

Microcontroller Based Substation Monitoring and Control System with Gsm Modem

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Abstract : *The purpose of this project is to acquire the remote electrical parameters like Voltage, Current and Frequency and send these real time values over GSM network using GSM Modem/phone along with temperature at power station. This project is also designed to protect the electrical circuitry by operating an Electromagnetic Relay. This Relay gets activated whenever the electrical parameters exceed the predefined values. The Relay can be used to operate a Circuit Breaker to switch off the main electrical supply.*

User can send commands in the form of SMS messages to read the remote electrical parameters. This system also can automatically send the real time electrical parameters periodically (based on time settings) in the form of SMS. This system can be designed to send SMS alerts whenever the Circuit Breaker trips or whenever the Voltage or Current exceeds the predefined limits.

This project makes use of an onboard computer which is commonly termed as microcontroller. This onboard computer can efficiently communicate with the different sensors being used. The controller is provided with some internal memory to hold the code. This memory is used to dump some set of assembly instructions into the controller. And the functioning of the controller is dependent on these assembly instructions. The controller is programmed using Embedded C language.

Keyword: *GSM Modem, Initialization of ADC module of microcontroller, PIC-C compiler for Embedded C programming, PIC kit 2 programmer for dumping code into Micro controller, Express SCH for Circuit design, Proteus for hardware simulation.*

I. Introduction

Electricity is an extremely handy and useful form of energy. It plays an ever growing role in our modern industrialized society. The electrical power systems are highly non-linear, extremely huge and complex networks [1]. Such electric power systems are unified for economical benefits, increased reliability and operational advantages. They are one of the most significant elements of both national and global infrastructure, and when these systems collapse it leads to major direct and indirect impacts on the economy and national security [2]. A power system consists of components such as generators, lines, transformers, loads, switches and compensators. However, a widely dispersed power sources and loads are the general configuration of modern power systems [3]. Electric power systems can be divided into two sub-systems, namely, transmission systems and distribution systems. The main process of a transmission system is to transfer electric power from electric generators to customer area, whereas a distribution system provides an ultimate link between high voltage transmission systems and consumer services. In other words, the power is distributed to different customers from the distribution system through feeders, distributors and service mains. Supplying electricity to consumers necessitates power generation, transmission, and distribution [4]. Initially electric power is generated by using electric generators such as: nuclear power generators, thermal power generators and hydraulic power generators and then transmitted through transmission systems using high voltage. Power departs from the generator and enters into a transmission substation, where huge transformers convert the generator's voltage to extremely high voltages (155kV to 765 kV) for long-distance (up to about 300 miles) transmission [4]. Then, the voltage level is reduced using transformers and power is transferred to customers through electric power distribution systems. Power starts from the transmission grid at distribution substations where the voltage is stepped-down (typically to less than 10kV) and carried by smaller distribution lines to supply commercial, residential, and industrial users [4]. Novel electric power systems encompassing of power transmission and distribution grids consist of copious number of distributed, autonomously managed, capital-intensive assets. Such assets comprise: 1.) power plants, 2.) transmission lines, 3.) transformers, and 4.) protection equipment [1].

Electric utility substations are used in both the transmission and distribution system and operate independently to generate the electricity. A typical substation facility consists of a small building with a fenced-in yard that contains transformers, switches, voltage regulators, and metering equipment that are used to adjust voltages and monitor circuits [4]. A reliable and efficient process of these networks alone is not very significant when these electricity systems are pressed to their parameters of its performance, but also under regular operating conditions. Generators and loads are some components that coerce the continuous dynamic behavior [5].

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Table of Contents Microcontroller Based Substation Monitoring And Control

1. Understanding the eBook Microcontroller Based Substation Monitoring And Control
 - The Rise of Digital Reading Microcontroller Based Substation Monitoring And Control
 - Advantages of eBooks Over Traditional Books
2. Identifying Microcontroller Based Substation Monitoring And Control
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Microcontroller Based Substation Monitoring And Control
 - User-Friendly Interface
4. Exploring eBook Recommendations from Microcontroller Based Substation Monitoring And Control
 - Personalized Recommendations
 - Microcontroller Based Substation Monitoring And Control User Reviews and Ratings
 - Microcontroller Based Substation Monitoring And Control and Bestseller Lists
5. Accessing Microcontroller Based Substation Monitoring And Control Free and Paid eBooks
 - Microcontroller Based Substation Monitoring And Control Public Domain eBooks
 - Microcontroller Based Substation Monitoring And Control eBook Subscription Services

- Microcontroller Based Substation Monitoring And Control Budget-Friendly Options
- 6. Navigating Microcontroller Based Substation Monitoring And Control eBook Formats
 - ePub, PDF, MOBI, and More
 - Microcontroller Based Substation Monitoring And Control Compatibility with Devices
 - Microcontroller Based Substation Monitoring And Control Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Microcontroller Based Substation Monitoring And Control
 - Highlighting and Note-Taking Microcontroller Based Substation Monitoring And Control
 - Interactive Elements Microcontroller Based Substation Monitoring And Control
- 8. Staying Engaged with Microcontroller Based Substation Monitoring And Control
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Microcontroller Based Substation Monitoring And Control
- 9. Balancing eBooks and Physical Books Microcontroller Based Substation Monitoring And Control
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Microcontroller Based Substation Monitoring And Control
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Microcontroller Based Substation Monitoring And Control
 - Setting Reading Goals Microcontroller Based Substation Monitoring And Control
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Microcontroller Based Substation Monitoring And Control
 - Fact-Checking eBook Content of Microcontroller Based Substation Monitoring And Control
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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