VEX VRC High School 2023-2024
Reverse Engineering Online challenge

(N/a, 2024)

Atropos

Team no. 84899B

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Word Count:**498**/500

(Excluding Figure Captions, annotated images and Citations that make up 145 words)

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1: Introduction

Our team, Atropos, thrives on hard work in every project. In robotics competitions, we often rely on the convenience of a microwave for quick snacks to keep us energized.

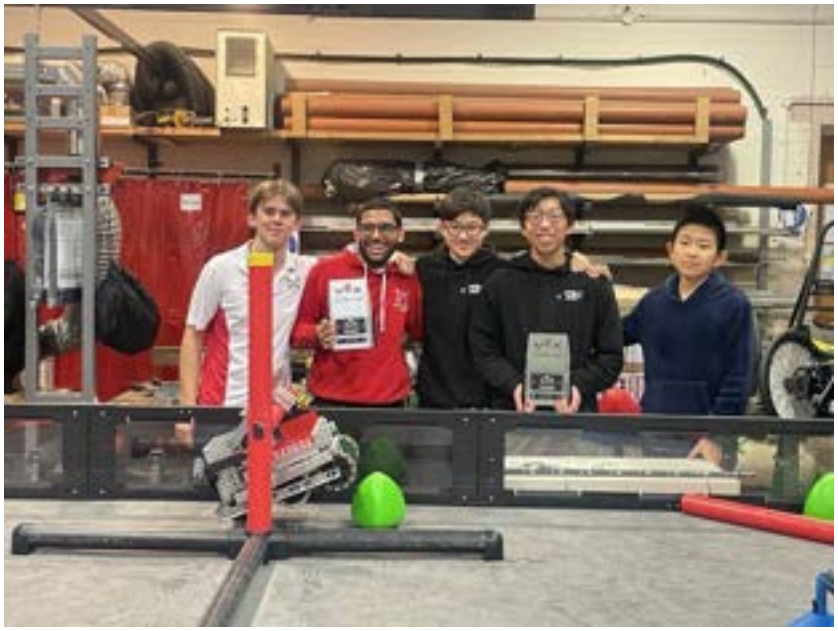


Figure 1&2: Our team members competing and winning a regional VRC event

Embracing the REC, we dissected a functional microwave, aiming to unravel its technologies and deepen our understanding, choosing it over alternatives like a digital thermostat and an old phone for its unique exploration potential.

2: Action Plan

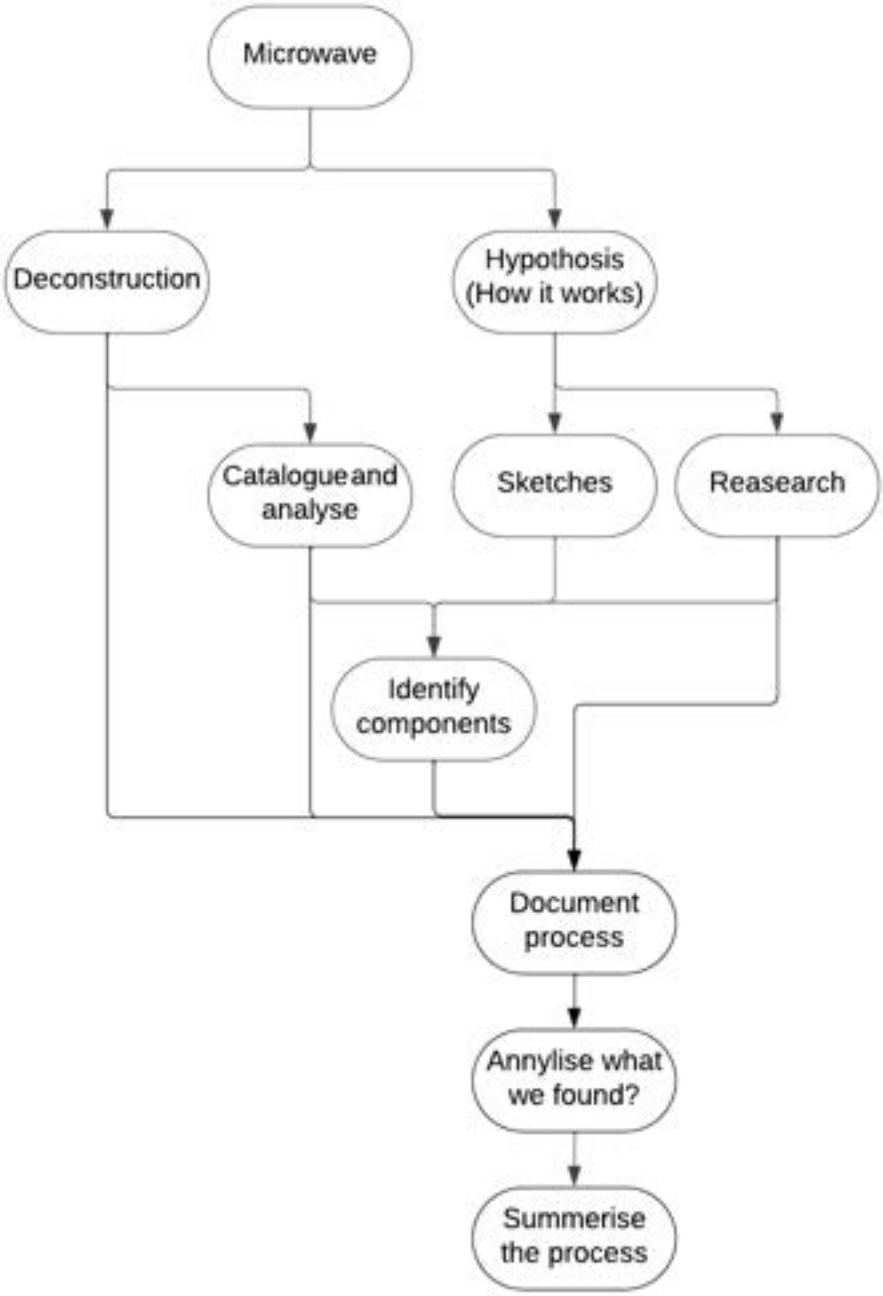


Figure 3: Pre-action plan of how to reverse engineer the microwave

3: Pre-Disassembly research

Pre-disassembly we drew sketches of how a microwave would work.

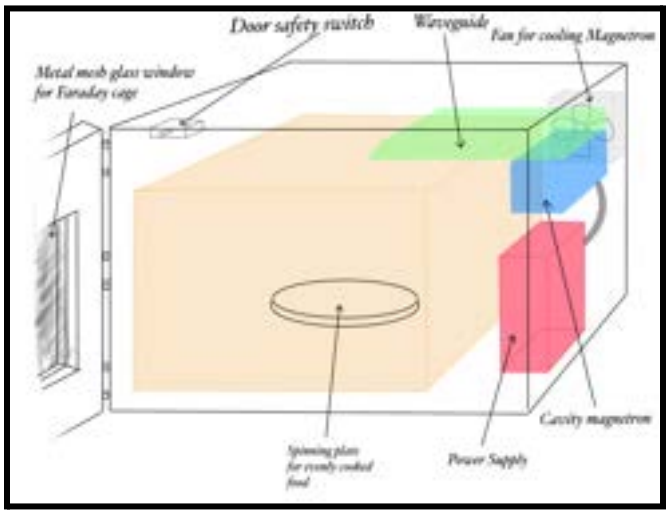


Figure 4: Basic sketch of microwave ***(Copyright 2014 Edison Tech Center, no date)***

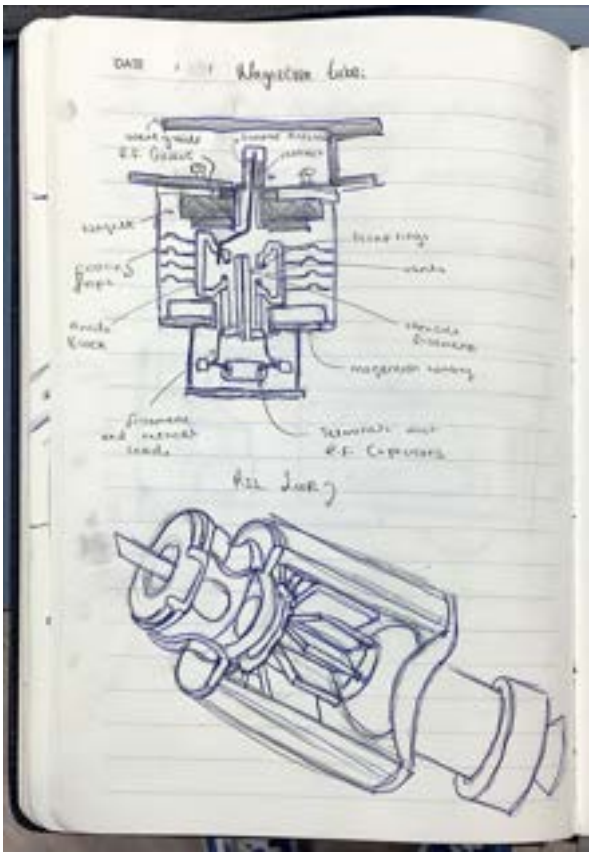


Figure 5: Sketch of magnetron

Figure 6: Transformer drawing

Figure 7: Lightbulb and microswitch.

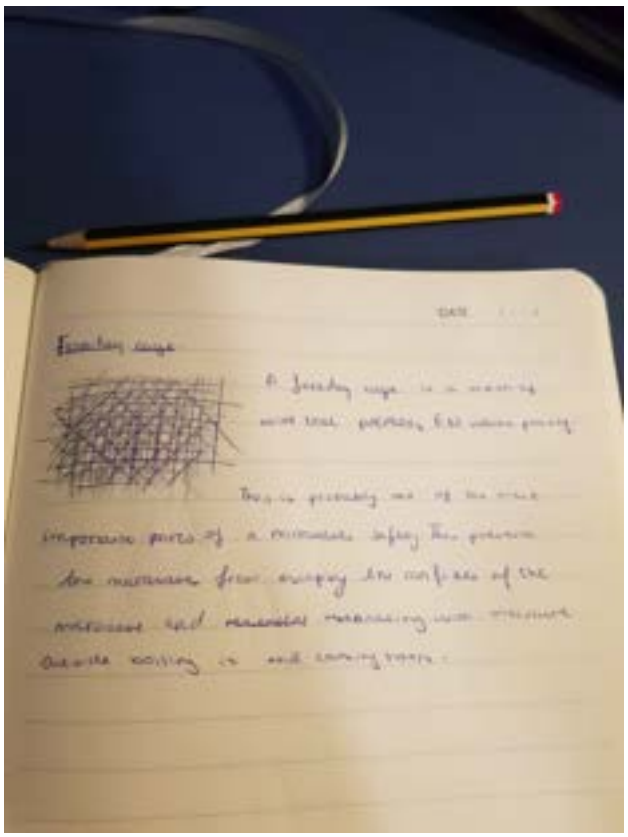
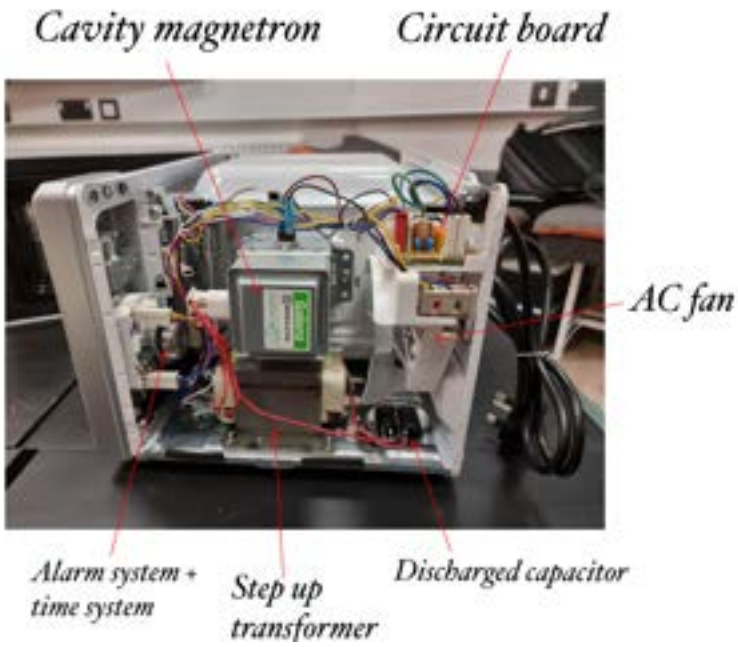


Figure 8: Faraday Cage

4: Disassembly process

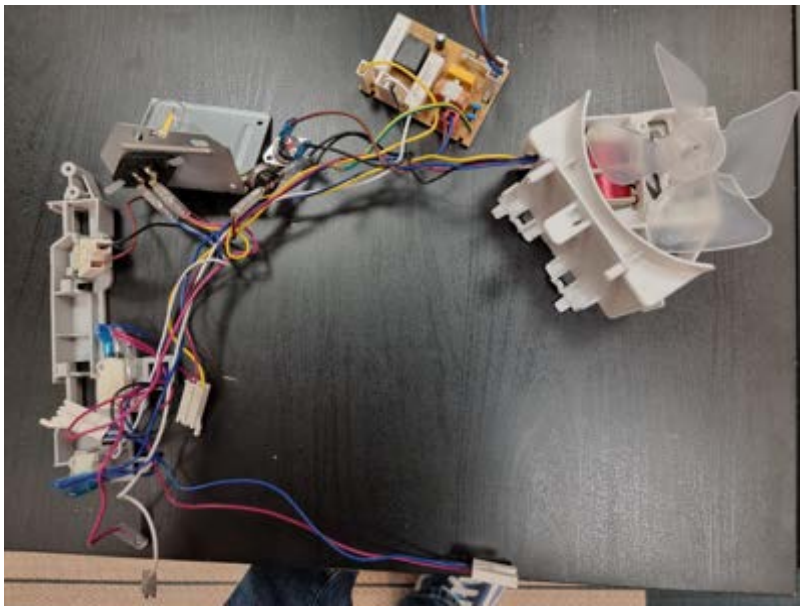
1. Removing back cover

2. Labelling components inside

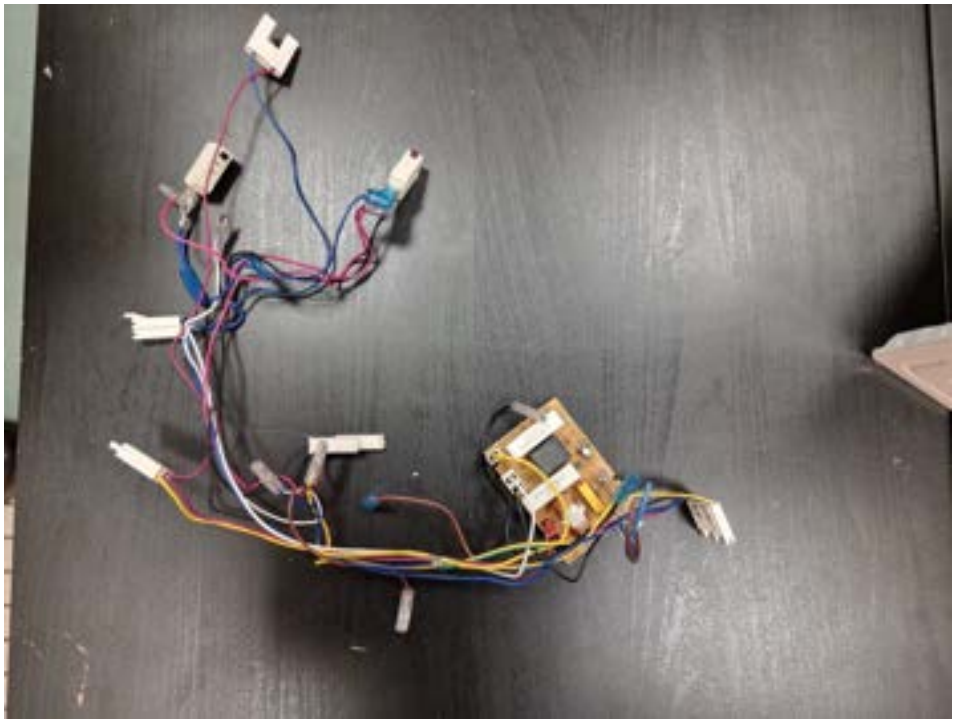


3. Our teacher in charge of discharging the capacitor

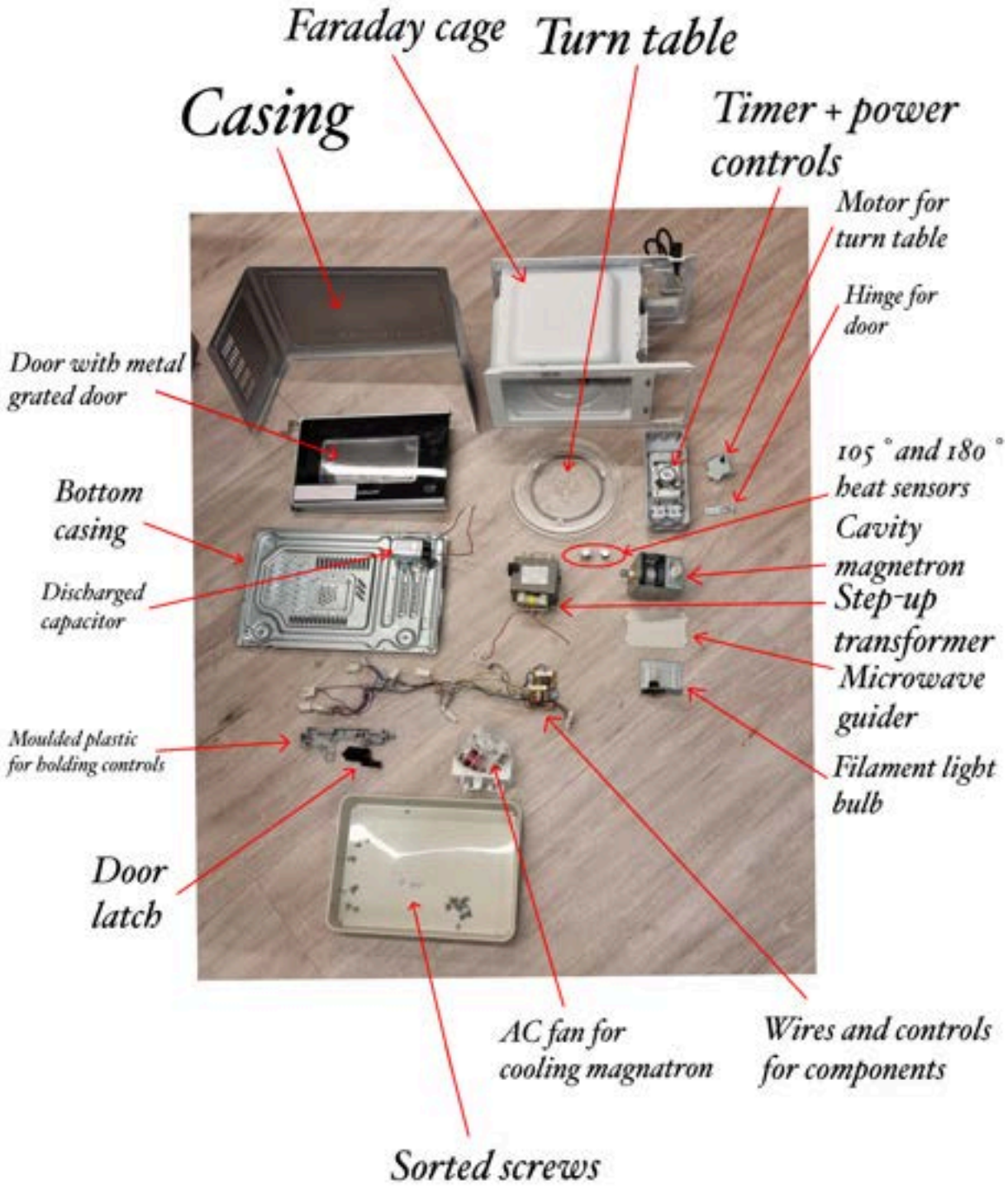
4. Remove the internal components leaving the wiring in (leaving the capacitor alone)



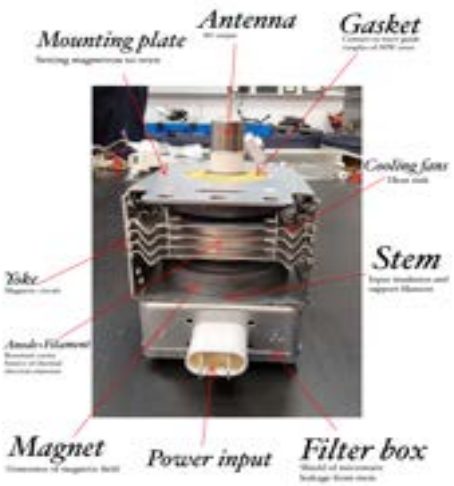
5. Disconnect wiring from components which deliver power from the power supply.



6. Laying out all components



5: Major components



5.1: Cavity Magnetron:

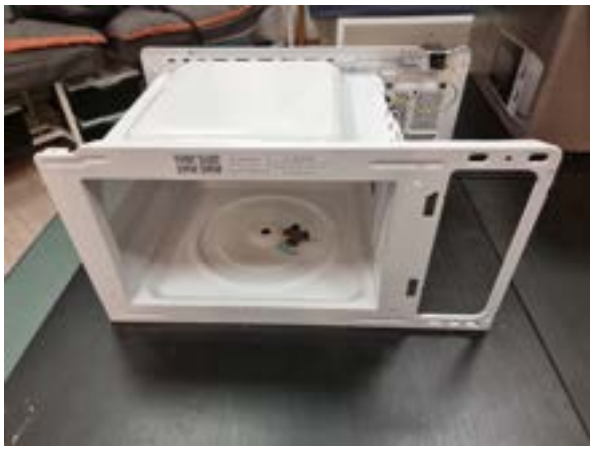
A cavity magnetron converts electricity into microwaves, electrons spiral around a cathode in a high-voltage field within a resonant cavity. Beryllium oxide dissipates heat, ensuring stable operation.

(Isle Web Design, 2020)

Data sheet: (Azuma, 2006)

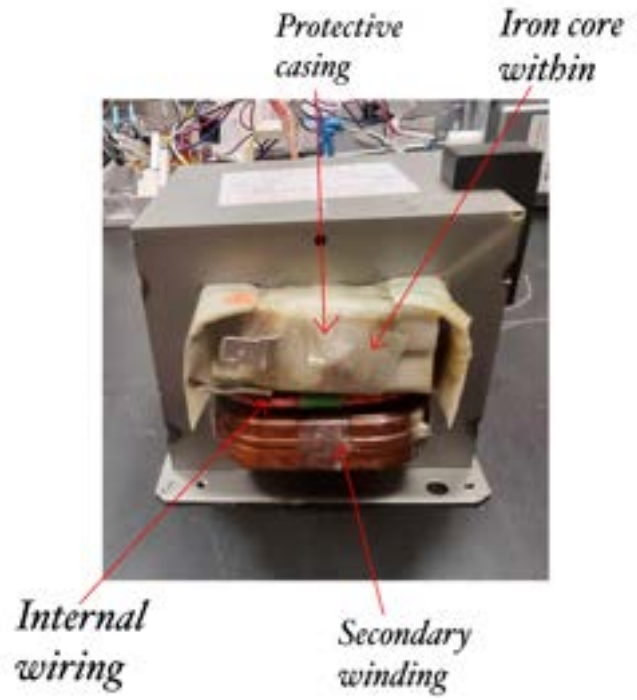
5.2: Faraday Cage:

A microwave's metal walls and door form a Faraday cage, containing microwaves and prevent electromagnetic radiation from escaping.



5.3: Transformer:

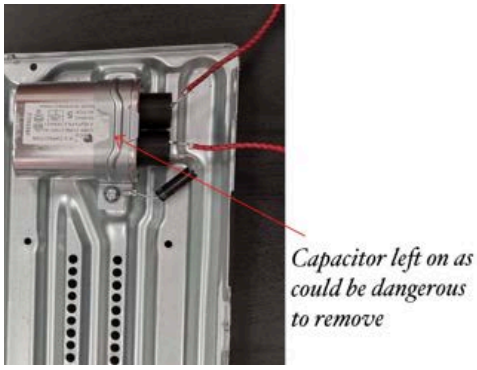
The transformer converts input voltage into 120V needed for the Magnetron.



Details: (*REPA GEV*, no date)

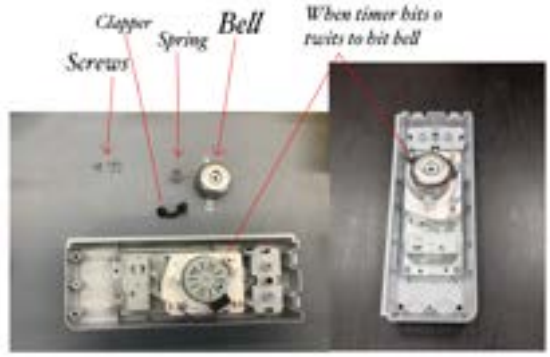
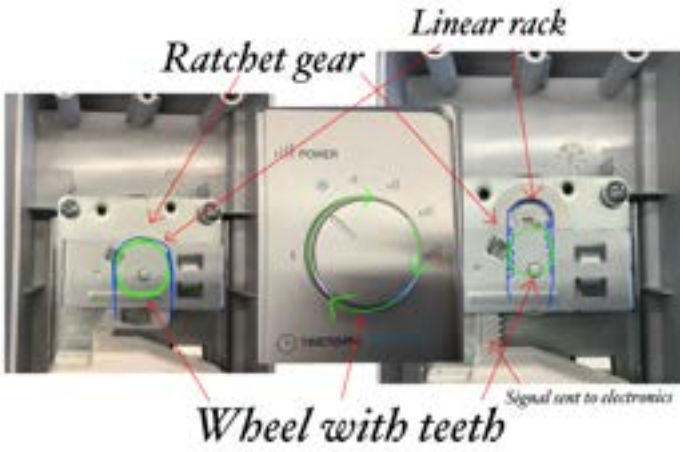
5.4: Capacitor:

The capacitor acts as a quick release battery and aids in supplying the voltage in such a way that doesn't overheat the magnetron and destroy other components with high voltages.



6: Minor components:

Casing	
Turntable	

Time + power control	 
Motor (5/6 RPM)	 
Door Microswitch to make sure the door is closed	

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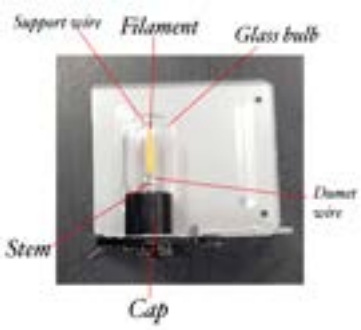
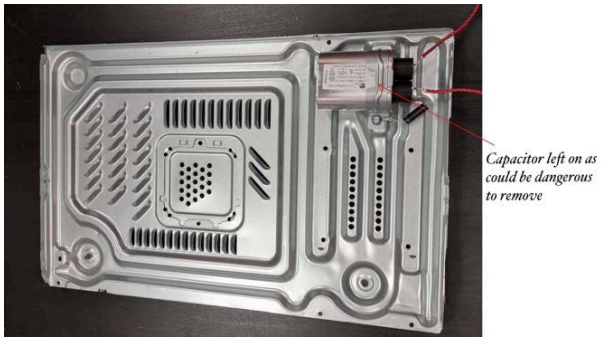
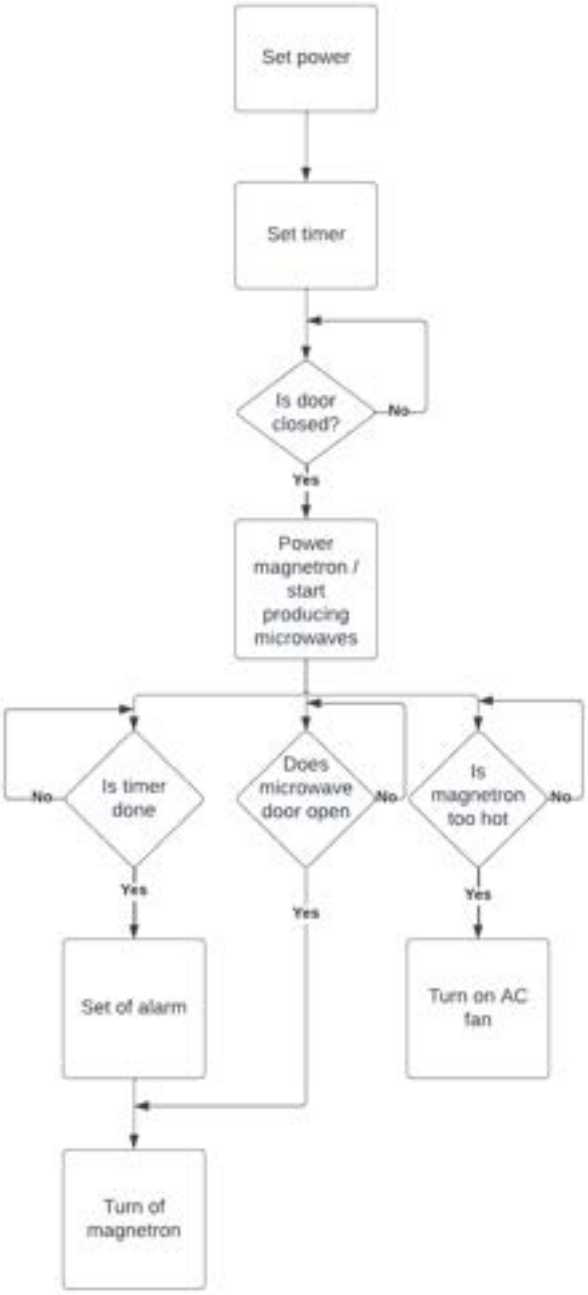
Heat sensors (105° and 108°)	
Microwave guide cover (made of mica)(*Microwave Waveguide Cover*, 2010)	
Filament light bulb	
AC fan	

Bottom casing	
Sorted screws	

7: Finding & Summary

7.1: Control diagram



7.2: Conclusion

During this course, we gained expertise in dismantling a microwave safely. We learnt how to take apart a microwave. The microwave consisted of diverse systems, including electrical and mechanical necessitating a comprehensive understanding. To achieve this, we delved into the mechanical parts and their specific elements.

9: Bibliography

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