PLC BASED RELAY CO-ORDINATION SYSTEM FOR SMART ELECTRICITY DISTRIBUTION

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***Abstract*: Power distribution system consists of various load lanes. Suppose these distribution system consist of three load lane which is attached to the same distribution line. If due to some problem load lane1 is off but other load lane also connected to the same line so that these two load lane also become off if there is no problem in these load. So that main of our project is to "PLC Based Relay Co-ordination System for Smart Electricity Distribution using PLC for stand by supply arrangement". In this project when one load lane is off the other load lane which is attached to the same line will be automatically on through relay.**

***Keywords*: Programmable Logic controller (PLC), Current Transformer (CT), Instrument Transformer (IT), R.**

Introduction

In last few years so many techniques are developed in field of relay co-ordination. The importance of coordination of different protective device is increasing now days. A power system consists of many number of equipment. So many more number of circuit breakers and relays are required to protect the system. A relay must get sufficient chance to protect the zone under its primary protection. Only if the primary protection does not clear the fault the back-up protection should initiate tripping and therefore over current relay co-ordination in power distribution network is a major concern of protection engineer.

II. DEVELOPMENT OF SYSTEM

The purpose of this work is to the tool is developed using concept of adaptive protection scheme. Relay setting parameters are set automatically in response to changing systems. Furthermore this proposed tool is suitable for the complex future radial distribution system. The block diagram of PLC Based Relay co-ordination System for Smart electricity distribution is as shown in below.

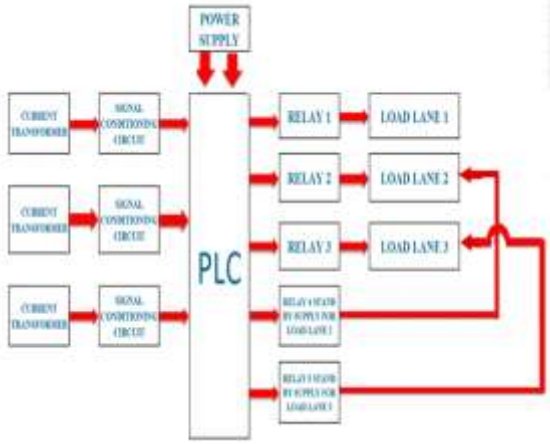


Figure 3.1: PLC Based Relay co-ordination System for Smart electricity distribution.

PROGRAMMABLE LOGIC CONTROLLER (PLC)

A programmable logic controller (PLC) or programmable controller is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes such as assembly lines or robotic devices or any activity that requires high reliability control and ease of programming and process fault diagnosis.

POWER SUPPLY

A device is the conversion of available power of one set of characteristics to meet specified requirements. Typical application of power supplies includes converting raw input power to a controlled or stabilized voltage and current for the operation of electronic equipment.

Power supplies belong to the field of power electronics the use of electronics for the control and conversion of electrical power. A power supply is sometimes called a power converter and the process is called power conversion. It is also sometimes called a power conditioner and the process is called power conditioning.

Relay

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive say a fan or an electric bulb.

III.Ladder Programming Development

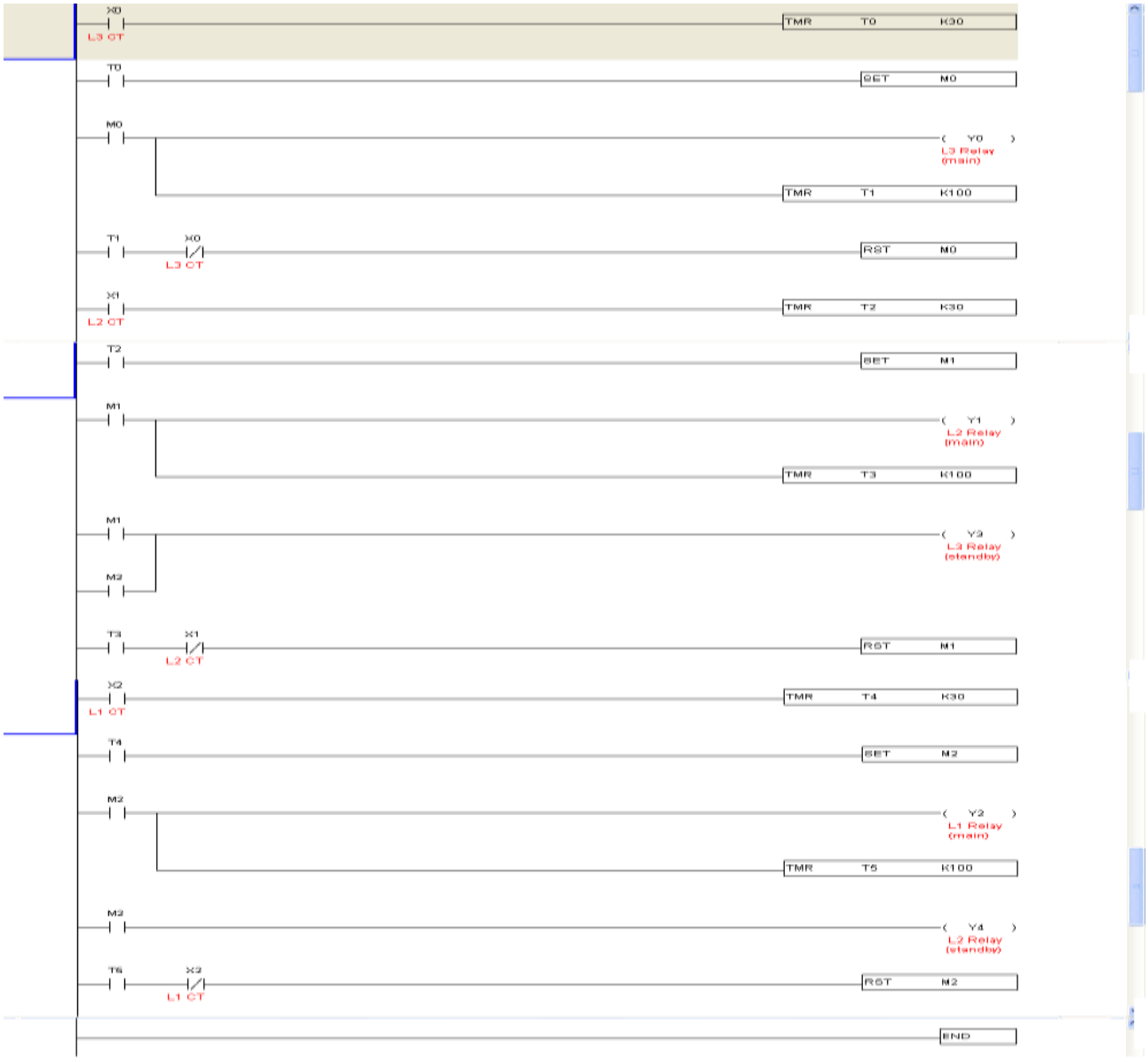


Figure. PLC ladder program

In the design of automated machine and control system for process programmable logic controllers are often used.For the controller to carry out its intended task, a control program is necessary. Therefore a formal and structured approach to software design must be adopted in order that the program can be easily understood debugged and documented. In terms of design methodology ladder programming is no different from the conventional computer programming. Thus considerable attention must be given to:

1) Task definition
2) Software design techniques
3) Documentation
4) Program testing

F) Program Structure

It is good practice to have a structured program with definite sections dealing with specific areas of operation. By adopting this approach, the programs developed are reliable and can be easily understood. It also eases the process of debugging hence leading to a shorter down time of the machine or process involved. These sections can be broadly categorized as follow:

1) Operating Modes
2) Process operation / Sequence Logic
3) Signal Outputs
4) Status / Indicator output

1. Operating Modes

Initial position: All automated equipment is likely to have an initial or home position. This is the position that all of its actuators will adopt prior to the operation of the equipment. Therefore to signify and initialize a basic position for the equipment, the home position of each actuator can be combined logically and programmed as a step in a sequential process.

2. Process Operation / Sequence

This is the main section of the program which determines the correct functioning of the operation. This is achieved through the use of both combinational and sequential networks. The resultant outputs do not normally drive the actuators directly, but instead are used to operate intermediate marker relays.

3. Signal output

Output signals to process actuators are formed by interlocking the resulting operation sequence output with any enabling conditions that exist in the operating modes mentioned above.

4. Status / indicator outputs

Process status is often displayed using indicator lamps or alarms, etc. Such elements are programmed in this section of the software. Standard logic instructions the processing potential of binary signals can be described using the three basic operations: AND / OR / NOT (negation) these basic logic operations can be used to solve combinational control problems. Combinational Logic Control Design Boolean algebra can be used as a tool to assist in the design of logic networks. The original logic circuit or program is first converted into a Boolean equation. Based on the rules governing Boolean algebra the equation is simplified resulting in more economical or elegant, in terms of logic functions, solution.

When dealing with fairly complex combinational logic tasks, the requirements can also be expressed in terms of Boolean equations so that it can be simplified before translating them into ladder logic.

The terms software and firmware both refer to digitally stored programs and data structures that are read and written by computers. In the PLC world, software is usually reserved for computer applications that allow the logical creation, monitoring, and troubleshooting of a PLC program. One example of PLC software is the RSLogix program developed by Allen-Bradley for use with their controllers. Firmware can be referred to as the actual program a PLC uses to execute logical instruction. Firmware is often stored in internal memory or on an Electrically Erasable Programmable Read-Only Memory (EEPROM). EEPROMs can be used to store program backups if there is a program fault or a sustained power loss to the PLC.

Sensor and Actuator Information Table.

System Sensor	System Actuator
L3 Current Transformer (X0)	Series Main Relay (Y0)
L2 Current Transformer (X1)	Series Main Relay (Y1)
L1 Current Transformer (X2)	Series Main Relay (Y2)
	Stand by Relay (Y3)
	Stand by Relay (Y4)

Table. Sensor and Actuator Information Table.

4. PERFORMANCE AND ANALYSIS

System Testing

System is critical element of measure of assurance and represents the review of specification ultimate review of specification and design. The system is tested during above methods as a theoretical and practicalverification of the results. An effort is made to compare the system with traditional one.

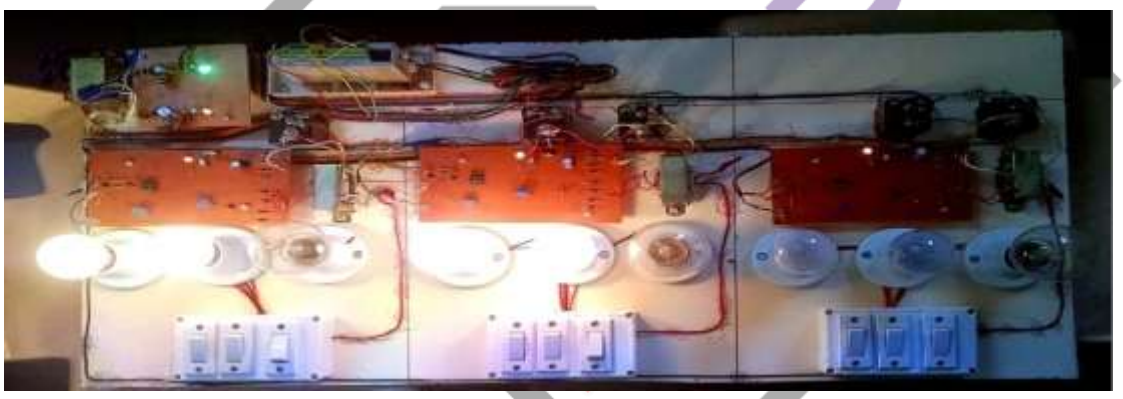
LANE L3 OVERLOAD CONDITION

Power distribution system consists of various load lanes. Suppose these distribution system consist of three load lane which is attached to the same distribution line. And load lane L3 is overload condition.

Photograph.3.Lane L3 Overload condition

Power distribution system consists of various load lanes. Suppose these distribution system consist of three load lane which is attached to the same distribution line. And load lane L3 is overload condition and Trip with in 3Sec.

Sr.No.	LOAD RELAY CONDITION	LANE L1	LANE L2	LANE L3
1	LOAD	NORMAL	NORMAL	OVER LOAD
2	Relay	ON CONDITION	ON CONDITON	TRIP WITH IN 3 SEC



Photograph.4.Lane L3 Overload condition Trip with in 3 second

LANE L3 RESTART CONDTION

Power distribution system consists of various load lanes. Suppose these distribution system consist of three load lane which is attached to the same distribution line. And load lane L3 is overload to normal condition and Restart within 10Sec

Sr.No.	LOAD RELAY CONDITION	LANE L1	LANE L2	LANE L3
1	LOAD	NORMAL	NORMAL	OVER LOAD TO NORMAL
2	Relay	ON CONDITION	ON CONDITION	RESTART WITH IN 10 SEC

Photograph.5. Lane L3 Normal condition Restart with in 10 second

CONCLUSIONS

In this paper implementable primarily focuses the electric energy produced at generating stations is transported over high voltage transmission lines to utilization points. In the early days electric systems were operated as isolated systems with only point-to-point transmission at voltages that are considered low by today's standards. To improve the power quality of the transmission lines compensation circuits are integrated. In order to increase the reliability of the system and reinstate the power supply in time it is of immense important to classify and locate the fault rapidly and to isolate the faulty section precisely.

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