

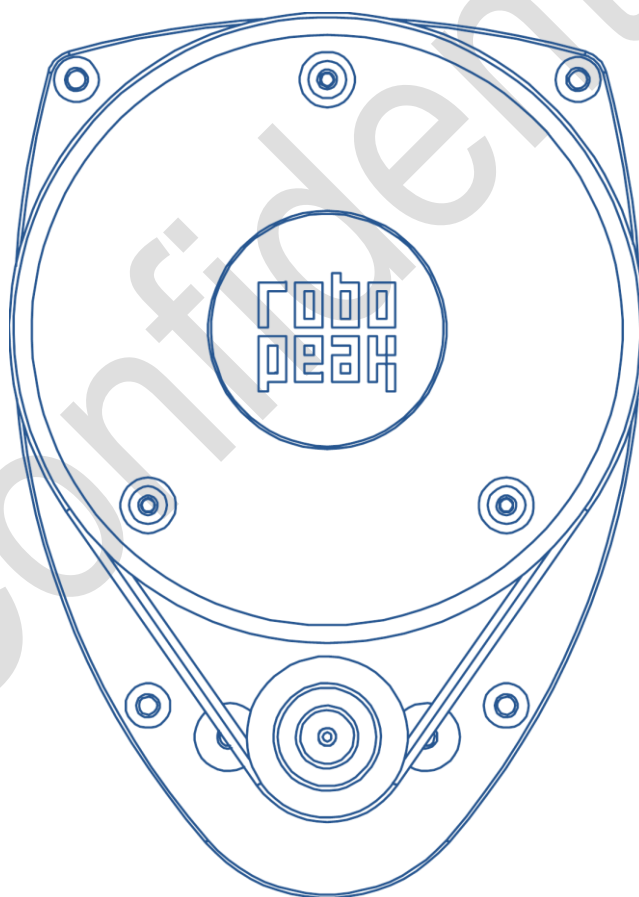


RPLIDAR

Low Cost 360 degree 2D Laser Scanner (LIDAR) System

Development Kit User Manual

2014-2
Rev.1



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1. Overview

Thank you for purchasing RPLIDAR development kit. By using this kit, customers can easily evaluating RPLIDAR's performance. RoboPeak also provides SDK code to help customers integrate RPLIDAR to their system.

Items in Development Kit

RPLIDAR Development Kit contains:

- RPLIDAR (PWM motor driver embedded)
- USB Adapter
- RPLIDAR communication cable
- Micro-USB cable



RPLIDAR

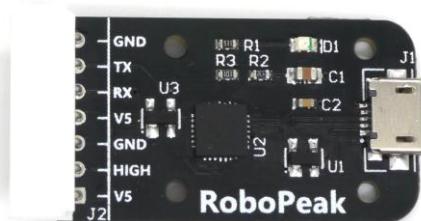
Low Cost 360 degree 2D Laser Scanner (LIDAR) System



RPLIDAR development kit contains standard RPLIDAR unit (A1M1-R1). The RPLIDAR embedded logic IO drivable (3.3V) motor controller which can be used to configure scan frequency by tuning motor speed. Developer also can choose to turn off motor for power saving purpose.

RPLIDAR usage and interface definition will be introduced in the coming sections.

USB Adapter



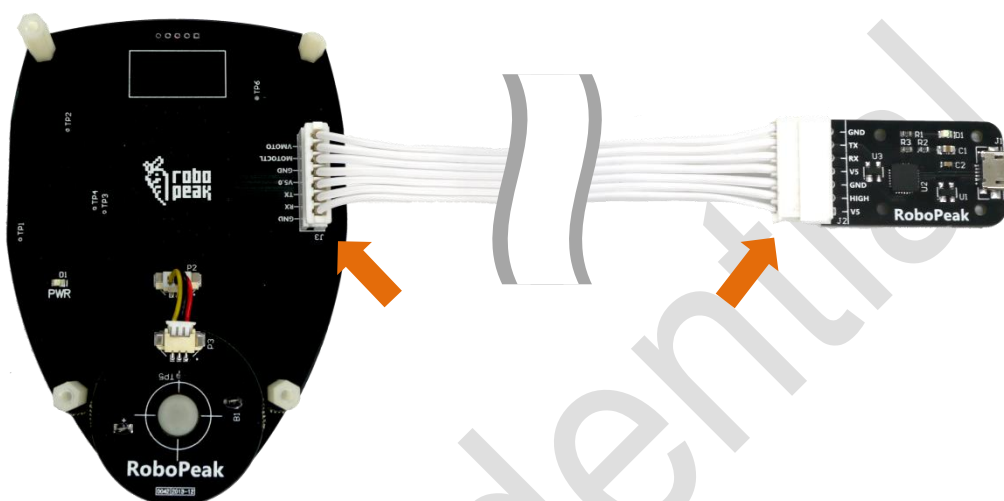
RPLIDAR development kit contains a USB adapter to provide power supply for RPLIDAR and convert RPLIDAR internal UART serial interface to USB interface.

2. Connection and Usage

Connection

RPLIDAR can be easily connect to PC by following bellow steps.

- 1) Connect RPLIDAR with the USB adapter using provided communication cable. The socket is in the bottom of RPLIDAR.



- 2) Connect the USB adapter to your PC using the Micro-USB cable
After connecting RPLIDAR to your PC through the USB cable, the LED in the bottom of the RPLIDAR will light up and RPLIDAR start scanning.












Install Driver for the USB Adapter

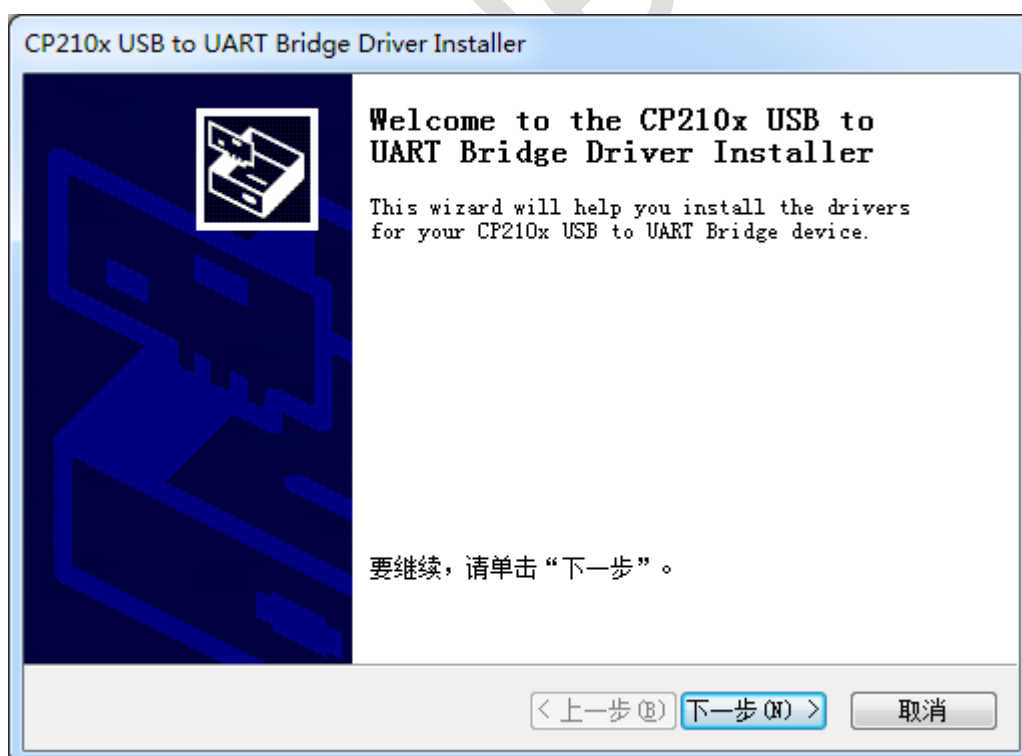
The USB adapter converts UART to USB using CP2102 chip. You need to install the device driver for the chip. The driver can be found in the provided SDK package or download from Silicon Labs's official website:

<http://www.silabs.com/products/interface/usbtouart/Pages/usb-to-uart-bridge.aspx>

Here's the installation steps in Windows:

After connecting the RPLIDAR with PC, find the driver file "CP210x VCP Windows" and choose correct operating system version accordingly: x86 for 32-bit OS and x64 for 64-bit OS.

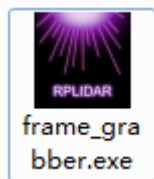
	x64	2014/2/8 21:01	文件夹	
	x86	2014/2/8 21:01	文件夹	
	<input checked="" type="checkbox"/> CP210xVCPInstaller_x64.exe	2013/10/25 11:39	应用程序	1,026 KB
	CP210xVCPInstaller_x86.exe	2013/10/25 11:39	应用程序	901 KB
	dpinst.xml	2013/10/25 11:39	XML 文档	12 KB
	ReleaseNotes.txt	2013/10/25 11:39	文本文档	10 KB
	SLAB_License_Agreement_VCP_Win...	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



After Installing the driver according to installation steps, you should see corresponding serial port name in the [Control Panel] -> [Device and Printers]. Please refer to the bellow figure.



Run Demo Application



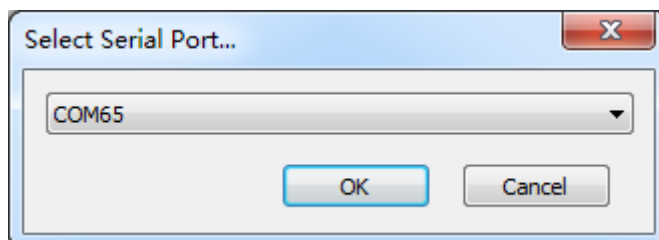
Frame_grabber is a GUI demo application provided by RoboPeak. You can view the scan result directly in the UI and save the scan result to files for further processing. The source code of this demo application is also provided for reference.

This GUI demo can only run under Windows. For Linux and MacOS users, please refer to the other simple demo provided in the SDK.

Steps to run the GUI demo application:

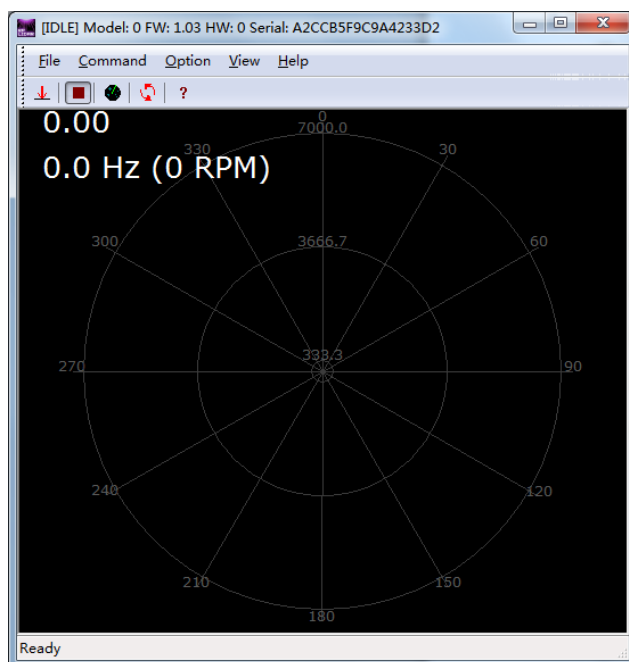
Please make sure you have connect RPLIDAR to PC using USB adapter and installed the device driver correctly before running the demo application.

Starting demo application frame_grabber.exe and choose serial port name identified in the previous step.







If the connection is ok, you shall see the UI like this:

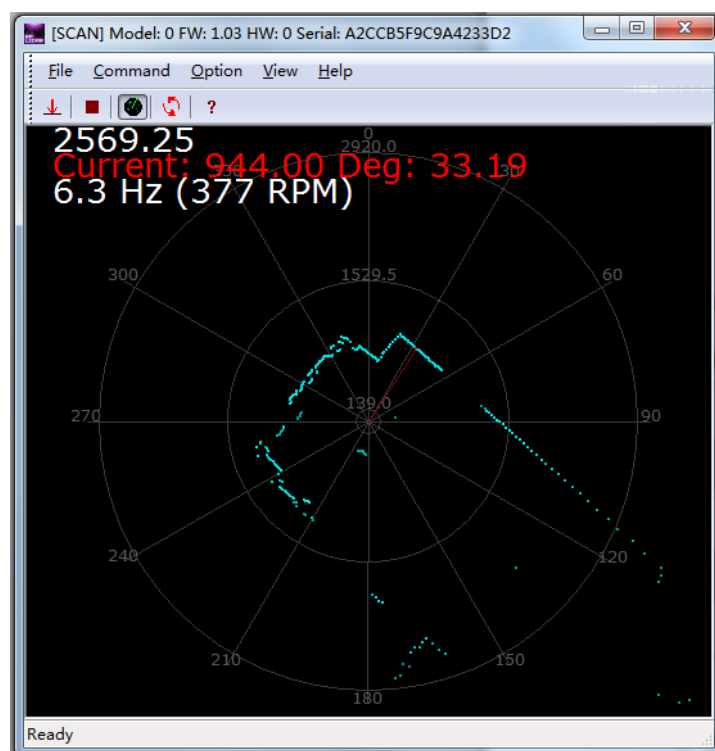
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The firmware/hardware version and serial number of the RPLIDAR will show in the title line of the GUI. The supported commands of RPLIDAR are showed in the tool bar. The descriptions are listed in the below table.


Button	Function	Description
	Start Scan	Scan data will be displayed after scan core starting work
	Stop Scan	Scan core enter power save mode
	Save Scan Data	Save current scan data to the local file
	Restart RPLIDAR	Restart scan core to clear internal errors

Press the Start Scan button , the scan data will be displayed in the UI:



Use the mouse wheel to zoom in and out. Move the cursor to any sample point, the distance and degree value to the RPLIDAR will be showed in the screen with red font. The scan frequency also showed in the UI.

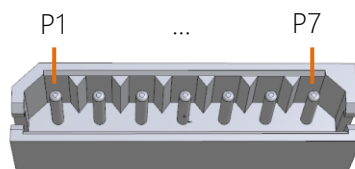
Trouble shooting

When scan core or laser power works abnormally, scan core will enter protection mode. This state can be retrieved using SDK API. If such scenario happened, sending restart command  can let scan core reset.

3. Development Guide and SDK Introduction

Pin Definition for RPLIDAR

The socket in the bottom of RPLIDAR is using 5267-7A specification: 2.5mm spacing 7 pin. Any communication cable has 5264-7 terminal block can be used to connect with RPLIDAR. Please find the detail pin definition in the bellow table:

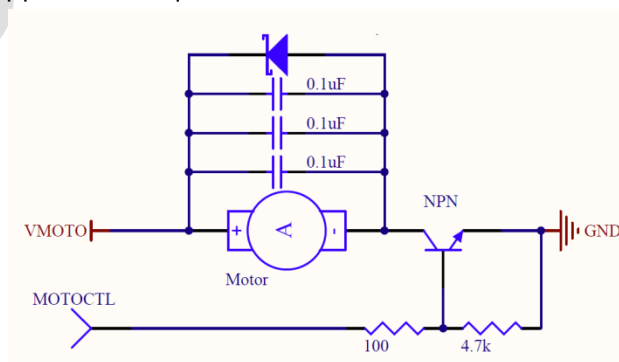


5267-7A

Pin	Signal name	Type	Description	Minimum	Typical	Maximum
P1	VMOTO	Power	Power supply for the RPLIDAR scan motor	-	5V	9V
P2	MOTOCTL	Input	Enable pin for RPLIDAR scan motor/PWM control signal (active high)	0V	-	VMOTO
P3	GND	Power	GND signal for RPLIDAR scan motor	-	0V	-
P4	V5.0	Power	Power supply for RPLIDAR scan core	3.6V	5V	6V
P5	TX	Output	Serial output for RPLIDAR scan core	0V	-	5V
P6	RX	Input	Serial input for RPLIDAR scan core	0V	-	5V
P7	GND	Power	GND signal for RPLIDAR scan core	-	0V	V5.0

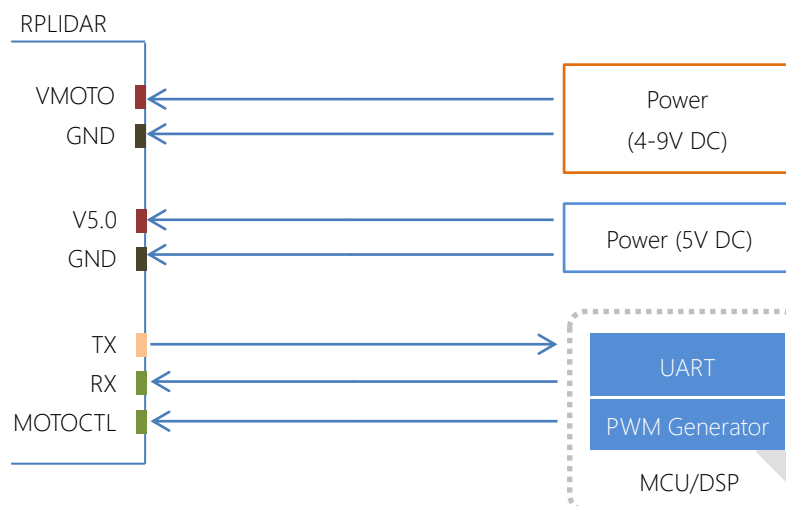
External system must provide required VMOTO and V5.0 power to make scan motor and scan core work correctly. In most of scenarios, VMOTO and V5.0 can share the same power supply.

MOTOCTL Pin used to control scan motor speed to adjust RPLIDAR's scan frequency, PWM signal also can be applied. The equivalent circuit showed as bellow:



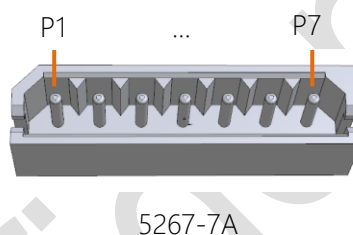
You can also refer to the bellow **Reference Design** for RPLIDAR development.

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Pin Definition for the USB Adapter

The USB adapter is also using 5267-7A specification socket: 2.5mm spacing 7 pin. Please find the detail pin definition in the bellow table:



Pin	Signal Name	Description
P1	V5.0	Power supply for RPLIDAR scan core, USB 5V input
P2	HIGH	constant 5V high level output
P3	GND	GND for RPLIDAR scan motor, USB GND
P4	V5.0	Power supply for RPLIDAR scan core, USB 5V input
P5	RX	Input pin for USB serial adapter
P6	TX	Output pin for USB serial adapter
P7	GND	GND for RPLIDAR scan core, USB GND

Configure RPLIDAR Scan Frequency

Since USB adapter's control signal MOTOCTL is fixed to high level, RPLIDAR's scan motor is always rotating at its highest speed which makes RPLIDAR working on a relative high scan frequency. You can configure RPLIDAR's scan frequency by controlling motor speed.

By connecting MOTOCTL signal to the device has PWM output function such as MCU's PWM output I/O port, RPLIDAR's scan frequency can be locked in a proper value by adjust duty ratio of PWM using the scan frequency feedback provided by RPLIDAR core.

Please refer to RPLIDAR protocol and application note for more information. SDK also contains the sample code.

SDK Usage

RoboPeak provides RPLIDAR SDK support both Windows and Linux platform. The SDK contains sample code. Please refer to SDK document for more information.

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4. Operation Recommendation

Pre-Heating for best performance

The scan core will heating when start working. We recommended pre-heating RPLIDAR (Start scan mode, the scan motor is rotating) for more than 2 minutes to get the best measurement accuracy.

Ambient Temperature

RPLIDAR's measurement resolution is sensitive to the ambient temperature. Improper use may even damage the sensor. Please avoid using RPLIDAR in extreme high temperature (>40 degree) and too low temperature (<-10 degree).

Ambient Light

Although RPLIDAR is not sensitive to ambient light, improper use may still lead to errors.

In indoor environment, please avoid lighting RPLIDAR with strong light source such as high-power laser.

In outdoor environment, please avoid facing RPLIDAR directly into sun light. This may leads to permanent damage to the image sensor of RPLIDAR.

The standard version of RPLIDAR may have less measurement range in strong sun light environment. Please contact RoboPeak for any customization options.

5. Revision History

Date	Content
2013-3-5	Initial draft
2014-2-11	Refine for final product

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