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ESP32 Cam for Prusa Connect



STEP 1 Introduction



In this guide, we will get **ESP32 Cam** running and connected to Prusa Connect.



 \triangle This guide is intended for experienced users.

This guide is suitable for Windows computer users only! If you use another operating system, please refer to the detailed guide.

- (i) For general information about Prusa remote-control services, visit the Prusa Connect and PrusaLink explained article.
- (i) Firmware for the **ESP32 Cam** has been developed **by Miroslav Pivovarsky**. There are several manufacturers of the ESP32 Cam hardware, which can be easily purchased from various online retail platforms.

The ESP32 Cam connects over a 2.4GHz Wi-Fi network.

STEP 2 Hardware Compatibility

- We managed to identify two versions of the ESP32 Cam that are available on the market.
- The main, easily noticeable difference is the number of resistors on the front of the PCB.
 - Version 1, with six resistors on the front, which we will use in this guide, supports programming via the CH340 USB-to-Serial converter.
 - Version 2, which has four resistors on the front, should be programmed using FT232RL or CP2102 converters. If you're using this version, please refer to the detailed guide.
- If you are **buying a new ESP32 Cam**, make sure you are getting the exact same version as the **Version 1** in the picture.
- We recommend buying it as a whole set together with the USB Bridge consisting of the CH340 USB to serial controller and a voltage stabilizer. Otherwise, the parts might not be compatible.

STEP 3 Hardware parts preparation

- For the following steps, please prepare:
- ESP32-Cam
 - With a compatible USB Bridge module
 - Several camera modules are available, offering various focal lengths for different viewing angles.
- A compatible USB cable. In this case, it is a **Micro USB to USB-A**.
 - (i) Make sure you are using a cable that provides a data connection. Some cables are designed for charging only and wouldn't do the job in this case.
- A compatible **USB power supply** capable of providing at least **2A current**.

STEP 4 Cam Hardware assembly

- Take the main ESP32 Cam module and attach it onto the USB shield.
- Open the camera connector safety latch by lifting it up.
- **Connect the camera module** connector into the ESP32 Cam and close down the safety latch to secure the cable in place.
- 🗥 Handle the electronics boards by its sides only to prevent an ESD damage.
- (i) We recommend printing a protective cover for the camera module.

STEP 5 Installing drivers

- Now, let's start with the **software** part.
- We will need to install CH340 USB-to-Serial converter drivers.
- Download and install the CH341SER.EXE driver from: http://www.wch-ic.com/search?q= CH340&t=downloads
 - In case the drivers linked above do not work, try using an older version.

STEP 6 Connecting the Cam to computer

- Now, we have to check if your computer detects the camera module properly.
- Using the compatible USB cable, connect the ESP32 Cam into your computer.
- Open up **Device Manager** (press Windows key + X, then press **m**)
- Navigate to the **Ports (COM & LPT)** section.
 - The Cam should appear as USB-SERIAL CH340 and a corresponding COM port number for it.
 - Note down the COM port number. In our case, it is COM12. We will need to know the number later on.
 - 🗥 Note that the number might differ in your case!

STEP 7 Downloading the firmware files

- Download the ESP32 Prusa Connect Cam firmware files
 - Find the latest release in the GitHub repository.
 - Download all the .bin firmware image files from the Assets column.
 - (i) We will need these image files in the upcoming steps.

STEP 8 Downloading the Flashing tool

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- Download the EXPRESSIF ESP32 Flash Download Tools
 - https://www.espressif.com/en/support/download/other-tools
- Extract the whole zip file.
- Run the **flash_download_tool_x**.x.x.exe
 - (\mathbf{i}) If you encounter issues, try running the app as an administrator.

STEP 9 Opening the flashing tool

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- On the first screen:
 - Set ChipType: as ESP32
 - Set WorkMode: as Develop
 - Hit OK to continue

STEP 10 Flashing tool Setup (part 1)

- Tick the first checkbox. The first line will become red temporarily.
 - Click the three dots button and select the following file from the firmware images we have downloaded earlier:
 - ESP32_PrusaConnectCam_web.ino.bootloader.bin
 - At the end of the line, set the address to:
 - 0x1000
- Proceed to the second line. Tick the checkbox, set the firmware image and an address to:
 - ESP32_PrusaConnectCam_web.ino.partitions.bin
 - 0x8000
- Proceed to the third line. Tick the checkbox, set the firmware image and an address to:
 - ESP32_PrusaConnectCam_web.ino.bin
 - 0x10000

STEP 11 Flashing tool Setup (part 2)

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- Set the SPI SPEED to: 80MHz
- Set the SPI MODE to: DIO
- Leave the DoNotChgBin option checked.
- Set the **COM**: port to the corresponding Com port number for your camera.
- Set the BAUD: rate to 460800.

Verify once more, that everything has been set correctly, as seen in the pictures.

STEP 12 Erasing and Flashing

- First, we will have to clear the Cam's memory.
 - Click the ERASE button.
 - A finished operation will be indicated by the FINISH完成 FINISH sign.
- Now, we can flash the firmware files into the Cam.
 - Click the **START** button.
 - Now, the flashing will begin. Do not touch, move or click anything while the process goes on. Wait until it finishes up! Otherwise, you can damage the camera module!
 - After the **FINISH**完成 **FINISH** sign appears again. Now, you can disconnect the camera from the computer.

STEP 13 Prusa Connect camera setup

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- Now, we will have to set up the camera in Prusa Connect.
 - Open up the Prusa Connect webpage (connect.prusa3D.com)
 - Log in.
 - Select a printer you wish to use the camera for.
 - Navigate to the **Camera** tab.
 - Click Add new other camera
 - A new camera will appear in the list. Here, you can give the camera a name.
- This is the most important part: Copy the TOKEN for the given camera and save it for later use.

STEP 14 Cam Hardware setup

- Now, we have to set up the Cam itself.
- Connect the Cam to the USB Power supply.
- Install the camera next to the printer, where you wish to use it.
 - (i) We recommend using it in a well-ventilated space as the camera's electronics might emit heat and might require a sufficient airflow for its cooling.
 - When placing the camera into a printed cover, make sure the cover allows for some **camera cooling** so that it doesn't overheat over time.
- A red LED light will light up on the camera module.

STEP 15 Connecting to Cam Wi-Fi

No Internet		No Internet
ESP32_camera_42.7.28 Connecting Enter the network security key	7	ESP32_camera_42.7.28 No Internet, secured Properties
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e Falcon		e Prusa Research Guest
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- After a brief moment, the camera will start in a **Wi-Fi AP mode**. Essentially, it starts it's own Wi-Fi network.
- Find the camera in the Wi-Fi list on your computer.
- Enter the default password: **12345678** and connect to it.
 - After establishing a successful connection, your computer might complain about having "No Internet" on the given network. That is OK.
 - (i) When copy-pasting the password, ensure there are no additional characters, such as a space, included.

STEP 16 Cam Software: Token setup

- Open up a new web browser window.
 - Open up the **192.168.0.1** IP Address as a webpage.
 - Alternatively, you can also use the http://prusa-esp32cam.local hostname (mDNS) instead of the IP Address.
 - (i) If you're experiencing difficulties viewing the webpage on a specific device, such as an iPhone, consider trying a different platform.
- The camera's configuration interface should appear.
- In the Camera configuration tab, insert the **Token** into the marked field. Click **Save**.
 - This is the **Prusa Connect camera token** we have obtained in an earlier step.
 - Wait until the token has been saved successfully.

STEP 17 Cam Software: Cam config

- Since we're in the camera configuration tab already, we can set up the image options:
- Set up the **frame size** (resolution).
 - (i) This will improve the image quality significantly, as the resolution is set to the lowest possible by default.

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If you have connectivity issues due to bad Wi-Fi signal, decreasing the image quality and resolution might help.

- Set up the **refresh interval** and click Save.
- Clicking **Capture snapshot** will refresh the image you see on the page.
- Click Download snapshot to view the image in full scale.

(i) The third image is an original example snapshot captured by the ESP32Cam with a 170° wide-angle lens.

STEP 18 Cam software: Wi-Fi config

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- Head into the Wi-Fi configuration tab.
- Select Scan Wi-Fi networks.
 - A list of networks will appear. Make sure the network you intend to connect to is listed and has a strong signal.
- Enter the SSID (network name) and password for the chosen network into the dedicated fields, then click 'Save & Connect'.
- After entering the Wi-Fi credentials, click 'Reboot' in the top right corner to restart the camera. Shortly after, it should connect to the specified Wi-Fi network.

STEP 19 Cam software: Optional items

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- We should now have completed setting up the camera.
- While we are on the ESP camera's configuration page, let's take a quick look at the other options it offers.
 - On the Authentication tab, you can set a password to access the configuration page.
 - The **System** tab provides several advanced options such as:
 - Setting a **Hostname** (mDNS record) for easier future access to the configuration page over the local network.
 - For a manual firmware update, select the firmware file (ESP32_PrusaConnectCam_web.ino.bin) and click 'Upload file & Update.' Afterwards, reboot the camera.
 - Update from cloud. To check for firmware updates, select 'Check Update from cloud.' If a newer version is available, click 'Update from cloud'. Note that the camera has to be connected to the Internet, before using these functions.

STEP 20 Cam in Prusa Connect

- Disconnect your computer from the ESP32 Cam Wi-Fi network and reconnect it to your usual network.
- Head back to **Prusa Connect** site.
- After a short wait, the camera image will be displayed in Connect. You can find it under the 'Camera' tab, within the printer details, and also on the printers list pages.

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