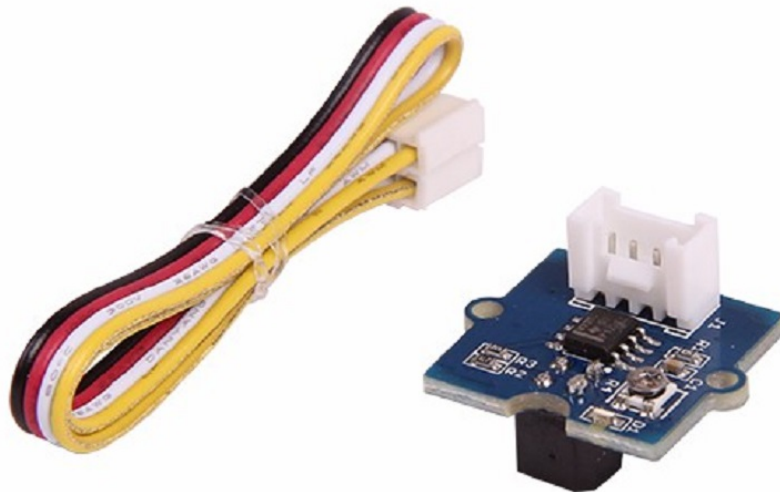# Grove - Infrared Reflective Sensor

Grove - Infrared Reflective Sensor is used to detect the presence of an object within a specific range. The sensor consists of an IR LED and a photosensor (phototransistor) pair. The light emitted by the IR LED gets reflected by any object placed in front of the sensor and this reflection is detected by the photosensor(phototransistor). Any

white (or lighter) colored surface reflects more than black (or darker) colored surface.

When the reflected light is detected, it produces **Digital LOW** (or Binary **0**) output on the **SIG** pin. The on-board LED indicator will also glow. If no reflection is detected or if the object is too far from the sensor, the output on the **SIG** pin stays at **Digital High** (Binary **1**). The on-board LED indicator will be off as well. The detectable range of this sensor is 4–16 mm. The module incorporates a Rail-to-Rail Operational Amplifier to amplify the output of phototransistor. There is a potentiometer which can be used to adjust the gain of the amplifier, that is, sensitivity of detection.

With this sensor, you can build the following (but not limited to) applications: **line following robots**, **optical encoders** and **object counting applications**.

Get One Now 🛒

[https://www.seeedstudio.com/Grove-Infrared-Reflective-Sensor-v1.2-p-2791.html]

> ⚠️ **Caution**
> This product is also mildly sensitive to non-IR radiations and hence any bright light on photosensor impairs or disturbs IR light detection.

Version Tracker

Product version	Changes	Release date
Versions older than v1.2	Initial	June 2012
Version 1.2(current version)	Optimized layout	April 2016

Features

- Grove compatible and easy to use

- Highly sensitive and reliable

- Small footprint

- Adjustable sensitivity for different occasions

> **Tip**
> More details about Grove modules please refer to Grove System
> [https://wiki.seeedstudio.com/Grove_System/]

Specifications

Parameter	Value
Operating voltage(V)	3.3−5V
Operating current(mA)	14.69−15.35 mA
Effective detectable distance	4−15 mm
Response time	10 µs
Phototransistor: Peak sensitivity wavelength	800 nm
IR LED: Peak light emitting wavelength	940 nm
Reflective photosensor	datasheet [https://files.seeedstudio.com/wiki/Grove-Infrared_Reflective_Sensor/res/RPR-220.pdf]
Output operational amplifiers	datasheet [https://files.seeedstudio.com/wiki/Grove-Infrared_Reflective_Sensor/res/LMV358_datasheet.pdf]
Weight	4 g

Platforms Supported

Arduino	Raspberry Pi		
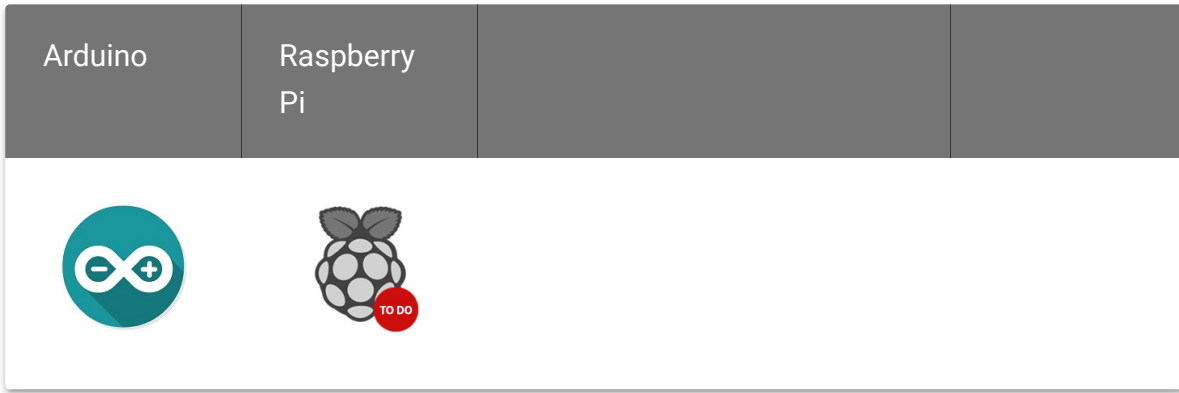
⚠️ **Caution**

The platforms mentioned above as supported is/are an indication of the module's software or theoritical compatibility. We only provide software library or code examples for Arduino platform in most cases. It is not possible to provide software library / demo code for all possible MCU platforms. Hence, users have to write their own software library.

Hardware Overview

(front view)

RPR-200 Reflective photosensor (photoreflector)

- **RPR220 Reflective photosensor** - Highly sensitive reflective photosensor.

- **LMV358** - rail-to-rail operational amplifier.

- **LED Indicator** - The LED will switch on when the received infrared light intensity exceeds a preset level.

- **Light sensitivity adjustment potentiometer** - adjust the sensitivity of photosensor to light.

Getting Started

Let us see how to implement few basic applications with this module:

Play With Arduino

Line Following

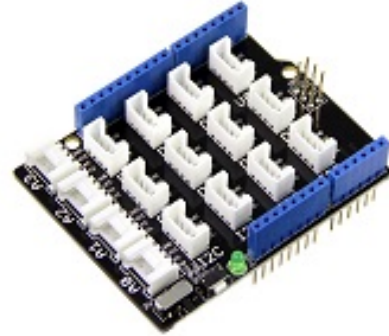This sensor can be used to help a robotic car follow a black line.

HARDWARE

- **Step 1.** Prepare the following materials:
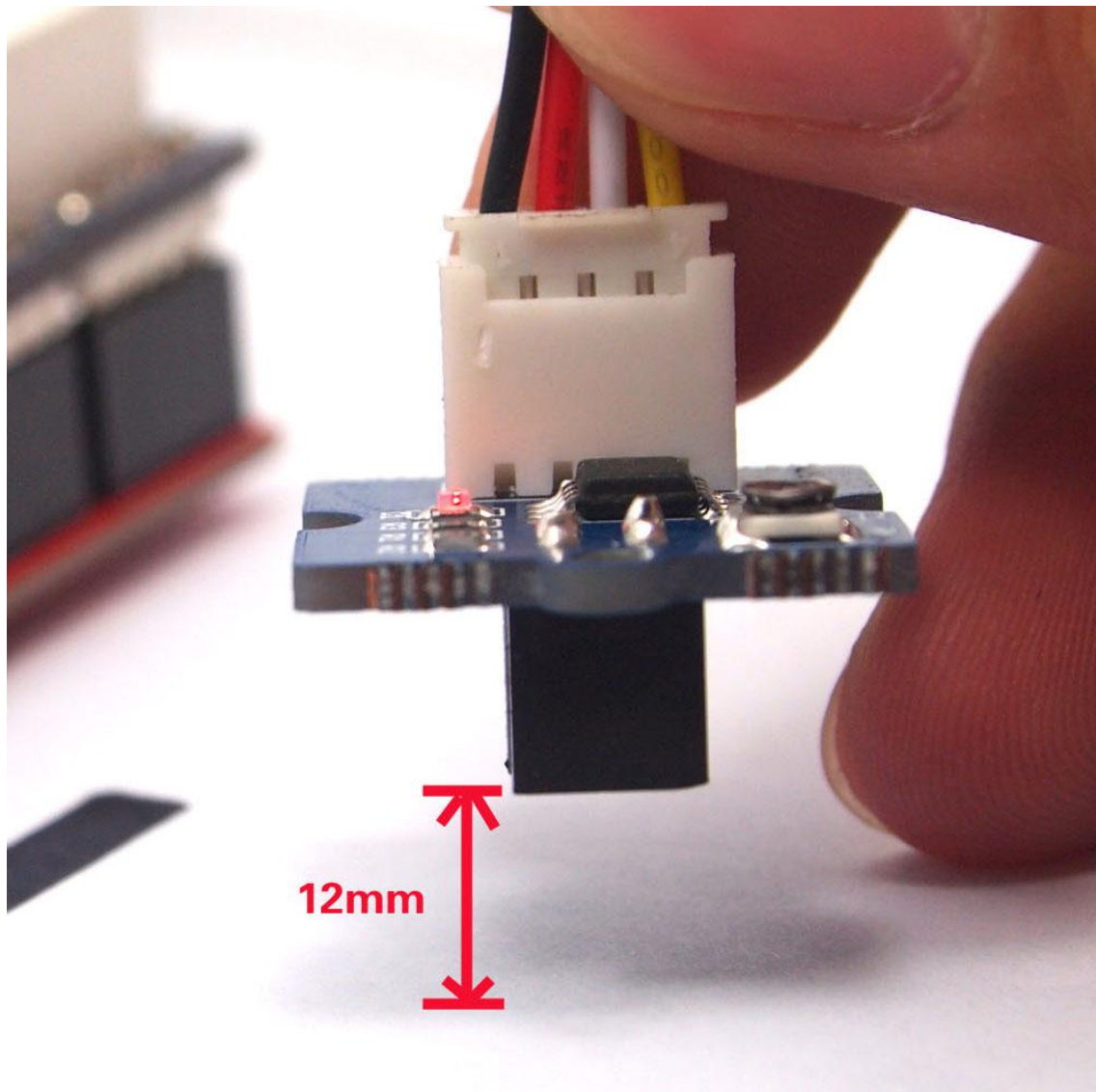
Seeeduino V4.2	Base Shield

Get One Now
[https://www.seeedstudio.com/Seeeduino-V4.2-p-2517.html]

Get One Now
[https://www.seeedstudio.com/Base-Shield-V2-p-1378.html]

- **Step 2.** Connect Grove - Infrared Reflective Sensor to any port of Grove-Base Shield via the Grove cable, we use **D2** in this demo.

- **Step 3.** Place this sensor 12mm above the white(or other bright color) paper.

- **Step 4.** Adjust the potentiometer with a screwdriver to change the sensitivity of reflective photosensor, until the LED indicator glows. As your rotate clockwise, the reflective photosensor will be more sensitive to light.

Adjust the resistor
to make the LED on.
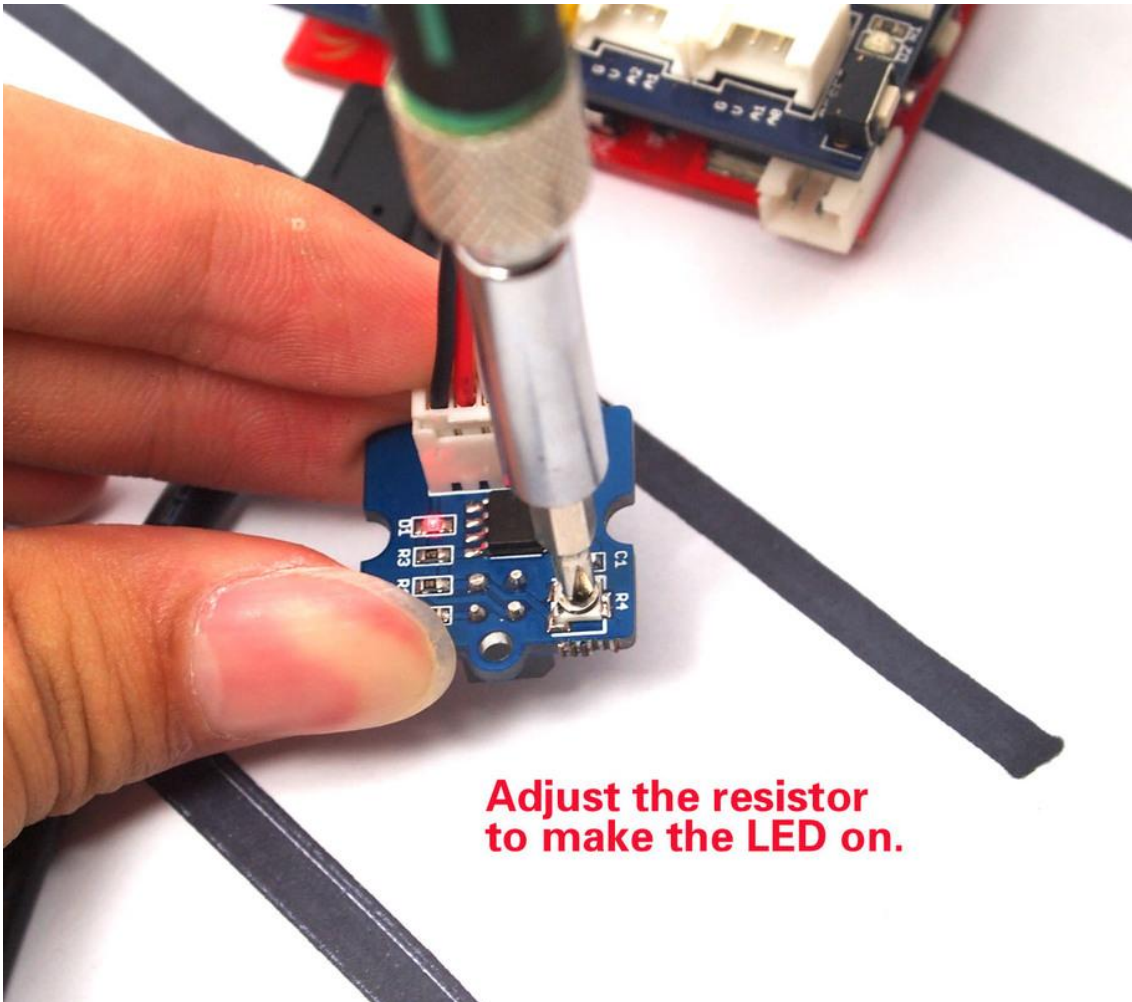
> ✏ **Note**
> Use a proper screw-driver to adjust the tiny potentiometer. Applying heavy pressure or frequent adjustments might damage the wiper of the potentiometer.

- **Step 5.** Maintain the vertical distance, move the sensor horizontally towards the black line. The indicator LED should go off over the black line. If it is still on, adjust the potentiometer until it is off.

The red LED is on

The LED is shut.
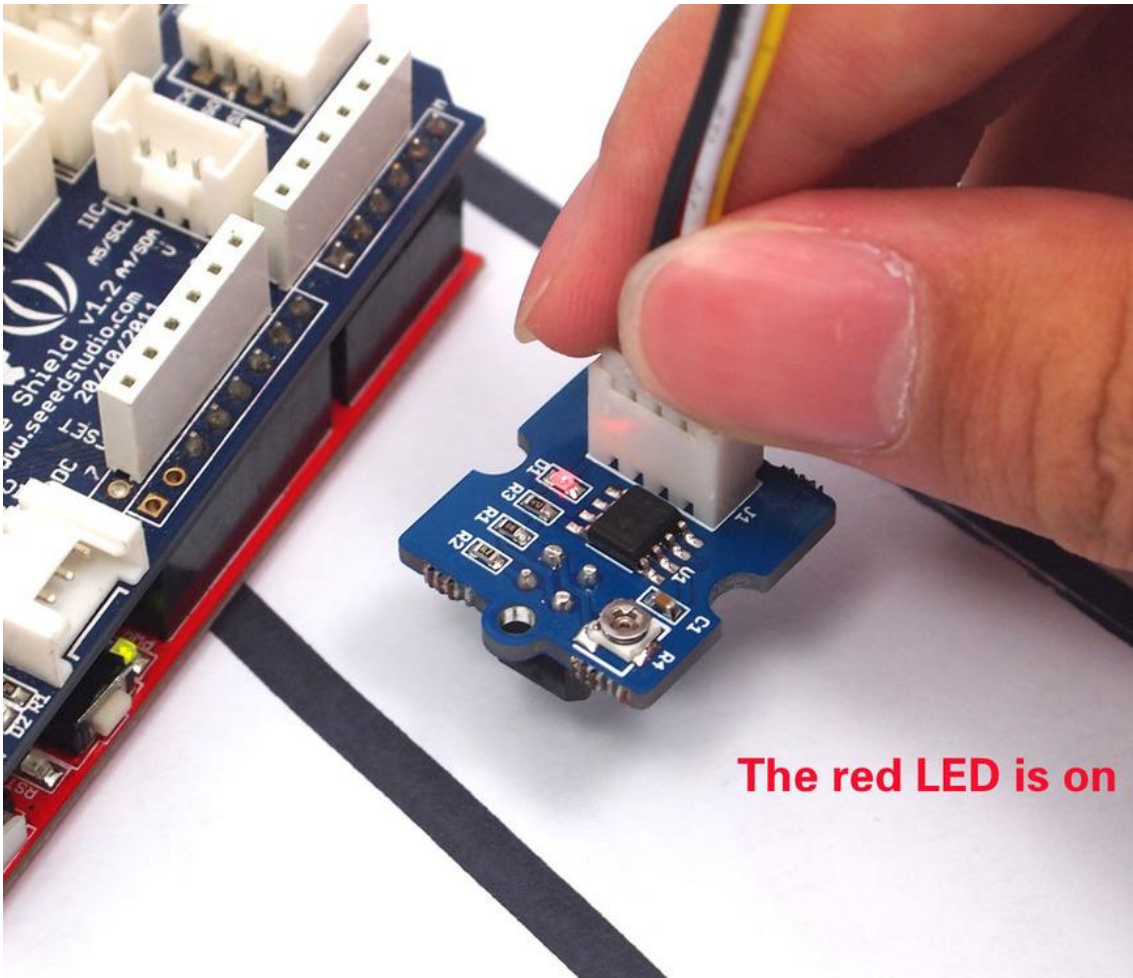
Rotary Speed Detection

Let us implement simple optical encoder to detect the speed of a motor

HARDWARE

- **Step 1.** Prepare the following materials:
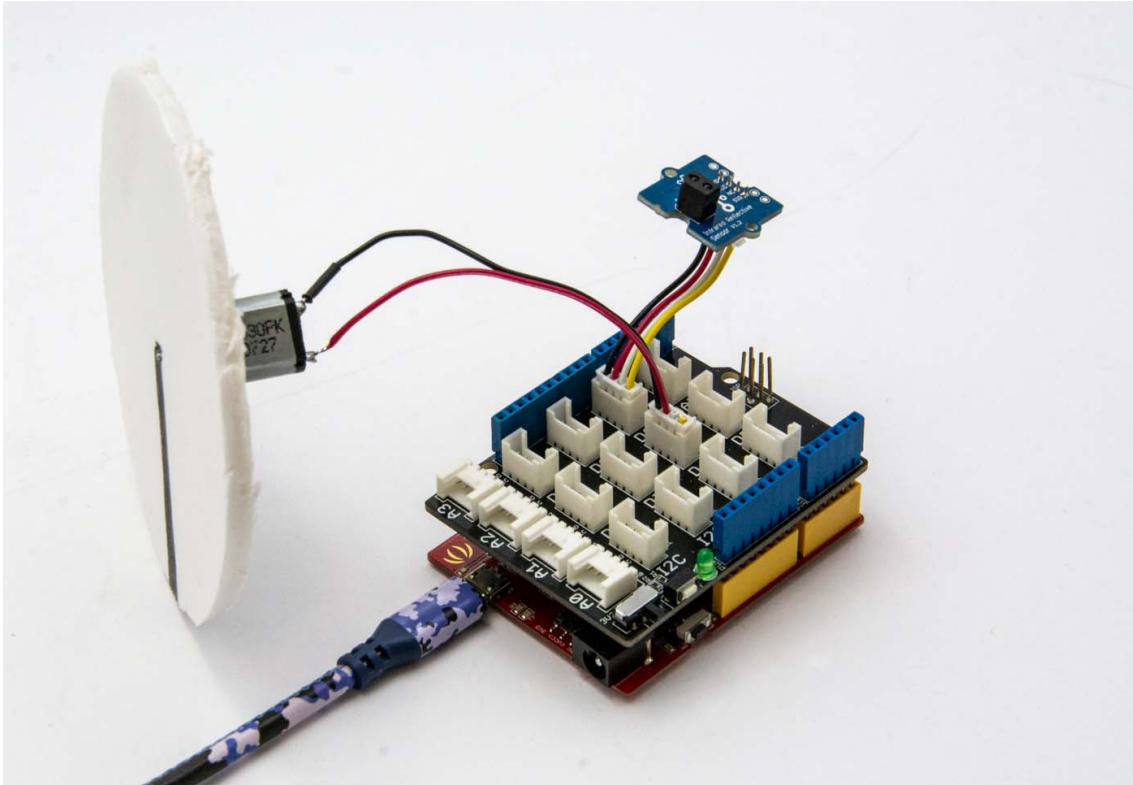
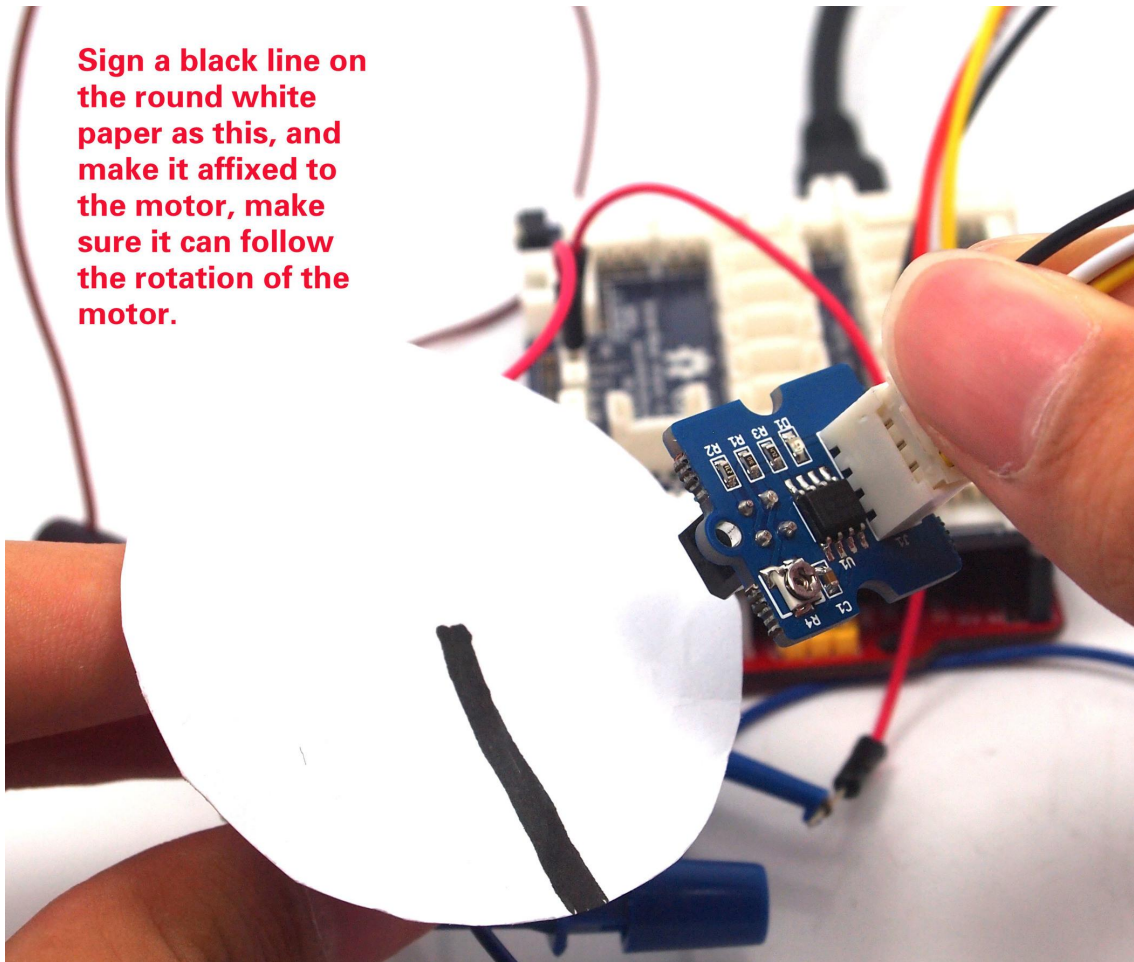| Seeeduino V4.2	Base Shield
Get One Now [https://www.seeedstudio.com/Seeeduino-V4.2-p-2517.html]	Get One Now [https://www.seeedstudio.com/Base Shield-V2-p-1378.html]
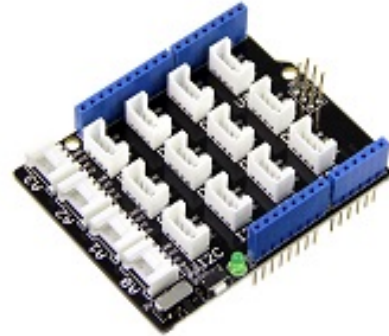
- **Step 2.** Connect the Infrared Reflective Sensor to the **D2** port of Grove - Base Shield and connect the motor to the **D6** (In fact, you can just connct VCC and GND to power the motor).

- **Step 3.** Attach a round, white paper plate (with a black line marked on it) to the motor. Place the sensor near this rotatory encoder. Run the motor.

Sign a black line on the round white paper as this, and make it affixed to the motor, make sure it can follow the rotation of the motor.

SOFTWARE

- **Step 1.** Download the library Arduino timer1 *library* [https://files.seeedstudio.com/wiki/Grove-Infrared_Reflective_Sensor/res/TimerOne-ArduinoLib.zip] and add it into the libraries file of Arduino IDE. A guide [/Guide_to_use_demos_downloaded_from_Seeed-s_Github] about how to run our demo code.

- **Step 2.** Refer to How to install library [https://wiki.seeedstudio.com/How_to_install_Arduino_Library] to install library for Arduino.

- **Step 3.** Open a new sketch, and copy the following code into the sketch.

```
1    unsigned int counter=0;
2    void blink()
3    {
4        counter++;
5    }
6    void timerIsr()
7    {
8        Timer1.detachInterrupt();  //disable the timer1
9        Serial.print("The speed of the motor: ");
10       Serial.print(counter,DEC);
11       Serial.println("round/s");
12       counter=0;
13       Timer1.attachInterrupt( timerIsr );  //enable the ti
14   }
15   void setup()
16   {
17       Serial.begin(9600);
18       Timer1.initialize(1000000); // set a timer of length
19       attachInterrupt(0, blink, RISING);  //INT0
20       Timer1.attachInterrupt( timerIsr ); // attach the se
21   }
22   void loop()
23   {
24
25   }
```

- **Step 4.** Upload the demo. If you do not know how to upload the code, please check how to upload code [https://wiki.seeedstudio.com/Upload_Code/].

- **Step 5.** Open the **Serial Monitor** of Arduino IDE by click **Tool-> Serial Monitor**. Or tap the `Ctrl` + `Shift` + `M` key at the same time. if every thing goes well, you will get the speed.
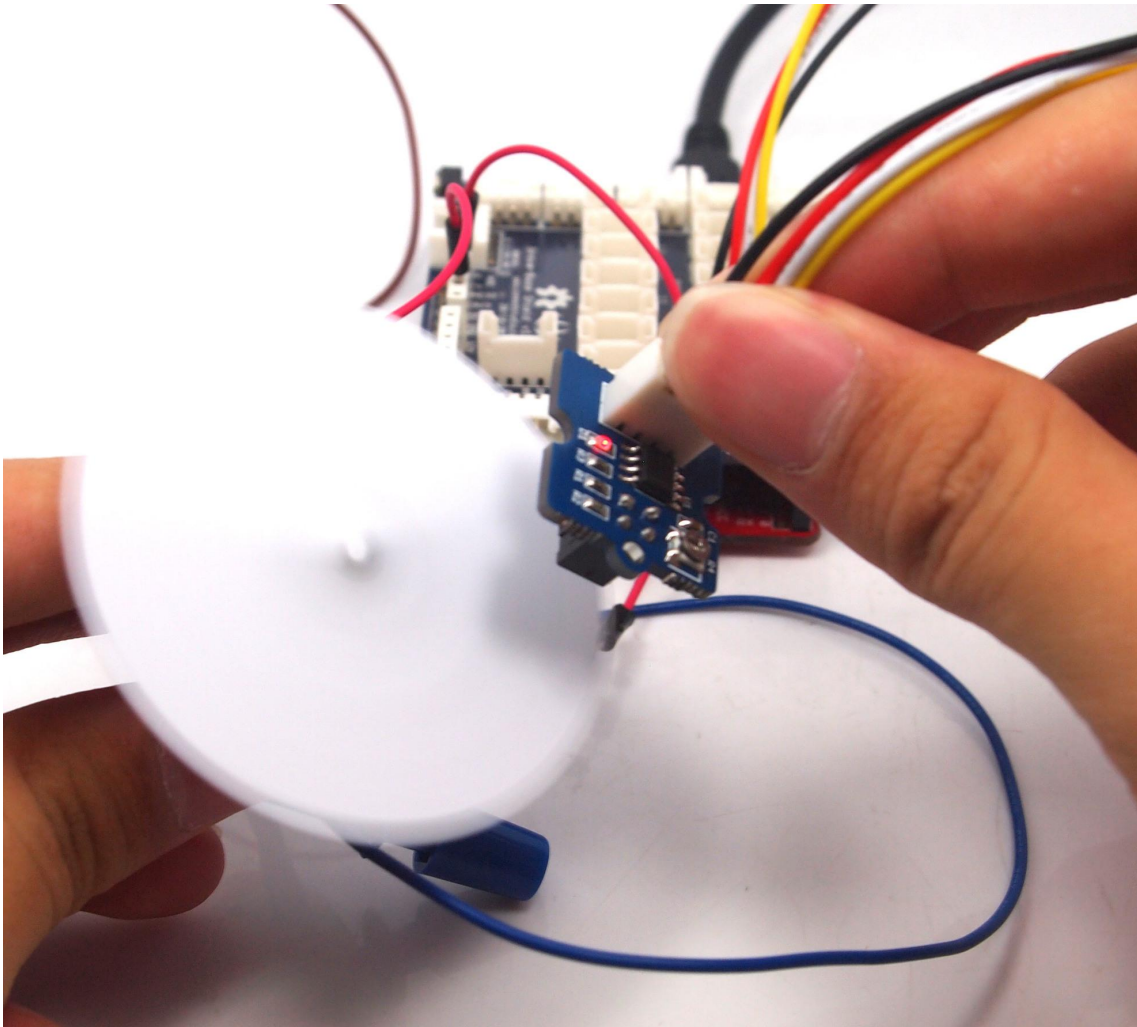
```
COM23

The speed of the motor: 0round/s
The speed of the motor: 76round/s
The speed of the motor: 84round/s
The speed of the motor: 83round/s
The speed of the motor: 85round/s
The speed of the motor: 85round/s
The speed of the motor: 85round/s
The speed of the motor: 85round/s
The speed of the motor: 85round/s
The speed of the motor: 85round/s
```

Play With Raspberry Pi

Hardware

- **Step 1.** Prepare the following materials:

Raspberry pi	GrovePi_Plus
Get One Now [https://www.seeedstudio.com/Raspberry-Pi-3-Model-B-p-2625.html]	Get One Now [https://www.seeedstudio.com/Grove p-2241.html]

- **Step 2.** Plug the GrovePi_Plus into Raspberry.

- **Step 3.** Connect Grove - Infrared Reflective Sensor to **D4** port of GrovePi_Plus.

- **Step 4.** Connect the Raspberry to PC via USB cable.
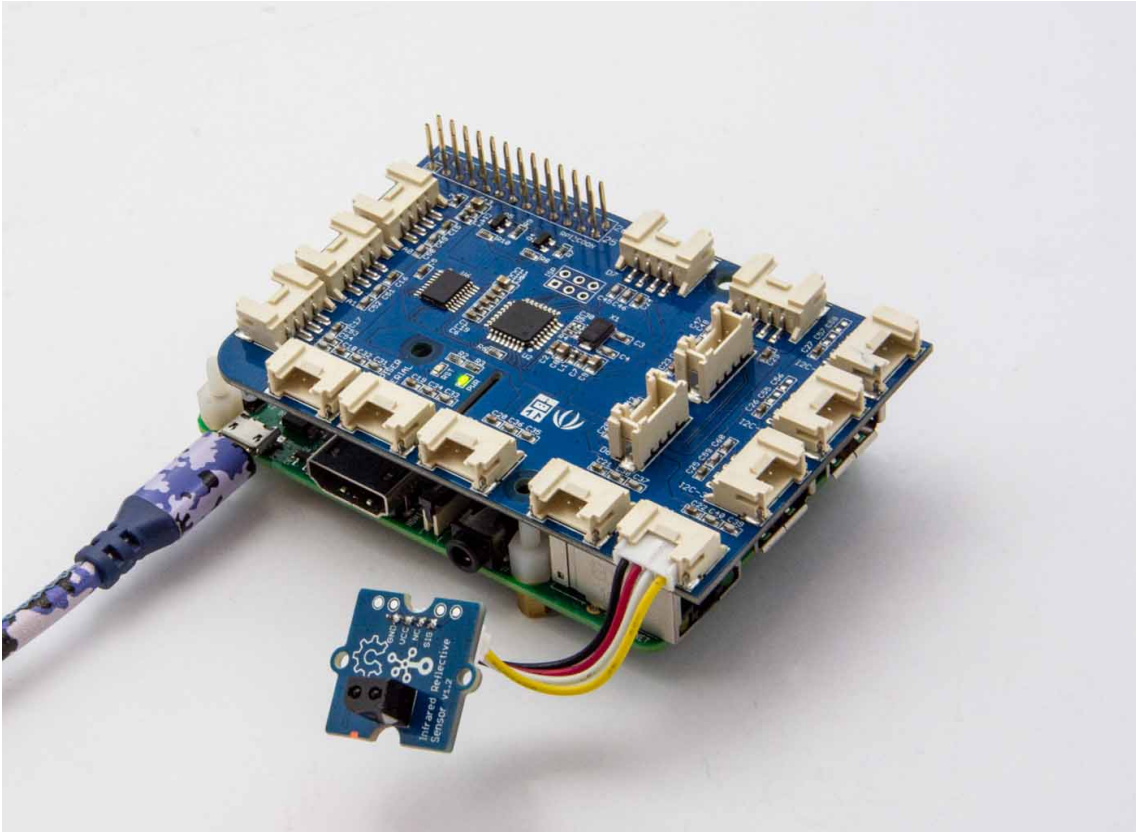
Software

- **Step 1.** Follow Setting Software
  [https://www.dexterindustries.com/GrovePi/get-started-with-
  the-grovepi/setting-software/] to configure the development
  environment.

- **Step 2.** Follow Updating the Firmware
  [https://www.dexterindustries.com/GrovePi/get-started-with-
  the-grovepi/updating-firmware/] to update the newest firmware
  of GrovePi.

> 🔥 **Tip**
> In this wiki we use the path **~/GrovePi/** instead of
> **/home/pi/Desktop/GrovePi**, you need to make sure Step 2 and Step 3 use
> the same path.

> ✏️ **Note**
> We strongly suggest you to update the firmware, or for some sensors you may get errors.

- **Step 3.** Git clone the Github repository.

```
1  cd ~
2  git clone https://github.com/DexterInd/GrovePi.git
```

- **Step 4.** Check the code.

```
1  cd ~/GrovePi/Software/Python
2  sudo nano grove_infrared_reflective_sensor.py
```

Then the code should be like:

```python
1  import time
2  import grovepi
3
4  # Connect the Grove Infrared Reflective Sensor to digita
5  # SIG,NC,VCC,GND
6  sensor = 4
7
8  grovepi.pinMode(sensor,"INPUT")
9
10 while True:
11     try:
12         # Sensor returns HIGH on a black surface and LOW
13         if grovepi.digitalRead(sensor) == 1:
14             print "black surface detected"
15         else:
16             print "white surface detected"
17
18         time.sleep(.5)
19
```

```
20        except IOError:
21            print "Error"
```

Then tap `Ctrl` + `X` to quit nano.

- **Step 5.** To run the demo, execute the following command in terminal:

```
sudo python grove_infrared_reflective_sensor.py
```

The result should be like:

```
 1  pi@raspberrypi:~/GrovePi/Software/Python $ sudo python g
 2  black surface detected
 3  black surface detected
 4  black surface detected
 5  black surface detected
 6  black surface detected
 7  white surface detected
 8  white surface detected
 9  white surface detected
10  black surface detected
11  black surface detected
12  black surface detected
13  black surface detected
14  black surface detected
15  black surface detected
```

Schematic Online Viewer

Resources

- **[Zip]** Grove-Infrared Reflective Sensor v1.2 Eagle Files
  [https://files.seeedstudio.com/wiki/Grove-
  Infrared_Reflective_Sensor/res/Grove%20-
  %20Infrared%20Reflective%20Sensor%20v1.2_eaglefile.zip]

- **[Zip]** Arduino Timer1 Library
  [https://files.seeedstudio.com/wiki/Grove-
  Infrared_Reflective_Sensor/res/TimerOne-ArduinoLib.zip]

- **[Pdf]** RPR220 Datasheet
  [https://files.seeedstudio.com/wiki/Grove-
  Infrared_Reflective_Sensor/res/RPR220_datasheet.pdf]

- **[Pdf]** Datasheet [https://files.seeedstudio.com/wiki/Grove-
  Infrared_Reflective_Sensor/res/LMV358_datasheet.pdf]

Tech Support

Please submit any technical issue into our forum
[https://forum.seeedstudio.com/].

[https://www.seeedstudio.com/act-4.html?
utm_source=wiki&utm_medium=wikibanner&utm_campaign=newpr
oducts]