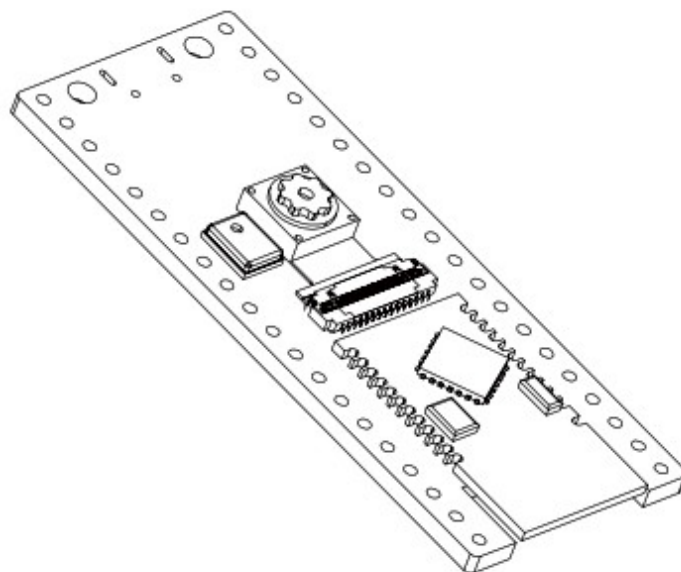


# ArduCam B0330 Pico4ML-BLE TinyML Dev Kit Instruction Manual

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# Arducam

**Pico4ML-BLE TinyML Dev Kit**  
**RP2040 Board w/ QVGA Camera, Bluetooth Module, LCD**  
**Screen, Audio, Reset Button & More**  
**SKU: B0330**  
**Instruction Manual**



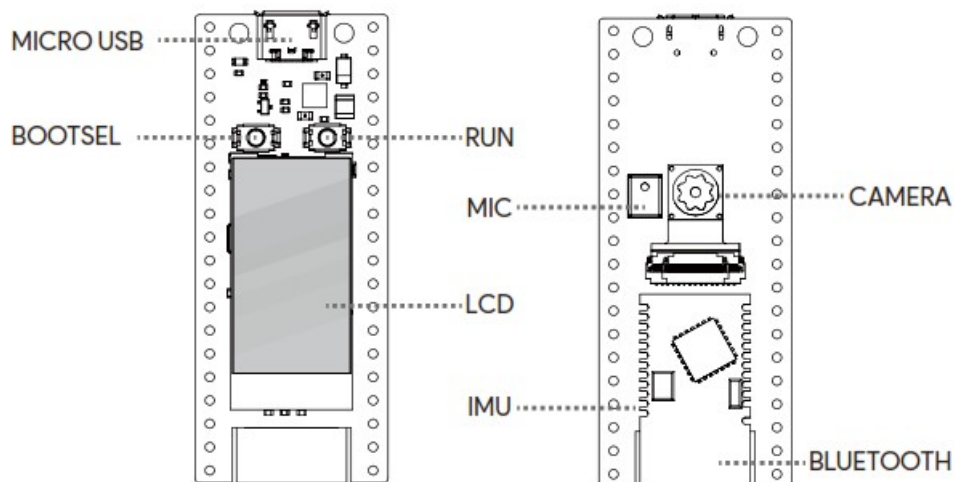
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## Introduction

Arducam Pico4ML-BLE increases the BLE module based on Pico4ML, which has been integrated with the RP2040 microcontroller, IMU, and display. This upgrade makes it to be a machine learning kit with the function of Bluetooth communication. We've included 3 pre-trained TensorFlow Lite Micro examples, including Person Detection, Magic Wand, and Wake-Word Detection. You can also build, train and deploy your models on it.

## Specs



1	Microcontroller	Raspberry Pi RP2040
2	IMU	ICM-20948
3	Camera Module	HiMax HMO1 B0, Up to QVGA (320 x 240@60fps)
4	Bluetooth Module	BT5.0
5	Screen	0.96inch LCD SPI Display (160 x 80, ST7735)
6	Operating Voltage	3.3V
7	Input Voltage	VBUS: 5V+/-10%. VSYS Max: 5.5V
8	Dimension	51×21 mm

## Quick Start

We've provided some pre-built binaries that you can just drag and drop onto your Pico4ML-BLE to make sure everything is working even before you start writing your code.

## Pre-trained Models

**Wake-word detection** A demo where Pico4ML-BLE provides always-on wake-word detection on whether someone is saying yes or no, using its onboard microphone and pre-trained speech detection model.

### **Magic Wand (Gesture Detection)**

A demo where Pico4ML-BLE casts several types of spells in one of the following three gestures: "Wing", "Ring" and "Slope", using its IMU and pre-trained gesture detection model.

### **Person Detection**

A demo where Pico4ML-BLE predicts the probabilities of the presence of a person with a Himax HM01B0 camera module.

## First Use

Go to the <https://github.com/ArduCAM/pico-tflmicro/tree/main/bin> page, then you will find the .uf2 files for the 3 pre-trained models.

### Wake-word Detection

1. Click on the corresponding uf2. file "micro\_speech.uf2"
2. Click on the "Download" button. This file will be downloaded to your computer.
3. Go grab your Raspberry Pi or laptop, then press and hold the BOOTSEL button on your Pico4ML-BLE while you plug the other end of the micro USB cable into the board.
4. Release the button after the board is plugged in. A disk volume called RPI-RP2 should pop up on your desktop.
5. Double-click to open it, and then drag and drop the UF2 file into it. The volume will automatically unmount and the screen should light up.
6. Hold your Pico4ML-BLE closer and say "yes" or "no". The screen will display the corresponding word.

### Magic Wand (Gesture Detection)

1. Click on the corresponding uf2. file "pico4ml\_ble\_magic\_wand.uf2"
2. Repeat the second to fifth steps mentioned in "Wake-word Detection Using" to light up the screen with the .uf2 file for magic wand.
3. Wave your Pico4ML-BLE quickly in a W (wing), O (ring), or L (slope) shape. The screen will display the corresponding mark.

### Person Detection

1. Click on the corresponding uf2. file "person\_detection\_int8.uf2"
2. Repeat the second to fifth steps mentioned in "Wake-word Detection Using" to light up the screen with the .uf2 file for person detection.
3. Hold your Pico4ML-BLE to capture images. The screen will display the image and the probabilities of the presence of a person.

## What's Next

## Build a Magic Wand with Edge Impulse

The increased Bluetooth help to implement wireless data collection, training, and model update by designing a web client based on WebBLE. The collected data is converted to a format that can be read by Edge Impulse through our conversion script, and then the transfer learning of the model is carried out. Please refer to the Doc page to build your custom wand project: <https://www.arducam.com/docs/pico/arducam-pico4mltinymldevkit/how-to-build-a-magic-wand-with-edge-impulse-on-arducam-pico4ml-ble/#26-gesture-recording>

## Build models on your own

If you are developing your own models on Pico4ML-BLE with the Raspberry Pi 4B or Raspberry Pi 400, you can refer to: <https://github.com/ArduCAM/pico-tflmicro>

Source file for the 3d-printable enclosure If you've got a 3d printer, you can print your own enclosure for Pico4ML-BLE with the source file in the link below: <https://www.arducam.com/downloads/UC-798-Pico4ML-BLE-CASE.zip>

## Contact Us

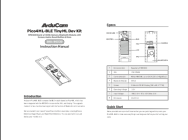
Email: [support@arducam.com](mailto:support@arducam.com)

Website: [www.arducam.com](http://www.arducam.com)






Skype: arducam

Doc: [arducam.com/docs/pico/](https://www.arducam.com/docs/pico/)

## Documents / Resources

	<a href="#">ArduCam B0330 Pico4ML-BLE TinyML Dev Kit</a> [pdf] Instruction Manual B0330, Pico4ML-BLE TinyML Dev Kit, B0330 Pico4ML-BLE TinyML Dev Kit
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## References

-  [Raspberry Pi Pico - Arducam](#)
-  [Simplifying embedded vision for all. - Arducam](#)
-  [GitHub - ArduCAM/pico-tflmicro: Pico TensorFlow Lite Port](#)
-  [pico-tflmicro/bin at main · ArduCAM/pico-tflmicro · GitHub](#)
-  [Arducam Pico4ML TinyML Dev Kit - Arducam](#)