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DESIGN OF ELECTRIC ENERGY METER FOR PREPAID BILLING AND THEFT DETECTION BASED ON GSM

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Abstract— **In this paper, using After getting the current consumption. The unit here is taken as numeric value. If the unit is reduced to minimum value it will intimate the user through alarm and LCD unit. If the user wants to add more units for him, he has to send a message to EB section. From the EB section the required value will be sent to the PIC controller through GSM modem. From the obtained value the PIC will increment the unit in the memory. Thus recharge process is done quickly with less manual interactions. Our system may be applied in Industrial control, medical system and access control.**

Keywords— Digital energy meter, GSM/GPRS, Microcontroller, prepaid billing.

I. INTRODUCTION

We propose that the consumption on electricity by prepaid billing is possible.Just like we recharge our mobile with some amount as per our usage and needs,this paper provides a method to use the electricity as the same with the help of pic microcontroller and GSM.

II. LITERATURE SURVEY

Subhashis Maitra (Oct 2008) In this paper, a new concept of energy meter will be discussed, where maximum demand of energy of a consumer will be indicated in the meter used by the consumer. After exceeding the maximum demand, the meter and hence the connection will automatically be disconnected by an embedded system inserted in the meter itself. According to the maximum demand, the consumer will purchase a cash-card of amount depending on the consumption of energy and after the full consumption, the consumer again has to purchase another cash-card or recharge the same and thus the hassle related to go to the billing office, to stand in a long queue and to submit the bill, can be avoided. Also this system helps to eliminate the draw backs of billing management system, such as to take the reading from the meter, to create the bill, to print the bill, to send the bill to the proper address and to collect the amount for the bill [6].

T El-Djazairy, B J Beggs and I F Stewart (Jun 1997) This paper presents the results of an investigation which show that the development of the GSM network as a low cost, global carrier of digital telecommunications signals provides exciting opportunities for novel applications such as the handling of power system metering and load management telemetry. As the use of GSM for telephony becomes more widespread, it is inevitable that costs will be driven lower, and it is also inevitable that this medium for the transfer of telemetry data will become very important to the electricity supply industry in the next few years. One major issue which will require to be addressed as this development takes place is the security protection of data being transferred, particularly in the radio link paths of the network.[7]

Li Kaicheng, Liu Jianfeng, Yue Congyuan, Zhang Ming: (Jun 2008) A power load management system based on ARM-7 microcontroller and GPRS is presented in this paper. The proposed system consists of electronic KWH meter, intelligent management terminal (IMT) and

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management centre. The intelligent terminal is sued to acquire information from KWH meter, control the energy-consuming device and communicate with management centre via GPRS network. How to implement the IMT by using ARM-7 microcontroller and GPRS telecommunication module is discussed in detail. Also the software design of the terminal with high performance embedded real-time operating system muC/OS-II is presented in this paper.[8]

P.K. Lee and L.L. Lai, Fieee (Jun 2007) In this paper, the authors discuss the way to adopt the cost effective GPRS applications. Although there have been lots of theories and concepts on the GPRS applications but the real applications applying to a large network, distributed power generation or building energy/power distribution monitoring are limited. The authors focus the application of the GPRS to this on-line system application and the techniques. A practical scheme is proposed and its use to real-life system will be introduced. A practical implementation for an wireless GPRS on-line Power Quality Monitoring System will be illustrated. Results and benefit to the end users in some practical applications will be discussed.[5]

H.G.Rodney Tan,C.H. Lee,V.H.Mok (Dec 2007) The development of a GSM automatic power meter reading (GAPMR) system is presented in this paper. The GAPMR system is consists of GSM digital power meters installed in every consumer unit and an electricity ebilling system at the energy provider side. The GSM digital power meter (GPM) is a single phase IEC61036 standard compliance digital kWh power meter with embedded GSM modem which utilize the GSM network to send its power usage reading using short messaging system (SMS) back to the energy provider wirelessly. At the power provider side an ebilling system is

used to manage all received SMS meter reading, compute the billing cost, update the database, and to publish billing notification to its respective consumer through SMS, email, Web portal and printed postage mailing. A working prototype of the GAPMR system was build to demonstrate the effectiveness and efficiency of automatic meter reading, billing and notification through the use of GSM network.[2]

III. PROJECT ANALYSIS

Our project consists of the hardware components that contain the following units.Is power supply unit, Microcontroller Unit, sensor unit, communication unit, display unit,Driver unit, Software unit.

Power Supply Unit - The supply of 5V DC is given to the system which is converted from 230V AC supply. The microcontroller will support only the DC supply, so the AC supply will be converted into DC using the ADC,so the pure 5V DC is getting as the output from the power supply unit. Here we are using the PIC microcontroller which will be capable of getting the supply of 5V DC.

Figure 1.Pic microcontroller-16F887

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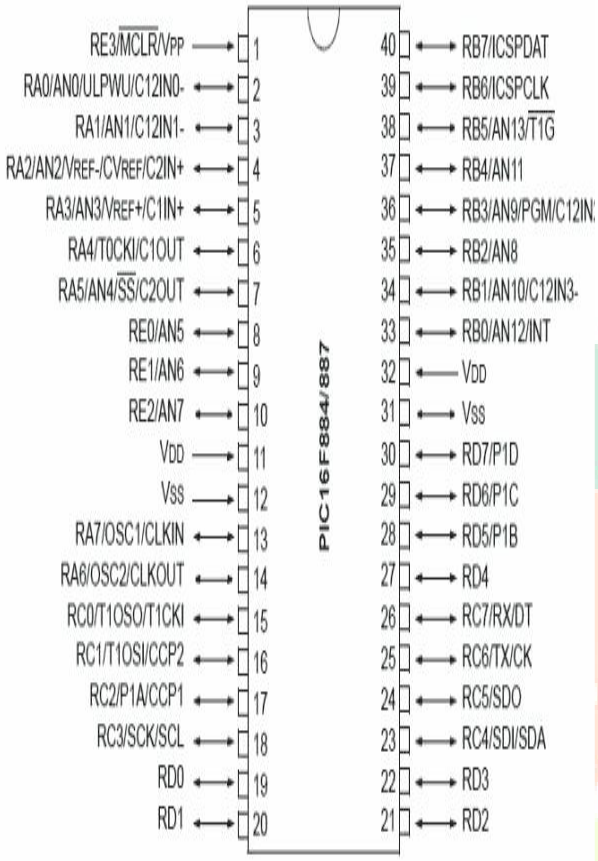


Fig 2:Pin configuration of PIC-16F887

Sensor unit - The sensor unit consists of current sensor. This sensor senses our regular usage of current in our home or industry, the load from energy meter is sensed by this unit to find the detection of thefts.

Communication unit -GSM Modem is a communication technology in which it is used to transmit the message from the monitoring section to the control section. Whenever there are any abnormalities in the sensors or for certain period of time, the microcontroller is used to transmit the data to the monitor section.

Display unit LCD -The display unit is mainly achieved by the 16X2 LCD. 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 (LCs). LCs does not emit light directly. The monitored data from the consumer is viewed in the display.

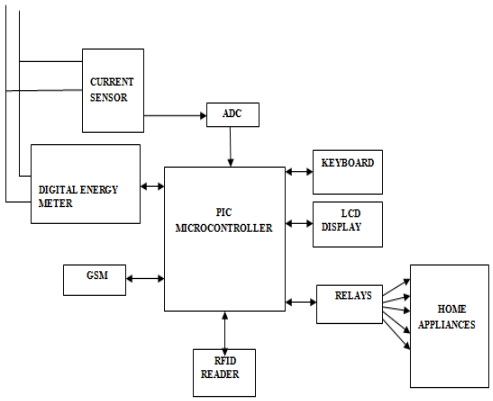
Fig: 3

Figure LCD Monitor

Driver unit - Here the relay driver is used to drive the load. Relay is an electromechanical switch which acts as an interface between the microcontroller and the load.

Software Unit - Software is used to compile the coding of the desired application for the corresponding embedded system, Hi-tech c compiler is used macro assemblers, real-time kernels, debuggers, simulators, integrated environments, and evaluation boards for the PIC microcontroller families.

Figure 4: Block diagram



GIVEN INPUT AND EXPECTED OUTPUT
Given Input: 230V, 5A, 50 Hz AC Supply
Expected Output: 12V, 500mA- 1A, DC Voltage

Microcontroller Unit Given input: It receives the input from the Current sensor and over analog to digital converter,Expected output: It sends the remaining pre defined units into text message format and sends it to the GSM modem.

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Sensor unit IR sensor Given input: The current sensor needs of 5V dc power supply, Expected output: ON\OFF pulse, which changes as per the LCD input is the output Communication unit

GSM Modem Given input: The serial text format data from the microcontroller is the input Expected output : Transmission of wireless packets to the network is the output,alert messages when unit expires or the date expires.

Display Unit LCD Given Input: The text from the microcontroller indicating the device status is given as input to the LCD. Expected Output: The received text is displayed on the LCD. E section,

IV. DETAILED VIEW OF PROJECT

Supply from the electricity board is given to the digital energy meter which is interfaced with PIC microcontroller and the current sensor is connected to the line after energy meter which senses the usage of our normal loads in our house or industry,relay is also interfaced with microcontroller and with loads.When load is on means relay will also on,if the load exceeds the GSM will send us a message.

We proposed to made a RFID for every meter,if the card is scratched with the RFID reader means it shows about our usage and we can programme the microcontroller with a keypad and LCD display we need to enter the amount how much we want as units also in the keypad,the amount is deducted from our account to the electicity board.

MERITS OF PROPOSAL SYSTEM

We can avoid the minimum payment for the absence for two to three months,we can also detect the thefts of electricity.

APPLICATIONS

Industrial control, Medical systems, Access control, Point-of-sale, Communication gateway, Embedded soft modem, General purpose applications.

V. RESULTS AND DISCUSSION

In our Approach we design a system with current sensor and GSM technology. Instead of this we can use SPI metering IC which will provide more parameters. By using three phase IC MCP3909 we can extend to the three phase supply.

VI. CONCLUSION

In this paper,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.

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