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Remote Monitoring of Transformer Health by Using Radio Frequency Module

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Abstract : Transformers are the heart of the transmission and distribution system.So monitoring of transformer should be done at regular interval to avoid faults and to maintain system stability and reliability. This project proposes and innovative design to develop system based on micro controller using Radio frequency. Three parameters current, voltage, temperature are of distribution transformer are continuously being monitor to protect transformer from various faults. Main objective of this project is to monitor transformer continuously on the basis of real time data to avoid fault and protect overall system. Previously and Presently transformers are monitored manually which was very time consuming and less accurate. This technique is categorized into offline monitoring technique which has many disadvantages so main aim of this project is to use online monitoring technique which is most accurate, fast and reliable to protect transformer from various faults.

Keywords: Transformer, Radio Frequency , monitoring, Real time data

INTRODUCTION

There are mainly two methods of transformer monitoring one is on line monitoring and other is off line monitoring technique. Offline monitoring has following disadvantages:

a) Operation is done manually
b) Time consuming
c) Demand a lot of labour work

So to avoid such problems online monitoring is done which is most accurate , fast and reliable which can protect transformer as well as overall system and maintain stability. On line monitoring is preferred as it transmits and receives data wirelessly so this wireless transmission system reduces complexity and also give fast response. On line monitoring can be done by using various devices such as zigbee, Wi-fi, Bluetooth, RF .Use of Radio Frequency has many advantages over other three devices.

a) Signals through RF can travel through larger distances making it suitable for long range applications

b) It is more strong and reliable and also uses a specific frequency so no interference from foreign equipment occur.

c) No external Antenna required

d) plug and play devices

e) Long range communication and low power consumption

RF Module

Radio Frequency communication is based on ISM band (Industrial Scientific and Medical) are radio bands reserved internationally for the use of radio frequency .It is very useful to send and receive real time data while monitoring transformer so at remote location where generally substations are at long distance so one can monitor transformer by just sitting in the office on personal computer by using radio frequency .This on line monitoring technique play important role in smart grid. Faults such as overcurrent, overvoltage,overtemprature can be avoided by using this monitoring technique. As prefault indication can be observed using RF signal so fault can be prevent and system failure can be avoided.There are three types of RF module. Transmitter Module,Receiver Module ,Transreciever module.we use transreciever for this project .

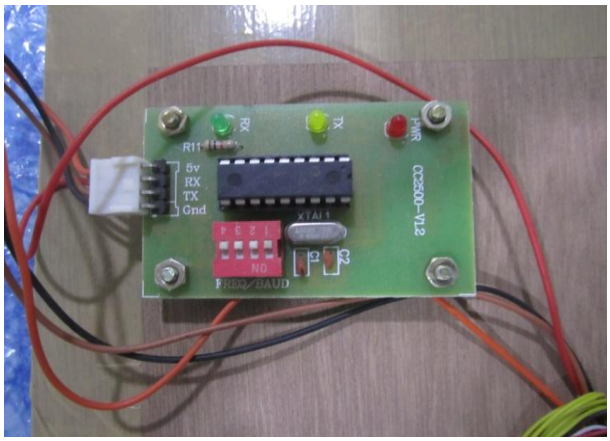

Fig. RF Module

PROPOSED WORKING:

The Diagram can be broadly divided in two sections one is Transmitter Unit which consist of Current Transformer , Potential Transformer and Temperature Sensor LCD along with micro controller and power supply. This unit in the first phase measures all parameters such as current voltage and temperature and then in next phase transmit these using Radio Frequency (RF) communication. An RF Transmitter receives serial data and transmits it wirelessly through RF through its Antenna . Second unit is the Receiver Unit. It receives data using RF receiver and forwards that data to personal computer using visual basic interface. RF has many advantages which we discussed earlier they are most suitable for long range communication so at remote location where substation is far so they are vey useful.

HARDWARE COMPONENTS :

1.Microcontroller AT89S52:

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The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K Bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry- standard 80C51 instruction set and pinout.

2.Max 232:

It is a level converter which is an integrated circuit that converts signals from RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits.The Max232 is a dual driver/receiver and typically converts the RX,TX signals.

3. Current Transformer :

A current transformer (CT) is used for measurement of electric currents. Current transformers are also known as instrument transformers. When current in a circuit is too high to directly apply to measuring instruments, a current transformer produces a reduced current accurately proportional to the current in the circuit, which can be conveniently connected to measuring and recording instruments.

4.Potential Transformer:

Potential transformer or voltage transformer gets used in electrical power system for stepping down the system voltage to a safe value which can be fed to low ratings meters and relays. Commercially available relays and meters used for protection and metering, are designed for low voltage.

5.LM7805:

The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation.

6.LM35:

The LM 35 series are precision integrated circuit temperature sensors ,whose output voltage is linearly proportional to the temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin.

7.LCD Display:

A 16*2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segment and other multi segment LEDs.

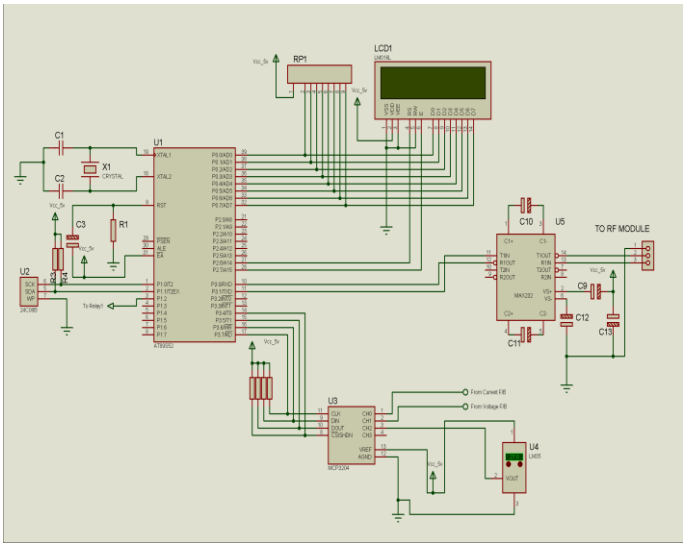
8.MCP3204 ADC:

The Microchip Technology Inc. MCP3204 devices are successive approximation 12-bit Analog-to-Digital (A/D) Converters with on-board sample and hold circuitry. The MCP3204 is programmable to provide two pseudo-differential input pairs or four single-ended inputs.

SOFTAWRE:Visual Basic

After programming the microcontroller using the MPLAB`S IDE, the next work is to design a interface for windows desktop which can display the received atmospheric parameters on the computer. This is achieved by designing a interface on Visual BASIC. Visual BASIC is a high level programming language evolved from the earlier DOS version called BASIC. BASIC means Beginners All purpose Symbolic Instruction Code. It is a fairly easy programming language to learn

CIRCUIT DIAGRAM



ADVANTAGES

- No wires involved in the proposed system. Hence we can avoid power and data loss.
- It can able to detect the faults due to over current, over voltage, increased temperature at real time using RF.
- Monitoring multiple transformers sitting in an office is possible.
- Prefault condition is easily detected and cleared at same time to avoid system failure.
- Fault monitoring requires less time also use of RF gives most accurate ,fast response
- This type of monitoring protects transformer and overall system so system reliability and stability increases.
- This type of monitoring provide significant benefits for utility cosumers as ideal power supply can be possible which is free from fault and losses.
- Overcurrent,overvoltage,overtemperataure thsese main faults are prevented using this technique .

APPLICATIONS

- Smart Grid
- Transformer monitoring in remote areas
- Industrial data acquisition system
- Wireless Data Transmission

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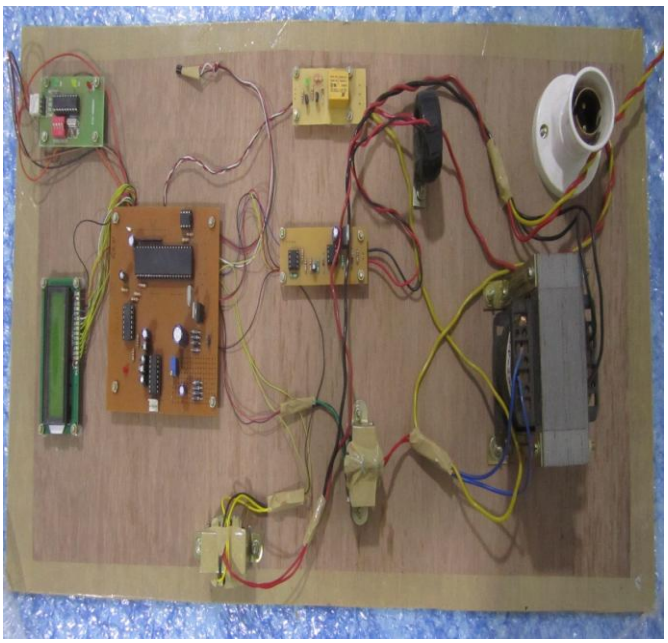
EXPERIMENTAL SET UP



CONCLUSIONS

The current project describes a monitoring system for distribution transformers using Radio Frequency which is very best replacement of all other monitoring techniques .This technique reduces human effort along with it gives prefault indication based on real time data wirelessly very accurately.This system gives accurate,fast and reliable response that protect transformer and overall system from various faults so it keeps transformer in healthy condition in minimum cost.

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