

# Introduction to Electronics



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## **Electronic Prototyping Boards**

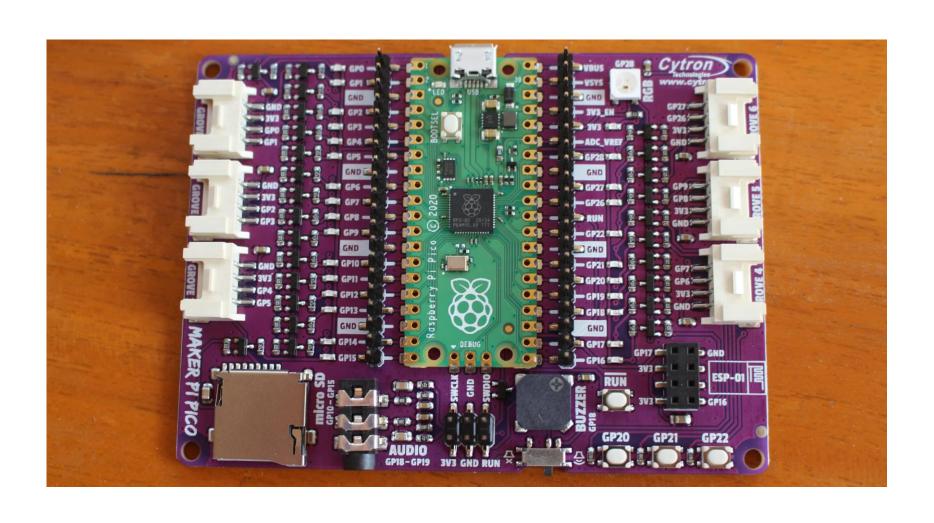


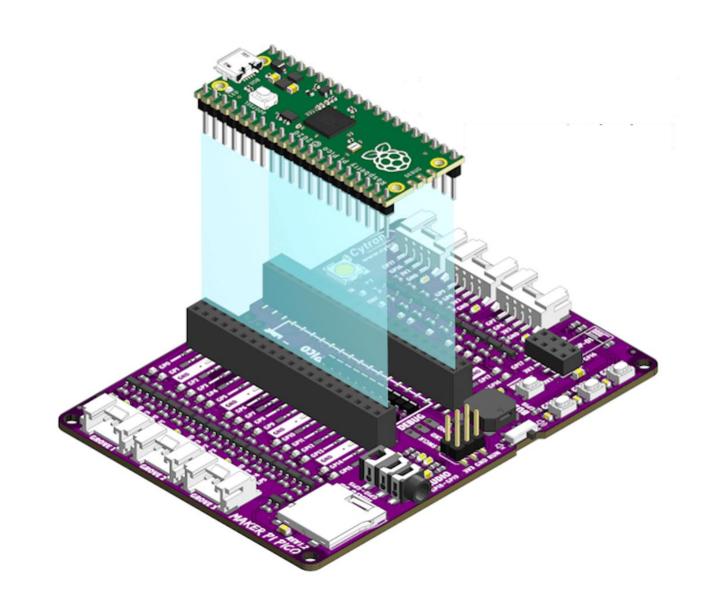


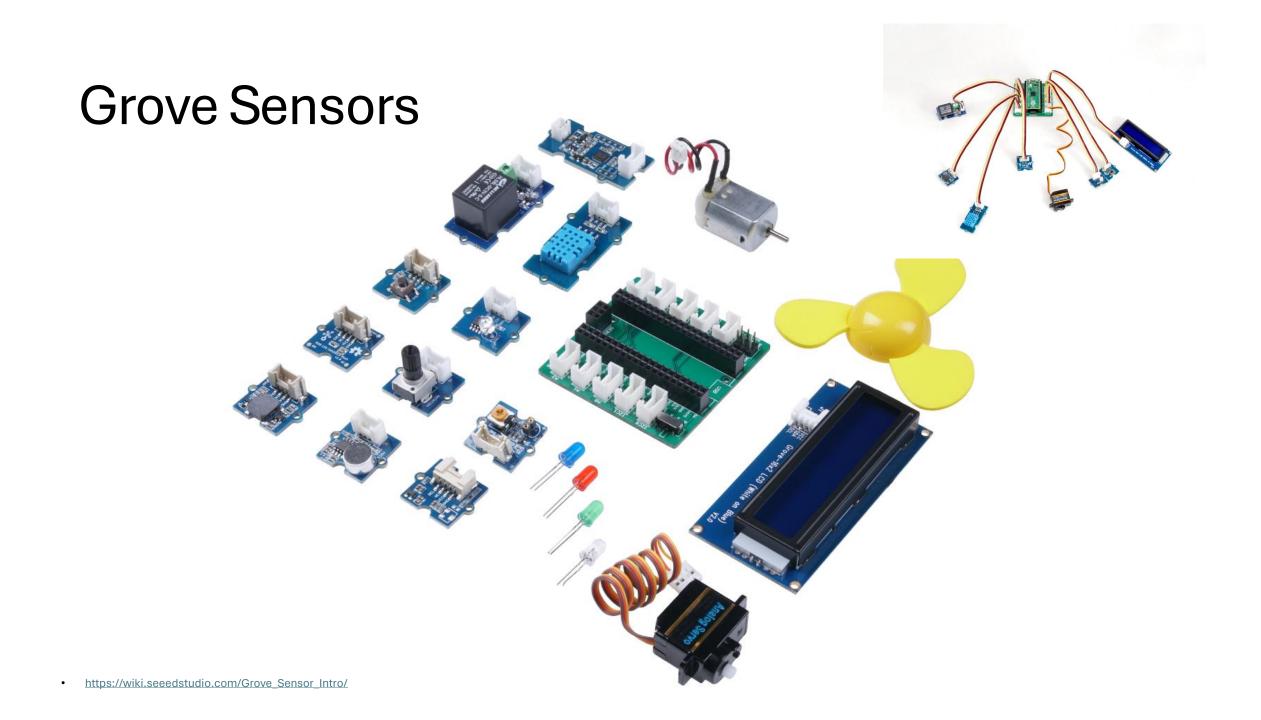


Microbit Pico Arduino

# Make Pi Pico Board by Cytron

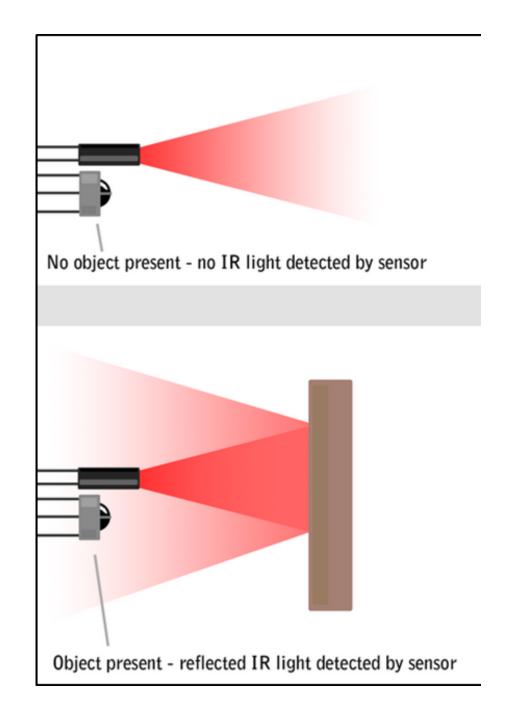




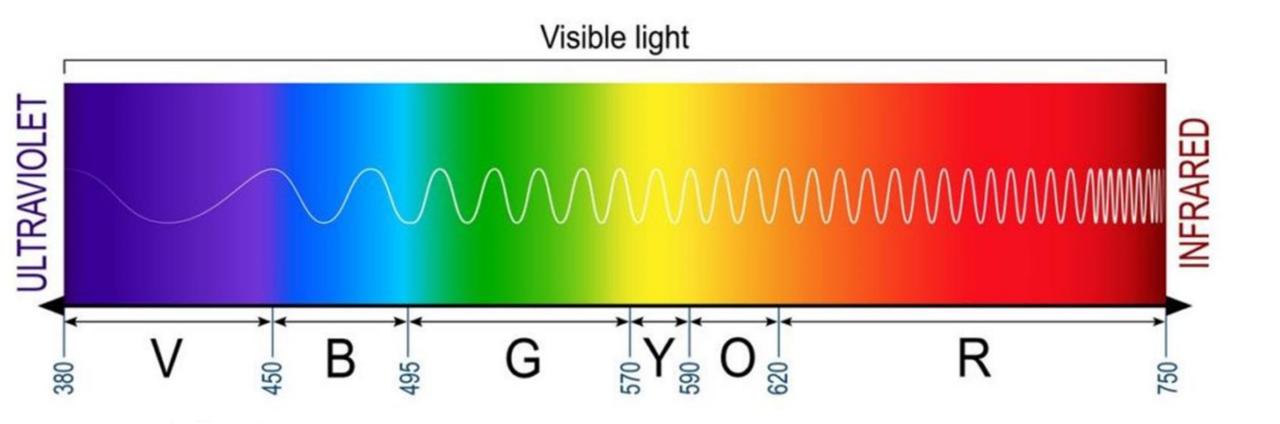


#### Infrared Sensor





#### Just Outside the Visible Spectrim



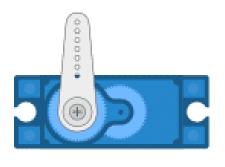
#### Animals that can see Infrared



#### Servos



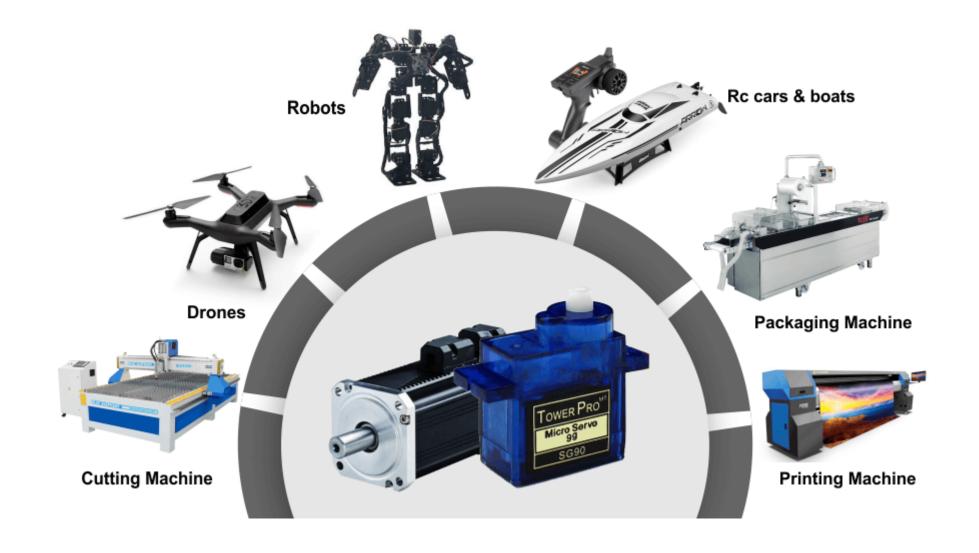
0 degrees



90 degrees



180 degrees



#### 3 Things Infrared Sensors are good for...

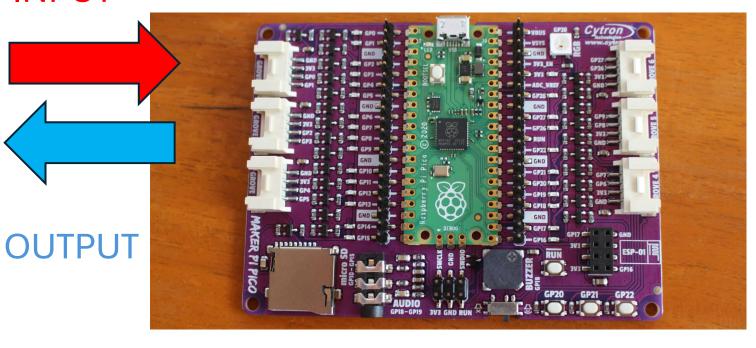
- Stopping robots colliding
- Counting objects on a a conveyor belt
- Detecting the presence of intruders.

# Our Project Today











# **Build a Simple Robot**



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Oh Dear, The Hungry Robot needs a Hospital Can you Fix Him?



# Anthropomorphism

Anthropomorphism is the attribution of human characteristics or behaviour to non-human entities, including animals.

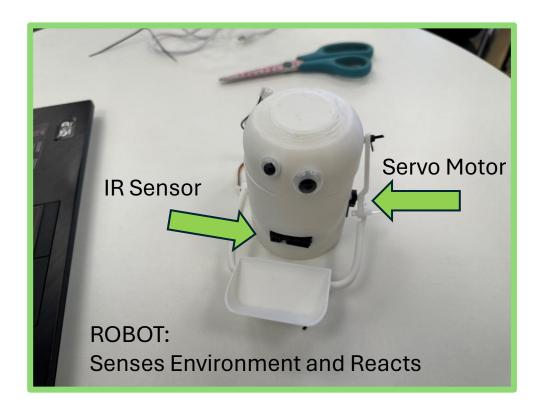






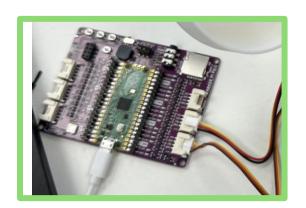
#### Demo of Hungry Robot

- Robot Body with
   a. IR Sensor to Detect Object
   b. Servo Motor that Moves when Object Detected
- 2. Software Program provides instructions on what to do when object detected that is move the servo motor
- 3. Electronics Board has the brains to understand the instructions and connects to the Sensor and Servo Motor



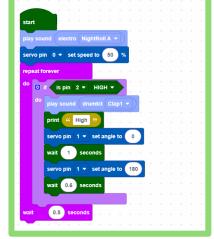
#### **HARDWARE:**

Pico Electronics Board



#### **SOFTWARE:**

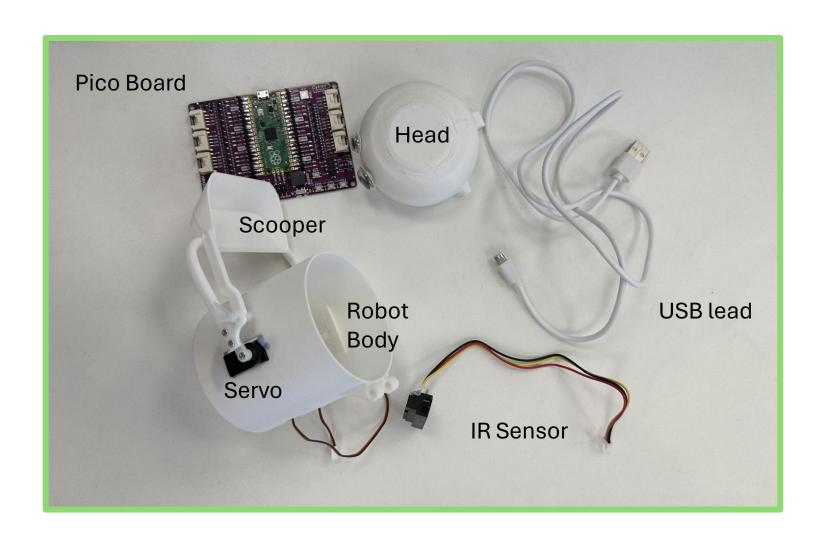
Instructions



# Robot Doctor Engineer Challenge

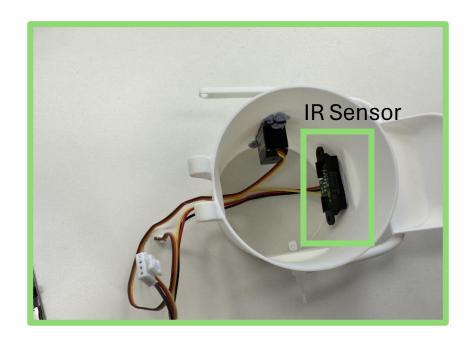
Can you mend the broken robot?

Have you the patience and making skills?



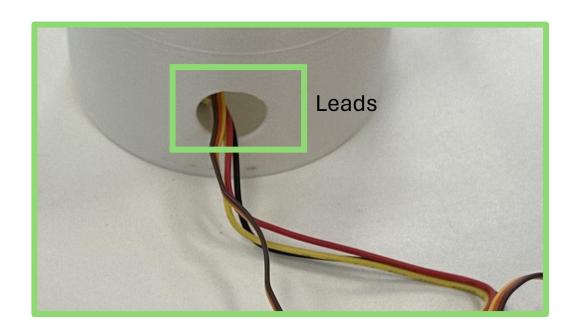
#### 1. Attach the IR Sensor

• Push the IR sensor through the rectangular hole at the front of the robot from the inside. Blue tack will help it stay in position.



#### 2. Pull Leads through Hole

• Pull all leads through the circular hole on the back of the robot body.

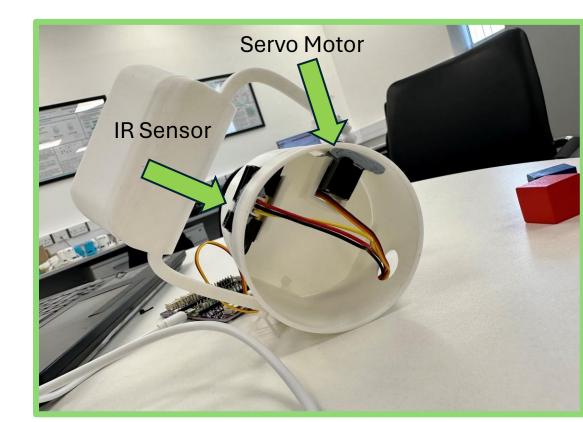


#### 3. Insert White Shelf on Top of Sensors

- Examine the white circular shelf.
- The white shelf sits inside the robot snugly on top of the servo and sensor with the smooth side facing upwards.
- Turn the robot upside down and turn the shelf so that the sensor and servo fit neatly into the spaces provided in the shelf.
- Push down to secure.

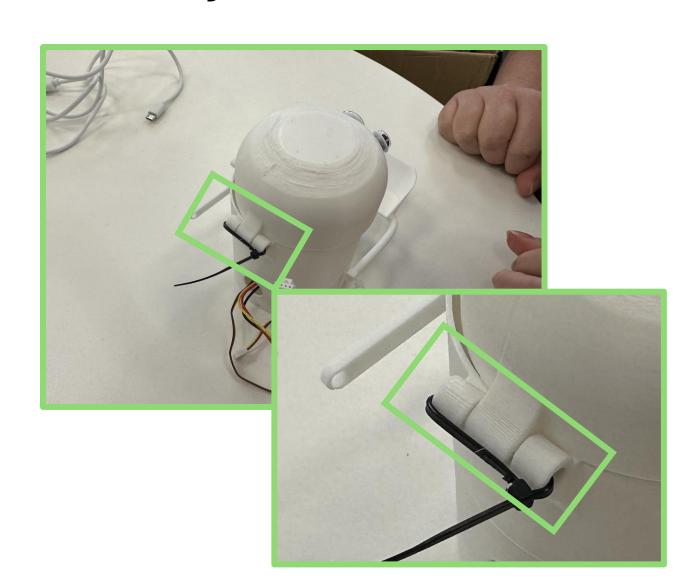


White Shelf



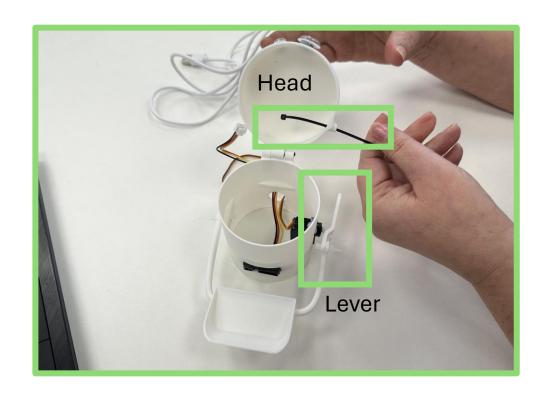
#### 4. Attach the Head to the Body

- Set the head on top of the body so that the hinge is connected (eyes to the front).
- Push one zip tie through the head and the body hinge.
- Bend the end of the zip tie and push the end of the tie through the hole at the top of the tie.
- Pull to secure...you will hear a zipping sound.



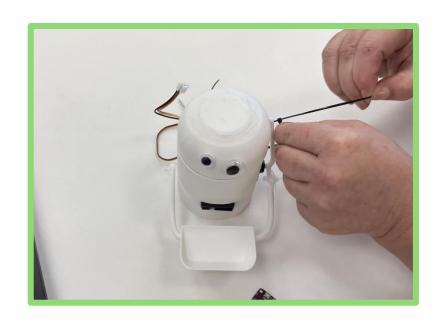
#### 5. Attach Lever

- Pull a zip tie through the hole on the head.
- Also pull it through the hole at the top of the lever above the servo motor.



#### 6. Secure Lever with Zip Tie

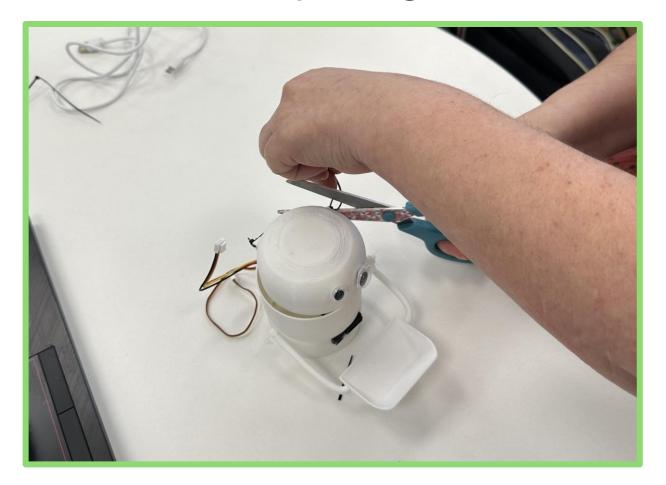
- Push the end of the 1<sup>st</sup> zip tie through the hole of a second zip tie.
- Push the end of the 2<sup>nd</sup> zip tie all the way down to the lever to secure.





#### 7. Ask Helper to Cut Ties and Check Build

Helper will make sure they are tight before cutting them



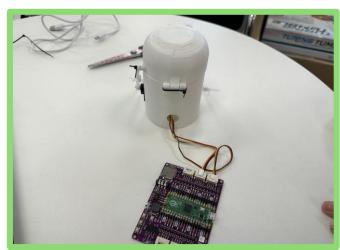
#### 8. Plug the Leads into the Board

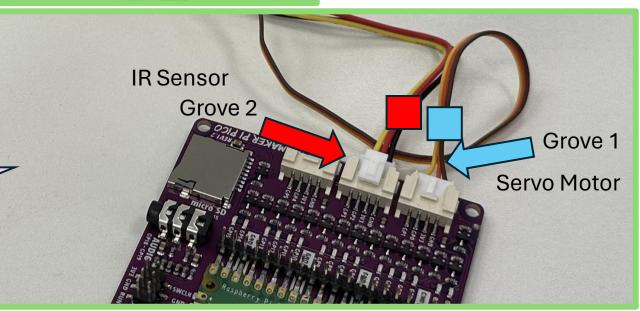
#### Plug the

 Servo Motor, with red tape, into Grove 1

• IR Sensor, with blue tape, into Grove 2

The numbers for the Grove Connectors are written on the edge of the board.







# Test Hardware with Software



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# Piper Make Website

9. Go to the following website:

https://make.playpiper.com/

10. Click onCreative Mode



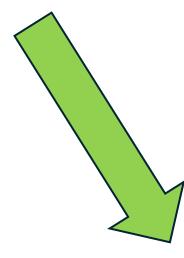
11. Click onNew Project

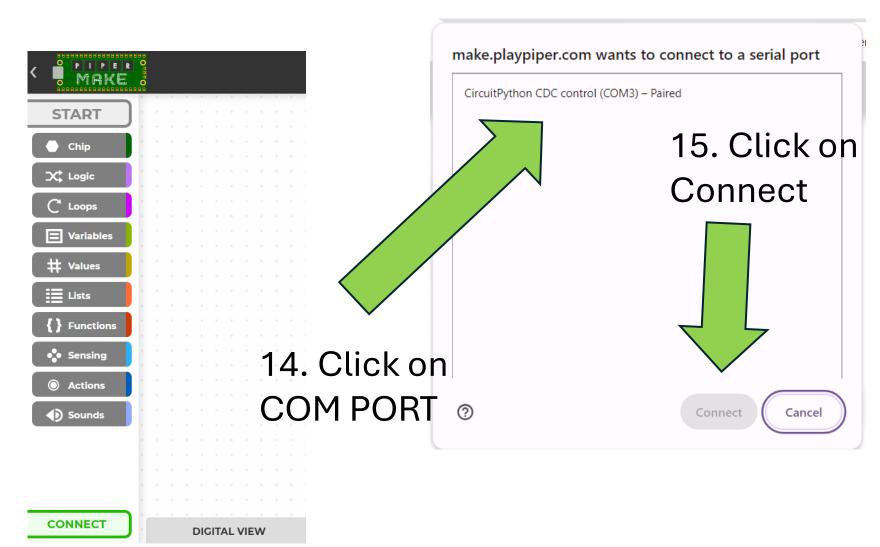


12. Click on the square on the right

#### **Connect Your Board**

13. Click on Connect



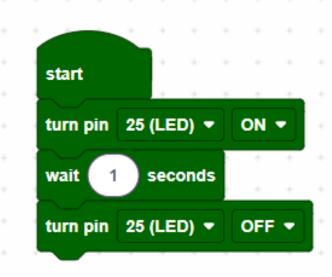


#### 16. Test Board – Blink an LED

- Create this program with block code.
- Hint: You can find the instructions in the Green Chip Section
- Click on Start to Run your Program

START

 Does the LED on the Pico turn in and off?



#### 17. Test Servo – Move Up and Down

- Add extra instructions as shown
- Hint: You can find extra instructions in the Blue Actions Section
- Click on Start to Run your Program
- Does the scooper move up and down?



#### 18. Test IR Sensor

- Add extra instructions inside a loop that runs forever as shown opposite.
- Hint: You can find extra instructions in the Logic and Loops Sections



- Change the seconds in the loop to 1.
- Click on Start to Run your Program
- Click on Console to see the printing.
- Put a block in front of the detector.
- Does it work as expected?



```
turn pin 25 (LED) ▼
          seconds
turn pin 25 (LED) ▼
servo pin 1 ▼ set angle to 180
          seconds
servo pin 1 ▼ set angle to
          seconds
servo pin 1 ▼ set angle to 180
          seconds
repeat forever
          is pin 2 ▼ HIGH ▼
               Food is here!
               I am hungry
```

Use the blue tack to adjust the IR sensor so that it is pointing slightly up if it is constantly being triggered.



# **Your Challenges**



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#### Challenges

1.

I would like the robot to eat blocks I place on the scooper so it looks like I am feeding the robot. 2

I would like the robot to use sounds demonstrating when it is eating and full so that it is more interactive and good for my blind friend.

3.

I would like the robot to greet me when it is turned on so I can connect emotionally with my robot. 4.

I would like the robot to tell me how many blocks it has eaten.

5.

I would like the robot to play some music when I press the button on the board.

6.

I would like the robot to stop eating when it is full (maybe 5 blocks) so that its like a real person. 7

I would like to open the robot head by pressing a button on the board to empty the robot easily.

8.

I would like the robot to.....

# Asking for User Input

 Create variables called human and robot to hold the name of the robot and human



- 2. Add the code opposite at the start of the program
- 3. View the printing in the console.

```
set human ▼ to ask " What is your name "

set robot ▼ to ask " What would you like to call me "

print robot ▼

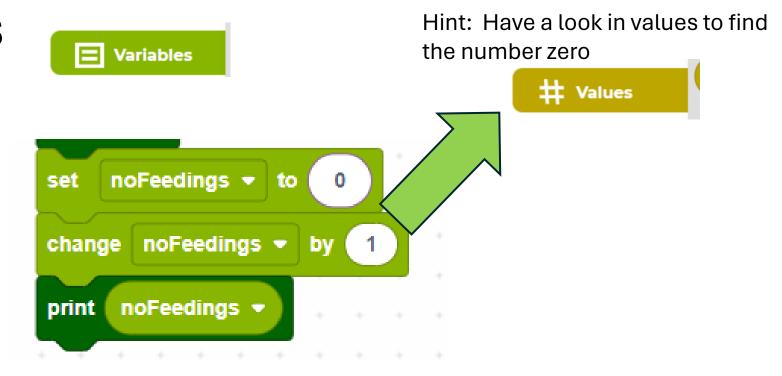
print " loves "

print human ▼

print " Can you feed me please? "
```

# Using Variables

- Create a variable called noFeedings
- Add the following code to test it out?
- Can you use this to count the number of feedings?



#### How to use the GP22 button

Some example code is provided to show how in the forever loop we are constantly Checking if the button is pressed.

If we press the button can you add some sounds?

```
repeat forever

do if is pin 22 

LOW when pulled UP 

do print 

Button GP22 is pressed 

wait 0.5 seconds
```

# Some code snippets

```
is pin 22 ▼ LOW when pulled UP ▼
                                                                                                                                                      play sound
                                                           1 to amlhungry?
                                                                                                                                                            " Ah, Food is served!
                                                                        hungry? ▼ to
                        electro Flight C ▼
                               without new line
                      Empty me carefully, please!
                                                                                                                                                  That was so yummy, Thank you so much
🟮 7 to greetings
                                                              😢 😯 to eat
       " Can you feed me please?
                                                                                                                                                  I am absolutely stuffed. I can't eat another bit..
                                                                                                          servo pin 1 ▼ set angle to 180
```

```
repeat forever
                      instrument piano ▼
                              duration eighth 🎝 🔻
```

```
create text with " 1 am now
```

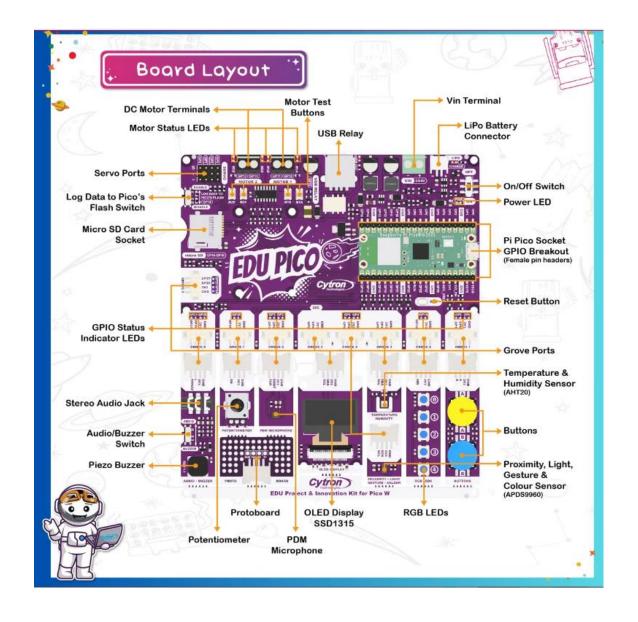


Extras

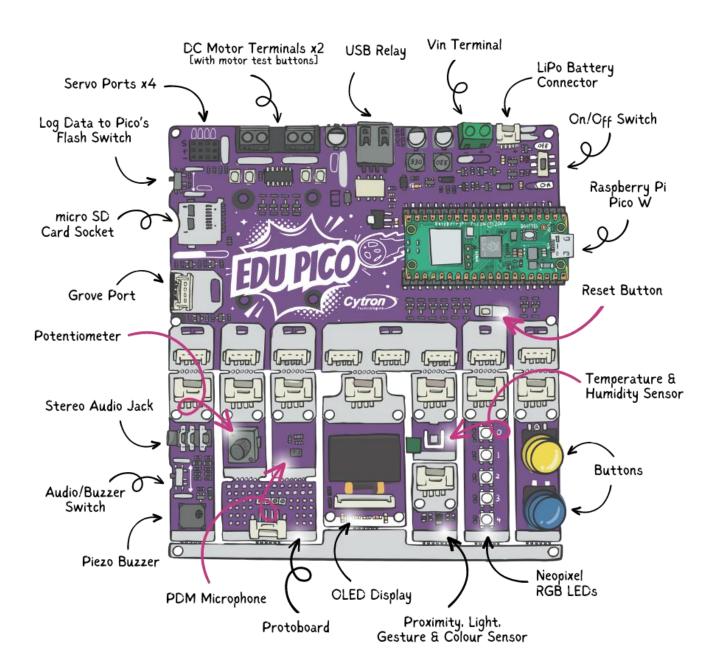


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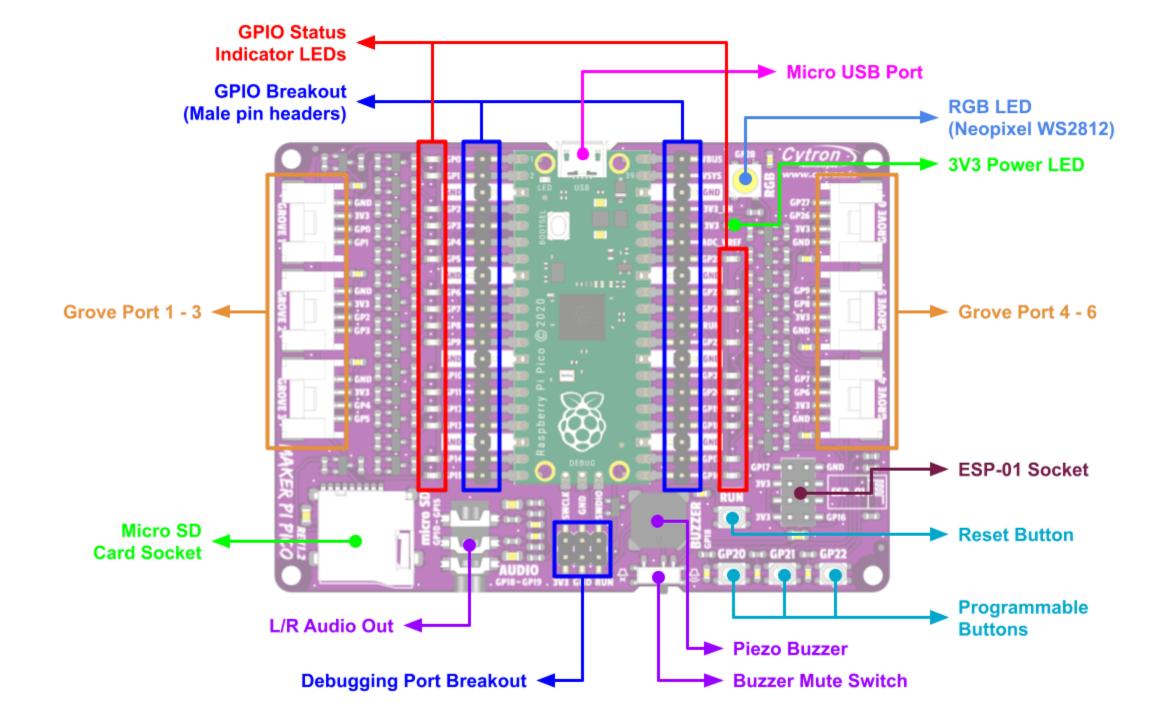
#### Edu Pico Board



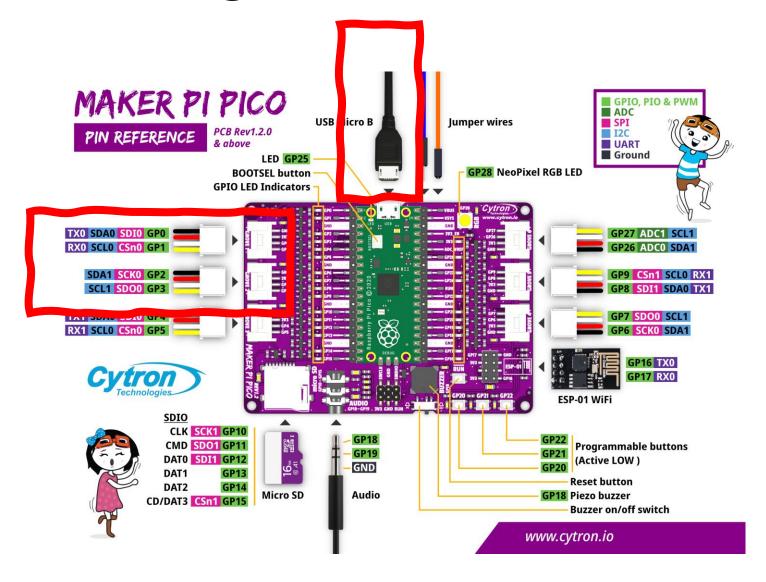








## What we are using.



## Link to Make Piper Large Project

```
https://make.playpiper.com/zmilcode=H4slADYCWVAA-1c_3fiNhL_PX-Eqnt23byX/JV/TCVc_WillowCostation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_Costation_
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