

# Energy Management System with Theft Monitoring Using GSM

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## ABSTRACT

Electricity is one of the most popular forms of energy used in the modern society. Nowadays, electricity energy demands are increasing constantly. The availability electrical energy is also serious issue since demand is greater than generation. This paper proposes the Automatic energy meter reading with indication using GSM. It developed to decrease the electricity consumption bill by providing the energy meter reading to the user with an alert message before increasing of unit charge. By using this system save the time required for conventional billing system and minimized human work load. User and service provider both are get correct reading and bill amount. Theft of electricity also avoids late bill payment. By apply this system data security improve. Due to this system service provider quickly find out illegal and late bill paying customer by accessing database. So GSM based AEMR system is more efficient that conventional billing system.

**Keywords:** GSM, AEMR

## I. INTRODUCTION

Traditional electricity billing process is very length and erroneous. Now a day energy meter reader goes to every premise and takes the reading manually then issues the bill. This requires huge number of labours and long working hours for billing. Visiting every consumer's home is something that causes a bit of inconvenience. For manual reading in different houses conditions vary leading to somewhat erratic results, especially when the meter is inside the home or in a hard-to- access place. All these lead to not so accurate billing. Which have some disadvantages like erroneous reading, easy manipulation, manual labour and time consuming. To avoid this difficult task, Automatic Energy Meter Reading (AEMR) system is introduced. In this paper we propose a method which uses GSM Network which eliminates the need of internet. "GSM Based Prepaid Energy Meter"

system consists of Energy Meter and the GSM Network. The system provides efficient power meter reading, usage notification and consumers maximum demand using GSM network. GSM modem utilizes the GSM network to send equivalent unit for the recharge amount to the Microcontroller and send message to the customers also. The message consists of details of energy required to the customers in the terms of the unit. In the energy provider side this system is used to update the consumer account and the database.

### 1.1 Need for Automatic Energy Meter Reading Technology:

The meter reading data is sent by the home unit to the Electricity Board (EB) office through power lines. This saves lot of manual data entry needed for entering the data of meter reading into the central system. The power line communication used here is bi-directional. Sometimes the power lines may be

noisy due to interference of external disturbances. During such cases the data transmission may be interrupted and error may get introduced in data. To avoid this noise a dedicated micro controller is used to enable data transmission even in the noisiest power line and also at any weather condition. Also Automatic supply tripping and restoring is done under case of failure in bill settlement by customer. The automated EB billing procedure fulfills a set of needs for the user and the EB workers.

1. Automatic generation of Electricity Bill, consumed by the consumer.
2. Allow the user to get updated regarding the details of power used in his house.
3. The automated EB billing system eliminates the need to pay the bills at the EB office.
4. Automatic supply tripping and restoring under the case of failure in bill settlement by the customer.

## II. SYSTEM DESIGN

### 2.1 Automatic Energy Meter Reading Technology:

In a developed system AT89S52 Microcontroller is used. The AT89S52 is programmed such that power supply will be switched off by using relay when the recharged amount gets used up. A 16X2 LCD is providing to read units available. Main power supply is connected to the load with the help of the Relay when recharge message given to the controller through the GSM. When consumer sends a message for recharge a meter to the GSM, Microcontroller checks the number and turn on the relay. The main function microcontroller is to compute the power with help of energy meter and turn the Relay ON/OFF. Number of Units is displayed on the LCD screen. As the Units are low a SMS message will send out to the consumer registered number through GSM modem.

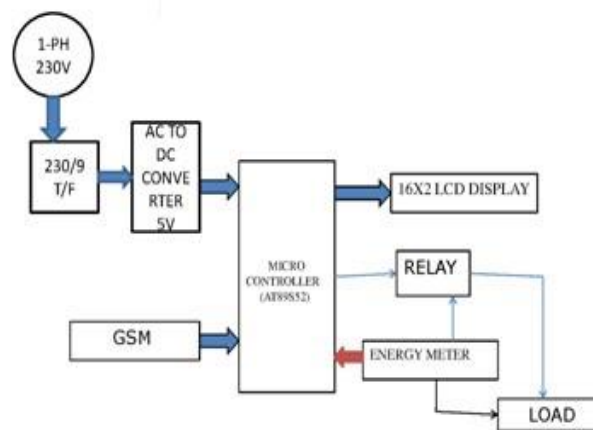


Figure 1

The first customer section consists of digital energy meter and control system. The output of the processor IC is a digital pulse, which depends upon the load used. These digital pulses are given as the input to the second section through the optocoupler. For every 100 pulse the micro controller receives it increases the number of units consumed by the consumer which is stored in the EEPROM. This is

then displayed in LCD. The modem receives the input from the microcontroller and transmits it to the EB side. These are received by the modem placed in the EB side and sent to the PC. Hence the number of units consumed and the amount is displayed in the LCD. The GSM communication module is used to send a message to the consumer about the units of power consumed and their balance and also LCD display is used to display the balance amount.

## III. HARDWARE ORIENTATION

The components of hardware implementation are as follows:

### 3.1 Power supply:

Power supply is main component of the meter. Power supply is provided to microcontroller and other device from direct ac lines or from AC to DC adapter.

### 3.2 AT89S52:

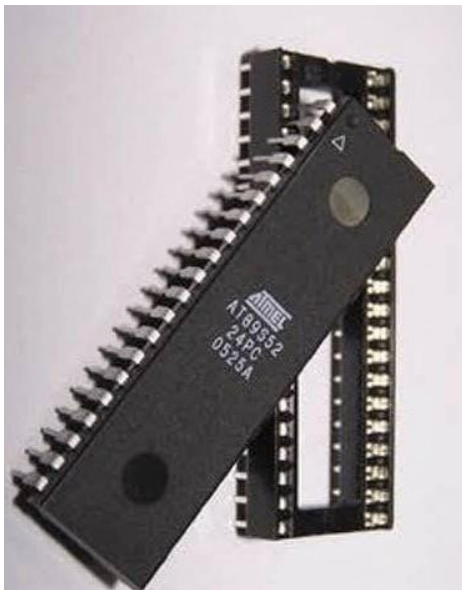


Figure 2

The AT89S52 is the heart of the system. It has low-power, high-performance 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. It controls the LCD display, generate interrupts, and the power line communication unit. Microcontroller is connected with optocoupler, EEPROM, power line MODEM and LCD. The EEPROM is used to store the output of the microcontroller permanently. The MAX232 interface is used to control the speed of data transfer between MODEM and the microcontroller.

### 3.3 Energy meter:

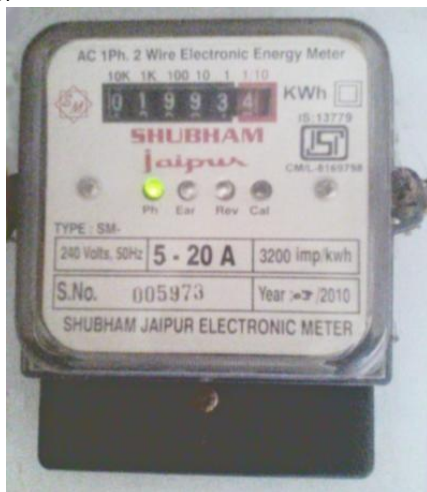


Figure 3

The ADE7751 is a high-accuracy, fault-tolerant electrical energy measurement IC that is intended for use with 2-wire distribution systems. It is electrically fed and composed of electronic controllers. It incorporates an interface which allows data to be transmitted from the remote terminal to the isolator block.

### 3.4 LCD Display [2\*16]:



Figure 4

LCD means Liquid Crystal Display. It is a display device which displays the information provided to it. Its shape and size varies from application to application.

### 3.3 EEPROM AT24C04:

AT24C04 provides 4096 bits of Serial electrically erasable and programmable read-only memory (EEPROM). It is two-wire Serial Interface. Filtered Inputs are present for Noise Suppression.

### 3.4 Relay



Figure 5

Relays are used to control a circuit by a low power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults.



Figure 6

### GSM

The term GSM stands for Global System for Mobile application. A GSM Modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator. When GSM Modem is connected to a computer to use the GSM Modem to communicate over the mobile network. While these GSM Modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

## IV. SOFTWARE REQUIREMENTS

### 4.1 KEIL Compiler:

KEIL an ARM Company makes C Compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards. Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors.

### 4.2 AT Commands:

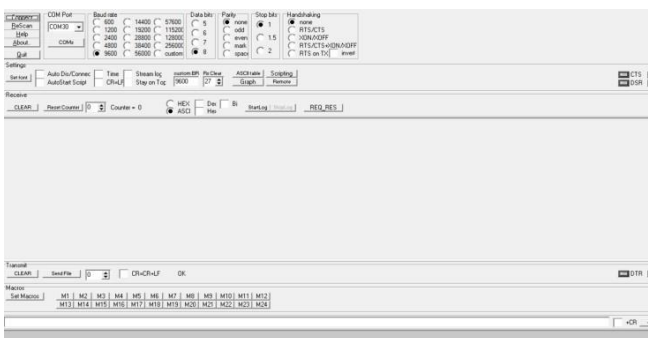


Figure 7

AT Commands are instructions used to control a modem. AT is the abbreviation of Attention. Every command lines start with “AT” or “at”. That is the reason, modem commands are called AT Commands. Besides this common AT command set, GSM modems and mobile phones support an AT command set that is specific to the GSM technology, which includes SMS-related commands like AT+CMGS (Send SMS message), AT+CMSS (send SMS message from storage), AT+CMGL (List SMS messages) and AT+CMGR (Read SMS messages).

## V. RESULTS

When power supply is given to the controller and controller take the readings from meter and send SMS to the user after every month. Below snaps are taken before utility off and on and when power supply on it will sends bill and consumed units to the user. When user not paid the counter will reaches to zero and power will off that is shown in below snap shot.



Figure 8

Figure: Sending messages to the user when supply is on and sends alert message before increasing unit charge.

## VI. CONCLUSION

Smart energy meter with reading indication has been developed by using GSM. Which is more useful to consumer for billing and maintaining less

bill payment and it decreases the human needs for paying and other issues related to billing. We can extend it for industrial purposes also by interfacing three phase meters but the circuit have to modify for getting proper voltage to the controller.

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