Advance Metering Infrastructure Using GSM Module with Load Control

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ABSTRACT:

These days the electricity department has to send employees for taking meter reading every month, which is an expensive and time consuming job. This project provides a convenient and efficient method to avoid this problem. The electricity office can take the readings of consumers using GSM at their place. The desired number is auto saved on the microcontroller over a missed call. The main objective of the project is to develop a wireless based meter reading system. Also the loads can be controlled GSM using this project.

The Unit reading can be calculated by microcontroller by obtaining values from Power Factor Unit and displays the reading on the LCD. The Unit reading obtained is also sent to the control room by a message via GSM modem. This GSM modem also receives commands from any cell phone to control the electrical loads. On receiving command it can even switch ON/OFF the load.

The power supply consists of a step down transformer 230/12V, which steps down the voltage to 12V AC. This is converted to DC using a Bridge rectifier. The ripples are removed using a capacitive filter and it is then regulated to +5V using a voltage regulator 7805 which is required for the operation of the microcontroller and other components.

Keywords: Global System for Mobile (GSM), General Pocket Radio System (GPRS), Automatic meter reading (AMR) System, Radio Frequency.

INTRODUCTION

Electricity has become vital in everyday life. It is tough to imagine a world and human life without electricity. But the vitality of electricity has meant that people consume vast amounts of energy unmindfully and carelessly. The world's energy consumption/capita stands at a staggering 2782 KWh. At this rate the world's energy resources would get depleted very soon The development of Advanced Metering Infrastructure or AMI system has brought the greatest change in the technology of energy

metering. This technology helps send energy consumption data from buildings, factories and houses to the utilities for load curve, power quality analysis and consumers billing purposes.

Advanced Metering Infrastructure (AMI) is also introduced to integrate the meter with grid and households for better analysis of transmitted power and usage. The AMI technology includes two-way communication between utility companies and customers' smart meter. This device communicates with consumers and utilities through power line carrier and this is aimed to help households to consume energy wisely .The AMI can be defined as a 'smart meter' device due to its user-interface ability and provision of all parameters that are related with users' energy consumption as well as utility companies. The parameters that are employed in AMI system are energy consumption, real power, reactive power, power factor, voltage, current and maximum energy demand. These parameters will ensure the energy usage quality at receiving end and provide information on current energy price to consumers. Moreover, most of the smart metering devices are able to record the activities of households through energy consumption profile. Several issues were reported by these companies regarding energy crisis, cyber security issues, smart meter robustness, communication signal and financial investment. These issues are future challenges in order to develop a better Advanced Metering Infrastructure system. Therefore, in this paper, several ideas of AMI system improvement are proposed so as to reduce or eliminate some current issues.

BLOCK DIAGRAM
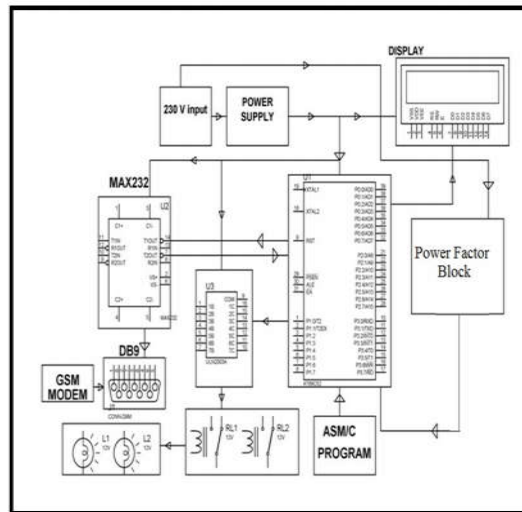
Block Diagram of Advance Metering Infrastructure

Power Supply
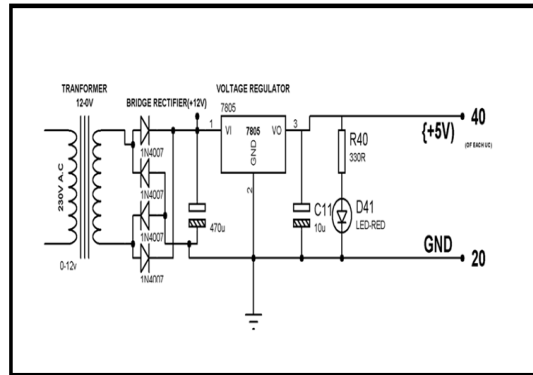
The circuit uses standard power supply comprising of a step-down transformer from 230v to 12v and 4 diodes forming a Bridge Rectifier that delivers pulsating dc which is then filtered by an electrolytic capacitor of about 470microf to 100microF.

The filtered dc being un regulated IC LM7805 is used to get 5v constant at its pin no 3 irrespective of input dc varying from 9v to 14v.The regulated 5volts dc is further filtered by a small electrolytic capacitor of 10 micro f for any noise so generated by the circuit. One LED is connected of this 5v point in series with a resistor of 330ohms to the ground i.e. negative voltage to indicate 5v power supply availability.

Features Of Microcontroller (AT89S52)

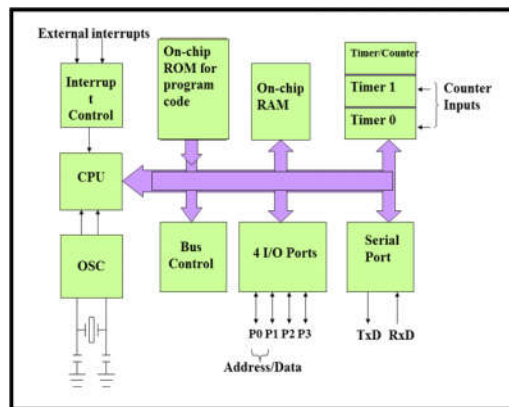Compatible with MCS®-51 Products

Flash Memory

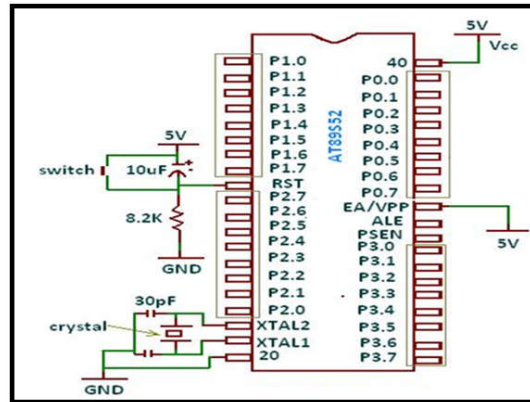Endurance: 10,000 Write/Erase Cycles

4.0V to 5.5V Operating Range

Fully Static Operation: 0 Hz to 33 MHz

Three-level Program Memory Lock

256 x 8-bit Internal RAM

Block Diagram of Microcontroller

Pin diagram Of MicrocontrollerAT89S52

GSM MODEM

A **GSM modem** is a specialized type of modem which accepts a SIM card and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone.When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network.
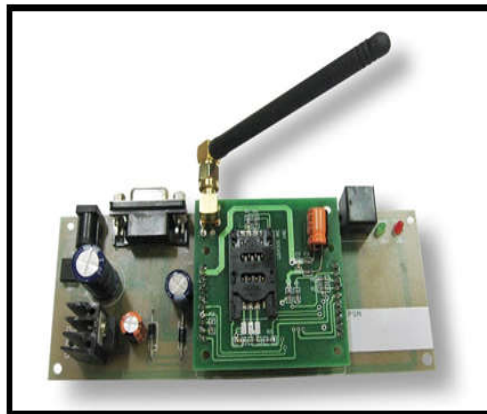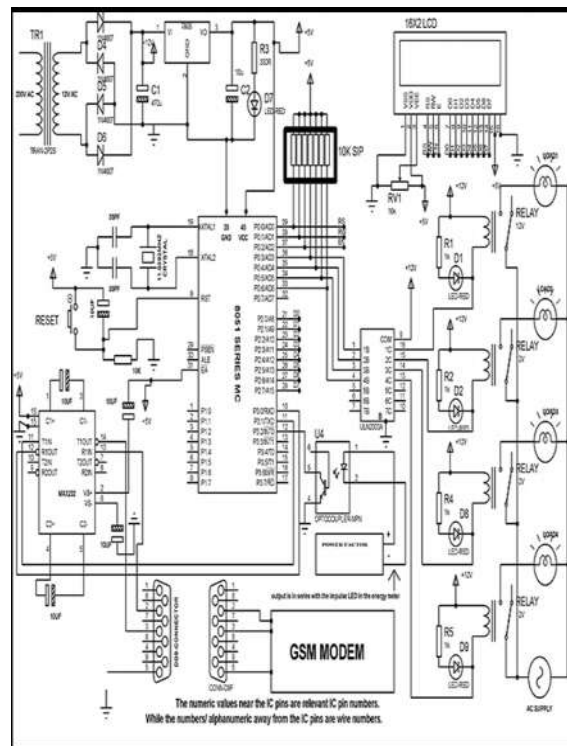

GSM Modem

While these GSM modems are most frequently used to provide mobile internet
 Connectivity, many of them can also be used
for sending and receiving SMS and MMS messages.
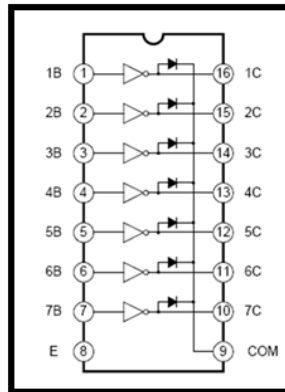
Relay driver uln2003

Circuit Diagram

ADVANTAGES AND FUTURE SCOPE

The system designed reduces the efforts of manual data collection of energy meter. Also, data which is received at service provider side is easy to manipulate for bill generation and other such tasks. With this system we can collect the reading as well as control the supply to the user. With addition of software at service provider side, the customer can be informed of current meter reading, bill for current cycle, status of the line and other parameters to the customer with message. Smart metering system is useful to both utility Provider and consumers. An intelligent circuit which detects theft and generate a switching pulse on detection of theft can be designed and integrated with the system. This smart energy meter system takes the advantage of existing GSM network that have full coverage of all housing and

industrial area all over the country which lead to low implementation cost, and it is simple to install. The provides reliable, effective and efficient automatic meter reading, online billing, and notification through the use of GSM network and android application, thus reduce human effort in meter reading and this method is very economical and time saving.

CONCLUSION

In this paper, it has been proposed a smart meter which takes advantage of the GSM network that has virtually access to every household and area across different countries.GSM based energy meter is easy to installation and beneficial for both energy provider and consumer. AMR not only solve the problem of manual meter reading but also provide additional feature such as power disconnect due to outstanding dues, power reconnect after pay dues, power cut alert, tempering alert. AMR also gives the information of total load used in a house on request at any time. It sends a SMS alert to energy provider company whether a person using more than specify limit of load. The statistical load used and profile can help customer manage their energy consumption. GSM communication not only implements the idea of prepaid consumption of electricity but also facilitates the utilities to control energy theft using our smart energy meter. The proposed meter is thus highly useful for power utilities for reducing electricity pilfering and ensuring revenue collection.

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