

Automatic Meter Reading System with Power Monitoring and Load Sharing

Rohini.S, Suganya.G, Jayasree.D
Guide: Mrs.K.Fathima.M.E

Abstract— The Existing domestic energy meter reading systems universally exist many problems, such as difficulty in construction, too narrow bandwidth, too low rate, poor real time, not two-way communication quickly etc. To solve above problems, this project uses the wireless technology for Automatic Meter Reading system. We are introducing a new way of communication between the EB section and the consumer using ZIGBEE technology for transmitting the customer's electricity consumption and bill information that is calculated using PIC microcontroller. The power fluctuations are monitored using the voltage sensor and current sensor and fed to the microcontroller which indicates it to the Electricity Board. Depending on the power generation, the house hold devices are controlled automatically. From EB section the information regarding the bill amount and payment are communicated to the consumer via GSM. This facilitates the consumer such that he can request for the bill information any time by sending a message to the monitoring section.

Index Terms— AMR , GSM, ZIGBEE, Automated billing system, Advanced Metering, Smart meters, Power monitoring meters.

1 INTRODUCTION

THE currently existing metering systems are manual and hence are error prone. One way to implement error free metering system is automatic meter reading system by using communication mediums such as RF or GSM/GPRS. These mediums can be used depending on the characteristics of technology and requirements of the implementation sites. But these mediums are generally costly and power consuming. Hence selecting the right communication technology is vital to the success of the project[1].

GSM which stands for Global System for Mobile Communication is widely used mobile communication architecture used in most of the countries. With the help of GSM modem one can embed a feature of pre-paid through mobile, also one can recharge energy meter through mobile by SMS. AMR (Automatic Meter Reading) is to increase the accuracy reading and improvise the communication between the customers and the government. [2] Then the low-power GSM connected to individual energy meters to send the reading to the customer and government for 30 days once.

2 EXISTING METHOS

In the existing methods system of energy meter is using Power Line Carrier Communication[1]. It is wired system and hence the performance is less compared to wireless systems.

Power line communication (PLC) has seen a lot of interest in the past few years due to the almost omnipresent nature of the power line grid. One of the potential applications of power line communication is automatic reading of electric, gas and

water meters.

Even though automatic meter reading (AMR) is a low data rate application, it demands both high reliability and low computational complexity. Moreover, the power line channel proves unfavorable to reliable communication due to its multipath nature, frequency selective effects, narrowband interference and presence of strong impulse and colored background noises

Disadvantages:

- The interference in the power line cable that occurs between the electric signal and data signal is not overcome in this project.
- The data rate is low.
- The impulse response is large.
- Not suitable for real time billing system.
- Speed is too low.
- Two way communications between the user and EB is not efficient.

3 PROPOSED METHOD

In the proposed method ZIGBEE technology used to transmit the meter reading to the customer and government with the required cost instantaneously. [4] GSM is used to provide information whenever the consumer requests about the current billing status and also for alerts to the consumer when he consumes power beyond his allocated usage.

• Energy Meter

Energy meter is a device that calculates the cost of electricity consumed by a home, business, or electrically powered device. In this project we use the static energy meter. According to the energy consumed it outputs the pulses to the PIC controller.

• PIC Process Of The System

The PIC is the main part this system. It is based on low power 16bit PIC16F877A processor. PIC consists of high performance and low cost of network technology. The memory

- Authors Rohini,Suganya and Jayasree are pursuing their Bachelors Degree in Electrical and Electronics Engineering in Vel Tech Engineering College,Chennai,India Email: rohinibe16@gmail.com, suganyabe07@gmail.com, jayasreebe14@gmail.com.
- Guide Mrs.Fathima.K is currently working as Assistant Professor in Vel Tech Engineering College,Chennai,India. Email:fathimakhadar@gmail.com.

organization of PIC consists of three memory blocks.

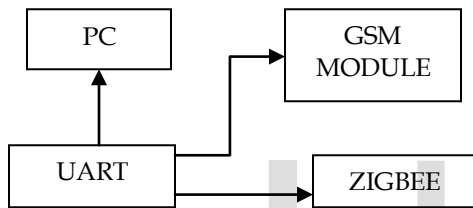
The program memory organization consists of 13bit program count memory space. Data memory split into number of banks and it consist of GPR and SFR. The general purpose register file can be accessed in a straight line or in some way through the file select register. SFR is used in the processor and peripheral for controlling the system.

Power Fluctuation Monitoring Section

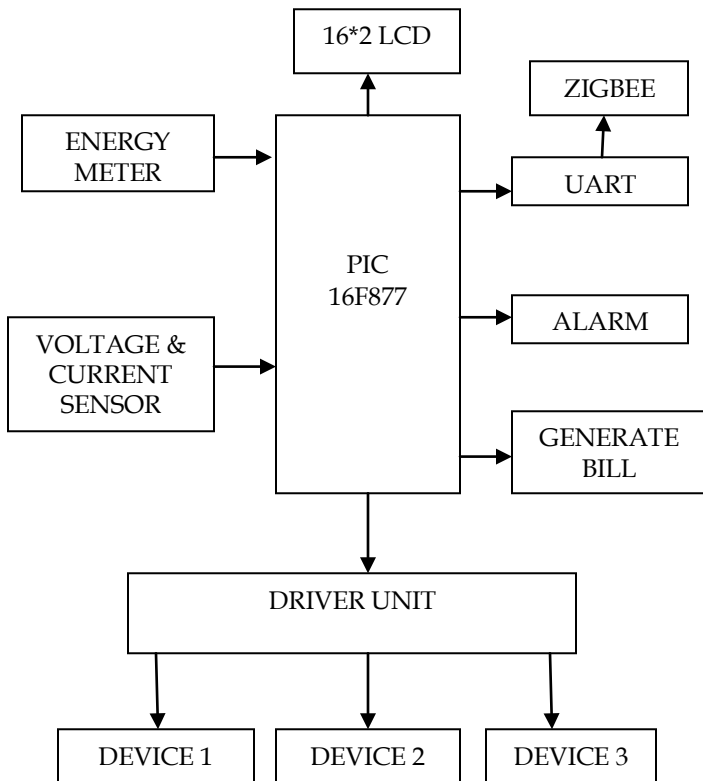
In this we continuously monitor the voltage and current using the voltage and current sensors. If the value of incoming voltage and current exceeds or becomes less than the value programmed as the prominent values. The voltage sensor has an isolating transformer that monitors the fluctuation in the nominal values.

BLOCK DIAGRAM:

• **EB SECTION:**



• **HOME SECTION**

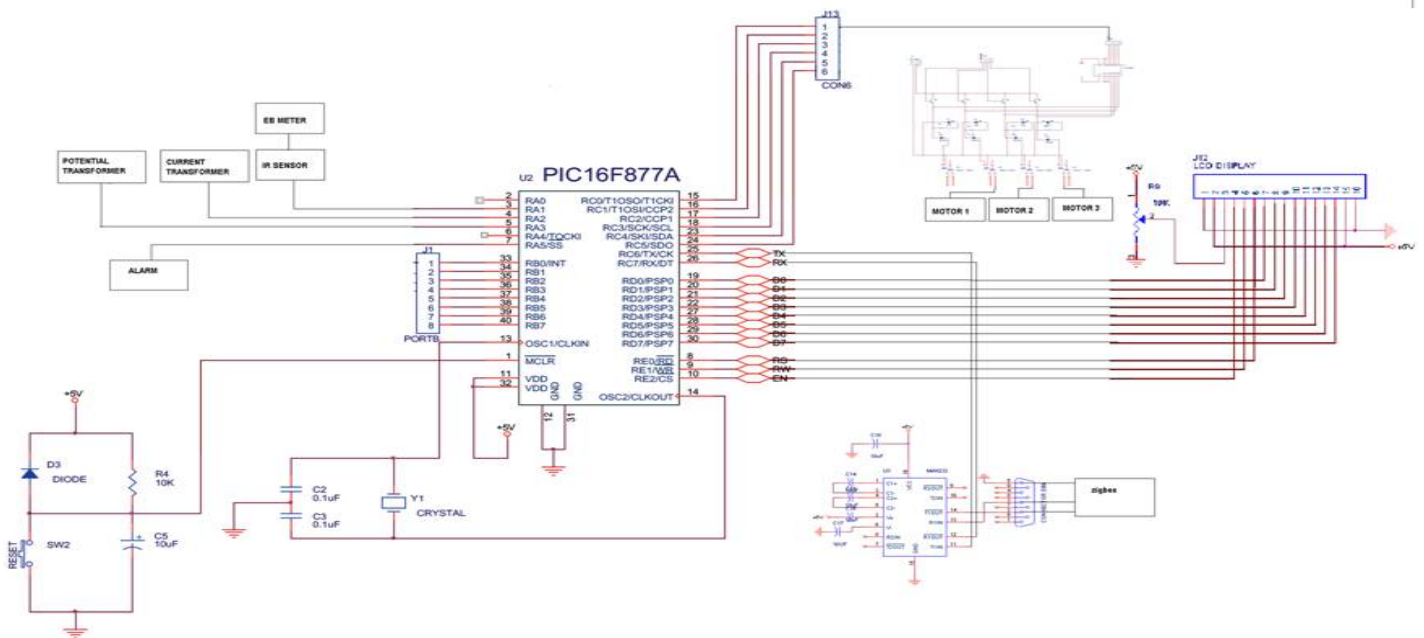


4 WORKING OF THE SYSTEM:

The proposed system introduces new method of meter reading reducing the manual errors that occur in the present reading systems.

• **HOME SECTION**

- Here we connect the Energy meters that measure the energy units consumed and transmit them as pulses to the microcontroller. We can recharge the meter to a particular prepaid amount. From that total amount the controller deduces the amount based on the units consumed.
- The PIC microcontroller here computes the amount of energy consumed and the corresponding bill amount based on the standard tariff rates programmed in it. The calculated values are transmitted instantaneously via ZIGBEE and updated in the EB section. The consumer is sent the warning messages to the consumer via GSM[4].
- The EB section continuously monitors the power consumption of the consumers in that particular locality and any abnormal consumption can be easily identified and power theft can be prevented. Also these meters provide facility to monitor the power fluctuation by using voltage and current sensors.
- Additionally, based on the power generation the house hold devices are controlled automatically depending on the power available to that particular consumer. Arrangement of a facility to print the bill automatically at the month end from the individual energy meters will reduce the burden of the consumers and the EB department.
- The GSM modem loads the recharge amount in one of the register of controller. For each pulses received at interrupt pin, the controller decrement the content of the register which is equivalent to the recharged amount left. If the content of the register falls below the threshold level, the controller activates the GSM to send a message to the user which indicates that amount left in the meter is low.
- In this paper, we implement the centralized monitoring of energy consumption, while making it prepaid. i.e., consumers can recharge their Energy Meters for an amount of their choice. Recharging is similar to that of a mobile phone. The GSM transmits the exchanged data between the end-users, which are the EB Station and the customer.
- The use of GSM module provides a feature of prepaid through SMS. The keypad is used to get banking information from an electricity consumer, and the LCD will display the user's account balance and the present electricity rate.
- PIC controller count the amount of energy consumed and display the balance amount onthe LCD .



- When the balance goes below the threshold, the GSM module will automatically send a reminder text message to the user to refill the account.
- Once the recharged amount expires, the connection will be terminated automatically, using the relays within the meter itself.
- **EB SECTION:**
- The power and billing information is continuously transmitted by the ZIGBEE module and monitored by the EB section. Whenever there is power theft identified or when there is power fluctuation the control can be sent from the EB section to cut the supply of the consumer.
- When the problem is resolved it can be reconnected in the same way. Any alerts regarding the power theft and also dues to be paid can be sent via message using GSM to the consumers.

Advantages:

- Low installation cost.
- Quick in action.
- Electricity theft is prevented.
- Better two way communication between the user and the Electricity Board.
- Low power consumption by the measuring unit.
- Upfront payment for electricity Lower overheads
- No billing hassle
- No disconnection/ reconnection

- Money and time based load connection / disconnection

5 CONCLUSION

This project helps in continuously managing and monitoring the electricity usage of consumers and helps them to conserve the energy. Looking at the benefits the system provides, there is a need to give it a support and implement it on a large scale all across. A simplified tariff structure will make life much easier for the utilities, the supplier and the consumer.

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