VCS^3 3D Kit

Build Guide

Introduction

This document aims to guide the user through the process of building the VCS^3 3D Kit.

The VCS^3 3D Kit is a self-contained hardware platform that houses the Sundance VCS^3 Core, two cameras, a screen, and the VCS^3 Hub. It demonstrates the Core's compact size and performance in video processing applications.

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Assembly Guide

Required items list

3D printed parts:

- 1x VCS^3 Holder
- 1x Bezel
- 1x Frame
- 2x Leg
- 1x Camera Mount

Electrical components:

- 1x screen
  - Model: B101UAN01.7 (10.1”, 1920x1200, 34 pin)
- 1x fan
  - Model: MC30060V2-000U-A99 (30mm x 30mm, 5V)
- 1x mini JST 2 pin male connector
  - Must be soldered to fan wires
- 2x camera
  - Model: Raspberry Pi Camera Module 2 (15 pin)
- 1x VCS^3 Hub
  - Model shown in images is V1.0
- 1x Sundance VCS^3 Core

Cables:

- 1x 4 pin MOLEX (150mm length min)
- 1x 10 pin JTAG (275mm length min)
- 1x 34 pin FFC (0.5mm pitch, 5.98” length)
- 1x 22 pin FFC (0.5mm pitch, 7.97” length)
- 2x 22 pin FFC (0.5mm pitch, 12” length)

Fixings:

- 4x M2.5 25mm plastic screws
- 4x M2.5 nut
- 12x M2 12mm plastic screws (only 11x required if using fan with 3 mounting holes)
- 12x M2 nut
- 6x M3 20mm countersunk screws
- 4x M3 10mm countersunk screws
- 10x M3 nut

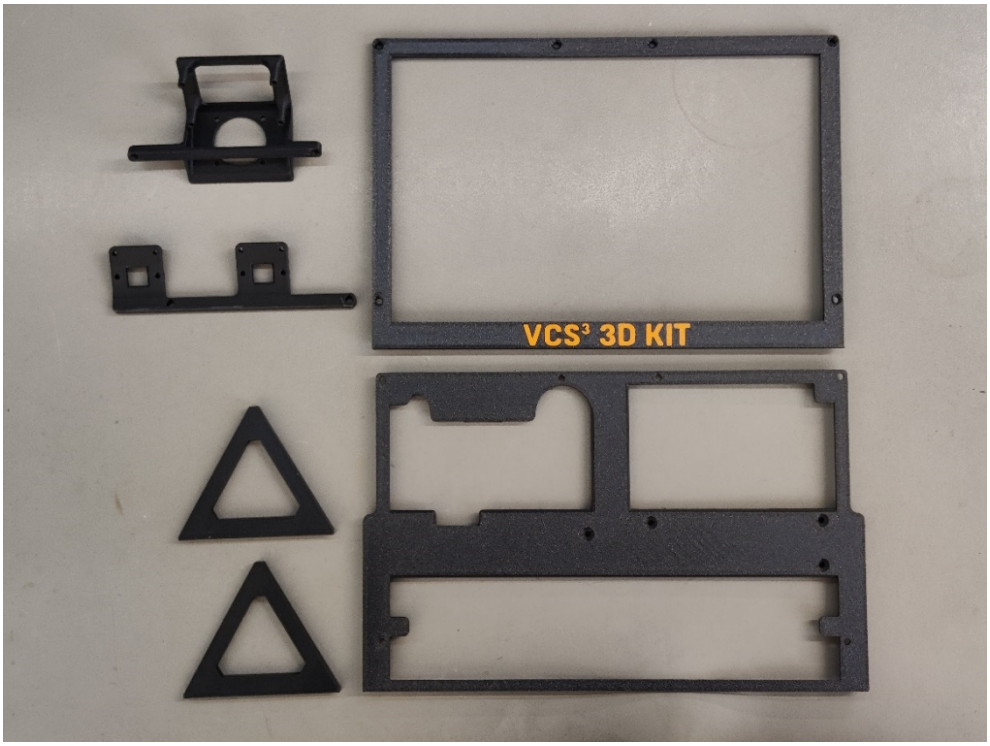

Figure 1: 3D printed parts required for 3D kit assembly.
Clockwise from top left: 1x VCS³ holder, 1x Bezel, 1x Frame, 2x Leg, 1x Camera Mount

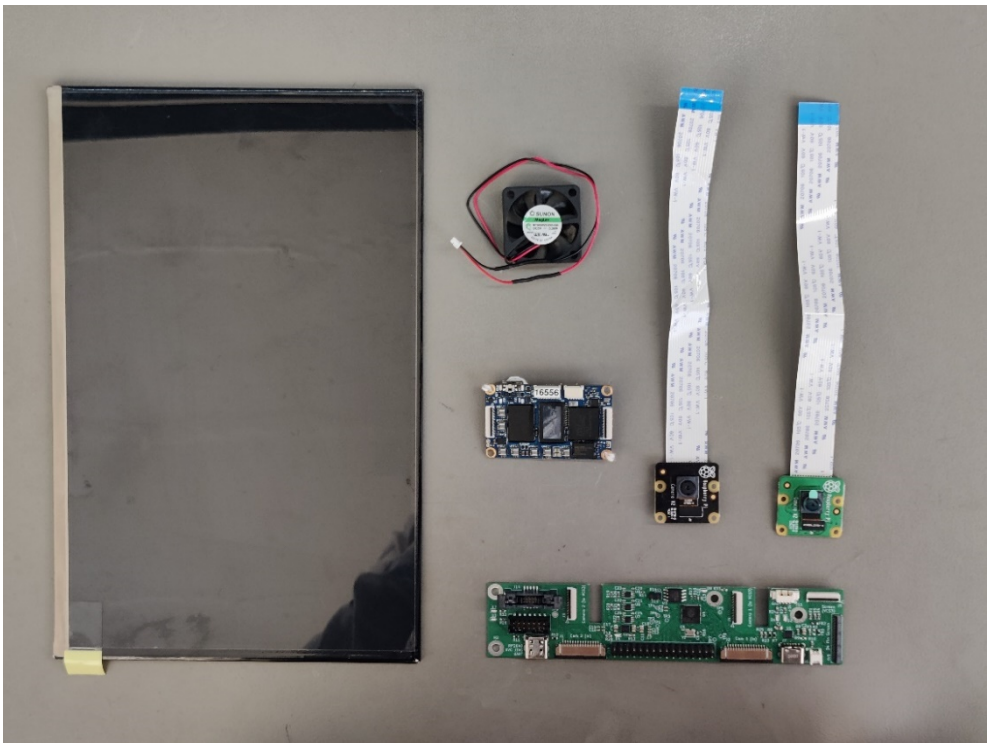

Figure 2: Electrical components required for 3D kit assembly.
Clockwise from left: 1x screen, 1x fan (with mini JST soldered on), 2x camera, 1x VCS³ hub, 1x Sundance VCS³ Core

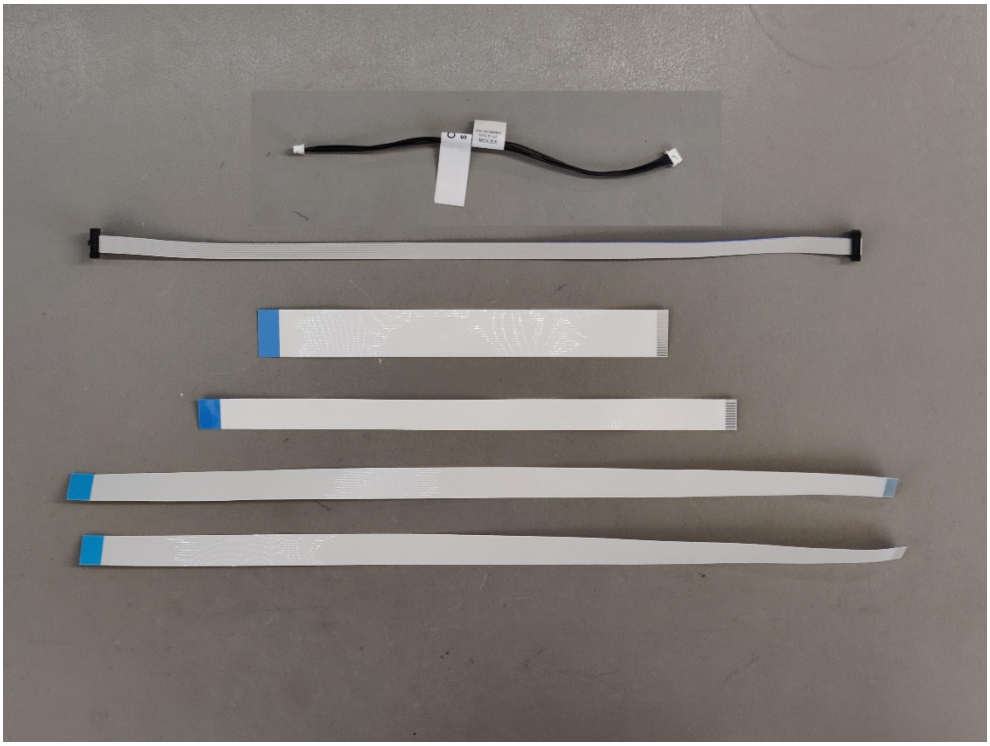

Figure 3: Cables required for 3D kit assembly.
Top to bottom: 1x 4 pin MOLEX (150mm min) 1x 10 pin JTAG (275mm min), 1x 34 pin FFC (0.5mm, 5.98”), 1x 22 pin FFC (0.5mm, 7.97”), 2x 22 pin FFC (0.5mm, 12”)

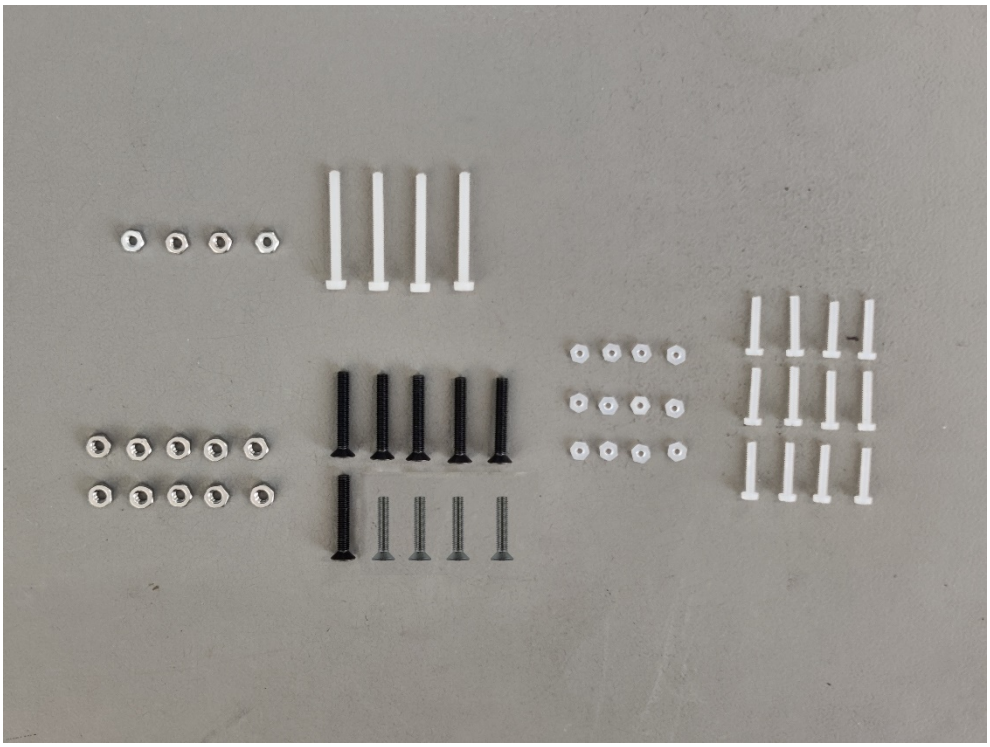

Figure 4: Fixing required for 3D kit assembly.
Clockwise from top left: 4x M2.5 25mm plastic screws, 4x M2.5 nut,
12x M2 12mm plastic screws, 12x M2 nut,
6x M3 20mm countersunk screws, 4x M3 10mm countersunk screws, 10x M3 nut

Assembly

Step 1: Connect cables to VCS^3 Hub

Connect the two long 22 pin FFCs (12”) to the “Camera 1” and “Camera 2” MIPI connectors.

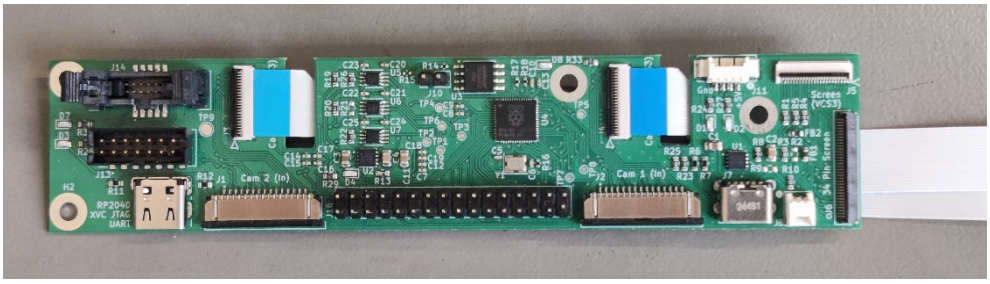

Figure 5: connecting both 22 pin FFCs (12") to Hub. Routed underneath the slots in the PCB

These cables must be routed using two right angle bends to avoid the mounting holes, as below.

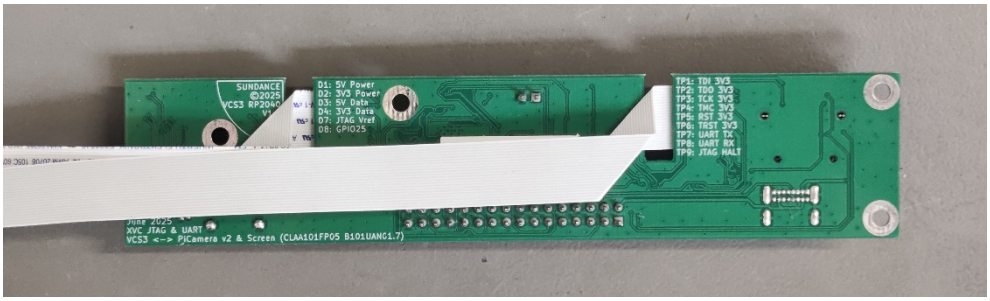

Figure 6: Routing for FFCs. Two sequential bends used to avoid the silver mounting holes

The JTAG cable should then be attached to the port with the levers.

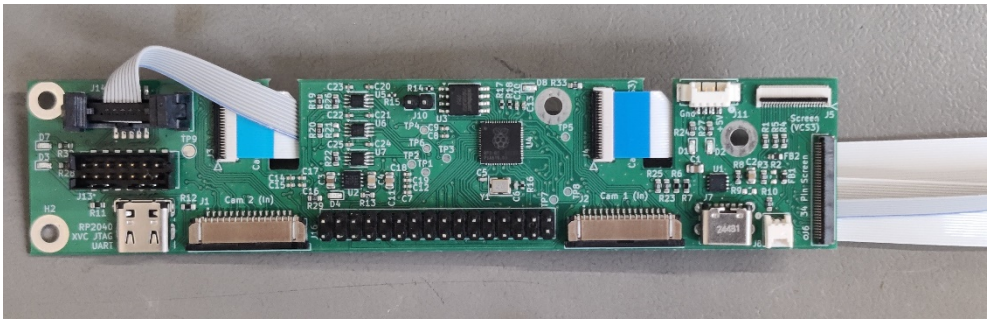

Figure 7: Attaching the JTAG cable. This should be routed under the Hub through the left-side notch. 90-degree bends not essential for this cable

Step 2: Attach the VCS^3 Hub to Frame

Using the 4x M3 10mm countersunk screws and M3 nuts, attach the Hub to the mounting points on the Frame.

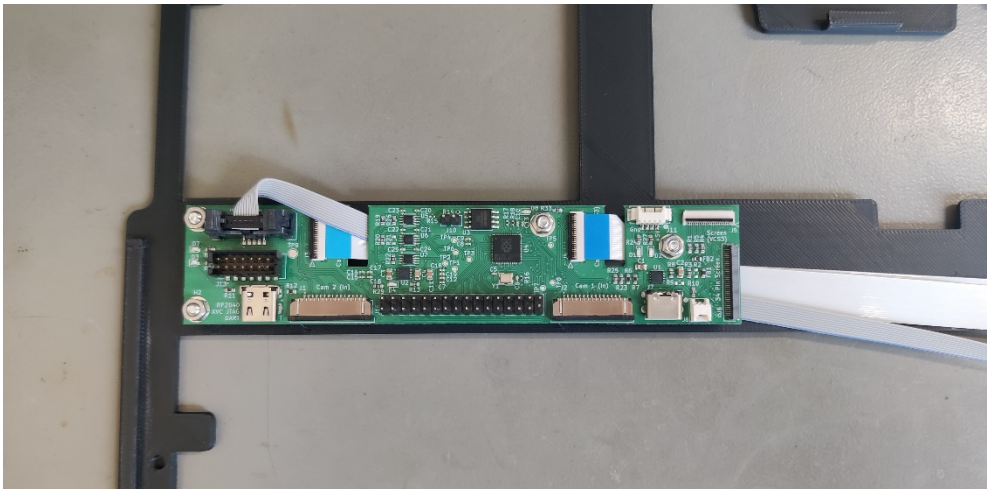

Figure 8: Attaching the Hub to the Frame using M3 screws and nuts

Ensure the screws sit flush on the back side of the Frame. This avoids pressure on the Screen.

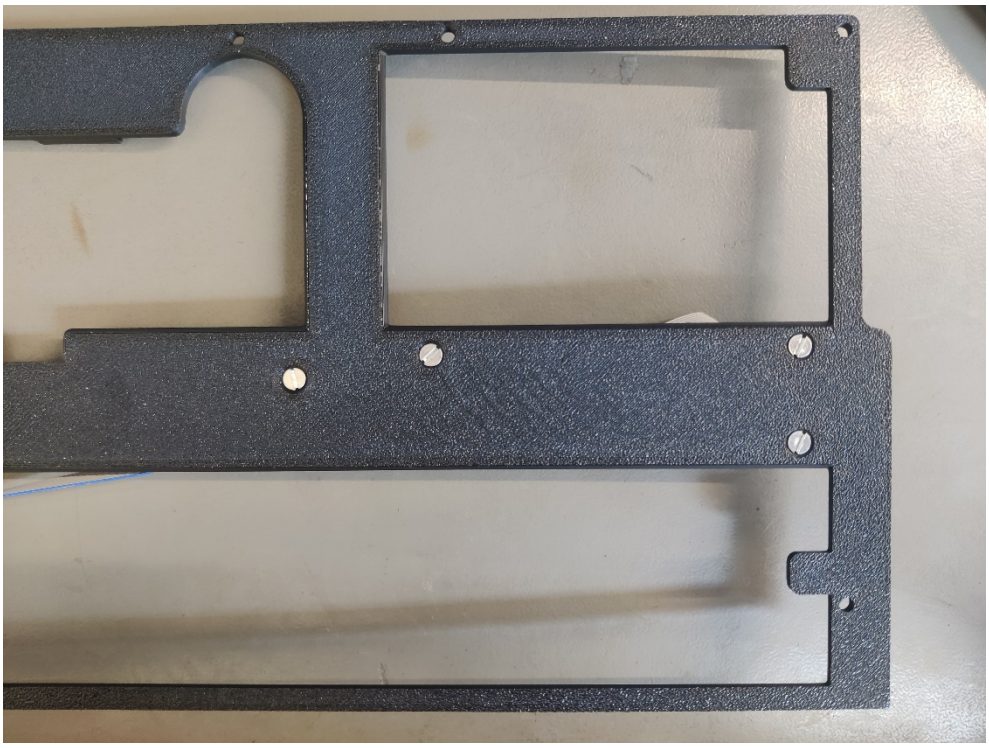

Figure 9: Countersunk screws attaching the Hub to Frame. Ensure the heads are flush with the Frame

Step 3: Attach the Bezel and screen to the Frame

Place the Bezel face down and slot the screen into it. The screen MIPI connector should be at the bottom right when viewed from this angle.

Figure 10: Inserting the screen into the Bezel, face down (rear view)

Then place the Frame onto the Bezel. Using 2x M3 20mm screws with M3 nuts, attach the Frame to the Bezel using the two bottom holes. Ensure the countersunk head is on the front-facing side of the Bezel.

Figure 11: Rear view of Frame placed on Bezel, and attached using the bottom two holes

Step 4: Attach VCS^3 Core and fan to VCS^3 Holder

Using 3x M2 12mm screws and M2 nuts, first attach the fan to the Holder. It is recommended to orient the screw heads on the front side of the holder (see pictures). Ensure that the fan is oriented to blow air over the Core… easy mistake to make :)

Next, using 4x M2.5 25mm screws and M2.5 nuts, attach the VCS^3 Core to the Holder, with the screw heads facing the front side.

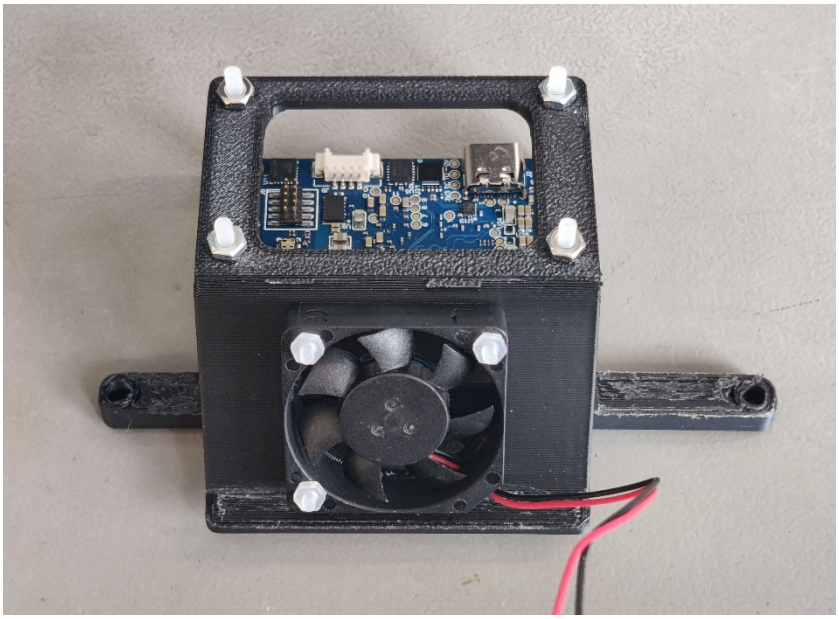

Figure 12: Rear view of the Holder, with the Core and fan attached

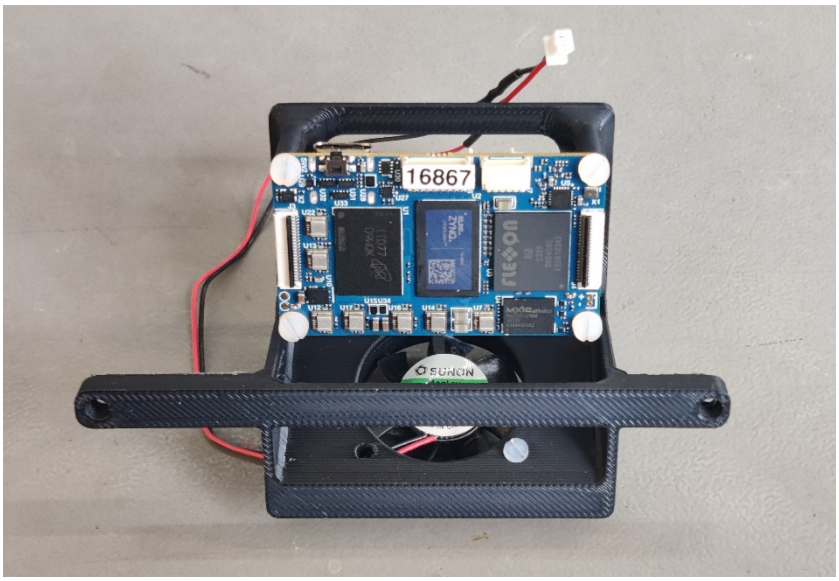

Figure 13: Front view of the Holder, with the Core and fan attached

Step 5: Attach cameras to Camera Mount

The “front” side of the Camera Mount is the concave side.

Using 4x M2 12mm screws and M2 nuts for each camera, attach the cameras to the rear side of the Mount. It is recommended to have the screw heads exposed to the front side of the Mount.

The cameras can be mounted facing forwards or backwards depending on the requirement. Either orientation should always attach to the rear side of the Mount.

The camera orientations shown in the photos may need to be swapped.

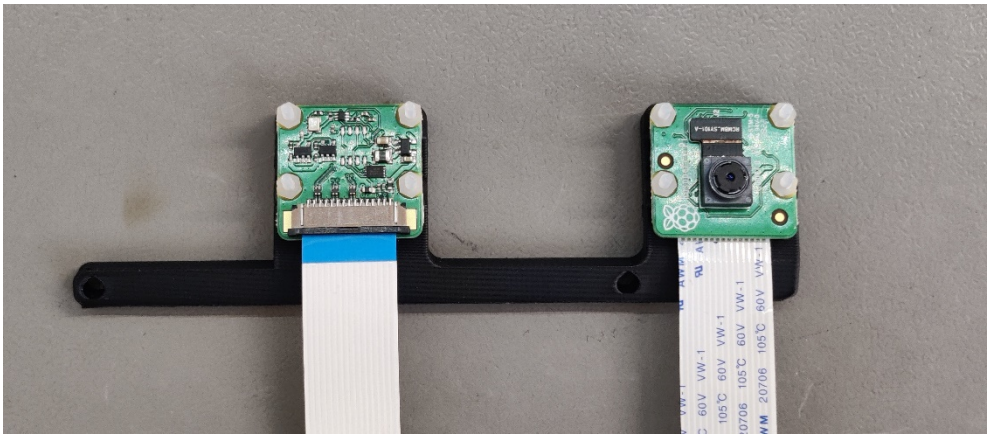

Figure 14: Rear view of the Camera Mount with both cameras attached

Figure 15: Front view of the Camera Mount with both cameras attached.
Both cameras should be attached to the rear side of the Mount

Step 6: Attach the VCS^3 Holder and Camera Mount to the Frame

Before assembly, ensure that the Holder has been adequately post-processed to ensure a good fit to the Frame. See section Post processing for more details.

Using 2x M3 20mm countersunk screws and M3 nuts, attach the VCS^3 Holder to the Frame. As viewed from the rear of the kit, attach to the **two top right holes**. These screws go through the Bezel, Frame, and Holder.

Figure 16: Rear view of VCS Holder attached to Frame

Using the remaining 2x M3 20mm countersunk screws and M3 nuts, attach the Camera Mount to the Frame using the **two top left holes** (when viewed from the rear of the Kit). Ensure the Camera Mount is tilting towards the front of the 3D Kit- see Figure 18 for clarification.

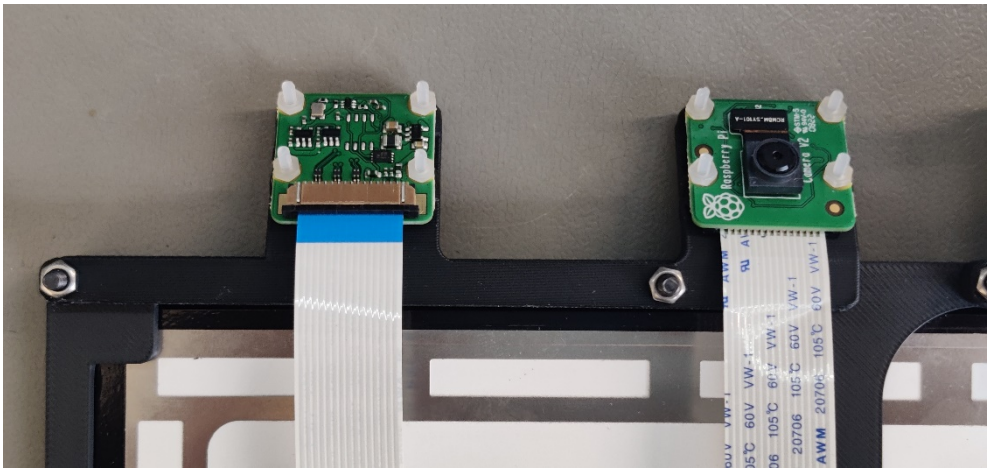

Figure 17: Front view of the 3D Kit with VCS³ Core and Camera Mount attached

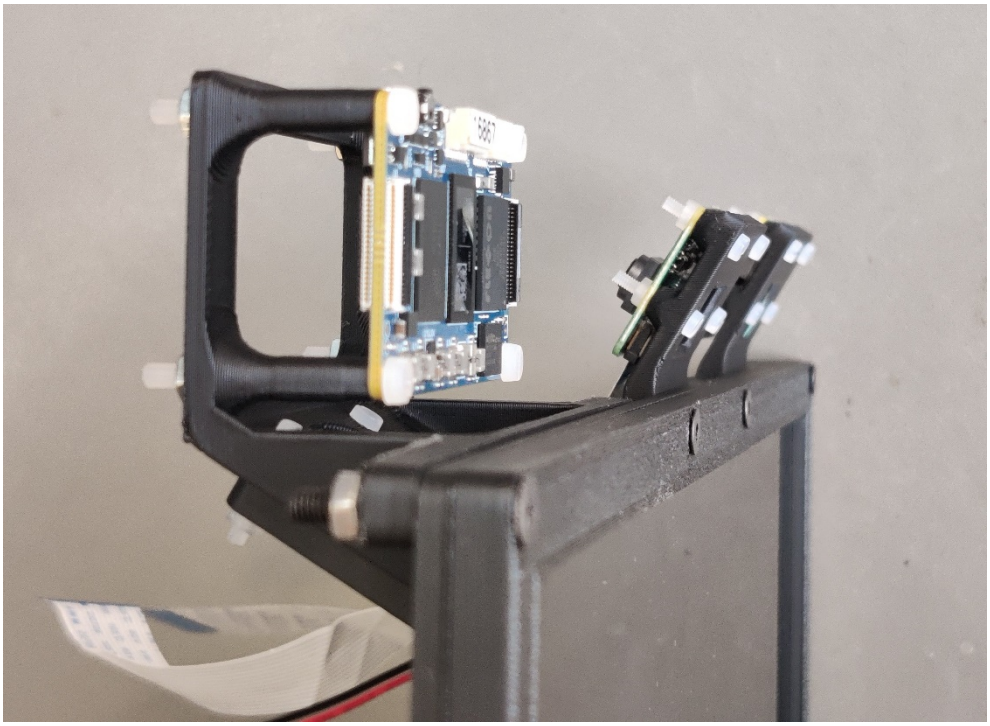

Figure 18: Side view of the 3D Kit. The Camera Mount is angled forwards, which angles the cameras perpendicular to the bottom of the legs

Step 7: Connect the remaining FFCs

Connect the 15 pin camera FFCs to their respective MIPI connectors, feeding the cable under the Hub PCB. If a camera is rear facing, its cable may require a twist. This can be placed underneath the Hub.

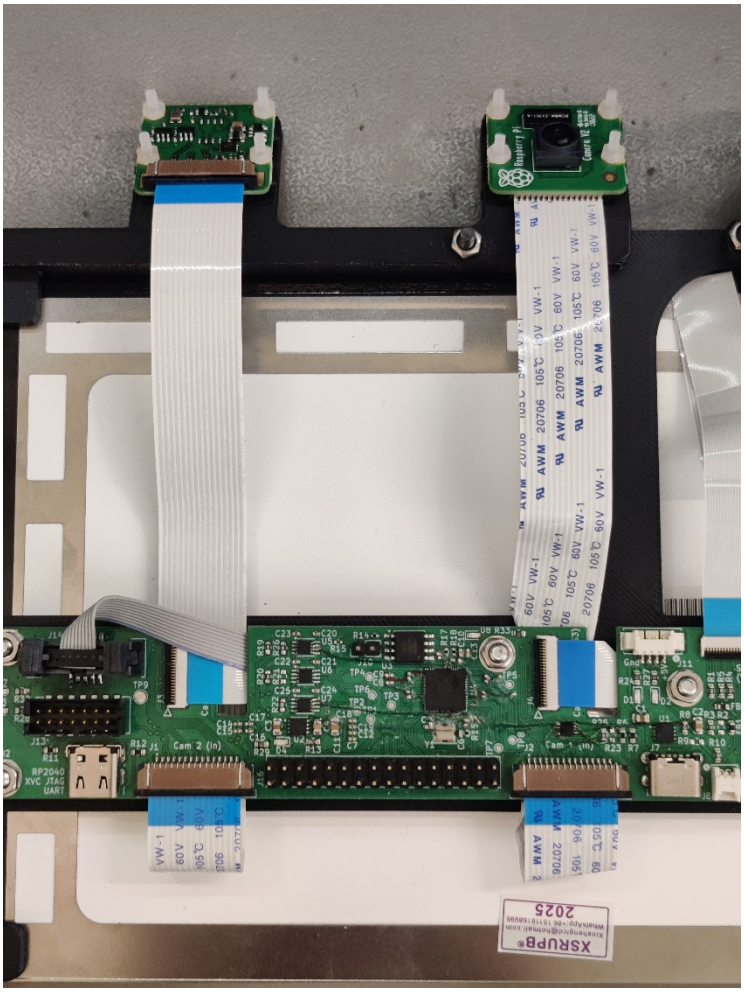

Figure 19: Camera FFCs connected to the VCS³ Hub. The rear facing camera's cable has a twist, which happens underneath the Hub

Then connect the 34 pin FFC (5.98”) to the rightmost MIPI connector on the VCS^3 Hub (as viewed from the rear of the Kit), and to the screen. There is a notch in the Frame which is intended to help with routing the cable underneath the Frame.

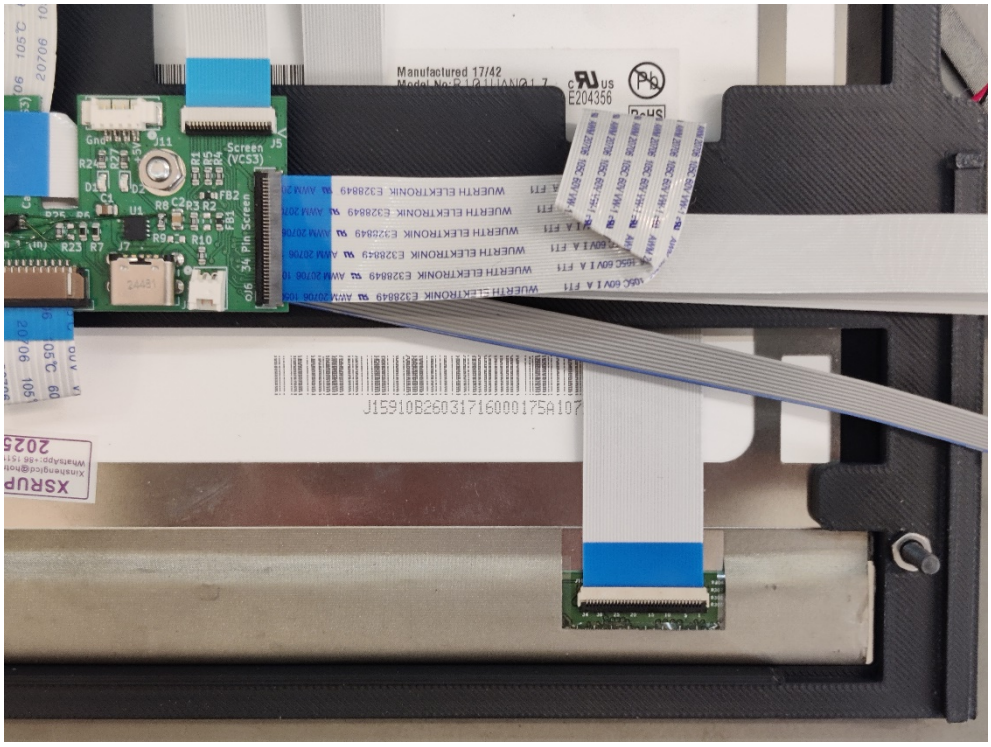

Figure 20: 34 pin FFC connecting the VCS^3 Hub to the screen. The cable is routed underneath the Frame and uses the notch to help.

Connect the 22 pin FFC (7.97”) to the top right screen connector on the VCS^3 Hub (as viewed from the rear of the Kit), and to the front right connector on the VCS^3 Core (as viewed from the front of the Kit).

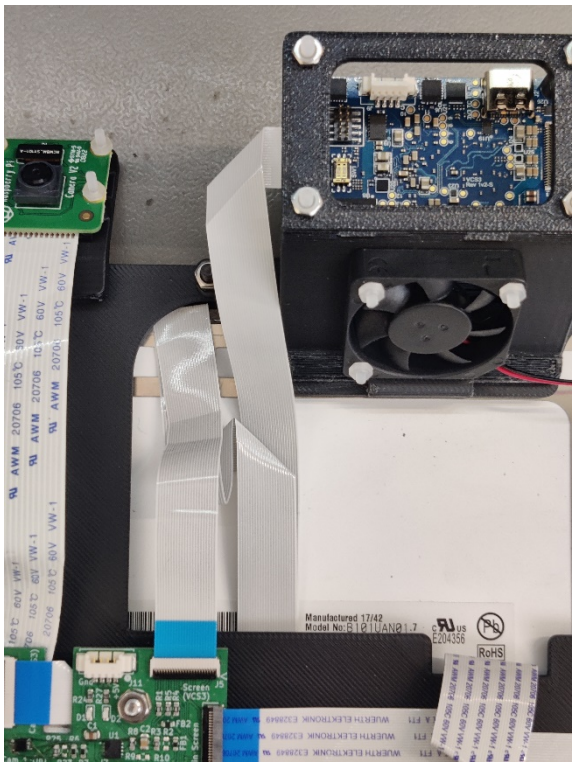

Figure 21: 22 pin FFC (7.97") connected to the top-right screen connector on the VCS^3 Hub. You may have to be creative to route this cable neatly- here it is tucked into both the top and middle sections of the Frame. A shorter cable would also work well

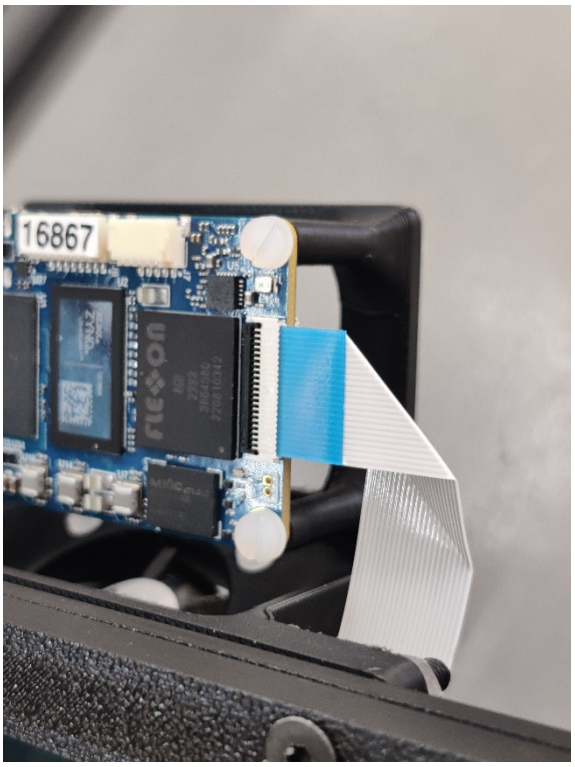

Figure 22: 22 pin FFC (7.97") connected to the front right connector on the VCS^3 Core. There is another 22 pin MIPI connector behind it, which is reserved for a camera connection

Connect the front-facing camera’s FFC to the other right-side MIPI connector on the Core.

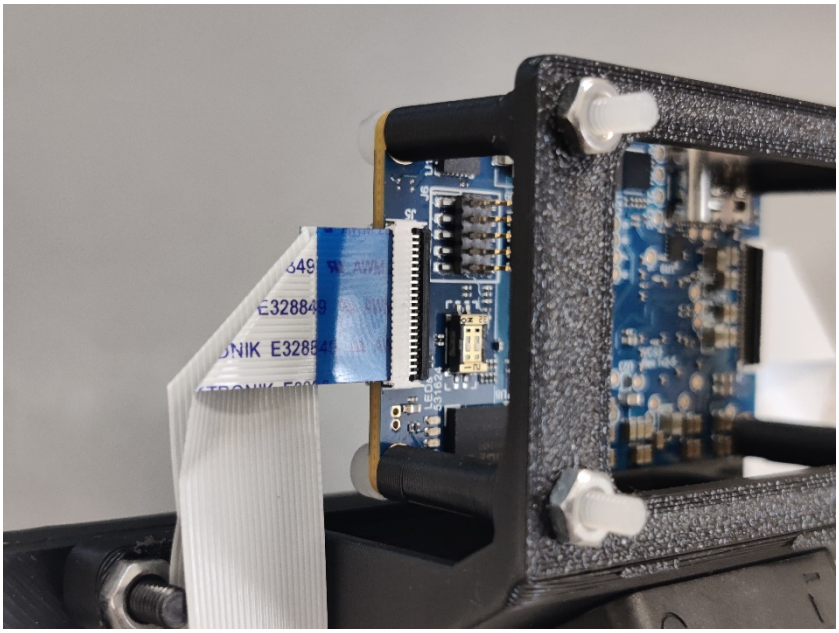

Figure 23: Connecting the front-facing camera to the Core (rear view). It is the closer of the two cables shown here

Connect the rear-facing camera’s FFC to the left front MIPI connector on the Core.

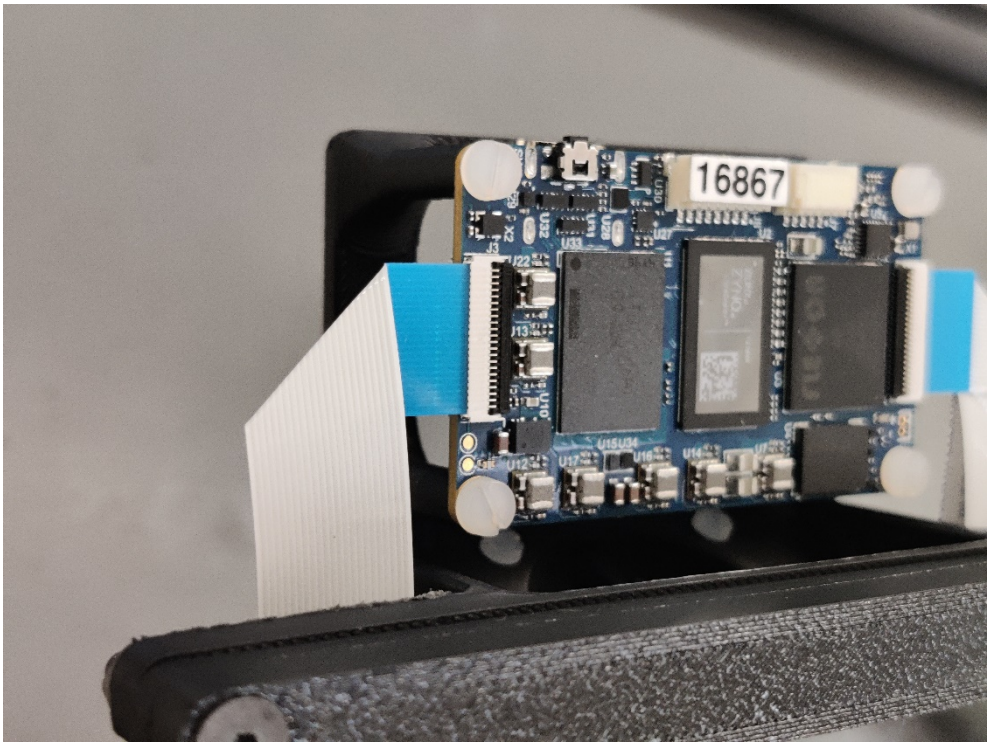

Figure 24: Front view of the rear-facing camera MIPI connection to the Core

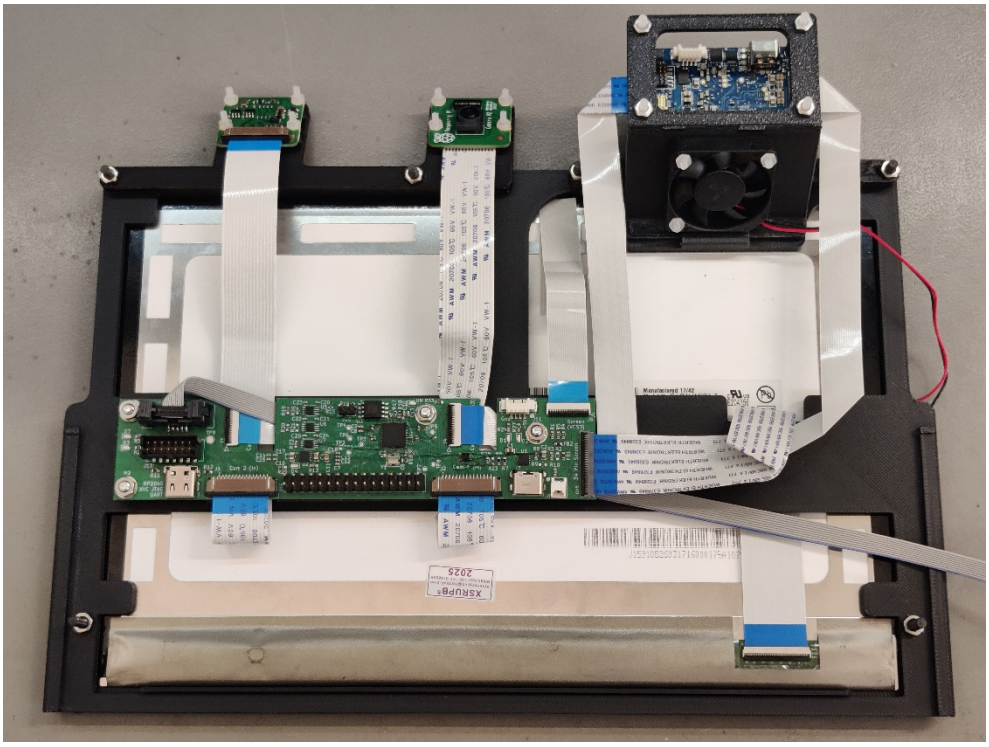

Figure 25: Rear overall view of the 3D Kit with all FFCs connected

Step 8: Connect all remaining cables

Connect the remaining end of the JTAG cable to the rear side of the VCS^3 Core.

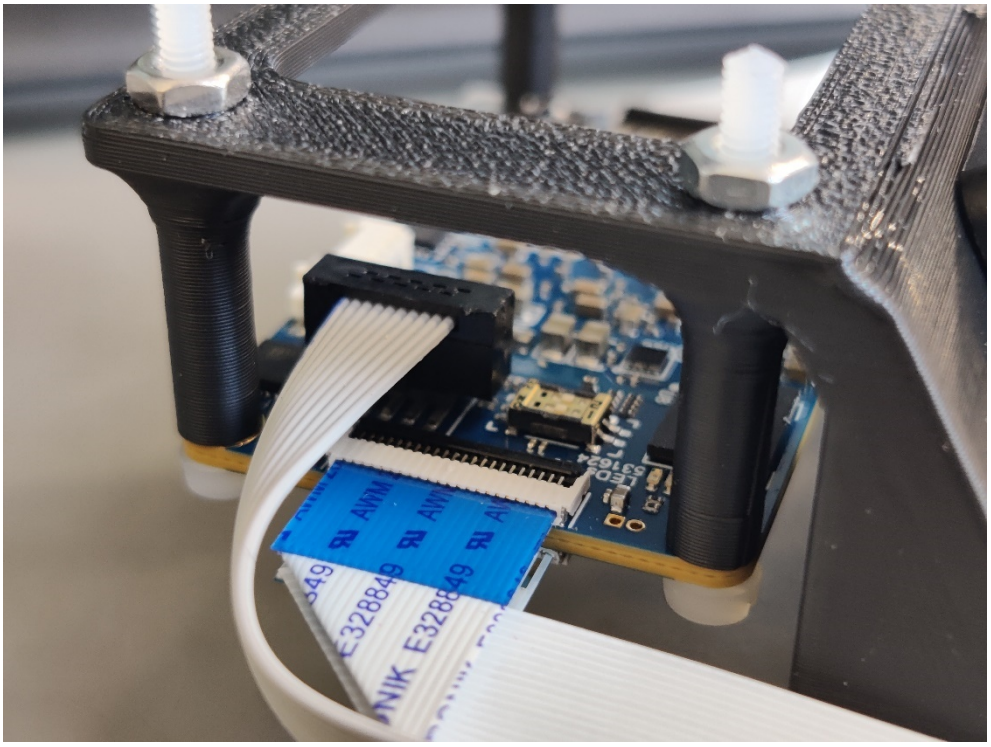

Figure 26: Connecting the JTAG cable to the rear side of the VCS^3 Core

Connect the 4 pin MOLEX cable to the 4 pin port on the VCS^3 Hub, and to the top 4 pin port on the VCS^3 Core.

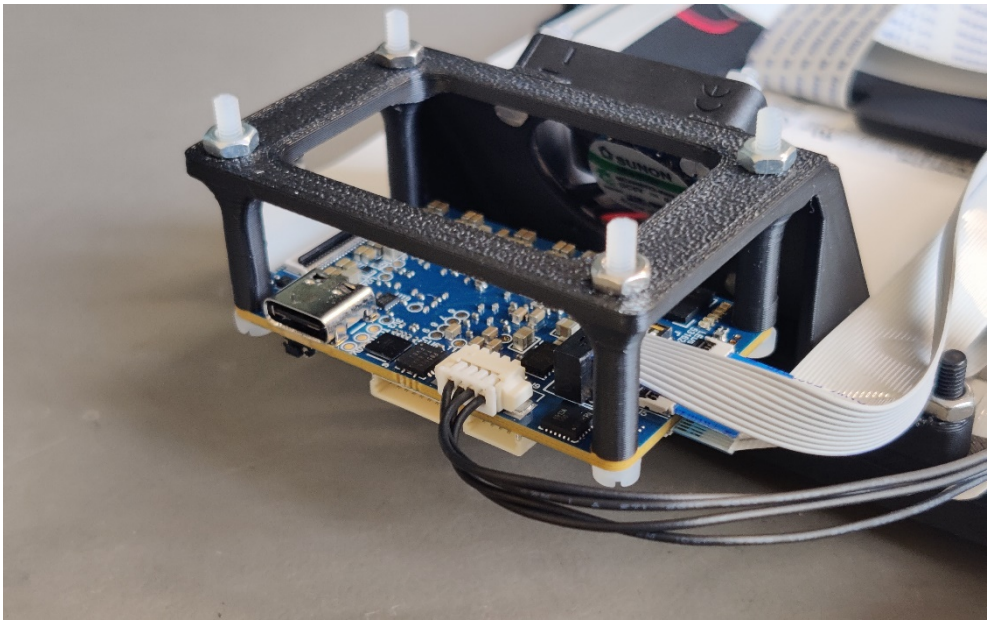

Figure 27: 4 pin MOLEX connecting to the top of the VCS^3 Core

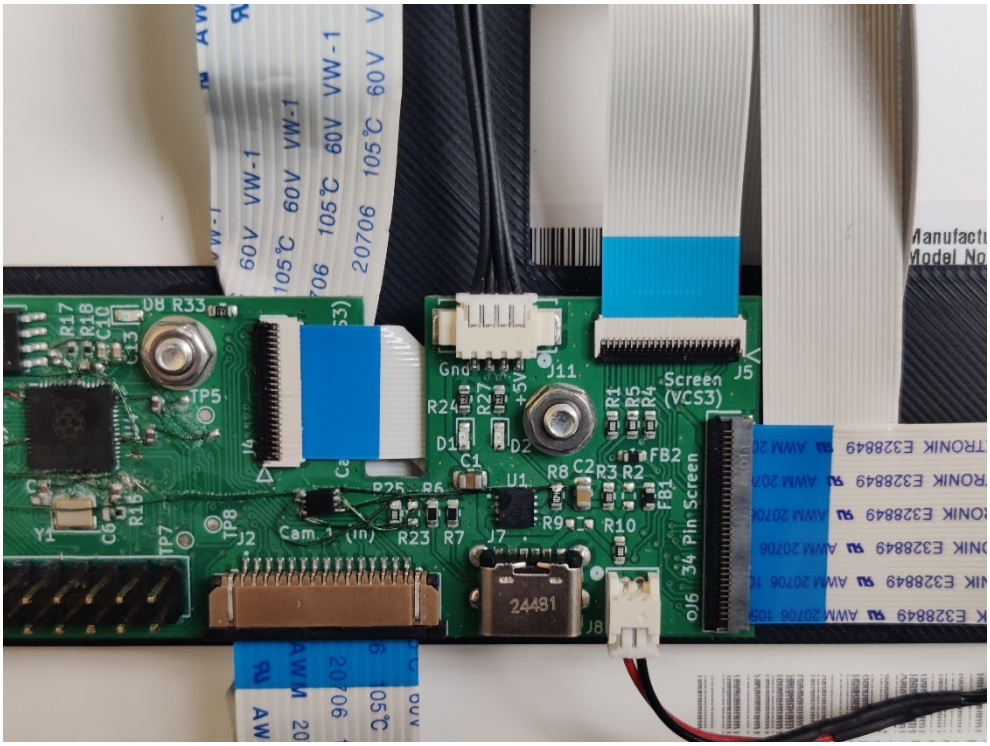

Figure 28: 4 pin MOLEX connecting to the 4 pin port on the VCS³ Hub

Connect the 2 pin fan connector to the bottom two pin port on the VCS³ Hub.

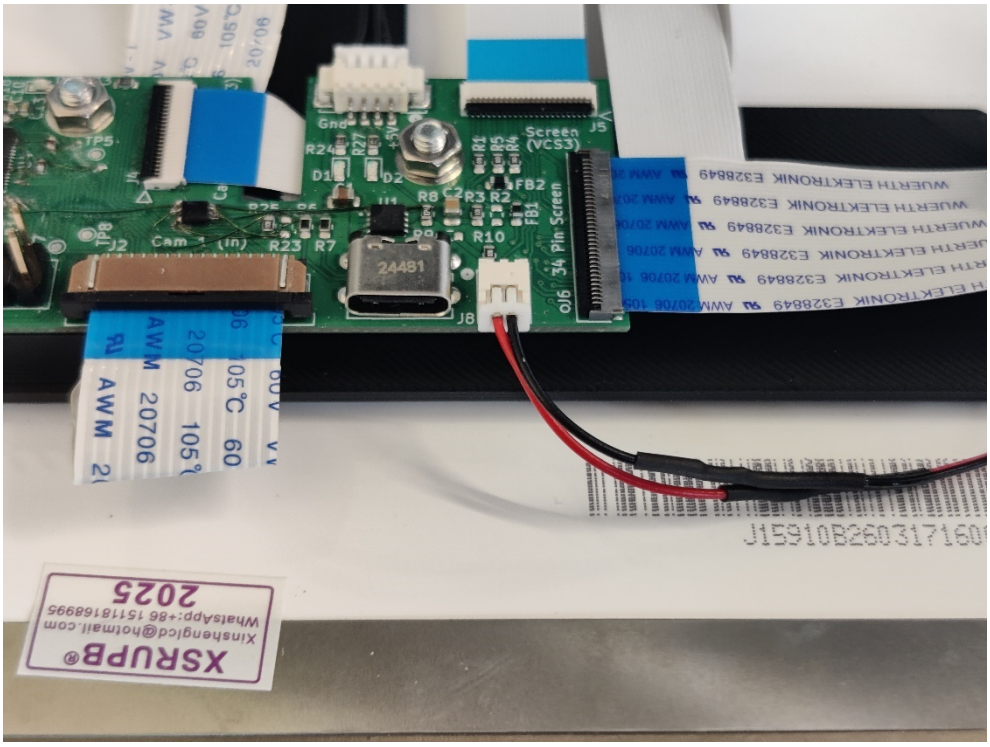

Figure 29: 2 pin fan connector in the VCS³ Hub

Step 9: Attach the legs

The Frame has two dovetail joints, one on each side. Slide the legs on to these joints. They may slide on more easily in one orientation than another, so flip the leg round if it's difficult to attach.

Figure 30: One of the legs attached to the Frame

Figure 31: The 3D Kit sits at a 45 degree angle to the ground

Step 10: Final check

Before powering on any of the devices, double check:

- Cables are not under excessive strain, pinched or otherwise damaged
- There are no shorts from loose wires/ metal scraps
- All cables are fully seated and locked as required
- The cables are in the correct ports with the correct orientations

And you are good to go!