Hanrun Paper
C-1080 Laser Cutter
User's Guide

1. Safety Guidelines

Before operating the laser cutting machine, please read the following safety precautions to ensure safe use of the equipment.

1.1. Electrical Safety

- **Power Requirements**: Ensure the machine is connected to a stable power source that meets specifications: AC220V±5% (or AC110V±5%), 50HZ±1. Avoid using the machine in areas with significant voltage fluctuations.
- **Grounding Protection**: The machine must be reliably grounded to prevent electrical leakage. Check the power cord and socket for proper grounding to ensure operator safety.

1.2. Laser Safety

- Always wear laser safety goggles when operating the machine to avoid damage from direct or reflected laser beams.
- Never open the protective cover while the machine is running to prevent laser leakage.

1.3. Material Safety

- **Approved Materials**: Only cut supported materials (e.g., paper, fabric, transfer film, heat transfer vinyl, PET, TPU).
- **Prohibited Materials**: Do NOT cut flammable, toxic materials (e.g., lead/cadmium-containing electroplated metals).
- **Material Fixation**: Secure materials using vacuum suction or clamps. Ensure edges are >50mm from the worktable perimeter.

1.4. Workspace Safety

- Place the machine in a stable, flat, and well-ventilated environment. Avoid direct sunlight and humid conditions. Allow sufficient space around the machine for operation and heat dissipation.
- Keep the area free from flammable/explosive materials and away from fire or water sources.
- Use the built-in exhaust system to promptly expel smoke during cutting and avoid the accumulation of harmful gases

2. Product Overview

The C-1080 laser cutting machine is equipped with intelligent visual and control software for high-precision cutting (accuracy up to ±0.1mm) with minimal wear. Its durable honeycomb worktable supports diverse materials like paper, fabric, heat transfer vinyl, PET, TPU, etc. The imported focusing lens offers excellent light transmittance for efficient energy transfer, enhancing both cutting quality and efficiency. Widely used in digital printing, heat transfer designs, direct-to-film printing, and custom decoration.

2.1. Product Features

- **Intelligent Laser Visual Control Software**: Enables fast material recognition and precise cutting, improving quality and efficiency.
- **High-Precision Cutting**: Achieves ±0.1mm accuracy, with minimal wear even during long-term use, meeting the high-precision demands of professional production environments.
- **Sturdy Honeycomb Worktable**: Features a durable honeycomb-structured platform with excellent stability and load-bearing capacity. It accommodates materials of various thicknesses and types, providing a reliable and secure base for consistent cutting performance.
- **High-Quality Imported Focusing Lens**: Features a beam diameter ≤0.1mm. Its high optical performance and light transmittance focus energy efficiently, improving speed and quality while extending lens lifespan.

3. Machine Components

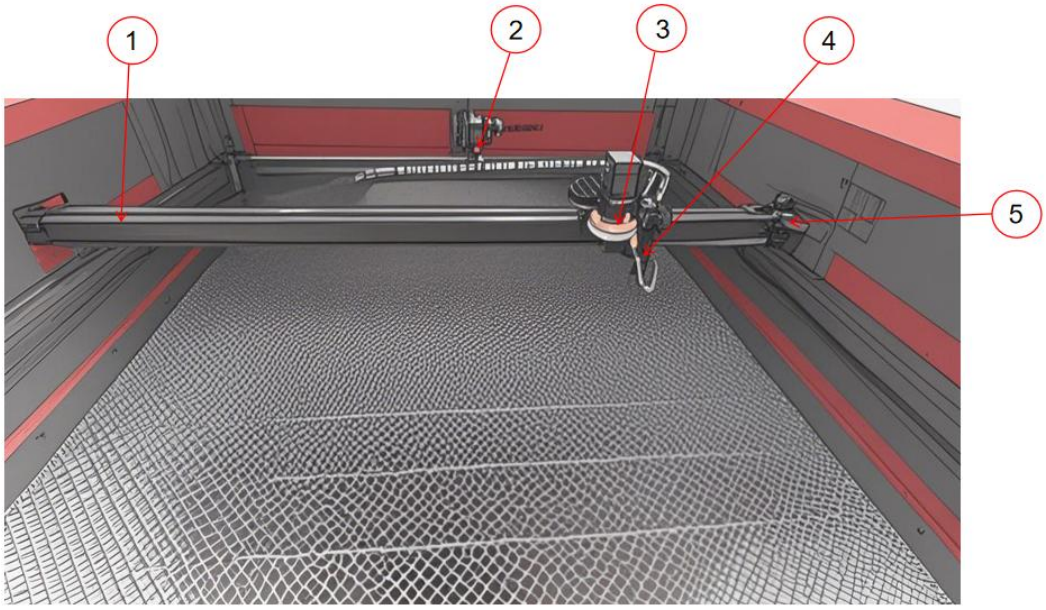
3.1. Front View

1. Laser A Knob: Adjusts laser power
2. Emergency Stop: Instantly cuts power in emergencies
3. Brightness Knob: Adjusts light for clearer pattern visibility
4. Control Panel

3.1.1. Control Panel Functions

1. File: File access and management
2. Origin: Return to origin
3. Laser: Laser on/off and settings
4. U Disk: Load files from USB
5. Frame: Set cutting frame/border
6. Fixed: Precise positioning
7. Z: Z-axis movement
8. X/Y: X and Y-axis movement
9. Stop: Halt operation
10. Start : Begin cutting job

3.2. Internal View



1. X-Axis Rail: Constructed from high-strength steel, the rail features excellent hardness, durability, and wear resistance, ensures precise motion during laser cutting and reduces positioning errors, enhancing overall machine stability and accuracy.
2. Y-Axis Motor: Controls X-axis forward/backward motion
3. Focusing Lens: Works with vision software for fine material detection and cutting
4. Laser Head: High-strength hardware for ±0.1mm accuracy
5. Autofocus Lens: High-transmittance, high-temperature-resistant, maintains beam focus during extended use

4. Hardware Installation

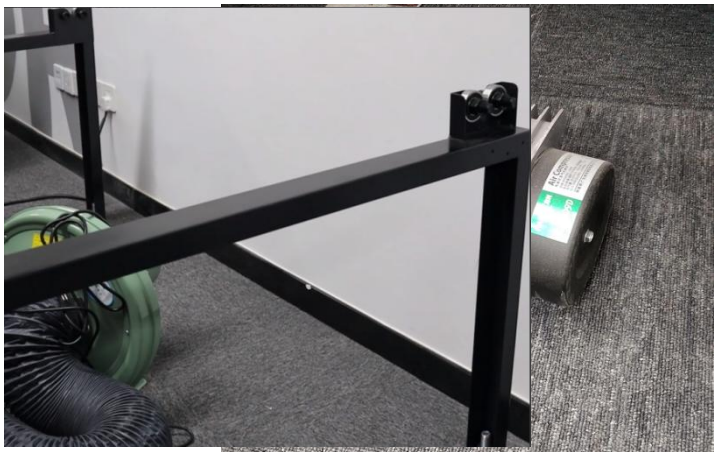
4.1. Included Components

Exhaust fan

Air extraction blower

Water chiller unit

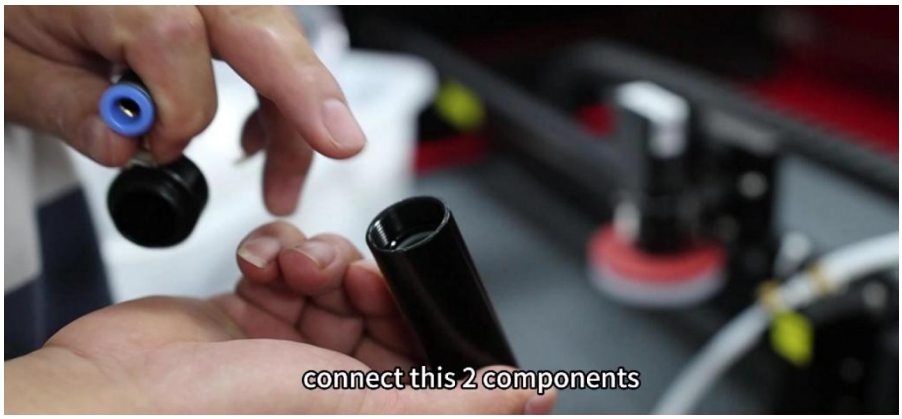
Media unwinding stand

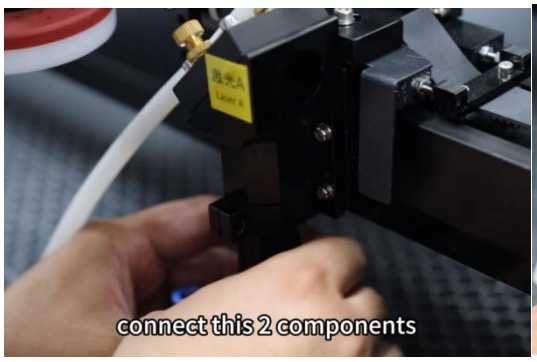


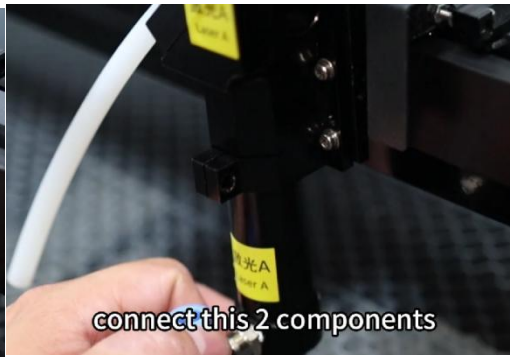
4.2. Installation Steps

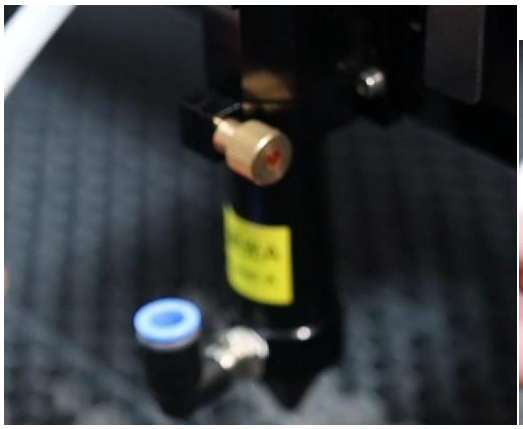
Step 1: Install the Laser Cutting Head

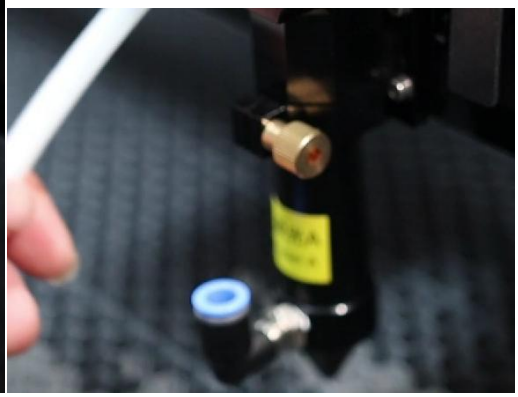
Mount the laser tube to the laser base and secure it using the provided screws.







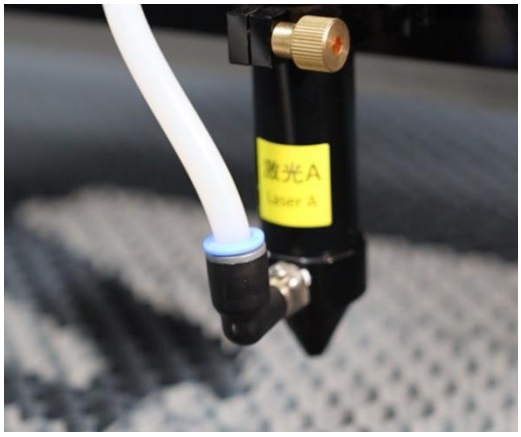




Note: The side of the laser head includes a blower outlet, which should face outward to allow hose connection.

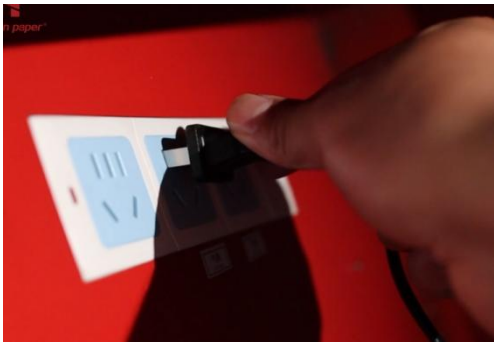
Step 2: Install the Air Duct blow pipe

Attach the flexible air duct to the blower port of the laser head.



Step 3: Connect the Air Pump

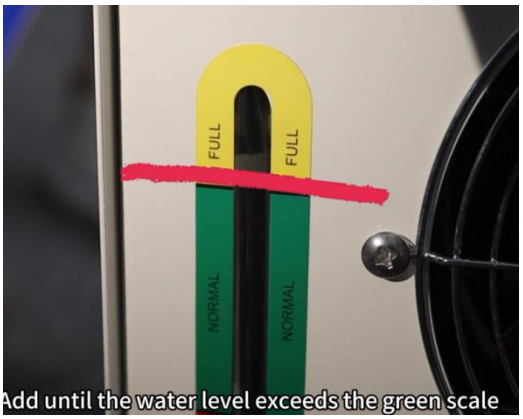
Plug the rear hose from the machine into the air pump. Use a key to open the left rear cover and connect the power supply for the pump.



Step 4: Install the Water cooler

Connect the power cable, alarm output, and two water in/outlet hoses. Plug the cooler's power cable into the power board.

Fill with water cooler until it exceeds the green level mark.



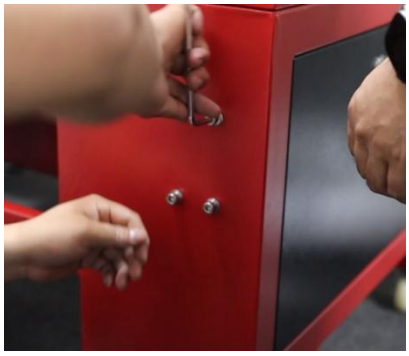
Step 5: Install the Exhaust System

Secure the duct with clamps, connecting one end to the exhaust port at the rear of the machine and the other to the external exhaust system.

Note: The exhaust fan is powered separately and must be plugged into an independent power socket.

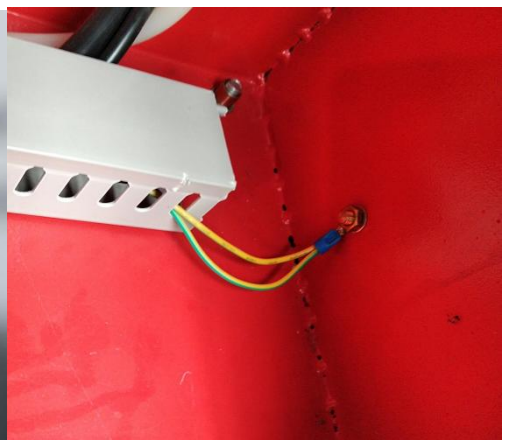
Step 6: Install the Media Unwinding Stand

Remove four screws on each side of the rear panel, install the stand, and re-tighten the screws.



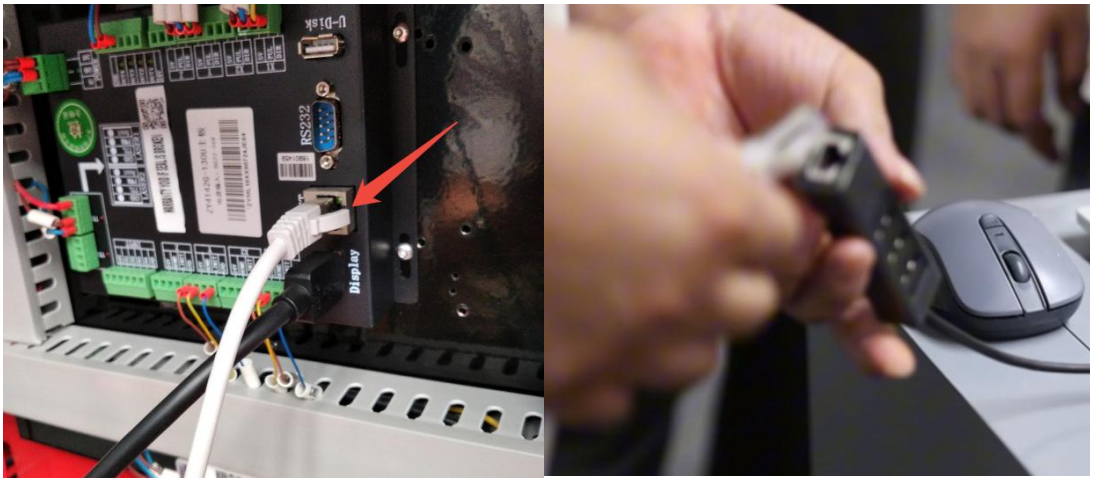
Step 7: Connect the Ground Wire

Expose the ground wire, loosen the grounding screw, and connect securely.



Step 8: Connect Data Cables

Connect the network and USB cables to your computer.

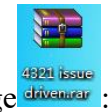


5. Driver and Software Installation

5.1. Driver and Software Overview

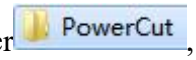
The installation process is generally the same across different operating systems. Please refer to the notes below for important considerations:

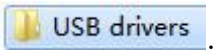
Before starting installation, note that two software packages are provided:

Driver Package 

: After extraction, it includes three folders

—Camera Driver

, Vision Driver 

, and USB Driver 

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Vision Software Package

Important: Always extract the compressed files before installation.

Install the driver package first, followed by the vision software.

Installation Order:

Install the Driver Package (Camera Driver, Vision Driver, USB Driver)

Then install the Vision Software Package

5.2. Camera Driver Installation

When using the Windows 7 64-bit operating system, please note:

Camera drivers for 64-bit and 32-bit systems are not interchangeable.

Installing the incorrect version may result in installation failure or the camera not functioning properly.

Make sure to select the correct driver version based on your operating system

5.3. Camera Driver Installation

When installing the software, connect the camera's USB cable to a USB port on the computer chassis. If the system prompts **"New Hardware Found"** followed by a message that the hardware is currently unavailable, this is because the camera driver has not yet been installed.

Once the hardware is detected, follow the steps below to install the driver:

Step 1: A "Found New Hardware Wizard" will appear.

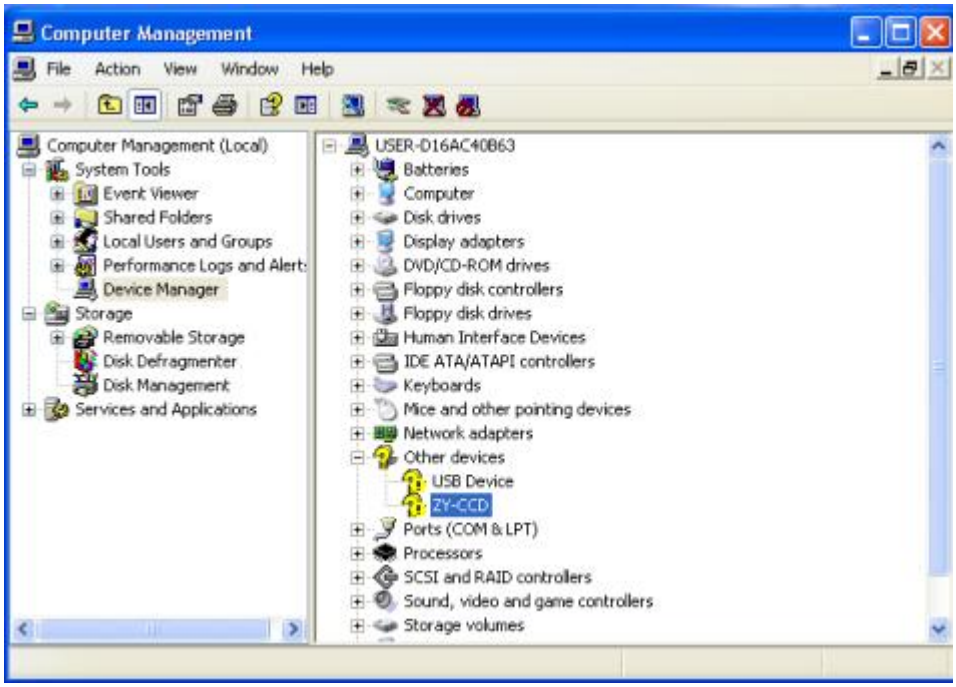


Figure 5.2.1: Camera Driver Installation Step 1

Step 2: Select **"Install from a list or specific location (Advanced)"**, then click **Next**.

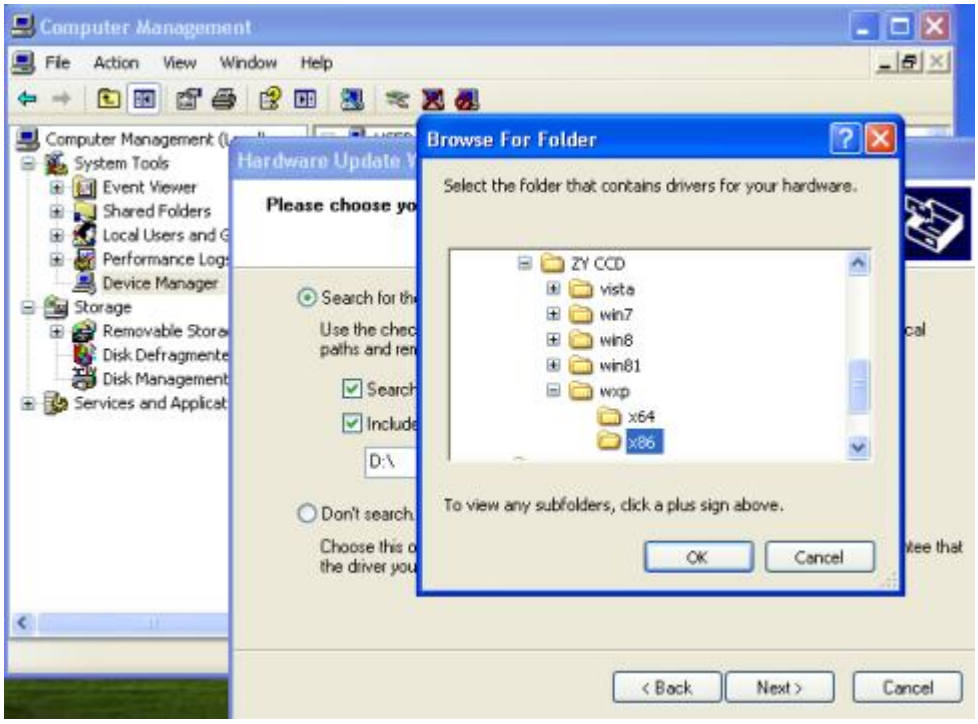


Figure 5.2.2: Choose to browse for the driver software

Select **"Install from a list or specific location (Advanced)"**, and click **Next**.

Click **Browse**, navigate to the folder where the camera driver is located, then click **Next**.

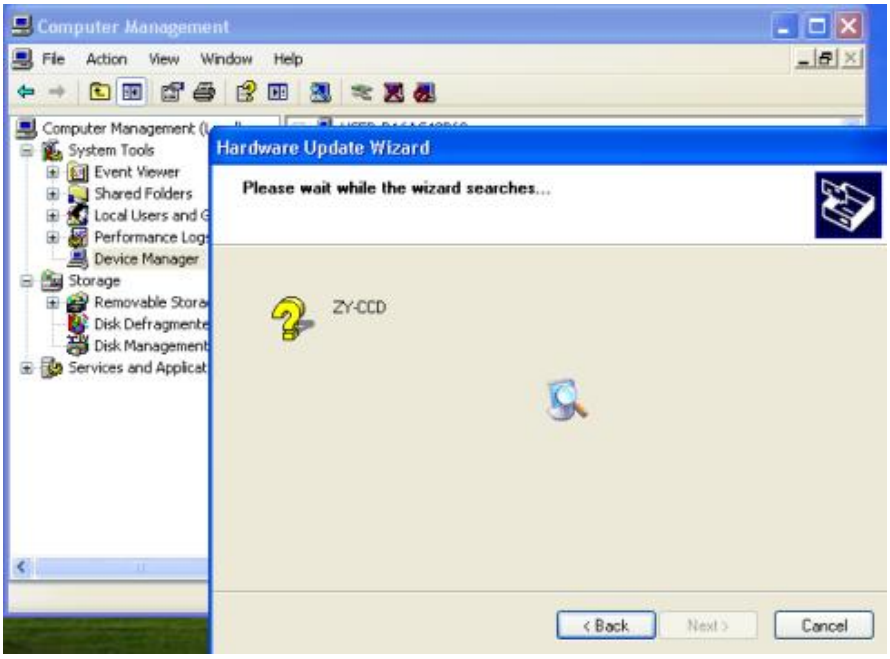


Figure 5.2.3

Step 3: Click **Finish** to complete the camera driver installation.

Once installed, you can verify successful installation in **Device Manager**, where the device will appear under **Imaging Devices** as **CCD Camera**.

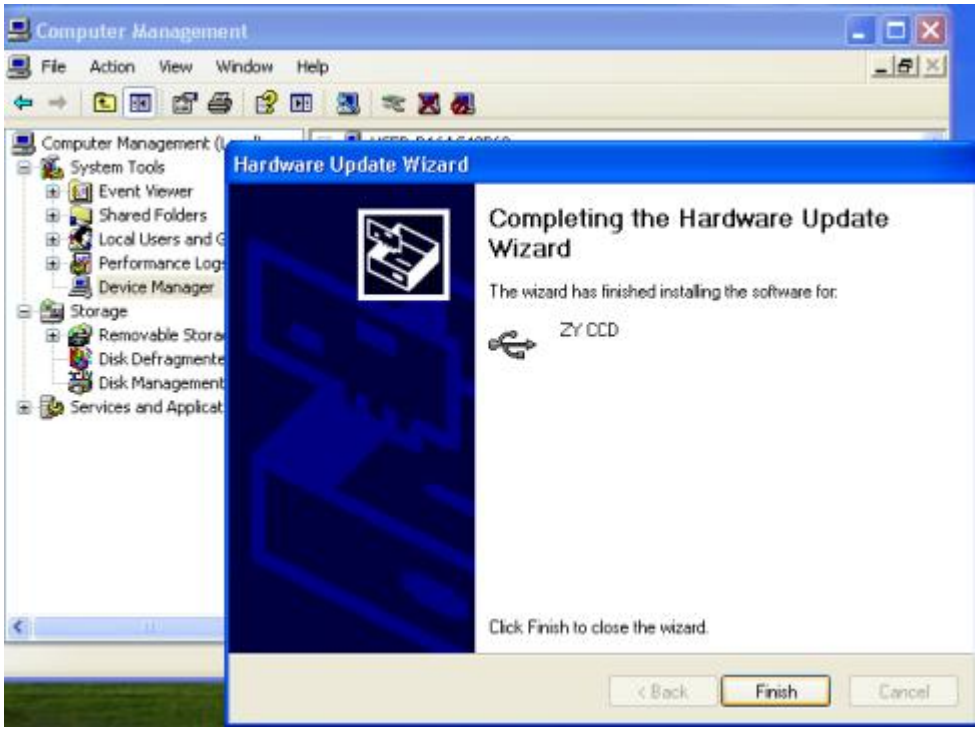


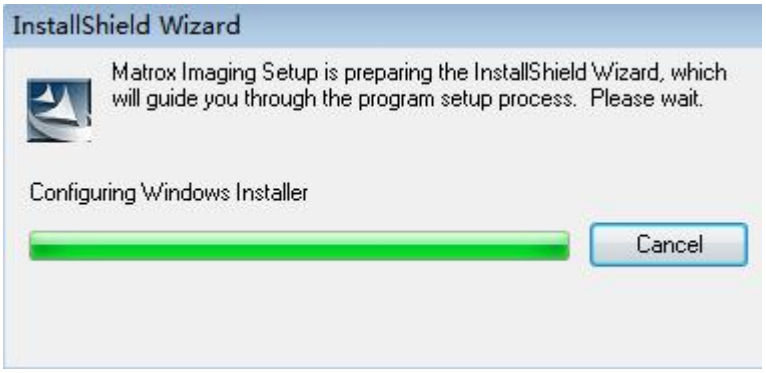
Figure 5.2.4

5.4. Vision Driver (MIL) Installation

After opening the vision driver folder PowerCut, you will see two subfolders Clean Setup: one for **installation** Setup and one for **uninstallation** Clean.

Before starting the installation by double-clicking the installation folder Setup, please modify the compatibility settings. Right-click on the setup.exe, select **"Properties"**, then go to the **"Compatibility"** tab in the pop-up window. Adjust the compatibility settings as shown in the figure below.

Double-click to install setup.exe and follow these steps:



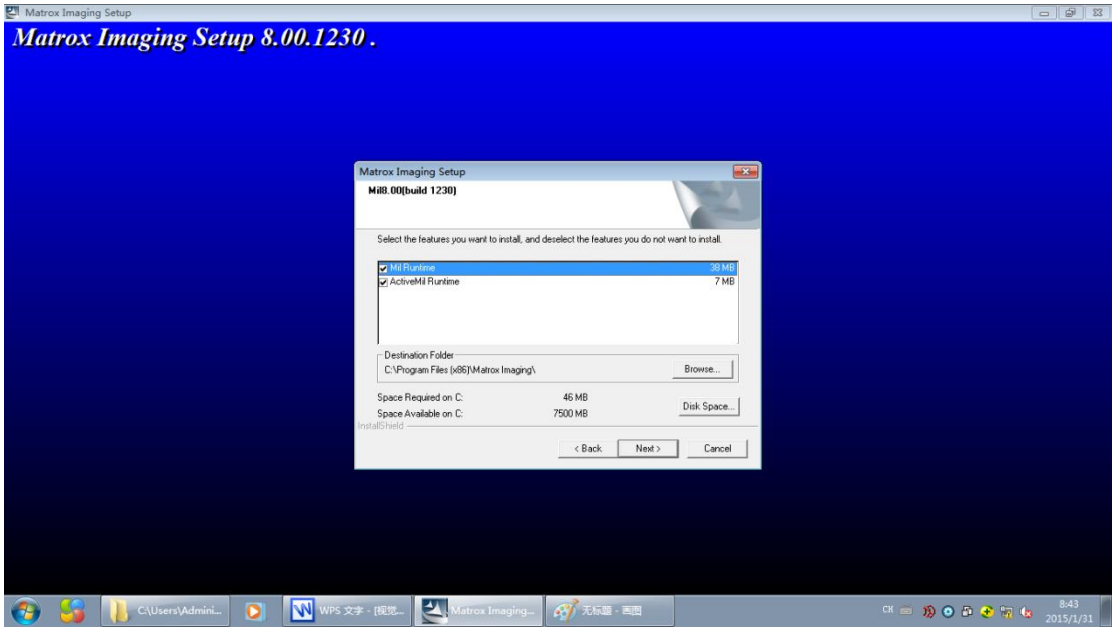


Figure Set up 1

Click "Next" on each screen.

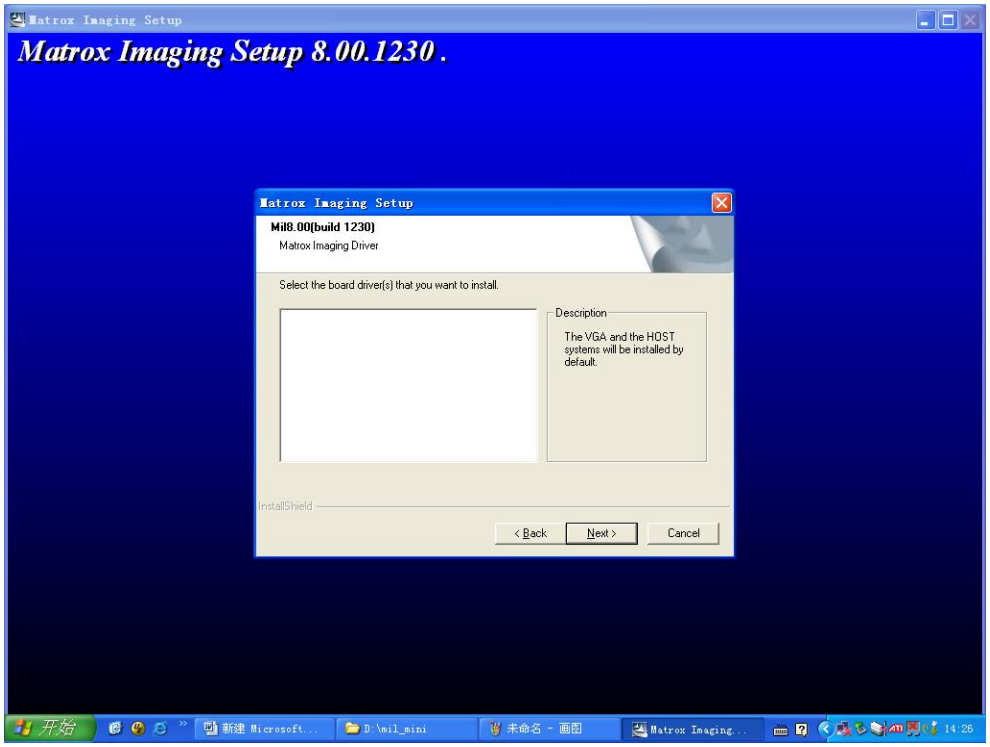


Figure Set up 2

Click "Next".

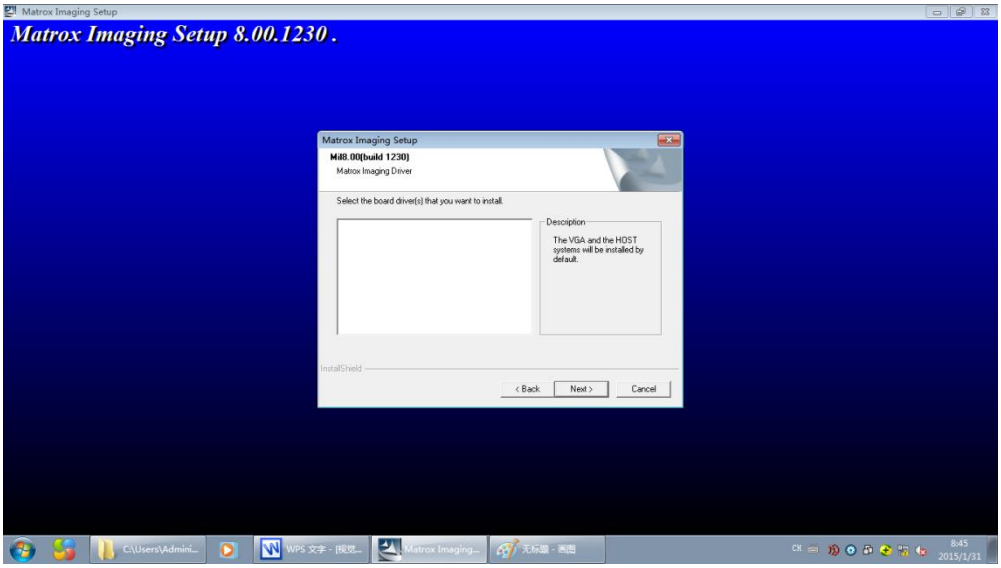
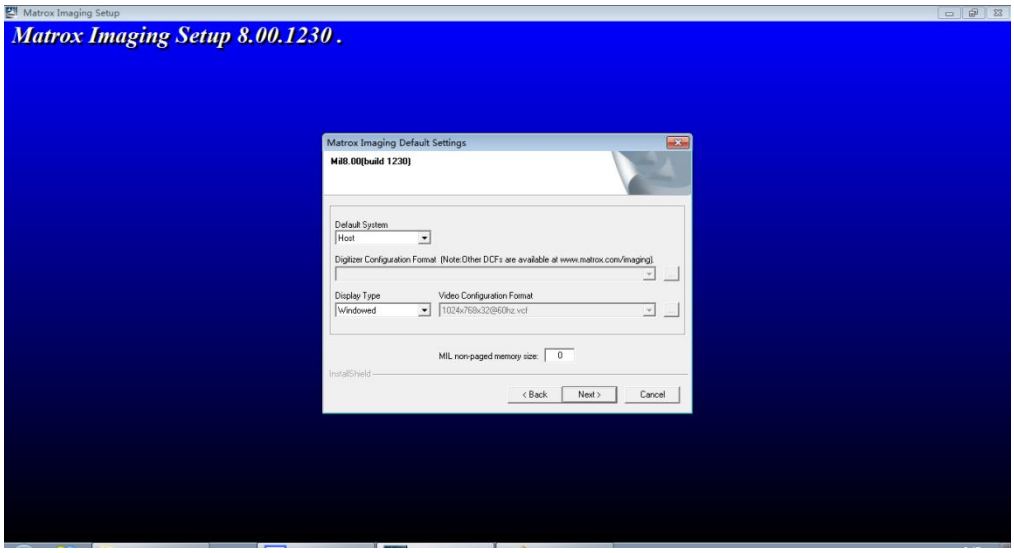


Figure Set up 3

Click "Next".



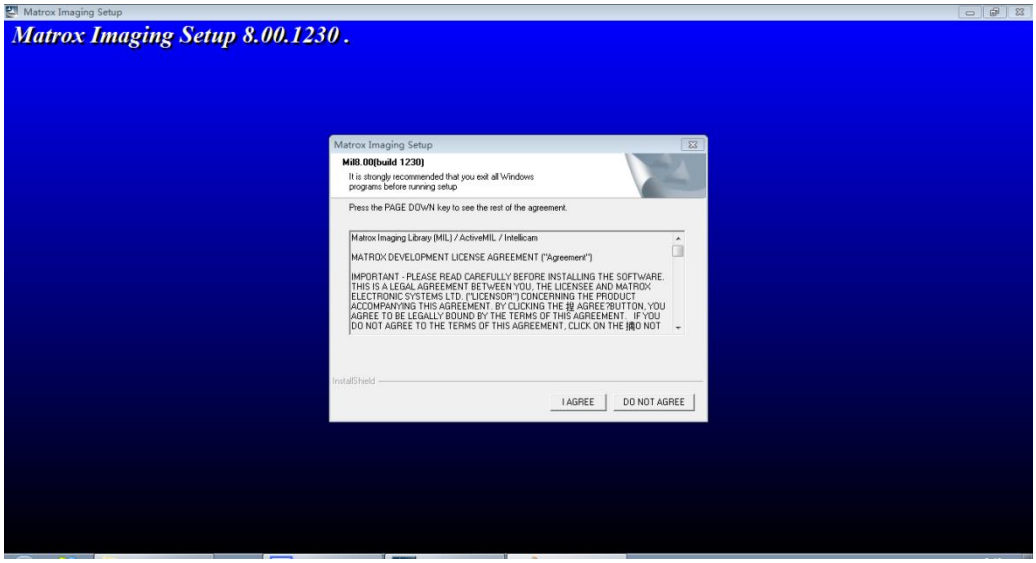


Figure Set up 4

Click “I agree”to accept the license agreement and reboot after installation.

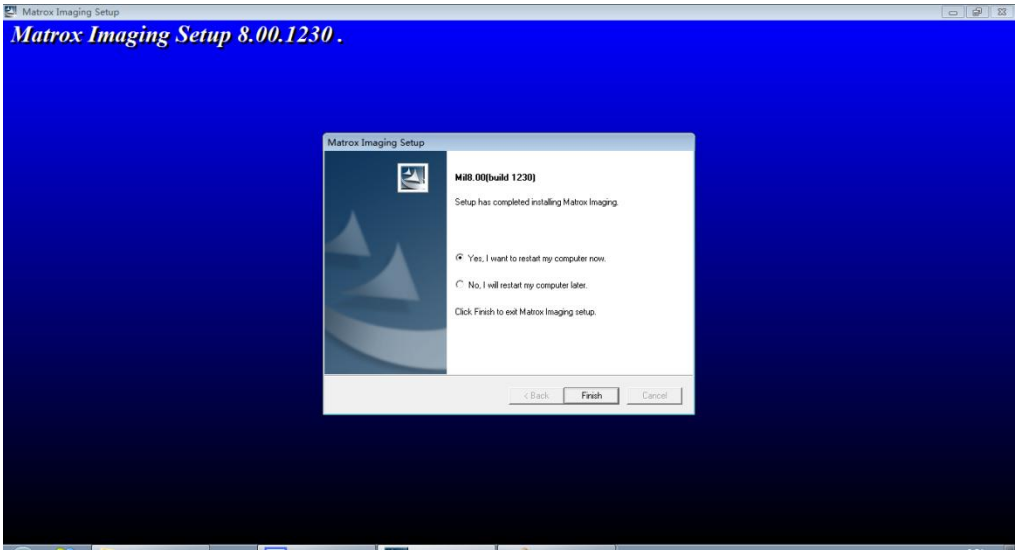
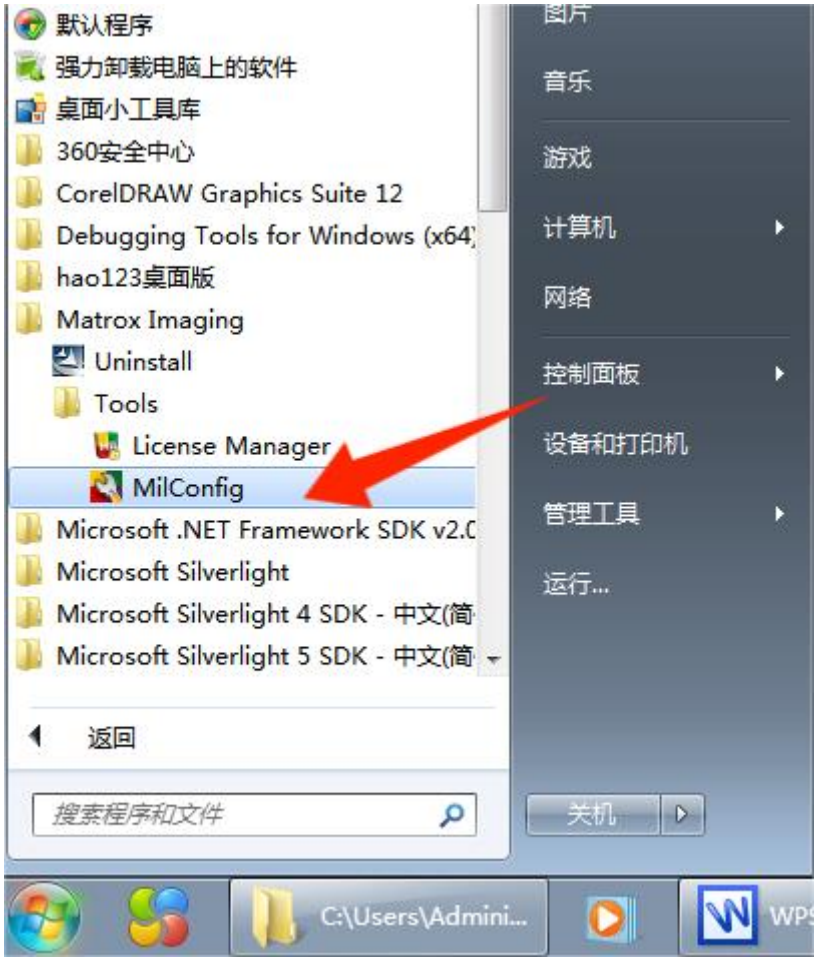


Figure Set up 5

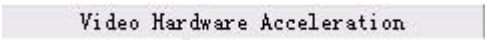
Finally, click “Finish” to complete the installation of Matrox Imaging Library (MIL).

At this point, **it is essential to restart your computer**. After restarting, please adjust the **hardware acceleration settings** as follows:

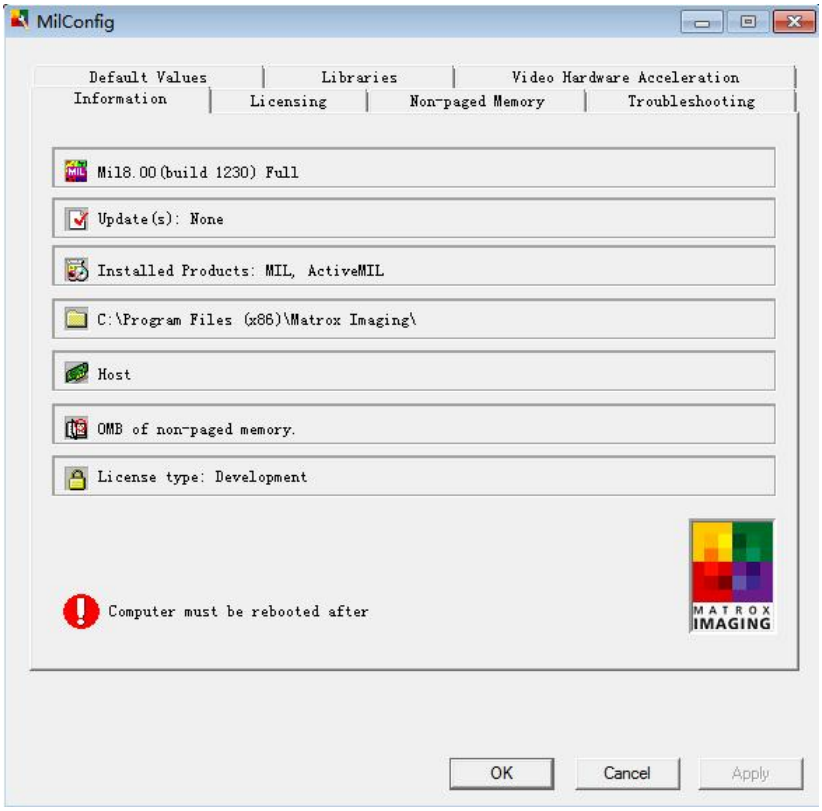
Click the Win Key in the lower right corner of your desktop, as shown in the figure below.

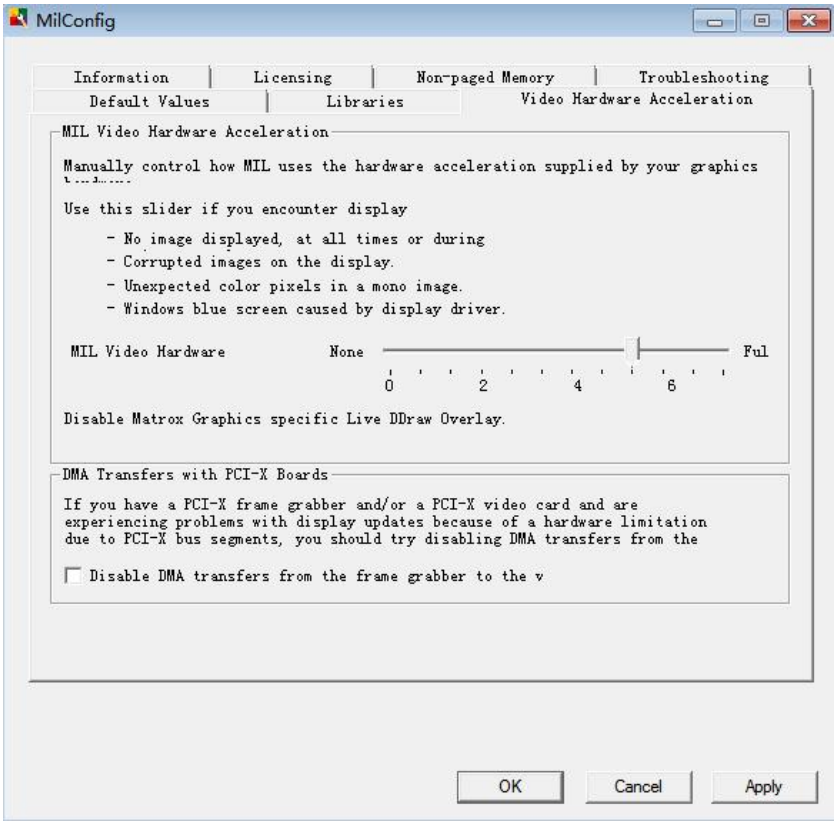


Click

, shows the pop-up dialog box, use the mouse to modify the hardware acceleration 

settings by moving the slider.It is recommended to set the value between **4 and 6**. After adjustment, click OK to apply the changes, as illustrated below.


MilConfig
Default Values
Libraries
Video Hardware Acceleration
Information
Licensing
Non-paged Memory
Troubleshooting
Mil8.00(build 1230) Full
Update(s): None
Installed Products: MIL, ActiveMIL
C:\Program Files (x86)\Matrox Imaging\
Host
0MB of non-paged memory.
License type: Development
Computer must be rebooted after
MATROX IMAGING
OK
Cancel
Apply


MilConfig
Information
Licensing
Non-paged Memory
Troubleshooting
Default Values
Libraries
Video Hardware Acceleration
MIL Video Hardware Acceleration
Manually control how MIL uses the hardware acceleration supplied by your graphics
Use this slider if you encounter display
- No image displayed, at all times or during
- Corrupted images on the display.
- Unexpected color pixels in a mono image.
- Windows blue screen caused by display driver.
MIL Video Hardware
None
Ful
0
2
4
6
Disable Matrox Graphics specific Live DDraw Overlay.
DMA Transfers with PCI-X Boards
If you have a PCI-X frame grabber and/or a PCI-X video card and are
experiencing problems with display updates because of a hardware limitation
due to PCI-X bus segments, you should try disabling DMA transfers from the
Disable DMA transfers from the frame grabber to the v
OK
Cancel
Apply

5.5. PowerCut Software Installation

After installing all the required drivers, you can proceed with the installation of the PowerCut Vision Cutting Software.

Double-click the installation folder

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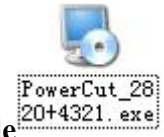
Then, **double-click the setup file** 

and follow the on-screen instructions by continuously clicking "**Next**" to complete the installation.

After installation, a **shortcut icon** will be created on the desktop

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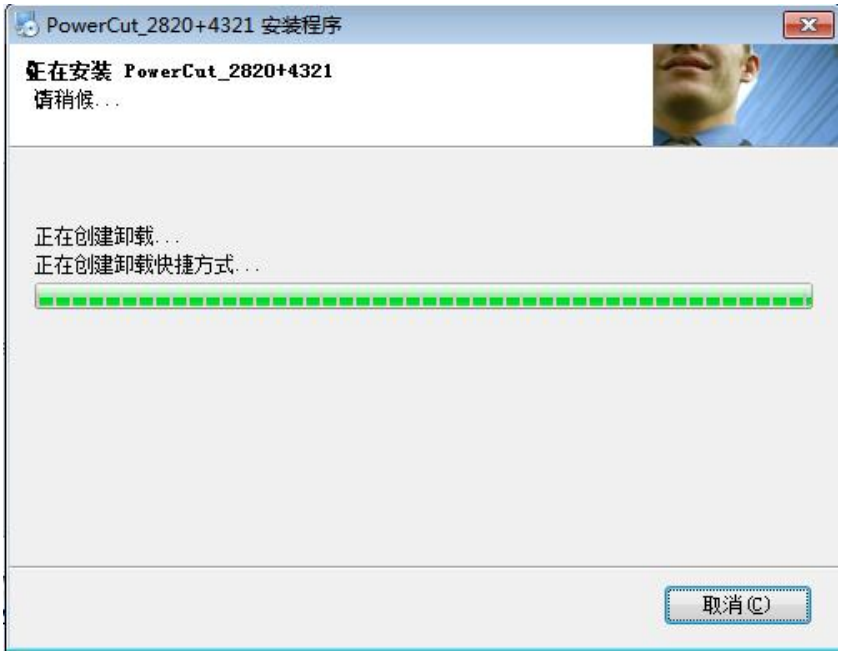
PowerCut_2820+4321 安装程序
安装文件夹
您想将 PowerCut_2820+4321 安装到何处？
软件将被安装到以下列出的文件夹中。要选择不同的位置，键入新的路径，或单击“更改”浏览现有的文件夹。
将 PowerCut_2820+4321 安装到:
C:\Program Files (x86)\PowerCut_2820+4321
更改(H)...
所需空间: 34.1 MB
选定驱动器的可用空间: 7.19 GB
< 返回(B)
下一步(N) >
取消(C)

PowerCut_2820+4321 安装程序
正在安装 PowerCut_2820+4321
请稍候...
正在创建卸载...
正在创建卸载可执行文件...
取消(C)



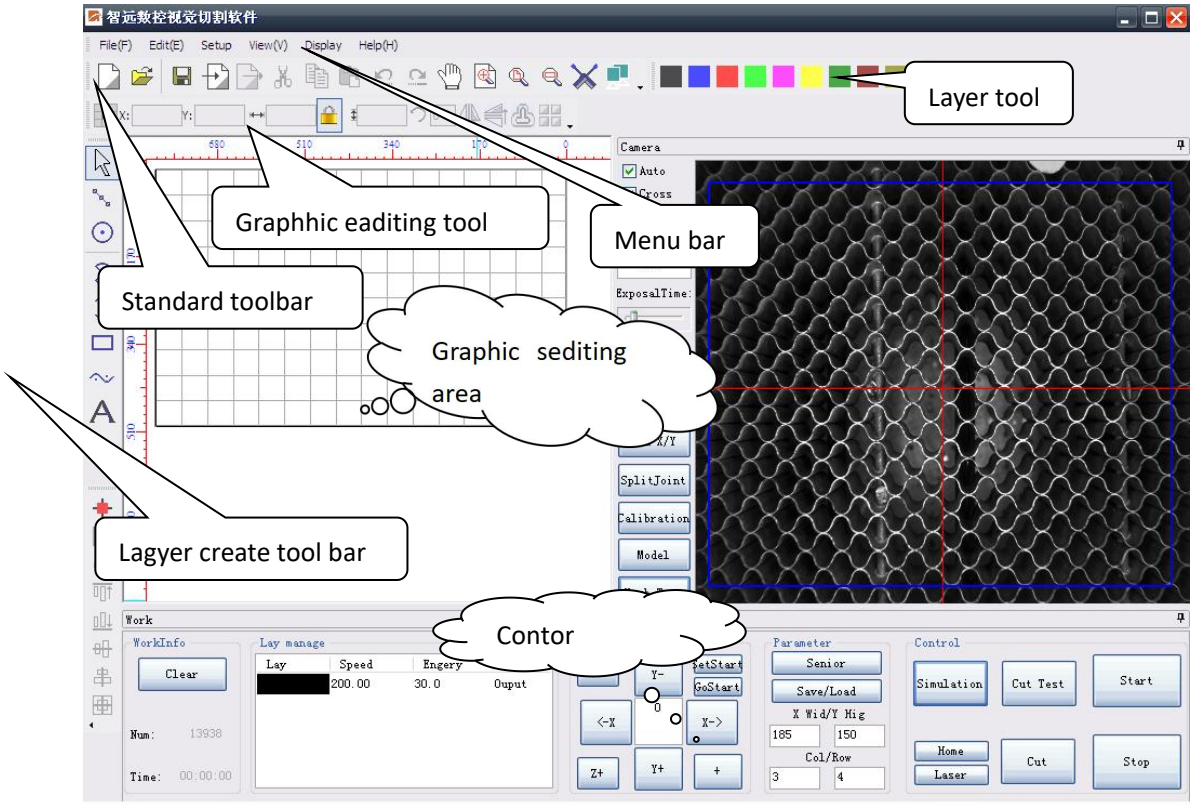
When prompted, select the appropriate language and click “Next” to complete the process.

Depending on your system (32-bit or 64-bit), after completing the driver and software installation, you must configure compatibility settings.

Locate the **desktop shortcut icon** for the PowerCut software, **right-click** it, and select **“Properties”** from the context menu.

Go to the **“Compatibility”** tab, and set the compatibility mode to **Windows XP**. This step is essential — otherwise, the software will fail to launch.5.7

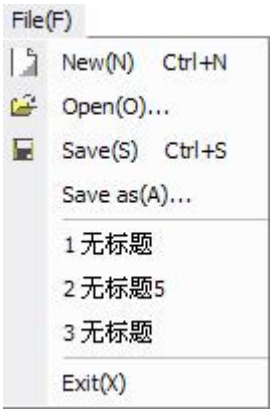
5.6. Interface Overview



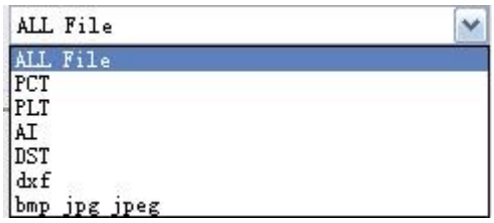
6. Menu Bar Functions

6.1. File Menu

Click the menu bar icon or press the shortcut key Alt+F to open the File drop-down menu.



- **New (Ctrl+N):** Create a new project or click .
- **Open (Ctrl+O):** Load supported files (PCT, PLT, AI etc.):



- **Save (Ctrl+S):** Save project as .PCT format
- **Save As:** Save to another location .PCT format.
- **Exit (Alt+X):** Exit the PowerCut.

Note: Differences Between PCT and CUT Files

PCT files are the project files saved by the PowerCut software. They can be opened and edited within the PowerCut software.

CUT files are the files used for laser processing. A PCT file must be converted into a CUT file through the PowerCut software before it can be imported into the CNC system for cutting.

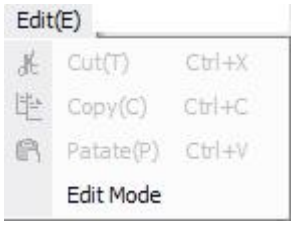
Please note:

CUT files cannot be opened or edited in PowerCut software.

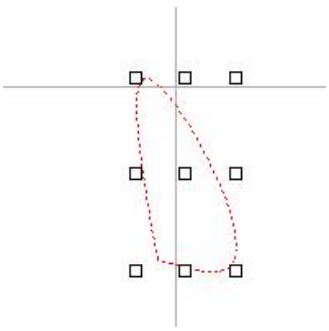
PCT files cannot be directly imported into the CNC system for processing.

6.2. Edit Menu

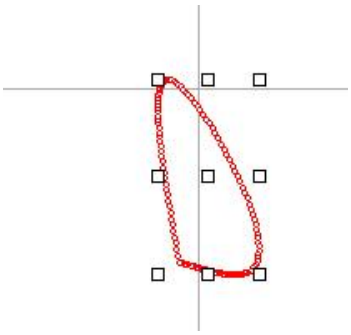
Click the menu bar Edit(E) or press the keyboard shortcut **Alt+E** to open the *Edit* drop-down menu.



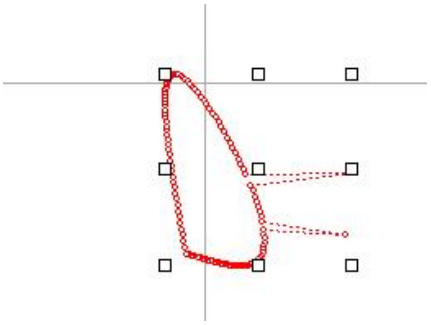
- **Undo**: Reverts the last action. Multiple undo operations are supported.
- **Redo**: Reverses the undo operation and restores the previous state.
- **Cut**: Cuts the currently selected object. The object will be removed. Shortcut: **Ctrl+X**.
- **Copy**: Copies the currently selected object without removing it. Shortcut: **Ctrl+C**.
- **Paste**: Pastes the object previously cut or copied. Shortcut: **Ctrl+V**.
- **Edit Mode**: After selecting a graphic, click this icon to enter edit mode. Edit points will appear on the graphic. You can move these points to modify the shape. This function is mainly used for graphic tracing, such as in the processing interface.



Select a graphic, click the Edit



Edit points appear on the graphic



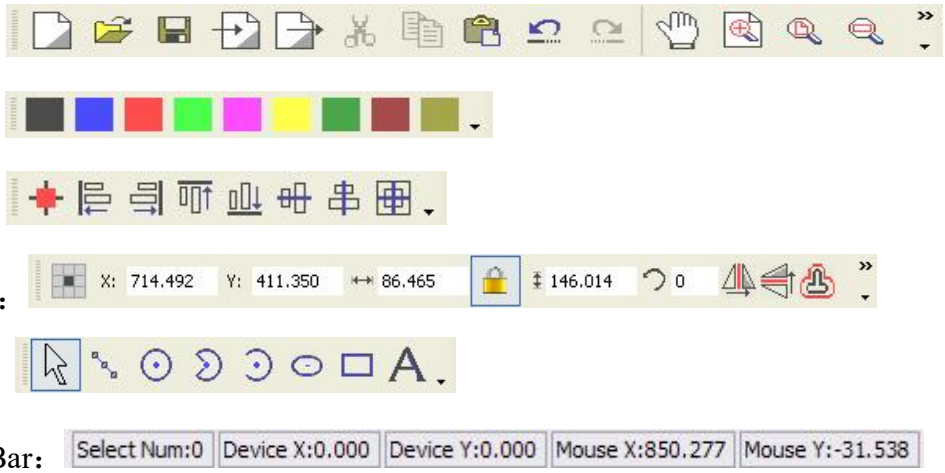
Drag the pointsadjust the shape.

6.3. View Menu

Click the menu bar icon View(V) or press the keyboard shortcut **Alt+V** to open the *View* drop-down menu.

Menu options include:

- Menu:
- Color:
- Move:
- Modify:
- Create:
- Status Bar:



6.4. Display Menu

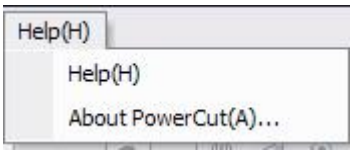
Click the menu bar icon Display to open the *Display* drop-down menu.

➢ **Select**: Allows selection of graphic objects. The mouse pointer will change accordingly.

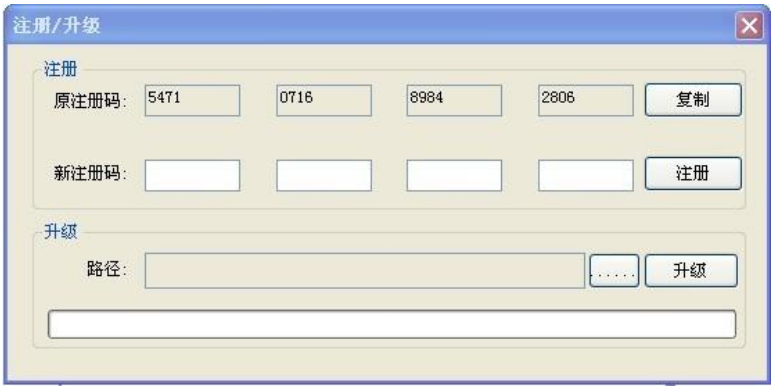
- **Pan**: Allows panning of the graphic view. The mouse pointer will change accordingly.
- **Show All**: Displays all graphic objects currently loaded.

6.5. Help Menu

Click the menu bar icon Help(H) to open the *Help* drop-down menu.



Click Help(H). Opens the Registration/Upgrade window to display license information.



- **Registration**: If the original registration code has expired, request a new 16-digit registration code from the software provider. Enter the new code in the input box and click Register.

- **Upgrade**: Obtain the upgrade file from the software provider and save it to a designated location on your computer. During the upgrade process, click the ....., locate the saved file, and confirm to complete the upgrade Update.
- **About**: Opens the *About* window About PowerCut(A)..., displaying company and software information.

7. Standard Toolbar

The Standard Toolbar provides quick access to general file editing functions, as shown below:

7.1. New File

Icon: . Creates a new drawing workspace. Shortcut key: Ctrl+N

7.2. Open File

Icon: . Opens an existing file. Supported formats: DXF, PLT, AI, PCT, BMP, DST, JPG, JPEG. Shortcut key: Ctrl+O

7.3. Save File

Icon: . Saves the current design and processing parameters as a .PCT file. Shortcut key: Ctrl+S

7.4. Import

Icon: . Imports a file into the current editing workspace. Supported formats include DXF, PLT, AI, PCT, BMP, DST, JPG, JPEG.

Note: *"Import"* inserts data into the current file, while *"Open"* replaces the entire file with a new one.

7.5. Export

Icon: . Exports the current design to PLT, DXF, or BMP formats. Enter a filename and click **Save**.

7.6. Cut

Icon: . Cuts the selected object. Shortcut key: **Ctrl+X**

7.7. Copy

Icon: . Copies the selected object. Shortcut key: **Ctrl+C**

7.8. Paste

Icon: . Pastes the copied or cut object into the workspace. Shortcut key: **Ctrl+V**

7.9. Undo

Icon: . Undoes the last action. Shortcut key: **Ctrl+Z**

7.10. Redo

Icon: . Redoes the last undone action. Shortcut key: **Ctrl+R**

7.11. Pan

Icon: . Moves the entire view within the editing workspace.

7.12. Show All Objects

Icon: . Zooms to fit all objects in the editing area.

7.13. Show Page

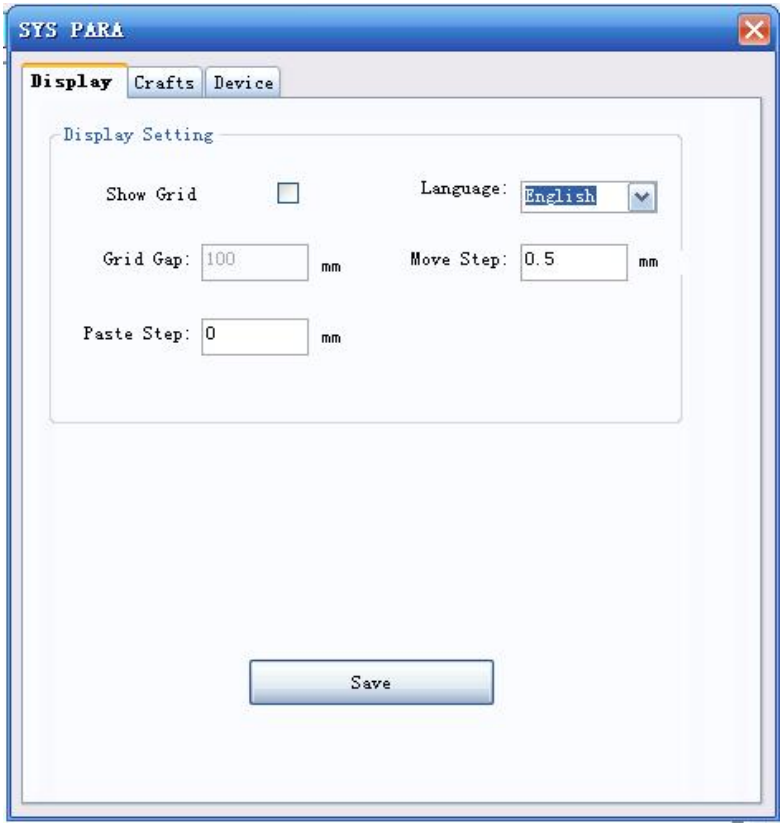
Icon: . Displays the entire page layout in the editing area.

7.14. Zoom In

Icon: . Allows area selection for zooming in on a specific section of the design.

7.15. Parameter Settings

Click this icon to configure system parameters. The settings window contains four tabs.

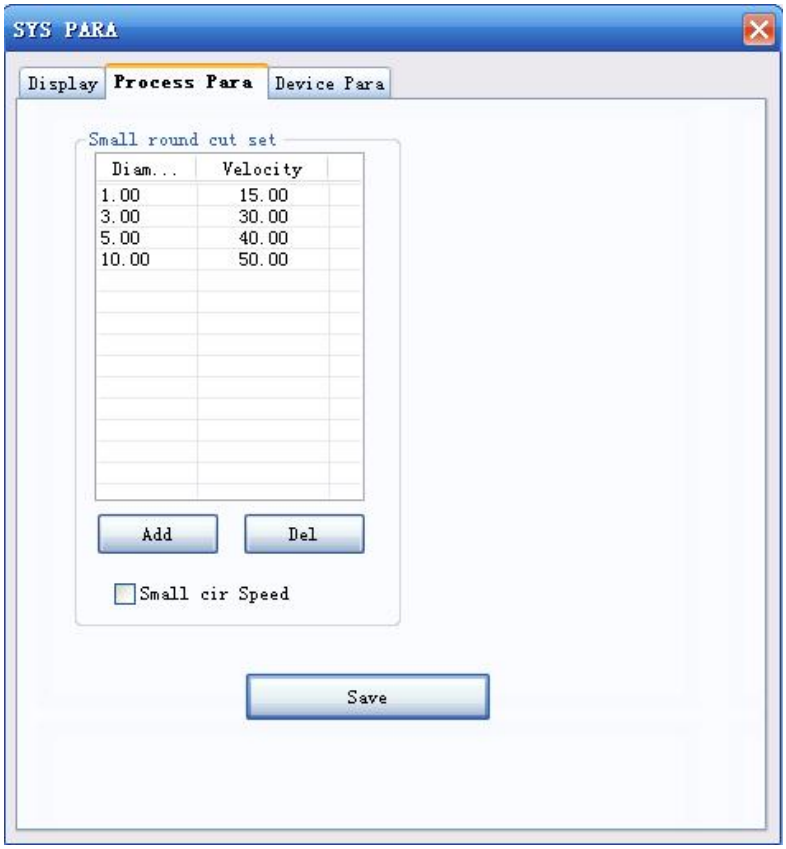


The **System Parameter Settings** window includes four tabs: **Display Parameters**, **Process Parameters**, **Device Parameters**, and **Extended Features**.

7.15.1. Display Parameters

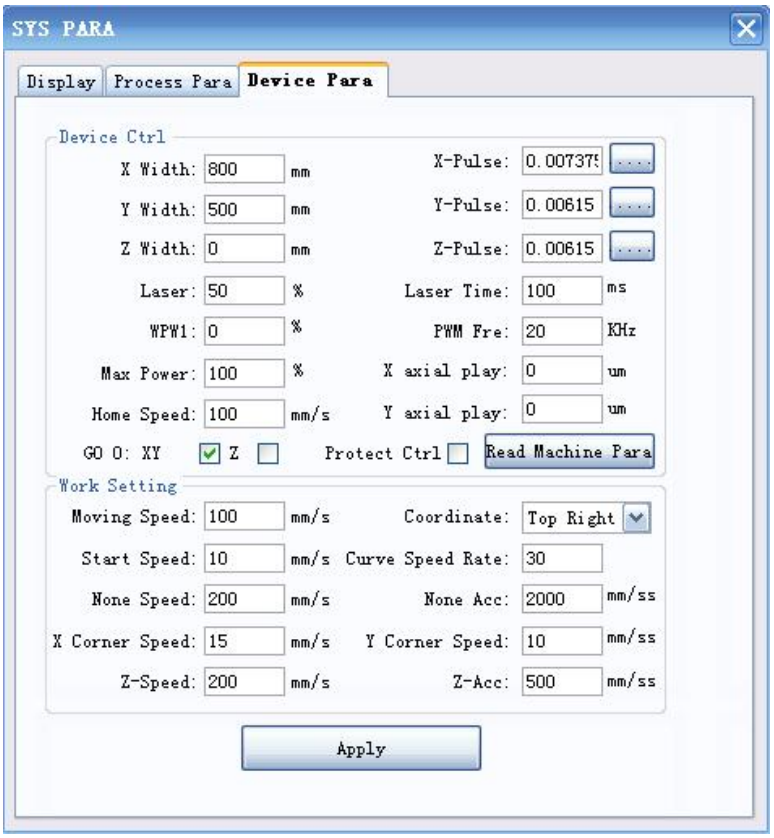
- **Show Grid**: Enable grid display in the editing area.
- **Grid Spacing**: Define spacing between grid lines.
- **Fine Movement**: Set precision move distance.
- **Paste Offset**: Set paste offset direction and distance (typically at a 45° angle).
- **Language**: Select the system language.
- **Save**: Save current settings.

7.15.2. Process Parameters



- **Small Circle Cutting Parameters**: Define speed and diameter for optimal cutting quality and efficiency.
- **Add:** Add new small circle cutting parameters. Double-click to edit existing entries.
- **Delete**: Select and remove a specific entry.
- **Enable Parameters**: Enable this setting for active use.
- **Save**: Save parameter configurations.

7.15.3. Device Parameters

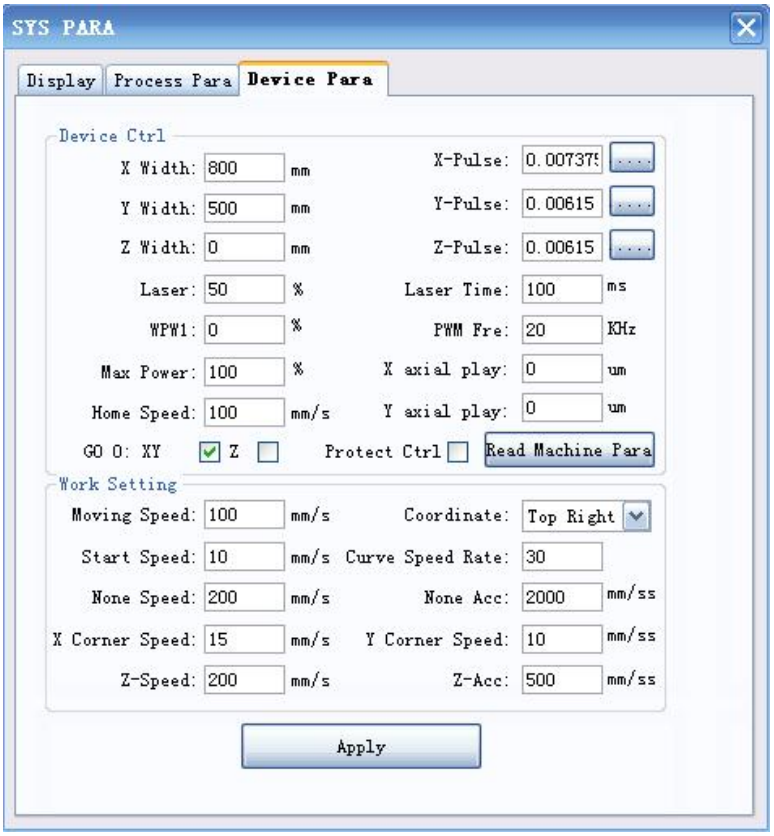


Device Control:

- Machine Width X: Maximum horizontal travel of the laser head (in mm).
- Machine Width Y: Maximum vertical travel (in mm).
- Machine Width Z: Applicable for machines with side-feeding; Z range = material length – X-axis width.Applicable to machines with left/right pusher systems. The Z-axis travel range is calculated as: Effective pushing length – X-axis width (unit: mm).

This parameter is not applicable for continuous feeding machines.

- X-Axis Pulse Equivalent: Defines the displacement per control pulse—also known as the minimum programmable unit. Click the button to set the pulse equivalent.



There are two methods to calculate pulse equivalent:

A. Theoretical Calculation

Motor Pulses per Revolution:

For stepper motors:

Example: With 1.8° step angle and 32 subdivision drive, pulses per revolution = 360 / 1.8 × 32= 6400 pulses.

For servo motors (e.g., Panasonic A5 series):

Default setting (PR008): 10,000 pulses per revolution.

Actual Travel per Revolution:

This value is determined during mechanical design. Please consult the mechanical design department.

Click the calculate Auto Calculate button to compute the pulse equivalent, then click OK to set it for the X-axis.

B. Practical Calculation

Theoretical Distance: Draw a horizontal line of 100mm and generate the processing file.

Measured Distance: After cutting, measure the actual result (e.g., 50mm).

Click

Auto Calculate, then

to set the measured pulse equivalent to the X-axis.

- Y-Axis Pulse Equivalent: Same calculation method as the X-axis.
- Z-Axis Pulse Equivalent: Same calculation method as the X-axis.
- Pulse Power: Set the power percentage for test firing (preliminary adjustment).
- Pulse Time: Set the duration for test firing output.
- Pre-ionization 1: Set the pre-ionization power percentage for Laser Tube 1.
- Pre-ionization 2: Set the pre-ionization power percentage for Laser Tube 2.
- Maximum Power: Set the maximum output power percentage for the laser.
- PWM Frequency: Set the PWM frequency according to the specifications of the laser source.
- Homing Speed: Set the speed at which the machine returns to its origin point.
- Homing Axis: Specify the axis for the homing operation.
- Read Device Parameters: Read and load the parameters currently stored in the controller.

Processing Settings

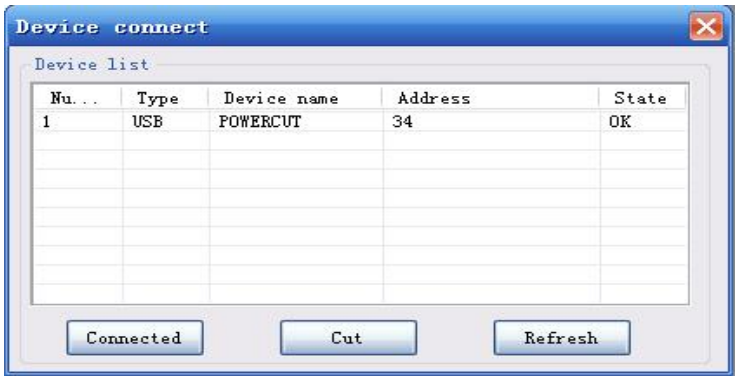
- Manual Move Speed (Fast): Sets the speed for manual (jog) movement of the machine.
- Coordinate System: Selects the working coordinate system (defines the position of the origin switch, e.g., top-left or top-right corner).
- Initial Speed: Sets the starting speed of the motor when initiating movement.
- Curve Speed Ratio: Adjusts the speed multiplier for cutting curves. A higher value increases the cutting speed for curves; a lower value results in slower but more precise cuts.
- Idle Travel Speed: Sets the speed for non-cutting (idle) movements of the machine.
- Idle Acceleration: Defines the acceleration rate for idle (non-cutting) movements.
- X-Axis Corner Speed: Sets the speed at which the X-axis moves through corners during cutting.
- Y-Axis Corner Speed: Sets the speed at which the Y-axis moves through corners during cutting.
- Z-Axis Speed: Defines the vertical movement speed of the Z-axis.

- Z-Axis Acceleration: Sets the acceleration rate for Z-axis movement.
- Protection Control: Enables detection of protection signals during the cutting process (e.g., emergency stop, enclosure door switch).
- Apply: Sends the configured parameters to the controller.

Note: The controller must be properly connected; otherwise, a communication error will occur.

7.16. Device Connection

Click the device icon to open the connection window:



Device List: Displays available devices with type, name, address, and status.

Connect: Double-click or select and click

Connect.

Disconnect: Select a device and click

Disconnect.

Refresh:

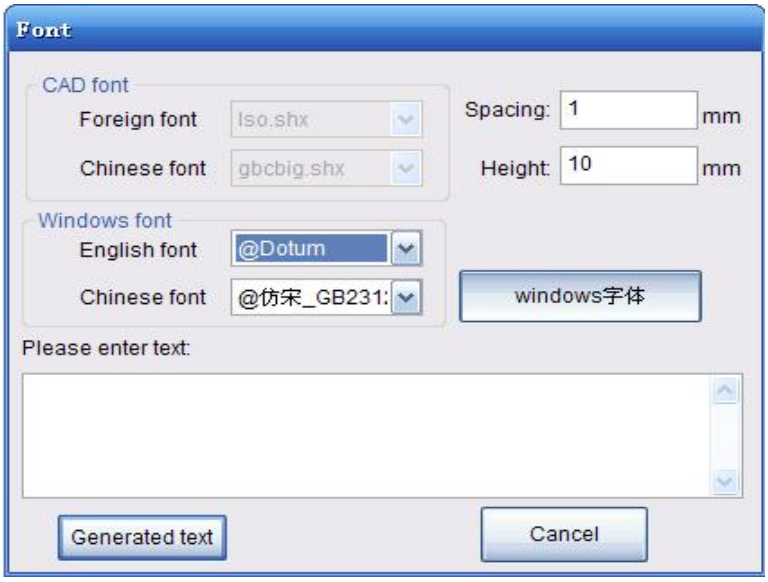
Updates the list of connected devices.

8. Graphic Creation / Modification Toolbar

8.1. Creation Toolbar

The graphic creation toolbar is used to draw common shapes such as lines, curves, circles, and rectangles. When a tool is selected, the corresponding icon appears pressed, as shown below:

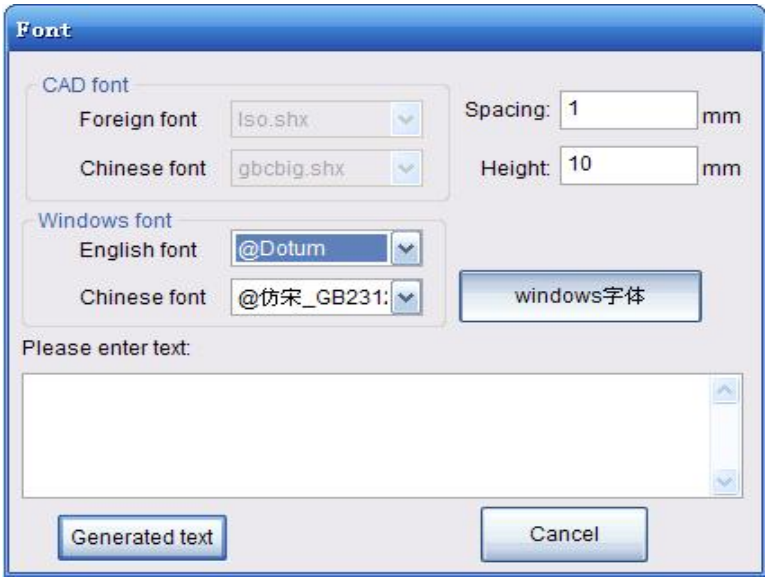
- Select: Click to activate the selection tool.
- Polyline: Click to draw a continuous polyline. Left-click to define each point; right-click to finish drawing.
- Circle: Click and drag with the left mouse button to draw a circle.
- 3-Point Arc: Click to define the center of the arc, then drag and click to define the radius, and finally click again to complete the arc.
- Arc: Click to define the start point and end point of the arc, then drag and click to form the curve. First define start and end points, then draw the arc.
- Ellipse: Click to define the center point, drag and click to set the X-axis diameter, then drag vertically and click again to set the Y-axis diameter.
- Rectangle: Click and drag on the screen to draw a rectangle of any size.
- Text: Click to insert and edit text onto a geometric shape. A dialog box will appear for text input and formatting.



8.2. Modification Toolbar

➢ Position Settings:

Corresponds to the toolbar icon . Clicking the icon opens a dialog box to set the reference point of the selected object.



When one or more objects are selected, a bounding box with eight anchor points and a center "X" will appear. Dragging the center "X" moves the object. Dragging any of the eight anchor points resizes the object.

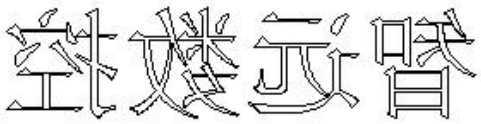
Selecting different reference points will adjust coordinate values accordingly.

The geometric properties of the selected object are displayed and can be edited directly in the input fields.

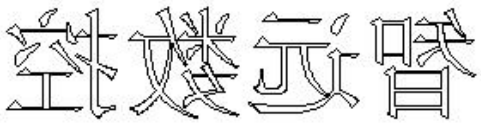
- Lock/Unlock Aspect Ratio: Corresponds to the toolbar icon . When locked, modifying one dimension will proportionally adjust the other. When unlocked, width and height can be changed independently.

- Rotate: Corresponds to the toolbar icon . Enter the rotation angle in the input field, then click the icon to rotate the selected object.

- Mirror X-Axis: Corresponds to the toolbar icon . After selecting a shape, clicking this icon will flip the shape horizontally along its center vertical axis.



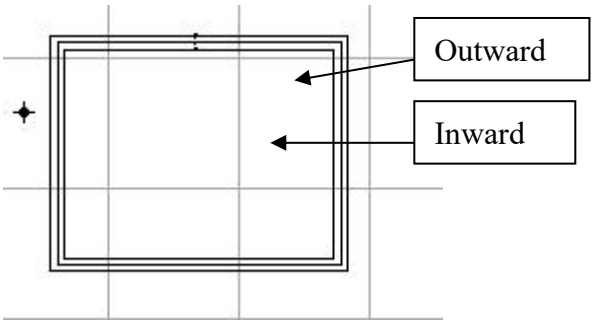
- Mirror Y-Axis: Corresponds to the toolbar icon . After selecting a shape, clicking this icon will flip the shape vertically along its center horizontal axis.



- Offset Inward/Outward:

- Corresponds to the toolbar icon . Select a vector graphic and click the icon to open the following dialog box:

Choose the desired offset direction and parameters. Click OK to generate a new parallel outline shape.



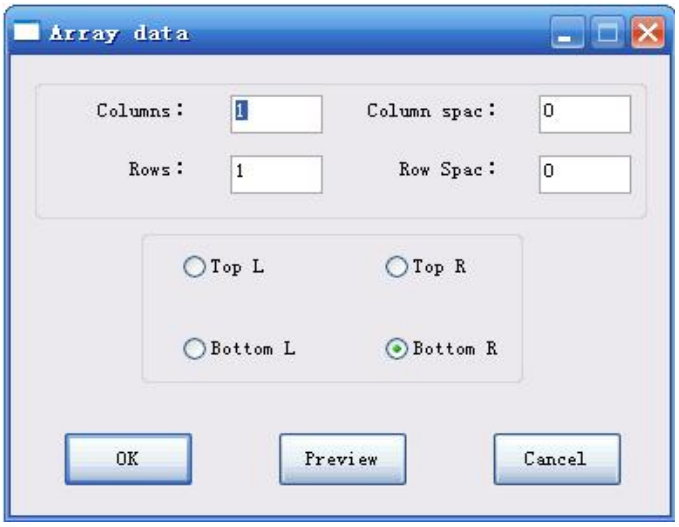
Inward offset will shrink the graphic by the specified distance.

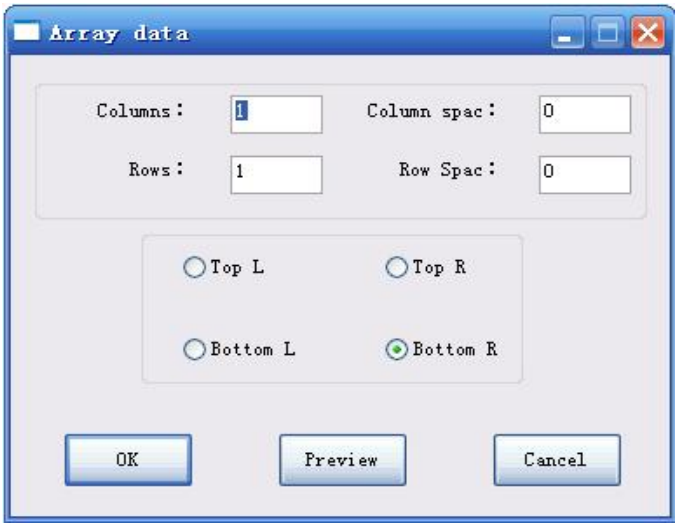
Outward offset will expand the graphic.

Important: When applying inward offset, the offset value must not exceed the radius of the shape.

- Array (Real Array):

Corresponds to the toolbar icon. Clicking this icon opens the following dialog box:





- Columns: Number of columns in the array.
- Rows: Number of rows.
- Column Spacing: Horizontal distance between columns.
- Row Spacing: Vertical distance between rows.
- Array Direction: Select the direction for the array from the original object (top-left, top-right, bottom-left, bottom-right).
- Preview: View the array layout.
- OK: Confirm and apply the array.
- Cancel: Cancel the operation.

Tip: Difference between "Array (Virtual)" and "Array (Real)":

Virtual Array: Only the original (parent) object is an actual entity. The duplicated graphics are for display only. When the parent object is moved or modified, the others follow. This saves memory.

Real Array: All generated objects are independent entities and can be edited separately.

9. Layer/Alignment Toolbar

9.1. Layer Toolbar

The Layer Toolbar is used to assign layers to processing objects. Each layer is represented by a different color.

To assign a layer:

Select the graphic object. Click a color icon in the Layer Toolbar. The object will be assigned to that color layer.

The software supports up to nine layers, each represented by a distinct color. Objects on each layer can be configured with independent processing parameters. (Details on layer-specific processing settings will be explained in later chapters.)

9.2. Alignment Toolbar

The Alignment Toolbar is used to align one or multiple selected objects. The available alignment functions are shown in the following toolbar:

- Center Alignment (to Canvas Center): Corresponds to the toolbar icon . Aligns the entire group of selected objects to the center point of the canvas (working area).
- Align Left: Corresponds to the toolbar icon . Aligns selected objects to the leftmost object's position.
- Align Right: Corresponds to the toolbar icon . Aligns selected objects to the rightmost object's position.
- Align Top: Corresponds to the toolbar icon . Aligns selected objects to the topmost object's position.
- Align Bottom: Corresponds to the toolbar icon . Aligns selected objects to the bottommost

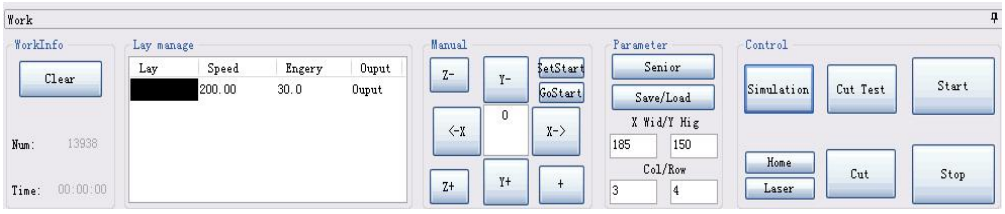
object's position.

- Align Horizontal Center: Corresponds to the toolbar icon . Aligns all selected objects along their combined horizontal centerline.
- Align Vertical Center: Corresponds to the toolbar icon . Aligns all selected objects along their combined vertical centerline.
- Align by Object Center: Corresponds to the toolbar icon . Aligns all selected objects based on their individual geometric center points.

10. Work Panel

The Work Panel includes modules such as Available Devices, Layer Management, Device Control, and Manual Control.

You can pin or auto-hide the Work Panel by clicking the pushpin icon on the right side. The red box in the figure highlights the Work Panel area.



10.1. Layer Management

The Layer Management section provides access to key information such as layer color, processing mode, speed, laser power, and output status.

When you right-click a selected layer, a shortcut menu appears with the following options: Move Up, Move Down, Move to Top, Move to Bottom, and Select Objects.

Click on a layer color to highlight the layer. Click

to move the layer up one level.

Click [Down] to move the layer down one level.

Click

to bring the layer to the top.

Click

to move the layer to the bottom.

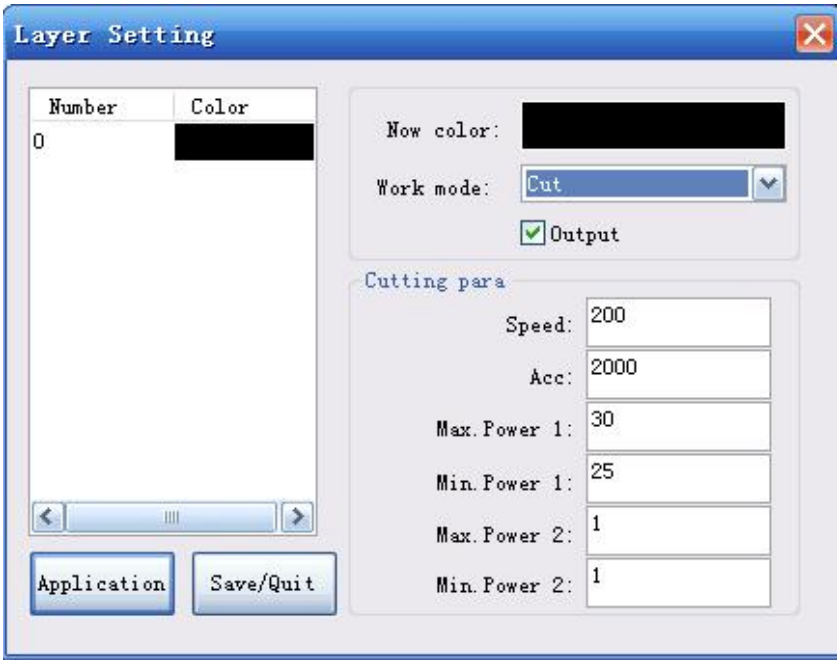
Click

to select all objects in that color layer.

Note: The processing sequence is based on the order of the layers. Changing the layer order directly

changes the processing order.

➢ Double-click on a layer to open the Layer Settings Window, as shown below:



The left side of the window shows all layers and their sequence. The right side displays configuration options for the selected layer.

➢ **Current Layer Color**: Displays the color of the selected layer. Clicking a different layer on the left will update this information.

➢ **Working Mode**: Click the drop-down arrow to select one of the three available working modes:

Output: When checked, the objects in this layer will be included in the laser processing file.

If unchecked, the objects will be excluded from output and will not be processed.

➢ Cutting Parameters:

- Processing Speed: Speed at which the objects in this layer are processed.
- Processing Acceleration: The acceleration from start speed to processing speed.
- Laser Power 1: Laser power percentage for Tube 1 at maximum speed.
- Corner Laser Power 1: Laser power percentage for Tube 1 at cornering speed.
- Laser Power 2: Laser power percentage for Tube 2 at maximum speed.
- Corner Laser Power 2: Laser power percentage for Tube 2 at cornering speed.

Click

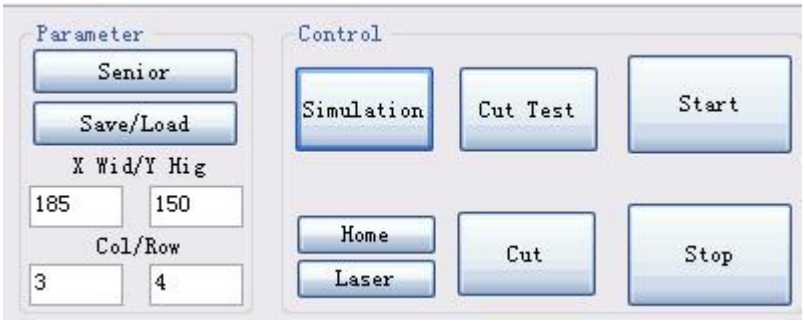
to confirm and apply the layer settings.

Click

to close the settings window without saving changes.

10.2. Device Control

The Device Control section includes options such as Vision Simulation, Start, Stop, Processing Mode, and Laser Pulse (Point Firing).



- Processing Mode: Click

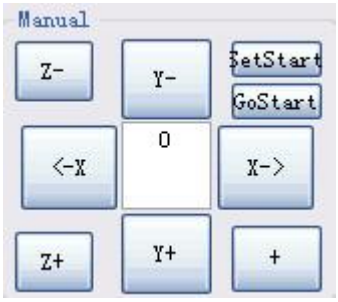
to select a processing mode. This setting must also be configured under Advanced Settings as shown below.
- Start: Click

to start processing according to the selected mode.
- Stop: Click

to stop the ongoing process.
- Laser Point Firing: Click

to perform a short laser pulse test.

10.3. Manual Control

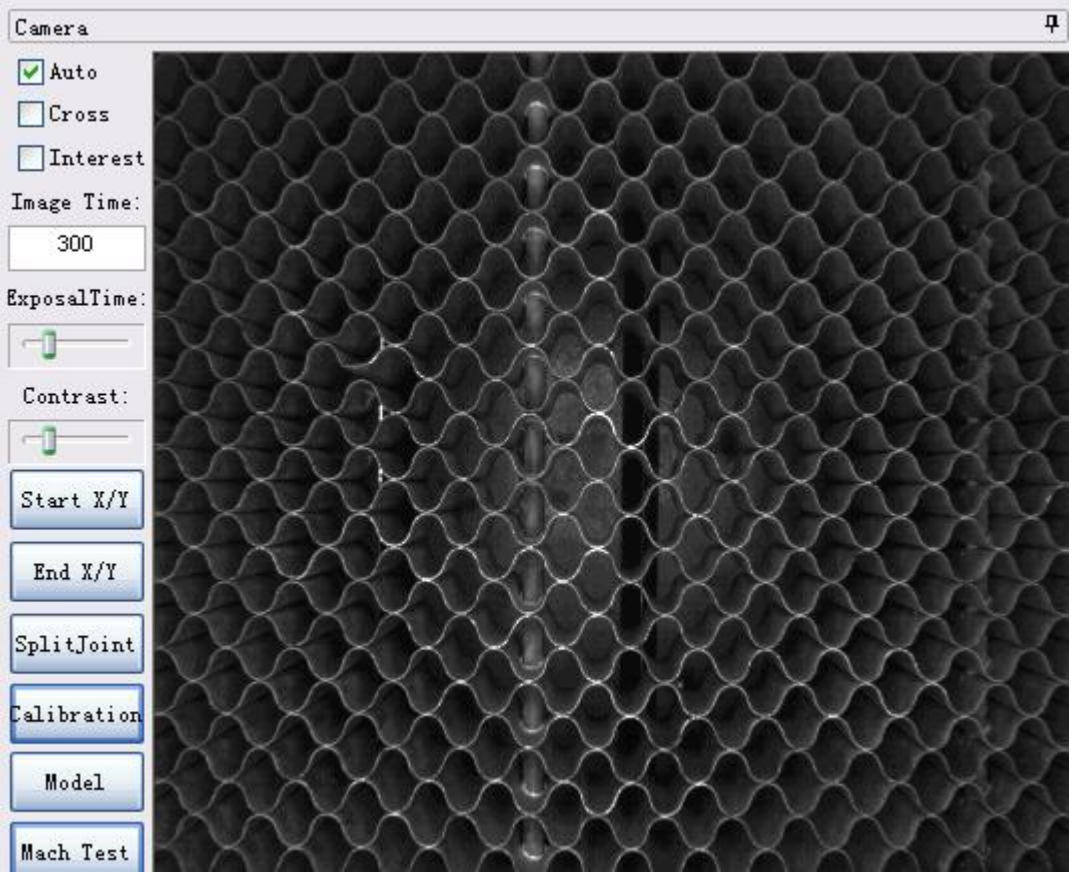


- This section allows for manual axis control.
- X+ / X−: Click to move the laser head along the X-axis (left/right).
- Y+ / Y−: Click to move the laser head along the Y-axis (up/down).
- Z+ / Z−: Click buttons to move the laser head along the Z-axis (up/down).
- Precise Movement: Enter a numerical value in the input field , then press a directional button.

The laser head will move the specified distance in the selected direction.

11. Vision Management

11.1. Camera Configuration



Physically, camera image quality can be adjusted by changing the aperture and focus. In the software, image tuning involves four key parameters: effective area, exposure time, contrast, and gain.

Effective Area: Select a target region within the camera's field of view to optimize processing.

Exposure Time: Controls the duration the sensor is exposed to light, affecting image brightness and potential delay.

Contrast: Adjusts the differentiation between the background and material to enhance clarity.

Gain: Amplifies image brightness by increasing signal sensitivity.

Note: When the image appears too dark, try adjusting the aperture, camera lighting, or increasing the exposure time. Be aware that longer exposure may result in motion blur or delayed image updates.

11.2. Calibration Management

11.2.1. Pixel Ratio Calibration

Click the calibration icon

on the left panel to open the pixel calibration window:

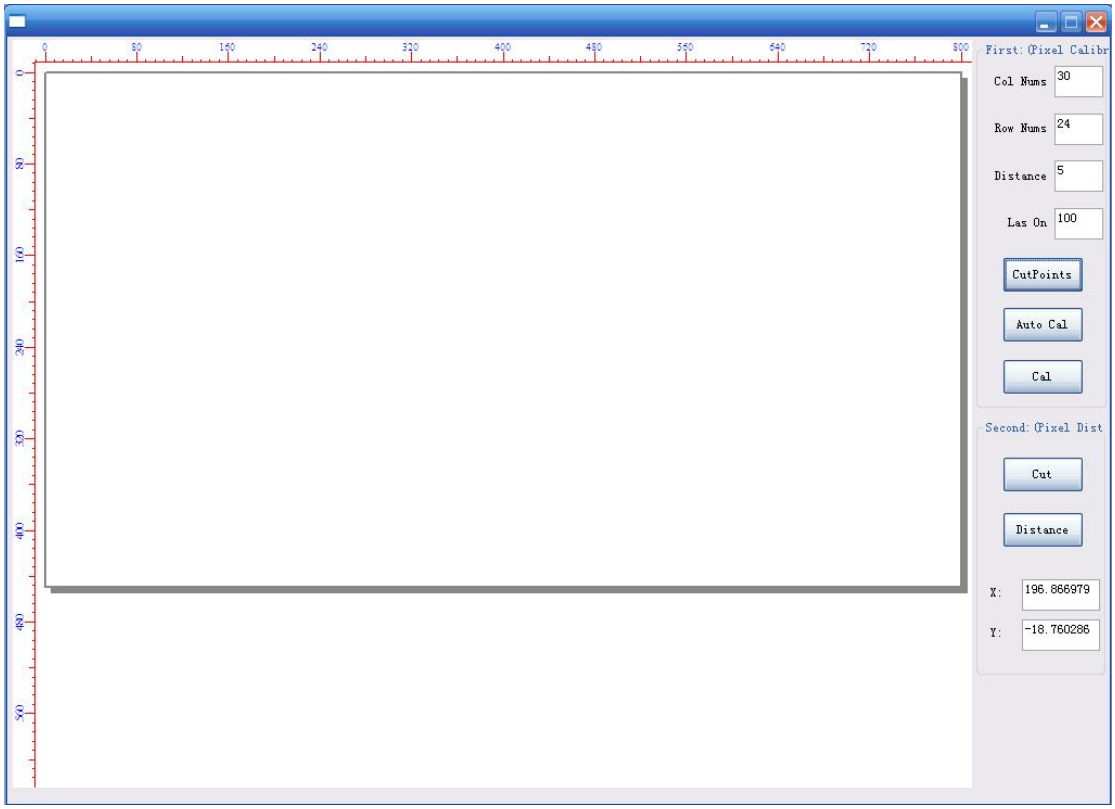


Figure 11.1.1 – Pixel Ratio Calibration Dialog

11.2.2. Marking Calibration Points

Estimate the area currently covered by the camera and fill in the number of rows, columns, spacing, and laser delay. Ensure the marked calibration grid is larger than the camera view. This allows the calibration points to fully occupy the camera's display area.

Tip: Calibration points should be clear and visible in the video preview. Use a low laser power and slightly raise the laser head to produce visible marks approximately 0.1 mm in width.

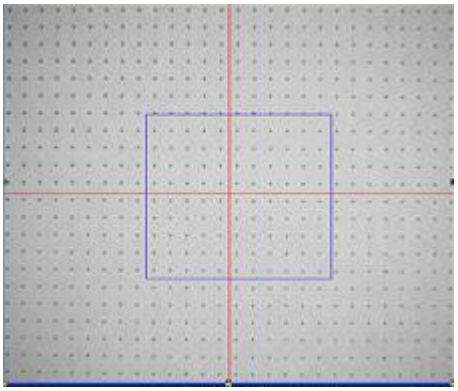


Figure 11.2.2 – Marking Calibration Points

11.2.3. Calibration Parameter Descriptions

Row Count: Number of calibration points in a row within the camera's view.

Column Count: Number of calibration points in a column.

Spacing: Distance between each calibration point (recommended: 3 mm or 5 mm).

Laser Delay: Duration the laser remains on while marking each point (recommended: 100–300 ms).

11.2.4. Calibration Procedure

1. Align the calibration grid horizontally and vertically with the machine's coordinate system.
   Avoid moving the calibration paper.
   Purpose: Ensure coordinate systems match to minimize rotation errors.
2. Move the camera over the calibration area and adjust lighting and image parameters.
3. Confirm the number of visible points in the camera's field and initiate pixel calibration.

Calibration Tips:

1. Fill the entire field of view with calibration points.
2. Ensure all points are fully visible within the image.
3. Focus especially on image clarity near the corners.
4. Try to keep the center row of points aligned horizontally and center column vertically with the coordinate system.

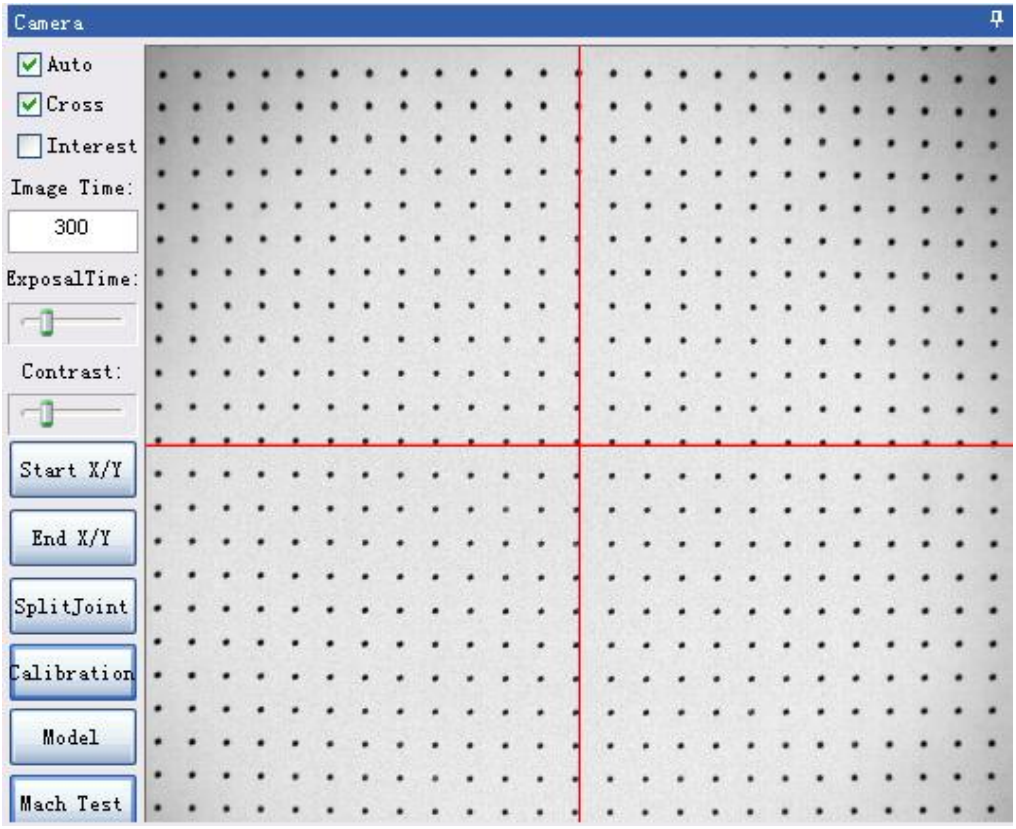


Figure 11.2.4.1 – Properly Captured Calibration Image

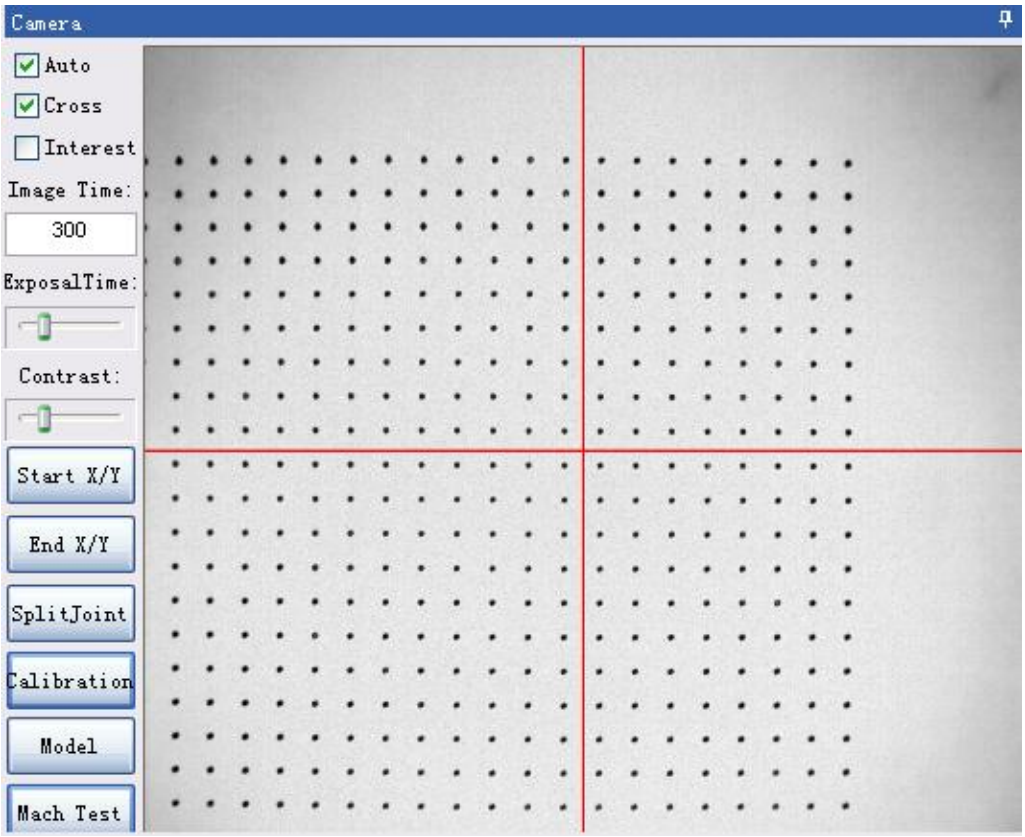


Figure 11.2.4.2 – Incomplete Calibration Coverage

In the video window, right-click anywhere to move the frame center to the clicked position.

5.

: If the calibration fails, a result window will be displayed. In this view, carefully inspect whether each green crosshair precisely overlaps with the corresponding calibration point.
If any misalignment is observed between the green crosshairs and the calibration points, the calibration must be redone.
If the number of calibration points does not match the expected count, the software will show a Pixel Calibration Point Count Error.

Use the left mouse button to double-click on the missing calibration point. Adjust the green crosshair so that it aligns perfectly with the center of the selected calibration point. Then click

to add the missing point.

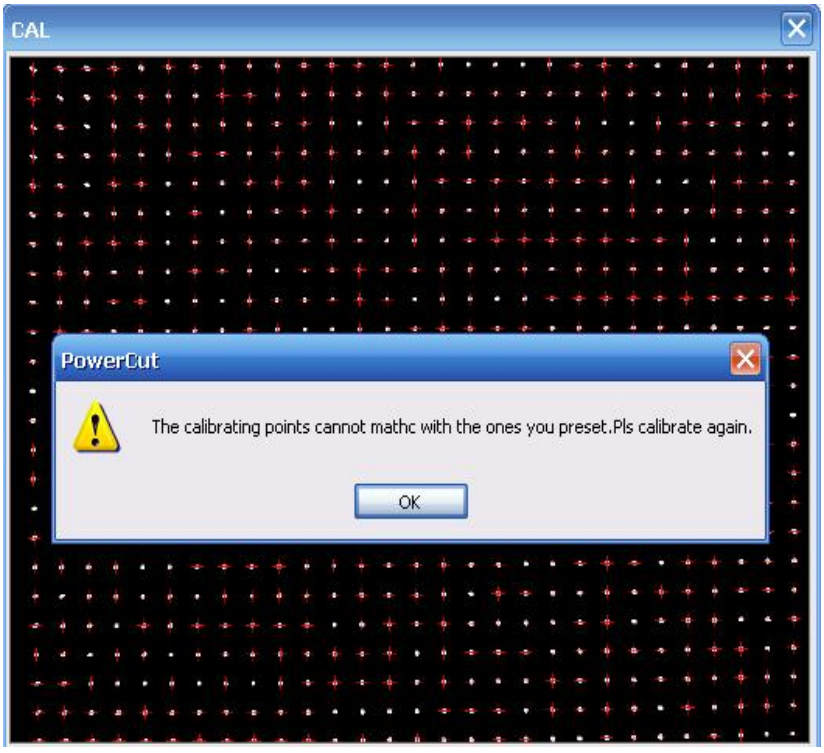


Figure 11.2.4.3 – Pixel Calibration Error

When calibration is successful, a confirmation dialog will appear. If not, a failure message will display. In that case, improve image clarity and verify all parameters before attempting calibration

again. The system automatically saves the calibration file upon success.

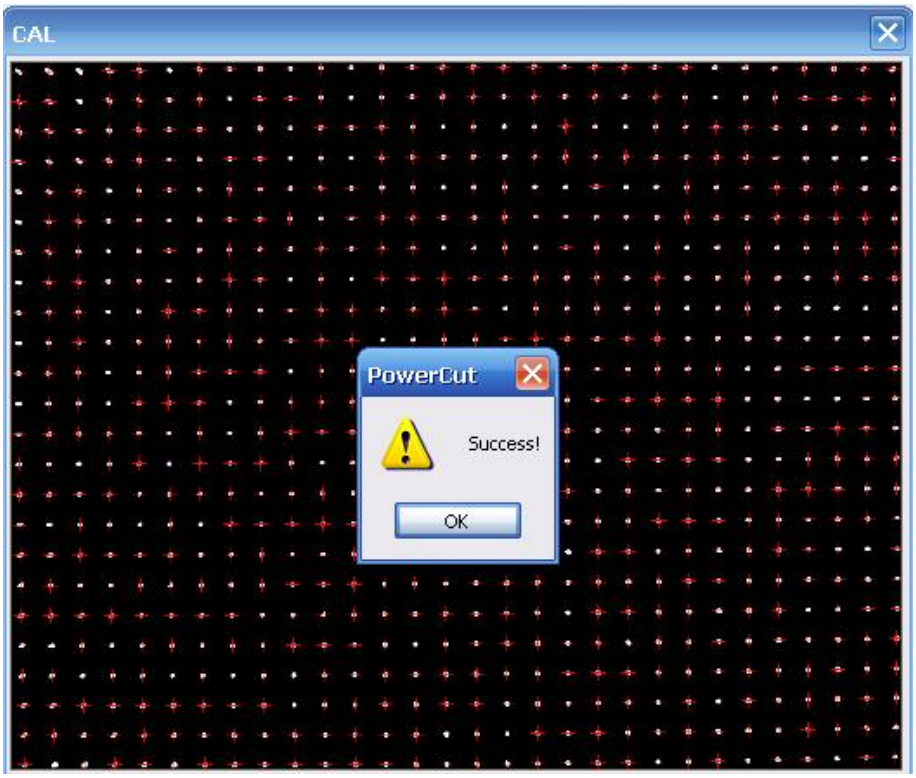


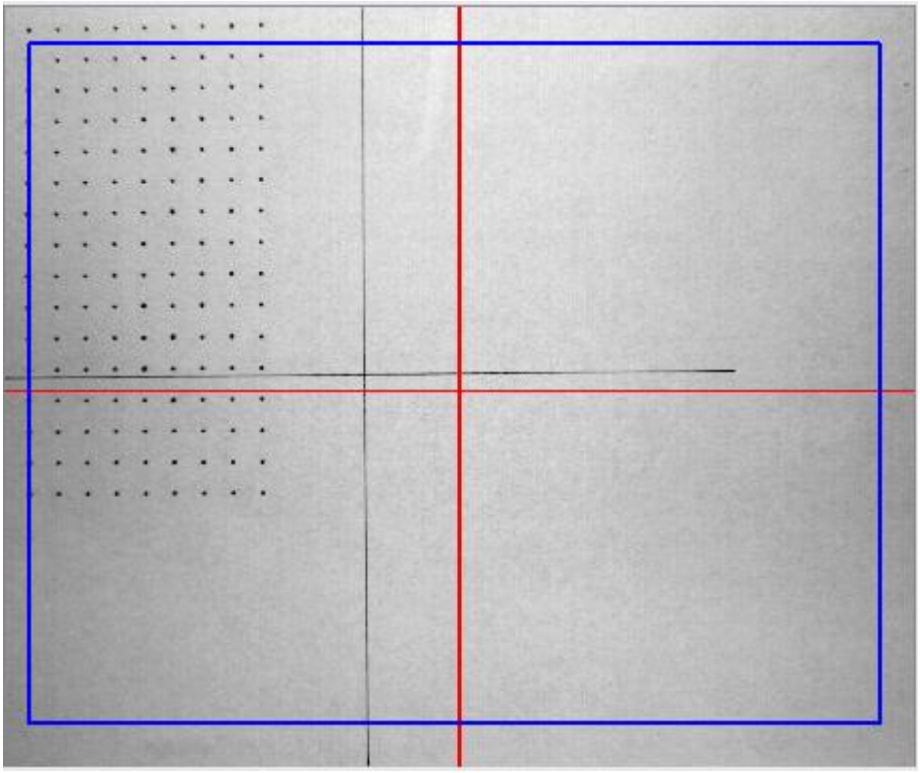
Figure 11.2.4.5 – Successful Pixel Calibration

11.2.5. Offset Calibration

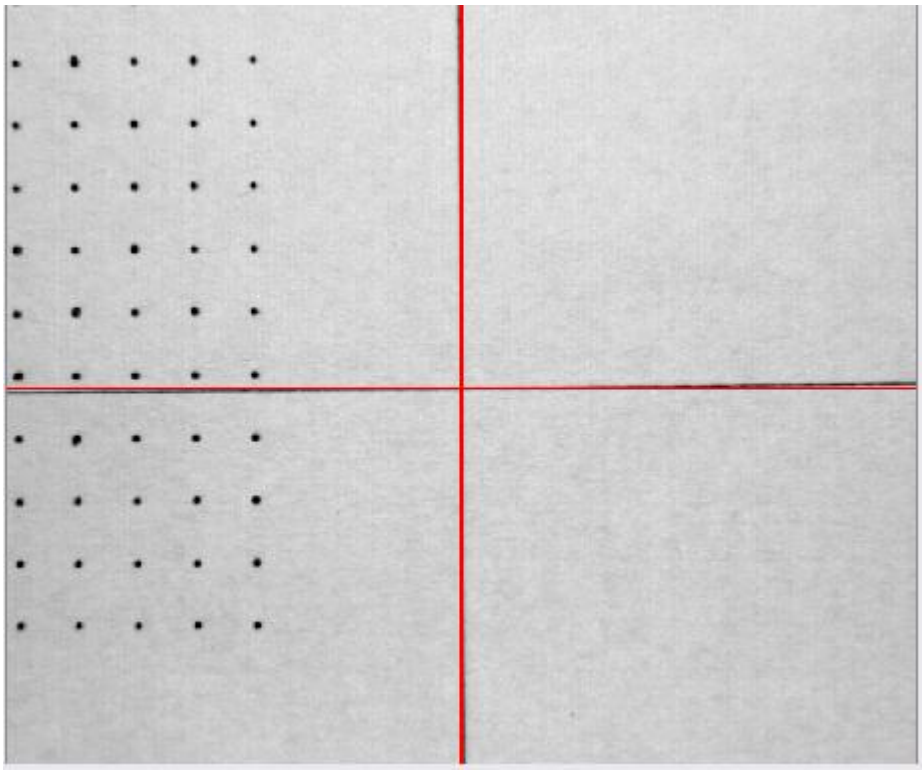
11.2.5.1. Procedure

Step 1: Place a white sheet on the working table. Move the laser head to the sheet's center, then initiate a marking operation Cut. Ensure power settings (Layer 1 parameters) are low enough to avoid cutting through the paper.

Step 2: Move the camera view until the blue crosshair perfectly aligns with the laser-marked cross. Once aligned, click Distance. The measured offset value will be displayed in the input field.



Before Alignment



After Alignment

12. Vision Cutting Workflow

Once the calibration process is completed, visual positioning cutting (mark point cutting) can be performed. The detailed steps are as follows:

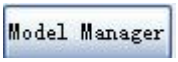
Vision Cutting Procedure:

1. Select or define a template.
2. Outline or import the cutting path.
3. Set matching parameters.
4. Save and check the template for use.
5. In the control panel under “Advanced,” select the cutting mode as Vision Cutting.
6. Set the number of rows and columns within the cutting area and configure related parameters, then click Start to begin the operation.

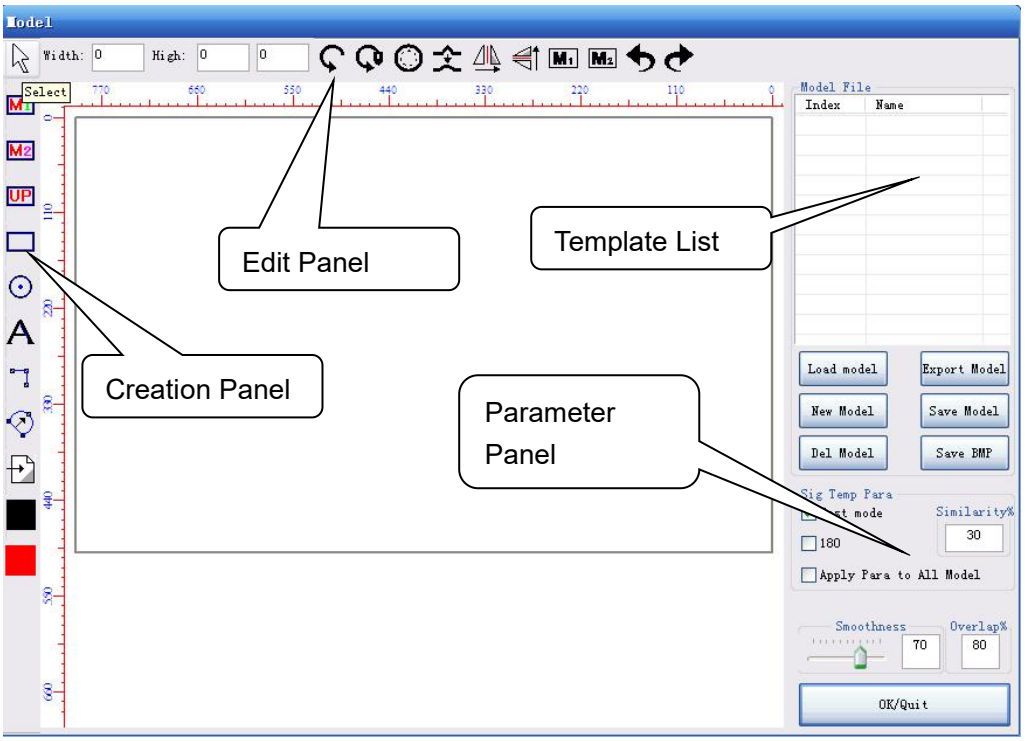
Standard Cutting Procedure:

1. Import the cutting file.
2. Select Standard Cutting.
3. Click Start to begin processing.

12.1. Template Management

Click 

to enable the Template Management function from the control panel. The template management interface is shown below:



12.1.1. Create a New Template

After the camera is properly connected, click

to generate a new bitmap image from the current camera position. In the Template Creation section, click

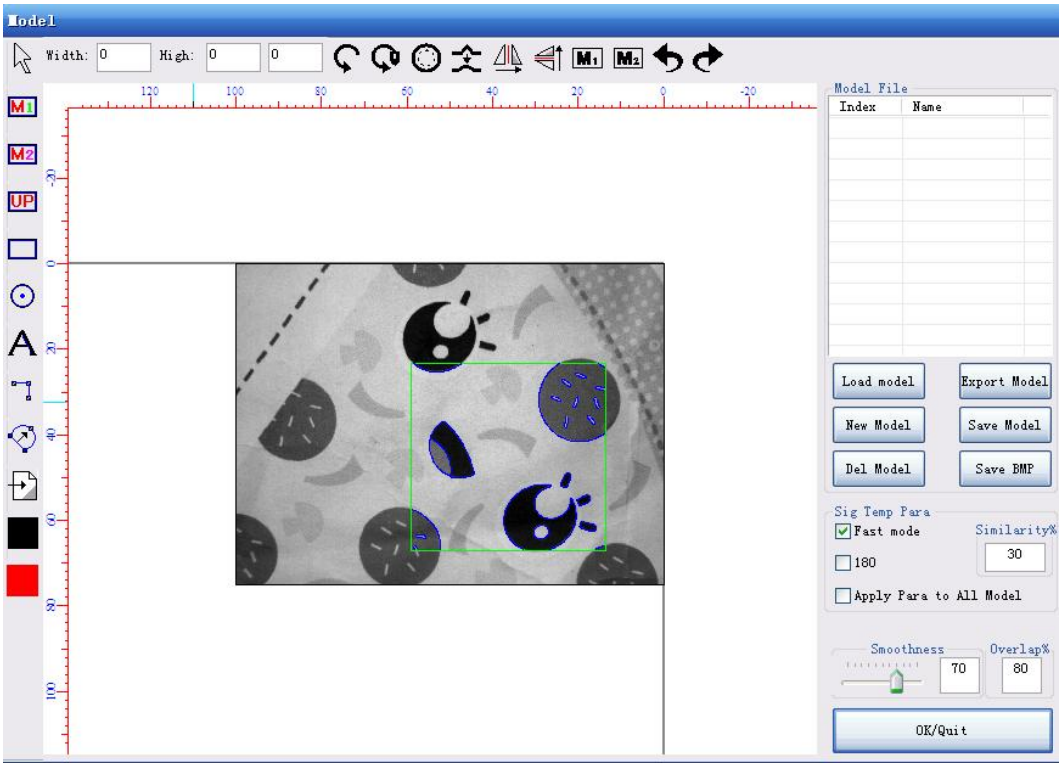
to create dual templates (for image stitching), or click

to update a specific section of a previously captured image (especially useful when stitched images are not fully aligned). To update an image section, click

, then select the region to update and click

.

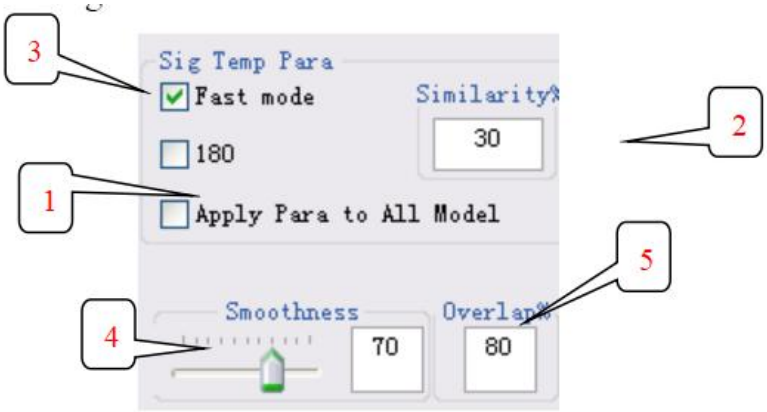
Use your mouse to draw a green rectangle to define the feature area for template matching. This region will be used to extract the template's feature lines, as shown below:



Single Template Example

The blue lines represent extracted template features. Unnecessary features can be manually deleted.

Template Parameter Settings:



Single Template Parameters: These parameters apply only to the currently selected template in the list.

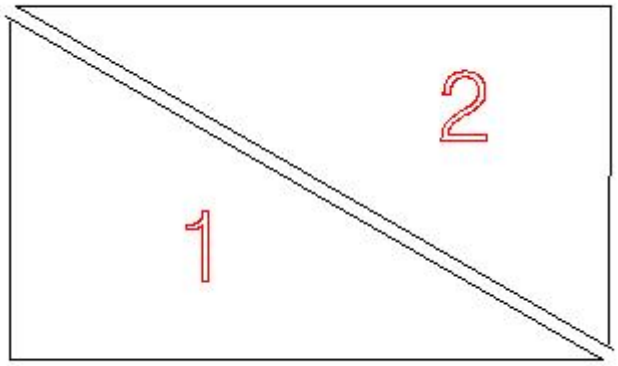
1. Apply Para to All Model: Enables the same settings for all selected templates in the list.
2. Similarity(%): Defines the minimum matching similarity. Objects with similarity below this

value will not be matched.

3. Fast Mode: Limits the maximum rotation angle for matching. For example, a setting of 20° allows matches within ±20° rotation. This improves matching speed. If unchecked, full ±180° rotation is supported, but matching may be slower.

All Template Parameters: All parameters within this section apply to all templates selected in the template list.

4. Flip 180°: When enabled, allows fast matching for templates rotated 180°.
5. Smoothing Factor: Filters template features to reduce excess details. A higher value (recommended 50–70) improves performance when templates are overly complex. Use the slider or manually input an integer value.
6. Overlap Ratio (%): Specifies the allowable overlap between newly matched objects and already cut material. For example, in the image below, Object 2 partially overlaps Object 1. If the overlap threshold is not high enough (e.g., set to 50%), Object 2 may not be cut to avoid duplication or damage to previous cuts.



12.1.2. Outline / Edge Tracing

When a cut graphic file (e.g. .ptl or .dxf) is already available, it can be directly imported. When no file is available, use the Outline function to trace the template edges manually.

Outline Workflow:

Step 1: Click the Outline button. Left-click to add nodes along the feature edge. Add as many as

needed.

Step 2: After finishing the node placement, right-click once to auto-generate control points.

Step 3: Drag control points with the mouse to fine-tune the edge. Repeat for each point until the path is satisfactory.

Step 4: Right-click again to start tracing a second object or twice to exit Outline Mode.

Editing Outline Data:

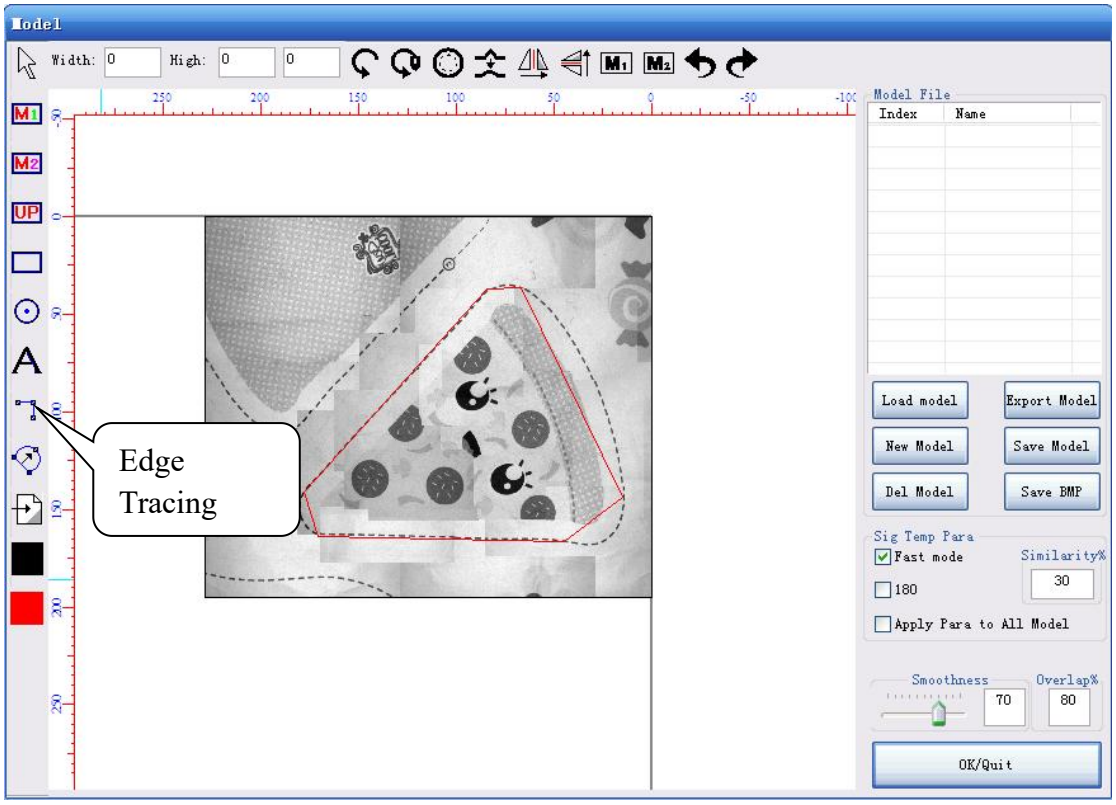
Step 1: If you are not satisfied with the initial tracing results and need to make modifications, left-click the “Edit” button to enable the trace data editing mode. Then, in the viewing area, left-click on the traced data object you want to edit to select it. Note: You must left-click to select a traced object. Box selection or clicking on non-traced objects will not work.

Step 2: Once the traced object is selected, its control points will automatically appear. You can then adjust them following the same method described in the tracing procedure. After completing the edits, right-click once to proceed to the next object to be edited, or right-click again to exit the editing mode when all modifications are complete.

Detailed Workflow with Illustrations

Edge Tracing Function Overview:

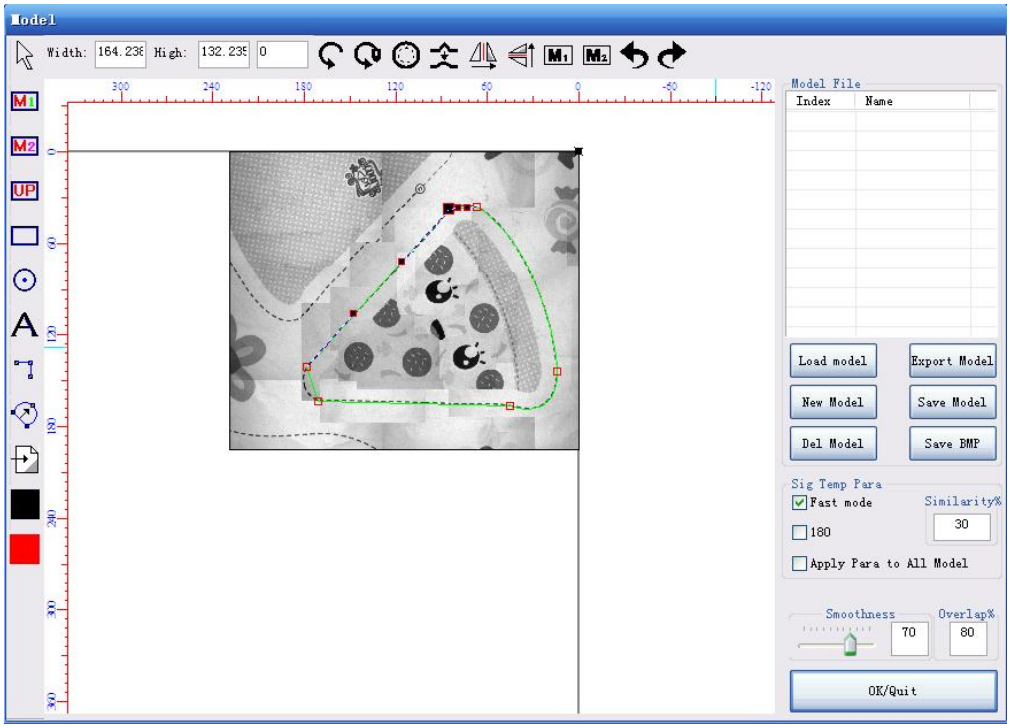
The tracing function allows users to manually outline the contour of a logo template to generate cut-ready vector data. After creating a template and obtaining its bitmap image (model.bmp), you can manually trace in the viewing area of the cutting software.



Click “New Template”, then use the selected shape as the base for tracing.

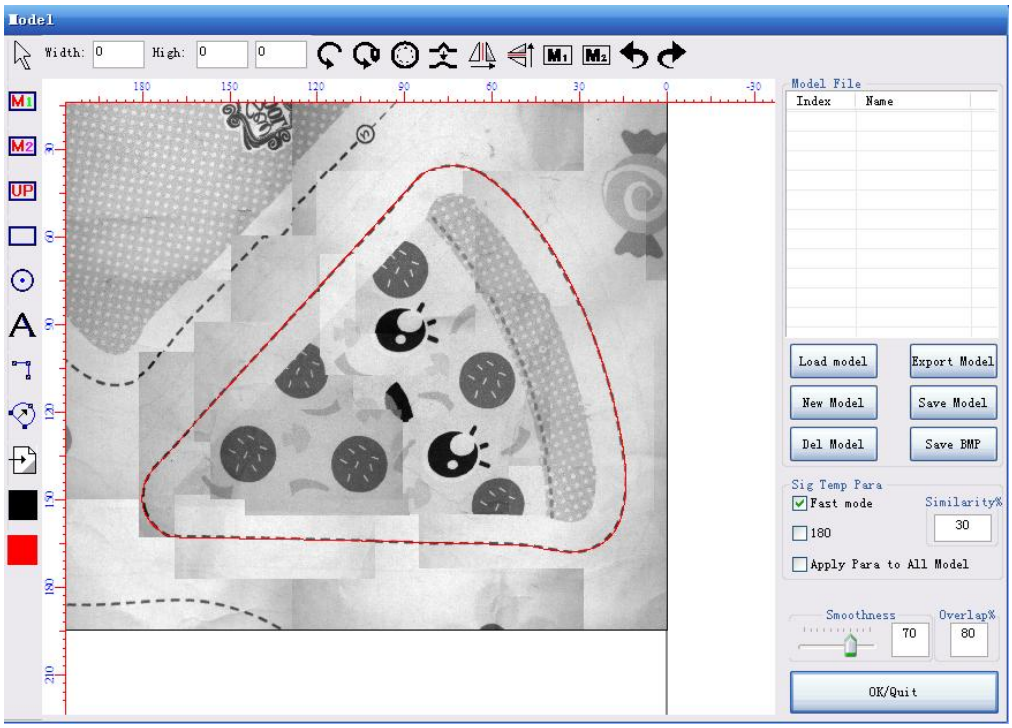
Click the Tracing Tool button and left-click in the viewing area to create tracing nodes on the template bitmap.

See below for an example of created tracing nodes:



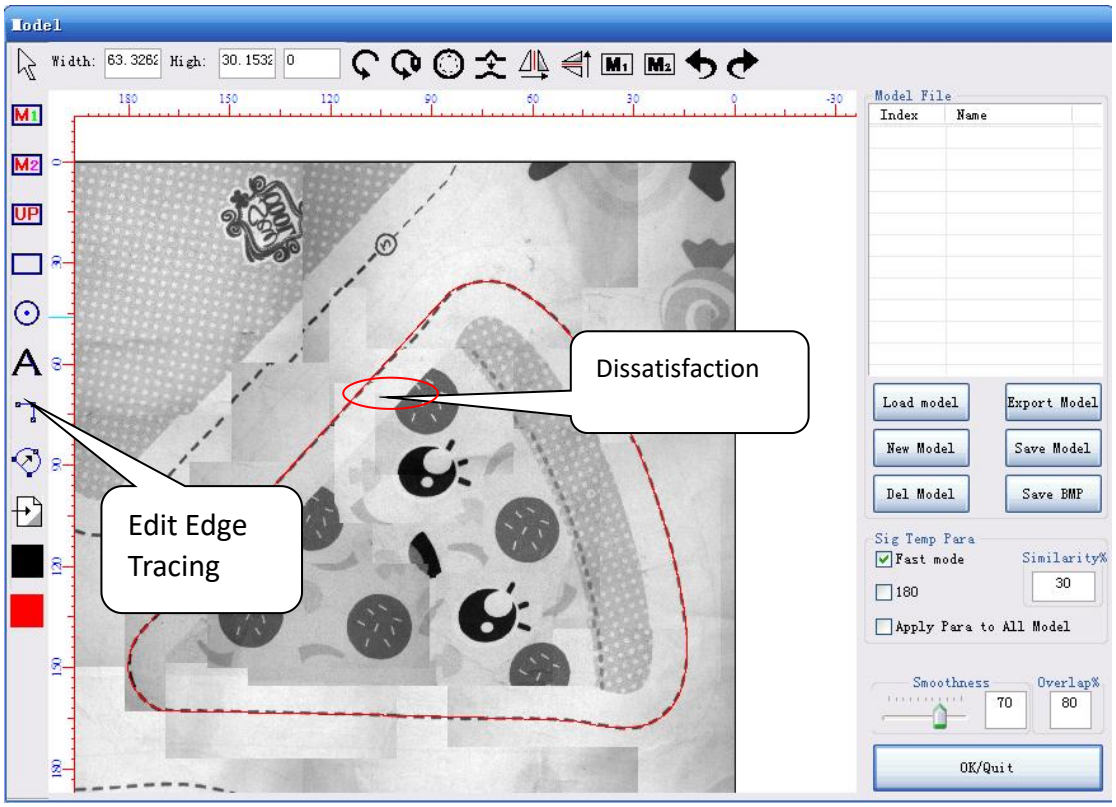
Once all control points are placed and adjusted, right-click twice or click button to finalize the traced edge data. The software will automatically assign this template data to the Red layer by default.

The image below shows the finalized traced contour data:



If you are not satisfied with the traced contour data (as shown in the red area below), you can modify it by clicking the “Edit Trace Data” button (purple area in the image). Then, in the viewing area, left-click to select the traced object you want to edit. Once selected, the control points will reappear. You can then adjust them using the same editing methods described earlier (see Image 2).

After finishing the adjustments, right-click twice to confirm and complete the traced template data (see Image 3).

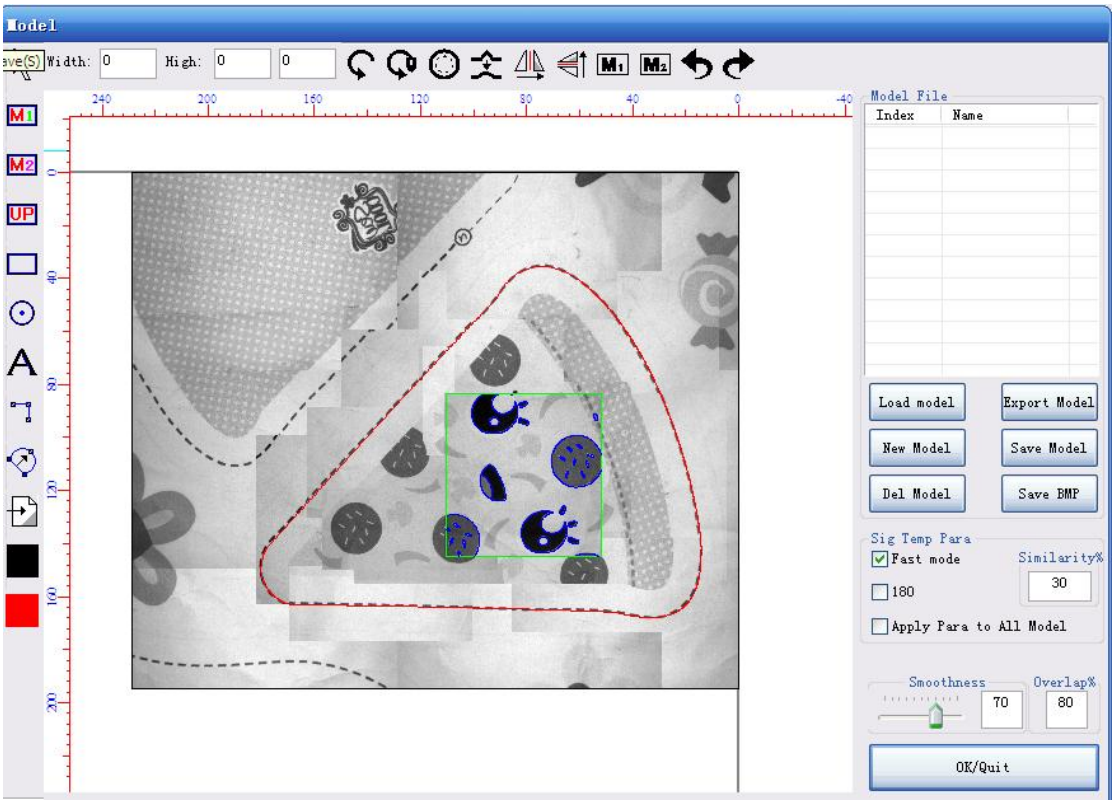


(2)

If you only need to fine-tune a specific node, left-click the node to select it, then use the arrow keys on your keyboard to move it slightly, as shown below.

(3)

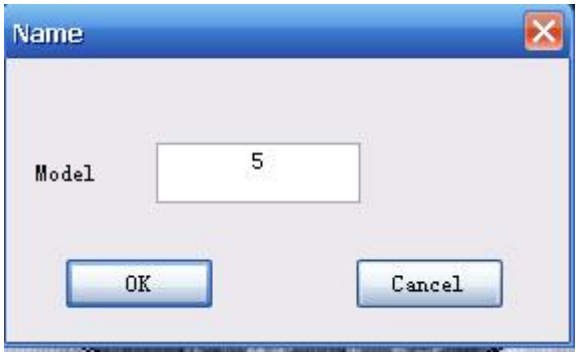
After making the adjustments, right-click as shown above, then click to Generate Data, exit the editing mode, and proceed to outline the features.



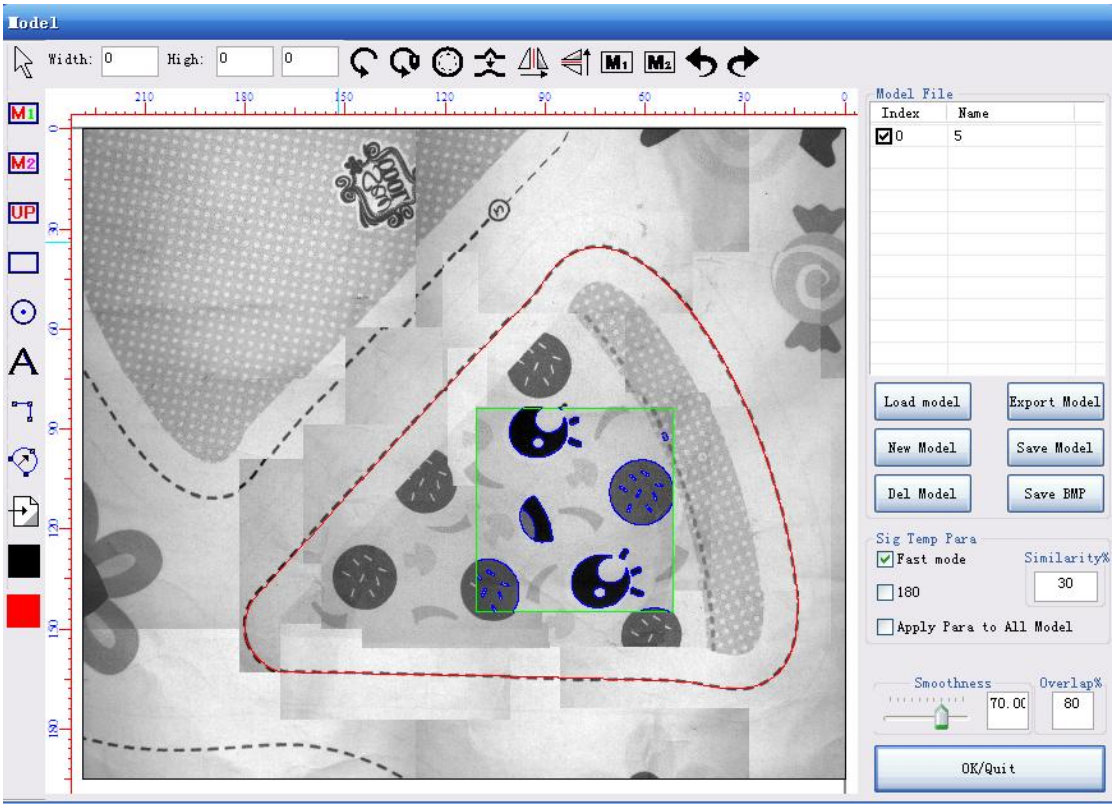
Next, use the mouse to draw a box around the template feature area by clicking and dragging over the relevant region. The template feature is used for positioning during vision cutting.

In the image below, the blue lines represent the extracted feature lines.

Click “Save Model” to proceed.



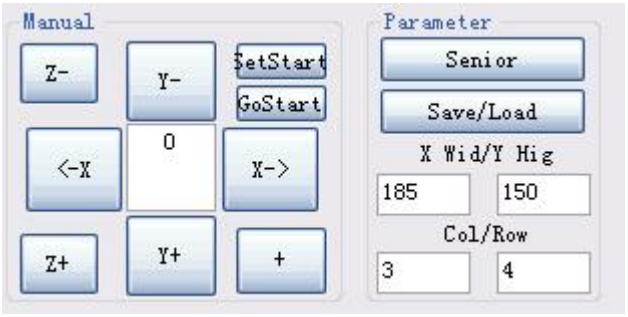
Enter a file name (e.g., “1234”) — any name is fine as long as it’s not duplicated.



Then, check the box next to the newly created template in the list (as shown below) and click "OK" to complete the process.

12.1.3. Setting Vision Cutting Parameters

On the software control panel, there is a dedicated area for configuring vision cutting parameters, as shown below:



Move the camera to the starting point, then click

"X Width / Y Height": Refers to the full width and height of the material to be cut within the visible

area of the camera.

"Col/Row": Sets the number of rows and columns to be cut within the machine's working area.

Click the "Advanced" button to open the vision cutting path settings, as shown below:

Cutting After Identification: The system performs cutting immediately after the camera detects each matched object in the screen area. (Lower efficiency)

Full Cutting After Identification: The system waits until all matching targets within the specified area are recognized, and then cuts them together. (Higher efficiency)

Dynamic Search: The system automatically adjusts the search based on the material's offset angle. This function is useful for minor deviations and only supports single-template matching.

Static Search: The camera searches based strictly on preset row width and column height, without error correction. Finally, select the "Label Cut" mode, then click "OK" to begin the cutting process.

13. Operating Procedure

Step 1: Install the Machine and Accessories

Follow the instructions provided in the hardware installation manual to assemble the machine and install all related accessories.

Step 2: Install the Software and USB Driver

Copy the software from the CD to your computer. Refer to Chapter 1 for detailed installation steps.

Step 3: Create Processing Graphics/Define Template/Select Template

You can use third-party software such as CorelDraw, Photoshop, or AutoCAD to design your graphics. Save them in supported formats like .PLT, .DST, .AI, or .DXF.
For .BMP images, convert them into mesh or dot formats (Photoshop is recommended).

Step 4: Set Processing Parameters

Use the software to load your graphic into the workspace by clicking the relevant icon. Once loaded, you can configure the processing parameters. See previous chapters for detailed instructions. After configuration, send the data to the machine or save it to a USB flash drive.

Step 5: Check Focus Distance

The laser focus should be roughly adjusted during hardware installation. Confirm that the focus is appropriate; fine-tune if necessary.

Step 6: Start Processing

Once all the above steps are completed, click the **Start** button to begin processing.

14. Maintenance & Care

14.1. Daily Maintenance

- After each use, clean the working table and remove all material debris and dust.
- Wipe the exterior of the machine using a clean, soft cloth to avoid corrosion caused by chemicals.
- Clean the X/Y axis guide rails and bearings daily. Wipe the contact surfaces with a dry cloth, then apply special lubricating oil using a clean cloth.
- Clean the mirrors and focusing lens using camera lens paper or medical cotton swabs dipped in alcohol. Wipe from the center outward in a spiral motion.

14.2. Monthly Maintenance

- Check all mechanical connections to ensure that screws and nuts are not loose. Tighten them if necessary.
- Inspect key components like the laser head and focusing lens. Clean or replace them if dirty or damaged.
- Ensure the transmission components (e.g., guide rails, lead screws) are well-lubricated. Add lubricating oil or grease regularly to minimize wear and maintain precision.
- Replace the water in the air conditioning tank and clean the dust cover regularly.
- Important: The quality and temperature of the circulating water directly affect the lifespan of the laser tube. Use only purified water. In winter, if the temperature drops below 0°C, replace the water with antifreeze promptly.

14.3. Quarterly Maintenance

- Clean the foam inside the air pump cover once per quarter.

15. Troubleshooting and Solutions

15.1. Connection Issues

Symptoms

(1) Communication error prompt appears

(2) Unable to read/write parameters

(3) File transmission is invalid

Solutions

(1) Check whether the USB cable is properly and securely connected

(2) Ensure the USB port is connected to the PC

(3) Confirm that the USB driver is correctly installed. Reinstall the driver if necessary

(4) Try reconnecting to a different, functioning USB port on the PC

(5) Turn off the machine for at least one minute, then power it on again

(6) Restart the PC and ensure both the device and PC are properly grounded

(7) If the issue persists, try using a different computer

For Ethernet connection:

When connecting via network cable, please disable the firewall and set the IP address correctly.

Do **not** set the last digit of the IP address to the same value as the controller (default IP: 192.168.1.168). After setting, click **OK** and ensure the firewall remains **disabled**.

15.2. Camera Connection Issues

Symptoms

(1) Camera image does not update after processing

(2) Camera cannot be opened, green LED remains off

Solutions

(1) Check the connection between the camera and USB cable for looseness. Ensure the USB cable and PC port have solid contact. Also check whether the USB cable is damaged. For older PCs, ensure the USB port provides sufficient power. If not, replace the computer

(2) Check for a faulty camera or damaged cable. Replace if needed. Verify that the USB port on the computer functions correctly

15.3. Laser Emission Issues

Symptoms

(1) No laser emitted during pulse test

(2) No laser output during processing

(3) Inability to control laser beam size

Solutions

(1) Check if the pulse test power has been set.

(2) Ensure the processing power has been properly configured.

(3) Inspect electrical wiring and confirm whether the control board is sending output signals.

15.4. Machine Not Moving

Symptoms

(1) Machine does not move when using arrow keys

(2) Machine fails to auto-home after startup

(3) Homing error

(4) Movement is restricted to one direction only

(5) After startup, homing completes, but the control panel displays "System is starting..."

Solutions

(1) Check whether the control board is sending pulse signals. Inspect wiring and driver connections. Test if the keys, buttons are functioning.

(2) Verify the homing switch and whether the control board's relevant I/O port is outputting pulses.

(3) Inspect if the homing switch is damaged or misaligned.

(4) Confirm the control board’s directional signal output and check driver connections.

(5) Check if the network cable from the panel to the Display port on the control board is properly connected.

15.5. Cutting Quality Issues

Symptoms

Edges appear with burrs, deformation, slag buildup, or have a rough finish

Solutions

Adjust the focal distance based on the material’s thickness and type

Regularly clean and replace nozzles and lenses

Set appropriate laser power, speed, and air pressure for each material type

15.6. Laser Power Issues

Symptoms

Edges are overly melted or cuts are incomplete

Solutions

(1) Perform regular laser maintenance and calibration

(2) Replace worn-out components

(3) Ensure the cooling system is working properly; use clean water and maintain correct

temperature

(4) Regularly calibrate the optical path

(5) Use a voltage stabilizer for consistent power supply

(6) Test and replace faulty power supply components

(7) Inspect and maintain the power control system

15.7. Abnormal Mechanical Movement

Symptoms

Cutting path deviates or motors make unusual noises

Solutions:

(1) Clean the guide rails and apply specialized lubricant to ensure smooth motion

(2) Check motor condition; if there's abnormal noise or overheating, repair or replace the motor

(3) Adjust the tension of timing belts to maintain proper tightness