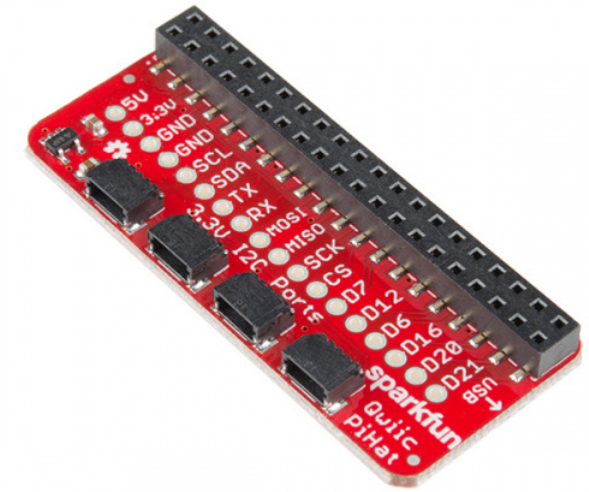
Qwiic HAT for Raspberry Pi Hookup Guide

CONTRIBUTORS:  *ENGLANDSAURUS*

Introduction

This Qwiic HAT for Raspberry Pi is the quickest and easiest way to utilize SparkFun's Qwiic ecosystem while still using that Raspberry Pi that you've come to know and love. This Qwiic HAT connects the I^2C bus (GND, 3.3V, SDA, and SCL) on your Raspberry Pi to an array of Qwiic connectors. It also has a few important pins on the Raspberry Pi broken out for easy access. Since the Qwiic system allows for daisy chaining (as long as your devices are on different addresses), you can stack as many sensors as you'd like to create a tower of sensing power!



SparkFun Qwiic HAT for Raspberry Pi

DEV-14459

$6.50

★★★★☆ 4

Required Materials

To follow along with this hookup guide, you will need any Raspberry Pi with 2x20 male headers.

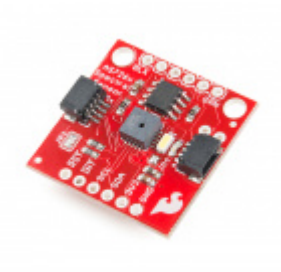
Raspberry Pi 3 B+
DEV-14643
★★★★½ 35

A Pi Zero W will also work but you will need to make sure to solder some male headers to it.

Raspberry Pi GPIO Male Header - 2x20
PRT-14275
$1.05

Raspberry Pi Zero W
DEV-14277
★★★★½ 44

Now you probably didn't buy the Qwiic HAT if you didn't have any Qwiic products to use with it, right? If you don't have any Qwiic products, the following might not be a bad place to start.



SparkFun Spectral Sensor Breakout - AS7262 Visible (Qwiic)
SEN-14347
$27.95
★★★★☆ 2

SparkFun Environmental Combo Breakout - CCS811/BME280 (Qwiic)
SEN-14348
$38.50
★★★☆☆ 20

SparkFun GPS Breakout - XA1110 (Qwiic)
GPS-14414
$53.50
★★★★½ 5

SparkFun Qwiic Adapter
DEV-14495
$1.60
★★★★★ 1

Finally, you'll need our handy Qwiic cables to easily connect sensors to your Qwiic HAT. Below are a few options.

Qwiic Cable - 50mm
PRT-14426
$0.95

Qwiic Cable - 100mm
PRT-14427
$1.50

Qwiic Cable - 200mm
PRT-14428
$1.50

Qwiic Cable - 500mm
PRT-14429
$1.95
★★★★☆ 1

Required Setup Tools

As a desktop, these devices are required:

- USB Mouse
- USB Keyboard
- HDMI monitor/TV/adapted VGA
- 5V Power Supply

Suggested Reading

If you aren't familiar with the Qwiic system, we recommend reading here for an overview.

Qwiic Connect System

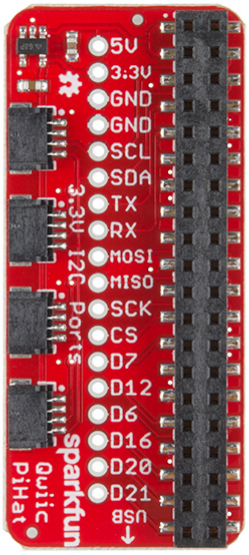
We would also recommend taking a look at the following tutorials if you aren't familiar with them.

I2C
An introduction to I2C, one of the main embedded communications protocols in use today.

Serial Terminal Basics
This tutorial will show you how to communicate with your serial devices using a variety of terminal emulator applications.

Hardware Overview

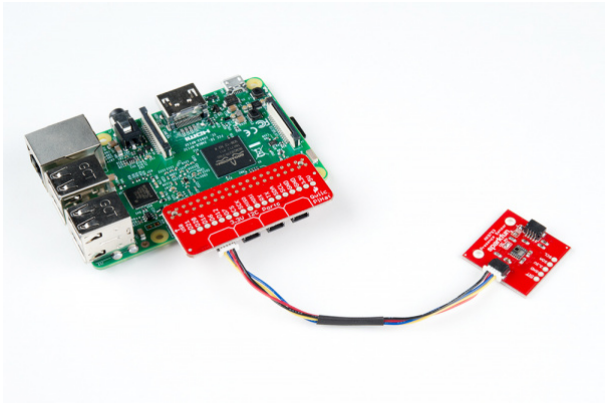
The Qwiic HAT has 4 Qwiic connect ports, all on the same I^2C bus. In addition to this, some of the pins on the Raspberry Pi are broken out for the user.



Hardware Assembly

To get started with your Qwiic HAT, simply plug it into the headers on the Raspberry Pi, make sure that the "USB" arrow on the HAT is pointing towards the USB on the Raspberry Pi.

Once the HAT is plugged in, you can start plugging in any Qwiic enabled sensors you might have.



Getting an OS

We recommend checking out the Raspberry Pi 3 Hookup Guide to install the operating system to flash the image to your microSD card for detailed instructions.

Raspberry Pi 3 Starter Kit Hookup Guide

APRIL 11, 2016

Guide for getting going with the Raspberry Pi 3 Model B and Raspberry Pi 3 Model B+ starter kit.

If you're starting from scratch with a blank microSD card, you'll want to install Raspbian. If you've already got a working Raspbian system, skip ahead to the next section. Be patient — each of these steps can take a while depending on the speed of your microSD card.

1. **Download an Image** — Download your favorite Linux distribution. For beginners, we recommend getting NOOBS image.
2. **Flashing the Image** — Follow the instructions from the Raspberry Pi 3 Kit Hookup Guide to flash your microSD card. You can also follow the official Raspberry Pi installation instructions.

Configuring the Pi

The peripherals are not turned on by default. For those using Qwiic-enabled devices, you will want to enable I2C port. There are two methods to adjust the settings. This is outlined in our Raspberry Pi I2C tutorial.

Raspberry Pi SPI and I2C Tutorial

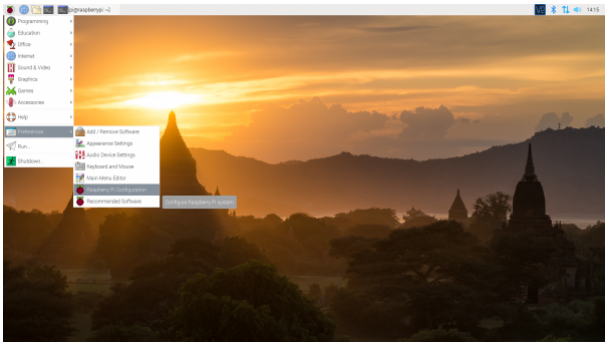
OCTOBER 29, 2015

Learn how to use serial I2C and SPI buses on your Raspberry Pi using the wiringPi I/O library for C/C++ and spidev/smbus for Python.

We've included the following instructions from the tutorial. To enable it, follow the steps below.

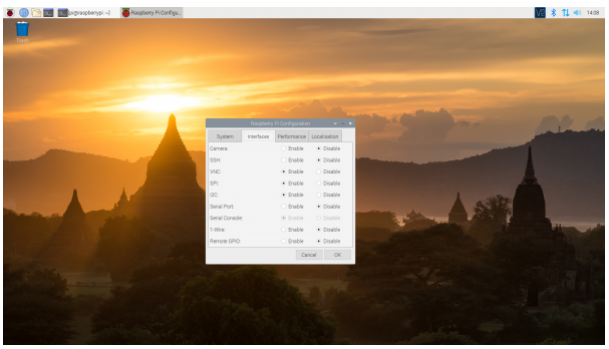
Raspberry Pi Configuration via Desktop GUI

You can use the Desktop GUI by heading to the **Pi Start Menu** > **Preferences** > **Raspberry Pi Configuration**.



Click on image for a closer view.

A window will pop up with different tabs to adjust settings. What we are interested is the **Interfaces** tab. Click on the tab and select **Enable** for **I2C**. At this point, you can enable additional interfaces depending on your project needs. Click on the **OK** button to same.

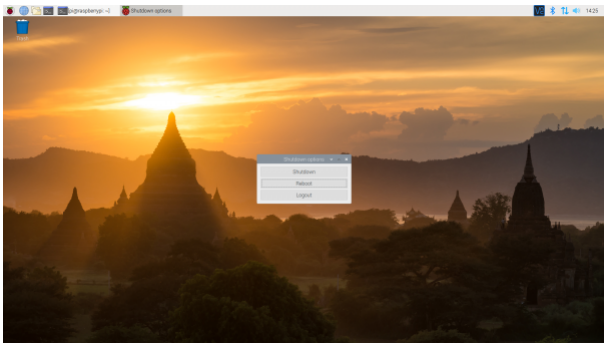


Click on image for a closer view.

We recommend restarting your Pi to ensure that the changes to take effect. Click on the **Pi Start Menu** >

Preferences > **Shutdown**. Since we just need to restart, click on the **Restart** button.

Shutdown



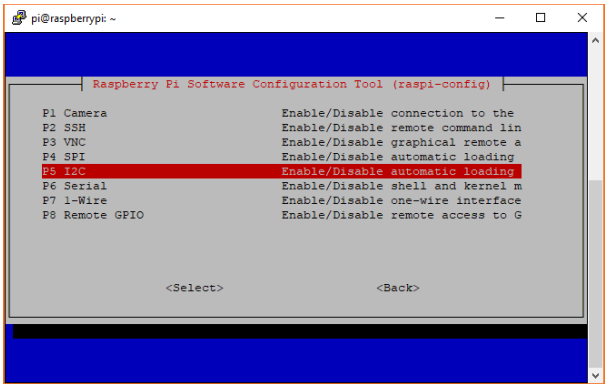
Turn Off, Restart, Log Off

Click on images for a closer view.

raspi-config Tool via Terminal

Again, we can use `raspi-config` to enable it.

1. Run `sudo raspi-config`.
2. Use the down arrow to select `5 Interfacing Options`
3. Arrow down to `P5 I2C`.
4. Select `yes` when it asks you to enable I2C
5. Also select `yes` if it asks about automatically loading the kernel module.
6. Use the right arrow to select the `<Finish>` button.
7. Select `yes` when it asks to reboot.



Raspi-config for I2C

The system will reboot. When it comes back up, log in and enter the following command

```
ls /dev/*i2c*
```

The Pi should respond with

```
/dev/i2c-1
```

Which represents the user-mode I2C interface.

Scanning for I2C Devices

If you are using the Raspberry Pi to quickly connect to I^{2}C devices, the best place to start would be to scan for an I^{2}C device on the bus.

Utilities

There is a set of command-line utility programs that can help get an I^{2}C interface working. You can get them with the apt package manager. Enter the following command.

```
sudo apt-get install -y i2c-tools
```

In particular, the `i2cdetect` program will probe all the addresses on a bus, and report whether any devices are present. Enter the following command in the command line. The `-y` flag will disable interactive mode so that you do not have to wait for confirmation. The `1` indicates that we are scanning for I^{2}C devices on I^{2}C bus 1 (e.g. i2c-1).

```
i2cdetect -y 1
```

You will get an output from your Raspberry Pi similar to the output below.

```
pi@raspberrypi:~/$ i2cdetect -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: 60 -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
```

This map indicates that there is a peripheral at address **0x60**. Your address may vary depending on what is connected to the I^{2}C bus. For advanced users, you can try to read and write its registers using the `i2cget`, `i2cset` and `i2cdump` commands.

Qwiic Py Drivers

Now that you have I^{2}C set up on your Pi, you can start programming your Qwiic devices on your Pi or if you'd like to start with some examples, we have a host of Python drivers for Qwiic breakouts available in the GitHub repository linked below. You can read more about Python for the SparkFun Qwiic system in this blog post.

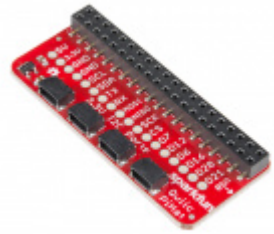
SPARKFUN QWIIC PY GITHUB REPO

Resources and Going Further

For more information, check out the resources below:

- Qwiic Hat Schematic (PDF)
- Qwiic HAT Eagle Files (ZIP)
- Qwiic System Landing Page
- Qwiic HAT GitHub Repository

Now that you have your Qwiic HAT ready to go, it's time to hook it up to some Qwiic enabled products.



SparkFun Qwiic HAT for Raspberry Pi
DEV-14459
$6.50
★★★★☆ 4

SparkFun RFID Qwiic Reader
SEN-15191
$21.50

SparkFun MicroMod Asset Tracker Carrier Board
DEV-17272
$149.95
★★★★★ 2

SparkFun Air Velocity Sensor Breakout - FS3000-1005 (Qwiic)
SEN-18377
$53.50
★★★★☆ 1

But I Already Have Sensors!

If you already have a handful of SparkFun sensors and parts? SparkFun has been putting our standard GND/VCC/SDA/SCL pinout on all our I^2C boards for many years. This makes it possible to attach a Qwiic Adapter that will get your SparkFun I^2C sensor or actuator onto the Qwiic system.

Here is the list of the boards that have the standard I^2C pinout and will work with the Qwiic adapter board:

- 9DoF Stick IMU - LSM9DS1
- 9DoF IMU - MPU-9250
- 6DoF IMU - LSM303C
- 6DoF IMU - LSM6DS3
- Triple Axis Accelerometer - LIS3DH
- Triple Axis Magnetometer - MAG3110
- Triple Axis Magnetometer - MLX90393
- Compass Module - HMC6343
- Atmospheric Sensor - BME280
- Barometric Pressure Sensor - MS5803-14BA
- Barometric Pressure Sensor - T5403
- Humidity and Temperature Sensor - Si7021
- Digital Temperature Sensor - TMP102
- Particle Sensor - MAX30105
- Air Quality Sensor - CCS811
- ToF Range Finder - VL6180

- Haptic Motor Driver - DRV2605L
- Micro OLED Display
- RGB and Gesture Sensor - APDS-9960
- RGB Light Sensor - ISL29125
- LED Driver - LP55231
- DAC Breakout - MCP4725
- 16 Output I/O Expander - SX1509
- Battery Babysitter - BQ24075

Check out this related tutorial:

Raspberry Pi SPI and I2C Tutorial

OCTOBER 29, 2015

Learn how to use serial I2C and SPI buses on your Raspberry Pi using the wiringPi I/O library for C/C++ and spidev/smbus for Python.