

Wireless Measurement System for Transformer

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ABSTRACT

The Project is about the “Wireless Measurement SystemForTransformer” Which deals with the electrical sensor or electrical parameter which is used for measurement. The functioning of each instrument with their advantages and disadvantages re explained in the subject. The same way this Project concludes the ZigBee used as a sensor.

I. INTRODUCTION

The purpose of a distribution transformer is to reduce the primary voltage of the electric distribution system to the utilization voltage serving the customer. A distribution transformer is a static device constructed with two or more windings used to transfer alternating current electric power by electromagnetic induction from one circuit to another at the same frequency but with different values of voltage and current. The transformer is valuable link in the transmission system ,if transformer get fails then the whole power system will be fail to supply power to consumer. The distribution transformer is widely used for distributes power to the consumers. Due to which it is very essentialto system monitor the distribution transformer, it not possible to monitor every transformer manually it will increase the cost of manpower. Mostly the fault occur in transformer due the increase in temperature of winding and oil, that will causes the reduction in the life of transformer, so need to be monitor oil level and temperature of oil. So by using ZigBee technology it is very easy to monitor number of transformer from the office, there is no need to monitor every transformer from side individually. Using ZigBee technology it is very easy to collect online data from.

ZIGBEE is based on IEEE 802.15 standard used to create a personal area network built from low power digital radios. It often transmits data over longer distances by passing data

through intermediate devices to reach more distant ones. It targeted at radio frequency applications that require long battery life, low data rate and secure networking. ZIGBEE has a data rate speed of 250 kbps best suited for single signal transmission from an input device or sensor. Transmission distances range from 10 to 120 meters line of sight, depending upon power output and environmental characteristics. The ZIGBEE specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. It is a low cost, low power wireless mesh standard. The low cost allows the technology to be widely used in wireless control and monitoring system applications. Each ZIGBEE network can have up to 65535 device nodes. The distance between ZIGBEE device nodes can be up to 50m and each node can transfer signal to the next. This will possibly make a very huge network. ZIGBEE is a wireless technology standard that has characterized of low power consumption having up to 6555 nodes and low data rates. Therefore it is suitable to apply in many home and industrial applications.

In many countries, communication based controlling and monitoring architecture is used for save power. Communication network may be wired or wireless. Communication through wired interface is very intricate and hard to implement or install. Wireless interfaces are chosen because they are easy to organize and install. Furthermore, ZIGBEE has some technical advantages over Bluetooth, Wi-Fi, infrared rays etc. ZIGBEE is a kind of low power-consuming communication technology for coverage area surrounded by 200m, with a data rate ranging from 20Kbps to 250Kbps, it is appropriate for use in home area networks, mainly for the remote control of electric home appliances. Monitoring system based on ZIGBEE technology that has potential to be more faith full and low priced, which has been presented in this paper. ZIGBEE is a specification for high level

communication, low power digital radios based on standard IEEE 802.15.4-2003.

A step down distribution transformer and bridge rectifier are used to obtaining a DC supply which is regulated to 5V DC using a 7805 voltage regulator IC. The sensors are used to sense the continuously changes in parameter of distribution transformer. The fluid level sensors respond to any change in parameters with change in voltage level of transformer. This whole data is send to the ADC (Analog to digital converter) which converts this analog data into digital form because microcontroller can took the digital form only.

II. OBJECTIVES

Following are the objectives of this project

- To Measure the voltage.
- To Measure the current.

- To Measure the Temperature.

Need of Project

- Now a day in the industry or in any system we measure the Current, Voltage & Temperature manually due to this there is chances of getting error in reading, in some cases it's impossible to measure manually. The main drawback of manual testing is we can't get reading continuously.
- To overcome these all drawbacks we implemented this system called as "Wireless measurement system for Transformer" by this system we can measure the Temperature, Voltage, and Current continuously. This system is wireless so we get the exact values without any errors.

Block Diagram

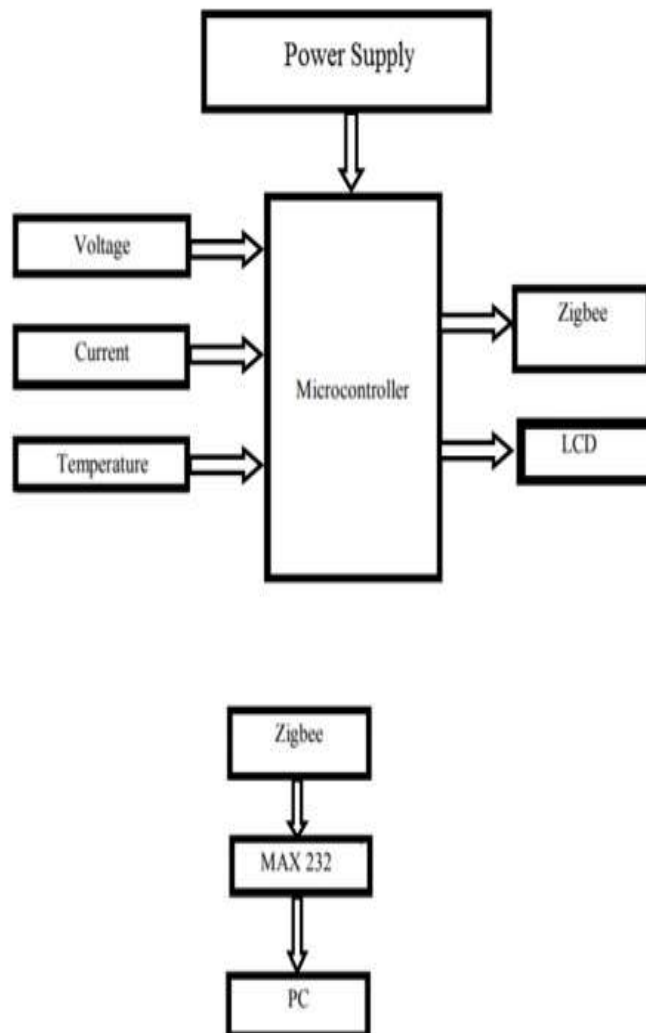


Fig .1 block diagram

III. WORKING

Wireless Measurement system for transformer: Wireless Measurement system for transformer and Xbee is a system that could be used for remote monitoring of temperature, current and voltage. In this modern world, there are so many places where we must have to control or monitor the temperature, current and voltage such as in hospitals, educational institute and semiconductor devices making industries where the humidity is strictly prohibited. In these places, if we install the separate system for monitoring of each factor such as temperature, current and voltage, then this could be so much expensive, and not easy to install everywhere. For resolving these issues, we have designed a system that is called a remote monitoring system with lab view and Xbee with the help of Arduino board, temperature, current and voltage sensors, LCD display and Xbee module. With the help of this system, the temperature, current and voltage could be remotely monitor through a PC.

Temperature sensor is used to sense the current temperature status of a transformer or generator. The output obtained from the temperature sensor is proportionally dependent on the temperature in degree Celsius sensed. The operating temperature ranges from -550 C to 1500 C. It draws about 60 micro ampere from the supply

and has reduced self-heating. It does not tend to possess a temperature rise more than 0.1 0C in still air. For every 0 C rise or fall in temperature the output response will be 10mV variation. This LM35 operates from 4V to 30V. It has + 1 temp sensor are attached to the Arduino analog pin 7 in this type we can measurement the sensor value i.e. temp of the transformer.

- Current sensor

It is a combination of IN4007 diode, a step-down transformer, variable resistor 47K, capacitor 1microF 25V, 5V Zennor diode. Usually 5V output is obtained during 250V. Variable resistance is adjusted to get the output.

Current sensor are attached to the Arduino analog pin 0

- Voltage sensor

It is a combination of IN4007 diode, a step-down transformer, variable resistor 47K, capacitor.1microF 25V, 5V Zennor diode. Usually 5V output is obtained during 250V. Variable resistance is adjusted to get the output.

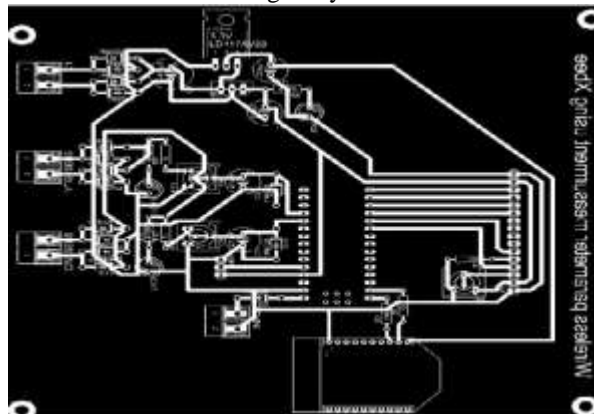
$AC\ Voltage = (230/1024) * ADC_Value$

Voltage sensor are attached to the Arduino analog pin 1

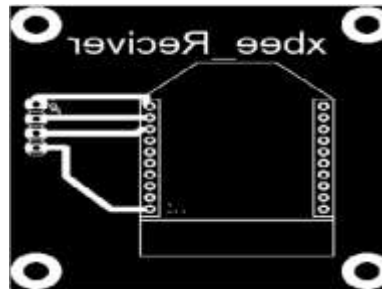
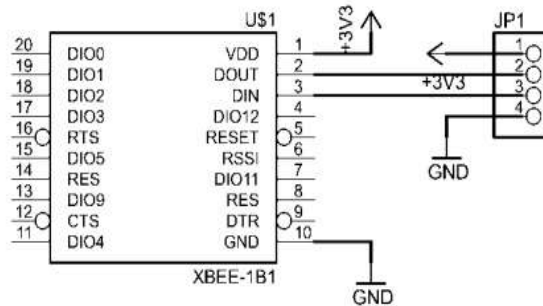
Hardware details

Connection Diagram

Design Layouts



Serial Receive



Power supply:-

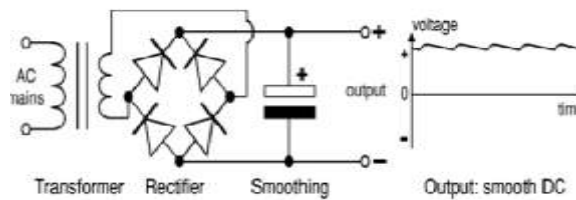


Fig.power supply

- Capacitor:

Capacitors store electric charge. They are used with resistors in timing circuits because it takes time for a capacitor to fill with charge. They are used to smooth varying DC supplies by acting

as a reservoir of charge. They are also used in filter circuits because capacitors easily pass AC (changing) signals but they block DC (constant) signals.



Circuit symbol:

Electrolytic capacitors are polarized and they must be connected the correct way round, at least one of their leads will be marked + or -.

- Diodes:

Diodes allow electricity to flow in only one direction. The arrow of the circuit symbol shows the direction in which the current can flow. Diodes are the electrical version of a valve and early diodes were actually called valves.



Circuit symbol

Diodes must be connected the correct way round, the diagram may be labeled a or + for anode and k or - for cathode (yes, it really is k, not c, for cathode!). The cathode is marked by a line painted on the body.

- Light-Emitting Diode (Led):
LEDs emit light when an electric current passes through them.

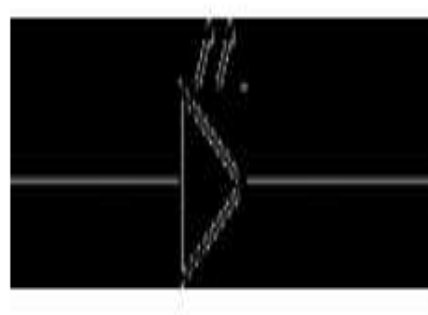


Fig: Light-Emitting Diode (Led):

A light-emitting diode (LED) is a two-lead semiconductor light source. LEDs are mainly used for the indication purpose. LEDs must be connected the correct way round, the diagram may be labeled a or + for anode and k or - for cathode (yes, it really is k, not c, for cathode!). The cathode is the short lead and there may be a slight flat on the body of round LEDs. If you can see inside the LED the cathode is the larger electrode (but this is not an official identification method).

LEDs can be damaged by heat when soldering, but the risk is small unless you are very slow. No special precautions are needed for soldering most LEDs.

The longer lead is the anode (+) and the shorter lead is the cathode (&minus). In the schematic symbol for an LED (bottom), the anode

is on the left and the cathode is on the right. Light emitting diodes are elements for light signalization in electronics.

IV. EXPECTED RESULT

The prototype hardware including the sensor for monitoring temperature, current, voltage of motor along with circuitry via successfully implemented. X-bee has been developed to meet the growing demand for capable wireless networking between numerous low power devices. Used for campus wide electrical and security from a single computer.

V. CONCLUSION:-

The prototype hardware including the sensors for monitoring temperature, current,

voltage of motor along with circuitry is successfully implemented. The communication between the master node and computer is also implemented. The sensor data can be stored in the format of excel fil. Compared to the traditional long wiring system and manual inspection, this system is accurate. The solution of ZigBee based wireless sensor network reduces the energy consumption due to its self-configuration and self-healing nature.

In this system a soil moisture sensor is designed which works on voltage divider rule, using metal rods and a nonconductive material soil moisture sensor was tested by making variations of water content in the soil. For dry soil the sensor showed zero percent and as the water level in soil increased the percentage increased.

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