SC1000 Fiber Laser Cutting CNC System User's Manual

A-CUTTER

Version： V1.00
2017/3/27

Preface

Introduction

This archive mainly describes about the interface, functions and operations of the fiber laser cutting CNC system software (We call it: SC1000). And if you want to know more about installation and debugging, please reference to ***Fiber Laser Cutting CNC System 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（2017-3）

Content

1 Introductions

1.1 Introduction of products

SC1000 is a flat fiber laser cutting CNC system software which includes graphic drawing and editing, cutting process dealing, cutting process controlling, system monitoring, components monitoring and debugging, and so on.

Features:

1) Operations are simple but functions are powerful.

- Developed based on RIBBON framework, software is not only beautiful but also easy to operate.
- UI design is more humanize, which is easier to use 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**

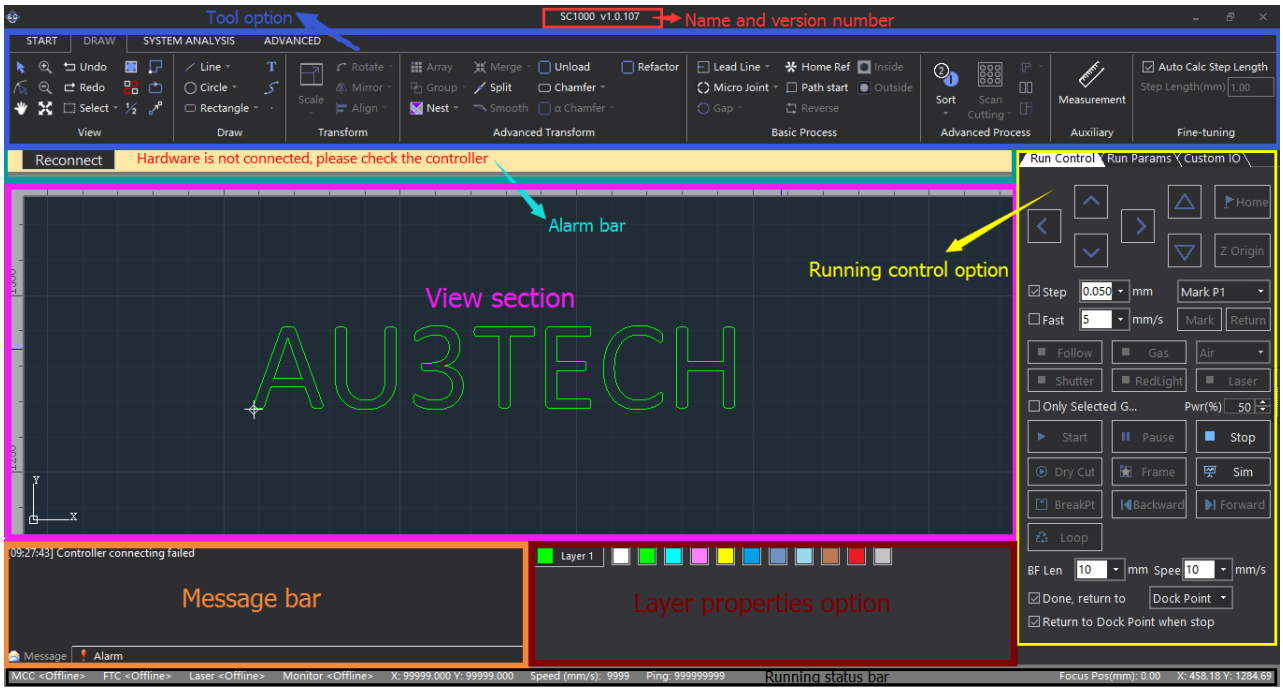
- Support all kinds of cutting process: Section drill, gradual drill, 3 stages drill, cutting with film, fix height cutting, and predrill and so on.
- Support laser's power/frequency adjusted with speed, to decrease or avoid the problem of firing corners when cutting carbon steel.
- Support multilayer 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) **Rea-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, gas 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:

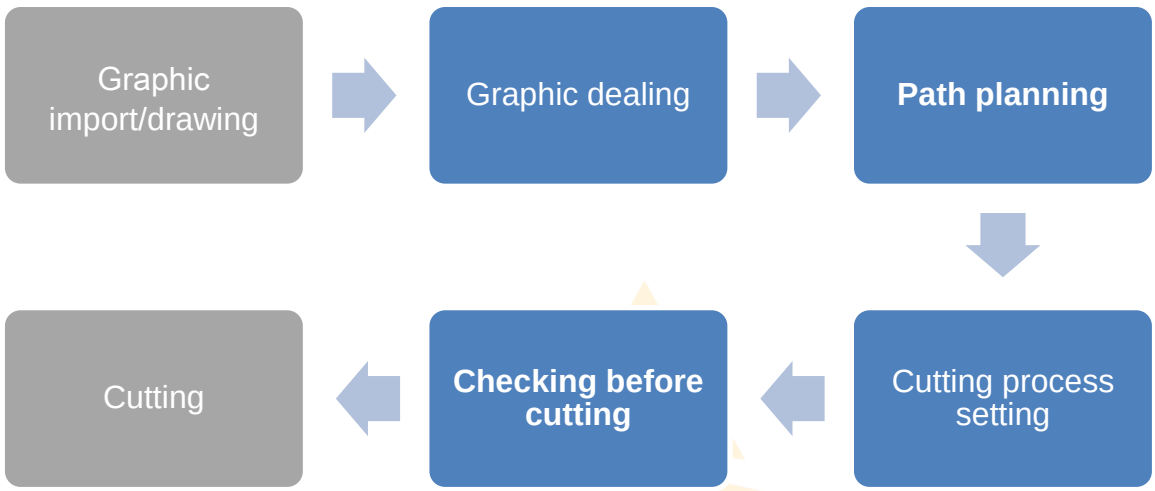
Name	Functions	Remark
Tittle bar	Display software's name and version number.	
Tool option	Mainly collects the tools needed for software operation, it has four submenu: START/DRAW/SYSTEM ANALYSIS/ADVANCED. User can do graphic drawing, graphic editing, graphic transformation, adding lead line, monitoring 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, machine tool's width displaying section. (机床幅面显示区).	
Running control option	Run all kinds of cutting actions through software.	
Message bar	Display the current running status in scrolling.	
Layer properties	Set up layer properties such as layer process,	

option	graphic transformation and so on.	
Running status	Display the running status, running location, cutting speed and so on.	

2 0perations

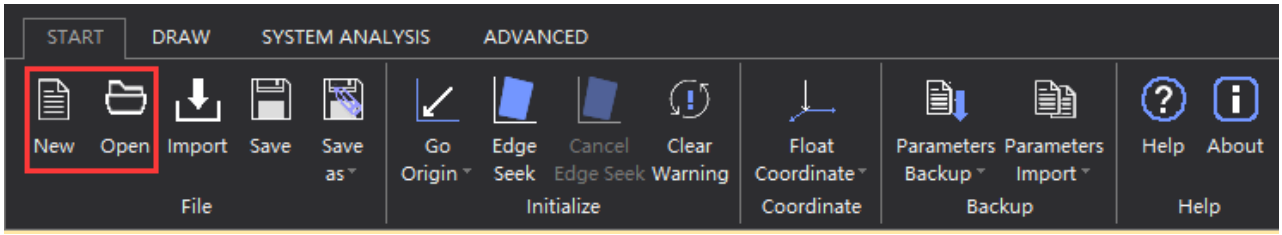
2.1 Quick actions

2.1.1 Operation flowchart



2.1.2 Graphic importing/drawing

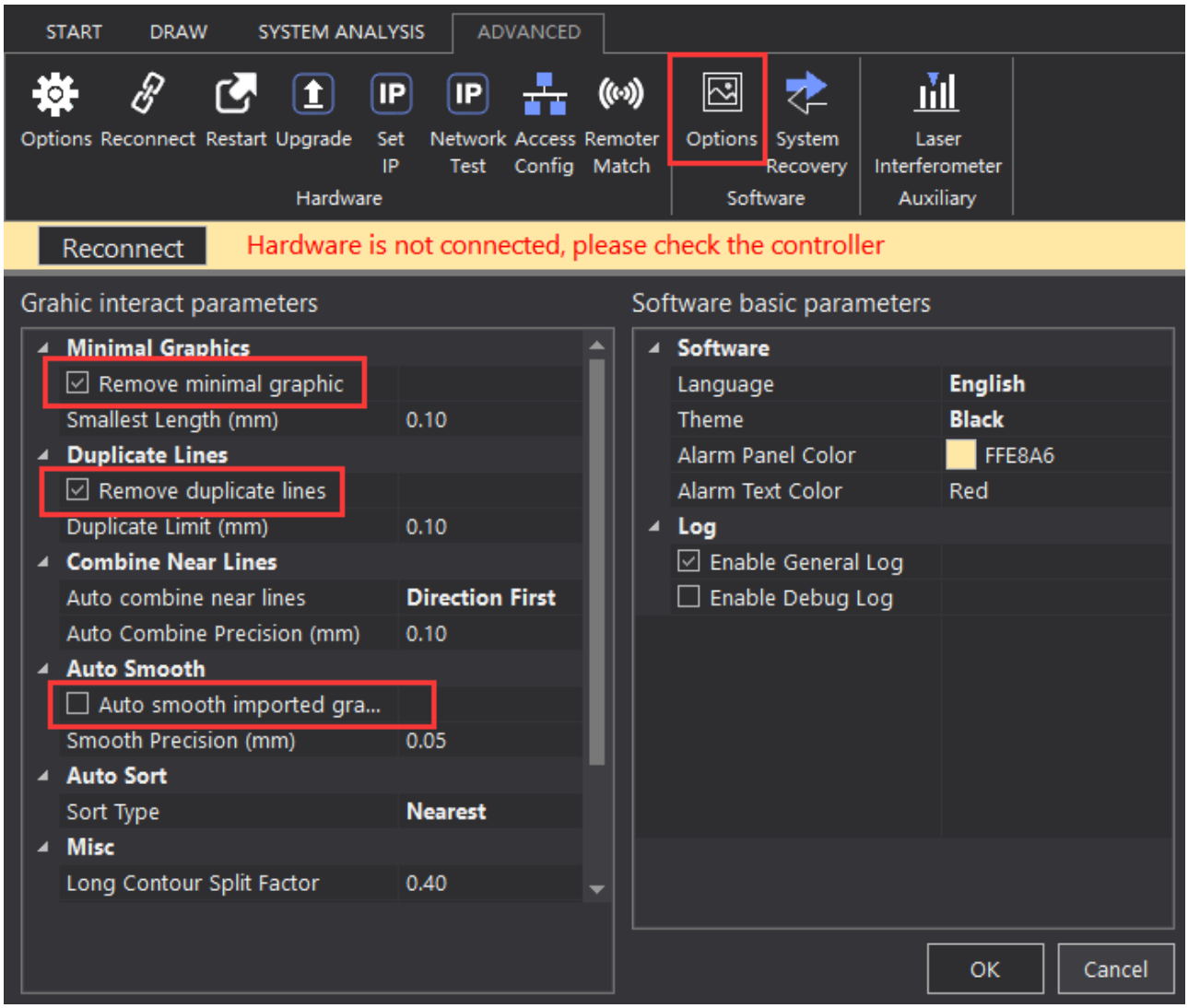
After start the software, user can import the file according to his needs or he can draw it by the drawing tool in the software.



Choose **"START"—>"Open"**, import the cutting file.
Choose **"New"** can build a new view section, user can draw any parts he need when cutting.

2.1.3 Graphic processing

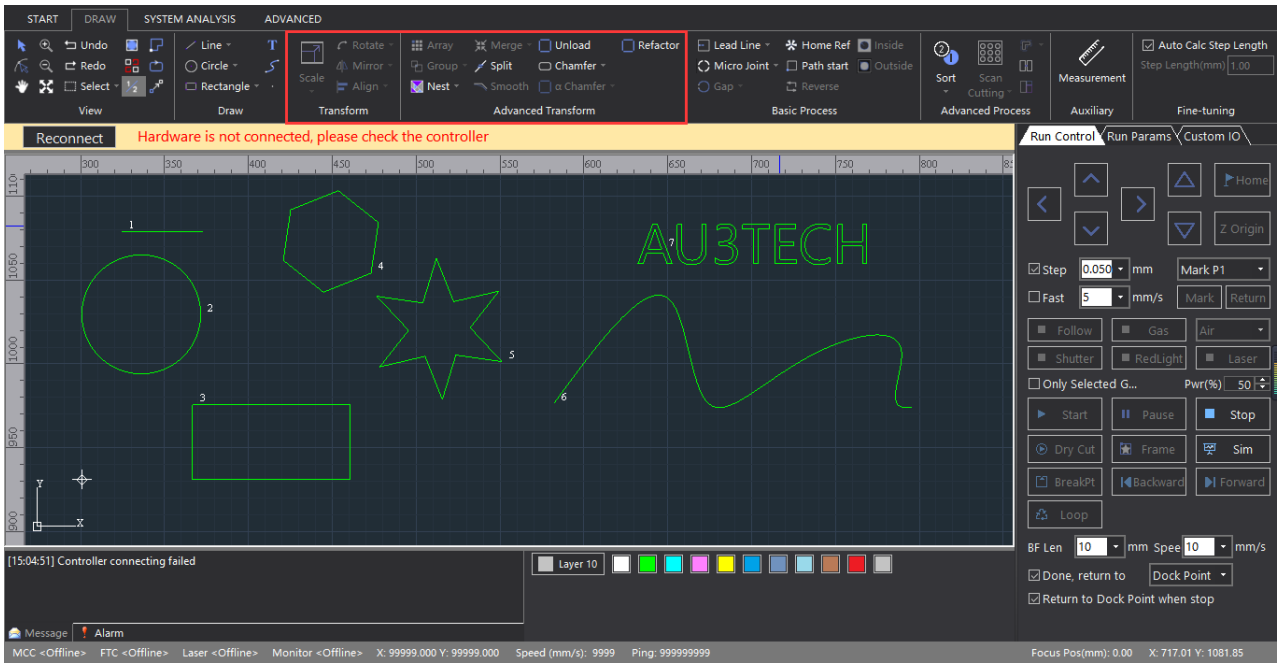
Before importing the cutting file, user can set up all the conditions he needs, including whether to auto remove minimal graphics, or whether to auto remove duplicate lines and so on.
Choose **"ADVANCED"—>"Options"**, select the options as below:



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.

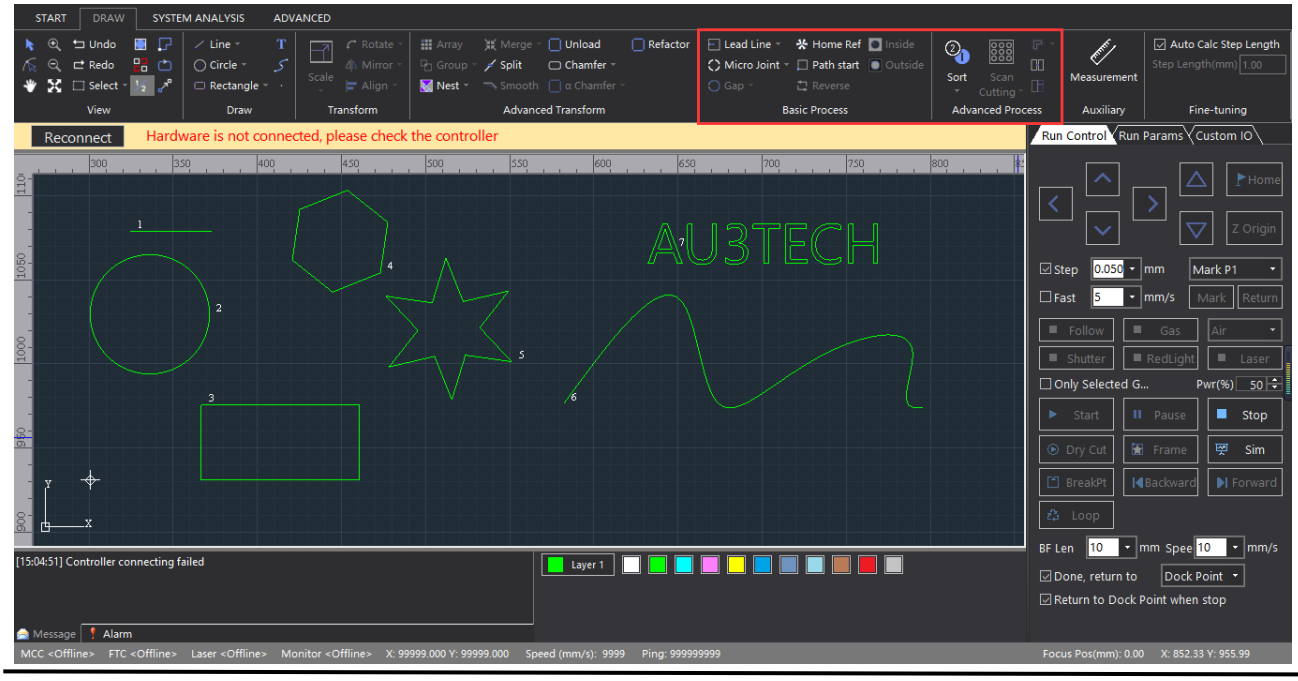


Tips

- 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 tracts

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

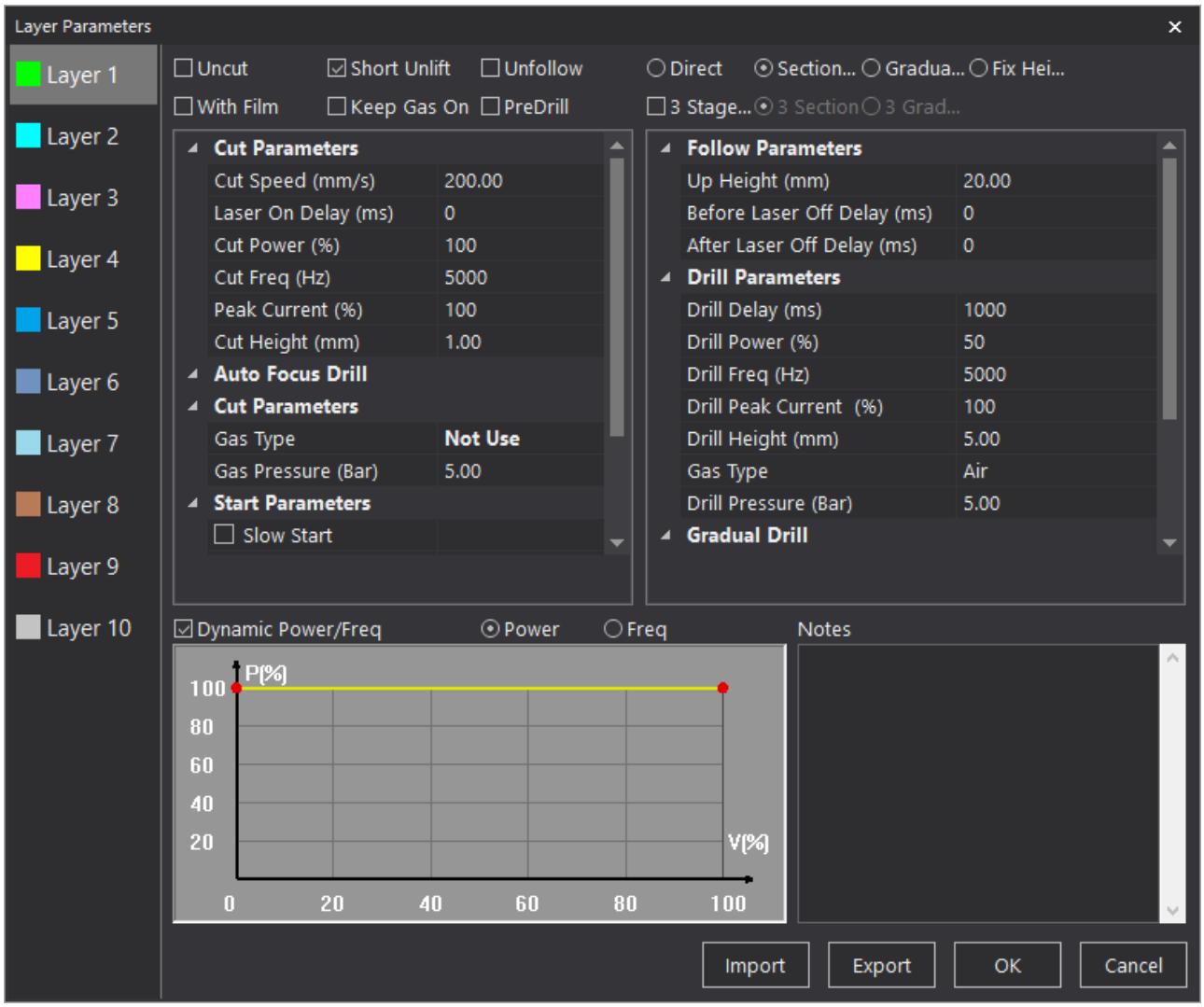


Tips

- 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. SC1000 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:

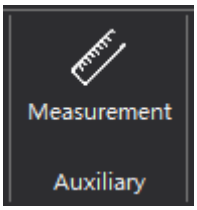


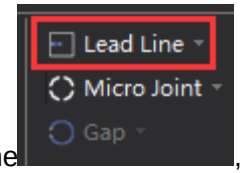
User can set up different parameters to achieve the best situation of cutting: cutting ways, cutting speed, cutting power, gas type/pressure, up height and so on.

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) SC1000 can measure the size of the graphic 

and check lead line 

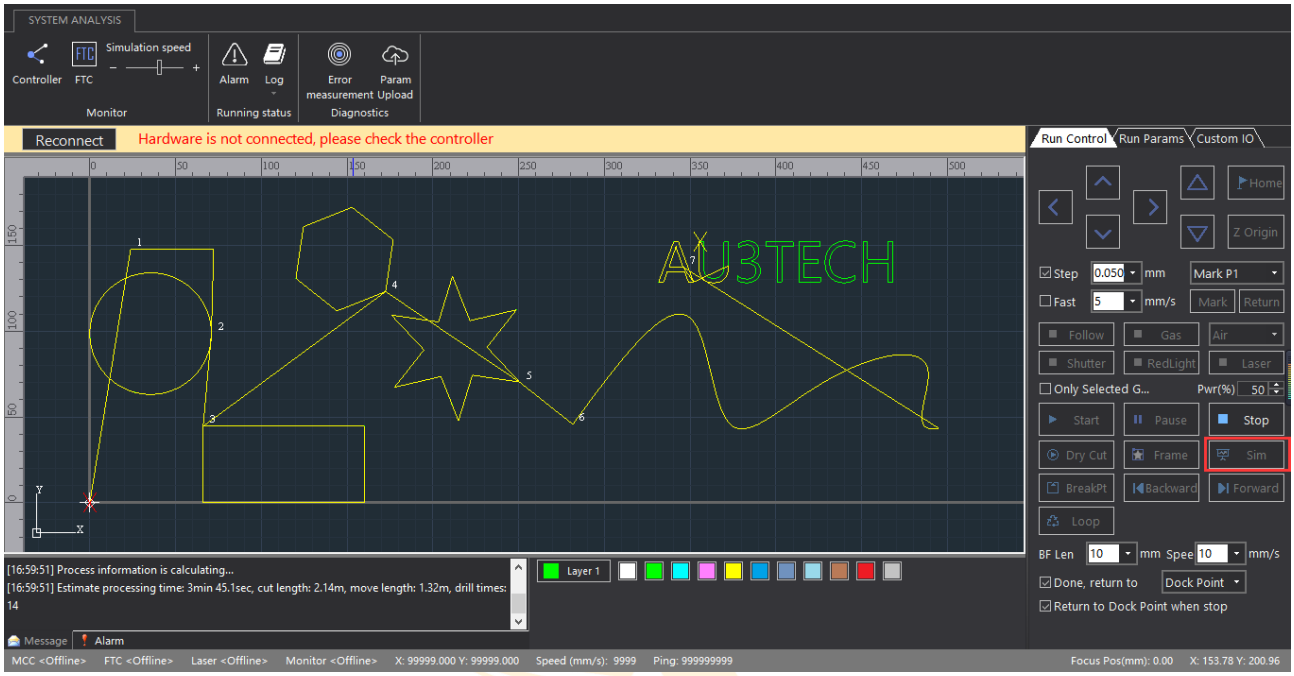
, it can also auto-remove the interfered lead line.  It shows the unclosed graphic. You can choose **unclosed curve/minimal graphic/similar graphic** in **"Select"**.

3) Please check the path planning in these aspects: **Cutting frame, running tracks** and so on by

setting parameters in running control option.

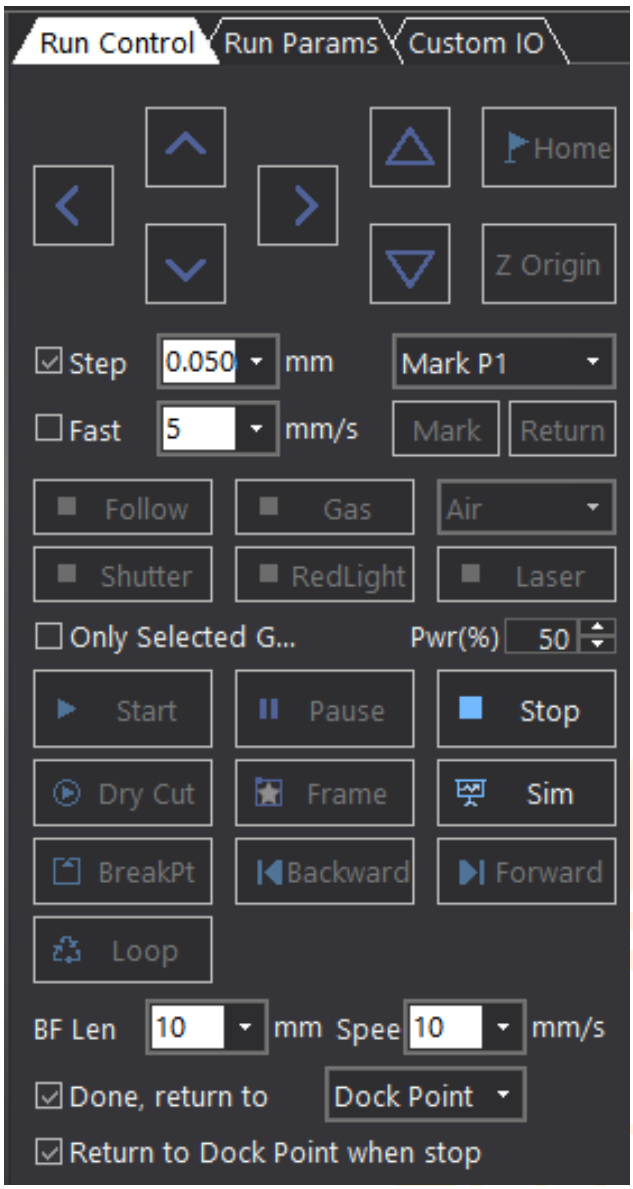
4) Click **"Edge seek",** SC1000 will order the machine to run along the graphic frame, so user can check whether if the workpiece is inside the frame or not so that user can adjust the place of the graphic/workpiece.

5) Click **"Sim"**, SC1000 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 SC1000 normally, or the relevant buttons will turn gray and can't be selected.



The meaning of each button shows as below:

Name	Functions	Remark
Start	Start cutting.	
Continue after pause	User can continue the cutting process after pause cutting.	After start
Pause	Pause cutting, SC1000 will reserve the current cutting information.	
Stop	Stop cutting.	
Dry Cut	Cutting without laser.	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	Make sure the cutting graphic is

	without laser.	inside the workpiece.
Sim	Simulate the cutting process without laser.	
BreakPt	SC1000 will auto locate the breakpoint after pause/stop.	
Backward	SC1000 will go backward some distance after pause/locate the breakpoint.	User can set up the backward speed/distance.
Forward	SC1000 will go forward some distance after pause/locate the breakpoint.	User can set up the forward speed/distance.
Loop	Mainly to cut the same graphic repeatedly.	User can set up the time and spacing distance

3 Functions

3.1 Tittle bar

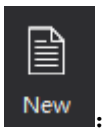
Tittle bar shows SC1000's logo and the version. User can check whether the version is the newest one, and if not, please download on our website: *www.a-cutter.com*

3.2 Tool option

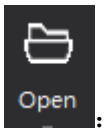
3.2.1 Start

3.2.1.1 File

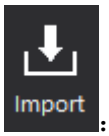
There are five functions in file part: "New", "Open", "Import", "Save", "Save as".

1) 

：Build a new view section, the former graphic will be covered and SC1000 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) 

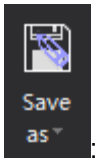
：Open a new graphic, and the former graphic on the view section will be covered by the graphic user just opened.

3) 

：Import a graphic user already has, and the former graphics on the view section will be covered by the graphics user just opened.

4) 

: Save the graphics on the view section.

5) 

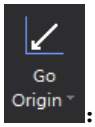
: Save the graphics on the view section in ".chf" or ".dxf" / at anywhere you want on the computer. User can also choose to export to sheets.

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

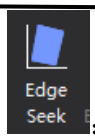
The initialization part collects all the functions user will be use at the beginning when all the equipment power on: **"Go origin", "Edge seek", "Cancel edge seek", "Clear warning".**

1) 

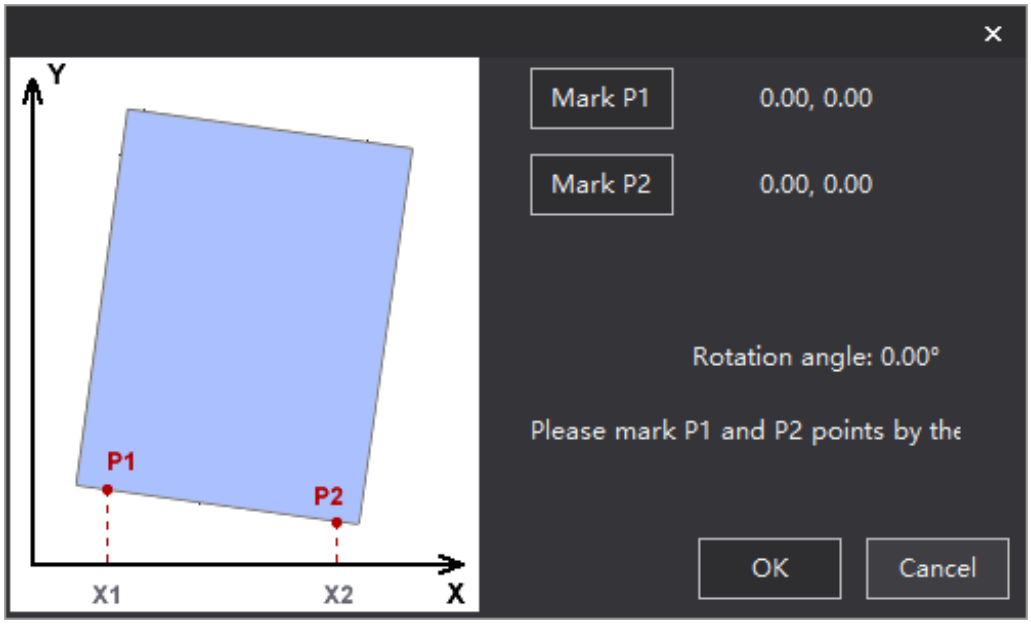
：After Z axis go back to origin, X axis and Y axis go back to origin of machine at the same time (default). Or user can choose **"Only Z follower" (only Z axis go origin), "Only X" (only X axis go origin), "Only Y" (only Y axis go origin).**

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.

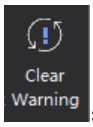
2) 

：According to the real place of the workpiece sheet to revise the coordinate of SC1000, 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:



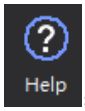
User can use the red light of laser from cutting head to seek one point along the edge of X axis and mark "P1". Then move to another point along the edge of X axis and mark "P2". After SC1000 auto-calculate the rotation angle, it'll revise the coordinate accordingly. Click the "OK" button, then "Edge seek" is over successfully.

"Cancel edge seek": after finish edge seek, the coordinate will rotate accordingly. And if you want SC1000 go back to the original coordinate, just click "Cancel edge seek".

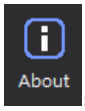
3) 

：System alarm has two different kinds of alarms: auto-clear warning and manual clear warning. For example, "Servo alarm" is manual clear warning, after clear all the problems of servo equipment, user can only clear the warning of SC1000 by clicking "Clear warning" button so that to make sure the safety of user and the equipment.

3.2.1.3 Help

1) 

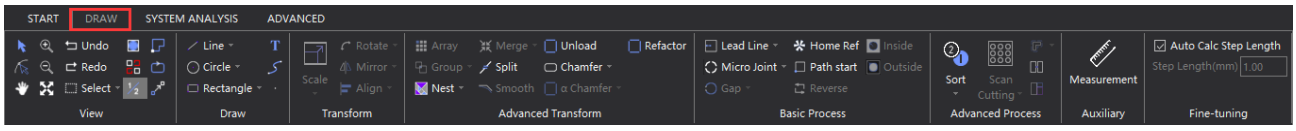
：Click **"Help"**, user can check ***SC1000 user's manual*.**

2) 

：Click **"About"** to check the information of version.

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.



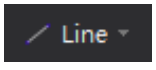
3.2.2.1 View

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.

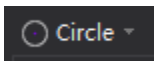
	Zoom in	User can zoom in the graphic in the view section.
	Zoom out	User can zoom out the graphic in the view section.
	Zoom Reset	User can restore the size of the graphic in view section to the original size.
	Revoke	Revoke the latest operation.
	Redo	Redo the latest operation.
	Select	User can choose "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

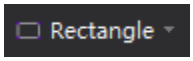
"Draw" part collects all the functions related to drawing, which based on AUTOCAD, user can easily design any graphic he want.

1) 

: Draw line. Click Mouse Right to finish the current drawing by selecting **"End Draw"**.

2) 

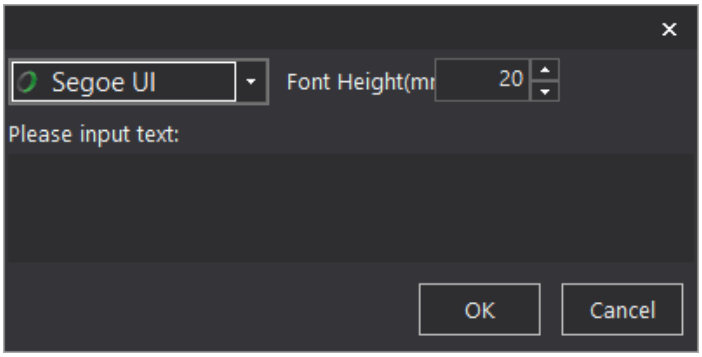
: Draw circle/circular arc/ellipse. User can choose **"Point Circle", "Point Arc", "Scan Arc", and "Ellipse"** through dropdown menu.

3) 

: Draw **rectangle/rounded rectangle/polygon/star** through dropdown menu.

4) 
: Input text. 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

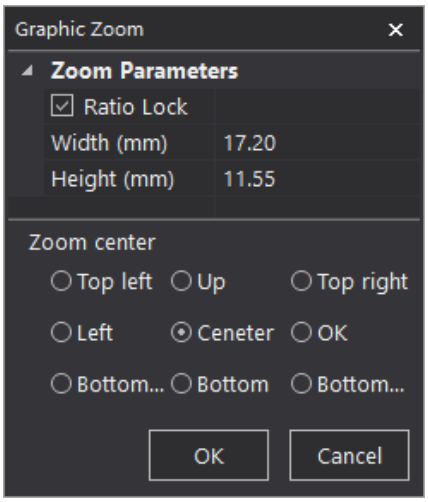
- User can draw through shortcut-menu by Mouse Right.
- SC1000 can auto-capture the key point, user can make full use of this function during draw.
- Click "Ctrl+C" and move the mouse at the same time to copy the selected graphic.
- Click " ← ↑ → ↓ " on the keyboard to adjust the place of selected graphic.

3.2.2.3 Graphic transformation

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.

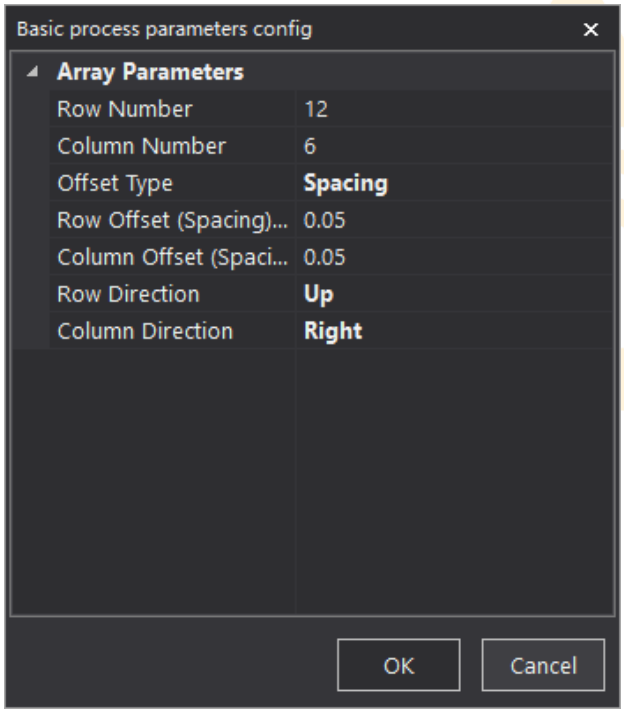
3) Mirror：User can mirror the selected graphic in horizon/perpendicular.

4) Align：SC1000 support various ways of alignment, includes: **"Left aligned", "Right aligned", "Horizontal aligned", "Top/Bottom aligned", "Vertical center", "Center".**

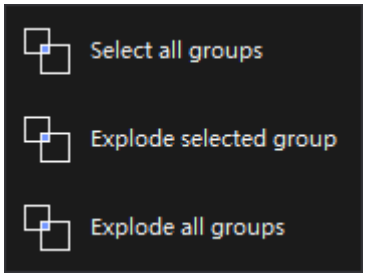
3.2.2.4 Advanced transformation

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 in one group.



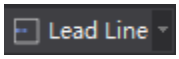
User can choose **"Select all groups", "Explode selected group", "Explode all groups".**

3) 

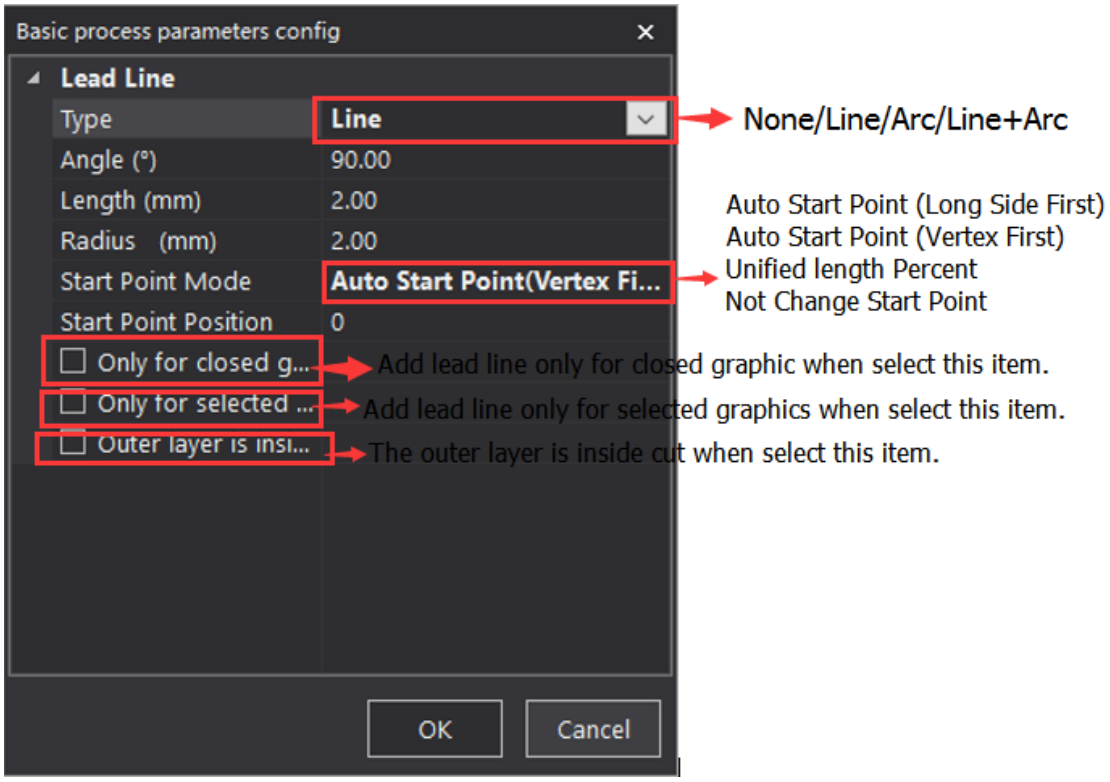
：User can merge multi lines/curves and make them a whole and independent graphic. User can explode one single graphic until it can't be separated.

3.2.2.5 Basic cutting process

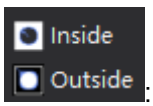
User can set up the path planning/basic process in this part.

1) 

：User can add lead line to selected graphics, and click the icon to set up the parameters related.



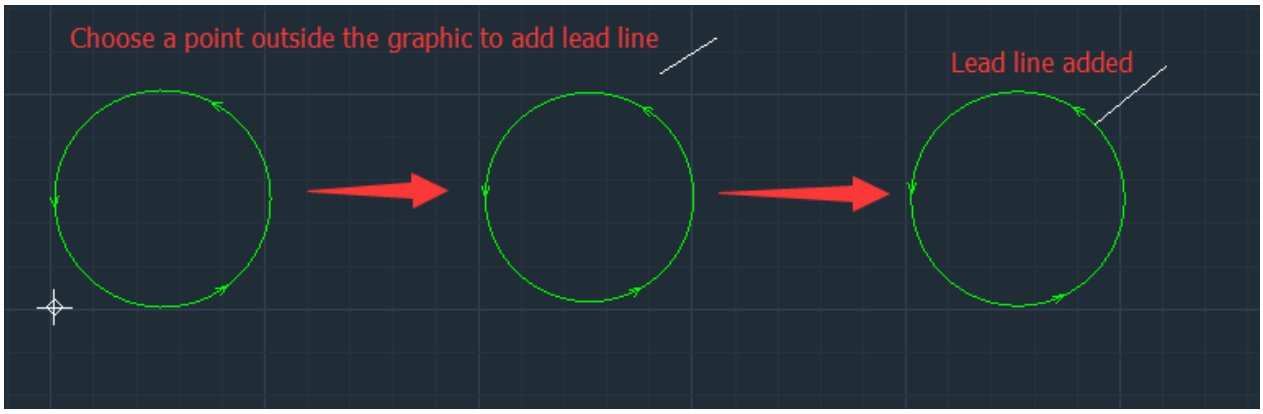
Tips

- 

: SC1000 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".**

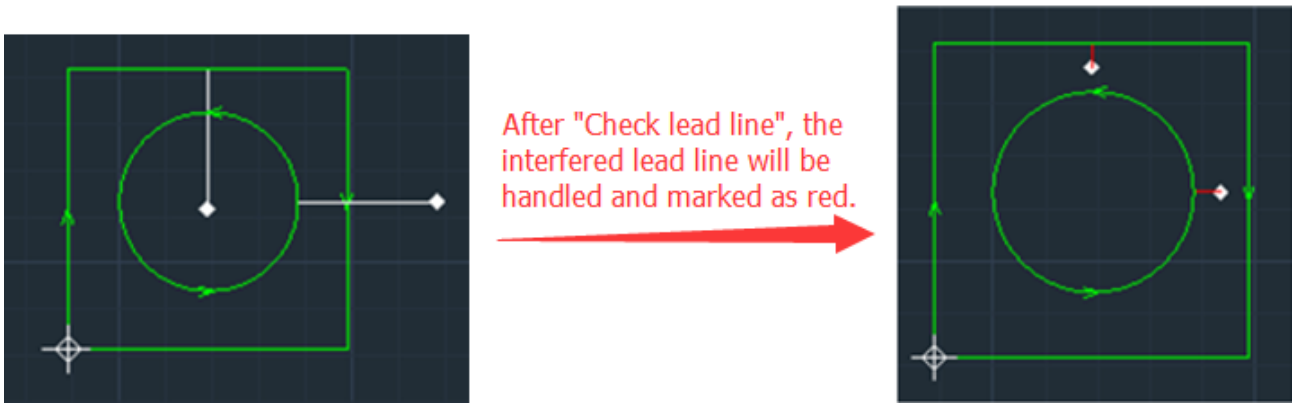
User can add lead line manually through **"Manual lead line"**. The adding ways shows as below:



Attention

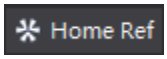
- "Manual lead line" can be added continuously, if user wants to dropout the lead line adding, please select "cancel" through Mouse Right or select  .

"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.

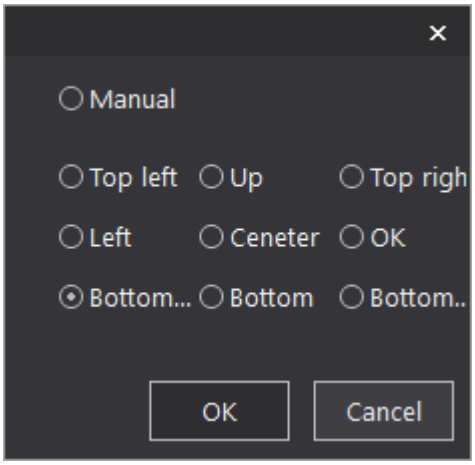


"Clear error mark": User can clear error mark of selected graphic. If user wants to clear all the lead lines, please click "Select all".

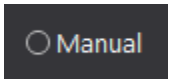
"Clear lead line": User can clear the red mark interfering lead line.

2) 

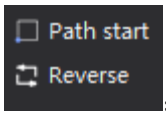
：User can set up the docking location of the cutting head after the cutting, that is to say the zero point of the cutting graphic.



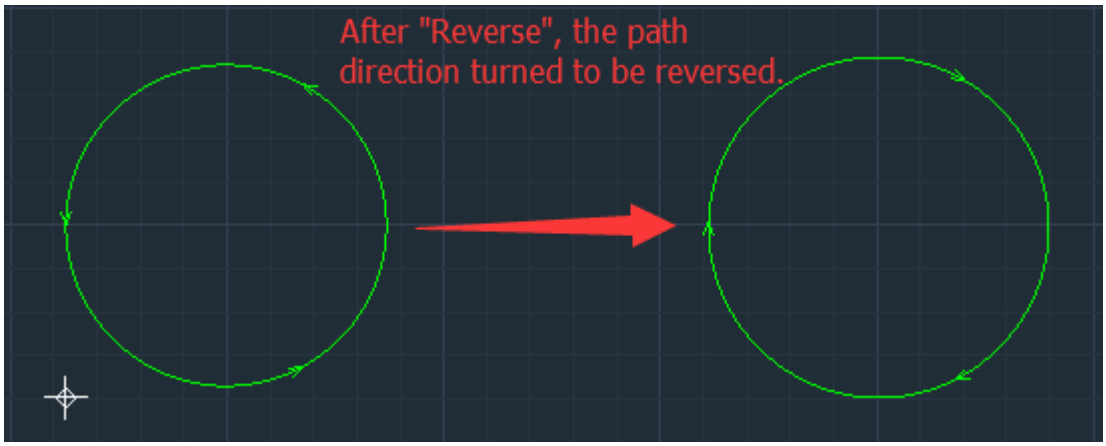
Attention

- SC1000 use "Floating coordinate system" for cutting, which is the location of cutting head (after cutting). SC1000 makes the docking location the same as the location of cutting head as default (after cutting) and at the same time the place of graphics in the view section will be adjusted accordingly.
- User can set up anyplace as the docking location through 

by clicking the icon of "Home Ref" and then user would better simulate the cutting process to make sure all the cutting graphics are inside the workpiece.

3) 

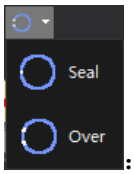
：User can change the path starting point through "Path start". After click "Path start", user can choose any point on the graphic contour as the current path starting point by Mouse Left. User can reverse the cutting path by click "Reverse".



Attention

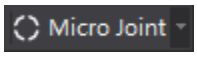
- The places of lead line/gap and other related things will be adjusted accordingly after the changing

of the path starting point.

4) 

：User can reserve gap/line segment of closed graphics in specified size. After adding gap, there will be red mark on the gap part and the gap part will not be cut during cutting. User can use this function to stop the cutting part from dropping down.

User can seal the unwanted gap though **"Seal".**

5) 

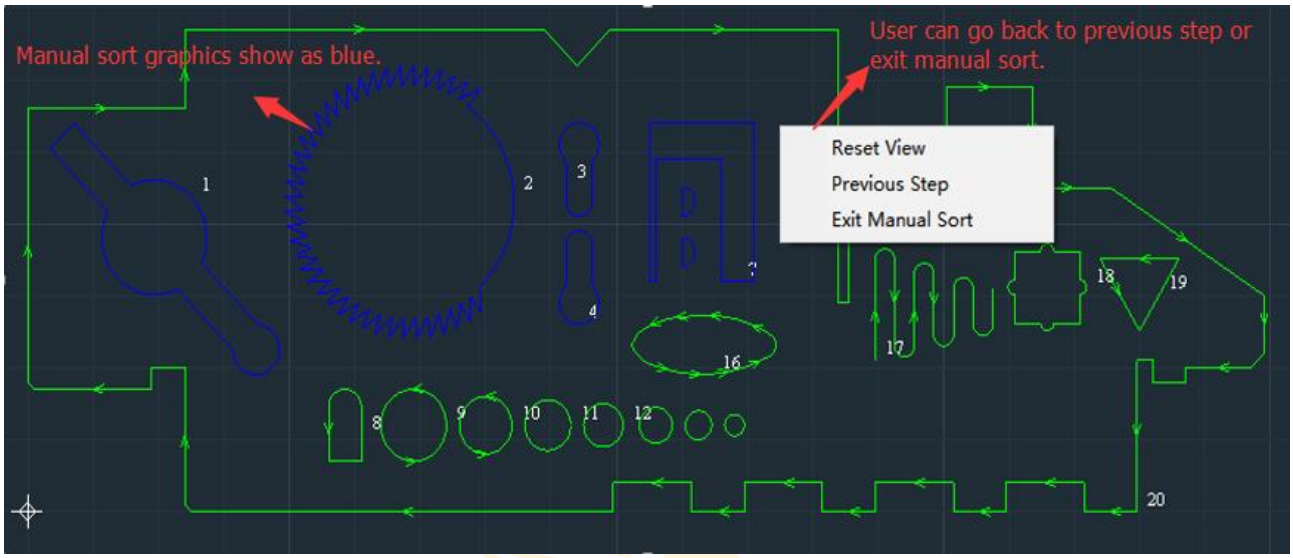
User can set up several not cutting line segments on the selected graphic contour. SC1000 support manual micro joint (default) and auto micro joint. After click "Micro Joint", user can add micro joint on any point of graphic contour. User also can set up parameters through dropdown menu.

Auto micro joint: User can set up auto micro joint type/number/length. User also can clear all the micro joint points by "Clear micro joint".

3.2.2.6 Advanced cutting process

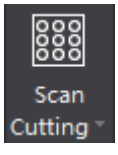
User can further optimized the path planning or process through this part.

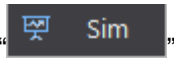
1) SC1000 provides various ways of sorting. User can choose the best one in order to decrease the length of moving in the air so that to increase the cutting efficiency. User can choose **"Left to right", "Right to left", "Bottom to top", "Top to bottom", "Nearest", "Inside to outside", "Outside to inside", "Small graphics priority" and "Manual sort". "Manual sort"**: User can easily sort according to his needs.



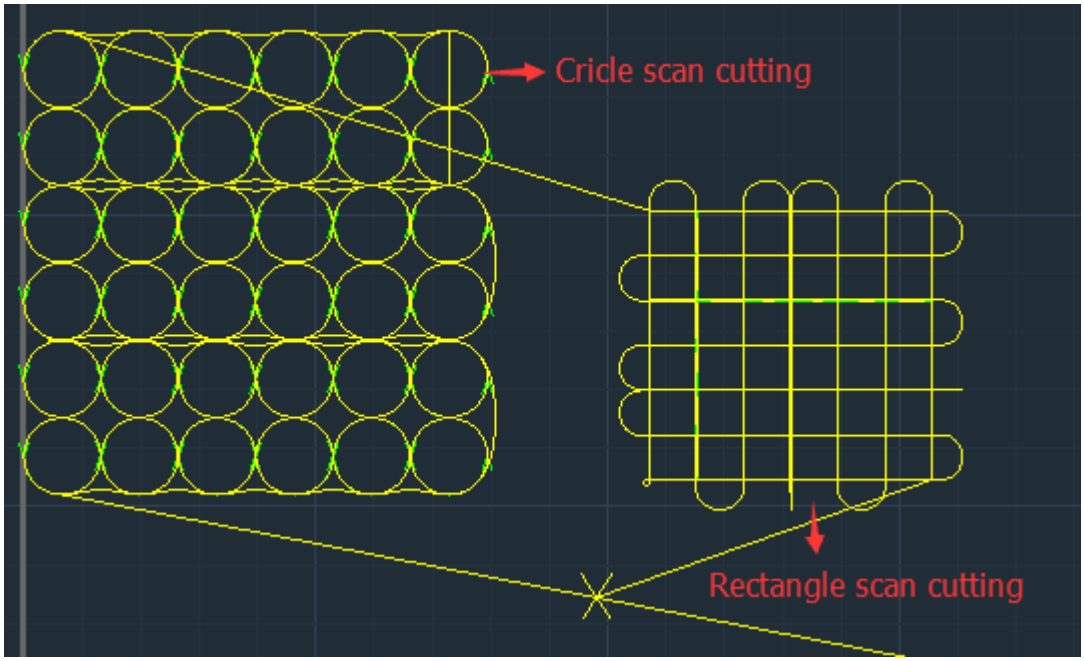
Tips

- 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.
- SC1000 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 graphics, and SC1000 will choose the best path planning to improve the efficiency and decrease the time. Select all the graphics (circles/squares in array) , click **"Scan Cutting"** then SC1000 will finish planning the path planning, and user can see the real path planning by clicking " 

".



Descriptions

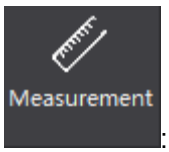
- If the selected graphics can't fit the conditions, then SC1000 can't do scan cutting, and the message bar will show a message "The selected graphics can't fit the conditions!"(新版软件对飞切的图形没有要求，是否考虑删除本句说明)

3) **"Bridge"** can be used to 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.

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

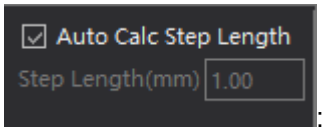
3.2.2.7 Auxiliary

"Auxiliary" part mainly collects some common measure tools.

1) 

: 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.

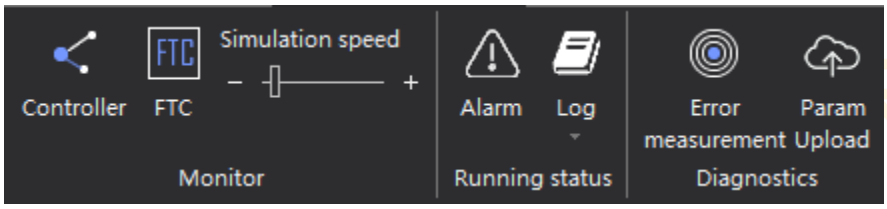
3.2.2.8 Fine-tuning

1) 

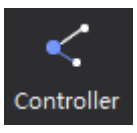
: User can use this function to micro adjust the place of selected graphics in fix step length or set up any step length user wants by arrow keys on keyboard.

3.2.3 System analysis

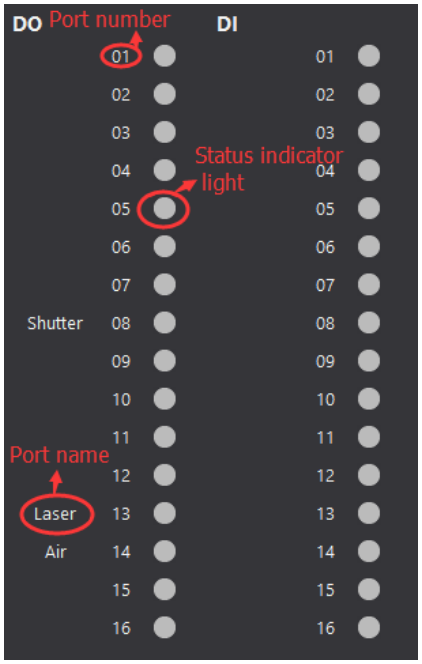
User can monitor the running status of software and hardware of SC1000 to see whether if it's running properly or not. If it's not, it's convenient for user to find out the real problem and then handle it.



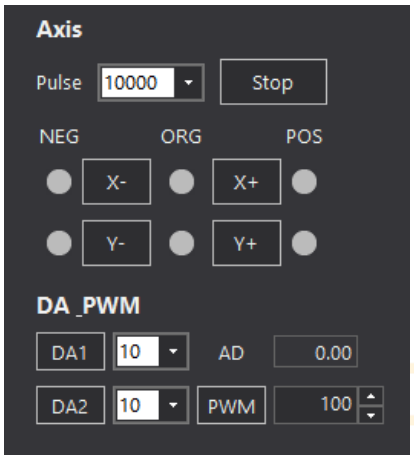
3.2.3.1 Components monitoring

1) 

is used to monitor the input/output status of CNC system. The light will be green if the input/output is working properly.



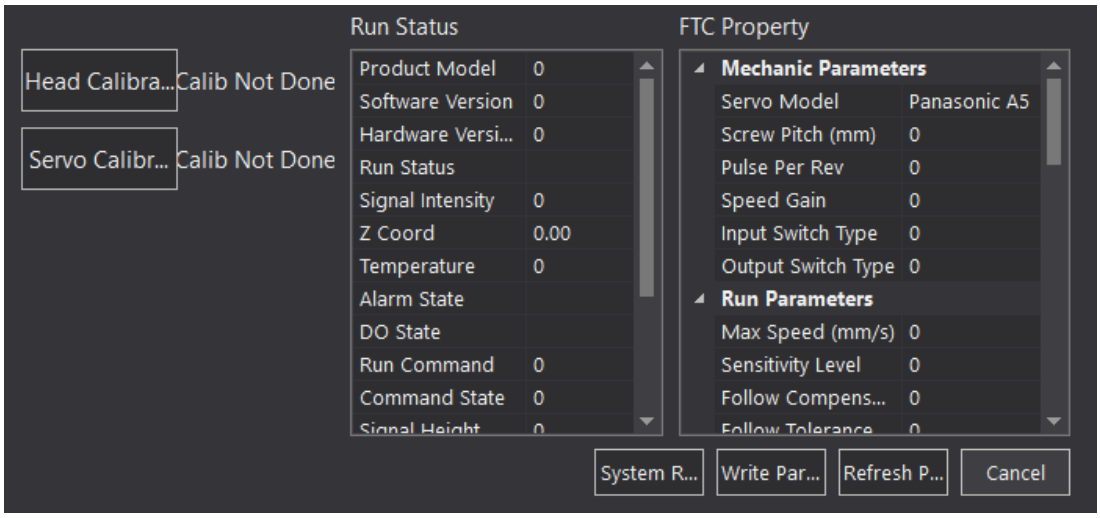
The output status of each axis can also be controlled.



Tips

- When installing SC1000, 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. User can set up the parameters of FTC91/FTC61. It'll be much more convenient for user to use our FTC91/FTC61.



Descriptions

- User can reference the descriptions of FTC to know the meaning of each parameter.
- The first time to power on, user needs to use head calibration/servo calibration, or cutting head can't follow stably.

3.2.3.2 Running status

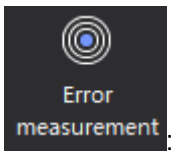
1) 

: User can check the current system alarm by clicking here so that user can easy find out the problem.

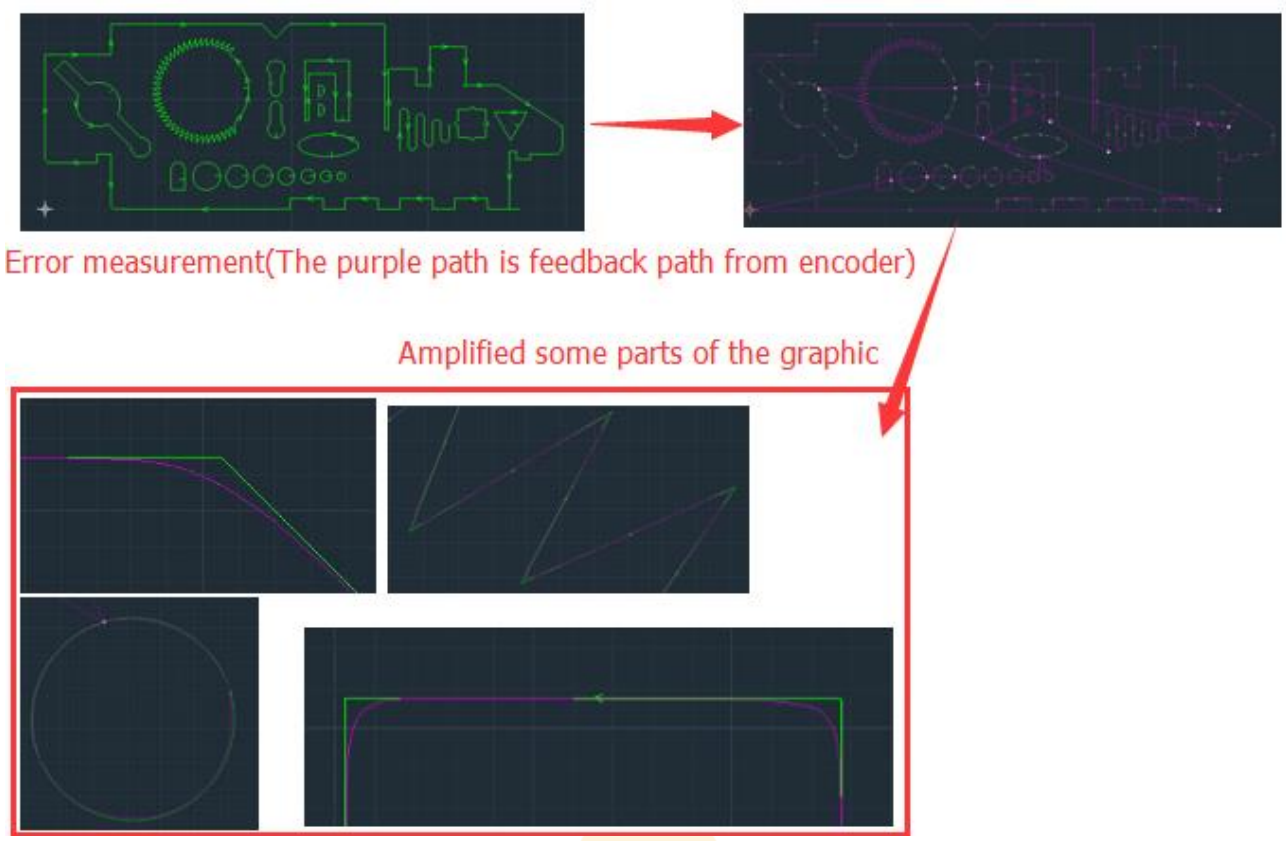
2) 

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

3.2.3.3 System diagnose

1) 

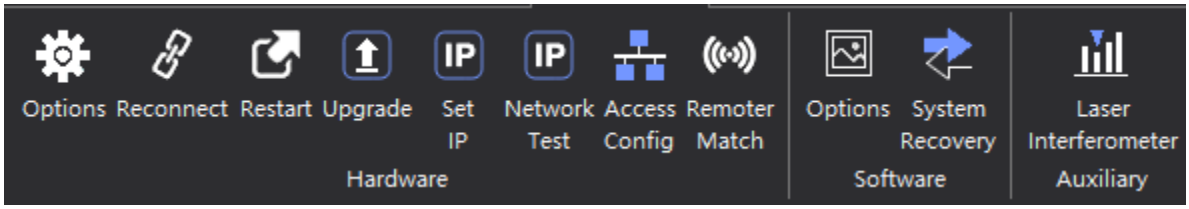
: SC1000 can do error analysis such as roundness error by comparing the real running path with the running path shows on the view section. SC1000 can draw the real running path by collecting the information of encoder. User can easily debug the machine, and check the running error of X/Y axis or measure circle and so on. It's very useful.



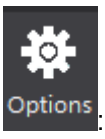
User can zoom in the view through the middle mouse button and measure the error by measurement tools.

3.2.4 Advanced

This part mainly collects the tools for hardware configuration/debugging when assembling the machine. The style of SC1000 and initial settings once been finished, please don't change them unless some special occasions happen.

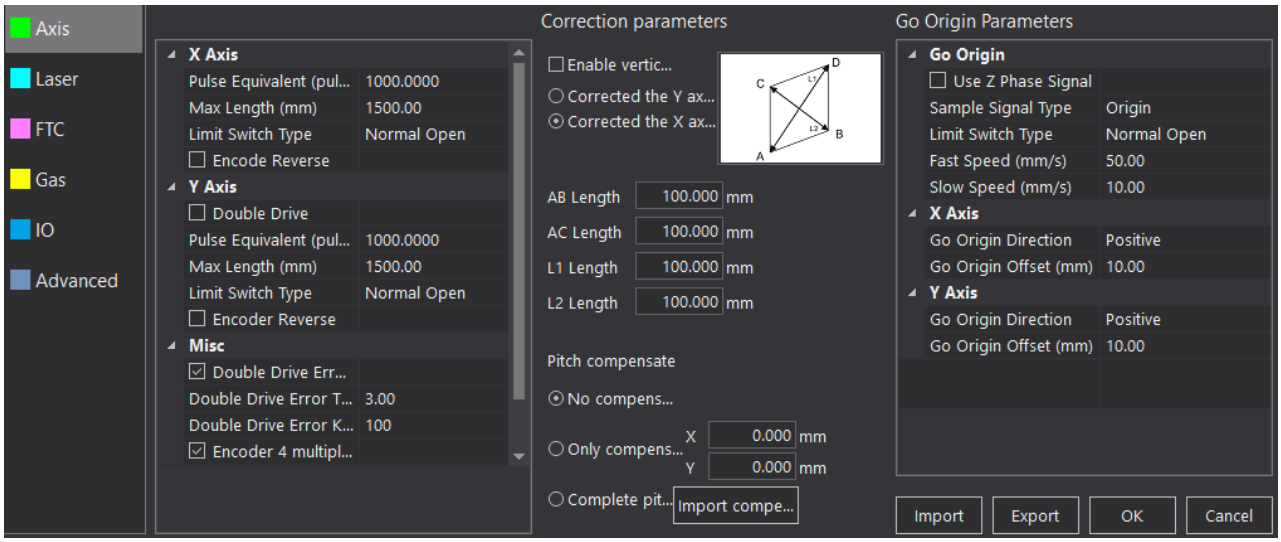


3.2.4.1 Hardware

1) 

: User can set up parameters of Axis/Laser/FTC/Gas/IO/Advanced through this part. Please carefully set up these parameters. Click "Options" and enter the password, and the initial password is "0000".

a) **Motion control axis:** including the basic parameters and go origin parameters.



The descriptions of each axis shows as below :(Y axis has the same parameters as X axis.)：

Axis Parameters	Name	Default Value	Remark
X-Axis	Pulse Equivalent(pulse/mm)	1000	The number of pulses needed to run 1mm
	Max Length(mm)	1500	Normal open/close
	Limit Switch Type	Normal Open	Limit switch type of X-axis should be the same with Y-axis.
	Encode Reverse	Don't select	
Y-Axis	Double Drive	Select	If checked, the Y axis enables dual drive mode
	Pulse Equivalent(pulse/mm)	1000	The number of pulses needed to run 1mm
	Max Length(mm)	3000	
	Limit Switch Type	Normal Open	Limit switch type of Y-axis should be the same with X-axis.
	Encode Reverse	Don't select	
Misc	Double Drive Error Alarm	Select	If checked, the software will alarm and stop when the alarm condition is reached
	Double Drive Error Tolerance(mm)	3.00	
	Double Drive Error Keep Time(ms)	100	
	Encoder 4 multiplier freq	Select	

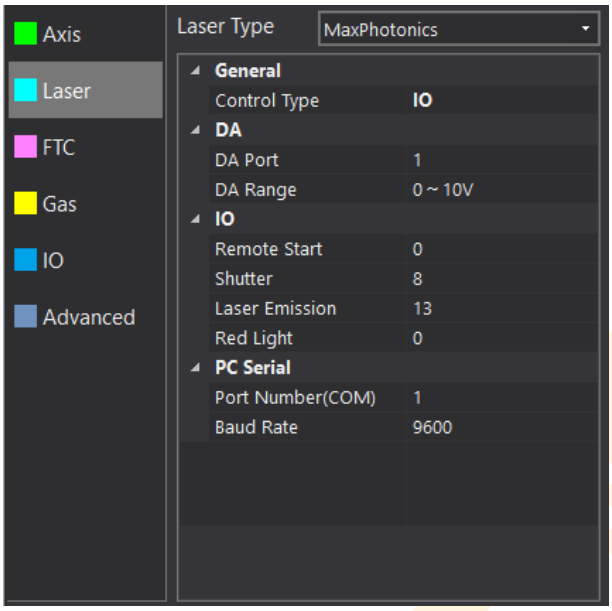
Correction parameters	Enable vertic	Don't select	
	Corrected the Y axis		
	Corrected the X axis		
	AB Length(mm)	100.000	
	AC Length(mm)	100.000	
	L1 Length(mm)	100.000	
	L2 Length(mm)	100.000	
	Pitch compensate	No compensate	
		Only compensate	X axis *0.000* mm
			Y axis *0.000* mm
		Complete pitch compensate	
Go Origin	Use Z Phase Signal	Don't select	
	Sample Signal Type	Origin	The user can select the limit signal or the origin signal
	Limit Switch Type	Normal Open	
	Fast Speed(mm/s)	50.00	
	Slow Speed(mm/s)	10.00	
X-Axis	Go Origin Direction	Positive	
	Go Origin Offset(mm)	10.00	
Y-Axis	Go Origin Direction	Positive	
	Go Origin Offset(mm)	10.00	

Attention

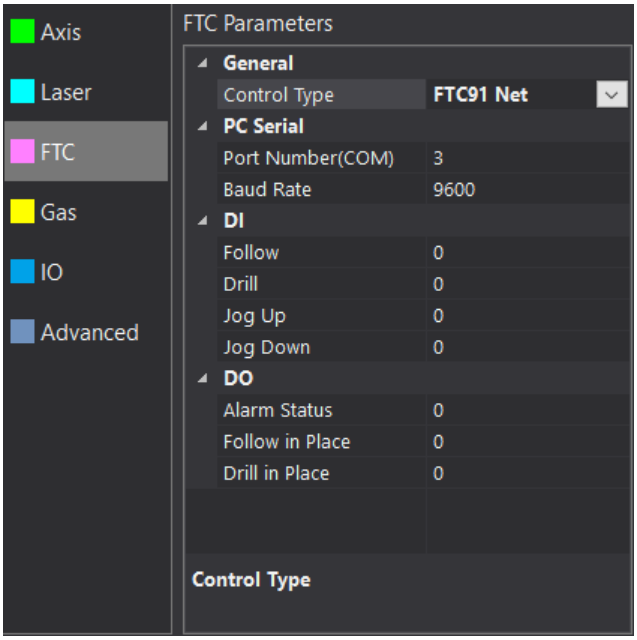
- Motion control axis' parameters are basic, please set up properly or it may occur error during running.
- If Y axis is double drive, please select "Double Drive".
- When the feedback direction of encoder is different from the real running direction, please select "Encoder Reverse".
- SC1000 can support two kinds of axis limited switch: NPN photoelectric switch/ mechanical switch, user can set up as normal open/close.

- User can choose origin signal according to real situation, and then connect it with motion control card. Once origin signal has been set up, the Go Origin direction must be the same as that of Origin, or Go Origin can't be finished and even result in damaging to equipment or even hurting people.("回原方向必须与原点方向一致"翻译是否准确)
- Go Origin speed can't be too fast or it may go over origin.

b) **Laser:** User can set up the communication/connection way. SC1000 support Raycus/IPG/Semiconductor/MaxPhotonics/Super/TXStar/Others.



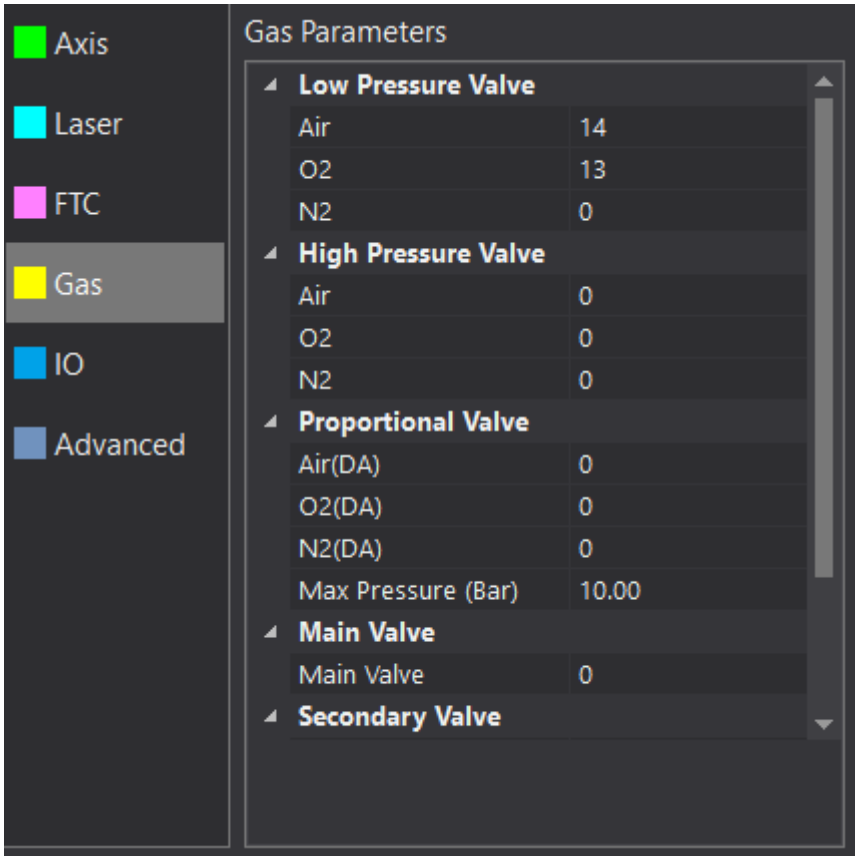
c) **FTC:** User can set up the communication/connection way. SC1000 can connect with our FTC91/FTC61 by Ethernet/IO port/Serial port/MCC3721H. User can connect them by I/O port if you use other focus tracking controller.



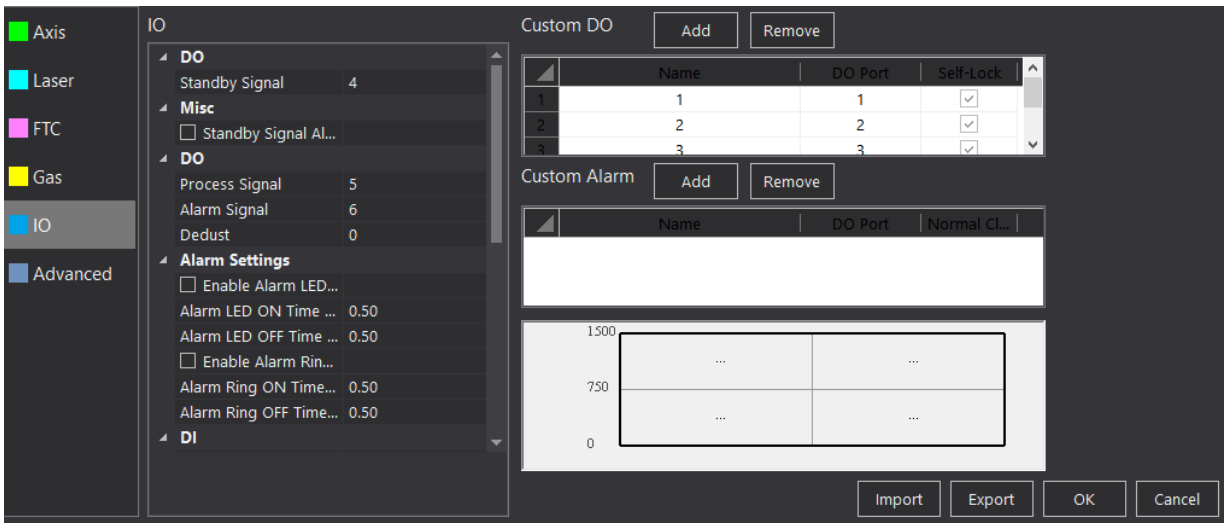
Descriptions

- If user choose FTC91, please select "FTC91 Net". If user choose FTC61, please select "FTC61 IO"/"FTC61 PC Serial". If user use MCC3721H motion control card, please choose"MCC3721H".

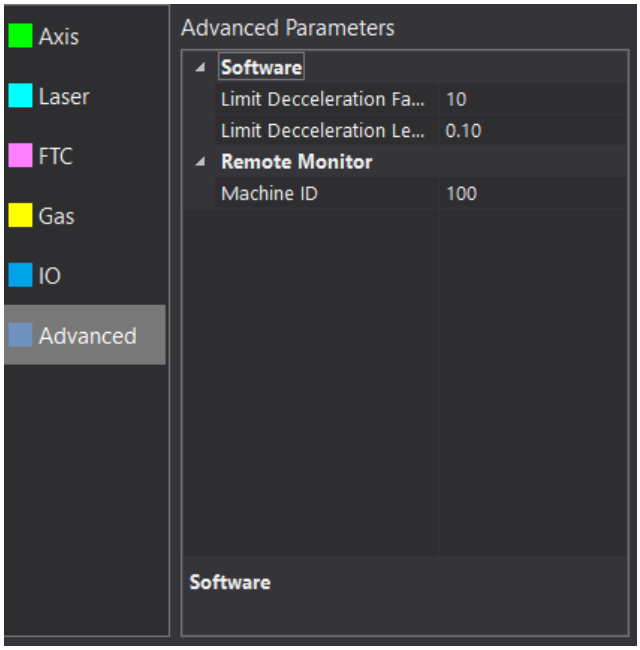
d) **Gas:** SC1000 Supports low pressure valve/high pressure valve/proportional valve for Air/O2/N2. User can set up accordingly.



e) **Input/Output:** User can set up Standby Signal/ Standby Signal Alarm/Process Signal/Alarm Signal/Dedust and alarm settings. SC1000 also supports user-define in input/output/alarms.

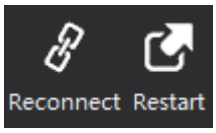


f) **Advanced**(这一块的文字怎么描述？原始版本没有对这一块的说明)



Attention

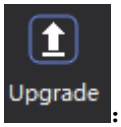
- If some I/O port has not been used, please set this port as "0".

2) 

Reconnect: User can reconnect quickly by "Reconnect" when computer is not well connected with SC1000 for some reasons such as pulling out the Ethernet cable. User can restart the motion control card by "Restart".

Descriptions

- SC1000 can auto reconnect when recovered the communication parts. If it's still not connected, please select "Restart" after selecting "Reconnect".
- If SC1000 runs smoothly, please don't select "Reconnect" or "Restart", or SC1000 will be forced to restart and break the communication.

3) 

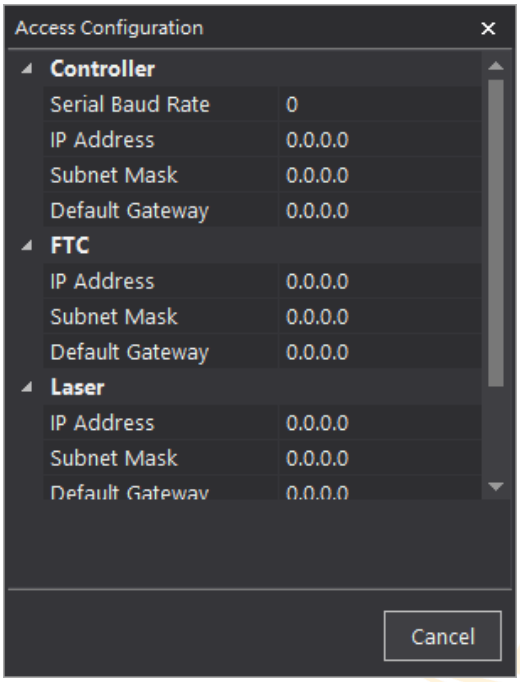
：User can upgrade motion control card by this function. After click "Upgrade", please select the program file to upgrade. Please make sure all the relative equipment are power on and SC1000 is open during the upgrading to avoid unpredictable events happening. After upgrading is over, just reconnect and restart SC1000.

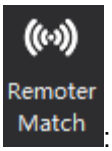
4) 

: SC1000 can set up IP automatically and test the IP address by "Network Test".

5) 

: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.

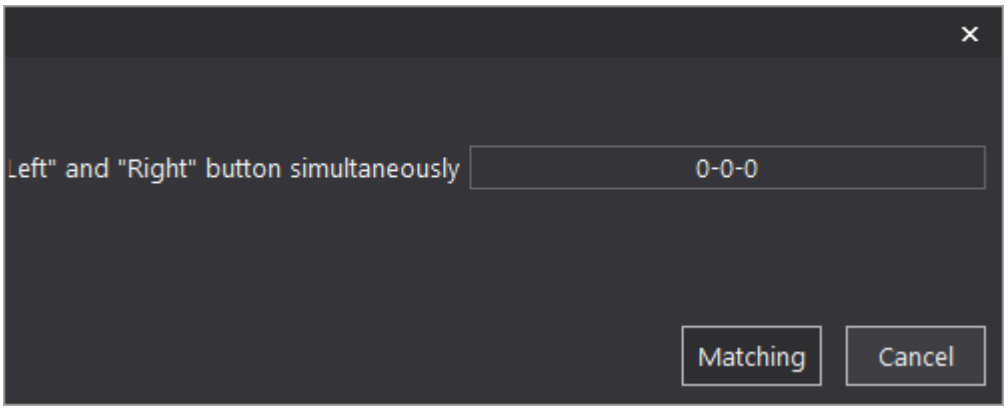


6) 

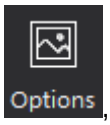
: Wireless remoter need to pair up before we can use.

Steps：

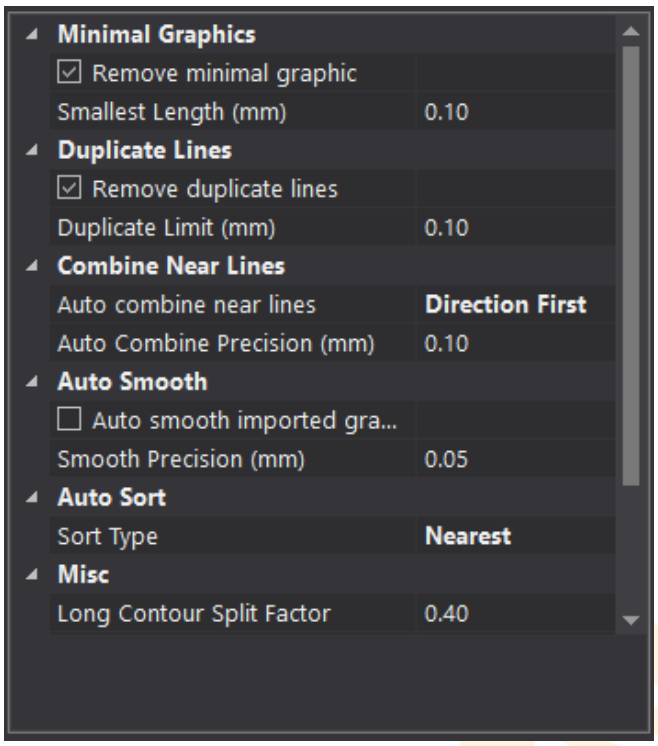
- Please connect the USB receiver to the computer;
- Click "Remoter Match";
- Press "Left" and "Right" button simultaneously. If there shows a serial number, it means match succeed.

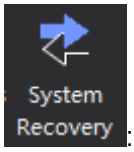


3.2.4.2 Software

1) 

, User can preprocessed and optimiz**ed the importin**g graphics according to your needs.



2) 

: User can do system recovery through here. (自己写的，原版本没有说明，欢迎补充)

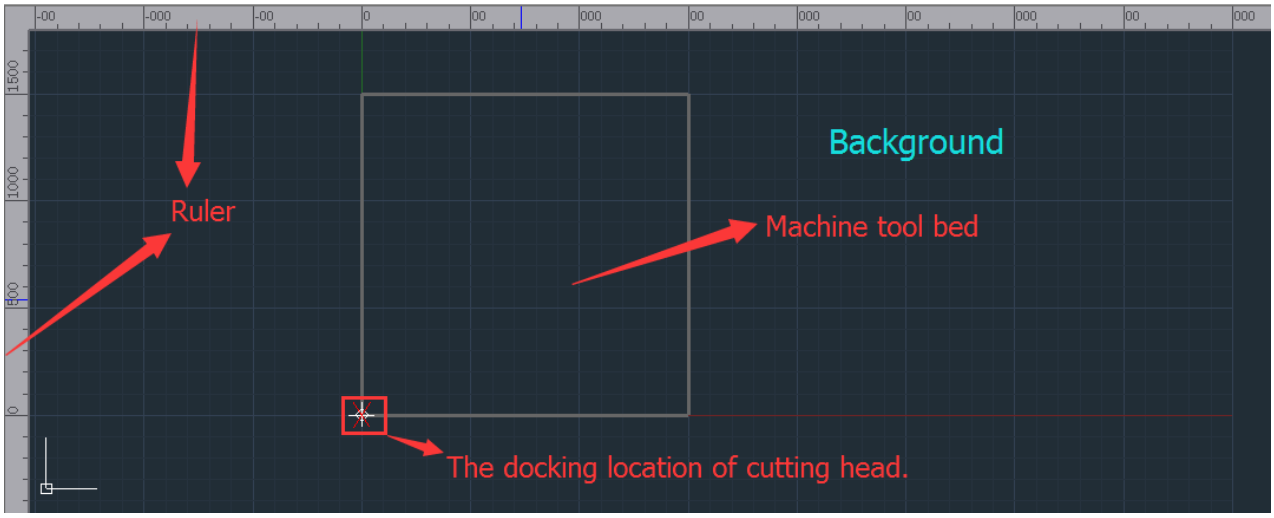
Tips

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

3.2.4.3 Auxiliary（原版本没有说明，欢迎补充）

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.



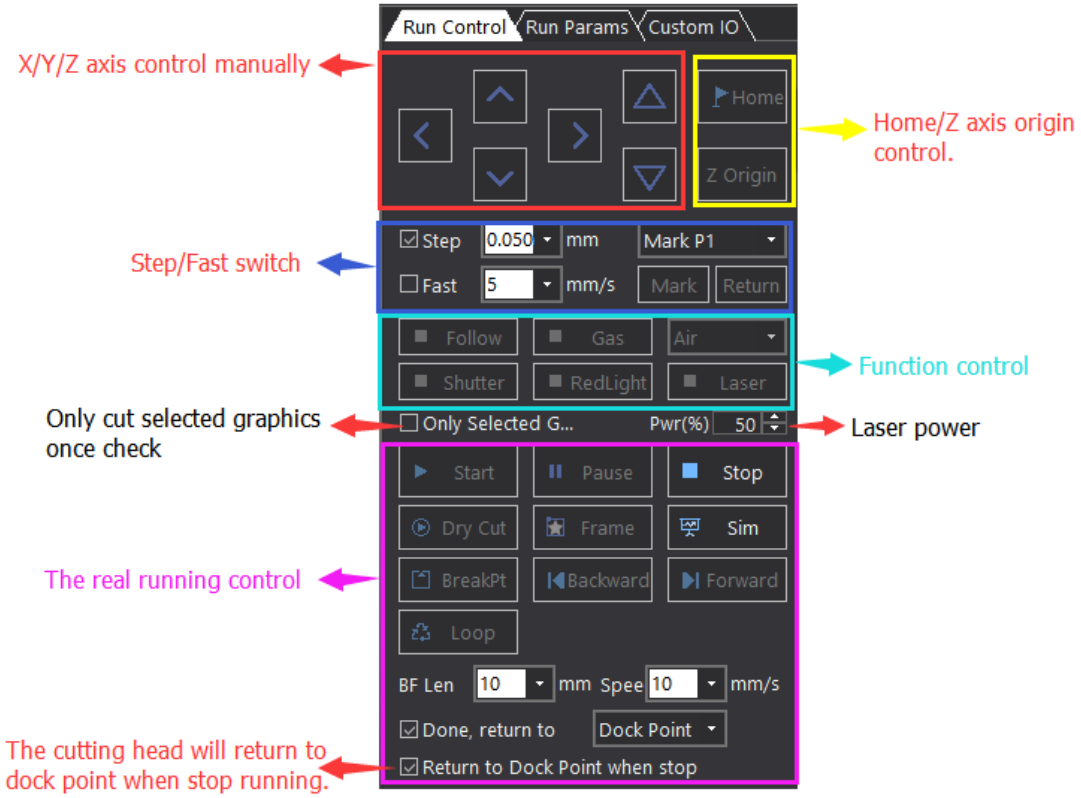
Coordination: SC1000 will use floating coordination (default), and the docking location of cutting head is the starting point of the cutting processing (The location of "X" in the view section.). User can simulate the cutting process/frame to make sure all the cutting graphics are inside the workpiece.

3.4 Running control option

Running control option is located in bottom-right, including all the running control actions and 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:

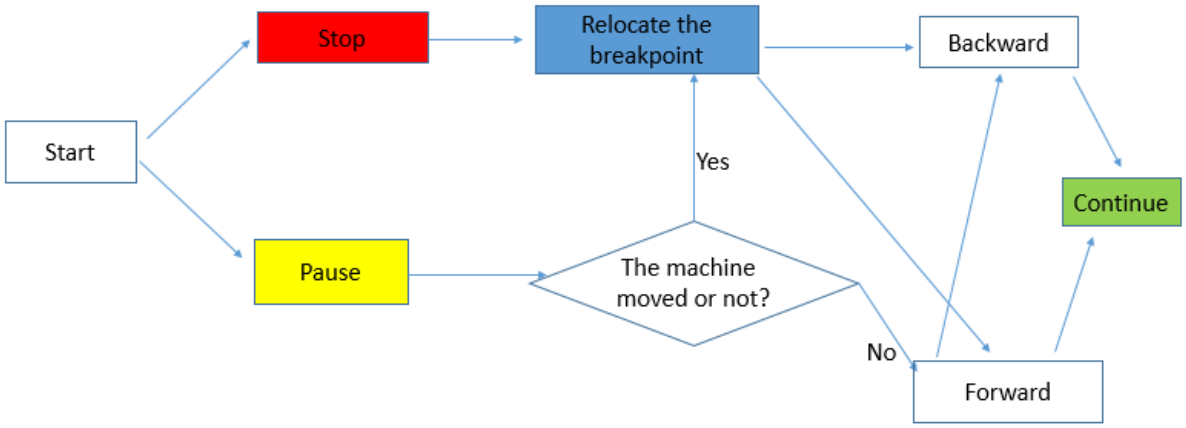


SC1000 supports controlling X/Y/Z axis to move manually. User can set up the moving pattern/speed by SC1000 (Step/Fast).

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

If the greenlight "■" of the button goes on, which means the function has been done. About "Laser", Mouse Left to open the laser, release it to shut the laser. While other functions need to be switched by "  ";

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", SC1000 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 delate 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"**: SC1000 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"**: SC1000 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 up running parameters through this part. The descriptions of each parameters show as below:

Name of running parameters		Descriptions	Default value
Run control	Go Frame Speed (mm/s)	Move speed when go frame.	10.00
	Move Speed (mm/s)	Move speed without laser.	10.00
	Move Acc (mm/s2)	Move accelerated speed without laser.	200.00
	Empty Move Acc Time (ms)	Accelerated time when empty move.	125.00
	Cut Acc (mm/s2)	Accelerated speed when cutting.	200.00
	Process Acc Time (ms)	Accelerated time when cutting.	125.00
	Circle Precision (mm)		0.01
	Corner Precision (mm)		0.10
Laser Control	Laser Freq (Hz)	Laser frequency.	5000
	Peak Current (%)	Peak current in proportion.	100
	Auto Control Shutter When Process	Check	Check
Gas Control	Default Pressure (Bar)		4.00
	Gas On Delay (ms)	Gas on delay when cutting	0
	First Gas On Delay (ms)	First gas on delay when cutting	0
	Gas Change Delay (ms)		0
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.	

	Enable Follow When Dry Cut	When dry cut, the cutting head will follow after check.	
Process	Clear track line after process done.	Clear track line after cutting.	
	Enable software limited	X/Y axis running path will be limited inside the workpiece after check.	
Graphic Process Control	Auto distinguish inner outer before process.		
	Enable micro-link deceleration		
	Micro-link slow down velocity (mm/s)		10.00
	Cool position delay (ms)		100
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

Attention

- "Cut Acc"/"Process Acc Time" can directly affect the cutting speed. User can properly increase the "Cut Acc" and decrease the "Process Acc Time" to improve the running efficiency in the condition that cutting machine will not shake.
- Before starting software stroke limit, SC1000 must do X/Y axis go origin one time, or SC1000 can't know the coordinate of cutting machine(机械坐标) and then SC1000 will start software stroke limit anytime.

Custom IO: User can define I/O port yourself 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 SC1000.

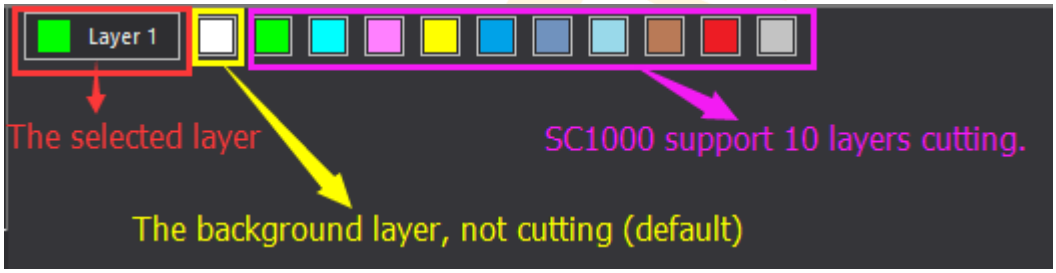
The descriptions of each message/alarm：

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.
Alarm	System alarm	This mainly records system alarm such as limited alarm/servo input alarm and so on.

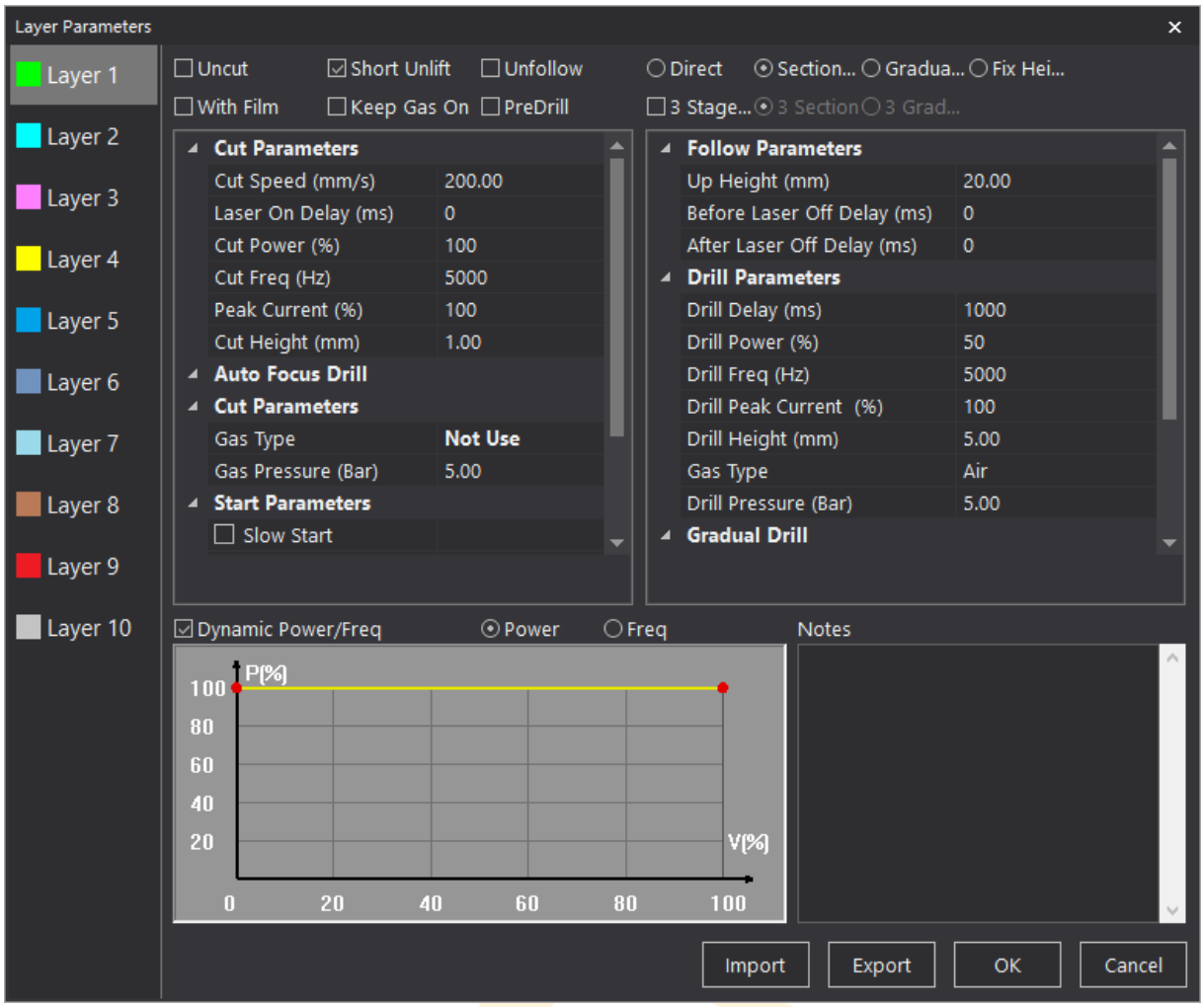
And all the messages and alarms can be checked by **"SYSTEM ANALYSIS" ->"Log".**

3.6 Layer parameters option

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



SC1000 can auto-match layer property according to user's selection. Layer parameters: click each layer to set up the parameters.



Descriptions

- The selected layer property can be revised any time and works immediately.

The descriptions of each parametes shows as below：

Layer	Name	Descriptions	Default value
Cut parameters	Cut Speed (mm/s)	Speed when cutting	200.00
	Laser on Delay (ms)	Delay time when laser on	0
	Cut Power (%)	Laser power in proportion when cutting	100
	Cut Frequency (HZ)	Laser frequency when cutting	5000
	Peak Current (%)	Laser peak current in proportion when cutting	100
	Cut Height (mm)	The following height when cutting	1.00

	Gas type	The type of gas when cutting	Not Use
	Gas pressure (Bar)	Gas pressure when cutting	5.00
Start parameters	Slow start	Start slowly when check.	
	Start length (mm)	Slow start length.	0.00
	Start speed (mm/s)	Slow start speed.	0.00
Follow parameters	Up Height (mm)	Z axis's up height after cutting.	20.00
	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
Drill parameters	Drill delay (ms)	The delay time after arriving at the drill location.	1000
	Drill power (%)	Laser power when drilling.	50
	Drill frequency (Hz)	Laser frequency when drilling.	5000
	Drill peak current (%)	The peak current in proportion when drilling.	100
	Drill height (mm)	The distance between tips and workpiece when drilling.	5.00
	Gas type	The type of gas when drilling.	Air/o2/Not use
	Drill pressure (Bar)	The gas pressure when drilling.	5.00

The descriptions of each special process shows as below:

Special process	Descriptions
Uncut	The selected graphic will be cut after check this option.
Short unlift	When the distance between two cutting point is shorter than the unlifted length that has been set, the cutting head will not lift once check this option.
Unfollow	The Z axis will not follow when cutting once check this option.
Direct cut	The cutting head will go directly to the following location when start cutting once check this option.
Section drill	Drilling in two different height.
Gradual drill	The cutting head will go directly to the drilling location and start drilling, and then go to the following location to cut after finish drilling.
Fix height drill	Drilling in some certain distance between tips and workpiece.

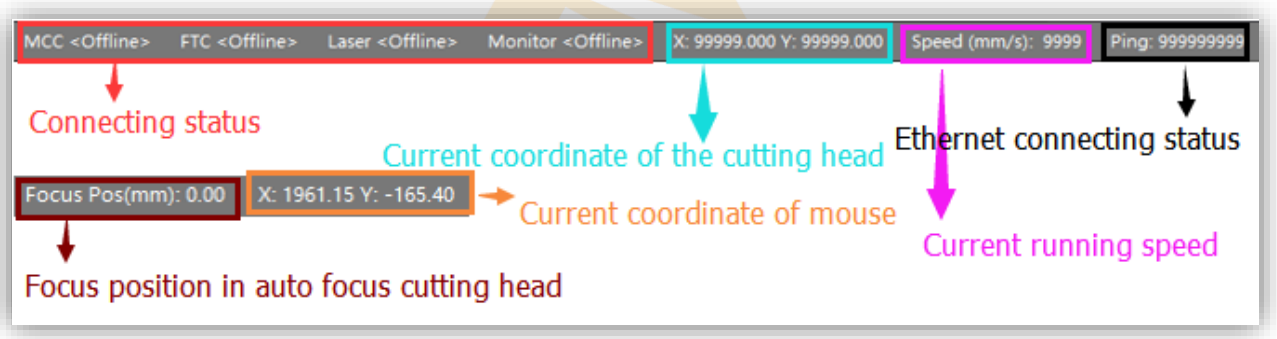
With film	Cutting with film once check this option. SC1000 will cut the graphic twice, once to cut the film with a certain height.
Keep gas on	Keep gas on when drilling.
Predrill	Drilling in advance before cutting.
3 stages drill/section/gradual	Drilling in 3 stages. (暂时没想到更合适的定义)

Descriptions.

- Layer parameters will be revised very often during cutting/debugging. So user can adjust all the parameters according to your needs to achieve 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 location, current cutting speed and so on, so that user can check it easily.



4 Warning and exceptions handling

4.1 System alarm and descriptions

SC1000 supports lots of alarms and protections accordingly during the cutting process, which can decrease the opportunity of the equipment damaging or people hurting because of user's improper operation. User must know all the alarms and the handling ways.

Alarm lists:

Type of alarm	The content of alarm	Trigger condition
Communication alarm	Hardware is not connected, please check the controller.	The communication between motion control card and sc10000 is broken
	FTC alarm	The communication between motion control card and FTC is broken
	Laser system alarm	The communication between motion control card and laser is broken
	Laser serial communication alarm	The communication between motion control card and laser serial port is broken
X axis related alarm (Y1/Y2/W axis related alarm are similar with X axis.)	Emergency stop alarm	User pressed the 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.
	Y1 axis double drive error	Y1 axis double drive error is out of range.
	X axis hardware positive limit alarm	The machine moves at the X axis 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.
	Z axis hardware up limit alarm	The cutting head moves at the Z axis hardware up limit.

FTC related alarm	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 note 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	The running status of FTC is stop, please go back to origin first.
Laser system alarm	Laser system unknown alarm	
	Laser system power alarm	
	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	
Water cooling machine alarm	Water cooling machine alarm	

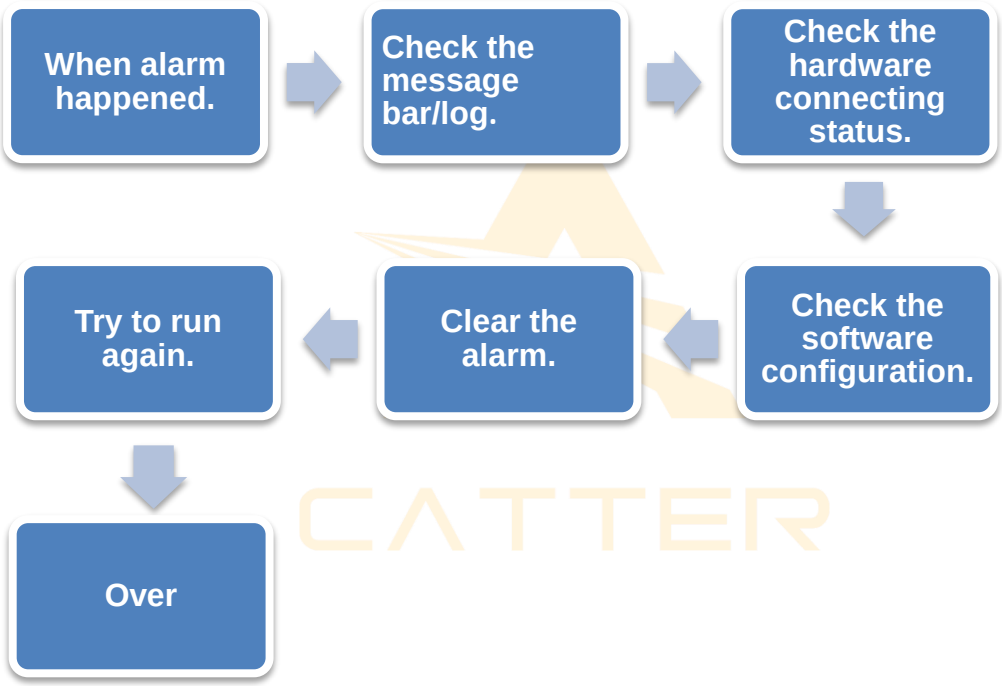
Descriptions

- System alarm has two different alarms, one is a little bit harmful, such as "follow error alarm of cutting head", once the warning condition has been cleared, SC10000 will auto clear the alarm. The other one is more harmful, such as "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 handling

When some normal exceptions occurred, user can do trouble-shooting by SC1000's diagnose, which can save user's time and improve the efficiency.

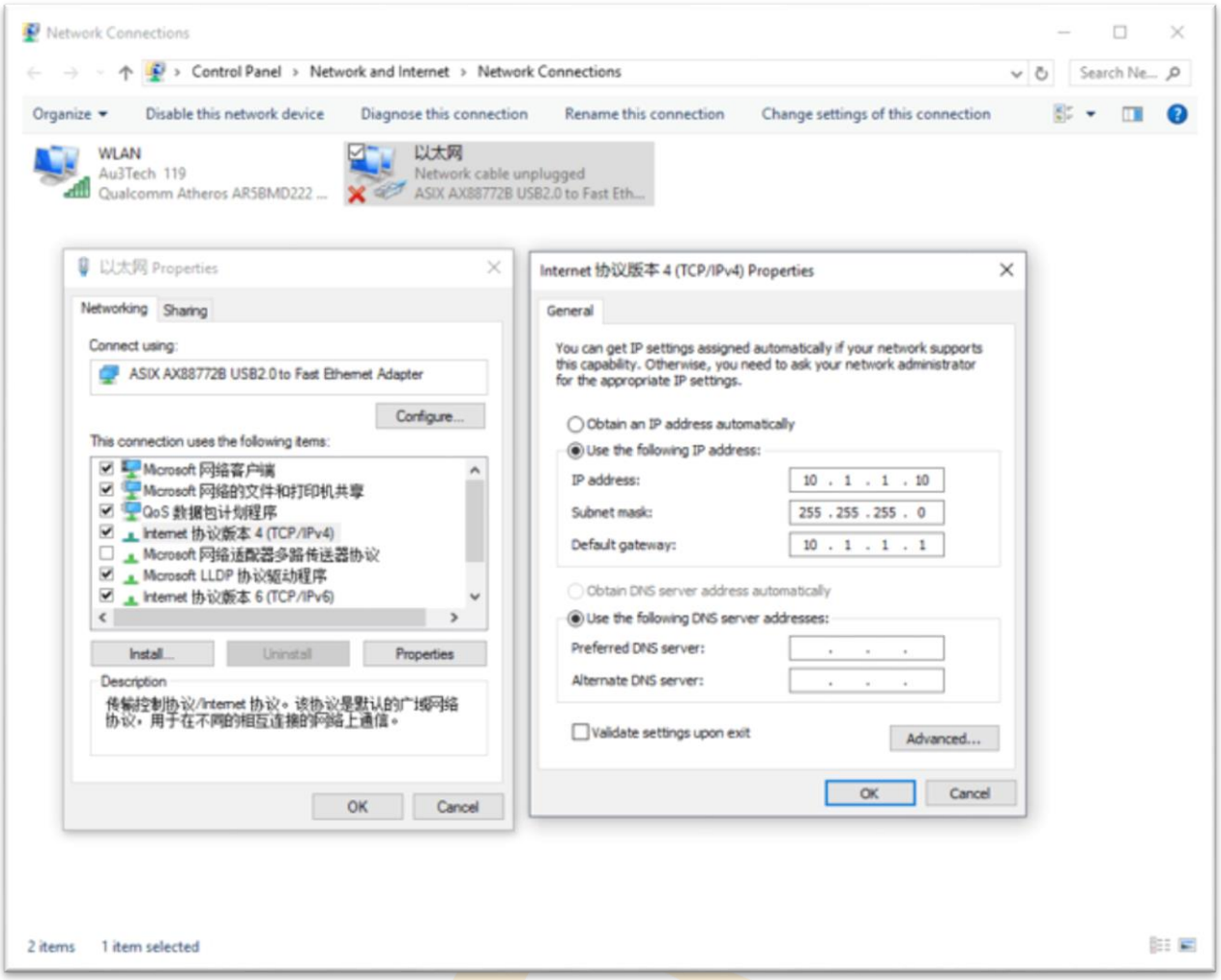
Graphic 4-1 Normal exceptions troubleshooting flow:



4.2.1 System communication exceptions

SC1000 was designed based on Ethernet, all the equipment are connected through Ethernet. When SC1000 can't connect with motion control card or FTC, user can check it out step by step as below:

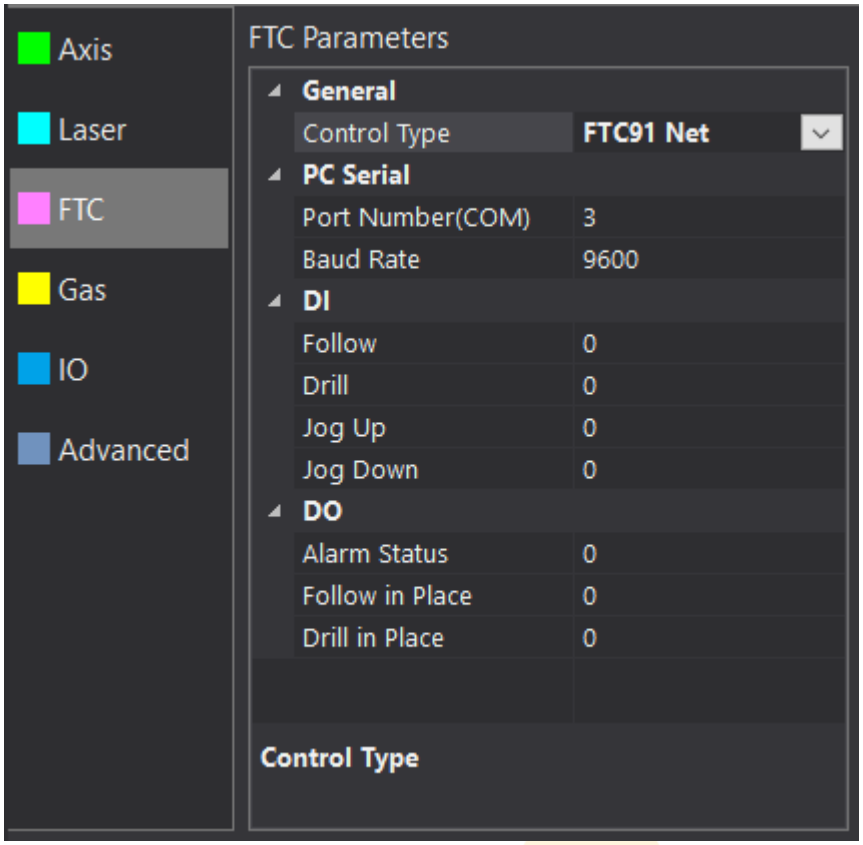
1) Please check whether if the IP has been set.(IP of motion control card/FTC has already been set before exporting the factory)



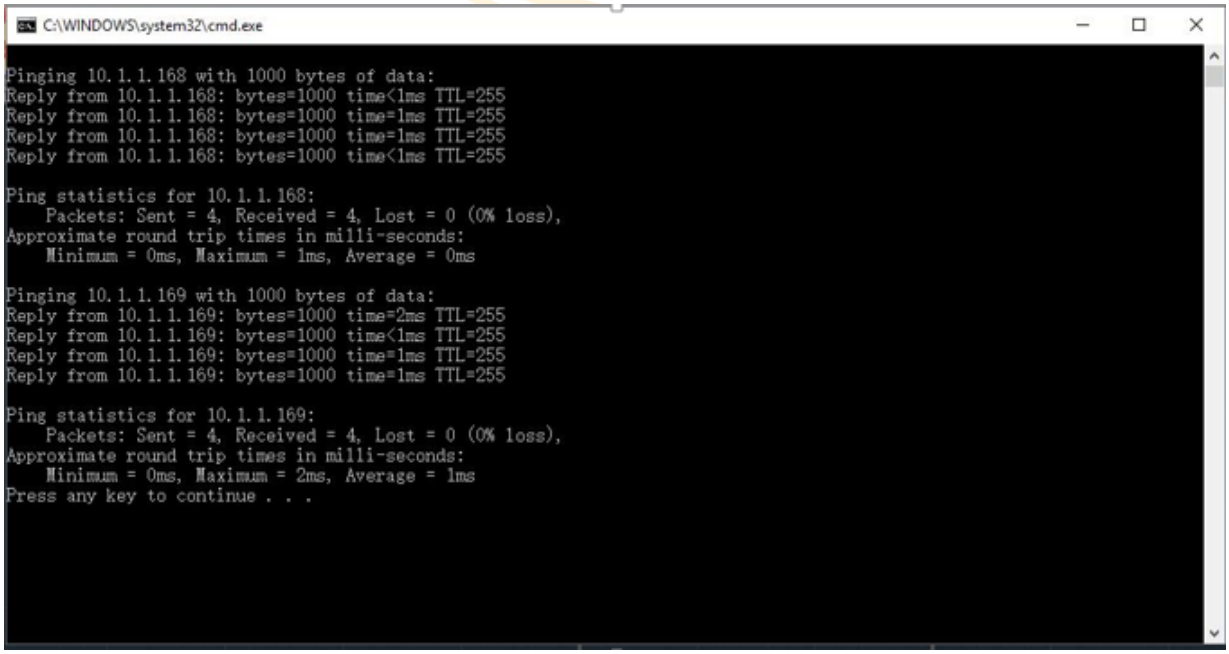
User can quickly set the computer's IP by " 

".

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. SC1000 supports crossed/cross-over cable.
3) when user use FTC91 capacitive height controller, please select "ADVANCED"->"Options"->"FTC" Control Type -> "FTC91 Net", if user use FTC61, please select "FTC61 IO"/"FTC61 PC Serial".



4) User can check the communication status by "Network Test".



4.2.2 Reposition 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.
SC1000 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 setting

Please set up pulse equivalent of each axis properly, or it can be result in running speed error/ accuracy error. The meaning of pulse equivalent: the number of pulse to make the machine run 1mm. e.g. when X Axis servo motor subdivision is 10000 for running 1 circle, the movement is 10mm, the pulse equivalent is 10000/10=1000. Pulse equivalent can be set up to 4 digital after decimal point.

4.2.4 Fly-cutting debugging

SC1000 supports all kinds of fly-cutting, please set up all the parameters related properly.