GSM Based Energy Meter Reading and Billing System

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ABSTRACT

The main objective of the proposed paper is to develop an energy meter which is totally based upon the GSM system and used to reduce the human efforts consumed during the door to door billing.

We can use this system instead of door to door billing system as the power consumed in this will also be displayed to the consumers so there will be minimum chances of errors. This system is based on microcontroller here we are using atmega16 microcontroller. This gives all the controlling over the equipments connected to the system.

Thus we are trying to present an idea towards the minimization of technical errors and to reduce human dependency at the same time. With the help of this project we are aiming to receive the monthly energy consumption from a remote location directly to a centralized office. In this way we can reduce human efforts needed to record the meter readings which are till now recorded by visiting every home individually.

Keywords: Microcontroller GSM System Voltage Ragulater.

1.0 Introduction

Till today meter reading for electricity consumption and billing is done by human operators by door to door billing system. This requires a very large number of human operators and long time to acquire complete data reading and billing from a particular area. However, there may be cases where human operators miss few houses in that particular area or restricted and slowed down due to bad weather condition, transportation problems, etc. Human operators makes more mistakes while reading a meter and sometimes the electric power meter of a consumer may be placed in a location where it is not easily accessible. Again printed billing can be lost in the mail box or being never delivered. More human operators and longer working hours is needed to complete the meter reading task due to the increasing number of residential housings and commercial buildings day by day, which increases the energy provider meter reading costs for operation. To obtain efficient meter reading, minimize billing error and operation costs, GSM based Electric Meter reading and billing system can be replaced with every energy meter in an area. It is a very efficient mode of data collection that allow substantial saving through the reduction of meter re-read, greater data accuracy, frequent reading, improved billing and customer service, more energy profiles and consumption trends updates and better deployment of human resource. "Electricity meter reading using GSM" implements the applications of the GSM technology into meter reading. GSM system stands for Global system for mobile communication (GSM) and is a wide area wireless communications system that utilizes the property of digital radio transmission to provide voice, data, and multimedia communication services. A GSM system coordinates the communication between mobile telephones (mobile stations), switching systems, and base stations (cell sites). One GSM radio channel is 200 KHz wide channels that are further divided into 8 frames. The GSM system contains mobile telephones (mobile stations), radio towers (base stations), and interconnected switching systems. We have selected a particular GSM modem SIM300 for our research work.

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The messages are sent from the mobile set that includes commands in written form which are processed to perform the required task according to the requirement. The purpose of designing this system is to implement microcontroller based control module that receives its instructions and command from a cellular phone over the GSM network. The microcontroller will carry out the issued commands and then communicate with the cellular phone.

2.0 Block Diagram
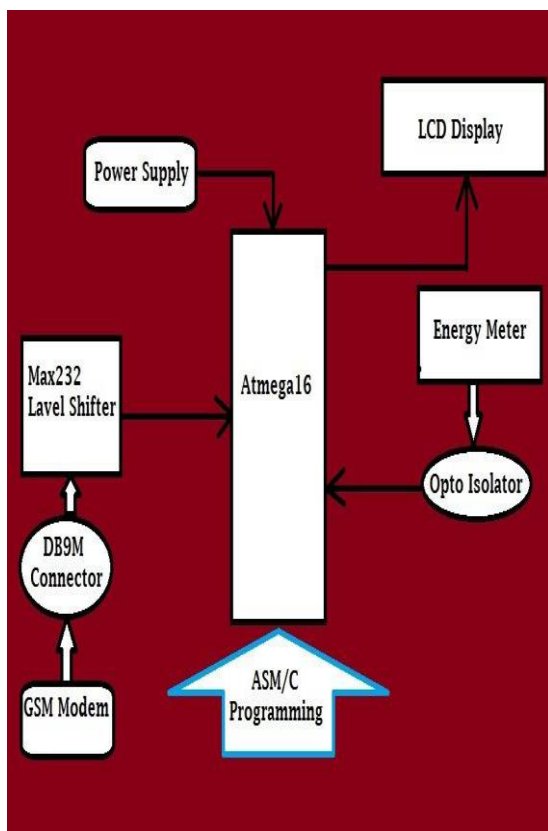
3.0 Hardware Used

3.1 Microcontroller (atmega16)

The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

The ATmega16 contains 16 Kbytes On-chip In-System Reprogrammable Flash memory for program storage. Since all AVR instructions are 16 or

32 bits wide, the Flash is organized as 8K × 16. For software security, the Flash Program memory space is divided into two sections, Boot Program section and Application Program section.
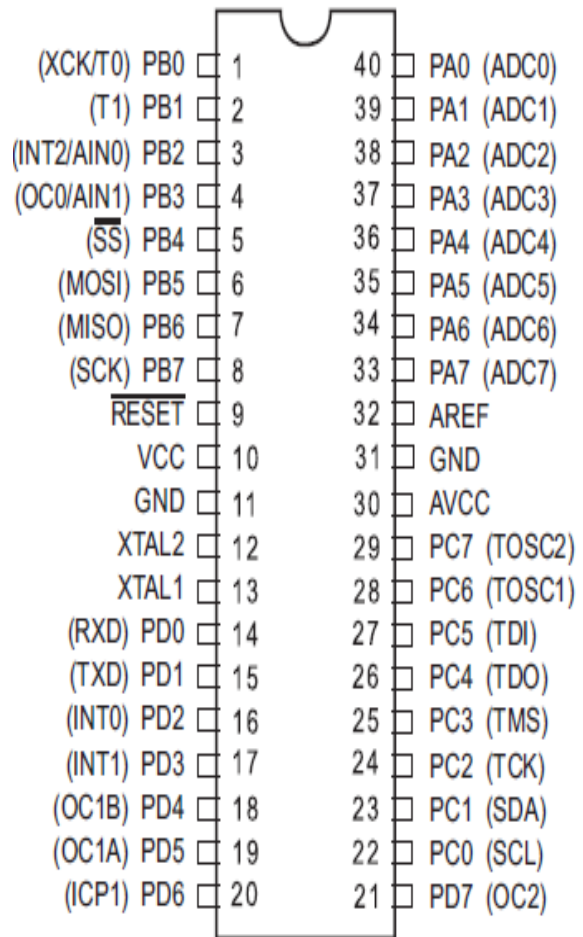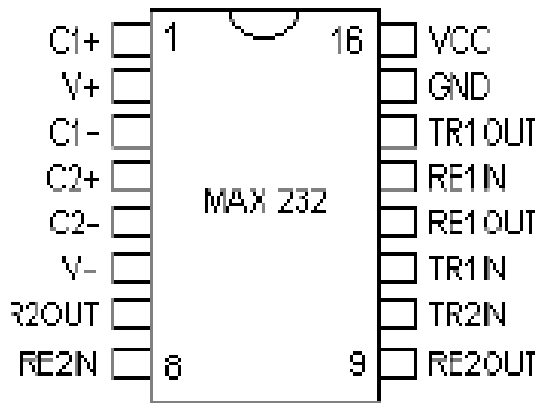

3.2 Pin configuration of atmega16

3.2.1 Max232

RS232 is the most known serial port used in transmitting the data in communication and interface. Even though serial port is harder to program than the parallel port, this is the most effective method in which the data transmission requires less wires that yields to the less cost. The RS232 is the communication line which enables the data transmission by only using three wire links. The three links provides 'transmit', 'receive' and common ground.

The 'transmit' and 'receive' line on this connecter send and receive data between the computers. As the name indicates, the data is transmitted serially. The two pins are TXD & RXD.

There are other lines on this port as RTS, CTS, DSR, DTR, and RTS, RI. The '1' and '0' are the data which defines a voltage level of 3V to 25V and -3V to -25V respectively.

3.3 Pin configuration of max 232

3.3.1 LCD display

LCDs are available in the market in a wide range like 8x1, 8x2, 16x1, 16x2, 20x2, 20x4, and 40x4. For this project we have used **16x2** that means 2 rows of 16 characters. It is a compatible module of Hitachi HD44780, having 16 pins including 2 pins for backlight.
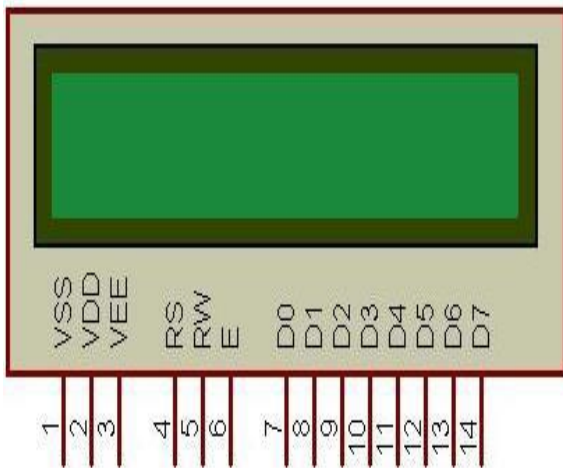

4.0 OPTO-Coupler

The general purpose opt couplers are made of a gallium arsenide infrared light emitting diode driving a silicon phototransistor.

Opt coupler is a semiconductor switching device which is used in conversion of analog signal into digital time pulse and this pulse is given to the microcontroller as the input optocouler consist of a diode and a phototransistor. And it is fabricated on a 6-pin dual in line package.
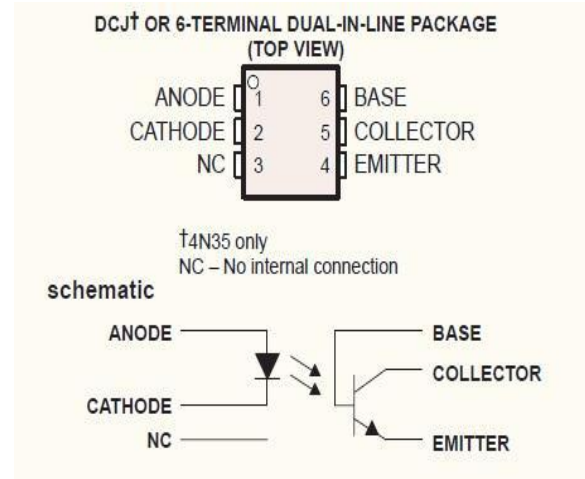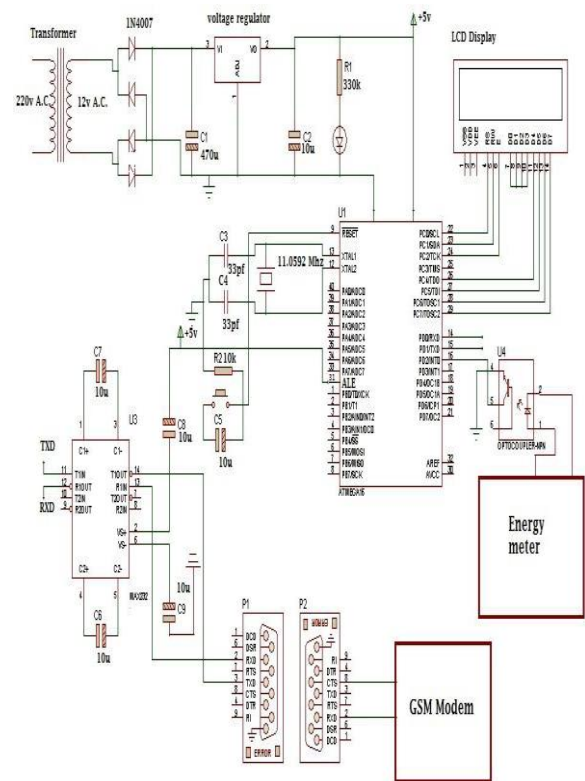

5.0 Software Used

5.1 CV-AVR

Code vision AVR is a compiler in which the programming of our Microntroller is done in embedded c language.

6.0 Circuit Diagram

7.0 Working of the Circuit

In this research we have a energy meter and is connected to an Opto-coupler, which counts the glowing led (we can increase the led glowing on/off time pulses according to our requirement), so after every time set by us its gives an interrupt and this interrupt is given to a programmable micro controller of 8051 family, The microcontroller takes the reading from the Opto-isolator which is connected to an energy meter and displays the reading on the LCD interfacing to a microcontroller. The reading of the energy meter is also sent to the cell phone of the user by a message through GSM modem being fed from the microcontroller via level shifter IC and RS232 link.

The power supply having a step down transformer 230/12V, which converts voltage to 12V AC. This 12V AC is converted to DC by using a Bridge rectifier and then regulated to +5V using a voltage regulator LM7805 which is required for the operation of the microcontroller and other components.

8.0 Conclusion

There is a lot of power is waste due to inefficient consumption of electricity by consumers. most of the time, The distribution company receive a large amounts due to pending bills which causes the substantial revenue losses and also results in hurdles to modernization because of lack of money. on the other hand, The consumers are facing problems like receiving due bills for bills that have already paid and the reliability of electricity supply is decreases. The solution of all these problems is to keep track of the consumer's load on a time to time billing basis, which will help us in assurance of accurate billing, for tracking the maximum demand, and detection of online theft. These are all the features to be concerned for designing an efficient energy billing system. The present project incorporates these features to address the problems faced by both the distribution companies and the consumers.

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