PROGRAMMABLE WATER JET SHOW IN AQUARIUM CONTROLLED BY PLC

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MAY 2008

"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Electronic & Drive)"

Signature : .....

Supervisor's Name : Mr. Shahrudin Bin Zakaria

Date : 7th May 2008

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This Report Is Submitted In Partial Fulfillment Of Requirements For The Degree of Bachelor In Electrical Engineering (Power Electronic and Drive)

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MAY 2008

"I hereby declared that this report is a result of my own work except for the excerpts that have been cited clearly in the references."

Signature : .....

Name : Mohd Fadrizan Bin Azizan

Date : 7th May 2008

For my beloved father and mother

Azizan Bin Md Rejab and Fadzidah binti Endut

In appreciation of supported and understanding.

ACKNOLEDGEMENT

Alhamdulillah, praise be to Allah, the Cherisher and Sustainer of world, most Gracious, most Merciful Lord.

Praise be to Allah for enabling me to completed this analysis and research for programmable water jet show in aquarium control by PLC project and report for my "Projek Sarjana Muda 2".

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Finally, I would like to honor my parent, for supporting me steadfastly and their appreciated advice through my project completion.

ABSTRACT

Programmable Water Jet Show in Aquarium Controlled By PLC was a project develops for the public exhibition. This project will use PLC (Programmable Logic Circuit) as the controller to control the movement of the water jet, lamp, and other accessory in the aquarium. This project can be control by manually and automatically. The water jet can be control in two basic directions which is, forward, and backward and also can be rotate clockwise and anticlockwise. So that people can see the movement of the bubbles in the aquarium. In this project, motors will be use to move the water jet in the aquarium. To make it more interesting, the lamp in the aquarium can be control by selection panel manual and automatic. In this case, four MR16 LED lamps will be use to make it more interesting and it will place at the four angle of the aquarium.

ABSTRAK

"*Programmable Water Jet Show in Aquarium Controlled By PLC*" adalah satu projek yg dihasilkan untuk pameran awam. Projek ini sebenarnya menggunakan PLC (Programmable Logic Circuit) sebagai pengawal untuk menggerakkan "*water jet*" selain menghidupkan lampu dan juga aksesori – aksesori lain dalam akuarium. Projek ini boleh dikawal secara manual dan juga automatik. "*water jet*" boleh digerakkan dalam dua pergerakkan asas iaitu kehadapan dan kebelakang dan juga boleh dipusingkan sama ada mengikut arah pusingan jam dan lawan jam. Dengan ini orang ramai boleh melihat pergerakkan buih – buih di dalam akuarium. Dalam projek ini, motor akan digunakan untuk menggerakkan "*water jet*" dalam akuarium. Untuk menampakkannya lebih menarik, lampu untuk akuarium boleh dikawal dengan memilih untuk dikawal secara manual dan automatik. Dalam kes ini, empat lampu akan digunakan iaitu jenis "*MR16 LED*" untuk mencantikkan lagi suasana di dalam akuarium dan keempat – empat lampu akan diletakkan di setiap penjuru akuarium.

TABLE OF CONTENTS

LIST OF FIGURE

LIST OF TABLE

LIST OF FLOW CHART

LIST OF APPENDIX

CHAPTER I

INTRODUCTION

1.1 Overview

This project is entitle "**Programmable Water Jet Show in Aquarium Controlled by PLC**" which is the water jet in aquarium can be controlled by manually or automatically.

1.1.1 What is an Aquarium?

What is an aquarium? An aquarium (plural *aquariums* or *aquaria*) is a vivarium consisting of at least one transparent side in which water-dwelling plants or animals are kept. Fish keepers use aquaria to keep fish, invertebrates, amphibians, marine mammals, and aquatic plants. The term combines the Latin root *aqua*, meaning water, with the suffix *-arium*, meaning "a place for relating to".

Most aquaria consist of simple glass panes bonded together by silicone. Usually plastic frames are attached to the upper and lower edges for decoration. Price, availability, and reliability make the glass aquarium an industry standard for sizes up to about 1000 liters (250 gal).

1.1.2 Water Jet

A water jet used for recreation is generally smaller than water cannon, but large enough that the water can spray several meters or feet. People can either insert money to pay for a predetermined amount of usage time, or push a button for free to

start and stop the water. The water jet can be turned to allow the person to spray the water in different directions.

In this project, I am using the concept of water jet by using air as a spray element instead of water to make bubbles in the aquarium. It is just like a normal air pump but the direction of air blow through the tube can be change.

1.1.3 PLC

Automation of many different processes, such as controlling machines or factory assembly lines, is done through the use of small computers called a programmable logic controller (PLC). This is actually a control device that consists of a programmable microprocessor, and is programmed using a specialized computer language. Before, a programmable logic controller would have been programmed in ladder logic, which is similar to a schematic of relay logic. A modern programmable logic controller is usually programmed in any one of several languages, ranging from ladder logic to Basic or C. Typically, the program is written in a development environment on a personal computer (PC), and then is downloaded onto the programmable logic controller directly through a cable connection. The program is stored in the programmable logic controller in non-volatile memory.

1.2 Project Objectives

- To develop new market of the aquarium
    - Nowadays pattern of the aquarium is almost the same as the aquarium that we know.
    - This project is about to make new market of the current aquarium
- To design new dynamic aquarium
    - Basically the design of aquarium is almost static
    - This project is about to create new design which is the position of the water jet inside the aquarium can easily change.
- To make function of the aquarium

- Along with this idea, peoples can play with the aquarium whether they want to move the water jet around the aquarium or set by automatically.

- To design an attractive demonstration aquarium
  - Children are more attractive to the things that they can play with.
  - By this aquarium, they will be more attracting to play and have some fun.

1.3 Project Statements

- Control for aquarium is relatively primitively
- No attempt to make control of aquarium
- Pattern for aquarium is almost static and not dynamic

1.4 Project scopes

- The movement of the air tube will be control by DC motor
- This project consist of hardware development and software
- The software in this project consists of application of programming software (CX-One) for PLC(OMRON CQM1H)

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter students should have all the knowledge about the components that will be used to complete the project. It is important to make a research about the function of the components otherwise the wrongful use can be damaged the circuit or ruin the whole project.

2.2 General Overview of PLC (Programmable Logic Controller)

A programmable logic controller (PLC) is a digital computer used for automation of industrial processes, such as control of machinery on factory assembly lines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed or non-volatile memory. A PLC is an example of a real time system since output results must be produced in response to input conditions within a bounded time, otherwise unintended operation will result.

2.2.1 Advantages of PLC

The PLC controller have many special features that make it advance compared with other type of controller. Here are the major advantages that can be distinguishably realized:

- The wiring of the system usually reduces by 80% compared to conventional relay control system.
- The power consumption is greatly reduced as PLC consume much less power.
- The PLC self-diagnostic function enable easy and fast troubleshooting of the system.
- Modification of control sequence or application can easily be done by programming through the console or computer software without changing of I/O wiring, if no additional input or output devices are required.
- In PLC System spare parts for relay and hardware timers are greatly reduce as compared to conventional control panel.
- The machine cycle is improved tremendously due to the speed of PLC operation is a matter of milliseconds. Thus, productivity increases.
- In much less compared to conventional system in situation when the number of I/Os is very large and control functions are complex.
- The reliability of PLC is higher than the mechanical relays and timers.
- An immediate printout of the PLC program can be done in minutes. Therefore, hardcopy of documentation can be easily maintained.

2.2.2 PLC Operation

A PLC consist of a Central Processing Unit (CPU) containing an application program and Input and Output interface modules, which is directly connect to the field I/O devices. The program controls the PLC so that when an input signal from an input device turn ON, the appropriate response is made. The response normally involve turning ON an output signal to some sort of output devices.

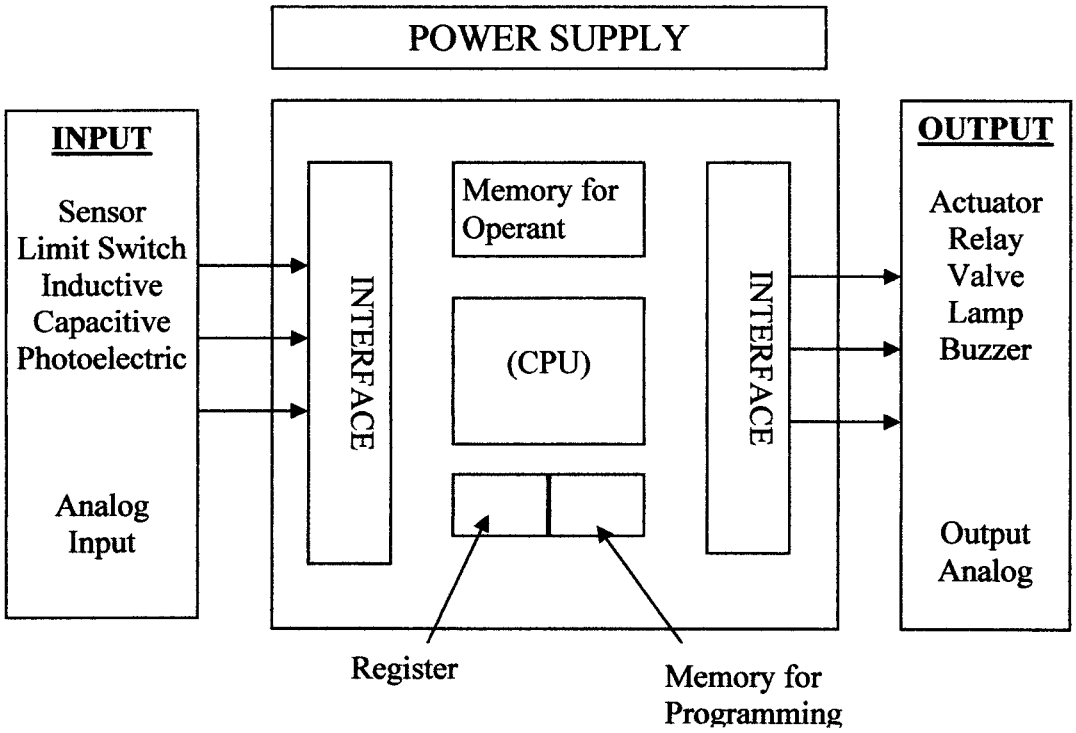

Figure 2-1: Basic structure of PLC for automation

2.2.3 CPU Units

The four models of CPU Units can be broadly divided into two groups: Models that support Inner Boards and the Controller Link Unit, and models that do not. The CPU Units also vary in their program capacities, I/O capacities, memory capacities, and the presence of an RS-232C port, as shown in the table 2-1 basic specifications of CQMH-CPU21 components below.

Table 2-1: Basic Specification of CQMH-CPU21 components

Model	I/O Capacity	Program Capacity (words)	DM Capacity (Words)	EM Capacity (Words)	CPU Unit built in inputs	Built in serial ports	Inner Board	Controller Link Unit
						Peripheral RS-232C Port		
CQMIH-CPU 21	256	3K	None	DC 16	Yes	Yes	Not supported	

2.2.4 CPU Unit Overview

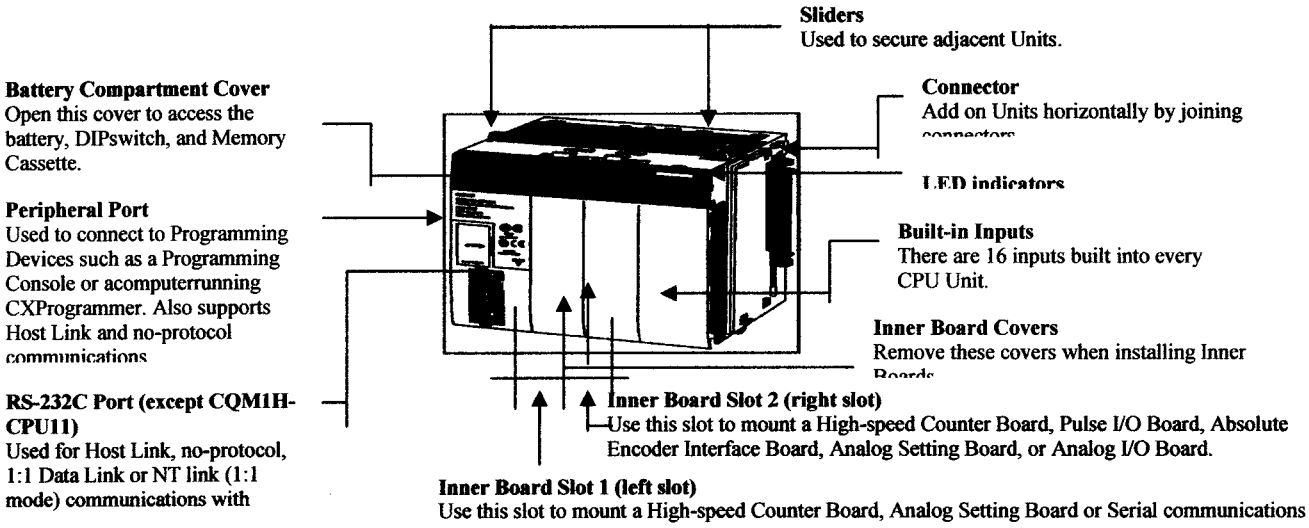

Figure 2-2: Main components of a CQM1H CPU Unit