Raycus Fiber Laser User Guide

RFL-QCW150/1500

Wuhan Raycus Fiber Laser Technologies Co., Ltd

TABLE OF CONTENTS

1 Safety Information....1
1.1 Symbols Used in this User Guide....1
1.2 Laser Classification....1
1.3 Safety Label....2
1.4 Optical Safety....4
1.5 Electrical Safety....4
1.6 Other Safety Rules....4
2 Product Description....5
2.1 Features....5
2.2 Package Contents....5
2.3 Unpacking and Inspection....5
2.4 Operation Environment....6
2.5 Announcements....7
2.6 Specifications....7
3 Installation....9
3.1 Dimensions....9
3.2 Dimensions of Optical Output Head....10
3.3 Cooling Requirements....11
3.4 Installation Procedures....11
4 Using the Product....13
4.1 Front Panel....13
4.2 Rear Panel....13
4.3 Power Connection....14
4.4 Interface Definition....15
4.5 Operation Modes....19
4.6 Installation and Operation instruction....29
4.7 Software instructions....29
4.8 Alarms and Solution....29
5 Warranty, Return and Maintenance....31
5.1 General Warranty....31
5.2 Limitations of Warranty....31
5.3 Service and Repair....32
Appendix 1—Software instructions....1
1.1 Recommended system requirements....1

1.2 Installation.....1
1.3 Running.....1
1.4 System Menu.....2
1.5 Home Page.....4
1.6 Waveform Edit.....8
1.7 Laser Configuration File.....13
1.8 Configuring the Local Area Connection for Ethernet.....14

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: Refers to potential personal hazard.

	CAUTION: Refers to potential product hazard.

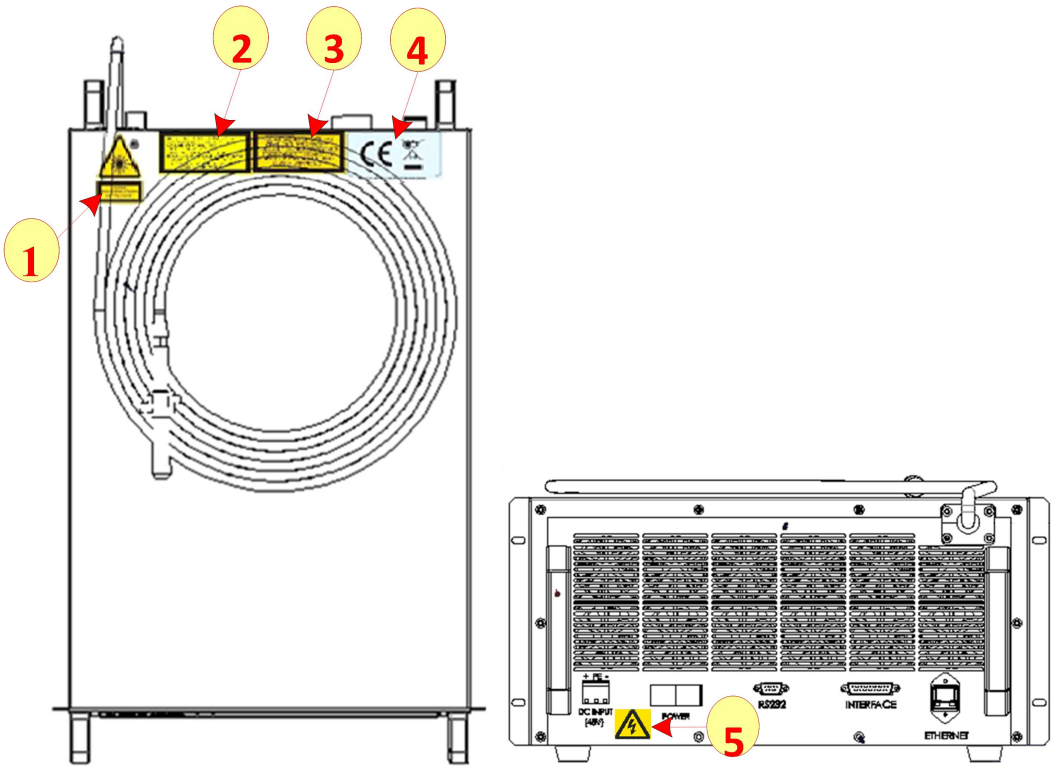
1.2 Laser Classification

This module of laser is 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 average light power radiated from the optical output is greater than 150 watts in PULSE mode and 250 watts in CW mode per optical output port. Direct or indirect exposure to 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 goggles must be worn all the time while the laser is operational.

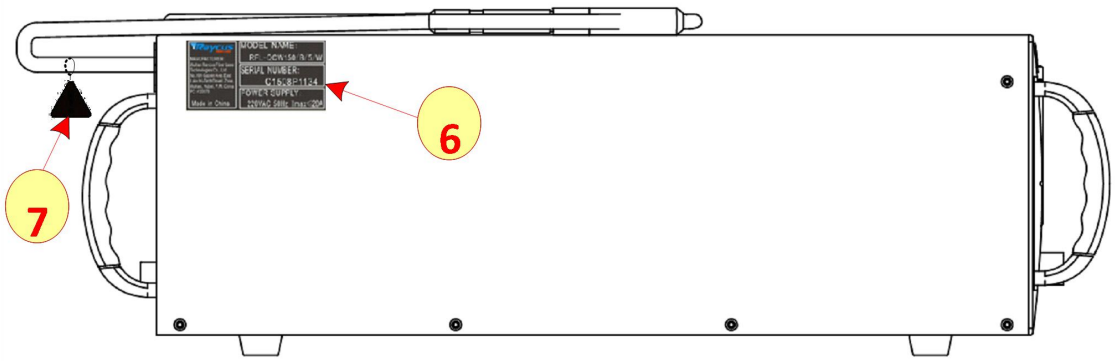
	WARNING: You must use appropriate laser safety goggles when operating this device. The laser safety goggles selected according to the range of wavelengths emitted from this product. The end user must ensure that the laser safety goggles used protects against light emitted by the device over its entire range of wavelengths: 900nm~1100nm. Please verify that the personal protective equipment (e.g. enclosures, viewing windows or viewports, goggles, etc.) being utilized is adequate for the output power and wavelength range.

1.3 Safety Label

Figure 1 shows the required laser safety labels and locations. These include warning labels indicating removable or displaceable protective housings, apertures through which laser radiation is emitted and labels of certification and identification.



(a) Labels on top (b) Labels on back

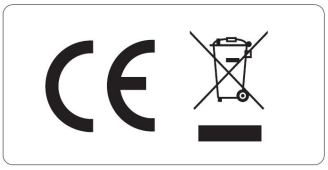
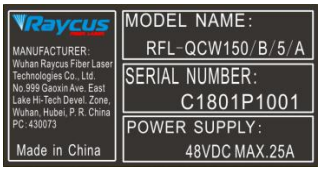


(c) Labels on side

Figure 1 Safety Label Locations

Specifications of these labels are as follows:

Table 1 Specification of safety labels

1：Aperture Label	2：Class 4 Laser Product
		
3：Class 2M Laser Product Label for Guide Laser	4：CE Compliance	5：Electrical Hazard
		
6：Identification Plate	7：Fiber don’t Fold	

1.4 Optical Safety

Any dust on the end of the QBH optical cable can burn the lens and damage the laser.

	CAUTION: If the output of the device is delivered through a lens with an anti-reflection coating, make sure that the lens is of good quality and clean.

1.5 Electrical Safety

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

	WARNING: Any interruption from the protective earth can result in personal injury.

(2) Make sure that the correct voltage of the DC power source is used.

	CAUTION: Failure to use the correct voltage could damage the product.

There are no operator serviceable parts inside. To prevent electrical shock, do not try to remove covers. Any tampering with the product will void the warranty.

1.6 Other Safety Rules

(1) Never look into the laser output head 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) There are no operator serviceable parts inside. All maintenance must be performed in Raycus or by qualified Raycus personnel. To prevent electrical shock, do not try to remove covers. And any tampering with the product will void the warranty.

2 Product Description

2.1 Features

Raycus RFL-QCW150/1500 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 integrated into user's machines.

Main Features:

- High beam quality
- Replace Lamp pumped laser
- High power conversion efficiency
- Three main modes of operation: CW, PULSE and Wave
- High pulse energy and high stability of average power, high peak power

Applications:

- 3C Stock Cutting
- Spot-Welding、Seam-Welding、Mircowelding、Precision-Welding
- Ceramic Cutting\ Lineation
- Long-Pulse Driling

2.2 Package Contents

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

2.3 Unpacking and Inspection

Raycus fiber laser is shipped in a package designed to provide maximum protection. Upon delivery, please inspect all packages 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 taking the unit out of the packing case to ensure that the fiber optic cable is not snagged and damaged. A comprehensive packing list is sent with the laser. 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 evidence or suspected damage to the unit.

It is recommended to keep 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, twist or excessive bend will damage the instrument.

2.4 Operation Environment

Table 1 shows basic operation environment of this device:

Table 2 Basic operation environment of the Laser

Power Source	48±10% VDC
Power Capacity	> 1000 watts
Environment	Flat with no vibration and shock Sufficient airflow
Temperature	0℃~40℃
Humidity	<80%
Weight	<50kg

Warning:

(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 cap. Failure to comply with this instruction will void the warranty.

(3) The output terminal of the laser is connected to an optic delivery cable. Please inspect the output head carefully for dust or other contamination. Use appropriate lens paper to clean it if necessary.

(4) Failure to follow the instructions may cause malfunction and damage to the device.

(5) It is not allowed to install the output head when the laser is in operation.

(6) Do not look into the output head directly. Wear appropriate safety goggles all the time when operating the laser.

2.5 Announcements

(1) Please make sure that the incoming DC voltages are 48V (±10%). Failure to connect power source correctly will damage the device.

(2) Use of controls or adjustments other than those specified herein may result in hazardous radiation and damage to the laser.

(3) It is very important to ensure the cleanness of the calibrated laser output head , otherwise it will cause irreparable damage to the laser.

(4) Please cap the output terminal when it is not in use. Do not touch the output lens. If necessary, please use appropriate lens paper and alcohol to clean the lens.

(5) Failure to follow the specified instructions may result in the loss of laser power. Such loss is not covered under warranty.

2.6 Specifications

The specifications are listed in the following table.

Table 3: Product Specifications

Model	RFL-QCW150/1500	
Optical Characteristics		Test Conditions
Operation Mode	CW/PULSE	
Polarization State	Random	
Max Average Power(W)	150 watts in CW 250 watts in PULSE	
Max Peak Power(W)	1500 watts	
Modulation Frequency(Hz)	0~5000	Nominal Output Power
Pulse Width(ms)	0.05-50	Nominal Output Power
Max Pulse Energy(J)	15	Nominal Output Power
Emission Wavelength(nm)	1080±5	Nominal Output Power
Output Power Instability	≤1.5%	Nominal Output Power; Time Interval: 5hrs; Ambient Temp.: 25℃
Red Guide Laser Power(mW)	0.1~1	
Output Terminal	QBH	
Beam Quality (BPP, mm•mrad)	<0.5@25μm Fiber Core <2@50μm Fiber Core	Nominal Output Power
Delivery Cable Length(m)	5	
Electrical Characteristics		
Power Supply	48±10% VDC	
Max. Power Consumption(W)	1000	
Control Mode	RS-232/AD/Ethernet	
Other Characteristics		
Dimensions(W×D×H)	450×237×725(include handles)	
Weight(kg)	<50	With air conditioner
Operating Ambient Temperature(℃)	0~40	
Humidity (%)	<80	
Storage Temperature(℃)	-20~60	
Cooling Method	Air-cooled	

3 Installation

3.1 Dimensions

Figure 2, Figure 3, Figure 4 shows dimensions of the product.

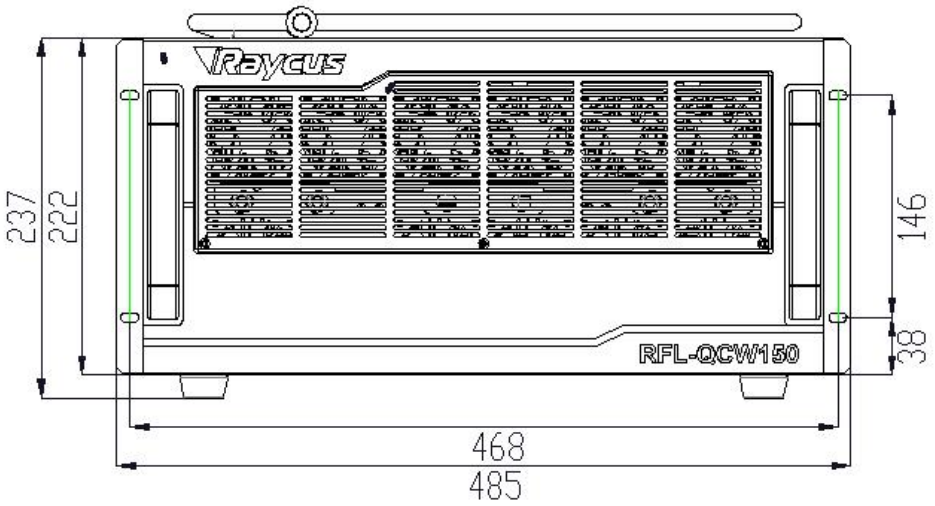


Figure 2 Front view of the Laser (unit: mm)

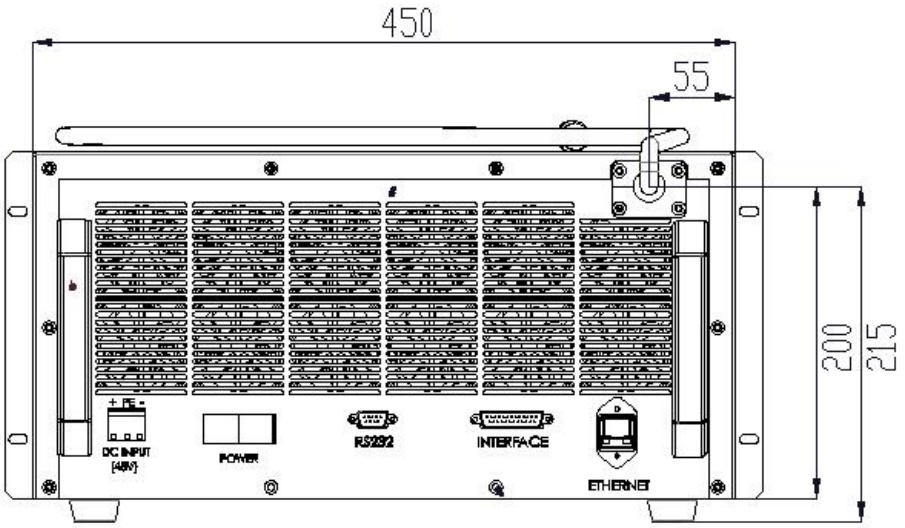


Figure 3 Rear view of the Laser (unit: mm)

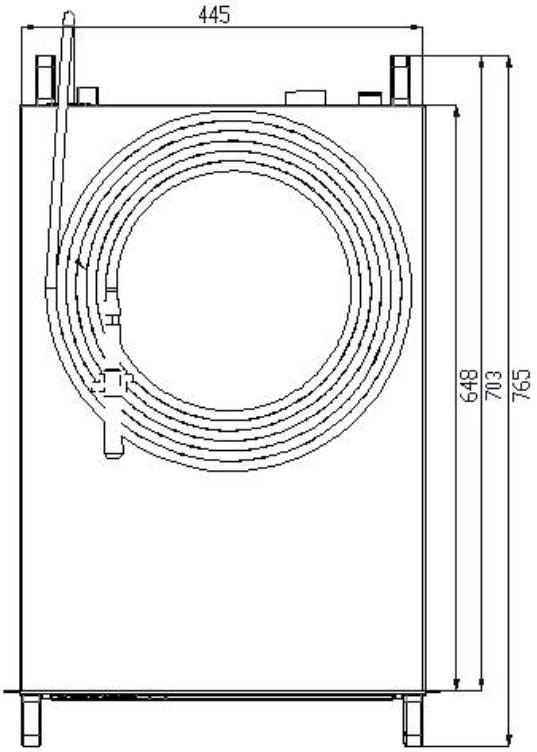


Figure 4 Top view of the Laser (unit: mm)

3.2 Dimensions of Optical Output Head

The optical output cable of Raycus RFL-QCW150/1500 fiber laser is QBH, and Figure 5 shows dimensions of the QBH optical output cable.

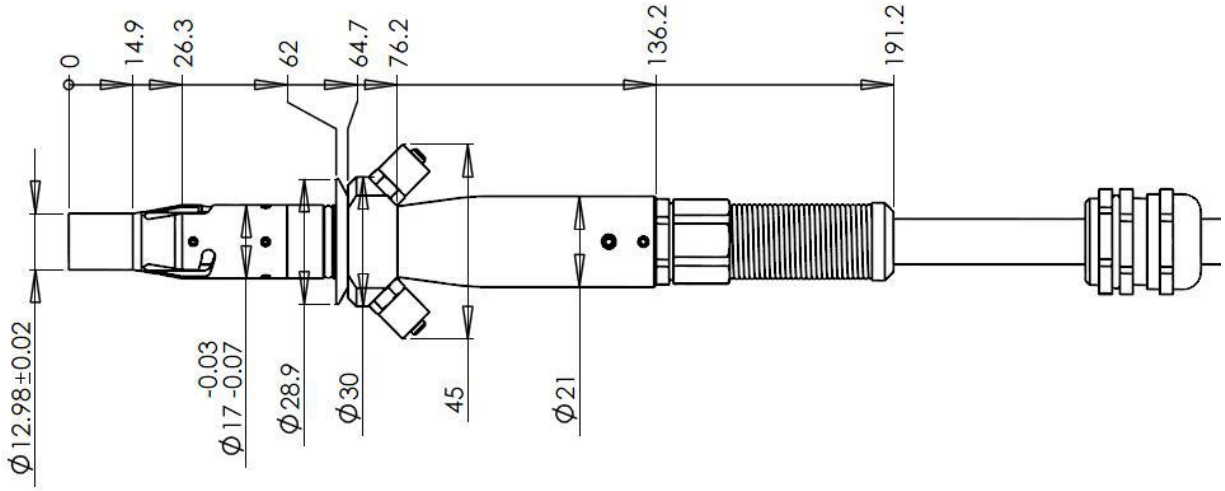


Figure 5 QBH--Optical Output Cable (unit: mm)

CAUTION:

- Inspect lens of the QBH optical output cable before install it into the processing head. The use of a dirty, or improperly cleaned QBH optical output cable can cause serious damage to the laser.

3.3 Cooling Requirements

1. Raycus RFL-QCW150/1500 fiber laser has fans for active cooling.

2. Make sure there is sufficient airflow to cool the device when the laser is operating. Of course, the laser can also be operated where the ambient temperature is maintained at 40℃constantly with an air-conditioner.

3. In front and rear panel of the laser is respectively provided with an air inlet port and an air outlet port, thus there must have ample room at the in front and rear panel of the laser for air circulation.

4. The window shutter with dust proof cover in front panel of the laser is removable. Customers are required to disassemble and clear the dust proof cover regularly for air circulation.

3.4 Installation Procedures

(1) Place the product in an appropriate position, immobilize it if necessary.

(2) Check if the power supply has the correct voltage (48±10% V DC), and the earth line is connected reliably.

(3) Connect the power cable and control cable to the product when power supply is OFF.

(4) Check the optical output head and clean it if necessary before install it. This procedure must be performed by Raycus personnel or person authorized by Raycus. If you find any dust or something that cannot be removed from the lens, stop installing the product and contact Raycus immediately.

(5) Prevent the delivery cable from treading, pinching or excessive bending during installation.

(6) During the installation and disassembly process, please take care to gently put the laser output head, do not be shocked.

(7) In the installation of laser output and output head process, please make sure that the surrounding environment is clean, otherwise it may pollute the output head(do to use fans to avoid dust)

(8) The optic fiber cable must not be bent with the radius less than 20 cm during transportation，storage and 30 cm when in operating.

	CAUTION: ◆ All the cables can only be connected when power supply is off. Hot plug may damage the laser.

	CAUTION: ◆ Ensure that there are no fiber bends with radius less than 30 cm. Avoid excessive twisting and tight bends during the robotic arm movements. Tight bends will damage the laser.

	CAUTION: ◆ Make sure the aperture and the cavity of the processing head is clean. ◆ Keep the protective cap properly, prevent it from contamination. Or the aperture will be contaminated when capped.

4 Using the Product

4.1 Front Panel

Figure 6 shows the front panel of QCW150/1500.

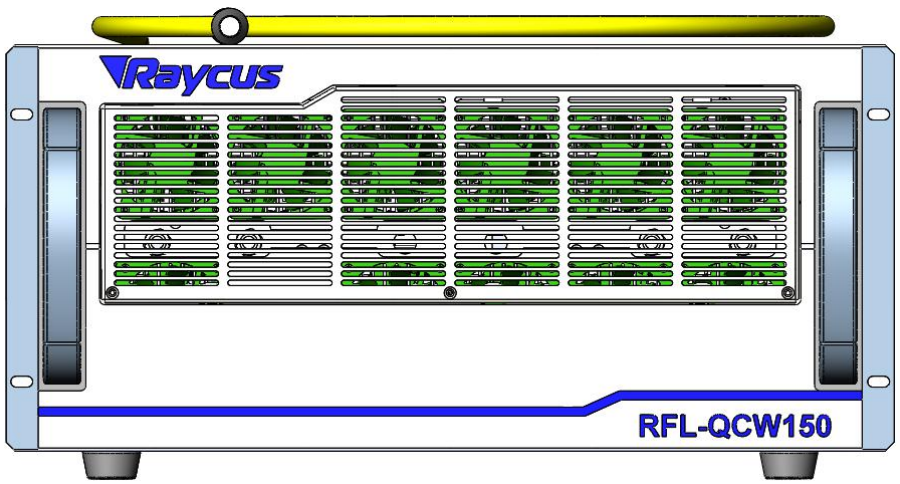


Figure 6 Front Panel View

4.2 Rear Panel

Figure 7 shows the rear panel of QCW150/1500.

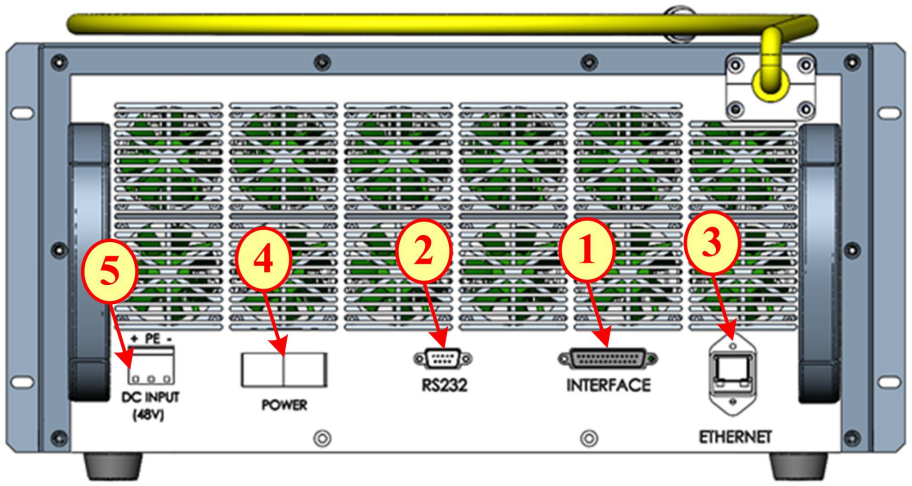


Figure 7 Rear Panel View

1. INTERFACE: This DB-25 interface connector is for all the control signals, including remote laser control, remote control mode setting, ready, analog control, modulation, etc.

2. RS-232: RS-232 interface connector, is used to connect the laser with PC Host. A matching RS-232 serial line is provided.

3. ETHERNET: Ethernet interface connector, is used to connect the laser with PC Host.

4. POWER: An air-break switch, to control the laser power supply ON and OFF.

5. DC INPUT: The socket for power supply. Check if the power supply has the correct voltage (48±10% V DC), and the minimum current must greater than 20A.

4.3 Power Connection

CAUTION:

- Before connect the product to DC power supply, you must check up that the DC power supply you will apply is in accordance with the specifications provided in Table 2

A power cord is provided in the package. Connect the external power supply to the socket "DC INPUT" on the rear panel with the provided power cord. On the rear panel, there are three wires labeled +, - and PE, respectively. You should connect the wires to the DC power supply according to the labels:

＋ → Power Supply(+48V)

\- → Supply Return(GND)

PE → Protective Earth(PE)

The power supply circuit of this laser shall be equipped with an DC circuit breakers which breaking capacity must greater than 20A. In order to operate easily, the DC circuit breakers should be installed as close to the laser as possible and earmarked such as "DC Circuit Breakers".

4.4 Interface Definition

4.4.1 Control interface

Figure 8 shows the control signals flow in the DB-25 interface connector.

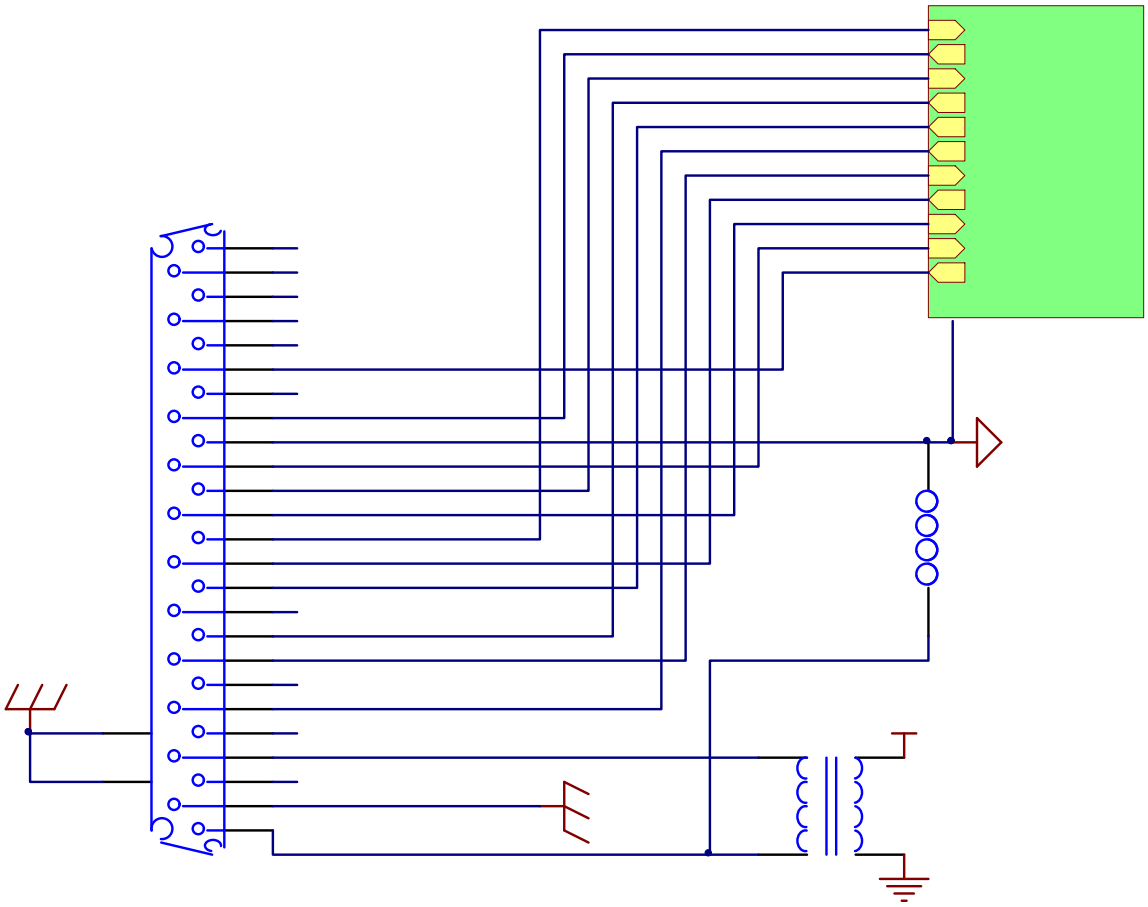


Figure 8 The control signals flow in the DB-25 interface connector

Figure 9 shows the digital signal input interface circuit:

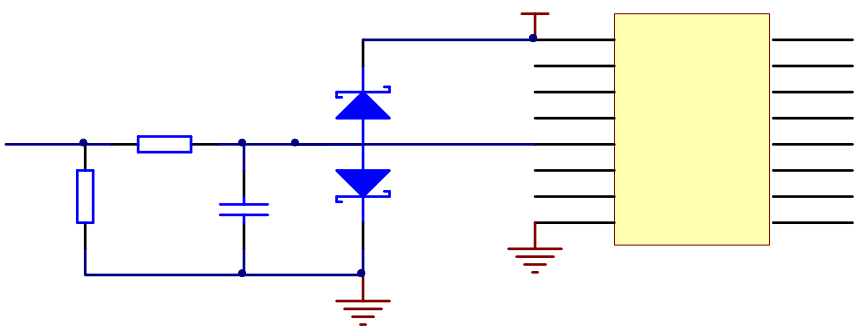


Figure 9: The digital signal input interface circuit

Figure 10 shows the digital signal output interface circuit:

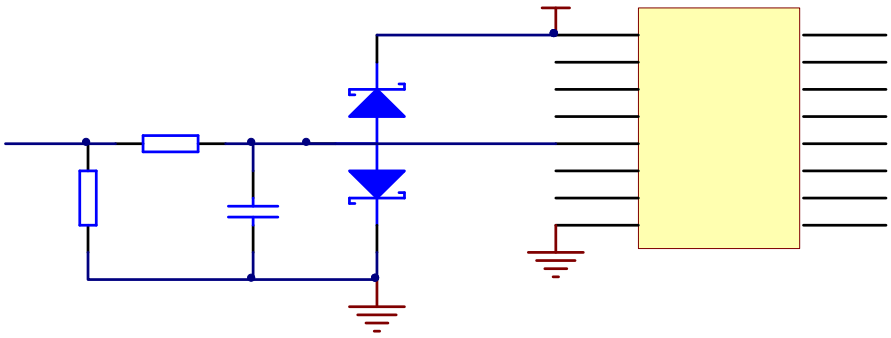


Figure 10 The digital signal output interface circuit

Figure 11 shows the 0-4V analog signal input interface circuit.

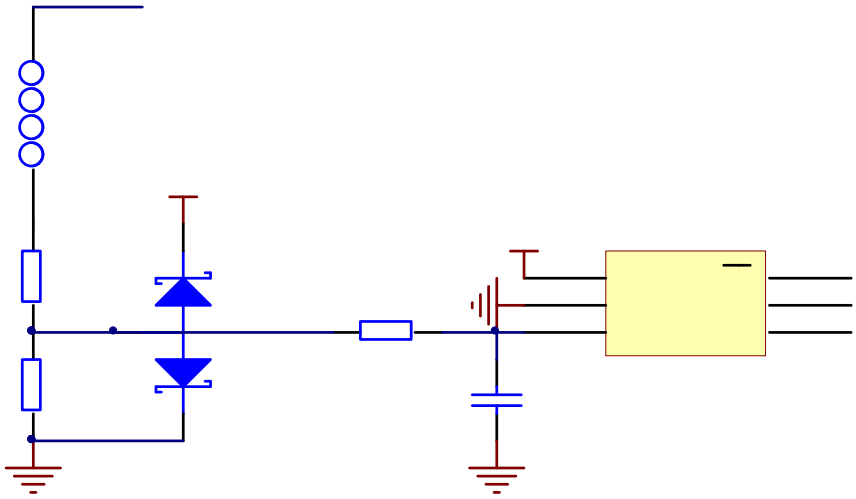


Figure 11 The 0-4V analog signal input interface circuit.

Figure 12 shows the analog signal output interface circuit.

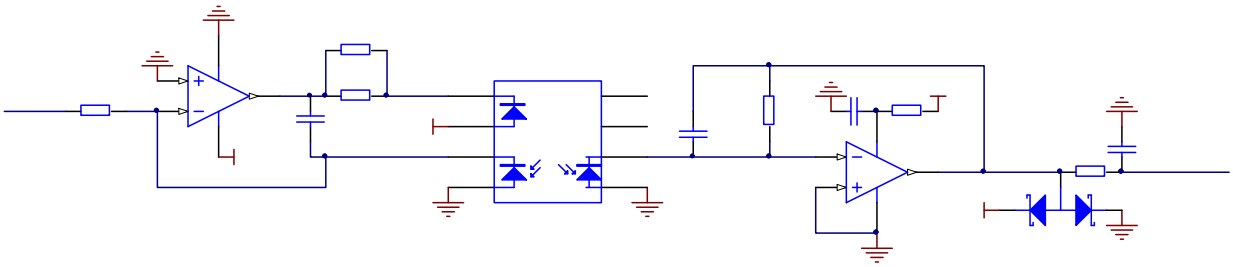


Figure 12 The analog signal output interface circuit.

All the control signals are integrated in the “INTERFACE” on the rear panel (Figure 6). We provide a DB-25 interface connector for the “INTERFACE”, as shown in Figure 13:

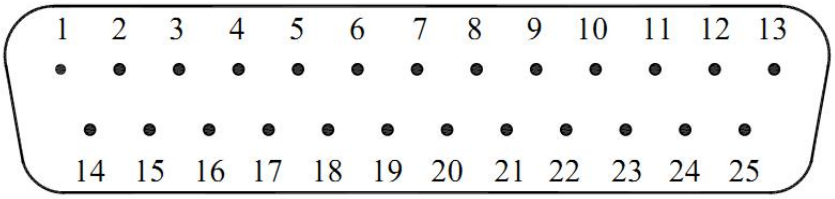


Figure 13 Pin number of DB-25 interface connector

Interface wire specification

The minimum wire gage is 18AWG at 15 meters (30 meters maximum regardless of gauge). The gage of the wire must increase as the distance increases. For connectivity, the wiring and/or cabling must have an overall shield to ensure proper functionality. The shield is to cover over all conductors and terminate at the unit where the conductors enter/exit the unit.

Table 4: DB-25 interface connector definition

Pin	Signal Name	Signal Type	Signal Level	Description
1	Supply Return	input	0V	Supply return for house keeping
2	Reserved			Customer connection is not allowed
3				
4				
5	T Case	output	0.01V/℃	Case temperature monitor 1℃/0.01V 0.25V=25℃
6	ILD Monitor	output	0-3.3V	Pump current monitor 0V corresponds to 0 current(power) 3.5V corresponds to max. current (power)
7	Emission Control	input	TTL	Positive edge——enables emission Negative edge——disables emission
8	External Analog Control	input	0-4.0V	Analog signal, setting the output power in AD mode: 0V corresponds to 0% power 1V corresponds to 25% power 4V corresponds to 100% power
9	Signal Return		0V	Reference for signals on pin 5,6,7,8,16,17,19,20,21,22,23,25
10	Reserved			Customer connection is not allowed
11				

12				
13				
14	Case		Earth	Direct electrical connection to laser housing
15	Housekeeping Power Supply	input	4.8-5.5V	Housekeeping, power supply for control PCB is derived from this pin
16	Error	output	TTL	High =normal operation Low =error
17	Modulation	input	TTL	High =ON Low （or disconnected）=OFF
18	Reserved			Customer connection is not allowed
19	Ready	output	TTL	High =normal operation(no error, main supply voltage is ON) Low =laser is not ready for emission activation(either an error is present or main supply voltage is OFF)
20	Reset	input	TTL（edge sensitive）	Negative edge clears all resettable errors
21	Guide Laser Control	input	TTL	High=Guide laser is ON Low= Guide laser is OFF
22	Emission ON/OFF	output	TTL	High =Emission ON Low= Emission OFF
23	Pbr Monitor	output	0-3.3V	Back reflection power monitor: 0 V corresponds to 0 power 3.3V corresponds to max. permissible level
24				NC
25	Pout Monitor	output	0-3.3V	Reserved

CAUTION： Please check the control voltage level and ensure that the level is in accordance with the requirements. Over voltage and voltage ripple may damage the product.

4.4.2 RS-232 Serial Port

Pin description for RS-232 serial port is shown on the Figure 14 and Table 5. And a matching RS-232 serial line is provided as shown on the Figure 15.

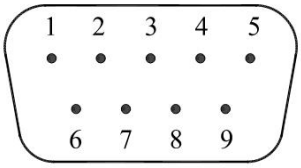


Figure 14 RS-232

Table 5: RS-232 pin definition

Pin	Description
2	RX
3	TX
5	GND
Others	NC

Figure 15 Wire of RS-232 serial

4.5 Operation Modes

There are three main modes of laser operation: **CW**, **PULSE** and **Wave**. The main differences between CW mode, PULSE mode and Wave mode are as follows:

- In PULSE mode the maximum peak power is considerably higher than in CW.
- In PULSE mode, the maximum pulse duration and the maximum duty cycle are limited to certain values (refer to Figure 16 PULSE mode operational range).
- In CW mode, the maximum pulse duration and duty cycle are not applicable.
- In Wave mode, the control system can store at most 100 waveforms and each of the waveform is made up by at most 200 points, representing a power curve. The output power for the laser varies with the power curve.

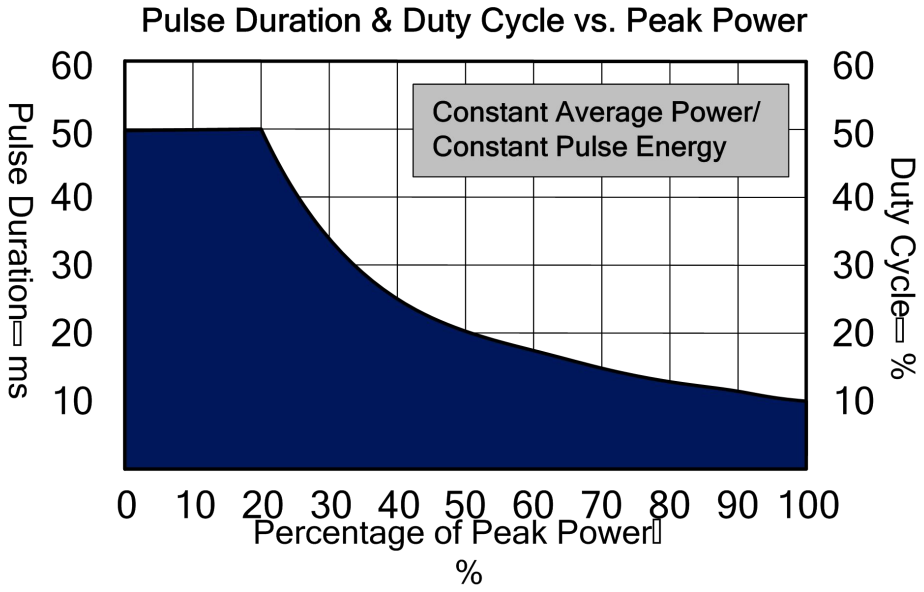


Figure 16 PULSE mode Operational range

4.5.1 Operation Sub-modes

For CW and PULSE mode of laser emission, there are three operation sub-modes: Standalone, Modulation, Gate. There are two ways to set the power level: either digital (RS-232 or Ethernet) or via external analog voltage (Analog Power Control enabled). There are also two ways to enable/disable the laser emission: either digitally (RS-232 or Ethernet) or via the signal applied to the pins 7-9 of the DB-25 interface connector.

Standalone (Modulation and Gate Disabled)

The emission starts/stops by：

1) command of “EMON” and “EMOF” via RS-232;

2) command of “EMON” and “EMOF” via Ethernet;

Modulation

The emission starts/stops is performed by means of the modulation signal applied to the pins 17-9 of the DB-25 interface connector under the assumption that emission has been enabled before.

Gate

Pulses are generated internally with parameters set by sending corresponding commands via RS-232 or Ethernet. Start and stop of the pulse train is controlled by means of modulation signal

applied to the pins 17-9 of the DB-25 interface connector under the assumption that emission has been enabled before.

The details of the main control functions in all modes and sub-modes of operation are listed in Table 6.

Table 6 The main control functions

Emission Enabling	**Hardware Emission Control Enabled[1]**	**Hardware Emission Control Disabled**
	Control interface (DB-25 – pin7-9)	RS-232 or Ethernet
Power Setting	Analog Power Control Enabled[2]	Analog Power Control disabled
	Control interface (DB-25 – pin8-9)	RS-232 or Ethernet
Guide Laser Enabling	External Aiming Beam Control Enabled[3]	External Aiming Beam Control disabled
	Control interface (DB-25 – pin21-9)	RS-232 or Ethernet
Reset Errors	RS-232 or Ethernet or Analog Interface	
Available Operation Modes	CW, Pulsed	
Available Operation Sub-Modes	Standalone, Modulation, Gate	
Operation Mode Selection	RS-232 or Ethernet	

1: To enable HARDWARE EMISSION CONTROL send the command “ELE” via RS-232 or Ethernet interface, to disable - “DLE.”

2: To enable ANALOG POWER CONTROL send the command “EEC” via RS-232or Ethernet interface, to disable - “DEC.”

3: To enable EXTERNAL AIMING BEAM CONTROL send the command “EEABC” via RS-232 or Ethernet interface, to disable - “DEABC.”

Wave mode

The Raycus software can reads a waveform file from the memory if a waveform has been edited and stored before (See Appendix 1.6 “Waveform Editing” for more information about how to edit and store a waveform). And the output power for the laser varies with the waveform(power curve).The emission starts/stops is performed by means of the modulation signal applied to the pins 17-9 of the DB-25 interface connector under the assumption that emission has been enable before.

Instruction for operating (recommended):

Step 1: Select the operating mode (CW/ PULSE/ Wave/ Standalone/ Modulation/ Gate);

Step 2: Set parameters of power, frequency and pulse width;

Step 3: Enable the laser (By positive edge signal applied to the pin 7-9 of the DB-25 interface connector or send command "EMON");

Step 4: Emission starts/stops (By means of the modulation signal applied to the pins 17-9 of the DB-25 interface connector)

4.5.2 Computer Interface/Commands

（1） RS-232 Configuration

A three-wire (RxD, TxD, GND) interface is used (null modem cable). The individual commands are described in "Interface Commands". The RS-232 interface is configured with the parameters as listed in Table 7.

Table 7 RS-232 Parameters

Parameters	Values
Baud Rate	9,600
Data Bits	8
Stop Bits	1
Parity	NC
Flow Control	NC

（2） Ethernet TCP/IP Interface

The default IP address of the laser is 192.168.0.10 and the laser only supports UDP communication. The laser listens for connections on port 8099. The command must be sent as a single string in a single packet. The individual commands are described in "Interface Commands" section of this manual.

Table 8: Ethernet Interface Pinouts

Pin	Description	Notes
1	TX+	Transmit Data+
2	TX-	Transmit Data -

3	RX+	Receive Data +
4	N/C	Not Connected
5	N/C	Not Connected
6	RX-	Receive Data -
7	N/C	Not Connected
8	N/C	Not Connected

（3） Commands

All commands and responses consist of printable ASCII characters. Commands are typically three or four letter mnemonic codes followed by a parameter, if required. All commands and responses are terminated with a <Carriage Return> (CR, 0x0D, \r) character. If a CR terminated string is received, but a valid command is not found, a response of “Command ERR” is sent.

The commands are shown in Table 9, “Interface Commands” as all uppercase for clarity; the actual commands are not case sensitive. A space character is also shown between the command and parameter for clarity. The space is not required.

Every command generates a response. The responses generally consist of the command echoed back. If there is a returned value, it is separated from the echoed command by a “:” character.

Table 9: Interface Commands

Code	Description	Examples
ABF	Aiming Beam OFF	Sent：“ABF” Response：“ABF”
ABN	Aiming Beam ON	Sent：“ABN” Response：“ABN”
DEABC	Disable External Aiming Beam Control	Sent：“DEABC” Response：“DEABC”
DEC	Disable External Control– Disables the external control input	Sent：“DEC” Response：“DEC”
DGM	Disable Gate Mode– Disables internal pulse generator.	Sent：“DGM” Response：“DGM”
DLE	Disable Hardware Emission Control	Sent：“DLE” Response：“DLE”
DMOD	Disable Modulation— Disables the modulation control input.	Sent：“DMOD” Response：“DMOD”
DPM	Disable Pulse Mode	Sent： “DPM” Response： “DPM
EEABC	Enable External Aiming Beam Control	Sent：“EEABC” Response：“EEABC”
EEC	Enable External Control– Enables the external control input.	Sent:： “EEC” Response：“EEC”
EGM	Enable Gate Mode—Enables internal pulse generator gated by signal applied to modulation input.	Sent：“EGM” Response：“EGM”
ELE	Enable Hardware Emission Control	Sent：“ELE” Response：“ELE”
EMOD	Enable Modulation— Enables the modulation control input.	Sent：“EMOD” Response：“EMOD”
EMOFF	Stop Emission— Stops emission.	Sent：“EMOFF” Response：“EMOFF
EMON	Start Emission— Starts emission.	Sent：“EMON” Response：“EMON”
EPM	Enable Pulse Mode	Sent：“EPM” Response：“EPM”
RBT	Read Board Temperature— Reads the temperature of the laser's control board. The response is an echo of the command, a delimiter of “:” and the temperature in degrees centigrade.	Sent：“RBT” Response：“RBT:36.6”
RCS	Read Current Setpoint—Reads the setpoint for the LD current. The response is the command echoed back, followed by a delimiter of “:”, and then the current setpoint in %.	Sent：“RCS” Response：“RCS:56.7” (Indicates that the LD current setpoint is 56.7%)

Code	Description	Examples
RCT	Read Laser Temperature — Reads the internal temperature of the laser. The response is an echo of the command, a delimiter of ":", and the temperature in degrees centigrade.	Sent："RCT" Response："RCT:34.5"
RDGW	Read Default Gateway –Reads the current default gateway of the device. The response is the command echoed back, followed by a delimiter of ":" and then the default gateway in dot-decimal notation.	Sent："RDGW" Response："RDGW:192.168.0.1"
RERR	Reset Errors — Resets any resettable errors.	Sent："RERR" Response："RERR"
RIP	Read IP –Reads the current IP address of the device. The response is the command echoed back, followed by a delimiter of ":", and then the IP address in dot-decimal notation.	Sent："RIP" Response："RIP：192.168.0.10"
RMASK	Read Subnet Mask — Reads the current subnet mask of the device. The response is the command echoed back, followed by a delimiter of ":", and then the subnet mask in dot-decimal notation.	Sent："RMASK" Response ： "RMASK ： 255.255.255.0"
RPRR	Read Pulse Repetition Rate — Reads the pulse repetition rate. The response is the command echoed back, followed by a delimiter of ":" and then the pulse width in Hz.	Sent："RPRR" Response："RPRR：10" (Indicates that the PRR is 10 Hz)
RPW	Read Pulse Width — Reads the pulse width. The response is the command echoed back, followed by a delimiter of ":" and then the pulse width in milliseconds (ms).	Sent："RPW" 返回："RPW：5.5" (Indicates that the pulse width is 5.5 ms)
SDC	Set Diode Current — Sets the diode current. The units are in percent of maximum current. The setpoint must be below 100% and above the minimum current setpoint. The current can also be set to 0. The response from the laser is the command echoed back, a delimiter of ":" and then the current setpoint for the laser. A value that is outside the acceptable range receives a response of "ERR: Out of Range."	Sent："SDC 34.2" Response："SDC：34.2" (Current Setpoint is set to34.2%) Sent："SDC 104.2" Response："ERR：Out of Range" (The setpoint is unchanged)
SDGW	Set Default Gateway —Followed by a number in dot-decimal notation sets the default gateway for the laser.	Sent："SDGW 192.168.0.1" Response："SDGW: 192.168.0.1"
SIP	Set IP — Followed by a number in dot-decimal notation sets the IP address for the laser.	Sent："SIP 192.168.0.10" Response："SIP 192.168.0.10"
SMASK	Set Subnet Mask— Followed by a number in dot-decimal notation sets the subnet mask for the laser.	Sent："SMASK 255.255.255.0" Response："SMASK 255.255.255.0"

<table>
<tr><th>Code</th><th>Description</th><th>Examples</th></tr>
<tr><td>SPRR</td><td>Set Pulse Repetition Rate — Sets the pulse repetition rate. The units are in Hz. The pulse width and the duty cycle (dependent on the pulse width and pulse repetition rate) must be within the specified range. The response from the laser is the command echoed back, a delimiter of “:”, and then the pulse repetition rate. A value that is outside the acceptable range receives a response of “ERR: Duty cycle too high, max.duty cycle XX.X%.”</td><td>Sent：“SPRR 10”
Response：“SPRR: 10”
(PRR is set to 10Hz)
Sent：“SPRR 100”
Response： “ERR: Duty cycle too high”</td></tr>
<tr><td>SPW</td><td>Set Pulse Width — Sets the pulse width. The units are in milliseconds (ms). The pulse width and the duty cycle must be within the specified range. Can only be set to integer multiple of 0.02ms.</td><td>Sent：“SPW 5.5 ”
Response：“SPW: 5.5 ”</td></tr>
<tr><td>STA</td><td>Read device status status—The status is reported as a bit-encoded 32-bit word. Undefined bits or bits defined as “Reserved” can be in any state and should be ignored. Each of the bits have the following meaning
<table>
<tr><td>Bit 0</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>Command Buffer Overflow</td></tr>
<tr><td>Bit 1</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>Overheat</td></tr>
<tr><td>Bit 2</td><td>-</td><td>0</td><td>=</td><td>Emission Off</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>Emission On</td></tr>
<tr><td>Bit 3</td><td>-</td><td>0</td><td>=</td><td>Back Reflection OK</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>High Back Reflection level</td></tr>
<tr><td>Bit 4</td><td>-</td><td>0</td><td>=</td><td>Analog Power Control Disable</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>Analog Power Control Enable</td></tr>
<tr><td>Bit 5</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>Pulse Too Long</td></tr>
<tr><td>Bit 6</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit 7</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit 8</td><td>-</td><td>0</td><td>=</td><td>Aiming Beam OFF</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>Aiming Beam ON</td></tr>
<tr><td>Bit 9</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>Pulse Too Short</td></tr>
<tr><td>Bit10</td><td>-</td><td>0</td><td>=</td><td>CW Mode</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>PULSE Mode</td></tr>
<tr><td>Bit 11</td><td>-</td><td>0</td><td>=</td><td>Power Supply OK</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>Power Supply Out of Range</td></tr>
<tr><td>Bit 12</td><td>-</td><td>0</td><td>=</td><td>Modulation Disable</td></tr>
<tr><td></td><td>-</td><td>1</td><td>=</td><td>Modulation Enable</td></tr>
</table></td><td>Sent: “STA”
Response: “STA: 4100"
This translates to the following:
4100 = 0x1004, so bits 2 and 12 are set. This means that emission is on and modulation is enabled.</td></tr>
</table>

<table>
<tr><th>Code</th><th>Description</th><th>Examples</th></tr>
<tr><td>STA (cont.)</td><td>Read device status status—The status is reported as a bit-encoded 32-bit word. Undefined bits or bits defined as “Reserved” can be in any state and should be ignored. Each of the bits have the following meaning
<table>
<tr><td rowspan="2">Bit 13</td><td>-</td><td>0</td><td>=</td><td>Compatibility Disable</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Compatibility Enable</td></tr>
<tr><td>Bit 14</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit 15</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td rowspan="2">Bit 16</td><td>-</td><td>0</td><td>=</td><td>Gate Mode Disable</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Gate Mode Enable</td></tr>
<tr><td rowspan="2">Bit17</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>High Pulse Energy</td></tr>
<tr><td rowspan="2">Bit 18</td><td>-</td><td>0</td><td>=</td><td>Hardware Emission Control Disable</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Hardware Emission Control Disable</td></tr>
<tr><td rowspan="2">Bit 19</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Power Supply Failure</td></tr>
<tr><td>Bit 20</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit 21</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit 22</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td rowspan="2">Bit 23</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Duty Cycle Too High</td></tr>
<tr><td rowspan="2">Bit 24</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Low Temperature</td></tr>
<tr><td>Bit 25</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td rowspan="2">Bit 26</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>GND Leakage</td></tr>
<tr><td rowspan="2">Bit 27</td><td>-</td><td>0</td><td>=</td><td>Hardware Aiming Beam Control Disable</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Hardware Aiming Beam Control Enable</td></tr>
<tr><td rowspan="2">Bit 28</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Aiming Beam Alarm</td></tr>
<tr><td rowspan="2">Bit 29</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Critical Error</td></tr>
<tr><td rowspan="2">Bit 30</td><td>-</td><td>0</td><td>=</td><td>Fiber Interlock OK</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Fiber Interlock Active</td></tr>
<tr><td rowspan="2">Bit 31</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>High Average Power</td></tr>
</table></td><td>Sent: “STA”
Response: “STA: 4100"
This translates to the following: 4100 = 0x1004, so bits 2 and 12 are set. This means that emission is on and modulation is enabled.</td></tr>
</table>

<table>
<tr><th>Code</th><th>Description</th><th>Examples</th></tr>
<tr><td>STR</td><td>Read Raycus Errs—Read the private abnormal status of Raycus Laser.
The status is reported as a bit-encoded 32-bit word.
<table>
<tr><td rowspan="2">Bit 0</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>ACDC1 Alarm</td></tr>
<tr><td rowspan="2">Bit 1</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>ACDC2 Alarm</td></tr>
<tr><td>Bit 2</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit 3</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit 4</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit 5</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td rowspan="2">Bit 6</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>BOOST ERROR</td></tr>
<tr><td>Bit 7</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td rowspan="2">Bit 8</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Cur Driver1 Alarm</td></tr>
<tr><td rowspan="2">Bit 9</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Cur Driver2 Alarm</td></tr>
<tr><td rowspan="2">Bit10</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Cur Driver3 Alarm</td></tr>
<tr><td rowspan="2">Bit 11</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Cur Driver4 Alarm</td></tr>
<tr><td rowspan="2">Bit12</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Laser Out1 Alarm</td></tr>
<tr><td rowspan="2">Bit13</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Laser Out2 Alarm</td></tr>
<tr><td rowspan="2">Bit14</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Laser Energy1 Alarm</td></tr>
<tr><td rowspan="2">Bit15</td><td>-</td><td>0</td><td>=</td><td>Normal operation</td></tr>
<tr><td>-</td><td>1</td><td>=</td><td>Laser Energy2 Alarm</td></tr>
<tr><td>Bit 16</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit17</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit18</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit19</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit20</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit21</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit22</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit23</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit24</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit25</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit26</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit27</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit28</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit29</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit30</td><td>-</td><td colspan="3">Reserved</td></tr>
<tr><td>Bit31</td><td>-</td><td colspan="3">Reserved</td></tr>
</table></td><td>Sent: “STR”
Response：“STR：4100”</td></tr>
</table>

4.6 Installation and Operation instruction

1) Particular care must be taken when taking out and installing the device.

   Notice: Please make sure there is sufficient airflow that allows for the specified heat load developed during operation.

2) Leave the protective cap on and check the lens of optical output head with bright light for dust, dirt or damage before installing the device. If needed, clean the lens first and put the protective cap on before the optical output head installed.

3) Particular care must be taken when installing the fiber optic cable as well as the optical output head. After installing the fiber optic cable, leave the protective cap and check the lens of optical output head again to confirm whether it is clean and then install it.

4) Check power switch on rear panel and ensure air-break switch is “OFF”. Connect electrical cables and connectors according to operating mode the end user selected. Make sure that incoming DC voltages are equal to the level noted in the specification.

5) Switching air-break to “ON”, and wait 10s for the control system activated after 5V voltage is supplied to the pins 15-1 of the DB-25 interface connector. Connect the device with PC Host via RS-232 serial port or Ethernet and start operating the device.

4.7 Software instructions

The details of software instructions see **【Appendix 1-Software Instructions】.**

4.8 Alarms and Solution

Some alarm may occur when the laser is running. If any alarm occurs, the ALARM light (yellow) on the front panel of the laser will light up and the laser will stop emitting and the alarm state can be displayed on “Raycus status” in Raycus software homepage. The instructions and solutions of alarms are as follows:

Table 10 Instructions and solutions for alarms of laser

Alarm Name	Reason	Solution
High/Low Temperature Alarm	Cooling system failure	Check the fan and ventilation ducts
Laser out Alarm	Internal failure of laser	Restart the laser, if this alarm continues to occur, please contact Raycus.
Laser energy Alarm	Internal failure of laser	Restart the laser, if this alarm continues to occur, please contact Raycus.
Current Drive Alarm	Internal failure of laser	Restart the laser, if this alarm continues to occur, please contact Raycus.
Control Supply Alarm	Internal failure of laser	Restart the laser, if this alarm continues to occur, please contact Raycus.
Boost Alarm	Internal failure of laser	Restart the laser, if this alarm continues to occur, please contact Raycus.
Main Supply Alarm	External failure of supply power source or internal failure of laser	Check if external supply power source is well or the air switch is closed; Restart the laser, if this alarm continues to occur, please contact Raycus.
High Average Power Alarm	Duty ratio too high or pulse width too long	Reduce duty ratio or pulse width; Restart the laser, if this alarm continues to occur, please contact Raycus.

5 Warranty, Return and Maintenance

5.1 General Warranty

Raycus warrants that all Raycus fiber laser products are conformed to applicable product specifications under normal use and are free from defects in materials and workmanship. The warranties start on the date of shipment from Raycus for a period of time as set forth in the applicable purchase contracts or product specifications. Raycus has the right to choose to repair or replace any product that proves to be defective in materials and workmanship selectively during the warranty period. Only products with particular defects are under warranty. Raycus reserves the right to issue a credit note for any defective products produced in normal conditions.

5.2 Limitations of Warranty

The warranty does not cover the maintenance or reimbursement of our product of which the problem results from tampering, disassembling, misuse, accident, modification, unsuitable physical or operating environment, improper maintenance, damages due to excessive use or not following the instructions caused by those who are not from Raycus. Customer has the responsibility to understand and follow this instruction to use the device. Any damage caused by fault operating is not warranted. Accessories and fiber connectors are excluded from this warranty.

According to the warranty, client should write to us within 31days after the defect is discovered. This warranty does not involve any other party, including specified buyer, end-user or customer and any parts, equipment or other products produced by other companies.

	WARNING: It is the customer's responsibility to understand and follow operating instructions in this User Guide. Accessories and fiber connectors are not covered by this warranty.

5.3 Service and Repair

- Do not open the device. There are no user serviceable parts, equipment or assemblies for user in this product. All service and maintenance shall be performed by qualified Raycus personnel.
- Please contact Raycus as soon as possible when problems under warranty about maintenance happened.
- The product returned with permission should be placed in a suitable container.
- If any damage happened to the product, please notify the carrier in document immediately.

We reserve the right to make changes in design or constructions of any of our products at anytime without incurring any obligation to make changes or install the same on units previously purchased.

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

© 2018 Wuhan Raycus Fiber Laser technologies Co., Ltd. All Rights Reserved.

Appendix 1—Software instructions

1.1 Recommended system requirements

1）Win XP or above

2）.NET 4.0 or above

1.2 Installation

1）Download the software package and unzip it directly:

Address：http://www.raycuslaser.com/index.php/index-show-tid-53.html

Figure 1 Download and unzip

2）Create a shortcut:

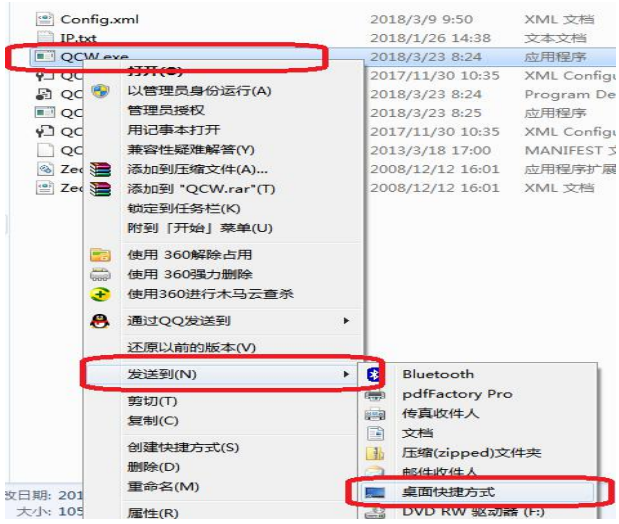


Figure 2 Create a shortcut

3）A shortcut on desk:

Figure 3 A shortcut on desk

1.3 Running

Double-click to run the software and the most common initial tasks are displayed for easy selection in Home Page.

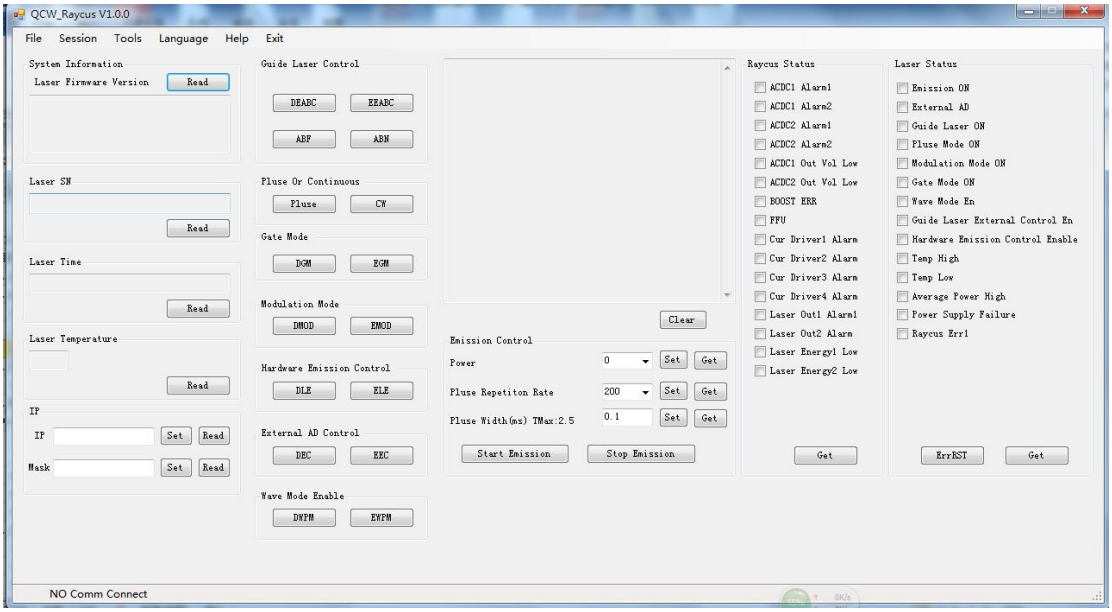


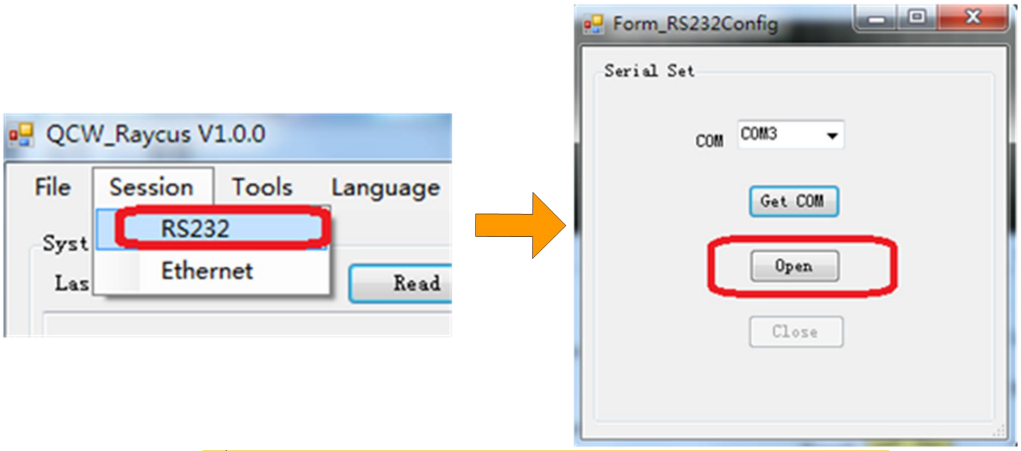
Figure 4 Home Page

1.4 System Menu

1）Communication Connection

① Serial RS-232 Connection

Select ***Session 》RS-232》Get COM 》open*** to connect serial RS-232 from PC host to the laser:



Note: The COM must be consistent with the serial port connected to the laser.

Figure 5 Serial RS-232 Communication

Click “open” and return Home Page.

② Ethernet Connection

Select ***Session 》Ethernet》connect*** to connect Ethernet from PC host to the laser:

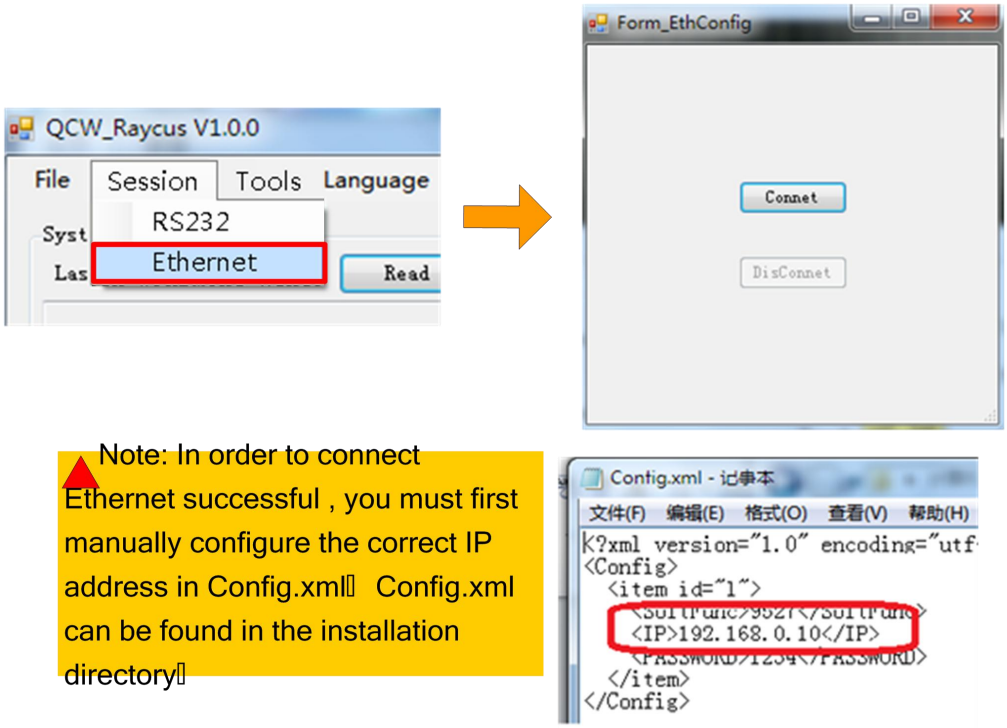


Figure 6 Ethernet Communication

Click "Connect" and return Home Page.

2）Tools

Click "***Tools 》Read Alarm Record***" to get the alarm record of the laser.

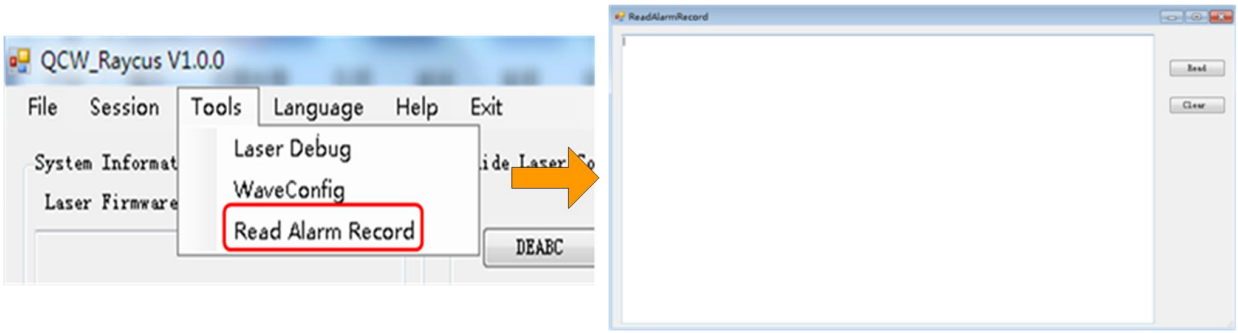


Figure 7 Get the Alarm Record

Click "***Read***" to get the alarm messages and click "***Clear***" to delete current alarm record.

3）Language

Click "***Language 》简体中文***" to switch language from English to Chinese.

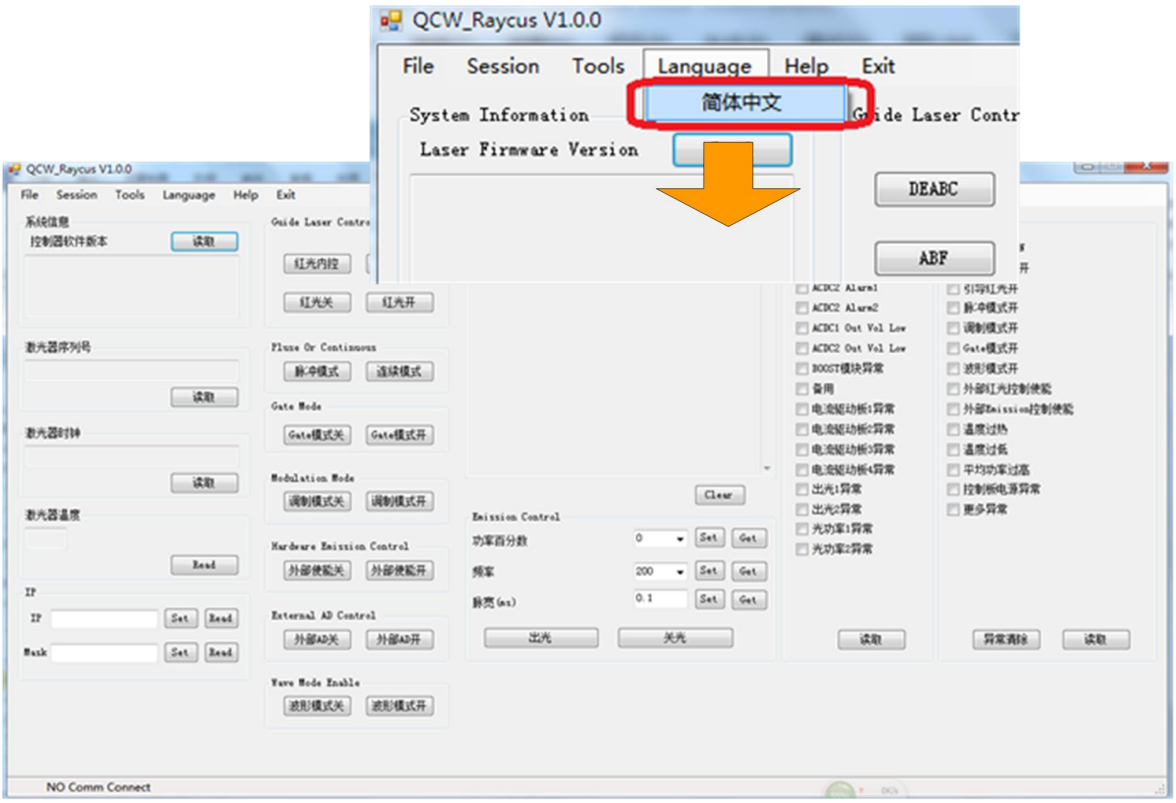


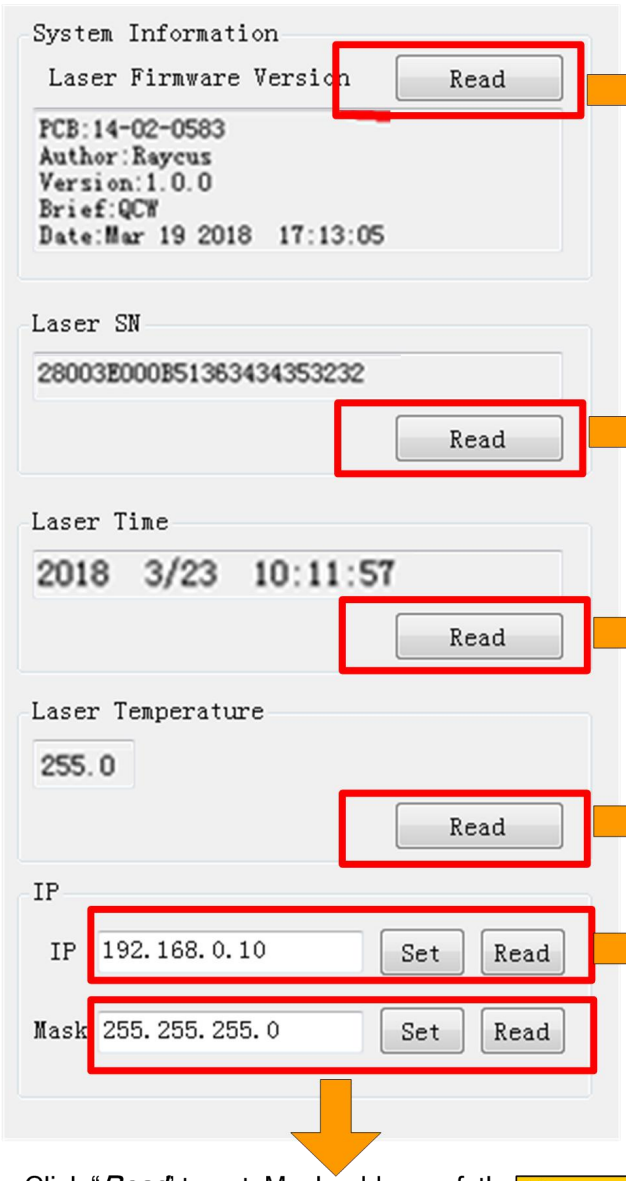
Figure 8 Language Switching

3）Help

Click "***Help***" to get the current version information.

1.5 Home Page

1）System Information



Click "*Read*" to get current information of laser firmware version.

Click "*Read*" to get the laser serial number which is globally unique.

Click "*Read*" to get current clock time of the laser .

Click "*Read*" to get temperature of heat sink in the laser.

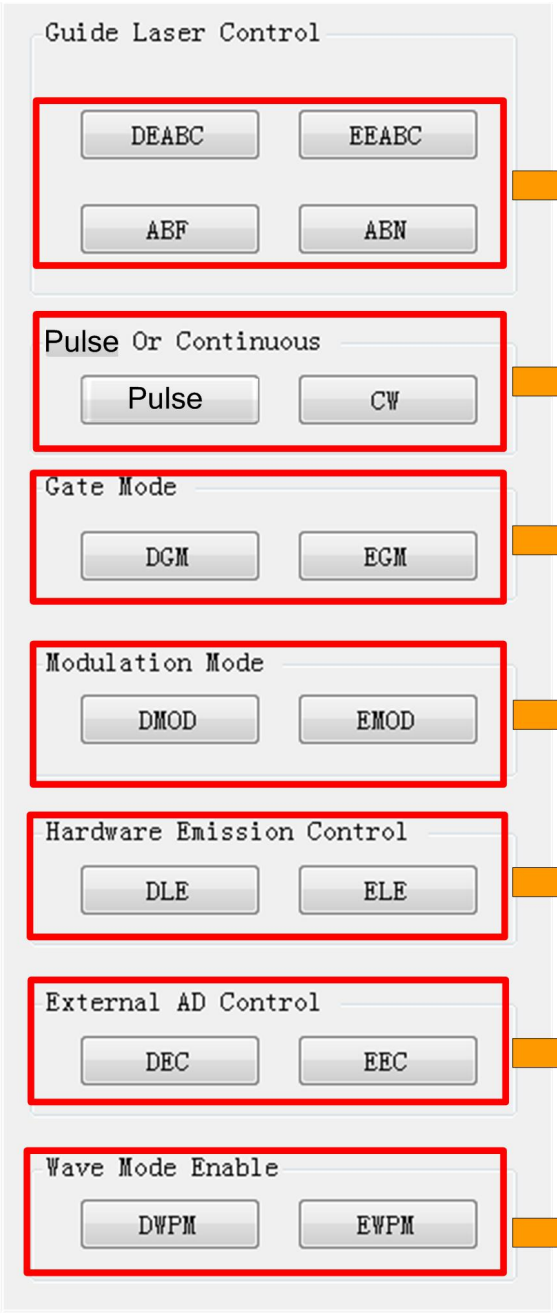
Click "*Read*" to get IP address of the laser. And if you want to reset the laser IP address, you can click "*Set*" after type new IP address in the input box .

Click "*Read*" to get Mask address of the laser. And if you want to reset the laser Mask address, you can click "*Set*" after type new Mask address in the input box .

Note: The laser Mask address must be consistent with PC Host , see <*1.8 Configuring the Local Area Connection for Ethernet*>

Figure 9 System Information on Home Page

2）Control Mode Setting



Click "*DEABC*"indicate that the aiming beam ON/OFF is controlled by buttons of "ABF/ABN"; Click "*EEABC*"indicate that the aiming beam ON/OFF is controlled by signal applied to the pins 7-9 of the DB-25 interface connector.

Click "**Pulse**" indicate that the laser is operating in PULSE mode; Click "**CW**" indicate that the laser is operating in CW mode.

Click "**EGM**" indicate that internal pulse generator is enabled and laser pulse sequence is performed by signal applied to the pins 7-9 of the DB-25 interface connector.

Click "*EMOD*" indicate that the internal pulse generator is disabled and Emission start/stop is performed by signal applied to the pins 17-9 of the DB-25 interface connector.

Click "*ELE*" indicate that hardware emission control is enabled and Emission start/stop is performed by signal applied to the pins 7-9 of the DB-25 interface connector.

Click "*EEC*" indicate external power control is enabled and power level is set via external analog voltage applied to the pins 8-9 of the DB-25 interface connector.

Click "*DEC*" indicate external power control is disabled and power level is set via (RS-232 or Ethernet).

Click "*EWPM*" indicate that laser is operating in Wave mode.

Figure 10 Control Mode Setting

Note: Steps of laser emission start:

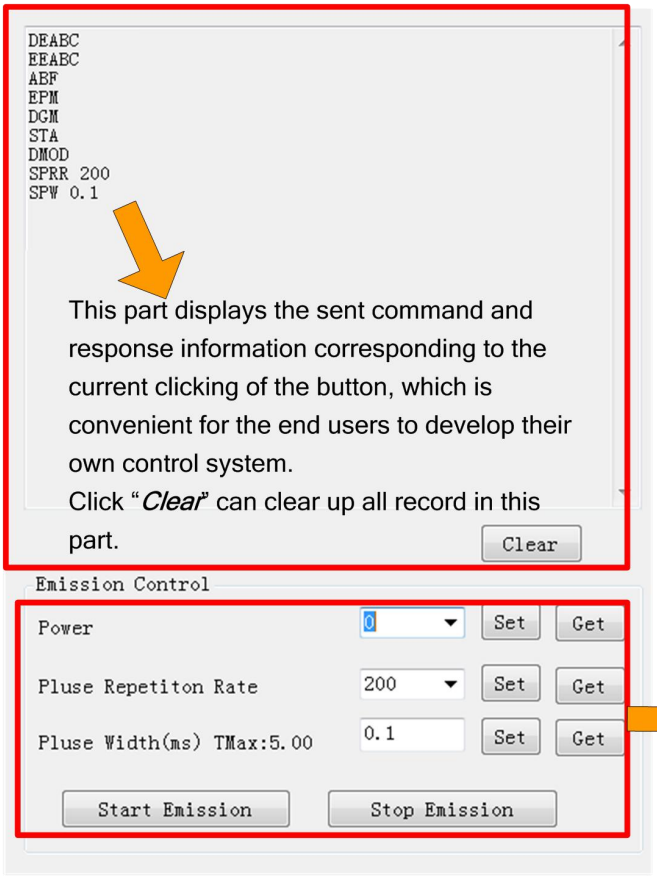
Step 1: Enable emission control

(Enable emission control is performed by signal applied to the pins 7-9 of the DB-25 interface connector if hardware emission control is enabled (ELE), while it is performed by command via RS-232 or Ethernet if hardware emission control is disabled (DLE).)

Step 2: Emission starts/stops

(In Standalone mode, emission starts is performed by command via RS-232 or Ethernet; In Gate/ Modulation /Wave mode, emission starst is performed by signal applied to the pins 17-9 of the DB-25 interface connector)

3）Parameter Setting and Reading and Emission Control



The end user can get and set laser parameters like Power level, Pulse frequency, Pulse width through this part. Emission start/stop can also be performed by clicking buttons of "Start Emission/ Stop Emission"

Notes:

A、 If the laser is operating in internal mode, emission start/stop can be performed by clicking buttons of "Start Emission/ Stop Emission".

If the laser is operating in Gate/ Modulation /Wave mode, "DEL" means that clicking buttons of "Start Emission/ Stop Emission" is enabled/disabled emission control, while "EEL" means that clicking buttons of "Start Emission/ Stop Emission" is invalid .

B、 When Pulse repetition rate is 0, output of laser is single pulse.

C、 The pulse width can only be an integer multiple of 0.02ms.

Figure 11 Parameter Setting and Reading and Emission Control

4）Laser Status

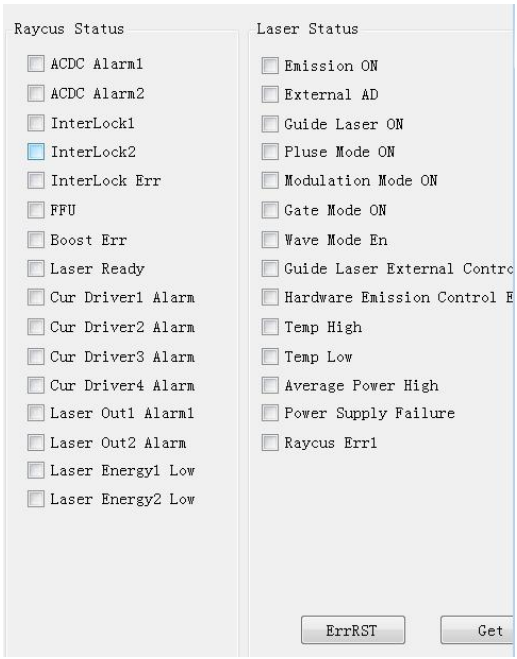


Figure 12 Laser Status

Click "***Get***" to get the current laser status and Click "***ErrRST***" to clear all current laser errors that can be cleared.

1.6 Waveform Edit

1）Click "WaveConfig" to enter the waveform editing page:

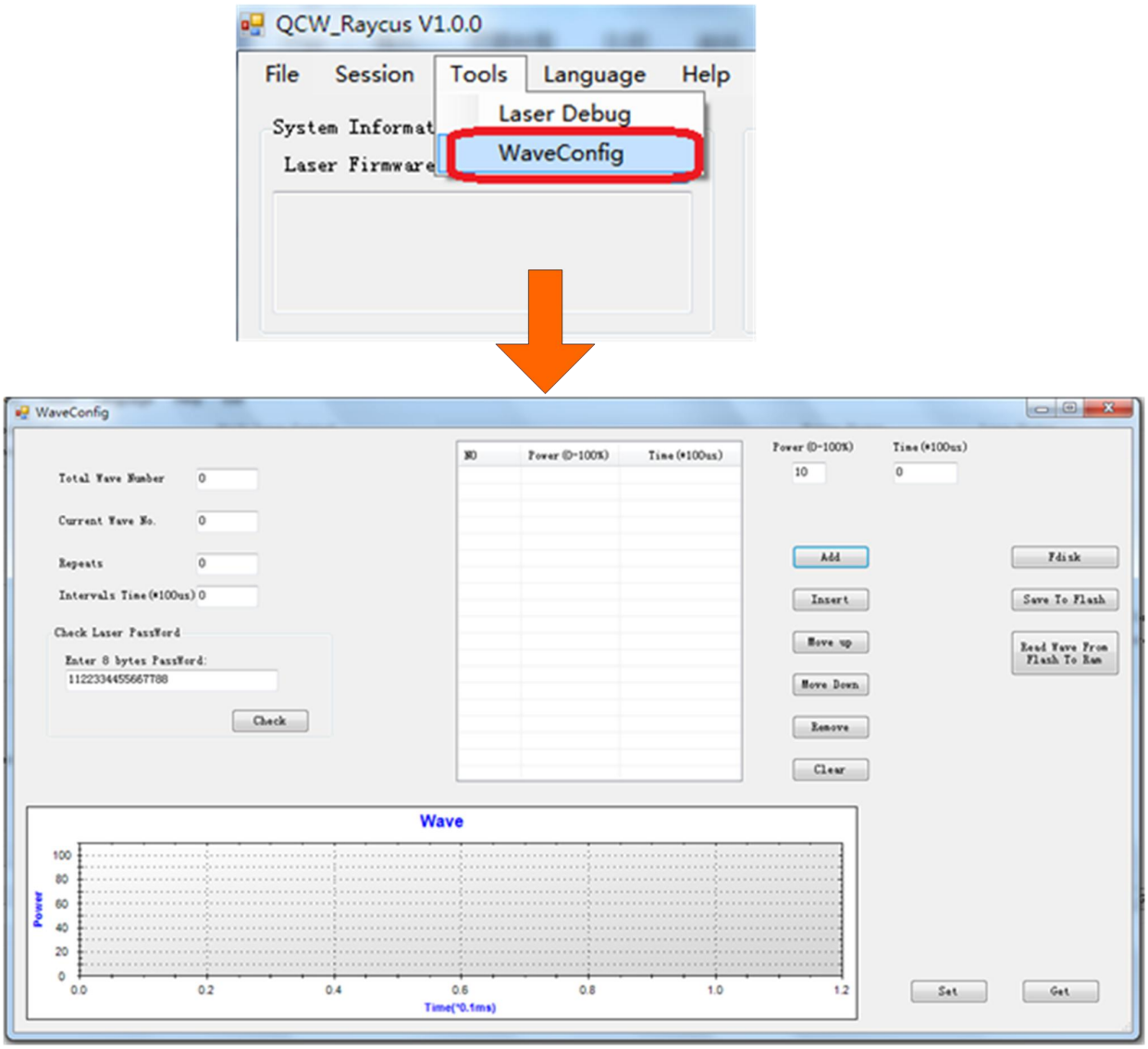


Figure 13 Enter the Waveform Editing Page

2）Steps of waveform editing:

①Read a waveform file flash to RAM:

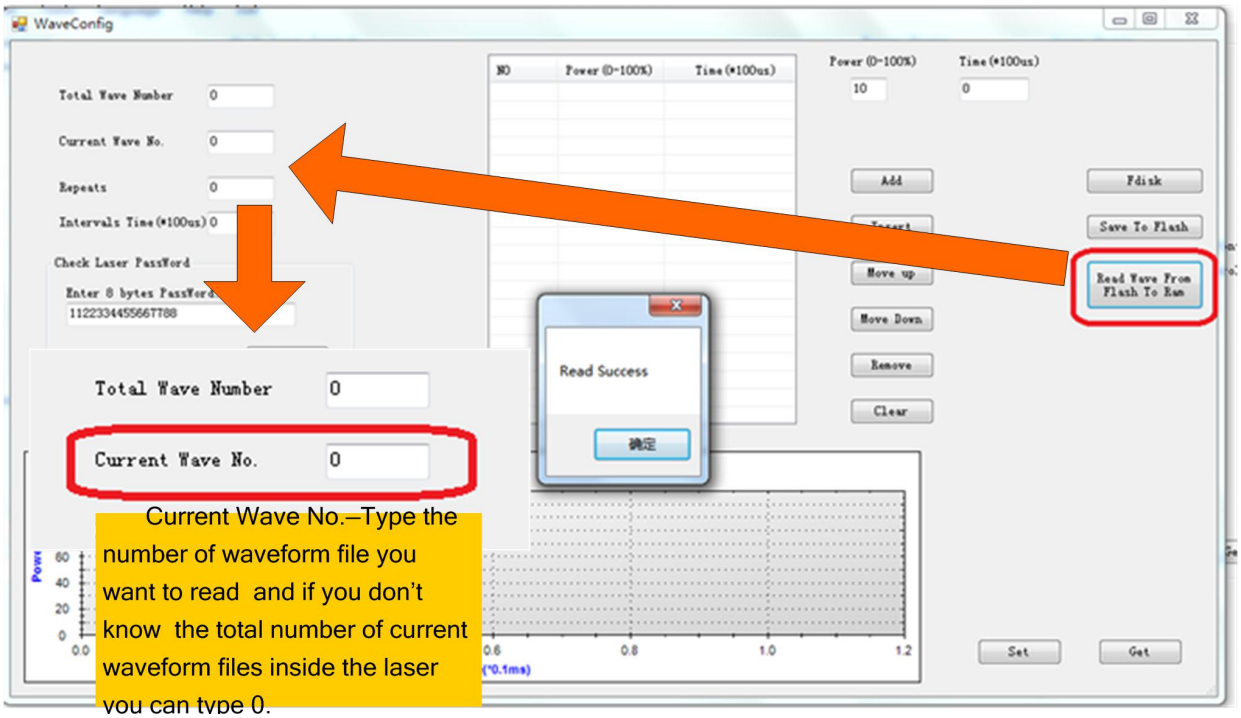


Figure 14 Read a waveform file flash to RAM

②Click "Get" to save current waveform file to flash:

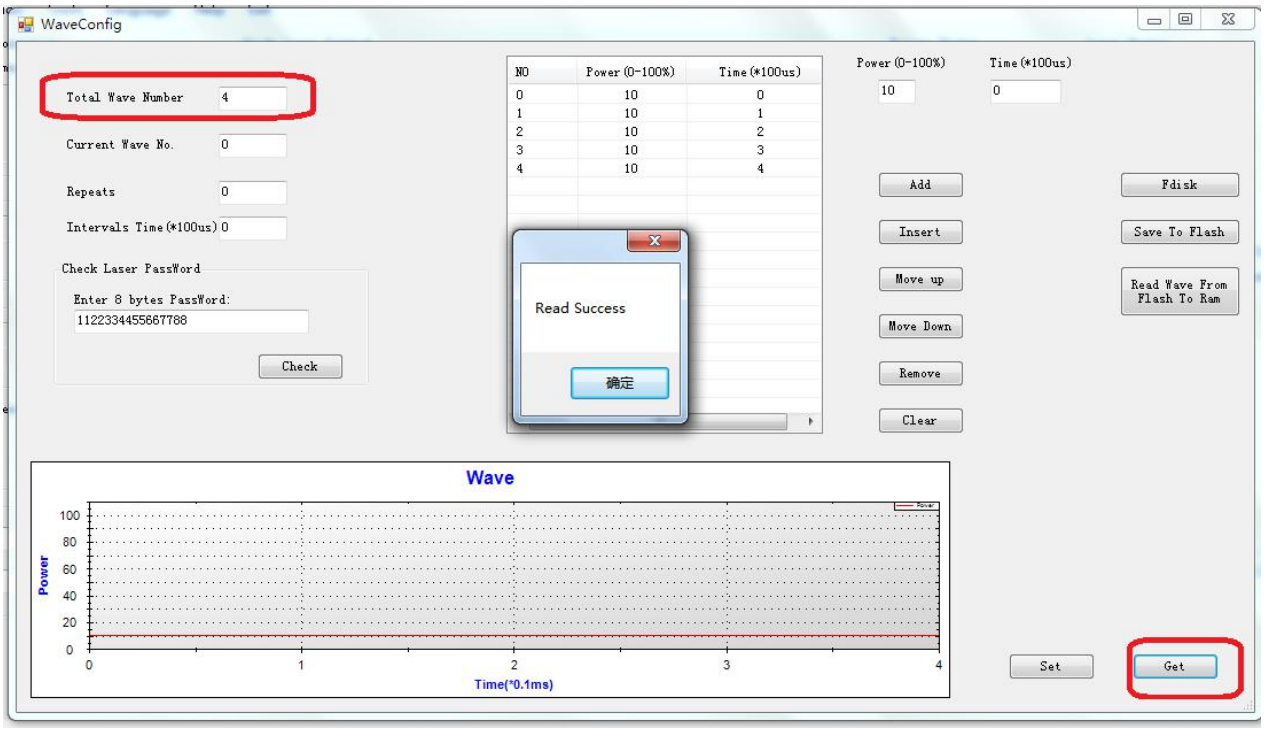


Figure 15 Save Current Waveform File to Flash

Total Wave Number indicate the total number of waveform files inside the laser, for example 4 means that optical waveform file number (Current wave No) is 0,1,2,3.

If the waveform file number you want to read is 3, type 3 in box of Current Wave No. and click “Get” to get corresponding waveform file.

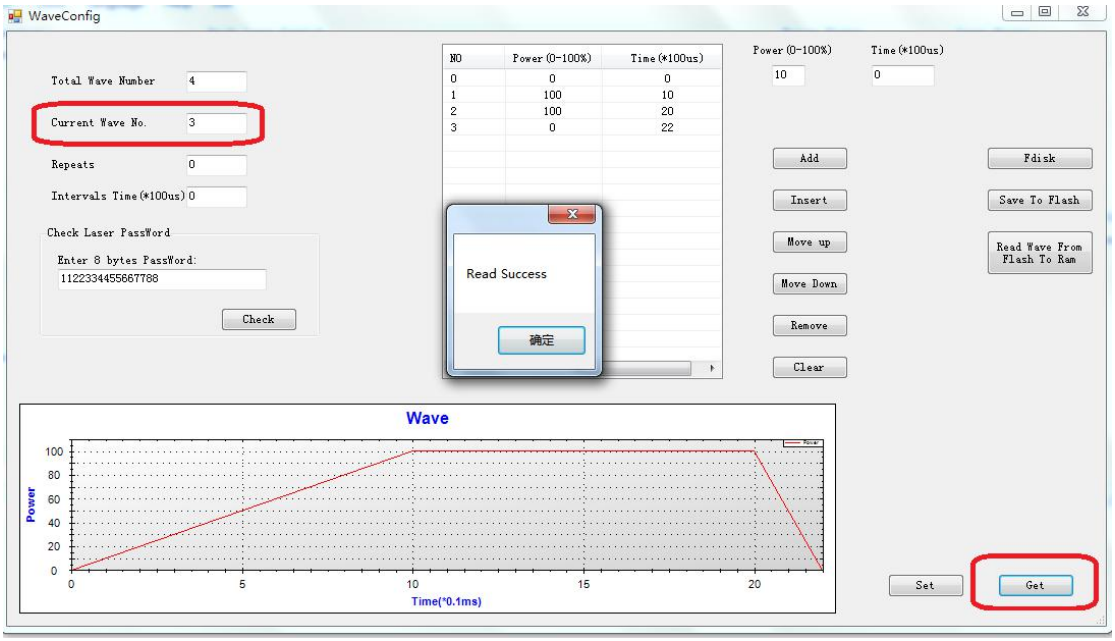


Figure 16 Get A Waveform File.

③Editing a new waveform file:

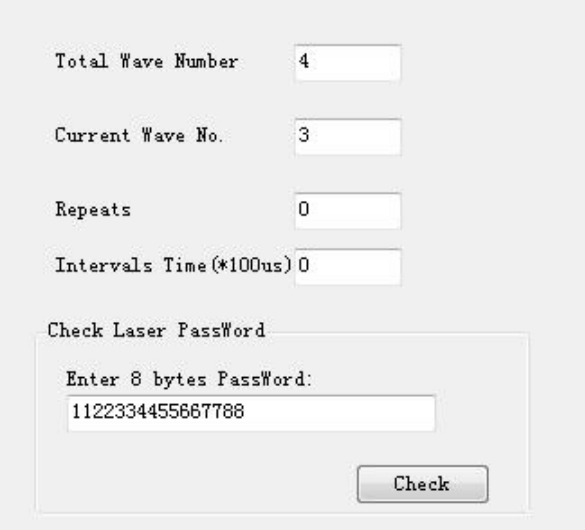


Figure 17 Editing a new waveform file

Firstly type current Total Waveform Numbers as the value of Current Wave No., which represent the current waveform’s number.

Repeats： The number of repetitions of the output waveform and 0 means infinite.

Intervals Time： Intervals time between waveforms in 100ms.

Adding new waveform requires password verification and the default password is 1122334455667788.

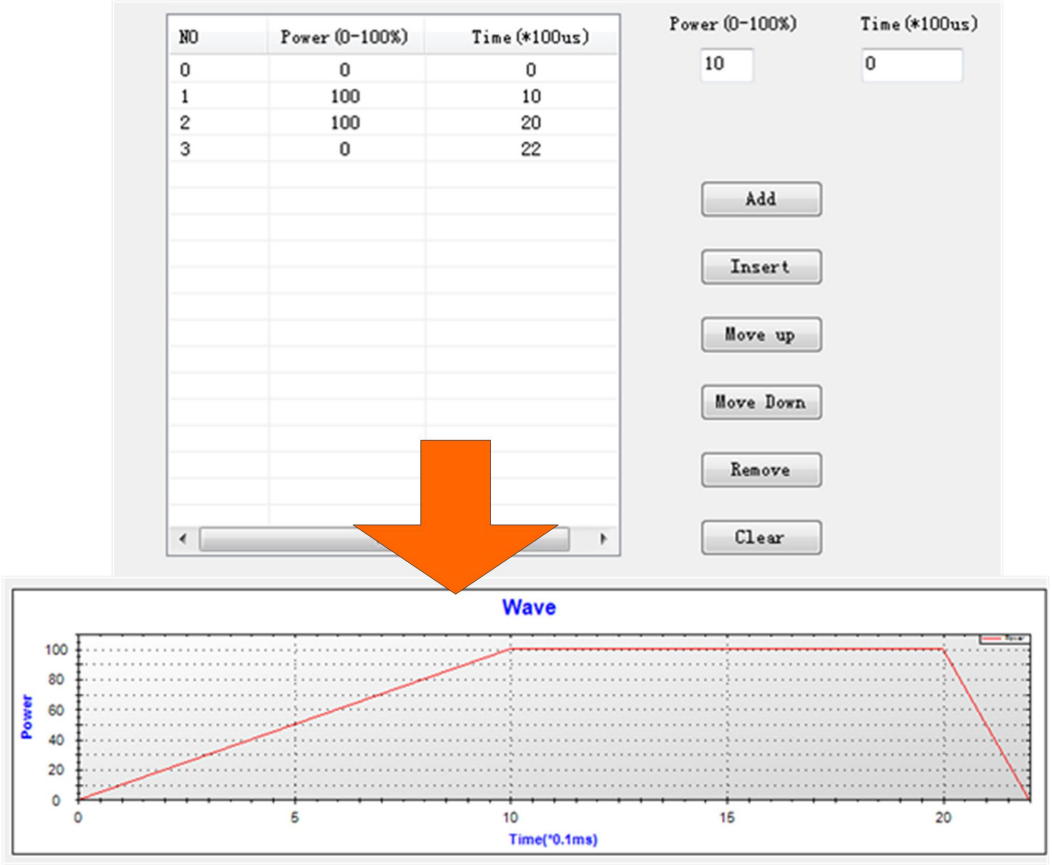


Figure 18 Editing a new waveform file by dots

The waveform files are described by power and time and each dot represents power level of the laser at a certain time. As shown in Figure 18, fours dots represents three sections of a waveform and the power level at time 0 is 0%, power level at time 1ms is 100%, power level at time 2ms is 100%, power level at time 2.2ms is 0%.

Table 1 Command of Waveform Editing

Command	Description
ADD	Add a new dot
Insert	Insert a new dot before current dot you selected
Move Up	Move up current dot
Move Down	Move down current dot
Clear	Clear all dots

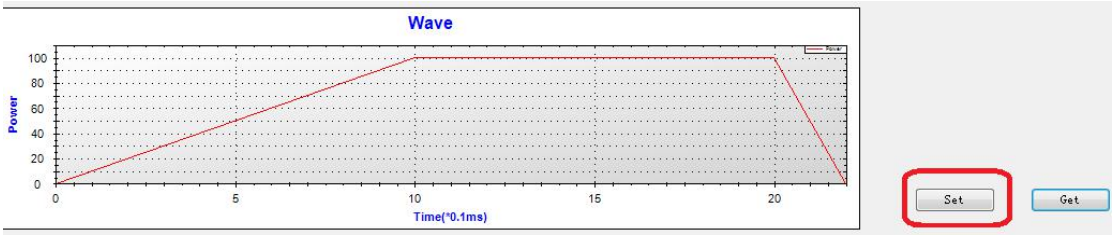


Figure 19 Download Current Waveform to RAM

Click “Set” to download current waveform to RAM

Figure 20 Download Current Waveform to Laser Flash

Click “Save To Flash” to download current waveform to laser flash.

3）Delete all waveform files

Figure 20 Delete All Waveform Files

Click “Fdisk” to format flash memory and delete all waveform files. The software does not support single waveform file deletion.

1.7 Laser Configuration File

1）Location of configuration file

Figure 21 Location of configuration file

2）Open configuration file

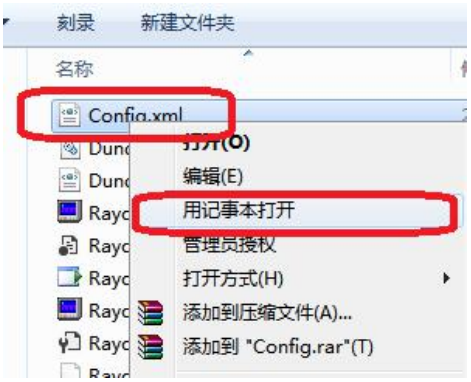


Figure 22 Open configuration file

3）Content in configuration file

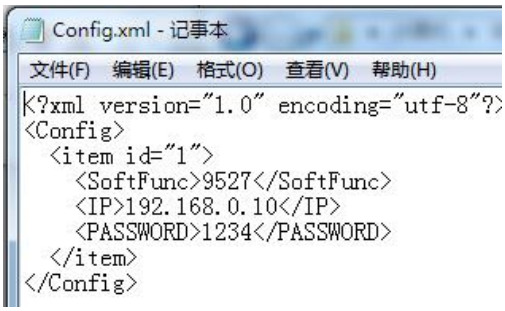


Figure 23 Content in configuration file

<IP>——This tag is for parameter of laser IP address setting.

1.8 Configuring the Local Area Connection for Ethernet

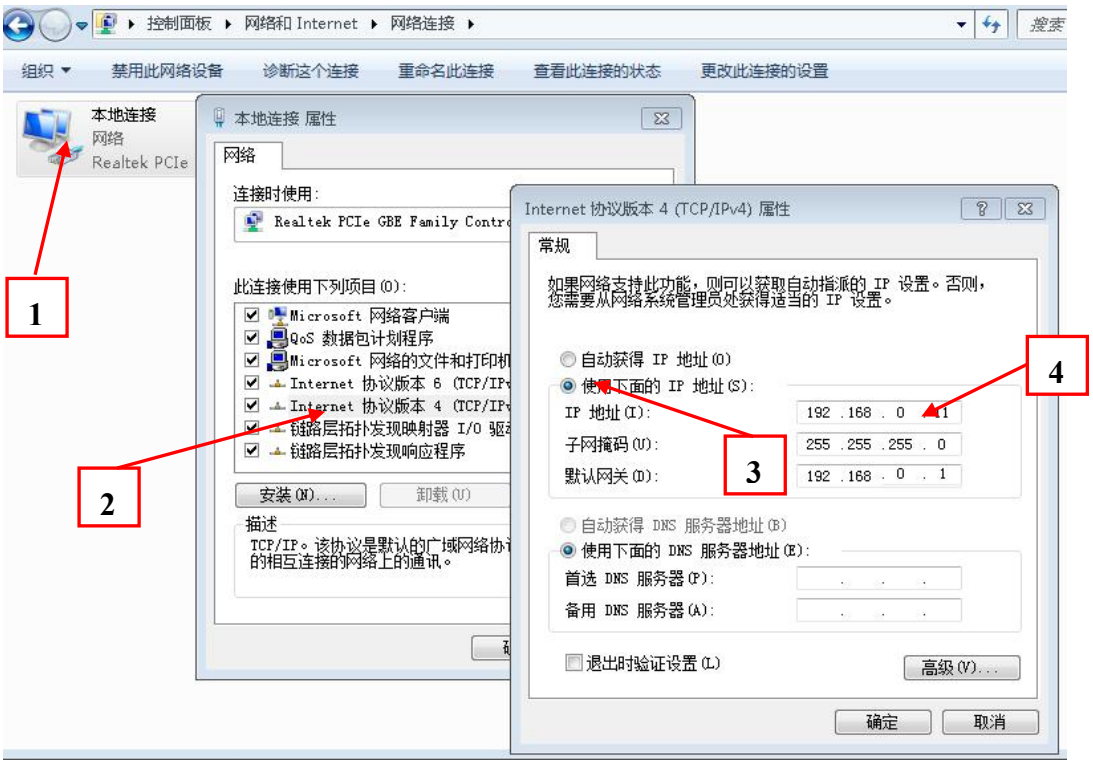


Figure 24 Configuring the Local Area Connection for Ethernet

1） Navigate to the Local Area Connection screen on your computer and click the “Properties” command button.

2） Select the Internet Protocol TCP/IP Setting(TCP/IP 4 on Windows) by double-clicking or click the “Properties” command button.

3） Click the Radio Button to “Use the following IP address” to manually assign the IP address.

4） Assign the IP address and Subnet mask:

For example: if current laser IP address is 192.168.0.10 and the PC Host IP address can assign as192.168.0.X（X can not be 0,1,10,255），Assign the Subnet mask to255.255.255.0，default gateway to192.168.0.1.

5） Press the “OK” command button to accept these manual changes.