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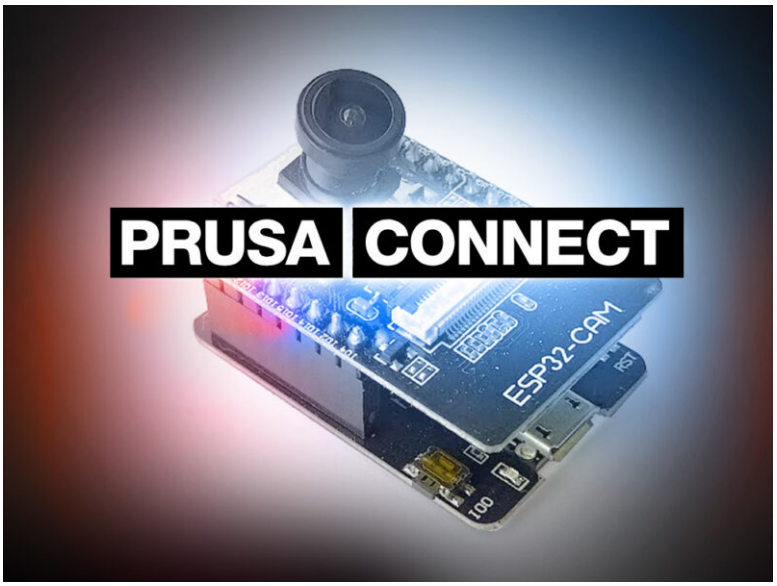
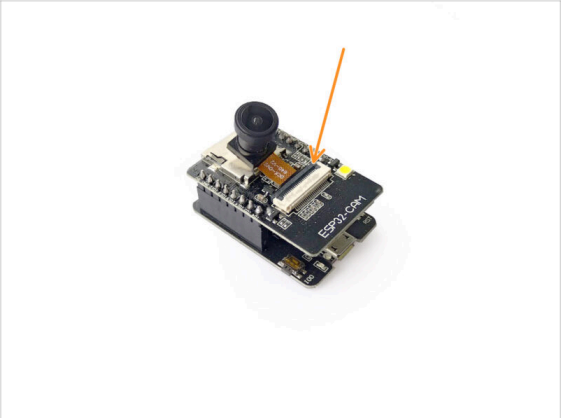
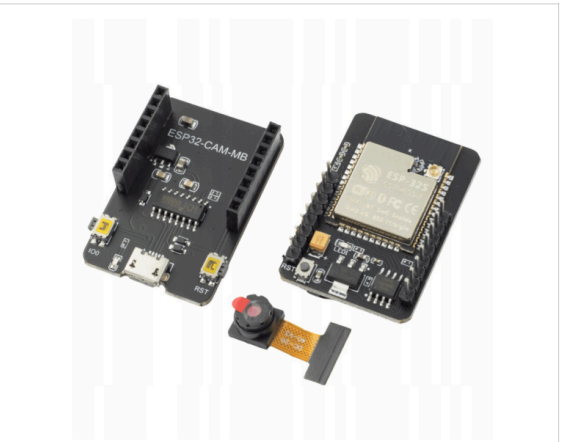
ESP32 Cam for Prusa Connect



STEP 1 Introduction





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

  ⚠ This guide is intended for experienced users.

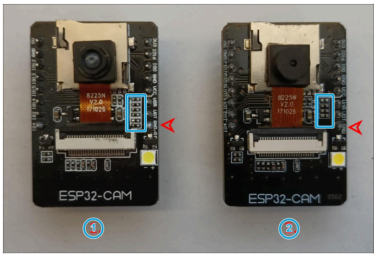
  This guide is suitable for Windows computer users only! If you use another operating system, please refer to the detailed guide.

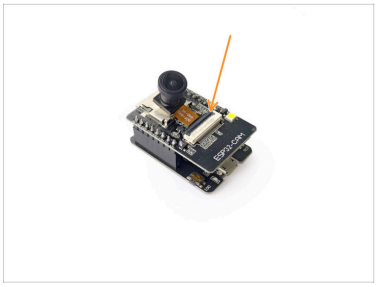
  ⓘ For general information about Prusa remote-control services, visit the Prusa Connect and PrusaLink explained article.

ⓘ 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

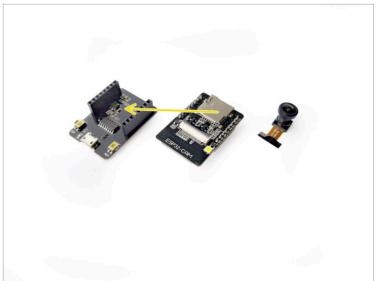
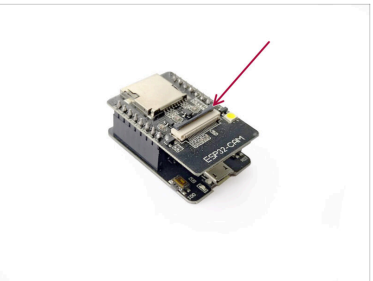


- **For the following steps, please prepare:**
- **ESP32-Cam**
  - With a compatible **USB Bridge** module
  - Several camera modules are available, offering various focal lengths for different viewing angles.
- A compatible USB cable. In this case, it is a **Micro USB to USB-A**.

ⓘ 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

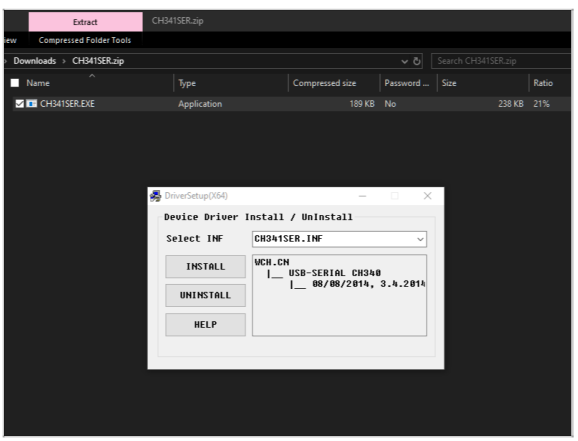




- Take the main ESP32 Cam module and **attach it onto the USB shield**.
- Open the camera connector safety latch by lifting it up.
- **Connect the camera module** connector into the ESP32 Cam and close down the safety latch to secure the cable in place.

⚠ Handle the electronics boards by its sides only to prevent an ESD damage.

ⓘ We recommend printing a protective cover for the camera module.

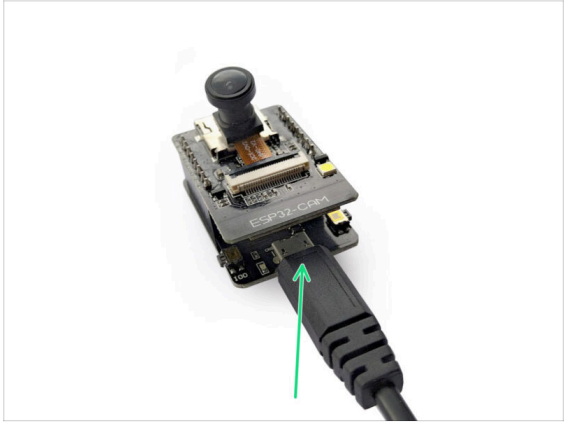
STEP 5 Installing drivers

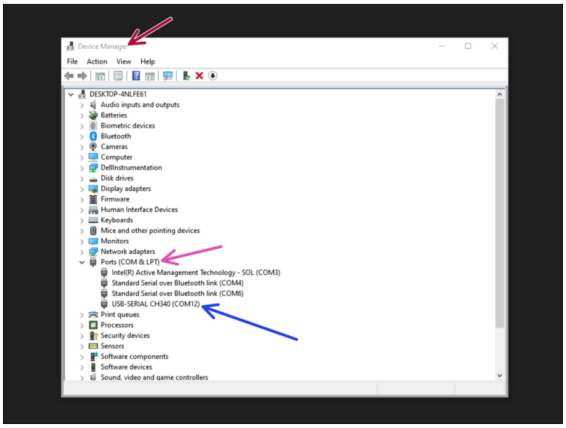


- Now, let's start with the **software** part.
- We will need to install **CH340 USB-to-Serial converter drivers**.
- Download and install the CH341SER.EXE driver from: http://www.wch-ic.com/search?q=CH340&t=downloads

In case the drivers linked above do not work, try using an older version.

STEP 6 Connecting the Cam to computer

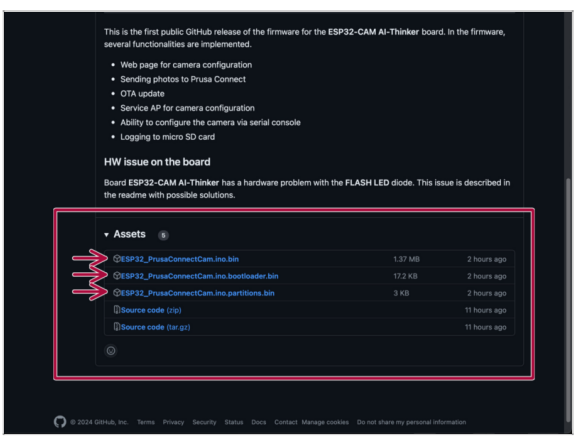




- Now, we have to check if your computer detects the camera module properly.
- Using the compatible USB cable, connect the ESP32 Cam into your computer.
- Open up **Device Manager** (press Windows key + X, then press **m**)
- Navigate to the **Ports (COM & LPT)** section.
  - The Cam should appear as **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!

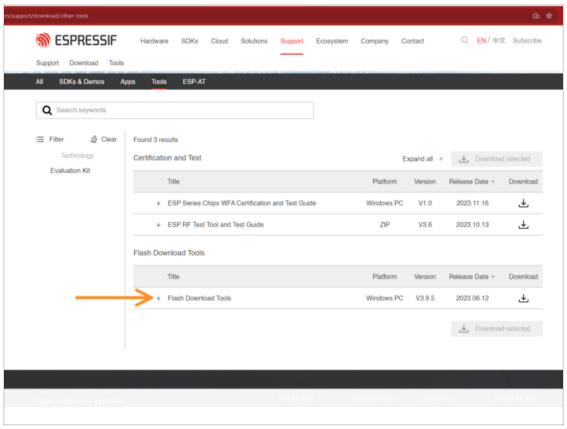
STEP 7 Downloading the firmware files

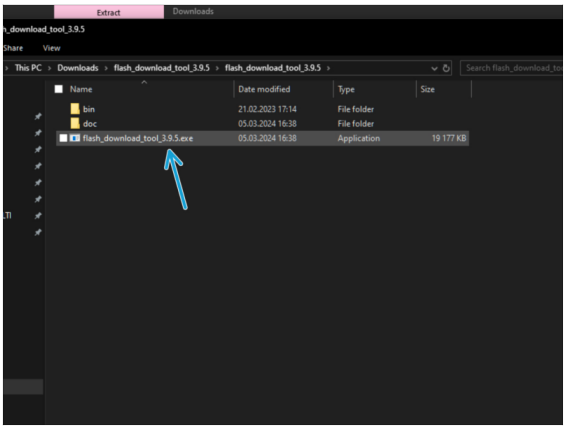


- Download the **ESP32 Prusa Connect Cam firmware** files
  - Find the latest release in the GitHub repository.
  - **Download all the .bin** firmware image files from the **Assets** column.

ⓘ We will need these image files in the upcoming steps.

STEP 8 Downloading the Flashing tool

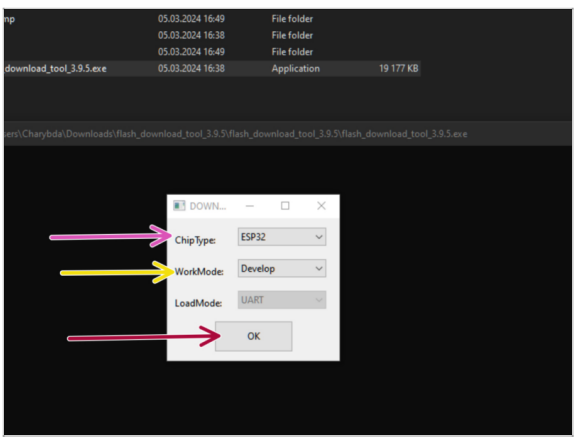




- Download the EXPRESSIF ESP32 **Flash Download Tools**
  - https://www.espressif.com/en/support/download/other-tools
- **Extract the whole zip** file.
- Run the **flash_download_tool_x.*x*.x.*exe***

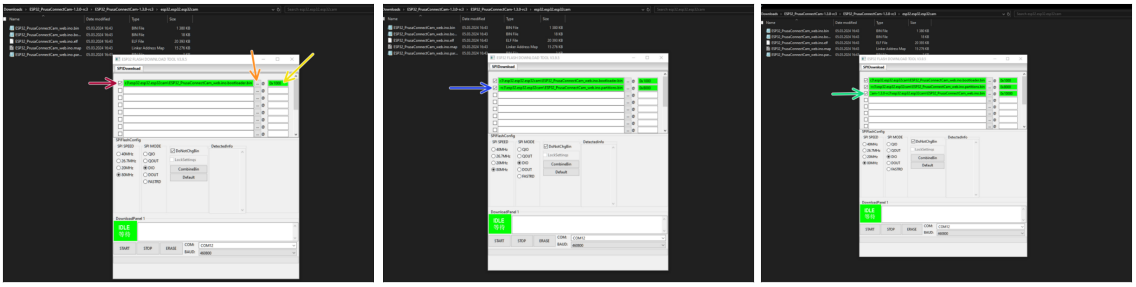
  ⓘ If you encounter issues, try running the app as an administrator.

STEP 9 Opening the flashing tool



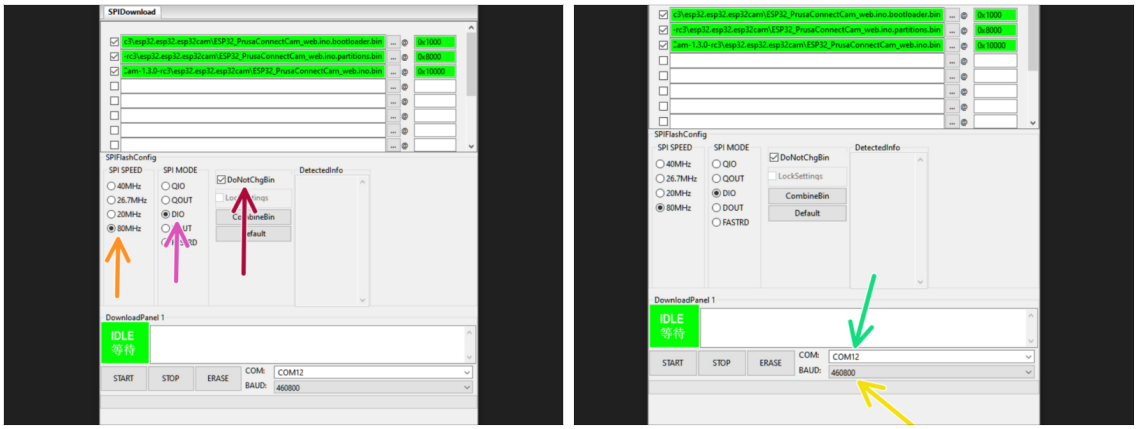
- On the first screen:
  - Set **ChipType:** as **ESP32**
  - Set **WorkMode:** as **Develop**
  - Hit **OK** to continue

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**

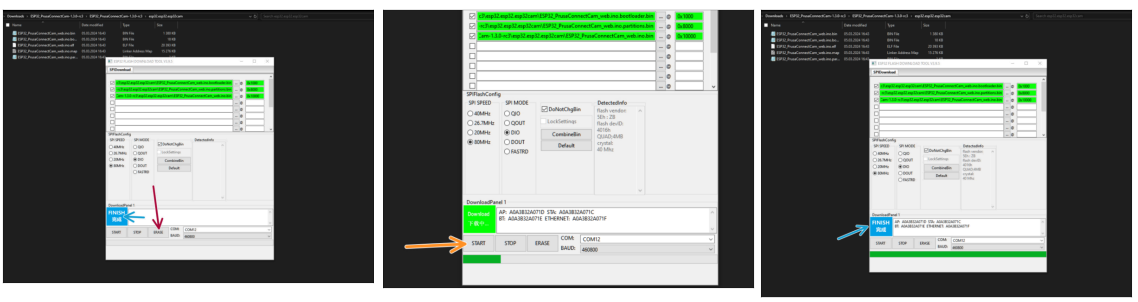
STEP 11 Flashing tool Setup (part 2)



- 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**.

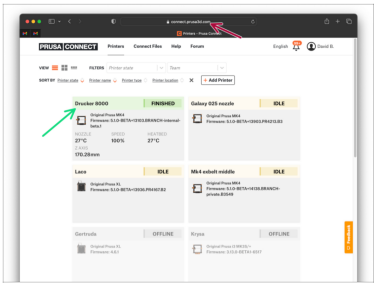
⚠ **Verify** once more, that **everything has been set correctly**, as seen in the pictures.

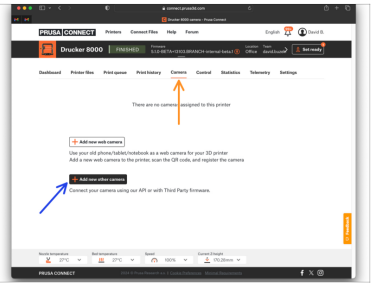
STEP 12 Erasing and Flashing

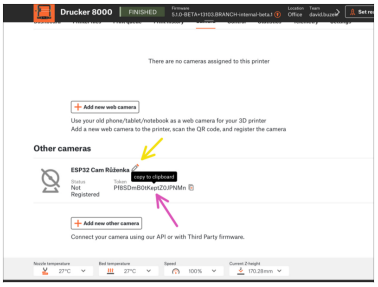


- First, we will have to clear the Cam's memory.
  - Click the **ERASE** button.
  - A finished operation will be indicated by the **FINISH完成 FINISH** sign.
- Now, we can flash the firmware files into the Cam.
  - Click the **START** button.
    - ⚠ Now, the flashing will begin. Do not touch, move or 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

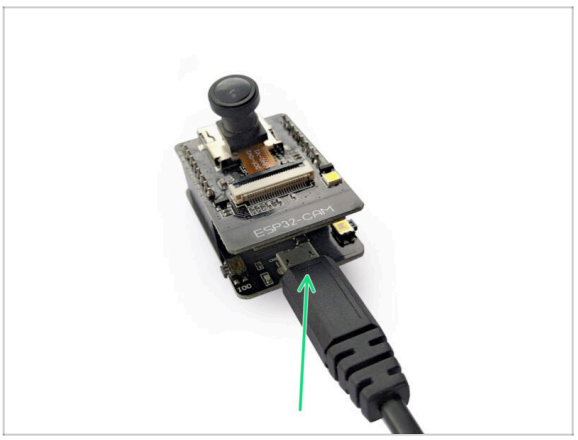






- Now, we will have to set up the camera in Prusa Connect.
  - Open up the **Prusa Connect** webpage (connect.prusa3D.com)
  - Log in.
  - Select a printer you wish to use the camera for.
  - Navigate to the **Camera** tab.
  - Click **Add new other camera**
  - **A new camera will appear** in the list. 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

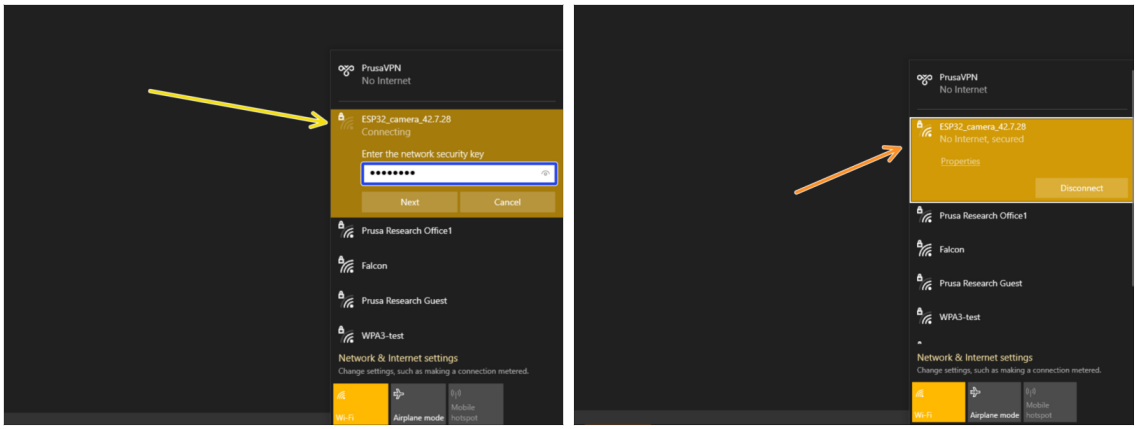


- Now, we have to set up the Cam itself.
- Connect the Cam to the **USB Power supply**.
- Install the camera next to the printer, where you wish to use it.

  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.

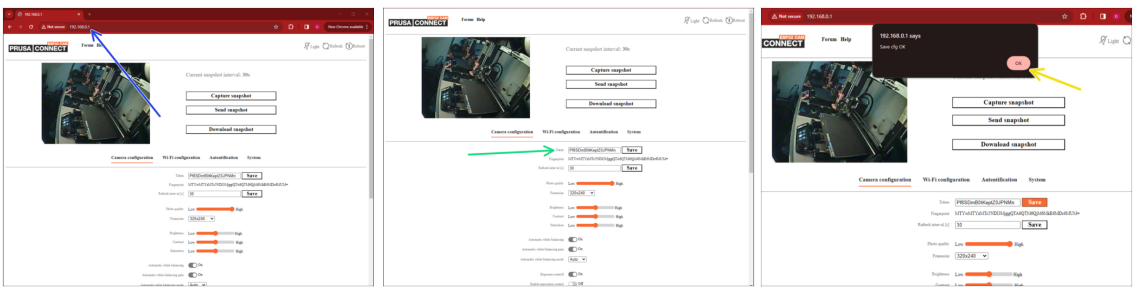
STEP 15 Connecting to Cam Wi-Fi



- 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.

  ⓘ When copy-pasting the password, ensure there are no additional characters, such as a space, included.

STEP 16 Cam Software: Token setup



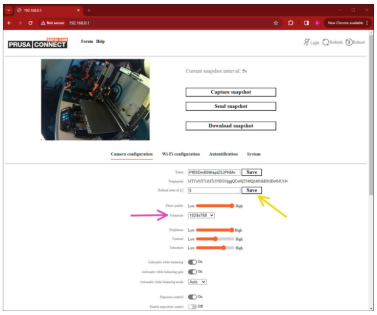
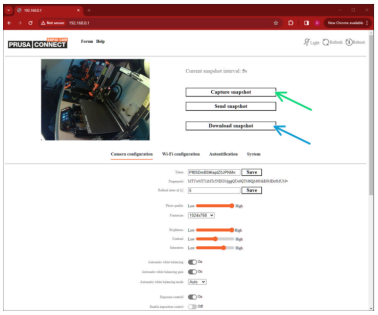
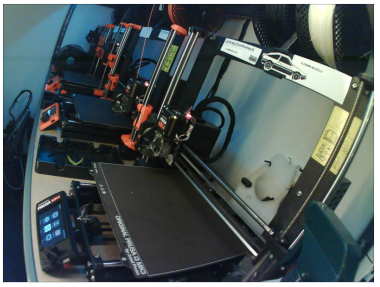
- Open up a new web browser window.
  - Open up the **192.168.0.1** IP Address as a webpage.

    📌 Alternatively, you can also use the http://prusa-esp32cam.local hostname (mDNS) instead of the IP Address.

    ⓘ 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**.

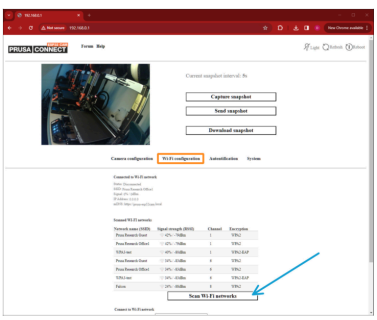
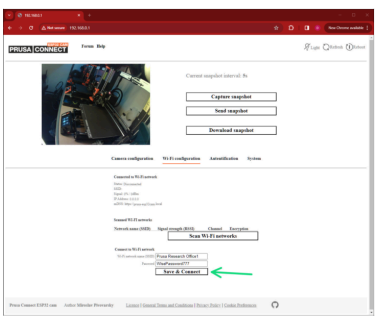
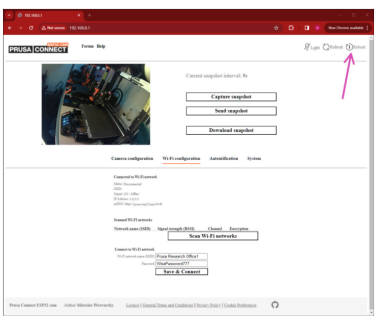
  ⚠ This is the **Prusa Connect camera token** we have obtained in an earlier step.
  - Wait until the token has been saved successfully.

STEP 17 Cam Software: Cam config

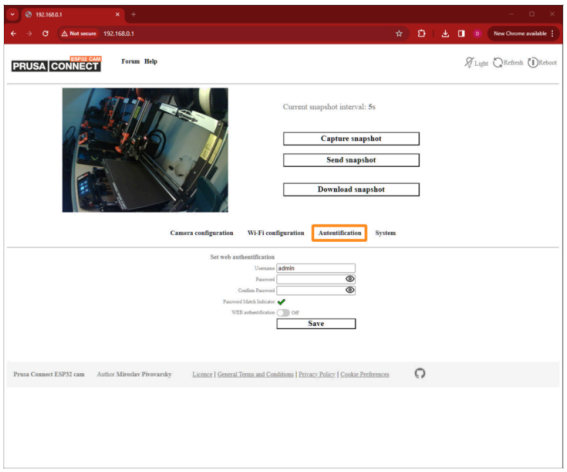
- Since we're in the camera configuration tab already, we can set up the image options:
- Set up the **frame size** (resolution).
  - This will improve the image quality significantly, as the resolution is set to the lowest possible by default.
  - If you have connectivity issues due to bad Wi-Fi signal, 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.
  - The third image is an original example snapshot captured by the ESP32Cam with a 170° wide-angle lens.

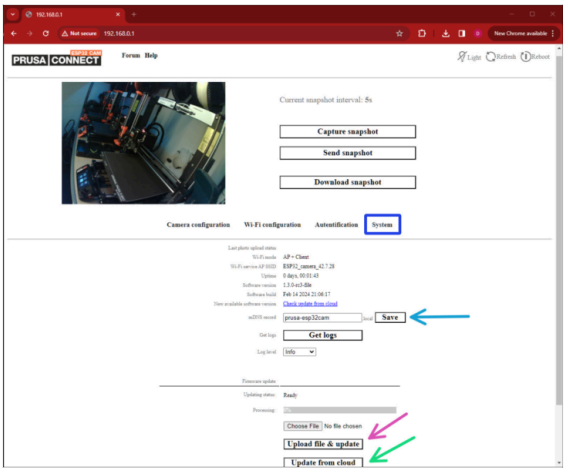
STEP 18 Cam software: Wi-Fi config

- 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.

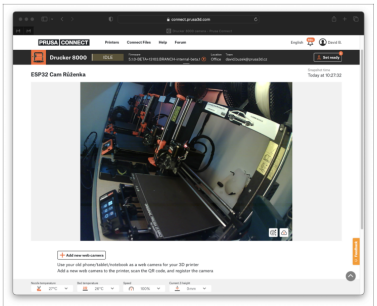
STEP 19 Cam software: Optional items

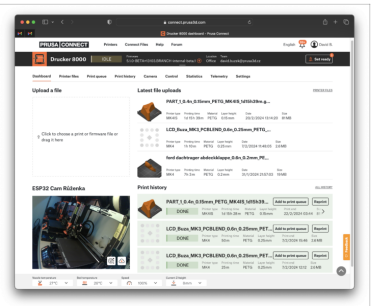


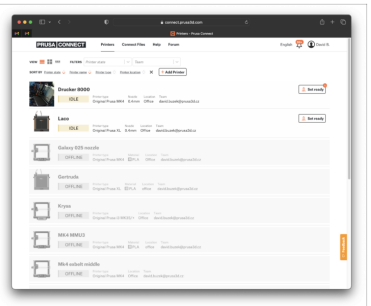


- **We should now have completed setting up the camera.**
- While we are on the ESP camera's configuration page, let's take a quick look at the other options it offers.
  - On the **Authentication** tab, you can set a password to access the configuration page.
  - The **System** tab provides several 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.

Notes:

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