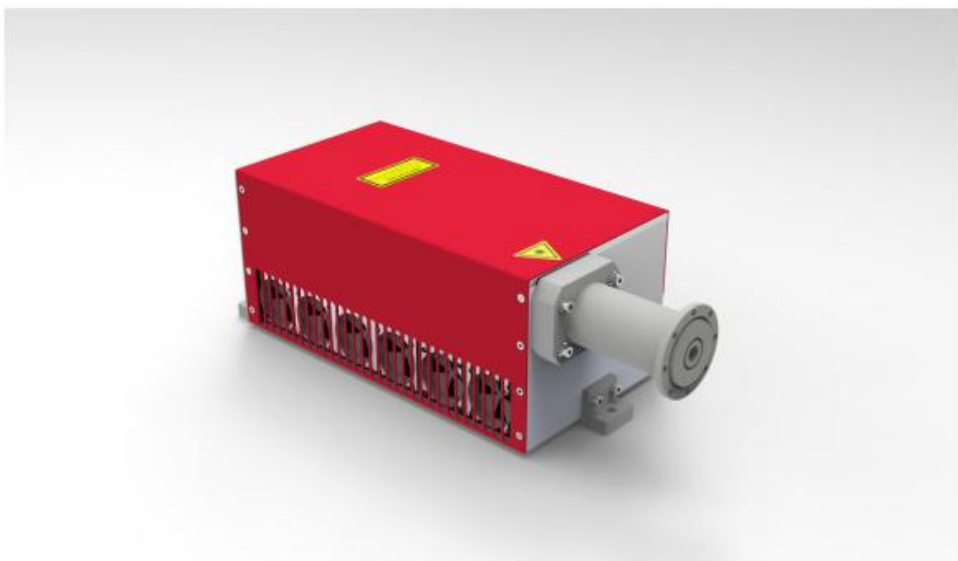




Shenzhen JPT Opto-electronics

Lark-355-3A

User Manual v2.0




Safety Information

Please read this manual carefully before operating this product.

In order to ensure the safe operation and optimal performance of the product, please strictly follow the safety notification below.

- Maintenance only can be carried out in JPT. Please do not remove the laser cover. Warranty will be invalid if warranty label is removed.
- The output wavelength of the laser is 355nm (invisible light), with an average output power of more than 3W, categorized as IV laser. It not only does great harm to the eyes, but also burns the skin. The reflected and scattered light of the device may cause harm to the human body. So please wear laser safety glasses throughout the use process.
- It is forbidden to place inflammable and explosive articles on laser path and low ignition point substances such as black paper, cloth and leather.
- **Caution:** Even when the indicator light is set, there will be a weak output of the ultraviolet indicator light at the laser output port.

Laser safety label

Label figure	Label information
 <p>当心激光 Caution, laser</p>	Laser label (attached on the cover plate near the output port)

<p><u>Component for Incorporation</u> This product is intended as a component for incorporation into a laser product, and as such requires additional features for laser Safety and to comply with IEC/EN60825-1 and 21 CFR1040.10</p>	<p>Warnings (Attached on the cover plate)</p>
<p>CAUTION-CLASS 4 INVISIBLE LASER RADIATION WHEN OPEN AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION</p>	<p>Safety Warning</p>



Laser safety glasses

Contents

Safety Information.....	2
1 Product introduction and technical parameter.....	1
1.1 Introduction.....	1
1.2 Technical parameter.....	2
2 Installation.....	3
2.1 Dimension.....	3
2.2 Installation.....	4
3. GUI control and interface.....	6
3.1 Interface.....	6
3.2 GUI interface.....	8
4. Laser control.....	11
4.1 Control mode.....	15
4.2 Control timing.....	15
4.3 Adapter card connection.....	17
5. Operation.....	19
5.1 Turn on laser.....	19
5.2 Turn off laser.....	20
5.3 Caution.....	20
6. Common problems.....	20

1 Product introduction and technical parameter

1.1 Introduction

Compared with IR lasers, the UV laser directly break the chemical bond in materials. The process generate much less heat to minimize thermal effect, processed material turn to Atom level, reduce contamination to the environment. The feature of UV laser is short in wavelength, Small spot size, intense energy, high solution, it's good for precision marking, narrow line width Requirement, high quality marking, less thermal effect, also with long term stability. Widely used in micro machining, micro hole drilling, cutting, scribing, already apply to many Material like metal, semiconductor material, ceramic, glass and polymer.

Lark-355-3A is the ultraviolet product of lark series at present. It adopts the heat management mode of conduction heat dissipation combined with air convection heat dissipation. Compared with Seal-355-3S, the water circulation cooling system is omitted, and customers can choose multiple lasers of the same level according to the actual situation. Compared with other similar products, in terms of optical parameters, it achieves narrow pulse width ($< 18\text{ns}@40\text{ KHZ}$), higher repetition frequency (40KHZ), better beam quality ($M^2 \leq 1.2$) and better beam roundness ($>90\%$); in terms of structural design, smaller size, lighter weight and better appearance; in terms of electrical control design, strong anti-electromagnetic interference ability, high thermal management efficiency, friendly GUI interactive interface. These characteristics make the product have better structural stability and stronger environmental adaptability, and thus realize the characteristics of good beam quality, high power stability, long life, high consistency, convenient installation, maintenance-free operation and so on.

1.2 Technical parameter

Table 1 Parameter list of 3W UV laser with air cooling

Parameter List	
Laser Type	3W UV laser with air cooling
Model Number	Lark-355-3A
Wavelength	355nm
Mean Power	>3W@40kHz
Pulse Duration	<18ns@40kHz
Frequency Range ^[1]	20kHz-150kHz
Spatial Mode	TEM ₀₀
Beam Quality (M ²)	M ² ≤1.2
Beam Roundness	>90%
Beam Full Divergence Angle	<2mrad ^[2]
Beam Diameter (1/e ²)	Non-expanding: 0.7±0.1mm ^[3]
Beam Expander Inside	10X ^[4]
Polarization Ratio	>100:1
Polarization Orientation	水平/Horizontal
Average Power Stability	RMS≤3%@24hr
Pulse-to-Pulse Stability	RMS≤3%@40kHz
Operating Temp.&RH	0℃~40℃; <80%
Storage Temp.&RH	-15℃~50℃; <90%
Cooling Mode	Air-cooling
Electricity Requirement	DC12V
Average Power Consumption	180W
Three-Dimensional Size	313.5mm*144.4mm*126mm (L* W* H) ^[5]
Weight	≈6.8kg

[1] The pulse stability will be better in this frequency range.

[2] Refers to the laser output directly from the window, without beam expansion shaping barre.

[3] The measured position is at the laser output window (without expander).

[4] Standard is 10 x; 6 x is customized.

[5] Refers to the dimension without expander.

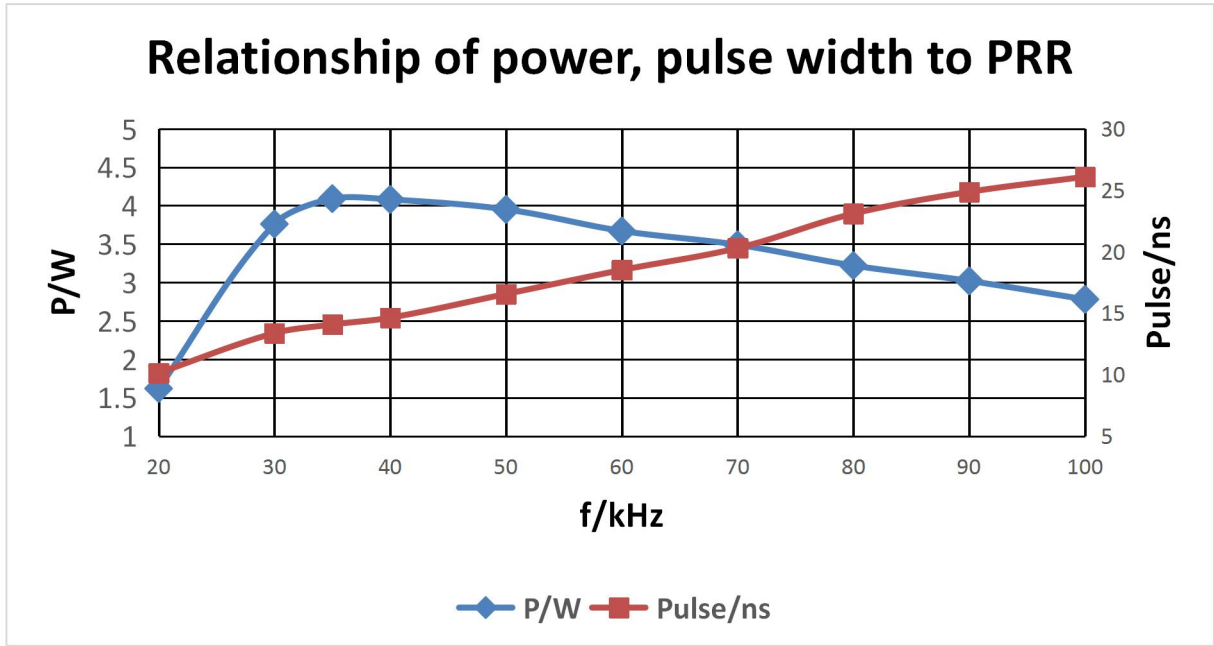


Figure 1 Diagram of 3W air cooling UV laser

2 Installation

2.1 Dimension

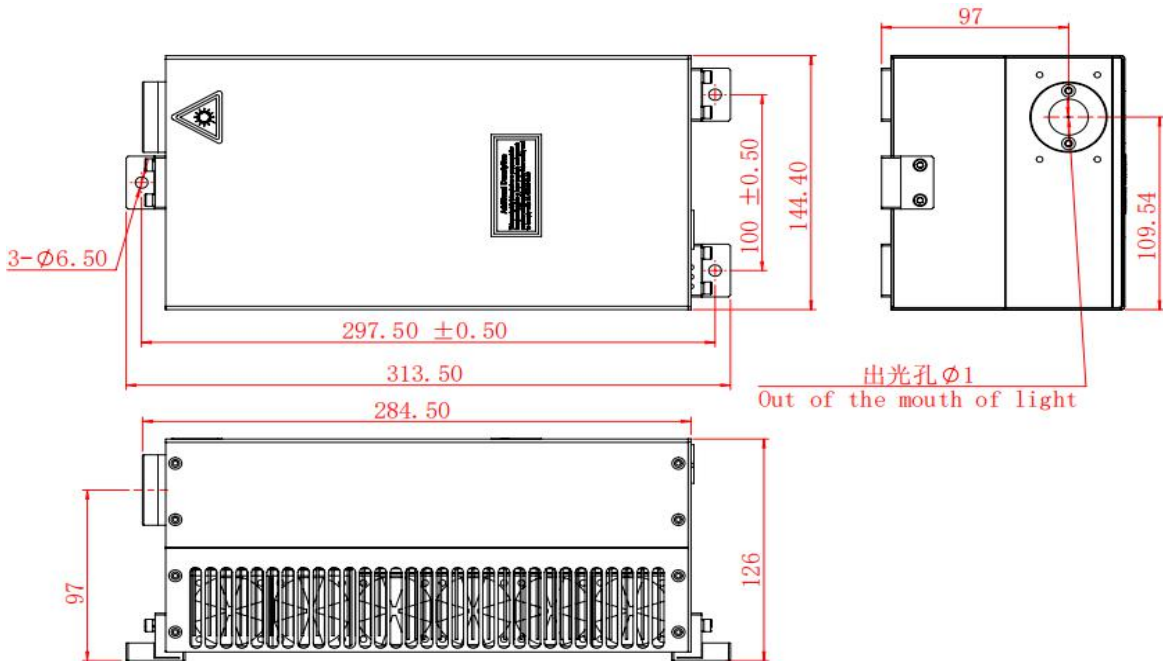


Fig.2(a) Laser installation - without beam expander

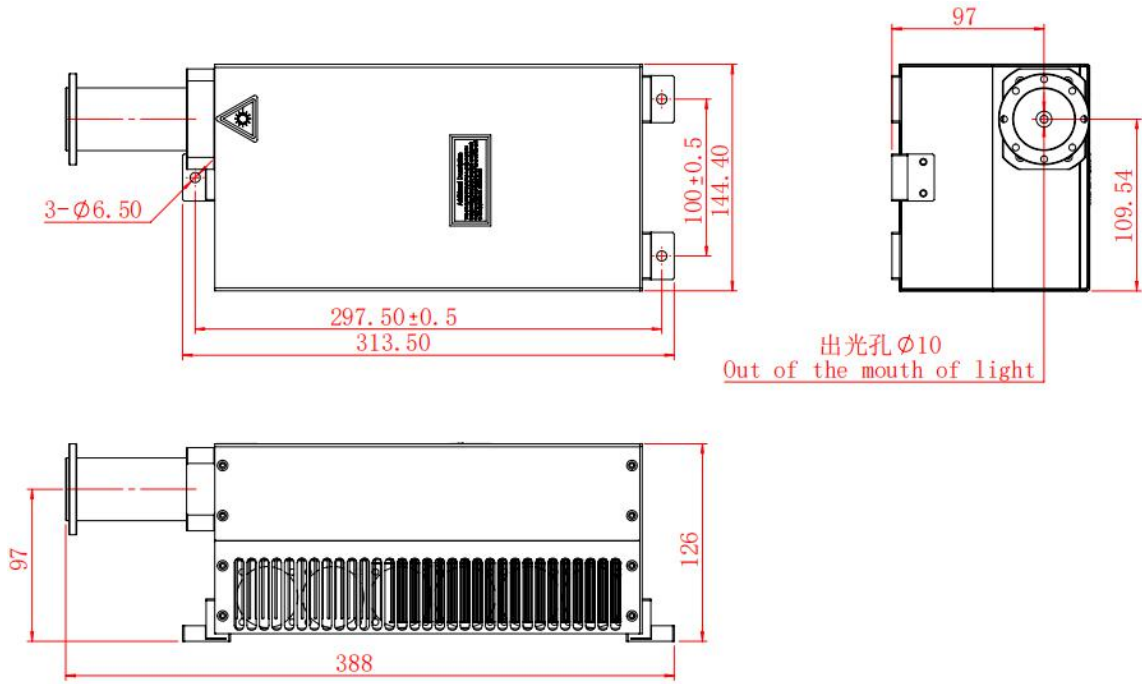


Fig.3(b) Laser installation - with beam expander

2.2 Installation

2.2.1. Fix method: use M6*20 screw to fix the laser head on the worktable by three screw holes in both besides.



Figure 4 Installation holes

2.2.2. For power connectors: Connect the 3V3 plug to the laser head and tighten the screws. The other end is connected to the switching power supply according to the positive and negative marks.

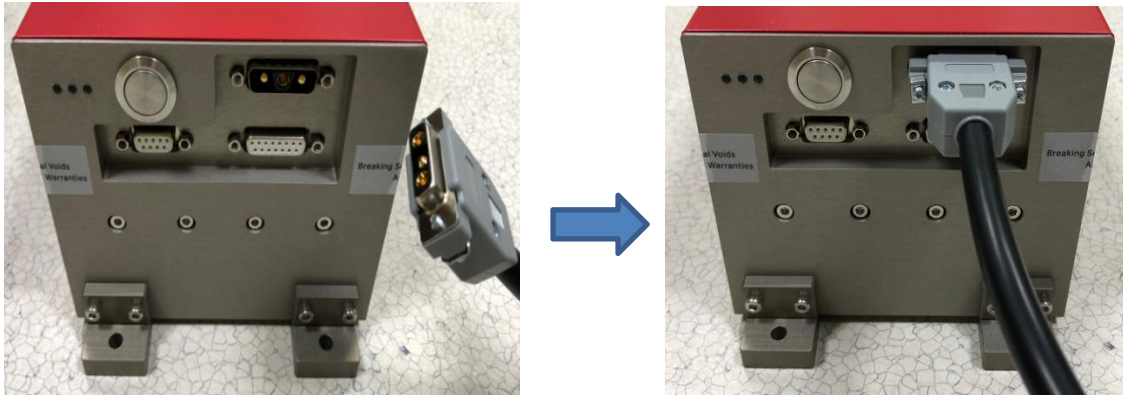


Figure 5 Power connection

2.2.3. For signal wires: Connect the DB15 signal wires to the laser, tighten the screws, and connect the adapter card at the other end.

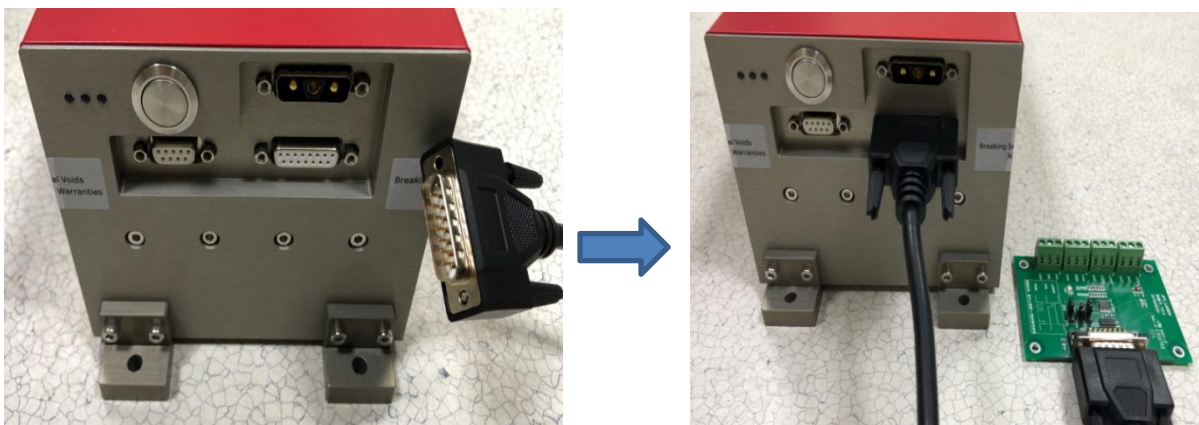


Figure 6 Control signal and adapter card

***Notice: Beam expander and installation sleeve are not covered by warranty**

3. GUI control and interface

3.1 Interface

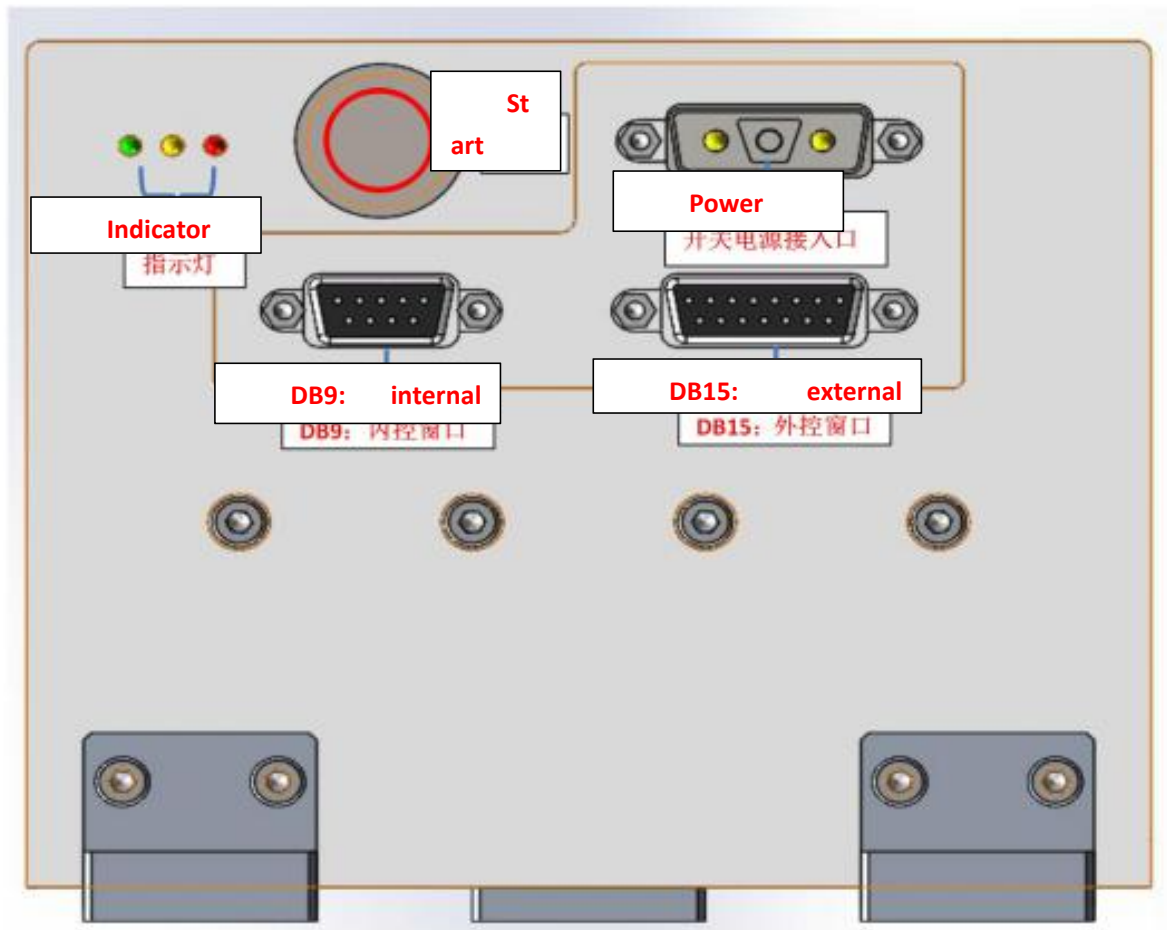


Figure 7 Laser interface

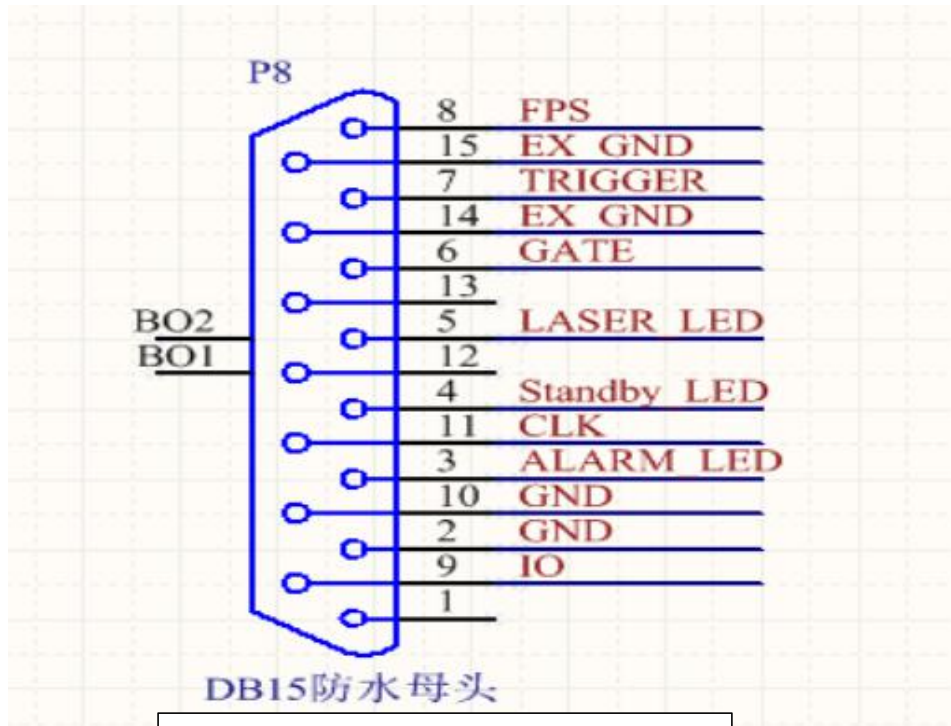
***Indicator light**

Red light Temperature alarm, when the temperature of LD is abnormal or the water temperature is abnormal, it will light up. Should cut off the power of laser immediately and find the issue.

Yellow light When the laser works well, it will show this light.

Green light The LD and laser work well.

Table 2 DB15 Pin out



DB15 water-proof plug

Pin	Type	Definition	Description	Remarks
1	Reserve	N/A	N/A	IN/A
2,10	Ground, Digit	GND	Return circuit for PIN3/PIN4/PIN5/PIN9/ PIN11	Internally
3	Output, Digit	ALARM_LED	Output the alarm signal	High level: abnormal; low level: normal. TTL level output; driving current ≤ 25mA.
4	Output, Digit	STANDBY_LED	Signal for the laser in standby state	Normally power on, the signal outputs a frequency of 1Hz, which can be indicated by an external led. TTL level output; driving current ≤ 25mA.
5	Output, Digit	LASER_LED	Signal for the laser in working state	High level: the laser is in working state (the pump current is normally on); low level: the pump current is not on. TTL

				level output; driving current $\leq 25\text{mA}$.
6	Input, Digit	GATE	Signal for switching on/off the light	External marking control card is provided. High level: indicating light; low level: pulse light. TTL level input
7	Input, Digit	TRIGGER	Modulation signal by external control	External marking control card is provided. TTL level input
8	Input, Digit	FPS	Signal for first pulse control	External marking card is provided. TTL level input
9	Input, Digit	LOAD INTERFACE_I O	Does not use. must be suspended.	Access level signal shall not exceed 3.3V
11	Input, Digit	LOAD-INTERFAC E_CLK	Does not use. must be suspended.	Access level signal shall not exceed 3.3V
12-1 3	Reserve	N/A	N/A	N/A
14-1 5	Ground, Digit	EX_GND	Return circuit for PIN6/PIN7/PIN8	External isolation ground

3.2 GUI interface

The function of GUI control is internal debugging and monitoring. All parameters have been debugged before ship out. Customers only need to ensure that the external control signals are properly connected, and can be used easily according to the correct operation.

- 1) Activate JPT.exe program, the interface will display as Figure 7

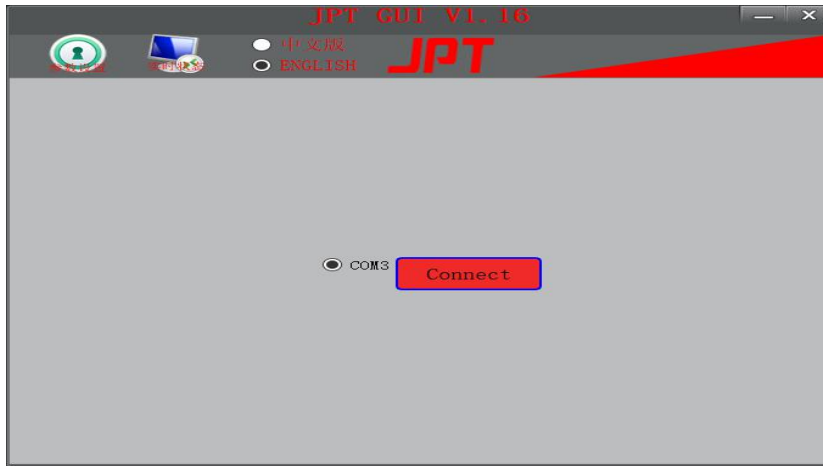


Figure 7

2) Select COM port connected with laser and click “Connect” button to enter interface 2 (Figure 8). If the connection fails, the COM port may be selected incorrectly. Reselect COM port and connect again.



Figure 8 GUI operation interface

Table 3 GUI function explanation

No.	Description
-----	-------------

1	GUI software edition number.
2	Switch button between Interface 2 and Interface 3.
3	Switch button between GUI Chinese and English version.
4	Set the duty ratio of Q Switch of laser under internal control mode to achieve power regulation.
5	Set the Q Switch frequency of laser in internal control mode, eg. “30” represents 30 kHz.
6	Set LD electricity current, unit “***/10”A, eg. “250” represents 25.0A.
7	Select Q-switch trigger mode, external control by default. External control mode denotes external input Q-switch signal: internal control mode denotes Q-switch signal generates from LD itself and the frequency and duty cycle are set by code 4 and 5.
8	On/Off Q drive.
9	On/Off LD.
10	Display LD actual current.
11	Record laser light emitting time.
12	Display LD warm up progress (Only for Lark series, switch on LD, Q under complete status).
13	Display LD1 real-time temperature.
14	Display LD2 real-time temperature.
15	Display real-time temperature of laser source cavity (MACH).
16	Display real-time temperature of electronic control box (E-MACH). (Only for Lark series).
17	Display real-time temperature of the second harmonic generation crystal (SHG).
18	Display real-time temperature of the third harmonic generation crystal (THG).
19	Q drive enable indicator light. Green-On, White-Off.
20	LD enable indicator light. Green-On, White-Off.
21	LD1 abnormal temperature warning indicator light. Red-Warning, White-Normal.
22	LD2 abnormal temperature warning indicator light. Red-Warning, White-Normal.
23	Indicator light of abnormal temperature in laser source cavity. Red-warning, White-normal.
24	Warning indicator light of abnormal laser internal communication. Red-Warning, white- Normal.
25	Warning indicator light of abnormal temperature in laser electric control box. (Only for LARK series).
26	Clock abnormal indicator light. Yellow-abnormal, white-normal.

27	Laser SN and circuit board software version number.
28	Laser usage permission. Cannot switch on LD, Q when period of validity terminated.
29	Real time display.

3) Click the "parameter setting" button to set the parameter. Before entering the parameter setting, you need to enter the access password, as shown in Figure 9



Figure 9

4) The factory password is "0-9" 6 random numbers. Click the "Enter" button to enter the password. When the password is incorrect, the following prompt appears, as shown in Figure 10.

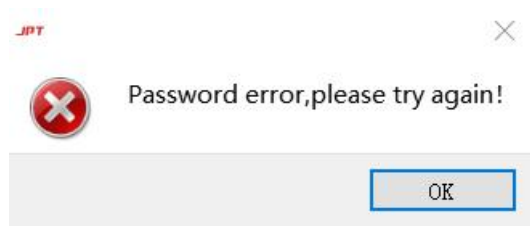


Figure 10

5) Click the "Reset Password" button to enter the password modification page. The password format is a 6-digit password with "0-9", as shown in Figure 11.

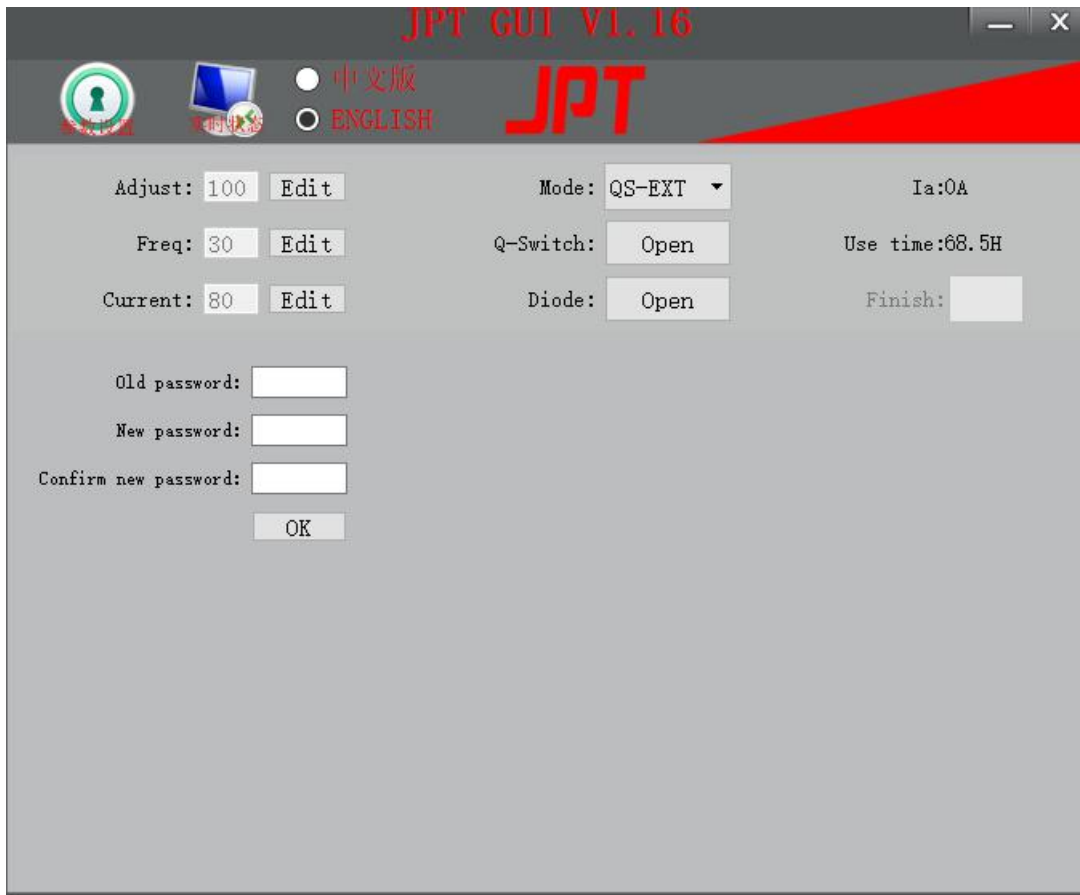


Figure 11

6) When changing the password, the following types of error prompts may appear, as shown in Figure 12. (Wrong password, new password should be more than 6 numbers...)

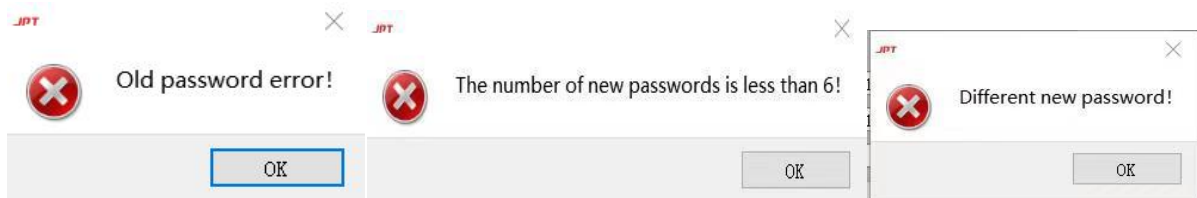


Figure 12

7) Following pop-up hint box appears when password reset successfully, as shown in figure 13.



Figure 13

8) The correct password has a memory function, it will automatically display when the password interface is opened, as shown in figure 14.



Figure 14

9) Parameter modification interface appears after entering the correct password, as shown in figure 15.

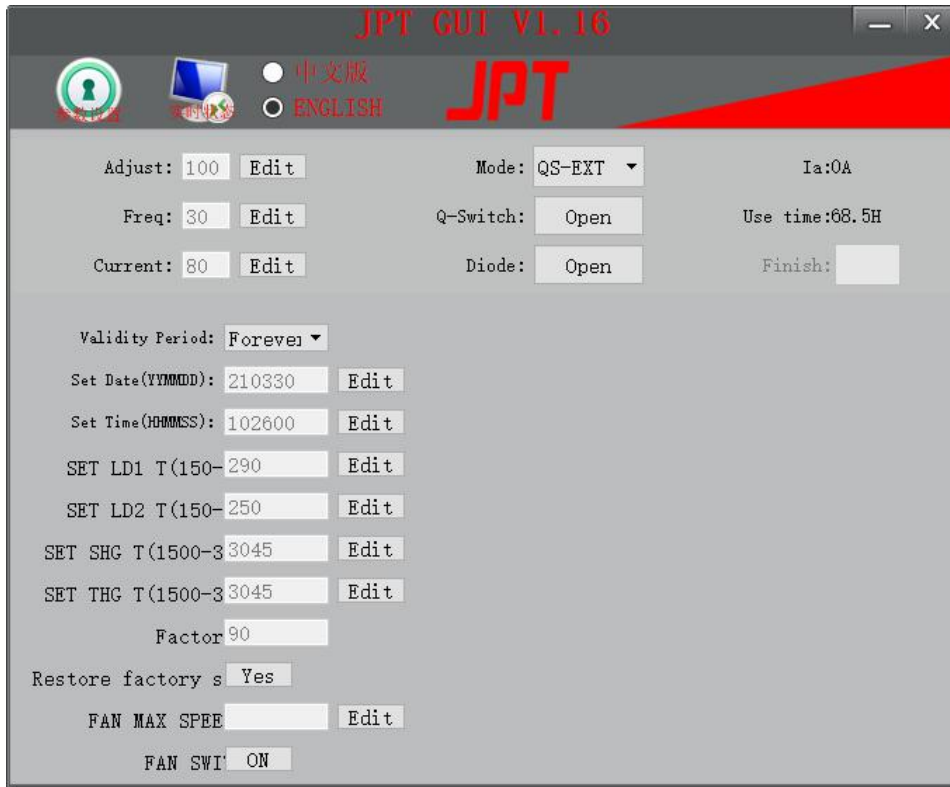


Figure 15

Table 4 GUI manual

No.	Description
1	Set the laser using time limit. LD and Q locked after expire and will not be able to emit light
2	Set date and clock, to calculate the time limit set in Number 1. Update number 1 setting effectively requires update number 2's date.
3	Time setting for current time adjustment.
4	Set LD1 constant temperature.
5	Set LD2 constant temperature.
6	Set constant temperature of second harmonic generation crystal.
7	Setting constant temperature of third harmonic generation crystal.
8	Display electric current set by default.
9	Restore current sets of parameters are the parameters by default, including duty ratio (ADJ), frequency (PRF), electric current (IS), mode switch (Mode), Q drive switch (QS), LD switch (Diode), LD1 temperature, LD2 temperature, SHG temperature, THG temperature.

Note:

1. Number 1 available setting time limit for: 0 day, 15 days, 30 days, 60 days, 90 days, 180 days, permanent.

4. Laser control

4.1 Control mode

The output control of laser is mainly controlled by GATE signal, and the output frequency and power are controlled by PWM signal, mainly by changing the frequency cycle and duty cycle of PWM.

Duty ratio: the ratio of the high level holding time to the time of the clock cycle in the output PWM signal. For example, if the frequency of a PWM is 50KHZ, then its clock cycle is 20 μ s. If the time of high level is 6 μ s, then the time of low level is 14 μ s, then the duty cycle is 6:20, that is to say, the duty cycle of PWM is 3:10.

At a certain frequency, the ADJUST = 100% corresponds to the high level of the laser PWM signal when it is 1 μ s, which represents the maximum power, the minimum pulse width and the highest peak power at that frequency. Increasing the high level pulse width (i.e. reducing the ADJUST value), the power of the flat rate laser decreases and the optical pulse width increases.

Through the frequency and duty ratio of the PWM signal (the signal driven by Q), the frequency, power and pulse width of the optical pulse can be controlled.

4.2 Control timing

The laser pulse can be controlled by internal control mode and external control mode. Mode selection is realized through mode switching of GUI interface.

Internal control mode: continuously output the laser pulse with the frequency and duty ratio set on GUI interface.

External control mode: output laser pulse with external given frequency and duty cycle signal.

In internal control mode or external control mode, LD and Q drive need to be turned on to output laser pulse normally.

4.2.1. External control mode signal sequence.

To realize the laser pulse output in the external control mode of the laser, it is necessary to connect the correct signal sequence in the DB15 of the laser, and the signal sequence is shown in Figure 9

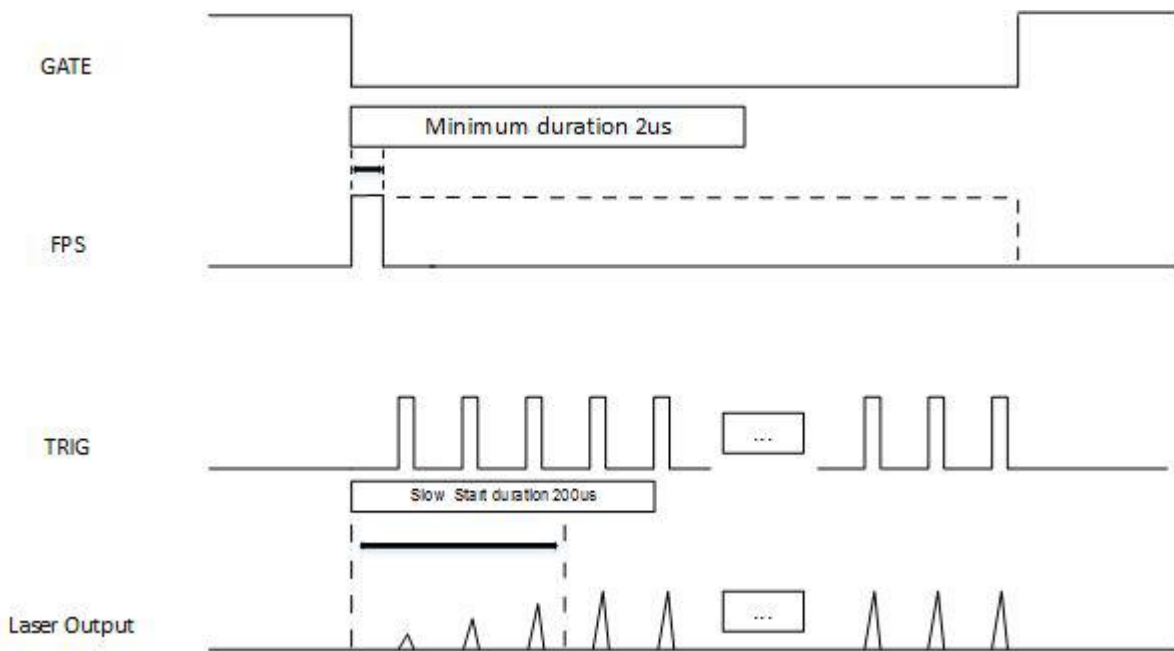


Figure 9 Control Sequence

Control Sequence description:

① Gate is the gate control signal, and the low level (light output) is effective, corresponding to the laser on the switching board.

② Trig is the frequency signal corresponding to PWM on the adapter board.

③ FPS is the first pulse suppression signal, and the high-level time is more than 2 μ s. When FPS signal is used, the corresponding slow start duration is 150 μ s.

④ When the first pulse suppression function is not needed, only GATE signal and TRIG signal need to be input.

⑤ All control signals are TTL level.

* For the use of different control card, we have made special adapter cards. Customers can get the sequence (same as Figure 9 showed) for laser control through adapter cards.

4.3 Adapter card connection

4.3.1. Connect instruction

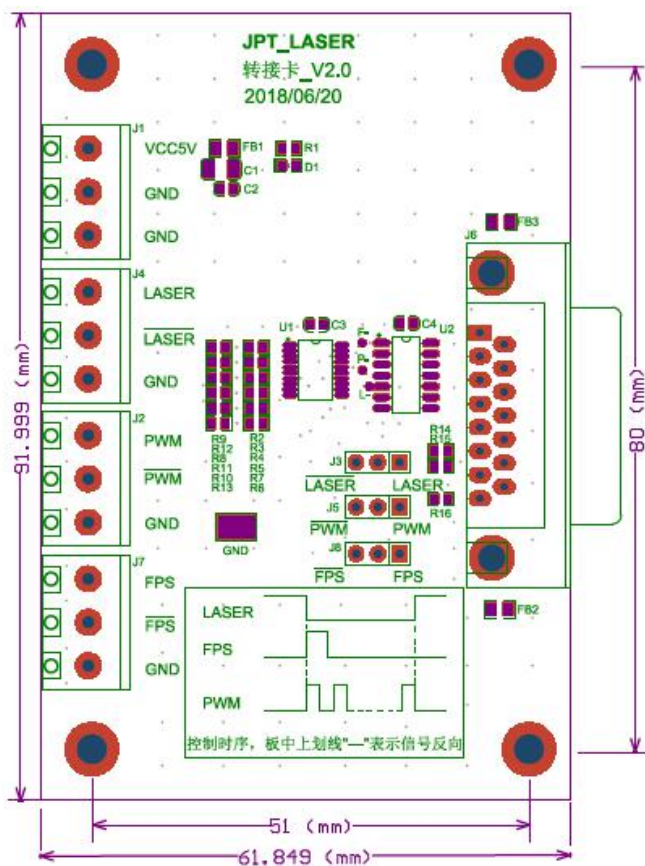


Figure 10 adapter card

- ① Laser Control Interface of Control Card Connected by Three Joints on the Left
- ② The right DB15 plug is connected to the corresponding interface of the laser head.

Method:

- adapter card +5V to control card VCC +5V; adapter card GND to marking control card GND.

- “Laser” on adapter card means the output laser signal is the same polarity as the GATE signal shown in Figure 9, “ $\overline{\text{Laser}}$ ” means the output laser signal is the converse polarity as the GATE signal shown in Figure 9. When the laser on signal to “laser”, use the short cap short circuit PIN2 and PIN3 of J3. When the laser on signal to “ $\overline{\text{Laser}}$ ”, use the short cap short circuit PIN1 and PIN2 of J3.
- “PWM” on adapter card means the output modulation signal is the same polarity as the TRIG signal shown in Figure 9, “ $\overline{\text{PWM}}$ ” means the output modulation signal is the converse polarity as the TRIG signal shown in Figure 9. When the modulation signal to “PWM”, use the short cap short circuit PIN2 and PIN3 of J5. When the modulation signal to “ $\overline{\text{PWM}}$ ”, use the short cap short circuit PIN1 and PIN2 of J5.
- “FPS” on adapter card means the output first pulse signal is the same polarity as the FPS signal shown in Figure 9, “ $\overline{\text{FPS}}$ ” means the output first pulse signal is the converse polarity as the FPS signal shown in Figure 9. When the first pulse killer signal to “FPS”, use the short cap short circuit PIN2 and PIN3 of J8. When the first pulse killer signal to “ $\overline{\text{FPS}}$ ”, use the short cap short circuit PIN1 and PIN2 of J8. When the FPS function is not enabling, please use short cap to connect 1,2 pins of J8.

4.3.2 Control card connection

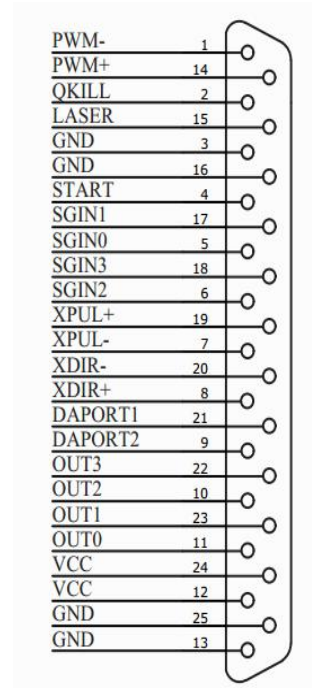
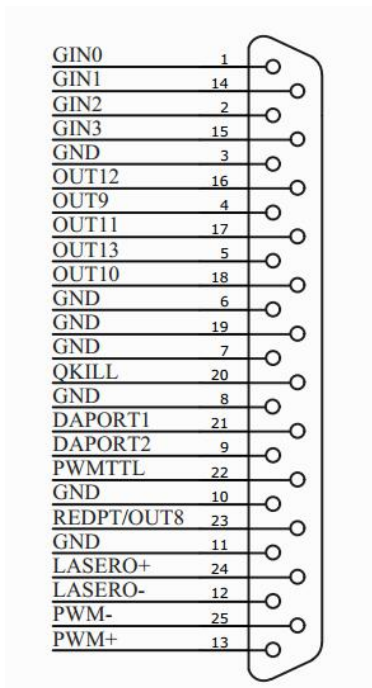


Figure 11 Type A of JCZ card

PIN12 to LASER, short circuit PIN2 and PIN3 of J3
 PIN22 to PWM, short circuit PIN2 and PIN3 of J5
 PIN 20 to FPS, short circuit PIN2 and PIN3 of J8

Figure 12 Type B of JCZ card

PIN15 to LASER, short circuit PIN1 and PIN2 of J3
 PIN14 to PWM, short circuit PIN2 and PIN3 of J5
 PIN 2 to FPS, short circuit PIN2 and PIN3 of J8

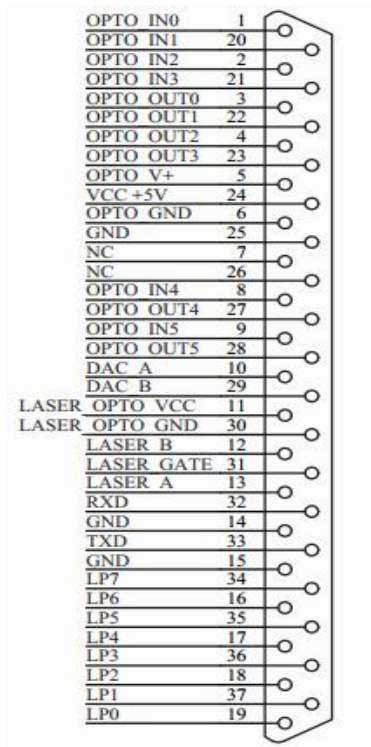


Figure 13 SAMlight interface

PIN31 to LASER, short circuit PIN1 and PIN2 of J3
 PIN13 to PWM, short circuit PIN2 and PIN3 of J5
 PIN 9 to FPS, short circuit PIN2 and PIN3 of J8

5. Operation

5.1 Turn on laser

5.1.1. Check laser outlook condition. If any particle/sticker blocks output port, please remove it.

5.1.2. Check whether the laser power interface and the switch power output line are normal and locked (if the input current is large, it must be locked), and check whether the signal line between the marking machine and the laser is connected normally and locked.

5.1.3. 220V is connected to the switch power supply, and the button switch is pressed (before this operation, it is necessary to connect the marking control card, and ensure that the control card has been powered to prevent laser damage). Confirm that the working indicator is normal, and then mark after the laser is stable.

5.1.4. When the laser works, the fan will adjust the speed according to the actual ambient temperature.

***When the laser temperature is abnormal, the alarm protection will occur; at this time, please check whether the fan is working normally or whether the power control wiring is normal.**

5.2 Turn off laser

5.2.1. Stop the processing.

5.2.2. Turn off key switch.

5.2.3. Turn off power supply.

5.3 Caution

5.3.1. Wear Laser safety glasses all the time.

5.3.2. Stop marking first, and then turn off the laser.

6. Common problems

Common problems	Causes and Solutions
Improper parameter setting	Cause: when the frequency is lower than 20kHz, the light becomes weak. At this time, the single pulse energy is very large, which is easy to damage the laser. When the frequency is higher than 150kHz, the light is particularly weak.

	<p>Solution: set the frequency in the range of 20-150khz.</p> <hr/> <p>Cause: the pulse length should be less than $\frac{1}{f}$, the laser will not emit light beyond this value.</p> <p>Solution: set the pulse length from $1\mu\text{s}$ to $\frac{1}{f}\mu\text{s}$.</p>
<p>Temperature alarm</p>	<p>Cause: if the temperature of laser cavity exceeds the range of 0-50 °C, the laser will be automatically protected and an alarm will be given at the same time.</p> <p>Solution: turn off the power, check whether the ambient temperature is within the range of 0-40 °C, and then turn on the laser.</p>
<p>No laser and indicator light</p>	<p>Cause: the button switch is not turned on or the power supply interface is loose, or the DB15 data line connection is loose.</p> <p>Solution: tighten the fastening screw of the power supply plug and turn on the button switch.</p>
<p>With laser, without indicator light</p>	<p>Cause: the laser line of the adapter card is not connected or wrongly connected (be sure to define the connection according to the control card).</p> <p>Solution: check whether the laser wiring is good, and connect the laser wire.</p>
<p>With indicator light, without laser</p>	<p>Cause: the PWM line is not connected or wrongly connected.</p> <p>Solution: check whether the PWM wiring of the adapter card is good, and connect the PWM wire.</p>
<p>Beam is not circular, with gap or cavity</p>	<p>Cause: the beam expander is dirty or not adjusted properly.</p>

	Solution: check whether the beam expander is in good condition or readjust its position.
--	-------------------------------------------------------------------------------------------------

This manual is for user operation. Official service and warranty will follow the actual sales contract and terms and condition. Thanks for your support.