LABORATORY REPORT

MECHATRONICS SYSTEM INTEGRATION

MCTA 3203

SEMESTER 2 2023/2024

WEEK 5

LAB: PLC INTERFACING

SUBMISSION DATE:

GROUP: 6

	NAME	MATRIC NUMBER
1.	MUHAMMAD AZIM ZUFAYRI BIN NORAZAM	2211973
2.	MUHAMMAD AMMAR FARIS BIN ARAFAS	2212645
3.	AHMAD ADAM BIN NORHELME	2219973
4.	AHMAD HAFIZULLAH BIN IBRAHIM	2216185

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ABSTRACT

This experiment demonstrates the integration of a Programmable Logic Controller (PLC) with a microcontroller using the OpenPLC Editor software. The successful connection between the PLC and Arduino underscores the critical role of software compatibility in developing system logic and behavior. Additionally, the incorporation of hardware components, including an LED, resistor, and the microcontroller, emphasizes the necessity of robust hardware for ensuring system reliability.

INTRODUCTION

This experiment investigates the integration of a Programmable Logic Controller (PLC) with a microcontroller using the OpenPLC Editor software. As automation systems grow in complexity, seamless interaction between software and hardware components is crucial. The OpenPLC Editor offers a versatile platform for programming and controlling PLCs, making it ideal for interfacing with Arduino.

We aim to demonstrate the importance of software compatibility in developing and implementing system logic. By connecting the PLC and microcontroller, we will show how OpenPLC Editor enables smooth communication and control. Additionally, we will integrate hardware components such as an LED, a resistor, and the microcontroller to illustrate their role in executing designed logic and ensuring system reliability.

This report will outline the procedures, observations, and outcomes, highlighting the critical role of compatibility and robustness in PLC-driven applications.

MATERIALS AND EQUIPMENT

- Microcontroller: Arduino (e.g., Arduino Uno)
- PLC Software: OpenPLC Editor
- LED: Standard 5mm LED
- Resistor: 220-ohm resistor
- Breadboard: For prototyping the circuit
- Jumper Wires: Various colours and lengths for connections
- USB Cable: For programming and powering the Arduino
- Computer: Running the OpenPLC Editor software
- Power Supply: 5V or appropriate power source for the Arduino
- Multimeter: For measuring voltage, current, and resistance

These components will be used to build and test the integration of the PLC with the microcontroller, ensuring proper functionality and reliability of the system.

METHODOLOGY

1. Setup Preparation:
   - Gather all necessary materials and ensure the computer has the OpenPLC Editor software installed.
   - Connect the Arduino to the computer via USB for programming and power.

2. Circuit Design:
   - Design the circuit layout on the breadboard, incorporating the Arduino, LED, resistor, and necessary connections.

3. OpenPLC Editor Configuration:
   - Launch the OpenPLC Editor and configure it to communicate with the Arduino.
   - Define the system logic using ladder logic programming.

4. Hardware Integration:
   - Connect the Arduino to the breadboard circuit as per the design.
   - Verify connections match the programmed logic.

5. Testing and Verification:
   - Upload the logic to the Arduino and power on the system.
   - Observe LED behavior and verify circuit parameters with a multimeter.

6. Troubleshooting and Iteration:
   - Debug any issues encountered and adjust the circuit or logic accordingly.
   - Repeat testing until the system functions correctly.

7. Documentation:
   - Record all steps, observations, and modifications made during the experiment.

8. Analysis and Conclusion:
   - Evaluate system performance and draw conclusions about software and hardware integration.
   - Reflect on the experiment's outcomes regarding compatibility and reliability.

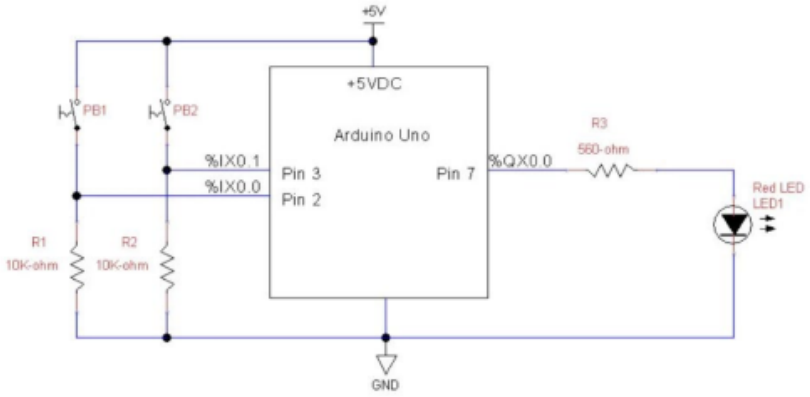
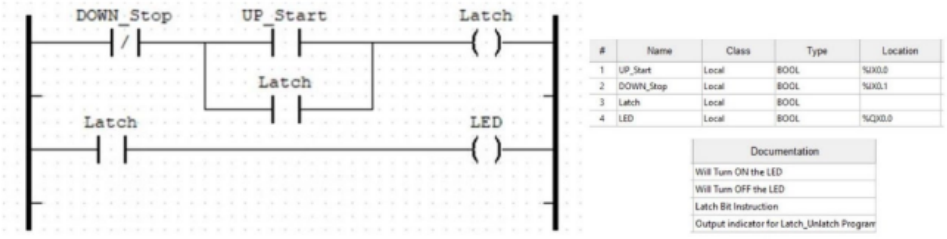


Fig. 4: Start-Stop Control Circuit



#	Name	Class	Type	Location
1	UP_Start	Local	BOOL	%IX0.0
2	DOWN_Stop	Local	BOOL	%IX0.1
3	Latch	Local	BOOL	
4	LED	Local	BOOL	%QX0.0

Documentation
Will Turn ON the LED
Will Turn OFF the LED
Latch Bit Instruction
Output indicator for Latch_Unlatch Program

Fig. 5: Ladder Diagram for the Start-Stop Control Circuit

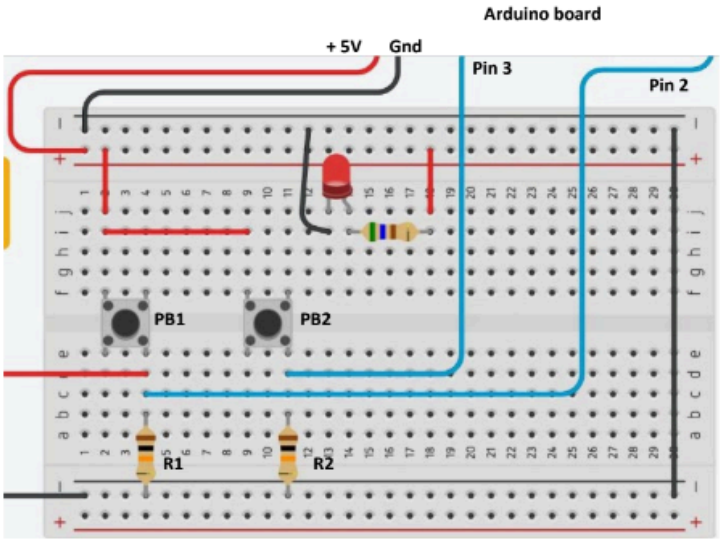
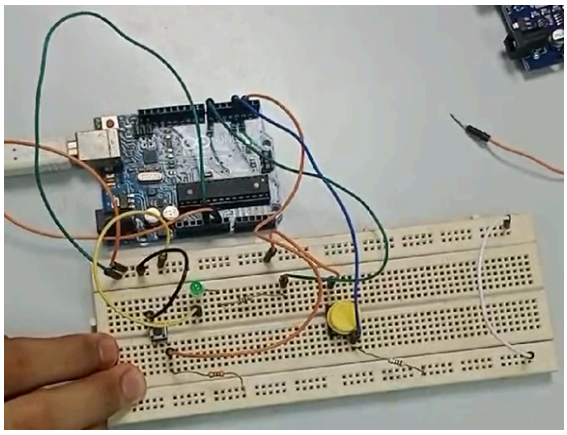
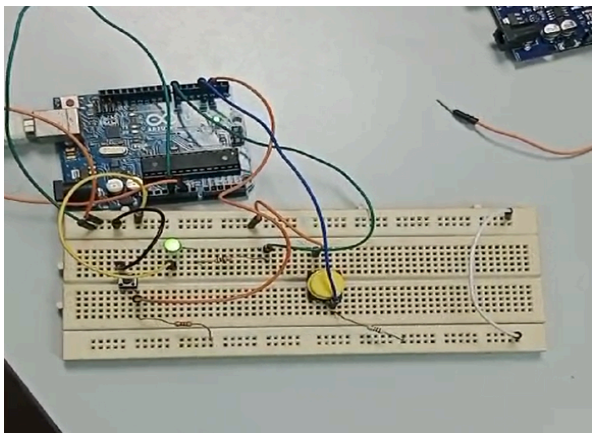


Fig. 6

RESULTS

DISCUSSION

In this experiment, we interface a PLC with a microcontroller using the OpenPLC Editor software. The integration of the PLC with the Arduino showed a seamless connection between the software and the hardware system. This highlights the importance of compatibility within the software used which played a crucial role in creating the logic and behaviour of the system. Next, the hardware component such as the LED, the resistor and the microcontroller itself shows the implementation and integration of physical hardware into the system which underlines the importance of robust hardware for reliability.

CONCLUSION

In conclusion, to devise a PLC interface with a microcontroller, it requires a complete and compatible blend of software programming and hardware integration. This experiment showcased the relationship between the software system and the hardware system actions, Furthermore, this experiment highlights the significance of real time data exchanve between the PLC and the microcontroller which is crucial to create a eficient and powerful control of process in the industry level.

RECOMMENDATIONS

- By upgrading the hardware components with sensots and actuator, we could model more advacned system and execute programs more accurately.
- We can conduct test for the integration between the PLC and the microcontroller to test and identify potential issues to refine the system’s performance.

ACKNOWLEDGEMENT

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our teaching assistants and our peers for their invaluable help and support in finishing this report. Their advice and guidance have greatly improved the quality and understanding of the project. Their commitments are greatly appreciated.

STUDENT DECLARATION

We, hereby declare that this project is entirely our own work except the documents that were given as references. Any external sources utilized for reference or inspiration have been properly cited and credited.

azim

__Muhammad Azim Zufayri Bin Norazam__

ammar

__Muhammad Ammar Faris Bin Arafas__

hafiz

__Ahmad Hafizullah Bin Ibrahim__

adam

__Ahmad Adam Bin Norhelme__