CONVEYOR BELT MOTOR USING CONTROL GRAFCET AS PROGRAMMING TOOL

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"Saya akui laporan ini adalah hasil kerja saya sendiri kecuali ringkasan dan petikan yang tiap-tiap satunya telah saya jelaskan sumbernya."

Tandatangan : .....

Nama Penulis : MAHATHEVAN A/L RAMASAMY

Tarikh : 11/05/2008

"Saya/kami akui bahawa saya telah membaca karya ini pada pandangan saya/kami karya ini adalah memadai dari skop dan kualiti untuk tujuan penganugerahan Ijazah Sarjana Muda **Kejuruteraan Elektronik (Elektronik Industri).**"

Tandatangan : .....

Nama Penyelia : PM HUZAIMAH HUSIN

Tarikh : 15 MEI 2006

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ABSTRACT

Conveyor systems have been a mainstay of material handling for over 100 years. Conveyors are ideally suited to solving handling problem as a complete system rather than as a individual units. A complete conveyor system involves a combination of conveyors, accessories and controls the monitor and control the movement of material through the operation process. In this project is concerned with learning and exploring Grafcet and PLC as programming tool. The programmable logic controller (PLC) was becoming more powerful and high technology that extensively used in automation works. Thus, an efficient approach which can represent the control process by using the graphical representation perhaps a good solution to helps the designer in order to programming the PLC's. There has been a growing interest in programming languages for PLC's. In order, the sequential function chart (SFC), an international standard based on the GRAFCET language was introduced in 1977 at France. The GRAFCET language has been used as one of the most important means for designing, programming and describing logic sequential control system. This powerful graphical language dedicated to the specification of the behavior of sequential logical systems. It is standardized by CEI and its semantic is defined for this type of applications. The GRAFCET is a very good tool for logic controller specification, and the graphical nature of the language makes GRAFCET easy or simply can learn and implement or use in automation works especially in company site. In this conveyor system it is easy to handling material because a part of conveyor in this system is can move up and down. It is suitable to handling material or product from one plan to another plan.

ABSTRAK

Sistem konveyer telah digunakan lebih seratus tahun lama. Satu system konveyer lebih sesuai digunakan untuk menyelesaikan masalah dalam pengangkutan barang atau produk berbanding dengan mengunakan konveyer secara individu. Dalam satu system konveyer, ia meliputi kombinasi konveyor-konveyer, aksesori, dan pengaturan pergerakan produk melalui satu proses operasi. Dalam projek ini iaitu mengatur pergerakan motor konveyer, ia meliputi pengetahuan dan pembelajaran mengenai PLC dan GRAFCET sebagai alat untuk mengaturcara. Grafcet merupakan satu cara pengaturcaraan dengan menggunakan PLC. Sistem pengaturcaraan ini adalah satu sistem pengaturcaraan berpiawaian antarabangsa dan telah diperkenalkan pada tahun 1977 di Prancis. Dalam GRAFCET, Pengaturcaraan bergantung kepada pergerakan carta (flow chart) yang dilukis berdasarkan system GRAFCET. Dengan menggunakan GRAFCET pengaturcaraan atau penyelesaian masalah dalam satu sistem automasi menjadi senang dan mudah untuk difahami. Dalam sistem konveyer ini, ia mudah digunakan untuk membawa produk kerana salah satu bahagian konveyer dalam sistem ini boleh bergerak ke atas dan bawah dan ia sesuai untuk mengasingkan barangan.

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CHAPTER I

INTRODUCTION

Conveyor Belt Motor systems have been a mainstay of material handling for over 100 years. Conveyors are ideally suited to solving handling problem as a complete system rather than as an individual unit. A complete conveyor system involves a combination of conveyors, accessories and controls the monitor and control the movement of material through the operation process by using control Grafcet as programming tool. In this project is concerned with learning and exploring Grafcet and PLC as programming tool. The programmable logic controller (PLC) was becoming more powerful and high technology that extensively used in automation works. Thus, an efficient approach which can represent the control process by using the graphical representation perhaps a good solution to helps the designer in order to programming the PLC's.

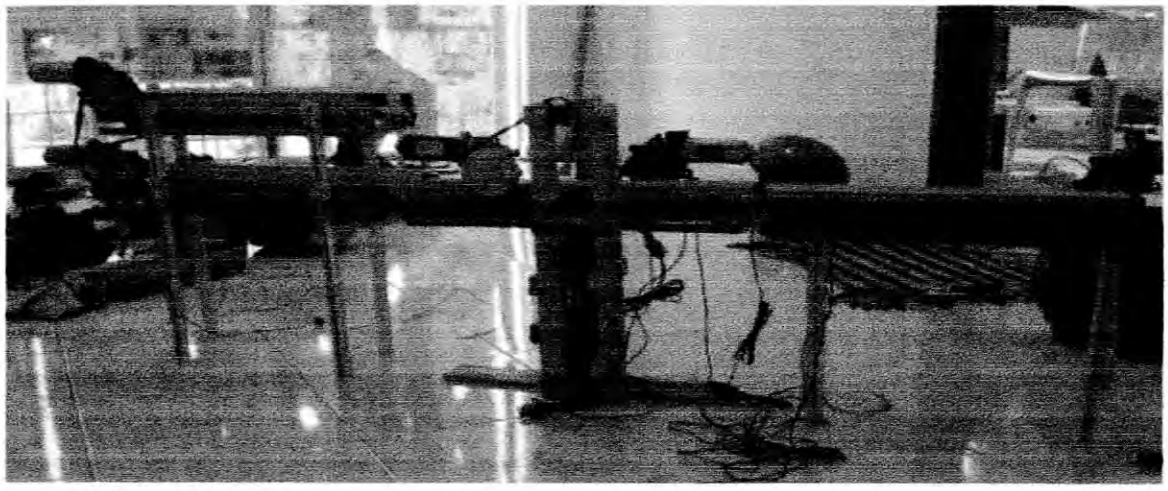


Figure 1.1: CONVERYER BELT MOTOR SYSTEM

In this project according to system in Figure 1.0, there is four conveyor are combines to result one conveyor belt system. The function of this system is to detect two types of products and transfer the products to two deferent locations in this system.

CHAPTER II

OBJECTIVE

The objective of the project is, study how to control the motor conveyor belt and automation system. Second is study and familiarize with the PLC programming and GRAFCET as programming tool. It is very important because in working environment the automation system is widely used by companies and industries. As an engineer, it is better if we understand and know how to control a conveyor or automation system by using PLC and Grafcet.

In this project we need to understand why we need to control the conveyor belt. For this project, we use PLC to control the conveyor and GRAFCET as programming tool. The purpose of used PLC to control the conveyor is, that the PLC is very easy to program by understanding the PLC program through ladder diagramed. If there is any problem during test or when the project is run, it's easier for troubleshoot. In this project we use GRAFCET as a programming tool. When we use GRAFCET we can understand the program of PLC easier, not by the ladder diagram but by the flow chart where used GRAFCET to draw it.

CHAPTER III

LITERATURE STUDY

Before and to complete this project, we to study and understand abuts PLC, Grafcet, and automation system

3.1 Programmable logic controller

A programmable logic controller is a computer designed for use in machines. Unlike a computer, it has been designed to operate in the industrial environment and is equipped with special inputs/outputs and a control programming language. The common abbreviation used in industry for these devices, PC, can be confusing because it is also the abbreviation for personal computer. Therefore, some manufacturers refer to their programmable controller as a *PLC,* which is an abbreviation for programmable logic controller.

Initially the PLC was used to replace relay logic, but its ever-increasing range of functions means that it is found in many and more complex applications. As the structure of a PLC is based on the same principles as those employed in computer architecture, it is capable of performing not only relay switching tasks, but also other

applications such as counting, calculating, comparing, and the processing of analog signals.

Programmable controllers offer several advantages over a conventional relay type of control. Relays have to be hard-wired to perform a specific function (Figure 3.1.1). When the system requirements change, the relay wiring has to be changed or modified, which requires time. In extreme cases, such as in the automation industry, complete control panels had to be replaced since it was not economically feasible to rewire the old panels with each model changeover. The programmable controller has eliminated much of the hand wiring associated with conventional relay control circuits. It is small and inexpensive compared to equivalent relay-based process control systems. Programmable controllers also offer solid-state reliability, lower power consumption, and ease of expandability. If an application has more than a half-dozen relays, it probably will be less expensive to install a PLC- Simulating a hundred relays, timers, and counters is not a problem even on small PLCs.

PB1(light lamp) PB2(turn off lamp)

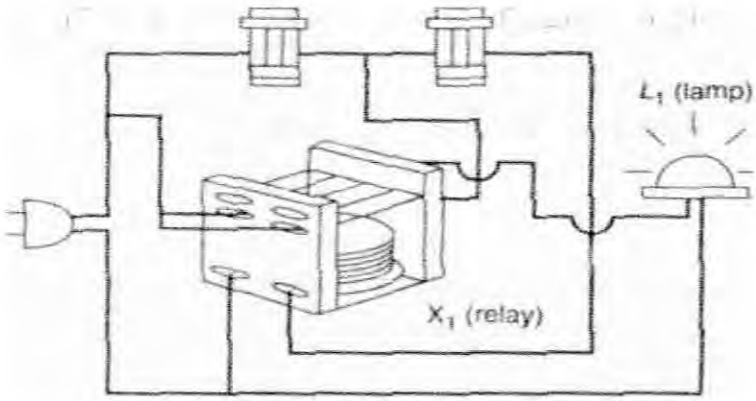


Figure 3.1.1: Relay wiring Diagram

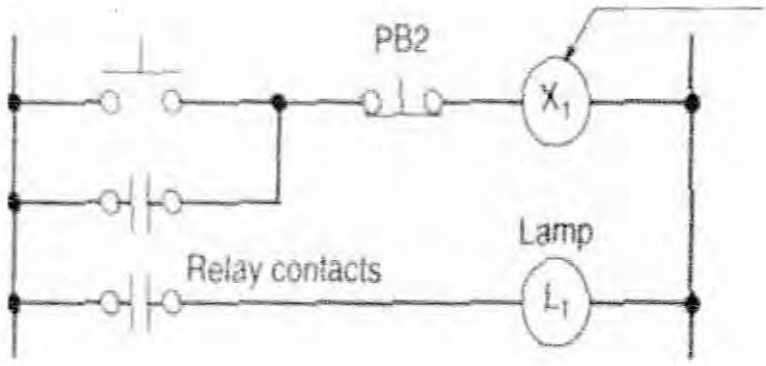


Figure 3.1.2 : Hard-wired relay of control(Schematic Diagram)

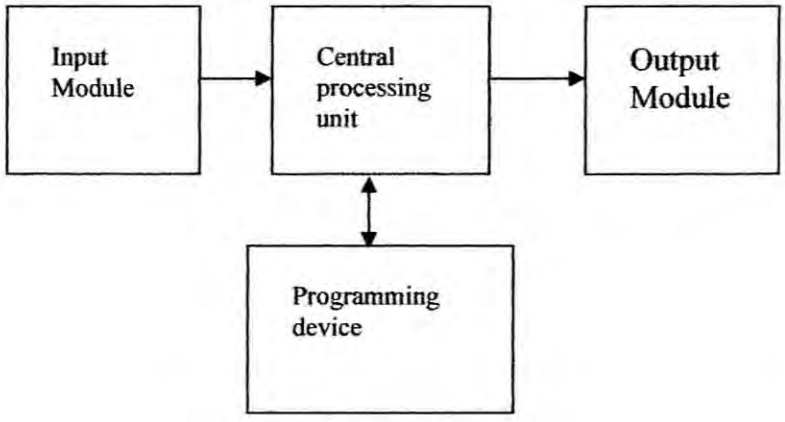


Figure 3.1.3: PLC Block Diagram

A personal computer can be made into a programmable controller if you provide some way for the computer to receive information from devices such as pushbuttons or switches. You also need a program to process the inputs and decide the means of turning OFF and ON load devices. A typical PLC can be divided into three parts, as illustrated in the block diagram of Fig. 2. These three components are the central processing unit (CPU), the input/output (I/O) section, and the programming device. The programmable controller is an event-driven device, which means, that are event taking place in the field will result in an operation or output taking place.

The central processing unit (CPU) is the heart of the PLC system. The CPU is a microprocessor-based system that replaces control relays, counters, timers and

sequencers. A processor appears only once in a PLC, and it can be either a one-bit or a word processor. One-bit processors are adequate for dealing with logic operations, PLCs with word processors are used when processing text and numerical data, calculations, gauging, controlling, and recording, as well as the simple processing of signals in binary code, are required. The principle of operation of a CPU can be briefly described as follows:

- The CPU accepts (reads) input data from various sensing devices, executes the stored user program from memory, and sends appropriate output commands to control devices.
- A direct current (dc) power source is required to produce the low-level voltage used by the processor and the I/O modules. This power supply can be housed in the CPU unit or may be a separately mounted unit, depending on the PLC system manufacturer.

- Most CPUs contain backup batteries that keep the operating program in storage in the event of a plant power failure. Typical retentive backup time is one month to one year.

The CPU -contains various electrical parts and receptacles for connecting the cables that go to the other units as well as to operational key switches.

Typical operation key switch positions are:

- OFF: System cannot be run or programmed.
- Run: Allows the system to run, but no program alterations can be made.
- Program: Disables outputs and allows creating, modifying, and deleting of programs.

The processor memory module is a major part of the CPU housing. Memory is where the control plan or program is held or stored in the controller. The information stored in the memory relates to the way the input and output data should be processed. The complexity of the program determines the amount of memory required. Memory elements store individual pieces of information called bits (for binary digits).

The actual control program is held within electronic memory storage components, such as the RAMs and EEPROMs. The processing unit scans data from the input and output

modules and stores their conditions in the memory. The processor unit then scans the user program stored in the memory and makes decisions that cause outputs to change.

Memory can be placed into two categories:

Volatile and nonvolatile. Volatile memory will lose its stored information if all operating power is lost or removed. Volatile memory is easily altered and quite suitable for most applications when supported by battery backup. Nonvolatile memory can retain stored information when power is removed accidentally or intentionally. PLCs make use of many different types of volatile and nonvolatile memory device.

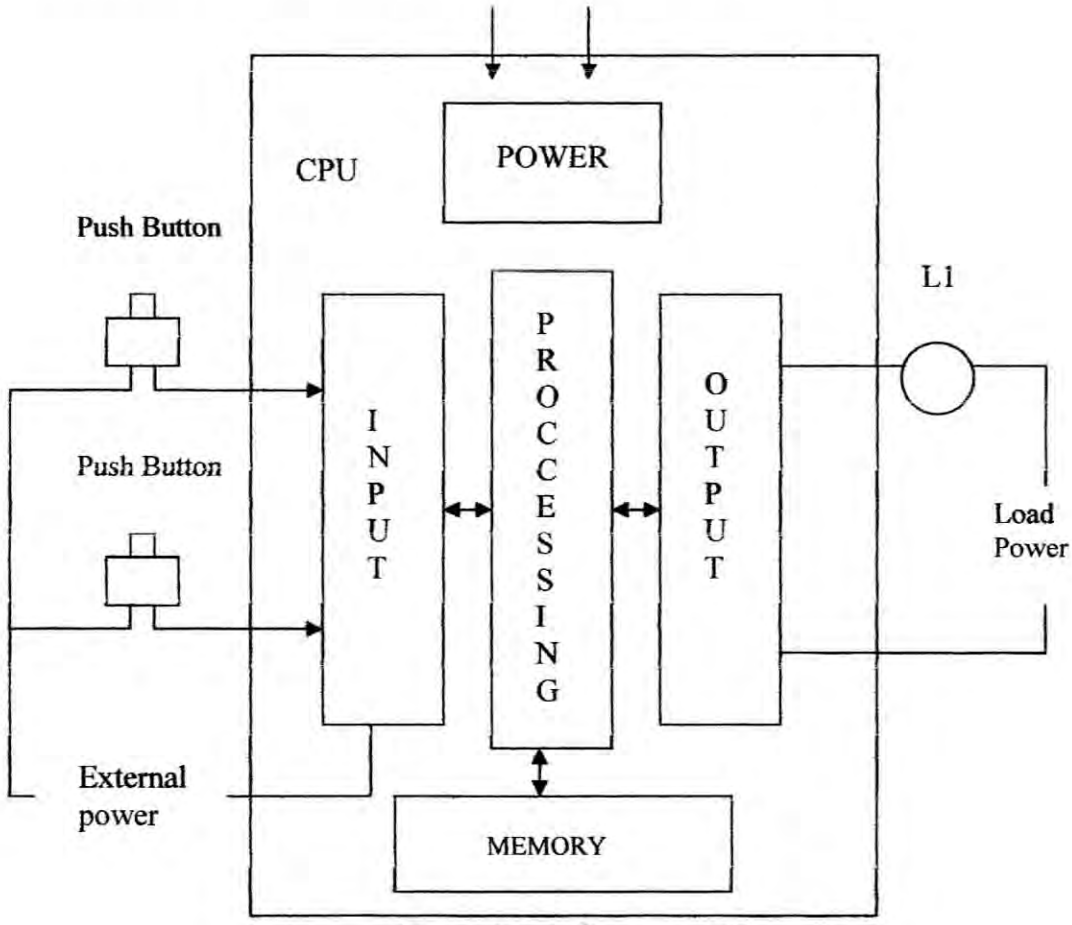
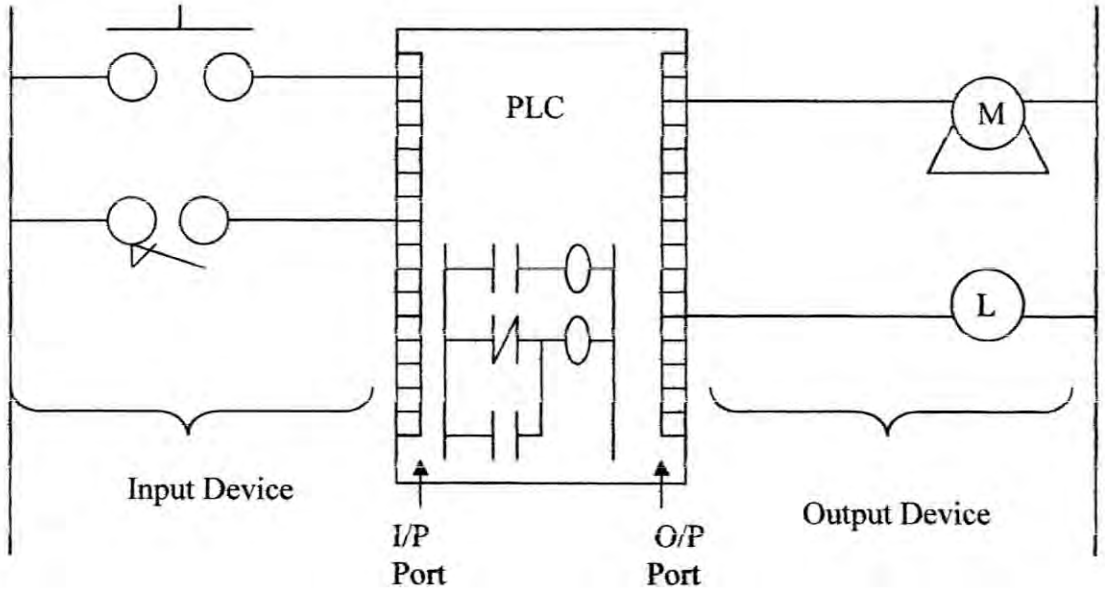
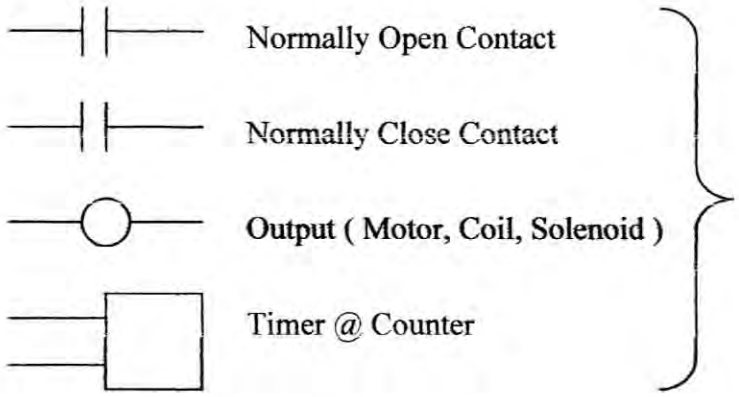


Figure 3.1.4: Processor Memory

Summary about PLC





Program device that we used in PLCs is

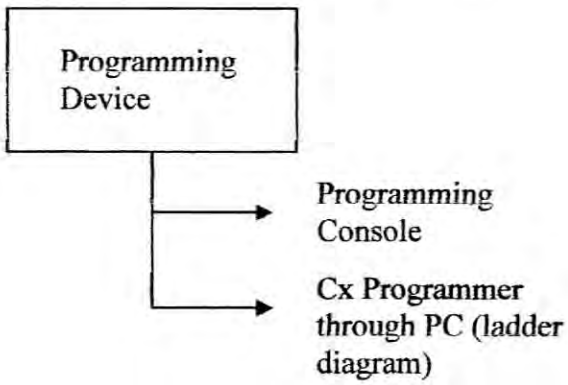


Figure 3.1.5: Summary about PLC

Motor Control Diagram

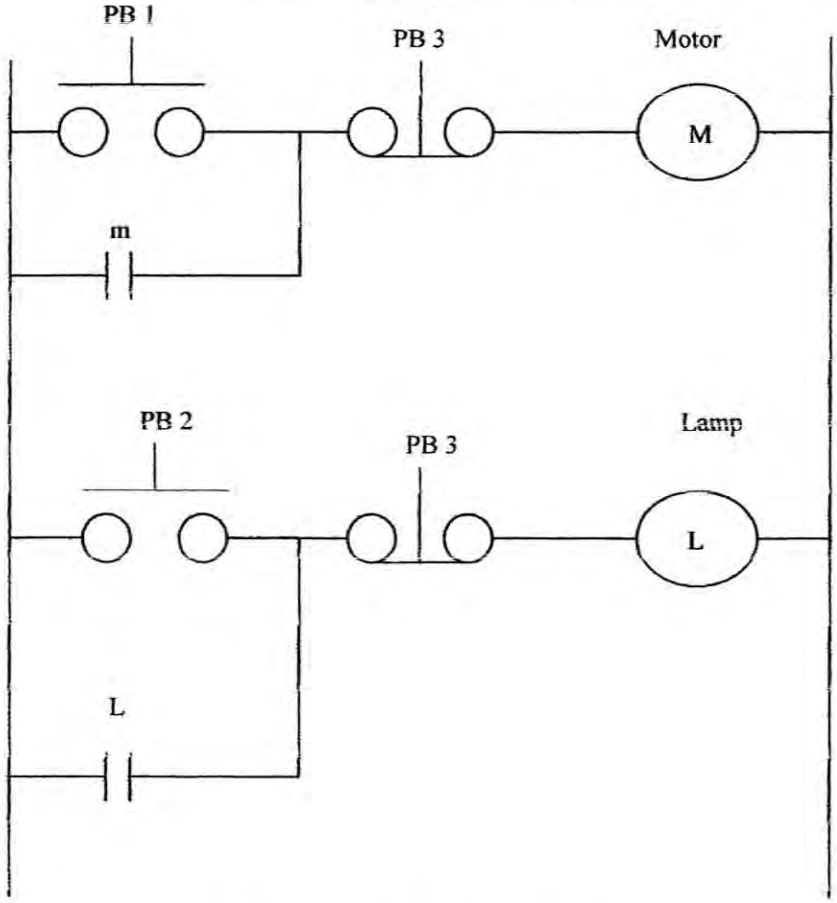


Figure 3.1.6: Motor Control Diagram