RESEARCH ARTICLE

SMART ENERGY METER READING AND FRAUD DETECTION SYSTEM

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ABSTRACT

The paper discusses the GSM Based Post-paid Energy meter And Fraud Detection System. This Energy Meter have capabilities like remote monitoring and controlling, Automatic Meter Reading, Theft Detection, Message alert, Auto disconnect and connect in case of Non Payment of bill.. Energy Meter utilizes GSM network, since it is a fastest & simplest way to communicate with the consumer. Consumer would receive SMS regarding electricity bill, tempering alert & Billing amount. This project helps in better energy management, conservation of energy and also solves unnecessary pester over inaccurate billing. The automatic billing system will keep track of the real time consumption will leave little scope for disagreement. In this way this project is beneficial for energy provider, IT Park, individual house holder.

Keywords: GSM Module, AMRS, GSM Module

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I. INTRODUCTION

In today's world, electricity becomes a basic and the most important necessity of life. Every individual needs electricity and the amount of electricity consumption are increasing day by day. The most important reason is that all home appliances need electricity. So at the end of the month, the MSEB department needs to dispatch the monthly hard copy bill.

Every month, the MSEB need to send a man power door to door to collect the reading of the meter. This involves human resource which encored the money. And to collect the meter reading from door to door, the meter reader need to use a camera to click the snap of the reading of the meter. This also involves the flow of money. Because this activity takes place throughout the country, every month and that too door to door, it cost allot to MSEB department. Many people have their meter

installed inside their home. So it makes it inconvenient for the user. Sometime the user is not available at home, so the meter reader sometime fails to take the meter reading.

In order to avoid all these problems, we have developed this post-paid energy meter system. This system basically consists of a meter and the microcontroller based system with GSM MODEM interfaced. The microcontroller will read the meter reading and via GSM MODEM, it will transmit the meter reading to the MSEB billing department.

This paper includes the following detail introduction of latest Automatic Meter Reading Systems described in section II and summarized results and discussion in section III.

II. Design of AMRS

An overall view of AMRS is shown in Fig. 1. And Fig.2. The main goal of AMRS project is to send periodical readings of an energy meter wirelessly to a server in the billing office of the electricity supply company. There were central points which will cover each geographical area, since each premises unit would have limited range of wireless coverage, while the central point's consists of long-range wireless transmitters that could deliver the meter-reading data over long distances to the MSEB billing office.
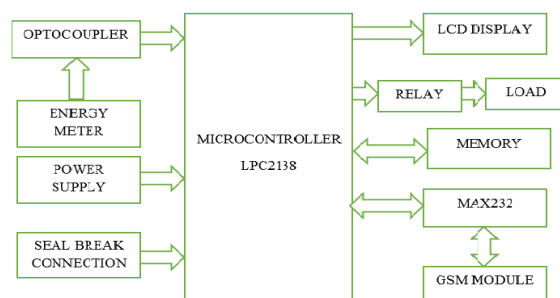

Fig.1.User Unit

Fig.2. MSEB Department Billing Unit

The server in the billing office provides high security to database system which enabled authorized staff members of the electricity board to read and print electricity bills. For premises out of the coverage area of any central point, the solution

expected was to make the nearest base unit (covered by a central point) as the central point for such remote base. This added an impulsion on the wireless device used for such purpose because such a device should have the capability of both transmitting and receiving the data. A block diagram of AMRS design is given in Fig. It consists of two main parts, the Sender (also called User Unit), and the Receiver (server database at the billing office of the electricity supply company).

A. The Sender (User Unit)

After conducting a survey of the energy kWh meters available in the India and comparing their characteristics and prices, we decided to use a single-phase MJ-093 meter, provided by the Jaipur Electronics Company. This meter satisfies power systems requirements as it runs with 230V/50Hz supply and can handle maximum current of 60(120)A. The meter has a pulse port provided for counting pulses and a memory to store records in case of power shutdown. The cost of the meter is □ 350 which was the lowest price available for Energy meter and within our budget. Note that since the cost of three-phase energy meter was about □ 1650 more than the cost of a single-phase meter, and this □ 1650 could have taken us out of our budget allocation, we had designed AMRS for a single phase supply system. But, the theory of implementing and working of a three-phase AMRS is similar to single phase automatic energy meter-reading system.
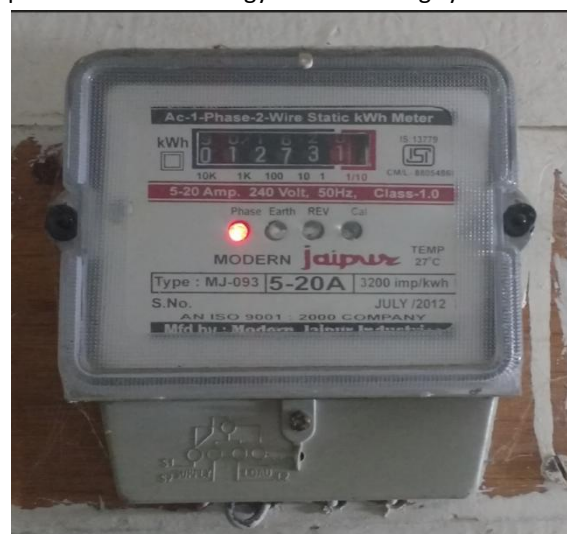

Fig.3.Energy Meter

The main objective of the microcontroller is to control the communication between the User Unit and the MSEB Unit. In ARM core we are using ARM7 processor and LPC 2138 controller for our project. As it has 60MHz clock operation so that it's operation is fast. Also it is easily available and it is cheaper than LPC2148.

A static RAM was chosen because it is faster compared to most kinds of ROM and is cheaper for the size of memory required for the project. The memory was divided into different blocks: one block of memory was used to store configuration files that can be updated remotely by the server through the microcontroller, another block was assigned for storage of the random numbers table which will be used for authentication, another block was used for recording the daily, weekly, and monthly power dissipation readings.

The nub of data communication about this system lies in wireless communication control terminals that uses GSM Modules to transmit long distance data extensively and reliably. It Support instructions of AT commands.SIM300 can be integrated with a vast range of applications. SIM300 is a Tri-band GSM/GPRS engine that works on frequencies GSM 900 MHz, PCS1900 MHz SIM300and DCS 1800 MHz provides GPRS multi-slot class 10 capabilities and support the GPRS coding schemes CS-1, CS-2, CS-3 and CS- 4. With a tiny configuration of 40mm x 33mm x 2.85 mm, SIM300 can fit almost all the space essential in our application. Therefore, the MCU can interface with GSM modules very expediently through serial interfaces.
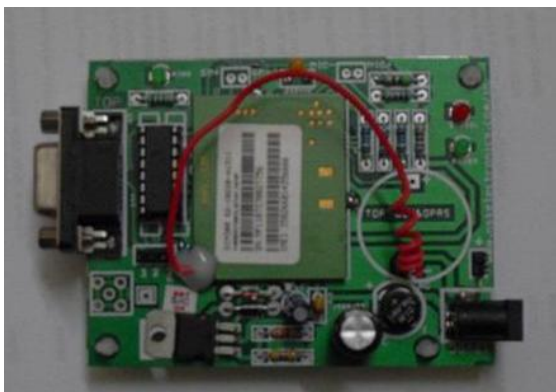

Fig.4. GSM Module Sim300

B. The Receiver (at the Billing Office)

The hardware at the billing office consists of Computer having software, RS232 and mobile phone.

The computer at the MSEB department consist of software created using visual basics for managing the billing and sending bill amount and monthly readings to the customer. The database server requires software for communication with the premises unit of each customer and, based on the consumption of data received, it needs to generate an electricity bill.

Prior to allowing communication between the transmitter and receiver, it will be necessary to authenticate the administrator at the billing office and the sender at the Premises Unit.

Using password to authenticate the administrator in the billing office, he/she can develop an electricity bill for the customer, upon receiving the consumption data, for the project, the bill calculator program was written using Visual Basic/Macromedia Flash MX, interfaced with a SQL database.

We are using Nokia 1100 for receiving monthly readings and fault detected from user side in the form of sms from GSM modem connected at user side and sending the bill amount and monthly reading to customer/user. We can also use GSM module SIM300 instead of using cell phone but due to easy availability of cell phone and cost restriction of project we are using mobile phone for demo model.

III. RESULTS DISCUSSION

An energy meter measures a consumed power by load over a period and stores it in non-volatile memory. At the end of month it sends a data in proportion with consumed power to receiver via a wireless GSM Modem. The receiver on the board system receives the data sent by transmitter in a load side meter. Receiver sends it to system at MSEB office and calculates monthly bill. Prepared Bill is successfully sent back to the registered consumer at the time of bill generation itself. Back ends database details and HTML source code details can be accessed anytime by the administrator.

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IV. Conclusion

In this paper, we have recommended a prepaid energy meter which takes advantage of the GSM network that has virtually access to every home and area across different countries. The GSM communication not only implements the idea of energy consumption of electricity but also promote the utilities to control energy theft using our smart energy meter. In this system, the data of electricity theft is directly informed to the central authority. Therefore, utilities can take immediate legal action against the accused consumer and hence control electricity fraud to a great extent. The recommended meter is thus highly helpful for power utilities for reducing electricity lifting and ensuring revenue collection.

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