SiViS

Prototype V1.1

ASSEMBLY MANUAL PROTOTYPE V1.1

Joan Carles Puchalt · Antonio Sánchez · Eugenio Iborra · Roberto Martínez · Salvador Genovés · Patricia Martorell

INTRODUCTION

This manual purpose is to help the successfully SiViS assembly, that is, a device created to capture images of *C. elegans* in a controlled environment.

At first, we (the authors) are going to supply a list of components, describing precisely each component with the aid of figures. Besides, we are going to include also the material features for every component, and an assembly diagram. The parts are jointed together with bolts and screws and, in some cases, glue.

COMPONENT LIST

The component list needed in order to assemble this device is the following:

- Bridge (x1) – Plastic PLA (Polylactic Acid)
- Door (x1) – Plastic PLA (Polylactic Acid)
- Filter (x1) – Plastic PLA (Polylactic Acid)
- Lid (x1) – Plastic PLA (Polylactic Acid)
- Pre-rack (x1) – Plastic PLA (Polylactic Acid)
- Rack (x1) – Plastic PLA (Polylactic Acid)
- Electronic box (x1) – Plastic PLA (Polylactic Acid)
- Display Box (x1) – Plastic PLA (Polylactic Acid)
- Frame (x1) – Plastic PLA (Polylactic Acid)

We employ bolts, screws and glue to assemble, so we provide the following list:
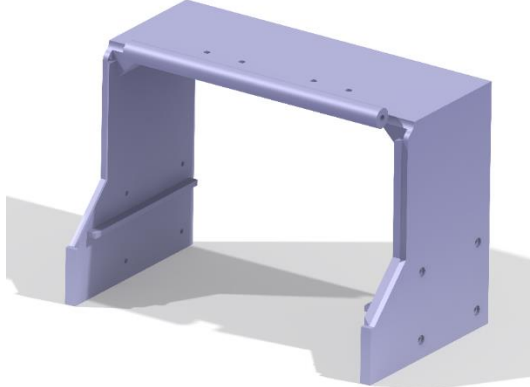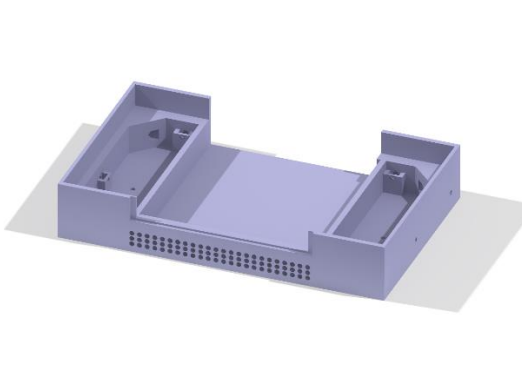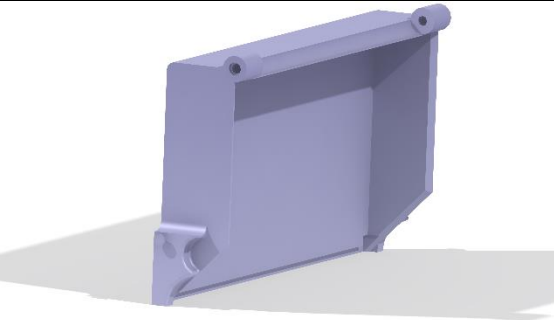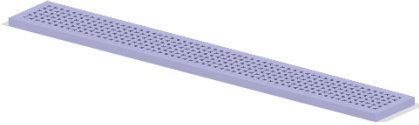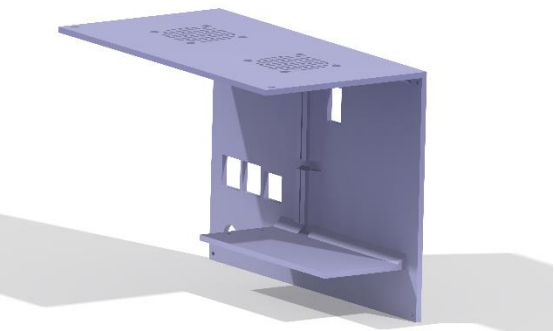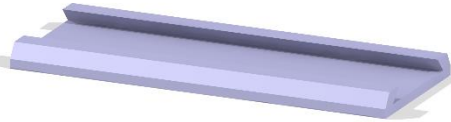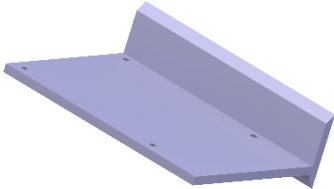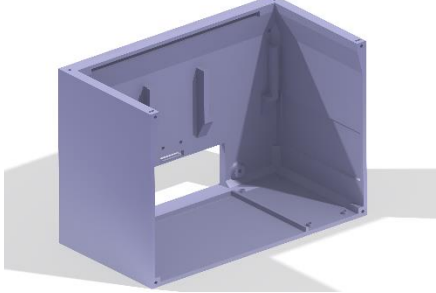
- Plastic bolts (2 units). PLA printed
- Screw M2x12 (8 units). Steel
- Screw M2x10 (6 units). Steel
- Screw M2.5x30 (2units). Steel
- Screw M2.5x20 (6 units). Steel
- Screw M3x30 (4 units). Steel
- Glue (silicone-based)

We too need the electronics parts, which are the following:

- 1 Camera Multiplexer IVPORT Rev.3
- 1 Flat Ribbon Cable 10 cm (FRC100)
- 3 Flat Ribbon Cable 20 cm (FRC200)
- 2 Camera Raspberry Pi
- 1 Raspberry Pi 7" display

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COMPONENT DESCRIPTION

In this section we are going to describe thoroughly every part.

Bridge	Display box
Door	Filter
Lid	Pre-rack
Rack	Electronic box

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Bridge:

This piece is enough rigid to avoid deformations, where the two cameras are fixed on the top. The door is fixed in the bridge axis with two bolts. On the bottom 'display box' is placed.

Display box:

Into this box is placed the display (lighting system), it has holes to allow air flowing. In this piece, the 'Filter' is pasted with glue in the slot to avoid dirt.

Door:

This piece purpose is to allow the expert to replace the Petri plates, while avoiding that the plates will be exposed to external light.

Filter:

This is a small part; its purpose is to filter the external air to avoid dust pollution of the plates while these are inside the device and let in air to refrigerate the display.

Lid:

This piece protects the electronic parts of the device from external dust and strikes. This part has two hole patterns in one of its sides, where we need to fasten two fans in order to force air flowing to dissipate the heat generate by the electronic components. It has wireways printed on lid.

Pre-rack:

This is a piece that is glued to the wall of the 'Electronic box'. It is a prismatic piece, with a dovetail to assemble with the rack (the rack fixes the Raspberry Pi).

Rack:

This piece is where we install a Raspberry Pi.

Electronic box:

This is the piece that we fasten to the back of the bridge piece, where all the electronics are installed. The tree parts (display box, bridge and electronic box) have pipes between them to allow crossing the air flow.
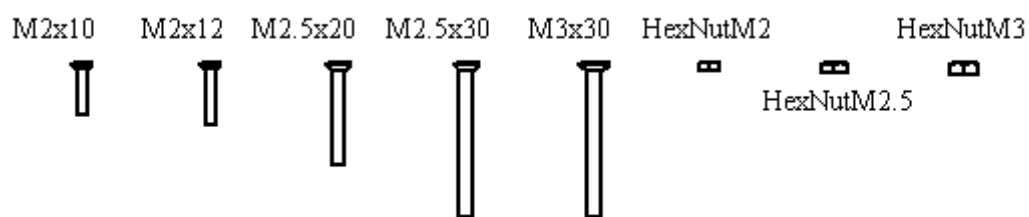
Frame:

This part is to hold the pallet, where Petri plates are placed, thus Petri plates are always at the same position.

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UNION METHODS

Here we provide a list of the needed screws to mount the device:

- Plastic bolts (2 units).PLA
- Screw M2x12 (8 units). Steel
- Screw M2x10 (6 units). Steel
- Screw M2.5x30 (2units). Steel
- Screw M2.5x20 (6 units). Steel
- Screw M3x30 (4 units). Steel
- Glue (silicone-based)

Plastic bolts:

These bolts are made of Polylactic Acid plastic. We made them via additive

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ELECTRONICS COMPONENTS

In this section we describe the electronic components needed in order to the SIVIS device to work properly. The list is the following:

Camera Multiplexer IVPORT Rev.3:

This electronic part's function is to connect the Flat Ribbon Cable to multiplex the signal received from the camera's controller (A raspberry Pi). It is a red PBC with four outputs and one input. Here is a photo of this PCB:
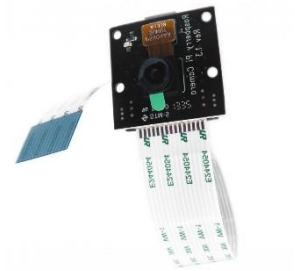
Multiplexer

Flat Ribbon Cable 10 cm and 20 cm:

It is printed circuitry in a flexible plastic matrix to transfer data between electronic devices.

Camera Raspberry Pi:

That camera is fastened to the 'Bridge' piece, where it goes on the inside ceiling of that piece. It is really a little PCB with a mini camera welded on top with tin wire.
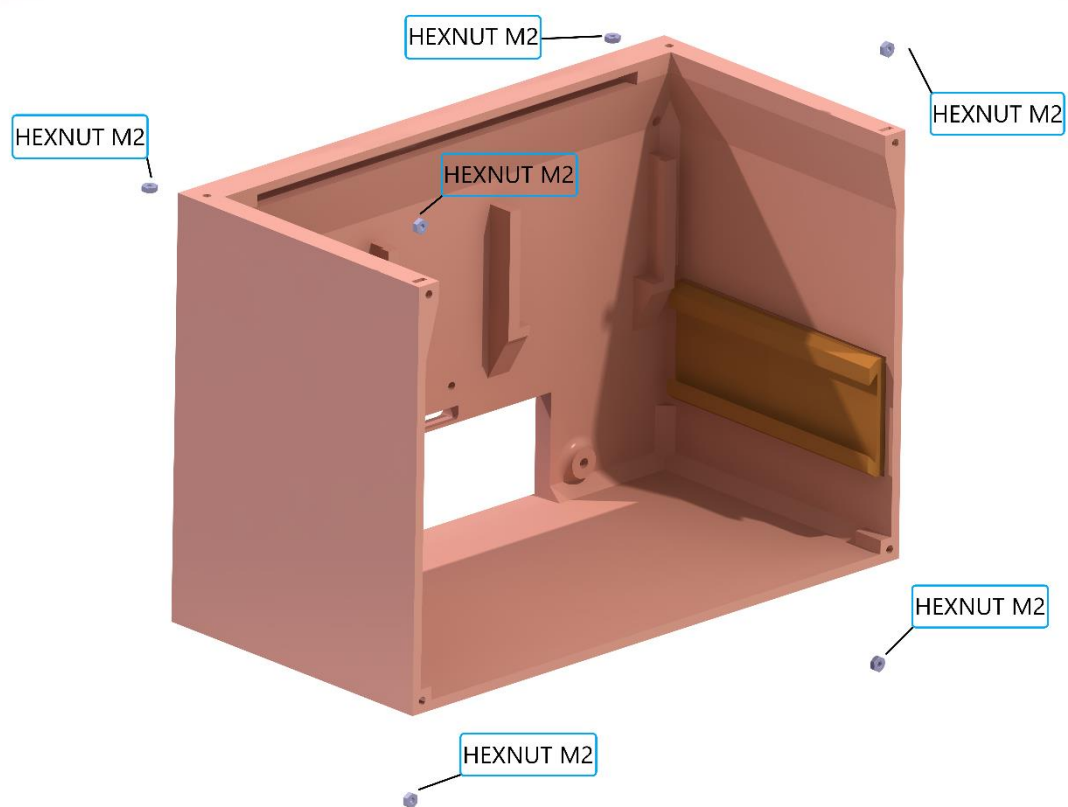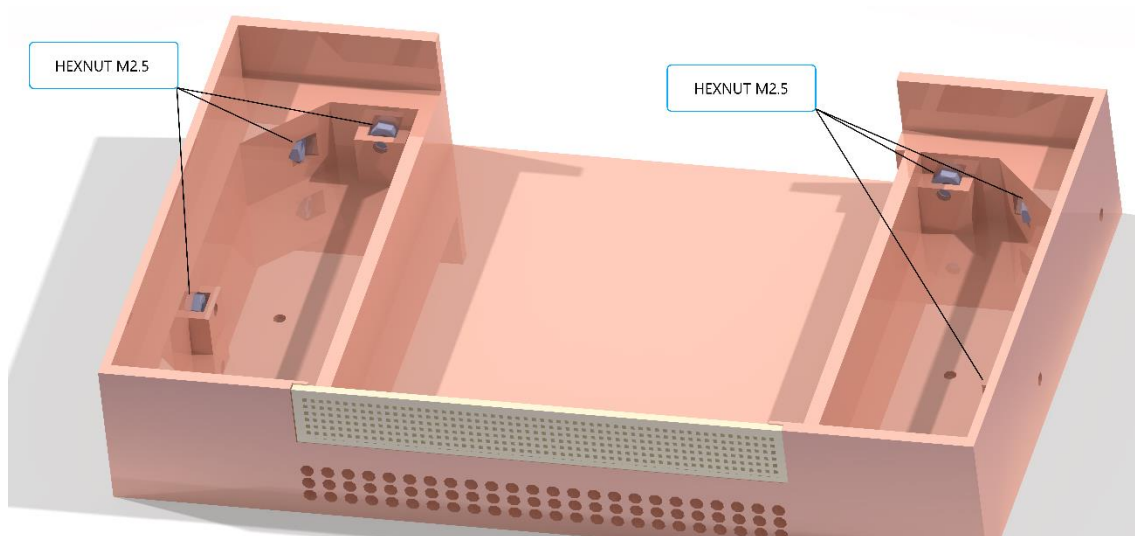
The Raspberry Pi Camera

We need two units of that electronic device. These are fastened to the inside ceiling of the 'Bridge' piece with screws.
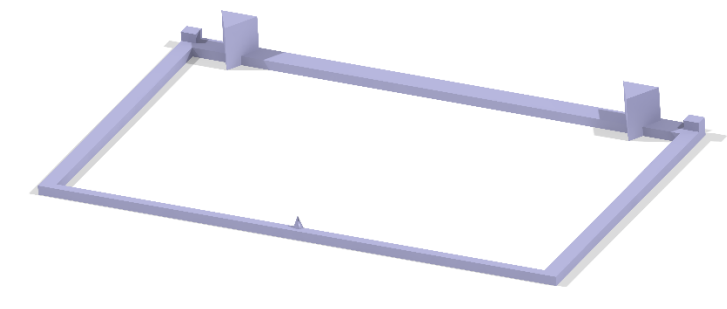
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ASSEMBLY SCHEME

Preparing the pieces:

1. Remove excess material from each plastic component carefully.
2. Paste the filter on the front side of the display box.
3. Paste the rubber vibrator on the frame vibrator.
4. Place and paste the pre-rack on one side of the electronic box.
5. Place the nuts in its places (nut holes) and fix with glue. Be careful not to occlude the inner part of the hole.
   a. Metric 2mm nuts.
   b. Metric 2.5mm nuts.
   c. Metric 3mm nuts.
6. Cut the EVA rubber, cover and paste to the inspection inner.
7. Remove touchscreen from display. Touchscreen is fixed with thermal glue, which to weaken it must be heated to 70 degrees during five minutes.
8. Connect the driver to the display.
9. Install the wiring in the 'Lid' piece.
   a. Place the fans and screw to the lid.
   b. Place the switch in the lid.
   c. Place the power connector.
   d. Follow the electric scheme.

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Steps 2, 4 and 5

HEXNUT M2.5

HEXNUT M2.5

HEXNUT M2

HEXNUT M2
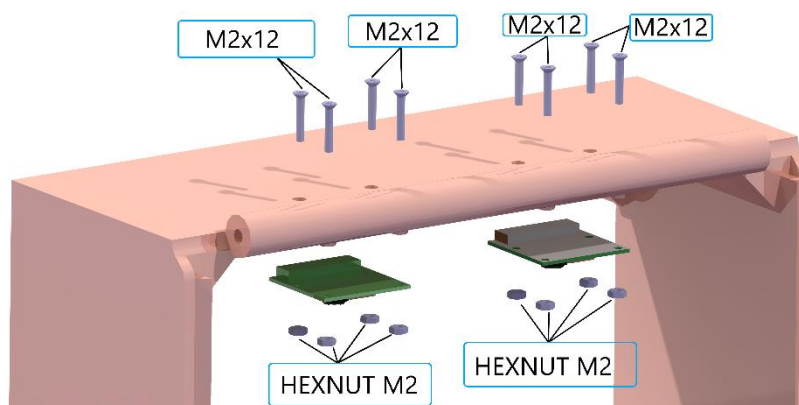
HEXNUT M2

HEXNUT M2

HEXNUT M2
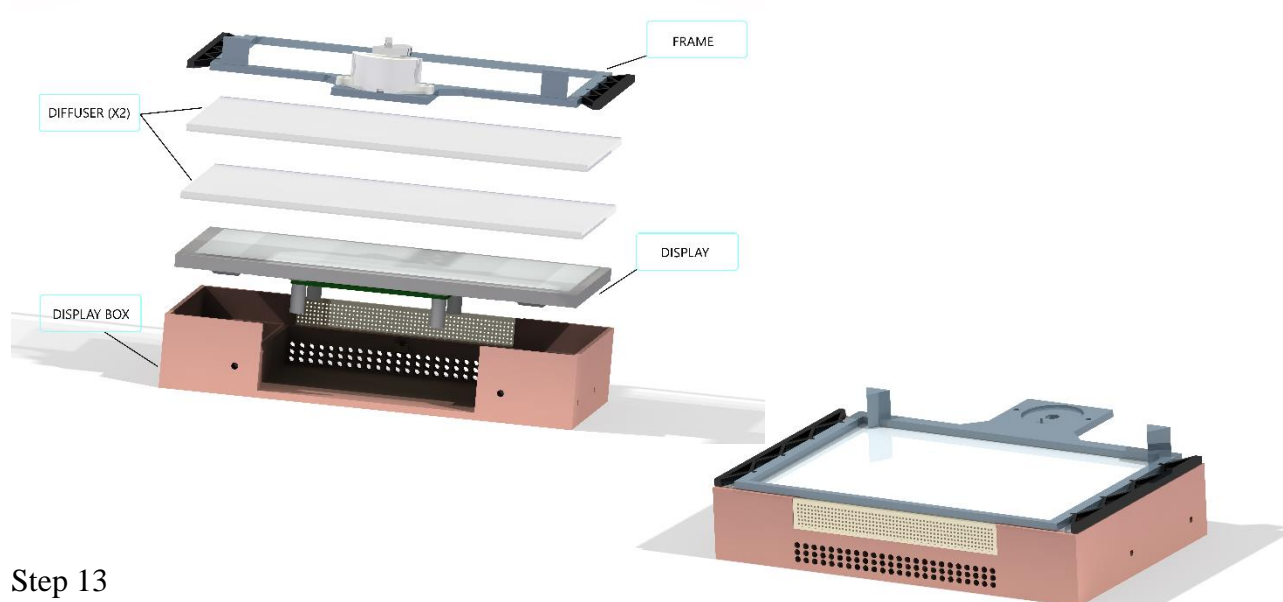
HEXNUT M2

Step 3

<u>Assembly:</u>

10. Place the cameras in its position and screw them to the 'Bridge' piece.
11. Place the display in the display box and place the diffuser on display.
12. Place the frame vibrator on the diffuser.
13. Screw the bridge and the display box between them.
14. Pass the camera cables and the display cable through the slots to electronic box
15. Screw the electronic box to the bridge and to the display box.
16. Screw the Raspberry Pi to the rack and place the rack in the pre-rack slot.
17. Connect the cables.
    a. Connect the camera cables to the multiplexer.
    b. Connect the input multiplexer to the camera slot in Raspberry Pi.
    c. Connect the Dupont cable of multiplexor to GPIO.
    d. Connect the display cable to the camera slot of Raspberry Pi.
    e. Connect the Dupont cable of display supply to the Raspberry Pi GPIO.
    f. Connect the Dupont cable supply to the Raspberry GPIO.
18. Place the lid and screw it to the electronic box.
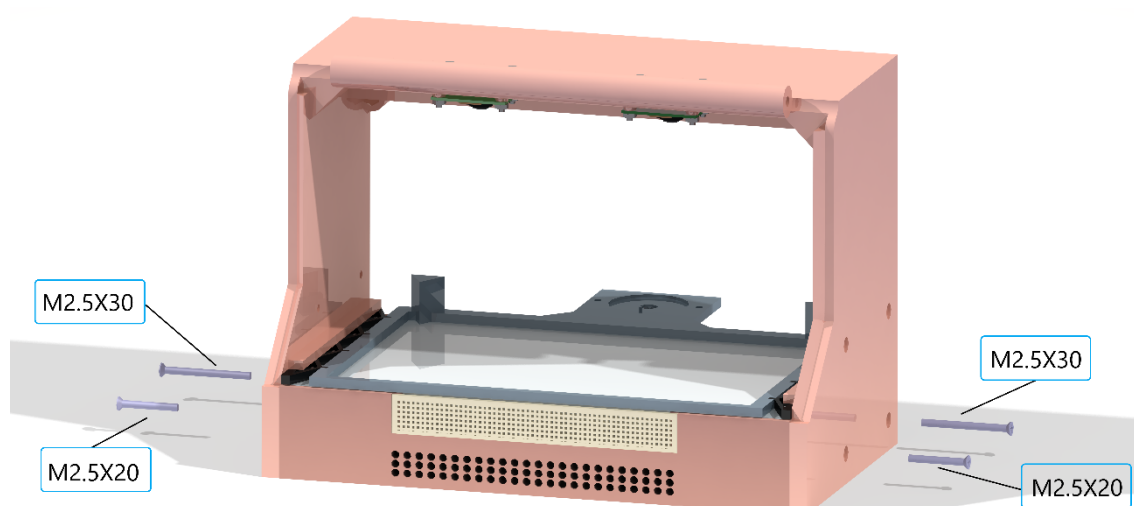19. Place the door and introduce the two bolts in their holes.
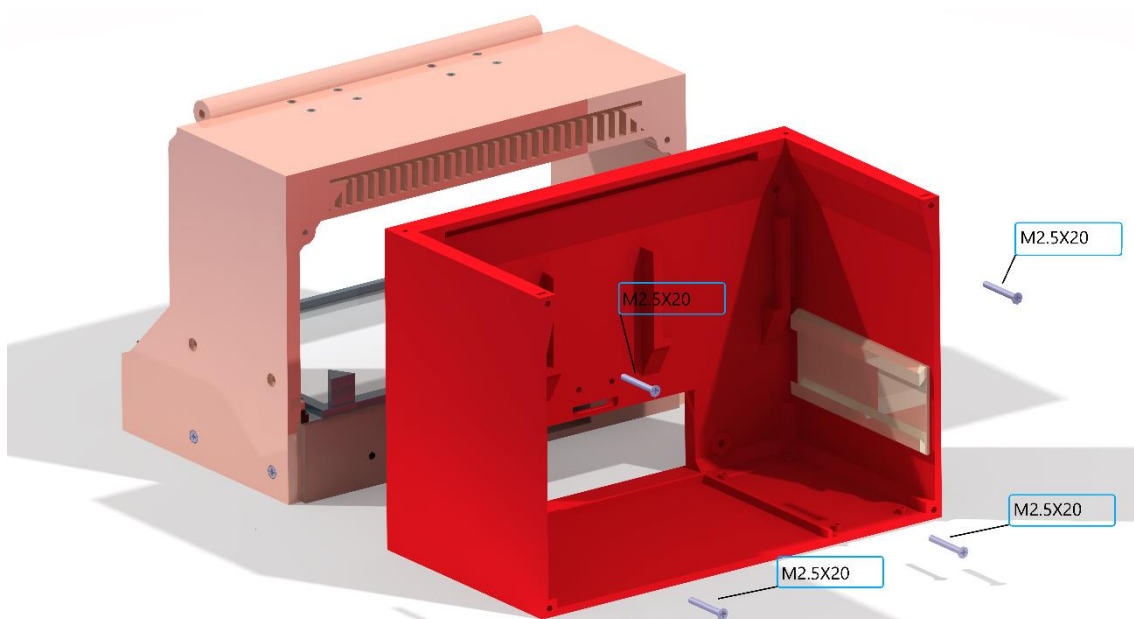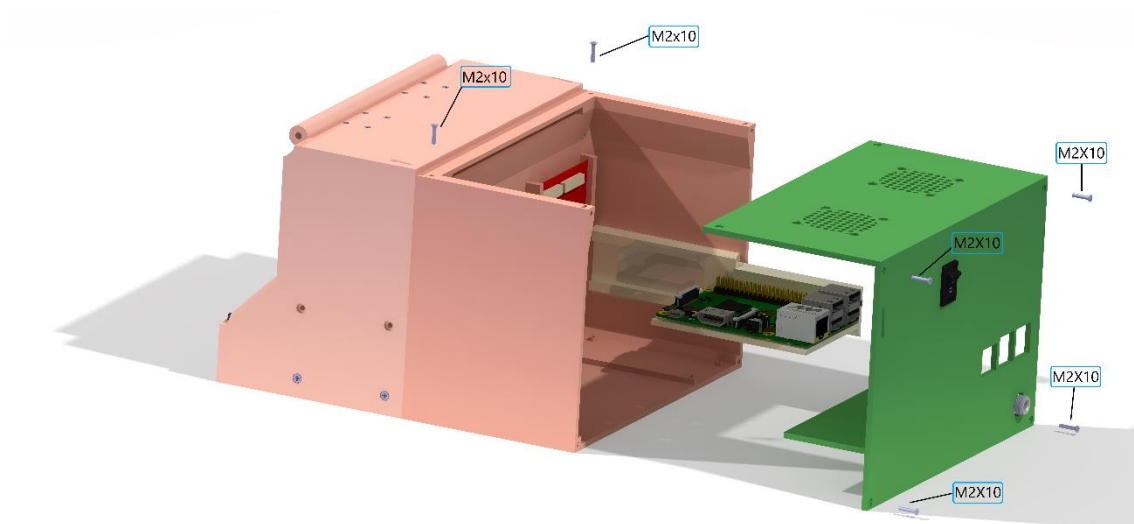
Step 10

Steps 11 and 12

Step 13

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Step 15

Step 18

Step 15

Step 19