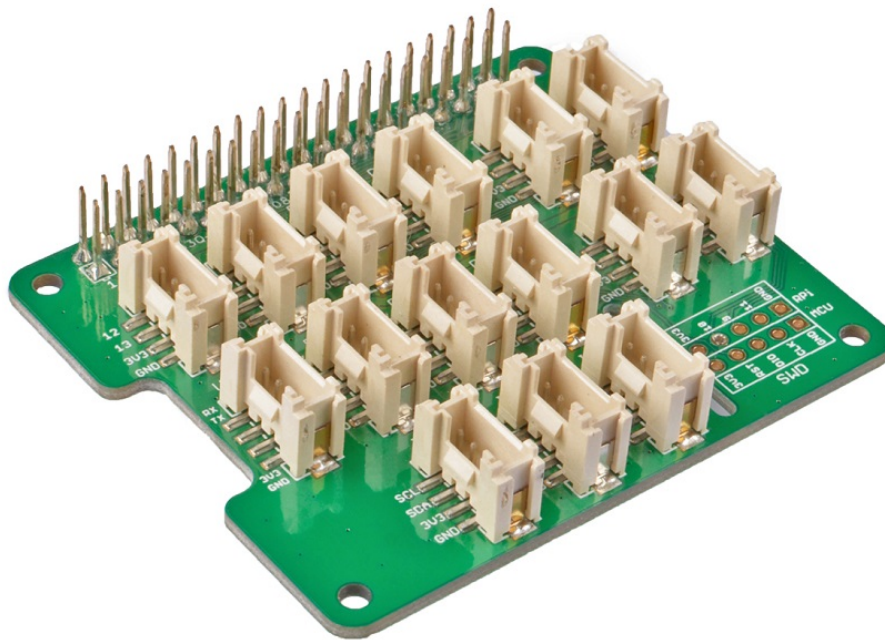


Grove Base Hat for Raspberry Pi



Today, the grove series of sensors, actuators, and displays have grown into a large family. More and more grove modules will join the whole Grove ecosystem in the future. We see the Grove helps makers, engineers, teachers, students and even artists to build, to make, to create...We always feel it is our responsibility to make the Grove module compatible with more platforms. Now we bring you

the Grove Base Hat for Raspberry Pi and [Grove Base Hat for Raspberry Pi Zero](https://www.seeedstudio.com/Grove-Base-Hat-for-Raspberry-Pi-Zero-p-3187.html) [https://www.seeedstudio.com/Grove-Base-Hat-for-Raspberry-Pi-Zero-p-3187.html], in another word, we bring the Raspberry Pi the whole Grove System.

The Grove Base Hat for Raspberry Pi provide Digital/Analog/I2C/PWM/UART port to meet all your needs. With the help of build-in MCU, a 12-bit 8 channel ADC is also available for Raspberry Pi.

Frankly speaking, it's about 60 Grove modules support the Grove Base Hat for Raspberry Pi now. However, we will continue to add new compatible modules, the more you use, the more grove added.



[https://www.seeedstudio.com/Grove-Base-Hat-for-Raspberry-Pi-p-3186.html]

Features

- Support Raspberry Pi 3B/3B+/4/Zero
- build-in MCU
- 12-bit ADC
- Multi-type Grove port

Specification

Item	Value
Operating Voltage	3.3V
MCU	STM32/MM32
ADC	12-bit 8 channel
Grove Port	6 Digital 4 Analog 3 I2C 1 PWM 1UART
Raspberry pi communication bus	I2C
I2C Address	0x04/0x08

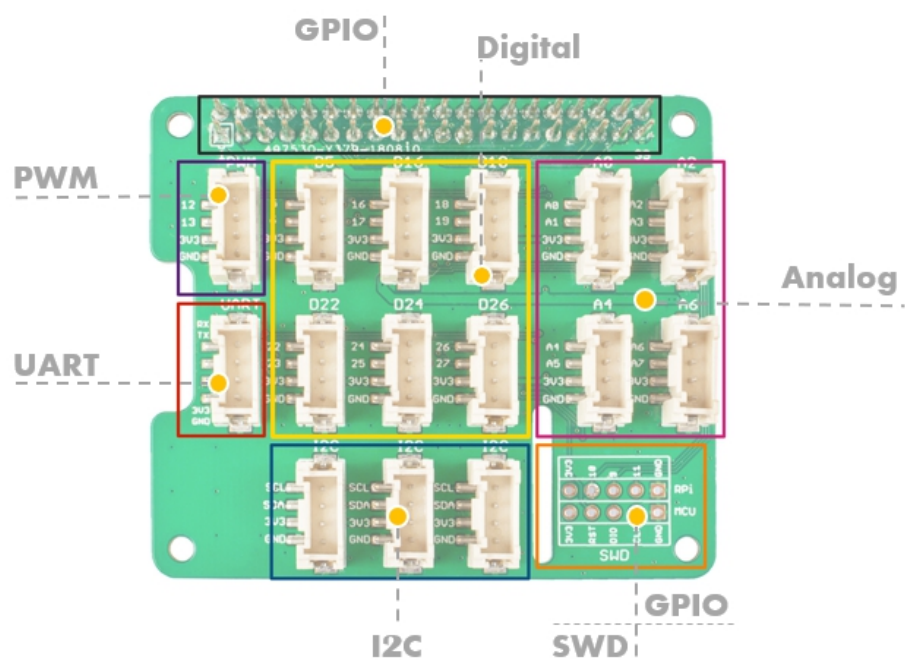
**Attention**

The operating voltage is 3.3V, please do not input more than 3.3V, otherwise it may damage the Raspberry Pi. Moreover, this hat can not work with 5V grove module via grove port, please use 3.3V compatible Grove module.

Hardware Overview

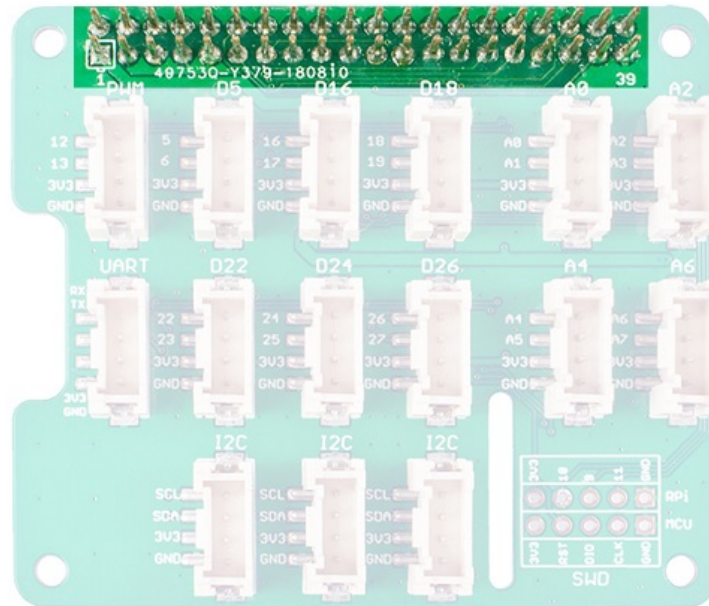
Pin Out

Overview



GPIO

The same pin out as the raspberry pi.



PWM(pulse-width modulation)

The Grove PWM Port connect to GPIO/BCM pin12(PWM0) and GPIO/BCM pin13(PWM1), which is the hardware PWM pin of Raspberry Pi, in addition, you can use all the GPIO pin as the soft PWM pin.



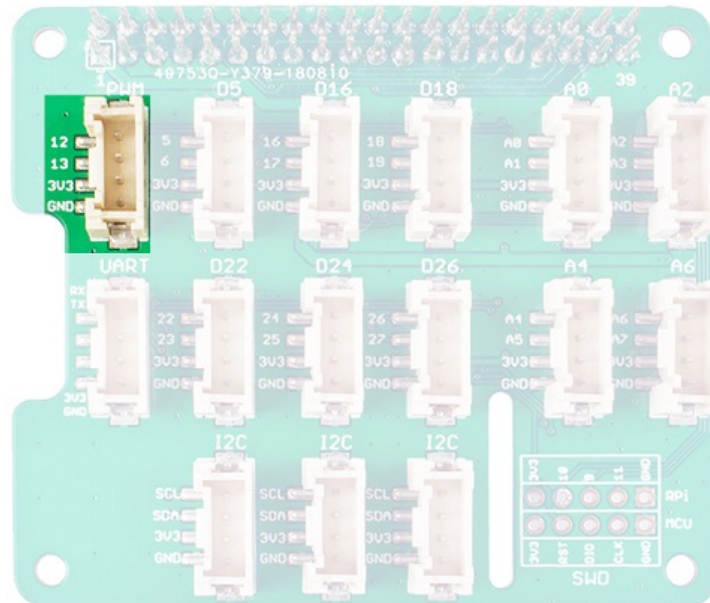
Note

0- All the silkscreen layer pin number besides the Grove port is the BCM pin number. The difference between BCM pins and the physical pins please refer to [here](https://www.raspberrypi.org/forums/viewtopic.php?p=726435) [https://www.raspberrypi.org/forums/viewtopic.php?p=726435]

1- Compared with hardware PWM, the software PWM isn't so accurate and will have trouble at high frequencies.

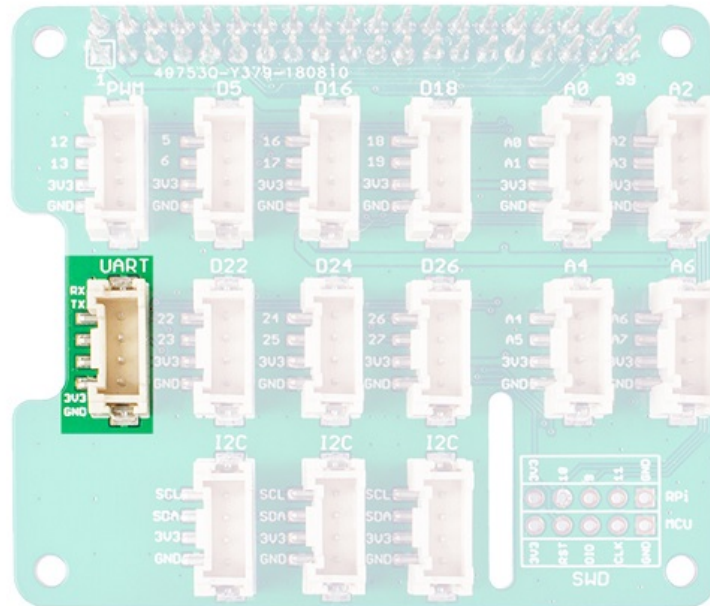
2- The GPIO/BCM pin18 is also marked as PWM0, actually the GPIO/BCM 12 and the GPIO/BCM 18 share the same PWM channel, so they can't set to different rate.

3- The audio jack output also uses PWM 0 and PWM 1, so you can't have audio output on that socket and use the PWMs at the same time.



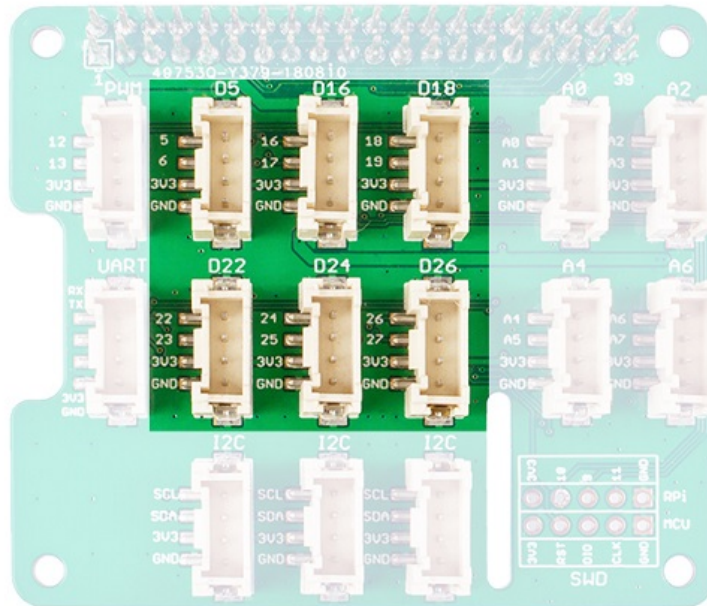
UART

The Grove UART port connect to the GPIO14(UART0 TX) and GPIO15(UART0 RX). UART is commonly used on the Pi as a convenient way to control it over the GPIO, or access the kernel boot messages from the serial console (enabled by default).It can also be used as a way to interface an Arduino, bootloaded ATmega, ESP8266, etc with your Pi.



Digital

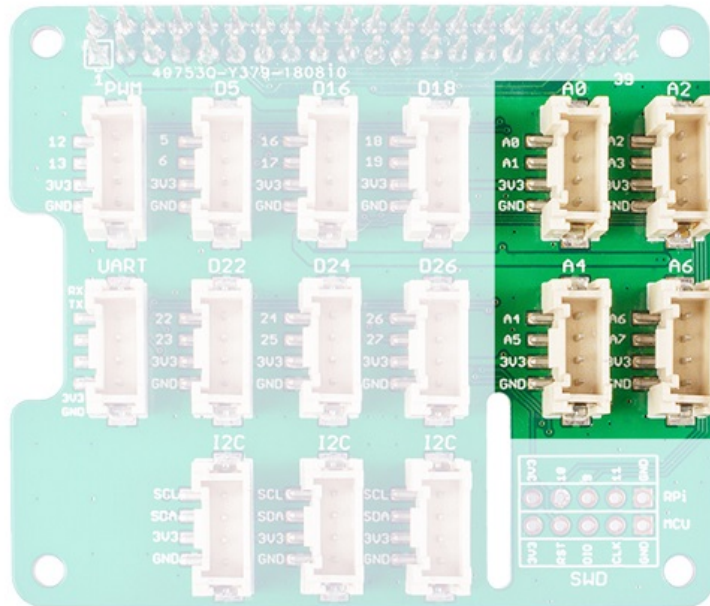
There are 6 digital Grove sockets in this board, normally the yellow wire(which connect to the top pin of the 4 pins Grove socket as) of Grove cable is the signal wire, so we name the digital Grove port **D5/D16/D18/D22/D24/D26**.



Analog

As we know, there is no ADC in the Raspberry Pi, so it can not work with analog sensor directly. Now with the help of the build-in MCU STM32, the Grove base hat can work as an external 12-bit ADC, which means you can use analog sensor with your Raspberry Pi. Even more pleasing is that not one but four analog Grove sockets are available.

The analog sensor inputs the analog voltage into the 12-bit ADC. After the ADC convert the analog data to digital data, it input the digital data to the Raspberry Pi through the I2C interface.

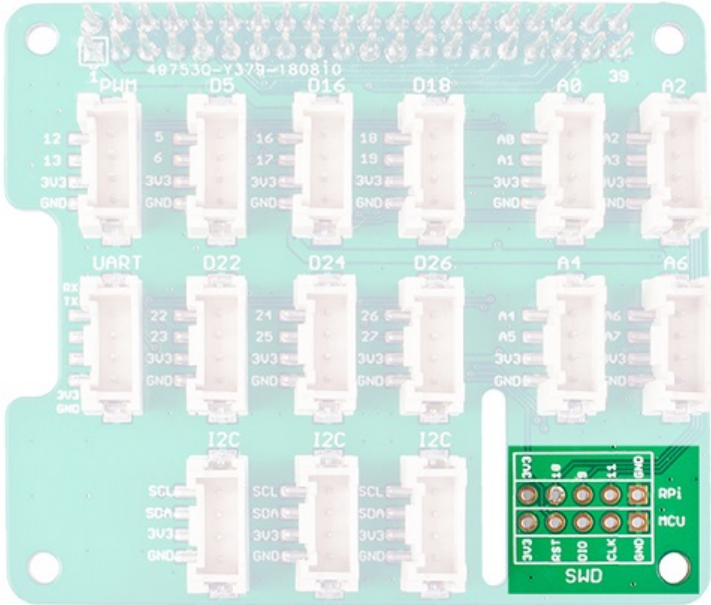


I2C

There are three I2C port available in this board, they all connect to the I2C pin of the raspberry directly. You can consider this part as an I2C hub. Most of seeed's new grove modules have I2C interface, you may find those three port is extremely useful.



https://wiki.seeedstudio.com/Grove_Base_Hat_for_Raspberry_Pi/



Grove Base Hat for Raspberry Pi Vs. GrovePi+

Parameter	Grove Base Hat for Raspberry Pi [https://wiki.seeedstudio.com/Grove_Base_Hat_for_Raspberry_Pi/]
Working Voltage	3.3V
MCU	STM32F030F4P6
Grove Ports	6 Digital(3.3V) 4 Analog(3.3V) 3 I2C(3.3V) 1 PWM(3.3V) 1 RPISER(UART) connect to Raspberry Pi(3.3V) 1 SWD
Grove-Parameter Digital	Connect to Raspberry Pi directly Grove Base Hat for Raspberry Pi [https://wiki.seeedstudio.com/Grove_Base_Hat_for_Raspberry_Pi/]

Grove-Analog	Connect to STM32F030F4P6(12bit ADC) and then transfer to I2C signal,route to Raspberry Pi directly
Grove-I2C	Connect to Raspberry Pi directly
Grove-PWM	Connect to Raspberry Pi directly
RPISER	Connect to Raspberry Pi directly
SERIAL	NA
SWD	Burn firmware to STM32F030F4P6
ISP	NA
Raspberry Pi Connector Pins	40



Getting Started

Hardware

Materials required

-- **Raspberry Pi x1** [<https://www.seeedstudio.com/Raspberry-Pi-3-Model-p-3037.html>]

-- Grove Base Hat for Raspberry Pi x1

-- Grove module

- **Step 1.** Plug the Grove Base Hat for Raspberry Pi into the Raspberry Pi.
- **Step 2.** Plug the Grove module into the corresponding Grove port.
- **Step 3.** Power the Raspberry Pi with micro-usb cable.



Warning

We recommend that you power up the Raspberry Pis after all the hardware connections are complete. Please do not hot plug the sensor module, otherwise the Raspberry Pi may crash.

Software



Attention

Due to chip shortage, we have replaced STM32 with MM32 in the latest version of the product, and the I2C address of the corresponding product has been changed from 0x04 to 0x08 in the old version, please change the I2C address in adc.py from 0x04 to 0x08 when using the library file provided by seed for development.

In this section we will introduce how to install the **seeed grove.py** library and how to use I2C, PWM, Digital and analog port of the Grove Base Hat for Raspberry Pi.



Tip

If you do not know how to use a raspberry pi, please check [here](https://www.raspberrypi.org/documentation/) [https://www.raspberrypi.org/documentation/] before start.

Architecture

To operate grove sensors, the grove.py depends many hardware interface libraries such as mraa/smbus2/rpi.gpi/rpi_ws281x.

App	User application
Grove Lib	Grove.py
HW Lib	SMBUS2
Interface	HW's GPIO/I2C/PWM
HW modules	Groves

Installation

Online one-click installation

One-click installation, quick start, what ever you call, with the single command below, we can install/update all dependencies and latest grove.py.



Attention

If you are using **Raspberry Pi with Raspberrypi OS >= Bullseye**, you **cannot use this command line**.

```
curl -sL https://github.com/Seeed-Studio/grove.py/raw/master,
```



Success

if everything goes well, you will see the following notice.

```
1 Successfully installed grove.py-0.5
2 #####
3 Latest Grove.py from github install complete !!!!!
4 #####
```

Step by step installation

Besides the one-click installation, you can also install all the dependencies and latest grove.py step by step.



Attention

If you are using **Raspberry Pi with Raspberrypi OS >= Bullseye**, you have to use this command line **only with Python3**.

```
1 git clone https://github.com/Seeed-Studio/grove.py
2 cd grove.py
3 # Python2
4 sudo pip install .
5 # Python3
6 sudo pip3 install .
```

Usage

Now you can use the Grove Base Hat for Raspberry Pi with dozens Grove modules, tap the command **grove_** and press the Tab key to check the supported Grove list.


```
1 pi@raspberrypi:~$ grove_  
2 grove_3_axis_compass_bmm150 grove_i2c_color_sensor.  
3 grove_4_digit_display grove_i2c_motor_driver  
4 grove_air_quality_sensor_v1_3 grove_lcd_1.2inches  
5 grove_button grove_led  
6 grove_collision_sensor grove_light_sensor_v1_  
7 grove_gesture_sensor grove_loudness_sensor  
8 grove_high_accuracy_temperature grove_mech_keycap  
9 pi@raspberrypi:~$ grove_
```

Then we will show you how to use them according to port type.

PWM Port



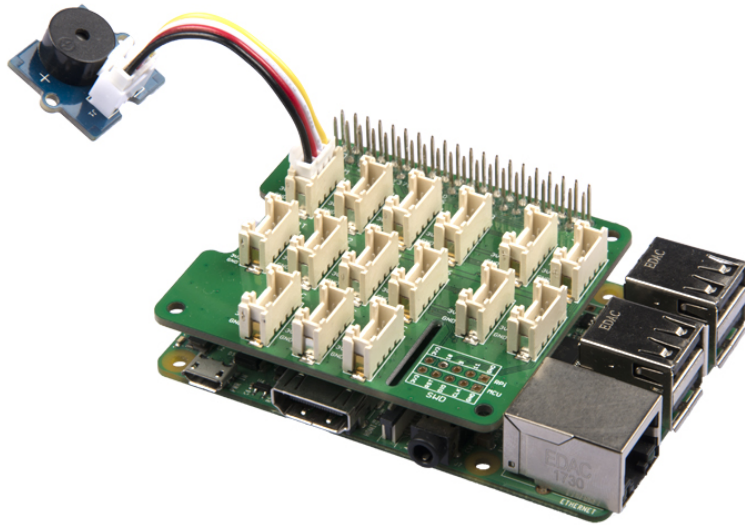
Attention

If you are using **Raspberry Pi with Raspberrypi OS >= Bullseye**, you have to use this command line **only with Python3**.

We will take the **Grove - buzzer**

[<https://www.seeedstudio.com/Grove-Buzzer-p-768.html>] for example to introduce the PWM port.

Hardware connection diagram



Tap the following command `sudo grove_pwm_buzzer` in the command line interface.

```
1  pi@raspberrypi:~$ sudo grove_pwm_buzzer
2  Insert Grove-Buzzer to Grove-Base-Hat slot PWM[12 13 VCC
3
4  3800
5  3400
6  3000
7  2900
8  2550
9  2270
10 2000
11 exiting application
```

The buzzer will ring a few times and then stop, the program will automatically exit.

Digital Port



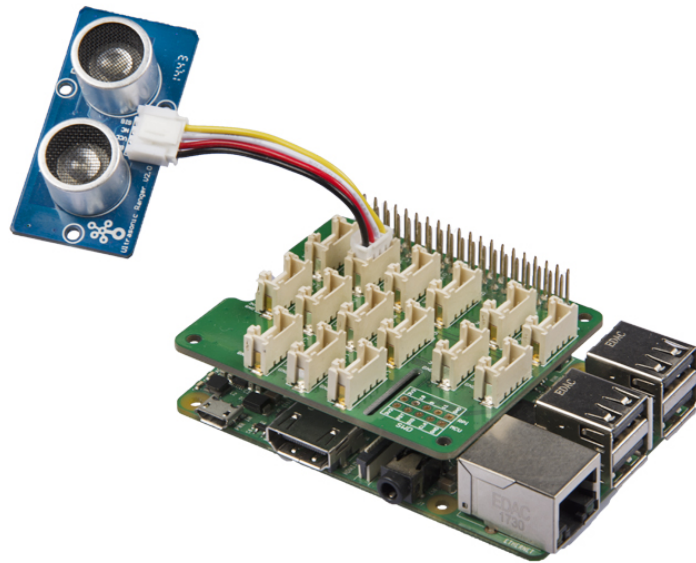
Attention

If you are using **Raspberry Pi with Raspberrypi OS >= Bullseye**, you have to use this command line **only with Python3**.

We will take the **Grove - Ultrasonic Ranger**

[<https://www.seeedstudio.com/Grove-Ultrasonic-Ranger-p-960.html>] for example to introduce the Digital port.

Hardware connection diagram



Tap the following command `grove_ultrasonic_ranger 5 6` in the command line interface.

```
1 pi@raspberrypi:~$ python3 grove_ultrasonic_ranger 5 6
2 Detecting distance...
```



```

3  6.979909436456088 cm
4  7.966469074117726 cm
5  12.451204760321255 cm
6  15.184797089675378 cm
7  17.429220265355603 cm
8  18.73230112010035 cm
9  20.717752390894397 cm
10 19.83807004731277 cm
11 17.3059003106479 cm
12
13 ^CTraceback (most recent call last):
14   File "/usr/local/bin/grove_ultrasonic_ranger", line 11
15     load_entry_point('grove.py==0.5', 'console_scripts',
16   File "/usr/local/lib/python3.5/dist-packages/grove/gro
17     time.sleep(1)
18 KeyboardInterrupt

```

When you change the distance between the Grove - Ultrasonic Ranger and the target object, the measurement value will change accordingly. Press `Ctrl + C` to quit.



Attention

For most grove module, you need to add the pin number parameter, like `grove_ultrasonic_ranger 5 6`, **5** and **6** are the GPIO/BCM pin. However, you may have noticed that in the first example `grove_pwm_buzzer`, we didn't add a parameter after the command. This is because the PWM port and I2C port do not require pin number parameters. You can find the pin number silkscreen just besides the Grove socket.

Analog Port



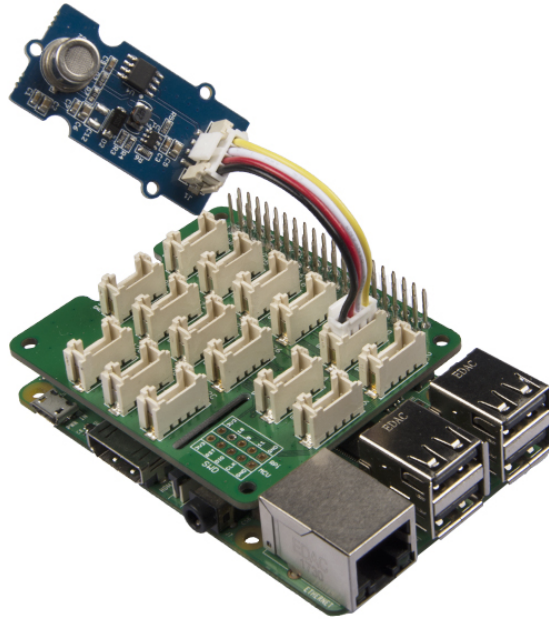
Attention

If you are using **Raspberry Pi with Raspberrypi OS >= Bullseye**, you have to use this command line **only with Python3**.

We will take the [Grove - Air quality sensor v1.3](https://www.seeedstudio.com/Grove-Air-quality-sensor-v1-3-p-2439.html)

[<https://www.seeedstudio.com/Grove-Air-quality-sensor-v1-3-p-2439.html>] for example to introduce the Analog port.

Hardware connection diagram



Tap the following command `grove_air_quality_sensor_v1_3 0 1` in the command line interface.

```
1 pi@raspberrypi:~$ python3 grove_air_quality_sensor_v1_3
2 Detecting ...
3 62, Air Quality OK.
4 63, Air Quality OK.
5 61, Air Quality OK.
6 61, Air Quality OK.
7 59, Air Quality OK.
8 62, Air Quality OK.
9 60, Air Quality OK.
```

```
10 60, Air Quality OK.
11 59, Air Quality OK.
12 60, Air Quality OK.
13 60, Air Quality OK.
14 60, Air Quality OK.
15
16 57, Air Quality OK.
17 ^CTraceback (most recent call last):
18   File "/usr/local/bin/grove_air_quality_sensor_v1_3", line 1, in <module>
19     load_entry_point('grove.py==0.5', 'console_scripts', 'grove-air-quality-sensor')
20   File "/usr/local/lib/python3.5/dist-packages/grove/grove.py", line 1, in <module>
21     time.sleep(.1)
22 KeyboardInterrupt
```

You can use this sensor to detect the air quality. Press `Ctrl+C` to quit.



Notice

You may have noticed that for the analog port, the silkscreen pin number is something like **A1**, **A0**, however in the command we use parameter **0** and **1**, just the same as digital port. So please make sure you plug the module into the correct port, otherwise there may be pin conflicts.

I2C



Attention

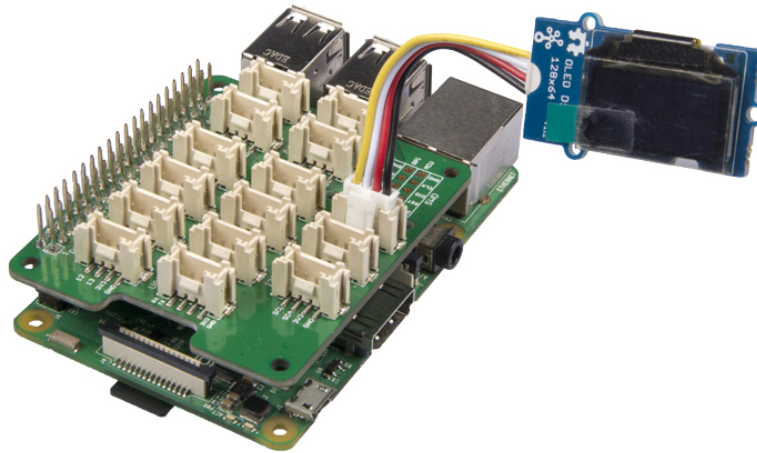
If you are using **Raspberry Pi with Raspberrypi OS >= Bullseye**, you have to use this command line **only with Python3**.

We will take the **Grove - OLED Display 128x64**

[<https://www.seeedstudio.com/Grove-OLED-Display-0-9-p-781.html>]

for example to introduce the I2C port.

Hardware connection diagram



Tap the following command `grove_oled_display_128x64` in the command line interface.

```
1 pi@raspberrypi:~$ python3 grove_oled_display_128x64
2 pi@raspberrypi:~$
```

It seems nothing happened, however you can find the most famous sentence in the cyber world if you check your oled. 😊



Note

If you use the I2C tool to scan the I2C address of the grove module, you may find two or more address. 0x04 is the address of the *Grove Base Hat for Raspberry Pi*.

Schematic Online Viewer



!!!Product Change Note:

Because ST32 series chips are out of stock globally, prices have increased several times and there is no clear delivery date. We have no choice but to switch to the MM32 chip. The specific replacement models are as follows: STM32F030F4P6TR is replaced by MM32F031F6P6. After the chip is replaced, the product functions, features, usage methods and codes remain unchanged. It should be noted that the firmware version has changed, and the factory firmware has been adjusted according to different chips. If you

need to re-burn the firmware, please download the firmware corresponding to the chip.

Resources

- **[Zip]** [Grove Base Hat for Raspberry Pi Eagle Files](https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/Raspberry%20Pi%20Grove%20Base%20HAT%20v1.0.zip)
[https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/Raspberry%20Pi%20Grove%20Base%20HAT%20v1.0.zip]
- **[Zip]** [Seeed Grove.py Library](https://github.com/Seeed-Studio/grove.py/archive/master.zip) [https://github.com/Seeed-Studio/grove.py/archive/master.zip]
- **[Zip]** [STM32F030F4P6TR-Firmware](https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/grove_rpi_base_hat-v0.2-20180905-02.zip)
[https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/grove_rpi_base_hat-v0.2-20180905-02.zip]
- **[Zip]** [MM32F031F6P6-Firmware](https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/MM32F031F6P6_firmware.zip)
[https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/MM32F031F6P6_firmware.zip]
- **[PDF]** [STM32 Datasheet](https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/STM32.pdf)
[https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/STM32.pdf]
- **[PDF]** [MM32F031F6P6_Datasheet.pdf](https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/MM32F031F6P6_Datasheet.pdf)
[https://files.seeedstudio.com/wiki/Grove_Base_Hat_for_Raspberry_Pi/res/MM32F031F6P6_Datasheet.pdf]

Project

This is the introduction Video of this product.

All-new Grove Base HATs fo...



Tech Support

Please do not hesitate to submit the issue into our [forum](https://forum.seeedstudio.com/)

[<https://forum.seeedstudio.com/>]



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