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WIRELESS SENSOR NETWORK BASED POWER THEFT DETECTION

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Abstract: In this paper, we propose monitoring power in smart grid applications using wireless sensor network(WSN) technology. This paper is not only useful to electricity board but also useful to monitor and transfer energy, calculating the fare, to an EB substation. This paper is also aimed at reducing the heavy power and revenue losses that occur due to power theft by the customers. An automatic circuit breaker may be integrated to the unit so as to remotely cut off the power supply to the house or consumer who tries to indulge in power theft. The ability of the proposed system is to inform or send data digitally to a remote station using wireless radio link adds a large amount of possibilities to the way, the power supply is controlled by the electricity board.

Keywords – Step down Transformer, Current Transformer, Precision Rectifier, Zigbee, LCD Display

1. Introduction

This method presents a new methodology to identify energy theft. The proposed paper is to notify a message to the nearby EB station if any power theft happens immediately the transformer number will be transferred to the EB station. The EB station will immediately send the person to find the people who indulged in this particular line faults may be caused due to over current or earth fault. Many developing countries confront widespread theft of electricity from government owned power utilities.[3] Honest consumers, poor people, and those without connections, who bear the burden of high tariffs, system inefficiencies, and inadequate and unreliable power supply. Line faults may be caused due to over current or earth fault. If there happens to be a connection between two phase lines then over current fault occurs. Earth fault occurs due to the earthing of phase line through cross arm or any other way. [1,6] Now in India, there is not any technique to detect the specific location of the fault immediately. Power theft is another major problem faced by Indian electrical system.

2. Block Diagram of the Proposed System

Figure 1 and 2 shows the block diagram for Transmitter Mode and receiver mode. The main components of the circuit are Step down Transformer, Current Transformer, Precision Rectifier,8051 Microcontroller, Zigbee and LCD Display. The Step down converters is used for converting the high voltage into low voltage. The converter with output voltage less than the input voltage is called as a step down converter. 230V AC is converted into 12V AC using a step down transformers. 12V output of step down transformer is an RMS value and its peak value is given by the product of square root of two with RMS value, which is approximately 17V. Current transformers are used in electronic equipment and are widely used for metering and protective relays in the electrical power industry.[2,7] The Precision rectifier also known as

a super diode is a configuration obtained with an operational amplifier in order to have a circuit behave like an ideal diode and rectifier. It is useful for high precision signal processing.

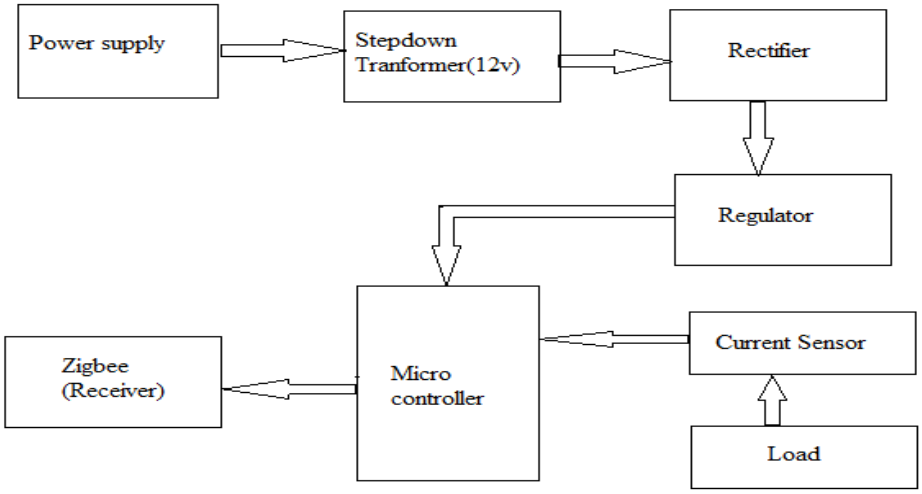

Fig. 1 Block Diagram for Transmitter Mode

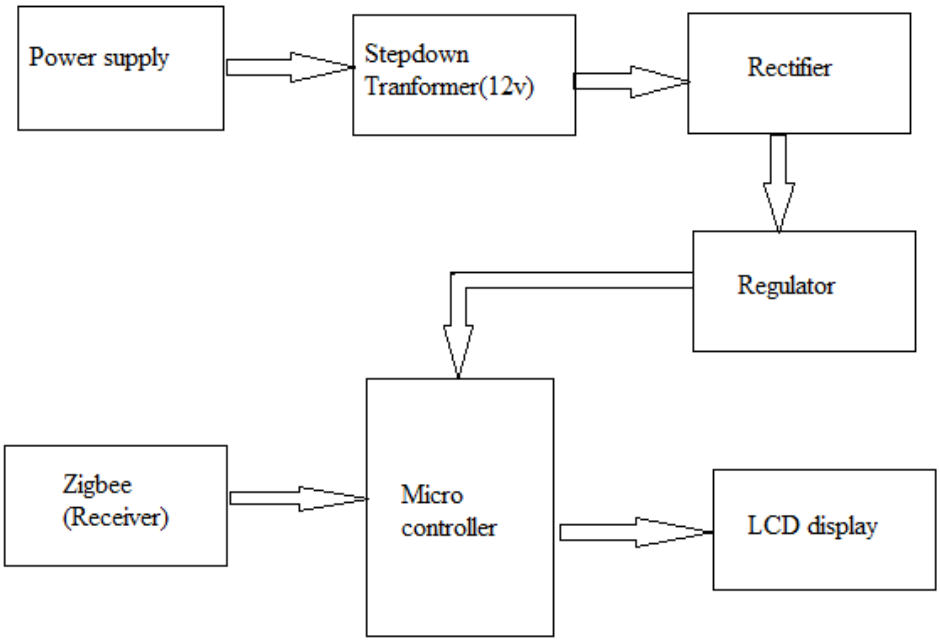

Fig.2 Block diagram for Receiver Mode

The ZigBee RF4CE standard enhances the IEEE 802.15.4 standard by providing a simple networking layer and standard application profiles that can be used to create interoperable multi-vendor consumer electronic solutions.

The benefits of this technology go far beyond, ZigBee applications include

- Home and office automation
- Industrial automation
- Medical monitoring
- Low-power sensors
- HVAC control
- Plus many other control and monitoring uses

In short, the transmitter feeds a signal of encoded data modulated into RF waves into the antenna. The antenna radiates the signal through the air where it is picked up by the antenna of the receiver. The received modulates the RF waves back into the encoded data stream sent by the transmitter. Liquid Crystal Displays (LCDs) offer several advantages over traditional cathode ray tube displays that make them ideal for several applications. Of course, LCDs are flat and they use only a fraction of the power required by cathode ray tube.

All wireless communication systems have the following components:

- Transmitter
- Receiver
- Antennas
- Path between the transmitter and the receiver

They are easier to read and more pleasant to work with for long periods of time than most ordinary video monitors. There are several tradeoffs as well as limited view angle, brightness and contrast not to mention high manufacturing cost. 16*2 LCD which is shown in figure is used in this project to display data to user. There are two rows and 16 columns. It is possible to display 16 characters on each of the 2 rows. It has two registers they are command register and data register.

LCDs can add a lot to your application in terms of providing a useful interface for the user, debugging an application or just giving it a “professional” look. The most common type of LCD controller is that provides a relatively simple interface between a processor and an LCD. Using this interface is often not attempted by inexperienced designers and programmers because it is difficult to find good documentation on the interface, initializing the interface can be a problem and the displays themselves are expensive.

3. Operation

When the normal condition the display shows “normal”. At the same time power thefted on the line the LCD display shows “power thefted”. Similarly this action the node‟s names are mentioned by the display. So we easily find out where the power theft occurs on the

transmission line. The proposed system provides the solution for some of the main problems faced by the existing Indian grid system, such as wastage of energy, power theft, manual billing system, and transmission line fault. We can detect the location from where the power is being stolen which was not possible before. It hence optimized the use of energy real time theft monitoring; it is used for currently used energy meters can be modified into this sensor, so no need to replace currently used energy meters. Figure 3 shows the hardware implementation of the proposed System.

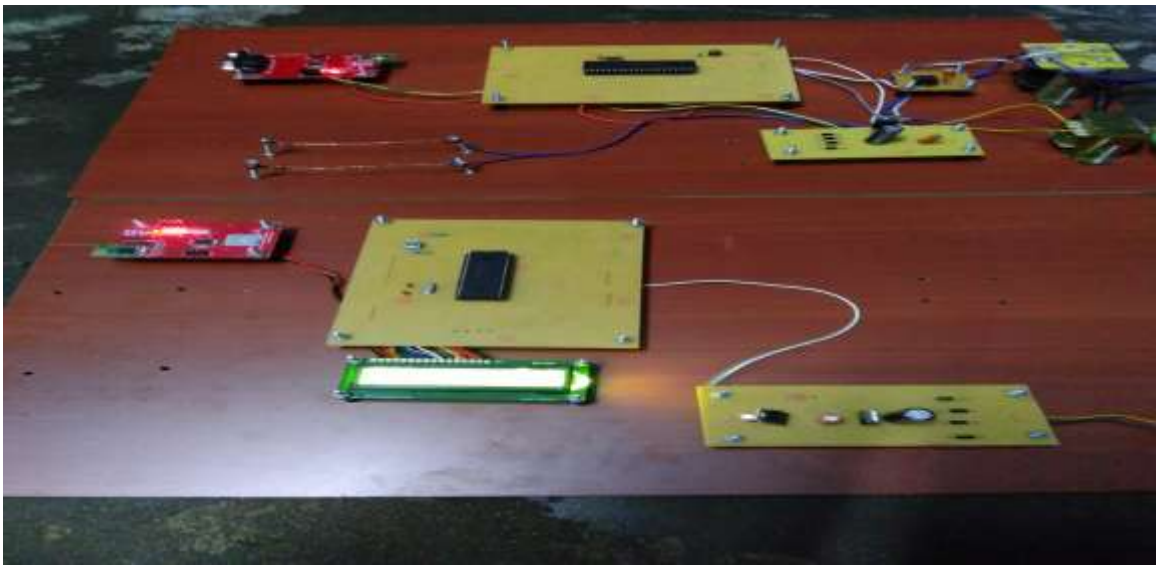

Fig 3:Hardware implementation

4. Future scope

In future, this project can be implemented and validated in remote areas. Future enhancements can be incorporated to suit the system for three phase electric distribution system in India. Along with all this new architectural components can be incorporated, so that the system can be completely used for optimizing the energy consumption. This method will reduce the energy wastage and save a lot of energy for future use. GSM module can also be used in place of Zigbee module.

5. Conclusion

This paper is aimed at reducing the heavy power and revenue losses that occur due to power theft by the customers. By this design it can be concluded that power theft can be effectively curbed by detecting where the power theft occurs and informing the authorities. Also an automatic circuit breaker may be integrated to the unit so as to remotely cut off the power supply to the house or consumer who tries to indulge in power theft. The ability of the proposed system to inform or send data digitally to a remote station using wireless radio link adds a large amount of possibilities to the way the power supply is controlled by the electricity board. The system design mainly concentrates on single phase electric distribution system, especially. The proposed system provides the solution for some of the main problems faced by the existing Indian grid system, such as wastage of energy, power theft, and transmission line fault.

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