



International Journal of Advance Engineering and Research Development

Volume 3, Issue 4, April -2016

GSM BASED PREPAID ENERGY METER

Sushant Karad¹, Yogesh Kadam², Kalyani Jagtap³, Pooja Ghadge⁴.

Department of Electronics Engineering, AISSMS IOIT, Pune

Department of Electronics Engineering, AISSMS IOIT, Pune

Department of Electronics Engineering, AISSMS IOIT, Pune

Department of Electronics Engineering, AISSMS IOIT, Pune

Abstract—this paper presents the design and modelling of GSM-based Energy Recharge System for prepaid metering. The present system of energy billing in India is based on post-paid, contains lots of error and also time and labour consuming. Errors get introduced at every stage of energy billing like errors with electro-mechanical meters, human errors, processing errors. The aim of the developed system is to minimize the error by introducing a new system of Prepaid Energy Metering using GSM. The GSM is used to provide the communication between user and provider. This will enable the user to recharge their electricity account from home. The system is based on LPC2148 microcontroller. *Hardware system of LPC2148 includes the necessary devices within only one MCU such as USB, ADC, DAC, Timer/Counter, PWM UART etc. The results obtained shows good system performance and error free.*

Keywords- : Prepaid, Recharge, Microcontroller, LCD, Relay, GSM.

I. INTRODUCTION

In recent years many attempts have been made to design the energy meter with instant billing technique but till now the designed energy meters are not efficient and do not provide replacement. Now a day the number of Electricity consumers is increasing in great extent. It is hard to handle and maintain the power due to growing requirements. Maintenance of the power is an important task as the human operator goes to consumer's house and take the meter reading and based on this reading produced the bill amount for this particular month in which electricity consumed by the customer. The billing process takes much time if the consumers are not in the house while taking reading of energy consumption and generating the bill. If the consumer did not pay the bill, the Electricity Board people need to go their house to disconnect the power supply. These consumes time and difficult to handle. The manual operator cannot find the Un-authorized connections or malpractices carried out by the consumers to reduce or stop the meter reading/power supply. Some of the energy meters which had been implemented are prepaid but it needs Smart card to recharge it. The major disadvantage of that method is that it needs internet and the computer interface.

In this paper we propose a method which uses GSM Network which eliminates the need of internet. "GSM Based Prepaid Energy Meter" system consists of Energy Meter and the GSM Network. The system provides efficient power meter reading, usage notification and consumers maximum demand using GSM network. GSM modem utilizes the GSM network to send equivalent unit for the recharge amount to the Microcontroller and send message to the customers also. The message consists of details of energy required to the customers in the terms of the unit. In the energy provider side this system is used to update the consumer account and the database.

II. LITERATURE SURVEY

Ashna.K "GSM Based Automatic Energy Meter Reading System with Instant Billing" proposed the design of a simple low cost wireless GSM energy meter and its associated wave interface, for automating billing and managing the collected data globally.

Vivek Kumar Sehgal "Electronic Energy Meter with Instant Billing" introduced the concept of Postpaid Energy Meter which automatically sense the energy used in the home and when it reaches value which is initially fed in the hardware it will disconnect the power line. A user interface given in the hardware for user which will interact with the hardware, through user interface user can set a value.

The major disadvantage of the present systems is these systems are postpaid base service, Electricity board gives the service before collecting the payment from the customers and it is difficult for Electricity board to collect the payable amount from the customers and at the same Electricity board cannot stop to providing the service. So there is need of a system service after payment

III. PROPOSED WORK

In a developed system LPC2148 Microcontroller is used .A 16X2 LCD is providing to read units available. Main power supply is connected to the load with the help of the Relay when recharge message given to the controller through the GSM. When consumer sends a message for recharge a meter to the GSM, Microcontroller checks the number and turn on the relay. The main function microcontroller is to compute the power with help of energy meter and turn the Relay ON/OFF. Number of Units is displayed on the LCD screen. As the Units are low a SMS message will send out to the consumer registered number through GSM modem.

To use the system again the user has to reload the units by recharging the system. The user has to send the message through the registered mobile number to GSM modem. After successful recharge, the load automatically gets ON, and the system will be loaded with the units corresponding to that recharge value. This system uses 5V regulated power supply for the microcontroller. The Main power supply (230V 50Hz) given to the relay to turn on the load.

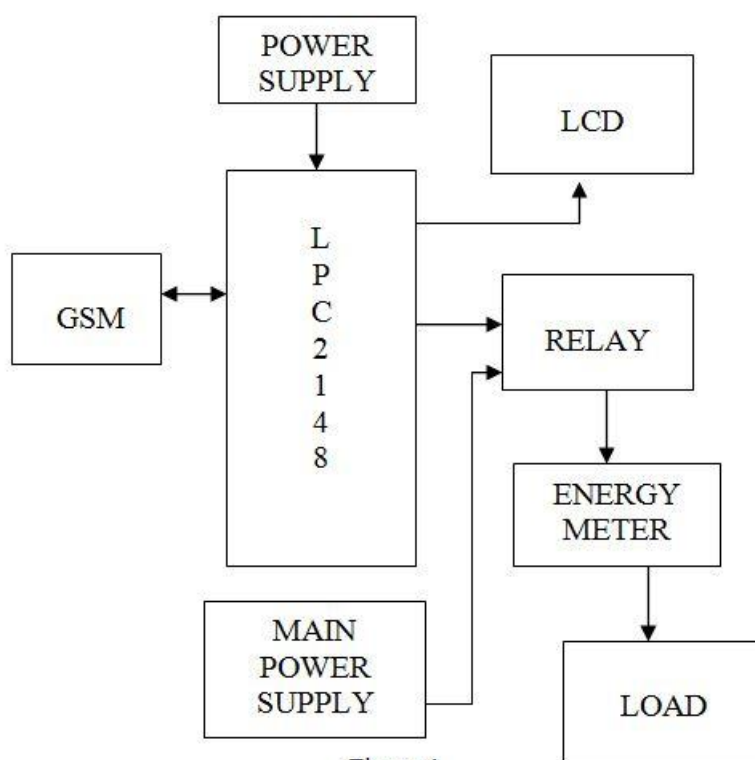


Figure 1

IV. HARDWARE DEVELOPED

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism is much simpler than those of micro programmed Complex Instruction Set Computers (CISC). LPC2148 microcontroller is used to control all the peripherals interfaced with it. GSM modem is used to provide the medium of communication between the user and service provider. GSM is configured and control by the AT commands. Relay is used to establish connection between load and main power supply. LCD which is used in 8-bit mode to display the status of recharge units continuously. An Electrically Erasable Programmable Read-Only Memory (EEPROM) is used to store the current no units remaining. An energy or electric meter is a device that measures the amount of electrical energy consumed by a residence, business, or an electrically-powered device. Electric meters are typically calibrated in billing units, the most common one being the kilowatt hour.

The developed circuit diagram and its simulation in proteus software are shown below:

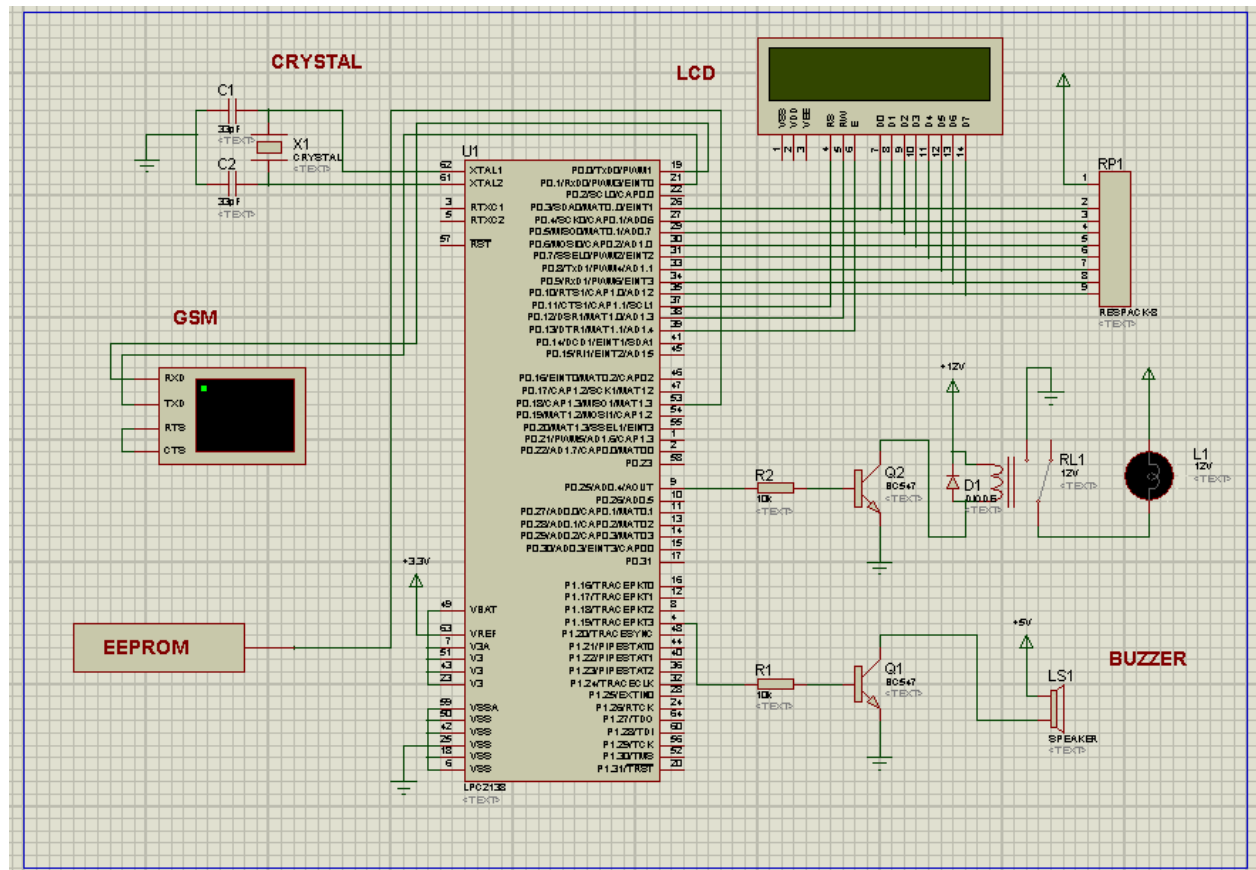


Figure 2

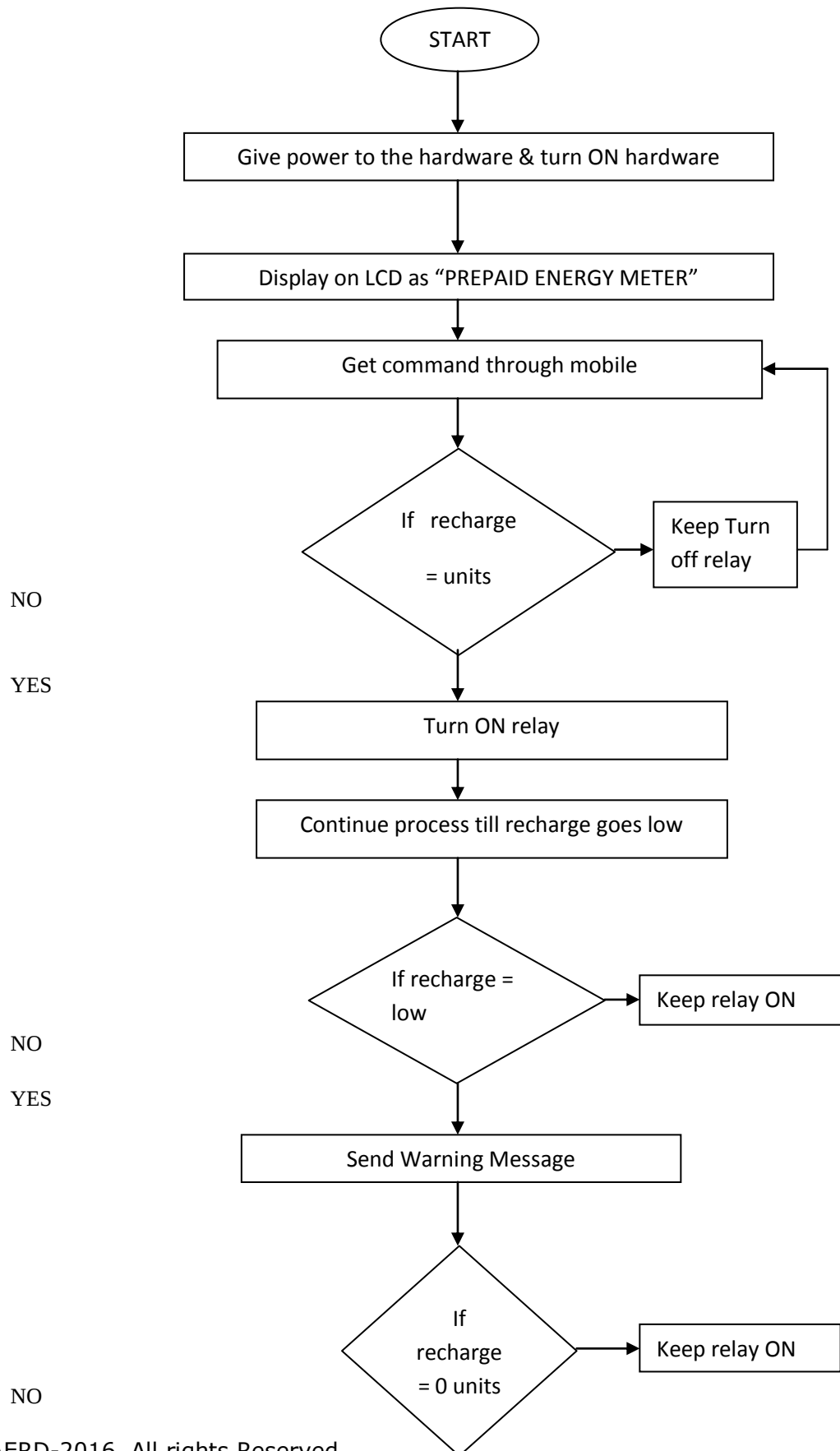
The programming for microcontroller is done using the Keil software. The Keil software provides IDE platform to develop the ARM based applications. Keil provide both modes to write the programme i.e. Assembly and Embedded C.

V. SOFTWARE DEVELOPED

Keil software is used for the Programming of controller. The program is written in Embedded C. Program is compiled, Debug and hex file is created using Keil software. The hex file is burned in controller using Flash Magic software. Algorithm for prepaid energy meter is given below:

- STEP 1:** Start the program.
- STEP 2:** Initialize the LCD and display “Waiting for the recharge”.
- STEP 3:** Enter the Recharge number or card no.
- STEP 4:** Configure the GSM and send number to the service provider
- STEP 5:** If the number is valid received the recharge units from the service provider and turn ON the relay.
- STEP 6:** If the number is invalid then enter the correct number.
- STEP 7:** When the electricity is consumed, then the recharge units will get decremented
- STEP 8:** When the 80% of the recharged units are consumed, then the user will get awarning message “recharge meter”
- STEP 9:** When the recharge units get over, the relay cut-off the household powersupply.
- STEP 10:** Stop the program

The flowchart for the prepaid energy meter is shown below:



YES

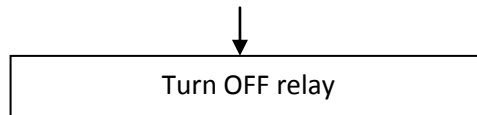


Figure 3

VI. CONCLUSION

The design of Smart Energy Meter using GSM technology can make the users to pay for the electricity before its consumption. In this way, consumers hold number of units and then use the electricity until the unit exhausted. If the available units are exhausted then the notification message send to the consumer's registered number and electricity supply is cut-off by a relay. This reduces the human labour and at the same time increases the efficiency in calculation of bills for used electricity. Prepaid Energy Meter will bring a solution of creating awareness on unnecessary wastage of power and will tend to reduce wastage of power. This paper will reduce the burden of energy providing by establishing the connection easily and no theft of power will take place.

VII. ACKNOWLEDGMENT

We are extremely grateful and indebted to our Research Guide and Principal Dr. P. B. Mane, for his enthusiastic interest, inspiring guidance throughout this study, which made us enable to attain our academic goal. His counsel help, constructive criticism, constant encouragement and thoughtful scientific suggestions during the entire research work were the pillar of our success in this venture. We have immense pleasure in expressing our deepest sense of gratitude and humble indebtedness towards him.

VIII. REFERENCE

- [1] Mrs Akanksha Shukla, Shobhit Saxena, SohilJain, "Embedded System Based Prepaid Electricity Metering & Billing" InternationalJournal of Emerging Trends in ElectricalAnd Electronics (IJETEE) vol. 2, Issue 4, April-2013.
- [2] Mrs Vivek Kumar Segi, Nitesh Panda, Nipun Rai Handa, Vipul Goel, "Electronic EnergyMeter" UKSim Fourth European ModellingAnd Simulation Department of Electronics &Communication Jaypee University ofInformation Technology Waknaghat, Solan HP (INDIA) 978-0-7695-4308-6/10 2010E.
- [3] Ashna K, Sudhish N George "GSM Based Automatic Energy Meter Reading Systemwith Instant Billing" Department of Electronics and Telecommunication CalicutIndia. 978-1-4673-5090-7/13 2013IEEE