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Design and Implementation of Power Controlling Management of Single Phase Power Supply Along With Automatic Electric Bill Generation Using Wireless Communication

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Abstract: ***The design is established for controlling single phase power which is supplied to house, because of disadvantages of traditional energy meter reading such as errors in reading, inaccuracy, external conditions affecting readings, delayed work. I have implemented automatic meter reading system based on Zigbee technology. It shows how to remotely control and monitor power, automatically cut-off power using micro-controller based switches, wireless hardware module, relays, digital meter and GUI using mat lab. It shows the complete information and power status of consumer which is stored in database; the data in a database is collected from remote module. To implement this, the wireless technologies used are Zigbee module. Static state relay for controlling power on/off outlets and sensors used to sense electric current being used by electric outlets. To measure the power, a measuring circuit senses the current and sends back a signal to the server module (PC) through Zigbee, where the measured data is stored in embedded board. Finally the measured data is displayed on GUI.***

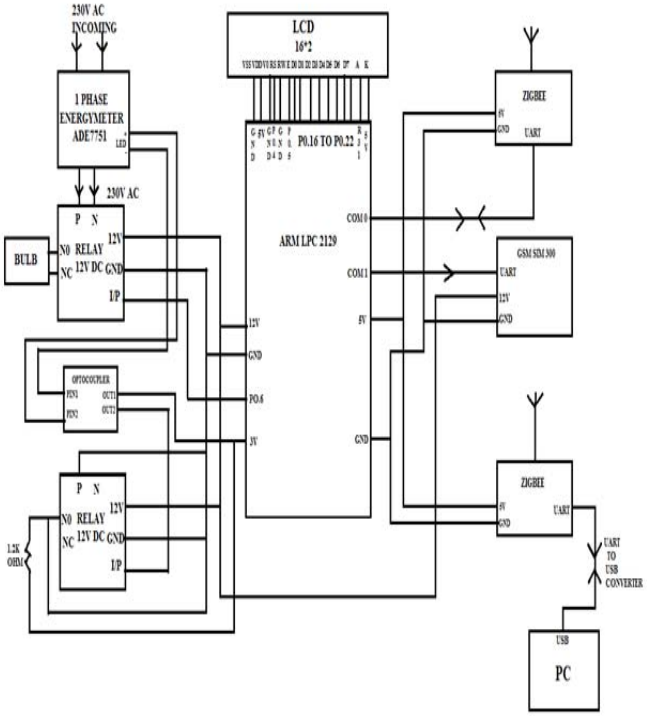
Keywords: Zigbee, GUI, pc, energymeter, database, remote module

1. Introduction

In many countries, communication based controlling and monitoring architecture is used to save power and have detectors and recorders to record power. Communication through wired interfacing and interconnection is very entangled and critical to install. To overcome the problems stated above, the wired communication channel can be replaced with wireless communication. No doubt, the probability of data packet loss is more in wireless communication due to interference but this can be avoided by using smaller size data packets. The proposed system makes use of wireless communication on which smaller size data packets are exchanged thereby overcoming the interference problem and also the proposed system is very easy to install as it uses wireless communication system.

2. System Architecture

The block diagram of the hardware implementation is show in the below figure.



3. Problem Statement

In the current situations, the power supply management is done manually which needs a linemen to make all the power supply related things possible and also the bill is prepared manually by the help of billing machine which is handled by particular man. If consumer has not paid the bill even after the time deadline, the linemen has to come and disconnect the power supply of that particular consumer manually.

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So to overcome the above stated problems, the proposed system will replace the manual control of power management with automatic remote control.

A. Existing System

Energy meter reading is taken manually and electric supply is disconnected manually by linemen if electric bill is not paid. In many countries, communication based controlling and monitoring architecture is used to save power and have detectors and recorders to record power. Communication through wired interfacing and interconnection is very entangled and critical to install. To design this system wireless interface is used because it is easy to install and advanced than the previous one [1].

At present, circuit breakers are used to disconnect the power supply from transmission line manually. This all done manually by linemen by using equipments to disconnect it. Normally Power is disconnected at transmission end or from the substation end [3].

B. Proposed System

The main objective of this work is to disconnect the power automatically to reduce the manual work, save power and life of linemen, the system is designed for remote power controlling and monitoring. Many lineman dies due to contact with the energized line so this system will provide an option of software to save the manual work and risk of dangerous situation for a lineman. There are many common incidents in electrical injury and on the spot current hurt injuries in which the use of various portable and faulty tools, open wire and unsafe electrical outlets are the reasons for the accidents. So, this is the concept of project; of automating this process using wireless communication and devices [4].

C. Objective

The main objective of this project is to overcome the manual power cutoff and manual bill generation of power consumed. This project mainly helps to overcome from all these problems and to reduce jitter in power supply management.

4. Methodology

In this paper, the data collection is done by using wireless technology that is Zigbee. The data is processed based on assembly coding language used for hardware and as well as mat lab based GUI to interface with hardware modules. The communication is done by using particular soft buttons assigned in mat lab coding, which has been put into an operating window by using GUI concepts. This whole system is mainly based on wireless data communication between hardware module and software part.

A. GSM SIM 300

This is a plug and play GSM Modem with a simple to interface serial interface. Use it to send SMS, make and receive calls, and do other GSM operations by controlling it through simple AT commands from micro controllers and computers. It uses the highly popular SIM300 module for all its operations. It comes with a standard RS232 12 interface which can be used to easily interface the modem to micro controllers and computers.

B. ZIGBEE C2500

CC2500 RF Module is a trans receiver module which provides easy to use RF communication at 2.4G Hz. It can be used to transmit and receive data at 9600 baud rates from any standard CMOS/TTL source. This module is a direct line in replacement for your serial communication it requires no extra hardware and no extra coding toIt works in Half Duplex mode i.e. it provides communication in both directions, but only one direction at same time.

C. ARM LPC2129

The LPC2129 are based on a 32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, together with 256 kB of embedded high-speed flash memory. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. With their compact 64-pin package, low power consumption, various 32-bit timers, 4-channel 10-bit ADC, two advanced CAN channels, PWM channels and 46 fast GPIO lines with up to nine external interrupt pins these microcontrollers are particularly suitable for automotive and industrial control applications, as well as medical systems and fault-tolerant maintenance buses.

D. Relay

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. The output section consists of contactors which connect or disconnect mechanically.

E. Energymeter(ADE7751)

The ADE7751 is a high-accuracy, fault-tolerant electrical energy measurement IC that is intended for use with 2-wire distribution systems. The ADE7751 incorporates a novel fault detection scheme that warns of fault conditions and allows the ADE7751 to continue accurate billing during a fault event. The ADE7751 does this by continuously monitoring both the phase and neutral (return) currents. A fault is indicated when these currents differ by more than 12.5%. Billing is continued using the larger of the two currents. The ADE7751 supplies average real power information on the low-frequency outputs F1 and F2. . These logic outputs may be used to directly drive an electromechanical counter or interface to an MCU. The ADE7751 will remain in a reset condition until the supply voltage on AVDD reaches 4 V. If the supply falls below 4 V, the ADE7751 will also be reset and no pulses will be issued on F1, F2, and CF.

F. LCD (16*2):

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores

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the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

5. Functional Description

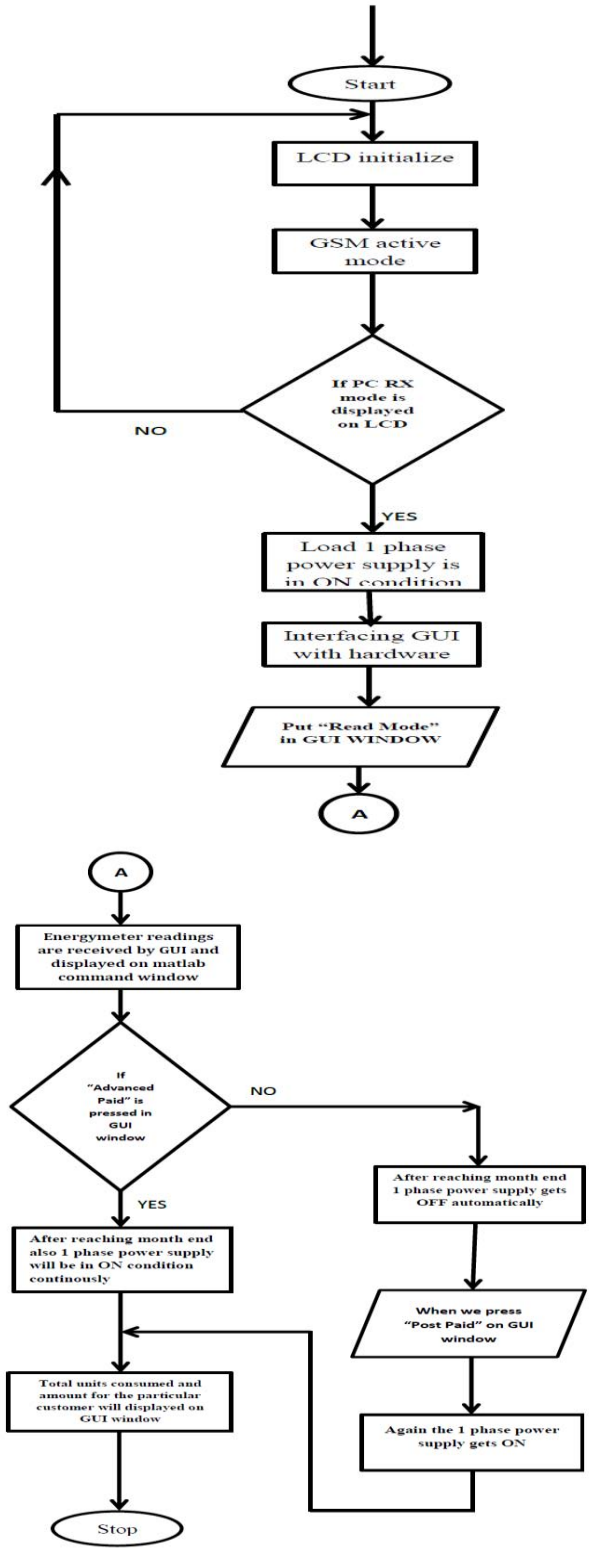

Figure 1: The flow diagram of the system

6. Experimental Result

Figure 2: Matlab GUI Window

Experiments have been carried out for controlling single phase power supply coming to the home. This experiment mainly concentrated on automatic bill generation of power consumed by particular consumer and automatic power cutoff when bill is not paid by the consumer within the time deadline. This whole experiment results in automatic power controlling and management and automatic bill generation for particular consumer.

Finally, we get the units and amount to be paid which is consumed by particular consumer for the present month as shown in the below fig.2.

7. Conclusion and Scope for Future Works

From this we can conclude, that the system proposes automatic disconnection of power and can have automatic bill generation of particular consumer. Power controlling can be done easily without the large number of manpower especially for power cut-off and electric bill generation.

Scope for future work is we can have a good design within it, so that it can sustain large numbers of power supply which is to be given to the consumer. We can use a good processor which can have good capability to perform the process properly. So that it cannot have any delay in transmitting the commands from any end. It will have a good scope in future to automatize the power supply without any delay problems in the whole system of operation.

The readings which we are getting into the GUI, that recent readings can be stored for considering previous readings. This previous readings are my first reading for continuous running condition of energy meter without taking readings from starting point of energy meter. This reading values can be stored and consider as my first reading for that present month for the particular consumer. This work can be done in future by having separate server, database, real time systems and pc for getting perfect readings for an continuous running systems.

By this, we can alter this proposed system design by making proper implementation of high speed devices for the better performance of whole system.

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