

## Automatic EB Billing Using GSM Technique

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**Abstract:** *Now a day the energy meter monitoring and taking the readings needs lot of manual power. It is also an urgent problem that the household wants to solve it because, the accuracy and real time of meter data copy affects the power system information level, management decisions and economic benefits. We overload electrical circuits it could cause a fire and load demand. The home appliances, which consume more power, cause an increase in the payment of excessive bills. Automatic Meter Reading (AMR) technologies in Electrical Utilities (EUs) have been exploiting their own infrastructure to bill their customers in an efficient and economical way. This project is having the facility of getting the meter reading and overload indication at any time by the customer mobile and EB office. We are using the PIC microcontroller for the efficient energy meter monitoring system. This system is connected with the energy meter with load. The IR receiver is used to count the reading of the energy meter. The value of the IR receiver will be given to the microcontroller. The EB bill and overload occurred message would be send to consumer mobile number and EB office mobile number by using GSM modem. The status will be displayed in LCD, which is interfaced with the microcontroller.*

**Key Words:** *Automatic Meter Reading (AMR), Electrical Utilities (EUs), PIC microcontroller, GSM modem.*

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### 1. INTRODUCTION

In recent years, energy meter reading is manually taken and sends to the EB office and the user, which is the main problem. It is rectified by using GSM technology. It can be used for commercial applications. It can be developed as a primary meter, sub meter or used for other electric metering applications such as demand reduction.

Its open system design and easy worldwide development leads to output with real time data based on accurate measurement. This electric meter is designed to meet requirements for data on demand from multiple users. Traditional meters focus only on single user applications at fixed time intervals.

It is the right solution in today's complex energy market combining low cost, high accuracy, minimum cost of communications with real time data access and reporting. This sophisticated GSM enabled meter combines elements of simplicity, is highly functional and reduces overall ownership costs.

Automatic Meter Reading (AMR) technology in Electrical Utilities (EUs) have been exploiting their own infrastructure to bill their customers in an efficient and economical way and facility to getting the meter reading and overload indication at any time by customer mobile number and EB office.

Since most facilities already have an existing network, the cost of communication is virtually less. This advanced meter provides peak demand (kW) with a date and time stamp informing when the peak demand occurred.

It also has the capability to periodically record and store interval data usage (load profile) based on a user defined interval. This functionality helps identify where, when and how much energy was

consumed. It can also store value of energy consumption by Time-Of-Use (TOU). This allows end users to identify how much energy was consumed during different periods of the day.

Some of these features are listed below,

- Higher speed
- Improved load profile
- Automatic billing
- Real time energy cost
- Load management
- Alarm warning at overload condition

### 1.1. Research Problem

Now a day the energy meter monitoring and taking the readings needs lot of manual power. It consumes wastage of energy and it is a time consuming process. Reading values are not accurate. We overload the circuits it could cause a fire and load demand. The number of electricity consumers is increasing in great extent. It became a hard task in handling and maintaining the power as per the growing requirements. If the consumer is not available, the billing process will be pending and human operator again needs to revisit.

Going to each and every consumer's house and generating the bill is a laborious task and requires lot of time. It becomes very difficult especially in rainy season. If any consumer did not pay the bill, the operator needs to go to their houses to disconnect the power supply. These processes are time consuming and difficult to handle. Moreover, the manual operator cannot find the un-authorized connections or malpractices carried out by the consumer to reduce or stop the meter reading/power supply.

The human error can open an opportunity for corruption done by the human meter reader. So the problem which arises in the billing system can become inaccurate and inefficient.

### 1.2. Objective of the Thesis

The main objective of this thesis is to greatly reduce the manpower, save time and to operate efficiently without any human interference by means of automatic EB billing and overload indication using the microcontroller chip with a new approach for data security and transmission of data using GSM technology.

### 1.3. Scope of Work

Better management of total energy usage and get details about the amount and timing of your energy use, so we can adjust accordingly and save money. Advanced meter data can be used to compare costs between competing utilities and to arrange for bulk-rate purchasing. Identify and implement operational strategies to control load factor, peak load requirements and reduce energy waste and understand the consumption patterns.

### 1.4. Methodology

The following methodology has been adopted in order to carry out the Research work:

- The complete control is done through microcontroller (PIC16F877A) with help of coding.
- This system is connected with the energy meter with load.
- The IR receiver is used to count the reading of the energy meter. The value of the IR receiver will be given to the microcontroller.
- At every 2 months the total bill amount will be transmitted to the EB section and the user mobile.
- If a user uses more than the fixed range of current means automatically an alarm will on and after some minutes the main supply will be switched off using relay circuit.
- The status will be displayed in LCD which is interfaced with the microcontroller.

## 2. BLOCK DIAGRAM

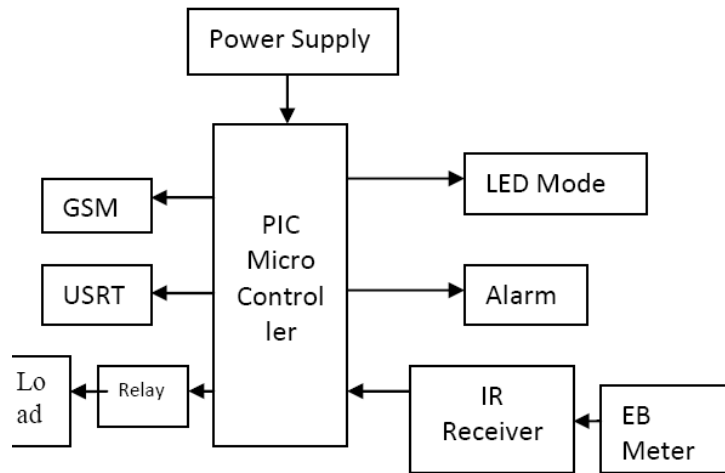


Fig1. Block diagram of home section

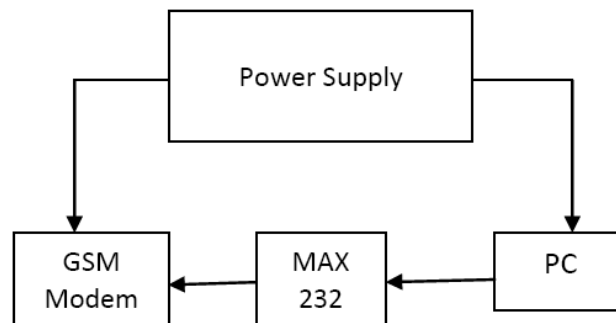


Fig2. Block diagram of EB section

### 2.1. Block Diagram Explanation

Here the input given to the project is 230V AC and controller get DC supply from rectifier circuit. The microcontroller is connected with the energy meter with load. The IR receiver is used to count the reading of the energy meter. The value of the IR receiver will be given to the microcontroller. At every 2 months the total bill amount will be transmitted to the EB section and the user mobile. If a user uses more than the fixed range of current means automatically an alarm will on and after some minutes the main supply will be switched off using relay circuit. The status will be displayed in LCD which is interfaced with the microcontroller.

## 3. HARDWARE DESCRIPTION

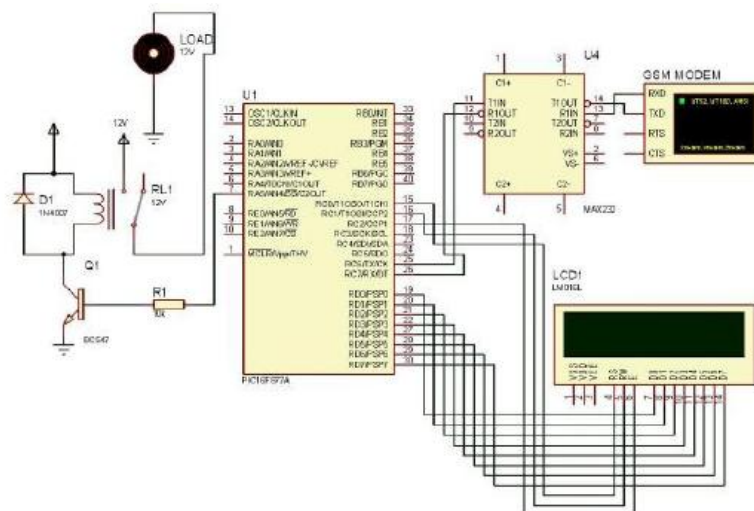


Fig3. Circuit diagram of hardware in home section

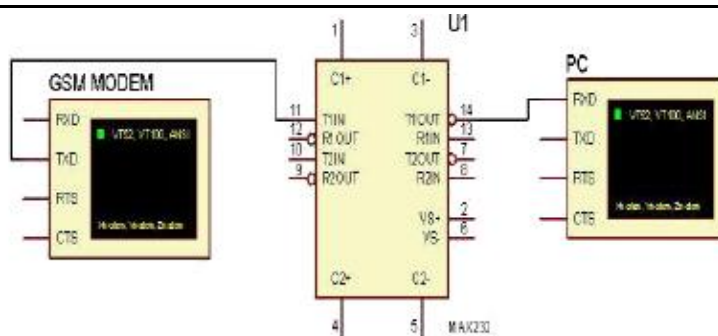


Fig4. Circuit diagram of hardware in EB section

### 3.1. Circuit Diagram Expiation

In this overload indication and automatic EB billing in energy meter project we are employed an electronic energy meter for calculating the electrical power consumption of the users.

The single phase, 230V, 50HZ AC supply is directly connected with the load section through the energy meter. This single phase 230V AC supply is step downed to 12V AC by 12-0-12V center tapped transformer for electronic section. For the microcontroller section +5V DC supply is needed. For this purpose 12V AC supply is rectified using diode bridge rectifier circuit. In this bridge rectifier there are four numbers of diodes(IC IN4007) are used.

The output DC supply from the bridge rectifier circuit is regulated by the voltage regulator IC7805 to maintain constant +5V DC supply. There are two number of capacitors are used for the filtering purpose.

This +5V DC supply is given to the Vin pin of the PIC16F877A microcontroller which controls the GSM modem circuit, buzzer circuit, LCD circuit and relay operation.

GSM modem is interfaced by the PIC microcontroller through MAX232 cable using IC MAX232EPE. +12V DC supply is given to GSM modem. In this, a SIM card is used for data transfer purpose. There are two number of GSM modems used one is for home section and another one is in EB section both acts like a transceiver.

Other peripherals such as LCD, buzzer and relay circuit are directly controlled by the microcontroller. There is a reset button by which we can reset the microcontroller.

In the EB section, the single phase, 230V, AC supply is step downed to 12V AC supply by 12-0-12V centre tapped transformer and it is rectified by the bridge rectifier and given to the GSM modem.

The GSM modem is connected to the computer through MAX232 cable. To send and receive the data from the EB section to home section, hyperactive terminal application is used.

### 4. HARDWARE OUTPUT HOME SECTION

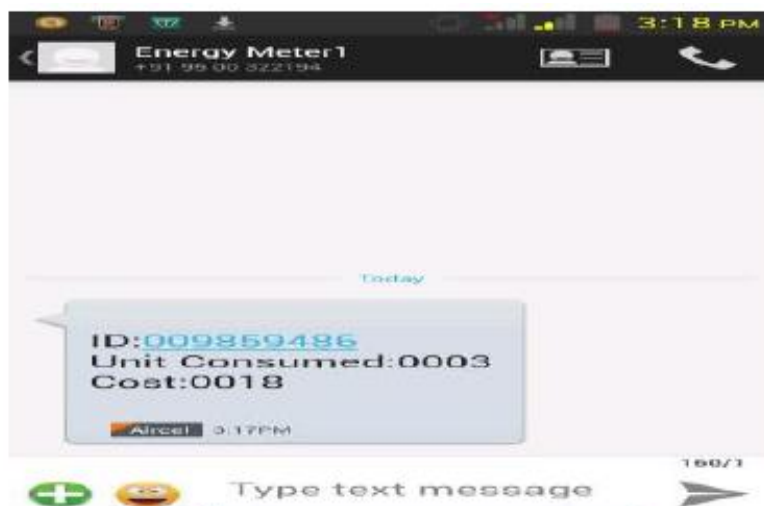


Fig5. EB Billing Output Value

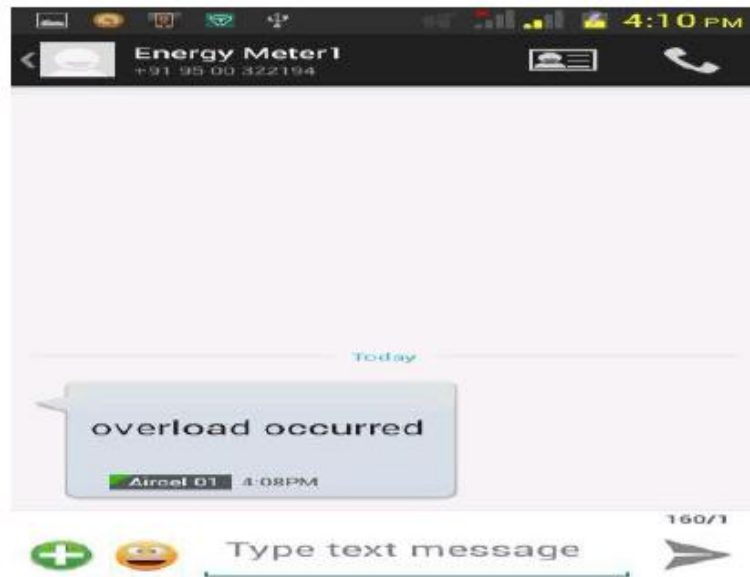


Fig6. Overload Indication Output

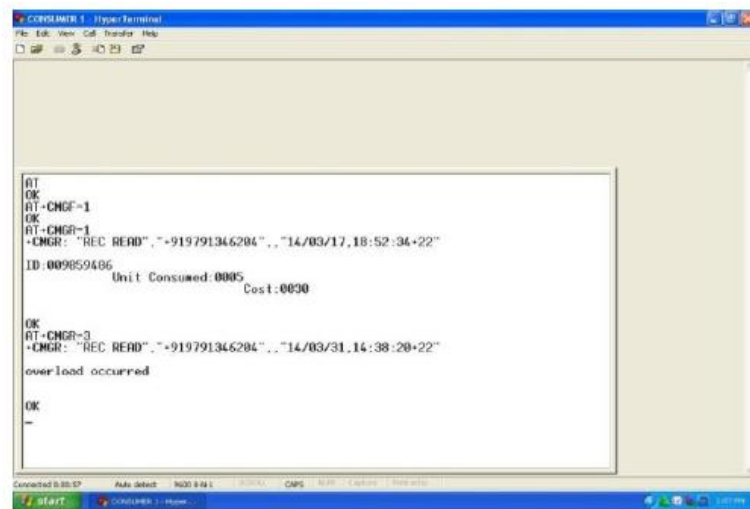


Fig7. EB Billing and Overload Indication Output Value in EB Section

## 5. HARDWARE KIT

Overload Indication and Automatic EB Billing Using GSM Technique

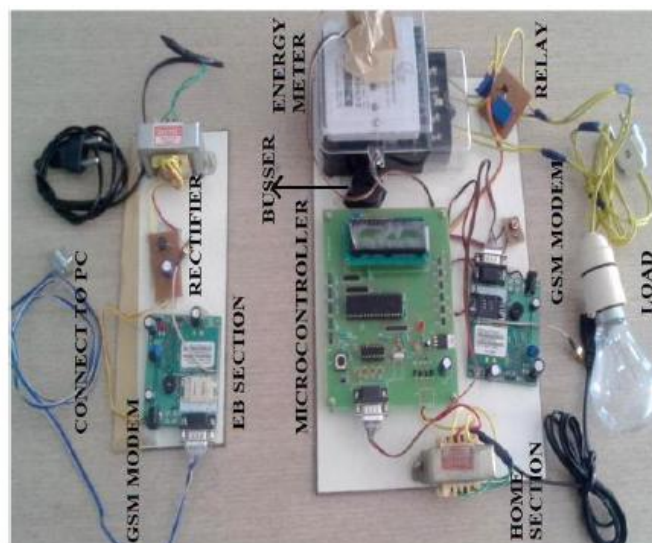


Fig8. Hardware Circuit Diagram

### 6. CONCLUSION

Various electronic meters have been developed and are still being developed. However the use of GSM in this particular system provides numerous advantages over methods that have been previously used. Data transmission is charged at standard SMS rates, thus the charges are not based on the duration of data transmission. The cost efficient transmission of readings ensures that power consumption values can be transmitted more frequently to a remote station. The implications of being able to transmit readings more often are that energy utilities will be able to generate timely bills, better understand energy demand patterns, manage meter failures more efficiently and manage fraud better. By performing overload indication and tripping the supply we can restrict the power utilization beyond the allocated ratings for customers and also voltage fluctuation problem to the neighbouring customers can be minimized.

### 7. FUTURE ENHANCEMENT

In our approach, we designed a system with IR sensor and GSM technology. Instead of this we can use SPI metering IC which will provide more parameters. By using three phases IC MCP3909 we can extend to the three phase supply and also advanced technologies such as WIFI, ZIG-BEE can be used instead of GSM technology.

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