STUDY THE BASIC PLC PROGRAMING

An Internship Report submitted to the

Department of Electrical and Electronics Engineering in

Partial Fulfillment of the Requirements for the Degree of

Bachelor of Science

In

Electrical and Electronics Engineering

Supervised By :

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Submit Date 25.10.2014

TO WHOME IT MAY CONCERN

This is to certify that Md. Sohel Rana (ID:113-33-703) student of Electrical and Electronics Engineering Department in Daffodil International University worked under my surveillance during his accomplishment of internship program from 19th February, 2014.

During his internship period, he has involved in assembling with all required instruments. He worked as a good player and has developed technical skills on the assigned area of interest.

I found him sincere, diligent, punctual and keen on achieving goals.

I wish him every success in his career.

……
Md. Shamim Miah
Instructor
Bangladesh Computer Education Development Society (BCEDS)

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This is to certify that Md. Juwel Khan (ID:113-33-780) student of Electrical and Electronics Engineering Department in Daffodil International University worked under my surveillance during his accomplishment of internship program from 19th February, 2014.

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Instructor

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APPROVAL

ThisInternship report is submitted to the Daffodil International University (DIU) is partial fulfillment to the requirement of the degree of Bachelor of Electrical & Electronics Engineering on August 2014 by the following student's & it has been accepted with satisfaction.

DECLERATION

This is Hervey declared that the work presented in this internship report is donned by the authors under the supervision Of Dr. M Shamsul Alam Professor and Dean, Department of Electrical & Electronics Engineering, Faculty of Engineering, Daffodil International University Dhaka, Bangladesh. We Hervey declare that the content of this internship is the result of work done by us and has not been submitted to any other University or Institution on for a higher degree or any other purpose.

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All praises and gratitude to almighty Allah, and blessings of who's made us enable to complete this internship. We are grateful to our supervisor Dr. M Shamsul Alam Professor and Dean, Department of Electrical & Electronics, Faculty of Engineering, Daffodil International University Dhaka, Bangladesh and also Md. Shamim Miah Instructor Bangladesh Computer Education Development Society (BCEDS) Mohammadpur, Dhaka-1207. For their constructive suggestion, scholastic guidance, constraint inspiration & kind co-operation throughout the entire internship work. It would have been impossible for us to accomplish our work without their invaluable advice. Finally, we wish to complement all the concerned teachers and staff of the department for their direct and indirect assistance at different stages of work.

ABSTRACT

During this present era of industrialization PLC has a wide range of application to reduce the human effort and make the life of workers easier. Modern industries are unthinkable without PLC and microprocessor system. Realizing this need and importance of automated system, we have chosen to build a prototype of PLC based belt conveyor system. We have the flexibility of number of number of product delivering or packing. In were system we connected number product moment and position of tray by two photo conveyor sensing system. Therefore, it is very commenting to keep the quantity constant in each plate and total number of product could be count total easily, in essence PLC based belt conveyor system is very smart and easier in industry application.

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Chapter # 01

PLC (Programmable Logic Controller)

1.1 Introduction:

The edge of modern science PLC (Programmable Logic Controller) is a new invention that is really give us comfortable in our day life. PLC Was first invented by Industrialist Richard-E-Morley in 1960. A group of engineers General Motors in 1968 was developed the first Programmable Logic Controller (PLC), when the companies were in search of an alternative to substitute complex relay control systems. But Now It has many features.

1.2 What is PLC?

A Programmable controller is a solid state user programmable control system with functions to control logic, sequencing, timing, arithmetic data manipulation and counting capabilities. It can be viewed as an industrial computer that has a central processor unit, memory, input output interface and a programming device. The central processing unit provides the intelligence of the controller. It accepts data, status information from various sensing devices like limit switches, proximity switches, executes the user control program store in the memory and gives appropriate output commands to devices like solenoid valves, switches etc.

Input output interface is the communication link between field devices and the controllers; field devices are wired to the I/O interfaces. Through these interfaces the processor can sense and measure physical quantities regarding a machine or process, such as, proximity, position, motion, level, temperature, pressure, etc. Based on status sensed, the CPU issues command to output devices such as valves, motors, alarms, etc. Programmer unit provides the man machine interface. It is used to enter the application program, which often uses a simple user-friendly logic.

1.3 Feature of PLC

- The main feature of PLC

- PLC can be easily programmable.
- PLC does not suffer the problem of wear & fatigue.
- PLC is cost saving.
- PLC can be checked without the connection of field device.

- PLC is possible to connect the very complex logic function conveniently

- PLC can be interfaced with computer system.

- Maintenance personnel can easily find out the problems & repair.

- PLC has fast response.

- PLC is very compact.

- PLC is power saving equipment.

1.4 Various Convenience of using PLC

- It can be use Program Instruction instead of general method of wiring
- We can Control any device insufficiently
- Temperature, Humidity, Noise cannot affect PLC
- It is very easy to read, Write & utilize program in PLC
- In PLC Logic & switching operation is used
- Various types of stepper motor, automatic door control, relays

1.5 Areas of Application of PLC

Every machine or system has a controller. Dependent on the technology type used, controllers can be separated into hydraulic, pneumatic, electronic and electrical controllers.

PLC has also application areas. That's are

i. Steel Corporation
ii. Cement Industries
iii. Beverage Industries
iv. Packaging sector
v. Chemical Industries
vi. Fertilizer
vii. Textile Mil
viii. Spinning Mil
ix. Power Sector
x. Paper Industries
xi. Ship Builders etc.

1.6 Size of PLC

I . Small PLC Compact PLC

Input/ Output System (6-40)

ii. Large PLC Module PLC

Input/ Output System (100-4800)

iii. Very Large PLC

Input/ Output System (10000-128000)

1.7 Basic Design of PLC

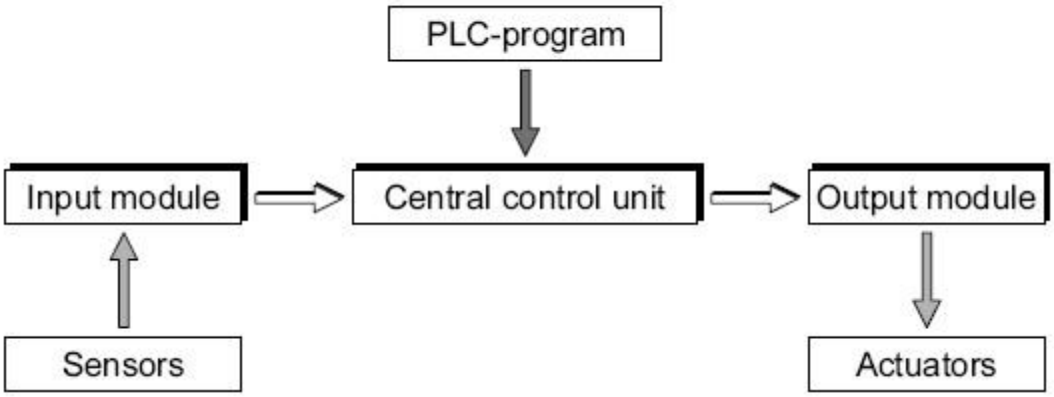


Figure1.1 Block diagram of Basic design of PLC

PLCs contain three basic sections:

1. Central processing unit (CPU).
2. Memory: EPROM, RAM, and so on.
3. Input/output section for communication with peripherals (ADC, DAC).

A PLC is basically a black box with a number of inputs from, and a number of outputs to, the outside world. It can make decisions, store data, do timing cycles and do simple arithmetic, convert codes and so on. The basic difference between this black box and a hardware logic system using IC chips or a relay controlled system, is that specific coded messages are stored in areas called program memory,

which are PROM or ROM and RAM chips. It is, however, much easier to change a program when a different process is required than to rewire the control system. For example, it may take electricians a couple of weeks to require a pipe mill, whereas a programmer will spend only a fraction of this time to reprogram a PLC since no wires will have to be changed. In addition, various recipes can be stored in memory and accessed when required, making the program extremely flexible.

The system operates through interaction with the processor and program memory. When the power to the system is turned on, the processor reads the first instruction stored in memory and acts on this instruction.

When completed, it goes back to the memory for the next instruction, and so on until task is complete. This operation is called the fetch-execute cycle. The processor communicates with the outside world via input and output modules.

1.8 Different Type of PLC

i. OMRON PLC
ii. MESSUNG PLC
iii. MITSUBISHI PLC
iv. SIEMENS PLC
v. LG PLC

1.9 Compare between LG PLC, Mitsubishi PLC & Siemens PLC

LG PLC	Mitsubishi PLC	Siemens PLC
LG PLC is a one kind of Programmable Logic Controller that is manufactured by LG corporation	Mitsubishi PLC is a one kind of Programmable Logic Controller that is manufactured by Mitsubishi corporation	Siemens PLC is a one kind of Programmable Logic Controller that is manufactured by Siemens corporation

LG PLC is a small PLC or compact PLC	Mitsubishi PLC is a large PLC or module PLC	Siemens PLC is very large PLC
The input/output system of LG PLC is 6 to 40	The input /output system of Mitsubishi PLC is 100 to 4800	The input/output system of Siemens PLC is 100000 to 128000
LG PLC is Used such industries or automatic controlling system where little bit of input/output system is used and normal type of controlling system is used such as motor controlling system, lighting controlling system etc. it is used in Industries, in automation, in automation industries	Mitsubishi PLC is used such like of industries or automatic controlling system where the input/ output system is large type of. Using Mitsubishi PLC we can control traffic signal by using Mitsubishi PLC.	Siemens PLC is used such type of Industries or automatic controlling system where the input/ output system is very high. Using Siemens PLC we can control the total manufacturing system of an industries.
The feature of LG PLC is better because it has small input/output system	The feature of Mitsubishi PLC is low than LG PLC because it has much i/o system than LG PLC but by using Mitsubishi PLC we can control more i/o system than LG PLC	The main feature of Siemens PLC is we can control total work of any system is automatically control by Siemens PLC
The programming of LG PLC is simple	The programming of Mitsubishi PLC is complex than LG PLC	The programming of Siemens PLC is most complex than LG & Mitsubishi PLC

CHAPTER 2
Design & Mode of Operation

2.1 Basic Structure of PLC

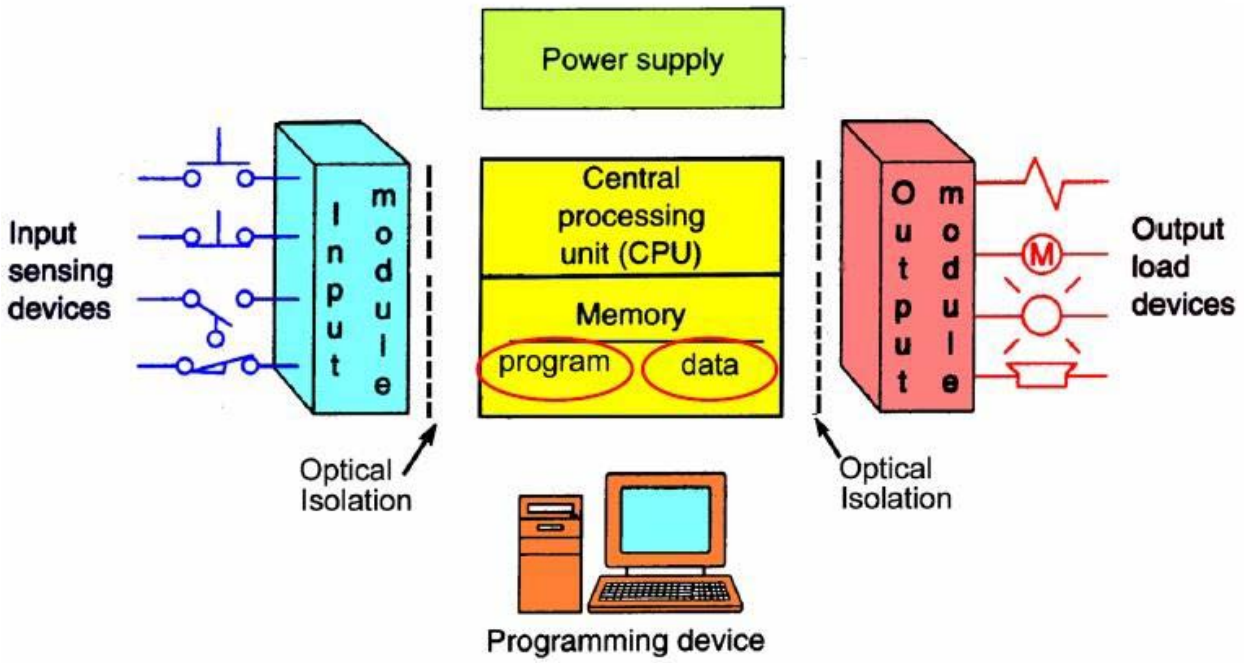


Fig: 2.1 Basic structure of PLC

i. **Central Processing Unit:** It bears the input signal & it process on the base of instruction. It stores the result to memory & display output as requires. Central processing unit processes all types of input data and sends to output as needed.

ii. **Power Supply unit:** The main AC voltages converted to (5 volt) DC. Then the program is developed and sends to PLC memory Unit.

iii. **Programming Device:** It consists of required program to this device & program is developed to this device also. After developing program the program is send to PLC memory unit.

iv. **Memory Unit:** Where the program is stored is called memory unit. This stored program is used based on instruction by CPU.

v. **Processor:** It receives the information from outside the system, stored to the memory and process as an instruction. So that from where the processor receives information is called input section. The processed action is send to output device. Switch, Level roller`, encoder is used as an input device. Motor, Solenoid etc. is used as an output device.

2.2PLC Overview

This low cost PLC system was designed to satisfy hunger of Automation of Indian Industry and also helps beginners as well as development engineers to get into Automation field.

System consists of following main sections:

(1) The CPU:

The CPU uses the 89c51 microcontroller, which operates at 11.0592 MHz It has 8k RAM, which can be used as data memory, 8k RAM that can be used as program memory as well as data memory, 8k EEPROM that can be used as program memory.

(2) Input/output Section:

This part of system is on separate board connected to processor via cable. It allows the processor to communicate with the outside world. It is also called Data Acquisition System (DAS).

This part of system provides 4 digital inputs consisting of 2 dc and 2 ac, 4 digital outputs consisting of 2 dc and 2 ac each. It also provides 8 analog inputs with following ranges:

1. –5v to +5v (one channel).
2. 0v to 10v (one channel)
3. 4mA to 20mA (one channel).
4. 0v to 5v (five channel).

(3) Timer/Counter:

The system has 2 timers or 2 counters or 1 timer and 1 counter. The timer provides maximum of 255sec delay and the counter provides maximum of 255 counts

(4) Serial Communication:

The system uses RS-232 serial data standard. Chip ICL232 is used as communication interface between RS-232 standard and TTL logic.

(5) Programming Device:

This system uses personal computer (PC) as programming device. The user can write program in user friendly language. The programming devices (PC) convert this user friendly language program into machine understandable language and transmit it to the PLC board via serial communication.

(6) Power Supply Unit:

This system provides +12v and -12v with maximum 2amps and +5v with maximum of 1amps

2.3 Input Device of PLC

i. Push Button Switch
ii. Selector switch
iii. Level Switch
iv. Flow Switch
v. Pressure Switch

vi. Temperature Switch

vii. Optical Switch

viii. Photo Electric Switch

ix. Proximity Switch

x. Thumbwheel Switch

Explanation of Input Devices:

i. Push Button Switch:

Fig: 2.2 Push Button Switch

There are various types of push button switch they are:

a) PV1 Series Long Life, Water Resistant Anti-vandal Switches

Fig: 2.3 PV1 Series Long Life, Water Resistant Anti-vandal Switches

The PV1 series water resistant, sealed, anti-vandal switches feature long life and custom laser engraved marking options. This anti-vandal switch features a clean, aesthetic look for high end products. It has a panel cut-out size of 19mm. It is sealed to IP65 ratings. Our anti-vandal switches are popular for use in kiosk applications, ticket dispensers and industrial-type applications. Also comes in black anodized finish

b) PV6 Series Illuminated, Sealed, Long Life Anti-vandal Switches

Fig: 2.4 PV6 Series Illuminated, Sealed, Long Life Anti-vandal Switches

The PV6 series illuminated anti vandal switches feature a long life expectancy and are water resistant. Illumination LED colours include red, yellow, orange, blue, green and white. Available with dot or ring illumination and a 16mm panel cut-out size. Applications for this anti-vandal pushbutton switch include kiosks and ticket dispensers, among other designs that require vandal resistance

c) PV8 Series Illuminated, Sealed Anti-vandal Switches

Fig: 2.5 PV8 Series Illuminated, Sealed Anti-vandal Switches

The PV8 series anti vandal switches feature a long life expectancy and are water resistant. Illumination LED colours include red, yellow, orange, blue, green and white. Dot or ring illumination options are available. 25mm panel cut-out size. This anti-vandal switch is available with 2 or 4 poles, and offers momentary or maintained options. Applications for this anti-vandal pushbutton switch include kiosks, security applications and ticket dispensers, among other designs that require vandal resistance in a public setting.

ii. Flow Switches

Fig: 2.6 Flow Switch

Unique Designs...For use in Liquids or Gases

These switches feature high quality, corrosion-resistant materials for use in the toughest environments. Material choices, ranging from stainless steel to Royton offer vast chemical compatibility. Versions include switches with fixed or adjustable actuation settings, models for viscosity compensation or high pressures, in-line models and designs to satisfy any mounting or space requirement.

iii. Stock Pressure Switch

Fig: 2.7 Stock Pressure Switch

A **pressure switch** is a form of switch that closes an electrical contact when a certain set pressure has been reached on its input. The switch may be designed to make contact either on pressure rise or on pressure fall. Another type of pressure switch detects mechanical force; for example, a pressure-sensitive mat is used to automatically open doors on commercial buildings.

iv. Temperature switch:

Fig: 2.8 Temperature Switch

The function of the temp switch is to communicate with your car computer and register the temperature on your cars gauge. To let you know how hot your car is running or if it's at risk of overheating. Which if occurs can cause very expensive repairs.

v. Optical switch

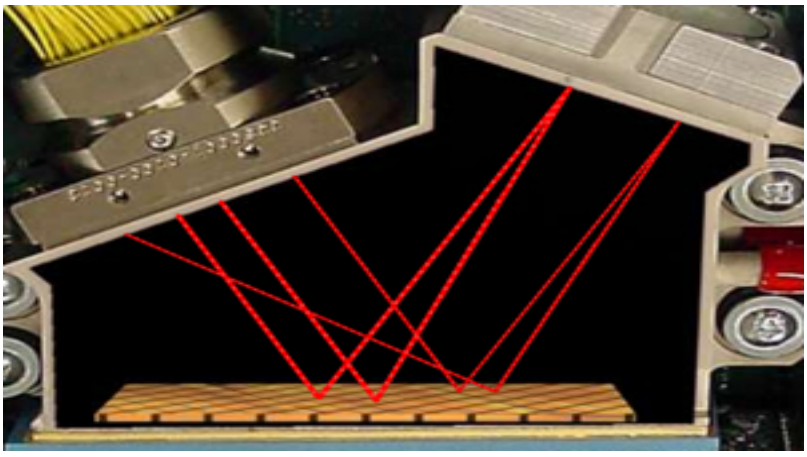


Fig: 2.9 Optical Switches

An optical switch is a device that transfers light signals between different channels in communications networks. Optical fiber networks were developed in the 20th century to carry higher quantities of data than were possible with earlier copper wire systems. Increasing use of the Internet and expanding cellular telephone and television offerings required greater quantities of data to be managed by communications networks.

vi. Photo electric switch:

Fig: 2.10 Photo Electric Switch

A photoelectric switch is a switch that is activated by light.
There are 2 common uses:

1. A light beam, like a Laser in a bank security system, shines from the source (Laser) to a photoelectric cell on the other side of the room. When the beam is broken (stepped through), the light is stopped and the photoelectric cell activates a switch, which sets off an alarm
2. Outdoor lights sometimes have photocells. These photocells sense when it is day (light) and night (dark). When it is dark enough they switch on the light automatically.

vii. Proximity switch

Fig: 2.11 Proximity Switch

Proximity switches open or close an electrical circuit when they make contact with or come within a certain distance of an object. They are most commonly used in manufacturing equipment, robotics, and security systems. There are four basic types: infrared, acoustic, capacitive, and inductive.

viii. Thumbwheel Switch

Fig: 2.12 Thumbwheel switch

A thumbwheel switch is a multi-position rotary switch. It contains a sprocket that can go forward or backward. As you can imagine from the name, you will be able to use a thumb, or a finger, to move the sprocket each way. They can be on a mechanical or an electronic device. These are sometimes called digital switches,

and you can see them in action on a variety of different devices. Some of them are very simple, while others are going to be quite a bit more complex

2.4 Output Device of PLC

i. Solenoid Valves
ii. Contractor
iii. Indicator Lamp
iv. Motor Stator
v. Alarm
vi. Generator

Explanation of Output Devices:

i. Solenoid Valves:

Fig: 2.13 Solenoid valves

A solenoid valve is an electromechanical device used for controlling liquid or gas flow. The solenoid valve is controlled by electrical current, which is run through a coil. When the coil is energized, a magnetic field is created, causing a plunger inside the coil to move. Depending on the design of the valve. When electrical circuit is removing from the coil, the valve will return to its de energized state.

ii. Contractor:

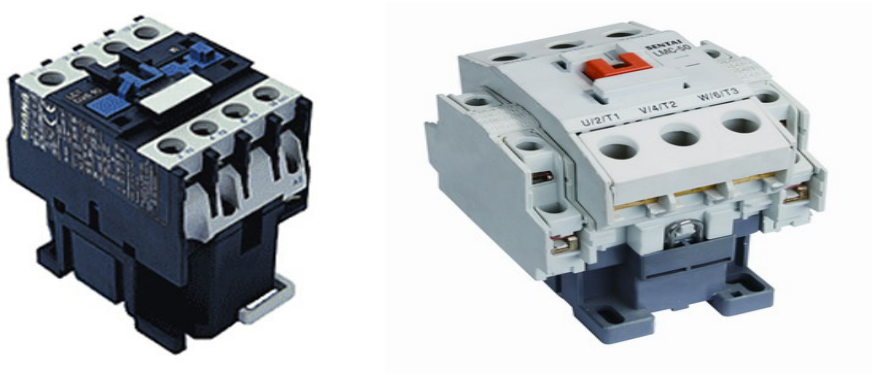


Fig: 2.14 Contractors

A **contactor** is an electrically controlled switch used for switching a power circuit, similar to a relay except with higher current ratings. A contactor is controlled by a circuit which has a much lower power level than the switched circuit.

iii. Indicator Lamp:

Fig: 2.15 Indicator lamps

Indicatorlamp–

indicatorconsistingofalighttoindicatewhetherpowerisonoramotorisinoperation pilot lamp, pilot light indicator a device for showing the operating condition of some system...

iv. Motor Stator:

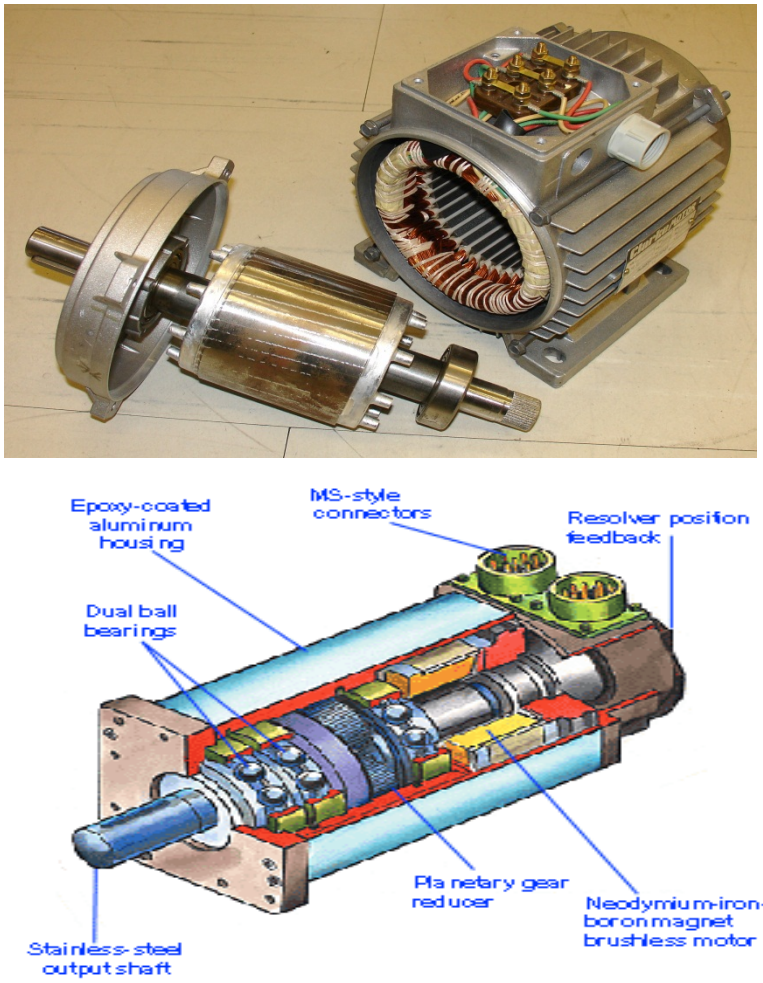


Fig: 2.16 Motor Stator

Motor Stator: A motorist an output device which have various constructive works in industries. Such as to run conveyor belt synchronous motor is used, for maintain other equipment various motor is used.

v. Alarm:

Alarm system monitoring has several uses. One of its main purposes is to prevent burglaries. If a thief tries to break into a building with an alarm system, a loud siren will sound and scare the burglar off. Meanwhile, the alarm company will see that the alarm has been triggered. Normally, a representative will call the building

to make sure it wasn't a false alarm and to make sure that everything in the building is okay.

Fig: 2.17Alarms

vi. Generator:

Fig: 2.18 generators

A generator is an electrical device which is used for power generation. By using PLC program we can control generator.

2.5 Different Type of Sensors

2.5.1 Inductive Sensors

Inductive sensors use currents induced by magnetic fields to detect nearby metal objects. The inductive sensor uses a coil (an inductor) to generate a high frequency magnetic field as shown in Figure.

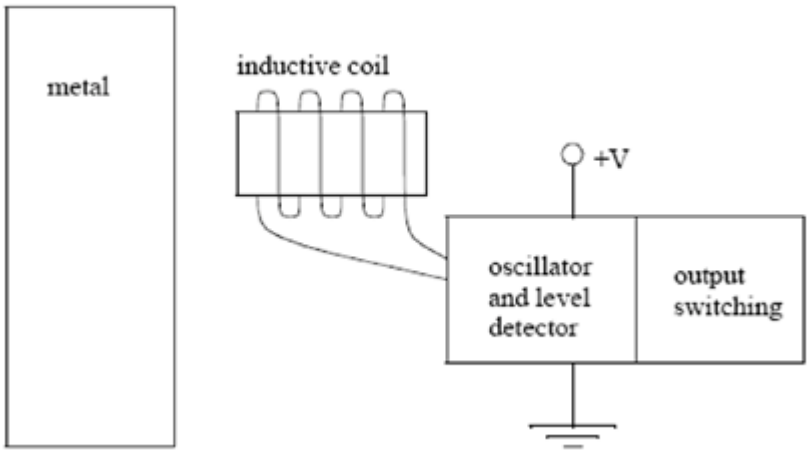


Fig: 2.19 Inductive Sensors

If there is a metal object near the changing magnetic field, current will flow in the object. This resulting current flow sets up a new magnetic field that opposes the original magnetic field. The net effect is that it changes the inductance of the coil in the inductive sensor. By measuring the inductance the sensor can determine when a metal have been brought nearby. These sensors will detect any metals, when detecting multiple types of metal multiple sensors is often used.

Example (CYLINDRICAL TYPE WITH LEADS)

Part number: PR08DC

Form au tonics PR Series

FEATURES:

Size: 8-12-18-30 mm diameter

2-wire DC, 3-wire DC or 2-wire AC models available

Normally open or normally closed

Shielded or non-shielded models

3-wire DC available NPN or PNP

Standard or long body versions

LED indication of output status

2 meter cable

2.5.2 Capacitive Sensors

Capacitive sensors are able to detect most materials at distances up to a few centimeters. Recall the basic relationship for capacitance.

$$C = \frac{Ak}{d}$$

where,

C = capacitance (Farads)
k = dielectric constant
A = area of plates
d = distance between plates (electrodes)

In the sensor the area of the plates and distance between them is fixed. But, the dielectric constant of the space around them will vary as different materials are brought near the sensor. An illustration of a capacitive sensor is shown in Figure. an oscillating field is used to determine the capacitance of the plates. When this changes beyond a selected sensitivity the sensor output is activated.

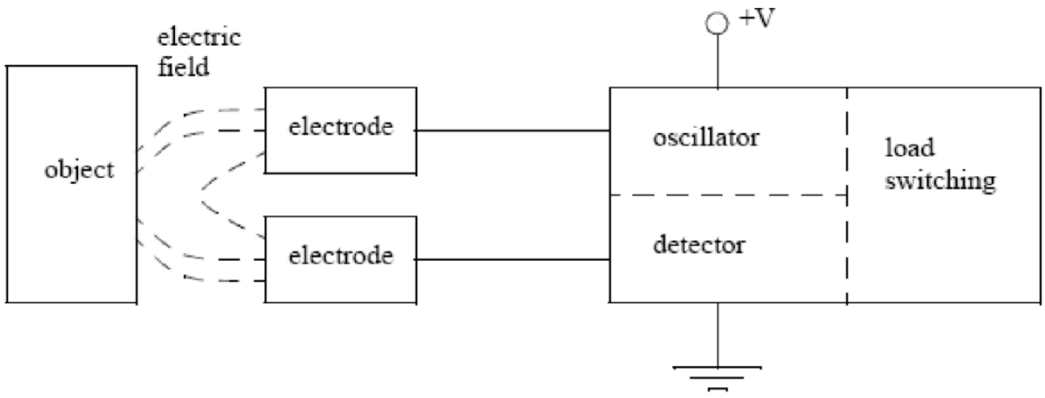
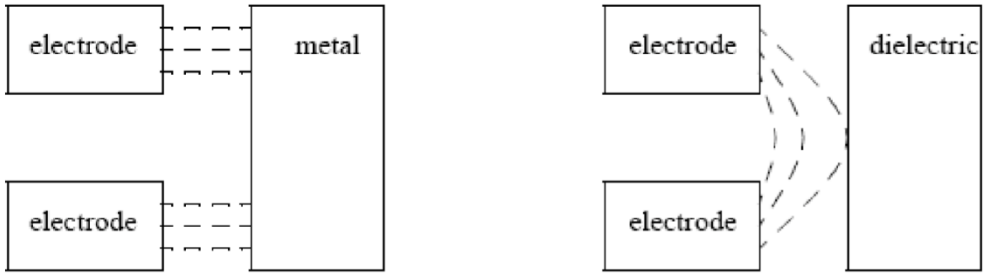


Fig: 2.20 Capacitive Sensor



Dielectrics and Metals Increase the Capacitance

The sensors are normally made with rings (not plates) in the configuration shown in Figure. In the figure the two inner metal rings are the capacitor electrodes, but a third outer ring is added to compensate for variations.

Without the compensator ring the sensor would be very sensitive to dirt, oil and other contaminants that might stick to the sensor.

Example: (CYLINDRICAL TYPE WITH LEADS)

Part number: CR18-8DN

Form au tonics CR Series

FEATURES:

Size: 18mm or 30 mm 3-wire DC or

2-wire AC models normally open or

normally closed

3-wire DC available NPN or PNP

Adjustable sensitivity

Detecting distance to 15mm

LED indication of output status

2 meter cable

IP66 (18mm) or IP65 (30mm)

2.5.3 Optical (Photoelectric) Sensors

Light sensors have been used for almost a century - originally photocells were used for applications such as reading audio tracks on motion pictures. But modern optical sensors are much more sophisticated.

Optical sensors require both a light source (emitter) and detector. Emitters will produce light beams in the visible and invisible spectrums using LEDs and laser diodes. Detectors are typically built with photodiodes or phototransistors. The emitter and detector are positioned so that an object will block or reflect a beam when

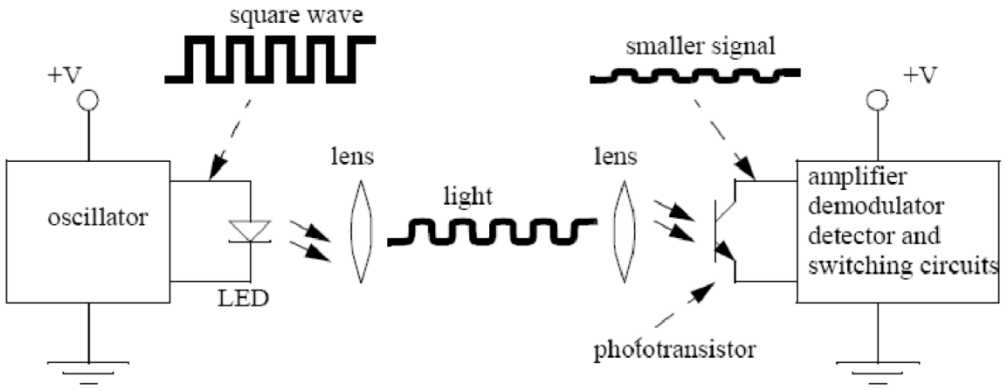


Fig: 2.21 A Basic Optical Sensor

In the figure the light beam is generated on the left, focused through a lens. At the detector side the beam is focused on the detector with a second lens. If the beam is broken the detector will indicate an object is present. The oscillating light wave is used so that the sensor can filter out normal light in the room. The light from the emitter is turned on and off at a set frequency. When the detector receives the light it checks to make sure that it is at the same frequency. If light is being received at the right frequency then the beam is not broken. The frequency of oscillation is in the KHz range, and too fast to be noticed. A side effect of the frequency

method is that the sensors can be used with lower power at longer Distances.

2.6Relays

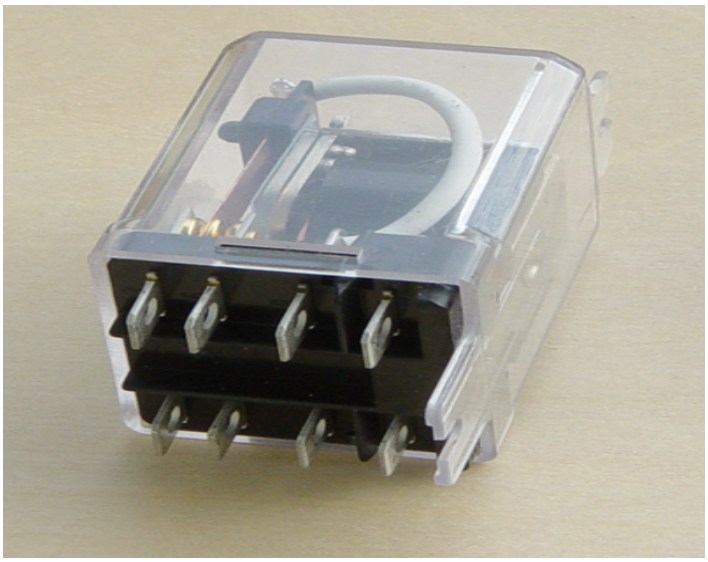


Fig: 2.22 8 pin Relay

A **relay** is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

Basic design and operation:

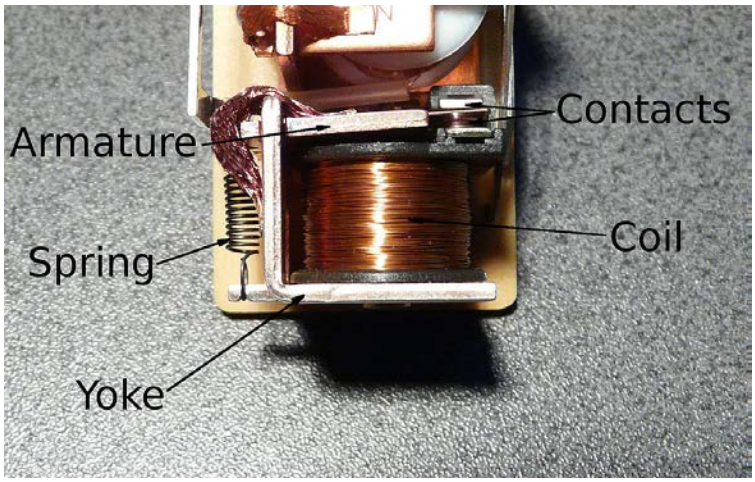


Fig: 2.23 Basic design of relay circuit

Operation:

A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB. When an electric current is passed through the coil it generates a magnetic field that activates the armature and the consequent movement of the

movable contact either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing. When the coil is energized with direct current, a diode is often placed across the coil to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike dangerous to semiconductor circuit components. Some automotive relays include a diode inside the relay case. Alternatively, a contact protection network consisting of a capacitor and resistor in series (snubbed circuit) may absorb the surge. If the coil is designed to be energized with alternating current (AC), a small copper "shading ring" can be crimped to the end of the solenoid, creating a small out-of-phase current which increases the minimum pull on the armature during the AC cycle.

CHAPTER 3

Memory and Addressing Of PLC

3.1 Type of PLC Memory

ROM: Read Only Memory. We can read the data from this memory, but we cannot write (store) any data or instructions into this memory.

RAM: Random Access Memory. We can read and write any data or instructions into this memory. If power fails then all data will be erased automatically.

PROM: Programmable Read Only Memory. By using a special program we can write any data or instructions into this memory for only one time.

EPROM: Erasable PROM. By using ultraviolet ray we can erase the contents of EPROM.

EEPROM: Electrically Erasable PROM. We can erase the contents of an EEPROM by a special electrical signal. In PLC the program or user memory is a battery backed RAM normally or EEPROM where the instructions-code are stored. The name 'data memory', 'work memory' etc. indicate the stored contents of all memory and / or purpose of use.

3.2 Instruction of PLC

An instruction is a symbol or a group of letters which initiates the PLC to perform a specific function. A set or a group of predetermined instructions which activate the PLC to execute desired sequential operation is known as program. The instructions used for microprocessor based system is known as the language for the system. Now a days, different types of high level language are available which provides commends and statements very close to the actual functions.

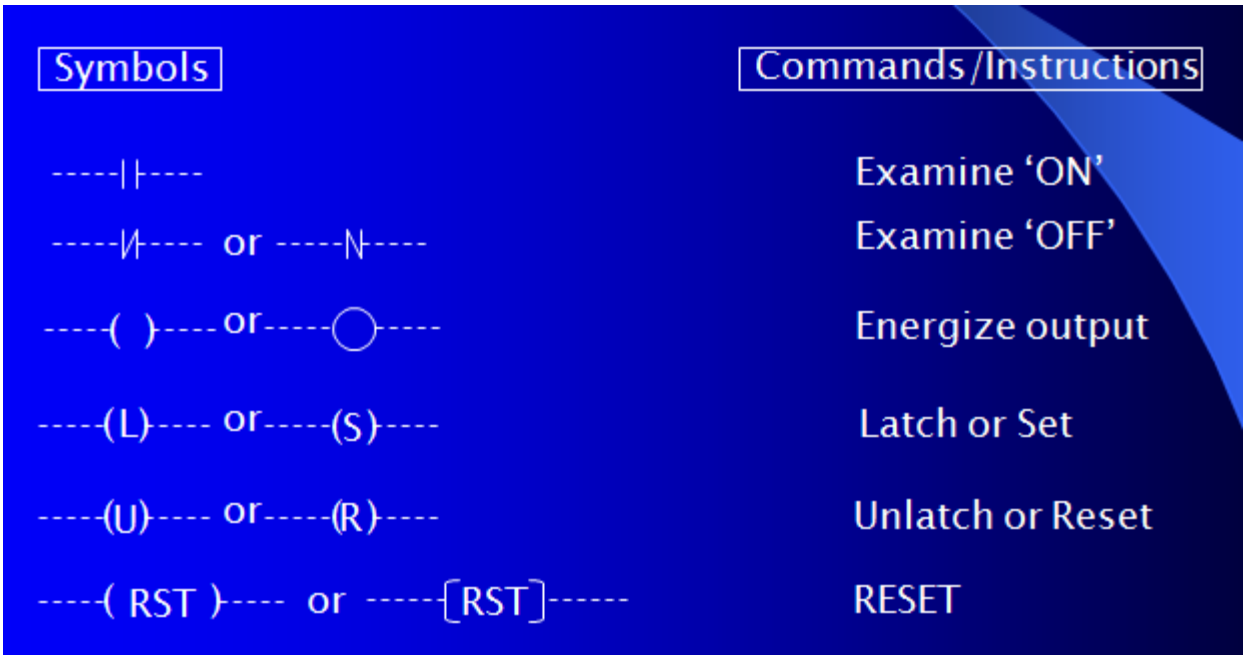
1. Relay instruction

2. Timer instruction (On-delay, Off-delay, accumulated value, preset value, reset accumulated value etc.)

3. Counter instruction (up-counter, Down-counter, reset instruction)

3.2.1 Instructions

Symbols



CHAPTER 4

Programming Language of PLC

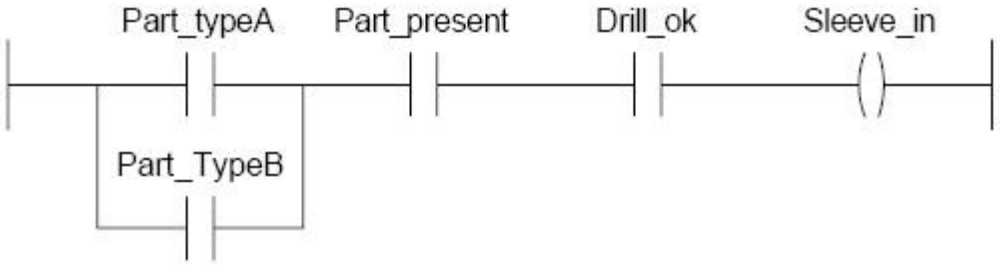
4.1 Instruction & Programming

The languages can be mixed in any way within a PLC project. The unification and standardization of these five languages represent a compromise of historical, regional and branch-specific requirements. Provision has been made for future expansion, (such as the function block principle or the language Structured Text) plus necessary information technology details (data type etc.) have been incorporated.

The language elements are explained with the help of a machining process involved in valve production. Two sensors are used to establish whether a work piece with correctly drilled holes is available at the machining position. If the valve to be machined is of type A or type B – this is set via two selector switches – the cylinder advances and presses the sleeve into the drilled hole.

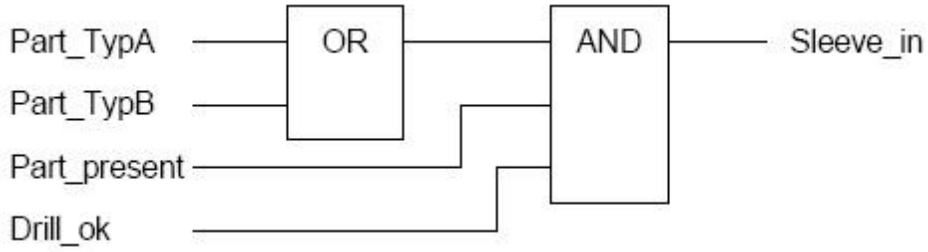
4.2Ladder Diagram (LD)

Ladder diagram is a graphic programming language derived from the circuit diagram of directly wired relay controls. The ladder diagram contains contact rails to the left and the right of the diagram; these contact rails are connected to switching elements (normally open/normally closed contacts) via current paths and coil elements.



4.3Function Block Diagram (FBD)

In the function block diagram, the functions and function blocks are represented graphically and interconnected into networks. The function block diagram originates from the logic diagram for the design of electronic circuits.



4.4Instruction List (IL)

Statement list is a textual assembler-type language characterized by a simple machine model (processor with only one register). Instruction list is formulated from control instructions consisting of an operator and an operand.

LD Part_ Type A

OR Part_ Type B

AND Part_ Present

AND Drill_ Ok

ST Sleeve_ in

With regard to language philosophy, the ladder diagram, the function block diagram and instruction list have been defined in the way they are used in today‘s

PLC technology. They are however limited to basic functions as far as their elements are concerned. This separates them essentially from the company dialects used today. The competitiveness of these languages is maintained due to the use of functions and function blocks.

4.5Structured Text (ST)

Structured text is high-level language based on Pascal, which consists of expressions and instructions. Instructions can be defined in the main as: Selection instructions such as

IF...THEN...ELSE etc., repetition instructions such as FOR, WHILE etc. and function block invocations.

Sleeve_in:=(Part_TypeA OR Part_TypeB) AND Part_present AND Drill_ok

Structured text enables the formulation of numerous applications, beyond pure function technology, such as algorithmic problems (high order control algorithms etc.) and data handling (data analysis, processing of complex data structures etc.).

4.6 Sequential Function Chart (SFC)

The sequential function chart is a language resource for the structuring of sequence-oriented control programs. The elements of the sequential function chart are steps, transitions, alternative and parallel branching. Each step represents a processing status of a control program, which is

Basic PLC Programming active or inactive A step consists of actions which, identical to the transitions, are formulated in the IEC 1131-3 languages. Actions themselves can again contain sequence structures. This feature permits the hierarchical structure of a control program. The sequential function chart is therefore an excellent tool for the design and structuring of control programs.

4.7 STATEMENT LIST (STL) PROGRAMMING LANGUAGE:

4.7.1 AND Gate

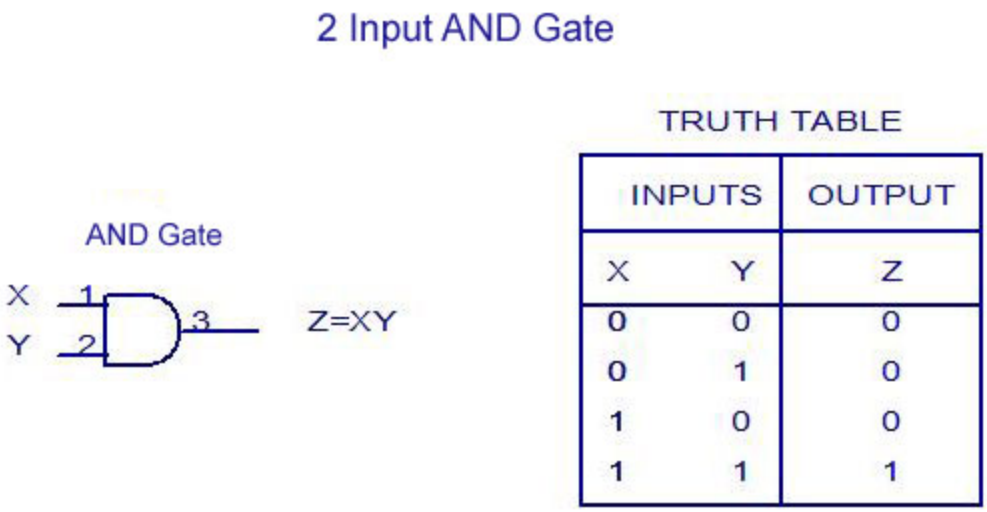


Fig 4.1 Two input AND gate and Truth Table

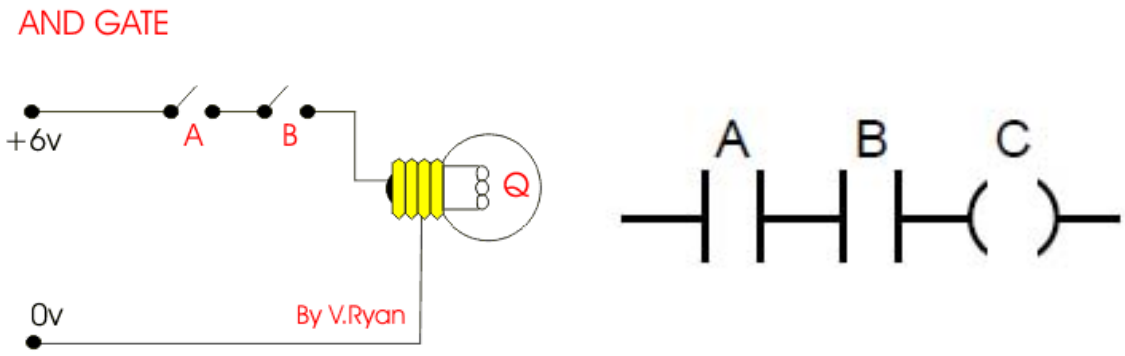
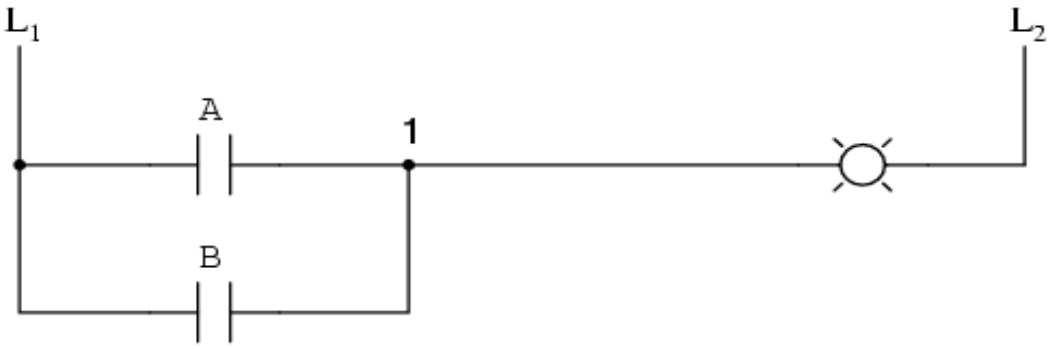


Fig: 4.2 Circuit& Ladder diagram of AND gate

4.7.2 OR Gate



A	B	Output
0	0	0
0	1	1
1	0	1
1	1	1

Fig: 4.3 Ladder diagram, 2-Input OR gate &its Truth Table

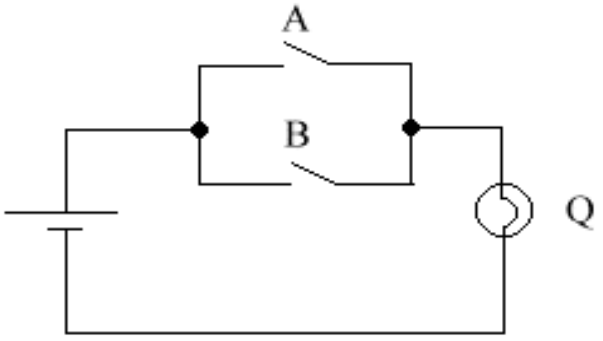
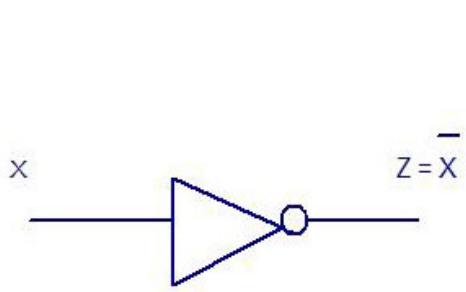


Fig: 4.4 Circuit diagram of OR Gate

4.7.3 NOT Gate



TRUTH TABLE

INPUT	OUTPUT
X	Z
0	1
1	0

Fig: 4.5 NOT gate & Truth Table

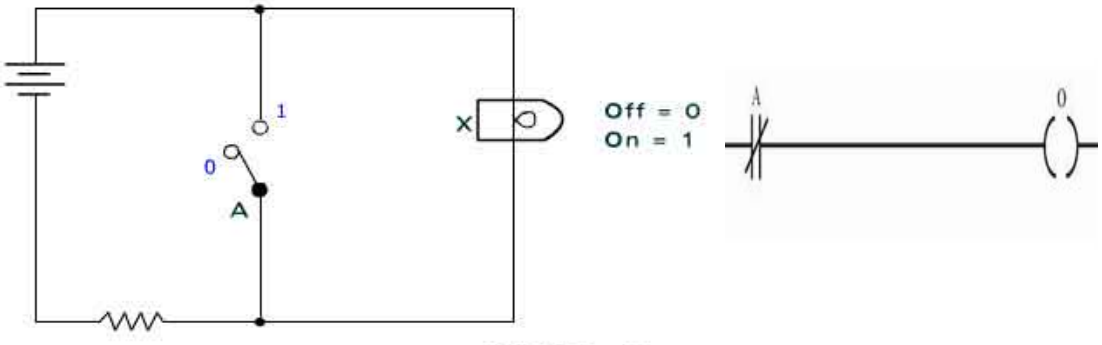


Fig: 4.6 Circuit & Ladder diagram of NOT Gate

4.7.4 NAND Gate

TRUTH TABLE

INPUTS		OUTPUT
X	Y	Z
0	0	1
0	1	1
1	0	1
1	1	0

Fig: 4.7 Two input NAND Gate & Truth Table

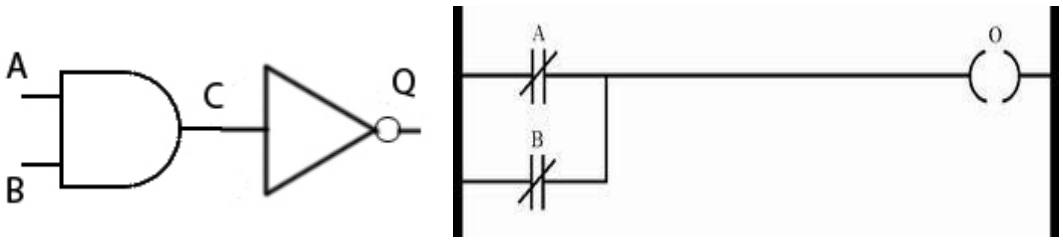
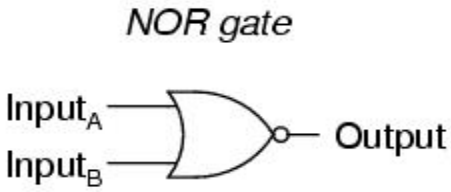


Fig: 4.8 Circuit & Ladder diagram of NAND Gate

4.7.5 NOR Gate



A	B	Output
0	0	1
0	1	0
1	0	0
1	1	0

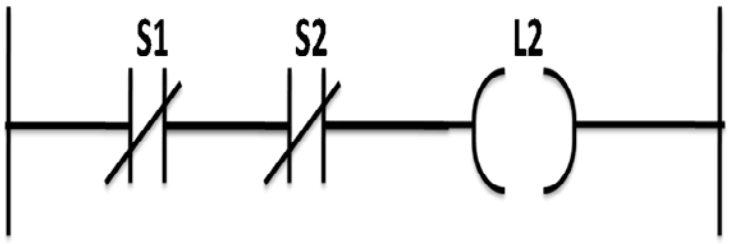


Fig: 4.9 Two input NOR gate, Truth Table& Ladder diagram

Chapter 5

LG PLC Programming

5.1 What is LG PLC?

LG PLC is one kind of PLC which is manufactured by LG Corporation. This is small or compact PLC. Input Output ability of this PLC is (6-10) six to ten. This PLC is very comfortable to use. Where input output system is less LG PLC is used in this sector.

5.2 LG PLC Panel Board Wiring Connection

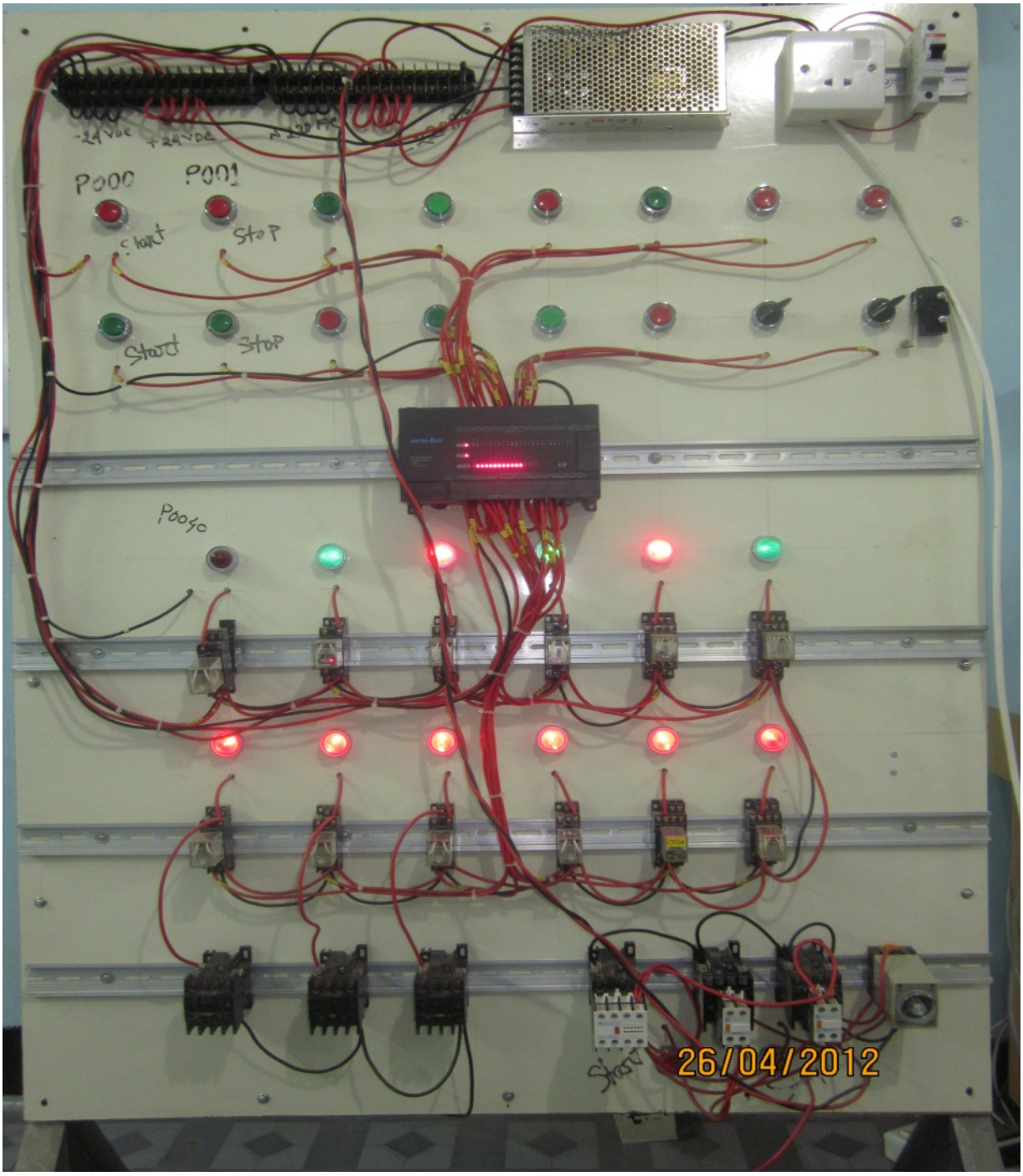


Fig: 5.1 LG PLC panel board wiring

5.3 Panel Board Equipment

i. MCB(molded care circuit)/MCCB(miniature circuit breaker)
ii. SMPS(switching mode power supply)
iii. Connector
iv. Push Button Switch
v. PLC
vi. Indicator Lamp
vii. Relay
viii. Relay Base
ix. PLC base
x. Magnetic Conductor / Dxilery Conductor
xi. Wire
xii. Selector Switch

5.4 LG PLC Addressing

Input Address	**Output Address**
P0000-P0007	P0040-P0043

5.4.1 LG PLC Timing Instruction

TON T0000 0050

5.4.2 Input Addressing Counting System of LG PLC

P0000	P0005	P000A	P000F	P0014	P0019
P0001	P0006	P000B	P0010	P0015	P001A
P0002	P0007	P000C	P0011	P0016	P001B
P0003	P0008	P000D	P0012	P0017	P001C
P0004	P0009	P000E	P0013	P0018	P001D……

5.4.3 Output Addressing Counting System of LG PLC

P0040	P0046	P004C	P0052	P0058
P0041	P0047	P004D	P0053	P0059
P0042	P0048	P004E	P0054	P005A
P0043	P0049	P004F	P0055	P005B
P0044	P004A	P0050	P0056	P005C
P0045	P004B	P0051	P0057	P005D…..

5.5 Series of LG PLC

i. Master K Series 80s
ii. Master K Series 120s
iii. Master K Series 200s
iv. Master K Series 400s

5.6 LG PLC Programming Software

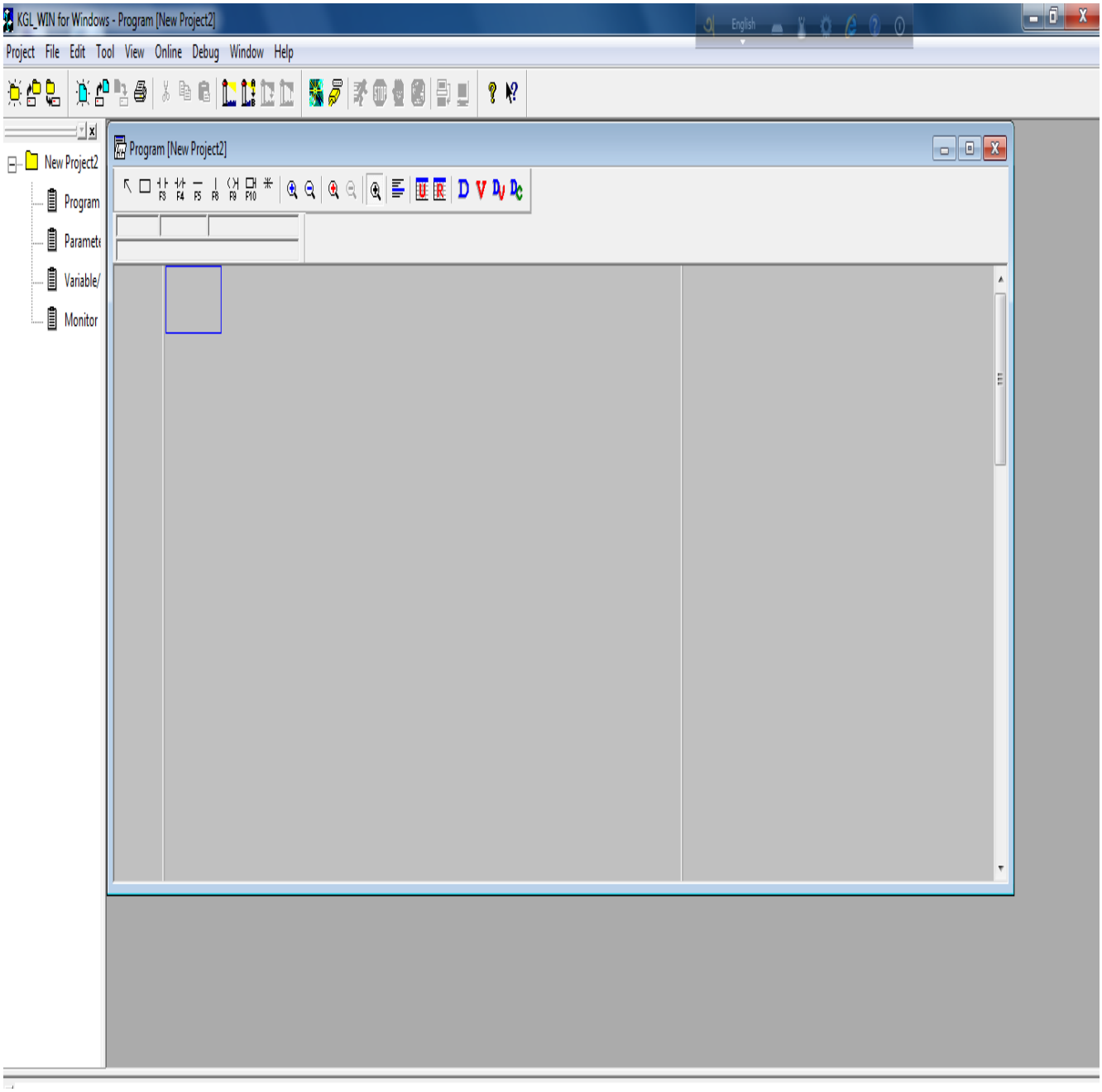
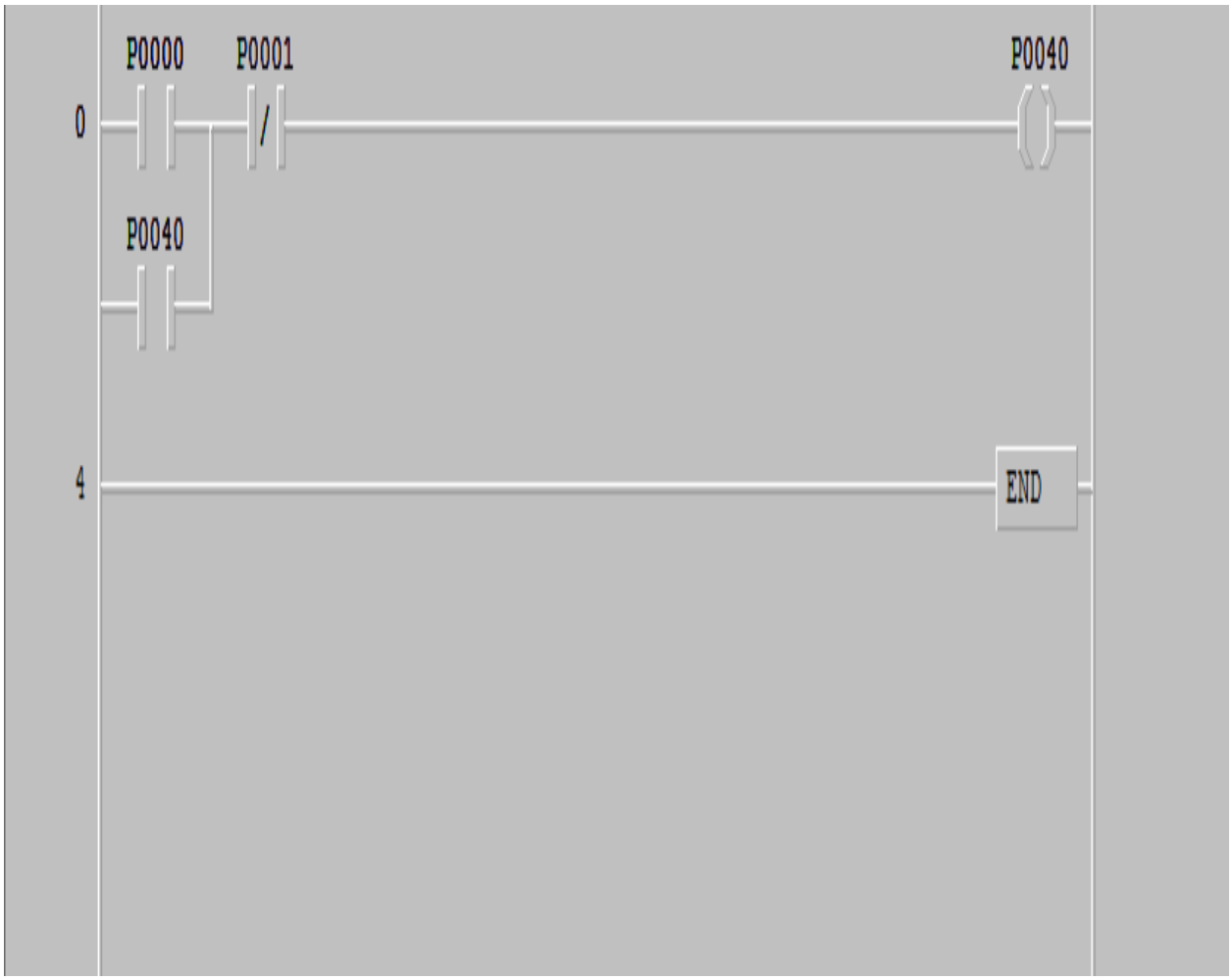


Fig: 5.2 LG PLC Programming Software

KGL_WIN is one type of LG PLC programming software. This software series is 80s. We have completed various programs by using this software.

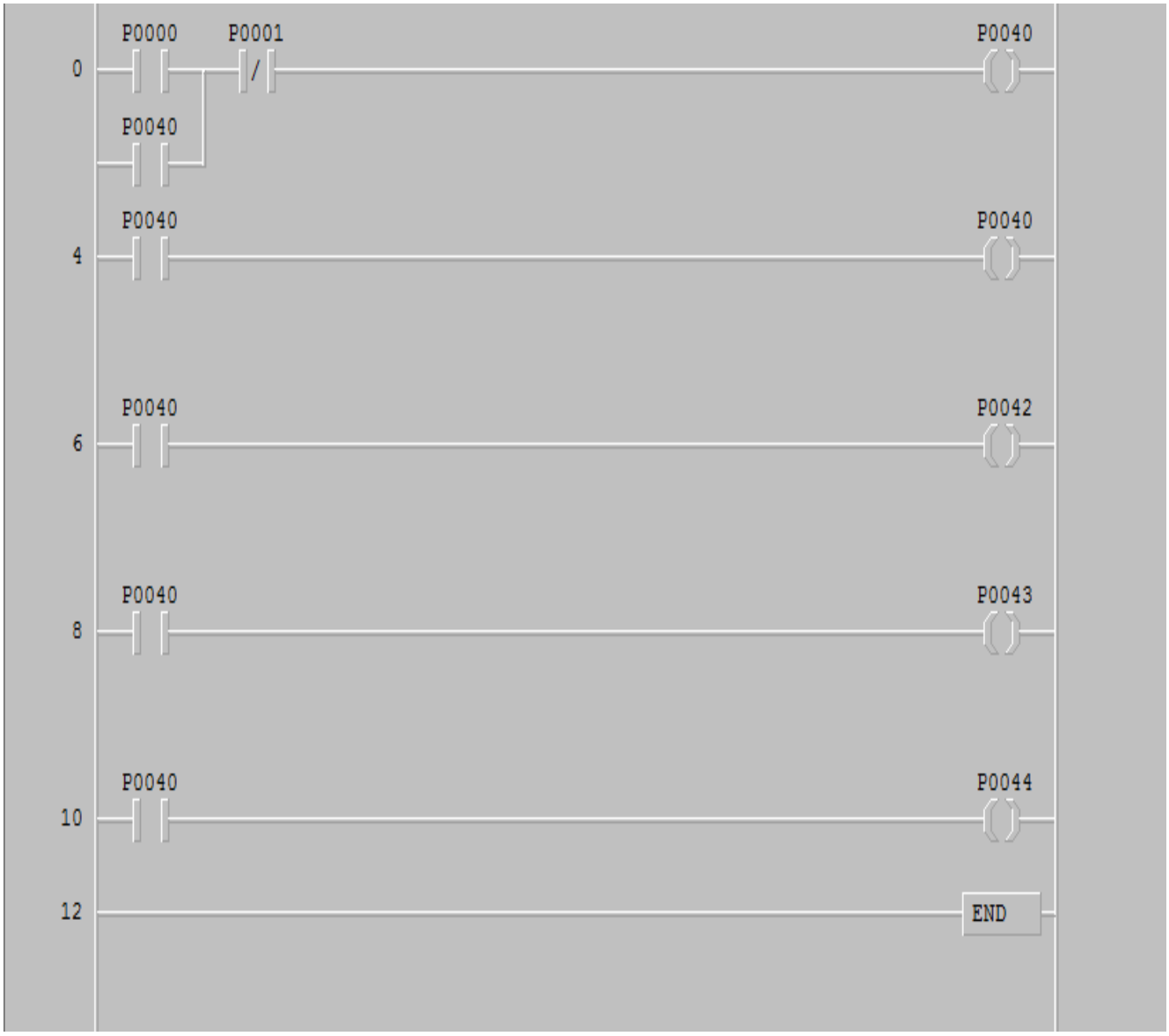
5.7 LG PLC Programs

5.7.1 One Motor Control Program



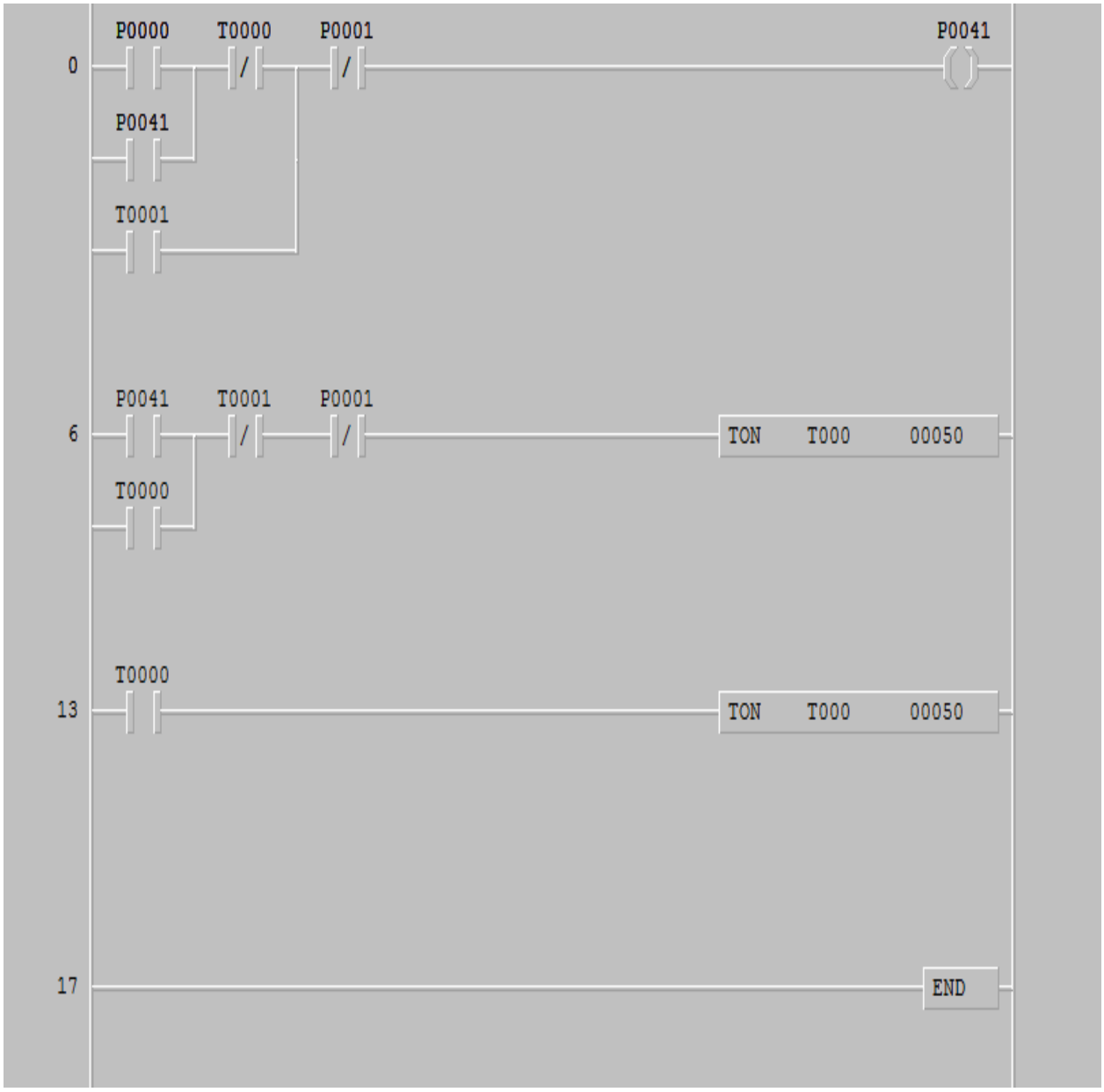
In this program when P0000 switch is press then P0040 load is start. We can turn off the output load of P0040 by pressing P0041.

5.7.2 Five (5) Motor Control Program



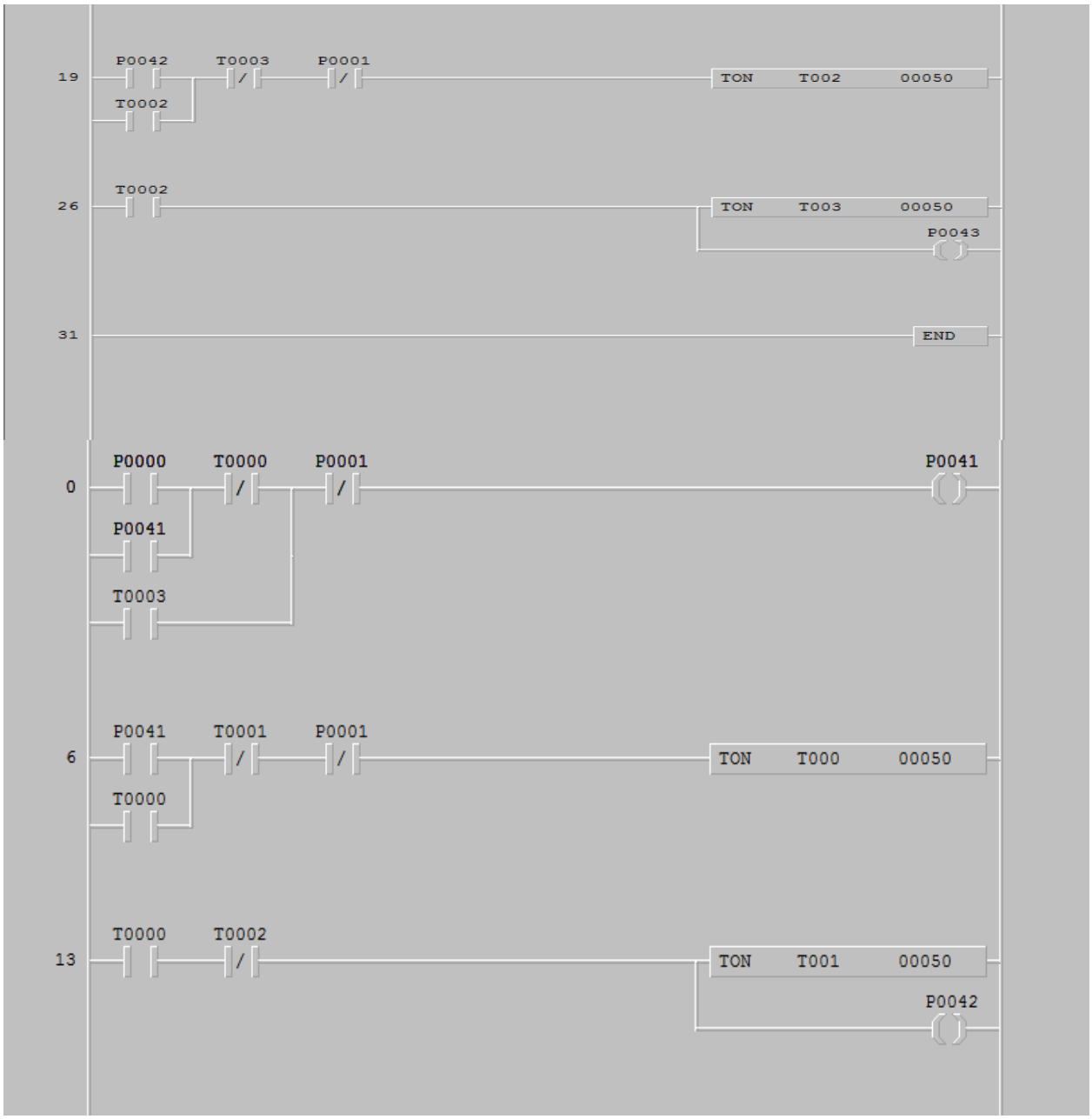
In this program shows five output load control automatically by using PLC program. When P0000 start switch is press then the motor P0040 is turned on and in other four motor the P0000 input worked as a feedback system. So that the other four motor is turned on. This is the way we can control five output motor.

5.7.3 One lamp flash program using timer



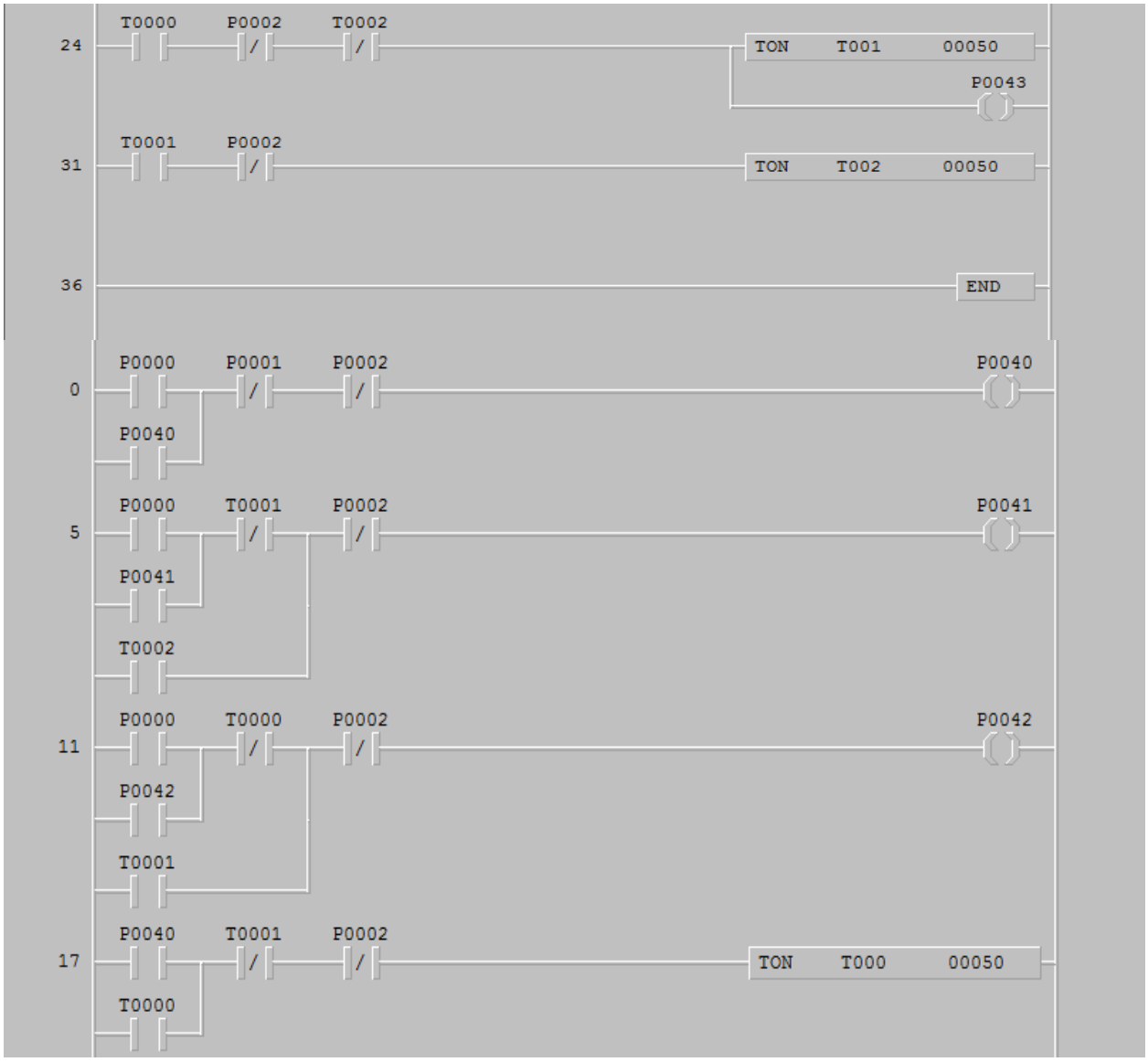
In this program when P0000 is press then lamp P0041 is flash on. Timer TON T00 50 is on by feedback P0041. When five seconds is gone then the timer T00 is send a signal to relay and lamp will off and other timer T001 is turn on. After five seconds T001 timer send a signal to relay and lamp will turn on. This process will be continuing. If we want to turn off light permanently then we have to press P0001 switch.

5.7.4 Three lamp flash program using timer



In this program when P0000 switch is press then P0041 lamp is turn on the timer TON T00 50 is on by the feedback P0041. After five seconds T00 timer send a feedback then P0041 is turn off and timer T001 and lamp P0042 is turn on and timer T02is turned on by the feedback of P0042. After five seconds timer T002 send a feedback then the lamp P0042 is turned off and timer T003 is turn on and P0043 motor is turned on. After five seconds timer T003 sends a feedback then P0041 lamp is turn on. This process will remain same.

5.7.5 A load shedding control program



In this program if P0000 switch is turn on then the lines P0040, P0041, P0042 is turned on. The timer T00 is also on by feedback P0040. After five seconds T00 send a feedback then P0043 line is turned off and timer T001 is on by feedback T00 and P0044 line is turn on. After five seconds Poo42 is turned off and P0043 is turned on. After five seconds P0041 is turned off and P0042 is turned on this process will be continuing

Chapter 6

MITSUBISHI PLC

6.1 What Is Mitsubishi PLC

Mitsubishi PLC is one kind of PLC which is manufactured by Mitsubishi Corporation. This is small or compact PLC. It has also large or module PLC. The input output ability of compact PLC is six to ten (6-10) and the input output ability of module PLC is one hundred to four thousand and eight hundred (100-4800). This PLC is very comfortable to use. Where input output system is less or medium Mitsubishi PLC is used in this sector.

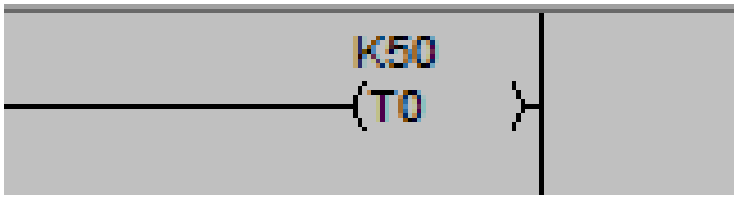
6.2 Input Address counting System of Mitsubishi PLC

X000	X006	X00C	X012	X018	X01E
X001	X007	X00D	X013	X019	X01F
X002	X008	X00E	X014	X01A	X020
X003	X009	X00F	X015	X01B	X021
X004	X00A	X010	X016	X01C	X022
X005	X00B	X011	X017	X01D	X023……

6.3Output Address counting System of Mitsubishi PLC

Y000	Y006	Y00C	Y012	Y018	Y01E
Y001	Y007	Y00D	Y013	Y019	Y01F
Y002	Y008	Y00E	Y014	Y01A	Y020
Y003	Y009	Y00F	Y015	Y01B	Y021
Y004	Y00A	Y010	Y016	Y01C	Y022
Y005	Y00B	Y011	Y017	Y01D	Y023……..

6.4 Timer Address of Mitsubishi PLC



6.5 Mitsubishi PLC Programming Software

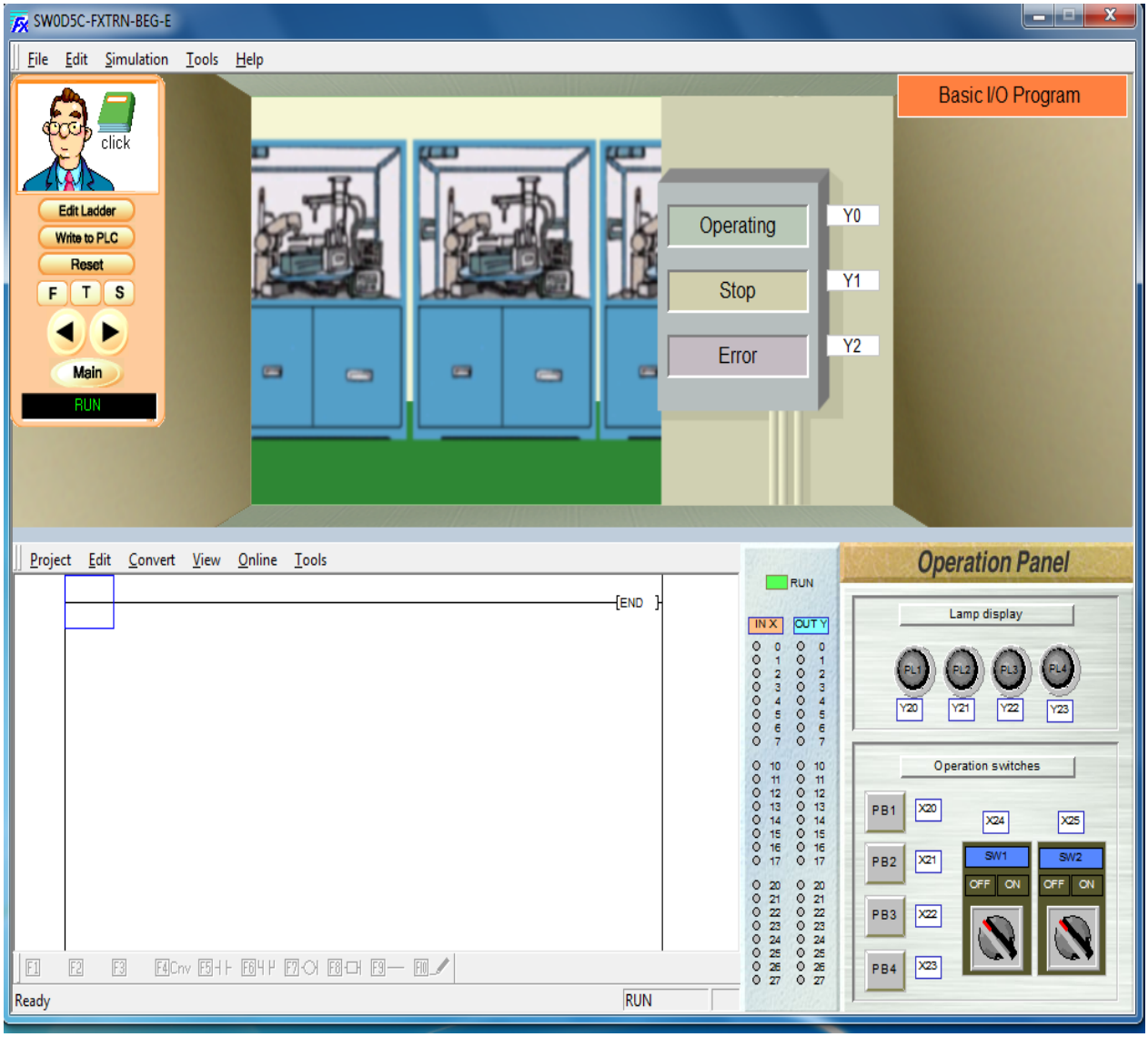
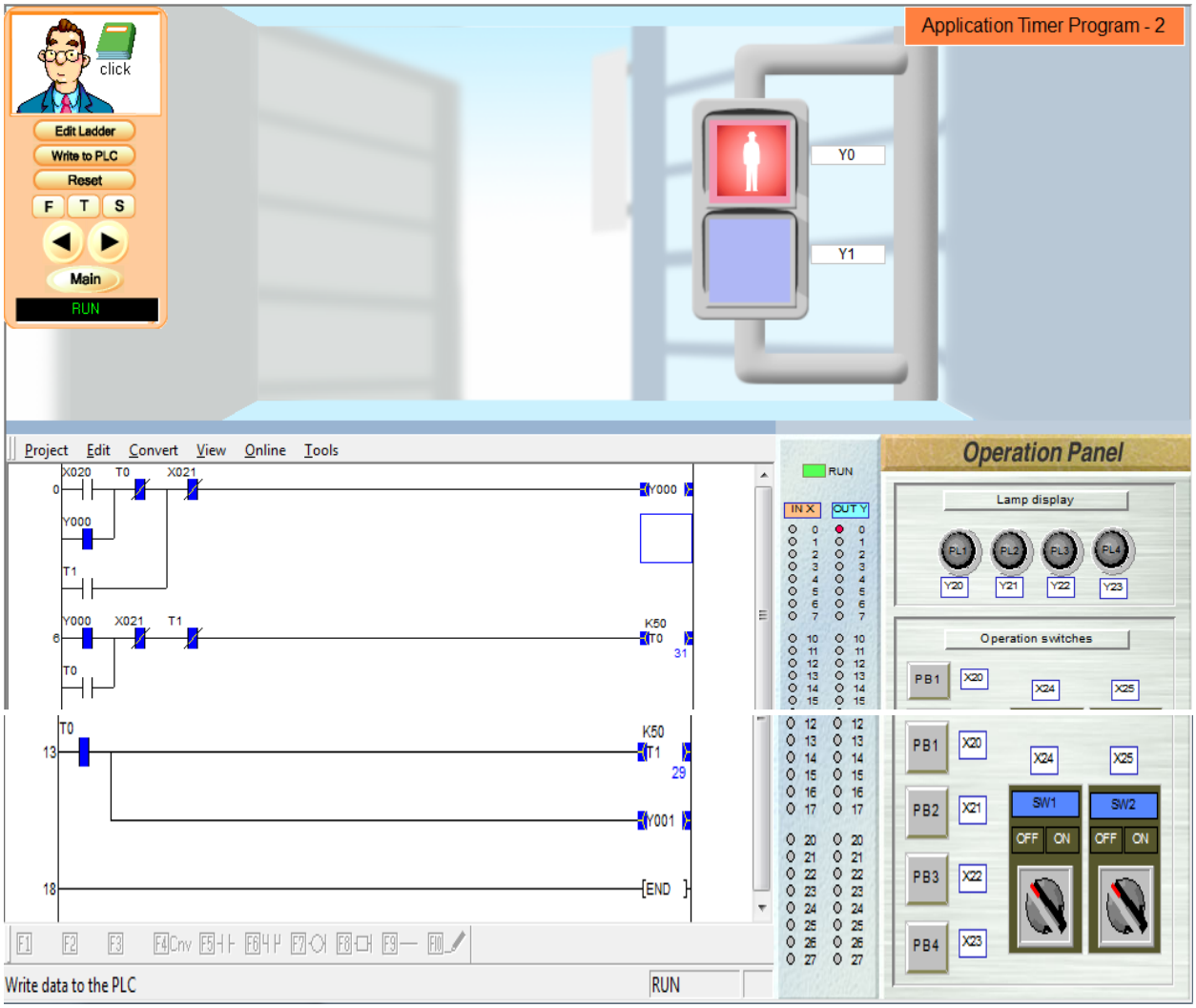


Fig: 6.1 Mitsubishi PLC Programming Software

SWOD5C-FXTRN-BEG-E software is used for programming in Mitsubishi PLC. By using this software we have completed various programs.

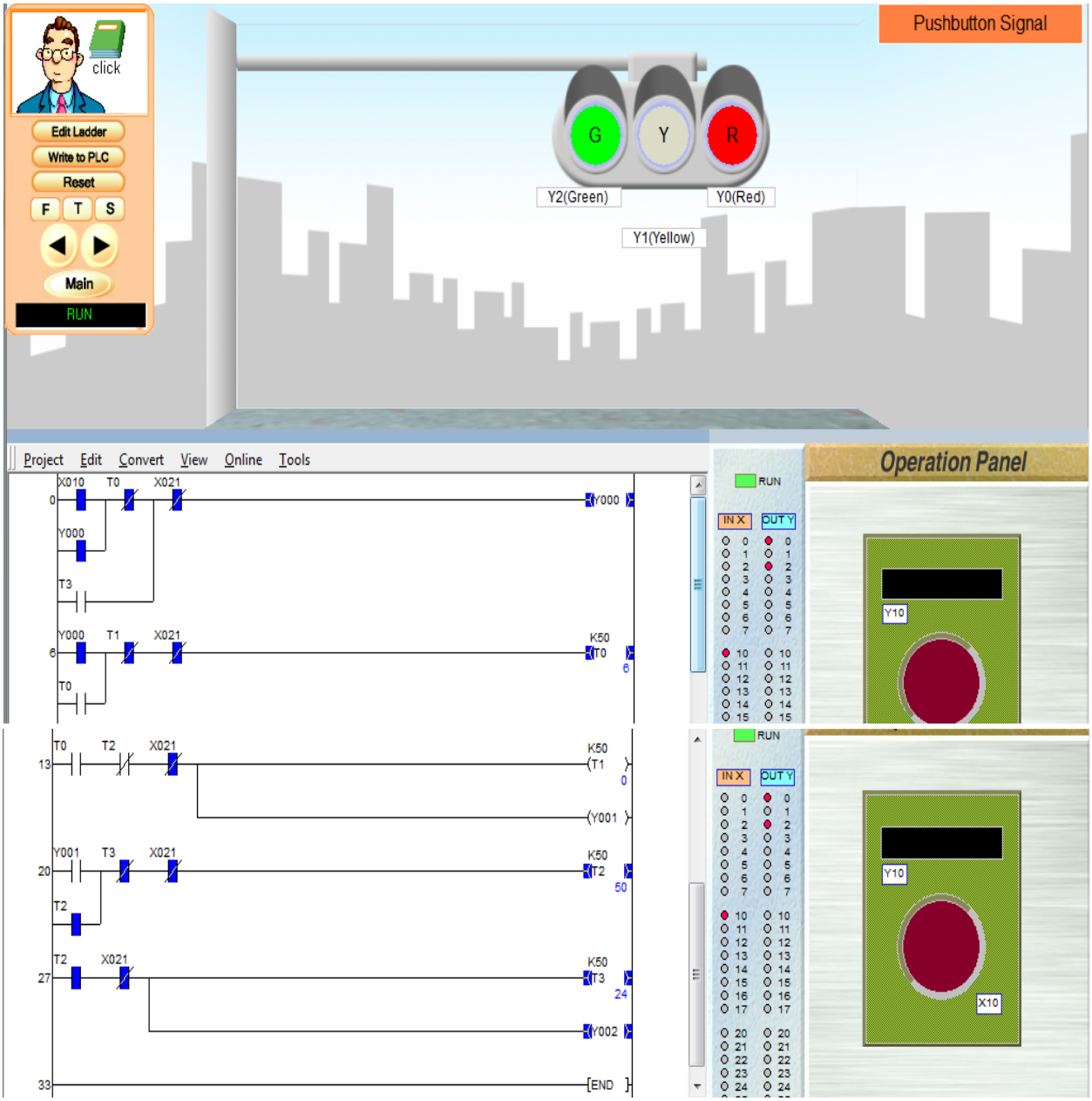
6.6 Mitsubishi PLC Program

6.6.1Traffic Control Program with Two Indicators



When switch Xo20 is press then Y0000 red light is turn on. Timer T0 is on also by feedback Y0000. After five seconds timer send a feedback then the timer T1 is on and Y1 green light is on also and in this time Y0 red light is off. After five seconds T1 send a feedback then again led light is on and green light is off. This process will be continuing.

6.6.2 Traffic Control Program with Three Indicators



In this program when X0010 switch is press then Y0 red light is turn on in the mean time timer T0 is on by the feedback Y0000. After five seconds T0 send a feedback then led light is off, yellow light is on and timer Ti is on and also timer T2 is on. After five seconds T2 timer send a feedback so Y1 yellow light is turn off and green Y2 light is turn on and also T3 timer is turn on. After five seconds T3 timer send a feedback then red light Y0 is on and green light Y2 is off. This process will be continuing

CONCLUSSION

A programmable Logic Controller (PLC) is a device that was invented to Replace the necessary sequential relay circuit for machine control. A person knowledgeable in relay logic system can master the major PLC functions. These are used extensively in nuclear reactor building and security control system .it is reliable compare to other control systems. These may be used to run a vibot. By using the PLC application logic we can control the airlock logic control panel of reactor buildings. These PLCs are used in many “real world” applications. So using these PLC’s nuclear reactor building doors namely Main Air Lock & Emergency Air Lock.

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