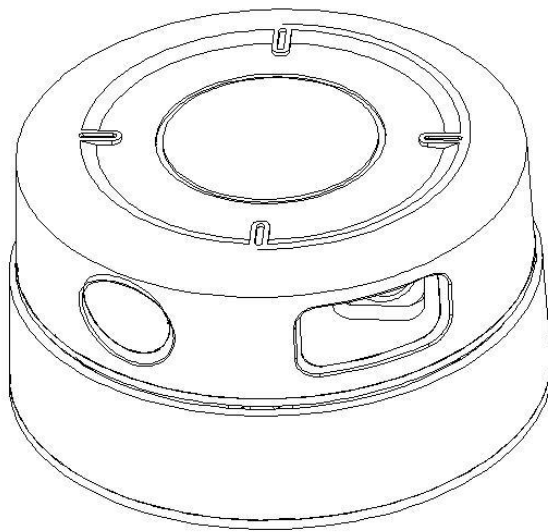# LS LIDAR

2D Low-cost Omnidirectional Laser Scanner

Introduction & Specifications

Model： LS01B

Baud：460800

V1.1

LeiShen Intelligent System CO., LTD.

Introduction

LS01B is a 2D Low-cost ranging scanner developed by LeiShen Intelligent System Co., Ltd. It performs 360 degree laser scan within 16-meters detection range and produces 2D point cloud data map which can be used in mapping navigation (SLAM), obstacle avoidance, route planning, etc.

The sampling rate and scan rate is adjustable, And the default value of sampling rate is 14400 points per second while scan frequency is 10Hz, angular resolution is 0.25°.
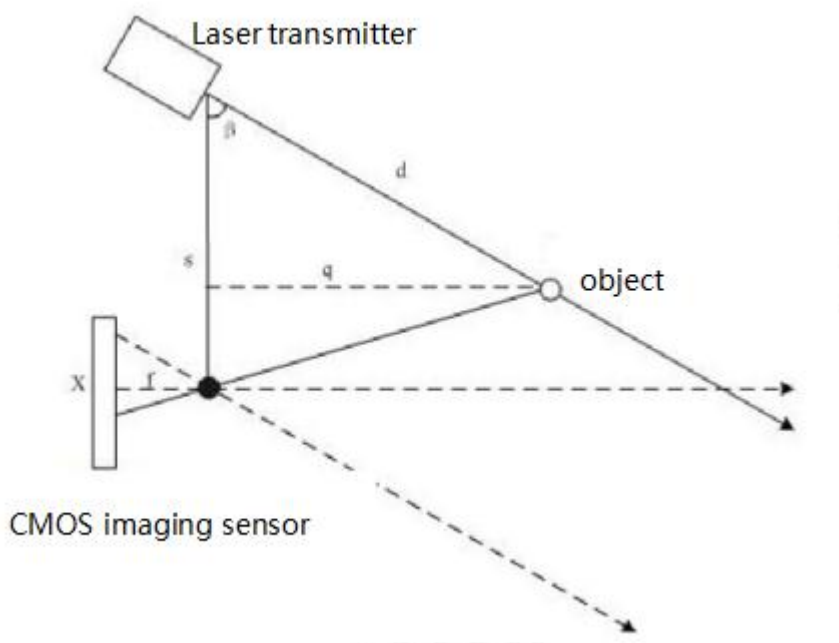
Besides, LS01B adopts laser triangulation system developed by LeiShen Intelligent System Co., Ltd, which enables it to function well in all kinds of indoor environment under 25,000Lux Sunlight.
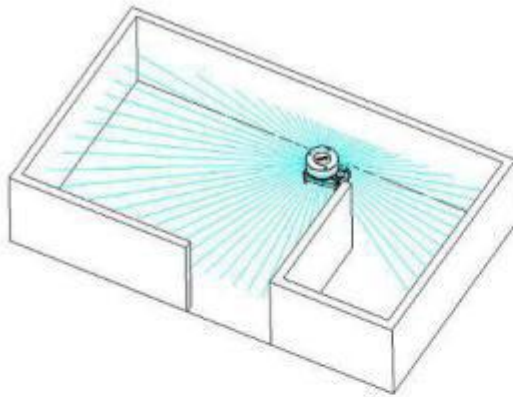
Principle

LS01B adopts laser triangulation method, and high-frequency image collecting and processing system. The default value of sampling frequency is 14400 points per second, which is customizable up to 4000 points per second.
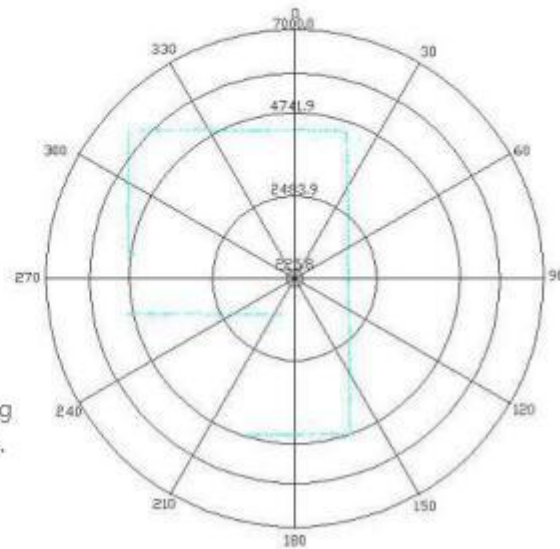
During every ranging process, the pulsed modulation laser of LS01B transmits an infrared laser beam, and a reflecting light spot takes shape when the laser signal returns through a set of optical lens to the image collecting and processing system after reaching the object.

Through the instant calculation of the embedded signal processing module in LS01B, data of distance between the object and LS LIDAR, together with relative direction angle, will be output from the communication interface.

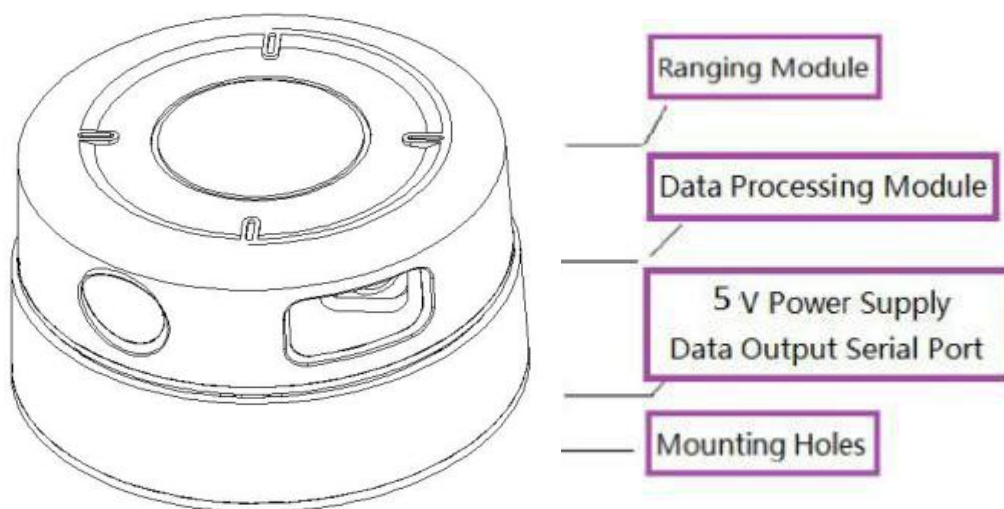* Notes: merely a diagrammatic drawing of ranging system. No strict proportion between two pictures.

Connection of Modules

LS01B LIDAR is mainly made up of high-frequency ranging core module, wireless transmission system, and mechanical spinning module which is driven by brushless stepper motor and spins inside.

Users can change scan frequency by adjusting the rotating parameters of the spinning system. The signal wire of LS01B can be connected directly to the UART interface of FPGA/DSP/ARM/SCM without transition through chips such as RS232, 422, etc.

When the system is correctly powered, users can get scanning and ranging data through the communication interface of LS01E(UART serial port/ USB/ etc.).

Ranging Module

Data Processing Module

5 V Power Supply
Data Output Serial Port

Mounting Holes

LS01B has rotating speed detection function, so that users can get real-time information about rotating speed through instructions. The built-in motor rotating speed stabilizing algorithm can make rectification to rotating speed when it is effected by change of external environment.
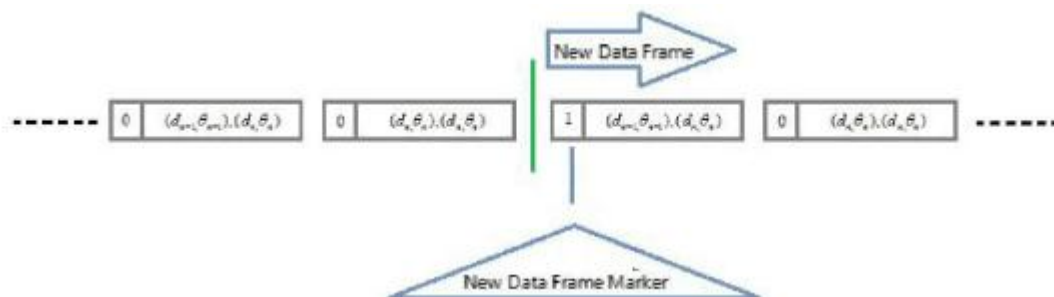
Data Message Format

During operation, sets of sampling data are output from communication interface in standard message format.

For more detailed information about communication protocol and data message format, please contact LeiShen.

Data type	Unit	Contents
Distance	mm	Distance between LS01E and sampling point.
angle	Deg	Angle from direction of sampling point to 0° base direction.
New Data Frame Marker	（Boolean Value）	Whether the sampling point belongs to a new scan.

The detecting data of LS01B are output in message format showed above, instructions from external system can start and stop the data output of LS01E or configure the format of output data.

For detailed information, please contact LeiShen.

Applications

● Navigation and localization of common robots.

● Navigation and obstacle avoidance of unmanned aerial vehicles.

● Navigation and localization of household nursing robot/ cleaning

robot.

● Obstacle avoidance of in-door service robot.

● SLAM (Simultaneous Localization & Mapping) algorithm.

Safety & Product Preservation

 LS01E adopts low-power （<1mW） infrared laser emitter which is driven by modulated pulse. The laser unit of LS01E emits laser beam only when it's spinning at high speed, thus the energy power reaching a certain direction in unit time is far less than 1mW. Laser safety criterion of CLASS 1 guarantees the safety of human beings and pets.

To avoid the possible saltation problem of laser power caused by external collision to LS01B or its own malfunction, Leishen develops protection module feature of product to ensure the laser power output below 1mW in safe range on any condition. When problems listed below happen, LS01B will stop output of laser emitter, as well as scanning and ranging to avoid damage to itself and its surroundings.

- Laser emission power exceeds limit level.

- Laser's failure of operation.

- Abnormal function of high-frequency ranging core module.

- Ultra-low speed of LIDAR scan （.1Hz lower than minimum value）

- Unstable rotating speed of motor.

External system can check device operation condition through communication interface, and bring it back to normal operation through instructions such as pause, restart, etc.
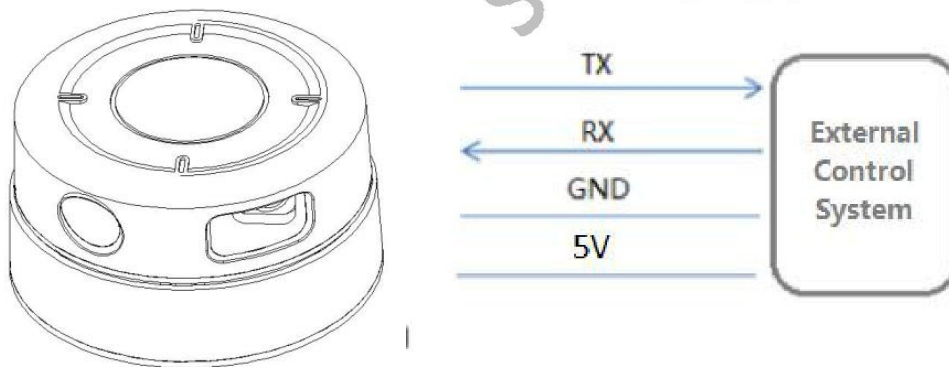
Parameters

Features	Unit	Minimum	Typical	Maximum	Notes
Laser Wavelength	nm	788	792	794	Infrared Wave Band（25℃）
Laser Power	mW	0.68	1		Average power
			Class 1-eyesafe		
Pulse Width	us	-	25	30	
Laser divergence angle	°		0.14°*0.16°		Horizental*Vertical
Laser emission duty cycle			40%		Set according to CMOS exposure time
Angle accuracy			0.05°		
Distance Range	m	-	0.20~28m	-	At 70% reflectivity
Distance Accuracy	mm	<10, within 1 m; <1% of measured distance, 1m-15m; <2% of measured distance, >15m			
Angular Resolution	Deg	0.25°	0.25°	1°	Adjustable
Sampling Duration	ms	-	0.0694	-	The interval between two sampling points (customizable)
Sampling Frequency	Hz	-	14400		Default value is 14400
Scan Frequency	Hz	3	10	10	customizable
Weight	g		180		

Communication & Interface

The standard configuration of LS01B adopts 3.3V voltage level UART serial port as communication interface, and it can be changed to other interfaces such as USB, Blue Tooth, etc. according to users' requirements.

The chart below shows specification of UART-based interface. For more detailed information about SDK, communication protocol, parameter customization, etc., please contact LeiShen.
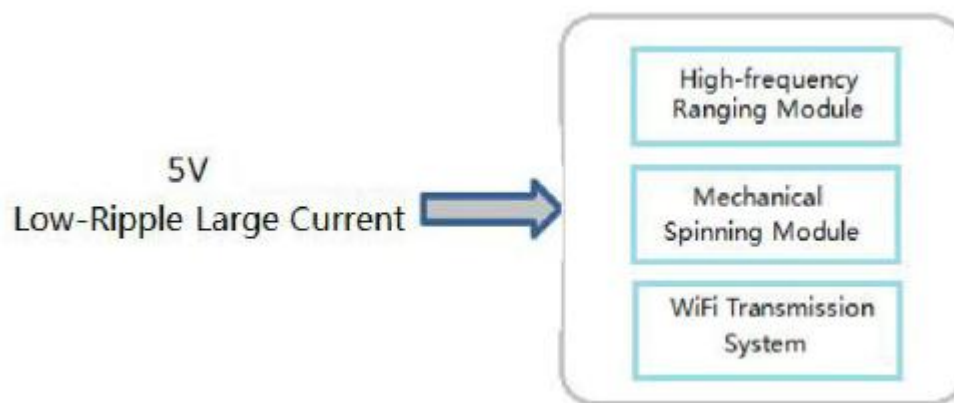
Item	Unit	Minimum	Typical	Maximum	Notes
Baud	bps	-	460800	-	Data transmission speed of serial port
Operating Mode	-	-	8 data bits, one stop bit, no parity bit.	-	
High-level Output Voltage	v	3	3.3	3.6	High-level voltage value of output signal
Low-level Output Voltage	v	0	-	0.3	Low-level voltage value of output signal
High-level Input Voltage	v	3	3.3	3.6	High-level voltage value of input signal
Low-level Input Voltage	v	0	-	0.3	Low-level voltage value of input signal

Power Supply

LS01B adopts individual power supply mode to high-frequency ranging module and mechanical spinning system. Both parts should be powered from external system to ensure the accuracy of scanning and ranging data.

Picture below shows the suggested mode of power supply, and more detailed specification is listed in following chart.

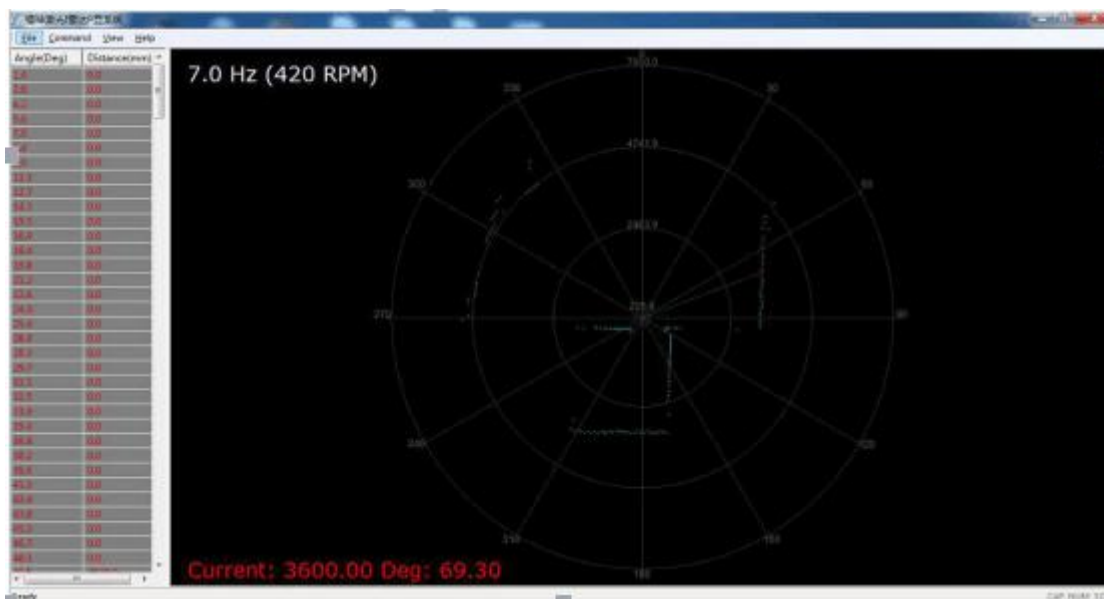| Item	Unit	Minimum	Typical	Maximum	Notes
Voltage of Ranging Core Module	V	4.5	5	5.5	Low ripple current is suggested
Current of Ranging Core Module	mA	-	500	-	5V PS, STDBY 5V PS, OPERATION
Voltage of Motor	V	4.5	5	5.5	Users can change angular resolution through adjustment of Motor voltage
Current of Motor	mA	-	320	-	At 5V power supply

Development Tool & Support

LeiShen provides customers with matched SDK development kit, which can perform simultaneous process to scanning data and present the data in dynamic image. The SDK kit helps users better apply LS LIDAR thus shortening project development period.

At present, LIDAR drivers and SDK kits based on Linux, Windows and ROS platforms are available. Versions based on Android, Mac OS and other platforms are to be developed in the future.

Please keep an eye on our website for newest information.

Size & Customization

For the convenience of product integration of users, some parts of

LS01B can be customizable according to certain requirements.

Pictures below are the diagrammatic drawings of mounting structure.

For more details, please contact LeiShen.