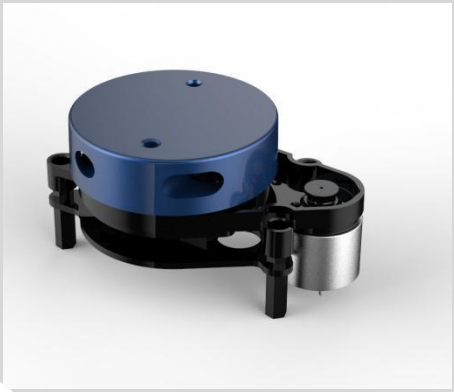
YDLIDAR X2 USER MANUAL



DOC#：01.13.000102

https://www.facebook.com/ydlidar/

CONTENTS

WINDOWS USAGE GUIDE

Device connection

When evaluating and developing X2 under windows, you need to interconnect X2 and PC.
The specific process is as follows:

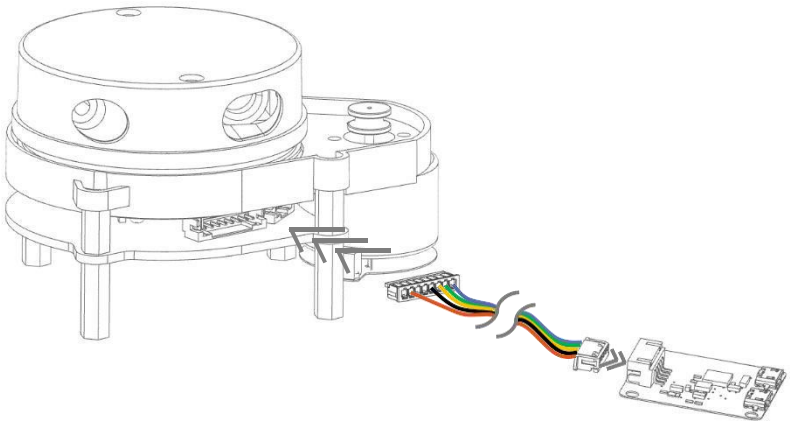


FIG 1 YDLIDAR X2 CONNECTION STEP 1

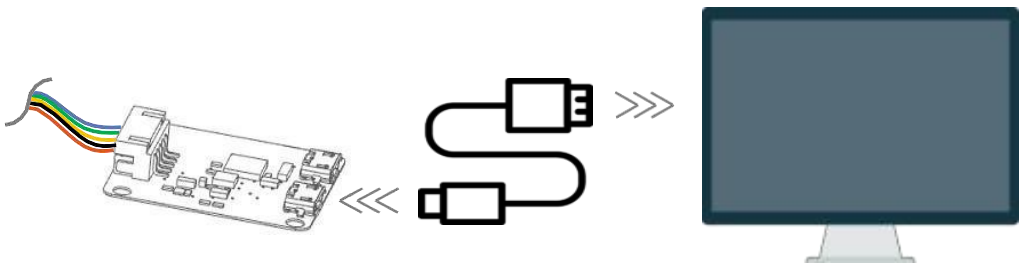


FIG 2 YDLIDAR X2 CONNECTION STEP 2

First connect the adapter board and X2, then connect the USB cable to the USB port of the adapter board and PC. Note that the Micro interface of the USB cable is connected to the USB_DATA.After X2 is powered on, it is in idle mode without turning its motor.

The USB interface's drive current in some development platforms or PCs is weak, so X2 needs a +5V auxiliary power supply to support its normal work.

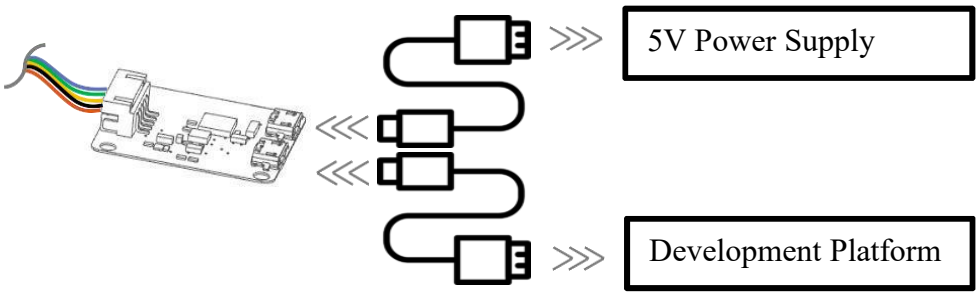


FIG 3 YDLIDAR X2 AUXILIARY POWER SUPP

Driver Installation

To evaluate and develop the X2 under Windows, please install the serial port driver of the USB adapter board which 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:

http://ydlidar.com/

http://cn.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

After extracting 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.

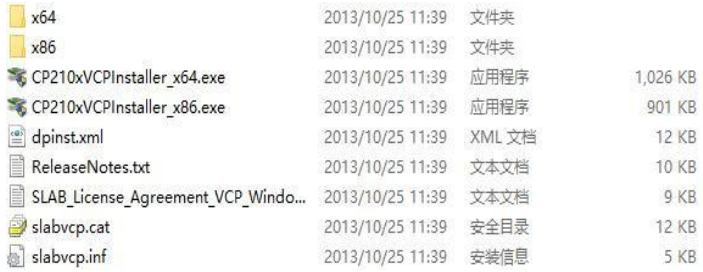


FIG 4 YDLIDAR X2 DRIVER VERSION SELECTION

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

FIG 5 YDLIDAR X2 DRIVER INSTALLATION

After the installation is complete, right click [My Computer], select [Properties]. Under the [System] screen, select [Device Manager] in the left menu to enter the device manager. Expand [Port] to see the serial port name corresponding to the identified USB adapter, which means the driver is successfully installed.The figure below is COM3. (Note that the port should be checked if X2 and PC are interconnected)

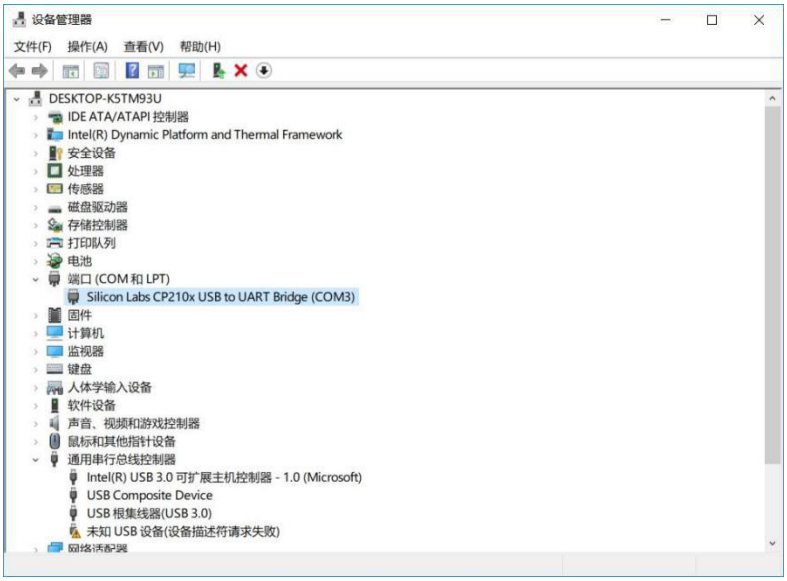


FIG 6 YDLIDAR X2 DRIVE INSTALLATION

Evaluation software

YDLIDAR provides Point Cloud Viewer, a point cloud data visualization software for X2 real-time scanning. The user can intuitively observe the X2 scan effect picture using this software. YDLIDAR provides X2 real-time point cloud data and real-time scanning frequency, and X2 version information can be read at the same time. And can save the scan data offline to an external file for further analysis.

Before using YDLIDAR, make sure that the X2 USB adapter board serial port driver is installed successfully, and check whether the X2 and PC USB ports are successfully interconnected. Run the evaluation software: PointCloudViewer.exe, select the corresponding serial port number and model number.

FIG 7 YDLIDAR X2 EVALUATION SOFTWARE

Note: The Lidar does not turn on the heartbeat function by default. This function needs to send the scan command continuously to make it work normally. If the scanning frequency is stopped, the Lidar will stop scanning. Currently, G4 and F4 are compatible with this function, and X2 and X2 are not compatible.

After confirmation,you can see the following screen：

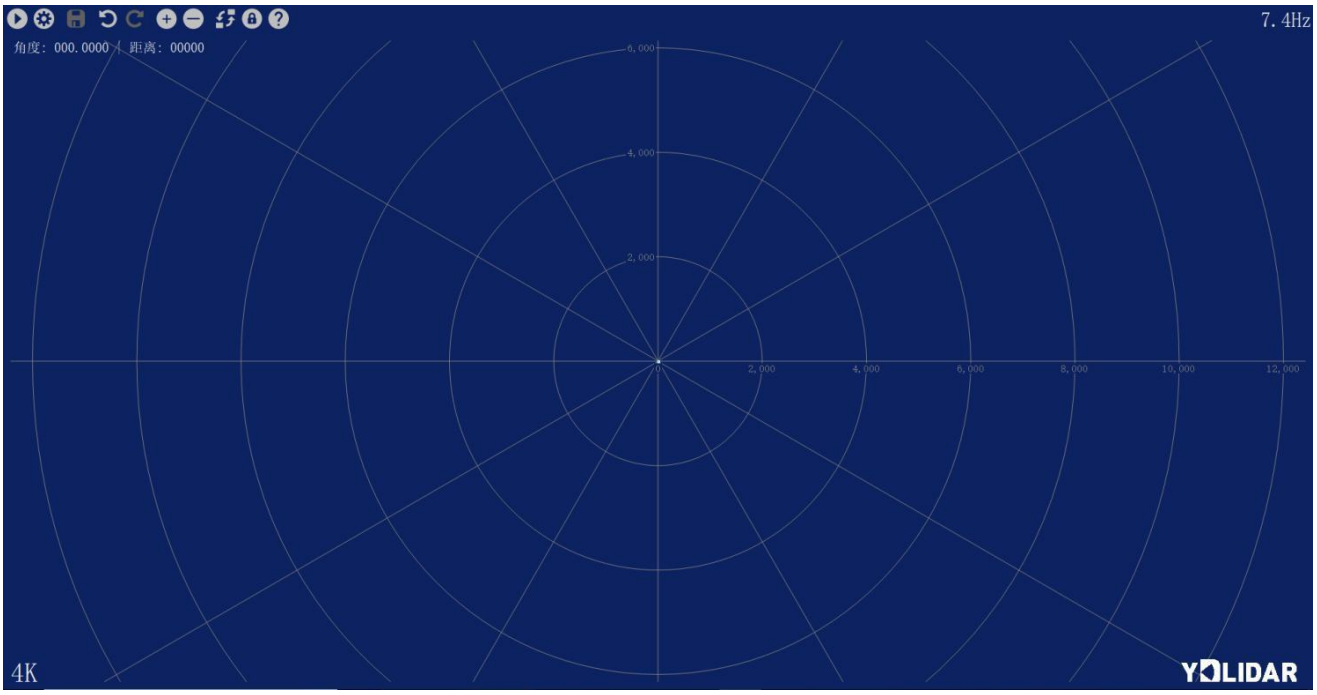


FIG 8 POINTCLOUD VIEWER EVALUATION SOFTWARE STARTUP DISPLAY

START SCANNING

Click  to start scanning and display the environment point cloud.

Clicking  to stop it,as shown below:

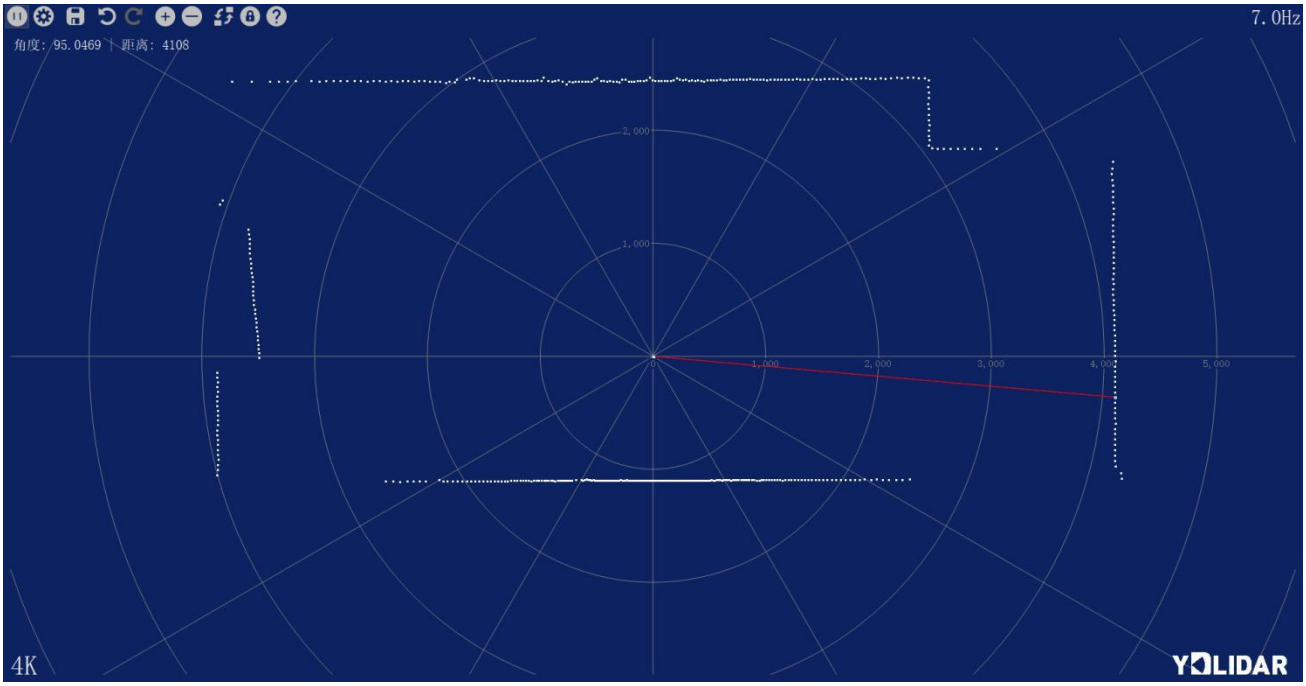


FIGURE 9 LIDAR SCANNING POINT CLOUD DISPLAY10

SYSTEM SETTINGS

Click System Settings  and the following settings box will pop up:

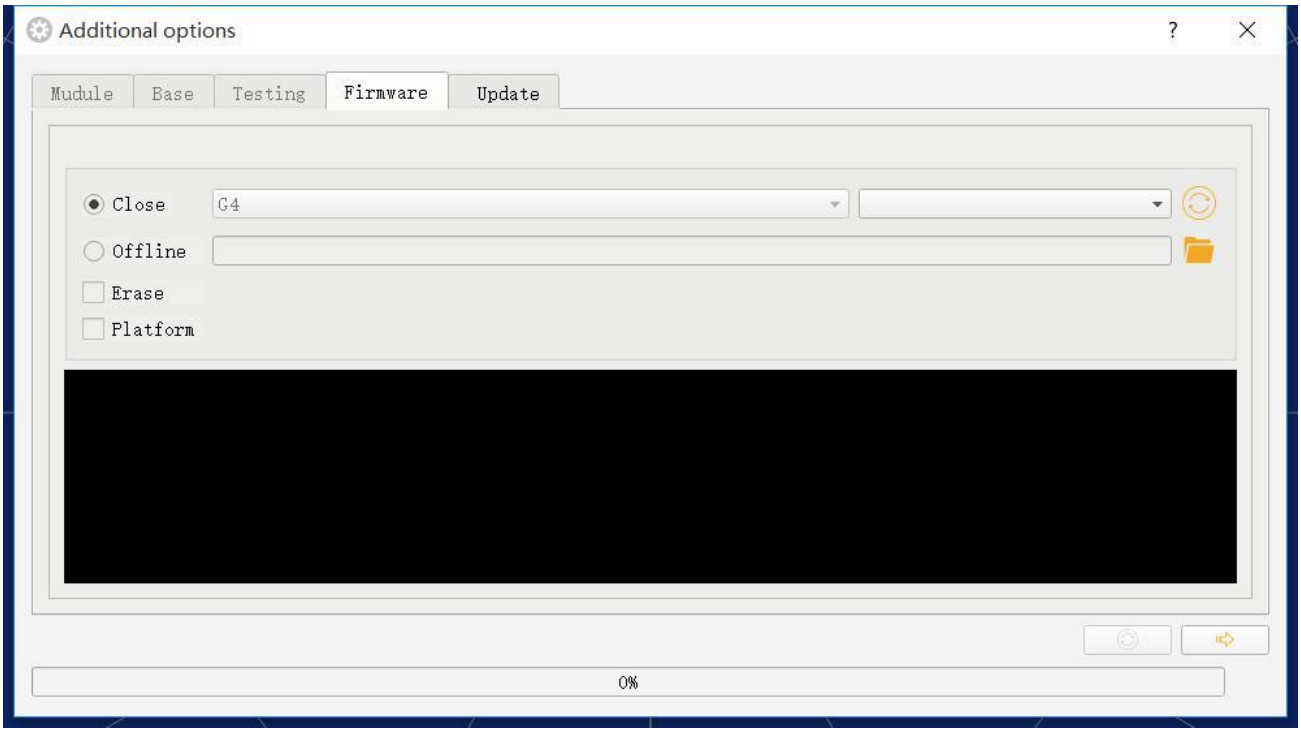


FIGURE 10 CLIENT SETTINGS BOX

As shown in the figure, you can configure and detect the Lidar on this setup page, as well as Lidar firmware upgrade, client software upgrade, etc.

SAVE DATA

During Lidar scanning,click , Save the point cloud data as prompted.The system will save the point cloud information scanned in a circle according to the following format.

```
angle:9.5469    ,    distance:4654
angle:9.8125    ,    distance:4709
angle:10.094    ,    distance:4763
angle:10.625    ,    distance:4947
angle:11.125    ,    distance:6204
angle:11.203    ,    distance:0
angle:11.391    ,    distance:6253
angle:11.766    ,    distance:0
angle:12.609    ,    distance:0
angle:12.719    ,    distance:7895
```

FIGURE 11 POINT CLOUD DATA SAVE FORMAT

ANGLE CALIBRATION

During the mechanical assembly of the Lidar, the user may have a deviation in the zero angle. In this case, the angle calibration function of the client can be used to calibrate according to actual needs. The specific operations are as follows:

(1) Unlock calibration function

Click the unlock control , the system will pop up the login box, the default password is ydlidar. The effect of these controls will change after unlocking.

(2) setting the baseline

Click and the system will provide a baseline of the appropriate size as a reference for the adjustment.

(3) Adjusting the angle

Click to adjust the angle to the appropriate position.

(4) save configuration

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

(5) Lock calibration function

After the calibration is saved, click again to lock the function to prevent misoperation. these controls will return to normal functionality after being locked.

FIRMWARE UPGRADE

Click System Settings and select Firmware, as shown in Figure 10. Click to get the latest firmware. When there is a new version, the user can click on the control to perform a firmware update on the Lidar.

Note:During the upgrade process,keep the Lidar power supply normal,communication stable,network steady.Do not plug or unplug the Lidar serial port.

SOFTWARE UPGRADE

The client software will be version-changed and users can update to the latest version for a better experience.

Click System Settings and select Update, as shown below:

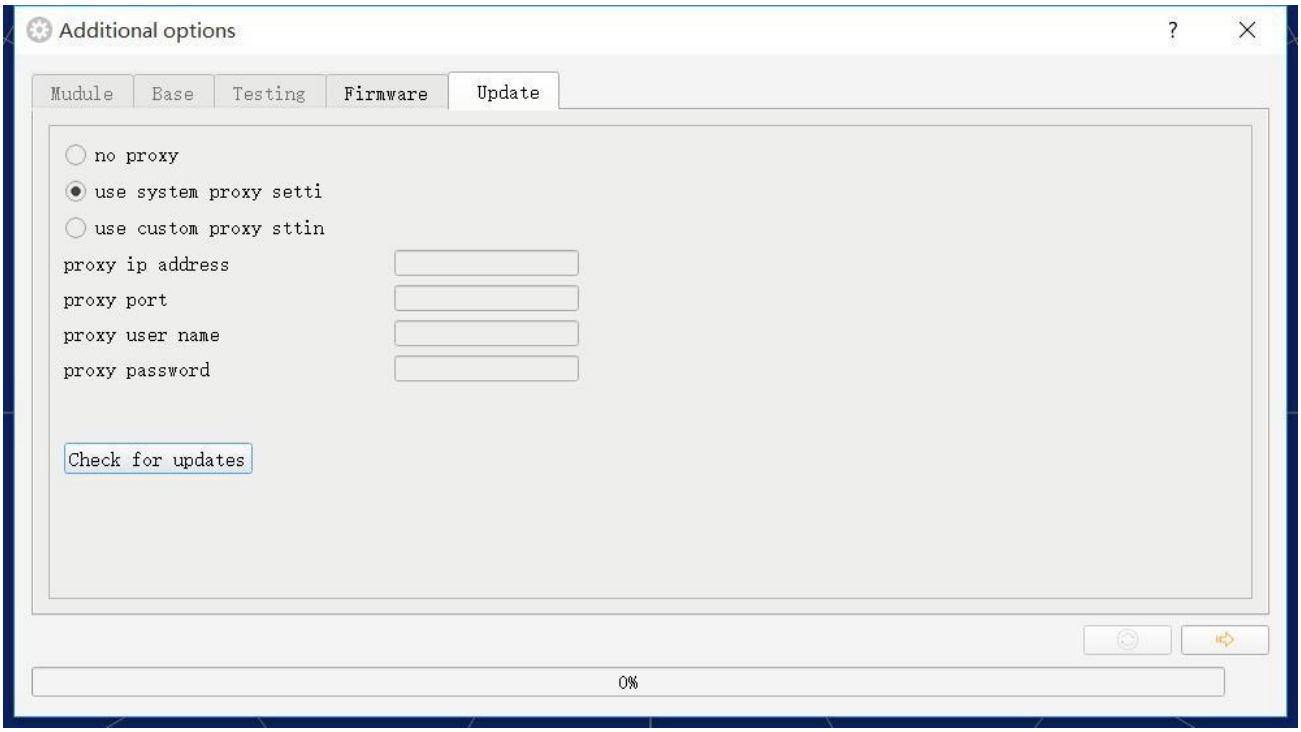


FIGURE 12 SYSTEM UPDATE PAGE

Select the configuration as shown above, click ‘check for updates’, if there is no new version, the system will prompt no update; when there is a new version, the software version information will be filled in the information box, click ⇨ to update the client software.

LINUX ROS OPERATION

Because there are many Linux versions, this article only uses Ubuntu 16.04, Kinetic version ROS as an example.

Device connection

Under Linux, the X2 and PC interconnect processes are consistent with those under Windows. See Device Connection under Window.

ROS Driver Installation

Before doing the following, make sure that the Kinetic version ROS environment is installed correctly.

（1） Use the command to create the ydlidar_ws workspace and copy the ROS driver package ydlidar in the X2 package to the ydlidar_ws/src directory. Switch to the ydlidar_ws workspace and compile again.

```
$ mkdir -p ~/ydlidar_ws/src
$ cd ~/ydlidar_ws
$ catkin_make
```

（2） After the compilation is complete, add the ydlidar environment variable to the ~/.bashrc file and make it effective.

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

（3） Add a device alias /dev/ydlidar to the X2 serial port.

```
$ cd ~/ydlidar_ws/src/ydlidar/startup
$ sudo chmod +x initenv.sh
$ sudo sh initenv.sh
```

RVIZ installation

（1） Online installation

```
$ sudo apt-get install python-serial ros-kinetic-serial g++ vim \
 ros-kinetic-turtlebot-rviz-launchers
```

（2） If there is a problem with the installation, update the source cache and reinstall it.

```
$ sudo apt-get update
```

RVIZ Check the scan results

Run the launch file and open rviz to view the X2 scan results, as shown in the following figure:

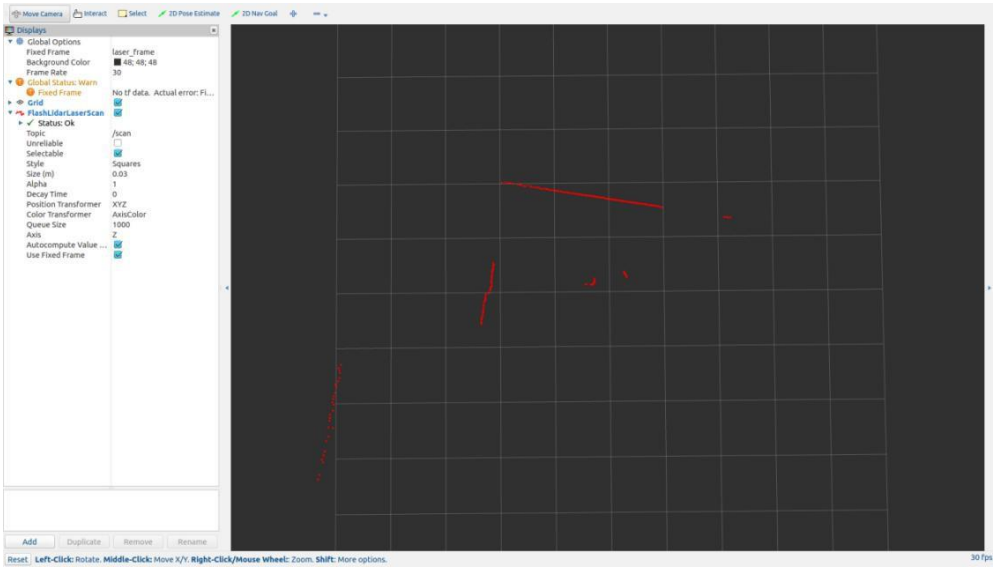


FIG13 YDLIDAR X2 RVIZ

Modify the scan angle problem

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 X2.launch's directory and use vim to edit X2.launch. The contents are as shown in the figure:

```
$ roscd ydlidar/launch

$ vim  lidar.launch
```

```
<launch>
  <node name="ydlidar_node"  pkg="ydlidar"  type="ydlidar_node" output="screen">
    <param name="port"         type="string" value="/dev/ydlidar"/>
    <param name="baudrate"     type="int"    value="115200"/>
    <param name="frame_id"     type="string" value="laser_frame"/>
    <param name="angle_fixed"  type="bool"   value="true"/>
    <param name="intensities"  type="bool"   value="false"/>
    <param name="angle_min"    type="double" value="-180" />
    <param name="angle_max"    type="double" value="180" />
    <param name="range_min"    type="double" value="0.08" />
    <param name="range_max"    type="double" value="8.0" />
    <param name="ignore_array" type="string" value="" />
  </node>
  <node pkg="tf" type="static_transform_publisher" name="base_link_to_laser4"
    args="0.2245 0.0 0.2 0.12 0.0  0.0 /base_footprint /laser_frame 40" />
</launch>
```

FIG 14 LIDAR.LAUNCH FILE

（2） The X2 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 end angle.
The specific scope needs to be modified according to actual use.

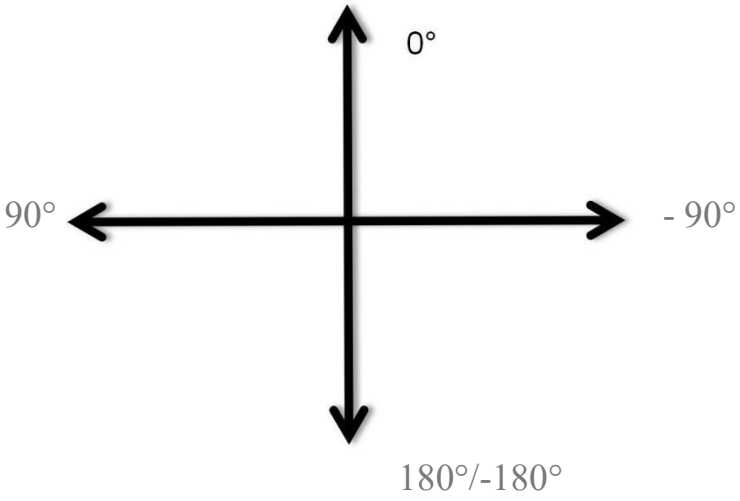


FIG15 YDLIDAR X2 COORDINATES DEFINITION

PRECAUTIONS FOR USE

Temperature

When the working environment temperature of X2 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 X2 lidar. Avoid use in high temperature (>40 degrees Celsius) and low temperature (<0 degrees Celsius) conditions.

Ambient lighting

The ideal working environment for the X2 is indoor, indoor lighting (including no light) will not affect the X2 work. However, avoid using a strong light source (such as a high-power laser) to directly illuminate the X2's vision system.

If you need to use it outdoors, please avoid that the X2's vision system is directly facing the sun. This may cause permanent damage to the vision system's sensor chip, thus invalidating the distance measurement.

Please note that the X2 standard version is subject to interference in outdoor strong sunlight reflection environments.

Power demand

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 X2, the external power supply of the +4V to the X2 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 some brands of power bank is too large.

REVISION

DATE	VERSION	CONTENTS
2019-04-24	1.0	FIRST WRITTEN