



WLR-716-Mini

Mini SLAM Navigation LiDAR

Product manual



Version Informaion: V2.1

VanJee LiDAR Wechat

Precautions

Please read the following safety precautions carefully to avoid damage to this product or other products connected to this product.

- **Power cord:** Only use the power cord approved by your country;
- **Check the product rating:** In order to avoid the impact of excessive current, please check the rating and marking instructions marked on the product, please refer to the manual for detailed information on the rating before connecting the product;
- **Overvoltage protection:** ensure that there is no excessive voltage connected to the product;
- **Grounding:** Ground the grounding wire of the power cable of this product. To avoid electric shock, before connecting any input or output terminal of this product, please ensure that the grounding end of the power cable of this product is reliably connected to the protective grounding terminal;
- **Anti-static protection:** Static electricity may cause damage to the instrument, and it should be carried out in an anti-static area or under the premise of good grounding as much as possible;
- **Optical cover protection:** It is strictly forbidden to use hard objects to scratch the optical cover, otherwise it may cause irreversible damage to the radar; in order to avoid dust affecting the ranging performance, please keep the optical surface of the product clean;
- **environment:** In order to ensure the normal operation of the radar, it is strictly forbidden to use or store the instrument in a flammable, explosive and corrosive environment;
- **Eye safety:** There is continuous infrared laser emission when the device is running. To ensure safety, please do not look directly at the light-emitting surface for a long time.
- **Product failure:** If you suspect that this product is malfunctioning, please contact the relevant personnel of Wanji Technology for testing. Any maintenance, adjustment or replacement of parts must be performed by Wanji; it is strictly forbidden to disassemble the instrument and open the cover without authorization;
- **Power-on reminder:** During use, the power-on time interval should exceed 10 seconds.

content

1. WLR-716-Mini Product Description	- 1 -
1.1 EQUIPMENT OVERVIEW	- 1 -
1.2 RADAR SCANNING RANGE AND NUMBER OF SHOTS	- 2 -
1.3 TECHNICAL SPECIFICATION SHEET	- 3 -
1.4 PREPARATION BEFORE USE	- 4 -
1.5 NOTES	- 4 -
2. The overall function of WLR-716-Mini host computer	- 5 -
2.1 NETWORK CONNECTION	- 5 -
2.2 VIEWING OF WAVEFORMS	- 8 -
2.3 FUNCTION PARAMETERS	- 10 -
2.3.1 Working Mode	- 10 -
2.3.2 Reboot/Restore	- 10 -
2.4 NETWORK PARAMETERS	- 10 -
2.4.1 Network parameter setting	- 10 -
2.4.2 UDP parameters	- 11 -
2.5 BASIC PARAMETERS	- 12 -
2.5.1 Display parameters	- 12 -
2.5.2 Application parameters	- 12 -
2.5.3 Filter setting	- 13 -
2.5.4 Detection parameters	- 13 -
2.6 MOTOR SPEED	- 14 -
3. The overall introduction of the IO part of the WLR-716-Mini host computer	- 15 -
3.1 IO INTERFACE DEFINITION	- 15 -
3.2 INPUT / OUTPUT LEVEL	- 15 -
3.3 IO ACTIVE LEVEL SWITCHING	- 17 -
3.4 FUNCTION INTRODUCTION OF REGIONAL OPERATION AREA	- 18 -
3.5 FUNCTION INTRODUCTION OF EVENT TABLE INFORMATION BAR	- 20 -
3.6 REGIONAL INFORMATION	- 21 -
3.6.1 Area information in configuration mode	- 21 -
3.6.2 Area information in query mode	- 22 -
4. Download and update WLR-716-Mini host computer program	- 23 -
4.1 MAIN PROGRAM UPDATE	- 23 -
4.2 ALGORITHM UPDATE	- 25 -
5. WLR-716-Mini ROS Driver Instructions-	- 26 -
5.1 CREATE WORKSPACE	- 26 -
5.2 MODIFY DEVICE PARAMETERS	- 26 -
5.3 RUNNING THE DRIVE	- 27 -
6. After- sales service	- 29 -

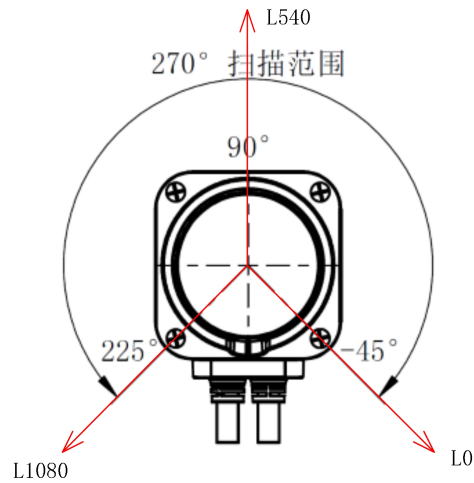
1. WLR-716-Mini product description

WLR-716- Mini is a measurement-type mini lidar independently developed by Wuhan VanJee Optoelectronics Technology Co., Ltd. The lidar adopts the TOF principle of laser, combined with high-frequency laser pulse generation technology, sophisticated optical scanning system and exquisite structural design, so that it can quickly and accurately scan within the range of 270 °/10 meters (@10% reflectivity). Ranging, its high stability and strong anti-interference ability to ambient light combined with its small size make it very suitable for navigation and obstacle avoidance of mobile robot chassis, unmanned forklifts and other types of industrial vehicles/robots. It is also suitable for logistics/security and other fields.

1.1 Equipment overview

- Mini model, saving assembly space;
- point cloud , suitable for complex environment navigation;
- Ultra-small light spot, the dispersion angle can be reduced to 10 milliradians, and the distance measurement is more accurate;
- Ultra-low horizontal angle, the horizontal angle is controlled at ≤ 0.5 degrees, and is not afraid of low installation positions;
- Flexible IO protection function, customize and adjust the protection area;
- Modular design + automated production to ensure mass production supply capacity;
- IP66 protection grade, can also operate stably outdoors;
- -25°C~50°C wide temperature range, can meet the use of harsh environment;
- Adopt class 1 laser to ensure eye safety;
- Support multiple installation methods;

1.2 Radar scanning range and number of shots



WLR-716-Mini lidar

W LR-716-Mini can provide point cloud data in the range of 270° , the position of 90° is directly in front of the sensor, and the direction of the single-turn scanning measurement sequence is counterclockwise . W LR-716-Mini has a blind zone of 90° , located in the interval of $225^\circ \sim 315^\circ$.

Since the WLR-716-Mini radar can be set up with two data transmission methods of " forward installation and reverse installation " , the corresponding single-turn scanning measurement sequence and the sequence relationship of data transmission are shown in the figure below, where L 0 represents the scanning of the initial angle ($\theta^\circ = 0^\circ$) Measurement distance, L 540 represents the scanning measurement distance of the 540th angular resolution ($\theta_{540} = 540/4 = 135^\circ$) , L 1080 represents the scanning measurement distance of the end angle ($= 270 \theta_{1080}^\circ$) , here only the above 3 angles are used. information to illustrate the order relationship, other scan measurement distance values between L 0 to L 1080 are not listed here.

The scanning sequence of the radar is fixed as follows: scan in a counterclockwise direction according to the resolution .

When the parameter configuration is " formal installation " , the data sending sequence is: L 0 L540 L1080 .

When the parameter configuration is " flip " , the data sending sequence is: L 1080 L540 L0 .

1.3 Technical Specification Sheet

Basic parameters	Product number	W LR-716- Mini
	Scanning principle	TOF
	Line count	single line
	size	Length 50mm , width 55 mm , height 72.5 mm
	Laser wavelength	9 05nm , (Class 1 eye safety)
	net weight	0.3 kg _
	Power consumption	4W
	Operating Voltage	9-28V DC
	Operating temperature	- 25 °C~ 50 °C
	storage temperature	- 30 °C~ 70 °C
Performance parameters	scanning frequency	15Hz / 25Hz _
	Detection distance	10m@10%/25m(@90%
	The scope of work	0.5-25 m _
	Ranging accuracy	±20 mm (typ.)
	out points	16200/27000 points/sec
	Horizontal field of view	270°
	Horizontal angle resolution	0.25°
	Response time	< 67ms
	Switch input	4 way, PNP and NPN compatible
	Switch output	3 R o a d PNP or 3 R o a d NPN
Relevant certification/ Interface Protocol	Protection class	IP66
	Communication Interface	Network port, IO signal line

1.4 Preparation before use

Before using the radar host computer/driver, please complete the corresponding operations according to the following contents

1) Before using the radar, ensure that the radar packaging box is well sealed and the radar label is clearly visible.

2) After unpacking the box, please confirm the integrity of the product and judge from the following two points:

A: Observe whether the radar filter cover is worn or not. Each radar is shipped with a protective film to ensure that the radar filter cover is not damaged during transportation.

Therefore, before use, make sure that the radar protective film is in good condition and then tear off the protective film. **(Note: Direct use without tearing off the protective film will affect the radar point cloud !)**

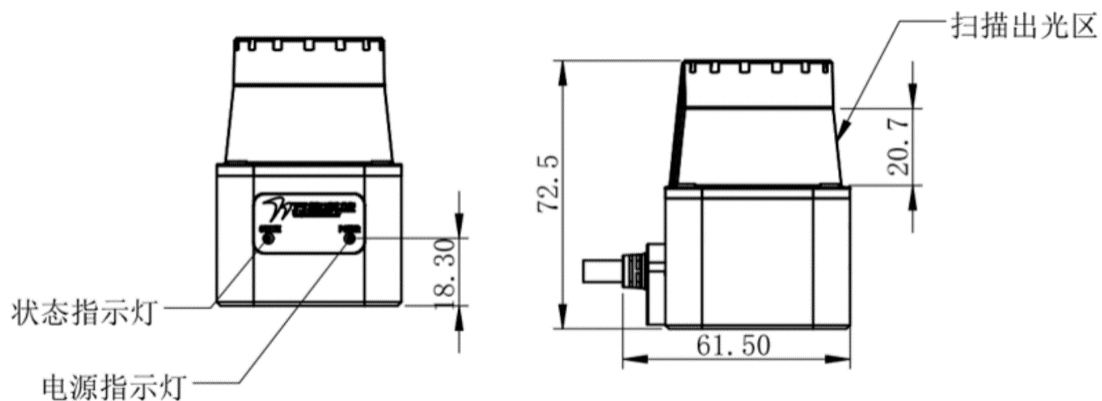
B: Observe whether the radar shell, cables and other components are damaged. The standard cable length of WLR-716-Mini is 1.5 m. Before use, make sure that the cables are in good condition without scratches, the radar terminal block is firmly fixed without loosening, and the radar shell has no Wear scratches.

3) After the above steps are confirmed, the power-on detection can be started. It is recommended to use a 9-28 V DC switching power supply/regulated power supply for power supply. After about 1S, the radar motor can be heard rotating.

After the above operations are completed, you can connect to the radar application software through the network

1.5 Notes

Dust with a soft brush (such as a paint brush), oily water-based cleaning agent (such as detergent mixed with water), gently wipe with a soft cloth, and organic solvent-based cleaning agents such as alcohol, acetone, etc. are strictly prohibited. Height of laser emitting surface : 47 mm from the bottom of the bottom case ;



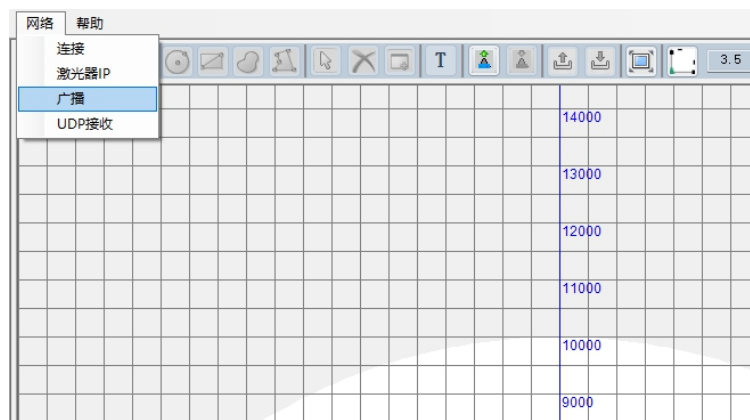
overall function of WLR-716-Mini host computer

2.1 Network connection

Use the WLR -716- Mini crystal head to connect to the network port slot of the PC / industrial computer/controller. After the connection is successful, you need to set the radar IP broadcast and set the PC network parameters.

- Radar IP Broadcast

1) Select Network→Broadcast, and the broadcast query IP interface will pop up;



2) Click the "Start Broadcast" button to view the IP and port number of the lidar;

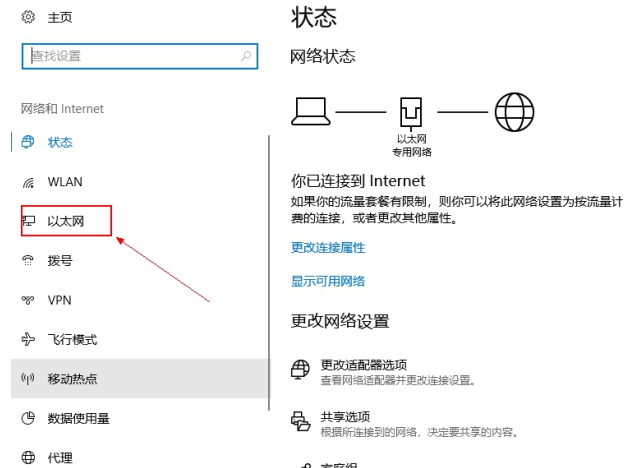


3) Set the network parameters of the PC and the radar to the same network segment according to the IP address and port number obtained from the broadcast .

- PC network parameter setting

4) Select the "Network and Internet" icon; click "Ethernet";

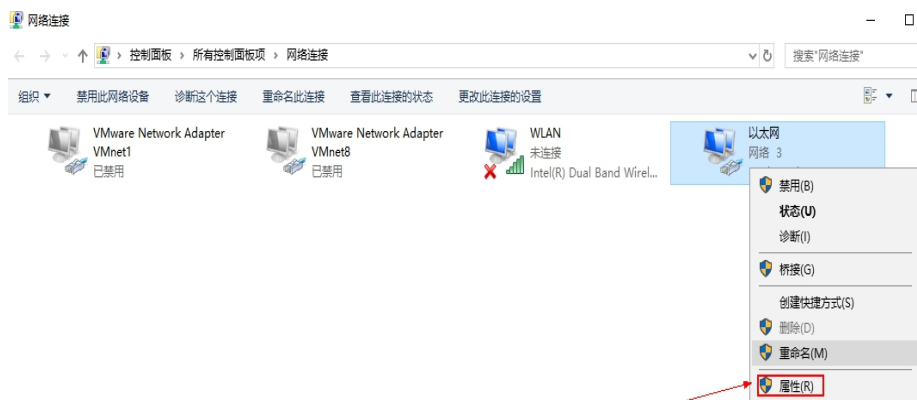
2.1



5) Click "Change Adapter Options";



6) Right-click the local link that is being used, and select the "Properties" menu item in the pop-up menu ;

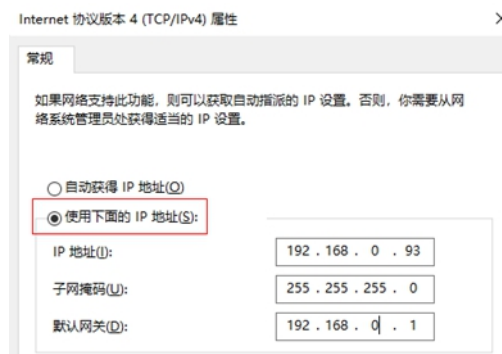


7) Double-click the "Internet Protocol 4 (TCP/IPv4)" item;

2.1



8) Select the "Use the following IP address" item;



9) According to the IP address obtained by broadcasting in step 2), set the network parameters of the PC and the network parameters of the radar under the same network segment;

For example, the IP address of the radar broadcasted in step 2) is 192.168.0.2. To make the PC and the radar set in the same network segment, the IP address of the PC can be set between 192.168.0.1 and 192.168.0.255 except 192.168.0.2 Any one of the 254 IP addresses other than that, the subnet mask is set to 255.255.255.0, and the default gateway is set to 192.168.0.1.



2.1

10) After the setting is completed, click OK, and close the PC network parameter setting interface to connect the PC and the radar normally;

11) Select Network → Connect to connect, as shown in the figure below;



2.2 Viewing of waveforms

Waveform chart view

Users can view the waveform of WLR -716-Mini on the host computer . The output waveform of lidar is mainly divided into two types: Cartesian coordinate system and polar coordinate system. You can use the host computer to perform related operations such as viewing, dragging and setting on the waveform . The specific instructions are as follows .

(1) View the waveform of the rectangular coordinate system

The left part of the application software interface is the point cloud waveform diagram of the lidar in the rectangular coordinate system, as shown in the following figure. The Cartesian coordinate system can be zoomed and zoomed by the mouse wheel. When the wheel is dragged to the maximum, the interval between the horizontal and vertical coordinates is 2.5 mm. Press the right mouse button to drag and drop the radar point cloud image . When the left mouse button is dragged over the point cloud point, the basic information of the point will be marked at the bottom of the application software interface, for example: the distance is 1378 mm → This measurement point is 1378 mm away from the origin of the coordinate system , at an angle of 139.22 ° → This measurement point is located at the lidar angle 139.22 °, and the measurement point is 523 → This measurement point is located at the 523rd point of the total radar point cloud .



2.1

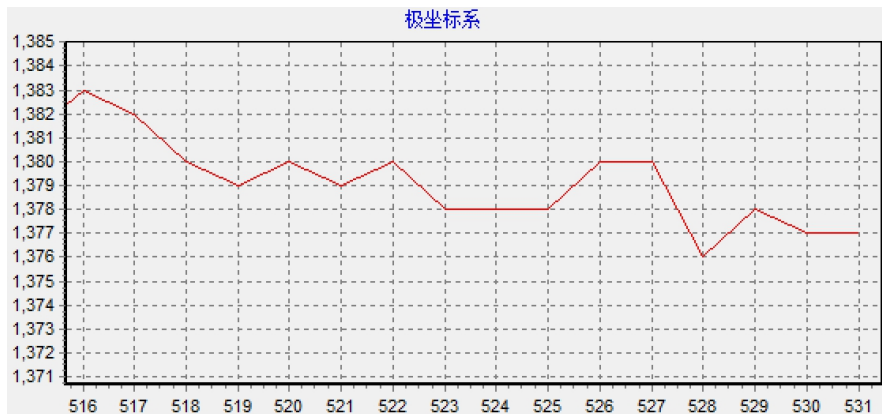
(2) Polar coordinate system waveform view

The upper right part of the application software interface is the point cloud waveform diagram of the lidar in the polar coordinate system, as shown in the following figure.

The ordinate in the polar coordinate system: the distance between the measured object and the center of the radar;

The abscissa in the polar coordinate system: the abscissa represents the measured point cloud number, the total measurement point is $270^\circ/0.25^\circ=1080$ (Note: 270° means scanning range; 0.25° means angular resolution)

mouse selects from left to right, the selected part will be enlarged; after the mouse selects from right to left, the polar coordinate system will return to the default size;



Double-clicking the polar coordinate system will pop up the "Scanning Received Data Settings" pop-up window.

Modifying the number of interval packets can change the refresh frequency of the point cloud image (the default value of the number of interval packets is 5, and you can directly delete the pop-up window after modification).

Change the number of interval packets to 0 to obtain all the scanned data. You can see that the point cloud image is smoother, but it requires computer performance.



2.3 Functional parameters

2.3.1 Working mode



工作模式

工作模式: 常规模式 ▼

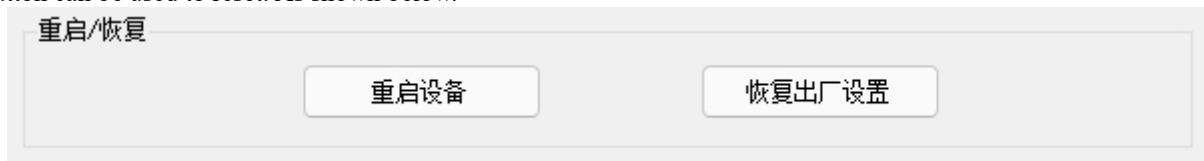
常规模式
降噪模式
区域报警

读取参数 下载参数

- Normal mode: without IO function;
- Noise reduction mode: without IO function, strengthen filtering function (performance consumption);
- Regional alarm: with IO function;

2.3.2 Reboot /Restore

The user can use the "Reset Settings" button in the "Restart/Restore" function in the basic parameters to restart the radar when the power is not turned off. When the parameter settings are wrong, the "Reset to Factory Settings" button can be used to reset. As shown below.



重启/恢复

重启设备 恢复出厂设置

2.4 Network parameters

2.4.1 Network parameter setting

Mini LiDAR through the "Network Parameter Setting" function , as shown in the figure below.



网络参数设置

IP地址: 192.168.0.2 子网掩码: 255.255.255.0 MAC地址: F8:B5:68:90:00:00

端口号: 2110 默认网关: 192.168.0.1 读取参数 下载参数

2.1

First, connect the host computer to the radar, and then the user can fill in the required parameters such as IP address, port number, subnet mask, default gateway, etc., and then click the "Download Parameters" button to download the WLR-716- Mini lidar . change the network parameters. After changing the network parameters of the lidar, it is necessary to change the network parameters of the PC and the IP address and port number of the WLR-716-Mini host computer when it is connected to the network, and then reconnect the host computer.

2.4.2 UDP parameters

-716-Mini through UDP .

- 1) Ensure the normal connection between the host computer and the radar TCP, click "Query Parameters", change the "target IP" of the radar to the computer IP, and click "Download"
- 2) parameters " , as shown in the figure below;

UDP参数

目的IP: 目的端口: 查询参数 下载参数

- 3) Change "Data Protocol" to "UDP " in the basic parameters and click to download, as shown in the figure below ;

网络参数 基本参数 功能参数 参数测试 程序下载

应用参数

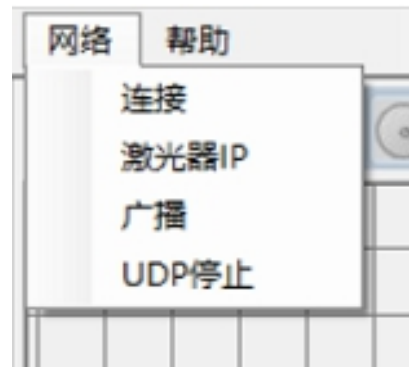
扫描模式: 数据协议: 心跳状态:

安装方式: 扫描起始点:

强度使能:

读取参数 下载参数

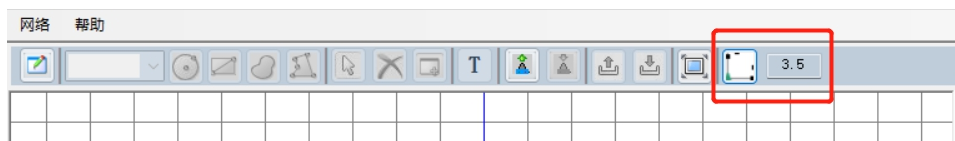
- 4) Disconnect the TCP connection and click UDP to receive, as shown in the figure below for the UDP receive mode .



2.5 Basic parameters

2.5.1 Display parameters

The user can set the drawing method of the Cartesian coordinate system. When the “Drawing Method” is set to “Point Diagram”, the size of the drawing point can be set, and when the “Drawing Method” is set to “Line Diagram”, the width of the line can be set. As shown below :



2.5.2 Application parameters

The user can modify the radar parameters through the "Application Settings" function;

Scanning mode : 1 5Hz/ 0.25 ° and 2 5Hz/0.25 ° can be selected. After switching the working mode, the waveform will be refreshed and displayed again after a period of time.

Installation method : choose according to the installation position of the equipment, if the equipment is installed upwards, choose the normal installation, and choose the inverted installation if the equipment is installed downwards;

Intensity enable : you can choose whether to enable the intensity value;

Data protocol : It can be configured as two modes of TCP and UDP;

Heartbeat status : After opening, the current connection status is detected between the device and the host computer through the heartbeat command of the Wanji protocol. If there is no heartbeat interaction, the device will reset the network ;

Scan start point: the rotation angle of the point cloud image (default value 1 35);

应用参数

扫描模式：

15hz/0.25°

数据协议：

TCP

安装方式：

正装

心跳状态：

关闭

强度使能：

使能

扫描起始点：

135

读取参数

下载参数

2.5.3 Filter settings

The user can decide whether to enable the smear filter function of the WLR-716- Mini lidar through " Filter Settings" , as shown in the figure below;

滤波设置

拖尾滤波：

开启

读取参数

下载参数

2.5.4 Detection parameters

The user can set the detection sensitivity through the detection parameters, mainly to filter the noise formed by water mist and dust. The default threshold voltage is 300, and the effective range is 300 to 700. The larger the threshold voltage , the stronger the ability to filter noise , but the distance measurement The ability will be reduced ; the number of modifications can record the number of modifications;

探测参数

阈值电压(mv):

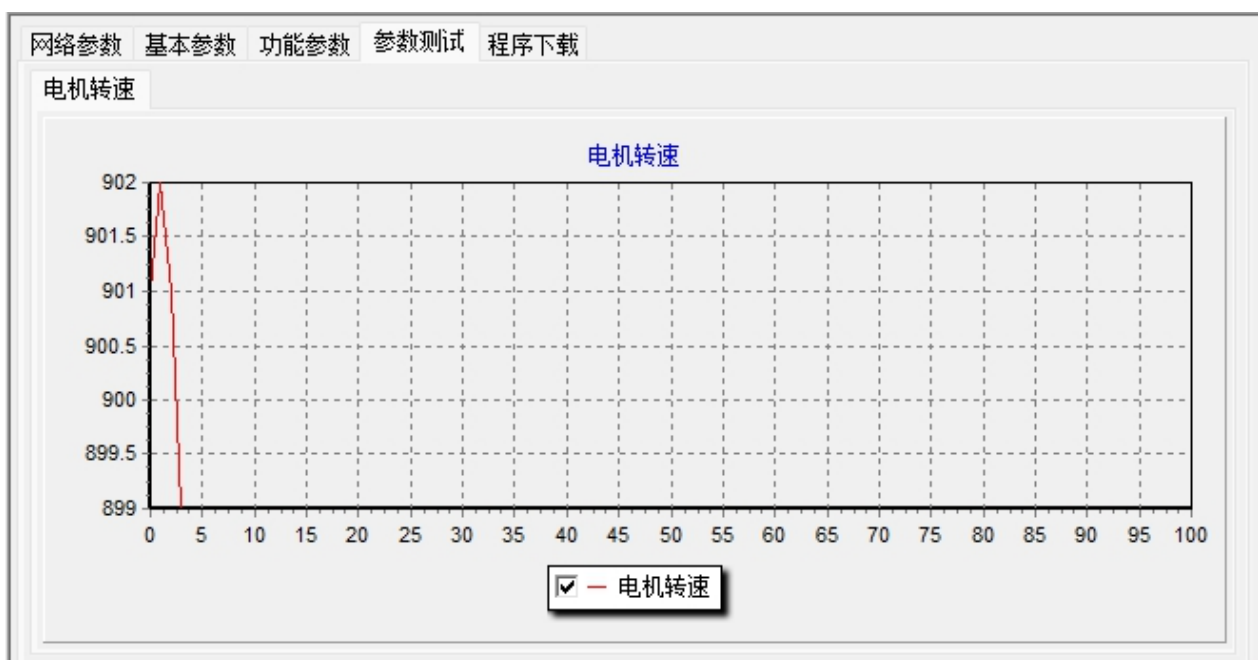
查询参数

修改次数:

下载参数

2.6 Motor speed

After the connection between the host computer and the radar is successful, check the "motor speed" , and the motor speed of the radar will be displayed in real time in the chart



3. The overall introduction of the IO part of the WLR-716-Mini host computer

3.1 IO interface definition

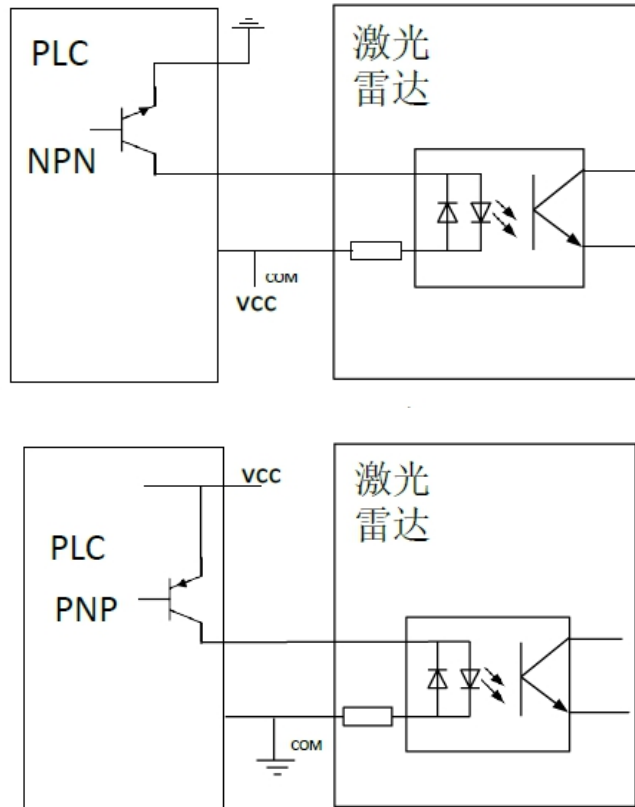
<p style="text-align: center;">12 Wire (Power + IO mouth)</p>	<p>From left to right :</p> <ol style="list-style-type: none"> 1. enter1 (IN1) yellow and white 2. enter2 (IN2) yellow 3. enter3 (IN3) brown and white 4. enter4 (IN4) Brown 5. enterCOM red and white 6. output 1 (OUT1) Purple 7. output2 (OUT2) blue 8. output3 (OUT3) Orange 9. outputcom black and white 10. Power + red 11. Power - Black Shield: Shield Ground
<p style="text-align: center;">USB port</p>	<p>standard micro USB interface</p>
<p style="text-align: center;">network cable</p>	<p>RJ45 Crystal Head</p>

3.2 Input/Output Levels

1. Input level :

4-way input, compatible with NPN and PNP input, BANK switching can be realized by combination, IO input is shown in the figure;

2.1

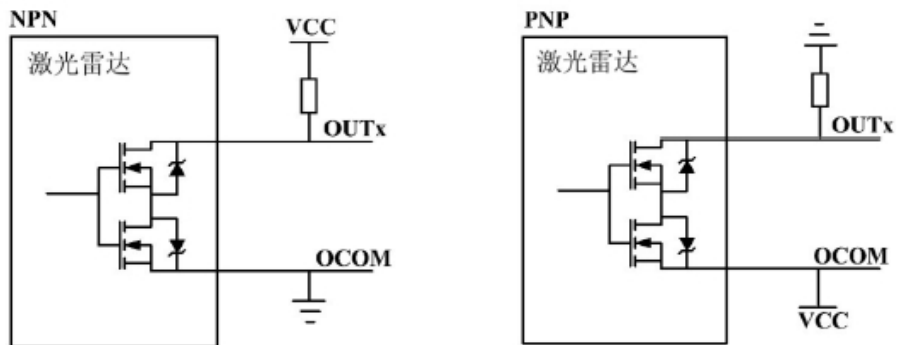


By changing the circuit connection, the zone group supports NPN Type and PNP. There are two types of external input ports, the connection methods are as follows:

- 1) When connecting an NPN type output, COM When the terminal is connected to a high level, the user output high level is 0, and low level is 1;
- 2) When connecting to PNP type output, COM When the terminal is connected to a low level, the high level of the user output terminal is 1, and the low level is 0.

2. Output level :

The 3-way output is compatible with NPN or PNP output, and the IO output is as shown in the figure;



2.1

- NPN output : The output of OUT1~OUT3 is active low ;

NPN output level and zone status:

area	Switch output		
	OUT1	OUT2	OUT3
Field 1 , 2 and3 have objects	Low	Low	Low
Field 2 and3 have objects	high	Low	Low
Field 3 has objects	high	high	Low
no object	high	high	high

Description: The innermost layer of Field1 , the middle layer of Field2 , the outermost layer of Field3

- PNP output: The output of OUT1~OUT3 is active high;

PNP type output level and area status;

area	Switch output		
	OUT1	OUT2	OUT3
Field 1 , 2 and3 have objects	high	high	high
Field 2 and3 have objects	Low	high	high
Field 3 has objects	Low	Low	high
no object	Low	Low	Low

Description: The innermost layer of Field1 , the middle layer of Field2 , the outermost layer of Field3

3.3 IO active level switching

The user can adjust the input and output effective levels of IO in the function parameters according to the actual needs.

As shown below:

IO高低电平切换

IN1有效电平: 低电平识别为1

IN2有效电平: 高电平识别为1

IN3有效电平: 高电平识别为1

IN4有效电平: 低电平识别为1

OUT1有效电平: 低电平

OUT2有效电平: 高电平

OUT3有效电平: 高电平

读取参数

下载参数

3.4 Function introduction of regional operation area

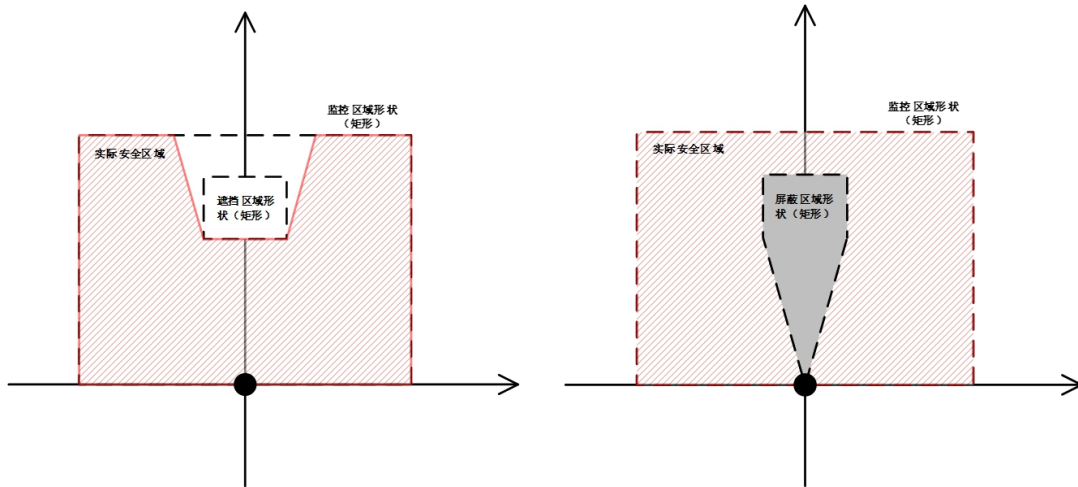


- ① Current mode: can be switched to configuration mode and query mode.




2.1


- ② Graphic Properties: Can be set to monitor, block and mask.



- ③ ~⑥: You can draw circles, rectangles, sectors and polygons.

- ⑦: Mouse click to switch functions:

displayed as an  icon, graphics can be added;

displayed as an  icon, the graphics can be moved and deleted;

- ⑧ Delete graphics: when ⑦ is an  icon, graphics can be deleted.

- ⑨ Add graphics: You can add graphics by inputting graphics parameters.

- ⑩ Add template: After clicking, the default initial graph and the corresponding event table will be automatically

2.1

added;

- ⑪ : read parameters: read all data parameters of the current radar;
- ⑫ : Download parameters: download all data parameters of the current radar;
- ⑬ : import template: import downloaded parameters;
- ⑭ : Export template: export the parameters of this radar for backup or for use by other radars;
- ⑮ : Self-adaptive, click to restore to the appropriate size.
- ⑯ : Switch point graph/line graph display.
- ⑰ : Set the size of point graph and the width of line graph.

3.5 Function introduction of event table information bar

When the current mode is the configuration mode, the event table information bar will be displayed, as shown in the following figure:

WLR-716M ini lidar can add up to 128 event tables, each event table can add up to 16 events, and each event can monitor up to 6 areas. The user can select the currently valid monitoring area through 4 input switches or protocols , and judge whether there is an object entering the corresponding area through 3 switch outputs.

As an example in the above figure, it is assumed that 4 input switches are used to switch the monitoring area. When I N2 detects a valid level, it will monitor the area (4), area (5) and area (6) in event 2 ; assuming that the area (4) If there is an obstacle, OUT1 will output a valid level signal.

- ① Event table name/event name can be renamed;
- ② Input delay: After the level of IN1~IN4 changes, the delay of switching the monitoring area;
- ③ I N1~IN4 check box : After unchecking , the actual wiring is useless;

行号	事件序号	事件名称	输入条件	监控个数	监控1	监控2	监控3
1	1	event1	IN1: 1 IN2: 0 IN3: 0 IN4: 0	3	区域名: 区域(2) <input checked="" type="checkbox"/> OUT1 <input type="checkbox"/> OUT2 <input type="checkbox"/> OUT3 删除	区域名: 区域(3) <input type="checkbox"/> OUT1 <input checked="" type="checkbox"/> OUT2 <input type="checkbox"/> OUT3 删除	区域名: 区域(4) <input type="checkbox"/> OUT1 <input type="checkbox"/> OUT2 <input checked="" type="checkbox"/> OUT3 删除
2	2	event2	IN1: 0 IN2: 1 IN3: 0 IN4: 0	3	区域名: 区域(5) <input checked="" type="checkbox"/> OUT1 <input type="checkbox"/> OUT2 <input type="checkbox"/> OUT3 删除	区域名: 区域(6) <input type="checkbox"/> OUT1 <input checked="" type="checkbox"/> OUT2 <input type="checkbox"/> OUT3 删除	区域名: 区域(7) <input type="checkbox"/> OUT1 <input type="checkbox"/> OUT2 <input checked="" type="checkbox"/> OUT3 删除

3.6 Regional Information

3.6.1 Area information in configuration mode

- 1) Areas and area groups can be added/deleted as needed, and can be renamed after double-clicking the mouse;
- 2) Regional alarm information: The user can adjust the triggering strategy of the IO signal through the regional alarm information . Area name: specify the corresponding area to be modified; hold time: the default is 335ms, the adjustable range is 1~10050ms, which means the time to keep the trigger state after the intrusion disappears; response time: the default is 335ms, and the adjustable range is 67~30016ms, which means After the intrusion is maintained for this time, the intrusion will be triggered; Detection method: "Points" and "Size" methods can be selected; Size threshold: When the "Detection method" is "Size", this parameter can be set. The adjustment range is 10~500mm, indicating the size threshold of the intrusion detection area. After identifying the intruder larger than this parameter, it is considered that there is an intrusion; Continuous points: when the "detection method" is "points", this parameter can be set, the default is It is 2 points, and the adjustable range is 1~270 points, which indicates the continuous point threshold of intrusion detection area. After identifying the intruder larger than this parameter, it is considered that there is intrusion.
- 3) Activation event table: You can query and switch the currently activated event table;
- 4) Event switching mode: choose whether the switching is based on external IO or protocol command , and only one switching mode is supported at the same time.
- 5) Area information output status: Display the real-time intrusion detection output status of the current monitoring area .
- 6) Monitoring events: can query and switch the currently monitored events;

日志信息 扫描波形 区域信息

添加区域组 添加区域 删除

区域组(1)
区域(1)
区域组(2)
区域(2)
区域(3)
区域(4)
区域组(3)
区域(5)
区域(6)
区域(7)

区域报警信息

区域名称: 区域(1)

保持时间(ms): 335

响应时间(ms): 335

检测方式: 点数

点数/尺寸: 2

区域信息输出状态

OUT1:

OUT2:

OUT3:

激活事件表

激活事件表: List1

查询参数 下载参数

事件切换方式

事件切换方式: 外部IO

查询参数 下载参数

监控事件

当前监控事件:

查询参数 下载参数

3.6.2 Area information in query mode

area information bar/output IO status is the same as the function in the above configuration mode;

Output IO state configuration:

Switch status: output IO status query switch ;

Sending frequency: a multiple of the current scanning frequency;

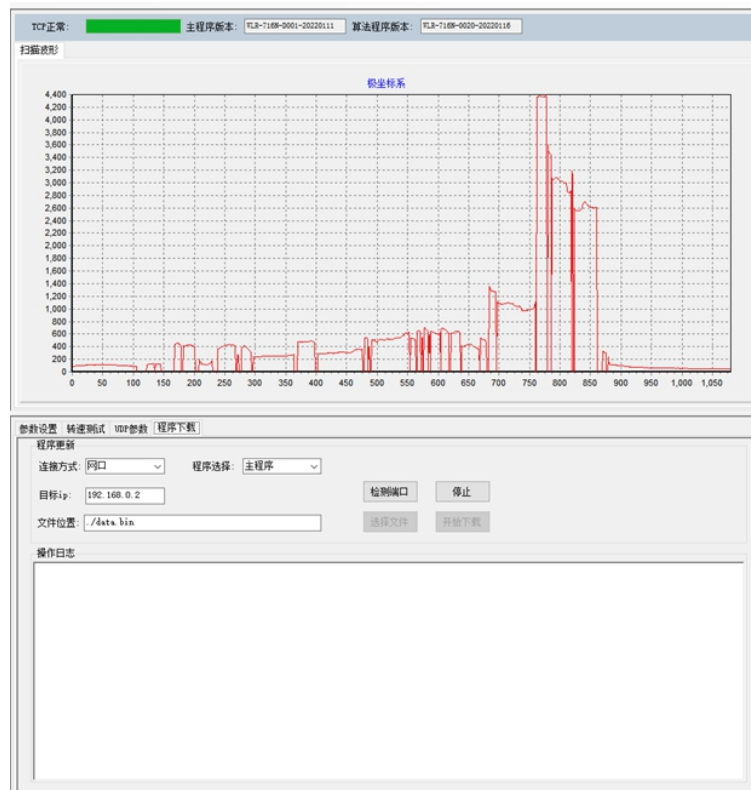
The screenshot displays the 'Area Information' (区域信息) configuration window. At the top, there are three tabs: '日志信息' (Log Information), '扫描波形' (Scanning Waveform), and '区域信息' (Area Information), with '区域信息' being the active tab. Below the tabs, the '区域信息' (Area Information) section is expanded, showing three sub-sections: '激活事件表' (Activated Event List), '事件切换方式' (Event Switching Method), and '监控事件' (Monitoring Event). Each sub-section contains a dropdown menu, a '查询参数' (Query Parameters) button, and a '下载参数' (Download Parameters) button. The '激活事件表' section shows 'List1' selected. The '事件切换方式' section shows '协议指令' (Protocol Command) selected. The '监控事件' section shows an empty dropdown. Below these, the '输出IO状态配置' (Output IO Status Configuration) section includes a '开关状态' (Switch Status) dropdown set to '关闭' (Closed) and a '发送频率' (Sending Frequency) field set to '扫描频率的' (Scanning Frequency) times a multiplier of '1'. The '输出IO状态' (Output IO Status) section shows three output channels: 'OUT1:', 'OUT2:', and 'OUT3:', each with an empty input field. A '下载参数' (Download Parameters) button is located at the bottom of the '输出IO状态配置' section.

4. Download and update the WLR-716-Mini host computer program

When the WLR-716-Mini lidar is downloaded, both the radar and the PC need to be set to 192.168.0.x network segment (IP of other network segments can not detect the port when updating the program), the last of the radar and PC One bit cannot be repeated, and the radar and the PC must be directly connected, and cannot go through devices such as switches, and then reconnect the host computer and the radar. Among them , the program update includes the main program update and the algorithm program update, and the user can select the program to be updated according to the needs.

4.1 Main program update

- 1) Connect the host computer to the radar, so that the host computer can display the point cloud data of the radar normally, as shown in the figure below;

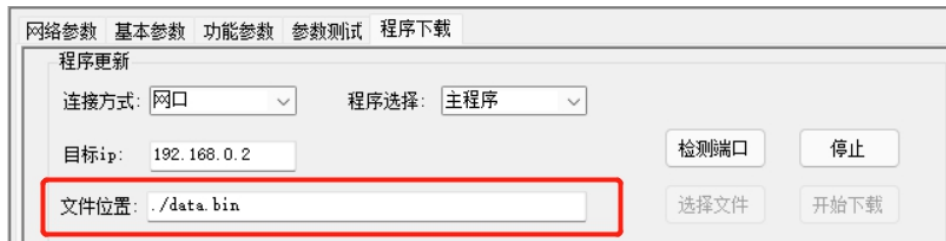


- 2) Disconnect the host computer from the radar, confirm that the program selection is: main program, change the target IP to the radar IP, click the "Detect Port" button, and the interface is as shown below ;

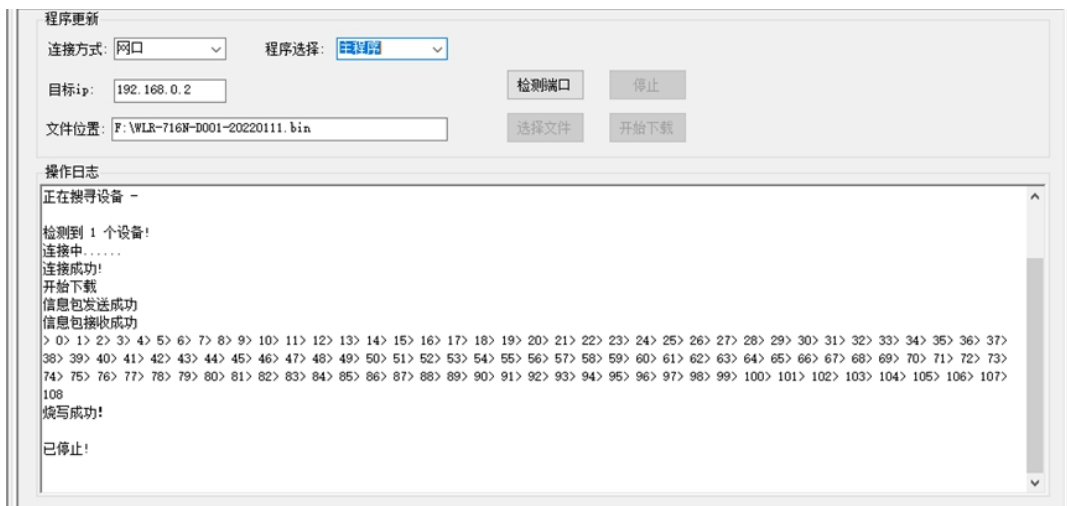
2.1



3) After the device is detected, click the "Select File" button to select the * .bin file in the folder , as shown in the following figure ;



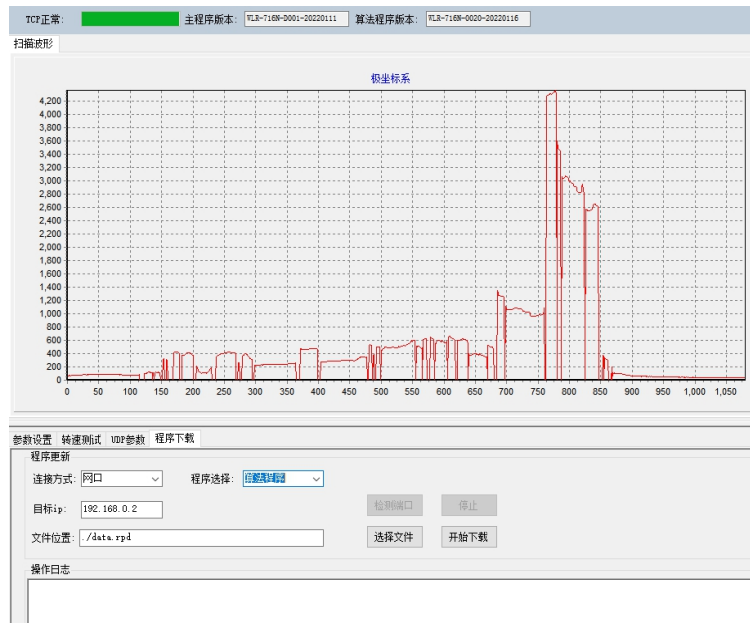
4) Click the "Start Download" button and wait for the prompt "Successful programming!", which means the main program update is complete, as shown in the figure below .



2.1

4.2 Algorithm update

1) Change "Program Selection" to "Algorithm Program", connect the host computer with the radar, so that the host computer can display point cloud data normally, as shown in the figure below;



2) Change "Program Selection" to "Algorithm Program", connect the host computer with the radar, so that the host computer can display point cloud data normally, as shown in the figure below;



3) Click the start download button and wait for the program to be successfully written, as shown in the figure below, and the algorithm program update is completed at this time.

2.1



5. Instructions for using WLR-716-Mini ROS driver

5.1 Create a workspace

1) Create workspace in terminal:

```
mkdir -p wanjilaser / src
```

2) Move the ros driver into the folder wanjilaser / src

```
cd wanjilaser
```

```
catkin_make
```

```
Scanning dependencies of target wj_716N_lidar_gencfg
[ 20%] Generating dynamic reconfigure files from cfg/wj_716N_lidar.cfg: /root/716N_test/wanji_716N_ros_driver_V1.0/devel/include/wj_716N_lidar/wj_716N_lidarConfig.h /root/716N_test/wanji_716N_ros_driver_V1.0/devel/lib/python2.7/dist-packages/wj_716N_lidar/cfg/wj_716N_lidarConfig.py
Generating reconfiguration files for wj_716N_lidar in wj_716N_lidar
Wrote header file in /root/716N_test/wanji_716N_ros_driver_V1.0/devel/include/wj_716N_lidar/wj_716N_lidarConfig.h
[ 20%] Built target wj_716N_lidar_gencfg
Scanning dependencies of target wj_716N_lidar
[ 60%] Building CXX object wj_716N_lidar/CMakeFiles/wj_716N_lidar.dir/src/wj_716N_lidar_01.cpp.o
[ 60%] Building CXX object wj_716N_lidar/CMakeFiles/wj_716N_lidar.dir/src/async_client.cpp.o
[ 80%] Building CXX object wj_716N_lidar/CMakeFiles/wj_716N_lidar.dir/src/wj_716N_lidar_protocol.cpp.o
[100%] Linking CXX executable /root/716N_test/wanji_716N_ros_driver_V1.0/devel/lib/wj_716N_lidar/wj_716N_lidar
[100%] Built target wj_716N_lidar
```

5.2 Modify device parameters

1) Open the wj_716N_lidar\launch\ wj_716N_lidar_01.launch file, as shown below:

```

<launch>
  <node name="wj_716N_lidar_01" pkg="wj_716N_lidar" type="wj_716N_lidar" respawn="false" output="screen">
    <param name="hostname" type="string" value="192.168.0.2" />
    <param name="port" type="string" value="2110" />
    <param name="frequency_scan" type="int" value="1" /> <!-- 1: 0.25°_15hz,
                                                    2: 0.25°_25hz,-->

    <!-- -135° -->
    <param name="min_ang" type="double" value="-2.35619449" />
    <!-- 135° -->
    <param name="max_ang" type="double" value="2.35619449" />
    <param name="frame_id" type="str" value="laser" />
    <param name="range_min" type="double" value="0" />
    <param name="range_max" type="double" value="30.0" />
  </node>
</launch>

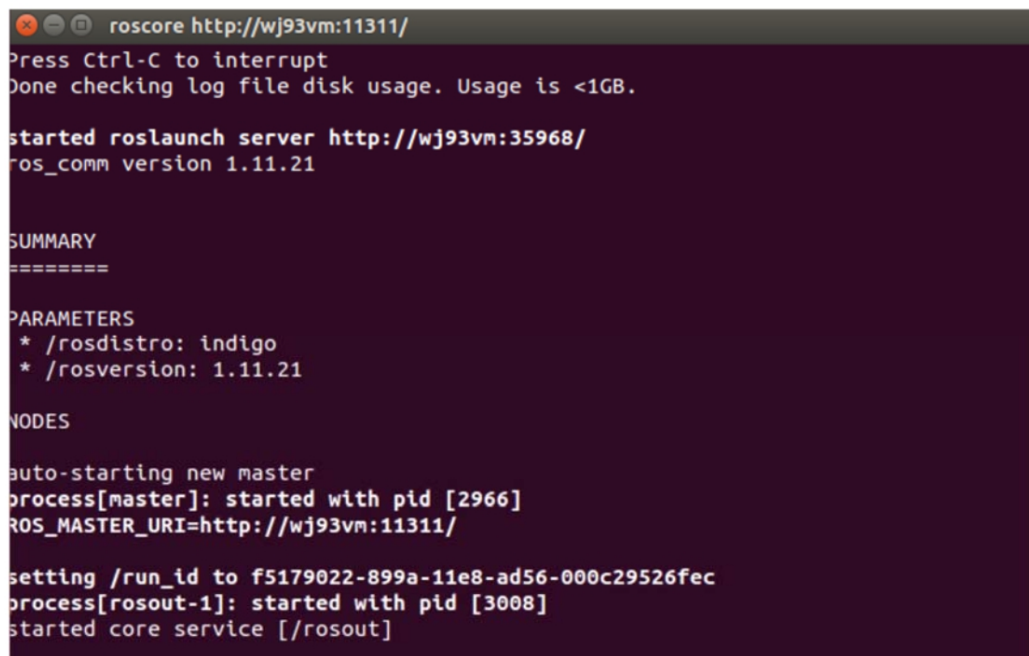
```

2) Correctly fill in the IP, port and scan frequency parameters currently used in WLR-716Mini into the corresponding positions.

Note: The settings of IP, port and scan frequency can only be done through the host computer that is matched with WLR-716Mini.

5.3 Running the driver

1) First run roscore as shown below



```

roscore http://wj93vm:11311/
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://wj93vm:35968/
ros_comm version 1.11.21

SUMMARY
=====

PARAMETERS
* /rostdistro: indigo
* /rosversion: 1.11.21

NODES

auto-starting new master
process[master]: started with pid [2966]
ROS_MASTER_URI=http://wj93vm:11311/

setting /run_id to f5179022-899a-11e8-ad56-000c29526fec
process[rosout-1]: started with pid [3008]
started core service [/rosout]

```

2) Open the folder where the project file is located and load the launch file, as shown in the following figure

cd wanjilaser

source devel / setup.bash

roslaunch wj_716N_lidar wj_716N_lidar_01.launch

2.1

```

process[wj_716N_lidar_01-1]: started with pid [32670]
laser ip: 192.168.1.3, port:2110
wj_716N_lidar_protocol start success
frame_id:laser
min_ang:-2.35619
max_ang:2.35619
angle_increment:0.00436325
time_increment:4.62963e-05
range_min:0
range_max:30
resize:1081
TCP-Connection is initialized!
[ INFO] [1637925207.811833073]: Start connecting laser!
[ INFO] [1637925207.813114792]: Successfully connected. Hello wj_716N_lidar!

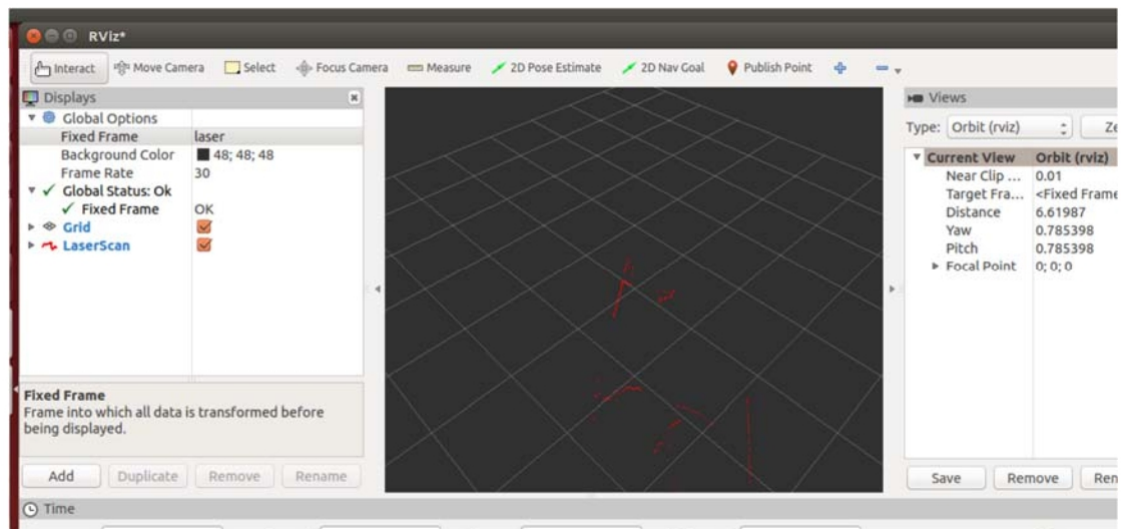
```

3) After the lidar connection is normal, load rviz to view the waveform. When rviz outputs the lidar scanning waveform normally, it proves that the ros driver is working normally

as shown in the figure below

```
roslaunch tf static_transform_publisher 0 0 0 0 0 map laser 100
```

```
roslaunch rviz rviz
```



6. After-sales service

- This product enjoys the stipulated free warranty service from the date of installation. During the warranty period, if the product is damaged or unusable due to non-human factors or product quality problems, please contact Wanji Technology or the local operator in time, and provide the purchase documents. The relevant service personnel will check your product. Do free repairs.
- No maintenance will be given to the products disassembled by the user.
- After the expiration of the warranty period, the relevant service personnel of Wanji Technology will also be responsible for the maintenance of product failure, damage and other problems, but the material cost of maintenance and replacement of components will be charged.
- After the expiration of the warranty period, the relevant service personnel of Wanji Company will still provide users with free services to answer questions, including consulting services such as purchase guidance, usage, and product installation.

