ERDI LASER®
ERDI TECH LTD

40mJ Laser Target Designator Module

Model: LDR40K1

1. PRODUCT DESCRIPTION

The LDR40K1 laser rangefinder/designator measures the distance to a target and performs coded laser designation of the target to guide laser-guided munitions.



2. PERFORMANCE SPECIFICATIONS

2.1 Main Functions

The main functions of the **LDR40K1 Laser Designator/Rangefinder** are as follows:

- Responds to laser designation commands and performs laser illumination using specified internal and external synchronization encoding modes.
- If no stop command is received after illumination starts, the system automatically stops after completing one illumination cycle.
- Supports laser code configuration.
- Performs laser rangefinding.
- If no stop command is received after initiating continuous ranging, the system automatically stops after **5 minutes (1 Hz)** or **1 minute (5 Hz)**.
- Provides multi-target indication capability.
- Includes reverse polarity protection for the power supply.
- Records and reports the total number of emitted laser pulses.

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2.2 Main Technical Parameters

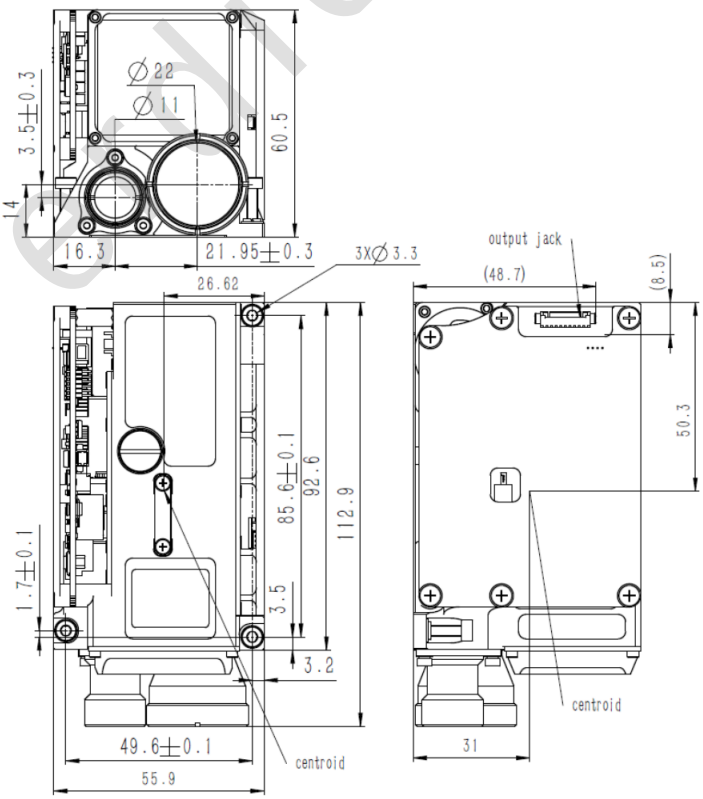
Parameter	Specification
Working Wavelength	1064 ± 3 nm
Pulse Average Energy	≥ 40 mJ
Energy Stability	Pulse energy variation ≤ 10% of the average within one illumination cycle
Pulse Width	15 ns ± 5 ns
Beam Divergence	≤ 0.4 mrad

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Parameter	Specification
Ranging Frequency	1 Hz / 5 Hz / Single shot
Ranging Accuracy	± 2 m (1 σ)
Minimum Range	≤ 100 m
Maximum Range	≥ 6000 m (at 10 km visibility, target reflectivity 0.2, target size 2.3 m × 4.6 m)
Continuous Ranging Duration	5 min (1 Hz) / 1 min (5 Hz)
Measurement Reliability	≥ 98%
Laser Encoding Accuracy	± 1 μs
Base Encoding Frequency	20 Hz
Continuous Illumination Duration	Short cycle: ≥ 18 s illumination, ≤ 10 s interval, continuous for 8 cycles Long cycle: ≥ 47 s illumination, ≤ 30 s interval, continuous for 2 cycles After completing one long and one short illumination, reactivation interval ≤ 30 min
Power Supply	DC 20 V – 28 V
Consumption	Average ≤ 50 W, Peak ≤ 100 W
Dimensions	≤ 115 mm × 65 mm × 60 mm
Weight	≤ 460 g

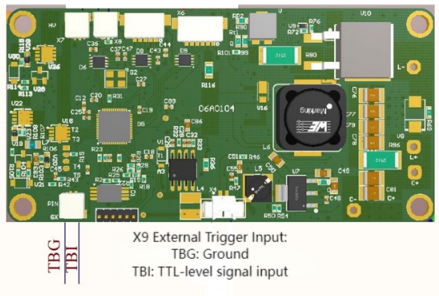
2.3 Mechanical Interface: See **Figure 1**



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2.3 Electrical Interface

- Communication interface: one RS-422 serial port.
- External trigger interface: provision for an external coding trigger. The external trigger input accepts TTL-level signals, 3.3 V logic, rising-edge triggered. Minimum pulse width: >10 μs.
- Connector: see figure below for pinout and connector type.



Connector interface definitions are shown in **Table 1**.

Table 1 – Electrical Interface Definitions

Pin No.	Signal Name	Description
1	422-GND	RS-422 ground
2	24V	Power supply +
3	24V	Power supply +
4	24V GND	Power supply −
5	24V GND	Power supply −
6	422_RX+	Host → Laser Rangefinder +
7	422_RX−	Host → Laser Rangefinder −
8	422_TX−	Laser Rangefinder → Host −
9	422_TX+	Laser Rangefinder → Host +

2.4 Environmental Conditions

Operating Temperature: −40°C to +60°C

Storage Temperature: −45°C to +70°C

3. COMMUNICATION PROTOCOL

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3.1 Communication Standard

Asynchronous Serial Communication Standard: RS-422

Baud Rate: 115200 bps

Data Format: 8 data bits, 1 start bit, 1 stop bit, no parity
For each byte, the least significant bit (LSB) is transmitted first. For multi-byte data, the lower byte is transmitted first.

3.2 Output Information

Output information refers to commands sent from the host system to the laser ranging module, consisting of:

Header (0x55)

Command Byte 1

Command Byte 2

Command Byte 3

Checksum — XOR result of bytes 1–4

The definitions for Command Byte 1 are as follows:

Table 2 – Command Byte 1 Definitions

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
0x00: Standby 0x01: Start self-test 0x02: Single ranging 0x03: Continuous ranging (1 Hz) 0x04: Continuous ranging (5 Hz) **0x05: Laser designation** **0x06: Long-period designation** 0x07: Short-period designation 0x08: Stop ranging/designation 0x09: Set gate value 0x0A: Report accumulated laser pulse count 0x19–0x20: Modify laser code parameters (Codes 9–16) 0x29–0x30: Read laser code parameters (Codes 9–16)							

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The definitions for **Command Byte 2** are as follows:

Table 3 – Command Byte 2 Definitions

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
During laser designation: Laser codes 1–16 (**long and short designation modes require code selection**) During ranging: 1 – First target; 2 – Last target When setting gate value: Low byte of range gate value When modifying parameters for laser codes 9–16: Low byte of laser code, period ×100 (e.g., 5000 represents 50 ms, range 40 ms–63 ms)							

The definitions for **Command Byte 3** are as follows:

Table 4 – Command Byte 3 Definitions

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
During laser designation: Set laser designation duration (1–25); **Not required for long or short designation modes (set to 0x00).** When setting gate value: High byte of range gate value. When modifying parameters for laser codes 9–16: High byte of laser code, period ×100 (e.g., 5000 represents 50 ms, range 40 ms–63 ms).							

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3.3 Input Information

Input information refers to the status data received by the host system from the laser rangefinder/designator module, including:

- Header (0x55)
- Status byte
- Target distance / accumulated laser pulse count (2 bytes); low byte first, high byte second;
  Laser code parameters for Codes 9–16, period ×100 (e.g., 5000 represents 50 ms, range 46 ms–56 ms); low byte first, high byte second;
- Current temperature of the laser rangefinder/designator module
- "Tail" is a checksum calculated as the XOR of bytes 1–5.

Definitions of the **status byte information** are shown in **Table 5**.

Table 5 – Status Byte Definitions

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00

0: No laser emission 1: Laser emission active	0: Valid ranging 1: Invalid ranging	Laser flag alternates between 1 and 0	1: Over-temperature warning 0: Temperature normal		0: No external trigger 1: External trigger present	00: Standby 01: Ranging 02: Designation

Target Distance Information Definition:
The distance value is represented by **2 bytes (16 bits)** as an integer, which can be directly converted to a decimal value.
In **standby mode**, status information is returned every **10 seconds** as part of the periodic self-test.
In **ranging** and **designation** modes, status is returned according to the laser emission frequency.

Cumulative Laser Pulse Count Definition:
Since a 16-bit binary number represents values in the range **0–65535**, and the laser rangefinder/designator has a service life of **1,000,000 pulses**, the pulse count is defined as a multiple of **20**, resulting in a range of **0–1,310,700**.

Current Temperature of the Laser Rangefinder/Designator Module:
Bits **d7–d0** represent the temperature in **two's complement** format, with a valid range of **–128 to +127**, in units of **°C**.

Notes:

- The status feedback frame is automatically transmitted every 10 seconds. That is, during power-on, standby, range-stop, or designation-stop states, one status frame is sent every 10 seconds.
- The device automatically stops ranging after 5 minutes at 1 Hz or 1 minute at 5 Hz (a total of 300 measurements).
- After modifying laser code parameters, the new settings must be saved to flash memory to ensure they are retained after power cycling.
- In Table 5, BIT05 alternates between 1 and 0, indicating that feedback data has been updated.
- Each time laser designation is started, one full designation cycle is executed automatically, after which the device stops emission. The laser code only defines the pulse interval, while the designation command includes a duration parameter (1–60 s).
- In long designation mode, the continuous emission time is 47 s, with a 30 s interval between two cycles.
- In short designation mode, the continuous emission time is 18 s, with a 10 s interval between cycles, for a total of 8 cycles.
- Preset Laser Code Information:

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Code 1 → Period = 50000 μs
Code 2 → Period = 49800 μs
Code 3 → Period = 49600 μs
Code 4 → Period = 49400 μs
Code 5 → Period = 50200 μs
Code 6 → Period = 50400 μs
Code 7 → Period = 50600 μs
Code 8 → Period = 50800 μs

The above values represent laser pulse interval times in microseconds (μs).

4. HARDWARE CONNECTION

4.1 Interface and Definitions

4.1.1 Standalone Test Cable Interface Definitions

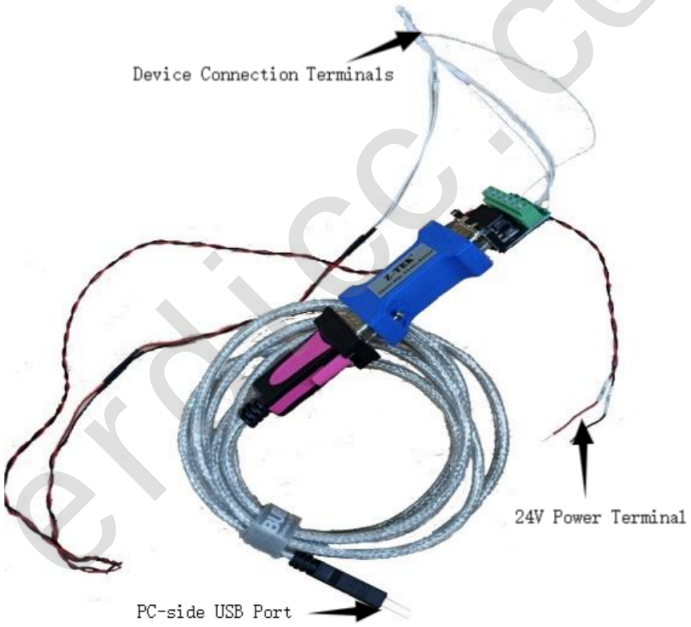


Figure 2 Standalone Test Cable

4.1.2 System Connection Cable

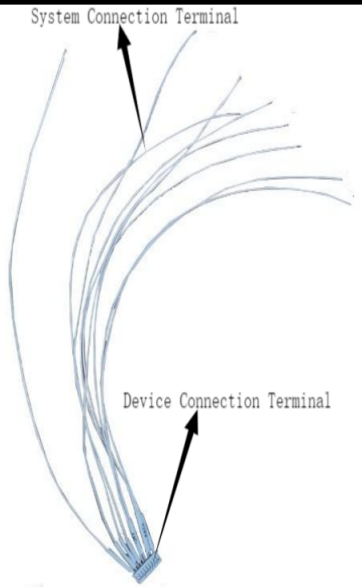


Figure 3 System Connection Cable

4.2 Connection

4.2.1 Standalone Test Cable Connection

During standalone testing, for ease of operation, a standalone test cable can be used to connect the system to the host computer.

The specific procedure is shown in Figures 4, 5, and 6 below:

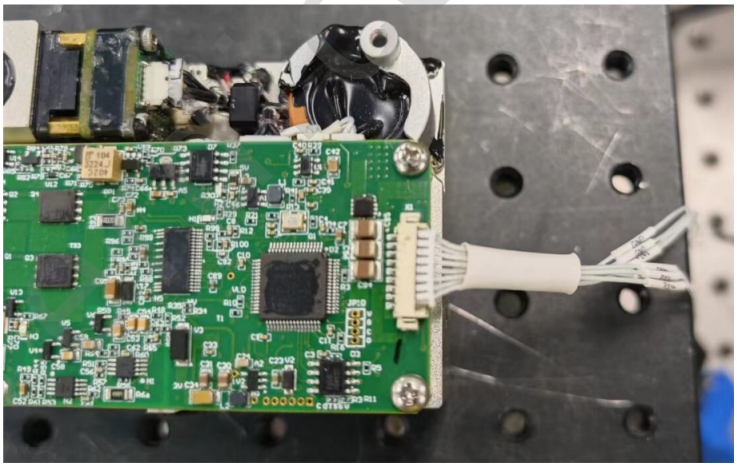


Figure 4 Device Terminal Connection

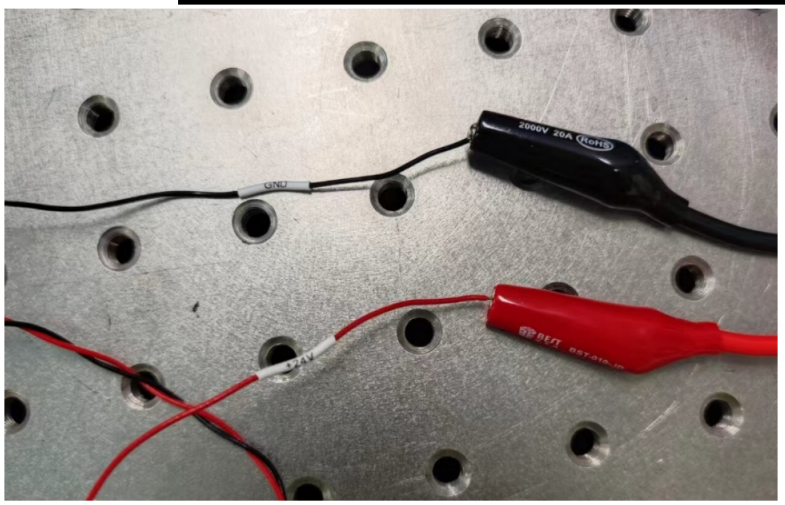


Figure 5 24V Power Supply Connection

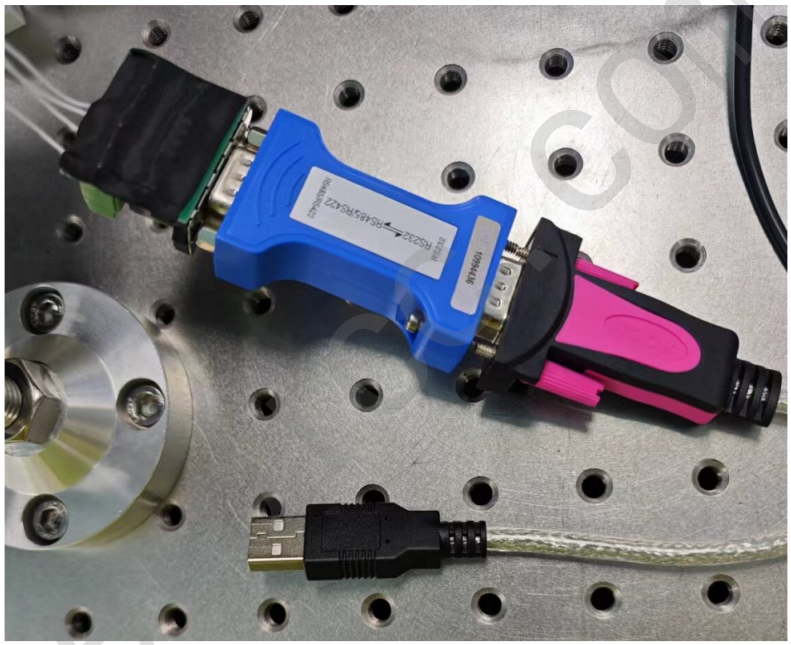


Figure 6 USB Terminal Connection to Host Computer

Standalone Test Wiring:

- Connect the standalone test cable plug to the laser device's corresponding 9-pin socket, as shown in **Figure 4.**
- Connect the **24V power cable** to the **DC regulated power supply**. Ensure correct polarity according to the wire markings, as shown in **Figure 5**.
- Connect the **USB cable** to the **computer**.

4.2.2 System Connection Wiring:

- Connect the **standalone test cable plug** to the laser device's corresponding 9-pin socket, as shown in **Figure 4**.

▶ Connect the **system connection cable terminals** to the system according to the identification labels.

5. HOST COMPUTER OPERATION

5.1 Host Computer Software

Open the software folder and double-click the **startup file "** DebugXY_606.exe **"** to launch the program.

5.2 Communication Connection

Asynchronous serial communication standard: **RS-422**

Baud rate: **115200 bps**



Check the communication cable, then click **"Detect"** until an available serial port is found.
Select a baud rate of **115200** and connect to the serial port.

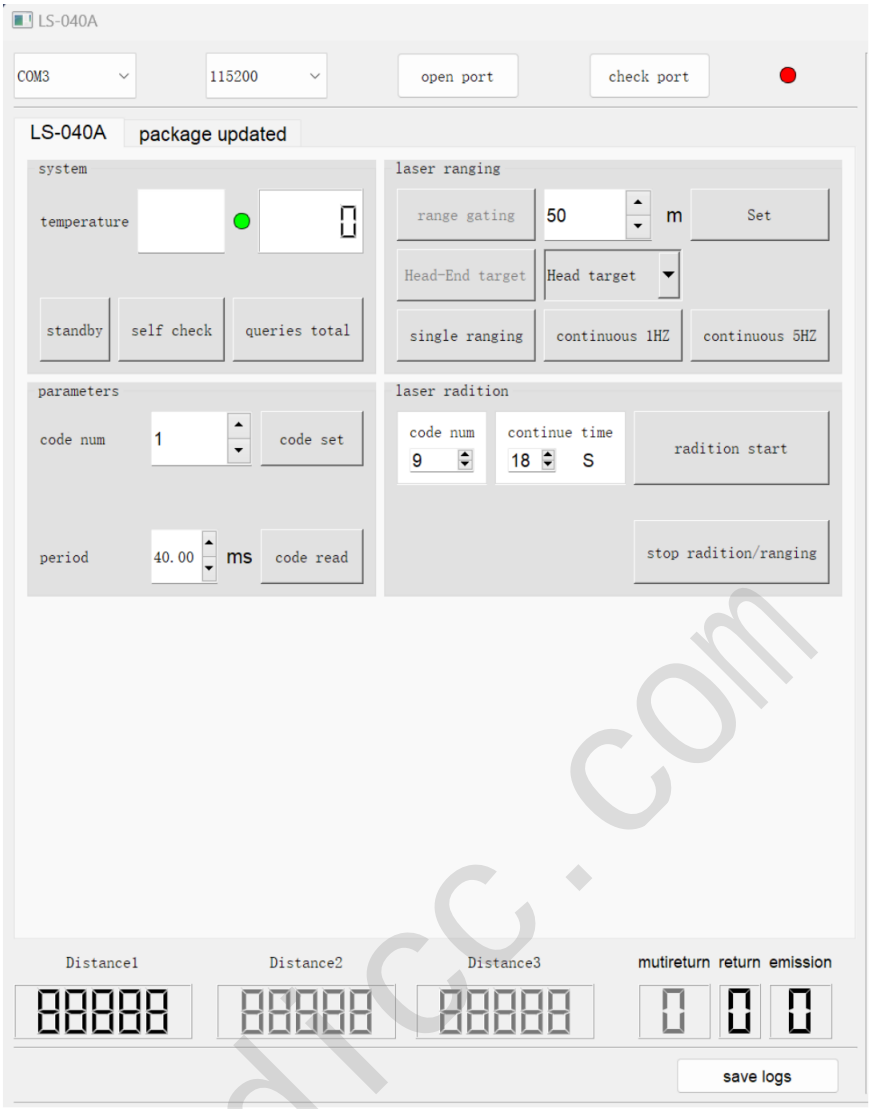
Once the connection is successful, the **icon changes to "** **"** to indicate a normal connection.

5.3 Receiving Information

The output information is displayed in the software's **data reception window**, with **heartbeat data transmitted every 10 seconds**.
Click **"Clear"** to delete historical data and start receiving again.
After executing each command, the system automatically resumes heartbeat data reception.

5.4 Command Transmission

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5.4.1 Status Bar – Operation and Fault Indication

The status bar icons indicate the device's current state:

Normal operation: Icon displays "●".

Over-temperature fault: Icon turns **red "●"** to indicate a fault condition.

Click **"Query Total Count"** to check the total number of laser emissions.
Click **"Self-Test"** to inspect the device's operating status.
Click **"Standby"** to switch the device into standby mode.

5.4.2 Command Bar – Sending Commands

The command bar includes the following functions:

Laser Pulse Count Query

Gate Value (Range Gate) Setting

Laser and Illumination Command Buttons (and a stop button for halting ranging/illumination mid-process)

After executing any command, heartbeat data reception will automatically resume.

5.5 Laser Ranging Parameter Settings

- The **range gate distance** defines the **minimum valid ranging distance**. Measurements below this threshold will display **0**.
- Select **First Target** or **Last Target**, then click **Single Measurement**, **1 Hz Measurement**, or **5 Hz Measurement** to perform the corresponding task.
  The system will return the measured distance of the selected target.

5.6 Laser Illumination Settings

- In the **Parameter Settings Panel**, configure the desired **encoding parameters** (Encoding Number and Encoding Period – i.e., the interval between two laser pulses).

  Note: The encoding parameters must be set before initiating any illumination task.

- Use **"Encoding Query"** to review the currently configured encoding parameters.
- Select the **encoding number** and set the **illumination duration** to start or stop a laser illumination task.

5.7 Distance Display

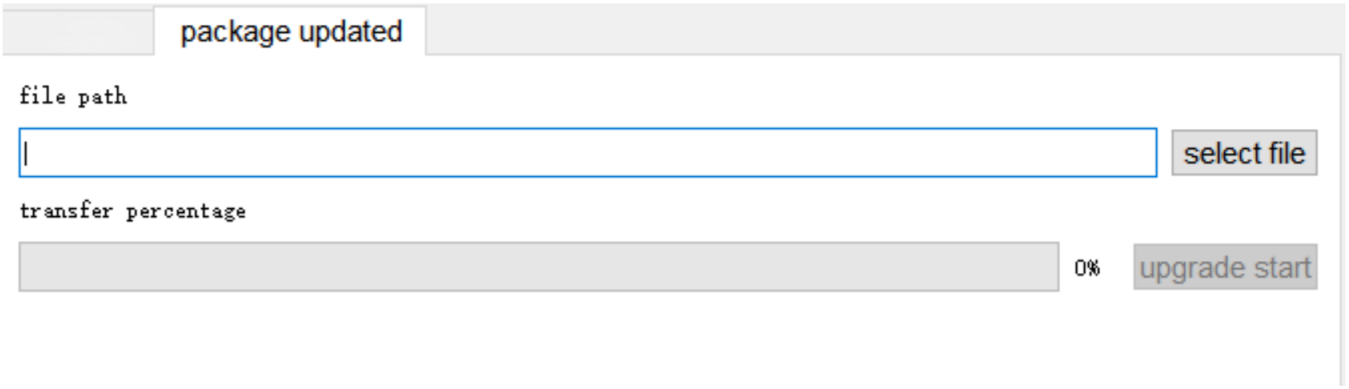
Displays the measured or calculated target distance during ranging or illumination operations.



When no ranging or illumination is being performed, the distance display appears as shown above.
During normal ranging or illumination operation, **"Distance 1"** displays the current measured distance.

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5.8 File Update



When a program update is required, click the **"Select File"** button to choose the update file. After selecting the file, click **"Update Start"** and wait for the progress bar to complete. When the "Update Successful" popup appears, the program update has been completed successfully.

5.9 Interface Function Descriptions

- **Close Port** – Opens or closes the serial communication port.
- **Check Port** – Scans for and detects available serial ports.
- **System** – System status panel:

  - **Temperature** – Displays the current device temperature.
  - **Standby** – Sets the device to standby mode.
  - **Check Self** – Performs a full system self-test.
  - **Query Total** – Displays the total number of laser emission pulses.

- **Laser Ranging** – Laser distance measurement panel:

  - **Set** – Configures the laser ranging gate threshold (minimum measurable distance).
  - **Single Ranging** – Performs a single laser distance measurement.
  - **Continuous 1 Hz** – Starts continuous ranging at 1 Hz frequency.
  - **Continuous 5 Hz** – Starts continuous ranging at 5 Hz frequency.

- **Parameters** – Laser code parameter configuration panel:

  - **Code Num** – Specifies the laser code number to be written.
  - **Period** – Sets the code period (the interval between two laser pulses).
  - **Code Set** – Writes the configured code number and period to the device.
  - **Code Read** – Reads the parameters of the selected code number.

- **Laser Radiation** – Laser designation (illumination) control panel:

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- **Code Num** – Selects the current laser code number for target designation.
- **Continue Time** – Sets the laser illumination duration.
- **Stop Radiation/Ranging** – Stops the current laser illumination or ranging task.
- **Radiation Start** – Initiates a coded laser illumination task based on the selected code number and duration.

- **Distance1 / Distance2 / Distance3** – Display the current measured distances; Distance 2 and Distance 3 correspond to multiple target returns.

- **Emission** – Laser emission indicator: "1" indicates normal laser output.
- **Return** – Laser return signal indicator: "1" indicates a valid return signal received.
- **MultiReturn** – Multi-target return indicator: "1" indicates multiple targets detected.
- A display of "0" for any indicator means the signal was not transmitted or received properly.

6. OPERATING PRECAUTIONS

- The laser housing is **hermetically sealed and dustproof**. Do **not** open the housing without authorization. Breaking the seal may cause **irreversible damage** to the internal laser components.
- Any **unauthorized disassembly** of the product will **void all warranty and after-sales support**.
- The device contains **high-voltage circuits**. Do **not** attempt to open or service it unless you are **qualified personnel**.
- To **protect the laser detector**, do **not** perform ranging on targets closer than **50 meters**.
- During operation, **do not block** the optical window with hands or any other object.
- When performing **optical axis alignment** or **indoor laser emission**, ensure that the **receiver window is fully covered** to prevent damage to the photodetector.

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7. TRANSPORTATION AND STORAGE

During transportation and storage, the device should be **protected from dust, moisture, extreme cold or heat**, and from environments containing **acidic, alkaline, or other corrosive vapors and chemicals**.