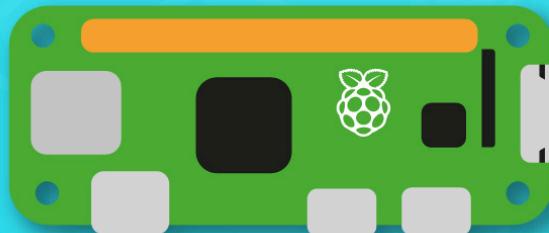
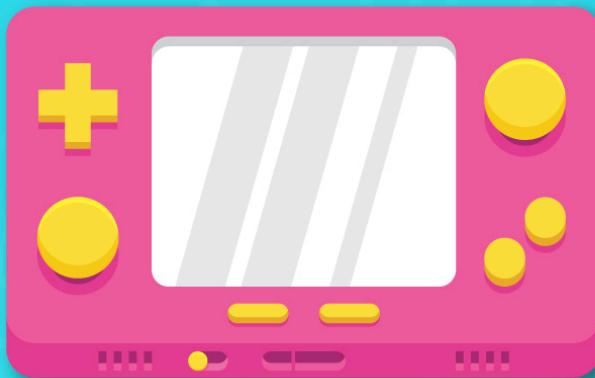




BUILD A PORTABLE GAME CONSOLE

FEBRUARY 29 | DUBAI RASPBERRY BIRTHDAY JAM



RASPBERRY

JAM

8th Birthday

Dubai | 2020





ABOUT THE ASSEMBLY

COMMUNITY
INNOVATION
WORKSPACE

- A **Smart Lab** based out of **iN5** since December 2014
- Over 250 Free workshops done
- **Assembly : HACK** - Embedded systems, IOT, hardware.
- **Assembly : CODE** - Software projects - APIs, frameworks, apps
- **Assembly: Data Science** - Advanced topics related to AI/Machine Learning
- Target Audience – **Students | Professionals | Entrepreneurs**
- Focus on Smart Technology and Practical Applications
- Forum: members.theassembly.ae



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FACEBOOK The Assembly

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The Assembly



OVERVIEW OF THE WORKSHOP

- Raspberry Overview & Introduction
- Software & Hardware Requirements
- Making the Connections
 - Keypad
 - LCD
 - External Display & Keyboard
- Installing Drivers
 - LCD
 - Updating Refresh Rate
 - Keypad
- Transferring games to the Pi
- PLAY!



RASPBERRY PI OVERVIEW

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So, what exactly **IS** Raspberry Pi?

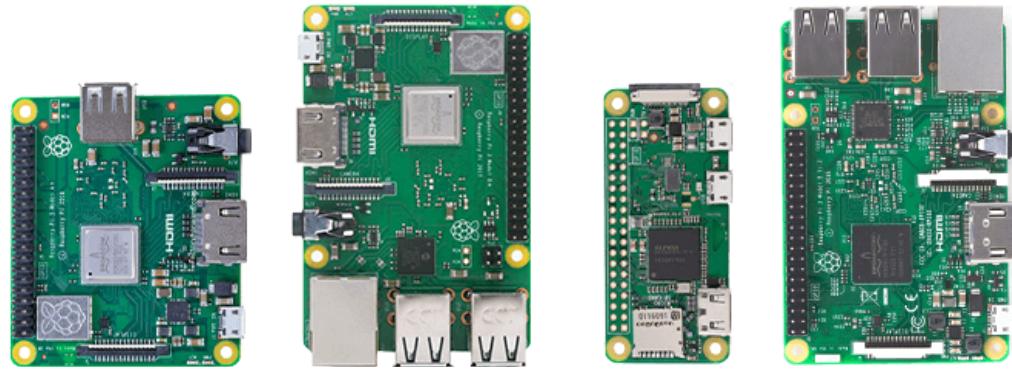
- Low cost, credit-card sized computer that uses a standard monitor, keyboard and mouse
- Allows people of all ages to explore computing and learn programming in different languages – Scratch or Python
- Does everything a standard PC can do – browse Internet, watch videos, make spreadsheets, play games!
- Ability to interact with the "outside world", allowing people to create fun, interactive projects!



TYPES OF RASPBERRY PI

How many kinds of Raspberry Pi **are** there?

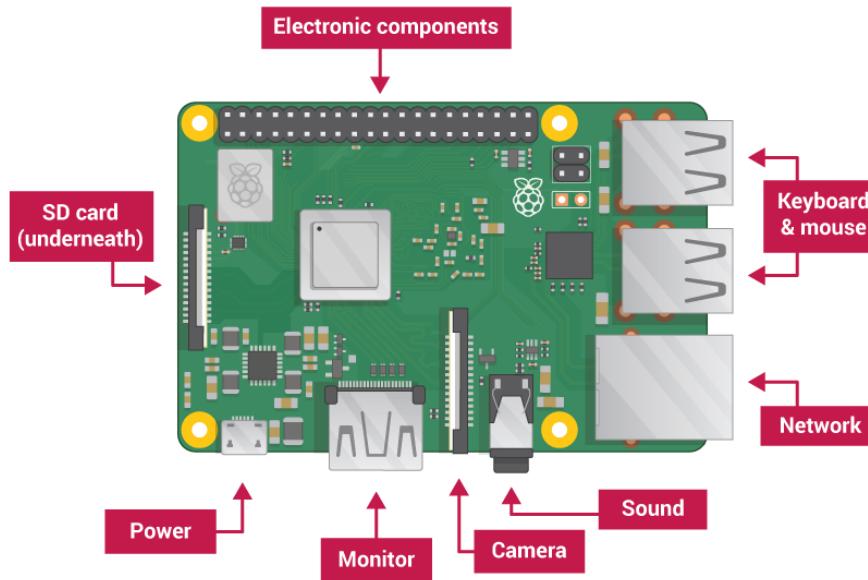
- Raspberry Pi 1A+/1B+
- Raspberry Pi 2B
- **Raspberry Pi 3A+/3B/3B+**
- Raspberry Pi Zero
- Raspberry Pi Zero W
- Raspberry Pi 4B





PI 3B+ LAYOUT & CONNECTIONS

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- Quad Core 1.2GHz Broadcom BCM2837 64bit CPU
- 1GB RAM
- BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board
- 100 Base Ethernet
- 40-pin extended GPIO
- 4 USB 2 ports
- 4 Pole stereo output
- Full size HDMI
- CSI camera port for connecting a Raspberry Pi camera
- DSI display port for connecting a Raspberry Pi touchscreen display
- Micro SD port for loading your operating system and storing data
- Upgraded switched Micro USB power source up to 2.5A



SOFTWARE REQUIREMENTS

Loaded SD Cards already provided:

- Balena Etcher
<https://www.balena.io/etcher/>
- RetroPie ISO Image
<https://retropie.org.uk/download/>



What you need to install:

- SSH Client: CyberDuck → <https://cyberduck.io/download/>





HARDWARE REQUIREMENTS

- Raspberry Pi 3B+
- Loaded Micro SD Card with RetroPie
- Micro-USB Cable & Power Supply
- Keypad Controller
- 5.3" TFT LCD Screen
- GPIO Layout
- Female Jumper Cables
- Monitor
- Keyboard
- HDMI Cable
- USB with ROM files





STEP 1: LOADING THE MICRO SD CARD WITH RETROPIE

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(This has already been done for you)

Before getting started with Raspberry Pi Zero, we need to format a micro SD Card (minimum 8 GB) using **Balena Etcher** and load the SD Card with the **RetroPie** Image.

1. Install Balena Etcher on your PC/Mac
2. Download the RetroPie Image (.img) on your PC/Mac - Make sure to *install the correct RetroPie Image depending on which Raspberry Model you'll be using*
3. Once Step 1 and 2 have been completed, launch Balena Etcher on your PC/Mac, connect your SD Card to your laptop and flash the downloaded RetroPie Image onto your SD Card
4. Once completed, insert the SD Card in your Raspberry and you're ready to go!



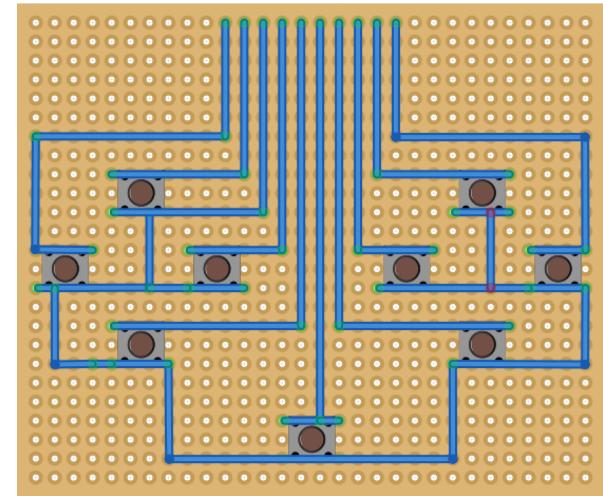
STEP 2: MAKING THE KEYPAD CONTROLLER

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(This has already been done for you)

For any gaming console, there's always a keypad controller required. For this workshop, we will be making our own handheld game controller to play the games on the RetroPie with.

1. Using **9 switches** and **solder board** - set up your connections as shown in the diagram

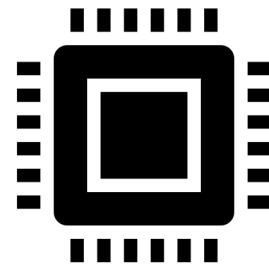


BACK VIEW
PINS LEFT → RIGHT
A-D-GND-C-B-START-DOWN-RIGHT-UP-LEFT



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MAKING CONNECTIONS!





STEP 3: CONNECTING THE KEYPAD CONTROLLER TO PI

2. Connect the pins from the solder board to the pins of your Raspberry Pi 3B+ as below:

A → GPIO5

D → GPIO21

GND → GND

C → GPIO12

B → GPIO6

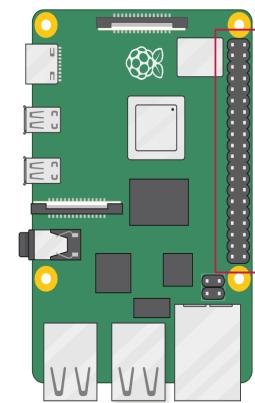
START → GPIO13

DOWN → GPIO19

RIGHT → GPIO16

UP → GPIO26

LEFT → GPIO20



Pin Number	Pin Color	Function
1	Black	3V3 power
2	Black	5V power
3	Black	5V power
4	Black	Ground
5	Black	GPIO 14 (TXD)
6	Black	GPIO 15 (RXD)
7	Black	Ground
8	Black	GPIO 18 (PCM_CLK)
9	Black	Ground
10	Black	GPIO 23
11	Black	GPIO 24
12	Black	Ground
13	Black	GPIO 25
14	Black	GPIO 8 (CEO)
15	Black	GPIO 7 (CE1)
16	Black	GPIO 1 (ID_SD)
17	Black	GPIO 10 (MOSI)
18	Black	GPIO 9 (MISO)
19	Black	Ground
20	Black	Ground
21	Black	GPIO 11 (SCLK)
22	Black	Ground
23	Black	GPIO 12 (PWM0)
24	Black	Ground
25	Black	GPIO 13 (PWM1)
26	Black	Ground
27	Black	GPIO 19 (PCM_FS)
28	Black	GPIO 16
29	Black	Ground
30	Black	GPIO 20 (PCM_DIN)
31	Black	Ground
32	Black	GPIO 21 (PCM_DOUT)
33	Black	Ground
34	Black	Ground
35	Black	GPIO 6
36	Black	GPIO 10 (PCM_FS)
37	Black	Ground
38	Black	GPIO 26
39	Black	Ground
40	Black	GPIO 1



STEP 3: CONNECTING THE KEYPAD CONTROLLER TO PI

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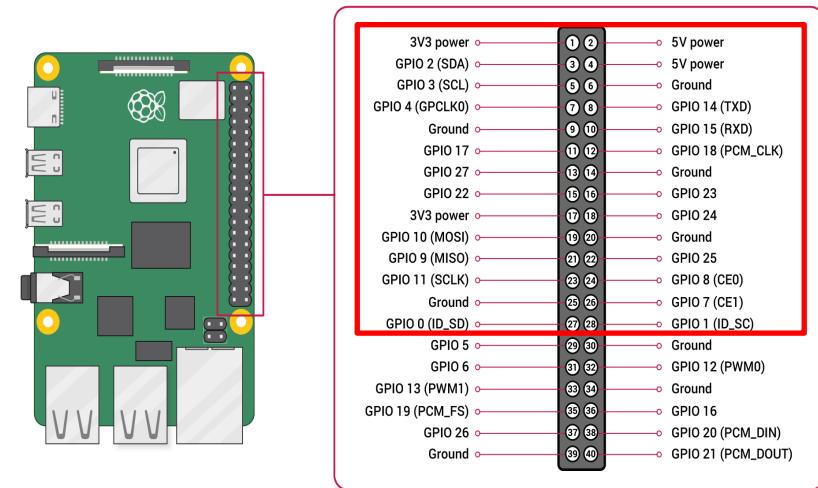
WILL USE COMBINATION OF
↓ AND START



STEP 4: CONNECTING THE LCD TO THE PI

We obviously need a 3.5" OR 3.2" screen to be able to play games!

Connect the provided LCD Screen to the Raspberry Pi Zero to the pins 1 - 26



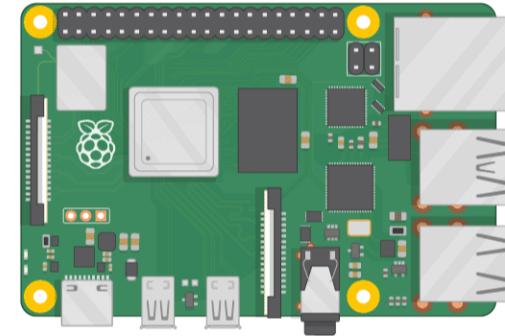


STEP 5: CONNECTING THE DISPLAY AND KEYBOARD

To set up and initialize Retropie with Wi-Fi, it is important to have a standard USB Keyboard connected and a display.

Go ahead and connect the HDMI Cable from the monitor to the HDMI Slot on the Raspberry Pi!

(Don't forget to connect the keyboard to one of the USB Slots on the Pi!)





STEP 6: POWER ON THE PI!

It's (finally) time to power ON the Pi!

1. Connect the Micro-USB to the power supply of the Raspberry Pi and connect the USB to the power bank provided to turn it on
2. RetroPie will prompt you to set up the controller buttons – use the wired keyboard to set up the buttons as below on your keyboard:

UP: ↑ ARROW KEY

DOWN: ↓ ARROW KEY

RIGHT : → ARROW KEY

LEFT: ← ARROW KEY

START: SHIFT KEY

SELECT: ENTER KEY

A: LETTER A

B: LETTER B

C: LETTER C

D: LETTER D

3. Press and hold any key on your keyboard to skip the setup for the rest of the keys



STEP 7: UPDATE LOCALE & ENABLE SSH

1. Use your arrow keys to browse to “**RETROPIE**” from the Main Screen
2. Click **A** on your keyboard to Select
3. Use your keys to browse to “**RASPI-CONFIG**”
4. Go to “**WIFI**” > Click **A** on your keyboard to Select
5. You will get a prompt to launch “RASPI-CONFIG” > Use your **Enter** key on the keyboard to select **YES**
6. Go to “**LOCALIZATION OPTIONS**” > Hit **Enter** to Select
7. Go to “**CHANGE LOCALE**” and use your keys to select “**en_SG.UTF-8 UTF-8**” and hit **Enter** to set the locale
8. From the same “**RASPI-CONFIG**” Menu > Go to “**INTERFACING OPTIONS**”
9. Use your keys to browse to “**SSH**” and hit **Enter** to activate it (this will allow you to transfer files/games and install drivers from your PC for the Pi)
10. From the same “**RASPI-CONFIG**” Menu > Click **Finish**

تركيب

THE ASSEMBLY

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STEP 8: CONNECT THE PI TO WI-FI

Next, you must connect your Pi to the Wi-Fi to be able to remotely connect to it (It is crucial that your Pi and PC are both connected to the SAME network)

1. If you have completed Step 7 successfully, then it should automatically prompt you to connect to Wi-Fi – Select “**CONNECT TO WI-FI NETWORK**”
2. When list of Wi-Fi networks are displayed, browse down to “**Hidden ESSID**” and enter the below:

SSID: ASSEMBLY

PASSWORD: (Will be entered by our volunteers!)

Once connected successfully, your Raspberry Pi should now have an IP Address displayed on the screen!



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INSTALLING DRIVERS!





STEP 9: SSH INTO YOUR PI!

Now that you have your Pi connected to the Wi-Fi and have a valid IP Address, you are ready to connect to it from your computer.

Launch CMD/Terminal from your PC/MAC

Type “**ssh pi@IPAddress**”

Type “**yes**” and hit Enter when prompted

Type the password “**raspberry**” when prompted



STEP 10: INSTALL THE DRIVER FOR LCD

From your SSH connection, type:

1. **sudo raspi-config** > Select **Advanced Options** > **Expand Filesystem** > **Finish** >
This will Reboot the Pi
2. SSH again into the Pi from CMD/Terminal using “**ssh pi@Your IP Address**”
3. **git clone https://github.com/waveshare/LCD-show.git**
4. **cd LCD-show/**
5. For 3.5 Inch Screen → **chmod +x LCD35-show**
For 3.2 Inch Screen → **chmod +x LCD32-show**
6. **sudo ./LCD35-show**

Your Pi will reboot automatically after the last command is executed and your LCD should work right after it does!

Note: if your screen is displaying upside down, after running step 4 & 5 again, run **sudo ./LCD35-show 180** and reboot the Pi again.



STEP 11: UPDATE THE REFRESH RATE

To update/change the refresh rate on the screen (recommended for games):

1. SSH to the pi from your PC/MAC again
2. **sudo nano /boot/config.txt**
3. Browse to find the line that starts with "dtoverlay=waveshare35a" add:
,fps=50,speed=48000000,debug=32,bgr=1
4. Select **CTRL+X** to close the File > Click "**Y**" > **Enter**
5. **sudo reboot** to see the changes



STEP 12: INSTALL THE KEYPAD DRIVERS

To install the keypad drivers, run the following commands from SSH:

1. `sudo apt-get update`
2. `sudo apt-get install python3-pip >`
enter Y to install
3. `sudo pip3 install keyboard`
4. `sudo pip3 install Adafruit-GPIO`
5. `sudo pip3 install Adafruit-blinka`
6. `git clone https://github.com/The-Assembly/RAT-Controller`
7. `cd RAT-Controller`
8. `mv * ~/`
9. `cd -`
10. `sudo nano /etc/rc.local`
11. Change the **first line** of the file to →
`#! /bin/bash`
12. In the same file, **before exit 0**, add line to file: `sh /home/pi/start.sh &`
13. Click **CTRL+X** to exit the file > Click “Y” to save > Hit **Enter**
14. `sudo reboot`



STEP 13: CONFIGURE YOUR KEYPAD

Once the drivers have been installed, all you need to do is to re-configure the keys on your keypad:

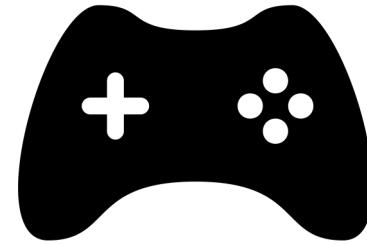
1. From the **Main Menu** for RetroPie > Click “**B**” on your wired keyboard to open “**OPTIONS**”
2. Browse to “**CONFIGURE INPUT**” > Click “**A**” on your wired keyboard
3. Click “**A**” again to select **YES** when prompted
4. Reconfigure your keypad using this layout





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INSTALL GAMES!





STEP 14: INSTALL GAMES

Now that your Pi is up and running with both the LCD and the Keypad, you are now ready to install the games to your Pi!

1. Download the "**ROM**" Files to your PC
2. On your PC > Launch **CyberDuck**
3. Click on "**OPEN CONNECTION**" > Select "**SFTP (SSH File Transfer Protocol)**"

Server: Your PI IP Address

Username: pi

Password: raspberry

4. Once open, you should be able to navigate to the **RETROPIE > ROMS** Folder
5. Copy the ROM Game Folders to their respective folders inside the Pi

E.g. a game folder with the extension ".gba" will need to be copied to the "GBA" Folder



FINAL STEP: PLAY!!

Restart your Pi and all your installed games should show up

You can now disconnect the external Monitor (HDMI) and the USB Keyboard and test out your hand-held game console!