



Pulsed Fiber Laser

YDFLP-120/200/300-M8-S-W-V2

USER MANUAL

Version 01



JPT

深圳市杰普特光电股份有限公司
SHENZHEN JPT OPTO-ELECTRONICS CO., LTD.

Safety information

Please read this user manual carefully before using this product.

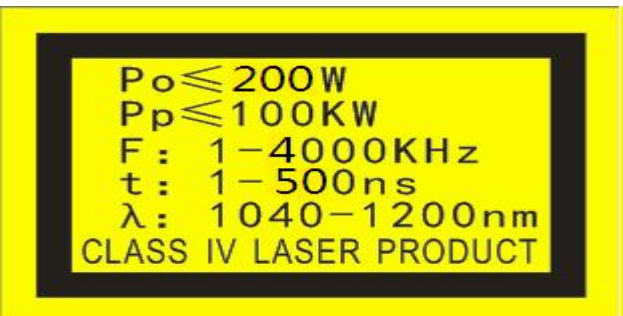
In this User's Manual we have provided you with important safety instructions for the product, as well as other reference information. To ensure your personal safety when operating this product and to achieve optimum product performance, please follow the cautions and warnings below, as well as other relevant operating practices within this manual.

- Before switching on the 48V AC power supply, please check the power supply voltage and the positive and negative power supply connections to ensure that they are correct before switching on the power supply. Connecting the power supply incorrectly may cause damage to the laser.
- Please do not disassemble this equipment without permission. All maintenance and servicing can only be carried out within JPT and upgrades can be carried out on site by technical support staff. If you disassemble this equipment without permission, the damage caused will not be covered by the warranty.
- The output wavelength of this equipment is 1064nm (invisible light), the average output power is more than 300W (peak power is more than 170KW), which belongs to Class IV laser, not only is it extremely hazardous to the eyes, but it will also burn the skin, and its reflected and scattered light may also cause harm to the human body, therefore, please wear OD4+ grade laser protective glasses throughout the entire process of using the laser (see Figure 1 for details).
- **Note:** Even when operating at 0% power setting, there will still be approximately 1W average power laser output at the isolator output.



Figure 1 Laser Safety Goggle

Table 1 Safety labelling of lasers

Label Pictures	Tagging Information
	Laser labels (located on the laser cover, near the fiber output)
	Usage Warning (located on the laser cover)
	Parameter information (located on the upper cover of the laser module)

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1. Product description

1.1 Product Description

JPT's pulsed fiber laser adopts the Master Oscillator Power Amplifier (MOPA) structure, in which the main oscillator uses the semiconductor laser as the seed source, and the power amplification is achieved by the travelling wave fiber amplifier. This MOPA fiber laser features independently adjustable pulse width and frequency, which can maintain a high and stable peak power output even when the pulse width and frequency are changed, providing an ideal light source for industrial laser marking, precision machining and other applications.

This type of fiber laser adopts the way of pumping the fiber-coupled output semiconductor laser, which has higher energy conversion efficiency; and the laser adopts the air-cooling system, which has a more compact heat dissipation structure and is more compact and portable; and the integrated all-fiber design makes the system maintenance-free and easy for customers to use.

JPT's pulsed fiber laser adopts the standard DB25 interface and uses 48V 12/20/30A DC power supply, adopting the standard DB25 interface method with excellent compatibility. Compared with similar products, JPT's pulsed fiber laser can adjust the pulse width and frequency within a certain range and can maintain a stable high peak power output, which is particularly advantageous in high-speed marking applications.

1.2 List of actual configurations

Please refer to the included list according to Table 2.

Table 2 List of fiber laser configurations

Item	Quantity
fiber laser	1 unit
Test Report	1 copy
power cable	1 unit
Isolator Dust Cap	1 unit
Laser use precautions table	1 copy
Configuration list	1 copy

1.3 Environmental requirements and precautions for use

Failure to use this fiber laser as specified in this User's Manual may result in a reduction in the reliability and service life of the product. Therefore, please read the following requirements and precautions carefully and refer to the relevant specifications when using the product.

1) The laser is powered by 48V DC, incorrect connection of the power supply may cause the laser to malfunction and not work!

2) When installing the laser, make sure that the bending diameter of the fiber cable is more than 15cm, if the fiber cable is not coiled according to the requirements, it may lead to abnormal light output or damage to the laser and not work properly!

3) Because of the ordinary K9 glass optical field mirror in the medium and high power application scenarios will appear "thermal lens effect", resulting in the processing of materials, focus drift, spot size inconsistency or unstable light phenomenon. **Users are recommended to use quartz or composite material optical field mirrors** with the laser.

4) The laser requires a high degree of environmental cleanliness, please handle the collimated output isolator carefully during the use or moving of the laser to prevent dust or other contamination, and cover the isolator output port with a protective cover when the laser is not in operation. Dust **on the output side of the isolator may cause the lens to heat up and be damaged, thus causing laser output power attenuation;**

5) Before mounting/dismounting the collimated output isolator, etc., check to make sure that the laser is powered off;

6) Do not look directly at the laser output head, and it is recommended that laser

protective eyewear be worn throughout operation!

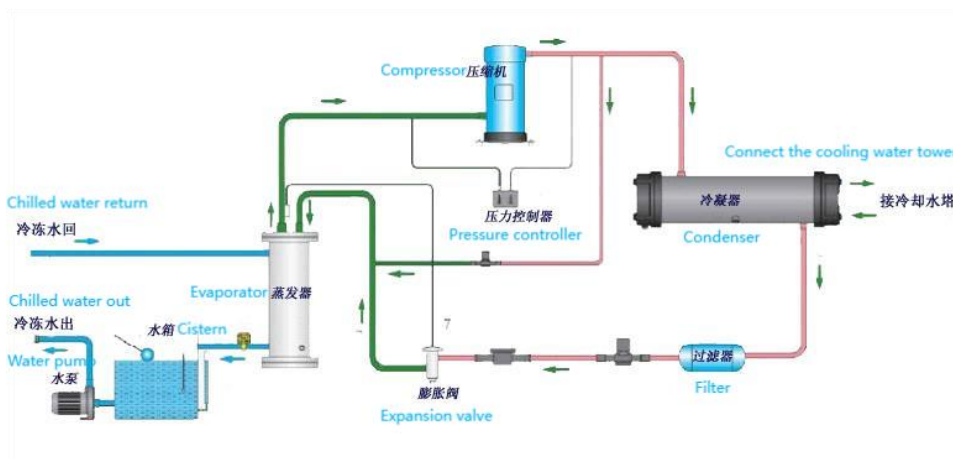
7) Model YDFLP-120/200/300-M8 laser pulse width has 14 preset selectable modes: Continuous、6ns、9ns、12ns、14ns、16ns、20ns、30ns、45ns、60ns、80ns、100ns、150ns、200ns. For other pulse width modes, please contact the factory for customization.

1.4 Introduction to water-cooled systems

1.4.1 Introduction to water cooling systems

Fiber laser system is water-cooled equipment, the cooling water circulation system has strict requirements, unsuitable water-cooling system will cause the laser system cannot be used normally, serious damage will result.

Chiller is a kind of water cooling equipment, is able to provide constant temperature, constant flow, constant pressure cooling equipment. The principle of the chiller is to inject a certain amount of water into the internal tank of the machine, through the chiller refrigeration system to cool the water, and then there is a water pump inside the machine will be low-temperature frozen water injected into the equipment need to be cooled, frozen water will be taken away from the heat inside the machine, the hot water will be high temperature again back to the tank for cooling, and so on the cycle of exchange of cooling, to achieve the effect of cooling for the equipment.



Water cooler selection:

1. according to the laser manual configuration to select the appropriate cooling capacity of the water cooler;

2. High precision of temperature control, preferably between $\pm 0.5^{\circ}\text{C} \sim \pm 1.0^{\circ}\text{C}$;

◆ The nominal cooling capacity and flow rate of the water cooler corresponding to the

laser are as follows:

Range	Nominal cooling capacity
120W	480W
200W	800W
300W	1200W

◆ As the Jabot pulsed fiber laser uses water as a cooling medium, the operating temperature of our lasers needs to be at the optimum working water temperature.

1. Water heater water temperature setting recommendations:

See label on machine for optimum operating temperature

Laser working water temperature range: optimum water temperature $\pm 3^{\circ}\text{C}$

2. Frost protection measures:

- 1) If there will never be a local power outage, the water cooler will not be shut down at night;
- 2) Drain the coolant from the laser, laser output head, and water cooler after each day's use;
- 3) Add a percentage of antifreeze mixed with pure water as coolant.

1.4.2 Precautions for water-cooled systems

- Cooling water needs to be deionized pure water, distilled pure water can also be used;
- To prevent bacteria from growing and causing damage to the water circuit, it is recommended that a percentage of anhydrous ethanol solution be added when filling up pure water;
- Water coolers require regular water changes, the normal cycle is half a month to a month, using deionized pure water or purified water;
- When the temperature is too low, you need to add antifreeze (customers are advised to use the brand: Clariant); mix it with a certain proportion (antifreeze: water), and then after the winter, you must clean the pipeline with pure water and resume the use of pure water or deionized pure water as a coolant, so as to prevent corrosion of the water circuit;
- Do not connect the water inlet and outlet ports in reverse, as this may cause irreparable damage to the laser;
- When shutting down for a long period of time, be sure to drain the cooling water inside the cooling system and inside the laser system, otherwise irreparable damage may be caused to the laser.

1.5 Naming rules for YDFLP series

Table 3 Naming rules for pulsed lasers

YDFLP - X - XX - XX - X - X

1 2 3 4 5 6

1. Basic product properties: Ytterbium doped pulsed fiber laser (YDFLP)

2. Product Type

3. output power

4 Pulse Characteristics: M-Series, Adjustable Pulse Width

LP Series, Fixed Pulse Width

5. Fiber properties: M: Near single mode fiber, $M^2 < 1.4$

L: Few-mode fiber, $M^2 < 1.8$

H: Multimode fiber, $M^2 > 2.5$

6. Additional features: R: Built-in red light

Example: YDFLP-E-50-LP-L: 50W average power, E version of LP series, less mode fiber, conventional laser.

YDFLP-80-M7-M-R: Average power of 80W, M7 series, near single mode fiber, built-in laser with red light.

YDFLP-200-M7-H-R: Average power of 200W, M7 series, multi-mode fiber, built-in laser with red light.

1.6 Technical parameters

Table 4 Laser Parameter Specifications

		120-M8-S-W-V2	200-M8-S-W-V2	300-M8-S-W-V2
M ²		<1.5		
Average output power	W	>120	>200	>300
Max pulse energy	mJ	0.96 mJ@12ns	0.95 mJ@12ns	0.86 mJ@12ns
Adjustable frequency range	kHz	1-4000		
Pulse width	ns	6-200		
Output power instability	%	<5		
Cooling method		Water cooling		
Supply Voltage	V AC	48		
Max power consumption	W	< 580	< 960	< 1440
Supply current	A	> 12	> 20	> 30
Center wavelength	nm	1064		
Spectral width @ 3dB	nm	<20		
Polarization direction		Random		
Anti-high-reflective		Yes		
Beam diameter	mm	3±0.5 or 10.5±1		
Power Adjustment Range	%	0 - 100		
Operating Temperature Range	°C	10 - 40		
Water cooler temperature range	°C	Optimum water temperature ±3		
Storage temperature range	°C	-10 - 60		
Laser Size	mm	411*205*90		
Weight	kg	Net: 8.35 Gross: 9.2		
Package size	mm	502*297*184		

Table 5 Laser power down frequency values (kHz)

Pulse width/ns	120W M8 frequency/kHz	200W M8 frequency/kHz	300W M8 frequency/kHz	Maximum frequency/kHz
1	CW	CW	CW	/
6	210	360	540	4MHz
9	160	280	420	
12	125	210	345	3MHz
14	120	200	315	
16	115	195	295	
20	110	180	270	
30	90	170	255	
45	80	165	250	2MHz
60	150	250	375	
80	150	250	375	
100	150	250	375	1MHz
150	150	250	375	
200	150	250	375	

*Above the reduced power frequency is the full power output range of the laser, and below the reduced power frequency is the reduced power output range of the laser, i.e., the laser will synchronously reduce the output power when the reduced power frequency is below in order to protect the laser, and the laser marking frequency corresponds to the change of the output power as shown in the following figure:

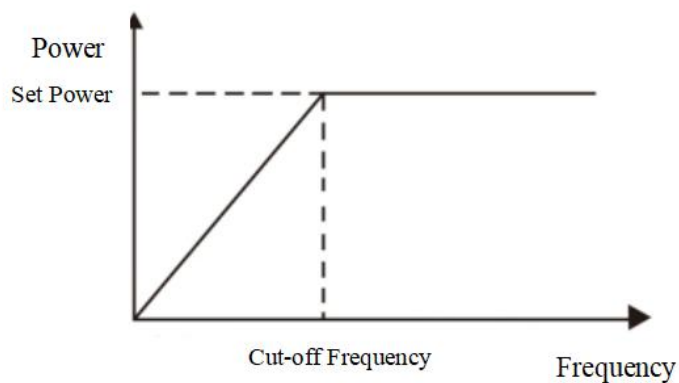


Fig. 2 Reduced power frequency corresponding to output power variation

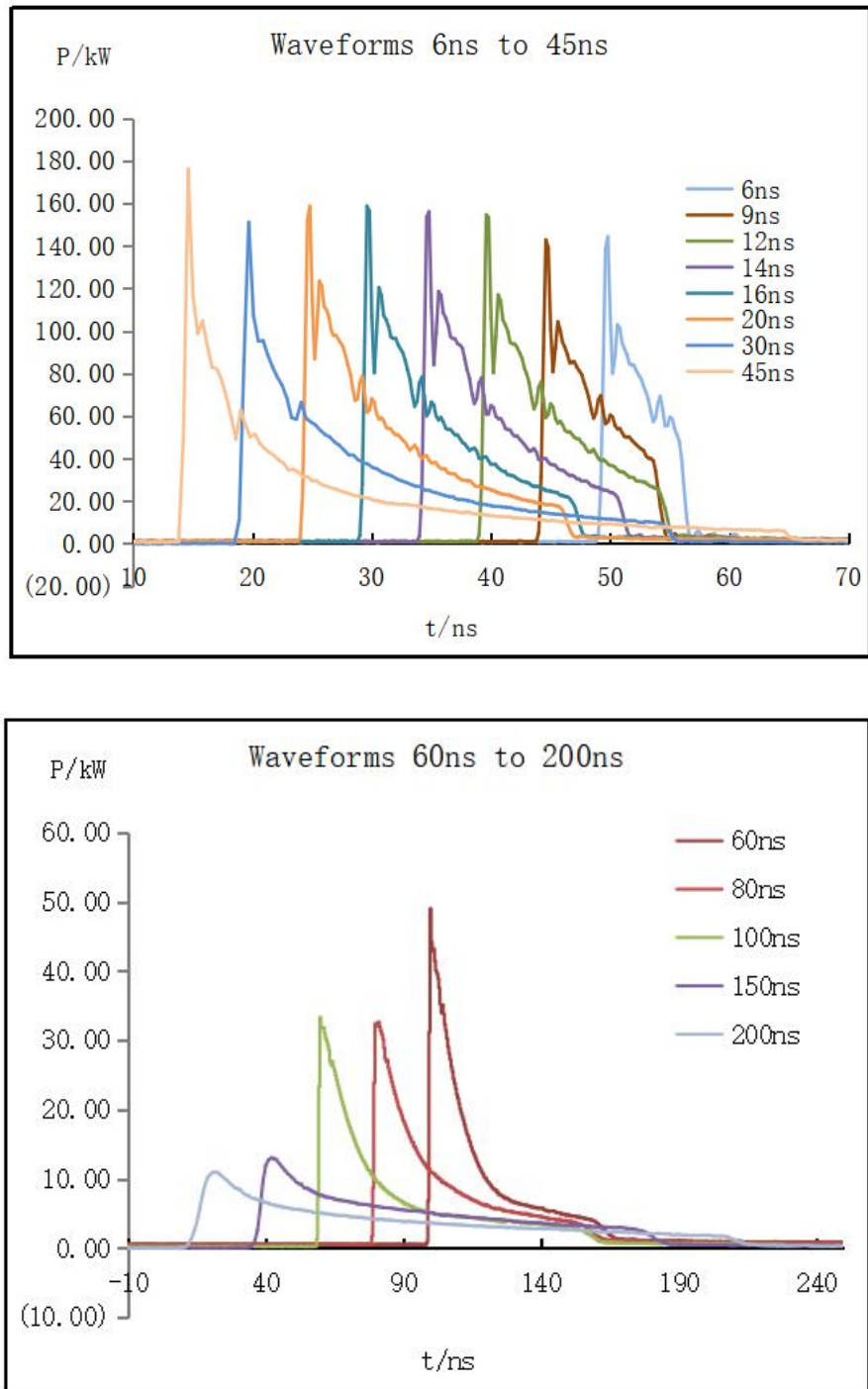


Fig. 3 YDFLP-120/200/300-M8 Output Waveform Curves

1.7 Mounting Dimension Drawing

YDFLP-120/200/300-M8-S-R-V2 Dimensions

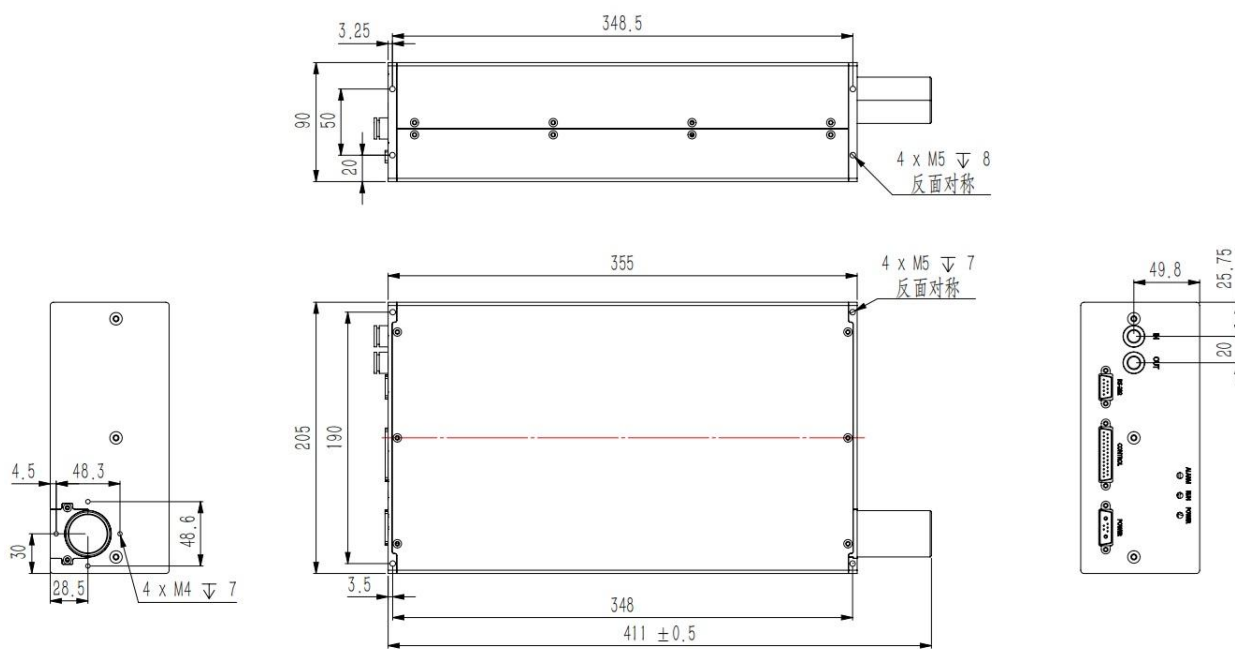


Figure 4(a) YDFLP-120/200/300-M8-S-R-V2 laser external dimensions (unit: mm)

2. Laser interface definition

2.1 Power Cord and Interface Installation

1) Secure the laser module to the bracket, taking care to keep the laser well ventilated.

2) Connect the power cord to a 48V DC power supply and make sure that the DC power supply can provide sufficient output power. Please pay attention to the polarity of the power cord when connecting. The red "48V+" of the power cord is the positive terminal of 48V DC, the black "48V-" is the negative terminal of 48V DC, and the yellow-green "PE" is the grounding wire of the chassis.

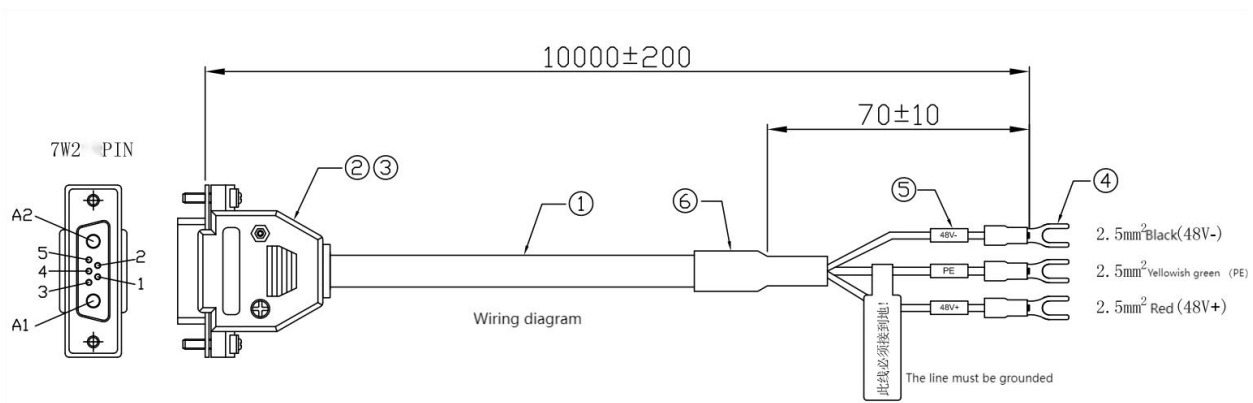


Figure 5 Schematic diagram of power supply cord

3) After confirming that the control interface of the external controller is compatible with the laser, connect the control cable to the laser control interface and **fix the lock**.

2.2 RS-232 control interface

The RS-232 control interface of the laser can be used to connect to a computer or a red card. After the interface is connected, the user can monitor and control the laser using GUI software, serial commands, or a red card, and each pin of the control interface is defined as follows:

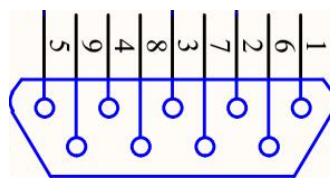


Figure 6 RS232 interface DB9

Table 6 RS-232 Interface Definitions

pinout	descriptions
1, 4, 6-9	connectionless
2	RxD laser reception
3	TxD laser transmission
5	GND

2.3 DB25 control interface

The DB25 control interface of the laser is generally used to connect the marking control board. The pins of the control interface are defined as follows:

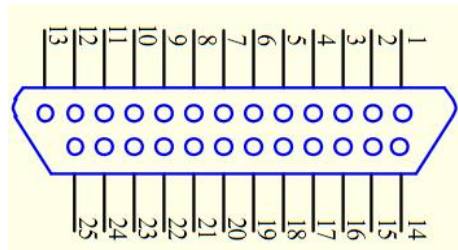


Figure 7 Control interface DB25

Table 7 Laser DB25 Interface Definitions

DB25 PIN#	Definition
1-8	IP0-IP7 power control
9	Power latch signal, rising edge active (this can be enabled in the GUI)
10-15	GND Note: Pins 10-15 are already connected to each other inside the laser, and the GND of the marking card is connected to at least one of these pins.
16, 21	Laser feedback signal Description: 16 is low, 21 is high: normal 16 is low, 21 is low: laser temperature alarm
19	Laser PA open signal Description: high level is on, low level is off

20	Frequency Modulated Signal, Square Wave
23	emergency stop Description: high level normal, low level emergency stop effective (this function can be enabled in the GUI) The emergency stop signal is low and then high, and the rising edge of MO needs to be detected before the light can come back on.
22	Red light enable (laser and red light are mutually exclusive, red light has priority *Note 2) Pulse Width Adjustment Enable (please refer to the Pulse Width Control section below for specific control methods) High for on, low for off
18	MO switch signal Description: High level is ON, low level is OFF.
17, 24, 25	Reserved, not connected

Note 1: Voltage amplitude requirements for DB25 control interface: high level range $>4.6\text{V}$, $<5.4\text{V}$; low level range $\geq 0\text{V}$, $<0.5\text{V}$.

Note 2: The factory default is red light priority mode, the priority level of red light PIN22 signal is higher than that of MO and PA signals, when PIN22 signal is high, MO and PA signals will be automatically shut down internally, and it is necessary to restart MO and PA after the PIN22 signal is low in order to come out of the laser; you can set up the priority mode in the GUI software (please read the "Introduction to the Control Functions of 3.1.2").

PIN 1-8 Power Control

The current of the pump laser diode, i.e. the laser power control mode, is regulated by setting the combination of TTL signals from PIN1~8 of the DB25 interface. Through the PIN1~8 pins can be set to combine the code in the range of 0~255, which corresponds to the power output of 0%~100% (the actual optical power output may not be linearly related to these settings). The specific settings can be referred to the example in Table 8:

Table 8 Examples of laser power settings

	Setting 1	Setting 2	Setting 3	Setting 4
PIN 1	0	0	0	0
PIN 2	0	0	0	0
PIN 3	0	0	0	0
PIN 4	0	0	0	0
PIN 5	0	0	0	1
PIN 6	0	0	1	1
PIN 7	0	1	1	1
PIN 8	1	1	1	1
amps	~50 %	~75 %	~87.5 %	~93.75 %

PIN 18-20 DB25 Control Timing

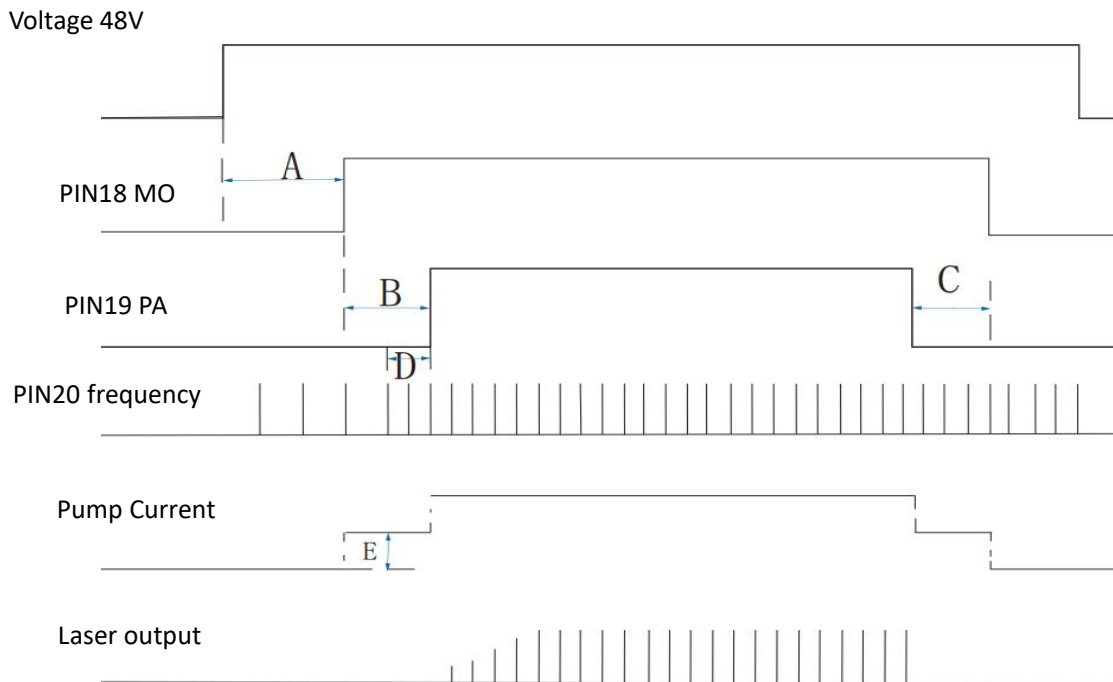


Fig. 8 DB25 control on light timing diagram

- A System initialization time: 12 seconds after the laser is powered up before the input signal can be received.
- B MO and PA signal delay: $\geq 4\text{ms}$.
- C Length of time for PA to advance MO off when switching off light: $\geq 0\text{ms}$.
- D Acquisition position of the frequency value in the internal frequency mode: the length of one complete frequency cycle before the PA turns on the light.
- E Level 2 Simmer value: Controls the height of the first pulse, which can be adjusted via the GUI (laser's accompanying measurement and control software).

Laser system self-lock: A state in which the laser stops receiving commands for reasons of self-protection and protection of other equipment when the laser receives abnormal detection signals (e.g., frequency signal $<1\text{kHz}$, low supply voltage, etc.). To recover, please restart the laser (re-power on the laser).

PIN 2, 3, 22 Pulse width control

The PIN2, PIN3 and PIN22 pins of the DB25 control interface are not only used for the basic control of the laser, but also for the laser pulse width control function. Table 9 is a description of the M8 laser pulse width control pins and signals.

Table 9 Laser Pulse Width Control Pin and Signal Descriptions

PIN.	name (of a thing)	descriptions
2	serial input	Serial input to the laser, set data bits synchronized with the rising edge of the serial clock
3	serial clock	Serial digital clock, $8\text{kHz} \leq \text{clock frequency} \leq 10\text{kHz}$, 10kHz recommended
22	Pulse Width Adjustment Enable	High: Enable, then the pulse width can be set by PIN2 and PIN3. Low or Not Connected: Not Enabled

① Pulse Width Control Command

➤ Commands are sent to the laser via the serial input on pin PIN2 of the DB25 control interface and a clock signal is sent to pin PIN3. The command description will be transmitted in binary form, first transmitting its highest valid bit.

➤ The structure of the commands transmitted to the laser by the user is shown below:



➤ 0xA5 (A5h) is the activation pulse width control byte, and 0xA5 and all subsequent data bytes are input to the PIN2 pin serial input.

➤ The data length of the input laser shall be a defined 4-bit byte.

➤ The first byte of the instruction code shall be encoded as 0x01.

➤ The PIN22 signal needs to be opened 10us in advance before adjusting the PIN2 and PIN3 signals; after the pulse width is adjusted, it needs to be delayed at the PIN2 and PIN3 signals for 10us before switching off the PIN22 signal (as shown in Figure 12).

➤ All instructions are designed to start with identification byte 0xA5.

➤ PIN19 needs to be set low before using the pulse width control function.

② Pulse width control command code

Table 10 Laser Pulse Width Control Command Codes

directives	command code	descriptions
Setting the pulse width	0x01	Set pulse width (ns)

The time required for the laser to complete the initialization of the pulse width is less than 50ms.

Note: If the command code sends a 3-bit 0x01 command, it will not be accepted by the laser.

③ Pulse Width Control Timing

- The following figure shows an example of the sampling timing diagram for setting the pulse width to 200ns, using the instruction 0x01 byte in the following order:

Example: 0XA5→0X01→0x00→0XC8

0XA5: represents activate pulse width control instruction 0X01: represents set pulse width instruction

0x00 and 0xC8: represents setting the pulse width to 200ns.

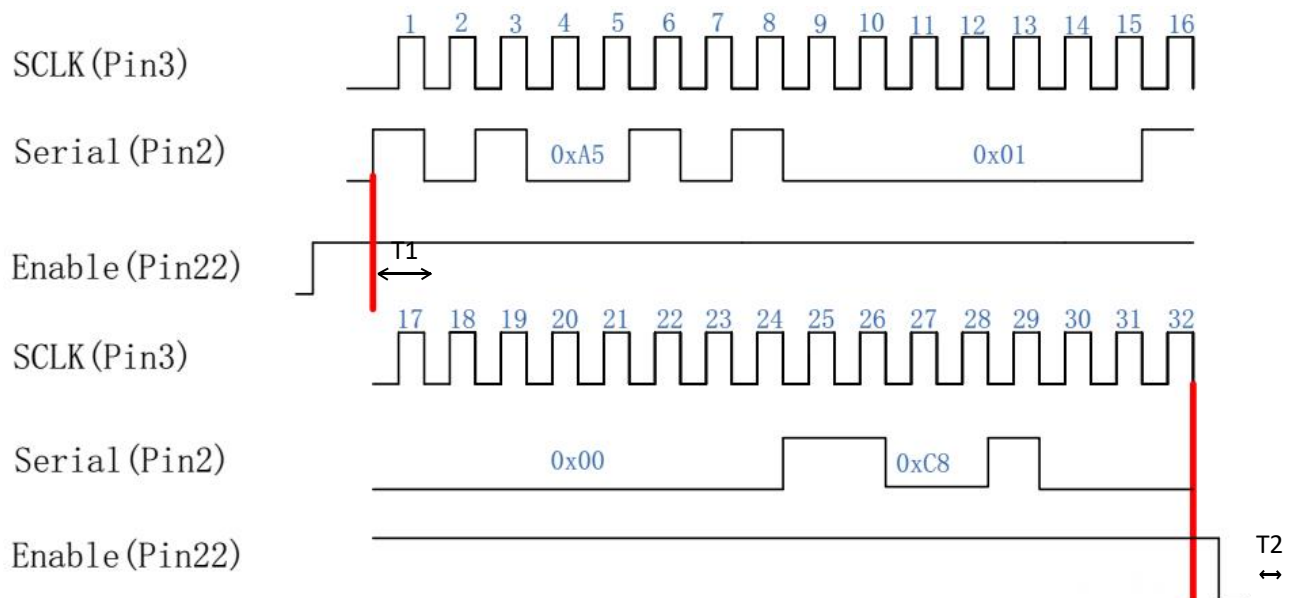


Fig. 9 Example of control timing with a pulse width of 200ns

T1: 10us duration, the pulse width adjustment enable signal needs to be turned on 10us in advance before adjusting the serial input and serial clock signal.

T2: Duration 10us, after pulse width adjustment is completed, it needs to be delayed for 10us before switching

off.

- If the user sets 350ns pulse width, input the instruction: 0XA5→0X01→0X01→0X5E, where 0X01 and 0X5E represent the pulse width value 350.
- The parameter of this instruction is the binary value of the pulse width.
- The user can compile any pulse width, but the laser will only accept the specified pulse width (refer to the various versions of the specification for the exact pulse width), and if an out-of-range pulse width value is given, the laser will output with the close pulse width value.

3. JPT laser measurement and control software

JPT has developed a GUI software specifically for YDFLP-E series lasers. It has many functions such as controlling the laser, setting default parameters, setting control modes, alarm monitoring, DB25 interface monitoring, internal parameter monitoring and so on. It is recommended that users use the laser with this measurement and control software. In addition to adjusting the default parameters of the laser, it can also be used for signal monitoring and troubleshooting when abnormalities occur during use.

3.1 Introduction to the software connection

3.1.1 Introduction to Software Connectivity and Controls

1) Connection method

Use the USB TO RS232 cable to connect the USB port of the computer host and the laser RS-232 control port.

Check the serial port number after connecting the cable: My
Computer->Properties->Hardware->Device Manager->

COM 端口 (COM 和 LPT)

Select the serial port number as the serial port number in the above figure, and then click Open Serial Port as follows

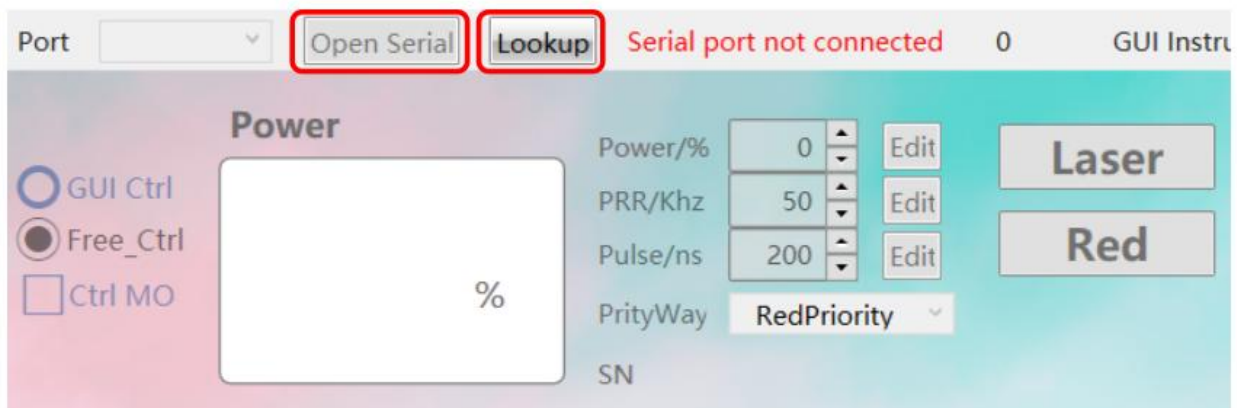


Figure 10 GUI serial port connection selection

2) Connection Status Description



Figure 11 GUI unconnected state

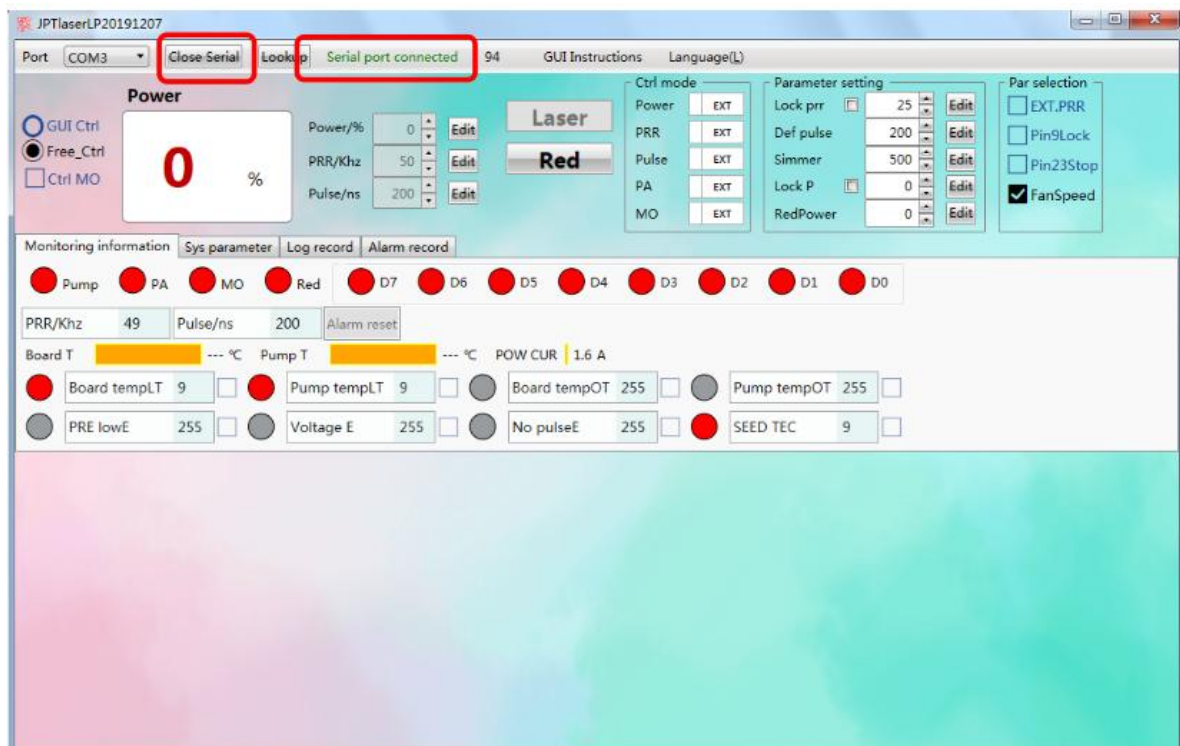


Figure 12 GUI Connected Status

3.1.2 Introduction to control functions

1) Controlled laser switching light

- ① Selecting the mode for controlling the laser

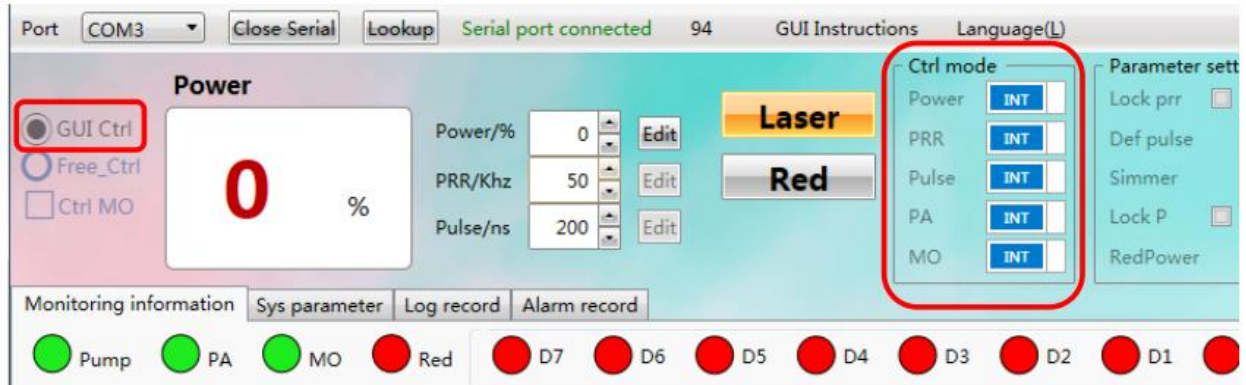


Figure 13 GUI Full Control Mode

GUI Full Control Mode: When GUI Full Control is selected, the parameters of Power, Frequency, Pulse Width, PA, MO in the column of "Internal/External Control Mode" will change to INT internal control mode. **This control mode does not have the function of power failure saving**, after the serial port is closed, it will change to "free control" mode, and all the parameters in the column of "internal/external control mode" will also change to EXT external control mode.

It is recommended that the user select this mode when temporarily testing the laser's internally switched light.

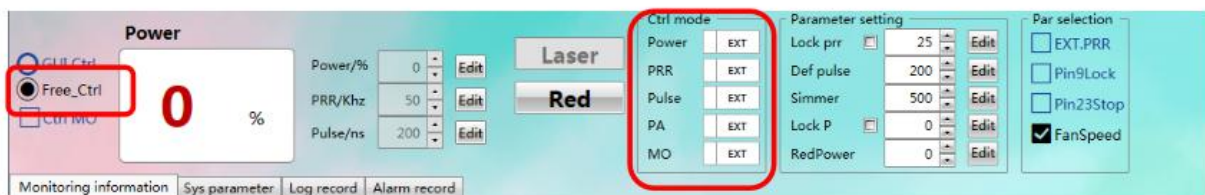


Figure 14 Free control mode

Free Control Mode: When free control is selected, users can choose the control mode for each parameter in the "Internal/External Control Mode" column. **This control mode has the function of power failure saving**, the parameter settings in the column of "internal/external control mode" will still be saved after the serial port is shut down.

It is recommended to choose this mode when users need to use the internal control

parameter signal. For example, if the user's marking board does not support the frequency adjustment function, the user can select the INT frequency internal control mode setting parameter in the column of "Internal/External Control Mode", and then the laser can be controlled by the external switch signal.

② Setting parameters and switching light

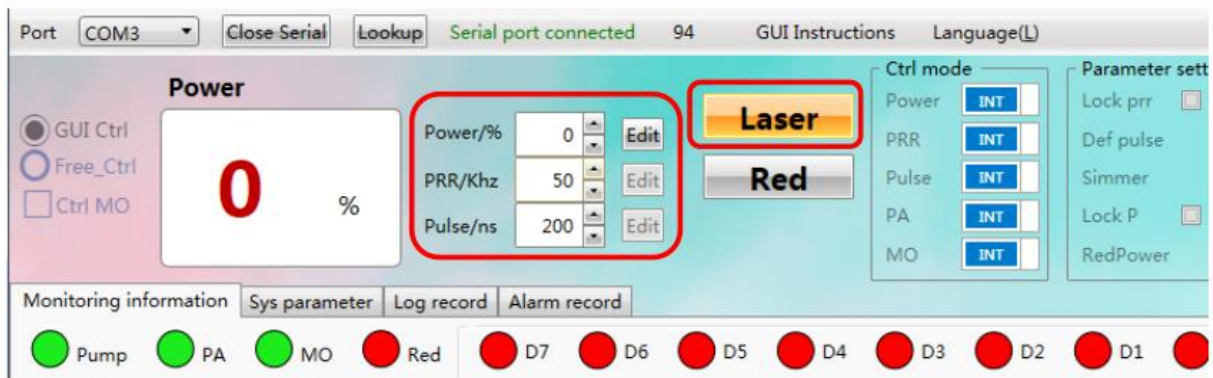


Fig. 15 Setting parameters and switching light

Setting parameters and switching off the light: After selecting the control mode, users can set the parameters for power, frequency and pulse width in the "Parameter Setting" column, and then click the "Edit" button on the side to confirm the input parameters. At this time, click on the "laser" button to turn on and off the light operation.

Note: The pulse width and frequency parameters are not modifiable during light output using the GUI software, and the power parameters can be modified in any case.

③ Independent control of the MO signal

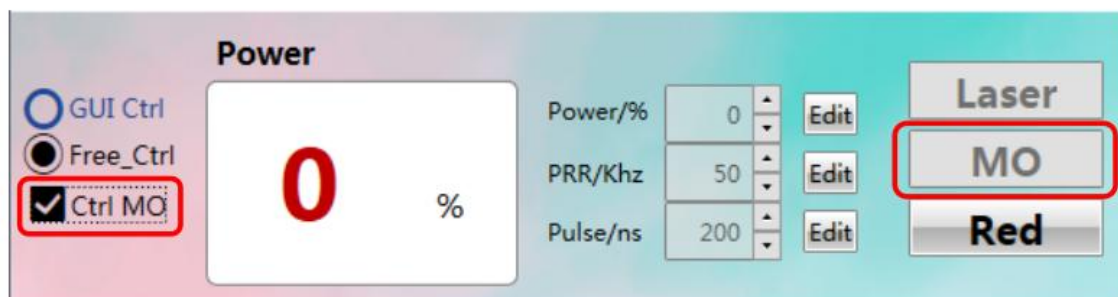


Figure 16 GUI control of MO status

Control MO: After this function is selected, the "MO" button will appear on the software interface, at this time, the user can click this button to control the switch of MO signal. **This**

control mode does not have the power failure saving function, and the function will be closed after the serial port is closed.

2) Default parameter setting and additional parameter setting selection

① Selection of red/laser priority function mode

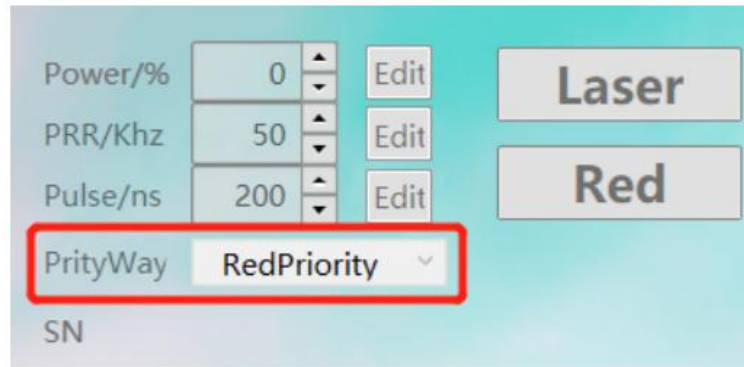


Figure 17 Red/Laser Priority Function Options

Laser first: Laser and red light are mutually exclusive and laser is preferred;

Red light priority: Laser and red light are mutually exclusive and red light takes precedence;

Laser Priority Red: Laser and red light are mutually exclusive, red light is turned on by default when there is no laser (password is required to set this option).

② Default parameter settings and mode selection

In the "parameter setting", "mode selection" option to modify the laser's default parameter settings and additional parameter settings to select the function, the parameter settings for immediate effect, with a power failure to save the function.



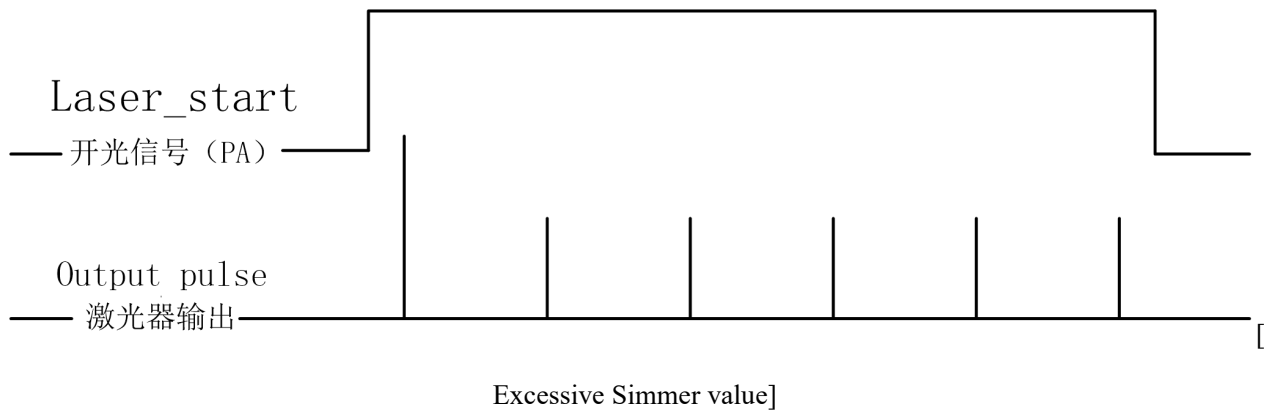
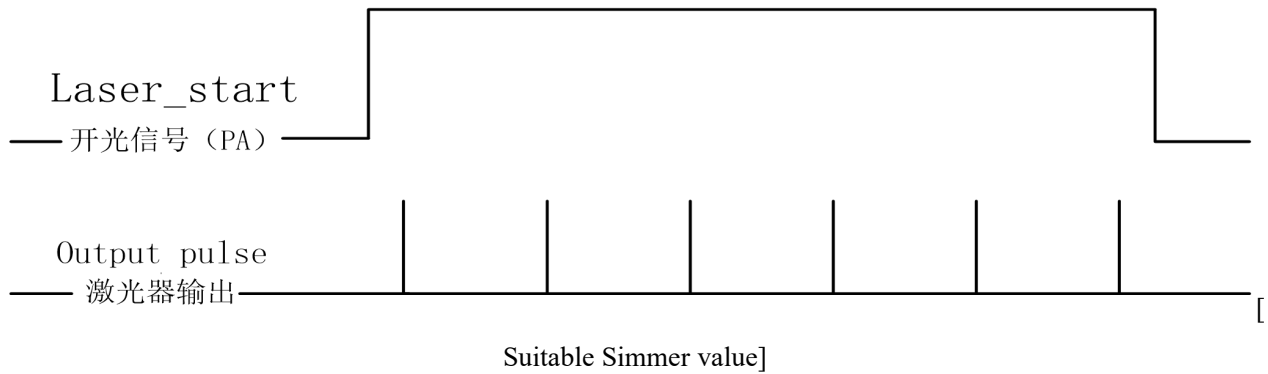
Figure 18 Default Parameter Settings and Mode Selection

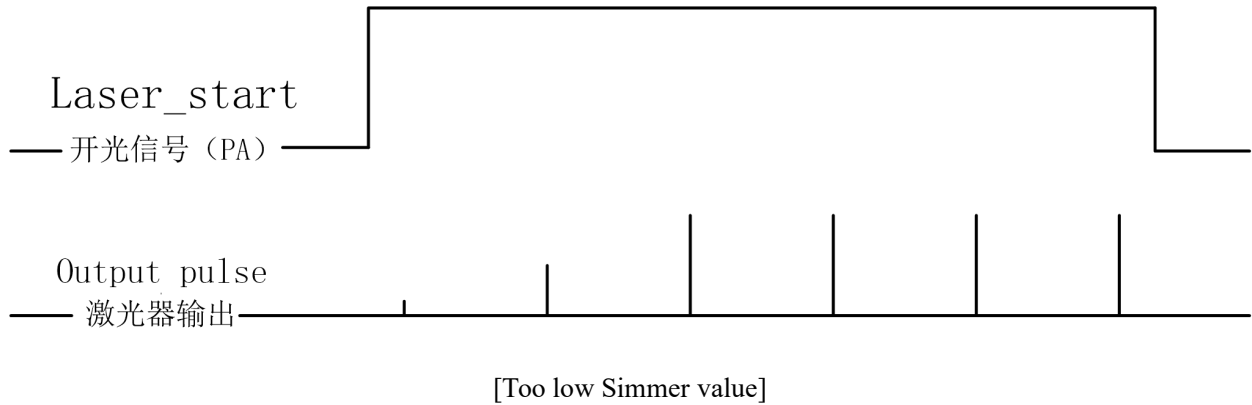
Locked Frequency: With Locked Frequency ticked, the laser will output according to the value set in the Locked Frequency window of the GUI.

Default Pulse Width: In case the pulse width signal is not available from the external control, the system outputs the value set in the GUI Default Pulse Width window bar.

Simmer: Used to adjust the height of the first pulse of the control, the larger the value, the higher the first pulse, setting range: 0-1000.

Example of Simmer settings:





Locked Power: With Locked Power ticked, the laser will output according to the value set in the Locked Power window of the GUI.

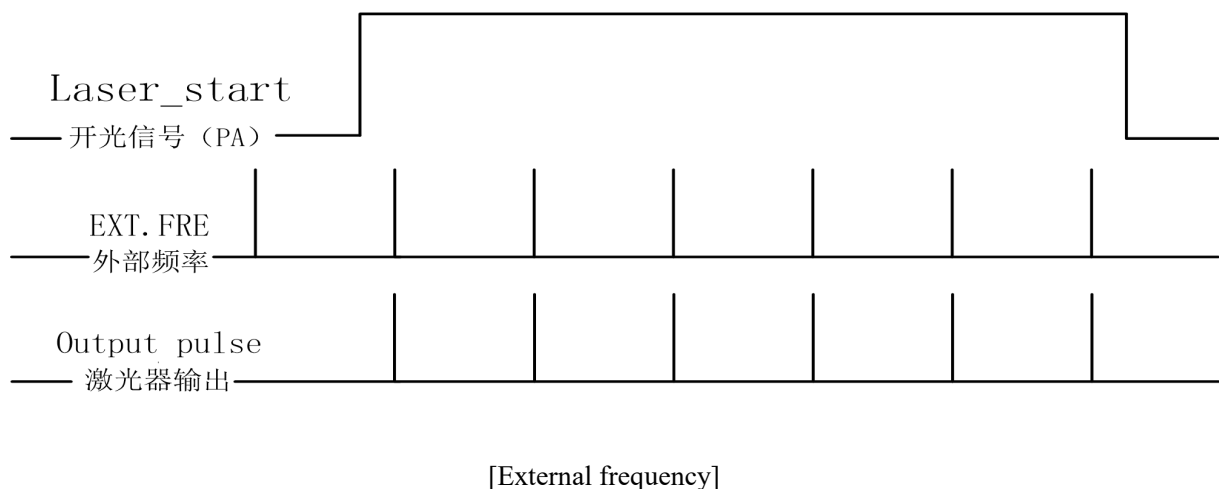
Red Power: The built-in red version of the laser can be adjusted by setting the red power to adjust the size of the red light brightness, ranging from 0-100.

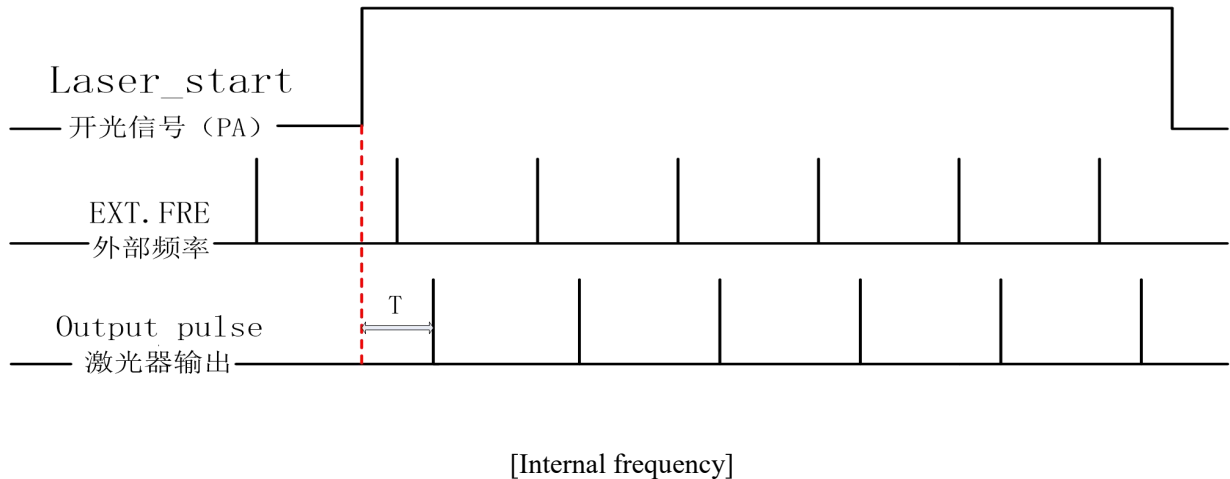
External Frequency: When this option is ticked the laser uses the external frequency mode, i.e. the final output pulse of the laser is synchronized with the external frequency signal, which can be used if the control card is optimized for external frequency signals;

When this option is unchecked the laser uses the internal frequency mode, where the system first calculates the external frequency signal and then sends out the pulse signal itself.

Internal frequency mode is used by default.

Examples of external and internal frequency settings:





T: duration of a single pulse cycle, maximum duration $\leq$ cut-off frequency cycle time.

Pin9 Latch: power latch function, if ticked, it means the function is enabled, the rising edge is valid, the default is unchecked.

Pin23 Emergency Stop: Emergency stop signal function, if ticked means the function is enabled, low level is valid, default unchecked.

Fan Speed Control: The laser fan rotates according to the temperature of the internal sensor, if this function is unchecked, the laser will rotate at full speed, the function is checked by default.

Note: TypeE software parameters are set "instantly" and do not require a laser restart.

3.2 Monitoring Introduction to Functions and Alarms

The monitoring function of the TypeE software allows you to observe a number of operating parameters as well as alarms. The laser sends the number of alarms saved in the system to the GUI software every time it is switched on.

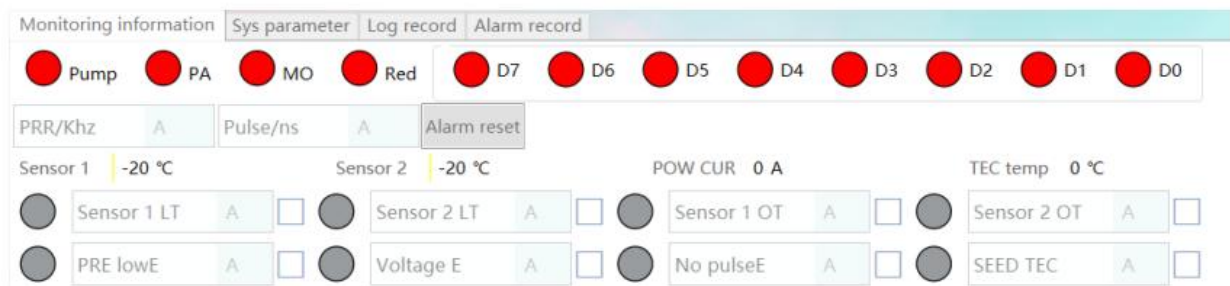


Figure 19 Status and Alarm Monitoring Screen

1) Status bar monitoring instructions

Pump Indicator: Monitor whether the laser pump is currently in normal working condition, under normal circumstances for the green light, such as the emergence of abnormal alarm will light up the red light.

PA, MO, Red indicator: Monitor whether the laser is currently receiving this control signal, green light is the state of received signal, red light is the state of not receiving signal.

D0-D7 Indicator: Monitor the current power signal of the laser, corresponding to the 8-bit binary mode, D0 is the lowest bit, D7 is the highest bit, the green light is the state of the received signal of the bit, the red light is the state of the non-received signal.

Frequency, Pulse Width: Monitor the current laser's operating frequency and pulse width parameters.

Sensor 1: Monitors the current laser optical module temperature.

Sensor 2: Monitors the current output isolator temperature.

Secondary Current: Monitors the current value of the laser's secondary drive current.

TEC Temperature: monitors the current laser seed source TEC temperature

System Parameters: Manufacturer's internal system parameter setting interface (for JPT's internal use only).

Logging: Logging of laser settings and alarm messages.

Alarm Record: Record the first 10 laser alarm records in sequential order.

2) Alarm Monitoring Description

Sensor 1 LT: Light path module temperature below set temperature alarm.

Sensor 1 OT: Light path module temperature above set temperature alarm.

Sensor 2 LT: Output isolator temperature below set temperature alarm.

Sensor 2 OT: Output isolator temperature above set temperature alarm.

Low primary current: Abnormal low primary current alarm.

Low supply voltage: The laser detects low or high supply voltage alarm.

No Seed Source Pulse: No seed source backlight signal is detected or the seed source backlight signal is less than 1kHz alarm.

Seed Source TEC: Seed Source Temperature Abnormal Alarm.

3) Alarm red light flashing indication description

In addition to the GUI monitoring status bar can be viewed in the laser abnormal situation of the alarm, but also through the indication of the light irregular flashing intuitively reflect the alarm status at this time (Table 11).

Table 11 Laser red light indication alarm messages

Red light flashing condition	warning message
short flash	Sensor 1 Alarm
long flash	Sensor 2 Alarm
long and short	No seed source pulse alarm
short-lived	Primary current low alarm
short and long	Seed Source TEC Alarm
long and short	Low voltage alarm

Alarm Recovery: Sensor 1 and Sensor 2 temperature alarms are self-recovery alarms, i.e., when the temperature is restored from the alarm temperature to the normal temperature range, the laser will be relieved from the alarm state, but the laser needs to re-receive the light signal in order to continue to emit light. In addition to sensor 1, sensor 2 alarm, the rest of the alarms need to restart the laser to be able to lift the alarm state.

4. Troubleshooting and handling measures

serial number	Common Failure Problems	Main causes and measures to address them
1	Laser fan does not rotate, no power supply	(1) Check laser power supply positive and negative wiring (2) Check the laser power supply and test whether the power supply meets the laser power supply requirements (3) Laser factory default fan speed mode heat dissipation, in the case of low ambient temperature to the laser power fan first full-speed operation, and then

		stop rotating, this is a normal situation, and so the temperature rises, the fan will be rotated (4) If the laser still does not power up after replacing the power supply that meets the requirements, please contact our technicians as soon as possible.
2	Laser Alarm	(1) Check whether the laser output red light flashes, if the red light flashes alarm reference to "alarm red light flashing instructions". (2) Other alarms can be monitored and investigated in conjunction with the GUI internal control software.
3	Normal power supply, no alarm, but no light	(1) Check DB25 wiring, need to define the correct wiring according to the laser (refer to Table 8 laser DB25 control interface definition) which Pin18, Pin19 signals control the laser open light (2) Check marking card power supply, software settings (3) Check the indication of the red light signal status, due to the red light priority principle, the indication of the red light signal is at a high level (Pin22 pin is high) state, the laser priority output red light, not out of the laser!
4	Low laser output power	(1) Check the laser power supply, the rated current of the power supply output should be greater than the current demanded by the laser. (2) Check the laser output lens, check the red beam mirror, vibration mirror, field mirror and other lenses through the laser light path, if there is dirt can be cotton swabs dipped in anhydrous ethanol gently wipe, please note that do not scratch the lens coating layer (3) Check that the laser output spot is not blocked, and make sure that the laser output port is coaxial with the scanner inlet port when installing. (4) Check the focus position and make sure that the parameters used are set to the optimum for the laser (5) It is normal for the laser power to degrade by less than 8%/year after use.
5	Intermittent light from laser	(1) Check the laser and the power supply is properly grounded, whether there is strong electrical or magnetic interference around the laser, if there is interference, it is recommended to use the signal line with shielding, strong power, weak power to distinguish between the alignment, based on the principle of red light priority, if the interference caused by the trigger of the red light is not out of the laser! (2) Check that the parameters and configurations used are in accordance with the characteristics of the material to be processed. For highly reactive materials or materials with high damage thresholds (e.g. ceramics), high peak

		power parameters and strong energy density parameters are required for processing, and intermittent light output may occur if the parameters and configurations used are poor.
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5. Maintenance and services

5.1 General Warranty

Upon shipment of all products manufactured to order or specification, JPT warrants any product that is defective in material or workmanship within the contractual warranty period and is warranted to conform to specifications under normal use. JPT reserves the right to selectively repair or replace any product that is defective in material or technology during the warranty period, and to provide repair or replacement service for products that fail due to faulty materials or manufacturing processes, and JPT reserves the right to collect payment for products that are defective under normal use.

5.2 Warranty limitations

- (1) Artificially tampered with disassembled or modified by persons other than JPT;
- (2) Damage caused by improper use, negligence or accident;
- (3) Used outside the scope of product specifications and technical requirements;
- (4) Faults caused by user software or interfaces that indirectly cause damage to the laser;
- (5) Used under abnormal operating conditions due to improper installation, maintenance, or other conditions not covered in this manual;
- (6) Accessories are not covered by the warranty.

The above is the JPT Company for the use of the product instructions for user reference only, the formal service and warranty content to the contract and after-sales service commitment to the agreement shall prevail, thank you for your support.

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We regularly check the contents of this manual and will make any necessary corrections in subsequent editions, but inevitably there are some errors, so suggestions for improvement are welcome.

***We reserve the right to make technical improvements without prior notice!**