

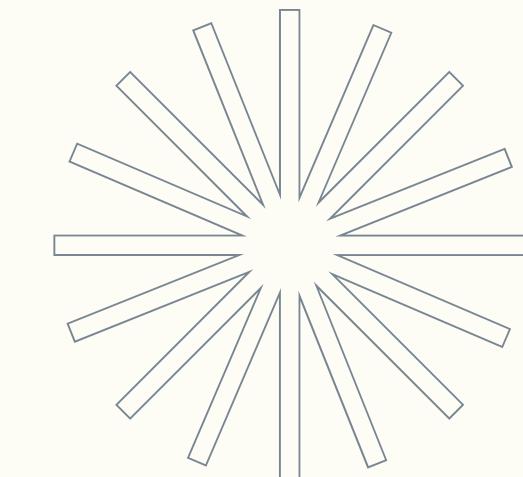
Q Group 3

# JOINING STATION

Industrial  
Automation  
Final Project

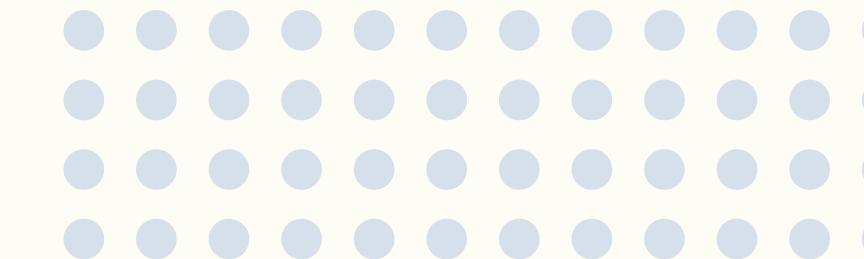
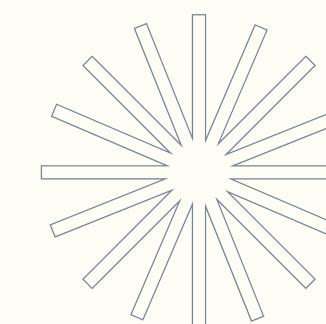
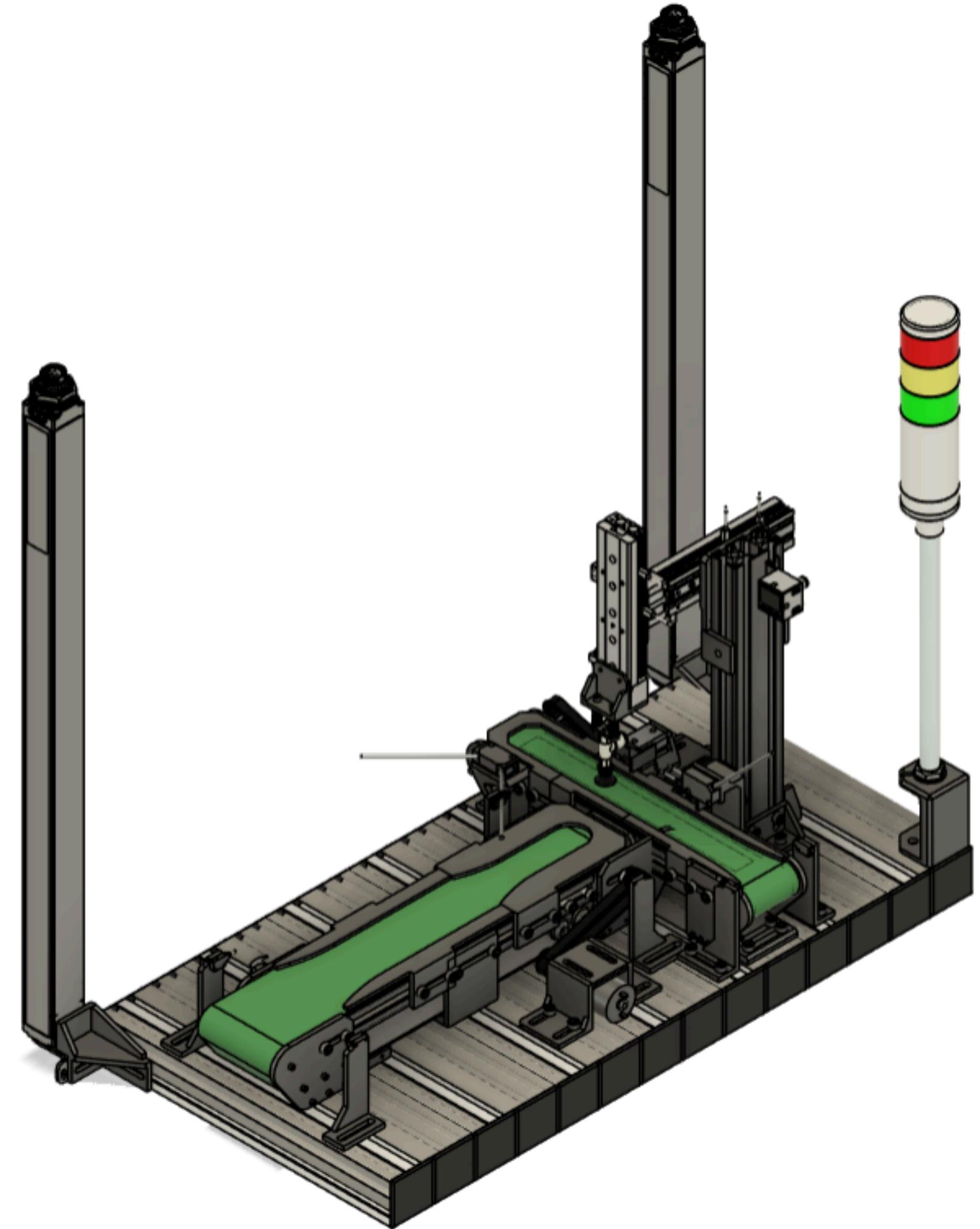
START PRESENTATION →

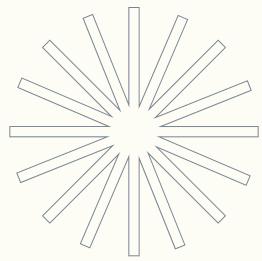
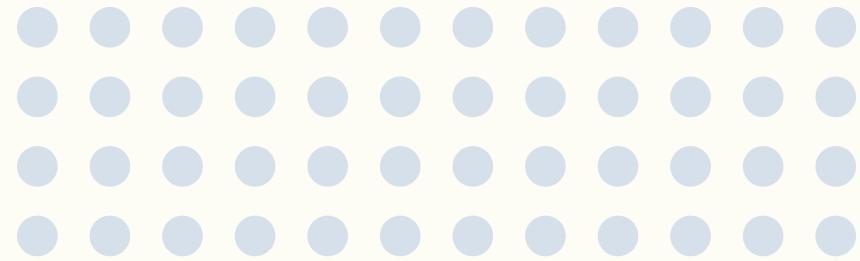




# Our Objective

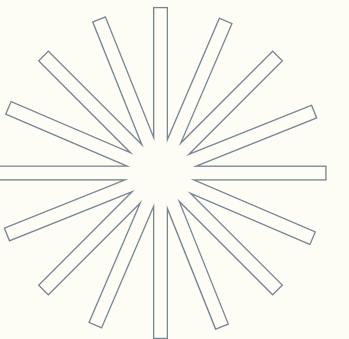
The objective of this project is to design and develop an automated joining station that integrates various components—such as DC motors, sensors, and pneumatic actuators—to facilitate hands-on learning in automation and control systems. This station aims to enhance our understanding of system functionality, component integration, and control flow in a simulated industrial environment, ultimately providing practical experience in robotics and industrial automation.





# Scope

- **Design and construction** of an automated joining station
- **Utilization of components** such as DC motors, sensors, and pneumatic actuators
- **Integration of components** to study system functionality and control flow
- **Practical experience** in automation and robotics in a simulated industrial context
- **Coverage of component selection** specifications, and system operation



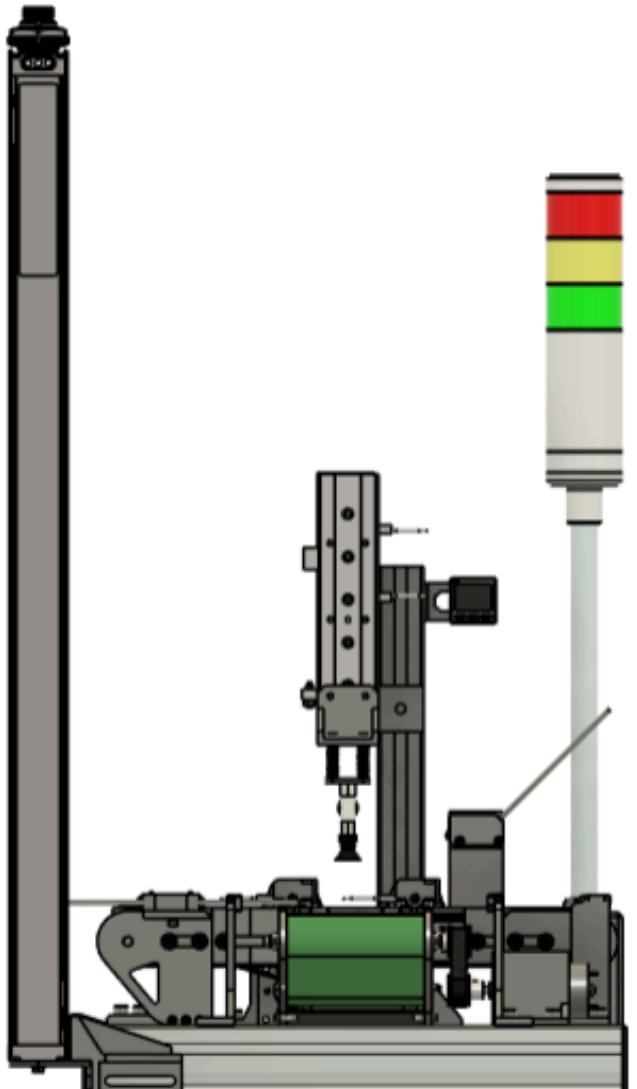
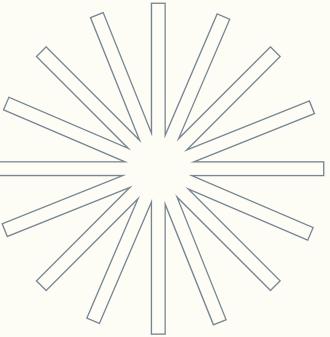
# Component Used

Input	
Address	Description
X0	Vacuum check
X1	Check cup condition
X2	End Con 2 (Cup conveyor) Check
X3	End Con 1 (Lid conveyer) Check
X4	Start Con 1 (Lid conveyor) Check
X5	Start Con 2 (Cup conveyor) Check
X6	Slide Table X ADV. (OUT) Check
X7	Slide Table X RTN. (IN) Check
X10	Slide Table Y RTN. (IN) Check
X11	Slide Table Y RTN. (OUT) Check
X12	Gate Check cup RTN. (IN)
X13	Gate Check cup ADV. (OUT)
X14	Gate Stopper RTN. (IN)
X15	Gate Stopper ADV. (OUT)

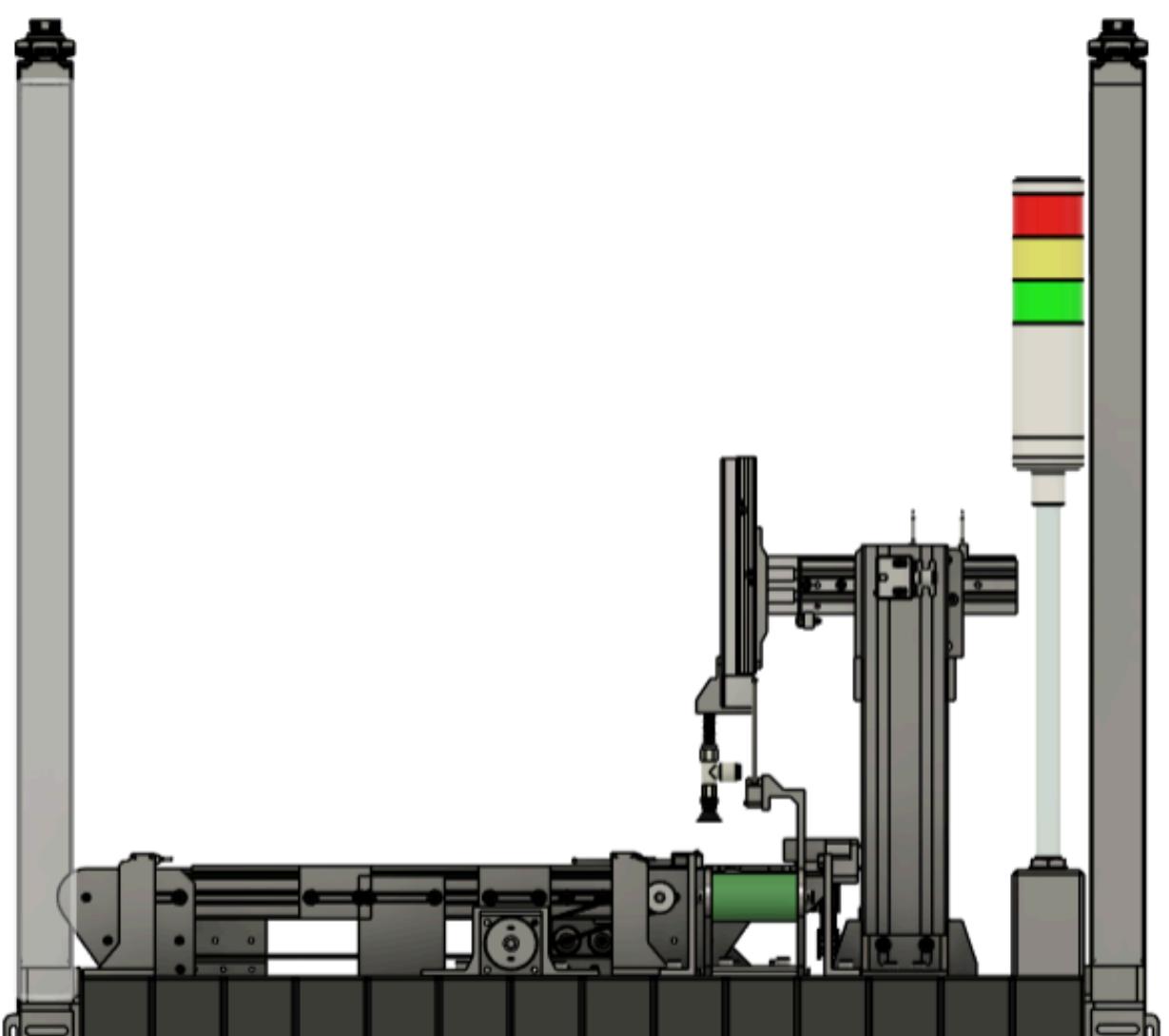
Output		
Address	Description	Sensor/Actuator
Y0	Slide Table X ADV. (OUT)	Pnuamatics Slide 1 Port 4 (A)
Y1	Slide Table X RTN. (IN)	Pnuamatics Slide 1 Port 4 (B)
Y2	Slide Table Y RTN. (IN)	Pnuamatics Slide 2 Port 5 (B)
Y3	Slide Table Y ADV. (OUT)	Pnuamatics Slide 2 Port 5 (A)
Y4	Conveyor Cup Forward	Relay 1 Motor 1
Y5	Conveyor Lid Forward	Relay 2 Motor 2
Y6	Gate Check cup on/off (Hold)	Pnuamatics Compact 1 Port 9 (A)
Y7	Gate Stopper on/off (Hold)	Pnuamatics Compact 2 Port 10 (A)
Y10	Vacuum on (Hold)	Vacuum generator
Y11	Vacuum off (Toggle)	Vacuum generator

# Methodology - Designing

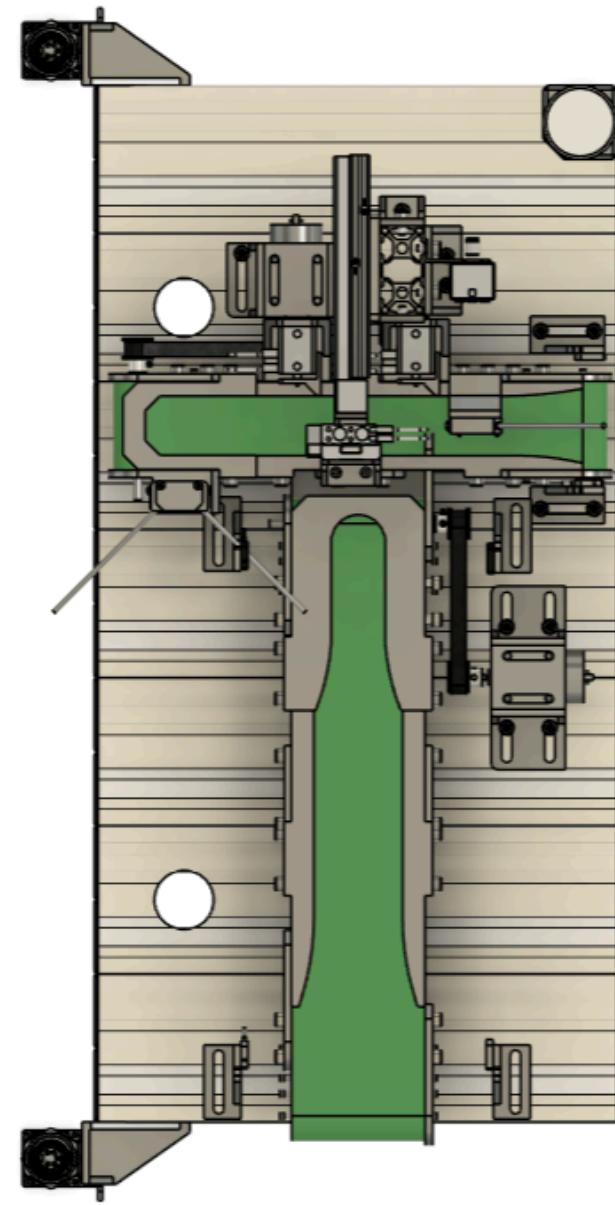
## 1. Scoping and Designing



Front

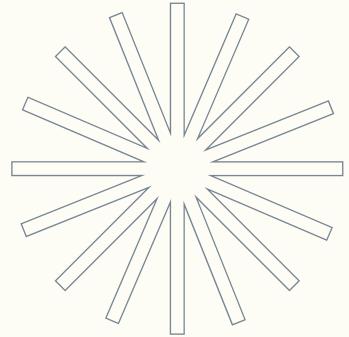
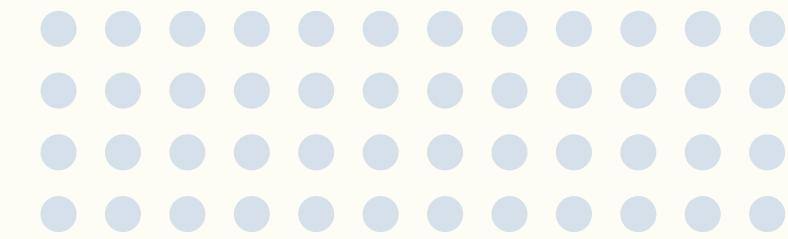


Side

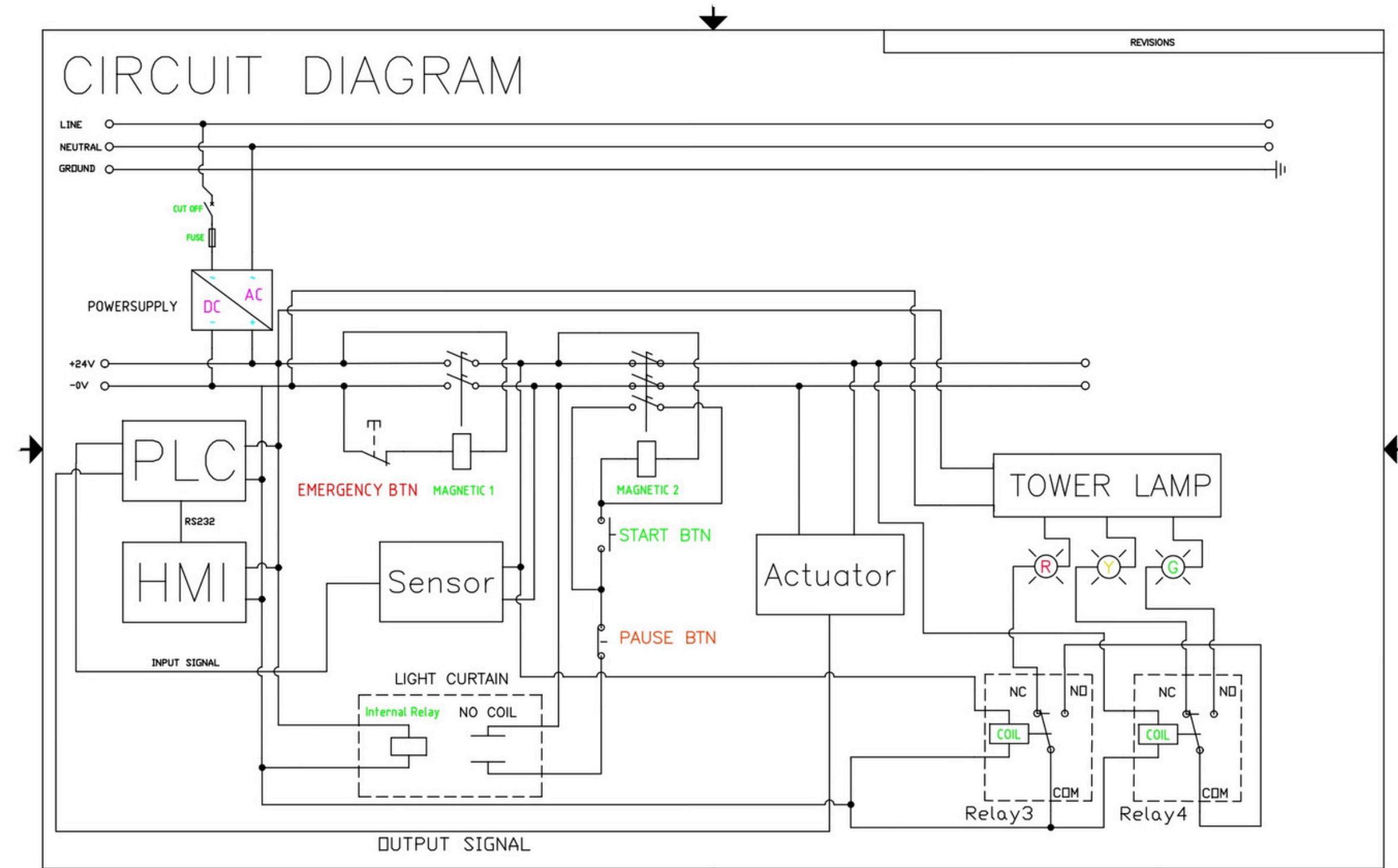


Top

# Methodology - Designing

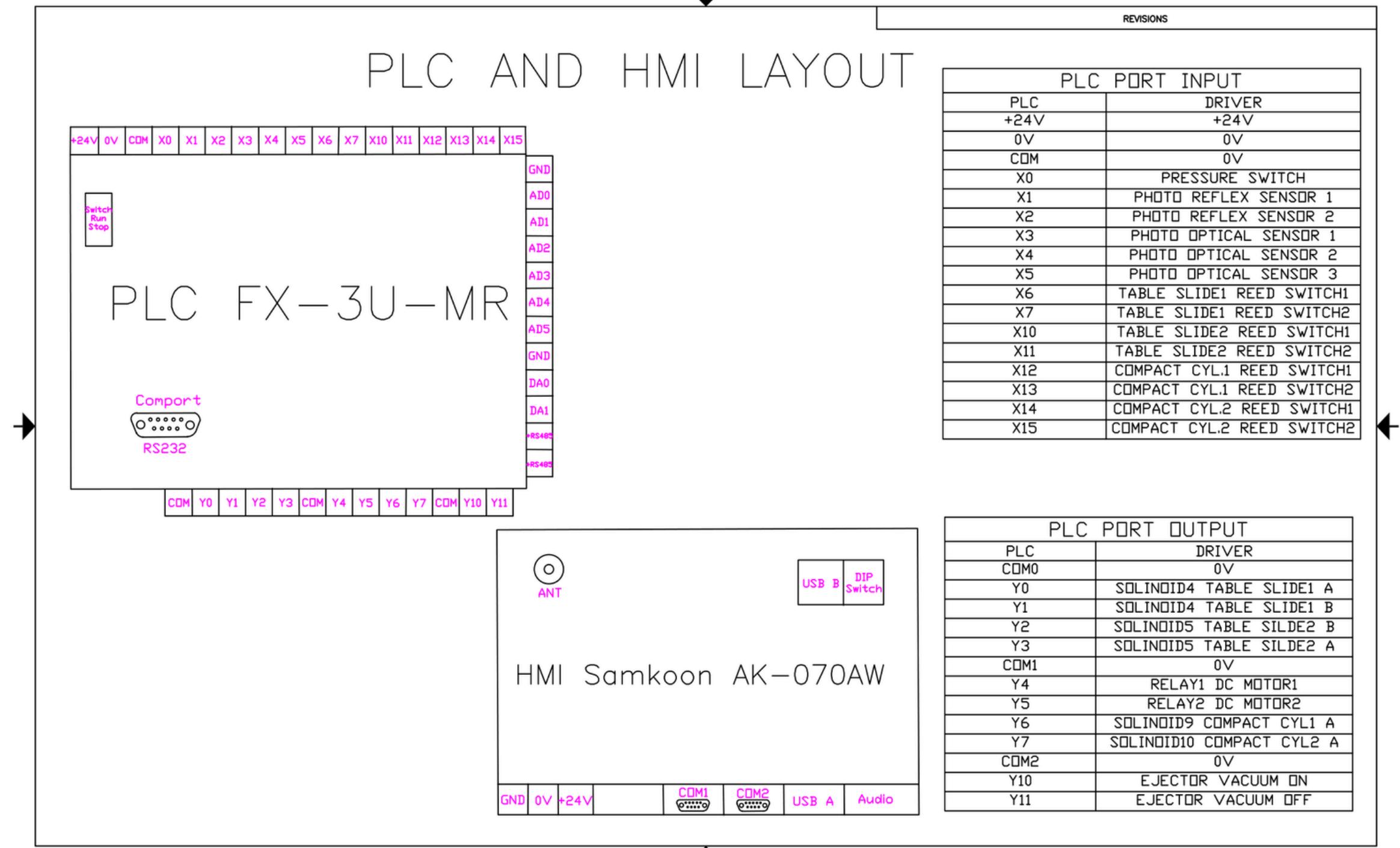


## Circuit Diagram

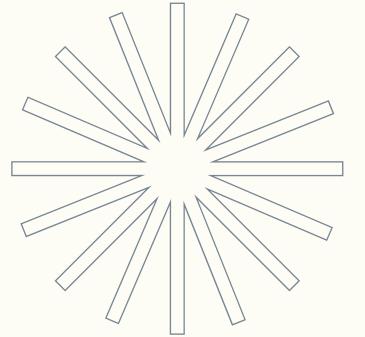
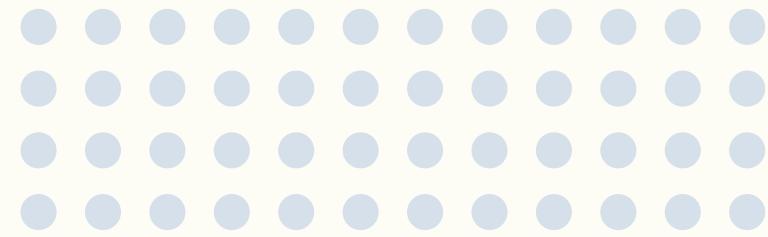


# Methodology - Designing

## PLC and HMI Diagram



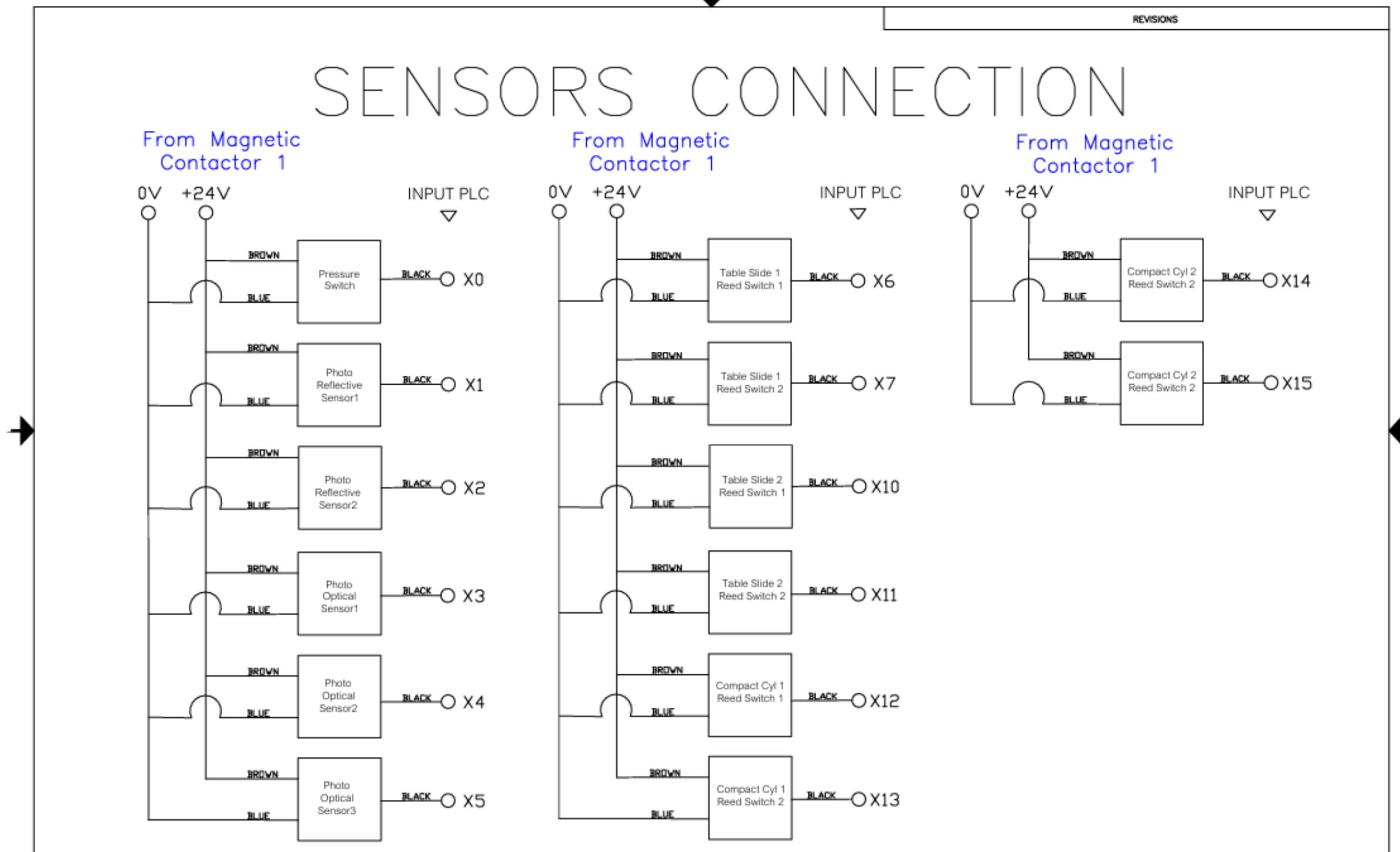
# Methodology - Designing



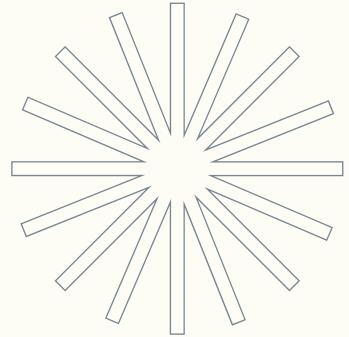
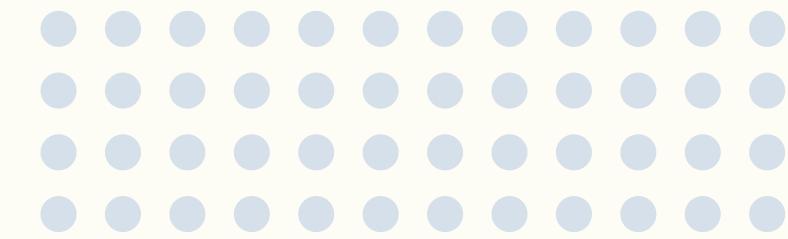
## Sensors Diagram

REVISIONS

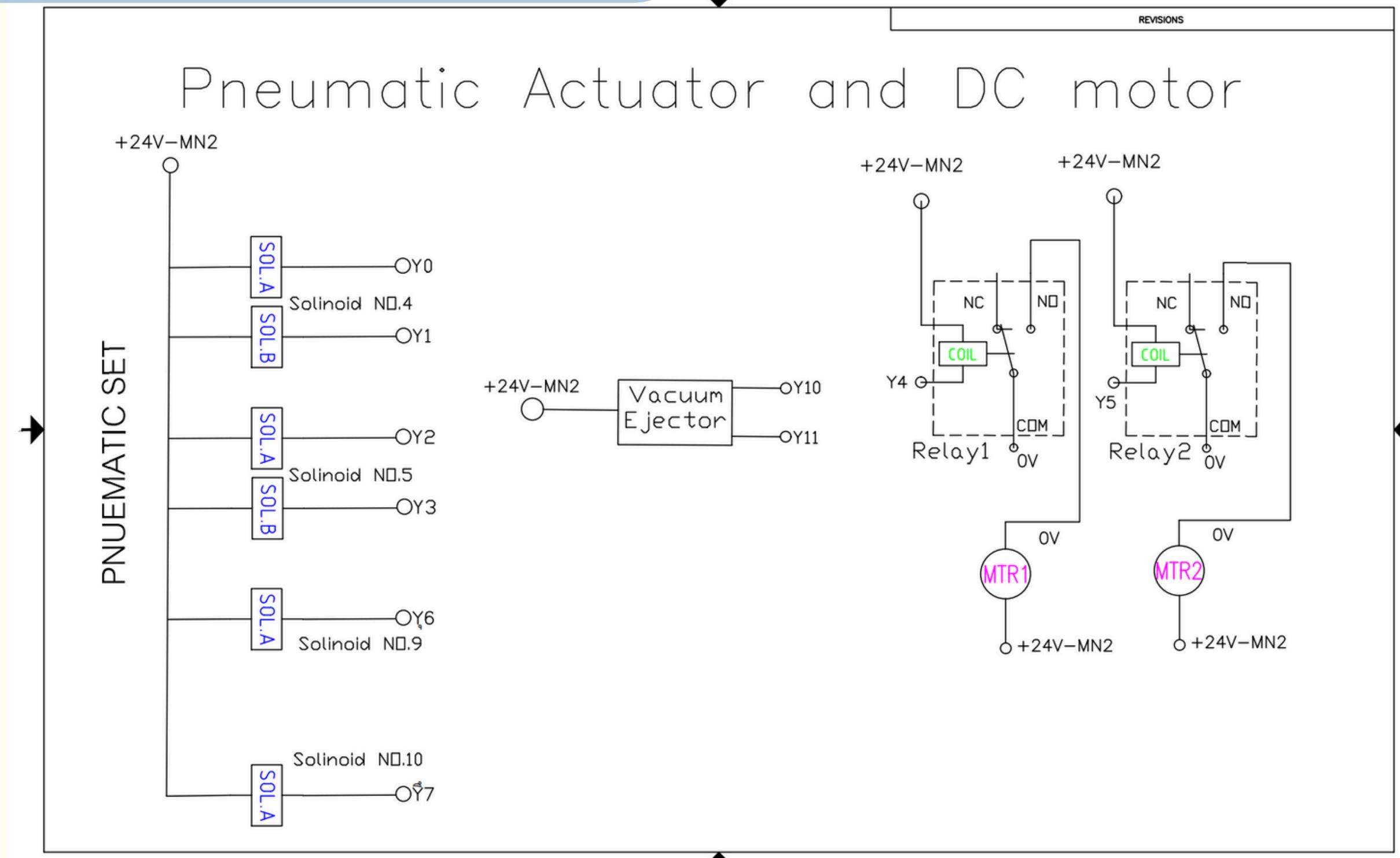
### SENSORS CONNECTION



# Methodology - Designing

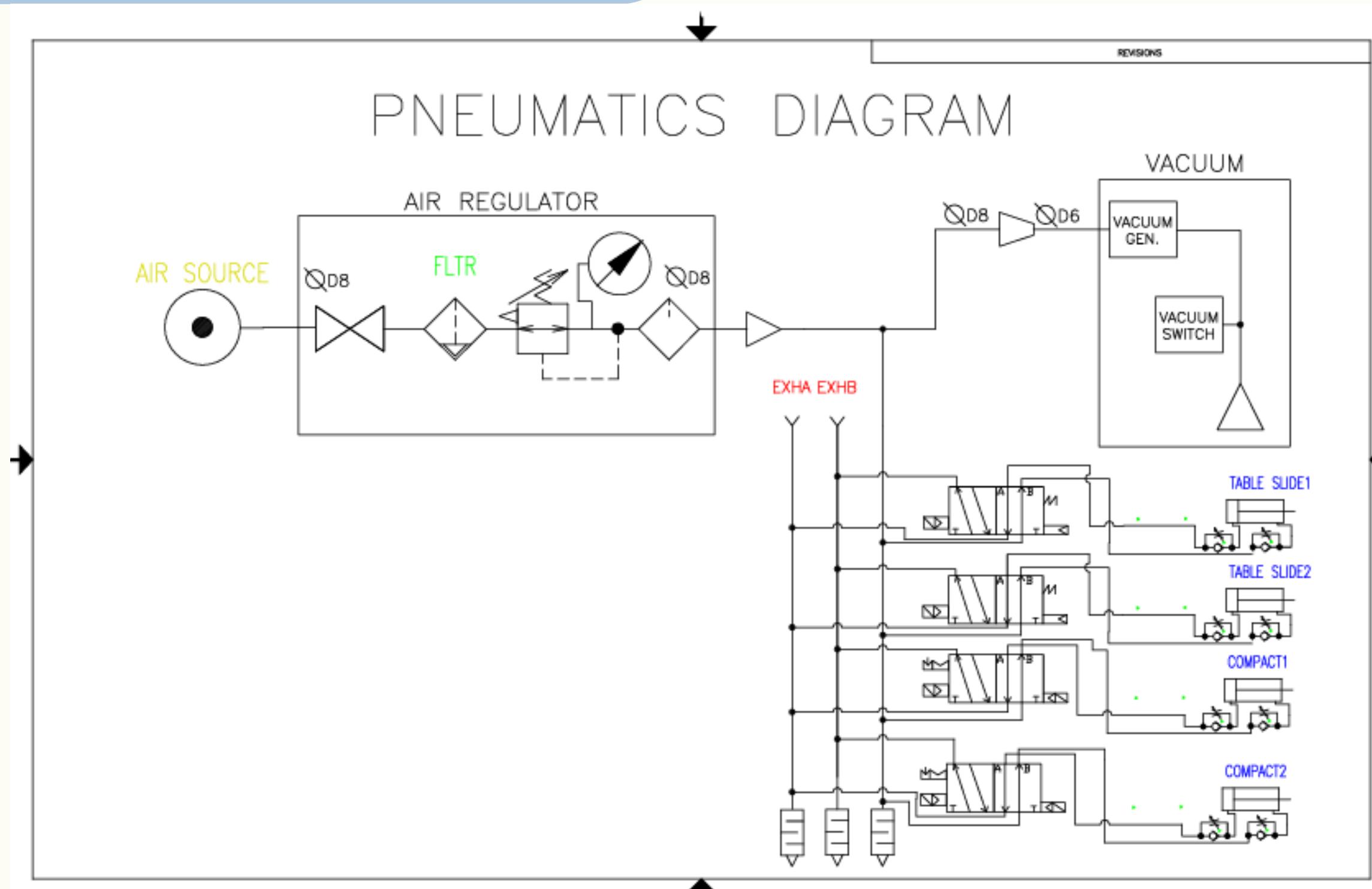
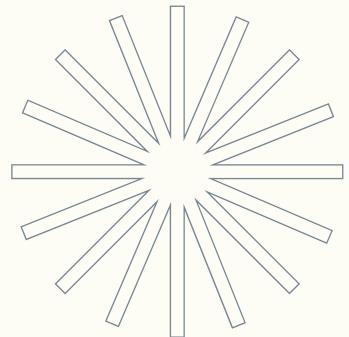


## Pneumatic Actuator & DC motor

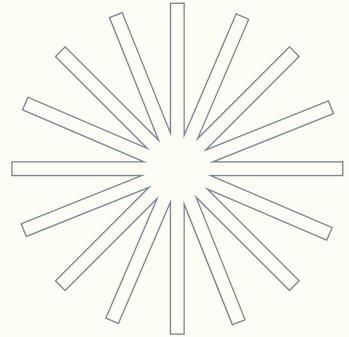
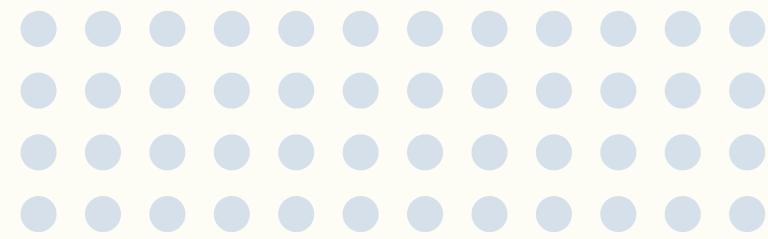


# Methodology - Designing

## Pnematic Diagram



# Methodology - Designing

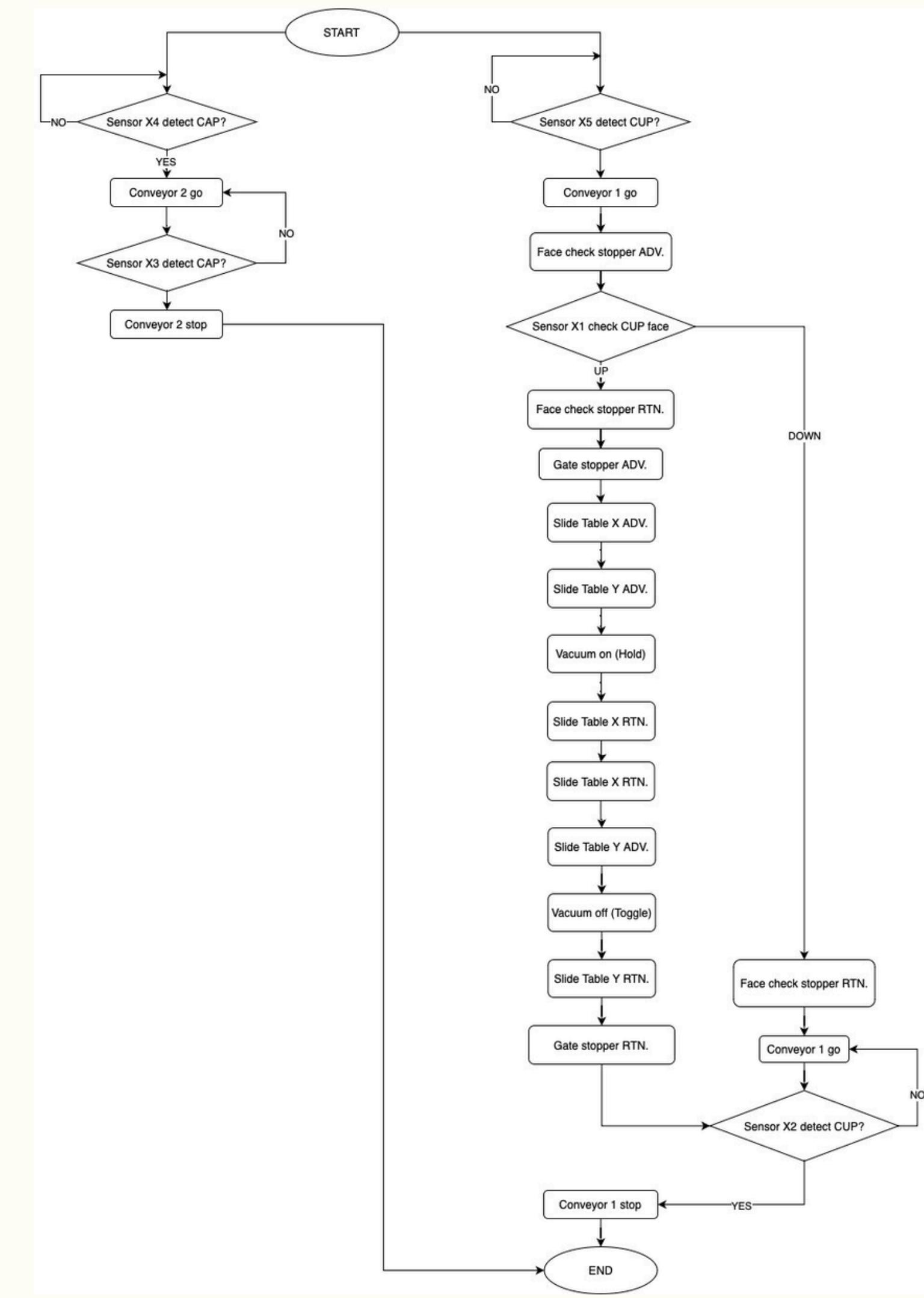


## Load Calculation

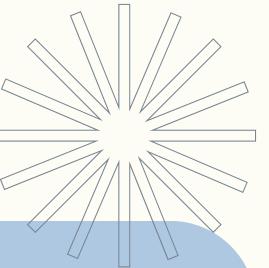
Component	MFG Part Number	Volt	Load (Ampere)	Amount	Total (Ampere)	25% (Ampere)	AWG	Area mm^2
Auto-Switch (Reed Switch)	SMC D-F8N	24VDC	0.04	8	0.32	0.4	20	0.5
Photoelectric Sensor	PZ-M31	24VDC	0.03	2	0.06	0.075	20	0.5
OMRON Relay	MY4N 24VDC	24VDC	0.04	2	0.08	0.1	20	0.5
Optical Sensor	EX11-EBD	24VDC	0.01	4	0.04	0.05	20	0.5
Mitsubishi Magnetic Contact	SD-Q11	24VDC	0.1	2	0.2	0.25	20	0.5
DC Motor 24 VDC 80 RPM	ZGA 37R	24VDC	0.36	2	0.72	0.9	20	0.5
Vacuum Switch	ZSE30AF-C6H-N-M	24VDC	0.04	1	0.04	0.05	20	0.5
Vacuum Generator	ZK2B10R5NL3-06-5	24VDC	0.04	1	0.04	0.05	20	0.5
Solenoid Value Set	VV5Q1110C6FU1	24VDC	0.42	1	0.42	0.525	20	0.5
				Total	1.92	2.4	20	0.5

# Methodology Designing

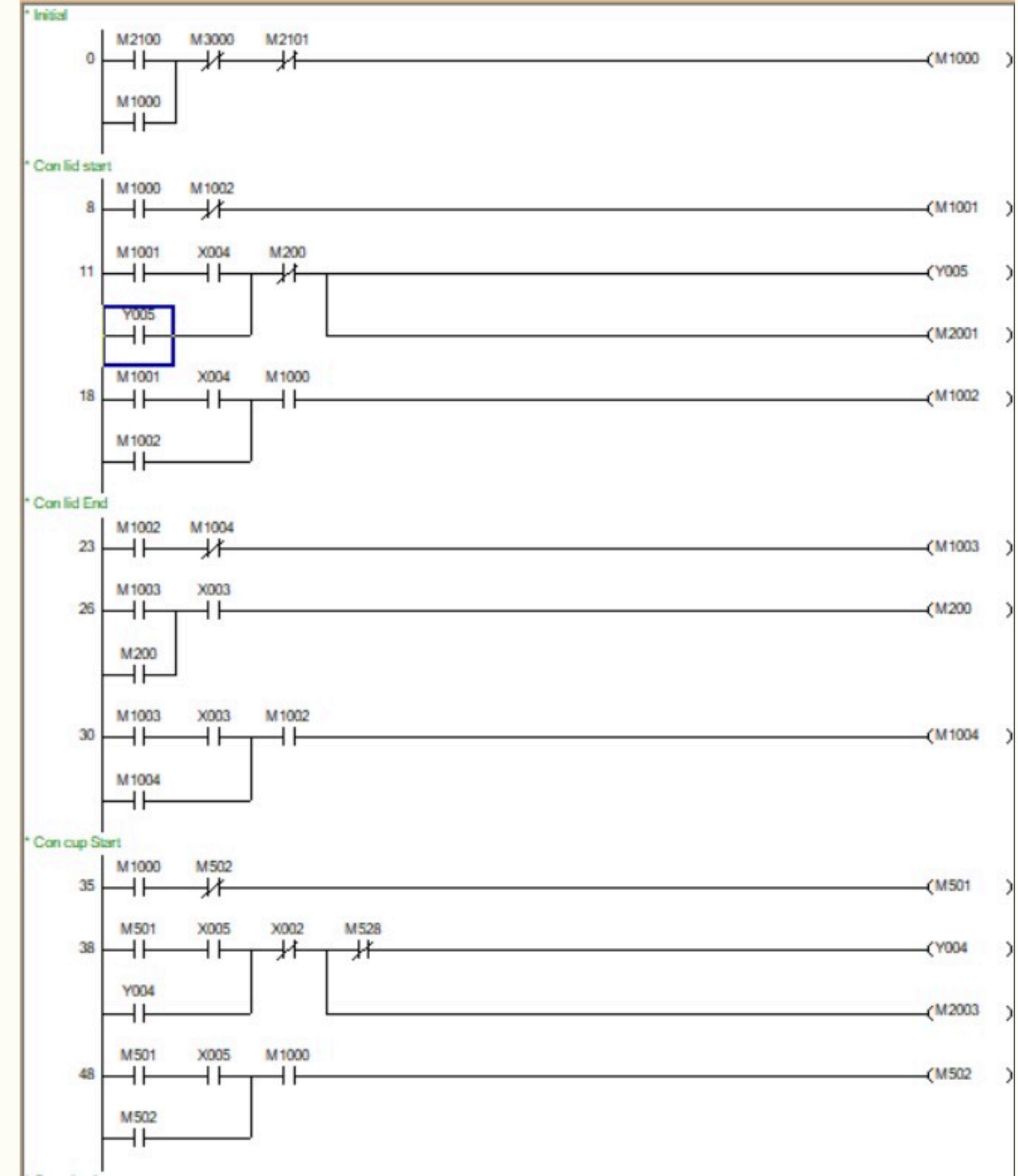
Flow Chart



# Methodology Designing

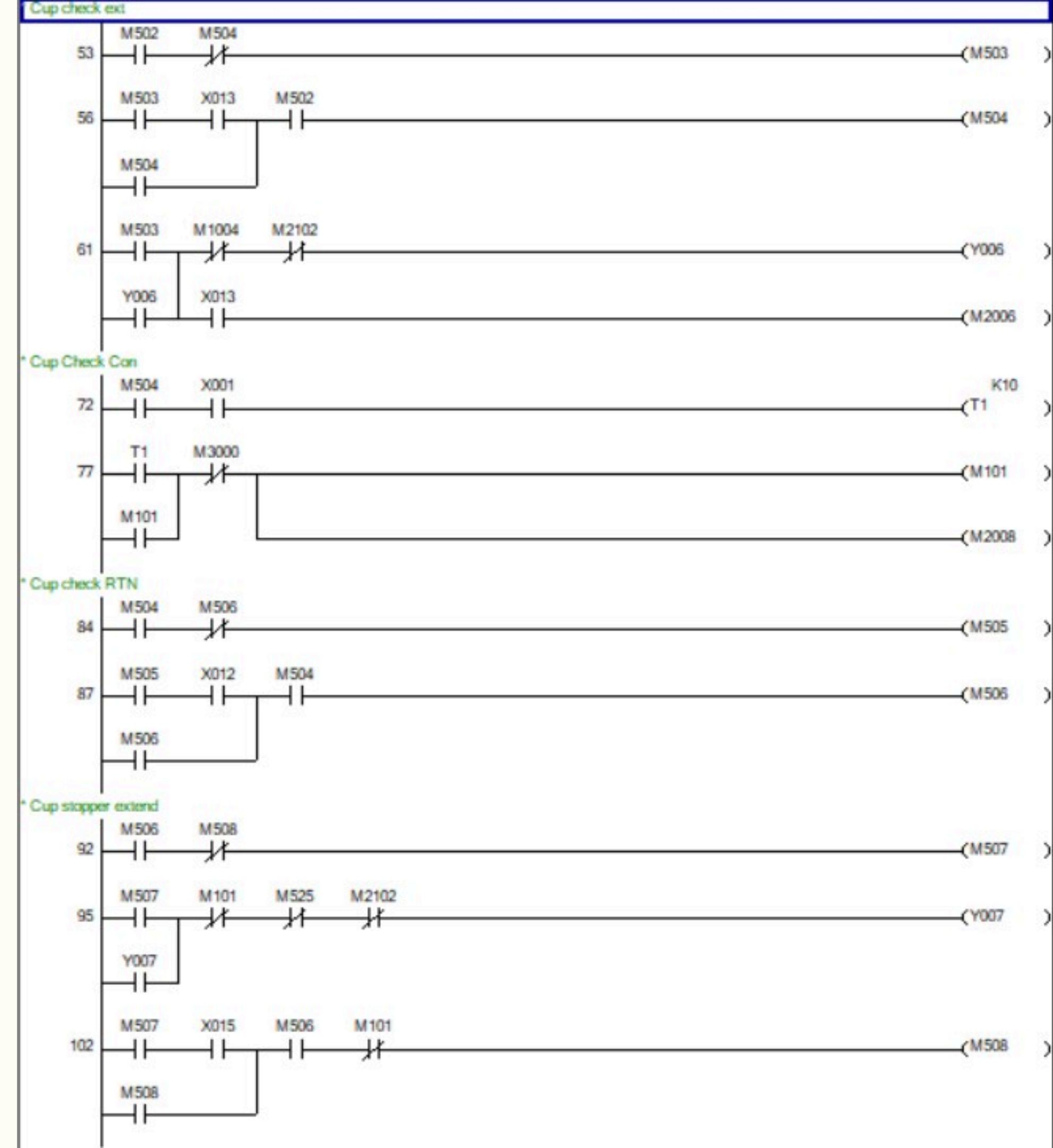
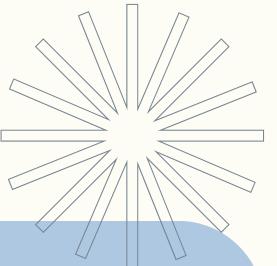


PLC

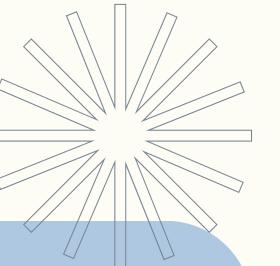


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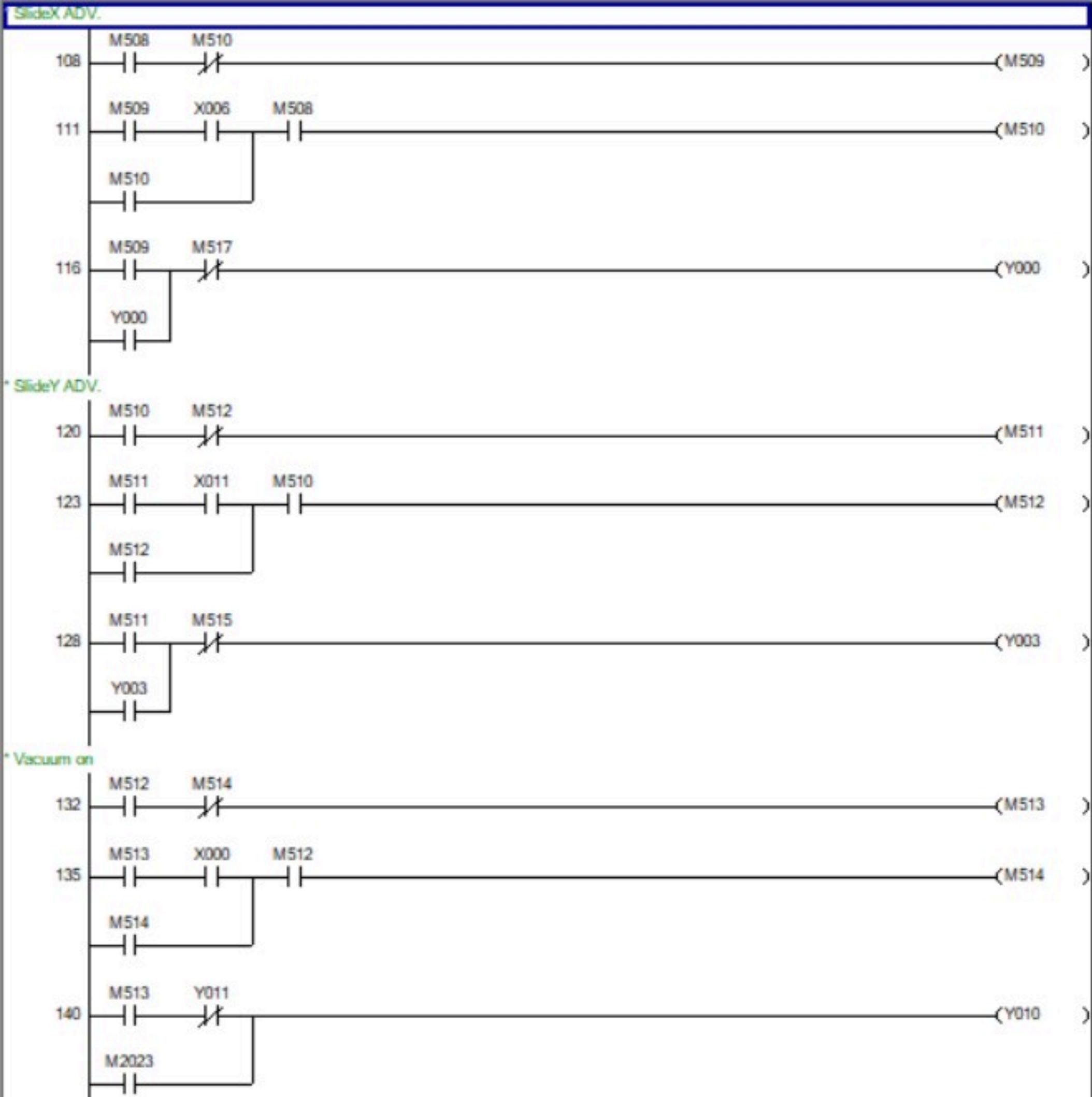
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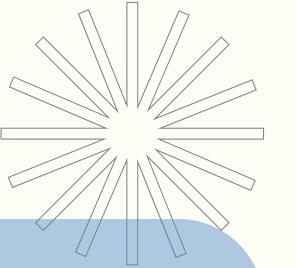
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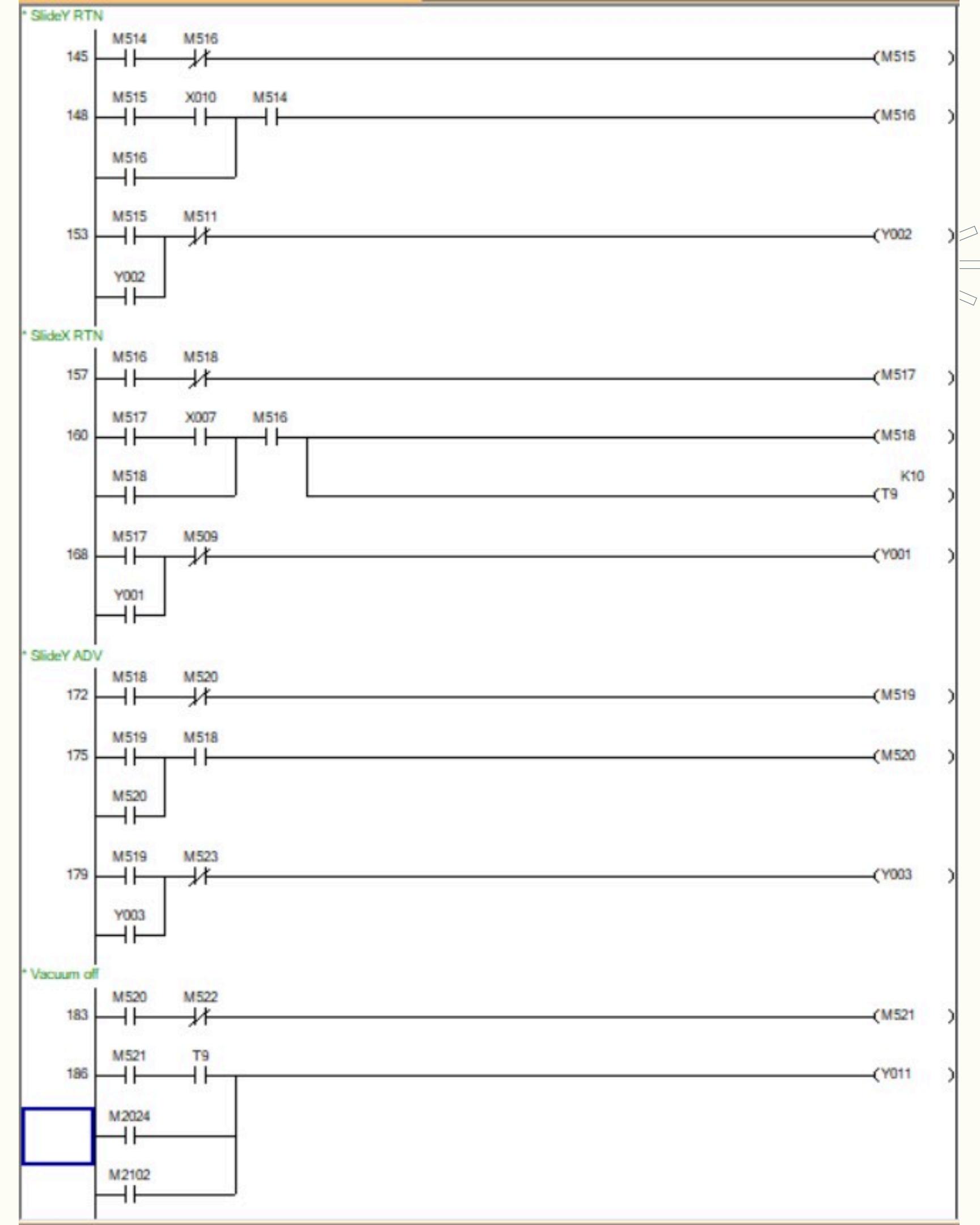
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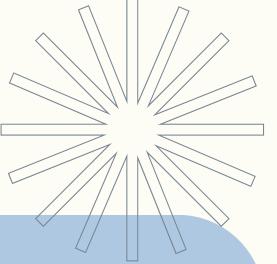
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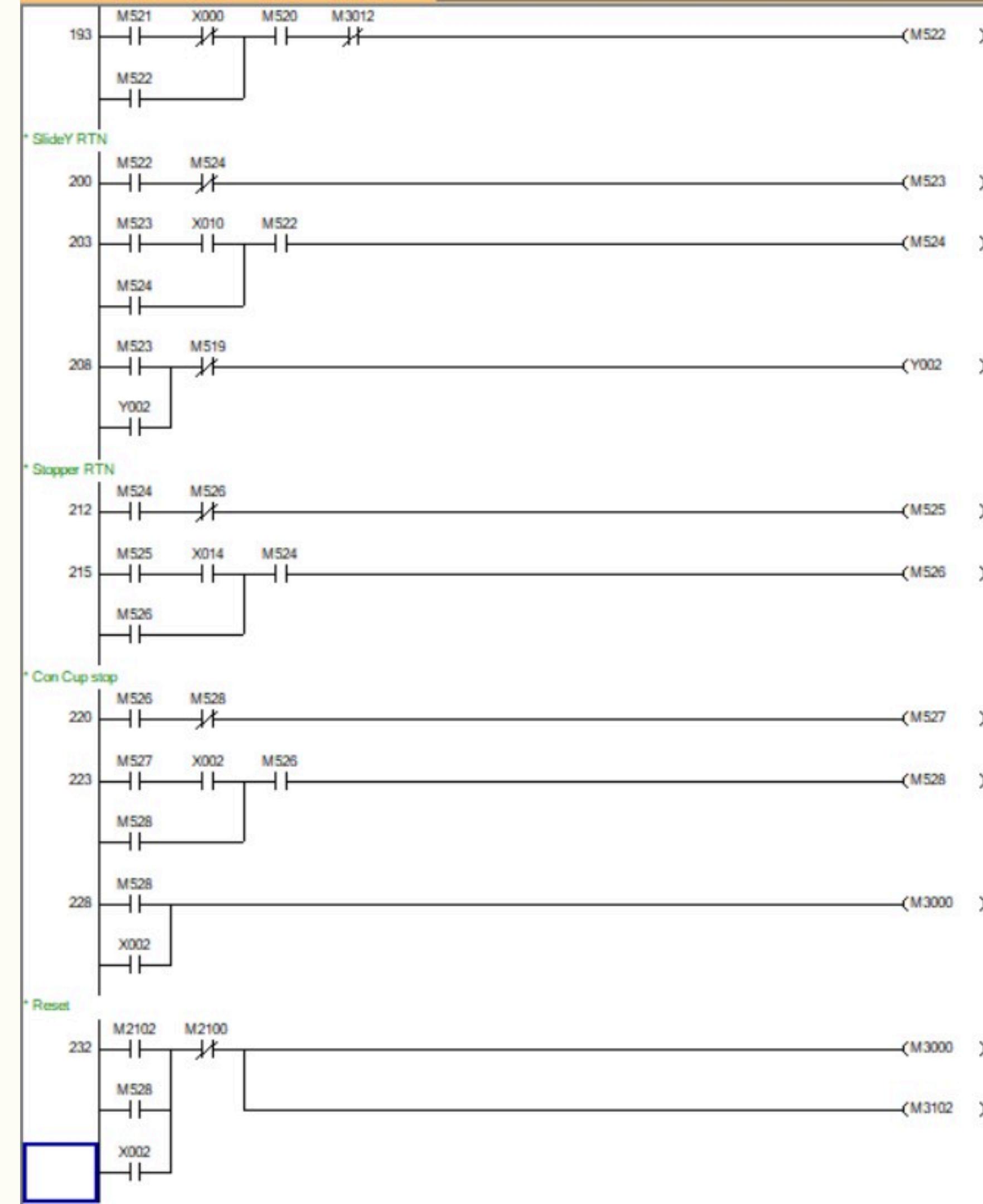
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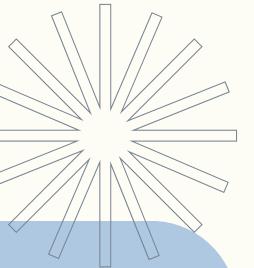
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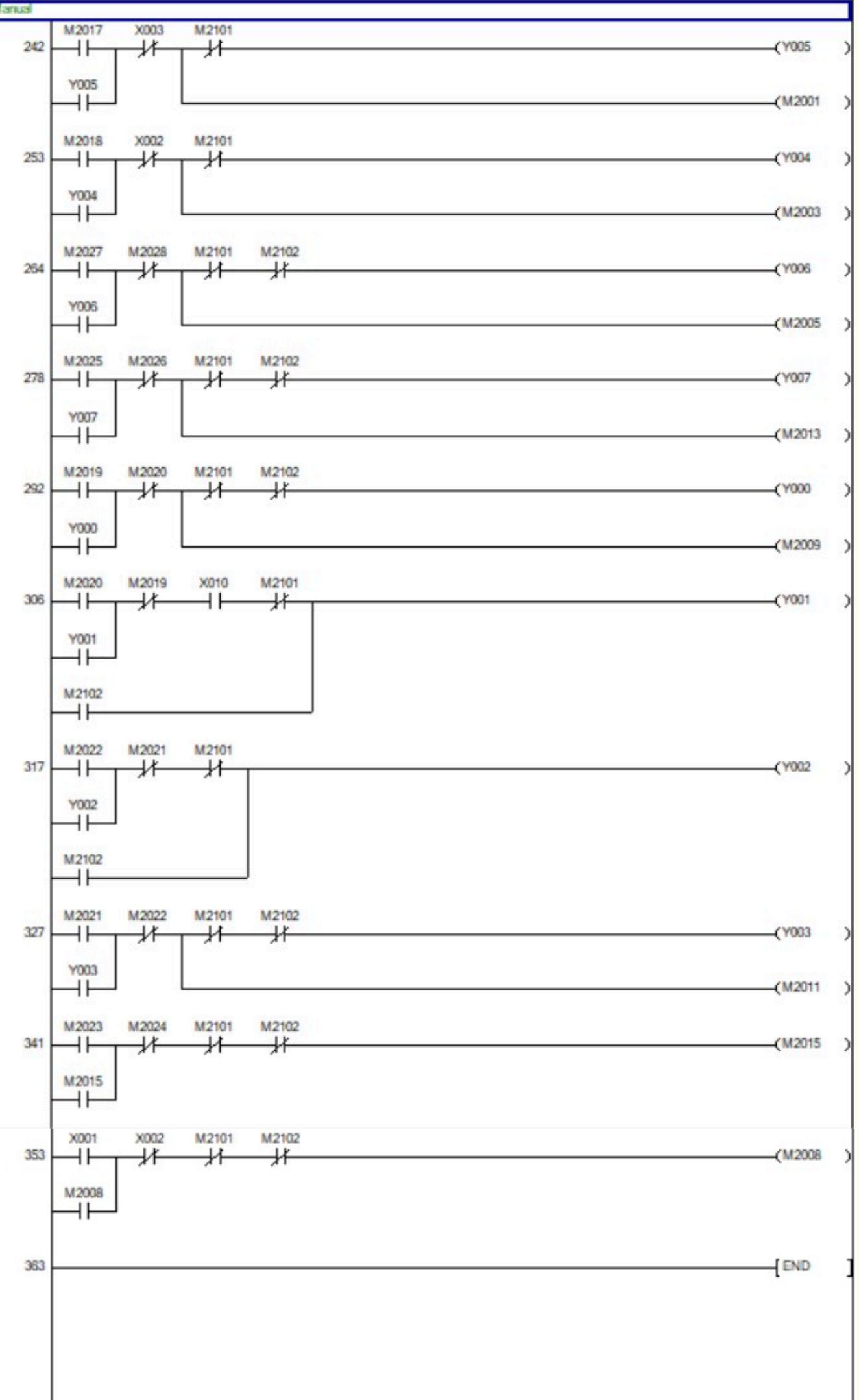
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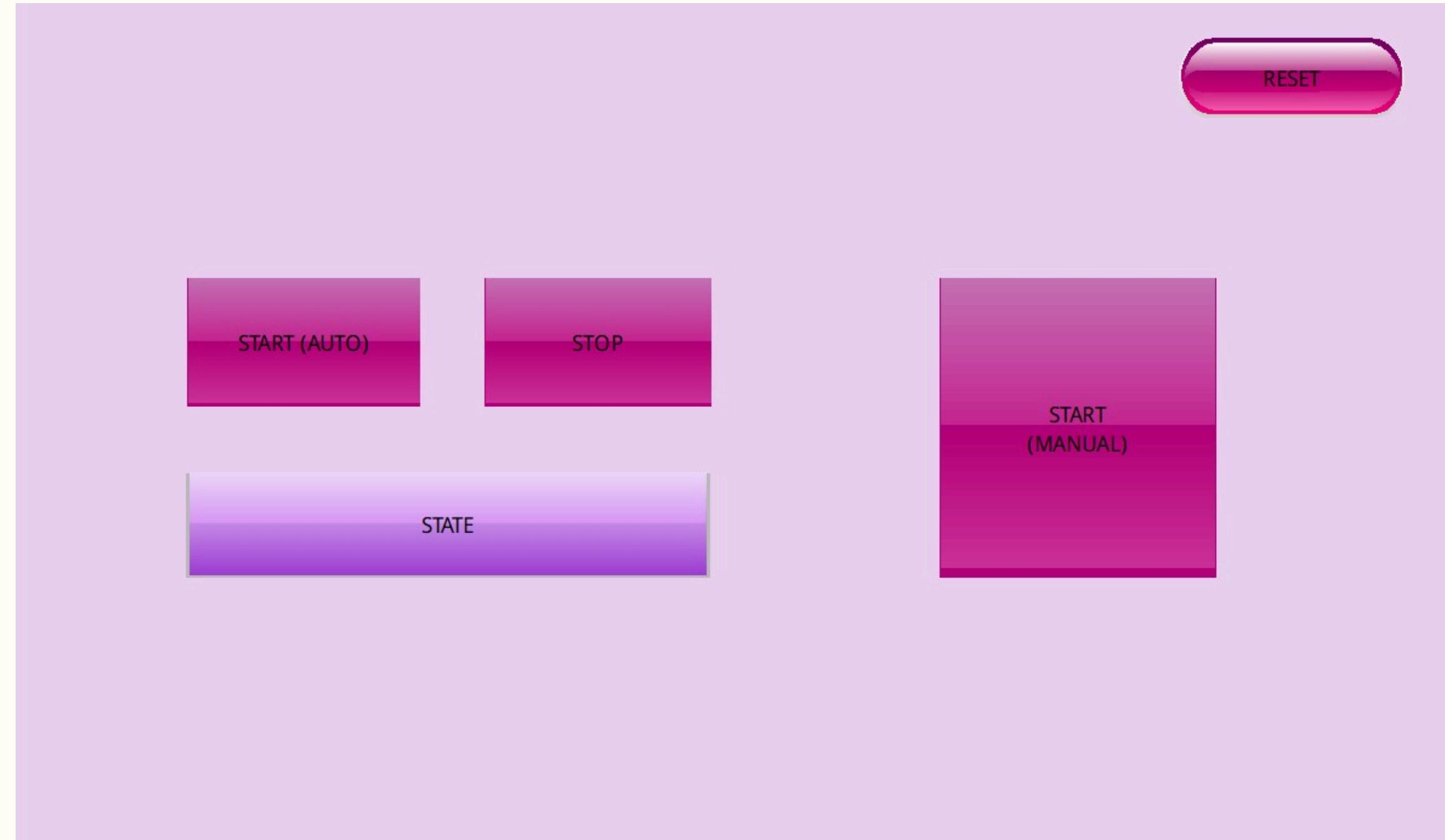
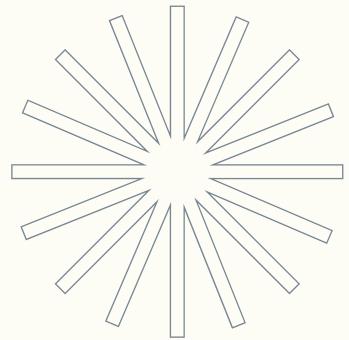
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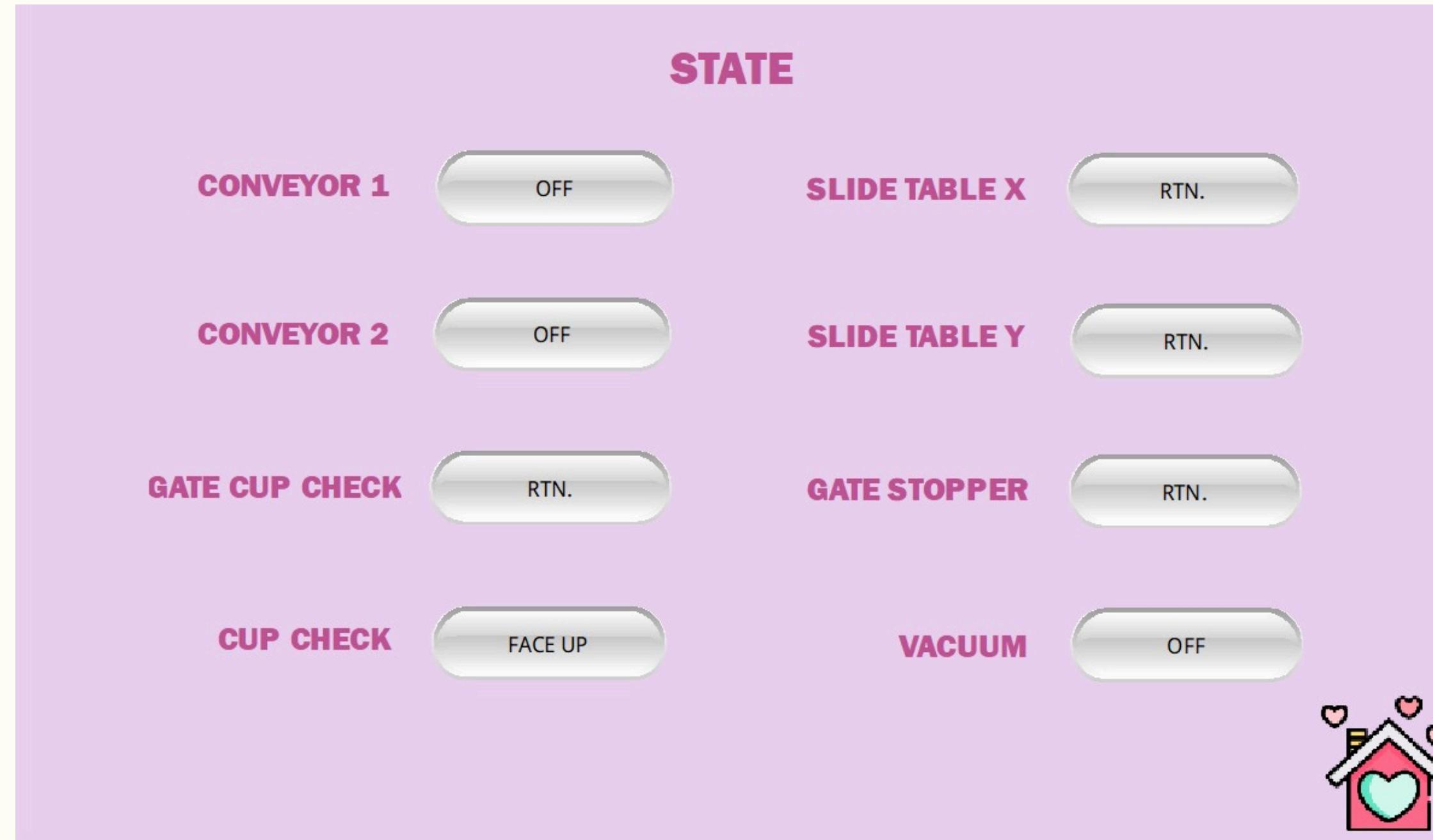
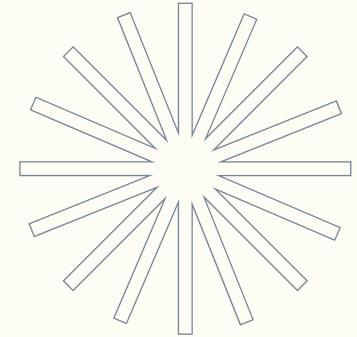
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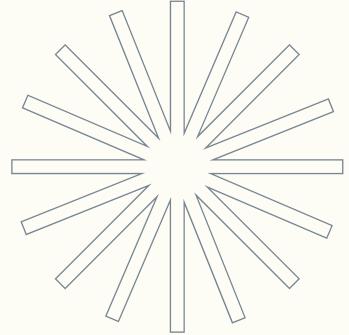
# Methodology - Designing



# Methodology - Designing



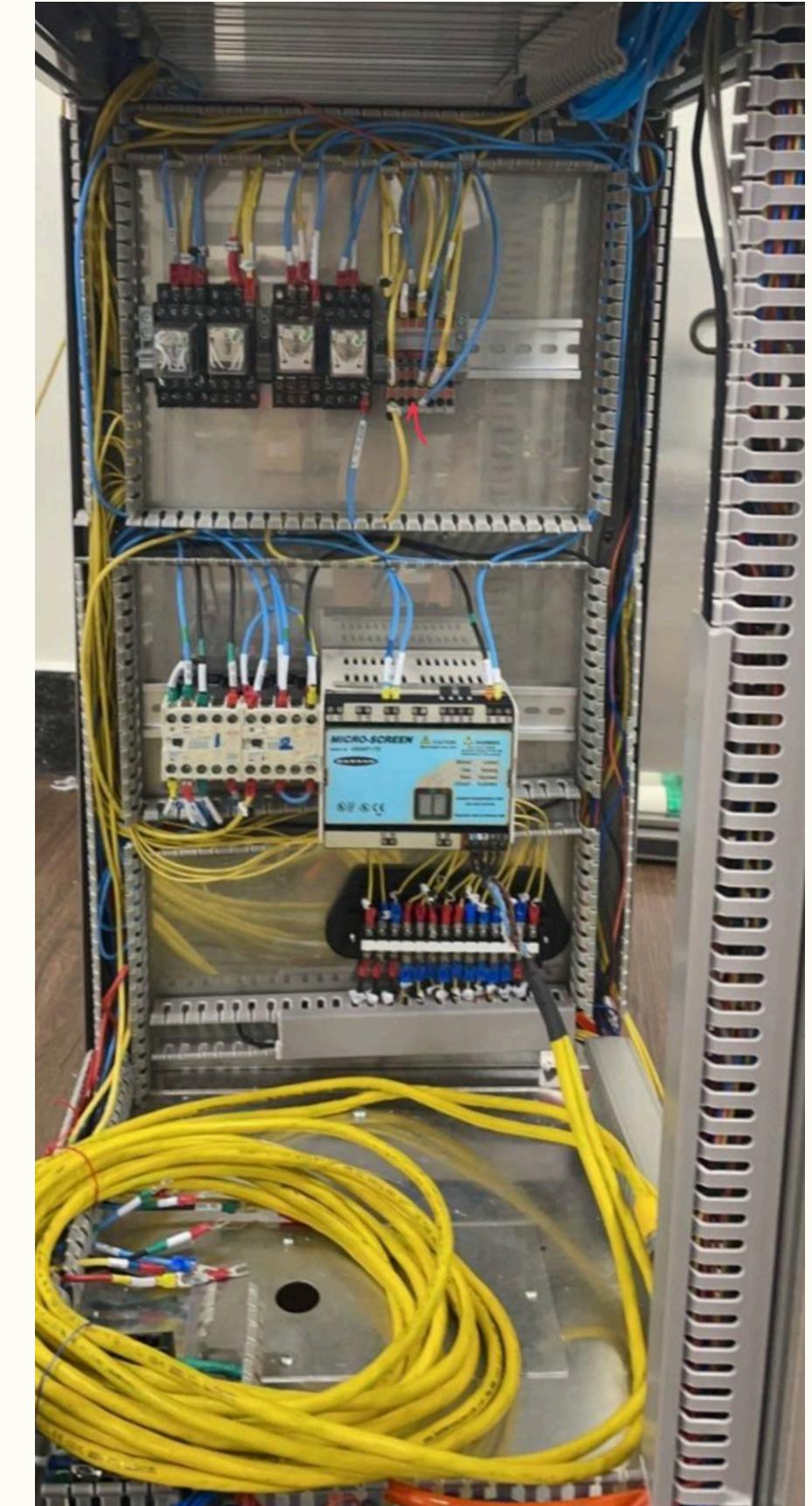
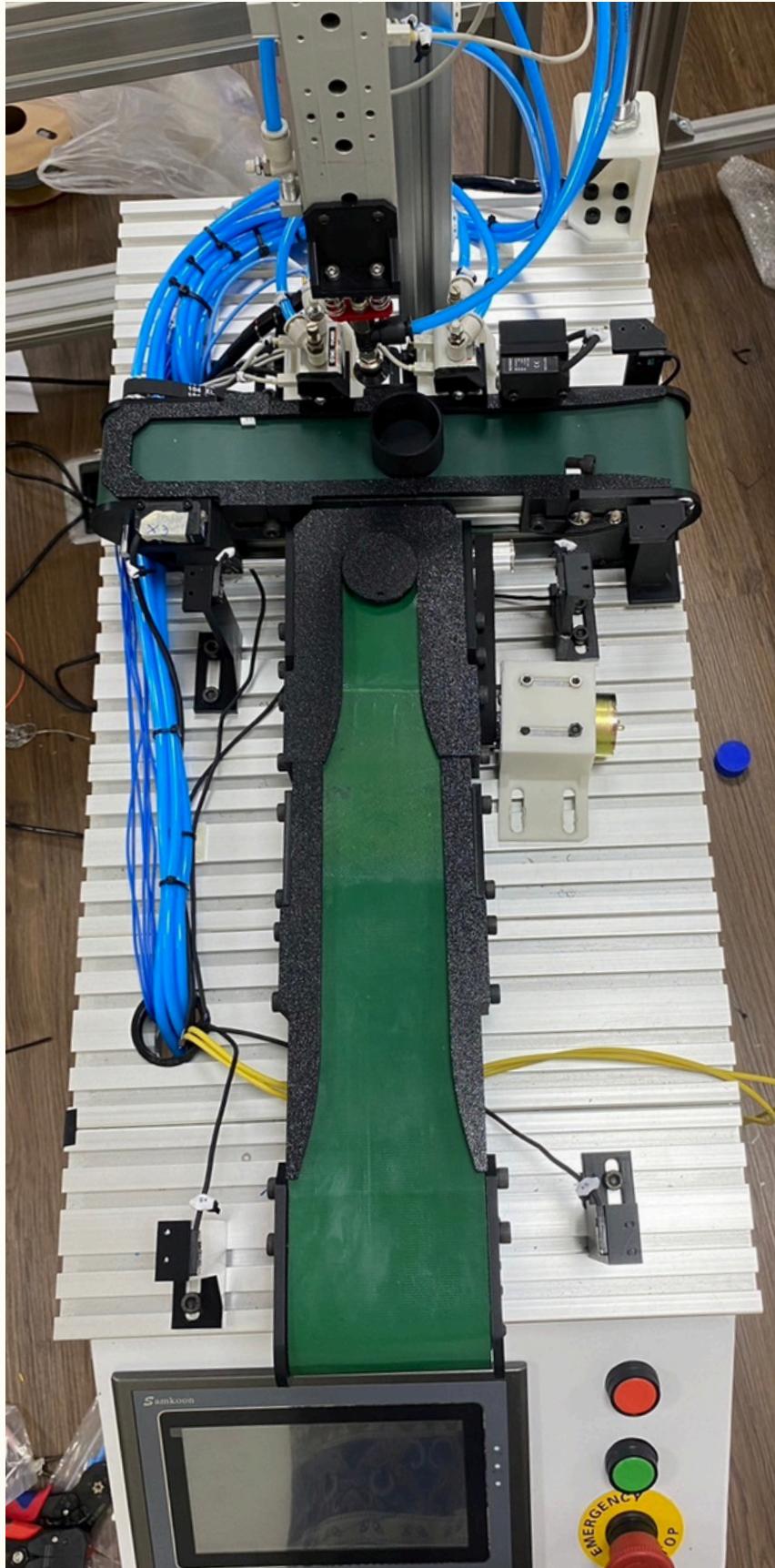
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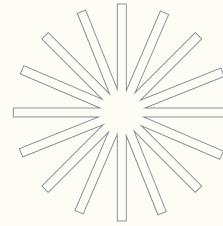


HMI



# Methodology - Assembly

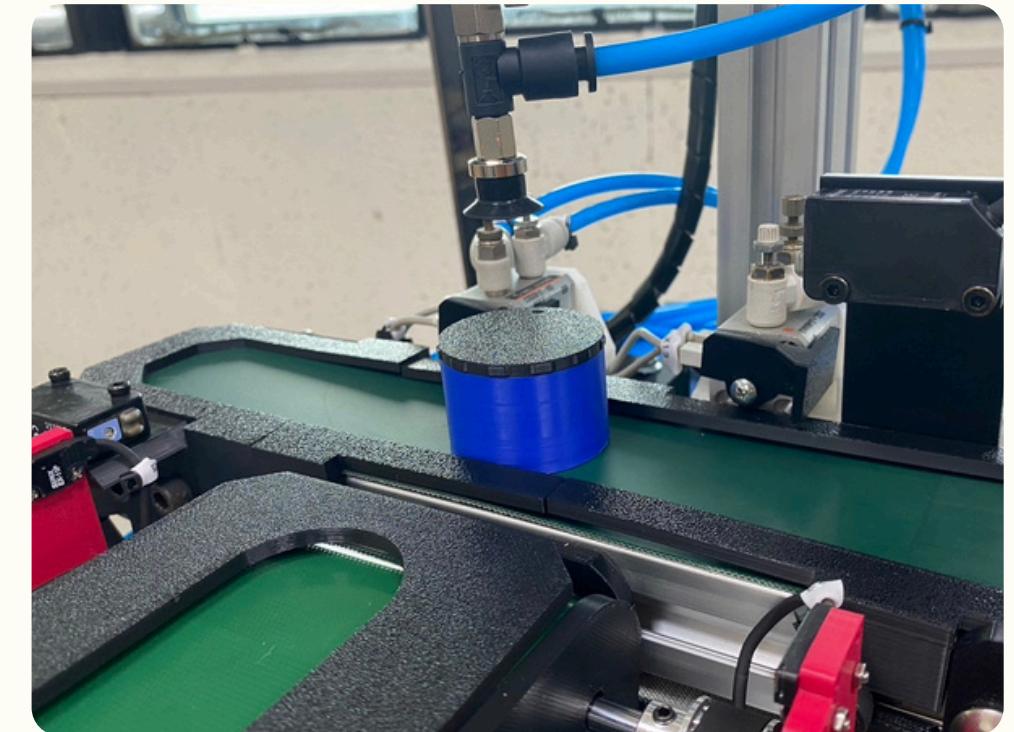




# Limitations

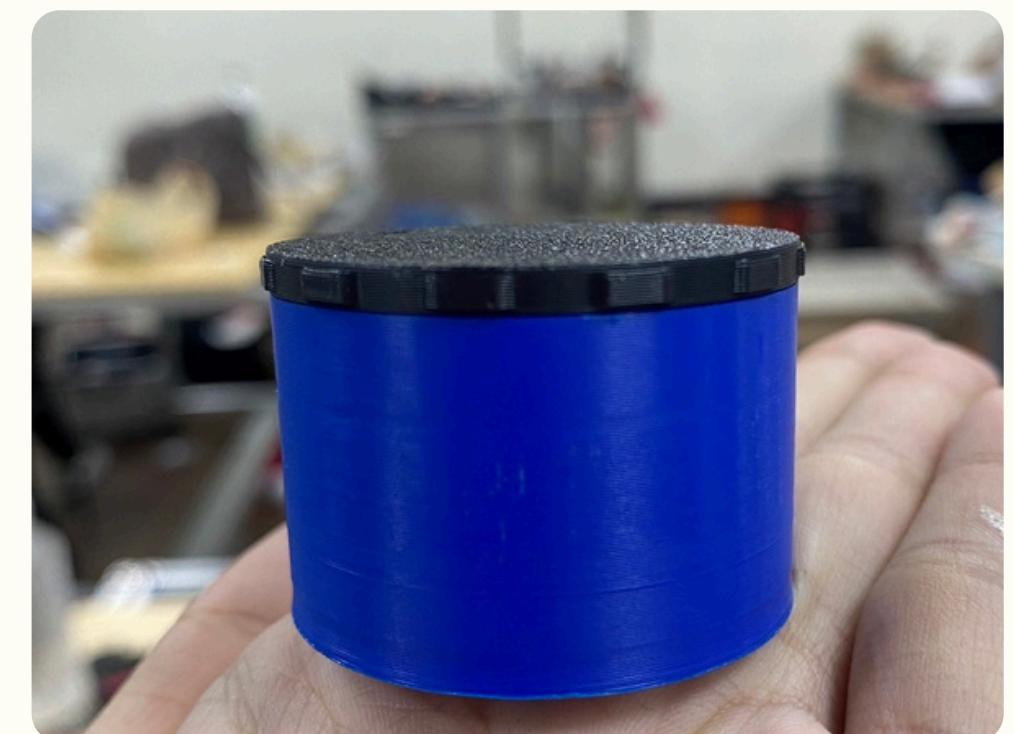
## One product per cycle

The system can only handle one product at a time, which slows down production speed and reduces the number of items made in a given time.



## Diameter of the cap

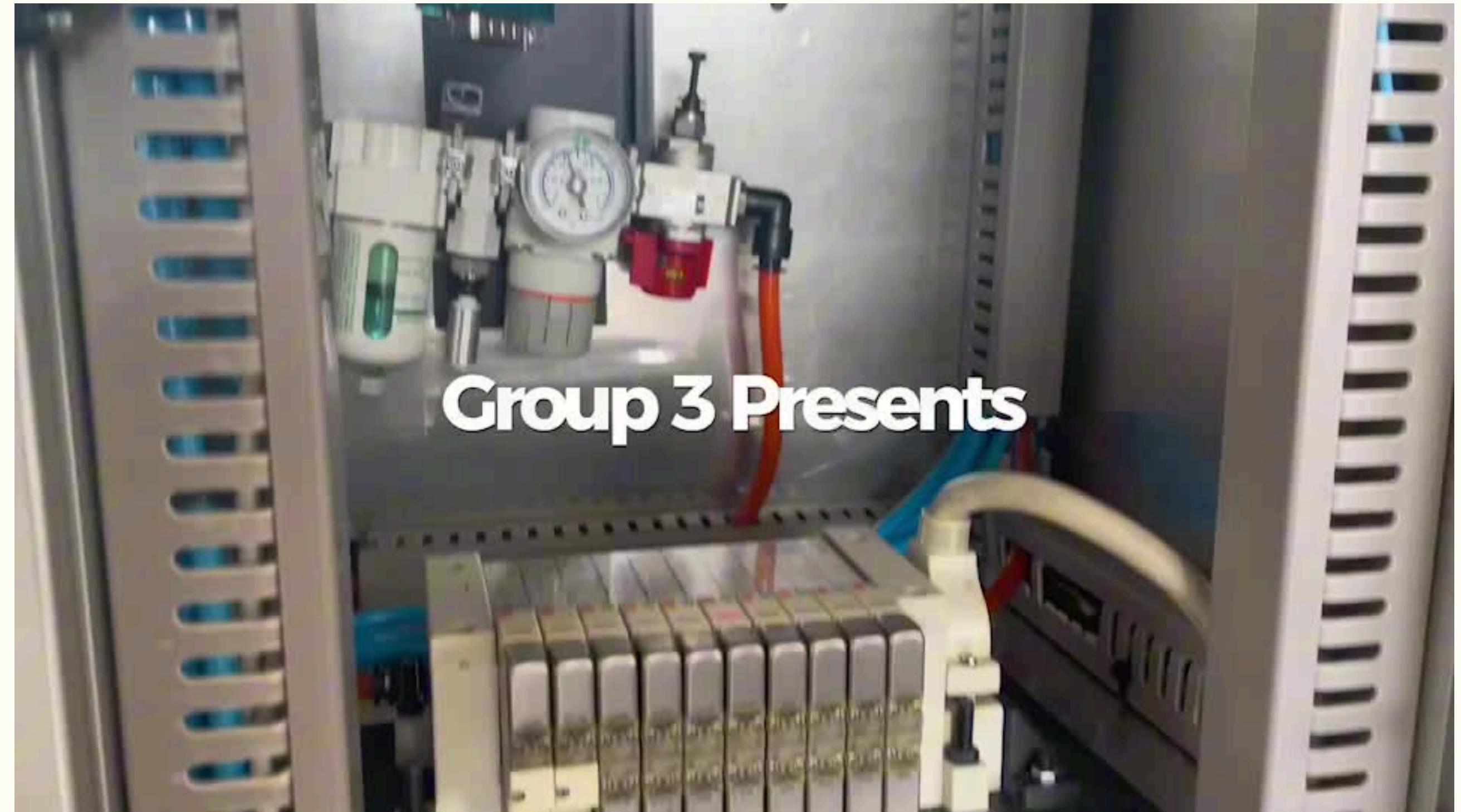
The system works best with a specific cap size, and if the cap size changes, it may not join the products properly.



## Limited Compatibility with Different Cap Materials

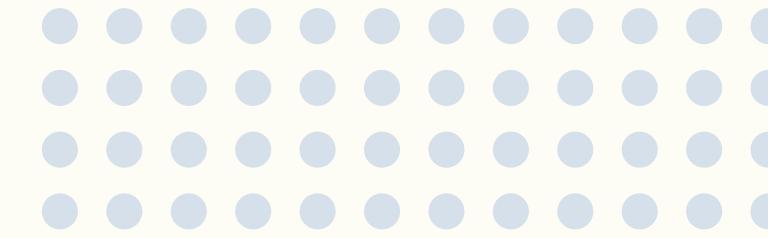
The system is optimized for specific cap materials, and changes in material (e.g., from plastic to metal) may affect its ability to join products securely.

# Results



Link: <https://youtu.be/bd32ZdjYCt0?si=-bVrfFdVJpL3clS4>

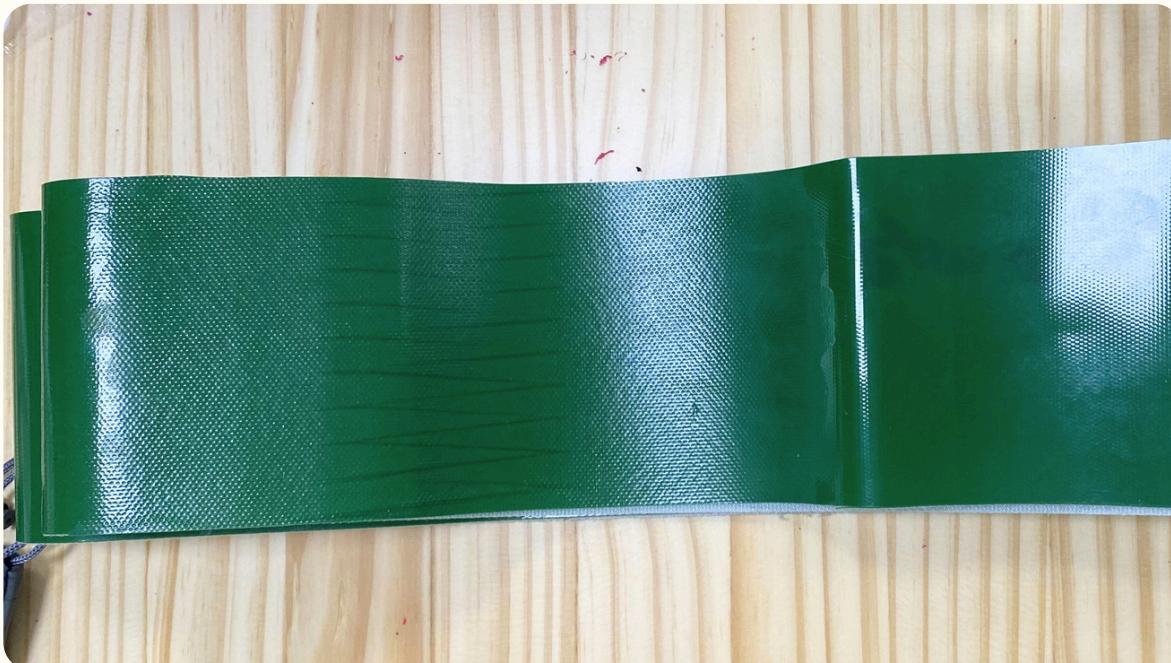
# Problems and Solutions



## Conveyor Belt Does Not Rotate

**Problem:** The conveyor belt fails to rotate properly, causing the system to stop or malfunction.

**Solution:** Added o-rings to the roller, tightened the pulley belt, and made it longer for better tension.

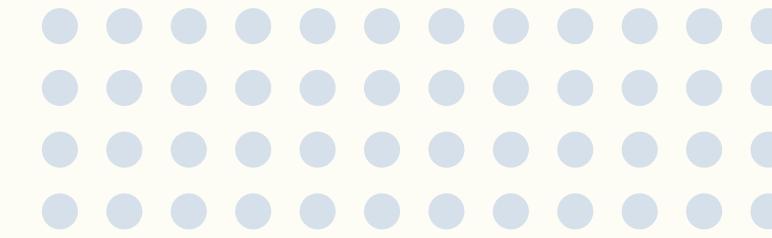


## Wrong Conveyor Size

**Problem:** The conveyor size was incorrect, leading to poor alignment and inefficient operation.

**Solution:** We re-measured and resized the conveyor to ensure proper alignment and improve performance.

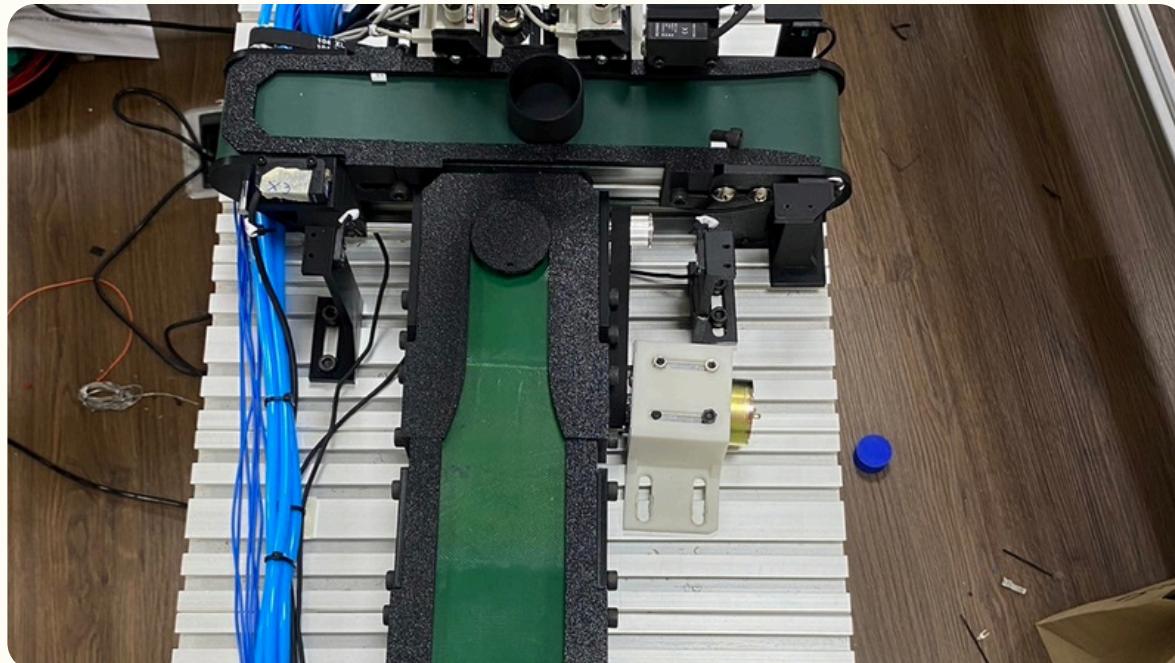
# Problems and Solutions



## Air Valve Isn't Releasing Air

**Problem:** The valve isn't releasing air, preventing the stopper from retracting.

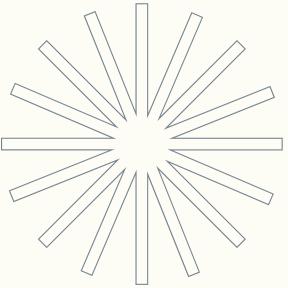
**Solution:** We switched the valve for testing and adjusted it to ensure proper air release.



## Conveyor Belt Has a Little Sound

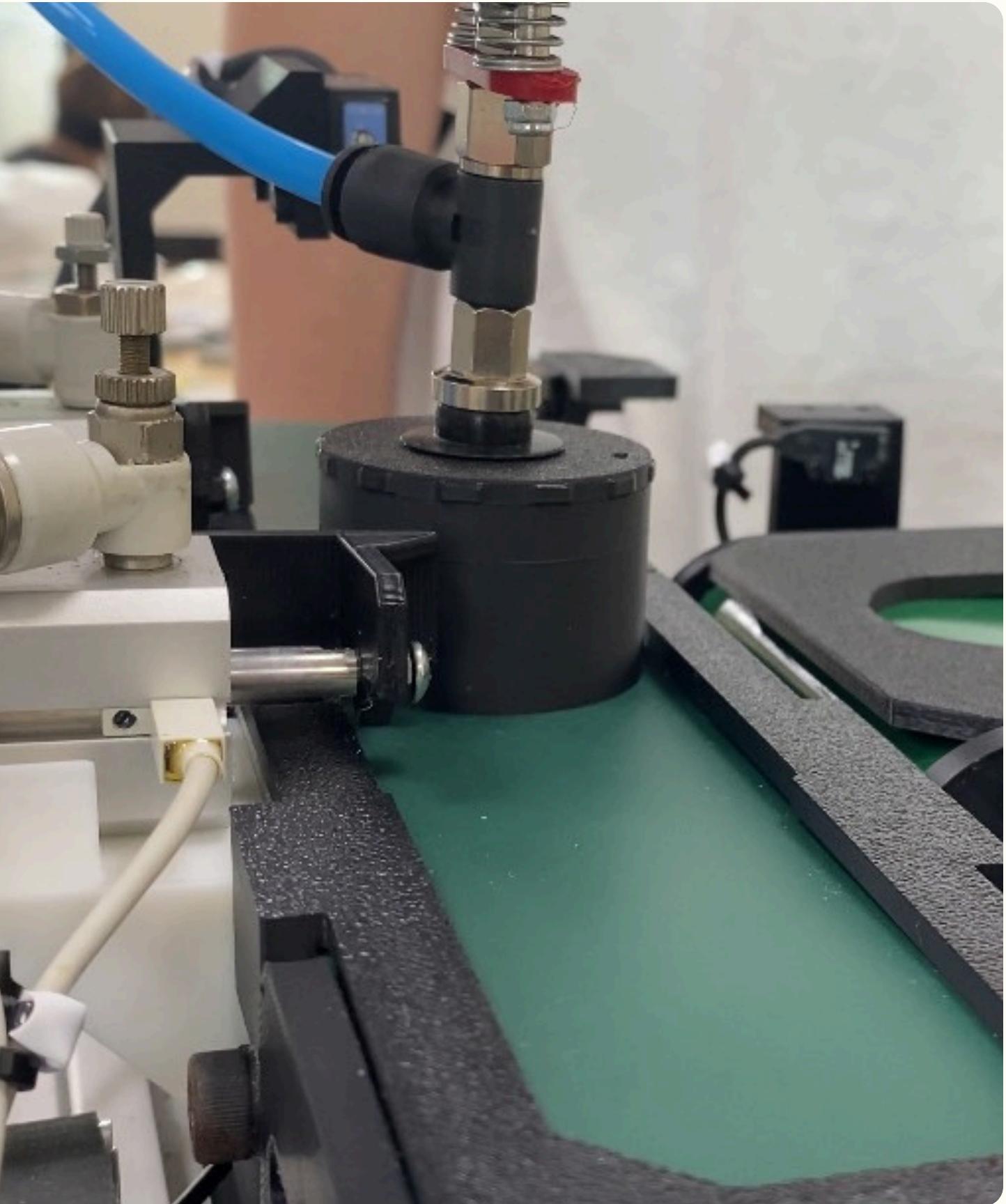
**Problem:** A squeak occurs during rotation, possibly due to friction or misalignment.

**Solution:** We checked for misalignment and adjusted the belt tension to reduce the noise.



# Conclusion

In conclusion, the development of the automated joining station provides a practical and comprehensive learning experience in the field of automation and control systems. By integrating various components such as DC motors, sensors, and pneumatic actuators, we have created a functional system that mirrors real-world industrial processes. This project not only enhances our technical skills in system design but also deepens our understanding of the complexities involved in component integration and control flow. The insights gained from this hands-on approach will be invaluable as we apply these principles in future endeavors within the realm of industrial automation. Ultimately, this project underscores the importance of automation in improving manufacturing efficiency and product quality, preparing us for the challenges of modern industry.



# Group Members

**Kirawut 65011333**



**Paveetida 65110145**



**Pimchanok 65110147**

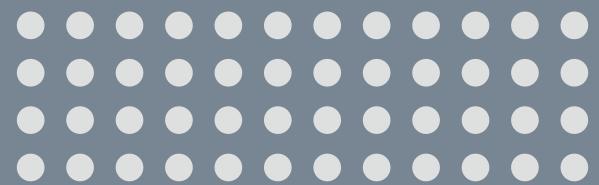
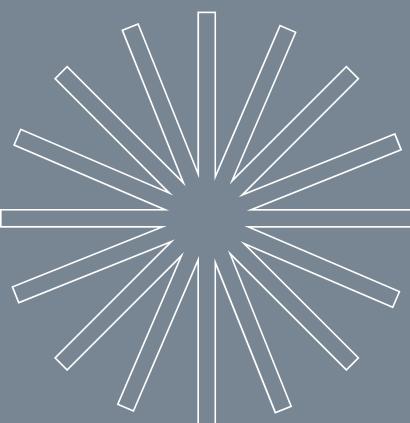


**Sirikorn 65110152**



**Suchaya 65110153**





**THANK  
YOU!**

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