



W Series

User Manual

V5.0.1 2023.01



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Operating Precautions

1. Keep the wires (OUT and OUT, IN and IN, OUT and IN, OUT and COM+, OUT and COM-, OUT and VCC, OUT and GND, etc.) separate from each other.
2. Do not drag the power cable violently.
3. 28V/0.2A is the limit for over-voltage/over-current on the OUT line. If 28V/0.2A is exceeded, the triode on the circuit board may be broken, causing the OUT level to halve or no change in level.
4. The external voltage and current must be stable, attenuation or increase within $\pm 5\%$ is acceptable. But the attenuated voltage and current must be within the range that will start the lidar properly.
5. The lidar cover must be kept clean, a dirty cover will cause the lidar's point cloud performance to deteriorate.
6. It is forbidden to unscrew the waterproof connector.
7. If the lidar is mounted on an iron accessory, ensure that the lidar dissipates heat normally.

1 Product Profile

1.1 Overview

The W Series Collision Avoidance LiDAR adopts TOF (Time of Flight) detection mechanism. With industry-leading shock and vibration resistance, reliability and stability, this series is suitable for AGV/RGV/robot and other indoor and outdoor equipment collision avoidance and intelligent area detection.

1.2 Features

- 1) The point cloud image of the environment is obtained through a 270° 2D scan, with the distance between the lidar and the object in front calculated in polar coordinates, the presence of obstacles in the detection area can be determined.
- 2) The lidar is connected via the USB interface of the PC and the detection area is set on the point cloud display software. Three independent detection areas can be set freely for each working area.
- 3) Detection area can be switched via input (up to 15 types).
- 4) The 0° angle position is at the opposite direction of the cable interface of the W LiDAR.

1.3 Application Areas

- 1) AGV obstacle detection
- 2) Robot obstacle avoidance
- 3) Security - building intrusion protection

1.4 Specifications

Model	A	A-P	C	C-P	B	B-P	I	I-P
Laser Class	905 nm (CLASS 1 eye safety)							
Detection Range	5m/10m/20m/30m The maximum range is xxx*0.1m, ie, the max. range of W050B is 5m							
Detection Accuracy	±3 cm							
Scanning Rate	10 Hz							
Data Point Generating Rate	20,000 pts/sec							
Scanning Angle	Maximum 270° (customizable, the coordinate origin is at the scanning center)							
Angular Resolution	0.18°							
Voltage	24VDC (9-28VDC)							
Current	<300mA							

Communication Interface	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP
Data Transmission Interface	Type C							
Detection Area Type	Correlated				Independent			
Input (1-4)	Optically coupled inputs for switching detection areas							
Detection Area Setting	Setting the area by [inputs 1, 2, 3, 4].							
Data Value Output	RS485	RS485	-	-	RS485	RS485	-	-
Output Response Time	<150 ms (scanning speed: 1 rec/100 ms)							
Input Response Time	Cycle: 100 ms							
Indicator	A flashing yellow light (left) indicates normal system operation; a flashing red light (right, near the type C connector) indicates an obstruction in the area							
IP Grade	IP 65							
Operation Temperature	-20~60°							
Weight	About 397 g							
Dimension	φ80 * 79.1 mm							
Cable Length	1 m							

! NOTE

NPN open-collector output, divided into normally open and normally closed, which can be modified by the configuration on the point cloud display software.

- **Normally open mode:** When the alarm output signal is low, it means that an object has been detected. Fault output line is high to indicate normal lidar operation, low to indicate lidar fault (OUT 1,2,3 outputs: low = object detected; fault output: high = normal operation).
- **Normally closed mode:** when the alarm output signal is high, it means that an object is detected, when the fault output line is low, it means that the lidar is working normally, a high level means lidar fault (OUT 1,2,3 outputs: high level = object detected; fault output: low level = normal operation).

PNP open-collector output, divided into normally open and normally closed, which can be modified by the configuration on the point cloud display software.

- **Normally open mode:** when the alarm output signal is high, it means that an object is detected; when the fault output line is low, it means that the lidar is working normally; a high level means lidar fault (OUT 1,2,3 outputs: high level = object detected; fault output: low level = normal operation).
- **Normally closed mode:** when the alarm output signal is low, it means that an object is detected, when the fault output line is high it means that the lidar is working normally, a low level means lidar fault (OUT 1,2,3 outputs: low level = object detected; fault output: high level = normal operation).

2 Electrical Connection

2.1 Interface

For model **A/A-P/B/B-P**:

The connection cable consists of 15 pins, the wiring definition is shown below.

NOTE: There are two kinds of cables for those lidar models, please refer to the actual cable of your lidar when wiring.

Pin Definition	Color	
	Cable 1	Cable 2
Power+	Brown	Brown
GND	Blue	Blue
COM-	Black	Black
COM+	Red	Red
IN1	Green	Green
IN2	Yellow	Yellow
IN3	Red and white	Red and white
IN4	Brown and white	Green and white
OUT1	White	White
OUT2	Grey	Grey
OUT3	Orange	Orange
Fault output	Purple	Purple
485-A	Pink	Pink
485-B	Light green	Light green
485-GND	Black and white	Black and white

For model **C/ C-P/ I/ I-P**:

One end of the connection cable is a 12-pin aviation plug, the other end is dispersed wires, whose wiring definition is shown below.

Wire definition	Color
Power+	Brown
GND	Blue
COM+	Red
COM-	Black
IN1	Green
IN2	Yellow
IN3	Pink
IN4	Light blue
OUT1	White
OUT2	Grey
OUT3	Orange
Fault output	Purple

2.2 Select Area Group Via Switch Value Input

Area Group	Input Signal			
	IN4	IN3	IN2	IN1
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

NOTE

When testing lidar model A/B/C/I, if only VCC, GND, COM+ and COM- are wired, the input pins are left open, the level of the input pins is all high and the area selected by the device is area 15.

When testing A-P/B-P/C-P/I-P lidars, if only VCC, GND, COM+ and COM- are wired, the input pins are left open, the level of the input pins is all low and the device selects area 0.

2.3 Data Value Interface

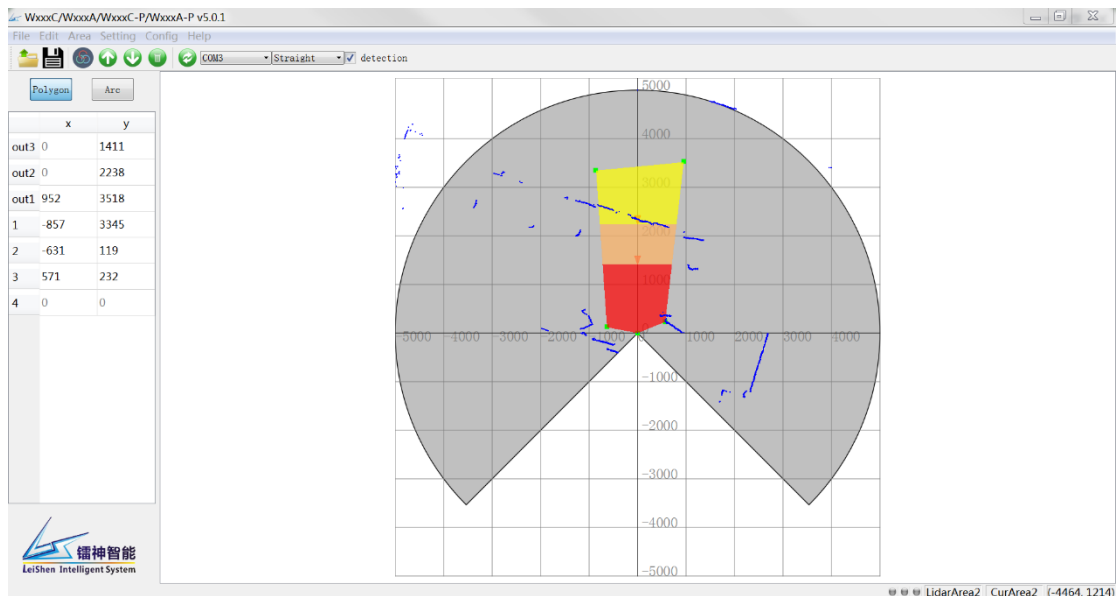
The lidar model A/ A-P/ B/ B-P have an RS485 data output, which can be sent to a PC using an RS485 to serial module. See the communication protocol for the RS485 output at **Appendix B**.

3 Point Cloud Display Software

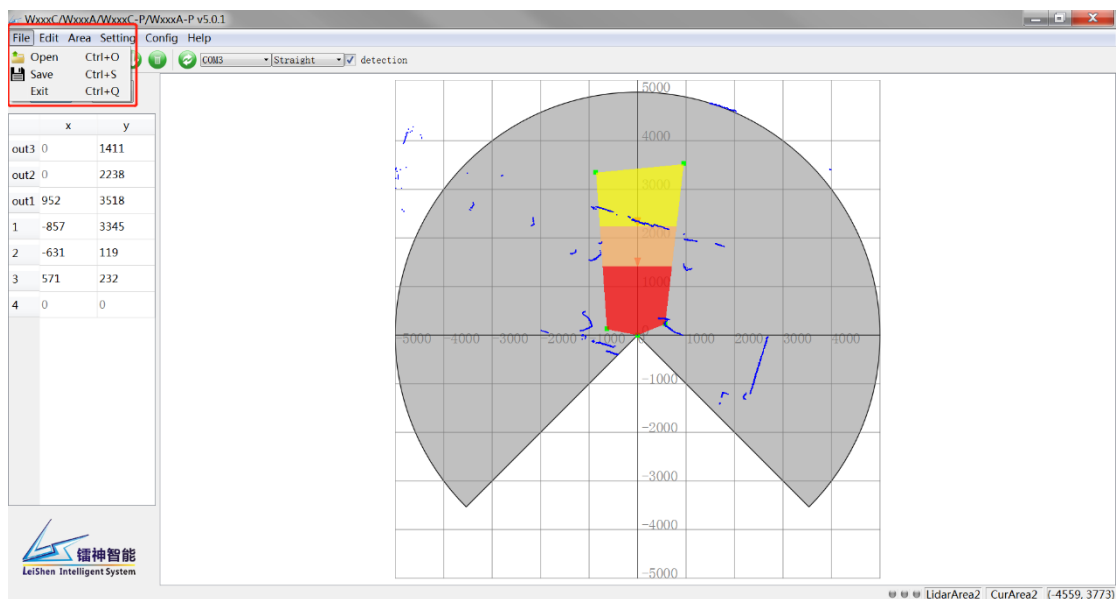
3.1 Correlated Type

3.1.1 Software Introduction

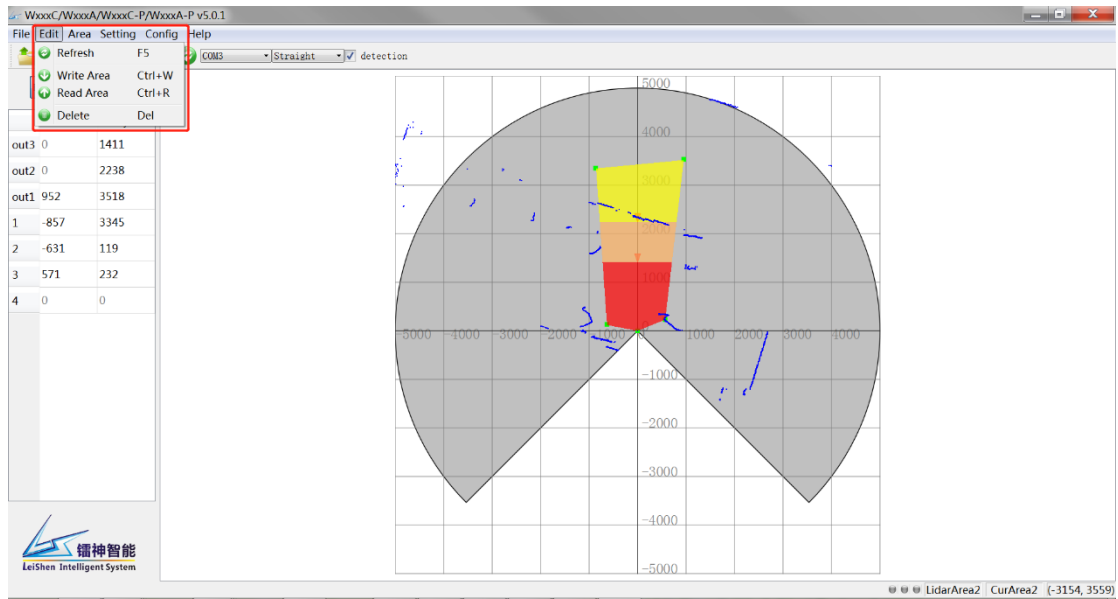
Open the point cloud display software, the interface is as below.



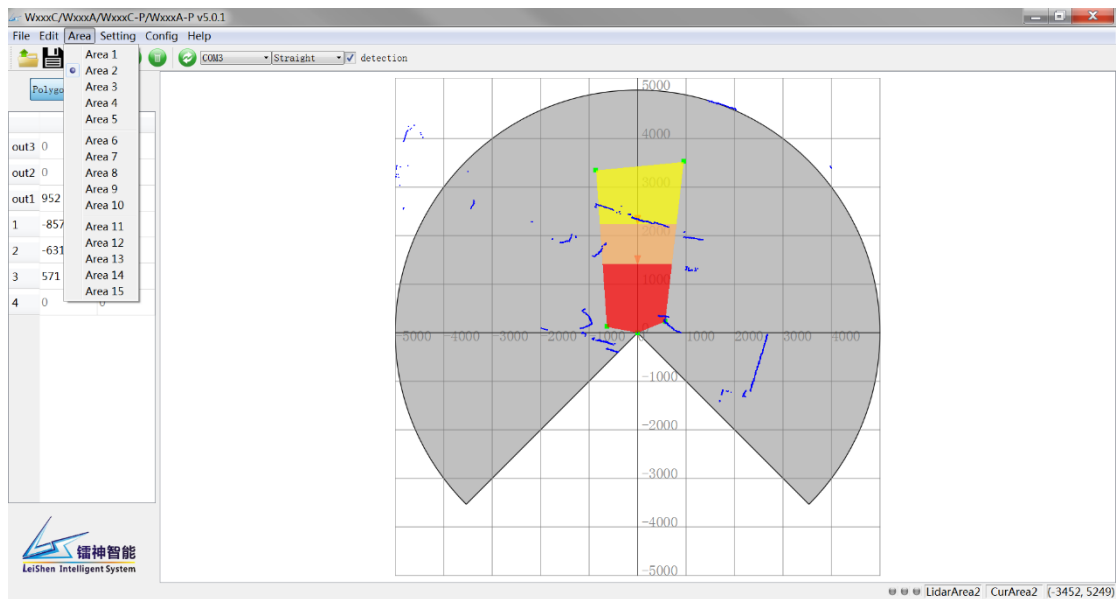
Click on the "File": where "Open" means open the offline file, "Save" means save the plotted area graph and "Exit" means exit the software.



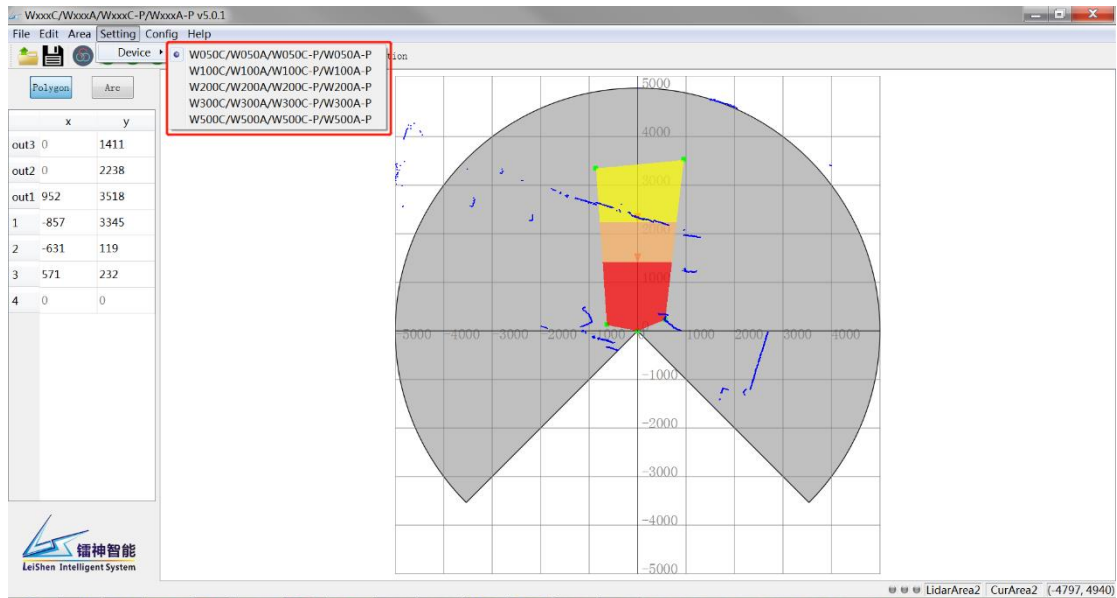
Click on the "Edit" button, where "Refresh" means update the serial port; "Write Area" means download the parameters of the currently configured area; "Read Area" means read the parameters of the area existing inside the lidar; "Delete" means delete the parameters of the area currently selected by the mouse.



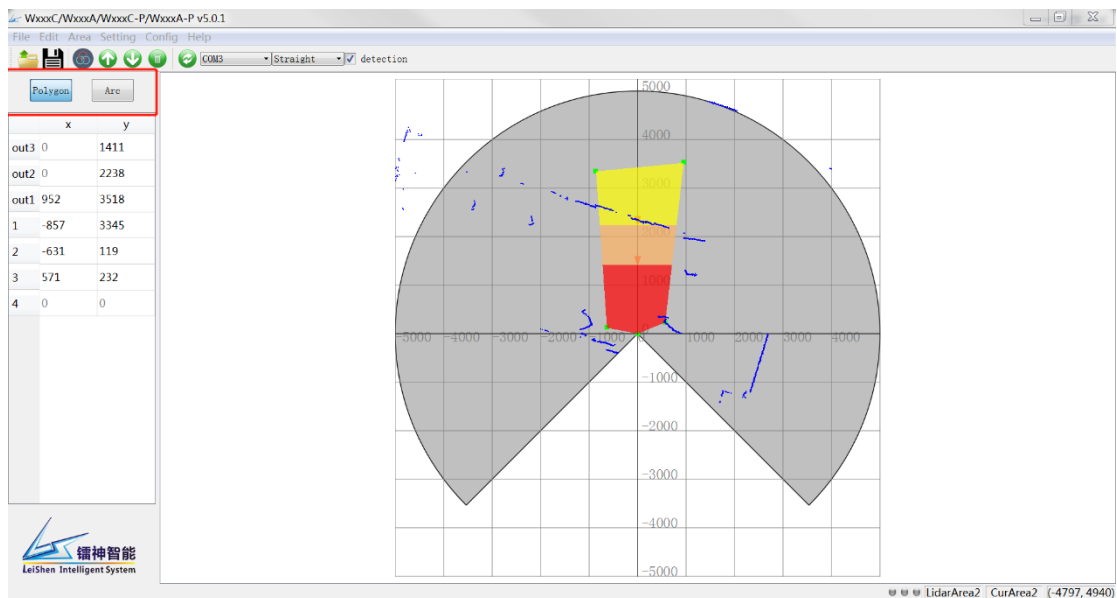
By clicking on the "Area" button, 15 different areas can be set and downloaded to the device for customer use.



Click on "Setting" → "Device" to select the current device model.

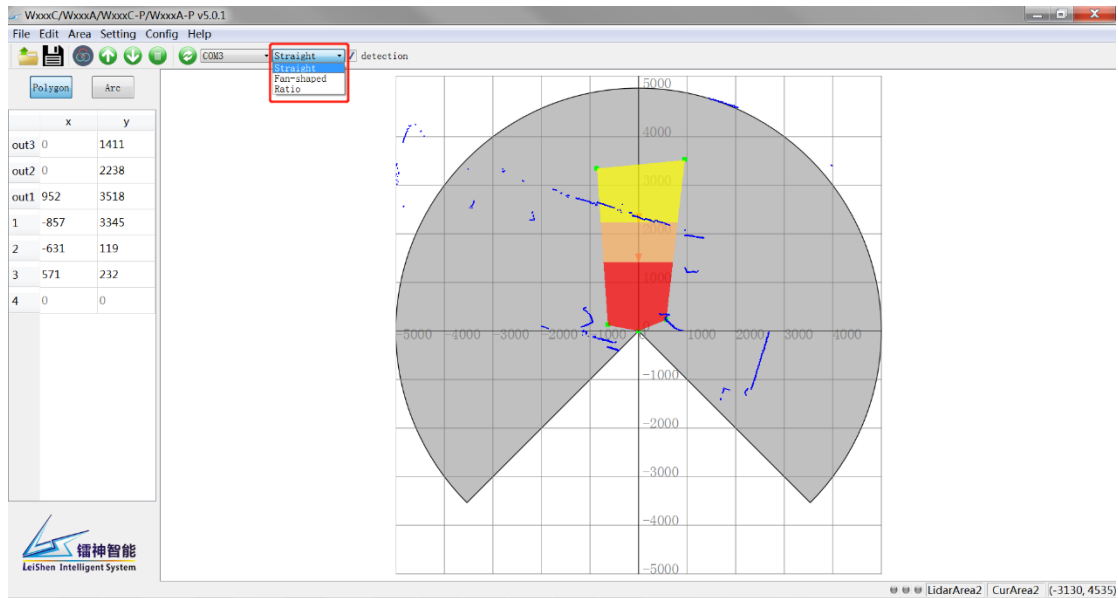


The outermost area of the lidar can be set in two ways: polygon and arc. In the picture below, the outermost area is a polygon. The detection area is drawn by dragging the mouse and the point is deleted by clicking the right mouse button while dragging the point.

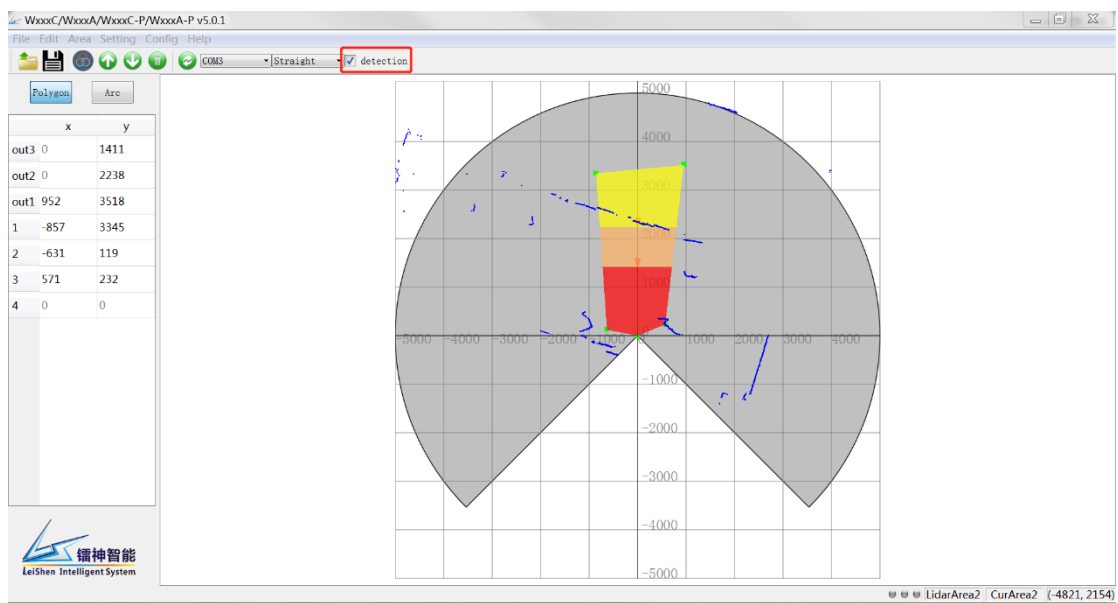


There are three different ways of setting up alarm areas for the same outer area as follows


- 1) Straight
- 2) fan-shaped
- 3) ratio

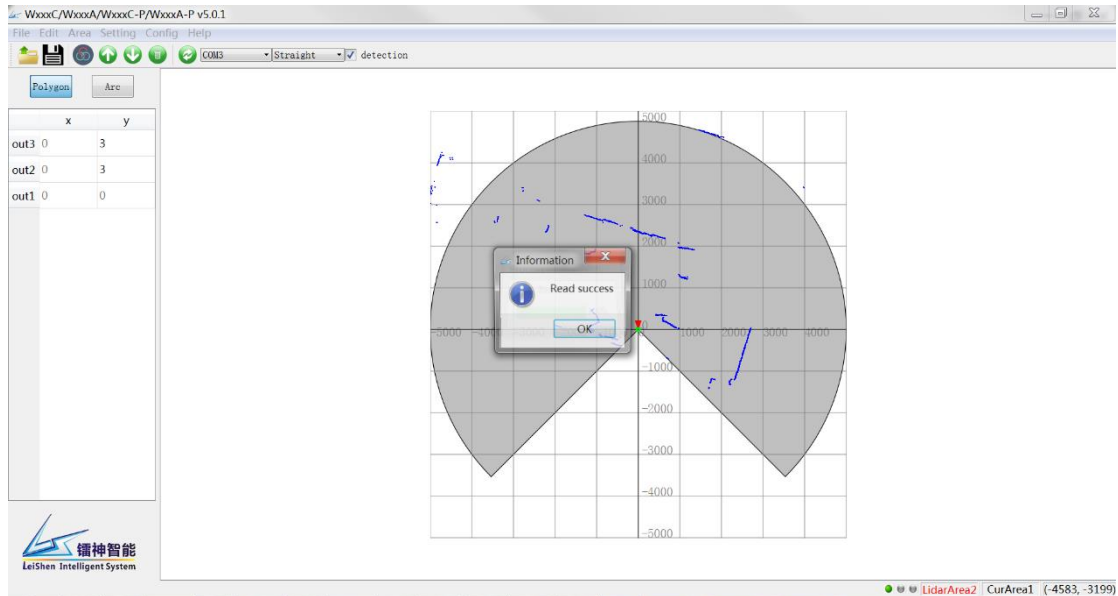



Select "COM" to open the serial port and click on the checkbox "Detection" to display the point cloud information of the obstacle in the lidar scanning area.

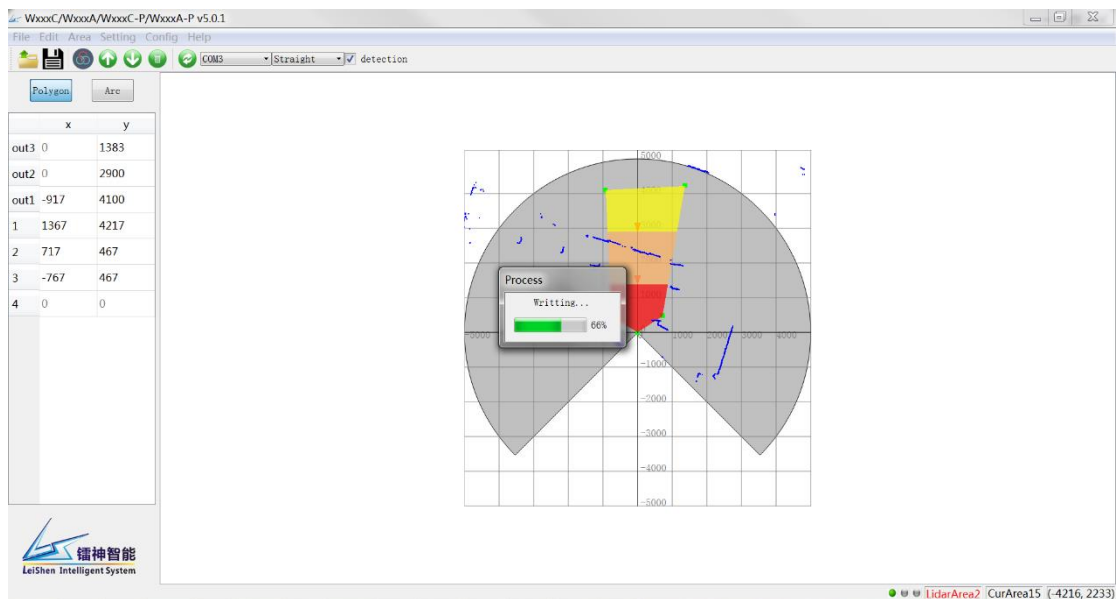


3.1.2 Operating Steps

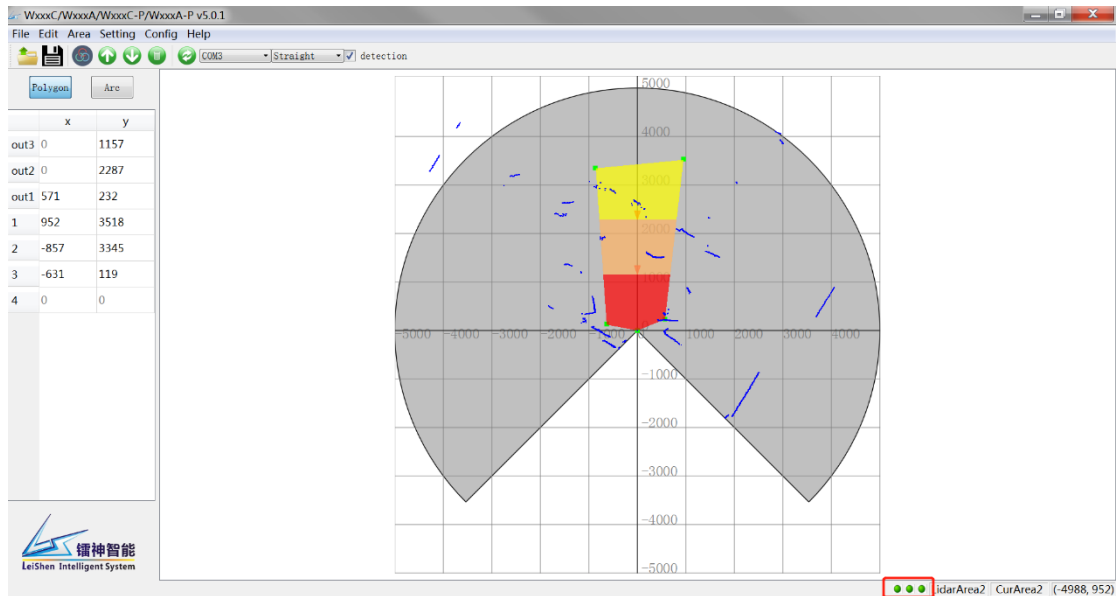
1) Connect the device, open the serial port, first click on "Read Area" or  to read the area that has been set up inside the lidar. The normal situation is shown below, otherwise please check if the serial cable of the lidar is connected properly.



2) Set the desired area as required and click on “Write Area” or  to download the set area parameters into the lidar. If the download is successful, it will show Write success, otherwise it will show Write fail. If it fails, please check the serial port and download again.



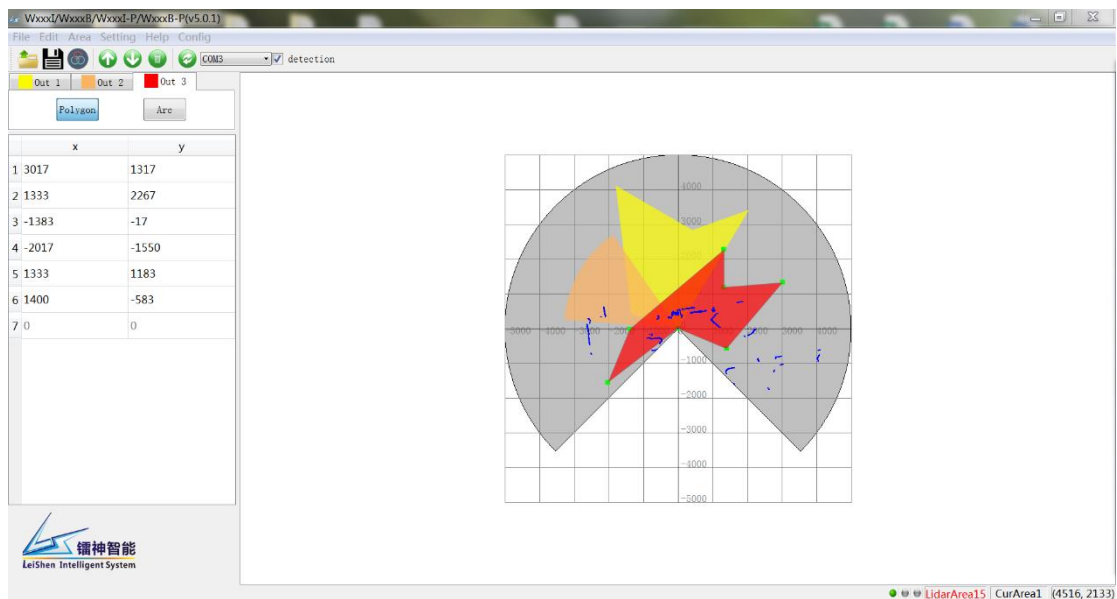
As shown in the picture below, there are three indicators, when all three green lights are on, it indicates that there is an obstacle in the red area.



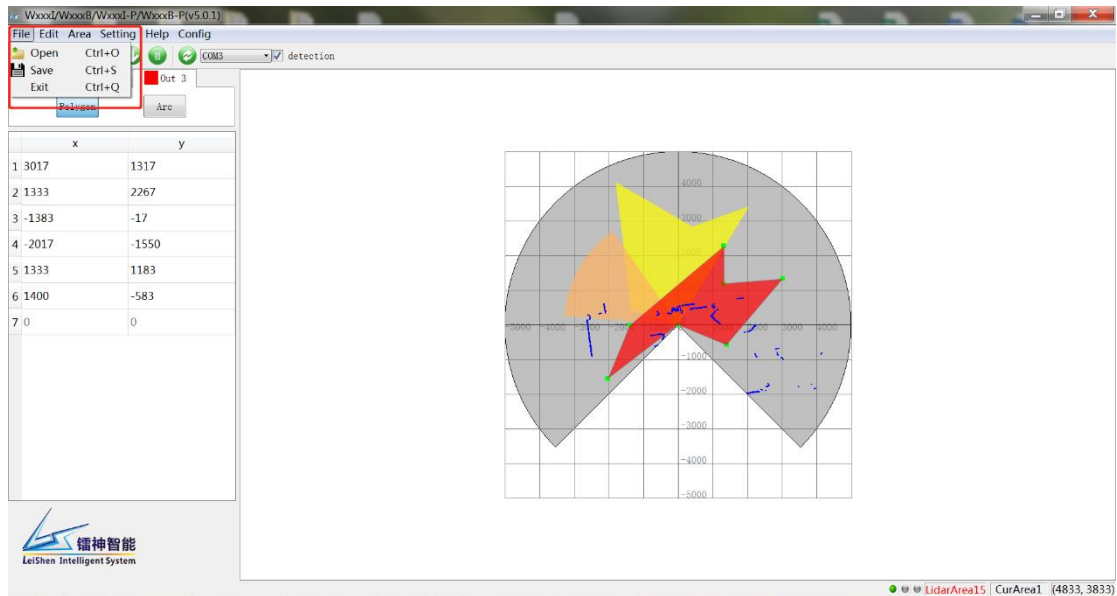
3.2 Independent Type

3.2.1 Software Introduction

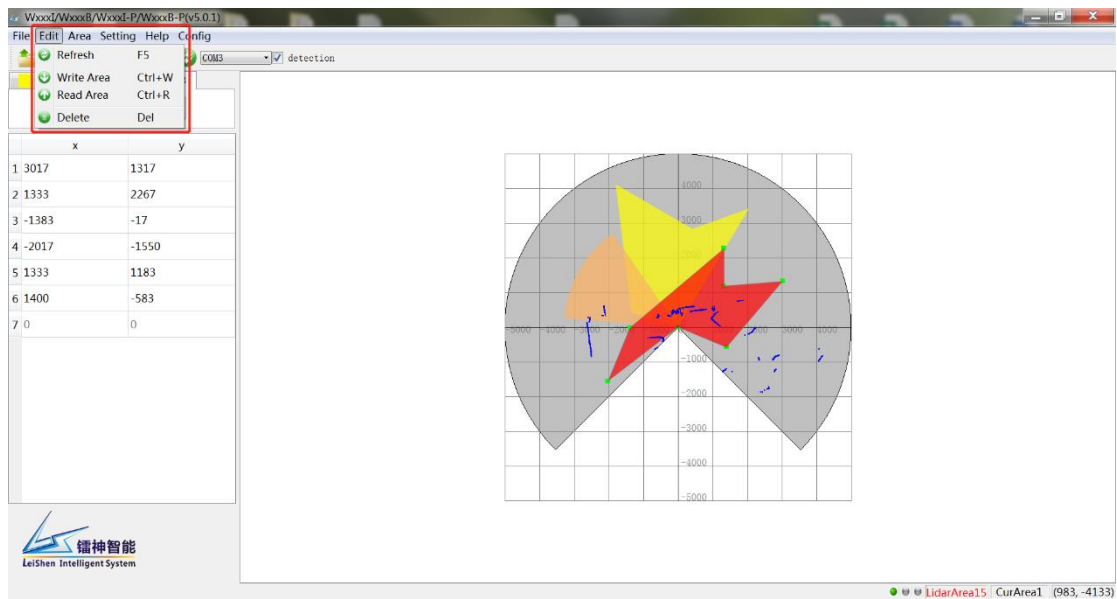
Open the point cloud display software, the interface is as below.



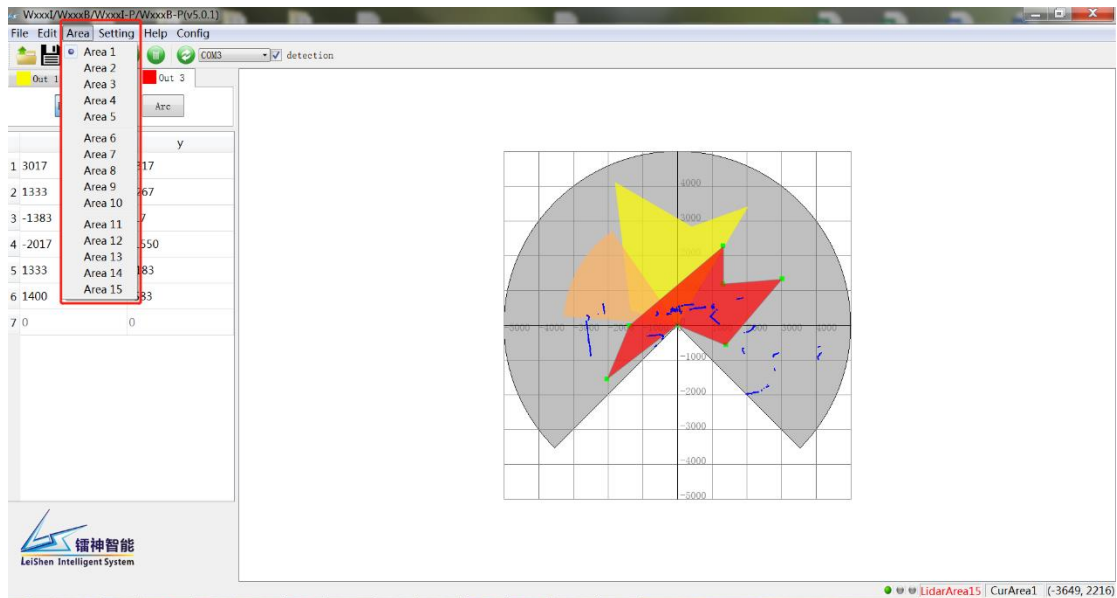
Click on the "File": where "Open" means open the offline file, "Save" means save the plotted area graph and "Exit" means exit the software.



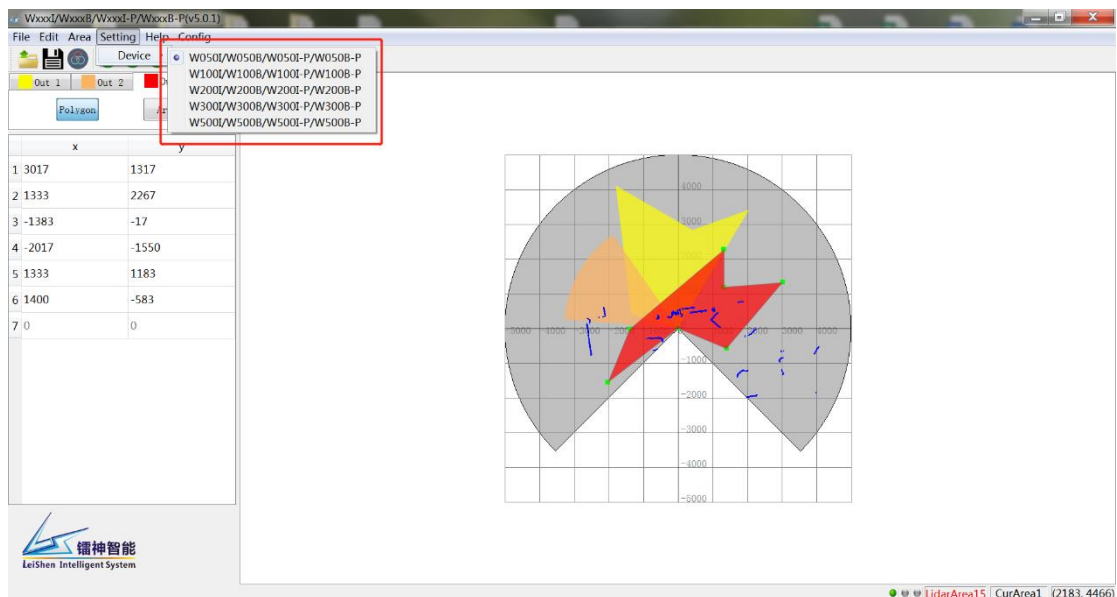
Click on the “Edit” button, where “Refresh” means update the serial port; “Write Area” means download the parameters of the currently configured area; “Read Area” means read the parameters of the area existing inside the lidar; “Delete” means delete the parameters of the area currently selected by the mouse.



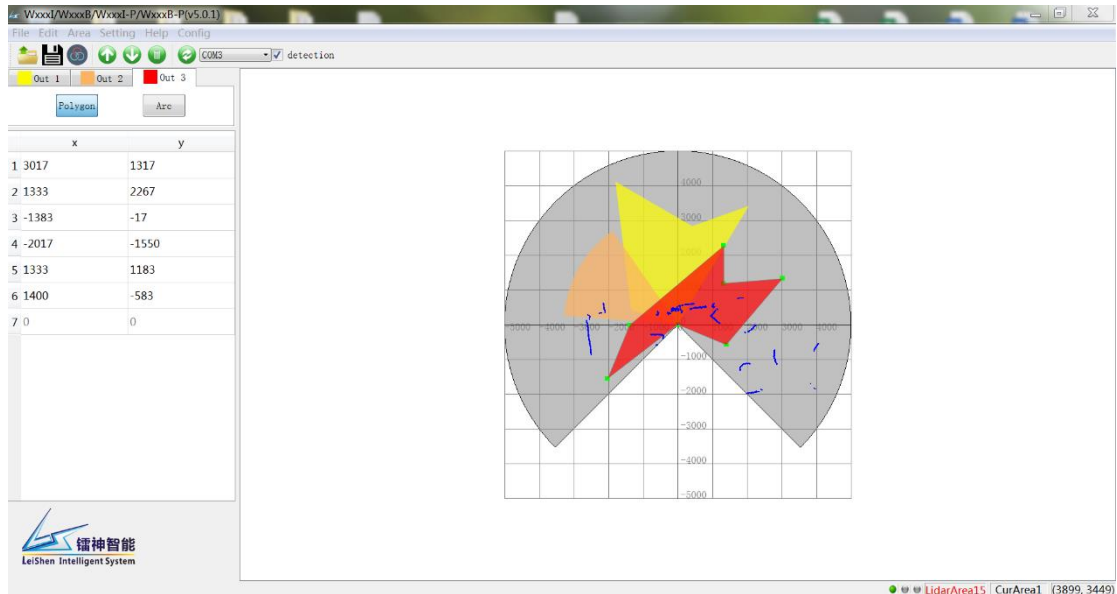
By clicking on the "Area" button, 15 different areas can be set and downloaded to the device for customer use.



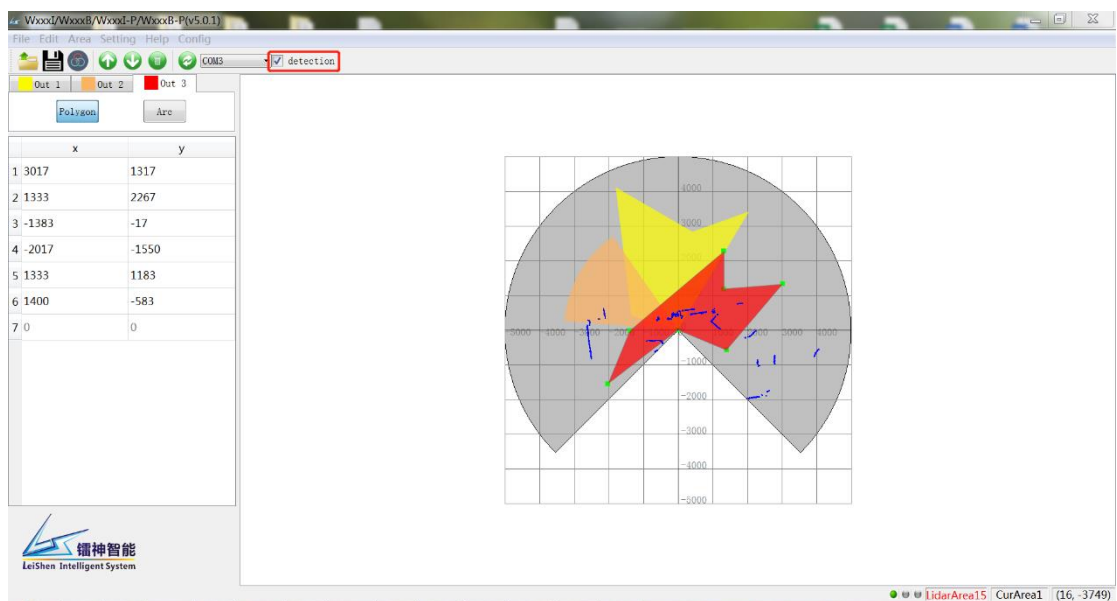
Click on "Setting" → "Device" to select the current device model.




The independent type of lidar can be set up in the same working area with three separate areas, each with two settings: polygon and arc. In the picture below, Area 1 is configured with Out 1 being the yellow area with the polygon setting, Out 2 being the orange area with the arc setting and Out 3 being the red area with the polygon setting. The detection area is drawn by dragging the mouse and the point is deleted by clicking the right mouse button while dragging the point.

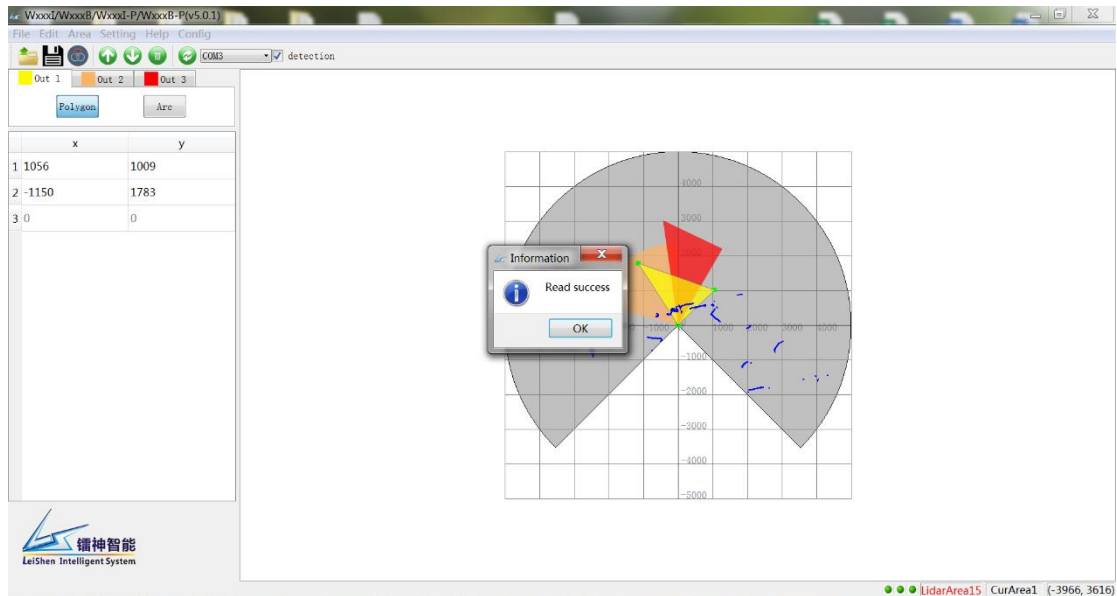



Select "COM" to open the serial port and click on the checkbox "Detection" to display the point cloud information of the obstacle in the lidar scanning area.

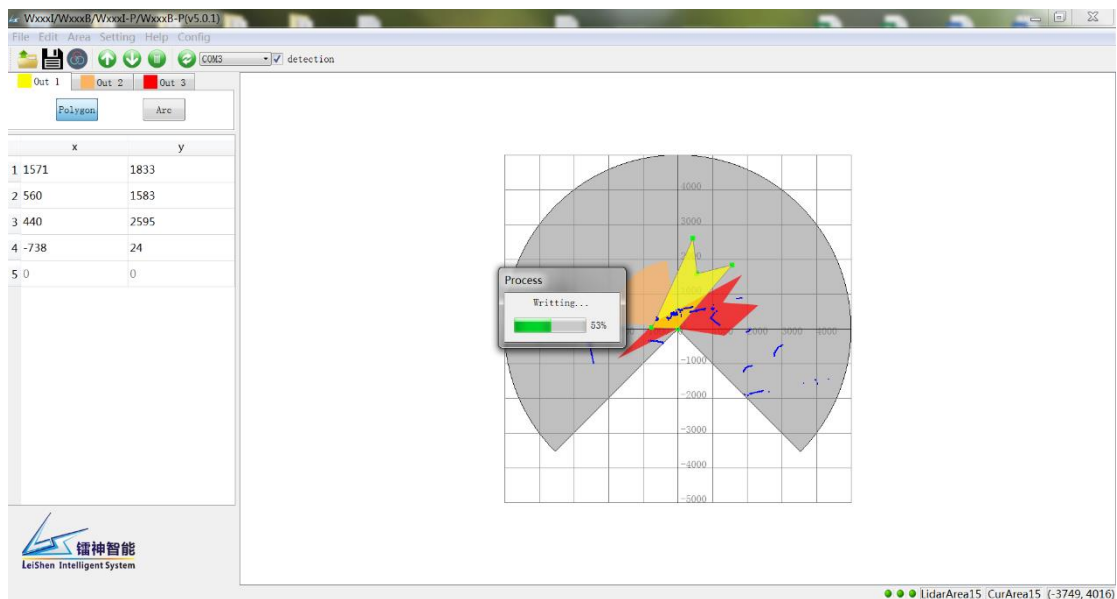


3.2.2 Operating Steps

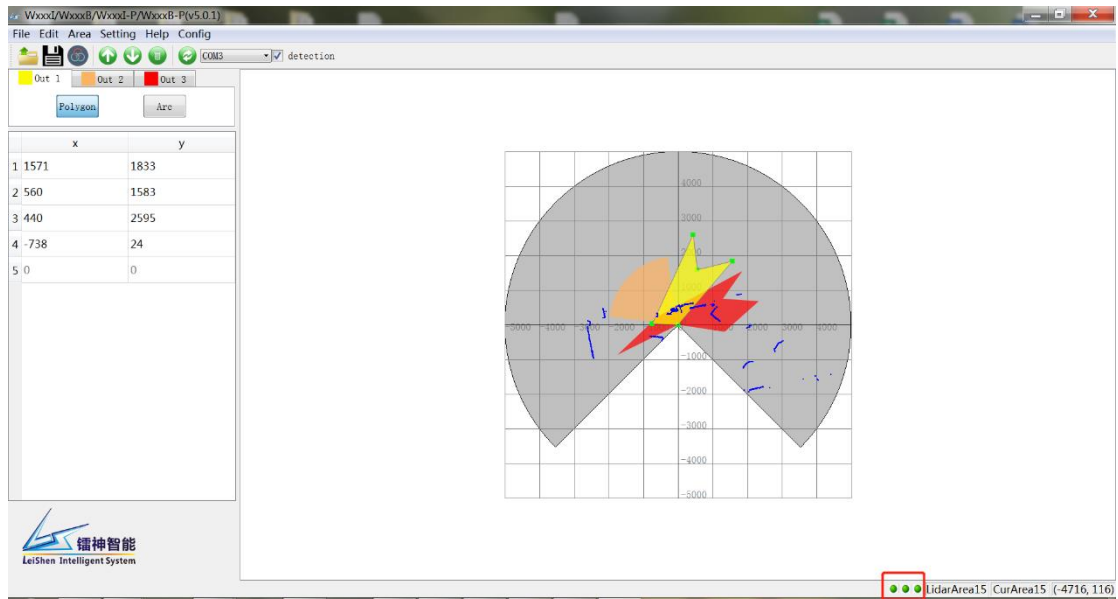
1) Connect the device, open the serial port, first click on "Read Area" or  to read the area that has been set up inside the lidar. The normal situation is shown below, otherwise please check if the serial cable of the lidar is connected properly.



2) Set the desired area as required and click on "Write Area" or  to download the set area parameters into the lidar. If the download is successful, it will show "Write success", otherwise it will show "Write fail". If it fails, please check the serial port and download again.

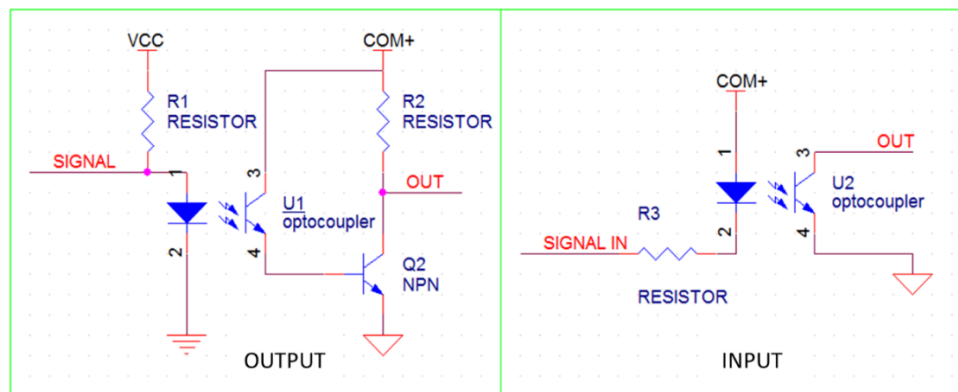


As shown in the picture below, there are three indicators, when all three green lights are on, it indicates that there is an obstacle in the red area.

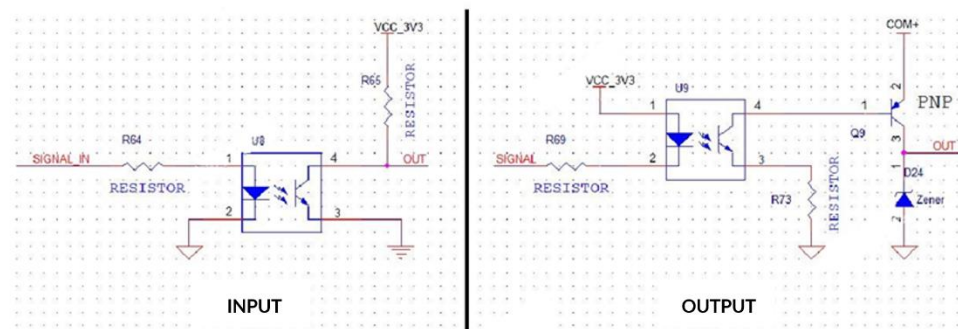


Appendix A Output/Input Circuit Diagram

NPN:



PNP:



Appendix B RS485 Output Communication Protocol

B.1 Lidar Communication Parameter

Communication mode: RS-485

Baud rate: 921600 bps

Check bits: NONE

Data bits: 8 bits

Stop bit: 1 bit

Data format: HEX

B.2 Data Format

header		Measured points		Angle 1		Distance 1		Angle 2		Distance 2		...	Angle n		Distance n		Checksum	tail	
0xfe	0xff	High 8 bits	Low 8 bits	High 8 bits	Low 8 bits	High 8 bits	Low 8 bits	High 8 bits	Low 8 bits	High 8 bits	Low 8 bits	...	High 8 bits	Low 8 bits	High 8 bits	Low 8 bits	Low 8 bits of the sum of the foregoing data	0xcc	0xdd

Measured points	Data content	
N	Angle	Distance
2 bytes	N*(2+2) bytes	

The above data are in HEX format and are transmitted once per frame.

Header: 2 bytes, fixed as FE, FF

Measured points: 2 bytes, representing the number of data points this frame of data is to transmit

Data content: N*(2+2) bytes, N is the number of measured points. Angle and distance are of 2 bytes respectively. See the table below:

Angle	
The high 8 bits of the angle	The low 8 bits of the angle

Checksum: 1 byte, is the low 8 bits of the sum of the foregoing data

Tail: 2 bytes, fixed as CC, DD

Revision History

Rev.	Release Date	Revised Content	Issued/Revised By
V5.0.0	2022-08-24	Initial	LS1286
V5.0.1	2023-01-04	Data transmission interface and IP grade added	LS1286



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