DOC# :01.13.005302

YDLIDAR 4ROS USER MANUAL

www.ydlidar.com

Shenzhen EAI Technology Co.,Ltd.

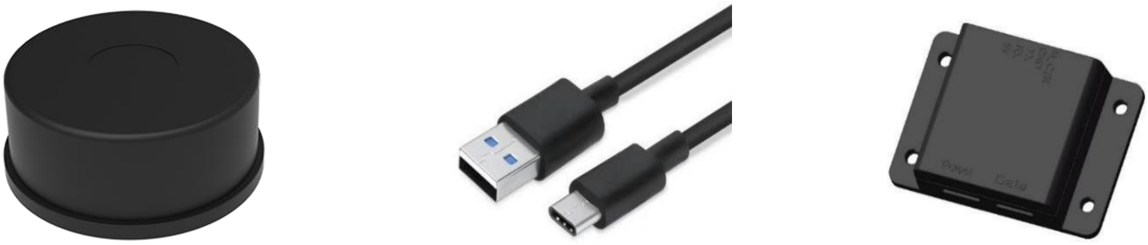
CONTENTS

1 YDLIDAR 4ROS LIDAR DEVELOPMENT KIT

The development kit of YDLIDAR 4ROS liadar (hereinafter referred to as 4ROS) is an accessory tool provided for performance evaluation and early development of the 4ROS. Through the 4ROS development kit, and with the evaluation software, users can observe point cloud data scanned by 4ROS on your environment or development on the SDK.

1.1 Development Kit

The YDLIDAR 4ROS LIDAR development kit has the following components:



4ROS Lidar USB Type-C Cable USB Adapter Board

FIG 1 YDLIDAR 4ROS LIDAR DEVELOPMENT KIT

CHART 1 YDLIDAR 4 ROS LIDAR DEVELOPMENT KIT DESCRIPTION

Item	Qty.	Description
4ROS Lidar	1	Standard version of the 4ROS Lidar. The 4ROS has an integrated motor drive for motor control
USB Type-C Cable	1	Use with USB adapter board to connect 4ROS lidar and PC. USB cable is both a power supply cable and a data cable
USB Adapter Board	1	Realize USB to UART, convenient for the rapid interconnection of 4ROS lidar and PC. In addition, it provides Micro USB power interface (PWR) for auxiliary power supply

Note: USB Adapter board has two USB TYPE C interface: USB_DATA、USB_PWR.

USB_DATA: Data powered interface. In most cases, this interface can be used to meet power and communication requirements.

USB_PWR: Auxiliary power supply interface. The USB interface of some development platforms has weak current drive capability. At this time, auxiliary power supply can be used.

2 USAGE UNDER WINDOWS

2.1 Device Connection

When 4ROS is evaluated and developed under windows, 4ROS and PC need to be interconnected. The specific process is as follows:

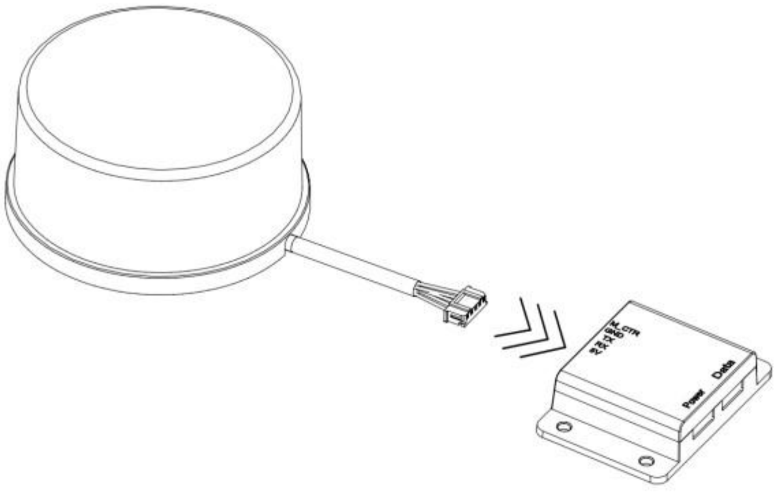


FIG 2 YDLIDAR 4ROS DEVICE CONNECTION STEP 1

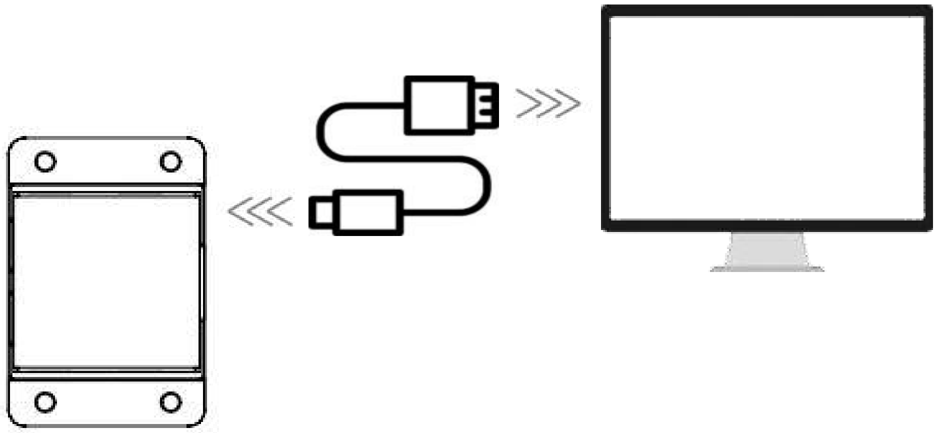


FIG 3 YDLIDAR 4ROS DEVICE CONNECTION STEP 2

Connect the adapter board with 4ROS first, then connect the USB cable to the USB port of the adapter board and the PC. Note that the Type-C interface of the USB cable is connected to the USB_DATA of the USB interface board, and the idle mode is used after 4ROS is powered on. The motor does not rotate.

The drive current of USB interface of some development platforms or PC is not sufficient. 4ROS Series need to be connected to the auxiliary power supply of +5V, otherwise the lidar will be abnormal.

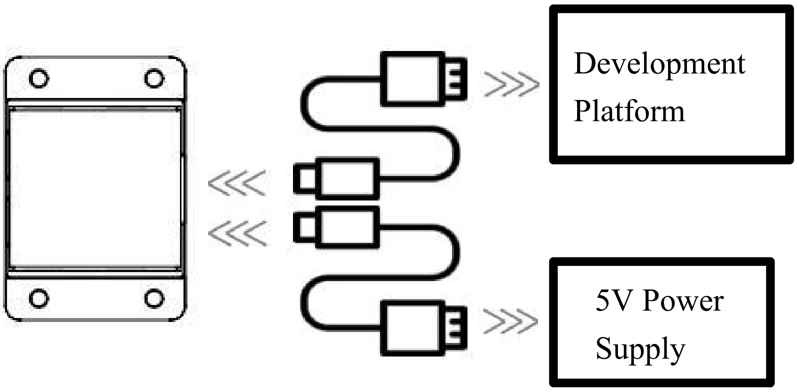


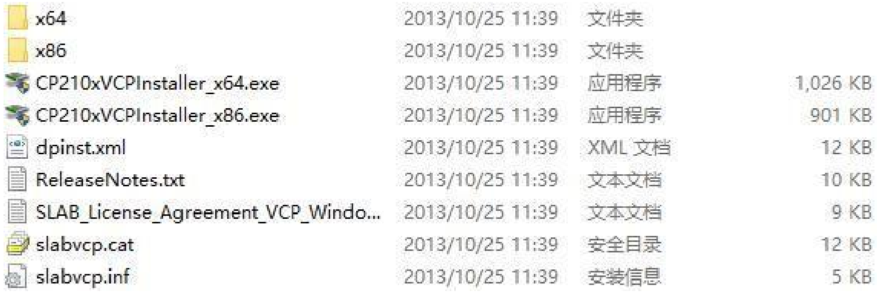
FIG 4 YDLIDAR 4ROS AUXILIARY POWER SUPPLY

2.2 Driver Installation

To evaluate and develop the 4ROS under Windows, you need to install the serial port driver of the USB adapter board. The USB adapter board of this kit adopts CP2102 chip to realize serial port (UART) to USB signal conversion. Its driver can be downloaded from our official website or downloaded from the official website of Silicon Labs.

https://www.ydlidar.com/dowfile.html?id=97 http://cn.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

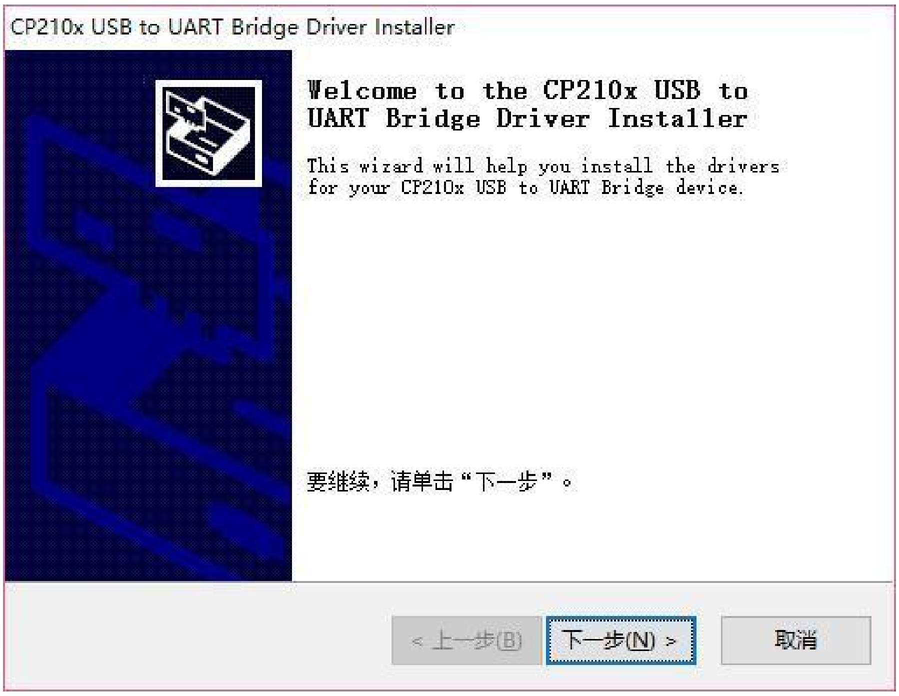
After unzip the driver package, run the CP2102's Windows driver installation file (exe file under CP210x_VCP_Windows). Please select the 32-bit version (x86) or 64-bit version (x64) installation program according to the version of the windows operating system.



x64	2013/10/25 11:39	文件夹	
x86	2013/10/25 11:39	文件夹	
CP210xVCPInstaller_x64.exe	2013/10/25 11:39	应用程序	1,026 KB
CP210xVCPInstaller_x86.exe	2013/10/25 11:39	应用程序	901 KB
dpinst.xml	2013/10/25 11:39	XML 文档	12 KB
ReleaseNotes.txt	2013/10/25 11:39	文本文档	10 KB
SLAB_License_Agreement_VCP_Windo...	2013/10/25 11:39	文本文档	9 KB
slabvcp.cat	2013/10/25 11:39	安全目录	12 KB
slabvcp.inf	2013/10/25 11:39	安装信息	5 KB

FIG 5 YDLIDAR 4ROS DRIVER VERSION SELECTION

Double-click the exe file and follow the prompts to install it.



CP210x USB to UART Bridge Driver Installer

Welcome to the CP210x USB to UART Bridge Driver Installer

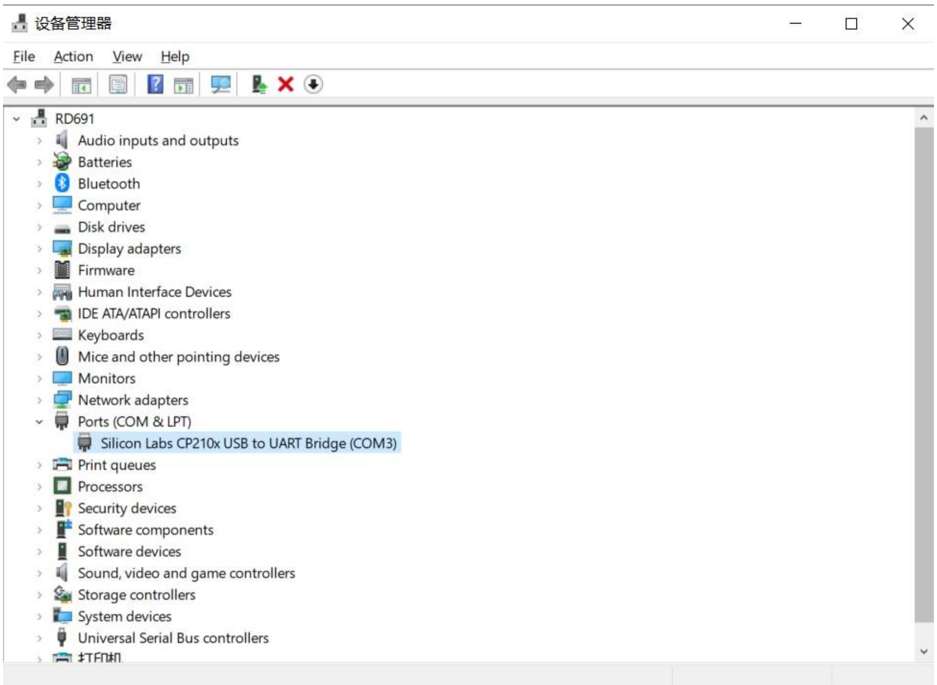
This wizard will help you install the drivers for your CP210x USB to UART Bridge device.

要继续，请单击“下一步”。

FIG 6 YDLIDAR 4ROS DRIVER INSTALLING

After the installation is complete, you can right-click on [My Computer] and select [Properties]. On the open [System] screen, select [Device Manager] from the left menu to access the [Device Manager].

Expand [Port] to see the serial port name corresponding to the identified USB adapter, that is, the driver installation is successful. The following figure shows COM3. (Note that the port must be checked in case of 4ROS and PC interconnection).



设备管理器

RD691
- Audio inputs and outputs
- Batteries
- Bluetooth
- Computer
- Disk drives
- Display adapters
- Firmware
- Human Interface Devices
- IDE ATA/ATAPI controllers
- Keyboards
- Mice and other pointing devices
- Monitors
- Network adapters
- Ports (COM & LPT)
  - Silicon Labs CP210x USB to UART Bridge (COM3)
- Print queues
- Processors
- Security devices
- Software components
- Software devices
- Sound, video and game controllers
- Storage controllers
- System devices
- Universal Serial Bus controllers
- 打印机

FIG 7 YDLIDAR 4ROS DRIVER INSTALLATION CHECK

2.3 Evaluation Software Usage

YDLIDAR provides LidarViewer, a point cloud data visualization software for 4ROS real-time scanning. Users can intuitively observe the 4ROS scanning effect chart. Real- time point cloud data and real-time scanning frequency are provided on YDLIDAR. At the same time, the version information of 4ROS can be read. Visualization software download link: https://www.ydlidar.com/Public/upload/download/TOOL.zip

Before using the YDLIDAR software, make sure that the 4ROS USB adapter board serial port driver is installed successfully, and interconnect the 4ROS with the USB port of the PC. Run the evaluation software: LidarViewer.exe, select the corresponding serial port number and model number. Meanwhile, users could choose language on the top right corner.

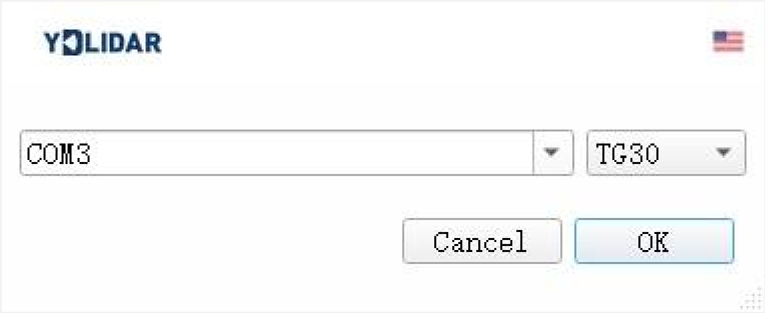
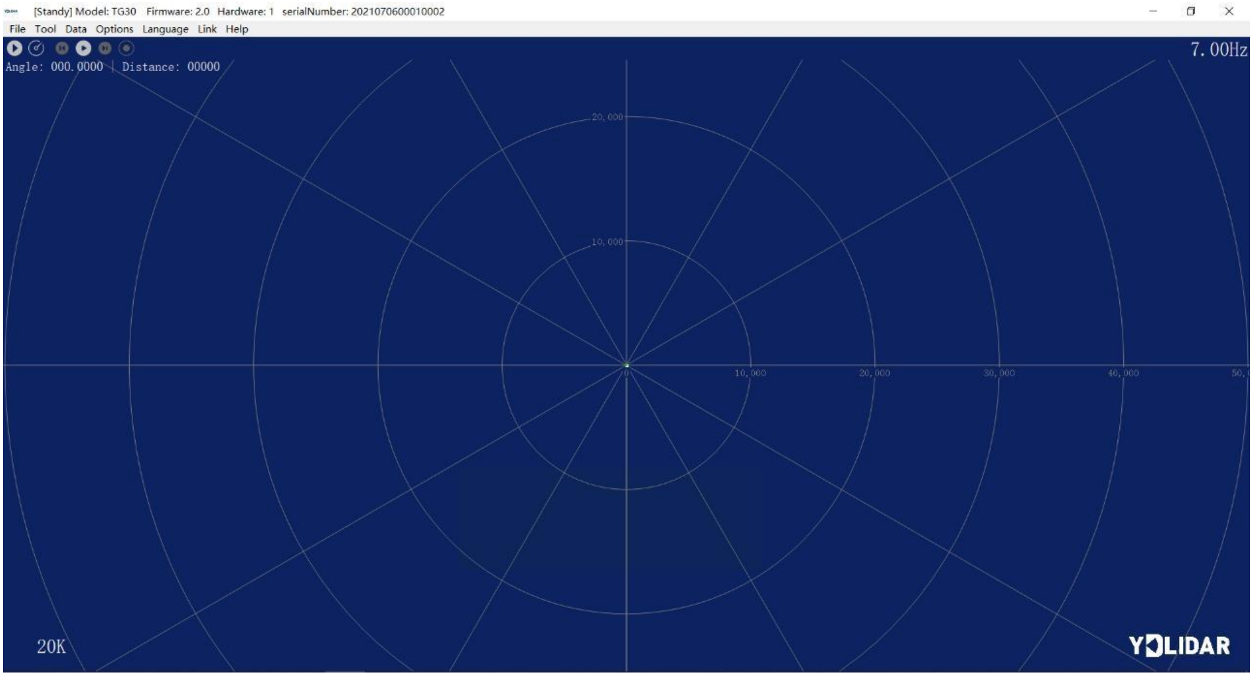


FIG 8 YDLIDAR 4ROS EVALUATION SOFTWARE

If the connection is correct, you will see the following screen:

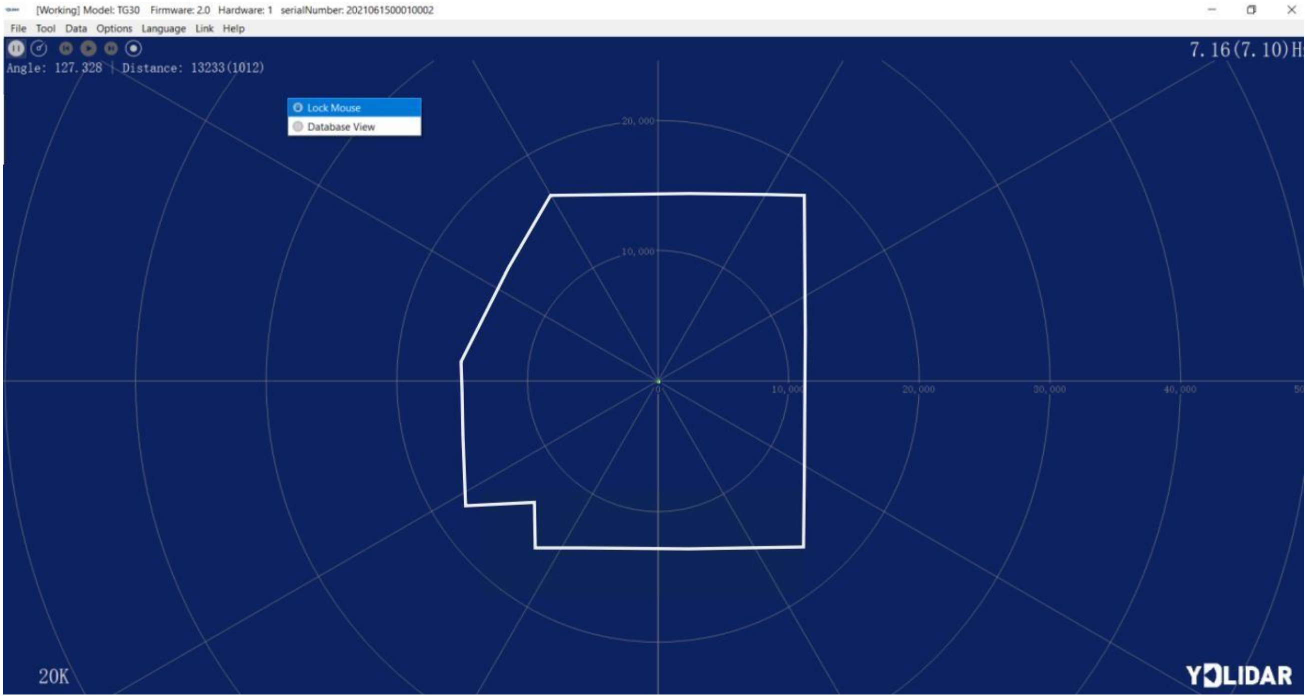

[Standy] Model: TG30 Firmware: 2.0 Hardware: 1 serialNumber: 2021070600010002

Angle: 000.0000 | Distance: 00000

FIG 9 POINTCLOUD VIEWER INTERFACE

2.3.1 Start Scanning

Click ▶ to start scanning and display the environment point cloud. Click ⏸ to stop it. as shown below:

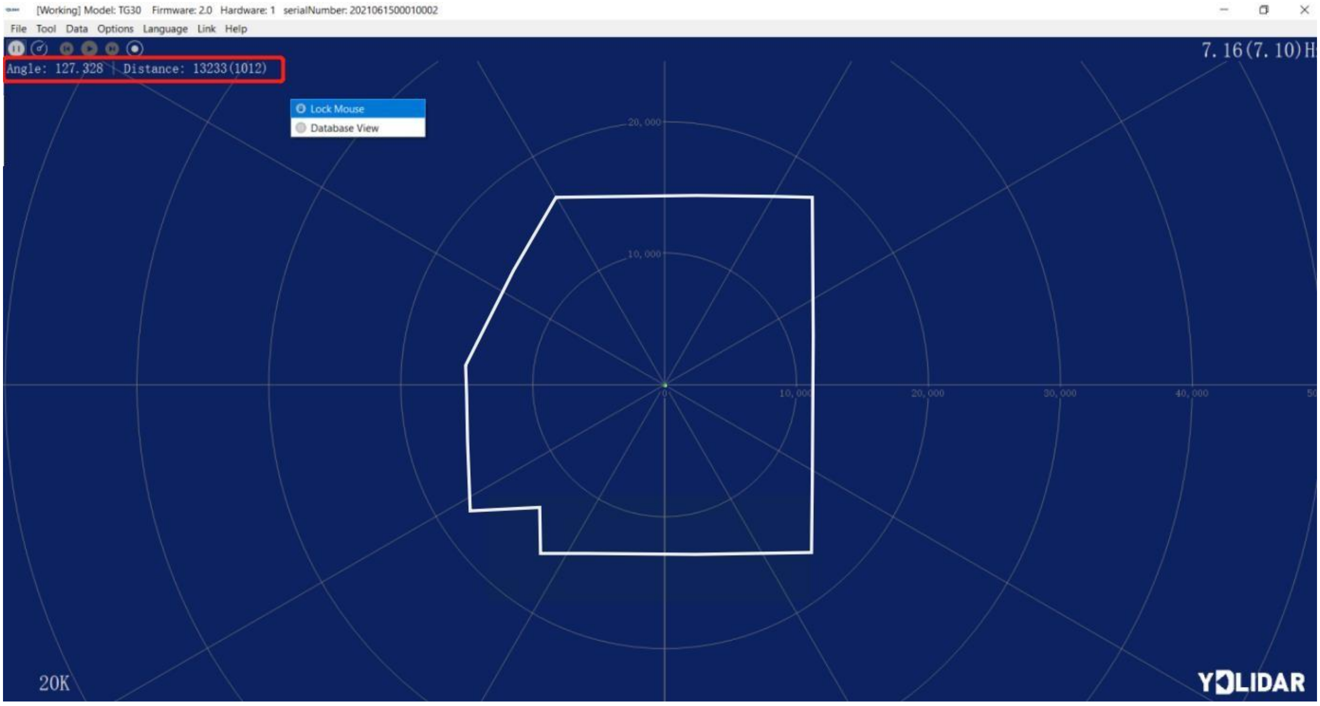

[Working] Model: TG30 Firmware: 2.0 Hardware: 1 serialNumber: 2021061500010002

Angle: 127.328 | Distance: 13233(1012)

FIG 10 LIDAR SCANNING POINT CLOUD DISPLAY

2.3.2 Data Presentation

F(unit: mm)


[Working] Model: TG30 Firmware: 2.0 Hardware: 1 serialNumber: 2021061500010002

Angle: 127.328 | Distance: 13233(1012)

FIG 11 OBTAIN LIDAR ANGLE & RANGE DATA

2.3.3 Data Storage

During lidar scanning, click [File] in the main menu, select [Export to Excel], and save point cloud data according to the prompts. Then the system will save the point cloud information scanned in a circle in Excel format.

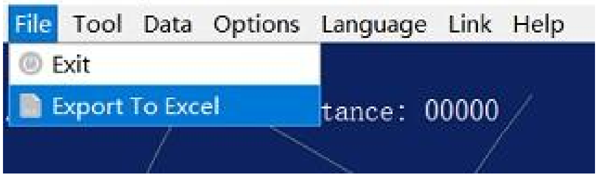


FIG 12 SAVE DATA

2.3.4 Scan Frequency

is used to adjust the scanning frequency (motor speed) of the lidar. Click and drag to adjust according to the demand. When the lidar is in the scanning state, you need to click the scan control again after adjusting the scan frequency.

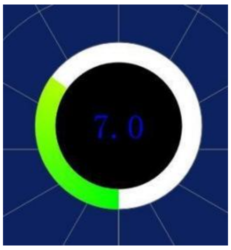


FIG 13 SCAN FREQUENCY ADJUSTMENT

2.3.5 Angle Calibration

In the process of mechanical assembly of the lidar, the user may have deviation of zero Angle. At this time, the Angle calibration function of the client can be used to calibrate according to the actual demand. The specific operation is as follows:

1) Turn on the calibration function

During lidar scanning, click [Tools] in the main menu and select [Zero Adjustment]. These controls will be displayed.

2) Adjust angle

Click control to adjust the Angle to the appropriate position.

3) Save configuration

After adjustment, click control , the system will automatically save the calibration parameters, and the calibration will take effect after saving.

2.3.6 Smoothing

Click [Tools] in the main menu, then select [Filtering] to add the lidar data filtering algorithm.

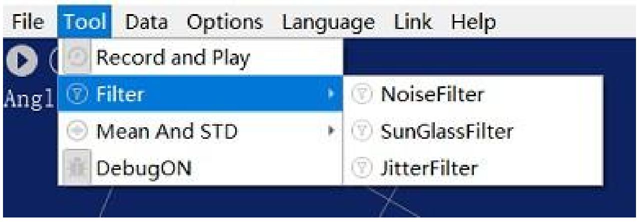


FIG 14 YDLIDAR 4ROS SERIES RUN EVALUATION SOFTWARE

Note: please click [Help] and select [More Information] to learn more about how to use the LidarViewer. (e.g. display mean and standard deviation, playback and recording, debugging, etc.)

3 LINUX ROS OPERATION

There are many Linux versions， this article only uses Ubuntu 18.04, Melodic version ROS as an example.

SDK driver address:

https://github.com/YDLIDAR/YDLidar-SDK

ROS driver address:

https://github.com/YDLIDAR/ydlidar_ros_driver

3.1 Device Connection

Under Linux, the 4ROS and PC interconnect processes are consistent with those under Windows. See Device Connection under Window.

3.2 Compile and Install YDLidar-SDK

ydlidar_ros_driver depends on the YDLidar-SDK library. If you have never installed the TDLlidar-SDK library, or it has expired, you must first install the YDLidar-SDK library. If you have the latest version of YDLidar-SDK installed, please skip this step, then go to the next step.

```
$ git clone https://github.com/YDLIDAR/YDLidar-SDK.git

$ cd YDLidar-SDK/build

$ cmake ..

$ make $ sudo make install
```

3.3 ROS Driver Installation

1) Cloning GitHub's ydlidar_ros_driver Package:

```
$ git clone https://github.com/YDLIDAR/ydlidar_ros_driver.git
ydlidar_ws/src/ydlidar_ros_driver
```

2) Build the ydlidar_ros_driver software package:

```
$ cd ydlidar_ws $ catkin_make
```

3) Package environment Settings:

```
$ source ./devel/setup.sh
```

Note: Add a permanent workspace environment variable. It will be very convenient if ROS environment variables are automatically added to your bash session every time you start a new shell:

```
$ echo "source ~/ydlidar_ws/devel/setup.bash" >> ~/.bashrc

$ source ~/.bashrc
```

4) Verify that your package path is set, echo the ROS_PACKAGE_PATH variable.

```
$ echo $ROS_PACKAGE_PATH
```

You should see something like this: /home/tony/ydlidar_ws/src:/opt/ros/melodic/share

5) Create Serial Port Alias [Optional]

```
$ chmod 0777 src/ydlidar_ros_driver/startup/*

$ sudo sh src/ydlidar_ros_driver/startup/initenv.sh
```

Note: After completing the previous operation, re-insert the LiDAR again.

3.4 Run the ydlidar_ros_driver

1) Run ydlidar_ros_driver with startup file, as shown below:

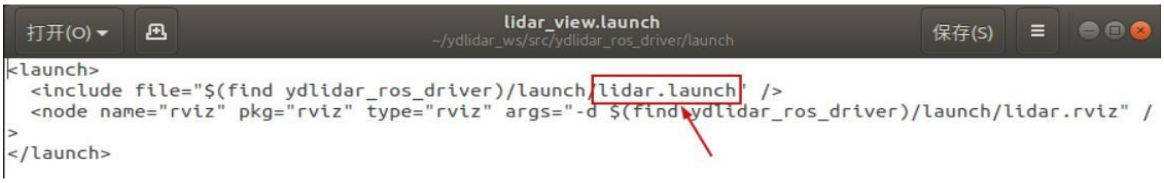
```
 $ roslaunch ydlidar_ros_driver TG.launch
```

2) RVIZ scan result checking

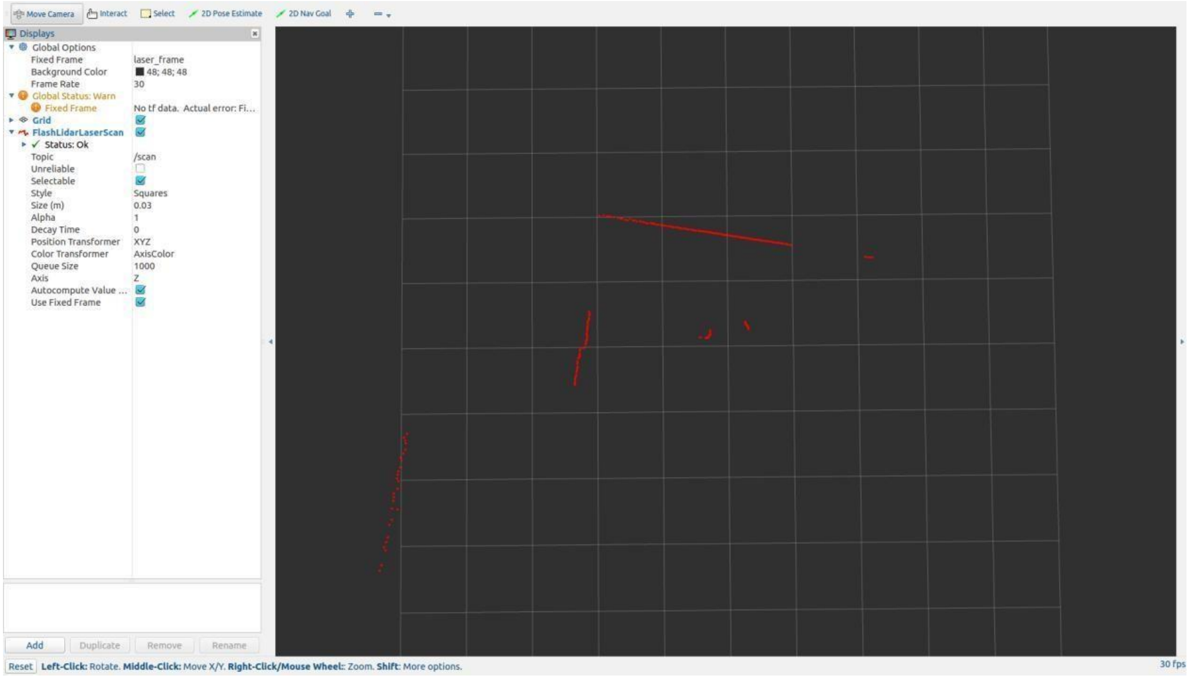
```
$ roslaunch ydlidar_ros_driver lidar_view.launch

### The scan results are visible in RVIZ
```

Note: Take G4 as an example by default. If you use other lidars, change the lidar.launch file in lidar_view.launch file to the corresponding **. (If using 4ROS series lidar, change to TG. Launch)



```
<launch>
  <include file="$(find ydlidar_ros_driver)/launch/lidar.launch" />
  <node name="rviz" pkg="rviz" type="rviz" args="-d $(find ydlidar_ros_driver)/launch/lidar.rviz" /
>
</launch>
```


Move Camera
Interact
Select
2D Pose Estimate
2D Nav Goal
Displays
Add
Duplicate
Remove
Rename
Reset
Left-Click: Rotate. Middle-Click: Move X/Y. Right-Click/Mouse Wheel: Zoom. Shift: More options.
30 fps

Global Options	
Fixed Frame	laser_frame
Background Color	■ 48; 48; 48
Frame Rate	30
Global Status: Warn	
Fixed Frame	No tf data. Actual error: Fi…
Grid	☑
FlashLidarLaserScan	☑
✓ Status: Ok	
Topic	/scan
Unreliable	□
Selectable	☑
Style	Squares
Size (m)	0.03
Alpha	1
Decay Time	0
Position Transformer	XYZ
Color Transformer	AxisColor
Queue Size	1000
Axis	Z
Autocompute Value …	☑
Use Fixed Frame	☑

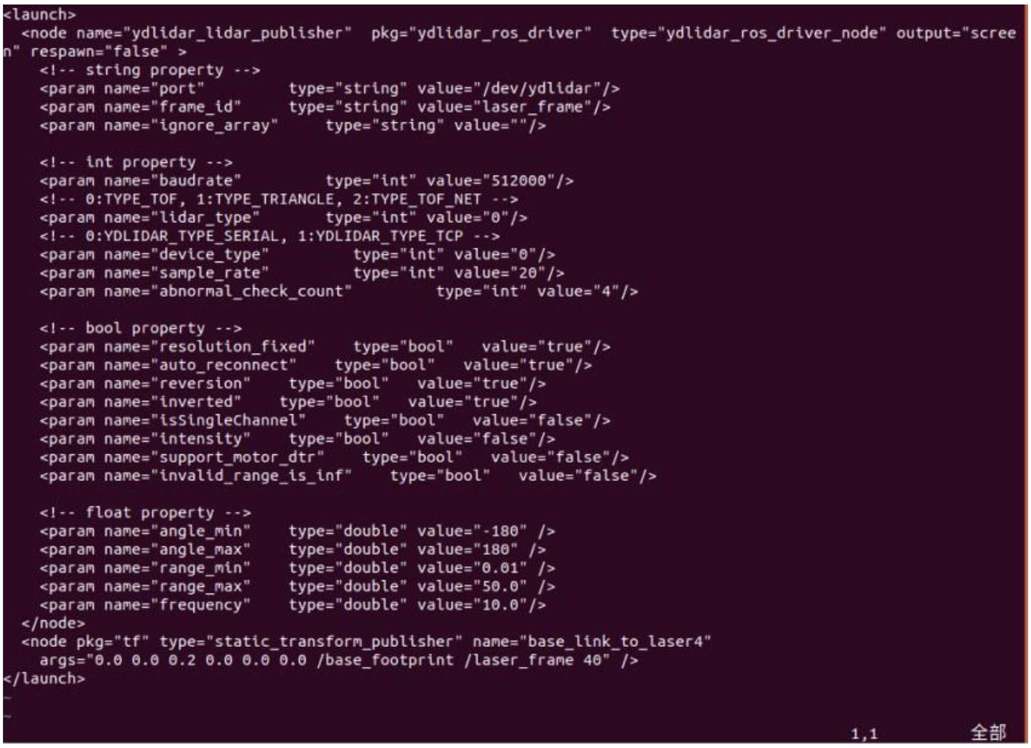
FIG 15 YDLIDAR 4ROS RVIZ

3.5 Modify Scan Angle

The scanning data seen by running the launch file is displayed by default with 360- degree data. To modify the display range, you need to modify the configuration parameters in the launch file. The specific operation is as follows:

1) Go to TG.launch directory and use vim to edit lidar.launch， the contents are as shown in the figure:

```
$ vim TG.launch
```



```
<launch>
  <node name="ydlidar_lidar_publisher"  pkg="ydlidar_ros_driver"  type="ydlidar_ros_driver_node" output="scree
n" respawn="false" >
    <!-- string property -->
    <param name="port"         type="string" value="/dev/ydlidar"/>
    <param name="frame_id"     type="string" value="laser_frame"/>
    <param name="ignore_array"     type="string" value=""/>

    <!-- int property -->
    <param name="baudrate"         type="int" value="512000"/>
    <!-- 0:TYPE_TOF, 1:TYPE_TRIANGLE, 2:TYPE_TOF_NET -->
    <param name="lidar_type"       type="int" value="0"/>
    <!-- 0:YDLIDAR_TYPE_SERIAL, 1:YDLIDAR_TYPE_TCP -->
    <param name="device_type"         type="int" value="0"/>
    <param name="sample_rate"         type="int" value="20"/>
    <param name="abnormal_check_count"         type="int" value="4"/>

    <!-- bool property -->
    <param name="resolution_fixed"    type="bool"   value="true"/>
    <param name="auto_reconnect"    type="bool"   value="true"/>
    <param name="reversion"    type="bool"   value="true"/>
    <param name="inverted"    type="bool"   value="true"/>
    <param name="isSingleChannel"    type="bool"   value="false"/>
    <param name="intensity"    type="bool"   value="false"/>
    <param name="support_motor_dtr"    type="bool"   value="false"/>
    <param name="invalid_range_is_inf"    type="bool"   value="false"/>

    <!-- float property -->
    <param name="angle_min"    type="double" value="-180" />
    <param name="angle_max"    type="double" value="180" />
    <param name="range_min"    type="double" value="0.01" />
    <param name="range_max"    type="double" value="50.0" />
    <param name="frequency"    type="double" value="10.0"/>
  </node>
  <node pkg="tf" type="static_transform_publisher" name="base_link_to_laser4"
    args="0.0 0.0 0.2 0.0 0.0 0.0 /base_footprint /laser_frame 40" />
</launch>
~
~
                                                                      1,1           全部
```

FIG 16 4ROS.LAUNCH FILE

Note: For more information about the file contents, please refer to

https://github.com/YDLIDAR/ydlidar_ros_driver#configure-ydlidar_ros_driver-internal-parameter

2) The 4ROS lidar coordinates follow the right-hand rule within ROS, with an angle range of [-180, 180]. "angle_min" is the start angle, and "angle_max" is the endangle. The specific scope needs to be modified according to actual use.

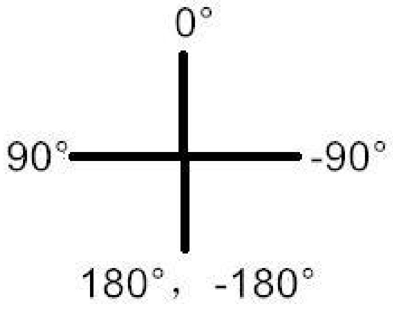


FIG 17 YDLIDAR 4ROS COORDINATES DEFINITION

4 CAUTION

4.1 Ambient Temperature

When the working environment temperature of 4ROS is too high or too low, it will affect the accuracy of the distance measuring system. It may also damage the structure of the scanning system and reduce the life of the 4ROS lidar. Avoid use in high temperature (>50 degrees Celsius) and low temperature (<0 degrees Celsius) conditions.

4.2 Ambient Lighting

4ROS use 905nm narrow pulse laser source, optimized optical and electric design enable strong light interference resistance, thus it could meet indoor and outdoor application requirements.

4.3 Power Supply

During the development process, since the drive current of the USB interface of each platform or the USB interface of the computer may be too low to drive the 4ROS, the external power supply of the +5V to the 4ROS needs to be provided through the USB_PWR interface of the USB interface board. It is not recommended to use mobile phone power bank because the voltage ripple of power bank is too large.

5 REVISE

Date	Version	Content
2022-07-01	1.0	Composing a first draft