

PLC BASED TRAINER WORKSTATION FOR STUDENTS

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ABSTRACT

PLC (Programmable Logic Controller) Is A Crucial Component In Industrial Automation, Making It An Important Task In Today's Industry. However, Industrial PLC's Are Expensive And Require Prebuilt Hardware Kits, As Well As Programming Software And The Necessary Programming Skills. This Paper Presents A Step-By-Step Procedure For A PLC Trainer Kit Or Workstation. The Paper Discusses Areas To Train Participants In PLC Programming Knowledge. The Trainer Kit Consists Of Push Buttons, Switches, Buzzers, Indicator Lights, And Blowers For Input And Output Signals. The PLC Module Used Is MITSUBISHI, And The Simulation Software Used Is GX DEVELOPER. It Also Includes Timers And Counters. After The Training, We Were Undertook Survey To Scale Effects Of The PLC Project ,And The Results Showed An Enhanced Understanding of the PLC Trainer Kit.

Keywords: PLC, Inputs (Switches)/Outputs (Indication Lamps), GX Developer Software, Cables, Etc .

I. INTRODUCTION

The use of antique relay control logic was replaced by PLC in the control of machines and processes in 1970, providing benefits such as higher efficiency and communication, flexibility, higher response time, and easy troubleshooting. So It become a major part of the industry base operation to control over various processes. PLCs are microprocessor- based controllers that receive digital and analog signals from given input modules such as selector switches , push buttons and sensors and by giving ladder logic to control output devices such as motors, pneumatic devices, horns and alarms and status indicators. PLCs can apply functions such as logical sequence .The rapid growth of technological development in PLC along with new models as well as innovations in PLC base automation technology and there efficiency and reliability has promoted its utilization beyond the industries. So it is imperative to develop expertise through training in the programming of PLCs, their also used for students and individuals interested in the industrial automation field, the challenges are there with PLCs include the high cost of industrial PLCs and the need programming . The most commonly used programming languages for Programmable Logic Controllers (PLCs) vary depending on the specific application and industry. Some popular programming languages for PLCs include ladder logic, and sets of commands. In the given context, it is mentioned that the programming language used for the embedded PLC is Function Block . Function Block is a graphical programming language used in PLCs, where functions and function blocks are interconnected to perform specific tasks. The synopsis highlights certain areas that are not adequately covered in existing PLC trainers, such as the hardware connection of input modules and output modules , basics of PLC and component of PLC symbols with descriptions. Additionally, a report indicates moderate performance in stability and reliability for their application. The training kit mentioned in the synopsis includes an Mitsubishi IPLC CPU unit with number of inputs and number of outputs. The input devices are selector switches, push buttons , while the output devices are light indicators.

II. METHODOLOGY

The project for better understanding is distributed in two parts; One is software which include ladder logic for the controlling purpose and Other is hardware part which includes actual results of the controlling system. A) software system: Participants are required to gone through the stepped process for writing the ladder logic (LL) program for the controlling output of the PLC trainer workstation .under the guidance of a lecturer ,participants will hardwire the PLC trainer workstation as To train students on automatic control trainer kit , they

must know LL programming for the PLC using ladder logic. Description explained above. students are trained in writing ladder logic programs for automatically controlling module and by giving the assignments based on latching procedures to enhance their PLC ladder logics. They will be required to write ladder logic for latching procedures with the given inputs [X20] for output ON, [X21] for output OFF, and a indicating lamp [Y20].B)hardware system: In this project to enhance programming skills as well as about controlling . for that we are using hardware module for actual implementation of outputs and inputs of PLC basically in this trainer kit main three components we are using like input module (such as push buttons, selector switches) ,output module(such as indicating lamps)and main component we are using is Mitsubishi PLC along withthat we also using the cables, connectors, SMPS, HMI,

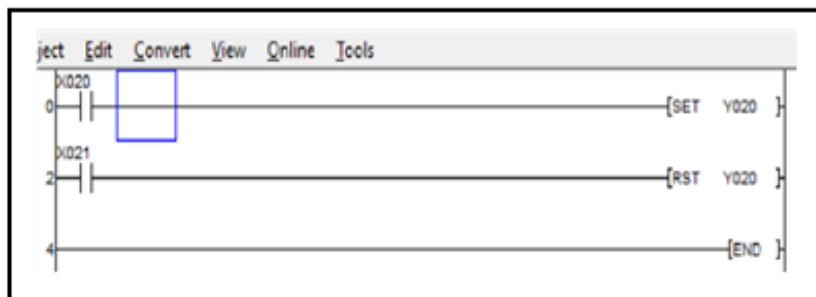


Figure 1: Latching program

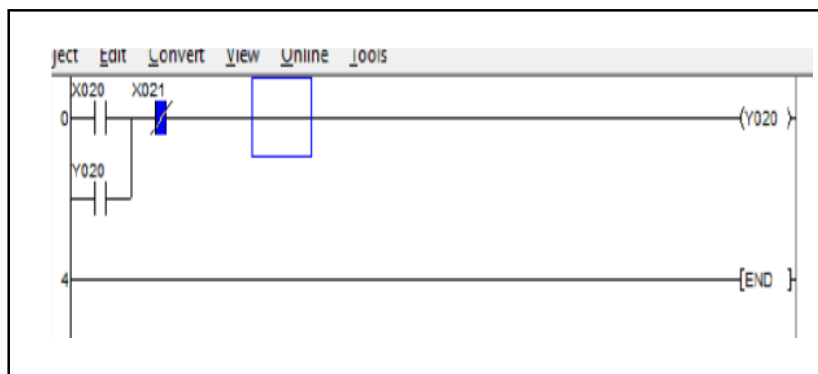


Figure 2: OR gate logic

III. MODELING AND ANALYSIS

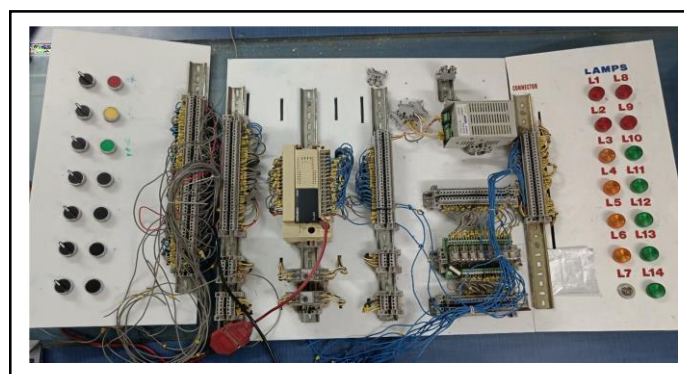


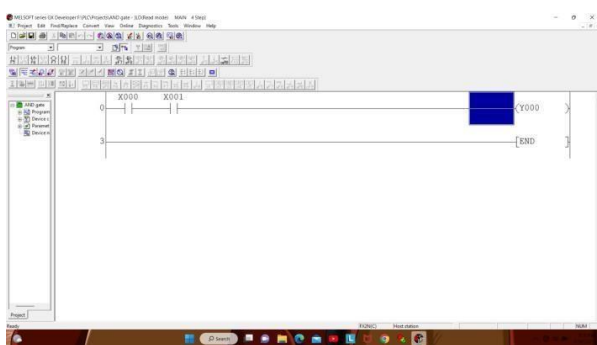
Figure 3: Working model

IV. RESULTS AND DISCUSSION

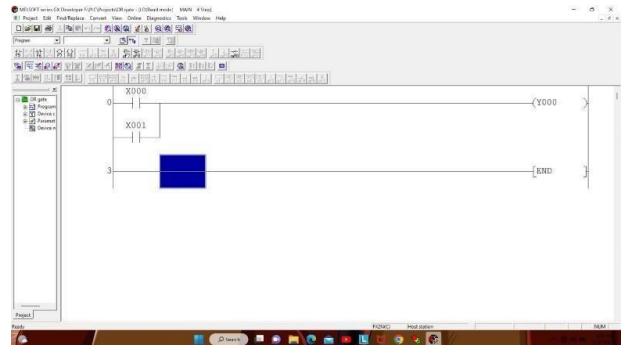
- a) The upcoming batches will be equipped with the practical knowledge required to perform PLC-related experiments using a PLC kit.
- b) The implementation of PLC technology in industries and manufacturing processes is crucial for their progress and advancement.
- c) This project aims to enhance the technical skills of students in control systems and programming.

- d) Students will have the opportunity to virtually demonstrate their experiments and observe the results.
- e) Enhanced knowledge and skills: The primary outcome of the PLC-based trainer kit is the improvement of knowledge and skills in automation and control systems. Students who use the trainer kit learn the fundamentals of PLC programming, ladder logic, and how to interface with input and output devices.
- f) Improved critical thinking: The PLC-based trainer kit requires students to think critically about how to solve problems and implement control systems. This enhances their critical thinking skills and improves their ability to troubleshoot and diagnose problems in real-world applications.
- g) Practical experience: The PLC-based trainer kit provides students with practical experience in automation and control systems. It allows them to apply theoretical knowledge to real-world applications and learn from their mistakes.
- h) Increased employability: Students who have experience in using PLC-based trainer kits are highly sought after by employers. The practical skills and knowledge gained from using the trainer kit increase their employability in the automation and control systems industry.
- i) Research and innovation: The PLC-based trainer kit inspires research and innovation in automation and control systems. Students who use the trainer kit may develop new ideas and concepts that could revolutionize the industry.

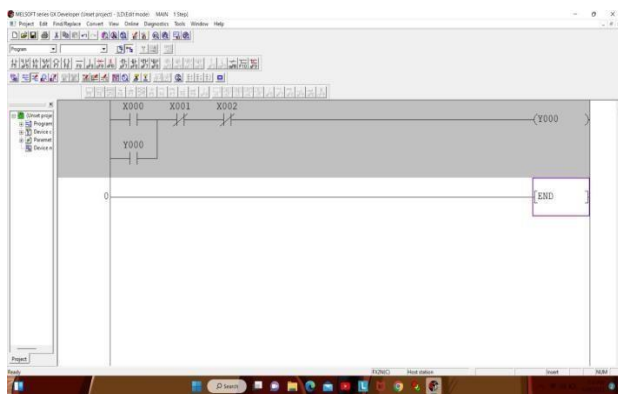
Following are some ladder logic programs simulation performed on GX-developer software.



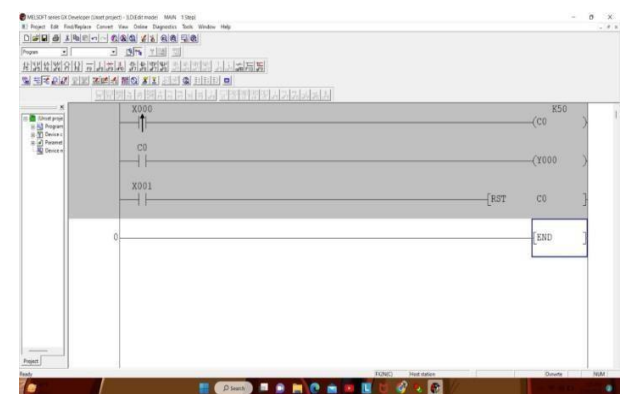
AND GATE



OR GATE

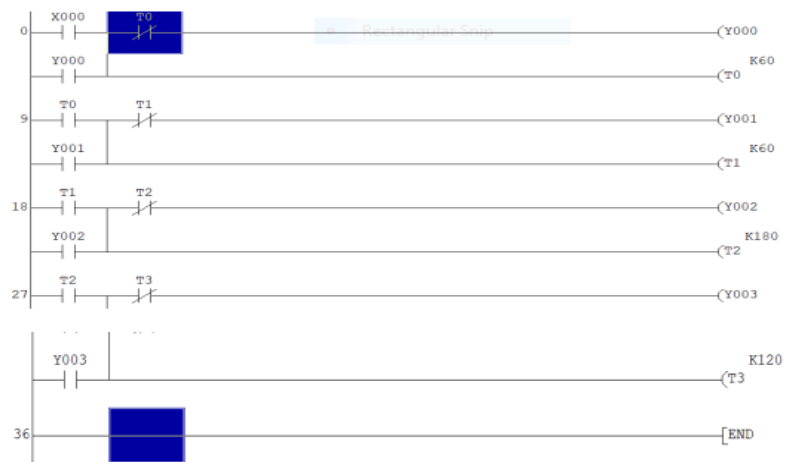


DOL STARTER



COUNTER PROGRAM

LADDER DIAGRAM



AUTOMATIC MIXING CONTROLLING IN TANK

V. CONCLUSION

PLC projects have become increasingly popular and relevant in today's technological world. PLCs are being widely used in various industries to improve efficiency, safety, and sustainability. PLCs offer flexible, reliable, and cost-effective solution for controlling automated processes, making them an ideal choice for industrial automation and control. Moreover, PLC projects are being used in the education sector to train students in automation and control systems. PLC trainer kits and laboratory exercises that simulate real-world applications are being developed to help students learn PLC programming and applications.

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