LABORATORY REPORT

LAB 5: Understanding Software and Hardware Aspects of PLC Interfacing with Microcontrollers

GROUP H

PROGRAMME: MECHATRONICS ENGINEERING

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ABSTRACT

This lab session introduces the basics of Programmable Logic Controller (PLC) programming using the OpenPLC Editor. We explore the interface between the PLC and a micro roller, illustrating its role in industrial automation processes. Through practical exercises, we aim to demonstrate the fundamental concepts of PLC control in modern manufacturing environments.

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INTRODUCTION

The Programmable Logic Controller (PLC) stands as a cornerstone in industrial automation, facilitating precise control and automation of electromechanical processes across diverse industries. In this lab session, we delve into the fundamentals of PLC programming using the OpenPLC Editor, a versatile tool for designing and implementing automation solutions. Our focus is on interfacing the PLC with a micro roller, a common component in manufacturing plants and machinery. Through hands-on experimentation and programming exercises, we aim to provide a comprehensive introduction to PLC control, highlighting its significance in modern industrial applications.

PROCEDURE

Materials And Equipment:

- openPLC editor and runtime installed on PC.
- Arduino Board.
- 2 Push Button Switches.
- Jumper Wires.
- LED.
- Resistors.
- Breadboard.

Experimental Setup:

1. In openPLC editor we create the ladder diagram shown in Fig. 1.
2. For the circuit as seen in Fig. 2, we connect one pin of the LED to the GND and the other using a resistor to a digital pin, in our case I connected it to D39. Moreover, we connect one pin of the pushbuttons to the 5V and the other to a resistor which then connects it to the ANALOG IN pins. I connected them to A0 and A7 for the first and second pushbuttons respectively.

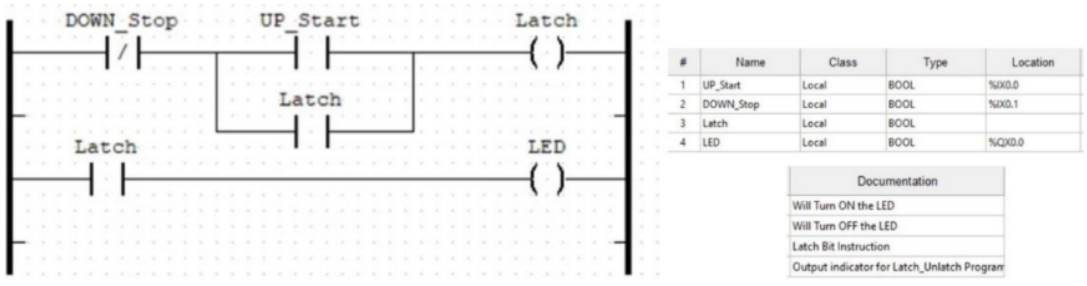


Fig 1

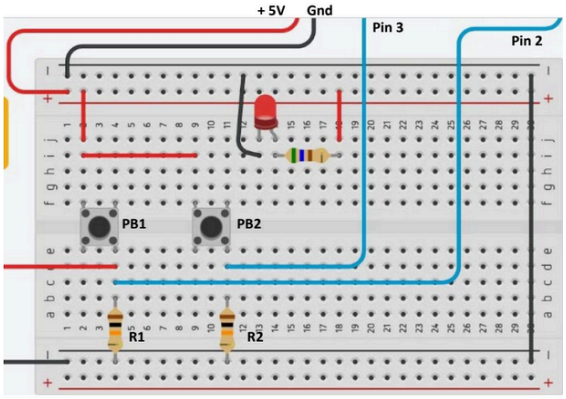


Fig. 2

Methodology:

1. Launch the software after downloading.
2. Start a new project (File → New → New Folder and name it →Select Folder)
3. Name the project: in the Create a new POU pop up window, name the project and select language → LD (ladder diagram)
4. Press the  to create a new variable and name it. (Class Filter= local, Type = BOOL).
5. Start creating the Ladder Diagram by right clicking and choose Add.
6. Create the Left the Right power rails, Contact (negated), Coil as shown in Fig. 2.
7. Once the ladder diagram is created, compile it by clicking the icon  .
8. The blinking led simulation can now be seen in the editor.
9. For task:
    a. Create the ladder diagram.
    b. Specify all variables used in the ladder diagram.
    c. Compile and simulate the ladder diagram in OpenPLC Editor.
    d. Upload the ladder diagram to the Arduino board.
    e. Ensure to select correct COM port number and all pin association between the OpenPLC variables and Arduino board.
    f. Build the circuit.

RESULTS

By conducting the experiment we were able to make a LED light blink unconditionally. Furthermore, for the task the LED turned on when pressed on the first pushbutton, then was turned off by pressing the other pushbutton.

DISCUSSION

When the start pushbutton is pressed the UP_Start contact in the OpenPLC ladder diagram will turn on causing the Latch output to turn on which in turn keeps the UP_Start contact to latch or in other words it'll stay on until the stop pushbutton is pressed. When that happens, the DOWN_Stop normally closed contact turns off in turn turning off the Latch output. When the Latch contact is on the second line, the LED turns on and the other way around is right too.

CONCLUSION

To conclude, we learned a lot in this lab session. Firstly, we learned the basics of PLC programming. Moreover, we learned how important PLC programming is in industrial automation. Last but not least, we learned how to solve complex automation problems in the real world of manufacturing.

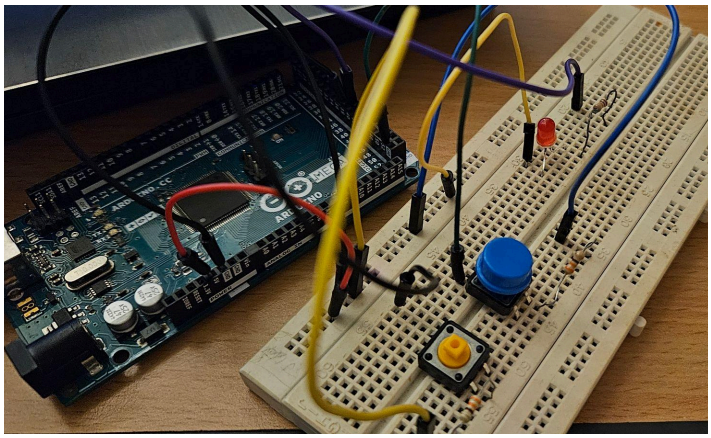
RECOMMENDATIONS

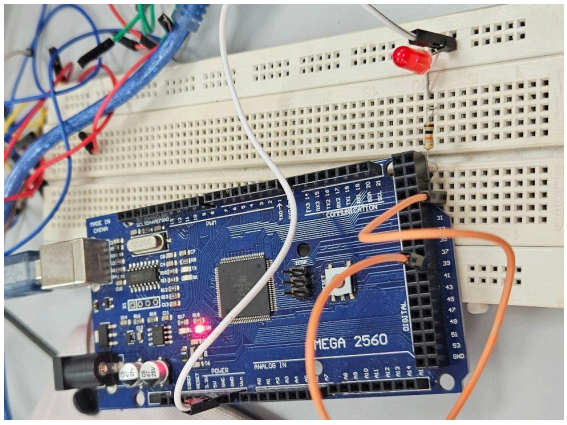
It is recommended that whoever tries to work with PLC and Arduino should take some time beforehand to understand both of them, especially OpenPLC. And to figure out the corresponding Location on the OpenPLC and Arduino output and input pins.

REFERENCES

2.4 Physical Addressing – Autonomy. (n.d.). https://autonomylogic.com/docs/2-4-physical-addressing/

APPENDICES

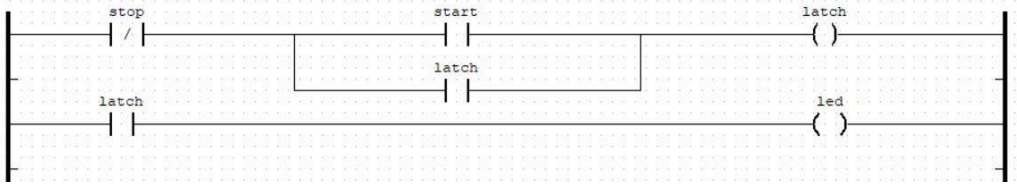




Description: Class Filter: All

#	Name	Class	Type	Location	Initial Value	Option	Documentation
1	led	Local	BOOL	%QX2.0			
2	stop	Local	BOOL	%IX2.0			
3	start	Local	BOOL	%IX2.7			
4	latch	Local	BOOL				

This example cascades two timers (TON and TOF) to generate a square wave. The width of the wave is determined by the size of the PT variable on both timers.

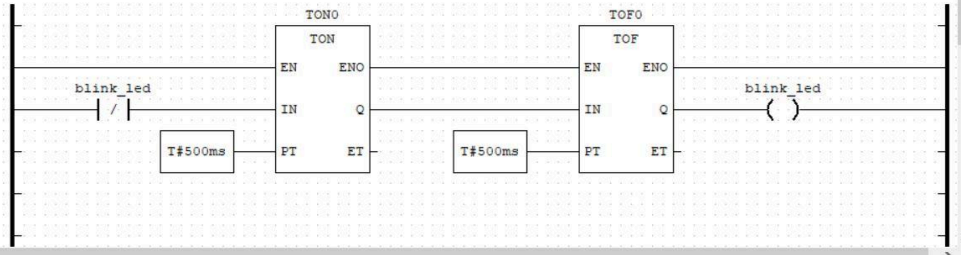


Blink ...s0.instance0

Description: Class Filter: All

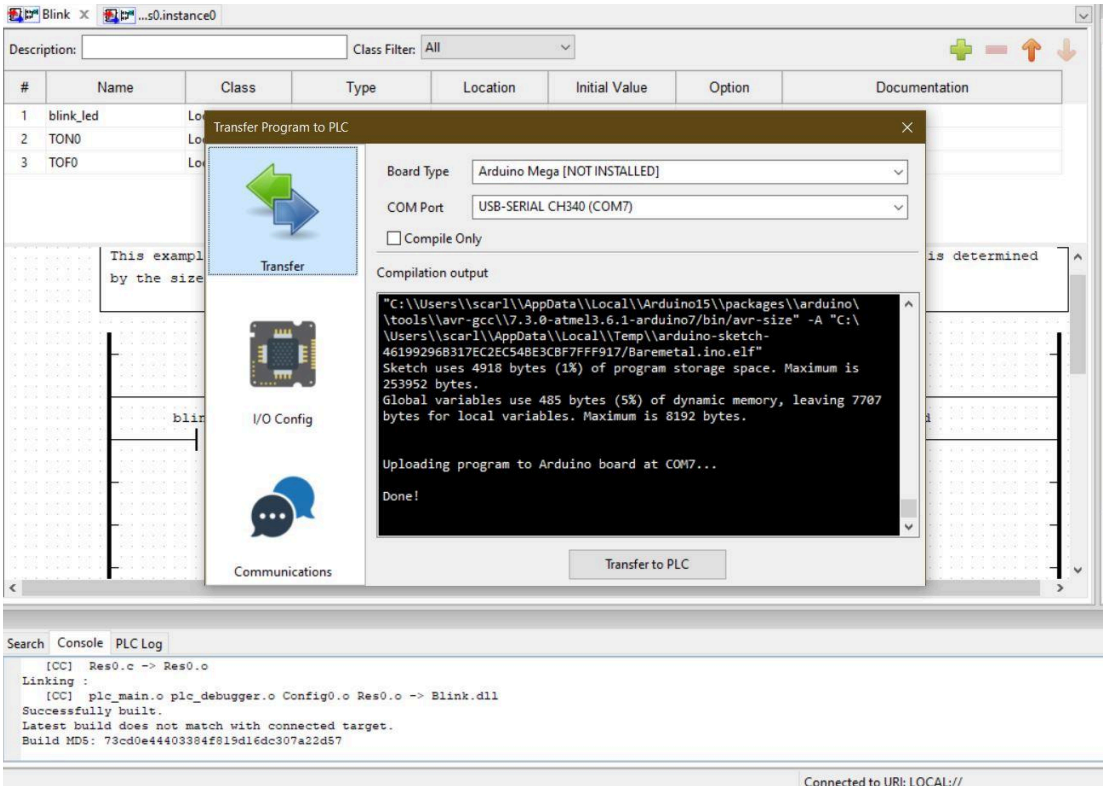
#	Name	Class	Type	Location	Initial Value	Option	Documentation
1	blink_led	Local	BOOL	%QX2.0			
2	TON0	Local	TON				
3	TOF0	Local	TOF				

This example cascades two timers (TON and TOF) to generate a square wave. The width of the wave is determined by the size of the PT variable on both timers.



Search Console PLC Log

```
    [CC]  Res0.c -> Res0.o
Linking :
    [CC]  plc_main.o plc_debugger.o Config0.o Res0.o -> Blink.dll
Successfully built.
Latest build does not match with connected target.
Build MD5: 73cd0e44403384f819d16dc307a22d57
```



ACKNOWLEDGEMENT

We would like to extend our gratitude to the team for their collective efforts in overcoming the challenges encountered during the interfacing of the experiment.. Special thanks to syeda samia our group member for their dedication in troubleshooting and adapting the configuration and code to achieve the desired functionality. This experience underscores the significance of teamwork, perseverance, and problem-solving skills in achieving success in electronics projects.

STUDENT'S DECLARATION

This is to certify that we are responsible for the work submitted in this report, that the original work is our own except as specified in the references and acknowledgement, and that the original work contained herein have not been untaken or done by unspecified sources or persons.

We hereby certify that this report has not been done by only one individual and all of us have contributed to the report. The length of contribution to the reports by each individual is noted within this certificate.

We also hereby certify that we have read and understand the content of the total report and no further improvement on the reports is needed from any of the individual's contributors to the report.

We, therefore, agreed unanimously that this report shall be submitted for marking and this final printed report has been verified by us.

Name: Syeda Samia Matric Number: 2123536 Contribution: Procedure, Results, Discussion, Conclusion, Recommendations	Read	✓
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	Agree	✓
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	Understand	✓
	Agree	✓