UNIVERSITY OF LIVERPOOL

DEPARTMENT OF ENGINEERING

PRODUCT MODELING & VIRTUAL REALITY (MNFG608)

Product name- Pix Bot

Manufacturing Report

Author: Swaraj Patra, ID: 201596665

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1.Introduction-

World today has gotten busier. Making it harder for parents to be more involved in their Kids development on top that for better or worse the world is getting smarter, driven by tech and information. This leads to a unique opportunity in the market for smart toys. There are lot of variables, but the PIX bot was specifically to address few major problems –

- *Parents having little to no control over their kid's screen time because of their busy schedule.*
- *Internet today is essential part of kids learning yet most never use it to its full potential.*
- *Most parents find handing over the phone to kids as easiest way to kill their boredom.*
- *Even while using the internet to learn, it is easy to go off topic.*
- *Addiction to digital world at a small age might lead to dire consequences.*

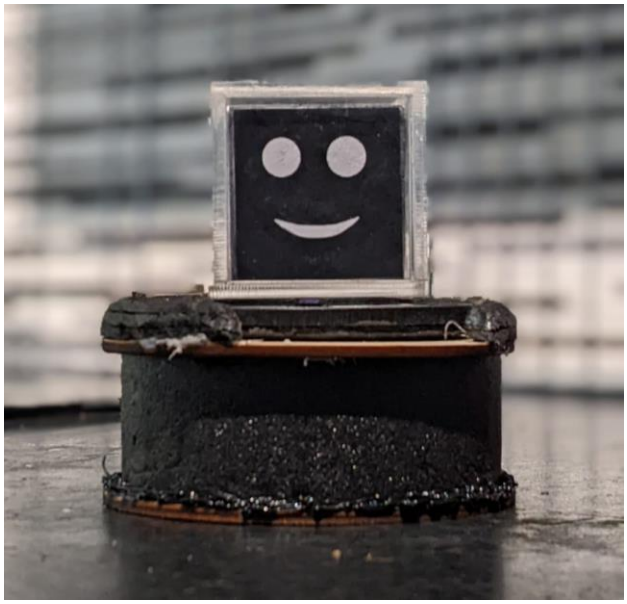
Addressing these daily problems using a Smart toy would allow it to have a unique selling point.

Solution-

- The toy which is powered by an A.I would use its data and parameters set by parents to determine when to provide access.
- The Ai also monitors their search and interrupts the connection if needed.

Apart from protecting children from digital addiction PIX also boosts their learning process.

- Able to answer kid's questions like a smart assistant.
- Actively tell them age-appropriate facts and news.
- Helps improving memory by asking questions.
- Track their interests and dislikes that can only be monitored by parents.



(Foam Modelling) `

(CAD Model)

This paper is made to provide the basic idea of its major features and the assembly and manufacturing of the parts

2Pix Bot Design

2.1 Design Features

The Major design features of the product include-

1. Being able to use it as a physical key for kids to access smart device in the house this can be done with the help of feature like IOT so it can create a network of devices in the house and the basic Ai program helps device decide appropriate time for kids to access other devices. This can also be parameter set by parents.

   The access can be in the form of digital access through IOT or QR code / OTP that is displayed on the PIX screen.

2. Knowledge transfer through Auditory learning. This is done by active or passive interaction with the PIX bot. these Ques can be identified by the AI micro processor which is supported by the mic and camera in the bot. The bot can say facts and answer question of kids using internet connectivity and internal storage. The internal storage can store data like basic program, information packs suitable for kids age and data on parameters set. The knowledge is mostly shared through audio but can also connect to other devices if more virtual understanding is needed.

3. The bot can function partially even without internet connectivity and perform tasks stored in its storage. Like support knowledge package, skill packages, collect user data.

   A knowledge package is collective data of knowledge on a particular topic the topics are categorized by age group and subjects.
   A skill package is a collective data that can be used to operate and Pix bot Module that helps in development of new skills like Piano, chess etc.

4. Security of the user's data is managed by having the AI inside the bot that can process user information in a secured cloud using blockchain tech. this data is only accessible to the parents.
   Another way of maintaining security is by reducing the dependency on internet use and isolate or redirect functions like browsing internet for information.

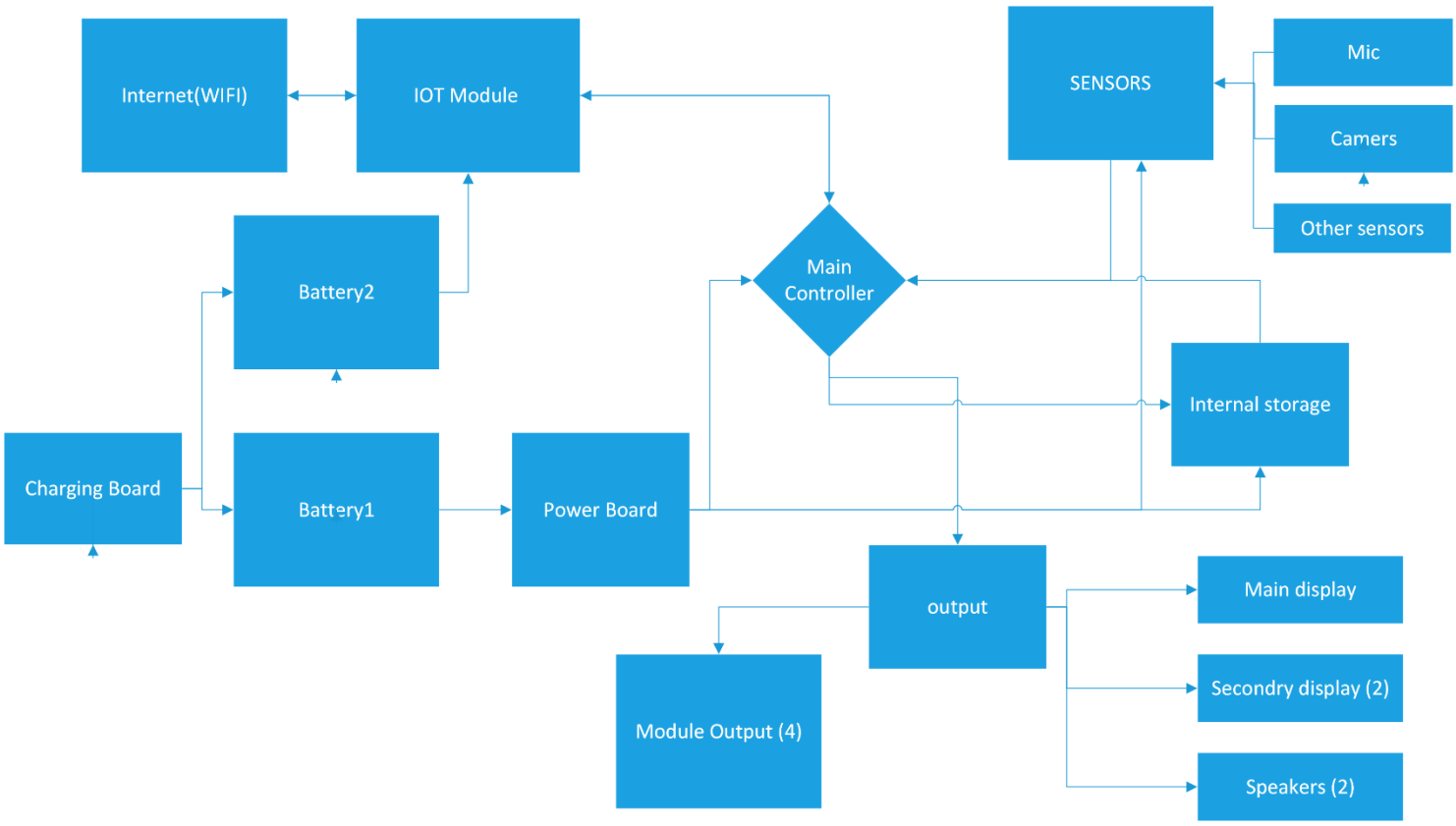
2.2 Bill of Materials. - For main product

Product	Smart Toy (Pix Bot)	**Module**	Product Design and Virtual reality
Name	Swaraj Patra	**Module Code**	MNFG608

No.	Parts	Constituents	Quantity
1	Main outer body	Poly Carbonate	1
2	Bottom seal cover	Poly Carbonate	1
3	Bottom Cover	ABS	1
4	M4-0.7 Allen screws	Brass	4
5	Seal	Silicon	2
6	Charge connector bottom	ABS, copper, 2 magnets	1
7	USB C cover	Silicon	1
8	Bottom seal under cover	Aluminum	1
9	IOT unit	PCB	1
10	IOT case	ABS	1
11	Battery	Solid state	2
12	Power control	PCB	1
13	Battery screws	brass	4
14	Speakers	Magnets and coils	2
15	Mic	Magnets and coils	1
16	Camera	Lenses and sensor	1
17	Control unit	PCB, Processors	1
18	Display	Flexible screen	1
19	LED board	LED, PCB	2

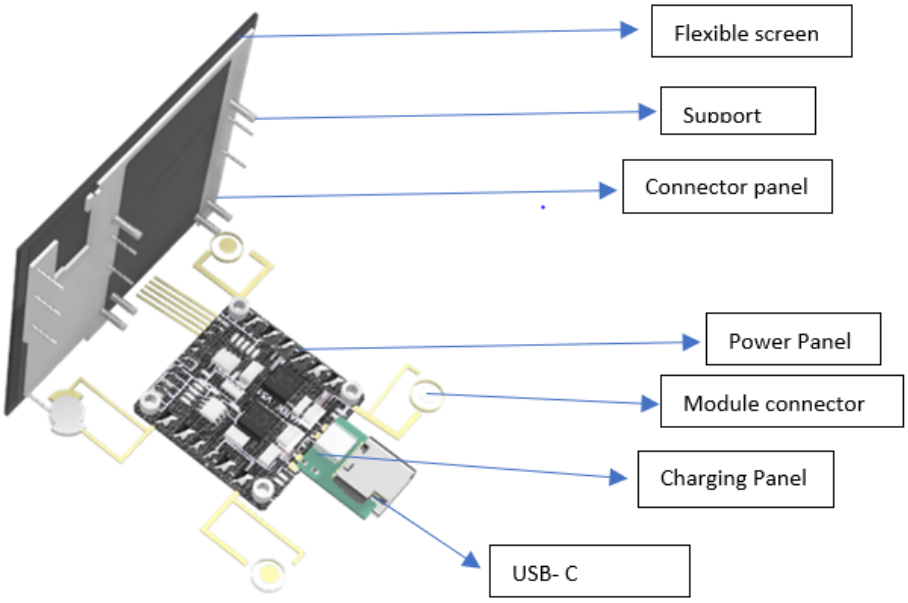
20	Display control	PCB	1
21	Camera and mic controller	PCB	1
22	Amplifier	PCB	1
23	Sensory	Sensors, PCB	1
24	Supports	Al, PP, AG	13
25	Part protection	GOO foam	1
26	Circuit board holder	Al, Ag, PP	5
27	Internal back panel	ABS	1
28	Side internal Panel	ABS	2
29	Back panel screws	Al	2
30	Base connective layout	Al, Ag, silicon, PCB	1
31	USB C port	Al, Ag, silicon, PCB	1
32	Mod Port	AL, ABS, AG	4

2.3 Functional Structure-



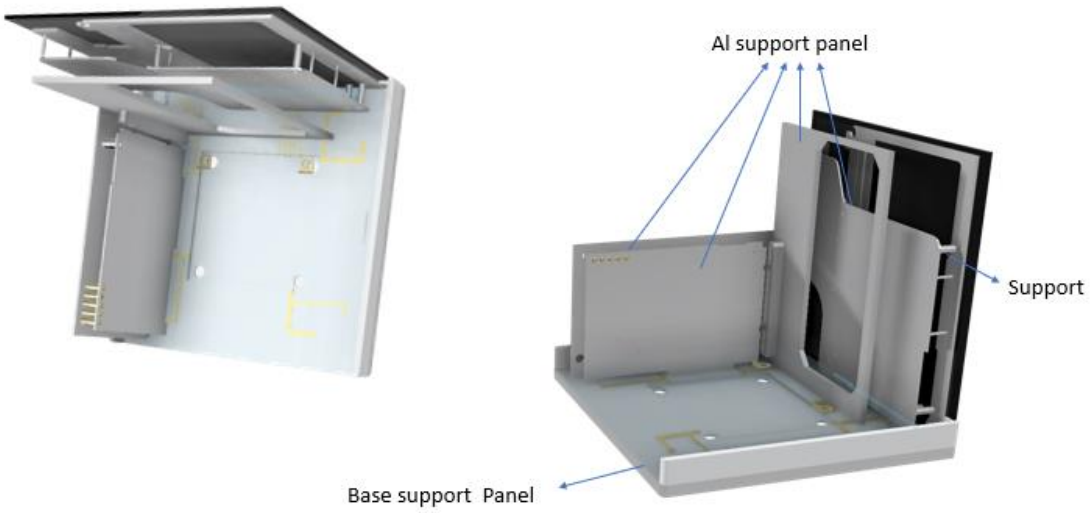
3. Assembly-

1.)



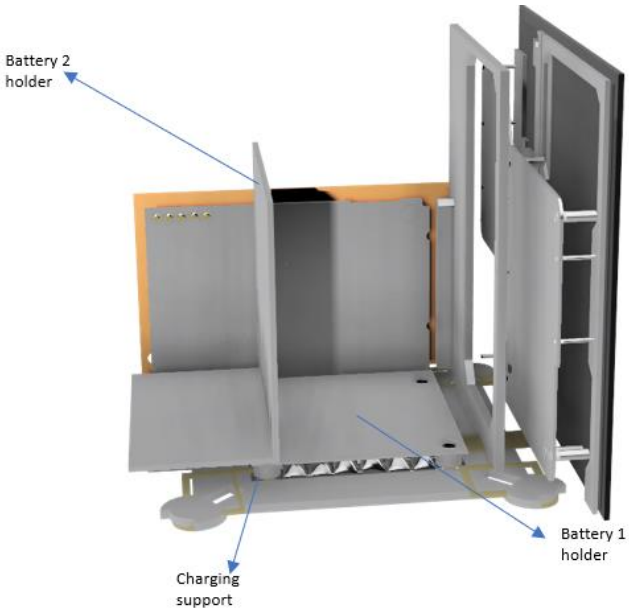
Inter circuit connections and some structural parts are made to make the bsic unit. All parts connected by resin and solder.

2.)



Support Pannels made out of Al, PP, semiconductors and conductors are made to accompony the circuits with internal basic wiring and sructural support. All connected by solder, spot welding and resin.

3.)

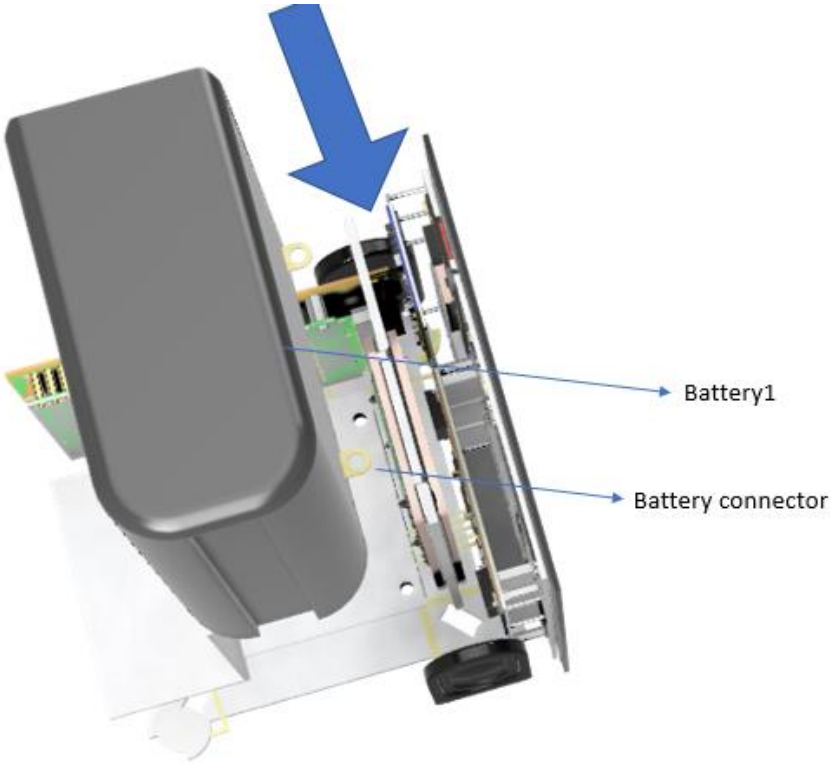


Battery support connected to the charging panel via spot welding and soldering on top support placed on charging panel.

4.)

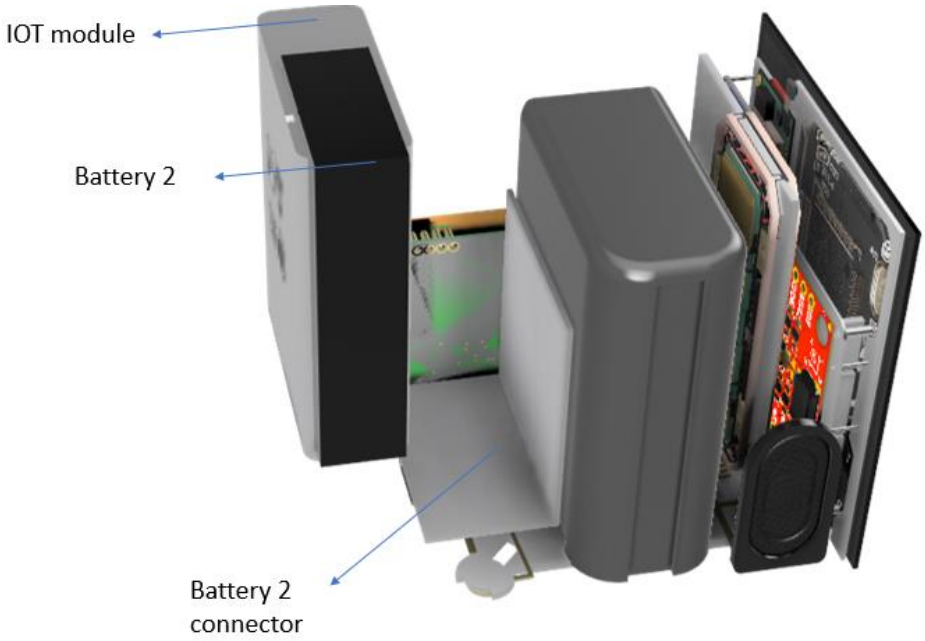
PCBs are connected to the board by fitting them in slots and soldering them to respective connections.

5.)



Battery 1 is connected to the battery base via screws thei battery is responsible to power the complete PIX except the IOT unit.This connectons are made using Screws that fit into the connector circuit.

6.)

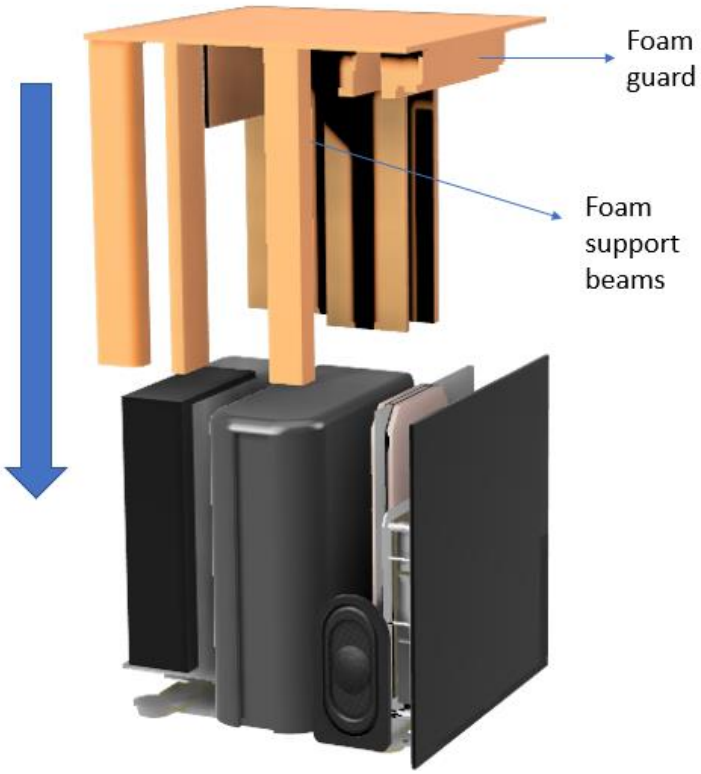


Battery 2 is connected to the battery support using resin and solder to make the connections to the power board and controller unit.

7.)

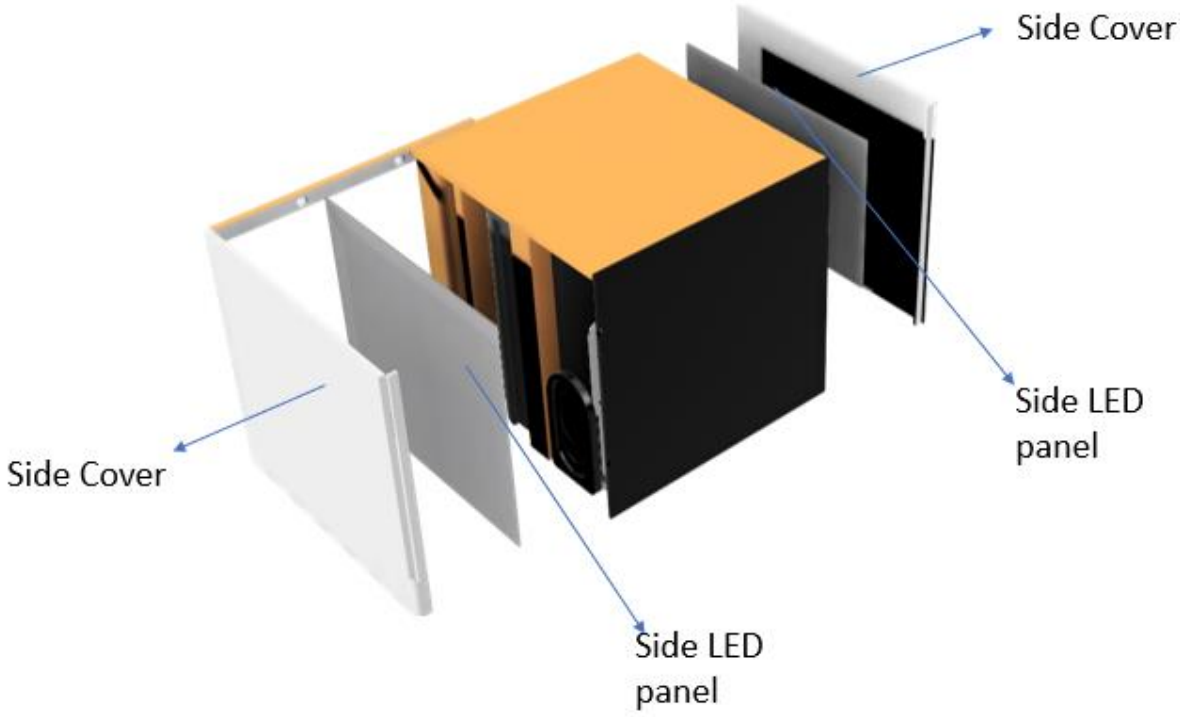
Swaraj Patra

Back View



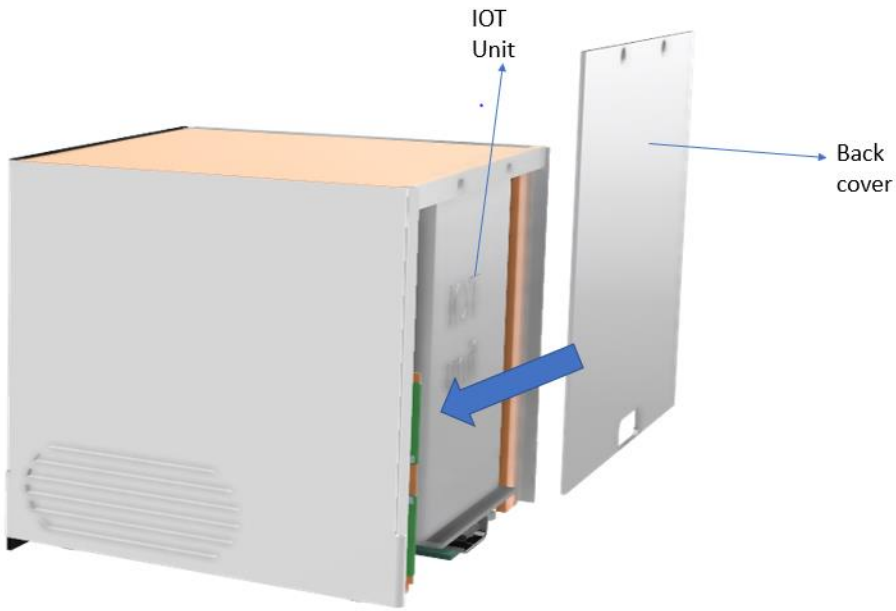
Foam cussion is added to secure the electronice inside the PIX during an impact is added. The Foam is an non newtonian Foam called GOO foam. This protects all the walls and also the beams fill in the empty gaps to distribute impact on other parts.

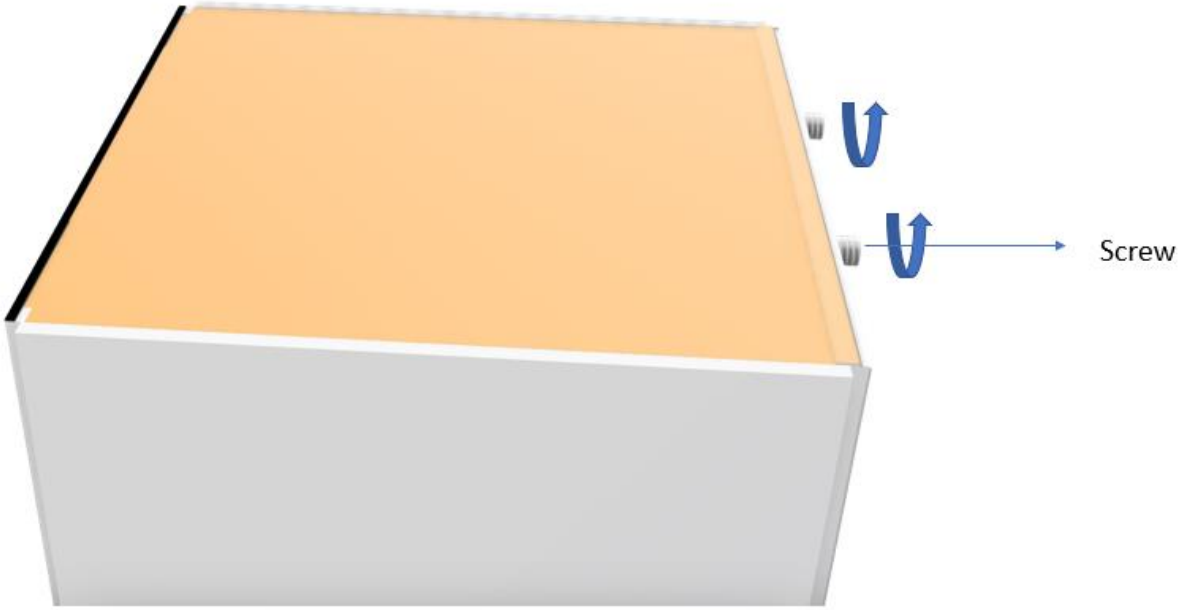
8.)



The side walls are fit with LED boards using solder and tolerence fit. The walls are then fit to the sides with snap fit and resin.

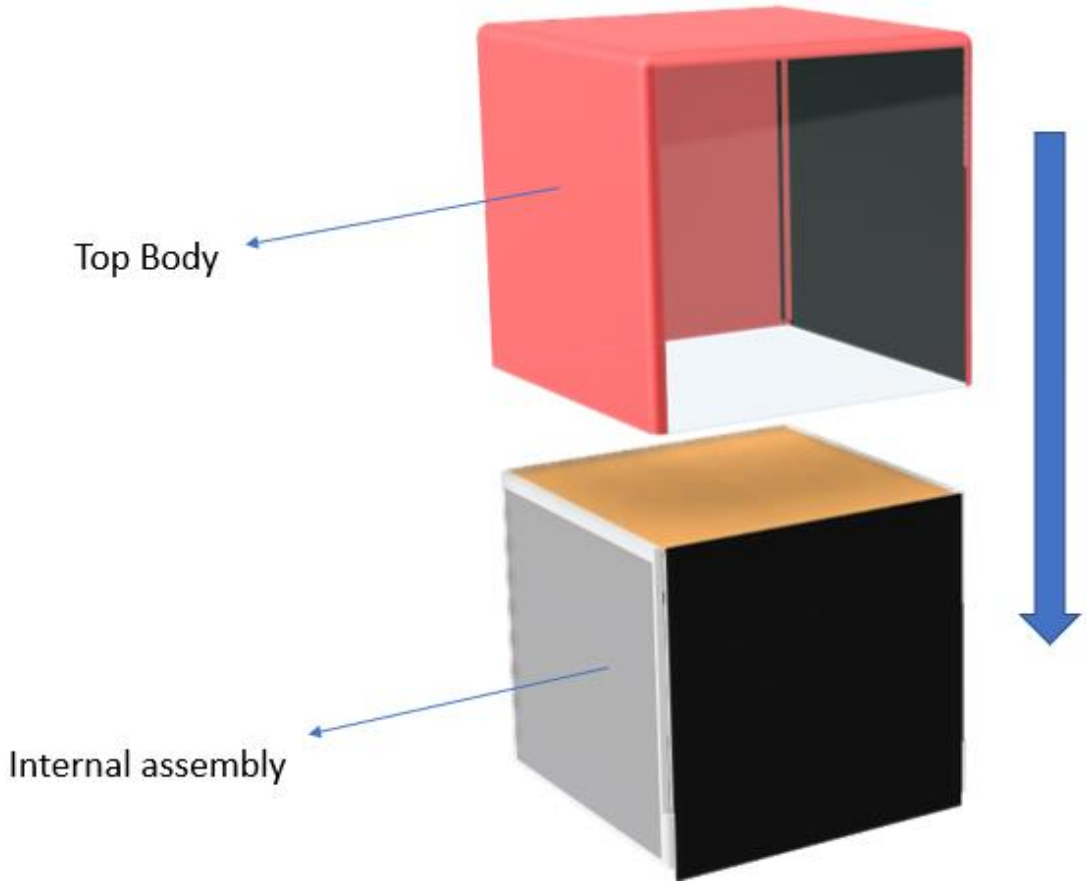
9.)





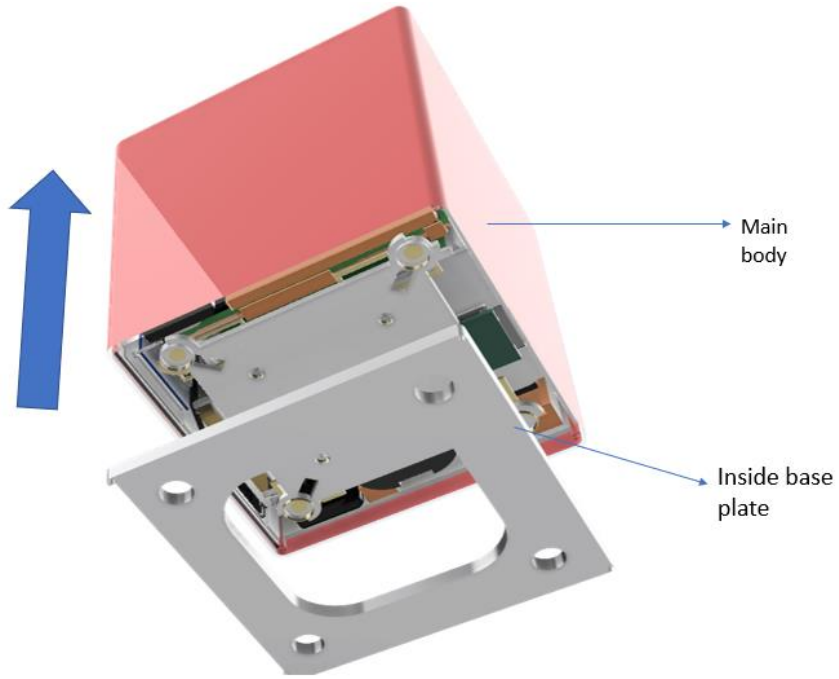
The back panel is press fitted then screws are fit into the back panel that pass through IoT unit and support unit.

10.)



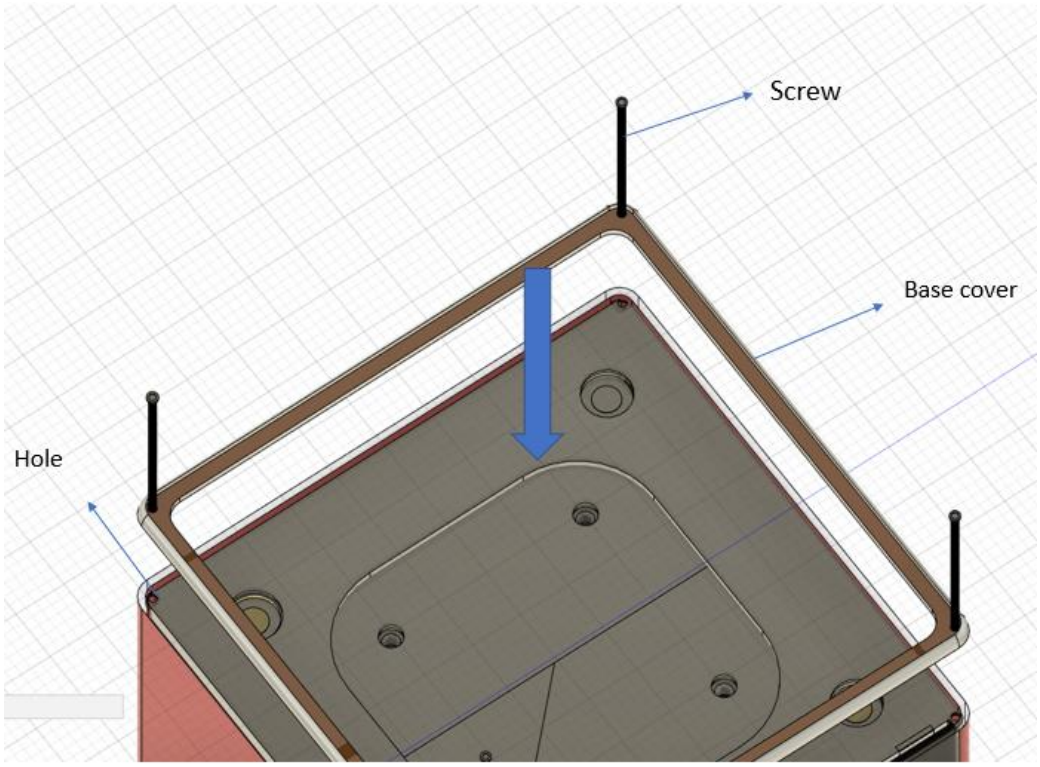
The assembeled unit is the pushed into the main body case with low tolerance.

11.)



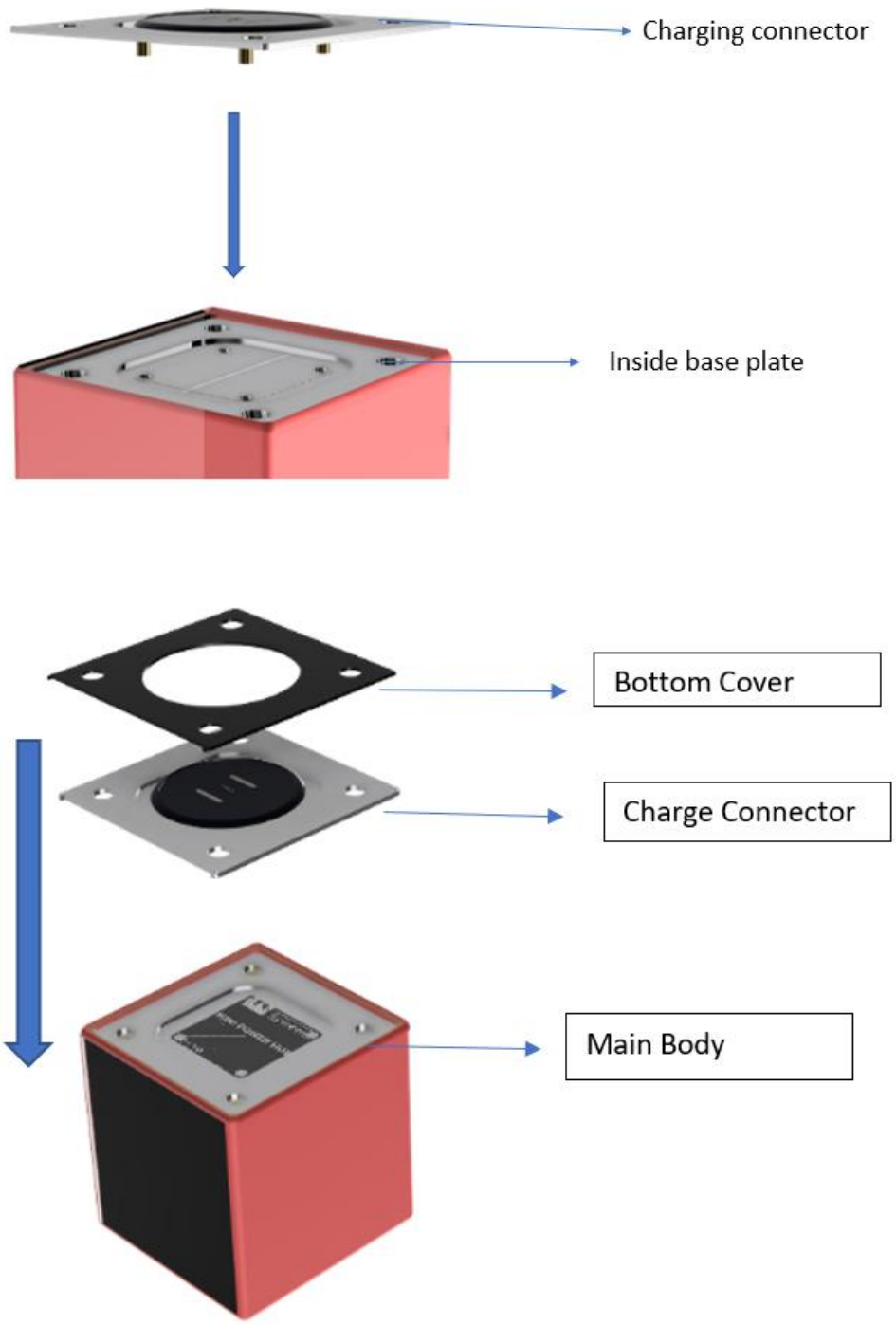
The base plate is then bonded at the bottom with silicon seal and resin to make one layer of protection from liquids.

12.)



Base cover is screwed at the bottom cover to encase all the units inside the main casing. These screws have to pass through the inside base plate then the base of internal assembly and then into the side grooves present in the main body.

13.)



Charging connector is connected to the internal base plate and the connecting rods are sealed using thermal paste and sealant and then the bottom cover is connected using Sealing Adessive and vacuum to create waterproofing in the bottom area.

4Manufacturing-

Parts need to be manufactured and some can be bought in directly and some parts must be manufactured.

PCBs can either be bought premade or custom manufactured in bulk by a different company.

No.	Parts	Manufacturing
1	Main outer body	Injection molded with temp ranging from 80-90 and pressure suitable for molding process. After this the body is coated on the inside with an almost opaque coating leaving one side transparent for the main display
2	Bottom seal cover	Injection molded with temp ranging from 80-90 and pressure suitable for molding process. After this the body is coated on the inside with an almost opaque coating.
3	Bottom Cover	Injection molded with temp ranging from 180-230 and pressure suitable for molding process
4	M4-0.7 Allen screws	Pre-manufactured
5	Seal	Silicon
6	Charge connector bottom	ABS injection molded into cover with copper connections and spring under copper connectors.
7	USB C cover	Silicon molding using UV cures silicon
8	Bottom seal under cover	Stamping or laser cutting followed by bending.
9	IOT unit	PCB- Premanufactured
10	IOT case	Injection molded with temp ranging from 180-230 and pressure suitable for molding process
11	Battery	Solid state – pre manufacture
12	Power control	PCB- premanufactured
13	Battery screws	Brass- premanufactured
14	Speakers	premanufactured
15	Mic	premanufactured

16	Camera	premanufactured
17	Control unit	premanufactured
18	Display	Flexible screen- premanufactured
19	LED board	premanufactured
20	Display control	PCB- premanufactured
21	Camera and mic controller	PCB- premanufactured
22	Amplifier	PCB- premanufactured
23	Sensory	Sensors, PCB- premanufactured
24	Supports	Al parts are slowly turned and drilled after which the sides are coated with insulation and the internal with conductive material.
25	Part protection	GOO foam- is molded like other foams it is placed inside an die and then pressure is added on the top cover until the solidification is completed. This is done to gain a denser foam.
26	Circuit board holder	Al parts are laser cut or punched after which they are lined with circuits by printing them and insulating them from rest of the body
27	Internal back panel	Injection molded with temp ranging from 180-230 and pressure suitable for molding process
28	Side internal Panel	Injection molded with temp ranging from 180-230 and pressure suitable for molding process
29	Back panel screws	Pre-Manufactured
30	Base connective layout	Al parts are laser cut or punched after which they are lined with circuits by printing them and insulating them from rest of the body
31	USB C port	Pre-Manufactured
32	Mod Port	Al parts are punched after which they are lined with circuits by printing them and insulating them from rest of the body

5 Summary

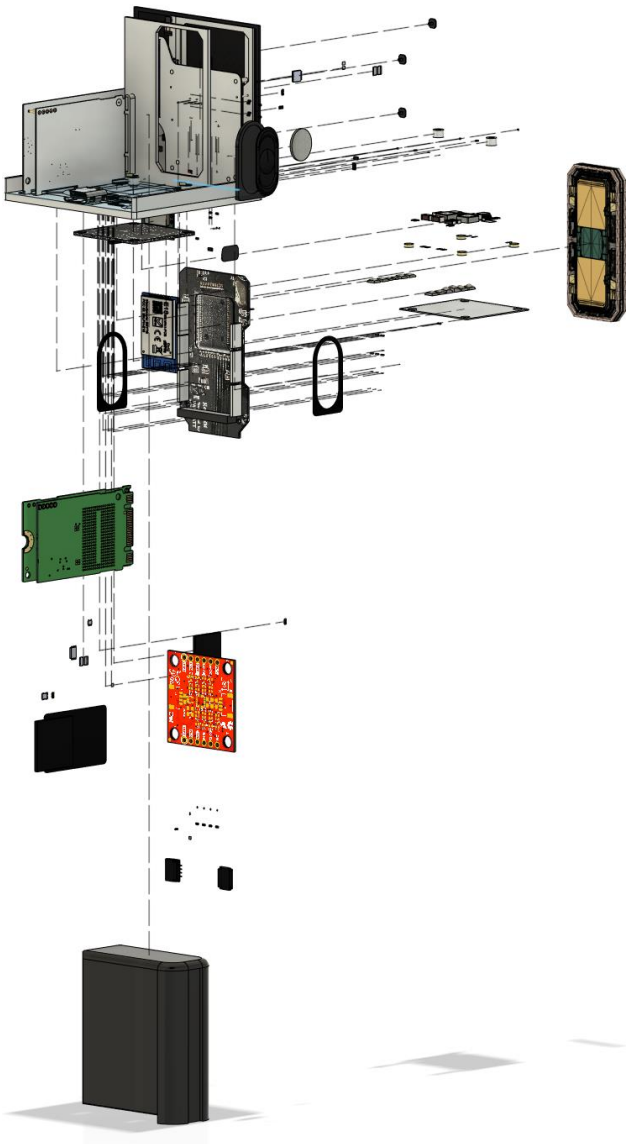
The PIX bot has been designed through CAD modelling to be easy to manufacture and assemble, which will have a positive effect on the products cost and production rate. The model is made using parts that need to manufacture most parts can be bought for lower price when bought in bulk and less research needs to be done.

The accurate costing for the device is hard as most parts are electronics and are hard to rate in value without further narrowing down the requirements. It also mentions parts like Solid State battery and GOO foam which are still in development phase.

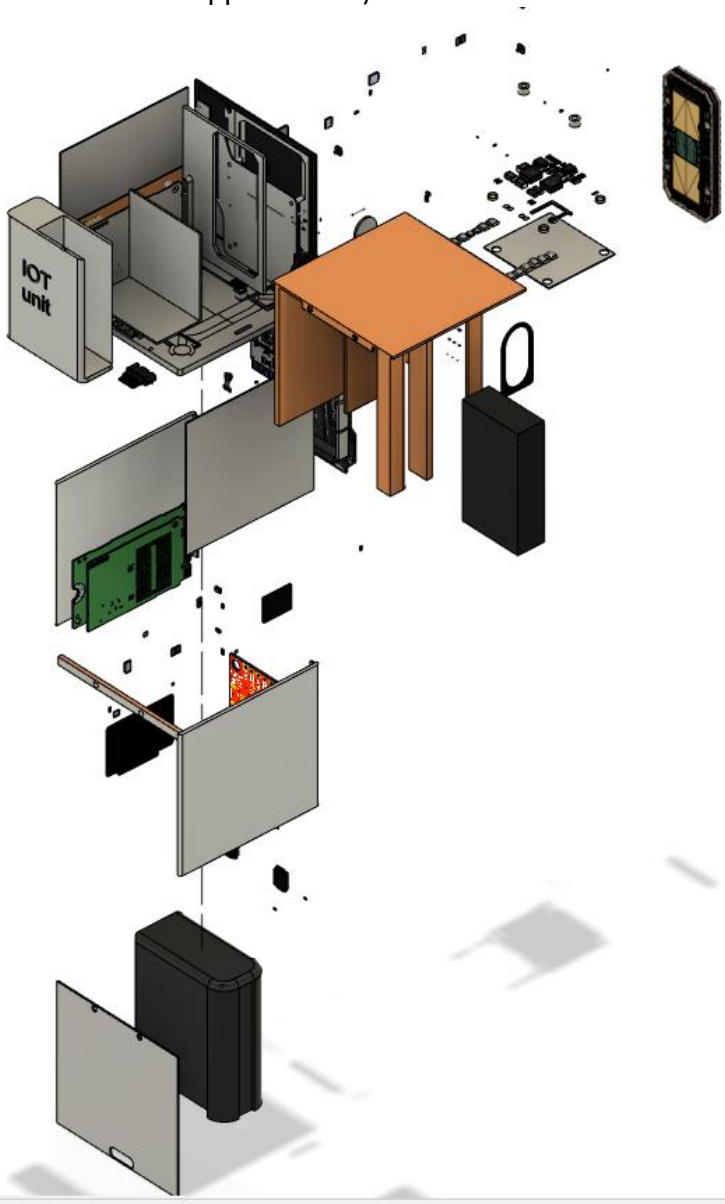
Since the device doesn't completely rely on processing it can be made a little dependent on server for difficult computing hence reducing the cost for processing after all this the cost of the product can be expected to be Round 100 pounds with very low to no profit margin after logistics and storage, but the profits can be recovered by sales of modules and packages.

Appendix

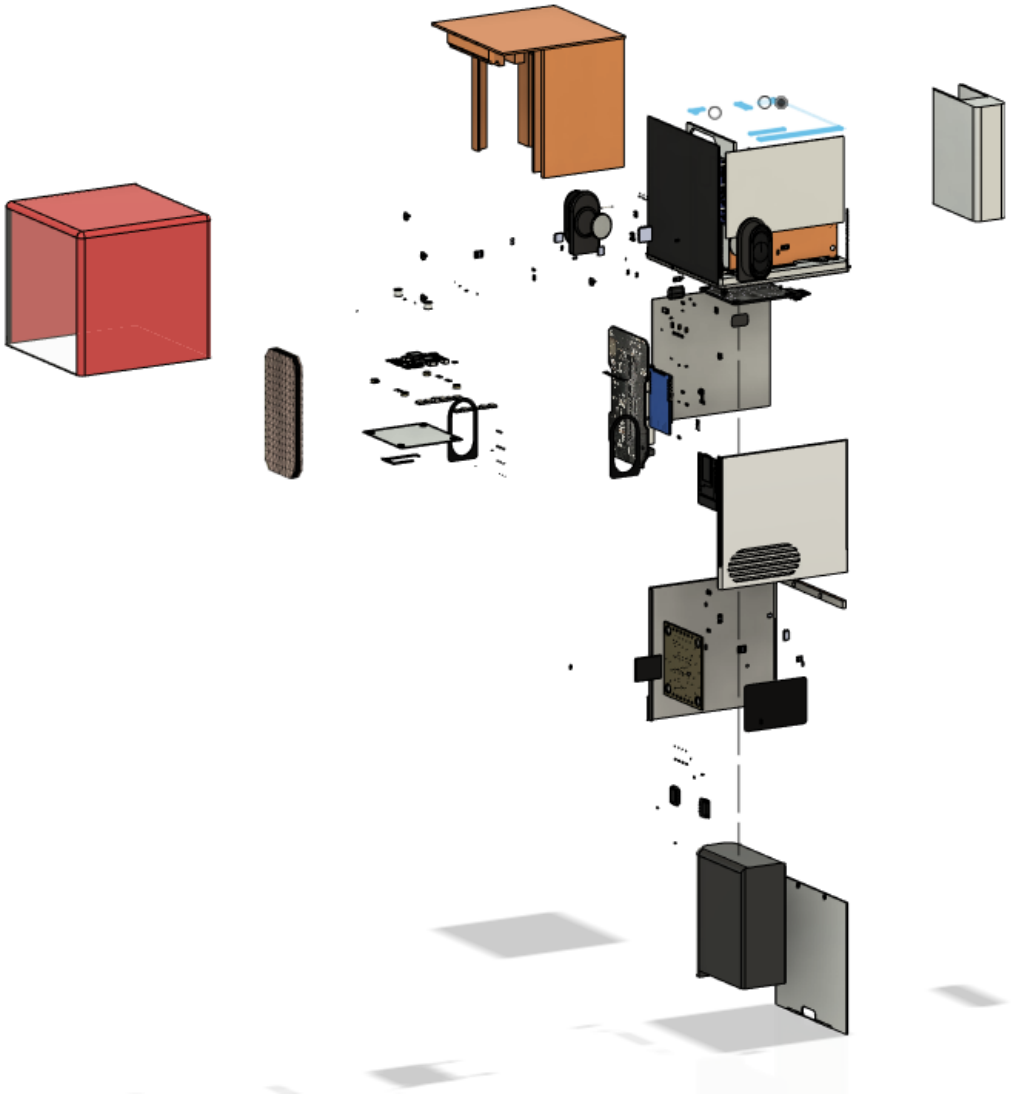
Exploded view (before IOT unit and Cover)



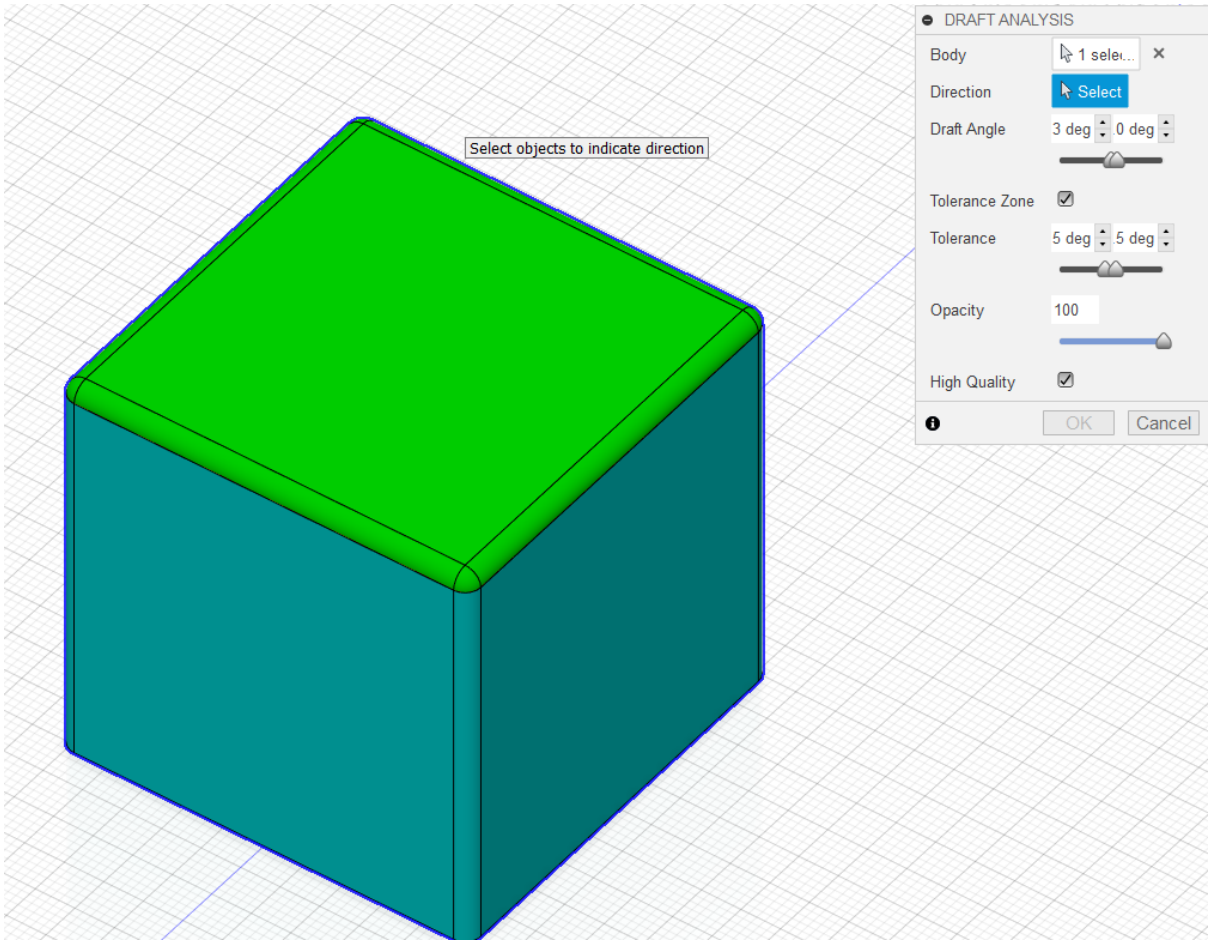
Exploded View (with IOT unit and support foam)



Explode View (with body cover and internal side covers.)



Draft angles on the main body



Draft angles on IOT case

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