RASPBERRY PI

QUICK START GUIDE
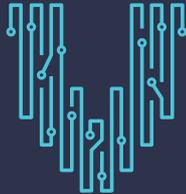
VILROS

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CHAPTER 1 – GETTING STARTED

1.1 INTRODUCTION

The Raspberry Pi is a small computer – a very small computer.

It consists of mostly the same parts as a standard desktop computer or laptop. A central processing unit (CPU) acts as a brain, random access memory (RAM) and long-term storage devices are used to hold data, a video display shows you what is happening, and you interact with all of this using mice, keyboards, joysticks, and other universal serial bus (USB) devices. The Pi may be less powerful than your Windows PC or Macintosh, but it is still impressive that it fits all of this on a board only slightly larger than a credit card.

The original goal of the UK-based Raspberry Pi Foundation was to create a device that would address their perception of falling standards in the teaching of computer science. As computers have evolved, they have become more difficult to write software for at a "low-level" – with close interaction between hardware and software. And as they have become more integrated in our daily lives, the consequences of breaking your computer by experimenting have become more severe...and expensive.

So, unlike conventional systems, the Pi is a machine that is designed to be played with and used for experiments. Its diminutive form factor and relatively low cost mean that you can do what you want with it, and this attracts far more diverse groups of users than just students and teachers.

1.2 TECHNICAL SPECIFICATIONS

The following diagram shows the available connectors on the Raspberry Pi.
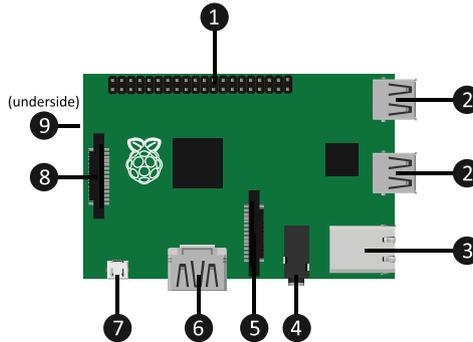
Figure 1. Connectors on the Raspberry Pi

1	General purpose input/output (GPIO) header – these pins can be controlled from software.
2	Universal serial bus (USB) socket for attaching peripheral devices such as mice, keyboards, or memory sticks. This is a dual socket and two USB devices can be connected at the same time.
3	10/100 Mb/s Ethernet (RJ45) socket for connecting to a network router.
4	4-pole 3.5 mm output jacket for audio and video.
5	MIPI camera serial interface (CSI).
6	High-definition multimedia interface (HDMI) video output.
7	Power in via micro-USB socket.
8	Display serial interface (DSI) flexible flat cable connector for liquid crystal displays (LCDs).
9	microSD socket. The card socket is attached to the underside of the board.

1.3 BASIC SETUP

Fitting a Heat Sink

When the components in a computer system work hard, they generate heat. And above a certain level, this heat can reduce the lifespan of the components or even break them altogether. A "heat sink" is a carefully designed block of metal that takes the heat away from the electronic component and then passes it into the air surrounding the device.

There are two chips on a Raspberry Pi that can get very hot if the device is working hard: the central processing unit (1), and the chip that controls the Ethernet and USB ports (2).
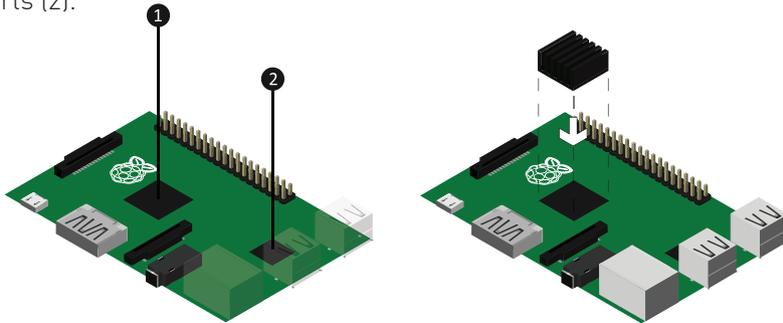
Figure 2. The main heat-out points on a Pi (left); and installing a heat sink on the CPU (right)

To install a heat sink:

      1. Unplug the Pi and leave it to cool before attempting to handle the device.

      2.On the bottom of the heat sink, peel away the plastic backing that covers the adhesive.

      3.Press the heat sink down firmly and directly onto the chip. Hold the pressure for a few seconds to allow the adhesive to work.

If you buy heat sinks for your Pi, only use the thermal adhesive that they arrive with; never use any other type of adhesive or sticky plastic to install a heat sink on a Raspberry Pi. The adhesive must be a special compound so that it effectively transfers heat from the chip on the Pi to the metal of the heat sink.

Connecting Power

Power is fed to the Pi through the micro-USB socket or, if you have a suitable connector, through the general purpose input output pins. However, providing power through the GPIO header pins bypasses the on-board protection circuitry that is designed to prevent damage to the device. For this reason, it should only be attempted by people who are experienced in building electronic circuits.

Connecting a Display

HDMI offers a high-quality video and audio signal, and is the preferred way of connecting all models of Raspberry Pi to a modern television. To connect a high-definition television:

   •Plug one end of an HDMI cable into the Raspberry Pi's HDMI socket, and the other end into an HDMI input on your TV.

If your display does not support HDMI, you can use the composite video and audio outputs to the auxiliary A/V input of most other televisions. These connections are colored yellow, red, and white.

Figure 3. Connecting a display to the Raspberry Pi
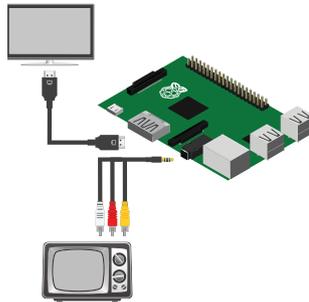
Connecting USB Devices

With most operating systems that you run on the Pi, human interface devices (HIDs) that connect using USB (such as mice, keyboards, and game controllers), and storage devices (such as USB memory sticks and hard drives) work without any problems or installation processes.

The Raspberry Pi can only supply a limited amount of power to USB devices. It is recommended that you do not connect any devices that draw over 100 mA. To use more power-hungry devices, you can use a powered USB "hub" – a device that allows multiple USB peripherals to be connected to a single USB socket on the Pi, and that has its own power supply.

Connecting to a Network

To make a wired network connection between the Pi and a network router:

      1.Plug one end of a CAT5 or CAT6 Ethernet cable with RJ45 connectors into the Ethernet socket on the Raspberry Pi.

      2.Plug the other end of the cable into your network router.

You must insert an SD card with a bootable operating system for the Pi's Ethernet support to be activated. If all of the cables are working correctly, the light-emitting diode (LED) on the right-hand side of the Ethernet socket will light or flash.

1.4 SD Cards

In the next chapter, you will learn about Raspberry Pi operating systems (in particularly, Raspbian Linux) and how to install them onto an SD card. This will complete the set-up of the Pi.

Inserting and Removing SD Cards

It is likely that you will need a memory card with more than 2 GB capacity, if you are intending to run an operating system on the Pi. MicroSD cards are widely available and generally very cost-effective.

To insert an SD card:

      1.Unplug the Raspberry Pi from its power supply.

      2.Locate the SD card socket on the underside of the Pi's board.

      3.When looking from above, the SD card's contacts should be facing up.

      4.Gently, push the SD card into the socket.
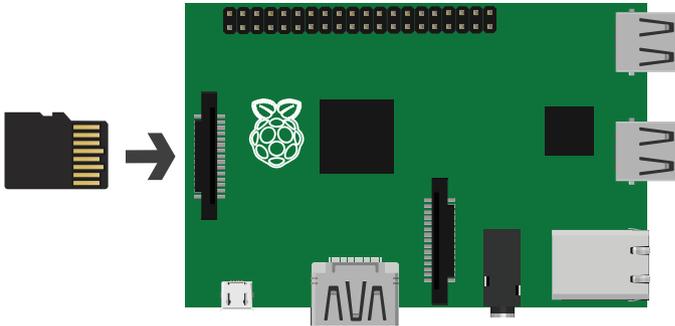
Figure 4. Inserting SD cards into the Raspberry Pi

To remove the SD card:

  •Gently pull the card out.

When inserting and removing SD cards in other computers, it is not always necessary to turn off the device. However, as the memory card contains its operating system, the Pi may access it at any time. Removing the card while the Pi is accessing it can corrupt data and, in extreme cases, may stop the card working at all.

CHAPTER 2 – INTRODUCING RASPBIAN

2.1 RASPBIAN AND LINUX

An operating system (OS) is a unique type of application that you run on your computer. It is an environment in which many other applications can run at the same time, with a consistent user interface and sharing the same resources. Microsoft Windows and Apple's Mac OS X are probably the two most well-known operating systems, but there are others.

Raspbian is a Linux distribution that is based on Debian, another popular version of Linux. It is designed for the Raspberry Pi and is the OS recommended by the Raspberry Pi Foundation. Once you are familiar with Raspbian, you will find that you are able to use other varieties of Linux without much help.

2.2 INSTALLATION OF RASPBIAN WITH NOOBS

New out of Box Software (NOOBS) is a tool that you can run on your Raspberry Pi, and it will help you install an OS. It stays on the SD card, even after the OS installed, and you can also use it to edit the Pi's main configuration file or replace the installed OS. The SD card supplied with your Pi already contains NOOBS.

If you want to install NOOBS on an blank microSD card, see section 2.3 Installation of NOOBS on a microSD Card.

Installing Raspbian

To install Raspbian, you will need to connect a keyboard, mouse, and display to your Pi.

First, ensure the Pi is completely off and unplugged, and then insert the SD card into the Pi's memory card socket. Reconnect the power to your Pi.

The Pi will start and load the NOOBS tool.

NOOBS only comes with the files that you need install Raspbian. If you want to install other operating systems, connect your Pi to your network router using an Ethernet cable and then restart NOOBS. Other operating system will populate.

To install Raspbian:

    1. Click the box next to **Raspbian**.
    2. On the toolbar, click **Install**.

When the installation is complete, the Raspberry Pi restarts and loads the raspi-config tool. This helps you to change certain important settings. For more information, see section 2.4 Raspi-config.

If you use NOOBS to install multiple operating systems on the same SD card then you will be asked which OS you want to use.

2.3 INSTALLATION OF NOOBS ON A MICROSD CARD

The microSD card that comes with your Pi already contains NOOBS. However, if you want to install NOOBS onto a blank microSD card, you can download the files that you need from the Raspberry Pi website.

To install NOOBS:

    1. Insert a FAT16 or FAT32-formatted microSD card into a suitable card slot on your computer. You may need a USB adapter for this.
    2. Download the latest version of NOOBS from
    http://downloads.raspberrypi.org/NOOBS_latest
    3. Open the NOOBS .zip file.
    4. Drag the contents of the .zip file onto your microSD card.
    5. Safely eject the microSD card.
    6. Ensure the Pi is completely off and unplugged, and then insert the SD card into the Pi's memory card socket.
    7. Reconnect the Pi's power supply.

2.4 RASPBIAN'S DESKTOP ENVIRONMENT

Raspbian's desktop is similar to Microsoft Windows and many of the ways that you use it are the same.

To interact with icons and buttons, click them with the mouse. If you right-click an icon, Raspbian displays a context menu. The options in a context menu only apply to the item that you clicked.

The desktop takes up most of the screen. This is where your programs will appear when you start them. And if you save files to the **/home/pi/Desktop** directory then you can see links to these files appear on the desktop.

When Raspbian's graphical desktop is running, you can access the raspi-config tool at any time by clicking LXTerminal on your desktop. Then type the following command and press Enter: `sudo raspi-config`

In the top left of the screen, you can find: the Raspbian menu, the Application Launcher, and the Wastebasket

In the top right of the screen, you can find: the network monitor, the volume control, a CPU monitor, and the clock.
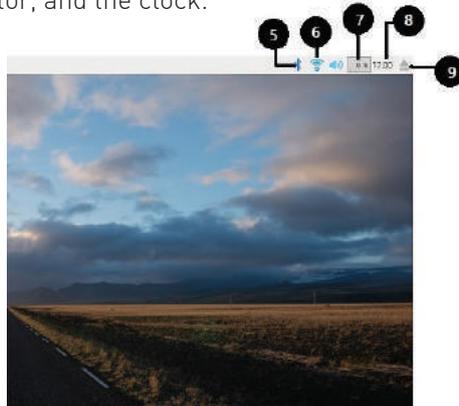
1	Menu: the Raspbian menu provides access to the system settings, applications and tools
2	Application Launcher: Click an icon to launch desired application
3	Task bar: holds all open applications.
4	Wastebasket: contains deleted files
5	Bluetooth: find and connect to bluetooth devices
6	Network Monitor: Configure wifi, shows status of network connection
7	Volume Control
8	Clock: With a calendar that launches when you click on the clock
9	Eject Button: click to savely remove connected devices

Connecting to Wifi

To connect to a Wifi network click on the network monitor (6 in diagram) then select the desired network.

Using the File Manager

You can use the File Manager to copy, rename, delete, and change the properties of files that are stored on the SD card or any USB storage devices that you attach to the Pi.

To open the file manager:
   •On the Application Launcher, click File Manager; or
   •Click the Raspbian Menu button, point to Accessories, and then click File Manager.

Accessing the Command Line

While most tasks can be completed using the desktop environment, there are still some things that you have to do from the command line.

To access the command line from the graphical environment:

On the Application Launcher, click LXTerminal; or

Click the Raspbian Menu button, point to Accessories, and then click LXTerminal.

> If you only want to run a single command, you can do this from the Raspbian menu. Click the Raspbian Menu button and then click Run. Type your command and then press Enter.

Understanding Linux Users and Superusers

If you have used more recent versions of Microsoft Windows then you may be used to running certain applications as an administrator. This idea is also in Linux. Superusers (often called "root") have full access to the system. Any applications you run as a superuser will also have full access to the system. To protect the system

from accidental or malicious damage, you rarely login to Raspbian as a superuser.

Normal users have less access to the core files needed by the OS, and this means that any applications that they run also have less access to the system. In Raspbian, pi is the user that logs into the desktop environment, and it is a normal user.

When you do need to change part of the system, or perform a task that only superuser can do, you can use the command line:

•Type sudo followed by a space, and then the command that needs superuser access privileges.

If you start a desktop program with sudo then the program also has full access to the system.

2.5 RESTARTING AND SHUTTING DOWN THE RASPBERRY PI

To restart the Pi:

1.Click the Raspbian Menu button and then click Shutdown...
2.Click Reboot, and then click OK.

To shut down the Pi:

1.Click the Raspbian Menu button and then click Shutdown...
2.Click Shutdown and then click OK.

CHAPTER 3 – BUILDING A MEDIA CENTER WITH OSMC

3.1 OSMC

Open source media center (OSMC) is a free media player that is based on Debian Linux and the Kodi media player. You can use it to play music and video files on your TV. These files can be on USB sticks, hard disk drives, other computers on your local network, and the Internet.

OSMC can play media files in many formats, including: 3GP, AAC, APE, AVI, CDDA, FLV, MIDI, MKV, MP3, MP4, M4A, MPEG, OGG, WAV, WMA, WMV, and many more.

Many people have a Raspberry Pi specifically for running OSMC or Kodi. The Pi's low cost, support for USB devices and networking, and built-in HDMI output make it an excellent choice for a media player that sits next to the TV and does not take up a lot of space.

3.2 INSTALLATION

OSMC includes a customized version of Debian Linux. This means that when you turn on your Pi, it loads Debian and then immediately opens the media player.

You can install OSMC on the same microSD card that you use for Raspbian, or you can install it to a new microSD card. To do this, you can use NOOBS.

> If you want to keep one microSD card for Raspbian and use another card for OSMC, see section 2.3 Installation of NOOBS on a microSD Card on page 8. Then install OSMC using the following instructions.

To begin:

       1.Plug in the Raspberry Pi.

       2.Connect a USB keyboard and USB mouse to the Pi.

       3.Connect one end of an Ethernet cable to the Pi, and plug the other end of the cable into your network router. Important NOOBS will not give you the option to

install OSMC unless the PI is connected via Ethernet Cable. (OSMC option is not avialble via Wifi)

To install OSMC on the same microSD card as another operating system (OS):

   •Hold Shift and turn the Pi back on. Do not release Shift until you see the NOOBS screen.

To install OSMC on a microSD card that contains NOOBS but that does not contain an existing operating system:

   •Turn on the Pi and then wait for the NOOBS screen.

If your microSD card already contains an OS, NOOBS can either remove the existing one or add OSMC as an additional option. To remove an OS, uncheck the box next to it. If you leave your existing OS on the SD card, the Pi asks you which one you want to load when it starts up.

To continue:
        1.In the list of operating systems, click the box next to OSMC_Pi2.
        2.Click Install.
        3.Click Yes.
        4.Click OK.
        5.On the Welcome screen, either:
   •Click your language; or
    •Use the Up and Down Arrow keys to highlight your language, and then press Enter.
        6.Click I Agree.
        7.Click Finish.

3.3 FIRST STEPS

The default appearance of OSMC is intended for use with remote controls and smartphone apps. This guide assumes that you want to control your media center with a mouse, so you should switch to the Kodi skin "Confluence".

Figure 7. The OSMC home screen

To do this:

1. On the OSMC home screen, press the Down Arrow key to highlight Settings. Then press Enter.
2. Press the Right Arrow key to highlight Skin, and then press Enter.
3. Highlight Confluence, and then press Enter.
4. Click Yes.
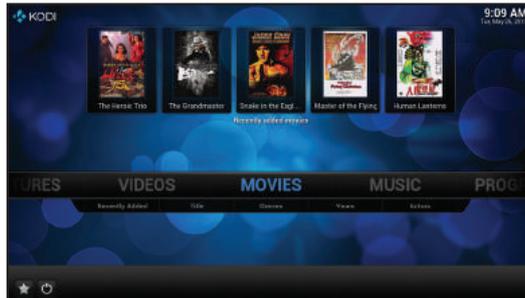
Figure 8. The OSMC home screen in the Confluence skin

In the OSMC skin, press the arrow keys on your keyboard to highlight menu options and items. Press Enter to "click" the item. Press Esc to return to the previous screen.

In the Confluence skin, click menu options and items with the mouse. To return to the previous screen, right-click with the mouse. If you right-click on movie and TV show files, an additional menu appears.

For a full list of OSMC's keyboard controls, see http://kodi.wiki/view/Keyboard

OSMC divides media files into categories depending on whether they are a movie file, an episode of a TV show, a music file, a picture or photo, or a program. You access the different types of file using different menu items on the home screen menu.

3.4 MEDIA FILES AND THE LIBRARY

Using OSMC, you can view files from USB devices (such as memory sticks and hard drives), files from other computers on your local network, or files across the Internet.

In addition to browsing for files each time you want to play something, you can add devices and network folders to your OSMC "library". The library is a list of all of the files that you have available, and often contains extra information such as preview images and descriptions. If you add a file to your library, it is still stored on the original device and is not available if you remove or turn off the device.

Playing Media Files from USB Devices

If you keep your media files on USB storage devices, you are not taking up space on the SD card used to run OSMC. You can remove USB devices at any time and use USB devices to transfer files from your PC to be played on your media box.

To play a video file without adding it to your library:

Insert the USB device into a slot on the Pi or USB hub. You can do this when the Pi is on.

On the OSMC home screen, point to Videos and then click Files.

Click the USB device that contains your files, and then click the file that you want to play.

Adding Files to the Library

Your OSMC library is made up of a list of "sources", and information about the media files that you have on your system. A source is a file path that OSMC remembers between sessions. When OSMC updates your library, it opens each source folder and examines all of the media files inside.

During this process, OSMC runs special programs called "scrapers". These add-ons find the information about the files in your library. For this to work, the file names of movies and TV shows that you want to add must follow a set pattern.

The instructions below are an example to get you started; for more detailed information, see

http://kodi.wiki/view/Naming_video_files

If your USB device contains movie files and TV shows, create two subfolders on the device and use one for movies, and the other for the TV show episodes.

When naming movie files, use the pattern: Title (Year).ext

For example: Five Deadly Venoms (1978).mp4

To add TV shows to your library, it is advisable to create a directory structure inside the TV show folder on the USB device. Create a folder for each TV series.

For example, create a folder called The Addams Family. Then create subfolders inside that for each season. For example, Season 1 and Season 2. Place the video files for each season in the correct subfolder, and name each file with the pattern:

Anything Including Spaces_sXXeYY.ext

Replace XX with the season number, and YY with the episode number.
For example: The Addams Family_s01e01.mp4

To add a selected folder on the USB device as a source and load the files into your library:

1. Insert the USB device into a free USB slot on the Pi or USB hub. You can do this when the Pi is on.
2. On the OSMC home screen, point to Videos and then click Files.
3. Click Add Videos... and then click Browse.
4. Click Root filesystem.
5. Click media, and then click the USB device.
6. Browse into the folder that contains your video files, and then click OK.
7. Click OK.
8. From the This directory contains list, select (Movies) or (TV Shows).
9. Click OK.
10. If you are asked whether you want to refresh info for all items, click Yes.

Playing Videos from the Library

Once you have added some videos to your library, you can access them from the OSMC main menu. To play a movie:

      1.On the OSMC home screen, click Movies.

      2.Click the name of a movie to start playing.
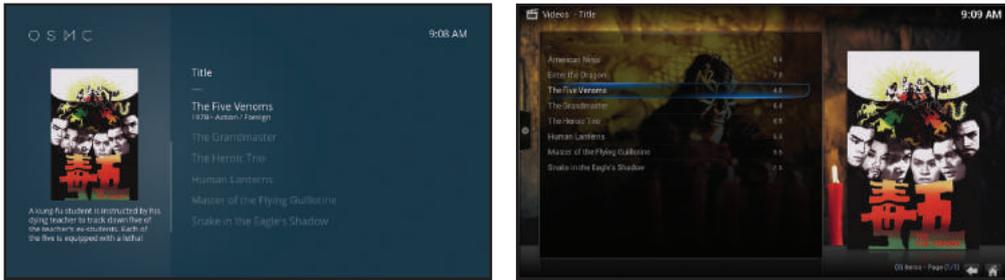
Figure 9. Playing a movie – OSMC (left) and Confluence (right)

In the Confluence skin, right-click the movie and then click Movie information to bring up a window containing all the information that the scraper could find out about that file.

To play an episode of a TV show:

      1.On the OSMC home screen, click TV Shows.

      2.Click the name of a TV series, and then click the episode that you want to play.

In the Confluence skin, right-click the TV series and then click TV show information to view the details of that series. Right-click an episode and then click Episode information to bring up a window containing all the information that the scraper could find out about that particular episode.

Figure 10. Viewing movie information

Removing USB Devices

Make sure that you properly eject USB devices from the system. This process stops OSMC from reading or writing to the device while you unplug it, and ensures that all of the changes that need to be made to the file system are completed. To safely remove a USB device:

1. On the OSMC home screen, point to Videos and then click Files.
2. Right-click the device, and then click Remove safely.

3.5 REMOTE CONTROLS

There are several ways that you can control OSMC with a remote control, instead of using a mouse or keyboard.

Controlling OSMC over HTTP

OSMC has a built-in web server that you can use to control OSMC over hypertext transfer protocol (HTTP). This turns any device with a web browser into a remote control for OSMC.

CHAPTER 4 – RETRO GAMING

4.1 CONFIGURING YOUR SYSTEM TO RUN RETROPIE

Upon powering on the device you should see the following screen.

Retropi logo will appear only appear if Retropie is Preloaded
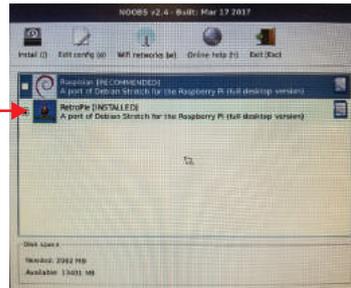
If your Micro SD Card is Preloaded With Retropie the Retropie logo will appear on the screen.
Select Retropie and click Install, once it installs you will then be prompted to set up the Controllers. You are Now Ready to Play!

If your card is Preloaded with NOOBS ONLY then the Retropie logo will NOT appear on the screen and you will first need to install Raspbian, and then download and install Retropie.
(If you have already installed Raspbian, skip ahead to step 4.2 on next page)

See instructions on how to install Raspbian on Page 9, Section 2.2 INSTALLATION OF RASPBIAN

Once you have Installed Raspian and connected to internet via Wifi (see page 13) or LAN cable. You can then proceed to Download and install Retropie. (See Below-Next page)

Open terminal by clicking on the terminal icon ⌦ on the top menu towards the left side of the screen.

4.2 DOWNLOADING AND INSTALLING RETROPIE

INSTALL UPDATES

Type the following in the terminal and press enter.

```
sudo apt-get update && sudo apt-get upgrade
```

After the packages install, you will be asked if you want to continue? {Y/n}
Type Y and then hit enter.

**You may receive other prompts/questions during update which will require your input to continue.

INSTALL RETROPIE

The following code can also be found at the link below: (If you have trouble with the code below please check the code online as the code is constantly updated, and may have changed since the time of print)

https://github.com/retropie/retropie-setup/wiki/manual-installation#install-retropie

Type the following into the terminal and press enter.

```
sudo apt-get install git lsb-release
```

🍓 Next,

```
cd   (Press Enter)
git clone --depth=1 https://github.com/RetroPie/RetroPie-Setup.git
(Press Enter)
cd RetroPie-Setup   (Press Enter)
sudo ./retropie_setup.sh    (Press Enter)
```

This may take some time, when it is done you will see this screen.

Choose Basic Install and select OK.

When it is done you will return to the main screen (pictured above).
If you would like to have your device automatically boot into emulation station upon powering on, follow the following OPTIONAL steps.

Select **Configuration/Tools** and select OK.

Select **autostart – Auto-start Emulation Statio/Kodi on Boot** and Select OK.

Select **Start Emulation Station at boot** and Select OK.
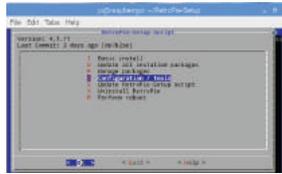
4.3 ADDING YOUR ROMS TO YOUR NEW RETROPIE

Please follow the steps below to transfer RetroPi Game ROMS from a flash drive to your Pi SD card.

NOTICE: Vilros assumes no responsibility for violation of laws pertaining to downloading of intellectual Property or Media. We make this good faith effort to inform you of your responsibilities in this regard. It is our policy to protect the rights of intellectual property creators and owners.

1. Insert the Micro SD Card into the Raspberry Pi

Note: The Raspberry Pi 3 Included in this kit does not have the click in mechanism, just insert firmly until it goes no further, do not force it. To remove just pull out.

2. Connect The Pi to a Monitor/Screen with the HDMI Cable
3. Connect the Gamepad(s) to the Raspberry Pi via the USB Ports

4. Connect the Power Supply to your Pi and plug in to power on.

You will be prompted to configure your gamepad(s) controls. Once you are done setting the Gamepad you will automatically be directed to the gaming interface.

*At this point it is best to shut down the Pi while you configure the flash drive on a regular PC or Mac.

Insert the flash drive into the PC or Mac and navigate to it through the file explorer. In our example we are using drive F:\

Double click on the drive letter to open it.

Go to File › New › Folder.

Name this folder **retropie**

(*Note the spelling) See below for clarification.

🍓 Eject the flash drive properly (click the drive letter and click eject).

🍓 Insert the flash drive into one of the USB ports and power the Pi back on

🍓 This will take a minute or so but you will see the Pi booting up and you should be back at the gaming interface.

🍓 Pull the flash drive out of the Pi and put it back into the PC/Mac.

🍓 Navigate to the flash drive as you did earlier and double click the retropie folder you created. You should see some additional folders that the Pi automatically created for you like the next image.
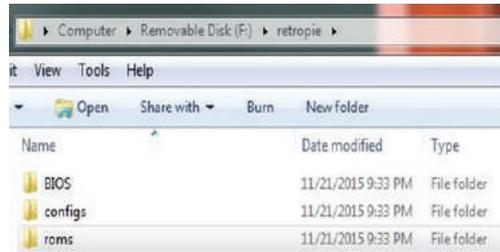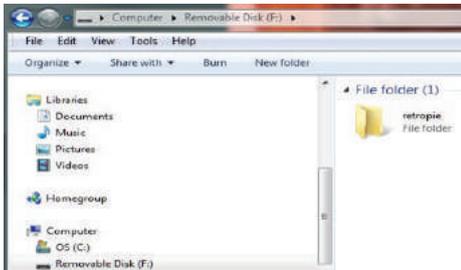
To further see that the flash drive is configured correctly double click on the roms folder and you will see a list of gaming manufacturers.
Ex: Atari2600
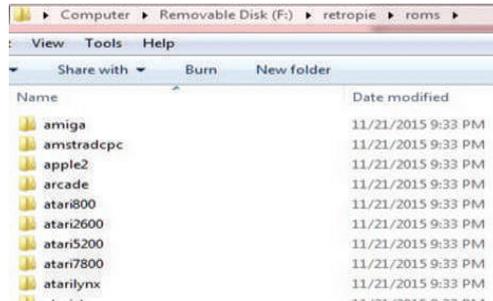
Once you have downloaded your ROMS to your PC unzip it (Windows utility should work fine) and copy the extracted file to the proper folder on the flash drive. For example if you have an Atari 2600 ROM it MUST get copied to the atari2600 folder you will have on your list.

Your flash drive is now ready to be reinserted into the Pi board again. Reboot the Pi and the games name should be listed under the manufacturers name in the gaming interface.

Questions? Comments?
Problems With Hardware?

We Love Hearing from our Customers!

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