OPEN ACCESS INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING

"3-PHASE FAULT DETECTION WITH GSM MODEM"

Rishikesh Vadje[1], Punam Kshirsagar[2], Rakhi Shinde[3], Aniket Kamble[4], Ankita Ramteke[5].
Electrical Engineering Department,
SKN-Sinhgad Institute of Engineering and Technology,
Kusgaon(Bk.), Lonavala, India

Abstract: ***The fault that occurred in the distribution and transmission systems is appropriately and correctly indicated in this paper using a GSM-based fault detection method. Various safety devices, voltage and current sense sections, microcontroller sections, LED display sections, and GSM (global system for mobile communication) modules are included in the proposed system. This device will assist the local electricity board and servicemen in detecting the fault quickly and avoiding transformer damage. The Current transformer, Potential transformer, Microcontroller, RS-232 cable, and GSM modem are all used in this device. With the aid of a Microcontroller, this device detects, analyses, and classifies faults automatically. Thissystem also shows the type of fault occurred in transmission lines, such as L-L (line to line), L-G (line to ground), L-L-G (double line to ground), L-L-L (double line to ground), L-L-L (double line to ground), L-L-L (double line to ground), L-L-G (double line to ground), L-L-G (double line to ground), L-L-G (double line to ground), L-L-G (symmetrical fault). This information is then sent to the service provider via GSM text message.***

Keywords: *Fault, GSM Modem, Transmission Lines, Microcontroller, Line to Line fault, Line to ground fault, LCD.*

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I INTRODUCTION

In the overall electrical power system, more than 80% of A transmission failure occurs.. In this paper the design and implementation of fault detection, classification and protection techniques of transmission lines are present.

When normally a fault is being detected that would be generally unseen that means we could not find where the fault occurred. As a result, we could not take action to fix the problem. On account of the project and research work, a blessing word is introduced to us that is if a fault is detected we can easily find the suspect's region where a fault is occurring. By implementing the proposed research work we can detect the fault easily by getting an SMS from a cell phone on the blessing of using the GSM module. The authentic goal is that the sensor faults in exact time and protects the transformer at the shortest possible time.

When a fault occurs, the insulating path and conducting path get affected which causes the short circuit and open circuit of the conductor. During ideal operating conditions, the power system equipment operated at normal voltage and current rating. But in faulty conditions, the voltage and current values swing from their reference value. Normally our power system is protected by switch-gear and protection equipment like relays, circuit breakers fuse to reduce the losses of service due to the electrical failure after the occurrence of faults.

A **fault**, also known as a fault current, is an irregular electric current that passes along a line in an electrical power system. A fault in a three-phase system can occur between one or more phases and ground, or it can occur only between phases. Faults can be divided into two categories:

1. Balanced fault: This fault is also known as a symmetric fault. It has an equal impact on all three phases of the transmission line. In total transmission line faults, approximately 5% of faults are symmetric.
2. Unbalanced faults are an example of an asymmetric fault. Asymmetric faults have no impact on all three phases of the transmission line. It is further subdivided into three types:

1) Line-to-line fault: This fault happens when two lines come into direct contact with each other, resulting in a short circuit between them. Asymmetric L-L faults account for around 5% of all faults.
2) Line-to-ground fault: A short circuit between one line and the ground causes this form of fault. This occurs as a result

of physical contact between the line and the ground conductor as a result of storm damage and lightning, among other things. In transmission line faults, this is the most common fault.

3) Double line-to-ground fault: A double line-to-ground fault occurs when two lines come into direct contact with each other and the ground conductor. This type of fault occurs 15-20% of the time.

II. FAULT IN THREE PHASE DEVICES AND THEIR CAUSES

A. Overvoltage: When the device voltage exceeds 110 percent of the nominal voltage rating, it is referred to as an overvoltage. Overvoltage can result from a variety of factors, including sudden load reductions, load switching, lightning strikes, control equipment failure, such as voltage regulators, and neutral displacement. The part connected to the supply could be damaged by this point of overvoltage.

B. Under-voltage: When the voltage supplying the drive is too low, this point arises. Under-voltage happens when the input voltage is less than the nominal voltage rating,such as when a 440 V system is operated by 220 V.

C. Overheating: Overheating occurs when thetemperature of the equipment exceeds the nominal values. When the equipment is overloaded, it can overheat. Short circuits, single line to ground faults, L-L faults, and other issues may cause overheating. It has the potential to harm machinery windings as well as the electrical system.

III THE CAUSES OF FAULT IN THREE PHASE DEVICES

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III.SYSTEM PROPOSED

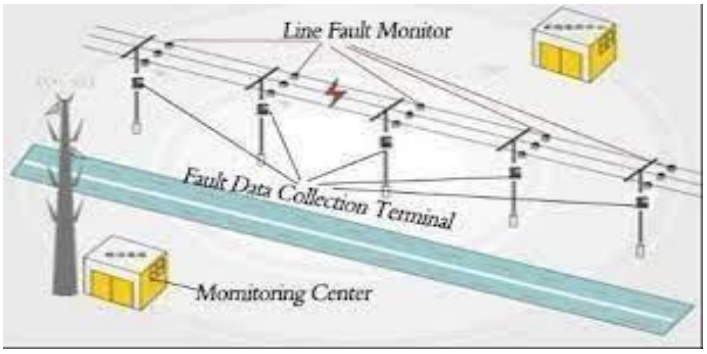


Figure 1 shows an overview of a fault detection system with several lines.

A. Block diagram

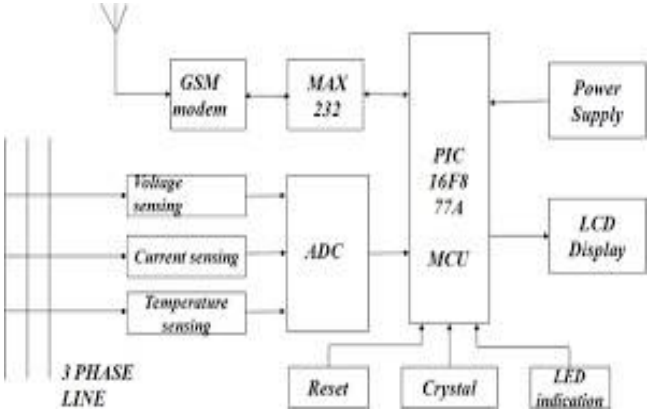


Figure 2: A block diagram of a GSM-based multiple line fault detection system.

B. Working Principle:

A block diagram of multiple line fault detection using GSM technology is shown in the figure. The three-phase parameters of voltage, current, and temperature are sensed by CT PT & LM 35 sensing equipment. When a transmission line failure occurs, voltage and current values deviate from their nominal levels. These values are continuously sent to the ADC (analogue to digital converter), which transforms them into digital values that the microcontroller requires. The microcontroller then compares the digital values from the ADC to reference values. If the real-time values differ from the reference values, the microcontroller sends a signal to the GSM, indicating that a fault has occurred in the device (e.g., a shift in voltage, current, or temperature). The GSM receives this signal from the microcontroller and sends an SMS to the service provider company as well as the local serviceman.

C. MICROCONTROLLER & LCD CIRCUIT INTERFACING.

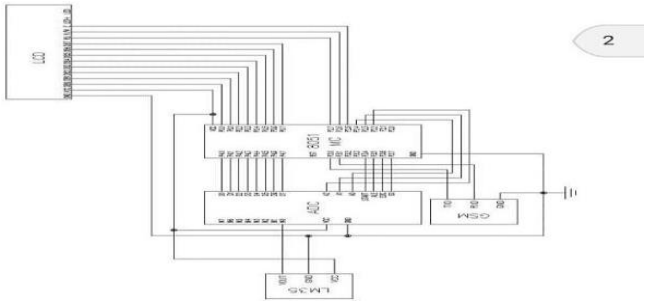


Figure: 3. Circuit Interfacing with Microcontroller & LCD.

IV REQUIRED HARDWARE

A. 89S52 MICROCONTROLLER

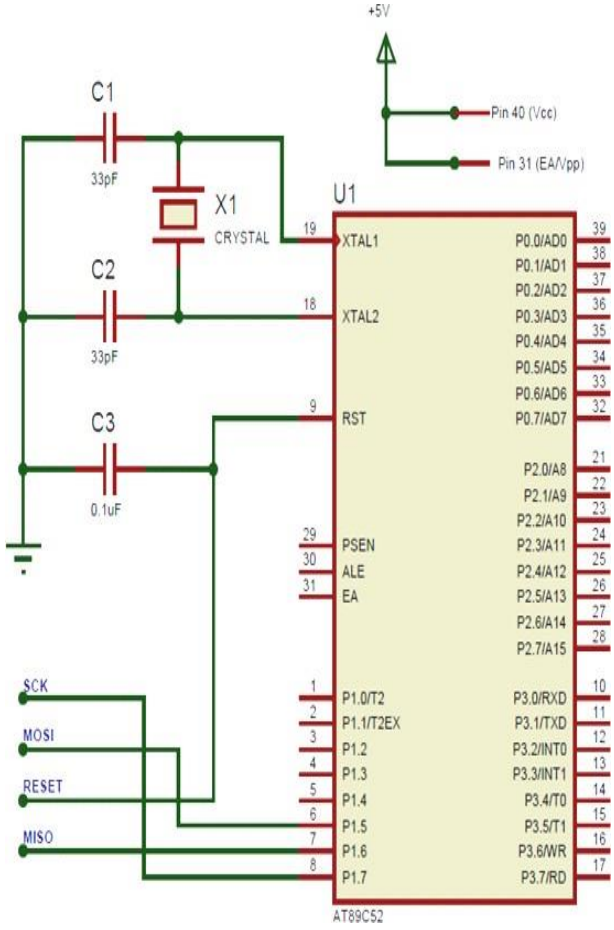


Figure: 4. Microcontroller At 89s52-Pin diagram.

The 89S52 has 4 different ports, each one having 8 Input/output lines providing a total of 32 I/O lines. Those ports can be used to output DATA and orders to other devices, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have 'dual function' meaning that they can be used for two different functions.

The first one is to perform input/output operations and the second one is used to implement special features of the microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer, or connecting the chip to a computer to update the software. Each port has 8 pins and will be treated from the software point of view as an 8-bit variable called 'register', each bit being connected to a different Input /Output pin.

B. LCD

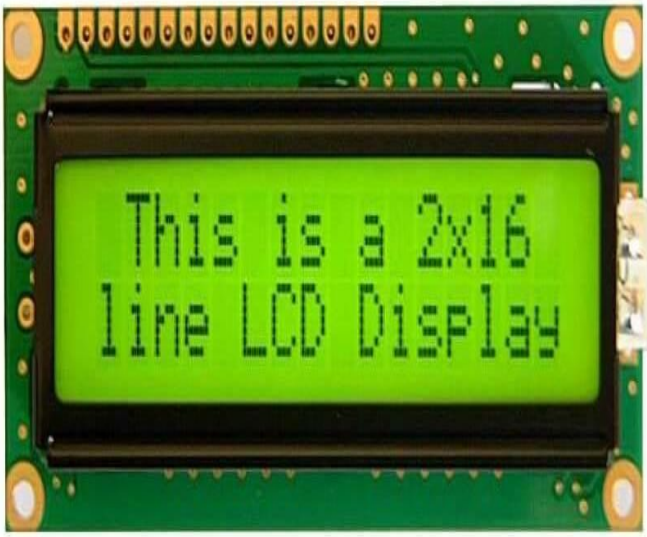


Figure: 5. LCD Display.

An LCD (Liquid Crystal Display) screen is a type of electronic display that can be used in a variety of ways. A 16x2 LCD is a very simple module that can be used in a variety of devices and circuits. A 16x2 LCD can display 16 characters per line on each of its two sides. Each character is represented in a 5x7 pixel matrix on this LCD. The intelligent alphanumeric dot matrix displays 16 x 2 characters.. Each character is represented in a 5x7 pixel matrix on this LCD. The 224 different characters and symbols can be seen on the 16 x 2 intelligent alphanumeric dot matrix monitor. Command and Data are the two registers on this LCD.

Various commands provided to the display are stored in the command register. The data register holds the information that will be shown. Putting data that creates the picture of what you want to show into the data registers, then instructions into the instruction register, is how you monitor the display. Liquid Crystal Library simplifies this for you in your Arduino project, so you don't have to.

Liquid Crystal Library simplifies this for you in your Arduino project, so you don't have to know the low-level instructions. The potentiometer connected across VEE pins can be modified to change the display's contrast.

C. GSM MODEM

Figure: 6. GSM MODULE

D. GSM MODULE

(Global System For Mobile Communications, originally Group Special Mobile), is a standard Avelp by European Telecommunication Standards Institute (ETSI) to describe protocols for second ration (2G) digital cellular networks used by mobile phones. It is the de facto global standard for communication with over 90 % market share and is available in over 219 countries territories.

The GSM standard was developed as a replacement for first-generation (IG) analog cellular networks, ad originally described a digital, circuit-switched network optimized for full-duplex voice telephony Thee was expanded over time to include data communication, first by circuit-switched transport then ket data transport via GPRS (general packet radio service) and EDGE (Enhanced Data rates for GSM Evolution or EGPRS).

Subsequently, the 3GPP developed third-generation (3G) UMTS standards followed by fourth (4G) LTE Advanced standards, which are not part of the ETSI GSM standard GSM is owned by the GSM Association. It may alsorefer to the initially most common voice codec Full Rate.

V ADVANTAGE

1. This system provides precise information on the type of fault that occurred in the line, such as L-G, L-L, and so on.
2. Because of the GSM system, which provides real-time status of the transmission system, we can easily track it from anywhere in the world. There is less upkeep.
3. This system is more adaptable than the current system, allowing it to quickly resolve the time taken to locate a fault in any area.
4. Because of its small size and light-weight, we can easily instal the device on a pole.
5. Reduce human intervention.
6. More accuracy.
7. More accuracy.
8. Improved Safety & security.

VI FUTURE SCOPE

This project can be used to protect equipment such as a three-phase motor. Equipment is connected to the transmission line. From the control room itself, it can be known in which line what type of fault has occurred can be known.

The aim of this paper is to send a short message to the service provider authority if a transmission line fault occurs. The distance between poles is used in this model to predict the position of the fault.

We should connect a GPS (global positioning system) to it in the future so that it can be sent to the exact location of the transmission line fault in terms of longitude and latitude. We will use sufficient programming in the future to determine the distance between the fault and the substation.

VII THE END RESULT

Fig7. Result displayed LED.

Fig 8. Result displayed on Mobile Phone.

Using this scheme, we can obtain the result shown in the image above. The result indicates a line-to-ground fault on the LCD, which happened during the blue process. SMS messages are also sent to the service provider business and local

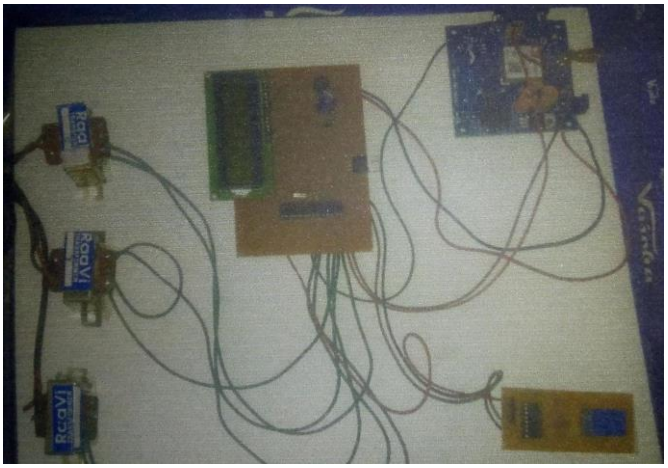
servicemen. All other faults, such as L-L faults, L-L-G faults, and so on, can also be observed.

VIII FINAL CONCLUSION

The review will surely help for the next research in the same field. Based on this study work the controlling of the electrical equipment can be done by using the IoT, GSM, and Wifi. The previous study done by authors hasn't used this device, also hasn't made simultaneous study. The main focus in this study is to switch and fault detection of electrical equipment and control it by command from another place. The study done here is the literature review for the next work. The work will be done by using circuit diagrams and the android application.

IX PROJECT IMAGE.

Fig 9. Example of a full project picture. (3 phase fault



detection with gsm modem).

X ACKNOWLEDGMENT

We would like to express our sincere gratitude towards our guide Prof Mrs. Ankita Ramteke for her continuous evaluation and help. Also we would thank our Principal Sir Prof. M S Rohokale for his motivation and confidence he showed upon us, which helped us in carrying continuous and extensive research as well as learning related to the topic.

REFERENCES

[1]M. Bertalmio, G. Sapiro, V. Caselles, and C. Ballester, “Image inpainting”, in Proc. SIGGRAPH, pp. 417–424, 2000.

[2]A. Criminisi, P. Perez, and K. Toyama, “Region filling and object removal by exemplar-based image inpainting.”, IEEE Transactions on Image Processing, vol. 13, no.9, pp. 1200–1212, 2004.

[3]Marcelo Bertalmio, Luminita Vese, Guillermo Sapiro, Stanley Osher, “Simultaneous Structure and Texture Image Inpainting”, IEEE Transactions On Image Processing, vol. 12, No. 8, 2003.

[4]Yassin M. Y. Hasan and Lina J. Karam, “Morphological Text Extraction from Images”, IEEE Transactions On Image Processing, vol. 9, No. 11, 2000.

[5]Eftychios A. Pnevmatikakis, Petros Maragos "An Inpainting System For Automatic Image Structure-Texture Restoration With Text Removal", IEEE Trans. 978-1-4244-1764, 2008.

[6]S.Bhuvaneswari, T.S.Subashini, “Automatic Detection and Inpainting of Text Images”, International Journal of Computer Applications (0975 – 8887) Volume 61– No.7, 2013.

[7]Aria Pezeshk and Richard L. Tutwiler, “Automatic Feature Extraction and Text Recognition from Scanned Topographic Maps”, IEEE Transactions on geosciences and remote sensing, VOL. 49, NO. 12, 2011.

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[20th -21st May, 2021]

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Address for Correspondence SKN Sinhgad Institute of Technology and Science Lonavala, Pune. 410 401, MS, India.

Website: www.sinhgad.edu

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