LR1000E2

SOURCE-PRESERVING ENGINEERING REFERENCE

LR1000E2 / SOURCE-PRESERVING USER MANUAL

SECTION 01

Document Control and Content Coverage

Model LR1000E2. Source manual issue: 2025.10. This customer-facing transcription preserves the supplied source facts and identifies unresolved source discrepancies without deciding them.

Customer-visible source figures use English terminology overlays only where required; dimensions, interface geometry, source formulas, and application silhouettes remain source-preserved.

CUSTOMER CONTENT ELEMENT	CONTROLLED PRESENTATION
Product reference	Supplied source product photograph
Mechanical, optical, and software figures	English terminology overlays on source geometry
Safety warning	English source-warning equivalent
Applications and product views	English-cleaned source visual plus compact source galleries

SECTION 02

Product Overview

The LR1000E2 series laser ranging module is a new high-precision, compact rangefinder module with a center operating wavelength of 905 nm. The measurement range is 4–1000 m, with a maximum nighttime range of up to 1200 m (visibility 10 km). The ranging refresh rate is 3–10 Hz, which can be customized according to customer requirements.

The module uses a UART-TTL communication interface and is supplied with dedicated test software and communication protocol documentation, enabling secondary development. It features compact size, light weight, high accuracy, and a high refresh rate.

It is suitable for integration into handheld devices such as night-vision devices, thermal imagers, telescopes, and laser illuminators for auxiliary ranging. The source also lists border-security monitoring, aviation, communications, railway systems, law enforcement, smart water conservancy, and outdoor sports as ranging scenarios. The civilian-integration boundary in the source safety section remains controlling.

SECTION 03

Technical Specifications

The values below are transcribed from the supplied source table. Listed standards, classes, and protection descriptions are source-stated references, not independent certification claims.

NO.	PARAMETER	SOURCE-STATED SPECIFICATION
1	Laser Wavelength	905 nm ±5 nm
2	Laser Beam Divergence	< 9 mrad
3	Optical Material	Resin Aspherical Lens
4	Receiving Aperture	9.2 mm × 14.5 mm
5	Measurement Range	4 m – 1000 m
6	Ranging Accuracy	±1 m (≤ 400 m)[1] ±1 m + D × 0.1% (> 400 m)[2]
7	Measurement Frequency	3 Hz – 10 Hz Adaptive
8	Measurement Accuracy Rate	≥ 98%
9	False Alarm Rate	≤ 1%
10	Communication Interface	UART-TTL (Customizable)
11	Baud Rate	115200 bps
12	Supply Voltage	3.3 V – 5 V
13	Startup Time	≤ 200 ms
14	Inrush Current	< 350 mA
15	Sleep Power Consumption	< 1 mW
16	Standby Power Consumption	< 0.3 W
17	Power Consumption (Short Range)	< 0.6 W
18	Operating Power Consumption	≤ 1 W
19	Operating Temperature	-20°C to +55°C (-40°C customizable)
20	Storage Temperature	-40°C to +60°C
21	Protection Rating	IP67 (Inside Lens Cavity)
22	Laser Safety Class	IEC Class I

NO.	PARAMETER	SOURCE-STATED SPECIFICATION
23	Dimensions	25.65 mm × 13.2 mm × 24.6 mm (Rectangular)
24	Weight	≤ 10 g
25	Shock Resistance	1000 g/ms (10 times/s along optical axis)
26	Vibration Resistance	5–50–5 Hz, 1 octave/min, 2.5 g
27	Reliability	MTBF ≥ 1500 h

SOURCE NOTES — 1) Target size 2.3m × 2.3m, reflectivity 90%;
2) Target size 2.3m × 4.6m, reflectivity 90%;
3) The accuracy indicated in the table refers to the accuracy of a whiteboard.

SECTION 04

Functional Description

The system supports single-measurement and continuous-measurement functions.

3.1 External Circuit Enable — Enables the module for normal operation.

3.2 External Circuit Disable — Disables the external circuit to reduce power consumption.

3.3 Single Measurement — Triggers a single distance measurement to the target. For low-reflectivity targets, the system automatically performs repeated measurements until stable distance data is obtained. The measured result is then transmitted through the serial interface in the standard data format.

3.4 Continuous Measurement — In continuous-measurement mode, the laser module performs repeated distance measurements on the target. The typical refresh rate is set to 2 Hz or 5 Hz, and the maximum refresh rate can reach 30 Hz (customized version required). The refresh rate can be adjusted through the serial interface.

SECTION 05

Hardware Installation Guide

4.1 Packing List

The source packing list contains one laser ranging module and one power cable.

Before connection, review the source electrical interface definition, mechanical interface figure, and optical-window recommendations in the following sections.

- Laser Ranging Module × 1
- Power Cable × 1

SECTION 06

Electrical Interface Definition

The six-pin definition below preserves the source signal names and module-to-host or host-to-module directions.

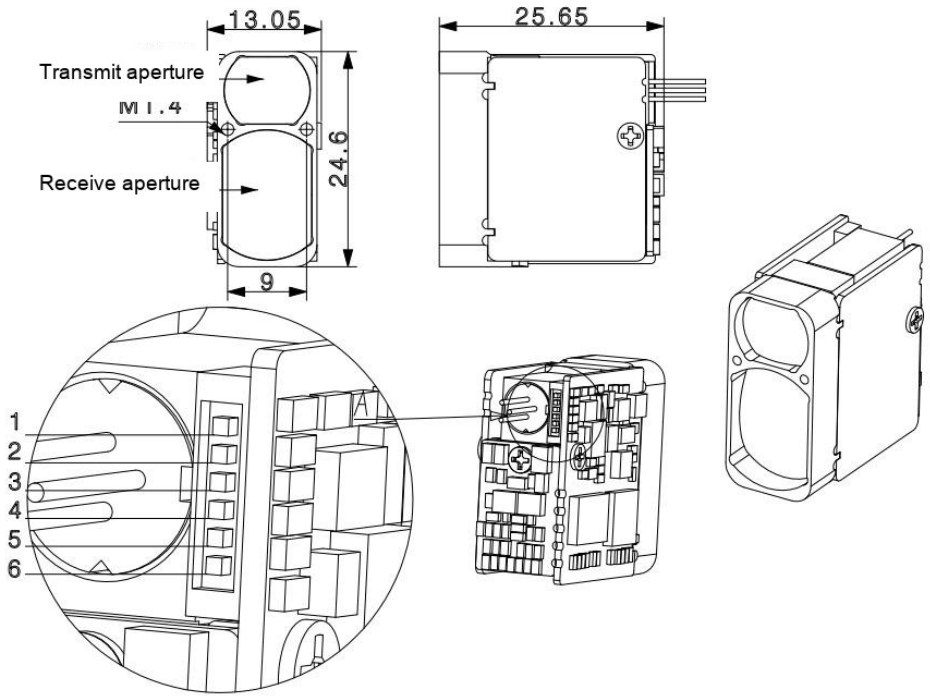
PIN	SIGNAL	SOURCE-STATED FUNCTION
1	GND	Power −
2	VCC	Power +
3	I/O (Reserved)	Reserved for expansion
4	TXD	Signal output port, Ranging Module → Host
5	RXD	Signal input port, Host → Ranging Module
6	SW-SHOT	Function Enable (active high) Note: Compatible with active-low control requirements

SECTION 07

Mechanical Interface

Use the supplied mechanical 2D pin-callout drawing as the mechanical and electrical interface reference. The visible source marks include 25.65 mm, 24.6 mm, 13.05 mm, 9 mm, M1.4, and physical pin callouts 1 through 6. The source geometry and dimensions are retained; this figure is not replaced by a generic CAD drawing.

TERMINOLOGY KEY — Figure labels are standardized as Transmit aperture and Receive aperture; source geometry is unchanged.



Source mechanical 2D pin-callout and electrical interface drawing — all supplied dimensions and physical pin callouts 1 through 6 retained.

SECTION 08

Optical Window Selection and Coating Recommendations

4.4.1 Material Recommendations — The source recommends H-K9L optical glass (Chengdu Guangming Optical Glass) or fused silica for the optical window. It states that H-K9L and fused silica are common colorless optical materials for the 300 nm to 2100 nm wavelength range, with good cost performance and physical properties.

4.4.2 Manufacturing Recommendations — The source recommends a wedge-angle tolerance of ≤ 3′ (tolerance grade ≤ Grade 7) and surface roughness Ra (arithmetic mean deviation) of 0.012.

4.4.3 Coating Recommendations — For a 905 nm laser rangefinder, the source recommends an anti-reflection coating for 855 nm to 955 nm with transmittance ≥ 99.5%. Depending on the operating environment, the source permits hydrophobic or hard protective coatings on the outer surface and refers other requirements to GJB 2485-95 with transmittance ≥ 98%. These are source-stated recommendations, not independently validated certification or standard-equivalence claims.

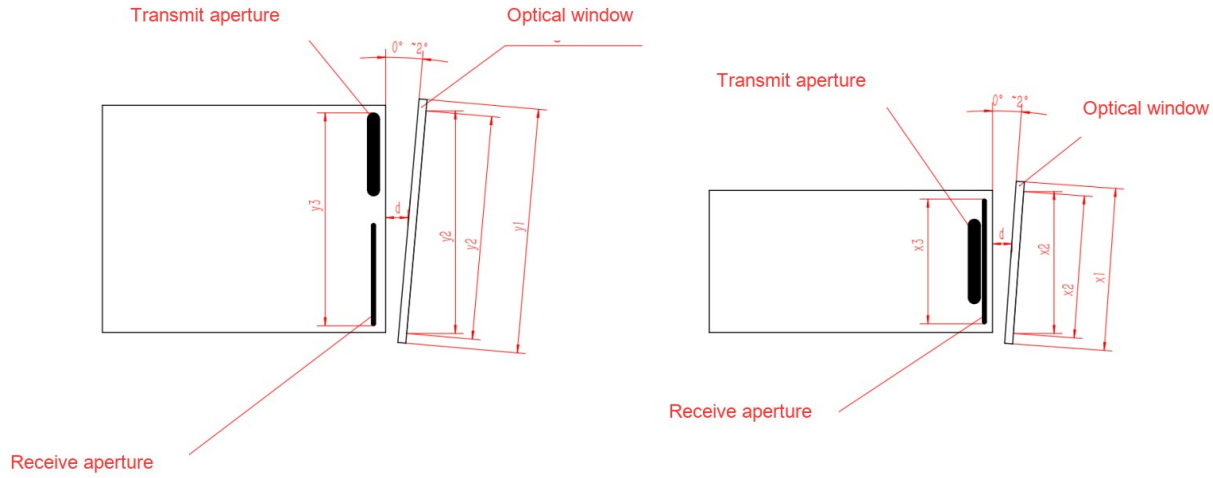
4.4.4 Shape and Usage — The effective aperture depends on the specific product. The source formula transcription is retained below with the generic source term rangefinder antenna corrected neutrally to rangefinder aperture. The two source arrangements are not assigned transmit or receive functions.

The source recommends a 2–4 mm window thickness according to the mechanical envelope, a transmit optical axis parallel to the window normal, and an air gap d < 0.5 mm between the Optical window and the rangefinder.

The source figure preserves both arrangement sketches and variables x1, x2, x3, y1, y2, y3, and d. It is a source recommendation figure, not a manufacturing drawing or independently validated design.

SOURCE ARRANGEMENT A	SOURCE ARRANGEMENT B
Effective optical-window aperture y2 minus optical-window outer diameter y1: y2 - y1 > 2 mm. **Rangefinder aperture y3 outer diameter minus the projected effective optical-window aperture y2: y3 - y2 > 1.5 mm.** **Keep the air gap d between the optical window and the rangefinder as small as possible.**	Effective optical-window aperture x2 minus optical-window outer diameter x1: x2 - x1 > 2 mm. Rangefinder aperture x3 outer diameter minus the projected effective optical-window aperture x2: x3 - x2 > 1.5 mm. Keep the air gap d between the optical window and the rangefinder as small as possible.

SOURCE FIGURE 3 TERMINOLOGY KEY — Figure 3 labels are standardized as Transmit aperture, Receive aperture, and Optical window. Both arrangements and x1–x3, y1–y3, and d are retained with no A/B functional assignment.

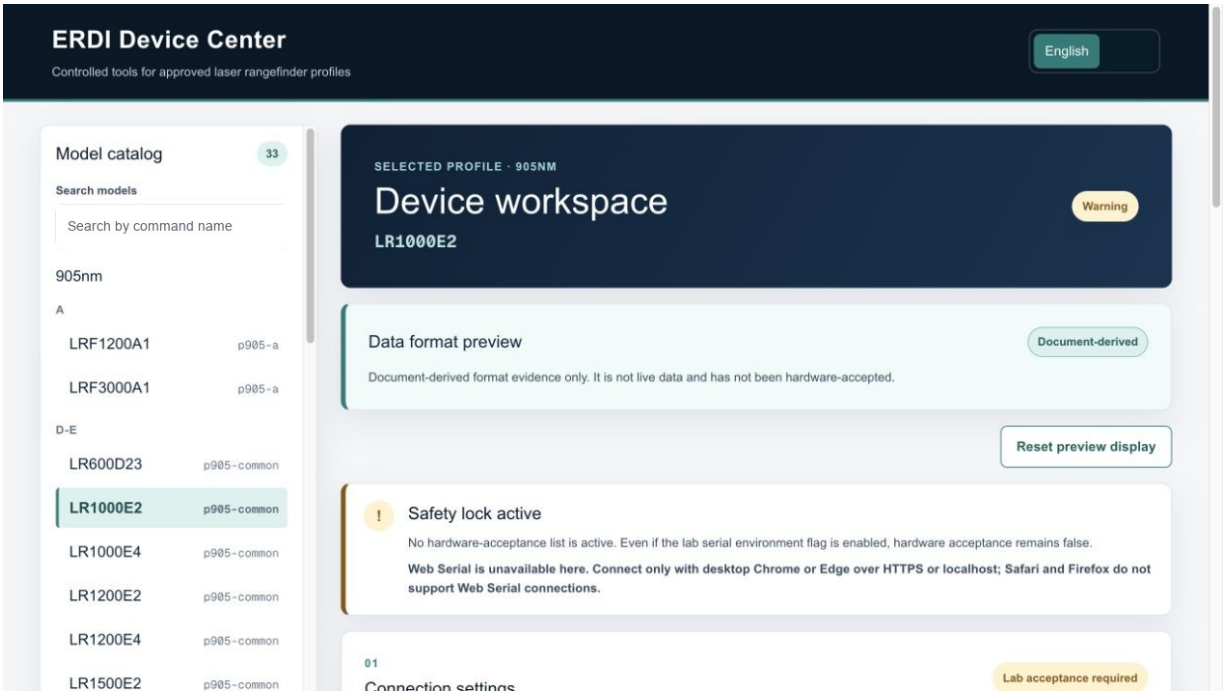


Source Figure 3 — both optical-window arrangements, formulas, and variables retained; English terminology overlay only.

SECTION 09

Browser UI Reference

This additional browser-based host-interface image is illustrative only. It does not replace the source protocol table and does not evidence a live module connection.



English-cleaned local browser-interface reference — illustrative only; not a live module connection.

SECTION 10

Legacy Source Software Reference

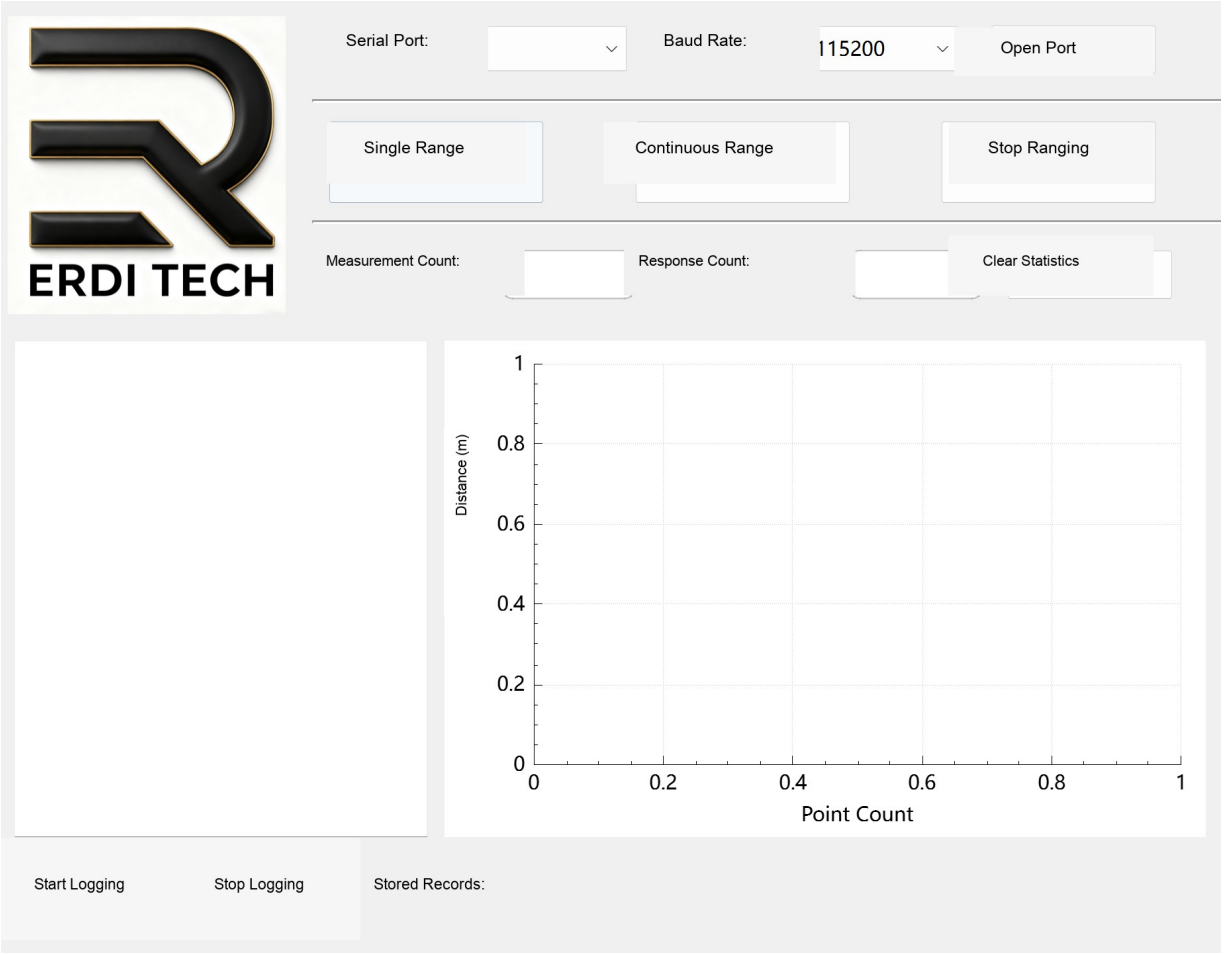
The following screenshot and procedure are retained from the supplied source as a legacy source software reference; they are not presented as the current customer software.

Source Step 1 — Insert the factory-supplied data cable into the ranging module to power the module and enable measurement-data output. Strictly control the source supply voltage within 3.3–5 V. The source instruction says the Enable pin must be pulled LOW (connected to GND).

Source Step 2 — Install the ERDI-Tools software and use TTL-to-USB conversion to connect the LR1000E2 serial signal to the computer. Connect module TXD to converter RXD and module RXD to converter TXD.

Source Step 3 — After installing the software, open the display interface.

Source Step 4 — Debug and test. Select the corresponding COM port shown by the computer. Set the baud rate after opening the interface; the source lists 9600 and 115200 among available values and directs the reader to the Communication Protocol.



Legacy source software reference — full English control-label overlay on the supplied interface geometry.

SECTION 11

Source Protocol Transcription

Source communication method: serial communication. Source default baud rate: 115200. Data bits: 8. Frame length: 8 bytes. All transmitted and received data is hexadecimal.

Source transmit checksum formula: SUM(Function Code + DATA1 + DATA2 + DATA3 + DATA4), lower 8 bits. Source reply checksum formula: SUM(Frame Header (H) + Frame Header (L) + Function Code + DATA1 + DATA2 + DATA3 + DATA4), lower 8 bits. The source warns that the transmit and response calculations differ.

Source LD generic frame form: 55 AA 86 FF FF FF STA SUM. The source reply marker is 55.

The four compact tables below visibly transcribe all 35 source data rows. Consecutive duplicate cell text created by source merged cells is shown once per repeated text run; no nonempty source token is removed.

SOURCE ROW	VISIBLE SOURCE TRANSCRIPTION
1	Frame Header (H) | Frame Header (L) | Function Code | D1 | D2 | D3 | D4 | Checksum
2	Send | 55 | AA | SUM(Function Code + DATA1 + … + DATA4)
3	Reply | 55 | AA | SUM(Frame Header (H) + Frame Header (L) + … + DATA4)
4	[Blank source separator row]

SOURCE ROW	VISIBLE SOURCE TRANSCRIPTION
5	Measurement Command
6	Single-Shot Ranging | Send | 55 | AA | 88 | FF | SUM[3 7]
7	Single-Shot Ranging | Send | 55 AA 88 FF FF FF FF 84
8	Single-Shot Ranging | Reply | 55 | AA | 88 | STA | FF | DIS_H | DIS_L | SUM[1 7]
9	Single-Shot Ranging | Reply | STA = other value: Measurement failed; STA = 1: Measurement successful DIS_H: High byte of the measurement result; DIS_L: Low byte of the measurement result Data is returned in hexadecimal format, and all measurement results are output as the actual value × 10
10	Continuous Ranging | Send | 55 | AA | 89 | FF | SUM[3 7]
11	Continuous Ranging | Send | 55 AA 89 FF FF FF FF 85
12	Continuous Ranging | Reply | 55 | AA | 89 | STA | FF | DIS_H | DIS_L | SUM[1 7]
13	Continuous Ranging | Reply | STA = other value: Measurement failed; STA = 1: Measurement successful DIS_H: High byte of the measurement result; DIS_L: Low byte of the measurement result Data is returned in hexadecimal format, and all measurement results are output as the actual value × 10
14	Stop Ranging | Send | 55 | AA | 8E | FF | SUM[3 7]
15	Stop Ranging | Send | 55 AA 8E FF FF FF FF 8A
16	Stop Ranging | Reply | 55 | AA | 8E | STA | FF | SUM[1 7]
17	Stop Ranging | Reply | STA = 0: Failed to stop continuous measurement; STA = 1: Successfully stopped continuous measurement
18	Angle Measurement | Send | 55 | AA | 8A | FF | SUM[3 7]
19	Angle Measurement | Send | 55 AA 8A FF FF FF FF 86
20	Angle Measurement | Reply | 55 | AA | 8A | STA | FF | ANG_H | ANG_L | SUM[1 7]

SOURCE ROW	VISIBLE SOURCE TRANSCRIPTION
21	Angle Measurement | Reply | STA = 0: Measurement failed; STA = 1: Measurement successful ANG_H: High byte of the measurement result; ANG_L: Low byte of the measurement result Data is returned in hexadecimal format, and all measurement results are output as the actual value × 10 Effective only for modules equipped with an angle sensor
22	[Blank source separator row]

SOURCE ROW	VISIBLE SOURCE TRANSCRIPTION
23	Power-On Self-Test
24	Self-Test Information | Reply | 55 | AA | 80 | STA | 00 | ErrCode | SUM[1 7]
25	Self-Test Information | Reply | STA = 0: Power-on initialization failed; ErrCode is the error code STA = 1: Power-on initialization successful
26	[Blank source separator row]

SOURCE ROW	VISIBLE SOURCE TRANSCRIPTION
27	System Settings
28	Baud Rate | Send | 55 | AA | TYPE | FF | SUM[3 7]
29	Baud Rate | Send | TYPE = 01: Set baud rate to 9600 bps TYPE = 02: Set baud rate to 14400 bps TYPE = 03: Set baud rate to 19200 bps TYPE = 04: Set baud rate to 38400 bps TYPE = 05: Set baud rate to 56000 bps TYPE = 06: Set baud rate to 57600 bps TYPE = 07: Set baud rate to 115200 bps TYPE = 08: Set baud rate to 128000 bps TYPE = 09: Set baud rate to 230400 bps The baud rate change does not take effect immediately; it becomes effective only after a reboot.
30	Baud Rate | Reply | 55 | AA | TYPE | STA | FF | SUM[1 7]
31	Baud Rate | Reply | STA = 0: Setting failed; STA = 1: Setting successful
32	LD Constant-ON Mode | Send | 55 | AA | 86 | FF | STA | SUM[3 7]
33	LD Constant-ON Mode | Send | STA = 0: LD constant-ON OFF; STA = 1: LD constant-ON ON 55 AA 86 FF FF FF 01 84 Enable 55 AA 86 FF FF FF 00 83 Disable
34	LD Constant-ON Mode | Reply | 55

SOURCE ROW	VISIBLE SOURCE TRANSCRIPTION
35	LD Constant-ON Mode | Reply | STA = 0: Already ON; STA = 1: Already OFF; STA = FF: Operation failed Note: Do not keep the constant-ON mode enabled for long periods.

SOURCE WARNING — Do not keep the constant-ON mode enabled for long periods.

SECTION 12

Safety Warnings and Operating Notes

All class, standard, operating-condition, and application-boundary language in this section is source-stated only; it is not an independent certification or verified standard-equivalence statement.

Do not look directly into the laser emission aperture to avoid eye injury (compliant with Class 1).

Operating ambient temperature range: −20 to +60 °C. Avoid high temperature, humidity, rain/snow, or dusty environments.

Do not disassemble the module yourself; otherwise, the warranty may become invalid or the device may be damaged.

This product is intended mainly for integration into civilian equipment such as UAVs, outdoor observation devices, and surveying/mapping systems, and must not be used for military applications.

The spot/beam adjustment mode is for developers only. Do not aim at human eyes in this mode to avoid eye injury.

Factors affecting ranging capability, ranging response time, and ranging accuracy include:

Target reflectivity: In general, the higher the target reflectivity, the better the ranging capability and the faster the ranging response. For example, a medium-reflectivity target may be measured up to 1200 m, a high-reflectivity target up to at least 1500 m, while a low-reflectivity target may only reach about 600 m. (Targets that hardly produce diffuse reflection, such as water surfaces, may be impossible to measure.)
Target shape: When the reflective surface area is too small or the surface is uneven, ranging capability and response speed will decrease accordingly.

Measurement angle: When the laser beam is incident perpendicular to the target’s reflective surface, ranging capability is higher and response is faster; otherwise, both ranging capability and response speed will decrease. Under extreme incidence angles, the ranging capability and response time specified in this manual cannot be guaranteed.

Measurement environment: Factors affecting ranging capability and response speed also include sunlight intensity, the concentration of water vapor and suspended particles in the air, and the angle relative to direct sunlight. (Rain, fog, snow, haze/smog conditions will reduce the ranging distance.)

The ranging performance of this series of ranging telescopes is specified under the following conditions:

The target has medium reflectivity, such as a building wall;

The target reflective surface is perpendicular to the laser emission direction;

The weather is clear, and the measurement is performed without direct sunlight.

Recommendation: When measuring long-distance targets, mount the module on a tripod to reduce vibration during measurement and achieve better ranging performance.

Factors affecting ranging capability and ranging response time include:

Target reflectivity: In general, higher target reflectivity provides better ranging capability and faster response. For example, a medium-reflectivity target may be measured up to 600 m, a high-reflectivity target up to at least 800 m, while a low-reflectivity target may only reach about 300 m. (Targets that hardly produce diffuse reflection, such as water surfaces, may be impossible to measure.)

Target shape: If the reflective surface is too small or uneven, ranging capability and response time will decrease accordingly.

Measurement angle: When the laser beam is incident perpendicular to the target's reflective surface, ranging capability is higher and response is faster; otherwise, both ranging capability and response speed will decrease. Under extreme incidence angles, the ranging capability and response time specified in this manual cannot be guaranteed.

Measurement environment: Factors affecting ranging capability and response time also include sunlight intensity, the concentration of water vapor and suspended particles in the air, and the angle relative to direct sunlight. (Rain, fog, snow, haze/smog conditions will reduce the ranging distance.)

Suitable Targets for Measurement
This product can measure high-reflectivity targets (e.g., highway traffic signs), medium-reflectivity targets (e.g., building walls), and low-reflectivity targets (e.g., trees, golf flagpoles, animals, etc.). As target reflectivity decreases to a certain level, the ranging distance will decrease accordingly.

The ranging performance of this module is specified under the following conditions:

The target has medium reflectivity, such as a building wall;

The target reflective surface is perpendicular to the laser emission direction;

The weather is clear, and the measurement is performed without direct sunlight.

Note:
When measuring long-distance targets, it is recommended to mount the module on a tripod to reduce vibration during measurement and achieve better ranging performance.

WARNING Laser emission aperture: do not look directly into the emitted beam or direct the developer-only spot/beam adjustment mode toward anyone's eyes. This English warning callout preserves the role of the supplied Chinese warning image.

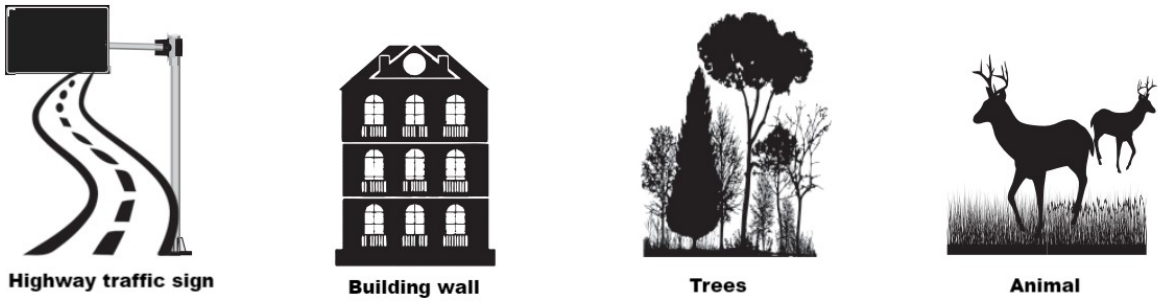
SECTION 13

Applications and Supplied Product-View Gallery

The English-cleaned nontechnical source visual retains the road, sign outline, building, trees, animals, and verified English application labels. Tiny source sign-panel text is neutralized without translation or technical inference.

Every supplied external source product view is retained in two compact 2–4-up gallery sheets without generic replacement artwork.

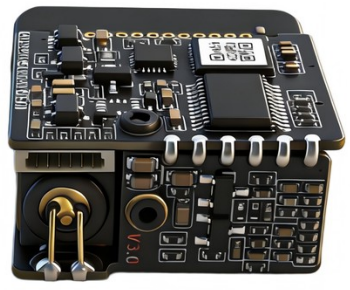
Supplied source video media (listed, not embedded and not a live link): E2-VC.mp4



English-cleaned nontechnical source visual — the tiny sign-panel text is neutralized without inferred translation.

Supplied external product views 1–4 — compact source gallery.

SOURCE VIEW 5



SOURCE VIEW 6

SOURCE VIEW 7

Supplied external product views 5–7 — compact source gallery.

SECTION 14

SOURCE DISCREPANCY — ENGINEERING CONFIRMATION REQUIRED

The following source discrepancies are retained neutrally and are not resolved or overwritten in this transcription.

1. 13.05 mm on the supplied mechanical figure versus 13.2 mm in the technical table.
2. The SW-SHOT pin source says Function Enable (active high) and Compatible with active-low control requirements, while the source software procedure says the Enable pin must be pulled LOW (connected to GND).
3. The source product narrative measurement/range examples conflict with the table range and with each other: 1200/1500/600 m versus 600/800/300 m, while the technical table states 4 m – 1000 m.