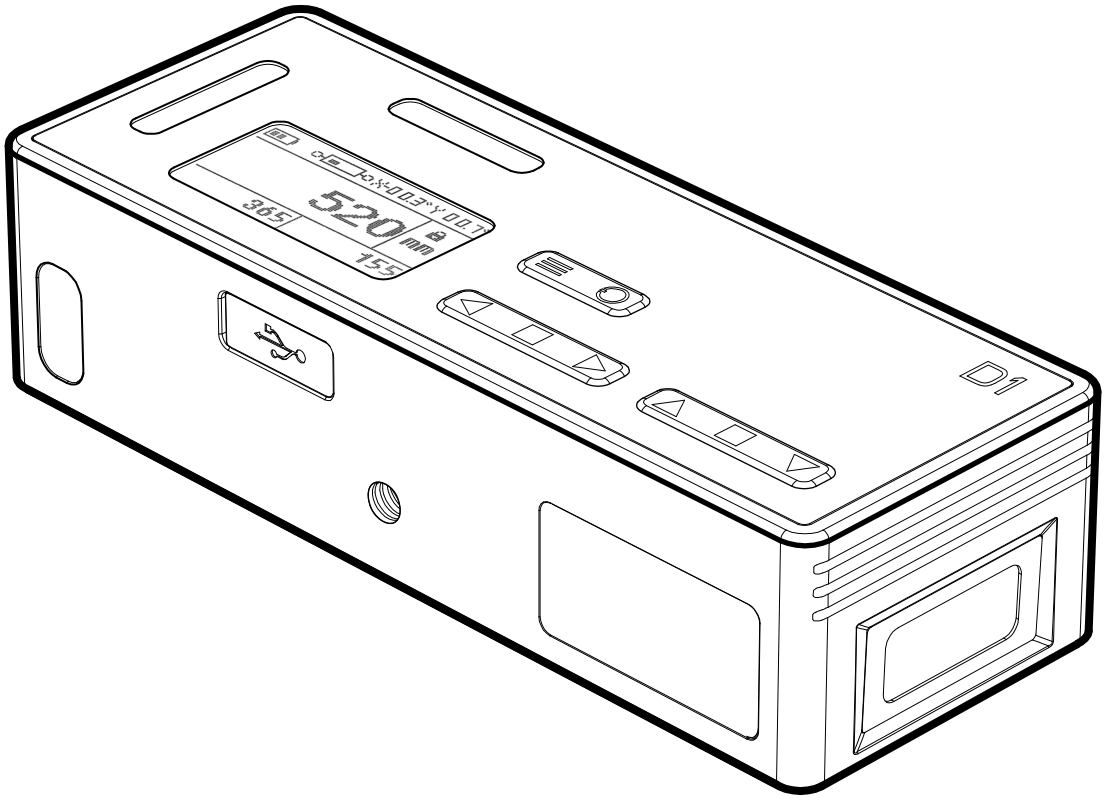
D1

Bilateral Laser Distance Sensor

User's Manual



Introduction

- Thank you for purchasing our products. Be sure you have read this manual and understood its contents before proceeding.
- This manual is only for client reference.
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Change History

Date	Version	Change Description
23/11/2022	1.0	First draft
30/11/2023	1.1	Updating manual layouts

Safety Policy

WARNING

- This product is intended to detect objects and does not have the control function to ensure safety such as accident prevention.
- Please read all safety instructions carefully before using this instrument.
- Do not use the product as a sensing device to protect the human body.
- Do not directly view or point the laser at an eye. This can create a hazard. Low-power visible lasers do not normally present a hazard but may present some potential for hazard if viewed directly for extended periods.
- Do not use this device in flammable or explosive environments.
- Do not use this device near strong electromagnetic interference.
- Do not disassemble or modify the device or the sensor module.

Cautions on Handling Laser Light

Laser Classification (Class 2)

The D1 produce visible Class 2 laser beams. (Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007)

Laser Hazardous Class

Classification according to IEC 60825-1-2014.

Class	Model	Description of hazardous evaluation
Class 1	—	Safe under reasonably foreseeable conditions of operation
Class 1M	—	Safe under reasonably foreseeable conditions of operation, except for diverging or large area beams when collecting optics used. Hazardous when collecting optics used.
Class 2	D1	Visible beam, low power. Blink response of eye affords protection.
Class 2M	—	Visible beam, low power. Blink response of eye affords protection. Hazardous when collecting optics used.
Class 3R	—	Direct intrabeam viewing is hazardous, but risk is lower than for 3B.
Class 3B	—	Direct intrabeam viewing is always hazardous.
Class 4	—	High power. Capable of producing hazardous diffuse reflections. Capable of producing skin burns and fire hazardous.

Warning Label

To ensure stable performance, please observe these precautions:

- Due to the exposed components of D1, please follow proper procedures to prevent damage from electrostatic discharge/transient voltage and current/power short circuits/squeezing or impact.
- Please don't touch the circuit board directly, especially sensitive optical components. Please make sure to wear anti-static gloves or wristbands.
- Make sure the wiring is strong. It is best to solder the cables and do not use pins to avoid unstable contact, which may lead to frequent power on and off. Instantaneous power off and on again may damage the control chip and optical components.
- Transparent liquids and oils need to be measured by adding a reflective float to the liquid surface.
- Black substances, such as crude oil, coal and other black gelatin and solid materials, require the laser to be vertically directed to a smooth surface, and the indoor environment can be stably measured up to 12 meters.
- Strongly reflective surfaces, such as mirror painted surfaces, smooth surfaces of stainless steel, aluminum plates, etc., need to be equipped with auxiliary materials for diffuse reflection. Use white paper for short distances and add 3M diffuse reflection material for long distances. First, connect the computer to check the amount of light returned. You can measure the distance normally between 60# and 3000#. If it is less than 60#, adjust the reflection angle (the strongest when it is vertical) or paste white paper to enhance the reflection signal.
- If it is greater than 3000#, adjust the reflection angle (inclined at a certain angle) or change to a frosted surface to weaken the signal strength.
- Avoid spraying insulating paint or other chemicals on the laser source and lens of D1. Otherwise, the coating on the laser source or lens will be damaged by chemicals and the laser cannot be emitted or received.
- To avoid mutual interference, the minimum distance between laser beams should be at least 15 cm (not less than 10cm) when using multiple modules.
- If glue filling is required, please consult a technician before proceeding. Otherwise, the light propagation path will be blocked and measurement will be impossible.
- Please read this manual thoroughly and follow the steps, otherwise repeated communication will affect your efficiency.

Electromagnetic Compatibility (EMC)

"Electromagnetic Compatibility" refers to the ability to operate stably in the presence of electromagnetic radiation and static charge environments without causing electromagnetic interference to other devices. Although the D1 already meets strict regulations and standards in this regard, it cannot completely rule out the possibility of potential interference to other devices.

Trash Disposal

This product should not be discarded as household waste. Please dispose of this product in accordance with the regulations implemented in the country/region of use.

Order Information			
Model	**Cable Connector Type**	**Ordering Code**	**Description**
D1-120	Type-C	M03-0400360000	IP56, Waterproof and dustproof housing, 0.06-120m, Working temperature:-10—50°C

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1.0 Product Overview

Figure 1. The product image

The D1 is an industrial-grade single-point laser ranging sensor that supports Bluetooth transparent transmission protocol.

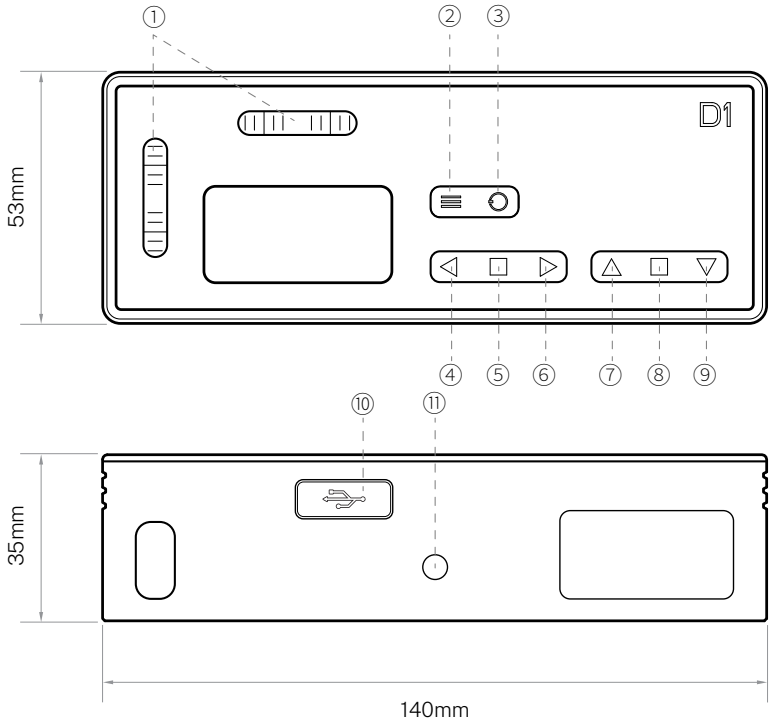
Its principle is based on phase-shift laser ranging, which is a type of time-of-flight ranging. Phase-shift ranging is typically suitable for measuring medium to short distances, with accuracy reaching the millimeter level, making it the most precise method of distance measurement currently available. This method is commonly employed in short-range distance measurement. When the continuously modulated beam reaches the object to be measured, the beam reflects. By comparing the phase changes in the received beams, the distance can be accurately calculated.

The D1 laser ranging products feature millimeter-level resolution, and wide-ranging applications, and are suitable for a broad temperature range. With high accuracy, they are applicable in various scenarios such as industrial control, PC applications, microcontrollers, competitions, and more.

Product Features

- **Long Range:** The bilateral laser rangefinder offers a maximum range of 120 meters, making it suitable for various long-distance measurement requirements.
- **Accurate Measurement:** It exhibits excellent temperature drift characteristics, automatically compensating for errors caused by temperature changes.
- **High Data Rate:** The system supports data acquisition rates of 10Hz and 20Hz, providing high-speed data collection.
- **High Precision:** It boasts high precision with an error margin of only ±2mm.
- **High Signal-to-Noise Ratio:** The system has a high signal-to-noise ratio, which means that measurement results are hardly affected by factors such as the target's color, surface roughness, and material.
- **Easy Center Point Location:** Multiple standardized interfaces are centrally designed for convenient fixation and center point location.
- **Good Optical Axis Consistency:** Precisely calibrated through dual-laser alignment, it ensures excellent optical axis consistency.
- **Rugged Housing:** Made of 7-series aerospace aluminum, it can withstand harsh industrial environments and collisions.
- **Built-in Battery:** The bidirectional laser can continuously operate for 8 hours.
- **Bluetooth Transparent Transmission Protocol Support:** Facilitates data integration with processing terminals.

2.0 Keypad Description



Number	Keys	Function Description
1	Horizontal Bubble with Built-in LED Indicator	Green Light: Press any keys to activate the green LED to assist in leveling the horizontal bubble. It automatically turns off after 60 seconds and can be reactivated by pressing any button again. Red Light: Lights up when an error is reported and the sensor returns to the error code. Normally, the sensor displays the measured value.
2	Function Key	Long press to switch length units. Short press to lock/unlock. While locked, a short pressing saves data to the history record.
3	Power Button	Long press to power on/off. Short pressing has no function.
4	Left Shift Key	Long pressing has no function. Short press to activate the left laser module and deactivates the right laser module.
5	Laser Dual Selection Key	Long press to turn off the left and right laser modules. Short press to turn on the left and right laser modules.
6	Right Shift Key	Long pressing has no function. Short press to activate the right laser module and deactivates the left laser module.
7	Up Key	Short press to view product information. In the length unit setting interface, short press to scroll up and select the length unit. In the history records interface, short press to scroll up and check history records.

8	OK Key	Long press to enter history records interface; short press to exit the history record interface; In the length unit setting interface, short press to save the length unit.
9	Down Key	In the length unit setting interface, short press to scroll down and select the length unit. In the history records interface, short press to scroll down and check history records.
10	Type-C	Available for charging and data transmission. The D1 controls the sending and receiving through commands. It can transmit measurement data to the PC through the serial port. The PC uses a serial port debugging tool or controls with serial communication functions to process data.
11	Fixed Hole	The sensor housing is made of sturdy and corrosion-resistant aluminum castings with front and rear covers. There are three mounting holes on the positioning base for secure installation.The fixed hole is the center of the laser, see Figure 3 for details.

◎ **Note:** To short press the key is to press the key less than 1 second. To long press the key is to press the key for more than 1 second.

As shown in the figure below, the accuracy of the horizontal bubbles of B, D, and E is 0.1, and the accuracy of the horizontal bubbles of A and C is 0.5.

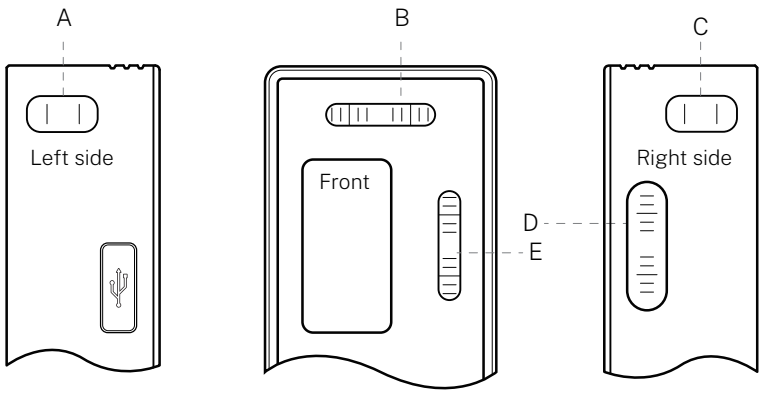


Figure 2. D1 horizontal bubble position

As shown in the figure below, the fixed hole is the center position of the bilateral laser.

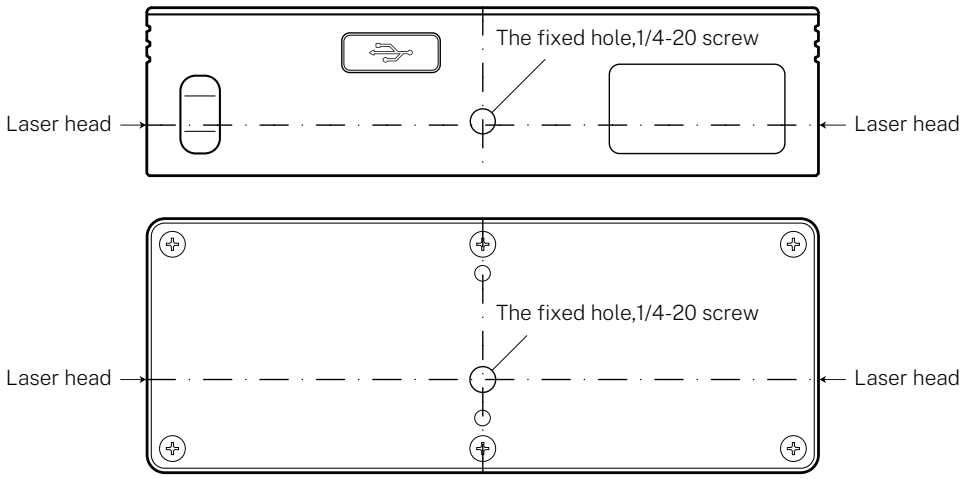


Figure 3. D1 hole location diagram

Application scenario reference:

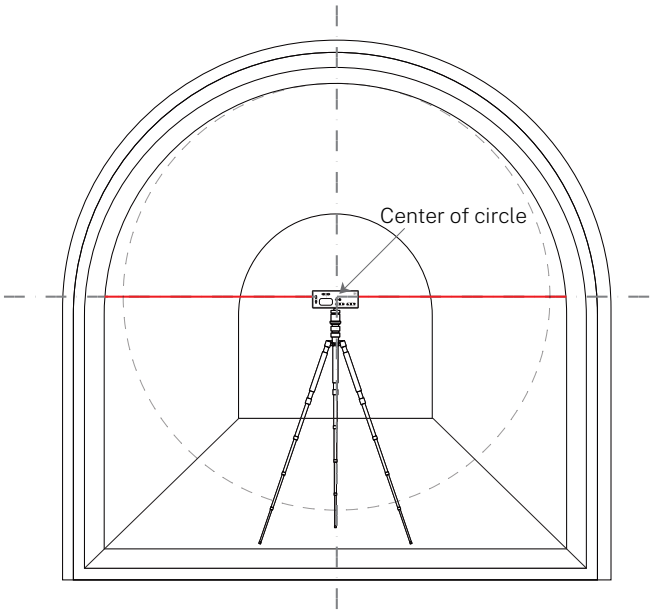
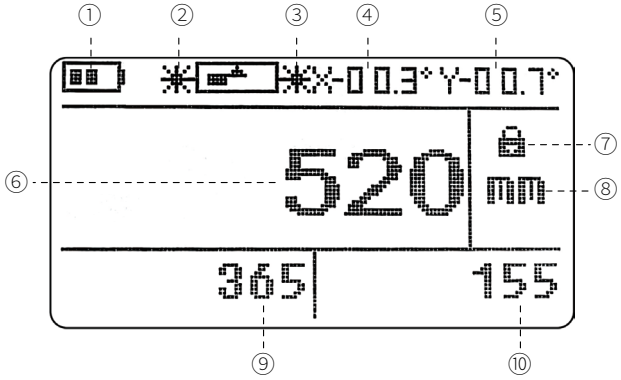


Figure 4. Tunnel application diagram

3.0 Display Description



Number	Description	Number	Description
1	Meter battery level	6	Sum of left and right measurement data
2	Left laser	7	Measurement lock/unlock
3	Right laser	8	Measurement unit
4	The x coordinate	9	Measurement data on the left side
5	The y coordinate	10	Measurement data on the right side

Long press the function key ≡ to switch units; short press the OK key □ to save the data and return.

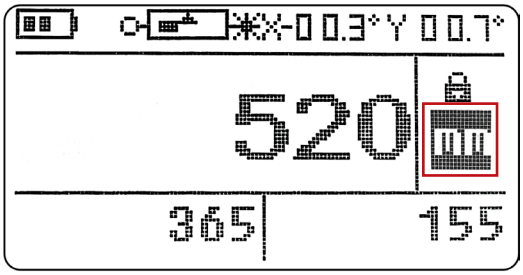


Figure 2. The flashing square inside the red box on the right represents the length unit, which includes m, mm, in, and ft.

Long press the OK key □ to enter the history records interface, short press the Up key △ and Down key ▽ to switch records, and short press the OK key □ to exit.

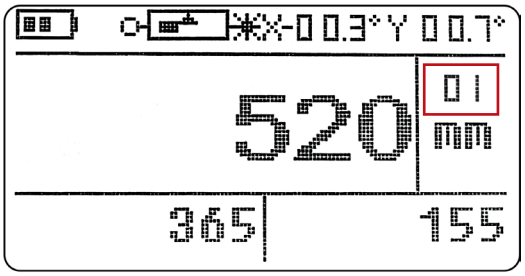


Figure 3. The red box on the right shows the history record serial number.

4.0 Specifications

Laser measurement function	Distance ranges (selection supported)	80m/ 120m (In conjunction with reflectors)
	Accuracy	±2mm
	Optical device parameters	Wavelength : 650nm Optical power : <1mW (Class 2 laser) Spot type : point laser Spot size : ≤ 6mm at 10m (See 7.0 Measurement Distance and Spots Sizes for details) Working life : Approximately 20,000 hours
	Low power consumption	Less than 1.2W, standby less than 0.2W
	Operating temperature	-10 — +50° C (Customizable -20 — +65°C , please contact us for details)
	Operating humidity	≤RH85%
Angle measure function	Accuracy	±0.1°
	Measuring range	±90°
	Display mode	Dynamic value display
Communication Protocol	TTL serial port	Type C
	Wireless communication	BLE 4.2
Serial port format	TTL	Baud rate: 115200 Data bits: 8 Stop bits: 1 Calibration: none Flow control: none
General Specifications	Waterproof rating	IP56
	Weight	345g
	Dimensions	140*53*35mm
	Material	Aluminum alloy
	Storage temperature	-20℃ — 60℃
	Storage humidity	≤ RH85%
	Battery	Built-in lithium battery, rechargeable. After fully charged, it supports continuous working for 8 hours in bilateral measurement mode.

- With strong reflectors, longer distances can be measured. The measurement range can be set through the downstream command, and the maximum setting is 120 meters.
- In harsh environments, such as outdoor sunlight, the performance will be affected. It can be used with a target reflector to improve performance.
- In fast mode, the recovered light signal is weak, the error will become larger, and there are certain requirements for the measurement target and distance, and not suitable for outdoor daytime applications.

a. Measurement Range

As an optical instrument, the operation of D1 is affected by environmental conditions. Therefore, the achievable measuring range may vary depending on the application, but the ranging accuracy will not be affected.

The following conditions may affect the measurement range:

Categories	Factors to extend the range	Factors to shorten the range
Target surface	Light-colored and bright surfaces	Dark and dim surfaces
Air particles	Clear air with a good air index (on sunny days).	Hazy, rainy, or snowy conditions
Measured angle	The laser beam strikes the surface at a perpendicular angle.	The laser beam strikes the surface at an oblique angle.

b. Ways to Prevent Errors in Measurement Results

◎ For rough surfaces

In order to prevent the spot from falling onto non-planar areas during measurement, it is recommended to use a reflector.

◎ For transparent objects

A trial measurement is necessary. At different positions and angles, the laser beam may strike the surface or back of the glass, resulting in different measurement data.

◎ For inclined or spherical surfaces

Be sure the surfaces are large enough to accommodate the spot size before taking measurements.

5.0 Protocol Descriptions

1. The D1 bilateral laser rangefinder can output measurement data to the PC through the serial port, and the PC can process the data through the serial port debugging tool or a control with serial port transceiver functions.

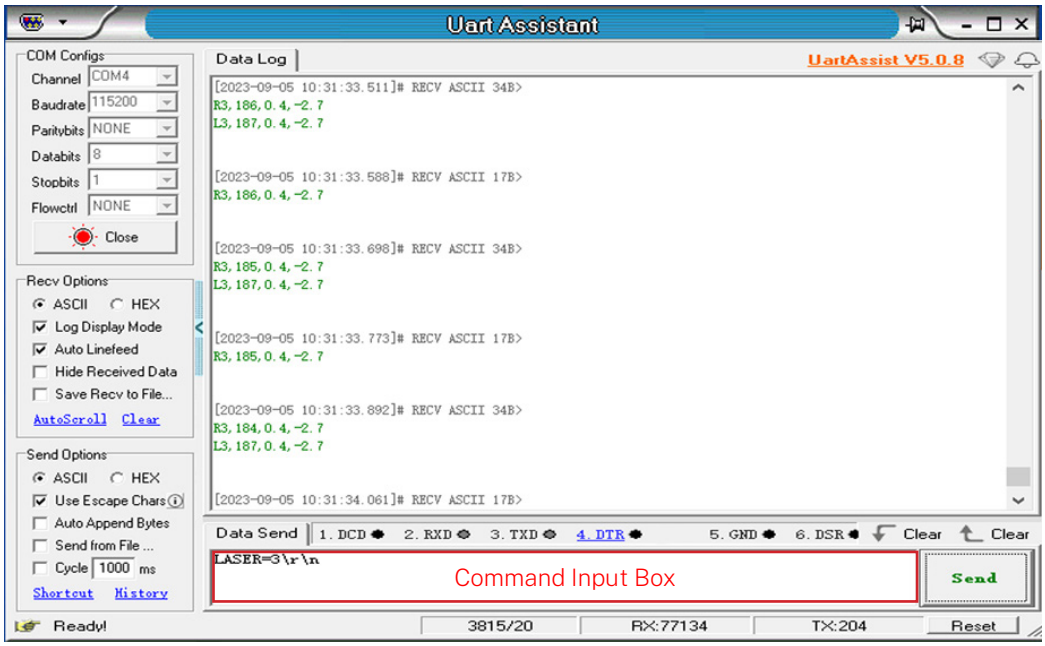


Figure 4. Serial port debugging assistant interface

2. The D1 bilateral laser rangefinder can send data to the Bluetooth host through the BLE Bluetooth module; you can download the test app for testing;
   The protocol formats of the two methods are the same, only one is listed;

   The data sent by the D1 bilateral laser rangefinder is called **uplink data**. The uplink data includes measurement data, status information, etc.;
   The data received by the D1 bilateral laser rangefinder is called **downlink data**. The downlink data contains setting instructions.

Scan the QR code to download the testing APP

3. Open the APP on your phone and select the corresponding Bluetooth to connect.

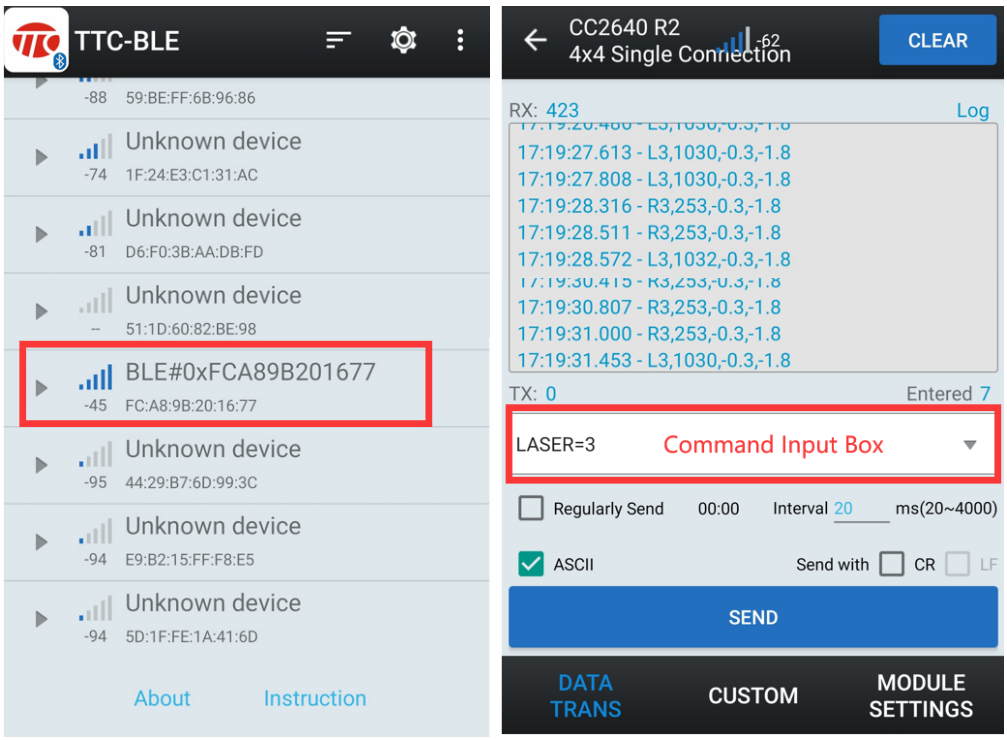


Figure 4. App interface

5.1 Set Commands

Definition

- <CR> Carriage Return
- <LF> Line Feed
- <...> Parameter Name. The angle brackets are not included in the actual command line.

⚠ **Note:** The request command and response command in the setting command are both in the format of <cmd><CR><LF>. In this document, only <cmd> is shown and <CR><LF> is omitted.

For example:

Turn off all laser modules		
	String	HEX
Send (downlink)	LASER=0	4C 41 53 45 52 3D 30 0D 0A
Receive (uplink)	LASER=0	4C 41 53 45 52 3D 30 0D 0A

5.2 Set the Laser On/Off

5.2.1 Turn Off All Laser Modules

	String	HEX
Send (downlink)	LASER=0	4C 41 53 45 52 3D 30 0D 0A
Receive (uplink)	LASER=0	4C 41 53 45 52 3D 30 0D 0A

5.2.2 Only Turn On The Left Laser Module

	String	HEX
Send (downlink)	LASER=1	4C 41 53 45 52 3D 31 0D 0A
Receive (uplink)	LASER=1	4C 41 53 45 52 3D 31 0D 0A

5.2.3 Only Turn On The Right Laser Module

	String	HEX
Send (downlink)	LASER=2	4C 41 53 45 52 3D 32 0D 0A
Receive (uplink)	LASER=2	4C 41 53 45 52 3D 32 0D 0A

5.2.4 Turn On All Laser Modules

	String	HEX
Send (downlink)	LASER=3	4C 41 53 45 52 3D 33 0D 0A
Receive (uplink)	LASER=3	4C 41 53 45 52 3D 33 0D 0A

5.2.5 Only Turn On The Right Laser Module

	String	HEX
Send (downlink)	LASER=?	4C 41 53 45 52 3D 3F 0D 0A
Receive (uplink)	LASER=X	The value range of X is 0,1,2,3

For example:

LASER=?

LASER=2 (the left laser module is turned off and the right laser module is turned on)

5.3 Set the Left Laser Measurement Mode

5.3.1 Set The Left Laser to Single Measurement

	String	HEX
Send (downlink)	L=02	4C 3D 30 32 0D 0A
Normal data (uplink)	L02, V, X, Y	L: The left laser 02: Normal data for single measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°)
Abnormal data (uplink)	L=82, Ee	L: The left laser 82: Abnormal single measurement results E: Indicating an error code e: For the value range, please refer to the Error Code Descriptions.

For example:

L=02

L02, 2603, 10.1, -0.8 (Measuring distance is 2603mm, X-axis inclination angle is 10.1°, Y-axis inclination angle is -0.8°)

L=82, E258 (258 indicates out of range)

5.3.2 Set The Left Laser to Continuous Measurement

	String	HEX
Send (downlink)	L=03	4C 3D 30 33 0D 0A
Normal data (uplink)	L03,V,X,Y L03,V,X,Y	L: The left laser 03: Normal data for continuous measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°)
Abnormal data (uplink)	L=83,Ee	L: The left laser 83: Abnormal measurement results E: Indicating an error code. e: For the value range, please refer to the Error Code Descriptions.

For example:

L=03

L03,1003,2.1,10.5 (Measuring distance is 1003mm, X-axis inclination angle is 2.1°, Y-axis inclination angle is 10.5°)

L03,1005,2.2,10.4 (Measuring distance is 1005mm, X-axis inclination angle is 2.2°, Y-axis inclination angle is 10.4°)

.....

L=83, E258 (258 indicates out of range)

5.3.3 Set The Left Laser to Fast Continuous Measurement

	String	HEX
Send (downlink)	L=04	4C 3D 30 34 0D 0A
Normal data (uplink)	L04,V,X,Y L04,V,X,Y	L: The left laser 04: Normal data for fast continuous measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°)
Abnormal data (uplink)	L=84,Ee	L: The left laser 84: Abnormal measurement results E: Indicating an error code. e: For the value range, please refer to the Error Code Descriptions.

For example:

L=04

L04,1003,89.9,0.1 (Measuring distance is 1003mm, X-axis inclination angle is 89.9°, Y-axis inclination angle is 0.1°)

L04,38023,89.8,0.2 (Measuring distance is 38023mm, X-axis inclination angle is 89.8°, Y-axis inclination angle is 0.2°)

.....

L=84, E252 (252 indicates the temperature is too high.)

L=84, E122 (122 indicates hardware abnormality.)

5.3.4 Set The Left Laser to Stop Measurement

	String	HEX
Send (downlink)	L=05	4C 3D 30 35 0D 0A
Normal data (uplink)	L=05	The left laser stops measuring. The laser turns off.

5.3.5 Query The Left Laser Measurement Setting Value

	String	HEX
Send (downlink)	L=?	4C 3D 3F 0D 0A
Normal data (uplink)	L=X	The value range of X is 02, 03, 04, 05

5.4 Set the Right Laser Measurement Mode

5.4.1 Set The Right Laser to Single Measurement

	String	HEX
Send (downlink)	R=02	52 3D 30 32 0D 0A
Normal data (uplink)	R02,V,X,Y	R: The right laser 02: Normal data for single measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°)
Abnormal data (uplink)	R=82,Ee	R: The right laser 82: Abnormal single measurement results E: Indicating an error code e: For the value range, please refer to the Error Code Descriptions.

For example:

R=02

R02,2603,1.1,1.2 (Measuring distance is 2603mm, X-axis inclination angle is 1.1°, Y-axis inclination angle is 1.2°)

R=82, E258 (258 indicates out of range)

5.4.2 Set The Right Laser to Continuous Measurement

	String	HEX
Send (downlink)	R=03	52 3D 30 33 0D 0A
Normal data (uplink)	R03,V,X,Y R03,V,X,Y	R: The right laser 03: Normal data for continuous measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°)
Abnormal data (uplink)	R=83,Ee	R: The right laser 83: Abnormal measurement results E: Indicating an error code. e: For the value range, please refer to the Error Code Descriptions.

For example:

R=03
R03,1003,0.3,0.5 (Measuring distance is 1003mm, X-axis inclination angle is 0.3°, Y-axis inclination angle is 0.5°)
R03,1005,0.4,0.5 (Measuring distance is 1005mm, X-axis inclination angle is 0.4°, Y-axis inclination angle is 0.5°)
.....
R=83, E256 (256 indicates strong reflection)

5.4.3 Set The Right Laser to Fast Continuous Measurement

	String	HEX
Send (downlink)	R=04	52 3D 30 34 0D 0A
Normal data (uplink)	R04,V,X,Y R04,V,X,Y	R: The right laser 04: Normal data for fast continuous measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°)
Abnormal data (uplink)	L=84,Ee	R: The right laser 84: Abnormal measurement results E: Indicating an error code. e: For the value range, please refer to the Error Code Descriptions.

For example:

R=04
R04,1003,0.3,0.5 (Measuring distance is 1003mm, X-axis inclination angle is 0.3°, Y-axis inclination angle is 0.5°)
R04,38023,0.3,0.5 (Measuring distance is 38023mm, X-axis inclination angle is 0.3°, Y-axis inclination angle is 0.5°)
.....
R=84,E258 (258 indicates out of range.)

5.4.4 Set The Right Laser to Stop Measurement

	String	HEX
Send (downlink)	R=05	52 3D 30 35 0D 0A
Normal data (uplink)	R=05	The right laser stops measuring. The laser turns off.

5.4.5 Query The Right Laser Measurement Setting Value

	String	HEX
Send (downlink)	R=?	52 3D 3F 0D 0A
Normal data (uplink)	R=X	The value range of X is 02,03,04,05

For example:

R=?
R03 (Continuous Measurement on the right)

5.5 Set the Bilateral Laser Measurement Mode

5.5.1 Set the Bilateral Lasers to Single Measurement

	String	HEX
Send (downlink)	A=02	41 3D 30 32 0D 0A
Normal data (uplink)	L02,V,X,Y R02,V,X,Y	L: The left laser 02: Normal data for single measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°) R: The right laser 02: Normal data for single measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°)
Abnormal data (uplink)	L=82,Ee OR R=82,Ee	E: Indicating an error code e: For the value range, please refer to the Error Code Descriptions.

For example:

A=02
L02,2603,10.1,-0.8 (Measuring distance is 2603mm, X-axis inclination angle is 10.1°, Y-axis inclination angle is -0.8°)
R02,2603,1.1,1.2 (Measuring distance is 2603mm, X-axis inclination angle is 1.1°, Y-axis inclination angle is 1.2°)
L=82, E258 (Error code 258 on the left)
R=82, E256 (Error code 256 on the right)

5.5.2 Set the Bilateral Lasers to Continuous Measurement

	String	HEX
Send (downlink)	A=03	41 3D 30 33 0D 0A
Normal data (uplink)	L03,V,X,Y R03,V,X,Y ... L03,V,X,Y R03,V,X,Y	L: The left laser 03: Normal data for continuous measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°) R: The right laser 03: Normal data for continuous measurement V: Value range: 0 — 40000 (unit: mm) X: X-axis tilt angle (-90° — 90°) Y: Y-axis tilt angle (-90° — 90°)
Abnormal data (uplink)	L=82,Ee OR R=82,Ee	E: Indicating an error code. e: For the value range, please refer to the Error Code Descriptions.

For example:

A=03

L03,2603,10.1,-0.8 (Measuring distance is 2603mm, X-axis inclination angle is 10.1°, Y-axis inclination angle is -0.8°)

R03,2603,1.1,1.2 (Measuring distance is 2603mm, X-axis inclination angle is 1.1°, Y-axis inclination angle is 1.2°)

.....

L=82, E258 (Error code 258 on the left)

R=82, E256 (Error code 256 on the right)

5.5.3 Set the Bilateral Lasers to Fast Continuous Measurement

	String	HEX
Send (downlink)	A=04	41 3D 30 34 0D 0A
Normal data (uplink)	L04,V,X,Y R04,V,X,Y ... L04,V,X,Y R04,V,X,Y	L: The left laser 04: Normal data for fast continuous measurement V: Value range: 0—40000 (unit: mm) X: X-axis tilt angle (-90°—90°) Y: Y-axis tilt angle (-90°—90°) R: The right laser 04: Normal data for fast continuous measurement V: Value range: 0—40000 (unit: mm) X: X-axis tilt angle (-90°—90°) Y: Y-axis tilt angle (-90°—90°)
Abnormal data (uplink)	L=82,Ee OR R=82,Ee	E: Indicating an error code. e: For the value range, please refer to the Error Code Descriptions.

For example:

A=04

L04,2603,10.1,-0.8 (Measuring distance is 2603mm, X-axis inclination angle is 10.1°, Y-axis inclination angle is -0.8°)

R04,2603,1.1,1.2 (Measuring distance is 2603mm, X-axis inclination angle is 1.1°, Y-axis inclination angle is 1.2°)

.....

L=82, E258 (Error code 258 on the left)

R=82, E256 (Error code 256 on the right)

5.5.4 Set the Bilateral Lasers to Stop Measurement

	String	HEX
Send (downlink)	A=05	41 3D 30 35 0D 0A
Normal data (uplink)	A=05	The bilateral lasers stop measuring. The lasers turn off.

5.5.5 Query the Bilateral Lasers Measurement Setting Value

	String	HEX
Send (downlink)	A=?	4C 3D 3F 0D 0A
Normal data (uplink)	A=X,Y X: the left laser Y: the right laser	The value range of X is 02,03,04,05 The value range of Y is 02,03,04,05

For example:

A=?

A=02,04 (The left side is a single measurement. The right side is fast continuous measurement.)

5.5.6 Set Bluetooth Single Data Reading

	String	HEX
Send (downlink)	A=06	41 3D 30 36 0D 0A
Normal data (uplink)	L3,131,1.6,33.5 R3,131,1.6,33.5	With each sending of this command, Bluetooth reports one measurement result.

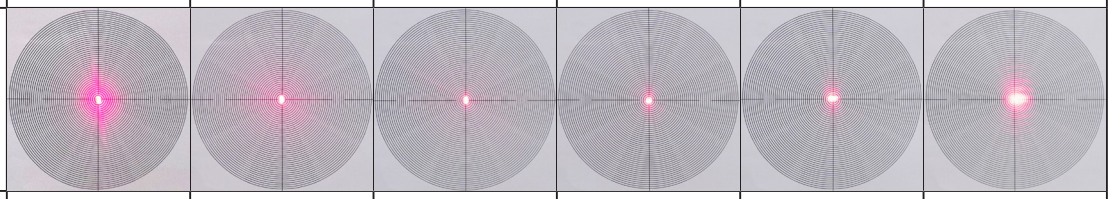
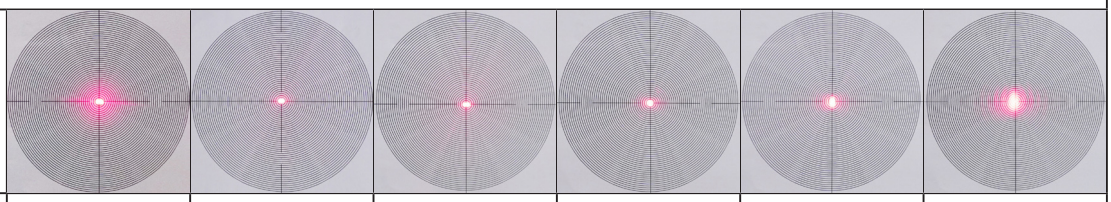
5.5.7 Cancel Bluetooth Single Data Reading

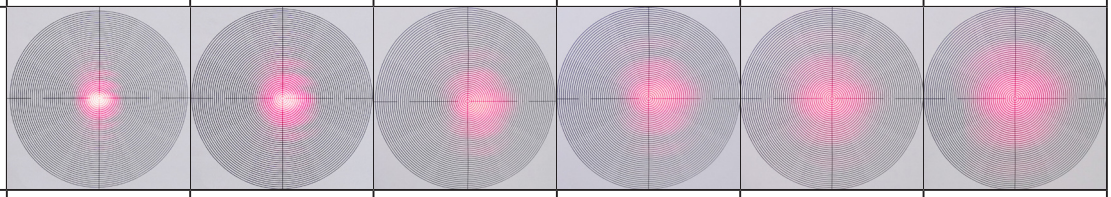
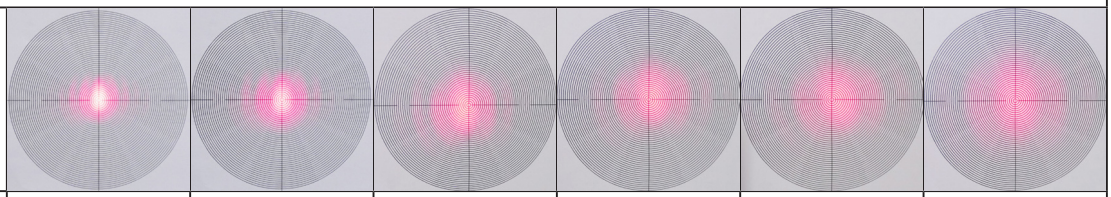
	String	HEX
Send (downlink)	A=07	41 3D 30 37 0D 0A
Normal data (uplink)	L3,131,1.6,33.5 R3,131,1.6,33.5	Reverting to the previous continuous transfer mode

6.0 Error Code Descriptions

Decimal	Hexadecimal	Descriptions
0	0	No error
140	8C	CUSTOM HEX protocol function code error
141	8D	CUSTOM HEX protocol calibration error
142	8E	CUSTOM HEX protocol parameters error
252	FC	The temperature is too high (Above 60℃)
253	FD	The temperature is too low (Below -20℃)
255	FF	Weak reflection or calculation failure
256	100	Strong reflection
258	102	Out of distance range
285	11D	Photosensitive element abnormality (Need a return to factory repair)
286	11E	Laser tube abnormality (Need a return to factory repair)
290	122	Hardware abnormality (Need a return to factory repair)

7.0 Measurement Distance and Spots Sizes

Range	0.05M	0.5M	1M	5M	10M	20M
Module flat test						
Spot size	3*4mm	3*4mm	3*4mm	3.5*4mm	6*3.5mm	10*6mm
Module side test						
Spot size	4*3mm	4*3mm	4*3mm	4*3.5mm	3.5*6mm	6*10mm

Range	30M	40M	50M	60M	70M	80M
Module flat test						
Spot size	9*12mm	14*10mm	22*12mm	24*14mm	22*16mm	24*18mm
Module side test						
Spot size	12*9mm	10*14mm	12*22mm	14*24mm	16*22mm	18*24mm

8.0 Maintenance and After-sales Service

8.1 Maintenance

1. The instrument should be stored in a dry place and protected from dust.
2. Make sure the instrument power supply is reliably connected before starting up. Please do not switch the power on and off continuously to avoid damaging components or accelerating the aging of electronic components and reducing their lifespan.
3. Never immerse the laser rangefinder in water.
4. Keep the instrument lens clean and wipe away dust with cotton cloth soaked in alcohol.
5. Never use corrosive or oily substances to clean the instrument lens.
6. Check the instrument regularly, especially after the instrument is used abnormally, or before and after the instrument performs important measurements.

8.2 After-sales Service

1. **"7-day return service":** Suppose the product has non-human quality problems within 7 days from the date of sale, the manufacturer's inspection report is attached, and the packaging accessories are intact, customers can choose to return, exchange, or repair the product.
2. **"15-day exchange service":** Free exchange and repair services are supported with non-human quality problems within 15 days from the date of purchase of the instrument and the manufacturer's test report is attached. When exchanging, please ensure that the packaging accessories are intact.
3. **"30-day free maintenance":** If the product has non-human quality problems within 30 days from the date of sale, the customer can choose to repair it. If the product still cannot be used normally after two consecutive repairs, the customer can choose to replace it with a new product of the same model.
4. **"One-year warranty service":** If quality problems occur with the product within one year from the date of purchase, the customer can send the machine to our designated maintenance center or our headquarters for inspection and repair. If parts need to be replaced during maintenance, the corresponding parts cost will be charged appropriately by our company. If there is no need to update parts, customers can enjoy free maintenance services.

8.3 After-sales Instructions

1. Factory warranty: All instruments are guaranteed by the factory or the service centers authorized by the factory. The company does not assume any responsibility for any issues not caused by our factory or designated service centers.
2. The included freebies are not covered by the warranty: Giveaways/freebies come with the purchase are not covered by replacement or warranty.
3. If customers return or replace an item, it should be returned in the same condition in which it was received, and it should include all items that were in the original package. Returns or replacements will not be accepted if the packaging is damaged, or missing any parts, or is damaged during return shipping because it wasn't packaged correctly, or the machine is used, scratched, or worn.

Warranty Policy

1. Warranty Period

Under normal use, a year warranty will be offered from the purchase date for malfunctions not caused by human factors.

2. Below circumstances are not applied for warranty and will be repaired for a fee.

- Damage caused by improper use, maintenance and storage by the buyer.
- Dismantled and repaired by oneself or at a repair center other than our factory.
- No warranty card or purchase invoice.
- The machine number on the warranty card is inconsistent with the repair product or has been altered;
- Product damage caused by force majeure.
- Parts that need to be replaced due to normal wear and tear.
- Loss or damage caused by abnormal factors such as temperature/humidity in the environment in which the instrument is used.
- Damage caused by improper operation.

3. When the instrument needs maintenance, please send it to the local dealer with the original purchase invoice/receipt.

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