

Prepaid Energy Meter with Theft Detection

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Abstract— *The Prepaid Energy Meter with Theft Detection System mainly works for detecting internal as well as external energy theft. Internal energy theft occurs after the energy reaches to energy meter while external energy theft occurs before the energy reaches to energy meter. The system works for theft detection and also allows user to use prepaid energy meter functionality.*

Using this functionality user will able to pay in advance and use the exact amount of energy. The system starts with GSM modem Connection and first configures the user number and gives authority to that number. When the external or internal theft occurs in system, the system immediately inform authority or user with message also system will able to send message when the prepaid balance is low or Zero. The system is made up of AVR Microcontroller, current sensors, GSM modem, LCD display, energy meter and load

Indexed Terms-- *Prepaid balance, AVR microcontroller, GSM module, current sensors*

I. INTRODUCTION

Nowadays, power distribution companies are not able to recover the 100% charge from users of what they are used due to many reasons, also there are many slabs of electricity charge based how much current that residential or commercial plot was using. But, parallely the state governments are not providing the subsidy amount to distribution companies for which they are levying low charges. And also at many places the meters are tempering, electricity theft was occurring. These all combinedly making losses to electricity distribution companies then extra charges was levying on honest consumers.

So, to avoid this I had made this project prepaid energy meter with theft detection such that the user can't able to get electricity until they paid, such that any subsidy will be paid by government directly to consumer

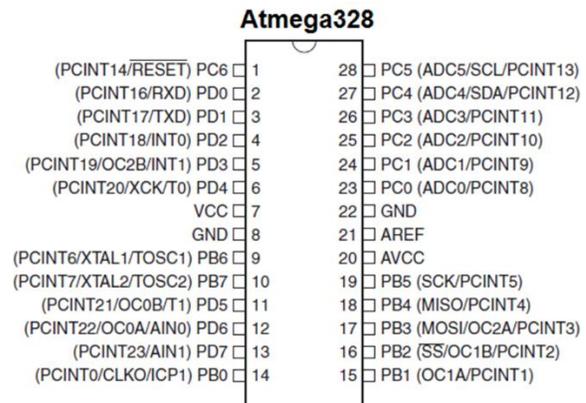
insread to energy distribution companies and also any theft will be detected by it. So the losses for discoms will be reduced.

To make the energy meter prepaid and theft detecting, I use a circuit that contains ATMEGA controller and GSM module.

Firstly, the GSM module is used to accomplish a user. After that the balance will be credited by user. The user can be able to use the amount of electricity based on recharge by user. The code uploaded to ATMEGA controller contains the charge per unit of electricity. IT displays message on lcd when internal or external theft occurs or when an tampering occurs using current sensors on it.

II. LITERATURE SURVEY

- AT MEGA CONTROLLER:
High performance, low power 8-bit controller
Advanced RISC architecture
High endurance non- volatile memory segments
Programmable serial USART
To program ATMEGA controller, it is necessary to know pin diagram of it.



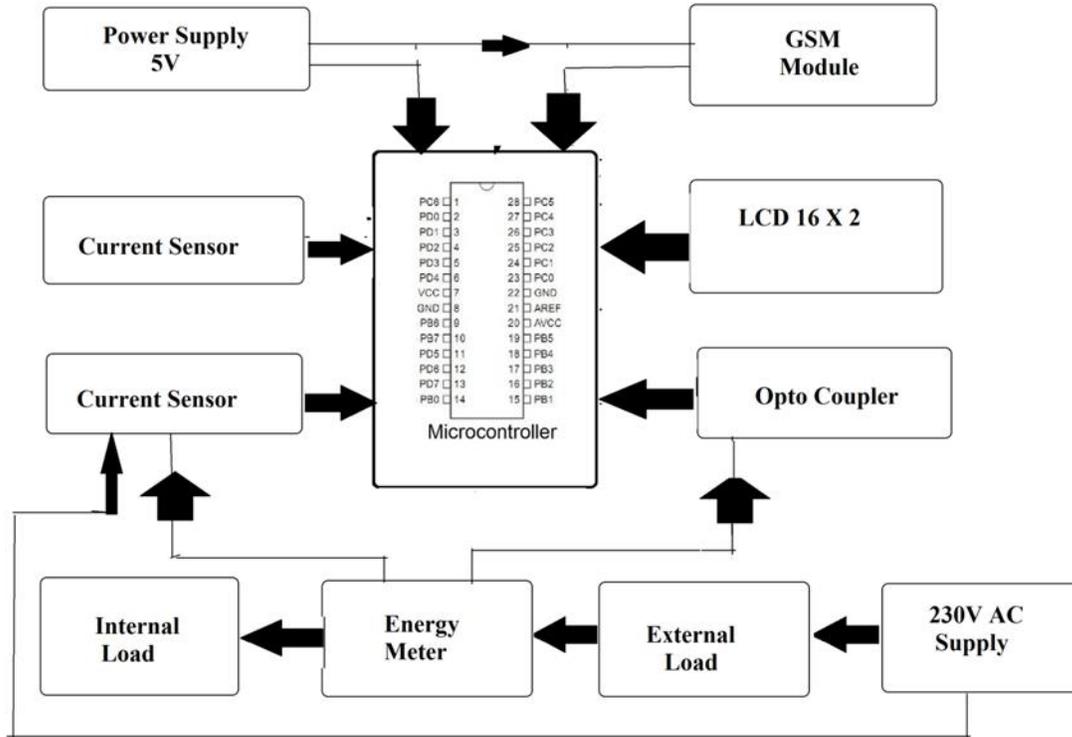
- GSM TECHNOLOGY

GSM is acronym of Global System for mobile communications and is one of the most widely used cell phone technology. GSM makes use of SIM (subscriber's Identity Module) card for identification of users account which allows GSM users to quickly move themselves from one GSM phone to another by moving the SIM card. Frequency bands used for GSM networks are 850 MHz, 900MHz, 1800MHz, and 1900MHz. The main advantages offered by GSM are:

- i. Standardization
- ii. Capacity
- iii. Quality
- iv. Security

III. SYSTEM ARCHITECTURE

Below is the block diagram of my project:



current sensors which are used to detect internal and external energy theft are connected to controller such that the controller will display in LCD whenever a theft is detected.

Pulse of the meter which represents 'cal' light of energy meter is connected to controller through optocoupler to calculate the energy consumed. Whereas it blinks 3200 times per kwh of energy consumed. i.e:- pulse signal will give 3200 pulses for every kwh of energy consumed.

Here the optocoupler is used since the pulse of energy meter should not be disturbed with remained part of circuit function.

GSM modem is used for user registration, authentication and recharge.

IV. RESULT AND DISCUSSION

- The project PREPAID ENERGY WITH THEFT DETECTION consist of ATMEGA328 microcontroller based system which allow user to use energy as per his requirement and consumption as soon as the system continuously monitors the energy theft.
- The system also consist ➤ Two loads one for the external theft and another is use as an internal load and the energy meter to measure the units ➤ LCD display and GSM SIM800 modem. • The LCD display is use to display the status of the system

and the GSM mode s use to communicate with the user as well as the authorization.

- At the start of the system the user have to turn on the GSM modem by pressing and holding the power button of the GSM modem till the blue light of the GSM modem starts blink.
- Then after by starting the system the system will turns off the main power supply and the LCD display will shows the status of the system.
- The system first asks for the user number to configuration.
- The user have to call the GSM modem to resister his number as user
- After registration the user will receives the configuration massage.
- After than the system will asks for the authentication.
- For the authentication repeat the above procedure used for the user configuration.
- After the all configuration the system will checks the balance.
- If the balance is null the system will not turn on the main power supply till the balance is greater than zero.
- To get the balance the user has to send SMS to the GSM modem.
- The format of recharge SMS is “RECHARGE ”
- As soon as system receives the SMS it verifies the SMS first. If the SMS format is wrong or there is any different SMS the system automatically reject the SMS and shows as INVALID SMS on the LCD screen.
- If the SMS is correct the system will adds that amount of balance and stores it in the internal memory to avoid data loss due to reset or power off.
- If the balance is less than 5Rs. or Rs.0 the system will automatically sends the alert SMS to the user.
- If user doesn't have enough balance he can get the credit amount by sending the SMS “CREDIT ”.
- The credit amount will be deduced from the next recharge.
- The user is allowing for only one credit at a time. He cannot get the two credits simultaneously.
- The system also monitors the energy theft like external theft and the internal theft. For this purpose the system uses two current sensors which sense the change in current due to theft.

- There are two switches are used to demonstrate the internal as well as external theft.
- By turning on the external load the system will detect the external theft and sends the SMS to the authorized number that the theft is detected.
- The internal theft is detected when the user try to bypass the meter.
- When the system detects the internal theft the system automatically sends the SMS to the authorized number that the internal theft is detected.
- If someone tries to open the meter the system detects it and sends the SMS to the authorized number that the meter is tempering.

CONCLUSION

A Embeddeed system for consuming electricity in prepaid mode was proposed in this paper. This system uses ATMEGA328P controller, GSM module for authentication of user and displaying status messages. This system will prevent user from thefting electricity and tampering meter

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