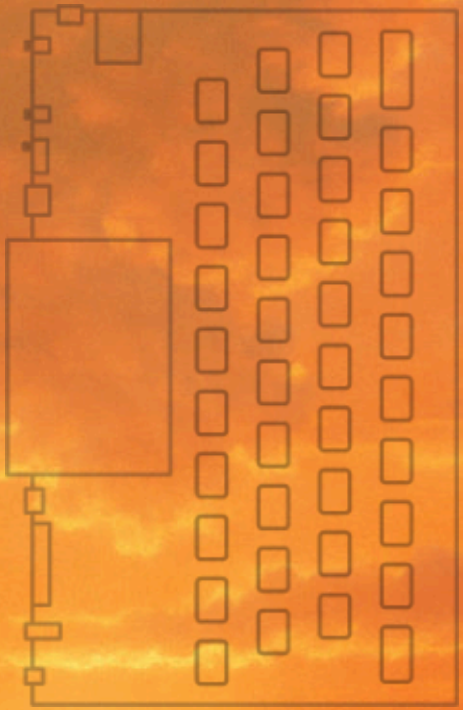
atomic14

ESP32 RAINBOW



QUICK START

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🛠️ Quick Start Guide

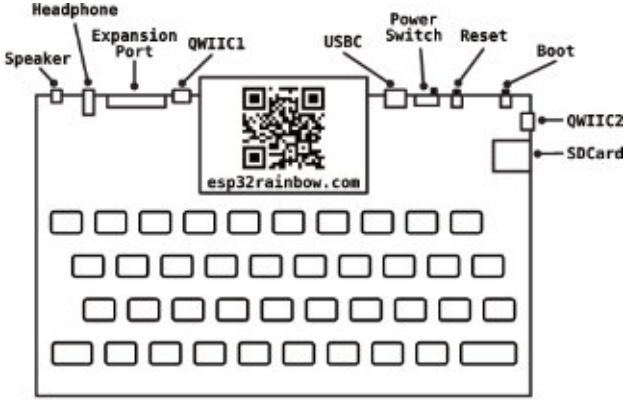
Model: **ESP-RAINBOW-01**
Power: **5V USB-C (cable not included)**
Manufacturer: **atomic14 (CMG Research Ltd)**
Website: **https://esp32rainbow.com**

📦 What's in the box?

- ESP32 Rainbow with TFT display and built-in speaker.
- Printed manual (you are reading this now).

🖥️ System overview

The ESP32 Rainbow is powered by an ESP32S3 microcontroller with 8MB of flash memory and 8MB of PSRAM.



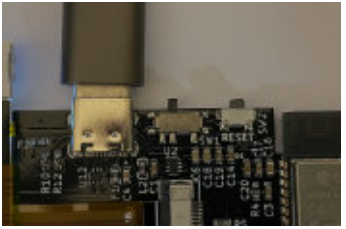
Audio output is provided by a 2W 8Ω speaker. Video output is provided by a TFT display (320x240 pixels, 16 bits per pixel).

Additional storage can be provided by an optional microSD card (not included).

🔌 Powering the device

Connect a USB-C cable to the device. Use a 5V USB power adapter rated at 1A or higher.

To power on, slide the switch to the left after connecting the USB cable.

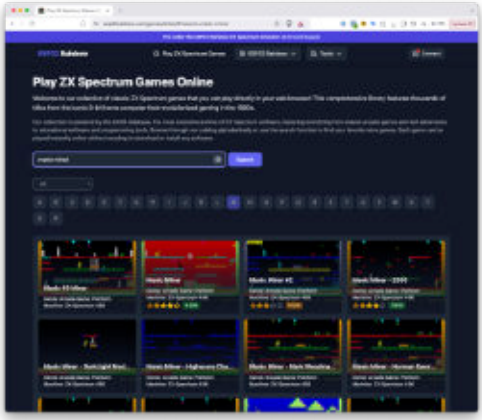


There are two indicator LEDs on the device: D3 indicates 5V power is available from the USB-C port. D2 indicates that the 3V3 power supply is active.

🎮 Loading games

You can load and play thousands of classic games on the ESP32 Rainbow.

The easiest way is to use the ESP32 Rainbow website, where you can browse a large library of games and send them directly to your device over USB.



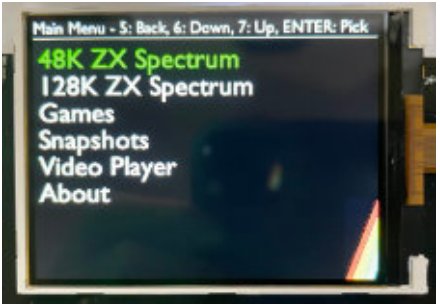
If you already have your own collection of games, you can use the website's file browser tool to transfer them to the device, or simply copy them onto a microSD card and insert it into the device.

The ESP32 Rainbow can use the common game formats: TAP, TZX, Z80 and SNA.

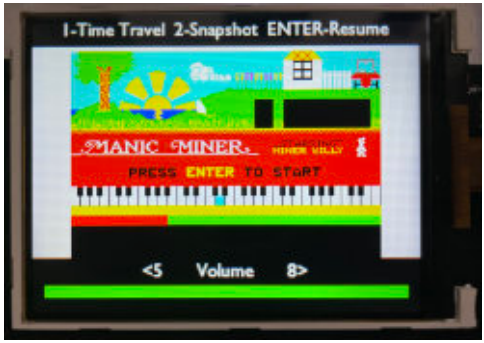
For optimal game loading performance, we recommend converting TAP and TZX files to Z80 format using the utility provided on the ESP32 Rainbow website.

🕹️ Using the device

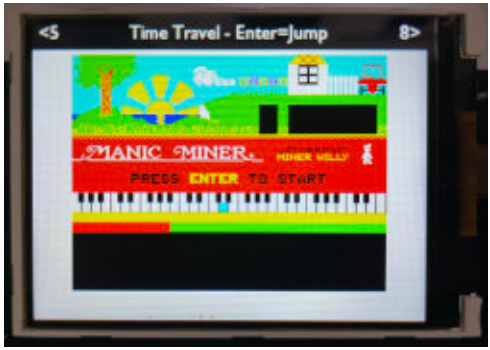
The main menu is controlled by the Spectrum cursor keys – “5”(⬅), “6”(⬇) and “7”(⬆). “6” and “7” are used to move up and down, “ENTER” to pick the menu option, and “5” to go back up the menu hierarchy.



During gameplay, you can push the “BOOT” button to enter a special mode.

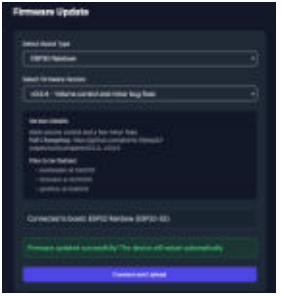


In this mode, you can change the volume using the “5” and “8” keys. Or you can take a snapshot by pressing “2”. You can also activate time travel mode by pressing “1”.



In time travel mode, you can use the “5” and “8” keys to step forward and backward in time by 1 second increments. “ENTER” will resume play.

Upgrading the firmware



To upgrade the firmware, you can use the firmware page on the ESP32 Rainbow website. This will allow you to flash new firmware to the device.

You can also download the src code and use PlatformIO.

Optional SD card

The ESP32 Rainbow can use an optional microSD card for storage. The microSD card should be formatted as FAT32.

Use a high-quality microSD card for best results and reliability. If the card is not detected, try a different card.

We recommend cards with the following markings from reputable manufacturers such as SanDisk.

These speed classes are not required for the ESP32 Rainbow, but they are a good indication of the quality of the card.

😐 Troubleshooting

🖥️ No display?

Check the power indicator LEDs. Both D3 and D2 should be lit.

D3 not lit? Check the USB-C power supply.

D2 not lit? Check that your power supply is providing 5V and has sufficient current.

D3 and D2 are lit: make sure the display ribbon cable is properly seated in the socket on the PCB.

💾 SD card not detected?

Check the card is properly inserted and formatted as FAT32. Make sure the card is high quality. Be aware that there are many counterfeit SD cards on the market.

😴 Unresponsive keyboard?

The keyboard is a capacitive touch keyboard. When the device is booted, the software runs through a calibration process to detect a baseline capacitance for each key. Make sure you are not touching the keys while the device is booting.

If the problem persists, try pressing the reset button or try power-cycling the device.

Make sure the keyboard is clean and free from dust and moisture.

💥 Game not working?

We've done our best to try and make sure most games work – but this is not a real ZX Spectrum. There will be incompatibilities. If you find a problem, try a different version of the game. Test the game in different emulators and then open an issue on the project's GitHub repository.

!? Still need help?

Still need help? Head over to the ESP32 Rainbow website. If you can't find the answers you need, then you can contact us via a GitHub issue or the website.

🤖 Software and Licence

All the code for the firmware and the design files for the PCBs are completely open source and licensed under the GNU General Public License v3.0. This program is distributed WITHOUT ANY WARRANTY; see the licence for details*.

https://github.com/atomic14/esp32-zxspectrum

https://github.com/atomic14/esp32-zxspectrum-hardware

"ZX Spectrum" is a trademark of Amstrad/Sky; used for descriptive purposes only.

***https://www.gnu.org/licenses/gpl-3.0.en.html**

♻️ Disposal & Recycling

Do not dispose of this product with household waste.

This device must be taken to an appropriate electronic waste collection facility in accordance with your local regulations.

RoHS Compliance: This product complies with the RoHS Directive 2011/65/EU, as amended by Directive 2015/863.

It contains no hazardous substances above permitted levels.

✅ CE EMC Declaration

Directive: 2014/30/EU (Electromagnetic Compatibility Directive)

UK Regulations: Electromagnetic Compatibility Regulations 2016.

CE and UKCA marks are shown on the back page of this manual.

Harmonised Standards Applied:

•EN 55032:2015 + A11:2020 (Emissions)
•EN 55035:2017 + A11:2020 (Immunity)

A full Declaration of Conformity is available online: https://esp32rainbow.com/compliance

⚠ Safety Information

EN English

•This is not a toy.
•Intended for hobbyists, students, and adult users interested in electronics.
•Not suitable for children under 8 years of age.
•Contains small parts and exposed electronic components.
•Supervise children during use.
•Do not allow the device to be mouthed, chewed, or exposed to moisture.
•Use only a 5V USB power supply rated at 1A or more.
•Operate in a dry, well-ventilated environment.
•Disconnect power before handling the circuit board or inserting/removing SD cards.

FR Français

•Ceci n'est pas un jouet.
•Destiné aux passionnés, étudiants et utilisateurs adultes intéressés par l'électronique.
•Ne convient pas aux enfants de moins de 8 ans.
•Contient de petites pièces et des composants électroniques exposés.
•La surveillance d'un adulte est recommandée.
•Ne pas mettre dans la bouche, mâcher ou exposer à l'humidité.
•Utilisez uniquement une alimentation USB 5V avec un courant d'au moins 1A.
•Utiliser dans un environnement sec et bien ventilé.
•Débranchez l'alimentation avant de manipuler la carte ou d'insérer/retirer une carte SD.

DE Deutsch

•Dies ist kein Spielzeug.
•Entwickelt für Hobbyanwender, Schüler und Erwachsene, die sich für Elektronik interessieren.
•Nicht geeignet für Kinder unter 8 Jahren.
•Enthält Kleinteile und freiliegende elektronische Komponenten.
•Die Aufsicht durch Erwachsene wird empfohlen.
•Nicht in den Mund nehmen, darauf kauen oder Feuchtigkeit aussetzen.
•Verwenden Sie nur ein 5V USB-Netzteil mit mindestens 1A Ausgangsstrom.
•Verwenden Sie das Gerät in einer trockenen, gut belüfteten Umgebung.
•Trennen Sie die Stromversorgung, bevor Sie die Platine anfassen oder SD-Karten einsetzen/entfernen.

IT Italiano

•Questo dispositivo non è un giocattolo.
•Destinato a hobbisti, studenti e adulti interessati all'elettronica.
•Non adatto a bambini di età inferiore agli 8 anni.
•Contiene piccoli componenti e parti elettroniche esposte.
•Si raccomanda la supervisione di un adulto.
•Non mettere in bocca, masticare o esporre all'umidità.
•Utilizzare solo un alimentatore USB da 5V con almeno 1A di corrente.
•Usare in ambienti asciutti e ben ventilati.
•Scollegare l’alimentazione prima di maneggiare la scheda o inserire/rimuovere la scheda SD.

ES Español

•Este dispositivo no es un juguete.
•Diseñado para aficionados, estudiantes y adultos interesados en la electrónica.
•No apto para niños menores de 8 años.
•Contiene piezas pequeñas y componentes electrónicos expuestos.
•Se recomienda la supervisión de un adulto.
•No meter en la boca, masticar ni exponer a la humedad.
•Utilice solo una fuente de alimentación USB de 5V con al menos 1A de corriente.
•Utilícelo en un entorno seco y bien ventilado.
•Desconecte la alimentación antes de manipular la placa o insertar/quitar la tarjeta SD.

NL Nederlands

•Dit apparaat is geen speelgoed.
•Bedoeld voor hobbyisten, studenten en volwassenen met interesse in elektronica.
•Niet geschikt voor kinderen jonger dan 8 jaar.
•Bevat kleine onderdelen en blootliggende elektronische componenten.
•Toezicht door een volwassene wordt aanbevolen.
•Niet in de mond steken, op kauwen of blootstellen aan vocht.
•Gebruik alleen een 5V USB-voeding met minimaal 1A stroom.
•Alleen gebruiken in een droge, goed geventileerde omgeving.
•Koppel de voeding los voordat u de printplaat aanraakt of SD-kaarten plaatst/verwijdert.

PL Polski

•To nie jest zabawka.
•Przeznaczone dla hobbystów, uczniów i dorosłych zainteresowanych elektroniką.
•Nieodpowiednie dla dzieci poniżej 8 roku życia.
•Zawiera małe części i odsłonięte komponenty elektroniczne.
•Zalecany nadzór osoby dorosłej.
•Nie wkładać do ust, nie żuć ani nie narażać na wilgoć.
•Używaj wyłącznie zasilacza USB 5V o wydajności prądowej co najmniej 1A.
•Używać w suchym i dobrze wentylowanym pomieszczeniu.
•Odłącz zasilanie przed dotknięciem płytki lub wkładaniem/wyjmowaniem karty.

Warranty & Returns

30 days from delivery – For any return (defect, damage, or change-of-mind) request an RMA at **crowdsupply.com/returns**. Crowd Supply and their logistics partner Mouser Electronics will handle the shipment.

24-month manufacturer warranty – Your ESP32 Rainbow is warranted by CMG Research Ltd (atomic14) to be free from defects in materials and workmanship for 24 months from the date you receive it.

Remedy – At our option we will repair, replace, or refund the unit. You pay return shipping to Mouser; we pay shipping back to you.

Exclusions – Misuse, modification, liquid damage, or use outside of specifications voids the warranty.

Statutory rights – This commercial warranty is in addition to your two-year legal guarantee under EU and UK consumer law.

Limitation of liability – To the fullest extent permitted, CMG Research Ltd is not liable for indirect or consequential losses; liability is limited to the purchase price.