MICROPROCESSOR BASED THERMOMETER DEVICE

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This report is submitted in partial fulfillment of requirements for the award of Bachelor of Electronic Engineering (Industrial Electronics) with honours

Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGEQAH@J STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : MICROPROCESSOR BASED THERMOMETER DEVICE

Sesi Pengajian : 2006 /07

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"I hereby declare that this report is the result of my own work except for quotes as cited in the references."

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"I hereby declare that I have read this report and in my opinion this report is sufficient in terms of scope and quality for the award of Bachelor of Electronic Engineering (Industrial Electronics) with honours."

Signature : .....

Supervisor's Name : CIK SYAFEEZA BTE AHMAD RADZI

Date : 3 MEI 2007

"He who doesn't trust himself, will never prevails himself in the future"

By Mohd Sufian Bin Musa

For my dear yanie, mum and sister Norazlina Musa.

&

Cik Syafeeza Ahmad Radzi and other family members and friends.

ACKNOWLEDGEMENT

With the grace of god and her love to all her devotees, mankind will always be loved by god if one's attitude and daily lifestyle does not harm other people. May her shrine will always been shined to those who loved god and serve human kind. "Mohd Sufian Bin Musa".

I would like to thanks my supervisor Cik Syafeeza Bte Ahmad Radzi for all the help, guidance and support to accomplish this thesis.

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Thank you.

ABSTRACT

This project is to design a thermometer that can display the current temperature at any time. The temperature is displayed by LCD at the press of the button. The logic of deciding the maximum and minimum temperatures is implemented in Assembly Language on microprocessor. This thermometer device uses the DS 1820 as a temperature sensor. This temperature sensor can detect any change of temperature in format from -55 ^{0}C to +125 ^{0}C. These sensors have relatively small physical sizes. The data from this sensor will be send to the brain of the thermometer- Integrated Circuit 16F84. This IC will be programming by the Assembly Language 8085. After that, as a result the LCD screen will show the temperature value in Kelvin and degree Celsius. All this process in the thermometer will use 5 Volt as a power supply for operates. This thermometer also used a microcontroller PID to control all the input from the circuit of sensor and the output to display temperature in digital number. This project is expected to improve the temperature measurement for everyone that need to know the accurate temperature.

ABSTRAK

Di dalam projek ini, saya dikehendaki membina satu alat pengukur suhu yang di programkan mengunakan bahasa microprocessor 8085. Pengukur suhu tersebut, boleh mengukur suhu pada bila-bila masa dan nilai suhu yang di ukur akan dipaparkan pada skrin LCD. Dalam pengukur suhu ini, saya mengunakan sensor suhu jenis DS 1820. Sensor suhu ini boleh mengesan sebarang perubahan suhu dalam julat -55 ^{0}C to +125 ^{0}C. Sensor ini bersaiz kecil dan sesuai digunakan berbanding jenis sensor yang lain. Data yang di ambil dari sensor suhu ini seterusnya di hantar pada litar bersepadu 16F84. Litar bersepadu tersebut akan di programkan mengunakan bahasa PIC. Seterusnya isyarat akan dihantar kepada skrin LCD dan nilai suhu akan dipaparkan dalam unit Darjah Selsius. Keseluruhan litar ini mengunakan bekalan kuasa sebanyak 5 volt. Hasil projek ini di harap dapat membantu mereka yang memerlukan pengukuran suhu dengan bacaan tepat tanpa ralat.

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LIST OF ABBREVIATIONS

LCD	Liquid Crystal Display
IC	Integrated Circuit
I/O	Input/Output

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CHAPTER I

PROJECT INTRODUCTION

1.1 INTRODUCTION

The LCD Thermometer is a one device that can display the current temperature at any time given. Over the last decade, the implementation of this idea has been attempted but it is not very effective because the measurement temperature is not too accurate. The solution for this problem is to design the thermometer with high accuracy using assembly language 8085 and the high sensitivity temperature sensor.

There have a one temperature sensor to detect the temperature, then the input will sent to the Integrated Circuit (IC) and finally to the Liquid Crystal Display (LCD) as an output. Actually, there could be several sources of errors during the measurement of temperature. The error is a calibration errors, sensor self heating and sensor time constant. To make sure the thermometer have the high accuracy, we should alert about the measurement error. This thermometer design will minimize all the errors during the measurement of temperature.

1.2 OBJECTIVE

The purpose of this design is to obtain an accurate temperature measurement. It can eased daily life and meant a lot to those who does need them. To success in this project, there are few objectives that have to achieve. Firstly we need to design the thermometer that can display the current temperature at any time. Then, the temperature value is display by LCD at the press of the button. Finally the logic of deciding the maximum and minimum temperature is implemented in Assembly Language on microprocessor.

1.3 SCOPE OF WORK

In this thermometer device, we had used the DS1820 as a temperature sensor. This temperature sensor can detect any change of temperature in format from -55 ^{0}C to +125 ^{0}C. These sensors have relatively small physical sizes. The data from this sensor will send to the brain of the thermometer- Integrated Circuit 16F84. This IC is programmed by the Assembly Language 8085. After that, as a result the LCD screen will show the temperature value in degree Celsius. All this process in the thermometer will use 5 Volt as a power supply for operates. This thermometer also uses a microcontroller PID to control all the input from the circuit of sensor and the output to display temperature in digital number.

1.4 PROBLEMS STATEMENT

This research is carried out to overcome the problem of current LCD thermometer in the market. One of the problem is the present LCD thermometer device is very expensive. Beside that, the measurements are not accurate and have much error. Also, mostly the thermometer design presently is too big and very weight.

1.5 METHODOLOGY

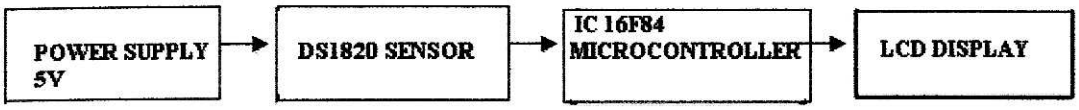

Figure 1.1: Overall Block Diagram

In this system, attention is given to three elements which consist of DS1820 temperature sensor, Integrated Circuit 16F84 Microcontroller and the Liquid Crystal Display (LCD). The main function for the temperature sensor is to detect the temperature value as an input. The IC16F84 is the brain of a microprocessor and is where all of the arithmetic and logical operations are performed. Finally the LCD is to display the temperature value as an output from IC.

1.6 THESIS STRUCTURE

The content of this thesis is about the flow of the project. This thesis is divided into five chapters to provide reader to understand the whole project. For the Chapter I, the overview of the project is briefly discussed.

The Chapter II will cover up all the project theory, perspective, method that are used to solve the problem and any hypothesis that related with the research of methodology.

Chapter III will cover the research methodology in this project. The Chapter IV covers the contrivance and the result of the data analysis or the project result.

Finally, the Chapter V will discuss whole content of this thesis and project. By the end of this chapter, there is some discussion for this project.

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter discusses the project theory, perspective, methodology and any hypothesis that related with the research of methodology.

2.2 CONCEPT OF PROJECT DEVELOPMENT

In today's world, that is important to know the actual temperature at any time given. Over the last decade, the implementation of this concept has been attempted but not all the design can measure the temperature accurately. Presently, the expensive thermometer such as infrared sensor has the ability to measure the temperature accurately. Hence, the solution is not only complex but also require a physical connection to access those device. A simple, cost effective solution is proposed here, by which devices as mentioned above can be controlled easily with users at anywhere on this world.

In this project, the temperature value will display at Liquid Crystal Display (LCD). So that is easy for user to read the temperature value. This device can be ON/OFF by push button.

2.3 DS1820 TEMPERATURE SENSOR

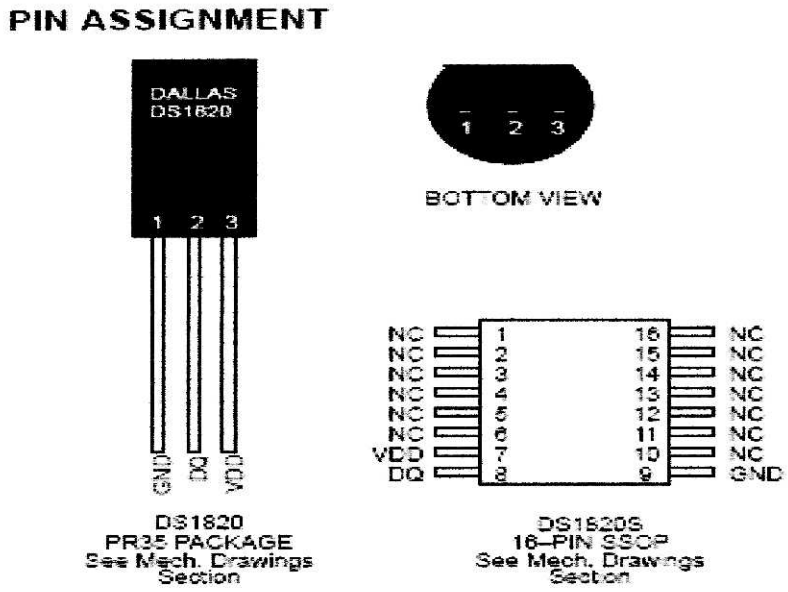

Figure 2.1: DS1820 Temperature Sensor

This temperature sensor is able to measure temperatures from -55°C to +125°C in 0.5°C increments or Fahrenheit equivalent from -67°F to +257°F in 0.9°F increments. The 0.5°C or 0.9°F increment means the thermometer will get temperature readings like 30.5°C or 30°C but never 30.1°C (for the case with Fahrenheit it is different, only 0.9°F increments or decrements).

2.3.1 DS1820 Digital Thermometer – Calculating an 8-bit CRC Value

When a data is communicated between two devices, it is common to use some type of error checking. Common examples are parity, a checksum and a cyclic redundancy check (CRC). The general idea is that the transmitter calculates and transmits a value and the receiver performs the same calculations and compares the result with the check value.

When interfacing with the Dallas 1820 1-wire digital thermometer, various commands are issued by the PIC to a specific DS1820 and data is then returned to the PIC as a series of nine bytes. Eight of these bytes contain data related to the temperature or are user bytes. The ninth and final byte is the cyclic redundancy check (CRC). The DS1820 calculates this final CRC byte using a defined algorithm to operate on the other eight data bytes.

The receiving processor may then operate on the eight received data bytes using the same algorithm and compare this calculated CRC with that calculated by the DS1820. If the two results do not match, a transmission error has occurred and the designer may have to restructure the program and repeat the process until the two CRCs matches.