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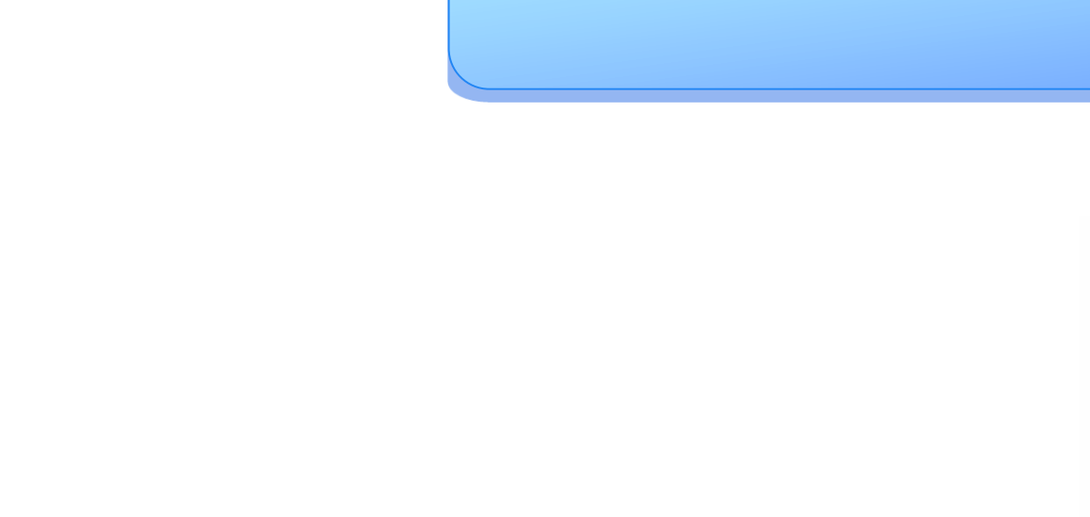
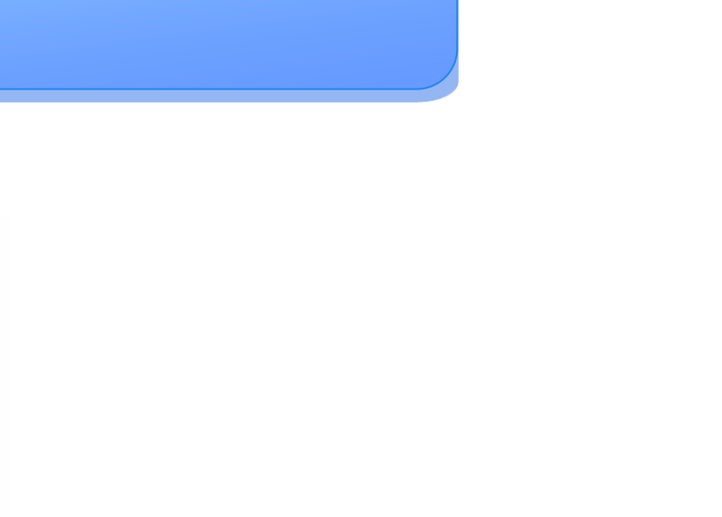
AOI Automatic optical inspection machine

S-AO600C

On line/Off line





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AOI working principle

Automated optical inspection machine (AOI) is a new type of testing technology. It has developed very rapidly in recent years. The structure of AOI consists of four parts: workbench, CCD camera system, electromechanical control and system software. When testing, firstly, the circuit board to be tested is placed on the workbench of the AOI machine, and the detection procedure of the product to be detected is called out through positioning. The X/Y workbench will send the circuit board under the lens according to the command of the setting program. With the help of the special light source, the lens will capture the image required by the AOI system and analyze it, then the processor will move the lens toward the lens. The next position is collected for the next image and then analyzed, and the image is subjected to continuous analysis and processing to obtain a higher detection speed. The process of AOI image processing essentially digitizes the extracted image, and then compares it with the pre-stored "standard". After analysis and judgment, it finds the defect to make a position prompt, and at the same time generates image text, and the operator further confirms or sends the repair station. Overhaul.

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Why Use AOI ?

Manual inspection

- Labor wages continue to rise
- Workers are highly mobile and frequently train newcomers
- Visual inspection is prone to fatigue and emotional
- Large difference in inspection standards

Use AOI

- One-time investment, low overall investment
- Equipment is faithful to serve you
- Running 24 hours a day
- Standardized operation

AOI plays a full role in the miniaturization, high-density, rapid assembly, and diversified development of SMT. The amount of information detected is large and complex, both in terms of real-time detection and feedback, and in the analysis and diagnosis of correctness. The era of manual visual inspection is gone forever. The intelligent development of AOI technology is bound to become an inevitable development trend.

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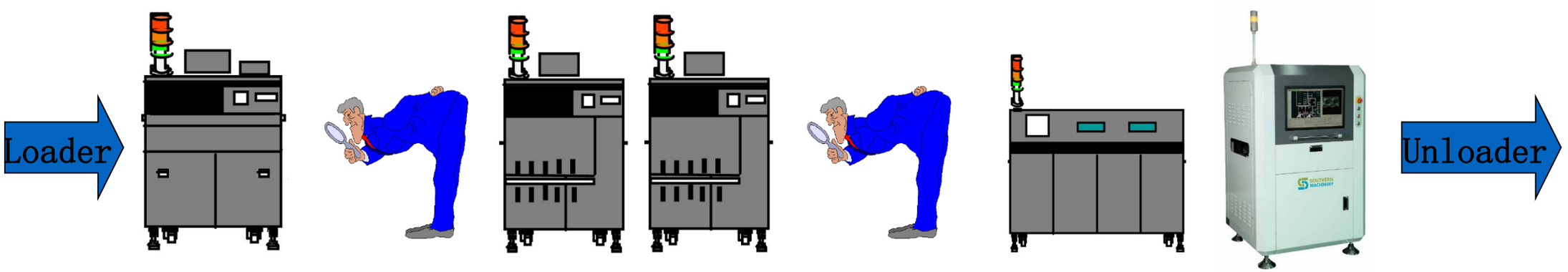
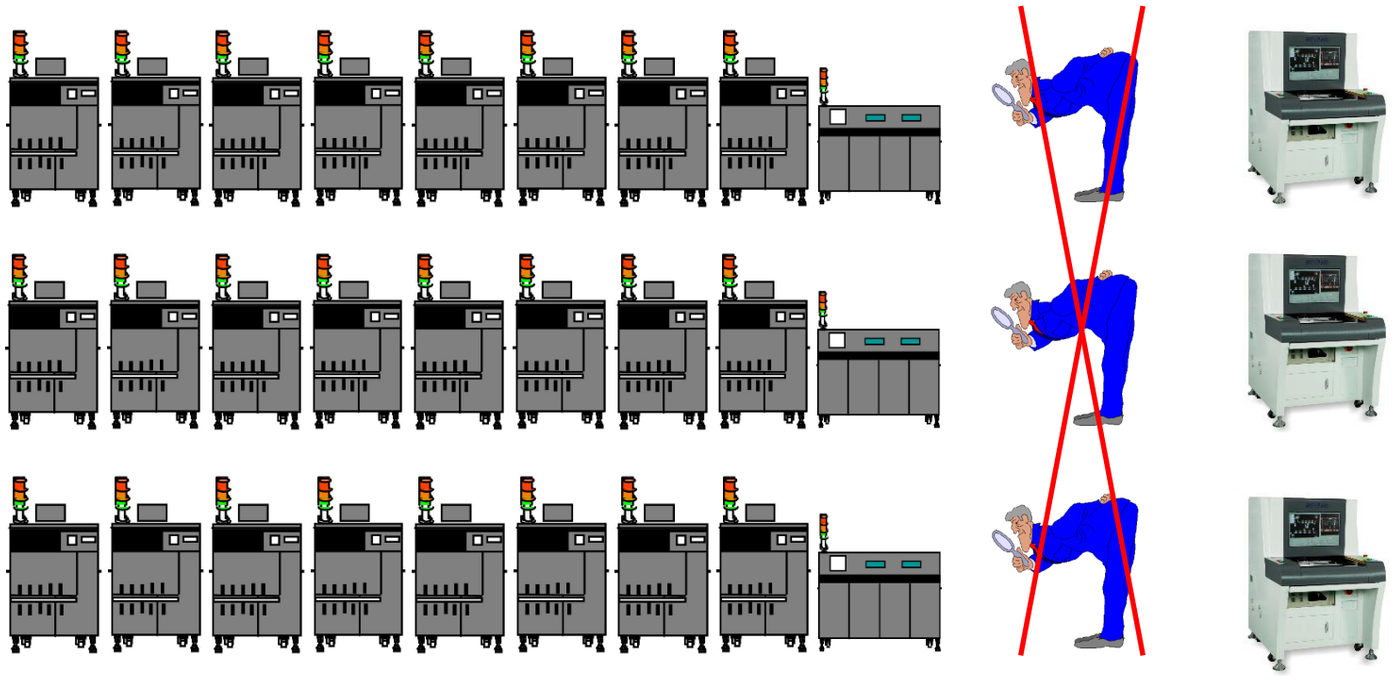
AOI Implementation Target

1. Verify the final quality of the PCB, usually at the end of the line.
   A concentrated reflection of the production process of the entire SMT production line.



Printer Manual Check PNP*n sets Manual Check Reflow AOI



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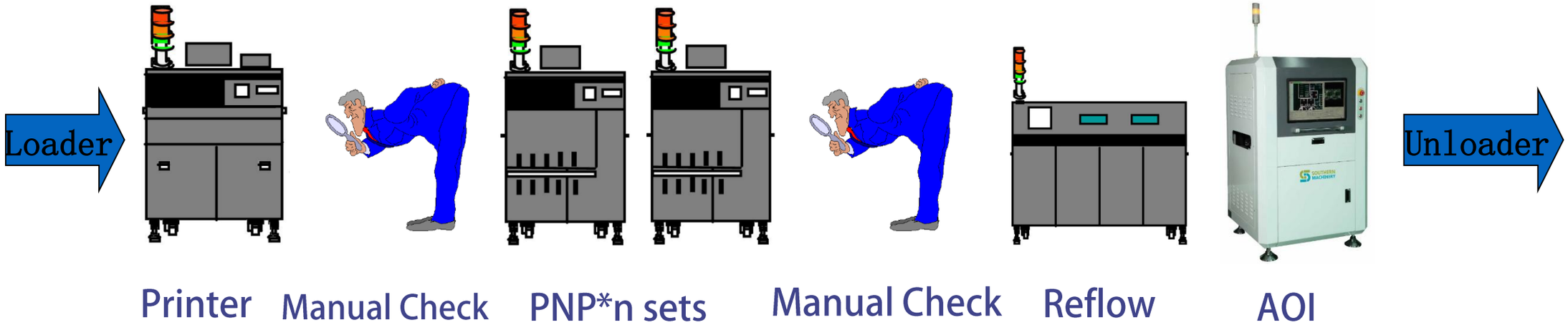
AOI Implementation Target

2. Process tracking, placing multiple AOIs in several locations on the production line, monitoring production status online, and providing a basis for process adjustment.



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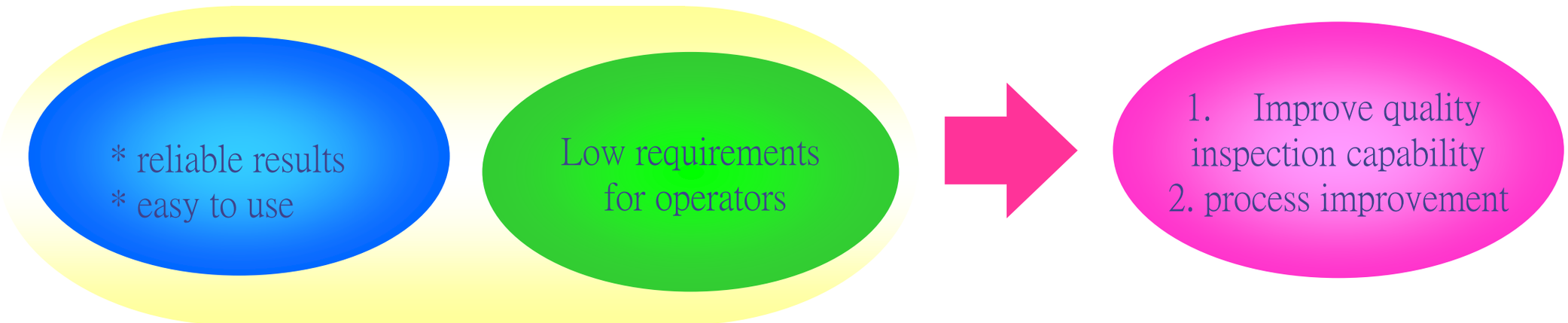
Comparison of detection results

Inspection Method	Efficient	Cost	With feedback ?	Support online production
Manu Inspection	Low	High	No	No
AOI Inspection	High	Low	Yes	Yes



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Feature

1. A variety of calculation methods to ensure accurate detection results, high detection, low false positives.
2. RGB three primary color light source enhanced detection effect
3. Programming and debugging methods are simple, one-click frame, quick debugging
4. Support the placement machine to import coordinate data
5. Industrial digital camera captures high-definition images at high speed
6. Million-level pixel HD lens
7. The servo motor and the grinding ball screw cooperate to form a precision conveying mechanism
8. Ergonomic design
9. Applicable to 0201 chip inspection capability
10. Upgrade space with accurate 01005 chip check
11. Support automatic connection with front and rear equipment on the production line (online type)
12. Test results automatically send OK / NG signal to the closing machine (online type)
13. Storage inspection results record for future reference
14. Image library management image data of commonly used components
15. Support jigsaw fast copy program and bad jigsaw skip detection
16. Optional: repair station, offline programming

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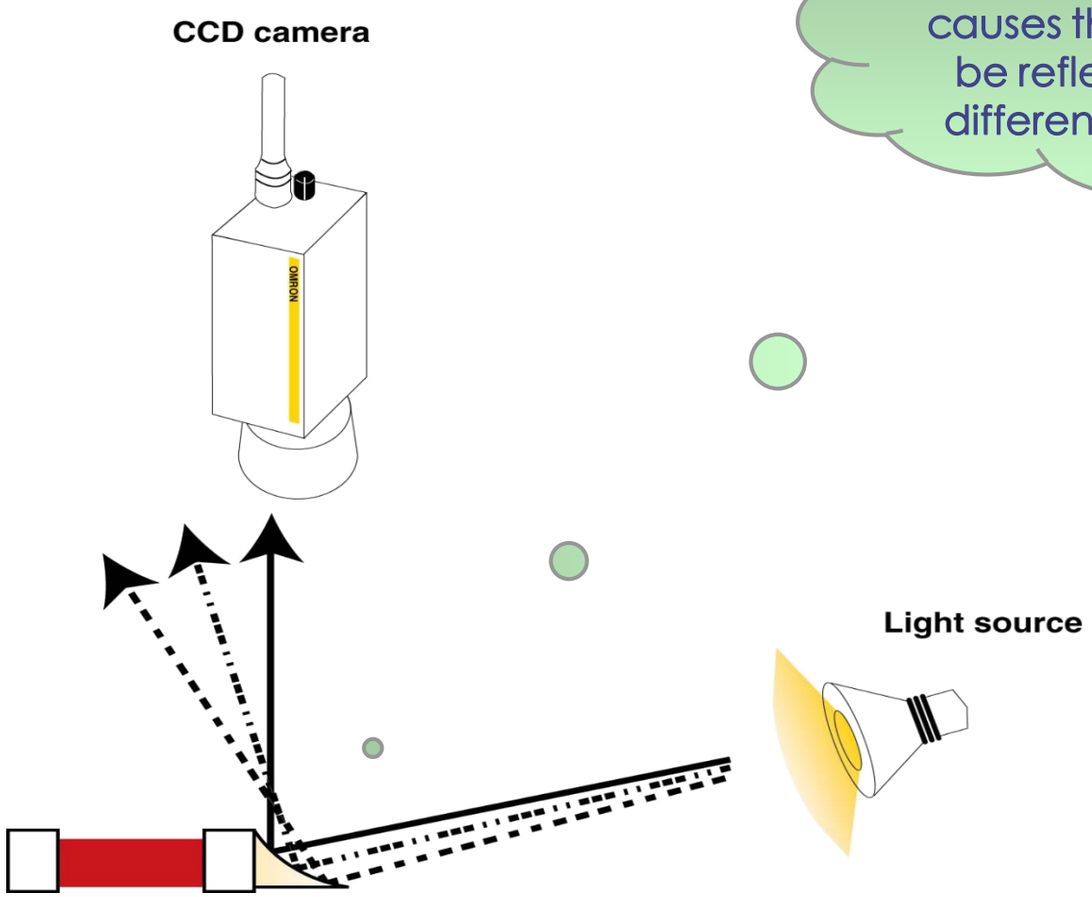
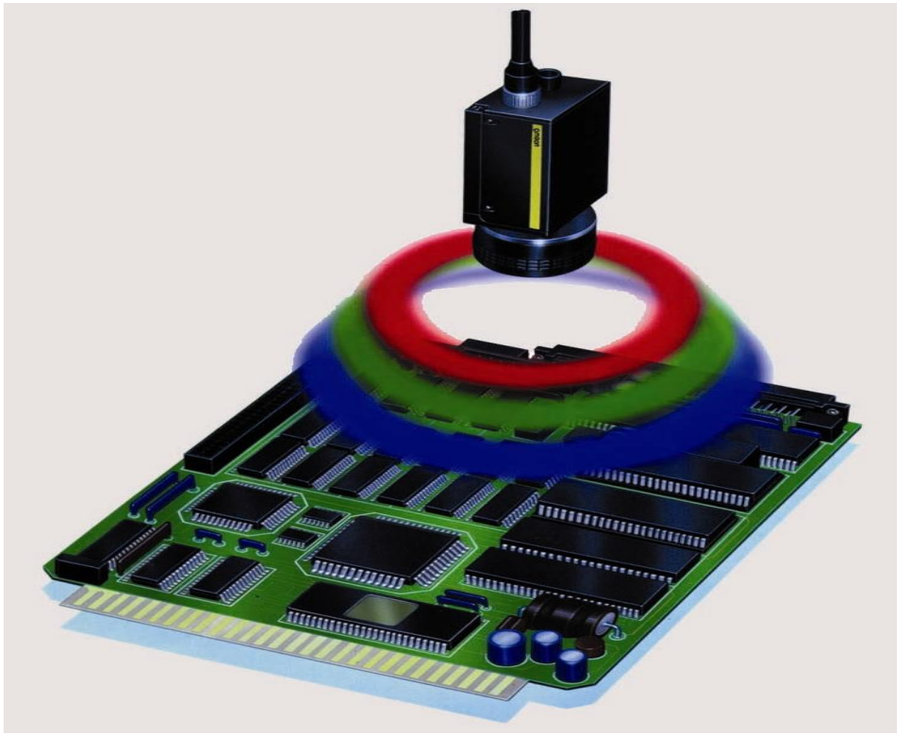
Light source and image relationship

The curved surface of the solder joint causes the light to be reflected at different angles.



The light source is a crucial factor, and the machine uses a circular three-primary RGB, RGBR source.



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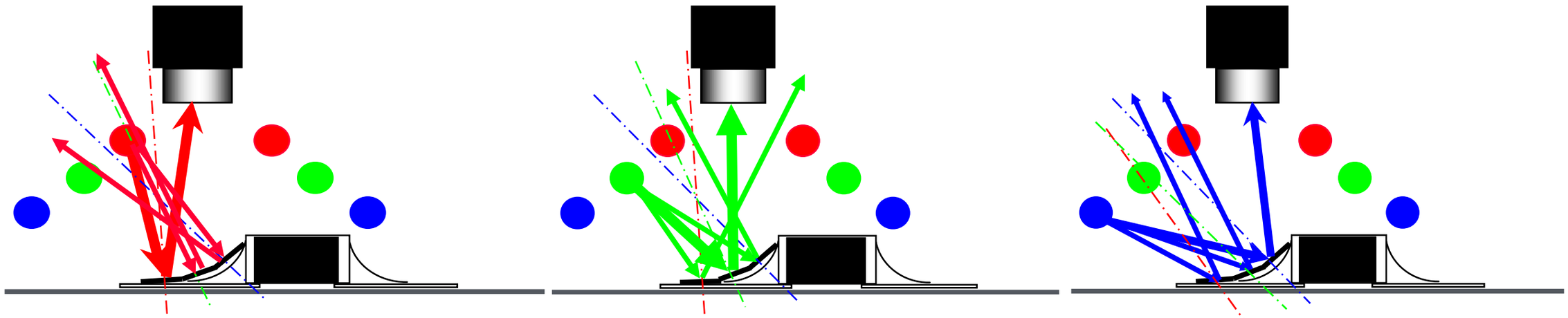
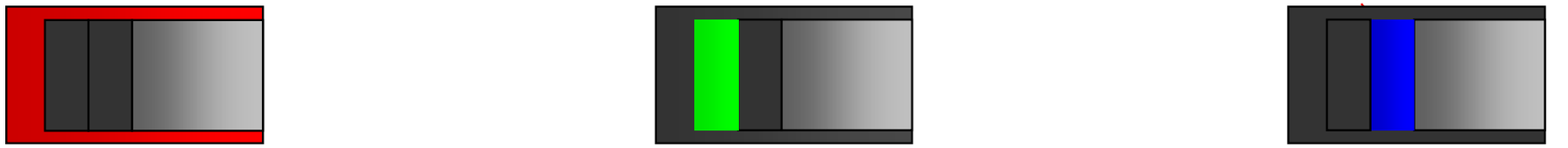
Light source and image relationship





Red light reflection camera effect

Green light reflection camera effect

Blue light reflection camera effect

The AOI has three kinds of ring lights of different heights of red, green and blue, and emits three kinds of colors on the PCB. The center line of the ring lamp illumination is vertically provided with a color camera for shooting the circuit board. The colored light incident at different angles is differentiated by reflection from the surface of the solder joint with smooth and oblique angles. The smooth part of the component is shown as a single color. The rough part of the component is diffused and displayed as the true color of the component. Through color light processing, the AOI converts the three-dimensional information of the component into two-dimensional color image information (as shown in the figure above).

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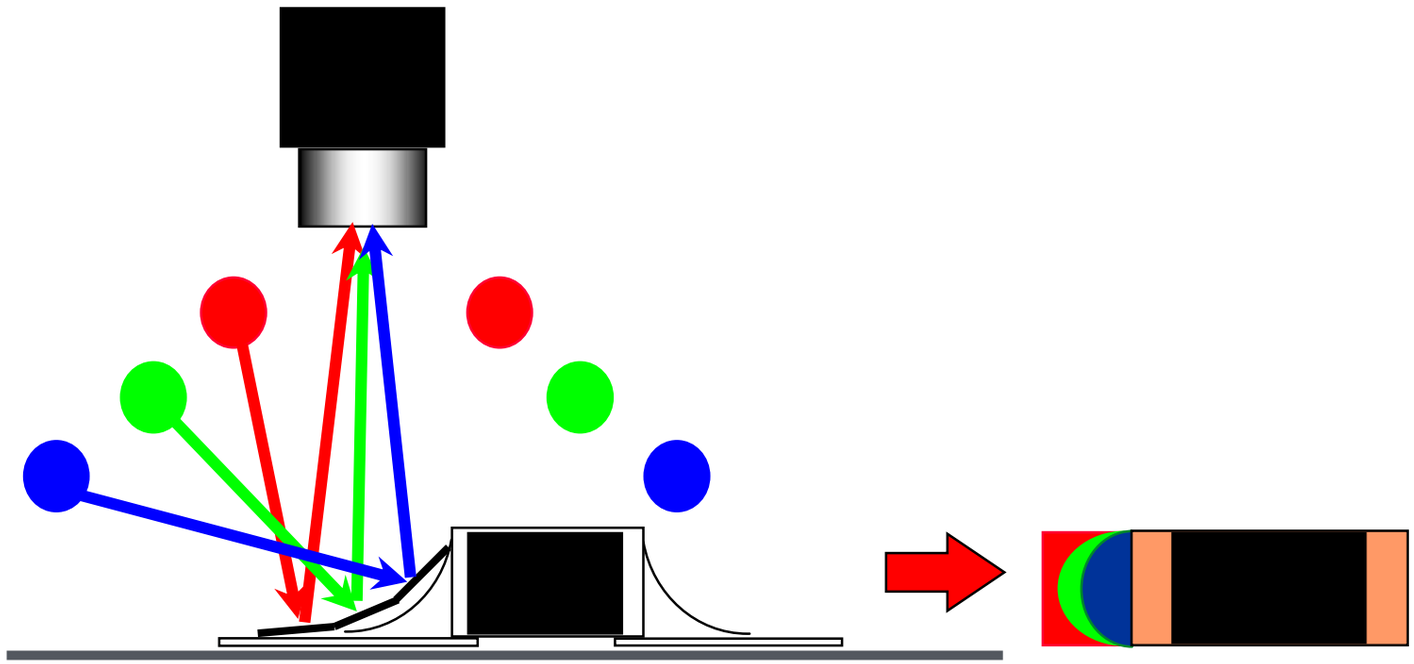
Light source and image relationship



Red, green and blue
tri-color light mixed
reflection camera effect

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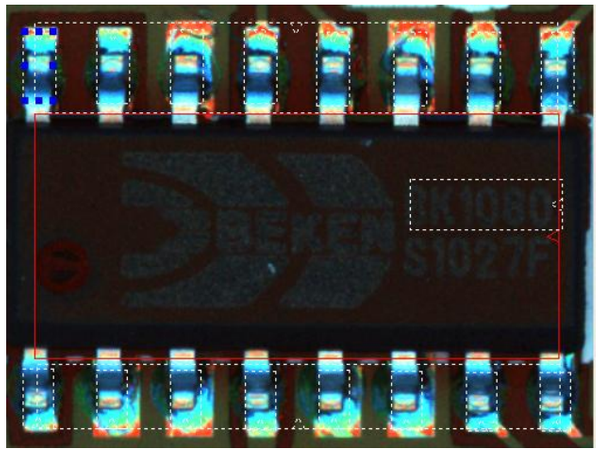
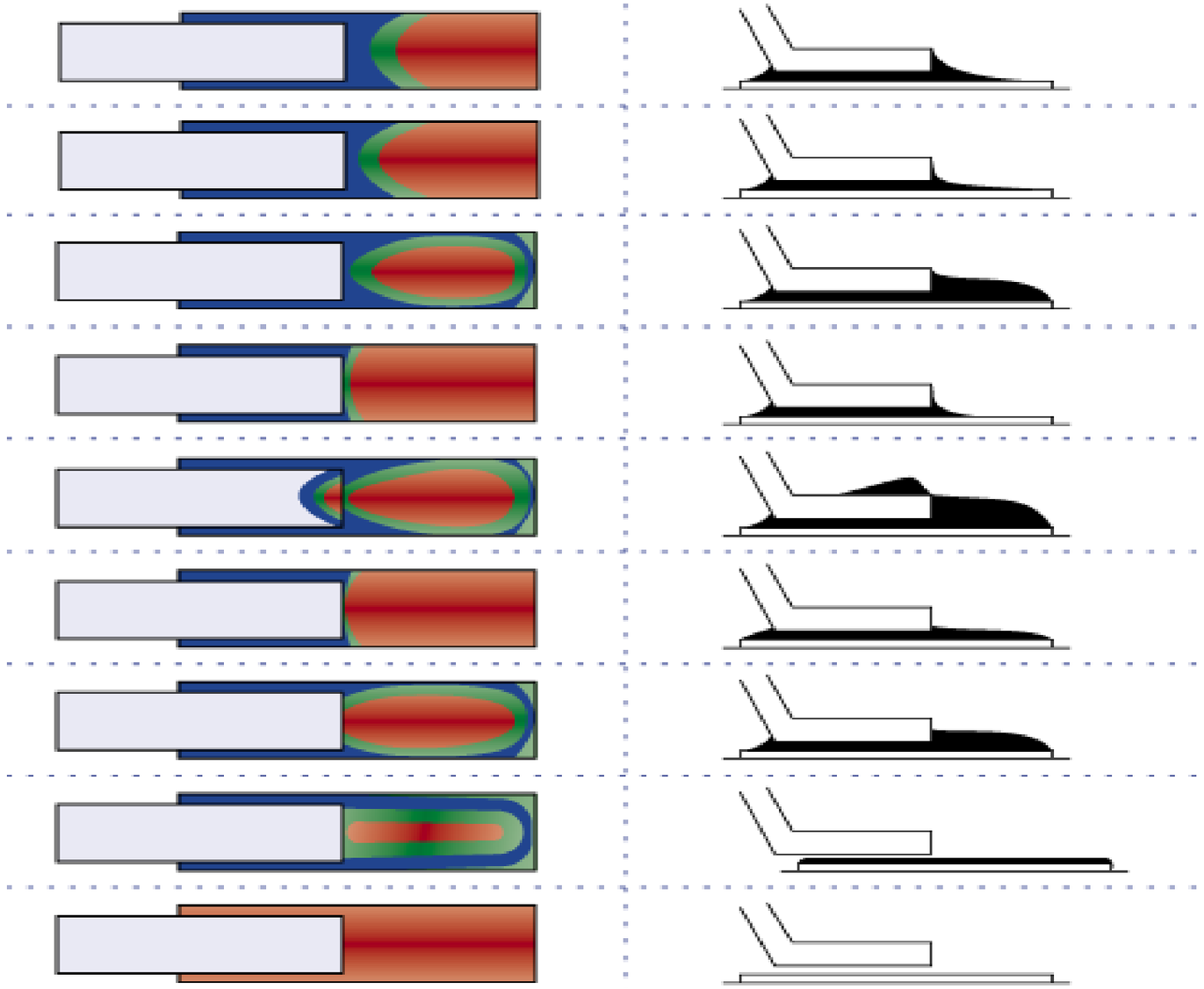
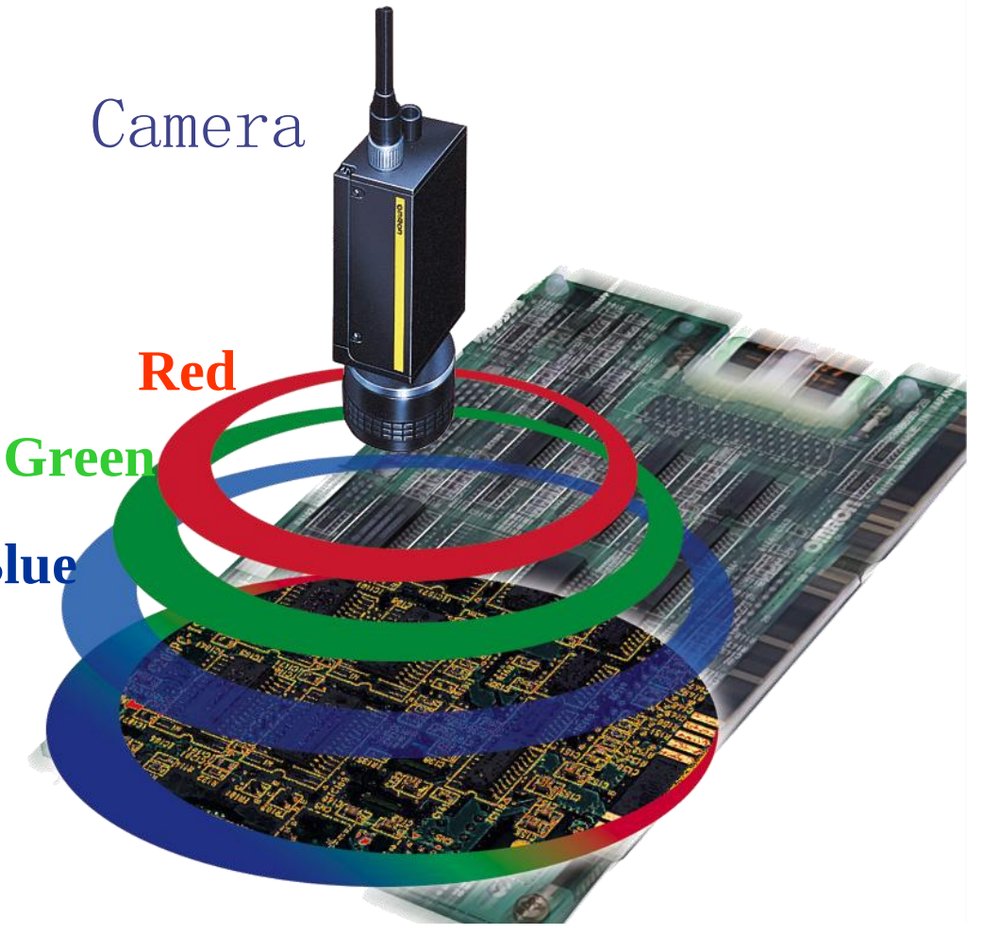
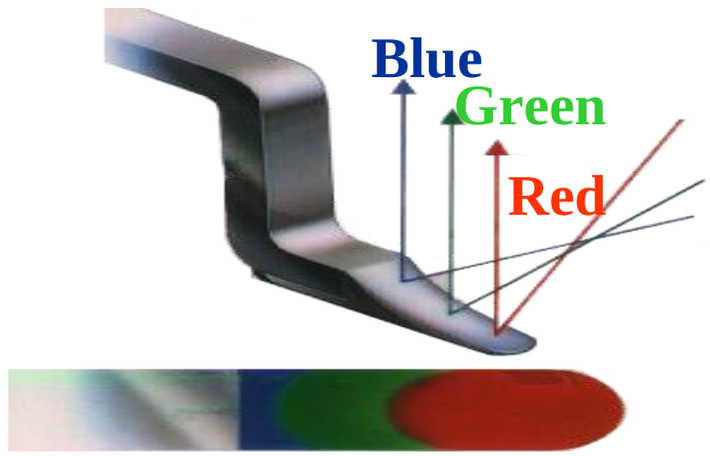
Examples and images









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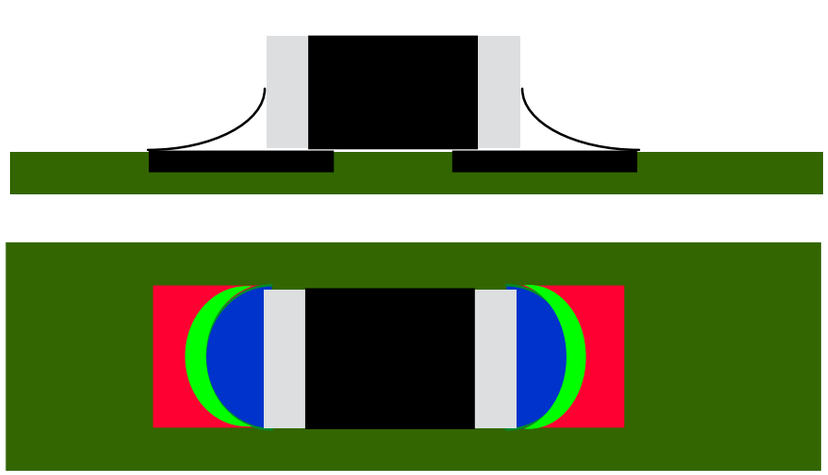
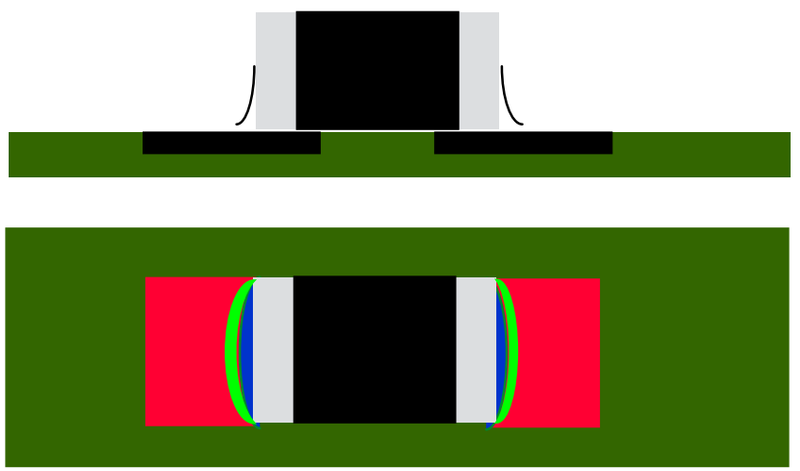
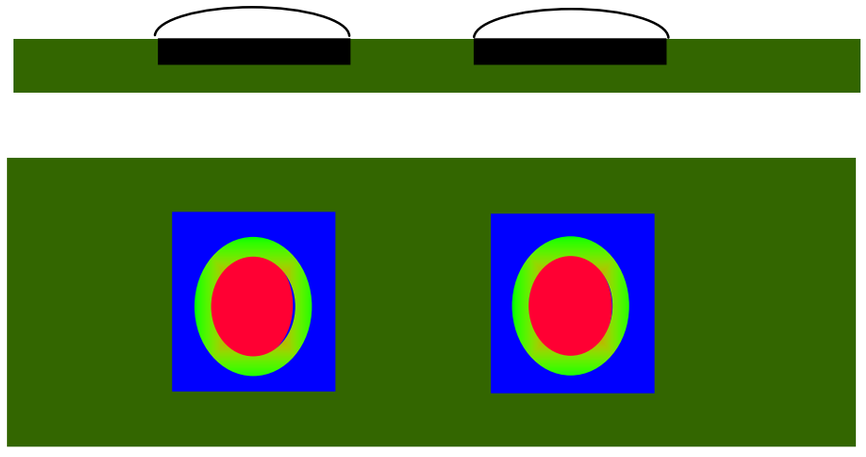
Solder imaging (CHIP component)



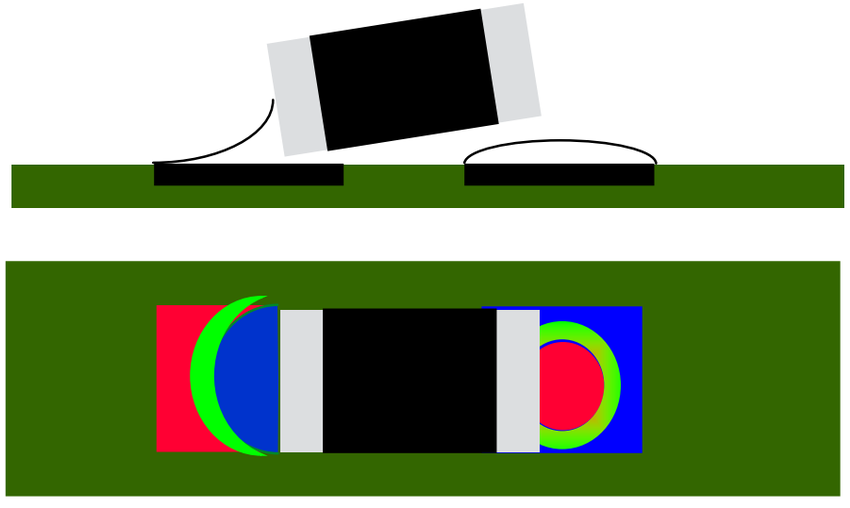
Good



Less solder



Missing component



Bad solder joint

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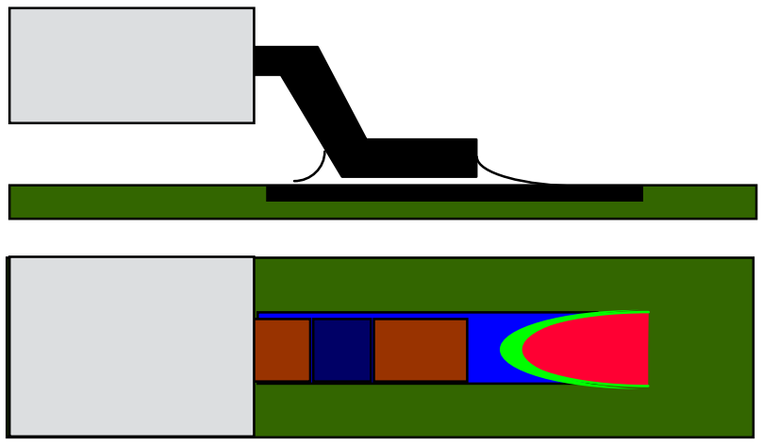
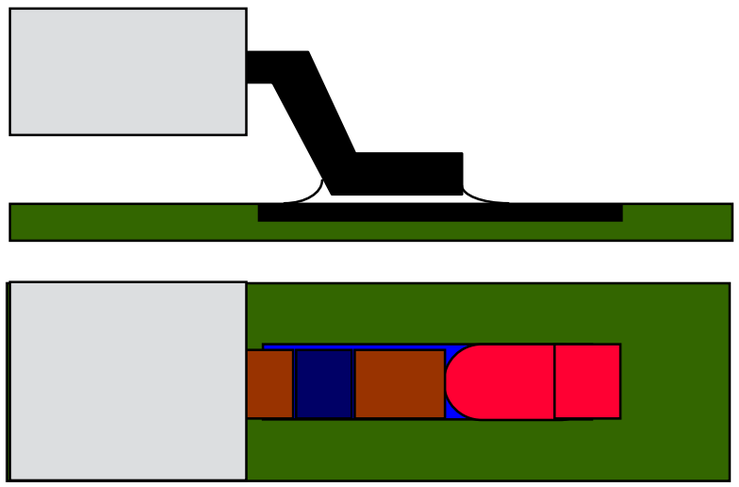
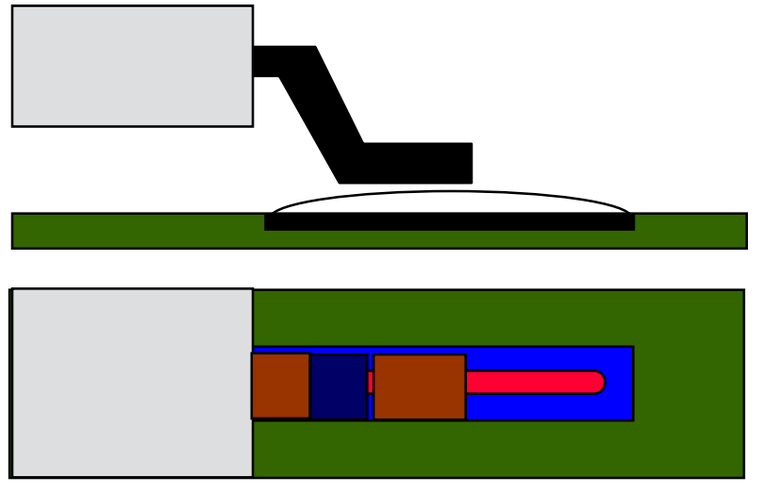
Solder imaging (CHIP component)



Good



Less solder



Bad solder joint

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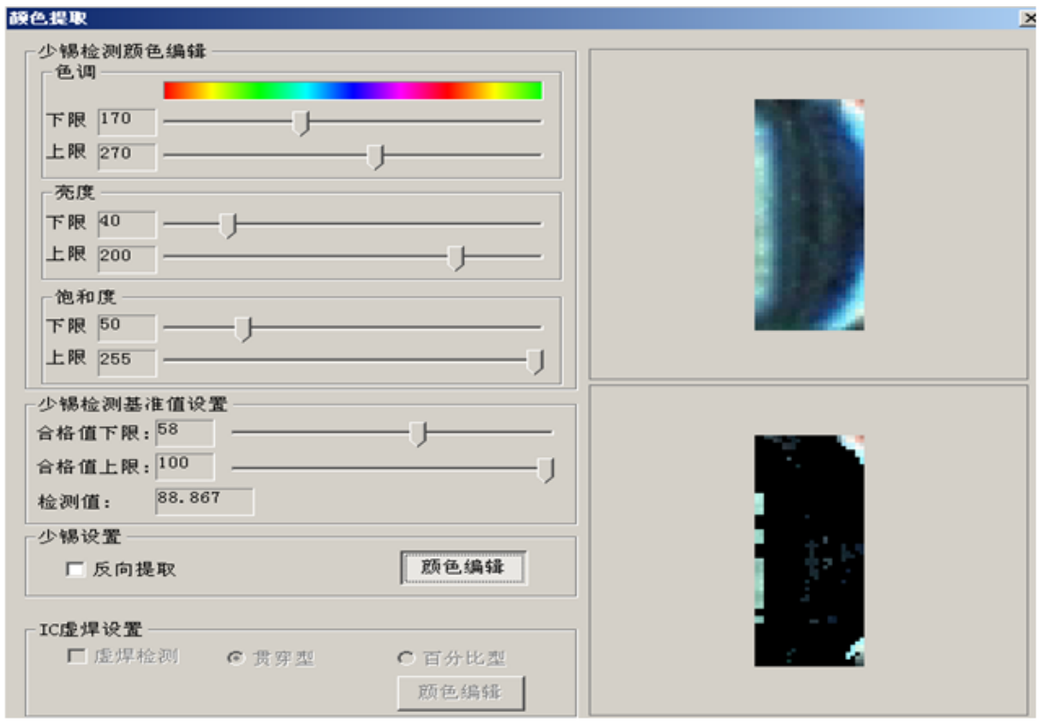
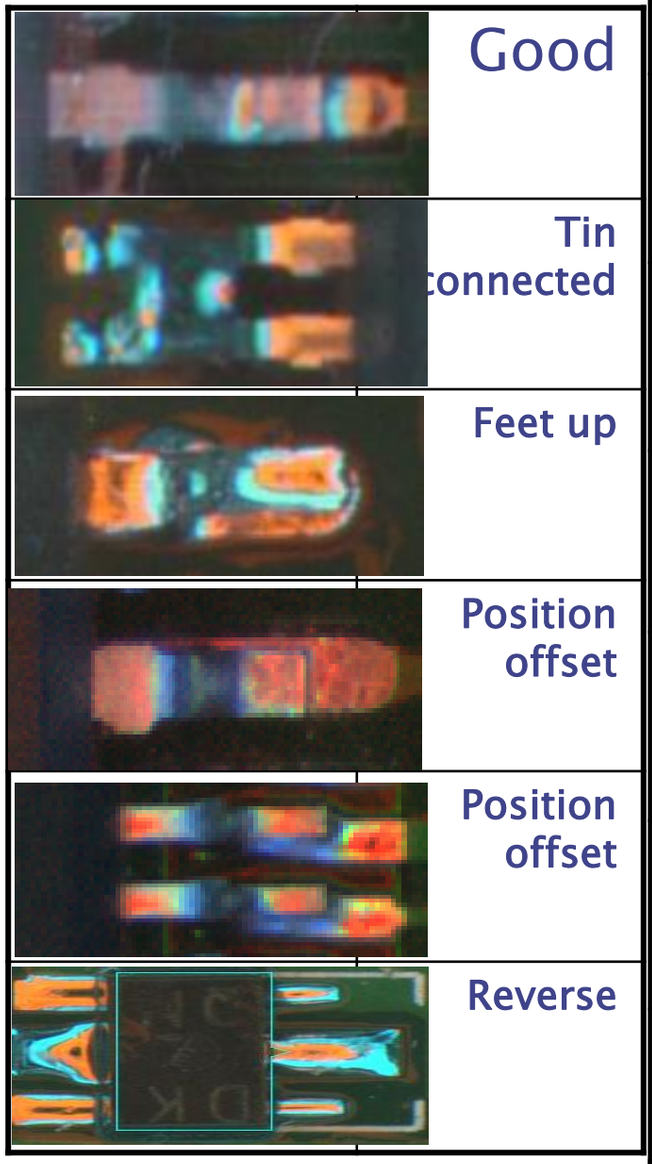
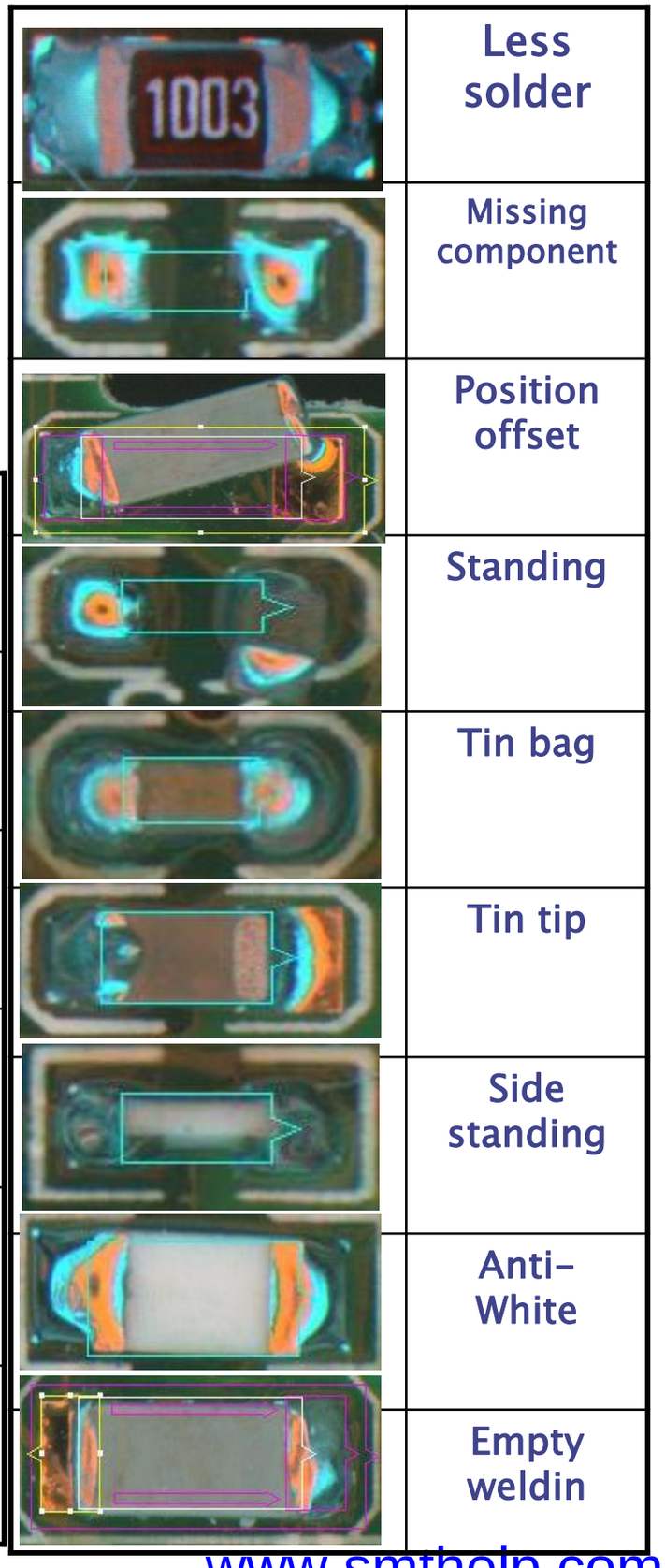
Software computing synthesis principle

- Color calculation
- Color extraction
- Gray scale calculation
- Image contrast



Common component picture





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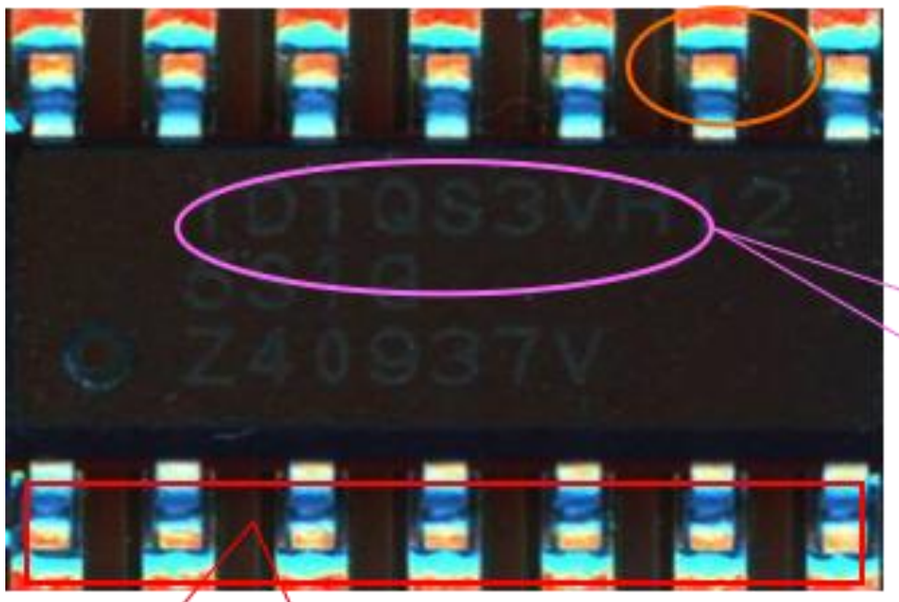
IC Inspection Method

Solder joint part: inspection by color analysis feature method



Silk screen part: Detected by OCV character verification technology

IC short-circuit detection: use short-circuit algorithm to detect whether each channel is short-circuited, hold linear interference filtering technology, reduce false positives

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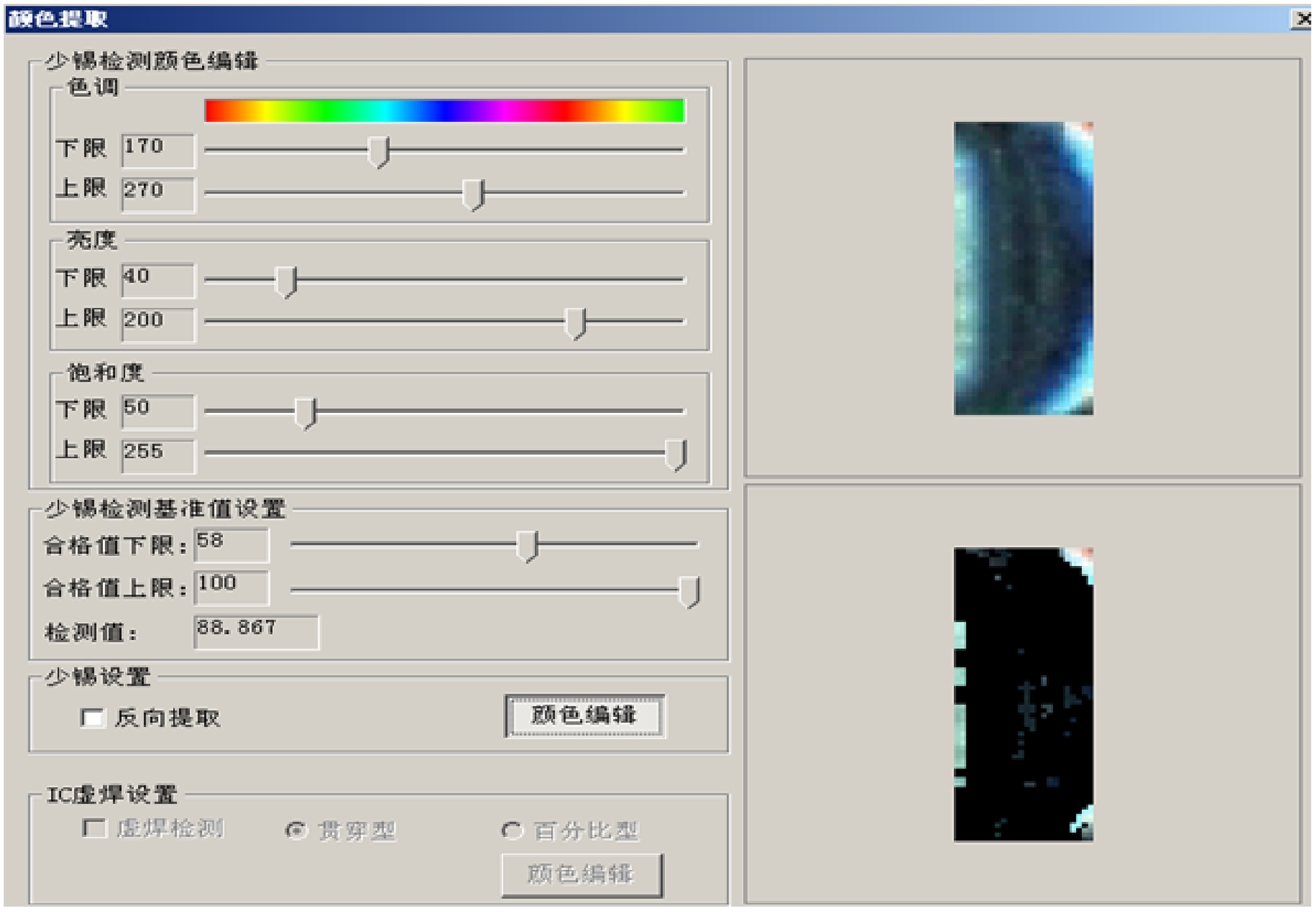
Solder joint detection method



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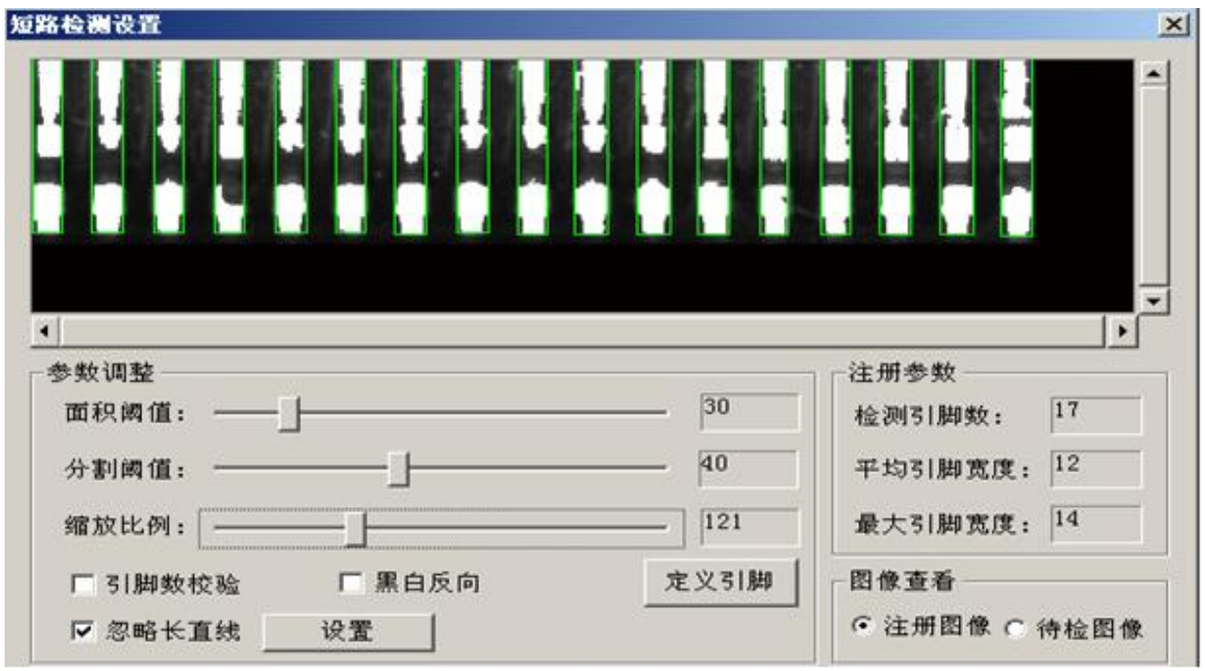
Character detection method

Tin connected detection method



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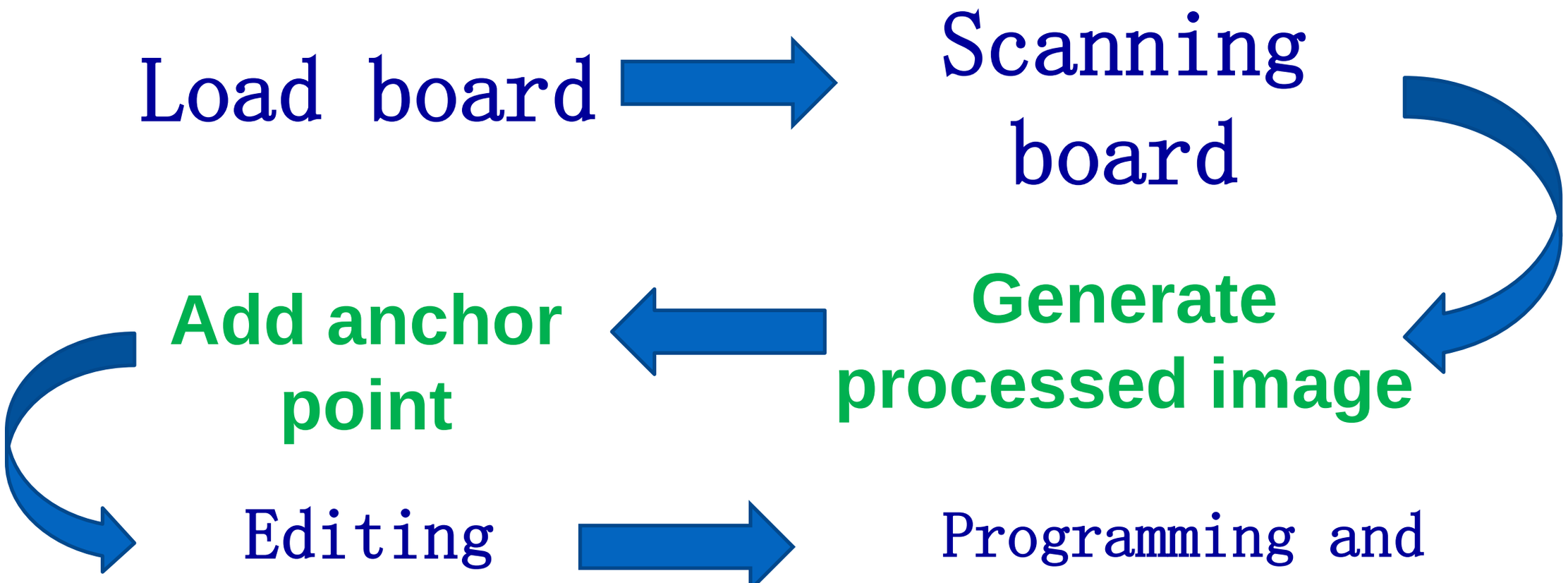
Programming steps:

1. New program 2. Take a full PCB image 3. Position mark setting
2. 4. Program editing 5. Learning and debugging 6. Detection use



Edited components can be stored in the component library and called directly next time.

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Specifications

		ON LINE S-A0600C	OFF LINE S-A0680C
Detection application	Applicable process	Solder paste before and after SMT reflow, before and after DIP wave soldering	
	Programming mode	Manuor ,auto written, CAD data import automatic corresponding component library	
	Detection type	**Solder paste printing:** presence, offset, less tin, more tin, open circuit, even tin, pollution, scratches, etc. **Defects in parts:** missing parts, multiple pieces, offsets, skews, tombstones, sideways, flips, wrong parts, breakage, reverse, etc. **Solder joint defects:** more tin, solder, tin, solder balls, glue, pins not exposed, copper foil contamination.	
	Calculation method	Color calculation, color extraction, grayscale calculation, image contrast, etc.	
	Detection mode	Optimized inspection technology covering the entire board, jigsaw and multi-mark, including Bad mark function	
	SPC Statistical function	Record test data and perform statistics and analysis throughout, and view production status and quality analysis in any area	
	Component angle	Support 0~359° rotation, minimum 1° angular distance	
	Mini Component	15um/Pixel: 01005 chip、0.3 pitch IC	
Optical configuration	Camera	Full color high speed industrial digital camera	
	Lens resolution	10um/15um/18um/20um/25um	
	Light source	Ring stereo multi-channel color light, depending on application selection RGB/RGBW/RGBR/RWBR	
Computer	CPU	Intel core	
	VGA	NVIDIA 1GB+	
	RAM	4GB	
	HDD	500GB+	
	OS	Win XP 32bit	
	Monitor	22 inches(Top door), 16:10	22 inches, 16:10

		ON LINE S-A0600C	OFF LINE S-A0680C
Machine system	Transmission and detection methods	Auto, L-R/R-L, Stepper motor to transport PCB and widen track, XY servo motor drive camera take picture	Manual, Y servo motor move PCB, X servo motor drive camera take picture
	PCB Size	50*50mm(Min)～400*360mm(Max)	20*20mm(Min)～460*350mm(Max)
	PCB Thickness	0.3～5.0mm	
	PCB Weight	Max: 3KG	
	PCB Margin	3mm, (can custom made)	
	PCB Curvature	＜5mm or 3% of PCB diagonal length	
	PCB Component H	Top: 35mm, Bottom: 75mm。Adjustable	
	XY Drive System	AC servo motor, precision ground ball screw	
	XY Moving speed	Max: 830mm/s	
	XY positioning accuracy	≦8um	
Parameter	Dimension	L980 * W960 * H1600 mm	L900 * W1100 * H1400 mm
	Power	AC220V/110V, 50/60Hz, 1.5KW	AC220V, 50/60Hz, 1.2KW
	PCB Conveyor Height	900±20mm	820±20mm
	Weight	600KG	360KG
	Communication Plug	Smema	--
	Air Supply	0.5MPa, (Optional power distribution control)	No use
	Certification	Meet CE safety standards	
	Ambient temperature and humidity	10～35℃, 35～80% RH (No condensation)	

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Maintenance specification

1. Daily maintenance is carried out by the operator of the production department. The maintenance contents are as follows:

a. Clean the surface of the machine casing;
b. Clean the dust on the display screen and the surface of the keyboard and mouse;
c. Clean foreign objects on both sides of the track to prevent unnecessary debris from falling into the machine;
d. Check if the static wire is well grounded.

2. Weekly maintenance is arranged by the technician for maintenance. The maintenance contents are as follows:

a. Check the operation of the lead screw and the guide rail;
b. Check the parallel condition on both sides of the track and the tension of the clip;
c. Check the operation of the motor, whether it is hot or abnormal, etc.;
d. Check the finishing status of the program and the SPC misjudgment status statistics of each model.

3. The monthly maintenance is carried out by the technicians during the month. The maintenance contents are as follows:

a. Check the usage status of the program and make backup updates in time;
b. Check the lubrication of the rotating part of the electric motor and clean it in time;
c. Check if the brightness of the light source is good. If necessary, do camera calibration.
d. Check all belt drive and belt tension;
e. Clean the cooling fan filter cotton.

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Maintenance item

In order to make the equipment work properly and extend the life of the equipment, please perform the following regular maintenance work:

1. After the end of the day, turn off the power of the computer and the machine, vacuum the dust on the machine surface and wipe the dust on the surface of the device with a white cloth.
Note: Do not use organic solvents to scrub the surface of the machine as it may damage the surface paint. Never use a wind gun. The air gun will blow dust and debris into the machine and attach it to the screw, rail or lens. Affect the normal operation of the machine.

2. For maintenance of the screw and guide rails every 1 month, first clean the oil with a clean white cloth, then use the 10-11 oil brush to evenly apply the grease to the surface of the screw and the guide rail.
Note: Grease and lubricant must be of good quality. Otherwise, the surface friction of the screw or the guide rail will be increased, thereby shortening the service life of the lead screw and the guide rail, and affecting the accurate positioning of the machine. Recommended: Germany OKS premium grease OKS422, or refer to the grease used in the maintenance of the placement machine.

3. Clean the filter cotton on the left side of the industrial computer panel every 1 month.

4. Perform a calibration of the light source every 6 months. Because the brightness of the LED light may change slightly after half a year, in order to ensure the normal test, the light source needs to be verified once.

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Welcome inquiry

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2, Find us more: https://www.facebook.com/autoinsertion

3, Know more our team: https://www.linkedin.com/in/ming-gan118/

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5, See more video in Youtube: Auto+Insertion

4, Looking for more informations: ming@smthelp.com

5.Wechat/Whatsapp/skype:+86 18126316729