ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

LDR25 Laser Ranging Target Indicator

Model:LDR25

PRODUCT DESCRIPTION

The LDR25 Laser Ranging Target Indicator is a precision photoelectric product that emits laser light at a specific target and calculates distance information based on the laser's flight time. The Laser Ranging Target Indicator realizes communication through RS422 communication interface, and has the characteristics of outstanding performance and simple operation. It has the following advantages in a wide range of application scenarios: small size, light weight, and low power consumption, suitable for handheld, airborne, and vehicle-mounted platforms. The Laser Ranging Target Indicator is 1064nm. Direct human eyes are prohibited. It is a precision photoelectric product that fires a laser at a specific target and calculates distance information based on the flight time of the laser. The Laser Ranging Target Indicator realizes communication through RS422 communication interface, and has the characteristics of outstanding performance and simple operation. It has the following advantages in a wide range of application scenarios: small size, light weight, and low power consumption, suitable for handheld, airborne, and vehicle-mounted platforms. The Laser Ranging Target Indicator is 1064nm. Direct human eyes are prohibited.

1 Product Function

- With laser ranging function;
- Provide target laser irradiation;
- Respond to the laser ranging command and can stop the ranging at any time according to the stop command;
- During ranging, each pulse outputs distance data and status information;
- Ranging has distance gating function;
- If no stop command is received after starting continuous ranging, ranging will automatically stop after 5min (1Hz)/1min (5Hz);
- Can set the illumination mode and encoding;
- Response to the laser irradiation command, follow the set mode, code, and irradiation, and can stop irradiation at any time according to the stop command;
- If no stop command is received after starting the irradiation, the irradiation will stop automatically after one cycle;
- During laser irradiation, each pulse outputs a distance value and status information;
- Power-on self-test and periodic self-test and output status information;
- Respond to the startup self-test command and output status information;
- Able to report the cumulative number of laser pulses; laser pulse counting function
- First and last target ranging function.

2 Product Description

The main components of the LDR25 Laser Ranging Target Indicator product are as follows:

- Receive and transmit components;
- Laser power drive circuit components;
- Control and information processing circuit components.

The composition diagram is shown in Figure 1.

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

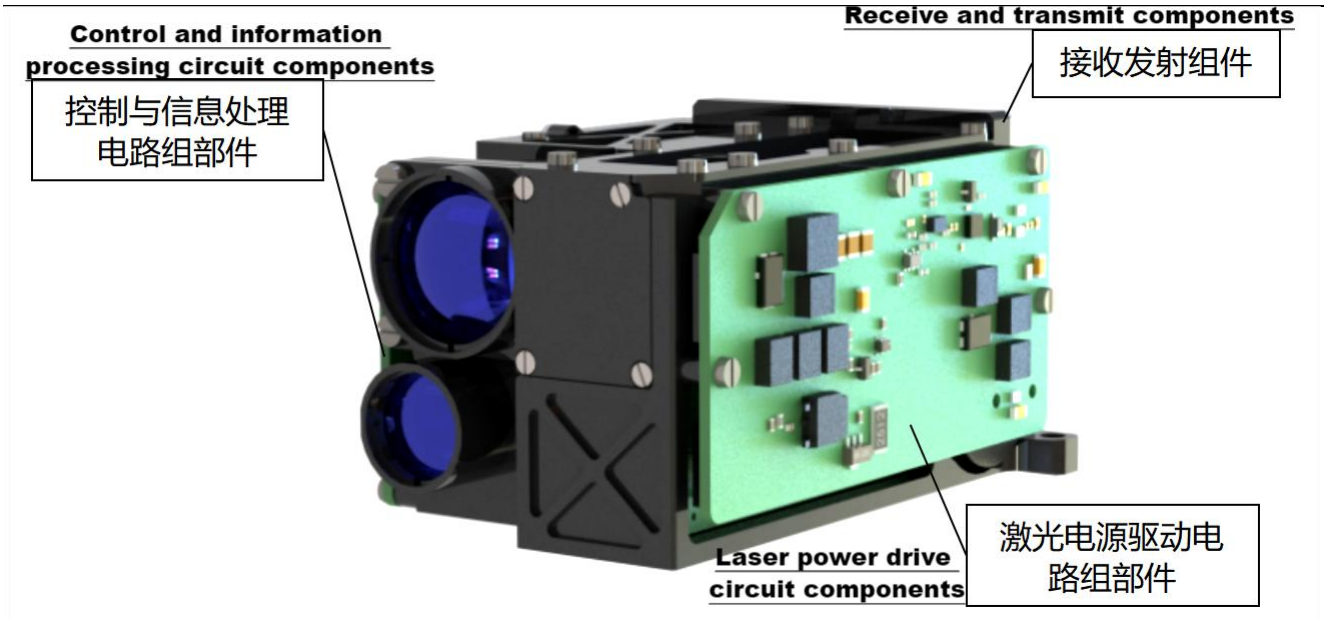


Figure 1 Schematic diagram of product composition

3. Mechanical and optical interfaces

The laser photometer is connected through screws, and the location of the mechanical and optical interfaces is shown in Figure 2.

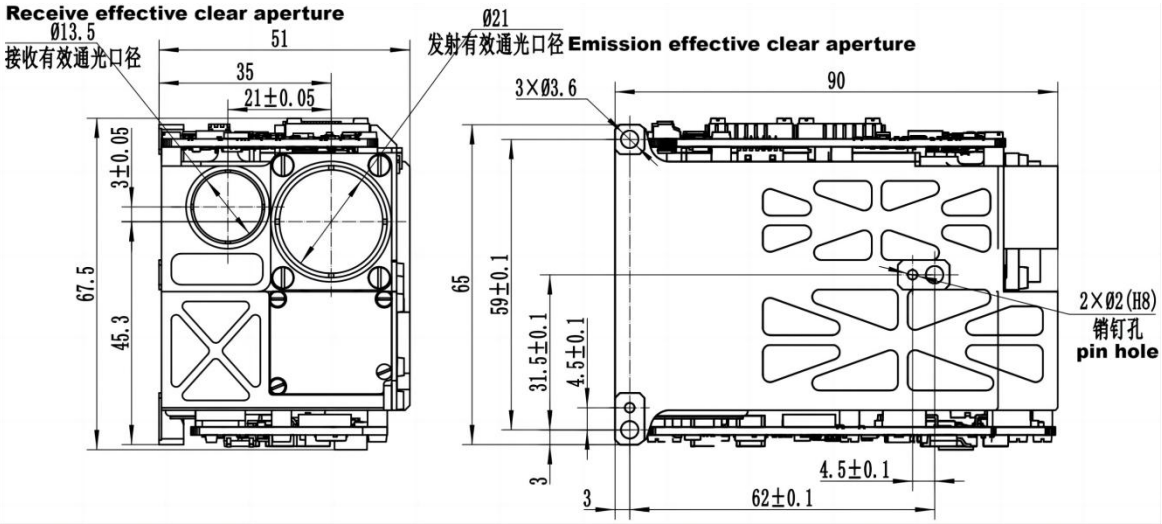


Figure 2 Mechanical and optical interface diagram

4. Electrical interface

The upper computer end is cross-linked with the female connector MOLEX 53048-0810 and the female connector MOLEX 530480210 by the connector plug MOLEX 51021-0800 and the connector plug MOLEX 151340201, respectively. The power supply and communication port pin definitions of the camera end are shown in Table 1 (receiving and sending relative to the camera).

Socket MOLEX 53048-0810		
Corresponding plug MOLEX 51021-0800		
Pin number	Signal name	Instructions
1	24V	Power+

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

2	24V	Power+
3	24VGND	Power supply-
4	24VGND	Power supply-
5	422_A	Host computer->laser measurement component+
6	422_B	Host computer->laser measurement component-
7	422_Z	Laser measurement components->Host computer-
8	422_Y	Laser measurement components->PC+
Socket MOLEX 530480210		
Corresponding plug MOLEX 151340201		
Pin number	Signal name	Instructions
1	SYNC_IN+	The external synchronization signal is a differential signal, and the interface type is RS422
2	SYNC_IN-	

Table 1 Definition of power supply and communication port pins at the detector side

5.Communication Protocol

5.1 Communication Protocol Definition

a） Asynchronous serial communication standard: RS422;

b） Baud rate: 115200bps;

c） Transmission format: 8 data bits, 1 start bit, 1 stop bit, no check bit;

d） For each byte of information, the lowest position (lsb) is transmitted first, and if it is a multi-byte message, the lowest byte is transmitted first.

5.2 The command sent by the upper computer system to the laser photometry module

1) Information header (0x55);
2) Command word 1;
3) Command word 2;
4) Command word 3;
5) The "message tail" is the checksum, the result of the xor operation of 1-4 bytes.

Table 2 Definition of command word 1

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
0x00: standby 0x01: Start self-test 0x02: Single ranging 0x03: Continuous ranging (1Hz) 0x04: Continuous ranging (5Hz) 0x05: Irradiation 0x08: Stop ranging/irradiation 0x09: Gating value setting 0xAA: Report the cumulative number of laser pulses 0x19 ~ 0x20: Laser coding 9 ~ 16 parameter changes 0x29 ~ 0x30: Reading of laser coding parameters 9 ~ 16							

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

Table 3 Definition of command word 2

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
During laser irradiation: laser code 1 to 16 (see Table 5) When laser ranging: 1-first target 2-last target When setting the strobe value: Distance from the low byte of the strobe value When laser encoding parameters 9 to 16 are changed: laser encoding low byte, period × 100 (5000 represents 50ms, 46ms-56ms) When reading laser coding parameters 9 to 16: laser coding low byte, period × 100 (5000 represents 50ms, 46ms-56ms)							

Table 4 Definition of command word 3

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
During irradiation: Laser irradiation time setting (1～42) When setting the strobe value: Distance from the high byte of the strobe value When laser encoding parameters 9 to 16 are changed: Laser encoding high byte, period × 100 (5000 represents 50ms, 46ms-56ms) When reading laser encoding parameters 9 to 16: laser encoding high byte, period × 100 (5000 represents 50ms, 46ms-56ms)							

Table 5 Definition of laser coding 1~8

Code type code	Pattern(ms)	Remark
0x01		Customers can customize
0x02		Customers can customize
0x03		Customers can customize
0x04		Customers can customize
0x05		Customers can customize
0x06		Customers can customize
0x07		Customers can customize
0x08		Customers can customize

5.3 Laser photometer sends data to system software

- Information header (0x55);
- Status word;
- Target distance/accumulated number of laser pulses (2 bytes), low byte first, high byte last, laser encoding parameters 9 to 16, period × 100 (5000 represents 50ms, 46ms-56ms) low byte first , the high byte comes last;
- Current temperature of laser illumination module;
- The "information tail" is the checksum, which is the result of the XOR operation of 1-5 bytes.
- The relevant definitions of status word information are shown in Table 6:

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

Table 6 Status word description

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
0: No laser 1: With laser	0: Ranging is valid 1: Ranging is invalid	Laser mark 1/0 alternating	1: Over-temperature alarm 0: Temperature is normal			00: standby 01: Ranging 02: Instructions	

Target distance information definition: The distance value uses 2 bytes (16BIT) to represent an integer, which can be directly converted into decimal.

Definition of the number of cumulative laser pulses: Since the range represented by a 16-bit binary number is 0~65535, and the service life of the laser detector is 1 million times, it is agreed that the number of laser emission times is a multiple of 20, and the range is 0~1310700;

Current temperature of the laser measurement module: d7-d0: complement representation, value range -128℃~+127℃.

TECHNICAL DATA

Table 7 List of LDR25 capability indicators

Laser wavelength	1.064μm
Pulse average energy	≥25mJ
Pulse capacity fluctuation	within a cycle, adjacent pulse fluctuation ≤8%(statistics after 2 seconds of light output)
Laser beam dispersion Angle	≤0.5mrad
Laser optical axis stability	≤0.05mrad
Pulse width	≤20ns
Power-on preparation time	≤3s
Ranging frequency	Single, 1Hz, 5Hz, 20Hz
Continuous ranging time	5min(1Hz), 1min(5Hz)
5Hz maximum continuous operating time	2min
Minimum range	≤100m
Typical ranging capacity	5000m
Ranging accuracy	±2m
Accurate measurement rate	≥ 98%
Ranging logic	first and last target
Irradiation distance	≥2km
Irradiation frequency	fundamental frequency 20Hz
Coding	in line with system requirements; With the ability to customize coding extension
Encoding mode	precise frequency code
Encoding accuracy	≤±2.5μs
Irradiation mode	one irradiation time ≥20s, start irradiation again, interval ≤15s, can be continuously irradiated for 8 cycles
Weight	440g
Size	≤91mm×68mm×51.5mm
Voltage	18V ~ 32V
Standby power consumption	≤4W
Average power consumption	≤50W
Peak power consumption	≤90W

1. Working band

The central wavelength of the laser when the LDR25 is working is 1064nm. It is forbidden to look directly at the laser of the light detector when it is working to avoid unnecessary personal injury.

2. Ranging capability

In an environment with visibility ≥ 8Km and humidity ≤ 60%, when testing a target plate (or other equivalent target) with a reflectance of 0.3 in size 2.3m×2.3m, the distance measuring capability of the laser photometer can reach more than 5000m,

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

and The accuracy rate is greater than 98%, which is also a key indicator for judging whether the laser detector is qualified. Figure 3 shows the relationship between laser range and visibility under theoretical conditions.

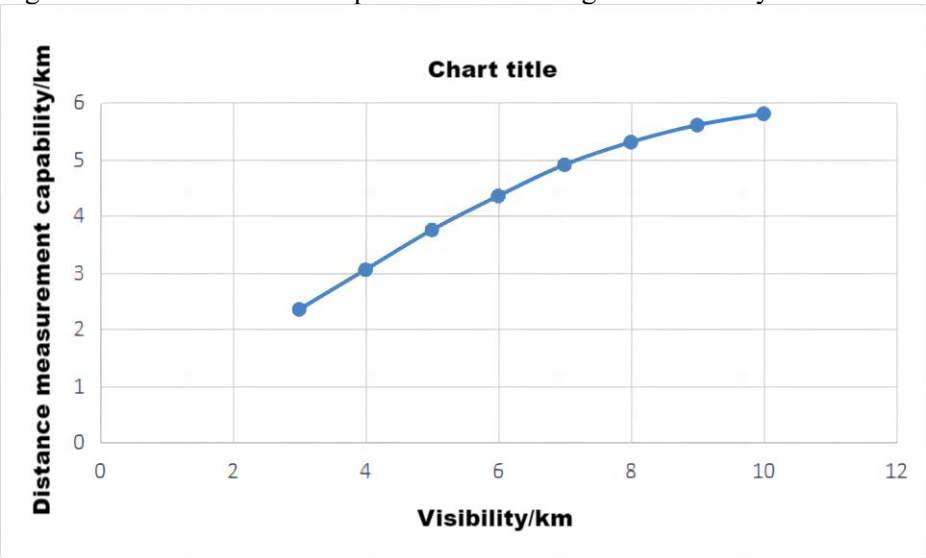


Figure 3 Relationship between illumination range and visibility

Factors such as target reflectivity and measurement angle will affect the ranging capability. Generally, the higher the target reflectivity, the better the ranging ability; the more vertical the laser angle is when it irradiates the measurement target reflective surface, the better the ranging ability. In practical applications, the laser of the illumination detector should be irradiated vertically to the target surface as much as possible. For targets with medium and high reflectivity, such as traffic signs and other targets, the performance of the illumination detector can also be better.

3. Ranging blind area

For targets within 100m, the laser photometer may not be able to accurately measure, which is its ranging blind spot. It is not recommended that users test targets in the blind area of the illumination detector because the echo of the illumination detector to targets in the blind area is strong, which may result in reduced detector life or ranging capabilities, especially for targets in the blind area. High reflectivity target testing may even cause permanent damage to the detector. Therefore, when the photometer is under close working conditions such as debugging, please block the receiving lens.

4. Distance measurement accuracy

For targets with an accuracy rate of ≥98%, the accuracy error of the laser photometer can reach within 2m. For example, for a target with an actual distance of 1000m, the maximum range of the measurement value of the laser photometer will be within 998m and 1002m.

5. Working frequency

The laser photometer can achieve single, 1Hz, 5Hz ranging and 20Hz irradiation by sending different instructions. For the corresponding instructions and operation instructions, see 3 Functions and Operations.

6. Weight

The total weight of the laser photometer is ≤440g.

7. Overall dimensions

91mm×68mm×51.5mm is the maximum size of the laser photometer.

8. Power supply voltage

The power supply voltage of the photometer ranges from 18V to 32V.

9. Environmental adaptability

The photometer can operate normally under the conditions of -40℃～60℃, and the storage temperature range is -55℃～70℃. It is recommended to work or store the photometer in a normal temperature and dry environment. Too high or too low temperature may cause the decline of certain indicators of the photometer. In particular, avoid using the photometer in an environment with drastic changes in temperature. , which may reduce the life of the photometer or cause malfunction.

10. Average energy

The average energy irradiated by the laser photometer is ≥25mJ.

11. Energy stability

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

Within one cycle, the fluctuation of adjacent pulses is ≤8% (statistics after 2 seconds of light emission).

12. Divergence angle

The laser beam divergence angle of the laser photometer is ≤0.5mrad.

13. Pulse width

The light pulse width of the laser photometer is 15±5ns.

14. Irradiation distance

When the laser photometer executes the irradiation instruction, the longest distance it can irradiate is ≥ 2500m (reference value).

15. Coding method

The laser photometer has user-defined coding expansion capabilities; the coding method of the laser photometer is precise frequency coding and external synchronization; the coding setting is 8 fixed codes + 8 expansion codes (the fixed code cannot be changed after being customized by the user, and the expansion code Users can set it by themselves, but it should not exceed 22Hz).

16. Coding accuracy

The coding accuracy of the laser photometer is ≤±2.5μs.

FUNCTION AND OPERATION

1 Function description

1.1 Laser ranging function

In normal working mode, the photometer enters the preparation state for receiving instructions. The results in this state are:

- Receive the ranging command and send back the distance information and status information through the serial port after completing the ranging;
- Ranging can be stopped at any time by pressing the stop command;

If no stop command is received after starting continuous ranging, ranging will automatically stop after 5min (1Hz)/1min (5Hz);

- During ranging, each pulse outputs distance data and status information once, and displays them through the host computer.

1.2 Laser irradiation function

In normal working mode, the photometer enters the preparation state for receiving instructions. The results in this state are:

- Can set the illumination mode and encoding;
- Response to the laser irradiation command, follow the set mode, code, and irradiation, and can stop irradiation at any time according to the stop command;
- If no stop command is received after starting the irradiation, the irradiation will stop automatically after one cycle;
- During laser irradiation, the distance value and status information are output once for each pulse and displayed by the host computer.

1.3 Distance gating function

Distance gating means setting a gating distance (in hexadecimal notation) within the range of the ranging capability. Target distance information lower than the gating value will not be sent back, and the distance measurement value higher than the gating within the range range is valid. ranging;

If you need to set it, the operation method is as follows:

- Send the "Gate value setting" command to the laser detector (see Tables 2, 3, and 4);
- Send the "ranging" command to the laser detector (see Tables 2, 3, 4), the laser detector measures the distance and determines whether the return distance value is greater than the distance gate value and then reports the ranging result (see 1.5.3) ;
- Send the “stop ranging” command (see Tables 2, 3, and 4) to stop ranging;
- If you do not need to use the distance gating function, you need to manually restore the initial settings (the gating value is set to 0).

1.4Self-check function

- Send the "start self-test" command to the laser detector (see Tables 2, 3, and 4);
- The laser detector starts self-test and sends back the current ambient temperature, working status and other information.
- The laser detector will perform periodic self-tests and send back information such as current ambient temperature and working status.

1.5 Laser pulse counting function

Send the "report cumulative number of laser pulses" command to the laser detector (see Tables 2, 3, and 4), and the laser detector will send back information on the cumulative number of laser pulses.

1.6 First and last target ranging function

First and last target ranging means that the distance information of up to two targets with different distances can be obtained in

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

one ranging.

2. Operation steps

2.1 Power on operation

- Before starting up, according to the interface requirements of 1.4, connect the laser detector, debugging cable, DC power supply and host computer as shown in Figure 4;
- Turn on the power supply to start.

Figure 4 Connection diagram

2.2 Shutdown operation

- Before shutting down, make sure that the working processes and tasks of each product are in the end state and the program exits;
- After completing the confirmation, disconnect the power and shut down normally.

2.3 Laser irradiation function operation

Send the "irradiation" command to the laser detector (see Tables 2, 3, and 4). The laser detector will illuminate according to the corresponding laser code and report distance information and status information (see 1.5.3). For example: send "55 05 01 14 45”, the laser detector will illuminate at 20Hz for 20s.

MAINTENANCE INSTRUCTIONS

1. Packing list

The list of items provided with the product is shown in Table 8. If there are other optional items that may not be reflected in the list, please refer to the actual product. (For the content of the table, please refer to the packing list in the product specifications)

Table 8 List of accessories

No.	Name	Quantity	Remark
1	Anti-static ziplock bag	1	
2	Desiccant	1	
3	Product certification	1	
4	Communication plug	1	A set of two
5	Packing box	1	
6	LDR25 Laser Ranging Target Designator	1	

2. Precautions for use

- It is forbidden to look directly at the laser of the photometer. If necessary, please observe under the protection of relevant professional equipment to avoid damage to human eyes;
- It is forbidden to touch the optical lenses directly with fingers or hard objects. Do not use detergent to clean the lenses unless necessary to prevent irreversible damage to the lens coating layer and affect product performance. If there is dirt on the exposed lens, just wipe it gently with a lens cloth. ;
- Do not use this product under direct sunlight, and it is prohibited to store this product in highly polluted environments or outside the storage temperature range to avoid uncontrollable effects on the photodetector;
- When the photometer is under close working conditions such as debugging, please block the receiving lens, otherwise excessive echo may cause permanent damage to the detector;
- This photometer adopts a certain degree of air-tight measures, but it is still recommended to use the product in an environment with an ambient humidity of less than 80%, and ensure that the use environment is clean and hygienic to increase the service life of the product;
- When taking the product, please pay attention to eliminate static electricity on the human body to prevent damage to circuit components.

2.1 Cleaning of optical components

- Dust particles should be blown off using an air blower;
- Fingerprints should be wiped with absorbent cotton dipped in a small amount of alcohol-ether mixture, and then wiped clean with a clean lens cleaning cloth.

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

2.2 Cleaning of structural parts and electronic devices

- When the power is off, lightly wipe the structural parts and electronic devices with alcohol and let them dry naturally before use;
- Keep the photometer, plug and cable as far away from moisture and dirt as possible;
- Dry the equipment thoroughly before packaging.

3. Inspection and maintenance

3.1 General inspection

Visual and power-on inspections should be performed after the product is used for the first time and after the resource module is replaced. For products in normal use, only perform power-on inspection before use.

The steps for visual inspection are as follows:

a. Check whether the appearance of the product is normal;

b. Check whether the cable connection is correct and the connection should be firm.

The power-on inspection steps are as follows:

a. Complete the boot operation;

b. Start the self-test test product;

c. Complete the shutdown operation after the inspection is completed.

3.2 Regular maintenance

The laser detector does not require maintenance under normal working conditions. Maintenance is required when stored in a dust-free environment for more than one year, which mainly includes general inspection and power-on inspection.

The product is generally inspected when it is not powered. The steps are as follows:

a. All marks and numbers on products and test cable plugs (sockets) should be correct and clear;

b. Various screws on the panel should be tightened;

c. It should be ensured that the optical glass of the product does not have light spots, pitting, water spots, mold, fingerprints, dust particles and other attachments and cracks that hinder normal observation.

Conduct a comprehensive inspection and maintenance of the laser detector when it is powered on, including:

a. Turn on the power of the products in sequence;

b. Complete the boot operation;

c. Start product self-test to test the product and complete product self-test;

Complete shutdown operation.

4. Packaging, transportation and storage requirements

4.1 Packaging

When unsealed products need to be restocked, they should be packed in the original packaging. When the product needs to be returned to the factory, the original packaging should be used as much as possible. When using other forms of packaging, it should not cause product performance degradation or damage.

4.2 Transportation

Repackaged products can be transported by cars, trains, planes, ships, etc. During transportation, the packages should be fixed on the transportation vehicle to avoid impacts, rough handling, and rain and snow. Road transportation and railway transportation environment refer to GJB 150.16A-2009.

4.3 Storage

Repackaged products must not be stored in the open air. The recommended storage environment is: a warehouse with a temperature of 0°C to 30°C, a relative humidity of no more than 70%, no erosion by corrosive substances, no strong mechanical vibration and impact, and no strong magnetic field.

LIGHT WINDOW SELECTION AND COATING SUGGESTIONS

1. Material suggestions

It is recommended to use optical glass H-K9L as the light window material. H-K9L is the most common colorless optical glass, suitable for the laser range of 300nm to 2100nm, with high cost performance and superior physical properties.

2. Processing suggestions

The wedge angle tolerance of the light window should be as small as possible, and the wedge angle tolerance is recommended to be ≤3′ (tolerance level ≤7);

The optical surface of the light window should be as smooth as possible, and the recommended arithmetic mean deviation (Ra) of the profile is 0.012.

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

3. Coating suggestions

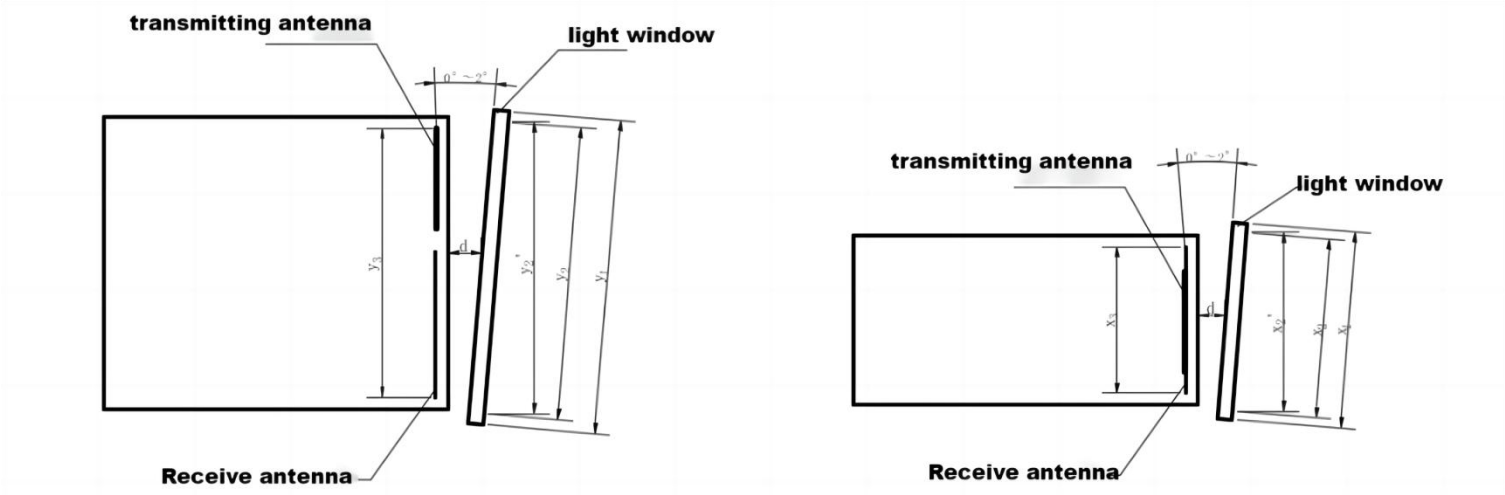
It is recommended that the light window of the 1064nm laser detector be coated with a 1040nm ~ 1090nm anti-reflection coating, with a transmittance of ≥99%, and the damage threshold of the coating layer should be ≥50MW/cm2;

According to the specific use environment of the product, you can choose other protective films such as hydrophobic film or hard film on the surface of the light window. The other indicators refer to GJB2485-95, and the transmittance is ≥97%.

4. Light window appearance and usage suggestions

The effective diameter of the light window depends on different products. Its overall dimensions should ensure that the effective diameter of the light window - the diameter of the light window is ≥ 2mm, and the outer diameter of the photometer antenna - the projection size of the effective diameter of the light window is ≥ 1.5mm. The schematic diagram is shown in the figure below. Since the light window has a certain absorption of laser light, it is recommended that the thickness of the light window itself be controlled within 2 to 4 mm according to the overall dimensions.

Due to the high transmittance of the light window, it is recommended that the axis deviation between the emission optical axis and the normal line of the light window be controlled within 0°~ 2°. The position diagram of the light window and the two lens barrels is shown in the figure below. At the same time, the air gap between the light window and the photometer should be as small as possible. Figure 7 is a schematic diagram of the two ways of placing light windows.



Effective diameter of light window y2 - diameter of light window y1 ≥ 2mm,
Rangefinder antenna outer diameter y3 - light window effective aperture projection size y2` ≥ 1.5mm,
The air gap d between the light window and the rangefinder should be as small as possible.

Effective diameter of light window x2 - diameter of light window x1 ≥ 2mm,
Rangefinder antenna outer diameter x3 - light window effective aperture projection size 2` ≥ 1.5mm,
The air gap d between the light window and the rangefinder should be as small as possible.

Figure 5 Schematic diagram of the appearance, size and placement of the light window in two ways

AFTER-SALES SERVICE

When the laser ranging target indicator fails, the entire machine needs to be returned to the factory for fault analysis, location and repair. The items that ERDI TECH can repair include but are not limited to the following aspects:

- Optical system;
- Laser emission module;
- Laser receiving module;
- Circuit components.

ERDI TECH provides one-year warranty service and lifetime technical support from the date of delivery of this product. During the

ERDI TECH LTD
Add:No.23,Chaoyang Road, Xihe street,
Longquanyi District,Chengdu, 610107, China.
TEL：+86-2881076698
Email：sales@erdicn.com

warranty period, ERDI TECH can replace or repair the product for free if it is caused by the quality of the product itself. If there is any product problem caused by the user's human error, our company will The cost of repairing and replacing accessories will be charged based on the actual situation; since the laser ranging target indicator is a precision optical instrument, please pay attention to protecting the product during use. If you have other use and maintenance problems, you can communicate with our after-sales personnel at any time.