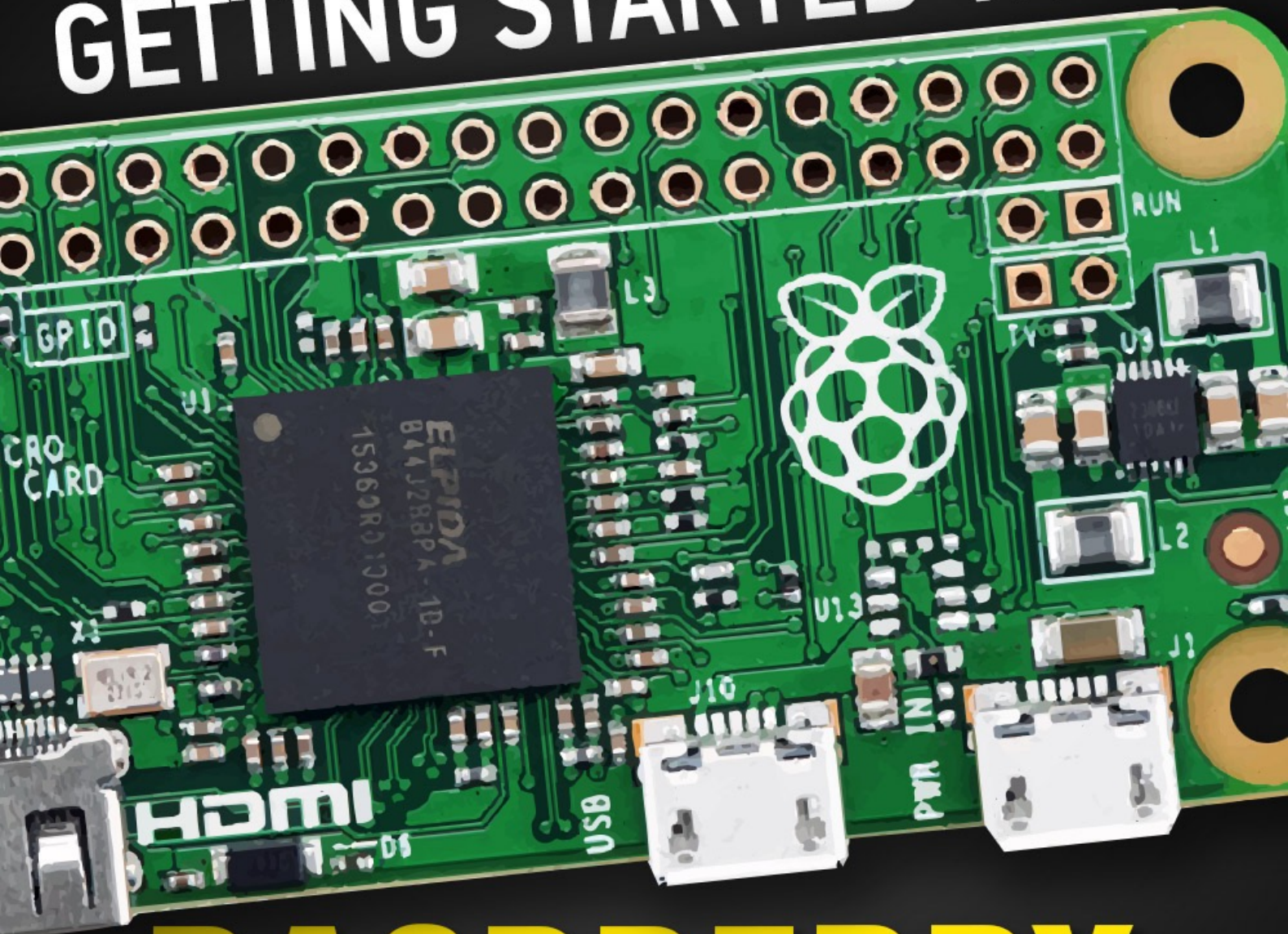


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GETTING STARTED WITH



RASPBERRY PI ZERO

by Christian Cawley

Getting Started with Raspberry Pi Zero

Written by Christian Cawley

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Read the original article here: <http://www.makeuseof.com/tag/getting-started-raspberry-pi-zero/>

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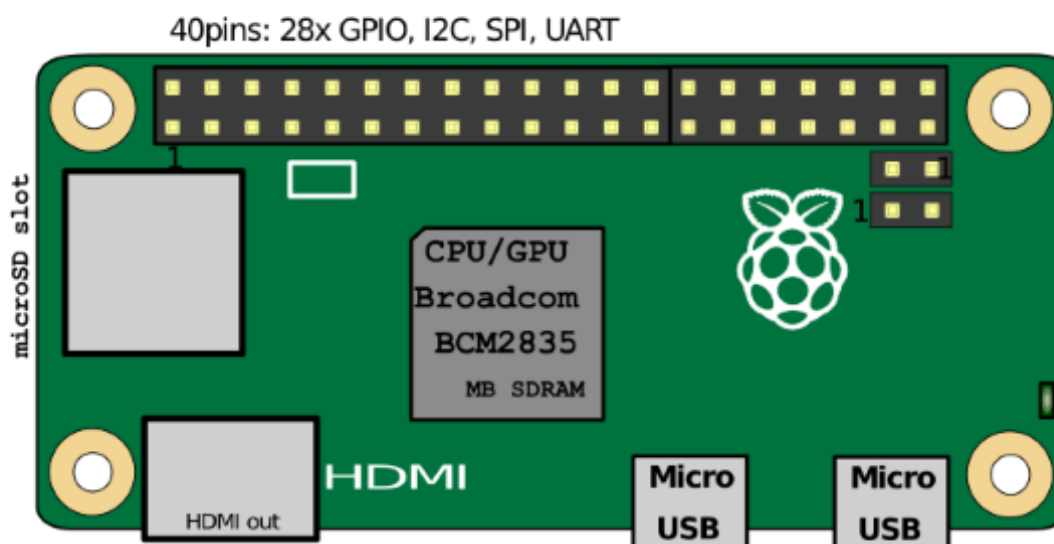
Whether you were lucky enough to [buy a magazine with one glued to the front](#), or you've patiently waited after buying the full kit online, the chances are that you're now the proud owner of a \$5 computer, [the Raspberry Pi Zero](#).

This remarkable slimline iteration of the Raspberry Pi shares hardware attributes with the [Raspberry Pi A+](#), while bringing affordable computing and projecting to anyone with around \$5 in their pocket.

If the Raspberry Pi was revolutionary, this takes that revolution to absolutely anyone who wants it, anywhere in the world.

What Is the Raspberry Pi Zero?

It's unlikely that you've ever had problems with the dimensions of the already compact Raspberry Pi, but just in case you have a need for an ultra-low-profile minicomputer with very little weight, the amazing chaps at the Raspberry Pi Foundation and its manufacturing partners (PremierFarnell, RS Components and Egomani) have done it again with the tiny Pi Zero.



The latest iteration of the Raspberry Pi is essentially a model A+ but with the ports removed, compressed into a single Micro USB OTG port (the familiar Micro USB power connector remains, the port on the right in the diagram above, supplying a lower-than-previous ~160 mA) and a Mini-HDMI port (RCA composite video is also available via the GPIO, ready for an optional connector to be soldered on). Audio is also sent via Mini-HDMI, but there is a PWM connection on the GPIO for DIY analogue audio out.

At the heart of the Pi Zero is a Broadcom BCM2835 SoC, housing a 1 GHz ARM1176JZF-S single-core CPU, Broadcom VideoCore IV @ 250 MHz GPU (still with HD support), and 512MB SDRAM.



Finally, a MicroSDHC slot is provided, for high storage disks with robust error-correction, while the GPIO is – in a Raspberry Pi first – unpopulated, which means you need to solder your own pins onto the Pi Zero. Among the “missing” components, you’ll find that there is no video input for the Raspberry Pi camera and NoIR camera modules.

Oh, and it’s just \$5. Did we mention that?

Resembling a piece of laptop RAM, the only way the Pi Zero could be any smaller is if it was packaged without the USB or HDMI connector. But that would lead to problems with developing projects.

What Do You Get in the Box?

Various kits are available, depending on where you get your Pi Zero from. Following launch of the computer, supplies are very low, thanks to the great success of the device launch. However, various sites currently offer kits for pre-order.

[Pimoroni.com](#) list a couple of kits. In the first, you'll get the Pi Zero, a mini HDMI adaptor and a micro USB OTG cable, which can be connected to a (preferably powered) USB hub, providing connectivity for wireless dongles, keyboard, mouse, external HDD, and any other USB components you need to connect. There's also a row of GPIO (General Purpose Input/Output) pins for you to manually solder onto the board.



You will also find a more modest kit, like that shipped on the cover of MagPi magazine, offering the Mini HDMI adaptor, USB OTG cable, GPIO header pins, and little else.

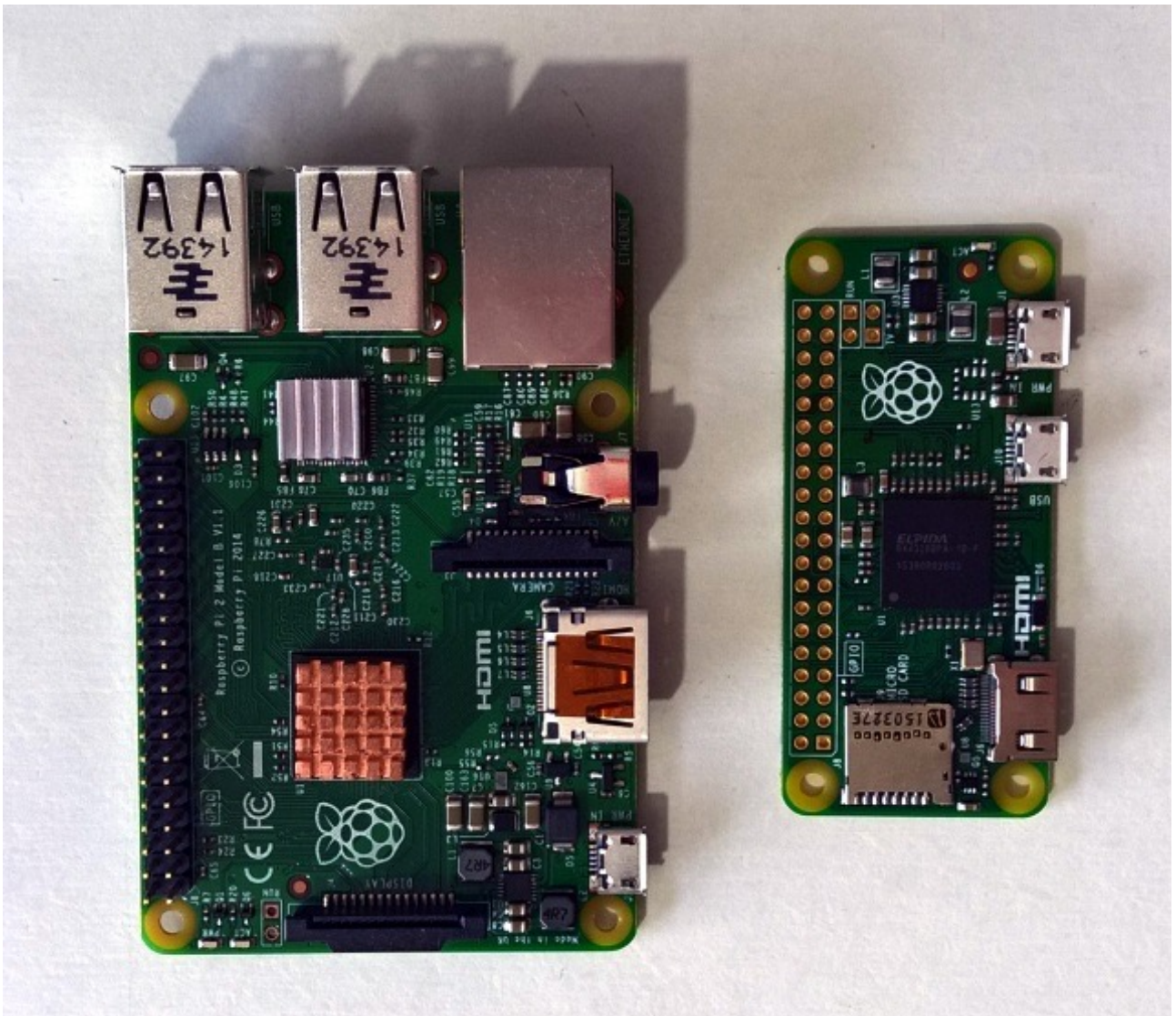


Variant kits are also available, depending upon which supplier you use. Along with the USB OTG cable and HDMI adaptor, you might find options including microSD cards and adaptors, a tin or case, rubber feet, and even mains adaptors.

Note that these kits will increase the basic price, depending upon which package you opt for. So while the Pi Zero on its own is only \$5 (or £4 in the UK), this might shoot up to \$20 or even beyond with the cables, microSD card and GPIO.

Size Comparison

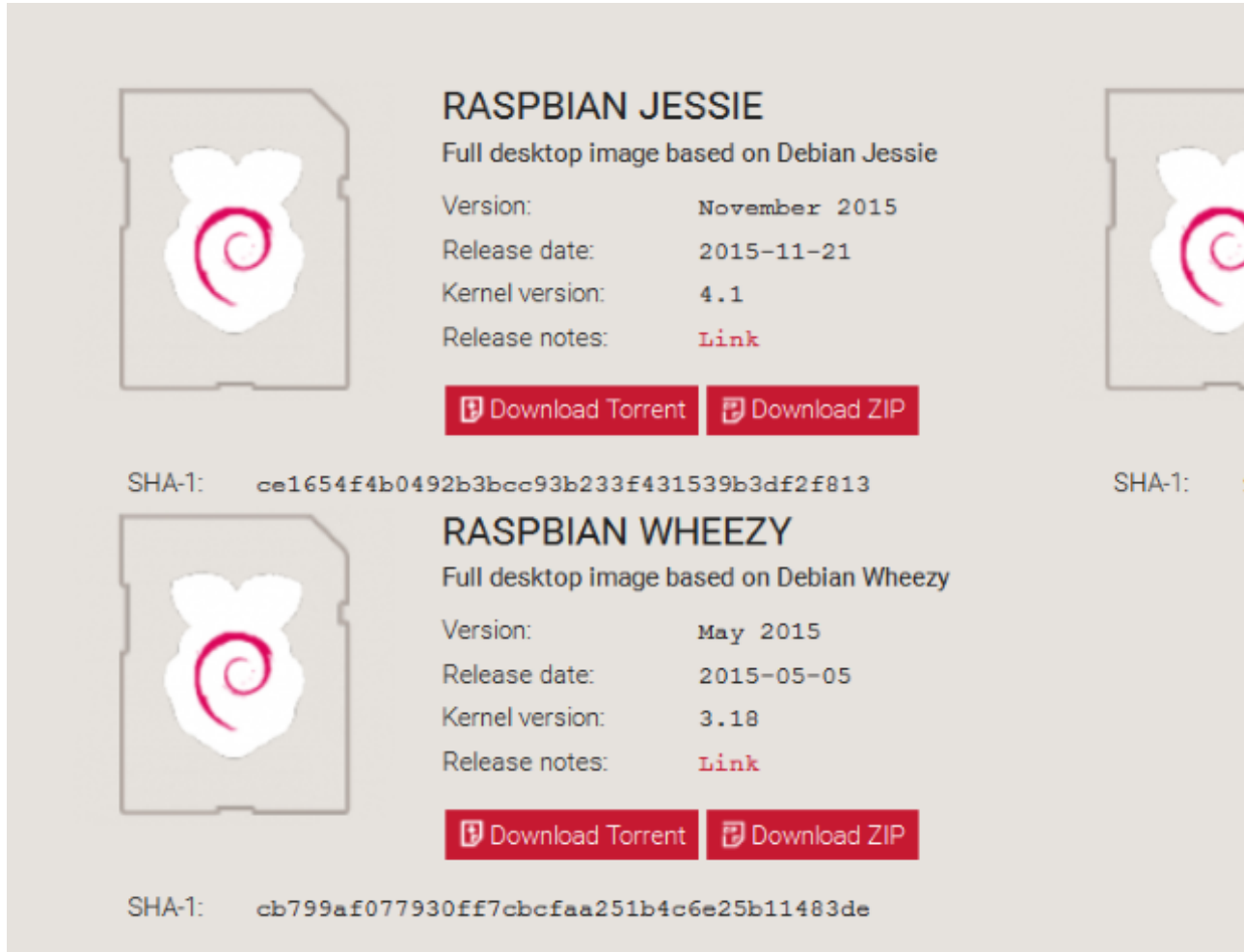
At 65 mm × 30 mm × 5 mm (2.56 in × 1.18 in × 0.20 in), the Raspberry Pi Zero is one hell of a tiny computer.



Less than half the size of the traditional Raspberry Pi, it's even-more-compact dimensions make it ideal for projects that require a board that can slip into small gaps, as well as one for which weight is a consideration. For example, the [Raspberry Pi 2](#) weighs 45 g (1.6 oz); in contrast, the Pi Zero is just 9 g (0.32 oz).

Get Started with the Raspberry Pi Zero

Now you've met the Raspberry Pi Zero, it's time to get it setup, switched on, and start your project. To begin with, you'll need to install an operating system onto a microSD card. This is done by inserting the card into your computer, usually using an adaptor (although some tablets and notebooks have built in slots for microSD cards), and writing your chosen Raspberry Pi distro to the card.



The screenshot displays the Raspbian download page with two main sections. Each section features a Raspberry Pi logo on the left and a list of details on the right. The top section is for 'RASPBIAN JESSIE', described as a 'Full desktop image based on Debian Jessie'. It lists the version as 'November 2015', the release date as '2015-11-21', the kernel version as '4.1', and provides a 'Link' for release notes. Below this information are two red buttons: 'Download Torrent' and 'Download ZIP'. The SHA-1 hash for this version is 'ce1654f4b0492b3bcc93b233f431539b3df2f813'. The bottom section is for 'RASPBIAN WHEEZY', described as a 'Full desktop image based on Debian Wheezy'. It lists the version as 'May 2015', the release date as '2015-05-05', the kernel version as '3.18', and provides a 'Link' for release notes. Below this information are two red buttons: 'Download Torrent' and 'Download ZIP'. The SHA-1 hash for this version is 'cb799af077930ff7cbcf8a251b4c6e25b11483de'.

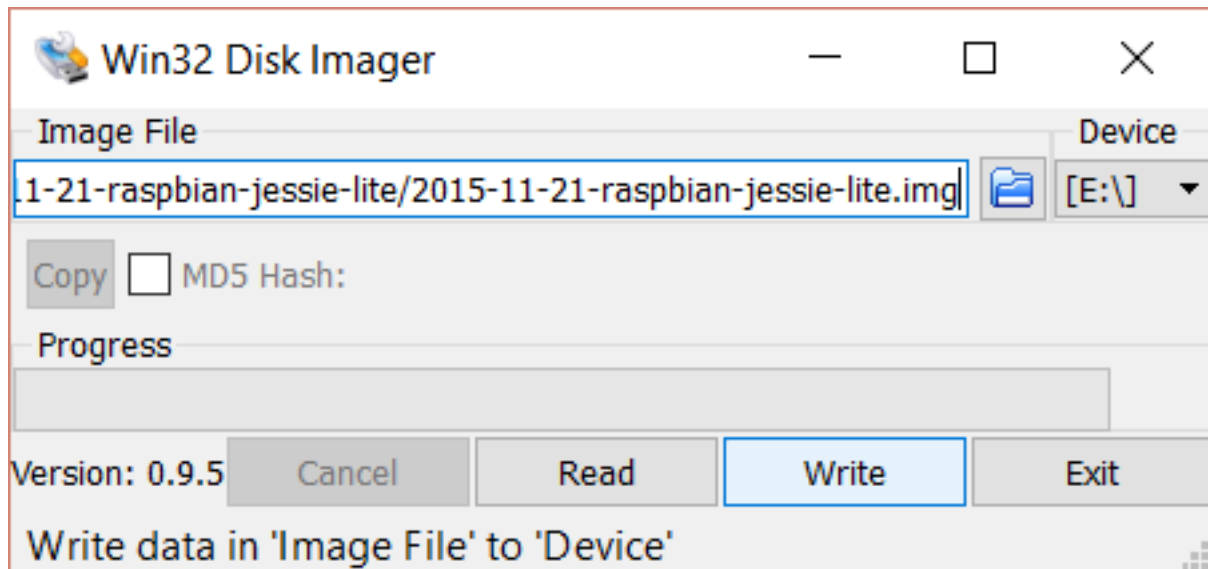
Version	Release Date	Kernel Version	Release Notes Link	Download Torrent	Download ZIP	SHA-1
Raspbian Jessie	November 2015	4.1	Link	Download Torrent	Download ZIP	ce1654f4b0492b3bcc93b233f431539b3df2f813
Raspbian Wheezy	May 2015	3.18	Link	Download Torrent	Download ZIP	cb799af077930ff7cbcf8a251b4c6e25b11483de

Currently, the best OS for the Pi Zero is [Raspbian Jessie](#). This free operating system is available from the [Raspberry Pi Downloads page](#) and can be installed on any Raspberry Pi model to date. Note that two versions are available, the Full desktop image and the Minimal image. The latter comes without some of the expected tools, but is a faster download and takes up less space on the SD card.

Writing the operating system is straightforward regardless of what operating system you're using.

Installing Raspbian with Windows

While Raspbian is downloading (or on slower connections, after), head to Sourceforge to download your copy [Win32 Disk Imager](#). When complete, install it.

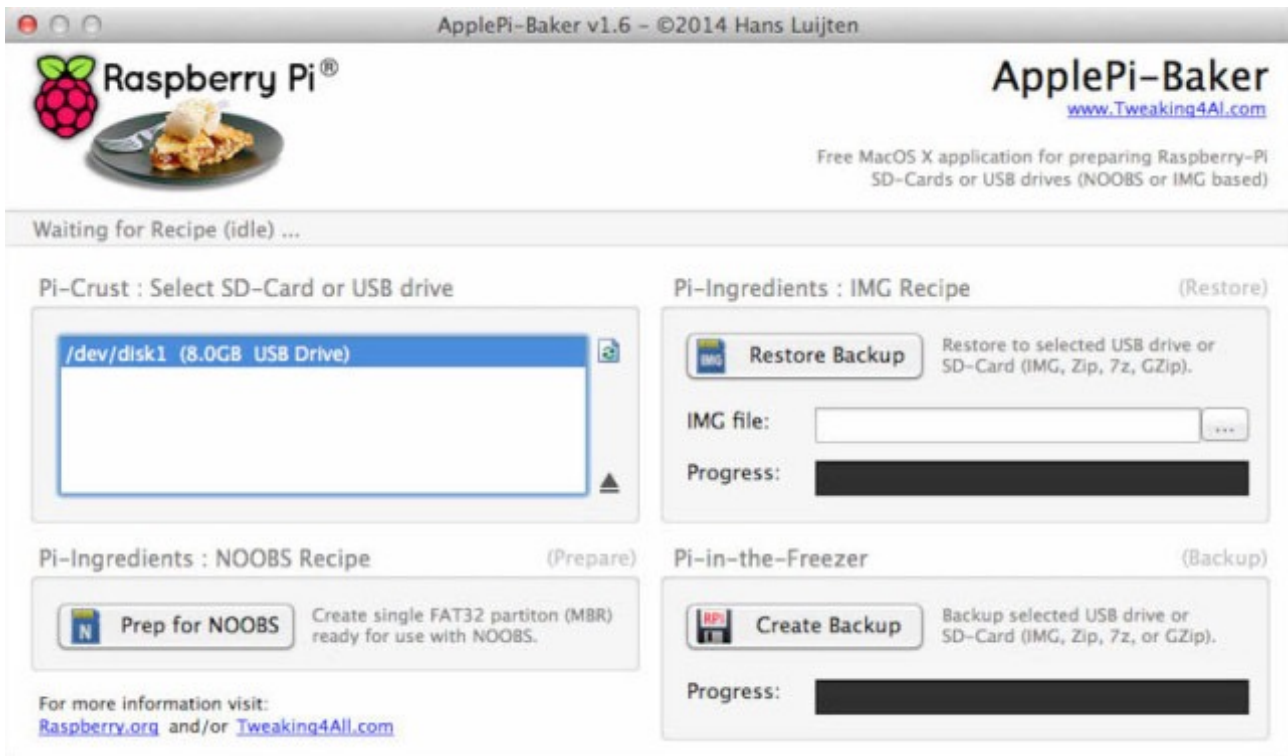


Once you have downloaded and unzipped the Raspbian, insert your formatted (using the [SD Association's Formatting tool](#)) microSD card into your PC's card reader (or a [suitable USB card reader](#)). Run Win32 Disk Imager, and ensure the drive letter corresponding to your microSD card is selected in **Device**.

Click in the Image File field to find the unzipped Raspbian .IMG file, select it, then **Write**. Wait until the progress bar has finished and Win32 Disk Imager informs you that writing has completed, and then safely remove the card from your PC. You can now pop it into the powered-off Pi Zero, connect the power cable and boot up. Our full guide for using the Win32 Disk Imager to install Raspbian [provides even more information](#).

Installing Raspian with a Mac

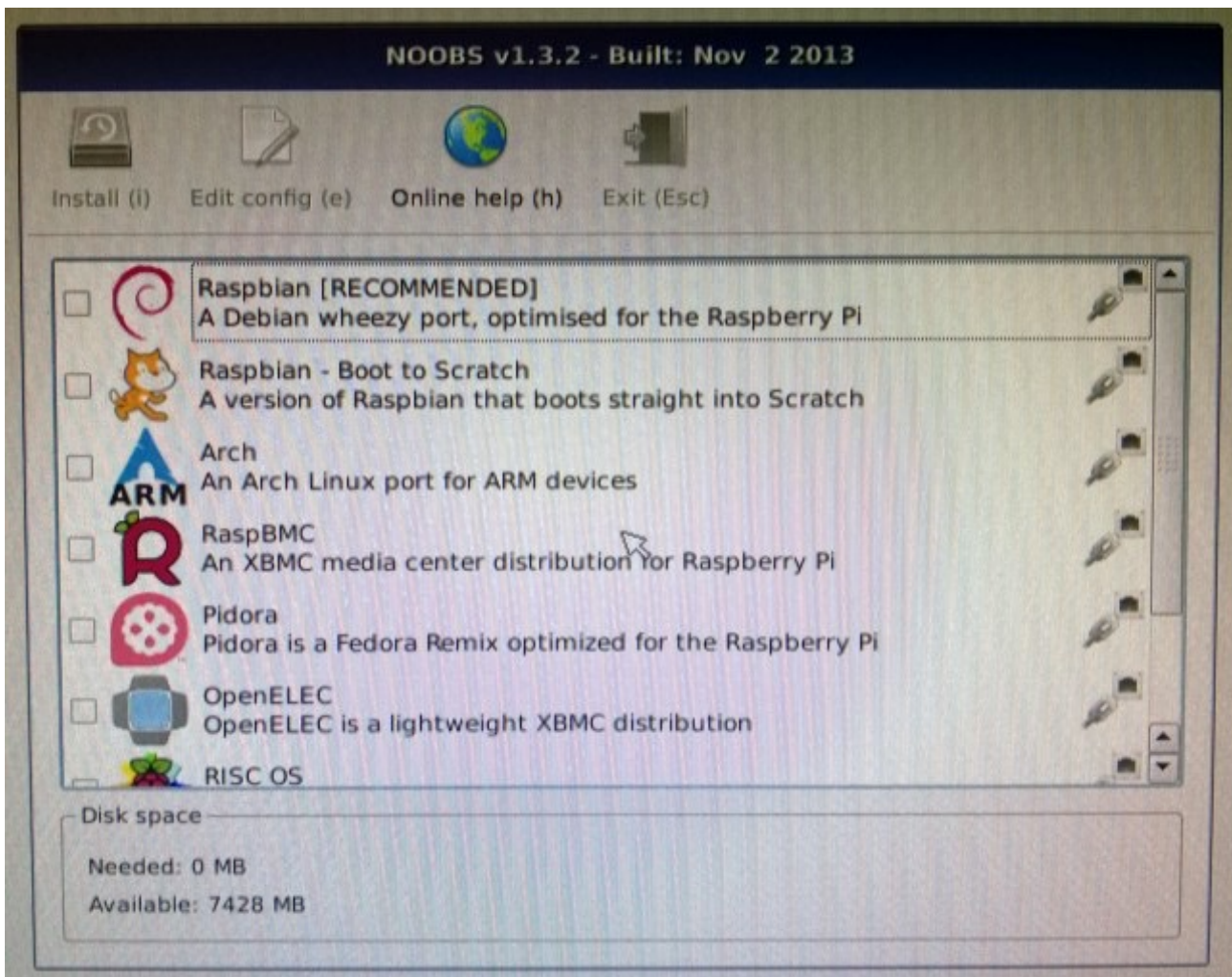
[Apple Pi Baker](#) provides a similar feature set as Win32 Disk Imager. Once your card is inserted and recognised, select it from the list on the left; then select your downloaded .IMG file from the right, and click **Restore Backup**.



Don't forget to eject the card when you're done to prevent data corruption.

Hey, NOOBS, Flash This!

Rather than install Raspbian this way, why not take a look at NOOBS? This software, which can be copied straight onto a formatted SD card, contains a number of different OSes (including Raspbian), ready for you to experiment with.



Due to the modest connectivity options of the Pi Zero, we would advise the full, offline NOOBS installation, which means that each of the operating systems offered with NOOBS is available for your Pi Zero without additional downloads. If you have a full-size Raspberry Pi, you can also use the online NOOBS installer to complete the installation, and then insert the card into your Pi Zero.

For the best results, Raspbian Jessie should be your preferred OS, at least at first. How you install it is up to you!

You might also be interested in creating a [full disk image backup](#) to save time with installation and setup in future.

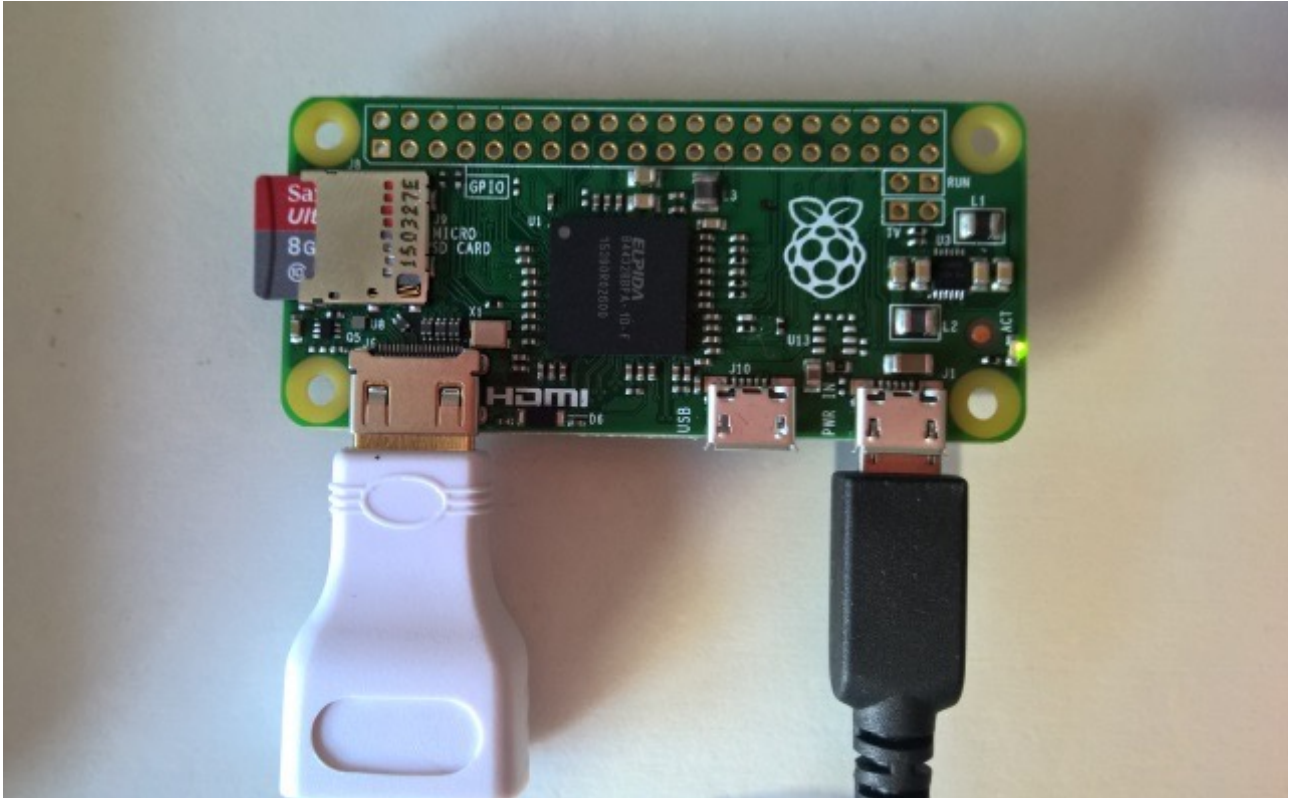
Pre-Installed SD Cards

Don't have an SD card for your Raspberry Pi Zero? Missing a card reader, or don't have the bandwidth to download a copy of Raspbian? Don't worry – you can [purchase microSD cards from Amazon with NOOBS pre-installed!](#)



Connecting the Cables

With your Pi Zero operating system writing to SD card, now is the time to connect the cables. If you want to see output from the Pi Zero on your monitor, connecting the HDMI adaptor cable should be your first step (unless you already have a suitable Mini-HDMI cable).



Are you planning on adding a USB device? You might opt to add a wireless dongle, as the Pi Zero doesn't ship with built in Wi-Fi or an Ethernet port. With a Wi-Fi dongle added, you'll be able to connect to the Pi Zero remotely via SSH, for instance, although note that this will require system

resources and if you opt to [power the Pi Zero with batteries](#), any network activity will reduce battery longevity.

Getting the Pi Zero Online

If you're installing with NOOBS, you'll need to take care to download the full, offline installer, as opposed to the lighter option. This will ensure you actually have an operating system to install, as opposed to a menu giving you a choice of OS to download.

Should you choose the lighter, online installation with NOOBS, you'll need to first ensure that the Pi Zero is connected to the Internet. In the absence of an operating system with which to setup wireless networking, you'll need to find a compatible [USB Ethernet adaptor](#), which might be micro USB compatible, or else standard USB connected to the an adaptor.

Watch: [Ethernet for the Raspberry Pi Zero](#)

However, other options exist. One popular alternative is connecting a [mini Ethernet PCB to the Pi Zero's GPIO](#), but this isn't an easy task for beginners. One thing to keep in mind is that connecting an Ethernet cable into the Pi Zero will almost guarantee instant connectivity; connecting a wireless dongle may not.

One shortcut you can use is to setup Raspbian and your wireless USB dongle on a full size Raspberry Pi. With the wireless card setup – the SSID is detected, the username and password input, and the connection made – you should then shutdown the Raspberry Pi, remove the microSD card and insert it into your Pi Zero. Similarly, remove the Wi-Fi USB dongle and attach this to the Pi Zero and boot up. If all has gone smoothly, you'll have saved time downloading, installing and configuring Raspbian for the Pi Zero, and have the device online immediately.

With the Raspberry Pi Zero online, you will be able to install new tools, browse the web, [access the Pi Store](#) and connect to other devices on your network.

Mouse and Keyboard Options

How will you control the Pi Zero? The obvious option would seem to be with a mouse and keyboard, but the limited USB connection options (unless you have a powered USB hub connected) may put a dampener on this.



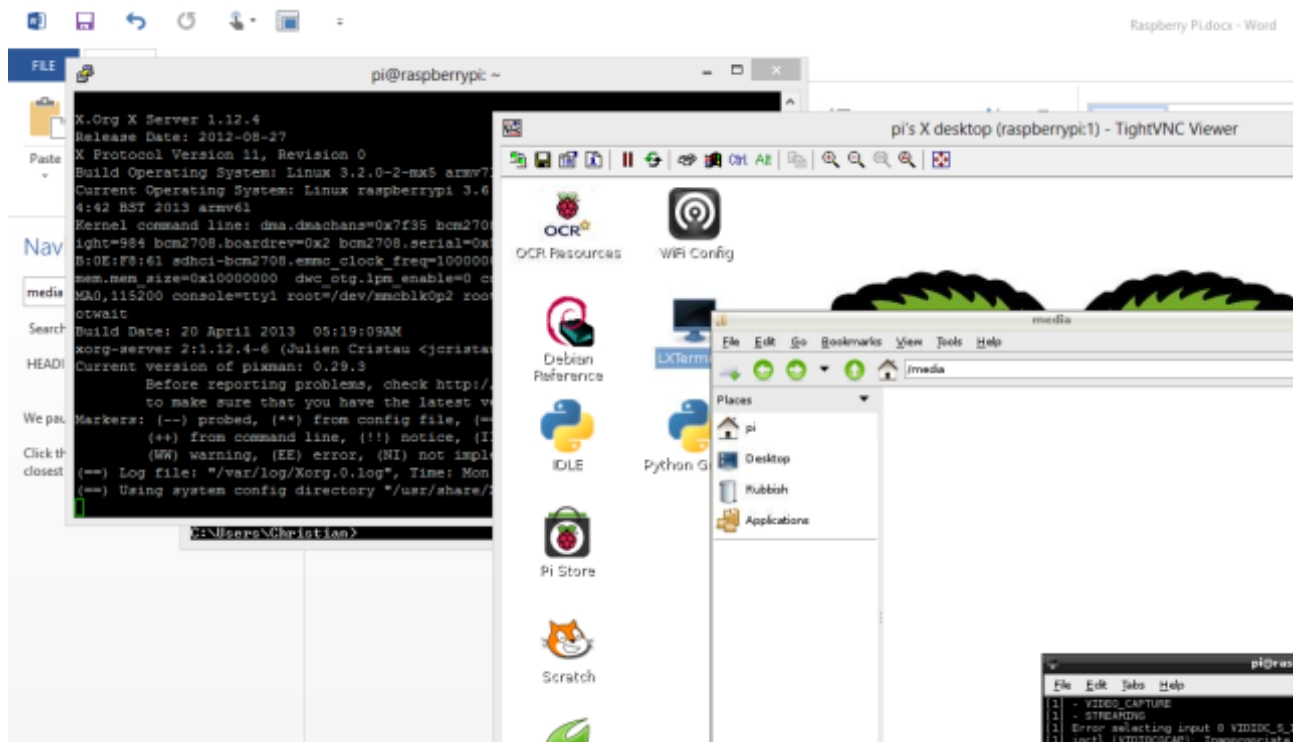
While Bluetooth is an also option (and [various keyboards with built-in touchpads are available](#)), this will still require a USB mouse to initially setup, as well as a Bluetooth dongle. The [Kano Raspberry Pi kit](#) comes with such a keyboard and touchpad.

Other options for entering text and controlling your Raspberry Pi Zero are available, however, using SSH or VNC.

Should You Connect a Monitor or Not?

The initial response to anyone reading this might of course be “well, how else will I be able to control the Pi Zero?”. But you don’t need a monitor connected to the device in order to control it.

While the Pi Zero does an HDMI connector, you may find that this isn’t compatible with your TV. Don’t worry too much – if your TV or monitor has VGA, an inexpensive HDMI-to-VGA connector can be used, [as we previously demonstrated](#).



You can also remotely connect to the Raspberry Pi Zero using a desktop or notebook computer. The most common way of doing this – and the easiest to setup – [is with SSH](#), which gives you command line access.

Not enough? You can enjoy a remote desktop experience on your [Raspberry Pi using VNC](#). This can be improved upon, using the Xming tool for VNC over SSH, and Windows RDP (remote desktop protocol) can be used if you install xrdp onto your Raspberry Pi Zero. But note that these options both require Ethernet or Wi-Fi connectivity.

With these solutions applied, you won’t need a monitor for your Raspberry Pi, as you’ll be able to control it via an application window on your main computer. Note that SSH and VNC options are also available for Android smartphones and tablets, and these are ideal for [connecting Android to your Raspberry Pi](#).

A Pi Zero Case

With your Raspberry Pi Zero connected, booted up and some method of controlling it established, it's time to find somewhere to keep it safe. Four mounting holes are provided in the PCB which allow you to screw the Pi Zero to whatever project you happen to be working on, but you might also require a more reliable, sturdy home for the little computer.

A [collection of Raspberry Pi Zero cases are available on Amazon](#), such as this compact, affordable offering:



Alternatively, you might rely on LEGO, or even 3D printing in order to achieve a safe home for the Pi Zero. Although the computer is smaller than the original Raspberry Pi, various [ideas for DIY cases](#) still apply to the compact little brother.

Adding Pins to the GPIO

Your Raspberry Pi Zero is capable of doing most of the things that a full-sized Pi can do... eventually. Straight out of the box, however, you're a bit limited thanks to the lack of GPIO pins.

Pins are either shipped in a separate container, or if you were lucky enough to get the Pi Zero on the front cover of MagPi magazine, they're not there at all. As a result, you'll need to order a suitable array of pins, not only for the GPIO, but also for the four pins next to the Raspberry Pi logo. These pins for the run/reset jumper, when fitted, enable you to [turn off your Raspberry Pi safely](#) with a Python script.

If you know how to solder, you should be fine with these new components. Otherwise, spend some time reading [our soldering tutorial](#). Bear in mind, however, that you might not actually want pins connecting to the GPIO. You might, for example, prefer a female header, as demonstrated [in this video](#).

Meanwhile, if you're not really sure whether you'll need the GPIO at all, check our in-depth look at using the pins, and how you can [communicate with any Raspberry Pi](#) more directly than you would via USB.

What the Pi Zero Means for Projects

You're probably not going to buy the Pi Zero to [use it as a desktop computer](#). Rather, this compact, half-sized Raspberry Pi is capable of revolutionizing the project you've already built or the ones you're looking at starting. To illustrate, here are five popular Raspberry Pi projects with a slight revision for Raspberry Pi Zero owners.

FM Radio

With GPIO pins added, the FM radio project can become even more compact. No network connectivity is required, and a compact rechargeable battery will make situating this project even easier (useful if you're situated in a land [governed by an oppressive regime](#)).

Home Automation with OpenHAB

Although a network connection is required for this project, the compact dimensions of the Pi Zero improve the possibilities of creating a compact, tidy home automation project.

Airplay Receiver

Watch: [DIY Raspberry Pi Streaming Music Station](#)

With this project, the little Pi Zero will need a network connection for streaming. However, the smaller dimensions mean that it can be easily migrated to other combo amps of virtually any size.

Build a Raspberry Pi iBeacon

It doesn't need a network connection, although it does require Bluetooth. Like the FM radio, the half-sized Pi will require a battery, but as a PiBeacon is small enough to be hidden out of sight.

A Raspberry Pi Media Center

For many the holy grail of Raspberry Pi usage, the Pi Zero will need network connectivity and typically a USB drive, necessitating the addition of a powered USB hub. However, the Pi Zero itself is light enough to be mounted on the rear of a TV – or even, if you're particularly adventurous, inside!

So, with the Pi Zero, all of these projects can be improved, either saving space or weight.

The Raspberry Pi Zero: A Must Have for DIY

DIY computing and robotics projects were given a shot in the arm by the original Raspberry Pi. Filling a surprisingly large niche that no one had previously identified in a satisfactory manner, the Pi became the *de facto* minicomputer, squeezing itself into spaces previously occupied by old PCs and discarded netbooks.

The Raspberry Pi Zero takes this success a step further, shrinking it down and introducing user choice for hardware components. Essentially a Raspberry Pi A+ on a strict diet, the Raspberry Pi Zero – costing just \$5 – is the computer that everybody with an interest in educating children in computing and building DIY projects should own.

The fact that the price point is so cheap it can be bought for the price of a cup of coffee – and (in an industry first) mounted to the front of a magazine – means that more children around the world can get access to it, and develop the skills that can help to push their lives away from poverty.

How will you be using the Pi Zero? Have you already started or completed some projects? Tell us more in the comments.

Image Credit: Efa via Wikipedia

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