AutoLaser User Manual

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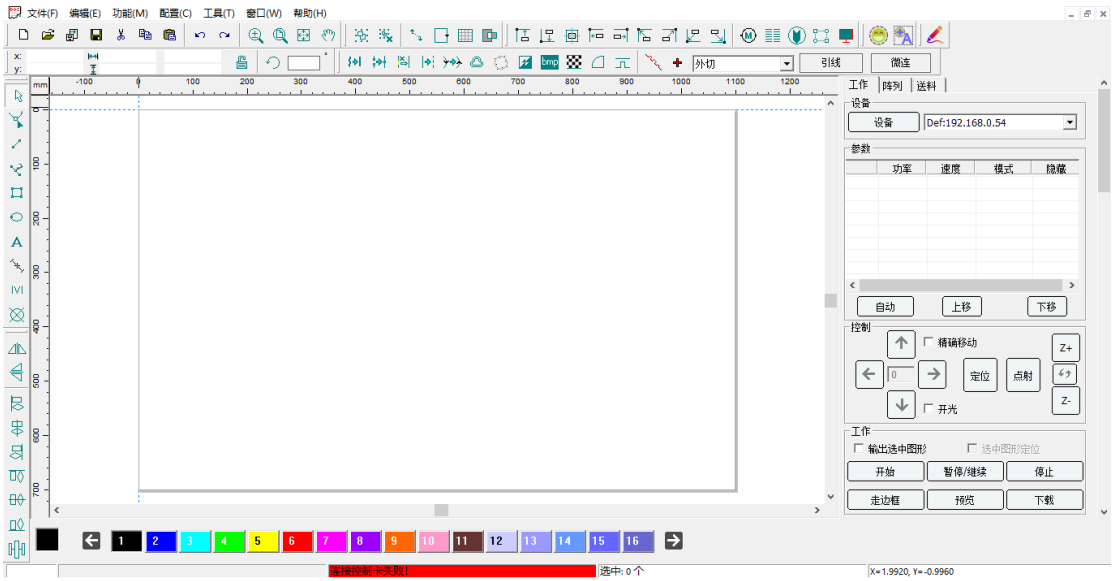
Part 1 AutoLaser software

Installation requirements: All of the following software is installed in 32 bits Windows 10 system, while 64 bits system is also supported by our software. Installation method of 64 bits system is the same as that of 32 bits system. When using CorelDRAW and AutoCAD software,please use officially full edition to avoid any failure of plug-in installation due to software edition or any other reasons.

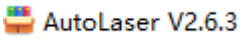
1.1 Software interface



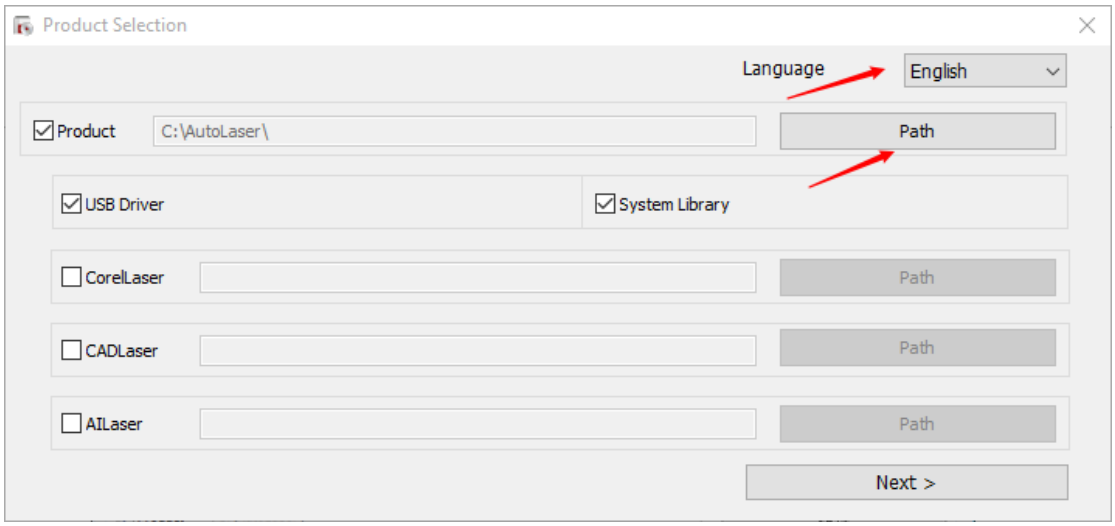
1.2 Installation

1.2.1 AutoLaser installation

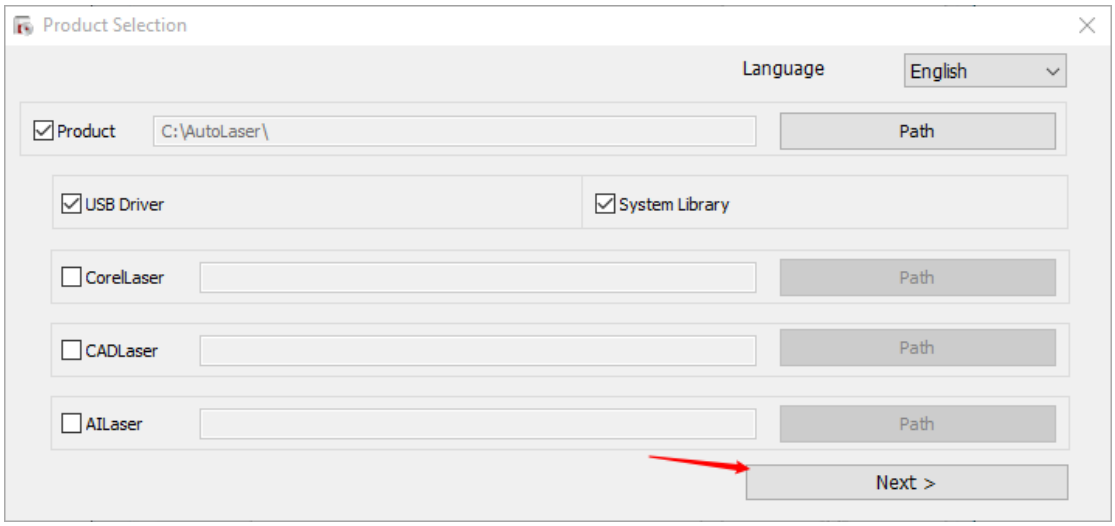
1) Double-click the installation package Autolaser VX.X.X to unzip and install. VX.X.X means the version number, such as V2.6.3



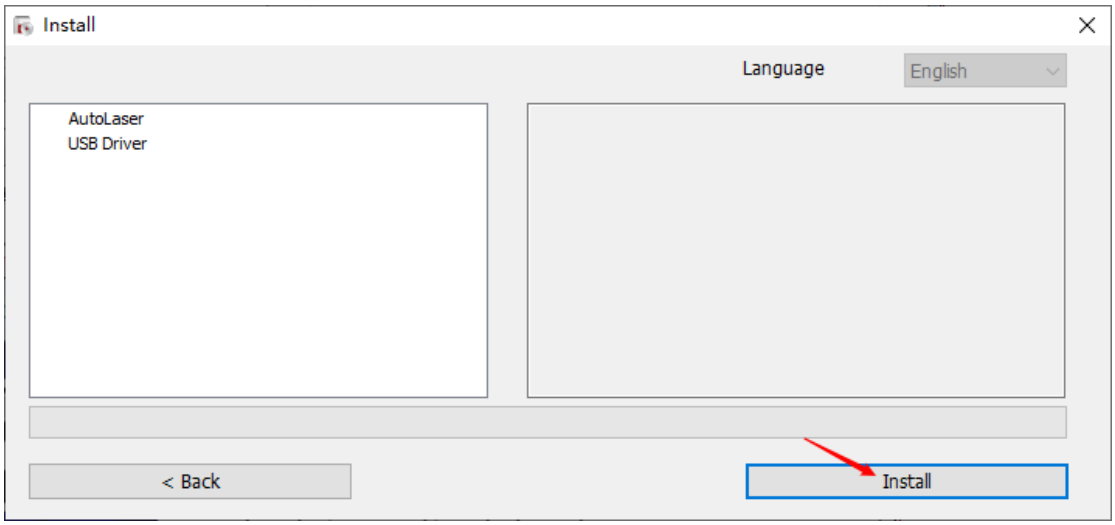
2) Files are decompressed automatically and started to be installed. Then select a language and the software will choose a default language such as Simplified Chinese, Chinese Traditional characters or English version according to the language of operation system.
3) Product installation path is installed by default in Disk C. If you want to install it into other disks, please click [Path] option in the option for the product catalogs, select the drive you want to install and then click confirm.



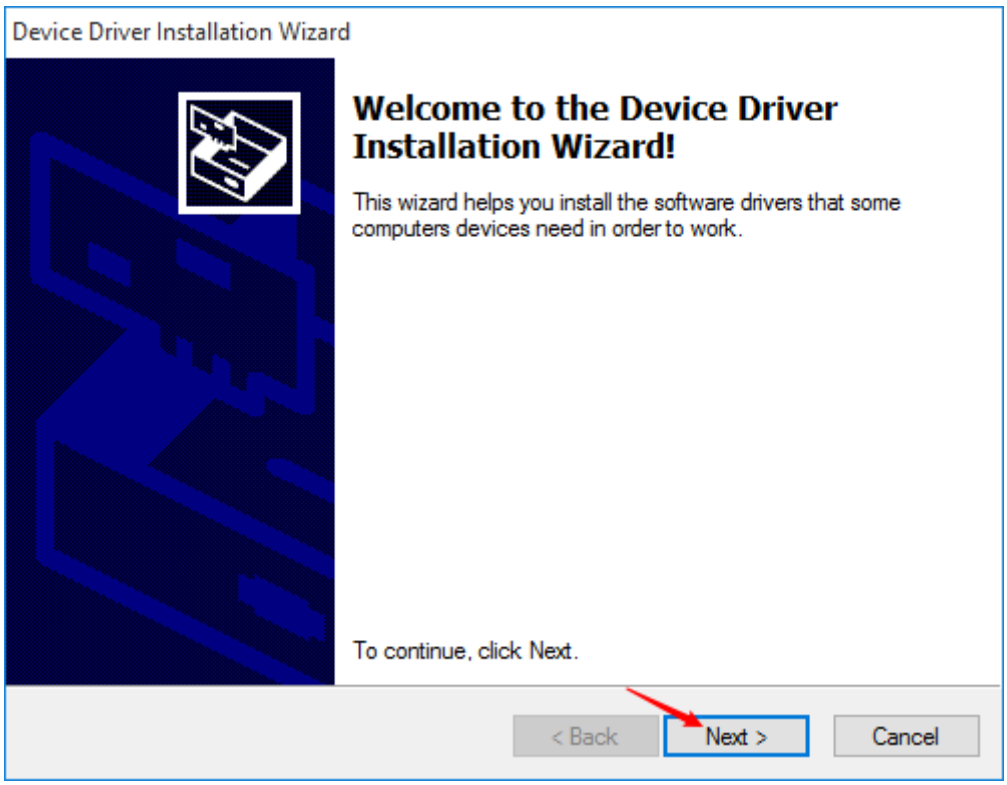
4) For the first time to install our software, it is checked by default which program is the user must install, Laser software, USB Driver and System Library.



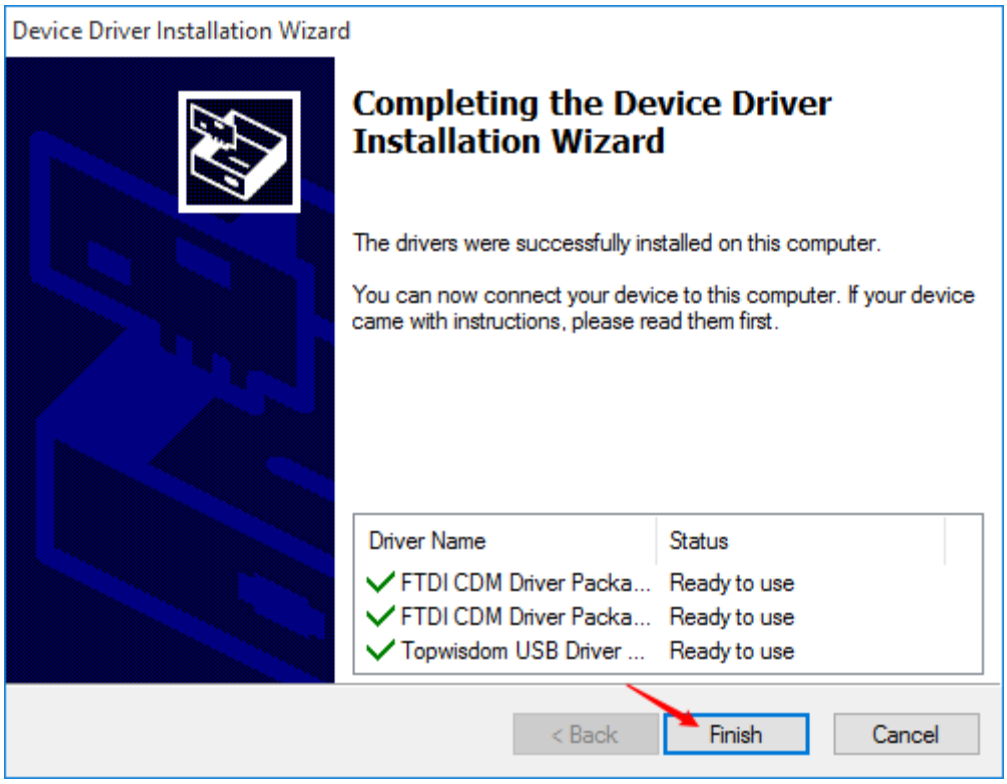
5) Click [Next] to continue.
6) Click [Install] to execute installation of Laser and USB driver.
7) Independent software supports software such as CorelDRAW, CAD, AI among others, if these products are required to be used with the Laser software, please click appropriate importing plugs-in to install.



Installing USB Drive…

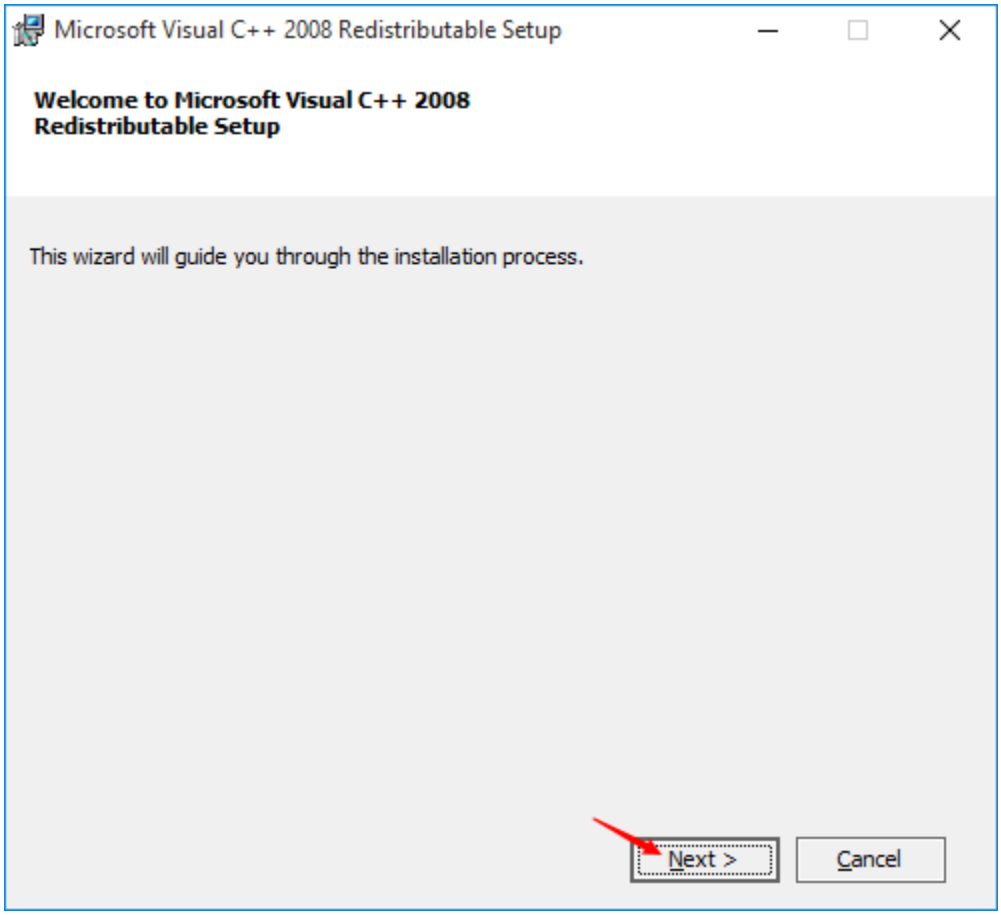


8) Click [Next].

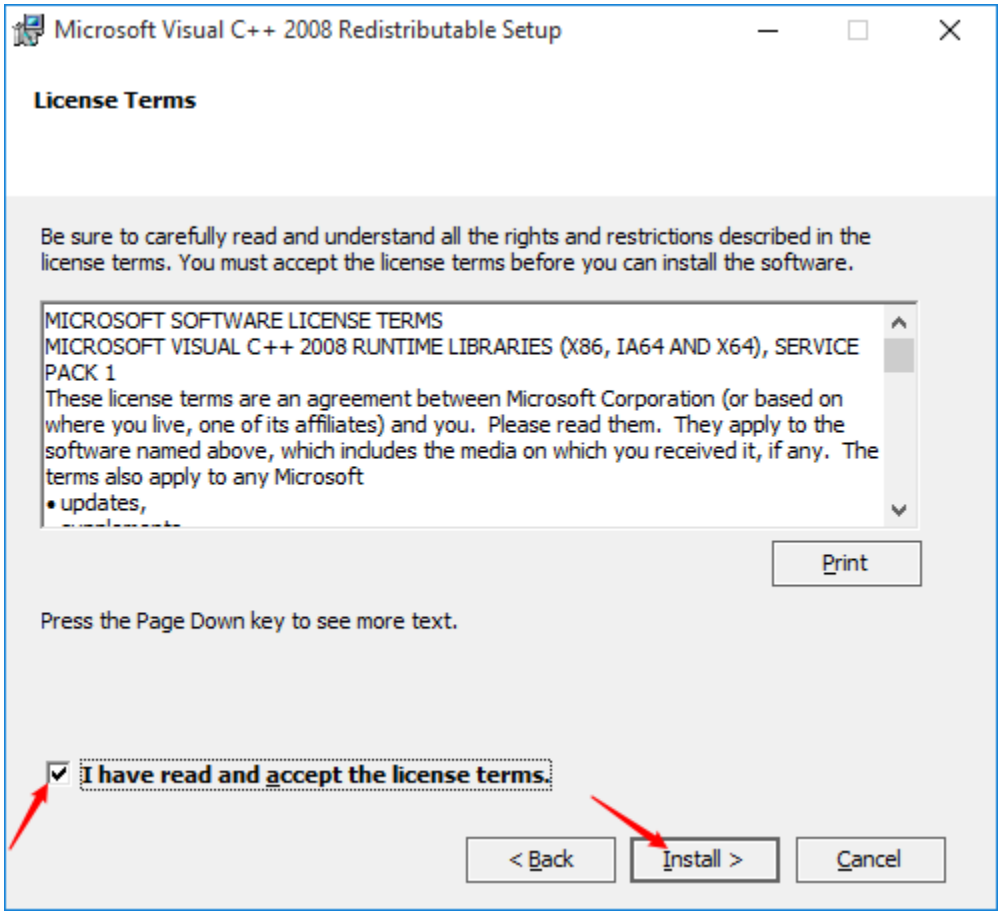


9) Click [Finish] and USB driver installation is completed.

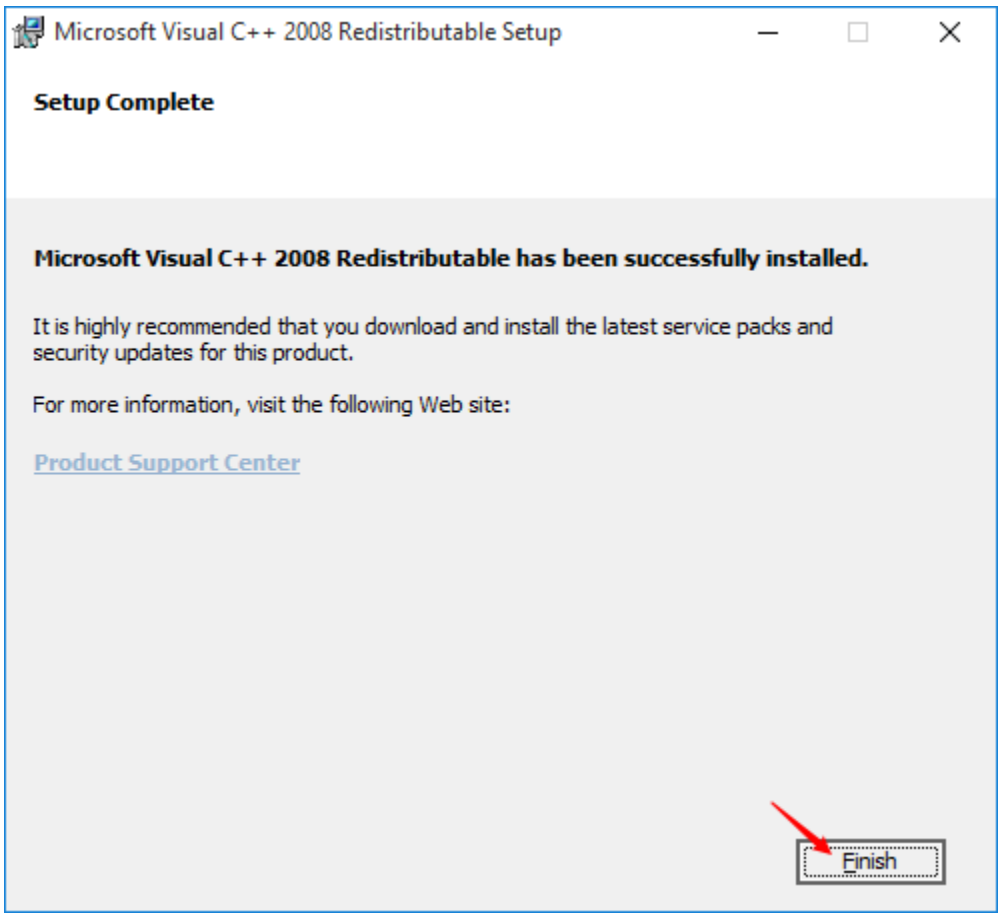
10) Now it is displayed a dialog for system library installation.



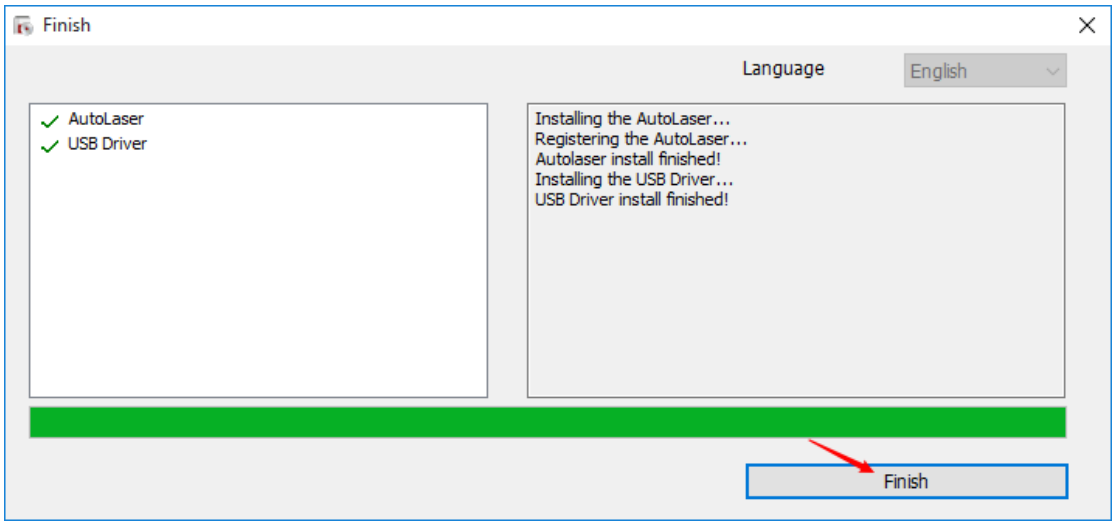
11) Click [Next] to continue.



12) Check the “I have read and accept the license terms” button and click [Install] to continue.
13) Click [Finish] button for completing installation of system library for laser software.



14) Click [Finish] button for installing completion.

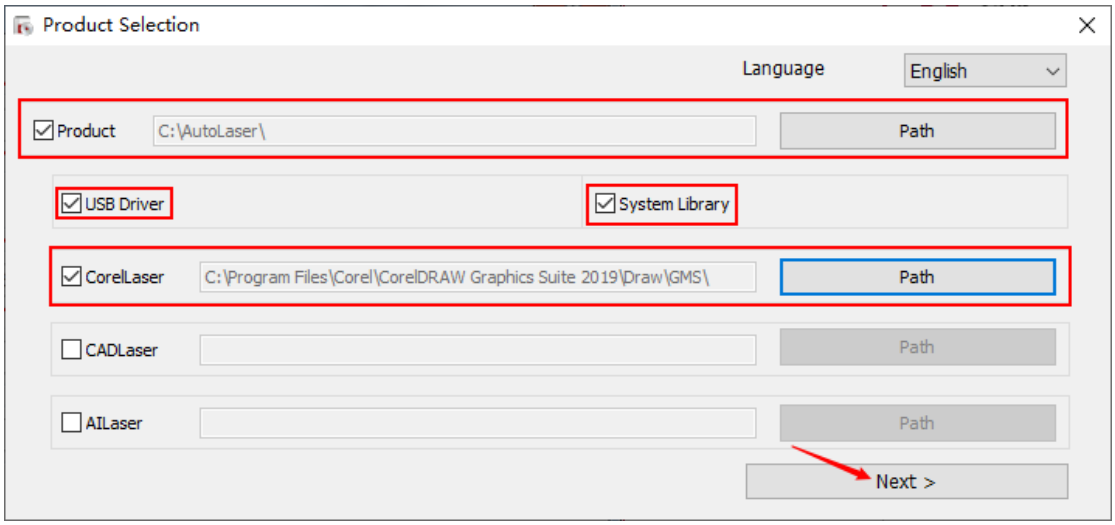


1.2.2 CorelDRAW importing menu installation

Note: Our present CorelDRAW importing menu supports versions of CorelDRAW 12 to CorelDRAW2020 of 32 bits and 64bits.

Take the CorelDRAW X7 as an example.

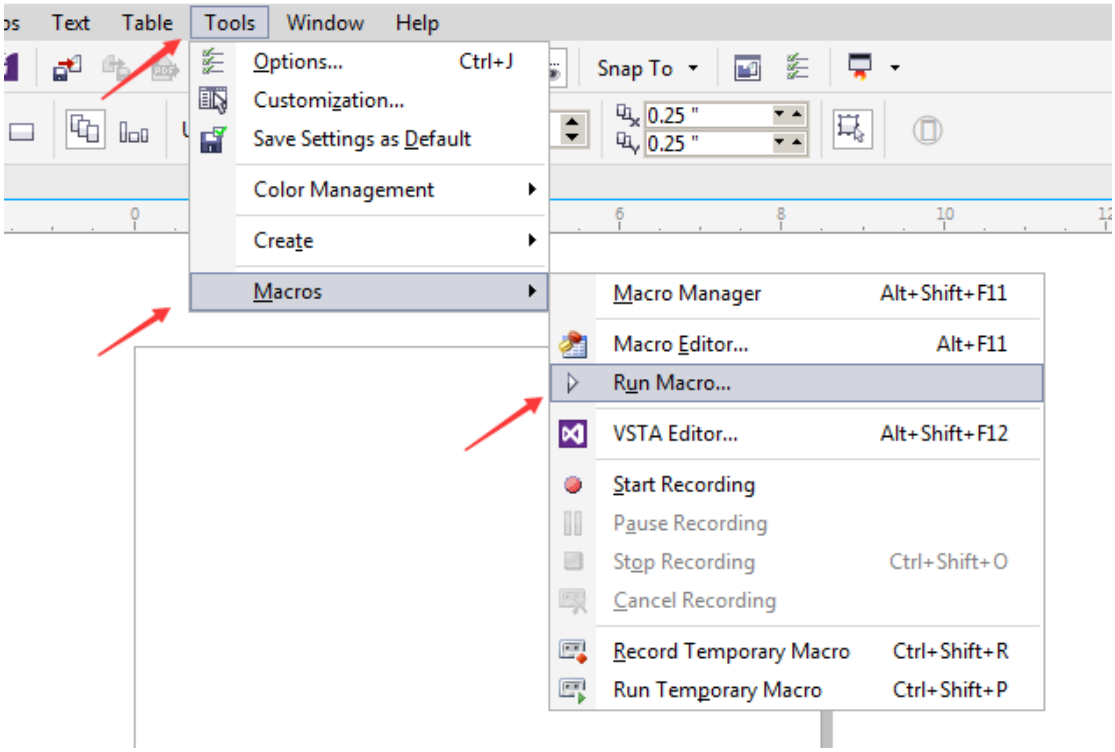
Installation method for CorelDRAW importing menu is the same as that of AutoLaser for the first time, users only need to



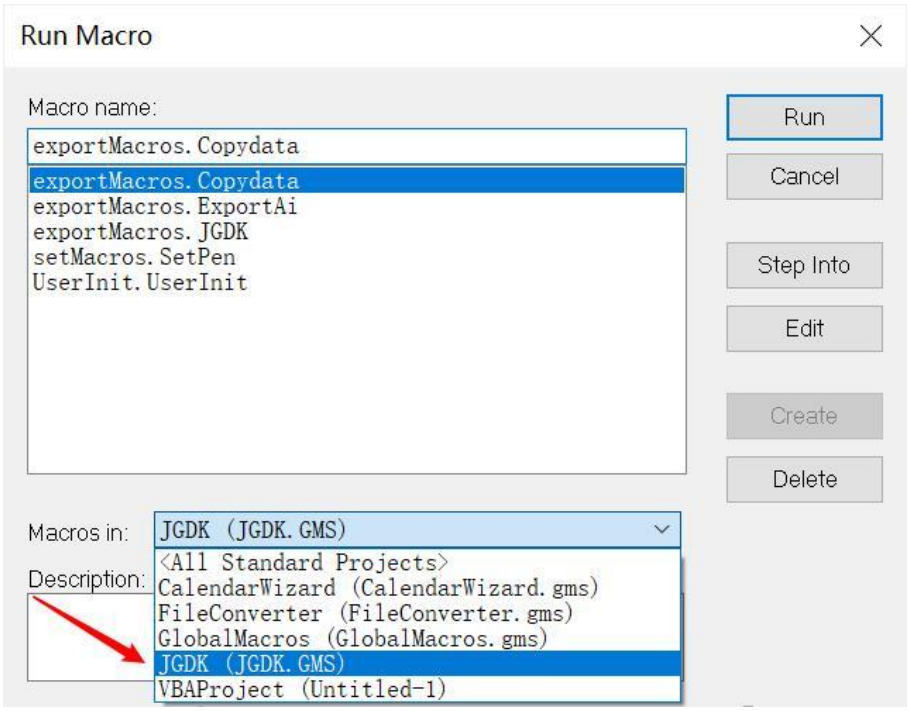
1) Click [Product].
2) Click [USB Driver].
3) Click [Corel Laser].
4) Click [Next] → [Install] → [Finish].

If CorelDRAW main menu won't display menu button after installation, the following procedures should be followed:

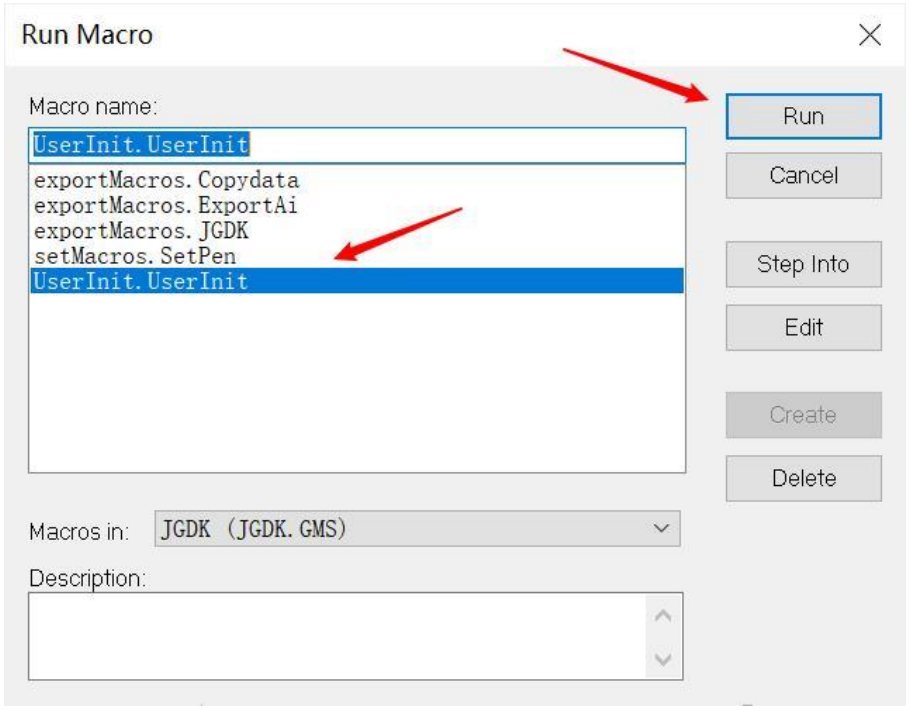
1) Start CorelDRAW.
2) Click menu list: [Tools] → [Macros] → [Run Macro…] and "Run Macro" dialogue would pop up.



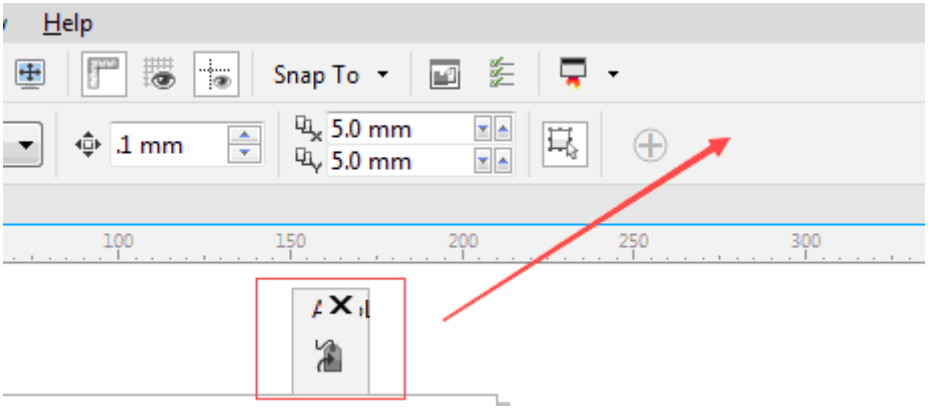
3) Select "JGDK(JGDK.GMS)" in the drop-down list of "Run Macro" dialogue box.



4) Choose “UserInit.UserInit” in macro name list box and click [Run].



5) The following icon button indicates that installation is successfully launched. Then drag and put the icon on the menu bar.

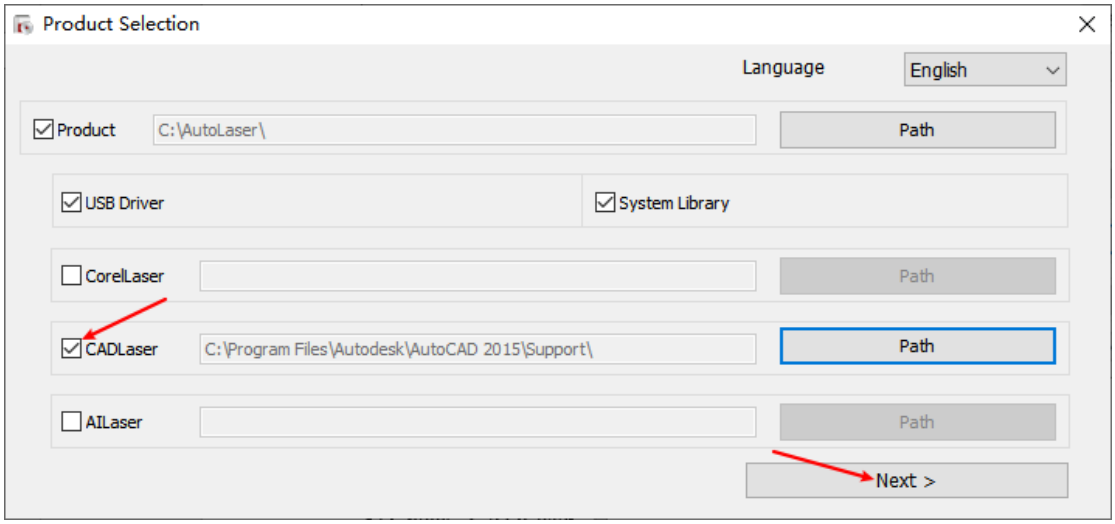


1.2.3 Installation AutoCAD Import Menu

Note: At present, our CAD import menu supports 32-bit and 64-bit versions from CAD2004 to CAD2015!

a) First Installation (Take AutoCAD2013 as an example below)

The method is similar to that of "installing AutoLaser for the first time".



1) Check "Product".

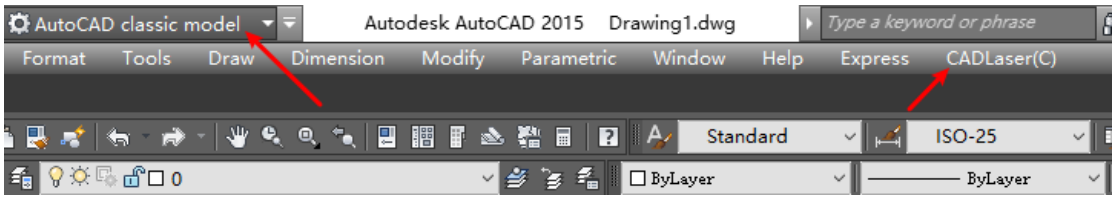
2) Check "USB Driver".

3) Check "CADLaser".

4) Click "Next", "Install" and "Finish".

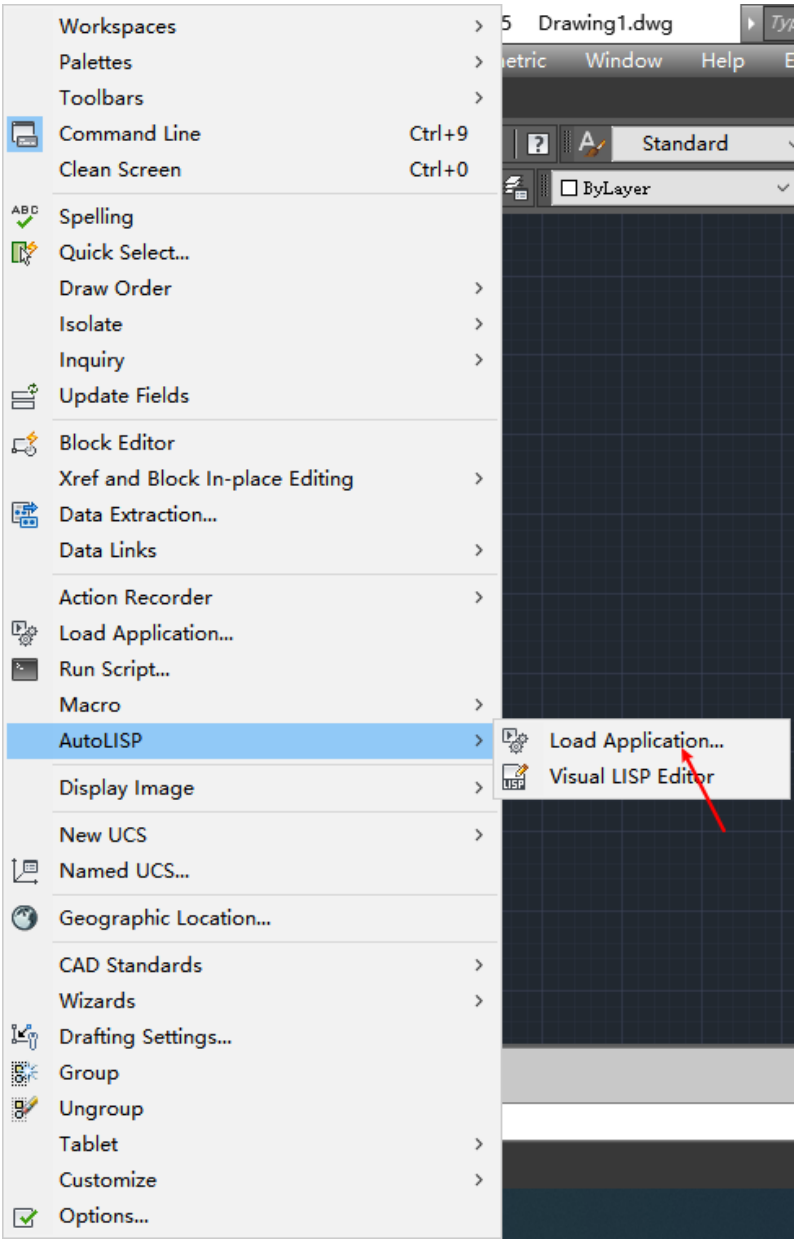
Note: If you need to specify the path manually, select to the AutoCAD 2013 directory.

After the installation is completed, open AutoCAD, switch to the classic mode of AutoCAD, and "CADLaser (C)" appears behind the menu bar, which means the installation is successful! As shown in the following figure:

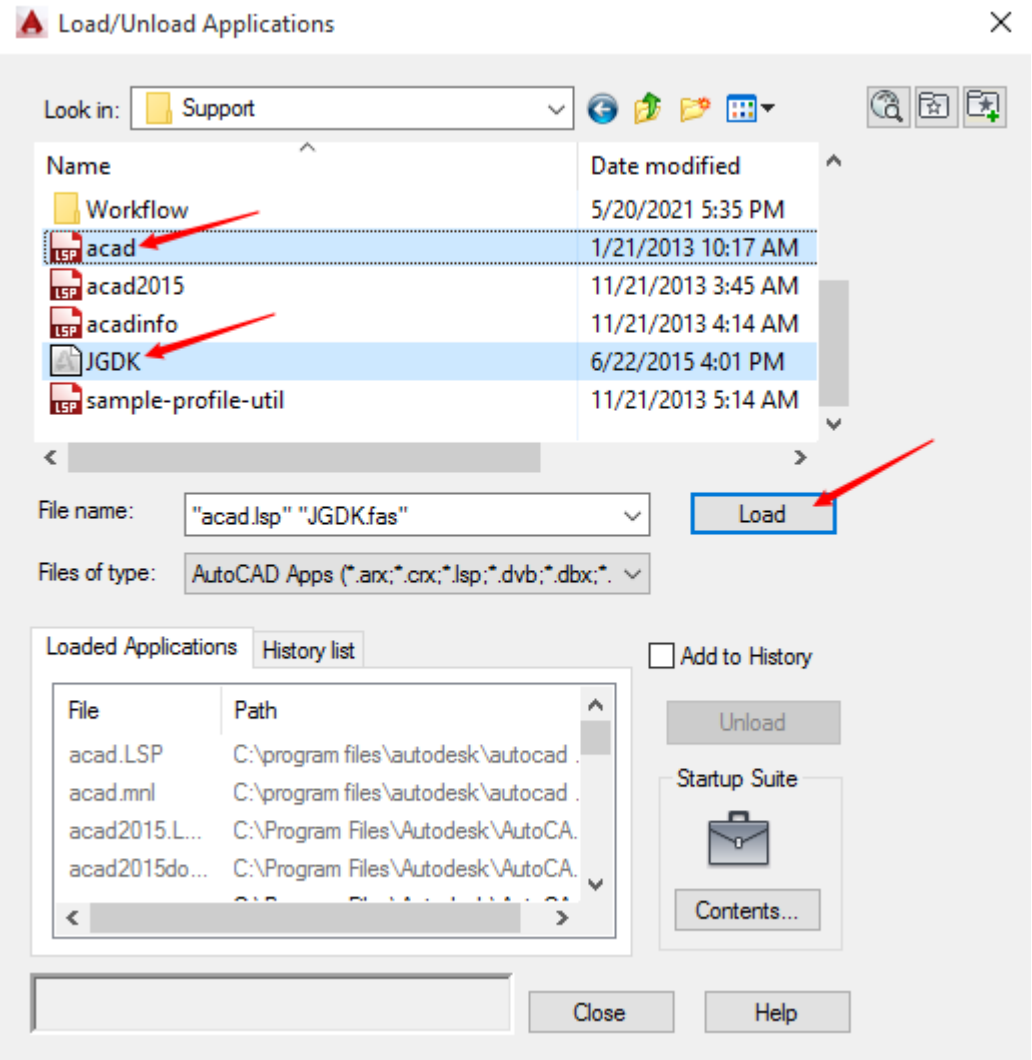


If you need to import graphics into the laser software many times, you need to turn off the laser software before you can continue importing.

5) If "CADLaser (C)" is not displayed, you need to go to Autolisp (i) in the tool to load the application. As shown in the figure:



6) In the pop-up window, select "JGDK.fas and acad.lsp and load.

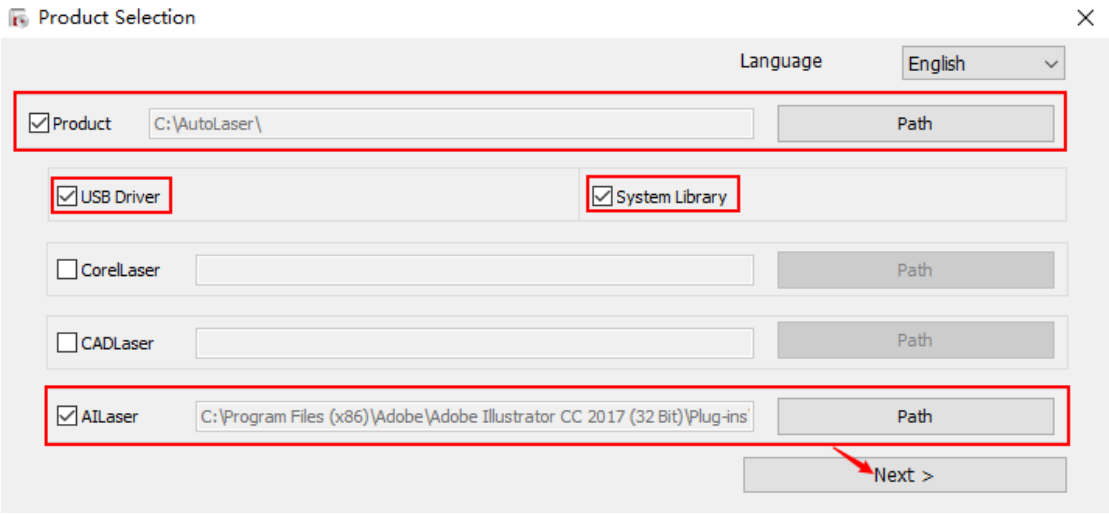


1.2.4 Illustrator importing menu installation

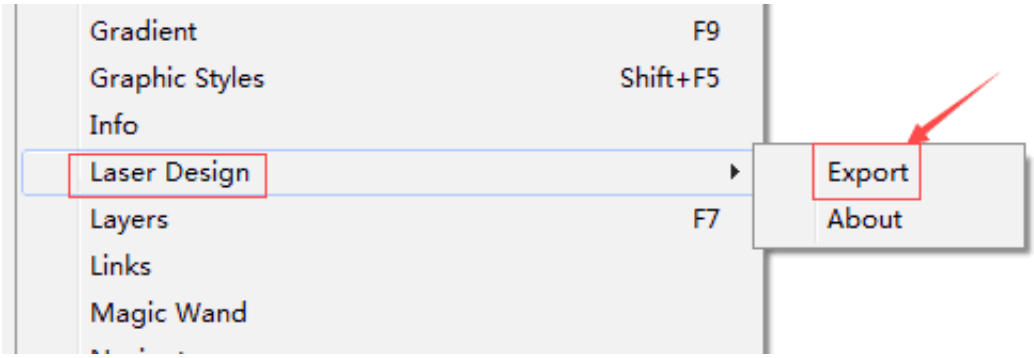
Note: At present our Illustrator importing menu supports versions from AI CS2 to AI 2017 of 32 bits and 64 bits! The CC version of AI includes 32-bit and 64-bit version, although only 32-bit version was provided before, our software actually supports both versions.

Take AI CS5 as an example.

The installation method of this importing menu is the same as that of Laser for the first time. Users only need to do the following steps:



1) Click [Product].
2) Click [USB Driver].
3) Click [Al Laser].
4) Click [Next] → [Install] → [Finish].
5) Open AI and select "Laser Design → Export", it would appear in the menu bar box. Such words indicate that installation is successfully completed as shown in the following figure.

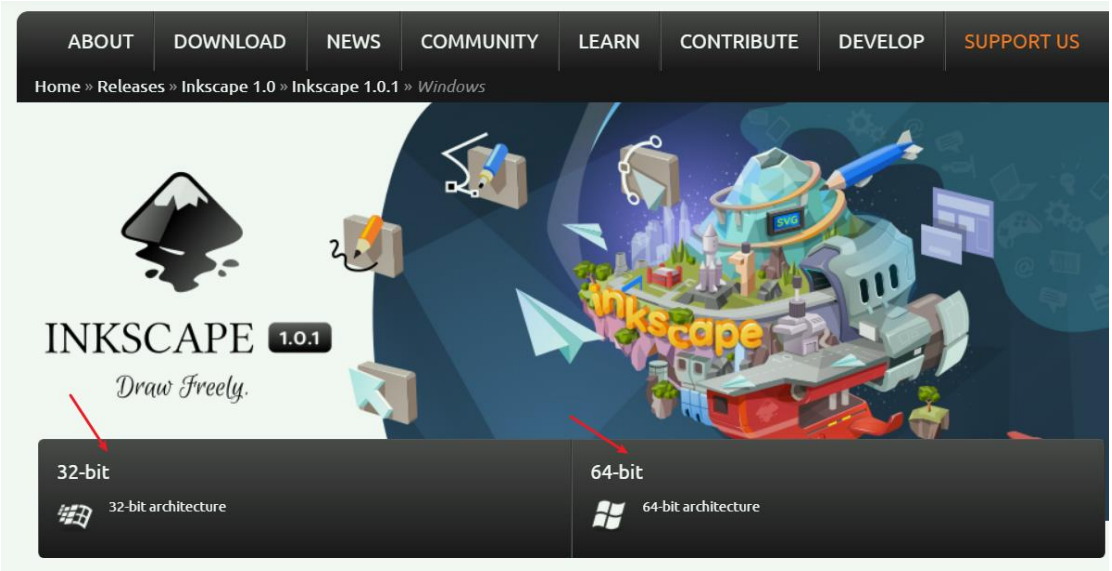


Note: If it is the second time for all importing menu of the above-mentioned software to be installed, there is no need to click [Product] or [USB Driver] and [System Library].

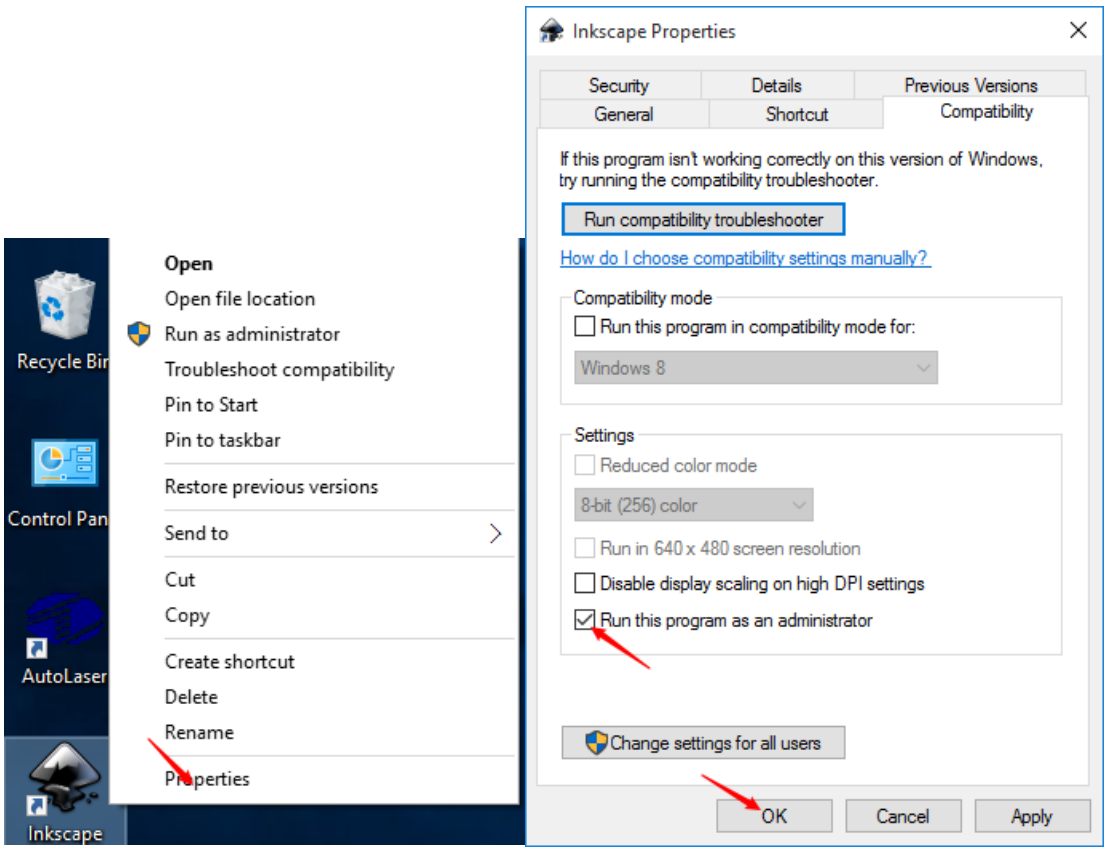
1.2.5 Inkscape importing menu

Note: Inkscape version needs to be 1.0 or above, and the operating system is Windows.

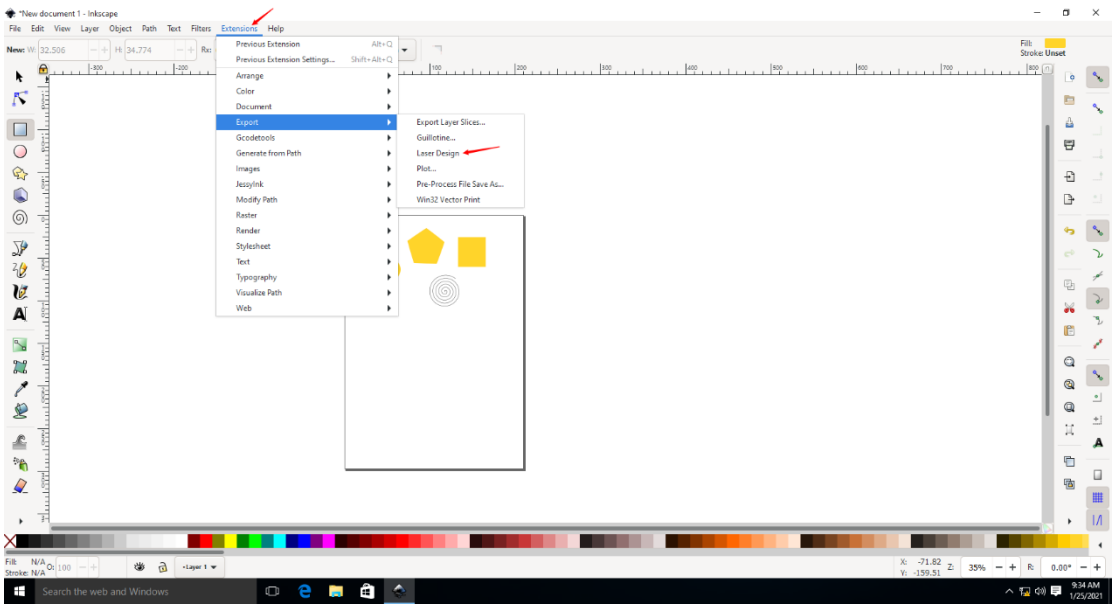
1. First download the installation package on the Inkscape official website.



2. Double-click installer to install AutoLaser(V2.5.5 or above), the installer will automatically install the plug-in to Inkscape extensions.
3. On the desktop, select the Inkscape icon, right-click, properties, select compatibility, check Run the program as administrator, and click OK.



4. Open Inkscape, draw graphics, select Extensions/Export/Laser Design in the menu, and export all graphics on the page to AutoLaser.

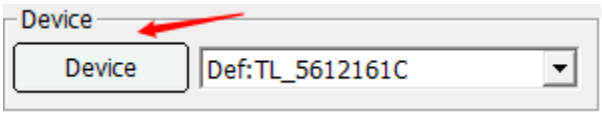


5. If you need to import graphics again, please close AutoLaser first.

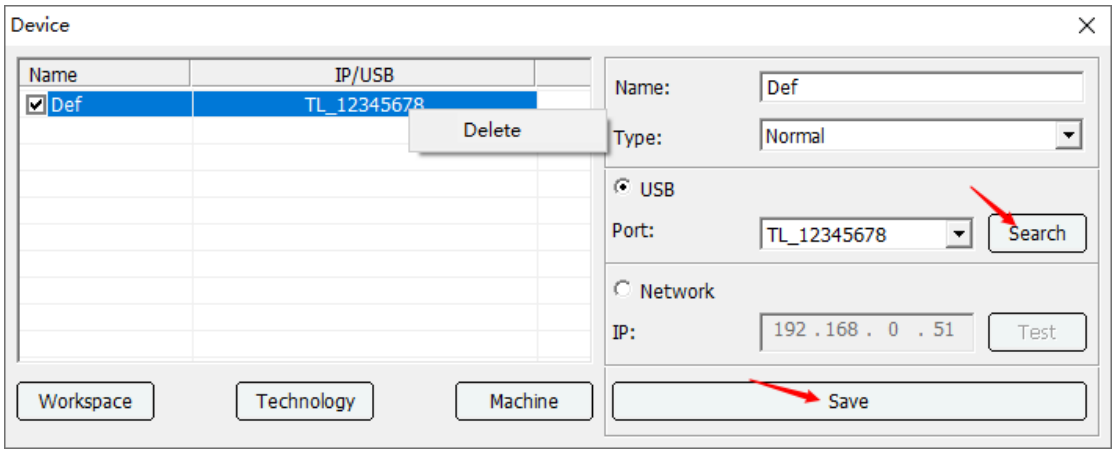
1.3 System settings

1.3.1 Device management

Open Laser software as shown in the following fig., and then click the [Device] button on the working area of the right side. Or click the "Device" button in the tool bar.



The setting related to machine includes machine workspace, technological parameters and machine parameters.



Name: Different devices may have the same IP address, so devices are named for the convenience of identification. Each name is sole in one copy of device management table.

Type: If the control card system version is V.L010 version, it will be changed to camera.

USB: Select usb communication, after connecting the control card with a USB cable, click search button to enumerate the device ports, click the drop-down box to select the port to be connected, and save. TL-403/TL-404/TL-410 display COM, TL-A1/A3/A4/B1/B2 display the USB port number, such as: TL_00000000.

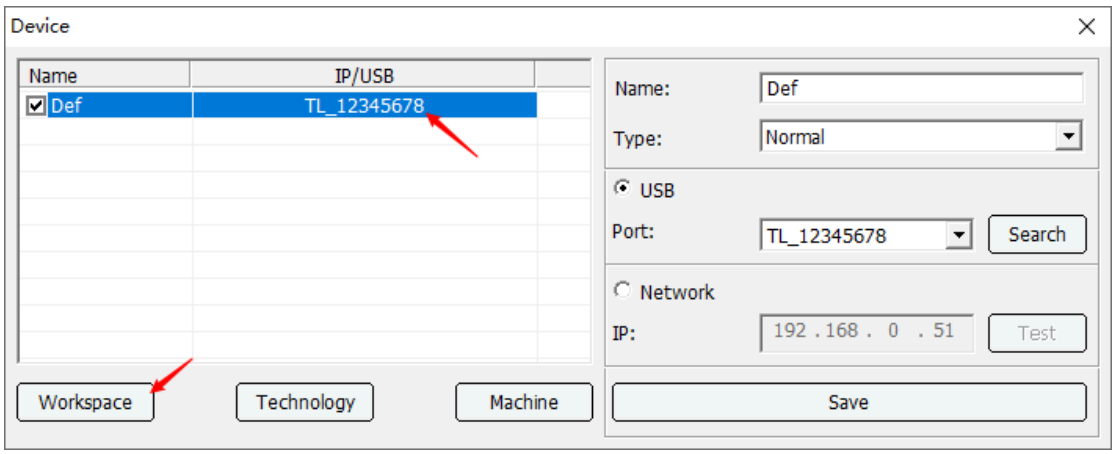
Network: IP address must agree with that shown on the device, otherwise laser software can't be connected to the device (refer to IP settings). Click Test button to test.

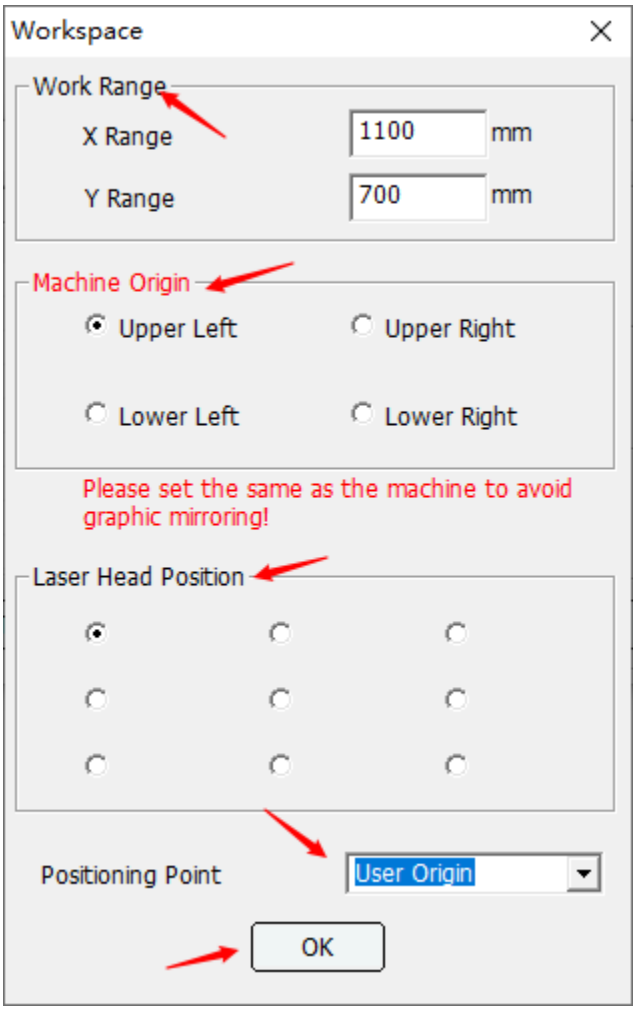
Save: Click records in the selection list and the selected record information will appear in the right side edit box. The [Name] from the list is the only mark for identification. If device name is the same as some record in the list, click [Save] button to modify the records in the list. If the device name does not exist in the list, click [Save] button to add a new record.

Delete: Device management table is a roster of all devices. If a device is no longer used, select it in the form and right click to open the menu, and then click [Delete] to delete. If a new machine is purchased, users can edit its name, IP address and device type in device information in edit column on the right side, and then click [Save] below to add it to the list.

1.3.1.1 Workspace parameters

Select the machine name whose breadth size needs to be modified, and click [Workspace] to open the workspace parameter dialogue box. As shown in the fig. below:



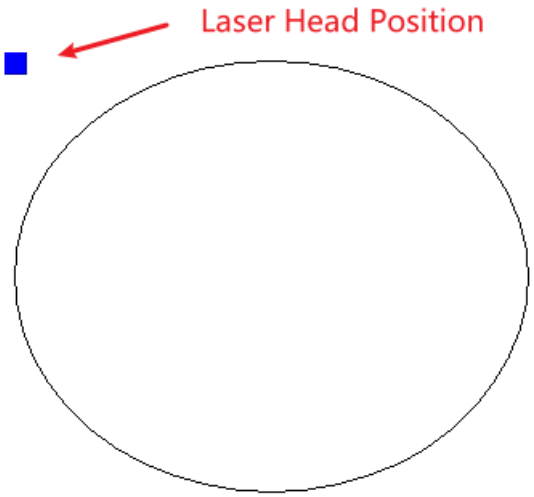


X Range: Refers to the maximum distance within which laser head can be moved in X axis direction starting from the machine reset point (namely machine original point). If the distance is bigger than the actual distance machine can be moved in X axis, laser head will crash.

Y Range: Refers to the maximum distance laser head can be moved in Y axis direction starting from the machine reset point (namely machine original point). If the distance is bigger than the actual distance machine can be moved in Y axis, laser head will crash.

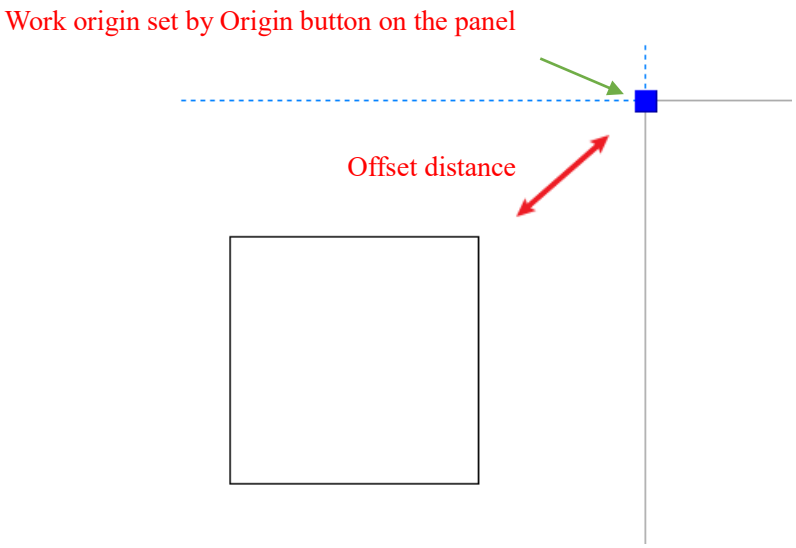
Machine Origin: Refers to the point where laser head returns after the machine is powered on or the "Reset" button of the panel is pressed. One of the points on Upper Left, Lower Left, Upper Right and Lower Right position could be set as machine reset point, and the parameters of such point should be in line with the installation of the machine.

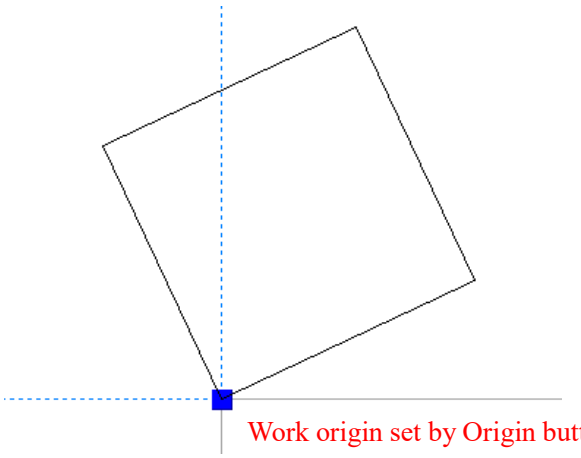
Laser Head Position: Refers to position of the graphics relative to the starting point (Pitch Dot). For example, select the left-top in the below figure, then the starting point of the cutting graphics is left-top.



Positioning Point:

- Machine Origin: Take the machine origin as the positioning point.
- User Origin: The position recorded by the positioning button (Origin Button) is the processing positioning point.
- Current Position: Take the current position of the cutting head as the positioning point.
- Absolute Coordinates: The position of the graphic on the software canvas is the processing position.
- Page Origin: Use the page zero coordinate as the origin of the laser head. (For example: a. The distance between the origin of the software and the starting point of the graphics processing is 100mm, then the file is sent to the controller for processing, no matter where the laser head is positioned, it will move 100mm in the corresponding direction before the graphics processing, and the processing returns to the page origin. b. Take any point of the graph as the starting point). As shown:





1.3.1.2 Technological parameters

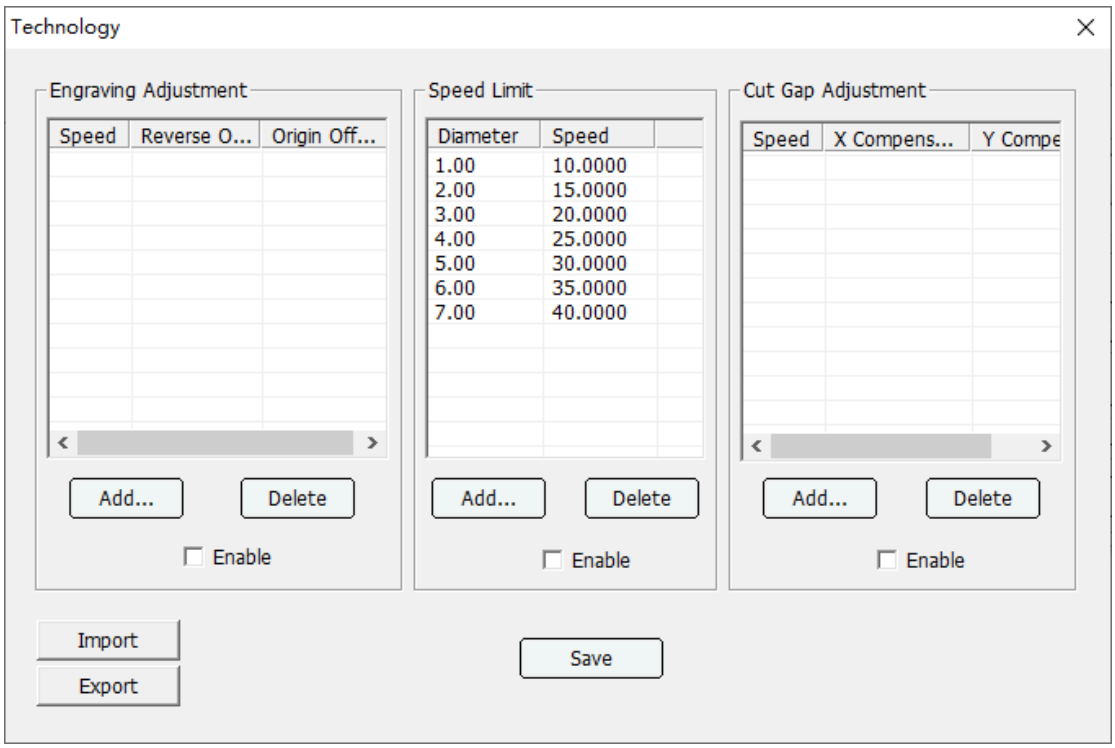
Select machine, click [Technology] and access into technological parameter settings, as shown in figure below.

Enable: The corresponding processing is launched.

Add: Add the corresponding processing parameters.

Delete: Delete the corresponding processing parameters.

Save: Save all processing parameters in the parameter list.



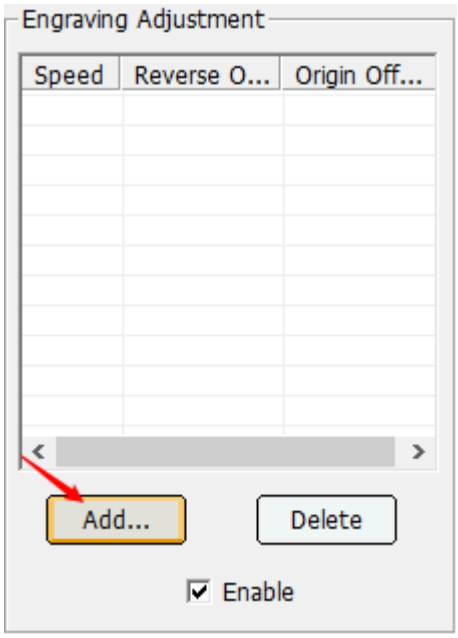
1.3.1.2.1 Engraving Adjustment

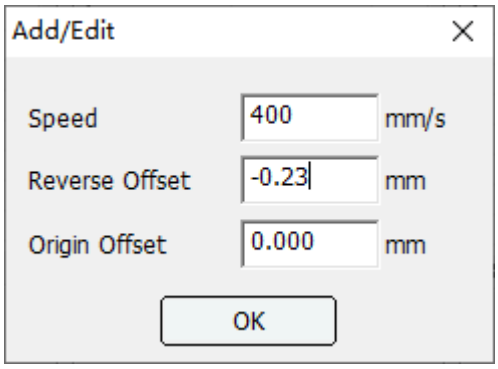
The different precision of machine would cause clearance error in the process of engraving from both horizontal sides. The clearance error in the inverse movement would cause double or vague image of carving effect. The software has carving clearance compensation function which can remove various clearances caused by model differences as shown in the table below:

Enable: Click [Enable] check box under the list and engraving compensation function is launched.

Add: Click [Add] button and parameter editing dialog box will pop up. After editing parameters, click [OK] to add a new item.

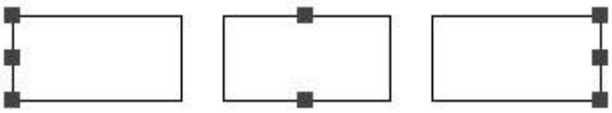
Delete: Select the record to be deleted in the list, and click [Delete] button below.



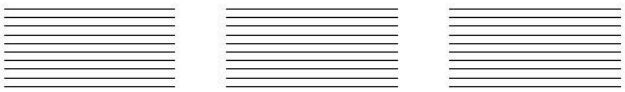


Test method:

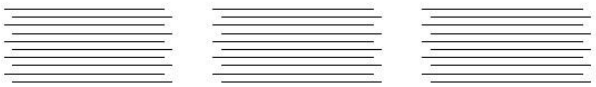
- Set the compensation value corresponding to engraving speed to 0;
- Reverse offset compensation testing process: make three 20 x 10 rectangles with interval length of 5mm. Set work for carving mode and carving precision scale to 1mm, and then output work.



- An ideal graphic is below.

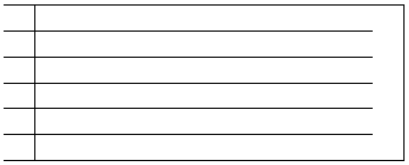


- If an ideal effect is achieved, compensation process, test or using of reverse offset parameters are not necessary.
- Possible actual carving results is below

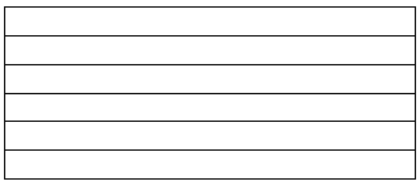


- Intermediate compensation which is used to align carving line in the middle is generally negative value and likely to be positive value depending on carving machine. And negative and positive value compensated with clearance value is also the compensation value for adjusting obverse and reverse direction. Positive and negative compensation value depends on the model of the machine. Generally speaking, the compensation value is first set to 0 so that the carving effect could be pre-viewed, and then set a big compensation value such as 3 mm is to preview sculpture effect, thus whether the compensation value is positive or negative would be known.

Origin Offset: This setting is used when engraving needs to cut the outer frame, and is used to accurately adjust the cutting position after engraving. Engraving primitives offset negative positive values to the left and negative values to the right.
Before compensation:

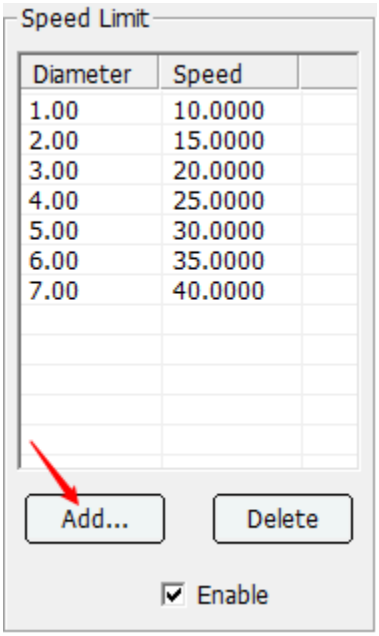


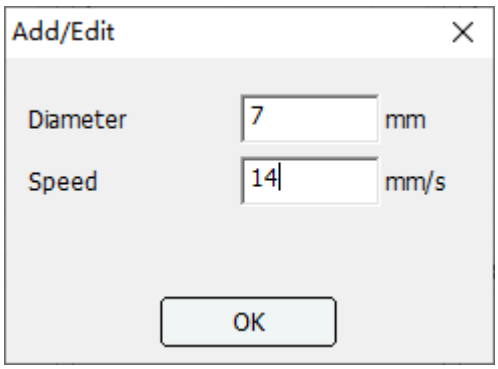
After compensation:



1.3.1.2.2 The speed limit of small graphic

The same graphic processed by different models, belts, pulleys and motor types may produce different effect even at the same speed. This is an objective factor influencing machine processing course. To solve this problem, the software provides a speed limit list targeted for different models to record the highest speed at which the machine can run in circles of different sizes (in the precondition of guaranteeing the effect), as shown in the follow fig.
Enable: The [Enable] option below the list allows users to decide whether to use speed limitation function.
Add: Click [Add] button and parameter editing dialog box would pop up. After editing parameters is completed, click [OK] to add a new item.
Delete: Select the record to be deleted in the list, and click [Delete] button below.





1.3.1.2.3 Cut Gap Adjustment

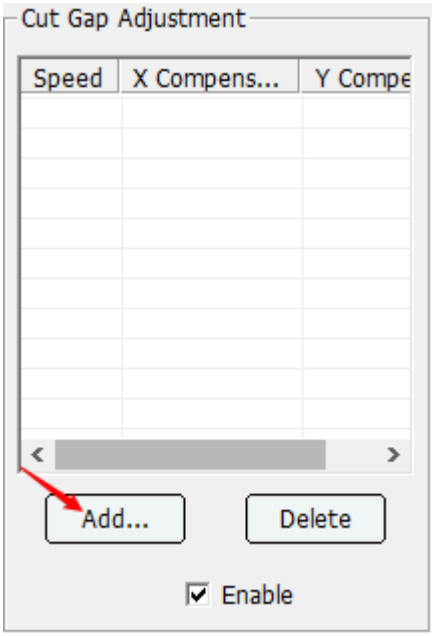
If the following processing effect appears, cutting clearance function could be launched.

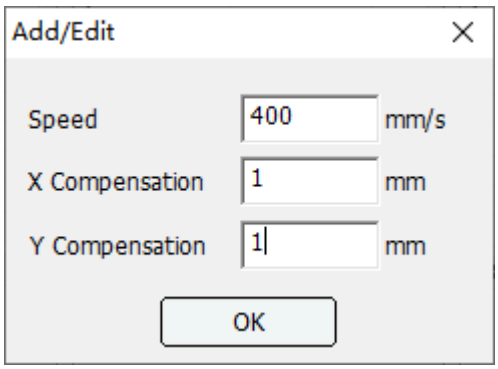
Enable: The [Enable] option of the list offer user's options for deciding whether to use function.

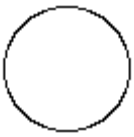
Add: Click [Add] button and parameter editing dialog box would pop up.

Delete: Select the record to be deleted in the list, and click [Delete] button below.

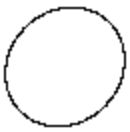
After editing parameters, click [OK] to add a new item.



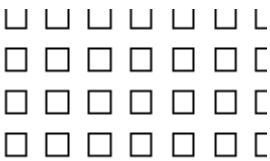




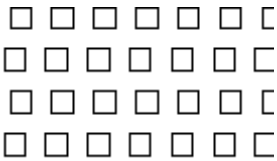
The original graphic



The processing result



The original graphic



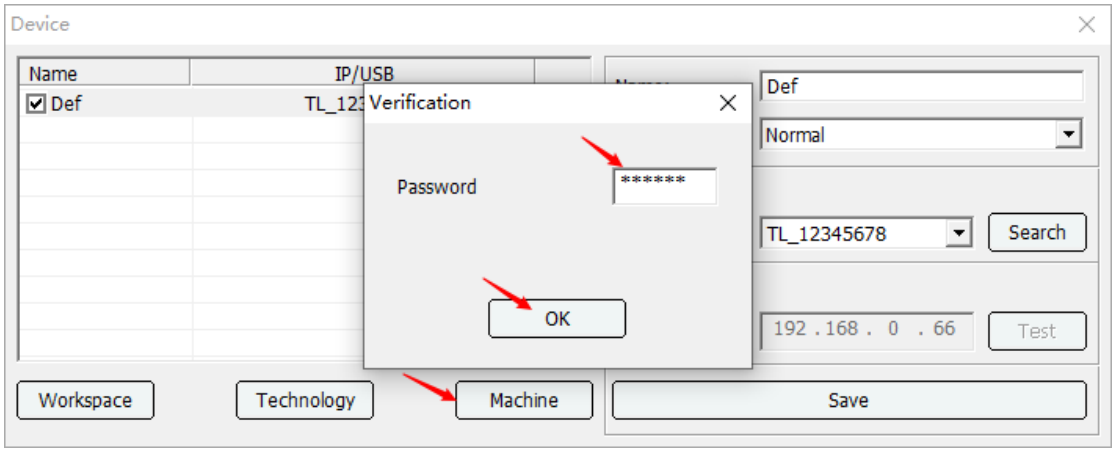
The processing result

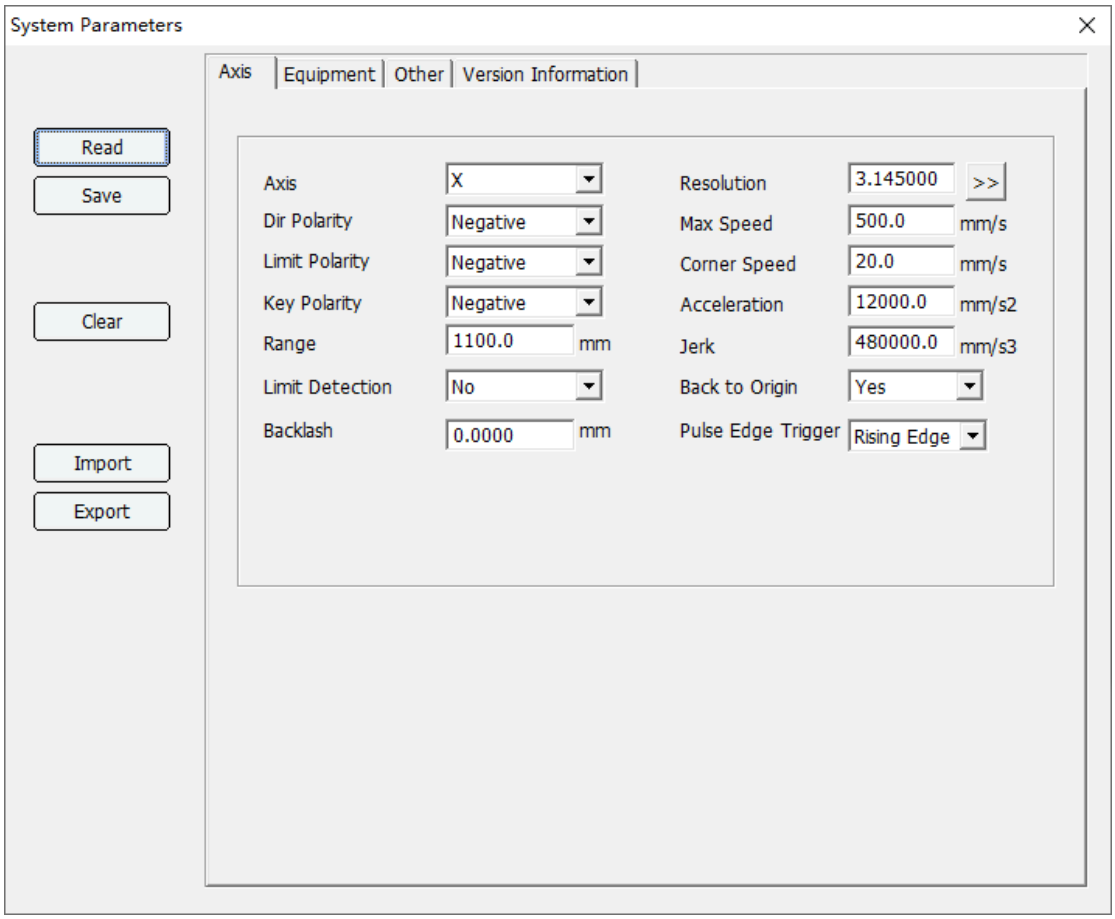
1.3.1.2.4 Import/Export parameters

When finish adding technological parameters, it is able to save the parameters file by [Export] button. And when reinstalls the system, it is able to load the previous parameters file to the laser software by [Import] button.

1.3.1.3 Machine parameters

Click the machine parameter and enter the password tz0001 to enter the parameter interface. As is shown in:





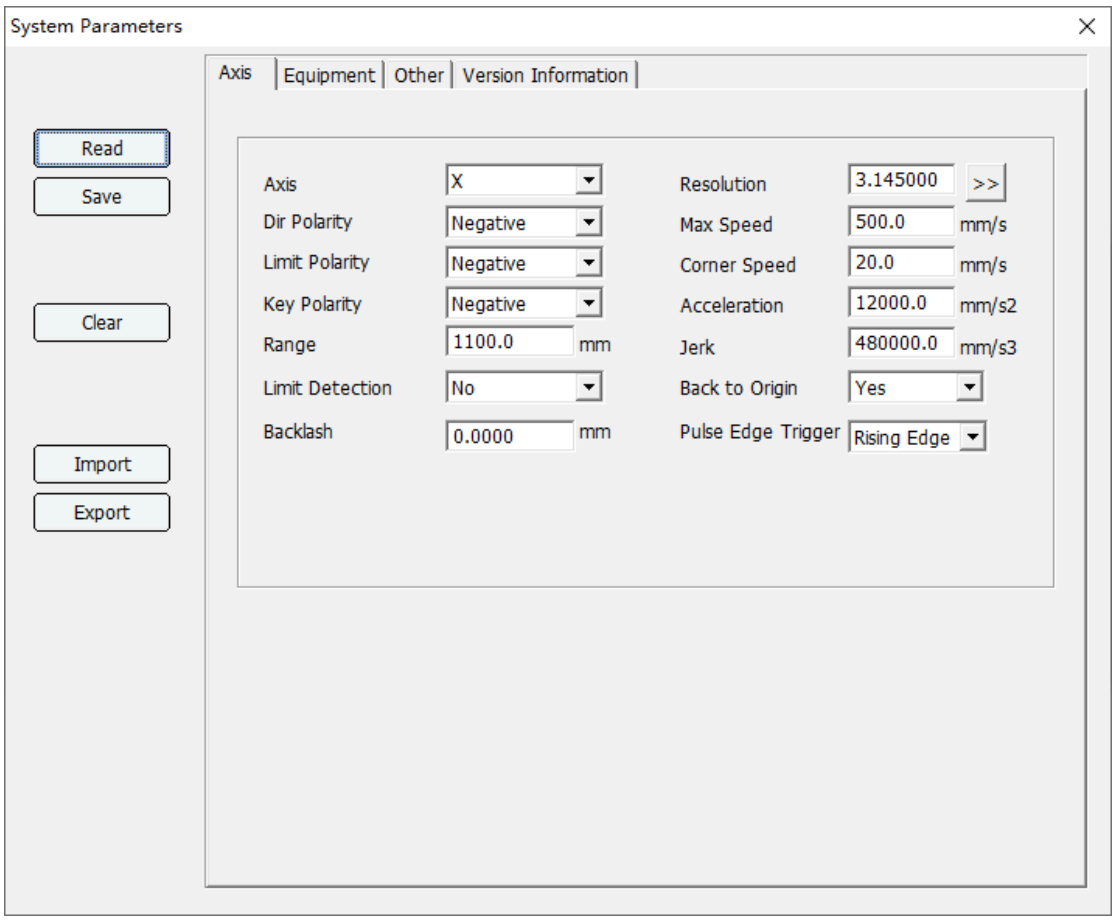
Read: Reads the parameters set by the control card， When the control card is disconnected, the read parameter timeout will be prompted, and the device parameter will be automatically read when the connection is successful.

Save: Saves the modified parameters in each list of system parameters.

Clear: Clears out all parameters in the various lists of system parameters.

Import/Export: This function is to export the control card parameters used or set by the user to the computer for saving. If you need to use the directly imported software again in the future, click "Save". You don't have to reset again.

1.3.1.3.1 Axis parameters



Axis: Shaft is divided into X Y Z U V W X2 Y2 Z2 V2.

Dir Polarity: Change the polarity when the axis goes back to the origin in the opposite direction.

Limit Polarity: When the limit polarity is positive, the limit signal high level is effective. When the limit polarity is negative, the limit signal is effective at low level.

Key Polarity: When the direction of the key and the direction of the axis movement do not coincide, the polarity is changed.

Range: Maximum stroke The maximum distance that can be moved by this axis.

Limit Detection: Check the limit switch to prevent shaft collision.

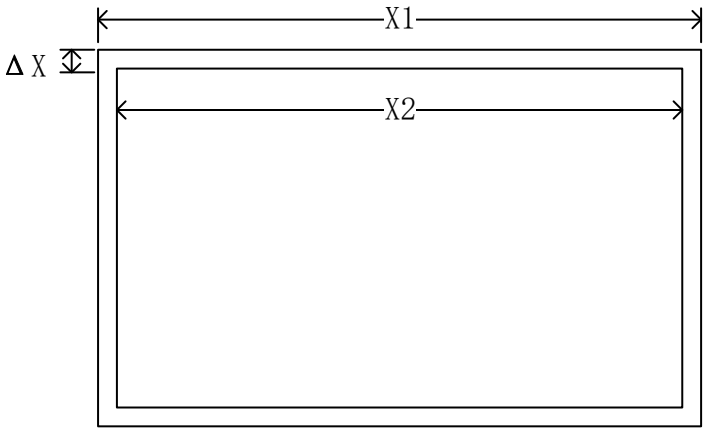
Backlash: Axial reverse motion clearance. Used to compensate for cutting misalignment.

Resolution: Resolution = the length of the laser head moving when the motor rotates one circle (mm)×1000/the number of pulses required by the driver for one rotation. Press the [>>] button here to display the theoretical length and actual length input boxes. The theoretical length is the designed length, and the actual length is the length measured with a ruler. Enter the corresponding length value into the corresponding option, and press the [OK] button, The system will automatically convert the correct resolution.

About the measurement of size:

The user can draw a rectangle, which can measure the length of the sides of the rectangle to calculate the resolution, or measure the diagonal of the rectangle to check whether the beam is perpendicular to the trolley. When measuring, the width of the laser beam should be considered, that is, the machine actually draws 2 rectangles when drawing the rectangle. The user measures the length of the 2 rectangles when measuring, and the average of the 2 lengths is taken as Actual length. The

diagonal length only needs to compare whether the diagonals of the same rectangle are equal. For example, measure the length of a rectangle, ΔX in the figure represents the width of the laser beam, measure the lengths of X1 and X2 in the figure respectively, and take the average value. The longer the length of the line, the more accurate the measurement.



Max Speed: The speed at which a shaft can run.

Comer Speed/Stop Speed: The speed at which the shaft starts and stops.

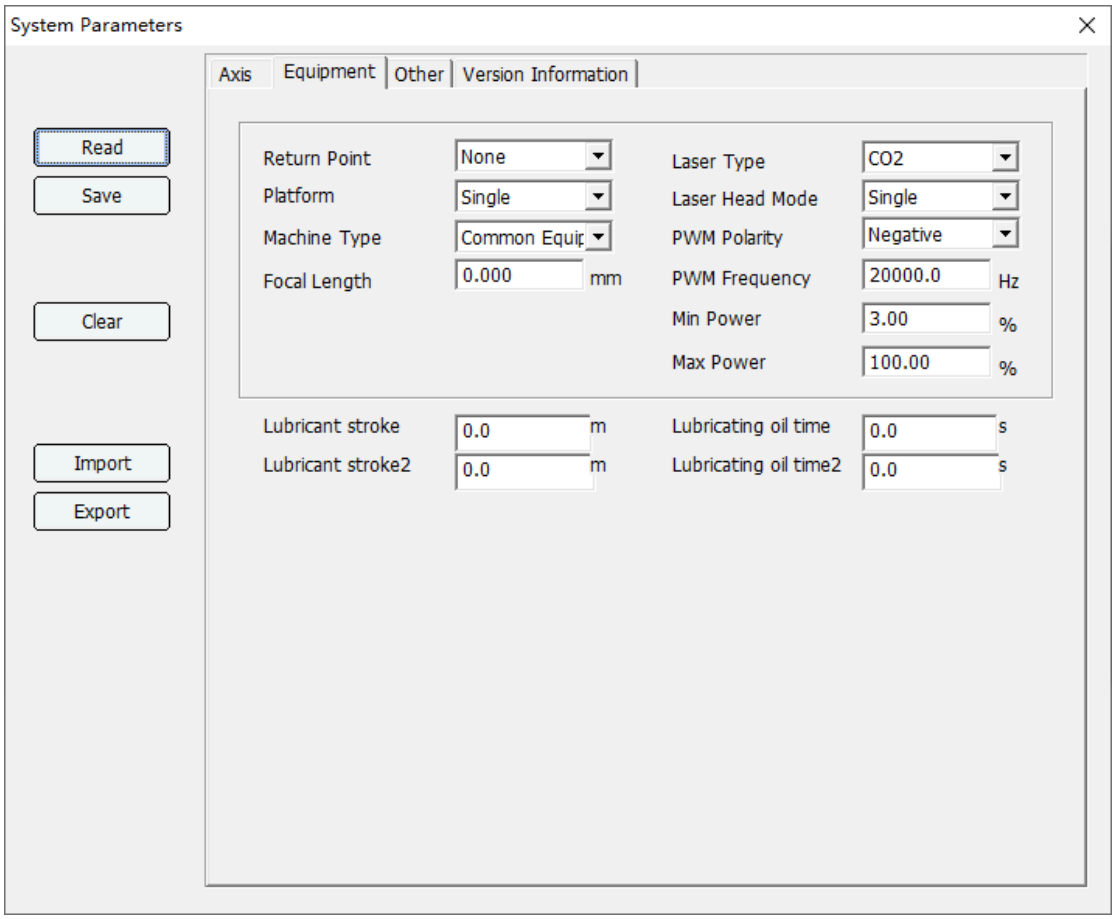
Acceleration: The maximum acceleration when the shaft runs, the greater the acceleration, the shorter the acceleration time, the greater the jitter.

Jerk: The acceleration of the axis from the minimum acceleration to the maximum acceleration (deceleration is the acceleration from the maximum acceleration to the minimum acceleration), the smaller the Jerk, the smaller the jitter, the slower the lifting speed, on the contrary, the greater the jitter, the faster the lifting speed.

Back to Origin: Whether each shaft goes back to the machine origin when the machine is electrified.

Pulse Edge Trigger: Rising edge or falling edge. According to the drive setting, it is usually triggered by the rising edge. If the reciprocating motion of the motion axis is always misaligned in one direction, change to the pulse edge triggering mode.

1.3.1.3.2 Equipment parameters



Return Point: The stop position of the laser head after the system reset and the completion of the work. There are three options: Machine Origin, User Origin and None.

- **Machine Origin** means the Origin of Machine, the XY coordinate value is 0.
- **User Origin** refers to the coordinate point selected by the user pressing the panel Origin key.
- **None** refers to the work will stop at the current position after completion.

Platform: Single, Double platform. After selecting the double platform mode, set the distance between the two platforms. The distance between the two platforms is determined by the distance between the upper left corner of the two platforms. A double-platform machine has two platforms, which move back and forth through the U-axis. One platform is kept in the working position, while the other one appears alternately on both sides of the machine. Thus, the feeding and picking action can be carried out without delaying the working time, so as to improve the working efficiency (this function should cooperate with the machine with this part). After selecting the dual-platform mode, the U-axis will move the set dual-platform distance once after each work is completed.

Machine Type: Common Equipment, Rotary Equipment (Round Object Engraving), Metal Mixed Cutting, Rotary Knife equipment, Tube Cutting, Ribbon Cutter.

Common Equipment refers to ordinary cutting and engraving models.

Rotary Equipment refers to the type of rotary engraving.

Metal mixing cutting is a model that can cut metal and non-metal cutting head with follow-up control.

The tube cutting machine is a device equipped with a rotating device for the mixed cutting machine

Rotary knife equipment is a cutting machine equipped with a spindle milling cutter.

Ribbon Cutter is a device used to cut webbing.

Focal Length: After setting this parameter, in the standby interface, press the "." decimal point button, the system prompts whether to execute auto focus, if so, the U-axis controls the laser head to move down (or the platform moves up), when the sensor detects that it is approaching the surface of the material, The signal of in-position is given, and the laser head moves up the focal distance (or the platform moves down) at this time to reach the focal position..

Laser Type: There are CO2 (CO2 glass tube), RF (radio frequency,) RF(Tickle) -radio frequency with pre-combustions. When the laser is a fry laser without pre-combustion, the RF type is selected. If it is a RF laser that requires pre-combustion, select the RF(Tickle) type (at this point, the control card in standby mode will output pulses of 1US width to the laser for pre-combustion).

Laser Head Mode: Single Head, Double 1, Double 2, Fixed Double Heads, Three Heads 1, Three Heads 2, Fix Three, Four Heads 1, Four Heads 2, Fix Four.

- **Single** means that the machine has only one laser head.
- **Double 1** means that the machine is a single belt and double motor intermixing model.
- **Double 2** means that the machine is a double belt and double motor intermixing model.
- **Fixed Double Heads** means that it a single belt, double heads cannot move automatically. The X-axis format needs to be set to one-half of the machine format
- **Three Heads 1** means that the machine is a single belt and three motor intermixing model.
- **Three Heads 2** means that the machine is a three belt and three motor intermixing model.
- **Fixed Three** means that it is a single belt, three heads cannot move automatically. Need to set the X-axis format to one-third of the machine format.
- **Four Heads 1** means that the machine is a single belt and four motor intermixing model.
- **Four Heads 2** means that the machine is a three belt and four motor intermixing model.
- **Fixed Four** means that it is a single belt, four heads cannot move automatically. Need to set the X-axis format to a quarter of the machine format.

The Double Heads Distance between the two laser heads is the distance between the origin of the two laser heads.

- Double Heads Distance1 : It is the distance between Laser 1 and Laser 2.
- Double Heads Distance2 : It is the distance between Laser 2 and Laser 3.
- Double Heads Distance3 : It is the distance between Laser 3 and Laser 4.
- Note: When the machine is an asynchronous double-headed model, Double Heads Distance1 means the distance between laser 1 and laser 3, and Double Heads Distance2 means the distance between laser 2 and laser 4.

PWM Polarity: Press "Select" to change PWM polarity. If it is found that the emphasis on light is small, the actual intensity of the light is enhanced. Then press "select" to reverse the PWM polarity.

PWM Frequency: Laser tube PWM waveform frequency, set according to the laser manual, CO2 tube is generally 20000, fry tube is generally 5000.

Min Power: Minimum duty cycle of laser PWM waveform. The minimum duty ratio is the minimum power when the laser does not emit light.

Max Power: Maximum duty ratio of laser PWM waveform. The maximum duty cycle is the maximum power specified by the laser. Setting: 0≦ minimum space occupancy: Maximum space occupancy is ≦100. If the maximum duty ratio is equal to the minimum duty ratio, then the light is powerful but not adjustable.

Platform Distance: When Plaform parameter is Double,set the Platform work size.

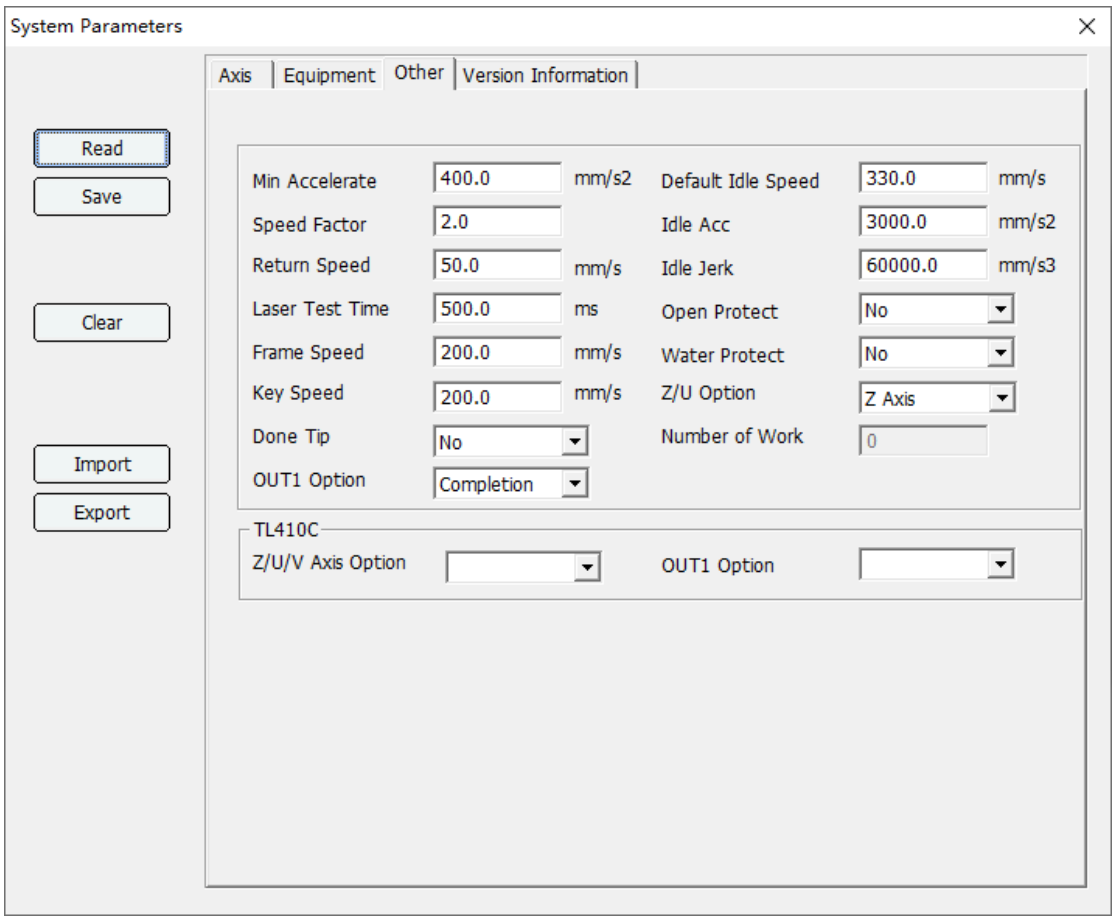
Lubricant stroke: After setting the distance, when the cumulative distance of the XY axis reaches the specified value, turn on the lubricant switch.
Lubricating oil time: Refers to output lubricating oil time.

Reference Parameters(Rotary Equipment): Reference Diameter, Reference Resolution and Object Diameter.

- ✓ Because cylindrical materials with different diameter, the range and the resolution of Y axis are different, the control card provides a Reference Diameter and Reference Resolution for convenience to calculate.
- ✓ After the reference diameter and reference resolution are set correctly, each time replace material, it just needs to set the Diameter parameter in main menu interface. Then the resolution and the max range of Y axis will be recalculated according to the Reference Diameter and Reference Resolution. It means you just need to set the new material diameter.
- ✓ Set the Equipment to Rotary Equipment. You will see the Object Diameter, Reference Diameter and Reference Resolution have a default value. Measure the diameter of a material for processing. Input this diameter into the "Reference Diameter" and "Object Diameter" parameters. The "Reference Resolution" can remain as default value or input the estimate value to it.
- ✓ Set the laser max power low, to draw out one 50 mm length line on the surface of material. Measure the real length of the line, 55 mm etc. Set the reference resolution value. Press " " button and shows a window to calculate the resolution. Set the "Expected" to 50, "Actual" to 55 in the resolution window. Press "Calculation" key to calculate the right resolution.
- ✓ Next time you replace the new material with different diameter, just set the "Object Diameter" parameter. At this time, the Y axis resolution automatically calculates the resolution and maximum range of the current object based on the reference diameter and reference resolution.

Calculation Formula:
Real resolution of Y axis = Object Diameter / Reference Diameter * Reference Resolution
Real range of Y axis = Object Diameter * π

1.3.1.3.3 Other parameters



Min Accelerate: The corresponding minimum acceleration at start and stop. The smaller the value is, the smaller the jitter when starting and stopping is, and the corresponding acceleration and deceleration time increases. The greater the value, the greater the jitter when starting and stopping, and the faster the acceleration and deceleration. Generally, it is 400mm/s2. If faster processing speed is needed, set the minimum acceleration above 850mm/s2 or 200mm/s2 if accurate processing is needed (the recommended value is based on the actual machine). Mm/s2

Speed Factor: Used to adjust the smoothness of the machine when turning. The range is from 0.00 to 5.00. The higher the value, the higher the turning speed, the shorter the processing time, and the greater the impact and jitter. The smaller the value, the smaller the turning speed, the longer the processing time and the smaller the jitter. Generally, it is 2. When the acceleration on the Y-axis is set to a high level (such as above 2500mm/s), the velocity coefficient can be set below 1.0, thus significantly reducing jitter. When fast machining is required, set the speed coefficient to 3 or above.

Rectum Speed: Is the return velocity of the system to the origin, in unit mm/s.

Laser Test Time: Is the time of automatic luminescence when the system presses the "Pulse" key, unit MS.

Frame Speed: Set the speed of the moving frame in mm/s.

Key Speed: Set the inching speed of the key in mm/s.

Done Tip/Number of Work: Set whether the processing is completed and opened; Open machining completion prompt, and set machining completion times.

OUT1 Option (TL-A3):

- Completion, work completion signal. Output low level pulse width for 1 second after work completion.
- Feeding, feeding indicator signal, low effective output when feeding.
- Laser status, laser light output indicator signal, low effective output when emitting light.
- Press, when feeding, the synchronous pressing signal of YU axis is low in effectiveness.
- Work status, When working, output low level signal, when pause or standby, output invalid signal.
- Pen, pen signal of head 1, drop pen, output low level, and lift pen to output high level.
- Nip Rolls, used for press stick control when rotating knife, low effective.

Default Idle Speed: When the default speed of the processing file is selected, the empty speed of the XY axis when the light is not out. Units: mm/s.

Idle Acc: The acceleration of the XY axis in the absence of light.. Units: mm/s2. The greater the acceleration, the faster the acceleration, the greater the relative jitter. On the contrary, acceleration and deceleration become smoother.

Idle Jerk: The acceleration of acceleration of the XY axis in the absence of light. Units: mm/s3. The faster the Jerk, the greater the relative jitter. On the contrary, acceleration and deceleration become smoother.

Open Protect: In the open state, the system will detect the protection signal of the open cover. In the open state, the system will not work.

Water Protect: Whether to detect laser water cooling protection.

Z/U Option (TL-A3): There are three options: U-axis Feed and U-axis Lift,or Z-axis signal. When it is a double-head mutual shift device or a rotary knife device, it needs to be set to Z axis signal.

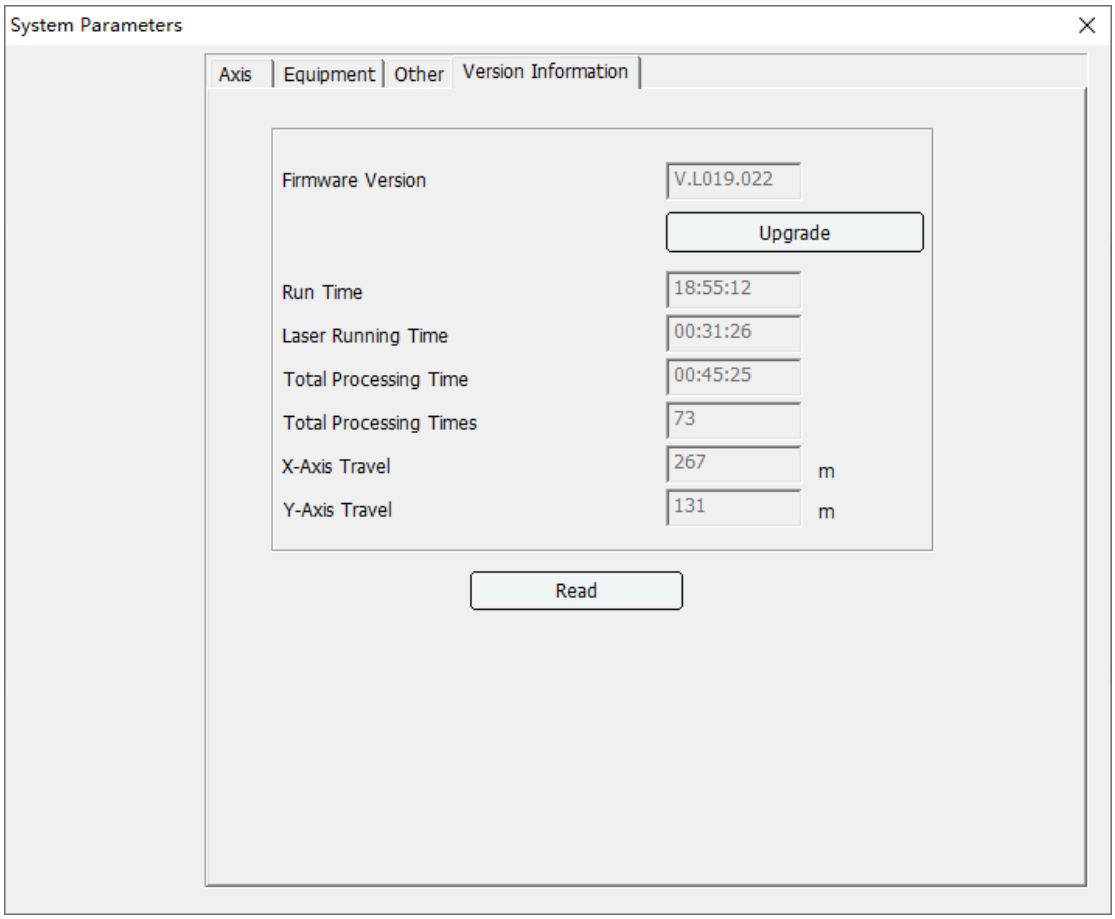
Z/U/V Axis Option (TL-410C): Z-axis feeding, U-axis platform lifting, V-axis for double-head mutual shift.

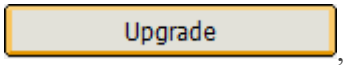
OUT1 Option (TL-410C):

- Completion, work completion signal. Output low level pulse width for 1 second after work completion.
- Feeding, feeding indicator signal, low effective output when feeding.
- Laser status, laser light output indicator signal, low effective output when emitting light.
- Pressing signal, feeding signal. When feeding, the synchronous pressing signal of YU axis is low in effectiveness.
- Pen signal, pen signal of head 1, drop pen, output low level, and lift pen to output high level.
- Nip Rolls signal, used for press stick control when rotating knife, low effective.

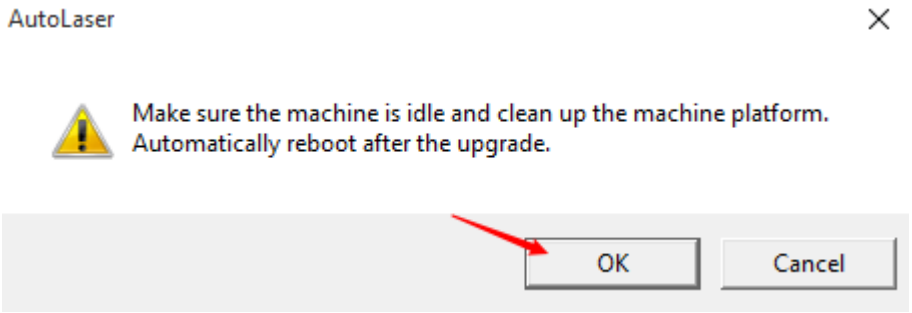
1.3.1.3.4 Version Information

Version information includes the current version number of firmware, boot time, light release time, cumulative processing time, cumulative processing times, cumulative X axis travel, and cumulative Y axis travel. Click [Read] to Read the above parameters.



Firmware upgrade click the current button 

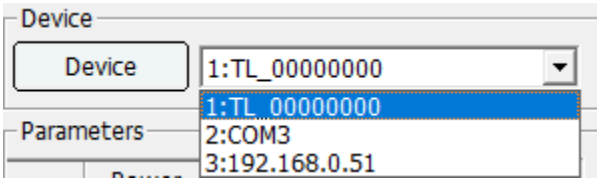
, Select the upgrade file you want（*. TFL, TZD_L019.TFL for example）, Click ok as shown in the figure:



After confirmation, please do not power off. The machine will restart automatically later.

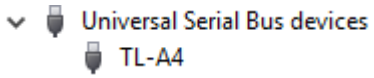
1.3.2 USB/IP settings

As shown in fig. below, on the upper right part of software interface device information is displayed. Laser software will communicate with machine through network or USB cable during the process of downloading graphics file, read-writing machine parameters, and executing online control. IP address is setting for network, and Com Port Number is setting for USB.

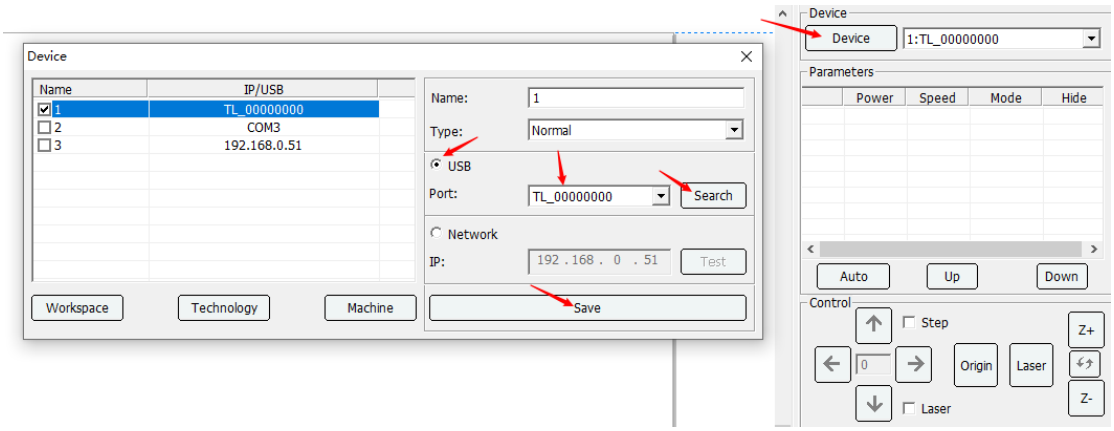


1.3.2.1 USB device settings

After the control card (TL-A4 e.g.) is powered on and reset, connect the computer with a USB cable, and the computer will automatically assign a USB device port for communication between them. As shown:`



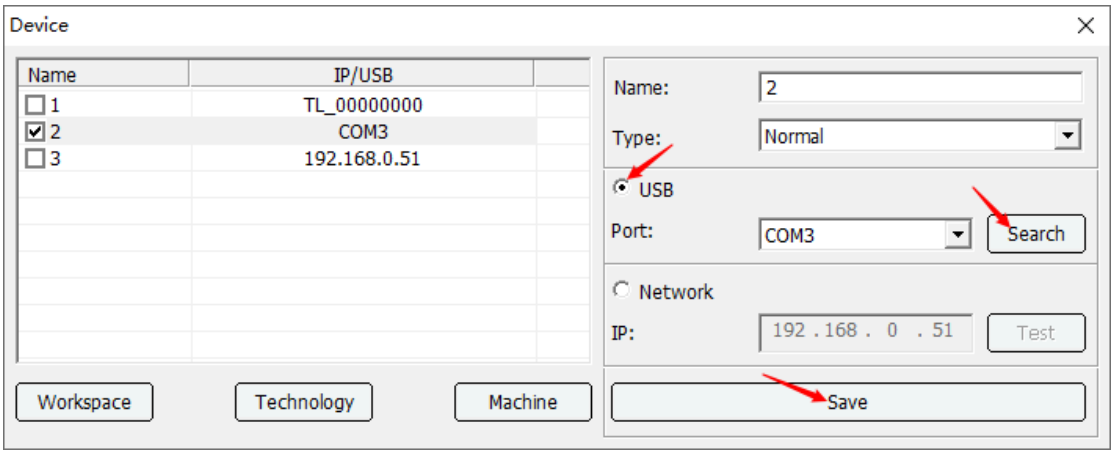
In the software, click the Device button, select the USB connection, click search, search for the port number or directly select the Auto (automatic) mode. When the Auto mode is selected, the software will automatically match whether the device is a USB port number or a COM port number. Automatic mode is suitable when connecting a device. If there are multiple devices, please use the mode of manually assigning port numbers.



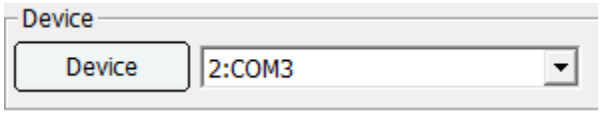
1.3.2.2 USB COM port settings

After the system reset of control card is completed, connect the computer with USB cable, the computer will automatically allocate a COM port for communication.

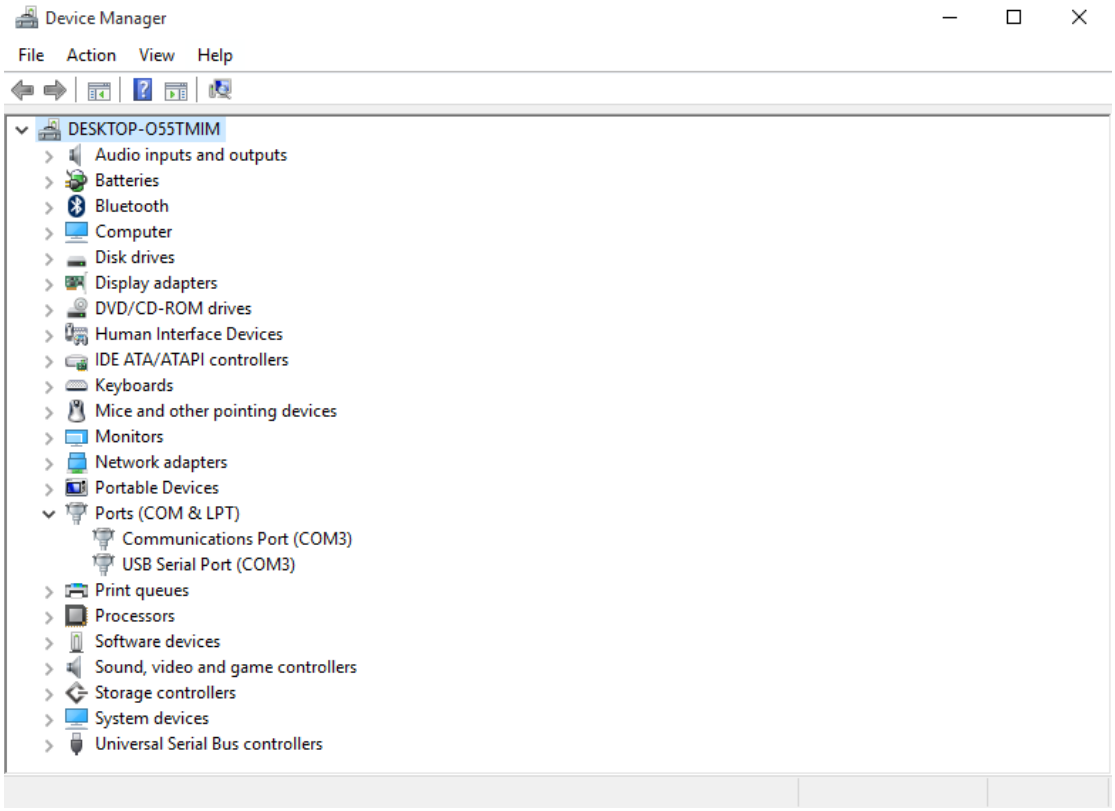
In the device settings, select USB connection, click Search, select the corresponding port number, such as COM3, and click Save.



After exiting, in the device list, select the corresponding port number device to communicate, as shown in the figure.

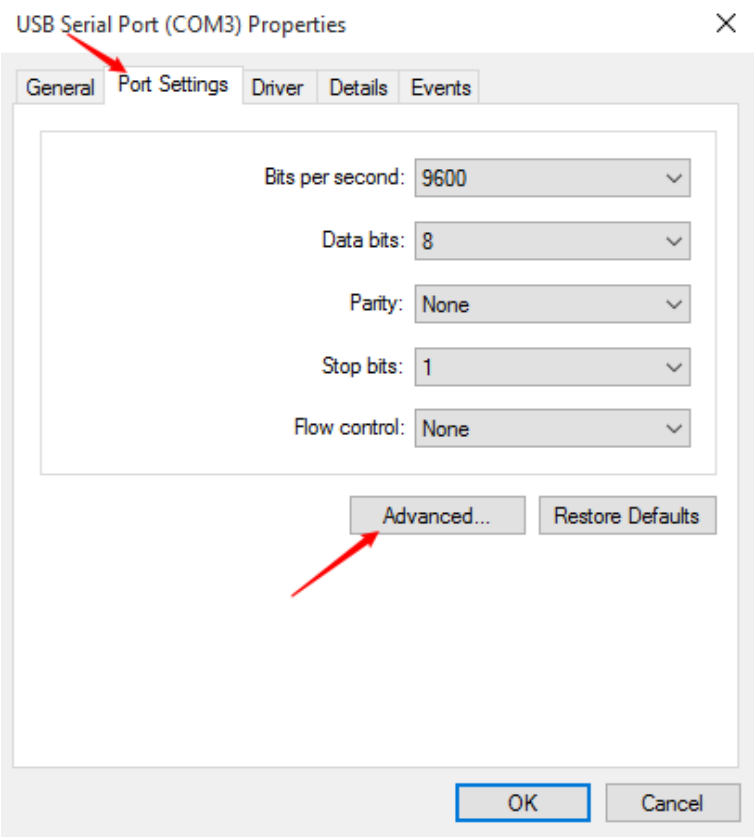


1. View the COM number. Select [Computer] and click the right key of the mouse to select [Device manager], click the port (COM and LPT), the "USB Serial Port (COM3)" is the port Number allocated by the computer! As shown below:

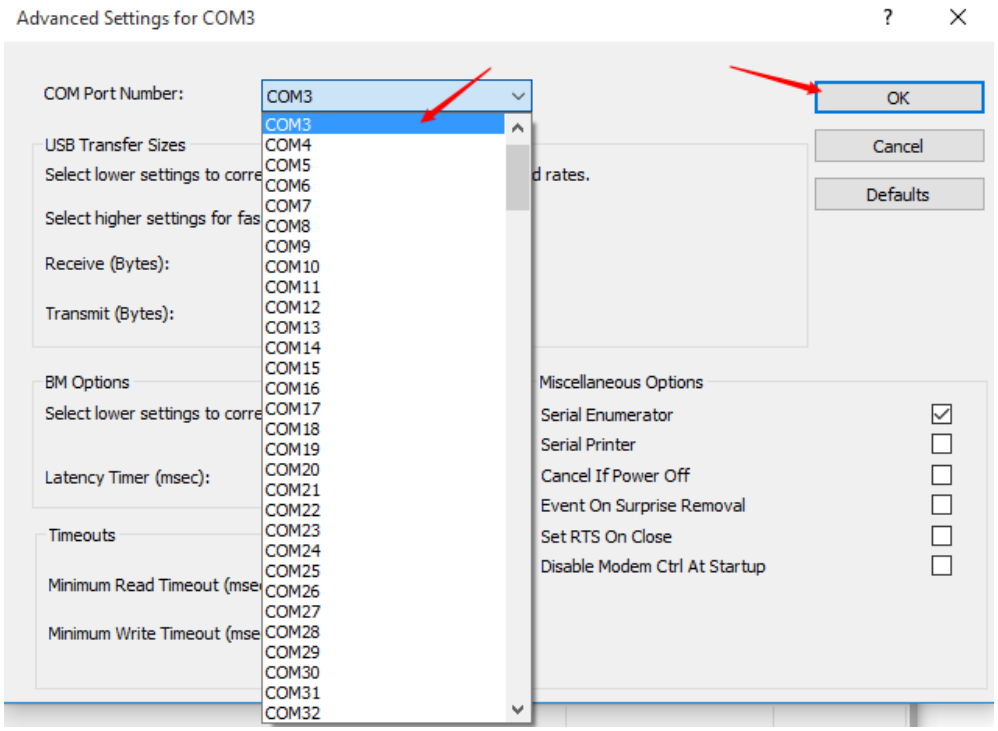


2. Change the COM port assigned by the computer

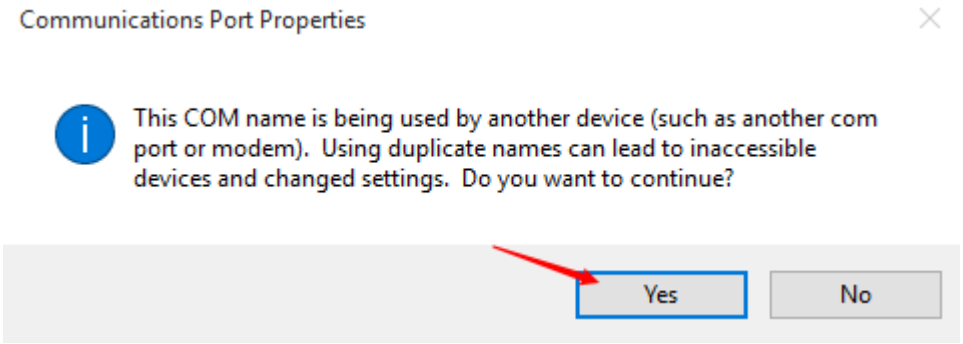
The USB Serial Port (COM3) under port (COM and LPT) directory displays the present allocated port number of the computer; port number changing steps are as follows.



1) Double-click USB Serial Port (COM3), the USB Serial Port (COM3) properties dialog box would pop out, and then click [Port Settings]; Click [Advanced…] and "Advanced Settings for COM3" dialog box would appear.
2) Select the port number you want to set in COM port Number option box.



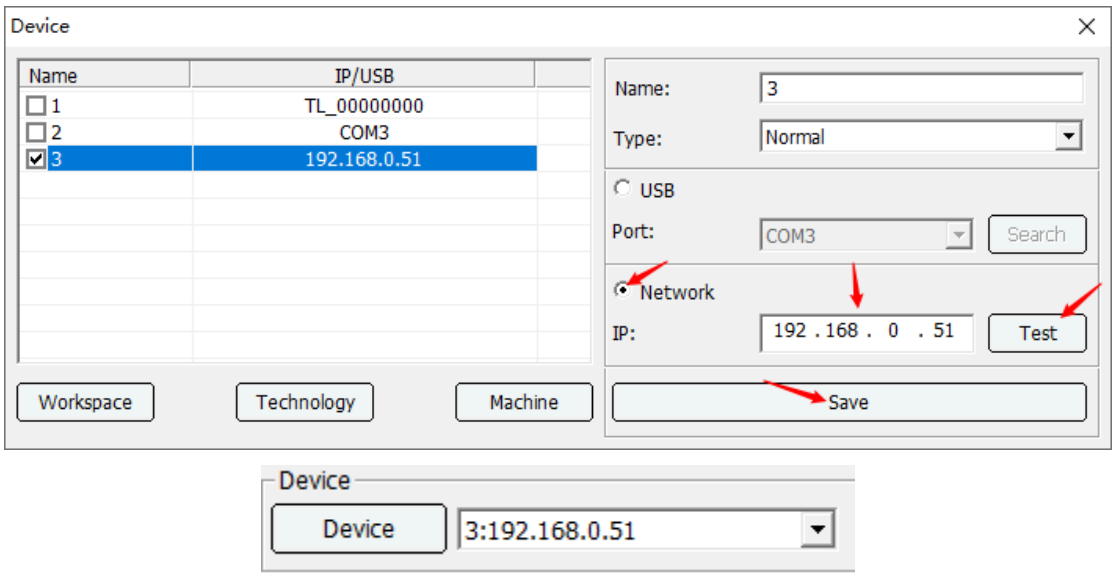
3) Click [OK] and the Communications Port Properties dialog box would pop out as shown in figure.



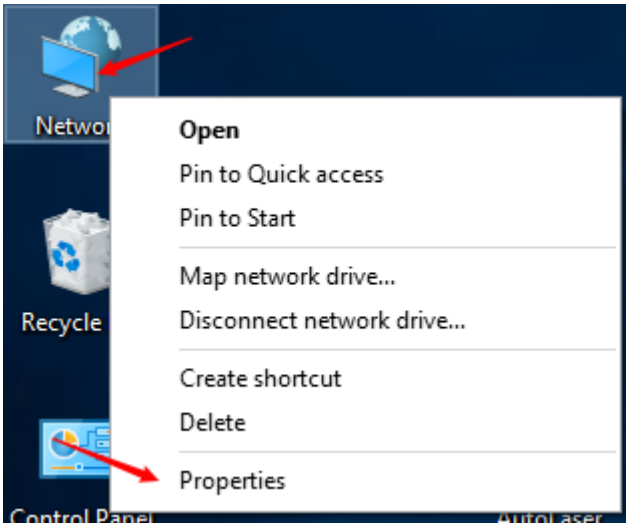
4) Click [Yes] and setting process is completed.
5) No display on the screen would indicate the machine is not connected to (Note: don't forget to install the USB driver and plug in the USB line).

1.3.2.3 Network communication

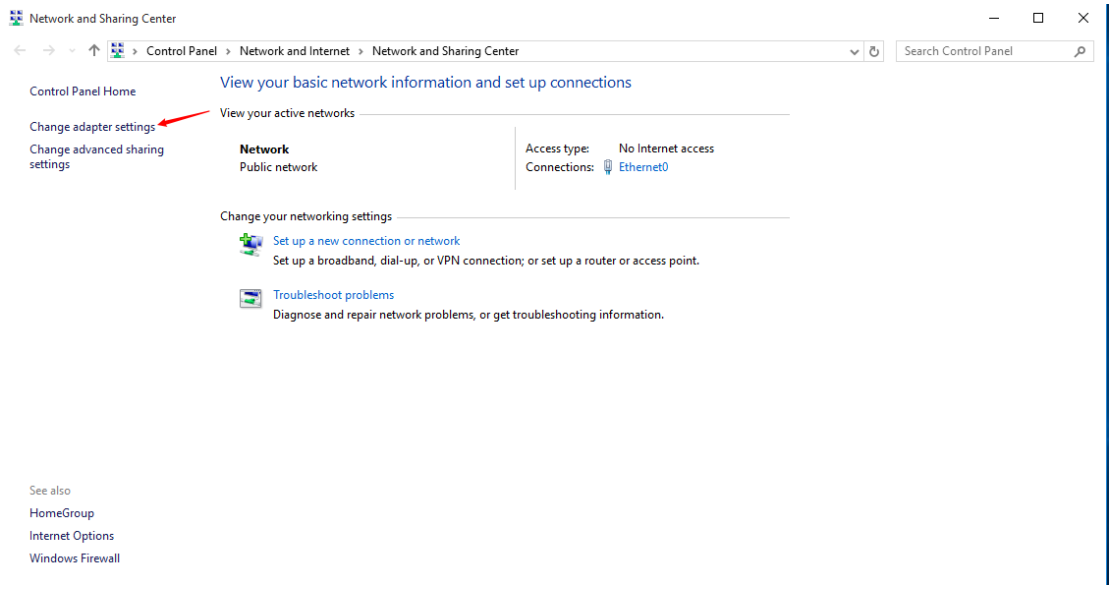
In the device setting dialog, set the IP the same as that in the machine. Then set the first three sections of IP in the computer to the same address value, and the last section to a different address. For instance, if the machine IP is 192.168.0.51, record the IP 192.168.0.51 for the selecting machine in Laser software. And set the computer IP to 192.168.0.100, thus network transmission can be conducted.



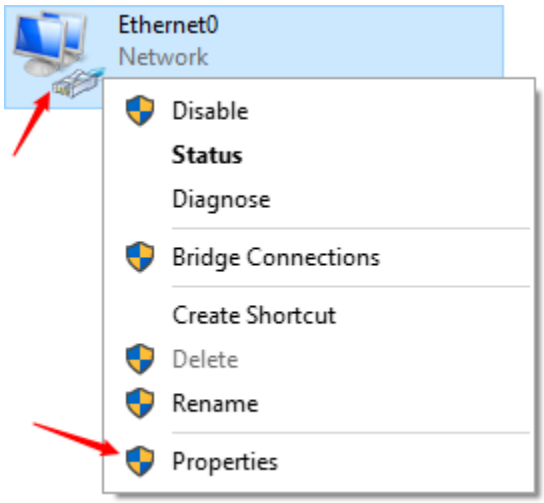
1) Network right-click properties.

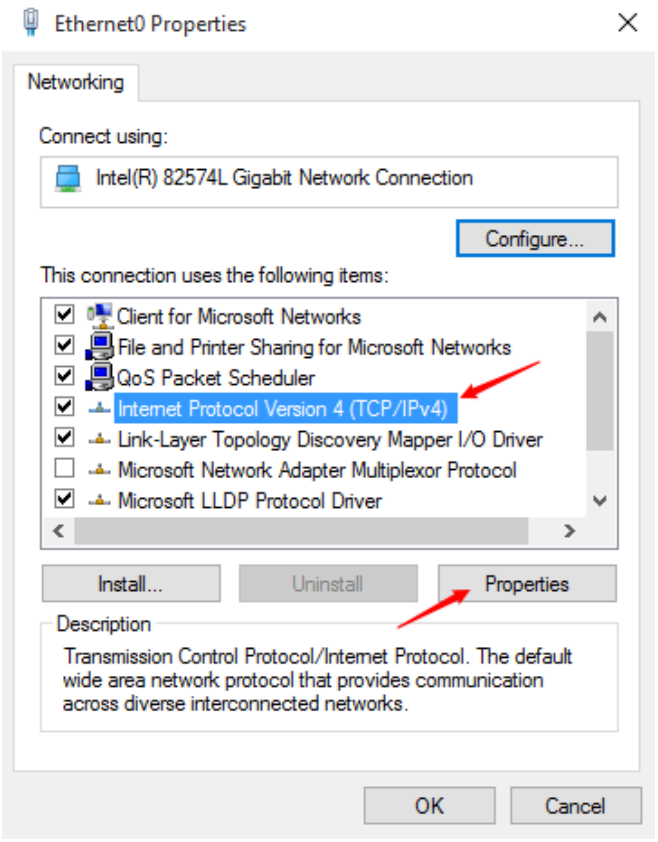


2) Click [Change adapter settings].

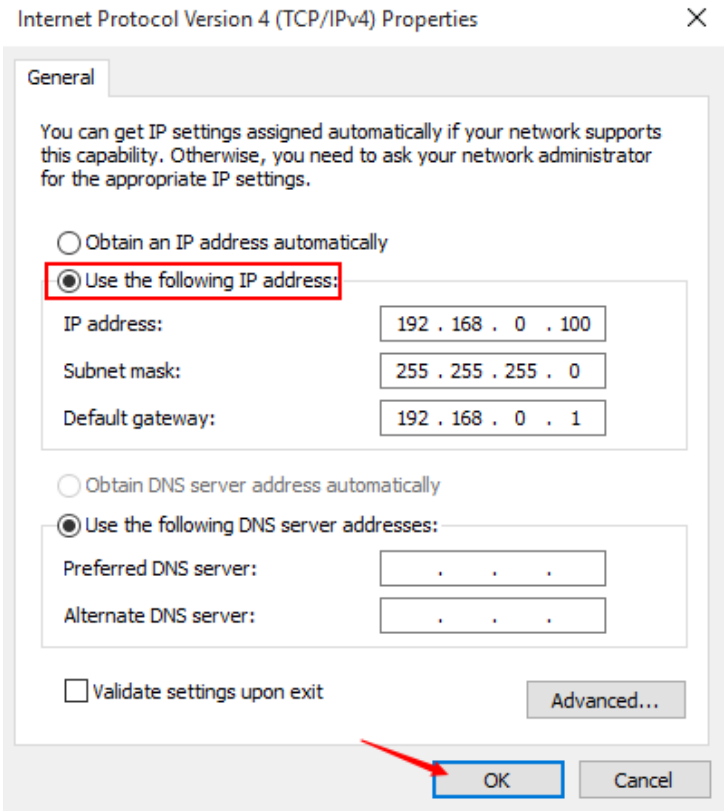


3) Select [Ethernet] and click right key to pop up [Properties] option. And then the [Ethernet properties] dialog box would appear. Double-click [Internet Protocol Version TCP/IPv4] and conduct setting parameters.





4) Select [Use the following IP address], input IP address, subnet mask code, and default gateway, as shown in fig. below.



After the above steps, click [OK] and the computer IP address setting is accomplished.

1.4 Basic operation

1.4.1 Graphics drawing

: Draw a polyline. At the end, you can click the right mouse button to select end or close.

: Draw a Bezier curve.

: Draw a rectangle. Hold down the Ctrl key to draw a square.

: Draw an ellipse. Hold down the Ctrl key to draw a circle.

: Text input.

: Delete line segment.

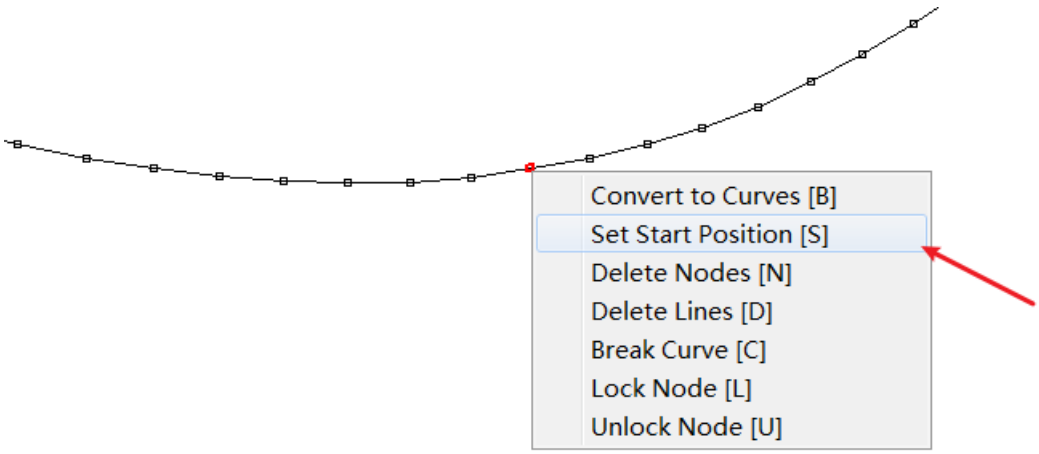
: Draw points.

1.4.2 Node editing

Set start position [S]: Set the selected point as the processing starting point. At this time, it is necessary to set the conver point of path optimization as the original starting point.And the corner priority and dislocation processing check box are not enabled. The setting process is as follows:

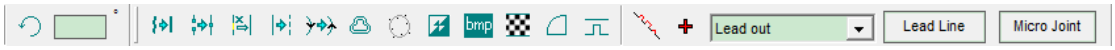
Click the [Node Edit] button, then frame or click part or all of the primitives, and zoom in appropriately to see the nodes of the primitives. As shown:

Select the node by frame, then click the right mouse button, a setting dialog box will pop up, and select [Set Start Position].

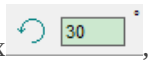


Convert to curves [B]: After selecting the graphics, you can convert the polyline to a Bezier curve.
Delete node [N]: Delete the selected node.
Delete lines[D]: Delete selected line segment.
Break Node [C]: Cut the graph from the selected node position.
Lock Node [L]: After locking the node, when adjusting the control point, the front and back control points will be changed at the same time.
Unlock Node [U]: After unlocking the node, only the current control point can be adjusted.
Note: After entering the node editing state, you can use keyboard commands to operate the node. The operation command is the letter after the option.

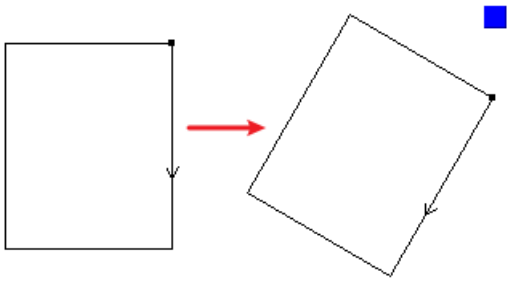
1.4.3 Tools



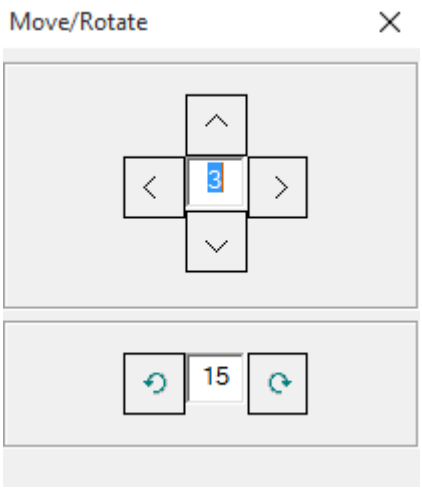
1.4.3.1 Rotation and displacement

After selecting the graph, enter the angle in the angle edit box 

, confirm, and you can rotate the graph. As shown:

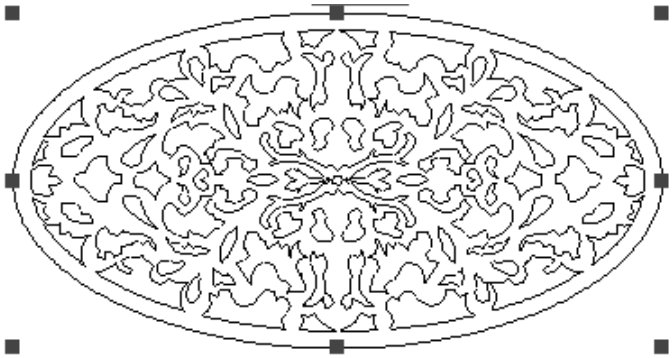


Click to have more rotation and displacement settings.



1.4.3.2 Merge lines

Lines merging function is a pre-treatment process to convert the curve of exceedingly high precision to that of more suitable size for the convenience of processing. Operation process is as follows:

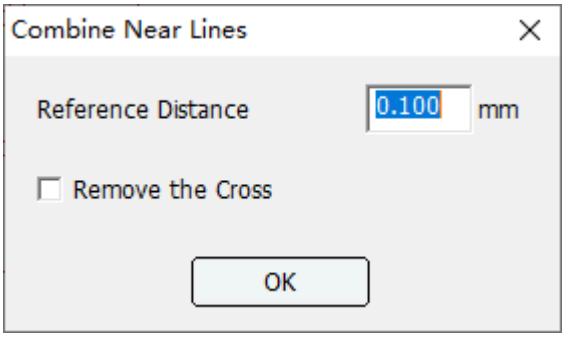


Select the graphics to be merged and click [Merge Lines] .

1.4.3.3 Combine near lines

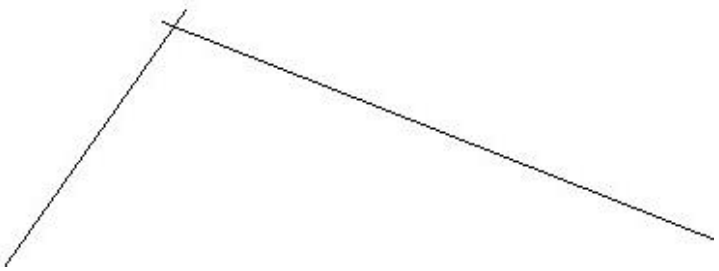
Adjacent merging function is the pre-treatment process for graphs failed to meet the standards. An entire graph but generated separately during drawing will make independent graphic element which should have one starting point and one final point separate into many independent segments. In such case, adjacent merging function could be used.

Click the with the mouse and parameters settings are shown as below:

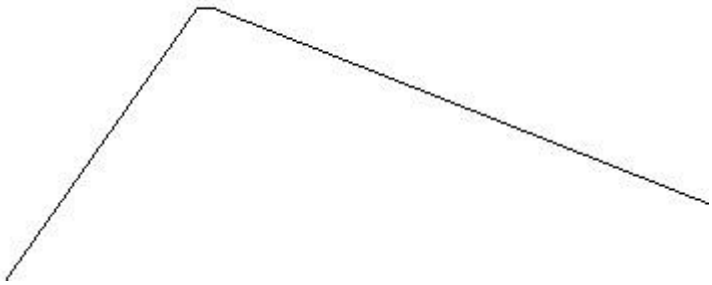


Reference Distance: Indicate the required maximum distance between the adjacent two lines of endpoints to be regarded as an entirety and to be merged.

Remove the Cross: If endpoints of two lines meet demands of merger and there is intersection between the two lines, intersecting part should be removed. As shown in the figure:



Changed to:

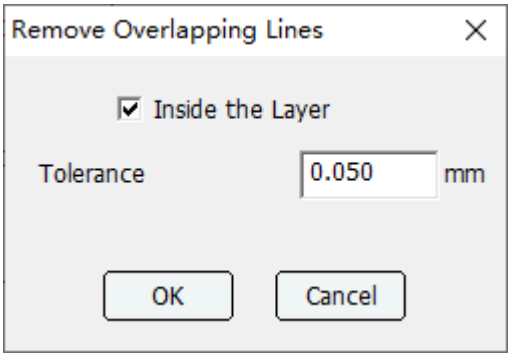


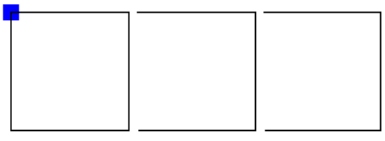
Two line segments are changed into a polygonal line.

1.4.3.4 Remove overlapping lines

If three squares are connected and there is an overlapped boundary line in the middle of each square, click [Remove Overlapping Lines] button as shown in the following fig.

A dialogue box would appear:

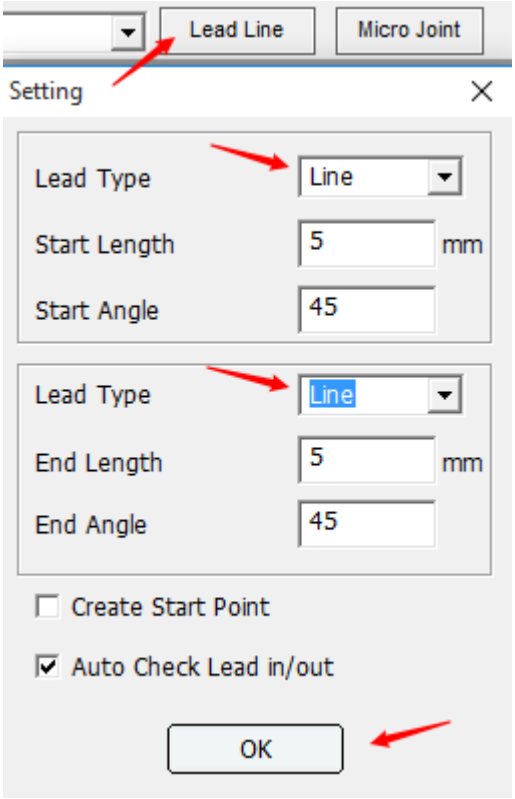




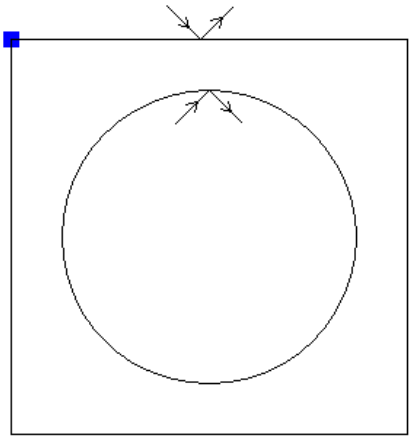
Select one rectangle and drag to move away and it can be seen after executing the above steps. For laser cutting, removal of redundant public side line can improve processing efficiency.

1.4.3.5 Lead line

Select the graphic element and click [Lead Line] button; the following dialog box would appear. And there are two type of lead line [Line] and [Arc].

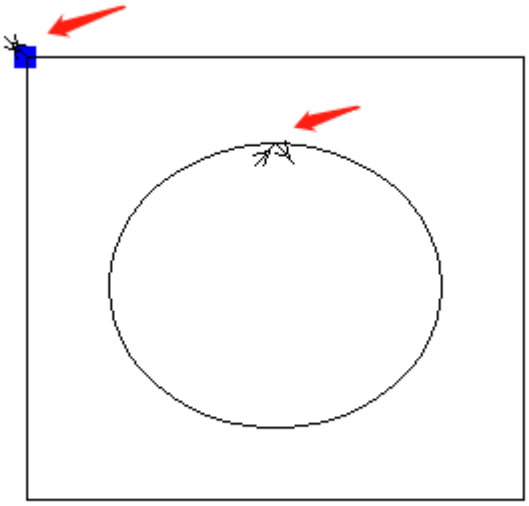


After click [OK], the interface turns to the following:



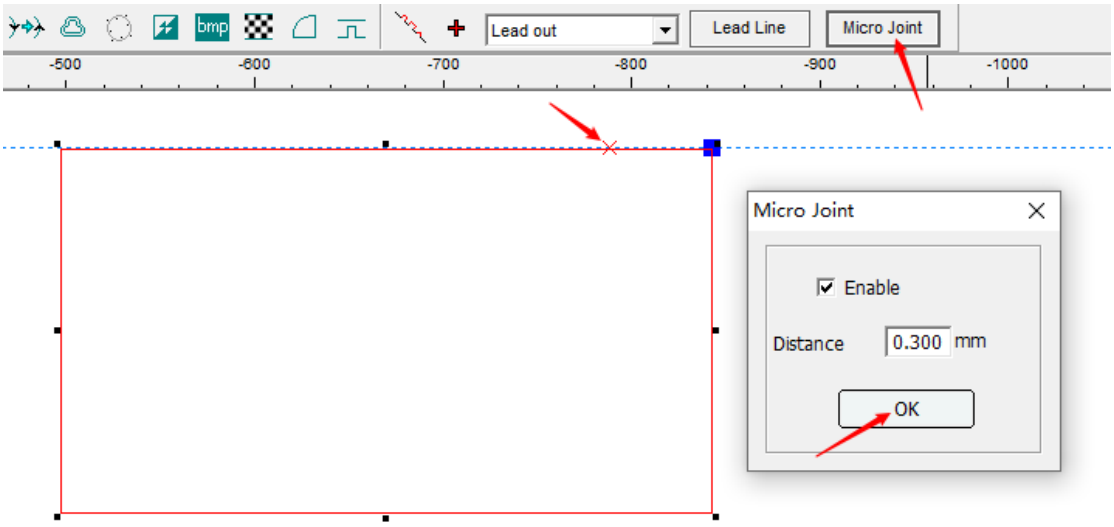
The direction angle and length of the lead line could be defined by the user. Check the

check box. It will be generated at the starting point，As shown in the figure:



1.4.3.6 Micro joint

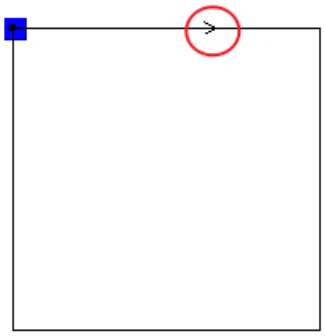
The micro joint is to leave an interface in the closed graph without cutting, so as to avoid the graph falling down after cutting, you can set the distance of the micro joint. After adding micro joints, the mark points will be displayed on the graph.



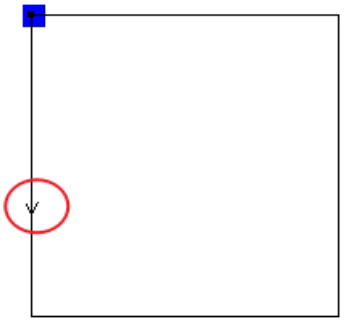
As shown in the figure, after the micro joint handling, in the work preview, after zooming in, the end position will remain 0.3mm without cutting:

1.4.3.7 Cutting direction

To edit the cutting direction of graphic, it has to click the button to show the direction of the graphic.



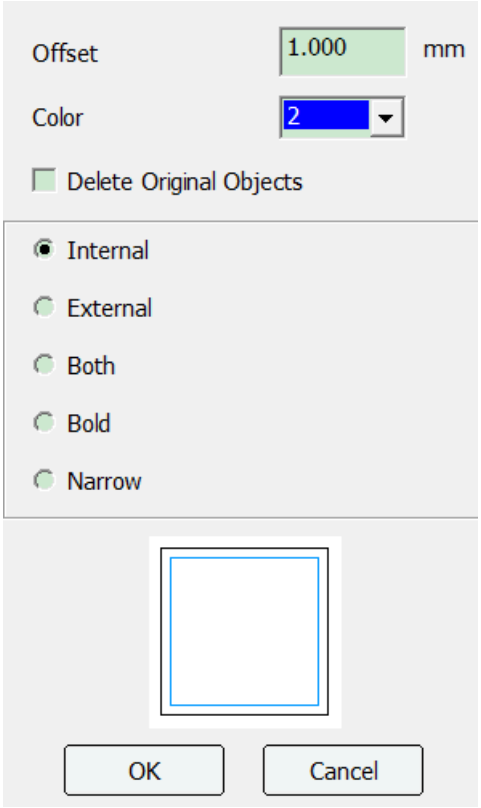
Click reverse direction to change the direction.



1.4.3.8 Offset shapes

Make unified profile modifications for the original graphic to offset error generated from laser spot.

Select the graph, click and the following picture would appear.

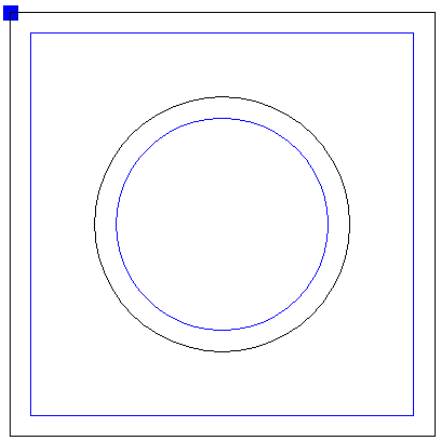


Offset: The length of the graphic needs to shrink and expand

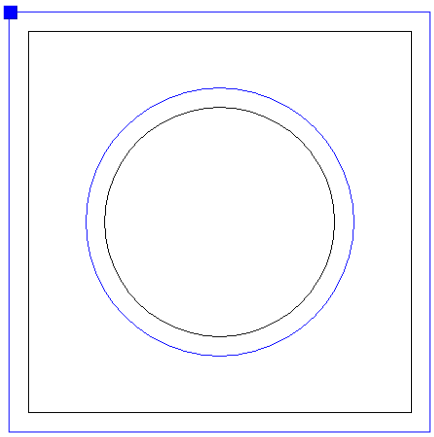
Color: The color generated after the graphics shrink and expand, customers can choose according to their needs.

Delete Original Objects: Whether to delete the original image after shrinking or expanding.

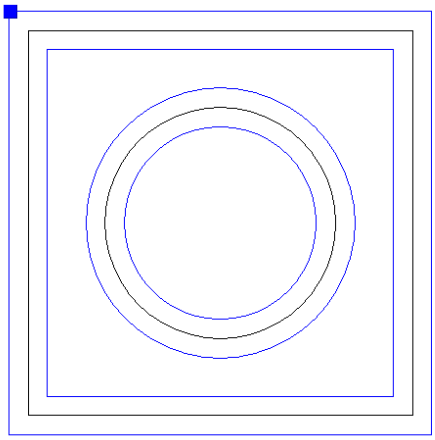
Internal: The graph will only shrink. As shown in figure:



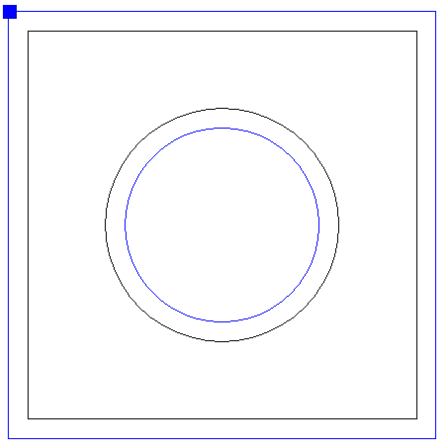
External: The graph only outward expansion action. As shown in figure:



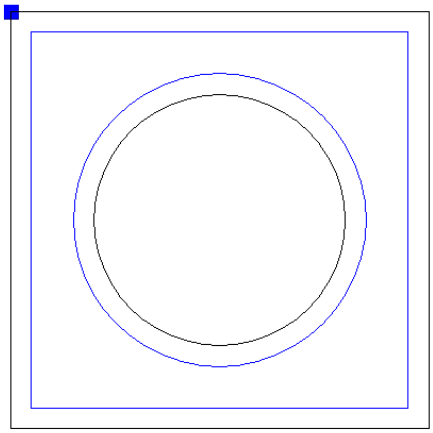
Both: In Both mode, the graphics will perform two actions of shrinking and expanding simultaneously. As shown:



Bold: This function is used when the graphics contain another graphics, the graphics inside only shrink, and the graphics outside only expand. As shown:



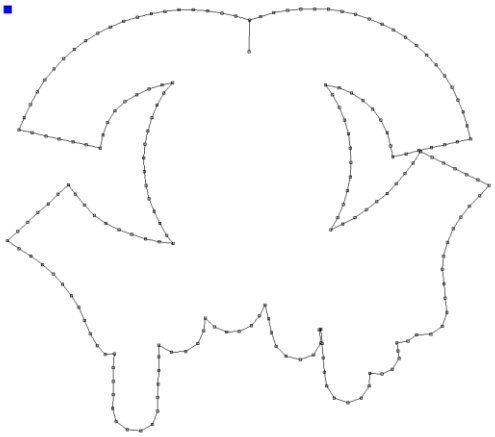
Narrow: This function is used when the graph contains another graph, the inner graph only expands, and the outer graph only shrinks. As shown:



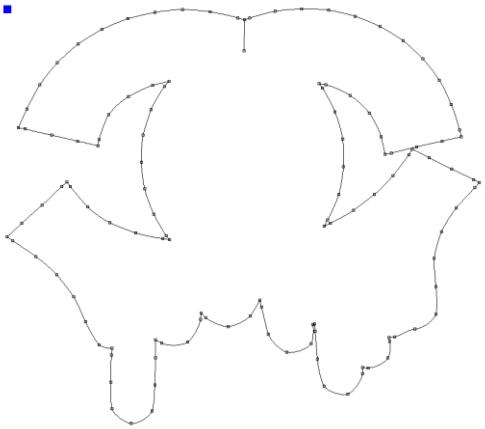
User can set parameters such as zoom mode and offset distance according to their needs, click [OK].

1.4.3.9 Fairing

As for *.dst、*.dsb、*plt type documents, if boundary lines are not smooth due to drawing, as shown in the fig. Below:



User can select the graphic and then click tool to smooth the boundary line and thus processing effect turns more smooth.



1.4.3.10 Bitmap color reverse

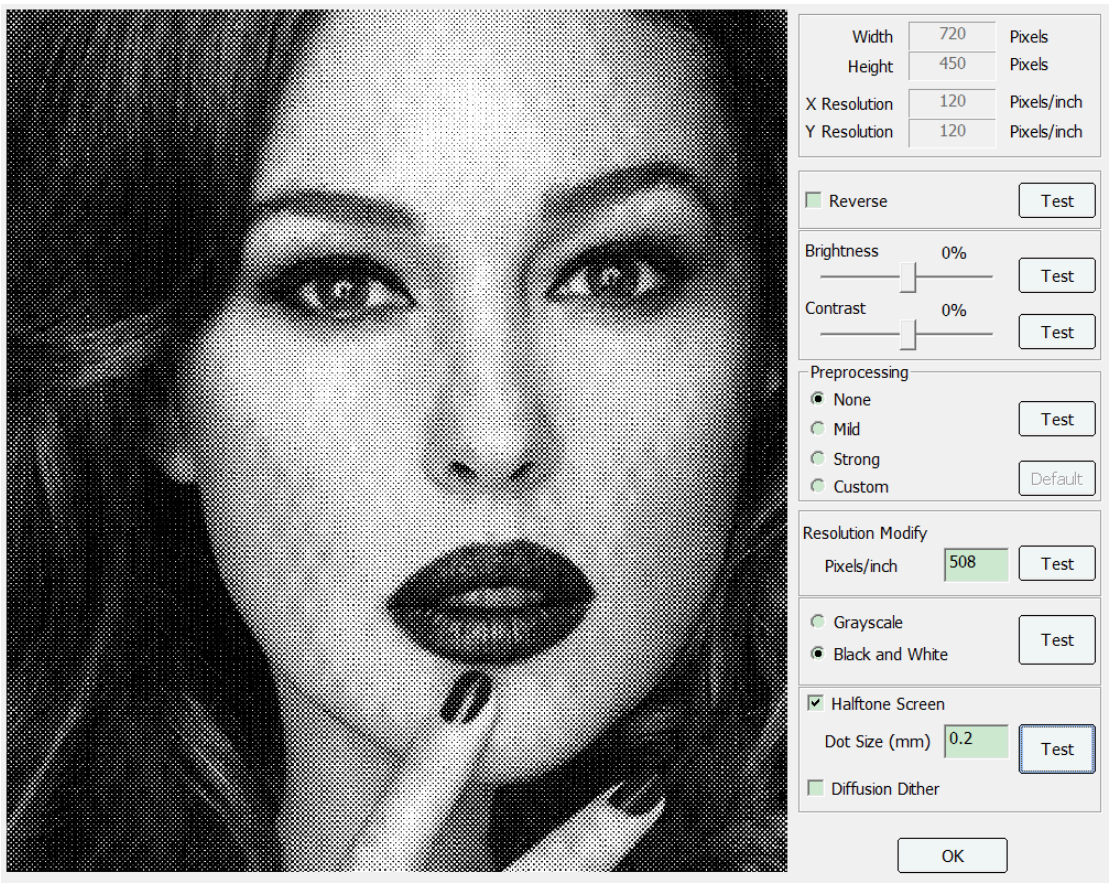
Select bitmap and click to reverse the color.

Before the change:

After the change:

1.4.3.11 Bmp Processing

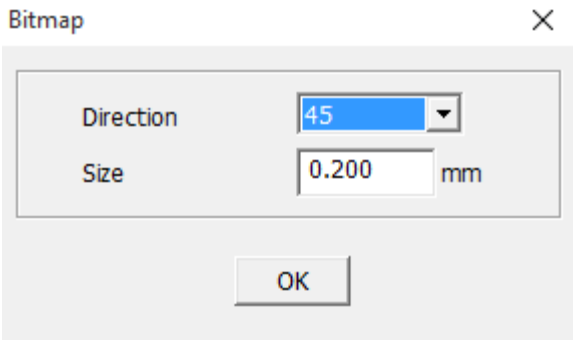
Select the one graphic, then click the button to process the bmp graphic.



Here, you can reverse the color of the image and change the brightness and contrast of the image. In order to improve the engraving effect, an image preprocessing function is provided to enhance the image contrast effect. If it is black-and-white engraving, we recommend checking the dot or scatter diagram processing. The recommended image resolution is 300 or above.

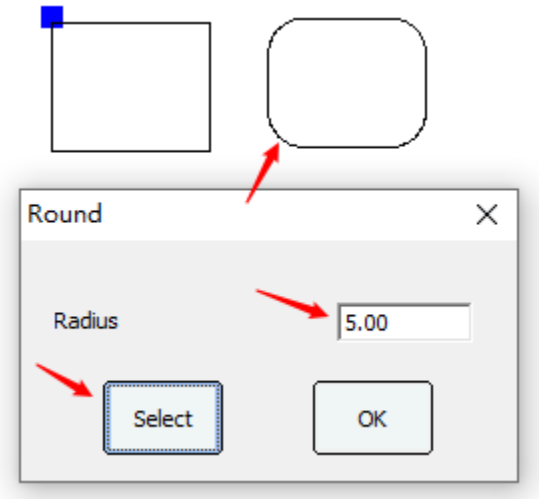
1.4.3.12 Halftone screen

After selecting the bitmap, select to set the direction and size of the dots, and to produce the dotmap, it is recommended to change the DPI of the bitmap to 300 or above.

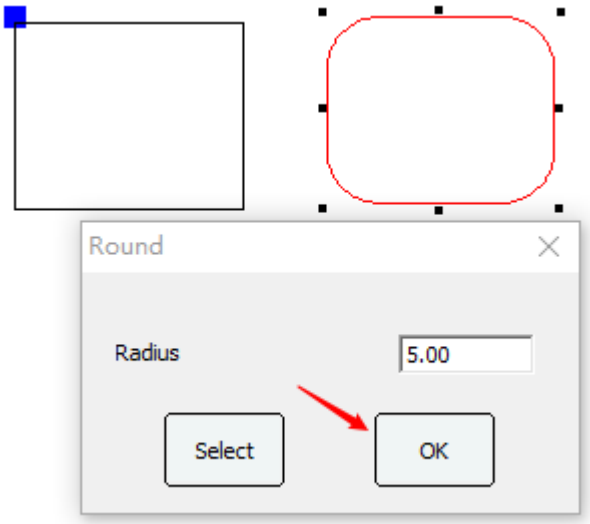


1.4.3.13 Round

Click the [Tools] option in the menu bar, and then select the [Round] function, or click the toolbar button . The following dialog box pops up. As shown:



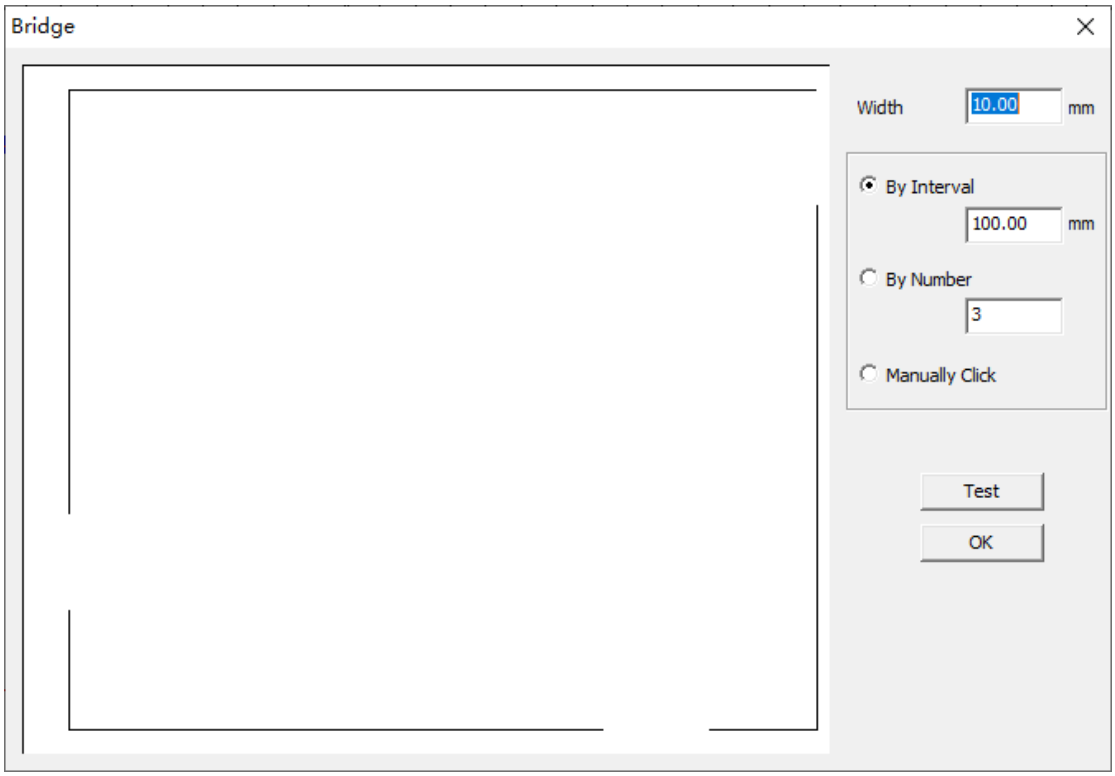
After setting the radius of the rounded corners, click the [Select] button, and then frame-select the graphics that need to set the rounded corners.



After setting the radius, select the graphics that need to be rounded, and then click the [OK] button to round the graphics.

1.4.3.14 Bridge

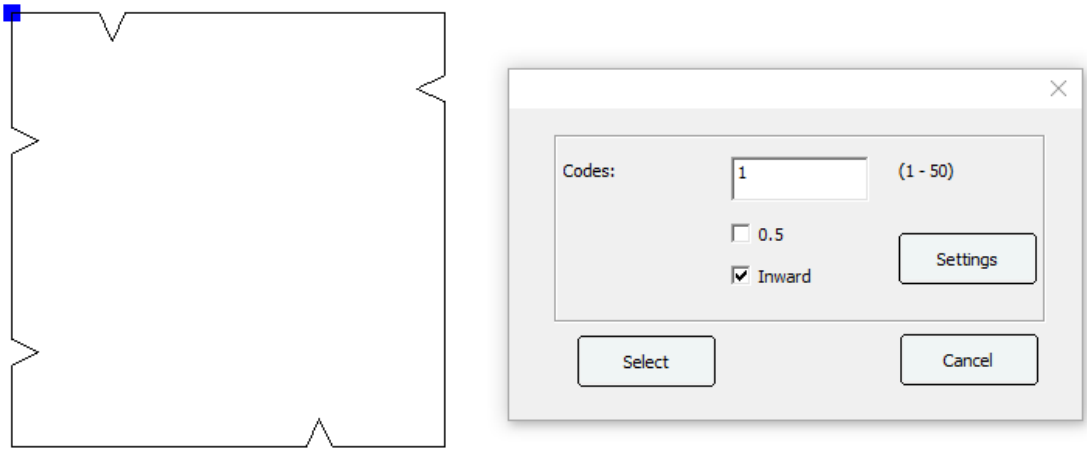
Click the [Tools] option in the menu bar, and then select the [Bridge] function, or click the toolbar button . After setting the width of the bridge position, you can set the bridge position according to the needs.



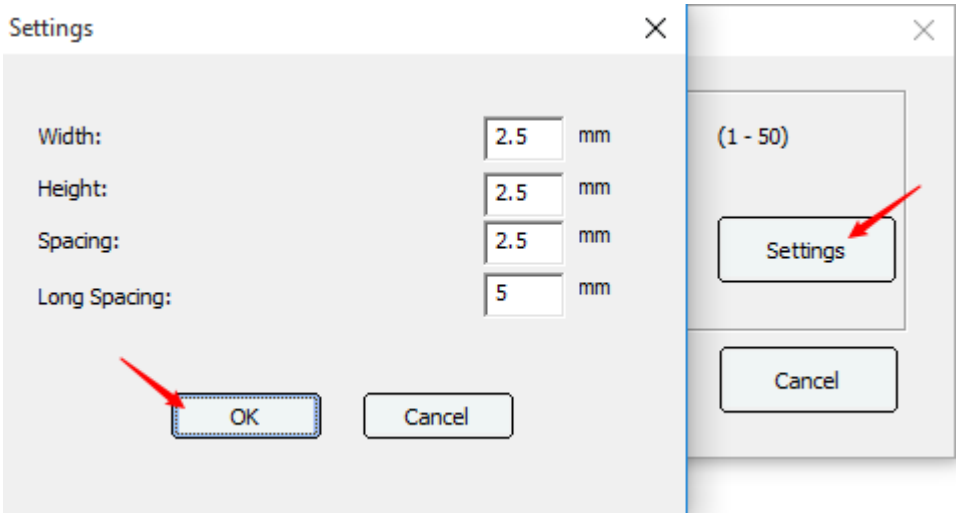
1. Set the bridge position according to the interval: just fill in the interval between the two bridge positions, the software will automatically increase the corresponding number of bridge positions according to the graphic size. Click [Test] to display the bridge position.
2. Set the bridge position by quantity: only need to fill in the number of bridge positions, you can increase the corresponding bridge position, click the test to display the bridge position.
3. Manually set the bridge position: After selection, the bridge position can be added at any position of the primitive. Click the line of the primitive with the left mouse button to increase the bridge position at the corresponding position of the primitive. After completion, click [OK].

1.4.3.15 Add size mark

1. Click the [Tools] option in the menu bar, and then select the [Add Size Mark] function, or click the toolbar button . Set the code number, and direction, click to select and then click the primitive line, you can add code teeth at the specified position of the primitive line.



2. Set the code attributes: If you want to change the size of the code teeth, click [Settings] to enter the code setting interface, set the code accordingly, and click OK after completion.

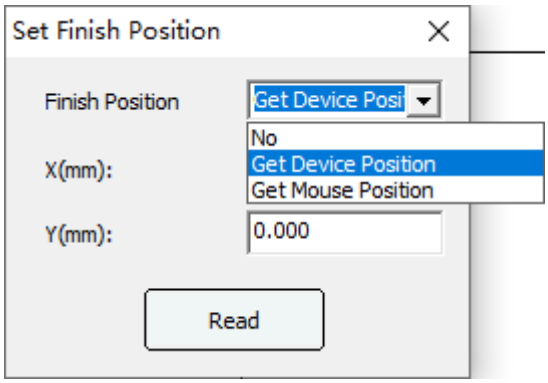


1.4.3.16 Set finish position

Click the [Tools] option in the menu bar, and then select the [Set Finish Position] function, or click the toolbar button . Open the Set Finish Position dialog box.

There are currently three modes for setting stops: "No","Get Device Position" and "Get Mouse Position".

As shown:

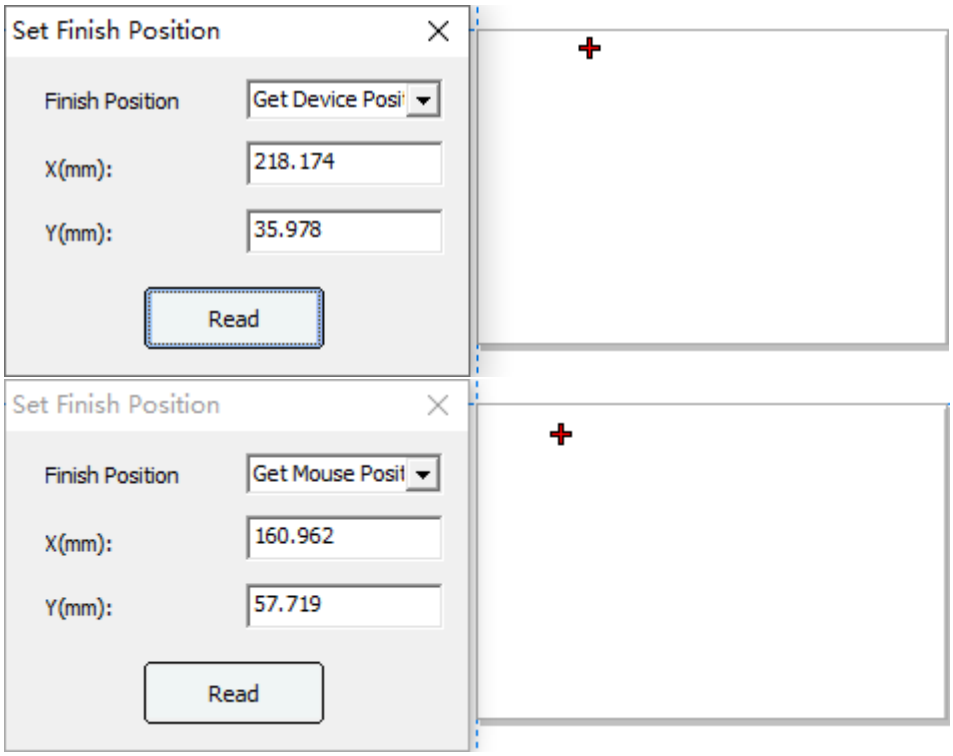


No: Do not set stops.

Get Device Position: It is to obtain the current position coordinates of the laser head, and use this coordinate as a stop point after the laser head is cut. If the controller sets the homing point as the positioning point, the laser head will return to this position after processing, and then return to the positioning point. Generally, when using this function, the "Return Point" should be changed to "None".

After successfully obtaining the device coordinates, a cross mark will be displayed in the software drawing area, and it indicates the position of the current laser head stop. As shown:

Get Mouse Position: Click the [Read] button and click the left button in the drawing area to set the current position as the coordinates of the stop. As shown:



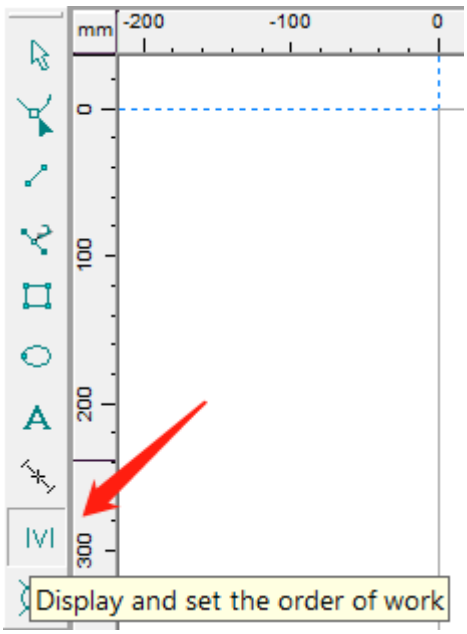
1.4.3.17 Extract contour

Image outline can be extracted, please see the example application in section 1.6 for details.

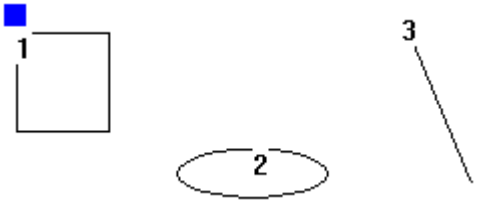
1.4.4 Display

1.4.4.1 Display and set the order of work

The processing order number display and manual sort tool is in the tool bar on the left side of the laser software.



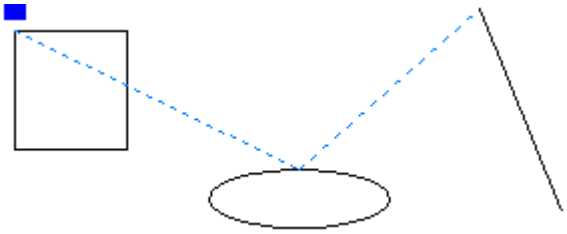
Click button to display graphic element processing order Number. And it goes into the manual sort stat. Click the left mouse button to select graphics for sorting, if you need to cancel the selection, you can right click to select the wrong graphics.



1.4.4.2 Jumper lines display

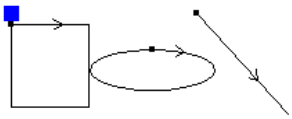
Graphics element display toolbar is at the upper part of the status bar, as shown in figure.

Click [Show Jumpers] button to display jumper lines between graphic elements.



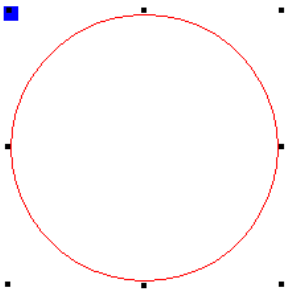
1.4.4.3 Processing direction and starting point display

Click [Show Direction] button to display cutting direction and the start point of graphic elements. Cutting direction and starting point is shown as below.

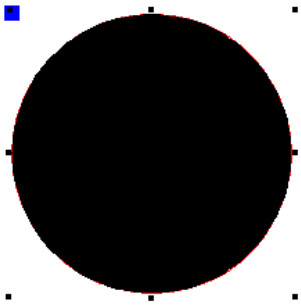


1.4.4.4 Carving effect display

Select the one graphic, and then click the button to show the carving effect. Note the graphic in the layer is for carving.



Before



After

1.4.5.5 Alignment and distribution

1. Page Align:

In the software toolbar and menu bar, there is the function of graph alignment and distribution, users can choose to use according to their needs. As shown in figure:

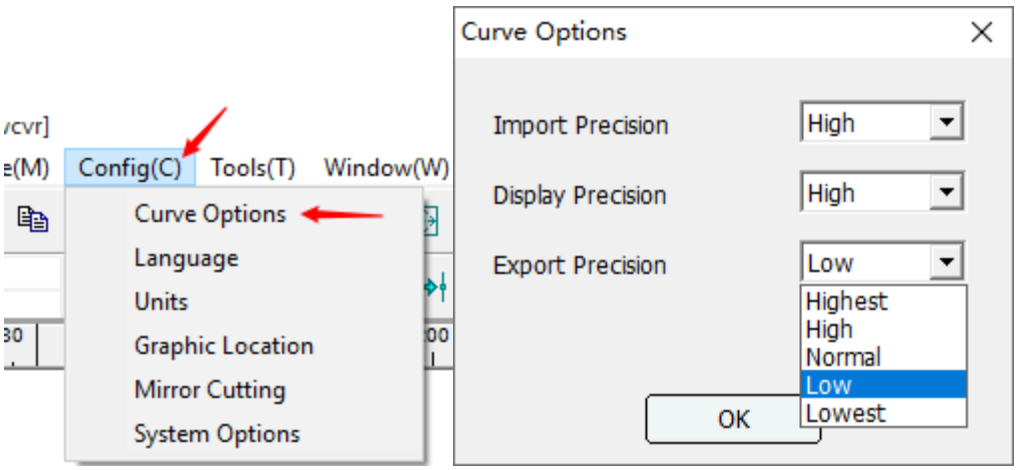
From left to right: Move to the Top (Ctrl+5), Move to the Bottom (Ctrl+6), Move to the Center (Ctrl+7), Move to the Left (Ctrl+8), Move to the Right (Ctrl+9), Move to the Upper Left (Ctrl+4), Move to the Upper Right (Ctrl+3), Move to the Bottom Left (Ctrl+1), Move to the Bottom Right (Ctrl+2).

2. Selection area align and distribution:

From top to bottom are: Mirror Horizontally, Mirror Vertically, Align Left (L), Align Center Horizontally (E), Align Right (R), Align Top (T), Align Center Vertically (C), Align Bottom (B), Distribute Space Horizontally (H), and Distribute Space Vertically (V).

1.4.5 Config

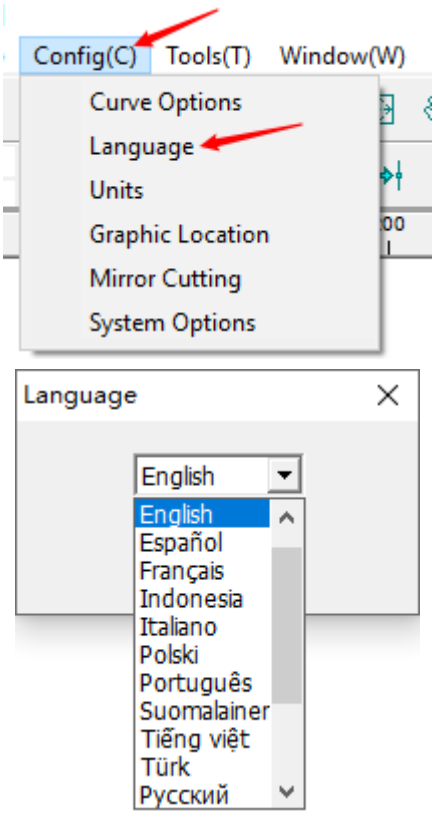
1.4.5.1 Curve options



In order to make the user cut more flexible and at faster speed, curve precision can be set up to improve the flexibility and speed of the working-piece. The software offers options of Lowest, low, normal, high, highest for users.

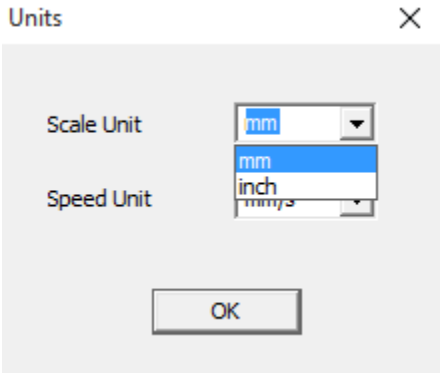
1.4.5.2 Language

The languages currently supported by the software are: German, English, Spanish, French, Indonesian, Italian, Polish, Portuguese, Finnish, Vietnamese, Turkish, Russian, Arabic, Chinese Simplified, Chinese Traditional, Japanese, Korean, which can be switched in [Config]-[Language].

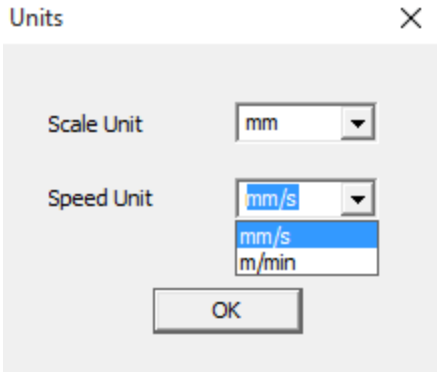


1.4.5.3 Units

All scale units and speed units of the software can be set. Open [Config] and select [Units].
Scale unit:

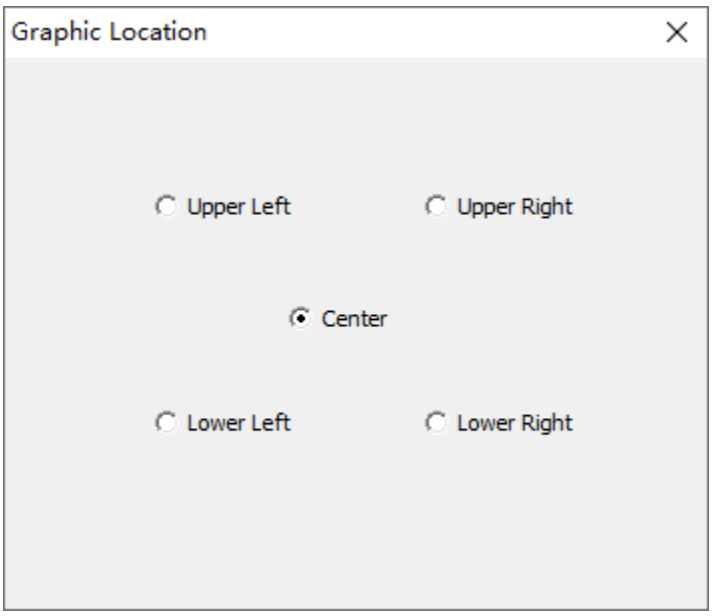


Speed unit:



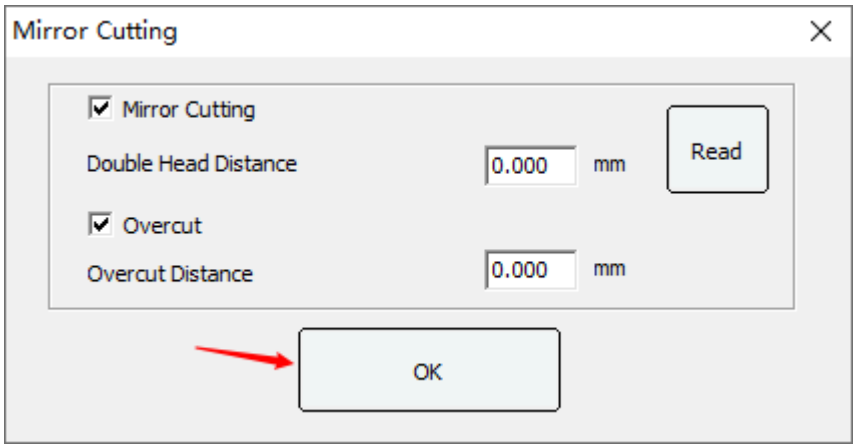
1.4.5.4 Graphic location

When importing and opening primitives with the software, the position of the primitives displayed within the effective format of the software. They are: upper left, upper right, lower left, lower right, center. Open [Congfig] and select [Graphic Location] to change.



1.4.5.5 Mirror cutting

Open [Config] and select [Mirror Cutting].



Mirror Cutting: This function is only used for the double-headed mutual-movement model. When this function is enabled, the mutual-movement of the head, that is, the laser 2 head, is used for mirror processing.

Double Head Distance: Indicates the distance between laser head 1 and laser head 2 after the machine is reset.

Read: Obtain the current distance between laser head 1 and laser head 2.

Overcut: This function is used for mirror image processing, whether the dividing line between the laser head 1 and the laser head 2 needs to be enabled for extended cutting.

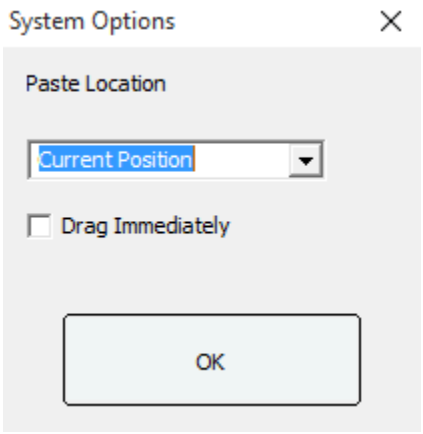
Overcut Distance: It is used to set the length of the cutting line between the laser head 1 and the laser head 2 during the over-cutting. Generally, it can be set according to the length of the backlash of the machine.

Note: This overcut distance is to cut and extend the corresponding lengths at both ends of the dividing line of the laser head 1 and the laser head 2, respectively.

For example: when the length of the dividing line (double head spacing) between the laser head 1 and the laser head 2 is 100mm, then the length of the overcut distance is set to 1mm, then the length of the cutting line cut is 1+100+1=102mm. That is, both ends of the dividing line will increase the cutting length by 1mm.

1.4.5.6 System options

Click [Config] and select [System Options].



Paste Location: Indicates the position to paste after the current graph is copied.

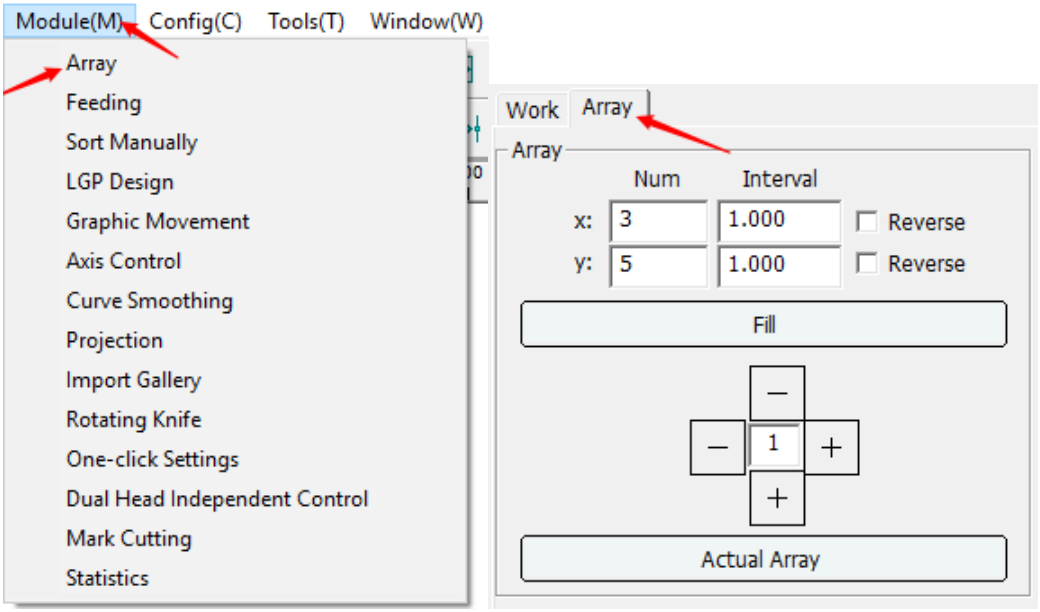
- **Current Position**: Indicates that the position of the currently copied graphic is the paste position.
- **Mouse Position**: Indicates that the position of pasted graphics changes with the movement of the mouse.

Drag immediately: After checking, you can drag any current figure without selecting the figure.

1.4.6 Module

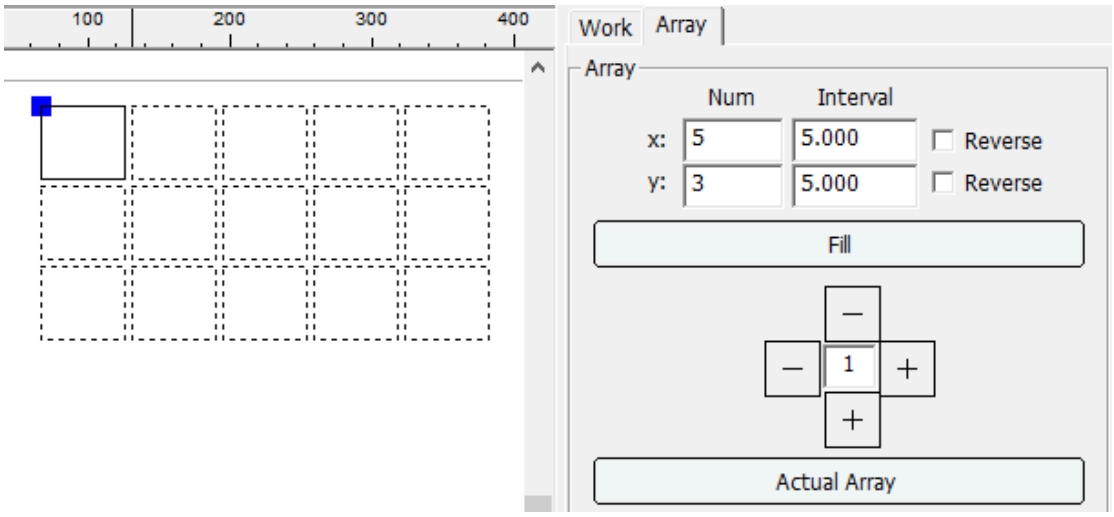
1.4.6.1 Graphics array

Open the array page to enable the [Array] function in the [Module] option in the software menu bar. After it is enabled, the [Array] function page will appear on the right toolbar of the software, as shown in the figure:

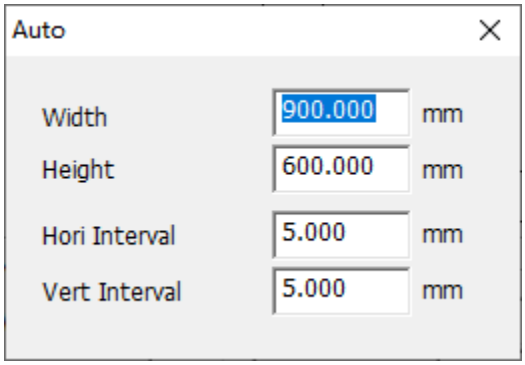


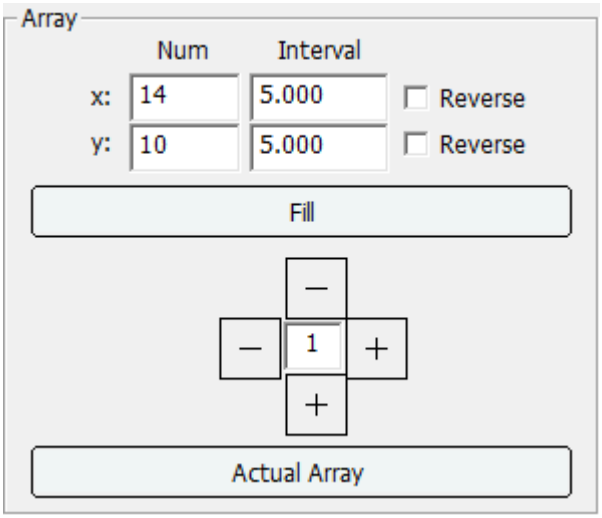
1.4.6.1.1 Virtual array

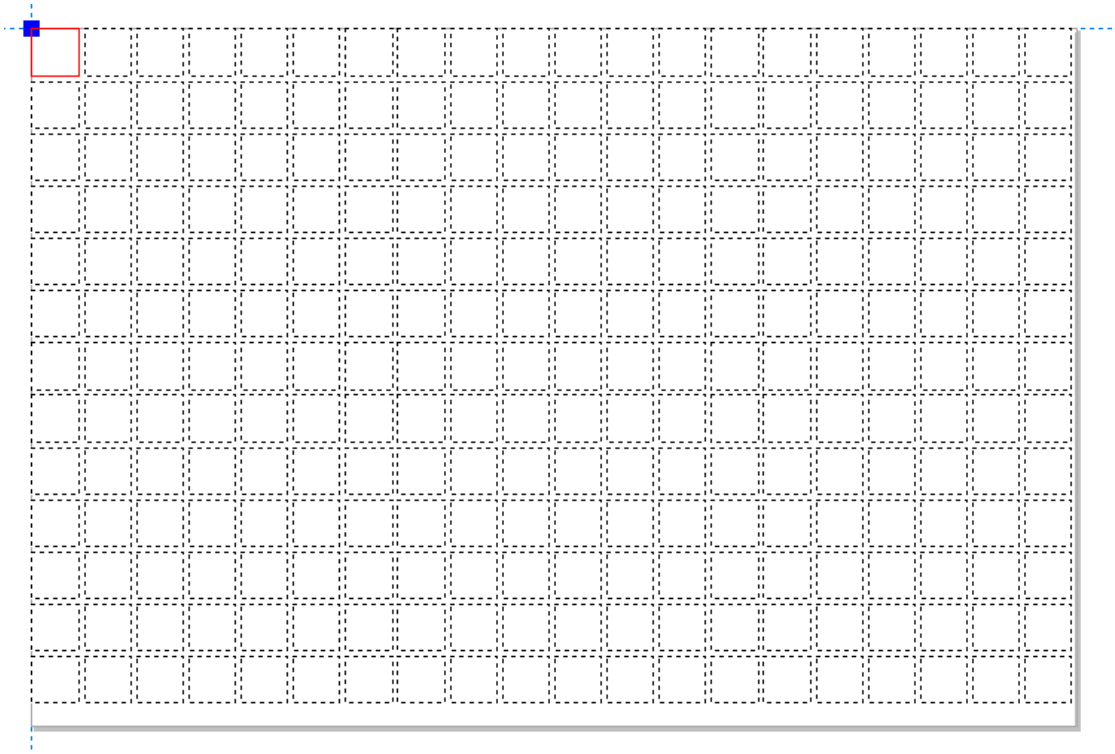
The [Array] page on the right side of dialog box toolbar is shown as the fig. below. If the Intelligence double laser heads machine is used, please select a virtual array to conduct type setting.



Click [Fill] button and automatic bestrewn setting dialog box would pop up. Input array scope value (width and height), the software will calculate columns, rows and remaining size of a specified breadth side based on the width, height and the interval value input by the user. Calculated parameters would be refreshed on the [Array] page, and generate a virtual graphic element.





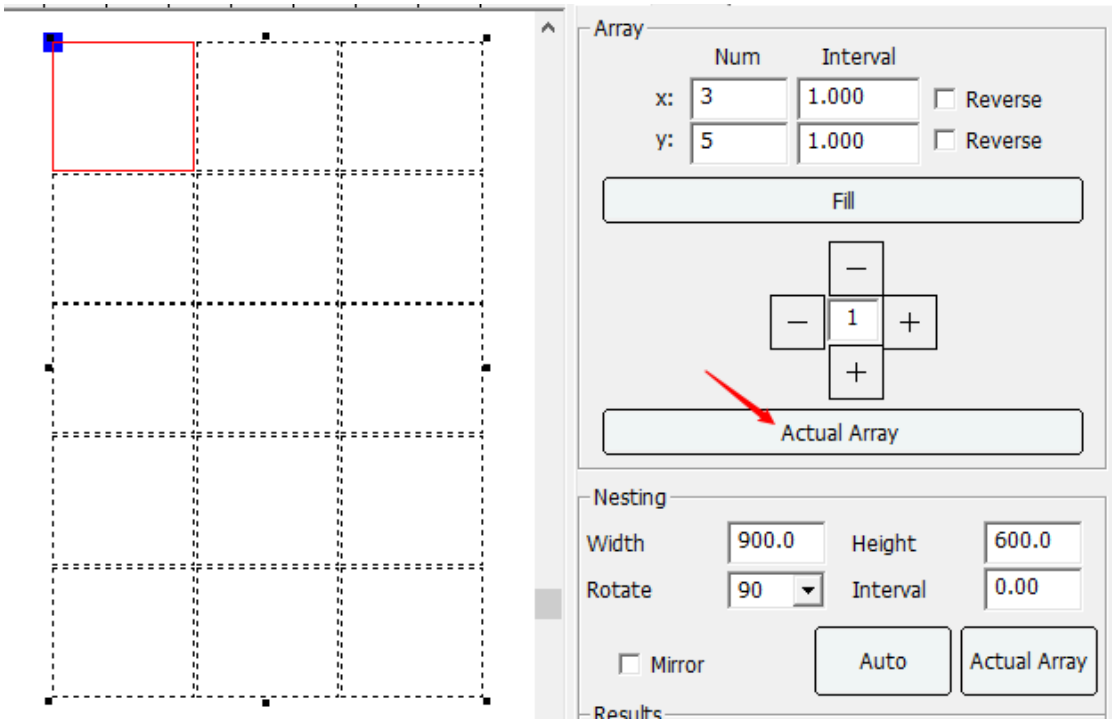


If bestrewn process isn’t required of, input the number of columns x and its interval, and the number of rows y and its interval after selecting graphic element, then graphic array is generated.

1.4.6.1.2 Actual array

Selected the graphic needs array.

1. Firstly, following the instruction of virtual array to generate the virtual array graphics.
2. Click the [Actual Array] button to convert the virtual array graphics to the real array graphics.

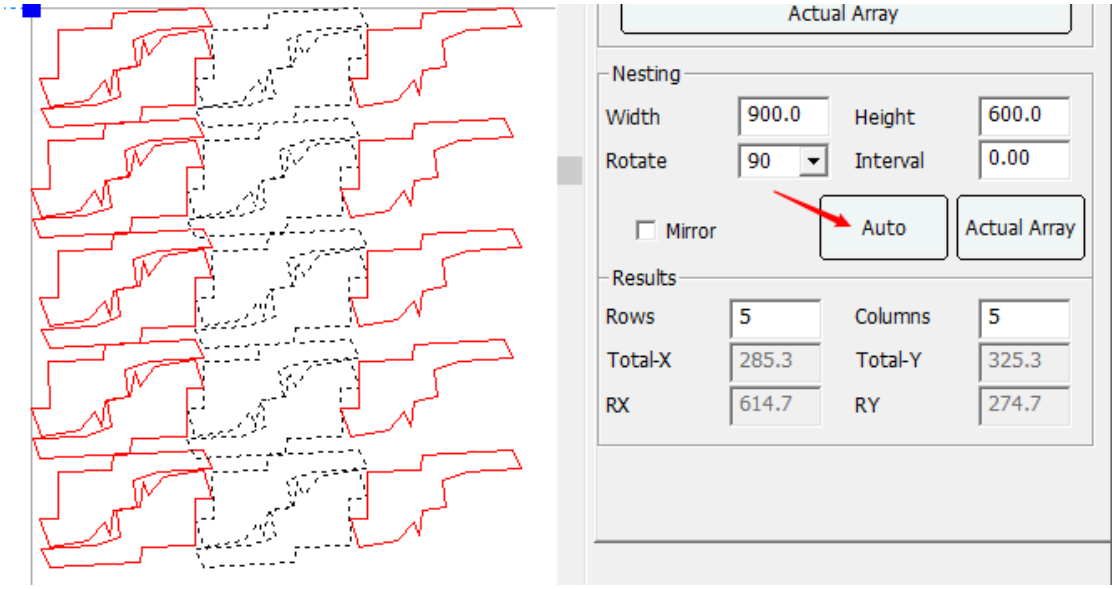


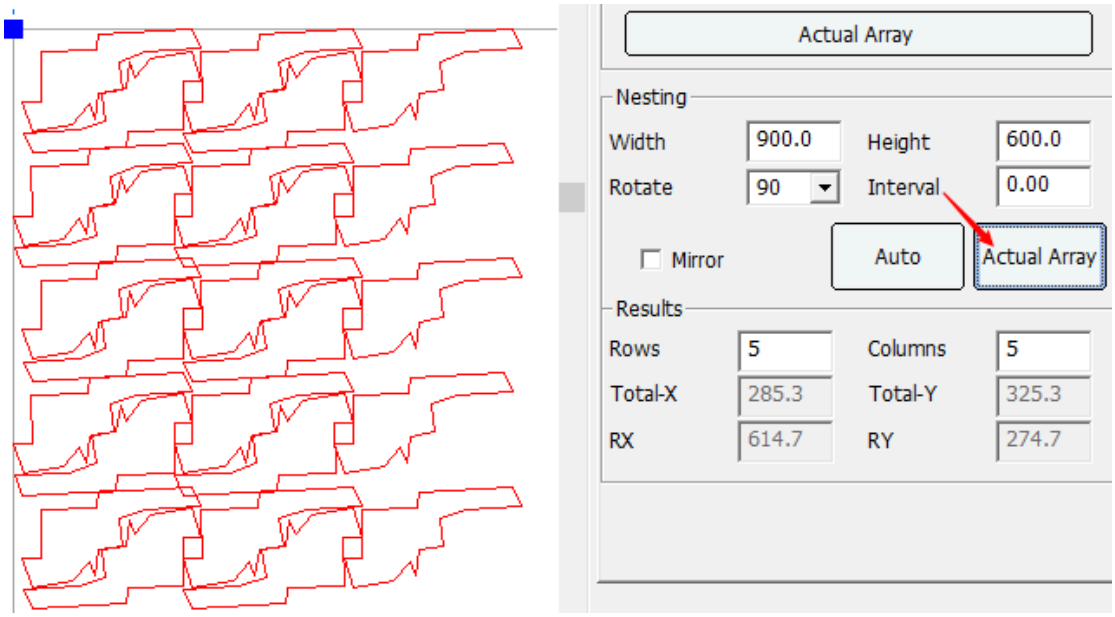
NOTE: The virtual array can be converted to actual array. But the actual array is unable to convert to virtual array.

1.4.6.2 Nesting

1.4.6.2.1 Auto nesting

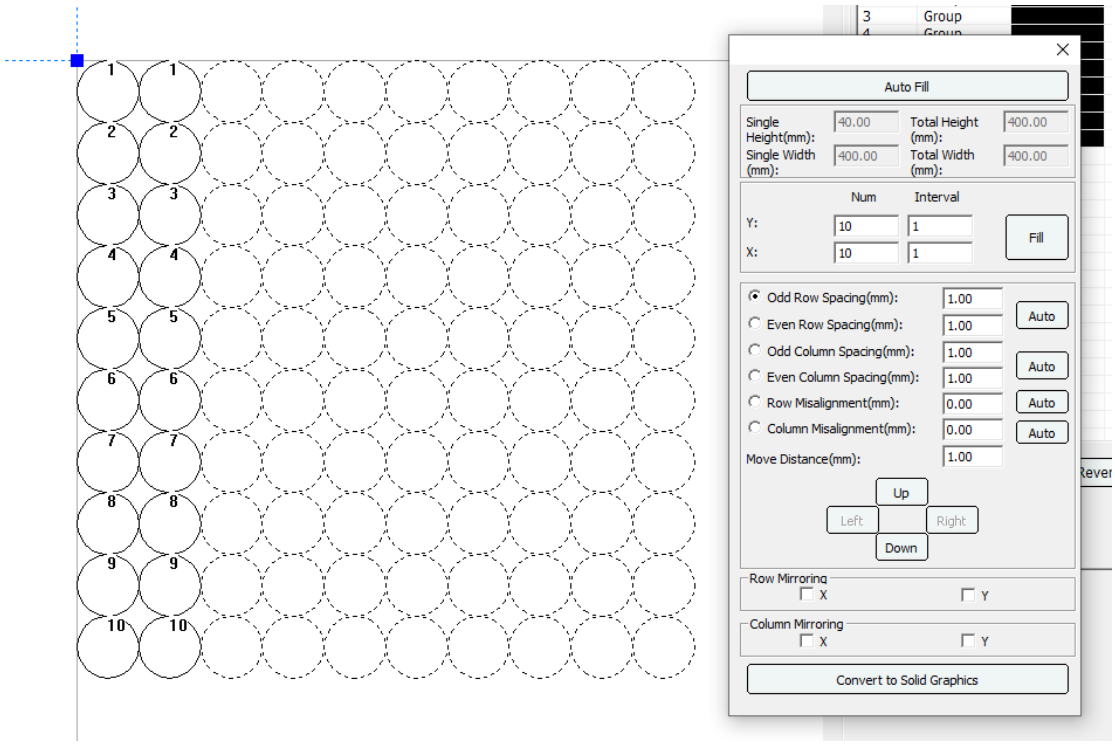
Import the graphic into the laser software. Then select it and open the array page to find out the nesting function. Input the width, height, rotate angle, interval and mirror option parameters. Then click the “Auto” button to nest. It will generate the virtual array by default, it can be used by the intelligence double laser heads machine. Click the “Actual Array” button to convert to the real array graphics. When converting to real array, the graphics is only able to be processed by one laser head. So if it is an intelligence double laser heads machine, it is advised to use virtual array.



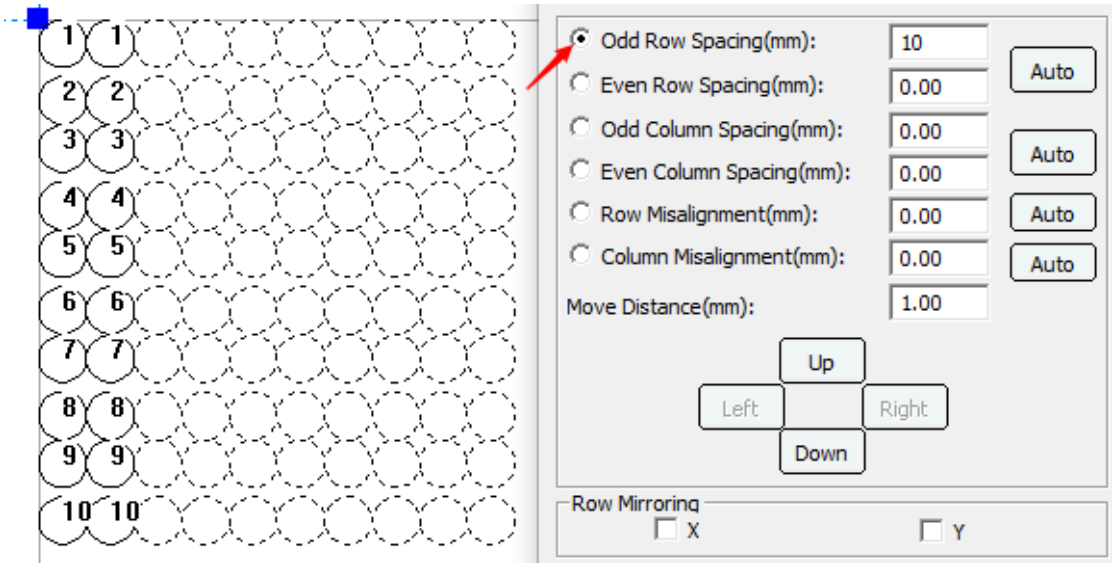


1.4.6.2.2 Manual nesting

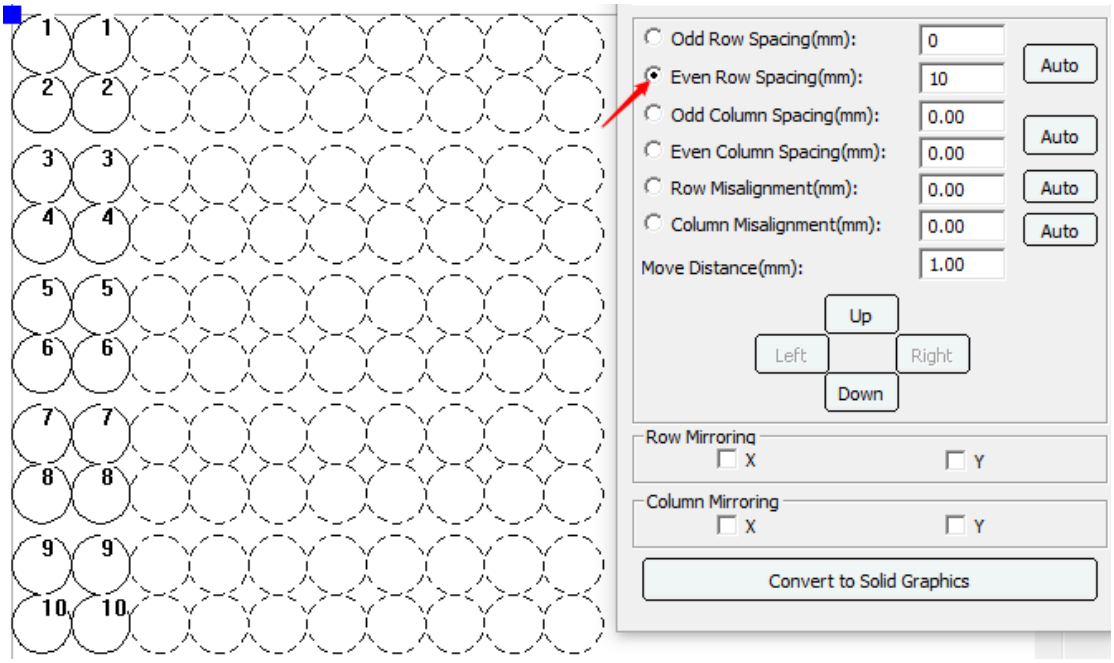
Import the graphic elements that need to be typed, and click the manual nesting button on the tool bar to pop up the manual layout setting interface. As shown:



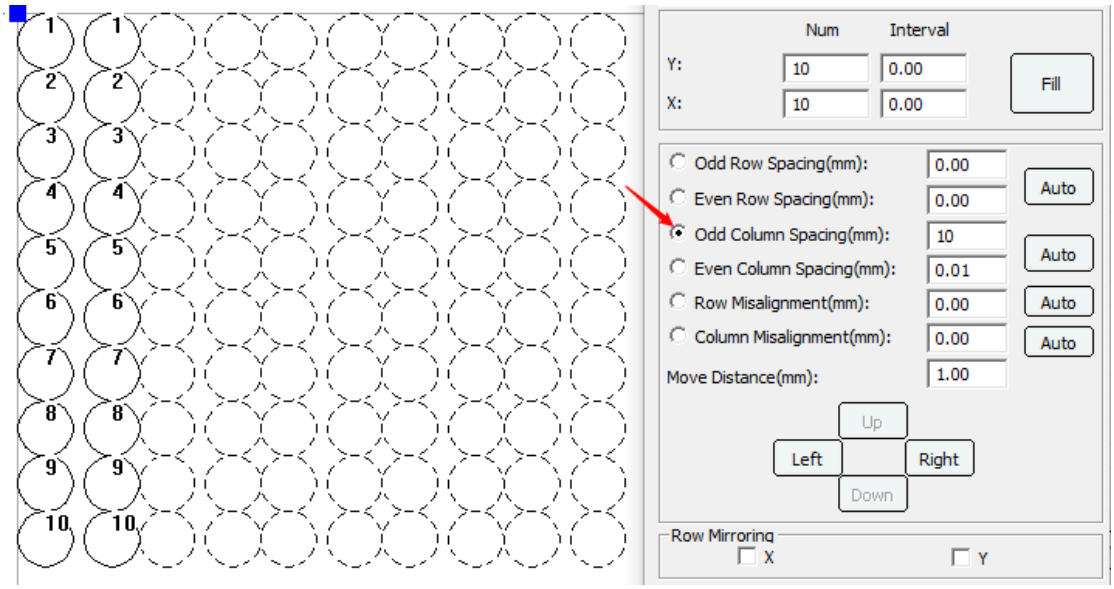
Odd Row Spacing (mm):



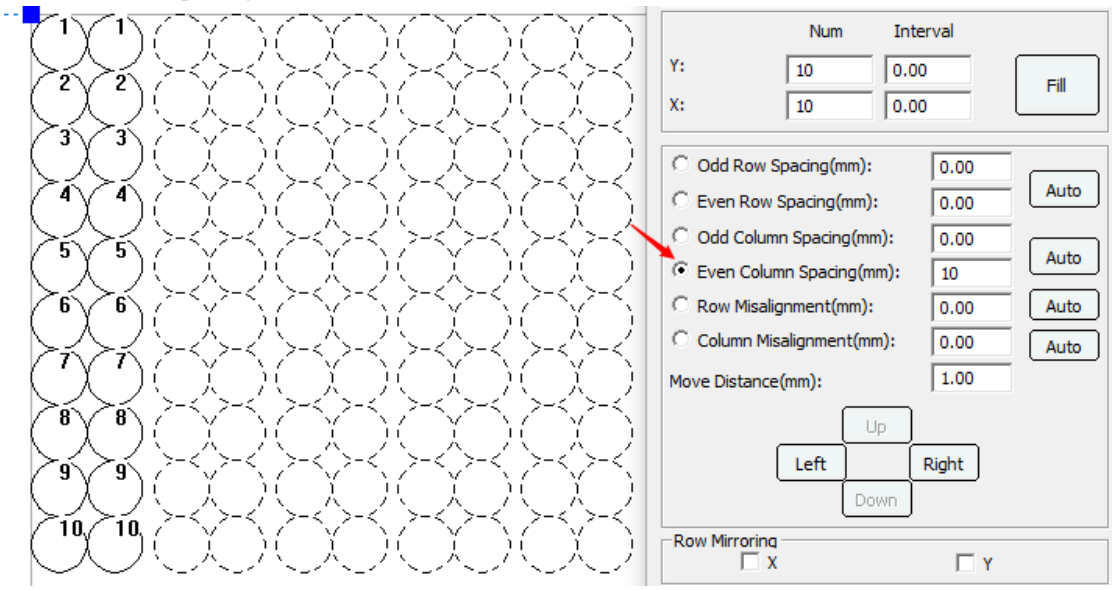
Even Row Spacing (mm):



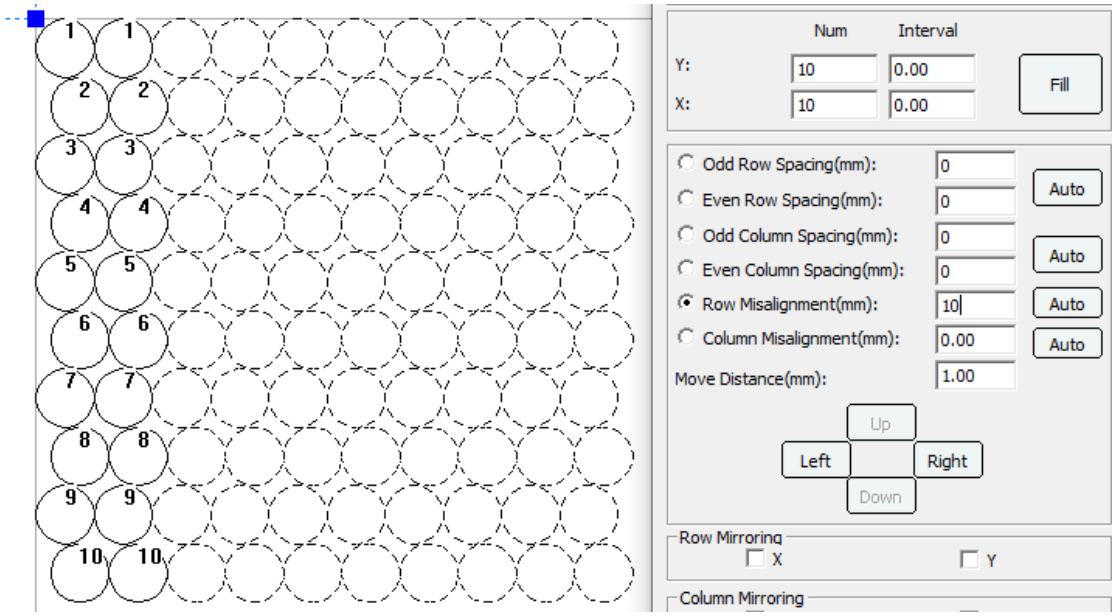
Odd Column Spacing (mm):



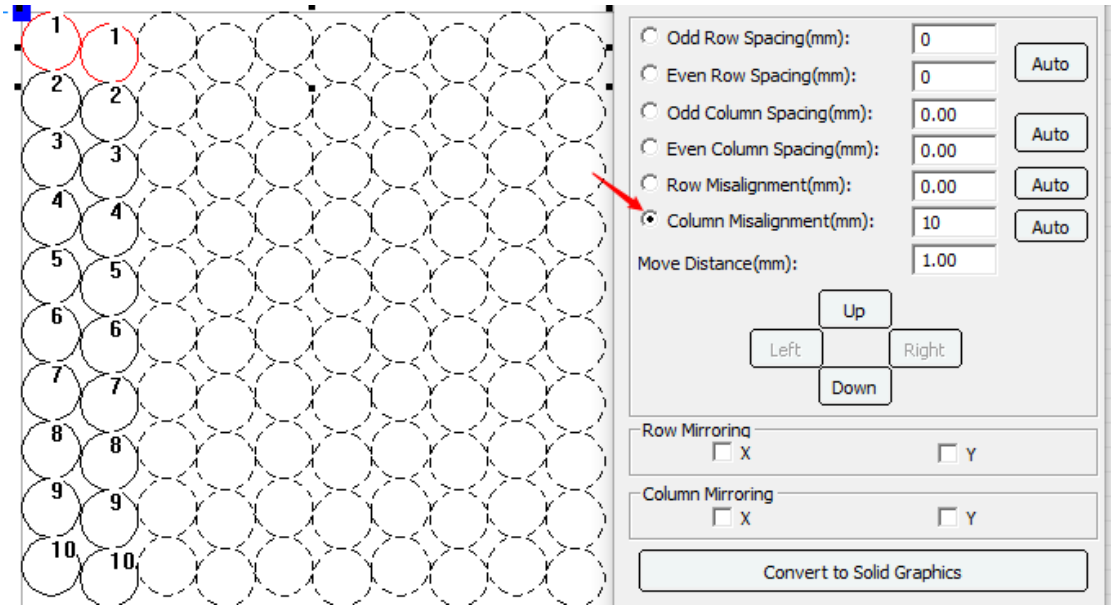
Even Column Spacing (mm):



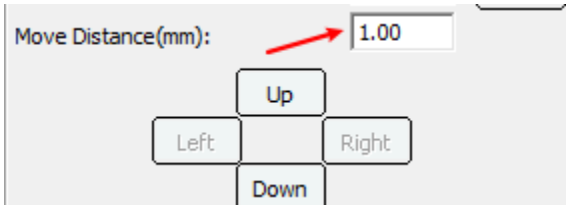
Row Misalignment (mm):



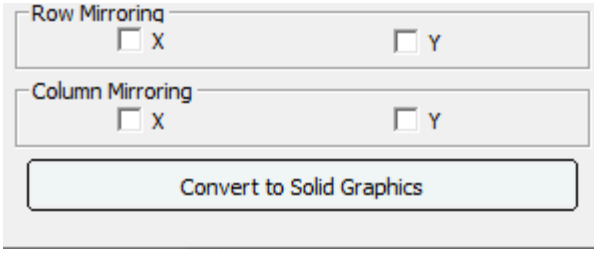
Column Misalignment (mm):



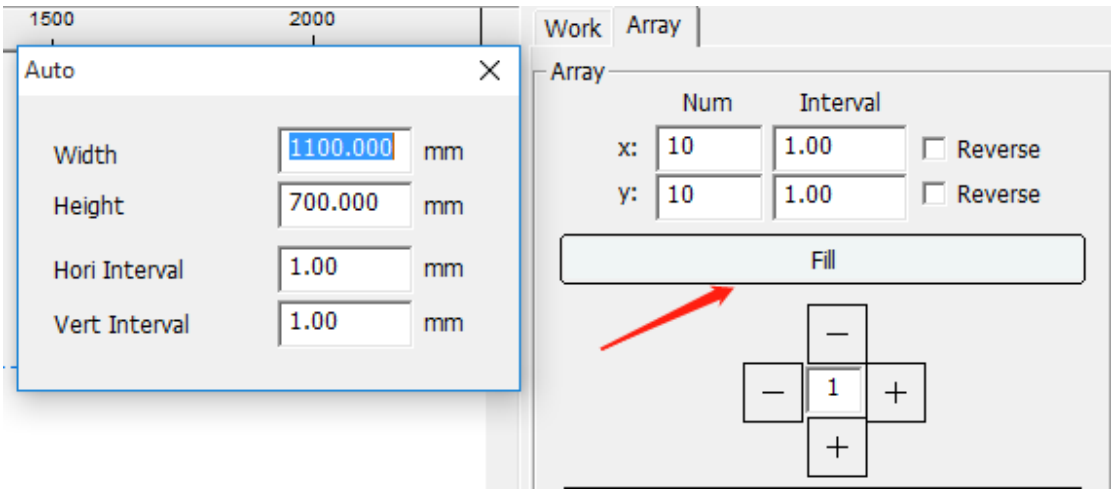
You can also use the "Move Distance" button to fine-tune the row and column misalignment. Just enter the distance you need to move.



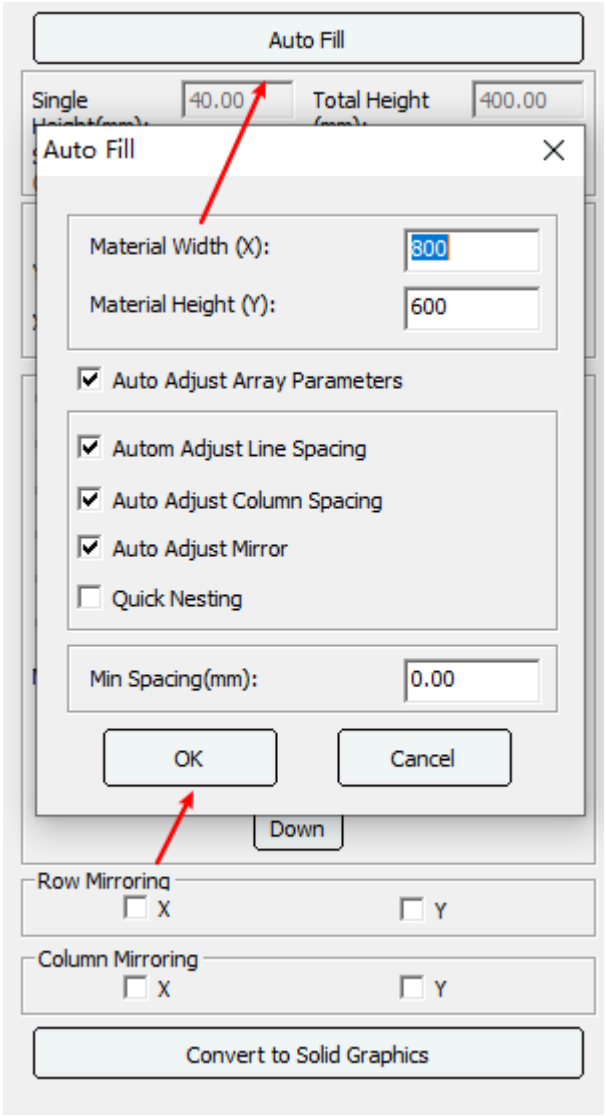
The row mirror and column mirror can be checked when necessary.



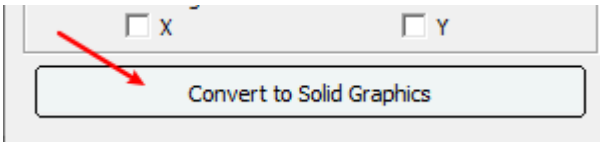
You can also use [Fill] to perform the array directly. As shown:



Automatically fill the format: Import the graphics and set the corresponding parameters, click OK!



The primitives arranged in the above nesting methods are all virtual arrays. The virtual array can support dual-head mutual shift processing, but the path optimization function is invalid. If you want to use the path optimization function, you only need to convert the virtual array primitives to real arrays. can. Click the [Convert to solid Graphics] button, and the double-head mutual movement function is invalid.

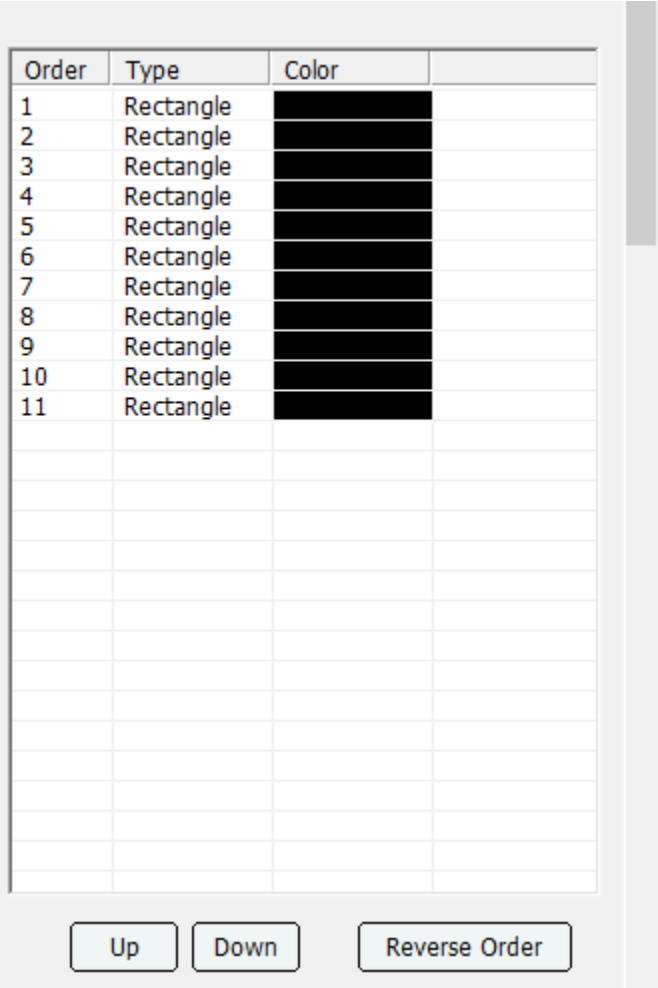


1.4.6.3 Feeding

Set the feeding times and feeding length of the file. For details, please refer to the feed processing and partition for over range of the example application.

1.4.6.4 Manual sorting

Select the graph in the list and click Up or Down button to change the order. Click twice on the sequence number in the list to modify the sequence number. Click [Reverse Order] to reverse the order.

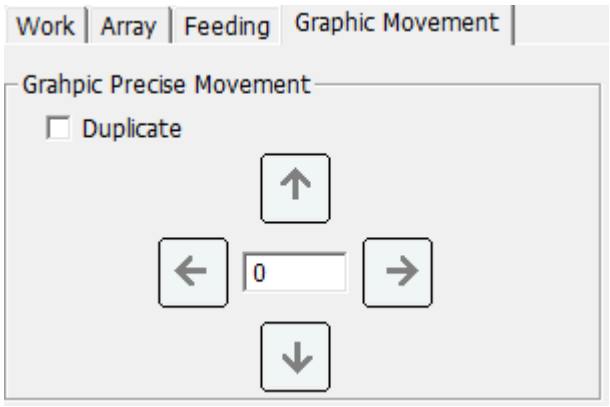


1.4.6.5 LGP design

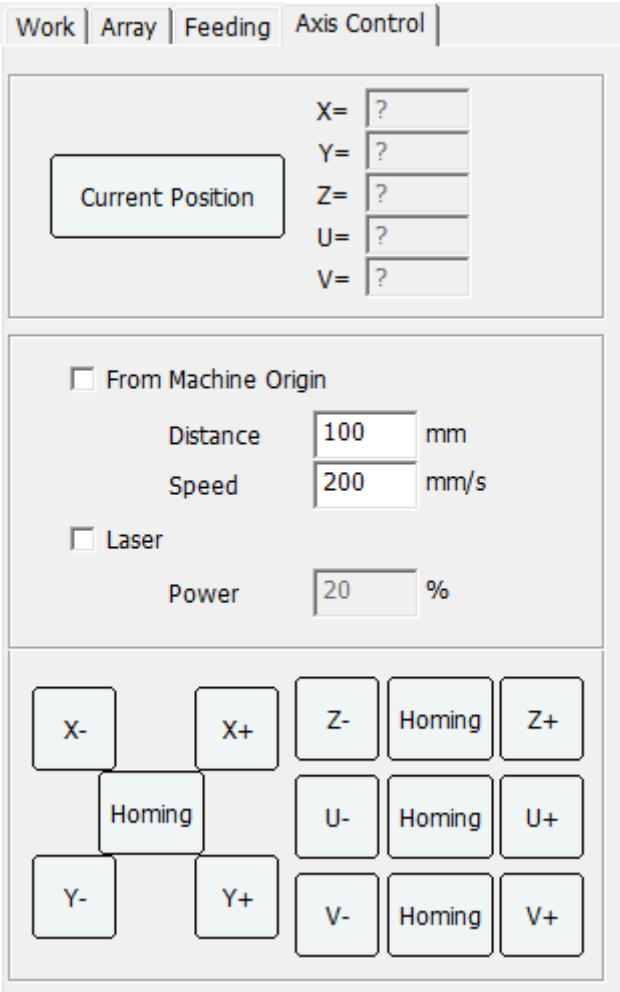
Used to design light guide plates.

1.4.6.6 Graphic movement

Enter data and move graphics accurately. Check [Duplicate], and after moving, copy and generate selected graphics.



1.4.6.7 Axis control



Current Position: Obtain machine coordinates.

From Machine Origin: Starting from the origin, move the specified distance at the specified speed.

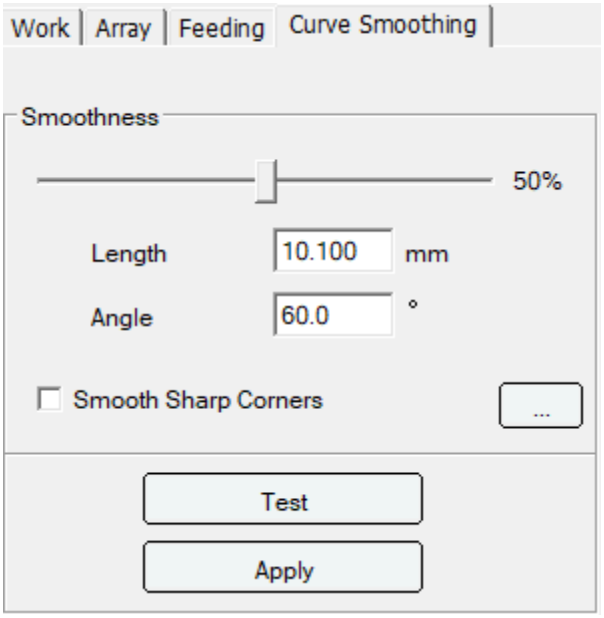
Laser: When moving, it emits light, and the laser power needs to be set.

Direction Keys: Press the direction keys to move each axis.

Homing: Move to the origin coordinate.

1.4.6.8 Curve smoothing

Used to smooth line segments. The greater the smoothness, the closer to the original image. After checking the sharp corner smooth, the sharp corner will be replaced by an arc. Click [Test] to preview the effect. Click [Apply] to finish smoothing.

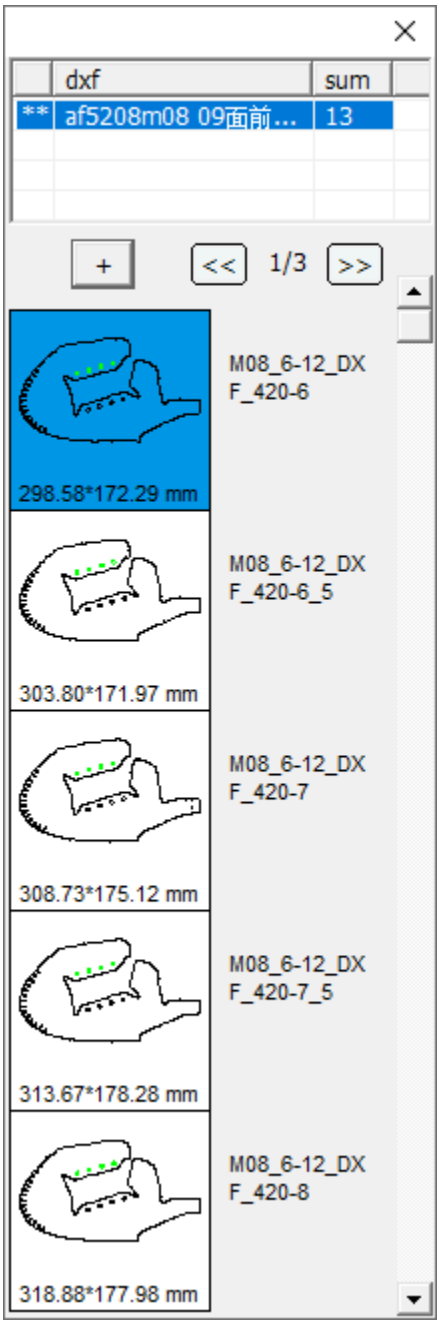


1.4.6.9 Projection

Use with projector. See Part 3 for details.

1.4.6.110 Import gallery

When the dxf file is in the form of a gallery, please use the import gallery function. Select [Module], [Import Gallery], open the dialog box, click + to open the file, click << and >> to turn pages. Select the graph in the graph list, double-click the right button to import the graph into the editing area.

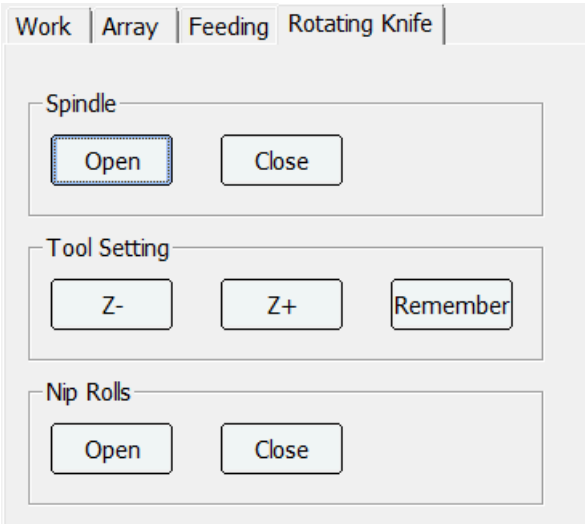


1.4.6.11 Rotating knife

Spindle: Turn on or off the spindle.

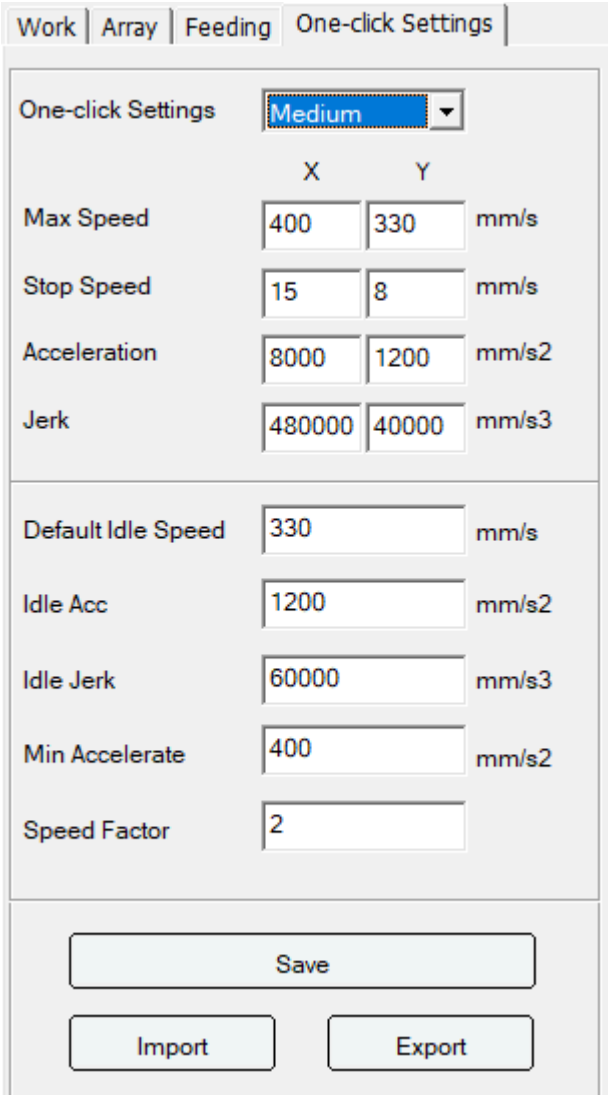
Tool setting: Press Z+/Z- key to move the cutting head, press [Remember(Record)], and record the Z axis coordinate as the current processing position.

Nip rolls: Open or close the pressing roller.



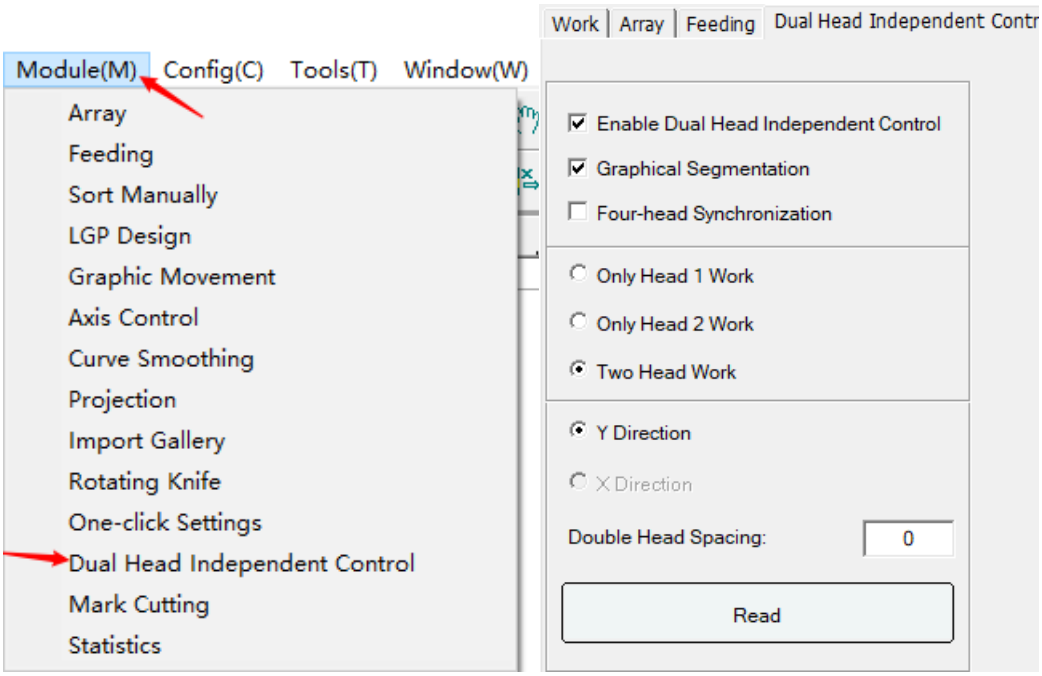
1.4.6.12 One-click settings

Three groups of motion parameters can be set fast, medium and slow, corresponding to different processing materials and processes. Click [Save] to write the parameters into the control card. Back up parameters through [Import] and [Export].



1.4.6.13 Dual head independent control

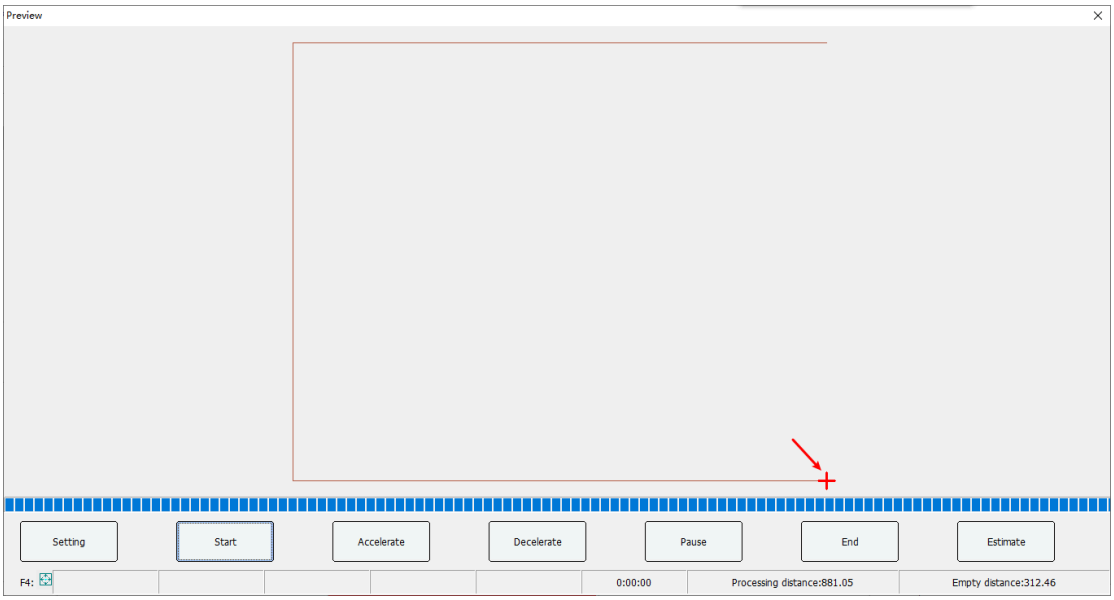
Click [Module] of the software and select [Dual Head Independent Control], the following window will pop up on the right side of the work bar.



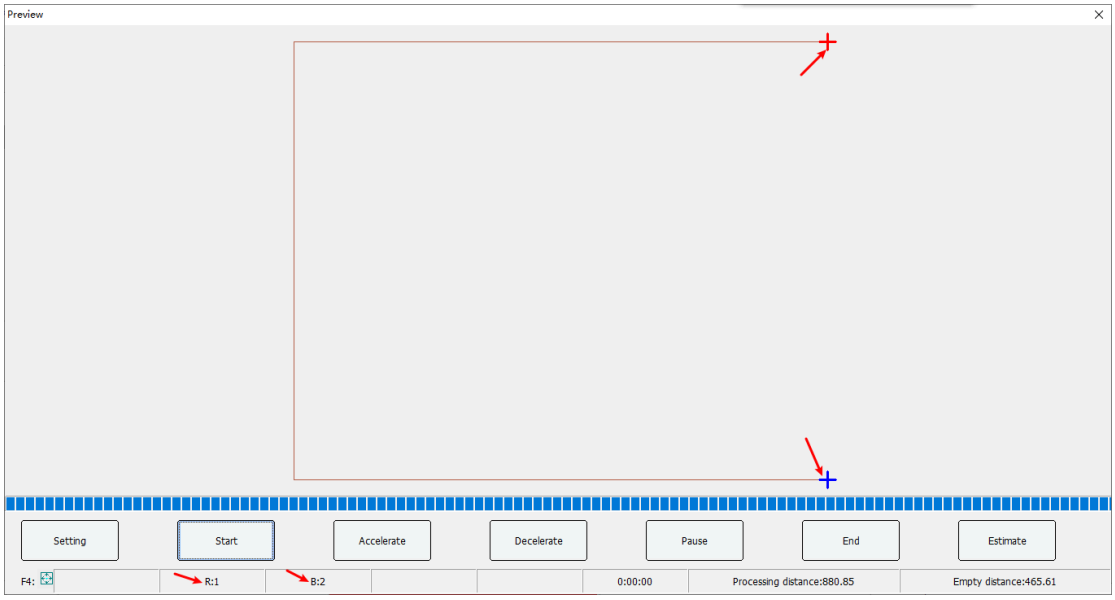
Enable Dual Head Independent Control: Whether to enable the dual-head independent control function.

Graphical Segmentation: Whether it is necessary to split a whole picture element. If it is checked, it is segmentation, otherwise it will not split the primitives. As shown:

Before splitting: Only Y1 head is processed.



After splitting: Y1 and Y2 cut in half each.



Four-Head Synchronization: It is used for asynchronous + mutual movement. When four-head model is used, four heads synchronously cut array graphics. Work situation: The cutting graphics must be virtual array graphics; In the control card, set the return point as the Start Point.

Only Head 1 Work: All cutting work will be completed by Y1, Y2 will not participate in cutting. The same is true in X-direction double-head mode.
Only Head 2 Work: All cutting work will be completed by Y2, Y1 does not participate in cutting. The same is true in X-direction double-head mode.
Two Heads Work: It means that Y1(X1) and Y2(X2) are both involved in cutting.
Y Direction: It means that there are two beams in the Y direction: Y1 (Near the origin) and Y2.
X Direction: It means that there are two beams in the X direction: X1 (Near the origin) and X2 .
Double Head Spacing: Used to display the current distance between the two beams of Y1 Y2 or X1 X2.
Read: Read the distance between the two beams between Y1 and Y2 or X1 and X2.

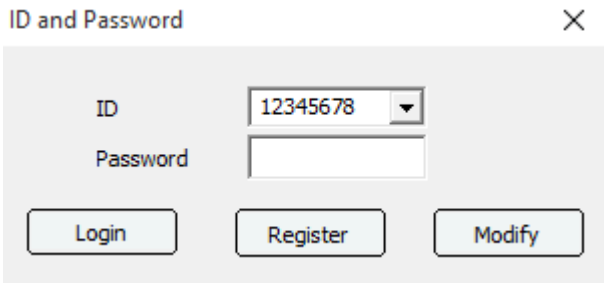
1.4.6.14 Mark point cutting

Mark point positioning and cutting function. See Part 4 for details.

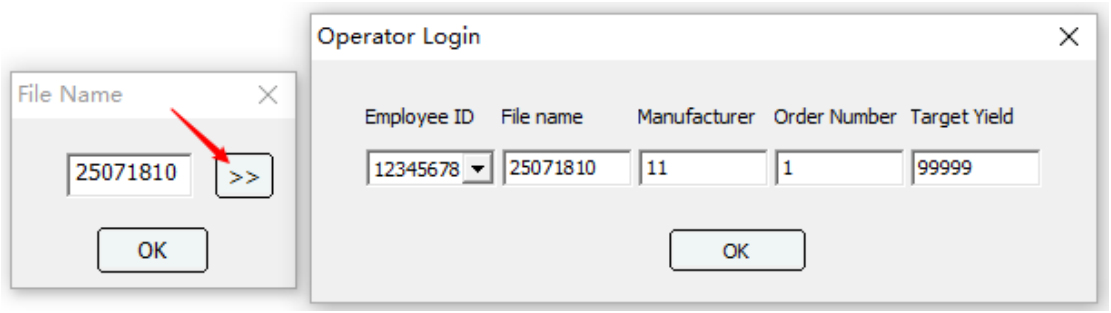
1.4.6.15 Statistics

When downloading files and setting order information, in the statistical function, you can read the file processing information of the control card.

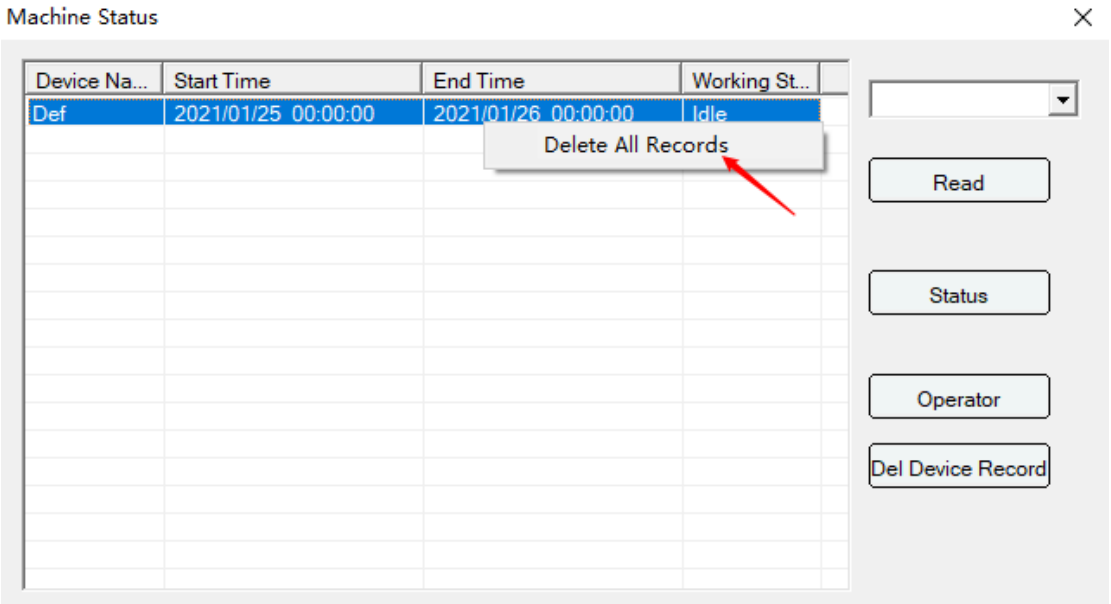
1. Click [Register] first, enter the verification code 00000000, and then create an administrator account and password.



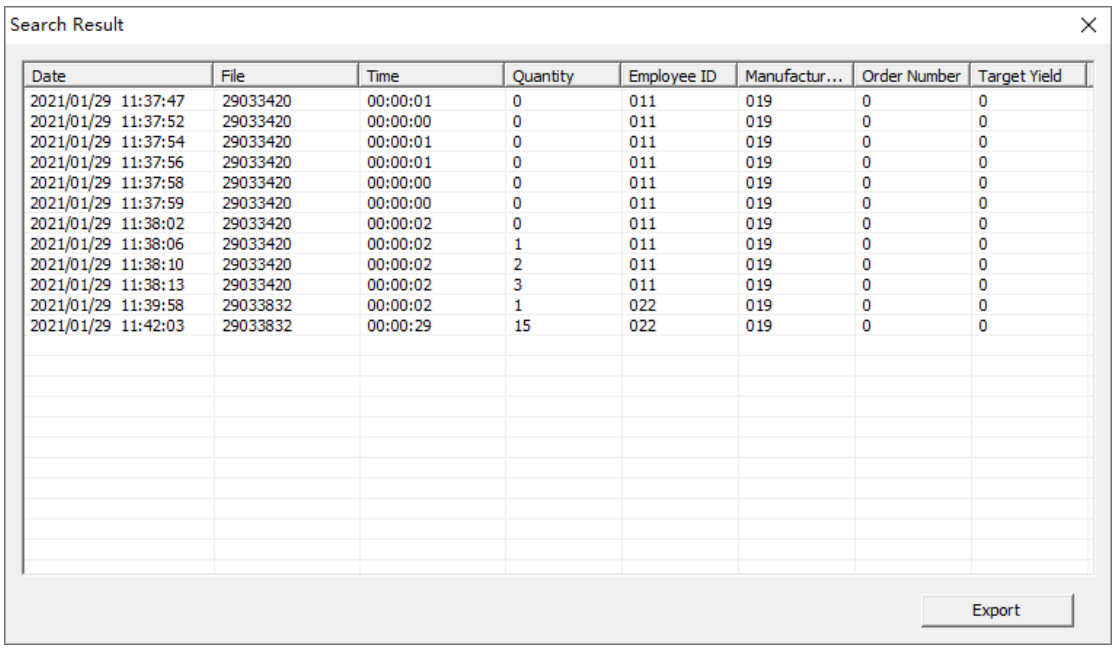
2. Click [Login], select the administrator account and enter the password to log in.
3. Click [Operator] to create an operator account and password.
4. Click the extended button >> in the download dialog box and enter the operator and order information.



5. When the order has been processed. Enter the statistical function page again, set the start time and end time of the query, and in the upper right corner drop-down box, select the corresponding machine port, click the [Read] button to read the machine record.
6. If you need to clear machine records, click [Del Device Record].



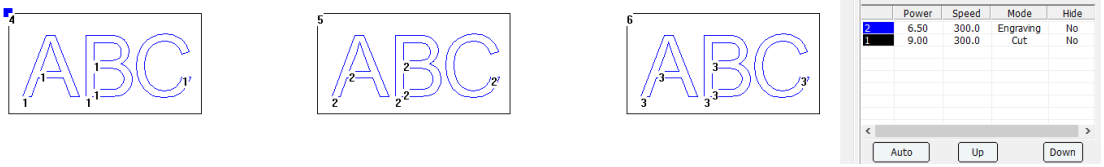
7. If you need to clear all the records that have been read and saved in the computer, right-click and select the list and select [Delete All Records].



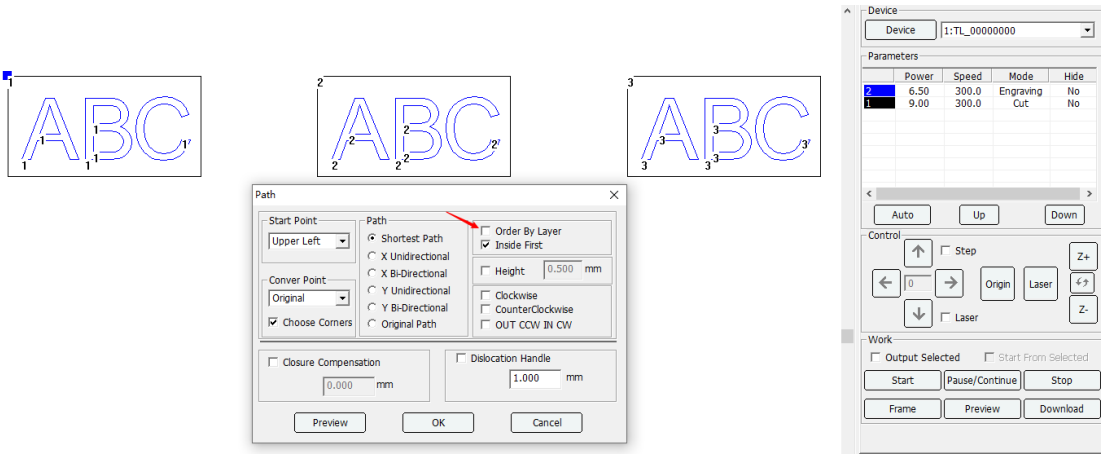
1.4.7 Group

It is able to group the graphics in the same layer or different layer. Select the graphics need to group.

Then Click “Group” button .Before:



After:

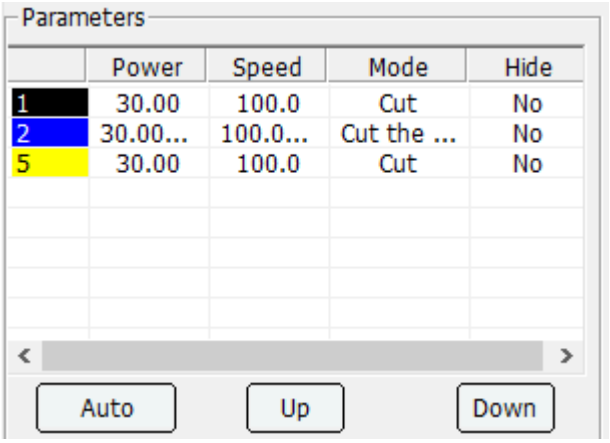


Note: The cutting path is changed when use the group function.

1.5 Output processing

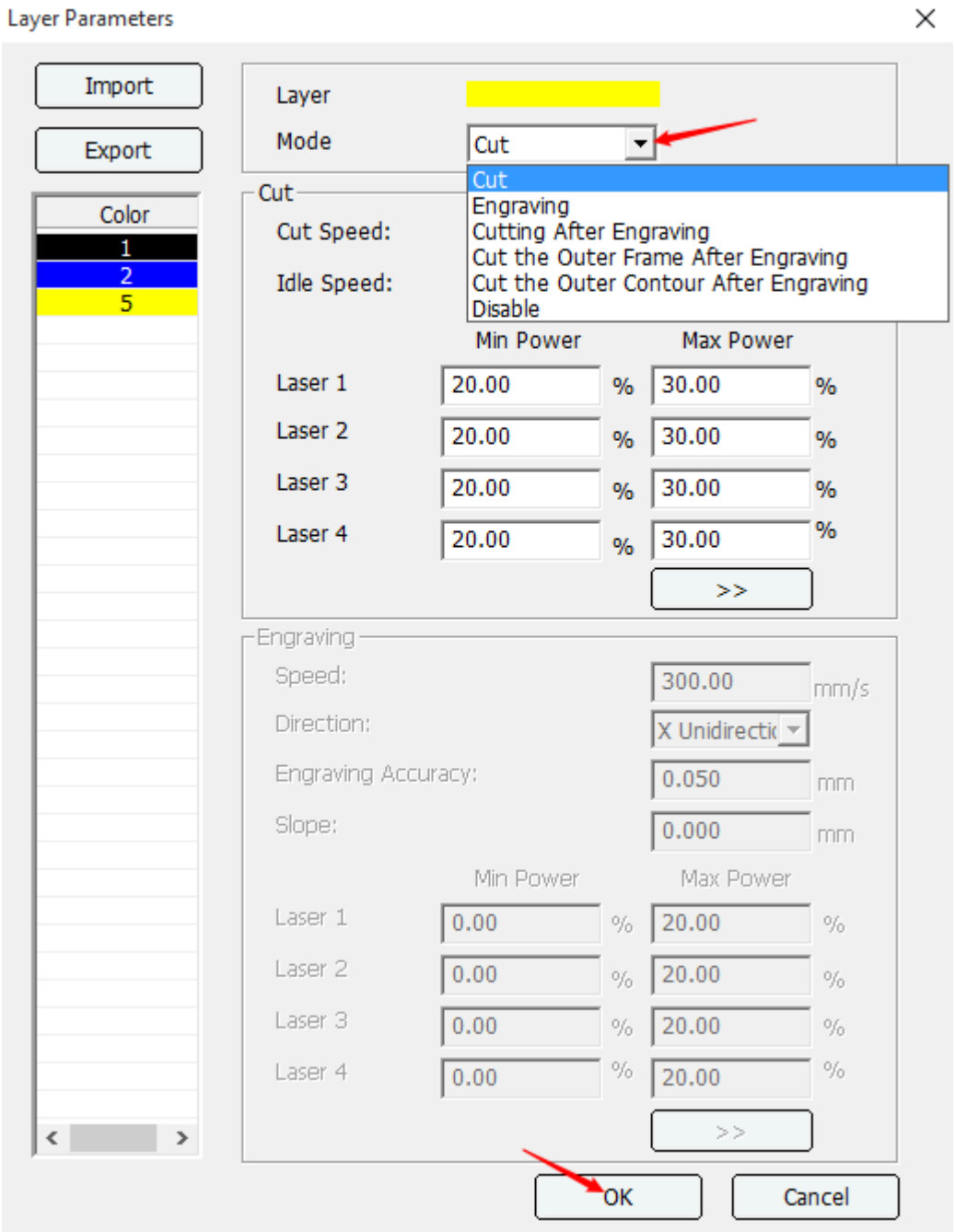
1.5.1 Layer parameter

Layer parameters are set for colors. The graphics in the same color are used the same layer parameters. There is a layer parameter list under the "work" interface of the right side of the dialog box toolbar of the main interface.



In the list, if the color order is topper, then the graphic in this color will priority to be processed. After a layer is selected, click the [Up] or [Down] button to change the processing order. Click the [Auto] button to automatically sort.

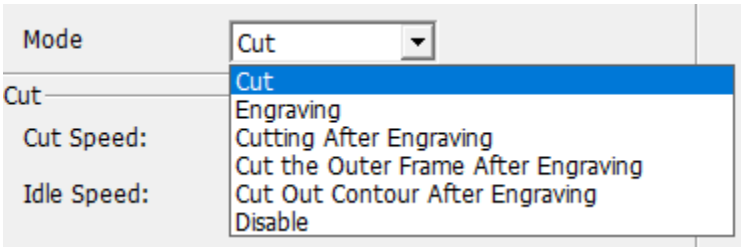
Select a layer and double click the mouse to open parameter setting dialogue box as the figure shown below.



Set parameters for the present layer. It is able to import or export layer parameters use the [Import] and [Export] button.

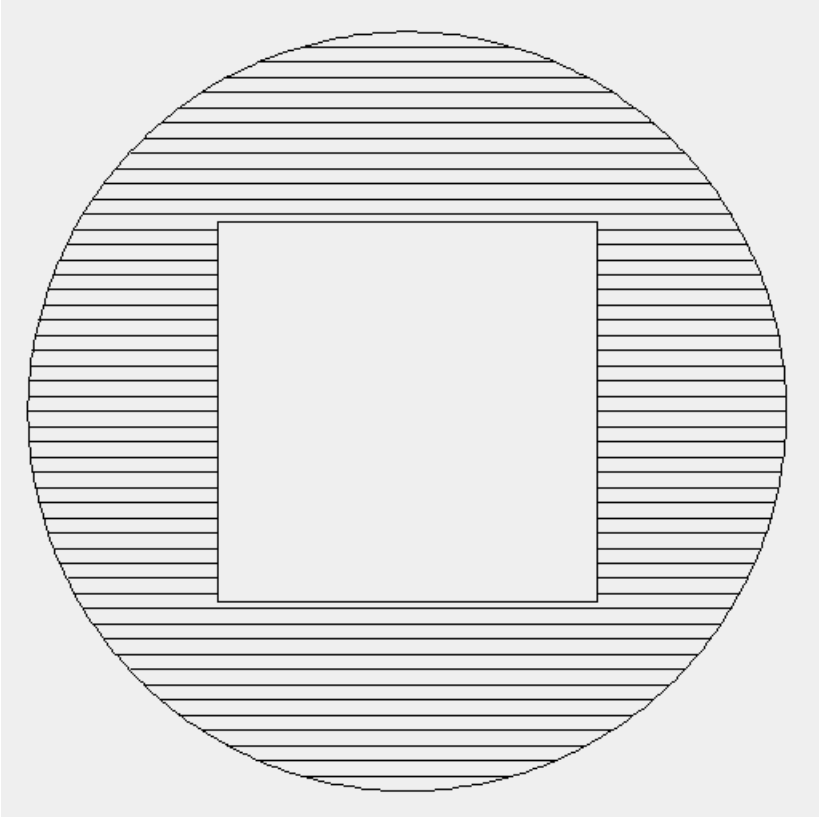
1.5.1.1 Processing Mode

Set different processing methods for the current layer.

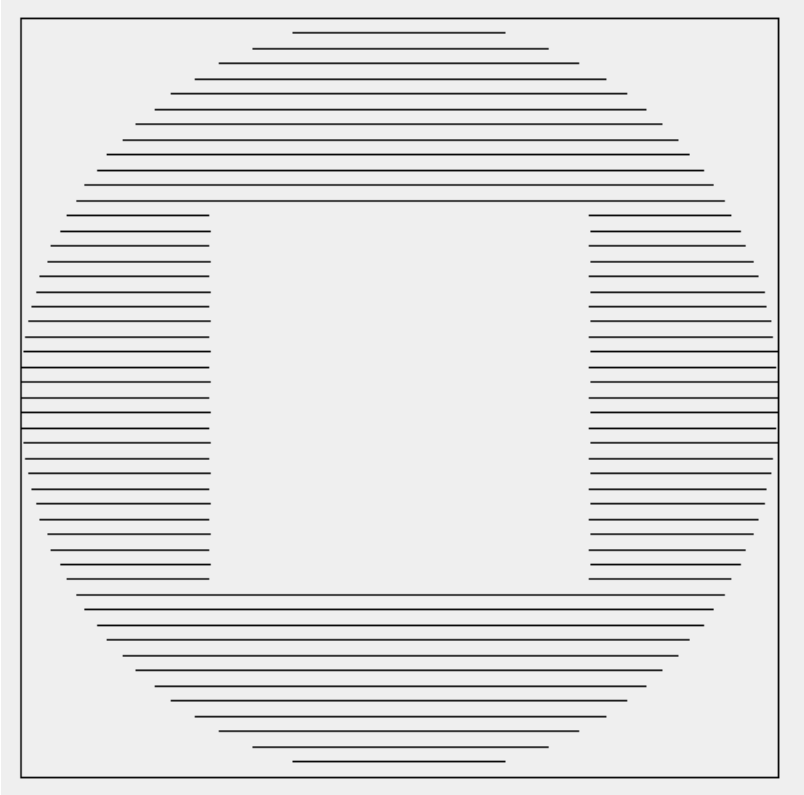


Cut: The processing only does the cutting action.

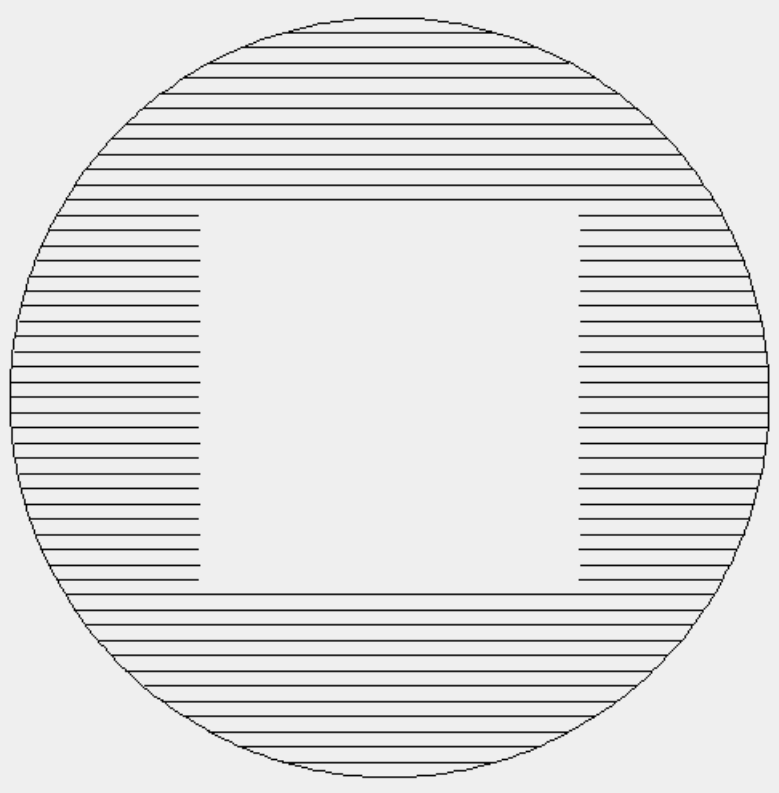
Engraving: The processing only performs engraving.
Cutting After Engraving: Engraving is done first, and then the contour of the cut primitive is done after engraving.



Cut the Outer Frame After Engraving: First make the engraving action, and then perform the external rectangle cutting action according to the size of the primitives after engraving.



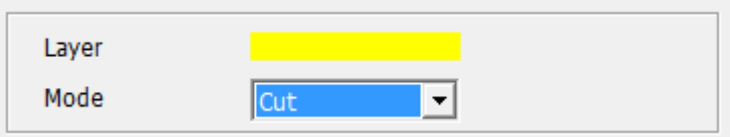
Cut the Outer Contour After Engraving: Make the engraving action first, and then cut the contour of the outermost figure after engraving.

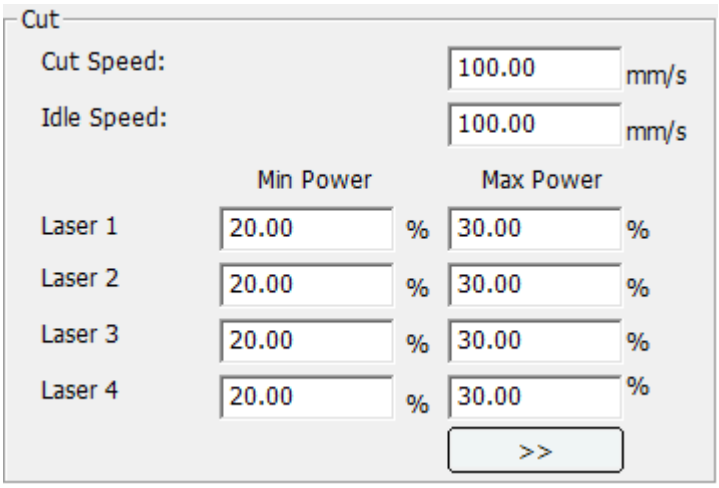


Disable: No engraving and cutting action, used for primitive alignment.

1.5.1.2 Cutting parameters

To set the cutting parameters, you need to adjust the processing method to [Cut] option:





Cut Speed: Refers to movement speed of laser head when cutting. When it is set to 0, the default processing speed of control card is adopted.

Idle Speed: Refers to movement speed of laser head with laser off or non-processing status. When it is set to 0, the default processing speed of control card is adopted.

Min Power: Refers to the laser power of the laser at the turning corner.

Max Power: Refers to the laser power of the while it arriving at the cutting speed.

>>: Click the extension button, and cutting extension settings dialog box would pop up.

Blowing: Defines whether air pump is started in the machine working process; if [Blowing] is clicked, [Auto Ctrl] is clicked, the machine will only "blowing" when laser on; if [Blowing] is clicked, while [Auto Ctrl] is not clicked, the machine will "blow" through the whole process.

Perforation Mode: After enabling, drilling can be realized at the start or end of the cutting graph

- **Perforation Delay**: Defines the specified waiting time of the laser on during drilling.
- **Interval**: Defines the specified waiting time of the laser off during drilling.
- **Power**: Refers to light power intensity during drilling.
- **Start Perforation**: Refers to the times for machines to conduct pulse drilling at the starting point.
- **End Perforation**: Refers to the times for machines to conduct pulse drilling at the end point.

Dot Mode: Refers to the working mode in which the user is allowed to make continuous line graphics in discontinuous dots pattern.

- **Interval**: The distance between dots.
- **Delay**: Refers to the time to open the laser processing point.

Delay After: Refers to the delay time in the same place after layer processing is completed.

Pause After Layer Processing: Refers to work pause after layer processing is completed.

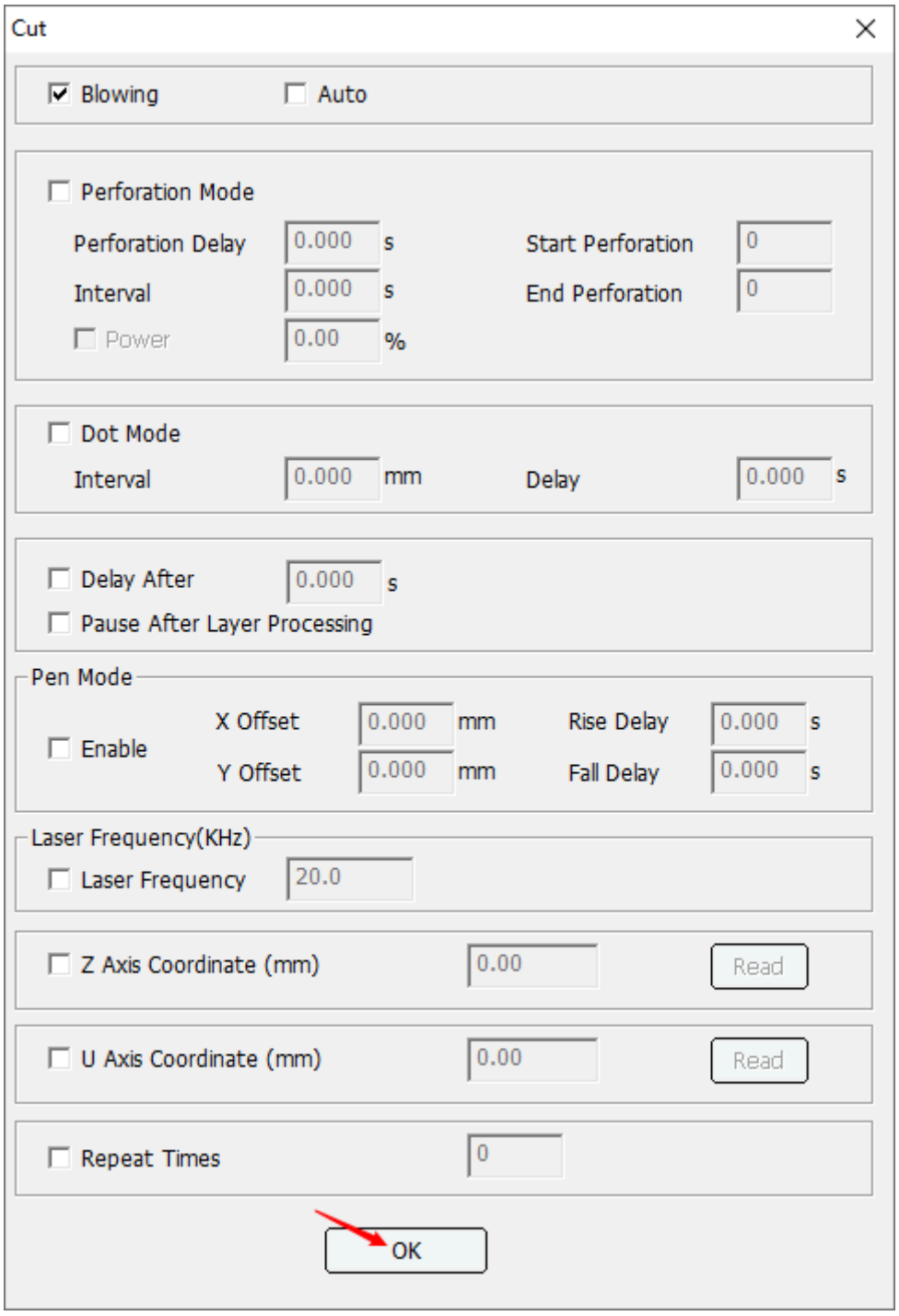
Pen Mode: When pen model is enable, set its offset between the pen and the laser head, and set the delay for pen rising / falling.

Laser Frequency: This function is only used for radio frequency laser tube, and the laser frequency can be set on the corresponding layer. This function is invalid for carbon dioxide tube.

Z-Axis Coordinate: When enabled, first move to the specified Z-axis coordinate position, and then process.

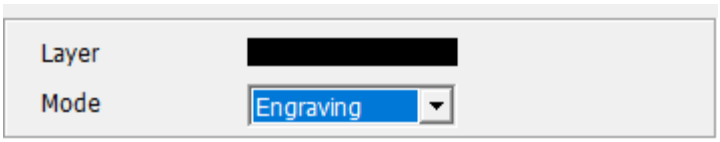
U-Axis Coordinate: When enabled, first move to the specified U-axis coordinate position, and then process.

Repeat Times: Used to set the number of repeated processing of the current layer.



1.5.1.3 Engraving parameter

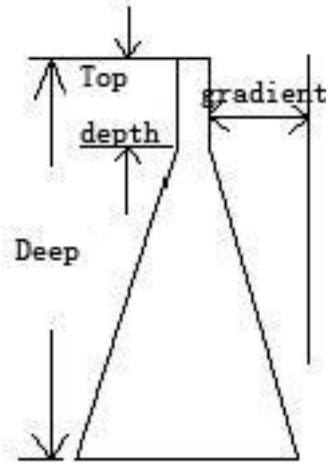
Select [Engraving] option before setting engraving parameters.



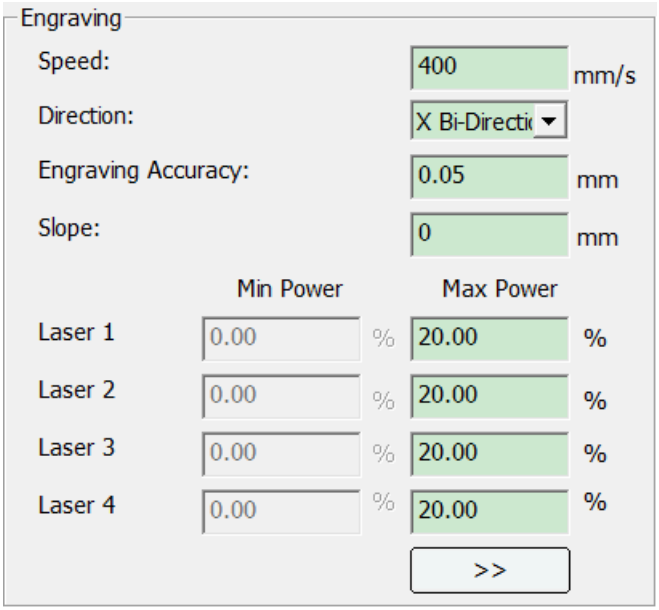
Speed: Refers to the working speed.

Direction: Refers to working method during engraving process, including "X Unidirectional","X Bi-directional" and "Y Unidirectional","Y Bi-directional" modes.

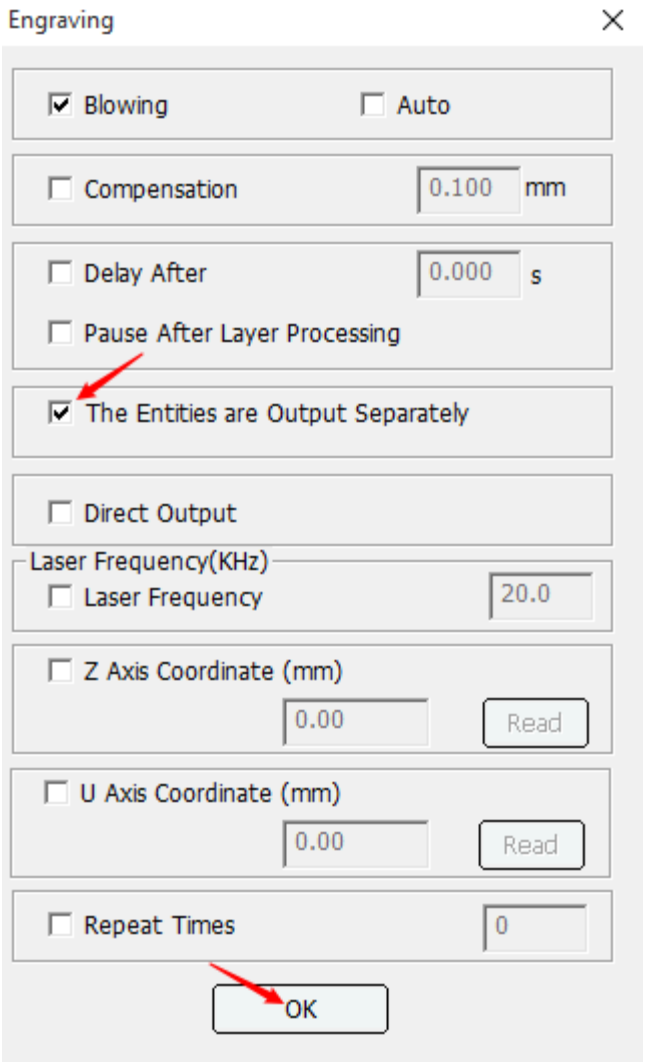
Engraving Accuracy: Refers to the interval distance between the adjacent two carving lines.
Slope: Refers to the gradient length set for slope carving. min power determines the top depth. The greater the min power, the deeper the top depth. The max power decides the depth of the graphics. The greater the power value, the deeper the depth. Slope distance determines the distance from the top to the bottom, the longer the distance, the flatter the slope.



Min Power: Refers to the light intensity of slope carving depth in processing.
Max Power: Refers to the light intensity of carving process or the light intensity at the deepest location of the processing graphic when slopes are carved.



> >: Click the extend button, carving extension setting dialog box would pop up, then click open:



Blowing: Defines whether the fan is started in the machine working process; if [Blowing] and [Auto Ctrl] is clicked, the machine will “blow” when it is engraving; if [Blowing] is Clicked, but [Auto Ctrl]] is not clicked, the machine will “blowing” through the whole process.

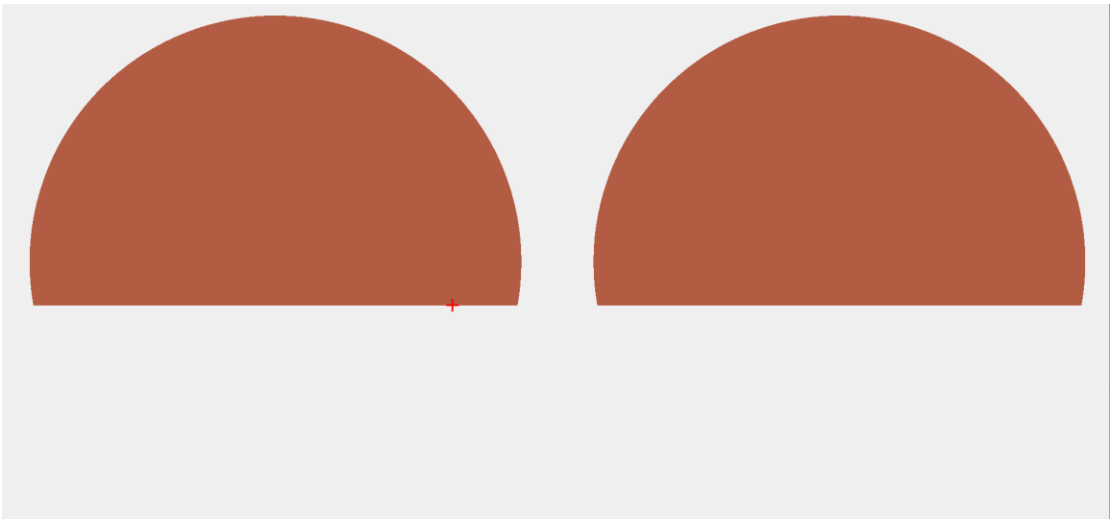
Compensation: Refers to compensation for problems such as small size or fuzziness of processing graphics.

Delay After: Refers to the delay time in the same place after layer processing is completed.

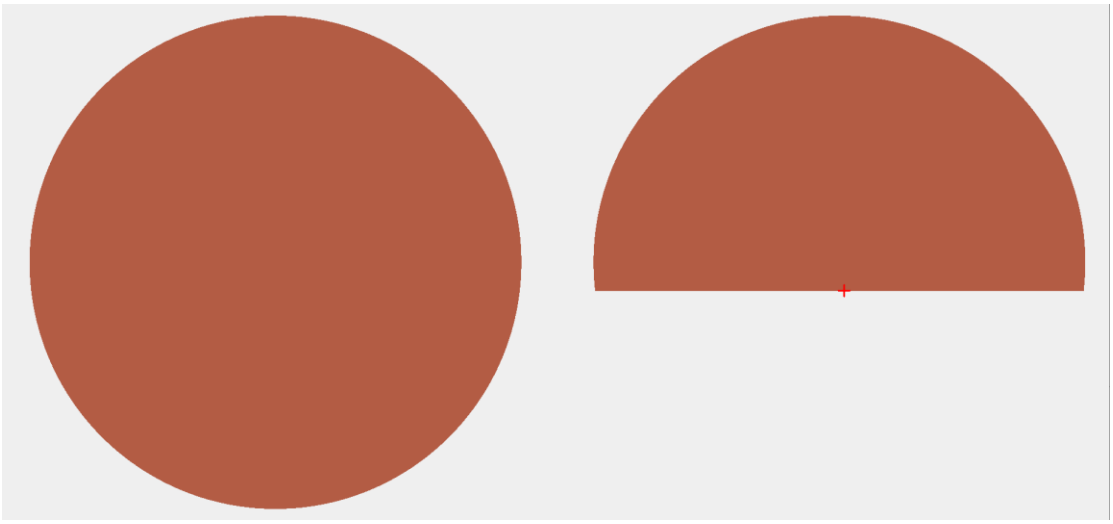
Pause After Layer Processing: Refers to work pause after layer processing is completed.

The Entities are Ouput Separately: Refers to the vector graphics that is carved one after another. The result is shown as below.

Before:



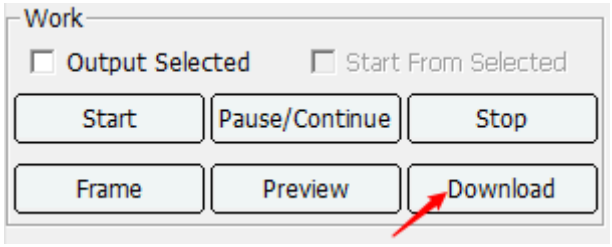
After:

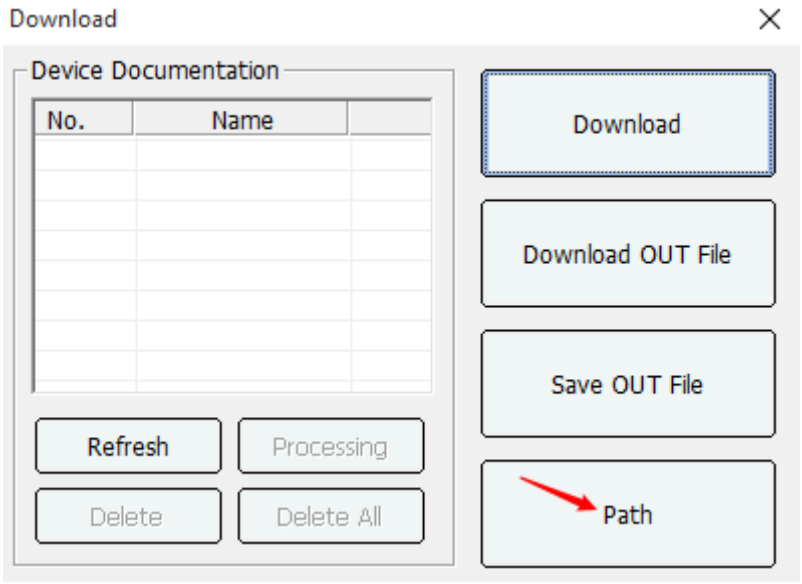


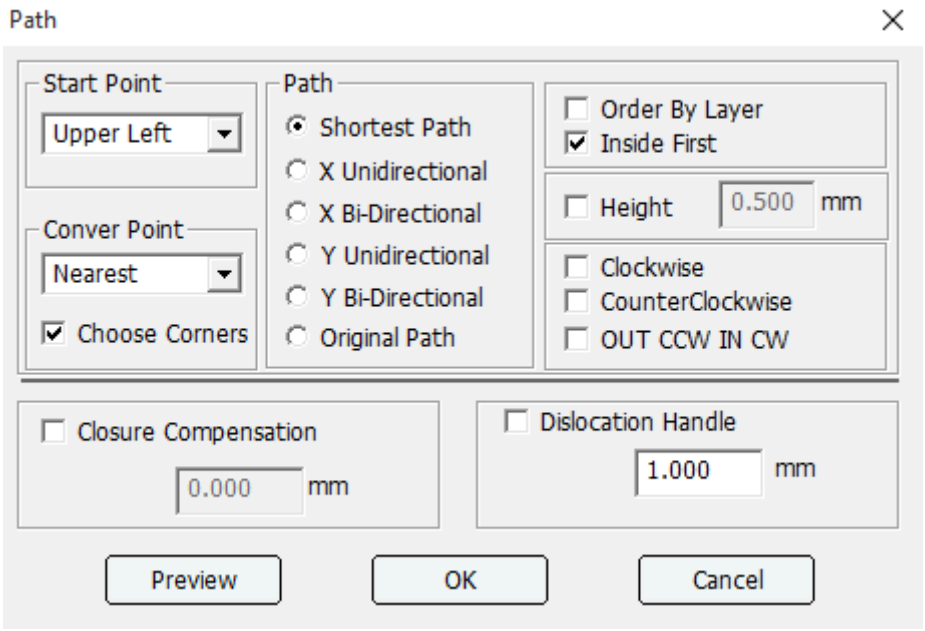
Direct output: This function is used when engraving the bitmap. Check this option to output the grayscale engraving of the bitmap, otherwise output the binary image (black and white image).
Laser Frequency: This function is only used for radio frequency laser tube, and the laser frequency can be set on the corresponding layer. This function is invalid for carbon dioxide tube.
Z-Axis Coordinate: When enabled, first move to the specified Z-axis coordinate position, and then process.
U-Axis Coordinate: When enabled, first move to the specified U-axis coordinate position, and then process.
Repeat Times: Used to set the number of repeated processing of the current layer.

1.5.2 Route optimization

Before downloading graphics, in order to make it to process in specific route, and to improve the processing speed while optimizing its route, click [Download], and then click [Path] button. Or click the path button on the tool bar.







1.5.2.1 Route optimization type

Route optimization includes: Shortest Path, X Unidirectional, X Bi-Directional, Y Unidirectional, Y Bi-Directional and Original Path.

Shortest Path: For non-arrayed graphics, take the shortest moving distance route of laser head as the processing route.

X Unidirectional: For arrayed graphics or graphics of regular arrangement, process from left to right by lines. The processing direction of closed curve in the same line should be the same, either anticlockwise or clockwise

X Bi-Directional: For arrayed graphics or graphics of regular arrangement, process from left to right in S shapes, either anticlockwise or clockwise. (e.g., some line is processed from left to right, and the following line will be processed from right to left.)

Y Unidirectional: For arrayed graphics or graphics of regular arrangement, process from top to bottom, closed curve of the same column should be processed at the same direction, either anticlockwise or clockwise.

Y Bi-Directional: For the array graphics or regular arrangement of graphics, processing from the top and bottom direction S column, counterclockwise or clockwise. (example: one column is processed from top to bottom, and the next column is processed from bottom to top.

Original Path: No optimization for any route. Without clicking the "Path Opt" check box to choose the original path.

1.5.2.2 Additional parameters

Start Point: Indicate the graph starting point from which work starts (upper left, upper right, lower left and lower right, etc.).

Order by Layer: Whether optimization can be conducted in the inside layer or is allowed to be optimized across layers.

Inside First: First process small graphs inside and then process outer bigger graphics.

Conver Point:

- **Nearest**: Modify the original graph starting point to make traveling shifts distance became the shortest.
- **Smooth**: Modify the original starting point and to make the speed change become gentlest.
- **Original**: The starting point whose original graph is not modified (applicable to manually specified starting point or graphs added with lead).

Choose Corners: Modify the processing starting point to the corner position of the graph.

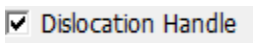
Height: Specify the area for path sorting, after processing one interval, continue processing the next one

Clockwise: After checking, the direction of the graphic element is invalid, and the laser head will cut clockwise when cutting.

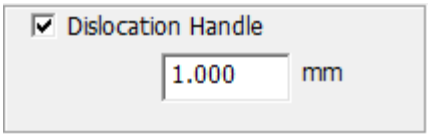
Counterclockwise: After checking, the direction of the graphic element is invalid, and the laser head will always cut counterclockwise when cutting.

Out CCW in CW: After checking, use a counterclockwise path when cutting external graphics, and a clockwise path when cutting internal graphics.

1.5.2.3 Dislocation handle

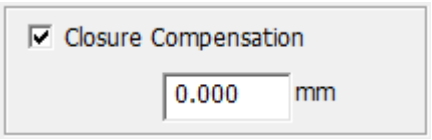
When processing parts size is inconsistent or sealing dislocation occurs and thus causing working piece failed to be cut, click the option and the problem is solved. Click check box of dislocation handle 

, no matter whether the route is optimized or not, dislocation treatment is conducted.



1.5.2.4 Closure compensation

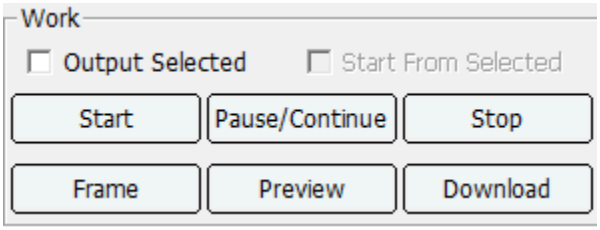
When materials are cut, as the minimum light intensity of the laser tube may not agree with photo sensitivity of the material and processing speed, the sealed part of closed graph may not be cut or carved. The software has a function of "closure compensation" to over cut a certain distance at the sealed openings to solve the problem. Set the distance value according to the actual need. Click the closure compensation check box, execute closed compensation no matter route is optimized or not.



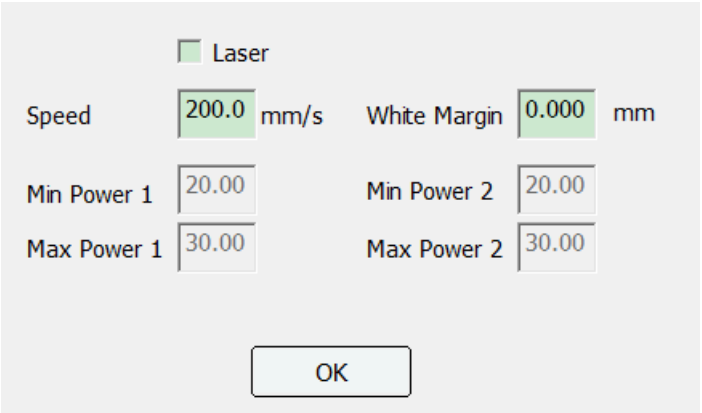
1.5.3 Work pre-treatment

1.5.3.1 Frame preview

Before processing, frame preview can be selected to check the dimension side of the processing graphic. Software main interface on the right side of the dialog box toolbar "Work" page is as shown in the figure below



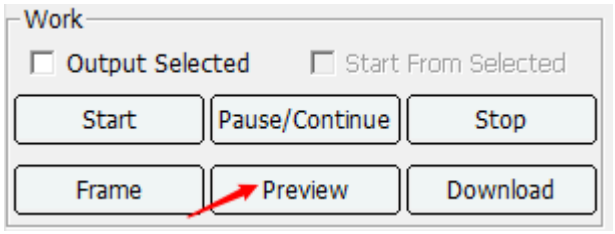
Click [Frame] button and the following interface is shown.



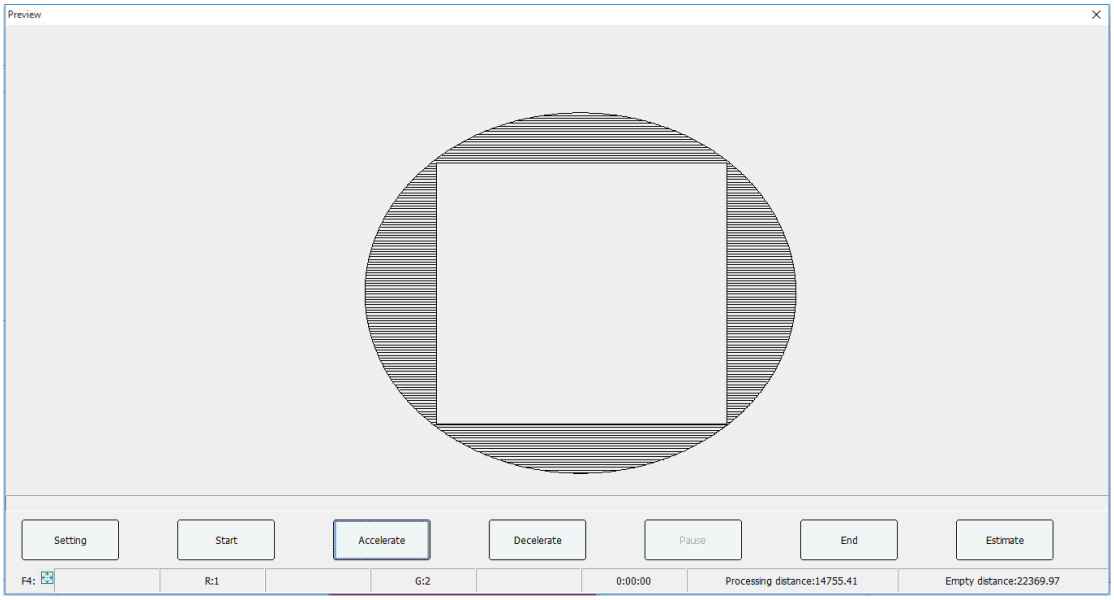
If there is a ready graphics file, it will walk along enclosing rectangles of present files starting from the anchor point. Set the movement speed and the white margin. If cutting border is required, set the min/max light power and click the [Laser] check button.

1.5.3.2 Work preview

The right side of the dialog box toolbar "Work" page is shown in the figure as below:



The working file to be downloaded to the machine can be processed in simulation to check the processing route, etc.



Setting: Set the current laser head mode and the minimum distance between the two heads before starting preview.

Start: To start the processing of simulation.

Accelerate: To speed up the simulation process.

Decelerate: To reduce the simulation processing speed.

Pause: Pause the simulation process.

End: Stop simulation processing.

Estimate: To estimate the processing time of the file (need to read the parameters of the control card).

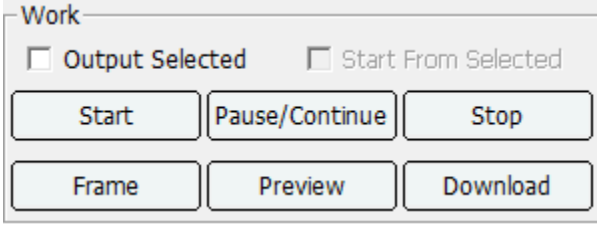
Processing distance: The total distance moved when the laser is turned on.

Empty distance: The total distance moved when the laser is turned off.

F4: Track preview can be zoomed and displayed by scroll wheel. Press the F4 key on the keyboard to zoom the track preview window to an adaptive size.

1.5.4 Output processing

After the processing parameters is set, output processing can be conducted, as shown in the fig. below



Start: Download the current file to controller and take the files as processing files to start work directly.

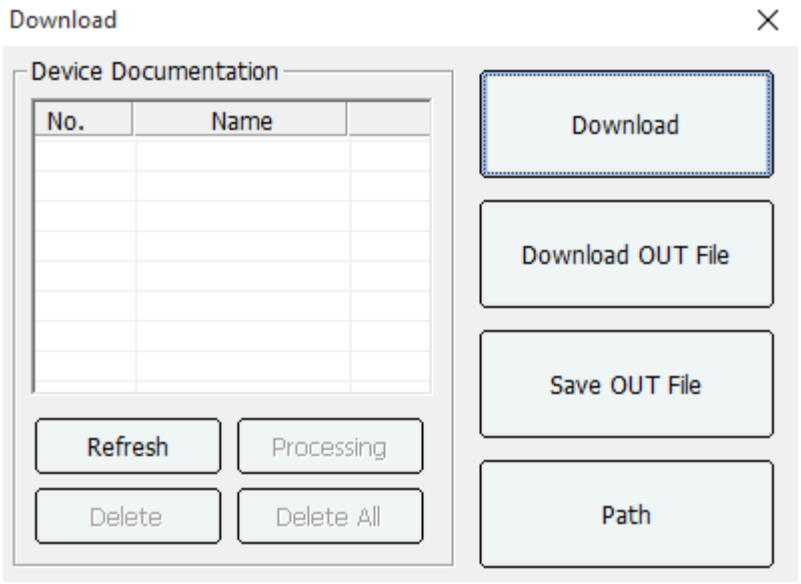
Pause/Continue: Tto continue or suspend processing.

Stop: Stop processing.

Output Selected: In the graphics editing area, only the selected graphics can be output for processing.

Start From Selected: The starting point of the selected graphic is used as the positioning point of the graphic.

Download: Click [Download] button and the following dialogue box would pop up.



Download: Download the current file to controller (will not directly work).

Download OUT File: Download the out file saved before to controller (will not directly work).

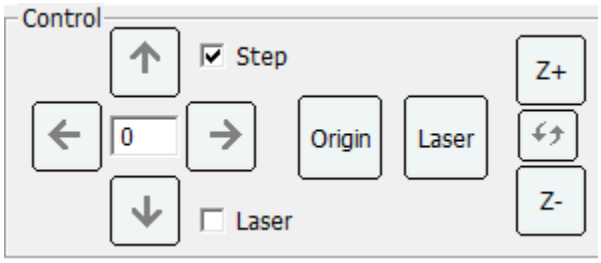
Save OUT File: Save current file in processing format (*.out file type) to designate path of the computer.

Path: Set the work path.

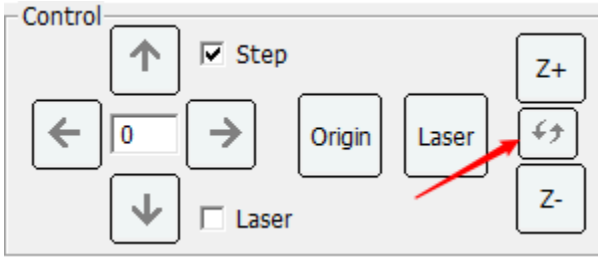
Device Documentation: Click [Refresh] to read all the processing files on the control card. Select the file to be processed and click [Processing] to start the work. Click [Delete] to delete the selected files, and [Delete All] to delete all the processing files on the control card.

1.5.5 Manual control

It is able to control the machine to move, laser fire, origin, pulse. If [Step] is clicked, set the distance to move, 100mm etc. then click the direction button or Z/U/V+/- button move axis. If laser is need to fire on when moving axis, click the [Laser] check box.



Select [Change] button to select Axis Z, U or V.

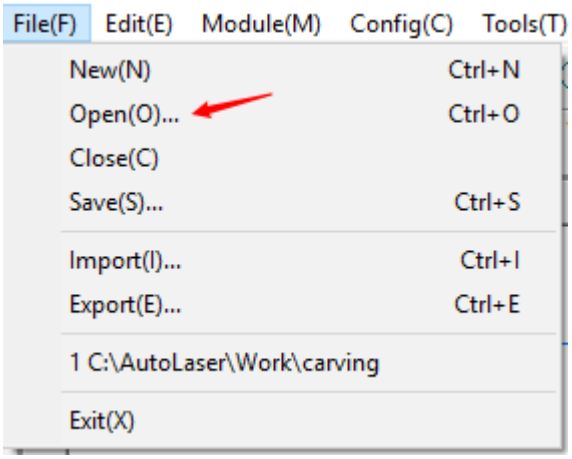


1.6 Case application

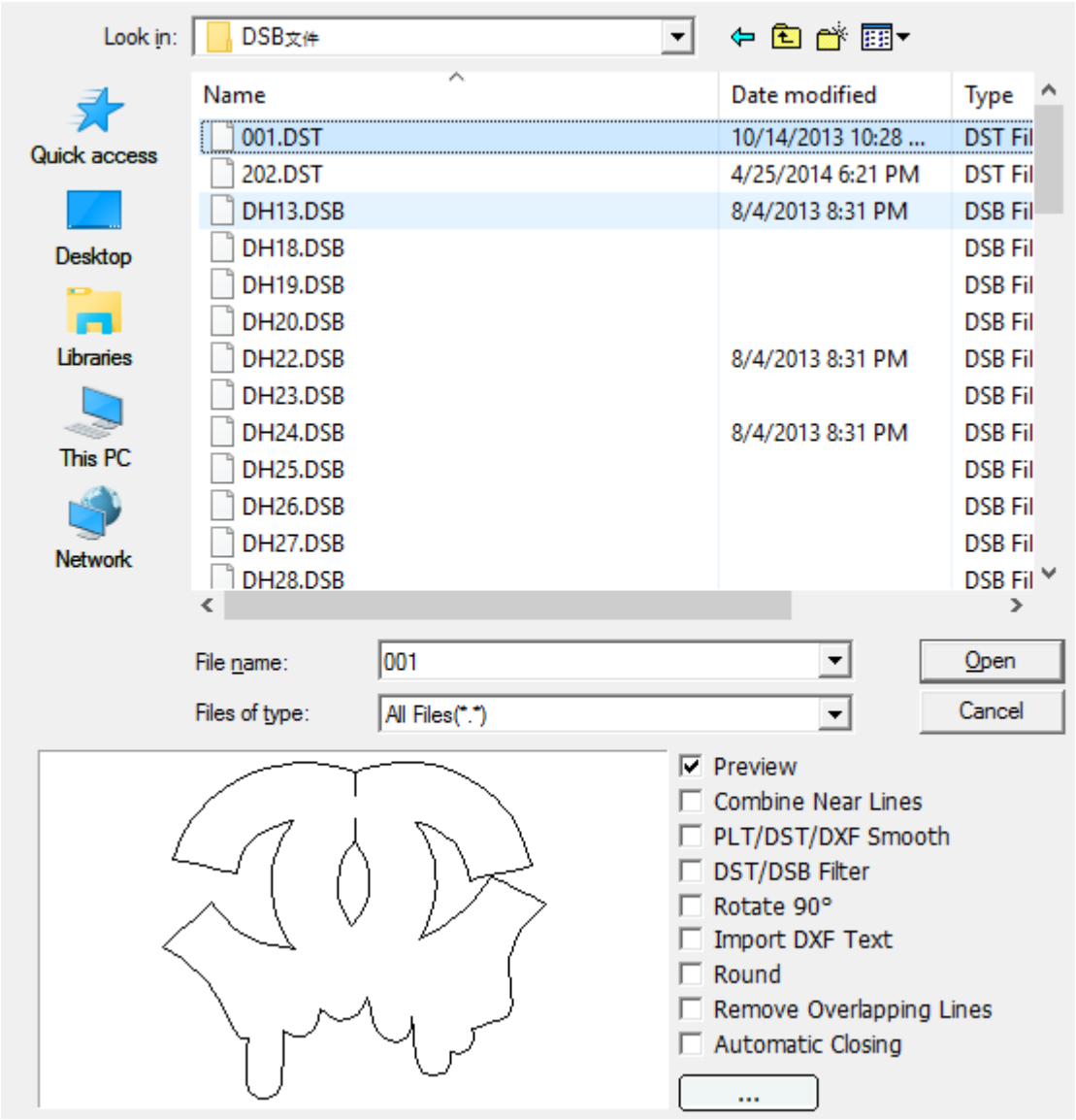
1.6.1 General output processing

This section offers an application example. To open a ready graphics for editing and fill layer parameters and then download to the processing program.

1) Open file

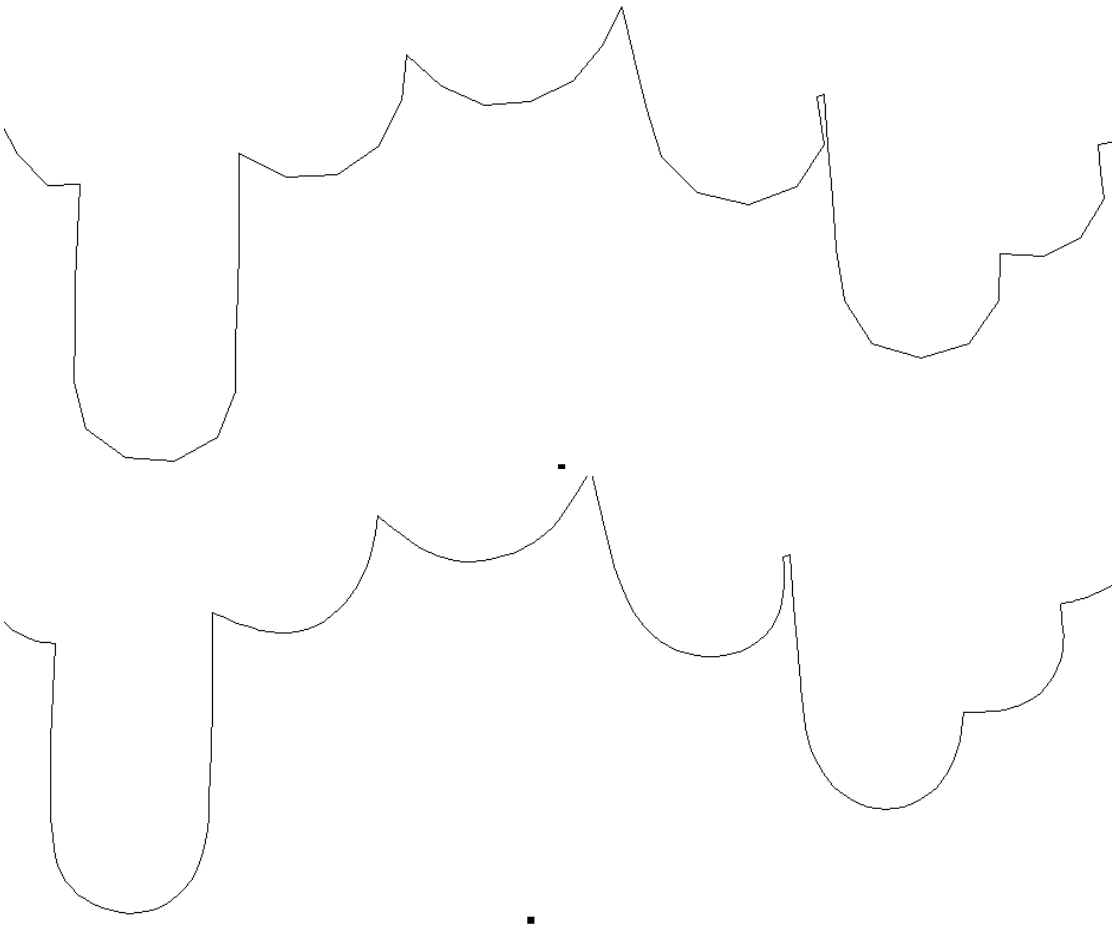


As shown in figure, click [File] → [Open] in the main menu and open dialog box would pop up. Find the saving route for “001.dsb” and then Click [Preview] and the file preview could be seen, then click open to open the file.

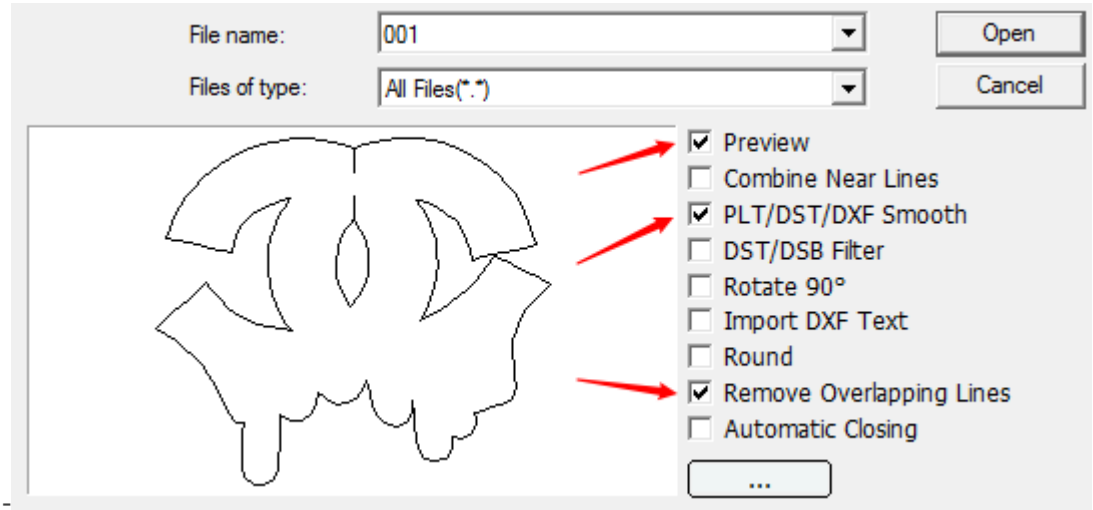


2) Edit

After the file is opened, the curve part of bottom is shown in line segments where turning corner could be clearly seen. The segments are not ideal smooth curves and need to be edited. Select the graphics and click the tool on the toolbar for editing, and the curve became smooth. Then the next step of editing layer parameters could be conducted.

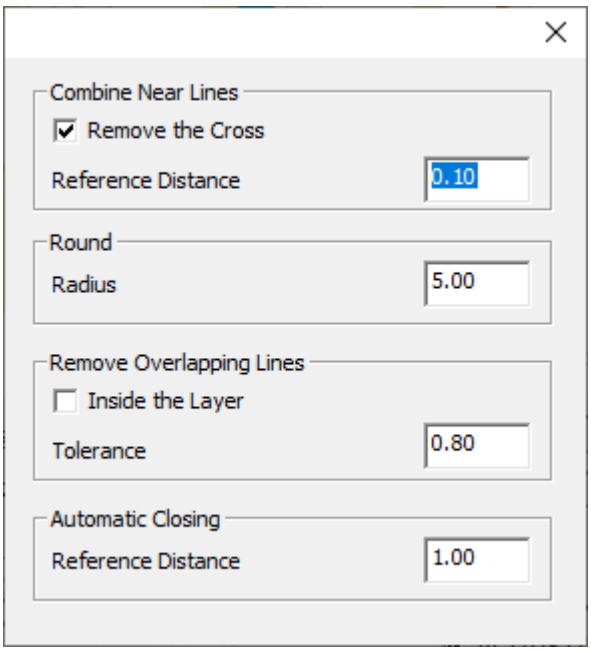


Of course, you can also smooth the graphics before opening or importing. There are many graphics processing options in the lower right corner of the open file dialog box for customers to use. Customers can check the corresponding graphics processing functions according to their needs. By default, the software selects the three options of preview, PLT/DST/DXF smooth, and delete coincidence.



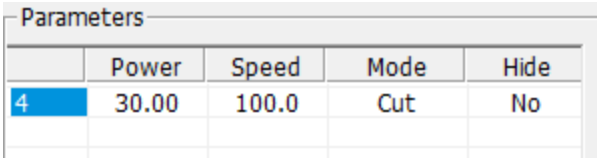
If you need to set the radius length of the round, the tolerance setting for deleting the coincidence line, the distance setting for automatic closing and adjacent merge, click the expand button

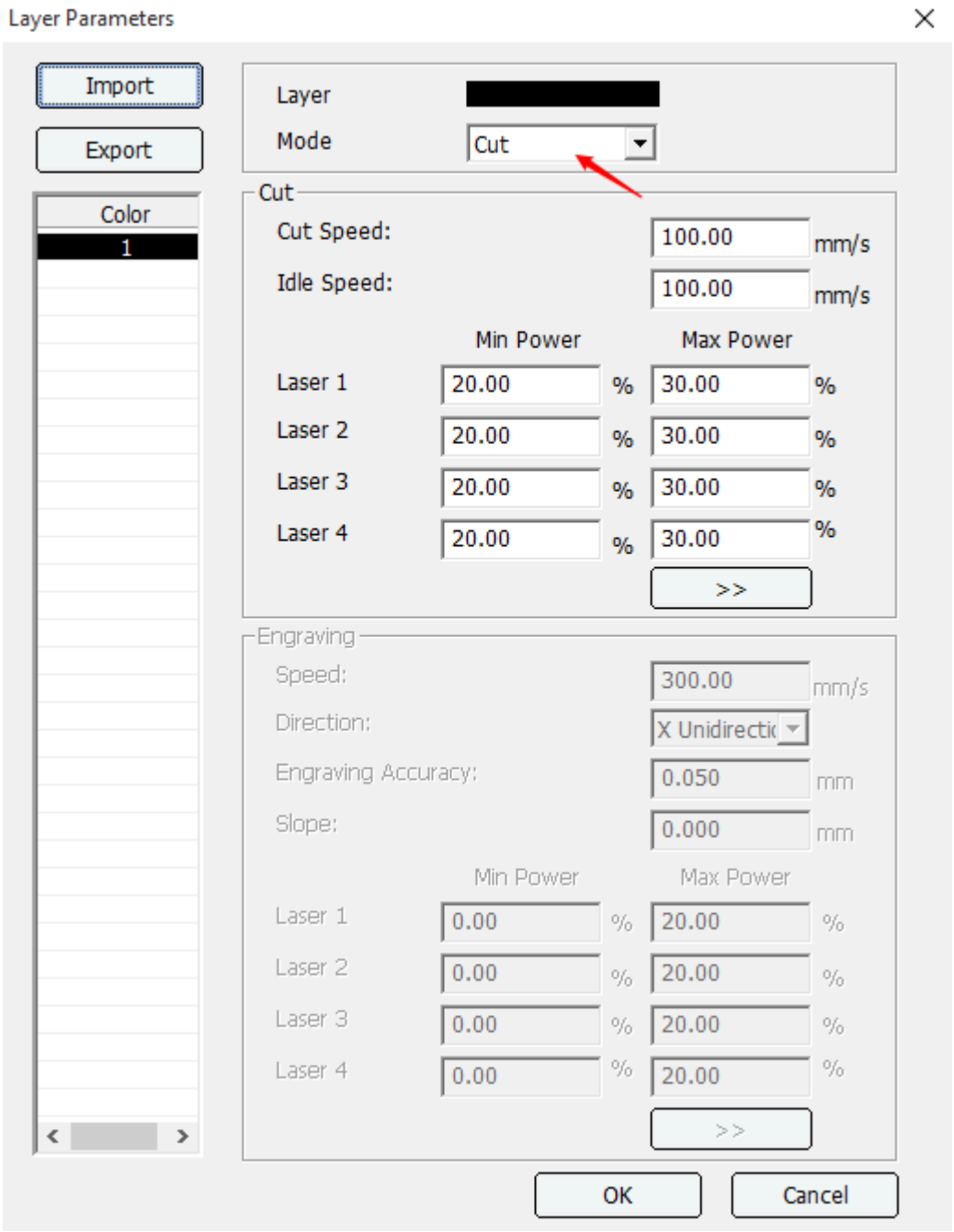
in the lower right corner of the open file dialog box, check the corresponding parameter and set the parameter That's it. As shown:



3) Work parameters setting

The entire graphic has only one color, that is, only one layer, so only one layer can be seen in the layer list. Double-click the first item in the list to open the parameter editing dialog box for this layer. Select the processing method [Cut], fill in the [Power] and [Speed] parameters, click [OK], the editing of the processing parameters is complete.

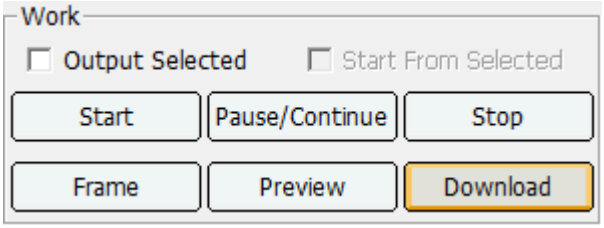


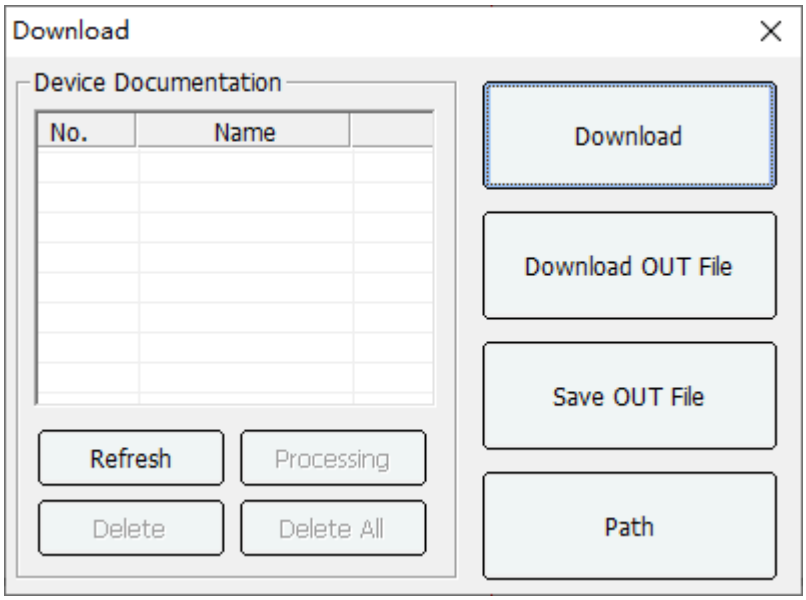


4) Download

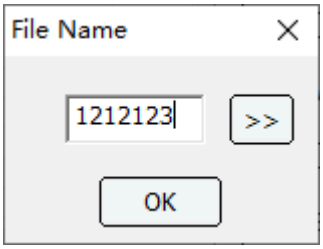
After editing the graphics and filling the processing parameters, downloading can be conducted. Select communication mode before downloading (Details could be referred to communication specification) and plug in corresponding communication cables.

Click [Download] button and dialog box would pop up.



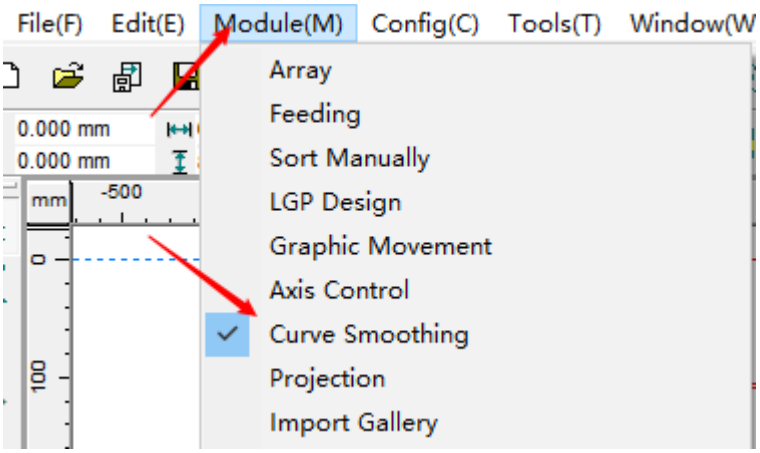


If you need to optimize the path, please click [Path], select the corresponding processing path, and then click the [Download] button to pop up the file name input dialog box. The length of the file name cannot exceed 8 characters, otherwise the excess part will be discarded. Click [OK] to download and wait for the download progress bar to finish, and there will be a beep on the control card, indicating that the download is successful, otherwise the download fails. At this time, you need to check whether the communication line is connected, and then try again.

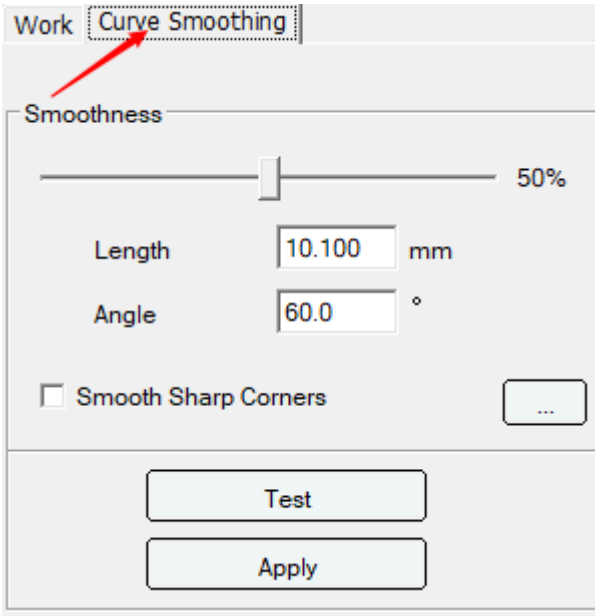


1.6.2 Curve smoothing

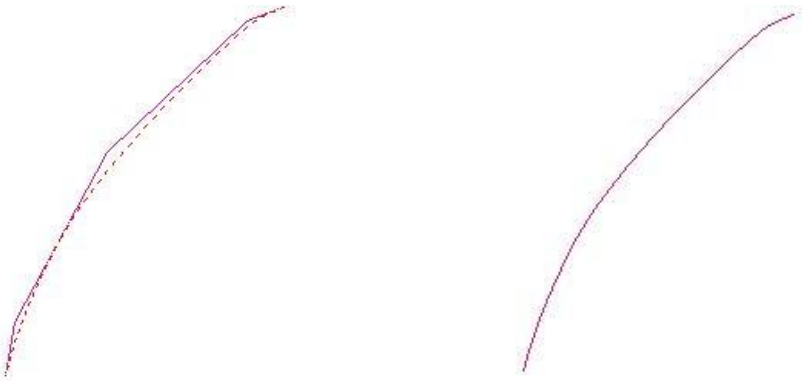
1) Click the [Module] / [Curve smoothing].



2) The Curve smoothing page will display.

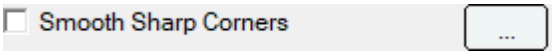


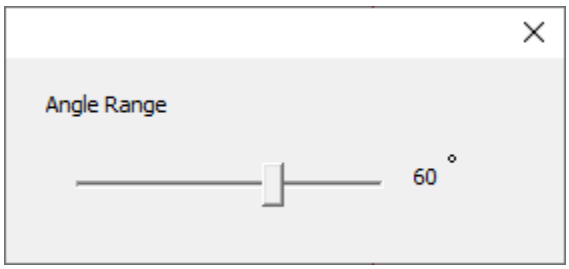
3) Drag the smoothness button to set the percentage. Click [Test] to view the smooth effect, click [Apply] to change.

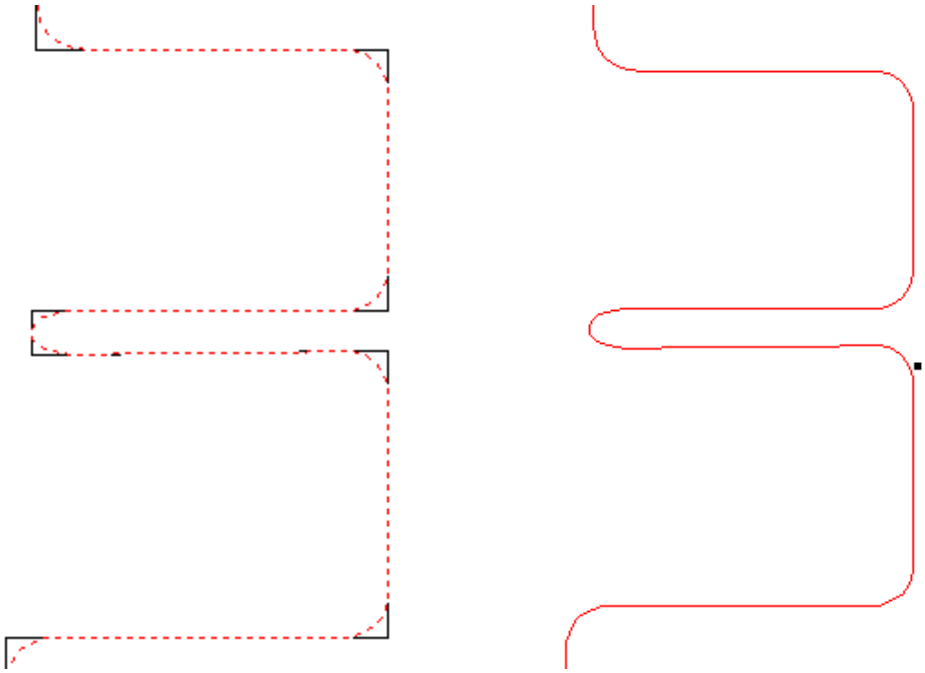


Before After

4) Sharp corner rounding: It is to round the sharp corners with many nodes in a certain angle range.





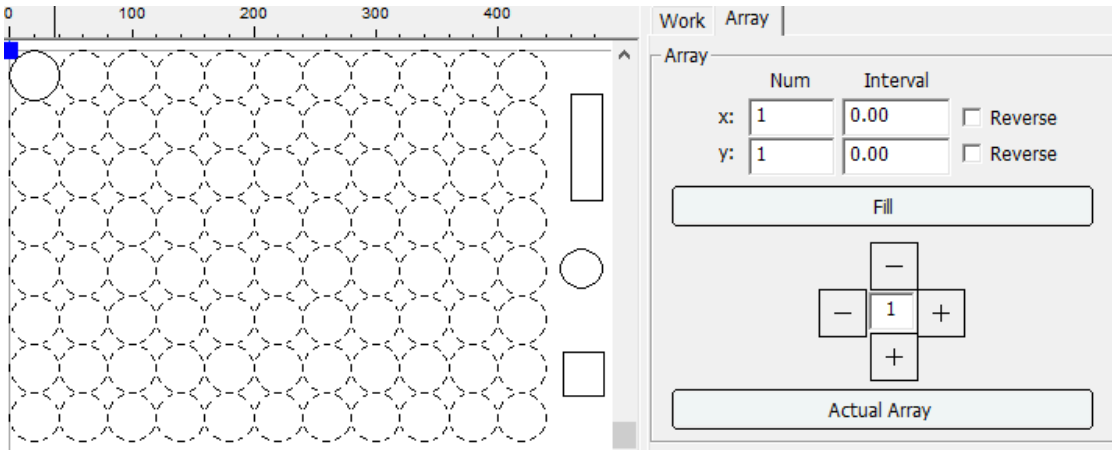


Before After

1.6.3 Intelligent double shift processing

Using virtual array functions with added extra leftover material graphics can realize the leftover material function. As shown in the fig. below.

.



If the machine is an intelligent double head model, it will automatically work in separate mode when virtual array is being cut. When the end of the leftover material is cut, closest laser head will be selected automatically to work.

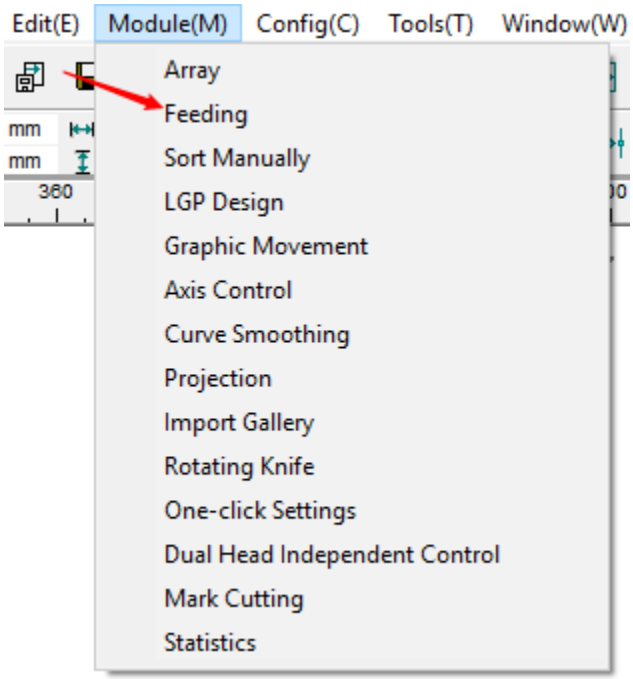
If dislocated material layout is required, two or more graphics could be arranged manually first, and then conduct grouping. After grouping, virtual array would be conducted.

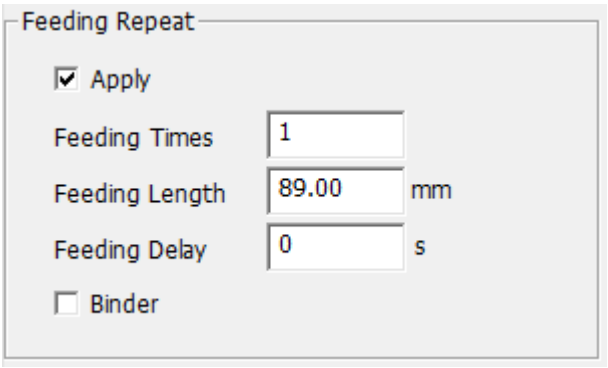
Virtual array direction is controlled by machine coordinate system and the anchor point position. Choose "Reverse" to modify the corresponding direction of the array.

1.6.4 Feed processing

For machines with installation of the feeding device, working-feeding - working cycling mode can be realized.

First, open the feeding page to enable the [Feeding] function in the [Module] option in the software menu bar. After it is enabled, the [Feeding] function dialog box will appear on the right toolbar of the software, as shown in the figure:





To use the feeding function, first check the [Apply] button. If no feeding is required, do not check the [Apply] button or set the [Feeding Times] to 0.

Feeding Times: Refer to the times for working and feeding. If working process is conducted once, feeding is conducted once. And this working cycle would be continued as such.

Feeding Length: Refer to the length of feeding.

Feeding Delay: Refer to the delay operation after feeding.

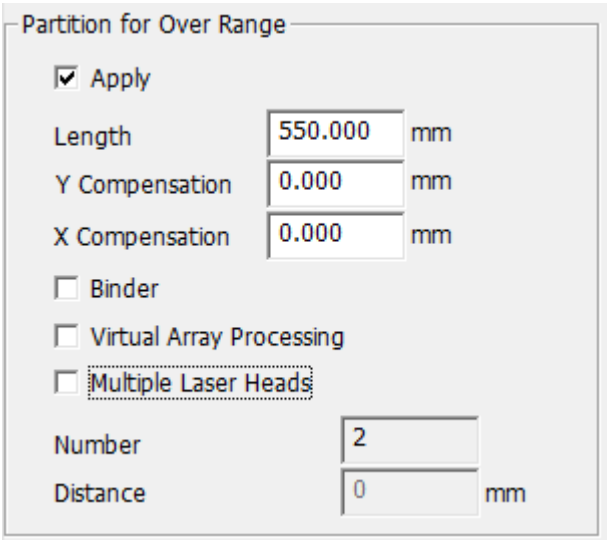
After the parameters is set, the [Apply] button need to be clicked. If feeding isn't needed, do not click the [Apply] button.

Binder: If you need to press the material through the pressing device for feeding, check this option.

1.6.5 Partition for over range

If the processing file length is too long and exceeds the vertical dimension of machine, and if the machine has the feeding function, large file segmentation processing function could be started.

Parameter settings for large file segmentation



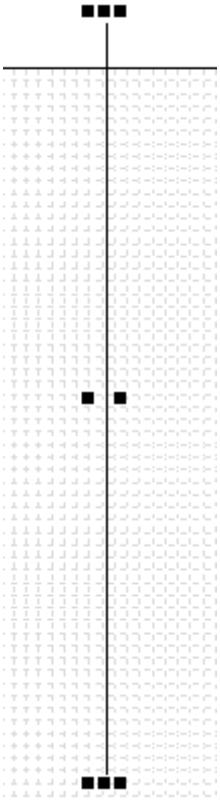
Length: The parameter should be no greater than the vertical dimension of the machine.

Y Compensation: When feeding movement deviates in the vertical direction, and cause dislocation of graphics, compensation coefficient should be set to compensate feeding deviation. This parameter test needs only to be done for once.

X Compensation: When feeding movement deviates in the horizontal direction, and cause dislocation of graphics, compensation coefficient should be set to compensate feeding deviation. This parameter test needs only to be done for once.

Test method:

If the height of the breadth side is 600 mm, draw vertical lines to 600 mm, set segmentation reference to 590 mm and compensation coefficient to 0, click [Apply] button. Machine processing process is as follows: Laser head move and cut from 0 to 590 of Y direction, then it feeds 590 mm distance. Then Laser head returns to position of coordinates Y 580mm, and cut to coordinates Y 590 mm. Check the test result.



The long line below is 590 mm, the short line above is 10 mm, if the Top bottom direction offset is 0.2mm, then the top bottom repay is 0.2. If the left right direction offset is 0.3mm, then the left right repay is 0.3.

After the compensation coefficient is measured, every time a large file is segmented, modification of different segmentation reference doesn't require testing compensation efficient again. When the machine structure changes, or become aged after using for a long time, compensation coefficient could be tested again by using the same method.

Binder: If you need to press the material through the pressing device for feeding, check this option.

Virtual Array Processing: Supports segmentation of virtual arrays and does not convert virtual arrays to solid graphics. This option is suitable for the situation where there are virtual array graphics and solid line graphics in the graphics.

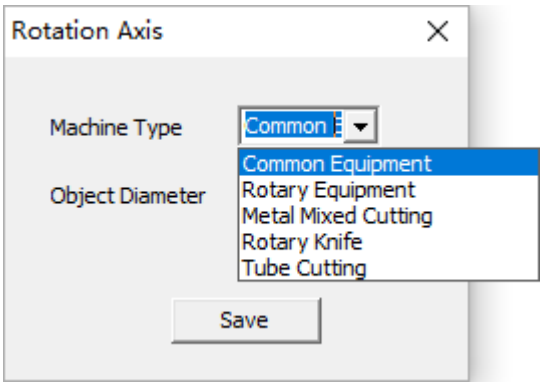
Multiple Laser Heads: After enabling, you can make multiple heads process the same graphics, you need to set the interval between the two heads.

Number: The number of laser.

Distance: The intervla between the two heads.

1.6.6 Rotation Axis

Click the [Rotation Axis] button in the tool bar to make quick settings, select the corresponding machine type and click Save, and the machine parameters will be changed accordingly.



When rotating engraving and cutting is required, the machine type needs to be set to Rotary Equipment.

Two parameters such as [Reference Diameter] and [Reference Resolution] need to be set up while choosing Rotary Equipment. After setting these two parameters, only [Object Diameter] needs to be set as we replace the roller. The diameter of the roller and its corresponding accuracy resolution could be input the same value as that of reference diameter and reference resolution.

Object Resolution Settings

a) Click on the software interface - Device- Machine - input password (tz0001) - and change the machine type to [Rotary Equipment] in machine parameter page. [Reference Diameter] and [Reference Resolution] can be used as reference parameters.

b) Reference parameter

   i. During roller processing course, as working piece of the different diameter needs to be replaced, the width and resolution of Y axis needs to be constantly modified. Control card provides a reference diameter and resolution.

   ii. After setting the reference diameter and resolution, new working piece diameter needs to be set in the [Object Diameter] parameter in machine parameter page. The resolution in [Axis] - Y axis parameter would be calculated automatically according to reference diameter and reference resolution, which means the diameter of the new working piece only need to be modified for once.

c) Reference parameter modification

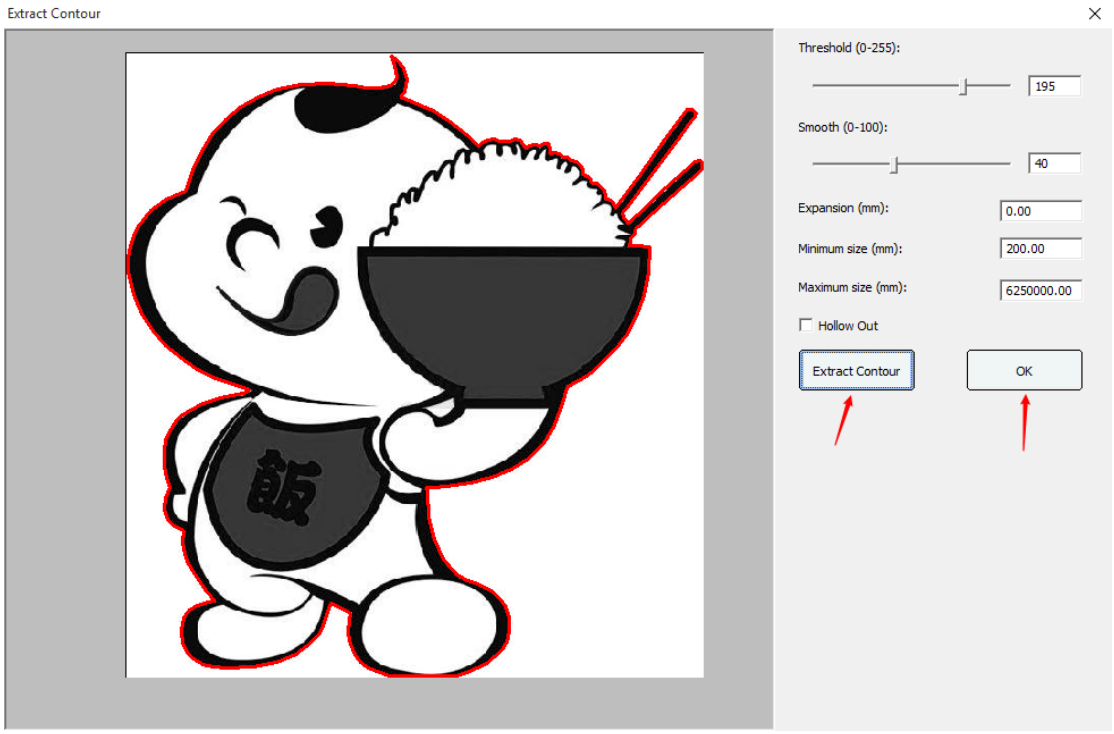
   i. When changing the device type into wheel equipment type, there is a default value for reference diameter and reference resolution. The user needs to firstly measure reference diameter with a scale, then the default value or a value estimated by the user could be used as a reference resolution, 10 for example.

   ii. Then draw a line on the current work piece such as 50, and measure the actual length, supposing it to be 55. Click the [>>] button beside the Reference resolution edit box and input expected length to 50 and actual length 55 according to the normal resolution modification process. Then click confirm and automatically calculate to the value 11 as reference resolution value for example.

d) Change new working piece while working, input present working piece diameter in the [Object Diameter]. At this time, resolution value in the Y axis in the axis parameters page would calculate resolution and maximum traveling range of present working piece based on reference diameter and reference resolution.

1.6.7 To extract the contour

First open the picture and click the menu bar button The "Extract Contour" function box will appear. After setting parameters, click extract contour to confirm. As shown in figure:



Threshold (0-255): The higher the threshold is, the more contours are extracted, while the lower the relative threshold is, the fewer contours are extracted.

Smooth (0-100): Smooth function on the graph line is not smooth, the user can drag the smooth bar to smooth.

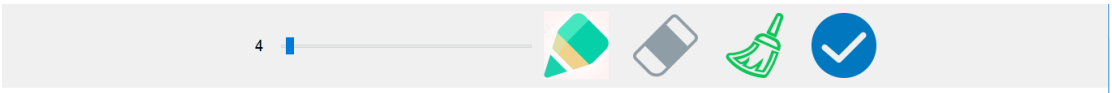
Expansion(mm): According to the user requirements of the outline of outward extension, a unit of 1mm.

Minimum size(mm)/ Maximum size(mm): The maximum and minimum size area of the outline required by the user is 1mm per unit.

Hollow Out: After selecting the hollow out, the inner and outer contours are extracted together.

1.6.8 Paintbrush Doodle

Click on the menu bar .You can access the brush doodle tool interface, As shown in the figure:



: Move this cursor to adjust the size of the brush tip, The larger the number, the thicker the brush.

: Brush, which allows you to draw in your workspace.

: Eraser, you can erase unwanted drawing. Note: The area removed by this tool is proportional to the size of the brush tip.

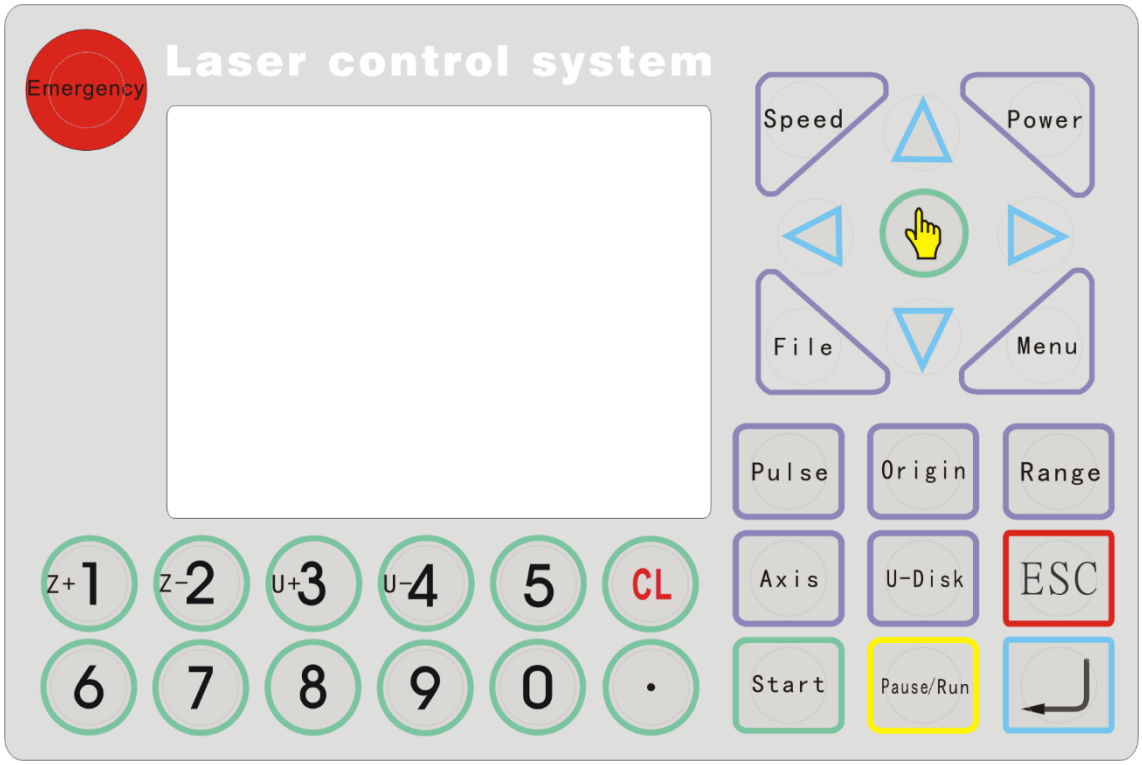
: Clean tool, can clear all the contents of the workspace.

: Confirm completion of work.

Note: It is recommended to be equipped with a writing board for design.

Part 2 Panel operation

2.1 TL-403C/403CB/404CA/410C operation panel



2.1.1 Key functions introduction

1.

Reset key: No matter in what state, click this button and the machine would enter into a reset state, and then return to machine origin.

2.

Speed key: Set the working speed and travailing speed.

3.

Power key: Enter into panel laser power setting interface.

4.

Menu key: Click this button to enter the main menu.

5.

File key: Enter the memory file selection interface.

6.

U-Disk key: Enter U disk file selection interface.

7.

Range key: To preview range.

8.

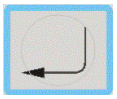
Pulse key: It is used for testing. It will be lighted per time when press and is mainly used for testing light route adjustment.

9.

Origin key: Move XY to one position and then press origin key to set this current position as anchor point for process. About the Return point, if "mechanical origin" is selected, the machine will return to the mechanical origin after reset, the coordinates are (0, 0). “Set point” is selected, it returns to the position where set by origin key last time.

10.

Axis key: Access into single axis movement interface.

11. 
Confirm key: A defining key, which indicates agreement of the current operation

12.

Exit key: A defining key, used to cancel the operation and return to the last interface.

13.

Start key: Press this key to start running the current file.

14.

Pause/Run key: Press this key in working mode to enter the suspension state. Repress to continue. In suspended state, after moving X or Y axis away, press this button again, it can automatically return to the stop position to continue working. When the machine is idle, press this button and the laser head will go to the anchor point.

15.

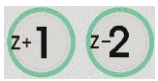
The number keys are used to change the selected area data. They can also be selected to choose the menu directly.

16.

Decimal key. Or for Auto Focus function.

17.

Delete key. In the main interface, press this button to clear the processing times

18. 

Z axis movement keys are used for moving Z axis.

19.

U axis movement keys are used for moving U axis.

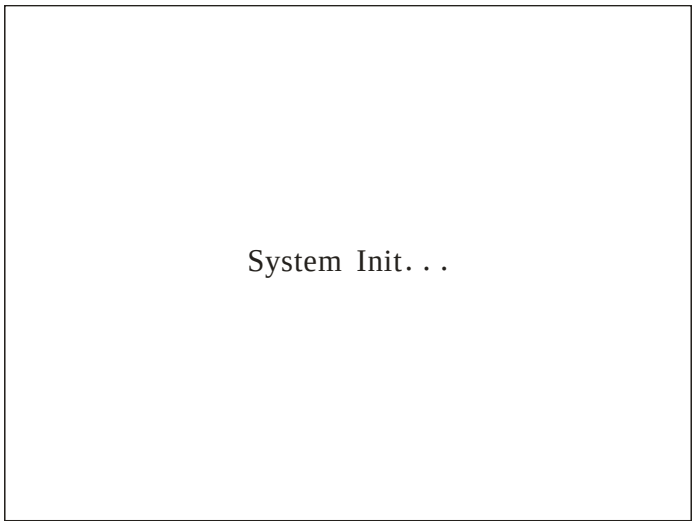
20. Direction keys are used for moving X and Y axis. Up and down keys in other interface can also be used to move current selection upward and downward.

21. Selection key: Standby interface is used to alter the speed of axis moving, other interface is used to modify parameters.

2.1.2 Main interface introduction

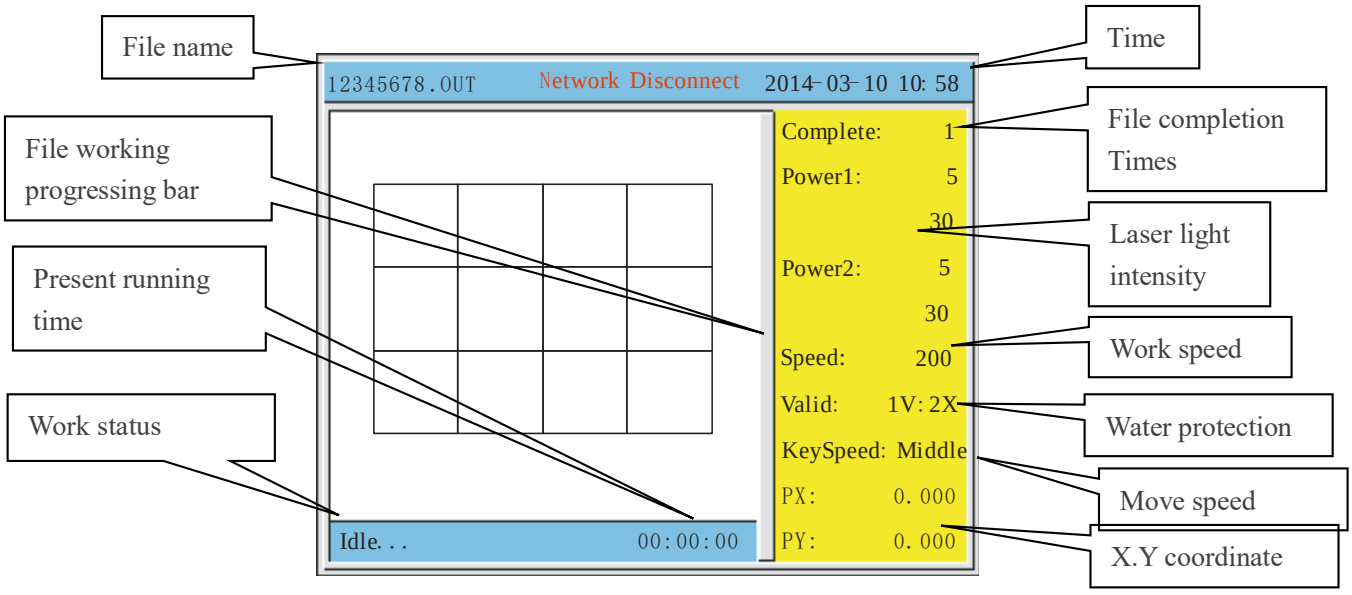
2.1.2.1 Starting up interface

Starting up interface is as follows:



2.1.2.2 Standby interface

After initialization is completed, standby interface would appear. As shown in figure



The top of the interface shows the file name, network status, the date and time. The white area shows the preview of the selected file. And the yellow area shows the complete times, default power, speed

of the machine., the water protect status, the speed of key moving, and the position of axis x and axis y. And at the bottom left of the interface, it shows the machine status and the last working time. The parameters are described below:

Network status: If connect the network, it'll show the IP address196.168.0.51. Otherwise, it shows Network disconnect.

Complete: The complete times of the selected file.

Power1: The power of Laser 1. The above value is min power value. The following value is the max power value.

Power2: The power of Laser 2. The above value is min power value. The following value is the max power value.

Speed: It shows the work speed.

Valid: The water protection status. In the figure, the water protection is 1X: 2X, 1X means water protection 1 not connected, 2X means water protection 2 not connected. If connect, it'll show 1V:2V.

Key Speed: Manually move axis speed, can press the [Select] key to change the speed, there are "Fast", "Middle", "Slow".

PX, PY: The coordinate in the current place.

When there is no file selected, it displays the default power and speed. When selecting the file, it shows the power and speed in the first layer of the file. When processing, it shows the power and speed of the current processed layer.

When the machine is processing, if you want to modify the speed of the current layer, press the pause button, then press speed button, you can modify the speed of the current layer. In the same way, press power button to modify the min/max power. If machine is processing, press "Left/Right" button, can immediately reduce or increase the laser power. Press once, plus or minus 1%. Left for reduce, Right for increase. When changed the speed of power during working operation, after the completion of processing, it prompts whether to save the changes of the speed and power value.

In standby mode, press

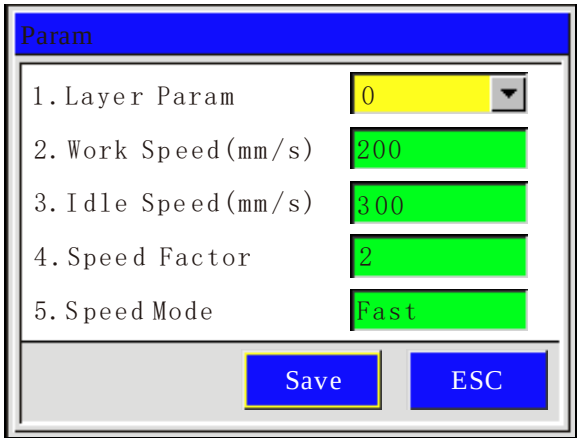
to clear the completed number of selected file. If the focus length was set in laser parameter interface, press

to auto focus. If the firmware version is V.L010.16 or later which is for camera cutting machine, press the

button to start label cut function.

2.1.2.3 Speed setting

After initialization is completed press the [Speed] button. As shown in figure:



This shows the speed setting is effective when the speed of working file set as defaulted.

Layer Param: when one file is selected, press button， to choose the layer number.

Work Speed: when one file is selected， it shows the work speed in current layer. Otherwise, it shows the system default speed value. The unit is mm/s.

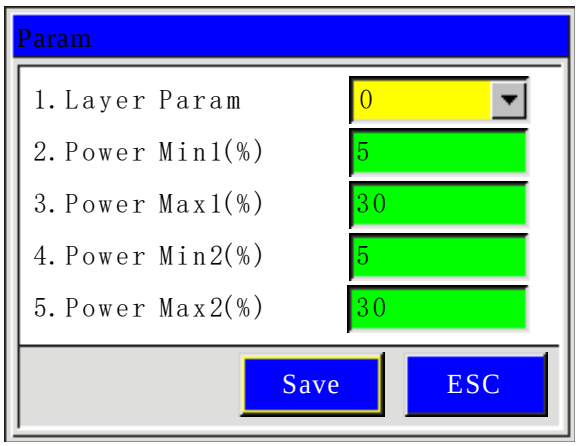
Idle Speed: the default move speed when laser is off. When one file is selected， it shows the idle speed in current layer. Otherwise, it shows the system default speed value. The unit is mm/s.

Speed Factor: it is applied to improve the smoothness of movement. The range is 0.00-3.00. The smaller the factor, the slower of planned speed of lines in work file, and then the smoother of movement when turning corner. Normally it is set to 2. If the smoothness is high demanded, set the factor to less than 1.

Speed Mode: Fast mode, faster cutting speed and increased jitter. Normal mode, stable speed and less jitter during cutting

2.1.2.4 Laser power setting

After initialization is completed press the "Power" button. As shown in figure:



Layer Param: When one file is selected, press button， to choose the layer number.

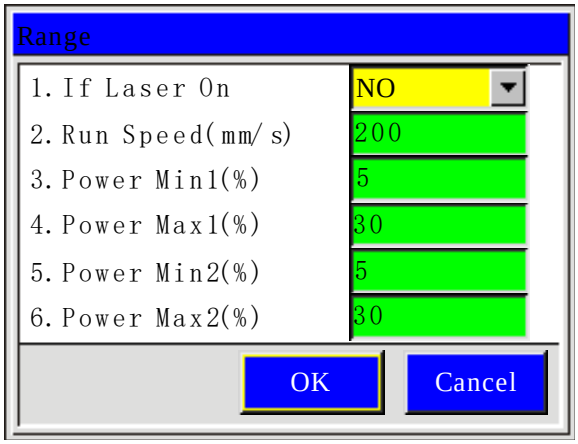
Power Min: When stroking curves, this power intensity applied for line start and the corner of the curve. Or it applied for the top depth when gradient carving. The range is 0.00~100.00%.

Power Max: When stroking curves, this power intensity is applied as the work speed was reached. Or it applied for the bottom depth when gradient carving. The range is 0.00~100.00%.

Power Min1 is the min light power of LASER-1. Power Min1 is the max light power of LASER-1. It is the same as Power Min2 and Power Max2 of LASER-2. When no file is selected, the power value is the system default power value. When pulsing, the Power Max will be used.

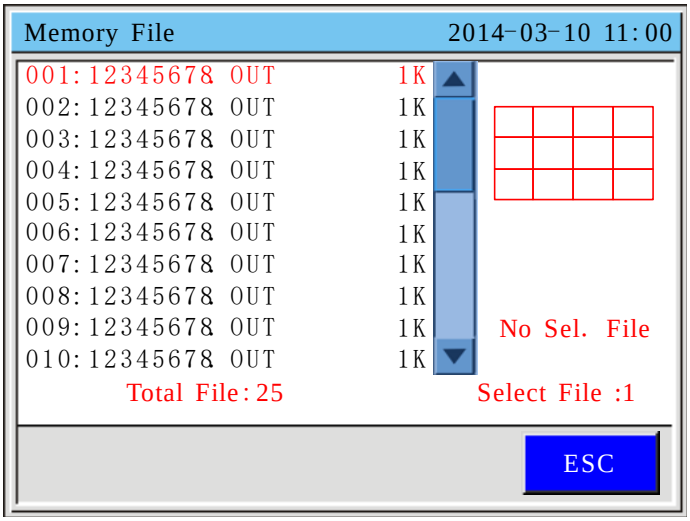
2.1.2.5 Frame preview

After initialization is completed press the [Range] button. As shown in figure:

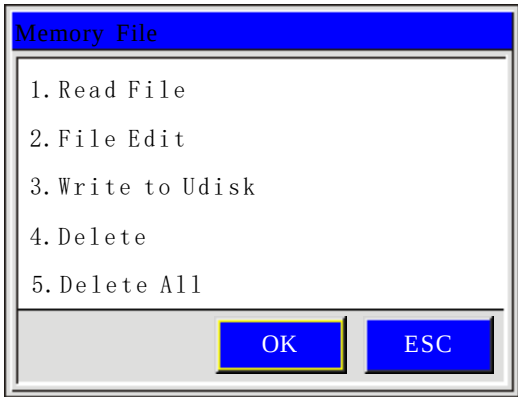


2.1.2.6 File selection

Press [Menu] key into the main menu, and select the Memory File button. Also can directly press [File] to enter, show as:



Press [Down/Up] to choose the file, press [Select] key to find the current file, press [ESC] to quit, press [Enter] to operate, show as:



Read File: Select this file to work.

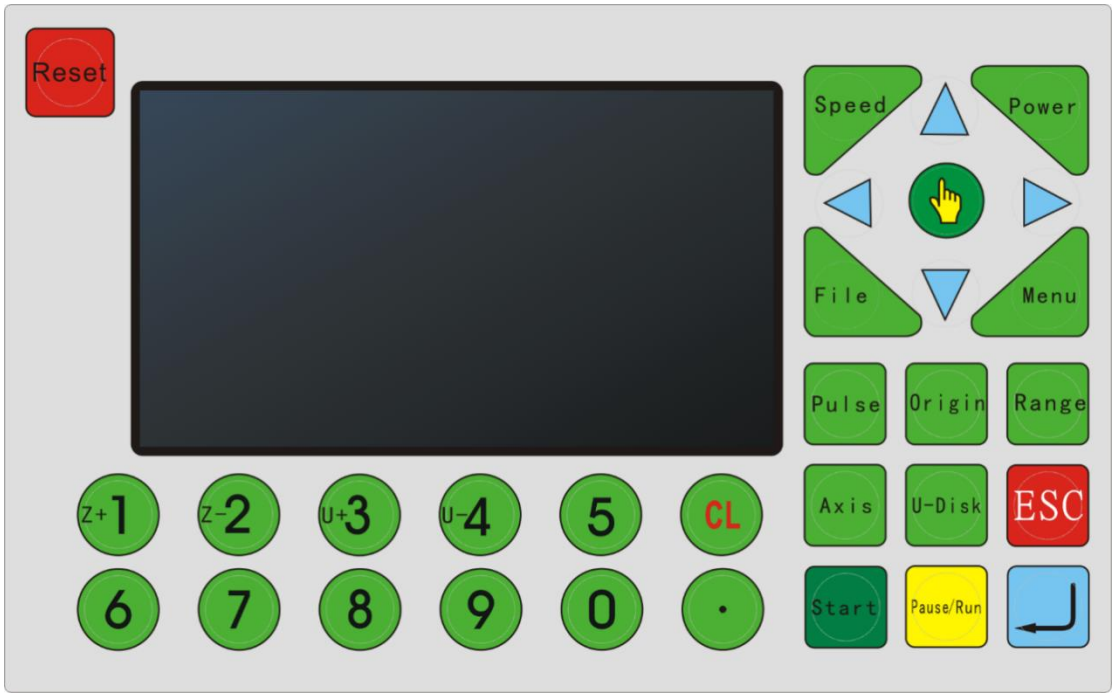
File Edit: Edit the file parameters like speed and power.

Write to U Disk: Copy the file into U disk.

Delete: Delete the current file.

Delete All: Delete all files.

2.2 TL-A3/A4 operation panel



2.2.1 Key functions introduction

1.

Reset key: No matter what state the machine, press this key, it'll go into reset state, and then return to machine origin.

2.

Speed key: Set the work speed and idle speed.

3.

Power key: Set the laser powers.

4.

Menu key: Press the key and go into the main menu interface.

5.

File key: Go into the memory file selection interface.

6.

U-Disk key: Go into the U disk file selection interface.

7.

Range key: Range preview.

8.

Pulse key: Use to test. Press one time, light one time. It is used to test the optical path and light power intensity

9.

Origin key: Set the start point from which the machine runs.

10.

Axis key: Go into the single axis movement interface.

11.
Enter key: Agree to the current operation.

12.

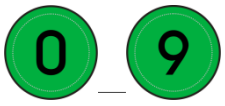
ESC key: Used to cancel the operation and return to the previous interface.

13.

Start key: Start processing the current file.

14.

Pause/Run key: Press the key to pause at the working state, or press again, it'll go on running. In the pause state, move the X or Y axis, then press this button, it'll automatically return to the break point to continue working. On the Stop state, press the key, the laser head will automatically return the anchor point.

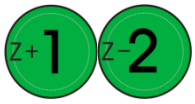
15. 

Number keys, change the data in the selected area. Also it can directly press the key to choose the item.

16.
Decimal key. Or for Auto Focus function.

17.

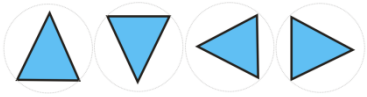
Delete key. In the main interface, press this button to clear the processing times

18. 

Z axis manual moving key, moving Z axis in main interface.

19.

U axis manual moving key, moving U axis in main interface.

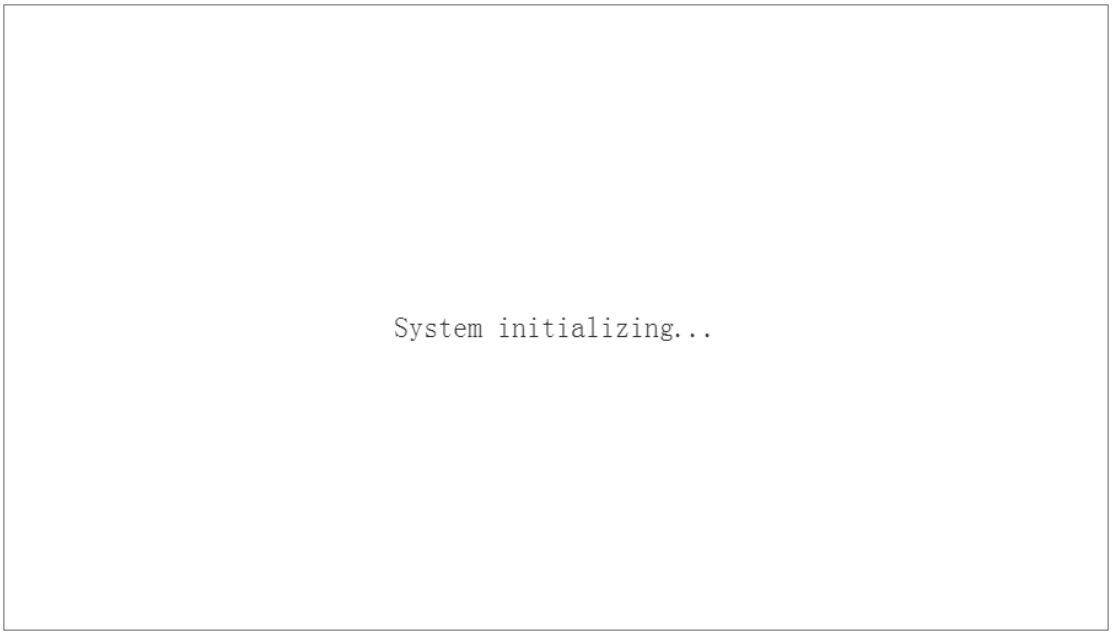
20.  Direction key, used to move the X, Y axis, in the other interfaces, used to move the curse to choose menu.

21. Select key, change the axis speed in the standby interface, in the other interface, used to change the parameters besides the numbers.

2.2.2 The main interfaces

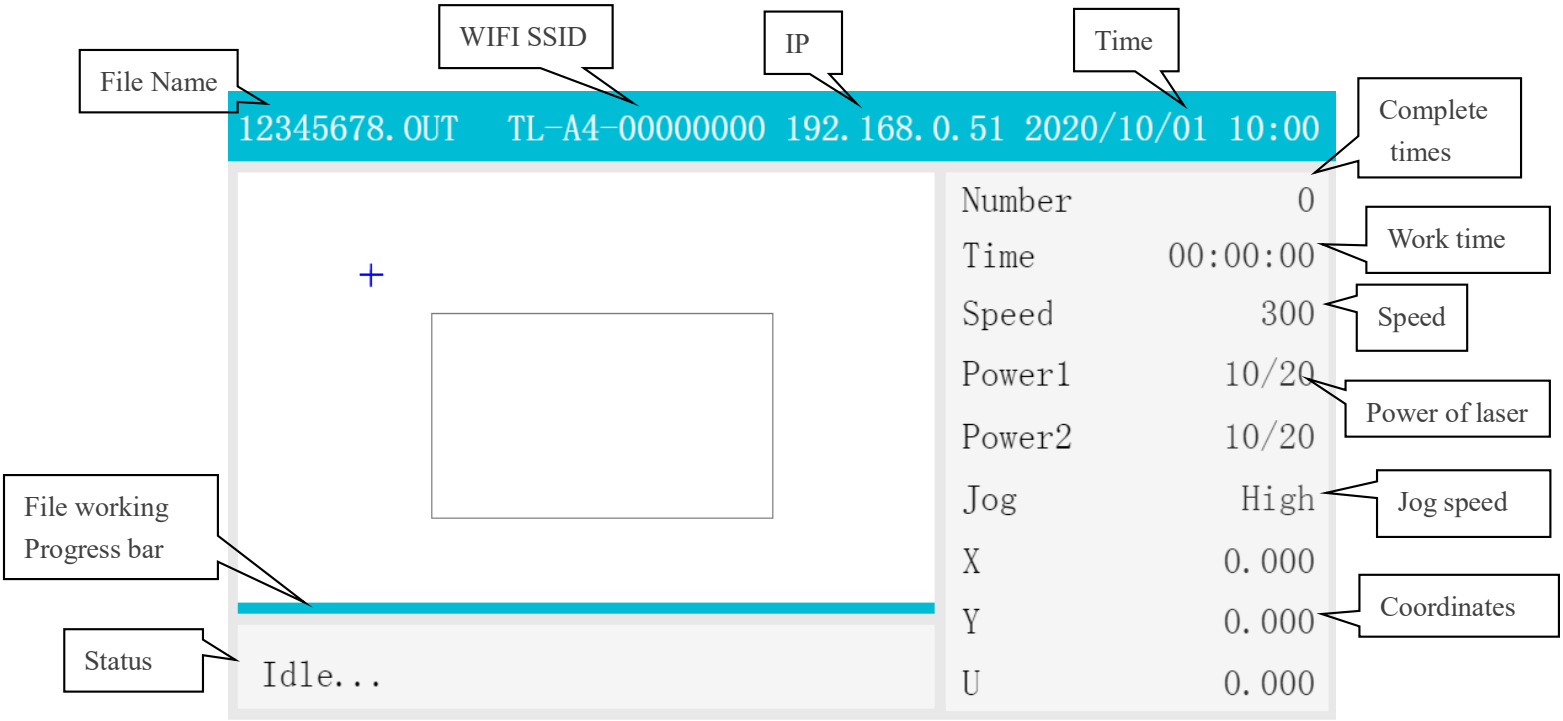
2.2.2.1 Starting up interface

The starting up interface is as show:



2.2.2.2 Standby interface

After initialization, it'll go into the standby interface, show as:



The top of the interface shows the file name, WIFI SSID IP Address, the date and time. The white area shows the preview of the selected file. And at the bottom left of the interface, it shows the machine status. When there is no work, the status displays "Idle...", while "Working..." when it is at work, and "Pause" when being paused. And the right side of the main interface shows the complete times, working time, speed, power of the file, the speed of jog, and the position of axis x, axis y, axis z and axis u, etc. The parameters are described below:

Number: The complete times of the selected file.

Time: The work time.

Speed: The working speed.

Power 1: The power of Laser 1. The left value is min power value. The right value is the max power value.

Power 2: The power of Laser 2. The left value is min power value. The right value is the max power value.

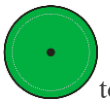
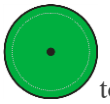
Jog Speed: Manually move axis speed, can press the [Select] key to change the speed, there are "High" or "Slow". The "High" is default speed set by user, and the "Slow" is half of the Jog Speed.

Notes:

- X, Y, Z, U: the coordinate in the current place in X axis, Y axis, Z axis and U axis. For double-head bidirectional model or a rotary cutting model, displays the coordinates of Z axis. When it is a normal model, displays the coordinates of U axis.
- When there is no file selected, it displays the default power and speed. When selecting the file, it shows the power and speed in the first layer of the file. When processing, it shows the power and speed of the current processed layer.
- When the machine is processing, if you want to modify the speed of the current layer, press the pause button, then press speed button, you can modify the speed of the current

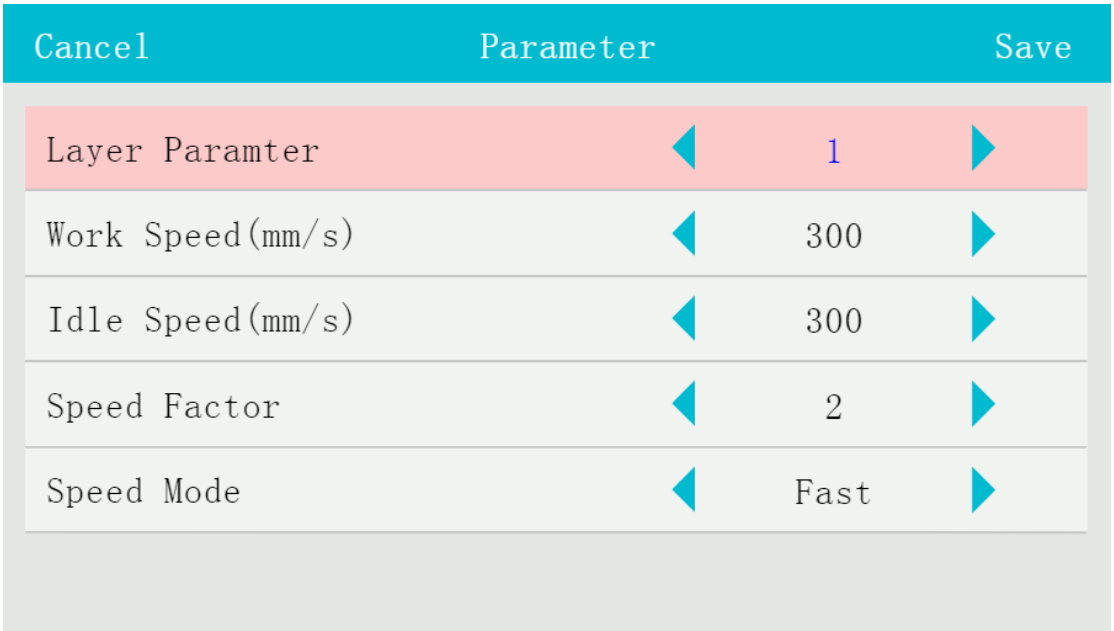
layer. In the same way, press power button to modify the min/max power. If machine is processing, press [Left/Right] button, can immediately reduce or increase the laser power. Press once, plus or minus 1%. Left for reduce, Right for increase. When changed the speed of power during working operation, after the completion of processing, it prompts whether to save the changes of the speed and power value.

- In the standby status, when the processing file is selected, press

to clear the number of completions of the current file.
- When the machine has autofocus, it can be set through the lifting the U-axis control platform (or cutting head), and the focal length is set in the laser parameters, press  to perform autofocus.
- Press number key [6] to start the positioned cutting with the camera software.
- For the rotary knife cutting model press the key [5] to enter the interface of tool setting test, press key [7] to display the control interface of the rotary knife cutter, press key [9] to record the completion / stop position on Z axis, press key [0] to automatically set the tool and press  to manually set the tool.

2.2.2.3 Speed setting

After initialization, press the [Speed] key, show as:



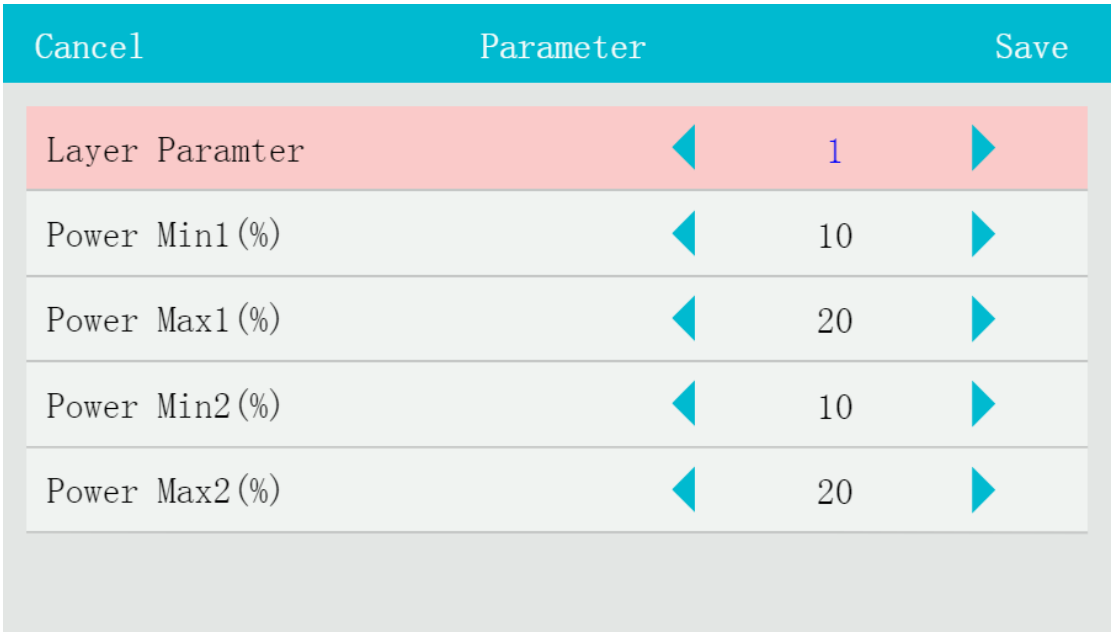
Layer Parameter: When one file is selected, press button, to choose the layer number.
Work Speed: When one file is selected， it shows the work speed in current layer. Otherwise, it shows the system default speed value. The unit is mm/s.
Idle Speed: The default move speed when laser is off. When one file is selected, it shows the idle speed in current layer. Otherwise, it shows the system default speed value. The unit is mm/s.

Speed Factor: It is applied to improve the smoothness of movement. The range is 0.00-3.00. The bigger the factor, the faster of planned speed of lines in work file, and the stronger jitter of motion. The smaller the factor, the slower of planned speed of lines in work file, and then longer the work time and the jitter of motion. Normally it is set to 2. If the smoothness is high demanded (i.e. above 2500mm/s), set the factor to less than 1. The jitter reduces obviously. In a need for acceleration, set the speed factor to 3.

Speed Mode: Fast mode, faster cutting speed and increased jitter. Normal mode, stable speed and less jitter during cutting.

2.2.2.4 Laser power settings

After initialization, press the [Power] key, show as:



Layer Parameter: When one file is selected, press [select] button, to choose the layer number.

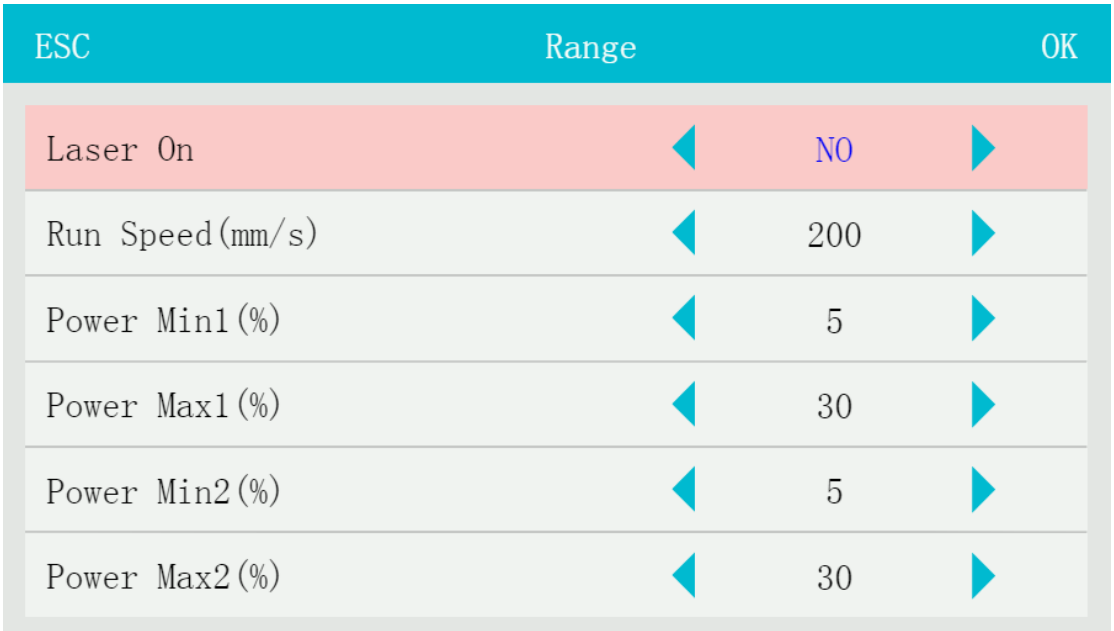
Power Min: When stroking curves, this power intensity applied for line start and the corner of the curve. Or it applied for the top depth when gradient carving. The range is 0.00~100.00%.

Power Max: When stroking curves, this power intensity is applied as the work speed was reached. Or it applied for the bottom depth when gradient carving. The range is 0.00~100.00%.

Power Min1 and Max1 is the light power intensity of LASER-1. Power Min2 and Power Max2 is the light power intensity of LASER-2. When there is no file selected, it displays the default power. The pulse power is the max light power currently displayed on the standby interface.

2.2.2.5 Range preview

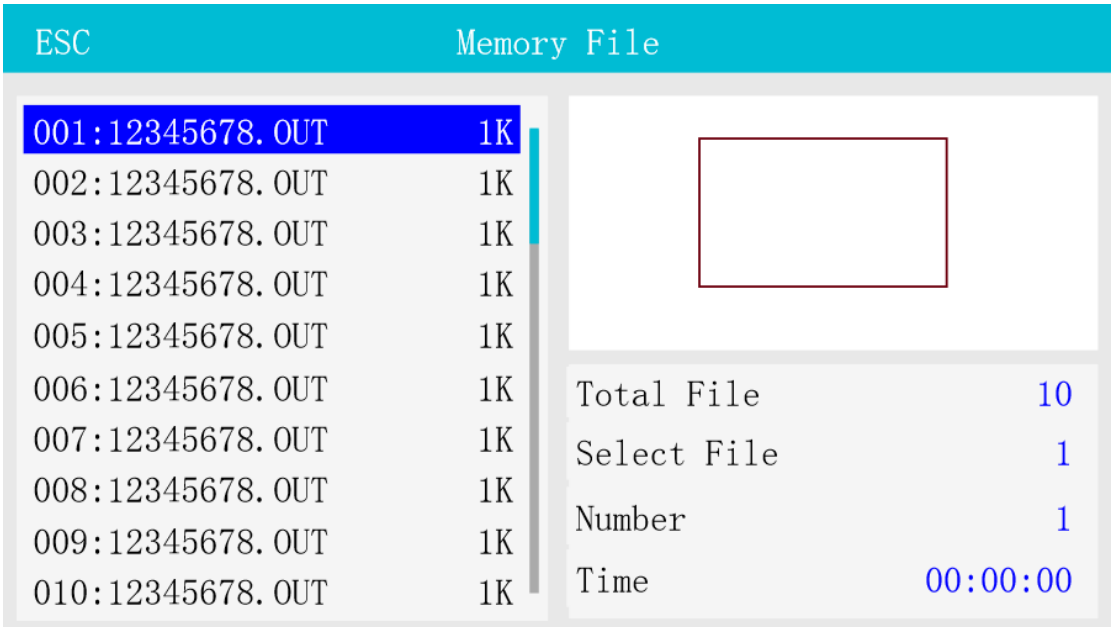
After initialization, press [Menu]/[Range] key, show as:



Laser On: Two range preview modes, one is for cutting range; the other for the running scale. Change the two preview modes by pressing the [Select], select [Yes] to cutting range, and select [No] to running scale to view the working range. Press [OK] to perform the operation after selection.
Run Speed (mm/s): The speed of running scale, unit is mm/s.
Power: When cutting the scale, it uses the system default power which is shown here. The min power intensity applied for line start and the corner of the curve. The max power intensity is applied as the run speed was reached. When cutting the scale, it uses LASER-1.

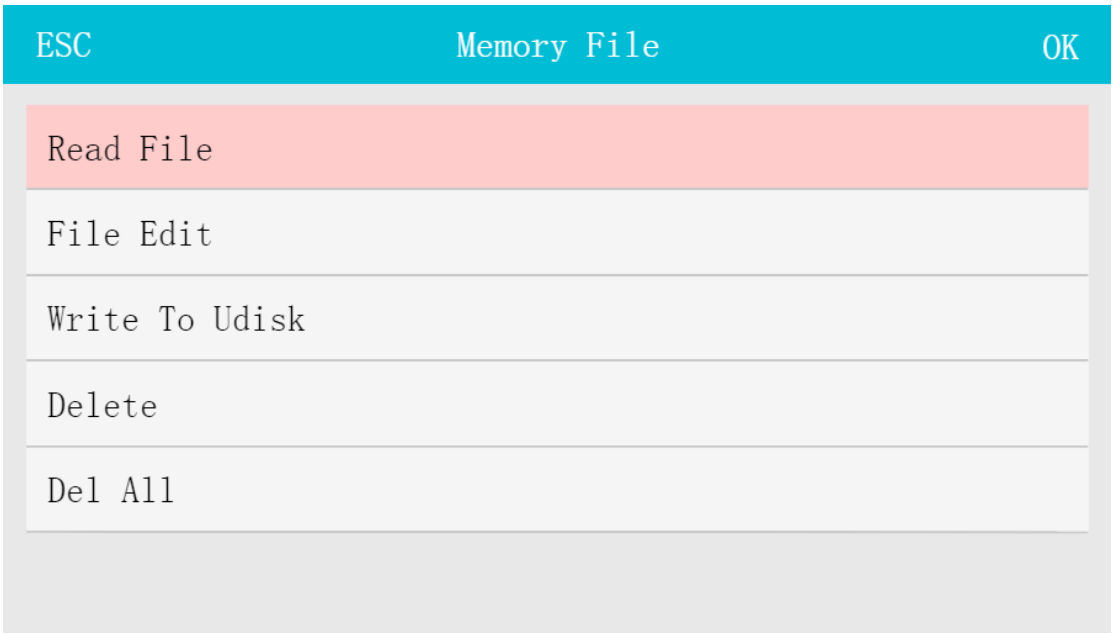
2.2.2.6 File selection

Press [File] key in the standby interface, directly select [File] / [Memory File] to enter, show as:

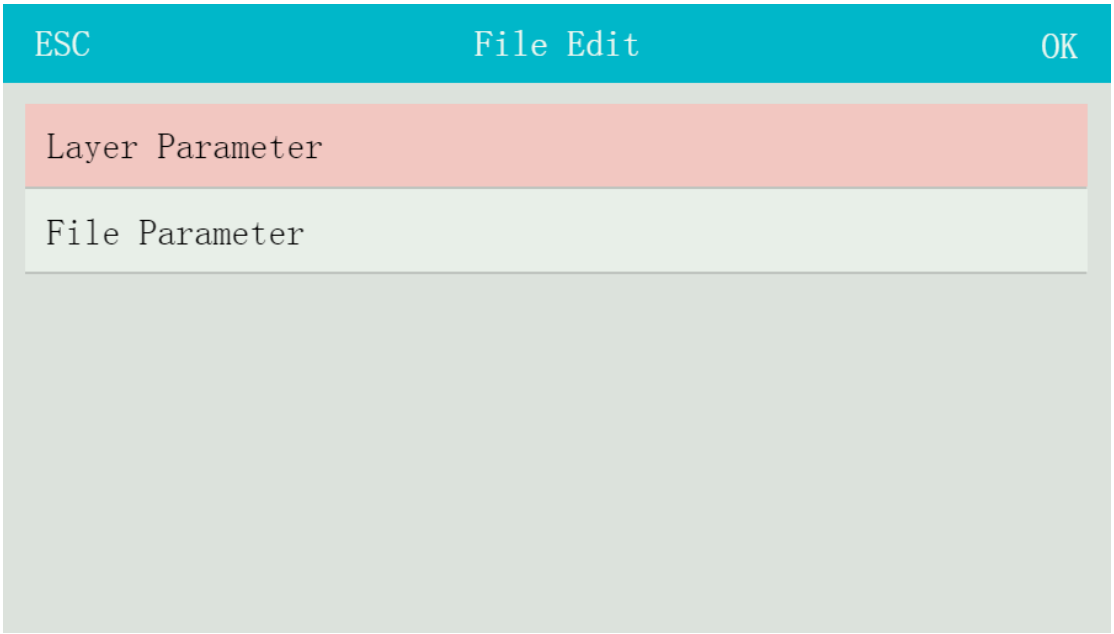


The list of files is displayed on the left side of the interface, the preview image in the upper right area, and the file information in the lower right area.
Total File: The total number of files, up to 500 files.

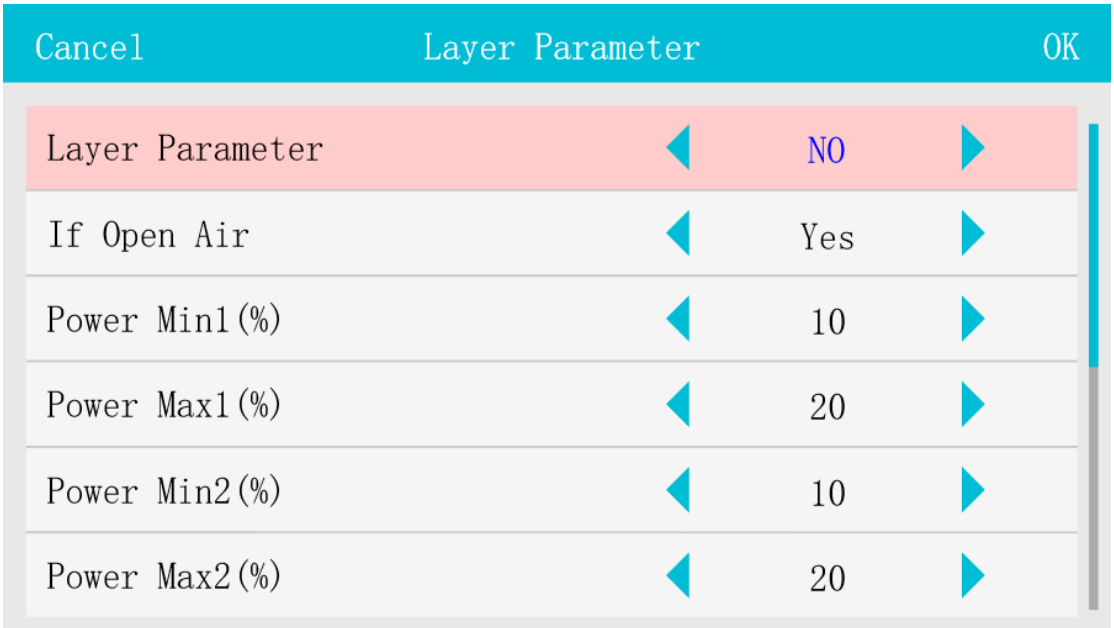
Selected File: The currently selected file.
Number: The completion times of the selected file.
Time: The previous processing time of the selected file.
Press [Down/Up] to view the file, press [Select] key to find the current file, press [ESC] to quit. Press [Enter] to operate, show as:
Read File: Select this file to work.
File Edit: Edit the file parameters like speed and power.
Write to U Disk: Copy the file into U disk.
Delete: Delete the current file.
Del All: Delete all files.
Press [Enter] to confirm the operation, press [ESC] to quit and return to the original interface.

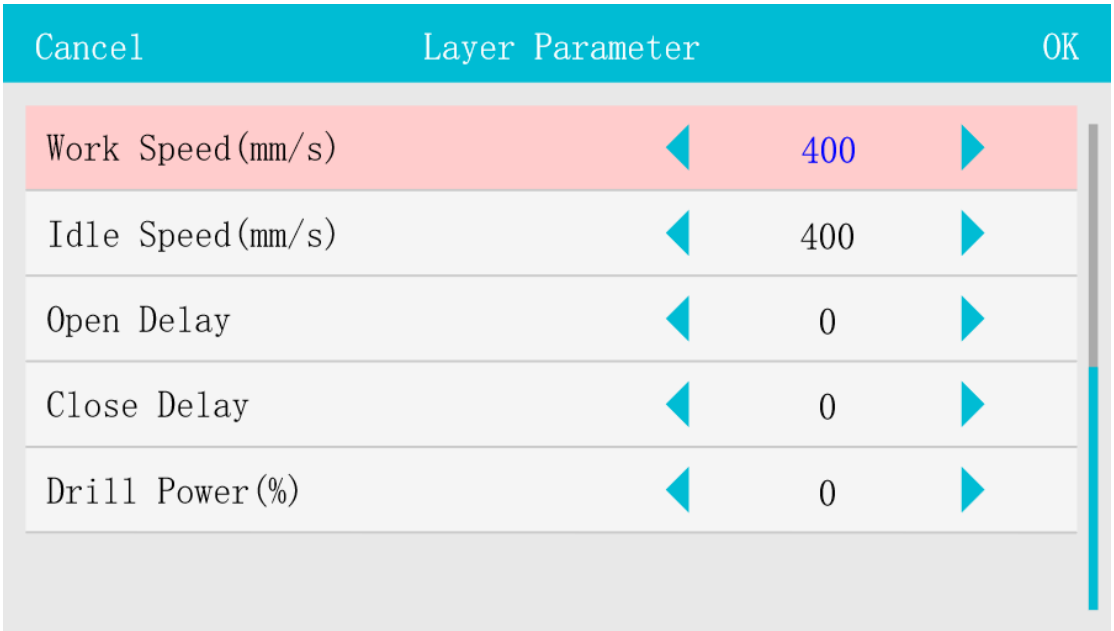


Under File Edit, the layer parameter and file parameter can be set, as shown in the Fig. Press [Enter] to enter into the next interface.

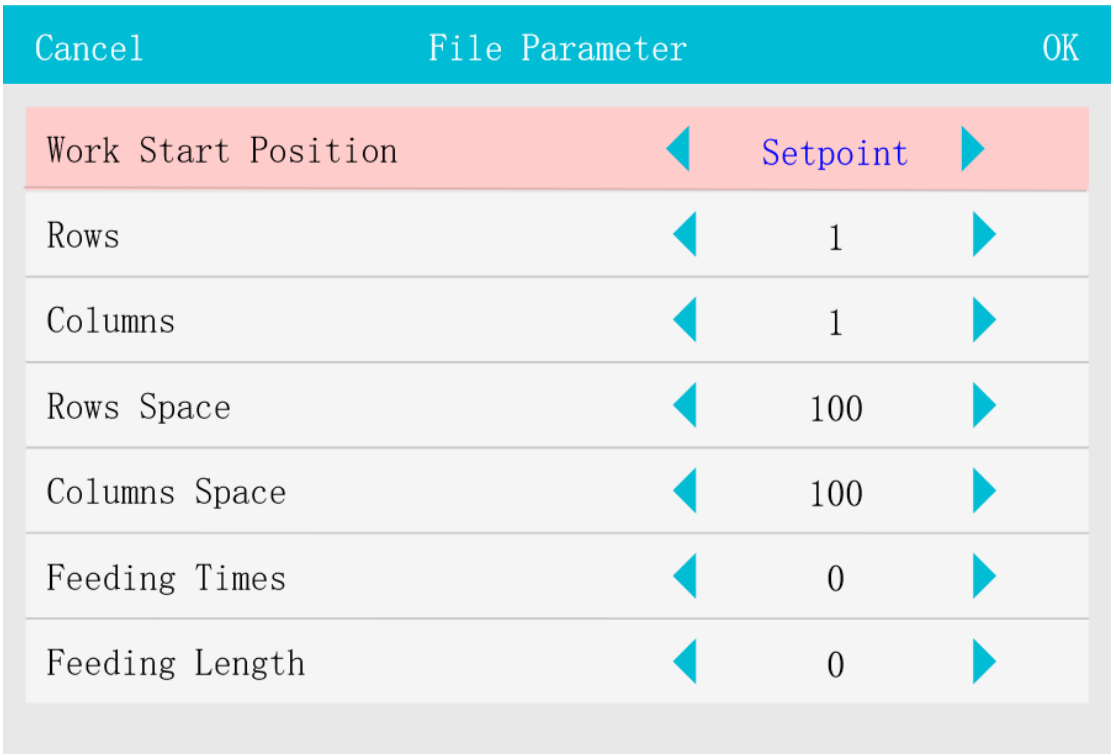


In Layer Parameter interface, set the parameters of each layer such as Blowing, Light Power, Speed, Laser On/Off Delay, etc. In particular, before the processing, first smooth the equipment to reduce jitter, set the On Delay to 0.05, and On Light Power to 0. Laser On/Off Delay: the unit is second.





Set the feeding times and length in the File Parameter, the length unit is mm.



2.2.3 Lifting platform description

Supplementary notes about the U-axis as a lifting platform and autofocus:

Before commissioning, please confirm that the U-axis parameters have been adjusted and OK, the U-axis function of [Equipment Parameters] has been changed to [Lifting], and the [Focal Length] parameter in [Laser Parameters] has been filled in, otherwise the controller will not respond accordingly Actions.

Movement method of lifting platform:

Press the decimal point key on the panel in the standby interface, the system prompts "Whether to start focusing". After confirmation, the U-axis starts to control the machine platform to move upwards until the machine platform touches the U-axis origin limit switch (Lmt_Z/U-), and then Move in the opposite direction to a certain distance. The distance in the opposite direction is the value of the [Focal Length] parameter in the [Laser Parameters] on the panel.

In this movement mode, the origin limit switch (Lmt_Z/U-) of the U-axis should be installed at the high point position of the lifting platform instead of the low point position.

Autofocus movement method:

Press the decimal point key on the panel in the standby interface, the system prompts "Whether to start focusing". After confirmation, the U-axis starts to control the laser head to move downward until the laser head touches the U-axis origin limit switch (Lmt_Z/U-), and then move in the opposite direction to a certain distance. The distance in the reverse direction is the value of the [Focal Length] parameter in the [Laser Parameter].

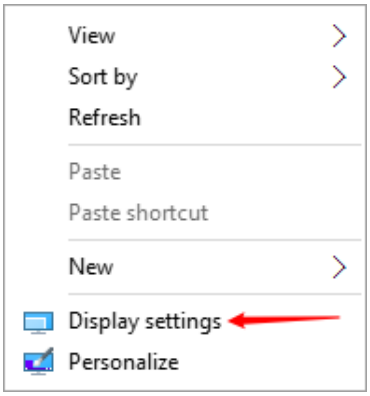
In this movement mode, the origin limit switch (Lmt_Z/U-) of the U-axis should be installed at the low point position of the lifting axis (laser head) instead of the high point position.

Part 3 Projection cutting

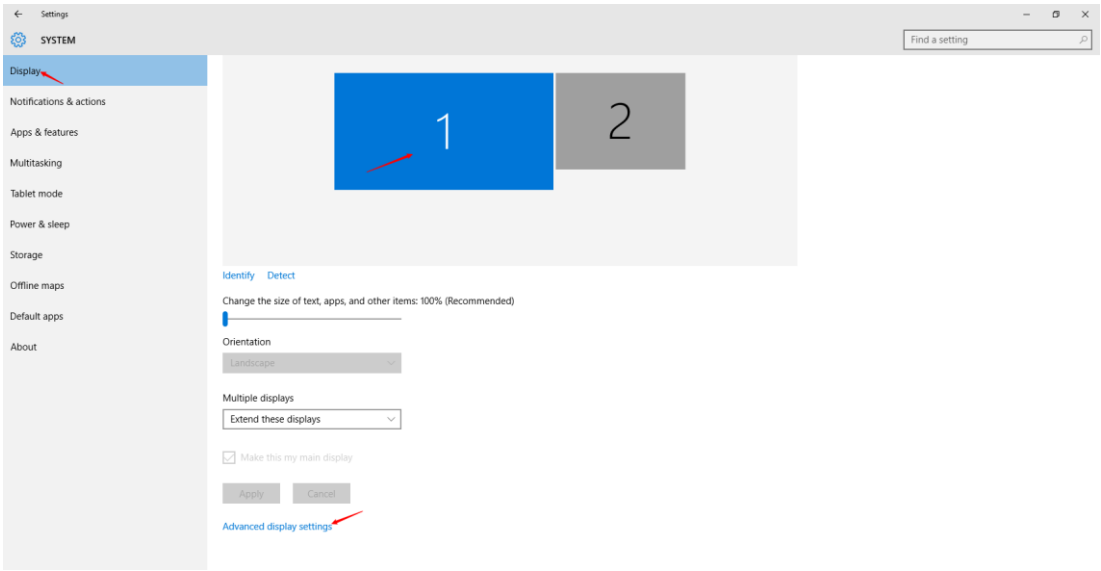
Note *In the following description, it is advised to use the projector with best resolution of 1366*768 and debugging on Windows 10 system. On Windows XP this debugging method is so familiar with on Windows 10. According to the best resolution of the projector, it is to choose the best installation location in the process of installation and debugging.

3.1 Installation

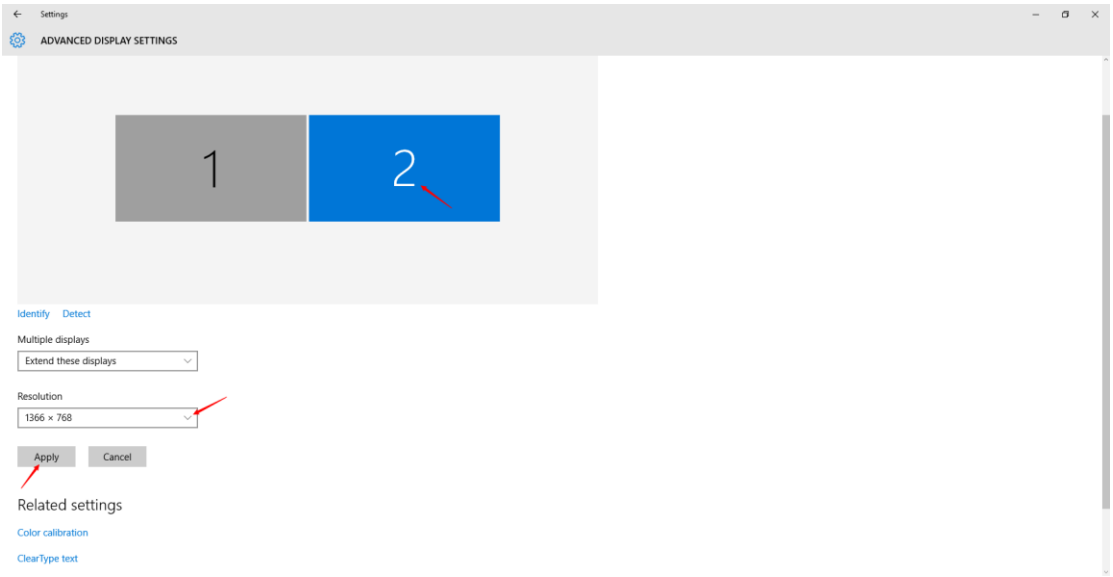
1. Using the bracket securing the projector directly above the machine. Make the projector is perpendicular to the work table as possible! Maintain an optimal resolution of the projector case, according to their own machine working width adjust the installation height
2. After installing projector linked to a computer, and reset the machine to the mechanical origin, first determine whether the laser head within the valid projection range, and then set the resolution of the computer the same as projector. Specific methods of operation are as follows:
   1) ·Right-click on the desktop and select Display Settings to enter as shown in the figure:



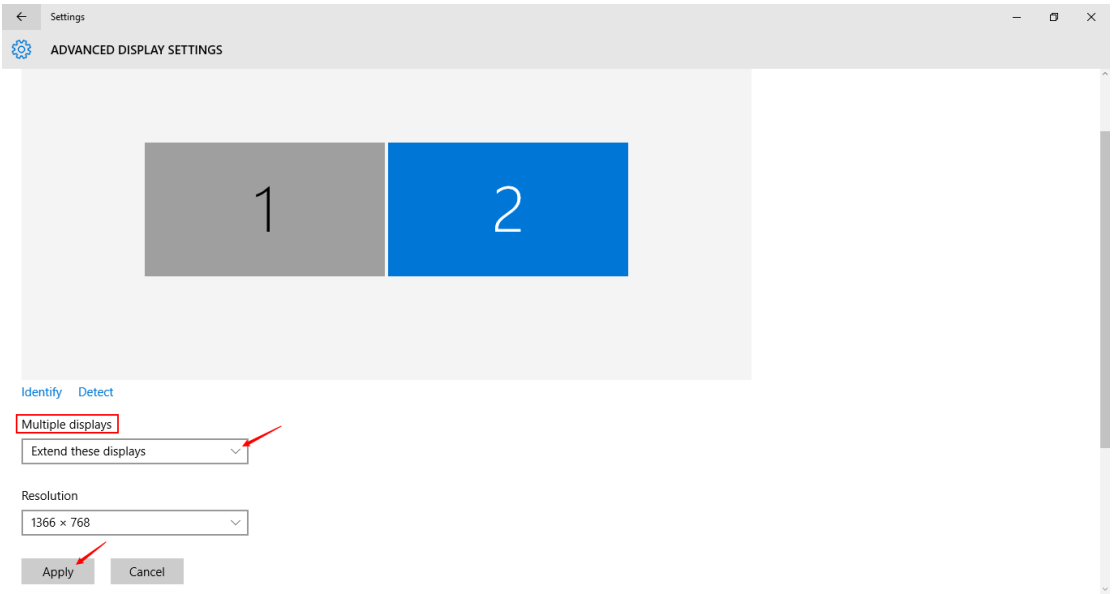
   2) Select number 1 and view the screen resolution of your computer, and then select number 2 to see the resolution of the projector. And adjust the projector's resolution to the best. Then set the screen resolution of your computer the same as the projector. As shown in the figure.



3) Select Number 2 and adjust the resolution of the projector to the resolution closest to number 1, as shown in the figure below:



4) After adjusting the resolution of the computer and the projector, select "Multiple displays" from the interface No. 2 to "Extend these displays"; After clicking "Apply". The diagram below:

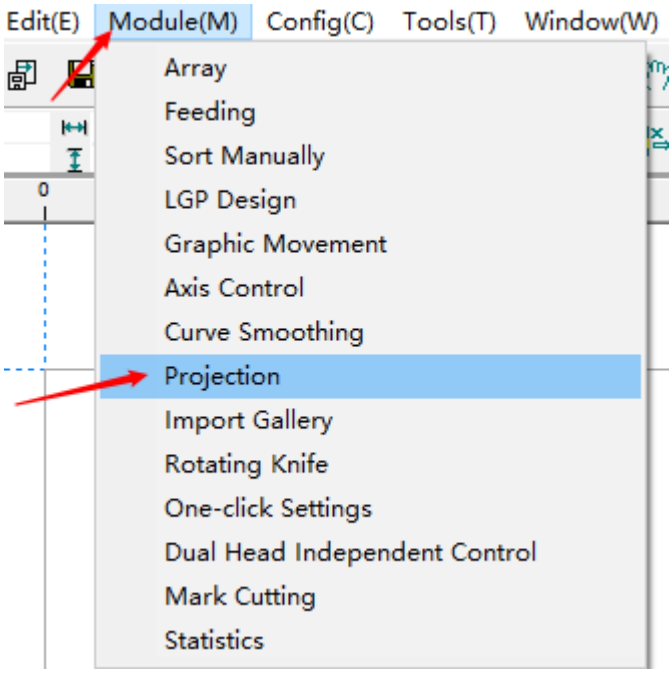


In the debugging process if the computer and the projector do not have the same resolution, you can select both to the nearest resolution.

3.2 Calibration

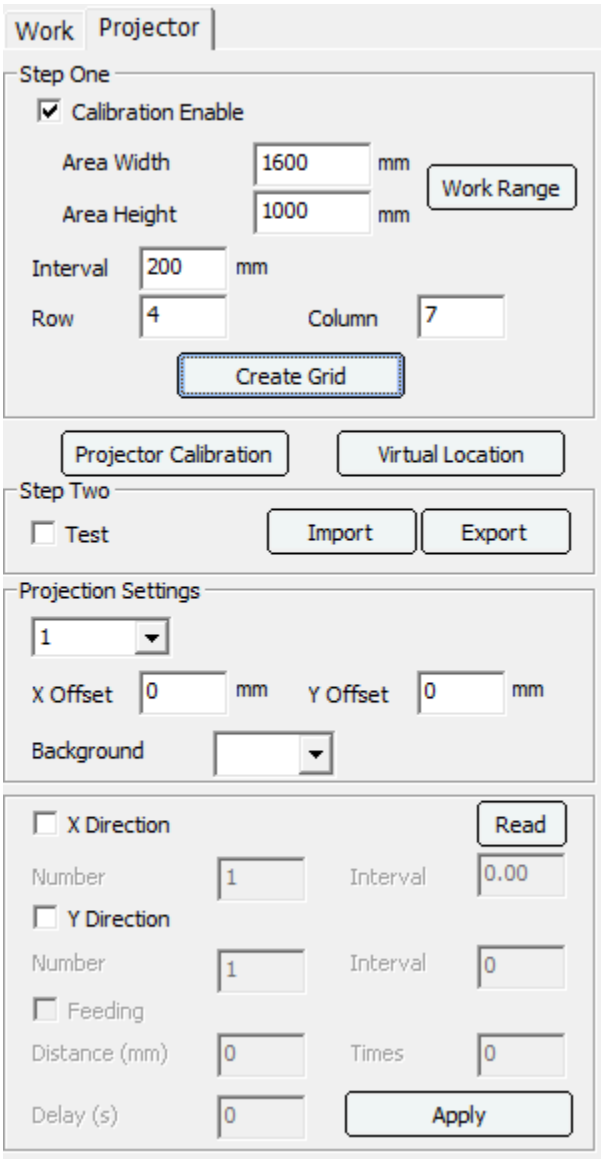
Following calibration is completed on the format for the 1600mm*1000mm machine.

1. Open laser software to make a 5-by-8 size 200*200 rectangle (full convergence), and let the machine cut it.
2. Insert the dongle on your computer, click on the software's [Module] option, select [Projection] as shown in figure:

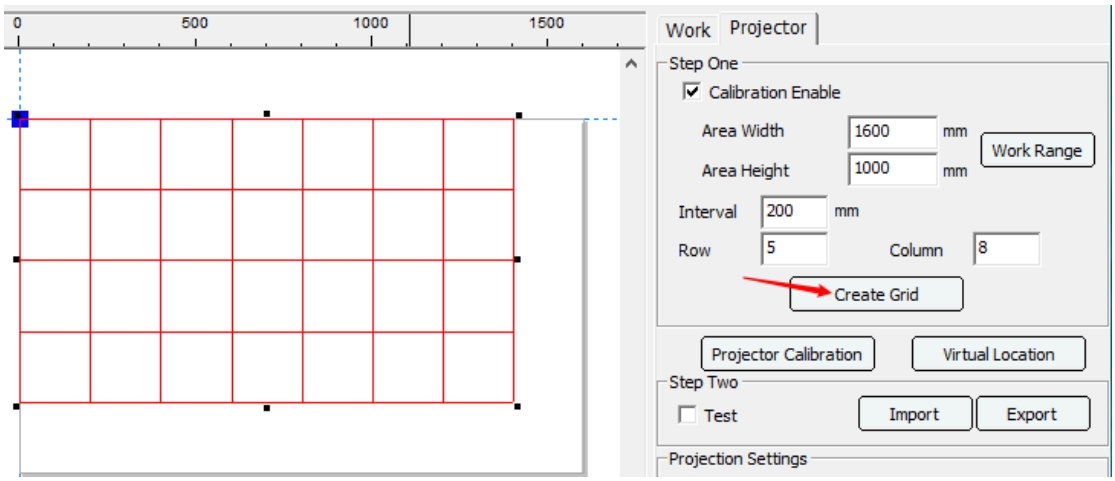


3. In right side of software, the function set area will display a [Projector] page, turned to projector page, at first check the [Calibration Enable] box, then fill in regional wide (X) and regional

height (Y), you also can directly click [Work Range] button then software will read maximum effective format of axis X/Y and calculate out the regional width and regional height.



4. Click [Create Grid] button. 5 rows and 8 columns 200mm rectangle will appear in plot area, while the size of this rectangle is a projector with a 1:1 into the working area of the machine as shown in Figure:



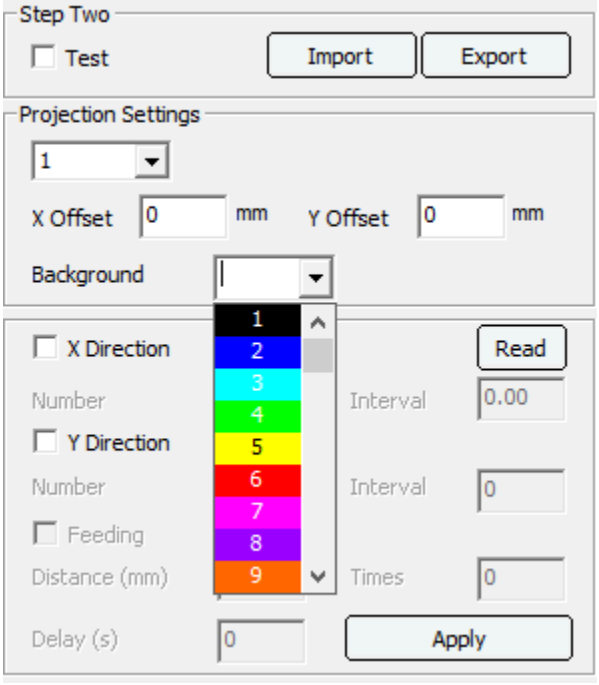
Note * since 1610 machine projector range cannot be taken to full size, so the figure should be 5 rows and 8 columns of the grid into 4 rows and 7 columns. But this does not affect the accuracy of calibration of the projector.

5. After grids are completed, go into work page to set the light intensity speed parameter, and then click on the download button to download file to cut grids. (Be sure processing set anchor is within valid range of the projection).
6. It will be seen that the cross circles are projected on the work table. Use the mouse left button to select it and hold on to drag, or double click the circle to use direction button on the keyboard to move it. Drag the circles to make the projected rectangle overlapping the cutting rectangle on the table. At last click [Projector Calibration] button. And enter the password tz0001, click on [OK]. The entire calibration process is finished.
7. Next time open the software, the calibration parameter will be loaded directly, and does not need calibrating again, and you can also use the import parameters and export parameters to load/save the calibration parameters.
8. Projection test. After the check, grids will be projected onto the machine to test the projection parameters are correct.

3.3 Project setting

1. **Laser head offset**: If there are multiple laser heads, you can set the XY offset value of each laser head.

2. **X/Y offset**: refers to the projector used in the process will inevitably be some bias, the cast out graphic is a little different as before. It is not in the same place! Then we can give it an x, y offset to correct accuracy of graphic casted out by the projector! Use a ruler to measure actual offset values to set these offset parameters. If there are multiple projectors, you can select each projector in Combobox and set the offset
3. **Background color**: refers to the actual background color the projector cast out. When the cut materials color is familiar with the background colors, the two colors will blend together, it will not show out the graphic. In this case, you only need to select a different color in the background color. As shown in the figure:



4. **Virtual location**: it means in the machine projected valid range the user can increase a temporary anchor point. After the machine work done, laser head will back to the location of the virtual position, it greatly shortens the distance of the laser head moving back and forth, make the laser work more easily and quickly. Setting methods should first set [Return point] to [None]. Then move the laser head to where you want to set as a virtual location, and then click on the software [Virtual location].
5. **Read**: Obtain the distance between two laser heads when used for projecting arrays, and arrange graphics according to the distance between the two heads.
6. **Number and interval**: when users need to use fixed double laser head cutting the same graphic you can use this feature. It only needs to fill in the corresponding parameter (Set the [Number] parameter to 2, and the [Interval] is the interval between the graphic for cutting by two laser head), click [Apply]. It will generate a copy of the select graphics in the X direction. Change the copy object to another layer then prohibited output it. Now the graphics will be fit to cut by the fixed double laser head machine.
7. **Feeding**: This function can be enabled when the user needs to feed the material after the cutting is completed. The distance and times of the feed need to be filled in, and whether there is a delay before feeding.

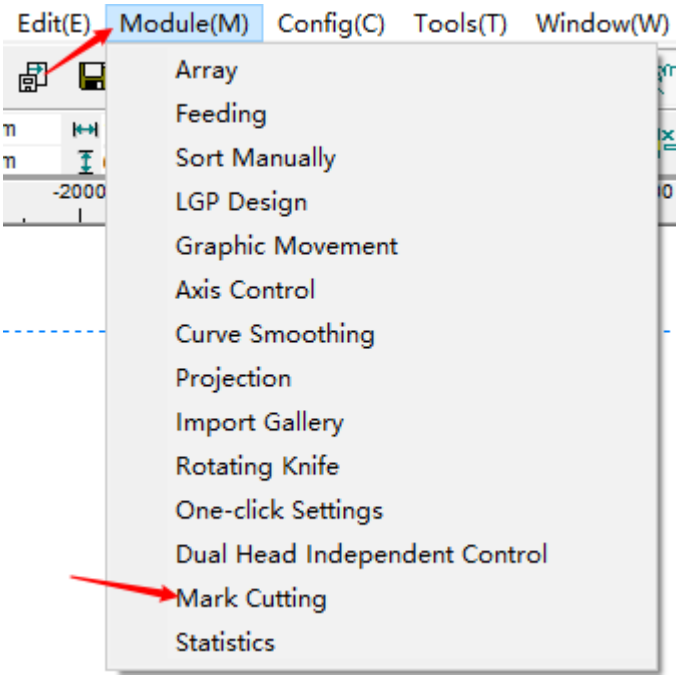
Questions and answer:

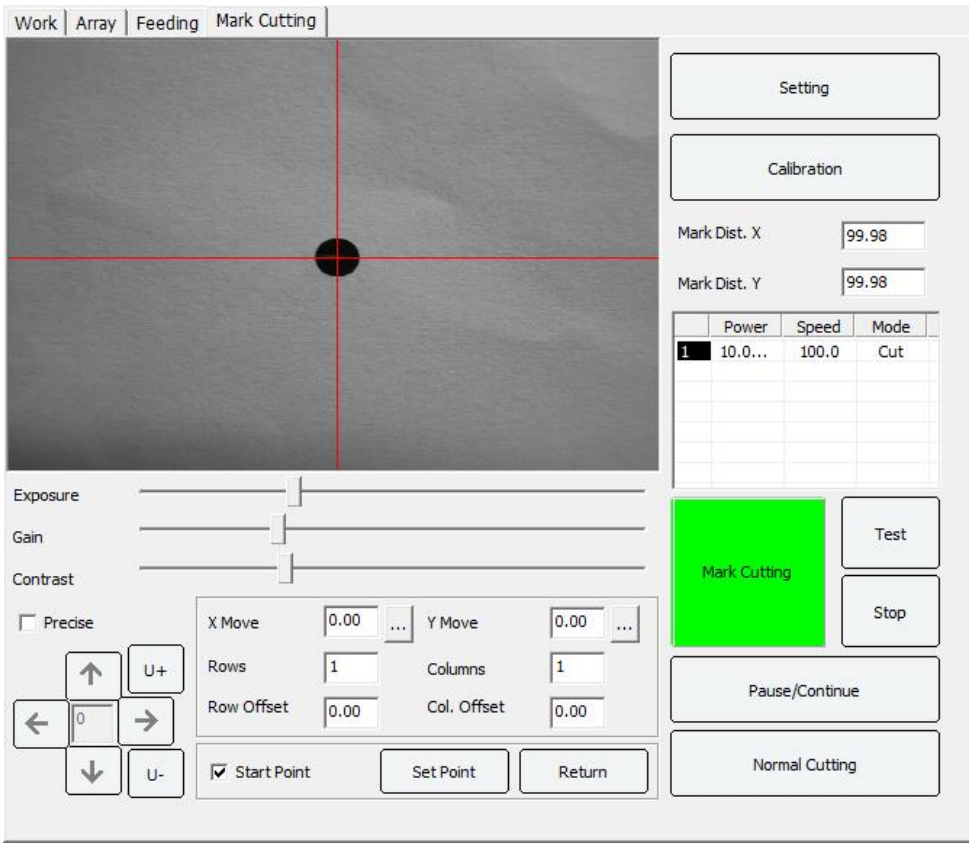
1. Check the [Calibration Enable] and found the following edited boxes are disabled. Check the control card is connected properly with your computer!
2. After calibration is complete, projection cannot normally found in the machine's workbench, or the projected object is not the same as the graphics in the software. Check the laser head is within the valid format into the projection range while doing calibration!
3. After connecting the projector with the HDMI cable, it is found that the projector is the main display and the computer screen is the secondary display. Please update the graphics card driver and make changes in the graphics settings.

Part4 Mark point cutting

4.1 Mark point cutting instructions

Open the Mark point cutting function: open the software, and select [Mark Cutting] in the menu bar [Module] option. As shown in the figure:





Setting: Set parameters such as recognition accuracy, rotation, first mark point position, photographing speed, photographing delay, mark point shape and size, etc.

Calibration: Camera calibration.

Mark Dist. X (Mark horizontal distance): The distance between two "Mark" points in the X direction should be filled in according to the actual distance.

Mark Dist. Y (Mark vertical distance): The distance between two "Mark" points in the Y direction should be filled in according to the actual distance.

Precise (Accurate movement): Move an axis accurately, fill in the distance to be moved after checking, and then click the direction key to move the axis.

X Move(Horizontal movement**) / Y Move** (Vertical movement**)**: When there are multiple sets of mark point graphic arrays, you need to set the first mark point distance of the two horizontal arrays. Then Move the camera to the center of the first Mark point and click [Set point]. Then open the extension button ... to pop up the measurement moving window, and click [First]. Then click the right mouse button in the camera display area, move the camera to the center of the next Mark point, and click the [Next] button. Click [OK] after completion, and the software will calculate the distance between the two Mark points by itself. The same applies to vertical movement (Y Move). As shown in the Figure:

Start Point: After checking, you can turn on the function of setting the starting point and returning to the origin.

Set Point (Set starting point): Set the starting point of the camera photography and the return position of the laser head after cutting.

Return (Back to starting point): No matter where the laser head is clicked, the laser head will return to the previously set starting position.

Numbers of rows and columns: The template is used to set the number of cutting primitives when cutting.

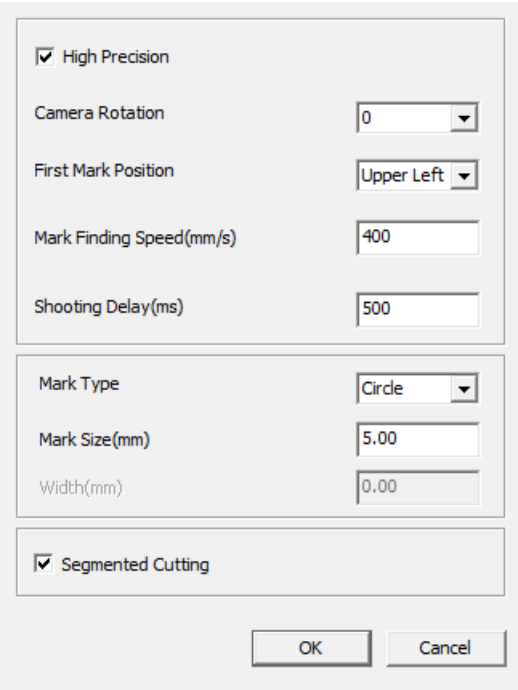
Row/Column Offset: It can be positive or negative used for multi-row offset cutting. When the laser head cuts the first row, it will automatically offset the corresponding distance according to the offset value set by the user before cutting the second row. The same applies to column shifting.

Exposure: Adjust the brightness of the picture, increase the exposure compensation if you want the picture to be brighter, and reduce the exposure compensation if you want the picture to be darker.

Gain: The brightness of the camera is improved, so that the camera can still display better images in a relatively dark environment.
Contrast: The degree of contrast between the bright and dark parts of the picture increases the contrast, the bright parts of the picture will be brighter, the dark parts will be darker, and the contrast between light and dark will be enhanced.
Mark Cutting: Take photos to identify the "Mark" point, and then locate the cut.
Normal Cutting: Common processing does not recognize the "Mark" point.
Test: Perform mark point photo recognition, but do not download files.
Pause/Continue: Pause work and click again to continue working.
Stop: Stop the current work and return the laser head to the starting position.

4.1.1 Mark point cutting settings

Click the [Setting] button, and the following window appears:



High Precision: The camera is more accurate when shooting Mark points. After the camera captures the Mark point, the laser head will automatically move to the center of the Mark point and then take a picture.
Camera Rotation: Set camera rotation angle, 0, 90, 180, 270.
First Mark Position: Choose according to coordinate system.
Mark Finding Speed (mm/s): The moving speed of the camera when shooting the Mark point and the moving speed of the right button in the video window can be changed according to the user's requirements.
Shooting delay (ms): The camera delays the waiting time before shooting the Mark point, so as to make the laser head stop completely before shooting and improve the accuracy of the camera shooting.
Mark Type: Set the mark point type. Circle, Square, Cross Line.
Mark Size (mm): Set the size of the currently used mark point graphic, which must be the current Mark point size, otherwise the software will prompt "No Mark point found".

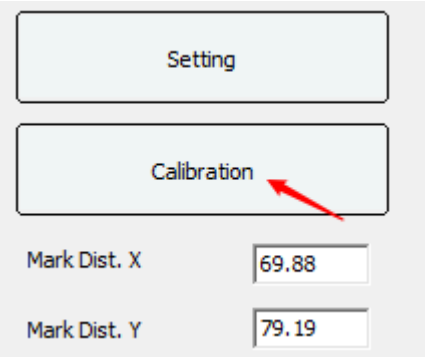
Width(mm): When the mark point type is a cross line, the line width of the cross line needs to be set. If the crosshair is a single line, set it to 0.
Segmented Cutting: After checking, in the Y direction, when the imported graphics have multiple sets of array Mark points, the software will automatically cut the graphics in sections.

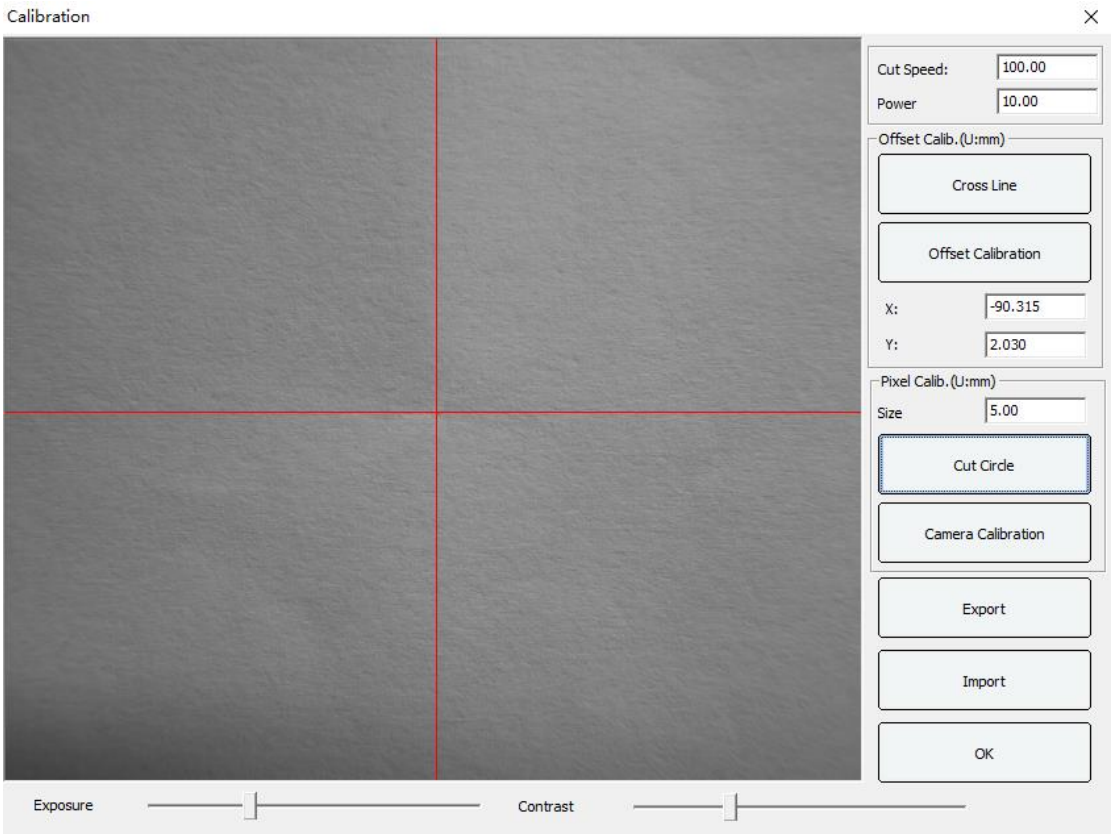
4.2 Camera calibration

Note: Before calibrating the camera, please check whether the X-Y axis resolution is correct and whether the X-Y beam is vertical. Firmly install the camera and lens to ensure normal communication between the software and the system, and then enter the camera calibration process.

4.2.1 Offset calibration

When using the Mark point cutting function for the first time, calibrate the camera first, otherwise accurate cutting will not be possible. Adjust the magnification of the lens and the brightness of the light source before calibration to ensure that the edges of the collected images are clear and the background is less noisy.
1. Connect the computer and the machine with USB cable or network cable, and check whether effective communication is possible.
2. Click [Calibration] to open the calibration interface.

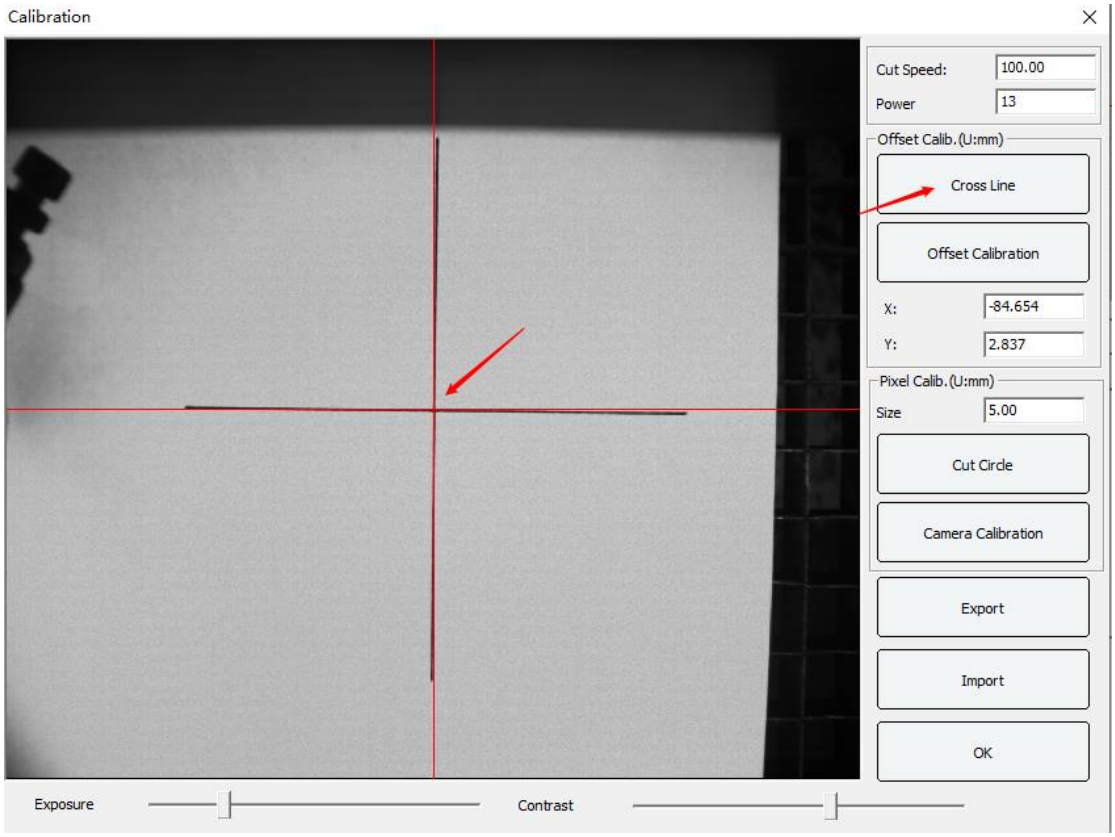


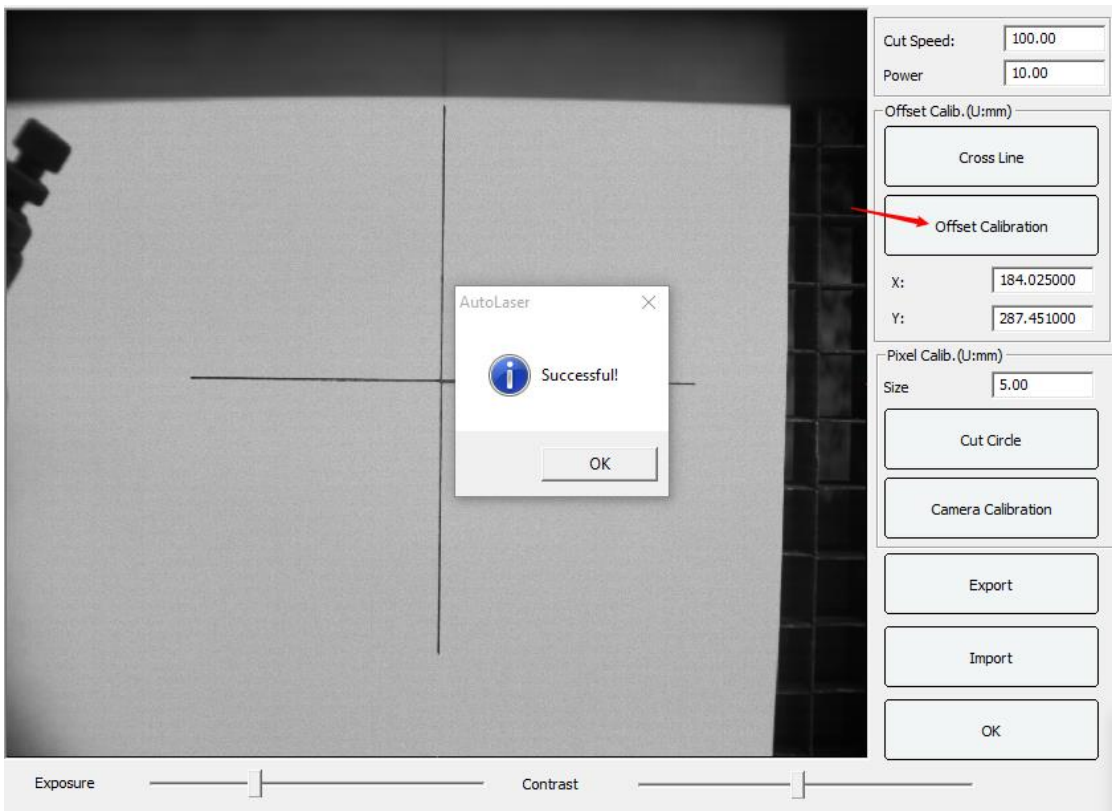


3. Put a piece of white paper on the machine table to fix it, move the laser head to the white paper range, and then adjust the cutting speed and light intensity, click on [Cross Line], and the laser head starts to work. And cut out the cross lines of corresponding size.

4. Move the laser head to make the red cross line displayed in the lens window coincide with the cut cross line.Click [Offset Calibration] to complete the distance calibration. As shown:

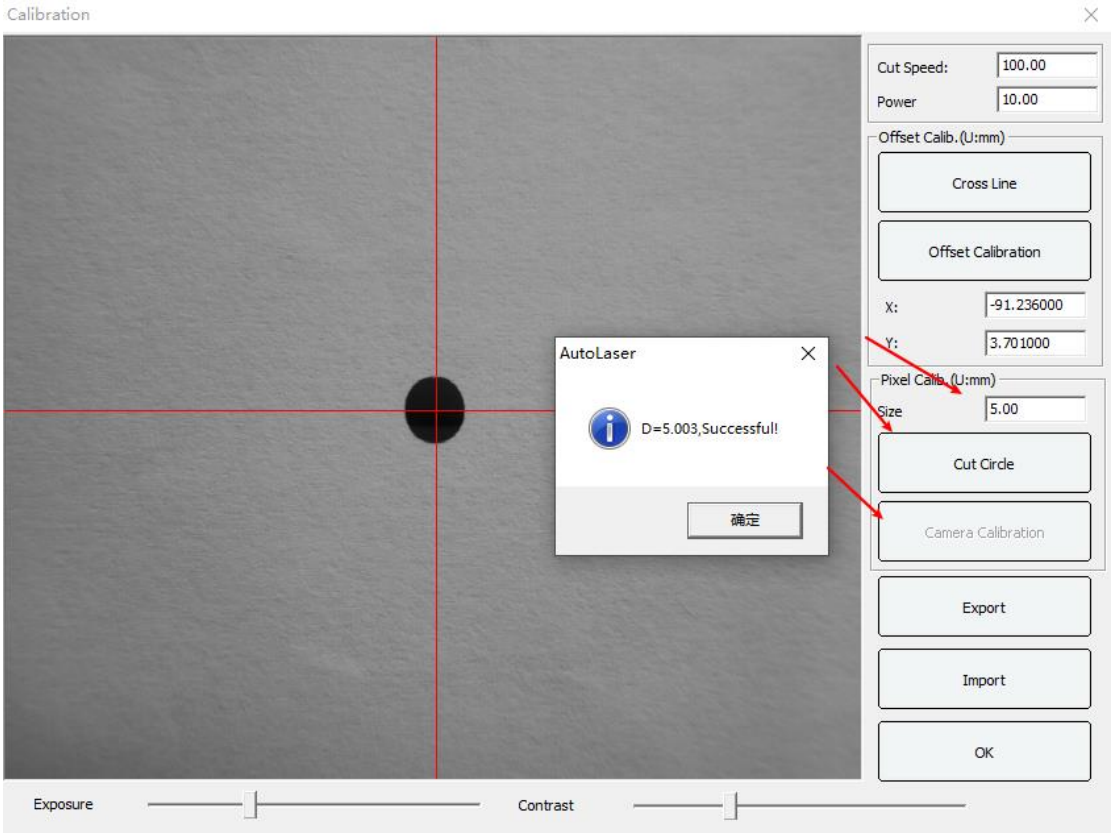
5. If the calibration fails, please adjust the camera exposure, contrast and other parameters in the calibration interface, and try the calibration again.


Calibration
Cut Speed:
100.00
Power
13
Offset Calib.(U:mm)
Cross Line
Offset Calibration
X:
-84.654
Y:
2.837
Pixel Calib.(U:mm)
Size
5.00
Cut Circle
Camera Calibration
Export
Import
OK
Exposure
Contrast


Cut Speed:
100.00
Power
10.00
Offset Calib.(U:mm)
Cross Line
Offset Calibration
X:
184.025000
Y:
287.451000
Pixel Calib.(U:mm)
Size
5.00
Cut Circle
Camera Calibration
Export
Import
OK
AutoLaser
Successful!
OK
Exposure
Contrast

4.2.2 Pixel calibration

1. Open the calibration management, first set the size of the calibration circle to be cut, generally 5mm, click the [Cut Circle] button, the machine performs the cutting calibration circle action, after the cutting is completed, move the camera directly above the calibration circle, click [Camera Calibration]. As shown:



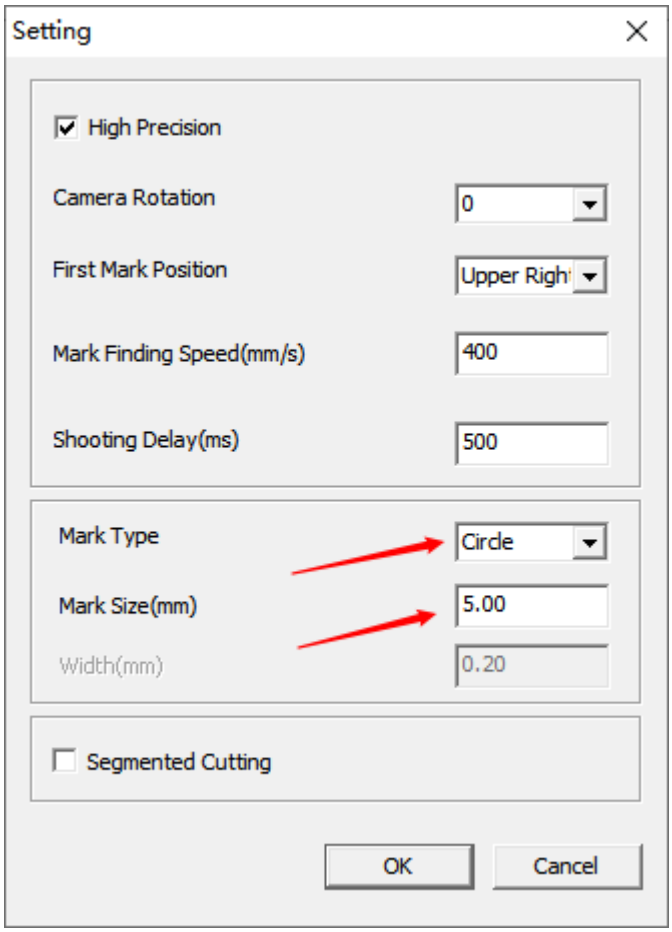
2. If the software prompts success! It means the pixel calibration is successful. If the calibration fails, please readjust the exposure and contrast.

3. Use the [Export] function to export the calibrated file for saving. When the camera does not shift and the focal length does not change, after reinstalling the software, just pass the previously saved calibration file through the [Import] function, import the software and click the [OK] button to take effect.

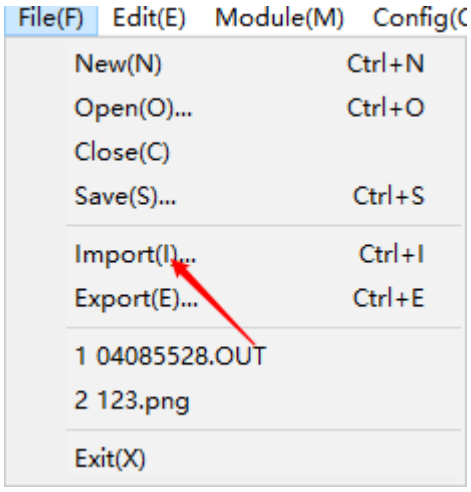
Note: If the camera shifts during use, the lens focal length changes, or the software is uninstalled and reinstalled, the camera needs to be recalibrated.

4.3 Mark point cutting process

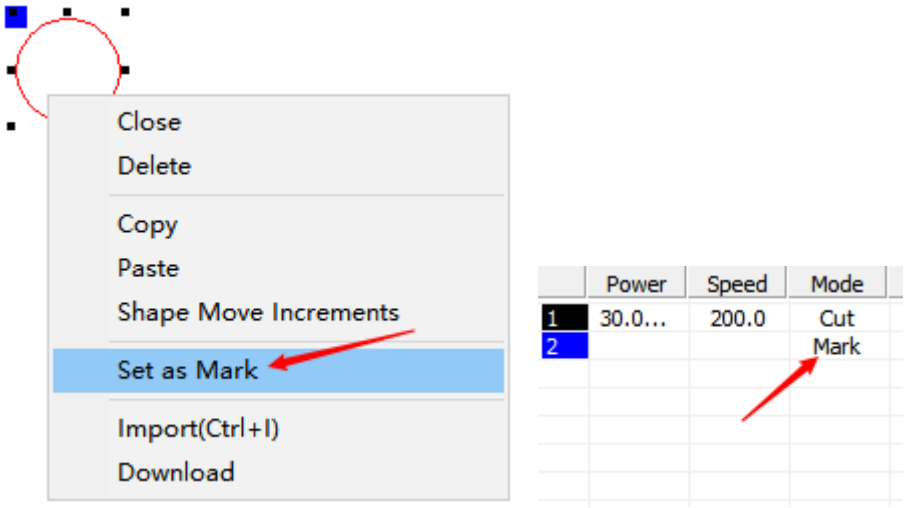
1. In the [Settings] dialog box, set the Mark Type and Mark Size that need to be recognized currently. After setting, click OK. As shown:



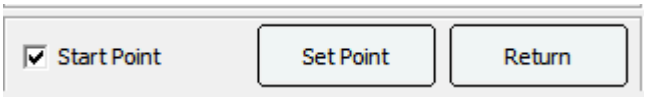
2. Click [File\Import] to import Mark point graphics.



3. Select the Mark point, click the right mouse button and select "Set as Mark Point", or click to automatically set the Mark point. At this time, the parameter bar on the right will automatically appear another layer parameter of the Mark mode. As shown in figure:



4. Move the camera directly above the first Mark, and click [Set point]. Then click [Test], if the camera moves normally, then click [Mark cutting].

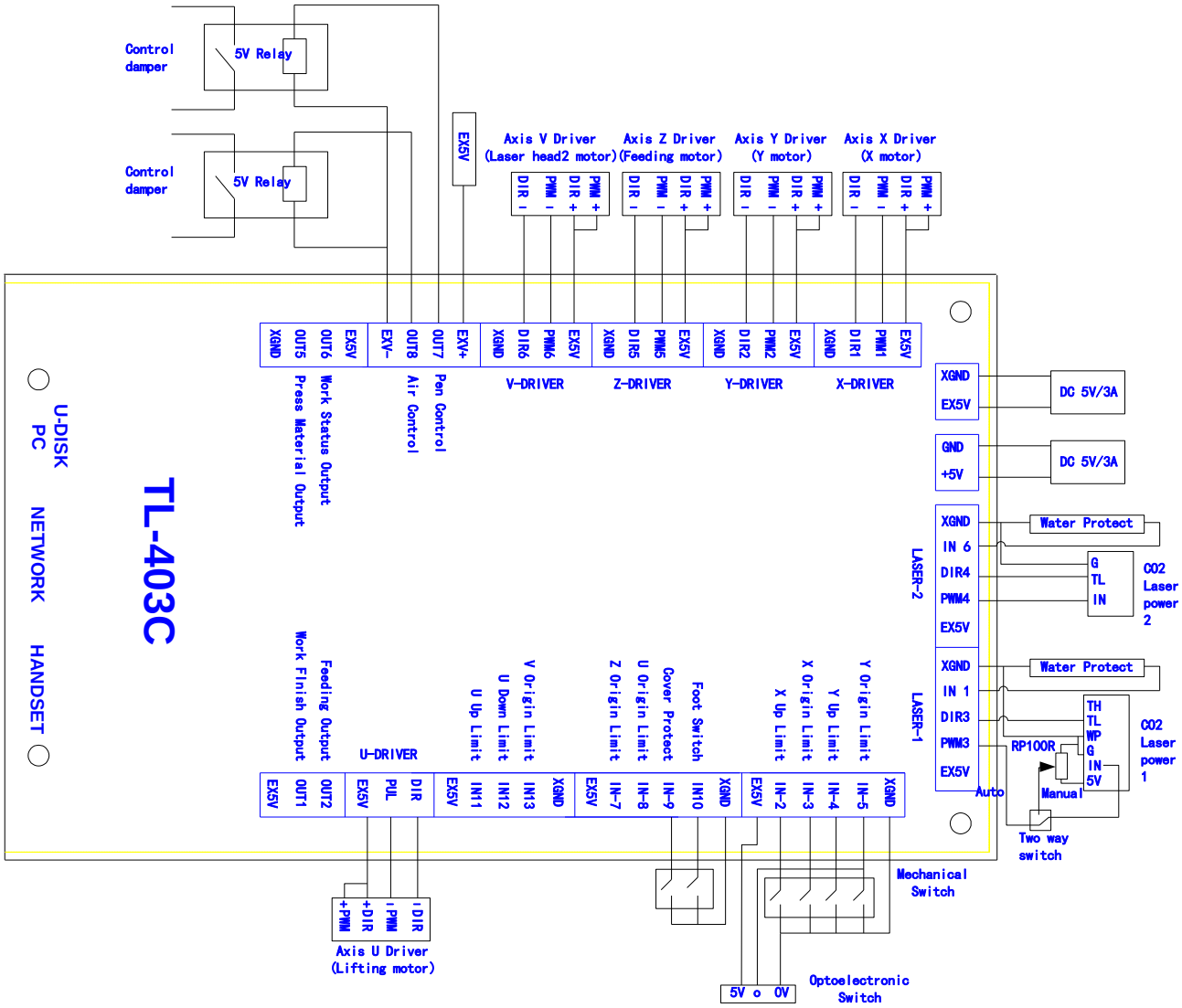


For more information, please see the “Instructions for Mark Point Positioning System”.

Part 5 Appendix

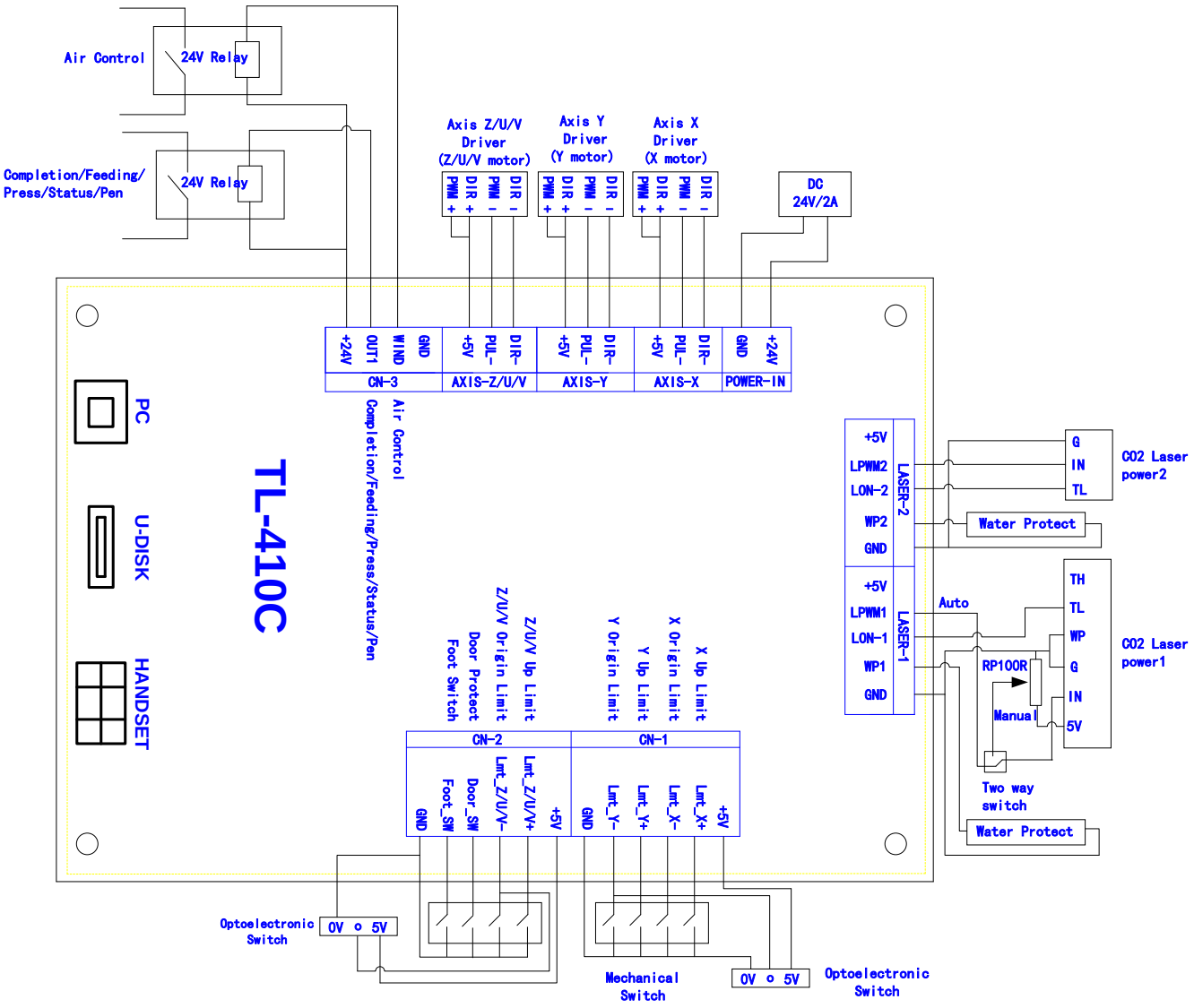
5.1 TL-403C/TL-403CB wiring diagram

Note: TL-403C/TL-403CB is supplied by DC 5V 6A power. Please read this diagram carefully to avoid wiring wrong.

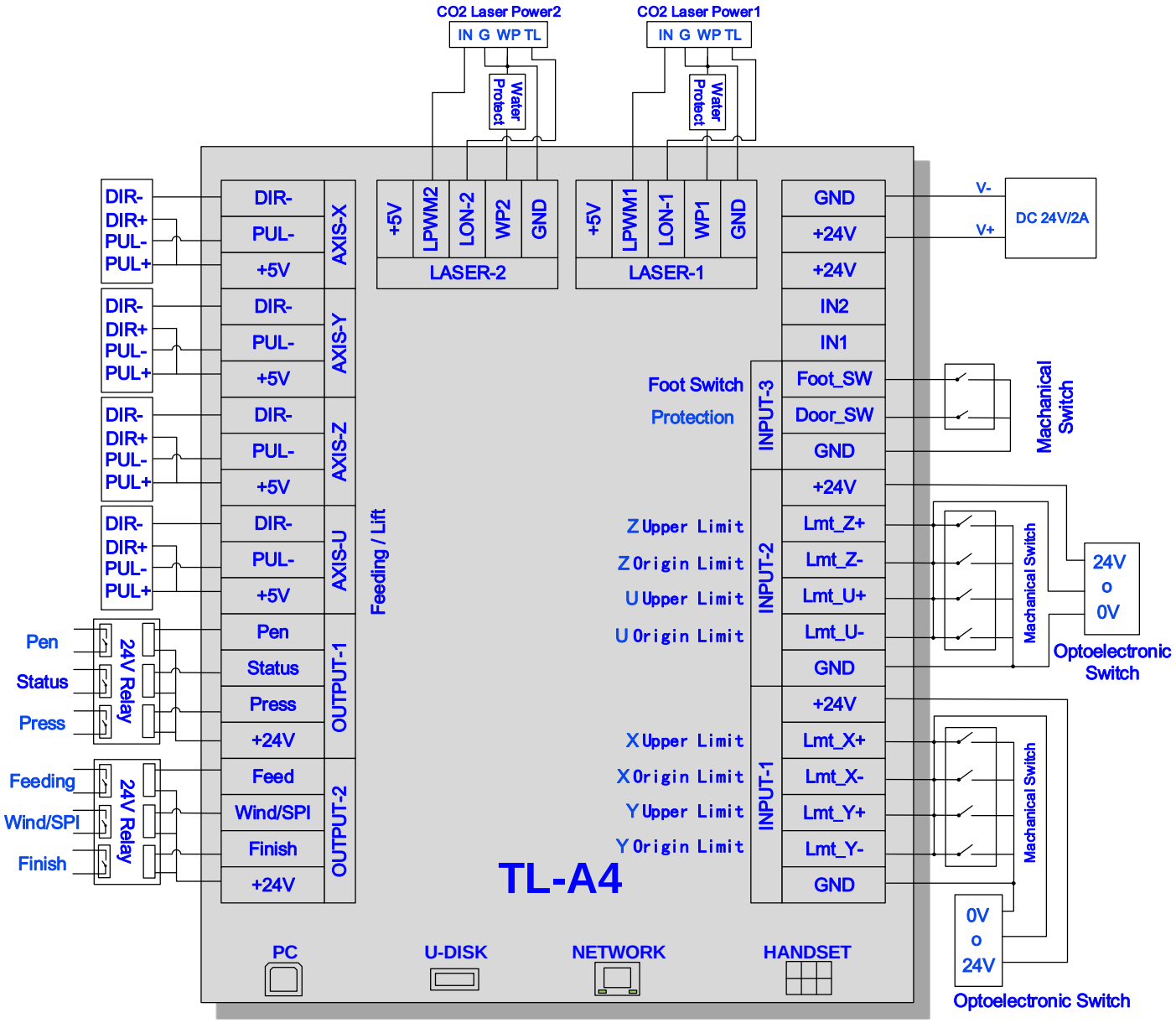


5.2 TL-410C wiring diagram

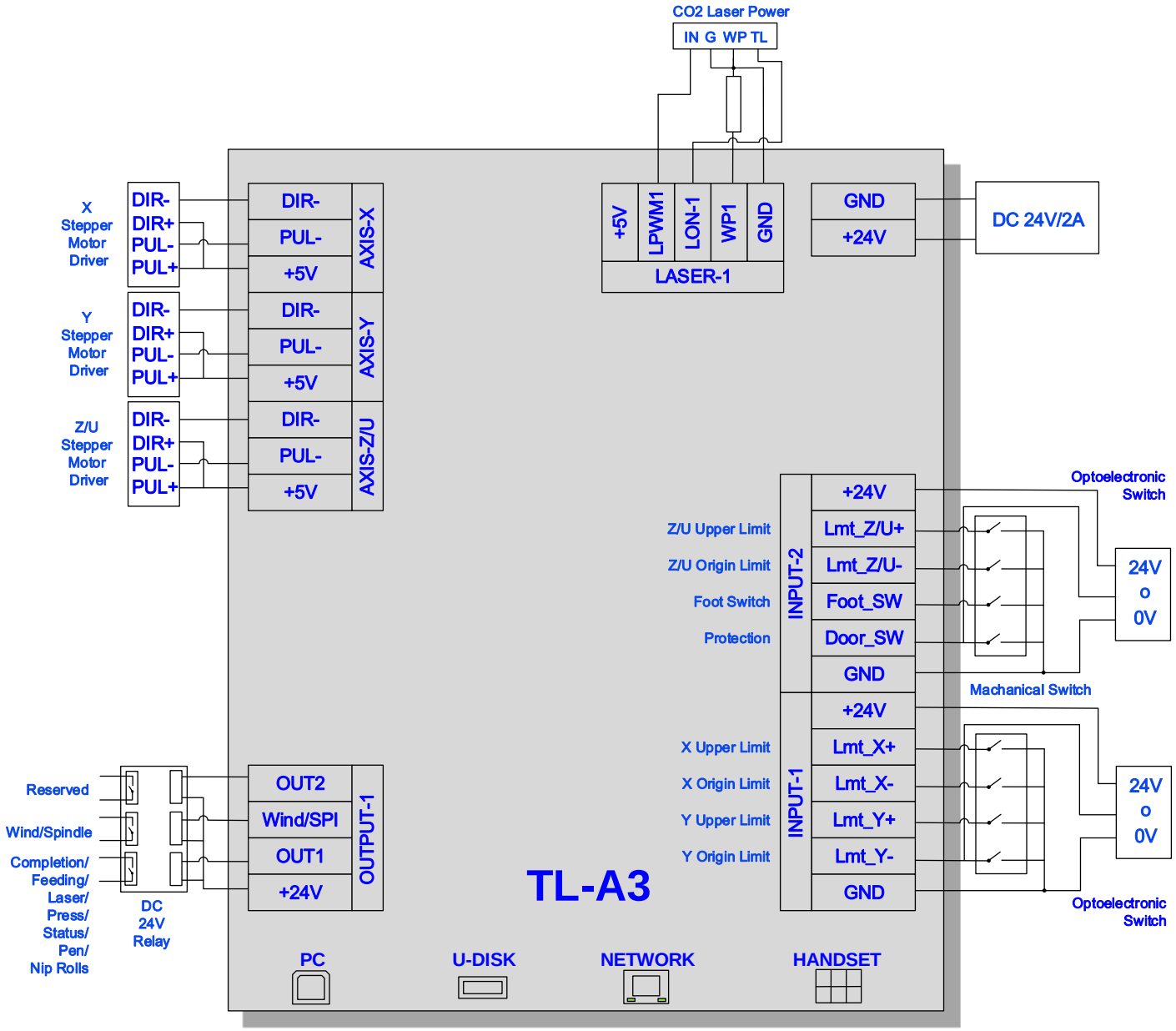
Note: TL-410C is supplied by DC 24V 2A power. Please read this diagram carefully to avoid wiring wrong.


Air Control
24V Relay
Completion/Feeding/
Press/Status/Pen
24V Relay
Axis Z/U/V
Driver
(Z/U/V motor)
Axis Y
Driver
(Y motor)
Axis X
Driver
(X motor)
DC
24V/2A
PWM +
DIR +
PWM -
DIR -
+24V
OUT1
WIND
GND
+5V
PUL-
DIR-
CN-3
AXIS-Z/U/V
AXIS-Y
AXIS-X
POWER-IN
PC
U-DISK
HANDSET
TL-410C
Air Control
Completion/Feeding/Press/Status/Pen
+5V
LPWM2
LON-2
WP2
GND
LASER-2
G
IN
TL
CO2 Laser
power2
Water Protect
+5V
LPWM1
LON-1
WP1
GND
LASER-1
Auto
TH
TL
WP
G
IN
5V
RP100R
Manual
CO2 Laser
power1
Two way
switch
Water Protect
Z/U/V Up Limit
Z/U/V Origin Limit
Door Protect
Foot Switch
Y Origin Limit
Y Up Limit
X Origin Limit
X Up Limit
CN-2
CN-1
GND
Foot_SW
Door_SW
Lmt_Z/U/V-
Lmt_Z/U/V+
+5V
GND
Lmt_Y-
Lmt_Y+
Lmt_X-
Lmt_X+
+5V
Optoelectronic
Switch
0V o 5V
Mechanical
Switch
0V o 5V
Optoelectronic
Switch

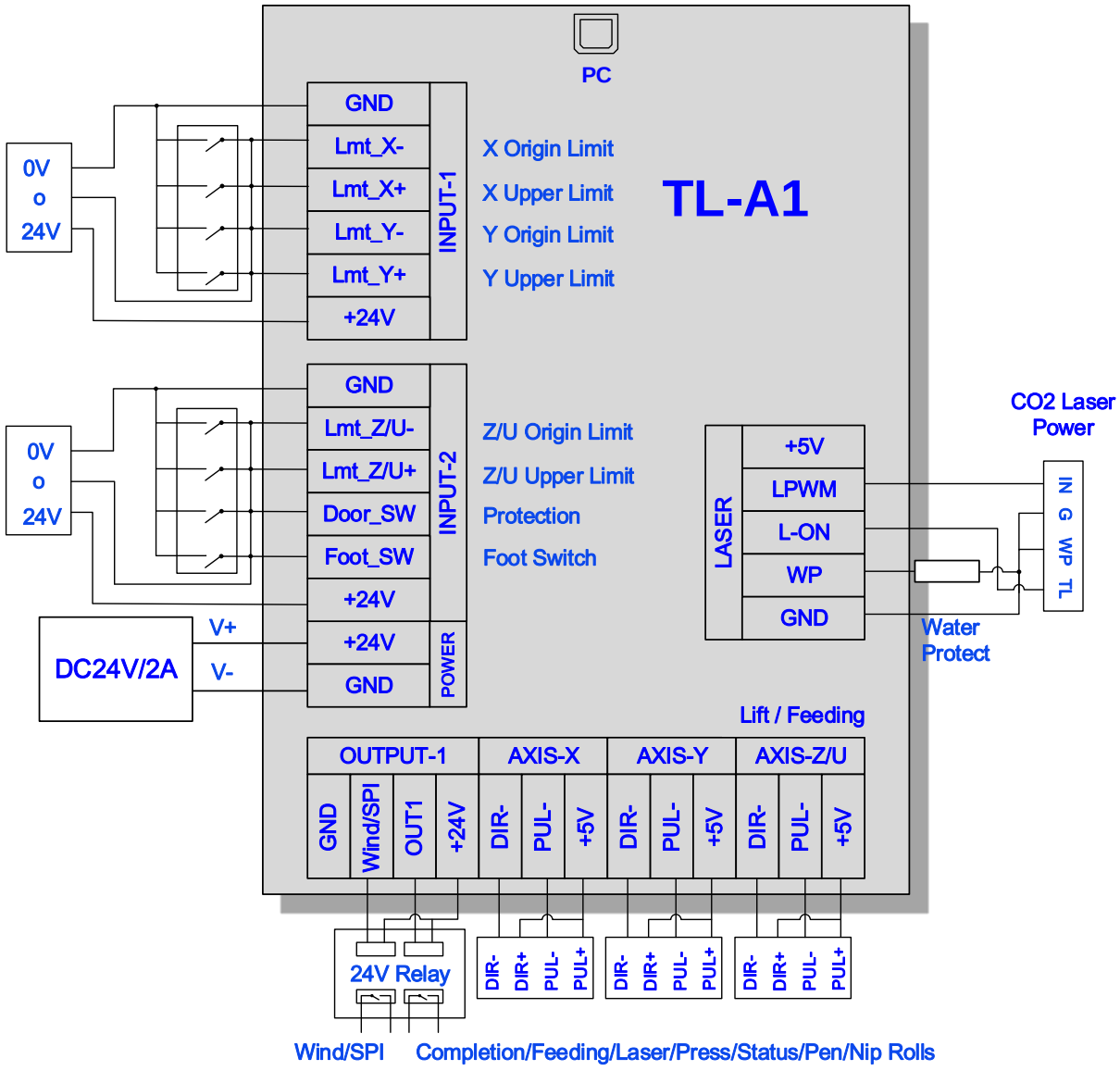
5.3 TL-A4 wiring diagram



5.4 TL-A3 wiring diagram



5.5 TL-A1 wiring diagram

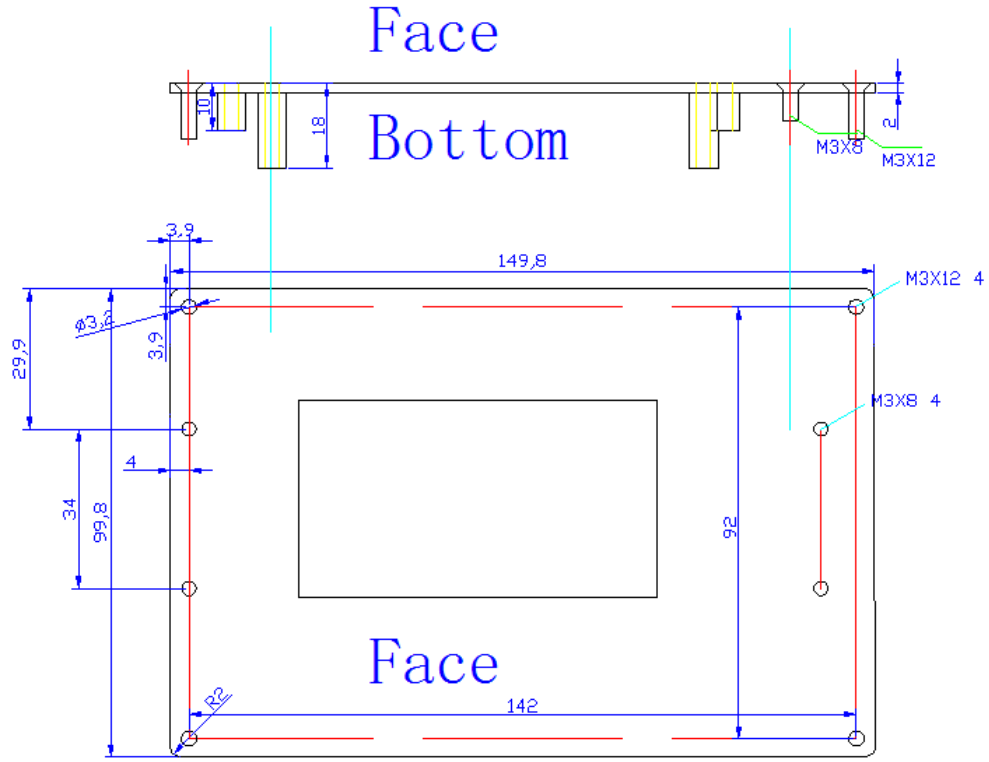


5.6 Installation dimension

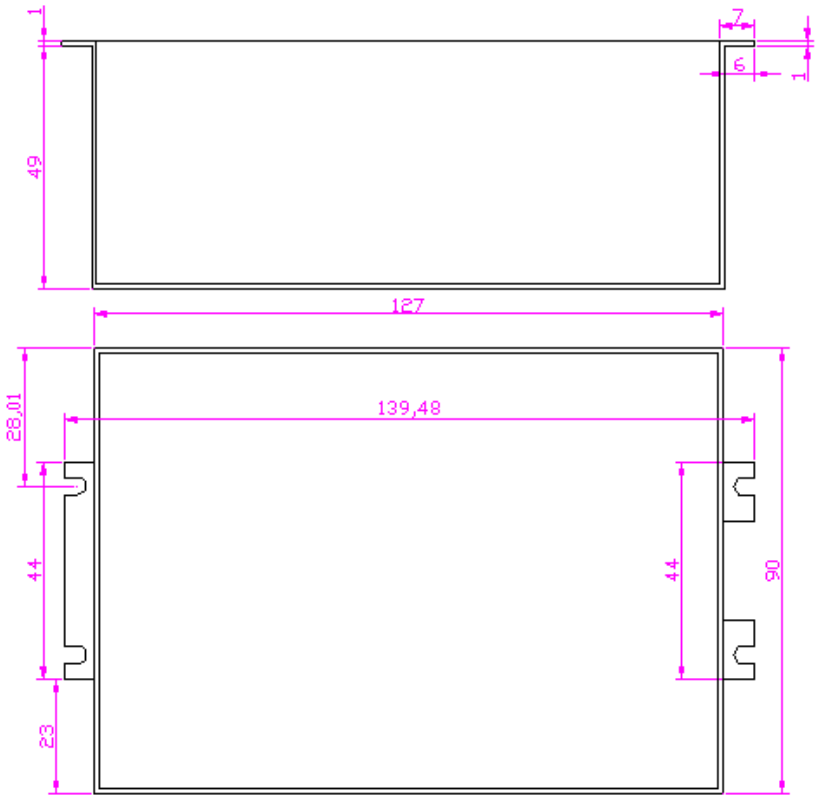
1. TL-403C/TL-410C/TL-404C Panel

The installation dimension of operation panel (the unit is mm):

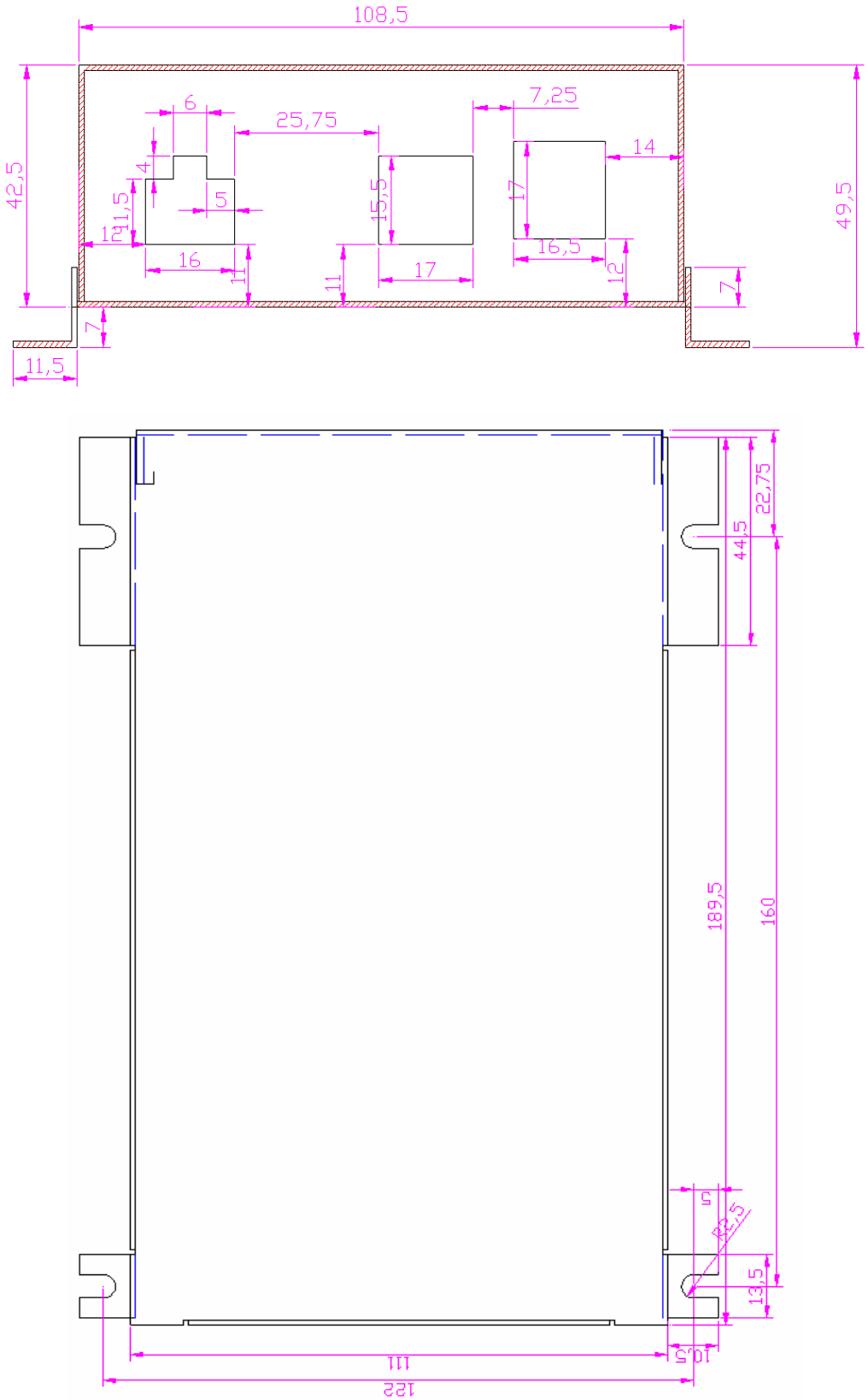
Front:



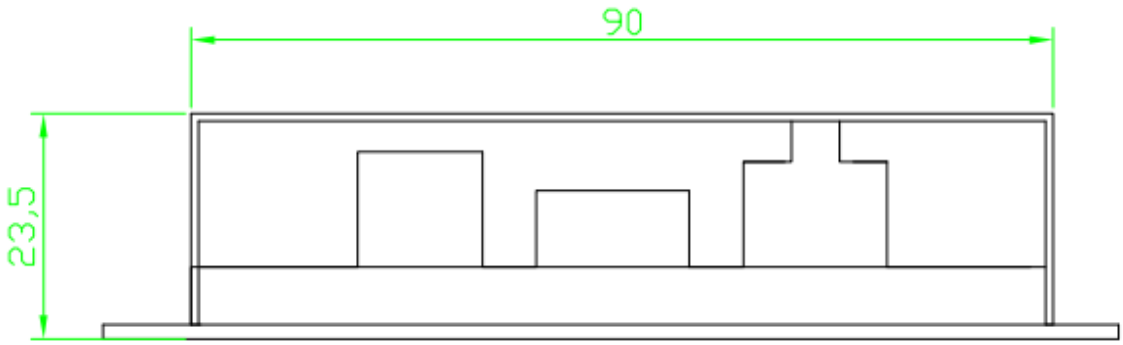
Back:

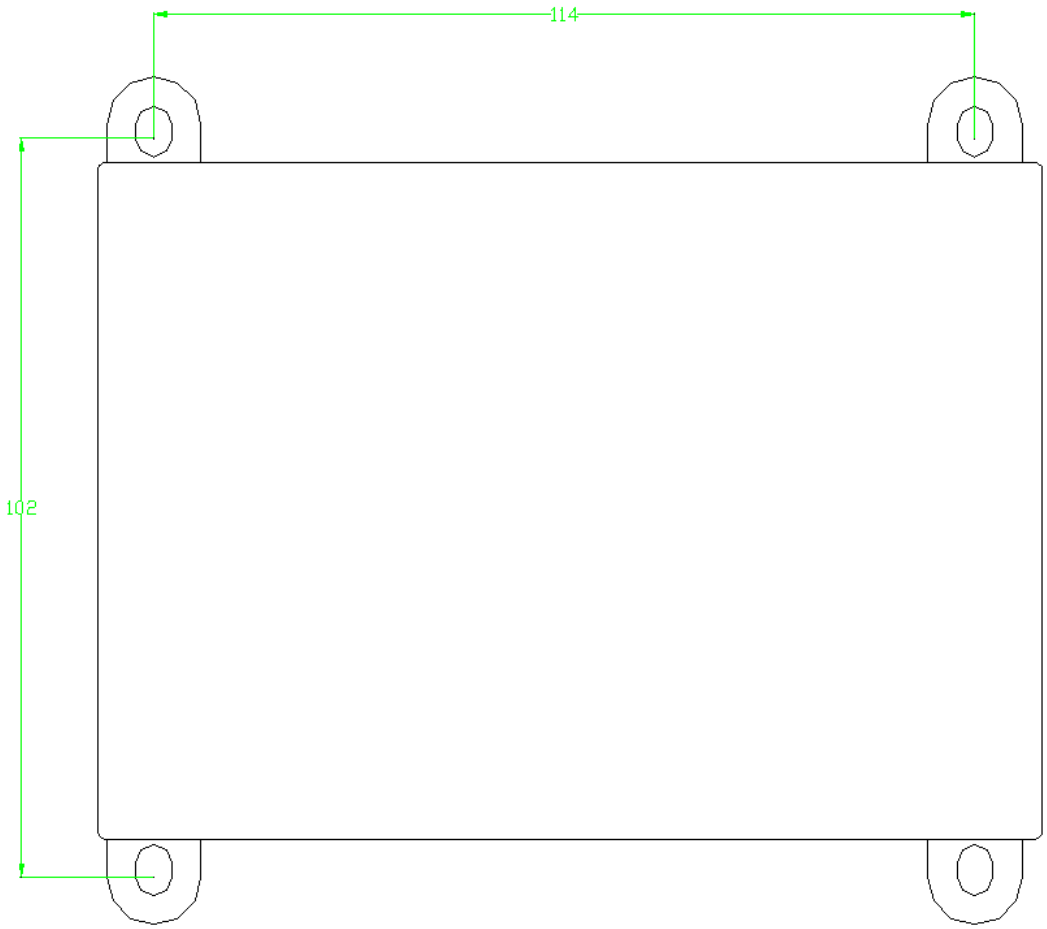


2. TL-403C mainboard



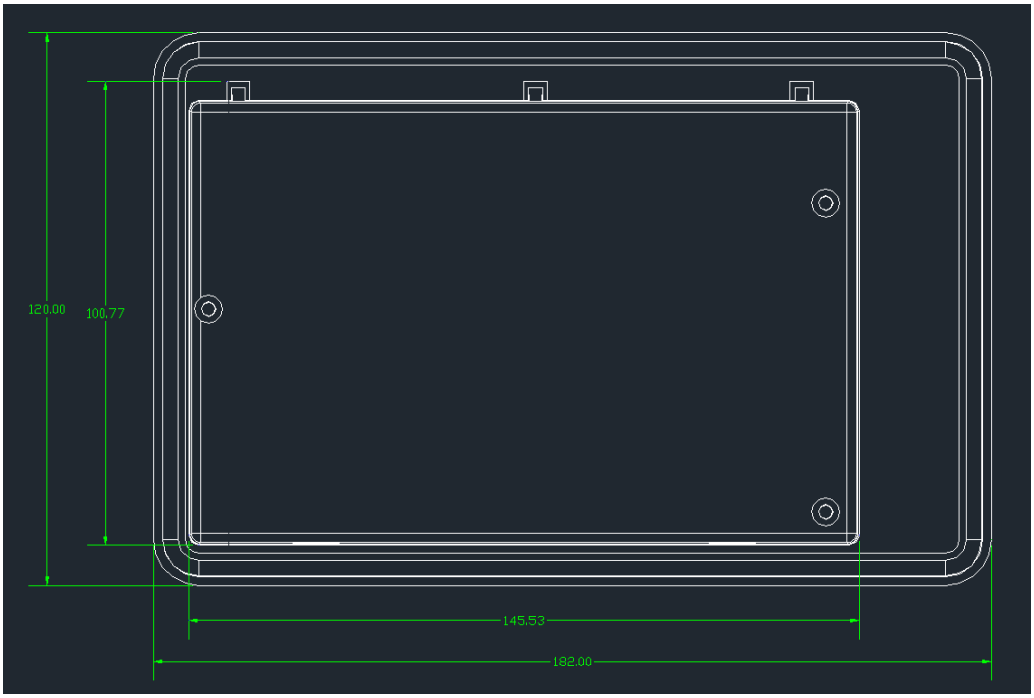
3. TL-410C mainboard





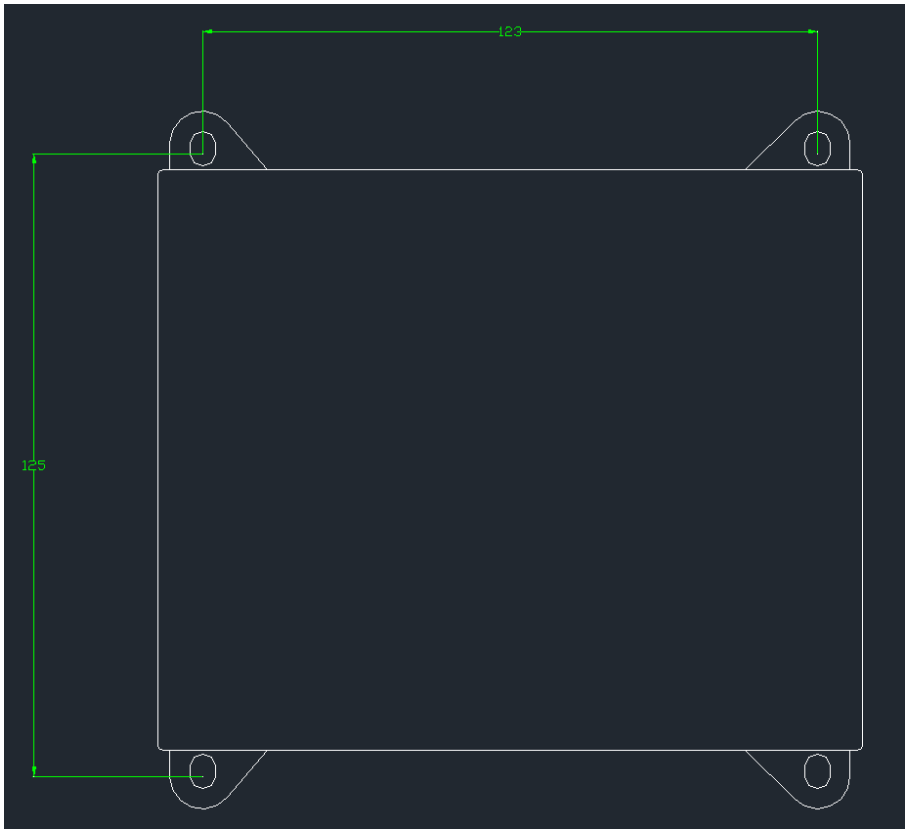
4. TL-A3/A4 panel

Back:

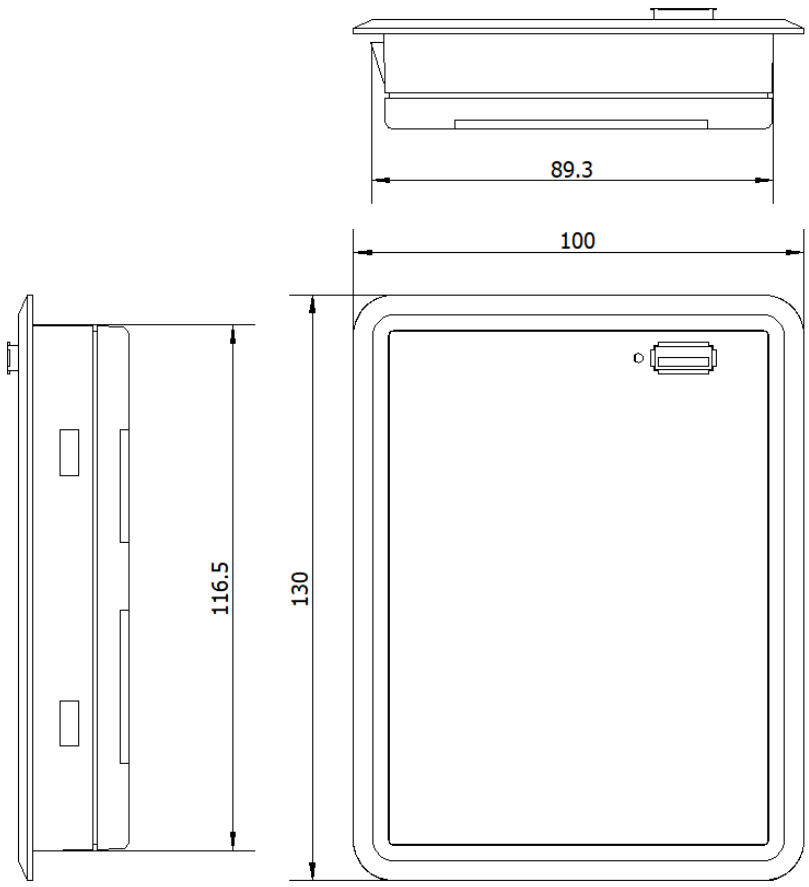


Front:

5. TL-A3/A4 mainboard



6. TL-A1



5.7 TL-410C Axis Z/U/V multiplexing and status signal Output

1) Axis Z/U/V multiplexing
   a) Multiplexing axis is a share port for Z-Feeding, U-Lifting, V-double laser.
   b) To change the multiplexing function, select Menu / Integrate / Equipment Set / Z/U/V Axis, then press the “Select” button to change. Press [Enter] to save.
2) Status Signal
   a) Some output status is out from OUT1 port. It includes finish signal / work status / press / pen / feeding.
   b) To change the output signal function, select Menu / Integrate / Equipment Set / OUT1, then press the [Select] button to change. Press [Enter] to save.

5.8 Common and special function

1) Press up, down, left, right button and the laser head can be moved.
   a) Click [Precise] button to make the laser head accurately move its relative position.
   b) Click [Laser] button and move, and the laser turns on during precise movement.

Application: When cutting some simple things, drawing could be omitted. It is useful to adjust axis resolution.

2) Press the Speed or Power button on the control panel to change the speed or power.
   a) If selected file is offered, power and speed of the file would be modified
   b) If there is no selected file, the default speed and power would be modified.

Application: there is no need to adjust power and speed on the computer software.

3) When the machine is in working mode, press the left and right button on the panel and working light intensity would be adjusted.
   a) Click the right button can increase light intensity by one percent.
   b) Click the left button can decrease light intensity by one percent.

Application: served as a potentiometer which can be directly checked and adjusted to the most appropriate light intensity.

4) Intelligent double head mutual shift.

Application:

   a) Without the need to artificially measure the distance between the two heads, the software will automatically assign distance according to pattern automatic switch light, thus saving the procedure of making layer to control the light switch.
   b) Leftover material can be added, when cutting the leftover material, the light will be automatically switched on and off.

5) Present files processing times clearance.

Press the CL button on the panel to clean the current file processing times.

6) Layer processing suspension.

Pause after processing one layer could be set (in layer parameter settings interface, press > > button to set).

7) Work preview.

The graphics working trajectory and calculated working time of processing to can be previewed (the parameter for working time estimate should be precise enough for on-line reading).

8) Large file segmentation feeding.

This method is commonly used when the graphic length is greater than the range of axis Y. The files can be split automatically to complete processing under the support of feeding (some application need to be conducted by the machines with feeding shaft).

5.9 Common problems

1) Unable to download file.
   a) Open the computer device manager; plug USB cable to check whether the computer can find the COM/Topwisdom USB Devices. If the control card and the cables are in normal status, port number COM/TL-XXXXXXXX will be displayed at the Port section in laser software. If the communication fails, try the following:
      - Restart the control card.
      - Replace the port.
      - Replace the USB cable and USB extension cable.
      - Ground the machine and the computer.

2) The “Out of range” message is displayed but the file breadth is enough for processing.
   a) Check whether the settings of [Machine Origin] and [Positioning Point] in Workspace setting page is wrong.
   b) In the case that software version doesn't match that of the control card, upgrade control card to the latest version.

3) Intelligent double-headed machine does not cut separately.
   a) Check the laser head type (Device- Machine - password (tz0001) - Equipment – Laser Head Mode). For single belt, [Double 1] should be adopted, for double belts, select [Double 2]. And then, set a proper minimum distance between the two heads.
   b) A virtual array should be used if the graphics is to be arrayed.

4) Control card firmware upgrading.
   a) Upgrading can be conducted through software (Device- Machine - password (tz0001) - Version Information - Upgrade (firmware version could be read first), and then find the firmware file (*.TFL)to be upgraded and conduct upgrading.

b) Upgrading can be conducted through U key.
   - Copy the firmware file (*.TFL) into U disk under the root directory.
   - Insert U disk to the USB interface on the main board.
   - Press the U disk on the control panel, make sure the machine can read U disk.
   - Press the Menu on the control panel, select [System] Or [Sys. Info] button, and select the [System Upgrade] Or [Sys. Update] button to upgrade.
   - Don't power off while upgrading. Do not perform other operations while upgrading. Generally speaking, upgrading can be finished in about three minutes. After upgrading is completed, the current version number can be checked in the system version.

5) The process time and the effect cut in embroidered format file are not good.
   a) When import file, click PLT/DST/DXF smoothing button in the laser software, and the process time and effect would be improved.
6) About the problem that the import menu cannot be imported
   a) For Windows10 system, please run the installation package with administrator privileges.
   b) Right-click the CorelDRAW, AutoCAD, Illustrator, Inkscape software icons, select properties, find the compatibility page, and then check "Run this program in compatibility mode", check "Run this program as an administrator" and click OK.
   c) After the installation is complete, and the compatibility mode has been enabled and running as an administrator, there is still no corresponding import menu icon appearing, indicating that this software is not a full version, please replace the full version of the software.