

PC-Based Power Failure Monitoring With SMS Notification

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Dedicated to my beloved family especially my father and mother, lecturer, and also
to all my friends

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ABSTRACT

PC-based power failure monitoring with SMS Notification is a system created to monitor and control a power system by sending a specific Short Message Service (SMS) from a cell-phone. The objective of this system is to monitor power failure within an electrical device via SMS notification when detection on failure of power point. To achieve the objective, LabVIEW is used to design a virtual instrument for front panel. By using the design panel, a number of parameter such as voltage, current, power, indicator for faulty power point and the reference cell phone numbers can be display on the screen of PC for monitoring purpose. Upon to it, all power points can be control by the design front panel with SMS notification at a same time. This system is extremely handy and convenience to operate at any place by controlling the ON and OFF switching of the devices. To implement this, a GSM modem is connect to LabVIEW front panel to receive the SMS from a reference cell phone. The utilization of GSM modem in this project as it ubiquity standard which enable subscribers to use their phones in many parts of the world, and make international roaming very common between mobile phone operators. The LabVIEW programming in the PC can be used to monitor and transmit controlling signals to the modem by connect a serial communication port RS232 between GSM modem and PC. AT command is used to control the function of the modem. Apart from that, data acquisition module is used for real time monitoring and interfacing between hardware and software. Then, the physical value was converts to the readable data by front panel. For future application, this system would be applied to laboratory and it will benefit to technician, students by upgrading the quality of learning in university.

ABSTRAK

PC-based power failure monitoring with SMS Notification merupakan satu sistem yang dicipta untuk memapar dan mengawal dengan menggunakan penghantaran satu spesifikasi *Short Message Service (SMS)* melalui telefon bimbit. Objektif utama sistem ini adalah untuk mengawal punca kuasa yang bermasalah melalui sistem *SMS* ketika mengesan punca bekalan kuasa yang bermasalah. Sebagai langkah untuk mencapai objektif projek, *LabVIEW* digunakan sebagai aturcara bergrafik untuk mencipta panel paparan peralatan maya. Oleh itu, parameter seperti voltan, arus, kuasa, penunjuk untuk bekalan kuasa yang rosak dan rujukan nombor telefon bimbit dapat dipaparkan pada komputer untuk tujuan pengawasan, dan semua punca kuasa dapat dikawal dengan menggunakan panel paparan *LabVIEW* melalui sistem *SMS*. Sistem ini boleh dikawal dari jauh di mana manusia boleh mengawal suis *ON/OFF* pada perkakas tertentu tanpa menggunakan wayar. Untuk melaksanakannya, satu *GSM modem* dihubungkan dengan panel paparan *LabVIEW* di mana ia boleh menerima *SMS* daripada satu rujukan nombor telefon bimbit. Projek ini memilih untuk menggunakan *GSM modem* kerana ia merupakan satu peralatan komunikasi yang mudah diperolehi di merata tempat. Ini adalah untuk membolehkan manusia berhubung antara satu sama lain dengan menggunakan telefon bimbit yang sedia ada di dunia ini. *PC* dihubungkan kepada *GSM modem* melalui perisian *LabVIEW* dengan menggunakan kabel *serial communication RS232* di mana ia dapat digunakan untuk memapar dan menghantarkan isyarat kawalan kepada *modem*. *AT commands* merupakan satu kod isyarat kawalan yang membolehkan *modem* tersebut berfungsi. Di samping itu, *Data Acquisition Module* digunakan untuk pengawasan masa nyata dan ia merupakan pengantaramuka di antara perisian dan perkakasan supaya nilai-nilai fizikal yang diukur dapat ditukarkan ke bentuk data yang dapat dibaca melalui panel paparan. Dengan mengaplikasikan sistem ini di makmal, ia akan memberi manfaat kepada staf makmal, pelajar dan juga meningkatkan kualiti pembelajaran universiti.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	PROJECT TITLE	i
	BORANG PENGESAHAN STATUS LAPORAN	ii
	STUDENT DECLARATION	iii
	SUPERVISORY DECLARATION	iv
	DEDICATION	v
	ACKNOWLEDGEMENT	vi
	ABSTRACT	vii
	ABSTRAK	viii
	TABLE OF CONTENTS	ix
	LIST OF TABLES	xii
	LIST OF FIGURES	xiii
	LIST OF ABBREVIATION	xv
	LIST OF APPENDIX	xvi
I	INTRODUCTION	
	1.1 Introduction	1
	1.2 Objective	3
	1.3 Problem Statement	3
	1.4 Scopes of Work	4
	1.5 Brief Explanation of Methodology	4
	1.6 Report Structure	5
II	LITERATURE REVIEW	

2.1	Introduction	6
2.2	Introduction to SMS	7
	2.2.1 Benefits of SMS	8
	2.2.2 SMS Application	10
2.3	LabVIEW	11
	2.3.1 LabVIEW Programming	12
	2.3.2 Advantages Of Using LabVIEW	12
2.4	WaveCom M1306B GSM/GPRS-Modem (Fastrack Modem)	15
	2.4.1 About Wavecom Products	17
	2.5 AT Commands Interface	19
	2.5.1 Basic Commands and Extended Commands	21
2.6	Data Acquisition	22
	2.6.1 NI DAQ USB 6009	22
	2.6.2 Advantages of Using NI USB-6009	28
2.7	Relay Circuit Diagram	29

III PROJECT METHODOLOGY

3.1	Introduction	30
3.2	Flow Chart Diagram	31
3.3	System Block Diagram	33
3.4	Methods of Send SMS Messages from a Computer	35
	3.4.1 The 1st Way: Sending SMS Messages from a Computer Using a Mobile Phone or GSM/GPRS Modem	36
	3.4.2 The 2nd Way: Sending SMS Messages from a Computer through a Connection to the SMSC or SMS Gateway of a Wireless Carrier or SMS Service Provider	37
3.5	Software Development	38
	3.5.1 Front Panel	38
	3.5.2 Block Diagram	39

3.5.3	Control and Indicator	40
3.5.3.1	Control	40
3.5.4	Use LabVIEW (Basic Serial Write and Read) to Send AT Commands to a Mobile Phone or GSM/GPRS Modem	42
3.5.5	Use LabVIEW (Basic Serial Write and Read) to Read AT Commands from a Mobile Phone or GSM/GPRS Modem	46
3.6	Troubleshooting On Relay Driver Circuit	48

IV RESULT AND DISCUSSION

4.1	Introduction	49
4.2	Analysis of Overall System	49
4.3	Analysis of Hardware	50
4.4	Software Analysis	52
4.4.1	Analysis of Front Panel – SMS Notification Section	52
4.4.2	Analysis of Front Panel – Power Supply Section	55
4.4.3	Analysis of Block Diagram	56

V CONCLUSION AND RECOMMENDATION

5.1	Conclusion	66
5.2	Recommendation	67

REFERENCE	68
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LIST OF TABLES

NO	TITLE	PAGE
2.1	Features GPS of WISMO GSM Product	18
2.2	Features GPS of Integra GSM Product	18
2.3	Features GPS of Fastrack GSM Product	19
2.4	Analog Terminal Assignment	25
2.5	Digital Terminal Assignment	26
3.1	Function of AT Command (1)	37
3.2	Function of AT Command (2)	42
3.3	Function of AT Command (3)	46
4.1	Function of VISA Configuration Serial Port Programming Code	56
4.2	Function of Concatenate Strings Programming Code	58
4.3	Function of VISA Write Programming Code	58
4.4	Function of VISA Read Programming Code	59
4.5	Function of VISA Close Programming Code	60
4.6	Function of Match Pattern Programming Code	61
4.7	Function of VISA Flush I/O Buffer Programming Code	62
4.8	Function of Others Programming Code	62

LIST OF FIGURES

NO	TITLE	PAGE
2.1	Most-Used Software for Data Acquisition and Instrument Control	15
2.2	GSM Modem	16
2.3	NI DAQ USB 6009	22
2.4	Device Block Diagram NI USB 6009	24
2.5	Analog Input Circuitry	26
2.6	Analog Output Circuitry	27
2.7	Example of Connecting a Load	28
2.8	Example of Relay Circuit for Controlling an AC Device	29
3.1	Flow Chart Diagram	31
3.2	System Block Diagram	33
3.3	Internal Components in Prototype	34
3.4	Window of Front Panel	38
3.5	Window of Block Diagram	39
3.6	Basic Control	41
3.7	Front Panel for String to Write and Read String	42
3.8	SMS-DELIVERs are Directly Stored; SMS-STATUS-REPORTs are Displayed	43
3.9	SMS-SUBMIT Message with a Validity Period (one day)	44
3.10	Text mode to Send a Short Message	44
3.11	Set Service Center Address to +60120000015(maxis)	45
3.12	Send a SMS-SUBMIT to Mobile Phone	45
3.13	Text mode to send a Short Message	46

3.14	Read a Short Message	47
3.15	List All the Short Message inside the SIM Card	47
3.16	Connection USB 6009 with Relay Driver Circuit	48
4.1	Overall System Block Diagram	51
4.2	Front panel of PC Based Monitoring Power Failure With SMS Notification (1) – SMS Notification Section	54
4.3	Front panel of PC Based Monitoring Power Failure With SMS Notification (2) – Power Supply Section	55
4.4	VISA Configure Serial Port	56
4.5	Concatenate Strings	57
4.6	VISA Write	58
4.7	VISA Read	59
4.8	VISA Close	59
4.9	Match Pattern	60
4.10	VISA Flush I/O Buffer	61
4.11	Block Diagram of PC Based Monitoring Power Failure With SMS Notification (1) – SMS Notification Section	64
4.12	Block Diagram of PC Based Monitoring Power Failure With SMS Notification (2) – Power Supply Section	65

LIST OF ABBREVIATION

PC	-	Personal Computer
VI	-	Virtual Instrument
LabVIEW	-	Laboratory Virtual Instrumentation Engineering Workbench
DAQ	-	Data Acquisition
NI	-	National Instrument
AC	-	Alternating Current
GSM	-	Global System for Mobile
RFI	-	Radio Frequency Interference
ADC	-	Analog-To-Digital Converter
NO	-	Normally Open
NC	-	Normally Closed
SMS	-	Short Message Service

LIST OF APPENDIX

NO	TITLE	PAGE
A	Datasheet WaveCom M1306B GSM/GPRS-Modem (Fastrack Modem)	69
B	Procedure for Testing	71
C	Safety Precautions	74

CHAPTER I

INTRODUCTION

This chapter will give reader a basic introduction to how the idea of this project generated. The chapter contains introduction, objective of the project, problem statement, scopes of work, brief methodology, and report structure.

1.0 Introduction

There has been tremendous rise in number of mobile customers in world (> 2 billion). Due to widespread growth of cellular network and drastic reduction in call rates and lower-end handsets, mobile usage has percolated all sections of society. Latest mobiles can not only allow you to click pictures, play music, store your address book, hook you to Internet, download e-mails, guide you through maze of city streets but also enable you to watch latest blockbusters, favorite TV programs, book tickets and transact business. In recent years, a system is developed for remote monitoring and control of devices using mobile through spoken commands. The system offer several attractive features like:

- control from anywhere in world if cellular coverage is available acknowledgement about execution of command from system to user
- uses spoken commands from user for control

- alerts user on occurrence of any abnormal
- conditions like power failure, parameters
- exceeding prescribed limits, etc.
- ease of implementation and cost-effective approach.

In a remote system monitoring application, a program (sometimes with the help of a group of sensors) is constantly monitoring the status of a remote system. If a certain condition is satisfied, the program will send a text message to the system administrator to notify him/her of the situation.

This project title is “PC-based power failure monitoring with SMS notification”. This project is an upgraded version of the current project. Very often, unstable voltage from the main power supply and power trips are encountered in the laboratory which will not only cause subsequent damages to sensitive equipment but also affect the learning process during experiments. Current project only achieved up parameters of voltage, current, power and faulty power points on the screen of PC. The current system only can give alert to person in charge by displaying warning message through PC. In order to improve current project, GSM modem will be implemented to send notification via SMS. This project use NI LabVIEW software to create a front panel of virtual instrument. The data acquisition module, NI DAQ (USB 6009) device is used for real time monitoring and it provides interfacing between hardware and software. Transducer is used to convert the measured voltage to DAQ readable voltage level. GSM modem is used to interface between the PC and the mobile phone. So, the system will send out a SMS to person in charge as warning if any abnormal of voltage level has occurred. This project is shown in the block diagram as below:

1.1 Objectives

The main purposes of this project are to design and implement a PC-based power failure monitoring with via SMS System. Therefore, the objectives as below should be achieved.

- i. To design and develop the PC-Based Power Failure Monitoring with via SMS System by using LabVIEW.
- ii. To design and develop the interfacing between software and control circuit by using GSM modem and LabVIEW.
- iii. To monitor the operated power point, and close all the power point in one time through the front panel with SMS notification.
- iv. To allow person in charge to take immediately action by using SMS notification when the unstable voltage level has occurred.

1.2 Problem Statement

Generally, electrical power is one of the importance basic necessary in our life. It has been used for driving the electrical and electronic equipments in our daily life to perform some tasks. Present equipment setups and devices used in commercial and industrial facilities, such as digital computers, power electronic devices, and automated equipment, are sensitive to many types of power disturbances. Power disturbances arising within facilities have increased significantly due to the increasing use of energy efficient equipment such as switch-mode power supplies, inverters for variable speed drives, and more. The monitoring, data collection and alerts user on occurrence of any abnormal for power quality study therefore has to be conducted. In the other side, the situation of power trip is one of the phenomena that always happen in the laboratory. Therefore, an alert system is necessary used to alert the responsible people immediately and take immediate action to prevent or safe our valuable things. For this situation, human need a system to help and initiate actions to alert or warn people who are in responsible, and to seek assistance before they are in danger. Therefore, “PC-Based Power Failure Monitoring with via SMS System” is the best alternative to overcome the problem.

1.3 Scope of Work

The scopes of works in this project are:

- i. LabVIEW is used to create the front panel of virtual instrument.
- ii. NI DAQ 6009 is a data acquisition unit that used to interfacing between hardware and software.
- iii. GSM modem is used to interfacing between the PC and mobile phone through via SMS if any abnormal of the system has occurred.
- iv. AT commands is used for controlling the functionality of modem.
- v. The cellular phone is used to send/receive a message for monitoring/control the condition of power point.

1.4 Brief Explanation of Methodology

First of all, this project is beginning by having a discussion with supervisor about the general ideas and concepts that would be used in this project. Next, for literature review stage, the background of this project is studied and research is done by referring various sources like: reference book, I.E.E.E journals, website of National Instrument, and data sheet. For the following stage, all the information related to components, DAQ, GSM modem information is seeking, and the most suitable would be selected for used in this project. On next stage, the LabVIEW programming is studied, and the front panel of virtual instrument is created and simulated. Hardware interfacing would be studied on the following stage. After that, the hardware for this project is built and assembled; and the system is ready for overall system testing. If the outputs of this system fulfill the project requirements and specification, so this project is considered success. If the output of this system did not fulfill the desired output, so the troubleshooting would be carry out until it reaches the project requirements.

1.5 Report Structure

This report is documentary delivering the ideas generated, concepts applied, activities done, and finally the product of project itself. It consists of five chapters. Following is a chapter-by-chapter description of information in this report.

Chapter 1 gives reader a basic introduction to how the idea of this project generated. The chapter contains introduction, objective of the project, problem statement, scopes of work, brief methodology, and report structure.

Chapter 2 is a literature review on theoretical concepts applied in this project. The chapter concludes the background study of power system, PC-based monitoring system. Besides that, this chapter also explains how the PC-based monitoring power failure with SMS notification work, what is LabVIEW, what is DAQ, what is GSM modem and application of others component. Then, why choose the specific DAQ, GSM modem, and related components.

Chapter 3 introduces the methodology of the project. The chapter contains the flow chart which explains the overall method taken along the project carry out. Besides that, this chapter also introduces the construction of the project, which involves hardware development and software development. Basically, the hardware development for the project concludes with front panel LabVIEW design, block diagram design, and study AT commands for GSM modem. Besides, the software development of project will discuss what graphical programming is, how to use the LabVIEW, and how to implement it on this project.

Chapter 4 will be covered all the result from designing process. It will also include a discussion about the project. The chapter concludes with discussion on front panel of virtual instrument and control circuit for the system.

Chapter 5 will be conclusion of the PSM project. The chapter concludes with some recommendation that can be implemented in the future.

CHAPTER II

LITERATURE REVIEW

This chapter is a literature review on theoretical concepts applied in this project. The chapter concludes the background study of power system, PC-based monitoring system. Besides that, this chapter also explains how the PC-based power failure monitoring with SMS notification work, what is LabVIEW, what is DAQ, what is GSM modem and application of others component. Then, why choose the specific DAQ, GSM modem, and related components.

2.1 Introduction

Throughout the world, there have been many researches about the concept and implementation of this PC-based power failure monitoring with SMS notification system. This project is implemented to enhance the available similar system with additional functions and applied it on the Laboratory of Electronic Industrial at UTeM.

Literature reviews are based in information obtained from valid sources such as books, articles of relevance, published paper or any other source deemed appropriate. One of the more famous sources for literature reviews from IEEE, denoting the Institute of Electrical and Electronics Engineers which is based in New

York, USA. The forms of literature include standards of practice, proceeding paper or conference papers such as those from the Power Engineering Conference.

2.2 Introduction to SMS

SMS appeared on the wireless scene in 1991 in Europe. The European standard for digital wireless, now known as the Global System for Mobile Communications (GSM), included short messaging services from the outset.

In North America, SMS was made available initially on digital wireless networks built by early pioneers such as BellSouth Mobility, PrimeCo, and Nextel, among others. These digital wireless networks are based on GSM, code division multiple access (CDMA), and time division multiple access (TDMA) standards.

Network consolidation from mergers and acquisitions has resulted in large wireless networks having nationwide or international coverage and sometimes supporting more than one wireless technology. These new classes of service provider's demands network-grade products that can easily provide a uniform solution, enable ease of operation and administration, and accommodate existing subscriber capacity, message throughput, future growth, and services reliably. Short messaging service center (SMSC) solutions based on an intelligent network (IN) approach are well suited to satisfy these requirements, while adding all the benefits of IN implementations.

SMS provides a mechanism for transmitting short messages to and from wireless devices. The service makes use of an SMSC, which acts as a store-and-forward system for short messages. The wireless network provides the mechanisms required to find the destination station(s) and transports short messages between the SMSCs and wireless stations. In contrast to other existing text-message transmission services such as alphanumeric paging, the service elements are designed to provide guaranteed delivery of text messages to the destination. Additionally, SMS supports several input mechanisms that allow interconnection with different message sources and destinations.

A distinguishing characteristic of the service is that an active mobile handset is able to receive or submit a short message at any time, independent of whether a voice or data call is in progress (in some implementations, this may depend on the MSC or SMSC capabilities). SMS also guarantees delivery of the short message by the network. Temporary failures due to unavailable receiving stations are identified, and the short message is stored in the SMSC until the destination device becomes available.

SMS is characterized by out-of-band packet delivery and low-bandwidth message transfer, which results in a highly efficient means for transmitting short bursts of data. Initial applications of SMS focused on eliminating alphanumeric pagers by permitting two-way general-purpose messaging and notification services, primarily for voice mail. As technology and networks evolved, a variety of services have been introduced, including e-mail, fax, and paging integration, interactive banking, information services such as stock quotes, and integration with Internet-based applications. Wireless data applications include downloading of subscriber identity module (SIM) cards for activation, debit, profile-editing purposes, wireless points of sale (POSs), and other field-service applications such as automatic meter reading, remote sensing, and location-based services. Additionally, integration with the Internet spurred the development of Web-based messaging and other interactive applications such as instant messaging, gaming, and chatting.

2.2.1 Benefits of SMS

In today's competitive world, differentiation is a significant factor in the success of the service provider. Once the basic services, such as voice telephony, are deployed, SMS provides a powerful vehicle for service differentiation. If the market allows for it, SMS can also represent an additional source of revenue for the service provider.

The benefits of SMS to subscribers center on convenience, flexibility, and seamless integration of messaging services and data access. From this perspective, the primary benefit is the ability to use the handset as an extension of the computer. SMS also eliminates the need for separate devices for messaging because services