

4km Laser Rangefinder Module LRF



Product Introduction

JIO-H0407X laser rangefinder LRF module adopts Jioptik's self-developed 1535nm erbium glass laser module, which has the features of long distance measurement, low power consumption, small size and safety for human eyes.

Range performance: 4000m (2.3x2.3m NATO target), 7000m (Maximum range)

Ranging accuracy ± 1 m

Measurement accuracy $\geq 98\%$

Weight ≤ 57 g

Product features

1. Integrated configuration design and front end face multi-point sealing installation, strong anti-imbalance ability, high durability, long working life, eye safety;
2. Using non-thermal receiving optical design technology, with good optical noise suppression ability, near distance ranging performance and high and low temperature optical performance;
3. The internal interface of the circuit adopts the welding wire direct connection process, which is firm and reliable, which can avoid the short circuit or poor contact caused by the loosening, oxidation and water vapor of the connector, and improve the reliability and life of the product.

Product performance index

Item	Index
Model	JIO-H0407X
Operating wavelength	1535nm ± 10 nm
Eye-Safe	Class 1 (IEC 60825-1)
Receiving Aperture	$\phi 19$ mm
Ranging range	30-7000m

Range performance	7000m	Maximum range
	≥5500m	Big target, Reflectivity: 60 %, observer visibility 12 km
	≥4000m	2.3×2.3m NATO target, Reflectivity: 30 %, observer visibility 8 km
	≥2300m	0.5×1.7m Person, Reflectivity: 10 %, observer visibility 8 km
	≥1100m	0.2×0.3m UAV, Reflectivity: 10 %, observer visibility 8 km
Communication Interface	RS422	
Humidity	≤ 60%	
Ranging accuracy	±1m	
Accuracy rate	≥98%	
Divergence angle	≤0.5mrad	
Ranging frequency	1~10hz	
Continuous ranging time	≥30min	
Non-parallelism of the laser optical axis to the mounting reference	<0.3mrad	
Size	≤48.5×36×26mm	
Voltage	5V	
Power consumption	Standby power consumption ≤1W. Rated power consumption ≤1.6W. Peak power consumption ≤4W	
Working temperature	-40 °C ~ +70 °C	
Storage temperature	-50 °C ~ +75 °C	
Weight	≤57g	
Shock	1800g, 6ms	

Note: All interfaces and parameters of the laser rangefinder module can be customized.

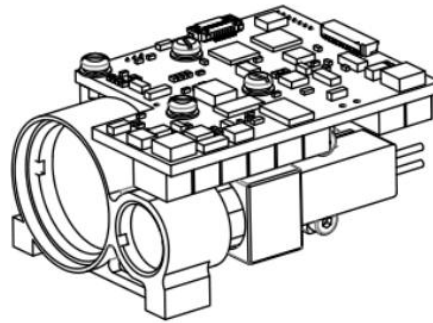
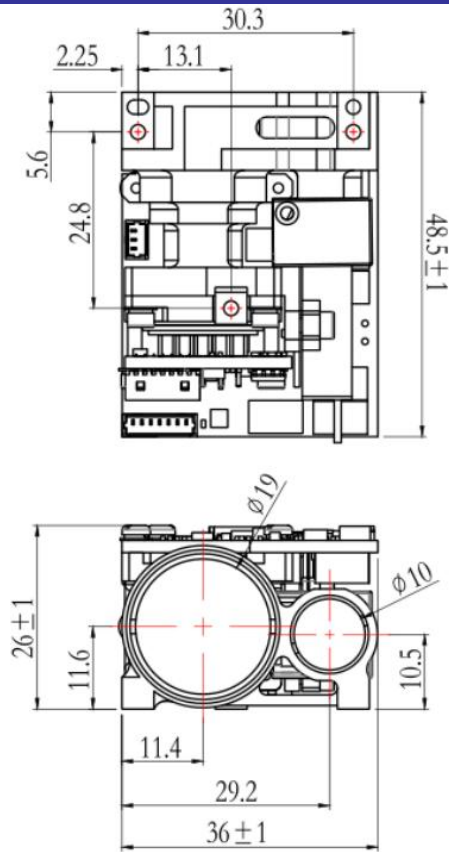
Applications for STA-H0407X Laser Rangefinder Module

Thermal imaging, night vision and other handheld mobile devices
Border observation and surveillance systems
Sensor kits for UAV pods and UGVs

Ranging mode and ranging time

a) Single maximum continuous ranging time: ≥35 min;
b) The maximum interval time for continuous distance measurement again: ≤15s.
Laser optical axis stability ≤ 0.1mrad (full temperature range);
Non-parallelism of the laser optical axis to the installation reference ≤0.25mrad;

Structure installation interface



Electrical Interface

Communication interface RS422/TTL communication;

Baud rate: 115200;

Data bits: 8;

Start bit: 1;

Stop bit: 1;

Parity bit: none;

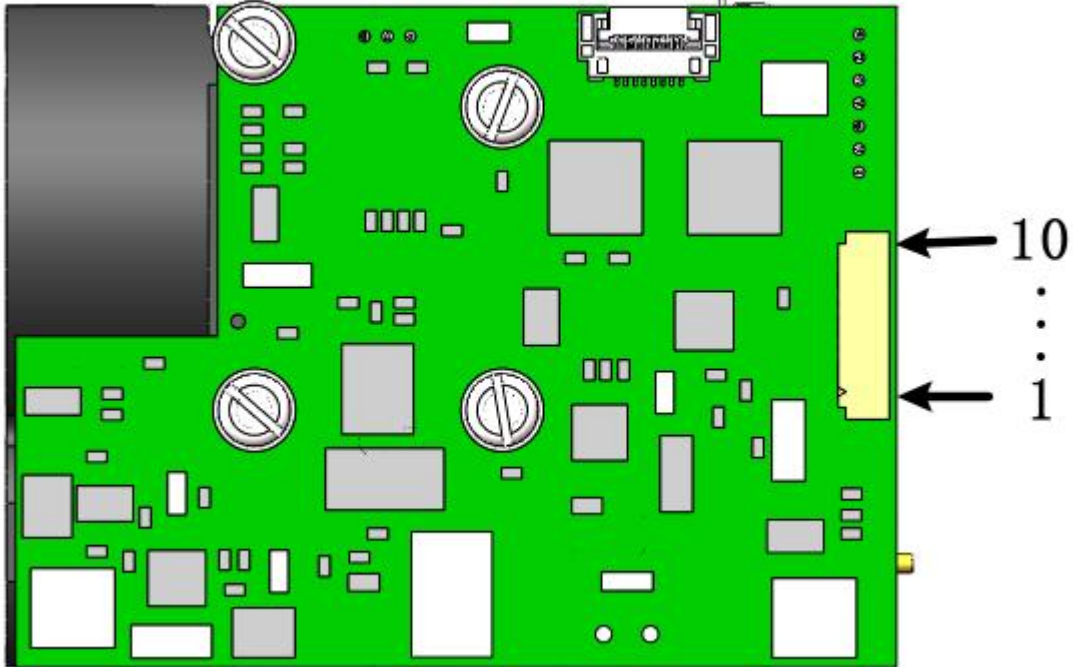
b) External Connector;

The upper computer side realizes the cross-link test with the DF52-10S-0.8 connector on the rangefinder side through the DF52-10P-0.8C connector.

Table 1 Pin definitions

Pin	Grade	Electrical Characteristics Definition	Remarks
P-1	VIN+	Input Power Positive	Power supply
P-2	VTN+		
P-3	COM	Input Power Negative	
P-4	COM		
P-5	RS422_TXD+	Signal output port	From rangefinder to host computer
P-6	RS422_TXD-		
P-7	RS422_RXD-	Signal input port	From host computer to rangefinder
P-8	RS422_RXD+		
P-9	SWDIO	Communication ground	
P-10	SWCLK	Clock port	

Position of pin 1 of connector



Serial communication protocol

1.Communication Protocol

1.1 Serial port parameters

Asynchronous serial communication standard: RS-422

Baud rate: 115200bps

Transmission format: 8 data bits

1 start bit

1 stop bit

No parity bit

For each byte message, the lowest bit (lsb) is transmitted first, or in the case of a multi-byte message, the lower byte is transmitted first.

1.2 Message format

The communication message format is as follows:

Message header (1 byte)
Subsystem ID number
Message body
Message tail (1 byte, i.e. checksum)

The message body portion of the above table is described in detail in Section 2, 'Data Protocol'. The message header, subsystem ID number and message tail are as described in Tables 1, 2 and 3.

Table 1: Description of the message header

Name of each byte	Data type	Byte Length	Value/value range	Comments
Message start code	Unsigned byte	1	0xEE	constant

Table 2: Description of subsystem ID numbers

Name of each byte	Data type	Byte Length	Value/value range	Comments
Subsystem ID No.	Unsigned byte	1	0x07	constant

Table 3: Description of message tail (checksum)

Name of each byte	Data type	Byte Length	Value/value range	Comments
checksum	Unsigned byte	1	0-255	The sum of each byte of the information body part is modelled against 256.

The first byte of the 'message header' is 0xEE, which is the synchronisation code indicating the start of a frame of information; the subsystem ID number is the identification number assigned by the system to the laser rangefinder for system identification of the monolithic body, and the subsystem ID number of the laser rangefinder is 0x07; the end of the message is the checksum, which is the modulus of the 256 taken by summing up all bytes of the message body .

2.Data protocol

2.1 Output messages

Output information refers to the commands sent from the system to the laser rangefinder. The command information packet is a 6-byte fixed-length format, and the information body is 6 bytes, as defined in Table 4:

Table 4: Output command information body data format

Command Content	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Start self check	0x01	N/A	N/A	N/A	N/A	N/A
5Hz Ranging	0x02	N/A	N/A	N/A	N/A	N/A
10Hz Ranging	0x04	N/A	N/A	N/A	N/A	N/A
Laser stop	0x05	N/A	N/A	N/A	N/A	N/A
Pulse count reporting	0x0A	N/A	N/A	N/A	N/A	N/A
Product identification reporting	0x10	N/A	N/A	N/A	N/A	N/A
Single ranging	0x0B	N/A	N/A	N/A	N/A	N/A
1Hz Ranging	0x0C	N/A	N/A	N/A	N/A	N/A
Temperature reading	0x06	N/A	N/A	N/A	N/A	N/A

Note 1: N/A defaults to 0x00.

2.2 Input information

Input information refers to the status information that the system receives from the laser rangefinder. The status information packet is a 9-byte fixed-length format, and the information body is 6 bytes, as defined in Table 5:

Table 5: Status information body

Status Content	Byte 1	Byte 2	Byte 3	Byte 4~5	Pulse Count Number
Power-on self-test answer	0x00	Power-up self-test results: 0x00: Normal 0x01: breakdown	When "Power-on self-test complete" : Status code (Note 1)	N/A	N/A
Startup self-test response	0x01	Initiate self-test results: 0x00: Normal 0x01: breakdown	When "startup self-test complete": status code (note 1)	N/A	N/A
5Hz Ranging	0x02	Is there a malfunction: 0x00: Normal 0x01: breakdown	Status code (Remark 1)	Laser distance value (Remark 2)	0~255
10Hz Ranging	0x04	Is there a malfunction: 0x00: Normal 0x01: breakdown	Status code (Remark 1)	Laser distance value (Remark 2)	0~255
Laser stop	0x05	N/A	N/A	N/A	N/A
Responding to pulse reporting	0x0A	N/A	N/A	Laser pulse counting (note 3)	N/A
Product identification reporting	0x10	Marker No. 1 (Remark 4)	Marker No. 2 (Remark 4)	N/A	N/A
Single ranging	0x0B	Is there a malfunction: 0x00: Normal 0x01: breakdown	Status code (Remark 1)	Laser distance value (Remark 3)	N/A
1hz Ranging	0x0C	Is there a malfunction: 0x00: Normal 0x01: breakdown	Status code (Remark 1)	Laser distance value (Remark 2)	0~255
temperature report	0x06	N/A	Temperature values (Remark 5)	N/A	N/A

Remark 1: Fault code is judged by bit, 0:Pass 1:fail Bit0~bit7 represent each SRU, see Table 6 for detailed definition.

Remark 2: Byte4 and byte5 represent the low and high distance values respectively (distance range: 0~65535, set the value to 0 when the distance measurement is invalid).

Remark 3: Actual laser pulse number = laser pulse count × 100 (Scale=100). (65535*100=6553500 times)

Remark 4: The product identification code consists of 2 bytes, byte 2 represents the product ID number of this laser rangefinder (as constant 0x03), and byte 3 represents the software version number of this laser rangefinder, in which the high four bits represent a digit and the low four bits represent a decimal.

Note 5: Byte 3 is the temperature value, representing the ambient temperature (temperature range -55~+125).

Remark 6: N/A default are 0x00.

Table 6: SRU Status Code Table

status bit (bit)	SRU Name
0	Standby, default 0

1	Standby, default 0
2	Standby, default 0
3	1: without echo; 0: with echo
4	1: The laser is not working ; 0: the laser is working normally
5	1: Temperature sensor overtemperature; 0: The temperature is normal
6	Standby, default 0
7	Standby, default 0

3. Control process

3.1 Information Response

After normal operation, the system sends control commands to the laser rangefinder, and the laser rangefinder starts to execute the commands and report status information to the system after receiving the commands. The main control flow is as follows:

When the system sends the "start self-test" command to the laser rangefinder, the laser rangefinder takes the initiative to report the detailed start self-test result information to the system after the start self-test is completed.

When the system sends the "range" command to the laser rangefinder, the laser rangefinder starts to measure the distance and reports the range status and distance value.

When the system sends the "laser stop" command to the laser rangefinder, the laser rangefinder stops the ongoing laser emission.

When the system sends the command "read product identification" to the laser rangefinder, the laser rangefinder replies "product identification code" within the response timeout.

Passive response timeout: 600ms.

Active response timeout (only when responding to "start self-test complete"): 1000ms.

3.2 Others

The two parties shall settle any outstanding issues through negotiation.