

Protection of 3-Phase Distribution Line Fault and Detection of Rise in Temperature of Transformer by using GSM Technique

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Abstract— The demand of household electrical application increases in our daily life and therefore the efficient and effective management of electrical distribution system required. Most of the existing systems are reliable on various applications but not perfect for electrical applications. Electrical environment will have lots of disturbance in nature, due to natural disasters like storms, cyclones or heavy rains transmission and distribution lines may lead to damage. The electrical wire may cut and fall on ground, this leads to very harmful for human beings and may become fatal. Also in summer season damage of transformer and blast occurs. So, a rigid, reliable and robust communications like GSM technology instead of many communication techniques used earlier. This enhances speed of communication with distance independency. This technology saves human life from this electrical danger by providing the fault detection and automatically stops the electricity to the damaged line and also conveys the message to the electricity board to clear the fault.

Key words: Arduino, LCD, Relay, GSM Module, Temperature Sensor

I. INTRODUCTION

In day by day increase in electricity supply requirements which increases demands on the network of power lines. The special protection schemes that could be beneficial by using communication scheme to increase the accuracy & reliability. There are some examples of fault over loading solid faults (i.e. Single line to ground, double line to ground, line to line, triple line to ground, three phase short circuit Faults), over voltage & under voltage fault.

Electrical equipment is prone to disturbances which are fault imposed on the system such as line break and short circuit. This in turn causes damage to the power equipment in the distribution system and also at the consumer's end. The impact can bring about a short or long-term loss of the electric power in an area. Prompt attention to power distribution faults is very vital in power systems, avoiding harm and instability to the system. To overcome these challenges, a power distribution monitoring and fault detection system using GSM technology is proposed. There are several existing systems that can be deployed but however they all have their respective limitations for electrical applications. This is why GSM technology is chosen to deliver a cost effective, rigid and robust communication as it enhances speed of communication irrespective of distance.

II. PROPOSED SYSTEM

A. Block Diagram:

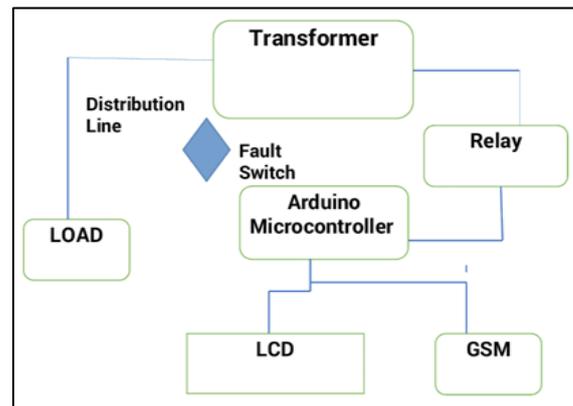


Fig. 2.1: Block diagram

B. Arduino:

The Arduino UNO is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6-analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with AC-to-DC adapter or battery to get started. The UNO differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the ATmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.



Fig. 2.2: Arduino UNO

C. LCD:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is

displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. Here we show temperature and the fault occur message.

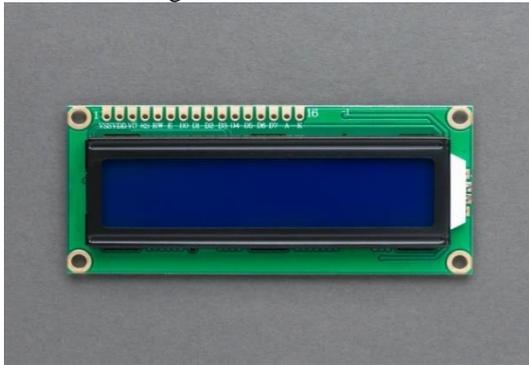


Fig. 2.3: LCD

D. Relay:

It is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. In this project we use 6V DC-SPDT type Relay.



Fig. 2.4: Relay

E. GSM Module:

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design. SIM900 we are used for SMS purpose. This module is compatible with arduino.



Fig. 2.5: GSM module

III. ACTUAL CIRCUIT DIAGRAM

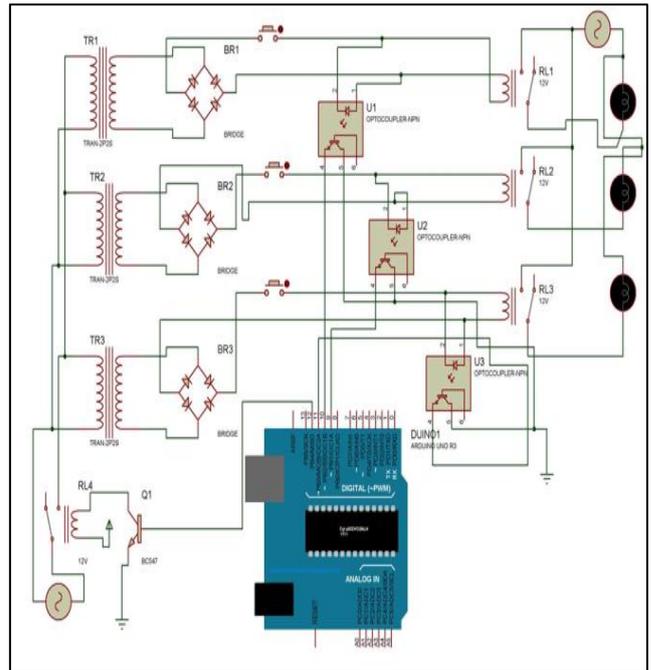


Fig. 3.1: Circuit Diagram

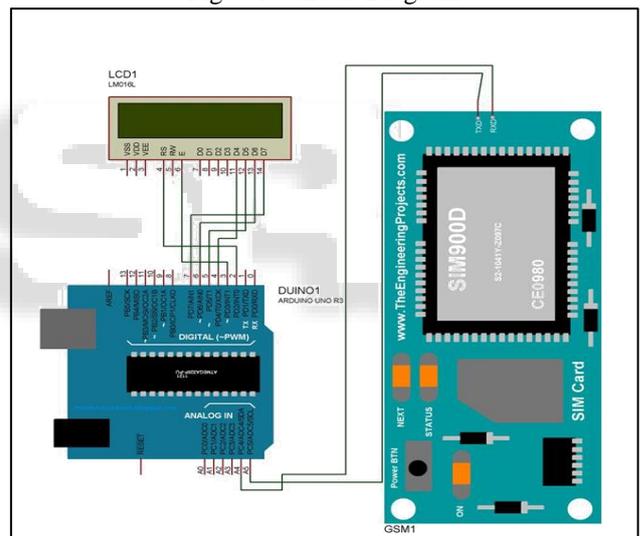


Fig. 3.2: LCD and GSM Interfacing with Arduino

IV. ACTUAL PROJECT WORKING DIAGRAM



Fig. 4.1: Demo Model

A. Working:

A Three Phase Line Fault Detection (TPLFD) is a device which provides visual indication & remote detection of the abnormal condition on electrical power distribution system. The solid and major faults as mentioned can be detected by GSM module via messages. While patrolling of this fault it can be detected by indication lamps on RYB phase. In recent, impedance relay or distance relays are used to detect and cleared the fault, but this system requires long time to calculate the distance using the impedance & the pre-fault current relay, till to reach the fault location and repair the faulty phase, the system will be in OFF state and the supply to the consumers is unreliable.

In this we had used the Current transformer (C.T.) of good sensitivity. The C.T. is connected or Clamped on each phase and the secondary terminal of each C.T. is connected to three single bridge rectifier which gives D.C. current and converted into respective voltage by using I to V converter. Here, some reference output voltage with respect to current is set to the input of Arduino, the Arduino circuit acts as the zero crossing detector, if the fault is detected then Arduino module sends the command to the GSM module and relay of phase indication lamp.

The GSM module creates the message using Arduino module which reads the faulty phase and sends message to the Operator, sub engineer and junior engineer of that location. After these, the operator will get the location of fault and faulty phase and alerting message at certain period. By this process the work or clearance of fault will be done quickly with their responsibility. The RYB indication is placed at the top of the pole or tower which will indicate at long distance and shows the faulty phase from far end which will shows the actual location of phase fault and hence Operator can find out the TPLFD circuit and can repair. The digital display is provided to show the pre fault current and the faulty phase on the location. Also after the fault is occurred the supply to the circuit is disconnected, so the external battery source with battery charging circuit is provided to keep the TPLFD circuit continuously in operation. And last detection is done by using temperature sensor, which sense the rise in temperature of transformer, at the same time transformer is isolated from the system. When the fault is cleared and the system become healthy the transformer will comes in system.

V. ADVANTAGES

- 1) The system helps to identification of exact fault on the respective phase.
- 2) Arduino based development provides major sophistications & flexibilities.
- 3) Minimizes human interface.
- 4) The system used is cost effective.
- 5) Improve the system availability and performance.

VI. APPLICATIONS

- 1) Industrial fault detection system.
- 2) It is used in distribution and transmission fault detection system
- 3) It can be used in Mines.

VII. FUTURE SCOPE

- 1) In future we can make a voice call which give information about fault and fault location.
- 2) In future we can replace GSM technique by WIFI system.
- 3) At present we are displaying fault on LCD And it can be display on MSEB Offices computer.

VIII. CONCLUSION

This paper concludes that the GSM technology used for the fault detection of three phase line through messages is provided to the In-charges of that location, by the means of communication protection schemes. The Messages of fault location will send to the In-charge at by the internal programming of Arduino connected to GSM Module. To get the exact faulty phase under abnormal condition has been occurred, the RYB Indicators are also provided for faulty phase indication purpose. Also this project helps to detect transformer temperature, when temperature rise to certain level transformer is automatically isolated from the system. If this system is implemented, our system will become reliable and faultless, which is our main vision in the project.

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