

# TEXAS INSTRUMENTS

T.I. ONLINE CHALLENGE

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MEMBERS:

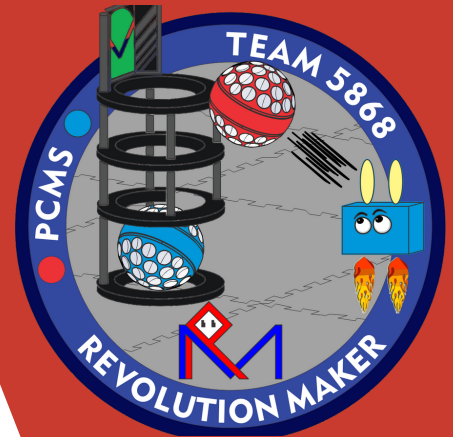
OSCAR MIO, 11TH GRADE  
JAYLEN CHOEK, 11TH GRADE  
KYLE LAM, 11TH GRADE

**SCHOOL:**  
**PUICHING MIDDLE**  
**SCHOOL MACAU**

**TEAM:**

**5868A**

**TEAM NAME:**  
**REVOLUTION MAKER**



<https://www.youtube.com/watch?v=NYgCh7EYSzg>



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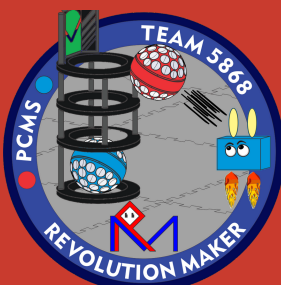
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# INTRODUCTION

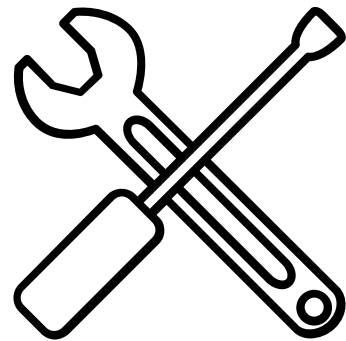
THIS IS OUR 3D PRINTER  
THE MAKERBOT  
REPLICATOR Z18

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**We are 5868A, a VEX team from Macau PuiChing Middle School. Our team wanted to take this challenge uniquely, which we decided to disassemble a 3D printer. It had taken us almost three weeks to fully dismantle it**



FIG. 1.



**THE REPLICATOR WEIGHT 41 KG [90 LBS], AND HAVE A SIZE OF 49.3 L X 56.5 W X 86.1 H [19.4 W X 22.2 D X 33.9 H IN]**

# WORKFLOW



## DISASSEMBLE CONCEPT

As we started to work with the 3D printer, we wanted to start to disassemble it from the bottom of the machine.

But soon, we found that it has difficulties to dismantle it from the bottom, and therefore, we decide to work from the top to lower our workload.

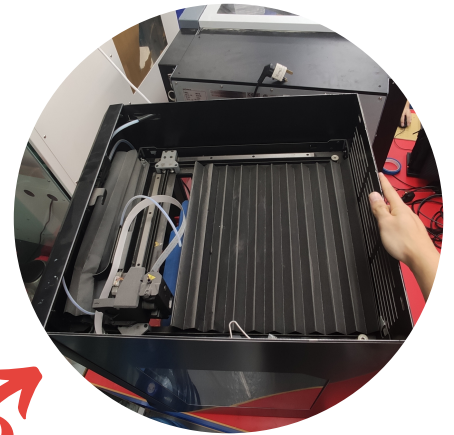
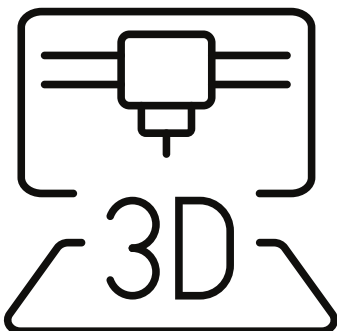


FIG. 2.  
Top of the print

## WEIGHING PROBLEM

Due to the size and weight of the replicator, it was so inconvenient that we couldn't dismantle it from multiple angles simultaneously. We are hard to move it all the while, which took us a lot of time to carry it to our workshop.

## THE STAGES



01

DECIDE WHERE  
TO START

02

PRODUCT  
DISASSEMBLY

03

CATEGORIZATION  
OF COMPONENTS



## WORK BEGUN



FIG. 3.

Photo taken from above after removing the top cover.

The process began with prying the top framework piece off.

## DIFFICULTIES

As soon as we started our work, we came across one of our biggest problems. Since the 3D printer had been put for a while, most of the screw was rusted. When we torqued it, we have an issue of screw stripped out by an apparent. As a result, We decided to use a violent way to break it down, which drill had been used.

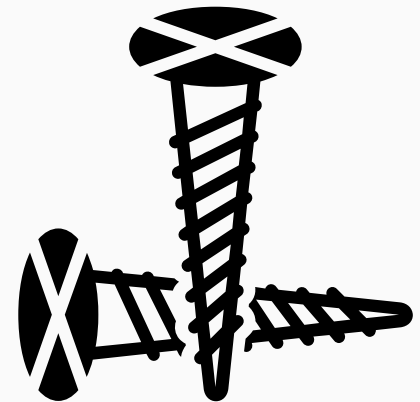


FIG. 4.



stripped screw

# PROGRESS

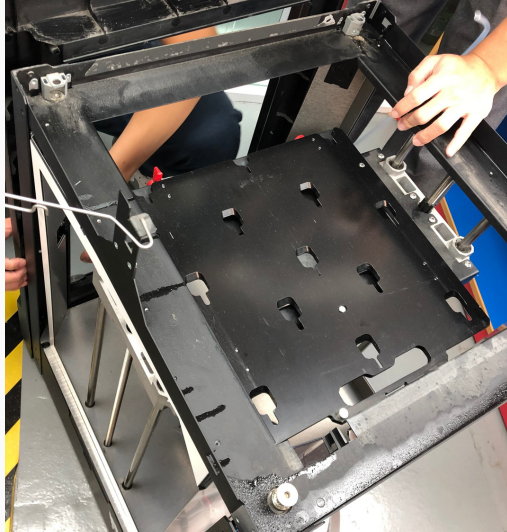


FIG. 7.

As we the separation goes on , the body of the 3D printer has mostly removed.

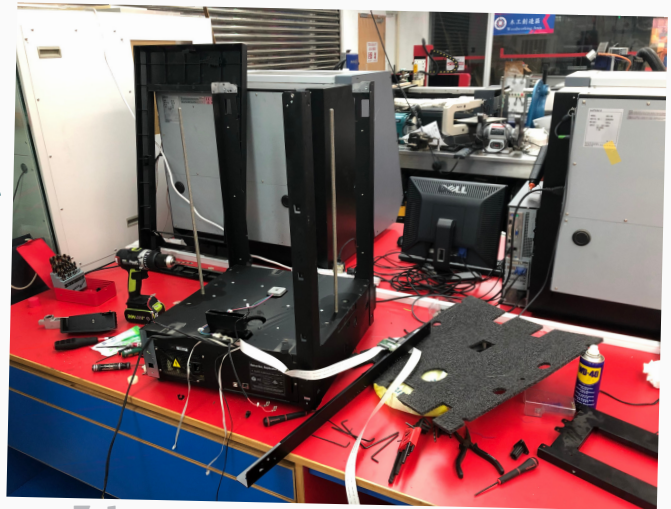


FIG.7.1

The body structure of the body are being removed

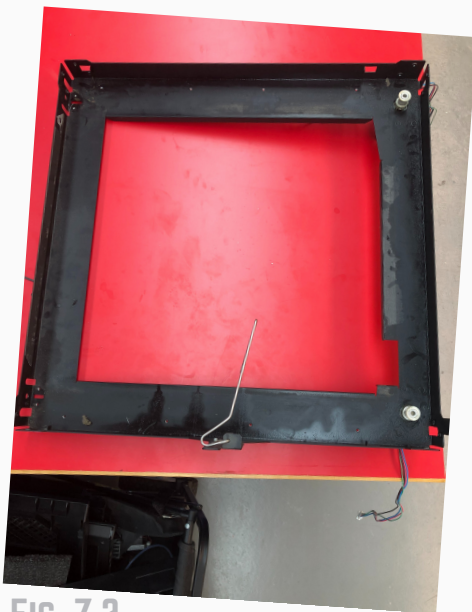


FIG. 7.2

The frame of the cover of the 3D printer



FIG. 7.3

Different assemble parts taken from the 3D printer



# PROGRESS

The body structure after disassemble

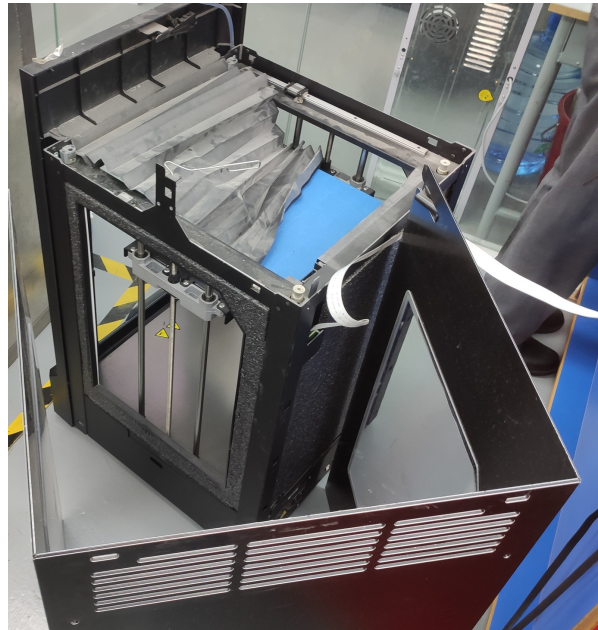


FIG. 9.1

Using different kinds of screwdriver to disassemble

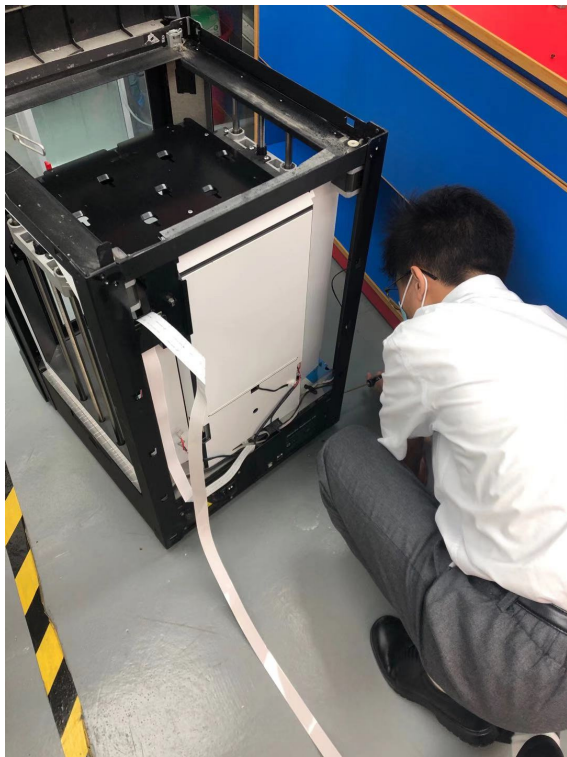


FIG. 9.

The data transmission line removed from the printer

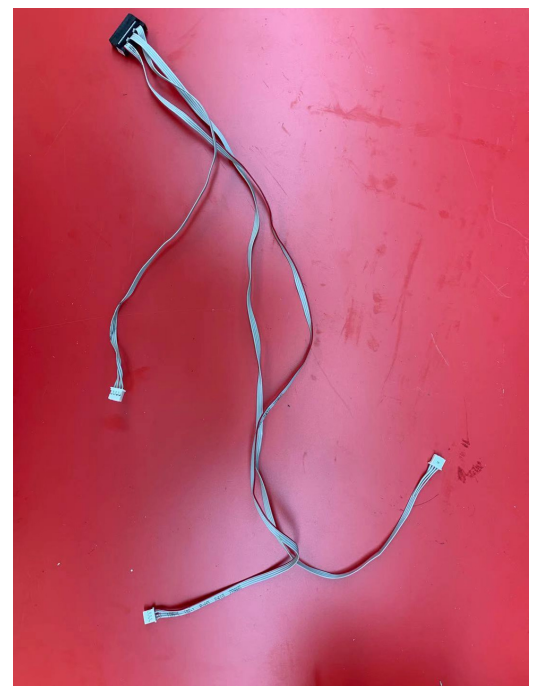


FIG. 9.2

# PROGRESS



FIG. 6.

Drill used to spin off the framework



FIG. 6.1

the biggest part of the chassis

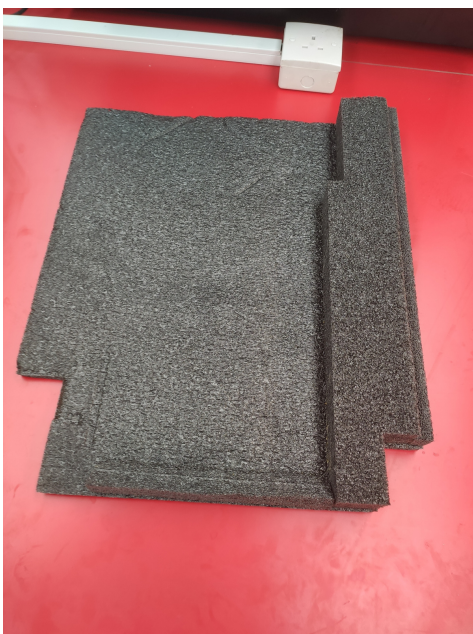


FIG. 6.2

the Protective material  
Taken out while  
disassembling





# PROGRESS



FIG. 8.1 Z positioner

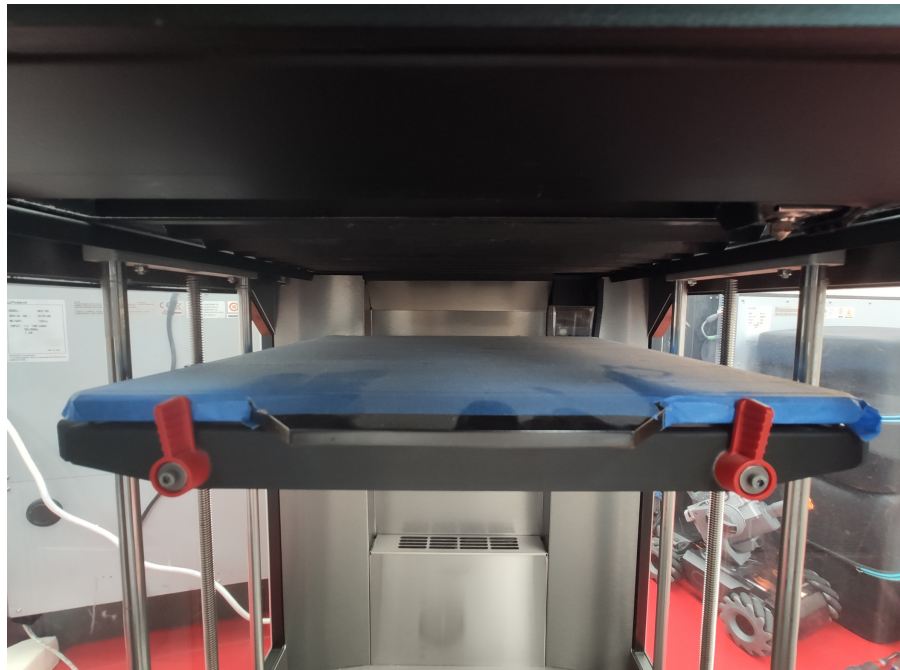


FIG. 8. inner of the 3D printer

Removal of small components  
inside the chassis



FIG. 8.2 Z positioner fixator

# PROGRESS

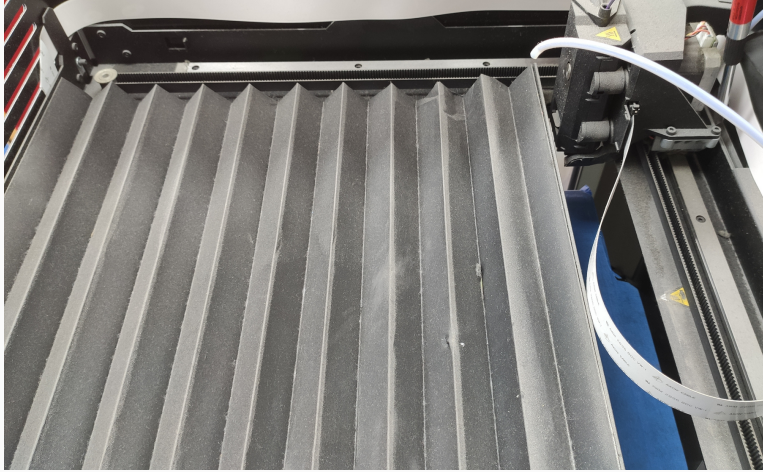


FIG. 10.



Removing the cover material is time consuming and risky as it is easy to break.



FIG. 10.1

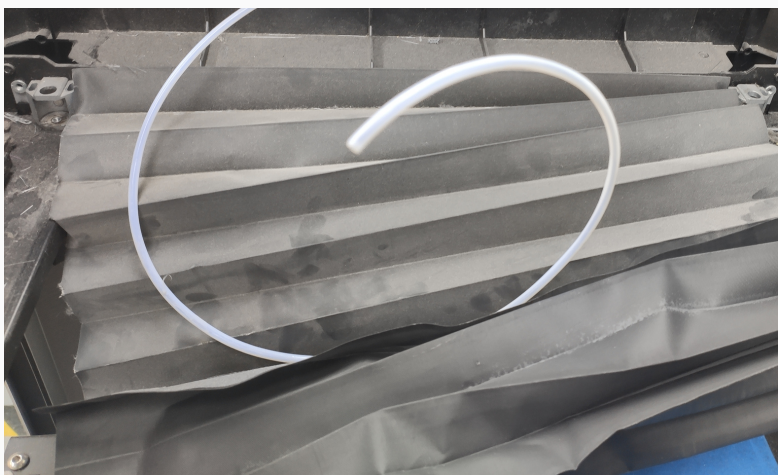


FIG. 10.2



# PROGRESS

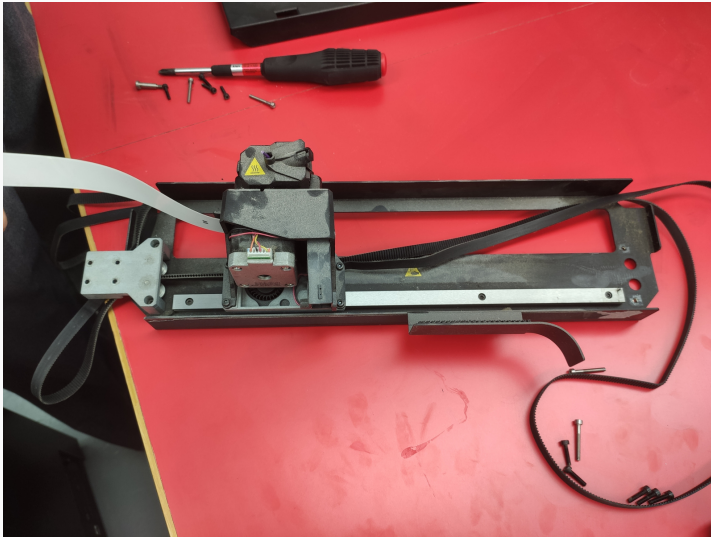


FIG. 5.

Seperation of the extruder and positioner xy

Once the frameworks was removed , the removal of the positioner along with the extruder had begun

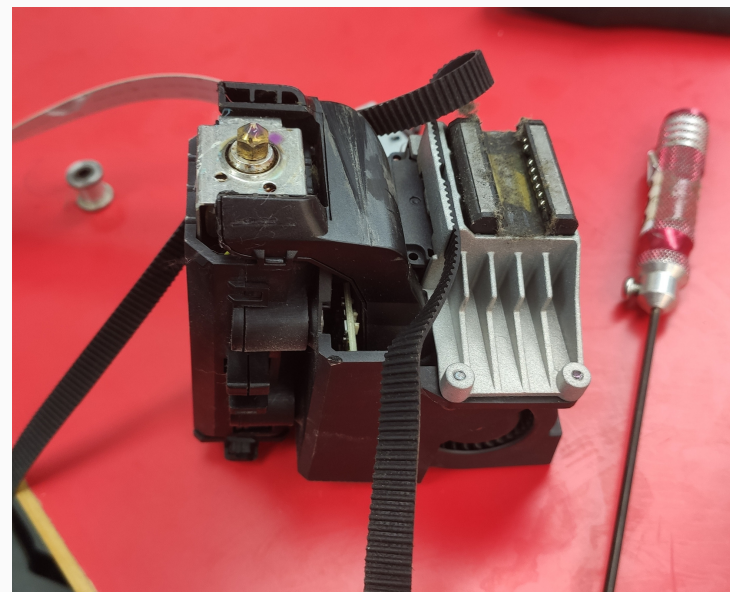


FIG. 5.1

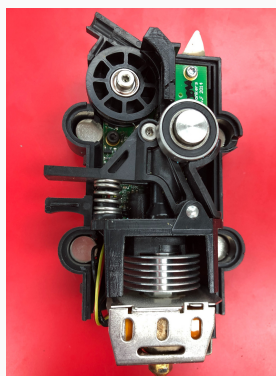


FIG. 5.2.



Interior of the extruder

## MOTHERBOARD

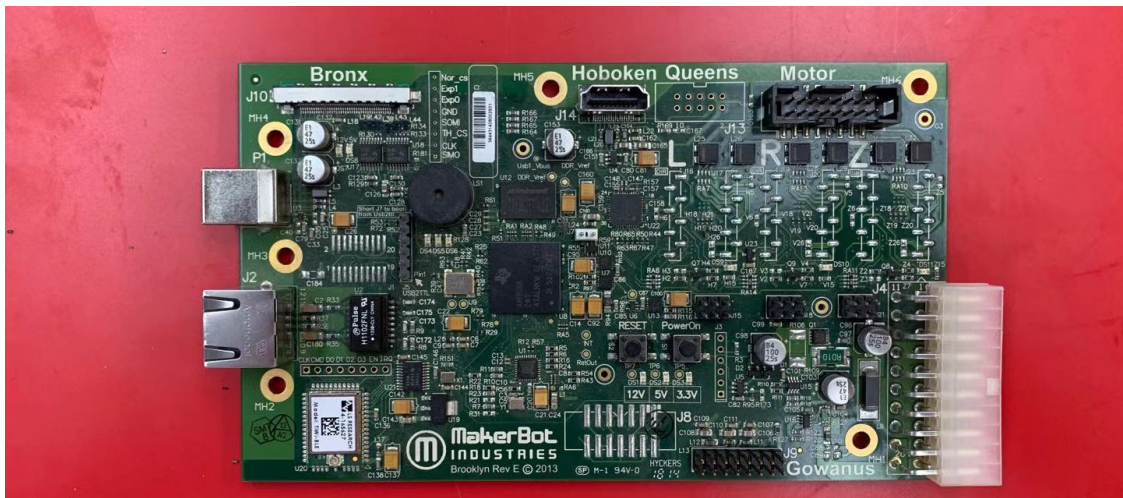


FIG. 11.  
operation panel of the 3D printer(Top View)

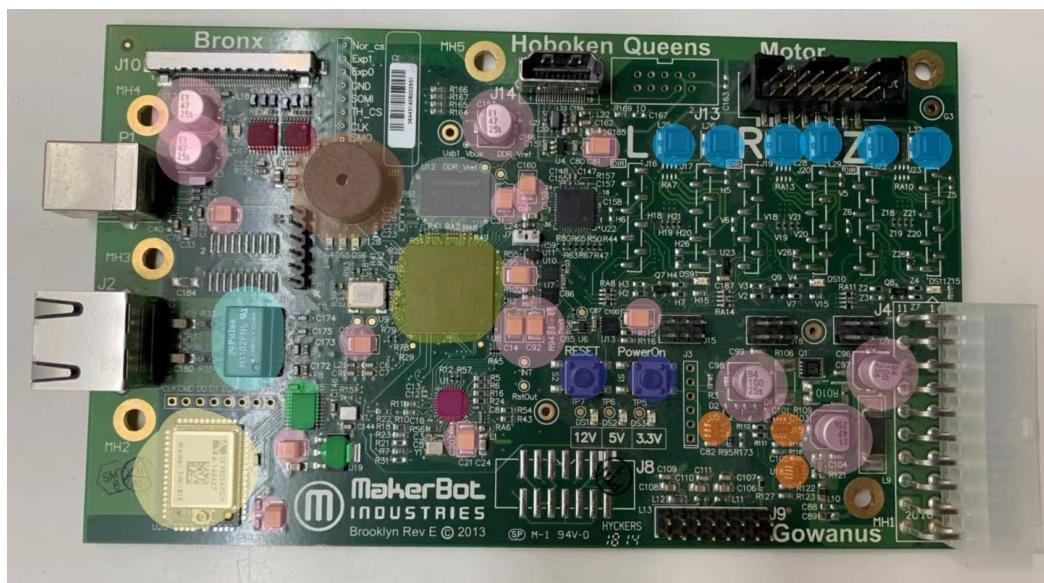







FIG. 11.1  
motherboard of the 3D printer color coded (Top View)






MAP Capacitor STRAM Transducer  
Switch Transformers Transceiver  
Level shifter Sensor Regulator  
Embedded Module

## MOTHERBOARD

Manufacturer Part Number Image	Quantity	Function	Datasheet
Texas Instruments <b>AM1808B ZWT D456</b> 	1	A media processor, mostly used as an image/video processor	<a href="https://www.ti.com/document-viewer/AM1808/datasheet">https://www.ti.com/document-viewer/AM1808/datasheet</a>
WinBond <b>W971GG6KB</b> 	1	A Double data rate (DDR) synchronous dynamic random-access memory (SDRAM) class of memory integrated circuits used in computers.	<a href="https://static6.arrow.com/aropdfconversion/93733ee0ca5e288d3efacd8a5389782515fecc43/164w971gg6kb.pdf">https://static6.arrow.com/aropdfconversion/93733ee0ca5e288d3efacd8a5389782515fecc43/164w971gg6kb.pdf</a>
PUI Audio <b>At 1438</b> 	1	Audio Sound Transducers include both input sensors, that convert sound into and electrical signal	<a href="https://www.puiaudio.com/media/SpecSheet/AT-1438-TWT-R.pdf">https://www.puiaudio.com/media/SpecSheet/AT-1438-TWT-R.pdf</a>
KEMET <b>T491</b> 	12	A tantalum electrolytic capacitor is an electrolytic capacitor, a passive component of electronic circuits.	<a href="https://www.mouser.com/datasheet/2/212/1/KEM_T2005_T491-1093550.pdf">https://www.mouser.com/datasheet/2/212/1/KEM_T2005_T491-1093550.pdf</a>
Pulse Electronics <b>H1102FNL</b> 	1	Audio Frequency (AF) Transformers work at frequencies between about 20Hz to 20kHz and are used in audio amplifier circuits	<a href="https://datasheet.octopart.com/H1102FNL-Pulse-datasheet-60241961.pdf">https://datasheet.octopart.com/H1102FNL-Pulse-datasheet-60241961.pdf</a>



# MOTHERBOARD

Manufacturer Part Number Image	Quantity	Function	Datasheet
<b>Panasonic 470FK</b> 	5	A tantalum electrolytic capacitor is an electrolytic capacitor, a passive component of electronic circuits.	<a href="https://datasheet.ciiva.com/23854/512974-23854193.pdf">https://datasheet.ciiva.com/23854/512974-23854193.pdf</a>
<b>Texas Instruments lvdso49</b> 	2	A transceiver is a combination transmitter/receiver in a single package.	<a href="https://datasheet.lscs.com/sz/lscs/1809041633_Texas-Instruments-SN65LVDS049PW_C206168.pdf">https://datasheet.lscs.com/sz/lscs/1809041633_Texas-Instruments-SN65LVDS049PW_C206168.pdf</a>
<b>Larid TiWi-BLE4-165627</b> 	1	The TiWi-BLE Bluetooth and Wi-Fi combo module is a high performance radio in a cost effective, pre-certified footprint.	<a href="https://d2jpyoab81qtd.cloudfront.net/resource-attachments/lsr-tiwi-ble-data-sheet.pdf">https://d2jpyoab81qtd.cloudfront.net/resource-attachments/lsr-tiwi-ble-data-sheet.pdf</a>
<b>Texas Instruments INA219</b> 	3	Digital power monitors perform mathematical processing on chip	<a href="https://www.ti.com/lit/ds/symlink/ina219.pdf?ts=1607413680366&amp;ref_url=http%253A%252F%252Fwww.google.com%252F">https://www.ti.com/lit/ds/symlink/ina219.pdf?ts=1607413680366&amp;ref_url=http%253A%252F%252Fwww.google.com%252F</a>
<b>Pulse Electronics LAN8710A-EZK-TR</b> 	1	An Ethernet transceiver is designed to connect electronic devices within a network, allow to transmit and receive messages	<a href="http://ww1.microchip.com/downloads/en/DeviceDoc/00002164B.pdf">http://ww1.microchip.com/downloads/en/DeviceDoc/00002164B.pdf</a>

# OPERATION PANEL

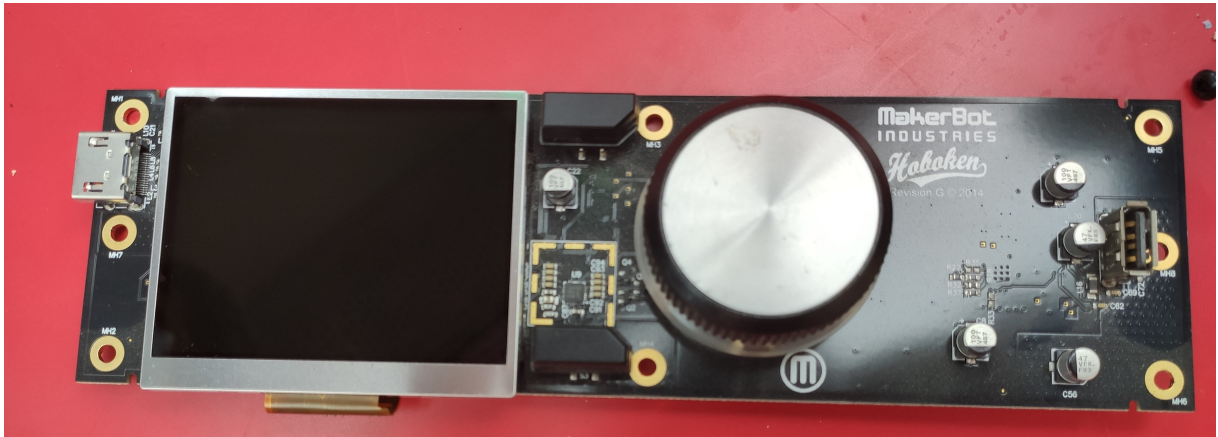


FIG. 12.

operation panel of the 3D printer(Top View)



FIG. 12.1

operation panel of the 3D printer (Bottom View)

# OPERATION PANEL



FIG. 13.

operation panel of the 3D printer color coded (Top View)

Capacitor    Monitor    Connector    Transceiver

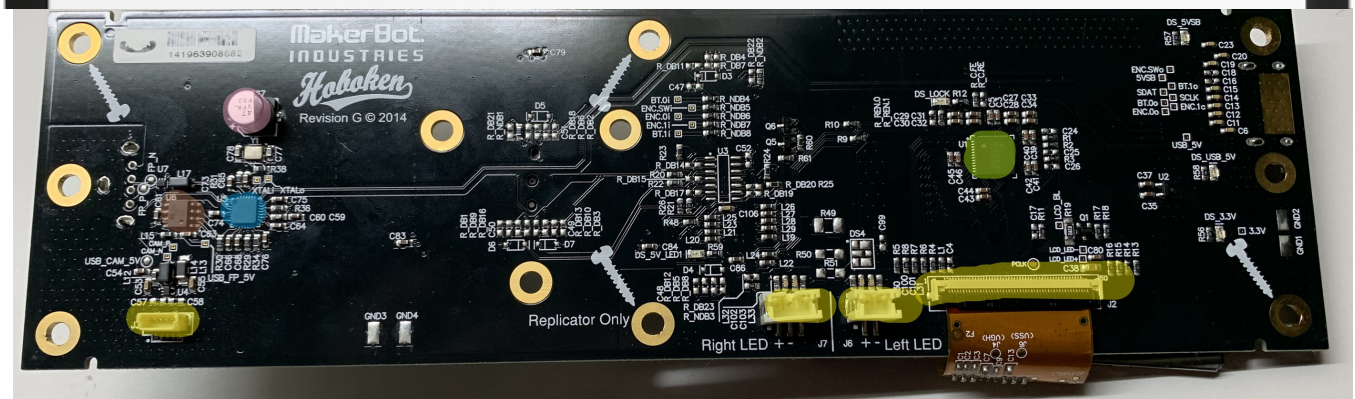


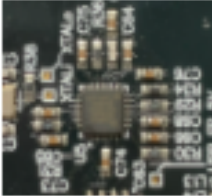

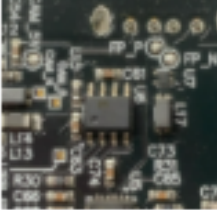
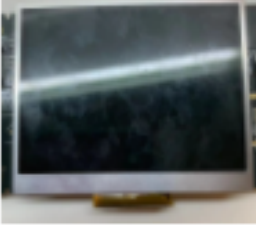
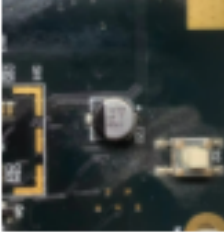
FIG. 13.1

operation panel of the 3D printer color coded (Bottom View)

Connector    Deserializer    Capacitor    Power switch  
Translator



## OPERATION PANEL

Manufacturer Part Number Image	Quantity	Function	Datesheet
<b>SMSC USB2412</b> 	1	The SMSC USB2412 is single transaction translator hub controller IC for embedded USB applications	<a href="https://ww1.microchip.com/downloads/en/DeviceDoc/2412.pdf">https://ww1.microchip.com/downloads/en/DeviceDoc/2412.pdf</a>
<b>Texas Instruments DS99R106VS</b> 	1	A Deserializer is used in high speed communications to compensate for limited input/output	<a href="https://www.ti.com/lit/ds/symlink/ds99r106.pdf?HQS=TI-null-null-mouser-mode-df-pf-null-ww&amp;ts=1607434500754&amp;ref_url=https%253A%252F%252Fwww.mouser.com%252F">https://www.ti.com/lit/ds/symlink/ds99r106.pdf?HQS=TI-null-null-mouser-mode-df-pf-null-ww&amp;ts=1607434500754&amp;ref_url=https%253A%252F%252Fwww.mouser.com%252F</a>
<b>Microchip MIC2026-1YM</b> 	1	The MIC2026 are high-side MOSFET switches optimized for general-purpose power distribution	<a href="https://ww1.microchip.com/downloads/en/DeviceDoc/mic2026.pdf">https://ww1.microchip.com/downloads/en/DeviceDoc/mic2026.pdf</a>
<b>AVNET URT_UMSH-8252MD</b> 	1	A monitor is an output device that displays information in pictorial form.	<a href="https://www.avnet-integrated.eu/fileadmin/user_upload/Files/Displays_NEW/Colour_TFT/URT/URT_UMSH-8252MD-5T_REV1_.pdf">https://www.avnet-integrated.eu/fileadmin/user_upload/Files/Displays_NEW/Colour_TFT/URT/URT_UMSH-8252MD-5T_REV1_.pdf</a>
<b>Panasonic 470FK</b> 	6	A tantalum electrolytic capacitor is an electrolytic capacitor, a passive component of electronic circuits.	<a href="https://datasheet.ciiva.com/23854/512974-23854193.pdf">https://datasheet.ciiva.com/23854/512974-23854193.pdf</a>

## KEY COMPONENT



FIG. 14.

date transfer station of  
the 3D printer (Top  
View)

operation panel of the 3D  
printer color coded (Bottom  
View)



FIG. 14.1

Connector MOSFET



FIG. 14.2

Hot end of the extruder where the  
filament is melted then extruded  
through a nozzle.



Transformer, provided by FSP  
Group. its maximum output 700w.  
(Side View)



# The whole framework of the 3D printer



# CONCLUSION

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Overall, we have learned a lot while disassembling machines. Not only the technique of disassembling but also the team spirit. We divided our work methodically for the best efficiency. There are members responsible for demolishing components, photographing, and record the details. At the time of working, we have cultivated a lot of tacit understanding, which helps our cooperation.

From our perspective, removing the rusted screw was the most significant challenge we have met. At first, we didn't notice those screws and striped a lot of them. As a result, we needed to use a violent method—use a drill to destroy the screw—to disassemble the printer.

When our teacher gave us the chance to disassemble this 3D printer, we were extremely excited about it; we hoped to gain useful knowledge and experience via the project. In the process, we met many problems. For example, due to its bulky size, we found difficulties in mobilizing the machine. Overall, we are very grateful to our teacher