

**PLC BASED AUTOMATION FOR CONTROLLING ELECTRICAL DEVICES**

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**Abstract**

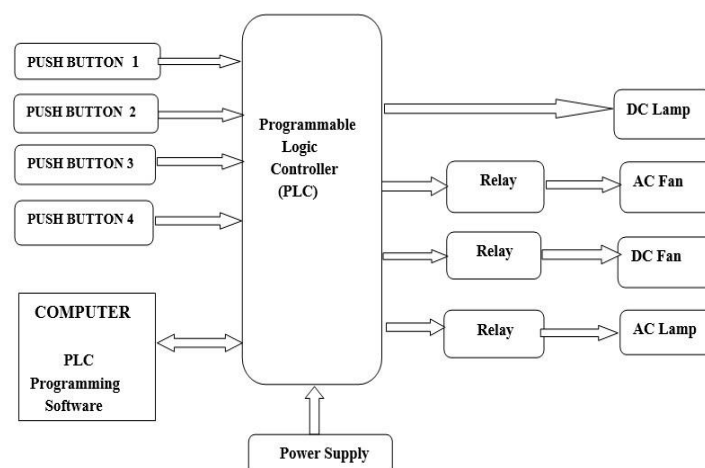
Automation is a technique that is used to control processes with reduced human assistance. With the help of automation, mechanical devices operate automatically without applying continuous input from the operator. Various inputs, sensors, actuators, and controllers, are the basic parts of an automation system. Various applications require controlling of electrical devices according to the condition of input. A programmable logic controller (PLC) is used for controlling the output devices based on the program. The paperwork includes inputs through push buttons using NO, and NC concepts, and controlling electrical field devices based on PLC programming written for the condition of the inputs.

**Keywords** - PLC, Push Buttons, Fans (AC and DC), Lamps (AC and DC), Relays, PC.

**Introduction**

To reduce the time of the process, automation provides the ability to multi-function with the same resources. As various applications require controlling electrical devices, an attempt to be made to design an automation system with the use of PLC. The paper includes the work of controlling various devices like AC fans, DC fans, AC lamps, and DC lamps by using PLC. The ladder logic programming depends on the condition in which particular applications have to run. Sequentially on, sequentially off, interlocking concept, ascending and descending order, on-off using delay, and counting of sequence or process are some of the aspects of applications. Sometimes condition-based controlling is required. All these aspects of controlling are done with ladder programming.

Push buttons are used to start and stop the operation. As soon as a programmable logic controller (PLC) receives the signal from the push button used for start, the PLC starts to operate the electrical devices as per the program condition written. According to the requirement of the application, various PLCs are available in the market to complete the needs of the application. Programming software used for PLC programming depends on the selection of a particular PLC.

**PLC-Based Automation**

**Description of System Blocks**

**Push Buttons** – A mechanical device used for controlling electrical circuits. The process turns ON after pressing the push button with the help of latching or holding even after the release of the push button. The same button can be pressed and released to off the process. One separate button may be used to off the process.

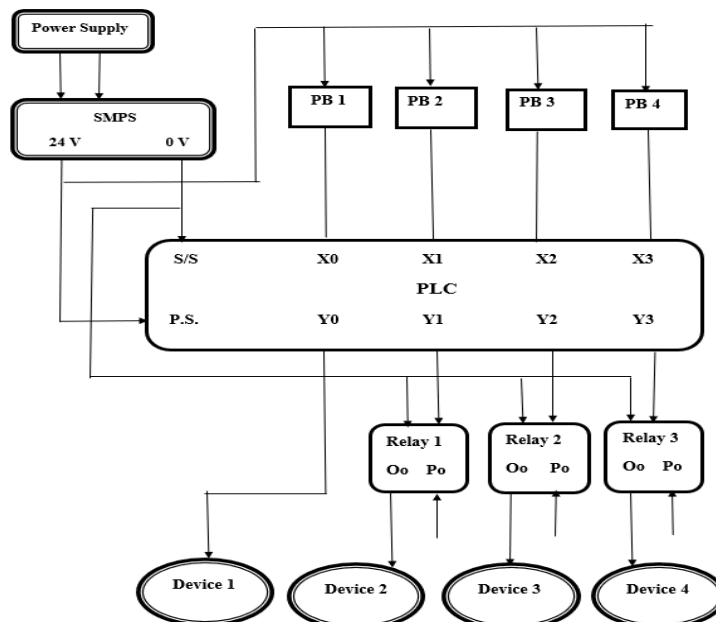
**Programmable Logic Controller** – PLC is used for controlling purposes. It connects with the inputs (i.e., push button) to take signals and control output electrical devices as per the program. Ladder logic is used as a programming language to program PLC. Cost, memory space, number of inputs and outputs, power requirement, speed of processing, types of inputs and outputs, etc are some parameters taken into consideration while selecting a PLC. There are various PLCs available in the market, The paperwork included DELTA PLC. The power supply, processor, input, and output are the three basic units of PLC.

**Outputs** – The output from the PLC is a 24 V DC Signal which is directly given to the devices that operate on a 24 V DC signal. The devices that operate on 230 V AC signal are getting signal through a relay. The PLC output of 24 V DC energized the relay and through the relay 230 V signal is provided to AC devices.

**Computer and Programming Software** - To program a PLC as per the requirement of process or condition, programming software is needed to be installed in the computer. There are many PLCs available in the market. So, the selection of particular software depends on PLC selection.

**Experimental Work**

The designed system worked as a PLC-based automation for controlling the electrical output devices. In this the start signal is applied using the push button, when the PLC receives the signal from the input, it will start to operate the output devices as per the program. The various types of programming are done by taking various conditions of operation which include sequentially ON and OFF, ON - OFF using ascending and descending order, Delay based operation of devices, counting of process, etc. The connections of inputs and outputs with PLC are done as per the diagram, the output from PLC is a 24 V DC so it is directly applied to the DC Lamp. AC appliances require a 230 V AC signal to operate, so with the help of a relay, we provide a 230 V AC signal to the appliances. Delta PLC is used for the designed work and the software used for PLC programming is WPLSoft 2.30.



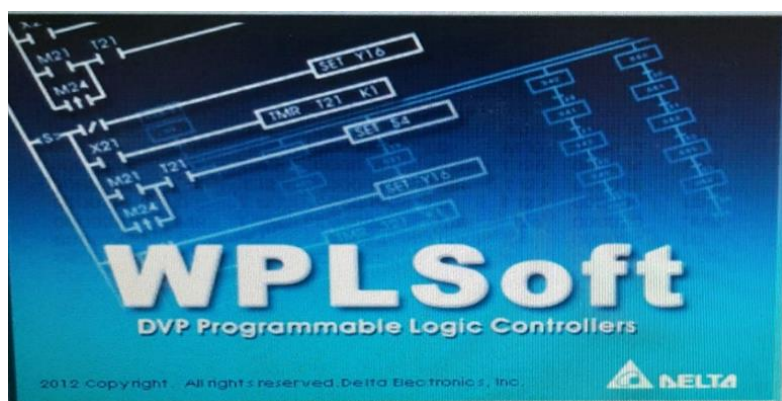
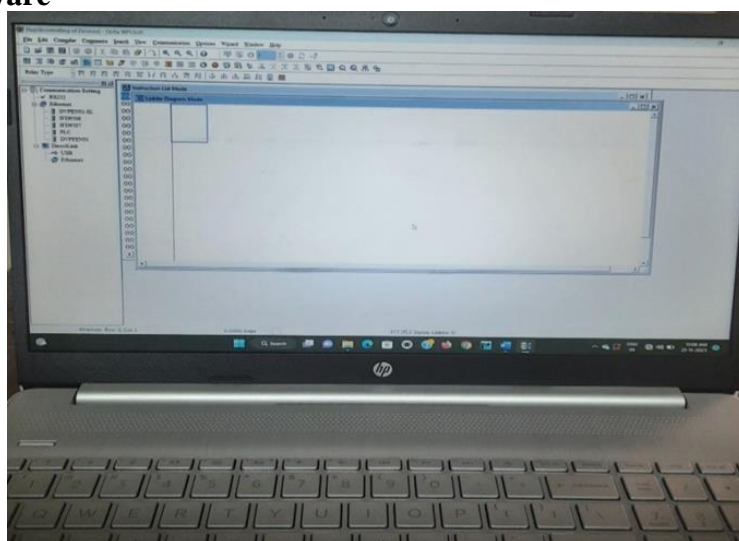
### Operating Voltage Used for Field Devices

S. N	Electrical Device	Voltage Applied	Applied Through
1	DC Lamp	24 V DC	PLC Output
2	DC Fan	24 V DC	Relay
3	AC Lamp	230 V AC	Relay
4	AC Fan	230 V AC	Relay

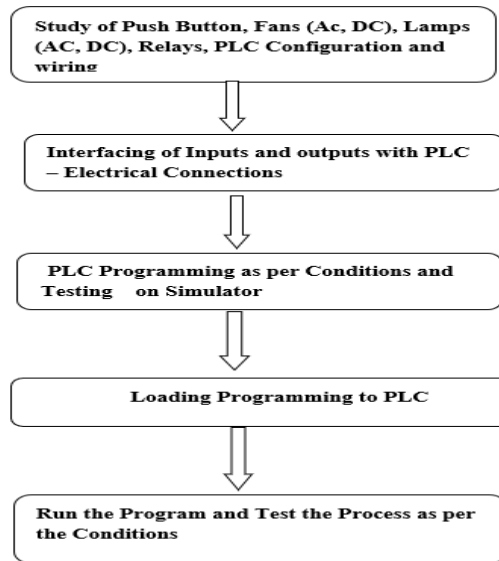
### Program Designed

1. Sequentially ON and OFF of devices.
2. ON and OFF devices using delay with the help of a timer.
3. Interlocking concept-based program
4. Various condition-based Operation
5. Counting of sequence or Process with the use of a counter.
6. Controlling based on the counting of process/ sequence.

### Programming Software



## Design Process



## Outcome

- Controlling of various electrical devices using PLC at a low cost will be possible.
- The number of devices can be controlled as per requirement.
- By changing the ladder logic program, the addition of devices for controlling is possible
- Provide automatic control over electric devices.
- To achieve consistency in the process of controlling.

## Conclusion

As per the signal from inputs, the PLC Starts to operate the devices. The controlling of output electrical devices is based on a program written to run the devices.

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