Microcontroller Based Energy Management Using PLCC

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ABSTRACT

Microcontroller based energy management system using PLCC communication is the new concept designed for automation and control network. This concept is aiming to be a low cost, low power solution for systems consisting of devices in house, factories. The project provides the facility for the state electricity board to effectively manage the power distribution in the city. As per the request of consumer electricity board will set the supply power value in watt. Each house will be having a control unit installed which will manage all the house hold appliances by using software programming and control. . It will receive the control signal from the state electricity board via PLCC module. And accordingly it will take the necessary actions as it will on the load or off the load. This is very helpful for power distribution and reduction in power consumption which unnecessarily increases the load on state electricity board.

Keyword : - *Embedded System, PLCC Modem, Current sensor, Loads, LCD .*

1. INTRODUCTION

Load shedding occurs when there isn't sufficient power accessible to satisfy the expanding need of customers, and a service organization stops the vitality supply to specific regions. The blackouts are taken place rapidly so that no area had to spend more than one hour without power. The major disadvantage of load shedding is that the consumers are totally restricted from using electric power. Even in case of an emergency they won't be able to use electric power. This project mainly aims to address this problem by dividing the loads of the consumer. In this project when it is required to do load shedding, power line communication is used for switching loads of consumers. Electric power generation may not always meet peak demand requirement. In these situations, overall demand must be lowered, either by turning off service to some devices or cutting back the supply voltage (brownouts), in order to prevent uncontrolled service disruptions such as power outages or equipment damage. Distribution control centers may impose load shedding on service areas via rolling blackouts or by agreements with specific high use industrial consumers to turn off equipments at the times of system-wide peak demand. The major disadvantage of load shedding is that the consumers are totally restricted from using electric power. Even in case of an emergency they won't be able to use electric power. This project mainly aims to address this problem by dividing the loads of the consumer into different priority group and when it is required to do load shedding then the loads of consumer will only get disconnected from the power supply. Thus providing consumers with the benifit of using electric power for their most needed load even when load shedding is done. In this project when it is required to do load shedding, power line communication is used for switching loads of consumers. Power line communication has proven to be a reliable communication technology This same

proven technology will allow the distribution control centers to monitor and manage their customers electricity usage as never

2. MOTIVATION

The world is facing the most critical problem of not getting the regular power. In many countries, peoples are not getting at least the primary needs of lights, fans, TV etc. In nearly every country, researchers expect existing energy production capabilities will fail to meet future demand without new sources of energy, including new power plant construction. However, these supply side solutions ignore another attractive alternative which is to slow down or decrease energy consumption through the use of technology to dramatically increase energy efficiency. To manage the available power more often the power is cut for particular area, and that area goes in dark i.e. not even a single bulb can work.

Instead, we can use available power in such a way that only low power devices like tubes, fans, desktops & TV which are primary needs should be allowed and high power devices like heater, pump-set, A.C. etc, should not be allowed for that particular period. The communication will consist of data transfer, controlling node operation. We are using PLCC protocol for the communication.

3. OBJECTIVE

The objective of this project is to design and develop a low cost power line communication module to control the loads of consumer, by using the existing power lines.

3.1 PROPOSED SYSTEM:

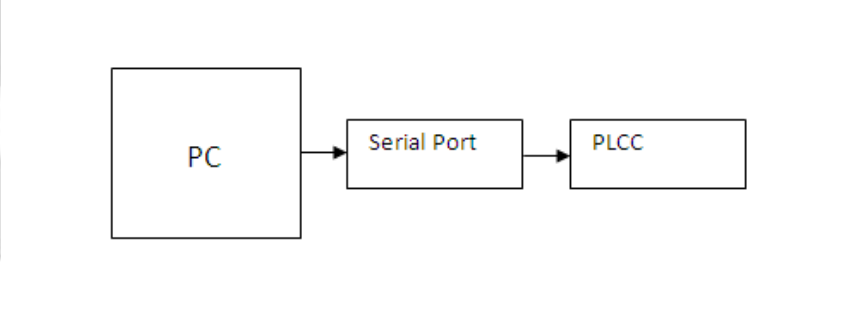
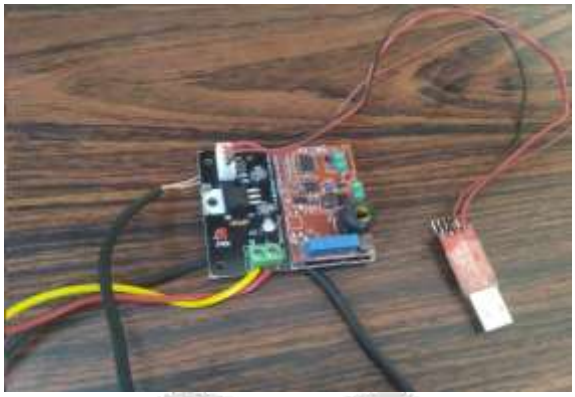


Fig1. Transmitter Node Block Diagram

PLCC is the best way for heavy line communication system where high voltage and current exist. In our framework we are using PLCC modem on both ends i.e. transmitter as well as receiver. In transmitter side we are using it to set maximum values of current consumption using our PC as shown in fig1. For achieving good communication link among them, it is very necessary to find suitable protocol. PLCC has major role in monitoring and direct load controlling for efficient power utilization. It covers enough area needed for communication and it works on low data rate of 4.8Kbps to 250Kbps with minimum power consumption.



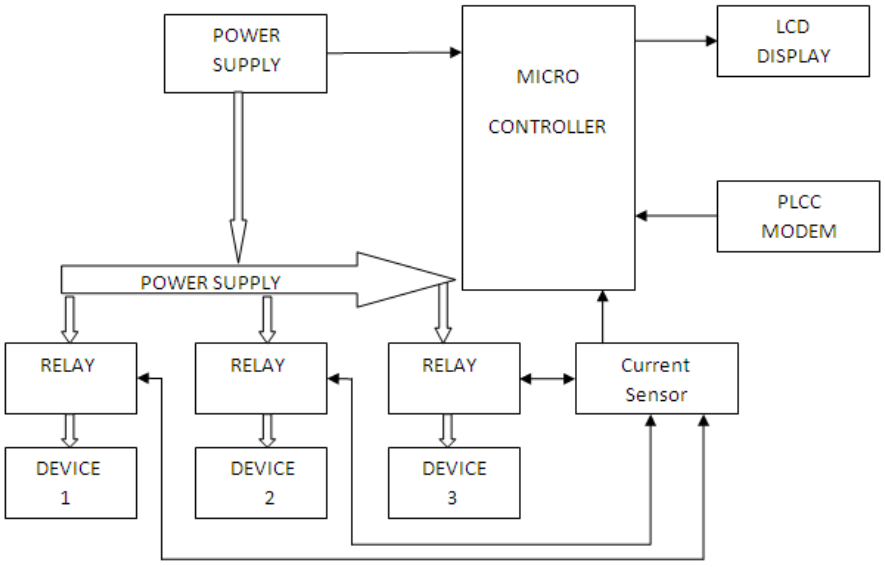


Fig3. Receiver Node Block Diagram

The proposed system consists of microcontroller which can be installed in the consumer premises and another microcontroller and PLC transmitter module installed in distribution control center. There will be PLC receiver module and three contactors for controlling the different priority devices in the consumer premises. This system consists of a microcontroller (AVR) which is the brain of our system. Microcontroller takes all decisions depending on the input which it gets. Initially controller will get input from PLCC modem and it will get set to value from transmitter. Further when we apply loads current sensor will come in action and depending on current consumption it will send values to controller. Depending on values of current sensor controller will take decisions by comparing on values set by PLCC and current sensor. If the load value is more than set value then it will turn of the applied load. Further depending on our priorities we can decide which device is to keep ON and which is to keep OFF. LCD is used to show values of current, power and wattage. By implementing/ installing this system we can save wastage of power and load scheduling problem can be solved.

Fig4. Default set values

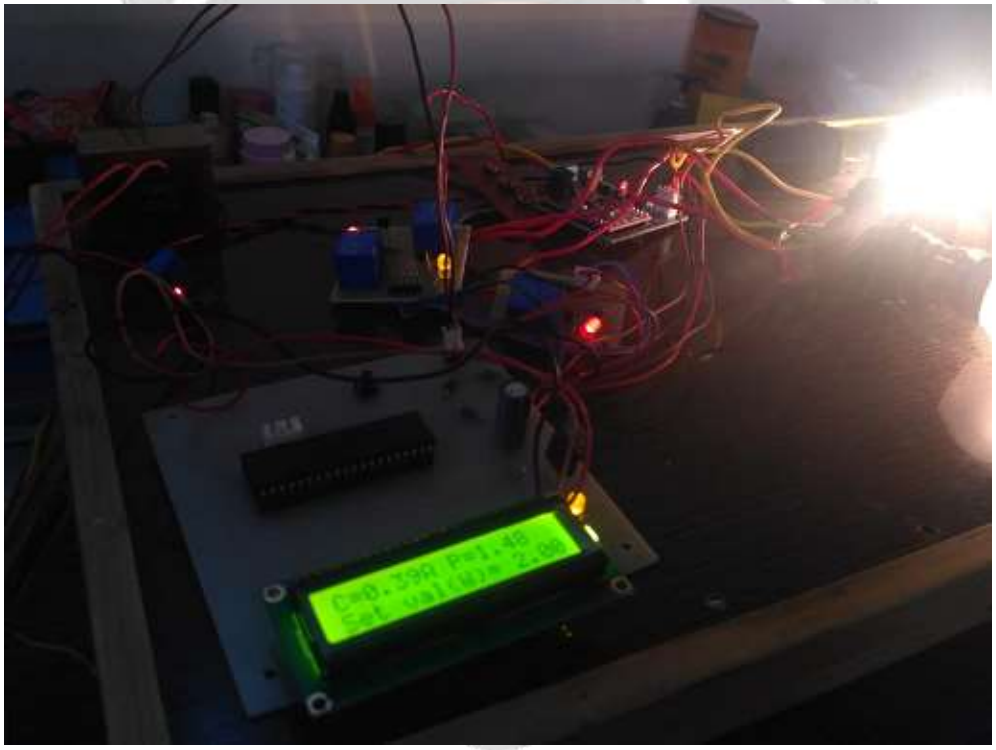


Fig5. Complete Working module

Model of the implemented circuit is shown below. It consists of the control circuit at the consumer side. Each bulb represents different consumer circuit.

4. CONCLUSIONS

the value of first load wattage is less than the threshold .then we press the 2 switch and thus connect the second load(bulb 2)as the value of this load is also less than the threshold we have set when we on the third switch the wattage limit exceeds and the system does not allow the third load(bulb 3)to turn on. . Each house will Thus we have concluded that as we turn on first switch the

first relay is on thus connect the first load (bulb 1) as be having a control unit installed which will manage all the house hold appliances by using software programming and control

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