ERDI LASER®
ERDI TECH LTD

160 mJ Laser Target Designator/Rangefinder Module

Model: LR160

1. PRODUCT DESCRIPTION

The LR160 is a 1064 nm, 160 mJ laser target designator and rangefinding system that delivers up to 30 km measuring range and 20 km laser illumination. It offers 10 Hz multi-target ranging with ≤ 5 m accuracy, 8–21 Hz coded illumination, internal and external synchronization with 304 µs delay, and flexible frequency and time-code modes. With a ≤ 306 × 145 × 94 mm envelope, ≤ 3.3 kg weight, 24 V DC input, RS-422 digital control and −40 °C to +60 °C operating range, the LR160 is ideal for UAV gimbals, aircraft pods, vehicle turrets and coastal/border defense systems.



2. KEY PERFORMANCE PARAMETERS

Laser Wavelength	1064nm±1nm
Laser Energy	85 mJ and 160 mJ (switchable)
Optical Delay	304 µs±1µs
Beam Divergence	≤0.2mrad
Laser Designation Frequency	8～21Hz
Ranging Frequency	10Hz
Laser Pulse Width	l0ns ～l5ns
Power Stability	≤8%
Ranging Range	0.2 m – 30 km (target size 10 m × 10 m × 8 m, visibility 30 km)
Ranging Error	≤5m
Target Selection	First Target / Second Target / Last Target
Valid Measurement Rate	98%
Trigger Mode	Internal Sync Illumination, External Sync Illumination (Trigger Delay: **304.0 µs ± 0.1 µs**)
Dimensions	≤306×145×94mm
Weight	≤3.3kg
Laser Designation Performance	**Laser Designation Center Frequency:** 20 Hz **Low/Normal Temperature, 85 mJ Output** Laser designation time: **90 s**, rest: **60 s**, **5 consecutive cycles** **Low/Normal Temperature, 160 mJ Output** Laser designation time: **60 s**, rest: **60 s**, **5 consecutive cycles**

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	High Temperature, 85 mJ Output Laser designation time: **90 s**, rest: **60 s**, **1 cycle** **High Temperature, 160 mJ Output** Laser designation time: **60 s**, rest: **60 s**, **1 cycle**
Ranging Performance	**Minimum Measuring Distance:** ≤ 300 m **Maximum Measuring Distance:** ≥ 30 km *(target size 10 m × 10 m × 8 m, diffuse reflectivity ≥ 0.2, visibility ≥ 30 km, relative humidity ≤ 70%)* **Ranging Frequency:** 10 Hz (up to 3 targets) **Continuous Operating Cycles:** ● **Low/Normal Temperature:** Operate **5 minutes**, rest **4 minutes**, **5 consecutive cycles** ● **High Temperature, 85 mJ Output:** Operate **5 minutes**, rest **4 minutes**, **2 consecutive cycles** ● **High Temperature, 160 mJ Output:** Operate **2 minutes**, rest **4 minutes**, **2 consecutive cycles**
	RS422
External Synchronization Interface	+5 V differential line-driver chip, RS-422 interface (laser emission delay from external sync signal: 304.0 μs ± 0.1 μs)
Coding Mode	Precise frequency coding and time coding
Period Accuracy	<±1us
Power Supply	DC 24V±4V
Startup Time	< 1 minute (at room temperature)
Low Temperature	**Operating temperature: −40 °C** **Storage temperature: −45 °C**
High Temperature	**Operating temperature: +60 °C** **Storage temperature: +65 °C**

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3. COMMUNICATION INTERFACE

1. The electrical connection interface consists of the **J30J-21ZKP** and **J30J-04ZK** connectors. The interface definitions are as follows:

Table 1 — J30J-21ZKP Interface Definition

J30J-21ZKP				
Pin	**Function**	**Description**	**Direction**	**Remarks**
1	TX+	RS-422 TX+	Output	RS-422 Communication Interface
2	TX-	RS-422 TX−	Output	
3	RX+	RS-422 RX+	Input	
4	RX-	RS-422 RX−	Input	
5	GND	RS-422 GND	GND	
6	EN+	Power Enable		24 V Power Enable Switch
7	EN-	Power Enable		
8-13		Not Connected / NC		
14	A	External Sync Differential + (A)	Input	A and B are the **A/B differential outputs of the RS-422 driver chip**
15	B	External Sync Differential − (B)	Input	
16	LED+	DC5V	Input	Laser Designation Power Supply
17	LED-	GND	Input	
18-21				

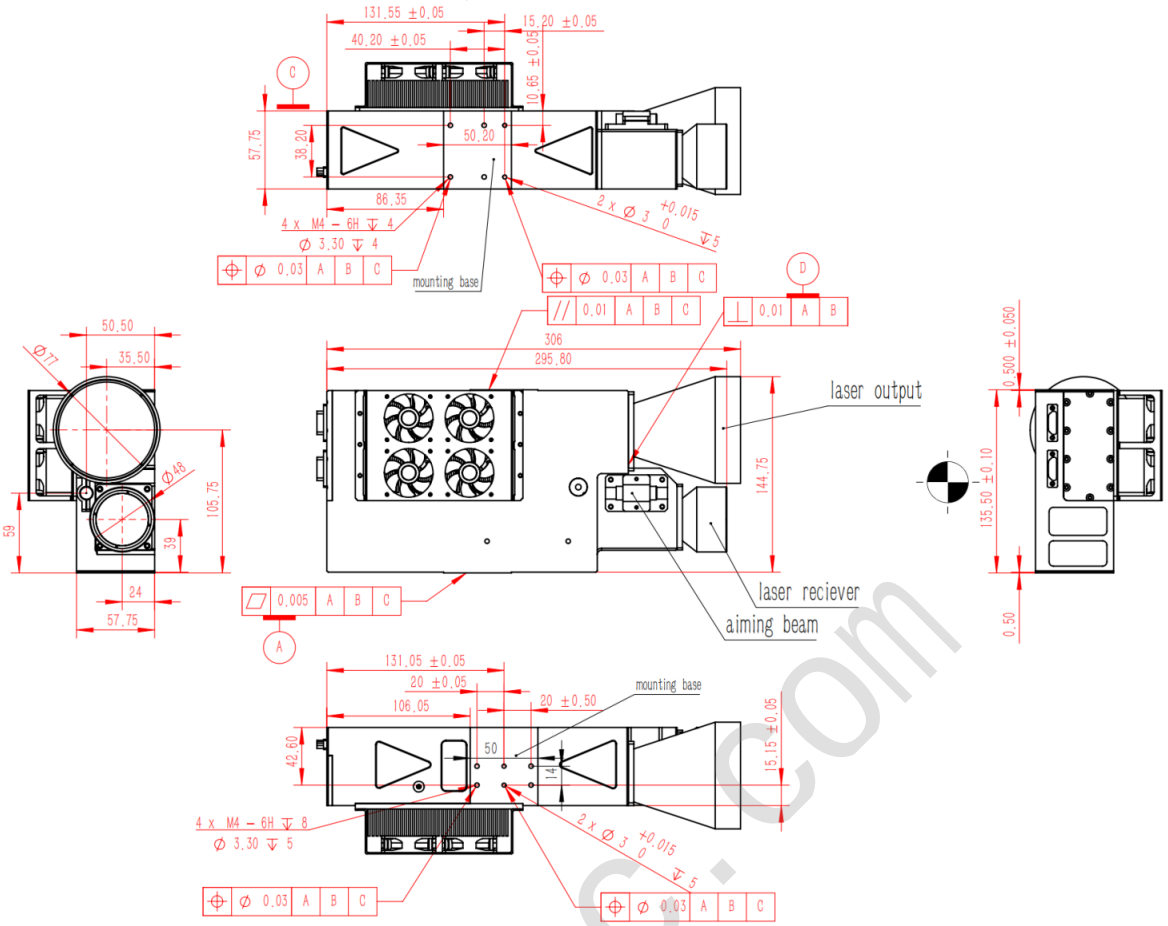
Table 2 — J30J-04ZK Interface Definition

J30J-04ZK				
Pin	**Function**	**Description**	**Direction**	**Remarks**
A、B	24V	Power Supply	Input	Red
C、D	GND	Power GND	Input	Black

2. **Power Supply Interface:** +24 VDC ±10%
3. **External Trigger:** RS-422 differential signal
4. **Cooling Method:** Cooling fan located at the front of the device

4. MECHANICAL DIMENSIONS

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5. TEST SOFTWARE OPERATION INSTRUCTIONS

Figure 1 Main interface of the laser rangefinder / target designator PC software

Operating procedure

- Connect the PC and the laser module using a USB-to-RS422 serial converter cable.
- Open the laser rangefinder/target designator PC software and enable the serial port.
- Connect the laser power cable and switch on the power supply.
- Click the button shown in the red box below to load the last saved settings.

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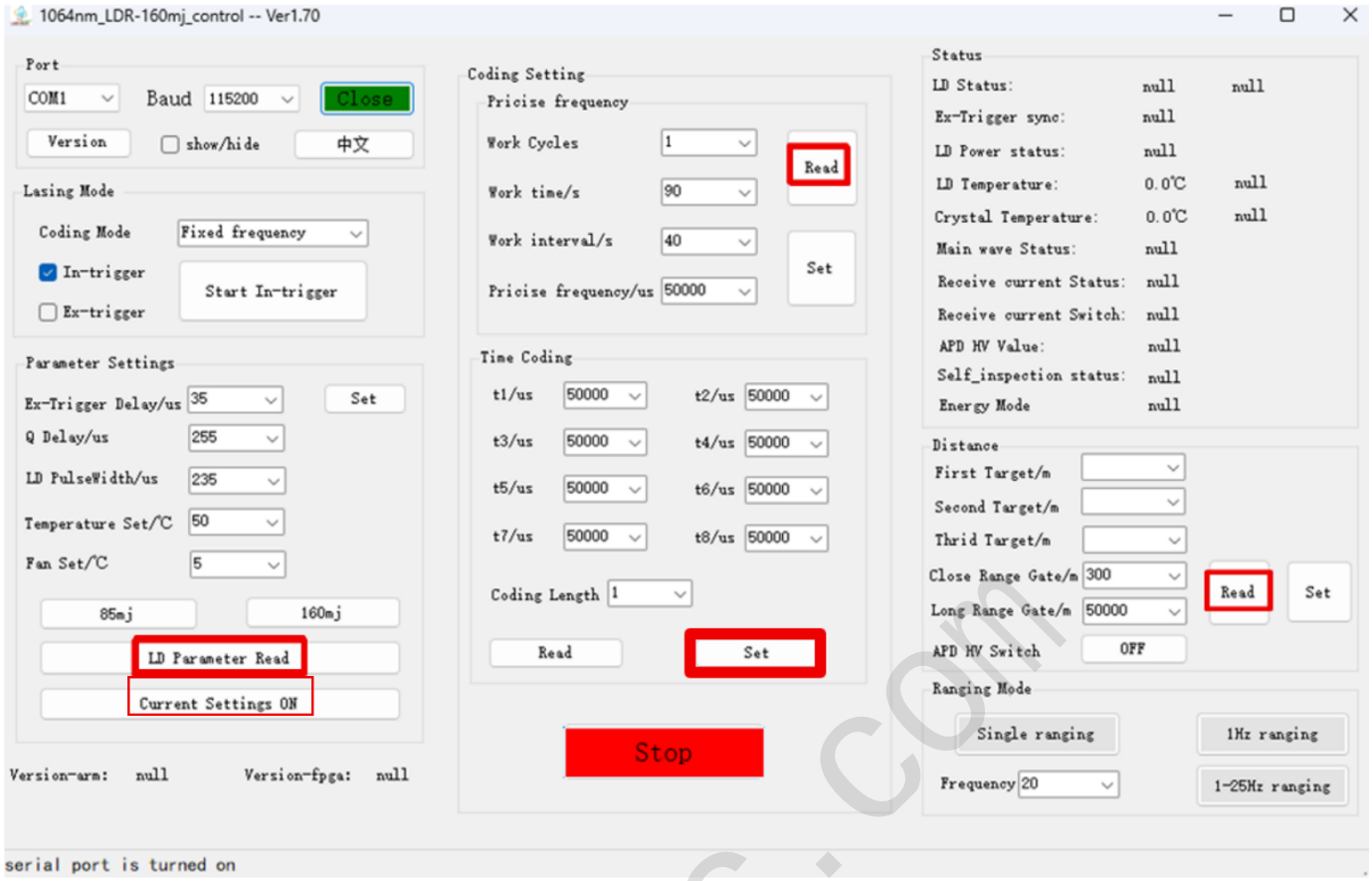
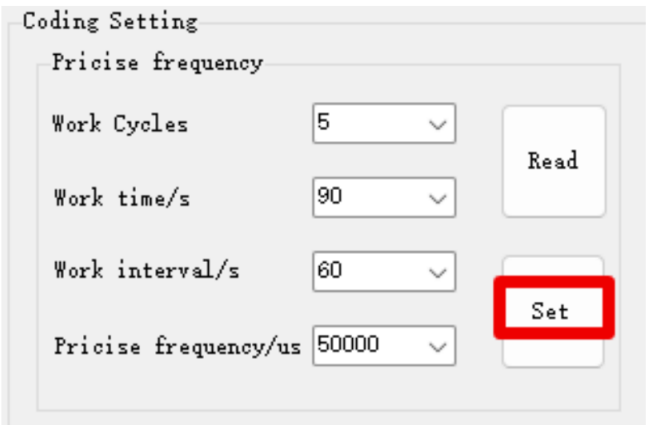


Figure 1 Main interface of the laser rangefinder / target designator PC software

- Please keep the parameter setting data unchanged (do not modify these values).
  The laser pulse energy levels are 85 mJ and 160 mJ.

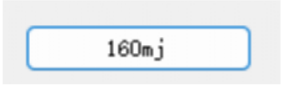


- Click the **85 mJ** button to emit laser pulses with an energy of **85 mJ**.
  The default lasing duration is **90 s**, followed by a **60 s** interval after each emission.
  This cycle repeats **5 times**.

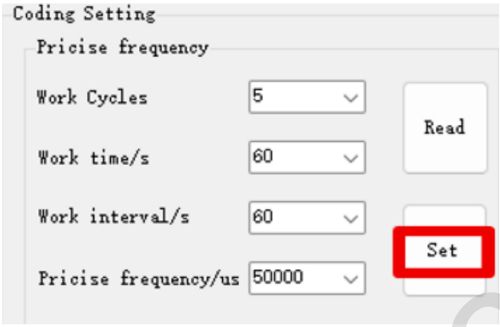


- The number of cycles can be set from 1 to 10.

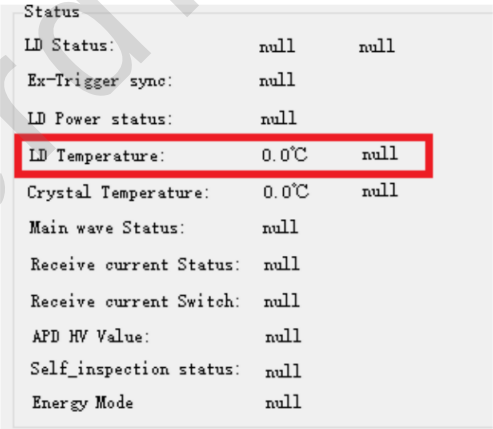
The lasing duration can be set from 1 to 90 s, and the interval after each emission can also be set from 1 to 90 s.
All parameters may be adjusted within these ranges.



- Click the **"160 mJ"** button to emit laser pulses with an energy of **160 mJ**.
  The default lasing duration is **60 s**, followed by a **60 s** interval after each emission.
  This cycle repeats **5 times**.

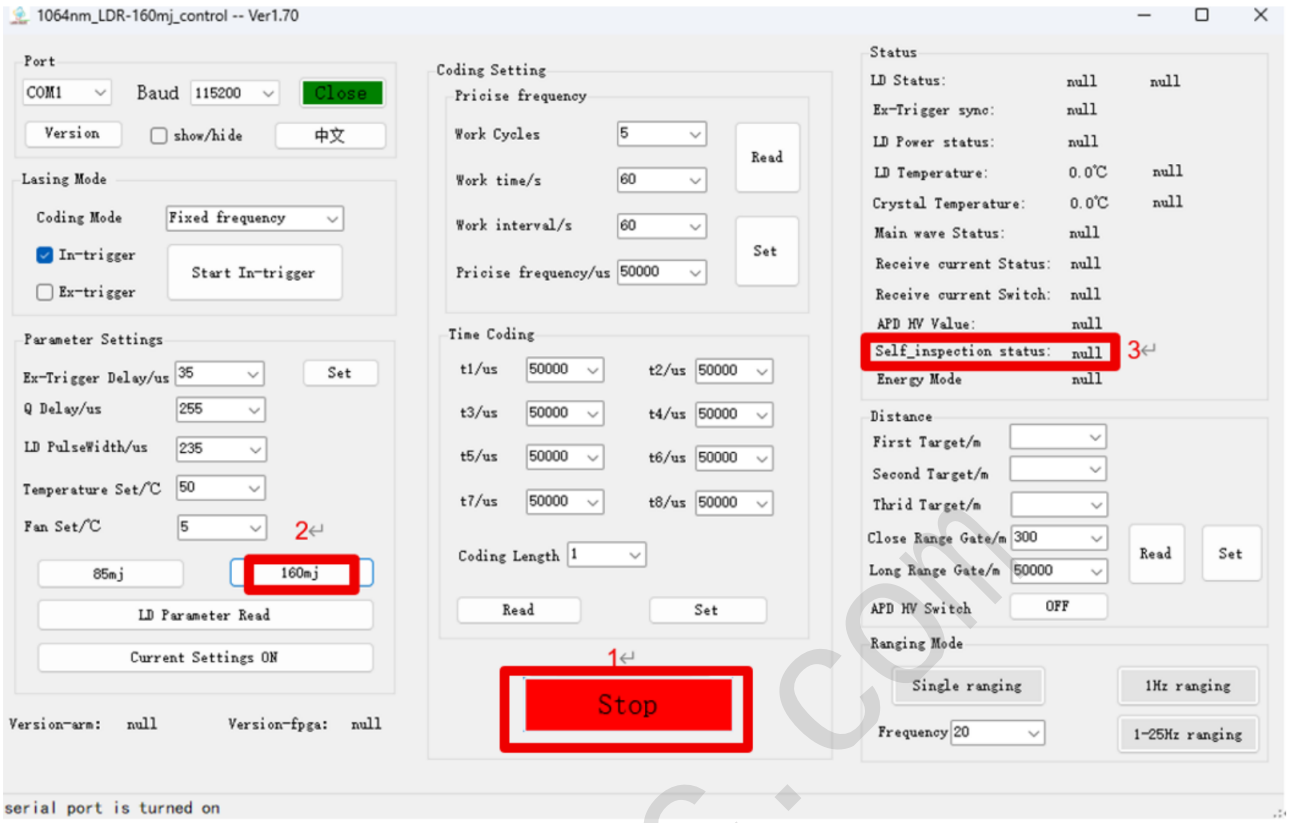


- The number of cycles can be set from **1 to 10**.
  The lasing duration can be set from **1 to 90 s**, and the interval after each emission can also be set from **1 to 90 s**.
  All parameters may be adjusted within these ranges.
- **Note:** When switching between energy levels, after clicking the corresponding setting button the system will automatically enter **self-test mode**. Wait for the self-test to complete **before** turning on the laser.

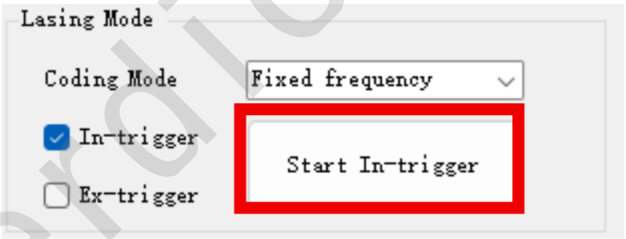


- **Note:** Before starting laser emission, wait for the temperature to reach the set value and switch on the APD high-voltage supply.
- **Note:** When switching energy levels, first stop laser emission, then click the desired energy-level button. After the self-check is complete, start emitting the laser (follow the numbered sequence shown in the figure).

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- Wait for the temperature to reach the set value (the default is **50 °C**; do not change this arbitrarily). The red box indicates the real-time temperature of the temperature-control system.



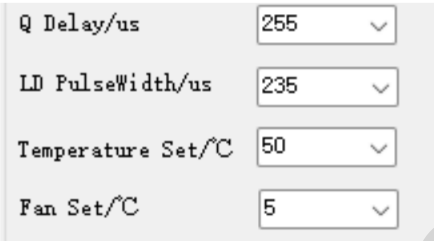
- After the temperature reaches the set value, click this button to start laser emission.
  Click the **Stop** button to end laser emission.
- **Parameter Description**
  As shown in Figure 1, the PC software (host computer) interface includes laser designator parameter settings and data display. The laser trigger mode (internal trigger, external trigger), encoding mode (fixed-frequency encoding, time encoding), operating time, drive current, and other parameters can be configured.
- **Trigger settings:**

➢ **External trigger**: The laser is triggered by an external differential signal, and the pulse repetition frequency follows the frequency of the external signal.
➢ **Internal trigger**: The trigger signal is generated by the internal control board (information processing board).

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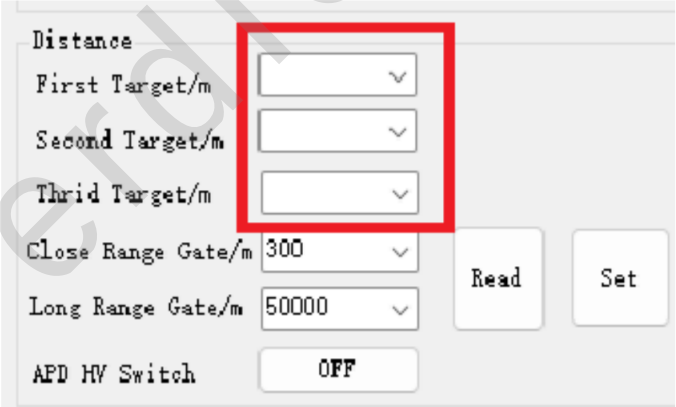
- Q-switch delay: the time delay between the Q-switch drive signal and the LD drive signal. Its value, together with the LD drive pulse width, affects the laser output energy. Typically, when the LD drive pulse width is set to 235 μs, the Q-switch delay is set to 255 μs.



- Q-delay, LD pulse width, and temperature should use their default values and do not need to be changed.

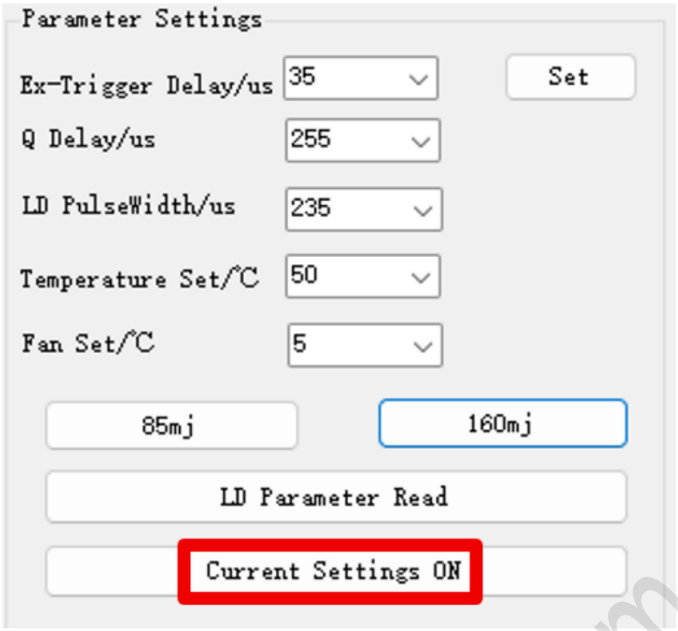


- The ranging modes include **single-shot ranging**, **1 Hz ranging**, and **1–25 Hz ranging**.
  The emission frequency (1–25 Hz) can be adjusted using the control in the red box.

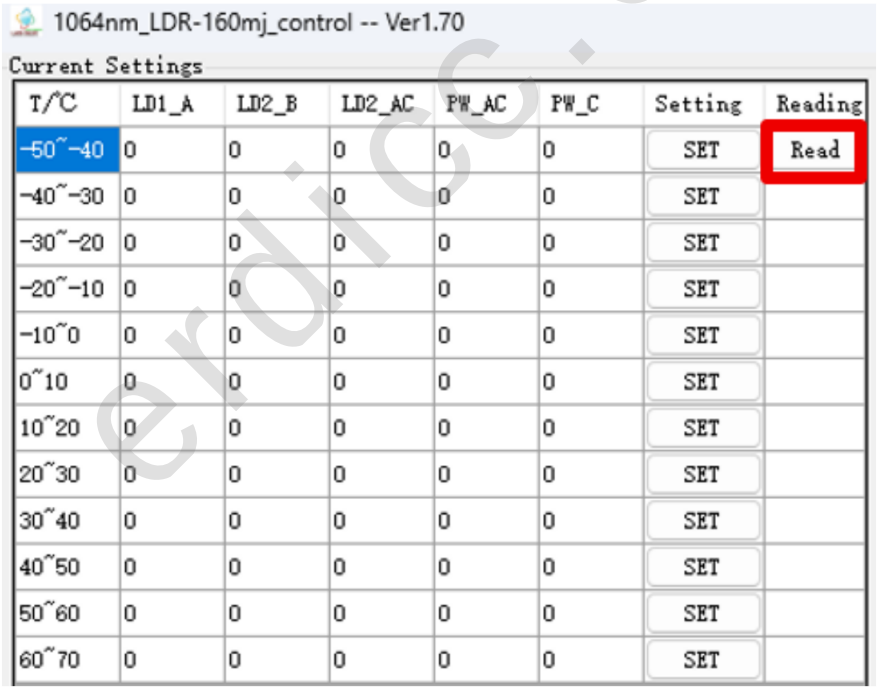


- The target distance value displayed in the red box shows the measured distance for both ranging and designation (illumination) returns.
  Near/far target selection is available. The default near/far distance range is **300 m to 50,000 m**, and it does not need to be changed.
- If you need to adjust the drive current or pulse-width compensation values, click the button in the red box shown in the figure to enter the **Settings** page.

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- Click the **Read** button to load the device's last set of parameters.
  Wait about 10 seconds for all data to be read back and displayed.



T/℃	LD1_A	LD2_B	LD2_AC	PW_AC	PW_C	Setting	Reading
-50~-40	0	0	0	0	0	SET	Read
-40~-30	0	0	0	0	0	SET	
-30~-20	0	0	0	0	0	SET	
-20~-10	0	0	0	0	0	SET	
-10~0	0	0	0	0	0	SET	
0~10	0	0	0	0	0	SET	
10~20	0	0	0	0	0	SET	
20~30	0	0	0	0	0	SET	
30~40	0	0	0	0	0	SET	
40~50	0	0	0	0	0	SET	
50~60	0	0	0	0	0	SET	
60~70	0	0	0	0	0	SET	

- You can adjust the compensation values in this box. After making the changes, click **"SET"** to apply the temperature-compensated current and pulse width.
  Exit this settings page, then click **"Current Setting ON"** again.

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Current Settings

T/℃	LD1_A	LD2_B	LD2_AC	PW_AC	PW_C	Setting	Reading
-50~-40	0	0	0	0	0	SET	Read
-40~-30	0	0	0	0	0	SET	
-30~-20	0	0	0	0	0	SET	
-20~-10	0	0	0	0	0	SET	
-10~0	0	0	0	0	0	SET	
0~10	0	0	0	0	0	SET	
10~20	0	0	1	5	0	SET	
20~30	0	0	0	0	0	SET	
30~40	0	0	0	0	0	SET	
40~50	0	0	0	0	0	SET	
50~60	0	0	0	0	0	SET	
60~70	0	0	0	0	0	SET	

- **Note:** In ranging mode, the operating time at different frequencies is fixed by the device and cannot be changed. For frequencies above 20 Hz, the maximum operating time is 90 seconds; for frequencies above 10 Hz, the maximum operating time is 180 seconds; for frequencies from 1 to 10 Hz, the maximum operating time is 300 seconds.
- **Note:** In designation/irradiation mode, after completing the irradiation cycles, the device must rest for 15 minutes.

BUILT-IN CODING DEFINITIONS

Precise frequency
This is the pulse repetition frequency of laser emission. For example, if the frequency is set (locked) to 20 Hz, the laser will emit pulses at 20 Hz.

Time coding
Time coding consists of **eight time values** and a **code length**.
Each time value represents the interval between two consecutive laser pulses.

For example, suppose the eight time values are:
40 ms, 43 ms, 46 ms, 49 ms, 50 ms, 53 ms, 56 ms, and 60 ms.

- If the **code length** is set to **3**, only the first three time values are used in the emission cycle:

➢ The interval between the 1st and 2nd pulses is 40 ms
➢ The interval between the 2nd and 3rd pulses is 43 ms
➢ The interval between the 3rd and 4th pulses is 46 ms
These three interval values are then repeated cyclically.

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- If the **code length** is set to **5**, the laser emission will cyclically repeat the first five time intervals.

6. COMMUNICATION PROTOCOL

6.1 Physical Interface

- Communication interface: **RS-422 full-duplex**
- Communication format: **1 start bit, 8 data bits, 1 stop bit, no parity**
- Baud rate: **115200 bps**
- Message format: **case-insensitive**

6.2 Communication Messages

The corresponding messages are sent from the computer to the device.

6.3 Communication Format

The communication format is as follows:

Frame Header	Data Length	Command Word	Data	Checksum
2 bytes	1 bytes	1 byte	N bytes	1 bytes

- **Frame Header:**
  The first byte is fixed to **0xEB**, and the second byte is fixed to **0x90**.
- **Data Length:**
  Indicates the total number of bytes being sent, **including the length byte itself but excluding the Frame Header**.
- **Command Word:**
  1 byte.
- **Data:**
  Instruction data to be transmitted.
  If the data is **16-bit**, it must be split into **two bytes**, with the **high byte first**, **low byte second**.
- **Checksum:**
  8-bit accumulated sum of all data bytes
  (**excluding the Frame Header and the Checksum itself**).

6.4 Control Commands

Table 1 — Laser Control Commands 1

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No.	Command	Description	Remarks
Byte 1	0×EB	Frame Header 1	
Byte 2	0×90	Frame Header 2	
Byte 3	0×14	Data Length	Byte3~Byte 22
Byte 4	0×00	Laser Stop	**Internal/External Sync Laser Designation Mode — Laser Stop**
	0×01	Single-Shot Ranging Start	
	0×02	1 Hz Ranging Start	
	0×03	1–25 Hz Ranging Start	
	0×04	External Sync Illumination Delay Setting	**External Sync Laser Designation — Laser Emission Delay After Receiving the External Sync Signal**
	0×05	Internal/External Sync Illumination Start	
	0×06	Range Gate Setting	
	0×07	Range Gate Query	
	0×08	Internal Sync Illumination Period Setting	
	0×09	Internal Sync Illumination Period Query	
	0×0A	Time Code Setting	
	0×0B	Internal/External Sync Illumination Switching	
	0×0C	LD Current Option Setting	**Default LD current = 0 (valid for the current power cycle only)**
	0×50	Q-Delay and LD Pulse Width Setting	
	0X51	LD Current Setting	
	0×52	Q High Voltage Setting	
	0X53	APD High Voltage Setting	
	0X54	LD Parameter Query	
	0×55	Receiver Status Setting	Default: OFF （Receiver on/off switch）
	0×56	Q High Voltage Status Setting	Default: ON (temporarily unavailable)
	0×57	LD1 Power Status Setting	Default: ON
	0×59	Fan Activation Temperature Setting	
	0×5A	Write Temperature Parameter Command	
	0×5B	Read Temperature Parameter Command	
	0×5C	Automatic/Manual Mode Switching Command	

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	0×5D	Query Current Temperature Parameter	
	0×5E	Disable 70°C Over-Temperature Shutdown Command	
	0×5F	Serial Port Firmware Upgrade Command	
	0×60	Software Version Query	
Byte 5~21	Data1~17		
Byte 22	Checksum		Sum of bytes 3 through 21

Table 2 — Description of Laser Control Commands 1

Relationship between **Byte 4** and **Data 1–17** contained in **Bytes 5 through 21**.

NUM	Byte 4	Byte5~Byte 21 Data 1~17		Remarks
1	0X00	Data 1~17	0×00	Laser Stop
2				
3	0×01、0×02	Data 1~17	0×00	Single-Shot Ranging, 1 Hz Ranging
4	0×03	Data 1	Ranging Frequency	Ranging Start Range: 1–25 Hz (1 LSB = 1 Hz)
		Data 2~17	0×00	
5	0×04 (Save)	Data 1	External Sync Emission Delay – High Byte	External Sync Illumination — Laser Emission Delay After Receiving the External Sync Signal Range: 303.0–305.0 μs (1 LSB = 0.1 μs) Factory Default: 304.0 μs
		Data 2	External Sync Emission Delay – Low Byte	
		Data 3~17	0×00	
6	0×05	Data1~5	0×00	**Laser Designation Start**
		Data 6	1. **Internal Sync Illumination Code Index:** ● **0x01:** Fixed Frequency ● **0xF2:** Time Coding 2. **In External Sync mode, this value is fixed to 0x01.**	
7	0×06	Data 1	Range Gate High Byte – Near Range	**Range Gate Setting** Unit: meters (minimum ranging distance **300 m**, maximum ranging distance **50,000 m**)
		Data 2	Range Gate Low Byte – Near Range	
		Data 3	Range Gate High Byte – Far Range	
		Data 4	Range Gate Low Byte – Far	

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			Range		
		Data 5~17	0×00		
8	0×07	Data 1~17	0×00	Range Gate Query	
9	0×08 (Save)	Data 1	Internal Sync Illumination Period – High Byte	Internal Sync Laser Designation Period Setting	**Internal Sync Laser Designation Period T.** Laser designation period = **45,000 μs – 125,000 μs**, unit: **μs** **Default: 50,000 μs (20 Hz)**
		Data 2	Internal Sync Illumination Period – Middle Byte		
		Data 3	Internal Sync Illumination Period – Low Byte		
		Data 4	Internal Sync Illumination Duration		Unit: seconds, range 1–90, factory default: 90
		Data 5	Internal Sync Illumination Interval		Unit: seconds, range 1–255, factory default: 40
		Data 6	Internal Sync Illumination Cycle Count		Range: 1–4, factory default: 1
10	0×09	Data 1~5	0×00	**Internal Sync Laser Designation Period Query**	
		Data 6	Synchronization Illumination Code Index: **0x01: Fixed Frequency** **0xF2: Time Coding**		
11	0×0A (Save)	Data1	Time Code length	Time Code length	Range: 1–8 (1 LSB = 1) Default: 1
		Data 2	Time Code 1 – High Byte	Time Code 1 1LSB=1us	Length: 8 Time Code values 1 LSB = 1 μs Range: 40,000–60,000 μs Default: 8 Time Code values set to 50,000 μs Each Time Code value is 16 bits (high byte first, low byte second).
		Data 3	Time Code 1 – Low Byte		
		Data 4	Time Code 2 - High Byte	Time Code 2 1LSB=1us	
		Data 5	Time Code 2 - Low Byte		
		Data 6	Time Code 3 - High Byte	Time Code 3 1LSB=1us	
		Data 7	Time Code 3 - Low Byte		
		Data 8	Time Code 4 - High Byte	Time Code 4 1LSB=1us	
		Data 9	Time Code 4 - Low Byte		
		Data 10	Time Code 5 - High Byte	Time Code 5 1LSB=1us	
		Data 11	Time Code 5 - Low Byte		
		Data 12	Time Code 6 - High Byte	Time Code 6 1LSB=1us	
		Data 13	Time Code 6 - Low Byte		
		Data 14	Time Code 7 - High Byte	Time Code 7 1LSB=1us	
		Data 15	Time Code 7 - Low Byte		
		Data 16	Time Code 8 - High Byte	Time Code 8 1LSB=1us	
		Data 17	Time Code 8 - Low Byte		
12	0×0B	Data 1	**Internal Sync: 0x00** **External Sync: 0x01**	Internal/External Sync	**Laser Designation** Switching
		Data 2~17	0×00		

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13	0×0C	Data 1	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**
		Data 2~17	0×00	
14	0×50 (Save)	Data 1	Q Delay – High Byte	**Laser Q-Delay and LD Pulse Width Setting** Range: **50–300 μs** (1 LSB = 1 μs)
		Data 2	Q Delay – Low Byte	
		Data 3	LD Pulse Width – High Byte	Range：50-300us (1LSB=1us)
		Data 4	LD Pulse Width – Low Byte	
		Data 5~17	0×00	
15	0×51 (Save)	Data 1	LD Current Option 0 Parameters	Range：0-140A(1LSB=1A)
		Data 2	LD Current Option 1 Parameters	Range：0-140A(1LSB=1A)
		Data 3	LD Current Option 2 Parameters	Range：0-140A(1LSB=1A)
		Data 4	LD Current Option 3 Parameters	Range：0-140A(1LSB=1A)
		Data 5~17	0×00	
16	0×52 (Save)	Data 1	Q High Voltage – High Byte	Range：2000-5000(1LSB=1V)
		Data 2	Q High Voltage – Low Byte	
		Data 3~17	0×00	
17	0×53 (Save)	Data 1	APD High Voltage – High Byte	Range：40-450(1LSB=1V)
		Data 2	APD High Voltage – Low Byte	
		Data 3~17	0×00	
18	0×54	Data 1~17	0×00	LD Parameter Query
19	0×55	Data 1	0x01: ON 0x00: OFF	Receiver Status Setting (Receiver ON/OFF Switch)
		Data 2~17	0×00	
20	0×56	Data 1	0x01: ON 0x00: OFF	Q High Voltage Status Setting
		Data 2~17	0X00	
21	0×57	Data1	0x01: ON 0x00: OFF	LD1 Power Status Setting
		Data 2~17	0×00	
22	0×59 (Save)	Data 1	Fan startup temperature point	**Fan Activation Temperature Setting** Unit: **°C** (range: **0–100**)
		Data 2	0x01: Set 0x00: Query	When querying, **Data1 = 0x00**.
		Data 3~17	0×00	
23	0×5A	Data 1	Temperature Index	
		Data 2	Current	Range: 0–140 A (1 LSB = 1 A)
		Data 3	Q Delay – High Byte	Q Delay Range: 50–300 μs (1 LSB = 1 μs)
		Data 4	Q Delay – Low Byte	
		Data 5	LD Pulse Width – High Byte	LD Pulse Width Range: 50–300 μs (1 LSB = 1 μs)
		Data 6	LD Pulse Width – Low Byte	

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		Data 7	Q High Voltage – High Byte	Range：2000-5000(1LSB=1V)
		Data 8	Q High Voltage – Low Byte	
		Data 9~17		
24	0×5B	Data 1~17	0X00	Read Temperature Parameter Command
25	0×5C	Data 1	Disable Automatic Mode: 0x00 Enable Automatic Mode: 0x01	Automatic/Manual Mode Switching Command
		Data 2-17		
26	0×5D	Data 1~17	0×00	Query Current Temperature Parameter Command
27	0×5E	Data 1-17	0×00	Disable 70 °C Over-Temperature Shutdown Command
28	0×5F	Data 1~17	0×5F	Serial Port Firmware Upgrade Command
29	0×60	Data 1~17	0×00	Software Version Query

Table 3 — Laser Return Data

No.	Command	Description	Remarks
Byte 1	0×EB	Frame Header 1	
Byte 2	0×90	Frame Header 2	
Byte 3	0×18	Data Length	Byte3~Byte26
Byte 4	0×00	Laser Stop Ranging/Illumination	Rangefinder /Internal Trigger
	0×01	Single-Shot Ranging	
	0×02	1 Hz Ranging	
	0×03	1–25 Hz Ranging Start	1-25Hz
	0×04	External Sync Illumination Setting	
	0×05	Internal/External Sync Illumination Start	
	0×06	Range Gate Setting	
	0×07	Range Gate Query	
	0×08	Internal Sync Illumination Period Setting	
	0×09	Internal Sync Illumination Period Query	
	0×0A	Time Code Setting	
	0×0B	Internal/External Sync Illumination Switching	
	0×0C	LD Current Option Setting	
	0×0D	1 Hz Status Frame	Uploaded at 1 Hz when the laser is not emitting
	0×50	Q-Delay and LD Pulse Width Setting	
	0×51	LD Current Setting	
	0×52	Q High Voltage Setting	
	0×53	APD High Voltage Setting	
	0×54	LD Parameter Query	
	0×55	Receiver Status Setting (Receiver ON/OFF Switch)	
	0×56	Q High Voltage Status Setting	

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	0×57	LD1 Power Status Setting	
	0×59	Fan Activation Temperature Point	
	0×5A	Write Temperature Parameter Command	
	0×5B	Read Temperature Parameter Command	
	0×5C	Automatic/Manual Mode Switching Command	
	0×5D	Query Current Temperature Parameter Command	
	0×5E	Disable 70°C Over-Temperature Shutdown Command	
	0×60	Software Version Query	
	0×EE	Receive Data Error	
	0×ED	Parameter Setting Failed	
Byte 5~21	Data 1~17		
Byte 22	Data 18	Status Word 1	
Byte 23	Data 19	Status Word 2	
Byte 24	Data 0	Ambient Temperature	S8,1LSB=1°C
Byte 25	Data 21	LD Temperature	S8,1LSB=1°C
Byte 26	Checksum		Sum of bytes 3 through 25

Table 4 — Laser Return Data Description
Relationship between **Byte 4** and **Bytes 5–25**

NUM	Byte4	Byte5~Byte25 Data1~17		Remarks
1	0×00	Data1~17	0×11	Laser Stop
2	0×01、0×02、0×03、0×05、	Data 1	Distance 1 High Byte	Target distance values for Single-Shot Ranging, 1 Hz Ranging, 1–25 Hz Ranging, and Internal/External Sync Laser Designation, in meters (m)
		Data 2	Distance 1 Low Byte	
		Data 3	Distance 2 High Byte	
		Data 4	Distance 2 Low Byte	
		Data 5	Distance 3 High Byte	
		Data 6	Distance 3 Low Byte	
		Data 7~17	0×00	
3	0×04	Data 1	External Sync Emission Delay – High Byte	**External Sync Laser Designation — Laser Emission Delay After Receiving the External Sync Signal** Range: **303.0–305.0 µs** (1 LSB = 0.1 µs) Default: **304.0 µs** (1 LSB = 0.1 µs)
		Data 2	External Sync Emission Delay – Low Byte	
		Data 3~17	0×00	
4	0×06、0×07	Data 1	Range Gate High Byte – Near Range	**Range Gate Setting, Range Gate Query** **Range Gate Setting** Unit: **meters** (minimum ranging distance **300 m**,
		Data 2	Range Gate Low Byte – Near Range	

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		Data 3	Range Gate High Byte – Far Range	maximum ranging distance **50,000 m**).	
		Data 4	Range Gate Low Byte – Far Range		
		Data 5~17	0×00		
5	0×08、0×09	Data 1	Internal Sync Illumination Period – High Byte	Internal Sync Illumination Period Setting	**Internal Sync Laser Designation Period T.** Laser designation period = **45,000 μs to 125,000 μs**, unit: **μs** Default: **50,000 μs (20 Hz)**
		Data 2	Internal Sync Illumination Period – Middle Byte		
		Data 3	Internal Sync Illumination Period – Low Byte		
		Data 4	Internal Sync Illumination Duration		Unit: seconds, range 1–90, default 90
		Data 5	Internal Sync Illumination Interval		Unit: seconds, range 1–255, default 40
		Data 6	Internal Sync Illumination Cycle Count		Range: 1–4, default 1
		Data 6-Data 17	0×00		
6	0×0A	Data 1	Time Code length	Time Code length	**Range: 1–8 (1 LSB = 1)** **Default: 1**
		Data 2	Time Code 1 – High Byte	Time Code 1 1LSB=1us	Length: 8 Time Code values 1 LSB = 1 μs Range: 40,000–60,000 μs Default: 8 Time Code values set to 50,000 μs Each Time Code value is 16 bits (high byte first, low byte second).
		Data 3	Time Code 1 – Low Byte		
		Data 4	Time Code 2 - High Byte	Time Code 2 1LSB=1us	
		Data 5	Time Code 2 - Low Byte		
		Data 6	Time Code 3 - High Byte	Time Code 3 1LSB=1us	
		Data 7	Time Code 3 - Low Byte		
		Data 8	Time Code 4 - High Byte	Time Code 4 1LSB=1us	
		Data 9	Time Code 4 - Low Byte		
		Data 10	Time Code 5 - High Byte	Time Code 5 1LSB=1us	
		Data 11	Time Code 5 - Low Byte		
		Data 12	Time Code 6 - High Byte	Time Code 6 1LSB=1us	
		Data 13	Time Code 6 - Low Byte		
		Data 14	Time Code 7 - High Byte	Time Code 7 1LSB=1us	
		Data 15	Time Code 7 - Low Byte		
		Data 16	Time Code 8 - High Byte	Time Code 8 1LSB=1us	
		Data 17	Time Code 8 - Low Byte		

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7	0×0B	Data 1	**Internal Sync: 0x00** **External Sync: 0x01**	Internal/External Sync Laser Designation Switching
		Data 2~17	0×00	
8	0×0C	Data 1	**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**
		Data 2~17	0×00	
9	0×0D (1Hz 上传)	Data 1	External Sync Emission Delay – High Byte	**External Sync Laser Designation — Laser Emission Delay After Receiving the External Sync Signal** Range: **303.0–305.0 μs** (1 LSB = 0.1 μs) Default: **304.0 μs** (1 LSB = 0.1 μs)
		Data 2	External Sync Emission Delay – Low Byte	
		Data 3	Time Code length	**Range: 1–8 (1 LSB = 1)** **Default: 1**
		Data 4	Internal Sync Illumination Period – High Byte	**Internal Sync Laser Designation Period T.** Laser designation period = **45,000 μs to 125,000 μs**, unit: **μs** Default: **50,000 μs (20 Hz)**
		Data 5	Internal Sync Illumination Period – Middle Byte	
		Data 6	Internal Sync Illumination Period – Low Byte	
		Data 7	Range Gate High Byte – Near Range	**Range Gate Setting, Range Gate Query** **Range Gate Setting** Unit: **meters** (minimum ranging distance **300 m**, maximum ranging distance **50,000 m**)
		Data 8	Range Gate Low Byte – Near Range	
		Data 9	Range Gate High Byte – Far Range	
		Data10	Range Gate Low Byte – Far Range	
		Data11~17	0×00	
10	0×50	Data 1	Q Delay – High Byte	**Laser Q-Delay and LD Pulse Width Setting/Query** Range: **50–300 μs** (1 LSB = 1 μs)
		Data 2	Q Delay – Low Byte	
		Data 3	LD Pulse Width – High Byte	Range: 50–300 μs (1 LSB = 1 μs)
		Data 4	LD Pulse Width – Low Byte	
		Data 5~17	0x00	
11	0×51	Data 1	Set LD Current Option 0	Range：0-140A(1LSB=1A)
		Data 2	Set LD Current Option 1	Range：0-140A(1LSB=1A)
		Data 3	Set LD Current Option 2	Range：0-140A(1LSB=1A)
		Data 4	Set LD Current Option 3	Range：0-140A(1LSB=1A)
		Data5~17	0x00	

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12	0×52	Data 1	Q High Voltage 1 – High Byte	Range：2000-5000(1LSB=1V)
		Data 2	Q High Voltage 1 – Low Byte	
		Data 3~17	0×00	
13	0×53	Data 1	APD High Voltage – High Byte	Range：40-450(1LSB=1V)
		Data 2	APD High Voltage – Low Byte	
		Data 3~17	0x00	
14	0×54	Data 1	Q Delay – High Byte	Range：50-300us (1LSB=1us)
		Data 2	Q Delay – Low Byte	
		Data 3	LD Pulse Width – High Byte	Range：50-300us (1LSB=1us)
		Data 4	LD Pulse Width – Low Byte	
		Data 5	LD Current Option 0	Range：0-140A(1LSB=1A)
		Data 6	LD Current Option 1	Range：0-140A(1LSB=1A)
		Data 7	LD Current Option 2	Range：0-140A(1LSB=1A)
		Data 8	LD Current Option 3	Range：0-140A(1LSB=1A)
		Data 9	Q High Voltage – High Byte	Range：2000-5000(1LSB=1V)
		Data 10	Q High Voltage – Low Byte	
		Data 11	APD High Voltage – High Byte	Range：40-450(1LSB=1V)
		Data 12	APD High Voltage – Low Byte	
		Data 13	External Sync Emission Delay – High Byte	**External Sync Laser Designation — Laser Emission Delay After Receiving the External Sync Signal** Range: **303.0–305.0 μs** (1 LSB = 0.1 μs) Default: **304.0 μs** (1 LSB = 0.1 μs)
		Data 14	External Sync Emission Delay – Low Byte	
		Data 15	Fan Activation Temperature Point	
		Data 16~17	0×00	
15	0×55	Data 1	0x01: ON 0x00: OFF	Receiver Status Setting
		Data 2~17	0×00	
16	0×56	Data 1	0x01: ON 0x00: OFF	Q High Voltage Status Setting
		Data 2~17	0×00	
17	0×57	Data 1	0x01: ON 0x00: OFF	LD1 Power Status Setting
		Data 2~17	0×00	
18	0×59	Data1	0x01: ON 0x00: OFF	Fan Activation Temperature Point (range 0–100)
		Data 2~17	0×00	
19		Data 1	Temperature Index	1-121

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	0×5A、0×5B	Data 2	Current	Range：0-140A(1LSB=1A)
		Data 3	Q Delay – High Byte	Q Delay Range：50-300us (1LSB=1us)
		Data 4	Q Delay – Low Byte	
		Data 5	LD Pulse Width – High Byte	LD Pulse Width Range：50-300us (1LSB=1us)
		Data 6	LD Pulse Width – Low Byte	
		Data 7	Q High Voltage – High Byte	Range：2000-5000(1LSB=1V)
		Data 8	Q High Voltage – Low Byte	
		Data 9~17		
20	0×5C	Data 1	**Disable Automatic Mode: 0x00** **Enable Automatic Mode: 0x01**	Automatic/Manual Mode Switching Command
		Data 2-17		
21	0×5D	Data 1	Current	Range：0-140A(1LSB=1A)
		Data 2	Q Delay – High Byte	Q Delay Range：50-300us (1LSB=1us)
		Data 3	Q Delay – Low Byte	
		Data 4	LD Pulse Width – High Byte	LD Pulse Width Range：50-300us (1LSB=1us)
		Data 5	LD Pulse Width – Low Byte	
		Data 6	Q High Voltage – High Byte	Range：2000-5000(1LSB=1V)
		Data 7	Q High Voltage – Low Byte	
		Data 8	Current Temperature Point	Disable Automatic Mode, fixed at –55
		Data 9~17		
22	0×5E	Data 1-17	0×00	Disable 70 °C Over-Temperature Shutdown Command
23	0×60	Data 1	Year (last two digits, e.g., 25 for 2025)	ARM Software Version
		Data 2	Month	
		Data 3	Day	
		Data 4	AA fixed value	
		Data 5	Current Version	
		Data 6	Current Version Revision	
		Data 7	Year (last two digits, e.g., 25 for 2025)	FPGA Software Version
		Data 8	Month	
		Data 9	Day	
		Data 10	AA fixed value	
		Data 11	Current Version	
		Data 12	Current Version Revision	

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		Data 13-17		
24	0×EE	Data 1~17	0×EE	Receive Data Error
25	0×ED	Data 1~17	0×ED	Parameter Setting Failed

Status Word 1

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Internal/External Sync Illumination 0: Internal 1: External	Ready / Standby 0: Standby 1: Preparing	Temperature Sensor Status 0: Normal 1: Error	Main Pulse 0: Normal 1: Error	Receiver ON/OFF Switch 0: ON 1: OFF	Receiver Current Status 0: ON 1: OFF	Ambient Temperature 0: Normal 1: Error	LD Temperature 0: Normal 1: Error (Over-Temperature > 70 °C)

Status Word 2

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Laser Designation Status 0: No Emission 1: Emitting	LD Current Status 0: Normal 1: Error	LD Power Status 0: ON 1: OFF	External Sync Signal Status 0: Normal 1: Error	X Default: 0	X Default: 0	LD Current Option LD Current Option 0: 0x00 LD Current Option 1: 0x01 LD Current Option 2: 0x02 LD Current Option 3: 0x03	

After laser emission ends, one complete data frame will be automatically returned.

7. POINTS TO NOTE

- Please read the instruction carefully before using the Laser Ranging Target Designator.
- Strictly follow the switching process, otherwise the device may be damaged.
- The product belongs to class4 strong laser products, which have irreversible damage to the human body; when working, it is strictly prohibited to look directly at the light outlet or aim at the human body.
- It is strictly prohibited for the operator to leave when working.
- Pay attention to the positive and negative connection, if the connection is reversed, the machine will be burned out.
- Pay attention to the heat dissipation of the shell when working for a long time, and add a radiator and a fan to assist in heat dissipation if necessary.
- Pay attention to keep the surface of the laser transmitting lens clean. If you find dirt, please use cotton wool and anhydrous alcohol to wipe gently. It is strictly prohibited to wipe directly with water.

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