



VisionCut Fast Operation Manual

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Before using this manual, please make sure that the hardware environment is set up, the PCI card driver, camera driver, and VisionCut software installed successfully, the installation steps, please refer to "VisionCut instruction".

In use of the machine with this system, please follow the steps as below.

Chapter 1 Test Preparation

Before start a cutting task, must ensure that all links of machine tool can be run normally. Therefore, before executing a cutting task, the machine tool parts must be tested, this test only for the first time switch on after the system installed.

After hardware connected, you need to do the following test:

- Limit switch is working correctly; Limit switch can protect the machine tool effectively.
- The origin switch is working correctly, whether can back to normal mechanical origin.
- Blowing device whether working correctly.
- Laser whether is under control as normal.

1.1 The Origin and Limit Test

Before perform, it is very necessary to carry on the test machine .You need to use "test" project under the system menu "signal detection" then popup menu. The dedicated IO input displays the state of origin switch and limit switch, red represents low level, green represents high level. Users can test these switches by controlling limit switch or origin switch manually. Such as: for normally open limit switch, one side of switch connects OGND, the other side connects the limit switch input of controller. Loosen the switch, the corresponding indicator should be green; press the switch, the corresponding instructions, light shows red, which means the switch is working properly, so do other switches.

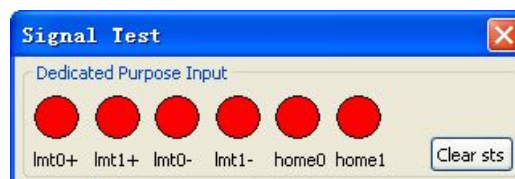


Figure1-1 machine testing

1.2 Axis Motion Test

After the origin and limit test, the user can test X, Y axis movement. The user needs to connect the servo or step motor to controller correctly. Then click "test" under the system software menu

"machine test".

Pop up the following interface:

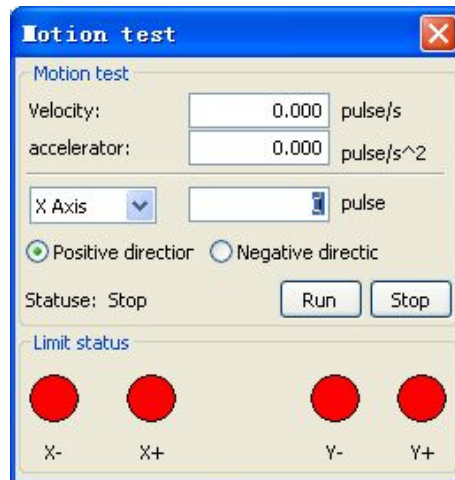


Figure 1-2 Machine movement testing interface

Under this page, you can choose the moving axis, at the same time set up the distance to move (in pulse), speed and acceleration (in pulse).

You can choose positive or negative movement; after setting, press "send" to start the X or Y axis movement. If the speed is set too slow, you may not feel movement, so you can increase the speed properly and test.

If the related axis is in motion, the interface will prompt "axis in motion", if you want to half-stop the movement, please press the "stop" button.

In the test, don't set the speed too larger and too many pulses in motion. This test is only to judge the motor working normally, the limit switch and the origin switch can work normally. The function can also test pulse equivalent. Such as 10000 pulse in motion, laser marking a point before starting, and a point after movement, then test the distance between the two points, so you can convert the pulse equivalent, unit is pulse/mm.

First, moving at low speed, press the corresponding direction limit switch manually in movement, so that the movement in this direction should stop immediately. After make sure limit protection effectively, then you can do other tests. So you can avoid the dangerous movement.

Chapter 2 Parameter Settings

The parameter Settings of VisionCut control software includes machine parameters and cutting parameters.

2.1 Machine Parameters

Click the "parameters" under the main interface, select "machine parameters", then pop-up machine parameter to set dialog box. As shown in below Picture.(May need the password for the first time, the password for rd8888).

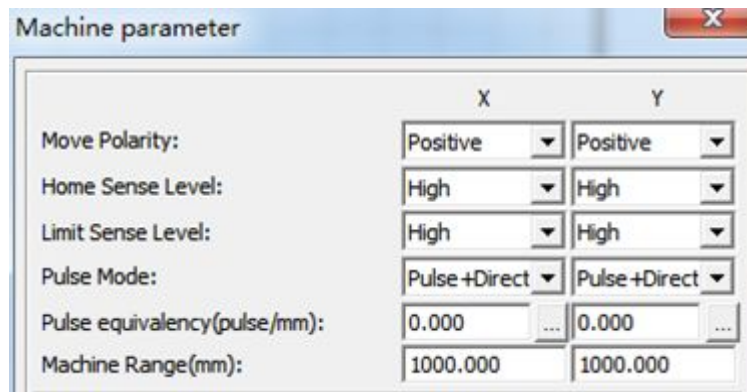


Figure 2-1 machine parameters

Machine parameters are used for parameter Settings after system assembly, once the machine model confirmed, this parameter will keep the same.

- **Direction polarity**

Direction polarity can change the direction of motor, when machine installed origin switch, in system debugging, it could the motor back to zero direction and the origin switch direction in the opposite, in order to ensure the motor can back to zero correctly, please change the motor direction connection order.(hardware wiring changed), revised and execute back to zero, then motor motion direction should be the same with the origin switch. There are the same settings in X, Y axis. The direction button of the operation control panel, if reverse to the control panel, please change the direction polarity, ensure the movement direction and operation control panel in the same direction.

- **Origin polarity**

The origin polarity is referring to the effective level state of origin switch. When in positive, high level effective, when in negative, low level effective. Here take a example for normally open origin switch. When one side of the origin switch connects the input terminal of board original signal, the other side connects OGND, the system didn't touch the origin switch, the system default is high, the origin

switch input invalid, when the system moves to origin switch, switch is closed, the origin switch input signal low effective. Therefore, it is a signal for control from low to high process when touched the origin switch. So for such a normally open switch, to set up the origin as negative, that is low level effectively. In contrast, for normally close and open, it should be set to positive, high level effectively.

- **Limit polarity**

The limit switch signal is similar to origin switch, if connects to normally open limit switch, set the limit property to negative, low level effectively, if connects to normally closed limit switch, set the limit property to positive, high level effectively.

- **Control mode**

The controller output pulse types: positive and negative pulse mode and pulse + direction mode. Set this option correctly according to the actual connection driver requirements.

- **Motor equivalent**

Motor equivalent value, the corresponding relations between motor rotating pulse and machine actual linear movement distance, unit is pulse/mm. This variable is very important, must set correctly.

The correct setting steps as bellow:

Firstly, according to the design parameters (pulse motor axis, screw pitch, etc.) to get a pulse equivalent in theory. The equivalent is basically accurate, but should be revised due to some pitch error or machine setting reasons. The revise method is as follows:

First of all, set a distance of 200 mm, moving related axis; and marked the starting point and end point when finished movement, to measure the actual distance between the two points, then put the two values into software automatic calculation dialog, the system will calculate a very accurate pulse equivalent automatically.

Calculation dialog box as shown in below Figure2-2.

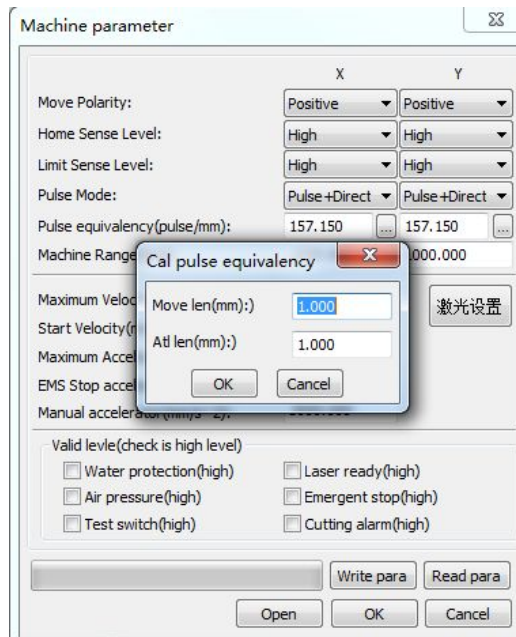


Figure 2-2 pulse equivalent calculation

- **Processing breadth**

Processing breadth setting has two functions: one is for soft limit protection, that is, when the data was beyond the setting breadth, which will do movement protection automatically. And alarming at alarm bar of interface. The other one is the actual breadth size displayed by software is the same as the machine tool dimension. This parameter should be set up according to the actual size of machine tool.

2.2 Cutting Parameters

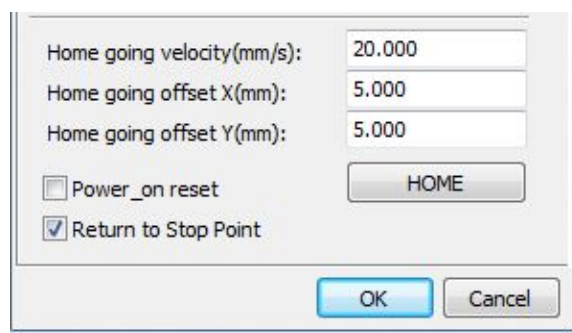


Figure 2-3 cutting parameter settings

- **Home going velocity**

System velocity back to the origin system reset acceleration, the idle acceleration.

- **XY home offset**
XY returning to the origin, generally set the machine origin point which far away a little distance from the origin switch
- **Power-on reset**
Resetting when start up VisionCut software.
- **Return to stop point**
Select this option after processing, laser head backs to the stop point.

Chapter 3 Camera Calibration

Before camera calibration, you can put one piece of white paper on the machine tool, it is convenient to calibration. Click "camera parameters" button on the operation panel, will appear the following camera parameters settings dialog.

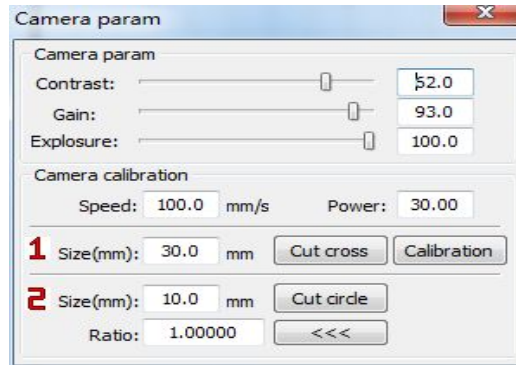


Figure 3-1 camera parameters

3.1 Calibration Precision

After correction, implement the precision calibration, cut a specified circle, click "circle" button, the system will cut a circle on the platform, then select Mark point as circle in Model parameters of control panel, specify the same diameter "D"=10mm, click match test, the size of circle as below figure showed:

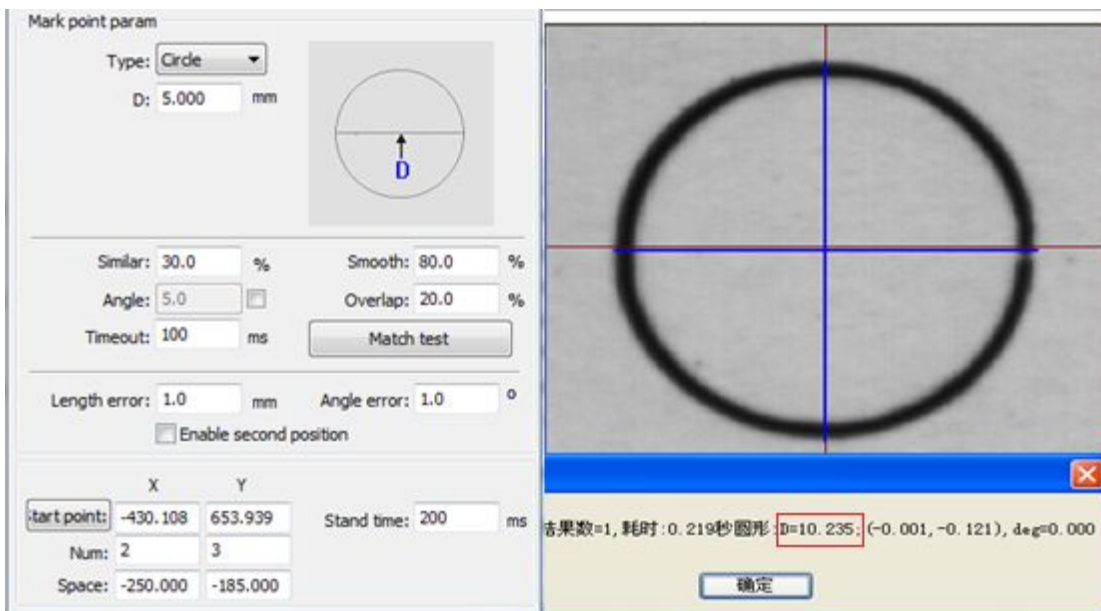


Figure 3-2 match test diameter measurement

Click "<<" button at the right of "scale" to correct pixel accuracy; fill the results of matching test with measuring length bar. Click "ok", the system will confirm the proportion coefficient automatically.

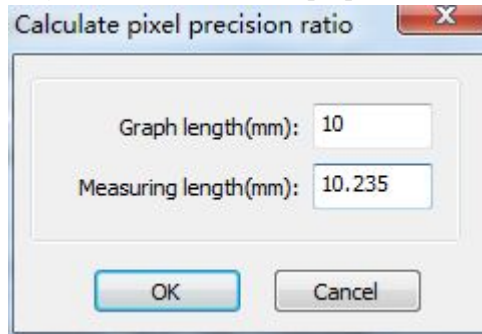


Figure 3-3 pixel precision calibration

3.2 Cross Cutting Camera Distance Correction:

- 1) Click "cross", the laser head will cut a cross quickly.

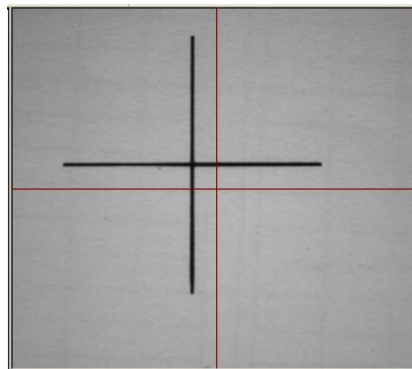


Figure 3-4 cut cross

- 2) Cut a cross, then move cross in the camera view center to overlap the center of cross center, click "Camera calibration". System will calculate the offset from camera view center to the center of laser head.

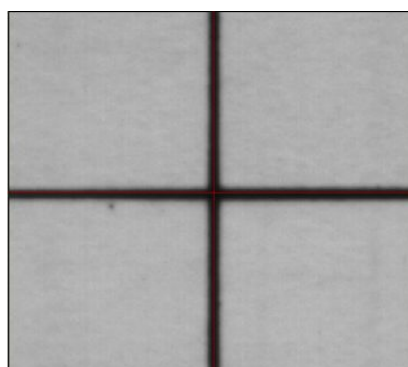


Figure 3-5 Camera distance calibration

Chapter 4 Execute a cutting task with Mark point identification

A cutting task should follow the following steps:

- (1) Coordinate system confirmation
- (2) Draw a machining file or import a file
- (3) Pre-processing documents (can be omitted)
- (4) The processing parameter settings
- (5) The Model parameter settings
- (6) Processing, and processing information

4.1 Coordinate System

In the laser cutting system, coordinate system is a very important concept. For laser cutting machine tool, there is a machine coordinate system; Machine coordinate system is decided by the origin switch installed on the machine tool. Installation location is determined, the origin position of the whole machine tool coordinate system is determined, as shown in Figure 4-1.

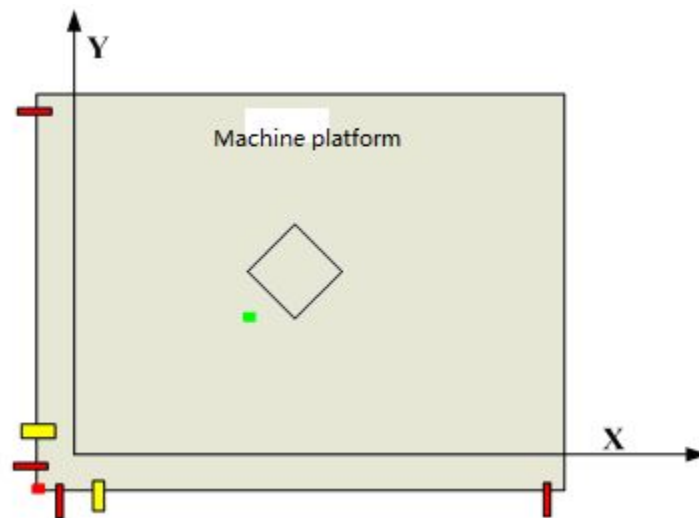


Figure 4-1 machine tool coordinate system

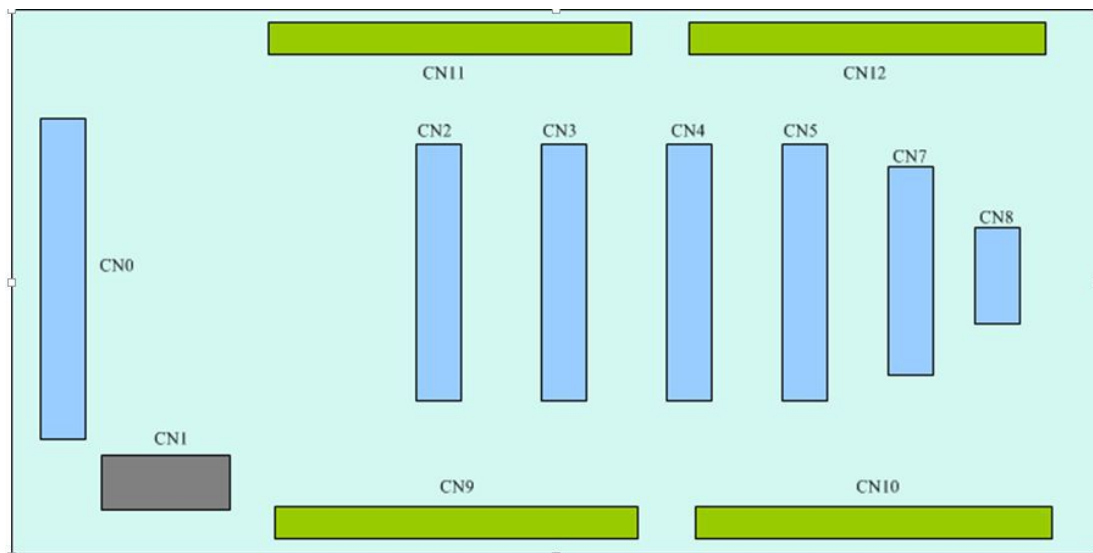
Once the machine origin switch is determined, must set the origin position parameters correctly, to ensure that the system correct movement. Horizontal direction represents X axis direction, vertical direction represents Y direction. As reference, default origin switch installed in the lower left corner of the machine width.

When the machine tool coordinate system is confirmed, you can import the graphics or drawings. In order to facilitate display, this software imports the center position of graphics overlapping to the machine tool center in the software. That is to say, the graphics always is displayed in the center of the width. After

importing, the user can move and rotating the import graphics.

Position point

The position point is the starting point of mark point searching, determined position point, setting the spacing of X, Y in Model parameter, the system searching movement range confirmed. The system defaults to back to positioning point automatically after processing.



The origin point setting is in the upper left corner, change.

1. The CN2, CN3 interface PIN9, PIN22, exchange interface

PIN9	DIR+	方向信号正相输出	PIN22	DIR-	方向信号反相输出
------	------	----------	-------	------	----------

2. On CN11, LMT0 - (PIN6) and LMT0 + (PIN5) exchange, LMT1 - (8) P I N and LMT1 + (PIN7) exchange.

		号输入
PIN5	LMT0+	第 1 轴正限位开关 信号输入
PIN6	LMT0-	第 1 轴负限位开关 信号输入
PIN7	LMT1+	第 2 轴正限位开关 信号输入
PIN8	LMT1-	第 2 轴负限位开关 信号输入

4.2 Import Graphics

User clicks the imported icon, the following dialog will be appeared.

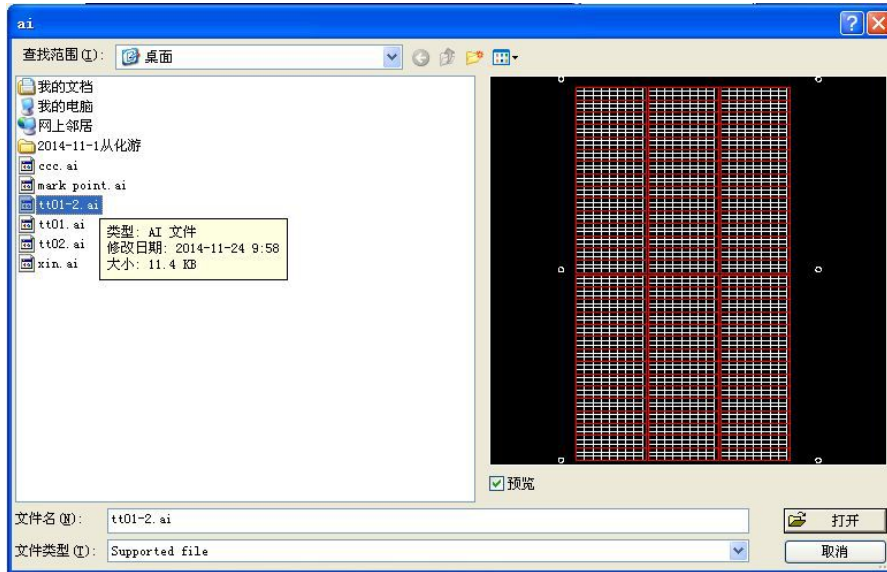


Figure 4-2 import processing file preview

Select the imported graphics, click "open". The waiting processing graphics will appear in the main view area.

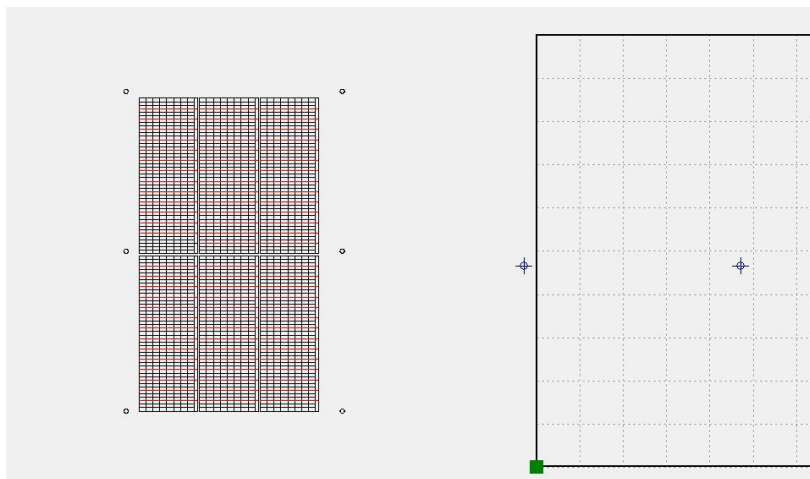


Figure 4-3 import processing files

The imported graphics output as the already made layer color, you can define the output cutting contour.


Layer	velocity	Enable	Blow
	100.000	NO	Blow 1
	100.000	YES	Blow 1

Figure 4-4 File processing parameter settings

4.3 Model Parameter Settings

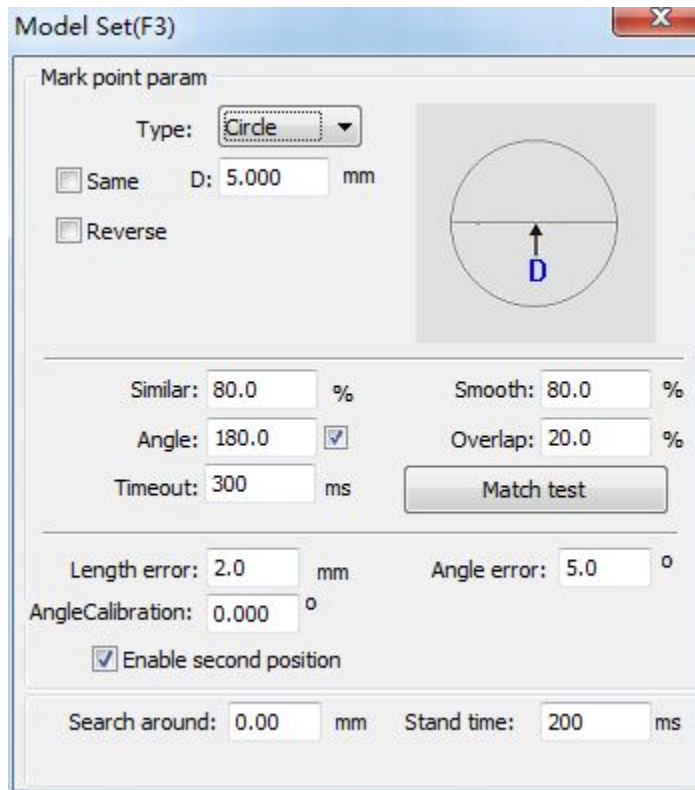


Figure 4-5 Model parameters

4.3.1 Mark point parameters

Choose the required Mark point types to make Model, respectively supporting circle, cross, rhombus, ellipse, circular ring, rectangle, square, triangle, and 8 kinds of Mark point style.

When making Model, please specifying different styles respectively according to the chart corresponding parameters (such as diameter, width).

4.3.2 Model matching parameters

Smoothing coefficient: the higher smoothing coefficient, the less extracting characteristics of scattered points.

Similarity: matching score between Model and the actual pattern, the higher the score, the more like of graphics. Similarity setting, will affect the match quality directly.

Overlapping: the overlapping percentage of two envelope rectangles of target graphics. This parameter controls the target graphics overlapping whether to identify or not.

Matching angle: the allowing model revolving and searching angle range. Such as: its value is set to 180 degrees, in the process of model matching, the range of angle searching is: - 180 ~ 180 degrees. The match angle should be set up according to the actual requirements, the wider the angle, the more the match time required. If the user does not need to set this parameter, can remove the option directly

Match overtime: this parameter controls the match time. To adjust the parameters when the target graphics matching failed due to lacking of time or to avoid waiting too long time in search process. This parameter is mainly affected by the model characteristics of complexity.

Matching test: The current model matches with the current target graphics in camera view range, test results will be back in results interface. You can know the mark point elated parameters from test results.

4.3.3 Enable Secondary Positioning

After searching the target, not set this location coordinates as criterion, but moved to the target automatically, take photos again, and repositioned target location coordinates.

Distance offset / Angle offset: When two-point positioning, such as you might find more features when searching feature 2, according to the distance between feature 1 to feature 2, if found multiple features in the circle arc of feature 1 as origin, then as angle to distinguish them.

Note: But when the offset is set too small, missing cut will be happened. Generally distance offset can be set within 2mm, angle offset within 5°, such as the workpiece requires more accurately, you can set smaller.

4.3.4 Mark point identification

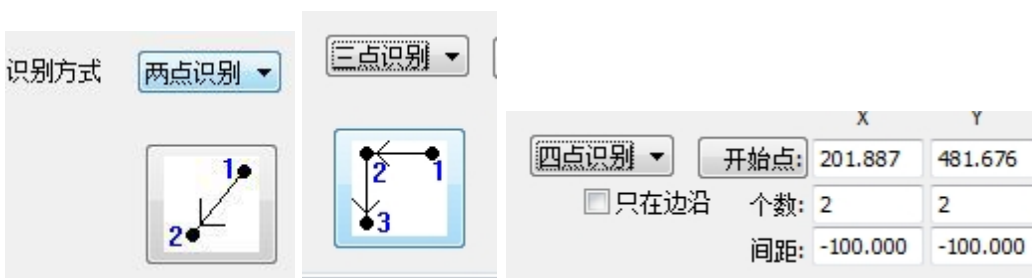


Figure 4-6

4.3.5 Mark point path settings

Select and import a Mark point in the graph (this sample is selected in the top right corner of the Mark point) and then click "start" button or click "setting the starting point" button in the main menu.

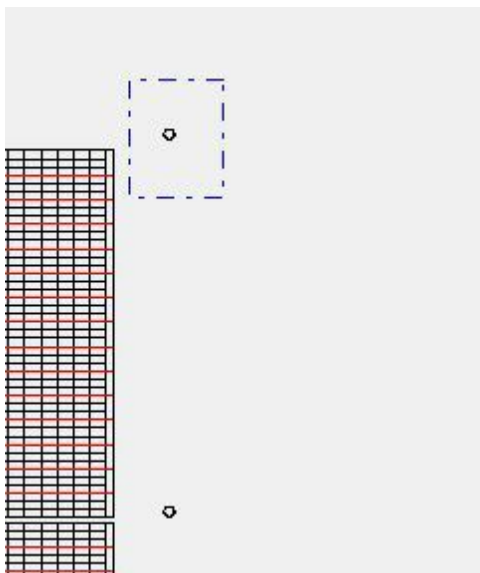


Figure 4-7 select the first Mark point

The system will automatically determine the starting point coordinates. And then determine the quantity of mark point of importing graphics, such as in this example, 2 Mark points in the X-direction, 3 Mark point in Y-direction, finally, fill in the spacing distance between the Mark point in X, Y direction respectively. Make the Mark Point overlapping, as shown below.

	X	Y		
开始点:	-224.989	435.000	稳定时间:	200 ms
个数:	2	3		
间距:	-250.000	-185.000		

Figure 4-8 Mark point parameter settings

After setting up the Mark point parameters, you can carry on processing set. Note: The spacing distances is negative due to the system taking the origin point at the lower left corner, but select the first Mark point to the upper right corner in this example.

4.4 Processing Settings

Move the axis, the camera will find the first Mark points, then match testing and check the matching result.

Figure 4-9 Mark point matching test

After the testing, click the "start" button on the control panel to proceed processing.

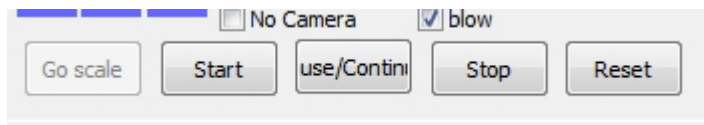
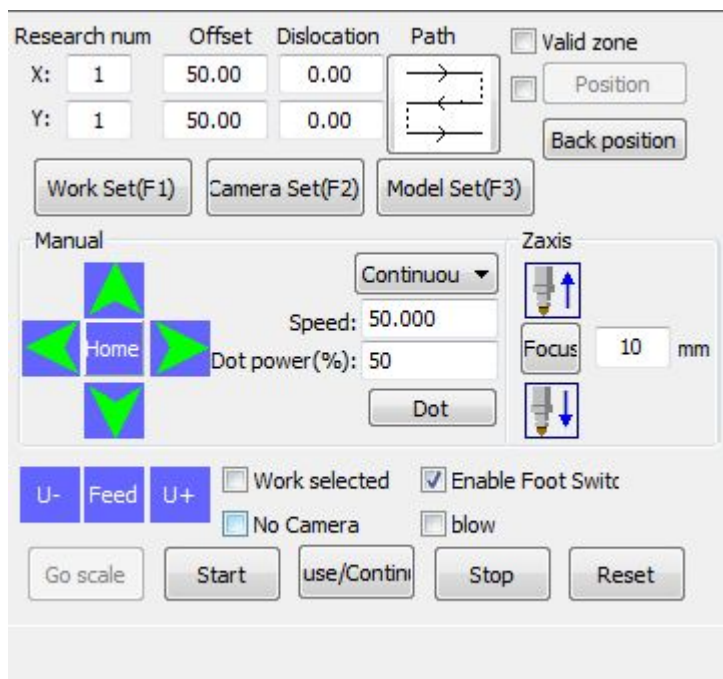


Figure 4-10 Start cutting

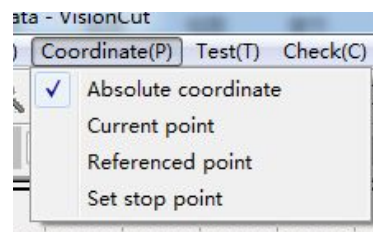
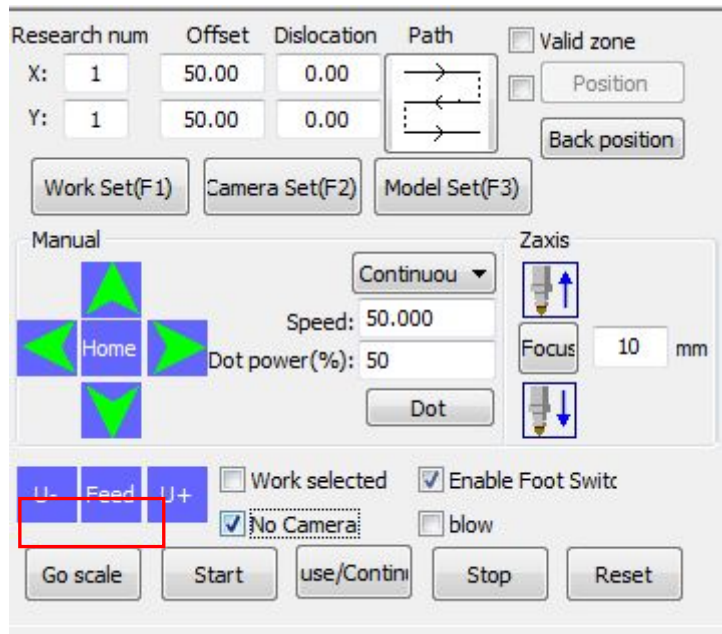
If all the Mark points indentified successfully, the system will start cutting automatically. Once mark point matching failure, the system will stop. At that time, please check whether the parameter is set correctly or not.

4.4 Array Processing



As above picture showed, set the searching times of X - direction and Y- direction, offsets, dislocation parameters, then array processing can be performed.

Chapter 5 Execute an ordinary cutting task



Choose ordinary cutting on the control panel, so the software running mode is ordinary cutting. Cutting positioning methods: absolute coordinates, the current position, positioning point.



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