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# SHENZHEN LDROBOT CO., LTD.

## DTOF LiDAR LD06 SPECIFICATION

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Product Name : DTOF LiDAR\_LD06

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Description : DTOF COAXIAL BRUSHLESS LiDAR with Raspberry pi SBC  
(based on Raspbian OS 32-bit kernel version 5.4)

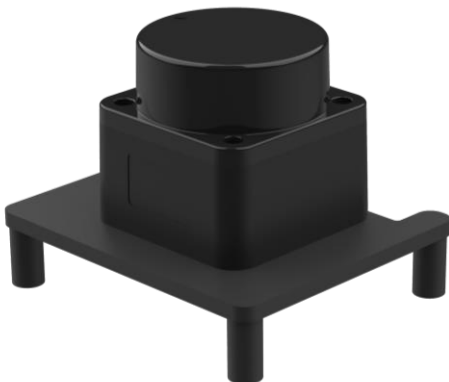
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Date : 2020-09-01

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File No : LD-LD06-DS-REV\_2.3\_EN

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## 1. DEVELOPMENT KIT

The development kit of DTOF LiDAR\_LD06 is an accessory tool (includes bracket & DTOF module & Uart cable & Assembly screws) provided for robotic device development or performance evaluation of sensor products, and for the educational purpose use of robotic device motion control and algorithm study, Users need to purchase a RPI SBC ( Raspberry PI3 A+/B+, Raspberry PI3 B, Raspberry PI 4B) to pair with DTOF module for use/development.



(a) TOFLIDAR\_LD06 (b) Uart cable (c) raspberry pi 4B /PI 3B/PI3 A+/Pi3 B+

FIG 1 TOFLIDAR\_LD06 DEVELOPMENT KIT

CHART 1 TOFLIDAR\_LD06 DEVELOPMENT KIT DESCRIPTION

Item	Qty	Description
TOFLIDAR_LD06	1	Detection product for space detection and obstacle recognition
Uart cable	1	Use for connection between the DTOF and Raspberry pi 4B for power and data transfer
Raspberry pi 4B/3B/3B+/3A+	1	As a computing tool for the TOF lidar data analysis and visualization into to display device

## 2. INSTALL RASPBIAN OS ON SD CARD

### STEP1: Download a Raspbian OS

To install Raspbian OS on a SD Card you will need to download a Raspbian OS firstly. User may download the Raspbian OS directly from the official website of raspberry foundation, Ldrobot TOF lidar user manual is based on the version of Raspberry Pi OS (32-bit) with desktop and recommended software as highlighted in the figure 2. <https://www.raspberrypi.org/downloads/raspberry-pi-os/>

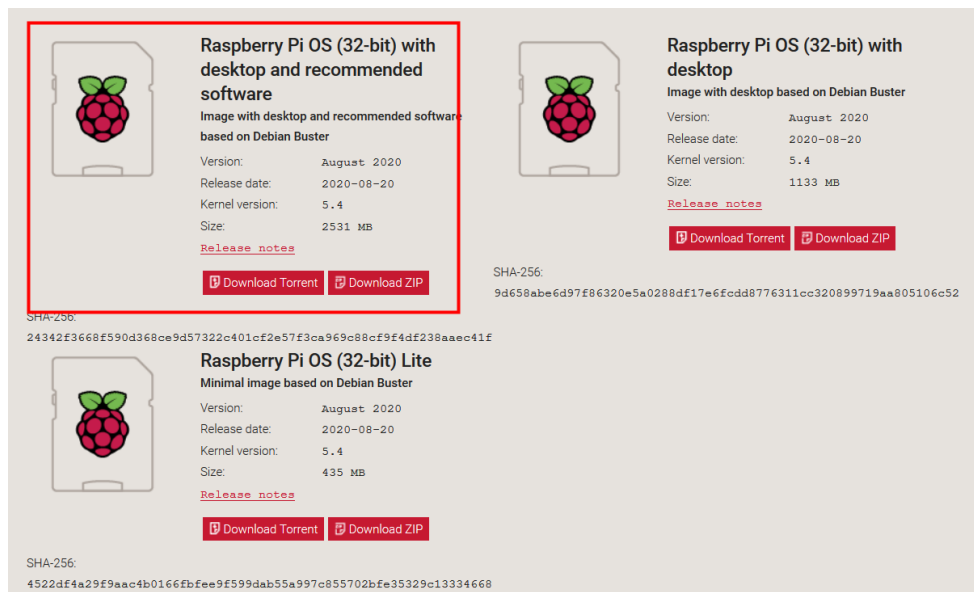


FIG 2. RASPBERRY OFFICIAL WEBSITE

### STEP2: Flash Raspbian OS into SD card

After downloading a Raspbian OS, you need to install win32diskimager as the tool to flash Raspbian OS into SD card. After the image file has been flashed into the SD card successfully, SD card will automatically display a boot partition.

<https://sourceforge.net/projects/win32diskimager/>

### 3. INSTALL ROS MELODIC ON RASPBIAN OS

Powering up the Raspberry Pi. And then insert the Micro SD card into the Pi SD-cage . Connects the Mini-HDMI cable to your display ,connect mouse and keyboard . Plug in the power cable to turn on the Raspberry Pi. Then modify the source file of Rasbian OS.

```
sudo vi /etc/apt/sources.list  
  
deb http://mirrors.ustc.edu.cn/raspbian/raspbian/ buster main contrib non-free rpi
```

#### STEP1: Install Dependencies and Download ROS source packages

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" >  
/etc/apt/sources.list.d/ros-latest.list'  
  
sudo apt-key adv --keyserver 'hkp://keyserver.ubuntu.com:80' --recv-key  
C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654  
  
sudo apt-get update  
  
sudo apt-get install -y python-rosdep python-rosinstall-generator python-wstool python-rosinstall  
build-essential cmake
```

Then initialize rosdep and update it

```
sudo rosdep init  
  
rosdep update
```

#### STEP2(OPTIONAL): Solve the ERROR:

ERROR :cannot download default sources list from:  
[https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/sources.list.d/20-](https://raw.githubusercontent.com/ros/rosdistro/master/rosdep/sources.list.d/20-default.list)  
default.list Website may be down.

```
sudo vi /etc/hosts
```

Add 151.101.76.133 raw.githubusercontent.com

Then reinitialize rosdep and update it

```
sudo rosdep init  
rosdep update
```

### STEP3: Install Melodic Desktop

You need to create a dedicated catkin workspace for building ROS and move to that directory.

```
mkdir ~/ros_catkin_ws  
cd ~/ros_catkin_ws  
rosinstall_generator desktop --rostdistro melodic --deps --wet-only --tar > melodic-desktop-wet.rosinstall  
wstool init -j8 src melodic-desktop-wet.rosinstall
```

The command will take a few minutes to download all of the core ROS packages into the src folder. If wstool init fails or is interrupted, you can resume the download by running:

```
wstool update -j 4 -t src
```

### STEP4: Fix the Issues

Let's install the compatible version of Assimp (Open Asset Import Library) to fix collada\_urdf dependency problem.

```
mkdir -p ~/ros_catkin_ws/external_src  
cd ~/ros_catkin_ws/external_src  
wget http://sourceforge.net/projects/assimp/files/assimp-3.1/assimp-3.1.1_no_test_models.zip/download -O assimp-3.1.1_no_test_models.zip  
unzip assimp-3.1.1_no_test_models.zip  
cd assimp-3.1.1  
cmake .  
make
```

```
sudo make install
```

The user need to install OGRE for rviz ,too

```
sudo apt-get install libogre-1.9-dev
```

The next step is to use the rosdep tool for installing all the rest of the dependencies:

```
cd ~/ros_catkin_ws  
rosdep install --from-paths src --ignore-src --rosdistro melodic -y
```

### **STEP5: Build and Source the Installation**

Once it has completed downloading the packages and resolving the dependencies you are ready to build the catkin packages. If you're using raspberry Pi 3, you need to increase the swap size first. If you are using raspberry Pi 4,you can skip this step.

```
sudo mkdir /swap  
cd /swap  
sudo dd if=/dev/zero of=swapfile bs=1024 count=2000000  
sudo mkswap swapfile  
sudo swapon swapfile
```

Then build.

```
cd ~/ros_catkin_ws  
sudo ./src/catkin/bin/catkin_make_isolated --install -DCMAKE_BUILD_TYPE=Release --  
install-space /opt/ros/melodic -j2
```

Now ROS Melodic should be installed on your Raspberry Pi 4. We will source the new installation with following command:

```
echo "source /opt/ros/melodic/setup.bash" >> ~/.bashrc  
  
source ~/.bashrc
```

Try launching roscore to check if everything was successful.

```
roscore
```

### **STEP6: Install udev library and wiringPi.**

Our driver depends on udev library, so udev library needs to be installed firstly.

```
sudo apt-get install libudev-dev
```

Then install GCC-5.

```
sudo apt remove gcc  
  
sudo apt install -y g++-5 gcc-5  
  
sudo update-alternatives --install /usr/bin/gcc gcc /usr/bin/gcc-5 10  
sudo update-alternatives --install /usr/bin/gcc gcc /usr/bin/gcc-5 20  
sudo update-alternatives --install /usr/bin/g++ g++ /usr/bin/g++-5 10  
sudo update-alternatives --install /usr/bin/g++ g++ /usr/bin/g++-5 20  
sudo update-alternatives --install /usr/bin/cc cc /usr/bin/gcc 30  
sudo update-alternatives --set cc /usr/bin/gcc  
sudo update-alternatives --install /usr/bin/c++ c++ /usr/bin/g++ 30  
sudo update-alternatives --set c++ /usr/bin/g++
```

Then install wiringPi, WiringPi has updated to 2.52 for the Raspberry Pi 4B.

```
cd /tmp  
  
wget https://project-downloads.drogon.net/wiringpi-latest.deb  
  
sudo dpkg -i wiringpi-latest.deb
```

After wiringPi being updated, you can check with the latest version update



```
gpio -v
```

## 4. START SERIAL ttyS0

```
sudo raspi-config
```

Open the system configuration interface as shown in the figure below, and select the **interface options**.

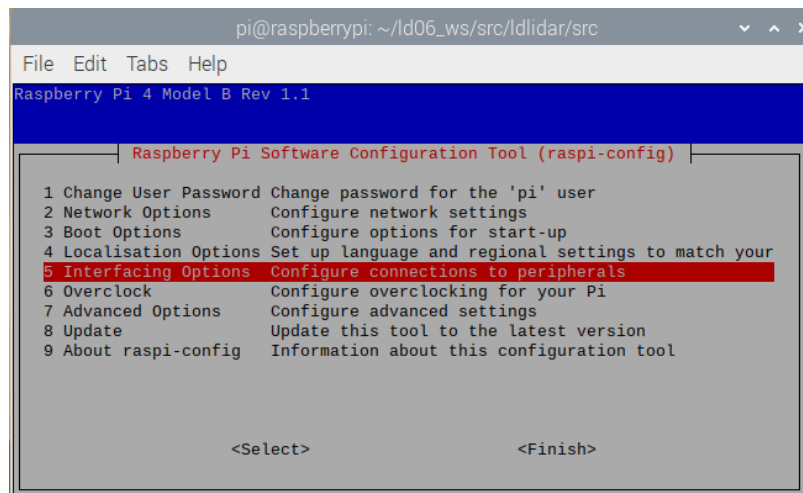


FIG 3. RASPBERRY SYSTEM CONFIGURATION I

Then select **P6 serial**.

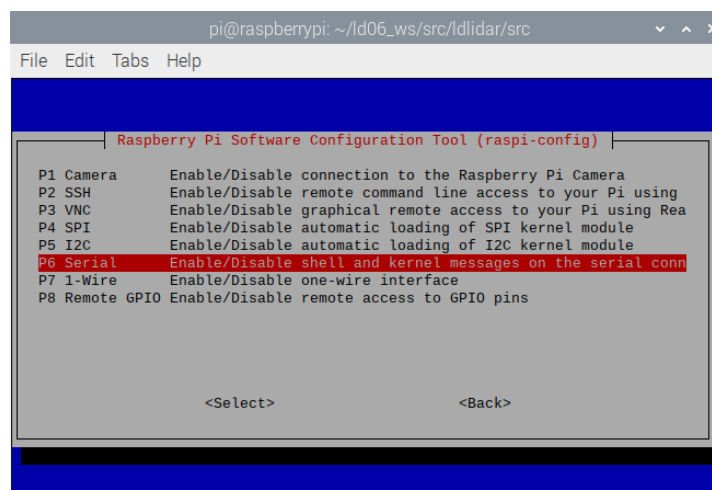


FIG 4. RASPBERRY SYSTEM CONFIGURATION II

Then click **Yes**.

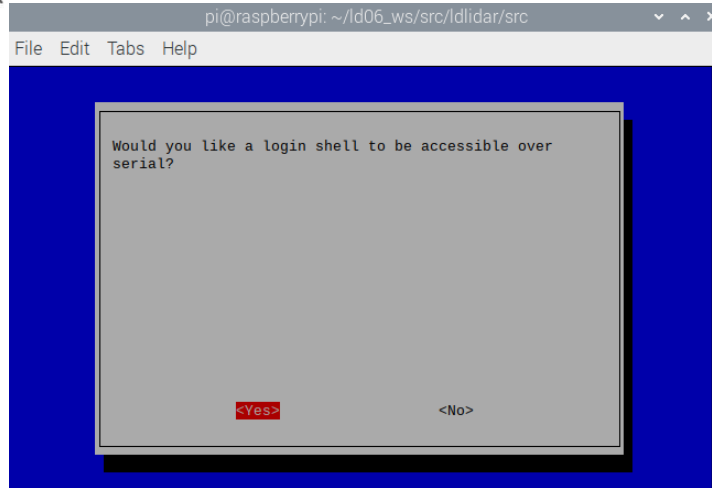


FIG 5. RASPBERRY SYSTEM CONFIGURATION III

Then Save and exit. Reboot raspberryPi. Please do not disconnect power during reboot. Otherwise, the serial configuration may not take effect.

```
reboot
```

Check if the serial port is open. View serial port mapping relationship

```
ls -l /dev
```

```
crw-rw---- 1 root video  241,  0 Jul  8 13:45 rpidvid-hevcmmem
crw-rw---- 1 root video  240,  0 Jul  8 13:45 rpidvid-intcmem
crw-rw---- 1 root video  238,  0 Jul  8 13:45 rpidvid-vp9mem
lrwxrwxrwx 1 root root      5 Jul  8 13:45 serial0 -> ttyS0
lrwxrwxrwx 1 root root      7 Jul  8 13:45 serial1 -> ttyAMA0
drwxrwxrwt 2 root root    40 Feb 14  2019 shm
drwxr-xr-x 3 root root   140 Jul  8 13:45 snd
```

FIG 6. RASPBERRY SERIAL PORT MAPPING

Serial0 is the serial port corresponding to the GPIO pin. If you see serial0 connected to ttys0, the serial port configuration is successful.

## 5. INSTALL LIDAR ROS PACKAGE

### STEP1: Device connection

Connect Lidar and Raspberry Pi 4B as shown in the figure below. 5v connect 5v Power, GND connect Ground, Motor PWM connect BCM18(pwm0), Lidar Uart TX connect BCM15(RXD).

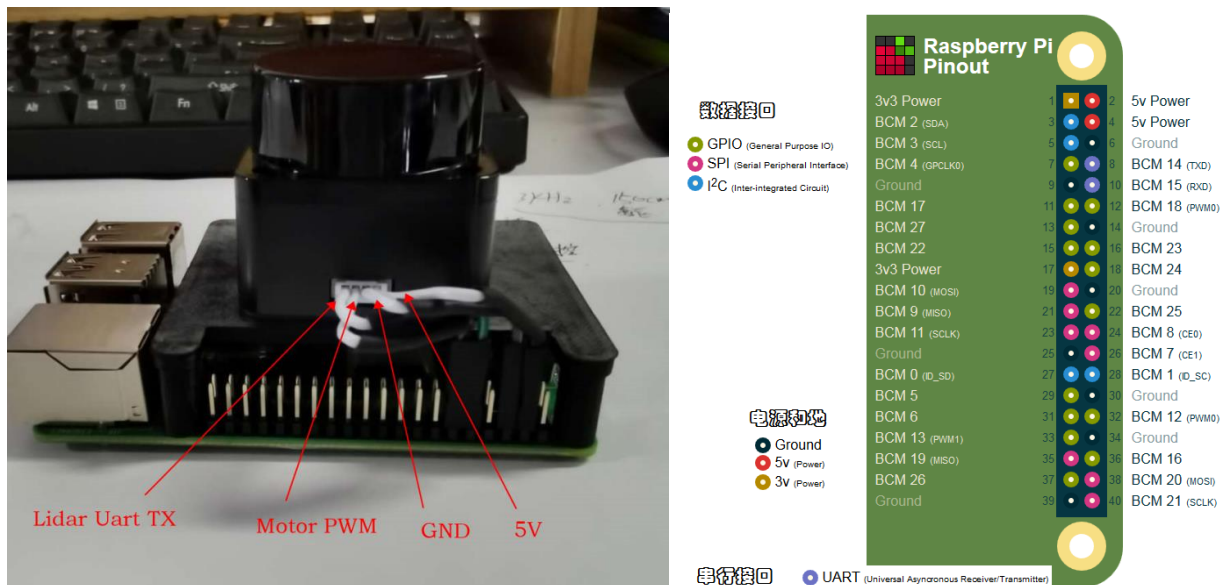


FIG 7. CONNECTION BETWEEN LIDAR AND RASPBERRY PI 4B

The users need to have the root permission of raspbian kernel system. After connecting TOF LiDAR\_LD06 with raspberry pi 4B/3B/3B+/3A+, you need to set the root password. Then log in to root. For convenience, we often set the password to raspberry. (low-case )

```
$ sudo passwd root
New password: Enter passwd : raspberry
Retype new password: Enter passwd : raspberry
passwd: password updated successfully
$ su
Enter passwd : raspberry
```

### STEP2: ROS DTOF\_LD06 Driver Compile

The ROS driver package has been uploaded into the `sdk_ld06_raspberry_ros/` directory. You just open the `sdk_ld06_raspberry_ros` workspace and compile.

```
$ cd /home/pi/sdk_ld06_raspberry_ros  
$ catkin_make  
$ source devel/setup.bash  
$ roslaunch ldlidar ld06.launch
```

### STEP3: RVIZ results

After running the launch file, you need to open a new terminal. Then run `rviz` to view the scan results, as shown in the following figure:

```
$ rosrun rviz rviz
```

You need to click the open config button. Then select the `ldlidar.rviz` file.

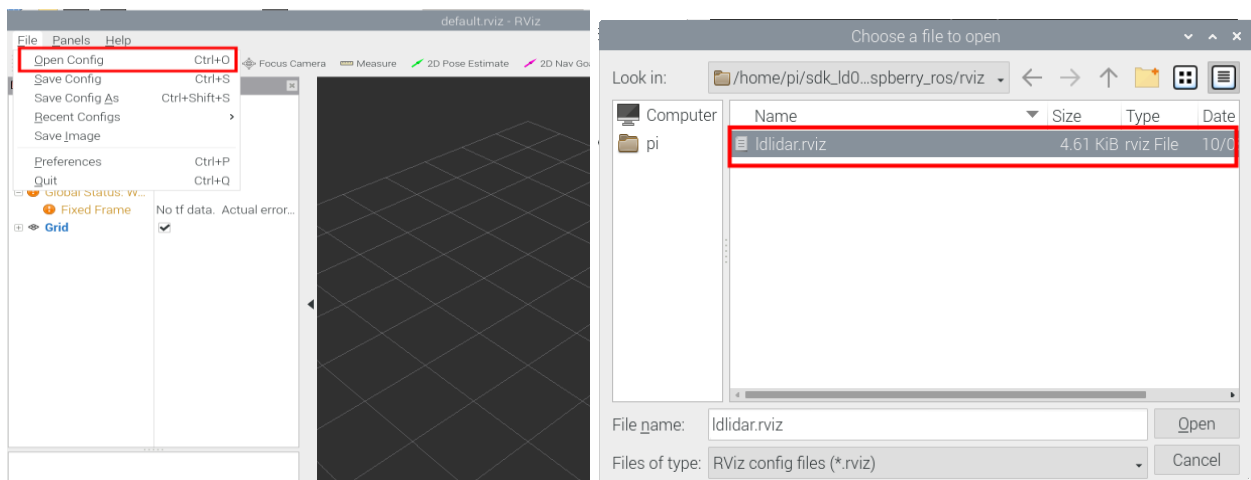


FIG 8 RVIZ CONFIGURATION

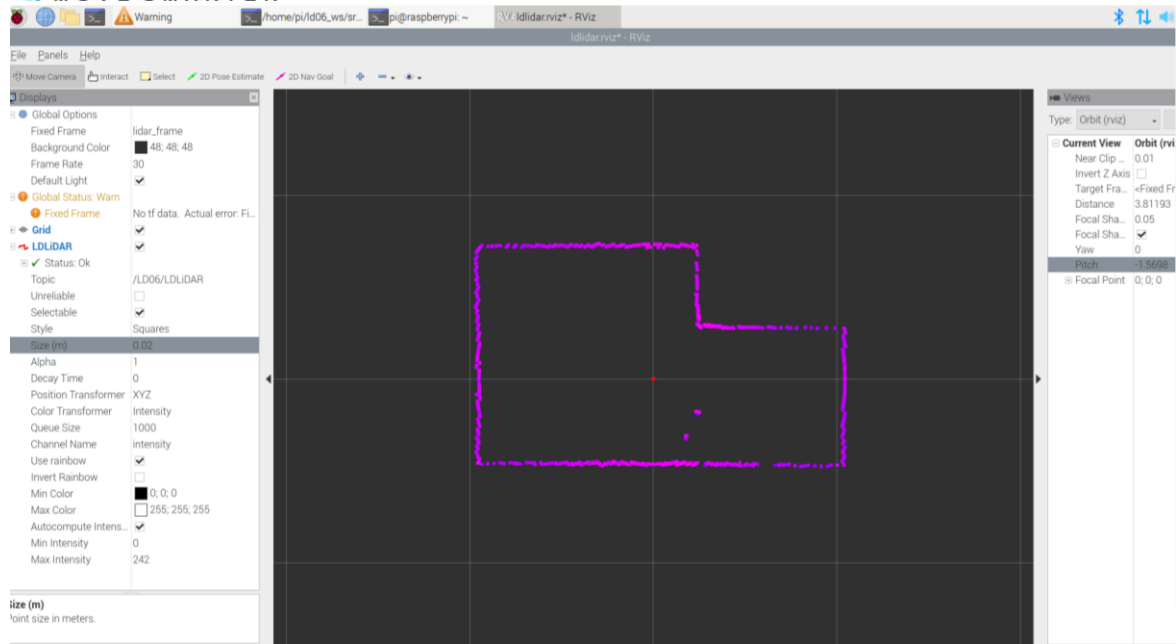


FIG 9 TOFLiDAR\_LD06 RVIZ

## 6. USE CAUTION

***ALARM: Please connect the TOFLiDAR\_LD06 before you power up the raspberry.***

### ● Temperature

When the working environment temperature of TOFLiDAR\_LD06 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 TOFLiDAR\_LD06. Avoid use in high temperature (>40 degrees Celsius) and low temperature (<0 degrees Celsius) conditions.

### ● Ambient lighting

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

If you need to use it outdoors, please avoid that the its 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 Lidar standard version is subject to interference in outdoor strong sunlight reflection environments.

### ● Power demand

For development ,both external adaptor or independent power bank works , but need to ensue 5V and 200MA current power input, for external adaptor solution, the Raspberry Pi SBC adaptor is the preference choose.