



SC2000 Fiber Laser CNC Cutting Software User's Manual

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Preface

Introduction

This archive mainly describes about the interface, functions and operations of the fiber laser cutting CNC system software (We call it: SC2000). And if you want to know more about installation and debugging, please reference to **Fiber Laser Cutting CNC System Software Quick Setup**. Before you use it and its relevant equipment, please read it carefully which can help you use it more conveniently. And since our product are keeping updating, so this manual cannot fully match in all aspects with the product, hope you can understand.

Readers

This manual mainly for those people below:

- Installation / debugging engineer
- Maintenance engineer
- Operator

The meaning of symbols

Symbol	Meaning
 Forbidden	It means high potential risk, if can't avoid, which can result in seriously damaging to equipment or even hurting people.
 Alarm	It means medium or low potential risk, if can't avoid, which can result in slightly or moderately damaging to equipment or hurting people.
 Attention	It means potential risk, if ignore this manual, which can result in damaging the equipment, losing all the data or some unpredictable results.
 Tips	It means can help you solve some problem or save your time.
 Explanation	It means additional information, which emphasizes and supplements the main part of manual.

Modification record

Modification record accumulates each updated descriptions of this archive. The newest updated archive includes all the updated contents of the old version.

Version V1.00 (2019-3)

Content

1 Introductions	5
1.1 Introduction.....	5
1.2 UI and descriptions	5
2 Operations.....	8
2.1 Quick actions	8
2.1.1 Operation flowchart.....	8
2.1.2 Graphic importing/drawing	8
2.1.3 Graphic processing.....	8
2.1.4 Cutting tracts.....	10
2.1.5 Cutting process setting	10
2.1.6 Checking before cutting	11
2.1.7 Cutting	12
3 Functions.....	14
3.1 Tittle bar	15
3.2 Tool option.....	15
3.2.1 Start.....	15
3.2.2 Draw	17
3.2.3 System analysis.....	31
3.2.4 Advanced	34
3.3 View section	48
3.4 Running control option	48
3.4.1 Running control	49
3.4.2 Running parameters	50
3.5 Message bar.....	52
3.6 Layer parameters option	53
3.7 Status bar.....	57
4 Warning and exceptions handling	58
4.1 System alarms and descriptions.....	58
4.2 Normal exceptions and handlings.....	61

4.2.1 System communication exceptions	62
4.2.2 Go origin exceptions	64
4.2.3 Pulse equivalent configuration.....	64
4.2.4 Fly-cutting debugging	64



1 Introductions

1.1 Introduction

SC2000 CNC cutting software is designed for flat fiber laser cutting which includes graphic drawing and editing, cutting process dealing, cutting process controlling, system monitoring, components monitoring and debugging, and so on.

Features:

1) Simple Operations, Powerful Functions.

- Developed based on RIBBON framework, the design is unique and the software is easy to be operated.
- UI design is more humanized, which is easier to use even without training.
- With powerful CAM functions based on AUTOCAD design, support graphic import, graphic drawing, graphic editing, and graphic transformation, graphic optimized and so on.
- Intelligent capturing, which makes drawing more convenient and accurate.
- Unique properties option design, which helps user to design the cutting graphic more easily.
- Support various sort methods, auto sort can recognize the film inside or outside the graphic to make sure the path planning optimized.
- Powerful lead line function, support various ways to lead line, auto added suitable lead line based on graphic nested relations. Support check/revise interfered lead line by one click.

2) Complete cutting process, debugging easily.

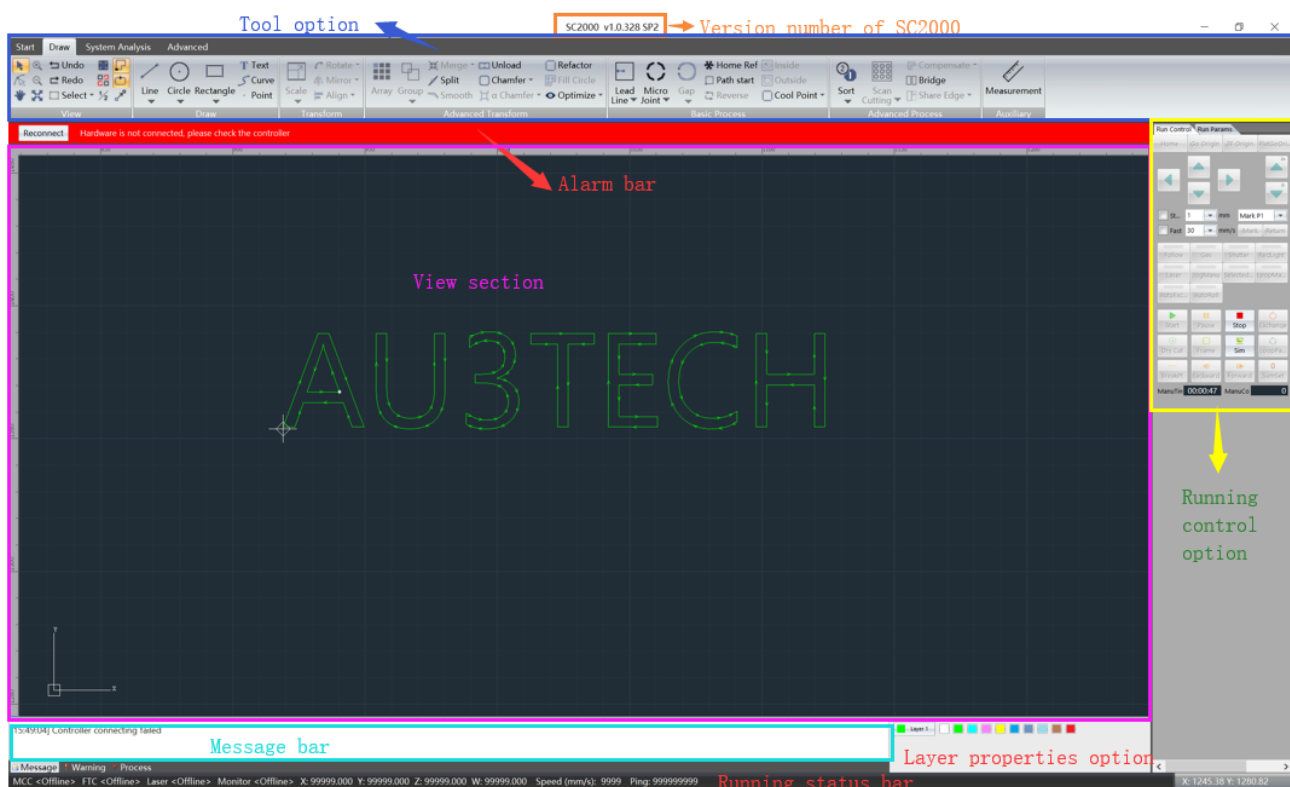
- Support all kinds of cutting process: Section drill, gradual drill, multi stages drill, cutting with film, fix height cutting, and predrill and so on.
- Support laser's power/frequency adjusted with speed, to decrease or avoid the problem of firing corners when cutting carbon steel.
- Support multilayer cutting or marking, and other sorts of processing ways.
- Support micro-joint, gap, over-cutting, bridge, kerf-compensation and so on.
- Powerful material database, which can save all sorts of material cutting process.
- Support complex functions: Edge seeking, fly-cutting and so on.
- Support breakdown position tracking/forward/backward and so on.

3) Real-time alarm, stable and reliable.

- Support running error measurement, it can check the error between running orbit and graphic error.
- Real-time alarming the status of capacitive height controller, laser source, auxiliary gas of electric laser cutting head and other equipment, make sure the security during cutting.
- More than 50 different kinds of alarms, to secure the equipment in whole aspect, avoid user's wrong operation.

1.2 UI and descriptions

Graphic 1-1 UI



UI design is very clear, from up to down: title option, tool option, alarm option, view option, running control option, message bar, graphic parameters option, and status bar. The functions of each section shows as below:

Name	Functions	Remark
Title bar	Display software's name and version number.	
Tool option	Mainly collects the tools needed for software operation, it has five submenu: Start/Draw/System Analysis/Advanced/Nest. User can do graphic drawing, graphic editing, graphic transformation, adding lead line, monitoring running status, configuration machine tool.	
Alarm bar	Display the current system alarm.	Alarm will be displayed in pop-up window, and once the alarm is cleared, the pop-up window will be gone.
View section	Graphic drawing/displaying section, displaying section of the machine's cutting area.	
Running control option	Run all kinds of cutting actions by software.	
Message bar	Display the current running status in scrolling to attract user's attention.	

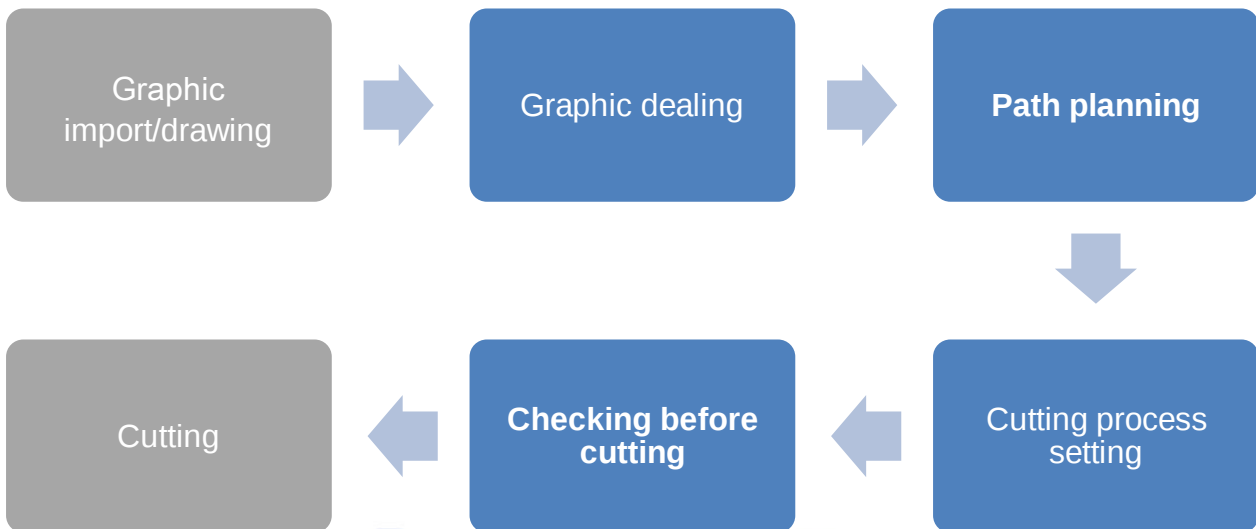
Layer properties option	Set up layer properties such as layer process, graphic transformation and so on.	
Running status	Display the running status, running location, cutting speed and so on.	



2 Operations

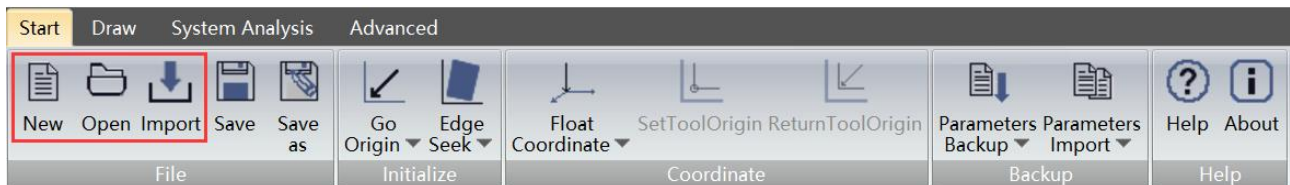
2.1 Quick actions

2.1.1 Operation flowchart



2.1.2 Graphic importing/drawing

After start the software, user can import the file for cutting according to your needs or you could draw a graphic yourself in the “Draw” section of the software.



Click **“New”**: build a new view section, user can draw any parts he needed for cutting.

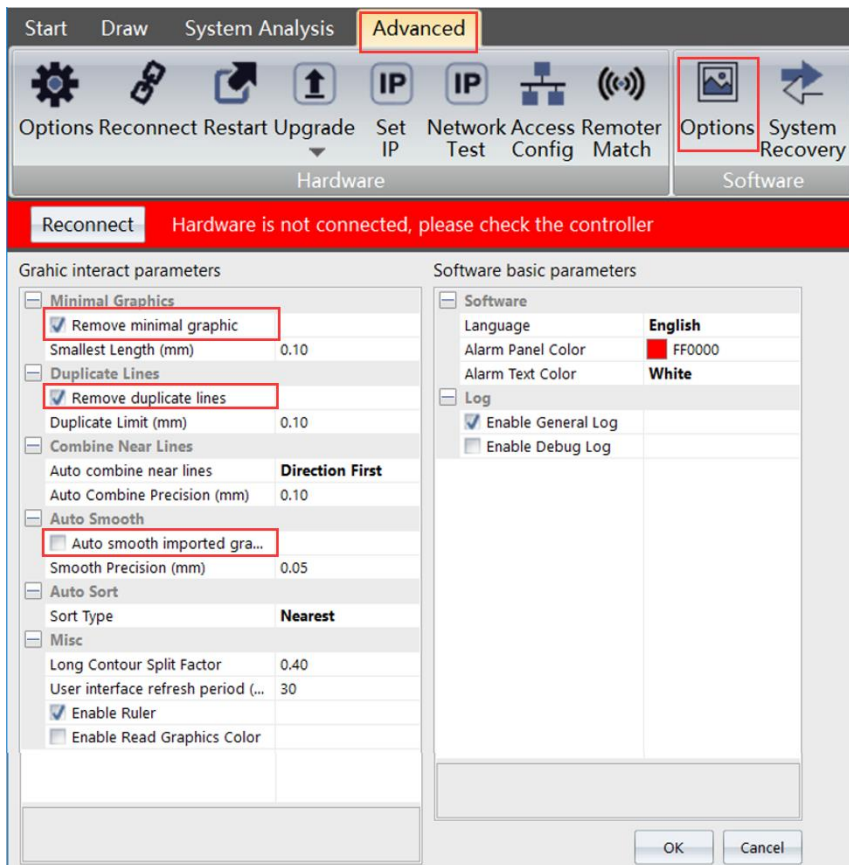
Click **“Open”**: user can open the file for cutting.

Click **“Import”**: user can import multi files that needed for cutting.

2.1.3 Graphic processing

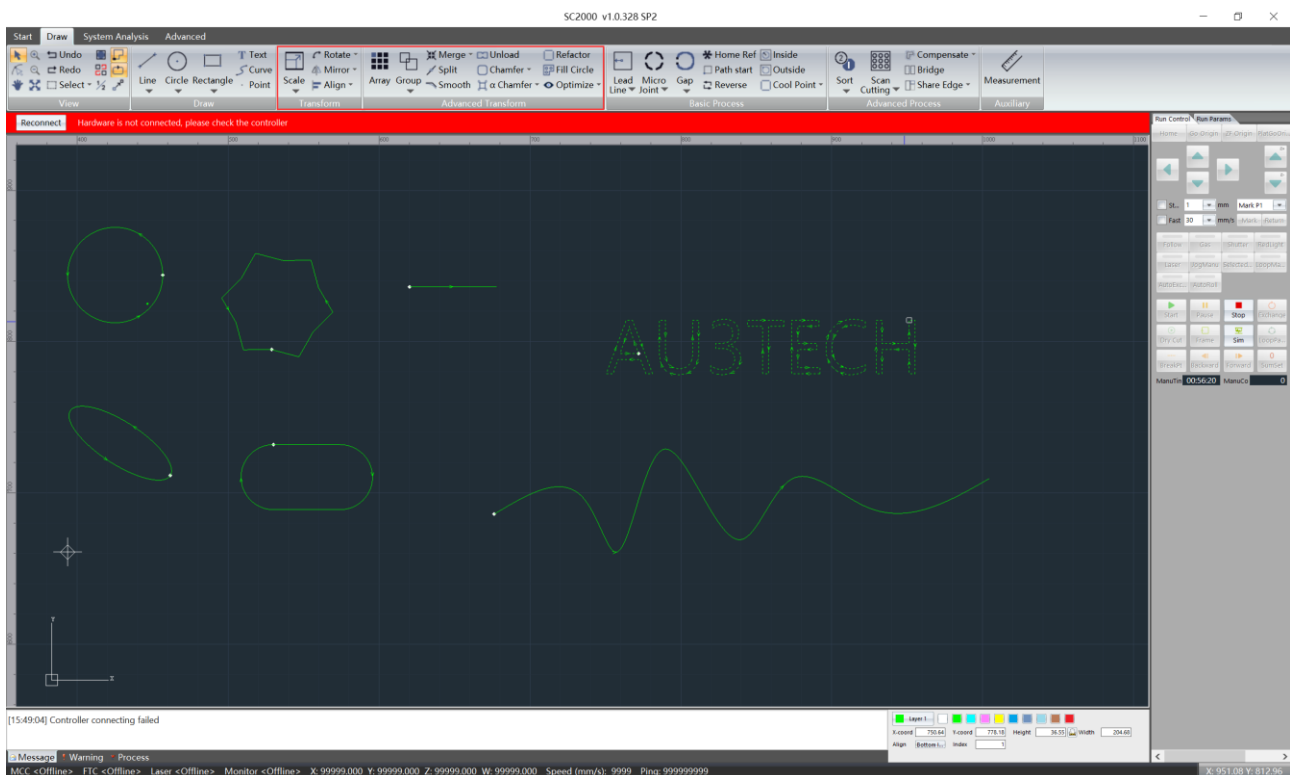
Before importing the cutting file, user can set up all the conditions he needs, including whether to auto remove minimal graphics, whether to auto remove duplicate lines and so on, so that the cutting software can automatically optimize the file for cutting when open or importing the graphic.

Choose **“ADVANCED”**—>**“Options”**, select the options as below:



After importing/ newly building the file, user can revise the file if they need.

- 1、 Choose in tool option “**DRAW**”, select suitable tool to revise the graphic: **Zoom in/out in proportion, rotate, mirror, align, array, group, nest, merge, split, smooth, unload, chamfer, chamfer R, refactor, fill circle.**
- 2、 Or use graphic transformation to adjust the graphics.



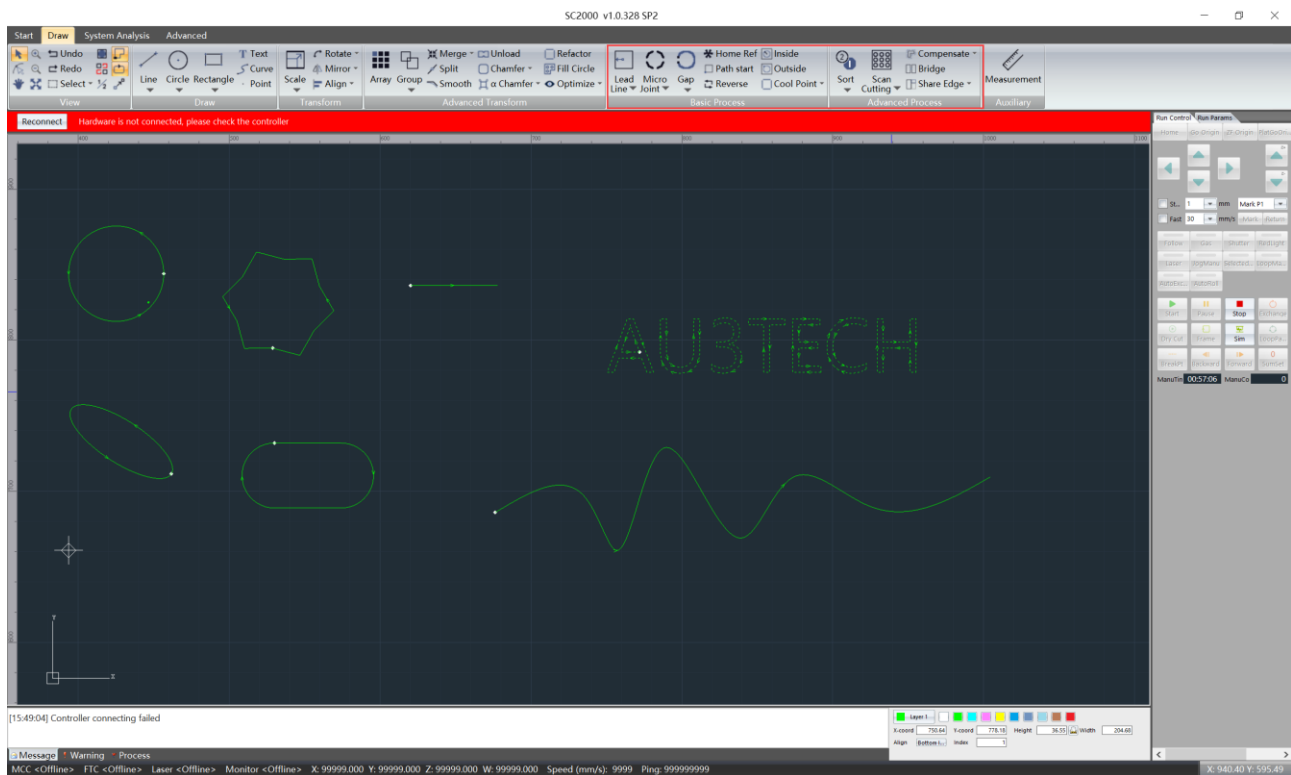


Tips

- User can quickly revise the selected graphics in its coordinate, size, alignment point, and cutting sort and so on in property option. It's also very convenient for user to adjust the graphics using these tools.
- Layer parameters can be used to revise the parameters of the selected graphic: uncut, short no-lift, unfollow, direct, section drill, gradual drill, fix height drill, with film, keep gas on, and so on.
- User can set chamfer R for rectangle.

2.1.4 Cutting tracks

After adjusting the cutting graphic, then comes path planning, including the lead line setting, micro-joint, gap, home ref, path start, reverse, inside, outside.



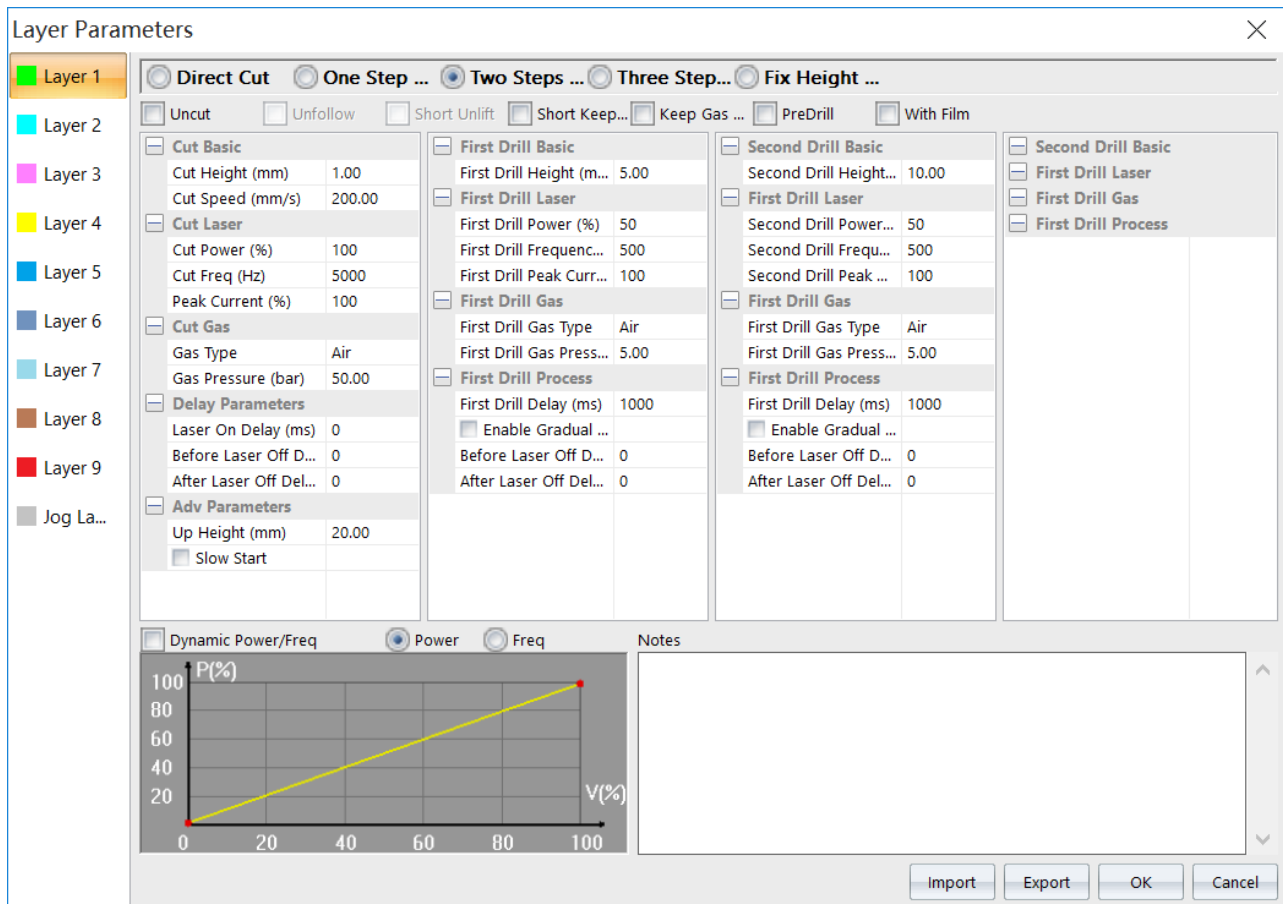
Tips

- Support auto/manual adding lead line, and checking the interfered lead line.
- Support various sort methods, please select by clicking "Sort". Auto-recognize the film inside/outside the graphic when sorting.

2.1.5 Cutting process setting

After checking the path planning, please set up the cutting process. SC2000 supports multi-layers: **1 background layer, 10 cutting layers**. And the parameters of each layer can be set up separately according to user's needs. Click the "**Layer X**" in the graphic properties to set up the layer parameters,

as below: 图片待修改(系统语言有问题)

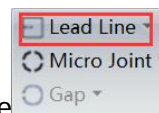
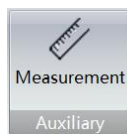


User can set up different parameters to achieve the best situation of cutting: cutting ways, cutting speed, cutting power, gas type/pressure, up height and so on.

2.1.6 Checking before cutting

Before you really start cutting, please check the cutting graphics and path planning to make sure everything has been settled properly.

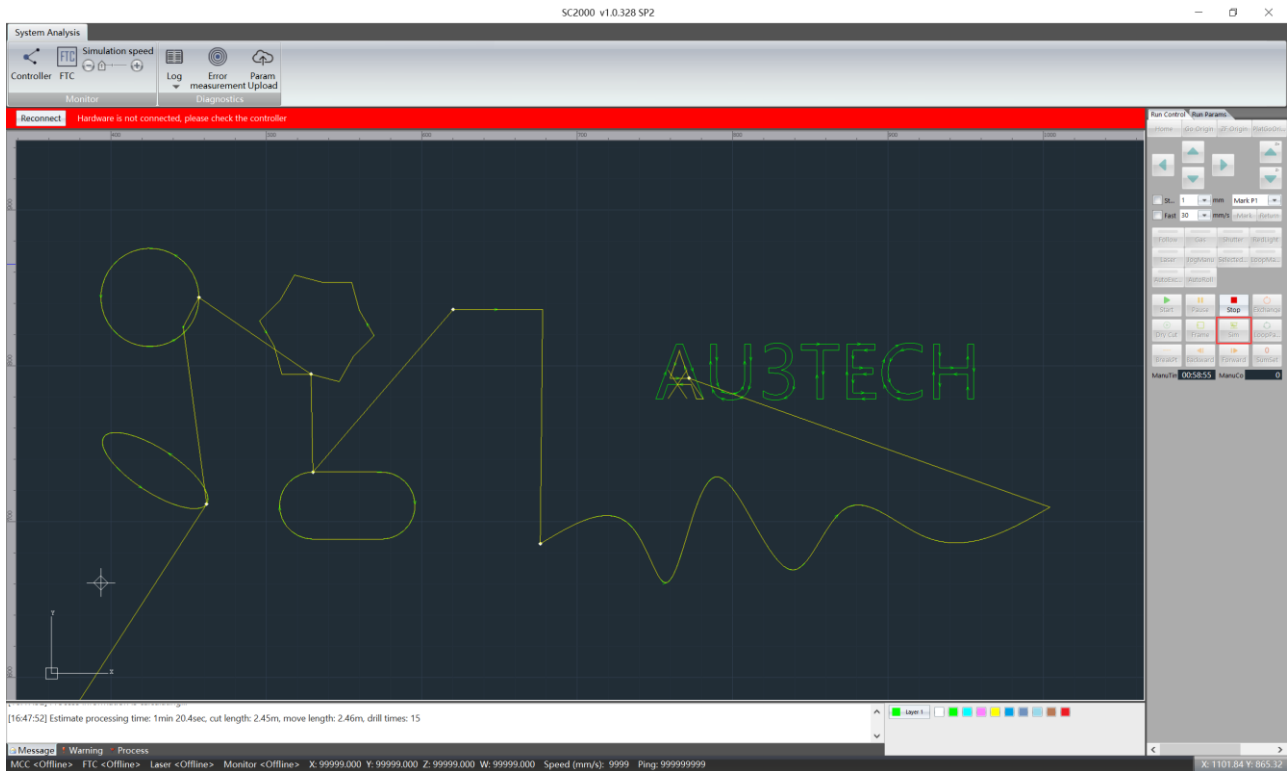
- 1) Please check the cutting graphic in these aspects: **Size, lead line, sort, unclosed curve, minimal graphic, similar graphic.**



- 2) SC2000 can measure the size of the graphic and check lead line, it can

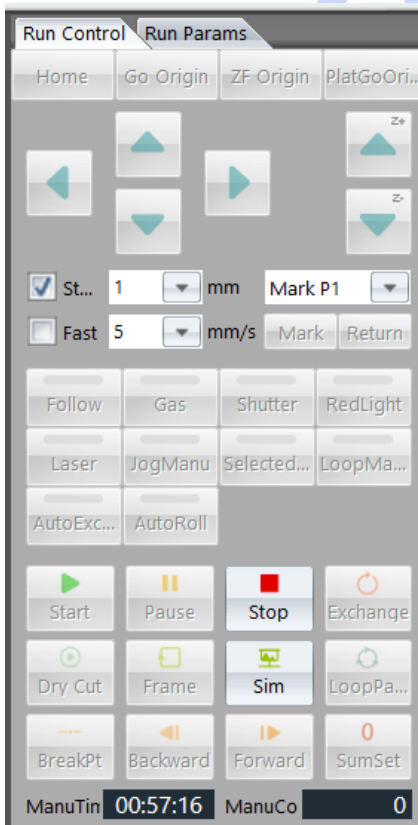
also auto-remove the interfered lead line. It shows the unclosed graphic. You can choose **unclosed curve/minimal graphic/similar graphic** in “Select”.

- 3) Please check the path planning in these aspects: **Cutting frame, running tracks** and so on by setting parameters in running control option.
- 4) Click “**Edge seek**”, SC2000 will order the machine to run along the graphic frame, so user can check whether if the workpiece is inside the frame or not so that user can adjust the place of the graphic/workpiece.
- 5) Click “**Sim**”, SC2000 will auto-simulate the cutting track, and the simulation speed can be adjusted.



2.1.7 Cutting

The running control must be done on the real machine. So the motion control card must communicate with SC2000 normally, or the relevant buttons will turn gray and can't be selected.



The meaning of each button shows as below:

Name	Functions	Remark
Follow	Let the cutting head follow the metal sheet.	
Gas	Let the gas on	
Shutter	The first time when you install your cutting machine, you could use "Shutter" and "Laser" to adjust the laser light.	
RedLight	Let the laser source emission red light.	
Laser	The first time when you install your cutting machine, you could use "Shutter" and "Laser" to adjust the laser light.	
JogManu	When you adjust your cutting machine or prepare to cut, you could use this function to move the cutting head to the location you want.	
Selected	SC2000 will only cut the selected graphics once this option has been checked.	
LoopMa	Manufacture could use this function to testing the stability of the cutting machine before dispatching the machine.	
AutoExchange	Check "AutoExchange", every time when finishing the cutting process, SC2000 will order the Z axis to go origin and the cutting platform will be exchanged one time.	The time of AutoExchange is the same as that of loop.
AutoRoll	Start the Auto Roll components.	
Start/Continue	Start cutting/Continue after pause.	
Pause	Pause cutting, SC2000 will reserve the current cutting information.	
Stop	Stop cutting.	
Exchange	When exchange platform has been set, click "Exchange", the platform will be exchanged one time.	
Dry Cut	Cutting without laser out.	If user wants Z axis to follow when dry cut, please select "Enable Follow When Dry Cut" in "Run Parameters".
Frame	Cutting the frame of the selected graphic without laser.	Make sure the cutting graphic is inside the workpiece.
Sim	Simulate the cutting process without laser.	
LoopParam	Set the time and distance of loop.	

BreakPt	SC2000 will auto locate the breakpoint after pause/stop.	
Backward	SC2000 will go backward some distance after pause/locate the breakpoint.	User can set up the backward speed/distance.
Forward	SC2000 will go forward some distance after pause/locate the breakpoint.	User can set up the forward speed/distance.
SumSet	Click to do the counting of cutting workpiece	Count the cutting workpiece.



3 Functions

3.1 Tittle bar

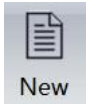
Titlle bar shows SC2000's logo and the version. User can check whether the version is the newest one, and if not, please download on our website: www.au3tech.com

3.2 Tool option

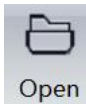
3.2.1 Start

3.2.1.1 File

There are five functions in file part: "New", "Open", "Import", "Save", "Save as".



- 1) **New**: Build a new view section, the former graphic will be covered and SC2000 will ask the user whether if to save the old graphic or not to avoid false operation and lose all the graphics in the old view section.



- 2) **Open**: Open a new graphic, and the former graphic on the view section will be covered by the graphic user just opened.



- 3) **Import**: The new imported graphic will not cover the former graphics on the view section, user can set the quantity when importing the graphics.



- 4) **Save**: Save the graphics on the view section in ".chf" format.



- 5) **Save as**: Save the graphics on the view section in certain format and at anywhere you want on the computer.



Tips

- Click the dropdown menu of "**Open**" to check the file list recently opened, and user can easily find the file he opened before.

3.2.1.2 Initialization

The initialization part collects all the functions user will be use at the beginning when all the equipment power on: "**Go origin**", "**Edge seek**", "**Cancel edge seek**", "**Clear warning**".

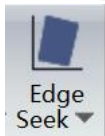


- 1) **Go Origin**: After Z axis go back to origin, X axis and Y axis go back to origin of machine at the same time (default). Or user can choose **“Only Z follower”** (only Z axis go origin), **“Only X”** (only X axis go origin), **“Only Y”** (only Y axis go origin).

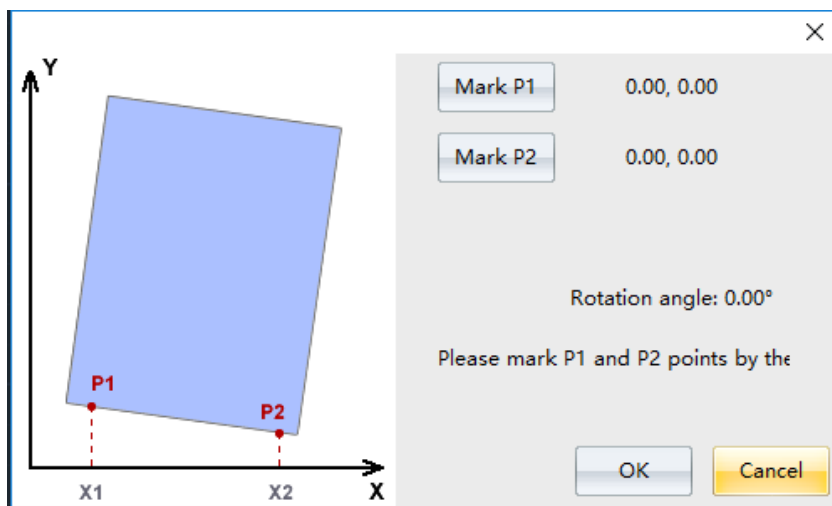


Attention

- Before axis go origin, please make sure the parameters of direction/type/speed and other parameters have already been set. Make sure “Go origin” button works properly and no obstacles on the workpiece sheet. Or it can possibly result in damaging to machine or even hurting people.



- 2) **Edge Seek**: According to the real place of the workpiece sheet to revise the coordinate of SC2000, so that user can make sure the cutting graphics are inside the workpiece sheet without moving the sheet. Click the “Edge seek” button, UI shows as below:

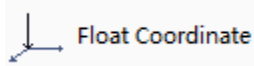


User can use the red light of laser from cutting head to seek one point along the edge of X axis and mark “P1”. Then move to another point along the edge of X axis and mark “P2”. After SC2000 auto-calculate the rotation angle, it'll revise the coordinate accordingly. Click the “OK” button, then “Edge seek” is over successfully.

“Cancel edge seek”: after finish edge seek, the coordinate will rotate accordingly. And if you want SC2000 go back to the original coordinate, just click “Cancel edge seek”.

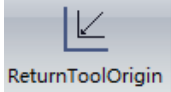
3.2.1.3 Coordinate

SC2000 supports float coordinate, tool coordinate and manual coordinate. User can choose the suitable coordinate for cutting process.



- 1) **Float Coordinate**: You may notice that the red sign “” in the view section is the real location

of the cutting head. The sign " " is the dock point of the graphic. In Float coordinate, SC2000 will move the dock point of the graphic to coincide with the real position of the cutting head then start the cutting process. So that SC2000 can start to cut wherever the metal sheet is in the machine bed or wherever the cutting head is in the metal sheet bed.

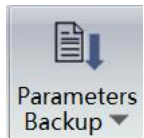
- 2)  **Tool Coordinate 1** : Please find the tool origin  first, then set the tool origin before

use  . In tool coordinate, SC2000 will move the dock point of the graphic to coincide with the tool origin you set before then start the cutting process.

- 3)  **Manual Coordinate** : User could assign any place as the origin point the cutting machine. (In case your cutting machine has no origin switch).

3.2.1.4 Backup

User can export the cutting parameters for backup in case the parameters file or the computer has been damaged.



: In the dropdown menu, user can choose to export the cutting parameters to file and saved on the computer or export the parameters directly to the hardware.



: In the dropdown menu, user can choose to import the cutting parameters from the computer or directly from the hardware.

3.2.1.5 Help



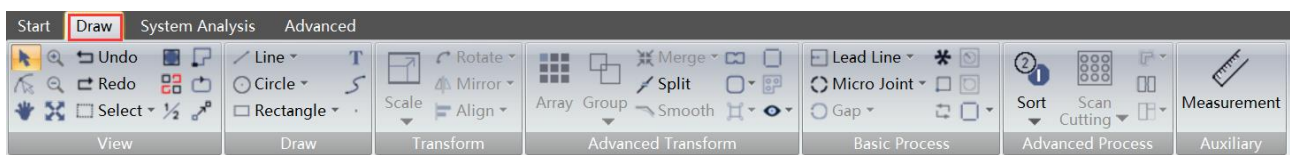
1. : User can check SC2000 user's manual here.



2. : User can check the version number here.

3.2.2 Draw

“View” collects all the functions related to graphic editing/path planning, user can easily design the cutting graphics and process he needs.

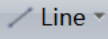
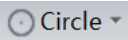
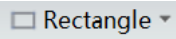
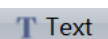


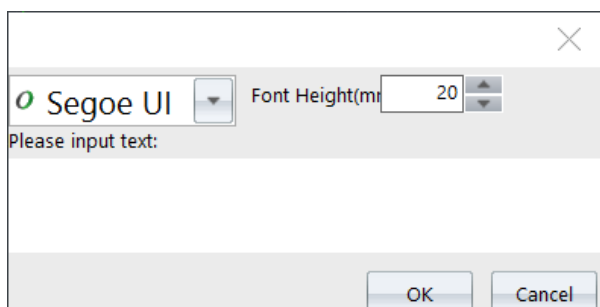
3.2.2.1 View

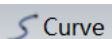
Icon	Name	Function
	Contour Select	User can select one/all graphics.
	Vertex Edit	User can edit the vertex of the selected graphic.
	View Move	User can move the view section by pressing the Mouse left.
	Zoom in	User can zoom in the graphic in the view section.
	Zoom out	User can zoom out the graphic in the view section.
	Zoom Reset	User can restore the size of the graphic in view section to the original size.
	Undo	Undo the latest operation.
	Redo	Redo the latest operation.
	Select	User can choose "Select All", "Invert Selection", "Select unclosed curve", "Select graphics smaller than", "Select similar curve".
	Show box for graphics	User can click here to show the box of graphic on view section.
	Show unclosed curve as red	User can click here to show unclosed curve as red.
	Show index	User can click here to show index.
	Show path start	User can click here to show path start.
	Show path direction	User can click here to show path direction.
	Show move path	User can click here to show move path.

3.2.2.2 Draw

“**Draw**” part collects all the functions related to drawing, which based on AUTOCAD, user can easily design any graphic he want.

- 1)  : Draw line/Pline. Click Mouse Right to finish the current drawing by selecting “**End Draw**”.
- 2)  : Draw circle/circular arc/ellipse. User can choose “**Point Circle**”, “**Point Arc**”, “**Scan Arc**”, and “**Ellipse**” through dropdown menu.
- 3)  : Draw **rectangle/rounded rectangle/polygon/star** through dropdown menu.
- 4)  : Text input. Support various ways of typing text, and user can set up the parameters of text, such as typeface, font height and so on.



- 5)  : User can draw curve in “**Polyline**” and select closed graphics through Mouse Right.
- 6) User can continuously draw Bezier Curve in “”. User can draw point in “”.



Tips

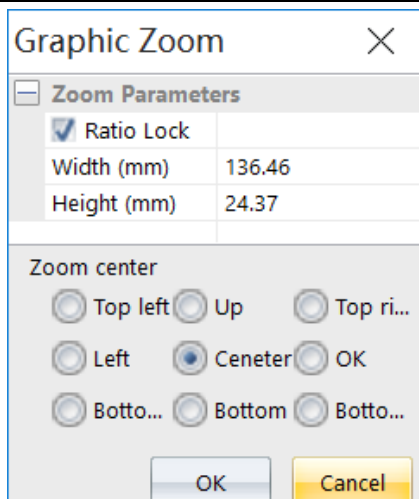
- User can draw through shortcut-menu by Mouse Right.
- SC2000 can auto-capture the key point, user can make full use of this function during draw.
- Click “Ctrl+C” and move the mouse at the same time to copy the selected graphic.
- Click “    ” on the keyboard to adjust the place of selected graphic.

3.2.2.3 Transform

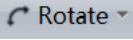
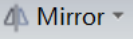
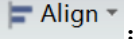
User can adjust the size/angle and so on in “**Transform**” part.



- 1)  : User can adjust the size in proportion of the selected graphic. Click “ ” to set up parameters.



User can choose to zoom the selected graphic in proportion or by certain height/width. User can also choose the zoom center according to his needs.

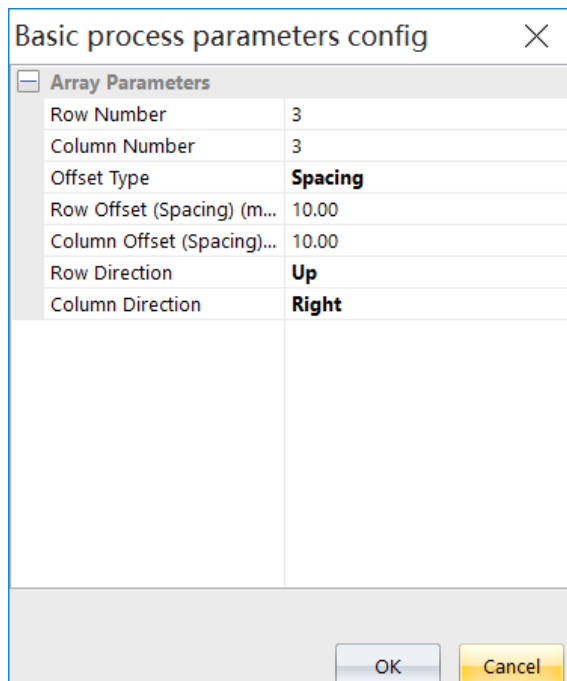
- 2)  **Rotate** : User can rotate the selected graphic in any angle.
- 3)  **Mirror** : User can mirror the selected graphic in horizon/perpendicular.
- 4)  **Align** : SC2000 support various ways of alignment, includes: **“Left aligned”, “Right aligned”, “Horizontal aligned”, “Top/Bottom aligned”, “Vertical center”, “Center”**.

3.2.2.4 Advanced transform

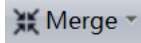
User can adjust the nested relationship among multi graphics.



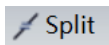
- 1) **Array** : User can array the selected graphic, which often used in cutting one single graphic for many times.



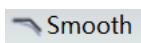
- 2) **Group** : User can relate multi irrelevant graphics as a whole group. The element of a "Group" can be graphics or groups that consist of graphics. Group can be exploded according to user's needs by the dropdown Menu.



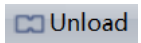
- 3) **Merge** : User can merge multi lines/curves and make them a whole and independent graphic. User can explode one single graphic until it can't be separated.



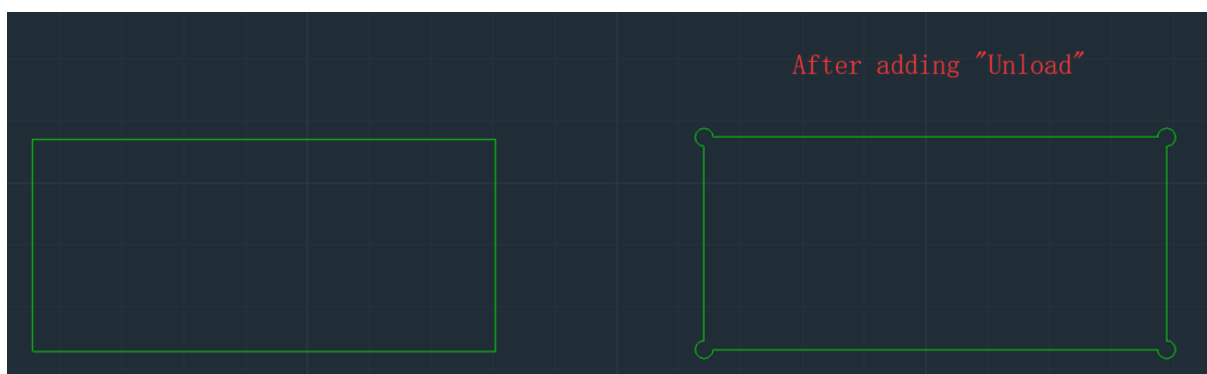
- 4) **Split** : User can split a graphic or line segment into multi discrete line segment.



- 5) **Smooth** : User can set smooth precision to smooth the corner of a curve. Unreasonable smooth precision may cause graphic distortion.



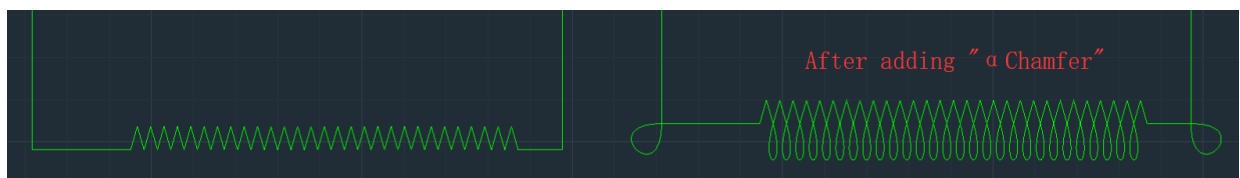
- 6) **Unload** : User can unload the stress of right angle to make bending much easier in the sheet-metal process. The size of the released angle can be set by setting its radius.



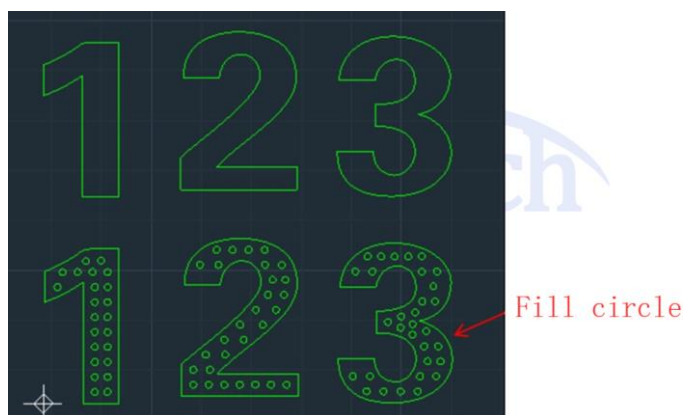
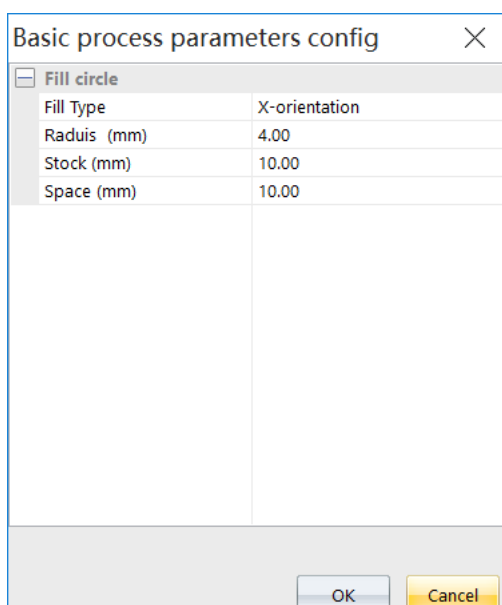
- 7)  **Chamfer** : User can choose to chamfer manually or automatically. User can chamfer any included angle manually, it's extremely convenient. Auto Chamfer means after setting the angle range and radius, SC2000 will chamfer all the graphics automatically.



- 8)  **α Chamfer** : To avoid the over burning on the corner.



- 9)  **Fill Circle** : Filled with circle mainly used in advertising process, user can fill a closed contour with circles in certain radius. User can set the parameters of radius, margin and space. (软件上对应的翻译需要修改)



- 10)  **Optimize** : Click dropdown menu, user can find 4 advanced optimized functions: **Clear duplicate lines, replace circle, adjust start point and single point replace circle.**

Clear duplicate lines: clear the duplicate lines in some special situations;

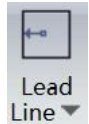
Replace circle: replace those fake circles (without a center point) with real circle that has center point. Kindly suggest you to use this function before fly cutting when cutting words for advertising.

Adjust start point: unify the start cutting point of all the graphics in the same orientation.

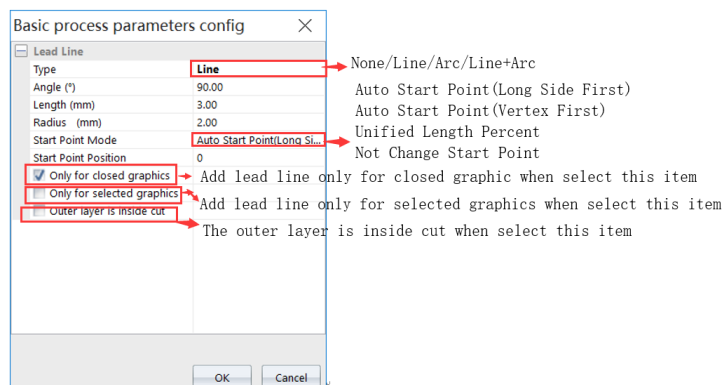
Single point replace circle: replace the chosen circle with point.

3.2.2.5 Basic cutting process

User can set up the parameters of path planning/basic process in this part.



- 1) **Lead Line**: User can add lead line to selected graphics, and click the icon to set up the parameters related.

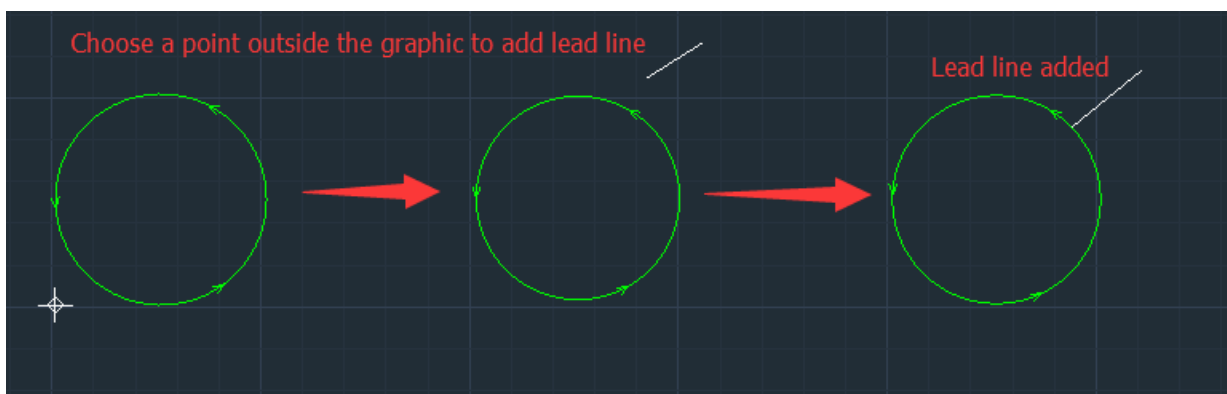


Tips

- SC2000 can recognize the nested relationship among graphics, and the outer layer is outside cut (default), if the outer layer needs to be inside cut, please select "Outer layer is inside cut".
- User can change the way of lead line through shortcut-menu.

User can click the dropdown menu of lead line to select: **"Manual lead line"**, **"Check lead line"**, **"Clear error mark"** and **"Clear lead line"**.

User can add lead line manually through **"Manual lead line"**. The adding way showed as below:

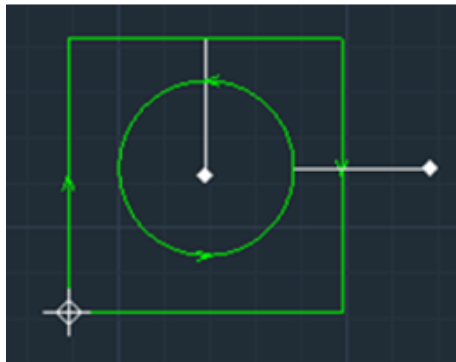




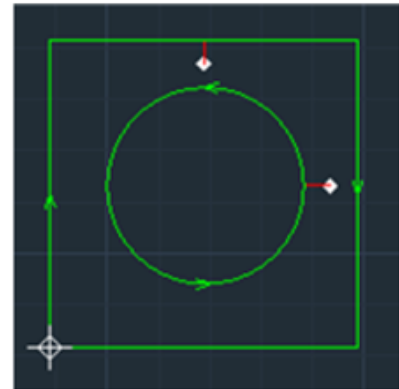
Attention

- “Manual lead line” can be added continuously, if user wants to dropout the lead line adding, please select “cancel” through Mouse Right or select  to end the lead line adding.

“Check lead line”: User can check the interfered lead line and clear the error lead line. Please check all the lead lines again once all have been finished.



After "Check lead line", the interfered lead line will be handled and marked as red.



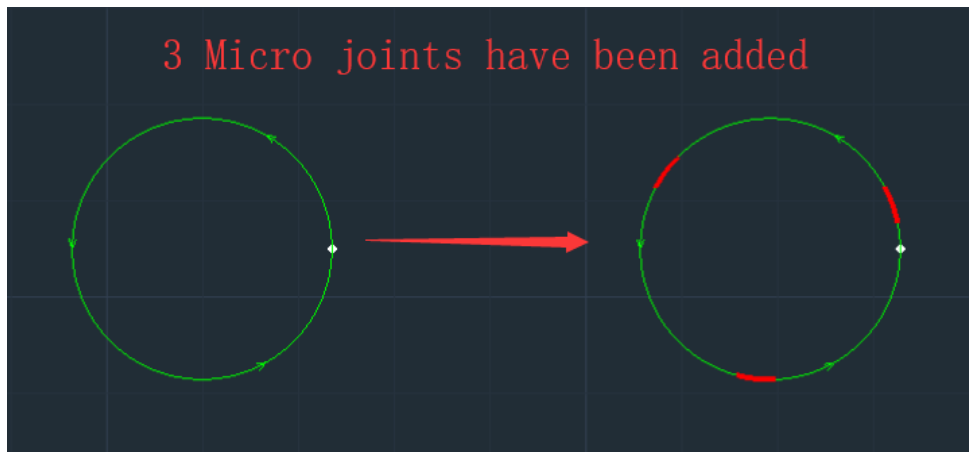
“Clear error mark”: User can clear error mark of selected graphic. If user wants to clear all the lead lines, please click “Select all”.

“Clear lead line”: User can clear the red mark interfering lead line.



- 2) **Micro Joint**: Set some segments to avoid cutting on the contour of the cutting graphics. SC2000 supports add micro joint manually (default) or automatically. Click “Manual Micro Joint”, and choose a point on a closed graphic with mouth left, then this point will be the micro joint. User can set the parameters on “Manual Micro Joint Parameters”.

Add Micro Joint automatically: User can set the “Micro Joint Length” then SC2000 will automatically add the micro joints accordingly. If you're not satisfied with the added micro joints, you can clear the micro joints that have been added. Or let the graphics exploded into several segments from the micro joints that have been added before according to your needs.



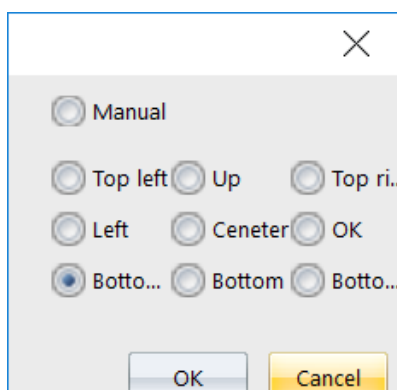
- 3) **Gap**: User can reserve some gaps/segments in certain size on the contour of closed graphics. When gap has been added, the gap part will be showed in red and laser source will not launch laser when cutting this part. This function can prevent the cutting parts from dropping out after cutting.



“Seal”: seal those unneeded gap.

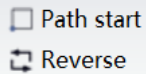
“Over”: Over cutting the certain length of the cutted graphic in case some part has not been fully cutted.

- 4) *** Home Ref**: User can set up the docking location of the cutting head after the cutting, which means the start cutting point of the cutting graphic.

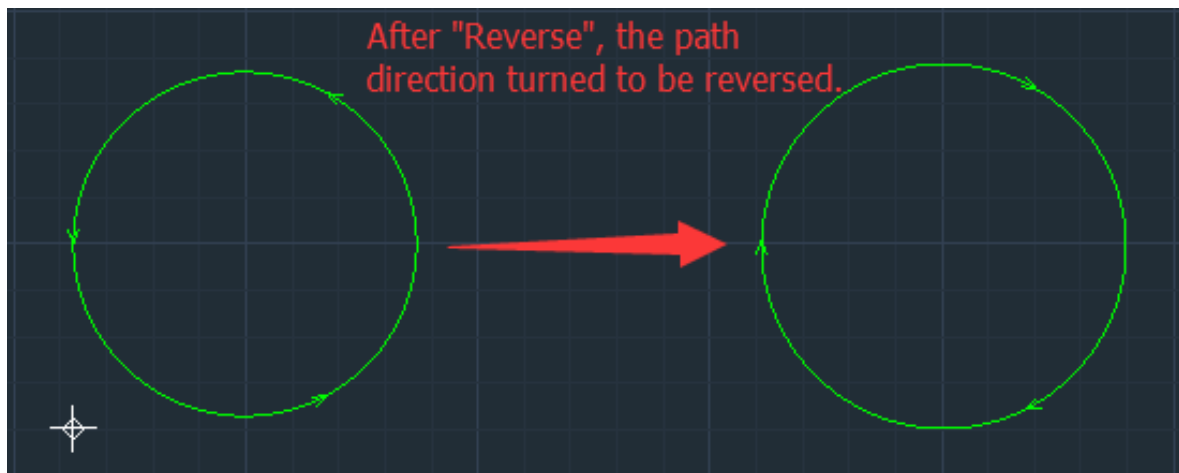


**Attention**

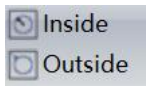
- When using "Floating coordinate system" for cutting, the dock position of cutting head will be regarded as the start cutting point. After user set the dock position and start cutting, SC2000 will coincide the dock position with the cutting head's current position in default and the location of the graphics in the view section will be adjust accordingly.
- User can set the dock position in anywhere you like. And after setting, kindly suggest you to simulate the cutting process to make sure all the cutting graphics are inside the workpiece.



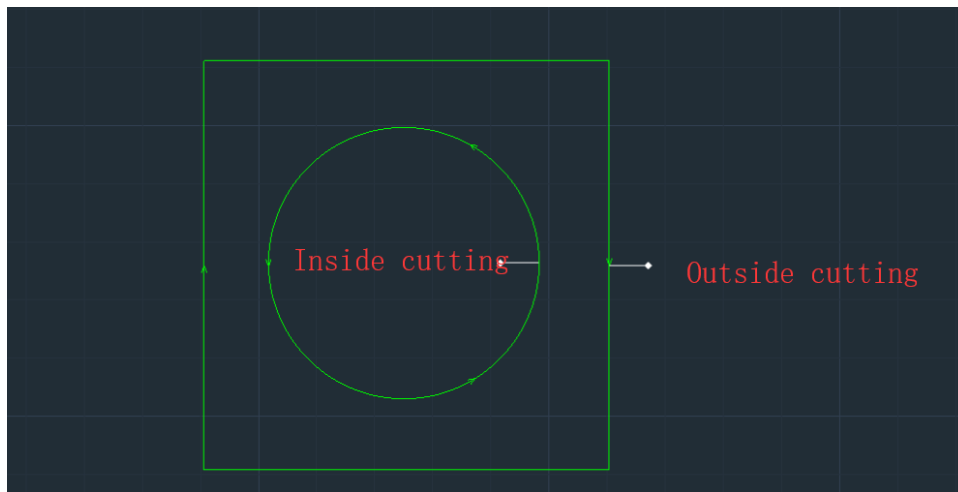
- 5) : User can change the path starting point through "Path start". After click "Path start", user can choose any point on the graphic contour as the current path starting point by Mouse Left. User can reverse the cutting path by click "Reverse".

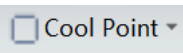
**Attention**

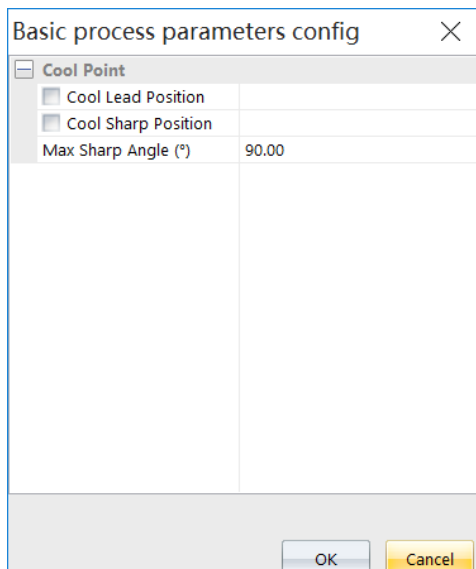
- The places of lead line/gap and other related things will be adjusted accordingly after the changing of the path starting point.



- 6) : Inside cutting means the lead line will be added inside the graphic and start cutting from the inside of the graphic. While outside cutting means lead line will be added outside the graphic and start cutting from the outside of the graphic.



- 7)  : When cutting the thick metal sheet with O2, having some reasonable cooling points are necessary to effectively avoid over burning on sharp corners. User can also add cool points at lead line and sharp corners, and the max sharp angle can be set accordingly.



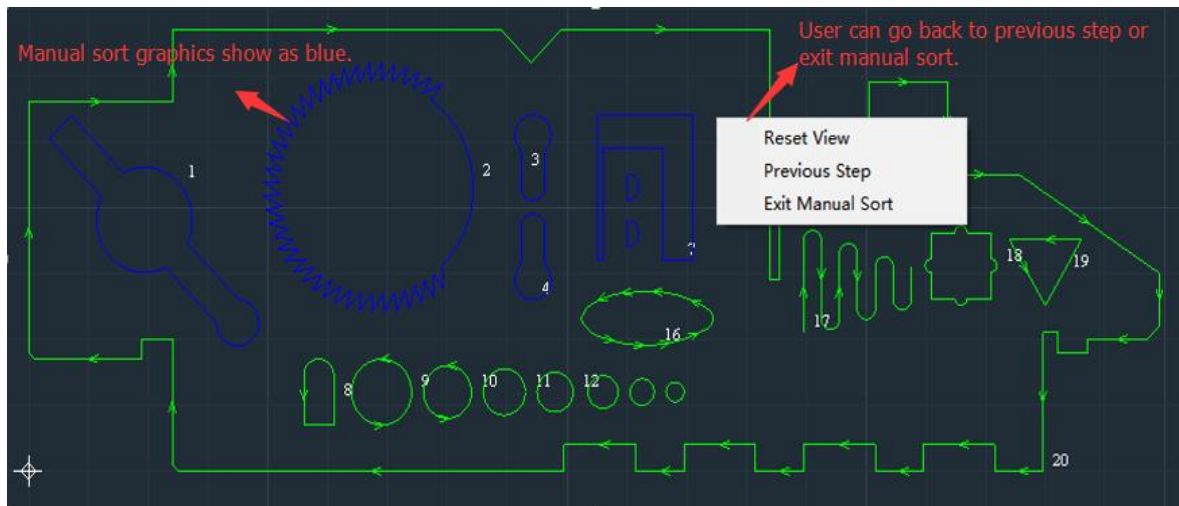
3.2.2.6 Advanced cutting process

User can further optimized the path planning or process through this part.



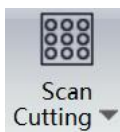
- 1)  : SC2000 provides various ways of sorting. User can choose the best one in order to decrease the cutting head's air moving distance for increasing the working efficiency. User can choose **“Left to right”, “Right to left”, “Bottom to top”, “Top to bottom”, “Nearest”, “Inside to outside”, “Outside to inside”, “Selected Layer First”, “Selected Layer Last” and “Manual sort”**.

“Manual sort”: User can sort manually according to your needs.



Tips

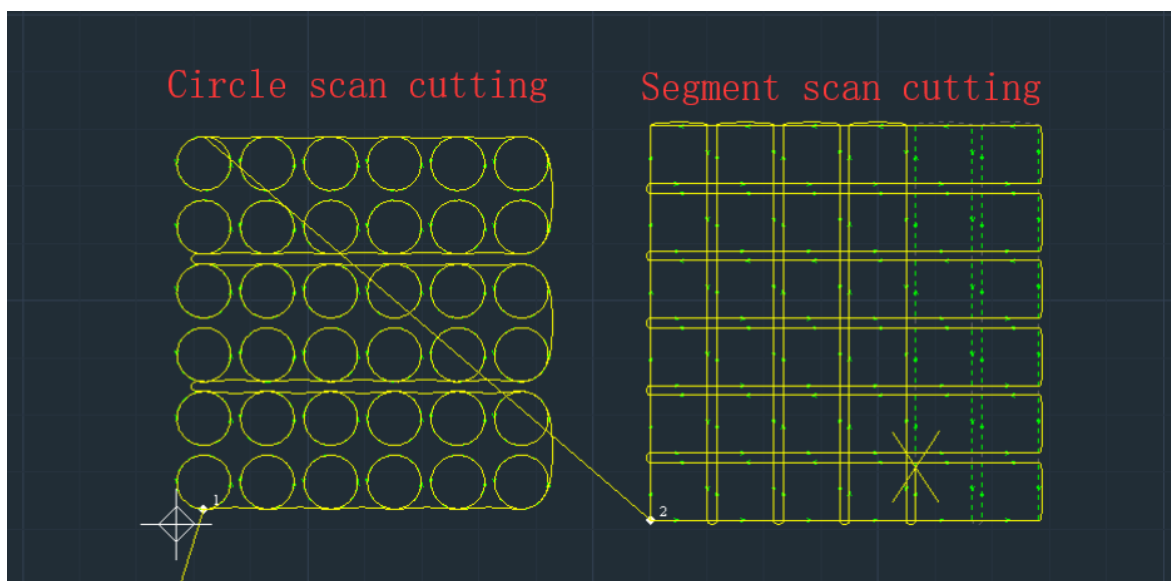
- After sorting, user can also quickly revise the cutting serial number through shortcut-menu.
- If user wants to select some graphic as the first/last one to be cut, please select the graphic and select "First process" or "Last process" through Mouse Right.
- SC2000 can auto sort based on nested relationship among graphics, and the graphics surrounded will always be cut in priority. If the out layer graphic is unclosed curve, then this function will not work.



- 2) **"Scan Cutting"** is applied for cutting regular graphics like circle or square in array.

SC2000 will adopt the optimal cutting path to for high cutting efficiency. Select all the graphics (circles/squares) that need to be cut , click **"Scan Cutting"** then SC2000 will finish cutting path

planning, user can check the real cutting path by clicking "Sim".

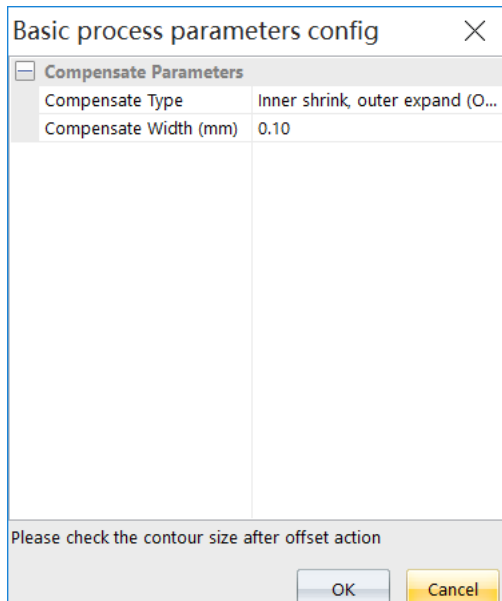




Descriptions

- If the selected graphics cannot satisfy the scan cutting conditions, SC2000 will not do scan cutting, and the message bar will show a message "The selected graphics can't fit the conditions!"
- Scan cutting conditions: for circle scan cutting, the diameters must be the same; while for segment scan cutting, the polygon must be consist of segments.

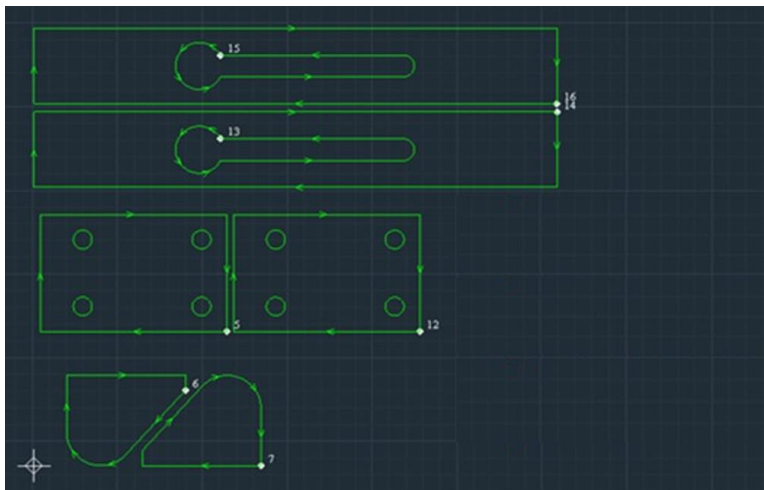
- 3)  **Compensate** : SC2000 can compensate the cutting kerf if the cutting accuracy is highly required. The graphic will be showed in gray line after compensation.



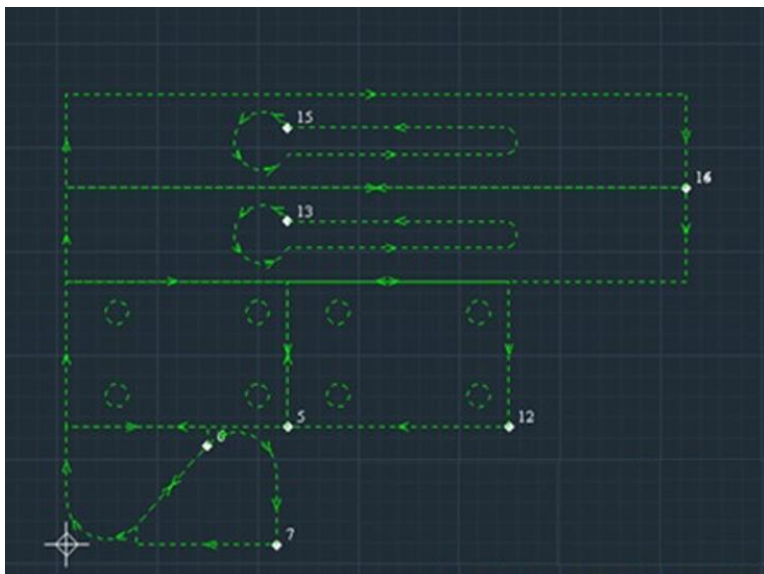
- 4)  **Bridge** : User can connect two independent and closed graphics into one part. This function is very useful for multi related parts cutting together or AdWords cutting. After selected "Bridge", user can set up bridge width. Mouse Left to select one independent contour and move mouse to select another independent contour then bridge over.



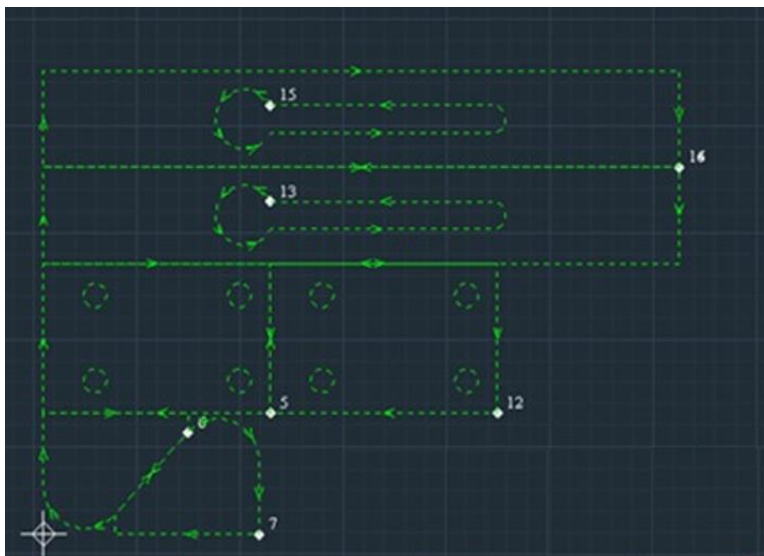
- 5)  **Share Edge** : User can use this function to cut graphics sharing their edges so that to cut the sharing edge one time to save the workpiece.



Before sharing edge, use mouse to move these graphics that need edge sharing closely enough, then SC2000 will automatically make these graphics adsorb each other .



After adsorbing, some edges have already coincided, which satisfy the edge sharing conditions.



Click "Share edge", edge sharing is done.

3.2.2.7 Auxiliary

"Auxiliary" part mainly collects some common measure tools.



Measurement: User can use this function to measure the distance between any two points on the view section. So user can measure the size of cutting graphics before cutting to make sure the cutting quality.

3.2.3 System analysis

User can monitor the running status of software and hardware of SC2000 to see whether if it's running properly or not. If it's not, it's convenient for user to find out the real problem and then handle it.



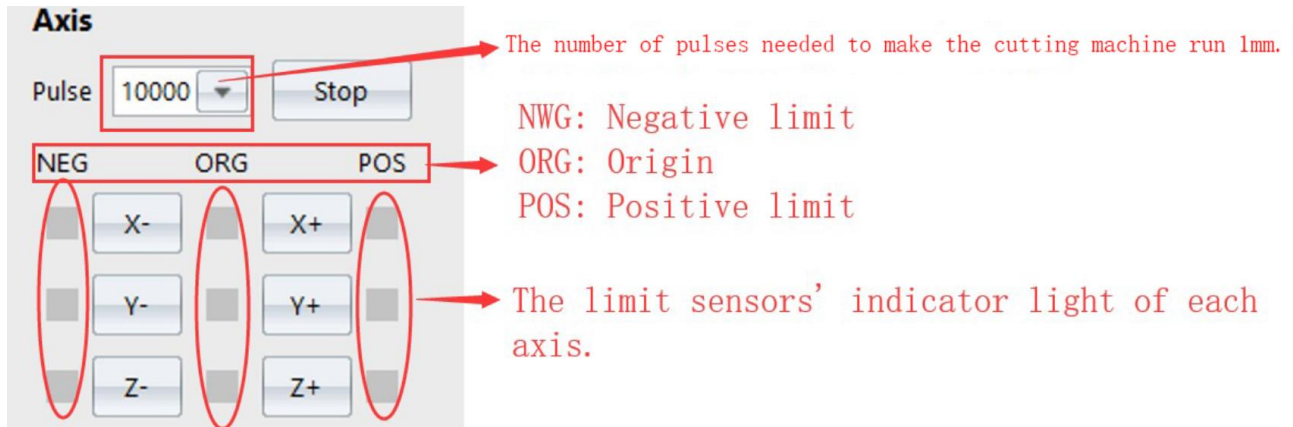
3.2.3.1 Components monitoring



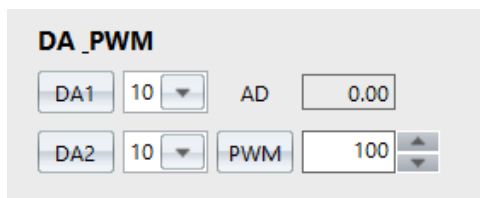
- 1) **Controller**: used to monitor the input/output status of CNC system. The light will be green if the input/output is working properly.

DO	Port number	DI
	01	01
	02	02
	03	03
	04	04
	05	05
	06	06
	07	07
Shutter	08	08
	09	09
	10	10
	11	11
	12	12
Laser	13	13
Air	14	14
	15	15
	16	16

The output status of each axis can also be controlled.



User can set the parameters of DA and PWM here:

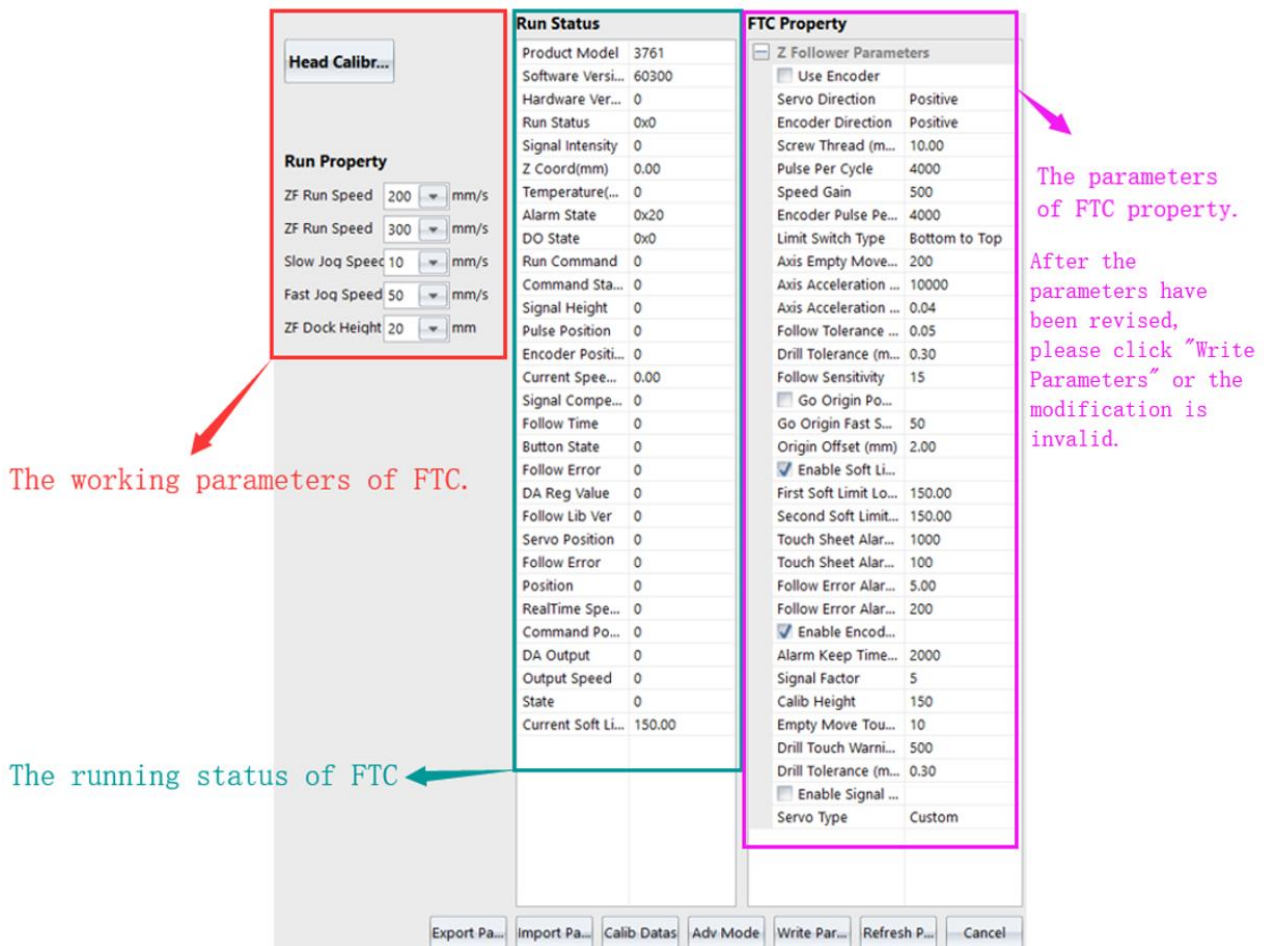


Tips

- When installing SC2000, user can check each input/output port to see if it's working properly though this function. If some port is not working properly, user can use this function to find out.



- 2) FTC: "Focus tracking controller" can monitor the running status of Z axis. Since the motion control card MCC3721H has already been integrated with capacitive height sensor module, so there is no need to preapre a seperated focus tracking controller, which is much more convenient for using and installation.



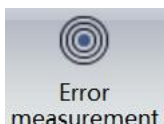
Descriptions

- Head calibration needs to be done after z axis go origin when in the first time that the machine power on. Or cutting head can't follow stably in z axis;
- The parameters of FTC can be import and export separately;
- Once the parameters of FTC Property has been revised, please click "Write Parameters" or the modification is invalid.

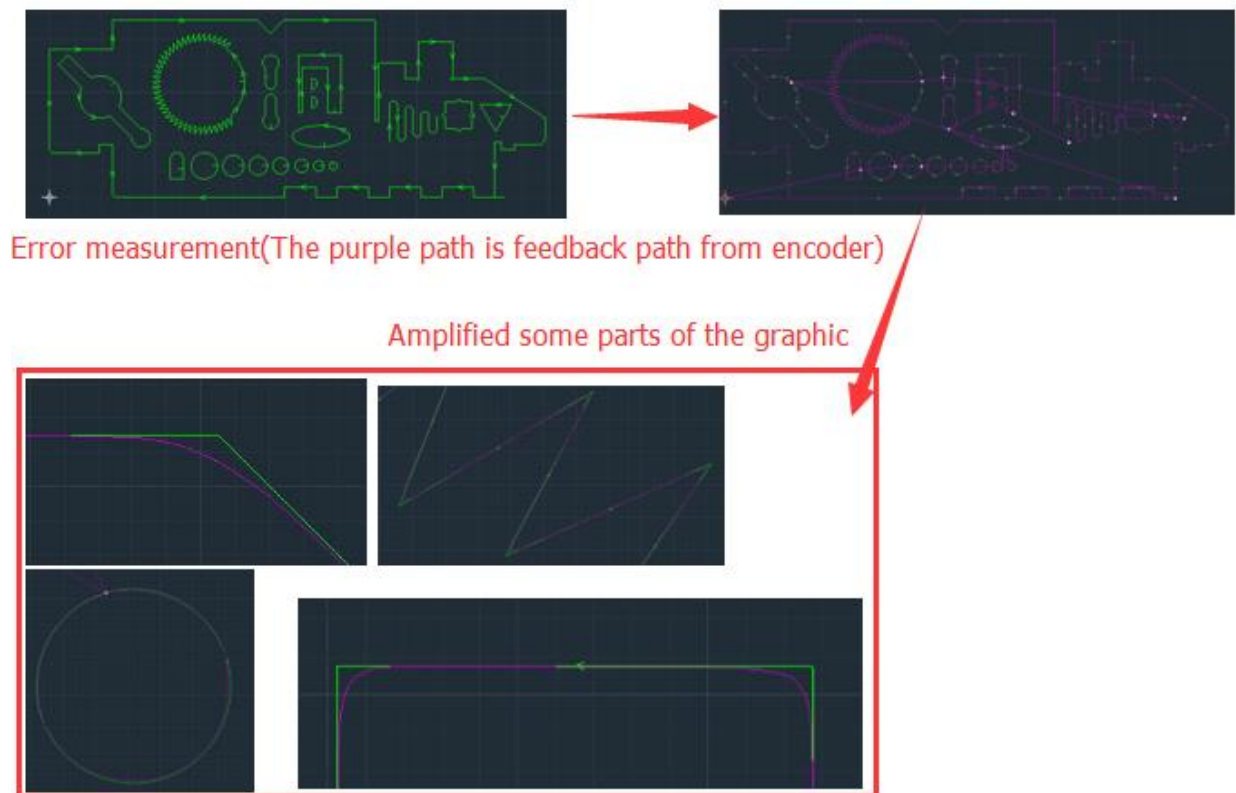
3.2.3.2 Diagnostics



- 1) **Log**: Click here to check the running log, including system alarms/ system messages. This record can only be kept in 15 days.



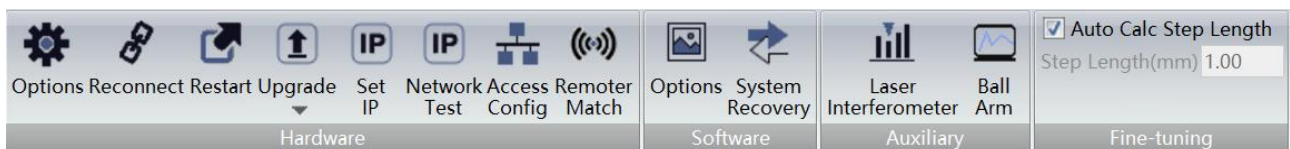
- 2) **Error measurement**: SC2000 can draw the real running path by collecting the information of encoder. User can easily debug the machine, and check the running error of X/Y axis or measure circle and so on.



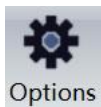
User can zoom in the view section through the middle mouse button and measure the error by measurement tools.

3.2.4 Advanced

This part mainly collects the tools for hardware configuration/debugging when assembling the machine. The style of SC2000 and initial settings once been finished, please don't change them unless some special occasions happen.



3.2.4.1 Hardware



- 1) **Options**: User can set up parameters of Axis/Laser/FTC/Auto Focus/Gas/IO/Advanced/Extended Card/Exchange Platform/Auto Roll Sheet through this part. Please carefully set up these parameters. Click "Options" and enter the password "0000".
 - a) **Motion control axis**: including the basic parameters and go origin parameters.

The descriptions of each axis showed as below :(The parameters of Y axis must be the same as X axis.):

Axis Parameters	Name	Meaning	Default Value	Remark
X/Y1Y2 Axis	Pulse Equivalent(pulse/mm)	if it needs 10000 pulse to make the X motor rotate 1 circle, and the cutting machine will move 10mm when X motor rotate 1 circle, then the pulse equivalent = 10000/10=1000.	1000	The number of pulses needed to make the cutting machine run 1mm. The parameter is very important!!!
	Max Length(mm)	Max running distance of each axis	1500	
	Limit Switch Type	Two types: normal open/closed	Normal Open	Limit switch type of Y-axis should be the same with X-axis.
	Encode Reverse	The feedback signal of encoder reverse.	Not check	
	Double Drive	Set Y axis as double drive.	Check	Only for Y axis.
	Double Drive Error Alarm		Check	If checked, the software will give an alarm and stop when the alarm condition is exist.

Misc	Double Drive Error Tolerance(mm)	The deviation distance in Y axis (Y direction) between Y1 and Y2	3.00	When these 2 situations occurred at the same time, SC2000 will pause and showed the alarm.
	Double Drive Error Keep Time(ms)	The duration time after double drive error occurred.	100	
	Encoder 4 multiplier freq	The multiplier frequency feedback by encoder.	Check	Please don't change this setting unless you're the administrator.

**Attention**

- Motion control axis' parameters are basic parameters, please set up properly or it may occur error during running.
- If Y axis is double drive, please select "Double Drive".
- When the feedback direction of encoder is different from the real running direction, please select "Encoder Reverse".
- SC2000 can support two kinds of axis limited switch: NPN photoelectric switch/ mechanical switch, user can set up as normal open/close.

The parameters of Go origin mainly refer to X/Y axis, the meaning and reference settings showed as below:

Axis Parameters	Name	Meaning	Default Value	Remark
Go Origin	Use Z Phase Signal	Choose Z phase signal as the origin signal.	Not check	
	Sample Signal Type	Two choices for origin signal: Origin or Limit.	Origin	If you prefer limit signal as the origin signal, please choose "Limit".
	Limit Switch Type	Two choices for limit switch type: Normal Open or Normal Close.	Normal Open	
	Fast Speed(mm/s)	Set the first Go Origin speed, please not set too fast.	50.00	SC2000 will adapt "go origin twice" with different moving speed each time to make sure the accuracy of locating the origin.
	Slow Speed(mm/s)	Set the second Go Origin speed, please not set too fast.	10.00	
X axis go origin	Go Origin Direction	The moving direction in X axis when go origin.	Positive	It must be related with the location of origin in X axis, or this action can't be done.
	Go Origin Offset(mm)	The moving distance after Go origin has been done.	10.00	If you don't want the origin switch as the location of the origin, to set the moving distance is a good way to choose a new place as the origin.

Y axis go origin	Go Origin Direction	The moving direction in Y axis when go origin.	Positive	It must be related with the location of origin in Y axis, or this action can't be done.
	Go Origin Offset(mm)	The moving distance after Go origin has been done.	10.00	If you don't want the origin switch as the location of the origin, to set the moving distance is a good way to choose a new place as the origin.
Advanced parameters	Enable Second Times Home	SC2000 will adapt "go origin twice" with different moving speed each time after this option has been checked	Not check	The accuracy is much higher when adapt this way to go origin and at the same time the duration time of go origin in this way will be much longer.

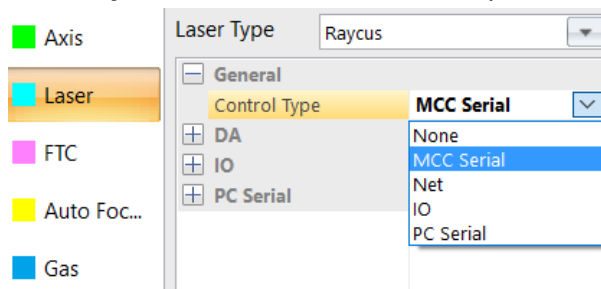


Attention

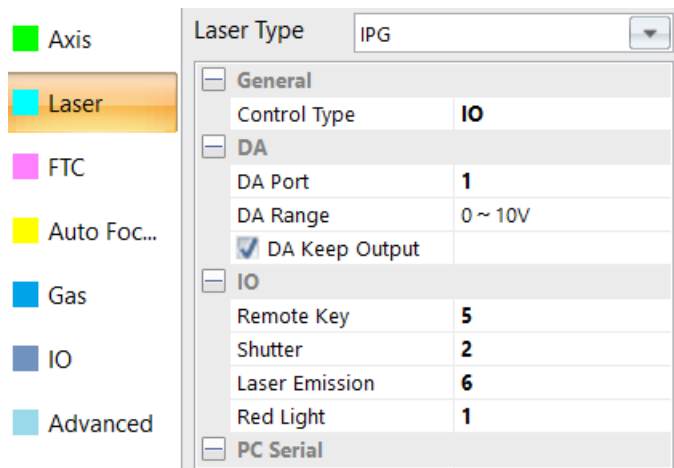
- User can choose origin signal according to your needs, and then connect it with motion control card. Once the origin signal has been confirmed, the Go Origin direction must be the same as that of Origin, or Go Origin can't be done and even result in damaging the equipment or even hurting people.
- Kindly suggest you not set the Go Origin speed too fast or it may go over the origin which may cause the failure in Go Origin.

- b) **Laser:** set the communication/connection way with laser source. SC2000 support laser source like Raycus/IPG/Semiconductor/MaxPhotonics/Super/TXStar/nLight/Others.

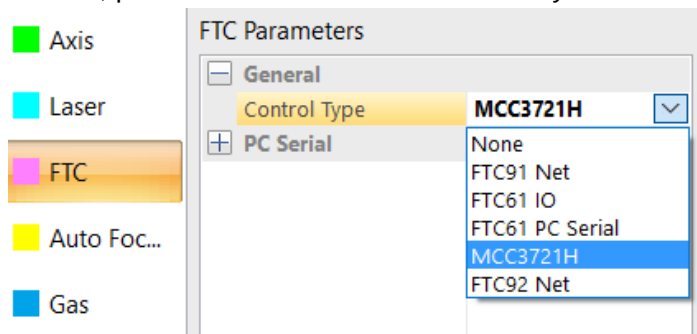
Take **Raycus** laser source as an example:



For Raycus laser source, SC2000 supports the control type both in MCC Serial and PC Serial. While for IPG, SC2000 supports the control type both in IO and Net:

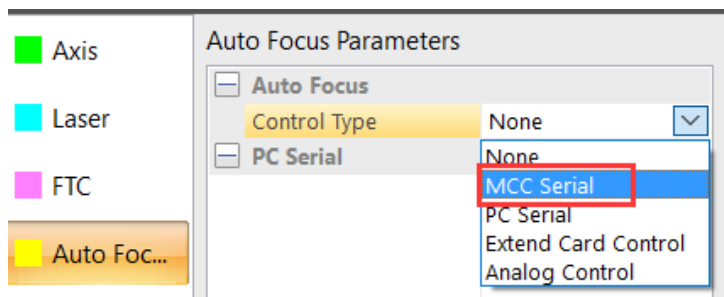


- c) **FTC**: set the communication/connection way with FTC. SC2000 can connect with our FTC91/FTC92/FTC61 by Net or IO port or PC serial. User can connect other types of focus tracking controller by I/O port. If you are using MCC3721H which has already been integrated with FTC module, please choose “MCC3721H” directly.

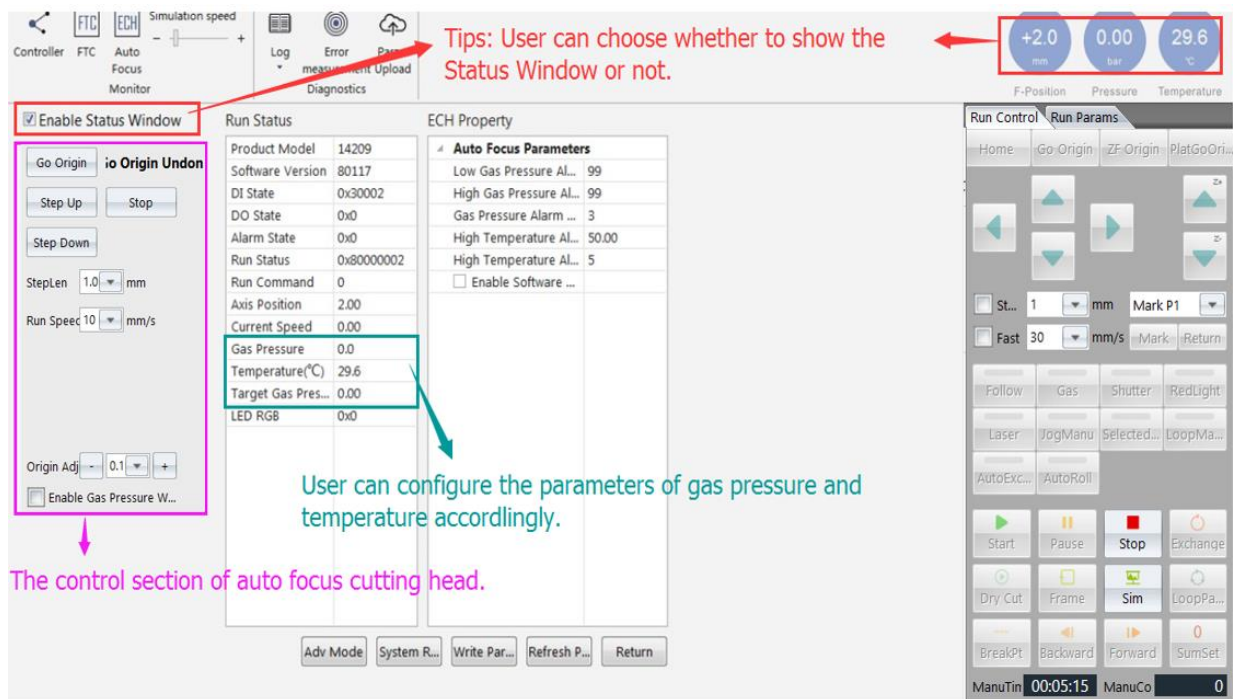


Descriptions

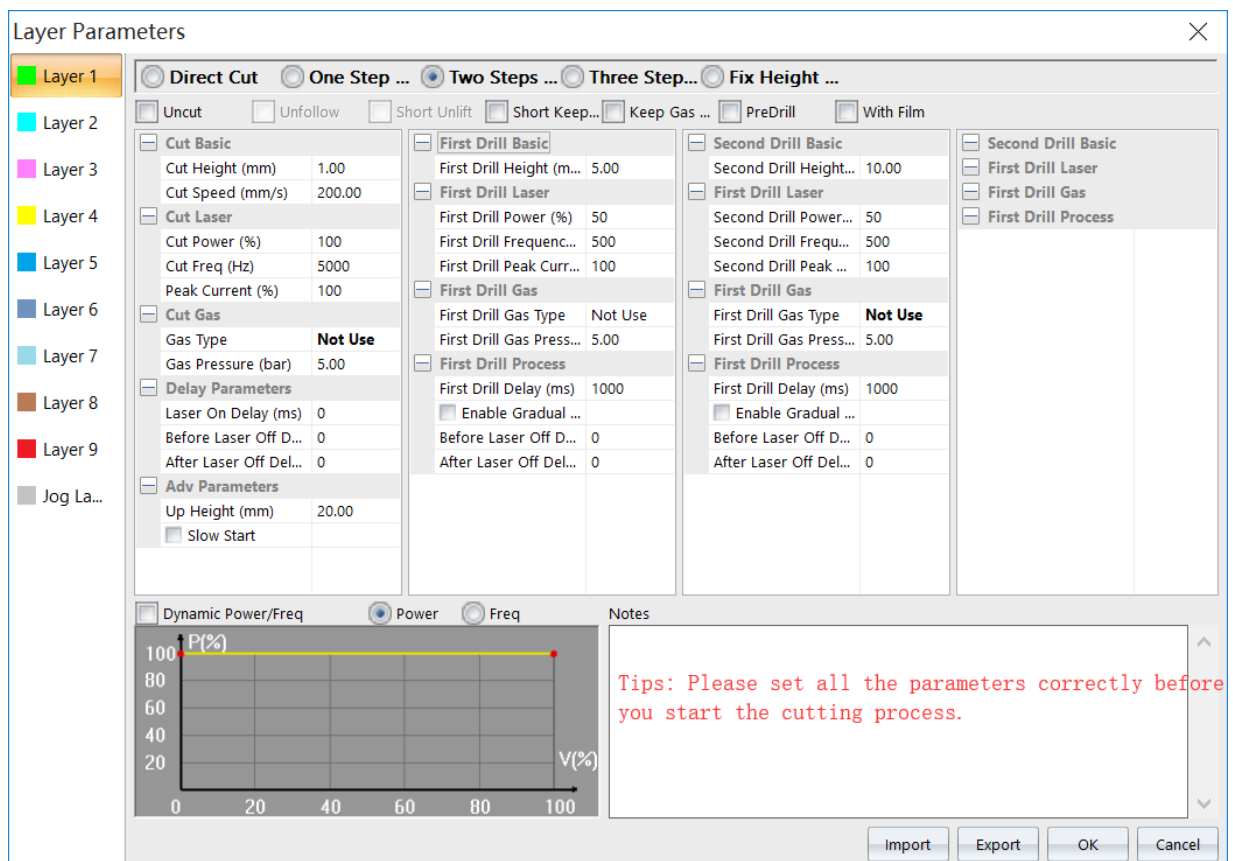
- If you choose FTC91, please select “FTC91 Net”. If you choose FTC61, please select “FTC61 IO”/“FTC61 PC Serial”. If you use MCC3721H motion control card, please choose “MCC3721H”.
- d) **Auto Focus**: set the controlling way of auto focus cutting head. SC2000 supports all kinds of auto focus cutting head manufactured by AU3TECH. Please set the parameters correctly before you start the whole controlling system.



Make sure the auto focus cutting head has been correctly connected with the motion control card, then choose “**SYSTEM ANALYSIS**”-“**Auto Focus Monitor**”, you’ll see the operation interface shows as below:



After all the movements of auto focus cutting head like "Go Origin", "Step Up", "Stop", "Step Down" can be done correctly, please configure the parameters of cutting process accordingly. Click "Layer", you'll see the interface shows as below:



- e) **Gas:** SC2000 Supports 3 types of low pressure valve, 3 types of high pressure valve, 3 types of proportional valve and 1 type of cool down gas. User can set the parameters according to your needs.

Gas Parameters

☐ Low Pressure Valve

Air	0
O2	10
N2	0

☐ High Pressure Valve

Air	0
O2	0
N2	9

☐ Proportional Valve

Air(DA)	0
O2(DA)	2
N2(DA)	0
Max Pressure (bar)	10.00
Air Proportional Valv...	0
O2 Proportional Valv...	0
N2 Proportional Valv...	0

☐ Misc

Cool Down Gas	0
---------------	---

Gas Type: ☐ Gas Type

Correction Poi: Set Point Num

NULL Set DA Close DA

Voltage(V) GasP(Bar)

- f) **Input/Output:** set IO ports, including: Standby Signal, Standby Signal Alarm, Process Signal, Alarm Signal, Dedust, Alarm settings, LED Settings, Emergency stop, Water alarm, and so on. SC2000 also supports custom in DI/DO/Alarm.

IO

Process Signal 0

Alarm Signal 0

Dedust 4

☐ Alarm Settings

☐ Enable Alarm LED...

Alarm LED ON Time ... 0.50

Alarm LED OFF Time ... 0.50

☐ Enable Alarm Rin...

Alarm Ring ON Time... 0.50

Alarm Ring OFF Time... 0.50

☐ LED Settings

☐ Enable Wait LED ...

Wait LED ON Time (s) 0.50

Wait LED OFF Time (s) 0.50

☐ Enable Manu LED...

Manu LED ON Time ... 0.50

Manu LED OFF Time ... 0.50

☐ DI

Emergency Stop 0

Water Alarm 0

Water Alarm Switch ... Normal Open

Laser Alarm 0

Laser Alarm Switch T... Normal Open

☐ Lubrication

Lubrication DO Port 0

Lubrication Interval (... 60

Lubrication Keep Ti... 30

☐ Section DO

Section DO Rows Co... 3

Section DO Columns... 3

Section DO Close De... 5

☒ Section DO Only ...

☐ Custom DO

Clear Ash Port 0

Fn1 Port Index 0

Fn1 Port Type Self-Lock

Fn2 Port Index 0

Fn2 Port Type Self-Lock

☐ Process Output

After Manu Done Op... 0

After Manu Done Op... 500

Settings for frequently used IO

Section DO Columns Count

Custom DO

Add Remove

Name	DO Port	Self-Lock
Custom Alarm		
Add Remove		
Name	DO Port	Normal CL...

Settings for custom DO/Alarm

3000

2000

1000

0

0 500 1000 1500

Settings for dedust in different sections

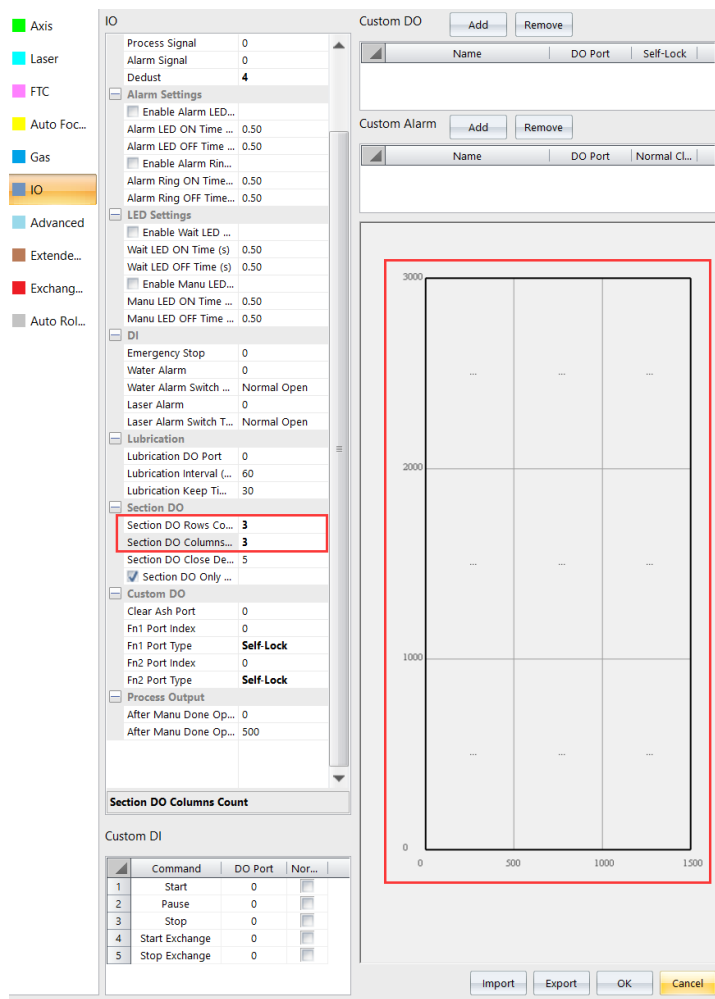
Custom DI

Command	DO Port	Nor...
1 Start	0	
2 Pause	0	
3 Stop	0	
4 Start Exchange	0	
5 Stop Exchange	0	

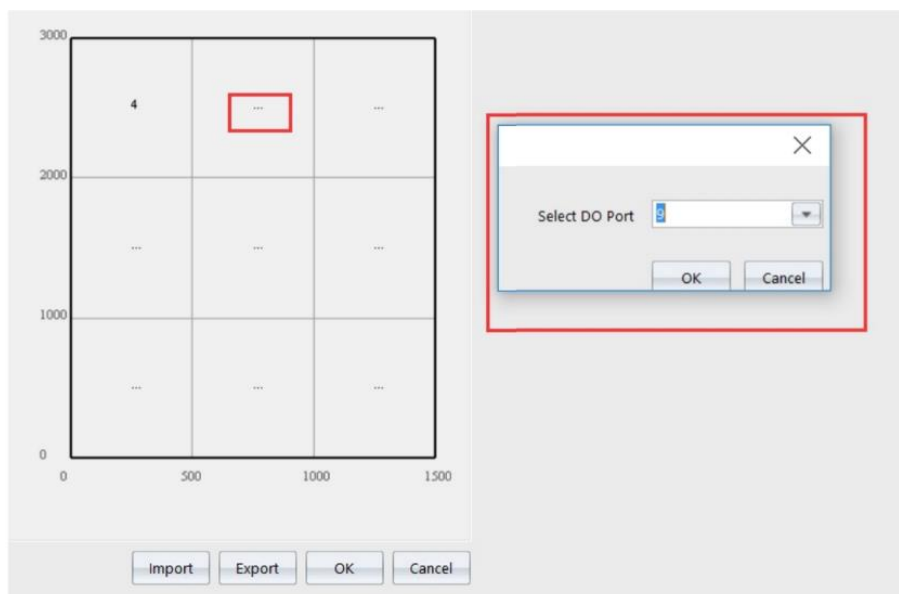
Settings for custom DI

Import Export OK Cancel

Section DO means to make the whole cutting area into different sections, for example: If I set as: "Section DO Rows Count: 3; Section DO Columns Count: 3". The cutting area will be divided into 3 x 3 = 9 sections showed as below:

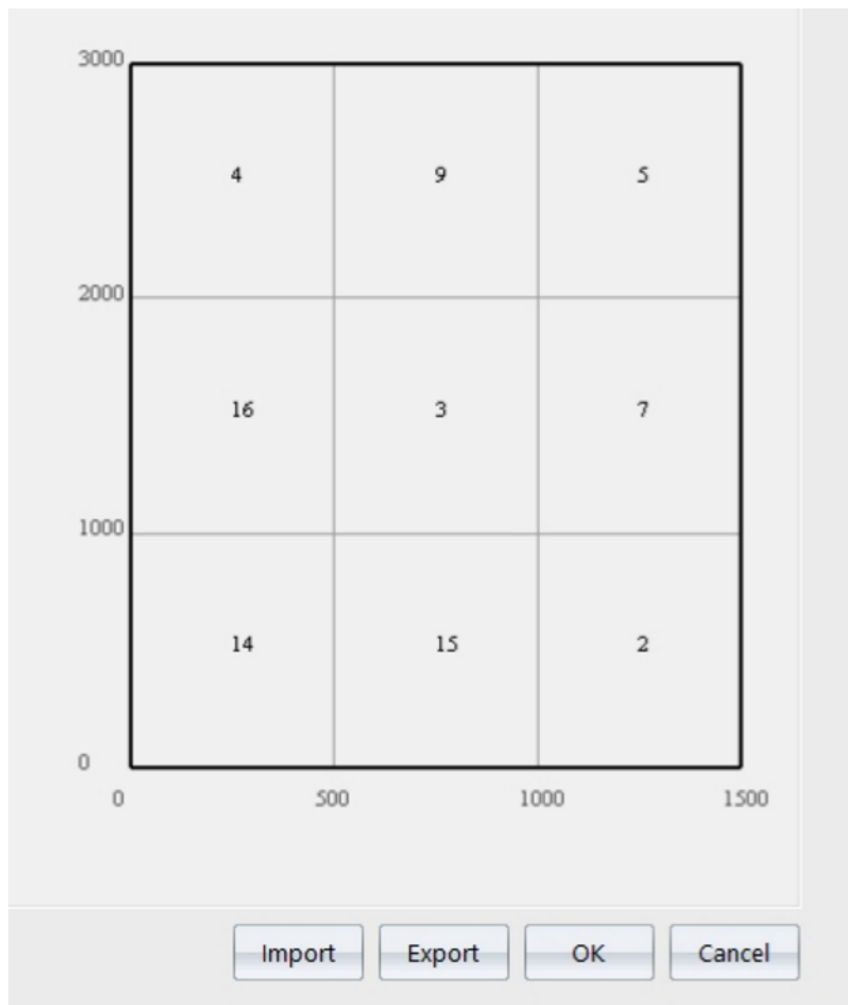


You may notice that there are three small points in each section, click it, then it will show a pop-up window showed as below:



Select the number of the DO Port and then click "OK", the number of the DO Port will be showed in the certain section.

Section DO Close Delay(s) means the ventilation of close delay of the previous Section DO, for example: If the Section DO Close Delay(s) = 5s, and the number of Section DO defined as below:



When the cutting head jumped from the section (named input 9) to the section (named input 7), the ventilation of close delay of the section (named input 9) will be 5 seconds.

When the cutting head jumped from the section(named input 3) to the section(named input 15), the ventilation of close delay of the section(named input 3) will be 5 seconds.

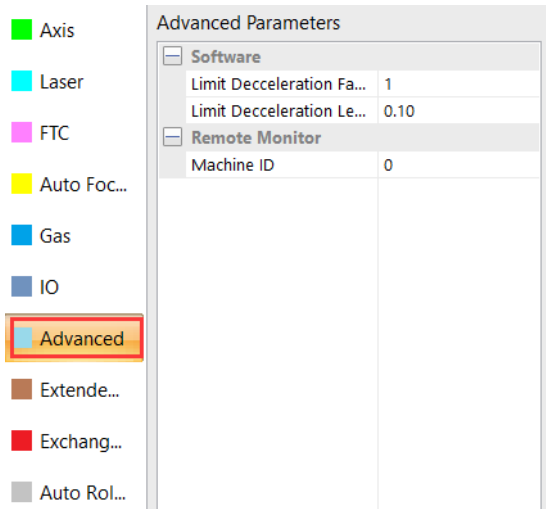
When the cutting head jumped from the section(named input 15) to the section(named input 2), the ventilation of close delay of the section(named input 15) will be 5 seconds.



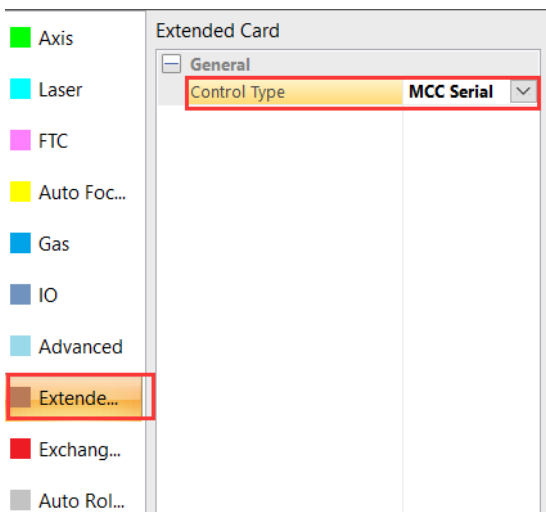
Attention

- If some I/O port hasn't been used, then this port can be set as "0".
- Each port can only be set one time.

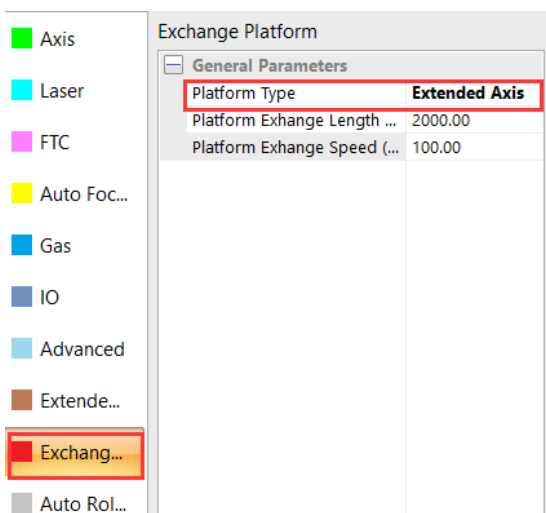
g) **Advanced Parameters:** for user to adjust some parameters related.



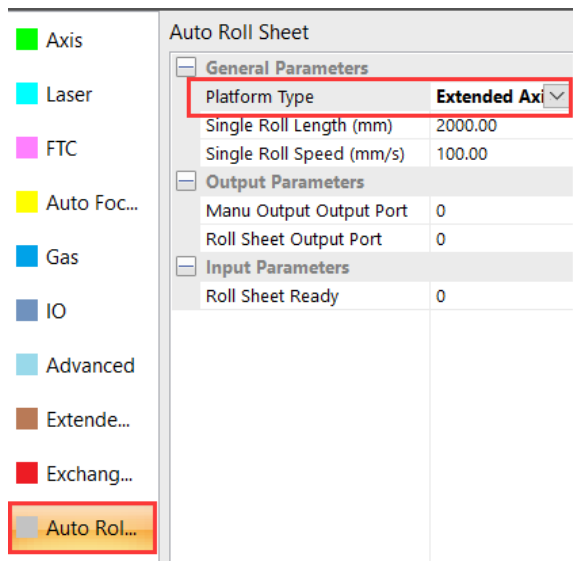
h) **Extended Card:** If you're using the extended card, please set the control type as "MCC Serial".



i) **Exchange Platform:** set the general parameters. SC2000 can only support extended axis to control the exchange platform at this stage.



- j) **Auto Roll Sheet:** set the general parameters of auto roll sheet. SC2000 can only support extended axis to control the exchange platform at this stage.

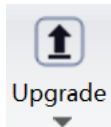


- 2) **Reconnect Restart** Reconnect: User can reconnect quickly by "Reconnect" when computer is not well connected with SC2000 for some reasons such as pulling out the Ethernet cable. User can restart the motion control card by "Restart".

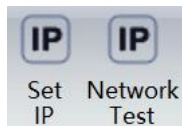


Descriptions

- SC2000 can auto reconnect when recovered the communication parts. If it's still not connected, please select "Restart" after selecting "Reconnect".
- If SC2000 runs smoothly, please don't select "Reconnect" or "Restart", or SC2000 will be forced to restart and break the communication.



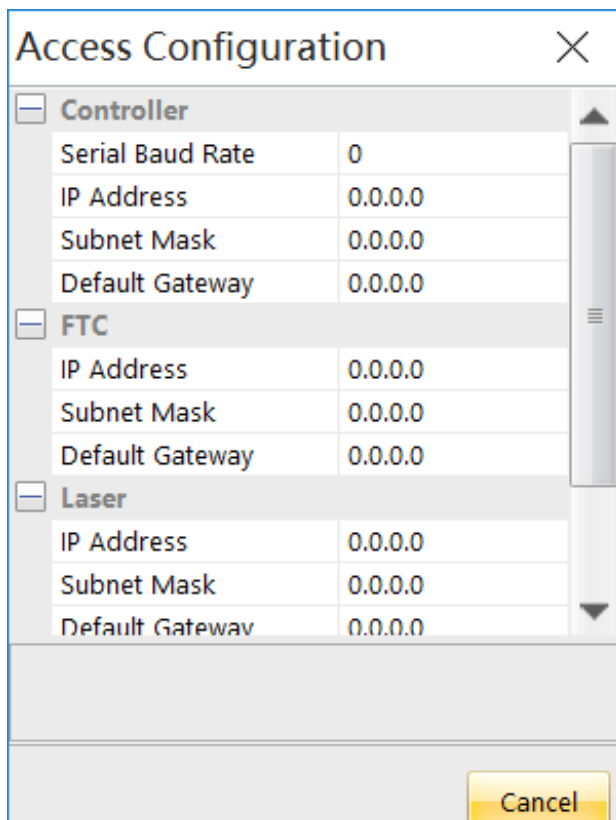
- 3) **Upgrade** : User can upgrade motion control card by this function. After click "Upgrade", please select the program file for upgrading. Please make sure all the related equipments have been powered on and SC2000 has been started during the upgrading to avoid unpredictable events happening. After upgrading is over, please reconnect it and restart SC2000.



- 4) **Set IP Network Test** : SC2000 can set IP automatically and test the IP address by "Network Test".



- 5) **Access Config** : Controller IP address: 10.1.1.168; FTC IP: 10.1.1.169; Laser IP: 10.1.1.170; User don't need to set Sub Mask and Default Gateway.



Access Configuration

☐ **Controller**

Serial Baud Rate	0
IP Address	0.0.0.0
Subnet Mask	0.0.0.0
Default Gateway	0.0.0.0

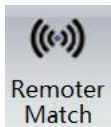
☐ **FTC**

IP Address	0.0.0.0
Subnet Mask	0.0.0.0
Default Gateway	0.0.0.0

☐ **Laser**

IP Address	0.0.0.0
Subnet Mask	0.0.0.0
Default Gateway	0.0.0.0

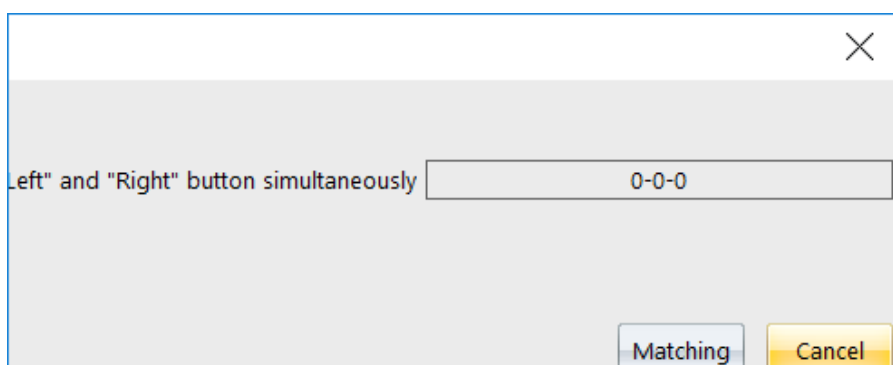
Cancel



- 6) : Wireless remoter needs to be paired up with SC2000 before we use.

Steps:

- Please connect the USB receiver to the computer or the motion control card;
- Click "Remoter Match";
- Press "Left" and "Right" button simultaneously. If there shows a serial number, it means match succeed.

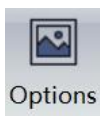


Left" and "Right" button simultaneously

0-0-0

Matching **Cancel**

3.2.4.2 Software



- 1) , User can preprocess and optimized the importing graphics according to your needs.

Graphic interact parameters		Software basic parameters	
☐ Minimal Graphics ☒ Remove minimal graphic Smallest Length (mm) 0.10		☐ Software Language English Alarm Panel Color ■ FF0000 Alarm Text Color White	
☐ Duplicate Lines ☒ Remove duplicate lines Duplicate Limit (mm) 0.10		☐ Log ☒ Enable General Log ☐ Enable Debug Log	
☐ Combine Near Lines Auto combine near lines Direction First Auto Combine Precision (mm) 0.10			
☐ Auto Smooth ☐ Auto smooth imported gra... Smooth Precision (mm) 0.05			
☐ Auto Sort Sort Type Nearest			
☐ Misc Long Contour Split Factor 0.40 User interface refresh period (...) 30 ☒ Enable Ruler ☐ Enable Read Graphics Color			



Tips

- The less the items needed to be preprocessed, the faster the graphics will be importing.



- 2) **System Recovery**: User can quickly recovery the last cutting graphics.



Tips

- When accidentally occurred power off during the cutting process, SC2000 will exit. In this situation, please restart it after power on, and click “System Recovery”, SC2000 will recover the last cutting graphics, then user can continue the cutting process by locating the break point.

3.2.4.3 Auxiliary



- 1) **Laser Interferometer**: coordinate with laser interferometer to measure the positional accuracy of the cutting machine.

For example:

Click “Advanced”-“Laser Interferometer”, enter into the error measurement UI of laser interferometer.

The cutting control section will be turned into the controlling UI of laser interferometer, user can set

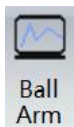
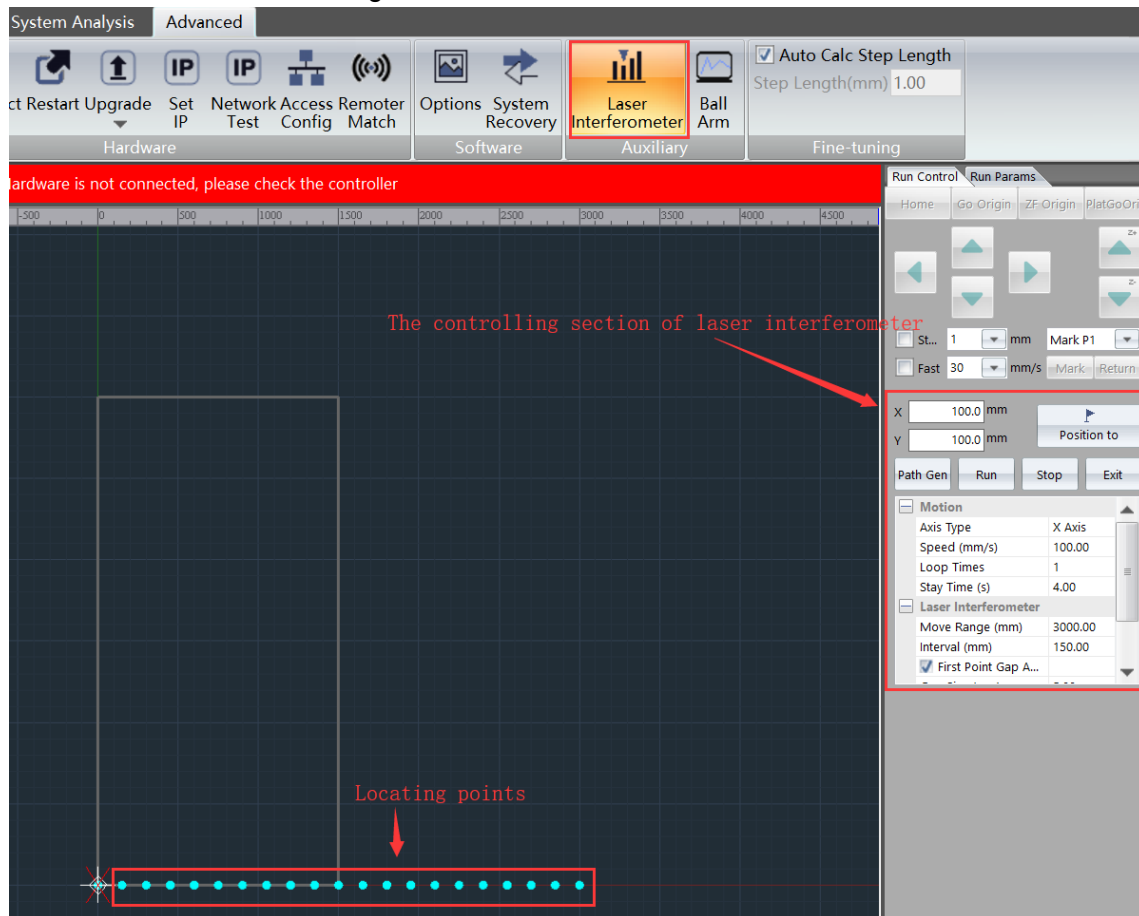
the parameters according to your needs.

Click “Path Generate”, SC2000 will automatically generate the motion trail in the view section.

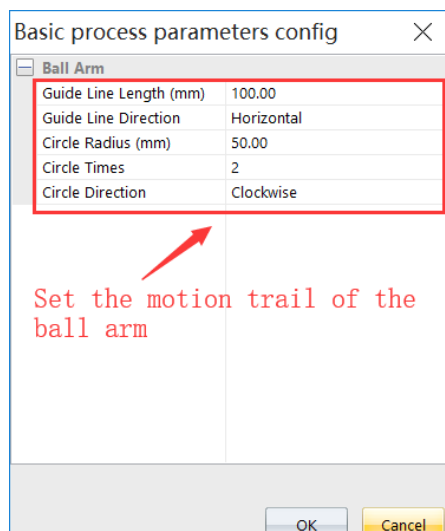
Click “Run”, execute the generated running program.

Click “Stop”, stop the movement.

Click “Exit”, exit the controlling UI of laser interferometer.



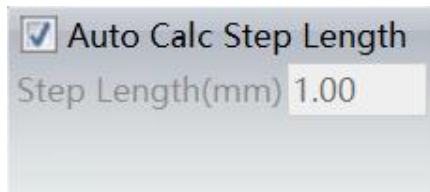
- 2) : coordinate with ball arm to measure the roundness of the cutting machine.



3.2.4.4 Fine-tuning of keyboard

User can adjust the location of the selected graphic in the view section by move steps with certain

step length on the keyboard “”.

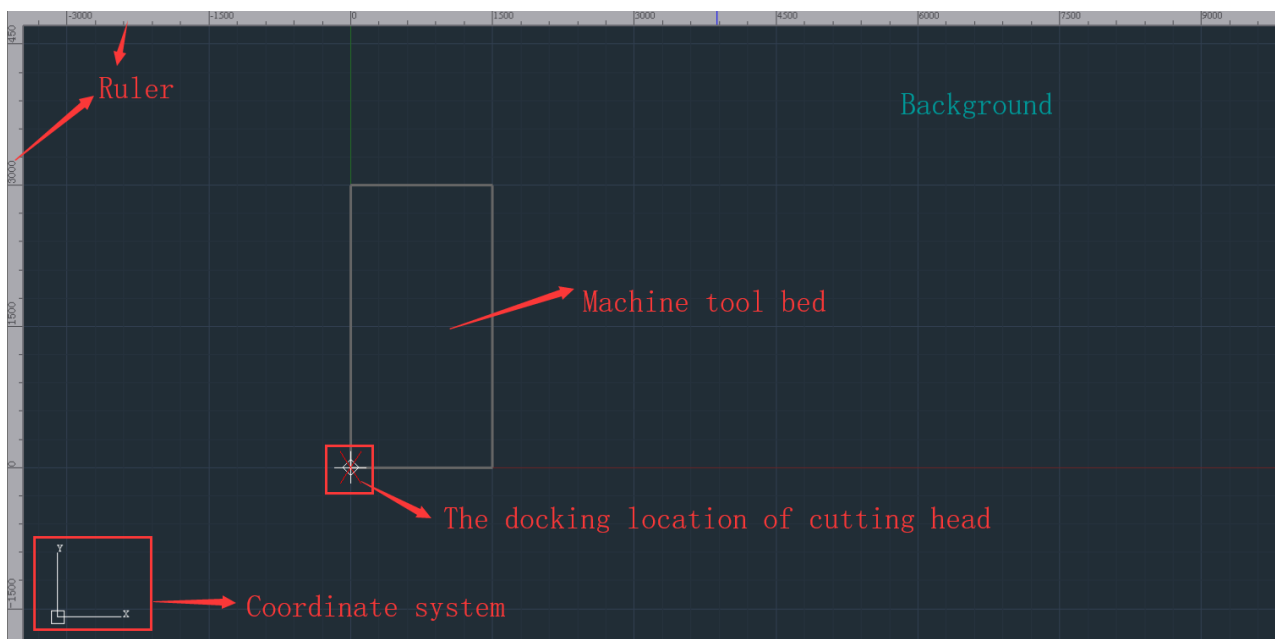


3.2.5 Nesting

More details, please check the user's manual of nesting.

3.3 View section

This section mainly display the graphics needed to be processed. User can draw/check graphics and zoom in/out the graphics by middle mouse button.



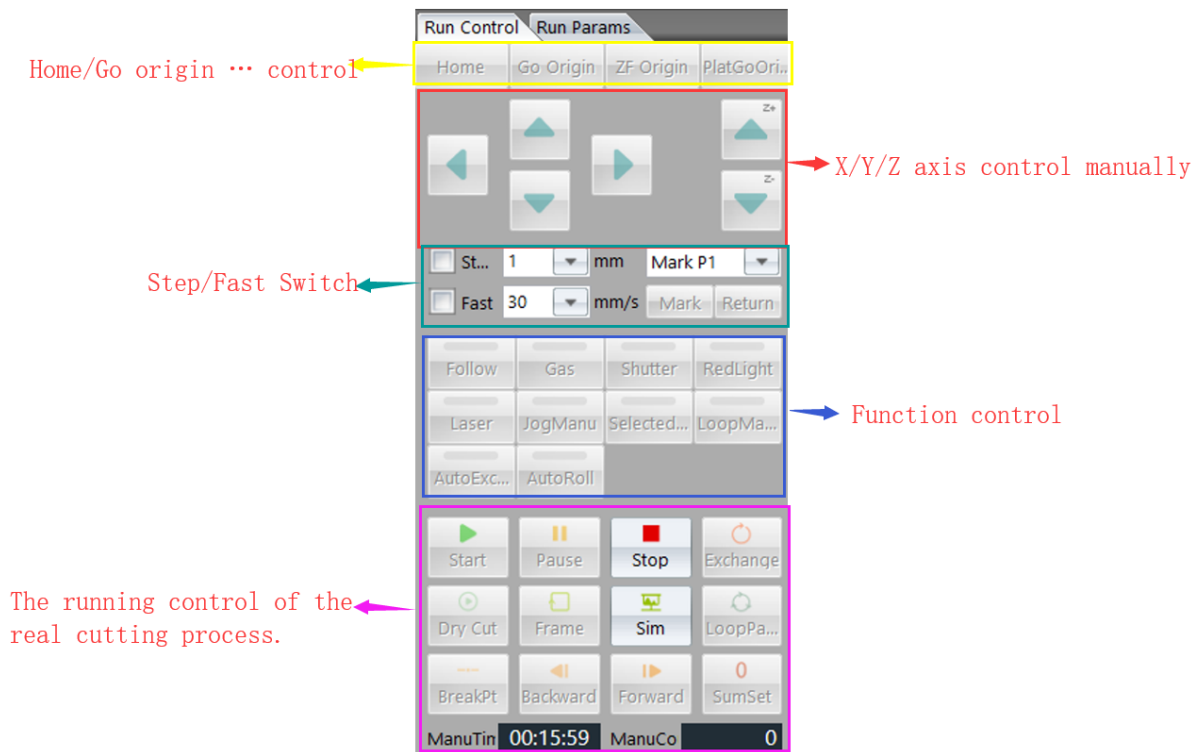
Coordination: SC2000 will use floating coordination in default, and the docking location of cutting head is the starting point of the cutting processing (The location of “” in the view section.). User can simulate the cutting process/frame to make sure all the cutting graphics are inside the workpiece.

3.4 Running control option

Running control option is located in the right side of the view section, including all the machine running control actions and running parameters. Please get to know each action/function before the cutting process to avoid improper operation.

3.4.1 Running control

Each function of running control shows as below:

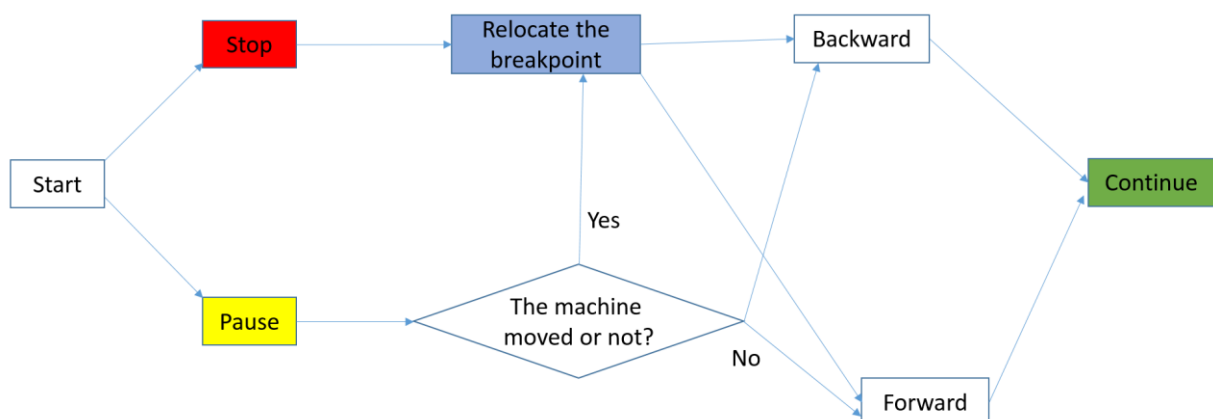


SC2000 supports controlling X/Y/Z axis to move manually. User can set the moving pattern/speed in SC2000 (Step/Fast).

User can control these functions separately: Follow/Gas/Air/Shutter/Red-light/Laser.

If the greenlight "■" of the button goes on, which means the function has been executed. About "Laser", Mouse Left to start the laser light, release it to shut the laser light. While other functions need to be switched before using.

You can reference the chart below to know the running control logic:



- 1) User can "Pause"/ "Stop" the cutting process during cutting. If you choose "Pause", SC2000 will stop at the moment and reserve the current cutting information and user can release "Pause" to continue the cutting (User also can move the cutting head by "Backward"/"Forward" to the proper

location before continuingly cutting.) If user moved the cutting machine after "Pause", please relocate the breakpoint first then you can continue your cutting process. If user choose "Stop" manually during cutting process, the current cutting process information will be delete and user must relocate the breakpoint first in order to find the last cutting location before continuingly cutting.

- 2) **"Dry Cut"**: Cut without laser.
- 3) **"Frame"**: SC2000 will do the cutting process without laser and Z axis will not follow (default). If user wants Z axis to follow, please select "Enable follow when dry cut".
- 4) **"Sim"**: SC2000 can simulate laser's real running path.
- 5) **"Loop"**: User can use it to cut one graphic repeatedly.

3.4.2 Running parameters

User can set the running parameters through this part. The descriptions of each parameters showed as below:

Name of Run Parameters		Descriptions	Default value	Notes
Manual Control	Pause BF length (mm)	The moving distance when backward or forward.	10.00	
	Pause BF speed (mm/s)	The moving speed when backward or forward.	10.00	
	Auto Stop return	After the cutting process has been done, SC2000 will order the cutting head go back to the dock point.	Check	
	Done return	After the cutting process has been done, SC2000 will order the cutting head to go back.	Check	
	Done return type	The returning point of the cutting head after the cutting process has been done.	Dock Point	According to your own needs.
Run control	Go Frame Speed (mm/s)	Move speed when go frame.	200.00	
	Move Speed (mm/s)	Move speed without laser.	200.00	
	Move Acc (mm/s ²)	Move accelerated speed without laser.	4000.00	
	Empty Move Acc Time (ms)	Accelerated time when empty move.	125.00	
	Cut Acc (mm/s ²)	Accelerated speed when cutting.	4000.00	
	Process Acc Time (ms)	Accelerated time when cutting.	125.00	The smaller the value is, the faster the cutting speed will be, so the cutting machine will be much easier shaking during cutting process.

				The minimum value is 50.
	Spline Precision (mm)		0.01	
	Corner Precision (mm)		0.10	
Laser Control	Laser Power (%)		50	Please set this parameter according to the real power of your laser source.
	Laser Freq (Hz)	Laser frequency.	1234	
	Peak Current (%)	Peak current in proportion.	100	
	Auto Control Shutter When Process	After cutting process has been started, SC2000 will auto open the laser shutter.	Check	
Gas Control	Manual Gas Type	The type of gas when manually operate the cutting machine.	Not Use	This parameter must be set correctly or there will be no effects when gas blowing.
	Default Pressure (Bar)		3.45	
	Gas On Delay (ms)	Gas on delay when cutting	100	
	First Gas On Delay (ms)	First gas on delay when cutting	100	
	Gas Change Delay (ms)		100	
Follow Control	Short Move Unlift Length (mm)		10	
	Enable Frog Style Up	Enable frog style up when move from one cutting point to another after check.	Check	
	Enable Follow When Dry Cut	When dry cut, the cutting head will follow after check.		
Process	Enable software limit	X/Y axis running path will be limited inside the workpiece after check.		
Graphic Process Control	Auto distinguish inner outer before process.	SC2000 will auto distinguish the nest relation of the cutting graphics before cutting.	Check	To make sure the sequence of the inner/outer cutting even if you didn't sort before cutting.
	Enable MicroLink Deceleration	The running speed will be decelerated when come across the micro link points.	Not check	Mainly used for lower laser power.

	Micro-link Slow down Velocity (mm/s)	The running speed will be decelerated as what you have set here.	10.00	
	Cool position delay (ms)	The gas blowing time of the cooling point after laser shutter has be shut.	100	
	Pre Drill Max Num	Set the max quantity of the pre dill in 1 time.	5	After the max quantity has been reached, SC2000 will cut the contour before starting its second pre dill.
Unit	Speed Unit	You can choose different speed unit.	mm/s; m/min	
	Acc Unit	You can choose different accelerated speed unit.	mm/s2; G	
	Gas Pressure Unit		bar	



Attention

- “Cut Acc”/“Process Acc Time” can directly affect the cutting speed of the whole cutting machine. User can properly increase the “Cut Acc” or decrease the “Process Acc Time” to improve the running efficiency in the condition that cutting machine will not shake.
- Before starting software limit, SC2000 must have done X/Y axis go origin at least 1 time, or SC2000 can't find the mechanical coordinate of cutting machine and then SC2000 may start software limit anytime.

Custom IO: User can define I/O port according to your needs.

3.5 Message bar

Message bar mainly displays all kinds of information during running process. User can pay attention to this part when operating SC2000.

[15:49:04] Controller connecting failed

[16:47:52] Process information is calculating...

[16:47:52] Estimate processing time: 1min 20.4sec, cut length: 2.45m, move length: 2.46m, drill times: 15

Message Warning Process

The descriptions of messages and alarms:

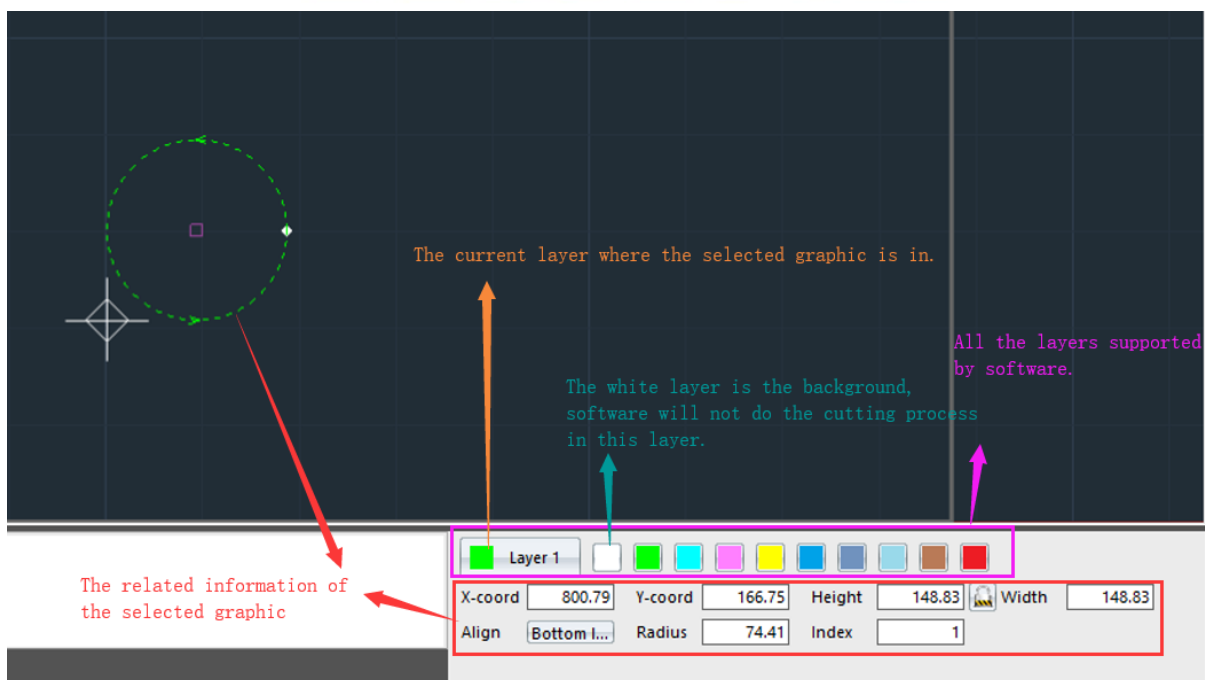
Message bar	Type	Descriptions
-------------	------	--------------

Message	Running status message	This type of message mainly records all the key running status, such as: the connecting status of motion control card/laser/FTC and so on.
	Cutting message	This type of message mainly records all the key cutting information, such as: cutting time/cutting distance/drilling number/cycle index and so on.
	Other message	This type of message mainly records like measurement results.
Warning	System alarm	This mainly records system alarm such as limited alarm/servo input alarm and so on.
Process	The statistics of the cutting records	The statistics of all the cutting files, the length of cutting path and times of drill of that day.
Laser	Print information of the laser source	When using Raycus laser source, and choose control type in "MCC Serial/PC Serial", user can print the information about the laser source.

All the messages and alarms can be checked in "System Analysis" -> "Log".

3.6 Layer parameters option

Layer parameters option includes cutting layer process property and one single layer property, user can quickly set the parameters accordingly.



Name of properties	Meaning	Notes
X coordinate	The X coordinate of the selected graphic.	

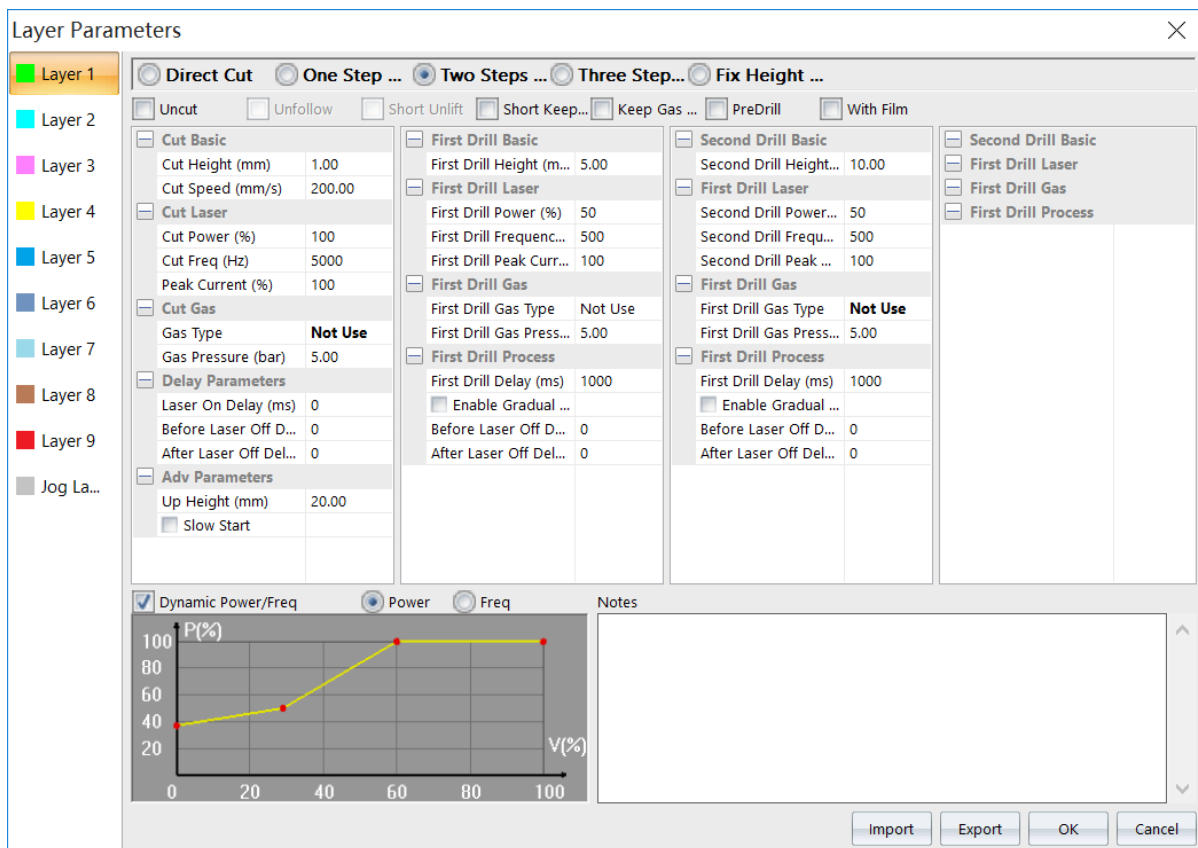
Y coordinate	The Y coordinate of the selected graphic.	
Height	The current height of the selected graphic.	
Width	The current width of the selected graphic.	
Radius	The current radius of the selected circle/arc.	Only for circle/arc
Corner R	The current corner R of the selected square.	Only for square
Vertex	The current quantity of vertex of the selected polygon/star.	Only for polygon/star
Out R	The current Out R of the selected polygon/star.	
In R	The current In R of the selected polygon/star.	
Align	The align when zoom in/out the selected graphic.	
Index	The current cutting index of the selected graphic.	



Descriptions

- All the layer properties can be revised any time and take immediate action.
- If user wants to revise only width, please open “”
- When more than one graphic have been selected, software will show the quantity of the selected contour.

SC2000 can auto-match layer property according to user's selection. Layer parameters: click each layer to set up the parameters.



The descriptions of process actions showed as below:

Process actions	Meaning	Notes
Direct cut	The cutting head will go directly to the following location when start cutting once check this option.	Frequently used.
One step drill	User can set one certain height for cutting head to drill, cutting process will start after the drilling process has been done. It mainly applies in thick metal cutting.	
Two steps drill	User can set 2 different heights for cutting head to drill step by step, mainly for thick metal cutting.	
Three steps drill	User can set 3 different heights for cutting head to drill step by step, mainly for thick metal cutting.	
Fix height cut	User can set one certain height for cutting process.	
Uncut	All the graphics in this layer will not be cut after check this option.	
Unfollow	The Z axis will not follow when cut all the graphics in this layer after check this option.	
Short unlift	When the distance between two continuous cutting points is shorter than the unlifted length that has been set before, the cutting head will not lift after check this option to improve the	

	cutting efficiency.	
Short keep gas on	The gas will keep providing when the distance between two continuous cutting points is shorter than the certain length that has been set before.	
Keep gas on	The gas will keep providing in the whole cutting process.	
Predrill	Drilling in advance before cutting.	
With film	Cutting with film after check this option.	

The descriptions of cutting parameters showed as below:

Layer	Name	Descriptions	Default value
Cut Basic	Cut Height (mm)	The following height when cutting	1.00
	Cut Speed (mm/s)	Speed when cutting	200
Cut Laser	Cut Power (%)	Laser power in proportion when cutting	100
	Cut Freq (HZ)	Laser frequency when cutting	5000
	Peak Current (%)	Laser peak current in proportion when cutting	100
Cut Gas	Gas Type	The type of gas when cutting	Not Use
	Gas Pressure (Bar)	Gas pressure when cutting	5.00
Delay Parameters	Laser on Delay (ms)	Delay time when laser on	0
	Before Laser off Delay (ms)	The delay time after cutting but before laser off.	0
	After Laser off Delay (ms)	The delay time after laser off.	0
Adv Parameters	Up Height (mm)	The up height of cutting head after cutting process has been done.	20.00
	Slow Start	Start slowly when check.	Not check
Drill Basic	Drill Height(mm)	The distance between nozzle tips and workpiece when drilling.	5.00
Drill Laser (%)	Drill Power (%)	Laser power when drilling.	50
	Drill Frequency(HZ)	Laser frequency when drilling.	5000
	Drill Peak Current (%)	The peak current in proportion when	100

		drilling.	
Drill Gas	Drill Gas Type	The type of gas when drilling.	Air/o2/Not use
	Drill Gas Pressure	The gas pressure when drilling.	5.00
Drill Process	Drill Delay(ms)	The delay time after arriving at the drill location.	1000
	Enable Gradual Drill	Drill gradually	Not check
	Before Laser off Delay (ms)	The delay time after cutting but before laser off.	0
	After Laser off Delay (ms)	The delay time after laser off.	0

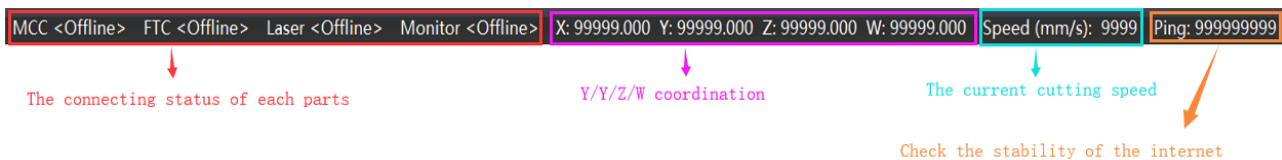


Descriptions.

- Layer parameters will be revised very often during cutting/debugging. So user can adjust all the parameters according to your needs for achieving the best cutting effects.

3.7 Status bar

Status bar mainly display the current running status, including the connecting status of motion control card/FTC/ Laser, X/Y's current coordination, current cutting speed and so on, so that user can check it easily.



4 Warning and exceptions handling

4.1 System alarms and descriptions

SC2000 supports multi kinds of alarms and protections during the cutting process, which can decrease the opportunity of the equipment been damaged or people been hurt because of user's improper operation. Kindly suggest you to read all the alarms and handling ways before you start to use the whole cutting equipment.

Alarm lists:

Types of alarms	The content of alarms	Trigger condition(待补充)
Communication alarms	Hardware is not connected, please check the controller	The motion control card is not well connected with the computer, please check all the wiring diagrams and the settings on the software.
	FTC is not connected, please check the FTC	FTC is not well connected with the motion control board, please check all the wiring diagrams and the settings on the software.
	Laser system is not connected, please check the laser system	Laser source has not been well connected with the motion control board, please check all the wiring diagrams and the settings on the software.
	Extended Card is not connected, please check the system	The extended card is not well connected with the motion control card, please check all the wiring diagrams and the settings on the software.
X axis alarms (Y1/Y2/W axis related alarm are similar with X axis.)	Emergency stop alarm	User has pressed the "Emergency" button.
	X axis servo input alarm	X axis servo driver works improperly.
	X axis encoder alarm	X axis encoder has no signal feedback/the feedback signal is in error.
	X axis double drive error	X axis double drive error is out of range.
	X axis hardware positive limit	The machine moves at the X axis

	alarm	hardware positive limit.
	X axis hardware negative limit alarm	The machine moves at the X axis hardware negative limit.
	X axis software positive limit alarm	The machine moves at the X axis software positive limit.
	X axis software negative limit alarm	The machine moves at the X axis software negative limit alarm.
FTC alarms	Z axis hardware up limit alarm	The cutting head moves at the Z axis hardware up limit.
	Z axis hardware down limit alarm	The cutting head moves at the Z axis hardware down limit.
	Z axis software up limit alarm	The cutting head moves at the Z axis software up limit.
	Z axis software down limit alarm	The cutting head moves at the Z axis software down limit.
	Z axis servo input alarm	Z axis servo driver works improperly.
	Cutting head touch panel alarm	The tips of cutting head touched the panel.
	Z axis encoder alarm	Z axis encoder has no signal feedback/the feedback signal is in error.
	FTC signal wire alarm	FTC signal wire is not well connected/or broken.
	FTC capacitance variation is too small	FTC capacitance variation is less than 200.
	FTC follow error alarm	FTC follow is out of range.(5mm in default)
	FTC is emergency stop, make FTC go to the origin first	The running status of FTC is stop, please go back to origin first.
	FTC alarm, please check the FTC working state	FTC has an alarm, please check if the working status of FTC is in good condition.
	ZF Axis Value Warning	The coordinate in Z axis is abnormal.
	Laser system unknown alarm	
	Laser system power alarm	

Laser source alarms	Laser system external interlock alarm	
	Laser output alarm	
	Laser system inside interlock alarm	
	Laser system power supply board alarm	
	Laser system current board alarm	
	Laser system unknown alarm	
	Laser system alarm, please check the laser system	Laser source has an alarm, please check if the working status of laser source is in good condition.
	Laser is Locked	The service life of laser source has been expired, please unlock the laser source.
Auto focus alarms	Auto focus hardware positive limit alarm	
	Auto focus hardware negative limit alarm	
	Auto focus software positive limit alarm	
	Auto focus software negative limit alarm	
	Auto focus servo invalid alarm	
	Auto focus alarm 5(6/7/8/9/10/15)	
	Auto focus Not go Origin	
	Auto focus low gas pressure alarm	
	Auto focus high gas pressure alarm	
	Auto focus high temperature alarm	
	Extended Card is not connected,	

Extended card alarms	please check the system	
	Extended Card Axis Hardware NEG Limit Warning	
	Extended Card Axis Hardware POS Limit Warning	
	Extended Card Axis Software NEG Limit Warning	
	Extended Card Axis Software POS Limit Warning	
	Extended Card Axis Servo Warning	
	Extended Card Axis Emergency Stop Warning	
	Extended Card Axis Warning 7(8/9/10/11/12/13/14/15/16)	
Water cooling alarm	Water cooling machine alarm	



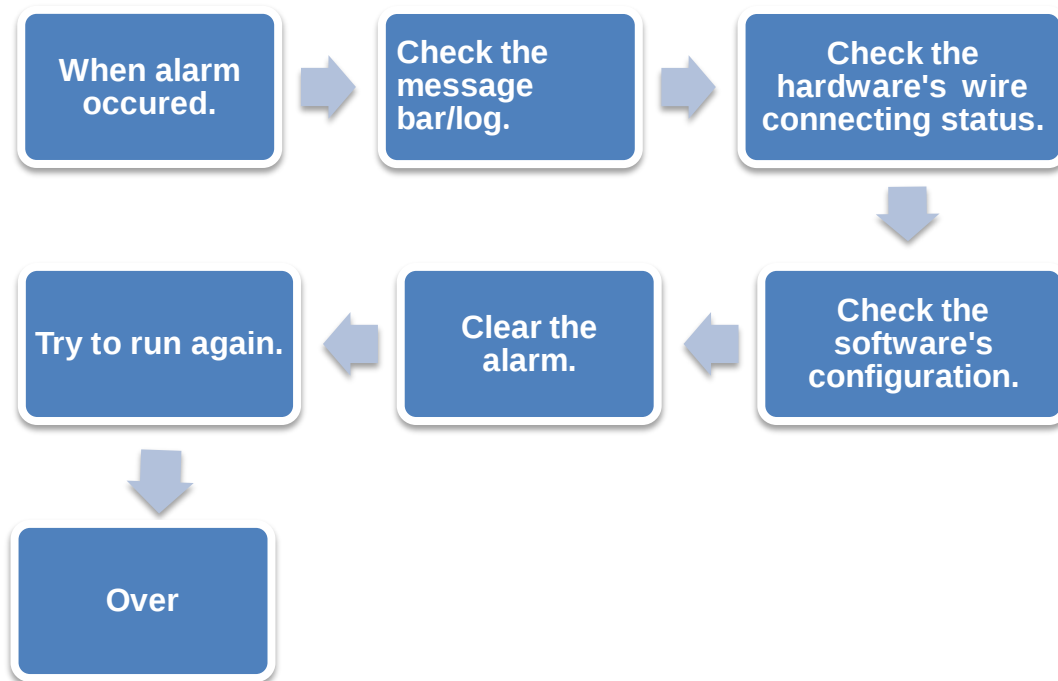
Descriptions

- System alarms can be divided into two kinds of alarms, one is less harmful, such as “Z Follower Parameters. Go Origin Power Up”, once the warning condition has been cleared, SC20000 will auto clear the alarm. The other one is more harmful, such as “X axis servo input alarm”, once the warning condition has been cleared, user must clear the warning manually to make sure the safety of equipment and user.

4.2 Normal exceptions and handlings

When some normal exceptions occurred, user could try trouble-shooting by SC2000's diagnose, which can save user's time and improve the efficiency.

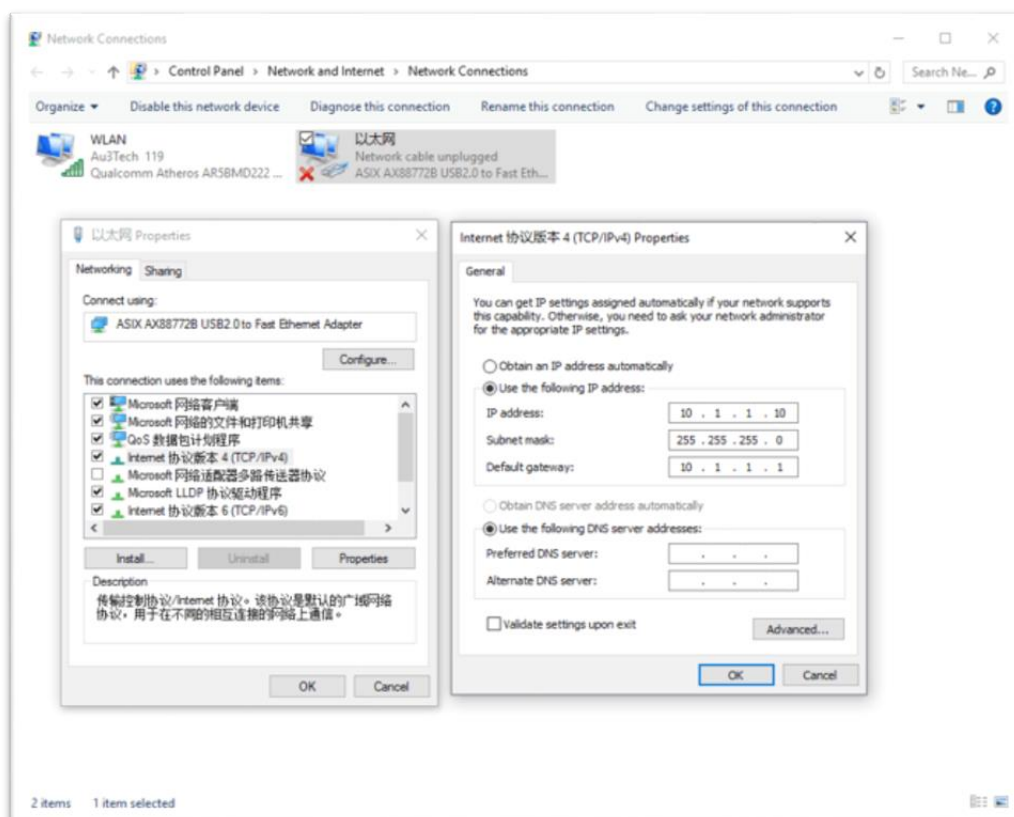
Graphic 4-1 Normal exceptions troubleshooting flow:



4.2.1 System communication exceptions

SC2000 was designed based on Ethernet, the whole equipment is connected through Ethernet. When SC2000 can't connect with motion control card or FTC, user can check it out step by step as below:

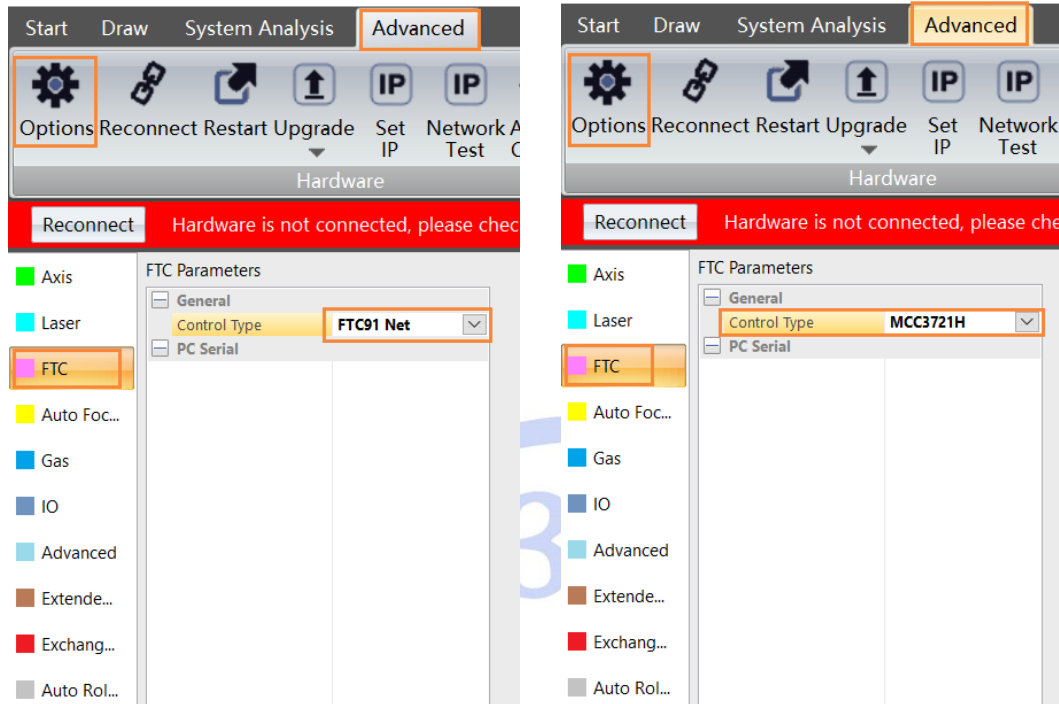
- 1) Please check whether if the IP has been set already.(IP of motion control card/FTC has already been set before exporting the factory)



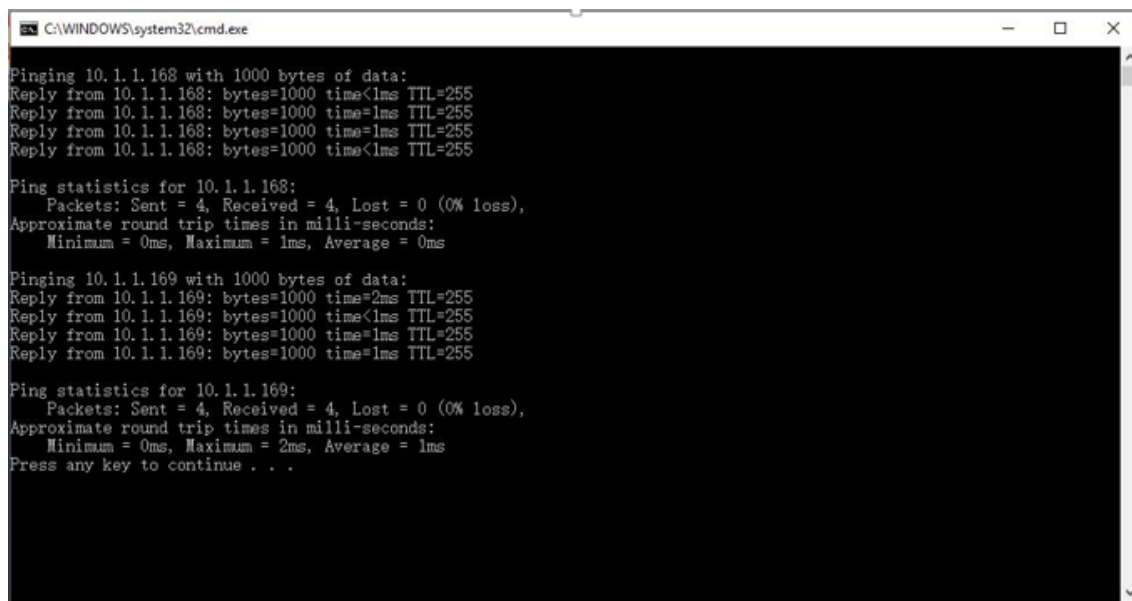


User can quickly set the computer's IP by “Set IP”.

- 2) Please check the indicator light of the Ethernet port. If the indicator light normally on/off, which means the communications is abnormal. User can check the network cable and try again. SC2000 supports crossed/cross-over cable.
- 3) when user use **FTC91/FTC92** capacitive height controller, please select “ADVANCED”->“Options”->“FTC” Control Type -> “FTC91 Net/FTC92 Net”. If you are using MCC3721H motion control card, please select the control type in “MCC3721H”.



- 4) User can check the communication status by “Network Test”.



4.2.2 Go origin exceptions

Before cutting head "Go Origin", please make sure the hardware running status/parameters have already been set properly. If some exceptions happen, please stop running the machine and do not start "Go Origin" before the exceptions have been cleared. Normal **"Go Origin"** exceptions and handling ways:

"Go Origin" exceptions	Analysis why	Handling ways
"Go Origin" error	1、Go Origin was set in the wrong direction. 2、X/Y axis' servo drivers were set in the wrong direction.	All the directions selected properly.
The "Home" signal doesn't work when Go Origin.	1、Origin switch broken/the wiring error. 2、Origin's sampled signal was error. 3、The limited signal wasn't connected with the origin signal when making the limited signal as the original signal.	1、Check whether if the Origin switch and the indicator light work properly. 2、Origin Limit wiring connected properly. 3、Origin sampled signal selected properly.
SC2000 reminds "X/Y axis" software limited alarm	Checked "Enable software limit" before the cutting head "Go Origin".	Don't check "Enable software limit" before the cutting head "Go Origin".

4.2.3 Pulse equivalent configuration

Users must accurately setup the parameters of pulse equivalent, or it can result in moving speed error and precision error. The definition of pulse equivalent: the number of pulses which can make the cutting machine travels 1mm.

e.g. when X Axis servo driver subdivide in 10000(the number of pules which can make the motor rotates 1 circle) , the motor of X axis rotates 1 circle, the cutting machine can step forward 10mm, then the pulse equivalent is $10000/10=1000$

4.2.4 Fly-cutting debugging

SC2000 supports all kinds of fly-cutting, please set up all the parameters related properly.