Instruction manual

—Multi-channel LED Light Source

SIMTRUM China
Telephone: +86 133 2643 0008
Email:info@simtrum.com

SIMTRUM Singapore
Telephone: +65 6996 0391
Email: info@simtrum.com

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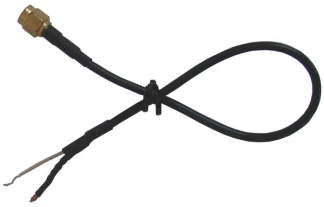
SIMTRUM China
Telephone: +86 133 2643 0008
Email:info@simtrum.com

SIMTRUM Singapore
Telephone: +65 6996 0391
Email: info@simtrum.com

SIMTRUM

I. Product components and accessories list

1. SLE-IX 	2. Manual controller 
4. Signal input cable 	4. Controller connection cable 
5. Power adapter 	6. Power supply cable 
4. RS232-USB cable 	8.End collimator 

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II. Use of symbols

	**Warning: This symbol is used to warn operators of hazards easily caused by visible and invisible SLE radiation!**
	**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.**
	**Danger: Beware of electric shock, high voltage danger!**

III. Safety precautions and instructions

	**Warning: SLE 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 SLE system.** **All SLE safety rules and standards are applicable. The safety precautions and instructions mentioned in this manual cannot replace the safety standards applicable with other countries.**

 Optical safety

	**Please pay extra attention to SLE products which wavelength range is greater than 700nm (invisible infrared light) or less than 400nm (invisible ultraviolet light). Because this invisible SLE is very dangerous.**

1.1. Do not observe SLE or scattered SLE radiation directly or indirectly.

1.2. Monitor should also be used even when the SLE level below Class I, it cannot observe directly with naked eyes.

1.3. Wear appropriate SLE goggles. Even though SLE goggles can protect a person's vision, make sure that never look into the SLE beam or highly reflective surface.

1.4. SLE beam on highly reflective surfaces can cause serious injury, such as mirrors, glass, metal, etc. Reflected scattered SLEs are also dangerous.

1.5. Do not aim at targets with a SLE randomly.

1.6. Do not use the SLE at the places marked "No Smoking" or "Flammable and Explosive", which may cause danger.

1.7. For invisible SLEs, use an infrared detector or infrared display card to verify if the SLE is working before operating the SLE.

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 SLE operation area. Set up reminder signs when the SLE is operating and impose restrictions on non-operating personnel to the SLE working area.

1.10. If the SLE is not in use or unattended, the SLE 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 therefrom 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 SLE head connected with the power supply tightly to prevent static damage.

2.2. Any operations to disconnect and connect the SLE 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 SLE system caused by lightning strike, static electricity, electrical interference, etc., it is necessary to ensure that the SLE 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. Product description and function introduction

Function declaration of front panel

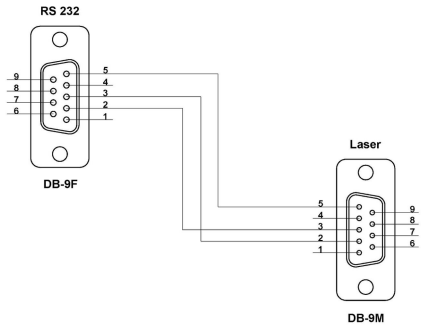
Function declaration of back panel

Product function description

	Items	Function introduction
A	Power switch	After connecting the SLE to the power supply, press the **Power switch** to turn on the device.
B	Light output port	Insert the optical fiber into the **Light output port** and tighten it, the light source will be output through the optical fiber.
C	Enable switch	After the power switch is on for five seconds, press the **Enable switch** to turn the light on or off.
D	RS232 port	By connecting the RS232 cable to the **RS232 port**, the SLE can communicate with the computer, and then control the output light on/off and brightness through the upper computer software.
E	DC12V Power plug	Connect the power adapter to the **DC12V Power plug**, will provide the working voltage for the SLE.
F	Trig port	**Trig port** is used for TTL . The white cable connects to positive electrode; the black cable connects to negative electrode. Connect the black cable then the white cable. The order is reversed when closing. When the external TTL signal is not input,the laser is at full power output; (1)Without signal input, the SLE is in CW operation; (2)When the external TTL signal is input at a low level(＜2.7V), the SLE is in a state of no power output; (3)When the external TTL signal is input at a high level(2.7V~5V), the SLE is at full power output. Note: The external input TTL signal voltage must be not exceed 5.5V,otherwise it is a risk that make the SLE breakdown.
G	Controller port	By connecting the controller connection cable to the **Controller port**, the SLE can communicate with the Manual controller, and then control the output light

		on/off and brightness through the **Manual controller**.

V. Pin assignment of the RS-232



Pin assignment of the RS-232			
Computer side DB-9F female connector	Pin	SLE side DB-9M male connector	Pin
TXD	2	RXD	3
RXD	3	TXD	2
Ground	5	Ground	5

VI. Operating environment

	**Harmful SLE radiation may occur if the control, adjustment and operation methods specified by SIMTRUM are not followed.**

	**It's not allowed to turn on the SLE until the temperature of the SLE shell close to the operating temperature, to avoid the device damage caused by excessive temperature differentials.**

	**In order to extend the lifetime of the SLE, it is recommended that: do not use it over the given temperature range by SIMTRUM. If it exceeds its limit temperature, the entire system will turn to protective state and cannot output SLE. Failure to operate follow this specification may cause fatal damage to the SLE. SLE have electrostatic discharge protection.**

The operating environment conditions of the SLE system are as follows:

1. Temperature: 10-40 ° C (ambient temperature)

   25 ± 3 ℃ (suggest base plate temperature)
2. Maximum relative humidity: <90%
3. Main power voltage: less than ± 10% of the nominal voltage.

VII. Preparing for operation

1. Provide voltage(Connect the 12VDC power adapter) to power supply as indicated on its back panel.
2. Remove the fiber cap and clean the fiber optic surface. Before installing the end collimator, the surface of the optical fiber should also be cleaned.
3. Before turning on the device, ensure that the optical fiber output safely directed into an enclosed optical path.

VIII. Installation and operating instructions

	**Make sure read all the safety instructions mentioned in the previous parts carefully and well understand**
	**Note: The SLE system must be installed and operated by a professional who is well knowledged in all SLE safety terms and equipment safety. The customer should take all necessary measures to ensure the safety of the SLE system. SIMTRUM is not responsible for any damage to the SLE 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 SLE temperature within limits. Otherwise it will cause fatal damage to the SLE.** ➢ **The temperature is required to change slowly within 10 ℃ -35 ℃, otherwise the SLE will not keep working well.** ➢ **Do not paste anything under the SLE.**

	➢ **Make sure there are no obstructions at 0.05m-0.1m from the ventilation opening and ensure a good heat dissipation environment.** ➢ **If the SLE system needs to be installed inside other equipment, please ensure well ventilation. Additional fans could be used for heat dissipation if necessary. The direction of the cooling air flow should be the same as the SLE fan.**

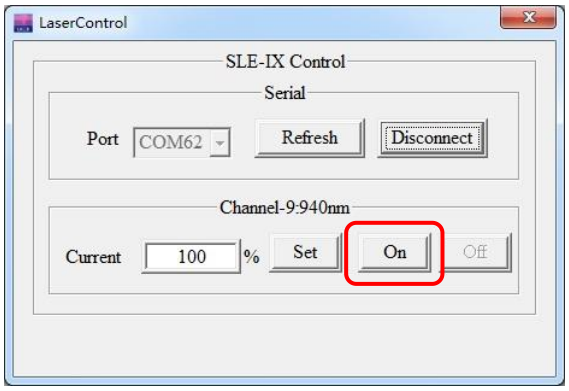
1. Connect the optical fiber input to the **Light output port** of the SLE, connect closely, and remove the optical fiber cap of the optical fiber outlet.
2. **Do not bend the optical fiber beyond its specified minimum bending radius(40mm)**
3. Connect the **Power adapter** to the **DC12V Power plug** in the back panel.
4. Press the **Power switch** in the front panel.

5. After turning on the **Power switch**, wait for about 5 seconds, the SLE system is ready, with the previous power setting memory, and the channel is consistent with the current position of the mechanical optical wheel.
6. There are three ways to make the SLE emit light:

   ①Press the **Enable switch** in the front panel;

②Click the "OUTPUT" button in the **Manual controller**;

③Click the "on" button in the upper computer software. Either of them can make the SLE to output the currently setting power percentage.

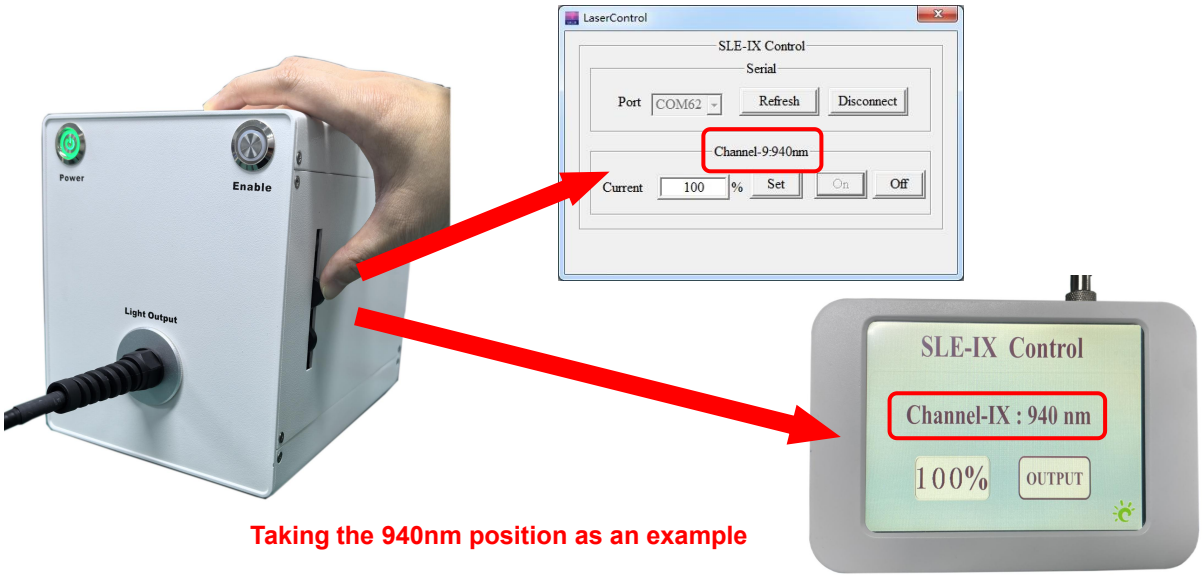


7. The light output control of the SLE is achieved through the coordination of **channel selection** and **light power adjustment**.

① The channel selection is controlled by a mechanical **Optical Wheel**, and the wavelength channel is manually replaced by turning the **Optical Wheel**;

The replacement of the channel can only be completed by the **Optical Wheel** of SLE. If both the upper

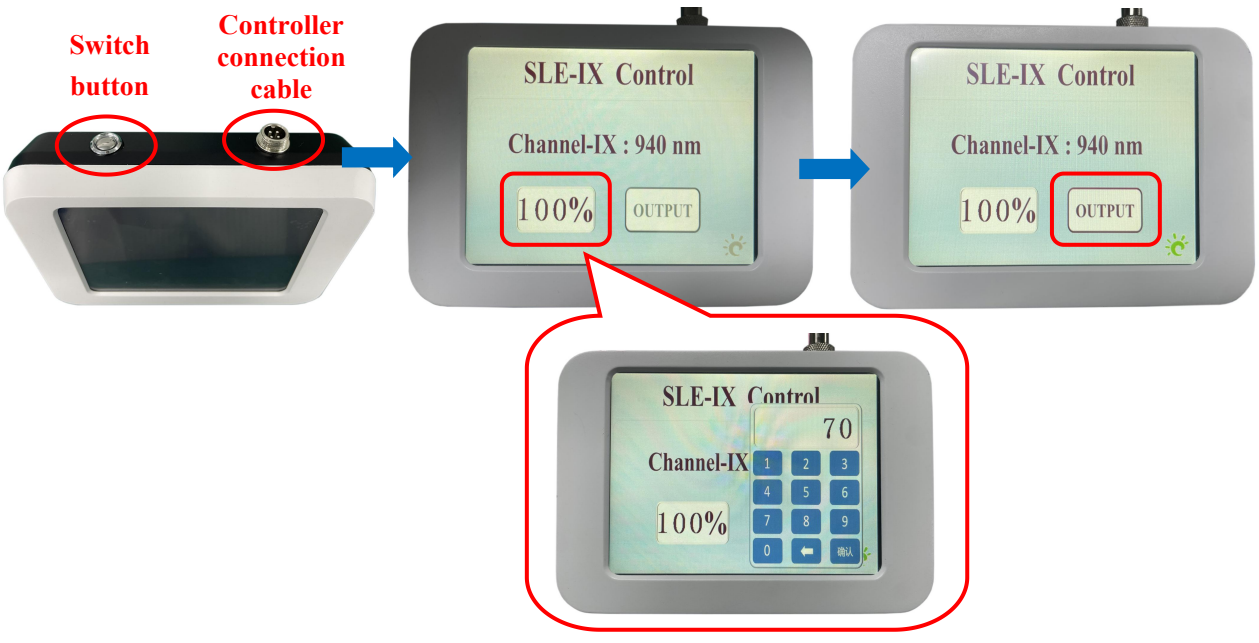
computer (RS232 software) and the lower computer (manual controller) are connected at the same time, the channel wavelength displayed by both will be consistent with the position of the **Optical Wheel**.



②The adjustment of output power is controlled by the circuit part, which is divided into CW control and TTL control.

8. In CW control mode, the power of the light source can be adjusted. Customers can choose between lower computer control(**Manual controller**) or upper computer control(RS232 software) to achieve this.

① Lower computer control is achieved by entering 1%~100% in the percentage box of the **Manual controller** to change the output power of the current channel. Connect one end of the **Controllor connection cable** to the **Manual controller** and insert the other end into the **Controller port** in the back panel. After turning on the SLE, press the switch button above the **Manual controller** to turn it on. Set the power percentage in the **Manual controller**, click "output", then the SLE will output the light source with the set power ;

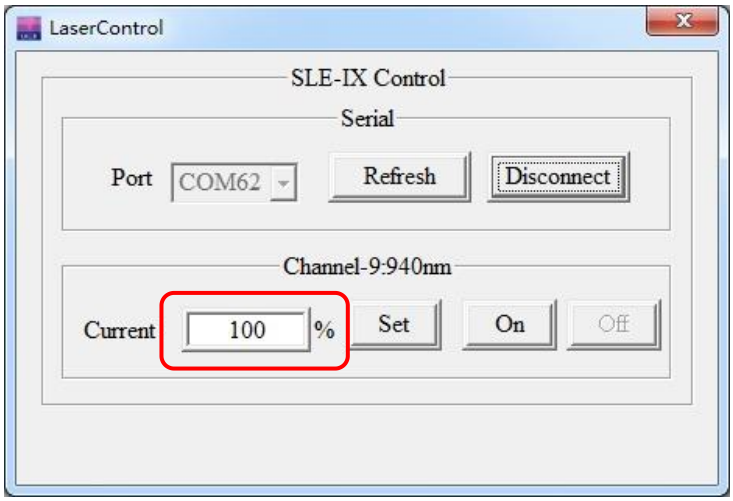


Attention A: The status display in the manual controller. When SLE does not emit light, the icon is displayed in gray; when rotating the optical wheel to select a channel, the icon is displayed in yellow(Whether in the illuminated state or not); when the light source outputs, the icon is displayed in green.

Not emitting light | The optical wheel is rotating | In the process of emitting light

Attention B: If the Manual controller is closed during SLE operation, wait for more than 3 seconds before reopening. If it is opened within 3 seconds, it can be closed again and reopened after 3 seconds.

②The upper computer control is to input 1%~100% in the percentage box of the computer software to change the output power of the current channel. Connect the USB end of the **RS232-USB cable** to the computer and insert the RS232 end into the **RS232 port** in the back panel. After turning on the SLE, opening the upper computer software can enter the power control interface for operation.



9. In TTL control mode, the frequency signal can be obtained by inputting High/Low levels through the external trigger interface and connecting the **Trig port** in the back panel to the signal generator, the high level is set to 5V, and the low level is set to 0V. Similarly, the frequency signal only controls the power output of the current channel wavelength. Connect the SMA interface of the **Signal input cable** to the **Trig port** in the SLE bake panel, and connect the other two pins to the signal generator (Pay attention to the line sequence). Turn on the signal generator to externally trigger TTL signal control for SLE.

Pay attention that before inputting the external trigger signal, the SLE needs to be in a continuous

light emitting state.

10. Control the operation of the SLE with RS232 software, a USB to RS232 connection cable can be used to connect the SLE to a computer. The SLE can be controlled through RS232 software. For specific operations, refer to the "**SLE Power Control Software Operation Manual**";
11. If the SLE turns off the power when in the illuminated state, or when it is working and the power is suddenly abnormally cut off, and then the SLE is turned on again, the enable is defaulted in the “Off” state. At this time, it is necessary to press the "**Enable**" button on the SLE front panel again, or click the "**OUTPUT**" in the manual controller, or click the "**on**" in the upper computer software to make SLE emit light again.
12. Turn off the SLE: Press the **Enable switch** again, then press the **Power switch** again, and unplug the power plug.
13. After use, please cover the fiber cap in time to prevent the fiber end surface from being polluted.

IX. Warranty and maintenance

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

1. The warranty period of this product is two years 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 Optical fiber bending damage caused by improper operation or damage caused by improper protection of output end face;

   2.3 Remove or damage or change the initial identification number or label;

   2.4 Any other claims not arising directly from defects in materials or workmanship.
3. The SLE should be used in a clean, dry, dust-free and static-free environment.
4. If there are any questions during operation, please contact SIMTRUM representative.

X. Appendix

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

XI. Fiber and fiber coupler instruction manual

Cleaning the end of fiber

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

1. Do not bend the optical fiber beyond its specified minimum bending radius(40mm).
2. 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 SLE until the ethanol is volatilized.
3. 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.

Step：

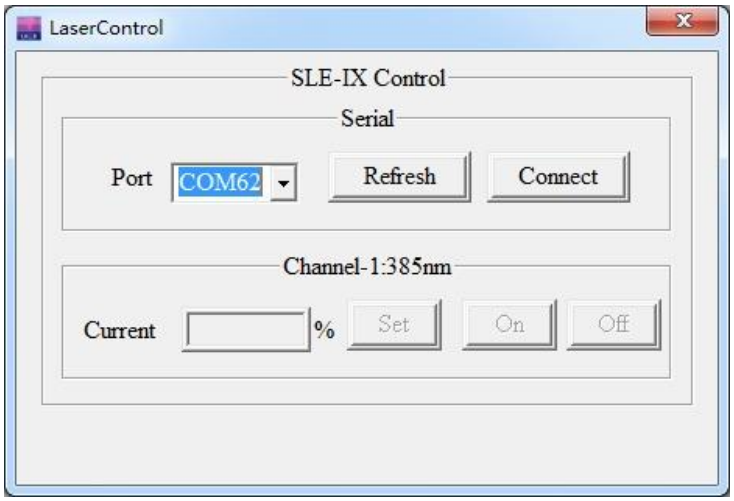
Connect the fiber input end to the SLE **Light output** port and tighten after insertion.

Matters needing attention

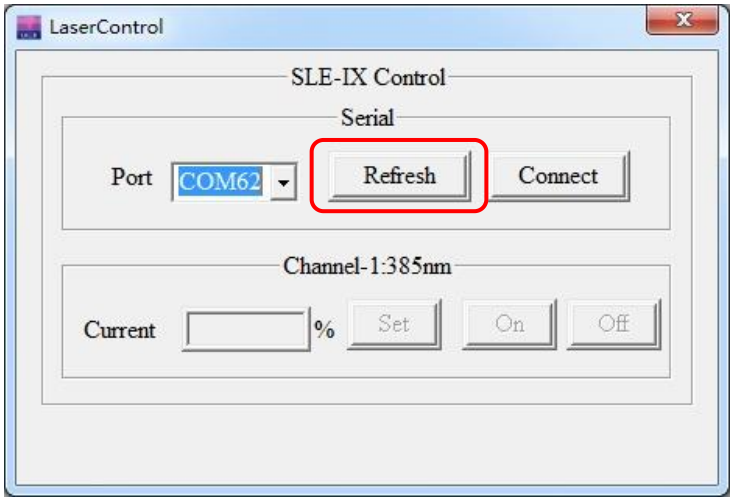
1. After the SLE is used, please cover the fiber cap in time to prevent the fiber end face from being polluted.
2. Try to avoid unplugging the fiber from the fiber coupler.

XII. SLE Control Software Instructions

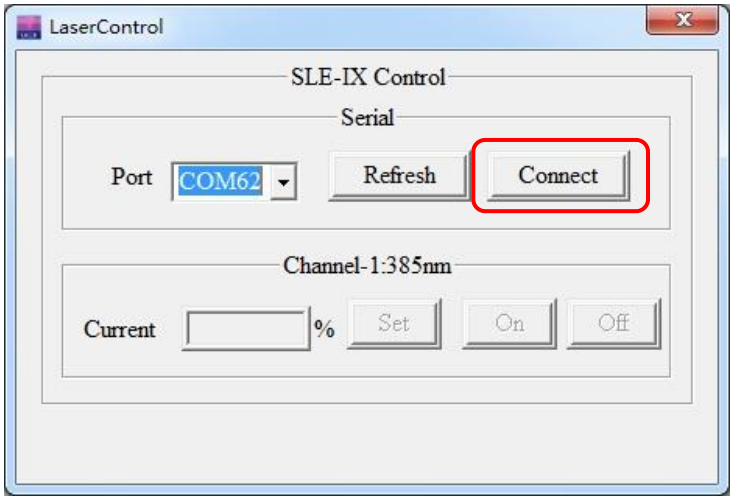
1. Before using the RS232 software, ensure that the driver is already installed in your computer.Refer to USB to RS232 Serial Line Drive and Instructions for driver installation.
2. Connect the solid state optical engine to the computer with RS232 cable (RS232 is 9-hole plug,Pin2-TXD; Pin3-RXD; Pin5-GND). Open the solid state light engine and then start the software "SLE Device Control" (get the software interface below).



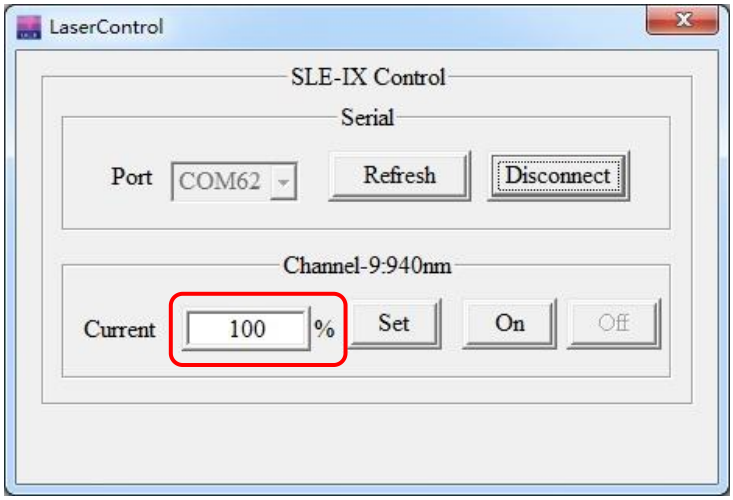
3. Click the **Refresh**, and the machine automatically updates the corresponding port.



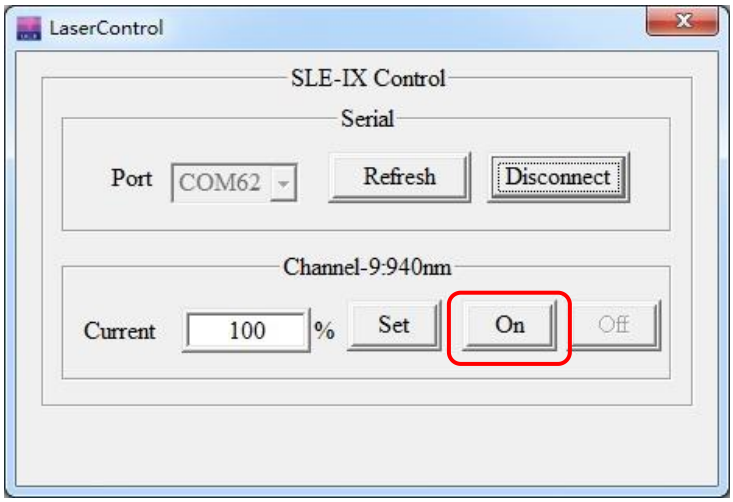
4. Click **Connect** first, and the interface will jump to the adjustment interface.



5. Power setting: Enter 1%~100% in the percentage box



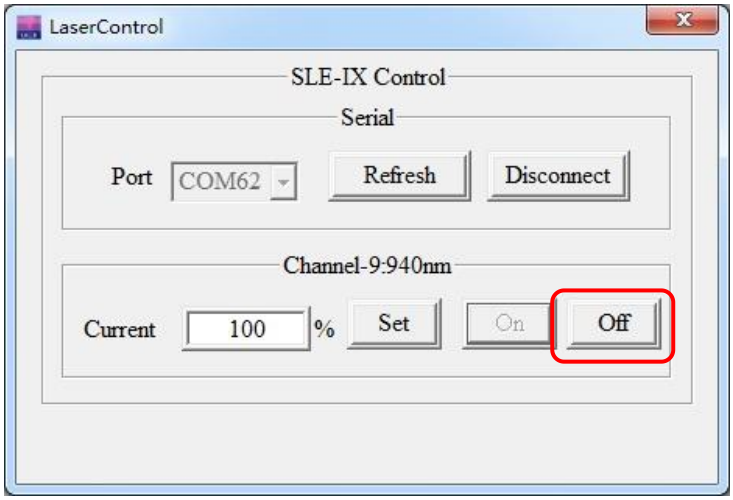
6. Click **on** to start outputting the set light source



Attention:

If the SLE turns off the power when in the illuminated state, or when it is working and the power is suddenly abnormally cut off, and then the SLE is turned on again,the enable is defaulted in the "Off" state. At this time, it is necessary to click "on" in the upper computer software to make SLE emit light again.

7. Click off to turn off the output light source



8. After the software operation ends, click × close the software.

9. If the RS232 communication is cut off during the software operation, after reconnecting the RS232 communication, the SLE operating value defaults to the final setting value.

XIII. RS-232 Communication protocol

Baud rate	**115200**
Check byte	**-**
Data byte	**8**
Stop byte	**1**
Data transmission	**Hexadecimal**

1.Setting and reading command

BYTE[0]	BYTE[1]	BYTE[2]	BYTE[3]	BYTE[4]	BYTE[5]	BYTE[6]	BYTE[7]
START CODE	FRAME SIZE	CHANNEL	COMMAND	DATA HIGH	DATA LOW	CHECKSUM	END CODE
0X53	0X08	0X01: (Channel 1 power	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte		SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D

		percentage setting)				
0X53	0X08	0X02: (Channel 2 power percentage setting)	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte	SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D
0X53	0X08	0X03: (Channel 3 power percentage setting)	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte	SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D
0X53	0X08	0X04: (Channel 4 power percentage setting)	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte	SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D
0X53	0X08	0X05: (Channel 5 power percentage setting)	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte	SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D
0X53	0X08	0X06: (Channel 6 power percentage setting)	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte	SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D
0X53	0X08	0X07: (Channel 7 power percentage setting)	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte	SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D
0X53	0X08	0X08: (Channel 8 power percentage setting)	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte	SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D
0X53	0X08	0X09: (Channel 9 power percentage setting)	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte	SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D

0X53	0X08	0X59 (Channel **X** switch setting) **X** is current channel number	0X01 Write 0x00 Read	The bytes are written from high-order byte to low-order byte Data=0X0001 is for on Data=0X0000 is for off	SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D

BYTE[0]	BYTE[1]	BYTE[2]	BYTE[3]	BYTE[4] - BYTE[19]		BYTE[20]	BYTE[21]
START CODE	FRAME SIZE	CHANNEL	COMMAND	DATA HIGH	DATA LOW	CHECKSUM	END CODE
0X53	0X08	0X80:（Read current channel information）	0x00 Read	The bytes are written from high-order byte to low-order byte		SUM BYTES 0 TO 19,TAKE LOW BYTE	0X0D

2.Correct response for setting command

BYTE[0]	BYTE[1]	BYTE[2]	BYTE[3]	BYTE [4]	BYTE [5]	BYTE [6]	BYTE[7]	BYTE[8]
START CODE	FRAME SIZE	CHANNEL	COMMAND	DATA 1	DATA 2	DATA 3	CHECKSUM	END CODE
0X41	0X09	0X01: (Channel 1 power percentage setting)	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X02: (Channel 2 power percentage setting)	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X03: (Channel 3 power percentage setting)	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X04: (Channel 4 power	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D

		percentage setting)						
0X41	0X09	0X05: (Channel 5 power percentage setting)	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X06: (Channel 6 power percentage setting)	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X07: (Channel 7 power percentage setting)	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X08: (Channel 8 power percentage setting)	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X09: (Channel 9 power percentage setting)	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X59: (Channel **X** switch setting) **X** is current channel	0X01	0X4F	0X4B	0X21	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D

3.Error response for setting command

BYTE[0]	BYTE[1]	BYTE[2]	BYTE[3]	BYTE [4]	BYTE[5]	BYTE[6]	BYTE[7]	BYTE[8]
START CODE	FRAME SIZE	CHANNEL	COMMAND	DATA 1	DATA 2	DATA 3	CHECKSUM	END CODE
0X41	0X09	0X01: (Channel 1 power	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D

		percentage setting)						
0X41	0X09	0X02: (Channel 2 power percentage setting)	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X03: (Channel 3 power percentage setting)	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X04: (Channel 4 power percentage setting)	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X05: (Channel 5 power percentage setting)	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X06: (Channel 6 power percentage setting)	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X07: (Channel 7 power percentage setting)	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X08: (Channel 8 power percentage setting)	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X09: (Channel 9 power percentage setting)	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE LOW BYTE	0X0D
0X41	0X09	0X59: (Channel **X**	0X01	0X45	0X52	0X52	SUM BYTES 0 TO 6,TAKE	0X0D

		switch setting) **X** is current channel					LOW BYTE	

5.Correct response for reading command

BYTE[0]	BYTE[1]	BYTE[2]	BYTE[3]	BYTE[4]	BYTE[5]	BYTE[6]	BYTE[7]
START CODE	FRAME SIZE	CHANNEL	COMMAND	DATA HIGH	DATA LOW	CHECKSUM	END CODE
0X41	0X08	0X01: (Channel 1 set power reading)	0X00 Read	The return value is a 16 bit hexadecimal data unit: %		SUM BYTES 0 TO 5,TAKE LOW BYTE	0X0D
		0X02: (Channel 2 set power reading)		The return value is a 16 bit hexadecimal data unit: %			
		0X03: (Channel 3 set power reading)		The return value is a 16 bit hexadecimal data unit: %			
		0X04: (Channel 4 set power reading)		The return value is a 16 bit hexadecimal data unit: %			
		0X05: (Channel 5 set power reading)		The return value is a 16 bit hexadecimal data unit: %			
		0X06: (Channel 6 set power reading)		The return value is a 16 bit hexadecimal data unit: %			
		0X07: (Channel 7 set power reading)		The return value is a 16 bit hexadecimal data unit: %			
		0X08: (Channel 8 set power reading)		The return value is a 16 bit hexadecimal data unit: %			

		0X09: (Channel 9 set power reading)		The return value is a 16 bit hexadecimal data unit: %		
		0X59: (Read the **X** switch position) **X** is current channel		The return value is 16 bit hexadecimal data. 1 is for on and 0 is for off		

BYTE[0]	BYTE[1]	BYTE[2]	BYTE[3]	BYTE[4] - BYTE[6]			BYTE[7]	BYTE[8]
START CODE	FRAME SIZE	CHANNEL	COMMAND	DATA 0	DATA 1	DATA 2	CHECKSUM	END CODE
0X41	0X09	0X80: （Read each wavelength）	0x00 Read	DATA[0] is the power percentage of current channel DATA[1] is the number of current channel DATA[2] is the switch status of the current channel			SUM BYTES 0 TO 19,TAKE LOW BYTE	0X0D