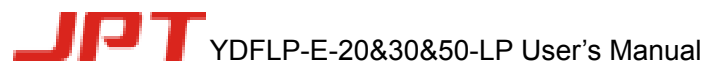# Pulsed Fiber Laser

YDFLP-E-20&30&50-LP

USER'S MANUAL

Version02

Safety Information

Please read this manual carefully before operating the YDFLP fiber lasers.

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

- Make sure the +24VDC power supply is connected in the correct way. Inappropriate connection might damage the product.

- To prevent electrical shock, please do not remove the laser cover. Warranty will be void if warranty label is removed.

- Please wear appropriate laser safety goggle (see below Fig.1.) before emitting the laser. We recommend OD4 goggle or better. This laser module carries a Class 4 laser rating, which emits invisible 1064nm wavelength laser radiation with average output power over 20W and peak power over 7kW. Both direct beam and reflect beam will cause permanent
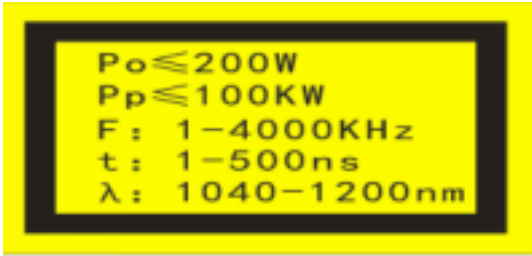
damage to the eyes, skin, and might cause fire.

- Caution: Even at 0% power emitting, the average output laser power is still around 100mW.

Figure 1 Laser Safety Goggle

Locations

Symbols	Information
	Laser Warning Triangle -Label of laser emission (Attached on the cover plate, near the output fiber）
	Compliance Label (Attached on the cover plate)

	Product Rating Information (Attached on the cover plate)
Po≤200W Pp≤100KW F： 1-4000KHz t： 1-500ns λ： 1040-1200nm	

Contents

1．Product Introduction

1.1 Product Description

JPT E type fiber laser control with standard DB25 interface and powered with 24V/5A(10A) DC. It is designed for high speed and precise marking applications. The pulse response and performance are much better comparing to the similar products. Significantly compact size is perfect for smaller marking system.

Photographs of typical E type fiber lasers are shown in Fig.2 and Fig.3 (the specific appearance is subject to actual delivery):

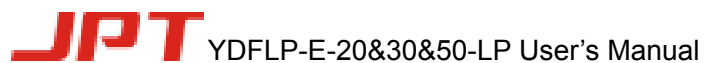**Figure 2 YDFLP-E-20&30-LP-S** **Figure 3 YDFLP-E-50-LP-L**

1.2 Packing List

Please refer to the packing list according to table 2.

Table 2 Packing list of YDFLP

Item	Quantity
Fiber Laser	1
Test Sheet	1
Packing List	1
Precautions	1

1.3 Operation conditions and safety instructions

Please read the following instructions carefully. Product reliability and lifetime probably be effected if not following the user's manual.

1) Make sure the +24VDC power supply is connected in the correct way. <u>Wrong connection or input voltage might damage the product.</u>

2) <u>Make sure the bending diameter of the fiber cable is larger than 15cm in anytime. Otherwise will cause power lost even laser damage.</u>

3) Make sure minimum10cm air gaps behind and in front of the fiber laser. And the air flow direction of the system should be the same as the laser. <u>Short ventilation distance and wrong air flow direction will lead to the laser temperature rise.</u>

4) The laser running ambient temperature range is <u>0~40℃</u>, laser will get internal alarm if out of this range. It's a protection action to insure the lifetime of the laser.

5) Please keep the fiber laser source clean especially the laser output window. Please remember to cover the output window when it's exposed to the open environment. <u>Dust on the window will cause heat and damage the lens, which results in output power lost even laser damage.</u>

6) Please make sure the power is off before installing and uninstalling the fiber laser.

7) Please **do not** look at the output window anytime when power on, and <u>wear laser safety goggle when operating the fiber laser.</u>

8) The standard pulse width is 200ns for YDFLP-E-20&30-LP-S and YDFLP-E-50-LP-L. Other

pulse width is available for customization request.

1.4 YDFLP Product Naming Convention

Table 3 Naming Convention for Pulsed Fiber Laser

YDFLP – X – XX – XX – X – X
                1 2 3 4 5 6

1、Product Name：Ytterbium Doped Fiber Laser Pulse (YDFLP)

2、Product type

3、Average Output power

4、Pulse Characteristics：**M series - adjustable pulse width**

                        LP series - fixed pulse width

5、Optical Fiber attributes：**S: Single mode, $M^2 < 1.5$**

    L: Low mode, $M^2 < 1.8$

    H: High mode, $M^2 > 2.5$

6、Additional function：R: Built-in red pilot laser

Examples：

YDFLP-E-20-LP-S：E type LP, using single mode type of optical fiber with nominal output @20W.

YDFLP-200-M7-H-R：Customized M7, using high mode type of optical fiber with the nominal output power @ 200W, integrated built-in red pilot laser.

1.5 Technical Specifications

Table 4 Specifications of the LP series pulsed fiber laser

Characteristic\Laser Type	Unit	E-20-LP-S	E-30-LP-S	E-50-LP-L
M²		<1.5		<1.8
Delivery Cable Length	m	2		3
Average Output Power	W	>20	>30	>50
Maximum Pulse Energy	mJ	0.8		1.25
Pulse Frequency Range	kHz	1-600		
Full Power Frequency Range	kHz	25-600	37-600	40-600
Pulse Width	ns	200		
Output Power Instability	%	<5		
Cooling Method		Air Cooled		
Power Supply Voltage	V	24(DC)		
Power Consumption	W	<110	<150	<220
Power supply current requirement	A	>5	>7	>10

Central Wavelength	nm	1064		
Emission Bandwidth（FWHM）	nm	<15		
Polarization		Random		
Anti-Reflection Protection		Yes		
Output Beam Diameter	mm	7.0±0.5		
Output Power Tuning Range	%	0～100		
Ambient Temperature Range	℃	0～40		
Storage Temperature Range	℃	-10～60		
Dimensions	mm	245*200*65		325*260*75
Package Size	mm	365*310*135		580*400*140
Weight	Kg	Net：3.75 Gross：4.35	Net：4.25 Gross：4.8	Net：8.2 Gross：9.5

Table 5 LP Series Fiber Laser Power Reduction Frequency Value（kHz）

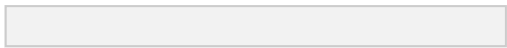| YDFLP-E-20-LP-S	YDFLP-E-30-LP-S	YDFLP-E-50-LP-L
25	37	40

★ The maximum output frequency will be limited to 600kHz.

*The laser will have expected output power when working above power reduction frequency. When working below power reduction frequency, the power will drop accordingly to maintain the output peak power. Below chart shows the relationship between frequency and output power:
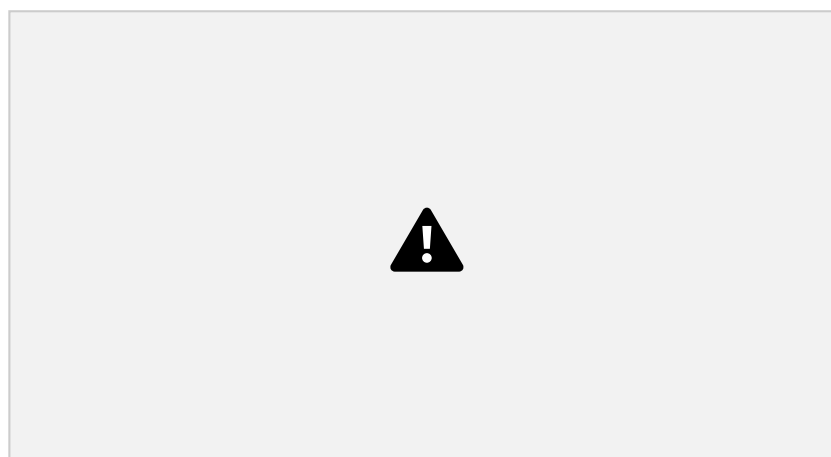
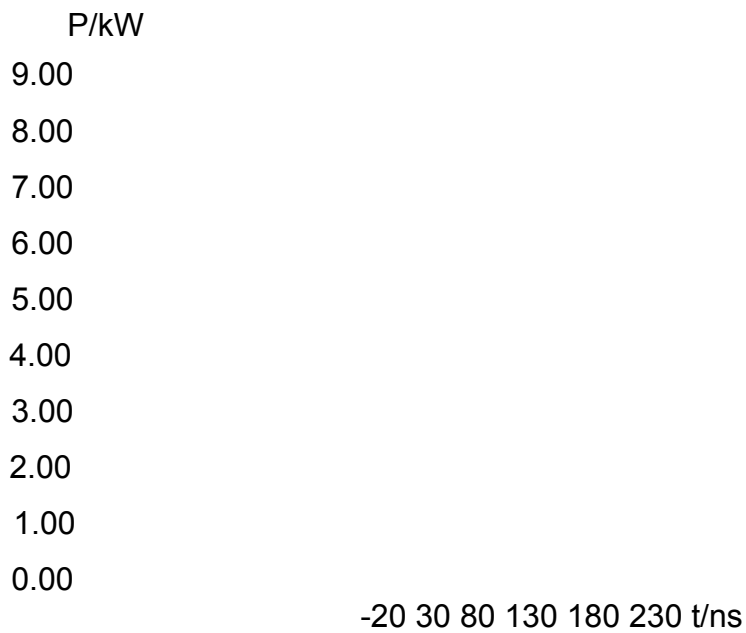**Figure 4 Power reduction frequency & Output power relationship charts**
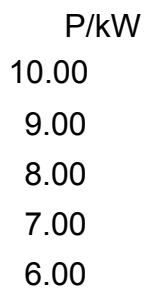
P/kW

9.00

8.00

7.00

6.00

5.00

4.00

3.00

2.00

1.00

0.00
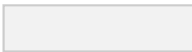
-20 30 80 130 180 230 t/ns

Figure 5 YDFLP-E-20&30-LP-S Output waveform graph

P/kW

10.00

9.00

8.00

7.00

6.00

5.00
4.00
3.00
2.00
1.00
0.00

-20 30 80 130 180 230 t/ns

Figure 6 YDFLP-E-50-LP-L Output waveform graph
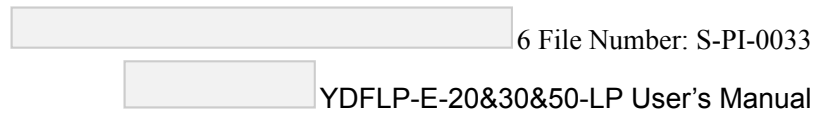
1.6 Installation Dimensions

1）YDFLP-E-20&30-LP-S Laser dimensions
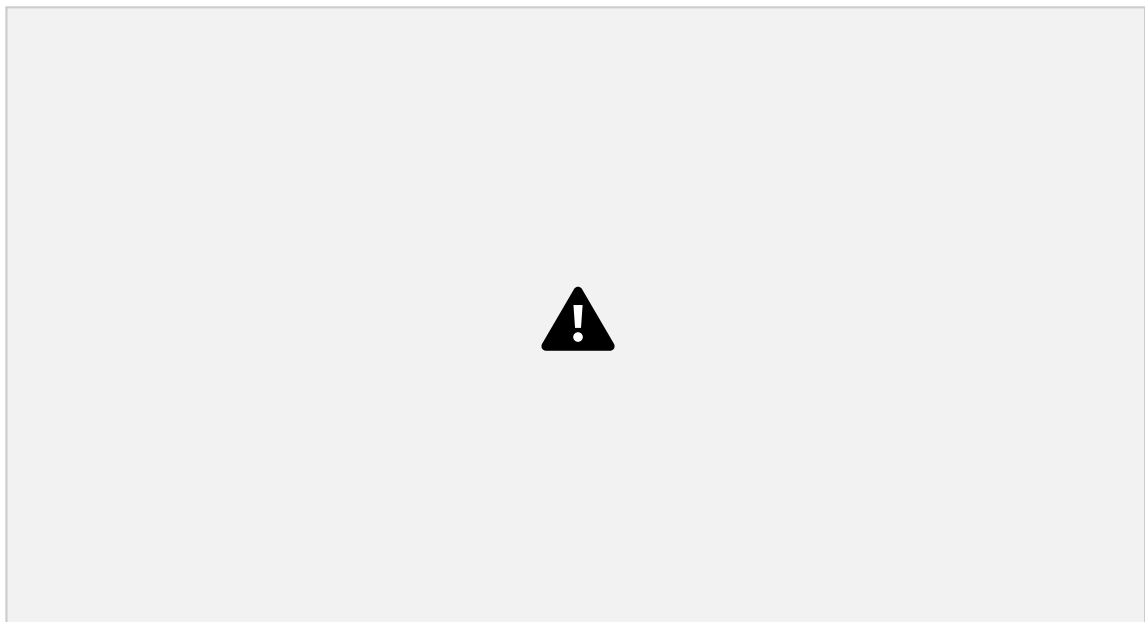
Figure 7 YDFLP-E-20&30-LP-S Laser module dimensions **(Unit：mm)**
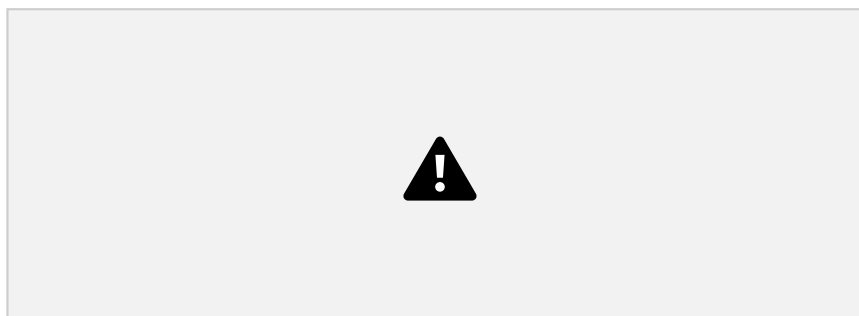
Figure 8 YDFLP-E-20-LP-S Standard isolated output head dimensions **(Unit：mm)**

Figure 9 YDFLP-E-30-LP-S Standard isolated output head dimensions **(Unit：mm)**

*The output isolator head is only for reference. Please be subject to the actual product.

2）YDFLP-E-50-LP-L Laser dimensions

Figure 10 YDFLP-E-50-LP-L Dimensions of fiber laser module（**Unit：mm**）

Figure 11 YDFLP-E-50-LP-L Dimensions of fiber laser module（**Unit**：**mm**）

*The output isolator head is only for reference. Please be subject to the actual product.

2. Laser Interface

2.1 Power Supply Connector

The length of standard power cord for laser is around 1250mm. Please refer to Figure 12 & Table 6 in below to install the power cable to the 24V DC power supply, and ensure the DC power supply can provide enough output power. Please also note the polarity of the cable when connecting.
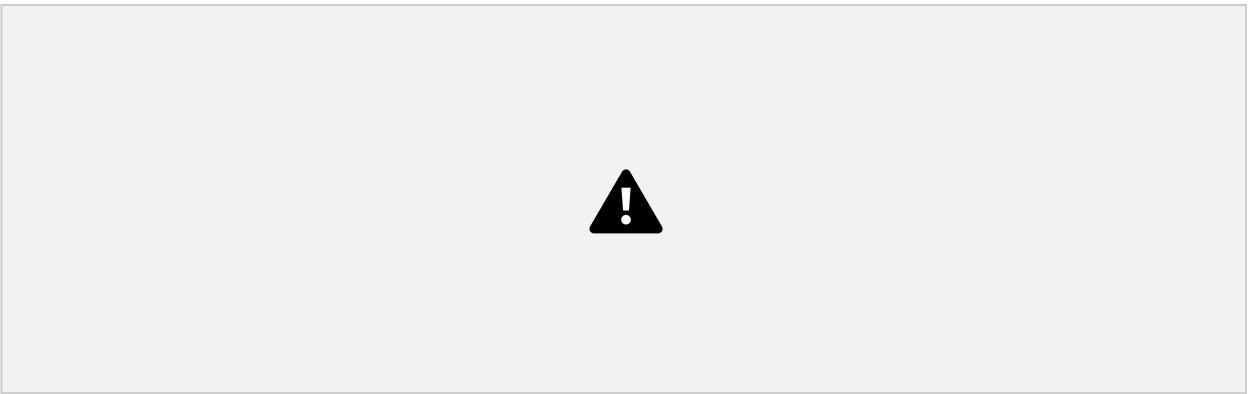
Figure 12 Diagram of the power supply cable

Table 6 Definition of power supply cable

PIN#	Description

EARTH	Ground wire
+	24VDC Positive
-	24VDC Negative

Note: Housekeeping (main and control power supply independent) function can be customized.

2.2 RS-232 Control Connector

RS-232 connector is available for connecting PC or red card. Customer can monitor and control laser by E type software, serial commands or red card after connected. Pins definition is shown in below Figure13 & Table 7:
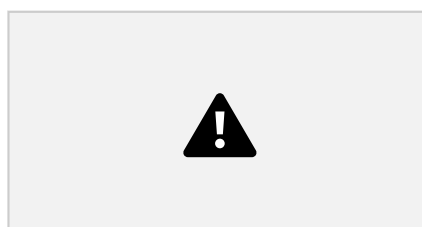
Figure 13 RS232 connector DB9

Table 7 RS-232 Interface definition

PIN#	Description
1, 4, 6-9	No need to connect
2	RxD
3	TxD
5	GND

Note：If need to control laser by serial commands, please refer to the E type manual of serial port instructions.

2.3 DB25 Control Connector

DB25 is the interface usually used to connect the marking control system. The Pins are defined as shown in Figure 14 and Table 8.

Figure 14 DB25 Connector

Table 8 DB25 interface definition

DB25 PIN#	Definition
1-8	IP0-IP7 Power Control
9	Latches power setting into the laser by rising edge
10-15	GND Description: PIN10-15 have connected to the ground inside the fiber laser, only need to connect control card GND with one of Pins.
16, 21	Warning signal Description:16 low level,21 high level: Normal 16 low level,21 low level: temperature alarm
19	Emission Modulation input (PA) HIGH: Emission ON LOW: Emission OFF
20	Frequency Modulation (TTL)
23	Emergency Stop signal High level: Normal; Low level: Emergency Stop (this function can be selected in GUI) Emergency stop signal is from low to high, need to detect the rising edge of MO firstly, then the laser can be re-emitted.

22	Control the pulse width ENABLE (Red Beam is preferred when Laser and Red Beam are mutually exclusive. * refer to note2) High Level: Red Beam On Low Level: Red Beam Off
18	MO signal for turn on/off HIGH: ON LOW: OFF
17，24，25	No need to connect

Note 1: 4.6-5.4V will be recognized as TTL high; 0-0.5V will be recognized as TTL low.

Note 2：Red beam Pin22 signal has higher priority than MO and PA signal. When Pin22 signal is high, MO and PA signal will be shut down internally. The laser can be emitted by restarting MO and PA after Pin22 signal is low. When laser (Built-in red pilot laser version) alarms, the red beam will take 2 short flashes and 1 long flashes as symbol till the alarm stops, and the cycle time is about 1.5s.

2.4 DB25 Control & Sequence

1) Output power control

PIN1~8 controls the output laser power by TTL signal. The encoding can be set within the range of 0~255 which is corresponding to the 0~100% output power. The actual output laser power may not be a linear relationship with these settings. And the actual output power also relate to the frequency (see Figure 4). Pls refer to the example in table 9 current setting:

Table 9 Current setting of LP fiber laser (example)

	Setting1	Setting2	Setting3	Setting4
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
Current	~50 %	~75 %	~87.5 %	~93.75 %

2) DB25 Sequence

SUPPLY VOLTAGE 24V

PIN18 MO

PIN19 PA

PIN20 PRR

PUMP CURRENT

LASER OUTPUT

Figure 15 DB25 Controlling Time Series Diagram

➢ A : 12 seconds System initialization time.
➢ B : ≥4ms MO and PA signal delay time.
➢ C : Switching off PA should earlier than MO or at same time.

➢ D：Frequency sampling time under internal frequency mode, at least 1 complete frequency period before turning on the laser (PA).

➢ E：SIMMER value. The first pulse energy can be adjusted via E type software. **Fiber laser control system self-locking:** If fiber laser is on abnormal status (high temperature, low 24V power supply etc.), it will stop working to protect the whole system. Please restart the fiber laser. Error messages are recorded in E type software.

3. JPT GUI Laser Testing Software-E type

E type is designed for YDFLP-E series laser. It has multiple functions including laser control, setting the default parameters, setting the control mode, alarm monitoring, DB25 interface monitoring, internal parameters monitoring etc. E type also records error events which caused system self-locking.
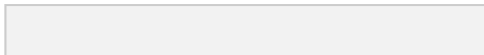
3.1 GUI Operation
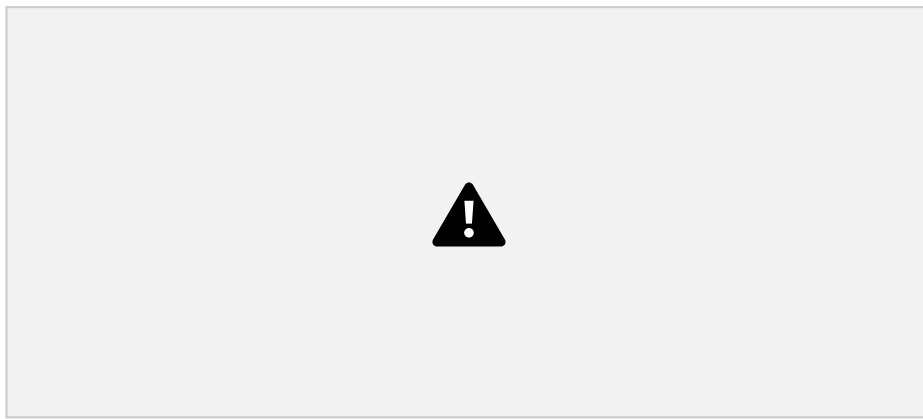
3.1.1 Serial COM port

1) Connecting method

Using USB TO RS232 cable to connect PC's USB to the Laser's RS-232 connector.

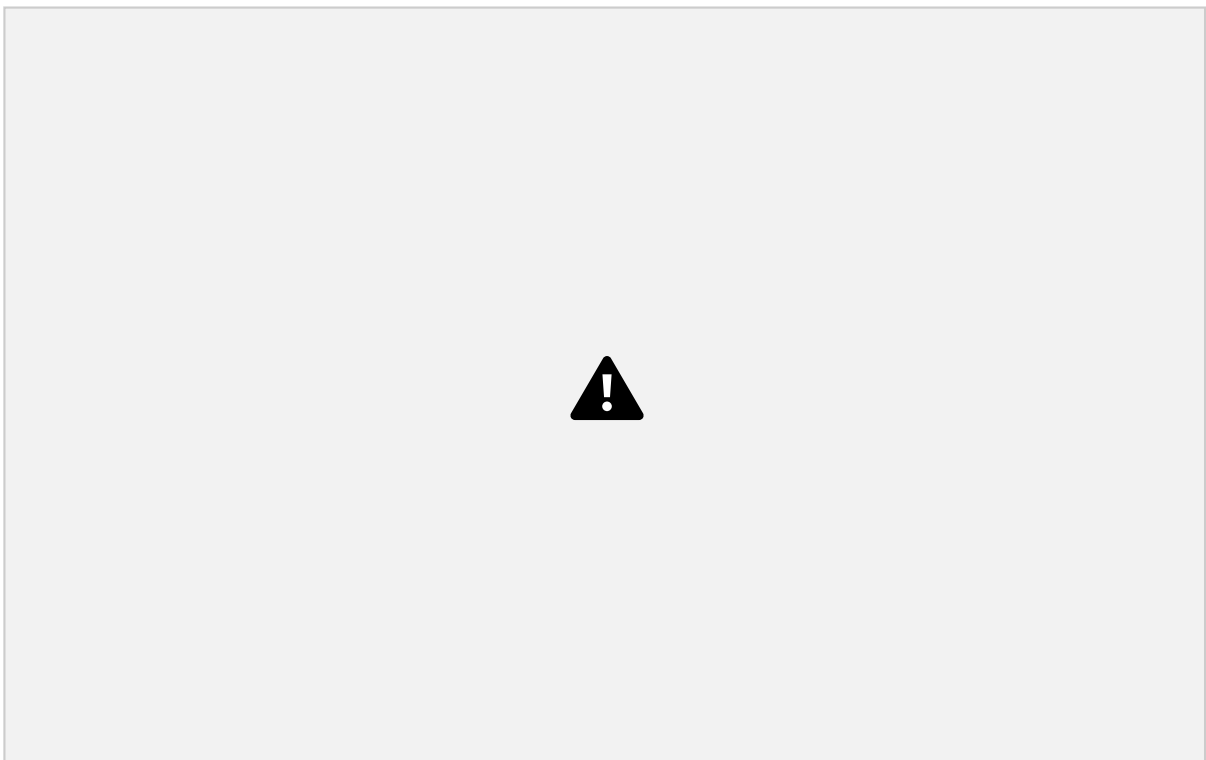Check the port number after connecting cable：my computer - > properties - > hardware - > device manager - >

将串口号选为上图的串口号，然后点击打开串口，如下

Click the Serial Comm Number as follow:

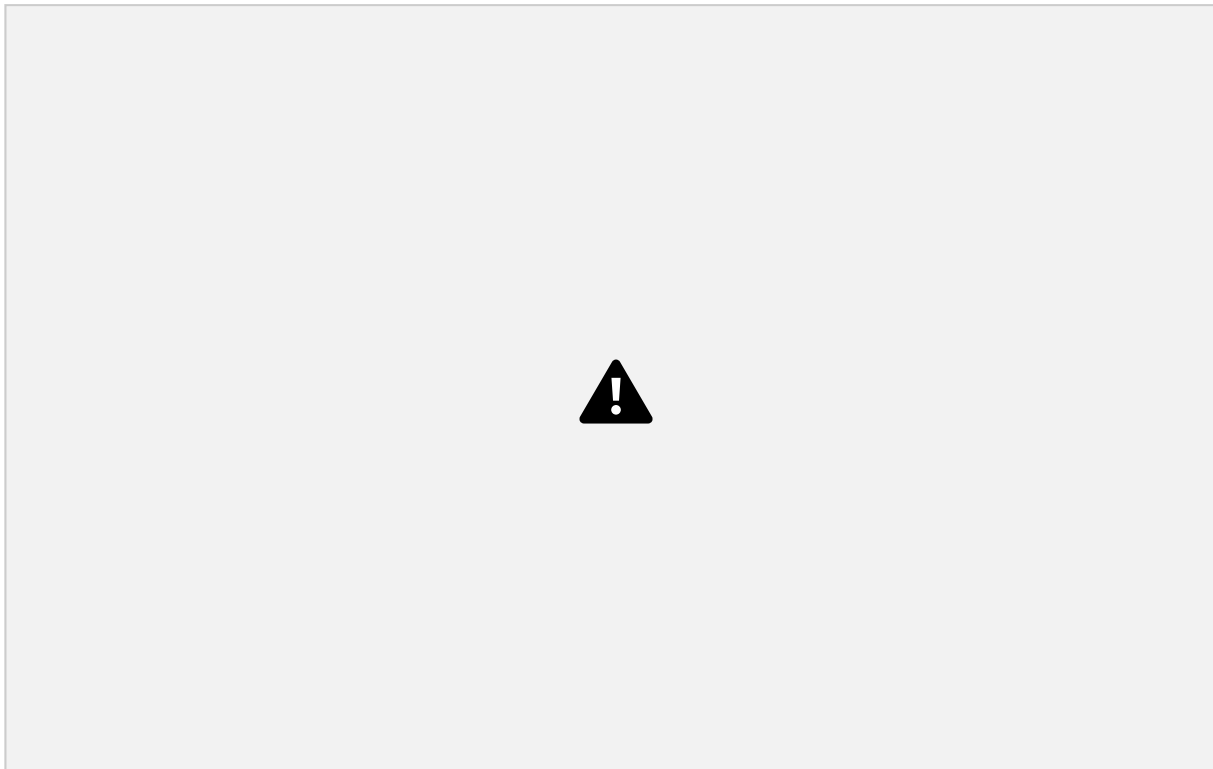13 File Number: S-PI-0033

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Figure 16 The selection of GUI Serial Port connection
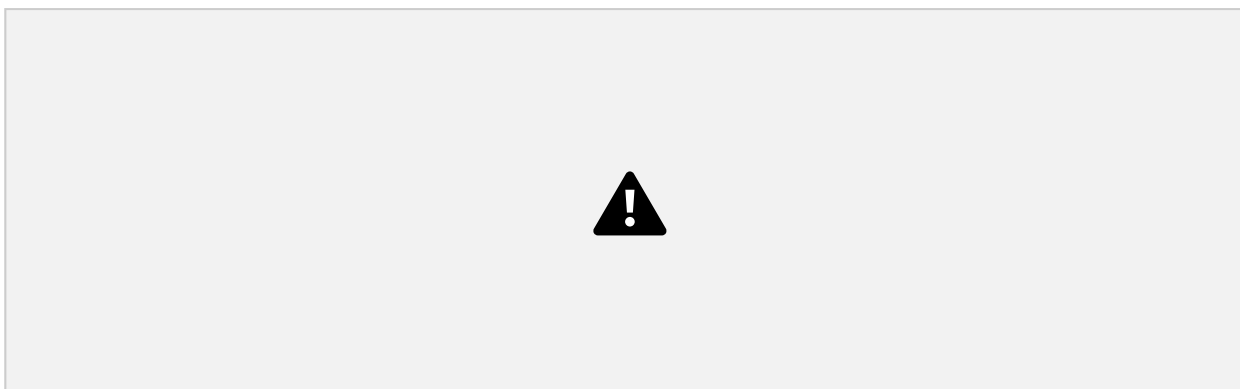
2) Connecting state

Figure 17 GUI disconnected state

Figure 18 GUI connected state

3.1.2 GUI control function

1) GUI control the emission

   ① Choose the GUI control Mode

Figure 19 GUI Full Ctrl mode

GUI Full Control mode(GUI Ctrl)：When selecting the GUI full Control mode, all the parameters of Internal/External Control mode (EG. power, frequency, pulse width, PA, MO) will change to Internal Control mode. This mode will not be preserved after power off. It will change to "Free Ctrl" mode after serial port closed, and all the parameters of Internal/External Control mode will

be changed to the previous free control mode setting. User can select this mode to test the emission of laser temporarily.

Figure 20 Free Ctrl mode

Free Control Mode (Free Ctrl): When selecting free Control mode, user can choose parameter control mode individually. In this mode, all the settings will be preserved after power off. EG. User can select this mode to lock a specific frequency or output power individually when don't want to control it by external signal.

② Set parameters and emitting

Figure 21 Setting parameters and emitting

After selecting full control mode, user can set power, frequency, pulse width and then press "edit" button to confirm. User can switch on/off emission when clicking "Laser" button.

Note: All the parameters except power can't be modified during emission.

③ Control MO signal

Figure 22 GUI control MO state

Ctrl MO: The "MO" button will be appeared on the interface after selecting Ctrl MO. User can control the switching of MO signal while clicking this button. This setting will not be preserved after power off.

2) Default parameter setting and selection

E type software can modify laser default parameter setting and selection in the option of "Parameter setting" and "Parameter selection". The parameter settings take effect immediately and save automatically after power down.
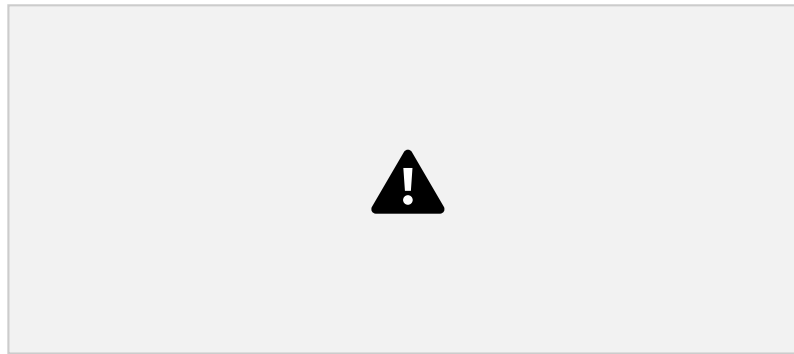
Figure23 Default parameter settings and selection

Lock PRR: Laser will lock to GUI setting frequency.

Default pulse: The laser will use GUI default pulse when no pulse width control command received.

Simmer：Can be used for controlling the height of the first pulse, the higher the value, the larger the first pulse. Setting range: 0-1000

Simmer setting examples：

Laser_start

Output pulse

[Appropriate Simmer]

Laser_start

Output pulse

[High Simmer]

Laser_start

Output pulse

[Low Simmer]

Lock power: Laser will lock to GUI setting power.

Red Power: Brightness of built-in red pilot(optional) can be adjusted, value range is 0-100.

External frequency: When selecting external frequency mode, the laser output pulse will be synchronized with external frequency signal. When not selecting this option, the laser will use with internal frequency mode. And the laser will calculate external frequency signal in MO and PA delay time. Default setting is internal frequency mode.

External frequency and internal frequency setting examples:

Laser_start

EXT.FRE

Output pulse

[External Frequency]

T

Laser_start EXT.FRE

[Internal Frequency]

Output pulse

*T=Duration of pulse period, maximum duration ≤ cut off frequency period

**Pin9Lock**：Power latch function is enabled if selected, rising edge is effective. Default setting is not selected.

Pin23Stop：Emergency stop function is enabled if selected, low level is effective. Default setting is not selected

Fan Speed Control：The laser fan speed will be control according to the value of the built-in temperature sensor. If not selected, the fans will run at full speed. Default setting is selected.

Note：The parameter setting of E type software takes effect immediately, no need to restart laser.

3.2 Laser monitoring function

The laser running status and alarm record can be read by E type software.
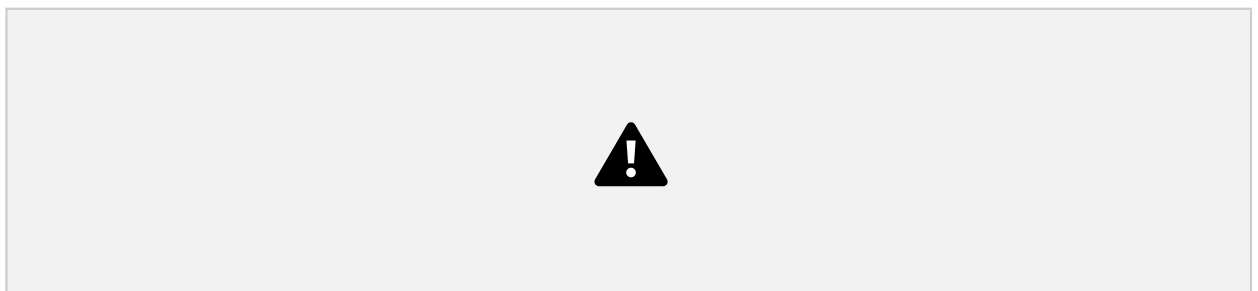
Figure 24 laser running status and alarm record

1) Status monitoring
Pump indicator light: Monitor whether the pump of the laser is currently in normal working state, which is green under normal conditions, and red light if abnormal alarm occurs.

PA、MO、Red indicator light: Monitor the control signal. Green light means signal is effective

(high level), and red light means signal is not effective (low level).

D0-D7 indicator light：Monitor the current power signal of the laser, corresponding the 8-bit binary mode, D0 is the lowest and D7 is the highest. Green light means this pin signal is effective (high level), and red light means this pin signal is not effective (low level).

PRR/kHz and PULSE/ns: Monitor the actual laser working frequency and pulse width. **Pump temperature:** Monitor the temperature of optical module.

Power current: Monitor the post amplifier driving current value of the laser. **System parameter:** Internal system parameter setting interface (For JPT internal use only). **Log record:** To record the laser setting and alarm.

Alarm record: To record the sequence of the latest 10 laser alarms.

2) Alarm description

Board tempLT: Board temperature is lower than the set temperature.

Board tempOT: Board temperature is higher than the set temperature.

Pump tempLT: Pump temperature is lower than the set temperature.

Pump tempOT: Pump temperature is higher than the set temperature.

PRE lowE: Pre amplifier low current alarm.

Voltage error: Supplying voltage is too low or too high.

No pulseE: No seed source backlight signal detected or backlight signal frequency less than 1kHz. **Seed TEC:** Seed source temperature is abnormal.

Warranty and service terms in User's Manual are for reference only. Official service and warranty are subject to official contract.