ERDI LASER®

LDR80K1 Laser Rangefinder Target Designator

Model:LDR80K1

PRODUCT DESCRIPTION

The LDR80K1 Laser Rangefinder and Target Designator System is a cutting-edge technological product meticulously crafted to meet the demands of high-precision target designation, rangefinding, and laser coding indication. This system effortlessly achieves precise measurements over ultra-long distances, with a maximum rangefinding capability exceeding 10km. Additionally, it boasts formidable strength in target designation, covering distances of 6000m and beyond. Notably, the LDR80K1 is designed with extreme lightweight in mind, with the entire unit's weight strictly controlled to be within 650g. This maintains its advantage of being compact and portable without compromising the stability and excellence of its performance.

To cater to the diverse needs of different operational scenarios, this system specially offers customizable laser divergence angles ranging from 0.3 ~ 1 mrad, providing high flexibility. Furthermore, the LDR80K1 strictly adheres to internationally recognized industry standards, ensuring its wide applicability and high reliability across the globe. With its outstanding durability, precise measurement capabilities, and compact, portable design, the LDR80K1 Laser Rangefinder and Target Designator System has undoubtedly become the ideal choice for professionals who pursue efficient and accurate operations.

The laser rangefinder target designator offers the following functions:

- Respond to laser ranging and target designator commands, with the ability to stop ranging or target designating instantly upon receiving a stop command.
- Output distance data and status information for each pulse during ranging.
- Automatically stop ranging after 5 minutes if no stop command is received after initiating 1Hz ranging.
- Automatically stop ranging after 5 minutes if no stop command is received after initiating 5Hz ranging.
- Allow for setting the target designator time, code, and output the selected settings.
- Respond to laser target designator commands by designating targets according to the set mode and code.
- Output distance values and status information for each pulse during laser target designation.
- Prioritize responding to target designator commands. If a target designator command is received during continuous ranging, immediately stop ranging and respond to the target designator command. While executing a target designator command, do not respond to any other commands except for stop target designator commands.
- Allow for adjustment of output energy.
- Report the cumulative number of emitted laser pulses (with data retention during power loss).
- Perform self-tests (including power-on self-test, periodic self-test, and start-up self-test) and output fault codes.

1）Power-on self-test: Including

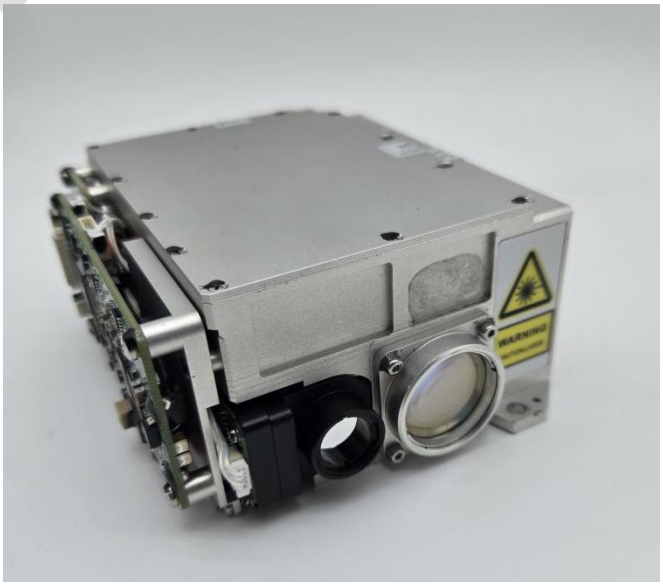
High temperature alarm;

2）Startup and periodic self-tests: Including

High temperature alarm;
Charging and discharging;
Laser emission/non-emission.

Note: As the laser range finder/designator can only detect charging and discharging issues as well as laser emission/non-emission faults when emitting a laser, the power-on self-test does not require the detection of these two faults. During startup and periodic self-tests, the laser range finder/designator reports the detection results from the last target designator or ranging operation.

- Capable of monitoring temperature and reporting the current operating temperature of the system;
- Outputs a temperature alarm.



TECHNICAL SPECIFICATIONS

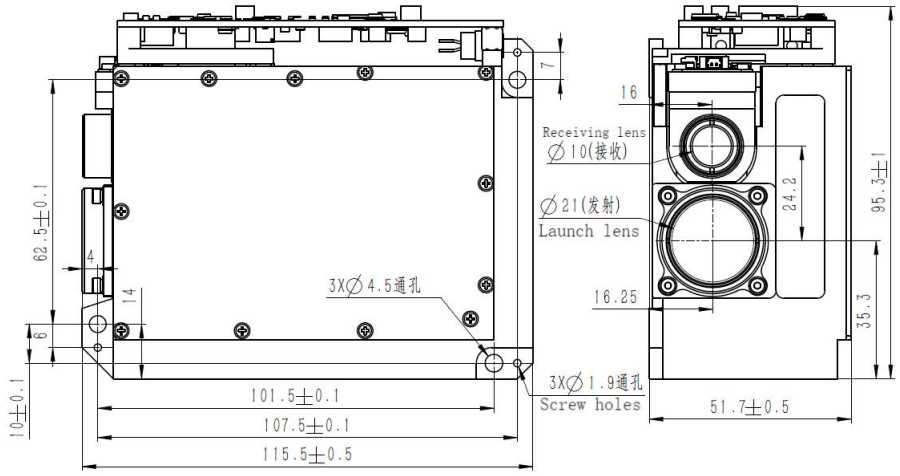
Range Finding/Target Indication Parameters	
Laser ranging and target designation operating mode	Ready to work instantly

Maximum ranging distance	≥10km (visibility 23km, target reflectivity 0.2, target size 2.3m x 2.3m)
Minimum ranging distance	300m
Ranging accuracy	≤5m
Ranging logic	3 goals
Laser target designation distance	≥6000m
Ranging frequency	1 ~ 20Hz
Target designation frequency	1 ~ 20Hz
Accuracy rate (or Measurement success rate)	98%
Continuous ranging time	5min(1Hz)/1min (5Hz)/20S（20hz）
Continuous laser target designation time	**Short-cycle Laser Target Designation:** ➢ Duration of a single illumination is not less than 17 seconds, with an interval of not more than 30 seconds, and continuous illumination for 8 cycles. **Long-cycle Laser Target Designation:** ➢ The duration of a single laser target designation is not less than 60 seconds. When initiating laser target designation again, the interval is not more than 45 seconds, and it is capable of continuous laser target designation for 4 cycles. ➢ After a single long-duration or short-duration target designation, the interval for restarting is not more than 30 minutes.
Encoding	Complies with MIL-STD-810F requirements; possesses user-defined coding expansion capabilities.
Laser encoding pattern	Equipped with external synchronization signal reception capability. Precise frequency codes (eight sets of pre-stored periodic code encodings); Customizable code patterns, etc.
Encoding accuracy	±2.5μs
Laser Parameters	
Laser Type	LD Pumped Nd:YAG Crystal
Cooling Method	Passive cooling, no temperature control
Wavelength	1064nm±3nm
Single Pulse Energy	≥80mJ
Energy Fluctuation	＜10% (Energy Standard Deviation / Average Energy Value × 100%) - Less than 10% (Energy Standard Deviation / Average Energy Value × 100%)
Repetition Rate	0～20Hz adjustable - Adjustable from 0 to 20 Hz
Pulse Width	≥15ns±5ns
Beam Divergence Angle	≤0.3mrad [Customizable 0.3mrad～1mrad]
Laser Beam Axis Instability	≤0.05mrad
Laser Start-up Time	10s
Laser Safety Class	Class 4
Environmental adaptability	
Operating Temperature	-40℃~55℃
Storage Temperature	-55℃~70℃
Vibration and Shock Standards	Meets the vibration and shock requirements for airborne equipment as specified in MIL-STD-810F
Electrical Parameters	
Power Supply Voltage	20 ~ 28VDC(typical 24 V)
Total Power Consumption	Standby Power Consumption: ≤ 5 W Average Power Consumption: ≤ 80 W Peak Power Consumption: ≤ 120 W
Communication Interface	RS422 (Standard)
Baud Rate	115200bit/s
Mechanical Parameters	
Weight	≤700g

Overall Dimensions	≤117×97×53mm
Non-parallelism between Mounting Base and Optical Axis	0.5mrad

STRUCTURAL DRAWING (mm)

The overall dimensions are ≤117×97×53mm (L×W×H). The mechanical interface is as shown in Figure 1：



ELECTRICAL INTERFACE

Baud rate: 115200 bits per second.

The socket model for the laser rangefinder target designator is J30J-15ZKP; the corresponding plug model for the photoelectric system end is J30J-15TJL(WL150A4). The specific signal definitions for the laser rangefinder target designator are shown in Table 1:

Pin	Signal Definition	Input/Output	Description	Remarks
1	+24V	Input	The power supply characteristics meet the relevant requirements of MIL-STD-810F.	Power supply
2	+24V			
3	+24V			
4	+24V_GND			
5	+24V_GND			
6	+24V_GND			
7	Power-on control +	Input\Output	See the requirements for the power-on control section for details.	I/O control
8	Power-on control -			
9	RS422_RX+	Input\Output	The signal level and drive capability meet the RS422 interface standard. Characteristic impedance: 120Ω.	The transmit/receive pin definitions correspond to the laser rangefinder target designator itself.
10	RS422_RX-			
11	RS422_TX+			
12	RS422_TX-			
13	RS422_GND			
14	External synchronization control signal +	Input	The signal level and drive capability comply with the RS422 interface standard.	External synchronization signal for controlling laser encoding.
15	External synchronization control signal -			

COMMUNICATION PROTOCOL

1.Scope

This document outlines the software communication protocol between the Computer Board (hereinafter referred to as JSB) and the Laser Rangefinder Target Designator (hereinafter referred to as LD).

Communication Protocol between JSB and LD

2.Interface Description

The communication between JSB and LD employs a four-wire RS422 interface, encompassing transmission in two directions: from JSB to LD (control commands) and from LD to JSB (return status).

3.Communication Standard and Baud Rate

For both control commands and return codes, the communication standard and baud rate are stipulated as follows:

- Asynchronous serial communication standard: RS-422;
- Baud rate: 115200bps;
- Transmission format: 1 start bit;
- Data bits: 8;
- Stop bits: 1;
- Parity bit: none.

For each byte of information, the least significant bit (LSB) is transmitted first. In the case of multi-byte information, the lower byte is transmitted first.

4.Message Format

The communication message format is as follows:

Table 3: Message Format Description

Message Header (1 byte)
Subsystem ID Number (1 byte)
Message Body
Message Tail (1 byte, i.e., checksum)

The "Message Header" is 0xdd, serving as a synchronization code indicating the start of a frame of information.

The "Subsystem ID" is 0x03, identifying the Laser Rangefinder Target Designator.

The "Message Body" represents specific control commands and return status information content (see "Data Protocol" for details).

The "Message Tail" is the checksum, calculated by summing all bytes of the message body and taking the modulo 256 of the result.

5.Time Sequence Control

After power-on and initialization, the LD (Laser Device) reports readiness information at a 10-second interval.

The JSB (Control System) sends various operational commands to the LD in real-time as needed. Upon receiving any command from the JSB, the LD must respond with a corresponding status frame within 20 milliseconds; otherwise, the response is considered invalid. For ranging commands and target designator commands, the LD continuously replies with status updates according to the pulse cycle until laser emission stops. For commands to read the laser pulse count, the corresponding return byte represents the pulse count; for ranging and target designator commands, the corresponding return byte represents the target distance.

During continuous ranging or target designation by the LD, it must respond to stop commands from the JSB at any time, providing feedback on the stop status. When the ranging or target designator period of the laser expires, it actively sends a stop status frame. It does not respond to other commands, and for ranging commands received during continuous ranging or target designator commands received during target designation, it does not respond to them belatedly after the current continuous ranging or target designation ends.

Target designator commands have higher priority than ranging commands. During ranging, the LD can still respond to target designator commands.

The self-check results returned by the LD should represent the latest power-on self-check, periodic self-check, or startup self-check results.

6.Exception Handling Requirements

- When the LD and JSB receive any scrambled data sequences, they should not enter an unknown state or cause a system lock-up. They should be able to respond normally when valid data sequences arrive.
- Both parties must strictly perform checksum verification, and any information that fails the verification should be discarded.
- Certain protective conditions should be designed to ensure that no communication data sequence can lead to unrecoverable failures.

7.Data Protocol

Output Information

Output information refers to the commands sent by the JSB to the LD, as described in Table 4.

Table 4: Description of Output Information

Pin	Labels	Content
0	Message Header	0xdd
1	ID Identifier	0x03
2	Command Word 1	See Table 5
3	Command Word 2	See Table 6
4	Command Word 3	See Table 7
5	Checksum	Checksum: Modulo 256 of the sum of bytes 0 ~ 4

Table 5 Command word 1 definition

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
0x00: No self-test 0x01: Self-test 0x10: Single ranging 0x02: Ranging at 1HZ 0x03: Ranging at 5HZ 0x04: Single shot (Short-time target designator mode: each cycle has a target designator time of 17s, with a 30s interval, capable of continuous target designator for 8 cycles) 0x05: Continuous shot (Long-time target designator mode: each cycle has a target designator time of 60 s, with a 45s interval, capable of continuous target designator for 4 cycles) 0x06: Short shot (One cycle, with adjustable target designator time < 60s)							

0x07: Stop ranging/target designator

0x08: Range gating (Lower limit for ranging distance, ranging will not display if below the set value)

0x09: Query laser cumulative count

0x0C: Ranging first target (Reserved)

0x0D: Ranging last target (Reserved)

0x0E: MRAK mode

0x11 ~ 0x20: Code setting (Corresponding to codes 1 ~ 16)

0x21 ~ 0x30: Code querying (Corresponding to codes 1 ~ 16)

Table 6 Command word 2 definition

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
For the laser target designator:0x01 to 0x10 correspond to codes 1 to 16. For range gating:The low byte of the distance value. For code setting:The low byte of the code cycle.							

Table 7 Command word 3 definition

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
For the laser target designator:The laser target designator time setting is from 0 to 60 seconds. For range gating:The high byte of the distance value. For code setting:The high byte of the code cycle.							

8.Input Information

Input information refers to the status information received by JSB from LD, as shown in Table 8.

Table 8: Description of Input Information

Pin	**Labels**	**Content**
0	Message Header	0xdd
1	ID Identifier	0x03
2	Status Word 1	See Table 9
3	Status Word 2	See Table 10
4	Target Distance / Accumulated Count / Code Cycle	The distance value can be directly converted into a decimal number. Since a 16-bit binary number represents a range of 0 ~ 65535, and the service life of the laser rangefinder target designator is 1 million times, it is agreed that the number of laser emissions is a multiple of 20, ranging from 0 ~1310700.
5		
6	Current temperature of the laser rangefinder/target designator.	Represented in two's complement, with a range of -128~ +127 degrees Celsius.
7	Checksum.	The sum of bytes 0~ 6 is taken modulo 256.

The relevant definitions of status word 1 and status word 2 information are shown in Table 9 and Table 10:

Table 9 Status word 1 information definition

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
0: No laser 1: With laser	0: Distance measurement is valid 1: Distance measurement is invalid	1/0: Pulse emission flag (0 and 1 alternate when a new pulse is generated)	1: Over temperature alarm 0: Normal temperature	1: UART device failure 0: UART device normal	1: Charge and discharge fault 0: Charge and discharge normal	Temperature control preparation status 0: Not ready 1: Ready	

Table 10 Status word 2 information definition

BIT07	BIT06	BIT05	BIT04	BIT03	BIT02	BIT01	BIT00
0x0～0xf corresponds to codes 1～16				0000: Standby 1001: Single ranging 0001: Ranging at 1HZ 0010: Ranging at 5HZ 0011: Single shot 0100: Continuous shot 0101: Short shot 0110: Range gating 0111: Stop ranging/target designator 1000: Self-check 1010: MARK ranging 1011: Code query			

PRECAUTIONS FOR USE

- The laser emitted by this product is classified as Class 3B. Do not expose it directly to human eyes or skin, or focus it through lenses.
- The laser housing of the product is designed to be airtight and dustproof. Do not attempt to open the housing yourself, as damaging the product's seal may result in damage to the core laser components.
- This product contains high voltage. Non-professionals should not attempt to disassemble the product.
- To prevent damage to the laser detector, do not range targets at close distances (within 50 meters), and do not cover the optical window with your hand or other objects.
- When adjusting the system's optical axis or emitting the laser indoors, ensure that the receiving window is fully covered to prevent damage to the photoelectric detector.