Smart Energy Meter

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Abstract- *In this project we are building a smart energy meter, which enables us to carry out the transactions direct through wireless technology and enables us to recharge the account from home. The Energy meter consists of an LCD interface, which displays the power consumed, and the amount of the bill for the power consumed. It gives an alarm when the balance goes below certain minimum amount. Such meters are already used in the market extensively in several African and European countries.*

Keywords- smart energy metering, automatic billing, RFID module etc,LCD, current sensor.

I. INTRODUCTION

In todays days accuracy in electrical billing is highly recommended.The conventional Electricity meter or Energy Meter device gives the power consumption of a residence, business or of electrical powered devices. But sometimes the functionality of it is limited due to its area of application, especially due to inaccessible position in the area.

The possible solution to this is Smart Energy Meter. The Smart energy meter are wireless energy meters and therefore can be installed in remote or inaccessible areas. This thus reduces human efforts as the wireless energy meter enables us to send data through a PC or remote devices so that the monitoring and analysis of the data can be easily done. The Smart energy meter gives real time consumption and accurate billing. It gives real time monitoring of electricity usage and therefore is cost effective and less time consuming. The measurement system is aimed to measure data related quantities such as units consumes, power consumes, active load etc.

II. METHODOLOGY

The measurement system is aimed to measure power quantities in real time. RTC is the heart of the system. All the operations and measurements are done in real time clock. The paper describes the design and implementation of digital based smart energy meter based on AVR microcontroller. For making current measurements a current sensor module is used. A test experiment is carried out so that the sensor can be interfaced with the AVR microcontroller to measure a dc current. The electrical isolation which is provided between the conduction current and the sensor circuit minimizes the safety concerns while working with high voltage systems

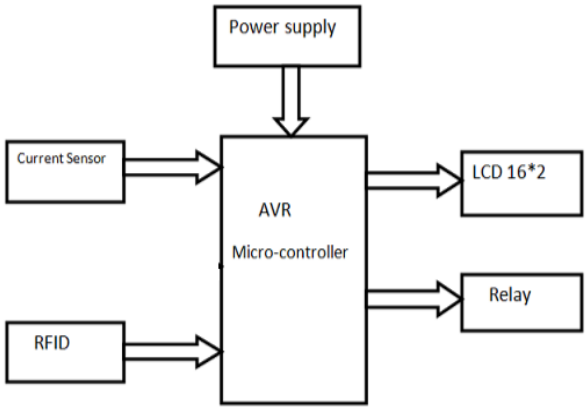

Fig. 1 block diagram

The relay used in this electrical circuit to control the circuit by opening and closing the contacts in another circuit. The relay control large voltage and current as it has amplfying effect because when a small voltage is being applied to relay coil it can result in large voltage switching by the relay contacts.

A RFID system is used in this circuit is made up of two parts: A tag or label and a reader. The RFID labels or tags are embedded with a transmitter and a receiver. The components on the tags consists of two parts: a microchip that stores and process information and an antenna to receive and transmit a signal.The tag contains the specific serial number for one specific object. A two-way radio transmitter-receiver called an reader or interrogator emits a signal to the tag using an antenna to read the information encoded on a tag. The tag responds with the information which is written in its memory bank. The interrogator will then this transmit the results of the information to an RFID computer program.

For a small and cost effective smart energy meter, a 16x2 LCD to display all our parameters is used in the system. This display is nothing to do with the distribution company providing the electricity. LCD is used to know the present

status of units and other stuff like voltage, current or power factor at the consumer side.We have small microcontroller having less number of pins 4 bit interfacing of LCD is done with the microcontroller to save pins for other stuff.

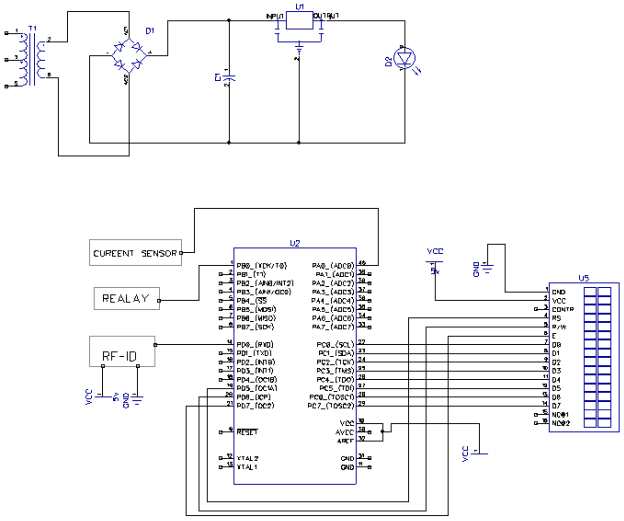

Fig. 2 circuit diagram

III. COMPONENTS

a) Power Supply Section-

A power supply unit (or PSU) for the operation internal components carries out the conversion of AC mains to low-voltage regulated DC power. The purpose of a power supply is to distribute proper DC voltage to each component.

b) Current Sensor-

For making current measurements a current sensor module is used. ACS712 allows measurement of direct or alternating current flowing through a conductor. The current generates a magnetic field which the sensor converts to proportional output voltage by using hall effect. The voltage is read by the microcontroller to an A/D converter and calculate peak value and corresponding rms value of load current

c) Microcontroller-

The microcontroller unit used in the system is ATmega16. It is an 8-bit microcontroller by Atmel. The IC has 40 pins. It consists of four ports namely A, B, C and D. The port A is the ADC port of the microcontroller. Relay is connected to the Port B (PB0) of AVR Controller which is XCK (External clock). , current sensor ACS712 is connected to Port A (PA2) of AVR controller, which is used for analog to digital conversion (ADC).

d)RFID Module-

RFID stands for Radio Frequency Identification. RFID is a basic technology that allows the identification of a device to be read wirelessly by a reader using radio frequency. Power-up the module and connect the transmit pin of the module to receive pin of the microcontroller.

e) LCD Display-

A 16x2 LCD means it can display16 characters per line and there are 2 such lines. LCD (Liquid Crystal Display) screen is an electronic display module.

f) Relay-

Relays are electromechanical or electronic switches that open or close circuits. Relays are used for protection purpose and control one electric circuit by performing opening or closing operation in another electrical circuit. When relay contact is in Normally Open position there is open contact when relay is not energised. When relay is Normally Closed,there is a close contact when the relay is not energised.In this case applying current to the relay will change the normal state of the contacts.

IV. CONCLUSION

The proposed system provides number of advantages as compared to the conventional energy meter reading system used in majority of households in India. Firstly, a lot of time and energy is saved. Also, due to reduced human intervention, there is less chance of error in noting down the energy meter reading. The bill is generated automatically and is sent directly to the consumer. The system consists of many other features also.

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