ESP32 Rainbow

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# Overview

The ESP32 Rainbow is imported as a bare board with no functionality. All value is added in the United Kingdom during the assembly process, firmware flashing, and Quality Assurance testing.

# Short Description

ESP32 Rainbow – a single board computer featuring an integrated keyboard, screen, speaker and SD Card slot. Emulates the Sinclair the ZX Spectrum 48K and 128K computers.

# BOM

|  |  |  |
| --- | --- | --- |
| **Component** | **Location** | **Cost (USD)** |
| Bare PCB | CN | $16.58 (per unit) |
| Screen and Speaker Assembly | UK | 16 hours ~ $320 $1.36 (per unit) |
| Quality Assurance | UK | 16 hours ~ $320 $1.36 (per unit) |
| Firmware development | UK | 200 hours ~ $20,000  Amortized over 1000 units: $20 per unit |
| Tool development | UK | 160 hours ~ $16,000  Amortized over 1000 units: $16 per unit |
| **Per unit cost** |  | **$55.30** |
| **%Value added in UK** |  | **70%** |

# Firmware and Supporting Tool Development

The firmware for the ESP32 Rainbow has been developed exclusively in the United Kingdom over a period of 14 months with an estimated 280-man hours. The cost to implement this would be approximately $28,000 (USD) for a contract firmware developer.

A white paper with lines

AI-generated content may be incorrect.

The supporting website and tooling has been developed over a period of 8 months with an estimated 160-man hours. The cost to implement this would be approximately $16,000 (USD) for a contract developer.

A white line on a white surface

AI-generated content may be incorrect.

# Assembly process

A black keyboard with colorful keys

AI-generated content may be incorrect.

The ESP32 Rainbow comes as bare PCB with no screen, speaker or firmware. All functionality to make the board a working system is added in the UK

## Display assembly

The screen is connected to the ribbon connector CN2.A close up of a circuit board

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Open the connector using a sharp tool or fingernail.A close up of a circuit board

AI-generated content may be incorrect.

Offer up the display cable and push it firmly into the connector housing.

A close up of a circuit board

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The display is attached to the board using a small square of 0.5mm double sided foam tape.

A black electronic device with a white square and a yellow ribbon

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Ensure the ribbon cable is carefully folded under the display and firmly press it into position using the double sided tape to secure it.

A screen on a device

AI-generated content may be incorrect.

## Speaker assembly

Sound is provided by a small 2.5W speaker.

A black electronic device with a black and red wire

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Carefully remove the backing paper from the back of the speaker to reveal the adhesive backing.

A black electronic board with wires and a white rectangular object

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Position the speaker on the PCB and press it down to attach. Connect the speaker cable to CN3.

A black electronic board with wires

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The fully assembled PCB A black keyboard with a black screen

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# Firmware

Connect the system to the USB port of a PC. Ensure the power lights are lit. If the power lights do not light follow the troubleshooting guide.

A close up of a circuit board

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Navigate to the ESP32 Rainbow website.A computer screen shot of a computer

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And proceed to the firmware flashing tool.

A screenshot of a computer

AI-generated content may be incorrect.

Click the “Connect and upload” button and then choose the “USB JTAG/Serial Debugging” device. If the device is not present consult the troubleshooting guide.

A screenshot of a computer

AI-generated content may be incorrect.

One the firmware has been successfully uploaded the device should reboot and the software will be installed. If the software does not start consult the troubleshooting guide.

A keyboard with a small screen

AI-generated content may be incorrect.

# Quality Assurance

Navigate to the “About” screen and confirm the correct version number is shown.A black electronic device with a black screen

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Press “T” to enter test mode.

A hand on a keyboard

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Insert an SD Card and verify that it mounts correctly. Press every key on the keyboard to ensure it is fully functional.

A hand pressing a keyboard

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