Raspberry Pi 4 Kit Hookup Guide

Introduction

Heads up! The Raspberry Pi 4 Model B has the same mechanical footprint as both the Raspberry Pi 3 Model B+ and the Raspberry Pi 2 Model B. This guide will show images of the Pi 4 Model B but you can still follow along with the previous Pi Models to configure your Pi's software settings!

The improved Raspberry Pi 4 Model B [2GB, 4GB, and 8GB] is another upgrade in the line of Raspberry Pi single board computers, what's new? This hookup guide goes through the same process of getting going that worked with the previous Raspberry Pi Models.
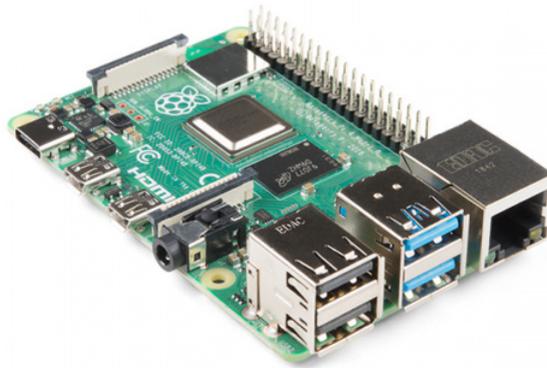

Raspberry Pi 4 Model B (2 GB)
○ DEV-15446
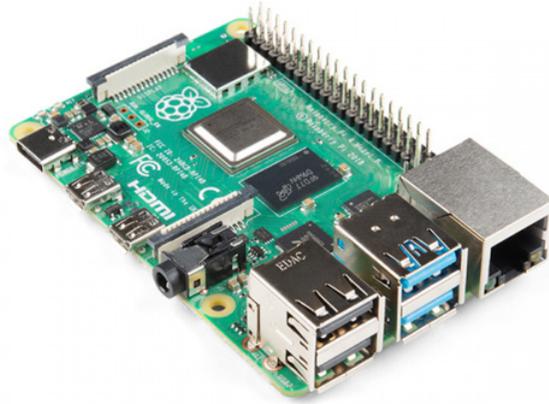
Raspberry Pi 4 Model B (4 GB)
◉ DEV-15447

Raspberry Pi 4 Model B (8 GB)
◉ DEV-16811

Product Showcase: Raspberry Pi 4 Model B

There are a few kits available depending on your project. Depending on the version that you order, you can have one that includes the 2GB or 4GB RAM.

Basic Kit	*Desktop Kit*	
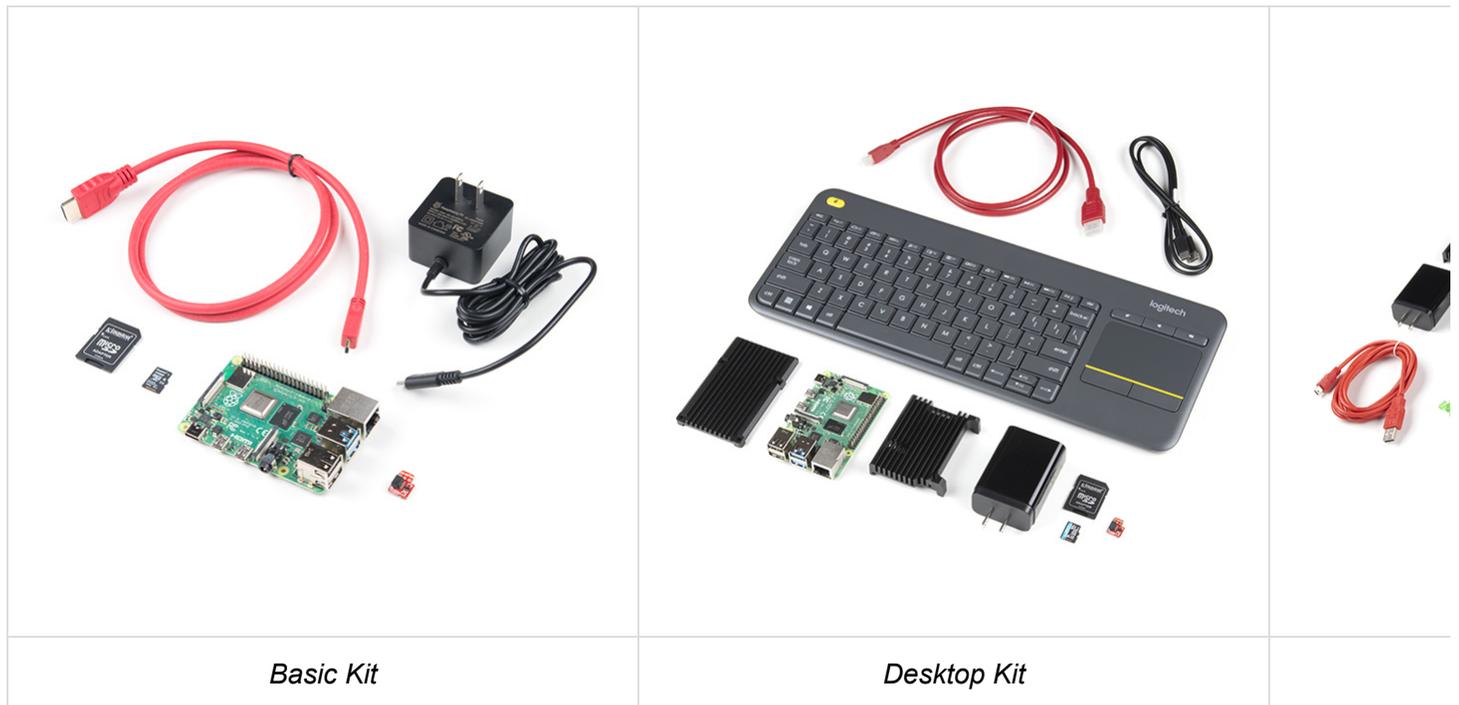
Materials Required

You'll need a mouse, keyboard, monitor, wall adapter with minimum power requirements, and cables to begin. Once configured, the Pi can be operated from its own peripherals or another computer connected over the Internet.

Kit Versions

There are three versions of the kit available at SparkFun. Each version includes a Raspberry Pi 4 with a different size RAM. Check out below for the different kit versions available!

- Basic
- Desktop
- Hardware Starter Kit

Product Showcase: SparkFunRaspberryPi 4 Kits

Basic Kit Version

The basic kit offers the bare bones of what you need to get up and running. This is assuming that you have a monitor, keyboard, mouse, and card reader [1] on hand. The connectors are different on the Pi 4 so the kit provides a mini-HDMI to HDMI cable and USB-C wall adapter at a minimum. The kits include a raw microSD card and SD card adapter so that you can flash your favorite Linux distribution. Last, a Qwiic Shim is included to easily connect a I^2C device to the Raspberry Pi.


SparkFun Raspberry Pi 4 Basic Kit - 2GB
⊖ KIT-16383

SparkFun Raspberry Pi 4 Basic Kit - 4GB
KIT-16384

SparkFun Raspberry Pi 4 Basic Kit - 8GB
KIT-16831

Product Showcase: SparkFun Raspberry Pi 4 Basic Kit

Desktop Kit Version

The desktop kit is pretty much the basic. However, a wireless keyboard with touchpad is included. We also include a heat sink case to keep your Pi cool as a cucumber when pushing your Pi's processing capabilities. The power supply included in this kit is provides a modular power system with the USB Type C wall adapter and Type C to Type C USB cable. Compared to the basic kit, the raw microSD card [1] included in this kit has a faster read/write speeds to take advantage of the Pi 4's processing power. This cuts the amount of time to flash or update the Linux distribution of your choice down significantly.

SparkFun Raspberry Pi 4 Desktop Kit - 2GB
KIT-16385

SparkFun Raspberry Pi 4 Desktop Kit - 4GB
⊖ KIT-16386

SparkFun Raspberry Pi 4 Desktop Kit - 8GB
⊖ KIT-16812

Hardware Starter Kit Version

The hardware kit is designed for those that are interested in prototyping a circuit on a breadboard. It includes components from both the basic and desktop kits. In addition, the hardware starter kit includes a breadboard, Pi Wedge adapter, IDC cable, LEDs, current limiting resistors, buttons, jumper wires, 2x20 extension header, 3.3V USB-to-Serial converter, and mini-B USB cable.

SparkFun Raspberry Pi 4 Hardware Starter Kit - 4GB
⊖ KIT-16388

SparkFun Raspberry Pi 4 Hardware Starter Kit - 8GB
⊖ KIT-17380

[1] **Note:** If you do not have a built-in card reader, you might want to consider adding a microSD USB reader to your cart in order to flash an image to the raw microSD card!

microSD USB Reader
⦿ COM-13004

Comparison Chart

Below is a table that shows the differences between the basic and desktop kits.

Includes	Basic	Desktop
Raspberry Pi 4 Version	2 GB / 4 GB / 8 GB	2 GB / 4 GB / 8 GB
Wall Adapter w/ Type C Cable	✓ (for the 2GB and 4GB versions)	
USB Type C Wall Adapter	✓ (for the 8GB version)	✓

USB Type C Cable	✓ (for the 8GB version)	✓
HDMI Micro to HDMI	✓	✓
MicroSD Card w/ Adapter	✓ (initial release of the 2GB version)	
High Speed MicroSD Card w/ Adapter	✓	✓
Logitech N400 Plus Wireless Keyboard & Touchpad		✓
Qwiic Shim	✓	✓
Heat Sink Case		✓
2x20 Extension Header		
Raspberry Pi Wedge w/ IDC Cable		
Breadboard		
M/F Premium Jumper Wires 6" (10 Pack)		
M/M Standard Jumper Wires 7" (30 Pack)		

Assorted Colored LEDs (20 Pack)		
330Ω 1/4 Watt Current Limiting Resistors (20 Pack)		
Multicolored Buttons (4 Pack)		
3.3V FTDI Basic Breakout		
Mini-B USB Cable		

Getting an OS

Note: You will need a microSD card with **minimum size of at least 8GB**! Not all microSD cards are the same. This is obvious in the memory size but the performance can also vary between microSD cards. The microSD card included in the basic kit (as shown on the left) is sufficient enough to run an image on the Pi 4. The microSD card included in the desktop kit (as shown on the right) has a faster read/write speed which enables you to flash, update, or boot an image in a shorter amount of time. Programs can also load faster as well.
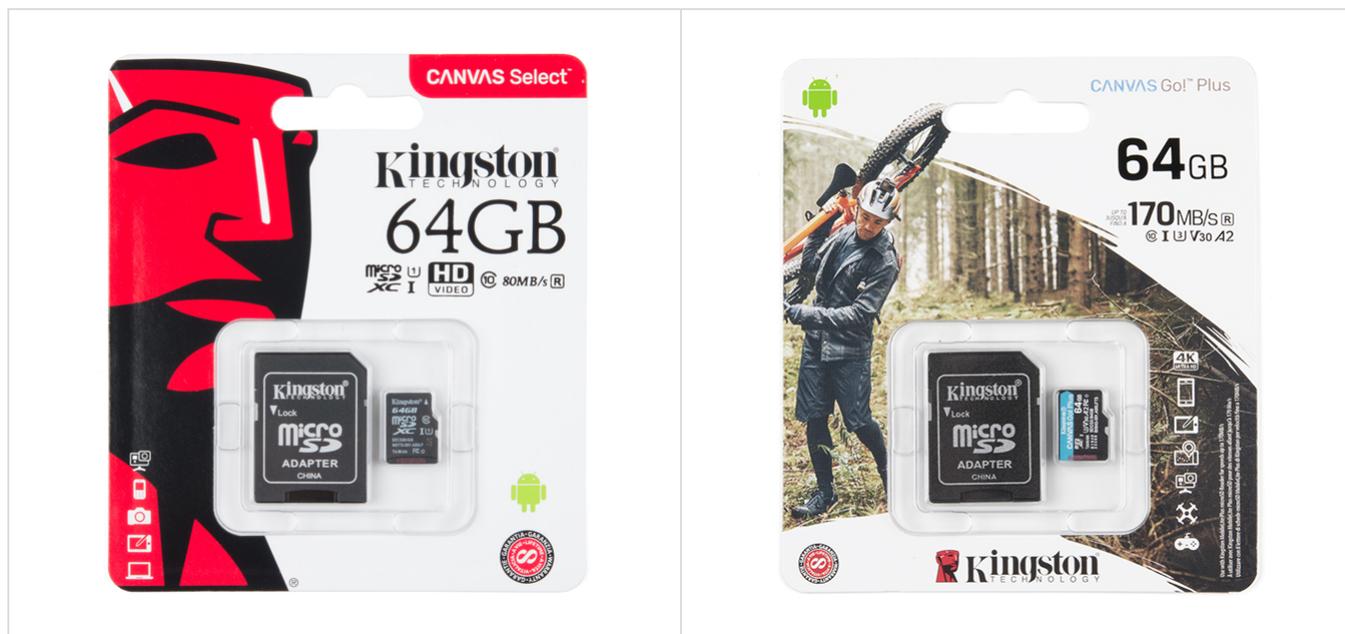
If you are looking to test the performance of your microSD card, there is a tool that you can download to test how well the microSD card performs. Don't be alarmed by the pass/fail. A slower performing microSD card is still be sufficient to run on the Pi 4. It just means that the Pi 4 may not be running at the optimum speed. The microSD card will . Click on the link below for more information!

<div align="center">

RASPBERRY PI SD CARD SPEED TEST

</div>

The microSD card included in each kit does not have an image flashed. You'll need to flash a new image to the microSD card if you are just starting out or if your existing image becomes corrupt somewhere down the line. There are a few Linux-based images available depending on your application. Or feel free to power down your Pi and switch microSD cards out to experiment with a different image. For beginners, we recommend getting NOOBS. Otherwise, the Raspbian with the PIXEL desktop would be the best.

- NOOBS (i.e. New Out-Of-the Box Software) - Contains Raspbian and LibreELEC. Other images can also be downloaded from the internet and installed.
- Raspbian - Official Raspberry Pi Debian-based computer operating system. There are three downloads. We recommend the desktop version with recommended software. The other downloads are the same but with less software. For advanced users, Raspbian Lite is the minimal text-only version and requires users to navigate using the command line interface (CLI).
- Other 3rd Party OS Images - There are other distributions available from third-party. If you are feeling adventurous, check out the other images available!

For the scope of this tutorial, we will summarize two of the images from the Pi foundation.

Flashing the Image NOOBS

If you decide to use NOOBS, you will need to:

- **Insert** the microSD card into a card reader.
- **Download** the ZIP file for NOOBS.

<div align="center">

DOWNLOAD NOOBS FROM THE PI FOUNDATION HERE!

</div>

- **Extract** the ZIP file.
- **Format** your Raspberry Pi's microSD card if needed.
- **Copy** all the contents from the unzipped folder into the microSD card.
- **Eject** the microSD card from your computer.

Flashing the Image Raspbian and 3rd Party OS Images

Note:! There are several tools available to flash your image distribution to a microSD card. For the scope of this tutorial, we'll assume that you are using the Raspberry Pi Imager for your OS. Make sure to install the software before continuing further.

Then follow the steps below to flash an image using the Raspberry Pi Imager.

- **Insert** the microSD card and card reader into your computer's port.

- Open the **software imaging tool** [2] of your choice (in this case, we'll use the Raspberry Pi Imager for your OS but you can use other images as well).

<div style="display:flex; gap:1em;">

DOWNLOAD THE LATEST RASPBIAN HERE!   **DOWNLOAD A 3RD PARTY OS HERE!**

</div>

- Press **CHOOSE OS** to select the Operating System from the list (in this case, we'll use one of the Raspbian images but you could use any of the 3rd party images).
- Press **CHOOSE SD CARD** to select mounted microSD Card.
- Press **Write** (it will take a while depending on the image and microSD card so just do a little dance as you wait).
- **Eject** the microSD card when finished.

[2] **Note:** Check out this extensive guide to flashing images to a microSD card. You could use Etcher.io, Win32DiskImager, or a command line tool depending on your personal preference.
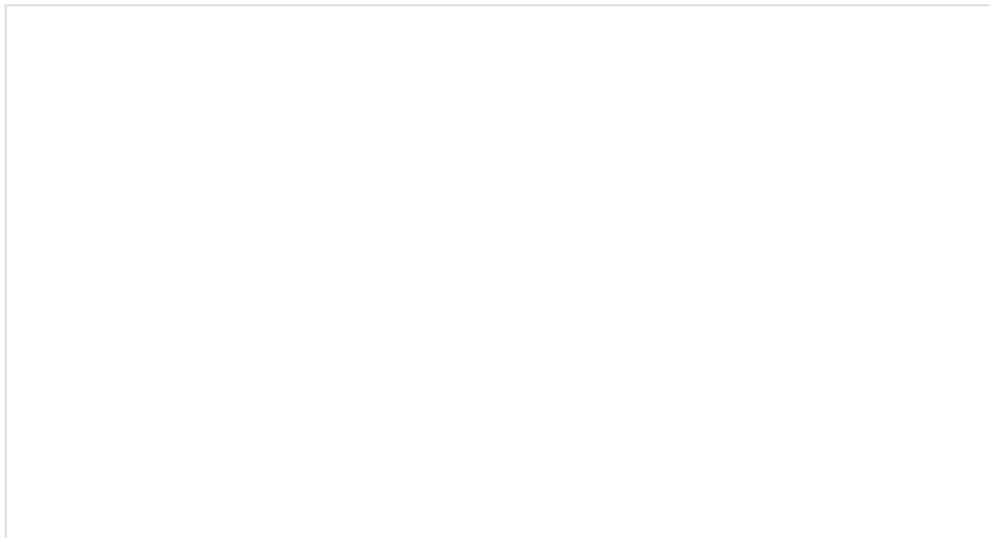
SD Cards and Writing Images
JUNE 4, 2015
How to upload images to an SD card for Raspberry Pi, PCDuino, or your favorite SBC.

Assembly

The Pi is straight-forward and easy to put together, but in the event that something doesn't seem right, this section will give you an idea of what it is supposed to look like to get the Pi up and running.

| Basic Kit | Desktop Kit |

Unbox and gather these components before beginning the assembly

Attaching a Heat Sink Enclosure Optional

Note: Under normal conditions, the Pi 4 can be run without the need for a heat sink enclosure. However, adding a heat sink will help prevent the Raspberry Pi 4 from throttling when you are pushing the Pi to its limits, such as running multiple displays at once. The following instructions are for those that are using the Raspberry Pi 4 with a heat sink enclosure. The basic kit does not include the heat sink enclosure. Make sure to add it to your cart with your favorite color!

Aluminum Heatsink Case for Raspberry Pi 4 - Obsidian Black
◉ PRT-15773

Aluminum Heatsink Case for Raspberry Pi 4 - Magnetite Grey
◔ PRT-15775

Aluminum Heatsink Case for Raspberry Pi 4 - Red
⊙ PRT-15893

Aluminum Heatsink Case for Raspberry Pi 4 - Gold
⊙ PRT-15774

CLICK TO SEE MORE ENCLOSURES!

If you are using the heat sink enclosure, grab the thermal pad that matches the size of the Pi's CPU. Remove the thin, clear plastic film and paper from both sides of the thermal pad. Attach the side that had the paper to the Pi's CPU. There are thermal pads shaped for other IC and can be added on those chips as well. However, those do not get hot.
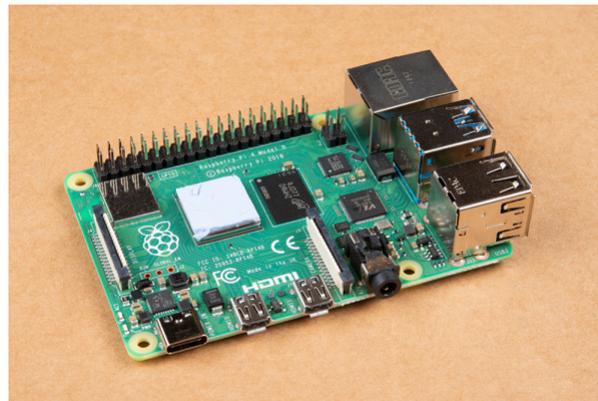
Grab the top of the heat sink case with the cutout for the GPIO pins and place it on the Pi. If you are using the DSI port or Raspberry Pi camera, now would be good time to insert the ribbon cable between the Pi and the top of the heat sink.
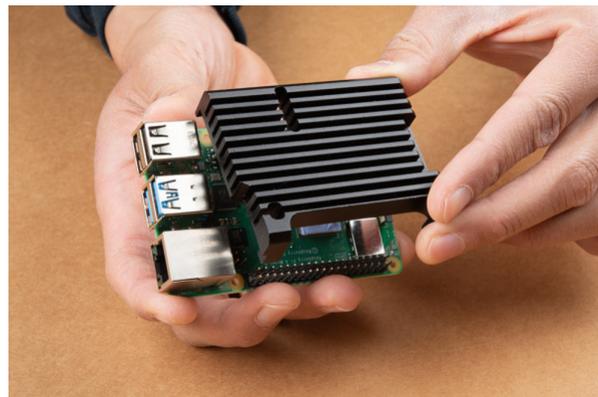
Align the mounting holes of the bottom of the heat sink case.

Screw and tighten the hex bolts using the allen key.

Rotate the Pi. Your heat sink enclosure should look like the image below!

Insert the microSD Card

With the image flashed on the microSD Card, insert it into the microSD socket.
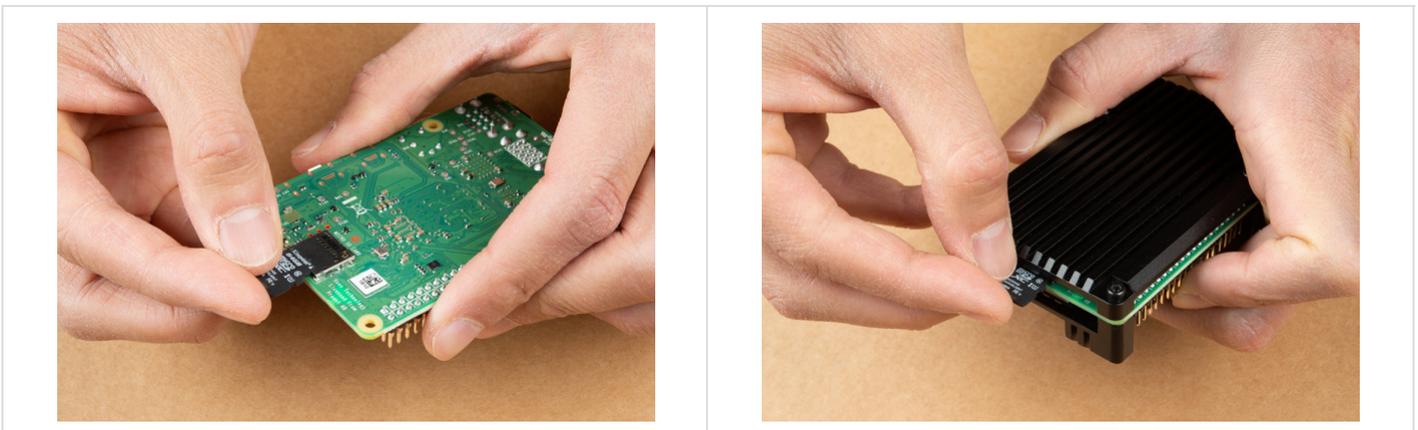
Attaching Peripherals

Attach desired consumer computer equipment. At a minimum to get up and running or navigate through the Pi, we recommend using a monitor, keyboard, and mouse. The following images will use a Pi without an enclosure to show where to connect the peripherals.

Monitor

Using a monitor with a HDMI port [3], insert the HDMI end of the cable to the connector. Then connect the mini-HDMI end of the cable to the connector. Note that the Pi 4 has two mini-HDMI outputs. You will need to connect to the **HDMI0** port. closest to the USB-C connector.
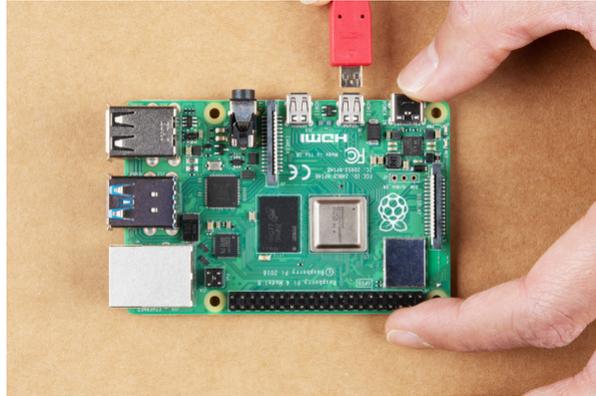
[3] **Note:** Depending on how old your monitor is, you may need an additional adapter to convert the HDMI to the input port. Some of these may be a VGA or DVI connector.

|	
VGA adapter	*DVI adapter*

Alternatively, you can attach a compatible LCD display via the DSI port or take advantage of the headless setups. Keep in mind that you may need to configure additional settings in order to get the Pi to output to the display.

Raspberry Pi LCD - 7" Touchscreen
◉ LCD-13733

Keyboard and Mouse

Connect a keyboard and mouse to the USB ports. In this case, we were using a wireless keyboard and mouse that had a USB dongle. While you can insert the HID device into any USB port, we recommend connecting it to the USB 2.0 port so that you have the faster USB 3.0 ports (with blue) are available for certain devices (i.e. flash drives).
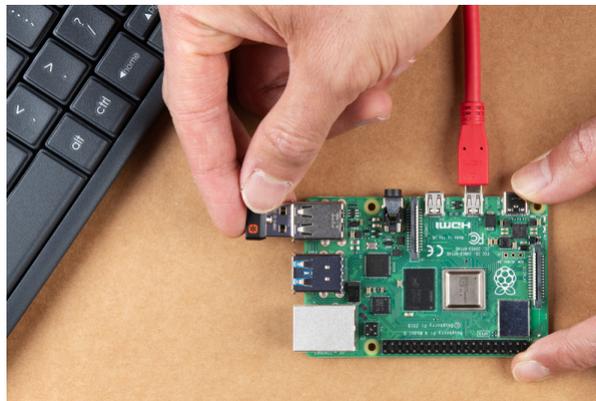
If you are using a wireless keyboard/mouse combo, the wireless USB dongle that is included maybe hidden in the battery compartment. If you are using the Logitech K400 Plus, flip it over and slide the compartment for the battery holder off.

Flipping over the cover, you'll notice that the dongle is attached inconspicuously on the back. Grab the wireless dongle from the back to insert into the Pi's USB port and slide the cover back on the Logitech K400 Plus.

To power the keyboard, make sure to flip the power switch to the green position on the side of the Logitech K400 Plus. Feel free to flip the power switch back to the red position to remove power.

Power Supply

If you have not already, make sure that you inserted the microSD card into the microSD socket. Once everything is connected, insert the power supply [4]!
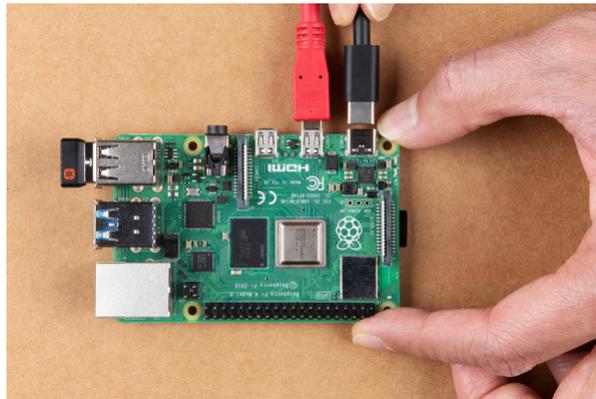
[4] ⚡ **Note:** The minimum power requirements to power the Raspberry Pi 4 Model B is **5VDC, 3A**. Not all power supplies are made the same so there may be voltage drops depending on specifications and cable. Make sure that your wall adapter or battery is stable and able to meet the minimum requirements. Depending on your country region, you may need a converter to connect to a wall outlet. The following products are compatible. If you decide to get the wall adapter, make sure to get the appropriate cable as well.

Raspberry Pi Wall Adapter Power Supply - 5.1VDC, 3.0A, 15.3W (USB-C)
⊖ TOL-15448

USB 2.0 C to C Cable - 1m
◉ CAB-16395

USB-C Wall Adapter - 5.1V, 3A (Black)
◉ TOL-16272

Completed Setup

At this point, your setup should look similar to the images below to get the Pi up and running. You could add ethernet, a second monitor, headphones, speakers, or a camera depending on your setup as well!

Connecting Hardware

Need easy access to the GPIO pins on the board? If you ordered a Qwiic cable, Qwiic enabled device, and any of the kits, take a look at the Qwiic SHIM [5] to quickly access the I^2C pins. If you are looking to use certain I^2C devices with Python, we recommend taking a look at the Qwiic Kit for Raspberry Pi to get started.

Qwiic SHIM for Raspberry Pi Hookup Guide

DECEMBER 5, 2019

Ever wanted to prototype I2C components on a Pi? Now you can!

Qwiic Kit for Raspberry Pi Hookup Guide

JULY 4, 2019

Get started with the CCS811, BME280, VCNL4040, and microOLED via I2C using the Qwiic system and Python on a Raspberry Pi! Take sensor readings from the enviroment and display them on the microOLED, serial terminal, or the cloud with Cayenne!

If you included the Pi Wedge with prototyping parts in your order or the Hardware Starter Kit, check out the associated tutorial for the Pi Wedge[5] to easily access the GPIO pins on a breadboard. We recommend taking a look at the Raspberry gPIo tutorial to get started with LEDs and buttons. If you decide to go headless, you can use the 3.3V FTDI to configure or control your Pi via serial.
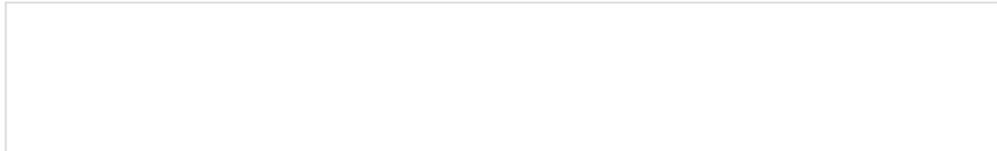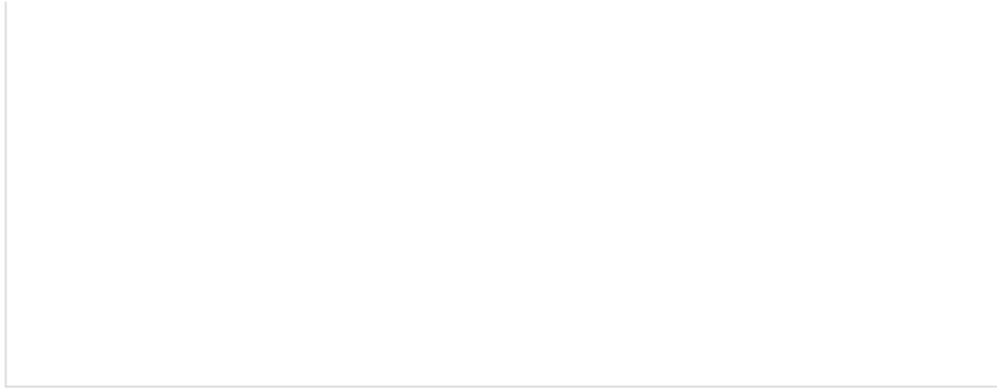
Preassembled 40-pin Pi Wedge Hookup Guide

OCTOBER 29, 2015

Using the Preassembled Pi Wedge to prototype with the Raspberry Pi B+.
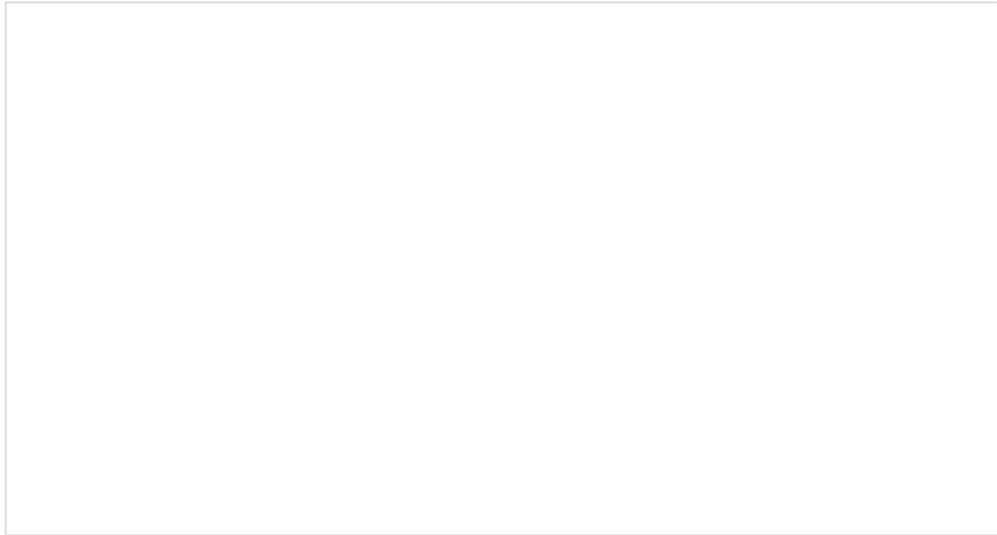
Raspberry gPIo

OCTOBER 29, 2015

How to use either Python or C++ to drive the I/O lines on a Raspberry Pi.

[5] **Note:** When using an enclosure with a Raspberry Pi, you may need an extension header to access the GPIO pins.
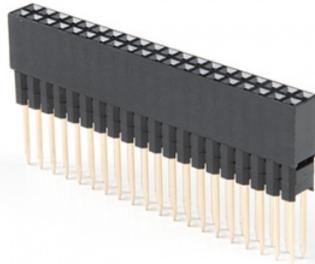
## Extended GPIO Female Header - 2x20 Pin (13.5mm/9.80mm)

◉ PRT-16764
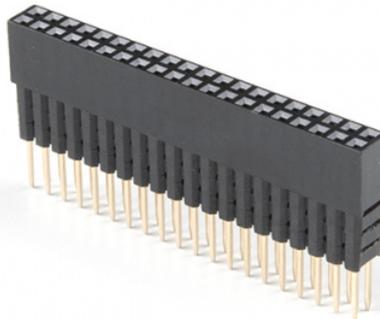
Extended GPIO Female Header - 2x20 Pin (16mm/7.30mm)

◉ PRT-16763

The Qwiic SHIM is not intended to be used with the heatsink case, as it prevents the case from properly connecting with the single board computer. The top of the case needs to be off should you use the SHIM or decide to use an extension header [PRT-16764] in conjunction with a Pi HAT. You can also use an extension header [PRT-16763] with the Pi Wedge's IDC cable. Note the differences in the pin length. The header with 7.30mm pin length uses three plastic spacers, which cover the pins more when using a HAT or the Pi Wedge's IDC cable.

Extension Header with 9.80mm Pin Length is Used to Help Stack the Qwiic SHIM and Pi Servo HAT on a Pi 4 with Heat Sink
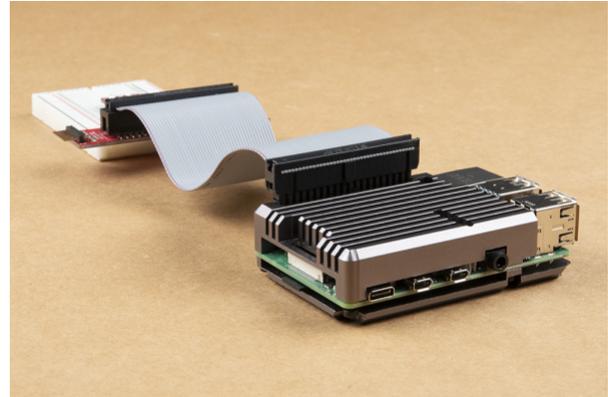
Extension Header with 7.30mm Pin Length is Used to Help Connect the Pi Wedge's IDC Cable to the Pi 4 with Heat Sink

The height of the enclosure and PCB varies depending on the design. The image below shows a Pi 3 in the enclosure. The overall height of the enclosure is lower than the Pi 4's heat sink enclosure so one 2x20 extension header was needed when stacking the Qwiic pHAT v2.0 on the Pi. You may need to stack additional extension headers so that the boards have enough clearance when using other enclosures and HATs.
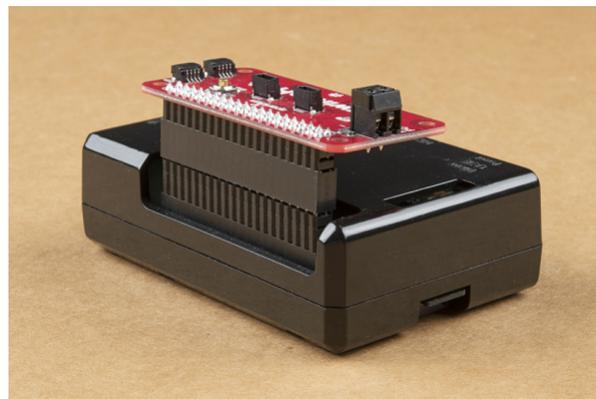
Methods of Working with the Pi

Once the Pi is configured, there are a few methods of using it depending on if you want to use it like a desktop or manage it remotely.

This section covers using the Pi in the following ways

- **Using HDMI-out with Monitor** -- Operate your Pi like a desktop computer.
- **Headless without a Monitor**
  - **Using the serial terminal** -- Some functionality.
  - **Using SSH** -- Operate through a network linked to another computer.
  - **Using VNC** -- Control the Pi's graphical desktop remotely over the Internet using a computer. This is useful if you decide to remotely connect to a Pi that may or may not be connected to a monitor.

Using HDMI-out with a Monitor

If this is the first time you are booting NOOBS, you'll need to connect your Raspberry Pi to a monitor and follow the installer. In the window, select **Raspbian Full [RECOMMENDED]** and click on the button to **Install**. You'll need to be patient as the software installs the OS to the microSD card. Once finished, click on **OK**. This will restart the Pi.

PIXEL Desktop (GUI)

By selecting NOOBS with Raspbian, it automatically logs in and starts a graphical user interface. Once the desktop installs, follow the wizard to configure your Raspberry Pi! You'll need to configure the settings based on your region, monitor, internet settings, and password. It is best to have the Pi check for updates and restart for the changes to take effect.
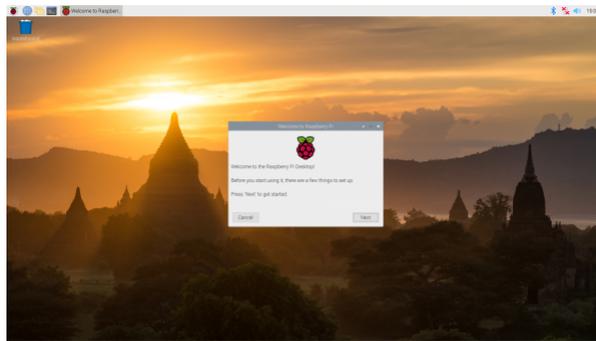
Command Line Interface (CLI)

If configured to boot to shell, log in with the following credentials:

username: `pi`
password: `raspberry`

Then, enter in the command line to enter a graphical environment should you decide to take advantage of the desktop-type menu-driven operating system.

```
startx
```

If you need to get back to text land, you can either

- Log off through the Task Bar Menu
  - drops back to the shell, closing down the X window system
- Open xterm from the Task Bar
  - opens a shell in a graphical window
- Use `CTRL + ALT + 1` through `CTRL + ALT + 8`
  - gives you a number of shells, with 7 being the graphic environment (if loaded).

Remember, shutdown with the task bar menu or enter the following command from a shell, and wait for the system to halt before removing power [6].

```
sudo shutdown -h now
```

[6] ⚡**Warning:** Removing power before properly shutting down will corrupt your Raspberry Pi's image. Make sure that you properly shut down before removing power from the Pi. Alternatively, you could write a Python script to turn off the Pi using a GPIO.


Raspberry Pi Safe Reboot and Shutdown Button
APRIL 20, 2020
Safely reboot or shutdown your Raspberry Pi to avoid corrupting the microSD card using the built-in general purpose button on the Qwiic pHAT v2.0!

Headless without a Monitor

As an alternative, you can also log into the Pi as a "headless" computer. This is basically a Raspberry Pi without a monitor, keyboard, or mouse. You can decide to connect to the Pi using a serial UART or SSH. For advanced users, you will need to turn on the interfaces before you can take advantage of these setups.
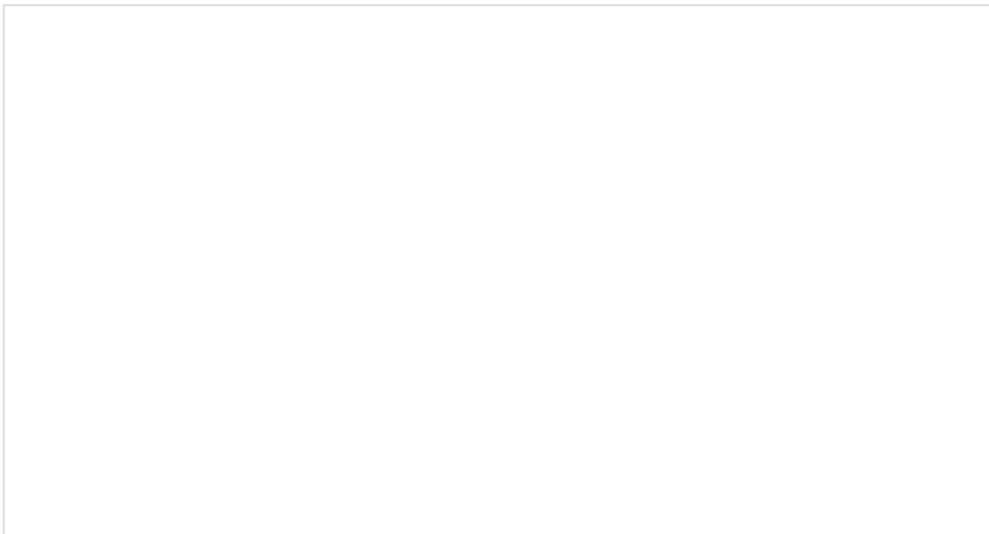
Headless Raspberry Pi Setup

APRIL 23, 2018
Configure a Raspberry Pi without a keyboard, mouse, or monitor.

How to Use Remote Desktop on the Raspberry Pi with VNC
JULY 9, 2018
Use RealVNC to connect to your Raspberry Pi to control the graphical desktop remotely across the network.

Configuring the Pi

This section goes over configuring the keyboard, wired, and wireless internet.

The Raspbian distribution comes defaulted to European hardware. With US keyboards, the `"` (quotation mark) symbol is replaced by `@` (commercial at) and our number sign `#` is replaced by the European pound sign `£`. This can make it aggravating when trying to `#define` things.

PIXEL Desktop (GUI)

The easiest method of configuring the Pi is using the PIXEL desktop. For those that need to adjust the settings again after the initial setup, check below!

Configuring the Keyboard Layout

To configure the keyboard layout again, head to the Task Bar Menu by clicking the **Pi Start Menu** > **Preferences** > **Raspberry Pi Configuration** > **Localisation**.

Configuring the Internet Interfaces

Raspbian does a good job of configuring wireless networks automatically. By default, DHCP is configured so that the Pi will receive an IP address when a network cable is plugged it to the Ethernet port or when a wireless network is connected.

To use the graphical network tool, right click on the icon on the right side of the task bar, and click "WiFi Networks (dhcpcdui) Settings". Then, select the interface desired (wlan0 or eth0) to disable the DHCP and set your own IP, if necessary.

To connect to a wireless network, click on the icon, select the desired network, and enter the password.

Hovering over the icon will bring up a status of wlan0 and eth0 that also shows the IP address.

Command Line Interface (CLI)

For advanced users using the command line, you can use the CLI to adjust the settings.

Configuring the Keyboard Layout

Invoke the config tool with the following command in the command line:

```
sudo raspi-config
```

Then take the following actions:

- **Set the default locale for the system**
    - Select "**Internationalisation Options**"
    - Select "**Change Locale**"
    - Deselect **en_GB.UTF-8 UTF-8**
    - Select **en_US.UTF-8 UTF-8**, (Ok)
    - Set **default to en_US.UTF-8**, (Ok)

- **Change the keyboard layout** -- from the Internationalisation Options menu,
    - Change **Keyboard Layout**
    - Leave set as: **Generic 105-key (Intl) PC** (Ok)
    - Select **Other** (Ok)
    - Select **English (US)** (Ok)
    - Select **English (US)** (Ok)
    - Select **default** (Ok)
    - Select **No compose key** (Ok)
    - Set **Ctrl+Alt+Bksp function** (Ok)

- **Finish with the dialog and get back to the shell**
    - Try the `"` and `#` keys at the prompt.

We recommend restarting the Pi at this point to ensure that the changes take effect.

Configuring the Internet Interfaces

At this time, the network configuration works out of the box so there's really nothing to configure, but in case something goes awry, here's the basics of what can be played with and a known-working configuration to compare with.

A configuration file, `interfaces`, configures both wired and wireless devices. Enter the following command into a terminal to edit the interfaces file.

```
sudo nano /etc/network/interfaces
```

Replace "nano" with "leafpad" if you prefer graphics. Here's what our Pi 3 is using:

```
# interfaces(5) file used by ifup(8) and ifdown(8)

# Please note that this file is written to be used with dhcpcd
# For static IP, consult /etc/dhcpcd.conf and 'man dhcpcd.conf'

# Include files from /etc/network/interfaces.d:
source-directory /etc/network/interfaces.d

auto lo
iface lo inet loopback

iface eth0 inet manual

allow-hotplug wlan0
iface wlan0 inet manual
    wpa-conf /etc/wpa_supplicant/wpa_supplicant.conf

allow-hotplug wlan1
iface wlan1 inet manual
    wpa-conf /etc/wpa_supplicant/wpa_supplicant.conf
```

By default, this file is set up to get its configuration from `/etc/wpa_supplicant/wpa_supplicant.conf` , which is really the proper place for wifi information. Here are the contents:

```
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1

network={
        ssid="myNetworkSSID"
        psk="mySuperSecurePassword"
        key_mgmt=WPA-PSK
}
```

A note on network configuration: Try the GUI tool first, and only modify the files as a last resort. If you find the tool doesn't work, save your configuration files as a backup, and don't be afraid to try your hand at a manual configuration.

Applying the Changes

Sometimes the link should be cycled for a new configuration to take. Rather than shutting down the pi and restarting, use `ifdown` and `ifup` to bring the link down and back up.

For **wireless** connections, use

```
sudo ifdown wlan
```

and

```
sudo ifup wlan0
```

For **wired** connections, use

```
sudo ifdown eth0
```

and

```
sudo ifup eth0
```

Troubleshooting

Having issues getting the Raspberry Pi to work? Check out this sticky note from the Raspberry Pi Foundation's forum for basic troubleshooting.

PI FOUNDATION FORUMS: BASIC TROUBLESHOOTING WITH THE RASPBERRY PI

Having problems with a piece of SparkFun hardware designed for the Raspberry Pi and interfacing it? Try checking out the SparkFun forums to see if we can assist.

SPARKFUN FORUMS

Resources and Going Further

Raspberry Pi Accessories

If you are looking to add additional features, check out the accessories to power your Raspberry Pi remotely, build a homemade motion-activated security system, or go retro by building your own arcade controller to emulate classic video games!

PiJuice HAT - Raspberry Pi Portable Power Platform
◎ PRT-14803

Raspberry Pi LCD - 7" Touchscreen
◎ LCD-13733

Raspberry Pi Camera Module V2
◉ DEV-14028

SparkFun PiRetrocade
○ KIT-14007

CLICK TO BROWSE MORE RASPBERRY PI ACCESSORIES

Here are some links to our other Pi resources.

- Raspberry Pi Foundation
  - Getting Started with the Raspberry Pi
  - Product Brief (PDF)
  - Schematic (PDF)
  - Mechanical Drawing (PDF)
  - Documentation
  - Projects
  - Pi Foundation Forums
  - Raspberry Pi Forums: Is Your Pi Not Booting? - Basic troubleshooting tips and solutions for a Raspberry Pi that is not booting up.
- The gPIo tutorial
- The SPI and I2C tutorial

Need some inspiration? Check out these tutorials and projects.
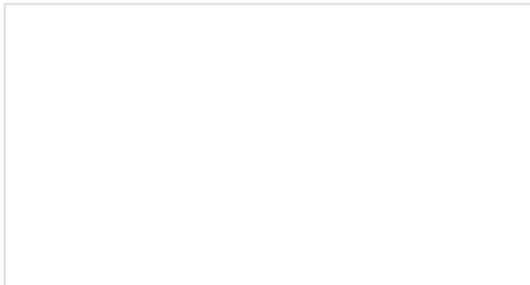
Qwiic pHAT for Raspberry Pi Hookup Guide
Get started interfacing your Qwiic enabled boards with your Raspberry Pi. The Qwiic pHAT connects the I2C bus (GND, 3.3V, SDA, and SCL) on your Raspberry Pi to an array of Qwiic connectors.
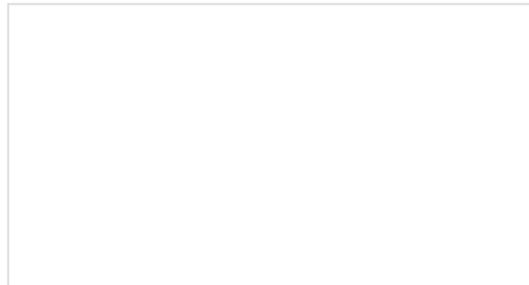
Qwiic Kit for Raspberry Pi Hookup Guide
Get started with the CCS811, BME280, VCNL4040, and microOLED via I2C using the Qwiic system and Python on a Raspberry Pi! Take sensor readings from the enviroment and display them on the microOLED, serial terminal, or the cloud with Cayenne!
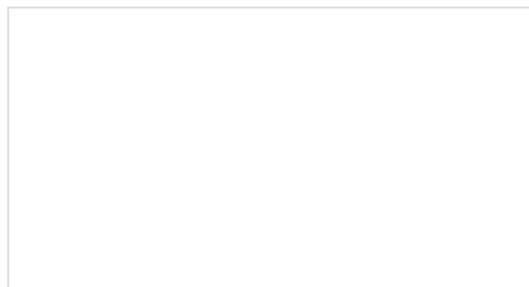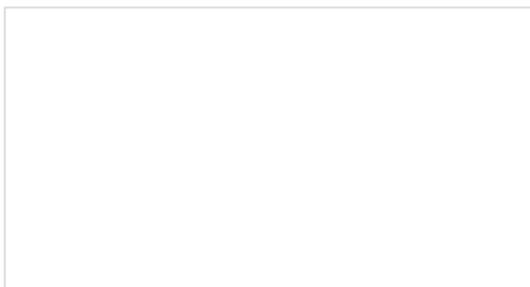
Getting Started with the Autonomous Kit for the Sphero RVR
Want to get started in robotics? Look no further than the SparkFun autonomous kit for the Sphero RVR! Whether you purchased the Basic or Advanced kit, this tutorial will get you rolling...

SparkFun GPS-RTK Dead Reckoning ZED-F9R Hookup Guide
The u-blox ZED-F9R is a powerful GPS-RTK unit that uses a fusion of IMU, wheel ticks, a vehicle dynamics model, correction data, and GNSS measurements to provide highly accurate and continuous position for navigation in the difficult conditions. We will quickly get you set up using the Qwiic ecosystem through Arduino and Python so that you can start reading the output!

Or check out some of these blog posts for ideas.
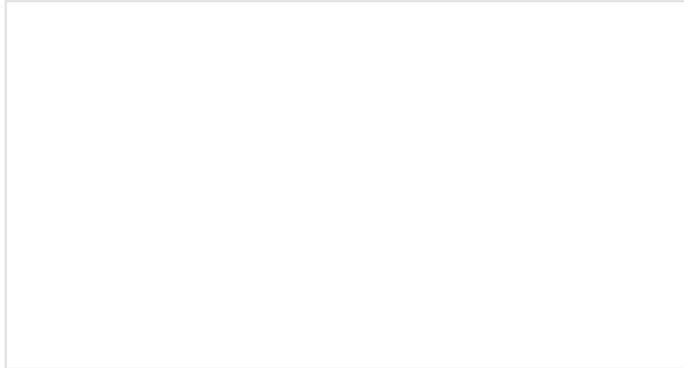
Enginursday: Time-lapse with the Raspberry Pi
NOVEMBER 21, 2013
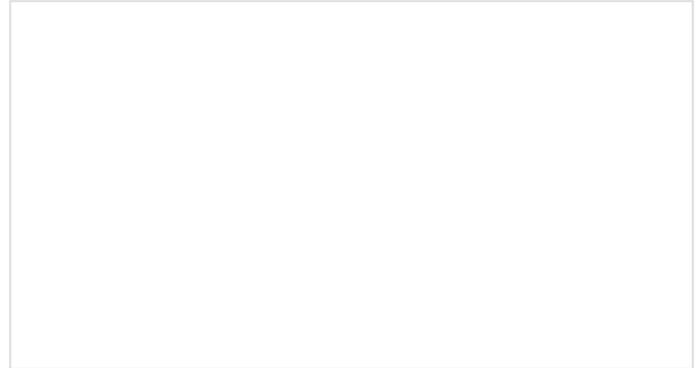
Enginursday: Monitor Twitter With a Raspberry Pi
DECEMBER 5, 2013
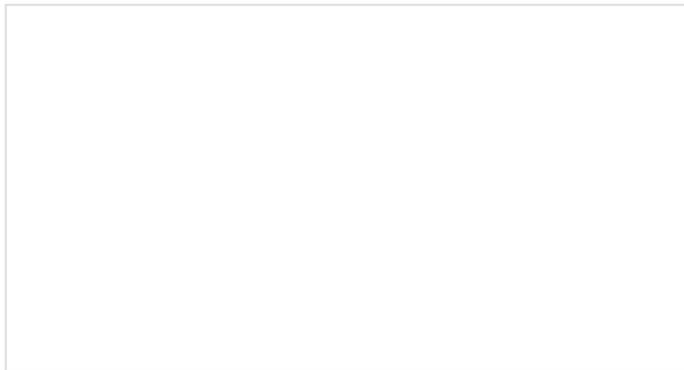
Enginursday: Time-lapse with the Raspberry Pi Pt. 2
FEBRUARY 13, 2014
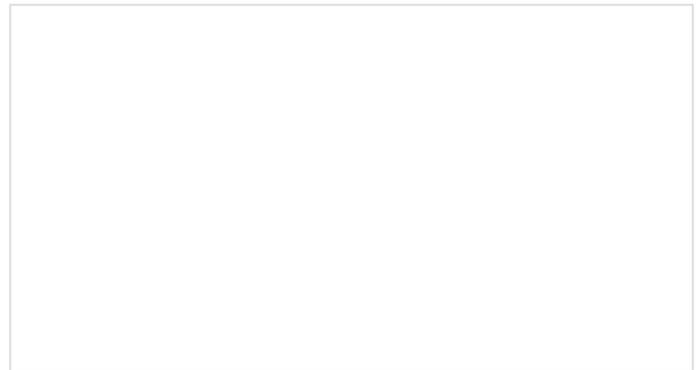
Raspberry Pi 3
FEBRUARY 29, 2016
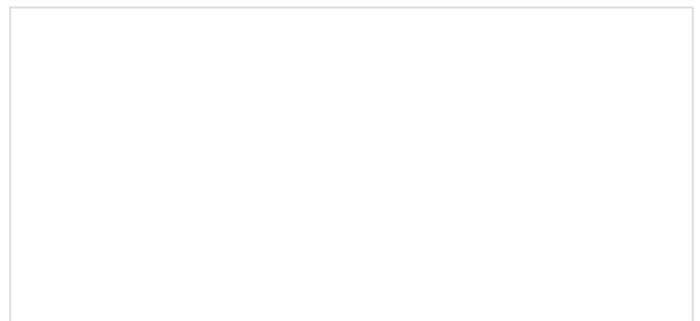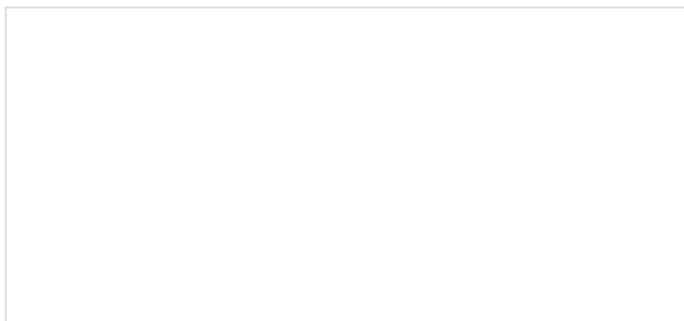
### T³: Raspberry Pi and the Stereo Arcana
JULY 19, 2016

T³: IoT Smart Pantry (Part 1)
SEPTEMBER 27, 2016

Friday Product Post: In Vivid 1080pi
OCTOBER 7, 2016

Taking Your PiRetrocade to the Next Level
NOVEMBER 10, 2016

Enginursday: Fun with Sockets
DECEMBER 22, 2016

Enginursday: Mort and Mary Present...Fun with Sockets, Part Deux - Old Products Never Die
DECEMBER 29, 2016

Enginursday: Eniac, The Data-Logging Web Server
JANUARY 26, 2017

IoTuesday: New Year's Resolution #2 – Healthier Eating
JANUARY 31, 2017
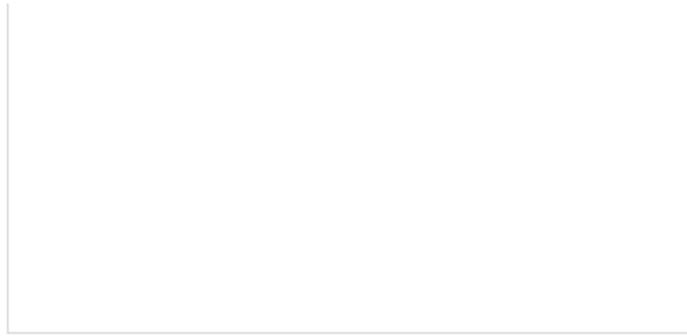
IoTuesday: Web-Style GUIs for your Raspberry Pi Hardware Project
FEBRUARY 21, 2017
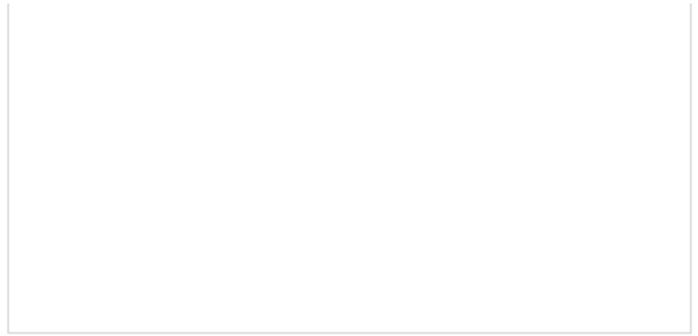
Hardware Hump Day: Cloning your Raspberry Pi
MARCH 8, 2017
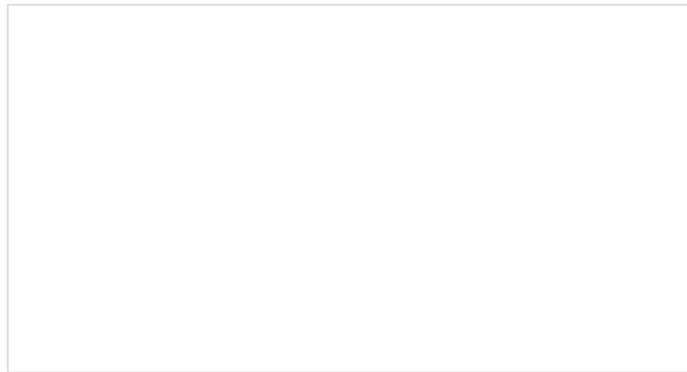
Enginursday: Home-Brew Alexa Endpoint
MARCH 30, 2017
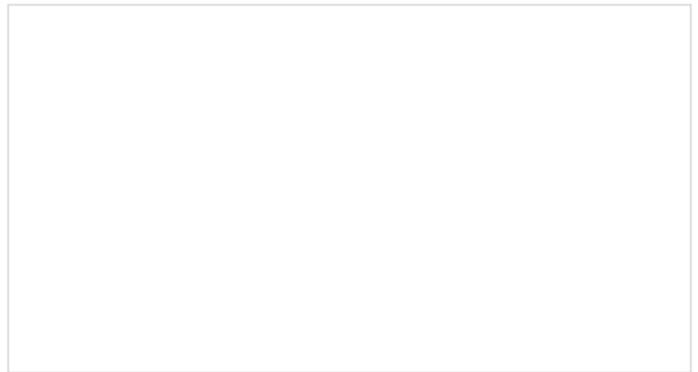
Automated Conference Room Signage
NOVEMBER 8, 2017
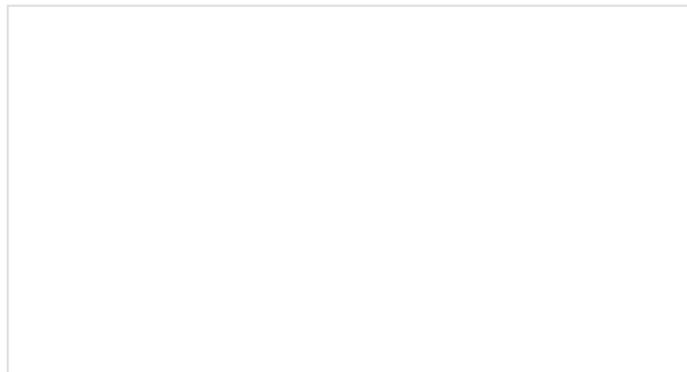
Swarming to Space on the Wings of XBee, RPi
NOVEMBER 9, 2017
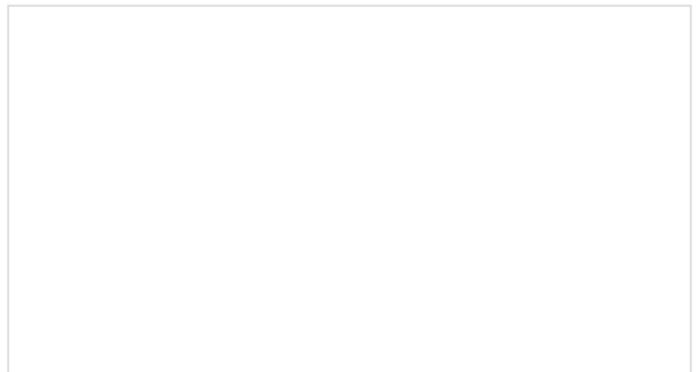
Mort and Mary Present: The Mind-Controlled Light Switch
JANUARY 25, 2018
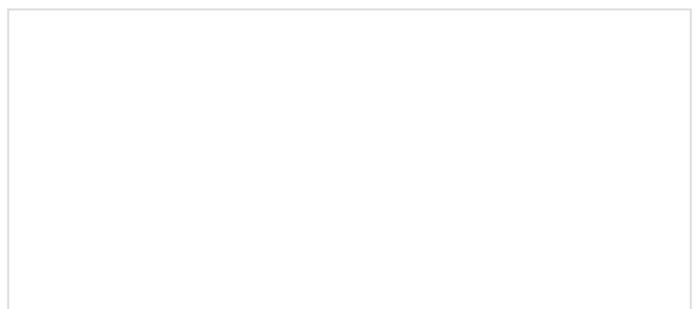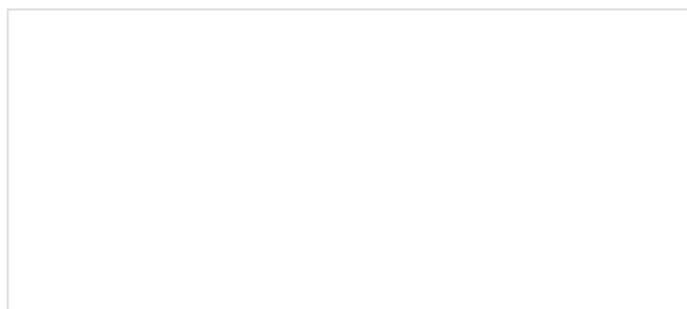
Raspberry Pi Python IDE Comparison

JUNE 12, 2018

Friday Product Post: Power up your Pi!

AUGUST 17, 2018
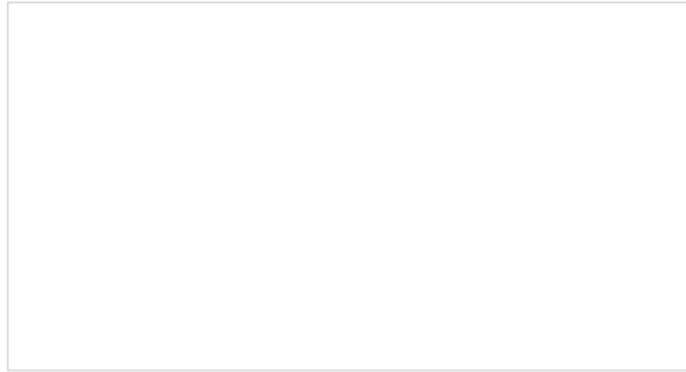
Hackbot in the Morning

NOVEMBER 13, 2018