



Automatic Energy Meter Reading and Control using Arm Processor & GSM (AEMRCAG)

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ABSTRACT: The usage of electricity is growing day by day in one hand, and on the other hand the production of electricity is going down at this new era. Therefore we are all at the edge of doing something either to use less electricity or to produce more electricity. It is impossible to stop consuming the electricity as the new technologies are implemented in the industries. Similarly it is impossible to produce more electricity since there is less amount of source. The only possibility is distributing and managing the electricity that we have at hand. This will be accomplished using this project, Automatic meter reading and control using ARM Processor and GSM. The ARM Processor used in this project is a 32 bit microprocessor. This is used to read the power consumed and send to the utility server for management. GSM/ GPRS are used for two way communication between utility server and ARM Processor. Relay is used for the control process, where the power is disconnected when the consumer fails to pay the bill and connects back once the bill is paid.

KEYWORDS: Energy meter, ARM processor, GSM, IC MAX-232 and Relay

I. INTRODUCTION

The traditional meter reading gives so many problems day by day due to the growth in population and environmental condition. This have been reduced by the developments of microcontroller. The reason for these problems are,

- a) The utility usages are written on paper manually which causes human error.
- b) The billing process will be bending due to unavailability of consumes during the utility worker's visit and theyhaveto visit again and again.
- c) It takes lot of time to visit each individual consumer's house. It is very difficult in natural calamities especially in rainy season.
- d) The utility workers cannot find the unauthorized connection of the consumer's.
- e) Consumers concern about the quality of power not continues supply of the electricity. This is not provided by the traditional meter.

The wireless technology along with microcontroller gives solution to these problems. It makes the exchange of information fast, secured and accurate. GSM/GPRS is widely used for communication which gives high speed transmission of information. This study proposes a AEMRCAG after considering the pro and cons of traditional meter reading system and wireless technology. This project uses CT & PT to read the current and voltage parameters of incoming electrical signal. Then the power parameters are computed using signal conditioning unit along with ARM based embedded system (AES). The calculated power parameters are transmitted to the utility server through wireless communication [GSM / GPRS], similarly the signal from utility server is also transmitted to the AES.

EXISTING:

The ordinary microprocessor is used to calculate the power consumption. This calculated power is transmitted to the utility server using (GSM / GPRS). The utility server has the details of every consumer. They calculate the amount to be paid for the particular month and send the details to the consumer via SMS. The details of how many units is consumed, the amount for a single unit for that particular month and due date can be checked in the net by the consumer.

PROPOSED:

The ordinary microprocessor uses pneumatic and corresponding opcode to develop a program. This is very laborious task and require lot of time to write the opcode. This problem is solved by using ARM processor which uses simple c programs for reading power consumption & communication. Power data is used for bill management. The SMS includes not only the amount but also the units for the month and the due date through GSM / GPRS. This will also be displayed in the energy meter display using LCD display. The message is also send on that day of due time and end of that day power to the energy meter is disconnected by using the control system which contains relay circuit. The power supply is connected to the energy meter only when the signal is send from the utility server

II. BLOCK DIAGRAM

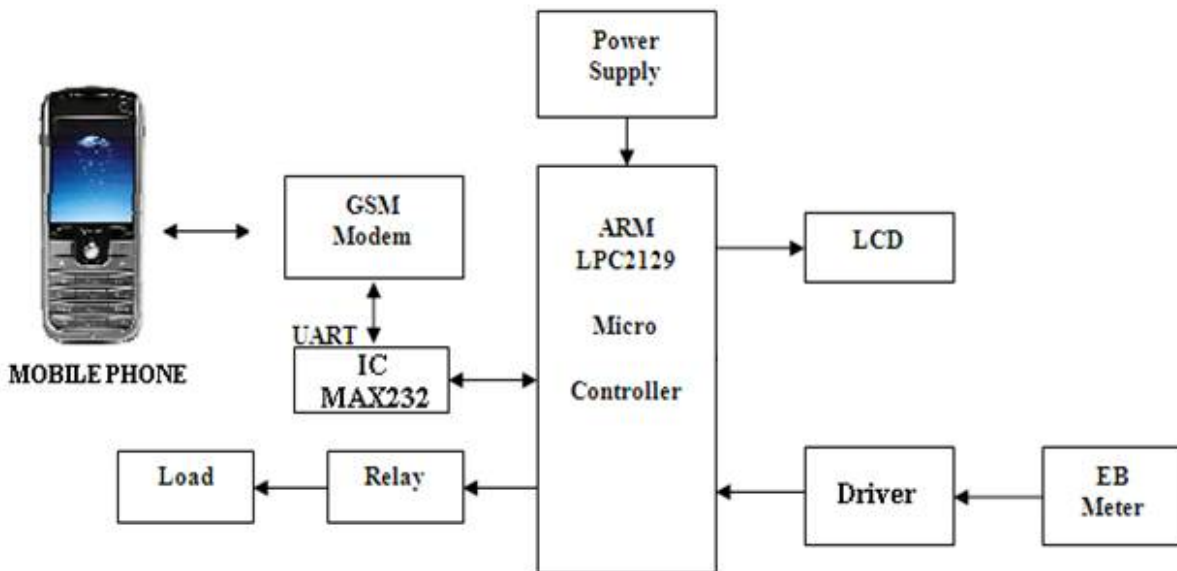


Figure-1: Block Diagram

This system consists of GSM modem, ARM processor (LPC 2148), IC MAX232, opto-coupler, relay, load and energy meter. The energy meter connected with hardware interrupt pin of ARM processor through opto-coupler. The opto-coupler is used to provide electrical isolation between energy meter and ARM processor. The energy meter sends the pulses to hardware interrupt pin of the ARM processor. The pulses produced by the energy meter based on current utilization of the load. The counter in the processor counts the interrupt pulses and increment the counter value. Based on counter value, the unit price will be pre-programmed and this value communicates to output port and controlling the load when it exit the reference value i.e., load turned off. The GSM modem connected with processor through IC MAX232 which is used to control the voltage level between these two devices. The LCD display unit interfaced with processor for displaying the information about the EB billing parameter.

Energy meter input is connected to EB power supply and its output connected to load through relay unit. ARM Processor operates at 5V, so a stepdown transformer is used to convert 230V into 5V. The arm processor accepts only the digital signal but the Energy meter produces analog pulses. It has been converted into digital pulses by using opto-coupler. Arm processor is programmed to calculate units and bill. In this energy meter it counts 32 pulses as 1 unit. Arm processor receives the pulse signal from the energy meter. It calculates the bill amount and displays the amount using LCD display. At this time GSM interface with the Arm processor and send the bill information to the consumer through SMS. If the consumer fails to pay the bill on due date, the utility server will send a signal to the ARM processor and the relay circuit will be activated and the power supply to the energy meter is disconnected.

III. IMPLEMENTATION AND RESULT

The purpose of Automatic Energy Meter Reading and Control using ARM processor and GSM is to control the overall power circuit from the utility server by using GSM. The concept is that the ARM processor generates the bill and GSM send it to the mobile. The data will be stored in the utility control unit. If the customer forget to pay the money, utility server send one pulse to processor through the GSM. This pulse will activate the relay control unit. The relay is used to control the load power. The power unit is disconnected when the relay turned ON. This relay circuit is always called as breaker circuit.

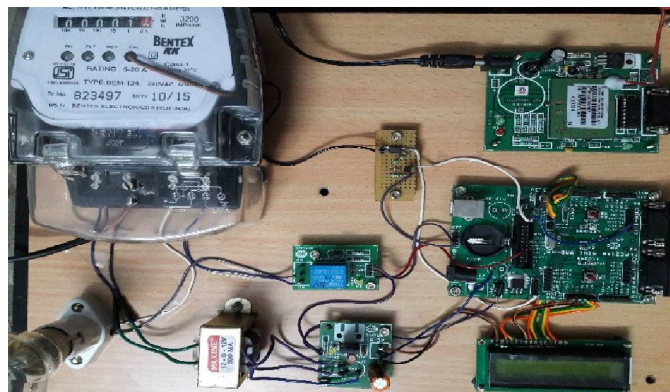


Figure 2- Automatic Energy Meter Reading and Control using Arm processor & GSM

Here, we use one load (60W) for checking the operation of the circuit designed. The unit and the amount will be displayed on LCD display. This LCD is placed on this energy meter circuit which is shown in figure 3.



Figure 3-Energy meter display

We take only four pulses to control the power unit for the demo purpose. The 32 pulses are equal to one unit. The first three units are assumed to be the power consumed for the particular month. When the third pulse is reached, a message is send to the customer stating the total unit for the month and the amount to be paid. The due date will also be send along with that message. This message is passed by ARM processor to the customer through GSM. The message that will be send to the customer is shown in figure 4.

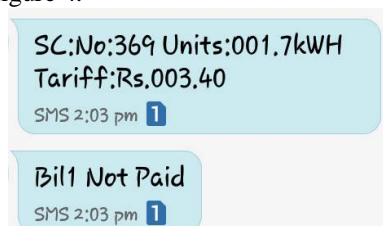


Figure 4- Sms generated to the customer

The fourth unit is assumed to be the due date. The bill has to be paid before the fourth unit if not the fourth unit will activate the relay circuit. Now the power circuit is braked by using relay control unit.



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IV. CONCLUSION

The development of energy meter is done continuously as the technology grows. The usage of GSM in this project makes better communication over existing one. The data is transmitted at standard SMS rates. Thus any data can be transmitted at lowest cost, even the data may be a largest one which takes lot of time for transmission. The data can be transmitted frequently to the remote station as well, using GSM. Since the transmission is done frequently the generation of bill is also done for each transmission of power data. This is also helps us to know the power requirements, meter failure and manage them. The unauthorized power consumption will be found out using this project. Though we cannot get the acknowledgement of the sent SMS, it doesn't affect the performance of the system. The human intervention is totally avoided. The bill generation can be checked at the moment of generation itself and the hard copies are also available which will help the utility server to fulfil the needs of the consumer.

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