



#### IOIO IOIO Module I.I Computing Concepts

### What is a computer?

#### Hardware

Physical components of a computer



mouse



IBM PC Motherboard by Martinez CC BY-SA 4.0

(CPUs, from left) Intel C80186-6 (1982) adapted from Nguyen, 2016. Intel i7 by Gaba, 2018. Intel i9 by Cole. CC BY-SA 4.0

### Software

Set of instructions, procedures, and routines that enable the computer to perform tasks.



#### System software

macOS®, Microsoft Windows, Linux®, Android™

#### Application software Microsoft Word, Google Maps<sup>™</sup>, Gmail<sup>™</sup>

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### **Programming Language**



# IOIOModule I.2IOIOCODERS Kit



**Raspberry Pi Setup** 

### Introduction



#### Introduction

This module will walk you through setting up the Raspberry Pi 4 provided with CODERS kit in ten simple steps.

This process should require less than 30 minutes.

#### Hardware components

**Included in the kit:** 

I. USB-C power supply cable with on/off switch

2. Case

3. Fan (silver screws)

4.Type-C card reader (used to reformat microSD)

5. Preloaded 32 GB Micro SD memory card

6. Heat sink stickers

7. Raspberry Pi 4 unit (black screws)



#### Hardware components

**Included** in the kit:

7. Keyboard

8. HDMI to micro HDMI converter cables (2) for monitor or television screen

9. Mouse



**CPU** central processing unit (processor)

### Raspberry Pi 4 (RPi)

GPIO

general-purpose input/output

**GB** gigabytes

**RAM** random access memory

**USB** universal serial bus

**USB-C** USB, type C (for power supply)

#### HDMI

high-definition multimedia interface



#### **Install Heatsinks**

Heatsinks help dissipate heat during operation. To install, remove the adhesive backing from the copper pieces. Apply these to the CPU, RAM, and ethernet chip.



#### BEFORE



#### Install Fan

The fan also helps cool components. Lower the fan onto the posts on lid of the case. Use silver screws to secure the fan in place.





BEFORE



### Install RPi in case

Lower the RPi into case. Be sure ports and screw holes are aligned and apply downward pressure when turning the screwdriver to avoid stripping screws.







BEFORE

**AFTER** 

#### **Connect fan to GPIO pins**

### To power fan, connect red wire to pin I (3V3 power) and black wire to pin 6 (Ground).





3V3 power	0	00		5V power
GPIO 2 (SDA)	o	34	0	5V power
GPIO 3 (SCL)	0	66	0	Ground
GPIO 4 (GPCLK0)	o	78	0	GPIO 14 (TXD)
Ground	0	00	o	GPIO 15 (RXD)
GPIO 17	0	1012	0	GPIO 18 (PCM_CLK)
GPIO 27	0	13 12	0	Ground
<b>GPIO 22</b>	o	60	0	GPIO 23
3V3 power	o	<b>D D</b>	0	GPIO 24
GPIO 10 (MOSI)	o	19 20	0	Ground
GPIO 9 (MISO)	0	00	0	GPIO 25
GPIO 11 (SCLK)	0	32	0	GPIO 8 (CE0)
Ground	0	29 29	0	GPIO 7 (CE1)
GPIO 0 (ID_SD)	o	2 2	0	GPIO 1 (ID_SC)
GPIO 5	0	29 80	0	Ground
GPIO 6	0	<b>(1) (2)</b>	0	GPIO 12 (PWM0)
GPIO 13 (PWM1)	o	83 83		Ground
GPIO 19 (PCM_FS)	o	65 60	0	GPIO 16
GPIO 26	o	37 83	0	GPIO 20 (PCM_DIN)
Ground	0	39 40	0	GPIO 21 (PCM_DOUT)





#### Insert microSD

#### Snap the case shut, then insert microSD card.





#### **BEFORE**



#### **Connect input**

#### Plug in USB cables for the mouse and keyboard provided into RPi.





#### **Connect output**

#### Plug in HDMI into a screen (monitor or TV, not provided) and insert the Micro HDMI into the RPi.





#### **Connect power supply**

Behind panel, underneath table, unplug the three-pronged cord. In its place, plug in the power supply cable. Insert cable into USB-C port.







#### Turn on screen and RPi

Turn on screen. Flip the switch on the power supply cord. You should hear the fan and see the startup screen for Raspbian.

If you don't hear the fan, check that the power cable is fully connected and the fan is properly plugged into the pins.

If the startup screen doesn't appear but you hear the fan, try removing the microSD card and putting it back in. It may not be seated properly.



### **Setup Operating System**

The installation wizard will walk you through setup process, covered in the following slides.

Welcome to Raspberry Pi	~	^	×	-
X				-
Welcome to the Raspberry Pi Desktop!				
 Before you start using it, there are a few things to set up	).			4.30
Press 'Next' to get started.				
Cancel	IP : 1	10.0.2 ext	2.15	
and the second states and the				

### **Configure Settings**

Once online, you'll be prompted to set country, language, and timezone.

	Welcome to Raspberry I	Pi 🔹 🛪 :	×
Set Country			
Enter the detail time zone, keyb	s of your location. This is used board and other international s	I to set the language, ettings.	
Country:	United States	•	0
Language:	American English	•	•
Timezone:	Chicago	-	•
	🔲 Use English language	🗌 Use US keyboar	d
Press 'Next' wh	en you have made your selecti	ion.	
Back		Next	

#### Set Password

#### Change password to something memorable.

Welcome to F	aspberry Pi			×
Change Password				
The default 'pi' user account current It is strongly recommended that you password that only you know.	tly has the password 'r u change this to a diffe	aspbe erent	rry'	*2
Enter new password:				
Confirm new password:				
Drace 'Neut' to optivate vous pour p	☑ Hide	charao	cter	rs
Press Next to activate your new pa	ISSWOID.			
Back		Next		

### **Configure display**

If you see a black border, check the box before clicking "Next".

Welcome to Raspberry Pi	-		×	
Set Up Screen				
The desktop should fill the entire screen. Tick the box below if your screen has a black border at the edges.				
This screen shows a black border around the desktop				
Press 'Next' to save your setting.				
The change will take effect when the Pi is restarted.				
Back	Ne	xt		

#### Connect to WiFi

#### Enter WiFi password from card provided to join MSUSponsored.

k from the list.		
I		1
or 'Skip' to continue	without co	onnecting.
	Skip	Next
	or 'Skip' to continue	or 'Skip' to continue without co

#### Update software

Go ahead and perform software updates. Once these have started, you may take a ten-minute break.

	Welcome to Raspberry Pi	- 🗆 ×
Update Softwar	re	
The operating sy updated if neces	ystem and applications will now be ch ssary. This may involve a large downlo	necked and bad.
Press 'Next' to without check	Installing updates - please wait	ntinue
Back	Skip	Next

#### **Open terminal**

Next, we will download and enable a package to secure RPi by entering commands into the terminal. Click fourth icon from top left.



#### Enter commands

Type each command where the cursor appears after the following: pi@raspberrypi:~ \$

After each command, hit enter key

	•1 L	
Install firewall	Enable firewall	Limit logins
sudo apt install ufw	sudo ufw enable	sudo ufw limit ssh/tcp
As super user, do (sudo) install uncomplicated firewall (ufw) using advanced package tool (apt)	As super user, enable ufw package	Limits connection to secure shell (ssh) using terminal control protocol (tcp) to six times in a row

#### **FINAL STEP - SECURE RASPBERRY PI**

Type each command given below where the cursor appears after

pi@raspberrypi: ~ \$

Then click enter

	•1 L	
Install firewall	Enable firewall	Limit logins
sudo apt install ufw	sudo ufw enable	sudo ufw limit ssh/tcp
As super user, do (sudo) install uncomplicated firewall (ufw) using advanced package tool (apt)	As super user, enable ufw package	Limits connection if attempted six or more times in a row

#### **Securing Raspberry Pi**

- I. To install firewall, type: sudo apt install ufw And, hit Enter.
- 2.To enable the firewall, type: sudo ufw enable And, hit Enter.
- 3.To limit login attempts on ssh port using tcp: sudo ufw limit ssh/tcp And, hit Enter.



### Activity I-2 Airport

#### Airport scenario



A sibling is arriving soon by plane for a visit. They are not familiar with the area where you live. They ask you for help.

What are the steps they need to take to get to your house?



### Module 1.3 Algorithms

#### **Remember Computer Programming?**



**Define -** determine objective, related factors

- **Prepare** specify elements, determine tools, design process
- Try code and execute

**Reflect** - evaluate performance in meeting objective

*Note.* Image above and conceptual basis adapted from CS Discoveries 2020 - 2021, open-source lesson plans provided by Code.org (<u>https://code.org/educate/csd</u>), mapped to standards developed by the Computer Science Teachers Association (CSTA). Licensed under CC BY-NC-SA 4.0.

## What are the steps to make spaghetti for yourself?



### A flow chart for making spaghetti

No

Wait five minutes.

Check again



#### Is your Raspberry Pi working?

**Goal:** Draw a flowchart to represent the steps that you will take to ensure that it is working without touching it!

