

Wireless Smart Energy Meter

¹Prince sharma, ²Rahul Agrawal, ³Rahul Choudhary, ⁴Rahul Jangid

Department of EE, SKIT Jaipur, India

Abstract: Wireless meter reading put more control into the hands of both utilities and consumer by giving them more detailed information about power consumption. In the work presented here, a technique has been developed to read electricity meter reading from a remote server automatically using the existing GSM networks for cellular phones. This technique can be applied for gas or water meters as well as. The meter send the meter readings like kilo-watt-hour (kWh), voltage, current, bill, etc. by SMS to a central server. The central server then stores the information in database for analysis and sends the bill to the customer mobile phone. The SMS based data collection cab be done very quickly and efficiently. Data can be collected after any desired time interval such as hourly, daily, weekly or monthly bases. Remote meter can be used in residential apartment and especially in industrial consumers where bulk energy consumed.

Keywords: Microcontroller (8051), Voltage regulator GSM modem, Energy Meter.

I. INTRODUCTION

Wireless power meters or wireless energy meters are wireless technology based electricity consumption meters. They are used for measuring power or electric energy and also to monitor using wireless communication. Wireless communication modules (such as GSM) enable the conventional energy meters to become wireless energy meters. These wireless meters eliminate manpower for metering and billing the customer's electricity consumption. The electricity consumption meter facilitates the billing of energy meter along with load control using wireless GSM technology. This is a microcontroller based wireless energy meter, as 8051 microcontroller is used for controlling the entire system. This microcontroller based wireless energy meter consists of major components or blocks such as microcontroller, relays, loads, electricity consumption meter, LCD display, power supply circuit, GSM modem, DB9 connector, MAX232, and relay driver.

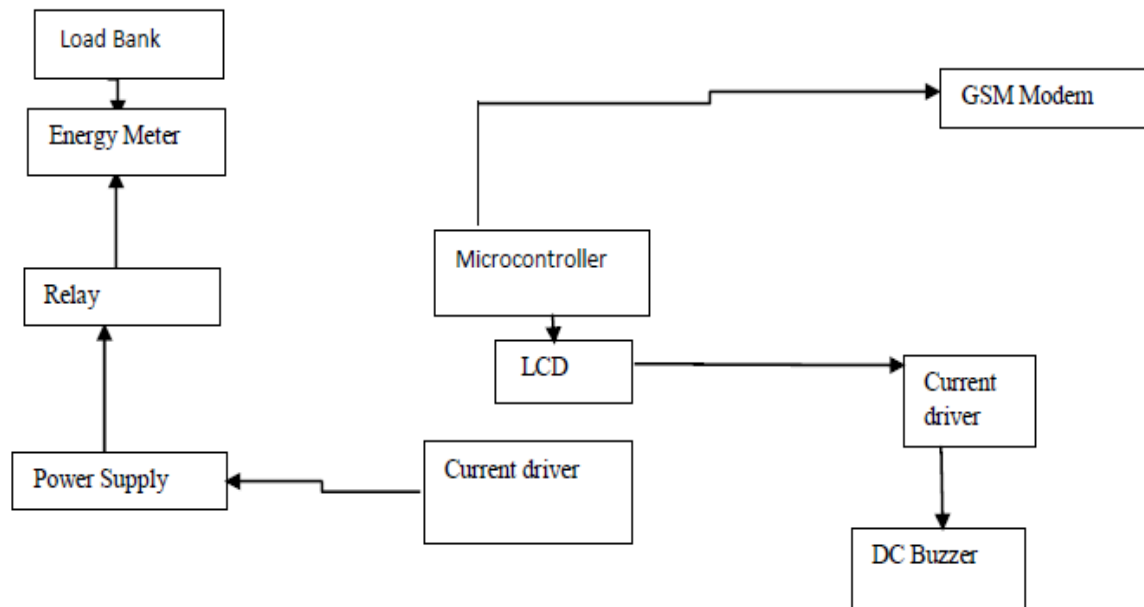
II. LITERATURE REVIEW

In 2006, Mr. Vinu v das [1] released its changes to the Electricity Customer Metering Code and Procedure to implement its decision to mandate interval meters for 2.6 million Victorian electricity customers. The Commonwealth issued a Joint Communiqué at the Council of Australian Governments meeting in Canberra on 10 February 2006 committing all governments to the progressive rollout of smart metering technology from 2007. In 2009 Mr. Ashnak, Sudhish N george [2] undertook a review of the program and found that there were "significant inadequacies" in advice to government and that project governance "has not been appropriate". Meters installed in Victoria have been deployed with limited smart functionality that is being increased over time 30-minute interval data is available, remote cut-off and start-up energization is available, and the Home Area Network will be available for households in 2010. In November 2010 Mr. Litingcao, Jingwan Tian and Dahang [3] was voted out of state government. The incoming coalition stated that the meter program would be reviewed and the Auditor General's recommendations implemented, specifically commenting on program governance, customer data protection, and cost recovery. In January 2011 the Energy Minister, Michael O'Brien, said he was not ruling out a suspension of the program. In December 2011 A. Arif Muhammad Al-Husain [4] publish the specification of smart meter with minor changes. The Indian Government after initially halting the planned implementation of Time-of-Use tariffs for general consumers has now allowed their introduction from mid-2011. In 2012, the first Smart Meter [5]. At the beginning of 2012 there were three approved Smart Meter [6] In-Home Displays directly available to consumers. Mr. S. Arun, Dr. Sidappa [7] present a Three Phase Voltage Unbalance Factor (VUF) which are monitored and managed by the advance metering infrastructure (AMI) In December 2013 Mr. Bharat Kulkarni represented

[8] The System Relies on a Dedicated Delay Tolerant Wireless Sensor Network(WSN) in which energy efficiency and reliability the design of the system. Inoctomber 2014

Mr. Rahul Ganesh Sarangle present [9] a general packet radio service modem (GPRS modem) and global positioning system module (GPS). The system reports real pollutant level. In December 2014 Mr. Tangsunantham and Mr. pirak presented [10] a possible solution of a wireless energy meter (WEM). Which is able to send a data to wireless Communication.

III. BLOCK DIAGRAM



Block Diagram

IV. CIRCUIT DIAGRAM & WORKING

Microcontroller based electricity consumption meter is consists of different blocks. To better understand the working of microcontroller based wireless energy meter, we must the working of each block of electronic energy meter. The major blocks are power supply block, microcontroller block, GSM modem block, and relay-loads block.

A. Power Supply Block:

This is basic block in every electrical and electronics projects circuit, which is used for providing the required power to the microcontroller and other components in the circuit. Generally, this power supply block consists of step-down transformer, bridge rectifier, and IC 7805 voltage regulator. Thus, the required 5V DC power supply is given to the microcontroller.

B. Microcontroller Block:

The microcontroller block can be considered as the main block of the entire circuit, as it is programmed to control all the components to perform the desired operation. Here, in this project microcontroller of 8051 family is used and programmed using Kiel software. The energy meter is interfaced with the microcontroller using an interfacing device or middle wire device namely Opto-coupler. Similarly, GMS modem is interfaced with a microcontroller using an interfacing device called as MAX232 and DB9 connector.

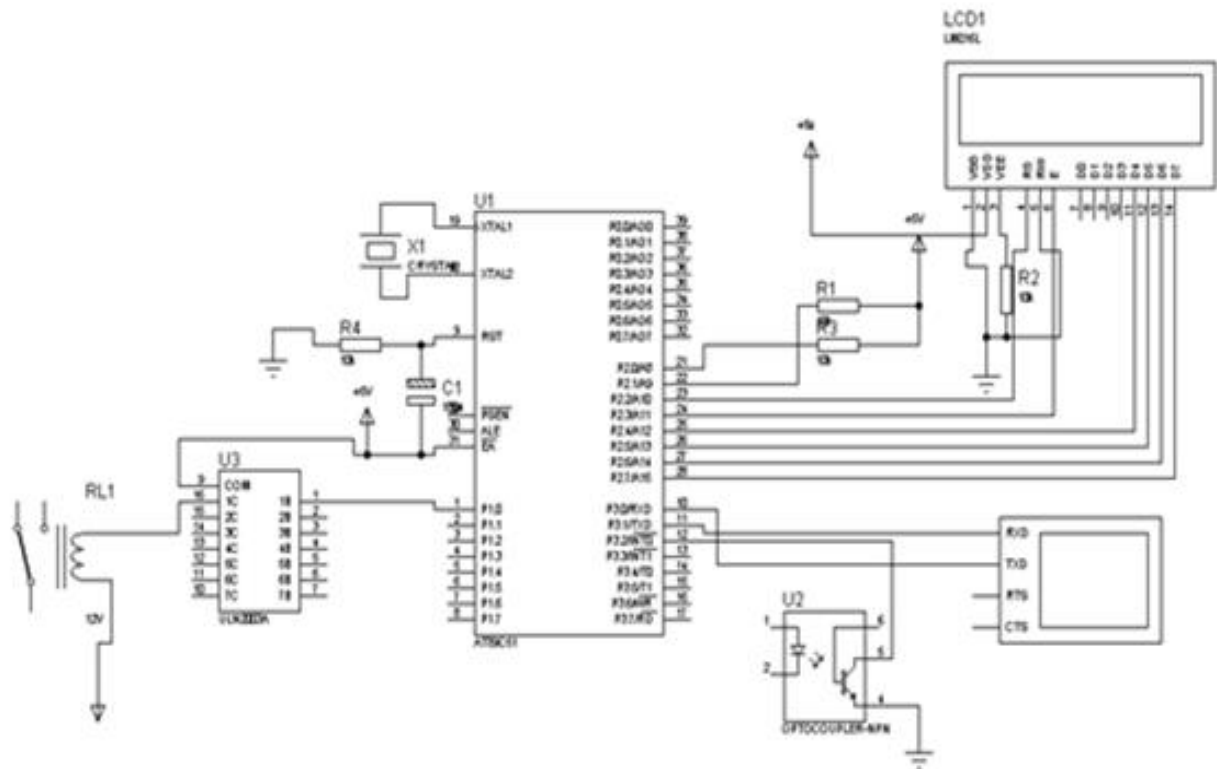
C. Relay and Load block:

Relay are interfaced with microcontroller using relay driver. The loads are connect between the relays and energy meter, such that loads are given a 230V AC power supply for their operation. This 230V AC power supply is given to operate the loads until therelays areswitched by the user by sending SMS from the registered mobile number to the GSM modem to turn off the loads. Primarily, we need to register the authorized person mobile number with the wireless electricity

consumption meter. This, registered mobile number can only have access or authority to regulate the loads and monitor the wireless energy meter system.

The microcontroller is programmed to give control commands to the relay driver such that to switch on or off the relays. By using registered mobile number, we can send appropriate commands to the GSM modem as per requirement, which are further used to switch on or off the loads using relays through relay driver. Thus, same information regarding the status of the GSM modem communication with energy meter, the status of the load whether it is on or off, the energy consumed by the loads, SMS sent to the GSM modem, the mobile

D. Circuit Diagram:



Circuit diagram

VI. CONCLUSION

From the above results we can see that we measure the bill for different loads operated at different time periods using smart energy meter. So it's a better option for consumers to cheque their meter reading, bill payment, and see real time operation of readings. In the present situation all customers are using manual communication. To reduce the manual efforts and human errors, we need to have some kind of automated system monitoring all the parameters and functioning of the connections between the customer and electricity board. Also by implementing this system we can control the usage of electricity on consumer side to avoid wastage of power. Since there is need to utilize energy in better and efficient way this pre-paid meter proves to be a boon in the power sector. In this system to save time of consumer, the consumed energy corresponding price is displayed for the consumer benefits. By the implementation of this system overall efficiency in operations of the electric board will improve. An attempt is made in this work to develop a system, which when interfaced with static electronic energy meter is avoided where in complexity of the circuit is reduced and cost also gets reduced of the meter. The consumers and the suppliers can be benefited by using the prepaid smart meter in the following ways.

- a. This system is of great advantage for the electricity department as this unit can be utilized effectively for preventing power theft, non-payment of electricity bills etc.
- b. The whole process of billing can be centralized.

c. Cost of manpower for billing / collection is reduced.

VII. FUTURE ENHANCEMENT

There are many enhancement can be done in future in the smart meter technology. The future enhancement are following

- a. Utilities will able to detect outages, connect and disconnect customers remotely, execute sophisticated demand-response programs and perform other customer services using intelligent smart meters.
- b. Customer will able to improve efficiency in the use of the electricity they purchase and the ability to save money by employing time-of-use rates and taking part in automated demand-response programs to shave peak usage.
- c. The same concept can be implementing by water supply department for controlling the usage of water and water billing system

REFERENCES

- [1] Vinu V Das, "Wireless Communication System for Energy Meter Reading" International Conference on Advances in Recent Technologies in Communication and Computing, Texas 2006.
- [2] Ashna.k, Sudhish N George. "GSM Based Automatic Energy Meter Reading System with Instant Billing", ISBN : 978-1-4673-5090-7, 2009 IEEE
- [3] Liting Cao, Jingwen Tian and Dahang Zhang "Networked Remote Meter Reading System Based on Wireless Communication Technology" IEEE International Conference on Information Acquisition, August 20 - 23, 2010Weimar, Shandong, China
- [4] A. Arif,Muhammad AI-Husain, Nawaf AI-Mutairi, "Experimental Study and Design of Smart Energy Meter for the Smart Grid", ISBN 978-1-4673-63747, 2011 IEEE
- [5] Ashna.k, Sudhish N George. "GSM Based Automatic Energy Meter Reading System with Instant Billing", ISBN 978-1-4673-5090-7, 2011 IEEE.
- [6] Adnan Rashdi, R. Malik, S. Rashid, A. Ajmal, S. Sadiq , "Remote Energy Monitoring, Profiling and Control Through GSM Network", International Conference on Innovations in Information Technology (IIT) 2012.
- [7] S.Arun, Dr.Sidappa "Design and Implementation of Automatic Meter Reading System Using GSM, ZIGBEE through GPRS". International Journal of Advanced Research in Computer Science and Software Engineering Research Paper. Volume 2, Issue 5, Dec. 2012.
- [8] Bharat Kulkarni "GSM Based Automatic Meter Reading System Using ARM Controller "International Journal of Emerging Technology and Advanced Engineering Website, Volume 2, Issue 5, July 2013
- [9] Mr. Rahul Ganesh Sarangle, Prof. Dr. UdaypanditKhot, Prof. JayanModi" Gsm Based Power Meter Reading and Control System "Mr. Rahul Ganesh Sarangle, Prof. Dr. UdayPaniKhot, Prof JayenModi International Journal of Engineering Research and Applications (IJERA), July 2014.
- [10] Mr. Tangsunantham and Pirak "Voltage unbalance Measurement in Three-Phase Smart Meter Applied to AMI System"(2014) of the SiridhornInternational Thai-German Graduate School North of Engineering.