CW Fiber Laser v3.0

USER MANUAL

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

Contents

1. Safety Information

Please read this manual carefully before attempting to install or operate the laser. This user manual details all the health and safety issues regarding the safe installation and operation. In order to ensure safe operation and optimal performance of this product, please strictly and correctly follow the warnings, cautions, operating procedures and other instructions accordingly.

1.1 Safety Responsibility

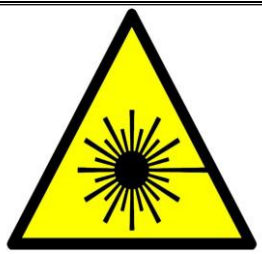
JPT fiber lasers should have equipped with machinery and security accessories for safe and correct operation. It's not, not suitable for direct and independent use. The intermediate manufacturers need to understand and follow the relevant operating specifications and protection standards before the equipment is sold to terminal customers.

1.2 Laser Classification

According to the relevant national standards and requirements, the series of laser must be classified on the basis of output power and laser wavelength. All JPT fiber laser belongs to Class4 laser instrument.

1.3 Laser Safety Symbol

JPT had affixed noticeable safety protection labeling in the critical area of the laser, including but not limited to laser, strong electricity and so forth that may cause any damage to human beings. Therefore, to ensure person safety when using this product, please do not overlook this information and must be take safety precautions.

	Laser Warning Triangle -Label of laser emission (Attached on the back of laser, near output cable)
	WARNING (Attached on the back of the laser, at bottom left)

1.4 Safety Guide

JPT high power fiber laser could cause unrecoverable damage to humans eyes and health. The output laser can readily ignite clothing,volatile substances, and burn human tissue etc. To ensure the safety of users, please read the safety notification carefully in below:

- Please do not remove covers as there are no product components and accessories available for users. All maintenance or service repair can be only performed in JPT factory.
- Be alert to the position of warning notifications posted,, and be cautious when operating.
- Personnel without safety training are prohibitted to enter relevant area when operating the laser system.
- Avoid operating laser in the dark environment.
- Flammable, explosive,volatile materials are prohibited to place in the area of laser system operation, such as gasoline, alcohol and so forth. Please also make sure the operating area is well-ventilated.

- Please make sure that a current-controlled AC power supply with proper grounding is used. It is essential to avoid possible personal injury.
- Before connecting laser to alternating current (AC) power supply, please make sure that the 220V AC power supply is connected properly. Wrong connection will spoil the fiber laser.
- Before laser starting, please check carefully whether the input cable, water pipe and output fiber cable(etc.)of the laser are in good conditions, whether the signal control interface is connected properly. You can switch on the laser after making sure everything is working well. Spoiled accessories and wrong operation will cause irreparable damage to the laser.
- There is an emergency stop button on the front panel of the laser.It is necessary to set protective device for emergency stop button and provide related training for operators.
- Avoid eyes and skins to contact with direct or scattered laser radiation. Please do not look at the fiber laser head when emitting. Be sure to wear laser safety glasses throughout the operation of laser.
- This laser module carries a Class 4 laser rating, it emits invisible 1080nm wavelength laser radiation with average output power of more than 1000W. It is recommended to wear laser safety glasses with1080nm wavelength and the protection level ≥ OD5.

Figure 1 Laser safety glasses

Instructions and precautions for safety glasses：

Laser protective glass is a special glass that can prevent or reduce laser damage to human eyes.

Choosing a protective glass are on the basis of the maximum output power (or energy)、the optical density (the larger the OD：OD value, the stronger the protective ability)、 the visible light transmittance (the value is lower than 20%, and the laser need to be used under the environment with good illumination).

2. Product Description

JPT CW fiber laser is the optimal combination of optical, mechanical, electrical and software components. Through controlling ports and controlling software, the operating status of the laser can be monitored in real time, alarm messages can be received in time, and the data can be collected. The laser uses water-cooling and self case design with competitive advantages of high energy conversion(electric to light), low power consumption, maintenance free, flexible output enabled by fiber delivery, and easy to assemble. It is the ideal laser source for industrial laser cutting, welding and other industrial applications.

2.1 Product Series

Single mode series including：

500W、800W、1000W、1200W、1500W、2000W、3000W、4000W

Multiple mode series including：3300W、4000W、6000W、8000W、12000W

MODEL:
SN:
DATE
RATED VOLTAGE:
RATED FULL LOAD:
MANUFACTURE:

Figure 2 Product Nameplate

MODEL:Laser Type

SN: Stock Number

DATE: Production date

RATED VOLTAGE: Rules for using power supply

RATED FULL LOAD:Laser power dissipation

MANUFACTURE:Name of Manufacturer

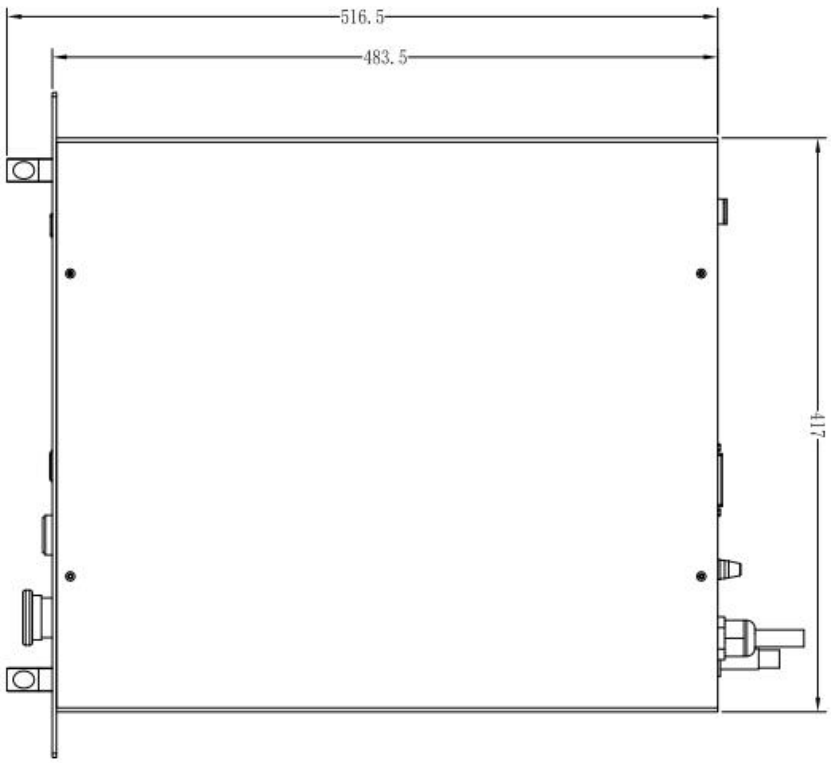
2.2 Product Parameters

2.2.1 The parameters of Integrated Laser Machine

The light output of JPT fiber laser system adopts water cooled QBH output,with excellent beam quality and stable power output. In order to coordinate with the installation and debugging, rollers and hoist rings are installed on the models>3000W. There are also handles for the models ≤3000W. Please choose the best way to move and assemble the machine. As shown in Table 1:

Table 1 Parameters of integrated laser machine

Parameters	Units	Specification
Dimensions （W*L*H）	mm	483*516.5*151.5
Weight	kg	37
Armored cable Length	m	8/15
Handling Way		Manual Carrying（with handle）



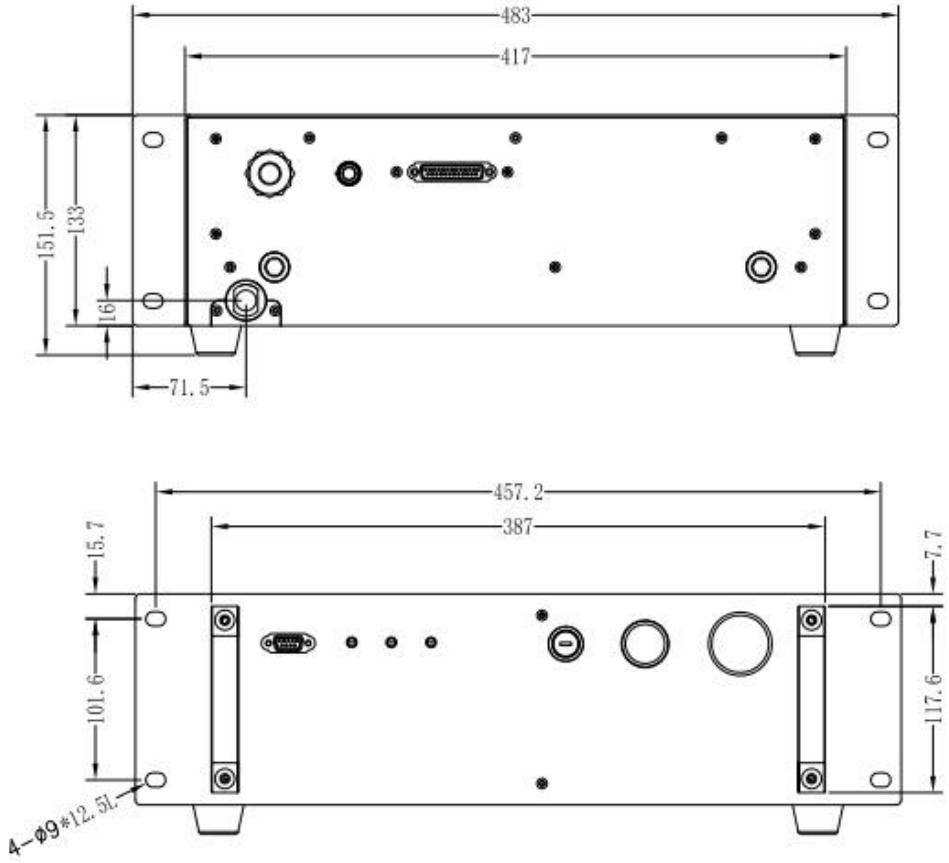


Figure 3 CW1000W Laser module dimensions **(Unit: mm)**

2.2.2 Product Specification

A. Optical Characteristics

S/N	Feature	Testing conditions	Minimum	Type	Maximum	Units
1	Operational mode		CW/Modulated			
2	Polarization		Random			
3	Average output power		See Figure 2			W
4	Central Wavelength			1080		nm
5	Spectral Width			4	6	nm
6	Short-term Stability	2 hours burn-in test		1.0	2.0	rms %
7	Long-term power stability	24 hours burn-in test		±1	±2	%
8	Switch on/off time				20	us
9	Modulation frequency				20	kHz
10	Red beam power		0.2			mW

B. Laser output Characteristics

S/N	Features	Symbol	Type / Parameters		Units
1	Laser Type		CW-1000C-W	CW-R-B-W -1000C	
2	Beam parameter product	BPP	＜0.5@14um	＜2@50um	mm*mrad
3	Armored cable Length		8	15	m
4	Cable bending radius	R	＞200		mm

C. QBH Dimensions

a.Model：CW-1000C-W

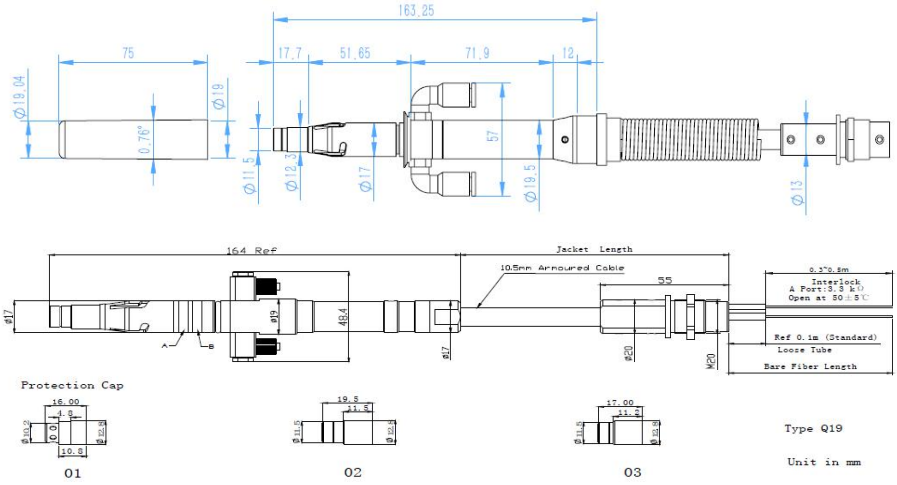


Figure 4 CW-1000C-W Laser module QBH dimensions **(Unit：mm)**

b.Model：CW-R-B-W-1000C

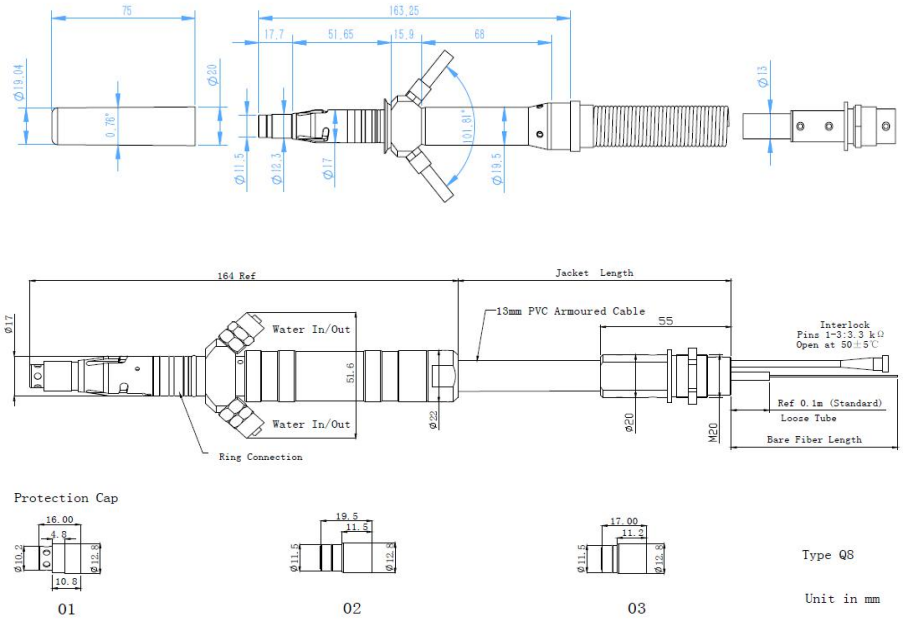


Figure 5 CW-R-B-W-1000C Laser module QBH dimensions **(Unit：mm)**

D. General Characteristics

S/N	Features	Min.	Type	Max.	Units
1	Operating Temperature	10		40	℃
2	Humidity	10		90	%

3	Storage temperature	- 10		60	℃
4	Laser “cold boot” temperature	10			℃

2.2.3 Interface Wire Description

1) Description of Laser panel interface

Front Panel View：

Figure 6 1000W Front Panel Layout

POWER Indicator light： The indicator light turns green when switching on; after waiting for 10seconds, it turns to red when completed power on.

RUN indicator light: It is green when power switches on. It turns to red after waiting for 10seconds till laser is active, then user can press START button to emit laser radiation .

ALARM indicator light： The laser shows normal when ALARM indicator light is green, red with buzzer indicates laser alarm.

START Button： Press it when the RUN indicator light turns to red, and the START light will turn to green.

Key Switch： 3-position key switch controls the laser operation mode: left position - ROBOT mode; Right position -TEST mode; Central position- Laser Off.

EMERGENCY： Laser alarms and cuts off the internal power supply when pressing the emergency stop button. Reset by turning clockwise,the user needs to restart laser or reset alarm signal after resetting,then the alarm can be eliminated.

RS232 interface： The interface that is monitored and issued instructions to the laser by the upper computer.

1000W Rear Panel View：

Figure 7 1000W Rear Panel Layout

INTERFACE/DB25: DB25 interface input (see table 2 for details)；

AC220V Interface: Laser Alternating Current adopts 220V input (see table 4 for details)；

FUSE: Time-lag fuse(220V20A)；

INLET: Laser inlet of cold water pipe diameter(8*12mm).

OUTLET:Laser outlet of cold water pipe diameter (8*12mm).

2) External control signal interface specification

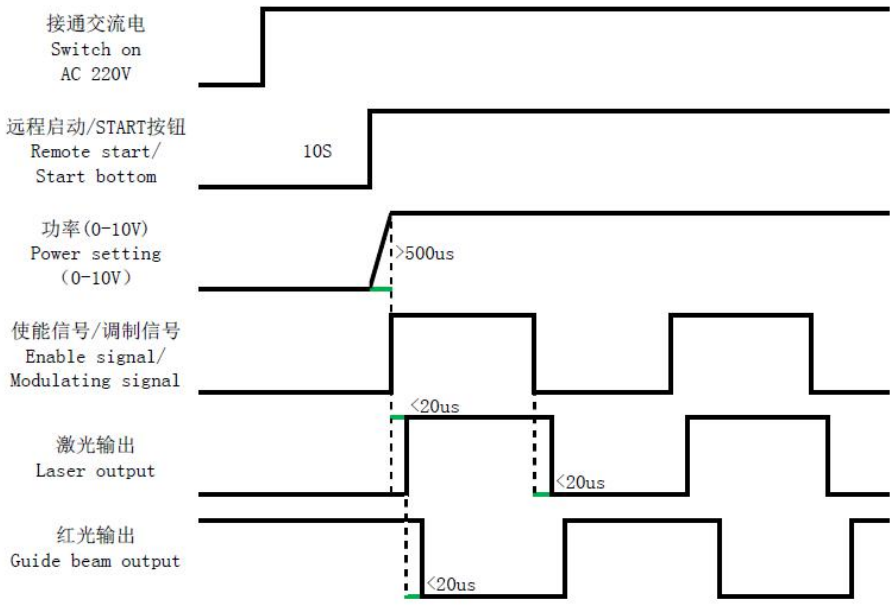
Table 2 External signal interface specification

PIN	Signal Name	Signal Type	Signal Level	Description
1	AD/RS+	Digital input	High level: 24V DC Low level:0V DC	High level: RS232 control mode; Low level: external control mode. Then switch key to “Robot”.
14	AD/RS-	Return		
2	Remote Start button+	Digital input	High level: 24V DC	Activate the laser shutters instead of pressing START button. High level is effective.
15	Remote Start button-	Return		
3	Modulation +	Digital input	High level: 24V DC	Connect Modulation+ to PWM+, Modulation- to PWM-. The laser emits when PWM signal is at high level.
16	Modulation -	Return		
4	Enable+	Digital input	High level: 24V DC	Laser enable signal: high level.
17	Alarm Output +	Digital output	High level: 24V DC	High level: the laser alarms.
5	Enable-/Alarm output-	Return		Return circuit for PIN4 / PIN17
18	0-10V+	Analog input	1-10VDC	Power control signal: 1-10V=10-100% power
6	0-10V-/Analog input GND	Return		

7	Red beam+	Digital input	Low level：24V DC	The laser is in external mode, and not emitting. Choose user control mode in GUI. High level: Red beam is off; Low level: Red beam is on. Note: The red beam is off automatically when the laser is emitting.
20	Red beam-	Return		
8	Interlock1+	Contact Closure Input		Interlock signal is passive contact. Please don't connect to external supply or ground. Recover automatically when reconnecting. Short circuit Interlock1+ and Interlock1-, Interlock2+ and Interlock2- before starting the laser.
21	Interlock1-			
9	Interlock2+			
22	Interlock2-			
11	Reset+	Digital input	High level: 24V DC	Laser alarm reset signal. Eliminating alarm messages by high level that is no less than 600ms.
24	Reset-	Return		
10				Reserved
23				
PE	Ground wire			Connect to ground

3) Laser sequence

Figure 8 Laser sequence Chart



2.2.4 Description of Electric Parameter

2.2.4.1 Control Mode

JPT laser includes Testing mode, RS232 mode, Robot mode：

1) Testing mode: When the key switch turns to “TEST”, and press the Start button, test mode will be showed on user interface by using laser controlling software. You can set the power on controlling software and choose either 20S output or continuous-wave output to emit. This operation is generally used to test power and determine the faults.(Notes: You need to press START button again every time when it emits.)

2) RS232 mode: The key switch turns to “ROBOT”， high level 24V is active with AD/RS signal input; You are able to control laser power by monitoring software; External input signal 0-10W shows analog failure under this mode; Other external signal can still control laser emission.

3) Robot mode : The key switch turns to “ROBOT”, the ROBOT mode is selected and is showed on the user interface. Press the “START” button and then once a signal is given from external board card, the laser will emit. Emission under the Robot Mode needs to fulfilling the following 3 conditions simultaneously:

- 18-6 analog quantity controls: external 0-10V
- 3-16 modulation signal PWN: high level 24V is effective, control frequency and duty ratio
- 4-5 Enable signal EN: Laser shutter

As following：

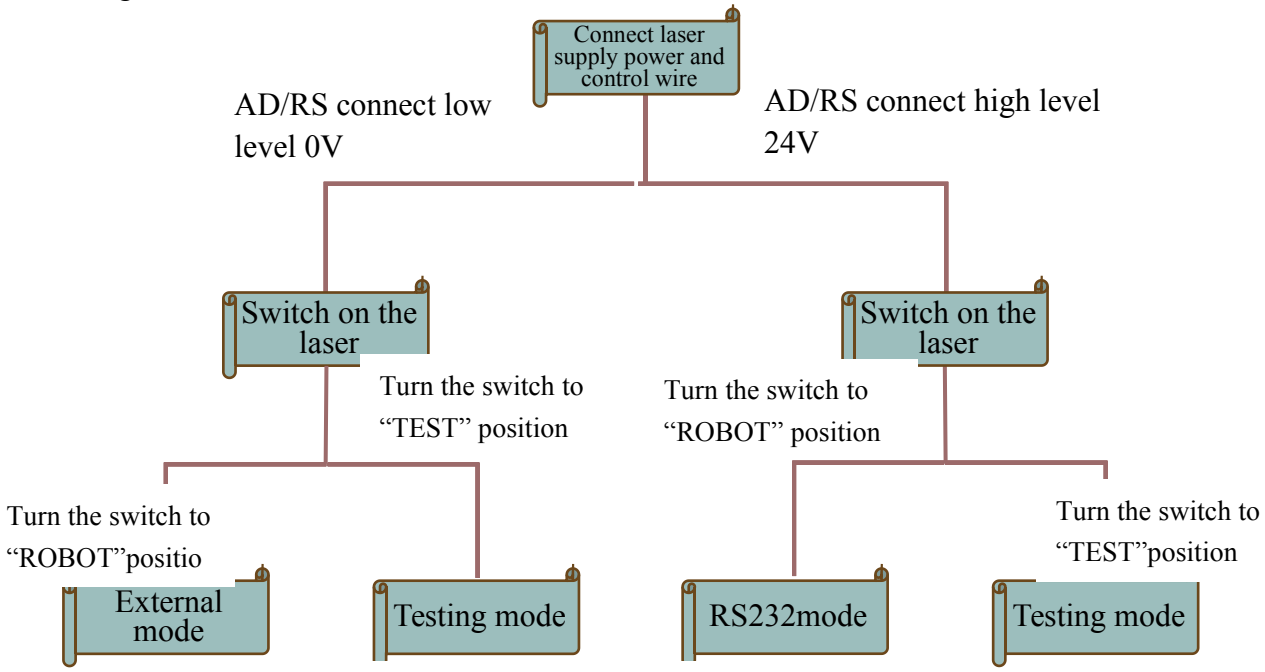


Figure 9 Control Methods

2.2.4.2 The Power Dissipation of Integrated Laser Machine

The power consumption is showed in below Table3. It is indicated on the nameplate of real panel.

Table 3 Power consumption of 1000W

Laser Power	Consumption
1000W	3300W

2.2.4.3 Power Supply Requirements

Based on different levels, JPT fiber laser use single and three-phase power supply methods respectively within the scope of relevant national standards.To ensure stable AC power supply, please install an independent voltage regulator between laser and the power grids.

Table 4 1000W AC input interface

S/N	Cables	Electric supply	Color
1	Live wire	L	Brown/Red
2	Neutral wire	N	Blue
3	Earth wire	Protective earth PE	Green/Yellow

Note: Please check the condition of laser power supply before power on. Power supply is 220VAC±10%. The laser with abnormal voltage, lack of neutral and lack of phase can not work properly.

3. Software Control

JPT has developed the host computer software with special characteristics for optical fiber system. The latest version of monitoring software is VER20191225.This is more convenient for our customer to use, and also can be better to cooperate with production and debugging. The main interface is as follows:

3.1 Function of Software

Main function of the Software: Laser control, operation instructions, output mode selection, laser status monitoring, and alarm message, etc.

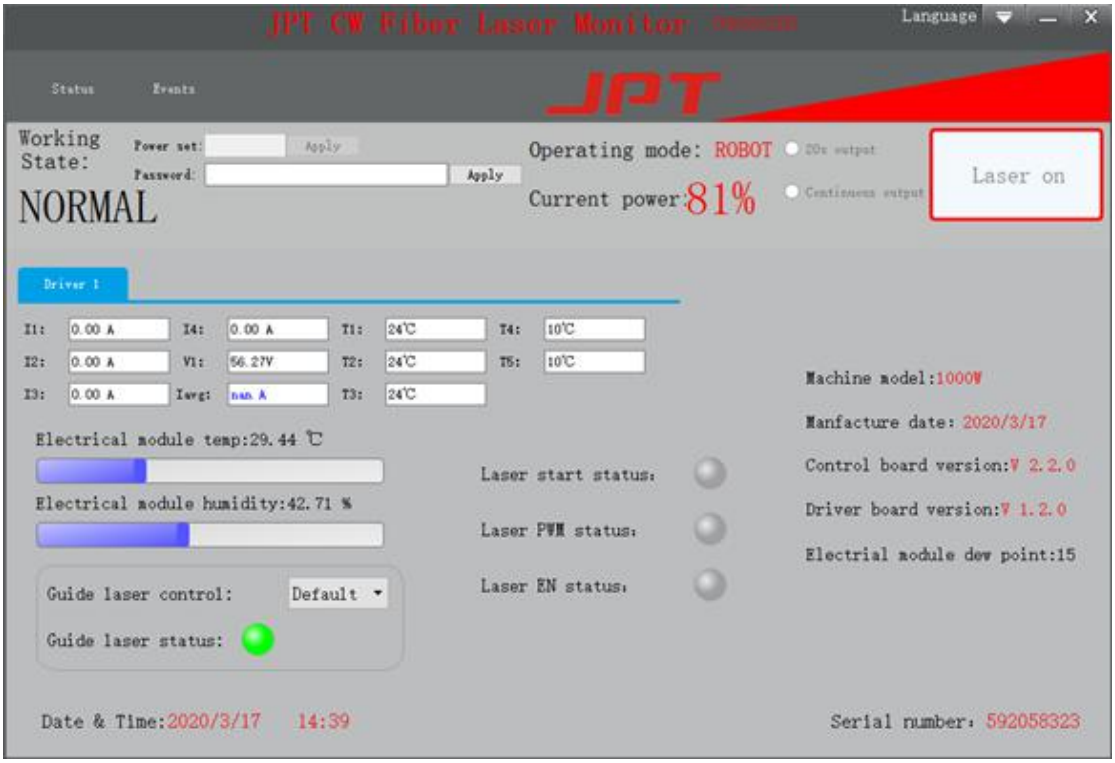
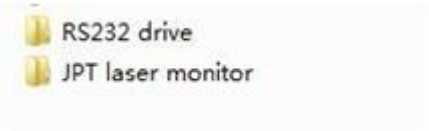


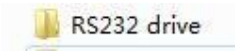
Figure10 1000W controlling interface

3.2 Setting Procedure

3.2.1 Driver Installation

1) Find the QR code on packing list, scan and download the monitoring software. As shown in the following figure:



2) Firstly open 

,then find the sub-folder 

and open it. Then choose 

and open it. This folder contains several drivers to be used in different operating systems. Simply install the suitable driver to the computer will do.

3) After installing the RS232 driver, then connect both ends of the USB2.0 to RS232 universal serial cable to the laser and computer respectively.(note: during the

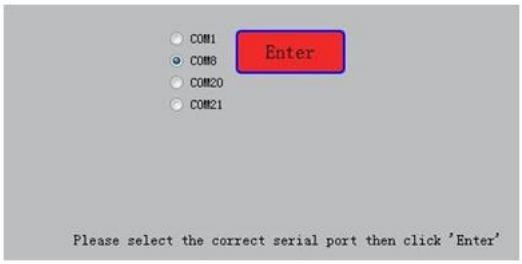
installation, no serial cable should be connected, otherwise errors will occur.) Then open the folder 

and execute the software 

.

3.2.2 Port Connection

Once the installation is completed, open the monitoring software which is shown in below. Choose the appropriate port on the left and then click the button on the right to enter the user interface.



3.2.3 Connection Status

Check whether the monitoring interface is connected properly, as shown in below:

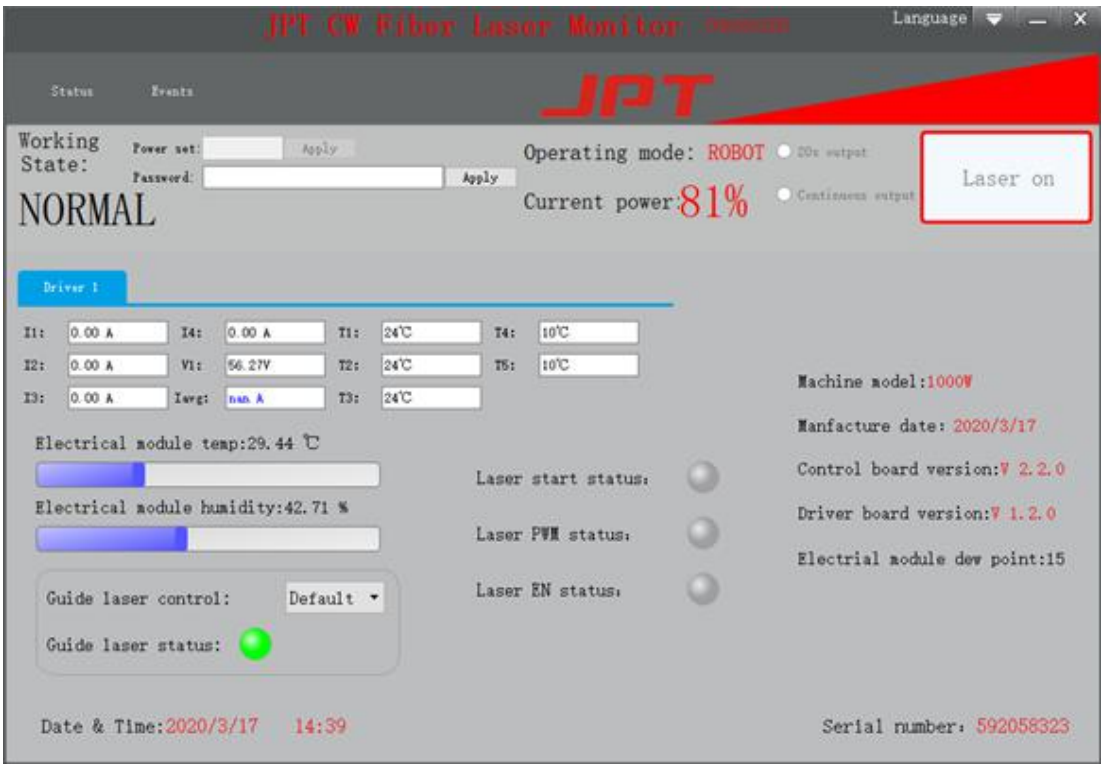


Figure 11 Monitor connected state

If it displays as shown in above figure when entering to interface, then it means the serial cable is connected properly and you can proceed to the next step. stage of operation.

If it displays as shown in below figure when entering to interface, then it means the serial cable is disconnected.

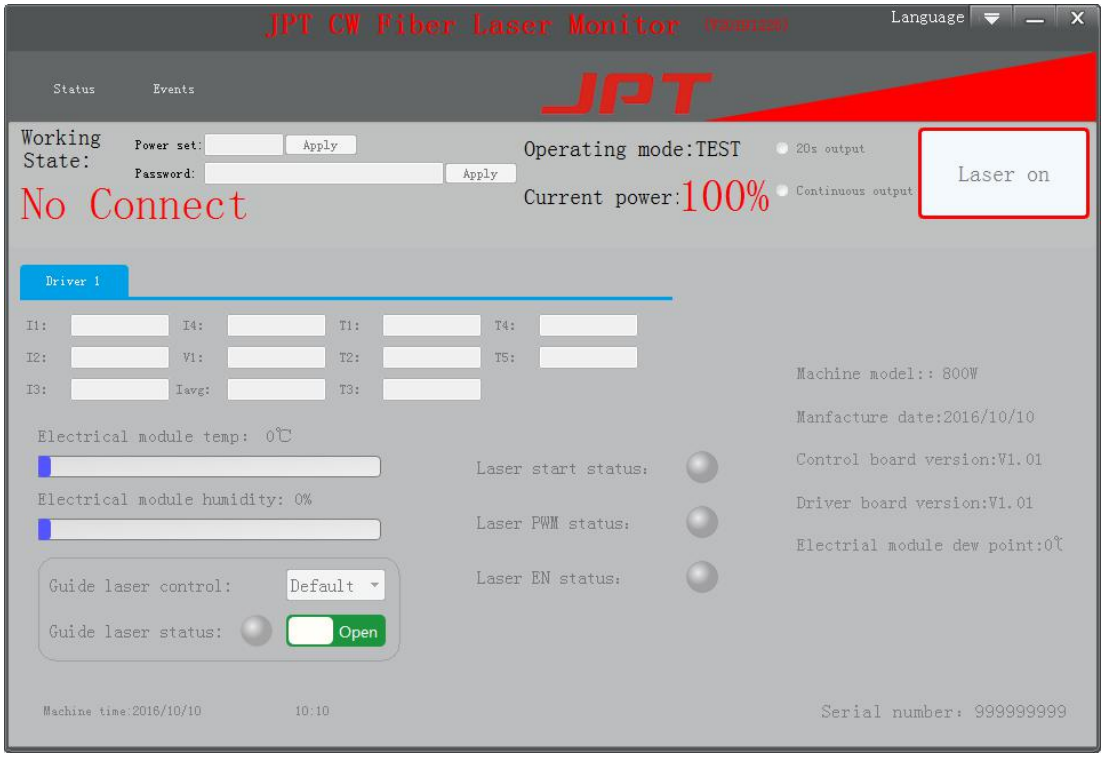


Figure 12 Monitor disconnected state

Under this condition, the laser cannot be controlled through the software. There are 3 possible reasons for this: the laser is powered off, the standard USB2.0 to RS232 serial cable is damaged or wrongly connected. Please check for the reasons one by one and restart the operation after troubleshooting.

4.Unpacking and Installation

4.1 Unpacking

JPT fiber lasers are packaged in cartons within built-in foam for protection. Please strictly following the relevant regulations to ensure personal safety.

After unpacking, you should review the packing list where place on the top of the package and make sure you have all components. The materials of the package all are

recyclable. Please re-use the original materials to pack the product intact to void any damages if need long-distance transportation again.

The packing list is as follows:

S/N	Part	Specification	Quantity
1	JPT 1000W CW fiber laser		1
2	Control Cable	5m/10m	1
3	Cotton swab	5m/10m	1
4	Dust-free paper		1
5	USB2.0-to-RS232 cable		2
6	Key switch		2
7	8*12mm Water pipe， 4*6mmWater pipe		2

As shown in below picture:

Figure 13 1000W Package

Please check all items against this list after unpacking: whether some accessories are missing, whether the cable is damaged, and whether the case shell is scratched,and so forth. If any damage to the unit is evident or suspected, please keep the pictures and contact JPT technical staff immediately. Do not attempt to install or operate the laser in any case. As QBH output head of fiber laser is a precision accessory, please pay attention to the following matters during shipping and operation.

- Please handle QBH with care carefully during using. Damage caused by violent bump, bend or other improper use is not covered by our warranty.
- The laser cable should never be trampled or bent to a circle with a radius less than 20cm during installation. Any damage to the laser caused by the improper actions is not covered by the warranty.

4.2 Installation

1. Place the laser and the fiber connector on a steady horizontal operation platform respectively. Make sure that during the installation and the processes afterwards, no component of the laser will be dropped or shaken severely.
2. Connect the laser to the water cooler.
3. Connect the laser head to the external device.
   i. Make sure with good and clean installation environment.
   ii. Connect water inlet and outlet of QBH output head to the high temperature inlet and outlet of the water chiller.
   iii. Plug QBH output head into welding joint or cutting head, and tighten properly to ensure that the laser head does not move.
   iv. Remove the protective cap from the laser head before needed to emit, and place the protective cap in an airtight plastic bag to prevent pollution. The plastic bag with the protective cap should be placed in a specific position for future use.
4. Connect the serial communication cable to the corresponding port of the laser and tighten the fixing bolt of the communication cable.
5. Connect external control signal interface to the user system and tighten its fixing bolts.
6. Check whether the air switch is in the off position. If not, switch it to the off position.

7. Check whether the emergency stop button(switch) is in the off position. If not, switch it to the off position.
8. Make sure that the user's power supply system is in the power-off state.
9. Plug the AC cable into the cable port and connect the end to the user's power supply system.The installation of laser is completed according to the actions listed above.

Attentions during installation：

- The metallic platform must be well grounded when laser is installed on it.There must be good electrical contact between the laser and installation platform to ensure the laser is well grounded.If the laser is placed on insulated platform, the laser drivers and laser head must be connected to the protector of the building through individual measures.
- The pollution of QBH laser head may lead to the degradation of the overall performance of the laser, and may lead to the damage of the output head, thereby reducing the output power even burning the laser.

5. Installation and Cleaning of QBH Laser Head

Laser output head QBH is a precision optical accessory that belongs to damageable and expensive components. And we have specially added protective devices for this accessory in the packaging process.

5.1 Inspection and Cleaning

It is required to check whether the end face of QBH is clean and dust-free before loading the cutting head, welding head or other accessories. Dust can be deadly to high-power laser output accessories, so please strictly follow below steps to clean QBH end face.

Make sure to check：

Remove the dust cap under the dust-free environment and observe whether there is residual dust on the end face of the quartz crystal under the light (Using microscope to observe in dust-free environment). If the dust-free conditions cannot be achieved, ensure QBH end face is down and there is dust-free when in actual factory inspection.

Cleaning steps:

- Fix QBH on holding fixture.
- Put a special wiping paper on the QBH window, then dip a small amount of isopropanol onto wipe paper with a round head swab.
- Drag the wiping paper in one direction to clean the end face and wipe away the dust or dirty spots.
- Observe whether the end face is clean and whether there are dirty spots under the microscope. Repeat the above 2 steps if there are dirty spots.
- Note that all cleaning accessories are non-reusable.

5.2 Assembly Guideline

Please select a suitable connector. Generally, common connectors on the market can match JPT's QBH output head.

Please make sure to lay the connector flat when assembling QBH into connectors. Insert QBH into the locking structure of the connector horizontally, tighten and fix it, then erect and fix the connector . See the figure 14 below:

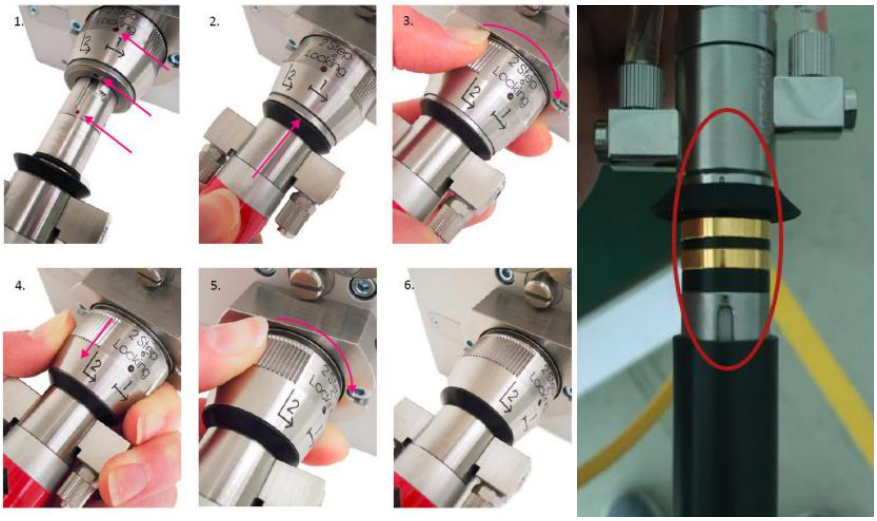


Figure 14 QBH assembly sequence

5.3 QBH Waterway

This laser system uses water cooling and the diameter of the water pipes are 4*6mm. The water supply flow shall be 1-2.5L/min, and the water temperature shall be 28-30℃. In order to avoid the abnormal laser operation due to water leakage, the water pipe should not be bent when connecting.Drain the internal residual water of QBH when not using it. QBH can be capped and inverted several times to allow residual water to flow out.

Note: QBH is covered with a packaging film when our laser is shipped from the factory. When taking out and inserting the water pipe, please keep it clean to prevent the dust and foreign material from entering into the water outlet, which may cause damage.

6. Cooling System Connection

6.1 Cooling System Introduction

Water cooler selection：

1. According to the configuration of the laser specification to choose the corresponding cooling capacity of the water cooler.

2. Choose the high precision of temperature control, better is somewhere between ±0.5℃ and ±1.0℃.

3. Must be dual coolant temperature design:two kinds of setting temperature. When meeting the needs of laser cooled by setting different temperature, meanwhile, also need to provide the water temperature that close to environment temperature to meet the cooling needs of the laser output.

◆ The nominal refrigerating capacity and flow rate of the water cooler are as follows:

Output power	Nominal refrigerating capacity	Water flow rate
1000W	4500W	12L/min

◆ As JPT continuous wave fiber laser using water as cooling medium, so the operating temperature of the laser needs to be more than 10℃. When the internal temperature of the laser system has big difference from the ambient temperature, it can cause condensation easily even irreparable damage for the laser. The ambient temperature might be lower than 5 ℃ in winter, and it will greatly help to protect the laser by taking anti-freezing measures.

1. Recommended setting of water temperature :

In summer: The temperature range for chilled water is from 26 to 28℃; for normal temperature water is from 28 to 30℃.

In winter: The temperature range for chilled water is from 24 to 26℃; for normal temperature water is from 26 to 28℃.

2. Specific anti-freezing measures:

1) Do not turn off the water cooler at night when there will never be a power failure.
2) Draining the cooling liquid in the laser, laser output head and water cooler after the daily use.
3) Add a mixture of antifreeze and purified water as coolant.

6.2 Precautions for Water Cooling System

- Using deionized water or purified water as cooling water, distilled water is also available to use.
- To prevent the growth of bacteria caused damage to waterways, it is recommended to add a certain proportion of anhydrous ethanol solution when filling pure water.
- Water coolers need to change water regularly, and the normal cycle is half a month to a month.
- Add antifreeze (Recommended brand: CLARIANT) mixed proportionally 3:7 (antifreeze : water) when the temperature is too low. Pipeline must be cleaned with purified water after winter and using deionized water or purified water as coolant in case of the corrosion of waterway.
- This may cause irreparable damage to the laser if the inlet and outlet are connected reversely .
- Be sure to drain the cooling water inside of the cooling system and laser system when in an extended outage, otherwise may cause irreparable damage to the laser.

7. Attention

7.1 Check before laser emission

- Checking when power off, no water flow

1. Whether the laser and QBH output head are well fixed.

2. Whether the operating space is well ventilated, and there is no combustible, flammable, explosive and volatile products, etc.
3. Whether the water cooling system has been configured according to the requirements in chapter 6
4. Whether the network voltage is normal,please check the detailed requirements in chapter 2
5. Whether the QBH laser head is inspected and cleaned according to the requirements in chapter 5
6. Whether the emission path of cutting head or welding head is shielded; Whether inside is clean and dust-free
7. Check whether there are any irrelevant personnel in the operation area

◆ Checking when power off, water flow

1. Start the chiller to set the temperature and check whether the water pipe joints are leaking

◆ Checking when power on, water flow

2. Whether the laser is alarmed and whether the system can start normally through monitoring software and the panel indicator light

3. Check the red light quality below the connector. The normal red light is a red near-circular spot with moderate and stable brightness

4. After ensure that the laser system is normal, please refer to the "safety guide" to operate laser carefully.

7.2 Laser On and Off Operating

Laser On

1) Turn on the chiller, make sure water flow properly
2) Switch on the power supply of laser
3) Rotate key to selected mode (Test or Robot)
4) Press the start button (or turn on remote start button)
5) Set power percentage (Not available when lower than 10%)

6) Laser on to emit laser (with necessary safety measures) Turn on the laser through internal mode and external mode according to your needs;

Laser Off

1) Power off the laser Turn off the lasers
2) Switch key to Off
3) Switch laser power supply controller to Off
4) Turn off the chiller

8. Alarm Messages and Troubleshooting

Fiber lasers are expensive precision optical devices with many built-in monitoring and protection functions. If the condition of emission when laser starts up can not be fully met during use, the laser will be locked and sending alarm messages by the monitoring software.

The corrective actions are as follows:

S/N	Alarm Message	Phenomenon	Eliminate Methods	Note
1	Over-current alarm		1.Restart or reset the laser. 2.Reduce the power to test if the alarm is still on. 3.Please contact the manufacturer directly if the alarm can't be eliminated.	
2	Over-pressure alarm		1.Restart or reset the laser. 2.Check whether AC220V is normal. 3.Please contact the manufacturer directly if the alarm can't be eliminated .	

3	Low pressure alarm	Laser emission is stopped, alarm buzzer is ringing, fault lamp is lit	1.Restart or reset the laser. 2.Check whether AC220V is normal. 3.Please contact the manufacturer directly if the alarm can't be dismissed.	After dismissing the alarm, restart the laser
4	Hardware over-current will cut off the protection		1.Restart or reset the laser. 2.Reduce the power to test if the alarm is still on. 3.Please contact the manufacturer directly if the alarm can't be dismissed.	
5	Hardware current is abnormal		1.Restart or reset the laser. 2.Please contact the manufacturer directly if the alarm can't be dismissed.	
6	Emergency stop alarm		1.Check whether the emergency stop button is pressed. 2.Restart or reset the laser. 3.Please contact the manufacturer directly if the alarm can't be dismissed.	
7	485 communication alerts		1.Restart or reset the laser. 2.Please contact the manufacturer directly if the alarm can't be dismissed.	

8	Interlock 1, interlock 2 alarm		1.Please short connect the two sets of signals before starting. 2.Restart or reset the laser. 3.Check whether the signal lines are short connected if the alarm is still on. 4.Please contact the manufacturer directly if the alarm can't be dismissed.	
9	Sensor 1 failure		1.Restart or reset the laser. 2.Check whether the laser is safely grounded. 3.Please contact the manufacturer directly if the alarm can't be dismissed.	
10	Sensor 1 alarm		1.Check laser output head whether there is red light.(The red light control mode is the default control state.) 2.Restart or reset the laser. 3.Check whether the laser is safely grounded. 4.Please contact the manufacturer directly if the alarm can't be dismissed.	
11	Sensor 5 alarm		1.Check whether the laser output head has red light .(The red light control mode is the default control state.) 2.Check whether the laser is safely grounded if the laser still occurs 3.Contact the manufacturer to unlock. 4.Check whether the laser is safely grounded Restart or reset the laser. 5.Please contact the manufacturer directly if the alarm can't be dismissed.	

12	Temperature sensors alarm		1.Restart or reset the laser. 2.Check whether the chiller is working normally if the laser still occurs. 3.Please contact the manufacturer directly if the alarm can't be dismissed.	
13	Expired		1.Connect monitoring software to check if the laser time is correct. 2.Restart or reset the laser if the time is wrong. 3.Please contact manufacturer if the laser time is still wrong after restarting. 4.Please contact manufacturer to send password for unlocking if the laser time is correct after restarting.	

9.Maintenance, Customer Service and Repair

9.1 General Warranty

1.1 There is no components built into the product that can be maintained by users. All the maintenance and repair should be done by the specialists in JPT.

1.2 After all products manufactured according to the order or specification are shipped, JPT will guarantee to repair the products with material and technique problems during the warranty period. Ensure that they meet the specifications under normal use.

1.3 In order to protect your rights and interests, please be sure to contact JPT as soon as possible after finding any defects or damages, and also apply product maintenance or replacement service. After authorized by JPT, please return this product with original warranty package.

1.4 JPT has the right to repair or replace any products with material or technical problems within warranty period. All maintenance or replacement products within the

warranty period that only with special problems are guaranteed free warranty. JPT reserves the rights to collect the payment for defective products under normal use.

1.5 If the product is not within the warranty period or warranty scope, the customer shall be responsible for the maintenance cost.

1.6 Please do not send any products back to JPT without confirmation.

1.7 JPT has the right to change any design or structure for the product without prior notice.

9.2 Warranty Limitations

This warranty excludes or does not cover defects or damage resulting from any of the following:

2.1 Output head (including bare fiber, optical fiber, optical fiber terminal, external coupler and collimator).

2.2 Unauthorized modification, maintenance, disassemble or opening neglect or damage from accident.

2.3 Improper use of operation outside of the specifications for the product.

2.4 Wrong operation, improper or inadequate maintenance or calibration by customer.

2.5 Do not follow the warning information in the manual.

2.6 Optical fiber is not warranted.

2.7 Components and accessories tampered, opened, disassembled or remolded by companies other than JPT, which have separate warranties.

2.8 The return of non-sale laser Non-sale laser returns,which affect the secondary sale of laser appearance, devices and accessories. According to processing method, fees will be charged according to the treatment(e.g. the appearance of the laser has irretrievable damage, dirt or scratch, irreversible damage on the output head protector, crystal and structure parts.)

2.9 More than three months from the date of acceptance of laser output head.

9.3 Other Considerations

3.1 Warranty return: Buyers pay for one way freight cost and insurance to JPT. JPT will pay for freight return cost and insurance back to the buyers.

3.2 Non-warranty return: Buyers pay for 2-way freight costs and insurance to JPT. If it includes both warranty items and non-warranty items, the non-warranty shall prevail;

3.3 Buyers will be charged for testing fee for all returned products that if conform to corresponding specification and standards, non-manufacturing defects or not used in accordance with user manual.

3.4 All products must be carefully packed in a suitable containers to avoid any damages in shipment to JPT.

3.5 Provide complete packing list with product model and serial number to ensure prompt repair.

※ The relevant technical parameters listed in this manual are for reference only and related product information might be changed without notice. All the specifications, parameters and agreement are subject to the terms of sales contract.

※ Shenzhen JPT Opto-electronics Co., Ltd reserves the right to the interpretation of the above Terms and Conditions.