



Networked Remote Meter Reading, Demand and Disconnection System Based on Wireless Communication Technology

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ABSTRACT: The paper replaces traditional meter reading methods. It enables remote access of energy meter by the energy provider. A GSM based wireless communication module is integrated with electronic energy meter of each entity to have remote access over the usage of electricity. A PC with a GSM receiver at the other end, which contains the database acts as the billing point. Meter reading from the GSM enabled energy meter is sent to this billing point whenever requested by the energy provider and these details are updated in a central database. Requests are sent from the billing point periodically. The complete usage of energy for the period and due bill is messaged back to the customer after processing this data. Units of energy consumed, bill amount and the last date of the payment of bill are displayed on the LCD within the system at consumer end. Bill amount and last date of payment are concurrently send to consumers' mobile phone. The energy provider can disconnect the power supply in case of failure in bill payment and also it can reconnect power supply after deposition of dues. The system can perceive its own malfunctioning. The check for evaluating the functioning of the system can be initiated by the energy provider whenever required. Once a particular system is found faulty it should be replaced as soon as possible. An alarm will ring at every consumer location during peak load upon overload. All these features makes the project a smart energy metering system which reduces human effort, perceive malfunction and aids wise use of energy.

KEYWORDS: Energy Meter, GSM Module, Utility Module

I. INTRODUCTION

The existing system for collection of energy consumption data the representatives of utility provider (KSEB) periodically visit each consumer location, manually reads the consumption data from the meter. Bill calculations are done manually and produce bill. Consumer then make the payment of the received bill. This is a much hectic process. Man made mistakes can be countless. Human resources are wasted and many other problems do occur. The system in use today has no provision to identify its fault. Unless and until agents of the utility provider pay visit to the consumer location, malfunctioning of the system cannot be identified. The proposed system solves this difficulty with its ability to perceive fault. The alarming depletion of energy resources demands very fruitful use of the energy. Today world is facing an intense energy crisis and the best solution left is to use less. The system aids in wise use of energy.

The proposed energy metering system is composed of a consumer module and an utility module. The consumer module is placed at the consumer location along with the energy meter. On receiving instructions from the utility PC, the instructions are executed by this module at customer side. The functions of this module include taking reading, connection and disconnection of supply, fault detection etc. The utility module is the one placed at the utility provider office (KSEB) consisting of a personal computer and GSM module. Details of meter reading, unit consumptions and status of bill payment of each consumer can be viewed at the office with ease.

II SYSTEM MODULE

CONSUMER SIDE MODULE

Fig. 1 shows the block diagram of consumer side module. This is placed at the consumer location along with the energy meter. On receiving instructions from the utility PC they are executed by this module at customer side. This include taking reading, connection and disconnection of supply, fault detection etc

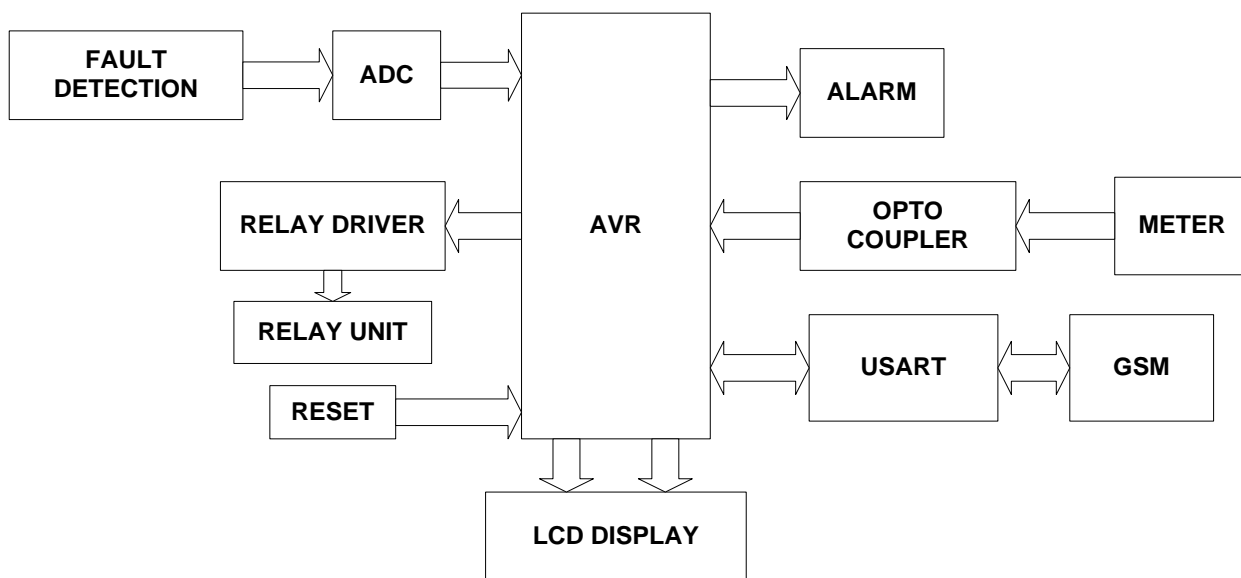


Fig.1 Consumer Side

UTILITY SIDE MODULE

This is the one placed at the utility provider office consisting of a personal computer and GSM module. Details of meter reading, unit consumptions and status of bill payment of each consumer can be viewed at the office with ease.

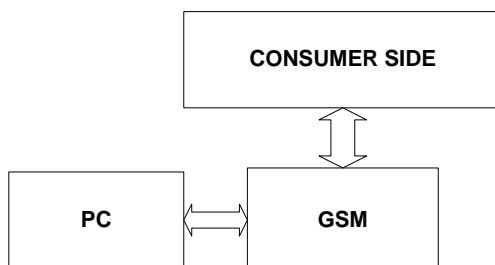


Fig.2 Utility Side Block diagram

III. WORKING

Networked Remote Meter Reading, Demand and Disconnection system Based on Wireless Communication Technology consist of two modules, one is the Consumer Module placed at consumer residence and the other one is the Utility Module located at the electric companies' office. The Consumer Module operations are controlled by Atmega32 microcontroller and the Utility Module operations are controlled by a personal computer.

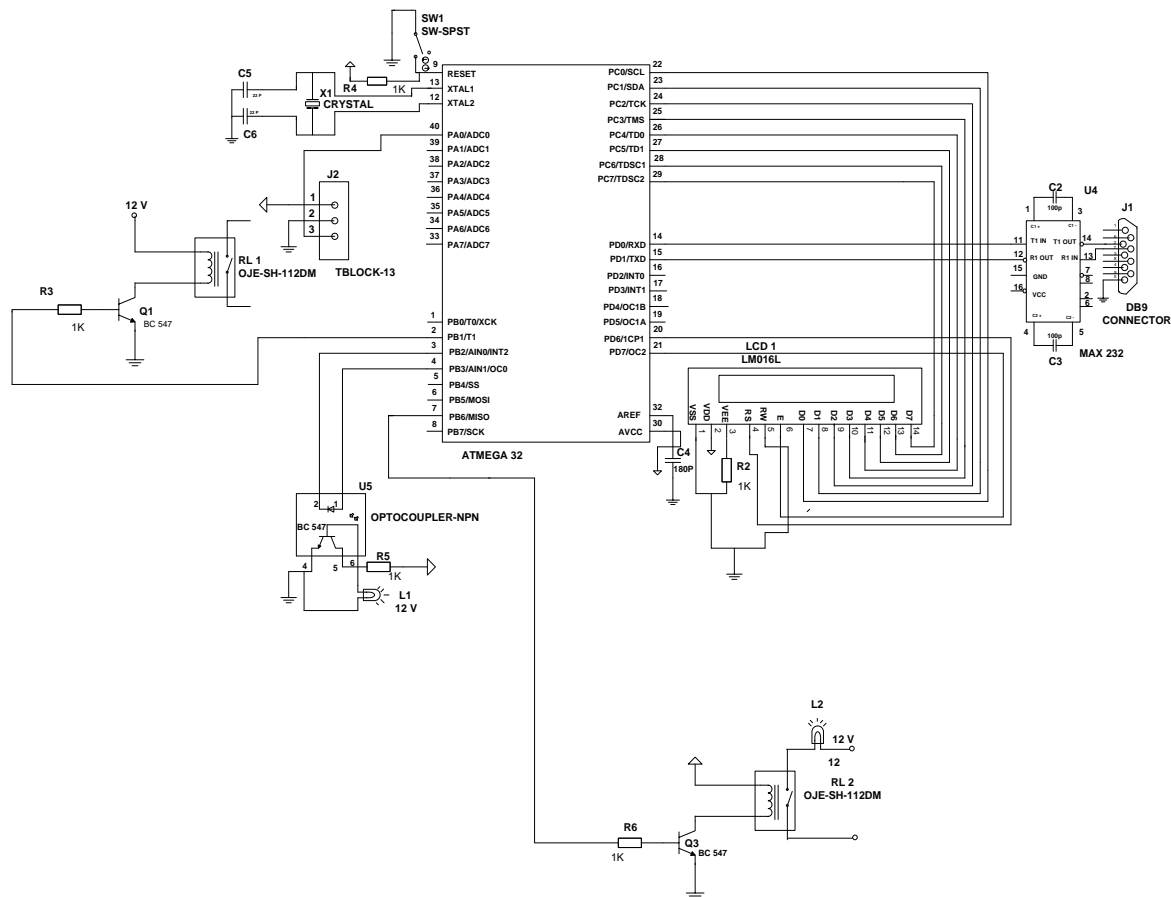


Fig.3 Circuit Diagram

Supply to the system is taken from the 230 V supply. The 230 V supply is rectified using bridge rectifier. The rectifier output is fed to two voltage regulators 7805 and 7812. 5 V dc voltage is obtained at the output of 7805 IC, which is given to the V_{cc} of the microcontroller Atmega32. 12 V dc voltage is obtained from the output of 7812 IC to drive the relay.

The microcontroller takes the energy meter reading with the help of an optocoupler connected to it. Units of energy consumed are calculated by counting the blinking of LED light in energy meter. The optocoupler is a device which transfers electrical signals between two isolated circuits using light. Optocoupler connected to port B of Atmega32. Optocoupler transfers the LED light blinking to Atmega32 port.

Wireless communication between the consumer and server is made possible by GSM technology. The GSM module is connected to Atmega32 using MAX232 connector. The receiver pins of MAX232 is connected to port C of the microcontroller and the transmit pins are connected to the receive pins of DB9 connector. Microcontroller transmits the units of energy consumption to the utility PC. Utility PC transmits many control signals to the microcontroller, upon



which the consumer module operates.

An LCD is interfaced with the microcontroller for displaying various information. LCD pins are connected to ports A and C of the microcontroller.

Alarm unit consist of a buzzer which will ring when the consumption exceeds the maximum permissible limit during peak time. The peak time period and the limit of consumption is fixed and programmed in to the controller. When the controller enters the set period CT continuously measures consumption and compares it with the set value. Buzzer will ring when the measured value exceeds the set value.

Fault detection is made possible by adding an auxiliary circuit which is connected to the circuit whenever required. The auxiliary circuit consists of a single bulb of known rating. Whenever the utility provider wanted to check the system, a signal is send to the controller from the PC. Microcontroller upon receiving this signal will transfer the supply from the consumer circuit to the auxiliary circuit, for time period equal to 1 minute this condition continues. Now the microcontroller collects the energy consumption of the auxiliary circuit and send to the PC. The received value is compared with the pre determined value. If both the values are not matching each other, fault is identified, else no fault.

The utility performs connection and disconnection of the supply to the consumer by sending signal C and D respectively. Relay circuit is connected to port D of the microcontroller. When signal C is received by the microcontroller, it sends a high signal to the base of transistor in the relay circuit. There by relay is energized and connection is established. Reverse process occurs when signal D is received.

JAVA programming language is used in the utility module. The utility page has five bars namely User Manipulation, Meter Reading, Consumer status, Payment, Logout. User Manipulation is where users' details are entered, saved and edited. Meter Reading bar has the button to initiate the request for collecting the meter reading. On receiving this instruction the microcontroller send back the unit. The bill amount is calculated automatically and send this bill amount to the consume module along with data such as unit consumed and last date of payment.

IV.CONCLUSIONS

Networked Remote Meter Reading, Demand and Disconnection System Based on Wireless communication Technology is highly effective in penalizing man work and making the system fully automatic. Hence the probability of error is negligible. Using wireless communication is very big boon which enables instant billing. This system can be utilized throughout the world as communication is done by GSM which is a universal standard. The consumer can receive bill anywhere around the world. This system monitors the flow therefore consumer only pay for what his usage. The system can perform checks to ensure its own proper functioning. The peak over load alarm unit incorporated with the system aids in the wise use of energy. Thus the system is highly effective system.

Data transmission is charged at standard SMS rates, thus the charges are not based on the duration of data transmission. The cost efficient transmission of readings ensures that power consumption values can be transmitted more frequently to a remote station. Thus this system can create a revolutionary moment in Indian energy distribution sector.

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