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DATA LOGGER USING PIC

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This report is submitted in partial fulfillment of the requirements for the award of
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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
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PROJEK SARJANA MUDA II

Tajuk Projek : DATA LOGGER USING PIC

Sesi Pengajian : 2006/2009

Saya FAZILA BINTI AZIZ

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For my beloved mother and father

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ABSTRACT

A data logger works with sensors to convert physical phenomena into electronic signals such as voltage or current. These electronic signals are then converted or digitized into ADC or DAC data. The data is then easily analyzed by software and stored on a computer hard drive or on other storage media such as memory cards. This project is separated into three parts. The first part includes designing and developing the software for data collection and recording. The program will be collected using windows control software. The output will be analyzed and recorded into table and graph. USB port connection is used to make an interfacing between electronics circuit and computer which is enable the system acquired data from the sensors. The second part of this project is developing the data logger circuit. This circuit used the LCD display as an output that able to display the reading from all sensors. For this part, it is needed to understand about the characteristics of the component used and the connection between electronics to make the circuit well functions. The final part of this project is joining the circuit to the computer using USB port connection to complete the data logger using PIC. Finally it can be monitored through the computer.

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ABSTRAK

Data logger adalah satu alat yang berkomunikasi dengan alat pengesan untuk menukarkan suatu fenomena fizik kepada isyarat-isyarat elektronik seperti voltan atau arus. Isyarat-isyarat elektronik ini kemudiannya akan bertukar ataupun terdigit kepada ADC atau DAC data. Data kemudiannya, dengan mudah dianalisis oleh perisian dan disimpan di dalam komputer atau media penyimpan yang lain seperti kad memori. Projek ini terbahagi kepada tiga bahagian. Bahagian pertama meliputi rekabentuk dan pembangunan perisian yang di perlukan untuk merekodkan data dengan menggunakan bahasa pengaturcaraan. Data akan dianalisis dan direkodkan ke dalam bentuk graf dan jadual lalu di paparkan pada komputer. Pangkalan USB di gunakan untuk mengantaramuka litar elektronik dengan komputer. Bahagian kedua melibatkan pembangunan litar elektronik yang menggunakan paparan pada LCD. Kemahiran yang di perlukan adalah yang berkaitan dengan ciri-ciri dan pemasangan komponen. Bahagian terakhir projek ini adalah penyambungan antara litar elektronik kepada komputer menggunakan pangkalan USB bagi menyiapkan keseluruhan data logger yang menggunakan PIC. Akhirnya, data logger ini boleh di pantau dengan melalui komputer.

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ABBREVIATIONS

PIC - PERIPHERAL INTERFACE CONTROLLER
DAC - DIGITAL ANALOG CONVERTER
ADC - ANALOG DIGITAL CONVERTER
VAC - VOLTAGE ALTERNATED CURRENT

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CHAPTER 1

INTRODUCTION

1.1 Project Introduction

Data Logger is devices that record measurements obtained from electronic sensors that sense physical properties such as temperature, gas and relative humidity. The data recorded by the data logger is generally stored in some type of data memory within the data logger. Typical data logger is battery powered and includes a sensor, microprocessor, memory, and computer interface. In data logger, a data gathering instrument monitors a process or situation and gathers and stores information about the process or situation for later analysis or archiving. Logging is used in database management systems to record updates to the database. A data logger is made up of a processor operationally connected to a non-volatile memory for storing measurements obtained from electronic sensors in communication with the data logger. The data recorded by the data logger is generally stored in some type of data memory within the data logger. In many instances, a non-volatile memory is used to ensure that the data stored in the data logger is saved even after the battery is removed or the data logger is damaged. Data is derived from the signal, and the microprocessor stores the data in the memory. The computer then analyzes the data.

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1.2 Project Objectives

The objectives of this project is to developed the data logger which is able to sense the temperature and air contaminant by using temperature sensor, gas sensor and humidity sensor. The data also will be interface to the computer using external memory card reader to collect the temperature data which is analyzed through software development using the windows control software.

1.3 Project Problem Statement

As we know, there are many kinds of method that can be used to measure the temperature or the air contaminant. The past few years ago, temperature is measured using a traditional method such as thermometer application which is required low-cost. This method is popular because it is simple and easy to implement but there are many disadvantages by using this method. The temperature reading is not very accurate. This is because the data that will get may cause reading error. By using this method, it is also difficult to transfer it into graph for analyzing. This method also limited to some application.

Nowadays there are many ways to measure the temperature such as by using temperature sensor, gas sensor, humidity sensor, pressure sensors and so on. The conventional method becomes not popular as before. This is because, the modern method used more accurate, have a wide range of application, easy to implement and also using technology. Even though there are many advantages of this method, but it is quite expensive and required high-cost to develop. This is because it is required many systems which is combined to make one complete systems.

Therefore, software application becomes more popular to overcome this problem. In addition, it is a solution for data logger to measure and record alerting system. This project also developed to overcome such problems occurred when using

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conventional and modern method. This is because it is required low-cost but the application is quite similar to the modern technology. So, it can reduce development cost for industries. It is also can rapidly analyze the result and display through computer and LCD display.

1.4 Project Work scope

The scope of work of this project is beginning from literature review. This is the first element of scope of work which is to find out information about the project. The main element of this project is needed to study the main component of the project such as sensor, a suitable microcontroller and programming. All the finding is based on internet sources and journals.

Then, this project is to de design and developed an electronic circuit to sense the temperature and air contaminants. After that, the output of this circuit can be monitored using LCD display. Lastly, need to integrate between hardware and software and testing the device. There are many kinds of method that can be used to developed this system but for this project, just using the software that included with this data logger to interface data from the output of PIC microcontroller to the computer by using external card reader.

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1.5 Overview

Completely, this report consists of 5 main chapters and there are Introduction, Literature Review, Methodology, Result & Analysis and Conclusion & Recommendation. In chapter 1, the introduction is briefly explained the overview of the whole project and why it must be implemented in real life. It is highlighting on the background, project objectives, problem statement, methodology and scope of work on the operation of data logger using PIC. All the theories are taken and referred to the previous student's project and internet are explained in detail in chapter II. In order to achieve the objective the methods that have been used in the project are explained in detail in Chapter III. This chapter also briefly explained the development of the project. It is including the integration of hardware and software that have been used in this project. Chapter IV is a Result & Analysis that explained analysis of the circuits. Conclusion & Recommendation are included in Chapter V whereas it is briefly described the conclusion of the project and suggestion on how to further improve this project for the future developer.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will discuss about the projects backgrounds. Its also includes some specifications about the market which is about the market ready product which is related to this project.

2.2 Overview

As mentioned before, there are many kind of products that have functions to record the measurements obtained from electronic sensors that sense physical properties such as temperature, gas and humidity. Nowadays, there are many ways to measure and records the data by using the market ready products such as temperature sensors, humidity sensors and gas sensors. The conventional method becomes not as popular as before. This is because the modern method used more accurate, have a wide range of applications, easy to implement and also use the latest technology. Even though there are many advantages of this method, but it is quite expensive and required high-cost to

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develop. This is because it is required many system which is too combined to make one complete system.

The examples of recent products are Data Logger products from Pico Technology, Data Logger Products from Omega Engineering, Information by Maxim Integrated Products by Dallas Semiconductor, Temperature sensor, Gas Sensor by Nova Lynx and Information by Bill Travis and Anne Watson Swager entitled Data loggers, part 4: *relative humidity sensors*.

2.3 Data Logger products from Pico Technology

Figure 2.3 Products from Pico Technology [6]

A data logger is an electronic device that is used to record measurements over time. Pico data loggers require no power supply and simply plug into a parallel, serial or USB port on computer. By connecting suitable sensors, Pico data acquisition products can be used to measure temperature, pressure, relative humidity, light, resistance, current, power, speed, vibration in fact, anything that need to measure as shown in the figure 2.3.

By referring Pico data loggers [6], they are supplied complete with PicoLog — this powerful but flexible data acquisition software allows to collect, analyze and display

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data. With PicoLog the data is viewable both during and after data collection, in both spreadsheet and graphical format.

2.3.1 Pico Data Logger Range

Along with voltage input data loggers the Pico data logger range also includes loggers designed for specific applications:

- The low-cost, educational DrDAQ data logger is used throughout the world by both educational institutions and individuals alike
- For measuring temperature and humidity loggers such as the TC-08 thermocouple data logger and RH-02 temperature and humidity data logger offer an accurate solution to your measurement needs
- The pH Measuring Kit features Automatic Temperature Compensation, and allows to accurately measure and record the acidity or alkalinity of a solution
- Ideal for use over large areas, the widely used EnviroMon data logging and alarm system is a network based system capable of automatically measuring and recording readings from up to forty sensors, and providing warnings when readings go out of range

Wide range of voltage input data acquisition products ensures that whatever application there is a suitable Pico data logger available. All data loggers are supplied with PicoLog powerful but flexible data logging software that allows to start measuring and recording data with the minimum amount of effort. Also supplied are software drivers and examples to allow user to use Pico data loggers with own software or third party software. By using a suitable sensor, voltage input data acquisition products can be made to measure anything that require, but for specific applications the Pico data acquisition range also includes educational data loggers with built in sensors and data loggers for temperature and humidity monitoring. Pico supplies a range of easy-to-use PC-based temperature and humidity data logging products. Designed to replace costly

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chart recorders and complicated "plug in" data acquisition boards, these devices simply plug into a port on desktop or laptop and do not require a power supply.

2.4 Data Logger Products from Omega Engineering

Data Logger: A device that can read various types of electrical signals and store the data in internal memory for later download to a computer. [7]

Small, simple and affordable like the picture shown in the figure 2.4, Omega Engineering data loggers can measure and record data at user specified intervals ranging from once every 2 seconds to once every 12 hours. Omega Engineering's Data Recording Software requires no programming skills, and enables the user to effortlessly select reading rate, specify the user's user ID, and initiate the start of data collection. The user will be using data logger just moments after receiving it. In addition, all data can be saved in a format easily read by spreadsheet applications such as "Microsoft Excel". It is Omega Engineering goal to bring the user accurate, low-cost, easy-to-use data loggers that integrate easily into the user's working environment. To better understand the user's needs and to better serve the user, we welcome and appreciate your feedback.

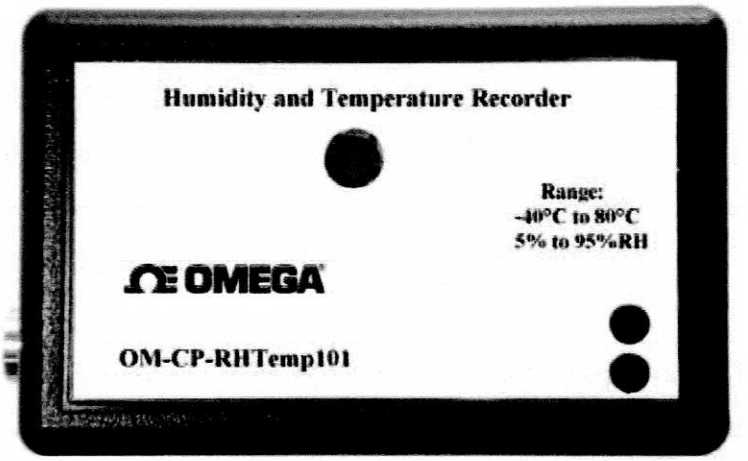

Figure 2.4 Products from Omega Engineering[7]

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