



# Laser instruction manual

— PSU-A-D

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## I. Product components and accessories list

1. Laser head



2. Power supply



3. BNC signal modulation cable



4. Power supply cable



## II. Use of symbols

	<b>Warning: This symbol is used to warn operators of hazards easily caused by visible and invisible laser radiation!</b>
	<b>Note: Remind operators to prevent danger, pay attention to whether the operation is correct, the wrong operation and connection may lead to personnel injury or damage of goods.</b>
	<b>Danger: Beware of electric shock, high voltage danger!</b>

## III. Safety precautions and instructions

	<b>Warning: Laser radiation can cause damage to eyes and skin. The safety precautions and instructions mentioned in this manual must be followed in the process of installing or operating this laser system.</b> <b>All laser safety rules and standards are applicable. The safety precautions and instructions mentioned in this manual cannot replace the safety standards applicable with other countries.</b>
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### Optical safety

	<b>Please pay extra attention to laser products which wavelength range is greater than 700nm (invisible infrared light) or less than 400nm (invisible ultraviolet light). Because this invisible laser is very dangerous.</b>
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- 1.1. Do not observe laser or scattered laser radiation directly or indirectly.
- 1.2. Monitor should also be used even when the Laser level below Class I, it cannot observe directly with naked eyes.
- 1.3. Wear appropriate laser goggles. Even though laser goggles can protect a person's vision, make sure that never look into the laser beam or highly reflective surface.
- 1.4. Laser beam on highly reflective surfaces can cause serious injury, such as mirrors, glass, metal, etc. Reflected scattered lasers are also dangerous.

- 1.5. Do not aim at targets with a laser randomly.
- 1.6. Do not use the laser at the places marked "No Smoking" or "Flammable and Explosive", which may cause danger.
- 1.7. For invisible lasers, use an infrared detector or infrared display card to verify if the laser is working before operating the laser.
- 1.8. Always use clean finger cots, latex gloves and other insulation equipment when handling optic problems.
- 1.9. Post warning signs in notable location of laser operation area. Set up reminder signs when the laser is operating and impose restrictions on non-operating personnel to the laser working area.
- 1.10. If the laser is not in use or unattended, the laser should be turned off completely.
- 1.11. Make sure the beam height is not near eye level to avoid inadvertent eye encounter with beam.



## Electrical safety

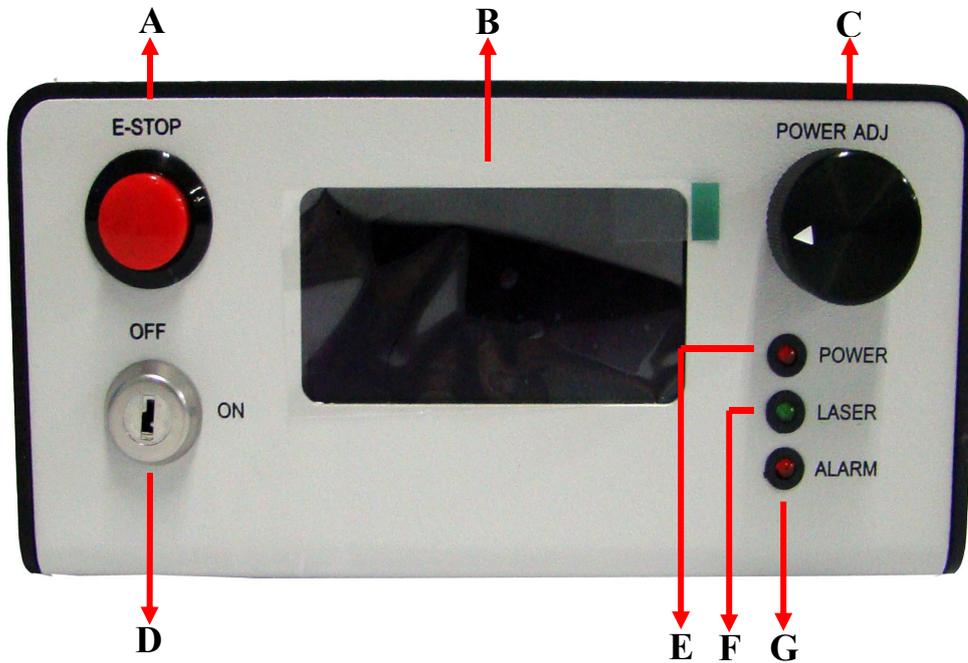


**Unauthorized repair is not recommended and the risks arising there from shall be borne by the user. The non-tear tag fails will lose the warranty any unauthorized repair may invalidate the warranty .**

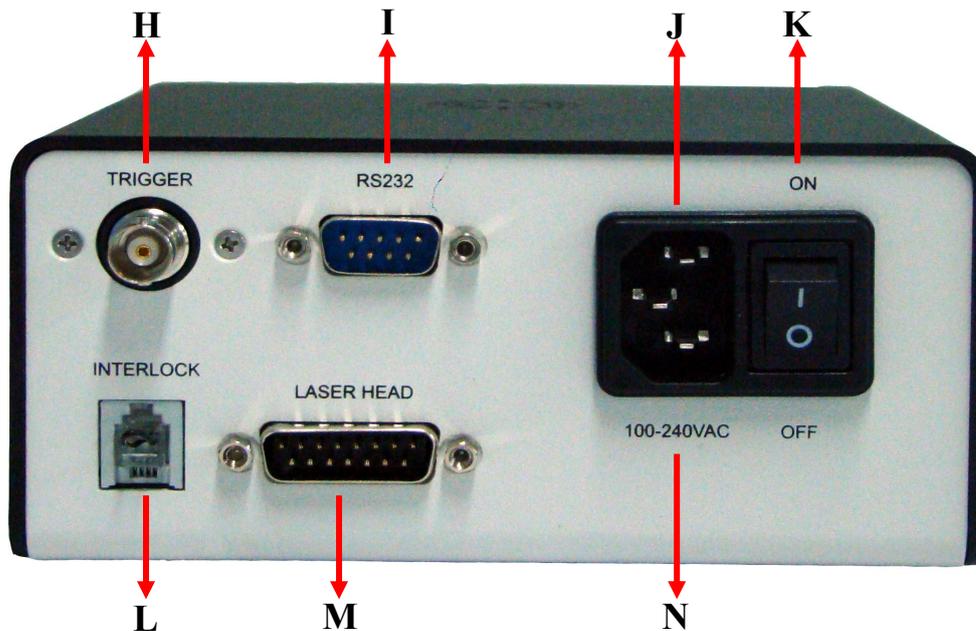
- 2.1. Unplug the main power cord immediately when the equipment is not in use. And keep the laser head connected with the power supply tightly to prevent static damage.
- 2.2. Any operations to disconnect and connect the laser head to the power supply need to ensure that the power is turned off.
- 2.3. If conditions permit, please keep enough distance from the device to reduce the risk of electric shock
- 2.4. Do not touch exposed wiring and components when power is on.
- 2.5. Ensure that insulated tools are used when maintaining or repairing electrical equipment.
- 2.6. In order to avoid damage to the laser system caused by lightning strike, static electricity, electrical interference, etc., it is necessary to ensure that the laser system is properly connected to the ground.
- 2.7. Follow all ratings on the product instructions to avoid fire disaster or electric shock. Please refer to the product instruction for detailed information about the rating before connecting the product.

## IV. Power supply description and function introduction

### Power supply front panel function description



### Power supply back panel function description



## Function description of power supply

	Items	Function introduction
<b>A</b>	Emergency stop button	Press this button to stop the laser when emergency occurs. To restart the laser, you need to restart the power switch and key switch after that the laser will resume working.
<b>B</b>	Display	Display the working state of the laser.
<b>C</b>	Adjusting knob	<p>a) Adjust current value in ACC Mode, turn the knob clockwise, the current is increased. Otherwise, the current is decreased;</p> <p>b) Adjust power value in APC Mode, turn the knob clockwise, the power is increased. Otherwise, the power is decreased;</p> <p>c) Switch the step length in Step menu;</p> <p>d) Switch Trigger mode in Trig menu;</p> <p>e) Switch lock mode in Option menu.</p>
<b>D</b>	Key switch	Use this key switch to turn on and off the laser after the system is powered on.
<b>E</b>	Power on indicator	Connect the power supply to 100-240VAC, the power on indicator will light.
<b>F</b>	Laser on indicator	The "laser on indicator" will light when the laser starts to work.
<b>G</b>	Alarm indicator	<p>The "Alarm indicator" will light in the following situations.</p> <ul style="list-style-type: none"> <li>➤ Press the emergence stop button or unplug the interlock.</li> <li>➤ Power supply faults. (Please turn off the laser system and contact us when this happens)</li> </ul>
<b>H</b>	Trigger	Trigger is used for TTL or analog modulation. The red cable connects to positive electrode; the black cable connects to negative electrode. Connect the black cable then the red cable. The order is reversed when closing.
<b>I</b>	RS232 interface	Connect it to your computer via a RS232-USB cable.
<b>J</b>	Power supply socket	Supply voltage to the power supply.
<b>K</b>	Power switch	Power switch is the main power unit of the power supply. It is switched between "on" and "off". The power supply will turn of when the power switch is set to "off".
<b>L</b>	Security lock "interlock"	Unplug the RJ11 plug, or cut off the shorting stub on the plug (you must cut off both of the shorting stubs unless there is only one shorting stub). The laser system will stop working. The laser system can restore to normal working status by plug in the RJ11 plug or resuming shorting stub at this stage.
<b>M</b>	Laser head connection and control interface	It connects the laser head and power supply.
<b>N</b>	Voltage range	Supply voltage to the power supply as indicated.

## V. Operating environment

	<p><b>Harmful laser radiation may occur if the control, adjustment and operation methods specified by we are not followed.</b></p>
	<p><b>It's not allowed to turn on the laser until the temperature of the laser shell close to the operating temperature, to avoid the device damage caused by excessive temperature differentials.</b></p>
	<p><b>In order to extend the lifetime of the laser, it is recommended that: do not use it over the given temperature range by us. If it exceeds its limit temperature, the entire system will turn to protective state and cannot output laser. Failure to operate follow this specification may cause fatal damage to the laser. All our lasers have electrostatic discharge protection.</b></p>

**The operating environment conditions of the laser system are as follows:**

1. Temperature: 10-35 ° C (ambient temperature)  
25 ± 3 ° C (suggest base plate temperature)
2. Maximum relative humidity: <90%
3. Main power voltage: less than ± 10% of the nominal voltage.

## VI. Preparing for operation

1. Check out if the power switch is set to "off".
2. Provide voltage to power supply as indicated on its back panel.
3. You need to connect a BNC signal modulation cable to the trigger on the front panel of power supply for the modulation function. The red cable connects to positive electrode; the black cable connects to negative electrode. First connect the black cable then the red cable. The order is reversed when closing.

## VII. Installation and operating instructions



**Make sure read all the safety instructions mentioned in the previous parts carefully and well understand.**



**Note: The laser system must be installed and operated by a professional who is well knowledged in all laser safety terms and equipment safety. The customer should take all necessary measures to ensure the safety of the laser system. We are not responsible for any damage to the laser or personal injury caused by improper installation and operation. Please contact us if there is any question.**



- **We strongly recommend that place the machine on a well cooling platform to maintain the laser temperature within limits. Otherwise it will cause fatal damage to the laser.**
- **The temperature is required to change slowly within 10 °C -35 °C , otherwise the laser will not keep working well.**
- **Do not paste anything under the laser.**
- **Make sure there are no obstructions at 0.05m-0.1m from the ventilation opening to ensure a good heat dissipation environment.**
- **If the laser system needs to be installed inside other equipment, please ensure well ventilation is good. Additional fans could be used for heat dissipation if necessary. The direction of the cooling air flow should be the same as the laser fan.**

**Note: It is normal if the power protection light “Alarm” is on, when the power switch is “on” and disconnect to the laser head.**

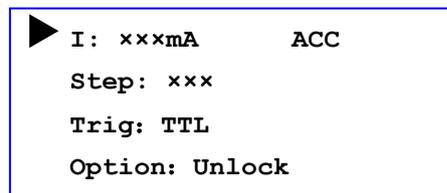
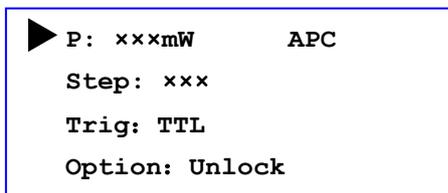
1. Connect the laser plug with the power supply. Fix the screw by side of the connection interface.
2. Connect the power supply cable to the power supply socket.
3. Remove the block label in front of the laser head. Open the shutter of laser head if there have one.
4. Turn on the power switch. The red indicator "Power" light up.
5. Turn on the key switch. The green indicator "Laser" lights up after about 5 seconds and the laser starts to work. The laser will operate stably after about 10 minutes at room temperature.
6. If the alarm indicator "Alarm" is on, please turn off the power switch. After a few minutes, turn on the power switch and the key switch the laser will back in operating mode.

7. Refer to “Laser TTL modulation instruction” or “Laser analog modulation instruction” according to different modulation mode.
  - 7.1. Laser TTL modulation instruction
    - a) Without signal input, the laser is in CW operation;
    - b) The laser is off when the signal input at low level (<0.7V);
    - c) The laser is on when the signal input at high level(> 2.3V);
    - d) The input voltage cannot exceed 5.2V.
  - 7.2. Laser analog modulation instruction
    - a) Without signal input, the laser is off;
    - b) The laser is off when the signal input at low level (<0.7V);
    - c) The laser outputs maximum when the signal input at 5V;
    - d) The laser will have different output power when the signal input voltage between 0-5V, such as 1.5V, 2.6V ...3.8V...
    - e) The input voltage cannot exceed 5.2V.
8. Turn off the laser system: Turn off the key switch, then turn off the power switch, after that unplug the power supply plug.
9. Close the shutter of laser head if there have one. Attach the block label.

### Operation procedure instruction of the power supply

**NOTE :** Factory default: Constant power mode, the screen lock state is “Unlock”. Turned off the laser and turned it on again, the default value is the last set value.

After connect the power cable. Turn the power switch at the back panel to “ON”, the red indicator light “POWER” at the front panel will up indicates that the power supplied. Then turn the key switch at the front panel to “ON”. The LCD screen light up and will display the boot screen as follows:



▶ Indicates the current project is changeable (when the screen is unlocked). Press Knob to switch over between function menus.

The first line displays the output power of the laser. Turn the knob clockwise, the output power is increased. Turn the knob counter-clockwise, the output power is decreased. Press and hold the knob, this line will display the current value. Turn the knob clockwise, the output current is increased. Turn the knob counter-clockwise, the output current is decreased.

The second line displays the step length. Turn the knob to adjust the step length.

The third line displays modulation mode. Turn the knob to adjust the modulation mode.

The forth line displays screen lock status. Unlock means the display is under unlock state, and you can change the laser operating current, operating power and step length; turn the knob to switch to Lock state, all values cannot change in unlock mode

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## VIII. Warranty and maintenance



**Warning: Do not open or remove the cover of the laser and the shell of the laser power supply without authorization please, otherwise there will be risk of personnel injury by the laser and invalidating the warranty at the same time. It is recommended to return the laser to us for repair if necessary.**

1. The warranty period of this product is one year from the shipping date.
2. Any of the following cases will not count as warranty object.
  - 2.1 Misused, improper operation, improper storage or unauthorized operation, and some processing operations supplemented by agency;
  - 2.2 Remove or damage or change the initial identification number or label;
  - 2.3 Any other claims not arising directly from defects in materials or workmanship.
3. The laser should be used in a clean, dry, dust-free and static-free environment.
4. If there are any questions during operation, please contact our representative.

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**IX. Appendix**

	<b>Accessories name</b>	<b>Included</b>	<b>Obiter dicta</b>
<b>A</b>	Optical fiber	/	/
<b>B</b>	Optical fiber bracket	/	/
<b>C</b>	End collimator	/	/
<b>D</b>	Linear prism	/	/
<b>E</b>	Optical fiber coupler	/	/
<b>F</b>	Polarization attenuator	/	/
<b>G</b>	Beam expander	/	/
<b>H</b>	Optical fiber oscillator	/	/
<b>I</b>	RS232 Driver USB Flash Disk	/	/
<b>J</b>	RS232-USB cable	/	/
<b>K</b>	Round adjustable attenuator	/	/
<b>L</b>	Optical filter	/	/
<b>M</b>	1/2 wave plate	/	/
<b>N</b>	Planoconvex lens	/	/
<b>O</b>	Cooling equipment	/	/
<b>P</b>	Heat sink	/	/
<b>Q</b>	Fan	/	/
<b>R</b>	Infrared card	/	/
<b>S</b>	Laser goggle	/	/
<b>T</b>	Connection plate	/	/
<b>U</b>	Extension cable	/	/

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## Fiber and fiber coupler instruction manual



### Safety precautions

Appropriate safety measures should always be taken when the laser works. Failure to take proper safety precautions can result in permanent damage to the retina or other serious damage. We suggest that, review standards, legislation and government regulations for operating laser safety measures for all operators or people who may have been exposed to laser radiation. We also strongly recommend that any laser used in the workplace should be used under the guidance of a person who has professional knowledge about laser safety.

All users should be cautious when using a laser instrument. This instruction manual gives a typical example of a 100mW visible laser. Please note special precautions should be taken when using invisible wavelength or high power laser.



Figure 1: Fiber coupler



Figure 2: 532nm laser with fiber coupler

### Summarize of fiber coupler

Fiber coupler is optical element that enables the free space laser beam enter to optical fiber effectively. The design is simple: A focusing optical system is used to reduce the beam as much as possible, the fiber input aperture is connected to the focus, make the maximum laser power send to the optical fiber. There are many kind of different fiber and fiber coupler on the market, this manual will focus on introduce fiber and fiber coupler produced by us. Four basic elements of fiber coupler: A fastener connecting the aperture of the laser, the focusing optical system inside the fastener, the fiber interface at the end of fastener and three adjusting screws for positioning.

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## Cleaning the end of fiber

**Note: Wipe the surface of fiber head every time when using fiber.**

1. Remove the fiber cap, and wipe the surface of fiber head with a cotton bud dipped in ethanol. Make sure use the fiber after the surface of fiber head is wiped up. Start the laser until the ethanol is volatilized.
2. Do not touch the surface of fiber end, the surface of fiber end do not contact with any other surface. The surface of fiber end need to wipe again if it is contaminated. Minimize times of fiber plugging and unplugging.

## Notes for fiber plugging and unplugging

1. It is necessary to first contact the fiber end to the internal coupler at an angle, then turn the fiber to a flat angle to insert the fiber into the coupler, do not insert the fiber end into the coupler directly.



Correct connection mode



Wrong connection mode

2. Please put on fiber cap in time after the fiber removed from coupler to prevent the fiber end from being contaminated.

## Notes for fiber operating

1. Fiber was in a coil and tied up before delivery, open the tie before use.
2. Do not stretching force to the fiber to avoid distortion along the fiber axis. The table below is the specification of minimum bending diameter of fiber:

Diameter of fiber( $\mu$ m)	Transport and storage(mm)	Operating(mm)
200	50	65
400	110	140
600	220	280

- 
- Fiber in transit or storage need to tie up and meets the requirement of minimum bending diameter it is necessary measure to prevent damage of fiber.



Correct tie up method



Wrong tie up method

### **Align of fiber coupler**

To maximize the amount of laser enter the fiber the coupler need to be aligned. All the fiber coupler will align by we before shipment, the optimum align position of fiber coupler may change caused by vibration during transport or large temperature difference during operating and storage and so on. If the laser cannot reach the expected output power, it may need to readjustment.

### **Readjustment the fiber coupler**

- Pull out the fiber from fiber coupler; do not take off the fiber coupler.
- Turn on the laser, maximum the output power of laser. The output of the laser will highly divergent because of the focusing optical system in the fiber coupler. (Figure 3) Let the laser warm up at least 5 minutes 20 minutes is recommended. Make sure an eclipser in front of the aperture.



Figure 3: Laser output power of unconnected fiber

- Use a power meter measure the output power when the fiber is not connected. Make sure the laser output power close to or exceed the power level of laser.

4. Connect the fiber to the fiber coupler. Make sure the fiber cap is taken off when adjusting the fiber. Do not touch the surface of fiber end, the surface of fiber end do not contact with any other surface.
5. Turn the three adjusting screws on the coupler clockwise or counter clockwise with a screw driver (the three screws should be adjusted together), until laser output from the aperture. At the meantime slide the front end cap of coupler with fingers gently to achieve the maximum output power (Figure 4). The output power maximum when the center of fiber is at the focal point of laser beam. Note: the center of coupler maybe not the most accurate coupling center (Figure 5).



Figure 4: Test laser output power

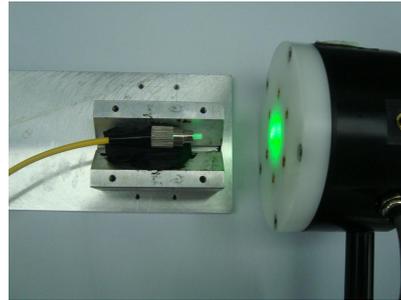


Figure 5: Adjustment complete

6. After the five steps above if the power is not reach the expected range, please follow the method below adjust focusing optical component.

### **Adjust focusing optical component in the coupler**

1. Focusing optical component located on the thread at the center of fiber coupler. Please turn the focusing optical component in coupler. Do not touch optical lens please and no more than half-turn at a time.(Figure 6)
2. If you turn to get a slightly less power than the maximum power, the aperture of fiber is close to overlap with the focus of lens.
3. Cleaning lens on fiber coupler with a cotton bud dipped in ethanol. Then connect fiber to the fiber coupler do the above procedure again until get maximum output power.
4. We suggest not use other glue or binder, they may produce invisible gas and cause permanent damage to optical component.



Figure 6: Focusing lens in coupler

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## **Instructions of fiber align**

1. The smaller the fiber core diameter, the harder to align.
2. Gently turn the screw and make sure the screw does not fall off the coupler when you let go.
3. Then first tighten part of screws, fine adjustment, finally find the maximum power position tighten all the three screws.
4. A damaged fiber may produce misalignment. If the problem persists, try replacing the fiber.
5. If customer wants to use free space laser could gently turn off the fiber coupler counter clockwise from alignment part of the laser.
6. Due to the very small size of the laser beam, dust, hair or of other material debris around the beam may cause significant optical changes, so all optical operations should be performed in a clean and dust-free environment.