

# **Modern Electricity Billing System and Fuse Detection Using GSM**

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**ABSTRACT:** In traditional metering method retrieving the energy data is not convenient and the cost of data logging system is high. So this project presents the design and development of Automatic Meter Reading (AMR) system. AMR system gives the information of meter reading, total load used, Auto power disconnect and reconnect system. This information is being sent and received by concerned energy Provider Company with the help of Global System for Mobile Communication (GSM) network via RS232 link. Two GSM modems are used one connected to energy meter and another connected to PC present in office of electricity board. Energy provider receives the meter readings within a second without visiting home. User interface consists of LCD which displays the power consumed and amount of bill to be paid. The advantage of our paper is not only reduces the labor cost but also increase meter reading accuracy and save huge amount of time.

**KEYWORDS:** GSM, AMR, interface , modem, LCD display.

## **I. INTRODUCTION**

At present, most of the houses in India have the traditional mechanical watt hour meters and the billing system is not automated. At the end of each month a person from the electricity board goes to every house and takes the meter reading manually. These meter readings are used for electricity bill calculation and this bill sent to consumer house by post. Customer goes to electricity department for paying this bill amount. But in this technique we are required great number of persons for reading the meters. The procedures of sending the bills to customer are very laborious. From many years, the electric power systems had undergone negligible changes in their operating conditions and the equipment employed for their control and monitoring. Many attempts have been made to design the energy meter with instant billing but till now the designed energy meters did not give any replacement for the system.

An energy meter is a device which is used to measure the consumption of energy of any residence or other industrial establishment. In conventional metering system, the power usage reading is made manually by moving to the consumer locations. This requires large number of labour operators and long working hours to complete the task. This metering system becomes very difficult especially in rainy season. If any consumer did not pay the bill, the electricity worker needs to go to their home to disconnect the power supply.

In this paper we are implementing automatic energy meter connected to electricity office through GSM network. When we use the electricity, the amount which we had used is calculated by energy meter at user interface. This information is passed to the micro controller. Nowadays, Short Message Service (SMS) is widely used as a form of data communication. It is about 2.4 billion active users which equals to 74% of mobile phone subscribers sending and receiving text messages on their phones. SMS is a communication application in Global System for Mobile communication (GSM) system. It allows interchange of short text messages between mobile telephone devices using standardized communication protocols.

The system is design to receive the SMS from any mobile vice to the GSM modem that connected to microcontroller. Here we use PIC16F877A micro controller programmed with embedded C language. This controller decodes the information given by energy meter and transmits the information to LCD module and GSM modem. The whole process is done automatically without any manual involvement hence the probability of occurrence of error is negligible. This system is not only sending the data but also it does provide power disconnect/connect feature, power cut feature and tempering alert feature. All these advantages give this product an edge over other pragmatically prevailing devices.

**II. OBJECTIVES OF ENERGY METER**

Our main objective is to develop a system which can transmit the meter reading of the user to the nearest electric meter billing and controlling station. When we use the electricity, the amount we had used is calculated by energy meter at user interface and then it is transmitted to EB station using GSM. If the user fails to pay the electricity bill, automatic fuse off from the electricity station will happen and after paying the bill the fuse will reconnected automatically. If there is any theft of power, the system will send a message to the EB station through the GSM.

**III. SYSTEM ARCHITECTURE**

This project is to develop a system for reading the energy meter and controlling the power line. In this research, different fields of engineering are combined to transmit the meter reading using latest advancement in automation. Our paper eliminates the need of employing EB meter reading and human error. Depending upon the power consumption, the meter reading varies accordingly. The microcontroller receives the energy meter reading and passes it to the GSM modem. If there is any fuse off, a command message will send from the GSM modem to the EB Office and in the case of delay in payment of bill, the fuse can be cut off from the EB Office itself and after payment it can be reconnected from there. In this project, the above said process is totally automated and the communication is made possible entirely through the power line.

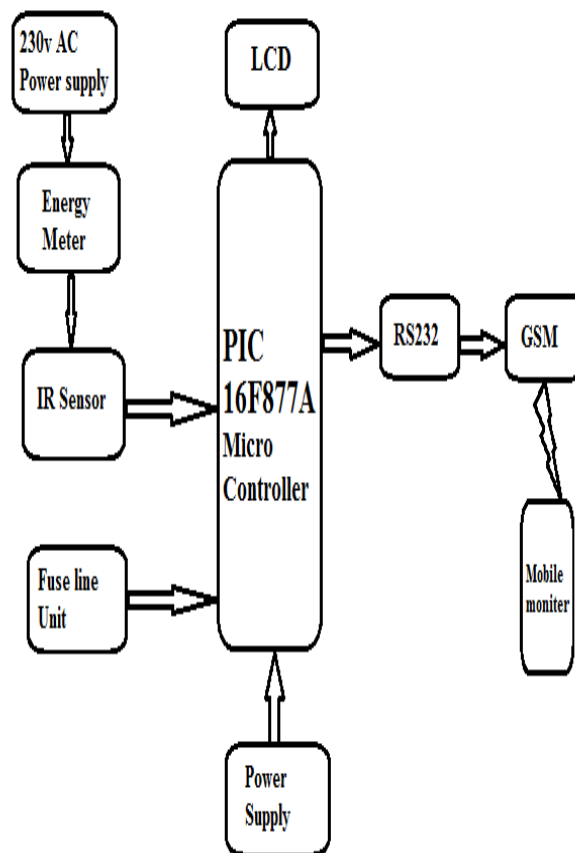


Fig. 1. Block diagram of GSM energy meter

**IV. HARDWARE REQUIREMENT**

S.NO	Hardware Parts
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1	Power supply board
2	PIC micro controller board
3	IR Sensor
4	GSM
5	LCD Display
6	Relay unit

#### **A. Power Supply**

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

#### **B. PIC Microcontroller**

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Peripheral Interface Controller". PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection. of application notes, availability of low cost or free development tools and serial programming (and re-programming with flash memory) capability.

#### **C. IR Sensor**

IR (Infrared) is the typical light source being used in the sensor for robot to detect opaque object.

#### **D. GSM**

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. GSM is the most popular standard for mobile phones in the world.

#### **E. LCD Display**

Liquid crystal display is very important device in embedded system. A liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly.

#### **F. Relay Unit**

A relay is an electrically operated switch. Relays are used where it is necessary to control a circuit by a low-power signal or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another.

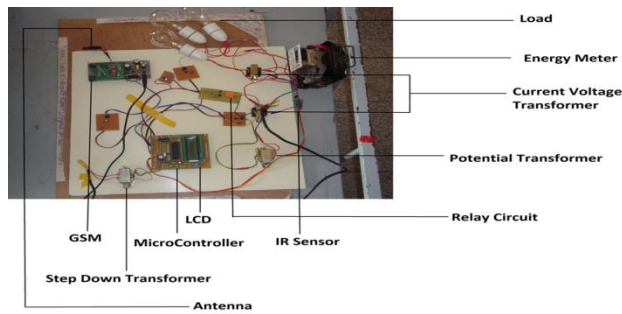


Fig. 2 Illustration of hardware GSM energy meter

## V. SOFTWARE REQUIRMENTS

S.No	Software Tools	Work Flow
1	MPLAB V8.10	Embedded Programming
2	CCS Compiler	Software development tools
3	ORCAD	PCB designing

### A. MPLAB IDE

MPLAB Integrated Development Environment (IDE) is a comprehensive editor, project manager and design desktop for application development of embedded designs using Microchip PIC micro and ds PIC microcontrollers.

### B. CCS Compiler

The dsPIC® family of Digital Signal Controllers (DSC) combines the high performance required in DSP applications with standard microcontroller features needed for embedded applications. Additional high-performance microcontrollers (MCU) without DSP are also available for other applications. All of these devices are fully supported by a complete set of software development tools, including an optimizing C compiler, an assembler, a linker and an archiver/ librarian.

### C. ORCAD

ORCAD Capture CIS is a software tool used for circuit schematic capture. It is part of the Or CAD circuit design suite. Capture CIS is nearly identical to the similar ORCAD tool, Capture.

## VI. FEATURES

1. Automatic Reading Feature
2. Power Cut Alert
3. Auto Disconnect
4. Auto Reconnect
5. Total Load Calculation
6. Full Secure

## VII. SYSTEM MODULE

In our paper we use two modules namely,

1. Transmitter module
2. Receiver module

### 1. Transmitter Module

The components used in the transmitter module are

#### i. IR Sensor

GSM Modem In the transmitter module IR sensor is used initially IR (Infrared) is the typical light source being used in the sensor to detect opaque object. Here it senses the number of rotations of the coil in the electronic meter and hence it can detect the energy consumed by the user. Then microcontroller is used for controlling of complete AMR system. If power cut off the contents of RAM memory must be stored in EEPROM and when power will be back the energy meter will be sense by the sensor. The microcontroller is interfaced with GSM modem and LCD module. Next to this GSM modem which is suitable for long duration data transmission is used. GSM modem is connected to a microcontroller which would transmit the data from meter to the electricity board and also receives the commands from electricity board. the modem will send units or pulses (power consumption) on a regular interval or on a request.

### 2. Receiver Module

The components used in the receiver modules are,

- i. LCD display
- ii. Buzzer

The Liquid crystal display is interfaced to microcontroller unit that are used to display the meter reading, power factor, power status, total load etc. When power is being consumed the sensor senses it and the microcontroller transmits that reading to the GSM and displayed by LCD. The buzzer or beeper is an audio signaling device and the typical use of buzzer includes alarm device and the buzzer buzz indicating the sudden shock or overloading.

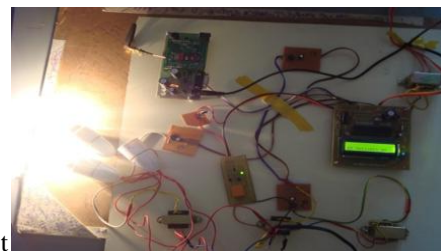


Fig. 3 Result for auto reconnect

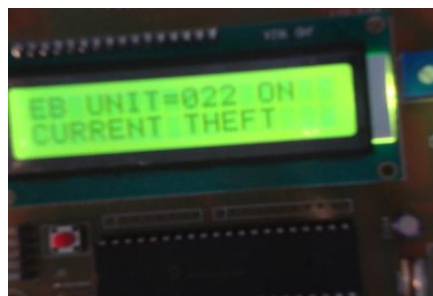


Fig. 4 Result for theft detection

### **VIII.THEFT OF POWER CAN BE DETECTED**

Theft of power can be detected by using this system. If the power is taken from main it is called theft of power. In compound house system the same case is used but it is not theft of power . The person from other house use the same process of taking power ,it is called theft. To avoid this problem same IP address is given to the sub meters of compound house. So that if different IP address comes the message will be sent to EB office .Thus we can find that the power is thefted.

### **IX. CONCLUSION AND FUTURE ENHANCEMENT**

Thus we have increased the accuracy in meter reading by eliminating human error and fuse detection process. The proposed methodology is used to automate the meter reading, to disconnect and reconnect the power line without the wastage of man power by the use of GSM technology. This method generates the message to the consumers either by day basis or weekly basis as per consumer requirements. The advantages of this project are

- Automation of all features including communication from the EB office to the customer.
- Saves data using automatic control and storage systems.
- It involves less cost to communicate.
- To increase n number of consumers to communicate and automate.

This paper has been stated for the use of EB billing purposes for a locality. This same technique of RF signalling and Ad-Hoc data transfer can be used in various other fields like disaster management for sending data to the relief centers. This technology can also be used in sending messages and information to nearby hospitals in emergency situations like in case of natural calamities

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