

MEASUREMENT LOGGING DATA USING BLUETOOTH

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To my love.....

Father, Mother, Family

And all my friends.

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ABSTRACT

This project consists of a sensor system that performs function of a temperature sensor and usage of a microcontroller. The objectives of this project are to implement a wireless technology. This is design to use Bluetooth communication as a wireless technology. This sensor system could be communicated with a computer without using any cables and it could be used in maximum range of 10 meters. This sensor system consists of two parts which are software and hardware. The software part is included of development programming of microcontroller which is the most important part in this system. The hardware part is developing by referring the programming that has been developing in software part.

ABSTRAK

Projek ini terdiri daripada sistem pengesan di mana ia menggunakan alat pengesan suhu dan pengawal mikro. Objektif projek ini adalah untuk mengaplikasikan penggunaan teknologi tanpa wayar. Projek ini direka bentuk dengan menggunakan komunikasi 'Bluetooth' sebagai teknologi tanpa wayar. Sistem pengesan ini mampu berkomunikasi dengan komputer tanpa memerlukan sebarang kabel dan lingkungan jarak maksima penggunaannya adalah 10 meter. Sistem ini terdiri daripada dua bahagian iaitu bahagian perisian dan juga bahagian litar. Di mana di bahagian perisian merangkumi pembangunan pengatur cara kawalan mikro yang merupakan bahagian terpenting dalam projek ini. Bahagian litar pula dibangunkan berpandukan pengaturcaraan pada bahagian perisian.

CONTENTS

CHAPTER	TITLE	PAGE
	PROJECT TITLE	i
	VERIFICATION FORM	ii
	DECLARATION	iii
	DEDICATION	v
	ACKNOWLEDGEMENT	vi
	ABSTRACT	vii
	ABSTRAK	viii
	CONTENTS	ix
	LIST OF TABLE	xiii
	LIST OF FIGURE	xiv
	LIST OF ACRONYMS	xv
	LIST OF APPENDIX	xvi
I	INTRODUCTION	
	1.1 Project Objectives	1
	1.2 Problem Statements	2
	1.3 Scopes of Work	2
	1.4 Project Methodology	3
	1.5 Hypothesis Result	3
	1.6 Report Structure	4

II LITERATURE REVIEW

2.1	Bluetooth Basics	5
2.2	Core Specification Versions	6
2.2.1	Range	6
2.2.2	Power	7
2.3	Bluetooth Technology Benefits	7
2.3.1	Range of Devices	7
2.3.2	Secure Connections	8
2.4	Bluetooth Technology Works	8
2.4.1	Overview of Operation	8
2.5	Architecture	11
2.6	Bluetooth Generic Packet Structure	14
2.7	Physical Channels	16
2.8	Basic Piconet Channel	17
2.8.1	Characteristics	17
2.9	Topology	19
2.9.1	Supported Layers	19
2.9.2	Adapted Piconet Channel	19
2.9.3	Inquiry Scan Channel	20
2.9.4	Physical Links	21
2.9.5	Active Physical Link	22
2.9.6	Scheduling and Acknowledgement Scheme	23
2.10	Bluetooth Wireless Technologies	24

III	PROJECT METHODOLOGY	
3.1	System Overview	27
3.2	Hardware Design	28
3.2.1	Power Supply	28
3.2.1.1	KA78M05	29
3.2.2	Project Circuit	31
3.2.3	Circuit Operation	31
3.2.4	PIC12F675	32
3.2.5	Temperature Sensor (LM35)	33
3.2.6	Bluetooth Module (BlueSMiRF)	34
3.3	Software design	35
IV	RESULTS AND DISCUSSION	
4.1	Simulations Process	37
4.1.1	PCB Schematic	39
4.1.2	Project Circuit	40
4.2	Discussion	41
V	CONCLUSION AND SUGGESTION	
5.1	Conclusion	42
5.2	Suggestions	43

REFERENCES	44
APPENDIX A	45
APPENDIX B	48
APPENDIX C	54
APPENDIX D	59
APPENDIX E	74

LIST OF TABLE

NO	TITLE	PAGE
3.1	Electrical Characteristic of KA78M05	30
3.2	Specification of the various micro-controllers	33
3.3	Specification of Temperature Sensor	33

LIST OF FIGURE

NO	TITLE	PAGE
2.1	Core Architectural Blocks	14
3.1	Project Methodology in a flowchart	26
3.2	Block Diagram of the Project	27
3.3	Power Supply Circuit	28
3.4	Mechanical dimensions of KA78M05	29
3.5	Project Circuit Schematic	31
3.6	Pin Diagram of PIC12F675	32
3.7	BlueSMiRF	35
3.8	Flowchart for microcontroller software	36
4.1	Simulation Schematic	38
4.2	PCB Schematic	39
4.3	Project Circuit	40

LIST OF ACRONYMS

ACL	-	Access Control List
AFH	-	Adaptive Frequency Hopping
ARQ	-	Automatic Repeat Request
CRC	-	Cyclic Redundancy Check
FHSS	-	Frequency Hopping Spread Spectrum
GAP	-	Generic Access Profile
HCI	-	Host Controller Interface
ISM	-	Industrial Science Medical
IUT	-	Implement Under Test
L2CAP	-	Logical Link Control & Adoption Protocol
LMP	-	Link Manager Protocol
LT_ADDR	-	Logical Transport Address
PC	-	Personal Computer
PDA	-	Personal Digital Assistant
PDU	-	Protocol Data Unit
PIC	-	Programmable Integrated Circuit
PIN	-	Personal Identification Number
PSB	-	Parked Slave Broadcast
QoS	-	Quality of Service
SDP	-	Service Discovery Protocol
TCI	-	Test Control Interface
TDD	-	Time Division Duplex
VB	-	Visual Basic

LIST OF APPENDIX

NO	TITLE	PAGE
A	PIC Source code	45
B	KA78M05 Datasheet	48
C	LM35 Datasheet	54
D	PIC12F675 Datasheet	69
E	BlueSMiRF Datasheet	74

CHAPTER I

INTRODUCTION

The aim of this project is to develop a measurement data logging system with data communication based on Bluetooth Technology. A user with a portable terminal such as notebook PC can receive measurement data from a Bluetooth enabled sensor system without any cable connection. This project constructs equipment that having temperature sensor system that will successfully operates and will logging the data to the portable terminal by using Bluetooth Technology.

1.1 Project Objectives

The objectives of this project are to implement a wireless technology. This project is design to use a Bluetooth communication as a wireless technology. Bluetooth device is use for transferring data from the sensor system to the computer.

The other objectives are to introduce of using microcontroller in developing electronic circuits. Microcontroller is now commonly use to simplify the complex circuit become a simple one and that may reduce manufacturing cost.

1.2 Problem Statements

There are a lot of measurement equipment had been created but they are so hardwired. Users find it problems as manageable to handle wires and have troublesome to place it on certain surface. Users just have wasting their time during monitoring the reading.

1.3 Scopes of Work

This project is divided into two parts:

(a) Software

There are two different types of programming will use to make this project success. They are PIC programming and Visual Basic programming. Proton IDE Lite is use to program the PIC which use an Assembly language. For Graphical User Interface, Visual Basic has been used. A reading from temperature system will be send to PC showed up on monitor by Visual Basic programming.

(b) Hardware

This project will occupy in designing and developing of temperature sensor system that will be incorporated with the software part.

1.4 Project Methodology

Firstly, the information of sensor system and circuits and Bluetooth technology is research including the components information such as microcontroller and temperature sensor. All the relevant information must be record to be a reference in future. The second methods are learning about programming language as Assembly and VB which suitable with this project. The third methods are choosing the apposite components such as Bluetooth device, temperature sensor and microcontroller. Design the appropriate circuit is on the fourth method. Circuit is design in a simple form. Then the hardware part will be developed for the next step. By refer to the hardware part, the software part will be developed which compatible by each other. Test for both parts before go to the debug process.

1.5 Hypothesis Result

At the end of this project, we will achieve the objectives of this project. The sensors circuit design will successfully function and the programming by using Visual Basic and C language will successfully debug including the Bluetooth system well-function transferring data without any problem and finally the reading of the sensor will display at the portable terminal as PC or PDA.

1.6 Report Structure

This report has been divided into five chapters, where in Chapter 1 is about overview of the project and included the objectives and methodology of this project. Chapter 2 is the part where Bluetooth technology is describe clearly.

All the methods to make this project success will be explained in Chapter 3. Followed by Chapter 4 where will be explained more details all about the result and analysis of this project.

And Chapter 5 is the last where contains the conclusion and suggestion of the project.

CHAPTER II

LITERATURE REVIEW

Bluetooth wireless technology is a short-range communications technology intended to replace the cables connecting portable and/or fixed devices while maintaining high levels of security. The key features of Bluetooth technology are robustness, low power, and low cost. The Bluetooth specification defines a uniform structure for a wide range of devices to connect and communicate with each other.

2.1 Bluetooth Basics

Bluetooth technology has achieved global acceptance such that any Bluetooth enabled device, almost everywhere in the world, can connect to other Bluetooth enabled devices in proximity. Bluetooth enabled electronic devices connect and communicate wirelessly through short-range, ad hoc networks known as piconets. Each device can simultaneously communicate with up to seven other devices within a single piconet. Each device can also belong to several piconets simultaneously. Piconets are established dynamically and automatically as Bluetooth enabled devices enter and leave radio proximity.

Unlike many other wireless standards, the Bluetooth wireless specification gives product developers both link layer and application layer definitions, which supports data and voice applications.

A fundamental Bluetooth wireless technology strength is the ability to simultaneously handle both data and voice transmissions. This enables users to enjoy variety of innovative solutions such as a hands-free headset for voice calls, printing and fax capabilities, and synchronizing PDA, laptop, and mobile phone applications to name a few.

2.2 Core Specification Versions

Bluetooth technology operates in the unlicensed industrial, scientific and medical (ISM) band at 2.4 to 2.485 GHz, using a spread spectrum, frequency hopping, full-duplex signal at a nominal rate of 1600 hops/sec. The 2.4 GHz ISM band is available and unlicensed in most countries.

2.2.1 Range

The operating range depends on the device class:

- (a) Class 3 radios
 - (i) Have a range of up to 1 meter or 3 feet.
- (b) Class 2 radios
 - (i) Most commonly found in mobile devices.
 - (ii) Have a range of 10 meters or 30 feet.
- (c) Class 1 radios
 - (i) Used primarily in industrial use cases.
 - (ii) Have a range of 100 meters or 300 feet.

2.2.2 Power

The most commonly used radio is Class 2 and uses 2.5 mW of power. Bluetooth technology is designed to have very low power consumption. This is reinforced in the specification by allowing radios to be powered down when inactive.

2.3 Bluetooth Technology Benefits

Bluetooth wireless technology is the simple choice for convenient, wire-free, short-range communication between devices. It is a globally available standard that wirelessly connects mobile phones, portable computers, cars, stereo headsets, MP3 players, and more. Thanks to the unique concept of “profiles,” Bluetooth enabled products do not need to install driver software. The technology is now available in its fourth version of the specification and continues to develop, building on its inherent strengths — small-form factor radio, low power, low cost, built-in security, robustness, ease-of-use, and ad hoc networking abilities. Bluetooth wireless technology is the leading and only proven short-range wireless technology on the market today shipping over five million units every week with an installed base of over 500 million units at the end of 2005.

2.3.1 Range of Devices

Bluetooth technology is available in an unprecedented range of applications from mobile phones to automobiles to medical devices for use by consumers, industrial markets, enterprises, and more. The low power consumption, small size and low cost of the chipset solution enables Bluetooth technology to be used in the tiniest of devices. Have a look at the wide range products made available by our members in the Bluetooth product directory and the component product listing.

2.3.2 Secure Connections

From the start, Bluetooth technology was designed with security needs in mind. Since it is globally available in the open 2.4 GHz ISM band, robustness was built in from the beginning. With adaptive frequency hopping (AFH), the signal “hops” and thus limits interference from other signals. Further, Bluetooth technology has built-in security such as 128bit encryption and PIN code authentication. When Bluetooth products identify themselves, they use the PIN code the first time they connect. Once connected, always securely connected.

2.4 Bluetooth Technology Works

Bluetooth wireless technology is a short-range communications system intended to replace the cables connecting portable and/or fixed electronic devices. The key features of Bluetooth wireless technology are robustness, low power, and low cost. Many features of the core specification are optional, allowing product differentiation.

The Bluetooth core system consists of an RF transceiver, baseband, and protocol stack. The system offers services that enable the connection of devices and the exchange of a variety of data classes between these devices.

2.4.1 Overview of Operation

The Bluetooth RF (physical layer) operates in the unlicensed ISM band at 2.4GHz. The system employs a frequency hop transceiver to combat interference and fading, and provides many FHSS carriers. RF operation uses a shaped, binary frequency modulation to minimize transceiver complexity. The symbol rate is 1 Mega symbol per second (MSPS) supporting the bit rate of 1 Megabit per second (Mbps) or, with Enhanced