	201	10-06-30	11:05:25	00009		100	174	40	0	7	0-67-1	0-59	2	
10003011052	Tes		0628		上的	regi auto	201	10-00-30	11:05:25	00009				-10	10	-	K-4-3	K-5	0	
100 million (1997)			- 10.20		() H () H ()	1000		100 Th (0.00	1 1 1 1 1 1 2 2 2 3	10.000.000	- C. 198						the second se	The second se		







Chapter X System Parameter Settings

In [Editing Mode], open [System Composition] in [System Configuration] in the menu bar, as shown in the following figure:

System Config.	
AOI Info. Model: VL-800 rial No.: 000001 Product data: 2020-03-18 Line: SMT-1 PCB Zero Pos.	Camera/ Illum FOV Size X : 32538 um Res. X: 16.269 Y : 32624 um Y: 16.312 Overlap: 10 % Shutter Time: 20 ms FOV Pixel Size X: 2000 Y: 2000
Front Track C Back Track Left Offset X : 492440 um Y : 378960 um Right Offset X : -3400 um Y : 378960 um Y : 378960 um Park Pos. Cur. Pos. Y : 140740 um Y : 197880 um	
Rail/Convey C Right->Let C Left->Right Auto Width Control I In And Out Insi Inspect And Pct PCB Out And In On PCB Remove Delay: Pcb LoadReg Delay: Back Plate Delay: PCB Load Dist Offset: 50 mm	Lead (mm) 20 20 16 100 Database Image: State s
	Save Exit

Front rail/rear rail: setting the zero position of the front and rear rails respectively.

Left offset: setting the position of the lower left corner when creating a new program.

Right offset: setting the position of the lower right corner when creating a new program.

Park position: the position of the machine to be inspected.

Rail/convey:setting the plate feeding direction of the rail.

Right board entry: right board entry and left board exit.

Left board entry: left board entry and right board exit.

Automatic rail width adjustment: the monorail and the lower cover can be automatically adjusted according to the track width saved by the program.

In and out insi: matching with the previous board entry direction to achieve in and out in the same direction.
Same-side inspection: matching with the previous board entrance direction and simultaneous entrance and exit in the same direction to achieve one-way entrance and exit and inspection in the same direction.

Speed setting: enter the running speed setting of the camera by opening [Speed Setting] alone.

FOV pixel size: the size of each image captured by the camera, in pixels.

Software limit: the limit of X.Y axis

Database: storage path of SPC data.

Open [System Technical Parameters] in the [System Configuration] in the menu bar under [Editing Mode], as shown below:

System Parameter	x
-Option-	
🗹 Last Program Auto Load	PCB Bad Mark Check
🔲 Auto_load PCB Model (Barcode Gun)	Use Bad-Mark before Fiducial Mark
🗹 Open Multi Pcb	Auto Change Teach mode when Fail
☑ Angle Check Or ⁵ Degre	Detect offset only is standard
☑ Do not view the inspect result	Foot Switch Check, Delay: 50 ms
☑ Using Error Code Change	Mark Fail, Remove PCB Delay: 0 s
Safety Sensor Check	□ Save Log File
🗹 Do not View Group Info	Close Tc On Check OCV
Event of MOUSE ON Director Availd	Fill NG Fow at Full Screen Display
☑ Split Inspect in Region	Close Been On InspectNG
Debug OnLine	Close beep on inspectivo
□ Panel NO View 00x00 NG View: Row:left -	Dienlan Gren sher
Many Barcode Mode NG Save	
Compare Best Of Inspect	Sharpen Image 60
✓ Kotate with the angle of mark point	Sharpen Image 2
Separate Inspect	AUTO Inspect IDMark
Save SPC NC Pictures with Search Size	RegionalChannelCheck
D save are no rictures with search size	Auto Save PCB
TRed Glue PCB	Synchro Move of Panel
🔽 No Wait Confirm Display	▼ 0201/0402 Split Detection
-Barcode set	Machine Folder Drive : D: 👻
✓ Barcode switching program	MachineNo.
Barcode NG: Direct out board 💌	C Drive Capacity 1 GB
Export CAD Step:	Auto Save 30 minute
Step1: No Operate	Fow Motor Delay 5 ms
Step2: No Operate	SN Style: Default Style 🗸
No Operate	Save Exit
Step4: No Operate 🗸	

This interface shows some basic options for AOI equipment, as introduced in the following part:

Last Program Auto Load: prompting {Open the Previous Program} at startup

Auto_load PCB Model (Barcode Gun): different boards will be tested after matching the opened program according to the barcode after scanning.

Open Multi PCB: used for collinear inspection of various PCB boards, and distinguished by ID Mark.

Do not view the inspect results: when meeting NG PCB during the test, if the user wants to display NG on the screen but doesn't want the NG interface to pop up, the user can check [Do not View the Inspect Results].

Use user-defined NG code: the system itself has set some NG codes for NG category, but it is usually not applicable. The user should check [Use User-defined NG Code]

Safety Sensor Check: used to close and open the safety light curtain.

Do not View Group Info: in editing mode, if multiple groups are added to an inspection frame, the system will pop up the images of each group at the bottom of the screen. If the user doesn't want to pop up this window, check [Do not View Group Info].

Spilt display mode: used for displaying false alarms according to the arrangement sequence of spilts when checking false alarms by BGA.

Many Barcode Mode NG Save: when each spilt of PCB has barcode, it can be stored according to barcode of single spilt.

Rotate with the angle of mark point: whether the image of a single FOV rotates with the rotation angle of Mark point.

Separate inspect: when checked, FOV photographing and inspection are separated, and it is not necessary to wait for the inspection operation to be completed before taking the next image. At the same time, there will be cases where the result will be produced after the operation is completed, such as delay after the image of the whole PCB is taken.

Optimizing the Park of Double Track: this option is used by double-track AOI, and it is not necessary to return to the park position for inspection when the front and rear tracks are switched, which can speed up the inspection.

Save SPC NG Pictures with Search Size: when checked, SPC will save images with search range size.

Red Glue PCB: used when editing red glue board program., After checking, the default inspection option of bonding pad is [Glue Overflow], which speeds up the program.

No Wait Confirm Display: in inspection mode, if the user chooses not to wait for result confirmation, and has not confirmed and closed NG result window in time, the next PCB result will not cover the current unconfirmed result window under normal circumstances. But if the user wants subsequent inspection results to cover the current result window in time, the user can check [No Wait Confirm Display].

PCB Bad Mark Check: if users need to use skip area, they need to check the function "PCB Bad Mark Check".

Only inspect the offset according to the standard: for the area method inspection frame, the user can

select to inspect its actual rotation angle by checking [Inspect Angle Offset]. If it exceeds the set allowable rotation angle, it will be reported NG. Selecting this function will slightly increase the inspection time.

Save log file: if special system problems need to be eliminated, the user can choose to save the log file and hand it over to the supplier for technical analysis.

Close Beep On InspectNG: if the user's machine is equipped with sound, the user can choose to turn off or turn on the sound effect. This equipment is generally not applicable.

Automatic double track recognition: this option is used for double track online machine. When the double track calling program is checked, it will prompt the use track of the current program. During the inspection, it is unnecessary to inspect ID Mark and directly call the inspection program according to the track, thus saving the inspection time.

Automatically save PCB thumbnail: when saving PCB data, the thumbnail of each board will be saved.

Synchro Move of Panel: when checked, if moving the component frame of PCB, the same component frame on other spilts will also move at the same time.

0201/0402 split inspection: when checked, [split inspection] will be automatically checked when [0201] and [0402] frames are used for making frames during program editing.

Machine Folder Drive: the user can choose to set the operating system drive letter and folder number of the program file storage. For example, if D and 1 are selected, the program files will be stored under D:\Machine_1\, and stored hierarchically according to the model and file name.

Auto Save: the system automatic saving time setting can remind users to save program files within a fixed time, so as to avoid the loss of the program being edited when the machine is shut down due to special software and hardware reasons.

Mode: the system also provides special mode settings for non-standard system users, which can be ignored by standard system users.

In [Editing Mode], open [User Management] in [System Configuration] in the menu bar, as shown below:

User ID	Role	Password	Disable	Creation Time
A001	00: Administrator	123456	RELEASED	Fri Tan 16 10:14:41
B001	02: Operator	234567	RELEASED	Fri Jan 16 10:14:50 2
GGGH	02: Operator	111111	RELEASED	Wed Dec 02 16:37:03 2
Create II	ser Change Harr	Delete liser		tive User Frit
oreate u	unange user	berete user	Je only he	Live uses

In the sub-interface, you can set the login user's authority and password. The authority is divided into [Administrator], [Programmer] and [Operator], and the password can be modified in [User Maintenance].

In the [Editing Mode], open [Bar Code Settings] in [Substrate Configuration] in the menu bar, as shown below:

'arameter		
I Barcode E	nabled	Length: 0
C Gun		ode Formate:
C Read Bar	code File	
One-Dim	1	
EAN8	C EAN13	C CODE39
C CODE93	C CODE128	C Other
	Barcode In	nage
Barcode Area pper-LeftX:	(mm)	Try Read Code
Barcode Area pper-LeftX: pper-LeftY:	(mm) 0.000 0.000 Move	Try Read Code
Barcode Area pper-LeftX: pper-LeftY: ower-RightX:	(mm) 0.000 Read 0.000 Move	Try Read Code

In this interface, you can set the bar code format and bar code area after checking [Start Bar Code], and the test data will be saved according to the bar code during the later test.

In the [Editing Mode], open [MES Settings] in [Substrate Configuration] in the menu bar, as shown below:

OutPut Type			
• Text C HTTP			
Save path set			
 OK And NG Same Path 	C OK and NG Oth	ner Pa	
Path:			
Path:			
TestTime SMT ModelName FileNamne LineName SerialNo CheckSign	Add >>	TestTime SMT LineName SerialNo	
UnderLine HorizontalLi FileName: TestTime SMT LineNa	ne me SerialNo		
File retention time : 0	(0-forever,unit: e:it can only be an	:day) interge, e.g: 8,15,18	3)
		Set	Close

The format and path of MES upload can be set after [MES Upload] is checked in this interface.

In the [Editing Mode], open [Register Default Settings] in [Base Board Configuration] in the menu bar, as shown in the following figure:

Components registered default setting		×
Capacitor Color Mode	Color extraction	Postion Offset:
🔽 R 🔽 G 🖾 B	Type: Insufficient Sold 🔽 🦵 Reverse Extraction	DX: 100
	Body Cell Color Show: TRound Get Barycenter	DY: 100 Angle
Other Color Mode		/
▼ R ▼ G ▼ B	Lower 170	Search Area:
	Upper 270	Range ratio: 80 %
	Lightness	✓ Solder follows position result
Brightness (Ontrast- (Ennance Capacitor)	Lower 40	Detection angle offset
	Upper 200	Split Inspect
Contrast: 0 0	Saturation	Algorithm
- Pof Volue Pargo	Lower 40	Resistor silk: OCV Other Silk: OCV C Statistical Mode
Rei valde Kange	Upper 255	Body: Regional - @ Weighted mean
Capacitor:	Ref. Value	Chip Paste: Color Ex 🗸 IC Paste: Regional 🗸
RC Single Box : 80	Lower bb	-All Panel.
0ther: 80]]	Upper 100]	Threshold: 200
	Solder Insufficent Color extraction Ref	Deep Threshold: 60
QFP	TAuto Adjust Lower of Result 75 📩 %	🗆 Blue Channel (Gray is Deault)
Threshold: 00)	V Lower Ref Limit	
Line Scale: 70	Lower Lmt: 10	OUV Parameter
Line Extend: 6 -	Inspect Set:	Deep Ihresh: 0 Ref + 0
🔽 Skip Line	Type: Resistance capacitance pad 🔻	Area Ihresh: 50 Is valid
	🔽 Lesstin 🗖 UnSolder 🗖 TinHole	Kef Value: PU
_ IC Lead Reg Set	☐ Exposed copper ☐ Overflow glue ☐ Wave foot	Max and Min diff:
☞ Width Limit Max Width: 100 Pixel	□ Solder Short □ Capactitance polarity	Threshold Proc: Default
	Change project name: Default 🗸	OCV Light Channel: Defualt RGB
NG Type Set		
Inspect Type:本体检测• NG Type: Default •	C Copper Leakage C Glue C DIP	Load Default Save Exit
	C Bridge C CAP	

In this interface, users can set the default value of each type of component frame when editing the program, and can modify the value according to their own needs to improve the efficiency of program editing.

Chapter XI Common Equipment Faults and Troubleshooting Methods

1. Shake during machine operation

Reason and solution: the level of the machine is not adjusted properly. Use a level meter to adjust the level of the machine and tighten the screws fixing the foot cup.

The steps for adjusting the machine level are as follows:

- (1) Suspend the four legs of the machine
- 2 Adjust the level of the left and right of the machine
- ③ Adjust the level of the back and forth of the machine (only one foot in front should be adjusted. An area can be fixed with 3 points), put down the suspended foot cup of the machine and tighten the screws for fixing the foot cup.
- 2. Electric shock when touching the machine

Reason and solution:

The ground wire of the machine has poor contact or is not grounded, and induced electricity with a certain voltage will be released through the servo driver during the operation of the machine.

This problem can be solved by grounding protection. The specific method is to lead a wire from the rear cover screw of the machine and connect it to the dedicated ground wire of the workshop. (Note: do not confuse or misconnect electrostatic wires with ground wires)

3. The machine makes the sound of "beeping" for a long time.

Reason and solution:

Computer hardware failure. Check whether the memory module is firmly inserted and reinsert it after pulling it out. Or, the computer maintenance personnel check for other faults.

4. The system prompts that X axis or Y axis cannot be moved when running the program

Reason 1: poor interface contact of motion control card.

Solution: close the program, pull out the interface of the motion control line, check whether there is any blockage or deflection at the interface, and reconnect after eliminating the problem.

Reason 2: poor contact at X or Y filter or falling off.

Solution: close the power supply and open the machine casing to confirm whether there is any poor contact.

Reason 3: loose wiring of the motion control card.

Solution: open the back cover of the machine, use a multimeter to inspect, and lock the loose part.

5. Black screen of display

Reason: the display power supply is not turned on or the signal line is not connected properly

Solution: check the power and signal lines of the monitor.

6. The component frame offsets when moving the camera left and right or back and forth

Cause: lens calibration is not accurate.

Solution: calibrate the lens. Select a clear character or positioning hole on the surface of the currently inspected PCB for lens calibration. There should be no similar pattern near the calibration area, otherwise the calibration result will be inaccurate.

7. Too many misjudgments in normal inspection

Reason 1: the component frame offsets

Solution: ① Check whether the PCB is fixed and fix the PCB and fixture.

⁽²⁾ Make the machine return to the calculation starting point to inspect whether the coordinates of the components offset as a whole. Then, reset the coordinate starting point.

Reason 2: incoming materials are changed (stand-by materials are used)

Solution: re-register a standard with new components and include the component standard and the newly-built standard into the same group.

Reason 3: inadequate learning and debugging lead to false report.

Solution: debug a few more boards.

8. Missing judgment of component

Reason 1: the component has no registered standard

Solution: register standard for the component and optimize the lens.

Reason 2: there is no lens optimization after adding components.

Solution: optimize the lens

Reason 3: the error range of the standard linked to the component is too large.

Solution: reduce the error range of the component standard by reducing the error multiple or re-register a standard to replace the component standard.

9. Constant offset or reversal of several components during inspection

Reason 1: the component frame has offset.

Solution: move the lens to the position of the component and pull the component frame

straight.

Reason 2: the incoming materials of components have been changed or the silk screen has been changed.

Solution: re-register a new standard for current component and include it and the component standard into the same group.

10. Missing inspection of IC pin short circuit

Reason 1:there is no short circuit inspection frame for IC pin.

Solution: carry out short circuit inspection on the standard of this component in the standard library.

Reason 2: the threshold of short circuit inspection is too large.

Solution: reduce the short circuit inspection threshold of components in the standard library.

11. Inspection failure because Mark point identification fails

Reason 1: PCB is not fixed properly.

Solution: lock the fixture for the PCB to fix the board.

Reason 2: PCB is not placed in the direction of thumbnail.

Solution: place the PCB in the direction of the thumbnail.

Reason 3: program debugging error.

Solution: check the inspection model name and call in the correct test program.

Reason 4: the component Mark point was not selected well. Or, the Mark point was oxidized on PCB and the color difference is too large.

Solution: cancel all Mark points and select other points to set Mark points.

12. The inspection cannot run normally after the exchanges of the programs made by two machines.

Reason: it is impossible to ensure that the mechanical origin of each machine is in the same position during the machine manufacturing process, and the coordinate origin for programming corresponds to the mechanical origin.

Solution: reset the origin of coordinates after the exchanges of the programs made by two machines, and then realign the position of the component frame for the exchanged programs. However, the program exchange between the two machines is only applicable to the PCB inspection program files that can be shared between the machines with the same board feeding direction and track direction and the same inherent resolution of the lens.

13. The host is not powered on

Cause: power socket failure.

Solution: use a multimeter to determine if there is voltage at the power input. If there is no voltage, it indicates that there is no power input, and the power supply needs to be replaced.

Chapter XII Repair and Maintenance of Equipment

12.1 To ensure the normal operation of the equipment and prolong its service life, please perform the following regular maintenance work:

a) At the end of the day, turn off the power supply of the computer and equipment, and suck the dust on the equipment table surface with a vacuum cleaner. If there is no vacuum cleaner, dry towel can be used to wipe off the board dust and the like from the bench surface. Note: do not blow the surface with an air gun. The dust and debris will be blown into the top of the equipment and will attach to the screw rod, guide rail or lens, which will affect the accuracy and service life of the equipment. If metal debris is blown into the electrical appliance, there may be short circuit and fire.

b) Wipe the dirt on the equipment surface with towel. Note: do not use organic solvent (such as board washing water) to wipe the surface of the equipment, otherwise the paint on the surface of the equipment will be damaged.

c) Maintain the screw rod and guide rail every month. Clean the old oil with clean white cloth, and then evenly brush the oil on the surface of the screw rod and guide rail with No. 10 or No.11 oil brush. Note: grease and lubricating oil must be of good quality. Otherwise, the surface friction on the screw rod or guide rail will be increased, thus shortening the service life of the screw rod and guide rail and affecting the accurate positioning of the machine. Recommended: Germany OKS Super Grease OKS422, or referring to the grease used in mounter maintenance.

d) Clean the filter cotton on the left side of the industrial computer panel every 1 month. Note: filter cotton should be dried after cleaning and then put back in place.

e) Check the light source every 3 months. Since the brightness of LED lamps may change slightly after half a year, the light source needs to be inspected once to ensure normal inspection.

f) Calibrate the camera every three months. Since the camera keeps moving every day, it is necessary to check whether the camera screws and lens screw are fixed properly and whether the calibration value is within the acceptable range.

12.2 Detailed inspection process of each component

1) Determining whether each groove-shaped photoelectric sensor works normally

There is one X-axis and one Y-axis on this equipment, and there are two groove-shaped photoelectric sensors in the width direction of the track. If paper is put into or taken out of the groove, the signal lights will normally be on or off.



2) Determining whether the PCB photoelectric sensor works normally

The equipment is equipped with a photoelectric sensor at the rail inlet end, the left baffle cylinder, the right baffle cylinder and the outlet end respectively. Under normal conditions, when a PCB passes through the rail, the signal lamp color will changes.

3) Determining whether the mechanical limit switch works normally

There is a mechanical limit switch at the end of the X axis and Y axis of this equipment, which can be checked and confirmed by multimeter. Under normal conditions, both ends of the connecting line are in conducting state. When the axis runs to the end, the mechanical limit is pressed to disconnect both ends of the connecting line. If the mechanical limit switch is damaged, a spare part installed in the side-by-side position can be used for replacement.

4) Lubrication and maintenance of screw rod and guide rail parts

Screw rod and guide rail are the main transmission components of the equipment operation. Their maintenance is the most important part to ensure the transmission and positioning accuracy of the equipment. During the annual major maintenance, special attention should be paid to removal of old oil and dust and application of new oil. It is recommended to use the German super lubricating grease OKS-422. The specific operation steps are as follows:



Step 1: use cloth strips to wipe off the old oil on the screw rod/guide rail.

Step 2: apply grease evenly on the surface of the screw rod with a special oil gun, and push the X/Y axis to move back and forth to absorb the grease.



Step 3: if the slide block on the guide rail has an oil nozzle protection cover, take it off before filling.



Step 4: insert the oil injection gun head into the oil injection nozzle of the sliding block and press it tightly. Gently press the pressure rod of the oil injection gun to evenly inject grease into the sliding block, and make the sliding block slide back and forth on the guide rail to evenly apply the grease.



12.3

3. Confirmation form of check process/results

	No.	Check content	Inspection result	Responsible person	Remarks
	1	Check whether the power supply is well wired and grounded.			
	2	Check whether the power supply and signal wiring on the back of the host are in good contact. Lay emphasis on motion control card and image collection card.			
	3	Check whether the camera fixing screws re firm.			
	4	Check whether the light source connection is stable and whether the light source will flash when shaking the light source line.			
Hardware part	5	Check whether the light source casing will collide with the machine housing; use the mirror to check if there is any unlit LED inside the light source.			
	6	Check whether the track screws are tight and whether the width adjustment function is normal.			
	7	Check whether the buttons on the machine panel are normal.			
	8	Check whether the main power switch of the equipment works normally and whether it is fixed and locked.			
	9	Check whether the camera cover is properly installed.			
	10	Repeatedly lift and lower the flip cover of the display to observe whether there are abnormal image display and other abnormal situations.			
	11	Check whether the host is fixed and locked by screws.			
	12	Check and clean the filter screen at the front end of the industrial control			

		computer.		
	13	Check whether the display works normally, whether the buttons are operated effectively, and whether there are scratches on the surface, etc.		
Software part	14	Clear the hard disk files that are not necessary for the equipment and store the files in categories.		
	15	Open the machine condition monitoring window to check whether the origin signal, limit signal and in-place signal of the X axis and Y axis are normal.		
	16	Check whether the working regions of the X axis and Y axis are all within the visual range of the camera.		
	17	Check whether the aperture and focus adjustment screw on the camera lens are locked.		
	18	Start and exit the program to see whether AOI software can be started normally and whether there is any error.		
	19	Open the light source brightness inspection window and use the color paperboard to adjust the light source to the standard value.		
	20	Take a PCB for lens calibration.		
	21	Use PCB to make a simple program: check whether the standard registration is normal and whether the inspection frame will offset during the inspection.		
	22	If fixture is used, check whether the fixture and clamp plate is normal (whether the plate is firmly fixed).		
	23	Check whether the equipment system backup is normal		
Abnormal situation, handling and				

results	
Remarks:	1. In the table, \circ indicates normal situation, and " x " indicates abnormal situation
	2. In case of any abnormality, the abnormal situation, handling and results must be filled in and signed by the responsible department head for confirmation.
Equipment mainta	ainer: Approved by: Reviewed by: