OrangePi-Remote-Enclosure Assembly Guide

Edge Device Build Manual – v1.0

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Overview

The OrangePi-Remote-Enclosure is an all-in-one, 3D-printable case that houses an OrangePi Zero 2 W (2 GB) and an Arducam 5 MP autofocus USB camera. It protects your hardware while providing easy access to power, data, and cooling. This guide walks you through everything from printing the parts and flashing the OS to soldering cables and final assembly.

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1. Tools & Materials

1.1 Tools

- **M3 Allen wrench**
- **3D printer** (or access to one)
- **Soldering iron** (set to ~250 °C)
- **Wire strippers**
- **Hot-glue gun**

1.2 Software

- **BalenaEtcher** (for flashing DietPiOS)

1.3 Consumables & Fasteners

- **Solder**: 22 AWG rosin-core (lead-free recommended)
- **Glue stick** (for hot-glue gun)
- **M3 × 12 mm SCHS bolts** × 3
- **M3 × 10 mm SCHS bolts** × 4

1.4 Electronic Components

- **OrangePi Zero 2 W (2 GB)** × 1
- **64 GB MicroSD card** (pre-flashed) × 1
- **Arducam 5 MP USB camera** × 1
- **56 kΩ resistor** × 1
- **USB-C male breakout board** × 1
- **14 × 14 × 6 mm heatsink** × 1
- **9 × 9 × 5 mm heatsink** × 1

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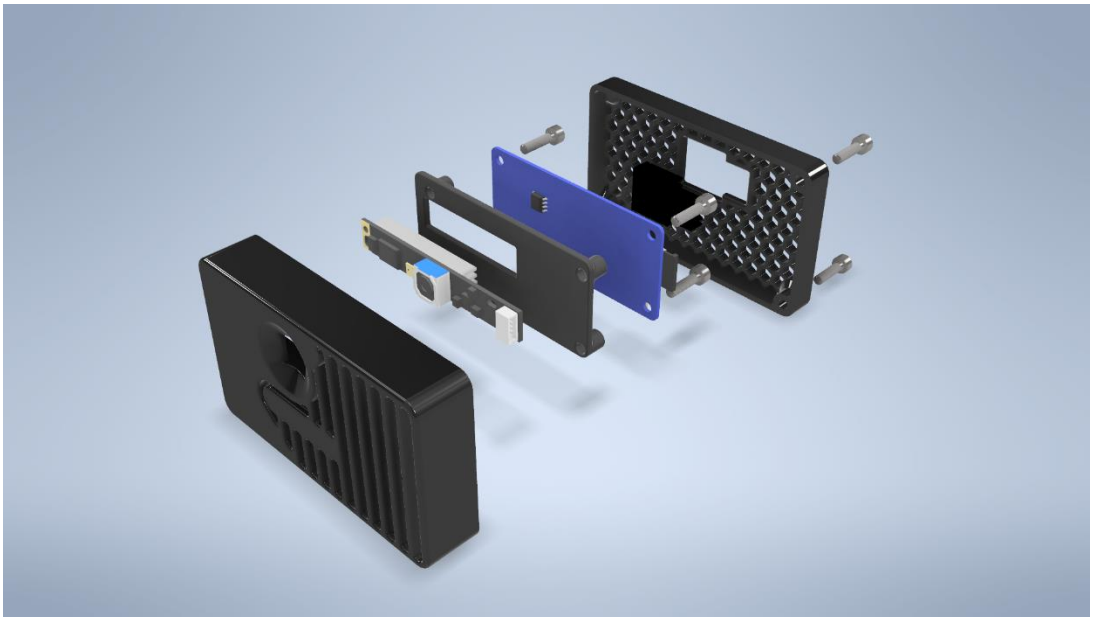
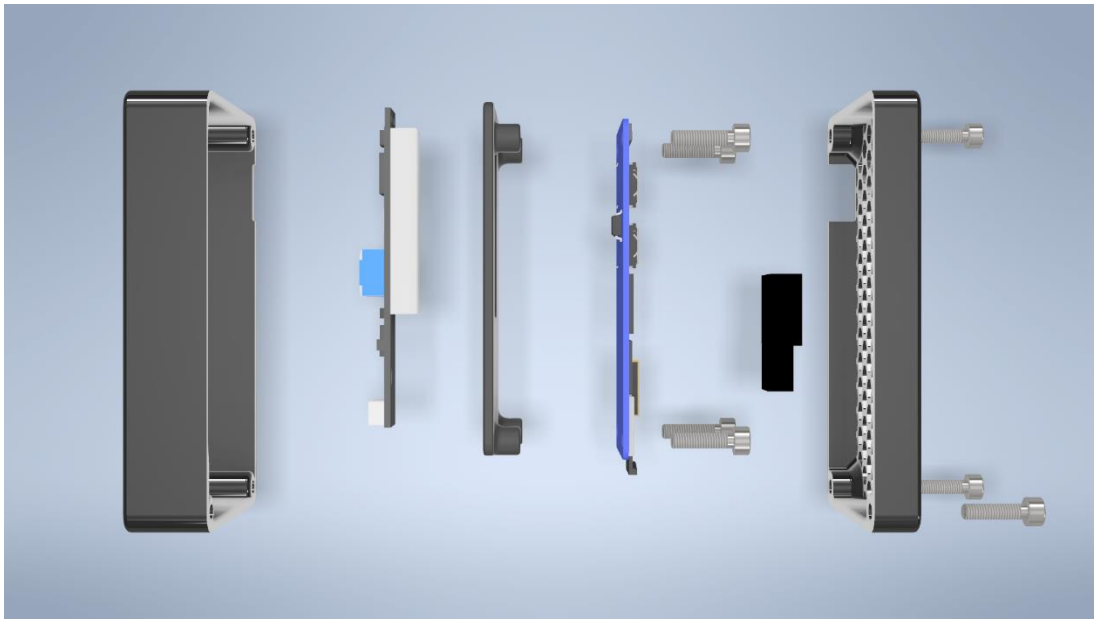
2. Pre-Assembly

2.1. Review assembly layout





2.2. Print all parts at your preferred quality (PLA at 20–30% infill recommended).

- Open the printed STL files in your slicer:
  - RemoteCasingBody.stl
  - RemoteCasingBackCover.stl
  - PiMountBracket.stl
- Orient each with the flattest face down:
  - **Body**: camera hole down.
  - **Back Cover**: heat-sink hole down.
  - **Bracket**: base down.

2.3. Flash the OS

2.3.1 Install BalenaEtcher on your computer.

2.3.2 Flash DietPiOS to the 64 GB MicroSD card (see Appendix A for link).

2.3.3 After flashing, boot your OrangePi and finish the setup, following the prompts.

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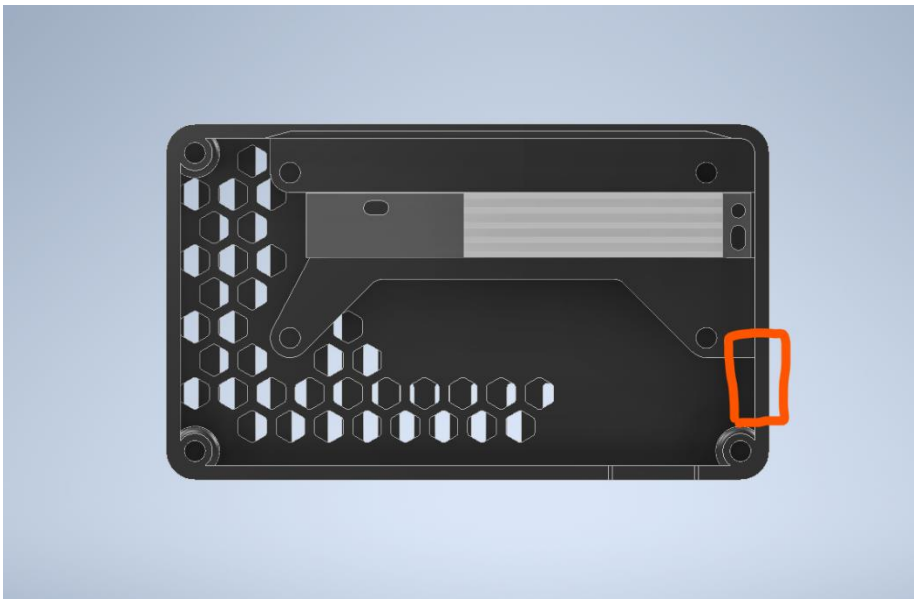
3. Electrical Preparation

3.1. Cable Length & Routing

3.1.1. **Preheat** your soldering iron (250 °C) and hot-glue gun.

3.1.2. **Fit the camera** into the body slot and route its USB cable along the bottom wall in a counter clockwise direction.

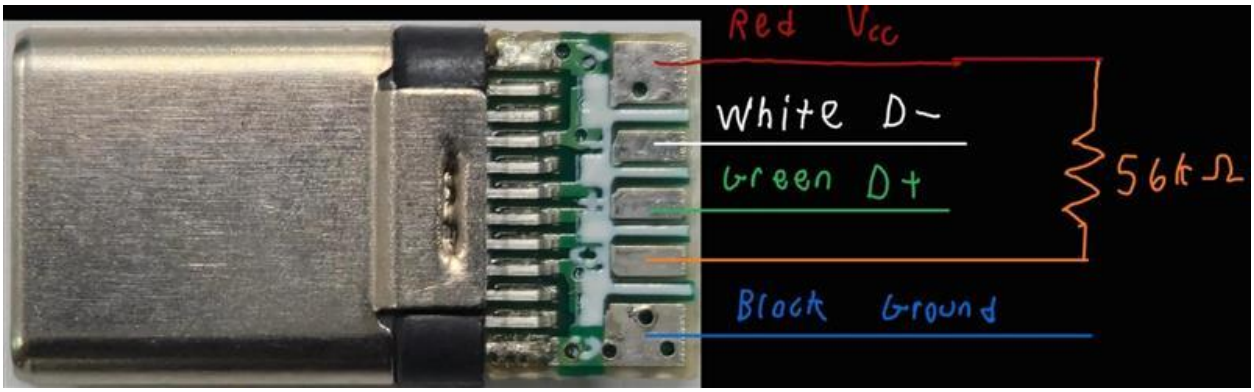
3.1.3. **Mark** the cable at the corner where it exits the case as shown below.



3.2 Resistor Wiring

1. On the Male USB-C breakout, identify the **CC pin** and the **GND pad**.
2. **Trim** the 56 kΩ resistor leads to ~5 mm.
3. **Solder** one lead to CC, the other to GND (so CC is pulled to ground).

- **Figure 2: CC-to-GND resistor diagram**

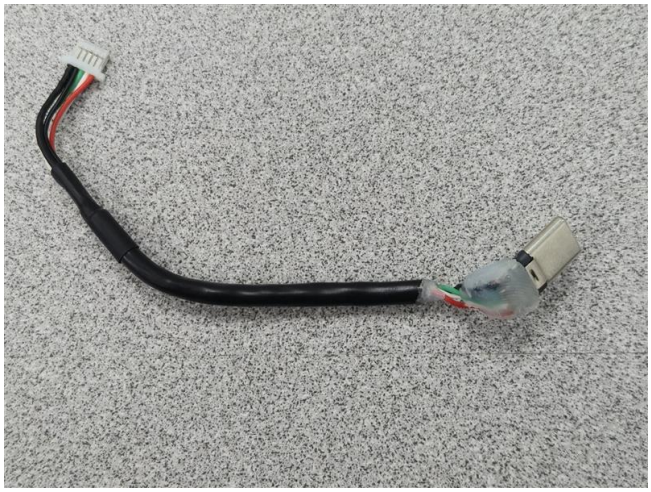


3.3 Breakout Pre-Tin

1. **Apply a small bead of solder** to each pad on the breakout.
2. If you're new to soldering, see the "Tips & Tricks" in section 5.

3.4 Camera Cable Soldering

1. Strip and tin the four wires of the Arducam USB cable.
2. **Wire colors → breakout pads**:
    - **Red** → VCC
    - **Black** → GND
    - **Green** → D+
    - **White** → D–
3. **Unplug** the cable from the camera before adding the resistor.
4. **Visually inspect** under magnification for any bridges.
5. **Encapsulate** the breakout in hot glue, bending the cable to ~90° as shown.
    - **Final soldered & glued breakout**



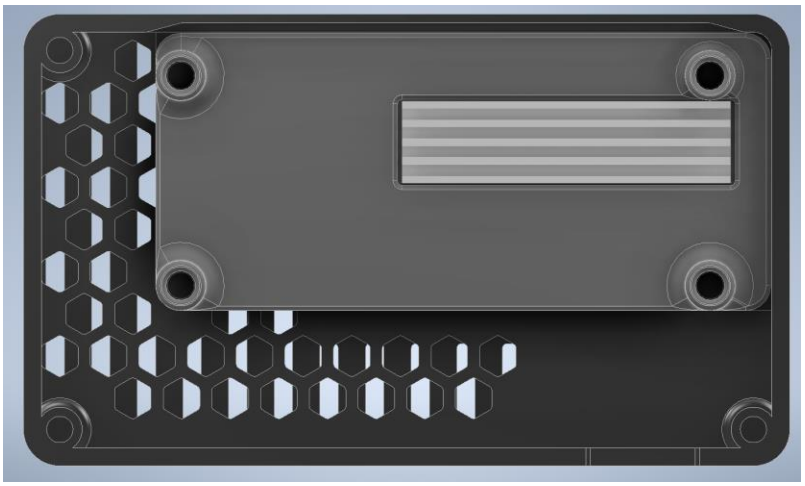
4. Enclosure Assembly

4.1 Camera & Cable

1. **Seat the camera** in its slot, lens outward.
2. **Route** the cable around the left side, counter-clockwise.
    - **Figure 4: Camera installed**

4.2 Pi Mount Bracket

1. **Insert** the PiMountBracket into the main body, matching the chamfered edges.
2. **Figure 5: Bracket orientation**



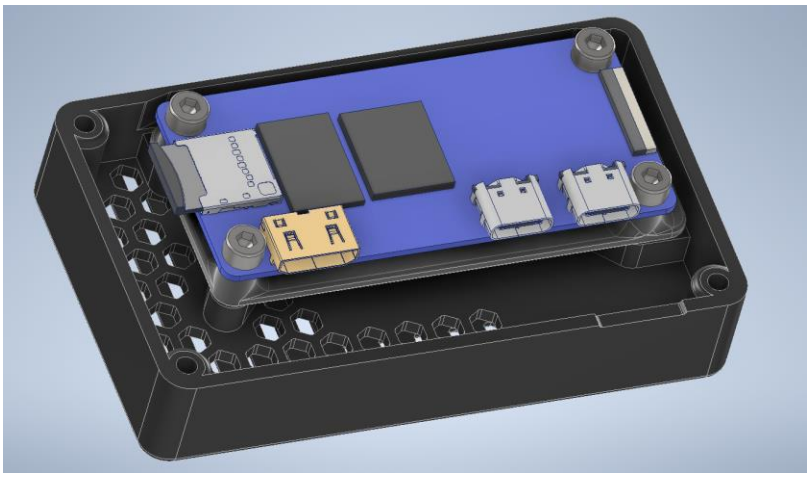
4.3 Antenna Installation

1. **Screw on** the OrangePi wireless antenna.
2. **Wedge** it between the bracket standoffs so it stays snug.

3. **Route** the antenna cable clockwise around the top-right standoff.
    - **Figure 6: Antenna mounted**

4.4 Mounting the OrangePi

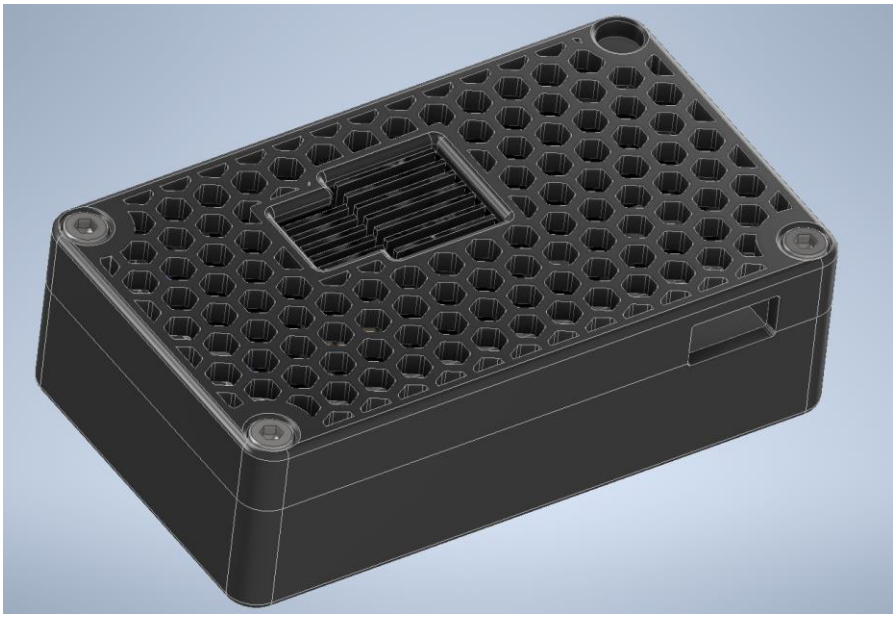
1. **Insert** the flashed MicroSD card into the Pi's slot.
2. **Plug** the camera cable into the leftmost USB-C port.
3. **Secure** the Pi to the bracket with three M3 × 12 mm bolts (top-left, top-right, bottom-left).
4. **Attach** the antenna connector (above the bottom-right hole).
5. **Fasten** the final bottom-right M3 × 12 mm bolt.
    - Torque: snug, but do **not** overtighten—threads are plastic.
    - **Figure 7: Pi seated & bolted**



4.5 Heatsinks & Back Cover

1. **Center** each heatsink on its component (SoC, LAN IC, etc.).
2. **Peel & stick**, pressing gently to ensure adhesion.
    - **Figure 8: Heatsinks applied**

3. **Align** the Back Cover and insert four M3 × 10 mm bolts.
4. Tighten snugly—watch for stripped plastic.
    - **Figure 9: Completed assembly**



5. Tips & Tricks

- **Soldering**: Use flux, a fine-tip iron, and keep wires tinned to avoid cold joints.
- **Hot-glue**: Apply sparingly—just enough to insulate, avoid large blobs that deform the case.
- **Alignment**: Test-fit all parts before final fastening to ensure nothing binds.

Appendix A: Parts & Links

- **Arducam 5 MP USB camera**
- **USB-C Male Breakout Board**
- DietPiOS
- BalenaEtcher