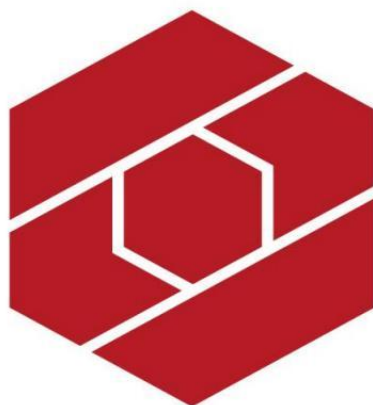


YFCW-100-SM-0506SA

CW Fiber Laser User Manual



GZTECH

Company Introduction

Wuhan Guangzhi Technology Co., Ltd. was established in May 2018 in Optics Valley of Wuhan. The Chairman, Dr. Huang Zhihua, is a graduate of Tsinghua University, and the founding team boasts profound expertise in theoretical design, technology development, and product engineering. The company specializes in the research and development, production, and sales of pulsed lasers, as well as offering laser process development and customized laser solutions. The products are primarily applied in fields such as new energy, hard and brittle material processing, surface marking, and cleaning. Based on fiber laser technology and solid-state laser technology, and integrating high-speed electronic control software and thermal control structure technology, the company has successively launched a series of industrial laser products including fiber MOPA, QCW, fiber infrared picosecond and green lasers, as well as solid-state nanosecond ultraviolet lasers. Additionally, it possesses OEM/ODM development capabilities for other special wavelength research and customization-type lasers.

GZTECH is named after a passage in *Mozi's Explanations of the Classics*, which reads, “Jing (shadow), when guang (light) arrives, jing vanishes; if guang exists, jing will never arise.” The 21st century is the Photonics Century, and GZTECH is dedicated to illuminating traditional manufacturing fields by utilizing advanced laser technology, thereby creating incremental value for society.

GZTECH is headquartered in Wuhan, with sales and service centers established in Shenzhen, Suzhou, and Jinan, as well as a Foreign Trade Department responsible for overseas business. Guided by the mission of “Promoting lasers to be a fundamental productivity tool in intelligent manufacturing”, GZTECH is committed to relentless technological innovation and continuous improvement of laser performance, aiming to make lasers a fundamental productivity tool in the field of future intelligent manufacturing.

GZTECH will proceed with utmost sincerity on the path to long-term success, growing and developing together with customers.

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Chapter 1 Safety Information

1. Safety warning signs and classifications

The following safety warning sign requirements must be strictly observed during the operation of lasers:

Sign type	Descriptions and requirements
	Warning: There is potential harm to the human body, and operations must be carried out following established procedures. Violation may result in personal injury. During operation: It is mandatory to wear qualified protective glasses at all times; direct viewing of or exposing skin to the laser beam is strictly prohibited.
	Attention: There is potential harm to the equipment, and operations must be carried out following established procedures. Violation may result in equipment damage. During operation: Avoid touching optical lenses or high-precision components; ensure that grounding and power supply meet specifications.
	Caution laser: This sign is posted at the laser output port. It indicates the presence of Class IV visible light, invisible light, and ultraviolet radiation from the laser. Direct exposure can cause permanent retinal damage.

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2. Laser safety protection requirements

Laser Class: CW fiber lasers all belong to Class IV lasers (with power greater than 500mw). In China, they are also classified as Class 4 according to GB 7247.1-2012.

Protective equipment: Specialized protective glasses that shield against laser must be selected and worn throughout the entire operation process.

Operation prohibitions: Direct contact with the laser output head or mirror-reflected areas is prohibited; installing cameras or optical instruments while the laser is in operation is prohibited; disassembling the enclosure or adjusting internal components without powering off is prohibited.

3. General safety regulations

Mirror reflection risk: Secondary radiation may be generated after the main laser beam is reflected by a flat surface. Although the energy is relatively low, it may still cause damage to the eyes or material surfaces. It is necessary to avoid the reflection path during operation.

Key points for optical operation: Before the laser operates, be sure to remove the dust cap from the collimating isolator. When the laser is functioning normally, avoid allowing your eyes or skin to come into contact with the laser emitted directly from or scattered by the laser output end. Do not look directly into the laser output head against the laser. Ensure that you are wearing laser safety glasses correctly when operating the laser.

Electrical safety: Before using the laser, please ensure that the power supply is a 24/48 VDC power source. Check the power supply voltage as well as the positive and negative terminals to make sure the connection is correct before powering it on. Incorrect connection may cause damage to the laser.

4. Operating environment and maintenance

Environmental requirements: Temperature: 10°C - 35°C; Humidity: 20% - 70% (no condensation). The equipment must be placed inside a ventilated and dust-proof cabinet, away from high-temperature or humid environments. The cooling fan should be kept at a distance of 5 cm or more from obstacles to ensure unobstructed airflow.

Daily maintenance: Do not collide with the scanning table or optical components. In case of a malfunction, shut down the equipment immediately and contact professional personnel. Regularly clean the dust from the equipment surface and keep the work area clean and tidy.

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5. Protection commitments and government-required safety assurances

Please read this manual thoroughly and sign the safety confirmation form before operation. Improper operation may lead to irreversible consequences! Although the laser itself is safe, necessary protective measures still need to be taken during use. Both equipment manufacturers and end-users should strictly adhere to laser safety standards, which is a fundamental prerequisite for ensuring safe production. In usage situations, it is imperative to commit to installing laser protection devices with isolation and blocking functions, even when the laser is in an activated state. Relevant safety requirements can be referred to in the national standard GB 7274.1-2012.

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Chapter 2 Product Introduction

This product is a continuous-wave fiber laser, featuring high beam quality, a compact structure, high electro-optical efficiency, and stable and reliable performance. It serves as a dependable laser source for industrial applications such as laser marking, laser welding, laser cutting, and laser cleaning. This product adopts standard industrial control interfaces, making it adaptable to various user operating environments.

1. Configuration list

Name	Quantity	Unit
CW fiber laser	1	Set
Test report	1	Sheet
Laser user manual	1	Piece

2. Optical characteristics

No.	Characteristics	Parameter value	Unit
1	Central wavelength	1064 ± 1	nm
2	Spectral width	< 5	nm
3	Output power	> 100	W
4	Power adjustment range	10 - 100	%
5	Laser switching ON/OFF time (at full 100 W)	< 15	μs
6	Output power instability (continuous operation at 25 °C for 8 hours)	< 2	RMS %
7	Beam quality M^2	1.05 ~ 1.1	/

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8	Polarization direction	Random	/
9	Indicator light power (660nm red light)	1 ~ 2	mW
10	Maximum modulation frequency	20	kHz
11	Delivery cable length (customizable)	5	m
12	Output Spot Size (customizable)	6 ± 1	mm
13	Output core diameter	14	μm

3. Electrical characteristics

No.	Characteristics	Parameter value	Unit
1	Power supply voltage	48	V
2	Working current	< 8	A
3	Power consumption	< 400	W
4	Recommended power supply	> 500	W

4. Environmental requirements

No.	Characteristics	Parameter value	Unit
1	Operating temperature	0 ~ 40	°C
2	Storage temperature	0 ~ 60	°C
3	Cooling method	Air cooling	/

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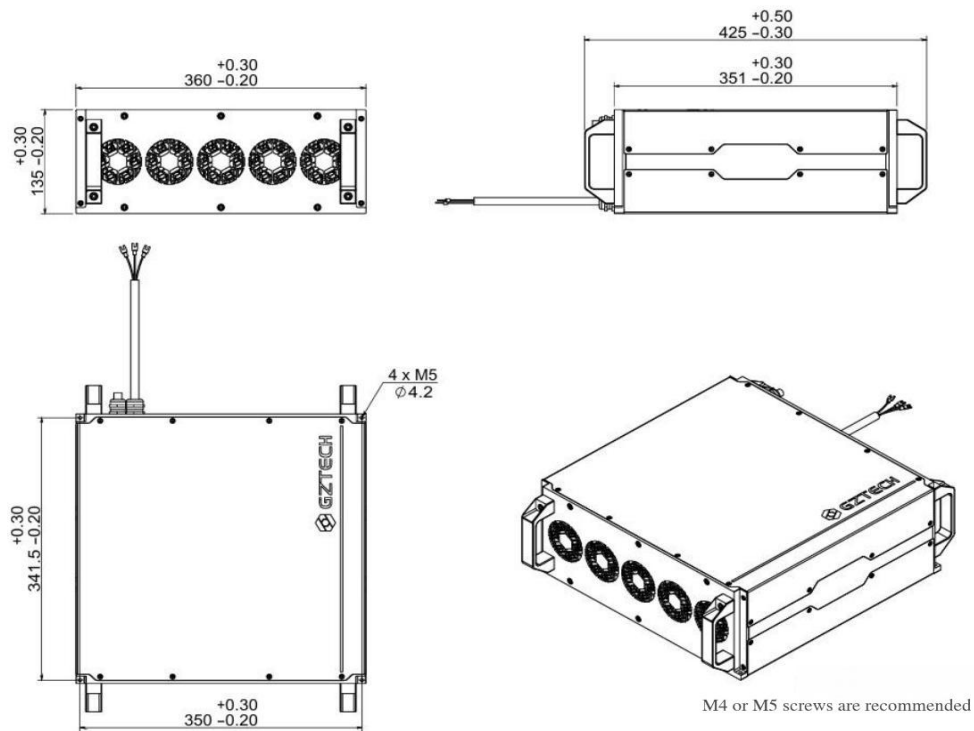
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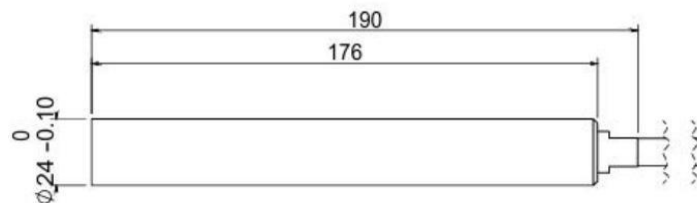
5. Structural characteristics

No.	Characteristics	Parameter value	Unit
1	Laser dimension	360*351*135	mm ³
2	Output head dimension	176*Φ24	mm ³
3	Net weight	< 23	kg

6. Dimension



Laser dimension



QCS dimension

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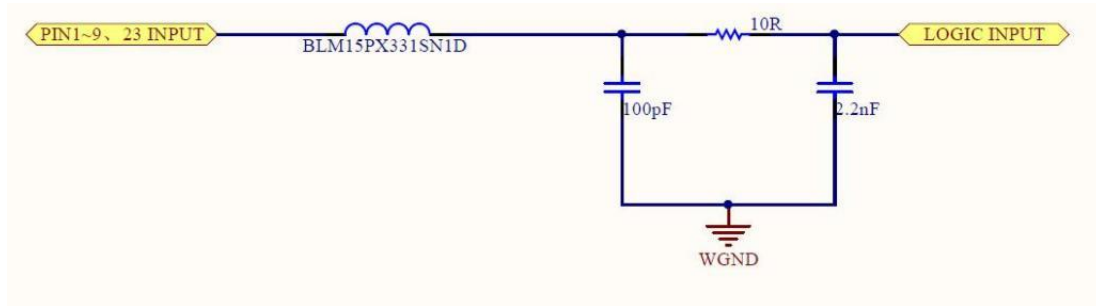
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Chapter 3 Laser Interface Description

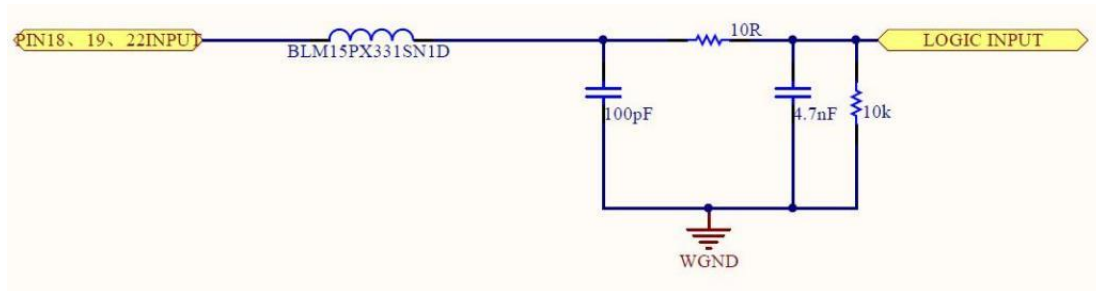
1. Electrical input-output characteristics

DB25 interface for digital signal input



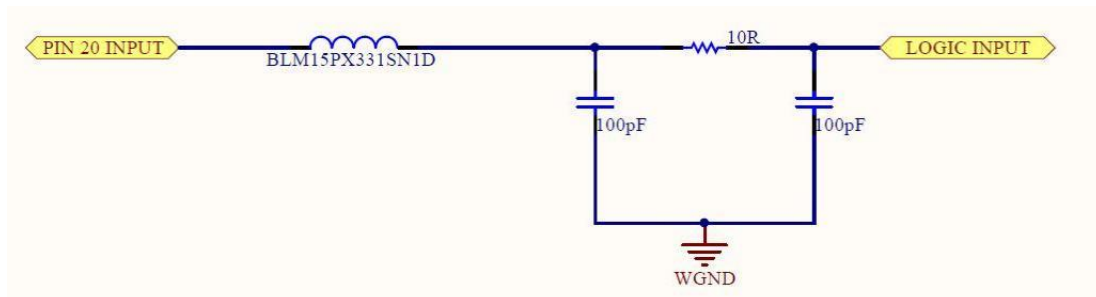
Maximum input voltage: 5.5V; Minimum operating input current: 8mA

Pin 1–9 and Pin 23 Input



Maximum input voltage: 5.5V

Pin 18, Pin 19, and Pin 22 Input



Maximum input voltage: 5.5V; Minimum operating input current: 8mA

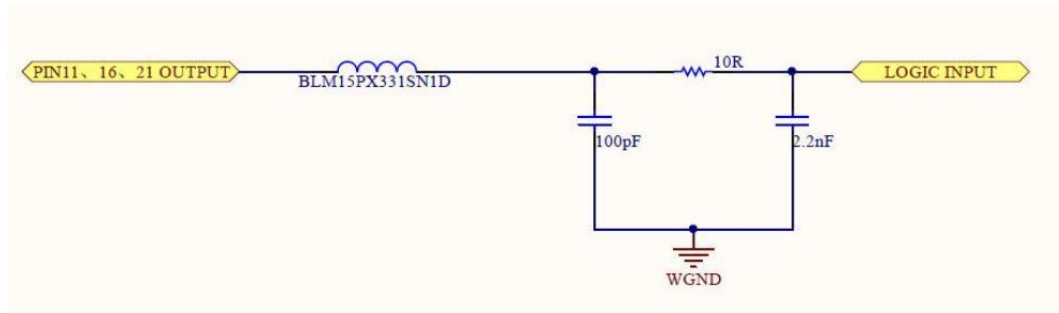
Pin 20 Input

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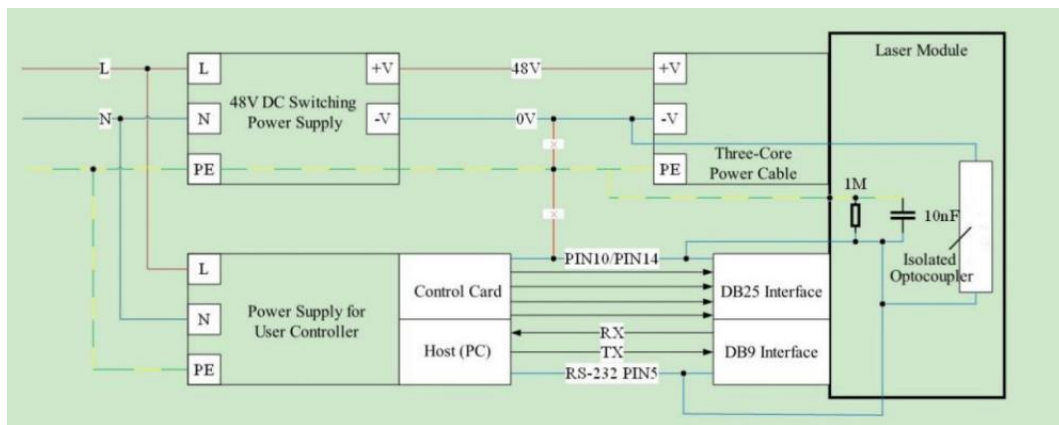
DB25 interface for digital signal output



Pin 11, Pin 16, and Pin 21 Output

Maximum output: 5V; Maximum output driving current: 10mA

2. Electrical connection diagram



3. Power interface definitions

The definitions for the laser power interface are shown in the following table:

Table 1 Power interface definitions

Line ID	Color	Definition
PE	Yellow-green	Grounding
0 V	Blue	48V-, negative pole
48 V	Brown	48V+, main power supply 48V

Note: The DC power supply voltage is 48V according to the laser model. For details, please refer to “electrical characteristics--power supply voltage” in the specification sheet.

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4. DB9 interface definitions

The RS232 interface type is DB9 male connector. The specific pin definitions are shown in the following table. When connecting to a computer, a crossover cable is required.

The definitions for the DB9 interface are shown in the following table:

Table 2 DB9 interface definitions

Pin	Definition
1,4,6-9	No connection
2	RXD
3	TXD
5	GND

5. DB25 interface definitions

The definitions for the DB25 interface are shown as follows:

Table 3 DB25 interface definitions

Pin	Definition	Note
1-8	Power setting, 8-bit bus, with pins 1-8 corresponding to data bits D0 ... D7. A value ranging from 0 to 255 represents the power from minimum to maximum.	Input with isolation
9	Power latch signal, active on the rising edge.	Input with isolation
10,14	GND	
11,16,21	Alarm status	Output with isolation

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12,13,15, 17,18,20, 23,24	Reserved	
19	EM signal -- Laser switching on/off control signal, active high. High level is greater than 3.7V; Low level is either unconnected or less than 0.8V.	Input with isolation
22	Red light indication control signal, active high.	Input with isolation
25	The analog power setting can be customized within (0.4~4.7V) or (0.4-10V), corresponding to 10-100%.	Input with isolation

Note: The high level range of DB25 signal is greater than 4.6V and less than 5.4V; the low level is less than 0.5V.

Table 4 Laser status output table

Pin 16, 21 status:		
Pin 16	Pin 21	Status introduction
LOW	LOW	Temperature alarm. Abnormal BNC input. Abnormal power supply.
LOW	HIGH	Normal operation. The laser is in the self-test phase and is not prepared for use.
HIGH	LOW	Anti-laser alarm
HIGH	HIGH	System error

PIN 11:

LOW -- The laser output is turned off; HIGH -- The laser is currently outputting.

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Chapter 4 Software Instructions

1. Driver installation

Double-click the provided serial port driver, click “Next”, wait for the installation to complete, and then click “Finish”. As shown in the following figure:

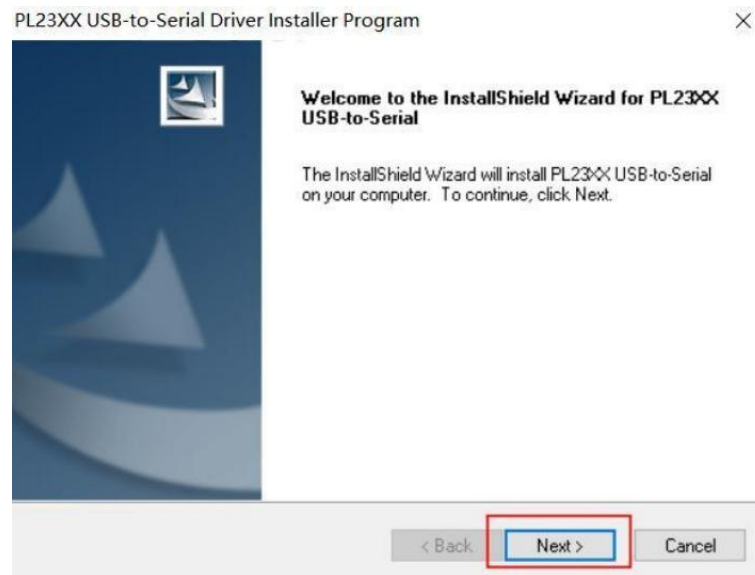


Figure 1 Install the serial port driver

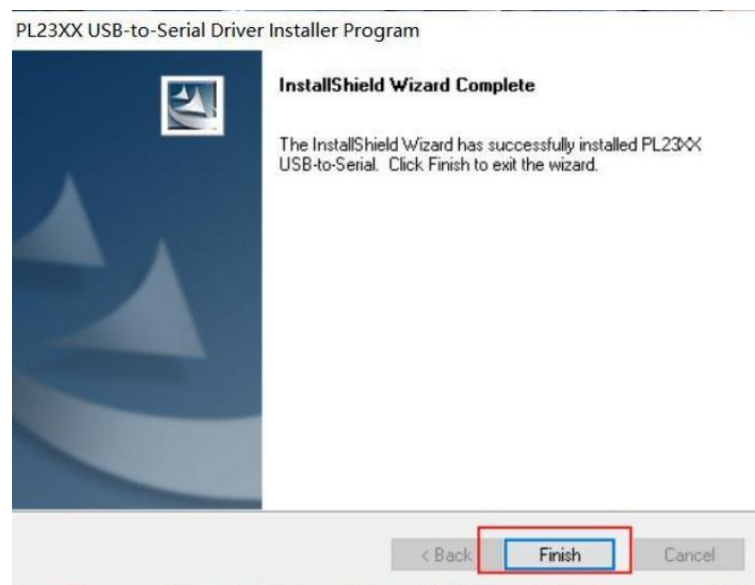


Figure 2 Installation completed

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◆ Check the corresponding serial port of the laser:

1) This PC → Management → Device Manager → Ports. As shown below, the serial port number is COM3.

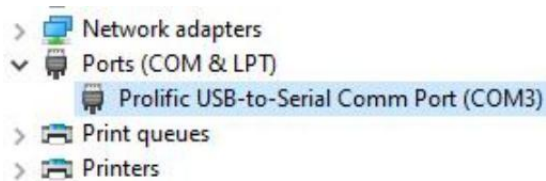


Figure 3 Serial port search

2) As shown in the figure below, the serial port is not found. Please reinstall the serial port driver.



Figure 4 Serial port not found

2. Navigation function



Figure 5 Navigation control number

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1 -- “Automatic Connection”: No need to manually select a serial port. The system will automatically iterate through all available serial ports until a successful connection is established or all ports have been tried.

2 -- “Language”: The interface displays Chinese by default, and switches to English after pressing

3 -- “Official Website”: Click to open the link to our company’s official website.

4 -- “Contact”: Click to open the link to our company’s contact information interface.

5 -- “Help”: Click to open the link to our company’s relevant file download interface.

6 -- “Manual Connection”: Manually select the serial port corresponding to the laser, and press this to initiate the connection to the laser.

7 -- “Information”: After pressing it, the main interface will jump to the information interface (Section 4).

8 -- “Home”: After pressing it, the main interface will jump to the general control interface (Section 5).

9 -- “More”: After pressing it, the main interface will jump to the additional control interface (Section 6).

10 -- “State”: After pressing it, the main interface will jump to the status interface (Section 7).

11 -- “Abnormal”: After pressing it, the main interface will jump to the abnormal data table interface (Section 8).

12 -- “Parameter”: After pressing it, the main interface will jump to the data interface (Section 9).

13 -- “DB25”: After pressing it, the main interface will jump to the DB25 interface (Section 10).

14 -- “Chart”: After pressing it, the main interface will jump to the line chart interface (Section 11).

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3. Software connection

1) Refresh serial ports

When the program is launched, it will automatically read all currently-available serial ports on the computer. If you connect the computer to the laser using a serial port cable after opening the program, you need to refresh the program's serial port status. Simply press the shortcut key **[Alt + R]** to refresh the current serial ports, which must be in the **unconnected state**. It is not available during the connection process or when already connected.

2) Automatic connection

After pressing this button, the system will automatically iterate through all currently available serial ports. During the connection process, it will send commands to the laser. The connection will be considered successful only when it is confirmed that the serial port cable is indeed connected to the laser. Otherwise, it will proceed to test the next serial port. The entire process will conclude when all serial ports have been checked or a successful connection has been established with one of them. Throughout the connection process, the progress will be displayed. When the connection succeeds, the progress will reach 100%; when it fails, the progress will halt, and connection information will be shown in a message box.

If the serial port number corresponding to the laser is already known, it is recommended to use manual connection.

3) Manual connection

Select the serial port corresponding to the laser from the drop-down box above the button. Press the "Manual Connection" button to initiate the connection process. A pop-up window will display whether the connection is successful or failed, and connection information will also be shown in the message box.

If the computer is currently connected to a large number of serial ports, it is recommended to use manual connection, as it will take less time.

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4. Information interface

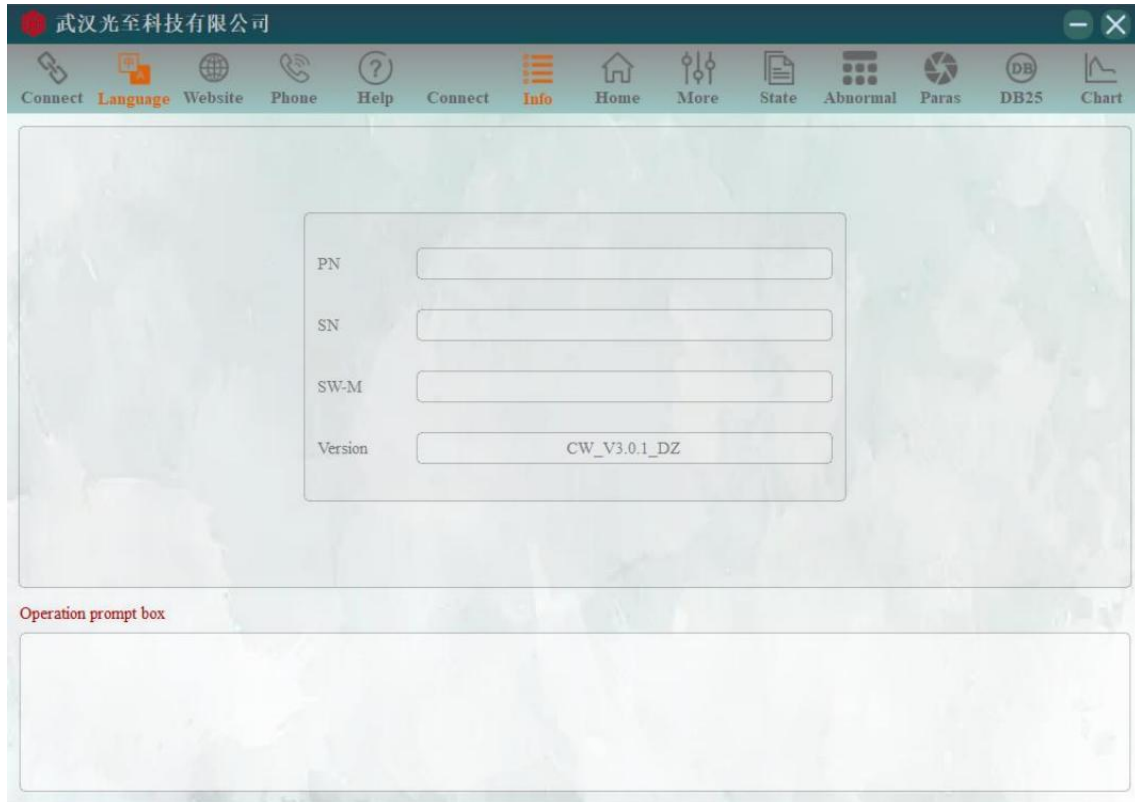


Figure 6 Information interface

This interface defaults to displaying the version of the upper computer program. After a successful connection, it retrieves information from the laser and displays the laser's PN (Part Number), SN (Serial Number), and SW-M (main control version).

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5. Control interface



Figure 7 Control interface

◆ Laser control

1) Red light

Click the red light switch control. When the switch is green (on the right side), it indicates that the red light is turned on, and the red light status indicator turns green. When the switch is gray (on the left side), it indicates that the red light is turned off, and the red light status indicator turns gray.

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2) Laser

This function is only available **when the laser control is set to GUI control**.

When clicking the laser switch control, if the switch turns green (on the right side), it indicates the laser is turned on, and the laser status indicator turning green signifies that the laser is currently active. If the switch is gray (on the left side), it indicates the laser is turned off, and the laser status indicator turning gray signifies that the laser is already off.

3) Error status

When not connected, the status indicator defaults to gray. After connection, the system reads the error status code and PD protection status code from the MONITOR feedback. If both codes are 0x0, it indicates a normal status, and the status indicator turns green. If either of the codes is not 0x0, it indicates an abnormal status, and the status indicator turns red. Under abnormal status conditions, laser emission is prohibited.

4) Power

This function is only available **when power control is set to GUI control**.

The setting range is 0% to 100%. After entering the desired power percentage value in the power input box, press “Enter” or click the “Confirm” button to set the corresponding power percentage.

Once set, the real-time power percentage can be viewed in the parameter monitoring section to confirm whether the setting has been successfully applied.

5) Frequency

This function is only available **when PWM signal control is set to GUI control**.

After entering the desired frequency value in the frequency input box, press “Enter” or click the “Confirm” button to set the corresponding frequency (in kHz).

Once set, the real-time frequency can be viewed in the parameter monitoring section to confirm whether the setting has been successfully applied.

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6) Duty cycle

This function is only available **when PWM signal control is set to GUI control.**

After entering the desired duty cycle value in the duty cycle input box, press “Enter” or click the “Confirm” button to set the corresponding duty cycle (in %).

Once set, the real-time duty cycle can be viewed in the parameter monitoring section to confirm whether the setting has been successfully applied.

7) Filtering strength

The selectable filtering strength values are 0, 3, 4, 5, and 6.

Simply choose the desired value from the drop-down box and click the corresponding setting button to apply the configuration.

◆ Mode control

1) Power control

When operating under GUI control, the laser’s power parameters can be adjusted through this program (via DB9 interface). When using DB25 control, the power is externally controlled, and the program’s power-setting function becomes unavailable. For analog control, the power can be set via external analog signals.

2) Laser control

When operating under GUI control, the laser’s emission can be controlled through this program (via DB9 interface). When using DB25 control, the laser is externally controlled, and the program’s laser control functions become unavailable.

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3) PWM signal

When operating under GUI control, the laser's frequency and duty cycle can be adjusted through this program (via DB9 interface). When using DB25 control, the frequency and duty cycle are externally controlled, and the program's frequency and duty cycle control functions become unavailable.

4) Power mode

The power mode can be set to either latch mode or follow mode.

◆ Parameter monitoring

Real-time feedback of laser-related parameters, such as power, frequency, duty cycle, main circuit voltage, main circuit current, circuit temperature, and optical path temperature, is provided.

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6. More interface

Note: Prior to (and excluding) main control version V9.8.10, the external interface enable function was not available; Prior to (and excluding) main control version V9.8.12, the mode customization function was not available.

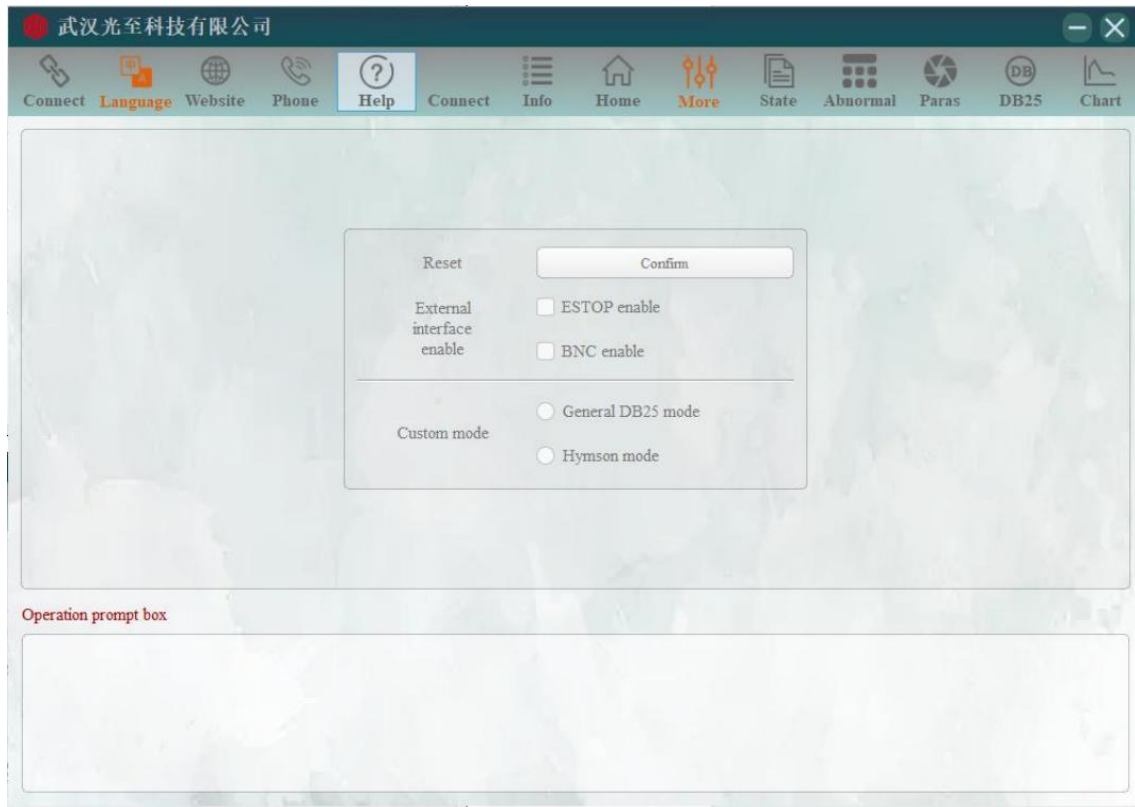


Figure 8 More interface

You can choose whether to enable the ESTOP and BNC external interfaces (select according to the actual conditions of the laser). A restart is required for the settings to take effect.

Mode customization: Configured for certain customized laser models.

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7. Status interface

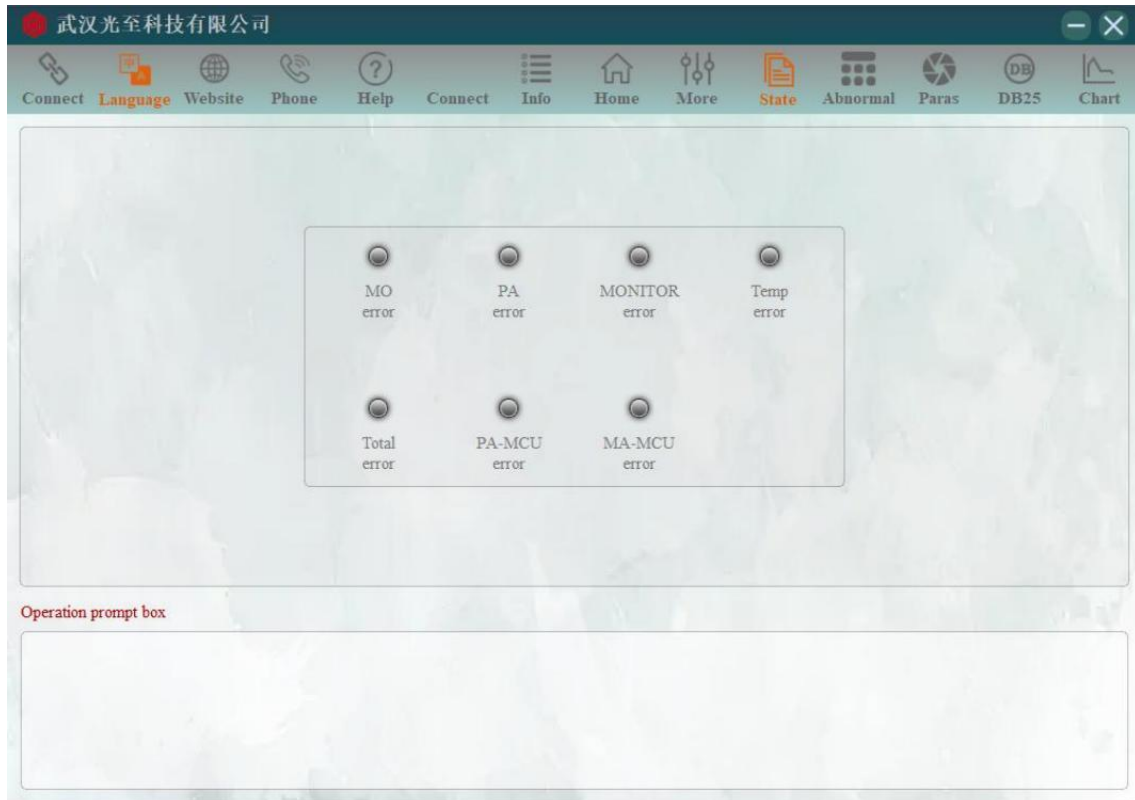
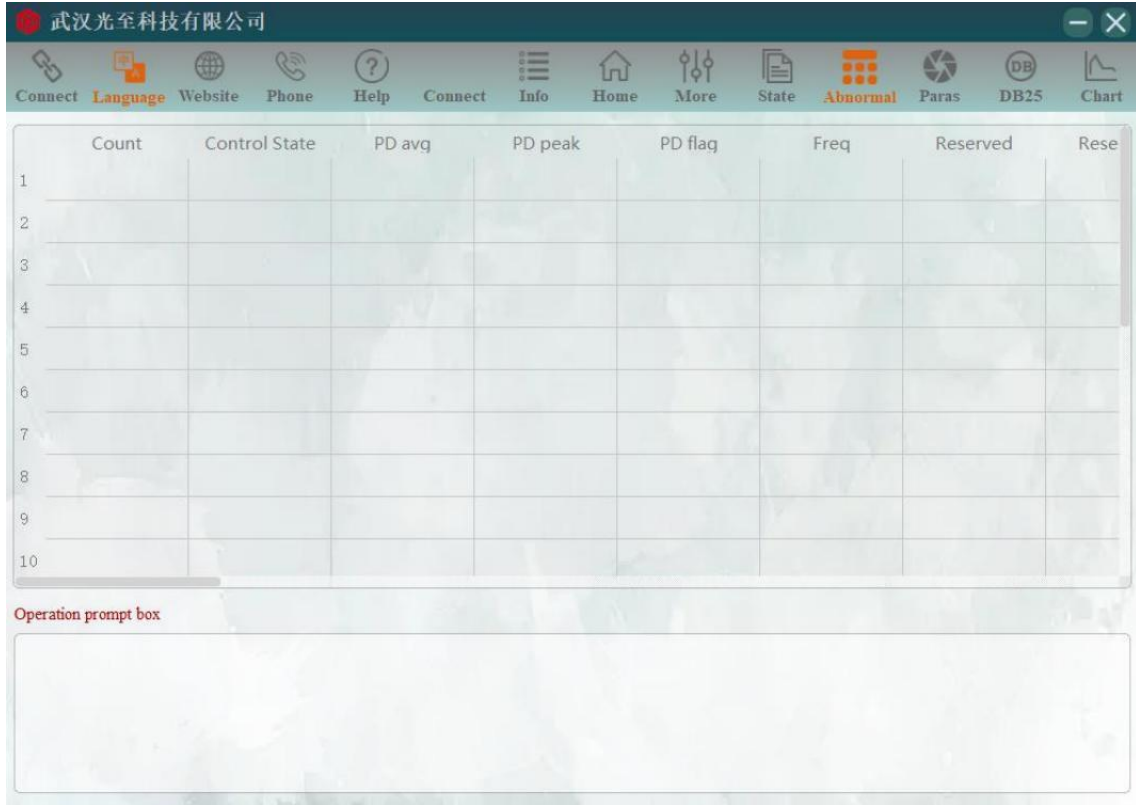


Figure 9 Status interface

After a laser abnormality occurs, detailed error information can be viewed on the status interface. When not connected, the status indicator defaults to gray; it displays green for normal operation and red for abnormal conditions.

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8. Abnormal table interface



Count	Control State	PD avg	PD peak	PD flag	Freq	Reserved	Rese
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Operation prompt box

Figure 10 Abnormal table interface

Upon successful connection, historical abnormal data will be initially retrieved and displayed on this interface. After a laser abnormality occurs, the software will automatically retrieve the laser's recent abnormal data again and display it on this interface, with a maximum of 20 entries shown.

Right-click on the table and select **[Save]** to save the data to the “abnormal_data.csv” file in the same directory as the program. When using this function, please ensure that the file is not open or occupied by other applications; otherwise, the save operation will fail.

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9. Parameter interface

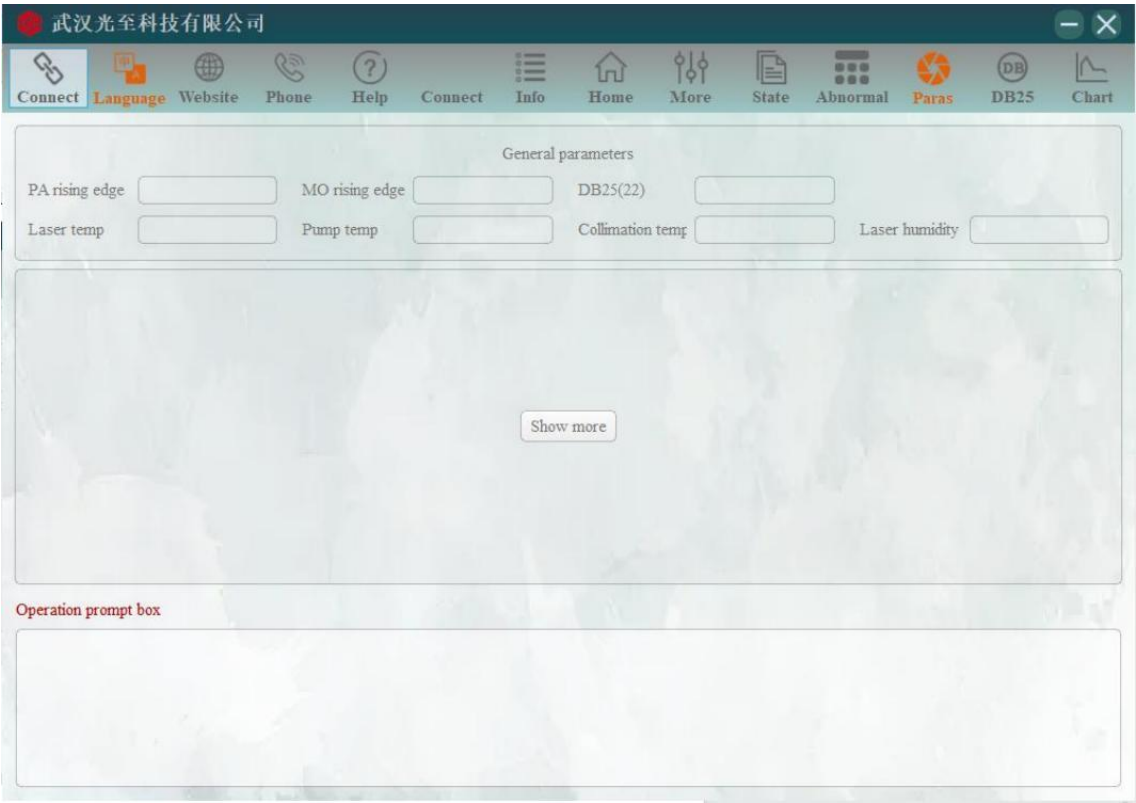


Figure 11 Parameter interface

Display real-time parameters related to the laser, with only the general data sections shown by default.

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10. DB25 interface



Figure 12 DB25 interface

You can view the open/closed status of each DB25, where gray indicates closed and green indicates open.

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11. Trend chart interface

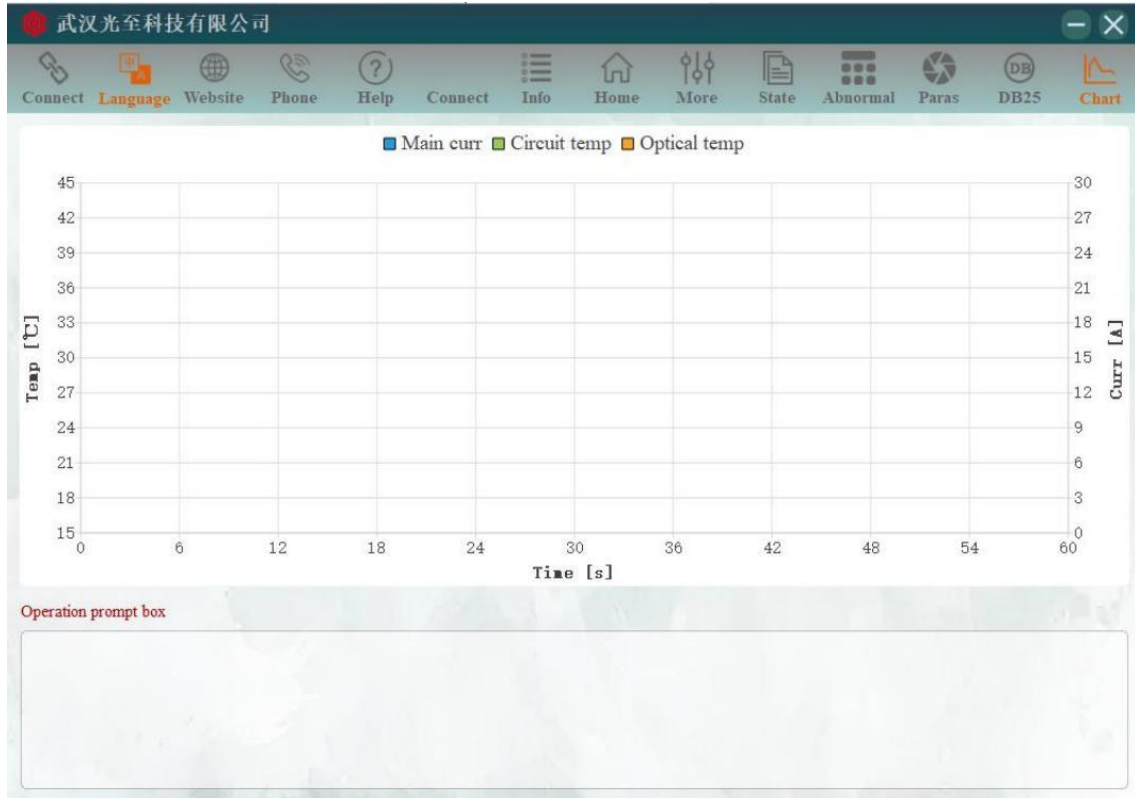


Figure 13 Trend chart interface

After a successful connection, the main circuit current, circuit temperature, and optical path temperature of the laser will be acquired and displayed in real-time on a line chart, allowing users to observe the changing trends.

The chart only displays data from the most recent 60 seconds.

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12. Data recording

After connecting to the laser, a corresponding database file with the “.db” extension will be generated, named using the laser’s SN (sn.db). The file will be created in the “cw_dbs” folder located in the same directory as the software. The database consists of four tables in total.

tab_day: Daily data table. Data is recorded each time the laser provides feedback, with a maximum retention of 5 days’ worth of data in total.

tab_year: Yearly data table. The format is consistent with the daily data table, with records captured every 15 minutes for long-term storage.

tab_gui: GUI operation log table. Records all commands issued to the laser via software operations, along with their corresponding timestamps.

tab_error: Records abnormal command feedback data from the laser.

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Chapter 5 Product Usage

1. Pre-startup preparation

- 1) Check the laser for any external abnormalities, including dents on the casing, or any bending, detachment, or damage to the output armored cable.
- 2) Check the cleanliness of the output head end-face to ensure it is free from dirt, scratches, or defects before laser emission.
- 3) Securely mount the laser on the support frame, ensuring proper ventilation is maintained during operation.
- 4) Connect the power cable to a 24V or 48V DC constant-voltage power supply, ensuring the power supply can provide sufficient output power. Please refer to the power interface definitions for details. Incorrect power connections may result in laser damage or burnout.
- 5) Connect the signal cable between the equipment and the laser, and verify that it is securely fastened.

2. Operational steps

- 1) Pre-startup Preparation.
- 2) Turn on the power supply of the equipment and the laser. Wait approximately 15 seconds after powering up the laser power supply before proceeding with subsequent operations.
- 3) After the equipment is turned on, check that the laser is in a normal state.
- 4) Click the red light switch button and check if there is red light output from the output head. Then, set the power percentage to 10%, click the laser switch button, and use a frequency-doubling plate to observe whether the corresponding laser output and the laser spot are abnormal.

3. Precautions

- 1) Laser protective glasses should be worn during operation.
- 2) When shutting down, stop the operation of the laser first, and then turn off the power supply of the laser.

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Chapter 6 Serial Port Command Instructions

1. Serial communication settings

Baud Rate: 115200

Data Bits: 8 bits

Stop Bits: 1 bit

Parity Bits: None

Table 5 Protocol format

Command (in lowercase)	Space	Parameter	New line
'string'	' '	'xxx'	'\n'

Example: To set the power to 10%; send: 'pp 10\n';

The laser will return 'pp: 10\n' within 50ms;

If 'Input instruction error: 10\n' is received, it indicates a setting error.

Table 6 Laser command parameter table

Command	Parameter	Remarks	Data type
pp	Sets the power percentage, which is only valid when the power control is set to serial port.	Percentage 0-100	int
out	Sets the laser output, which is only valid when the laser output control is set to serial port. 0--Turn off the output 1--Turn on the output	--	int

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outputsw	Sets output control 0--DB25 control 1--Serial port control	--	int
powersw	Sets power percentage control 0--DB25 control 1--DB9 control	--	int
guide	Sets red light 0--Turn off the output 1--Turn on the output	--	int
cnmode	0--Normal mode: After power-off, power percentage and output control modes switch to DB25 control; 1--Custom mode: Power percentage and output control modes can be saved.	Not lost after power-off	int

Note: We can also set the serial communication to control the laser parameters through MODBUS protocol. Please contact us if you need.

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Chapter 7 Troubleshooting Guide for Common Product Issues

1. Common product issues and solutions

Table 7 Troubleshooting table for common issues

Issue No.	Issue Description	Solutions
1	Fan not rotating after laser power-on	1) Check if the power connection is normal; 2) Replace the power supply.
2	Abnormal noise from the laser	1) Ensure that the noise is coming from the laser fan, not from other devices; 2) Check for foreign objects on the rear cover of the laser; 3) Check if the abnormal noise is due to improper installation of the laser.
3	No laser emitting	1) Ensure that the laser fan is functioning normally and that there are no obstructions in the optical path; 2) Ensure that the hardware connections are normal, including DB9 or DB25 connections; 3) Ensure that the input voltage is normal; 4) Confirm that the software settings are correct; Check if the software is raising any alarms; 5) Connect to our company's "GUI" software to control the laser to emit laser. If it does not emit laser, an alarm message will be displayed.

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4	Low laser power	1) Check if the laser parameters are set correctly; 2) Check if the power meter is functioning properly for testing; 3) Check if the output head of the laser is contaminated; 4) Use our company's "GUI" software to control the laser to emit laser and test the power.
5	Abnormal laser spot	1) Observe if the lens on the output head of the laser is clean and undamaged while the laser is powered off.
7	Laser parameters not adjustable	1) Check whether the control software is the GUI software of our company. 2) Check the control mode settings and select the corresponding internal or external control mode. 3) Check whether the control cable is properly connected.

If the above solutions do not resolve the issue, please contact our company's after-sales personnel.

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Chapter 8 Warranty Statement

Damage to personnel or equipment caused by failure to operate in accordance with this manual is not covered by the warranty;

Users are prohibited from disassembling or assembling the equipment by themselves, and repairs must be carried out by authorized technicians from GZTECH.

Do not open the laser. If you encounter any malfunctions or have questions, please contact Wuhan Guangzhi Technology Co., Ltd. If the label is torn off or damaged, the company will not provide a warranty.

Warranty Terms for Fiber Laser Products: The free warranty period for fiber lasers starts from the date of the sales contract and varies from 24 months to 36 months depending on the model, with the specific period subject to the contract agreement;

Warranty Terms for Solid-State Laser Products: The free warranty period for solid-state lasers starts from the date of the sales contract and is 18 months, with the specific period subject to the contract agreement. For wear-and-tear components exposed to the user's operating environment, including beam expanders and window mirrors, the warranty period is 6 months.

Extended Warranty Service: After the laser warranty expires, to ensure post-sales service quality, customers can purchase extended warranty services. For specific pricing, please consult the business department.

Remote Service: For laser malfunction issues, please call our after-sales service hotline tel: 400-863-9698. We promise to respond within 24 hours.

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Certificates

RoHS Certification



FCC Certification



FDA Certification



CE Certification



For more detailed certification source documents,
please visit GZTECH official website: <https://en.gzlasertech.com/>

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