

## **Microcontroller Based Substation Monitoring and Control System with Gsm Modem**

**Amit Sachan**

*Department of Energy & Power Engineering NIMS University, Jaipur, Rajasthan*

**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].

# Microcontroller Based Substation Monitoring And Control

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## **Microcontroller Based Substation Monitoring And Control:**

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*ITSPWC 2022* S. Kannadhasan, R. Nagarajan, George Ghinea, Alagar Karthick, Basim Alhadidi, Kanagaraj Venusamy, 2022-08-04 We are delighted to introduce the proceedings of the first edition of the 2022 International Conference on Intelligent Technologies in Security and Privacy for Wireless Communication ITSPWC 2022 This conference has brought researchers developers and practitioners around the world who are leveraging and developing the Wireless Communication The theme of ITSPWC 2022 was Security and Challenges for Wireless Communication and Power Energy The technical program of ITSPWC 2022 consisted of 33 full papers including 5 invited papers in oral presentation sessions at the main conference tracks The conference tracks were Track 1 Recent Trends in IoT Track 2 Recent Trends in Smart Energy Systems and Transmission Track 3 Recent Trends in Embedded Systems and Track 4 Recent Trends in Communication Systems Aside from the high quality technical paper presentations the technical program also featured one invited talk and two technical workshops The invited talk was presented by Prof Kaushik Pal from Universidade Federal do Rio de Janeiro Brazil The ITSPWC workshop aimed to gain insights into key challenges understanding and design criteria of employing wireless technologies to develop and implement future related services and applications It was a great pleasure to work with such an excellent organizing committee team for their hard work in organizing and supporting the conference In particular the Technical Program Committee led by our Co Chairs Dr R Nagarajan Dr George Ghinea Dr Alagar Karthick Dr Bassim Alhadidi and Prof Kanagaraj Venusamy who have completed the peer review process of technical papers and made a high quality technical program We are also grateful to all the authors who submitted their papers to the ITSPWC 2022 conference and workshops We strongly believe that ITSPWC conference provides a good forum for all researcher developers and practitioners to discuss all science and technology aspects that are relevant to Security and Privacy in Wireless Communication We also expect that the future Wireless Communication

conference will be as successful and stimulating as indicated by the contributions presented in this volume Dr S Kannadhasan IoT and Analytics in Renewable Energy Systems (Volume 2) O.V. Gnana Swathika,K. Karthikeyan,Sanjeevikumar Padmanaban,2023-08-11 Smart cities emanate from a smart renewable energy aided power grid The smart grid technologies offer an array of benefits like reliability availability and resiliency Smart grids phenomenally contribute to facilitating cities reaching those sustainability goals over time Digital technologies such as the Internet of Things IoT automation artificial intelligence AI and machine learning ML significantly contribute to the two way communication between utilities and customers in smart cities Five salient features of this book are as follows Smart grid to the smart customer Intelligent computing for smart grid applications Novel designs of IoT systems such as smart healthcare smart transportation smart home smart agriculture smart manufacturing smart grid smart education smart government smart traffic management systems Innovations in using IoT and AI in improving resilience of smart energy infrastructure Challenges and future research directions of smart city applications ICAE 2022 Prasaja Wikanta,Alena Uperiat,Abdurahman Dwijotomo,2023-06-28 This is proceeding for the 5th International Conference on Applied Engineering ICAE 2022 held online in Batam Indonesia on 5 October 2022 ICAE is an annual conference organized by Politeknik Negeri Batam This year ICAE was structured in 3 tracks namely Electronics Informatics and Mechanicals ICAE received 64 papers in various topics including Control Systems and Mechanical Engineering Applied Mechanics and Control Systems Computational Mechanics and Microelectronic Circuits and Systems Micro Electro Mechanical System RFID and Electronics Design Electronics materials Sensor Networks Fuzzy Systems AI and Expert Systems Virtual Reality Augmented Reality Architecture and Topology Geo Information GIS and Remote Sensing Multimedia Content IoT Semiconductor technology IoT Devices and other related fields All submission were peer reviewed with at least 3 reviewers provided for each paper A total of 37 selected which is around 58% acceptance rate We express gratitude to all who contributed to the success of ICAE 2022 We acknowledge the invaluable assistance of the track chairs and the track program committee members It required the significant efforts of many people to make this virtual conference possible especially in this time of COVID 19 pandemic We thank the Organizing Committee members along with the numerous reviewers for their assistance with the reviews of the submitted manuscripts These reviewers serve to bring a broad set of perspectives to the research arena We especially thank the authors who have provided the submitted manuscripts The quality of these papers is a tribute to the authors and also to the reviewers who have guided any necessary improvement Last but not least we are greatly indebted to the three keynote speakers Prof Yusep Rosmansyah S T M Sc Ph D from Information Technology Research Division KKI School of Electrical Engineering and Informatics STEI Institut Teknologi Bandung ITB Indonesia Dr Hj Mohammad Nabil Almunawar Associate Professor School of Business and Economics Universiti Brunei Darussalam Ashwani Singh PhD Global R for delivering the keynote speeches in this conference We hope this ICAE proceeding will have impact to the research community in the longer

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