# MONITORING AND PROTECTION OF DISTRIBUTION TRANSFORMER USING GSM MODULE

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**Abstract -** *The aim of the project is to design a monitoring and protection system for distribution transformer with the help of GSM and GPS technology. The present monitoring system requires manpower which is the time consuming and it is difficult to predict the occurrence of faults. In this project, we designed a system which continuously monitors the transformer parameters such as load current, voltage, oil level and ambient temperature with the help of sensors. These values displayed continuously on the LCD display and it is recorded in the system memory. If any abnormalities occur in the transformer then an alert message with the parameter values are send to the monitoring centre along with the location by means of GSM and GPS which are integrated with the Adriano board. This system will help the transformer to operate smoothly and identify the problems before any catastrophic failure.*

*Key Words*: **GSM module, Microcontroller, Fault indicator, Buzzer.**

## 1. INTRODUCTION

In power systems, distribution transformer is electrical equipment which distributes power to the low voltage users directly, and its operation condition is an important component of the entire distribution network operation. We need a distribution transformer real- time monitoring system to detect all operating parameters operation, and send to the monitoring centre in time. It leads to online monitoring of key operational parameters of distribution transformers which can provide useful information about the health of transformers.

 This will help to identify problems before any serious failure which leads to a significant cost saving and greater reliability. Widespread use of mobile networks and GSM devices such GSM modems and their decreasing costs have made them an attractive option not only for other wide area network application.

## 2 Block Diagram
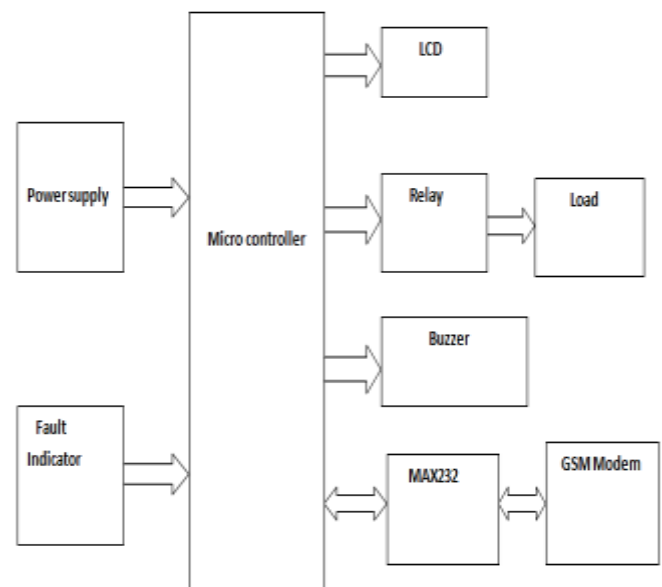


Power supply

Power supply is the circuit from which we get a desired DC voltage to run the other circuits. The voltage we get from the main line is 230V AC but the other components of our circuit require 5V DC. Hence a step-down transformer is used to get 12V AC which is later converted to 12V DC using a rectifier. The output of rectifier still contain some ripples even though it is a DC signal due to which it is called pulsating DC. To remove the ripples and obtain smoothed DC power filter circuits are used. Here a capacitor is used. The 12V DC is rated down to 5V using a positive voltage regulator chip 7805. Thus a fixed DC voltage of 5V is obtained.

A 5V regulated supply is taken as followed:



Block Diagram of a Regulated Power Supply System
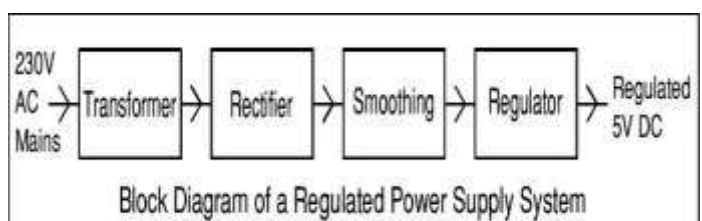
Each of the blocks described below:

1. Transformer – step down high voltage AC mains to low voltage AC.

2. Rectifier – converts AC to DC output is varying.

3. Smoothing – smooth the DC from varying greatly to a small ripple.

4. Regulator – eliminates ripple by setting DC output to a fixed voltage.

## Fault indicator

The first fault indicators came onto the market from Horst Mann (Germany) in 1946. The E.O. Schweitzer Manufacturing Company introduced a product to the U.S.A in 1948. A fault indicator is a device which provides visual or remote indication of a fault on the electric power system. Also called a faulted circuit indicator (FCI). The device is used in electric power distribution networks as a means of automatically detecting and identifying faults to reduce outage time. Recent development include a remotely programmable overhead line indicator , fault indication for paper – insulated lead cable , and overhead fault for mesh networks.

## Microcontroller



Microcontroller is defined as a system on computer chip which includes number of peripherals like RAM, EEPROM, etc. required to perform some predefined task. There are number of popular families of microcontrollers which are used in different applications as per their capability and feasibility to perform various task, mostly used of these are 8051, AVR and PIC microcontrollers .In this subject we will introduce you with AVR family of microcontrollers. AVR is an 8- bit microcontroller belonging to the family of Reduced Instruction set Computer (RISC). In RISC architecture the instruction set of the computer are not only fewer in number but also simpler and faster in operation. The other type is CISC. We will explore more on this when we will learn about the architecture of AVR microcontrollers in following section. The microcontroller transmits and receives 8-bit data. The input/output registers available are also of 8-bits. The AVR families controllers have register based architecture which means that both the operands for a stored in a register and the result of the operation is also called stored in a register.

## LCD



A liquid crystal display (LCD) is a flat –panel display uses the light modulating properties of liquid crystal. The display used is 16x2 LCD (Liquid crystal display); which means 16 characters per line by 2 lines. The standard is referred as HD44780U, which refers to the controller chip which receives data from an external source and communicates directly with the LCD. Here 8-bit mode of LCD is used i.e. using 8-bit data bus. LCDs are used in a wide range of applications including computer monitors, televisions instrument panels and indoor and outdoor signage.

## MAX232

The MAX232 is an integrated circuit first created in 1987 by Maxim integrated Products that converts signal from a TIA-232(RS232) serial port to signals suitable for use in TTL-compatible digital logic circuits. The MAX232 is a dual transmitter /dual receiver that typically is used to convert the RX, TX, CTS, RTS signals. The MAX232 (A) has two receivers that convert from RS-232 to TTL voltage levels, and two drivers. The drivers provide TIA-232 voltage level outputs from a single 5-volt supply by on chip charge pumps and external capacitors. This makes it useful for implementing TIA-232 in devices that otherwise do not need any other voltage .Typically, the first driver/receiver pair of the MAX232 is used for TX and RX signals and the second one for CTS and TRS signals.

## Relay

Relay is a simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core an iron yoke which provides a low reluctance path for magnetic flux. A relay is an electrically operated switch. It consists of set input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any numbers of contacts in multiple contact forms, such as make contacts, breakcontacts, or combinations. Relays are used where it is necessary to control a circuit by an independent low –power signal, or where several circuits must be controlled by on signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on

another circuit .relays were used extensively in telephone exchange an early computers to perform logical operations.

GSM Modem



In this project GSM modem is used to develop an interface between mobile and microcontroller by using GSM SIM. It connects microcontroller to network provider to send the SMS. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem is like a dial-up modem. The basic difference between them is the dial-up modem sends and receives data through a fixed telephone line while the wireless modem sends and receives data through waves. Like a GSM mobile phone, aGSM [7] modem also requires a SIM card from a wireless carrier to operate. SIM 300 is a Fixed Cellular Terminal (FCT) used for data applications. It is a compact and portable terminal which satisfy various data [7] communication over GSM.it also can be connected to a computer with a standard RS232C serial port .SIM 300 offers features like Short Message Services (SMS), DataServices, Fax Services and data file connectivity through wire is not available or not possible .the SIM 300 is easy to set up. It also finds its applications in IT companies, Banks, Financial Institution, Service Providers.

## ADVANTAGES

1. No need to monitor from relay room.

2. Save time.

3. Save men work.

4. Long life.

5. No maintenance is required.

6. Negligible electricity consumption.

## 3. CONCLUSION

The GSM based monitoring of distribution transformer is quite as compared to manual monitoring and also it is reliable as it not possible to monitor always the oil level, oil temperature rise, ambient temperature rise , load current manually. After receiving of message of any abnormality we can take action immediately to prevent any catastrophic failures of distribution transformer. In a distribution network there are many distribution transformers and associating each transformer with such system, we can easily find out that which transformer is undergoing fault from the message sent to the mobile.

## Result

The temperature of windings is raised above 130-degree Celsius which is an abnormal condition. The sensor senses the condition and it places the high signal on A0 pin and then the Adriano transmits the signal to GSM and GPS which is turn sends the message to the programmed number. By the same way, oil level was lowered manually and the message was received and the fault was displayed on the LCD display.

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## BIOGRAPHIES

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