

**300m / 500m VCSEL Illuminator**  
**Model No.: FLTT-XXX-Y.YW-Z00m**

**Manual**

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### Statement

**You are appreciated to read this manual carefully before operating this product. And you are also appreciated to place this manual at hand to know about the operation procedures at any time.**

**Frankfurt Laser Company provides accurate and reliable information to any user, however, the loss caused by any user misunderstanding and any factor by third party is not undertaken by FLC. You are not notified if the manual is changed.**

**The unauthorized agency or person is forbidden to use this manual, patent and any other IP.**

### Copyright

**The content in this manual is forbidden to wholly or partially copied or saved.**

### Revision History

<b>Revision History</b>	<b>V.01: June 01, 2020 First version</b>
	<b>V.02: 808/ 940nm wavelength products updated</b>

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## 2 Introduction

### 2.1 Introduction

Thank you for purchasing our products and hope you will satisfy our products. This user manual describes the functions, operation steps, precautions, and service maintenance of the product.

To ensure that you use this product effectively, please read this user manual thoroughly before using it. After reading this user manual thoroughly, please store it near the machine for reading at any time. Please note that some illustrations in this user manual may be different from the product you received without prior notice.

### 2.2 Relevant conventions in this user manual

The following describes the tags and text format used in this user manual.



#### Warning

Failure to follow the instructions highlighted in this way may result in death or serious personal injury.  
Please strictly follow all warnings to ensure safe use of this machine.

The following will introduce the concepts and symbols used in this user manual:



Triangle symbol represents DANGER, please adopt the corresponding precautions.



This warning symbol represents the Danger of Burns



Diagonal symbol represents Forbidden for this Operation



This warning symbol represents Forbidden for Disassemble



Black circle symbol represents Essential for this Operation



This warning symbol represents Essential for Cutting off the Electrical Power

### 2.3 Safety Notices






To achieve the normal working condition of this product, all operators should carefully read and follow the operating instructions in this user manual. Please store this user manual near the machine where it is easy to read.




Please read the following before using this machine. It contains important information for user safety and preventing equipment failure. Please follow all precautions listed in this user manual.

#### 2.3.1 Electricity safety instructions



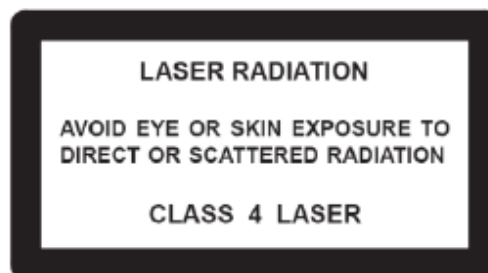
- Do not modify the machine, otherwise it may cause fire, electric shock or shutdown. If this machine uses a laser, modify the machine without authorization, the laser beam light source may be blind.
- Do not attempt to disassemble the cover and panel fixed on the unit. Some products are equipped with high-voltage parts or laser

	<p>beam light sources, which may cause electric shock or blindness.</p>
	<ul style="list-style-type: none"> <li>• Only use the power cord provided in the product box. If the power cord is not included, only the power cord and plug specified in the "Power Cord Specifications" should be used. Failure to use this power cord may result in fire or electric shock.</li> <li>• The power cord included in the product box should only be used with this machine. Do not use it with any other products. Failure to follow this precaution may result in fire or electric shock.</li> <li>• Only use the specified power supply voltage. Failure to do so may result in fire or electric shock.</li> <li>• Do not use a multi-socket adapter to connect to any other electrical equipment. Using a power socket with a current greater than the rated current may cause fire or electric shock.</li> </ul>
	<ul style="list-style-type: none"> <li>• Do not plug or unplug the power cord when your hands are wet, otherwise it may cause electric shock.</li> </ul>
	<ul style="list-style-type: none"> <li>• Insert the power cord plug fully into the power socket. Failure to do so may result in fire or electric shock</li> </ul>
	<ul style="list-style-type: none"> <li>• Do not scratch, abrade, heat, twist, bend, stretch, or damage the power cord, or place heavy objects on it. Using damaged power cords (exposed batteries, broken wires, etc.) may cause fire or downtime. If you find any of the above, please turn off the power switch immediately, unplug the power cord from the power socket, and call an authorized service technician for repair.</li> <li>• In principle, do not use extension cords. Using an extension cord may cause fire or electric shock. If you must use an extension cord, please contact an authorized service technician.</li> <li>• Do not put water containers, metal clips or other small metal objects on the machine. If water is accidentally poured or metal objects fall into the inside of the machine, it may cause fire, electric shock or shutdown. If small metal parts, water or other similar objects enter the machine accidentally, please turn off the power switch immediately, unplug the power cord from the power socket, and call an authorized service technician for repair.</li> </ul>
	<ul style="list-style-type: none"> <li>• If the machine becomes abnormally hot, smokes, emits peculiar smell, or produces abnormal noise, do not continue to use it.</li> <li>• In this case, please turn off the power switch immediately, unplug the power cord from the power socket, and call the service technician for repair. If you continue to use it regardless of these</li> </ul>

	<p>warning, it may cause fire or electric shock.</p> <ul style="list-style-type: none"> <li>• If the machine is dropped or the cover is damaged, please do not continue to use it. In this case, please turn off the power switch immediately, unplug the power cord from the power socket, and call the service technician for repair. If you continue to use it regardless of these warning, it may cause fire or electric shock.</li> </ul>
	<ul style="list-style-type: none"> <li>• Insert the plug of the power cord into a power socket equipped with a ground terminal.</li> </ul>
	<ul style="list-style-type: none"> <li>• Do not use flammable sprays, liquids or gases near the machine.</li> <li>• Do not place this machine in a place where children can easily reach it.</li> <li>• Do not block the ventilation holes of this unit by any objects. Otherwise, heat may accumulate inside the machine, which may cause a fire or malfunction.</li> <li>• Do not install the unit in a location exposed to direct sunlight, and do not install it near an air conditioner or heater. Otherwise, the internal temperature of the machine will change, which may cause malfunction, fire or electric shock.</li> <li>• Do not place the machine in a dusty, soot, or steamy place, and do not place it near the kitchen stove, bathroom, or humidifier. Otherwise, it may cause fire, electric shock, or shutdown.</li> <li>• Do not place the machine on an unstable or inclined table, and do not place it in a location subject to large shaking or vibration. Otherwise, it may fall or tip over, causing personal injury or mechanical failure.</li> <li>• After installing this unit, place it on a stable base. If the unit moves or falls over, it may cause personal injury.</li> <li>• A high temperature area inside the machine may cause burns. When checking the internal faults of the machine, please do not touch the label with "Caution! High temperature!".</li> </ul>
	<ul style="list-style-type: none"> <li>• Ensure to use the machine in a well-ventilated location. Using the machine for a long time in a poorly ventilated room may harm your health. The room should be ventilated regularly.</li> <li>• When moving the unit, please unplug the power cord and other cables. Failure to do so may damage the power cord or cable, and cause fire, electric shock, or downtime.</li> <li>• When moving the unit, please hold the location specified in the instruction manual or other documents. If the unit falls over accidentally, it may cause serious personal injury. At the same time, the machine may be damaged or malfunction.</li> </ul>

	<ul style="list-style-type: none"> <li>• Unplug the power plug from the socket at least once a year and clean the area between the plug terminals. Dust accumulated between the plug terminals may cause a fire.</li> <li>• When unplugging the power cord, please hold the plug. Pulling on the power cord directly may damage it and cause fire or electric shock.</li> </ul>
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### 2.3.2 Laser safety precautions



#### Laser class:



According to IEC 60825 and 21 CFR 1040.10 standards, this product is a Class 1M (Class2) high-power laser equipment.

The product outputs 800-1000nm, 1.5 (2.2W) power laser. This power can hurt human eyes and skin. The output radiation is invisible light, and direct or scattered laser light can cause damage to human eyes. Proper laser safety protective glasses must be worn correctly during the operation of this product.

- FLTT-XXX-Y.YW-Z00m is a laser module that users use to integrate with other equipment. The user will be responsible for the integrated product.
- The technical intellectual property rights of FLTT-XXX-Y.YW-Z00m Laser Illuminator belongs to FLC, and it is in the stage of patent pending.
- FLTT-XXX-Y.YW-Z00m emits 1.5W (2.2W) visible light and invisible light rays with a wavelength of 800-1000nm and a Class 1M (Class2).
- Never open the case. There are no user-replaceable parts, equipment and accessories installed in the case. Any maintenance and service can only be carried out through FLC or authorized institutions.
- It is forbidden to move or reinstall the output collimation head or output fiber when the laser is running.

#### Laser Warning Symbol:

Symbol	Description	Position
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <p><u>DO NOT REMOVE</u> Warranty avoid if removed</p> </div>	Warranty Symbol, if this label is broken, the warranty will not be allowed.	At the top of the case

	Laser radiation warning symbol	At the top of the case
	Warning symbol	At the top of the case or in the front of the case

### 2.3.3 Usage environment and precautions

- There are no user-replaceable parts in the case, please contact FLC for repairs.
- It is forbidden to use this product in a high-humidity environment. FLC shall not be responsible for the warranty for the damage caused thereby.
- FLTT-XXX-Y.YW-Z00m outputs the laser through the collimator. Before turning on the power, please ensure that the laser output is reliably fixed and connected. When measuring the output power, the end face needs to be chamfered at a small angle. At low power output, use the infrared detection film to check the quality of the output light spot, and gradually increase the output power.
- Before making any changes to the laser output or collimator, the laser output must be turned off. To adjust the optical path, the laser output must be adjusted to a low power output level.
- Excessive reflection into the laser will result in poor laser performance and possibly damage. This value is only valid for the working wavelength. If there is a possibility of reflection of other wavelengths in the user system, please contact FLC.
- For collimator output, please ensure that the mirror surface of the output lens is clean. After the operation is completed, please close the collimator output cover. Do not touch or use solvents to clean the lens. Special lens paper must be used to clean the lens.
- According to IEC 60825 and 21 CFR 1040.10 standards, this product is a Class 4 high-power laser equipment (Class 4). The product outputs 800-1000nm, 1.5W(2.2W) power laser. This power can hurt human eyes and skin. The output radiation is invisible light, and direct or scattered laser light can cause damage to human eyes. Laser protective glasses are not a standard accessory of this product, but proper laser safety protective glasses must be worn correctly during the operation of this product. Under any circumstances, it is forbidden to direct the laser output at people or animals.

## 3 Product Descriptions & Applications

### 3.1 Product Appearance



### 3.2 Product description

This laser illuminator is designed with independent patented technology and self-developed VCSEL chips. To ensure the reliability of the laser illuminator, a unique photoelectric isolation design is adopted. To facilitate integration, standard interface parameters such as power supply and control signals are adopted. It is suitable for dome cameras and bullet cameras for security monitoring systems and is a high-quality infrared lighting source.

Multi-protocol is used to facilitate customer integration. There are both industry wide Pelco D protocol and industry protocol, as well as Sony VISCA protocol for cameras, and FLC protocol. During the laser angle conversion process, the user can set the preset position, and then call the preset position, the laser can automatically adjust the divergence angle to the set angle.

VCSEL is used as the laser source of this illuminator. It has wide operating temperature range, long lifetime and high reliability, higher PCE with lower power consumption and environmentally friendly. Lower optical density with its larger emitting area. It has the advantages of maintenance-free, high beam quality, uniform and delicate light spot, no fringes and dry spots, easy integration, and convenient use in special occasions.



### 3.3 Feature

- High performance VCSEL chip, no attenuation
- High efficiency up to 40%@25°C, >35%@50°C
- VCSEL chip, wide operating temperature -40~85°C
- VCSEL array chip with large emission area, good safety
- Motorized large dynamic beam angle zooming
- High reliability, lifetime up to 50,000hrs
- Compact, easy to integrate
- RS232, RS485, TTL interface optional
- Negligible off-axis divergence, easy to collimate with camera lens
- Uniform beam intensity, speckle free
- Operating state memory
- CE certified
- Predefining position
- Low heat, high efficiency

### 3.4 Applications

- Security surveillances

- Machine vision
- Gesture recognition
- Display
- Medical applications
- Freckle and hair removal

## 4 Specifications

### 4.1 Spec Parameters

There may be some changes between sample and drawing, thus, the actual spec please refer to the sample that you received. And if any inquires please contact us.

Parameters	Values		Unit	Remarks
<b>Model no.</b>	FLTT- XXX-1.5W-300m	FLTT- XXX-2.2W-500m	-	
Laser mode	Multimode			
Wavelength	808/850/940		nm	
Optical power	1.5	2.2	W	At emission exit
Spot shape	Circular			
Illuminating distance	300	500	m	
Spot uniform	Very good			
Fan angle	1.7 ~ 70		degree	±0.2
Operating voltage	DC12		V	
Operating current	1.0	1.2	A	
Operating mode	Pulsed			
Lifetime	50,000		hrs	
Operating temperature	-40 to +85		°C	
Storage temperature	-40 to +85		°C	
Power consumption	12	14.4	W	
Dimensions	L70xW51xH51		mm	
Material	Aluminum Alloy			
Surface color	Black		-	
Laser classification	Class 1M	Class2		
Power anode	3 Red (6 PIN)			
Power cathode	3 Black (6 PIN)			
Weight	300		g	
Heat dissipation	Forced wind			
Signal Control anode	See definition control line (12 PIN)			

Communication interface	RS232/RS485/TTL		
Communication protocol	Pelco_D		
Baud rate	9600		
Signal Control cathode	Black		
Signal Control Voltage	3-6	V	

## 4.2 Communication Protocol

### 4.2.1 PELCO-D Communication Protocol

(Command parameters: The default standard rate is 9600bpsm, no parity, 8 data bits, 1 stop bit)

Communication methods (232, TTL, 485 can be selected)

**Attention:** In the process of switching the laser, please note that the time interval between turning on the laser and turning off the laser should be at least 150ms, otherwise the laser can only receive the first command. After the laser is turned on, the time interval of the zoom command is 20ms, and the motor The time required for the minimum position 0 step to reach the maximum position 482 step should be about 1500ms

#### Command format

- Set and query command format:  
FF 01 AA P0 P1 P2 EE  
(Start) (System) (Fixed) (Command) (Parameter) (Parameter) (End)
- Control command format: A PTZ control command is a 7-byte hexadecimal code, the format is as follows:

Word 1	Word 2	Word 3	Word 4	Word 5	Word 6	Byte7
Sync byte	Slave address	Command word		Parameter word		Check byte
FF	Refer to Remark1	Command1	Command2	Parameter1	Parameter2	Refer to remark 2

Remark1: The slave address can be set to decimal 1 ~ 200.

Remark2: checksum from Word2 to Word6.

Check byte = MOD[(Word2 +Word3 +Word4 +Word5 +Word6)/100H]

#### Instruction list (Only list command words and parameter words)

##### 4.2.1.1 Modify the slave address

FF 01 AA 00 00 P2 EE

⇒ P2: Range from 0x01 ~ 0xC8, i.e. 1~200 in decimal.

Change slave address 01 to 09: FF 01AA 00 00 09 EE

Change slave address 05 to C8 (decimal =200): FF 05AA 00 00 C8 EE

#### 4.2.1.2 Set the motor speed

FF01 AA 01 P1 P2 EE

- ⇒ P1 P2: It is the high and low eight bits of the speed information, P1 is the high 8 bits of the speed information, P2 is the low 8 bits of the speed information, the range of "P1 P2" is 0x03E8~0xEA60, corresponding to the decimal 1000~60000, the larger the value of "P1 P2", the faster the motor rotates, and vice versa .

#### 4.2.1.3 Set the motor direction

FF 01 AA 02 00 P2 EE

- ⇒ P2: Set as "00", When the zoom is small, it rotates in the reverse direction, and when the zoom is large, it rotates in the forward direction; if it is "01", it rotates in the forward direction when the zoom is small, and it rotates in the reverse direction when the zoom is large. If the motor control direction is reversed, this command can be used to correct.

#### 4.2.1.4 Zoom instruction

If you find that the motor control direction is opposite, you can use the change direction command to correct it

- ⇒ Zoom in: FF 01 00 20 00 00 21
- ⇒ Zoom out: FF 01 00 40 00 00 41
- ⇒ Zoom stop: FF 01 00 00 00 00 01
- ⇒ Turn on the laser at address 01: FF 01 00 09 00 01 0B
- ⇒ Turn on the laser (power is not adjustable, turn on the maximum power output)
- ⇒ Turn off the laser at address 01: FF 01 00 0B 00 01 0D
- ⇒ Turn off the laser.

#### 4.2.1.5 Turn on/off the laser at the keyboard preset position

Turn on laser: FF 01 00 07 00 FE 06

Turn off laser: FF 01 00 07 00 FF 07

Call the preset position 254 to turn on the laser,

Call the preset position 255 to turn off the laser.

This command sends a position query instruction to the slave 1MCU.

0 x FF 0x01 0xAA 0xE7 0x00 0xC8 0xEE This command feeds back the motor position of slave 1 as 200 (0xC8).

#### 4.2.1.6 Set baud rate

FF 01 AA 1D 01 2C EE, give command to set Baud rate as 300

FF 01 AA 1D 02 58 EE, give command to set Baud rate as 600

FF 01 AA 1D 04 B0 EE, give command to set Baud rate as 1200  
 FF 01 AA 1D 09 60 EE, give command to set Baud rate as 2400  
 FF 01 AA 1D 12 C0 EE, give command to set Baud rate as 4800  
 FF01 AA 1D 2580 EE, give command to set Baud rate as 9600  
 FF 01 AA 1D 4B 00 EE, give command to set Baud rate as 19200

#### 4.2.1.7 Command summary

- ⇒ The instruction to change address 01 to P2: **FF 01 AA 00 00 P2 EE**  
**FF 01 AA 00 00 02 EE**  
**FF 01 AA 00 00 03 EE**  
**FF 01 AA 00 00 04 EE**  
**FF 01 AA 00 00 05 EE**  
 ...  
**FF 01 AA 00 00 C5 EE**  
**FF 01 AA 00 00 C6 EE**  
**FF 01 AA 00 00 C7 EE**  
**FF 01 AA 00 00 C8 EE**
- ⇒ The instruction to change the motor direction of address 01 to forward rotation: **FF 01 AA 02 00 01 EE**
- ⇒ The instruction to change the motor direction of address 01 to reverse: **FF 01 AA 02 00 00 EE**
- ⇒ Change motor speed command: **FF 01 AA 01 P1 P2 EE**  
**Change the motor speed of address 01 to 0x03E8: FF 01 AA 01 03 E8 EE**  
**Change the motor speed of address 01 to 0x03E9: FF 01 AA 01 03 E9 EE**  
**Change the motor speed of address 01 to 0x03EA: FF 01 AA 01 03 EA EE**  
**Change the motor speed of address 01 to 0x03EB: FF 01 AA 01 03 EB EE**  
**Change the motor speed of address 01 to 0x03EC: FF 01 AA 01 03 EC EE**  
 ...  
**Change the motor speed of address 01 to 0xEA5D: FF 01 AA 01 EA 5D EE**  
**Change the motor speed of address 01 to 0xEA5E: FF 01 AA 01 EA 5E EE**  
**Change the motor speed of address 01 to 0xEA5F: FF 01 AA 01 EA 5F EE**  
**Change the motor speed of address 01 to 0xEA60: FF 01 AA 01 EA 60 EE**
- ⇒ Zoom in: **FF 01 00 20 00 00 21**
- ⇒ Zoom out: **FF 01 00 40 00 00 41**
- ⇒ Zoom stop: **FF 01 FF 01 00 00 00 01**
- ⇒ Turn on the laser at address 01: **FF 01 00 09 00 01 0B**
- ⇒ Turn off the laser at address 01: **FF 01 00 0B 00 01 0D**
- ⇒ System reset: **FF AA EE** (Status after reset: the address is 01, the direction is forward, the speed is 60000 (EA 60))
- ⇒ Set the motor position: **FF 01 AA E5 P1(H) P2(L) EE** (Note: It is the motor position that can be set in the range of 0 460 (00 00 01 CC))

⇒ Query the motor position: **FF 01 AA E6 00 02 EE**

#### 4.2.1.8 Correspondence between motor position and light spot divergence angle

Motor position	Beam angle	P1,P2 data	Motor position	Beam angle	P1,P2data	Motor position	Beam angle	P1,P2 data
0	70	00 00	75	44. 34	00 4B	240	14. 81	00 F0
10	68. 47	00 0A	78	42. 61	00 4E	255	13. 68	00 FF
13	66. 44	00 0D	81	41. 11	00 51	270	12. 27	01 0E
15	65. 64	00 0F	88	39. 85	00 58	285	11. 13	01 1D
18	64. 01	00 12	95	38. 32	00 5F	300	9. 71	01 2C
21	62. 55	00 15	100	37. 04	00 64	315	8. 29	01 3B
24	61. 29	00 18	105	35. 22	00 69	338	7. 45	01 52
28	59. 58	00 1C	115	33. 39	00 73	345	6. 58	01 59
32	57. 62	00 20	125	31. 54	00 7D	360	5. 72	01 68
36	55. 84	00 24	135	29. 68	00 87	375	4. 86	01 77
40	54. 27	00 28	145	28. 07	00 91	390	4. 29	01 86
45	52. 67	00 2D	155	26. 72	00 9B	405	3. 52	01 95
50	51. 64	00 32	165	24. 54	00 A5	420	3. 15	01 A4
55	49. 16	00 37	180	22. 06	00 B4	435	2. 43	01 B3
60	47. 97	00 3C	195	20. 13	00 C3	450	2. 0	01 C2
65	46. 53	00 41	210	18. 45	00 D2	460	1. 57	01 CC
70	45. 32	00 46	225	16. 78	00 E1			

#### 4.2.2 FLC Communication Protocol

(Command parameters: The default standard rate is 9600bpsm, no parity, 8 data bits, 1 stop bit)

Communication methods (MAX232/485)

#### Command format

Unless otherwise specified, all parameters in the protocol are in hexadecimal format.

AA	55	LONG	ADDR1	ADDR2	COMM	DATA	SUM1	SUM2
(Start)		Length	Received Address	Sent Address	Command	DATA1	CheckSum	High low bytes

- 10: LD Turn on/off
- 11: LD Power adjust control
- 12: Zoom adjust control
- 13: Slave address setting
- 14: Response mechanism
- 15: System reset

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#### 4.2.2.1 Command summary

- ⇒ LD power switch control
  - AA 55 06 01 FF 10 01 02 16
  - AA 55 06 01 FF 10 02 02 17
- ⇒ LD power adjustment control
  - AA 55 06 01 FF 11 00 02 16
  - AA 55 06 01 FF 11 01 02 17
  - AA 55 06 01 FF 11 02 02 18
  - AA 55 06 01 FF 11 03 02 19
  - AA 55 06 01 FF 11 04 02 1A
  - AA 55 06 01 FF 11 05 02 1B
  - AA 55 06 01 FF 11 06 02 1C
  - AA 55 06 01 FF 11 07 02 1D
  - AA 55 06 01 FF 11 08 02 1E
  - AA 55 06 01 FF 11 09 02 1F
  - AA 55 06 01 FF 11 0A 02 20
  - AA 55 06 01 FF 11 0B 02 21
  - AA 55 06 01 FF 11 0C 02 22
  - AA 55 06 01 FF 11 0D 02 23
  - AA 55 06 01 FF 11 0E 02 24
  - AA 55 06 01 FF 11 0F 02 25
  - AA 55 06 01 FF 11 10 02 26
  - AA 55 06 01 FF 11 11 02 27
  - AA 55 06 01 FF 11 12 02 28
  - AA 55 06 01 FF 11 13 02 29
  - AA 55 06 01 FF 11 14 02 2A
  - AA 55 06 01 FF 11 15 02 2B
  - AA 55 06 01 FF 11 16 02 2C
  - AA 55 06 01 FF 11 17 02 2D
  - AA 55 06 01 FF 11 18 02 2E
  - AA 55 06 01 FF 11 19 02 2F
  - AA 55 06 01 FF 11 1A 02 30
  - AA 55 06 01 FF 11 1B 02 31
  - AA 55 06 01 FF 11 1C 02 32
  - AA 55 06 01 FF 11 1D 02 33
  - AA 55 06 01 FF 11 1E 02 34
  - AA 55 06 01 FF 11 1F 02 35
- ⇒ Zoom adjustment control
  - AA 55 06 01 FF 12 00 02 17
  - AA 55 06 01 FF 12 01 02 18
  - AA 55 06 01 FF 12 02 02 19

AA 55 06 01 FF 12 03 02 1A  
AA 55 06 01 FF 12 04 02 1B  
AA 55 06 01 FF 12 05 02 1C  
AA 55 06 01 FF12 06 02 1D  
AA 55 06 01FF 12 07 02 1E  
AA 55 06 01 FF12 08 02 1F  
AA 5506 01 FF 12 09 02 20  
AA 55 0601 FF 12 0A 02 21  
AA 55 06 01 FF 12 0B 02 22  
AA 55 06 01 FF 12 0C 02 23  
AA 55 06 01 FF 12 0D 02 24  
AA 55 06 01 FF 12 0E 02 25  
AA 55 06 01 FF 12 0F 02 26  
AA 55 06 01 FF 12 10 02 27  
AA 55 06 01 FF 12 11 02 28  
AA 55 06 01 FF 12 12 02 29  
AA 55 06 01 FF 12 13 02 2A  
AA 55 06 01 FF 12 14 02 2B  
AA 55 06 01 FF 12 15 02 2C  
AA 55 06 01 FF 12 16 02 2D  
AA 55 06 01 FF 12 17 02 2E  
AA 55 06 01 FF12 18 02 2F  
AA 55 06 01 FF 12 19 02 30  
AA 55 06 01 FF 12 1A 02 31  
AA 55 06 01 FF 12 1B 02 32  
AA 55 06 01 FF 12 1C 02 33  
AA 55 06 01 FF 12 1D 02 34  
AA 55 06 01 FF 12 1E 02 35  
AA 55 06 01 FF 12 1F 02 36  
AA 55 06 01 FF 12 20 02 37  
AA 55 06 01 FF 12 21 02 38  
AA 55 06 01 FF 12 22 02 39  
AA 55 06 01 FF 12 23 023A  
AA 55 06 01 FF 12 24 02 3B  
AA 55 06 01 FF 1225 02 3C  
AA 55 06 01 FF 12 2602 3D  
AA 55 06 01 FF 12 27 02 3E  
AA 55 06 01 FF 12 28 02 3F  
AA 55 06 01 FF 12 29 02 40  
AA 55 06 01 FF 12 2A 02 41  
AA 55 06 01 FF 12 2B 02 42  
AA 55 06 01 FF 12 2C 02 43  
AA 55 06 01 FF 12 2D 02 44



AA 55 06 01 FF 12 2E 02 45  
AA 55 06 01 FF 12 2F 02 46  
AA 55 06 01 FF 12 30 02 47  
AA 55 06 01 FF 12 31 02 48  
AA 55 06 01 FF 12 32 02 49  
AA 55 06 01 FF 12 33 02 4A  
AA 55 06 01 FF 12 34 02 4B  
AA 55 06 01 FF 12 35 02 4C  
AA 55 06 01 FF 12 36 02 4D  
AA 55 06 01 FF 12 37 02 4E  
AA 55 06 01 FF 12 38 02 4F  
AA 55 06 01 FF 12 39 02 50  
AA 55 06 01 FF 12 3A 02 51  
AA 55 06 01 FF 12 3B 02 52  
AA 55 06 01 FF 12 3C 02 53  
AA 55 06 01 FF 12 3D 02 54  
AA 55 06 01 FF 12 3E 02 55  
AA 55 06 01 FF 12 3F 02 56  
AA 55 06 01 FF 12 40 02 57  
AA 55 06 01 FF 12 41 02 58  
AA 55 06 01 FF 12 42 02 59  
AA 55 06 01 FF 12 43 02 5A  
AA 55 06 01 FF 12 44 02 5B  
AA 55 06 01 FF 12 45 02 5C  
AA 55 06 01 FF 12 46 02 5D  
AA 55 06 01 FF 12 47 02 5E  
AA 55 06 01 FF 12 48 02 5F  
AA 55 06 01 FF 12 49 02 60  
AA 55 06 01 FF 12 4A 02 61

.....

AA 55 06 01 FF 12 F0 02 07

⇒ Slave address setting

AA 55 06 01 FF 13 02 02 1A

⇒ Response mechanism

AA 55 06 01 FF 14 FF 03 18

AA 55 06 FF 01 14 05 02 1E

Power on from the machine, return the value to the PC

⇒ MCU RESET:

AA 55 06 01 FF 15 00 02 1A

⇒ Query software version

51 53 30 31 32 33 34 35 36 37 38 39 41 42 43 4B

⇒ Query product serial number

51 4E 30 31 32 33 34 35 36 37 38 39 41 42 43 4B

#### 4.2.2.2 Case Study

- ⇒ LD power switch control:  
**AA 55 06 ADDR FF 10 DATA SUM1 SUM2**  
Head: AA 55  
Length: 06 --- The number of all bytes after this byte  
Slave Address: ADDR FF --- slave address (1~C8) and master address (FF)  
Command: 10  
Data: DATA --- 1 mean power on, 2 mean power off  
Checksum: SUM1, SUM2
- ⇒ LD power regulation control  
**AA 55 06 ADDR FF 11 DATA SUM1 SUM2**  
Head: AA 55  
Length: 06 --- The number of all bytes after this byte  
Slave Address: ADDR FF --- slave address (1~C8) and master address (FF)  
Command: 11  
Data: DATA --- Decimal range 0~29, higher value mean higher power  
Checksum: SUM1, SUM2
- ⇒ Zoom adjustment control  
**AA 55 06 ADDR FF 12 DATA SUM1 SUM2**  
Head: AA 55  
Length: 06 --- The number of all bytes after this byte  
Slave Address: ADDR FF --- slave address (1~C8) and master address (FF)  
Command: 12  
Data: DATA --- Decimal range 0~10, higher value mean longer distance of lens adjustment  
Checksum: SUM1, SUM2
- ⇒ Slave address setting  
**AA 55 06 ADDR FF 13 DATA SUM1 SUM2**  
Head: AA 55  
Length: 06 --- The number of all bytes after this byte  
Slave Address: ADDR FF --- slave address (1~C8) and master address (FF)  
Command: 13  
Data: DATA --- Decimal range 0~200  
Checksum: SUM1, SUM2
- ⇒ Response mechanism  
**AA 55 06 ADDR FF 14 DATA SUM1 SUM2**  
Head: AA 55  
Length: 06 --- The number of all bytes after this byte  
Slave Address: ADDR FF --- slave address (1~C8) and master address (FF)  
Command: 14

Data: DATA ---

- The host requests the slave to respond (FF)
- The slave responds to the host request (EE)
- Slave machine starts or resets and answers normally without error (01)
- Slave data packet receiving timeout response (02)
- Slave command bit received error response (03)
- Slave data bit received error response (04)
- LD power detection error response (05)
- Set up ongoing response (20)
- LD power on complete response (21)
- LD power off complete response (22)
- LD power adjustment completed response (23)
- Answer of zoom adjustment setting completed (24)
- Reply to address setting completion (25)
- Response to system reset completion (26)

Checksum: SUM1, SUM2

⇒ System reset

**AA 55 06 ADDR FF 15 00 SUM1 SUM2**

Head: AA 55

Length: 06 --- The number of all bytes after this byte

Slave Address: ADDR FF --- slave address (1~C8) and master address (FF)

Command: 15

Data: DATA --- 0

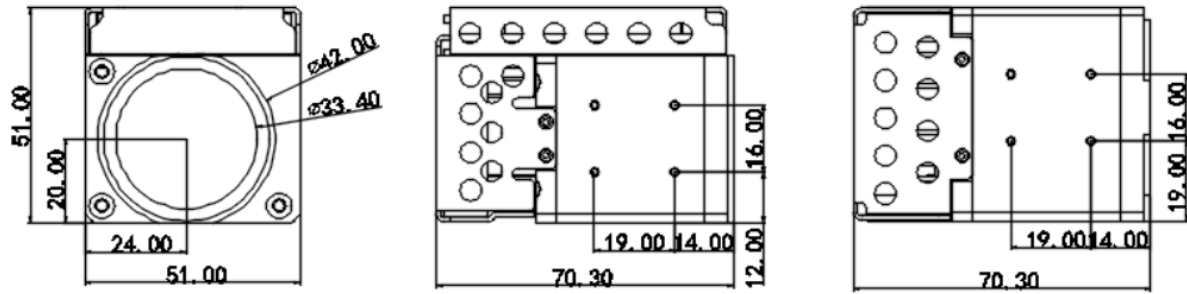
Checksum: SUM1, SUM2

#### 4.2.3 Sony VISCA Communication Protocol

- ⇒ Turn on: 81 01 04 00 02FF
- ⇒ Turn off: 81 01 04 00 03FF
- ⇒ Zoom out: 81 01 04 08 02 FF
- ⇒ Zoom in: 81 01 04 08 03 FF
- ⇒ Stop: 81 01 04 08 00 FF
- ⇒ System reset: 81 01 06 05 FF
- ⇒ Motor speed: 81 01 05 P1(H) P2(L) FF (Note: The motor speed setting range is not greater than 60000.)

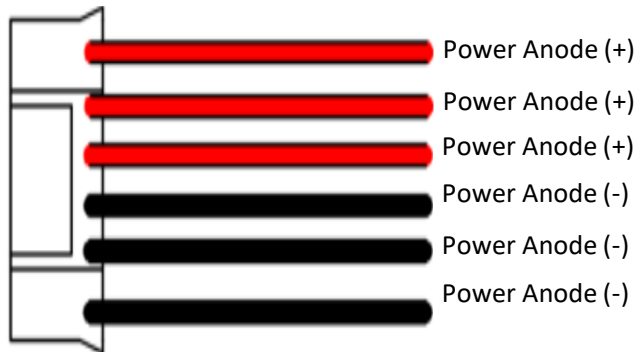
### 4.3 Installation and Connection Diagram

#### 4.3.1 Mechanic Schematic

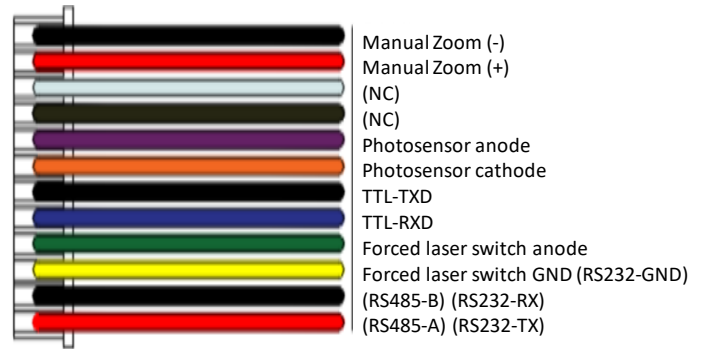


#### 4.3.2 Connection Schematic

##### Connection of power supply line (6 PIN)



##### Connection of control line (12 PIN)



Please add 470ohm resistance filter or corresponding inductance filter at both ends of RXD and TXD to strengthen the anti-interference ability during TTL communication.

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## 5 Operation

### 5.1 Preparation before starting

5.1.1 Installation: Before installation, please refer to the preface, safety matters and usage environment and precautions.

#### 5.1.2 Connection:

5.1.2.1 *Connect and install the laser output collimator on the front panel of the laser to the user's target system;*

5.1.2.2 *Connect the laser control interface RS485 and RS232 to the computer serial port (or the laser control interface USB to the computer USB port), and ensure that the computer serial port (USB port) operates normally, and confirm that the software serial port parameter settings are correct;*

5.1.2.3 *Connect the laser to an external 12V DC power supply and pay attention to the positive and negative poles of the power supply and the ground wire must keep good contact.*

### 5.2 Boot

5.2.1 Remove the lens cap on the output end, otherwise the emitted laser will burn the plastic cap and damage the optical lens;

5.2.2 Turn on the DC power supply connected to the laser;

5.2.3 Wait 3 minutes until the laser preheating is completed;

5.2.4 Issue a boot command.

### 5.3 Shut down

5.3.1 Issue a shutdown command;

5.3.2 Turn off the 12V DC power supply;

5.3.3 Cover the output port.

### 5.4 Precautions:

5.4.1 The laser can be turned on/off at any time during operation.

5.4.2 The laser power monitoring function is only used as a rough monitoring of the output power, and an external power meter should be used for accurate power measurement.

## 6 Service and repair

FLC laser service policy: If consumers purchase the company's products through legal channels, if there is a performance failure that is not artificially damaged, they are entitled to FLC "repair, return, and replacement", which is called three guarantees.

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- 6.1 To protect your legal rights, please pay attention to the following information:
- 6.1.1 When purchasing the machine, please fill in the warranty card in a complete, correct and true manner with the supplier or the company's sales.
  - 6.1.2 Please keep the warranty card and purchase invoice properly.
  - 6.1.3 Please bring the original warranty card and invoice when repairing it (invoice and warranty card must be filled out by the company or the vendor and stamped with the official seal, and must not be altered, otherwise it will be invalid);
  - 6.1.4 The warranty period is three months, calculated from the date of issuing the invoice.
  - 6.1.5 If there is no invoice or three guarantee certificates, the validity period of the three guarantees will be calculated based on the date of manufacture of the main body barcode plus 90 days.
- 6.2 During the normal use of this machine, if there is a performance failure that is not artificially damaged, you enjoy the following three guarantees:
- 6.2.1 The warranty period of the whole laser of FLC is one year.
  - 6.2.2 During the validity period of the three guarantees, if the laser has a performance failure that is not artificially damaged, it will enjoy free warranty service.
  - 6.2.3 Counting from the date of purchase, if the machine has a performance failure that is not artificially damaged within 7 days, you can choose to return the payment at the invoice price or replace the laser of the same model or repair it.
  - 6.2.4 From the 8th to 15th day from the date of purchase, if the laser has a performance failure that is not artificially damaged, you can choose to change it.
  - 6.2.5 Replace the laser with the same model and specification or repair it.
- 6.3 If one of the following conditions is met, the warranty is not covered, and FLC or its authorized service center will implement reasonable maintenance fees.
- 6.3.1 The validity period of the three packs is exceeded.
  - 6.3.2 Except for those without three guarantees certificates and valid invoices, but it can still be proved that they are within the validity period of the three guarantees.
  - 6.3.3 The warranty certificate does not match the product model identification, or the warranty certificate is altered.
  - 6.3.4 Without the authorization of FLC, disassemble, repair, or modify the system software, causing damage or mal function.
  - 6.3.5 Damage caused by failure to use, maintain and maintain in accordance with the instructions for use;
  - 6.3.6 Soaked in water, broken or circuit board burned.
  - 6.3.7 The fragile stickers are torn off or are fuzzy.
  - 6.3.8 Damage caused by force majeure.

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## 7 Pack List

Items	Descriptions	Qty.
1	300m(500m) VCSEL illuminator	1
2	User's manual	1

## 8 Application

This product is designed with independent patented light intensity homogenization technology and original imported laser chip. To ensure the reliability of the laser illuminator, a unique photoelectric isolation design is adopted. To facilitate integration, standard interface parameters such as power supply and control signals are used. This product has undergone optical homogenization with independent intellectual property rights, and has a more uniform spot, more stable and lower heating effect than similar products in the market. It is suitable for security monitoring systems such as high-speed dome cameras, box cameras and pan-tilts, and is an ideal infrared lighting source.

It is recommended to use day and night cameras with a focal length above 100 mm.

## 9 Annex:

### Repair Form

Customer Name: \_\_\_\_\_

Contact person: \_\_\_\_\_ Address: \_\_\_\_\_

Tel.: \_\_\_\_\_ Fax: \_\_\_\_\_

Mobile phone: \_\_\_\_\_ Email: \_\_\_\_\_

Reworks order no.: \_\_\_\_\_

Rework item quantity: \_\_\_\_\_ pieces

Issues	Product Name	Item no.	Malfunction description
1			
2			
3			
4			
5			
6			
7			

**Frankfurt Laser Company**  
**An den 30 Morgen 13**  
**61381 Friedrichsdorf**  
**Germany**

Reworking code is valid within 30 days after confirmed by fax or email. You are appreciated that you send back the repairing product with repair form with full information.

FLC (Signature) :

Date: