



RFL-QCW450/1500FS

User Guide

Wuhan Raycus Fiber Laser Technologies Co., Ltd.



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1 Safety Information


Thank you for choosing Raycus fiber laser. This User Guide provides important safety, operation, warranty and other information. Please read it carefully before you use this product. In order to ensure safe operation and optimal performance of the product, please follow the warnings, cautions, operating procedures and other instructions accordingly.

1.1 Symbols Used in this User Guide

	◆ WARNING: Describes a hazard that lead to a personal injury or death.
	◆ CAUTION: Describes a hazard that lead to a minor personal injury or product damage.

1.2 Laser Classification

This series of lasers are classified as a high power Class 4 laser instrument according to the European Community standards EN 60825-1, clause 9. This product emits invisible laser radiation at or around a wavelength of 1080 nm, and the total light power radiated from the optical output is greater than 450W (depending on model). Direct or indirect exposure of this level of light intensity may cause damage to the eye or skin. Despite the radiation being invisible, the beam may cause irreversible damage to the retina and/or cornea. Appropriate and approved laser safety eyewear must be worn all the time while the laser is operational.

	<p>◆ WARNING: You must use appropriate laser safety eyewear when operating this device. The laser safety eyewear is selected according to the range of wavelengths emitted from this product. The end user must ensure that the laser safety eyewear used protects against light emitted by the device over its entire range of wavelengths. Please check the safety labeling on the product (Figure 1) and verify that the personal protective equipment (e.g. enclosures, viewing windows or viewports, eyewear, etc.) being utilized is adequate for the output power and wavelength ranges listed on the product.</p>
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1.3 Safety Labels

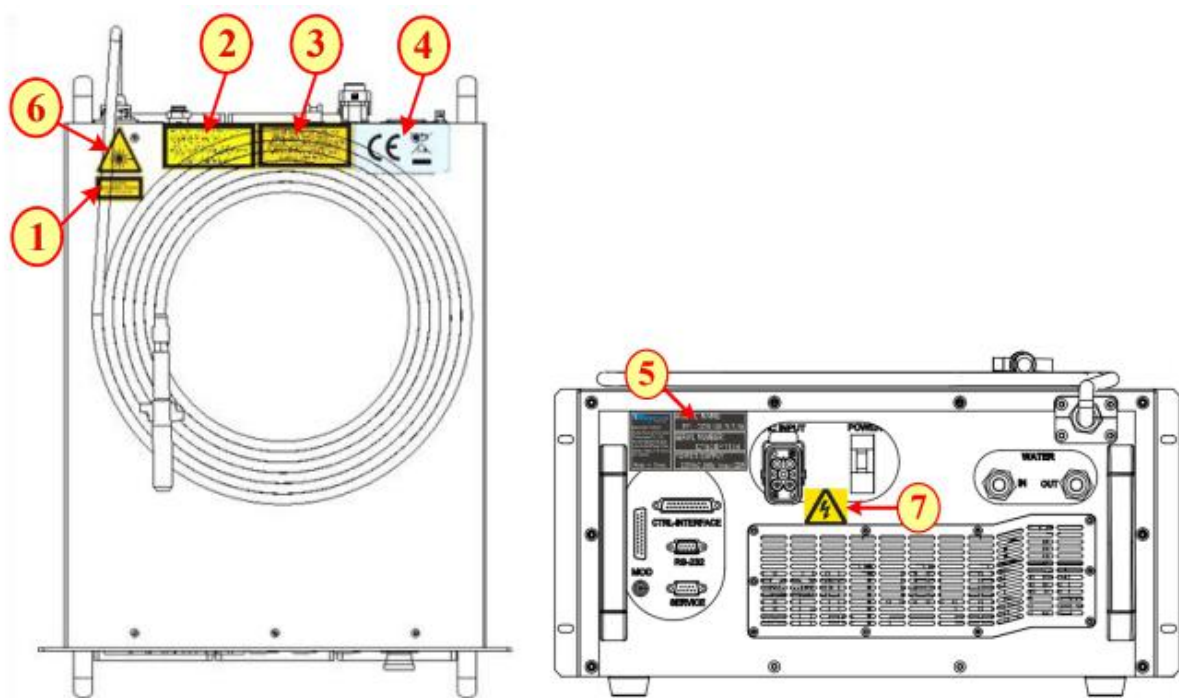


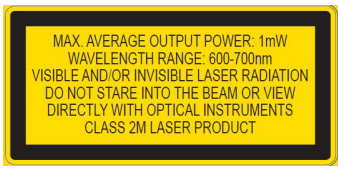






Figure 1 Safety Label Locations


Figure 1 shows safety labels and their locations. These include warning labels, apertures through which laser radiation is emitted and labels of certification and identification, etc. Specifications of these labels are as follows:

Table 1 Safety Labels

		
1: Aperture Label	2: Class 4 Laser Product	3: Class 2M Laser Product Label for Guide Laser
		
4: Identification Plate	5: CE Compliance	6: Laser Radiation Hazard
		
7: Electrical Hazard		


1.4 Optical Safety

Any dust on the end of the collimator assembly can burn the lens and damage the laser.

	<p>◆ CAUTION: DO NOT emit when the protective cap is not removed, or the laser will be damaged.</p>
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1.5 Electrical Safety

1) Make sure your product is grounded through the PE line of the AC power cord. The grounding must be firm and reliable.

	<p>◆ WARNING: Any interruption from the protective earth will electrify the enclosure, which may result in personal injury.</p>
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2) If the fuse blows out, replace it with only the same types and ratings. The use of other fuses or material is prohibited. You can contact Raycus for the information of the fuse.

- 3) Make sure that the correct voltage of the AC power source is used.



◆ **CAUTION:** Failure to connect the laser to the correct voltage could damage the product.

There are no operator serviceable parts inside, so do not try to remove covers, or electrical shock may be caused, and warranty will be void.

1.6 Other Safety Rules

- 1) Never look into the laser output port when power is supplied to the laser
- 2) Avoid using the laser in a dim or darkened environment
- 3) If this device is used in a manner not specified in this document, the protection provided by the device may be impaired and the warranty will be voided.
- 4) Do not remove the covers of the laser, or the warranty will be void. All maintenance must be performed in Raycus or by qualified Raycus personnel.

2 Product Description

2.1 Features

Your Raycus QCW fiber laser is designed for industrial and scientific research applications with high pump conversion efficiency, low power consumption and excellent beam quality. It is compact and ready to use. It can be used as a stand-alone unit or easily inserted into user's apparatus.

Main Features:

- High beam quality
- Replace lamp pumped laser
- High Photoelectric conversion efficiency
- Pulse mode and continuous mode
- High pulse power / energy stability with peak power

Applications:

- 3C material cutting
- Spot welding, seam welding and micro welding

- Long pulse drilling

2.2 Package Contents

Please refer to the packing list accompanying the shipment to check actual items included.

2.3 Unpacking and Inspection

Your Raycus QCW fiber laser is shipped in a package designed to provide maximum protection. Upon delivery, please inspect all packaging for evidence of mishandling or damage. If you find any evidence of mishandling, please save the damaged material and contact the shipping agent and Raycus immediately.

Remove all the contents from the packing case. Take extra care when removing the unit from the packing case to ensure that the fiber optic cable is not snagged and damaged. A comprehensive packing list is included with the system documentation. Check all items against the list and contact Raycus immediately if there is any missing item or evident damage to the unit. DO NOT attempt to install or operate the laser, if there is any evident or suspected damage to the unit.

It is recommended that you do not discard the packing materials, as they will be necessary if you ever need to ship the unit back for service at a later date.。



◆ CAUTION: The fiber optic cable and output head are precise optic instrument, ANY vibration or impact to the output head, and twist or excessive bend to the cable will damage the instrument.

2.4 Operation Environment

The operation conditions are listed in the table below:

Table 2 Operation Conditions for the Laser

Power supply voltage	Single phase 220V±10%、 50/60Hz AC
Power supply capacity	>1800W
Installation environment	Flat and no vibration
Relative temperature	0°C~40°C
Ambient humidity	< 80%

weight	<50kg
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warnings:

- 1) Make sure the instrument is properly grounded before you use it.
- 2) There are no user serviceable parts, equipment or assemblies inside the product. All service and maintenance shall be performed by qualified Raycus personnel. In order to prevent electric shock, please do not break the seal or uncover the shield. Failure to comply with this instruction will void the warranty;
- 3) Please check the fiber connector carefully to prevent dust or other pollution. Please use special paper when cleaning the fiber connector lens.
- 4) If the laser is not used according to the method specified in this manual, the laser may be in abnormal working state and cause damage.
- 5) It is not allowed to install the fiber connector when the laser is in operation;
- 6) Do not look into the output head directly. Wear appropriate protective eye glasses all the time when operating the laser;

2.5 Precautions for Use

- 1) Make sure that the correct voltage of 220VAC power source is used. Failure to connect power source correctly will damage the device
- 2) Failure to follow the instructions may cause malfunction and damage to the device, such damage is not covered by warranty.
- 3) Please cap the output head when it is not in use, and make sure the cap is clean;。
- 4) It is not allowed to install the output head when the laser is in operation;
- 5) Failure to follow the instructions may cause malfunction and damage to the device, such damage is not covered by warranty

2.6 Specifications

Table 3 Product Specifications

Models	RFL-QCW450/1500FS	Testing Environment
Optical Characteristics		
Operation Mode	CW/pulse	
Vibration direction	Random	
Maximum average power (W)	450（pulse） 500（CW）	
Maximum peak power(W)	1500	
Repetition rate (Hz)	50-5000	Rated output power
Pulse width(ms)	0.1-75	Rated output power
Maximum pulse energy (J)	15	Rated output power
Wavelength (nm)	1080±5	Rated output power
Output power instability	±1.5%	Rated output power; Working duration: ≥6hrs; Working temperature: 25℃
Output power of guide laser (mW)	0.1~1	
Optical Output Characteristics of QBH		
Beam quality (BPP, mm ×mrad)	<0.5@25μm <2@50μm	Rated output power
Cable length (m)	5(25μm); 15(50μm)	
Electrical Characteristics		
operating voltage	Single phase220V±10%、 50/60Hz AC	
Maximum power consumption(W)	1800(pulse mode) 1700(CW mode)	
communication mode	RS-232/AD	
Other Characteristics		
Dimensions(W×H×D)	450×237×739(include handles)	
Weight(kg)	<50	
Operation temperature (℃)	0~40	
Operation humidity (%)	<80	
Storage temperature(℃)	-20~60	
Cooling method	Water cooling	

3 Installation

3.1 Dimensions

Figure 2~Figure 4 show the dimensions of the laser.

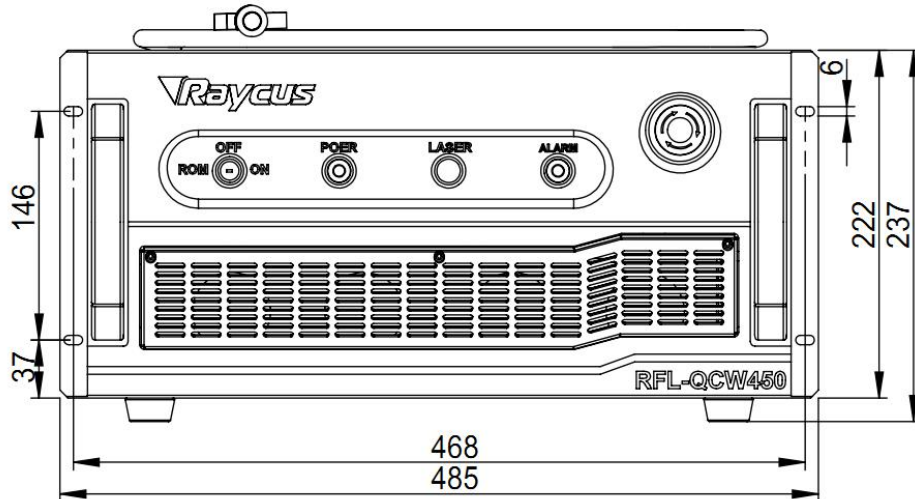


Figure 2 Front panel view (unit: mm)

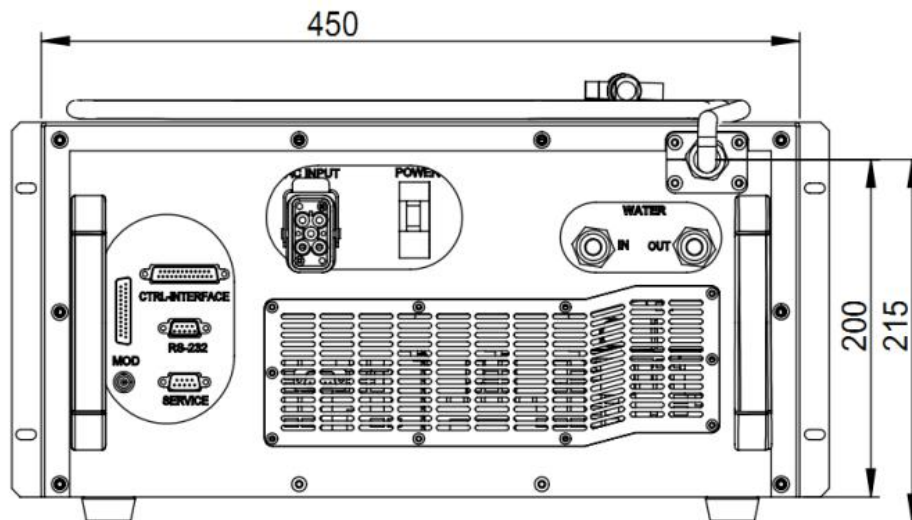


Figure 3 Rear panel view (unit: mm)

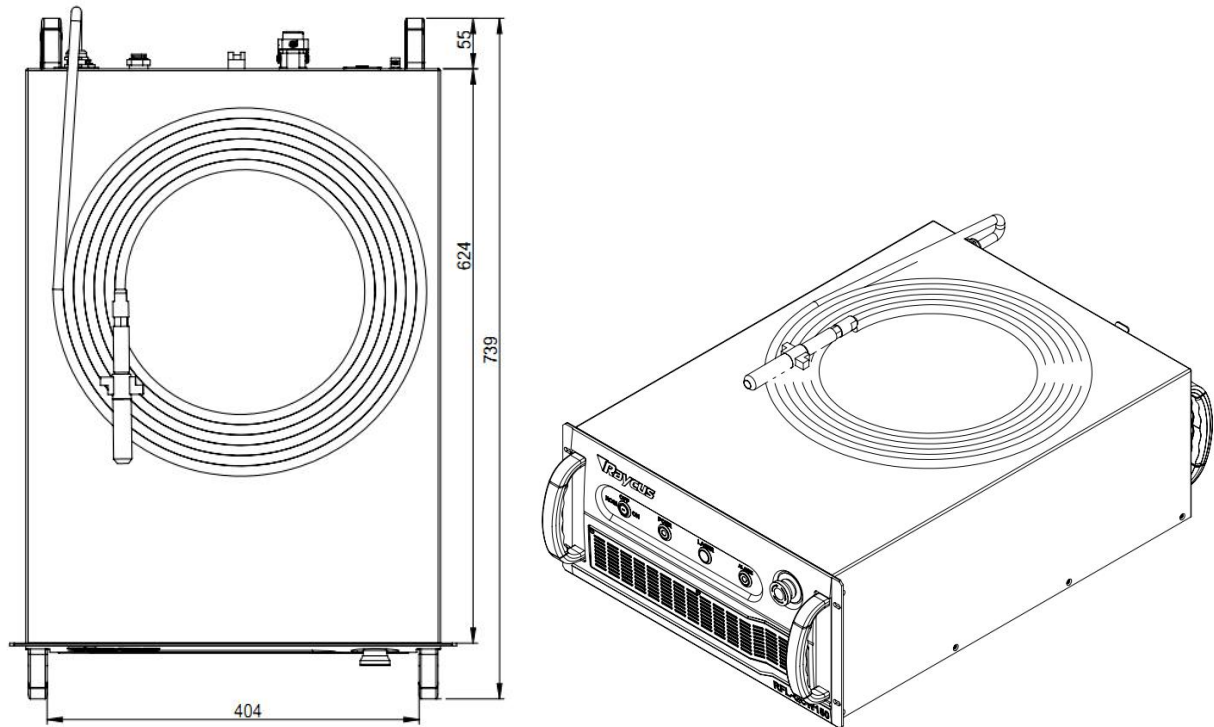


Figure 4 Top and Side view (unit: mm)

3.2 Dimensions and installation of fiber connector

Figure 5 shows the dimensions of the fiber connector.

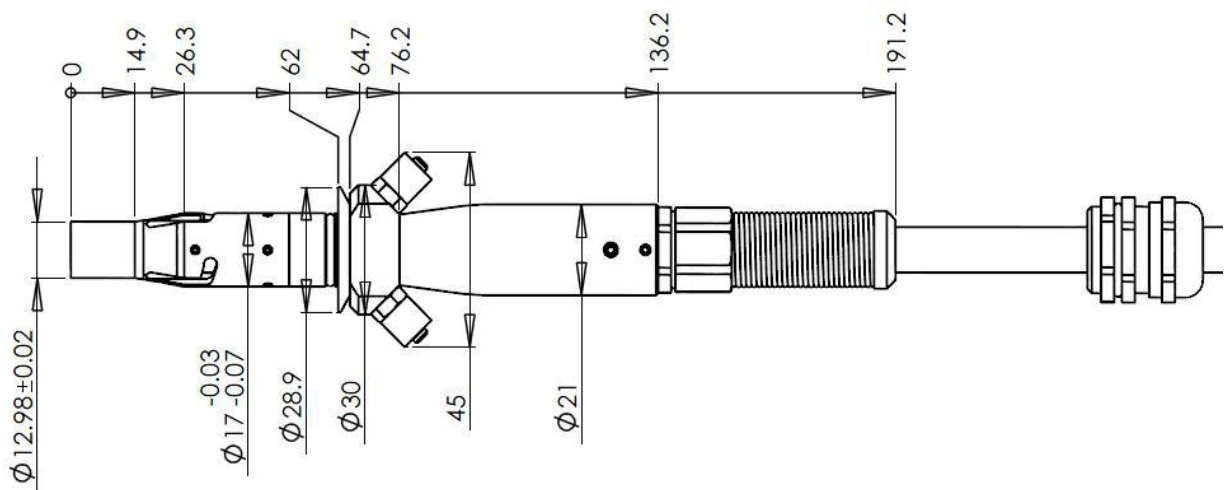


Figure 5 RFL-QBH Fiber Connector (mm)



CAUTION:

- ◆ The two interlock pins on the QBH fiber connector must be shorted before the laser is turned on. Please check the fiber connector to ensure that.
- ◆ Inspect the aperture before install the fiber connector to the process optics. Clean the aperture if necessary.

3.3 Cooling Requirements

Table 4 Cooling Requirements

Parameters	Unit	values
Cooling capacity	W	>1800
Minimum flow	L/min	4
Maximum input pressure	Bar	7
Water pipe size	mm	10 (PU quick plug water pipe)

1) Water temperature setting:

- Summer (ambient temperature above 30 °C) 29 ± 0.5 °C
- Winter (ambient temperature below 30 °C) 25 ± 0.5 °C.


2) Coolant requirements:


- Pure water is used as cooling water, and it is recommended to use purified drinking water.
- In order to prevent the pipeline blockage caused by mold growth in the water chiller, it is recommended to add ethanol when filling pure water, and the volume ratio of ethanol is 10%
- When the ambient temperature of the equipment is between - 10 °C and 0 °C, ethanol with volume ratio of 30% must be used and replaced every two months.。
- When the ambient temperature of the equipment is lower than - 10 °C, double system (with heating function) chiller must be used, and the continuous operation of the cooling system shall be ensured.

3) Other requests of cooling system:

- When starting the cooling system for the first time, check whether there is water leakage in the whole water system and joints. The external water pipe must be installed and connected according to the water inlet (in) and water outlet (out) marked by the laser, otherwise the laser may not work properly.

- If the laser is not used for a long time, the cooling water inside the cooling system and the laser should be drained, otherwise the irrecoverable damage of the laser equipment will be caused.

	<p>◆ CAUTION: Please set the water temperature in strict accordance with the requirements above. Too low temperature may lead to condensation on the laser module and the fiber connector. This can cause serious damage to the equipment.</p>
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	<p>◆ Before starting the laser, ensure that the cooling system works normally and the water temperature reaches the appropriate temperature. (summer: 29 ± 0.5 °C; winter: 25 ± 0.5 °C)</p>
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3.4 Installation Procedure

- 1) Place the laser in an appropriate position, immobilize it if necessary;
- 2) Check if the power supply has the correct voltage ($220\text{VAC} \pm 10\%$, 50/60Hz), and the earth line is connected, make sure it is firm and reliable;。
- 3) Connect the power cable and control cable to the product when power supply is OFF;
- 4) Insert the water pipes into the inlet and outlet;
- 5) Please check the laser fiber connector and clean it as necessary before installing it into the process optics. If dust is found on the output cable, please contact Raycus in time, and do not continue to install and operate the laser for the time being.
- 6) Do not step on, squeeze or bend the Yellow / metal armored protective sleeve excessively during the installation of optical fiber to avoid damage to the optical fiber.
- 7) In the process of installation and disassembly, please pay attention to handle the laser fiber connector with care and avoid vibration.
- 8) In the process of installing the fiber connector, the surrounding environment should be clean, otherwise it may pollute the fiber connector (do not

use electric fan to dissipate heat when it is hot every day in summer, so as to avoid large dust in the air).

9) The minimum bending radius of the fiber should not be less than 20cm under non-working conditions such as transportation and storage. The minimum bending radius should not be less than 30cm when the laser is working

	<ul style="list-style-type: none"> ◆ CAUTION: All the cables can only be connected when power supply is off. It is possible to damage the laser by installing the control line under electricity
	<ul style="list-style-type: none"> ◆ The laser fiber connector must be placed in a natural state as far as possible. It is forbidden to twist the fiber connector. ◆ If the twine diameter of the feeding fiber is too small, the laser will be damaged.
	<ul style="list-style-type: none"> ◆ In the process of installation and disassembly, please handle the fiber connector with care to avoid vibration. ◆ Before assembling the laser fiber connector, the optical lens and the cavity of the cutting cable must be clean and pollution-free. ◆ Please keep the protective cap of the fiber connector properly to prevent it from being polluted; otherwise, the fiber connector will be indirectly polluted when the protective cap is put on.

4 Using the product

4.1 Front Panel

Figure 6 shows the front panel of the laser.

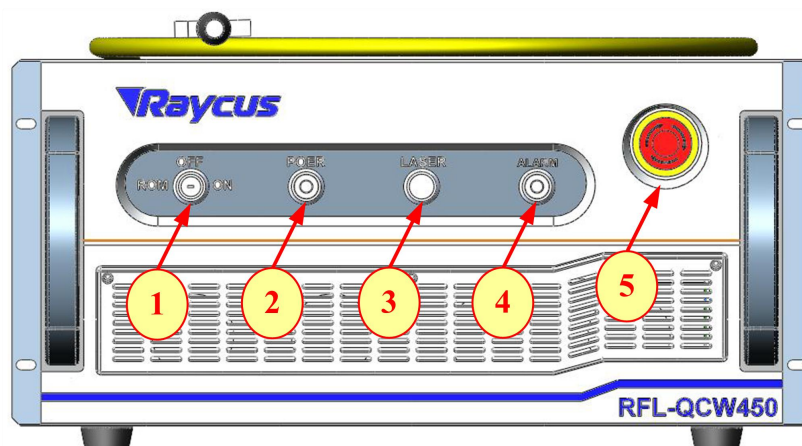


Figure 6 Front Panel

1. REM/OFF/ON: Key switch, the power switch of the laser. Insert the key; either turn the key clockwise to the 'ON' position or counterclockwise to 'REM' position will power on the laser.

2. POWER: Power indicator, when the green light is on, it means the power is on.

3. LASER: Laser emission button, it's a button with an annular LED indicator (red color). When this button is pressed down, the product is ready for emission, and the LED illumines. Press again will release the button, and disable the emission.

4. ALARM: Alarm indication: when the yellow light is on, it means that fault occurs in the laser.

5. EMERGENCY STOP: Press to turn off and lock the laser immediately. Rotate clockwise to release the button. However, the laser must be powered on again with the key switch to resume normal operation.

4.2 Rear panel

Figure 7 shows the rear panel of the laser.

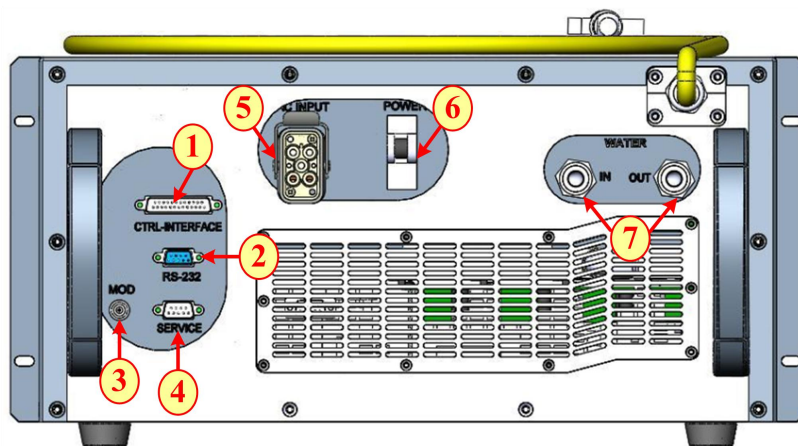


Figure 7 Rear Panel

1. CTRL-INTERFACE: Control interface, this interface is a male DB25 connector and it's multi-functional.

2. RS-232: RS-232 interface, It is used for the connection between laser and PC. Raycus provides RS-232 serial line.

3. MOD: Modulation input, the BNC connector for switching the laser on and off in remote control modes. The control signal should be able to apply current over 10mA, and the voltage should be 24V.

4. SERVICE: It is used for remote control of starting the laser (as key switch) and interlock function.

5. AC INPUT: The socket for supply input that can be only mated with the plug on the power cord Raycus provided.

6. POWER: The Main Switch of the laser, it must be turn on before starting the laser.

7. WATER: Pipe connectors, the inlet and outlet for cooling water flow in and return, mated with 10 mm (outer diameter) PU pipes.

4.3 power connection


	◆ Before connecting the AC power supply, please check whether the AC power supply provided is consistent with specifications listed in Table 1
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Figure 8 shows the power cord of the laser.



Figure 8 Power Cord of the Laser

- One end of the power cord is a plug; insert it in to the socket 'AC INPUT' on the rear panel. Notice that the plug is wrong-side preventing. After insert it, lock it with the lever (Figure 9);

- The other end of the power cord is stripped off and each wire is crimped with a 'pin-type cable connector'. There are three wires labeled L, N and PE, respectively. Connect the wires to the AC power supply according to the labels;
- L----Phase Line;
- N----Neutral;
- PE----Protective Earth;



Figure 9 Lock the Plug with the Lever

4.4 Interface Definitions

4.4.1 SERVICE:

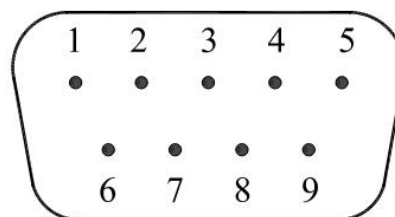


Figure 10 Pin Numbers of SERVICE Port


The pin definitions are listed in Table 4.

Table 5 Pin Definitions of SERVICE Port

Pin	Definitions	Note
6	INTERLOCK+	Pin 6 and 7 must be connected before emitting
7	INTERLOCK-	

Other pins are idle.

- SERVICE port is a female DB25 connector. If the pins 6 and 7 are disconnected, the laser will stop emitting immediately and the Yellow alarm light will be on. After connecting pins 6 and 7 is, it is necessary to power on the laser again.
- Before the laser leaves the factory, 6 and 7 pins have been pre connected on the interface.

	◆ Interlock interface shall not be connected with active signal, otherwise it will cause interface damage and laser failure
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4.4.2 Modulation Input

The 24 V modulation signal should be connected to the interface shown in Figure 11. The modulation signal cable is provided as shown in Figure 12 below.

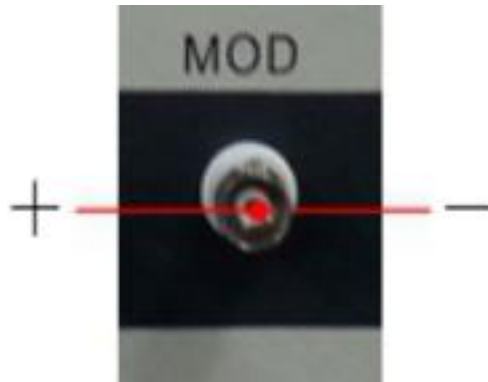



Figure 11 Modulation Input



Figure 12 Cable for Modulation Signal

	<ul style="list-style-type: none"> ◆ The core of the modulation signal cable is the positive, and the external metal mesh is the negative. ◆ Before the modulation signal is connected to the laser, please check whether its voltage meets the product requirements.
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4.4.3 Control Interface

Figure 13 shows the control interface of the laser.

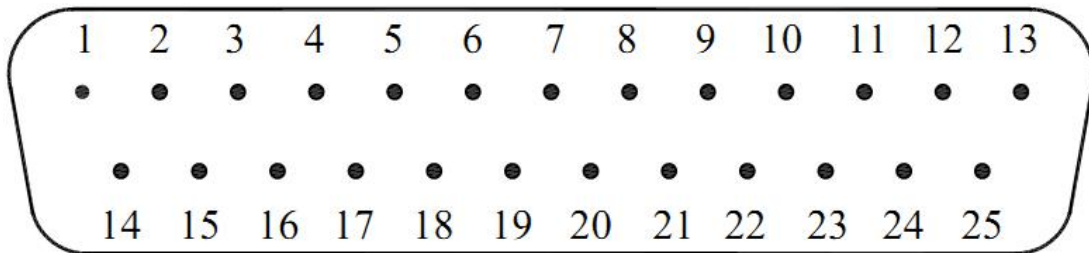


Figure 13 Control Interface

The pin definition of DB25 is listed in Table 5

Table 6 Pin Definition of Control Interface

Pin	Definition	Note
6	The external control of enabling, has the same function as the "laser" key on the front panel, but can not be used with the "laser" key at the same time. When using the external control of enabling, "laser" key should be in the state of popping up. High level is to enable the laser.	Compared with pin9, the high level is 24V
9	External GND1	GND1
20	Power supply for fault signal	24V, Compared to pin9
24	Fault signal High level means error	Compared to pin9

Note: Fault signal high level is valid. When there is an abnormal event in the laser, it will send out the fault signal and turn on the alarm lamp.

4.4.4 RS-232 Serial Port

Figure 14 shows the description of RS-232 cable.

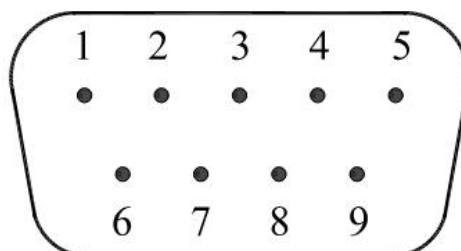


Figure 14 RS-232 Cable

The pin definition of RS-232 cable is listed in Table 6.

Table 7 Pin Definition of RS-232 Cable

Pin	Definition
2	RX
3	TX
5	GND

Other pins are idle.

the RS-232 serial port cable is also provided, as in Figure 15.



Figure 15 RS-232 Cable



- ◆ Please check the voltage of control signal to ensure it meets the requirements. Over voltage or voltage fluctuation may damage the laser.

4.5 Software Operation

4.5.1 Software installation

Double click "QCW control software. MSI" to install the control software. The icon as shown in Figure 16 will be generated on the desktop after installation.



Figure 16 Icon of QCW Control Software

Double click the icon to open the software. The control interface is shown in Figure 17.



Figure 17 Control software Interface of QCW

Select the correct serial port, set the baud rate to 19200, click the serial port switch button, and the button displays "serial port is closed". Click to open the serial port, and the serial port number and baud rate will be displayed as immutable state.

4.5.2 Startup Settings

There are four working modes of the laser: internal CW mode, internal modulation mode, external CW mode and external modulation mode. Among them, the first two are internal modes, which are used for internal debugging of Raycus personnel, and can also be used for customer debugging; the latter two are external modes, which are provided to customers. When using external mode, the modulation signal (MOD) of 24 V voltage must be provided, and this voltage needs to have at least 10 mA drive capability.

4.5.2.1 Internal CW Mode

When internal CW mode is selected, the laser can emit continuously, the power can be set to 25% - 100% adjustable to adjust the output power of the laser. Note that in internal CW mode, there is no laser output when the power setting is lower than 25%. After setting the power parameters, click the "send parameters" button to send the power parameters to the laser. If the laser is accepted successfully, the dialog box of "sending successfully" as shown in Fig. 18 will be displayed; after the parameters are sent, click the "Emitting" button to enable the laser, and the laser will be in the state of waiting to emit. At this time, press the "laser" button on the front panel, and the laser will emit immediately. In the process of emitting, the power can be changed. After the parameters are sent through the "send parameters" button, the output power will be changed according to the newly set power by clicking the "Emitting" button. In the emitting process, click the "Stop Emitting" button to stop emitting, and click the "Emitting" button again to emit according to the parameters sent last time.



Figure 18 Sending Successfully Window

4.5.2.2 Internal Modulation Mode

When internal modulation mode is selected, the laser will be set to the modulation output mode, and the parameters such as frequency and duty cycle can be generated by setting the laser parameters. The power can be set to 10% - 100% adjustable, frequency from 0Hz to 5000Hz, and two modes of duty cycle or pulse width can be selected. When the duty cycle mode is selected, the duty cycle range is 1% - 75%, and when the pulse width mode is selected, the pulse width is adjustable from 0.1ms to 75ms.

When either duty cycle mode or pulse width mode is selected, the other mode is locked, but another parameter will be calculated and displayed according to power and frequency, as shown in Figure 18. When the duty cycle mode is selected, the power is set to 100%, the frequency is set to 10Hz, and the duty cycle is set to 10%. The software will calculate the output pulse width of 10ms according to the frequency and duty cycle. Similarly, when the pulse width mode is selected, the power is set to 50%, the frequency is set to 20Hz, and the pulse width is set to 8ms. The software will calculate the duty cycle as 16% according to the frequency and pulse width.

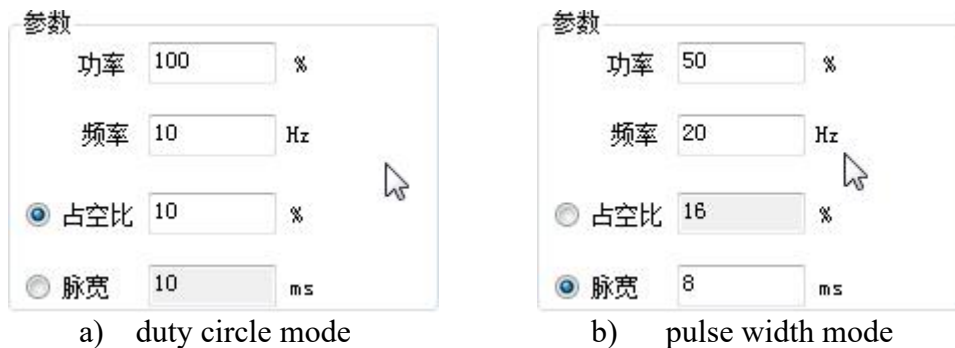


Figure 19 Setting Parameters in Internal Modulation Mode

4.5.2.3 External CW Mode

When the external CW mode is selected, the laser will emit light according to the external modulation signal, and the external modulation signal is effective at 24 V high level. At this time, the power is adjustable from 10% to 100%, and the parameters such as frequency and duty cycle are generated from the outside signal. The operation is the same as that in 4.5.2.2. After setting the power parameters, click the "send parameters" and "Emitting" buttons in turn, and press the "LASER" button on the front panel, and the laser will emit immediately according to the external modulation signal.

4.5.2.4 External Modulation Mode

The operation process is the same as 4.5.2.2. After setting the parameters, when the external modulation signal is 24 V high level, the light will emit according to the set parameters, otherwise the laser will not emit.

Note: when the laser works in 4.5.2.2 internal modulation mode, 4.5.2.3

external CW mode and 4.5.2.4 external modulation mode, the setting of pulse parameters shall meet the requirements of Figure 20, with two restrictions, namely:

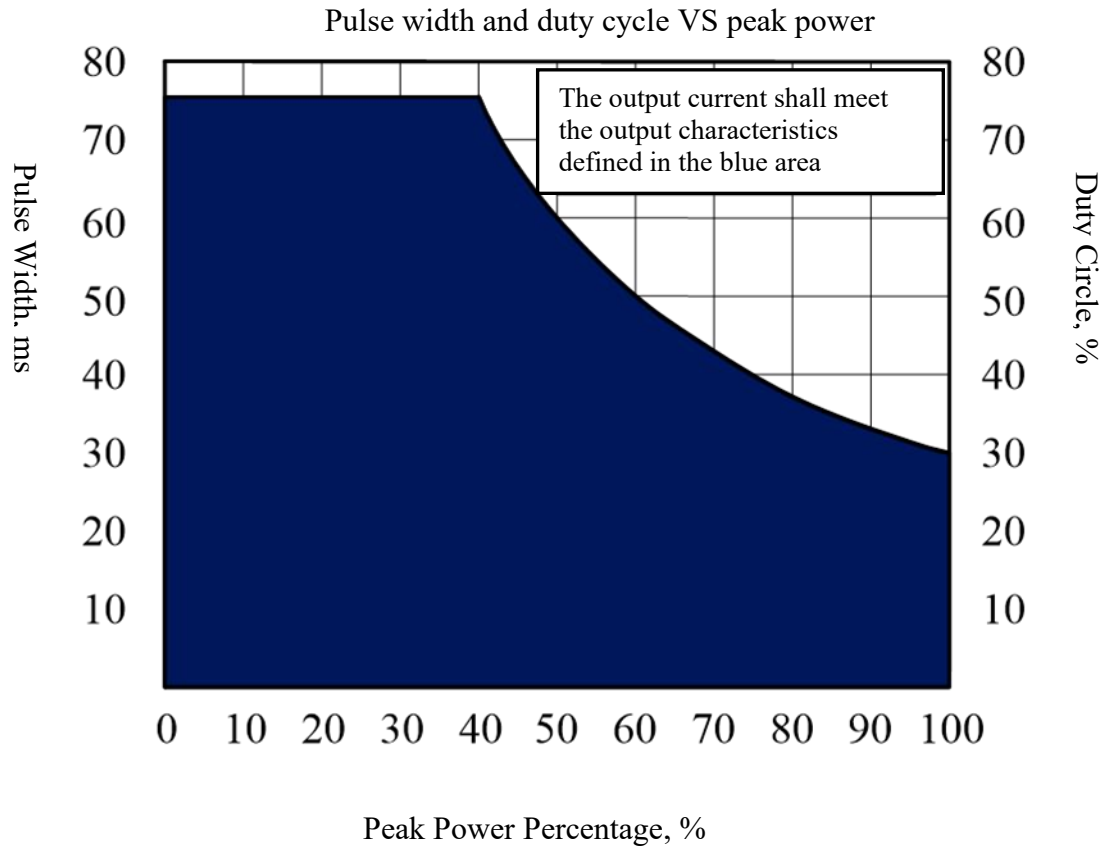


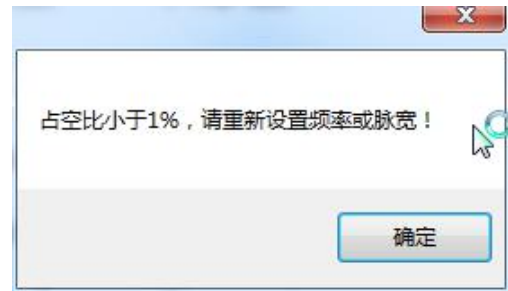
Figure 20 Output Characteristics of Laser

- (1) $\text{power (0-100)} * \text{duty circle (1-75)} \leq 3000$
- (2) $\text{power} * \text{pulse width (0.1-75)} \leq 3000$

When the duty cycle mode is selected, only the above conditions (1) and (2) need to be satisfied. If the setting parameters exceed the above two limits, the parameters will not be allowed to be sent to the laser. If the power is set to 100% and the duty cycle is set to 40%, which does not meet the above condition (1), when sending parameters, it will prompt "QCW average power overrun, please reduce power or duty cycle", as shown in Figure 21 (a)



(a) power 100%, duty circle 40%



(b) frequency 10Hz, pulse width 0.5ms

Figure 21 Parameter Setting Prompt Diagram

When the pulse width mode is selected, in order to ensure that the output duty cycle is not less than 1% and not more than 75%, the above three conditions should be met at the same time. If the power is set to 100%, the frequency is set to 10Hz, and the pulse width is set to 0.5ms, the message "duty cycle is less than 1%, please reset the frequency or pulse width!" will be prompted when sending parameters. As shown in Figure 20 (b). If the power is set to 30%, the frequency is set to 100Hz, and the pulse width is set to 8ms, the message "duty cycle is greater than 75%, please reset the frequency or pulse width!".

With the same operation as 4.5.2.1, click the "send parameters" and "Emitting" buttons in turn, and press the "LASER" button on the front panel at the same time. The laser will emit according to the set frequency, duty cycle or pulse width. In the same way, the laser parameters can be changed in the process of emitting.

Special instructions: when the laser frequency is set to 0Hz, the pulse width can be set as 0.1ms-75ms, which can meet the following conditions, without meeting the above three conditions at the same time

$$\text{Power} * \text{Pulse Width} \leq 3000$$

Under this condition, the laser will not repeat emitting at a certain frequency. When the "LASER" button on the front panel is pressed, after sending the parameters, click the "Emitting" button once, and the laser will emit once according to the set pulse width, and emit again when pressing "LASER" again.

4.6 Common Faults

Some faults may occur in the process of using the laser. When the fault occurs, the alarm light on the front panel of the laser will be on, and the laser will stop emitting. When the laser fails, you can select the "super terminal mode" menu in the software and click the "online" button. At this time, there will be a fault message will be displayed in the blank on the right, as shown in Figure 22.

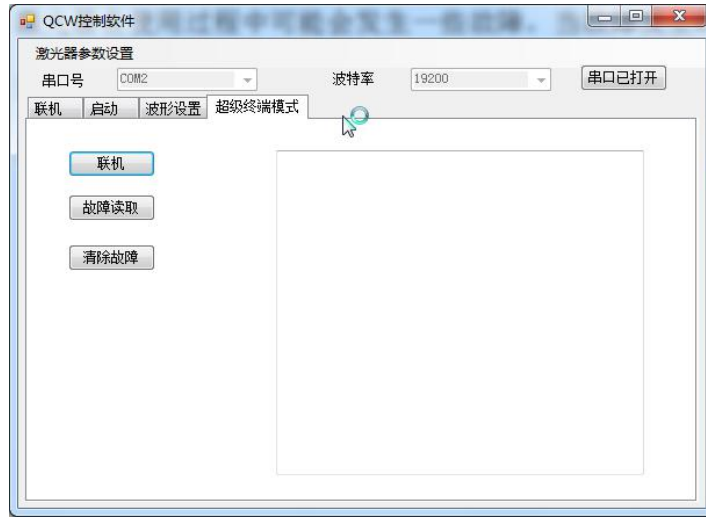


Figure 22 Laser Fault Display Diagram

Table 8 Common Faults and Troubleshooting Table

Type	Cause	Solutions
Laser button failure	The "LASER" button is pressed before turning on the laser	Pop up "LASER" button, Restart the laser.
High/Low temperature failure	Cooling system failure	Check the water cooler and ventilation duct
Emitting failure	Internal causes of the laser	If failure still occurs after restart, contact Raycus personnel
Power failure	Internal causes of the laser	If failure still occurs after restart, contact Raycus personnel
Current board failure	Internal causes of the laser	If failure still occurs after restart, contact Raycus personnel
Pulse width failure	Exceeding the condition of "power * pulse width ≤ 3000"	Restart the laser, reset appropriate parameters.
Duty circle failure	Exceeding the condition of "power * pulse width ≤ 3000"	Restart the laser, reset appropriate parameters.
Interlock failure	Interlock signals not connected	Connect the interlock signals, restart the laser.

5 Warranty, Return and Maintenance

5.1 General warranty

After all products manufactured according to the order or specification are delivered, Raycus guarantees the products with material and technical problems, and ensures that they meet the specifications under normal use.

Raycus has the right to selectively repair or replace any products with material or technical problems during the warranty period. For all products repaired or replaced during the warranty period, only those with special problems are guaranteed free of charge. Raycus reserves the right to receive payment for the products with problems under normal use.

5.2 Limitations of Warranty

The products and their parts (including optical fiber) damaged due to tampering, opening, detaching, wrong installation and improvement caused by non Raycus personnel, or the damage caused by misuse, negligence or accident, or the damage caused by use beyond the specification, improper installation and maintenance, abuse or failure to use according to the information and warning in the user's manual are not covered by the warranty. The user has the responsibility to understand and operate according to the operation instructions in the user's manual and operation specification. The damage caused by wrong operation is not guaranteed. The output optical fiber and output cable are not covered by warranty.

Within the scope of the warranty, the user must make a written request within 31 days from the date of discovery of the product problem. The warranty does not involve any third party (including the specified user, and does not include parts, equipment or other products not manufactured by Raycus).



- ◆ The user has the responsibility to understand and operate according to the operation instructions in the user's manual and operation specification. The damage caused by wrong operation is not guaranteed. The feeding fiber and fiber connector are not covered by warranty.

5.3 Technical support and product maintenance

- 1) There are no parts built-in for user maintenance in this product, so all maintenance shall be carried out by Raycus technical personnel.
- 2) In case of any fault in the use of the product, the technical personnel of Raycus shall be informed in time and troubleshooting shall be carried out
- 3) All repair or replacement products must be placed in the original packaging box provided by Raycus. Otherwise, Raycus has the right not to repair any product damage caused by this.
- 4) Please check whether the products are complete and undamaged when receiving the products. If there are any abnormal conditions, please contact the carrier and Raycus in time.

Raycus will continue to develop new products. The product information listed in the manual is subject to change without notice. All technical parameters are subject to the contract terms.

All the items about warranty and service above provided by Raycus are for users' reference; formal contents about warranty and service are subject to the contract.