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Wireless Based Automatic Energy Meter Reading with Instant Billing Prepaid System

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Abstract*: *This paper presents the idea of prepaid energy meter for efficient power management. In this proposed system consumer have to recharge the account from centralized electricity office. According to recharge consumer gets number of units of Electricity. Consumer will use Electricity units as per his/her requirement. When the number of units are below the certain limit then message will send to the authorized person that 'Balance is low' and when the number of units goes to zero then automatically the power supply will be cut by using relay circuit. After recharging again the Electricity units are available for the consumer.

Keywords: **Energy meter, Global system monitoring (GSM), short messaging system, MAX 232, DB9 Connector, PIC microcontroller 16F877X.**

1.INTRODUCTION

In Traditional energy meter reading system, the person from the electricity office takes snapshot of energy meter from each home. This process is so much time consuming and so many errors get occurs while calculate the bill. If consumer will not pay the bill then also manual work required for power cut.

So, to overcome problem of traditional energy meter billing system we are going to implement GSM Based Automatic Energy Meter Reading system with prepaid mode.

2.RESEARCH METHODLOGY

2.1: Problem Identified:

The main problem caused in case of the Energy Meter and Water Meter reading is that, it was required manual process for billing purpose. The Electricity board and Water board cannot invest lots of money for their solution. But the consumers are facing lots of problem due to this manual process. In this process the data is manually collected and send to the Electricity office again calculated by manual process. Due to this process some time consumer may suffers from the problem of extra charges than that of power consumed. Another issue is compliant cannot be made at the time of meter reading but back to the office. There is no facility of comparing the previous month's electricity usages with the current month. Also making compliant about the bill or devices is difficult with this system. Another serious issue is that consumer can not communicate with the centralized office to make the complaint about the power failure or latest news related to power consumption.

2.2: Proposed Work

To overcome disadvantages of traditional billing system, we are going to implement prepaid billing system. In prepaid system consumer have to recharge the account. Then electricity units will be available for consumer.
According to use of electricity the number of units is goes on decreasing. When units below certain limit consumer get message on mobile phone. The consumed units is calculated by using PIC microntroller and after that microcontroller display the remaining units. When units reaches to zero automatically power supply will cut by using relay circuit.

3. Block Diagram:

The 230 volt AC supply is given to the step down transformer because PIC microcontroller support to 5 volt only. After that AC voltage is converted in to DC voltage by using rectifier. Then fixed DC voltage is regulated by using voltage regulator. Here we get fixed 5 volt DC supply. This DC supply is given to the LCD display, PIC microcontroller and MAX 232 IC.
MAX 232 output is not directly connected to GSM Modem hence, here we are using DB9 connector between PIC microcontroller and MAX 232. GSM modem is used to monitor day by day, hour by hour energy meter reading. Separately, 230 volt AC supply is given to Energy meter and at the output side of energy meter load is connected. The energy meter is connected to PIC microcontroller via opto-coupler. When Load is in use then only unit count is goes on decremented.

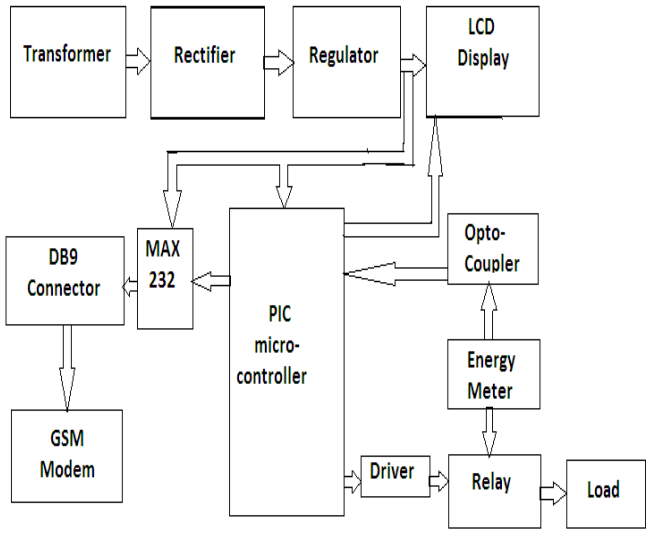

Fig.1: Block diagram of GSM based energy meter

5. DESIGN OF SYSTEM:

The PIC microcontroller, a LCD display, GSM modem ,GSM is world's most popular technology, it was develop to solve the fragmentation problems of the first cellular system in Europe[10],MAX 232, USB DB9 Connector, the GSM energy meter. In this, meter is designed using embedded code and AT commands which controls our GSM modem for sending messages to every client's mobile number when administrator takes meter reading after every month. While the message is sending, this data is stored in EEPROM. Real time clock module with energy meter has all recording of usage details about energy consumption. In centralized office, the GSM unit will receive collected data and make billing of specific meter of each user. The system design can be classified in two categories, Hardware implementation and software implementation.

5.1 Hardware Implementation

In this system, power supply is used to provide the power to the whole circuitry like GSM modem, relay, transformer, resistors, capacitors are the main components used for designing the smart meter. Power supply is also given to the energy meter in which load or bulb for practical set up. In this proposed system, we have used PIC microcontroller, The MAX 232 chip is used to interfacing the different component.

When power supply is given to the meter, the metering IC create output in the form of pulses which can be counted using default timer of PIC microcontroller. These pulses identified by transition of high and low voltage of the automatic voltage regulator.

For taking reading from the meter the microcontroller is programmed using software interfacing with the help of kill software. When the energy usage reading is taken this data is stored and updated in software. After measuring one unit of energy consumption, controller is automatically incremented and the output is displayed on the 16*2 LCD display. Real time clock is used to update time date information. EEPROM is used to store the content.

5.2 Software Implementation:

For Software Implementation we have used the software "MPLAB Version 8.0". In Software Implementation, The main part is programming of the "PIC" microcontroller and Interfacing of each device like LCD Display, Relay, Opto coupler, Transformer with microcontroller. Once the power supply is given hardware circuit is get initialized. The microcontroller monitors the reading of energy meter 24*7 hours.
The recharged units get loaded into the microcontroller. By taking values of current and voltage from transformer, consumer power get calculate. After that, microcontroller will decrement the unit count. If the number of units is equal to zero then power supply will automatically cut by using relay circuit as well as, the message like "RECHARGE YOUR ACOOUNT" send to the authorized person.

5.3 Flow Chart:

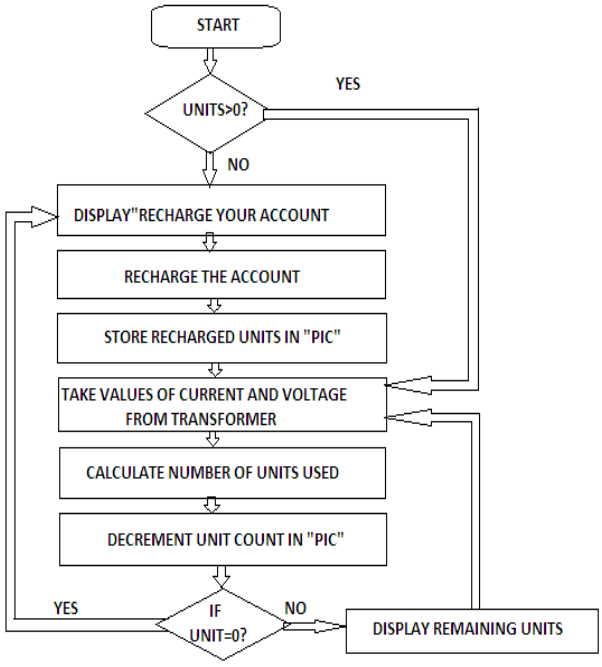

Fig2. PIC program flow

If units are not equal to zero, then microcontroller will display the remaining units of the recharge. At the time of

the recharge the account, Each energy meter has unique account number and the mobile number of the authorized person is register in the centralized office.

5.4 Components of Hardware in System:

The components of hardware implementation are as follows:

5.4.1 **Real time clock**
The RTC is actually useful for updating the data, information of time and date of every second, hours. This RTC always updates the date and time whenever power supply is not given.

5.4.2 **EEPROM and relay**
This EEPROM memory is used to store the information regarding the amount of unit which are consumed by the specific meter of any consumer. When the power supply is not given then that time also it also store s the data. Relay is used for automation process. The relay is used as a switch for the system.

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

5.4.4 **Microcontroller**
In this system, PIC microcontroller is used. IC 16F877x is used.

6. CONCLUSIONS:

Efficient billing system can be achieved by prepared mode.Due to prepaid mode of billing system, manual work gets reduced. The human errors, over running of meter reading and manual efforts are reducing by using prepaid mode. GSM is also used for continuously monitoring the energy meter day by day, hour by hour.
Pre-payment mode in which when units are below limits then message will send on the consumer mobile.

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