



RASPBERRY PI 5 HOME ASSSISTANT WORKSTATION ASSEMBLY GUIDE

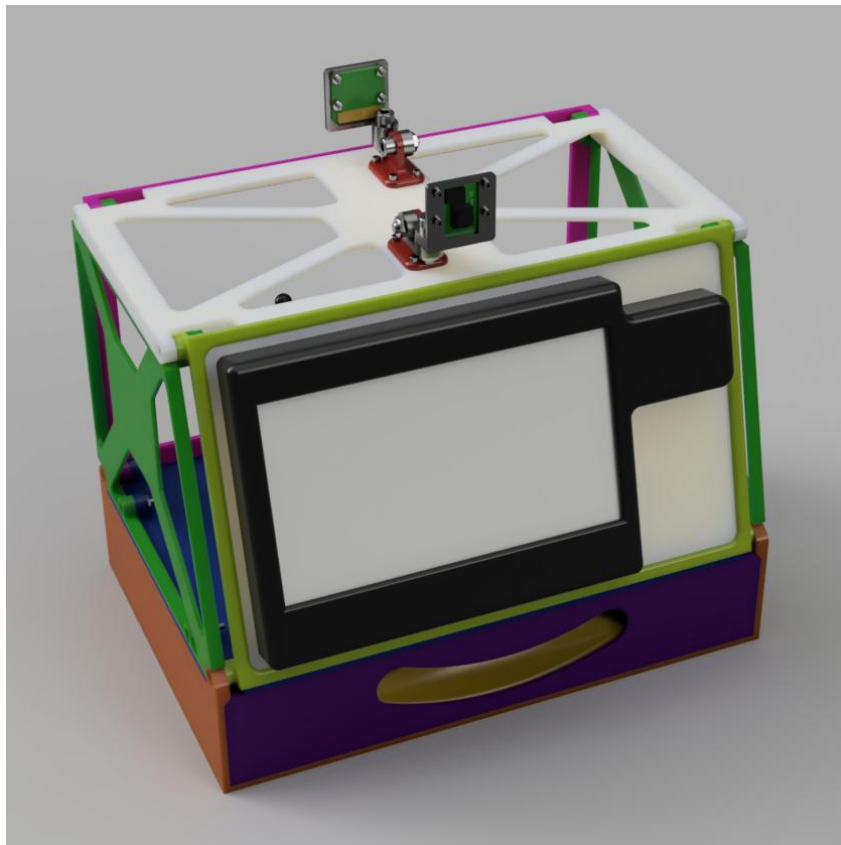
Raspberry PI 5 Home Assistant Workstation Assembly Guide

1. Overview

I designed this Raspberry PI 5 Home Assistant Workstation to neatly house all the hardware required to create a local Smart Home Assistant network hub, enabling anyone to create their own fully private local Smart Home Assistant network to control all the Smart Devices they have in their homes, such as Smart Plugs, Smart Globes and any other Zigbee compatible Smart Home Devices.

This Raspberry PI 5 Home Assistant Workstation can house the following hardware:

- Raspberry PI 5 (4GB, 8GB or 16G) Microprocessor
- Raspberry PI 5 Active Cooler
- Raspberry PI 5 AI Hat (optional)
- Sonoff Zigbee USB Dongle
- Waveshare 7" HDMI LCD (C) Touchscreen Monitor
- Gugxiom 2.4G Wireless Touchpad Keyboard
- PI Camera Module 2 and / or PI Camera Module 3 (optional)



2. Home Assistant Overview

Building Your Own Smart Home with Raspberry Pi 5 and Home Assistant

Imagine having full, private control of your entire smart home including lights, locks, sensors, thermostats, etc., without relying on the cloud, monthly subscriptions, or corporate data collection. With a Raspberry Pi 5 and a Sonoff Zigbee USB Dongle, you can unleash a powerful, secure, local smart home system using Home Assistant, the open-source smart home platform that's taken DIY enthusiasts and professionals by storm.

This setup is not just a hobby project; it is a privacy-centric, customisable, low-cost powerhouse that rivals commercial hubs like Alexa, Google Home, and Apple HomeKit — and in many areas, outperforms them.

Why Use a Raspberry Pi 5 With Home Assistant?

The Raspberry Pi 5 brings significant performance improvements over earlier models, including faster CPU, better networking, and more memory, making it an ideal platform for running Home Assistant smoothly. Home Assistant is a software platform that acts as the central brain of your smart home, coordinating and automating devices from dozens of brands and standards.

Instead of devices talking to remote servers in the cloud, your Raspberry Pi runs the automation locally, meaning:

- **Faster response times:** Commands execute instantly, no internet latency.
- **Greater privacy:** Your data stays in your home network, not on outside servers.
- **More reliability:** Devices continue working even if the internet goes down.
- **No subscription traps:** Full access without paying for premium cloud features.

Using a Raspberry Pi 5 plus Home Assistant gives you not only cost savings, but true ownership of how your smart home behaves.

Enter the Sonoff Zigbee USB Dongle

Most smart home devices communicate wirelessly using protocols like Zigbee, Z-Wave, Wi-Fi, or Bluetooth. Zigbee, in particular, is a low-power, mesh networking protocol used by many affordable and reliable smart devices, from sensors and switches to bulbs and plugs.

The Sonoff Zigbee USB Dongle plugs directly into your Raspberry Pi's USB 3 port and acts as a Zigbee Coordinator, essentially the bridge between Zigbee devices and Home Assistant.

How does it work?

1. **Coordinator Role:** The dongle forms and manages the Zigbee network, allowing devices to join securely.
2. **Mesh Networking:** Zigbee compatible devices (like smart bulbs or sensors) communicate with each other and the dongle, creating a resilient mesh, if one path is blocked, information finds another route.
3. **Device Pairing:** Using Home Assistant's interface, you "pair" Zigbee compatible devices to the Sonoff dongle. Once paired, Home Assistant recognises and controls them.
4. **Local Communication:** All communication between Home Assistant and the Zigbee devices happens locally, there is no need for external servers.

Compared to Wi-Fi devices that can congest your network and rely on cloud services, Zigbee is efficient, reliable, and ideal for battery-powered sensors.

Benefits Over Cloud-Based Smart Home Hubs

You might be asking, why not just use Alexa or Google Home? While they have made smart homes accessible, they come with some limitations:

1. Privacy and Security

Cloud-based systems often send device states, usage patterns, and commands to remote servers.

With Home Assistant:

- **All automation and control stays local.**
- **Your usage data is not harvested for marketing or analytics.**

2. Independence from the Internet

If your internet goes out, Alexa and Google Home might lose control of your smart bulbs or locks. With a Raspberry Pi 5 + Home Assistant:

- **Devices continue functioning normally.**
- **Automations still run without external connectivity.**

3. Interoperability and Flexibility

Commercial hubs often lock you into specific brands or ecosystems. Home Assistant:

- Supports hundreds of brands and standards.
- Lets you create complex automations and dashboards.
- Integrates not only Zigbee but also Wi-Fi, Bluetooth, Infrared, and more.

4. Customisation and Power

With Home Assistant, you can:

- Create conditional automations (e.g., “When motion detected *and* after sunset, turn on hallway light at 30% brightness until no motion is detected for 5 minutes”).
- Build sophisticated dashboards for phones, tablets, or wall displays.
- Customise notifications and alerts without requiring cloud dependencies.

Example Smart Devices You Can Control

Once your Sonoff Zigbee USB Dongle is up and integrated with Home Assistant, you can pair it with a wide variety of Smart Devices. Here are some common Smart Devices:

Smart Lights

- **Zigbee bulbs and LED strips:** Turn on/off, dim, change colour, and automate based on time of day or occupancy.
 - **Example:** “At sunset, gradually ramp living room lighting to 70%.”

Smart Plugs and Switches

- Convert non-smart appliances into controllable devices.
 - **Example:** “Turn off the coffee maker at 9 PM every night.”

Sensors

- **Motion Sensors:** Detect movement to trigger lights or security routines.
- **Door/Window Contacts:** Monitor openings for security or energy savings.
- **Temperature & Humidity Sensors:** Feed data into climate automations.

Thermostatic Controls

- Integrate Zigbee thermostats or radiator valves to maintain comfort efficiently.
 - **Example:** “If the bedroom is below 20°C at 6 AM, increase heating.”

Locks and Security

- Control door locks and integrate with automations like “Lock back door at 10 PM.”

Automations That Bring It All Together

By using Home Assistant, these devices do not just exist, they work in unison:

- When your phone connects to Wi-Fi after 6 PM, activate “Evening Mode”, turn on hallway lights, adjust thermostat, and arm entry sensors.
- If a water sensor detects moisture while you are away, flash lights and send a mobile alert, all without cloud delays.

Summing Up: Smart, Secure, and Yours

Building a Home Assistant network with a Raspberry Pi 5 and a Sonoff Zigbee USB Dongle is one of the most exciting ways to take control of your smart home. It combines performance, privacy, flexibility, and fun into a system that is both powerful enough for experts and approachable for beginners.

Whether you are driven by privacy, frustrated with cloud features behind paywalls, or simply curious about automation’s potential, this DIY smart home setup offers a compelling path forward. You are not just installing devices, you are creating an intelligent environment that responds to your life, your preferences, and your values.

Welcome to the future of truly **your** smart home.

3. Bill Of Materials

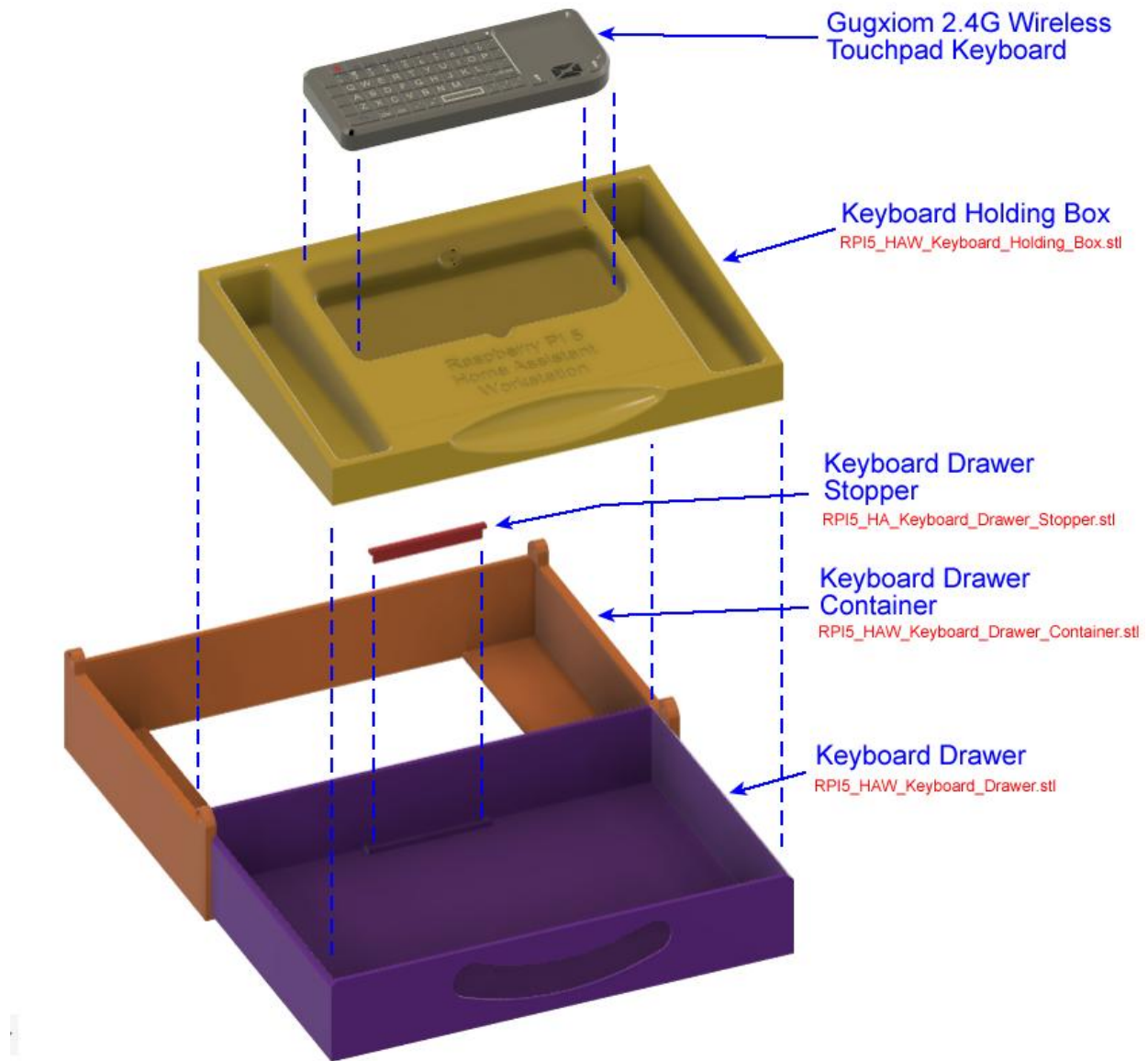
Part No.	File Name / Description
1	RPI5_HA_Keyboard_Drawer.stl / Keyboard Drawer
2	RPI5_HA_Keyboard_Drawer_Stopper.stl / Keyboard Drawer Stopper
3	RPI5_HA_Keyboard_Drawer_Container.stl / Keyboard Drawer Container
4	RPI5_HA_Keyboard_Holding_Box.stl / Keyboard Drawer Holding Box
5	Gugxiom 2.4G Wireless touchpad Keyboard
6	RPI5_HA_Hardware_Support_Plate.stl / Hardware Support Plate
7	Sonoff Zigbee USB Dongle
8	RPI5_HA_Zigbee_USB_Dongle_Holder_Cover.stl / Zigbee USB Dongle Holder Cover
9	Raspberry PI 5 (4GB, 8GB or 16GB) Microprocessor
10	Raspberry PI 5 Active Cooler
11	Raspberry PI 5 AI Hat (optional)
12	RPI5_HA_Raspberry_PI_5_Container_Cover.stl / Raspberry PI 5 Container Cover
13	RPI5_HA_Top_Panel.stl / Top Panel
14	RPI5_HA_Left-Hand_Side_Panel.stl / Left-hand Side Panel
15	RPI5_HA_Right-Hand_Side_Panel.stl / Right-hand Side Panel
16	RPI5_HA_Rear_Panel.stl / Rear Panel
17	RPI5_HA_PI_Camera_Module_2_or_3_Bracket_Stand.stl / PI Camera Module 2 or 3 Bracket Stand (optional)
18	RPI5_HA_PI_Camera_Module_Stand_Vertical_Axis_Bracket.stl / PI Camera Module Stand Vertical Axis Bracket (optional)
19	RPI5_HA_PI_Camera_Module_2_or_3_Stand_Holding_Bracket.stl / PI Camera Module 2 or 3 Stand Holding Bracket (optional)
20	PI Camera Module 2 and / or 3 x 1 or 2 (optional)
21	RPI5_HA_7_inch_HDMI_LCD_Screen_Support_Base.stl / 7" HDMI LCD Screen Support Base
22	Waveshare 7" HDMI LCD (C) Screen
23	RPI5_HA_7_inch_HDMI_LCD_Screen_Cover.stl / 7" HDMI LCD Screen Cover
24	RPI5_HA_7_Inch_HDMI_LCD_Screen_Support_Base_Cover_Plate.stl / 7" HDMI LCD Screen Support Base Cover Plate
25	M3 Threaded Heat-set Insert x 4
26	M2 Hexagon Socket Head Bolt x 12mm Long x 16 (optional)
27	M3 Hexagon Socket Head Bolts x 8mm Long x 4
28	M3 Hexagon Socket Head Bolt x 12mm Long x 4
29	M3 Hexagon Socket Head Bolt x 16mm Long x 4 (optional)
30	M5 Hexagon Socket Head Bolt x 20mm Long x 4
31	M2 Hexagon Nut x 16 (optional)
32	M3 Hexagon Nut x 8
33	M5 Hexagon Nut x 4 (optional)

NOTE: All of the 3D Parts should be printed by aligning the parts horizontally with your 3D Printer's printing plate, except for the Keyboard Drawer (RPI5_HA_Keyboard_Drawer.stl), which is best printed aligned at 45 degrees to your 3D Printer's printing plate. This will greatly reduce the printing time and supports auto generated to 3d print this part, thus saving you a lot of wasted filament. Refer to the photograph below:



4. Assembly Guide

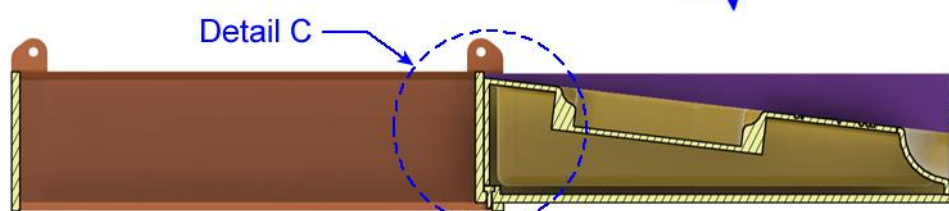
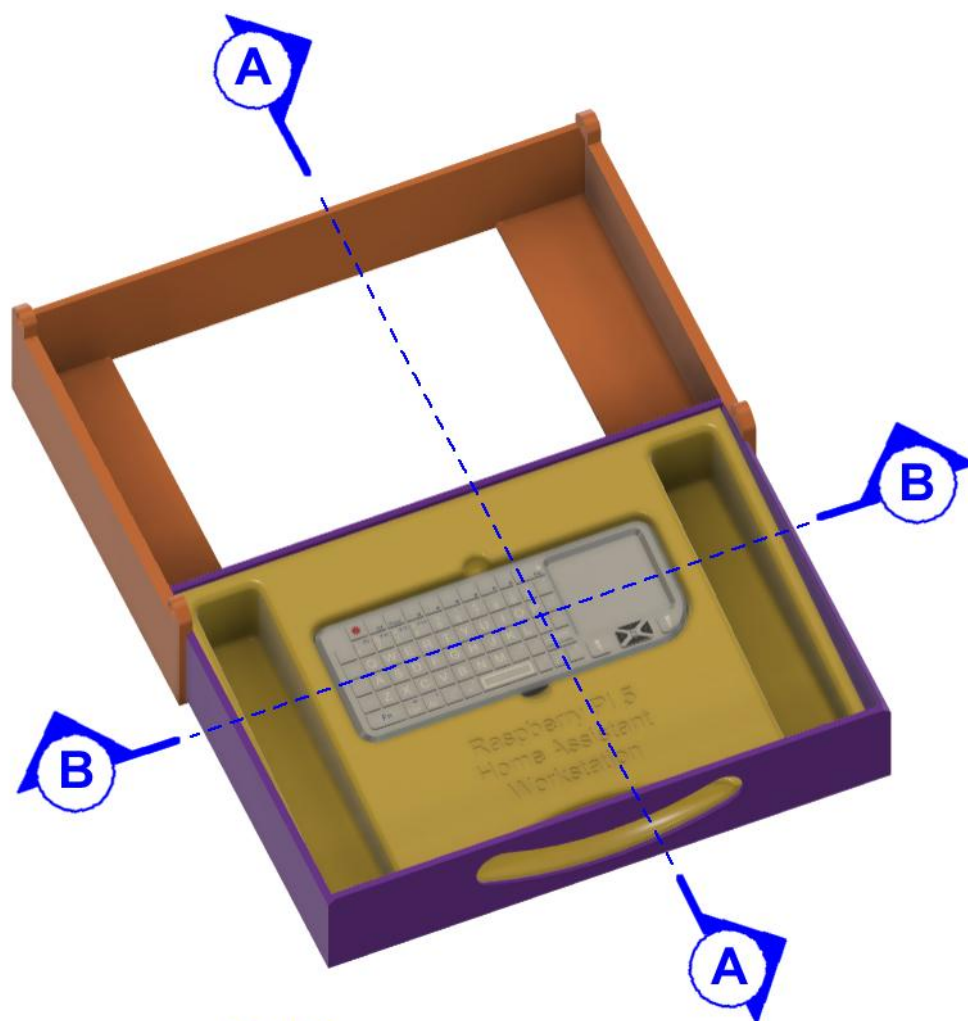
A. Keyboard Drawer Assembly



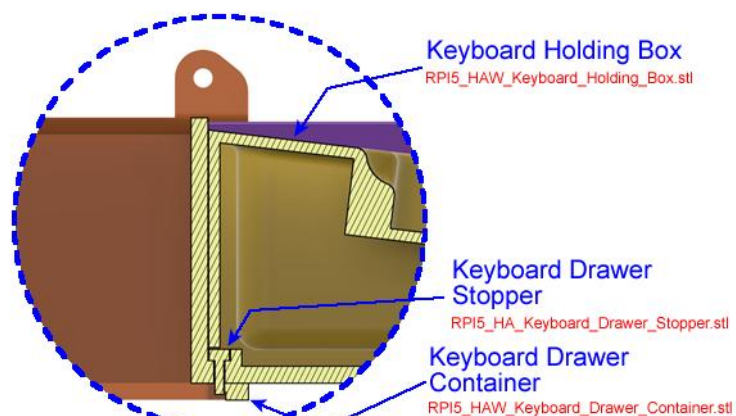
The first stage of the assembly process is to assemble the Keyboard Drawer parts. This is relatively straight forward, aside from inserting the Keyboard Drawer Stopper. The Keyboard Drawer Stopper is designed to stop the Keyboard Drawer from completely sliding out of the Keyboard Drawer Container. Refer to Enlarged Detail C in the diagram below.

The easiest way to insert the Keyboard Drawer Stopper into the Keyboard Drawer is to insert the start of the Keyboard Drawer into the Keyboard Drawer Container then rotate the Keyboard Drawer down in the horizontal plane, until you can push the Keyboard Drawer Stopper through the slot at the rear of the Keyboard Drawer. Once you have done this correctly; you can insert the Keyboard Holding Box into the Keyboard Drawer. Next, remove the Keyboard USB Dongle from the Gugxiom 2.4G Wireless Touchpad Keyboard and turn its power switch ON. Now insert the Keyboard USB Dongle into one of the USB2.0 ports on your Raspberry PI 5 and insert the Gugxiom 2.4G Wireless Touchpad Keyboard into the Keyboard Holding Box. You can then slide the Keyboard Drawer into the Keyboard Drawer Container, and the Keyboard Drawer should not be able to slide completely out of the Keyboard Drawer Container.

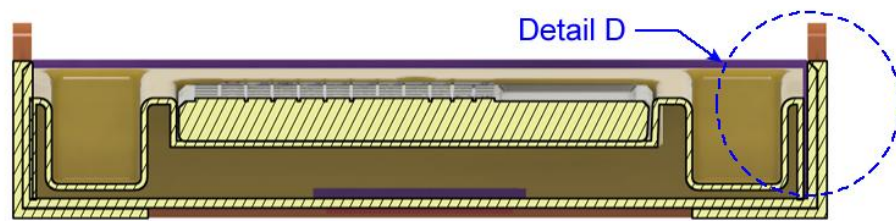
The Keyboard Drawer is prevented from being able to be pulled out of the Keyboard Drawer Container due to the 45-degree angled lip at the top of the Keyboard Drawer Container. Refer to Enlarged Detail D below.



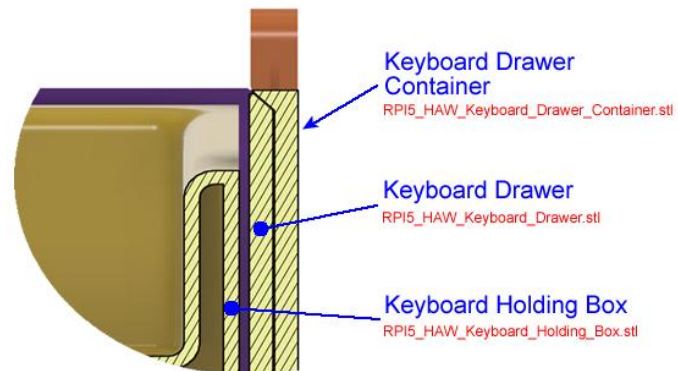
Section A-A



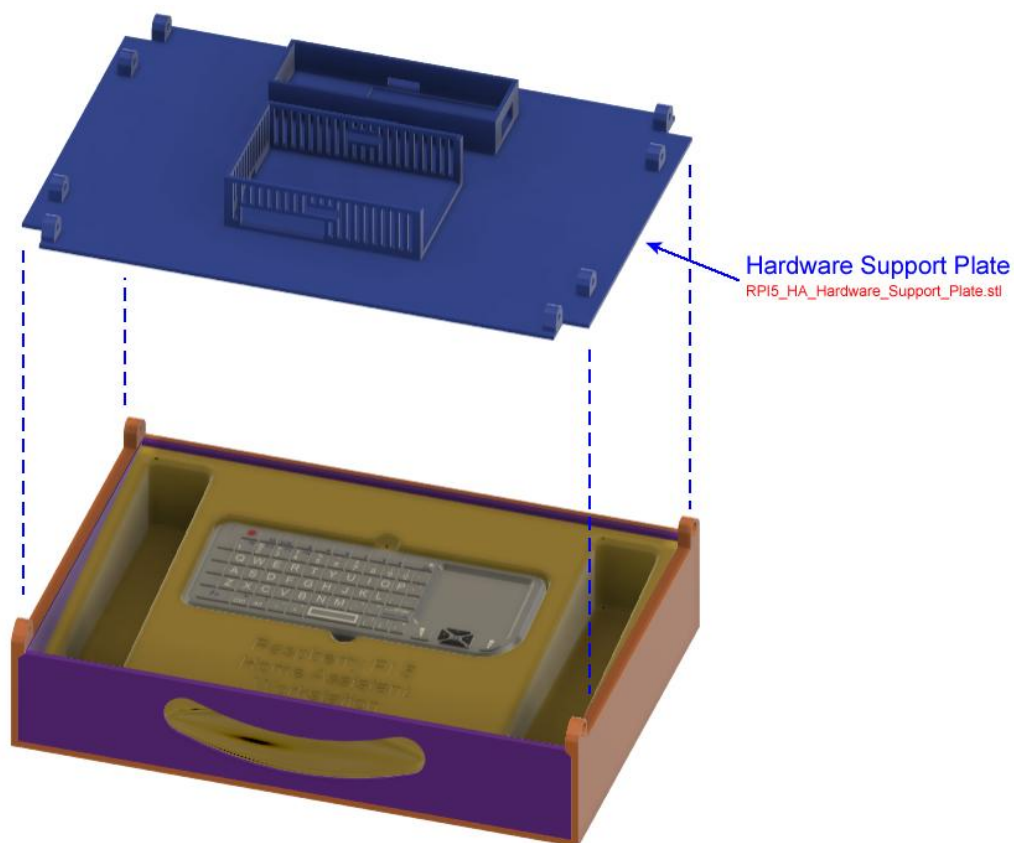
Enlarged Detail C



Section B-B



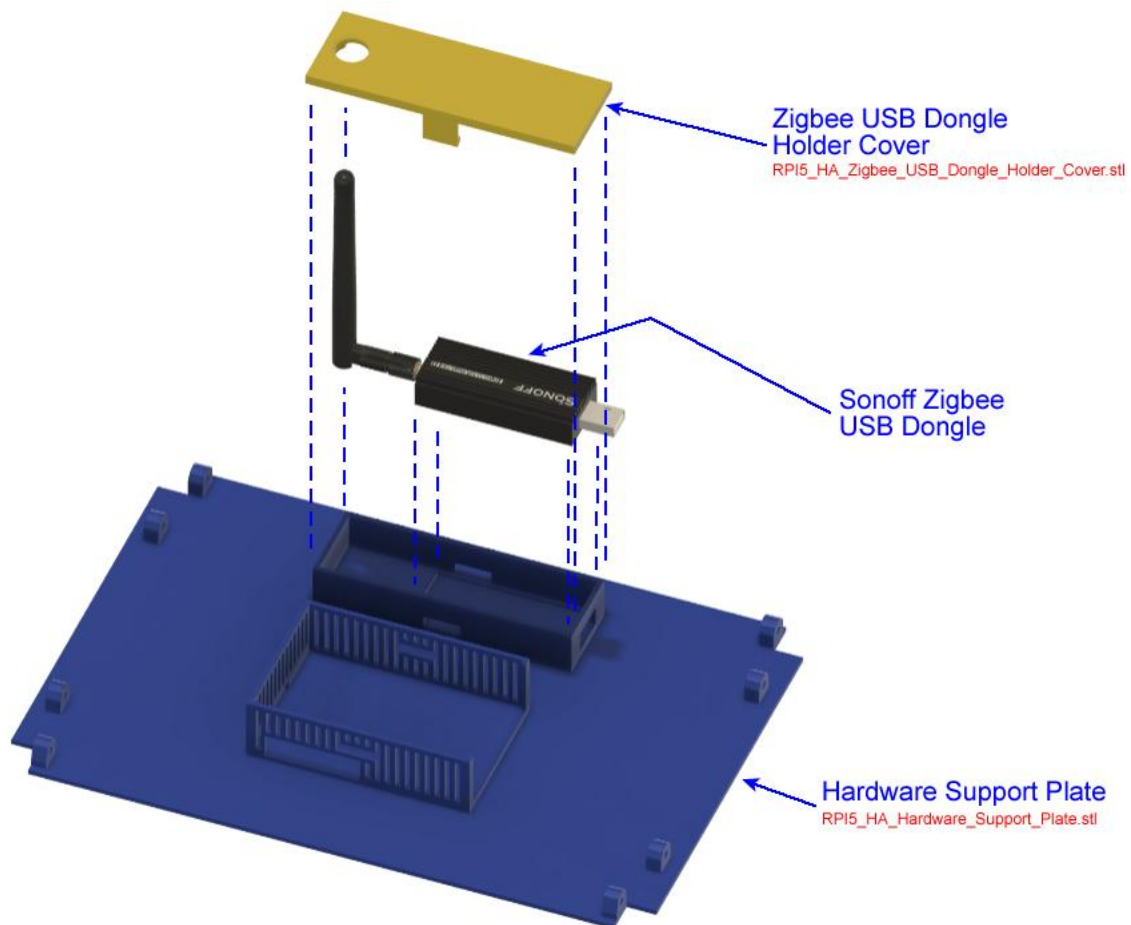
Enlarged Detail D



B. Hardware Assembly

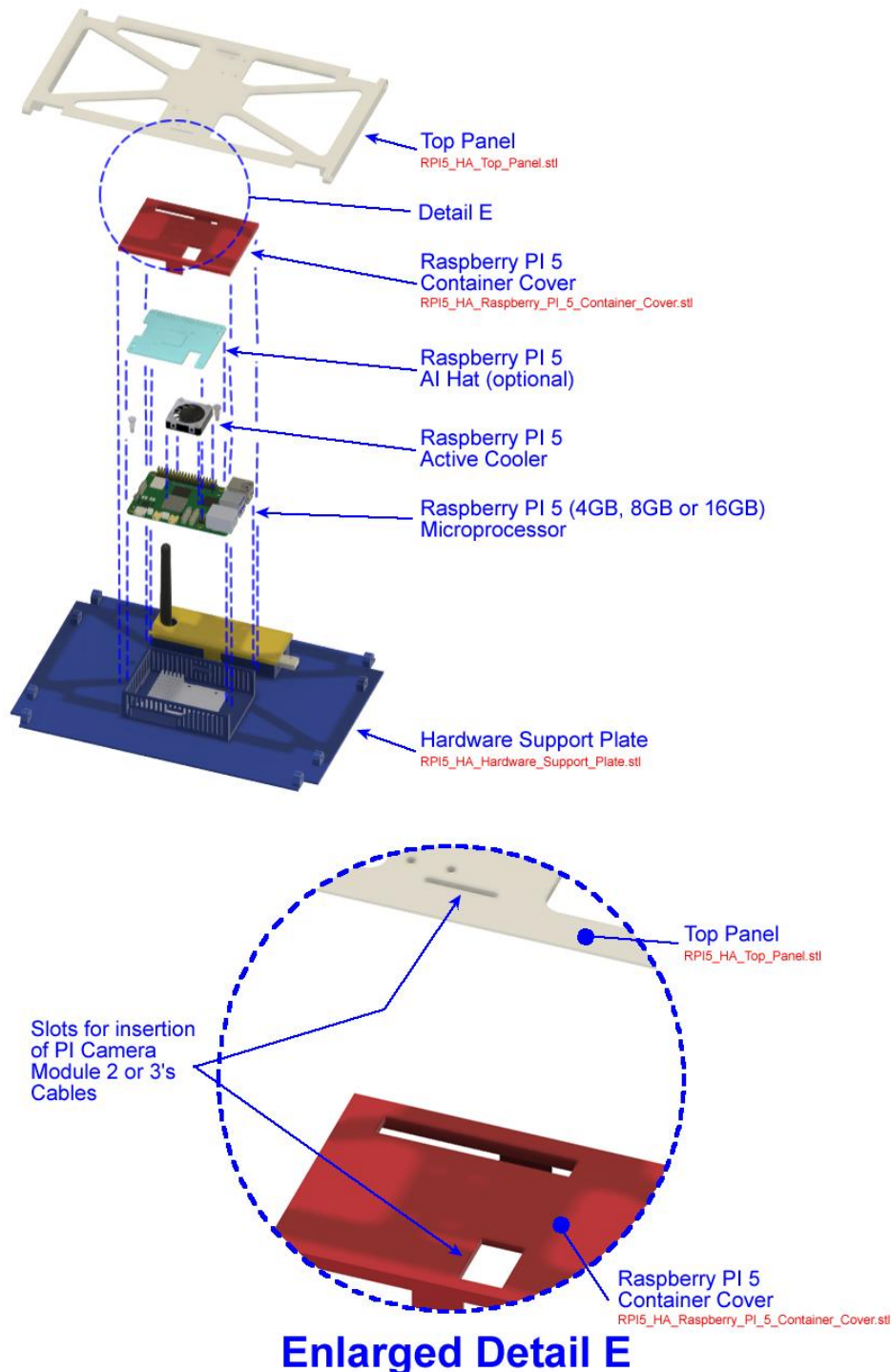
Next, you can place the Hardware Support Plate on top of the Keyboard Drawer Container. This will be fastened to the Keyboard Drawer Container using M3 Hexagon Head Bolts and M3 Hexagon Nuts later in the assembly process. Refer to the Diagram above.

You can then insert the Sonoff Zigbee USB Dongle into the Zigbee USB Dongle Container on the Hardware Support Plate. Then you can push the Zigbee USB Dongle Holder Cover over the Zigbee USB Dongle Container to hold the Zigbee USB Dongle firmly in place. Refer to the Diagram below.



Next, you can insert your Raspberry Pi 5 microprocessor into the Raspberry Pi 5 Container on the Hardware Support Plate. Install the Raspberry Pi 5 Active Cooler on top of your Raspberry Pi 5 microprocessor board. Refer to the official Raspberry Pi website (<https://www.raspberrypi.com>) if you need assistance with this. You can then insert the Raspberry Pi 5 AI Hat on top of our Raspberry Pi 5 microprocessor board if you want to use this. This is optional but will greatly assist with Object Detection and other computationally intensive Python applications if you want to develop these later.

NOTE: If you want to use the PI Camera Module 2 or 3 cameras, feed their cables through the Top Panel and Raspberry PI 5 Container Cover now, then insert the cable(s) into your Raspberry Pi 5 microprocessor board. It is also a good idea to flash your preferred Operating System on to a MicroSD Card and then insert the MicroSD Card into the MicroSD Card Slot on your Raspberry Pi 5 microprocessor before inserting your Raspberry Pi 5 into the Raspberry Pi 5 Container on the Hardware Support Plate. Be careful here to avoid damaging the MicroSD Card. Refer to the Diagram and Photo below.





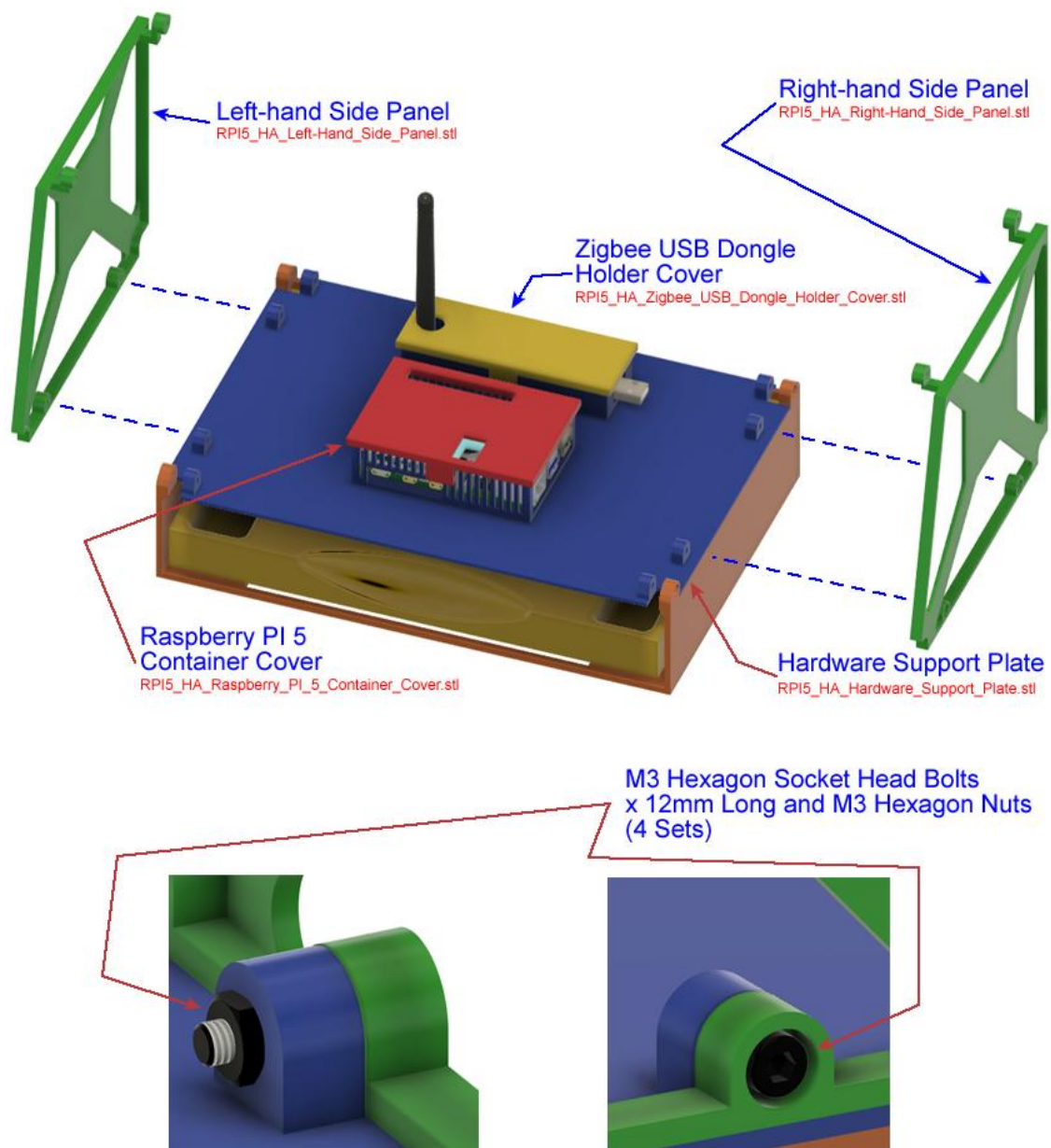
You can then push the Raspberry Pi 5 Container Cover onto the Raspberry Pi 5 Container on the Hardware Support Plate.

Now you can use a Male to Female USB Cable to connect the Zigbee USB Dongle to one of the USB3.0 ports on your Raspberry Pi 5 microprocessor.

C. Left-hand and Right-hand Side Panel Assembly

You can now install the Left-hand and Right-hand Side Panels on top of the Hardware Support Plate, using four M3 Hexagon Socket Head Bolts x 12mm Long and four M3 Hexagon Nuts. Refer to the Diagram below.

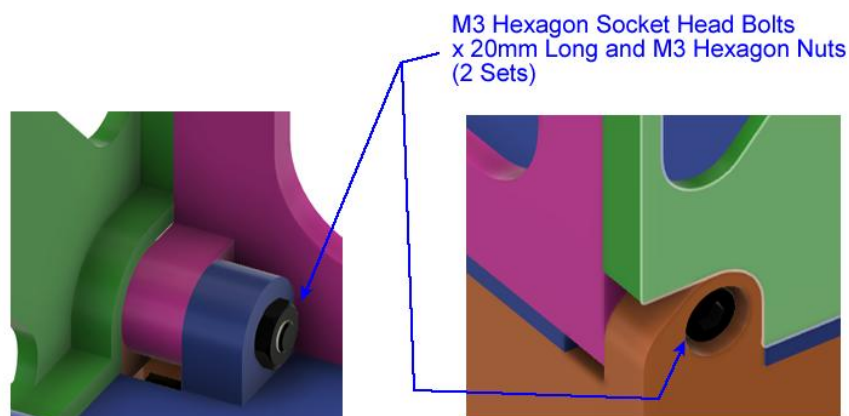
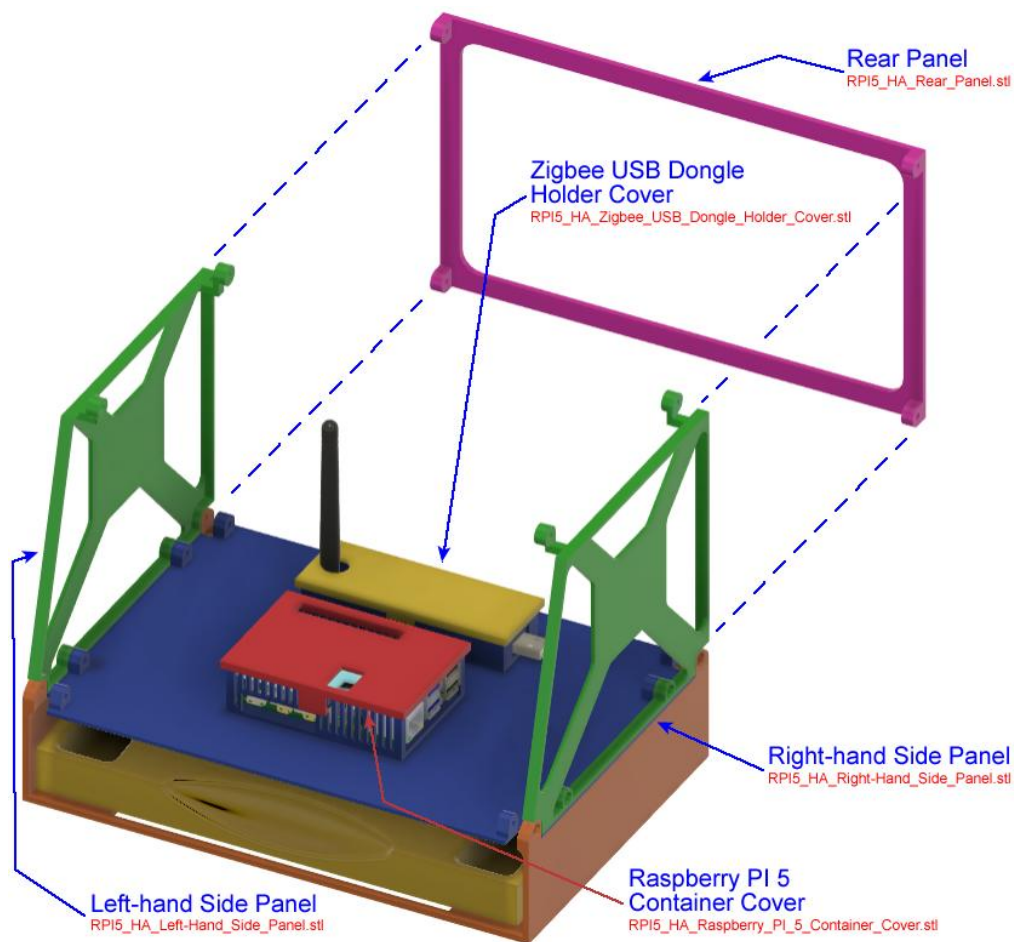
NOTE: Depending upon your 3D Printer's tolerances, you may need to use a M3 Hexagon Allen Key to screw the M3 Hexagon Socket Head Bolts through the connection lug bolt holes on the Hardware Support Plate and Panels. I also recommend inserting a small screwdriver into the two or three connection lug bolt holes of the different Panels and then whirling it around to ensure the connection lug bolt holes are correctly aligned before inserting the M3 Hexagon Socket Head Bolts.



Left-hand and Right-hand Side Panel Lower Connections

D. Rear Panel Assembly

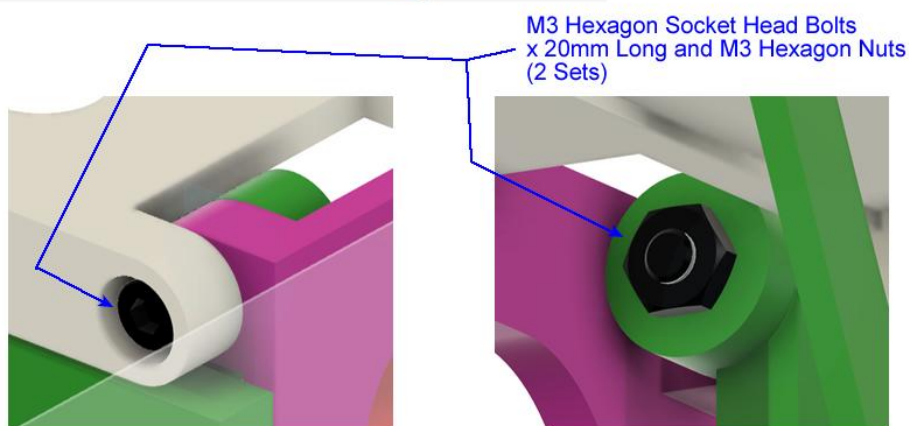
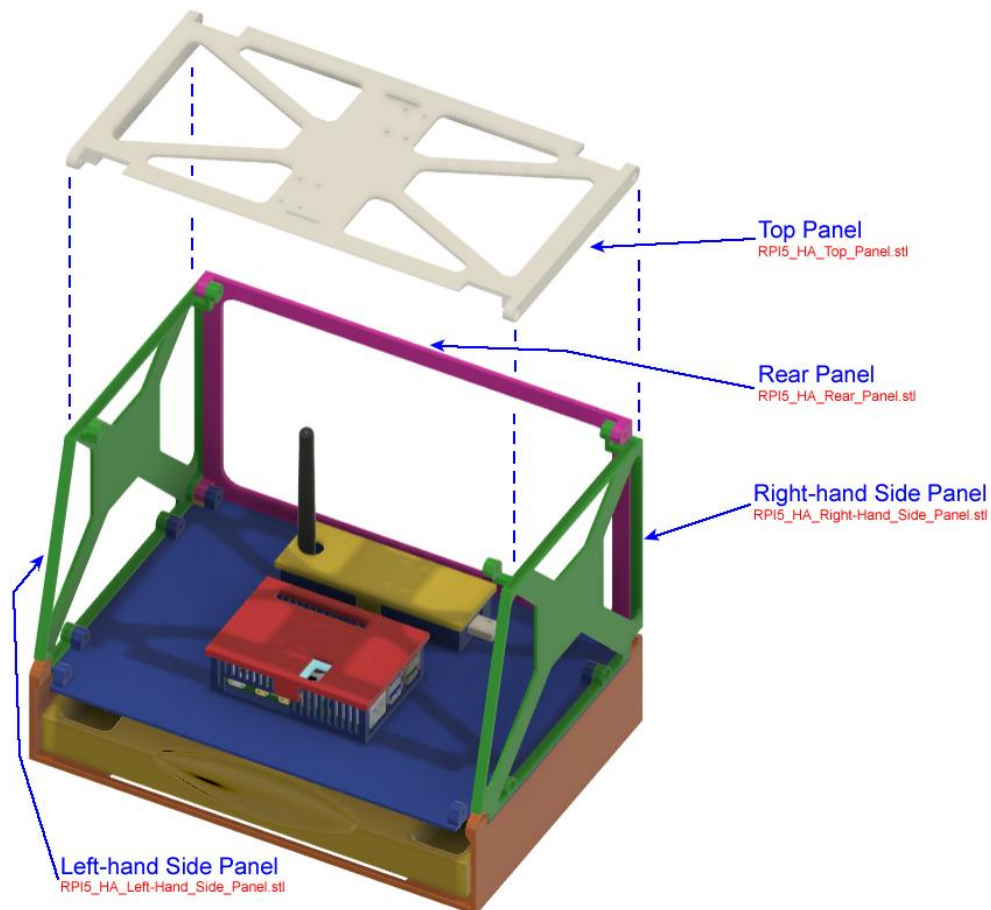
You can now install the Rear Panel on top of the Hardware Support Plate, using two M3 Hexagon Socket Head Bolts x 20mm Long and two M3 Hexagon Nuts. Refer to the Diagram below.



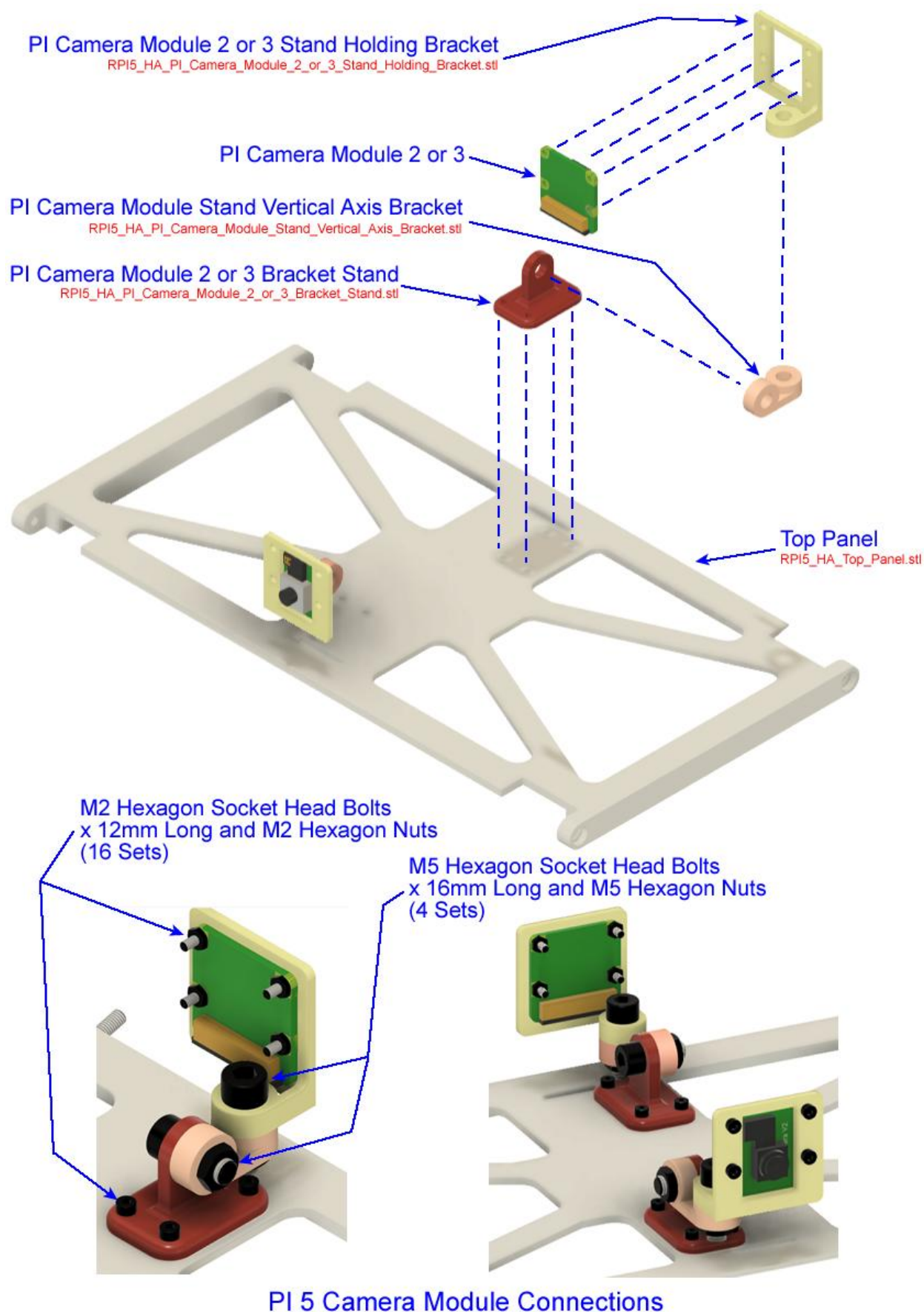
Rear Side Panel Lower Connections

E. Top Panel Assembly

You can now install the Top Panel on top of the Left-hand, Right-hand and Rear Panels, using two M3 Hexagon Socket Head Bolts x 20mm Long and two M3 Hexagon Nuts. Refer to the Diagram below.



Top Panel Rear Connections



If you want to use the PI Camera Module 2 and / or 3 cameras you can now install them on the Top Panel.

First connect the PI Camera Module 2 or 3 Bracket Stand/(s) on top of the Top Panel using four or eight M2 Hexagon Socket Head Bolts x 12mm Long and four or eight M2 Hexagon Nuts.

Next, connect the PI Camera Module Stand Vertical Axis Bracket/(s) to the PI Camera Module 2 or 3 Bracket Stand/(s) using one or two M5 Hexagon Socket Head Bolts x 16mm Long and one or two M5 Hexagon Nuts. This allows you to adjust the vertical plane (tilt) direction of your PI Camera Module 2 or 3 camera/(s).

Next, connect the PI Camera Module 2 or 3 camera/(s) to the PI Camera Module 2 or 3 Stand Holding Bracket/(s) using four or eight M2 Hexagon Socket Head Bolts x 12mm Long and four or eight M2 Hexagon Nuts.

Then, connect the PI Camera Module 2 or 3 Stand Holding Bracket/(s) to the PI Camera Module Stand Vertical Axis Bracket/(s) using one or two M5 Hexagon Socket Head Bolts x 16mm Long and one or two M5 Hexagon Nuts. This allows you to adjust the horizontal plane (pan) direction of your PI Camera Module 2 or 3 camera/(s).

Refer to the Diagram above.

F. Front Panel Assembly

Now you are ready to install the Front Panel Assembly which holds the Waveshare 7" HDMI LCD (C) Screen.

First, install the M3 Threaded Heat-set Inserts into the 7" HDMI LCD Screen Cover using a soldering iron.

Next, place the Waveshare 7" HDMI LCD (C) Screen on the 7" HDMI LCD Screen Support Base ensuring to correctly align the bolt holes. Push the Waveshare 7" HDMI LCD (C) Screen's power and HDMI cables through the slot in the 7" HDMI LCD Screen Support Base.

Next, connect the 7" HDMI LCD Screen Support Base to the 7" HDMI LCD Screen Cover using four M3 Hexagon Socket Head Bolts x 8mm Long.

Next, plug the Waveshare 7" HDMI LCD (C) Screen's power and HDMI cables into the appropriate sockets on your Raspberry PI 5 Microprocessor board.

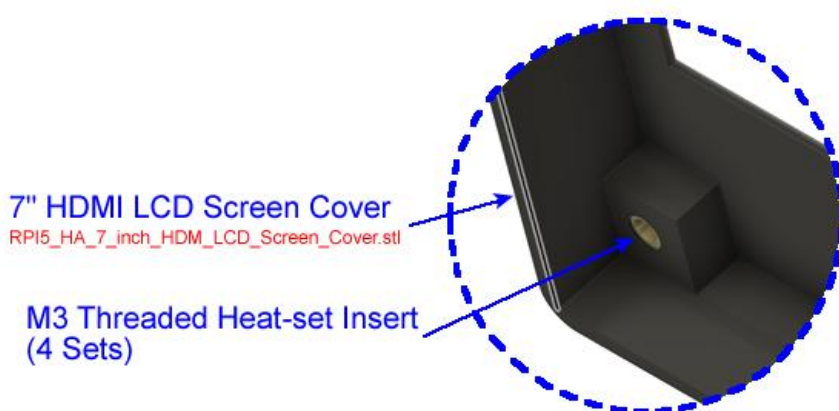
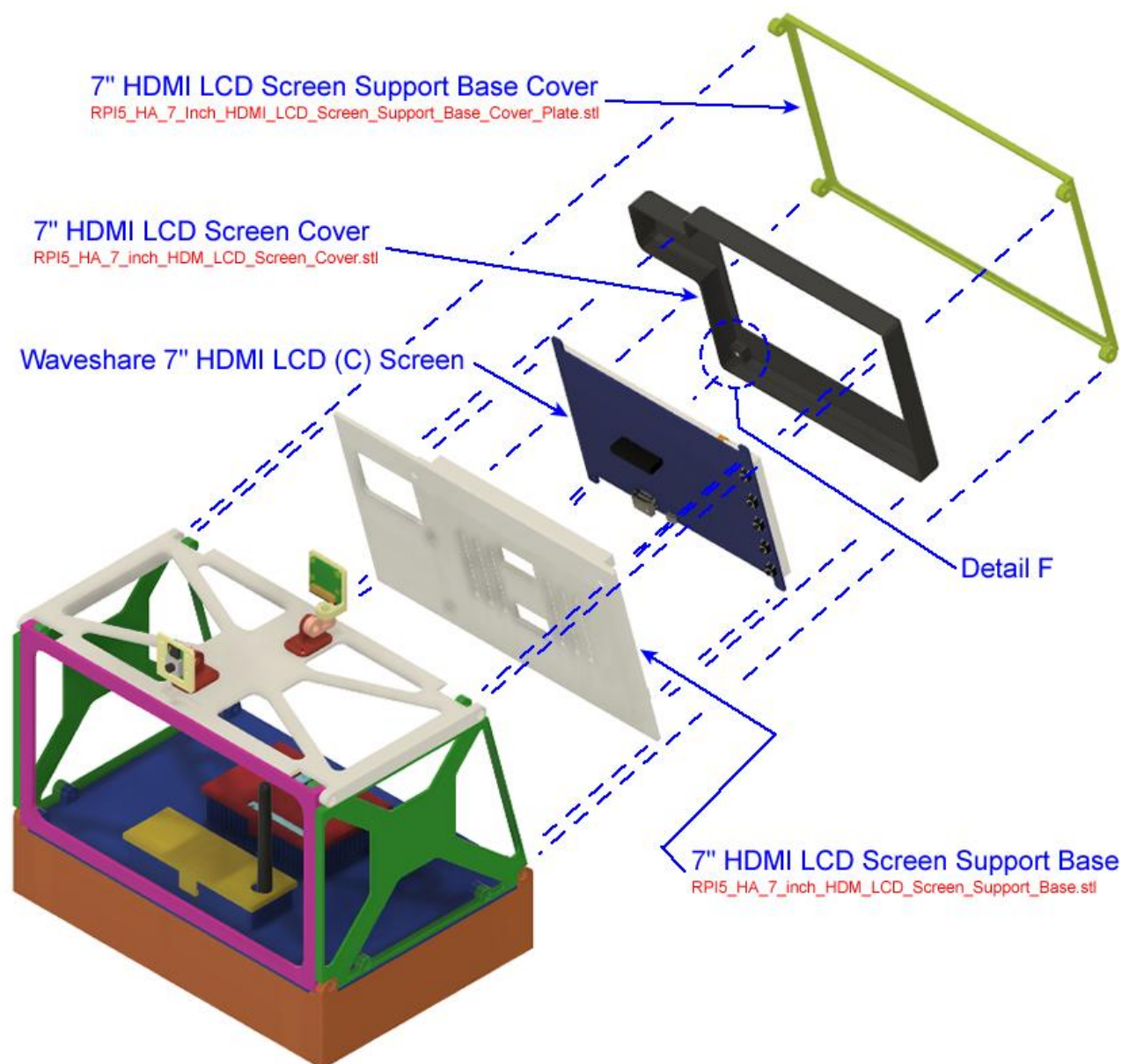
Next, plug your Raspberry PI 5 Microprocessor's USB-C Power socket.

Now, place the 7" HDMI LCD Screen Support Base Cover over the Waveshare 7" HDMI LCD (C) Screen assembly.

Now, connect the 7" HDMI LCD Screen Support Base top connection lugs to the Top Panel and Left-Hand and Right-hand Panel's top connection lugs using two M3 Hexagon Socket Head Bolts x 20mm Long and two M3 Hexagon Nuts.

Now, connect the 7" HDMI LCD Screen Support Base bottom connection lugs to the Hardware Support Panel and Left-Hand and Right-hand Panel's bottom connection lugs using two M3 Hexagon Socket Head Bolts x 20mm Long and two M3 Hexagon Nuts.

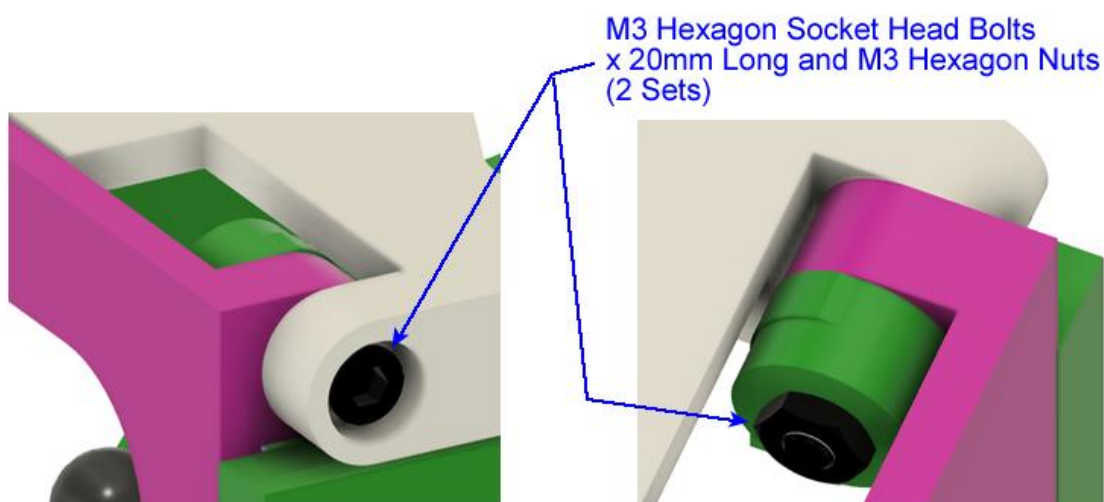
Refer to the Diagrams below.



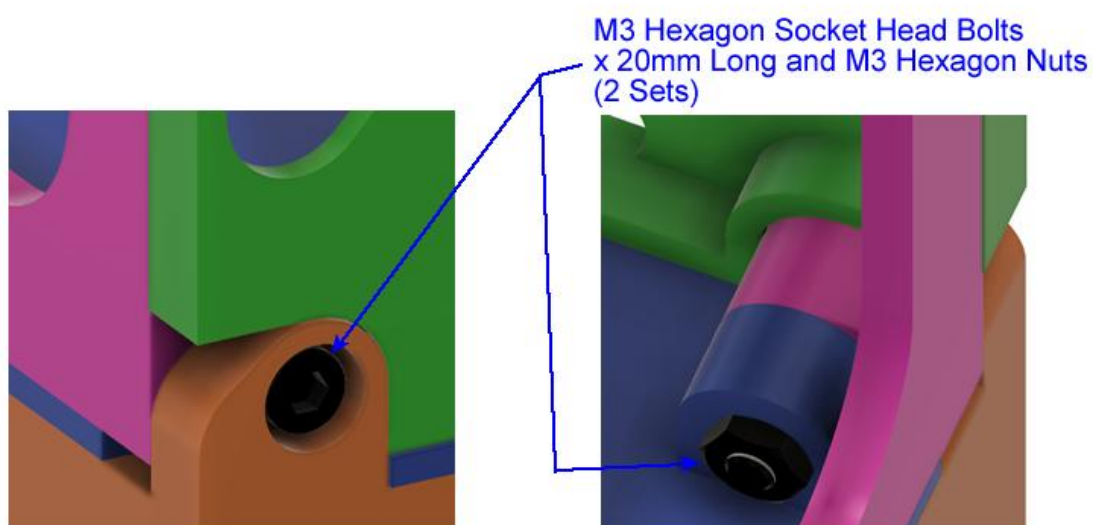
Enlarged Detail F



Waveshare 7" HDMI LCD (C) Screen Connection



7" HDMI LCD Screen Support Base Cover Top Connections



7" HDMI LCD Screen Support Base Cover Bottom Connections

You can now plug the Raspberry PI 5 Microprocessors power adaptor into your mains power, and your Raspberry PI 5 will boot up all ready for you to configure your local Home Assistant Smart Devices.

