

LR2000E4

SOURCE-PRESERVING ENGINEERING REFERENCE



LR2000E4 / SOURCE-PRESERVING USER MANUAL

SECTION 01

Document Control and Content Coverage

Model LR2000E4. 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.

Representative Common Housing View — the supplied product media is shared across multiple E-family source files and does not confirm the exact LR2000E4 production configuration.

CUSTOMER CONTENT ELEMENT	CONTROLLED PRESENTATION
Product reference	Representative Common Housing View
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 LR2000E4 is a compact 905 nm laser rangefinder module. Model-specific wavelength, range, frequency, dimensions, weight, power, interface, and environmental entries are transcribed without substitution in the Technical Specifications table below.

The supplied source describes a UART-TTL interface, test software, and a communication protocol for integration evaluation. Performance and configuration statements remain limited to this model's own source rows and notes.

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 $\pm$ 5 nm
2	Laser Beam Divergence	< 6 mrad
3	Optical Material	PMMA
4	Receiver Aperture	9.2 mm $\times$ 14.5 mm
5	Ranging Range	4m-2000m
6	Ranging Accuracy	± 1 m (≤ 400 m) $d \times 0.4\%$ ($400 \text{ m} < d \leq 2000 \text{ m}$)
7	Ranging Frequency	2 Hz – 10 Hz, adaptive
8	Valid Measurement Rate	$\geq 98\%$ ($\leq 400\text{m}$) $\geq 80\%$ ($400\text{m} < d \leq 2000\text{m}$)
9	False Alarm Rate	$\leq 1\%$
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	Startup Inrush Current	< 400 mA
15	Operating Power Consumption	≈ 1.2 W
16	Operating Temperature	$-20^\circ\text{C} \sim +60^\circ\text{C}$
17	Storage Temperature	$-40^\circ\text{C} \sim +60^\circ\text{C}$
18	Protection Rating	IEC Class 1
19	Laser Safety Class	25.65mm*14.2mm*26.2mm (square)
20	Dimensions	≈ 10 g
21	Weight	1000 g/ms (10 times/s along the optical axis)

NO.	PARAMETER	SOURCE-STATED SPECIFICATION
21	Shock	5–50–5 Hz, 1 octave/min, 2.5 g
22	Vibration	IEC Class 1
23	Reliability	MTBF≥1500h

SECTION 04

Functional Description

The device supports single-shot measurement and continuous (multiple) measurements.

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-Shot Measurement

Triggers a single distance measurement. For low-reflectivity targets, the module will automatically repeat the measurement until stable distance data is obtained, and then reports the result via the serial port in the standard data format.

3.4 Multiple Measurements

In continuous measurement mode, the laser module performs continuous ranging with a typical update rate of 2 Hz, and a maximum update rate of up to 10 Hz.

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.

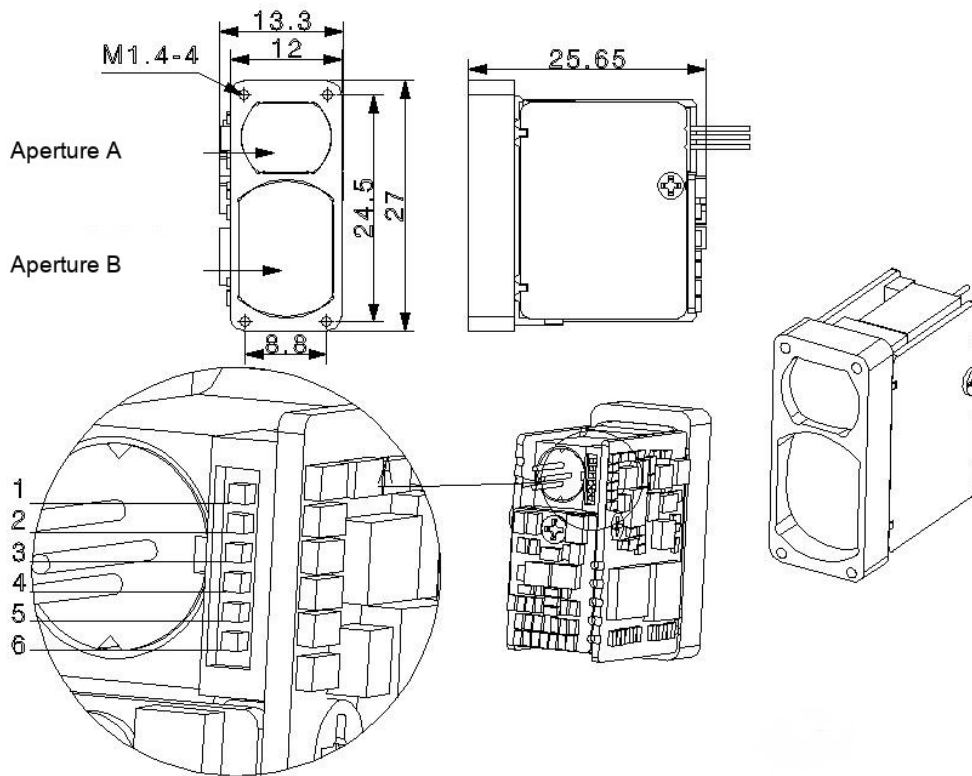
PIN	SIGNAL	SOURCE-STATED FUNCTION
1	GND	Power –
2	VCC	Power +
3	I/O (Reserved)	Reserved for expansion
4	TXD	Signal output port, Ranging Module → Host
5	RXD	Signal input port, Host → Ranging Module
6	SW-SHOT	Function Enable (active high) Note: Compatible with active-low control requirements

SECTION 07

Mechanical Interface

Use the supplied LR2000E4 mechanical 2D pin-callout drawing as a source-derived customer reference, not a manufacturing drawing. The visible source marks include 25.65 mm, 24.5 mm, 27 mm, 13.3 mm, 12 mm, 8.8 mm, M1.4, and physical pin callouts 1 through 6. Both source optical openings carry the same functional label; the English overlay therefore uses neutral Aperture A and Aperture B labels without assigning transmit or receive function.

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



Source-derived LR2000E4 mechanical and pin-callout reference — dimensions and pins retained; ambiguous optical labels shown neutrally as Aperture A and Aperture B; not for manufacturing.

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 $\leq 3'$ (tolerance grade $\leq$ 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 $\geq 99.5\%$. 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 $\geq 98\%$. These are source-stated recommendations, not independently validated certification or standard-equivalence claims.

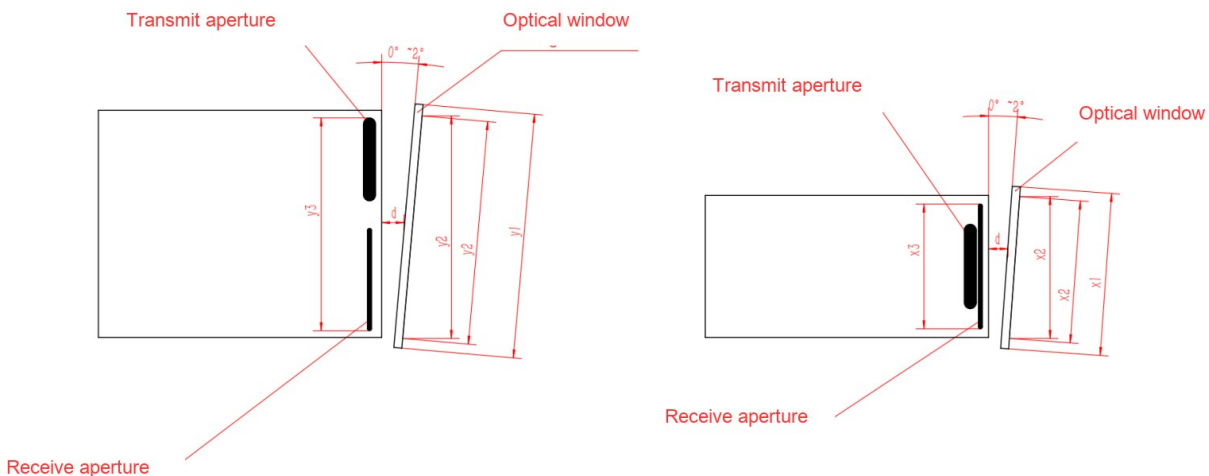
4.4.4 Shape and Usage — The effective aperture depends on the specific product. The source formula transcription is retained below with the generic source term rangefinder antenna corrected neutrally to rangefinder aperture. The two source arrangements are not assigned transmit or receive functions.

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

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 LR2000E4 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.

The screenshot shows the ERDI TECH software interface. On the left is the ERDI TECH logo. The top section contains controls for 'Serial Port' (a dropdown menu), 'Baud Rate' (set to 115200), and an 'Open Port' button. Below these are three buttons: 'Single Range' (highlighted), 'Continuous Range', and 'Stop Ranging'. The middle section has 'Measurement Count' and 'Response Count' (both with input fields) and a 'Clear Statistics' button. The bottom section features a large empty box on the left, a graph on the right, and 'Start Logging', 'Stop Logging', and 'Stored Records:' buttons at the bottom. The graph is titled 'Distance (m)' on the y-axis and 'Point Count' on the x-axis, both ranging from 0 to 1 with grid lines every 0.2 units.

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

SECTION 10

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: $\text{SUM}(\text{Function Code} + \text{DATA1} + \text{DATA2} + \text{DATA3} + \text{DATA4})$, lower 8 bits.

Source reply checksum formula: $\text{SUM}(\text{Frame Header (H)} + \text{Frame Header (L)} + \text{Function Code} + \text{DATA1} + \text{DATA2} + \text{DATA3} + \text{DATA4})$, 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 11

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.

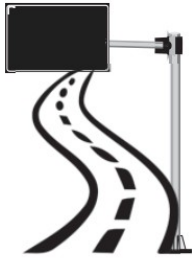
SECTION 12

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): E4-VC.mp4



Highway traffic sign



Building wall



Trees



Animal

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

SOURCE VIEW 1



SOURCE VIEW 2



SOURCE VIEW 3



SOURCE VIEW 4



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 13

SOURCE DISCREPANCY — ENGINEERING CONFIRMATION REQUIRED

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

1. From Protection Rating onward the supplied specification table is structurally shifted; preserve each source cell and do not reassign values by comparison with another model.
2. Both source optical ports are labeled Launch lens; use neutral Aperture A/B labels until engineering confirms transmit/receive identity.
3. Shared E4 product media and STEP evidence may only be labeled as representative common housing.
4. Source reply contains only 55; no complete reply frame may be inferred.