

CS10-S1A

Single-point lidar

Product manual



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1. Description and characteristics

Product Description:

The CS10 – S1A is a cost-effective single-point lidar that uses dToF technology to obtain range information, data is transmitted through a serial port, and uses an 815nm laser as the active light source. The detection distance is 0.05m ~ 15m, and the absolute accuracy is within 3cm, which can be used in robot SLAM, indoor ranging and other fields.

Features

- Measuring range: 0.1~15m @60% indoor
- Absolute precision \leq 3cm
- The frame rate is adjustable from 1.8K/3.6K/7.2KHZ

Applicable scenarios

- ✓ Robot SLAM
- ✓ Industrial Measurements
- ✓ The drone is set at height
- ✓ Liquid level detection

2. Product introduction

2.1 Technical Specifications

parameter	least	typical	utmost	unit	remark
Input voltage	4.8	5.0	5.2	V	
Input current	-	-	100	mA	
Start-up time	-	113	-	ms	Time from power-up to data output
Laser wavelength	-	815	-	nm	
Range	0.05	-	15	meter	Indoor environment, 30% reflectivity
absolute error	-	-	30	mm	10% ~ 90% reflectivity
Frame rate	1.8	3.6	7.2	KHz	
FOV	-	2	-	Deg	Receiver
ESD	-	-	2	kV	Human body model
Operating temperature	-10	-	60	°C	
Storage	-20	-	65	°C	

temperature					
relative humidity	15		90%	%	Non-condensing environment
Data interface	UART				
Eye-safe	Class 1				
Exterior dimensions	36mm x 16mm x 19.5mm				
The weight of the whole machine	≤9g				

2.2 Block diagram of a LiDAR system

The CS10-S1A LiDAR hardware system mainly includes two parts: MCU processor and dTOF module, and the distance information of the module is output to the terminal through the UART interface.

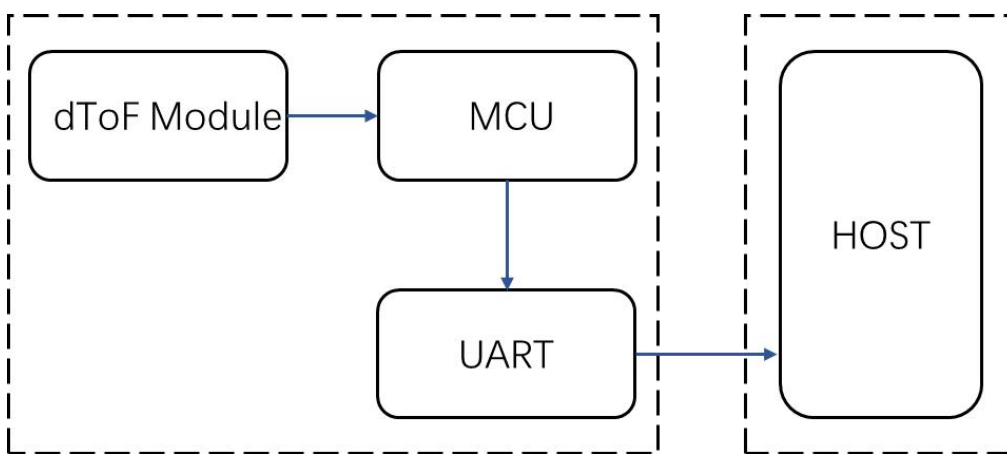


Figure 2-1. Block diagram of the CS10 single-point LiDAR system

3. Module performance

3.1 Absolute precision

Absolute accuracy is the difference between the measurement and the true value, and is used to characterize the proximity of the measurement to the true value, and its formula is defined as follows:

$$\text{Accuracy} = \left| \frac{\sum_{i=1}^N S_i}{N} - S \right|$$

10% Reflectance Full Scale Absolute Error $\leq 3\text{cm}$:

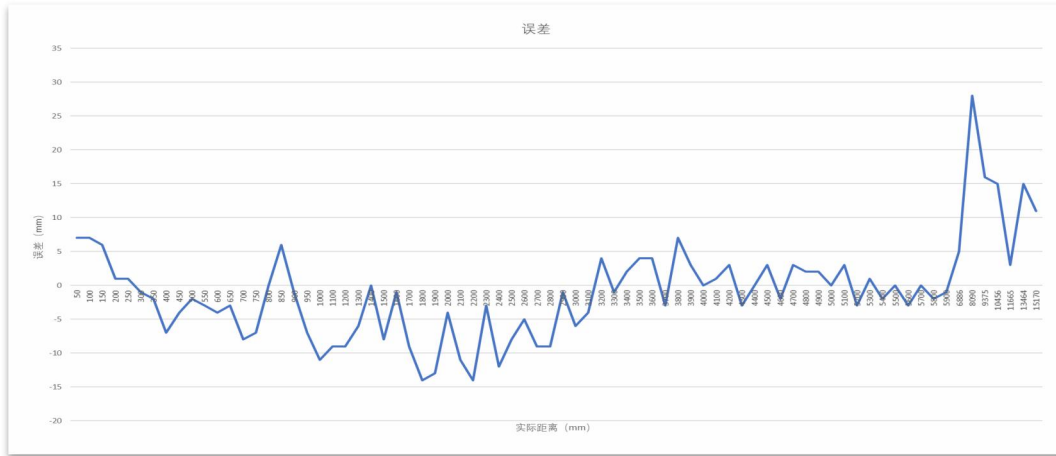


Figure 3-1. 10% reflectance error

90% reflectance full-scale absolute error $\leq 3\text{cm}$

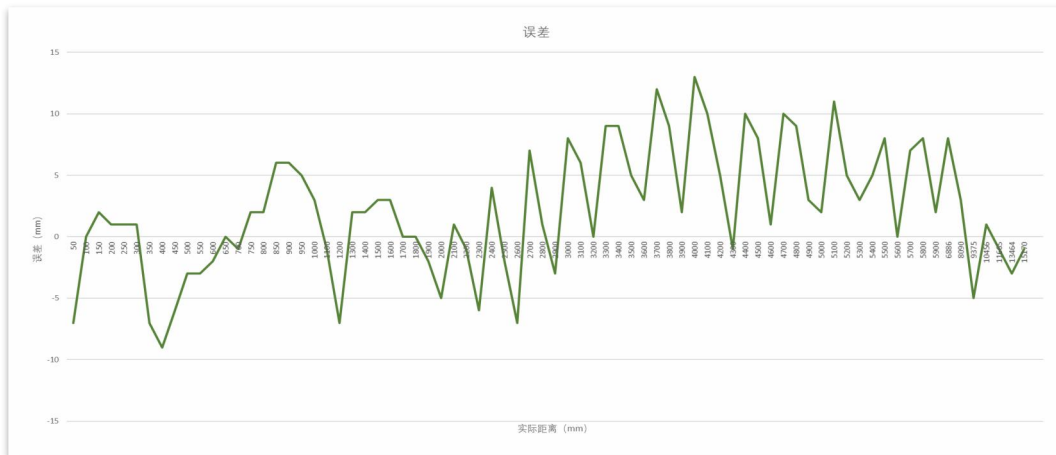


Figure 3-2. 90% reflectance error

3.2 Standard deviation

Standard Deviation: Refers to the fluctuation between the measurement result and the true value, and is used to characterize the data jitter of the measurement result, and its formula is defined as follows:

$$\text{STD} = \sqrt{\frac{\sum_{i=1}^N (S_i - S)^2}{N}}$$

10% reflectance full scale standard deviation $\leq 1\text{cm}$:

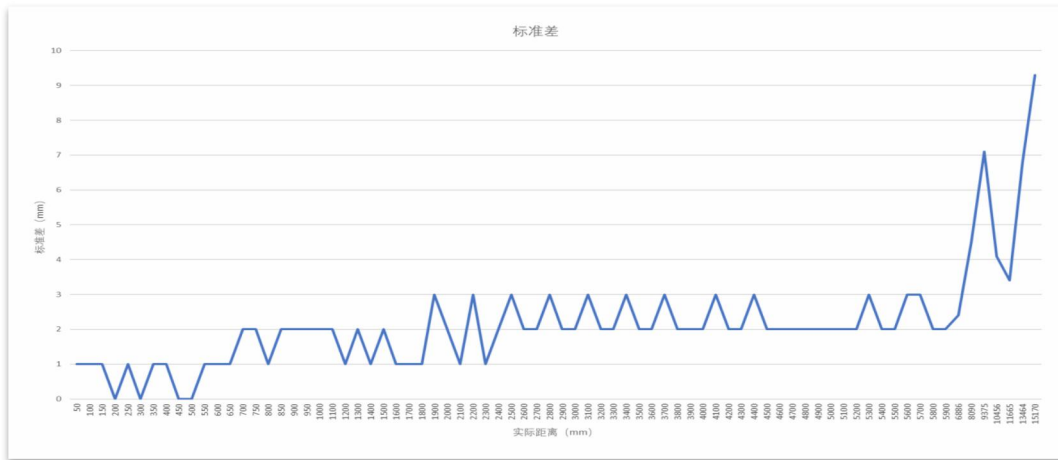


Figure 3-3. 10% reflectance standard deviation

90% reflectance full scale standard deviation $\leq 1\text{cm}$:

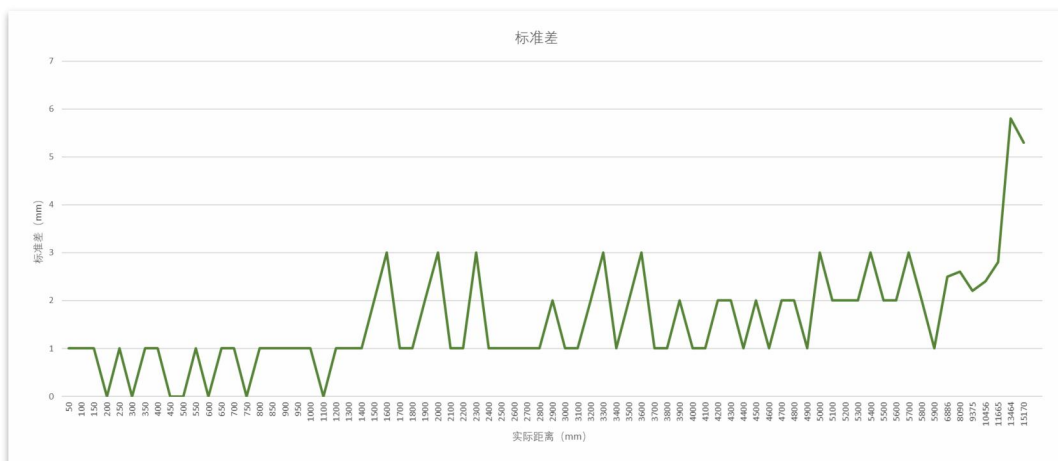



Figure 3-4. 90% standard deviation of reflectivity

4. Electrical connection

	Connector specifications	GH1.25-4P (Female sockets)
	red line	UART – RX
	Black	GND

	Yellow line	UART – TX
	green line	VCC - 5V

5. Serial port protocol

5.1 UART settings

Attribute	Value
Baud rate	576000
Check digit	None
Data bits	8
Stop bits	1

5.2 Data Output Format

- 1) Packet size: 6Byte
- 2) Data format:

Frame	Start character	Distance		Energy value		Check digit
Byte	1	2		2		1
	FA	L	H	L	H	

example:

The screenshot shows the UartAssist V5.0.2 interface. On the left, the serial port settings are configured as follows:

- 串口号: COM6
- 波特率: 576000
- 校验位: NONE
- 数据位: 8
- 停止位: 1
- 流控制: NONE
- 状态: 打开

The data log on the right shows a stream of hexadecimal data. A red box highlights the sequence 'D5 1C 66 02' in the log, with a red arrow pointing to it labeled '距离值' (Distance value) and a blue arrow pointing to the next sequence 'AD FA D8 1C 52 02 94' labeled '能量值' (Energy value).

Distance value 0x1CD5 = 7381mm

Energy value 0x0266 = 614

5.3 Frame rate switching process

- 1) ac ca 00 00 00 00 (Stop the instruction)
- 2) ac ca 03 00 00 03 (Toggle the command -1.8k output mode)
// ac ca 03 01 00 02 (Toggle command -3.6k output mode)
// ac ca 03 02 00 01 (Toggle the command -7.2k output mode)
- 3) ac ca 00 01 00 01 (Reboot command)

6. Mechanical structure

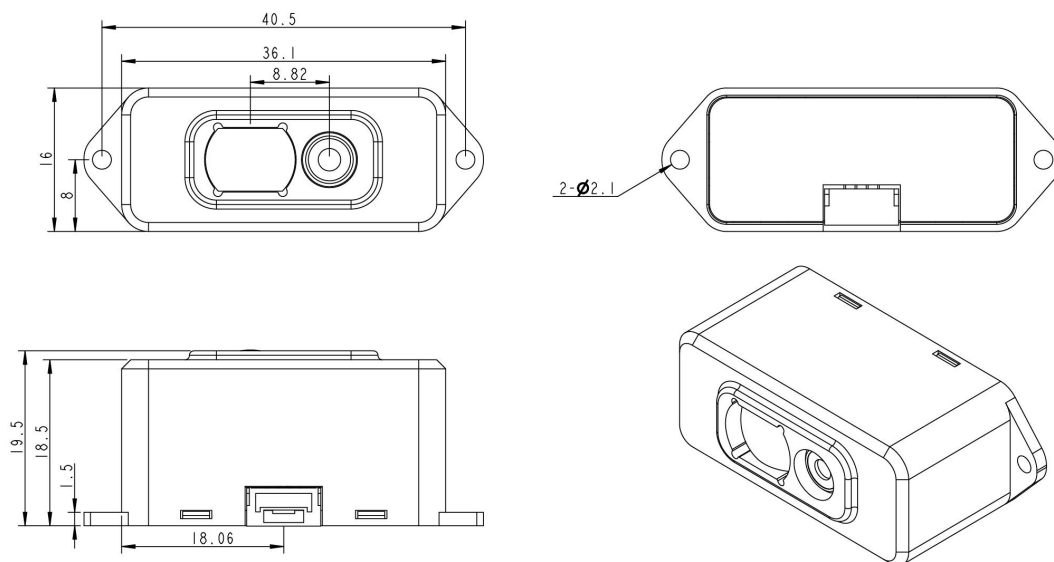


Figure 6-1 CS10 Schematic diagram of the structure of a single-point lidar

7. Instructions for the use of the upper computer

7.1 Upper computer interface

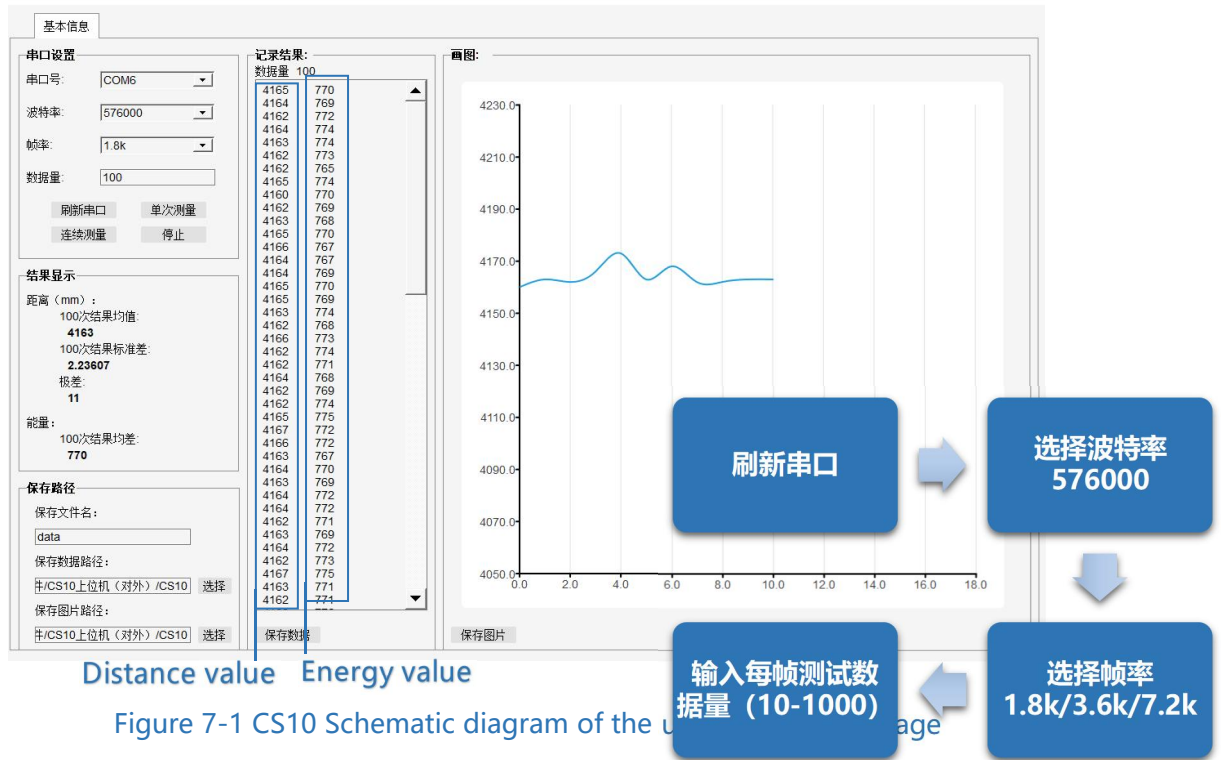



Figure 7-1 CS10 Schematic diagram of the upper computer interface

The host computer interface includes real-time data display, data path saving, serial port setting, result display, graphic output interface and other functions;


7.2 Serial port settings

interface display	Procedure
	<ul style="list-style-type: none"> ➤ Flashed the serial port ➤ Select baud rate 576000 ➤ Select the frame rate 1.8k/3.6k/7.2k ➤ Enter the amount of test data per frame (10-1000)

7.3 Data Measurement

interface display	Instructions
	<p>Single measurement: Only one set of data is output after a single click</p> <p>Continuous test: The output will continue after being single-handed, until the end of clicking Stop</p>

7.4 Data shows

interface display	Instructions
 <p>结果显示</p> <p>距离 (mm) :</p> <p>100次结果均值: 220</p> <p>100次结果标准差: 2</p> <p>极差: 13</p> <p>能量:</p> <p>100次结果均差: 1100</p>	<ul style="list-style-type: none"> ➤ Mean: The average value of 10~1000 distance values ➤ Standard deviation: 10~1000 standard deviations of distance values ➤ Range: The difference between the maximum and minimum values of 10~1000 distance values ➤ Energy value: the average of 10~1000 energy values

7.5 Data Retention



保存路径

保存文件名：
data

保存数据路径：
/03 软件/CS10自动标定/CS10 选择

保存图片路径：
/03 软件/CS10自动标定/CS10 选择

Figure 7-2 Schematic diagram of the CS10 data saving page

The data is ultimately saved in the form of txt documents or images in the specified folder directory.

8. Camera Cleaning Steps

1. Do not use any chemicals or water on the radar lens to wipe it;
2. Use a lens purge brush to remove dust and dirt from the lens as much as possible;
3. Wipe with a dry, clean microfiber cloth.

Disclaimer

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