GDS-F31-**Type of Obstacle avoidance**

Laser scan sensor user's Manual

CORON ELECTRONICS (WUHAN) CO.,LTD

Catalogue

A.   Product overview

The GDS-F31-C laser scanning sensor adopts the principle of time flight (TOF) ranging and integrates cutting-edge technologies in the fields of optics, electricity and mechanical kinematics. The GDS-F31 laser scanning sensor can achieve a 270° field Angle and a maximum of 25m area protection. GDS-F31 is a industrial level of scanning laser obstacle avoidance type sensor, broad to use environment requirement, indoor and outdoor can work reliably, especially using the intelligent multiple echo technology, precise temperature control system and reliable in sealing design, make its in bad weather rain, fog, snow, still can ensure reliable work under different temperature conditions.

TOF ranging principle: launch device laser pulse wave, system start time, time for t1, when laser met object, part of the energy return, laser receiver to receive return laser wave, stop timing system, time for t2, laser scanning sensor and the distance between the object to be tested is: S = C x (t2 - t1) / 2, C is the speed of light.

GDS-F31 series sensor features introduction：

1．laser protection level 1, eye safety;

2．large field of view, long distance, high speed, accurate measurement;

3．precise temperature control design, operating temperature range -25℃ ～ +50℃;

4．reliable airtight design, protection class IP65

Attention: The Type-C interface rubber plug should be kept closed when not in use, otherwise the equipment's protection level will decrease and affect its durability

B.   Technical parameters

	GDS-F31
Angular resolution	**0.33°**/ 0.5°/ 1°
Working mode	Obstacle avoidance
Regional group	16 area groups (each area group contains 3 areas)
Switching input	4
Switching output	3* Area output +1* sync/status output (output current Max 100mA)
Parameter Setting interface	RS232
Data output interface	RS232

Description:

1. F31 series of products can support three kinds of Angle resolution switch, the default Angle resolution is 0.33°.

General parameters

Item	Typical value	Item	Typical value
Scanning angle	270°	Sweep frequency	15Hz
Farthest distance	25m	10% reflectivity detection range	8m
Measurement accuracy	±3cm	Repeat accuracy	3cm[1]
Resolving power	<3m:5mm <5m:10mm <8m:15mm[2]		
Laser level	Class 1 laser (in line with GB7247.1-2012), safe for human eyes		
Laser wavelength	905nm	Protection grade	IP67
Working distance	0.05~5m/8m	Working voltage	DC9~28V
Power dissipation	<4W[3]	Size	60mm*60mm*85mm
Working temperature	-25℃~50℃	Storage temperature	-40℃~70℃
Light resistance	80000Lux		

(1) Test conditions: 10% reflectivity within 8m.

(2) Resolution: at different distances, the resolution of the equipment is different. In a range of 3m, it can recognize the minimum resolution of 5mm, in a range of 5m, it can recognize the minimum resolution of 10mm, in a range of 8m, it can recognize the minimum resolution of 15mm.

(3) Due to switching power supply loss, conversion efficiency and other factors, it is recommended to choose the power supply power greater than 4W.

EMC test

Test Items	Technical Requirement
Voltage terminal conducted disturbance	Comply with iec61000-6-4:211 power terminal conduction disturbance limits
Conducted common-mode harassment of telecommunication ports	Comply with iec61000-6-4:211 power terminal conduction disturbance limits
Radiation disturbance under 1G	Comply with the limits of radiation disturbance in IEC61000-6-4:211
Electrostatic discharge immunity	In line with iec61000-6-2:2005 test class provisions (contact discharge 2kV, 4kV, air discharge 2kV, 4kV, 8kV), to meet the performance criteria A requirements
Continuous wave radiation disturbance immunity	In line with iec61000-6-2:2005 test class provisions (test voltage 10V/m), to meet the performance criteria A requirements.
Electrical fast transient burst immunity	In line with iec61000-6-2:2005 test class (power input port test voltage 0.5kV, 1kV, 2kV), to meet the requirements of performance criterion A
Surge (impact) immunity	In line with iec61000-6-2:2005 test class provisions (wire-line 0.5kV, 1kV, wire-ground 0.5kV, 1kV, 2kV), to meet the performance criteria A requirements
Continuous wave conduction disturbance immunity	Comply with iec61000-6-2:2005 test class (power input port test voltage 10V), meet the requirements of performance criterion A
Power frequency magnetic field immunity	It meets the requirements of IEC61000-6-2:2054 experimental class (magnetic field intensity 30A/m), and meets the requirements of performance criterion A
Voltage sag and short interruption immunity	Comply with iec61000-6-2:2005 test class. Voltage sag -30% (0.5 cycle) to meet the requirements of performance criterion A; Voltage sag is reduced by -60% (5 cycles, 50 cycles), meeting the requirements of performance criterion A; Voltage short interruption (250 cycles), meet the requirements of performance criterion C.

C.   Series products

1. Roduct categories

Product series	Model	Type of output	Driving ability	Ranging ability
N series	GDS-F31-CNL005	NPN	Low level drive	0.05m~5m
	GDS-F31-CNL008	NPN	Low level drive	0.05m~8m
P series	GDS-F31-CPH005	PNP	High level drive	0.05m~5m
	GDS-F31-CPH008	PNP	High level drive	0.05m~8m

Description:

1. As for driving capability, "low level drive" means that the device has driving capability at low output voltage, and "high level drive" means that the device has driving capability at high output voltage.

1. 2. High level voltage range: 9-28V, consistent with the supply voltage.

2.tailed instructions

N series: idle state (detect no obstacles), output low level;Trigger state (with obstacles), output high level;Wiring mode, OUT pin is connected to the cathode of the driving circuit, as shown in the figure below;

P series: idle state (detect no obstacles), output high level; Trigger state (with obstacles), output low level;Connection mode, OUT pin is connected to the anode of the driving circuit.

```
          F3X OUT
             |
             |
             ▽
             |
       Power supply
            V-
```
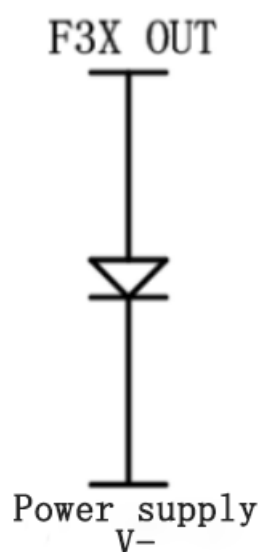
Selection of radar to PLC circuit

*PH, ·NH·high-level·drive, ·PL, ·NL·low-level·drive

PLC·model	PLC·state	Radar·selection
Co·yin	Barrier·free·PLC·circuit·breaker, ·barrier·free·PLC·conduction	PH
Co·yin	Barrier·free·PLC·conduction, ·barrier free·PLC·circuit·breaker	NH
common·anode	Barrier·free·PLC·conduction, ·barrier free·PLC·circuit·breaker	PL
common·anode	Barrier·free·PLC·circuit·breaker, ·barrier·free·PLC·conduction	NL

D.　Mechanical dimensions

(The dimension in the figure is mm)
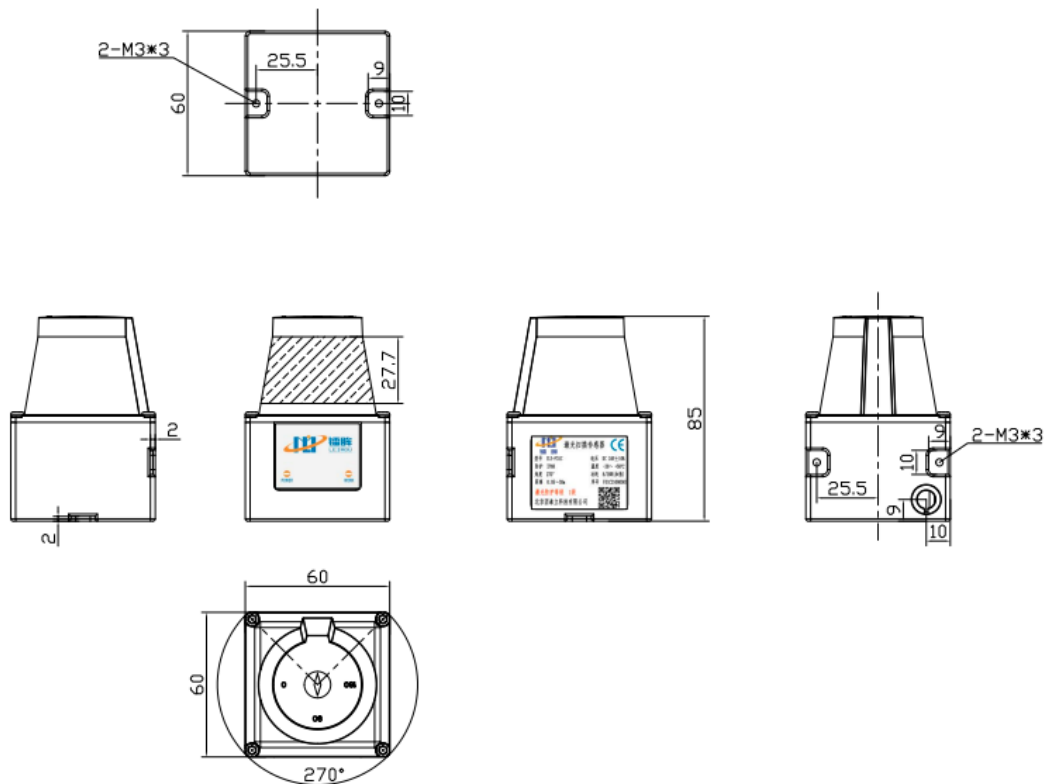
E.   Electrical connection

1. Pin Definition

The current model of radar has two outgoing methods

1.1 Loose wire 28AWG 15 wire

Power supply			
S/N	Cable color	Pin definition	Pin function description
1	Red	V+	Positive power supply
2	Red and white	V+	Positive power supply
3	Black	V−	Negative power supply
4	Blackandwhite	V−	Negative power supply

Serial port (RS232)			
S/N	Cable color	Pin definition	Pin function description
5	Blue	RX	RS232 receiving pin
6	Orange	TX	RS232 transmit pin
Note: RS232 ground power supply is negative			

Output			
S/N	Cable color	Pin definition	Pin function description
7	White	OUT1	Device Ready
8	Brown	OUT2	Innermost detection output
9	Brownandwhite	OUT3	Middle layer detection output
10	Green	OUT4	Outermost detection output
Note：OUT1:Device Ready，Abnormal output of equipment status			

Input			
S/N	Cable color	Pin definition	Pin function description
11	Yellow	COM	Common input PNP:INGND NPN:IN 9~28 V
12	Purple	IN4	Switching input
13	Light green	IN3	Switching input
14	Pink	IN2	Switching input

| 15 | Gray | IN1 | Switching input |

1.2 Loose wire 26AWG 14 wire

Power supply			
S/N	Cable color	Pin definition	Pin function description
1	Red	V+	Positive power supply
2	Black	V-	Negative power supply

Serial port (RS232)			
S/N	Cable color	Pin definition	Pin function description
3	Black and white	GND	RS232 grounding pin
4	Blue	RX	RS232 receiving pin
5	Orange	TX	RS232 transmit pin

Output			
S/N	Cable color	Pin definition	Pin function description
6	White	OUT1	Device Ready
7	Brown	OUT2	Innermost detection output
8	Brownandwhite	OUT3	Middle layer detection output
9	Green	OUT4	Outermost detection output
Note：OUT1:Device Ready，Abnormal output of equipment status			

Input			
S/N	Cable color	Pin definition	Pin function description
10	Yellow	COM	Common input PNP:INGND NPN:IN 9~28 V
11	Purple	IN4	Switching input
12	Light green	IN3	Switching input
13	Pink	IN2	Switching input
14	Gray	IN1	Switching input

2. DB15 Pin definition

2.1 Loose wire 28AWG 15 wire

DB15P/N	Color	Pin definition	Function
1	Red/red and white parallel	V+	Positive power supply
2	Orange	TX	RS232transmit pin
3	Red	V+	Positive power supply
4	White	OUT1	Device Ready
5	Black/blackandwhiteparallel	V-	Negative power supply
6	Blue	RX	RS232 receiving pin
7	Black	V-	Negative power supply
8	Gray	IN1	Switching input
9	Pink	IN2	Switching input
10	Lightgreen	IN3	Switching input
11	Purple	IN4	Switching input
12	Brown	OUT2	Innermost detection output
13	Brownandwhite	OUT3	Middle layer detection output
14	Green	OUT4	Outermost detection output
15	Yellow	COM	Common input PNP:INGND NPN:IN 9~28 V

2.2 Loose wire 26AWG 14 wire

DB15P/N	Color	Pin definition	Function
1	Red/red and white parallel	V+	Positive power supply
2	Orange	TX	RS232transmit pin
3	Red	V+	Positive power supply
4	White	OUT1	Device Ready
5	Black	V-	Negative power supply
6	Blue	RX	RS232 receiving pin
7	Blackandwhiteparallel	V-	Negative power supply
8	Gray	IN1	Switching input
9	Pink	IN2	Switching input
10	Lightgreen	IN3	Switching input
11	Purple	IN4	Switching input
12	Brown	OUT2	Innermost detection output
13	Brownandwhite	OUT3	Middle layer detection output
14	Green	OUT4	Outermost detection output
15	Yellow	COM	Common input PNP:INGND NPN:IN 9~28 V

3. Electrical connection diagram

3.1 Loose wire 28AWG 15 wire

Note:

1. Connect all four power cables, not only two.

2. Use the same ground for the serial cable and power supply.

3. Control unit: the device outputs signals to the radar for area group switching. If the COM terminal is connected to V-, the input pin needs to be connected to V+; If COM is connected to V+, input pin needs to be connected to V-. The input only needs a pressure difference of greater than or equal to 9V between the two ends of the input to be detected.

4. Controlled unit: it outputs signals from radar to equipment to indicate whether there are obstacles at present. The output high level is consistent with the radar power supply voltage.

5. Measurement of output signal of the controlled unit: Output signal OUT1,OUT2,OUT3,OUT4 is relative to the power supply ground. Measurement mode: the multimeter is adjusted to dc voltage, the black stylus contacts the radar power supply V-, and the red stylus contacts the output signal for measurement.

3.2 Loose wire 26AWG 14 wire

Note:
1. The meaning marked on the connection in the figure is:
Pin definition/wire color
Such as:
IN1/ Grey Input port 1/ grey
2. Use the same ground for the serial cable and power supply
3.4 Connect all power cables
4. Prepare the rs232-GND ground wire Use the same ground as the serial port ground cable and power supply

control unit (input)
IN1/Gray
IN2/Pink
IN3/Light green
IN4/Purple
COM/Yellow

Radar line section

Controlled unit (output)
OUT4/Green
OUT3/Brown and white
OUT1/White
OUT2/Brown

RS232
9 5
8 4
7 3
6 2
1

RS232-GND (Black and white)
RS232-RX/Blue
RS232-TX/Orange

24V Power Supply
L N V+ V-
0V/Black
+24V/Red

220V AC

Note:

1. Connect all four power cables, not only two.

2. Use the same ground for the serial cable and power supply.

3. Control unit: the device outputs signals to the radar for area group switching. If the COM terminal is connected to V-, the input pin needs to be connected to V+; If COM is connected to V+, input pin needs to be connected to V-. The input only needs a pressure difference of greater than or equal to 9V between the two ends of the input to be detected.

4. Controlled unit: it outputs signals from radar to equipment to indicate whether there are obstacles at present. The output high level is consistent with the radar power supply voltage.

5. Measurement of output signal of the controlled unit: Output signal OUT1,OUT2,OUT3,OUT4 is relative to the power supply ground. Measurement mode: the multimeter is adjusted to dc voltage, the black stylus contacts the radar power supply V-, and the red stylus contacts the output signal for measurement.

F.   Area selection

GDS-F31-Ccan switch input IO signals or select the current working area group through the upper computer. Note that the two methods are incompatible. Select the correct radar based on requirements.

When radar switches region group for IO signal, 16 region selection signals can be switched by IN1, IN2, IN3, and IN4, as shown below.

	IN4	IN3	IN2	IN1
Regional group 1	0	0	0	0
Regional group 2	0	0	0	1
Regional group 3	0	0	1	0
Regional group 4	0	0	1	1
Regional group 5	0	1	0	0
Regional group 6	0	1	0	1
Regional group 7	0	1	1	0
Regional group 8	0	1	1	1
Regional group 9	1	0	0	0
Regional group 10	1	0	0	1
Regional group 11	1	0	1	0
Regional group 12	1	0	1	1
Regional group 13	1	1	0	0
Regional group 14	1	1	0	1
Regional group 15	1	1	1	0
Regional group 16	1	1	1	1

Refer to "Chapter 7 - Software Operation" when switching area group for upper computer by radar. The baud rate of the serial port is 115200, with 8 data bits, 1 stop bit and no parity bit.

The specific communication protocols are as follows:

Set up the work area group		
Byte number	Content	Instructions
0-3	AA 8888 AA	Frame header
4	Main command number	0xE3
5	Subcommand number	0x13
6-9	Data frame length	Contains all bytes of the header and the tail of the frame
10	Regional group	1-16
11	XOR check	Xor check from byte 4 to byte 10 inclusive
12-15	88 AA AA 88	End of frame
Description: After receiving the command, the device returns to the execution state of the command, with success 00 and failure 01.		

Set up work area group - reply		
Byte number	Content	Instructions
0-3	AA 8888 AA	Frame header
4	Main command number	0xF3
5	Subcommand number	0x13
6-9	Data frame length	Contains all bytes of the header and the tail of the frame
10	Data	0- Success 1- failure
11	XOR check	Xor check from byte 4 to byte 10 inclusive
12-15	88 AA AA 88	End of frame

Example Query a working area group		
Byte number	Content	Instructions
0-3	AA 8888 AA	Frame header
4	Main command number	0xE4
5	Subcommand number	0x13
6-9	Data frame length	Contains all bytes of the header and the tail of the frame
10	XOR check	Xor check from byte 4 to byte 9 inclusive
11-14	88 AA AA 88	End of frame

Query working area group - Reply		
Byte number	Content	Instructions
0-3	AA 8888 AA	Frame header
4	Main command number	0xF4
5	Subcommand number	0x13
6-9	Data frame length	Contains all bytes of the header and the tail of the frame
10	Data	1-16 current working area group
11	XOR check	Xor check from byte 4 to byte 10 inclusive
12-15	88 AA AA 88	End of frame

Proactively report the results		
Byte number	Content	Instructions
0-3	AA 88 88 AA	Frame header
4	Main command number	0xD5
5	Subcommand number	0x0E
6-9	Data frame length	Contains all bytes of the header and the tail of the frame
10	Device status	0-Normal 1-Abnormal
11	Work Area	0x00-0x15

	Group	
12	Outer trigger state	0- Not enabled 1- Not triggered 2- Trigger
13	Middle trigger state	0- Not enabled 1- Not triggered 2- Trigger
14	Inner trigger state	0- Not enabled 1- Not triggered 2- Trigger
15-16	Outer trigger minimum angle	Angle corresponding to the closest distance triggered by the outer layer (Weight 0.01°, IN 50 Representative 0.5°)
17-18	Outer trigger minimum distance	The closest distance to the outer trigger (in cm)
19-20	Middle trigger minimum angle	Angle corresponding to the closest distance triggered by the middle layer (Weight 0.01°, IN 50 Representative 0.5°)
21-22	Middle trigger minimum distance	Middle trigger closest distance (in cm)
23-24	Inner trigger minimum angle	Angle corresponding to the closest distance triggered by the inner layer (Weight 0.01°, IN 50 Representative 0.5°)
25-26	Middle trigger minimum distance	The closest distance to the inner trigger (in cm)
27	XOR check	Xor check from byte 4 to byte 10 inclusive
28-31	88 AA AA 88	End of frame
Note: Multiple bytes are represented by high bytes first and low bytes last		

G.   Software operation

1. Summary

The GDS-F31-C obstacle-avoiding laser sensor supports RS232 serial port and Type-C for data communication. The connection mode is serial port. RS232 and Type-C are displayed in the software as serial port numbers. The baud rate is 115200 by default.

The following GDS-F31-C obstacle avoidance laser sensor is referred to as F31-C.

2. Software interface

Execute

1. Select the corresponding radar product

2. Click Continue to enter the software operation interface
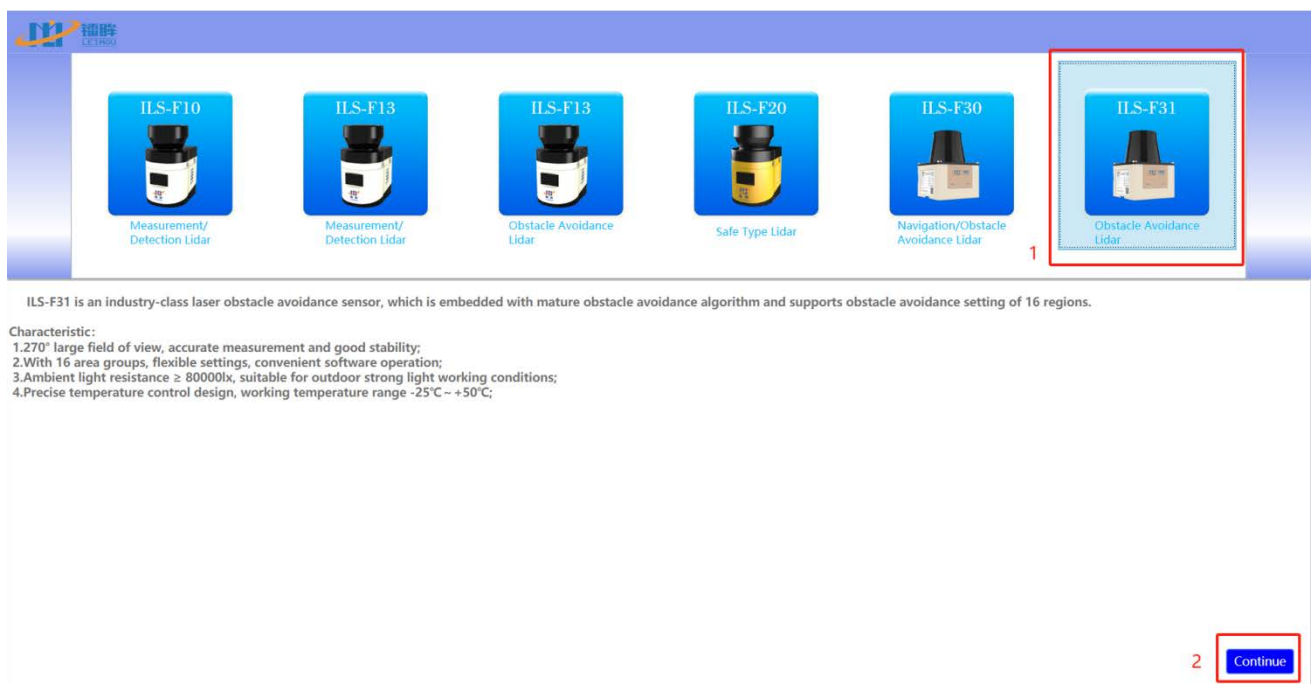
Fig. 2.0 Main interface of upper computer software

The software interface is shown in the figure below, including four areas: connection, operation area, menu bar and image area.
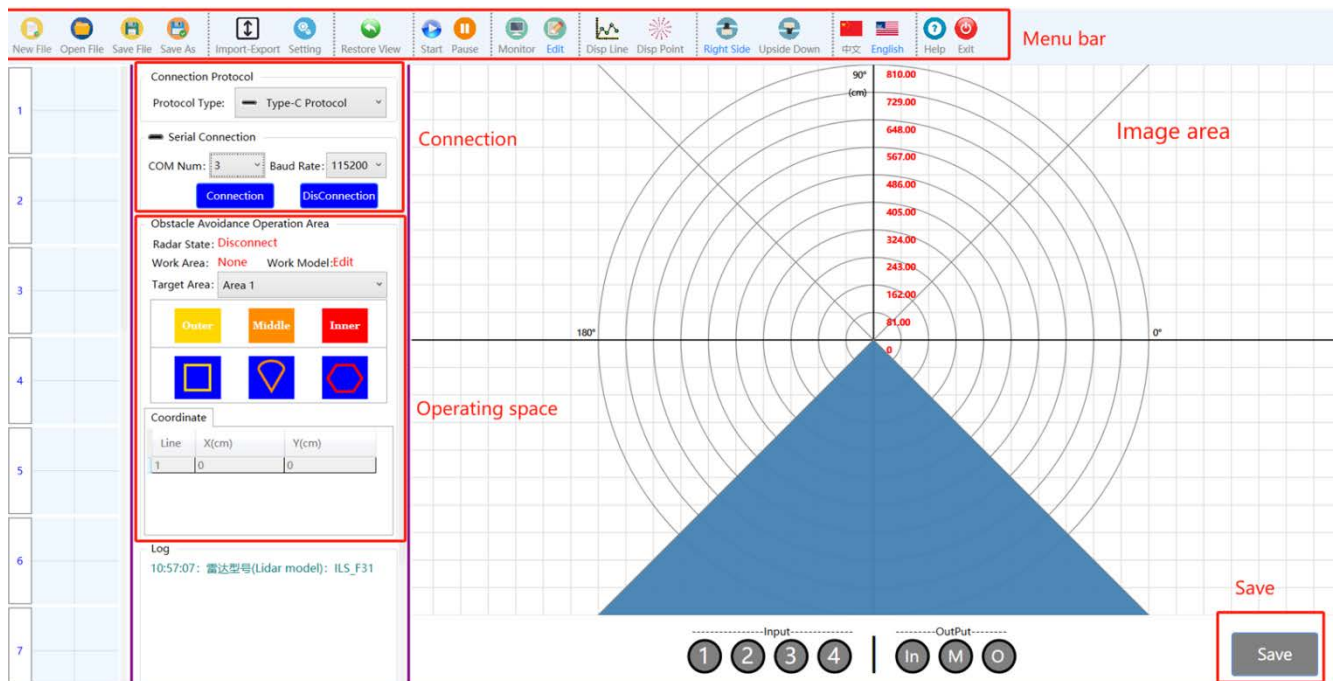
Figure 2.1 Main interface of upper computer software

1. Connection: Select a connection mode based on the actual connection situation

2. Operation area: used for regional drawing graph selection and coordinate display modification.

3. Menu area: Used to switch functions such as view display and parameter configuration.

4. Image area: used to display radar point cloud and current area information, and draw area obstacle avoidance graph. Zoom in and out through the mouse wheel, and drag by holding down the left mouse button.

3. Detailed instructions

3.1.　Device connection

When RS232 or Type-C is used for connection, the software will automatically identify the connected serial cable in the device after startup and display it in the form of serial number. You can directly select the correct serial port number for connection. The baud rate of the serial port must be 115200.
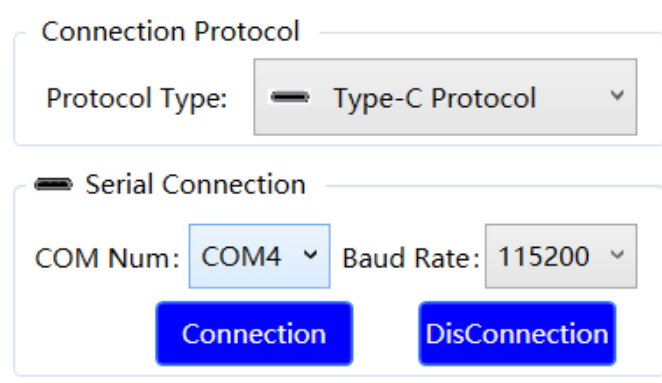
Figure 3.1.1 Serial port connection

After the serial port is successfully connected, the software automatically initializes the serial port. The following information is displayed in the lower left corner of the software. After the initialization is complete, perform other operations.
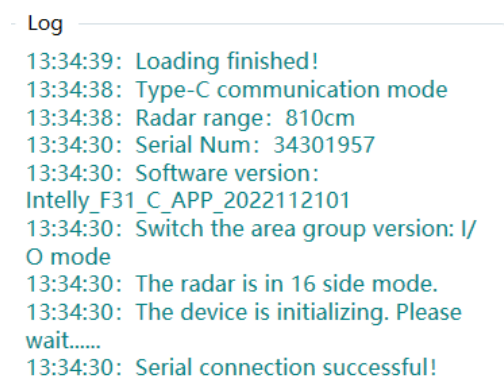
Figure 3.1.2 Successful connection

3.2. Menu area function description

3.2.1 Region import and Export

F31-C provides the one-click configuration function for device profile parameters. You only need to configure the first device in the current environment. You can download the configuration file to the new device for subsequent installation and replacement.

Click the "Region import and export" button to pop up the sub-interface. After completion of the first device configuration, through the "radar configuration in the local" function, equipment has been set of contour parameters can be generate configuration files stored in mobile device, and then through the radar "imported" the configuration file will generate configuration files directly imported into the newly installed equipment, can be directly to work after the restart.

After saving radar configuration to local, a configuration file named ETemp-F30. ini is generated.
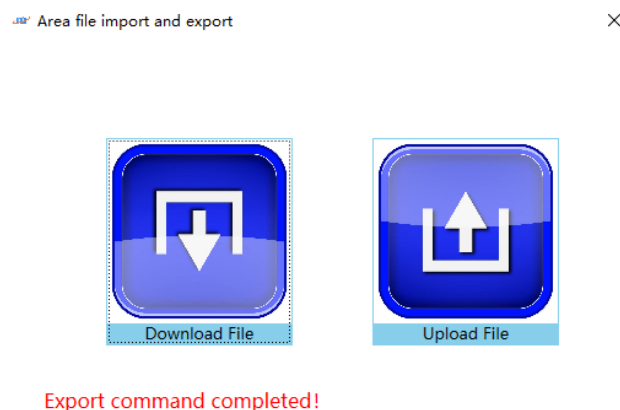
Figure 3.2.1 Region export

The process of "Configuration file import radar" was about good enough to make the 150s. Pay attention not to power off during the process. When the configuration was completed, restart the system after power off as prompted.

Figure 3.2.2 Zone import

3.2.2 Parameter setting

Click the "Parameter Setting" button to pop up the sub-interface.

Parameter Setting   ✕

| Obstacle Avoidance | Other Parameter |

Basic Parameter

Detection Width: [0mm ▼]   [Set]

Recovery Delay: [2000] ms   [Set]

[One-click query]

Data reporting channel

Channel Type: [Type-C Transn ▼] [Query] [Set]

Regional Parameters

○ Whole Region   ○ Single Region

Region Selection: [____ ▼] Level Selection: [____ ▼]

Response Time: [____ ▼]

Sensitivity: [____ ▼]

Detection Widtl [____ ▼]

[Set]   [Query]

Protocol mode switching work area group

Select Work Area: [____ ▼]

[Set]   [Query]

Level type (no trigger)

Err   In   Mid   Out

[Hi]   [Hi]   [Hi]   [Hi ▼]   [Query] [Set]

Port Reset

[Data Port Reset]

Area Enabled Setting

Area Enabled: [Prohibit ▼] [Query] [Set]

Angular Resolution

Resolution: [0.33° ▼] [Set] [Query]

Log

Area 12:	120ms,2level	120ms,2level	120ms,2level
Area 13:	120ms,2level	120ms,2level	120ms,2level
Area 14:	120ms,2level	120ms,2level	120ms,2level
Area 15:	120ms,2level	120ms,2level	120ms,2level
Area 16:	120ms,2level	120ms,2level	120ms,2level

Start query.....
Level type query successful!
Default level state: B1
Start query.....
Area detection enabled query successful!
Start query.....
Query resolution succeeded O(∩_∩)O！！

[Clear]

Figure 3.2.3 Parameter Settings

Parameter Setting   ✕

| Obstacle Avoidance | Other Parameter |

Indicator Light Setting

Outer Layer: [Green ▼]

Middle Layer: [Yellow ▼]   [Query]

Inner Layer: [Red ▼]   [Set]

Scan Range:

Start Angle: [-45]

Query   [Set]

End Angle: [225]

Log

Acquire indicator successfully!
Start query......
Get scan range successful!

[Clear]

Figure 3.2.4 Other parameter configuration

1. **Probe width**

The minimum detection width is disabled by default, that is, the minimum detection width is limited to 0mm. In this state, the minimum object detection width of the device is adaptive, maximizing the capability of   F31-C obstacle detection.

The minimum detection width can be set to 30mm, 40mm, 50mm, 70mm, 150mm and 170mm, 190mm, 210mm, and 250mm in total. When manually setting the minimum detection width to any of the enabled states, the trigger width of obstacles in the protected area will be forcibly limited. Objects below this width will not trigger the protected area alarm.

When any minimum detection width is set to enable, the width of the actual barrier alarm in the shielding protected area is affected by the distance between the object and F31-C radar as well as the reflection surface of the object. The farther the distance is, the greater the minimum detection width that can be recognized.

2. **Recovery time delay**

Detection recovery delay namely barrier after leaving the protection area, the output signal switching for barrier-free state delay time, the purpose is to prevent because of the limitation of planar scanning laser radar, unable to detect three-dimensional stereo space environment of space equipment collision, recovery time delay is added to keep equipment obstacles the trigger zone alarm signal, Before the device starts to move, the obstacle can completely leave the three-dimensional space where the protected area is located.

The detection recovery delay is 2000ms by default and can be adjusted from 0 to 60000ms. When it is set to 0, the output signal will switch to barrier-free state immediately after the obstacle leaves the scanning section of F31-C. It is recommended that users increase delay protection after receiving barrier-free signal.

3. **Data reporting channel**

The device supports 232 serial port transmission and TYPE-C transmission. The data upload channel can be changed here to cope with the need to read data through the 232 serial port after debugging through TYPE-C. Before exiting the upper computer, the data reporting channel settings can be modified here.

4. **Regional parameters**

The area detection response time represents the triggering time of F31-C to objects within the area contour. The first stage time is about 60ms.

The sensitivity of area detection represents the trigger points scanned by the laser on the obstacle. When the laser points scanned on the obstacle is greater than the set value, the radar will output the trigger signal to shield the influence of noise points on the radar in the environment. This parameter and minimum detection width can control the size of test,

both can separate Settings take effect respectively, the difference is that the minimum detection is step width, and the parameter is more flexible and exquisite, when you need to filter specific objects in the area of the scan, can through the waveform view the object's trigger points and corresponding filter, Note Distinguish objects to be filtered from real obstacles in the waveform to prevent misoperation.

For example, you can set the response time to 120ms and the sensitivity to level 3. Then, obstacles need to be detected continuously for 120ms and at least 3 laser points are scanned on obstacles each time, and the radar outputs trigger signals.

5. Protocol switching area group

F31-C obstacle-avoidance radar supports two ways to switch area groups respectively. 1. Enter I/O to switch to an area group. 2. The two radar modes are incompatible. Select the correct radar based on your requirements. By default, radar switches area groups through IO.

When radar switches area groups through IO signals, refer to Section 3.4 (Area Settings) of this chapter for setting. When the radar switches the area group through the upper computer, select the area group to be used and click Set.

6. Level type

To better and more comprehensively adapt the equipment to customer usage scenarios, the radar trigger output level signal can be freely changed according to actual needs, such as converting the PH type to NH level output.

7. Data port reset

When the radar data port is occupied, click this button to forcibly release the radar data port.

8. Regional detection parameters

When setting "enable" at that time, radar obstacle avoidance information can be read through the obstacle avoidance protocol section of "Section 6 Region Selection". When setting "prohibit", stop uploading obstacle avoidance information.

9.   **Angle resolution**

The F31-C radar has a factory default angle resolution of 0.33 ° and supports free switching of four angle resolutions: 0.25 °/0.33 °/0.5 °/1 °.

10.   **Protocol switching area group**

1. Indicator setting

The user can customize the color of the inner and outer three-layer trigger indicator according to their own needs. The default color is red for the inner layer, yellow for the middle layer, and green for the outer layer. It supports seven color indicator configurations including white, green, blue, red, purple, yellow and blue.

2.Scan range setting

The origin on the coordinate axis represents the laser emission point- 45 ° represents the left boundary of the laser scanning range, that is, the negative half axis of X axis. 225 ° represents the right boundary of the laser scanning range, that is, the positive half axis of X axis.

3.2.3 View recovery

One-click to restore to the initial state of the graph; In the monitoring mode (described below), the image area can be scaled and moved. After clicking this function, it can easily return to the initial style. Note that the view restoration will not affect the radar parameters, but the restoration of the display angle of view.

3.2.4 Start display/pause display

After the radar connection is successful, the software is in the display state by default. At this time, the software can intuitively observe the point cloud data and area information. You can manually click pause display. At this time, the software will no longer update the point cloud data and area information in real time. Note that when the display is paused, it will not affect the normal obstacle avoidance use of the radar.

3.2.5 Monitor mode/Edit mode

After the radar connection is successful, the software is in monitoring mode by default.

Monitoring mode: only the observation point cloud and obstacle avoidance result information can be carried out, and the region cannot be drawn and modified.

Edit mode: you can not only observe the point cloud and obstacle avoidance information, but also draw and modify the region shape.

3.2.6 Line display/point cloud display

Two display modes of radar measurement data in the canvas. After the radar is successfully connected, the software is displayed on the line by default.
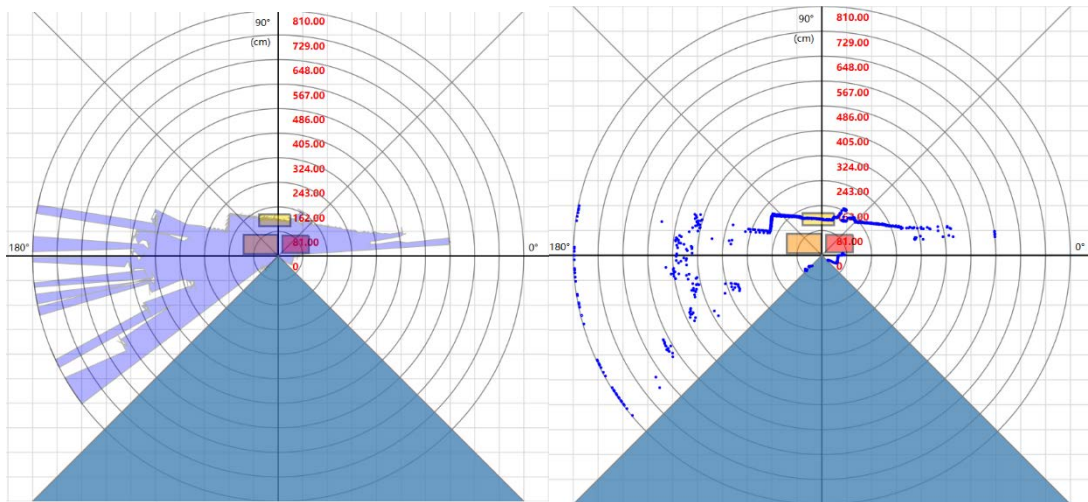
Figure 3.2.5 Line displayFigure 3.2.6 Point cloud display

3.2.7 Formal display/flip display

After the radar is successfully connected, the radar is displayed in normal mode by default. When the radar is inverted, manually click "Inverted display", the point cloud picture will keep matching with the environment.

Figure 3.2.7 Formal/flip display
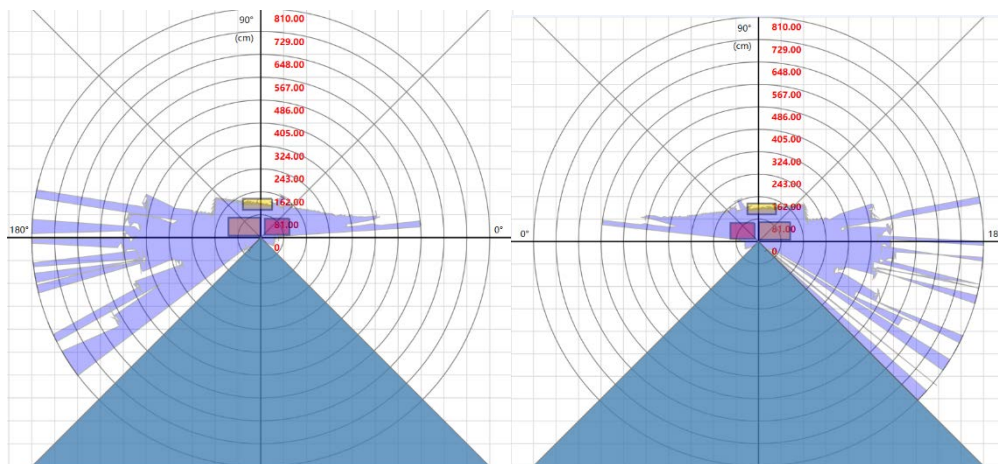
Figure 3.2.8 Formal displayFigure 3.2.9 Flip display

3.2.8 Help

The introduction of each menu is convenient for operators to use.

3.3.   Area Settings and image display

3.3.1 Operating area

Figure 3.3.1 Operation area

1. Radar status: after the radar is connected, the current working status of the radar will be uploaded in real time. If there is any abnormality, the wrong code will be displayed.

2. Working area group: the current radar working area group is displayed by switching the input IO or protocol of the radar.

3. Current mode: select edit mode and Monitor mode in the menu bar and send a message.

4. Target area group: The user can view and edit a selected area group during an operation.

5. Region selection: Each region group contains three regions: outer layer, middle layer, and inner layer. You can select one of these areas to edit.

6. Graphic selection: the current software supports three kinds of graphic drawing: rectangle, sector and polygon. You can choose different shapes according to different areas to draw, to meet diverse needs.

7. Coordinate display: display the detailed coordinate data of each point in the current region, which can be modified and fine-tuned.

8. Log: Displays the current operation information.

9. Scroll bar: The mouse moves to the edge of the scroll bar, you can move up and down. The dividing line on the right can be moved left or right to change the size of the operation area.
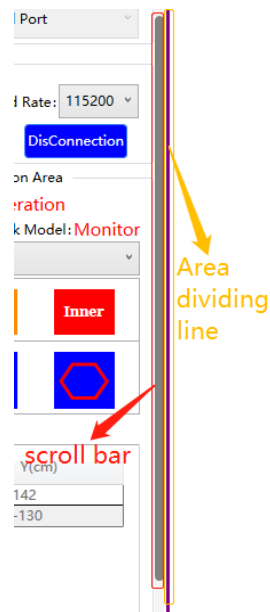
Figure 3.3.2 scroll bar

3.3.2 Image area
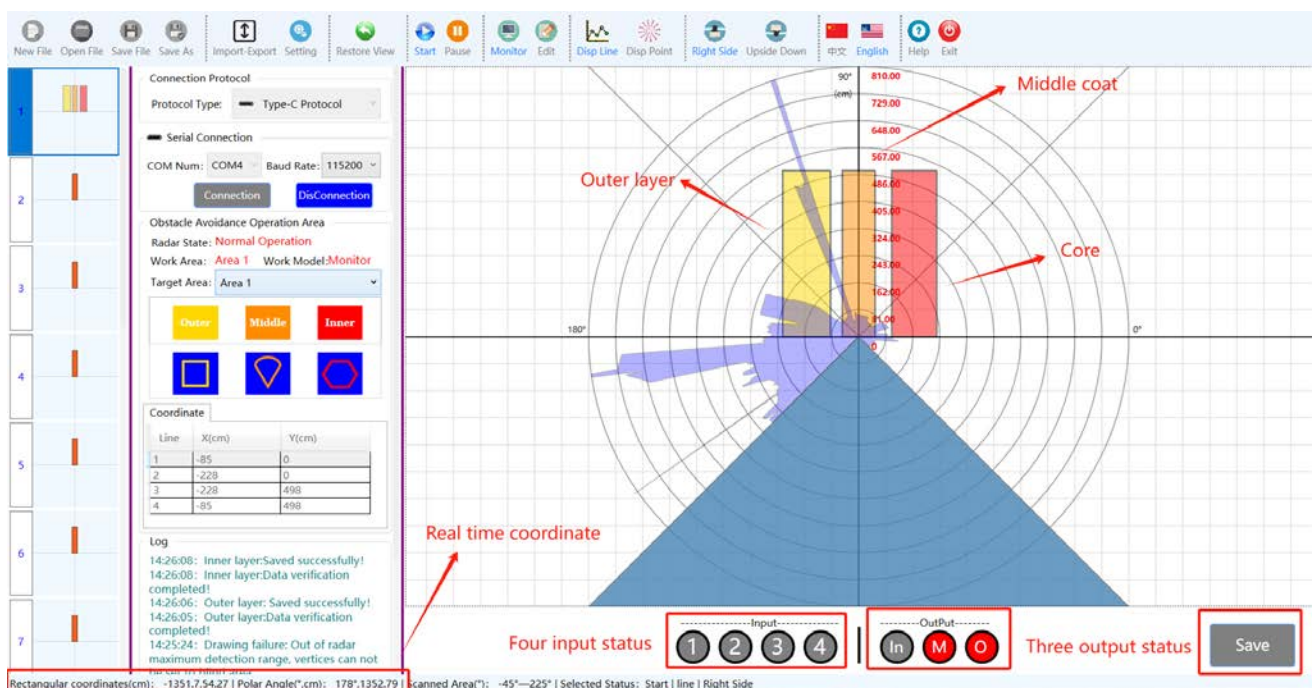
Figure 3.3.3 Image area

3.4.   Regional settings

3.4.1. Area group signal selection

When F31-C by IO switch input signal choose the current working group of the region, switch to the corresponding region group, the corresponding region group can automatically switch to work of starting test outline within the scope of state and the switch quantity lose signal IN1 and IN2, IN3, IN4 control, can switch 16 kinds of region selection signal, selection is shown below.

	IN4	IN3	IN2	IN1
Regional group 1	0	0	0	0
Regional group 2	0	0	0	1
Regional group 3	0	0	1	0
Regional group 4	0	0	1	1
Regional group 5	0	1	0	0
Regional group 6	0	1	0	1
Regional group 7	0	1	1	0
Regional group 8	0	1	1	1
Regional group 9	1	0	0	0
Regional group 10	1	0	0	1
Regional group 11	1	0	1	0
Regional group 12	1	0	1	1
Regional group 13	1	1	0	0
Regional group 14	1	1	0	1
Regional group 15	1	1	1	0
Regional group 16	1	1	1	1

3.4.2. Area contour drawing

Data monitoring and area contour setting can be carried out in the image area at the same time. The current working area group is determined by four inputs. A single area group can detect up to three different areas at the same time. To set

an area group, you need to set the outer area, middle area, and inner area. By default, the initial area is a rectangle 100cm wide and 500cm long.

The software is in Monitoring mode by default. You need to manually switch to Edit mode on the menu bar. The origin "O" on the coordinate axis represents the laser point. -45° represents the left boundary of the laser scanning range. 225° represents the right boundary of the laser scanning range. You can set the region contour in edit mode. When setting a region in a region group, you need to select one of the target region levels, namely "outer layer", "Middle layer", or "Inner layer".
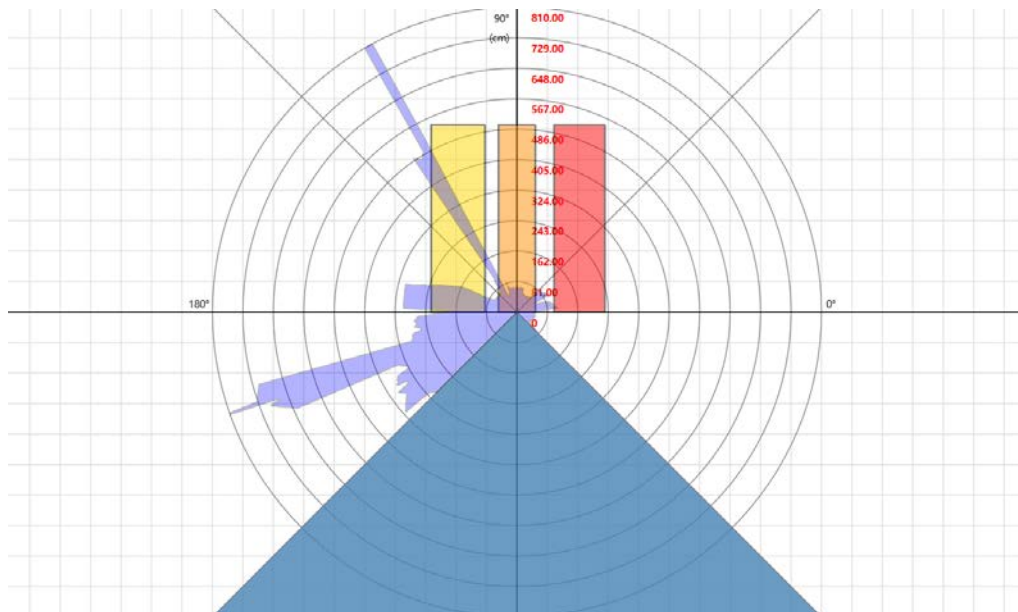
Figure 3.4.1 Image area

①、 **Rectangle drawing**

A. Switch mode to edit mode. If the radar is already in edit mode, you do not need to switch.

B. Select the area group that you want to modify and the area (outer/middle/inner) that you want to modify.

C. Select the image as rectangle. A default rectangle will be generated in the image area.

D. The left coordinate area displays the coordinates of the four vertices of the current rectangle.
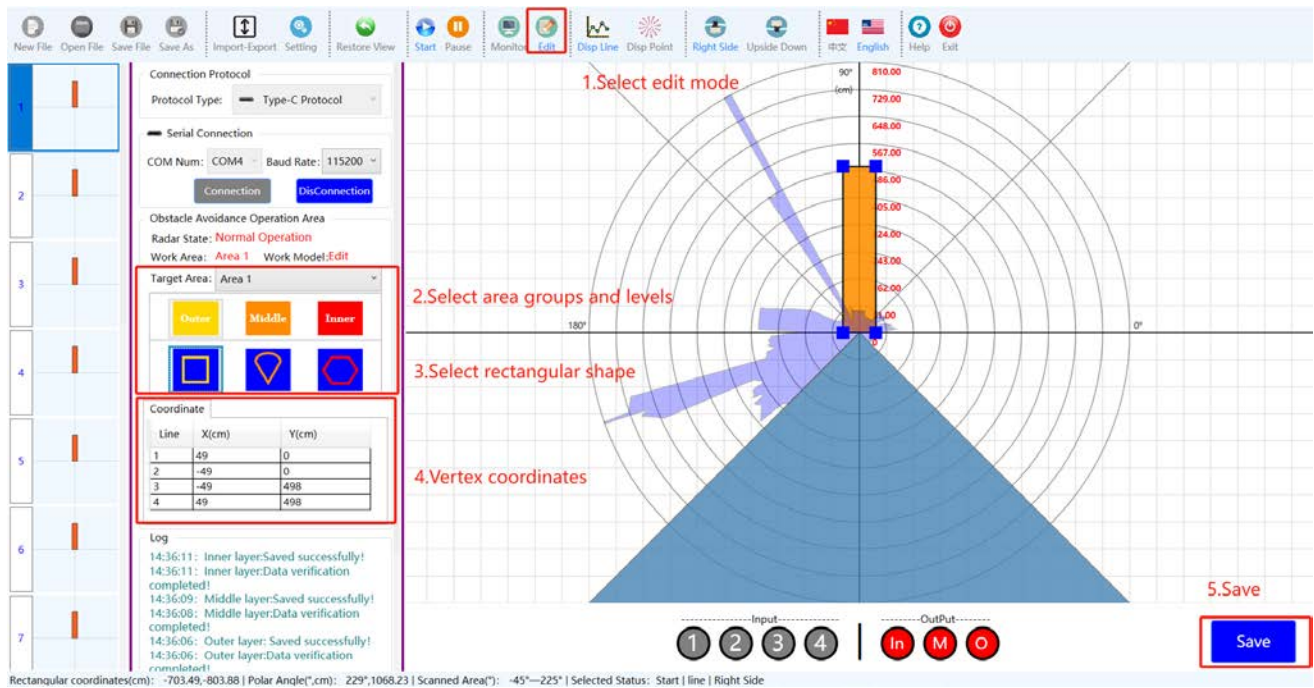
Figure 3.4.2 Rectangle drawing procedure

A. To modify the rectangle, move the mouse pointer to the position of the vertex to be dragged, and the mouse will turn into a cross shape. Click the left button of the mouse, and the vertex will turn orange. The left coordinate displays the current vertex coordinate in real time. You can fine-tune the coordinate manually. After entering the new coordinate, click Enter.
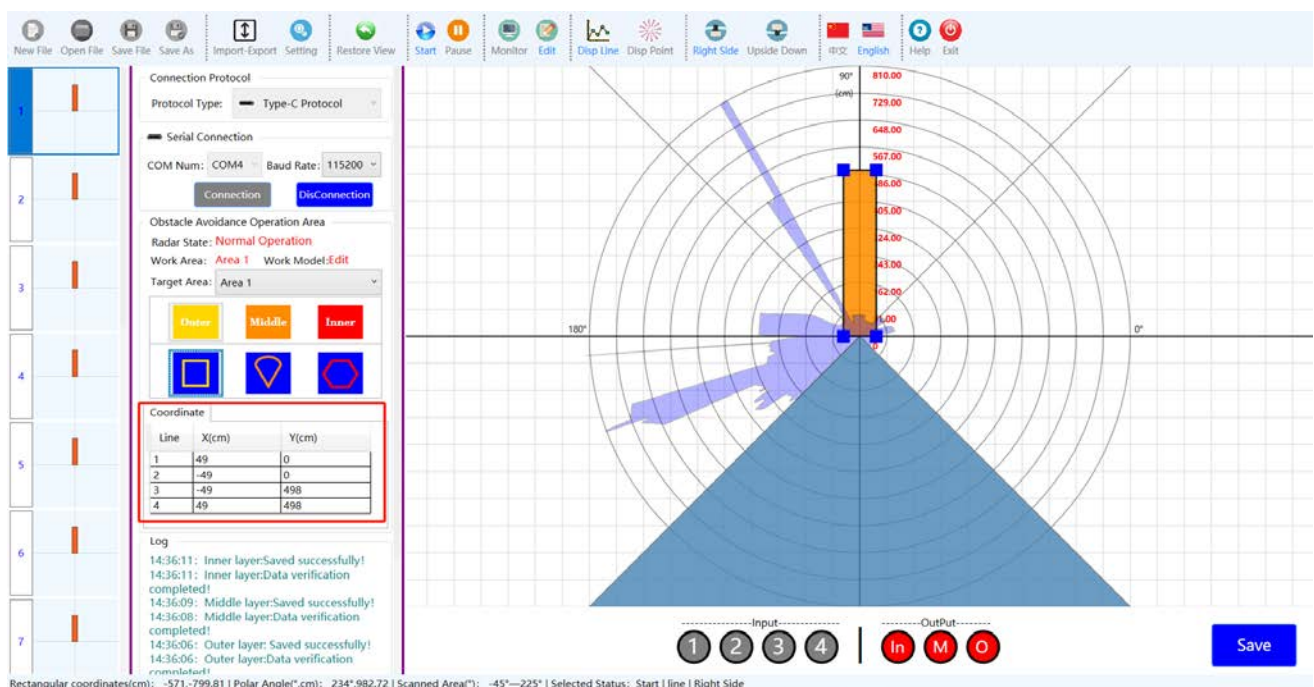
Figure 3.4.3 Rectangle drag

A. After drawing, click the save button, and the window as shown below will pop up after clicking the button. The outer, middle and inner layers can be saved at most simultaneously. Therefore, after all three layers are drawn, click Save.
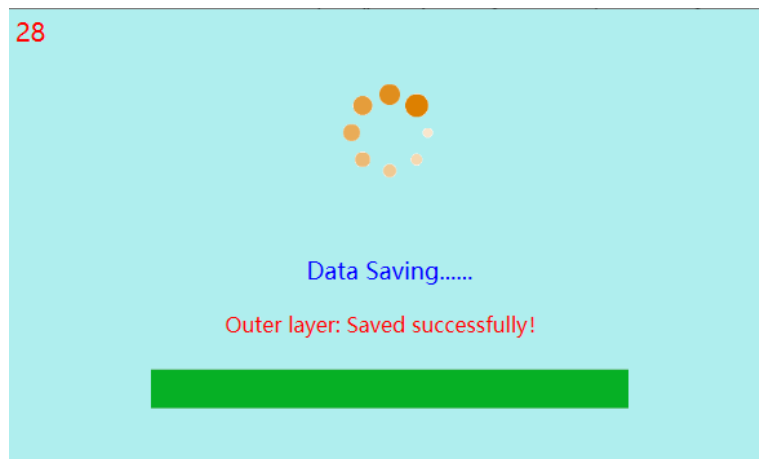
Figure 3.4.4 Rectangle graphic saving

②、**The fan to draw**

A. Switch mode to edit mode. If the radar is already in edit mode, you do not need to switch.

B. Select the area group that you want to modify and the area (outer/middle/inner) that you want to modify.

C. Set the image to sector. A default rectangle will be generated in the image area.

D. The left coordinate area displays the coordinates of the two vertices of the current sector.
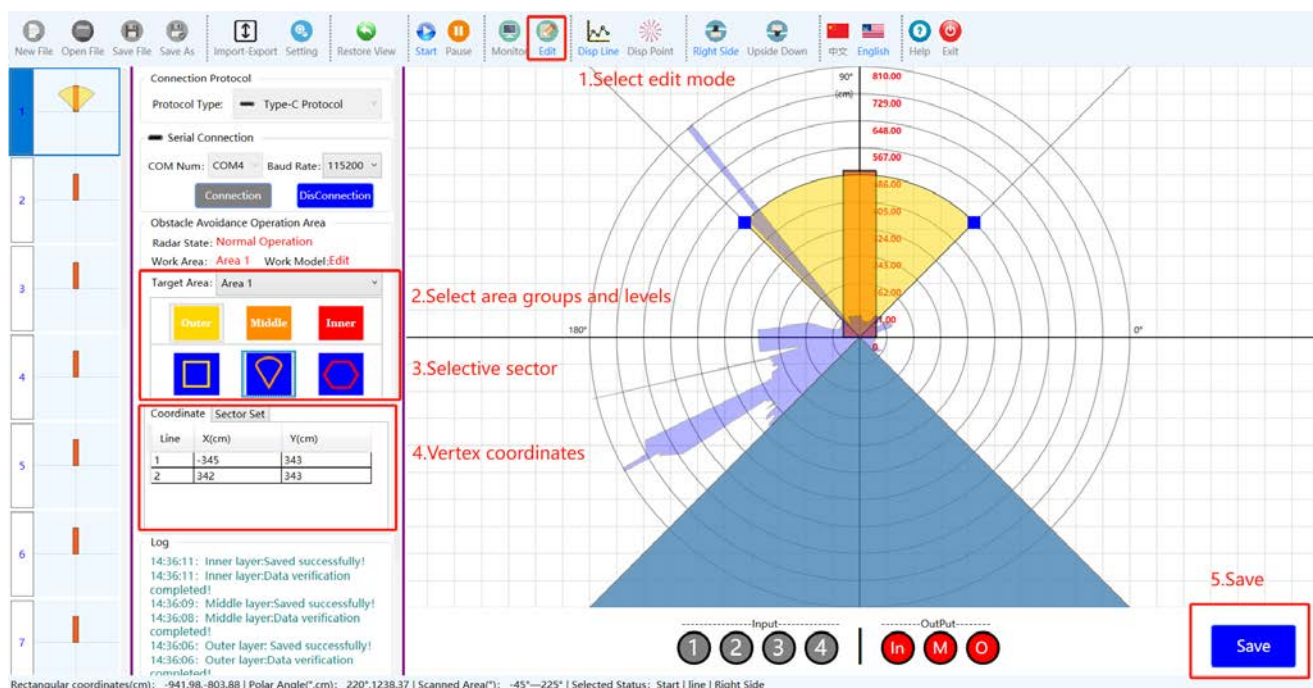
Figure 3.4.5 Steps of sector drawing

A. Fan-shaped modification: move the mouse pointer to the position of the vertex to be dragged, and then the mouse

will turn into a cross shape. Click the left mouse button, and the vertex will turn orange. At this point, the left

coordinate displays the current vertex coordinate in real time. You can fine-tune the coordinate manually. After

entering the new coordinate, click Enter.
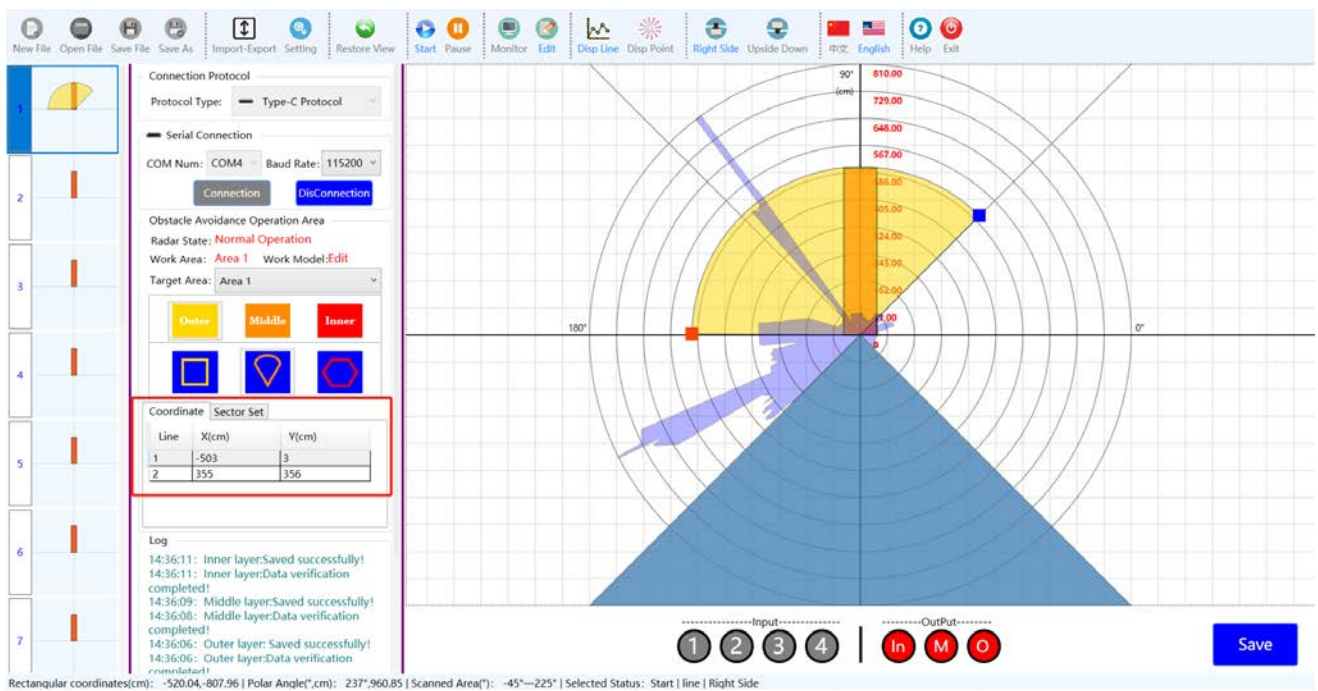
Figure 3.4.6 Fan-shaped drag

A. Click Save to save the modification.

③、Polygon drawing

A. Switch mode to edit mode. If the radar is already in edit mode, you do not need to switch.

B. Select the area group that you want to modify and the area (outer/middle/inner) that you want to modify.

C. Select the image as polygon. A default polygon will be generated in the image area.

D. The left coordinate area displays the vertex coordinates of the current polygon.
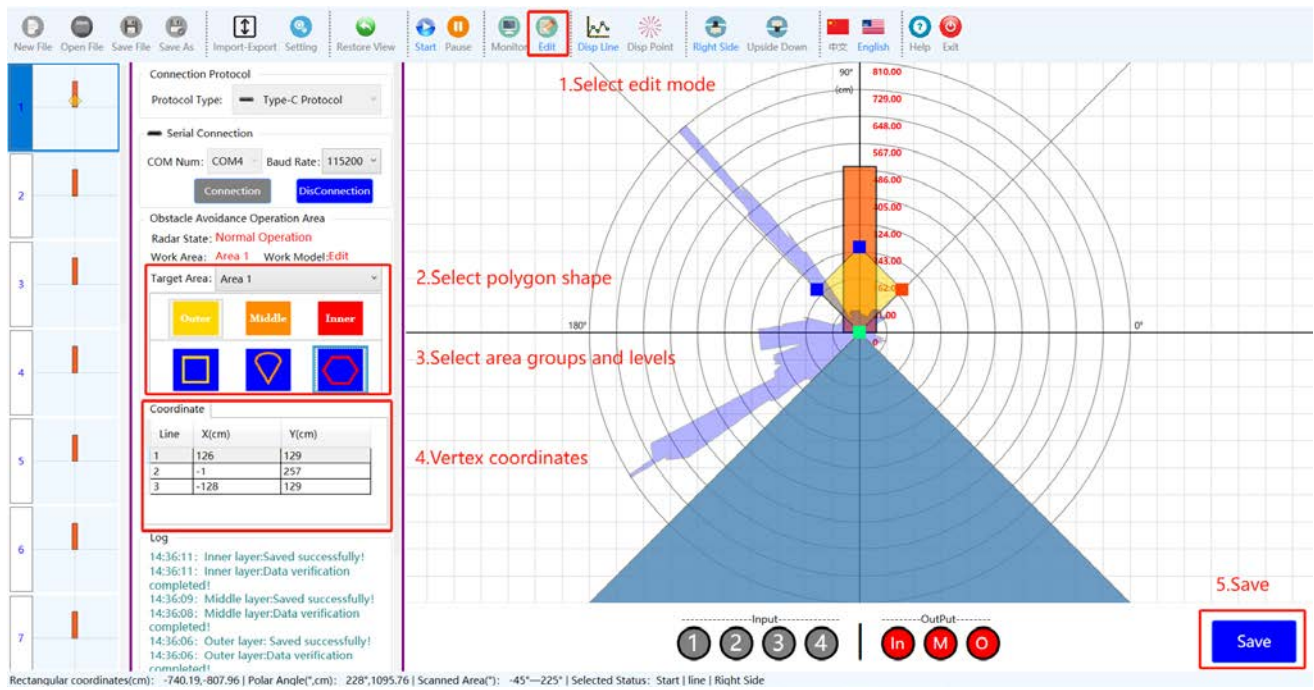
Figure 3.4.7 Steps of polygon drawing

E. Polygon drag, move the mouse pointer to the position of the vertex to be dragged, then the mouse will turn into a cross shape, click the left button of the mouse, then the vertex will turn orange, drag, reach the target position, raise the left button of the mouse.

F. Add a vertex, place the mouse pointer at the origin O, and then the mouse will turn into a cross shape. Click the left button of the mouse to drag it and release the left button when it reaches the appropriate position.
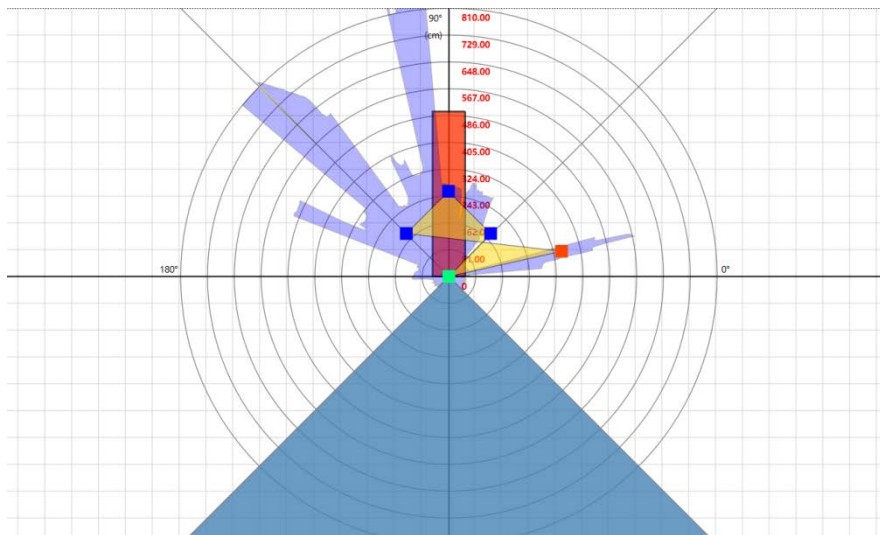
Figure 3.4.8 Polygon dragging process
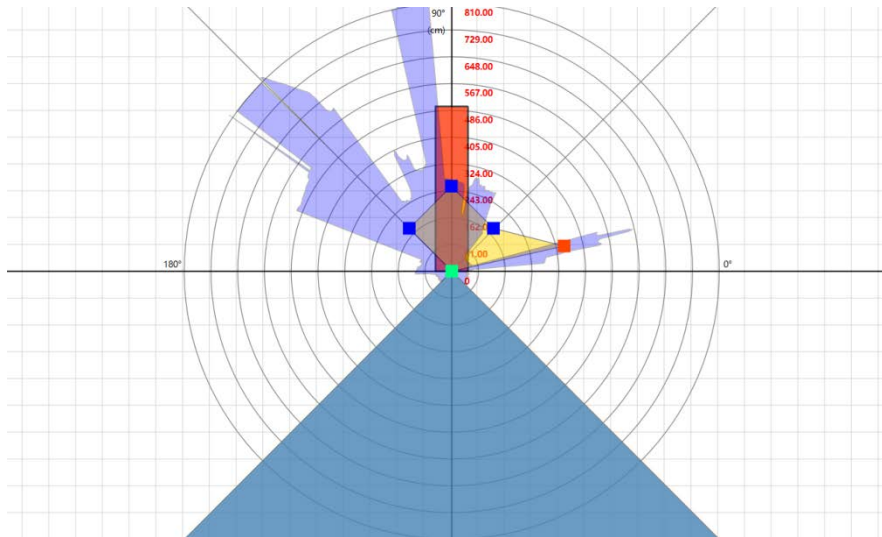
Figure 3.4.9 Polygon drag completed

A. Delete a vertex. Click on the vertex to be deleted, and then the vertex will turn orange. Click Delete to Delete it.
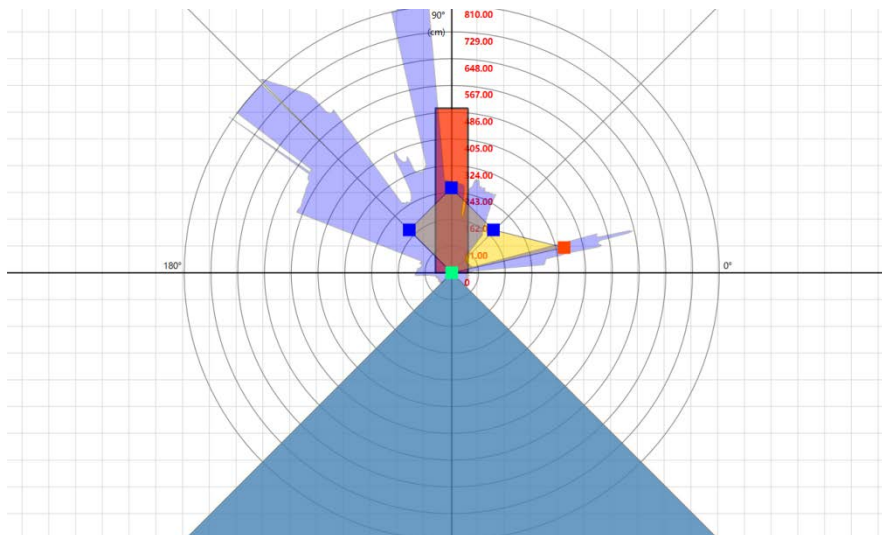
Figure 3.4.10 Removing vertices from polygons

④、**Region Group Graph Copy**

a. The switching mode is edit mode. If the radar is already in edit mode, it is unnecessary to switch

b. Select the area group to copy and right-click to copy to the area group to paste

c. Click Save in the image area after pasting
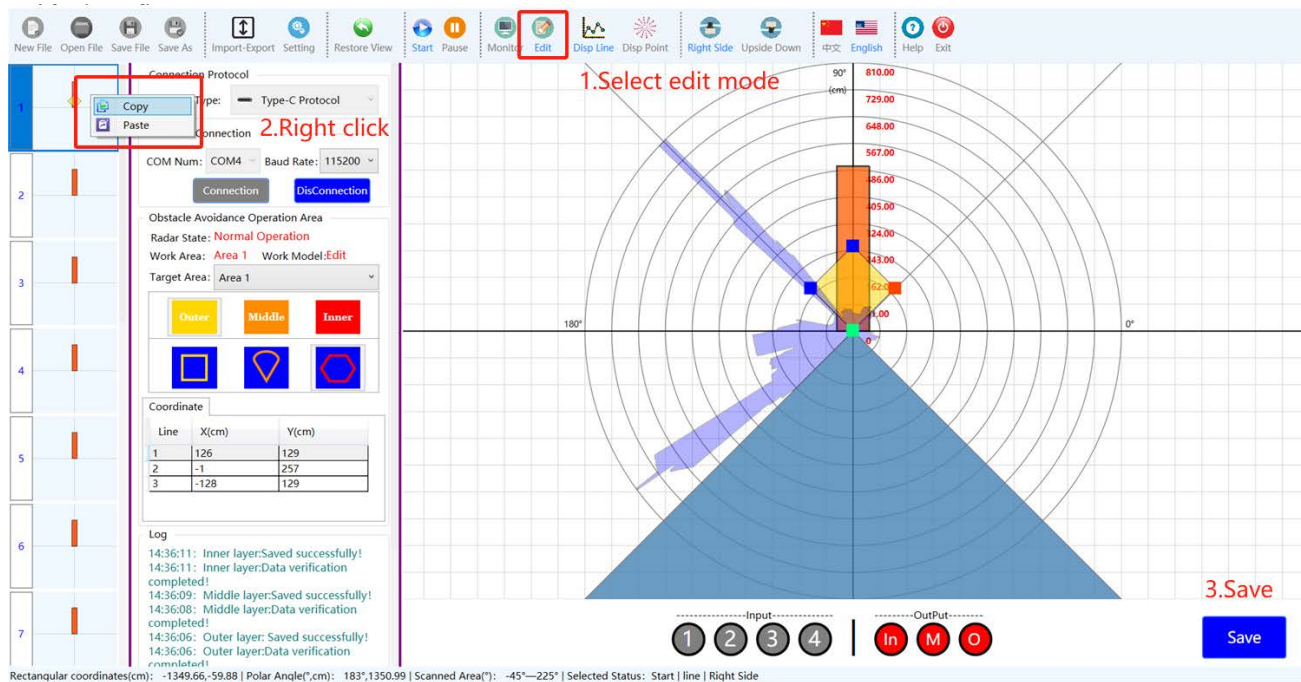
Figure 3.4.11 Region Copy
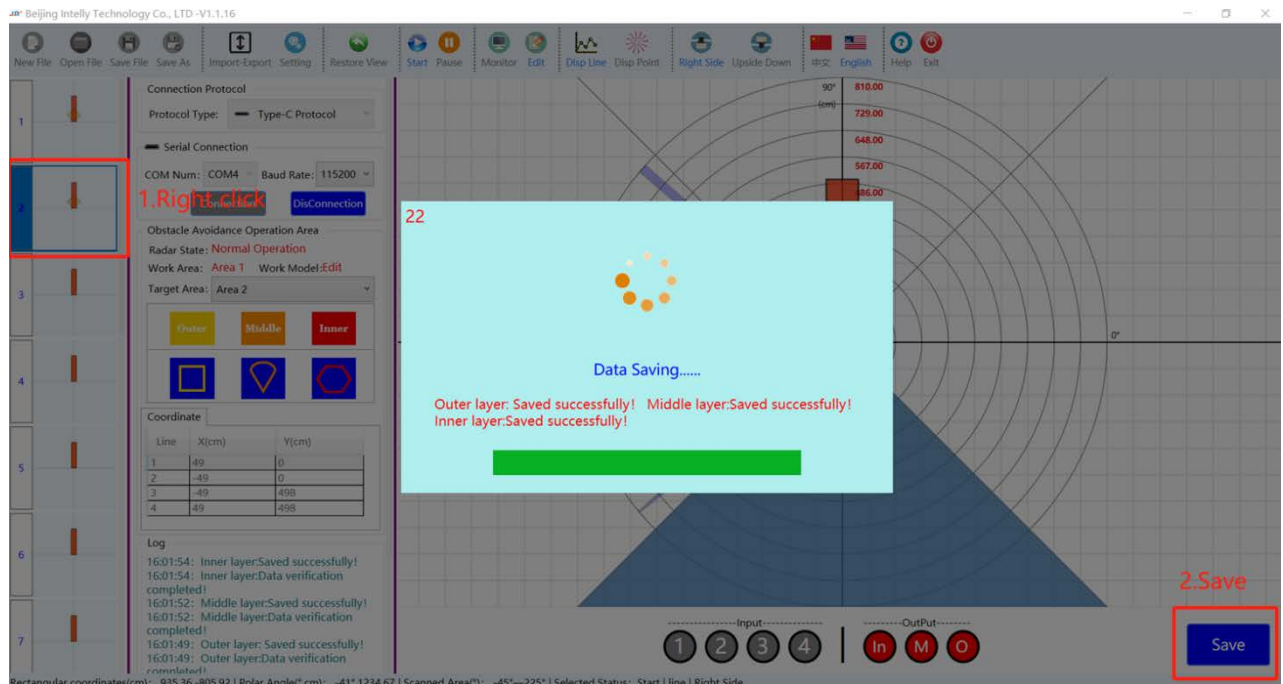
Figure 3.4.12 Region Paste

⑤、**Offline Profile**

a. In the software operation interface, you can select to create a new file or open the configuration file exported from the previous radar. You can customize the saving path and file name for new files **(the following operation takes the new file as an example**)
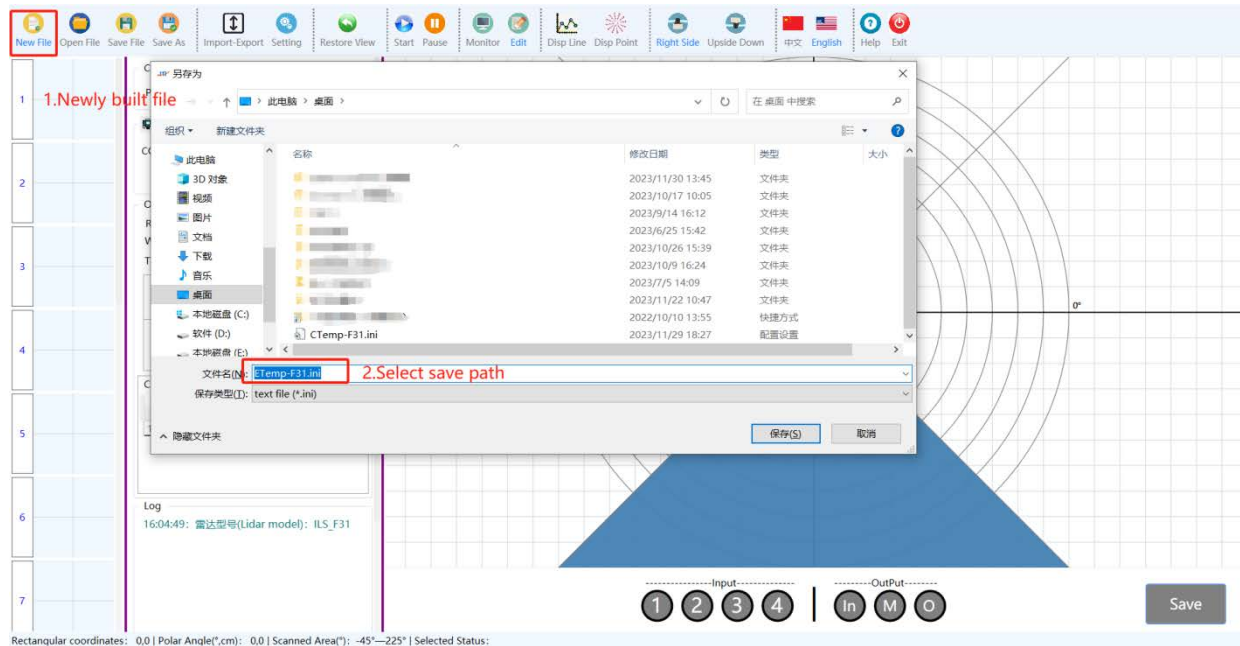
Figure 3.4.13 New File

b.Modify obstacle avoidance area and obstacle avoidance parameters in parameter settings according to your actual needs, and click Save File after setting.
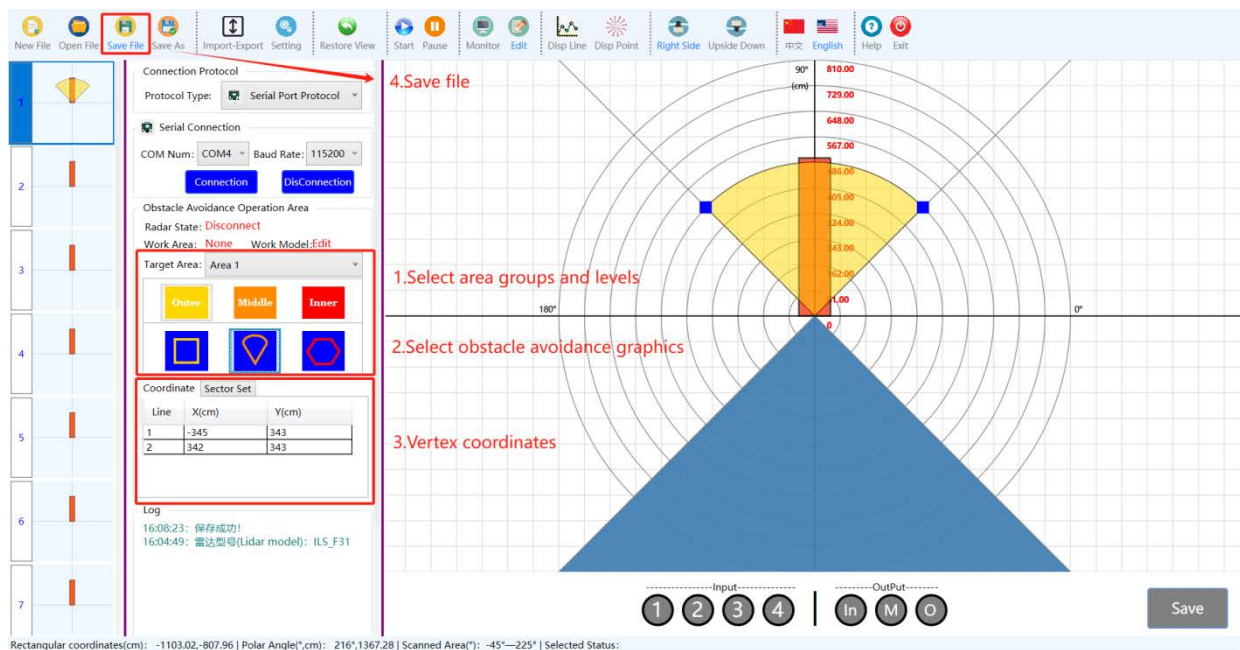
Figure 3.4.14 New File

c.Click the parameter configuration to configure the minimum detection width, recovery delay, area group, response time of internal and external obstacle avoidance areas and sensitivity registration according to the site environment. For detailed parameter meanings, refer to Section 3.2.2 Parameter Settings in Chapter 7.

d.After saving, the configuration file can be imported into the radar according to the process in Section 3.2.1 of Chapter VII

Figure 3.4.15 Other parameter settings

3.5.System status and detection results

The laser device completes the initialization and enters the detection state about 15s after power-on. According to the parameters set by the user, continuously detect the presence of objects in the target area. After the device is powered on and started, upload laser cloud point data, area detection results, and system working status automatically.

The contents of data monitoring interface include current radar status display, input and output status display, current working area group display, laser cloud point display mode, mouse position information and contour display area group.

The current radar status shows whether the radar works normally. If the abnormal code "Exx (xx value any number)" is displayed, please contact our staff for analysis and judgment. Working area Indicates the area group information that is currently in use.

Input and output status display includes four inputs and three outputs. Four-way input Select the current working area group. Three-way output corresponds to the detection status of different levels of each area group. If the current area is triggered, the corresponding status indicator is red; if the current area is not triggered, the corresponding status indicator is gray.

Mouse position information display content including "coordinates" and "Angle position", which coordinates is will scan Angle and position in the coordinate system after scanning distance transformation, Angle position is directly display the current mouse corresponding Angle and distance in radar scanning range, in addition to the Angle, position information of the units are in cm.
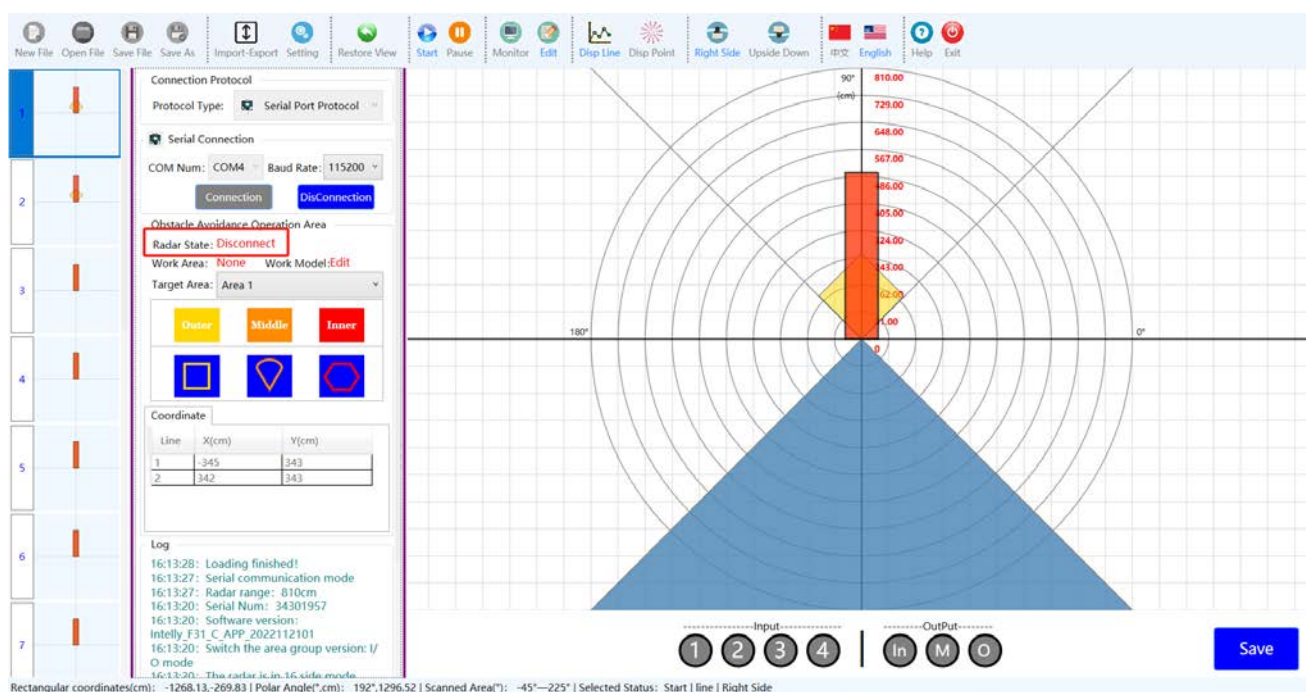

Figure 3.5.1 Data monitoring display information

Multiple operation log records are displayed in the log area, and you can also clear logs. Right click the logging area to clear the log
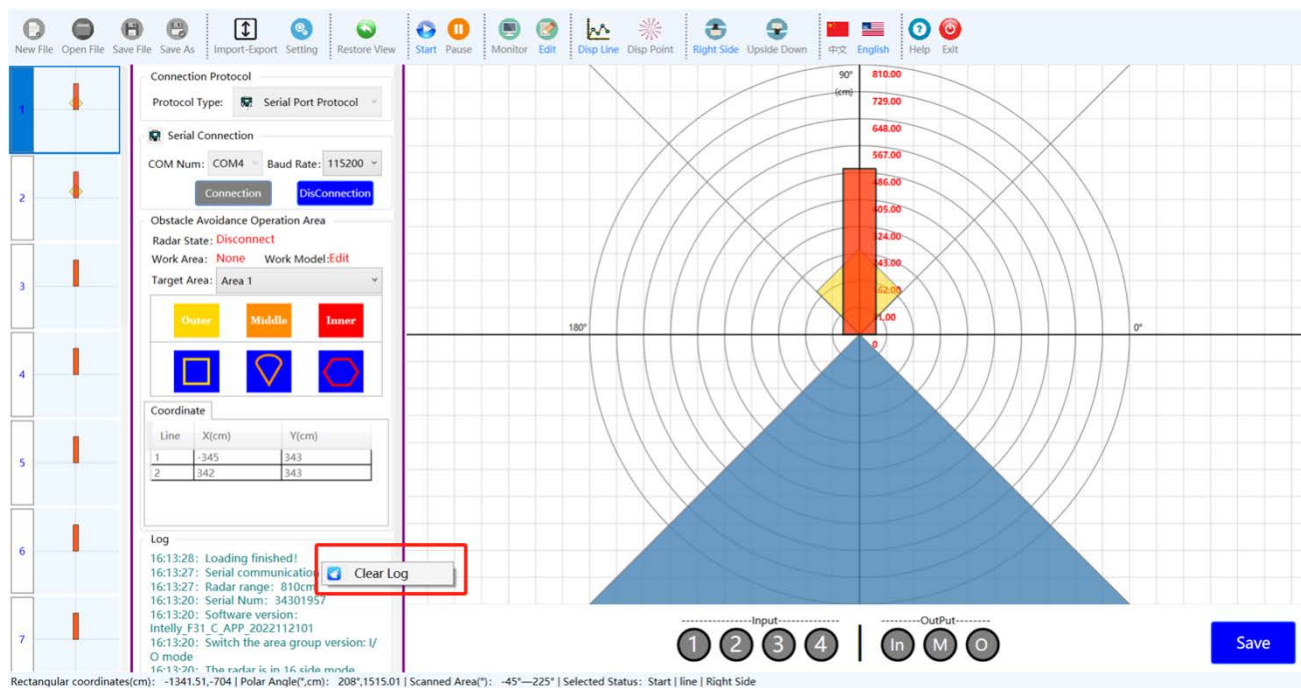

Figure 3.5.2 Log information clearing

H.   Using the operating

Before starting the device, ensure that the power cord is connected to the switching power supply. Ensure that the device window is clean.

Power on the switching power supply, the device can start and work normally. Disconnect the switching power supply and the device can be shut down.

Multi-color radar default color: outermost - green middle layer - yellow innermost - red

| Equipment state		Power indicator (red)	Running indicator light (green or other)
barrier-free		🔴Constant light	🟢Constant light
Have obstacles	Outermost layer	🔴Constant light	**Multicolor version**
			🟢200ms twinkle
	Middle layer		🟡200ms twinkle
	Innermost layer		🔴200ms twinkle

I.   Assembly requirements

1. Matters needing attention

- Note the following when installing the GDS-F31-C secure laser sensor:

- Pay attention to the up-down Angle and left-right Angle after the sensor is installed, which causes the device to fail to work properly. When the equipment running at 100 cm narrow environment, even if the detection area is set to radar as the center, around the area of 40 cm, if about sensor installation Angle deviation is too big, may be detected in the process of running around metope and alarm, if the sensor installation elevation deviation is too large, up and down during operation may be detected by the ground or other objects above cause alarm.

- Ensure that the installation environment is dry and free from smoke or other air impurities to avoid contamination or affect the normal operation of the device. When the impurities in the air are too large and the smoke and steam are too strong, the equipment cannot work normally.

- Anyway, be careful not to point frequency-viewing lights, fluorescent lights or other strong light sources directly at the scanning plane, as they interfere with the sensor's working in certain situations.

- At the same time, pay attention to maintaining a sufficient minimum distance. The protection function can be implemented through GDS F31-C only when a sufficient minimum distance is formed between PGDS-F31-C and the dangerous area. The minimum distance depends on the proximity speed of the body or body part, the running speed of the machine or equipment, the sensitivity of the protection of the GDS-F31-C security area, the height of the scanning plane and the possible switching time between monitoring area groups.

- Unconsciously check the switching time between monitoring area groups. Taking into account the input delay and the possibility that a person may be in the protected area at the time of the switch, the protection mechanism must be effectively switched in a timely manner (before there is a risk to that person).

2. Installation

- When two or more sensors are installed in front of each other, you are advised to tilt at least 1.5° to prevent interference.

  -
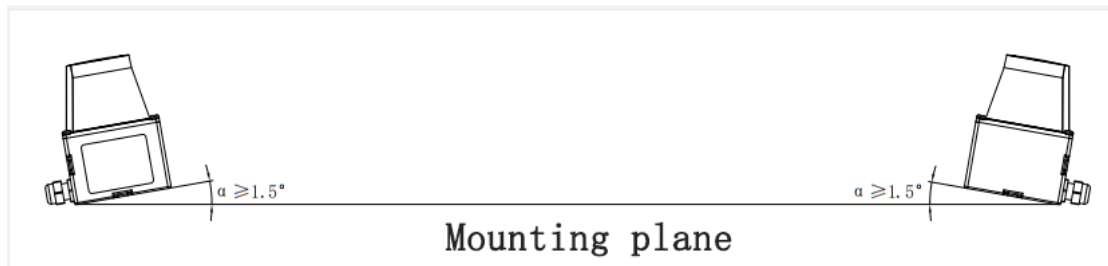
- When two or more sensors are installed on the same plane in the same direction, you are advised to tilt the sensor at a 1.5° Angle to prevent interference.
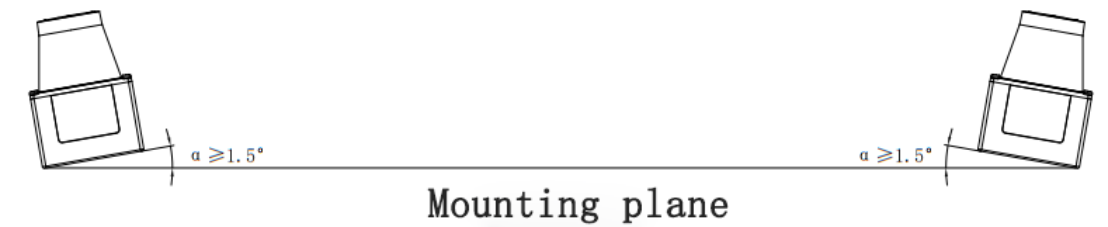
- According to the conical scattering emission of the sensor, the installation height of the laser obstacle sensor is recommended to be at least 200mm above the ground.

- If the installation height is less than 200mm, the installation Angle is 1.5°.
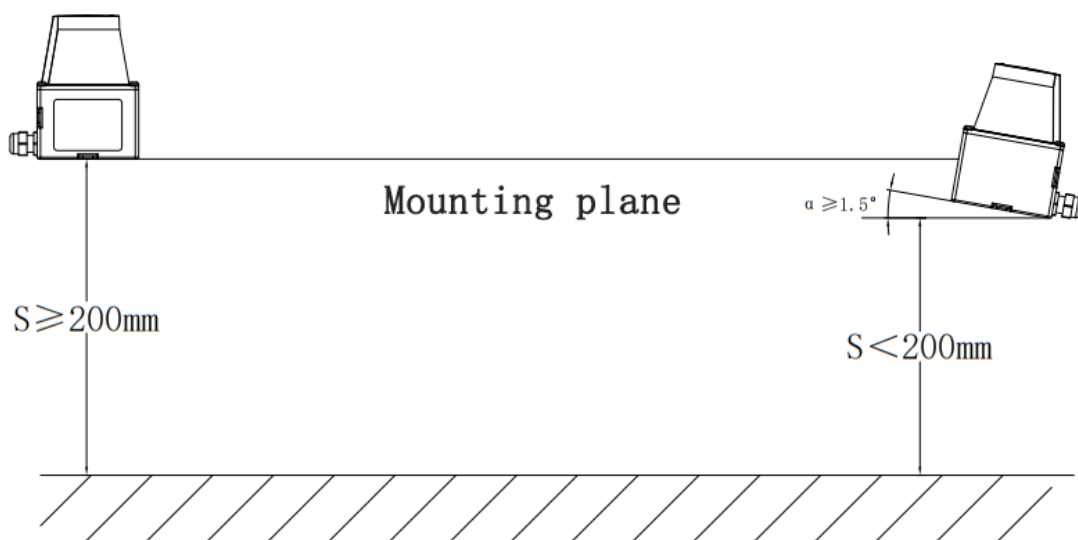
J.   User instructions

When using the laser device, strictly follow the technical specifications. If the laser device is used beyond the specified range, the device cannot work properly. The user must be responsible for the device damage caused by the device environment that does not conform to the technical specifications.

Any use of the machine for any other purpose and any change to the machine, even within the scope of assembly and installation, will result in the loss of any warranty rights to the laser equipment. Please ensure the correct use of the laser equipment and the use and installation of protective devices in special application scenarios.

CORON

CORON ELECTRONICS (WUHAN) CO.,LTD

Http：www.twcoron.com   E-mail：coron@twcoron.com

Service Hotline：400-826-8555   Tel：027-82821687   82848306   Fax：027-82843751