Visual positioning laser cutting control system DSP 2.0

User Manual

V2.0

Content

1 System Installation

1.1 Contents of the Control System

Control System includes hardware (controller 1 piece MPC03LX) & control software & Dongle .All in the package include software CD.

File name	Content	Remark
Install	Setup	
Drivers	Controller&Dog driver	
Doc	User Manual	Operation manual of Word format
Demo Data	PLT，BMP，…	
Read me	version explain	

1.2 Installation of the controller

1.2.1 Computer configuration Requirements

System: Window2000、Win XP;

CPU：above PIII；

Motherboard：at least one PCI expansion slot (MPC6515 does not require), at least two USB ports, the motherboard needs to support high-speed camera USB interface as USB2.0, one COM communication port for MPC6515;

Memory: at least 256M；

Hardware：at least 10G；

CD-ROM；

1.2.2 Automatic Installation

The drivers of controller are in “Drivers”.First shut down the computer, put the controller(MPC03LX) into PCI expansion slot, Then boot.

System detects the PCI card, then "Found New Hardware" dialog box come out, click "Cancel." In the Device Manager, select the device driver and update it.

1.2.3 Manual Installation

Generally, automatic installation is ok, but it fails sometimes, because of damage of the installer. Then it need to be manually installed.

Assume that the operating system was installed on the C disk.

Copy …\Drivers\Mpc03ls.inf to C:\WINDOWS\INF;

…\Drivers\MPC03LS.SYS to C:\WINDOWS\SYSTEM32\DRIVERS.

When installing, You should make sure the version of operating system. If it is Win2000, you must copy the file to Win2000 directory; if it is WinXP, you must copy the file to WinXP directory.

1.3 Installation of the software

1.3.1 installation of upper control software

Open the Install folder, double-click Setup.exe, then the following dialog box appears;

Click "Install" button, the following dialog box appears;

Press "cancel" button to cancel the installation of the control system;
Next, the camera driver is installed automatically.
please click "OK" to complete the installation of the control software.

1.3.2 Install the camera

The camera driver will be automatically installed with the 32-bit operating system.

1、 **32-bitoperating system:**

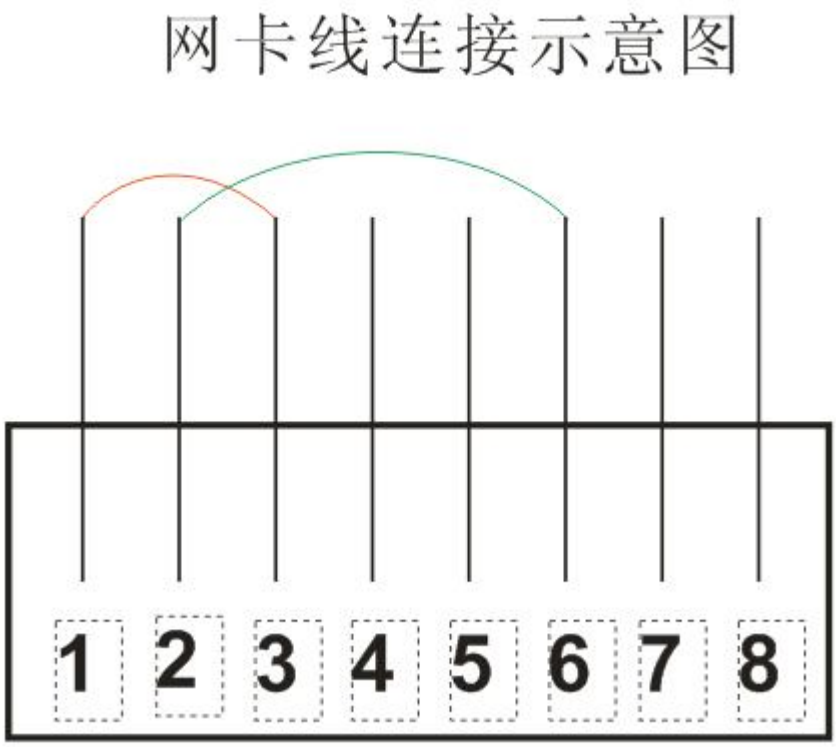
double-click C:\VisionLaserCut10\CameraDriver\x86\setup.bat.

2、 **64-bitoperating system:**

double-click C:\VisionLaserCut10\CameraDriver\x64\setup.bat.

1.4 Install the Network Card

1. firstly, Separate card must be installed ,if the lights look green, it means the network card is in working condition. If there is no net to connect, you can make one.. use 10cm length cable to from connected network environment. Card production line is as follows: crystal head towards their own cable, mount up, line connecting 1,3 and 2,6 Line.



After Vision and contrl modules are installed. put the dongle into your computer's USB port, the lower right corner will appear the following dialog box:

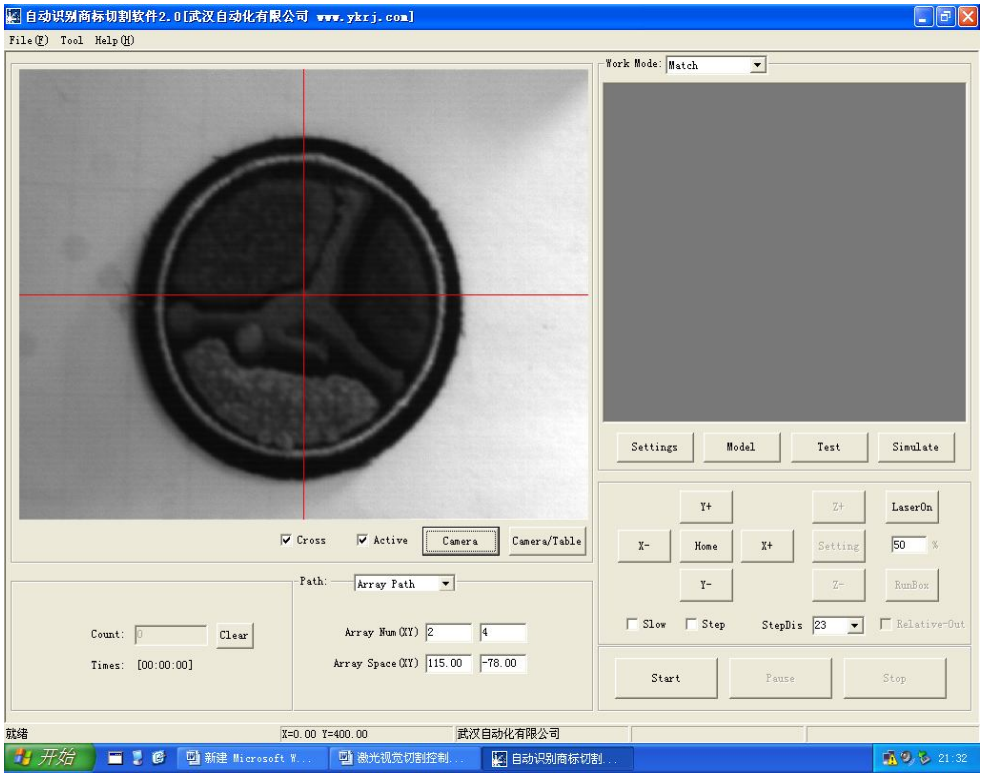
Windows operating system will automatically find the drivers to complete the installation of the software dongle. After all the hardware are installed.

2 Advanced control system configuration instructions

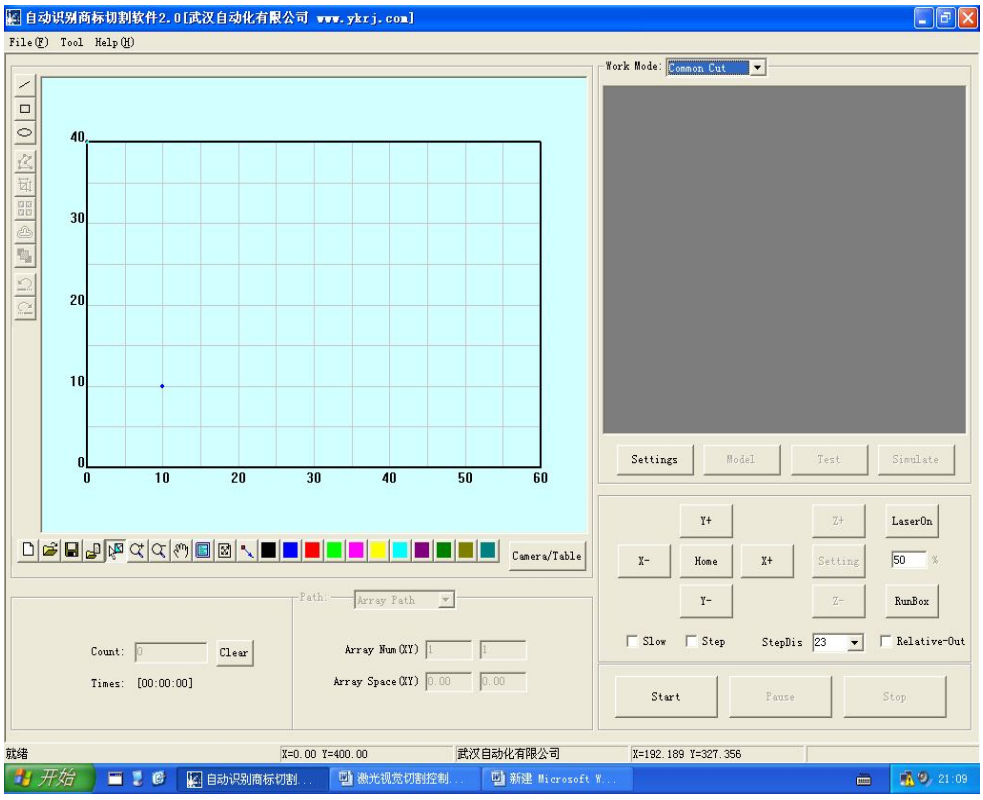
2.1 machine setting

Click on  ,the desktop application icon , Open control system software for first time.

Match mode: Feature location, the interface as follows:



Common mode: normal cutting, the interface as follows:



2.1.1 New

Click **New**  to create a new document。

2.1.2 Open

Click **Open**  to open an existing document in *.ec3 format.

2.1.3 Save

Click **Save**  to save active document as *.ec3 format.

2.1.4 Select

To select a rectangle area, click **Select**  。

2.1.5 Zoom In

Click **Zoom In**  to view larger image。

2.1.6 Zoom Out

Click Zoom Out  to view smaller image.

2.1.7 Pan

To move the current view, click the hand tool **Pan**  。

2.1.8 Zoom Worktable to Fit

View whole worktable by clicking **Zoom Worktable to Fit**  。

2.1.9 Zoom Object to Fit

View all graphics by clicking **Zoom Object to Fit** 。

2.1.10 Setting Stop

The icon is .
In normal cutting mode, when processing is completed. The position it stops.

2.2.1 control panel interface

Click the File menu under the "Machine Settings" ,dialog box will appear as follows:

2.2.1.1 Company Information

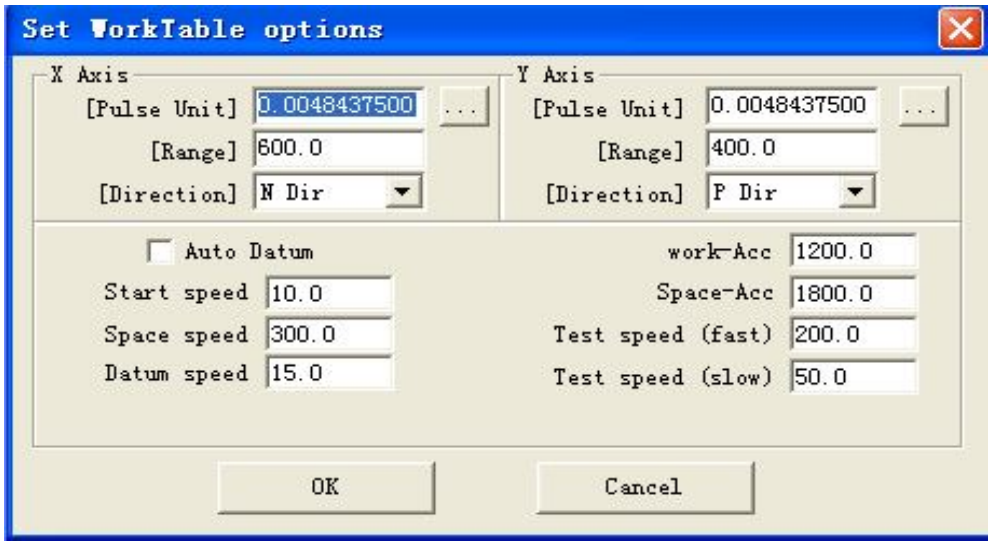
Manufacturer’s basic information.

2.2.1.2 Machine Setting

The parameters in machine setting are advanced configuration parameters, any Changes would result the laser machine doesn’t work properly. Generally , users do not need to modify. If it is Special circumstances, you should change it with the guidance of manufacturers.

Others,

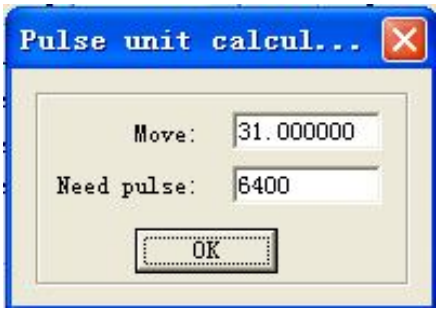
Enter the "Table Settings" interface ", the following appears;



X-axis represents the horizontal axis, Y axis represents the longitudinal axis.

2.2.2 Impulse equivalent

Control system sends a pulse laser head moving distance. Click on the button the following dialog box appears;



The data 20.400000 means laser head move distance is 20.40000, when stepper motor Rotate 360^{o}. 6400 means it need 6400 pulses to make the motor Rotate 360^{o}.

2.2.2 Table range

The maximum extent of the laser head moves(millimeters).

2.2.3 The homing direction

X axis on the right forward, Y-axis is positive above. Must ensure that the installation location and the home switch correspond to the settings option.

2.2.4 Back to the origin when boot

whether back to the origin when booting. If you do not select this item, then click the arrow key to move the laser head is relatively low speed to avoid collision. If you select this item, the system starts soft limit function, the laser head movement speed,and not collision.

2.2.5 Take-off speed

X, Y axis motion initial velocity. The machine will Shake if the speed is too large.

2.2.6 Air-way speed

When processing, without laser, the laser head runs the fastest speed.

2.2.7 The homing speed

The speed back to the origin when booting. This value should not be too large, otherwise there may be damage to the home switch and the machine may be have a greater shock.

2.2.8 Work acceleration

X, Y axis acceleration when cutting, it depends on the machine.

2.2.9 air-way acceleration

X, Y-axis no light air-way movement of the acceleration, it also depends on the machine.

2.2.10 Manual speed (fast)

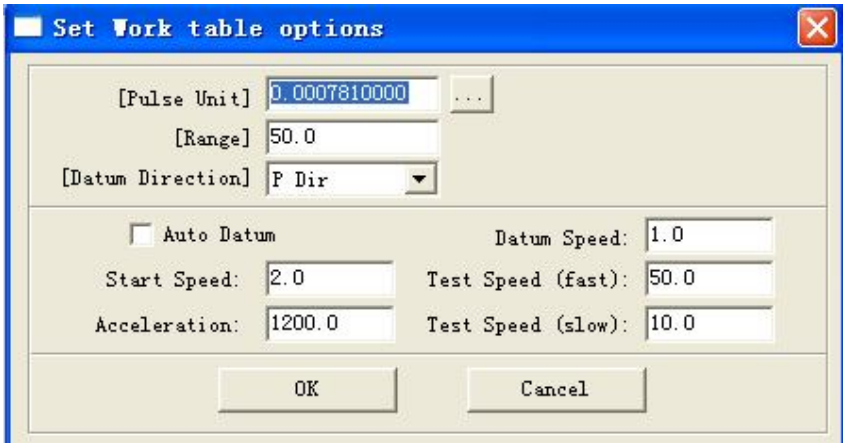
Select the [back to the origin when booting], manually move the laser head speed.

2.2.11 Manual speed (slow)

Do not choose he [back to the origin when booting], manually move the laser head speed.

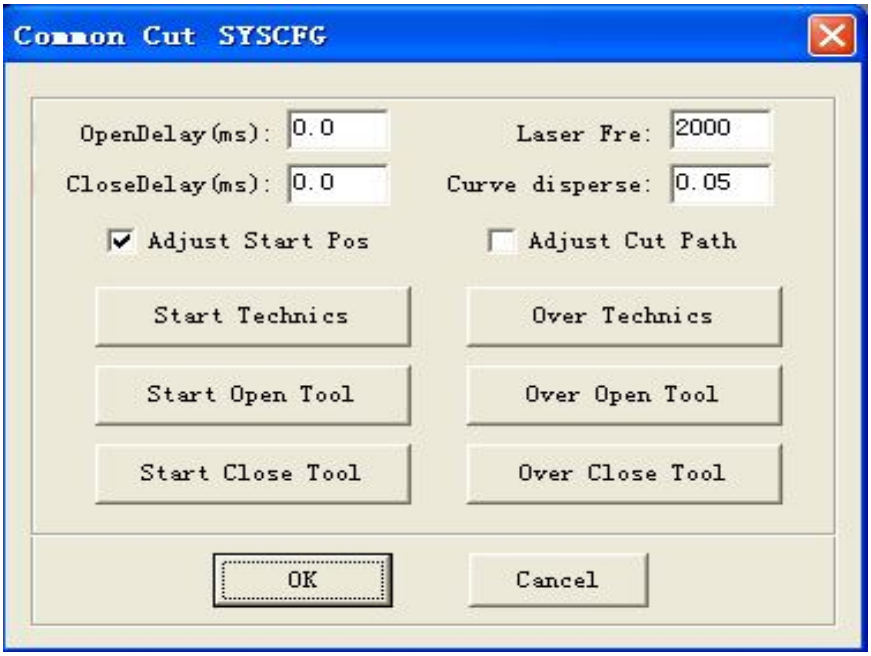
Into the "Z-axis settings" interface , the following interface appears：

When select the "Z-axis feeding support organization", "Z-axis settings" become effective. Z-axis is generally used to feed.



The parameters in this interface have the same meaning as table parameters.

Click into "cut set" interface ", the following interface appears:



Opening light delay(ms):start move after laser was opened for a moment.

Turn off delay(ms):turn off the laser after the move stops for a moment.

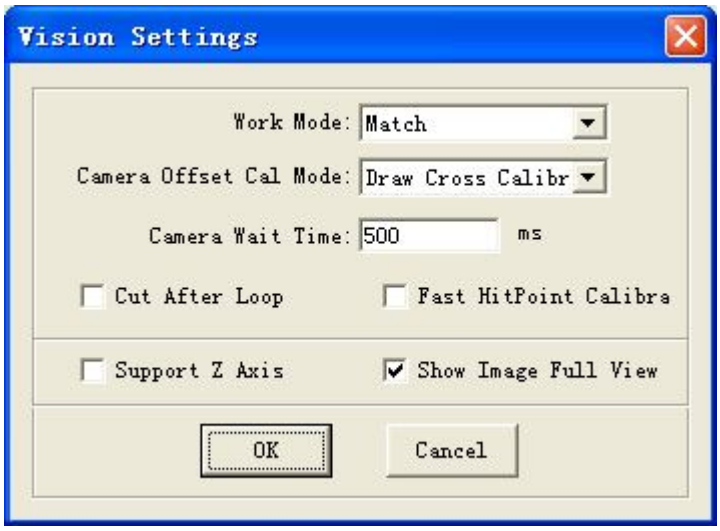
Laser frequency: Set the laser frequency.

Discrete accuracy: the smaller the value, the higher the graphic precision, but the calculation speed will be slower, and it will affect the processing speed. Generally, cutting plexiglass should choose a smaller value. others, use the default values.

Optimization start position: For single closed object, if you choose this choice, it analyze the start cutting position automatically, this setting help ensure that the object of sealing.

Optimal path: By Path Optimization, in order to improve processing efficiency. It will adjust each object's Processing sequence.

Click on "visual settings", the following interface appears;



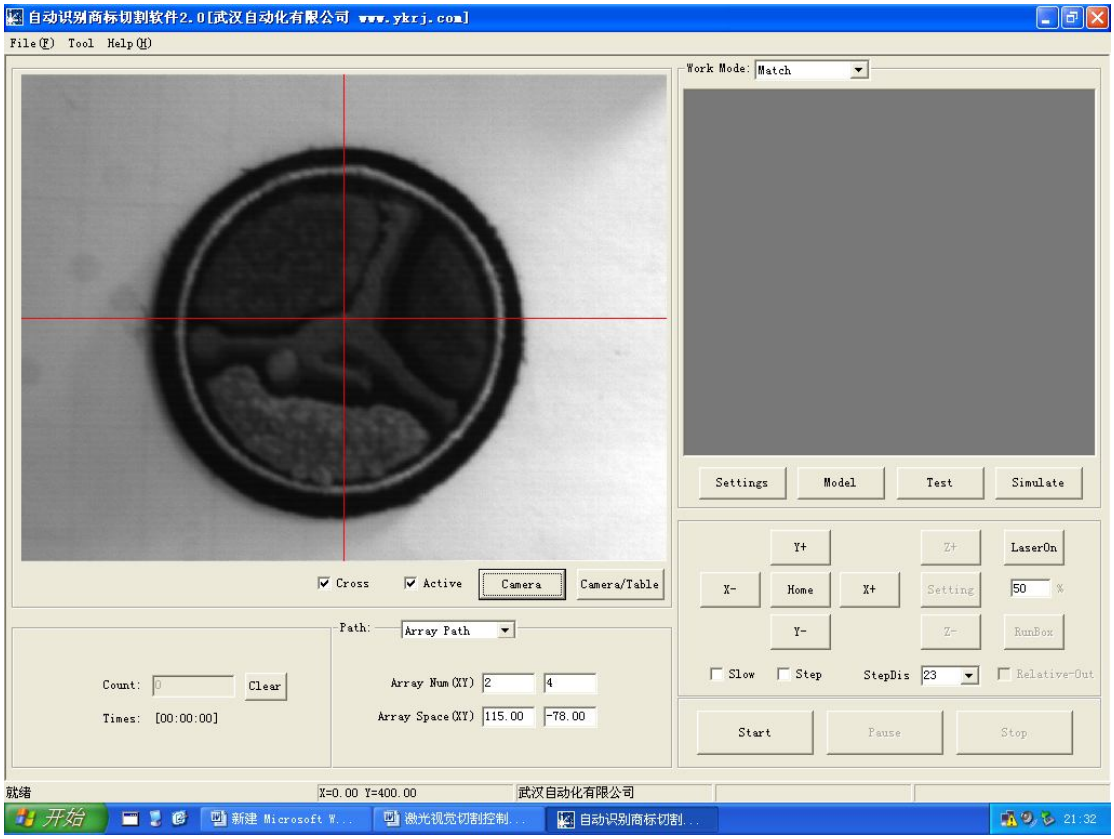
Work Mode: support Match mode and Two Mark Locate

Camera offset correction mode: support the reticle correction, and contour detection correction mode. Specific operations, see later description. Camera to take pictures before settling time: camera movement to the camera position will be stable over time, then shoot the image. The time is too short lead to an unstable image, cutting allowed. Appropriate to reduce the exposure time and gain can improve the response speed of the camera The camera parameters and the response speed and response speed of the machine motion in place. Recognition of the entire board after cutting: to confirm whether all of object identification process.

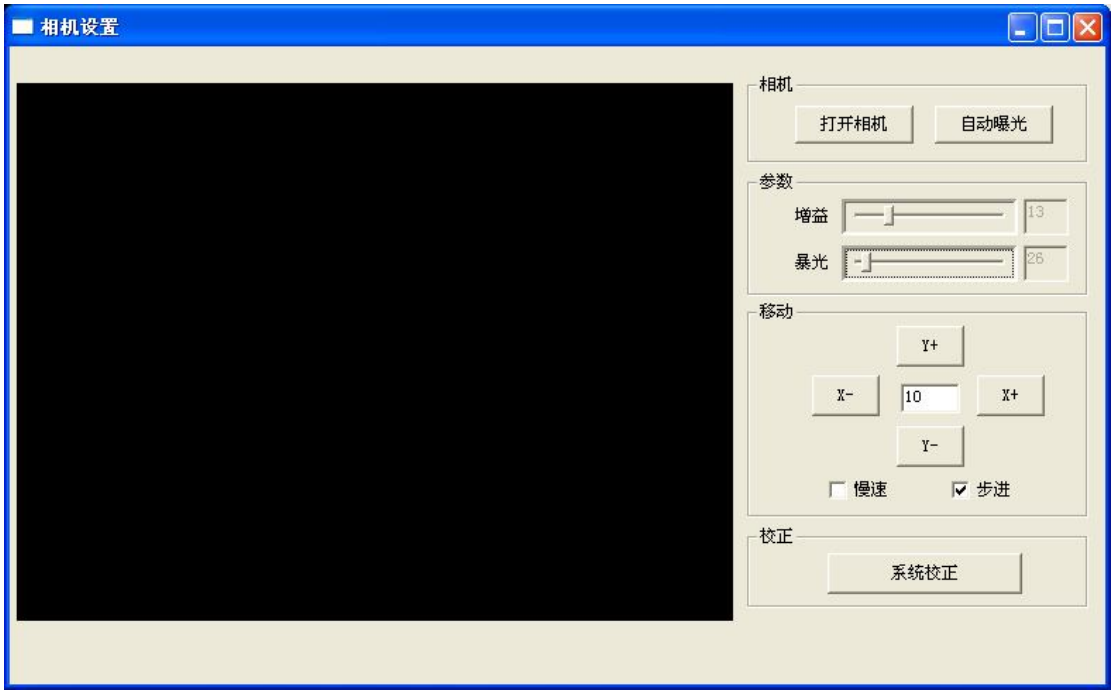
Take the S-shaped trajectory: when the system search path for the "standard array path", you can take the S-shaped efficiency.

Support the Z-axis feed sector: If the machine matching the feed mechanism, then select this option. Otherwise, deselect this option.

3 Camera settings and system calibration



Click on the "Camera Settings" button in main interface, the following dialog box appears:



The left graph shows the image captured by the camera.

3.1.1 Open camera

If you have clicked camera setting, the interface displays without graphics. Then , you should click again to drive the CCD visual equipment , until the image shows up.

3.1.2 Expose automatically

If you do not satisfy the image, which has been shoot by the camera, You can use this function to improve the definition. If you want to improve the definition better, it should use Manual adjustment.

3.1.3 Gain

If the effect of the picture taken by CDD is not very good . You can use this function to improve.

3.1.4 Expose

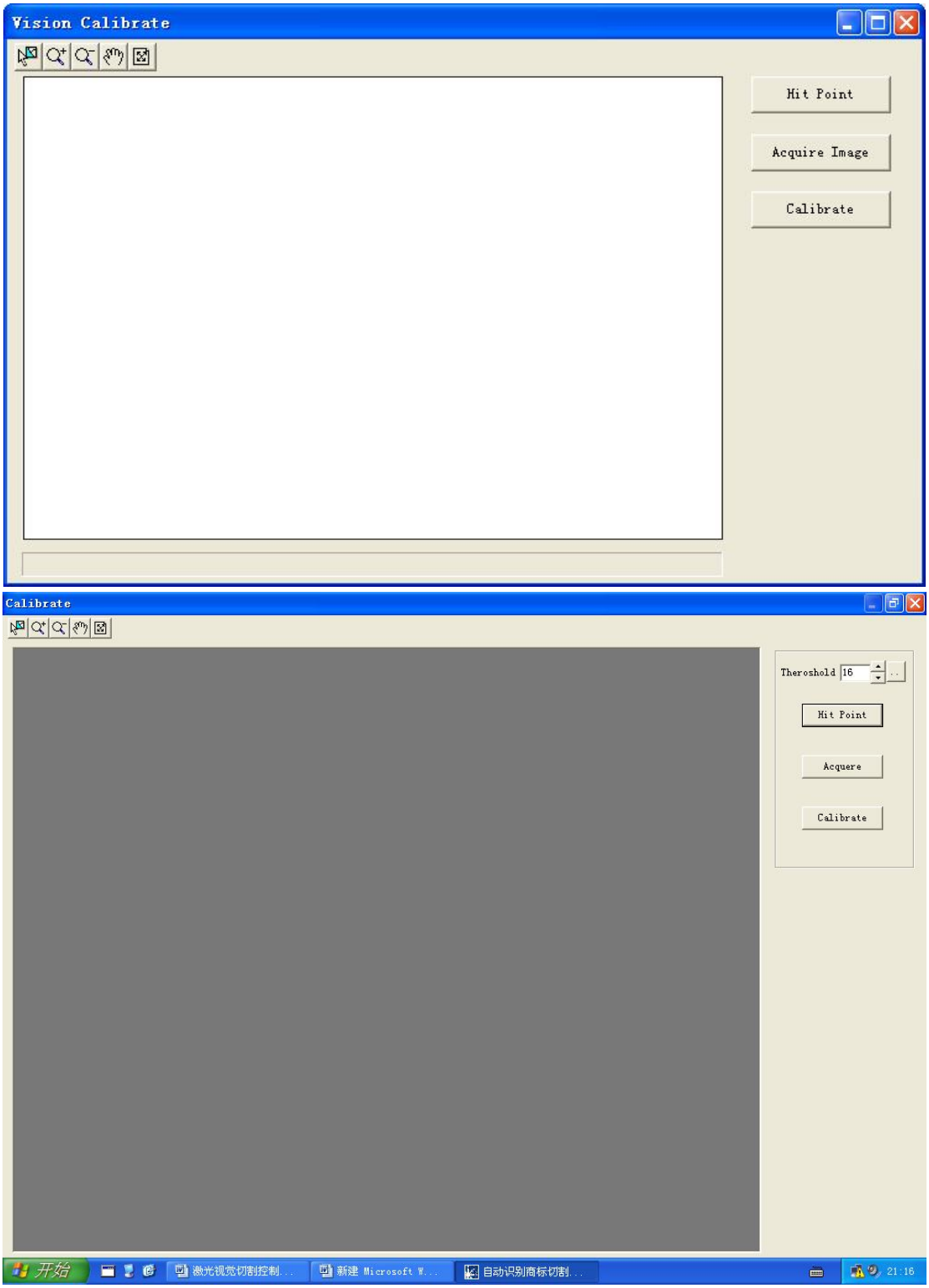
Manual adjust the Expose, Recommended value is about 25ms, If the value is too large, it will affect the camera response speed.

3.1.5 Move

The icons are Y+、Y-、X+、X-，click these icons to make laser head move.

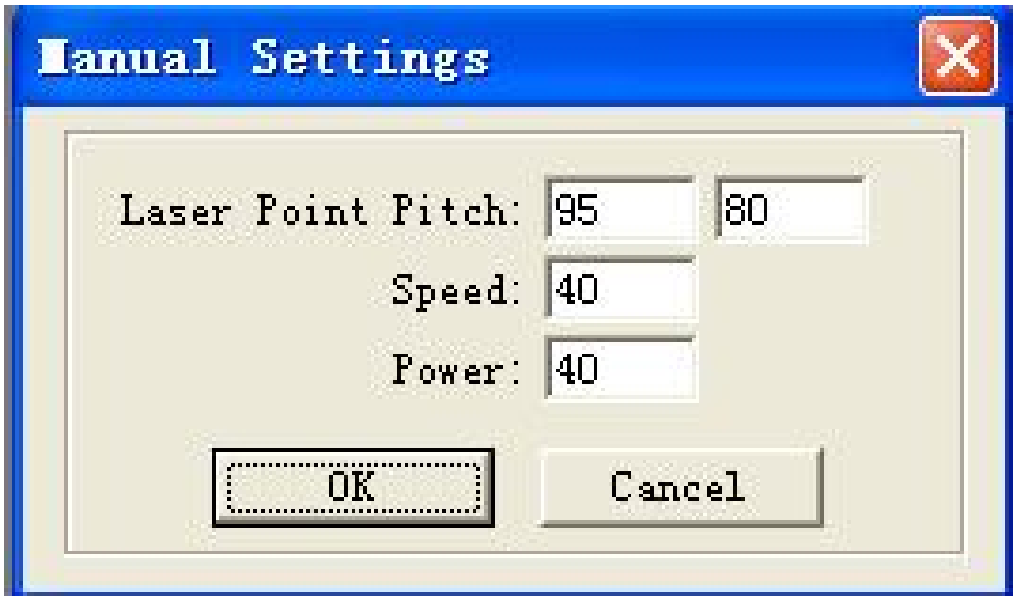
3.2 System calibration

Click "Calibrate" button, the following interface appears:



3.2.1 Dot

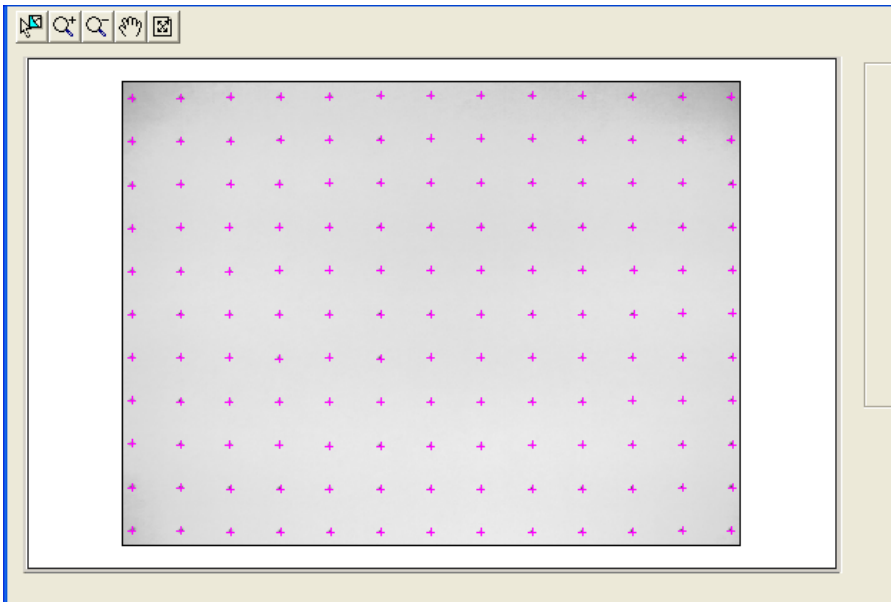
This is most important step. firstly, put a piece of white paper under the camera. A4 is enough, In order to ensure the effect of the picture taken by CCD. There is nothing between CCD and A4 paper. Click on “dot” button, the following interface appears:



Set the Parameters in the Dialog box, then click on “ok”. CCD will move to the middle of the range. If some dots are not in the range, you should move the camera manually, until you can see all the dots taken by laser.

3.2.2 Get Image

When all the dots are in camera field of view. Click on “get”, as following interface.



Enlarge the image, check whether each crosshair is in middle of each laser dot. If not ,you

should move crosshair to middle of laser dot. If some dots aren't be checked. You can reduce the threshold, or adjust gain and expose. If a small number of dots can not be detected, the system can calibrate automatically.

Then click the "correction", the parameters are saved in system. And the camera parameter setting is finished.

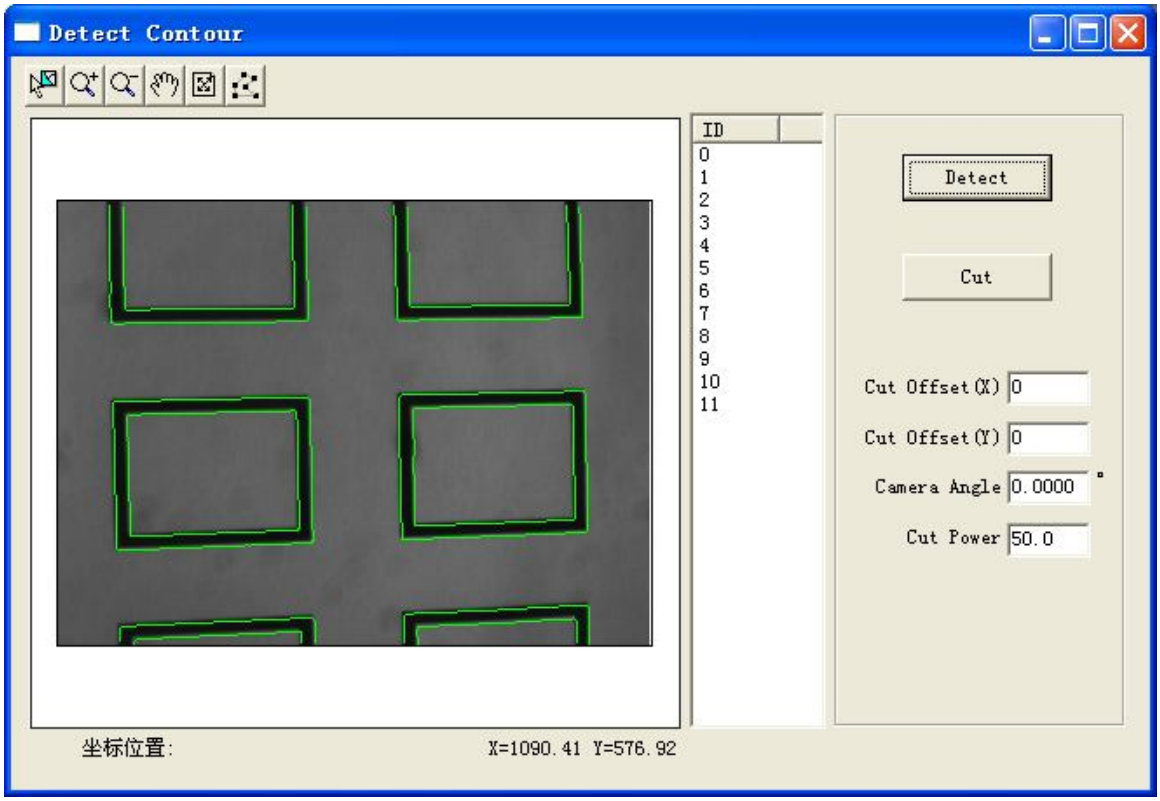
3.3 camera offset correction: File—>camera offset

Two modes: Contour detection correction、Crosshair correction.

3.3.1 Contour detection correction

After finishing the parameters correction, It need to measure the accurate distance between CCD and laser head by correction test. And then, record data.

Click on "file"——> "camera shift"



System will detect some graphic border automatically based on color contrast. Take the middle rectangle for example, we only need graphic frame, so click  to delete excess box.

3.3.1.1 Cutting test

Click the button, laser head will cut around the rectangle with the set parameters cutting power and cutting speed.

3.3.1.2 X-axis offset

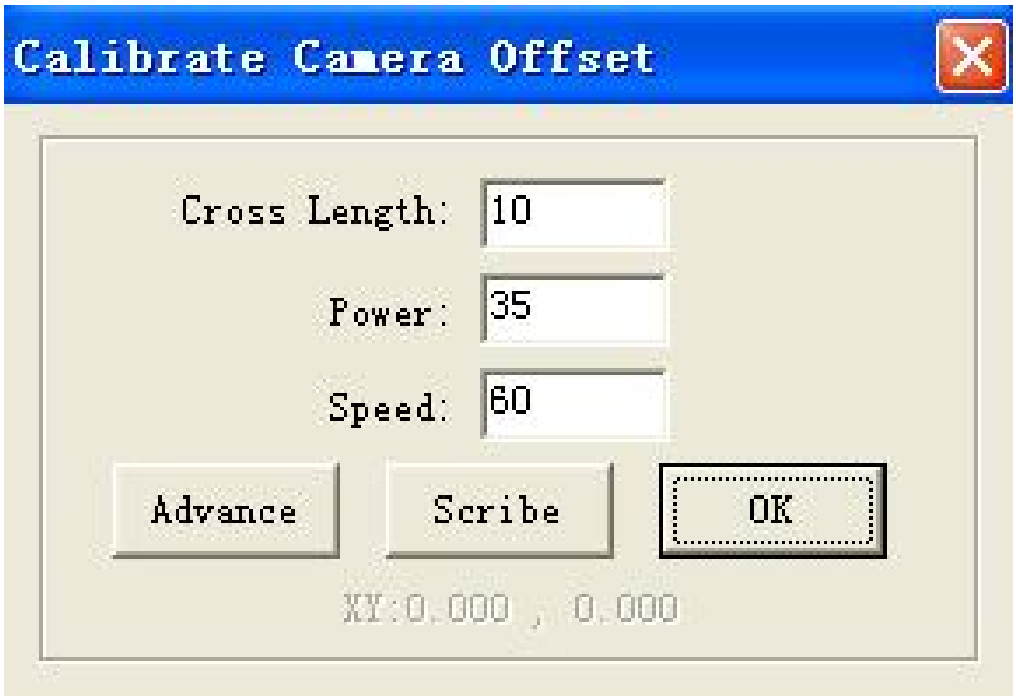
If there have aberration between cutting figure and actual figure . Then you can adjust this distance by input data, until the Overlap value between cutting graphic and border is 0.

3.3.1.3 Y-axis offset

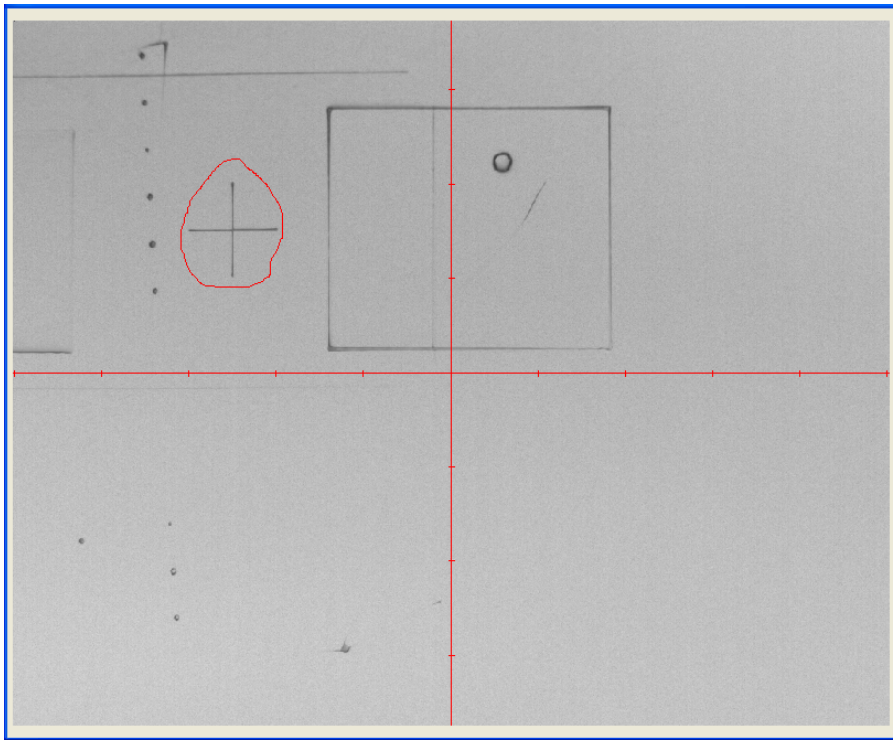
The setting is as the same as X-axis offset.

3.3.2 Crosshair correction

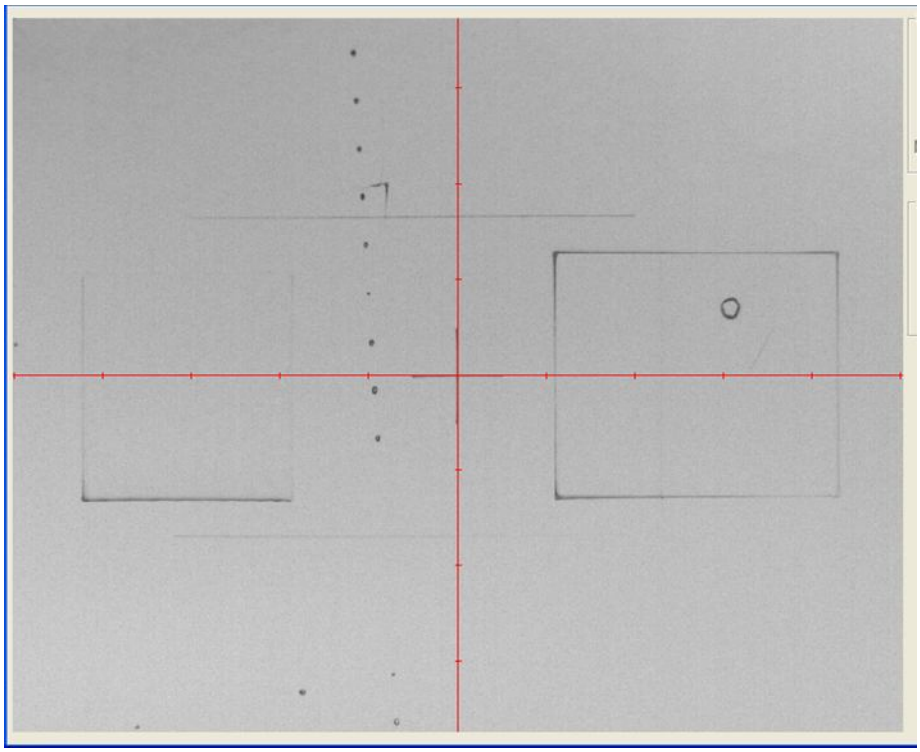
Click on "file"——>"camera shift"



Click on "groove", system will groove a Crosshair (10mm), with the speed of 60. The camera will move to crosshair center, then pop up the following interface automatically:



If the current crosshair center is not coincident with camera center, move the camera to ensure them coincident.



Click on “OK”, The system will prompt you whether to adjust the new offset parameters.

Click on "OK" to complete one correction. In order to ensure parameter stability, it need to groove at least 3 times.

4 Templates Setting

4.1 Templates setting

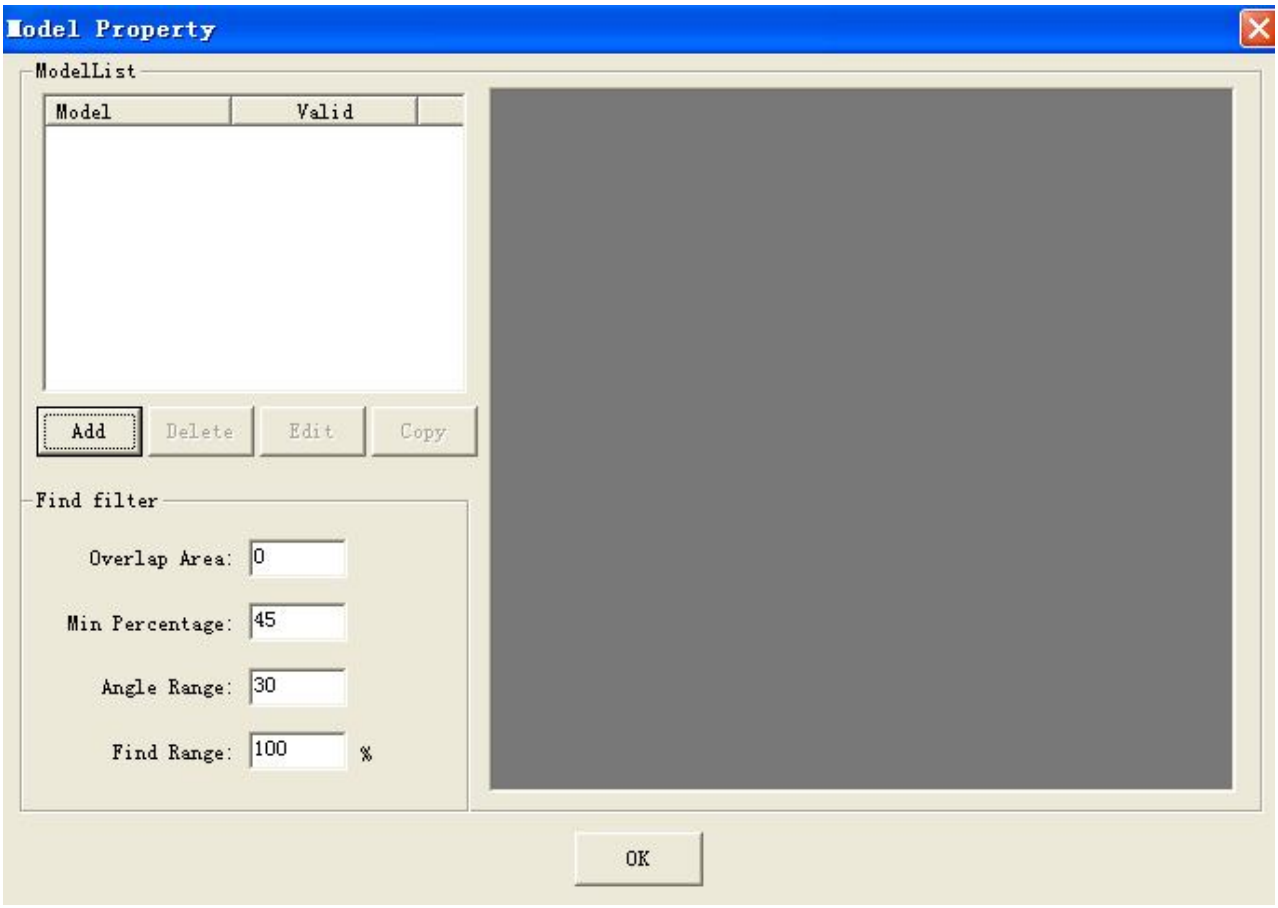
In the main interface, click the "Template Settings" pop up the following screen.

Allow the overlap area: Theoretically cutting lines do not overlap, when the trademark to endure the close,or the cutting line,cutting line identification errors lead to overlap if the overlapping area is zero,there will be leakage of standard filters.

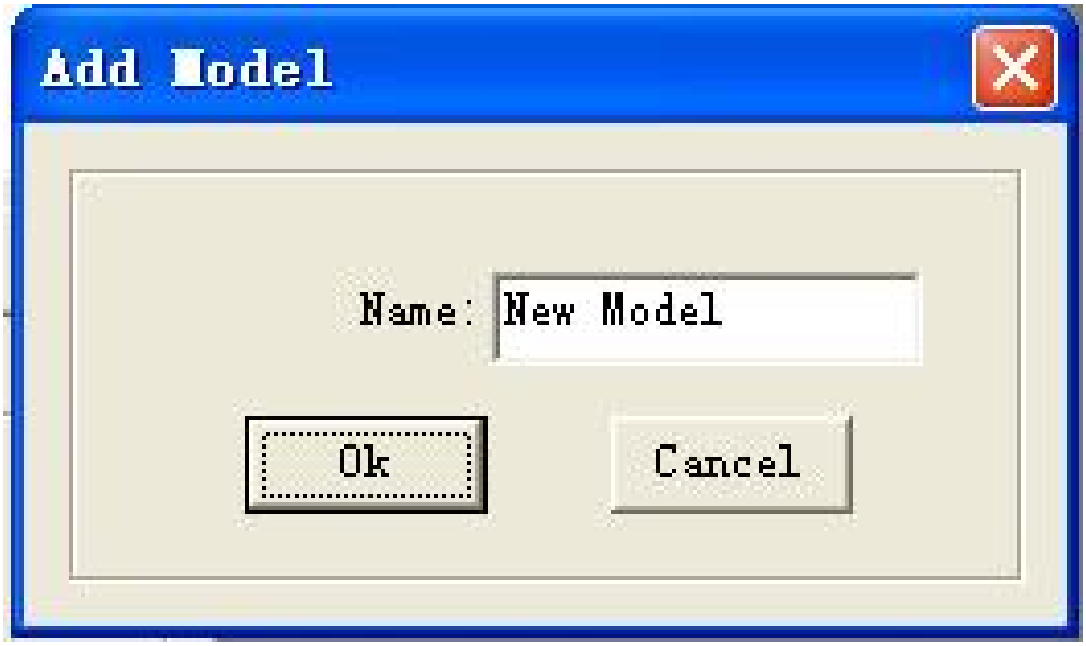
Minimum similarity: Trademarks that identify when and template defined minimum degree of similarity beween odjects.Too easy to leak standard,is too small to be identified shoud not object.

Angle range: Allow identification of the object and template object rotation angle.
Small deformation of the center area of the camera,in order to improve the accuracy of a small mark,you can set the search scope,remove the sdge of the deformation of the object,to improve accuracy.

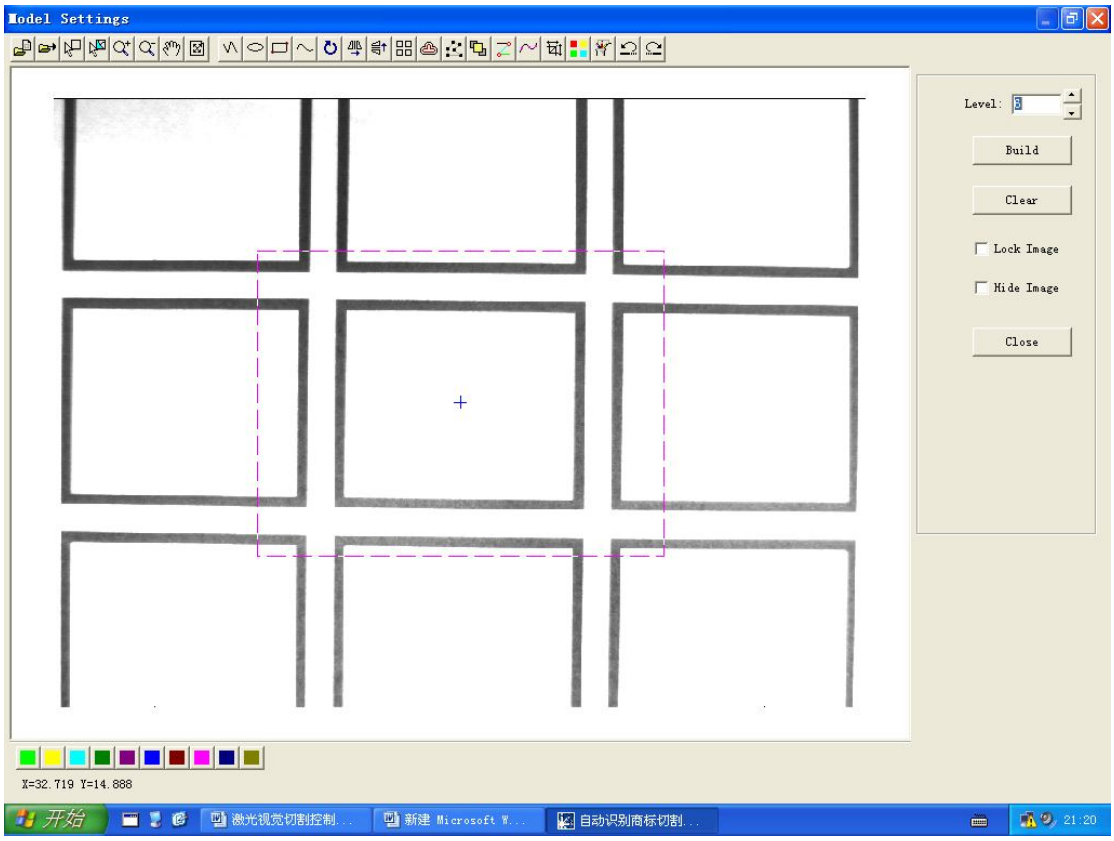
Effective search range: Small deformation of the center area of the camera,in order to imporve the ccuracy of a small mark, you can set the search scope,remove the edge of the deformation of the object,to improve accuracy.



Click "Add" to generate a new template.



Click "OK" appears as the template editing interface.



Click **"feature definition"** the system automatically analyzes the image within the dashed border, and generate the characteristics of the blue line.

In the production of template template image shows the central area of the camera is better.

Click **"Clear"** if identification to the graphics frame, the graphics are not always effective, you can click the Clear button, re-defined characteristics.

Click on the **"reduced set image"** after all of the images can not be selected command hit

Click the **"Hide Images"** show after only vector data, remove the clutter to facilitate acquaintance of the minimum of characteristics.

This parameter sets the minimum acceptable visual detection of objects of acquaintance, if the camera is marked in identifying graphics may be appropriate to reduce the leakage value. The default is 50. Fast mode setting of the number around 30, normal mode angular error of about 50.

Relative to the actual template, mark the angle setting error, equipment installation has been configured to allow for the 10 plus or minus 10 degrees of deviation, when the support is set to mark 180 placed at any angle, the smaller the number the faster identification.

4.1.1 Import

Corresponding toolbar icon  .

Software supports to import data, including: *. PLT, *. AI, *. DXF, *. DST, etc.

Click to select the next common *.plt CorelDraw grlhics,into PLT and vector graphics in graphics and picture frame borders overlap.Accurate mobile graphics then hold down the CTRL key down each time when about graphics moving distance 0.05mm;

Hold down the CTRL+SHIFT key down each time around,the graphics move a distance of

0.025mm.

4.1.2 Export

Corresponding toolbar icon  .

Export vector data within the template editor for the *. PLT, *. DXF file, to facilitate the exchange.

4.1.3 Setting the scope of the template

Corresponding toolbar icon 

Select the template range operations.

4.1.4 Choose

Corresponding toolbar icon 

Select to edit graphics. Select a section of graphics or graphics, you can select the parts move, delete, change the layer and other editing operations.

4.1.5  :Zoom display graphics data.

Click the button, the screen can be enlarged with a mouse click on the graphic data (the data does not change the actual size).

4.1.6  : Narrow the display graphics data.

Click the button, the screen can be reduced with a mouse click on the graphic data (the data does not change the actual size).

4.1.7 Pan the screen.

Click the button, you can move the screen.

4.1.8 Full screen

Click the button, you can move the screen.

4.1.9 Multi-line

Corresponding toolbar icon.

Draw arbitrary lines. On the screen and click the mouse to drag the mouse to draw arbitrary lines. Click the "C" key graphics can be automatically closed.

4.1.10 Oval

Corresponding toolbar icon.

Ellipse. Drag the mouse on the screen and click the mouse to draw the ellipse, hold down the Ctrl key while dragging the mouse you can draw a circle.

4.1.11 Rectangle

Corresponding toolbar icon

Draw a rectangle. Click the button, drag the mouse on the screen, draw a rectangle of any size. Press "Ctrl" key while dragging the mouse to draw a square.

4.1.12Bezier

Corresponding toolbar icon

Draw Bezier curves. Drag the mouse on the screen and click the mouse to draw Bezier curves.

4.1.13 Rotation

Corresponding toolbar icon

Rotating graphics. Click "Choose" button , select the desired on-screen.

4.1.14 Horizontal mirror

Corresponding toolbar icon
Graphics to mirror the level of the selected.

4.1.15 Vertical Mirror

Corresponding toolbar icon .
Vertical mirror to the selected graphic.

4.1.16 Array Copy

Corresponding toolbar icon.
Array copy the selected graphic objects.

4.1.17 Side extension

Corresponding toolbar icon.
Expansion of the selected graphic object side.

4.1.18 Node Editing

Corresponding toolbar icon

Node of the selected graphics editing. Click the button, select the graphic that node will be a small box will appear. As shown below:

Mouse over the node, drag the mouse to change the shape of the graph.

Mouse over the graphics, the mouse will become the cross, this time double-click to add nodes. If you need to remove the node, simply hover your mouse over the node to delete, click the "Delete" button.

4.1.19 Sorting

Corresponding toolbar icon

Set the output sequence.

4.1.20 Merge connected line

Corresponding toolbar icon

Connected to the data merge.

4.1.21 Smooth line

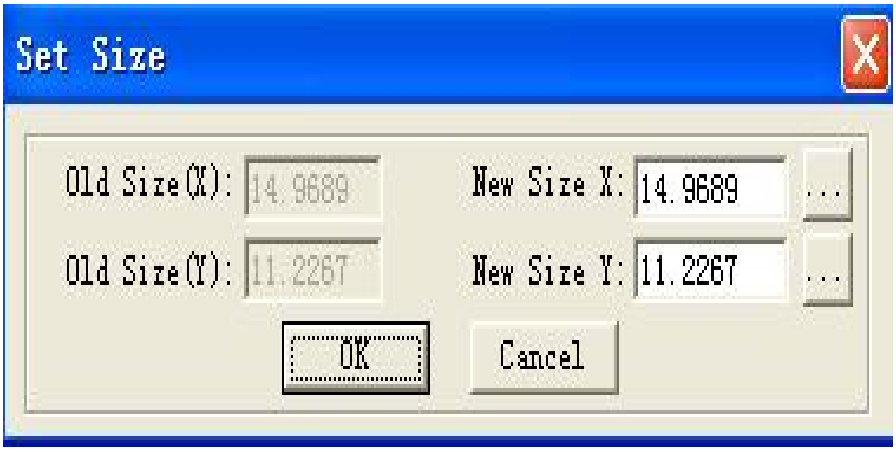
Corresponding toolbar icon

Smoothing of curves, can increase the cutting speed and smoothness.

4.1.22 Size

Corresponding toolbar icon

Zoom Graphics. Click "Choose" button , On the screen, select the required scale of the graphics, click the button, the following dialog box:



Enter the desired X, Y direction of the length, click OK to change the size of graphics.

If you need graphics with scaling, you first enter the X direction or Y direction of the length value, and then click the button after the dialog box ...

4.1.23 Corresponding toolbar icon.

System basis points range, the entire image mosaic of the region.

4.1.24 Export

On the toolbar, click **Export** to save the current document as *.bmp document.

Save current shot image as the *.bmp format to complete the edge enhancement work using CorelDraw.

4.1.25 Remove

Corresponding toolbar icon.

Back to previous edit state.

4.1.26 Recovery

Corresponding toolbar icon.

Back to the revocation of the previous state.

4.1.27 Cutting data stratified

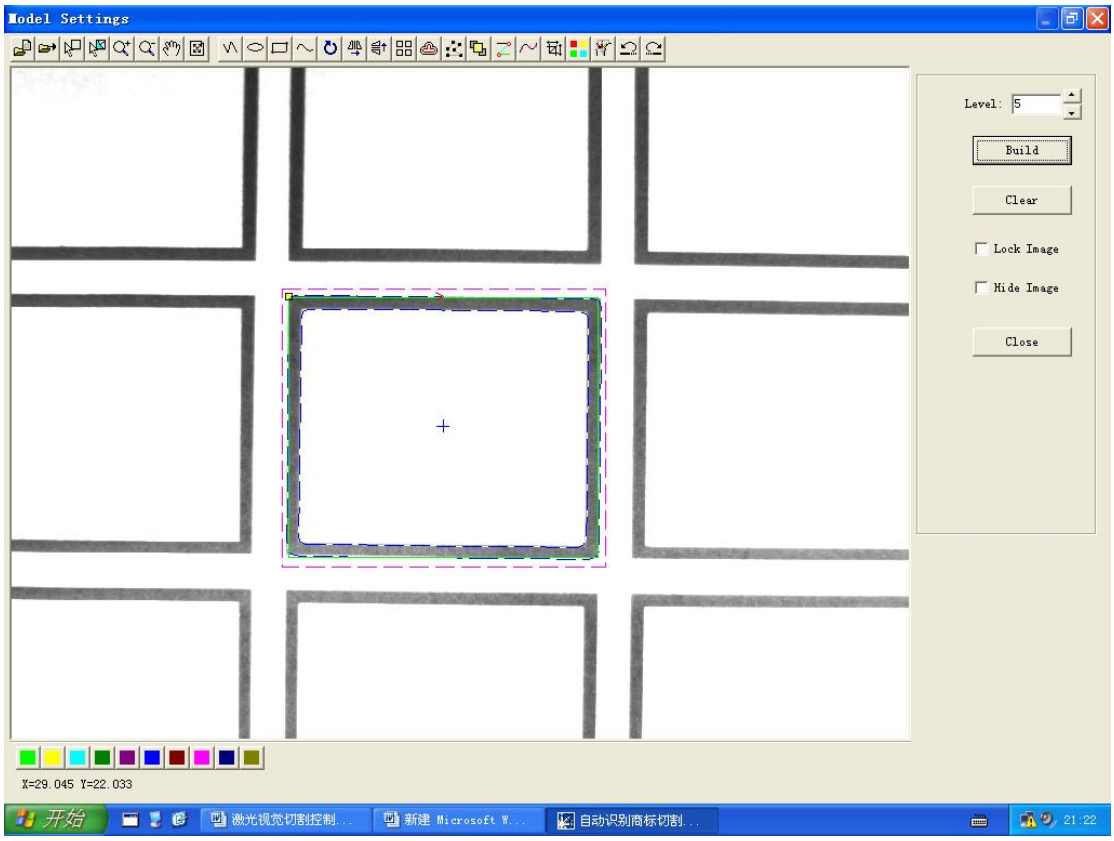
After cutting in the production line after the following icon:

Within the green border graphics which said laser cutting head to the border. Blue dotted line is the feature definition to the graphics system to find the border does not belong to the output layer, processing the color line is not output.

5 Output

Output Interface Description

After defining the template settings, close the template settings interface, and its processing into the main interface as shown below:



5.1 Manually move the control

5.1.1 

Stepping mode: If the button input value is: 10, said laser head in order to slow

[manual call table set interface speed (slow)] to the Y-axis positive direction 10mm.

Non-stepping mode: Click on this button, the laser head quickly to the Y-axis positive direction [manual call table set interface speed (fast)], release it immediately.

5.1.2  Stepping mode: Click this button if the button input value is: 10, said laser head in order to slow [manual call table set interface speed (slow)] to the Y-axis negative direction 10mm.

Non-stepping mode: Click on this button, the laser head quickly to the Y-axis negative direction [manual call table set interface speed (fast)], release it immediately.

5.1.3  Stepping mode: Click this button if the button input value is: 10, said laser head in order to slow [manual call table set interface speed (slow)] to move the X axis is 10mm.

Non-stepping mode: Click on this button, the laser head quickly to the positive X-axis direction [manual call table set interface speed (fast)], then immediately stop the release.

5.1.4  Stepping mode: Click this button if the button input value is: 10, said laser head in order to slow [the interface to manually set the tone table speed (slow)] to the X-axis negative direction 10mm.

Non-stepping mode: Click this button, the laser head quickly to the negative X-axis direction [manual call table set interface speed (fast)], release it immediately.

5.1.5  XY origin reset.

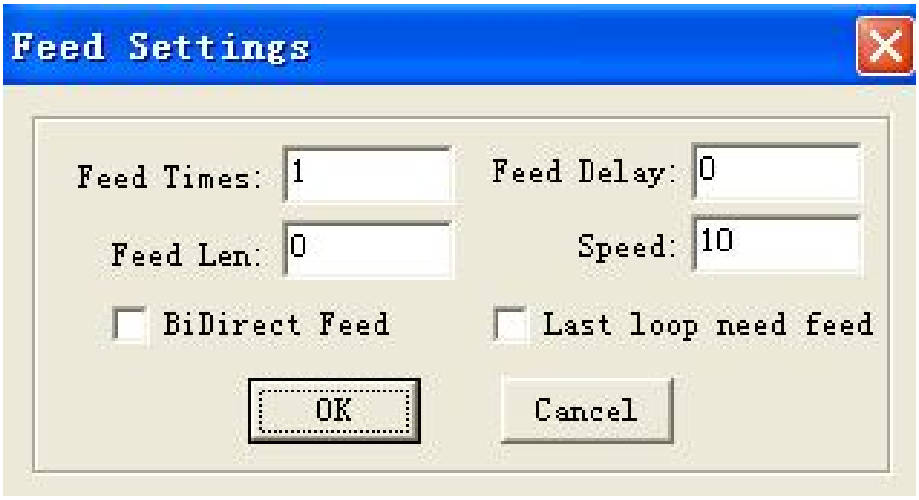
5.1.6  Step mode: Click this button if the button input value is: 10, said laser head in order to slow [the interface to manually set the tone table speed (slow)] to the Z-axis negative direction 10mm.

Non-stepping mode: Click this button, the laser head quickly to the negative Z-axis direction [manual call table set interface speed (fast)], release it immediately.

5.1.7  Click this button if the button input value is: 10, said laser head in order to slow [the interface to manually set the tone table speed (slow)] to the Z-axis negative direction 10mm.

Non-stepping mode: Click this button, the laser head quickly to the negative Z-axis direction [manual call table set interface speed (fast)], release it immediately.

5.1.8  Set the characteristics of the feed sector.



5.1.9 

Laser light test switch.

5.1.10 

Cutting mode sense.

5.1.11 
Cutting mode sense.

5.2 Search path

5.2.1 Standard array of paths:

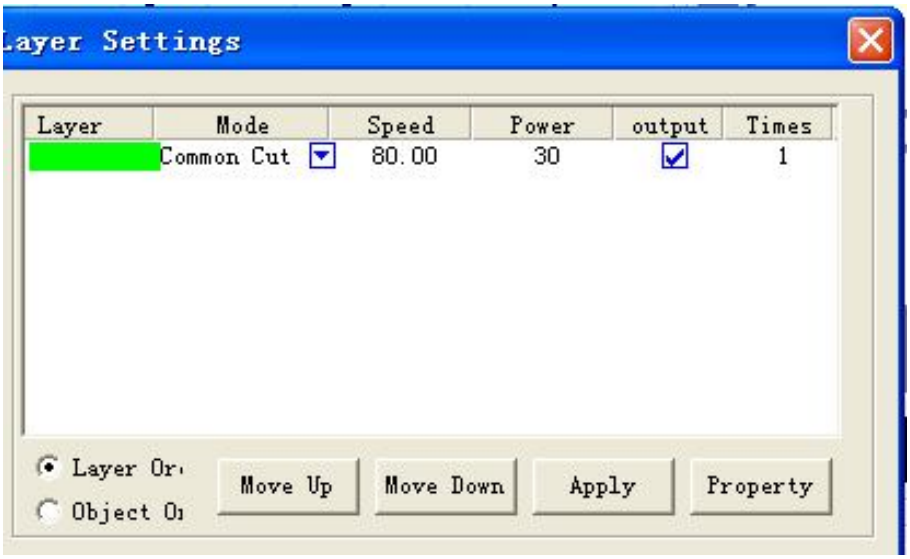
The number of arrays (XY).

XY direction input material to be cut on the number.

5.2.2 array spacing (XY)

Roughly two graphical input of the offset between the XY system in the next graph cut motion when you step away from calling this number, value leakage occurs cut too large, too small to affect the processing quality.

5.3 Processing Parameters



Set of processing characteristics of each layer.

5.4 Testing

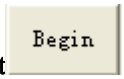
The system will recognize an object under the camera and cutting test results.

5.5 Simulation

The system according to the specified path to identify all the objects and display to the workbench, not cutting.

5.6 Part of the control button

5.6.1Start 

To start processing, click **Start** 

5.6.2 Pause 

To pause the machine and laser, click **Pause** 

5.6.3 Stop 

Click to stop the machine. Laser tube will return to the starting point.

6 Appendix

1. After reinstalling the software or the system, how to keep the existing configuration and calibration parameters configure?

2. How to deal with no-finding the camera?

The first machine motherboard must support USB2.0 high speed interface, and the camera is installed in the Device Manager display properly. If the camera is a temporary connection error, you can try to unplug and then plug the camera USB connector allows the system to re-search.

3. How to deal with marked leakage occurs?

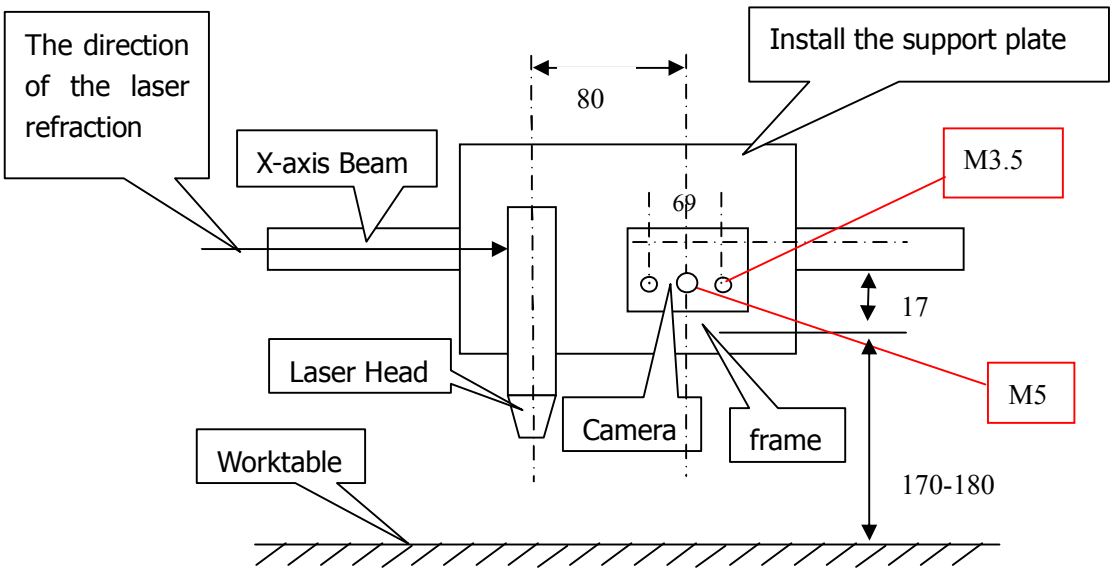
To ensure the uniformity of light throughout the system, in the production of camera parameters to adjust the template as a clear outline, followed by similarity can be reduced.

4.How to deal with prompting trial period after the program started?

There are two main reasons: First, the machine has just started or just plug the network cable

to connect the local network address is still in the state are getting. At this point you can connect other networks to stabilize and then start the system. Second, the visual module detected lawful authority. The trial period has expired; or the system can not detect network card. System must be installed network card drivers, and plug the Internet cable connecting the signal. Lights in green card status.

6.1 System Configuration



Note: 1 Unit: mm

2 Screw thread in this picture is on camera. There should be corresponding mounting holes in the mounting board

3 Dimension error: ±1mm

6.2 Correcting test image