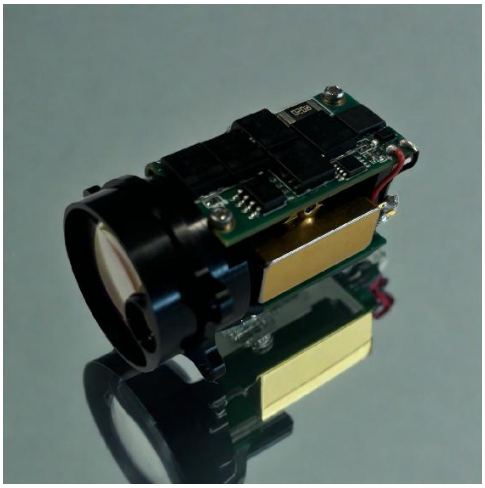
1535nm Eyesafe Laser Ranging Modul 0105C

Model:LRF0105C

PRODUCT DESCRIPTION



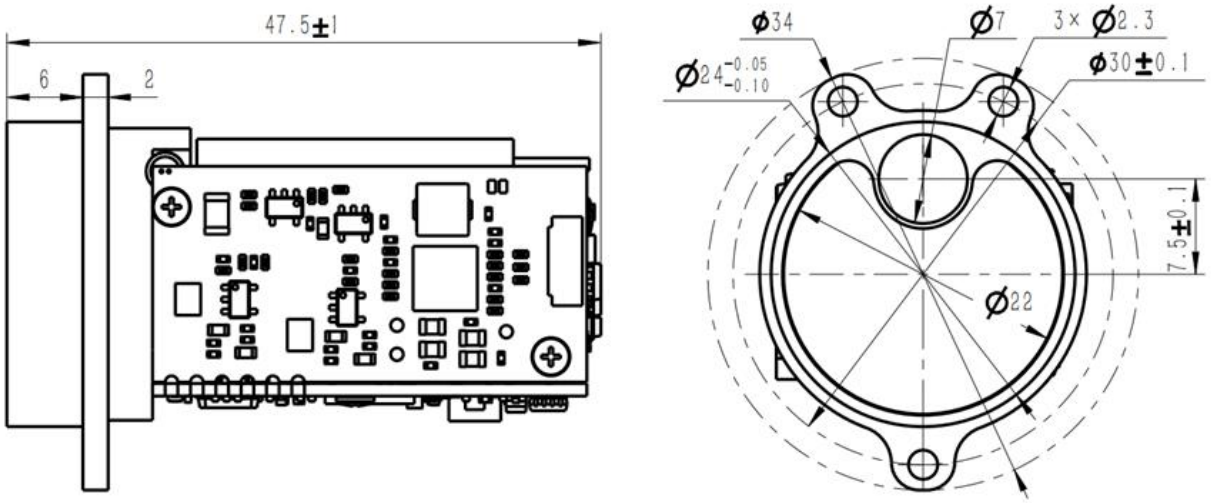
LRF0105C small laser rangefinder module is a precision optoelectronic product that emits laser to the target and calculates the distance information according to the laser flight time. This laser rangefinder module realizes communication through the Uart (TTL_3.3V) communication interface, and has the characteristics of outstanding performance, simple operation, small size, light weight, and low power consumption.

TECHNICAL SPECIFICATIONS

Project		Performance Indicators
Model		LRF0105C
Laser Wavelength		1535±5nm
Eye Safety		Class I
Divergence Angle		≤1mrad
Launch Lens Diameter		Φ8 mm
Receiver Lens Diameter		Φ20 mm
Measuring Range （Reflectance 30%; visibility ≥ 8km.）	Big Target （4m×6m)	≥4000m
	NATO objective(2.3m×2.3m)	≥3000m
	People(0.5m×1.7m)	≥1500m
	Drones(0.2m×0.3m)	≥1000m
Minimum Range		≤15 m
Ranging Frequency		Single, 1Hz, 5Hz, 10Hz
Ranging Accuracy		±2 m
Range Resolution		≤20 m
Precision Rate		≥98%
False Alarm Rate		≤1%
Number of multi-target detections		Up to 3 targets
Electrical Interface		FWF08002-S06B13W5M
Supply Voltage		DC3 ~ 5 V
Standby power consumption		≤1mW
Average power consumption		≤0.8W
Peak Power Consumption		≤1.5W

Weight	≤29±1 g
Dimension (L×W×H)	Φ34mm×47.5mm
Operating Temperature	-40 ~ +70 ℃
Storage Temperature	-55 ~ +75 ℃
Impact Resistance	1200 g/1 ms（GJB150.16A-2009）
Anti-vibration	5～50～5 Hz，1 Octave range /min，2.5 g
Ranging Logic	First and last target, multi-target ranging, distance selectivity
Activation Time	≤950 ms
Data Interface	UART（TTL_3.3V）
Electrical isolation	Isolation of power ground, communication ground and structure ground
Reliability	MTBF ≥ 1500h
Optical axis stability	≤0.05 mrad
Non-parallelism between optical axis and mounting surface	≤0.5 mrad
Electromagnetic Compatibility (EMC)	CE/FCC Certification
Eco-friendly	RoHS2.0

MECHANICAL DIMENSION(mm)



Mechanical and optical interface diagram

ELECTRICAL INTERFACE

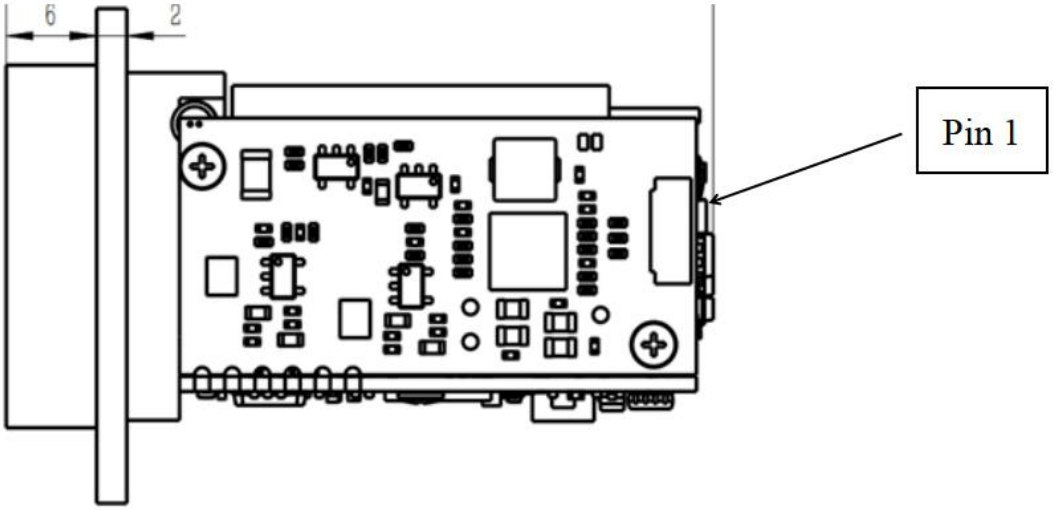
a) Power supply voltage: 3~5V;

The host computer realizes cross-linking test with the rangefinder through a 6PIN connector (FWF08002-S06B13W5M (Teska connector)). The pin definition of the communication port on the rangefinder is shown in the table.

Product electrical pin definition

Pin	Identification number	Definition of electrical characteristics	Cable color
P-1	COM	Input power negative pole	Power supply
P-2	VIN+	Input power positive pole	
P-3	-	(empty)	
P-4	TTL_TXD	Signal output port	From rangefinder to host computer

P-5	TTL_RXD	Signal input port	From host computer to rangefinder
P-6	POWER_CTL	Low power control port	＞0.7V to turn on, ＜0.15V to turn off



Connector connection 1 pin position

SOFTWARE

1. Interface Overview

The system is connected to the laser rangefinder through the TTL interface. The system sends control commands to the laser rangefinder through the serial port and receives the status and self-test information of the laser rangefinder.

2. Communication interface

The data transmission between the rangefinder and the host computer includes the following:

- Control commands: including single, 1Hz ranging commands, 5Hz ranging commands (expandable), query commands, etc.;
- Return data: including distance information, ambient temperature, rangefinder status, etc.

The data exchange between the rangefinder and the host computer adopts TTL communication, and its characteristics are as follows:

- Baud rate: 115200bps (factory)/57600bps/9600bps;
- Byte structure: low bit first, high bit last;
- Byte composition: 1 start bit, 8 data bits, 1 stop bit, no check.

3. Basic format of data packet

Table 1 Data packet format

Segment description	Segment length (bytes)	Ranges	Notes
Frame header	2	0xEE 0x16	Fixed value
Data length	1	2~9	The data length is the total number of bytes of the device code, command code, and command parameters.
Device code	1	0x03	Fixed value
Command code	1	0~255	Indicates the control object of the current control command
Command parameters	0~4	0~255	Indicates the control object parameters of the current control

			command
Checksum	1	0~255	The checksum is the sum of all the byte data of the device code, command code, and command parameters, and takes the lower 8 bits.

4. Control instructions

Table 2 Control instructions table

Command Code	Description	Command parameter bytes
0x01	Equipment self-test	0
0x02	Single distance measurement	0
0x03	Set first/last/multi-target	1
0x04	Continuous distance measurement	0
0x05	Stop distance measurement	0
0xA0	Set laser distance measurement module baud rate	4
0xA1	Set continuous distance measurement frequency	2
0xA2	Set minimum gate distance	2
0xA3	Query minimum gate distance	0
0xA4	Set maximum gate distance	2
0xA5	Query maximum gate distance	0
0x90	Query total number of light outputs	0
0x91	Query the number of light outputs during this power-on	0

5. Response data (ranging module → system)

Table 3 Response data table

Command Code	Description	Command parameter bytes
0x01	Device self-check	4
0x02	Single distance measurement	7
0x03	Set first/last/multi-target	0
0x04	Continuous distance measurement	4
0x05	Stop distance measurement	0
0x06	Distance measurement exception (This command is sent back after the single distance measurement or continuous distance measurement response command is sent back only when the status in the distance measurement exception command is abnormal)	4
0xA0	Set the baud rate of the laser ranging module	4
0xA1	Set the continuous ranging frequency	2
0xA2	Set the minimum gate distance	2
0xA3	Query the minimum gate distance	2
0xA4	Set the maximum gate distance	2
0xA5	Query the maximum gate distance	2
0x90	Query the total number of light outputs	3
0x91	Query the number of light outputs during this power-on	3

COMMUNICATION PROTOCOL

1. Equipment self-test

1) Sent to the laser ranging module:

Table 1 Self-test instruction table

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0x01	0x04

2) Laser ranging module returns:

Table 2 Self-test return data table

Bytes	0	1	2	3	4	5	6	7	8	9
Description	0xEE	0x16	0x06	0x03	0x01	Status3	Status2	Status1	Status0	Check_sum

Status3:	Reserve		
Status2:	Echo strength 0x00~0xFF		
Status1：	bit0--MCU system status	1 Normal	0 Abnormal
	bit1--Laser light status	1 Light emitting	0 No light
	bit2--Main wave detection status	1 Main wave	0 No main wave
	bit3--Echo detection status	1 Echo	0 No echo
	bit4--Bias switch status	1 Bias on	0 Bias off
	bit5--Bias output status	1 Bias normal	0 Bias abnormal
	bit6--Temperature status	1 Temperature normal	0 Temperature abnormal
	bit7--Light off status	1 Valid	0 Invalid
Status0：	bit0--5V6 power status	1 Normal	0 Abnormal

2. Single distance measurement

1) Send to the laser distance measurement module:

Table 3 Single distance measurement instruction table

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0x02	0x05

2) Laser ranging module returns:

Table 4 Single ranging return data table

Bytes	0	1	2	3	4	5	6	7	8	9
Description	0xEE	0x16	0x06	0x03	0x02	Status	The high 8 bits of the ranging value integer	The lower 8 bits of the ranging value integer	Distance measurement decimal places	Check_sum

When measuring the distance between the first and last targets:

Status： 0x00 indicates that the distance measurement result is a single target;
0x01 indicates that the distance measurement result has a front target;
0x02 indicates that the distance measurement result has a rear target;
0x03 reserved;
0x04 indicates that the distance measurement result exceeds the distance;
0x05 reserved.

When measuring distance between multiple targets:

Status_bit3~0： 0x00 indicates that the distance measurement result is a single target;
0x01 indicates that the distance measurement result has a front target;
0x02 indicates that the distance measurement result has a rear target;
0x04 indicates that the distance measurement result exceeds the distance;
0x05 reserved

3. Set the first/last/multi-target

1) Send to the laser ranging module:

Table 5 Set target command table

Bytes	0	1	2	3	4	5	6
Description	0xEE	0x16	0x03(Data length)	0x03	0x03	Target	Check_sum
Target: 0x01 sets the first target distance measurement; 0x02 sets the last target distance measurement; 0x03 sets the multi-target distance measurement							

2) Laser ranging module returns:

Table 6 Return data table

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0x03	0x06

4. Continuous distance measurement

1) Send to the laser distance measurement module:

Table 7 Continuous distance measurement command table

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0x04	0x07

2) Laser ranging module returns:

Table 8 Continuous ranging return data table

Bytes	0	1	2	3	4	5	6	7	8	9
Description	0xEE	0x16	0x06	0x03	0x04	Status	The high 8 bits of the ranging value integer	The lower 8 bits of the ranging value integer	Distance measurement decimal places	Check_sum
When measuring the distance between the first and last targets: Status: 0x00 means the distance measurement result is a single target										

5. Stop ranging

1) Send to the laser ranging module:

Table 9 Stop ranging instruction table

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0x05	0x08

2) Laser ranging module returns:

Table 10 Stop ranging return data table

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0x05	0x08

6. Distance measurement abnormality

Laser distance measurement module returns:

Table 11 Distance measurement abnormality return data table

Bytes	0	1	2	3	4	5	6	7	8	9
Description	0xEE	0x16	0x06	0x03	0x06	Reserve	Reserve	Reserve	Status1	Check_sum

Status1: bit0--MCU system status; 1 Normal 0 Abnormal
bit1--Laser light status; 1 Lighting 0 No light
bit2--Main wave detection status; 1 With main wave 0 Without main wave
bit3--Echo detection status; 1 With echo 0 Without echo
bit4--Bias switch status; 1 Bias on 0 Bias off
bit5--Bias output status; 1 Bias normal 0 Bias abnormal
bit6--Temperature status; 1 Temperature normal 0 Temperature abnormal
bit7--Light off status; 1 Valid 0 Invalid
This command will only be returned when bits 0~7 in Status1 are abnormal.

7. Set the baud rate of the laser ranging module

1) Send to the laser ranging module:

Bytes	0	1	2	3	4	5	6	7	8	9
Description	0xEE	0x16	0x06	0x03	0xA0	BaudHigh24	BaudHigh16	BaudLow8	BaudLow0	Check_sum

2) Laser ranging module returns:

Bytes	0	1	2	3	4	5	6	7	8	9
Description	0xEE	0x16	0x06	0x03	0xA0	BaudHigh24	BaudHigh16	BaudLow8	BaudLow0	Check_sum

8. Set the continuous ranging frequency

1) Send to the laser ranging module:

Bytes	0	1	2	3	4	5	6	7
Description	0xEE	0x16	0x04(Data length)	0x03	0xA1	Freq	Num	Check_sum3

Freq: 0x01 1Hz ranging mode
0x05 5Hz ranging mode (expandable)
Num: 0x00 reserved

2)Laser ranging module returns:

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0xA1	0xA4

9. Set the minimum gating distance

1) Send to the laser ranging module:

Bytes	0	1	2	3	4	5	6	7
Description	0xEE	0x16	0x04(Data length)	0x03	0xA2	DIS_H	DIS_L	Check_sum

DIS_H: distance high 8 bits
DIS_L: distance low 8 bits
DIS: 10~4000 minimum gate distance range, unit m

2)Laser ranging module returns:

Bytes	0	1	2	3	4	5	6	7
Description	0xEE	0x16	0x04(Data length)	0x03	0xA2	DIS_H	DIS_L	Check_sum

DIS_H: distance high 8 bits
DIS_L: distance low 8 bits
DIS: 10~4000 minimum gate distance range, unit: m

10. Set the maximum gate distance

1) Send to the laser ranging module:

Bytes	0	1	2	3	4	5	6	7
Description	0xEE	0x16	0x04(Data length)	0x03	0xA4	DIS_H	DIS_L	Check_sum
DIS_H: distance high 8 bits DIS_L: distance low 8 bits DIS: 10~4000 maximum gate distance range, unit m								

2)Laser ranging module returns:

Bytes	0	1	2	3	4	5	6	7
Description	0xEE	0x16	0x04(Data length)	0x03	0xA4	DIS_H	DIS_L	Check_sum
DIS_H: distance high 8 bits DIS_L: distance low 8 bits DIS: 10~4000 maximum gate distance range, unit m								

11. Query the minimum gate distance

1) Send to the laser ranging module:

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0xA3	0xA6

2)Laser ranging module returns:

Bytes	0	1	2	3	4	5	6	7
Description	0xEE	0x16	0x04(Data length)	0x03	0xA3	DIS_H	DIS_L	Check_sum
DIS_H: distance high 8 bits DIS_L: distance low 8 bits DIS: 10~4000 minimum gate distance range, unit m								

12. Query the maximum gate distance

1) Send to the laser ranging module:

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0xA5	0xA8

2)Laser ranging module returns:

Bytes	0	1	2	3	4	5	6	7
Description	0xEE	0x16	0x04(Data length)	0x03	0xA5	DIS_H	DIS_L	Check_sum
DIS_H: distance high 8 bits DIS_L: distance low 8 bits DIS: 10~4000 minimum gate distance range, unit m								

13. Query the total number of light outputs

1) Send to the laser ranging module:

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0x90	0x93

2)Laser ranging module returns:

Bytes	0	1	2	3	4	5	6	7	8
Description	0xEE	0x16	0x05	0x03	0x90	PNUM3	PNUM2	PNUM1	Check_sum
PNUM3: Total number of light outputs, bit23~bit16 PNUM2: Total number of light outputs, bit15~bit8 PNUM1: Total number of light outputs, bit7~bit0									

14. Query the number of times the light is emitted during this power-on

1) Send to the laser ranging module:

Bytes	0	1	2	3	4	5
Description	0xEE	0x16	0x02	0x03	0x91	0x94

2) Laser ranging module returns:

Bytes	0	1	2	3	4	5	6	7	8
Description	0xEE	0x16	0x05	0x03	0x91	PNUM3	PNUM2	PNUM1	Check_sum

PNUM3: The number of times the light is emitted during this power-on, bit23~bit16;
PNUM2: The number of times the light is emitted during this power-on, bit15~bit8;
PNUM1: The number of times the light is emitted during this power-on, bit7~bit0