

Supplementary information

Faster Operation of 2LabsToGo-Eco Using Debian 13, Django 5, and Raspberry Pi 5, verified via screening of cannabidiol-containing oils

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Instruction S1 Upgrade instructions

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1. Update the 2LabsToGo-Eco-Software on a Bullseye (Debian 11) OS system

Updating the software on a Bullseye system will update to Django 5 LTS.

- Stop the running software: disconnect the board, close all tabs, and quit the server in the running terminal (Ctrl+c).
- Open a new terminal and change to the folder “2LabsToGo-Eco”.
`cd ~/2LabsToGo-Eco` (ENTER).
- Execute
`git config pull.rebase false` (ENTER)
followed by
`git pull` (ENTER).

The output will be like this:

```
remote: Enumerating objects: 31, done.
remote: Counting objects: 100% (31/31), done.
remote: Compressing objects: 100% (8/8), done.
remote: Total 17 (delta 7), reused 17 (delta 7), pack-reused 0 (from 0)
Unpack objects: 100% (17/17), 3.23 KiB | 137.00 KiB/s, ready.
Von https://github.com/OfficeChromatography/2LabsToGo-Eco
  c39177e..1173aeb main -> origin/main
Update c39177e..1173aeb
Fast-forward
 .github/workflows/image-arm64-eco-django5.yml | 64
+++++
 .github/workflows/image.yml | 88 -----
-----
2LabsToGo-Eco-Software/Dockerfile | 31 ++++++-----
2LabsToGo-Eco-Software/app/app/asgi.py | 19 ++++++
2LabsToGo-Eco-Software/app/app/routing.py | 13 -----
2LabsToGo-Eco-Software/app/app/settings.py | 4 +-
2LabsToGo-Eco-Software/app/app/wsgi.py | 16 -----
2LabsToGo-Eco-Software/app/connection/routing.py | 2 +-
2LabsToGo-Eco-Software/docker-compose.yml | 19 ++++++-----
2LabsToGo-Eco-Software/requirements/base.txt | 26 ++++++-----
2LabsToGo-Eco-Software/run.py | 26 ++++++-----
11 files changed, 155 insertions(+), 153 deletions(-)
create mode 100644 .github/workflows/image-arm64-eco-django5.yml
delete mode 100644 .github/workflows/image.yml
create mode 100644 2LabsToGo-Eco-Software/app/app/asgi.py
delete mode 100644 2LabsToGo-Eco-Software/app/app/routing.py
delete mode 100644 2LabsToGo-Eco-Software/app/app/wsgi.py
```

- Start the software as usual.

2. Upgrade to Trixie (Debian 13) on Raspberry Pi 4B or Pi 5B

The upgrade to Trixie OS requires complete reinstallation.

Before the upgrade

- From the old installation, copy the software folder (2LabsToGo-Eco-Software) to a remote PC or USB stick (backup of the database and the images folder).

Upgrade

- With the help of the Raspberry Pi Imager (www.raspberrypi.com/software), write the OS onto a Raspberry Pi microSD card (64 GB, www.berrybase.de). Select the model: Pi 4 or Pi 5, the operating system: Raspberry Pi OS (other) → Raspberry Pi OS Full (64-bit), a port of Debian Trixie with desktop environment and recommended applications. Follow the Imager instructions (hostname, country, keyboard, username, and password). Ignore any warnings from the Explorer/File Manager about the SD card.
- After the writing process is finished (the SD card is unmounted), remove the SD card from the card reader and insert it again. The Explorer/File Manager will present the card's content.
- Open the file config.txt with a simple text editor (not WORD), scroll down to the end of the file, and type (line after [All])
`dtoverlay=uart3` (in case of Raspberry Pi **4B**)
or
`dtoverlay=uart2-pi5` (in case of Raspberry Pi **5B**; see also 3. Upgrade the 2LabsToGo-Eco with a Raspberry Pi 5B)
- Unmount the SD card and remove it from the card reader.
- Insert the SD card into the Raspberry Pi and connect the 2LabsToGo-Eco to power.
- After the booting and setup process is finished, open a terminal and clone the GitHub repository (Internet access required) with
`git clone https://github.com/OfficeChromatography/2LabsToGo-Eco.git`
- Following the 2LabsToGo-Eco Assembly Guide (<https://doi.org/10.1016/j.aca.2025.344103>, Supplementary data), install the recommended software packages, but do not install avrdude (see 4. Flashing the firmware).
- Then change to the folder 2LabsToGo-Eco-Software in the terminal
`cd 2LabsToGo-Eco-Software`
followed by
`python3 install.py |& tee install-py.txt`
- Thereafter, execute
`python3 run.py |& tee run-py.txt`
which takes a while.
The last output line is "Quit the server with CONTROL-C."

The logfiles install-py.txt and run-py.txt can be consulted if anything went wrong.

After the upgrade

To access the formerly created software methods and captured plate images, the old database and the old media folder (images, gcode files) must be imported.

- In the still open terminal, quit the server with Ctrl+c.
- Change to the app directory

```
cd app
```

followed by

```
python3 db-import.py
```

This Python script will rename the newly created (empty) database and the newly created media folder. The script will also delete all “0001_initial.py” files to re-run the migrations with the following *python3 run.py* command, loading the old database.

- From the backup, copy the database (2-LabsToGo-Eco-Software/app/db.sqlite3) and the media folder (2LabsToGo-Eco-Software/app/media) to the app folder to the app folder of the new software installation, using the file manager. (see also 6. Remote access to the Raspberry Pi with Trixie)

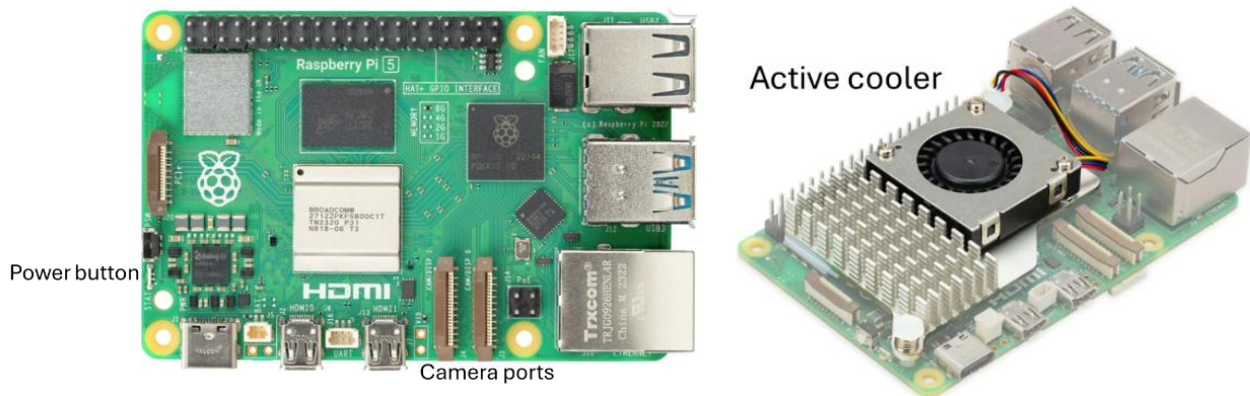
Following the Assembly Guide (<https://doi.org/10.1016/j.aca.2025.344103>, Supplementary data), define an alias to start the Django server.

- Open a terminal and type the alias.
- Open the Chromium browser (see 5. Password for a new keyring) and connect to the Django server: 127.0.0.1:8000
- Log in with the old user.
- Use serial port `ttyAMA3` for the Raspberry Pi 4B and `ttyAMA2` for the Pi 5B, respectively.

3. Upgrade the 2LabsToGo-Eco with a Raspberry Pi 5B

Bill of materials

Parts	Amount	Exemplar supplier	Euro (+VAT)
Raspberry Pi 5B	1	berrybase.de	82.27
Active cooler for Raspberry Pi 5	1	berrybase.de	4.96
Camera cable for Raspberry Pi 5, Standard-Mini, 500 mm	1	berrybase.de	2.94
Raspberry Pi microSD card, 64 GB	1	berrybase.de	16.39
		Sum	106.55
<i>Alternative to the camera cable</i>			
Flex cable for Raspberry Pi Zero and camera module, 3.8 cm	1	berrybase.de	1.85
CSI/DSI Extender (Adafruit No. 3671)	1	eckstein-shop.de	3.53



The active cooler with a temperature-controlled fan is mandatory for the Pi 5, instead of using heat sinks, to be on the safe side keeping the CPU below 50 °.

Without any modification, the Raspberry Pi 5B fits into the 2LabsToGo-Eco electronic box.

The Raspberry Pi 5B has a power button for booting or shutting down (www.raspberrypi.com/documentation/computers/raspberry-pi.html#power-button). Usually, the Pi 5B boots when powered on (green LED blinking), but it may be necessary to press the power button to boot after re-powering the 2LabsToGo-Eco.

However, the Pi 5B camera ports are 15-pin FPCs, while the Pi 4B and the HQ camera have 22-pin FPCs. Therefore, the camera cable must be exchanged.

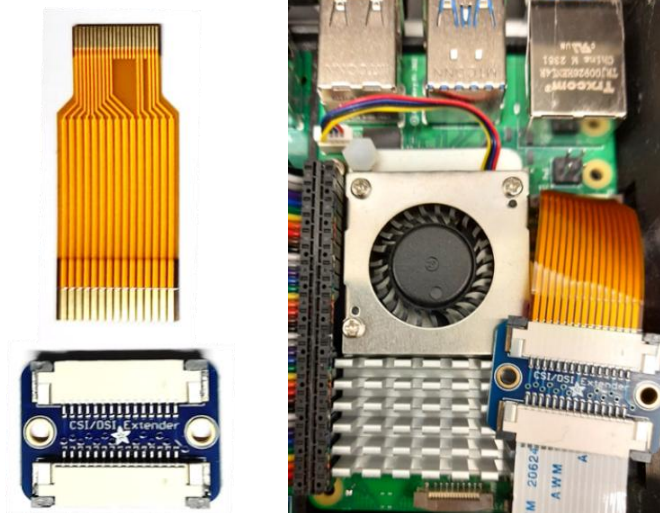
Option 1

- Unmount the camera cabinet and connect a 50-cm Raspberry Pi 5 camera cable with the 22-pin end to the HQ camera.



Option 2

- Without unmounting the camera cabinet, use a short 22-pin-to-15-pin cable and a CSI/DSI Extender to connect the old camera cable to the Raspberry Pi 5B.



4. Flashing the firmware

Flashing the firmware is required only if it has been updated.

With Bullseye, the firmware can be flashed as described in the Assembly Guide (<https://doi.org/10.1016/j.aca.2025.344103>, Supplementary data), but the flashing command was changed to

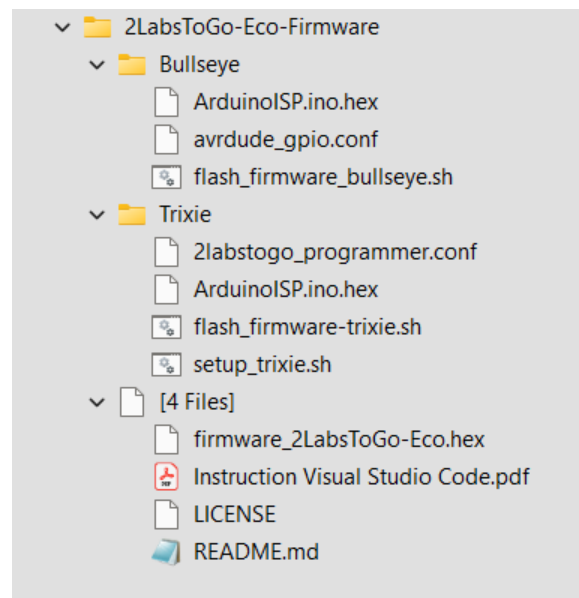
```
sudo bash flash_firmware_bullseye.sh
```

to be executed in the Bullseye folder (see below)

```
cd ~/2LabsToGo-Eco/2LabsToGo-Eco-Firmware/Bullseye
```

With Trixie, however, flashing the firmware requires a procedure different from that described in the Assembly Guide, as outlined in the present manuscript.

Therefore, the GitHub folder “2LabsToGo-Eco-Firmware” was restructured to provide the files for flashing the firmware with both OS, Bullseye and Trixie.

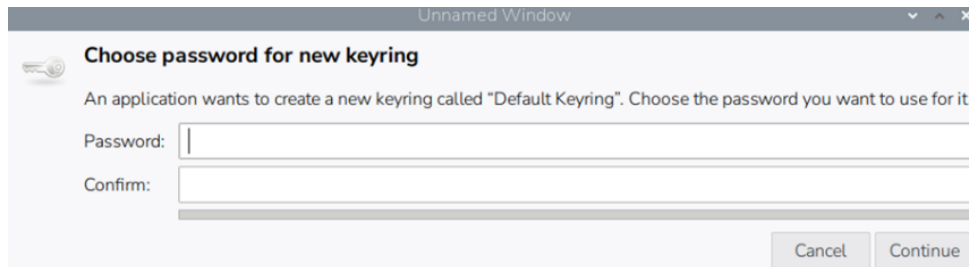


Preparing Trixie for flashing the firmware

- Open a terminal and change to the respective firmware directory
`cd ~/2LabsToGo-Eco/2LabsToGo-Eco-Firmware/Trixie`
- Then execute the bash script “setup_trixie.sh” to install avrdude 8.1 from source
`sudo bash setup_trixie.sh`
- Thereafter, perform a Raspberry Pi logout and login again.
- To flash the firmware, execute the bash script “flash_firmware-trixie.sh”
`sudo bash flash_firmware-trixie.sh`
- Generally, do not forget to place the 4x2 jumper onto the “ISP to Pi” port on the mainboard before flashing and to remove it after the flashing process.
- Note that after a firmware update, both PID tunings must be performed again to save the settings in the firmware (Assembly Guide).

5. Password for a new keyring

When opening Chromium in Trixie, a form is displayed each time asking for a password for a new keyring.

A screenshot of a dialog box titled "Choose password for new keyring" with a key icon. The text inside says: "An application wants to create a new keyring called 'Default Keyring'. Choose the password you want to use for it." There are two input fields labeled "Password:" and "Confirm:". At the bottom right are "Cancel" and "Continue" buttons.

“A keyring stores sensitive information such as passwords, encryption keys, certificates, and other credentials. Setting a password encrypts this data, preventing unauthorized access.” [Google KI search].

However, nobody will use the 2LabsToGo-Eco for internet shopping or online banking, leaving the credentials on the Raspberry Pi.

Therefore, disabling the request for a keyring password can be done as follows.

- Close Chromium.
- Open a terminal and execute
`sudo rm ~/.local/share/keyrings/*`
[If there are no keyrings saved, an error will be displayed to be ignored.]
- Restart Chromium, and it will prompt again to create a new keyring.
- Click on “Continue” without entering a password; an empty one will be created.
- In the following warning, again click on “Continue”.

6. Remote access to the Raspberry Pi with Trixie

In Trixie, the Wayland VNC server is preferred and can also be used with the RealVNC Viewer for remote access to 2LabsToGo-Eco. However, Wayland does not allow the remote transfer of files or folders, for example, plate images.

The new “Raspberry Pi Connect”

(www.raspberrypi.com/documentation/services/connect.html), introduced with Bookworm, allows remote access to the Raspberry Pi desktop through a web browser but does not enable file and folder transfers.

Fortunately, the Real VNC Server is also preinstalled in Trixie, but must be activated.

- Therefore, open a terminal and execute
`sudo raspi-config`
- In the opened configuration menu, select:
3. Interface Options (ENTER) / I3 VNC (ENTER) => Server enabled? (ENTER) => Yes (ENTER)
and
6. Advanced Options (ENTER)/ A7 Wayland / W1 X11 Openbox window manager with X11 backend (ENTER) => Yes (ENTER)
- After a reboot, open a terminal and execute
`sudo systemctl start vncserver-x11-serviced`
followed by
`sudo systemctl enable vncserver-x11-serviced`

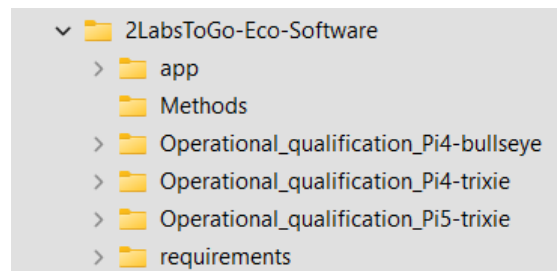
Thereafter, the active Real VNC icon  (without an X) should be displayed in the top bar if a static IP address was set.

7. Operational qualification

The camera commands and the serial ports are different depending on the Raspberry Pi model and the operation system.

The camera commands are libcamera and rpicalm for Bullseye and Trixie, respectively. The serial ports are ttyAMA1, ttyAMA3, and ttyAMA2 for Pi 4-Bullseye, Pi 4-Trixie, and Pi 5-trixie, respectively.

Therefore, three folders are provided in the software folder for the different installations.



To execute the correct show command,

- change to the respective directory, for example

```
cd ~/2LabsToGo-Eco/2LabsToGo-Software/Operational_qualification_Pi4-trixie
```

followed by

```
sudo bash show.sh
```