

## Substation Monitoring Using Microcontroller and GSM

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### ABSTRACT

#### Article Info

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The purpose of this project is to accumulate the remote electrical parameters like voltage, current , temperature and frequency then send these real time readings by GSM network using GSM modem/phone alongside temperature at power station. This project is additionally designed to protect the electrical circuitry by operating a spdt relay. The relay takes action whenever these electrical parameters exceed the predefined readings. The relay is often used to cut the foremost electrical supply. User can receive values of various electrical parameters to their Mobile messages to read the remote electrical parameters. This technique can also automatically send the important time electrical parameters periodically(based on time settings) within the type of SMS. This system is often designed to send SMS alerts whenever the relay trips or whenever the voltage or current exceeds the predefined limits. This project makes use of a microcontroller. The controller can efficiently communicate with the various sensors getting used. The controller is given some internal memory to carry the code. This memory is employed to carry set of assembly instructions to the controller. And the functioning of the controller depends on these assembly instructions. The controller is programmed using embedded c# language.

#### Article History

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**Keywords :** Substation Monitoring, Real Time Values, Microcontroller, GSM Module

### I. INTRODUCTION

The healthy Power can be supplied by Substation but for that Great Monitoring han to be done for the goods of consumers favour in this automated era. Depending on the voltage levels and utility users, there are various substations such as Transmission Substation and Distribution Substation those supply

electrical power to various loads. Remote monitoring make these substations to be operated through wireless communication technologies like GSM, GPRS, Ethernet, etc. with specified parameters. These parameters include voltage, current, frequency, power factor, temperature, and so on. The following GSM based project deal with substation monitoring aspects. Here in this project we made a prototype

of substation and just one parameter voltage is to be remote monitored. A substation facility may be a small building which contains transformers, switches, voltage regulators, and metering equipment that are meant to adjust voltages and monitor circuits. A substation is assessed as: 1) Transmission 2) Distribution. The distribution side of substation is that the major focus of the project. Since the facility generated at the most stations is transported many miles using transmission lines before they reach the substations. an enormous amount of power loss is observed during the transportation of the power. Therefore, measurements must be obtained either at sending stations and consumer end, to ensure quality of power supply is maintained continuously. The main objective of the project is to make sure that expensive equipment like power and distribution transformers are guarded against damages thanks to overloading and faulty conditions like short-circuit, surges etc. The transformer will be continuously monitored by the designed monitoring and control system. To achieve this objective a prototype model is supposed for “Microcontroller Based Substation Monitoring and Control System with GSM(Global System for Mobile Communication) Module”. the planning is initialised on microcontroller that monitors and the parameters like RMS secondary voltage of the distribution transformer, RMS secondary current of the distribution transformer, frequency of the availability, power factor, active and reactive power and complicated power of the substation.

To improve the quality of power with suffer solution it is necessary to be familiar with what sort of constraint has occurred.

Today electricity still suffers from power outages and blackouts due to the lack of automated analysis and poor interference of the utility end over the Grid. Now, these parameters will give the utility end to provide the needed view by collecting information from the different sub-systems of the grid. A sensor node will decide the

1. The valuation of sensible data: we assign three levels {0, 1, and 2}.
2. The selection of a communication policy: priority 0-no further action is performed, priority 2-value is sent to the sink because it is considered as urgent and a notification has to be directly sent, Level 1-we assume that value should be reported because it may signal as fault or a problem that is less urgent than priority-2 data.

### 1. 1 OBJECTIVE OF PAPER

- ❖ Real Time Monitoring
- ❖ To Maintain Continuity of supply
- ❖ To Improve Power Quality
- ❖ Substation/power station voltage can be monitored from anywhere in the world
- ❖ Feedback of the devices being operated can also be developed.
- ❖ Efficient and low cost monitoring system Monitoring is easy and user friendly

### 1. 2 BLOCK DIAGRAM

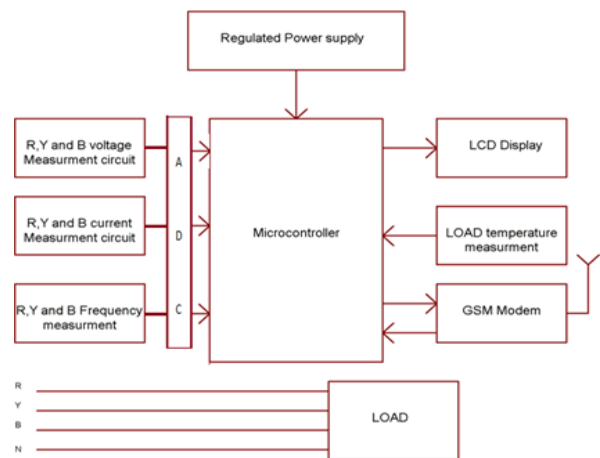


Fig. 1 Block Diagram of project

### 1. 3. DATA FACTS

GSM interfacing with microcontroller:

Features of SIM:- Dual Band 900/1900MHz,

Power Consumption- About 10mA

Temperature :- -40 Degree Celcius to 75 Degree Celcius

Input voltage :- 7. 5V. AT commands are used for Interfacing

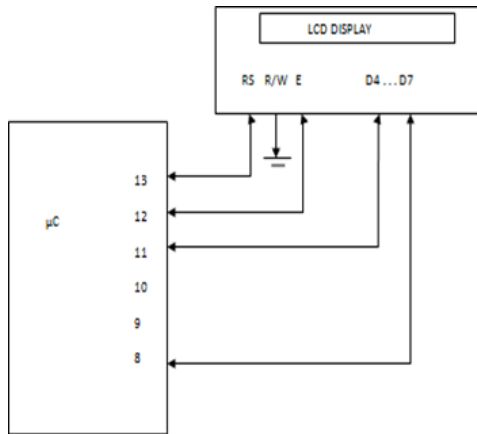


Fig -2: GSM interfacing with Microcontroller

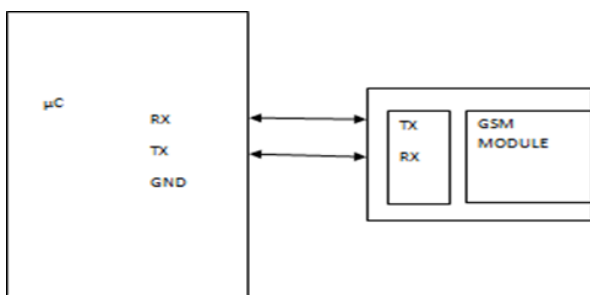


Fig - 3 : LCD interfacing with Microcontroller

### 3. HARDWARE IMPLEMENTATION:

#### 3. 1 Voltage Measurement circuit:

Apparatus : 3 - Phase supply, 3-Phase variac, Transformer, Bridge Rectifier, register, LCD Display, Arduino

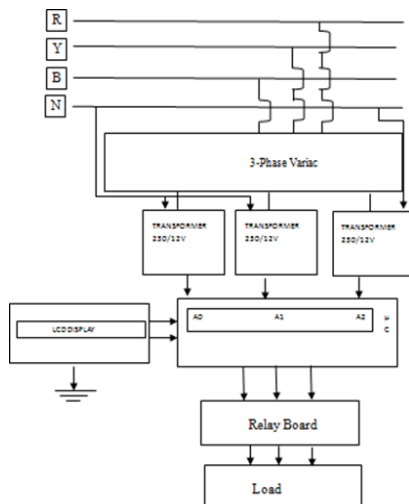


Fig -6: Block diagram representation of Voltage measurement circuit

#### WORKING:-

The aim of stepping down 3 phase voltage are being employed for one connection is completed with the incoming phase wire and thus the facing connection is completed with the neutral wire. For our project we've set the working voltage range between 210V to 250V. The voltage is varied with the help of 3 phase variac. The limit are often easily altered as per the need . It will Operate if the voltage is in the Prescribed range . If the Voltage is beyond the permissible limit then the relay will operate and isolate the circuit.

A message is shipped through GSM stating the sensed condition as under voltage or over voltage. As the voltage gets the range then it'll connect load with the supply .

#### 3. 2 Current Measurement circuit:

Apparatus: Load, relay (10A capacity), GSM, LCD

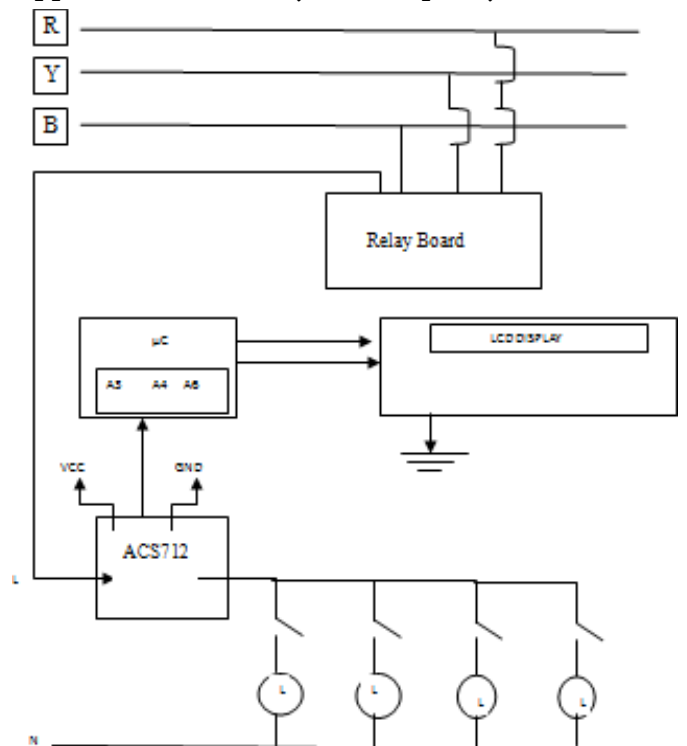


Fig -4 : Block diagram representation of current measurement circuit

**WORKING:**

The circuit makes use of current sensor ACS712. Three current sensors are employed for the aim of measuring currents altogether 3 phases. One connection is completed with the incoming phase wire and on the opposite connection is completed with the wire on which the load is connected. For current the upper limit is about at 1.6A. The limit are often easily altered in case the load is modified . Here 4 lamps are connected as load. Limits are set such that the circuit operates satisfactorily if 3 lamps are turned ON. the relay operation will takes place and isolate te circuit when the 4th lamp is executed , the relay will operate to attach the load with availability . Again a message is sent stating that the power has been restored.

**3. 3 Frequency Measurement Circuit**

Apparatus: IC555 Timer, 220K, POT, +5V DC, GS, LCD Display

**Working:**

Three transformers are employed for the aim of stepping down 3 phase voltage. First Connection is done with wire of incoming phase and the other connection is done with the neutral wire. We have taken the range of 210V to 250V for our project. The voltage is varied with the help of 3 phase variac. The Range can be easily modified. The circuit operates satisfactorily if the voltage is within the limits. The relay operates and isolates the circuit if the voltage comes in contact with the above limit then the operation of Measurement will execute. A message is shipped through GSM stating the sensed condition as

under voltage or over voltage. As the voltage, attains the prescribed limit, the relay again connects the load with the availability .

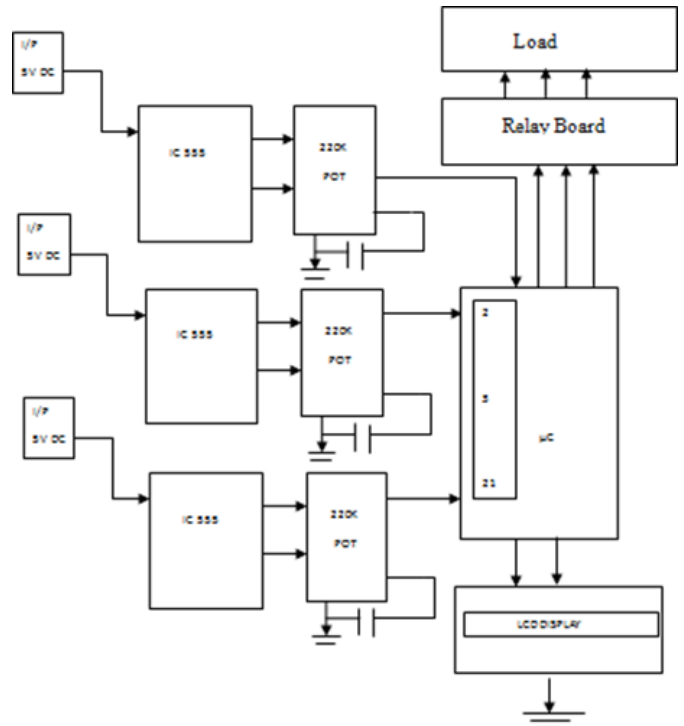


Fig – 7 : Block diagram representation of Temperature measurement circuit

**3. 4 Temperature Measurement circuit**

Apparatus: LM 35 Temperature Sensors, Load, LCD Display, Arduino

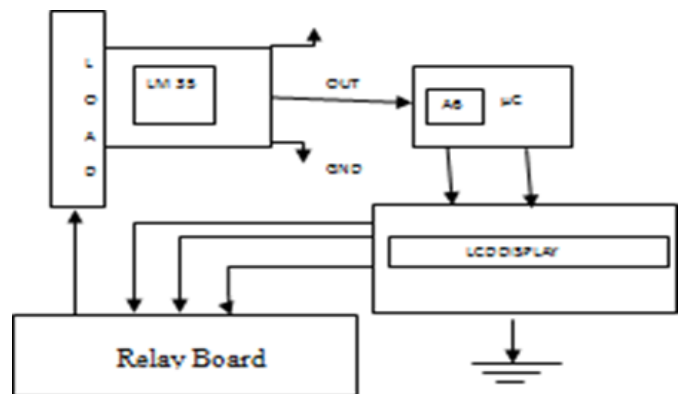


Fig -8 : Temperature measurement circuit Block diagram

## WORKING:

The circuit makes use of temperature sensor LM352. Only one sensor is used for the aim of measuring the temperature. The Measurement Circuit has three pins such as Output, Input which are connected to Ground and the VCC which is Input Voltage. The limit is kept at 80°C. The limit are often easily altered as per the need . The relay operates and isolates the circuit if the temperature exceeds 80°C. A message is shipped through GSM stating the condition as overheating of the equipment with which the sensor is connected. When the temperature comes within the bounds , the relays hook up with the equipment with the availability . A message is sent stating that the power has been restored.

### 4. 1 ADVANTAGES

- ✓ GSM based user-friendly interfacing.
- ✓ Low power consumption.
- ✓ Controls high and low voltage devices.
- ✓ Long life.
- ✓ GSM message alert.
- ✓ Fast response.
- ✓ Efficient and low cost design.
- ✓ Low power consumption.
- ✓ The Device can be operated from anywhere in the world

### 4. 2 APPLICATIONS

- ✓ This system can be used for monitoring in Substations, Power Stations.
- ✓ This system can be implemented in industries.
- ✓ It can be used in places where humans cannot work.
- ✓ Mainly in military applications, robots play a vital role for detection of explosives.

- ✓ It Can be used to control devices

## 5. RESULTS



Fig 8 - Actual Electrical Parameters Such as Current, Voltage, Frequency and Temperature recorded as OutputAC

## II. CONCLUSION

On completion of our project “Substation Monitoring using Microcontroller and GSM” we can improve the power quality of system and provide uninterrupted power supply. Also real time monitoring of electrical parameters is obtained which can provide safety to the substation and its equipments. Secondly, using highly advanced IC’s with the project has been successfully implemented. Thus the project has been successfully designed and tested.

## III. ACKNOWLEDGEMENT

On the submission of our project report of “SUBSTATION MONITORING USING MICROCONTROLLER AND GSM”, we would like to extend our gratitude & sincere thanks to my Guide and their constant motivation and support during the course of our work. It is all because of their untiring endeavours, able

guidance and valuable suggestion, that could synchronize our efforts in covering the many diverse feature of the project and thus helped us for the smooth progress and success of the project. We truly appreciate and value their guidance and encouragement from the commencement to the end of this project report. Their Continuous effort and knowledge would be remembered lifelong.

#### IV. REFERENCES

- [1]. Sachan, Amit. "Microcontroller based substation monitoring and control system with gsm modem." IOSR Journal of Electrical and Electronics Engineering 1, no. 6 (2012): 13-21
- [2]. Murugan, T., Periasamy, A., & Muruganand, S. (2012). Embedded based industrial temperature monitoring systems using GSM. International Journal of Computer Applications, 58(19).
- [3]. Ranvir, K.V., Solanke, M.A., Ratnaparkhi, R.P. and Sable, A.N., 2015. Substation Monitoring System. International Journal of Engineering and Technical Research, 3(2), pp.306-308.

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