UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGNING DATA LOGGER FOR RTU SYSTEM IN DISTRIBUTION AUTOMATION SYSTEM

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Power) with Honours.

By

MOHAMAD HAMIROEL NAZRIN BIN MOHAMAD HUSNI ALHADI

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

……

(Project Supervisor)

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ABSTRAK

Sistem Pengagihan Automasi (DAS) adalah untuk memantau dari jauh sistem pengagihan yang memudahkan kawalan penyeliaan peranti dan memberikan alat sokongan keputusan. Dalam DAS terdapat perolehan data yang dikenali sebagai Unit Terminal Kawalan Jauh (RTU). Fungsi RTU adalah untuk mengumpul maklumat dari lapangan dalam bentuk nilai-nilai analog atau digital, penggera dan status dan jumlah meter. Sistem pengumpulan data adalah digunakan untuk mengumpul data daripada RTU. Data ini digunakan untuk memantau sistem dan sistem akan memberi isyarat kepada pengguna apabila kesilapan berlaku dalam RTU. Kerosakan itu akan berlaku apabila RTU berada dalam keadaaan voltan rendah atau lebihan voltan. Sistem pengumpulan data direka dengan menggunakan perisian Visual Basic. Pengumpulan data direka untuk meningkatkan sistem pemantauan di RTU kerana sistem ini disambungkan menggunakan rangkaian LAN tanpa wayar dan lebih mudah untuk memantau tanpa pergi ke lokasi RTU.

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ABSTRACT

Distribution Automation System (DAS) is for remotely monitors the distribution facilitates supervisory control of devices and gives decision support tools. In DAS there is a data acquisition called Remote Terminal Unit (RTU). The function of the RTU is gather information from the field in the form of analogue or digital values, alarm and status points, and metered amounts. In this system data logger is used to collect data from the RTU. The data are used to monitor the system and the system will alert the user when any faults occur in the RTU. The fault will occur when the RTU indicates undervoltage or overvoltage. The data logger system will be designed using Visual Basic software. The data logger is designed to improve the monitoring system in the RTU because the system is connected using a wireless LAN network and it is easier to monitor without going to the RTU location.

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DEDICATION

This report is dedicated to
my beloved famiy,
my supervisor, P.M. Mohd Arrif Bin Mat Hanafiah,
my academic advisor, Mr. Khalil Bin Adha
and my classmates, Nur Alia Bt Rusli, Siti Sakinah Bt Mohammed khir,
Mohamad Afif B Mohamad and Nurul Fatin Bt Rosdani
who enabled me to complete
my final year project

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LIST OF ABBREVIATIONS

RTU	-	Remote Terminal Unit
DAS	-	Distribution Automation System
GUI	-	Graphical User Interface
HMI	-	Human Machine Interface
LAN	-	Local Area Network
MTU	-	Master Terminal Unit
SCADA	-	Supervisory Control and Data Acquisition
GSM	-	Global System for Mobile
TCP/TP	-	Transmission control protocol / internet protocol
PIC	-	Peripheral Integrated Circuit
LED	-	Light Emitting Diode
CPP	-	Controller Pitch Propeller
GSM	-	Global System for Mobile Communication

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CHAPTER 1
INTRODUCTION

1.0 Project background

Distribution Automation System (DAS) is based on an integrated technology, it involves in analyzing data and collects statistics for the system to control the resolution that in the field and justify that the desired result is obtained. (Ahmed, 2010). In Distribution Automation System (DAS), a data acquisition device called Remote Terminal Unit (RTU) is used to record and acquire electrical parameter data, such as voltage, current, switch status, temperature, and oil level. In this project, the data logger is connected through the Remote Terminal Unit (RTU) system via wireless LAN communication network to collect the data from the system. The data logger is an electronic device that uses to collect the data from the system. The data logger is an electronic device that uses to collect and record data through time with a built-in instrument or sensor or via external instrument and sensors. The data logger basically access the output of a number of transducer and convert the measurement into a form that can be recorded.

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1.1 Motivation

The system will make wider the user's ability to make change to the process and to see what is happening in the process. When the process is very simple, the user able to instantly see what is happening and reach out to make the operation change as needed. The user can control the system by using the user interface from their computer. This will help in improving the system because when the faults occur, the user can control the system without going to the fault location.

1.2 Problem statement

RTU (Remote Terminal Unit) collects information from the field in the form of digital or analogue values, and status point. The data from RTUs are stored at the time received and any data update will overwrite old values with new values. However, performance statistics are important in supplying customers and the regulator with actual figures on power quality of segments of the network. So now to produce a performance statistic, the data must be collected consecutively.

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1.3 Objective

i. To perform a data logger system for RTU (Remote Terminal Unit) in DAS (Distribution Automation System)
ii. Designing a user interface that can control RTU (Remote Terminal Unit) system
iii. To create an extra security in data logger system

1.4 Scope

The scope of this project will focus on:

i. To design user interfaces that can monitor data from the RTU using Microsoft Visual Basic 2010 Express
ii. To design a data logger that can interact with the RTU system through wireless LAN network
iii. To create Graphical User Interface (GUI) that can control RTU using Microsoft Visual Basic 2010 Express

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CHAPTER 2
LITERATURE REVIEW

2.1 Basic principle

2.1.1 Distribution Automation System (DAS)

Distribution Automation System (DAS) enhance a utility's operation and develop the reliability of its distribution power system. Next, it provides express electricity network management and support Smart grid. The DAS basically monitors the distribution system in long distance, facilitates supervisory control of device and gives decision support tools to increase the system performance in Supervisor Control and Data Acquisition (SCADA). (Ahmed, 2006)

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2.1.2 Remote Terminal Unit (RTU)

Remote Terminal Unit (RTU) existed as a set of sub system, not favouring some design instead concentrating on application. RTU created as a part of supervisory control and data acquisition or distribution automation system. In RTU hardware, it consists of many components such as main board, power supply, digital input, digital output, analogue input, UART, LCD Display, Buzzer and LED Indicators. (Jusoh *et al.*, 2014). Figure 2.1 shows hardware components in RTU. Remote Terminal Unit commonly is used to acquire electrical parameter data from the line, process information, and transmit commands and instruction to components of the system appropriately. Furthermore, RTU also have a process of transmitting the information from communication network and communicate with the central computer. Furthermore, the RTU communicates with sensor that measure field equipment conditions and with actuators that changes field equipment conditions. (Smith and Block, 1993)

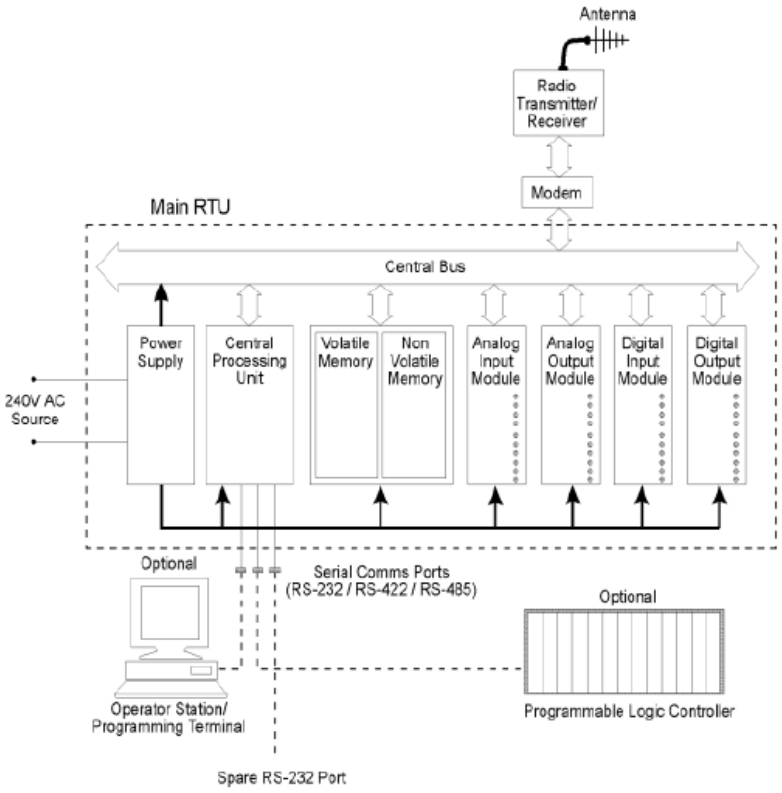

Figure 2.1: Hardware components in RTU

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2.1.3 Data Logger

Data logger is an electronic device that can collects the data continuously. It also can be called as a data recorder. Data logger can interface with a personal computer and use software such as Visual Basic software to active the data logger. In software that consists of data logger system, the user can analyse the collected data. Table 2.1 shows the comparison between standalone, web and wireless data logger. Besides. Data logger has capability to implement data communication by employing to GSM network. (Munandar, 2014)

Standalone Data Logger	**Web based Data Logging systems**	**Wireless Data Logger**
Simple and quick to deploy	Remote monitoring system	Centralized data collection for a board reaching system
Inexpensive	Wide range of wired plug and play sensor	No manual data offload to speed data gathering time
USB manual offload	Data on the web	Self-healing networks

Table 2.1: Comparison between standalone, web and wireless data logger

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2.1.4 Visual Basic Software

Visual Basic is a development tool that using programming language and can be used to build software applications and attractive and functional user interface that can be used in other application. Furthermore, Visual Basic also can create application for web, hand held devices, and host of other environment and settings. (More, Willis and Newsome, 2010). Figure 2.2 shows the example of visual basic software user interface.

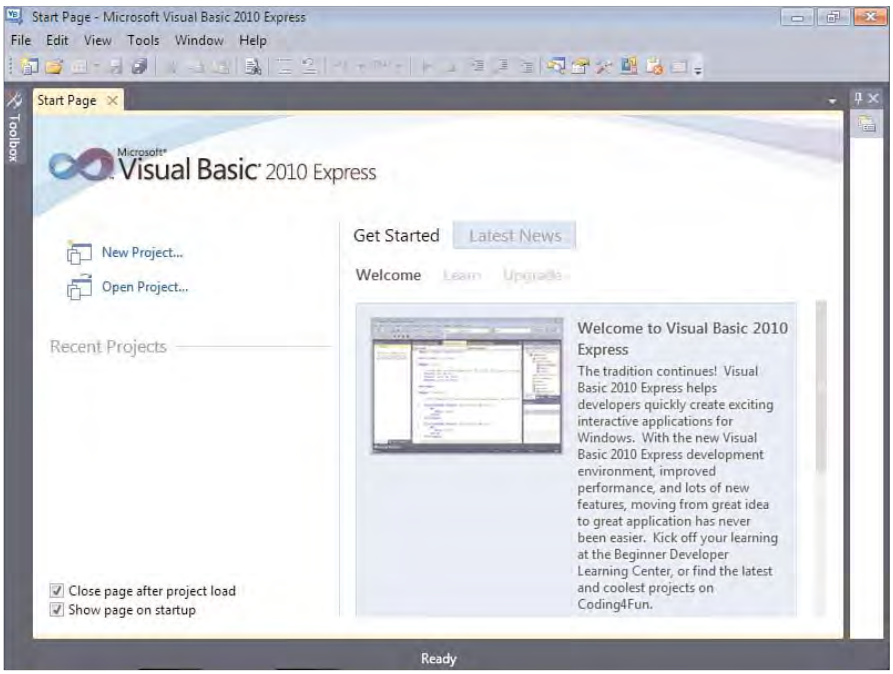

Figure 2.2: Example of Visual Basic software

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2.1.5 LAN wireless protocol

Implementing wireless communication protocols on distribution automation system, it will easier to communicate with the RTU from long distance. Remote distribution points can be access from an integrated into an existing SCADA system or web application. This will allow the cost of utilities reduced and extend their distribution automation system to the furthest points in their distribution system.

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