ERDI LASER®

LDR80K2 Laser Rangefinder &Laser Target Designation

Model:LDR80K2

1 PRODUCT DESCRIPTION

LDR80K2 1064nm Laser Rangefinder & Laser Irradiation. The ranging capability for NATO targets is ≥ 20 km. The ranging frequency is 1~ 20 Hz. The laser illumination distance is ≥8 km. The pulse width is ≥ 15 ns ± 5 ns. The beam divergence angle is ≤ 0.25 mrad. The weight is ≤850 g.

2 TECHNICAL SPECIFICATIONS

CONTROL FUNCTION	
The laser target indicator can achieve the following control functions through the serial interface.	It can respond to laser ranging and irradiation commands, and can stop ranging and irradiation at any time according to the stop command.
	During ranging, distance data and status information are output once for each pulse.
	If no stop command is received after starting the 1Hz ranging, it will automatically stop after 5 minutes.
	If no stop command is received after starting the 5Hz ranging, it will automatically stop after 5 minutes.
	It can set the irradiation time and coding, and can output the selected settings.
	It can respond to the laser irradiation command and perform irradiation according to the set mode and coding.
	During laser irradiation, the distance value and status information are output once for each pulse.
	It gives priority to responding to the irradiation command. During continuous ranging, if an irradiation command is received, the ranging should be stopped and the irradiation command should be responded to immediately. During the execution of the irradiation command, it will not respond to other commands except the stop irradiation command.

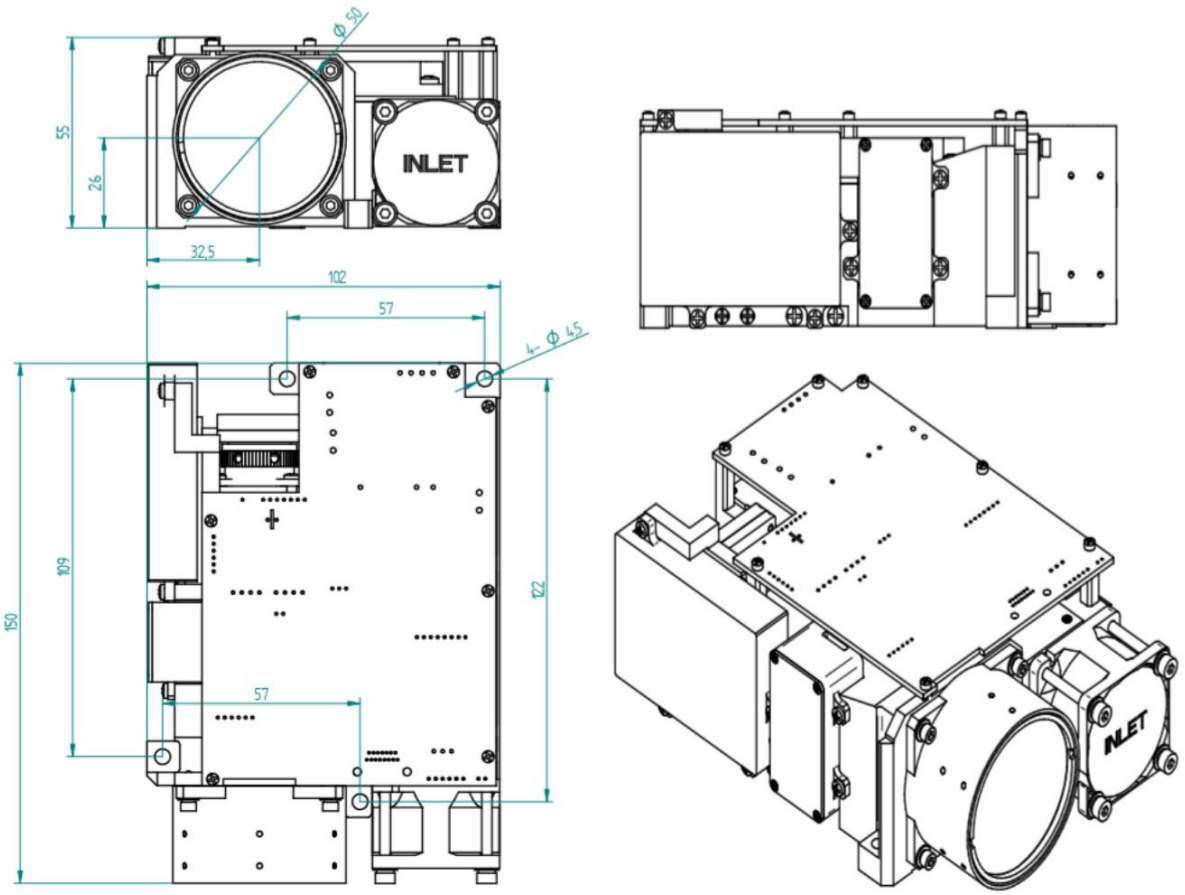
https://erdicn.com **Email :** sales@erdicn.com
Tel: +86-28-81076698 **Fax:**+86-28-87897578
ERDI TECH LTD

	It can report the cumulative number of emitted laser pulses (the data will not be lost in case of power failure).
	It conducts self-checks (including power-on self-check, periodic self-check, and initiated self-check), and outputs fault codes. a. Power-on Self-check: (Including high-temperature alarm); b. Initiated and Periodic Self-check: (Including high-temperature alarm, charging and discharging, laser emitting/non-emitting.) Note: Since the laser range finder and illuminator can only detect the faults of charging and discharging as well as laser emitting/non-emitting when the laser is being emitted, the power-on self-check does not require the detection of the above two types of faults. During the initiated self-check and periodic self-check, the laser range finder and illuminator reports the detection results from the last irradiation or ranging operation.
	It can monitor the temperature and report the current operating temperature to the system.
	It provides temperature alarm output.
PARAMETER INDICATORS	
Pump Source	Laser LD (Laser Diode) Pumping
Cooling Method	Passive cooling, no temperature control
Working Mode	Laser Ranging, Laser irradiation
Operating Wavelength	1064nm±1nm
Pulse Energy	≥80 mJ
Laser Energy Stability	Within a single irradiation cycle, the pulse energy fluctuation does not exceed 10% of the average energy.
Pulse Width	≥15ns±5ns
Beam Divergence Angle	≤0.25 mrad
Stability of The Laser Optical Axis	≤0.05mrad
RANGING PERFORMANCE	
Ranging Frequency	1~20 Hz
Continuous Ranging Time	≤300m
Maximum Ranging Distance	≥20 km (Under the conditions of a target with a size of 2.3m×2.3m, a diffuse reflectance coefficient of not less than 0.2, a visibility of not less than 23 km, and a relative humidity of not more than 70%)
Ranging accuracy	±1m.
Successful Ranging Rate	≥98%
Continuous Laser Ranging Time	5min(1Hz)/1min (5Hz)/20S（20hz）
IRRADIATION PERFORMANCE	
Precision of Laser Coding	±1μs
Trigger mode	Internal synchronization irradiation, external synchronization irradiation (trigger delay: 304.0us ± 0.1us)
Laser Irradiation Frequency	1~20Hz

Laser Irradiation Distance		≥10000m
Laser Target Designation Cycle		Short - duration irradiation mode: The irradiation time for each cycle is 17 seconds, with an interval of 30 seconds. It can perform continuous irradiation for 8 cycles.
		Long - duration irradiation mode: The irradiation time for each cycle is 60 seconds, with an interval of 45 seconds. It can perform continuous irradiation for 4 cycles.
LASER CODING		
It complies with the requirements of MIL-STD-810G standard and has the expandable capability of user self-coding.		
It has the ability to receive external synchronous signals and encodes by controlling the laser beam emitting mode through external signals.		
Coding method: Precise frequency code (encoded with eight groups of pre-stored periodic codes).		
DIMENSIONS AND WEIGHT		
External Dimension Envelope		≤150×102×55mm
Weight		≤850g
Degree of non-parallelism between the installation reference base and the optical axis		0.5mrad
INPUT POWER SUPPLY REQUIREMENTS		
During operation, the average power consumption is not more than 55W, and the peak power consumption is not more than 100W.		
The operating voltage range is from 20V ~ 28V.		
THREE-PROOFING FOR ELECTRICAL COMPONENTS		
After the circuit board is designed and debugged, it is coated with three-proofing paint for "three-proofing" treatment.		
ENVIRONMENTAL ADAPTABILITY REQUIREMENTS		
High Temperature	Operating temperature	≤ +55°C
	Storage temperature range	≥ -40°C
Low Temperature	Operating temperature	≥ -40°C
	Storage temperature range	≥ -45°C
Vibration Requirements		It can withstand the flight vibration as well as the impacts during takeoff and landing, and all equipment can withstand the environmental conditions of automobile transportation.
		The vibration is in the form of a swept frequency spectrum. From 15Hz to 33Hz, it is a sinusoidal vibration with equal displacement, and the displacement magnitude is 0.91mm; from 33Hz to 700Hz, it is a sinusoidal vibration with equal acceleration, and the acceleration is 2g.
		Vibrate in each of the three directions for 1 hour.
		Specimen Status: The product is placed on the test bench in the normal operating state for the impact test, and the product is powered on.
		After the impact test, the product should operate normally.
Shock Requirements		Vertical axial direction: ≥ 10g,
		Horizontal axis direction: ≥ 10g,
		Longitudinal axis direction: ≥ 10g;
		Post-peak sawtooth wave with a duration of 11ms. For the X, Y, and Z

	axes, in two directions of each axis, once for each direction, a total of 18 times.
	Specimen Status: The product is placed on the test bench in the normal use state for the shock test, and the product is powered on.
	After the shock test, the product should operate normally.

3 OUTLINE DIMENSION(mm)



4 PIN INTERFACE

1. The electrical connection interface consists of connectors J30J-21ZKP and J30J-04ZK, which are defined as follows:

Table 1 J30J-21ZKP Interface Definitions

J30J-21ZKP				
pinout	functionality	clarification	orientations	note
1	TX+	RS422 +	exports	RS422 communication

2	TX-	RS422 send -	exports	interface
3	RX+	RS422 Receive +	importation	
4	RX-	RS422 Receive -	importation	
5	GND	RS422 Ground	GND	
6	EN+	power supply enable (computing)		24V power supply enable switch
7	EN-	power supply enable (computing)		
8-13		unoccupied		
14	A	External Synchronous Differential+ (A)	importation	A, B are the A and B outputs of the differential chip (RS422 chip)
15	B	External Synchronous Differential - (B)	importation	
16	LED+	DC5V	importation	Indicator light power supply
17	LED-	GND	importation	
18-21				

Table 2 J30J-04ZK Interface Definitions

J30J-04ZK				
Pinout	functionality	clarification	orientations	note
A, B	24V	Power supply	importation	bonus
C, D	GND	electric place	importation	(loanword) hack (computing)

2. Power supply interface: +24VDC±10%.
3. External trigger: RS422 differential signaling.
4. Cooling Mode: The cooling fan is located on the front of the unit.

5 EMBEDDED SOFTWARE

1. physical interface

Communication interface RS422 full duplex;

Communication format: 1 start bit, 8 data bits, 1 stop bit, no parity bit;

Baud rate: 115200bps;

Format of communication: case-insensitive.

2. newsletter

Send the corresponding message through your computer.

3. Communication formats

The format of the newsletter is as follows:

header	data length	command word	digital	calibration
2 bytes	1 bytes	1 byte	N bytes	1 bytes

- Header: Fixed first byte 0xEB, second byte 0x90.
- Data Length: The number of bytes sent, including the length byte itself, except for the frame header.
- Command word: 1 byte.
- Data: Command data sent, if it is 16bit data, it is split into two bytes, with the high bit at the front and the low bit at the back.
- Checksum: sum of the data (8 bits, except header and checksum), remainder to 0XFF.

3. Control command

Table: Laser Control Commands

serial number	command	clarification	note
Byte1	0XEB	Frame header 1	
Byte2	0X90	Frame header 2	
Byte3	0X14	data length	Byte3~Byte22
Byte4	0X00	Laser stops ranging or irradiating	
	0X01	Single ranging start	
	0X02	1Hz ranging start	
	0X03	1-25Hz ranging start	
	0X04	External synchronized irradiation delay setting	External synchronized irradiation Output delay after the laser receives the external synchronization signal
	0X05	Synchronized internal and external irradiation activation	
	0X06	Distance Selection Setting	
	0X07	Distance Selector Inquiry	
	0X08	Internal synchronized irradiation cycle setting	
	0X09	Internal synchronized irradiation cycle query	
	0X0A	Time code setting	
	0X0B	Synchronized internal/external irradiation switching	
	0X0C	LD current option setting	Default LD current 0 (valid for this power-up)
	0X50	Q delay, LD pulse width setting	
	0X51	LD current setting	
	0X52	Q High pressure setting	
	0X53	APD High Voltage Setting	
	0X54	LD parameter query	
	0X55	Receiver status setting	Default off (Receiver on/off switch)
	0X56	Q High pressure state setting	On by default (not available at this time)
	0X57	LD1 Power state setting	Enabled by default

	0X59	Fan start temperature point	
	0X5A	Write Temperature Parameter Instruction	
	0X5B	Read Temperature Parameter Command	
	0X5C	Command to switch between auto and manual mode	
	0X5D	Query Current Temperature Parameter Command	
	0X5E	Turn off the over-temperature 70℃ stop light output command	
	0X5F	Serial Upgrade Command	
	0X60	Software version search	
Byte5~21	Data1~17		
Byte22	calibration		Accumulate the 3rd to 10th bytes and balance to 0XFF.

Table: Laser Control Command Description

Correspondence of Byte4 bytes to Byte5 to Byte21 bytes of data 1 to 17

NUM	Byte4	Byte5~Byte10 Data1~17		note
1	0X00	Data1~17	0X00	Laser stops ranging or irradiating
2				
3	0X01, 0X02	Data1~17	0X00	Single shot ranging, 1Hz ranging
4	0X03	Data1	ranging frequency	ranging activation Range:1-25Hz (1LSB=1Hz)
		Data2~17	0X00	
5	0X04 (Save)	Data1	High external synchronized light out delay	External synchronized irradiation Output delay after the laser receives the external synchronization signal Range: 303.0-305.0 (1LSB=0.1us) Factory default: 304.0
		Data2	Low external synchronized light out delay	
		Data3~17	0X00	
6	0X05	Data1~5	0X00	irradiation start
		Data6	1. Internal synchronized irradiation code serial number: 0X01:Fixed frequency 0XF2:Time coding 2、This value is fixed to 0X01 for external synchronization.	
7	0X06	Data1	Distance Selection Tongo - Proximity	Distance Selection Setting Unit is m (minimum range 300m, maximum range

		Data2	Distance Selector Low - Proximity	50,000m)	
		Data3	Distance Selection Tongo - Remote		
		Data4	Distance Selector Low-Remote		
		Data5~17	0X00		
8	0X07	Data1~17	0X00	Distance Selector Inquiry	
9	0X08 (Save)	Data1	Internal synchronized irradiation cycle - high	Internal synchronized irradiation cycle setting	Internal synchronized irradiation period T. Irradiation period = (45000us-125000us) in us; default: 50000us (20Hz)
		Data2	Internal synchronized irradiation cycle - medium		
		Data3	Internal synchronized irradiation cycle - low		
		Data4	Internal synchronized irradiation working hours		Unit S, range 1~90 Factory default 90
		Data5	Length of internal synchronized irradiation intervals		Unit S, range 1~255 Factory default 40
		Data6	Number of cycles of internal synchronized irradiation		Range 1~4 Factory Default 1
10	0X09	Data1~5	0X00	Internal synchronized irradiation cycle query	
		Data6	Synchronized irradiation code serial number: 0X01:Fixed frequency 0XF2:Time coding		
11	0X0A (Save)	Data1	Time Code length	Time Code length	Range 1-8 (1LSB=1) Default: 1
		Data2	Time Code 1 - High	Time Code 1 1LSB = 1us	Length: 8 bits Number of Time Codes 1LSB = 1us Range: 40,000-60,000us The default 8 Time Code value is 50000us. The Time Code value is 16 bits, (high byte first, low byte second).
		Data3	Time Code 1 - low		
		Data4	Time Code 2 - High	Time Code 2 1LSB = 1us	
		Data5	Time Code 2 - low		
		Data6	Time Code 3 - High	Time Code 3 1LSB = 1us	
		Data7	Time Code 3 - low		
		Data8	Time Code 4 - High	Time Code 4 1LSB = 1us	
		Data9	Time Code 4 - Low		
		Data10	Time Code 5 - High	Time Code 5 1LSB = 1us	
		Data11	Time Code 5 - Low		
		Data12	Time Code 6 - High	Time Code 6 1LSB = 1us	
		Data13	Time Code 6 - low		
		Data14	Time Code 7 - High	Time Code 7	

		Data15	Time Code 7 - Low	1LSB = 1us
		Data16	Time Code 8 - High	Time Code 8
		Data17	Time Code 8 - low	1LSB = 1us
12	0X0B	Data1	Internal synchronization: 0X00 External synchronization: 0X01	Synchronized internal/external irradiation switching
		Data2~17	0X00	
13	0X0C	Data1	LD current option 0: 0X00 LD current option 1: 0X01 LD Current Option 2: 0X02 LD Current Option 3: 0X03	LD current option setting Default: LD current option 0
		Data2~17	0X00	
14	0X50 (Save)	Data1	High Q delay	Laser Q delay, LD pulse width setting Range: 50-300us (1LSB=1us)
		Data2	Low Q latency	
		Data3	LD pulse width high	Range: 50-300us (1LSB=1us)
		Data4	Low LD pulse width	
		Data5~17	0X00	
15	0X51 (Save)	Data1	LD Current Option 0 Parameters	Range: 0-140A (1LSB=1A)
		Data2	LD Current Option 1 Parameters	Range: 0-140A (1LSB=1A)
		Data3	LD Current Option 2 Parameters	Range: 0-140A (1LSB=1A)
		Data4	LD Current Option 3 Parameters	Range: 0-140A (1LSB=1A)
		Data5~17	0X00	
16	0X52 (Save)	Data1	Q High Pressure - High	Range: 2000-5000 (1LSB=1V)
		Data2	Q High Pressure - Low	
		Data3~17	0X00	
17	0X53 (Save)	Data1	APD High Pressure - High	Range: 40-450 (1LSB=1V)
		Data2	APD high pressure - low	
		Data3~17	0X00	
18	0X54	Data1~17	0X00	LD parameter query
19	0X55	Data1	0X01: Open 0X00: Closed	Receiver status setting (Receiver on/off switch)
		Data2~17	0X00	

20	0X56	Data1	0X01: Open 0X00: Closed	Q High pressure state setting
		Data2~17	0X00	
21	0X57	Data1	0X01: Open 0X00: Closed	LD1 Power status setting
		Data2~17	0X00	
22	0X59 (Save)	Data1	Fan start temperature point	Fan Start Temperature Point Setting Unit ℃ (Range 0-100)
		Data2	0X01: Setting 0X00: Query	Dada1 is 0x00 when queried
		Data3~17	0X00	
23	0X5A	Data1	Temperature Serial Number	
		Data2	amps	Range: 0-140A (1LSB=1A)
		Data3	High Q delay	Q delay Range: 50-300us (1LSB=1us)
		Data4	Low Q latency	
		Data5	LD pulse width high	LD Pulse Width Range: 50-300us (1LSB=1us)
		Data6	Low LD pulse width	
		Data7	Q High Pressure - High	Range: 2000-5000 (1LSB=1V)
		Data8	Q High Pressure - Low	
		Data9~17		
24	0X5B	Data1~17	0X00	Read Temperature Parameter Command
25	0X5C	Data1	Off Auto: 0X00 Enable Auto: 0X01	Command to switch between auto and manual mode
		Data2-17		
26	0X5D	Data1~17	0X00	Query Current Temperature Parameter Command
27	0X5E	Data1-17	0X00	Turn off the over-temperature 70℃ stop light output command
28	0X5F	Data1~17	0X5F	Serial Upgrade Command
29	0X60	Data1~17	0X00	Software version search

Table: Laser Return Data

serial number	command	clarification	note
Byte1	0XEB	Frame header 1	
Byte2	0X90	Frame header 2	
Byte3	0X18	data length	Byte3~Byte26
Byte4	0X00	Laser stops ranging or irradiating	Rangefinder /Internal Trigger
	0X01	Single Distance Measurement	
	0X02	1Hz ranging	
	0X03	1-25Hz ranging start	1-25Hz
	0X04	External synchronized irradiation setting	

	0X05	Synchronized internal and external irradiation activation	
	0X06	Distance Selection Setting	
	0X07	Distance Selector Inquiry	
	0X08	Internal synchronized irradiation cycle setting	
	0X09	Internal synchronized irradiation cycle query	
	0X0A	Time code setting	
	0X0B	Synchronized internal/external irradiation switching	
	0X0C	LD current option setting	
	0X0D	1Hz status frame	Uploads at 1Hz when no light
	0X50	Q delay, LD pulse width setting	
	0X51	LD current setting	
	0X52	Q High pressure setting	
	0X53	APD High Voltage Setting	
	0X54	LD parameter query	
	0X55	Receiver status setting (Receiver on/off switch)	
	0X56	Q High pressure state setting	
	0X57	LD1 Power status setting	
	0X59	Fan start temperature point	
	0X5A	Write Temperature Parameter Instruction	
	0X5B	Read Temperature Parameter Command	
	0X5C	Command to switch between auto and manual mode	
	0X5D	Query Current Temperature Parameter Command	
	0X5E	Turn off the over-temperature 70℃ stop light output command	
	0X60	Software version search	
	0XEE	Receiving data abnormality	
	0XED	Failed to set parameters	
Byte5~21	Data1~17		
Byte22	Data18	Status word 1	
Byte23	Data19	Status word 2	
Byte24	Data20	environmental temperature	S8,1LSB=1°C
Byte25	Data21	LD temperature	S8,1LSB=1°C
Byte26	calibration		Byte3~Byte25 byte accumulation and balance to 0XFF

Table: Description of laser return data

Correspondence of Byte4 bytes to Byte5~Byte25 bytes

NUM	Byte4	Byte5~Byte25 Data1~17		note	
1	0X00	Data1~17	0X11	Laser stops ranging or irradiating	
2	0X01, 0X02, 0X03, 0X05,	Data1	Distance 1 high	Target distance values for single ranging, 1Hz ranging, 1-25Hz ranging, internal/external simultaneous irradiation, in m	
		Data2	Distance 1 low		
		Data3	Distance 2 high		
		Data4	Distance 2 low		
		Data5	Distance 3 high		
		Data6	Distance 3 low		
		Data7~17	0X00		
3	0X04	Data1	High external synchronized light out delay	External synchronized irradiation Output delay after the laser receives the external synchronization signal Range: 303.0-305.0 (1LSB=0.1us) Default: 304.0 (1LSB=0.1us)	
		Data2	Low external synchronized light out delay		
		Data3~17	0X00		
4	0X06, 0X07	Data1	Distance Selection Tongo - Proximity	Distance Selection Setting, Distance Selection Inquiry Distance Selection Setting Unit is m (minimum range 300m, maximum range 50,000m)	
		Data2	Distance Selector Low - Proximity		
		Data3	Distance Selection Tongo - Remote		
		Data4	Distance Selector Low-Remote		
		Data5~17	0X00		
5	0X08, 0X09	Data1	Internal synchronized irradiation cycle - high	Internal synchronized irradiation cycle setting	Internal synchronized irradiation period T. Irradiation period = (45000us-125000us) in us; default: 50000us (20Hz)
		Data2	Internal synchronized irradiation cycle - medium		
		Data3	Internal synchronized irradiation cycle - low		
		Data4	Internal synchronized irradiation working hours		Unit S, range 1~90 Default 90
		Data5	Length of internal synchronized irradiation intervals		Unit S, range 1~255 Default 40
		Data6	Number of cycles of internal synchronized irradiation		Range 1~4 Default 1
		Data6-Data17	0X00		
6	0X0A	Data1	Time Code length	Time Code length	Range 1-8 (1LSB=1) Default: 1
		Data2	Time Code 1 - High	Time Code 1 1LSB =	
		Data3	Time Code 1 - low		

				1us	Length: 8 bits Number of Time Codes 1LSB = 1us Range:40,000-60,000us The default 8 Time Code value is 50000us. The Time Code value is 16 bits, (high byte first, low byte second).
		Data4	Time Code 2 - High	Time Code 2 1LSB = 1us	
		Data5	Time Code 2 - low		
		Data6	Time Code 3 - High	Time Code 3 1LSB = 1us	
		Data7	Time Code 3 - Low		
		Data8	Time Code 4 - High	Time Code 4 1LSB = 1us	
		Data9	Time Code 4 - Low		
		Data10	Time Code 5 - High	Time Code 5 1LSB = 1us	
		Data11	Time Code 5 - Low		
		Data12	Time Code 6 - High	Time Code 6 1LSB = 1us	
		Data13	Time Code 6 - low		
		Data14	Time Code 7 - High	Time Code 7 1LSB = 1us	
		Data15	Time Code 7 - Low		
		Data16	Time Code 8 - High	Time Code 8 1LSB = 1us	
		Data17	Time Code 8 - low		
7	0X0B	Data1	Internal synchronization: 0X00 External synchronization: 0X01	Synchronized internal/external irradiation switching	
		Data2~17	0X00		
8	0X0C	Data1	LD current option 0: 0X00 LD current option 1: 0X01 LD Current Option 2: 0X02 LD Current Option 3: 0X03	LD current option setting Default: LD current option 0	
		Data2~17	0X00		
9	0X0D (1Hz upload)	Data1	High external synchronized light out delay	External synchronized irradiation Output delay after the laser receives the external synchronization signal Range: 303.0-305.0 (1LSB=0.1us) Default: 304.0 (1LSB=0.1us)	
		Data2	Low external synchronized light out delay		
		Data3	Time Code length	Range 1-8 (1LSB=1) Default: 1	
		Data4	Internal synchronized irradiation cycle - high	Internal synchronized irradiation period T. Irradiation period = (45000us-125000us) in us; default: 50000us (20Hz)	
		Data5	Internal synchronized irradiation cycle - medium		
		Data6	Internal synchronized irradiation cycle - low		

		Data7	Distance Selection Tongo - Proximity	Distance Selection Setting, Distance Selection Inquiry Distance Selection Setting Unit is m (minimum range 300m, maximum range 50,000m)
		Data8	Distance Selector Low - Proximity	
		Data9	Distance Selection Tongo - Remote	
		Data10	Distance Selector Low-Remote	
		Data11~17	0X00	
10	0X50	Data1	Q High latency	Laser Q Delay, LD Pulse Width Setting/Inquiry Range: 50-300us (1LSB=1us)
		Data2	Q low latency	
		Data3	LD pulse width high	Range: 50-300us (1LSB=1us)
		Data4	Low LD pulse width	
		Data5~17	0X00	
11	0X51	Data1	Set LD current option 0	Range: 0-140A (1LSB=1A)
		Data2	Setting LD Current Option 1	Range: 0-140A (1LSB=1A)
		Data3	Setting LD current option 2	Range: 0-140A (1LSB=1A)
		Data4	Setting LD current option 3	Range: 0-140A (1LSB=1A)
		Data5~17	0X00	
12	0X52	Data1	Q High Pressure 1-High	Range: 2000-5000 (1LSB=1V)
		Data2	Q High Pressure 1-Low	
		Data3~17	0X00	
13	0X53	Data1	APD High Pressure - High	Range: 40-450 (1LSB=1V)
		Data2	APD high pressure - low	
		Data3~17	0X00	
14	0X54	Data1	Q High latency	Range: 50-300us (1LSB=1us)
		Data2	Q low latency	
		Data3	LD pulse width high	Range: 50-300us (1LSB=1us)
		Data4	Low LD pulse width	
		Data5	LD current option 0	Range: 0-140A (1LSB=1A)
		Data6	LD Current Option 1	Range: 0-140A (1LSB=1A)
		Data7	LD Current Option 2	Range: 0-140A (1LSB=1A)
		Data8	LD Current Option 3	Range: 0-140A (1LSB=1A)
		Data9	Q High Pressure - High	Range: 2000-5000 (1LSB=1V)
		Data10	Q High Pressure - Low	
		Data11	APD High Pressure - High	Range: 40-450 (1LSB=1V)
		Data12	APD high pressure - low	
		Data13	High external synchronized light out delay	External synchronized irradiation Output delay after the laser receives the external synchronization signal Range: 303.0-305.0 (1LSB=0.1us) Default: 304.0 (1LSB=0.1us)
		Data14	Low external synchronized light out delay	

		Data15	Fan start temperature point	
		Data16~17	0X00	
15	0X55	Data1	0X01: Open 0X00: Closed	Receiver status setting
		Data2~17	0X00	
16	0X56	Data1	0X01: Open 0X00: Closed	Q High pressure state setting
		Data2~17	0X00	
17	0X57	Data1	0X01: Open 0X00: Closed	LD1 Power status setting
		Data2~17	0X00	
18	0X59	Data1	0X01: Open 0X00: Closed	Fan start temperature (range 0-100)
		Data2~17	0X00	
19	0X5A, 0X5B	Data1	Temperature Serial Number	1-121
		Data2	amps	Range: 0-140A (1LSB=1A)
		Data3	Q High latency	Q delay Range: 50-300us (1LSB=1us)
		Data4	Q low latency	
		Data5	LD pulse width high	LD Pulse Width Range: 50-300us (1LSB=1us)
		Data6	Low LD pulse width	
		Data7	Q High Pressure - High	Range: 2000-5000 (1LSB=1V)
		Data8	Q High Pressure - Low	
		Data9~17		
20	0X5C	Data1	Off Auto: 0X00 Enable Auto: 0X01	Command to switch between auto and manual mode
		Data2-17		
21	0X5D	Data1	amps	Range: 0-140A (1LSB=1A)
		Data2	Q High latency	Q delay Range: 50-300us (1LSB=1us)
		Data3	Q low latency	
		Data4	LD pulse width high	LD Pulse Width Range: 50-300us (1LSB=1us)
		Data5	Low LD pulse width	
		Data6	Q High Pressure - High	Range: 2000-5000 (1LSB=1V)
		Data7	Q High Pressure - Low	
		Data8	current temperature point	Off auto mode, constant -55
		Data9~17		
22	0X5E	Data1-17	0X00	Turn off the over-temperature 70°C stop light output command
23	0X60	Data1	Year (e.g., the last two digits of 2025)	AR M software version

		Data2	Month	
		Data3	date	
		Data4	AA fixed position	
		Data5	current version	
		Data6	Minor changes to the current version	
		Data7	Year (e.g., the last two digits of 2025)	FPGA Software Version
		Data8	Month	
		Data9	date	
		Data10	AA fixed position	
		Data11	current version	
		Data12	Minor changes to the current version	
		Data13-17		
24	0XEE	Data1~17	0XEE	Receiving data abnormality
25	0XED	Data1~17	0XED	Failed to set parameters

Status word 1

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Synchronized internal/external irradiation 0: within 1: External	Ready/Standby 0: Standby 1: In preparation	Temperature sensor status 0: Normal 1: Anomalies	main wave 0: Normal 1: Anomalies	Receiver on/off switch 0: Open 1: Closure	Receiver current status 0: Open 1: Closure	environmental temperature 0: Normal 1: Anomalies	LD temperature 0: Normal 1: Abnormal (70°C over temperature)

Status word 2

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
radiation status 0: No Light 1: Lighting	LD current state 0: Normal 1: Anomalies	LD Power Status 0: Open 1: Closure	External Synchronization Signal Status 0: Normal 1: Anomalies	X Default 0	X Default 0	LD Current Options LD current option 0: 0X00 LD current option 1: 0X01 LD Current Option 2: 0X02 LD Current Option 3: 0X03	

Return data is automatically returned at the end of the light output.

6 INSTRUCTIONS FOR USE

1. **Security**

The laser wavelength of the Laser Rangefinder & Target Designator is not within the human-eye-safe band. It can directly cause harm to human eyes and skin. Therefore, it is necessary to avoid the direct incidence of the emitted light beam into human eyes and onto the skin to prevent accidental injuries.

In order to ensure the safety of the test subjects and the testing personnel, the following safety measures have been taken during the design process of the LDR40K1 Small Laser Rangefinder & Target Designator:

a) Conduct safety design and analysis in accordance with MIL-STD-810G "General Requirements for Equipment Safety Work";

b) Use non-flammable materials, and ensure that the mechanical and electrical interface connections are stable and reliable;

c) The components that control the key systems and key functions are designed with error-proofing features;

d) Adopt reasonable design methods to prevent the accumulation of water vapor, which may lead to short circuits;

e) It operates below the safe voltage for the human body.

2 . Installation and Calibration

The mechanical interface of the laser rangefinder and target designator includes screw mounting through holes. Fix the laser rangefinder and target designator on the mounting platform with screws of the specified specification. Then, connect the communication plug to the connector socket of the laser rangefinder and target designator, and correctly connect the power supply according to the interface definition.

3.Suggestions for the Use of the Optical Window

3.1 Material Selection

3.1.1 Optical Window Material

The optical window material selects Chengdu Bright Optical Glass H-K9L. H-K9L is the most common colorless optical glass, suitable for the laser range of 300nm to 2100nm. It has a high cost-performance ratio and superior physical properties.

3.1.2 Processing Requirements

a) The wedge angle tolerance of the optical window should be as small as possible. We recommend that the wedge angle tolerance ≤ 3′ (the tolerance grade ≤ Grade 7);

b) The optical surface of the optical window should be as smooth as possible. We recommend that the arithmetic average deviation of the profile (Ra) is 0.012.

3.2 Usage Suggestions

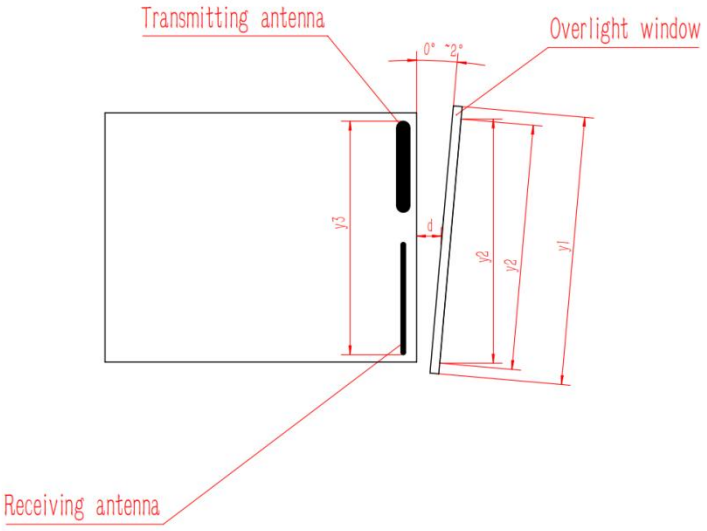
3.2.1 Suggestions for Optical Window Coating

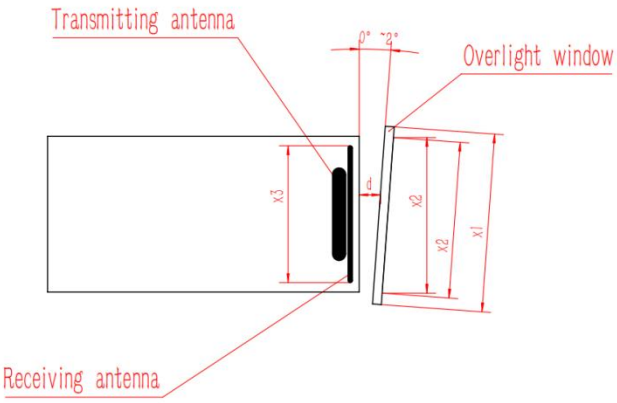
It is recommended to coat the optical window of the 1064nm Laser Rangefinder & Target Designator with an anti-reflection coating in the range of 1040nm to 1090nm, and the transmittance ≥ 99%. According to the specific usage environment of the product, other protective films such as a hydrophobic film or a hard film can be additionally selected to be coated on the outer surface of the optical window. For the remaining indicators, refer to MIL-STD-810G, and the transmittance ≥ 97%. In addition, the damage threshold of the film layer should be ≥ 50MW/cm².

3.2.2 Optical Window Shape and Usage Suggestions

The effective aperture of the optical window varies depending on different products. Its external dimensions should ensure that the difference between the effective aperture of the optical window and the outer diameter of the optical window is ≥ 2 mm, and the difference between the outer diameter of the rangefinder and designator antenna and the projected size of the effective aperture of the optical window is ≥ 1.5 mm. The schematic diagram is shown as follows. Since the optical window has a certain absorption of the laser, it is recommended that the thickness of the optical window itself be controlled within 2 to 4 mm according to its external dimensions.

Due to the relatively high transmittance of the optical window, it is recommended that the axial deviation between the transmitting optical axis and the normal of the optical window be controlled within the range of 2° to 4°. The schematic diagram of the positions of the optical window and the two lens barrels is shown as follows. At the same time, the air gap between the optical window and the rangefinder and designator should be as small as possible.





The effective aperture of the optical window y_2 - the outer diameter of the optical window y_1>2mm
The outer diameter of the rangefinder antennay$_3$-the projection size of the effective aperture of the optical window y_2，>1.5mm
The air gap d between the optical window and the rangefinder should be as small as possible

The effective aperture of the optical window x_2 - the outer diameter of the optical window x_1>2mm
The outer diameter of the rangefinder antenna x_3-the projection size of the effective aperture of the optical window x_2，>1.5mm
The air gap d between the optical window and the rangefinder should be as small as possible

Schematic diagrams of two ways of the external dimensions and placement of the optical window

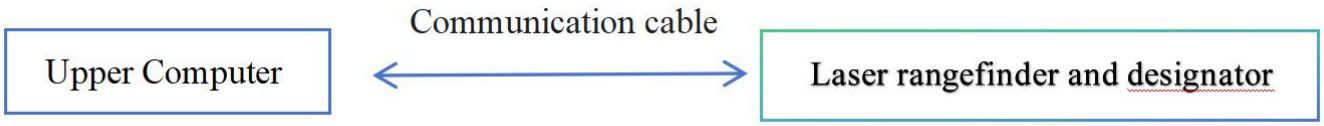
4. .Operation

To enable you to fully understand various functions of this system and correctly master the installation, usage, and maintenance methods, please carefully read the content of this chapter before installing and using this system.

4.1 Power-on Operation

4.1.1 Before Power-on

Before powering on, correctly connect the product and the cross-linked equipment according to the cross-linking diagram shown below.



Cross-linking Diagram of the Product and Equipment

4.1.2 Power-on

Power-on operation: Connect the power supply.

4.2 Power-off Operation

4.2.1 Before Power-off

Before powering off, it should be confirmed that the working process and task of the product are in the finished state, and the program is exited (at least 50 ms after the product returns data).

4.2.2 Power-off

Power-off steps: Disconnect the power supply.

4.3 Usage Operation

To enable you to fully understand various functions of this product and correctly master the installation, usage, and maintenance methods, please carefully read the content of this chapter before installing and using this system.

After the product is powered on, a power-on self-check will be carried out before usage operation. Other detection tasks can be carried out only after the test is passed. The self-check process and method are as follows:

a) Wait for the reply of the self-check instruction;

b) Receive the normal reply of the self-check instruction.

4.3.1 Ranging Mode

Operation steps in the ranging mode:

a) Send the "Single-shot Ranging" command to the laser rangefinder and designator. The laser rangefinder and designator will conduct single-shot ranging and report the ranging status and distance value;

b) Send the "1Hz Ranging" command to the laser rangefinder and designator. The laser rangefinder and designator will conduct ranging once per second and report the ranging status and distance value;

c) Send the "Stop Ranging" command to stop ranging;

d) Send the "5Hz Ranging" command to the laser rangefinder and designator. The laser rangefinder and designator will conduct ranging five times per second and report the ranging status and distance value;

e) Send the "Stop Ranging" command to stop ranging;

f) Send the "20Hz Illumination" command to the laser rangefinder and designator. The laser rangefinder and designator will conduct ranging twenty times per second and report the ranging status and distance value;

g) Send the "Stop Ranging" command to stop ranging;.

4.3.2 Self-check Mode

Self-check operation method:

a) Send the "Self-check" command to the laser rangefinder and designator;

b) The laser rangefinder and designator will start the self-check and send back information such as the current ambient temperature and working status.

4.3.3 Low Power Consumption Mode

Operation method in the low power consumption mode:

a) Send the "Enable Low Power Consumption" command to the laser rangefinder and designator;

b) The laser rangefinder and designator will enter the low power consumption operation state and send back the status information;

c) Send the "Disable Low Power Consumption" command to the laser rangefinder and designator;

d) The laser rangefinder and designator will enter the normal standby state and send back the status information.

4.3.4 Illumination Mode

Operation steps in the illumination mode:

a) Send the "Laser Illumination" command to the laser rangefinder and designator. The laser rangefinder and designator will emit laser periodically at a fixed frequency once and report the ranging status and distance value;

b) After one cycle time elapses, the illumination will stop automatically.

5. Inspection and Maintenance

5.1 General Inspection

When the product is used for the first time or after the resource module is newly replaced, visual inspection and power-on inspection should be carried out. For products in normal use, only power-on inspection is required before use.

5.1.1 Visual Inspection

The steps of visual inspection are as follows:

a) Check whether the appearance of the product is normal;
b) Check if there is any error in the cable connection, and the connection should be firm.

5.1.2 Power-on Inspection

The steps of power-on inspection are as follows:
a) Complete the startup operation according to the steps;
b) Complete the self-check operation as required;
c) After the inspection is completed, complete the shutdown operation according to the steps.

5.2 Regular Maintenance

The laser rangefinder and designator does not require maintenance under normal working conditions. Maintenance is required if it is stored in a dust-free environment for more than one year. The maintenance content includes:

5.2.1 General Inspection

Conduct a general inspection of the product in the unpowered state. The steps are as follows:
a) All markings and numbers on the product and the test cable plug (socket) should be correct and clear;
b) All kinds of screws on the panel should be tightened;
c) It should be ensured that there are no attachments such as light spots, pockmarks, water stains, mildew, fingerprints, dust particles, etc., and cracks that will interfere with normal observation on the optical glass of the product when viewed visually.

5.2.2 Power-on Inspection

Conduct a comprehensive inspection and maintenance of the laser rangefinder and designator after powering it on. The content includes:
a) Turn on the power of the product in sequence;
b) Complete the startup operation according to the steps;
c) Complete the self-check operation as required;
d) Complete the shutdown operation according to the steps.

6. Analysis of Fault Phenomena and Troubleshooting Methods

The laser rangefinder and designator is a precision product. When a fault occurs, the entire device needs to be returned to the factory for fault analysis, location, and repair. Self-repair is not allowed.
Common fault phenomena and troubleshooting methods are shown in the following table.

Common Fault Phenomena and Troubleshooting Methods

Fault Phenomena	Possible causes	Inspection method	Troubleshooting measures
The product cannot be powered on normally.	Faults in the power supply and connection cables Circuit faults	Check the power supply and connection cables.	Replace the power supply or connection cables. In case of a circuit fault, contact the manufacturer for assistance in resolving it.
Communication commands cannot be sent.	Faults in the connection cables Abnormal power supply Communication failure of the laser rangefinder and designator	Check whether the connection cables are normal. Check whether the power supply is normal.	Replace the connection cables and the power supply. For communication problems, contact the manufacturer for assistance in resolving them.

7. Packaging, Transportation and Storage Requirements

7.1 Packaging

For the product that has been unsealed, when it needs to be restocked, it should be packaged according to the original packaging. When the product needs to be returned to the factory, the original packaging should be used as much as possible. When other forms of packaging are used, it should not cause a decrease in product performance or damage to the product.

7.2 Transportation

The repacked product can be transported by means of automobiles, trains, airplanes, ships, etc. During transportation, the packaged items should be fixed on the means of transportation to avoid impacts, rough handling, exposure to rain and snow, and other such situations. For the road transportation and railway transportation environments, refer to MIL-STD-810G.

7.3 Storage

The repacked product shall not be stored outdoors in the open air. It should be stored in a warehouse with a temperature range of 0°C to +30°C, a relative humidity not exceeding 70%, free from the erosion of corrosive substances, without strong mechanical vibration and impact, and without a strong magnetic field.

Safety Precautions

For the safe use of this product, please carefully read this instruction manual before operating the product.

a) This laser rangefinder and designator is a precision optical and mechanical product. Operating it in violation of the regulations may lead to dangerous laser injuries. Do not open or adjust any part of the laser rangefinder and designator, and do not attempt to repair or adjust the performance of the laser rangefinder and designator by yourself.

b) Pay attention to electrostatic protection: The electronic components of the laser rangefinder and designator are sensitive to electrostatic discharge. Do not touch any electronic devices without protective measures.

c) Only turn on the power of the laser rangefinder and designator for operation within the specified voltage and power range.

d) It is prohibited to touch the optical lenses with fingers or hard objects (to prevent oil contamination or scratching of the lenses).

e) It is prohibited to measure high-reflectivity targets at an extremely close distance (to prevent damage to the core devices of the detector).

f) It is prohibited to store the laser rangefinder and designator under non-specified conditions (such as a highly polluted environment, beyond the storage temperature range, etc.).

g) It is prohibited for the laser rangefinder and designator to be subjected to strong mechanical impacts (vibration, shock, dropping, etc.).