NC UV9060MAX

Visual positioning system

User manual

Catalogue

Summary

The vision printer is an all-in-one application with a high degree of integration between the line-scan camera and the software and hardware of the flatbed printer.

Compared with other vision printers on the market, the advantages of this product are the following: no additional peripherals such as sensors, gratings, magnetic gratings, light sources, power supplies, etc.; Install the camera on the left side of the trolley, and it's easier and faster to operate than other vision software on the market.

It can be applied to high-precision positioning printing of metal/non-metal badges, jewelry, logos, packaging and other materials.

Install hardware

Table 2-1 Hardware list of camera

NO.	Name	Model	Number	Type	Note
1	Line-scan camera	Custom-made	1	Required	Integrated packaging
2	Camera board		1	Required	Integrated packaging
3	Printer board	Custom-made	1	Required	Included in the printer
4	Visual dongle	Custom-made	1	Required	
5	Camera cable	Accessories included	1	Required	4m

2.1 Feature and parameter of the camera

Table 2-2 Scanning parameter of the camera

NO.	Parameter	Value	
1	Width：	219 mm	
3	Resolution：	600dpi	
3	Color	Gray	
4	Distance	8mm or so	
5	Mode	Hardware triggered/free-running	
6	Light source	RGB LED	
7	Transmission interface	Gigabit Ethernet	
8	Power supply	24V/1A	
9	Size/Weight	263×40×26.5mm	<1.0Kg
10	Temperature/Humidity	5-50℃	10%~90%RH

2.2 Physical feature of the camera

Table 2-1 Size
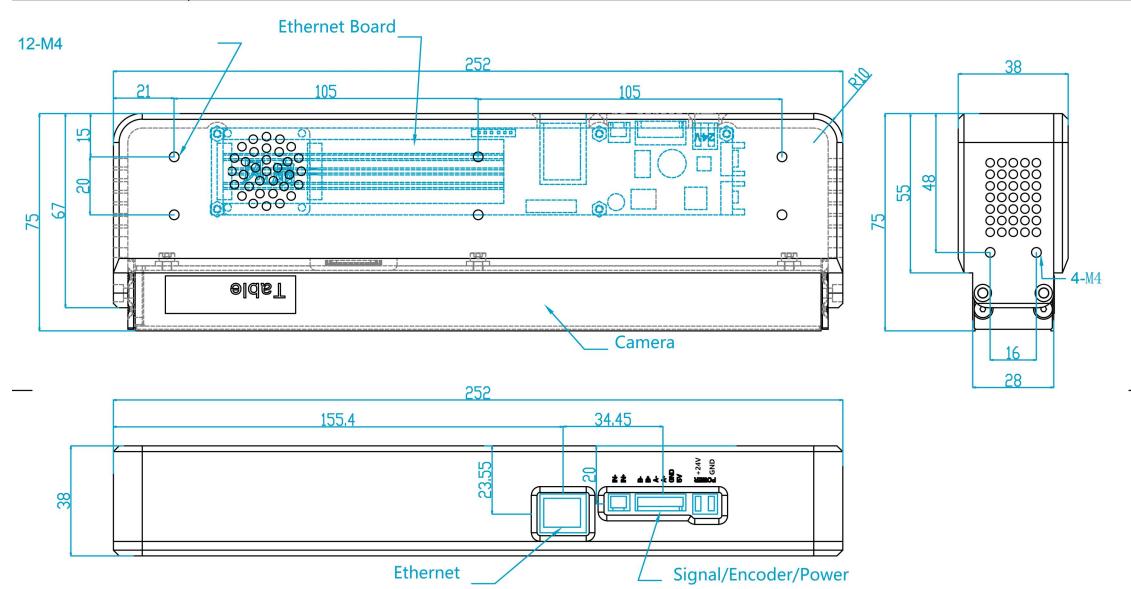
Table 2-2 Size of camera board
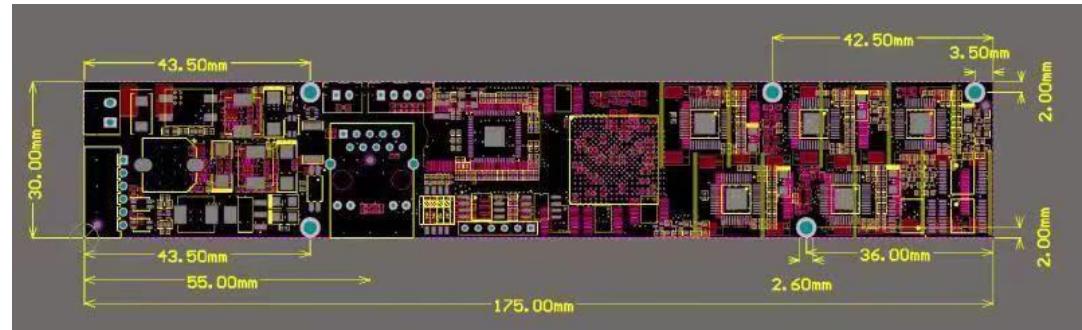
2.3 Camera electrical characteristics

The camera board is encapsulated, and the communication network port, power supply interface, start-stop signal interface and encoder signal interface are reserved.

The acquired signals are shown in Figure 2-4, which are the 5 (3.3V) and 7 (GND) signals of the origin, corresponding to the start-stop signal (3-24V) in the above figure.

Table 2-3 Camera board line
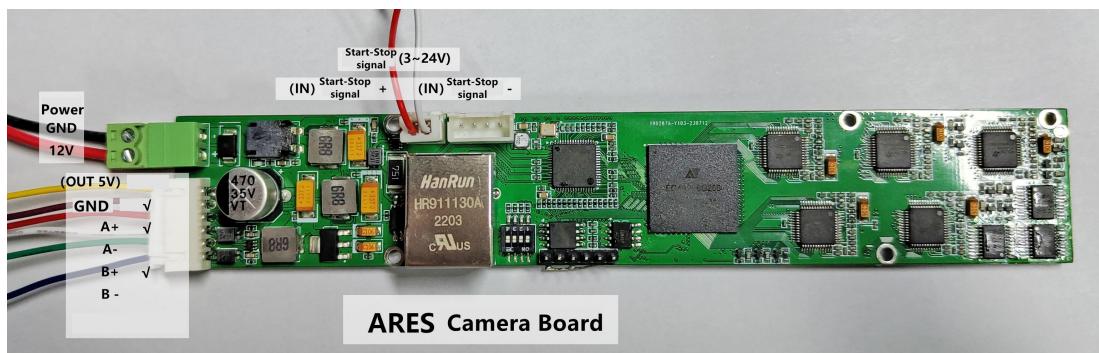
Table 2-4 Hardware-triggered wiring diagram
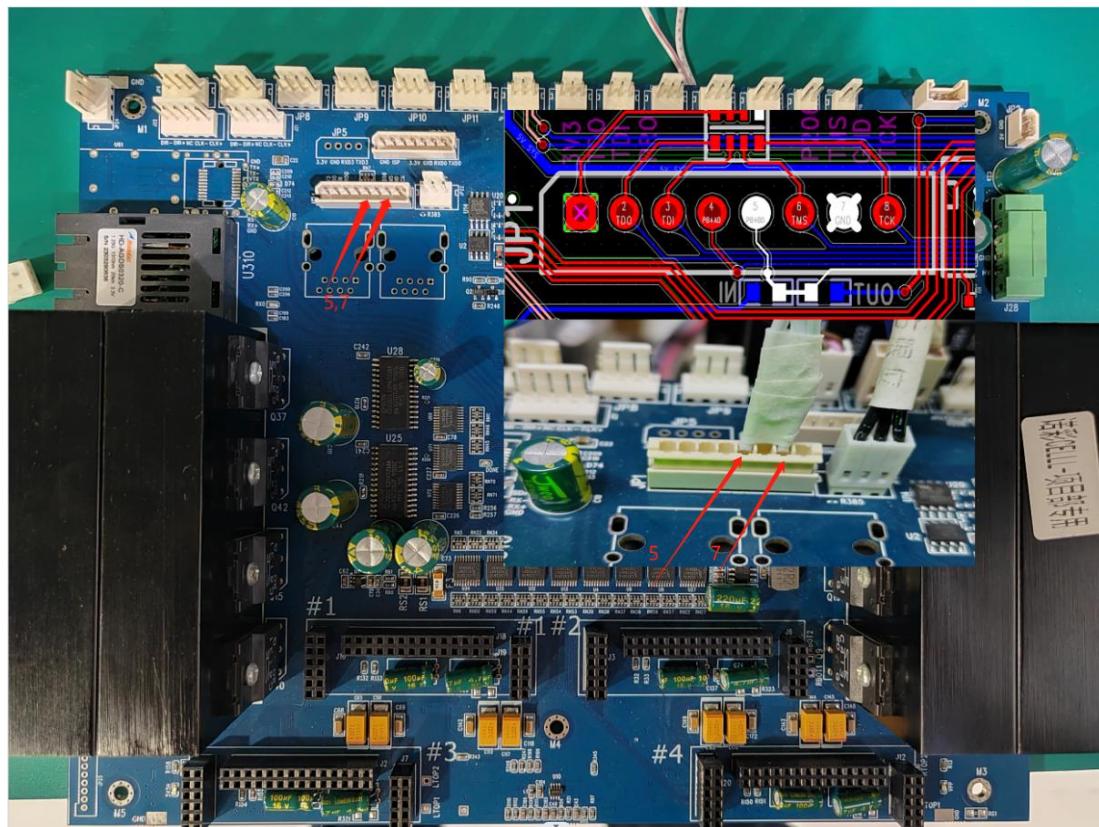
2.4 Initial calibration of the camera

Main points：

①Platform level：Calibrate the mechanism platform by the dial gauge to ensure that the level error of the mechanism platform is within 0.10mm;

②Camera pitch angle：Raise the Z-axis, fix the dial gauge on the platform, stick the gauge head on the edge of the camera glass, and move the platform back and forth to ensure that the front and rear pitch angle error is within 0.05mm;

③Camera tilt angle：After calibrating the pitch angle, move the cart to the left and right, and the

left and right inclination angle error is within 0.10mm;

④Camera parallel angle：Fix the head on the side of the camera and confirm that the Y-axis parallelism error is kept within 0.05mm.

Table 2-5 Schematic diagram of installing and calibrating the camera
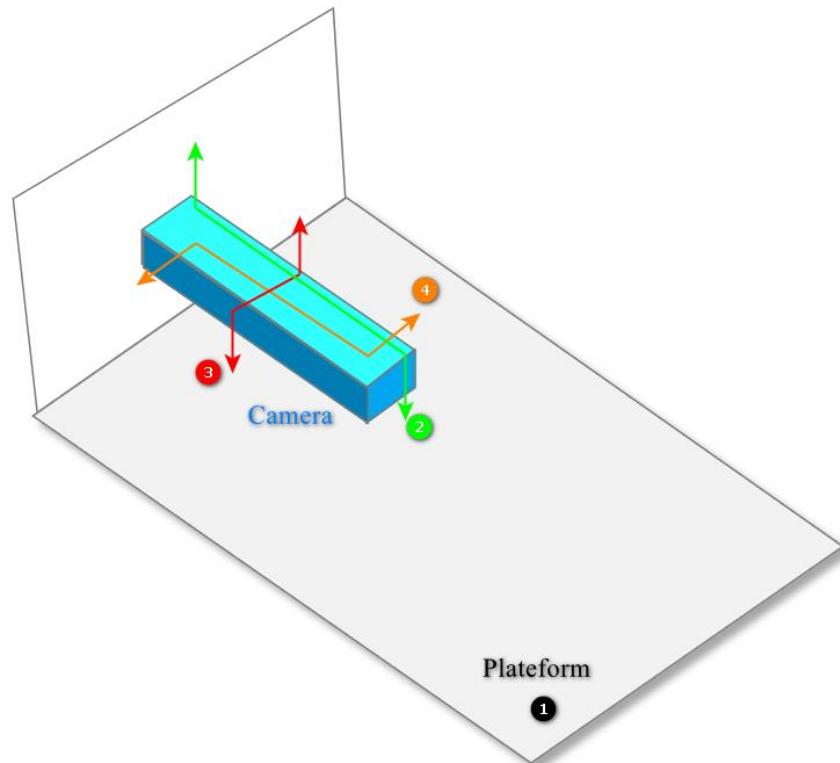
Install the software

Table 3-1 Software list of the camera

NO.	Type	Tool's Name	Mode	Note
1	Built-in tools	CIS Camera Viewer	Necessary	IP settings、Camera calibration
2	Scan and print tools	NC_MAX_I3200(3-4H)_ATools_V203.2GL_20241015	Necessary	Printer tool: ATools

3.1 Install the software of the camera

（1）Install npcap-1.75.exe (It will uninstall wincap4.1.3 automatically), check the third column while installing;

（2）Install

 Ares GIGE Line Scan Camera_2.1.123_x64.exe 。

（3）Set the IP address and connect the camera
　　①Find the catalogue and open it

 ip_tool_ui.exe ;

　　②The camera is connected by a network port after installing the camera. The printer uses the network port to USB port to access, click 【Operate】 to assign the IP, and display Success.

　　③Open cis_gv_demo.exe Make sure that the camera can be recognized properly and display the camera device information.
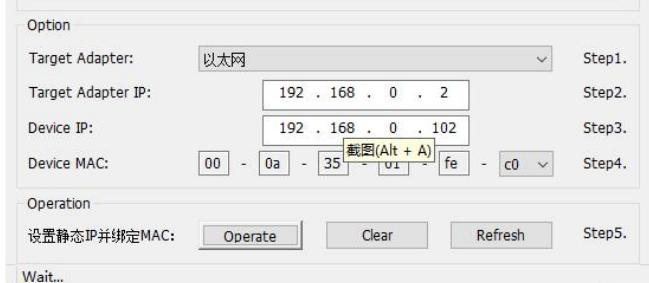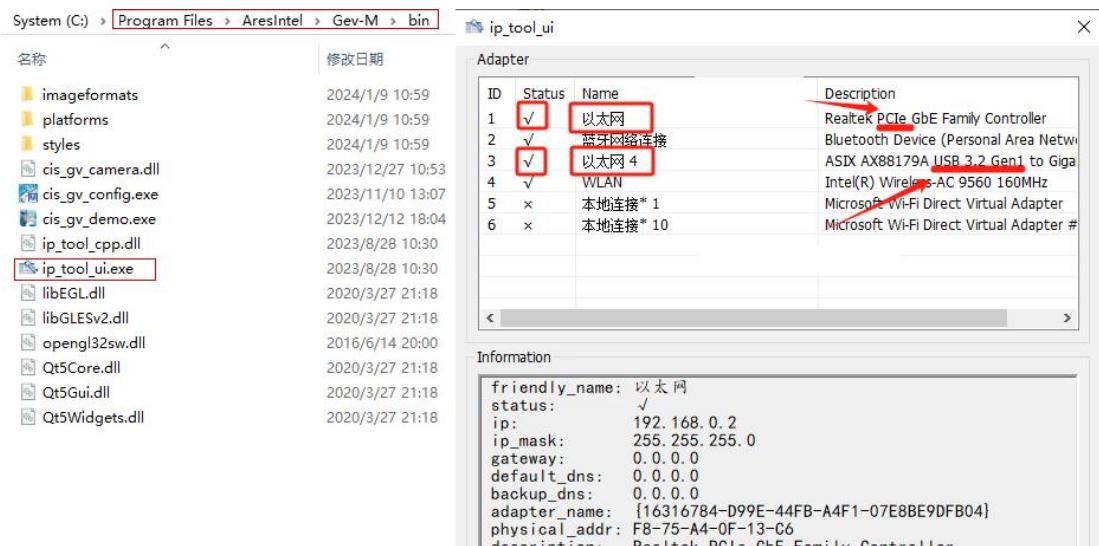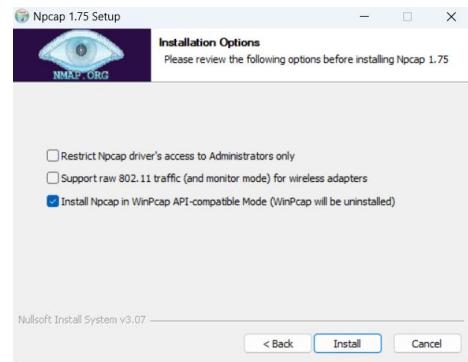
3.2 Install the driver software

Click Right as an administrator for the first time； nocai_aligntool.exe

Make sure the IP address is correct and the specific procedures can refer to the user manual
Confirm the camera scanning parameters as shown in the figure on the right.
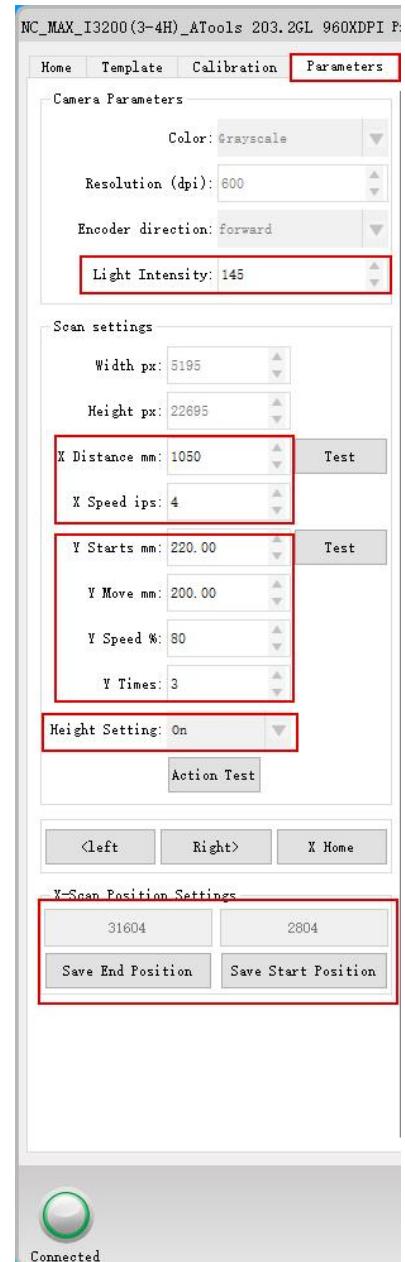
3.3 Install FlexiPRINT 22

Add the printer model, set up the Hot Folder the same as the Drive Hot Folder.
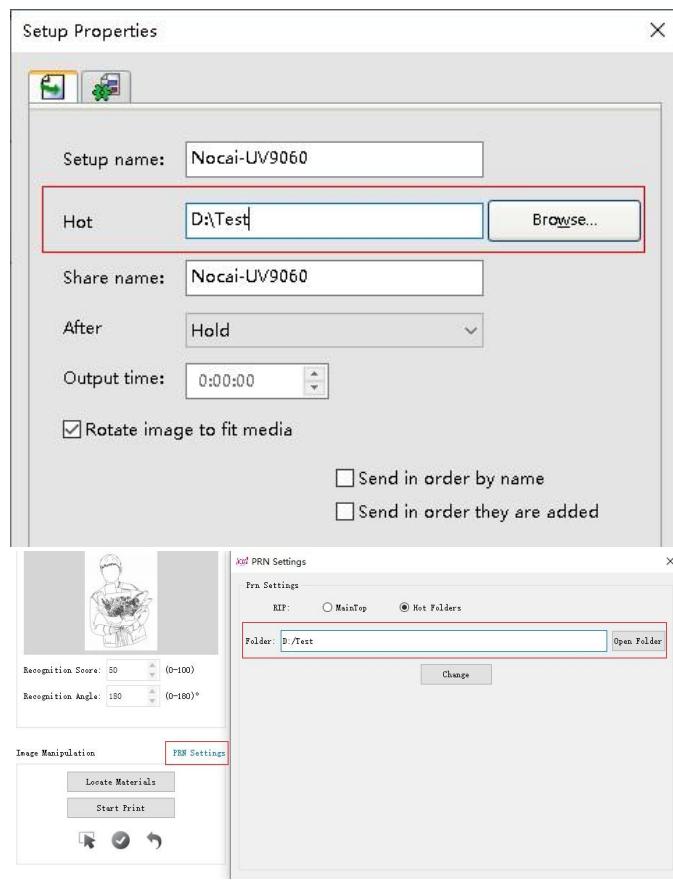
Print the calibration diagram

1.Use the built-in printing calibration map function of the driver to confirm the white edge value of X and Y, confirm the lower limit of the Z-axis height, and make the 900×600mm calibration map printed in the center;

2.Precautions and operations:
Do not warp the paper, open the suction function and fit it to the surface of the platform;
Do not hit the wireframe to the pasting position, otherwise it will increase the calibration error;
Rise to the【Scan Correction】height, click 【Start Scan】, click 【Start Calibration】, and click once from the upper left corner to the lower right corner of the image
(After clicking twice, the "Grid Diagram" will be   selected automatically)；
Click 【Start Calculation】 and return to wait for the calibration result.

3.Standard：
Check whether each point is calibrated in increments of 100, returning a total of 5 rows and 8 columns with a total of 40 points；
The returned calibration error is in the range of X<0.15, Y<0.15, and the best is X<0.05, Y<0.05.

Camera calibration

Open the camera software, click 【Device Connection】, confirm that the connection is normal, and the camera parameters are set as follows; Make sure that the Z-axis height is in the lower limit position.

5.1 Calibrate the height

（1）The camera uses the 【Auto-Trigger】 【Disable】 mode to move out of the cart to the top of the calibration map, and moves the platform so that the lens can collect three horizontal lines;
（2）Click 【Continuous Collection】 to observe the clarity of the three lines, adjust the height of the Z-axis manually with the button board, and jog to find the position slightly that makes the line image the clearest, at this time, the line occupies 5-8 pixels in the acquisition area generally, and the gray value inside the line is the smallest, so as to ensure that the imaging of the three lines is clear and the degree of virtual and real is consistent;
（3）When the cart is reset, the Z-axis height of the title bar will be updated, and the height will be recorded as the【Scanning Correction】 height.

5.2 Forward and backward pitch calibration

（1） Use the printer driver software to confirm the scanning parameters and scan the calibration map;

（2）Compare the clarity of the lines at the stitching position of the calibration drawing, and if the clarity of the front and rear is different, tune the height of the mounting screws on the front/rear side of the camera to ensure that the clarity of the front and rear sides is consistent.
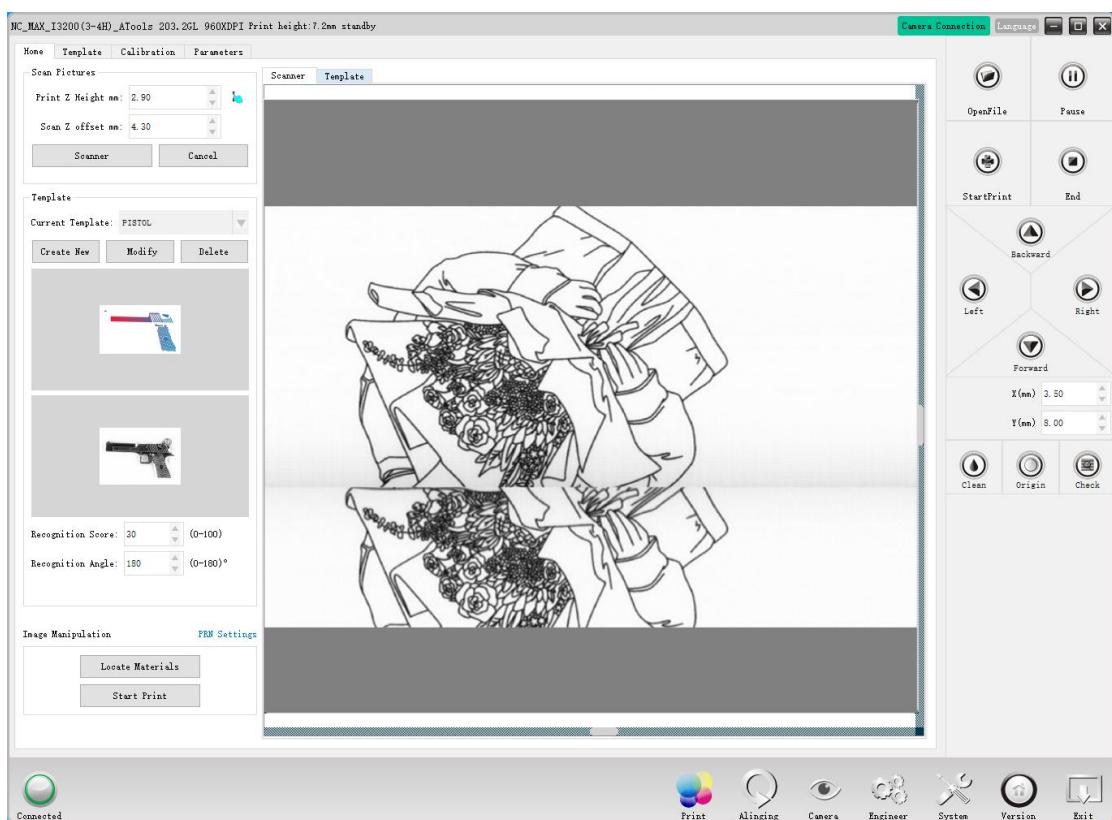
5.3 Left and right tilt angle calibration

（1）The camera uses the 【Auto-Trigger】【Disable】 mode to collect the horizontal lines of the calibration map and confirm that the clarity of the two ends of the horizontal lines is consistent;

（2）If necessary, the inclination can be measured with a dial gauge to ensure that the deviation is within 0.10mm.

5.4 Horizontal parallel calibration of Y-axis

（1）Use the printer driver software to confirm the scanning parameters and scan the calibration map;

（2）Check the staggered lines of the splicing position to ensure that the front and rear splicing lines can be connected, or at least the joint position is in the calibration drawing, close to the center position; Generally, the line on the upper side of the stitching position is staggered to the left, and the camera needs to be tuned to the left before installation.

5.5 Calibration

Recalibration is required when the camera position changes;

（1）A piece of opaque, uniform texture, and delicate white paper (photo paper and coated paper are recommended) above the platform, and remove the camera to the top of the white paper;

（2）Generate brightness data by the camera software;
　　①The trigger mode and start-stop signal are 【Self-trigger】【Disabled】;
　　②Make sure that the RGB brightness is changed to "200", click 【Continuous Acquisition】, if the camera light up, please shake the white paper horizontally and it is not disturbed by noise, click 【Acquisition Stop】 after 2s, click 【Bright Field Data Generation】, and confirm that the output bar on the lower left side 【Bright Field Data has been generated】;
　　③Make sure that the RGB brightness is changed to "0", use opaque paper to cover the lens to eliminate ambient light interference, click 【Continuous Acquisition】, click 【Acquisition Stop】 after 2s, click 【Dark Field Data Generation】, and confirm that the output column on the lower left side【Dark Field Data Generation】has been generated;
　　④Click【Save】, put the file in the bin directory of the printing software installation, click the calibConfig1.calib file, and click Save to replace it;

（3）Use the camera software to check whether the flat field calibration is effective;
　　①Click【Load】, Load files that are saved after they are generated;
　　②Click【Use calibration】, change the brightness of 3 lamp to "200";
　　③Click【Continuous Acquisition】, move the camera to see if it is pure white on the white paper and see if the pixels are grayscale 255.
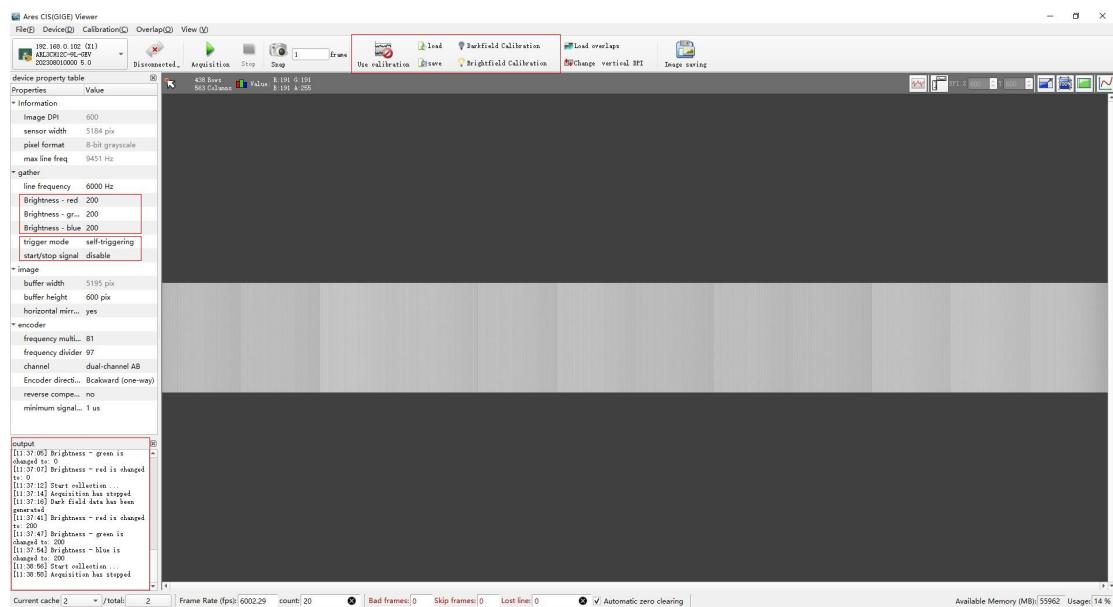
Instructions for the visual positioning printing tool

6.1 Parameters

The parameter settings are shown in the driver software installation diagram, parameter description and function introduction

Name	Instruction	Suggestion
Color	The default option for the camera, the camera is a grayscale camera	√
Resolution	600dpi	√
Encoder direction	【Forward/Reverse】	√
Exposure time	The brightness of the camera is filled in according to the material of the material, and 200 is used for calibration, and the exposure of different materials is different	×
	(120-180 is recommended for bright materials and 160-300 for dark materials, please adjust it according to the actual effect)	
Format width	Camera length, a fixed parameter, refers to the number of pixels that the current camera length has	√
Format height	The width of the image at the time of scanning 1pass, the pixels calculated based on the width	√

X movement distance	The farthest distance the cart moves to the left while scanning	√
X movement speed	The speed at which the cart moves to the left while scanning	√
Y start scanning	Sets the starting position of the Y-axis stage to be scanned when the scan starts, and adjusts it according to the actual position	×
	(The first line of the calibration grid can be captured clearly)	
Y movement distance	It is used to set how far the Y axis moves after X-scan is completed, that is, the stitching distance in the Y direction	√
Scan times of Y axis	Refers to the number of splices in the Y direction, and the platform needs to scan several times to complete the overlay	√
Save the starting position	Set the start position of the camera to light up in the "Start ~ End" area, and adjust it according to the actual position	×
Save the end position	Set the end position of the camera to light up in the "Start~End" area, and adjust it according to the actual position	×

6.2 Camera calibration

Operation：

1．Make the Z-axis to the "lower limit", and the "Z-axis height" is 0mm;

2．Click 【Print calibration diagram】

Description: The grid area is the material placement area, which does not exceed the edge boundary line, and the built-in grid is 100mm×100mm, and 6×9 are arranged; If you need to reduce the placement area, you can import PRN printing (M×N arrangement) by yourself, and you need to re-calibrate the camera every time the starting point of printing changes, and the calibration file can be backed up and moved to other computers for use;

3．Rise to the height of 【Scanning Correction】and click 【Start Scanning】, and the scan map will be generated in the right area (2 splicing);

4．Click 【Start Calibration】, click once in the image from the upper left corner to the lower right corner, and after the two clicks are completed, the "Grid Diagram" will be selected automatically; As shown in Figure 5-1;
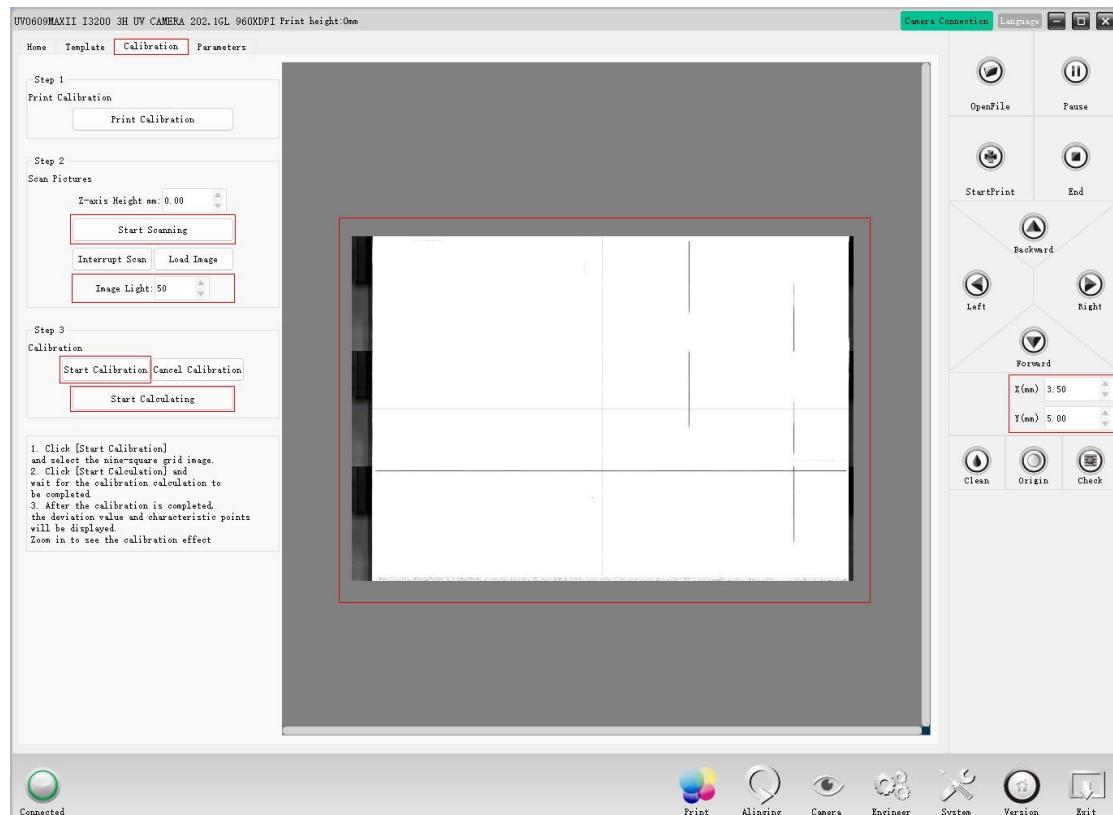
5-1 Camera calibration

Result：

5．It is the best effect to keep the error of X and Y within 0.05, and the error within 0.15 can be used normally;

6．Check whether blue marker is progressing in units of 100mm, the normal calibration will return 5×8 intersection point coordinates, and the outermost group of intersection points will not generate coordinates; As shown in Figure 5-2 and Figure 5-3;

7．After the calibration is completed, the excess part outside the grid will be cut off, and the picture will be displayed as the identified locatable area, as shown in Figure 5-2.
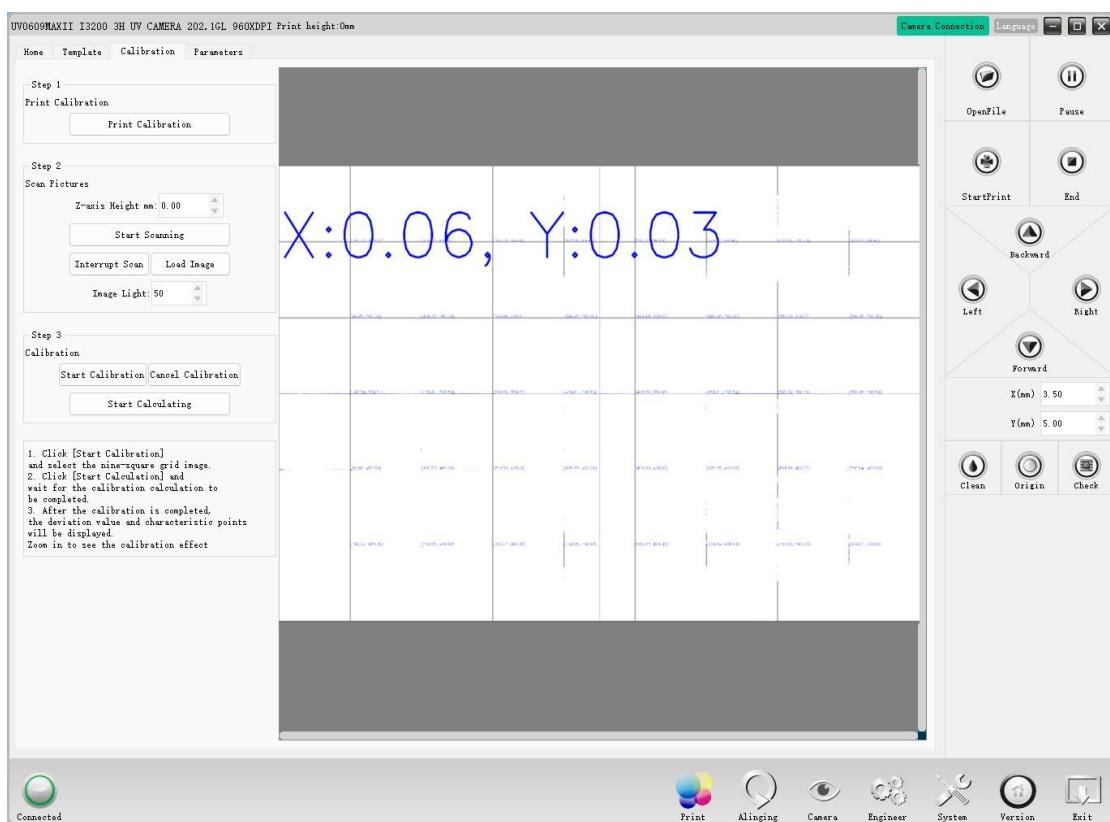
Figure 5-2 Calibrate coordinates
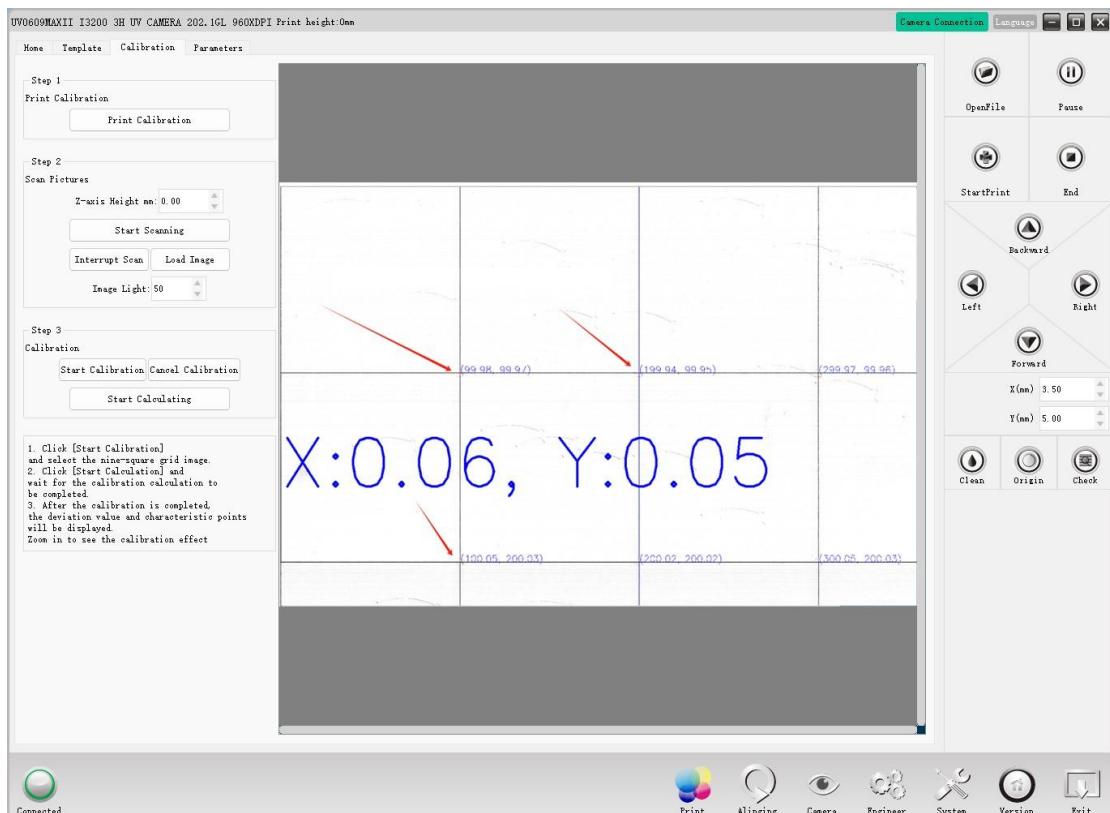
Figure 5-3 Calibrate coordinates

6.3 Vision tool template configure

Scan material：

Fill in the 【Printing Height】according to the height of the material and save it, and confirm the 【Scanning and Correction】 height;（If necessary, the cart can be moved out of advance to the top of the material to confirm the safe height of the print head.）

Adjust and confirm the exposure time of the camera, click 【Scan】on the main interface, the camera will move out automatically for scanning, and wait for the scanning to complete the imaging on the right;

The adjustment of the exposure value needs to be confirmed according to the material scanning effect, and some recommended values are shown in "Typical Material Usage Parameters";
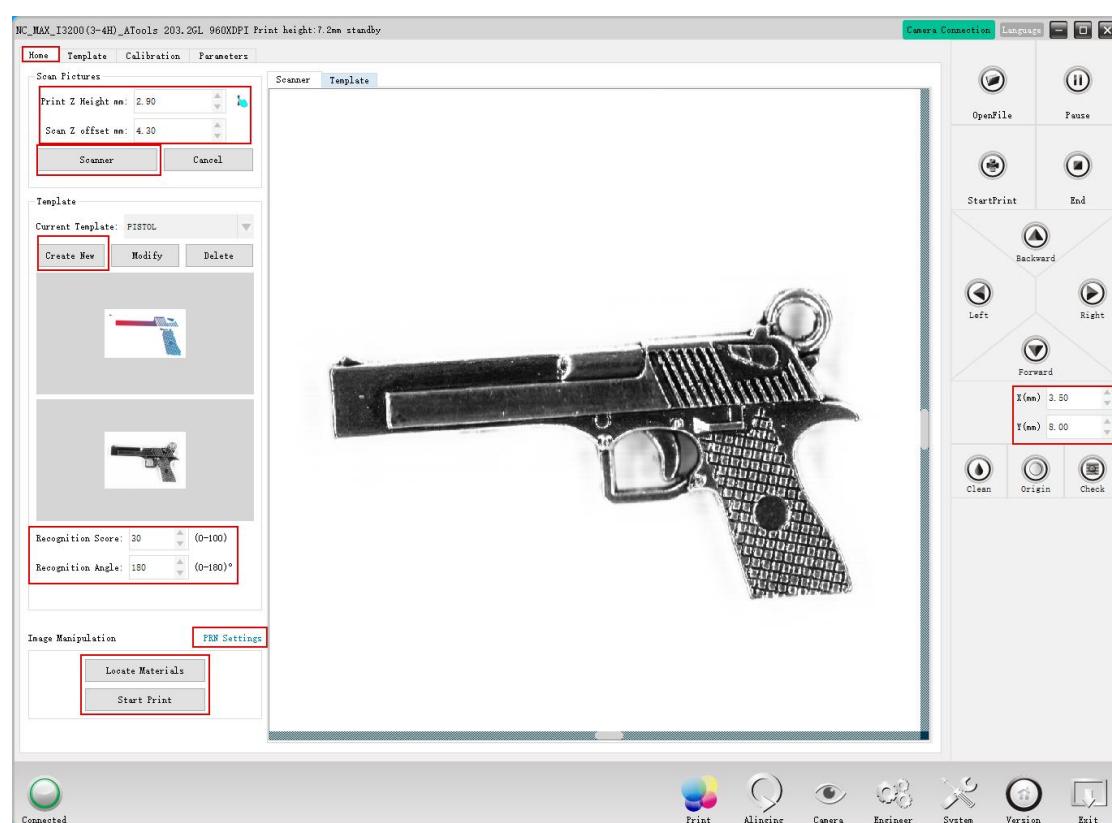
Figure 5-4 Scan and create new modle

Modle configure：

Click 【Create new modle】，and input【Modle name】，click OK，and wait for the template configuration option；

Click 【Locate materials】，click 【OK】；

Pay attention to the selection template to select materials with clear lines, clear outlines, positive directions, and do not connect with other materials, and do not frame too many blank areas around the materials;

Select 【Recognition Mode】 on the left, click 【Clear Feature Area】 (the new template will inherit the existing template features), then click 【Box Select Feature Area】 to select several

features with clear contours and continuous line segments, and click【Add Feature Area】 to calculate the features; For some undesirable feature areas, select the feature area by box selection and click 【Delete Feature Area】, and the feature will no longer be calculated in the area. Click Save Template, and the template feature selection is completed;

①The standard mode corresponds to conventional badges (badges with more uneven surfaces such as metal badges);

②Simple badges correspond to flat materials (such as acrylic sheets, solid color flat badges, and other simple badges with no complex lines inside);

③Simple planes correspond to simple shapes on paper such as rectangles, squares, circles, etc.;

④Custom patterns need to configure relevant feature recognition parameters;
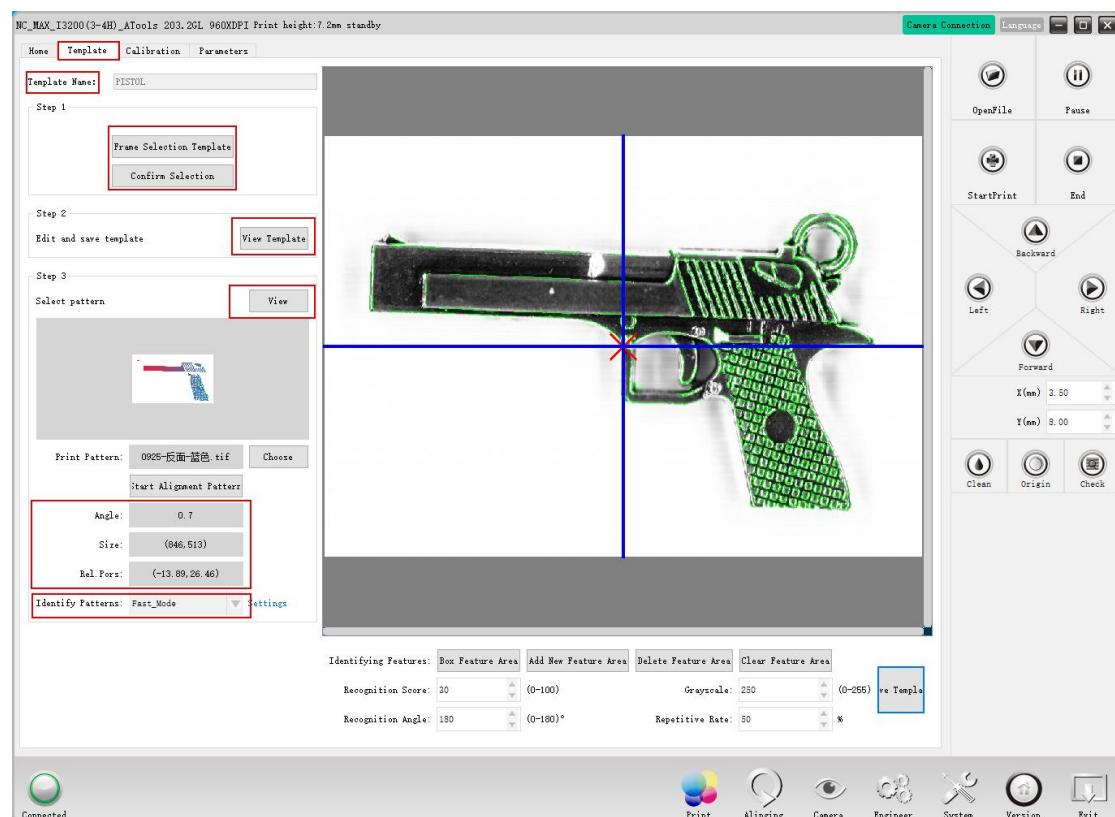
Figure 5-5 Template configure

Figure 5-6 Feature selection

6、Description of feature recognition parameters：

① Recognition score (0-100%): When picking up feature points for recognition, it is considered that the coincidence rate between the material identification and the number of feature points of the template is XX%, the pattern is drawn in this area; The actual score needs to be adjusted according to the recognition;

②Recognition angle (0-180°): with the selected template as the 0 benchmark, the material feature points of each rotation angle of each XX ° on the left and right are within the recognizable range; Generally, it is adjusted according to the actual situation and identification of materials;

③Gray scale (0-255): the gray level of the template processing when the feature is picked, the gray scale of the bright surface material with high reflectivity is recommended to be more than 200, and the gray scale of the dark surface material with high absorbance is recommended to be below 180, and the gray scale range is also affected by the exposure time, and the actual value needs to be adjusted according to the template feature picking;

④Overlap rate (0-100%): When picking up feature points, increase the repetition of material recognition according to the density of material placement; Generally 5-10, when the material is placed intensively, the repetition rate is increased to 60% or higher to increase the success rate of identification
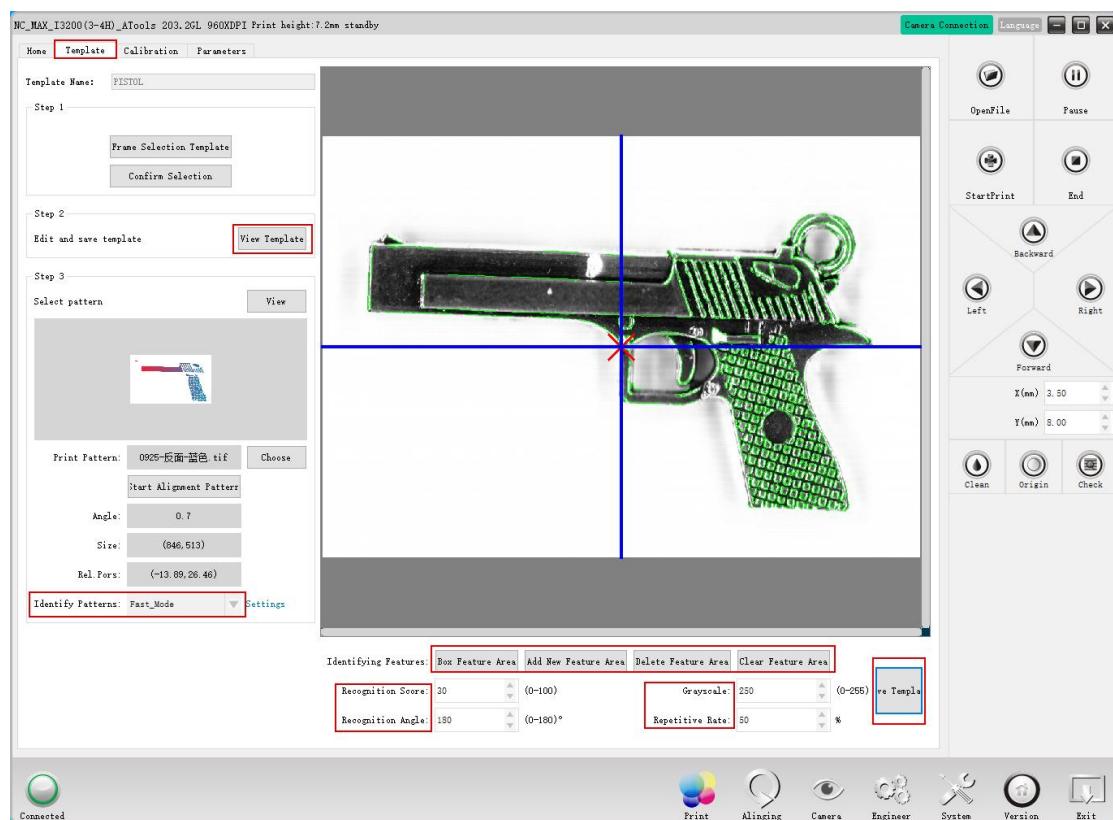

Figure 5-7 Feature recognition parameters

7、 For the template pattern that needs to be aligned, click【Start Alignment Pattern】, double-click the blue dot in the center of the pattern with the left mouse button to keep it unreleased, you can drag the pattern for alignment, and click Save to confirm the alignment information 【Angle】,【Size】,【Relative Coordinates】;

①Opacity (0-100%): Adjust the transparency of the pattern to facilitate alignment;

②Image scale (0-100%): adjust the scale size of the pattern in the XY direction, which is convenient for use when the drawing and the material do not match;

③Pattern outline: After checking, the pattern will only display the outline line, which is convenient for alignment and confirming the size;

④Rotation and translation: click the left button on the pattern in the blue frame, use the WASD button and QE button to control the translation and rotation of the pattern respectively, or the six alignment buttons at the bottom of the interface, the translation magnification can be ×0.1, ×1, ×2, ×5, and the rotation magnification can be ×0.01, ×0.1, ×0.5, ×1, ×5;

⑤Automatic alignment: the pattern finds the matching position automatically according to the angle and position of the material template;

After the template is made, the exposure value, feature parameters, identification parameters, and alignment information used are all saved in the template, and when scanning the same material, you can first select the template that has been made before, and generally there is no need to change the exposure value and other parameters, and you can start scanning after confirming the height;
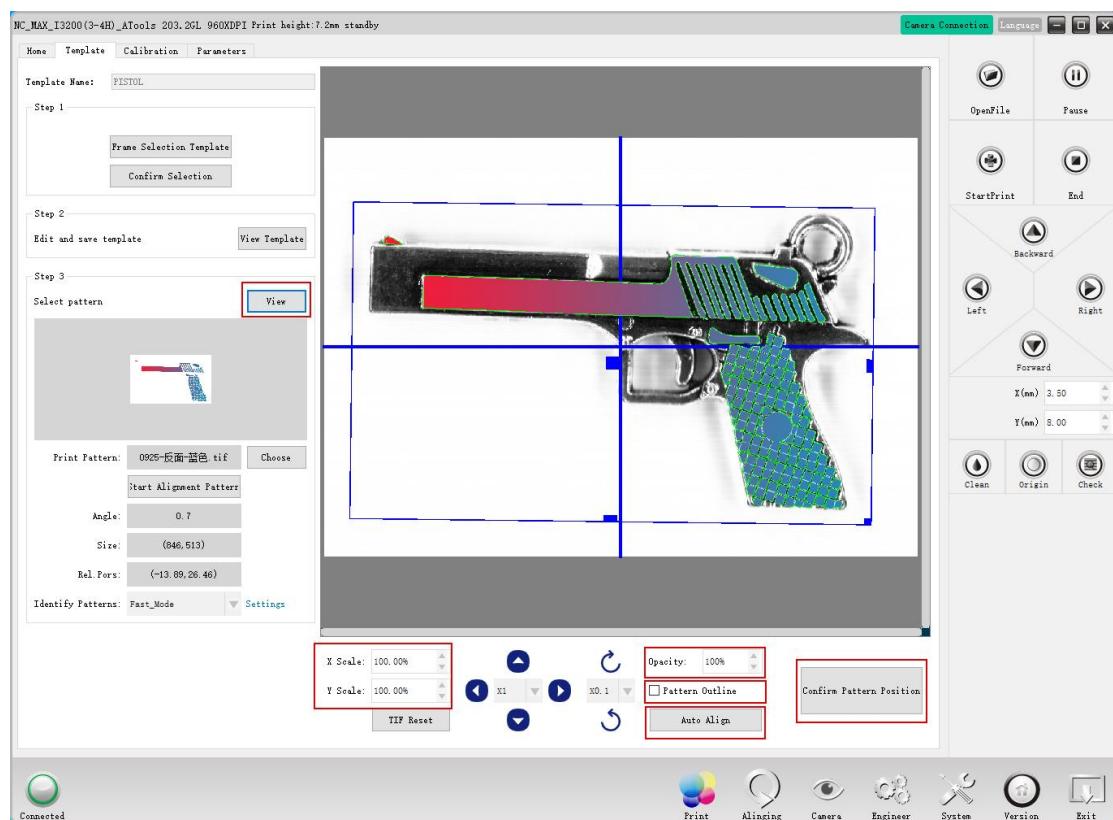
Figure 5-8 Pattern alignment

Recognize the drawing：

8、Confirm that the recognition score and recognition angle are appropriate, click【Draw according to the template】, and wait for the drawing to be completed; Generally, the recognition score should not be lower than 10 to avoid jamming caused by excessive calculation. When the drawing is too small, it is necessary to reduce the recognition score, and the blank area is

incorrectly drawn, and the recognition score is generally increased.

Identification scores and angles for some typical materials are described in the next section：

9、Editing steps of the pattern：
①Click the 【Frame Selection】 button to select the single/multiple patterns that need to be confirmed/deleted; ②Click the【Confirm】button to keep the drawing pattern only in the box selection area; ③Click the【Delete】button to delete the pattern in the box selection area; ④ Click the 【Repeal】button to restore all deleted patterns;

10、 Click 【Print Drawing】, and the image will be generated and sent to the set hot folder directory for processing by the software;
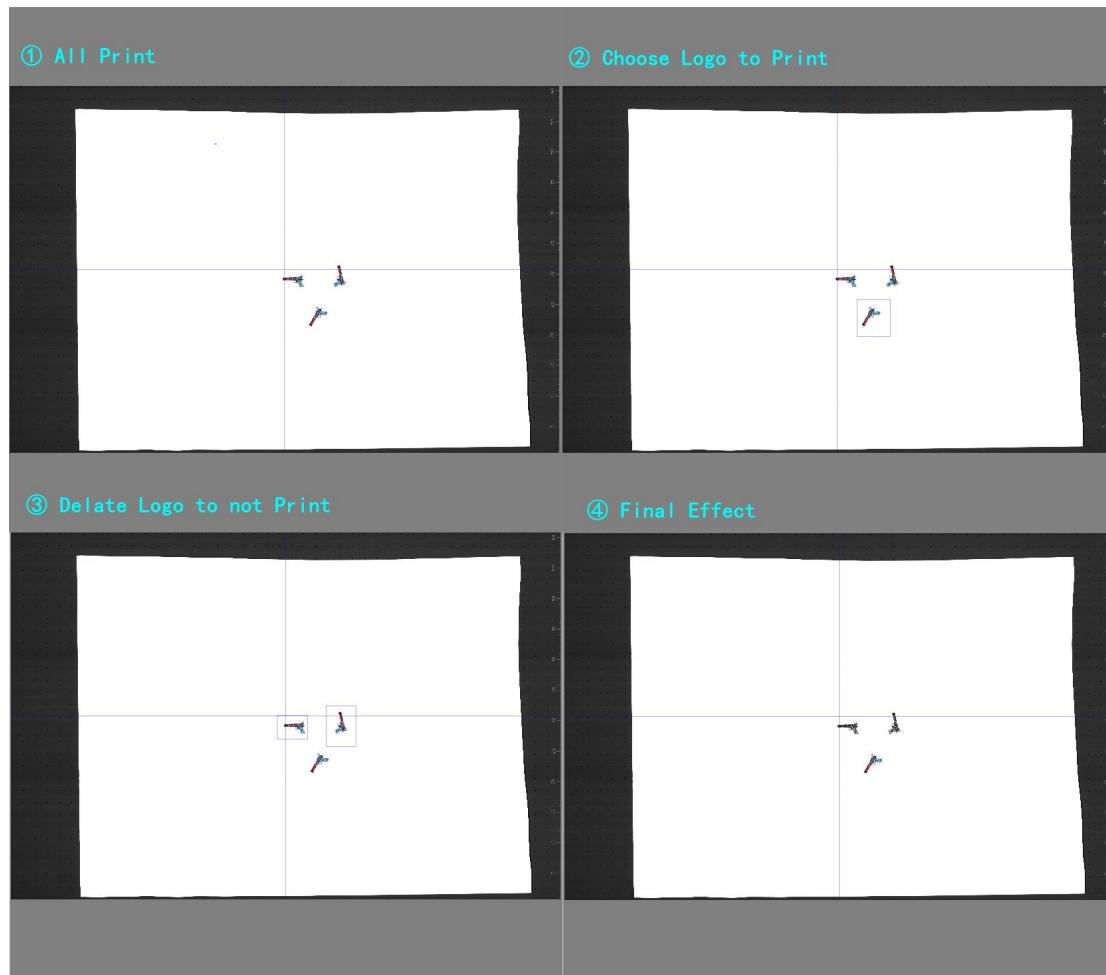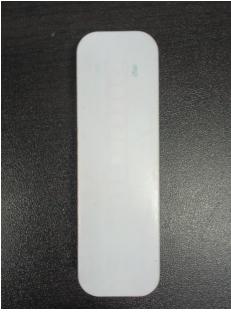
Figure 5-9 Editing the pattern

Typical material parameter

Figure 7-1   Typical material parameters are recommended

Material	Texture	Color/Reflection	Exposure	Gray level	Repetition rate	Identify scores	Identify mode
	Metal 1	Gold/ weak reflection	110	240	10	30	Standard mode
	Metal 2	Silver /weak reflection	95	220	20	25	Standard mode
	Metal 3	银色/Strongreflection	85	180	10	23	Standard mode
	Acrylic 4	Transparent/NO flection	110	200	5	40	Simple badges

	Plastic 5	Black/ NO flection	240	255	50	25	Simple badges
	Plastic 6	White /NO flection	200	65	10	70	Simple badges
	Resin 7	White /NO flection	160	80	5	20	Standard mode

Common problems

NO.	Problem	Reason and measures
1	NO vision tool module in the driver	1.Install Ares camera software；2.Insert the dongle；
2	The camera cann't be connectted	1.The network cable of the camera is loose, or the network cable is not plugged into the network port of the computer mainboard directly, or the network cable is not a Gigabit network port, which affects communication; 2.The camera network adapter is not assigned the IP address correctly, please confirm that it is 192.168.0.2; 3.The npcap-1.75 runtime environment is not installed correctly

3	The camera doesn't light up	1、The external trigger of the camera is not connected to the signal cable or setting properly; 2、If the camera is occupied or disconnected in the background, click the green camera connection in the upper right corner of the printer driver, and then tap the red camera to disconnect to confirm that the camera is reconnected.
4	Some areas are missing and blackened during camera acquisition	1.If the camera network transmission data is lost, confirm that the network port is normal, and replace it; 2.The signal transmission cable between the camera and the board card is loose, or the cable of the board card is loose, please re-plug it.
5	The camera lights up normally, but it doesn't take pictures	1.The camera encoder cable is confirmed to be normal, and the plug-in and unplugging interface is guaranteed not to be loose; 2.The camera settings trigger the start and end of the acquisition at a position larger than the format height; 3.The motion range of the camera is larger than the acquisition area;
6	Camera X-direction scan parameter settings	Motion area> lit area> width height 1.Camera dpi=600，Individual pixel size=0.0423mm/pix 2.If you set the height of a single camera image to 12000pix, the actual scanning width=12000×0.0423=500mm 3.The distance of the X-axis of the cart should be greater than 500mm from the trigger position 4.Therefore, the full width is set at 960mm) format height is 960÷0.0423=22695pix
7	The camera scans the imaging distortion	Confirm the camera encoder parameter value and the scanning speed of the camera in the X direction；
8	Abnormal calibration diagram	1.Size 900mm×600mm，Modify the carrier start point and white edge to print in the center position to prevent it from exceeding the normal printing area; 2.If you use the calibration map incorrectly, do not add white edges to the PRT file of the calibration diagram； 3.High-speed, low-feather default printing calibration map, and make color registration settings in advance to ensure the accuracy of the drawing and facilitate calibration calculation；
9	Abnormal imaging of calibration scans	1.Printing the calibration diagram onto adhesive tape may cause blurred line acquisition； 2.Please lay out the paper and turn on the suction to ensure that the lines are not bent；

10	The calibration calculation never returns results	1.If the calibration box is incorrect, please select the box from top left to bottom right so that all lines are included； 2.If the lines are not clear, please scan with an exposure value of around 180；
11	The calibration chart has a large calibration error; The calibration map has fewer grids, and the calibration map has fewer coordinates;	1.The camera is not calibrated to the proper position and needs to be recalibrated； 2.The start of the Y-axis scan is not in the correct position, resulting in the front side not being calibrated； 1.Re-frame the calibration area to expand the range of box selection slightly； 2.Image overexposure, adjust the exposure value, you can adjust the image light source according to the situation after scanning, and the image light source can be adjusted to about 200 for 180us exposure；
12	The camera lights up the first time when you scan, and the camera doesn't light up anymore when you scan	The camera is disconnected and reconnected, and the driver restarts
13	The image of the material is blurred	1.Re-calibrate the camera； 2.If the height of the Z-axis is too high, re-adjust the height of the Z-axis under the condition of ensuring the safety of the printhead, and the general adjustment amount is 0-0.5mm according to the depth of field of the camera；
14	There are a lot of mosaics when imaging	If the acceleration and deceleration during scanning is too large and exceeds the camera travel frequency, change the acceleration and deceleration area and acceleration, and change the X-scanning speed；
15	When creating/modifying a template, there is no normal jump after selecting the material	The calibration file does not match the current scan width (the current scan > cannot be framed during calibration), or is not calibrated；
16	The selection of template features is not ideal	1.Adjust the gray level, clear the features, and re-select the it； 2.Change the exposure time to rescan the material；
17	There is a deviation in the repeated adjustment of the pattern alignment	If the size of the original drawing does not match the size of the material, adjust the ratio of the image X and Y;
18	Drawing from the template "Draw Failed"	1.If the template is not ideal, the features are re-selected, and it is necessary to confirm that the exposure value of the template is the same as that of the scanned material； 2.The recognition score and recognition angle are not appropriate, and the score is too high or the angle is too small, resulting in the failure to identify the material；

19	The drawing recognition rate is low	1.When the box is selected, it is slightly larger than the material, and the blank space will lead to a low recognition rate； 2.If the feature is not ideal, reselect the feature； 3.To reduce the score, it is recommended to adjust the recognition angle according to the placement situation, redraw, and continue to lower the score if the recognition rate is still low； 4.When selecting features, the repetition rate increases, and when the material is dense, it needs to be adjusted, and the recognition rate will decrease if the repetition rate is too low；
20	The blank space misidentifies the drawing pattern	1.The recognition score is too low and needs to be fine-tuned to increase the recognition score； 2.If the number of misidentified patterns is small, use the draw delete function to delete the misidentified patterns manually；
21	The number of identified items is significantly higher than the actual number of materials	1.The repetition rate is too high and needs to be reduced； 2.The selection of features is not suitable, and it is necessary to choose continuous, clear, and unique lines；
22	The drawing pattern is offset from the actual item	1.If the selected feature is not suitable, and the feature area is misidentified, such as symmetrical materials, try to select the asymmetrical feature area； 2.If the recognition mode is not suitable, follow the instructions to select the appropriate mode； 3.When the number is small, the misalignment pattern can be removed manually；
23	Printdrawing drives a crash	Failure to use images in the format provided in accordance with the requirements for drawing; CMYK color mode, 1234 spot color channels, TIF pictures do not save image transparency；
24	Printing a paint plot could not find the resulting image	Check whether the Hot Folder settings take effect. Confirm the use of the retained/automatically turned on after receiving；
25	The position deviation of the printed map is large	1.Confirm the material alignment effect of the template making； 2.Confirm that the item is not likely to be moved during printing； 3.Check whether the XY white edge value is the XY white edge value used for calibration；
26	The position of the plot is regularly offset	X：If the trigger position is reset, recalibrate it; The starting point of the carrier has changed and it has been recalibrated；

		Replace the waveform, recalibrate or add X offset;
		Y：If the start position is reset, recalibrate it；
		Camera：The camera is loose, offset from the mounting and calibration position；
27	The white ink and varnish is lighter/thicker in the printout	Adjust the proportion and frequency of white ink and varnish in the driver；
28	The hollowed-out part of the material is obscured	1.Do not save transparency when saving a TIF file； 2.Set the white ink indentation in the Rip software； 3.The pattern is offset to the cut-out；
29	Error messages are repeatedly reported when using the printer driver software to upgrade the software program	1.Click Confirm or close the pop-up window when the error pop-up window is reported, and it can be upgraded normally after several consecutive times; This method is invalid when upgrading keyboard program resources; 2.Uninstall Npcap 1.75, install Winpcap 4.1.3, and then uninstall Winpcap 4.1.3 and install Npcap 1.75 back for the camera；