DIGITAL REMOTE THERMOMETER

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
DIGITAL REMOTE THERMOMETER

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This Report Is Submitted In Partial Fulfillment of Requirements For The Bachelor Degree of Electronic Engineering (Industrial Electronic)

Faculty of Electronic Engineering and Computer Engineering
Universiti Teknikal Malaysia Melaka

April 2007
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Date : 30 April 2007
Dedicated to my beloved friends and family

And everything is possible with you by my side my love
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DECLARATION

This Final Year Project contains information pertaining to the Digital Remote Thermometer using PIC microcontroller. This Project comes under the subject BENU 4983 Project offered by Faculty of Electronic Engineering & Computer Engineering, UTeM. This documentation report aims to provide the reader about the overall information techniques about this project. The focus of the project is remote the thermometer using PIC microcontroller.

I admired that this is an original my own work with the acceptance which I have referenced them to explained sources.
ABSTRACT

Digital remote thermometer in the market currently, mostly the output is represented in BCD display to show the measured temperature. Beside, digital remote thermometer is usually used in certain area such as office building and factory where the temperature has to stable in order to produce a quality product. But most of this digital remote thermometer is not user friendly because only display the temperature of the room without gives a clear warning to the user. Thus, this project is to build a digital remote thermometer with using PIC microcontroller. The PIC is to produce output of the thermometer where in this project the output is an alarm. Therefore, users are able to know the temperature of the certain area. Distance between transmitter and receiver circuit can reach hundred meters, provided both units are connected to the mains supply. In this project, main power supply will be used a transmission medium to transmit the data. By using the main supply where there is existing connection in building, the thermometer can transmit the data to the whole building. The operation of this remote thermometer is based on the temperature measured by a sensor in range of 0°C to 100°C. Signal from the temperature sensor are sent to the microcontroller by using transmission line. Microcontroller are used for this project is PIC 16F877A. The output from the system will sound the alarm when the temperature is over the value specified. While the input are the frequency value where it is determine the limitation for every measured temperatures.
ABSTRAK

Dibandingkan dengan kebanyakan termometer kawalan digital yang digunakan pada masa kini, kebanyakannya menggunakan paparan BCD untuk memaparkan nilai keluaran bagi suhu sesuatu bilik yang disukat. Selain itu, ia biasanya digunakan pada bangunan pejabat dan kilang yang memerlukan suhu yang sentiasa stabil bagi mengekalkan kualiti sesuatu produk yang dihasilkan. Tetapi kebanyakan thermometer kawalan digital tidak mesra pengguna kerana hanya memaparkan nilai suhu tanpa memberikan isyarat amaran yang kepada pengguna. Maka, tujuan projek ini adalah untuk merekabentuk satu termometer kawalan digital yang menggunakan pengawal mikro sebagai unit utama. Melalui projek ini, pengguna dapat mengetahui keadaan suhu sesuatu bilik tanpa perlu berada di dalam bilik atau tempat tersebut. Selain itu, jarak antara pemancar dan penerima boleh mencapai sehingga 100 meter dengan menggunakan bekalan kuasa. Tujuan bekalan kuasa digunakan adalah sebagai medium penghantaran bagi mengawal suhu pada jarak yang jauh. Termometer ini akan beroperasi berdasarkan suhu yang disukat melalui pengesan yang boleh menyukat suhu antara 0°C hingga 100°C. Isyarat daripada alat pengesan ini akan dihantar kepada pengawal micro PIC menggunakan tali pemancar bekalan kuasa dan diterima dari litar penerima yang terus disambung kepada PIC. Dari masukan tersebut, maklumat mengenai keadaan suhu didalam bilik tersebut ditentukan oleh mikro pengawal. Pengawal mikro yang digunakan dalam projek ini adalah PIC 16F877A. Sistem ini akan membunyikan penggera untuk memberi amaran kepada pengguna jika suhu tersebut melebihi had yang ditentukan dalam pengawal mikro PIC.
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LIST OF ABBREVIATION

LED - Light Emitting Diode
MCU - Microcontroller Unit
PIC - Peripheral Interface Controller
       - Programmable Logic Controller
EEPROM - Electrically Erasable Programmable Read Only Memory
IC - Integrated Circuit
CPU - Central Processing Units
ROM - Read-Only Memory
I/O - Input/Output
Hz - Hertz
DC - Direct Current
AC - Alternating Current
RAM - Random-Access memory
RD - Read
WR - Write
ADC - Analog to Digital Converter
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CHAPTER 1

PROJECT OVERVIEW

1.1 INTRODUCTION

Thermometer is a device that measures the temperature of things. The name is made up of two smaller words: "Thermo" means heat and "meter" means to measure. Applications thermometer is widely used in many fields. Many applications using a controller based system to navigate and handling the signal throughout the sensor. By utilize the capability of microcontroller, remote thermometer sensor can monitor and control the temperature in several locations in an office building. Microcontroller is a comprised unit of microprocessor, analog to digital converter, RAM and several digital inputs/outputs. This system used PIC16F877A microcontroller as a processing centre for all the input and output.
In this project, PIC microcontroller will monitor the temperature on a fix area and will aware the user when in some ranges of temperature which is specified early. This project will utilize the microcontroller to read input from the sensor. From the input, the microcontroller will recognize the temperature level either normal or over due. Then output from PIC will be sent to an alarm system. The other important part for the system is the sensor that will sense the temperature level.

1.2 PROJECT DESCRIPTION

This project is about creating a digital remote thermometer that operates merely similar to the operational thermometer that we can found out today. The data of the temperature is monitored and controlled by microcontroller.

The digital remote thermometer is used to measure the temperature level from a certain distance. This project will produce warning signal when the temperature are over the limit. The temperature sensor can able read the temperature in range between 0°C and 100°C.

This project is used microcontroller which has advantages where can process the data and perform the action based on input reading. If we refer to conventional remote thermometer in market today, it is expensive. But instinctively this will create another solution of producing a digital remote thermometer with using microcontroller.
1.3 PROJECT OBJECTIVES

The objective of this project is to design a digital remote thermometer that will monitor the temperature remotely. This project will produce a warning user when temperature rising above the temperature specified. This project also builds around PIC microcontroller as a brain of the system.

1.4 PROBLEM STATEMENT

In order to support quality, regulatory and accreditation requirements, more industries today are requiring specialized systems to monitor temperature level. PIC is included in this digital system that makes the hardware more compact, where it can program and produces more outputs. So, there is not necessary now to build a digital remote temperature with a complex circuit.
1.5 SCOPE OF PROJECT

Every project has its own defined scope to make it different from any other projects. In the first part of this project, is to acknowledge and able to use PIC microcontroller for this digital remote thermometer that will control the system. The important scope here is designing the circuit that can function with all the peripherals connected to it which can either be as an input or output from the controller.

For the second part, is to use the appropriate sensor for the system. In this part, the sensor chosen can be able to monitor the temperature level away from the area. The temperature will be monitored remotely where temperature sensor will transmit the reading to the receiver circuit. Then receiver circuit will send the information to the controller.

The final part is program built the program for the project. The program must be able to control all the input and output connected to the microcontroller. The program builds on MPLAB software and simulate before it is downloaded into the microcontroller. The simulation ensures the program run smoothly with all the peripherals and run effectively before implemented on the real circuit.
1.6 METHOD

From other electronic project, which referring to the concept of controlling the temperature level, alarm system and basic PIC source code as a reference to the PIC programming language. Some reference obtained used different type of PIC microcontroller and for this project PIC 16F877A is used.

Resources play important roles in order to make a comparison before deciding the suitable method that can be applied for this project. Resources like web pages, journals and researching through books was really helpful.

1.7 THESIS OUTLINE

The first chapter is including the introduction, project description, project objectives, problem statement, scope and methodology of project. Beside that, the objectives of the project have been comprised. The second that is the literature review about the project. In the literature review, it includes several previous research has done for this project until its present state. Moreover, this chapter exposed the ideas that have been explored for the project.

The third section is about the project methodology. In this chapter, the methods and the project flow chart has been explained in clearly. The fourth chapter is about the component of microcontroller and external circuit that connected to the microcontroller. In this chapter, the functional of microcontroller, other part of the components and circuit will be explained in detail about how it’s functional and connection to the PIC microcontroller.