



RF Based Automatic Energy Meter Reading System

Prashant Shende*
Department of ENTC,
DMIETR, Wardha, India

Pranoti Mude
Deptt of CSE,
KIT, Seloo, Wardha, India

Swapnil Jain
Deptt of ENTC,
DMIETR, Wardha, India

Abstract— This paper describe RF based Automatic meter reading, or AMR, is the technology of automatically collecting data from energy meter and transferring that data to a central database for billing and/or analyzing. In order to overcome these disadvantages of the traditional meter reading system, a solution is a Wireless Energy Meter which is able to transmit its measured data wireless to a computer. This technology help to overcome the many problem regarding to the collecting the energy meter data, like data is provided to a user on the basis of actual consumption value rather than on basis of estimate consumption value, for this project data transmission done with the help of RF module.

Keywords— AMR, RF transmitter, RF receiver, energy meter, automatic energy metering device.

I. INTRODUCTION

This In today's gigantic world where power consumption has been using unconsciously for innumerable applications, there is need for some entity, which can make people realize the importance of preserving the energy and consume it in considerable amount. One more problem especially prominent in industrial fields is consuming more power than the predestined one, which will unnecessarily leads to penalty.

RF based Automatic meter reading, or AMR, is the technology of automatically collecting data from energy meter and transferring that data to a central database for billing and/or analysing. This means that billing can be based on actual consumption rather than on an estimate based on previous consumption, giving customers better control of their use of electric energy. The Transmitter is connected to the meter and it counts the pulses from it and displays it over the LED display. It also transmits the data over RF. At the receiver end the data is received by a receiver module and the microcontroller will display it over the LED display. Sometimes the meters are installed inside people's homes and, if the consumer is not at home, the meter-reader cannot record the fortnightly or monthly consumption. This results in burden for both consumer and the electricity supply company. Dissatisfaction of some customers who consider meter-readers entrance to their homes as some sort of invasion of their privacy. Indian peoples are facing this problem more and recently problem became more critics when 5000 houses in one local area have same electricity bill. In order to overcome these disadvantages of the traditional meter reading system, efforts are underway around the world to automate meter reading and to provide comprehensive information to the consumer. In order to minimize the problems use of RF based Automatic meter reading is need of future.

Granted the electronic energy meters have outperformed the electromechanical meter in terms of functionality and performance, the entry of analog, digital and mixed-signal integrated circuits in large quantity for military, aerospace and high volume consumer products, promise the successful marriage between high reliability and low cost electronics that the industry has been waiting for. Recognizing the cost constraint of single phase meters, as well as help meter manufacturers meet their volume requirements, while reading their cost targets and alleviating their reliability concerns. The paper is structured as follows: Section III presents system design. In section IV hardware implementation is presented. Then we provide our conclusions in Section V.

II. LITERATURE SURVEY AND RELATED WORKS

For measuring the usage of the consumption of energy electronic meter or electromechanical meter is fixed in existing system. Currently the meters take the recording kWh units. There are many AMR systems which are based on GPRS, Bluetooth, and GSM technology. For long distance data transmission GPRS is used but it is impossible to implement as still the regular use of GPRS is not possible to common people. In GSM technology instant billing system is introduced but there may be chances of missing SMS which decreases system performance but in proposed system this problem is overcome.

III. SYSTEM DESIGN

In propose system consisting of two sections- transmitter & receiver. Let's see each section one by one. Energy meter consist of phase and neutral. Phase's wires are two first is voltage sensitive and second is current sensitive. We know that power =VI from which we count power consumption of any household appliances.

Here with using optocoupler circuit which is a parallel combination of photodiode and transistor which is envelope in single packet, therefore whatever input supply that is grounded by resistance. In transistor, on collector side 5 V supply is

given (which is come from power circuit). A Switch is attach between collector and emitter, so whenever 5V pulse come switch is on circuit is completed and 5V pulses output is given to PC5 (port c pin no.5) of microcontroller. Microcontroller has in built A/D converter which converts analog input into digital serially. In general energy meters have power load capacity of 1000 KWh means, when the LED blinks 3600 times then 1 unit is counted. But for demo purpose provision has made such that 1 blink counts for 1 unit. In microcontroller burn the program in such a way that for blinking of LED 1 time then 1 unit is counted. If transmitter section is off then “NO SIGNAL” is shown on LCD display. Whole programming is takes place in embedded C. For programming purpose “MIKROC PRO AVR” Software is which is used to simulate program in embedded C.

Here with using microcontroller Atmel8 which have in build EPROM which stores count. Microcontroller sends count to LCD present on transmitter .It display units on it. Microcontroller sends data from TXD pin (PD1) to transmitter section serially bit by bit (e.g. if count is 3 then it send 00000011).Transmitter takes 5V supply from power supply unit, and serially receive data from microcontroller and sends to antenna. Here transmitter is operated at 433 MHz of frequency. RS232 protocol is used for communication purpose. It sends data to receiver section at the baud-rate of 1200 bits/sec. On receiver side 9V dc supply is given to circuit. This voltage is storage in capacitor in the form of charge, which is further regulated by IC 7805 to provide constant 5V supply to the microcontroller. Antenna receive signal from transmitter side (which is operated at 433MHz).This signal given to RXD (PD0) pin of microcontroller and fed to LCD to display units on it. Operating distance of RF is 200 m.

System can be reset by shorting the jumper terminals on the kit then EPROM clears data and system start to count units from zero.

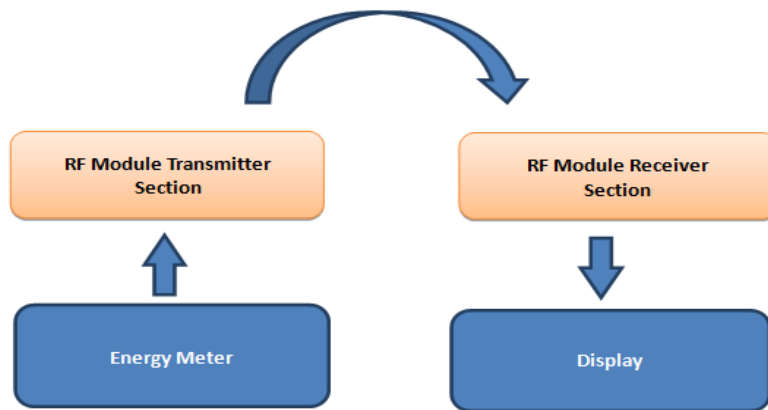


Fig.1 Block diagram of proposed system

IV. HARDWARE IMPLEMENTATION

In this system power supply is provided to meter. A RF unit shows the interfacing with the microcontroller. The collected data from energy meter and transferring it on specific base station for the purpose of billing and analyzing, this reduces the man power with the more accuracy. Hardware implementation includes following points as discussed below.

V. A POWER SUPPLY

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

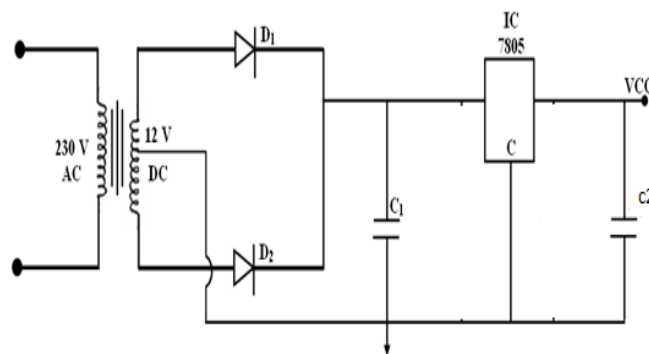


Fig. 2 Power Supply

VI. B RF TRANSMITTER

The RF transmitter, ST-TX01-ASK is an ASK Hybrid transmitter module. ST-TX01-ASK is designed by the Saw Resonator, with an effective low cost, small size, and simple-to-use for designing, frequency range:315 / 433.92 MHZ, supply Voltage: 3~12V, output power 4~16dBm.

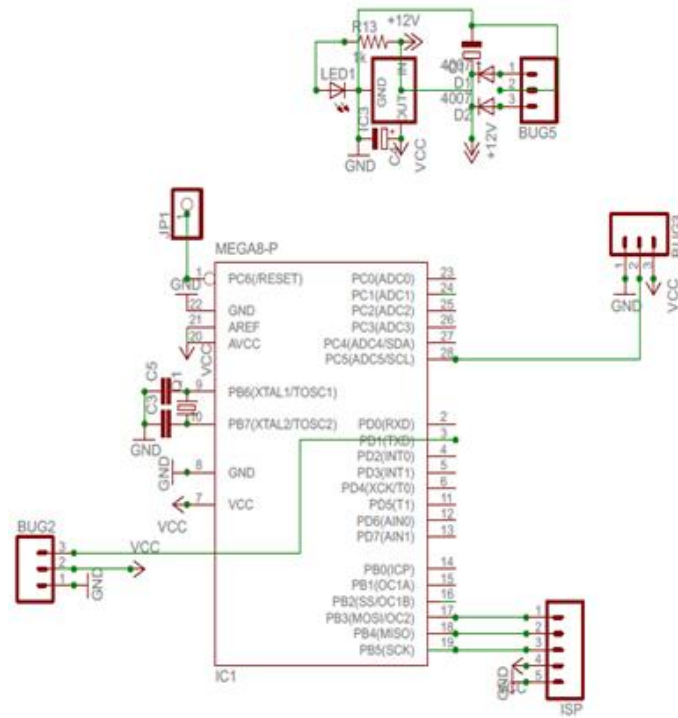


Fig. 3 Transmitter section circuit.

VII. C RF RECEIVER

The receiver ST-TX01-ASK is an ASK Hybrid transmitter module. ST-TX01-ASK is designed by the Saw Resonator, with an effective low cost, small size, and simple-to-use for designing, frequency range:315 / 433.92 MHZ, supply voltage: 3~12V.

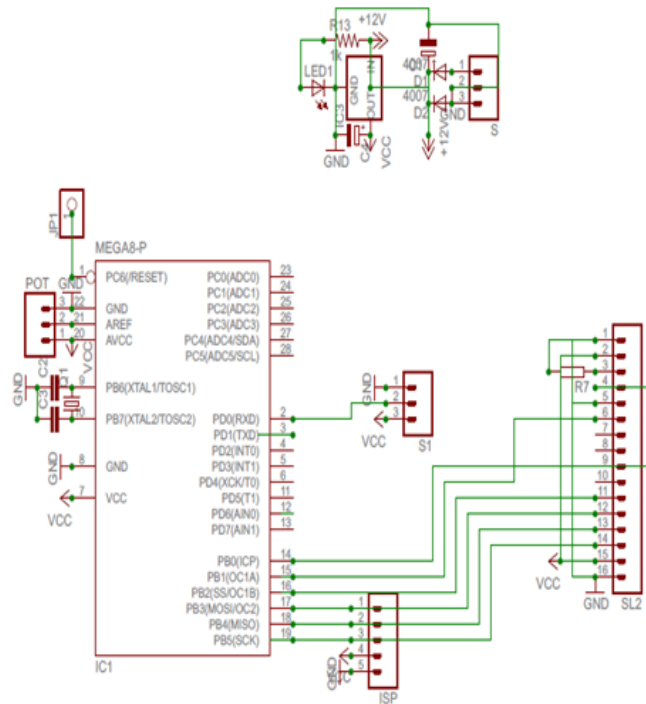


Fig. 4 Receiver Section circuit

VIII. D LCD

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.



Fig. 4 LCD Display

IX. CONCLUSION

In this work an automatic energy metering device is described which allows the visualization of power consumption of electrical devices like a TV or washing machine in real time. The current system enables residents to have an immediate overview about the actual and short term history power consumption. Future work will include developments towards automatic and remote control of devices. A further approach could be that once a day accumulated data is sent from the household to the energy provider. This gives the energy provider the opportunity to better calculate the needed.

REFERENCES

- [1] Prof. Dr. K. P. Satheyamoorthy, "Smart energy meter load control", International Journal of Advanced Research in Electrical, (IJAREEIE), ISSN (Online): 2278 – 8875, Vol. 2, Issue 8, August 2013
- [2] 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, May 2013.
- [3] Bharat Kulkarni "GSM Based Automatic Meter Reading System Using ARM Controller", International Journal of Emerging Technology and Advanced Engineering Website, Volume 2, Issue 5, May 2012.
- [4] Mr. Rahul Ganesh Sarangle, Prof. Dr. UdaypanditKhot, Prof. JayanModi "Gsm Based Power Meter Reading And Control System", International Journal of Engineering Research and Applications (IJERA) vol. 4, June-July 2012.
- [5] A. Abdollahi, M. Dehghani, and N. Zamanzadeh , "SMSbased reconfigurable automatic meter reading system," IEEE International Conference on Control Applications (CCA 2007), Oct, 2007, pp. 1103 - 1107.
- [6] C. Brasek, "Urban utilities warm up Engineering, Vol.15, No.6, pp.10-14, December/January 2004/05.