

UNIVERSITI TEKNOLOGI MARA

**THE CENTRALISED HAZARDOUS GAS
DETECTOR USING MICROCONTROLLER**

ISHAK BIN HJ ANNUAR

**Thesis submitted in fulfillment of the requirements
for the degree of
Master of Science**

Faculty of Electrical Engineering

July 2006

ABSTRACT

Monitoring and controlling system are imperative to prevent human and environment from dangerous effect of various factors of pollution. Until now, air pollution has been analyzed with precision laboratory instrument which are time-consuming, expensive, and can seldom be used in real-time in the field. As such, nowadays many applications for measuring hazardous pollution a very precision analysis of the gas is not required, but only an alarm level detection and safety of human. In the meantime, most of lower cost sensor systems available in the market are portable and decentralized.

A new approach to centralized hazardous gas detectors using a low cost microcontroller system is presented. All relative work pertaining to the completion of the centralized system which composes of the development of gas sensor circuits, slave microcontrollers, RS-232 to RS-485 converter, optional central station were described. The centralized system utilizes a master slave communication where one master device controls the others slaves devices. The main station for operation of the system is monitored using Graphical User Interface (GUI) developed based on QBasic environment. A stand-alone main station is also developed by PIC microcontroller as an alternative central station. The GUI based on Visual Basic software is also developed for upgrading the capability with a new communication computer port operating under window environment. The developed system has shown that the auto switching mode of transmission could be implemented via the PIC microcontroller and RS485 transceiver. The use of PIC microcontroller has made the proposed system to be small in size which meets the trend of current technology. The complete prototype system is developed and the performance is reported.

CANDIDATE'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This topic has not been submitted to any other academic institution or non institution for any other degree or qualification.

In the event that my thesis be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA.


Name of Candidate	ISHAK BIN HJ ANNUAR
Candidate's ID No.	2002103634
Programme	MASTER OF SCIENCE IN ELECTRICAL (EE780)
Faculty	FACULTY OF ELECTRICAL ENGINEERING
Thesis Title	THE CENTRALISED HAZARDOUS GAS DETECTOR USING MICROCONTROLLER
Signature of Candidate	
Date	14/6/2006.....

TABLE OF CONTENTS

TITLE PAGE	
ABSTRACT	ii
CANDIDATE'S DECLARATION	
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	viii
LIST OF FIGURES	ix
ABBREVIATIONS	xi
CHAPTER ONE: INTRODUCTION AND LITERATURE REVIEW	1
1.0 Introduction	1
1.1 Research Objectives	2
1.2 Scope of Study and Research	3
1.3 Background of the Problem	4
CHAPTER TWO: THEORITICAL DESCRIPTION OF THE PROPOSED SYSTEM	8
2.0 Introduction	8
2.1 Sensing principles	8
2.2 Signal Conditioning	11
2.3 Embedded Analog to Digital Converter (ADC) preparation	12
2.3.1 Analog Ports	12
2.3.2 Analog to Digital Conversion	15
2.4 General Principles in Serial Transmission	16
2.5 Serial Transmission using Microcontroller	18
2.6 Application of Delay	23
2.6.1 A Multiple Loop of Delay	27

CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

1.0 Introduction

The dramatic growth in industrial development and population has brought the natural atmospheric environment become polluted and is rapidly deteriorating. Atmospheric pollution has become particularly serious since the era of Industrial Revolution. Furthermore, the human activities such as from stationary sources, i.e. petrochemical, oil and gas refineries and mobile sources, i.e. ships, automobiles, have contributed to atmospheric pollution [1]-[5].

Monitoring and controlling of such pollutants are imperative to prevent human life and environment disaster. Conventional analytic instruments are widely used and still dominant in measuring air pollution. However, conventional analytic instrument are expensive, difficult in process controlling and seldom be used in real-time in the field [6]-[9].

These issues have fuelled a rapid growth in development of gas sensors that are reliable, compact, with versatile applications, and cost effective. Moreover, an exhaustive analysis of the gas is not practically required in many applications such as home safety, and industrial workplace. However, an alarm level detection and safety of human are desperately needed in such applications. A lot of research and development has been focused on the development of semiconductor sensor in improving their performances; as a result, their applications have complied with environmental, industrials and domestic need [10]-[15].