

# An Enhancement of Prepaid Energy Meter Using Smart Card And GSM Module Techniques

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**Abstract**—Saving energy is high on the agenda for consumers and businesses, but with most of the electrical devices today, it's difficult to know how much energy we are actually using at any given point in time. Smart Energy Meter is a meter which helps the consumers to know their day to day power consumption to better control their usage and producers to manage production. This meter records consumption of electric energy in intervals of hour or less. Smart meters enable two-way communication between the meter and the central system. The proposed project comprises of hardware design using a low-cost 8-bit P89C51RD2xx microcontroller and the complete hardware design will be proposed. The Communication is through SMS. They are two one is admin password and second is user. By this admin password the cost per unit can be changed by the concerned officer. The system software driver is also developed using embedded-C programming language in Keil  $\mu$ Vision 4 IDE. Smart meters are also believed to be a less costly alternative to traditional interval or time-of-use meters and are intended to be used on a wide scale with all customer classes, including residential customers. The project also addresses about the various debugging tools such as Keil  $\mu$ Vision 4 C51 debugger and Flash magic tool 9.25 version used to test the implemented prototype.

**Keywords**—Smart Card, Micro controller AT89C51, MAX-232 Serial Communication, Liquid Crystal Display, Pre-paid Electricity Protocol

## 1. INTRODUCTION

Now-a-days electricity has become a basic need to humans. The consumption of electricity has increased a lot compared to the past years. The theft of electricity has also become a problem these days and there is no control over the loss due to theft of electricity. In this project we present you the smart energy meter device used to measure the consumption of the electricity by the individual and provide security against theft of electricity.

A smart meter is usually an electrical meter that records consumption of electric energy in intervals of an hour or less and communicates that information at least daily back to the utility for monitoring and billing purposes. Smart meters enable two-way communication between the meter and the central system. Unlike home energy monitors, smart meters can gather data for remote reporting.

The term Smart meter often refers to an electricity meter, but it can increasingly also mean a device measuring natural gas or water consumption. Smart energy meter is software based, power efficient device that accurately tracks energy consumption and performs computation. Meter readings can be transmitted to distributors/utilities over wireless media; thus, eliminating the need of manual meter reading collection process. The smart energy meter offers major benefits to both customers and companies in terms of efficiency, reliability, and cost saving.

Imagine if you knew how much energy you were consuming at home at any time of the day, and knew how much energy each device was using, will you stop using those energy hog appliances? or use them at the time of the day when the energy is cheapest?. In the economy turmoil we are currently in, I believe all of us are willing to make

those small sacrifices to lower down the bill numbers at the end of the month.

Smart energy meters are devices that will sit on your home, monitor energy data from your electricity meter, and let you know how much energy you are using – this put more control on your hands on how you spend your energy at home. Conventional electricity meters are normally hidden somewhere on a wall on the basement, and the only time you realize how much energy you've been spending is when the bill hit the door.

The new smart meters will provide Indian consumers with information regarding energy consumption that was not previously available with a traditional meter. This system will allow the easy disconnection of defaulted customers and power connections from a remote site. The new smart system is also able to instantly detect tampering with the power lines and sends signals to security personnel if necessary. Utility employees will also have the ability to change a customer's billing method from pre paid to post paid in a matter of consumption that was not previously available with a traditional meter. This system will allow the easy disconnection of defaulted customers and power connections from a remote site. The new smart system is also able to instantly detect tampering with the power lines and sends signals to security personnel if necessary. Utility employees will also have the ability to change a customer's billing method from pre paid to post paid in a matter of seconds, without having to physically visit the meter.

## 2. PROPOSED SYSTEM

In the present scenario, the use of advanced technologies such as digital metering has become extremely necessary to achieve greater efficiency, theft reduction to reduce AT & C

losses and to improve revenue collection. The utilities and planners should now focus on best use of electronic technology to develop a full 'smart' system, which is capable of offering long term benefits and comprehensive solutions in addition to theft reduction and usage reduction. In undeveloped and under developing countries proper distribution of power has to be done. So it's the duty of us, engineers to develop the equipments to reduce the power losses and power thefts by over usage.

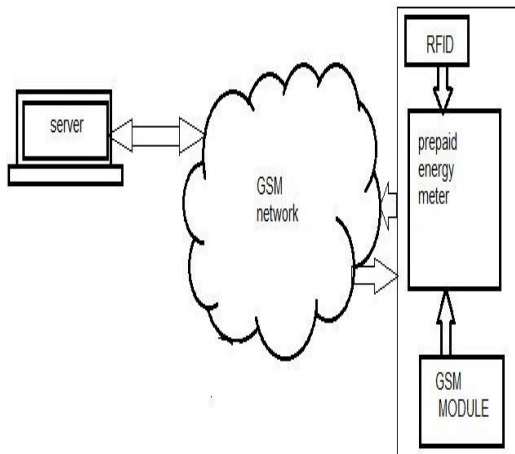


Figure 1. overview of the proposed system

There is no need for the electricity officials to visit the spot to disconnect the connections i.e., everything can be controlled over the GSM module. The user can also sell the electricity to the government which is created in his home using solar cells. These meters can also be used as prepaid energy meters by slightly modifying them.

The scope of the project work is to introduce advanced technology in converting dc voltage in to ac voltage and introducing smart energy metering concept. In future this project can be used to measuring natural gas or water consumption. These meters can be connected to GSM module and data (i.e. consumption) can be transmitted over GSM networks and the bills can be automatically issued to the particular customer through SMS. By making small modifications in the program (code) we can break the connection if user does not pay the bills in time.

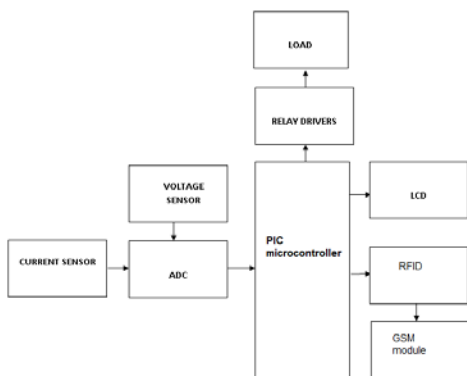


Figure 2. block diagram of proposed system

The P89C51RD2xx contains non-volatile 64KB Flash program memory that is both parallel programmable and serial In-System and In-Application Programmable. In-System Programming (ISP) allows the user to download new code while the microcontroller sits in the application.

In-Application Programming (IAP) means that the microcontroller fetches new program code and reprograms itself while in the system. This allows for remote programming over a modem link. A default serial loader (boot loader) program in ROM allows serial In-System programming of the Flash memory via the UART without the need for a loader in the Flash code. For In-Application Programming, the user program erases and reprograms the Flash memory by use of standard routines contained in ROM.

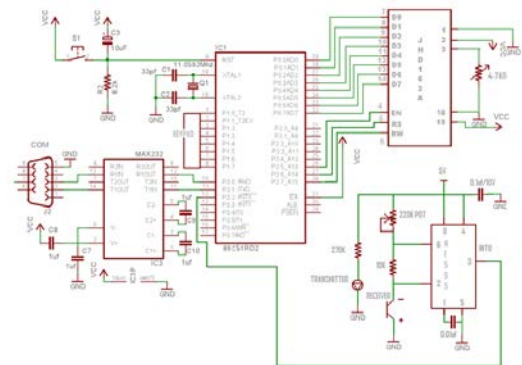


Figure 3. Complete circuit diagram of proposed prepaid energy meter

### 3. CONCLUSION

The prototype of the system has been developed and tested successfully. The advantage of the prepaid metering system and its design components have been discussed. This prepaid metering system minimize the human intervention in meter reading, bill calculations and billing delivery which ultimately reduces many defects than the currently existing postpaid billing systems. The modeling shows that the consumer is never allowed to consume more than wat he has paid for an entitled to request a recharge for continued supply. According to the usage of every consumer, the default amount is entered in the program. Such that, when the user swipes the card on the meter the default amount gets recharged and the supply passes to the load. With the help of GSM module the intimation is passed to the server . if more such systems are implemented, then it can be connected to a server and functioned as same as mobile network. This system was specially designed for India but can also be implemented in any other country. This is certainly beneficial to both consumers and power distribution companies.

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