

Wireless Transformer Parameter Monitoring System Using RF Module

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Abstract: This paper presents wireless transformer monitoring parameters. The main aim of this system is monitoring and controlling through RF module. The monitoring and control of transformer is done by using temperature sensor, microcontroller and RF transmission which is wireless communication. The three parameters of the transformer i.e voltage, current and temperature are monitored. Then send the same data to a remote location. Controller will make transmission between RF and client.

Keywords: Wireless control and Monitoring System, RF module, microcontroller, temperature sensor.

I. INTRODUCTION

A transformer is an electrical device which transfers energy between two or more circuits through electromagnetic induction. It play a vital role in the generation of power and different sections like generation unit, substation unit and distribution unit based on their need and requirements[2]. We control and monitored 3 parameters that is voltage, current and temperature. Monitoring and controlling is done by using LM35 Temperature sensor, microcontroller and RF module Hence it is necessary to keep on checking the condition when increase in temperature, pressure and environmental conditions. It is sensed by sensor & which is input signal to microcontroller. The signals are monitored and controlled through RF module. The system is design to sense the features of transformer and send information to controller, then controller will make the transmission through RF to the client. Remote receiver, which is also a microcontroller unit. It makes comparison between stored value and ref value. If any fault or error found then it is display on LCD.

III. DESCRIPTION

It consist of two parts i.e. transmitter and receiver.

Transmitter section:

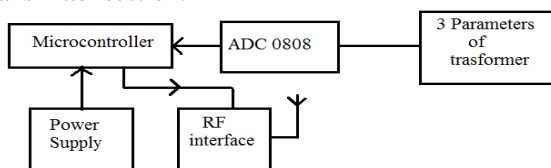
The main intension of this project is to acquire data of distribution transformers remotely by RF. For this real-time scenario we are using one temperature sensor, one potential transformer and finally current transformer for monitoring these three data of the transformer at the receiver side. Three values are taken which is analogy in nature. To a programmable microcontroller of 8051 family multiplexing mode connected through an IC ADC 0808. All the sensors values are sent sequentially by MC as per the frequency of multiplexing of the ADC. They are then sent directly to RF module which is operating at 433GHz for transmitting the same data.

Receiver section:

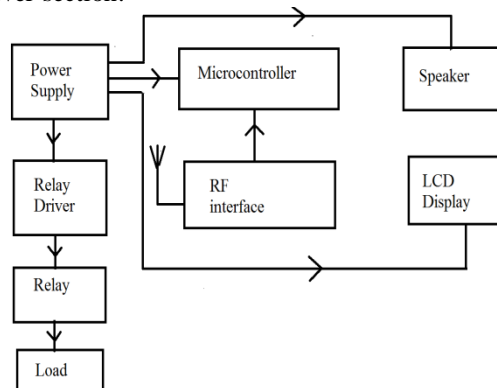
The real time data which is transmitted by the different RF module is received by remote receiver which is microcontroller based unit. The reference value is stored in the micro-controller. The received signal from this module is then compared with this stored value. The received value if exceeds this stored value then microcontroller will turn on the relay. The relay will in turn, turn ON the auto-voice announcement for the specific fault along with LCD display.

II. BLOCK DIAGRAM

Transmitter section:-



Receiver section:-



IV. METHODOLOGY

1. Power supply:- it has following parts:

• Transformer:

It covert alternating current from one value to other value of voltage with a limited loss of power. Step-up transformers has more winding towards the secondary section compared to primary section. This inturn increases the value of voltage. Step-down transformers have less winding towards the secondary section compared to that with the primary section. This inturn decreases the value of voltage.

The step down transformer are used commonly in power supplies to reduce the high risk associated with high voltage to considerably low voltage. The transformer has two coils namely primary coil and secondary coil. Between this two coils there is no electrical connection rather they

are connected by the alternating magnetic field. This field is created by using soft-iron core of the transformer.



Figure 1: Transformer

• Bridge rectifier:

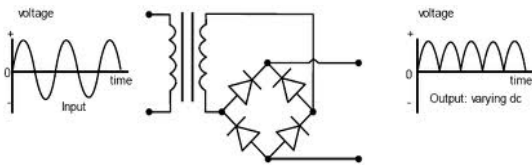


Figure 2: Bridge rectifier

An electric device which periodically reverses the direction that is from alternating current to direct current is rectifier. The output voltage from transformer is given as input to bridge rectifier. That converts alternating current into direct current which is pulsating.

• Filter:

Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothen the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore a regulator is applied at the output stage.

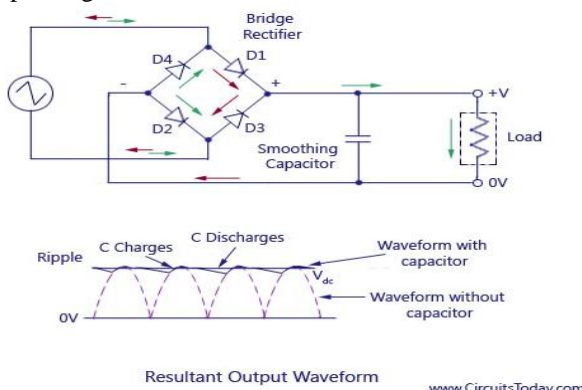


Figure 3: Filter

• Voltage regulator:

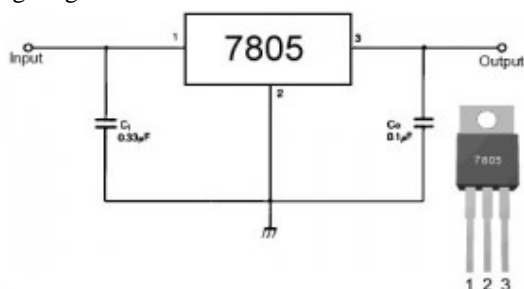


Figure 4: Voltage regulator

7805 is a voltage regulator integrated circuit. Fixed output voltage is not obtained due to fluctuation of the voltage source in the circuit. Constant value of output voltage is maintained by voltage regulator IC. 7805 provides +5V regulated power supply.

2. AT89S51/52:

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 non-volatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out.

The features of AT89S51/52 are as follows:

- Compatible with MCS@-51 Products
- 8K Bytes of In-System Programmable (ISP) Flash Memory
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Watchdog Timer

3. RF Module:



Figure 5: RF module

Rf module (radio frequency) is an electronic device that transmits and receives rf signals from one device to another. It is a transmitter module through which data can be transmitted and received by a receiver simultaneously.

4. LM35 TEMPERATURE SENSOR:

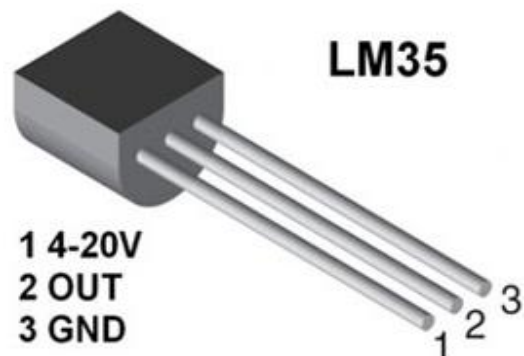


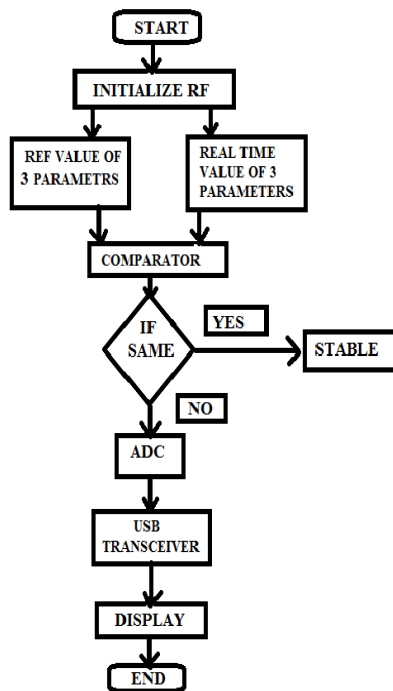
Figure 6: LM35 sensor.

LM35 are used to sense the heat. LM35 digital sensor has got 3 pin's i.e., VCC, GND and output pin's when LM35 is heated the voltage at output pin increases. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

V. SOFTWARE USED

1. Keil software for Microcontroller programming.
2. Flash magic software for Microcontroller burning.
3. Diptrace Software for PCB Layout.
4. Language: Embedded C Assembly.

VI. FLOWCHART



VII. ALGORITHM

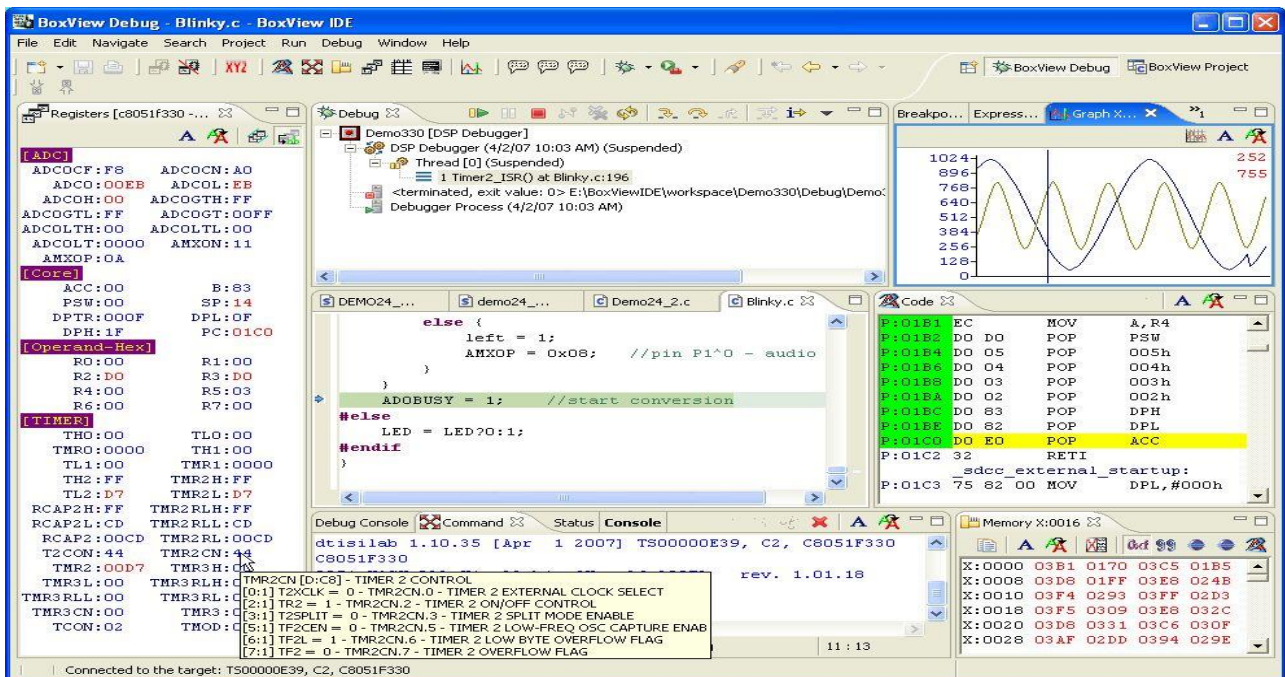
- [1] Start.
- [2] Initialize RF signal.
- [3] Ref value of 3 parameters & real time value of 3 parameters are compared.
- [4] If both the values are same then it is stable.
- [5] If not, then it is passed through ADC.
- [6] This signal can transmit & can also received by transceiver USB.
- [7] It is displayed on LCD.
- [8] End.

VIII. RESULT

This consists of two section transmitter and receiver. In this we are going to test temperature, current and voltage.

We use three parameters out of which one temperature sensor and two are used for measurement of current and voltage. The result shows higher temperature of transformer and flow of current.

We can see from the waveform that the yellow line which is current graph is not varying much with the time. The black waveform indicates the temperature which is varying with the time as the temperature is not fixed depends on the regulated transformer's parameter. Both current and temperature are not constant with time both are varying but temperature is changing much as compared to current.



IX.APPLICATION

1. Wireless telemetry for transmitting sensor data.
2. Remote control application with fast response requirements.
3. Point-to-point and point-to-multipoint network topologies.
4. Wireless home networking applications and also it is used for impedance matching.
5. Wireless data logging and audio transmission applications.

X.LIMITATION

1. Complex and bulky circuit
2. RF module network is compulsory.
3. Battery backup is compulsory at monitoring place.

XI.CONCLUSION

This study gives remedies from the faults occurring in transformer and it overcomes the drawbacks of previous working methods. The paper focuses much on the efficiency of controlling process of the transformer and mainly through wireless communication that eliminates the use of large cables which are of high cost, low reliability and maintenance. The RF Transmission helps in better way of communication which enhances the improvement steps in this process.

XII.FUTURE SCOPE

1. It provides an effective measure to save man power by providing automation transformer monitoring and controlling.
2. If every industry installs such wireless transformer system which will make controlling and maintaining easier because of its low cost and high efficiency.
3. This project can be extended by using GPRS technology, which helps in sending the monitored and controlled data to any place in the world.

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