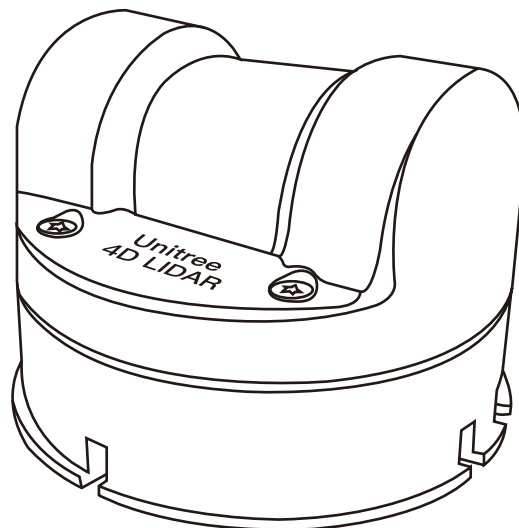


Unilidar 2

User Manual v1.0

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Unitree Lidar

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Introduction to Unilidar 2

• Purpose of the Software

Unilidar 2 is a software designed specifically for the Unitree 4D LIDAR L2, which can display real-time point cloud data from the laser detection and ranging device connected to a computer. With Unilidar 2, users can easily view the device status and point cloud data.

• Operating Environment

Unilidar 2 currently supports Windows (64-bit) systems.

• Hardware Configuration

There are no special configuration requirements for using Unilidar 2. However, due to the software's extensive point cloud display functions, please choose a computer with a high-performance graphics card.

Preparations Before Use

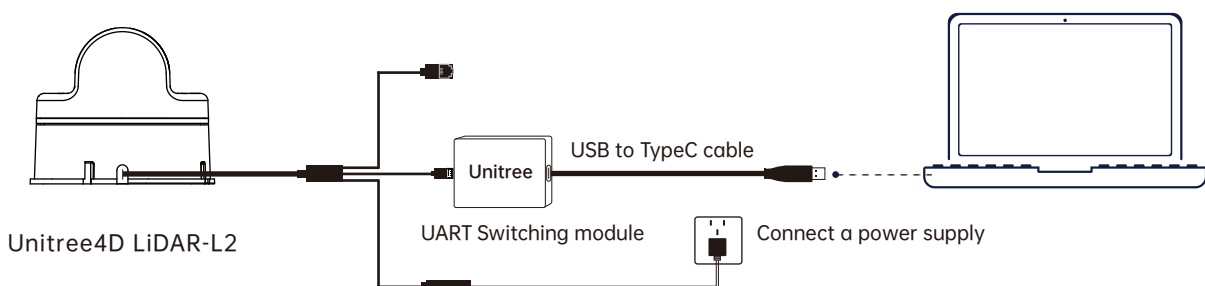
• Connecting L2 to PC

L2 supports both UART serial port connection and ENET network port connection. Ensure that the device is connected to a 12V power supply.

UART TTL Connection

For temporary testing or use of L2, it is recommended to use the converter module, power adapter, and data cable provided in the package. The connection method is as follows:

- Insert the 4PIN serial port of L2 into the converter module.
- Connect the power adapter to the power supply port of the cable for power supply.
- Insert the Type-C interface of the data cable into the data communication port of the converter module, and connect the other end to your personal computer.



ENET UDP Connection

L2 supports network UDP data transmission. Connect the network cable to the network port and power port of L2 to use it.

The network port of L2 can be directly used for data transmission. When using it, insert the network port into a switch or computer, and connect the power adapter to the power supply port of the cable. The default configuration information for L2 is:

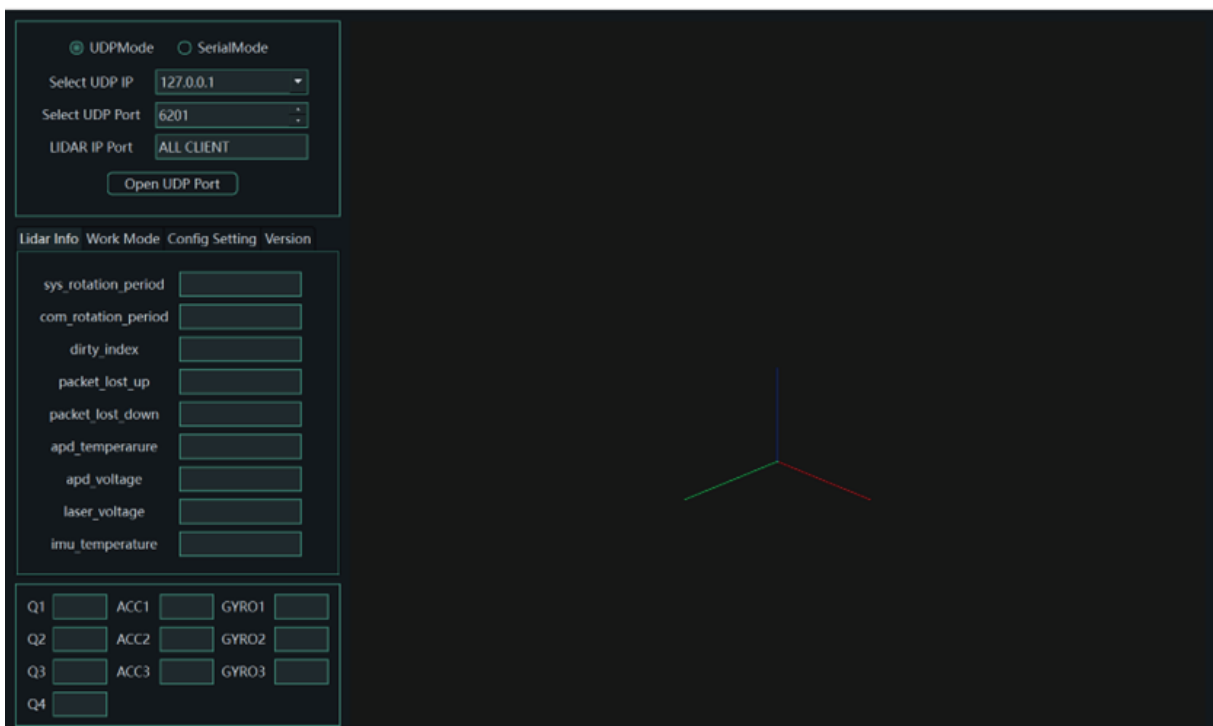
IP: 192.168.1.62, Gateway: 192.168.1.1, Subnet Mask: 255.255.255.0, the default target server IP address for sending data is 192.168.1.2. The radar UDP data transmission port is 6101, and the target server's receiving port is 6201. When using for the first time, please ensure that the target server's address and L2's IP do not conflict. If you need to modify the configuration information, it can be done through the host computer or SDK.

- The converter module, power adapter, and data cable are all included with the package, which can be used for power connection, control signal transmission, and data transmission. You can also use other cables according to your needs to improve the convenience and protection of the system (such as dust and waterproofing).
- When debugging, please be sure to place L2 on the rubber mat provided and place the rubber mat on a flat surface to ensure the radar works stably to avoid bumps and falls.

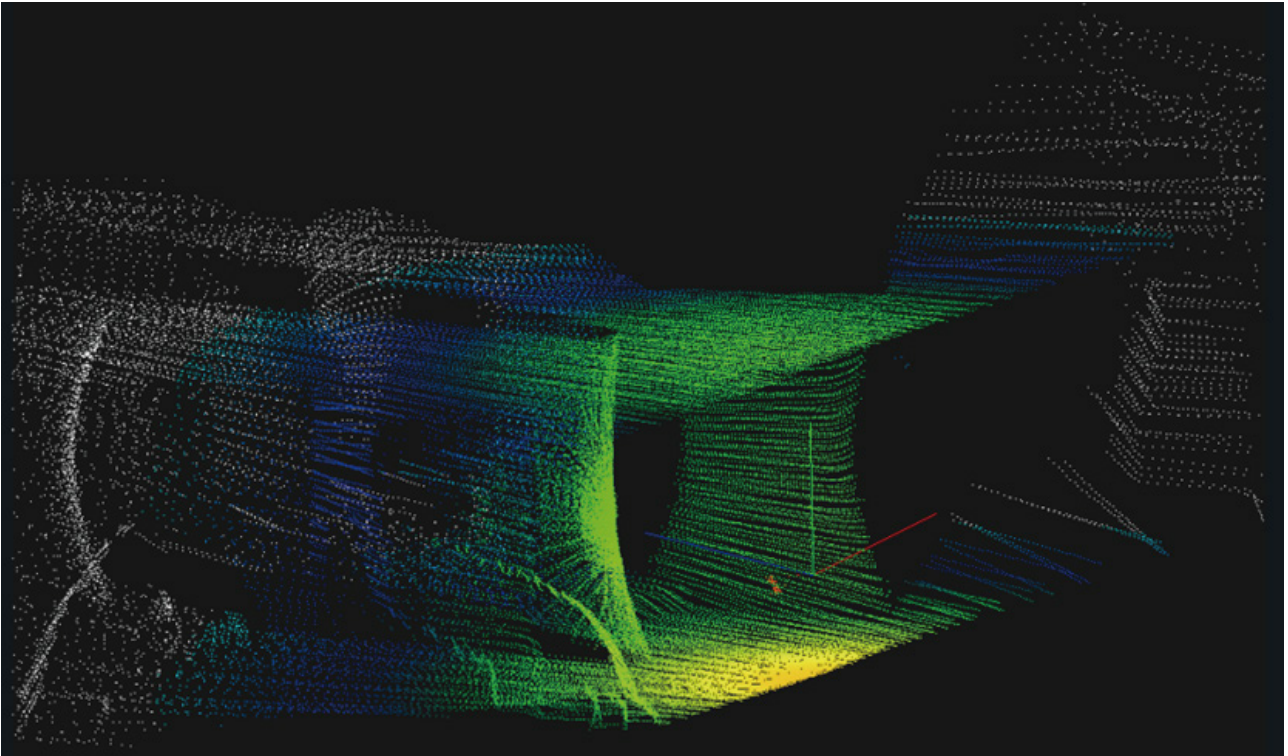
Getting Started

·Interface Overview

After launching Unilidar 2, you will enter the main interface of the software. The Unilidar main interface includes two parts: the device management interface and the point cloud display interface.



·Point Cloud Display Interface Description



Once Unilidar 2 connects to the device and starts sampling, the point cloud display interface will display the point cloud image, which includes a reference coordinate system.

You can zoom in or out of the point cloud image using the mouse wheel.

You can control the image display angle using the left mouse button or the up, down, left, and right arrow keys on the keyboard.

After the IMU display is activated, the coordinate system will automatically follow the direction of the radar and cannot be dragged.

·Device Management Interface Description

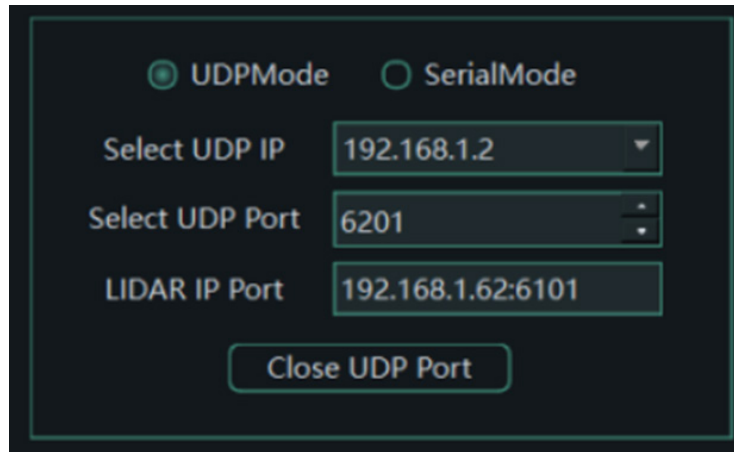
The device management interface on the left side of the software is as follows:

The interface is divided into three main sections:

- UDP Mode Configuration:** Features radio buttons for **UDPMode** (selected) and **SerialMode**. Below are input fields for **Select UDP IP** (127.0.0.1), **Select UDP Port** (6201), and **LIDAR IP Port** (ALL CLIENT), followed by an **Open UDP Port** button.
- Lidar Info:** A tabbed interface with **Lidar Info**, **Work Mode**, **Config Setting**, and **Version** tabs. The **Lidar Info** tab is active, showing a list of parameters with corresponding input fields: **sys_rotation_period**, **com_rotation_period**, **dirty_index**, **packet_lost_up**, **packet_lost_down**, **apd_temperarure**, **apd_voltage**, **laser_voltage**, and **imu_temperature**.
- Sensor Data:** A table-like structure showing data for four quadrants (Q1-Q4). Each quadrant has an input field for **Q**, **ACC**, and **GYRO** values.

Q	ACC	GYRO
Q1	ACC1	GYRO1
Q2	ACC2	GYRO2
Q3	ACC3	GYRO3
Q4		

•Output Mode Settings



The screenshot shows a dark-themed settings window for UDP Mode. At the top, there are two radio buttons: "UDPMode" (which is selected) and "SerialMode". Below these are three input fields: "Select UDP IP" with the value "192.168.1.2", "Select UDP Port" with the value "6201", and "LIDAR IP Port" with the value "192.168.1.62:6101". At the bottom center, there is a button labeled "Close UDP Port".

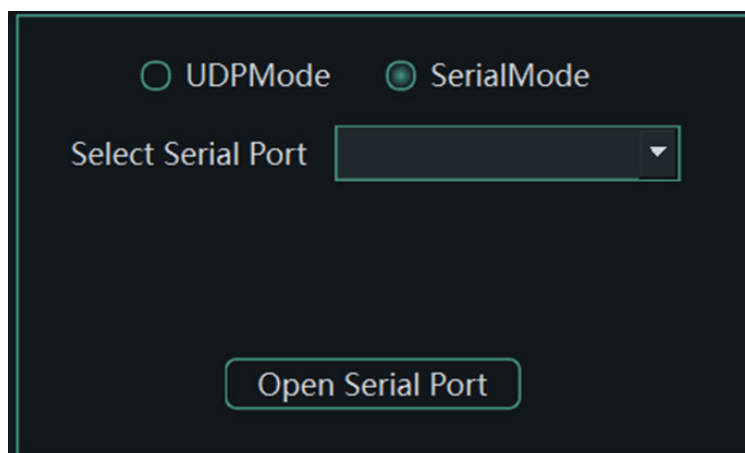
L2 can only output point cloud data through one of the two methods: UDPMode (ENET UDP) or SerialMode (UART TTL). Set this through "Work Mode" with "ENET/UART Select", and click "SetMode" to issue the command. If successful, a success prompt will be returned, and then click "Restart" to restart the radar for the changes to take effect. The default point cloud output for L2 is ENETUDP.

The default parameters for L2 are:

IP: 192.168.1.62, Gateway: 192.168.1.1, Subnet Mask: 255.255.255.0, the default target server IP address for sending data is 192.168.1.2. The radar UDP data transmission port is 6101, and the target server's receiving port is 6201.

When using UDPMode, please select the local address of the computer that receives the radar data. For the first use, please change the local IP of the computer to 192.168.1.2, the gateway to 192.168.1.1, and the subnet mask to 255.255.255.0.

After clicking "Open UDP Port", a connection with the radar will be established, and you can set the radar parameters below.



The screenshot shows a dark-themed settings window for Serial Mode. At the top, there are two radio buttons: "UDPMode" (which is unselected) and "SerialMode" (which is selected). Below these is a single input field labeled "Select Serial Port" with a dropdown arrow. At the bottom center, there is a button labeled "Open Serial Port".

When using SerialMode, you need to use a serial port converter board to connect L2 to the computer. After the serial port is recognized, select the corresponding COM port from the drop-down menu and click "Open Serial Port" to open the serial port and establish a connection.

Please note that the default point cloud output for L2 radar is ENETUDP. If you need to view real-time point cloud data via the serial port, please set the parameters to "UART" through "Work Mode" after the connection is established, click "SetMode" to issue the command. If successful, a success prompt will be returned, and then click "Restart" to restart the radar for the changes to take effect.

Additionally, if you forget the previously set IP parameters of L2, you can also reset the parameters by connecting to L2 via the serial port, and then reconfigure the parameters in "Config Setting" by clicking "Change" to issue the command. If successful, a success prompt will be returned, and then click "Restart" to restart the radar for the changes to take effect.

• Lidar Info Module

sys_rotation_period: The speed of the horizontal low-speed motor, in revolutions per minute (r/min).

com_rotation_period: The speed of the vertical high-speed motor, in revolutions per minute (r/min).

dirty_index: The index of dirt on the radar's optical surface.

packet_lost_up: The packet loss rate of the upper board of the radar.

packet_lost_down: The packet loss rate of the lower board of the radar.

apd_temperature: The temperature of the APD, in degrees Celsius (°C).

apd_voltage: The voltage of the APD, in Volts (V).

laser_voltage: The voltage of the laser emitter, in Volts (V).

imu_temperature: The temperature of the IMU, in Volts (V).

• Work Mode Module

Point cloud count: Sets the time for each point display, with options for 500 milliseconds, 1 second, 2 seconds, and 4 seconds.

Work Mode: Can set "Normal Mode" and "NEGA Mode", which are the normal mode and negative angle mode, respectively. In negative angle mode, the field of view is $360^{\circ} \times 96^{\circ}$. Note that in negative angle mode, the furthest measurement distance in the expanded angle range is slightly closer. After selecting the setting, click "SetMode" to issue the command, and then restart the radar by clicking "Restart" for the changes to take effect. The default is NEGA Mode.

3D/2D Mode: Can set "3D Mode" and "2D Mode", which sets the radar to 3D mode or 2D mode, respectively. The default is "3D Mode". After selecting the setting, click "SetMode" to issue the command, and then restart the radar by clicking "Restart" for the changes to take effect. The default is "3D Mode".

IMU Display Enable: After the IMU display is activated, the coordinate system will automatically follow the direction of the radar. You can set it to "Enable" or "Disable". After selecting the setting, click "SetMode" to issue the command, and then restart the radar by clicking "Restart" for the changes to take effect. The default is "Disable".

ENET/UART Select: L2 can only output point cloud data through one of the two methods: UDPMode (ENET UDP) or SerialMode (UART TTL). Set this through "ENET" or "UART". After selecting the setting, click "SetMode" to issue the command, and then click "Restart" to restart the radar for the changes to take effect. The default is "ENET".

Power On mode: Sets whether the radar starts automatically. Select "SELF START", and the radar will start automatically when powered on. Select "CMD START", and the radar will enter standby mode (Standby) without data output after powering on. You can start it by clicking "Normal" and then "Standby" in the Work Mode section of the host computer, or you can start it through the SDK interface. After selecting the setting, click "SetMode" to issue the command, and then restart the radar by clicking "Restart" for the changes to take effect. The default is "SELF START".

Gray Enable: Enables or disables the output of grayscale data. Select "Gray ON" to output grayscale data, or "Gray OFF" to disable the analysis of grayscale information and output no grayscale data. After selecting the setting, click "SetMode" to issue the command, and then restart the radar by clicking "Restart" for the changes to take effect. The default is "Gray ON".

Normal/Standby: Switches the status of L2 between normal working mode and standby mode in real-time.

SetMode: Except for the display time setting, all other parameter settings require clicking "SetMode" to issue the command after setting, and then click "Restart" to restart for the changes to take effect.

Restart: Restarts L2.

Synchronous: Obtains parameter information from L2.

• Config Setting Module

Lidar ChangeIP: Sets the IP address of the radar when outputting via ENET.

Lidar ChangePort: Sets the UDP data transmission port of the radar when outputting via ENET.

Lidar Gateway: Set the gateway for the radar when outputting via ENET.

Lidar SubnetMask: Set the subnet mask for the radar when outputting via ENET.

Usr ChangeIP: Sets the IP address of the target server when the radar sends data via ENET.

Usr ChangePort: Sets the UDP data reception port of the target server when the radar sends data via ENET.

Change: After setting the parameters, click to issue the command, and then click "Restart" to restart the radar for the changes to take effect.

Restart: Restarts L2.

Restore Factory Defaults: Restores the IP parameter information to the factory configuration, which is IP: 192.168.1.62, Gateway: 192.168.1.1, Subnet Mask: 255.255.255.0, the default target server IP address for sending data is 192.168.1.2. The radar UDP data transmission port is 6101, and the target server's receiving port is 6201.

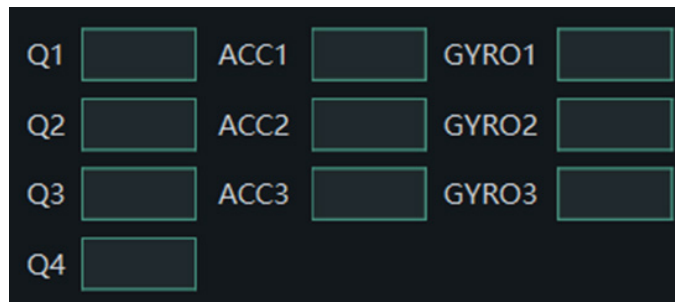
Version Information Acquisition



A screenshot of a software interface for version information acquisition. It features four input fields on a dark background: 'HW_Version', 'SW_Version', 'Name', and 'Data'. Each field is a rectangular box with a light blue border. Below these fields is a rounded rectangular button labeled 'GetVersion'.

You can obtain radar version information by clicking "GetVersion", which is usually used to determine whether a successful connection has been established with the radar.

•IMU Data Window



A screenshot of an IMU data window. It displays a grid of input fields on a dark background. The first row contains 'Q1', 'ACC1', and 'GYRO1'. The second row contains 'Q2', 'ACC2', and 'GYRO2'. The third row contains 'Q3', 'ACC3', and 'GYRO3'. The fourth row contains 'Q4'. Each label is followed by a rectangular input field with a light blue border.

Q1, Q2, Q3, Q4: These parameters represent the quaternion, which is used to describe the rotation state of the IMU (Inertial Measurement Unit).

ACC1, ACC2, ACC3: These parameters represent the acceleration data of the three axes of the accelerometer, corresponding to the acceleration values of the X, Y, Z axes.

GYRO1, GYRO2, GYRO3: These parameters represent the angular velocity data of the three axes of the gyroscope, corresponding to the angular velocity values of the X, Y, Z axes.

This manual will not be notified separately if updated.

You can check the latest version of the "User Manual" on the official website of Unitree.



<https://www.unitree.com/en/download>

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