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Wireless Communication System based Automatic EB Billing and Disconnection Schemes

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ABSTRACT: The proposed system an automatic meter reading system is designed using GSM Technology. The embedded micro controller is interfaced with the GSM Module. This setup is fitted in home. The energy meter is attached to the micro controller. This controller reads the data from the meter output and transfers that data to GSM Module through the serial port. The embedded micro controller has the knowledge of sending message to the system through the GSM module. Another system is placed in EB office, which is the authority office. The system generates the customer bill in every two months once as per government norms based on power usage of the customer. Then the used unit rate values are sent to the EB office PC through GSM module. According to the readings, the authority officer will send the information about the bill to the customer. If the customer doesn't pay bill on-time, the power supply to the corresponding home power unit is cut, by sending the command through to the microcontroller. Once the payment of bill is done the power supply is given to customer.

KEYWORDS: Transistor, Relay, Microcontroller, GSM, Energy meter.

I. INTRODUCTION

Electrical power has become indispensable to human survival and progress. Apart from efforts to meet growing demand, automation in the energy distribution is also necessary to enhance people's life standard. Traditional meter reading by human operator is inefficient to meet the future residential development needs. So there is increased demand for Automatic Meter Reading (AMR) systems which collects meter readings electronically, and its application is expanding over industrial, commercial and utility environment. Electronic utility meters are an important step towards automating the utility metering process. Automated utility meters have many new features that help to reduce the cost of utilities to customers and the cost of delivering utilities to the utility provider. The onset of rural electrification provides opportunities for new and more efficient metering technologies to be implemented. Traditional electro-mechanical meters, still widely used today, are prone to drift over temperature and time. This method of collecting of meter readings becomes more problematic and costly when readings have to be collected from vast, and often scattered rural areas. Meter readers are reluctant to make the effort to travel to such areas and will often submit inaccurate estimations of the amount of electricity consumed. For households at the top of high buildings and luxury housing plots, traditional meter reading is highly inefficient.

Traditional metering method is not convenient for energy measuring and billing, also more difficult (i.e.) measurement of energy consumed by the particular user done manually and data sent to electricity board where the amount is calculated based on the usage of electrical unit. The most common type of electricity meter is the electromechanical induction watt-hour meter. The electromechanical induction meter operates by counting the revolutions of a non-magnetic, but electrically conductive, metal disc which is made to rotate at a speed proportional to the power passing through the meter. The number of revolutions is thus proportional to the energy usage. The voltage coil consumes a small and relatively constant amount of power, typically around 2 watts which is not registered on the meter. The current coil similarly consumes a small amount of power in proportion to the square of the current flowing through it, typically up to a couple of watts at full load, which is registered on the meter. The disc is acted upon by two coils. One coil is connected in such a way that it produces a magnetic flux in proportion to the voltage and the other produces a magnetic flux in proportion to the current. The field of the voltage coil is delayed by 90 degrees, due to the coil's

inductive nature, and calibrated using a lag coil This produces eddy currents in the disc and the effect is such that a force is exerted on the disc in proportion to the product of the instantaneous current, voltage and phase angle (power factor) between them. A permanent magnet exerts an opposing force proportional to the speed of rotation of the disc. The equilibrium between these two opposing forces results in the disc rotating at a speed proportional to the power or rate of energy usage

II. PROPOSED METHOD

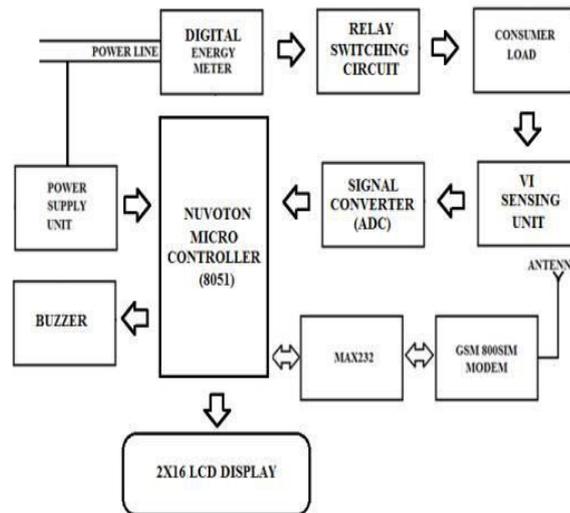


Figure 1. Proposed Block diagram

Figure 1 shows consists of Digital Energy Meter, Nuvoton Microcontroller, Voltage and Current sensing unit, buzzer, Relay and Liquid Crystal Display (LCD). Energy Meter IC generally produces electrical pulses proportional to the power consumed by the consumer and the power supply of microcontroller. Microcontroller calculates the energy consumed by the consumer utilizing the output of Energy Meter and programs loaded on the microcontroller. GSM800C modem interfaces with the microcontroller unit which is used to communicate the information about the measured bill to EB server as well as customer and also it shows the bill status and due date through SMS. Relay mainly performs the switching operation which is used to turn ON and turn OFF the power connection between energy meter and load through supply mains depending upon the bill payment.

A. LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines.

B. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

C. GSM Modem

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer.

D. Digital Energy Meter

A digital energy meter is used for providing energy measurements of non-sinusoidal waveforms. Voltage and related current components of a digitally sampled waveform are multiplied to form a product representative of instantaneous power. The products are summed or accumulated over a first time period, and the sums then accumulated over a second time period to form a second sum representative of total power over the second time period.

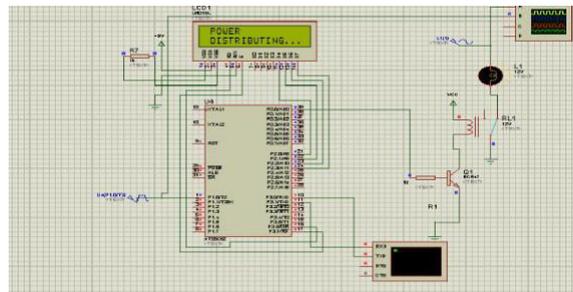


Figure 2. Software Simulation

III. HARDWARE IMPLEMENTATION

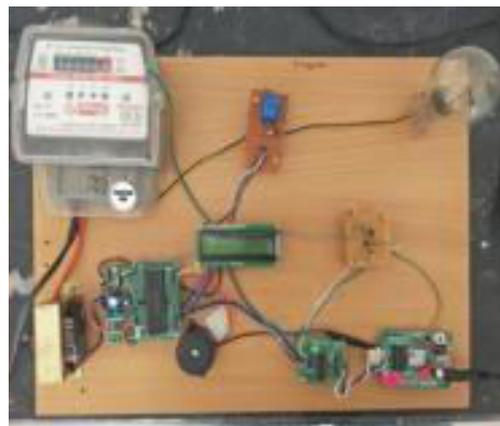


Figure 3. Hardware Implementation

IV. CONCLUSION

The proposed system is successfully completed to measure and control the consumer EB billing system by using wireless communication protocol. The embedded micro controller is interfaced with the GSM Module. This setup is fitted in home. The energy meter is attached to the micro controller. This controller reads the data from the meter output and transfers that data to GSM Module through the serial port. The embedded micro controller has the knowledge of sending message to the system through the GSM module. Another system is placed in EB office, which



is the authority office. The system generates the customer bill in every two months once as per government norms based on power usage of the customer. Then the used unit rate values are sent to the EB office PC through GSM module. According to the readings, the authority officer will send the information about the bill to the customer. If the customer doesn't pay bill on-time, the power supply to the corresponding home power unit is cut, by sending the command through to the microcontroller. Once the payment of bill is done the power supply is given to the customer. Power management concept is introduced; disconnect the supply for unpaid consumer.

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