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# Advanced Distribution Transformer Load Monitoring and Controlling

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**Abstract – DistributionTransformer is one of the important electrical equipment. Monitoring transformer's health had become a fiery task. Since incase of any damaged in the internal properties of the transformer will result in huge drawbacks. So it is mandatory to regularly keep an eye of the transformer. The main objective of this proposal is to acquire live data of transformer health remotely over the internet using Internet of Things (IOT) technology. We are going to monitor the transformer parameter such as temperature, current and voltage, Oil Level. These data will be sent over internet using MQTT protocol. In case of any power failure the user will be notified with an alert message using GSM Module. It also has a unique feature of detecting the phase failure. If any phase gets defect then it will indicated in the development board by an LED. These parameters will be displayed in an Android Application. By this process we can get to know the health of the transformer regularly and necessary step can be taken to maintain it in a proper way.**

**Keywords:**IOT(Internet of Things), GSM, Micro controller, Sensors.

## 1. INTRODUCTION

The distribution transformer is electrical equipment in power system which distributes power to the users directly, and its operating condition is important to the distribution network operators. The operation of distribution transformers underrated condition guarantees their long life. However, their life is significantly reduced if they are subjected to overloading, resulting in unexpected failures and loss of supply to a large number of customers thus effecting power system reliability.

Overloading and insufficient cooling of transformers are the main causes of failure. The monitoring device systems which are presently used for monitoring distribution transformer exist some problems and deficiencies. Few of them are mentioned below.

- ✓ Ordinary transformer measurement system only detects a single transformer parameter, such as power, current, voltage, and phase. While some ways could detect multi-parameter, the time taking and operation parameters are too long,
- ✓ Testing speed is not so fast.
- ✓ Detection system itself is not reliable. The performance is the device itself instability, poor jamming capability, low
- ✓ Measuring accuracy data, or even another system should is not affected.
- ✓ Timely detection data will not be sent to monitoring centers in time, which cannot judge distribution transformers three-phase equilibrium.

## 2. EXISTNG SYSTEM

This is presents design and implementation of a mobile embedded system to monitor and record key operation indicators of a distribution transformer like load currents, transformer oil and ambient temperatures. The proposed on-line monitoring system integrates a global service mobile (GSM) Modem, with standalone single chip microcontroller and sensor packages. It is installed at the distribution transformer site and the above mentioned parameters are recorded using the built-in S-channel analog to digital converter (ADC) of the embedded system.

The acquired parameters are processed and recorded in the system memory. If there is any abnormality or an emergency situation the system sends SMS (short message service) messages to designated mobile telephones containing information about the abnormality according to some predefined instructions and policies that are stored on the embedded system EEPROM. Also, it

sends SMS to a central database via the GSM modem for further processing. This mobile system will help the utilities to optimally utilize transformers and identify problems before any catastrophic failure.

**Demerits of Existing System**

- ✓ It is purely based on SMS services. It doesn't include android
- ✓ Application (Mobile App).
- ✓ Practically at some points this system could not work efficiently. Since SMS will be based on carrier charge a d continues monitoring is made impossible.
- ✓ Since SMS service is used it doesn't provide live tracking because SMS will have some latency on reception.
- ✓ If you want to make the latency minimum service provider will charge extra amount for it.
- ✓ There is no point of contact with consumer in the system.
- ✓ As a result the consumer will not get any knowledge about the power failure or system maintenance.
- ✓ It doesn't include the feature of Phase prevention which is any of phase fails there is no indication.

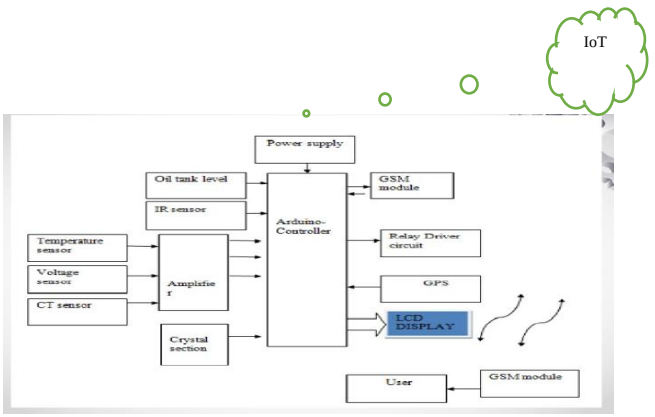
## 3. PROPOSED SYSTEM

The main objective of this proposal is to acquire live data of transformer health remotely over the internet using Internet of Things (IOT) technology. We are going to monitor the transformer parameter such as temperature, Oil Level, current and voltage. These data will be sent over internet using MQTT protocol. In case of any power failure the user will be notified with an alert message using GSM Module. It also has a unique feature of detecting the phase failure. If any phase gets defect then it will indicated in the development board by an LED.

**Merits of Proposed System**

- ✓ It is purely based on SMS along with MQTT services.
- ✓ It include android Mobile application
- ✓ Practically at every points this system could work efficiently. Since along with SMS.
- ✓ MQTT also used so continues monitoring is made possible.
- ✓ Cost effective.
- ✓ Since MQTT service is used it provides live tracking.
- ✓ There is common point of contact with consumer in the system.

**System Design**




Block Diagram

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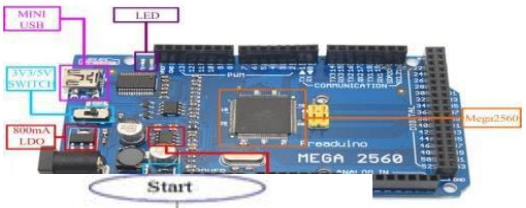
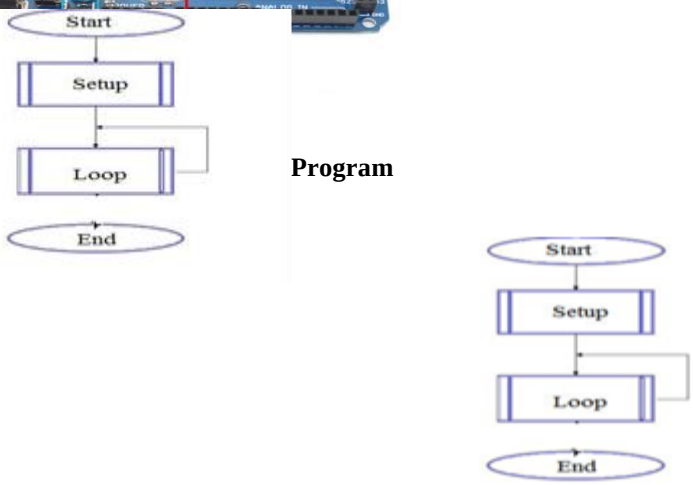
## 4. MODULE DESCRIPTION

### Schematic Diagram




### Program




Flow Chart in Arduino Program

## 5. GSM SIM 800c

SIM 800c is a Quad-band GSM / GPRS device, works on frequencies 850 MHZ, 900 MHZ, 1800 MHZ and 1900 MHZ. It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with 3V3 and 5V DC TTL interfacing circuitry, which allows User to directly interface with 5V Microcontrollers (PIC, AVR, Arduino, 8051, etc.) as well as 3V3 Microcontrollers (ARM, ARM Cortex XX, etc.). The baud rate can be configurable from 9600-115200 bps through AT (Attention) commands. This GSM/GPRS TTL Modem has internal TCP/IP stack to enable User to connect with internet through GPRS feature. It is suitable for SMS as well as DATA transfer application in mobile phone to mobile phone interface. The modem can be interfaced with a Microcontroller using USART (Universal Synchronous Asynchronous Receiver and Transmitter).

### FEATURES

- ✓ Quad Band GSM/GPRS: 850 / 900 / 1800 / 1900 MHz
- ✓ Built in RS232 to TTL or vice-versa Logic Converter (MAX232)
- ✓ Configurable Baud Rate
- ✓ SMA (Sub-miniature version A) connector with GSM L Type Antenna
- ✓ Built in SIM (Subscriber Identity Module) Card holder
- ✓ Built in Network Status LED.

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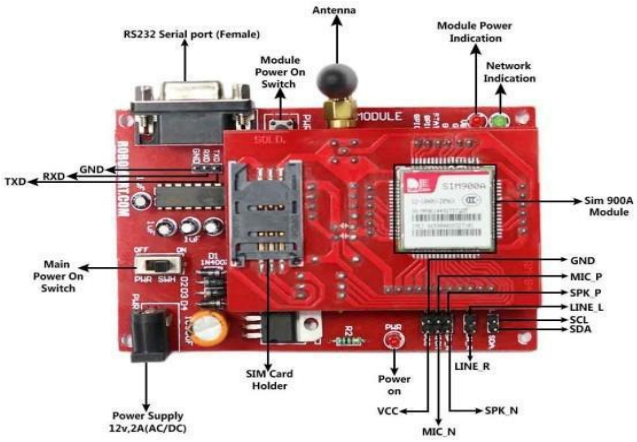
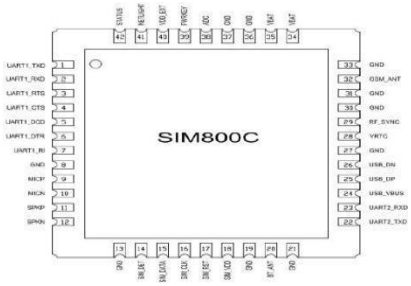
**PIN DIAGRAM:**



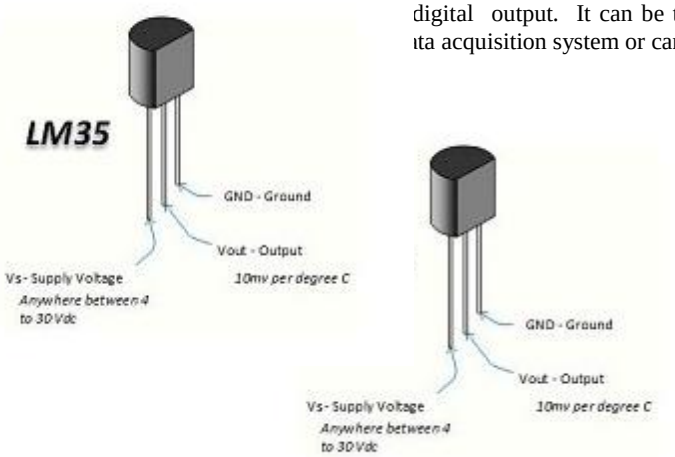

**PIN DESCRIPTION**




SIM800C Pin

**6.VOLTAGE SENSORS**

ıge in a wire, and generates signal proportional to it. The generated signal digital output. It can be thenutilized to display the measured voltage in a ıta acquisition system or can be utilized for control purpose.



## 7. CURRENT SENSOR

### Current Sensor (ACS712)

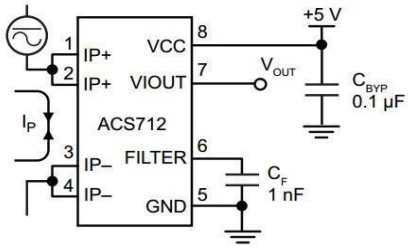
ACS712 current sensor interfacing with Arduino for ac and dc current measurement: I .Acs712 is a cheap solution for current sensing in industry, power sector and communication applications. We will show how to display measured value of currents on LCD and how to send this data to computer using serial communication of Arduino

#### Working

This ACS712 sensor consists of a linear Hall Effect circuit along with copper conduction path. Copper conduction path is located around the surface of the die. When ac or dc current passes through a copper conduction path, it produces magnetic field. This electromagnetic field interacts with Hall Effect sensor. Hall Effect circuit converts this electromagnetic filed into proportional voltage either ac or dc depending on input current type. This output voltage is measured with the help of Arduino or any microcontroller. After measuring this voltage, we convert it back into current using sensitivity equations.

### Pin Diagram

Pin out of ACS712 current sensor is given below. Pin number 1, 2 and 3,4 are used for current sampling. In other words you will connect these pins in series with the load of which current you want to measure.




Pin Diagram of ACS712

Pin number is ground connection of 5 volt power supply and pin number 6 is used to connect filter capacitor. One terminal of filter capacitor should be connected with pin number 6 and other terminal should be connected with ground. Similarly pin number 8vcc is a power supply pin and you should connect dc 5 volt with it. Pin number 7 is the output pin of acs712 current sensor. From output pin, we will measure voltage with the help of arduino.

## 8.OIL LEVEL SENSOR

Oil level sensor is a device which is used to check the oil level in the transformer. Due to overheating the oil start to evaporate and the oil level decreases and thus this decrease in the oil level **may** be dangerous to the transformer. Thus this sensor indicates the level and we get aware about the level. Thus we can look over the oil **viscosity** also.

## 9.TEMPEATUE SENSOR

### Temperature Monitoring (DS18B20)

Temperature sensor vary from simple ON/OFF thermostatic devices which control a domestic hot water heating system to highly sensitive semiconductor types that can control complex process control furnace plants. We remember from our school science classes that the movement of molecules and atoms produces heat (kinetic energy) and the greater the movement, the more heat that is generated. Temperature Sensors measure the amount of heat energy or even coldness that is generated by an object or system, allowing us to "sense" or detect any physical change to that temperature producing either an analogue or digital output.

There are many different types of Temperature Sensor available and all have different characteristics depending upon their actual application.

Thermistor

## 10.CONCLUSION

Transformers are most generic and expensive piece of equipment of the transmission and distribution system. Regular monitoring health condition of transformer not only is economical also adds to increased reliability. In the past, maintenance of transformers was done based on a pre-determined schedule. With the advancement of communication technology now it is possible to receive fault information of transformer through GSM technology remotely to the operator and authorities so one can able to take possible solution before converting fault in to fatal situation.

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