



## DIGITAL ENERGY MANAGEMENT FOR HOUSES AND SMALL INDUSTRIES BASED ON PLC SYSTEM

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### ABSTRACT

The aim of the paper is to implement the power line communication (PLC) system in an overhead Low Voltage (LV) power network and control the home appliances and energy management by using Power Line Communication (PLC). Power line communication (PLC) carries data on a conductor that is also used simultaneously for AC electric power transmission or electric power distribution to consumers. A wide range of power line communication technologies are needed for different applications, ranging from home automation to Internet access. A simple home automation system using Power Line Communication (PLC) is convenient for people with disabilities and elderly to control lamps and other home appliances. The computer operates as a host station, connecting to the PLC modem serially using Recommended Standard 232 (RS232) and a transceiver MAX232. User will automate the home appliance based on the Graphical User Interface

(GUI) by Sending Command from the Master PC. The GUI is designed using the Visual Basic 6.0. The PLC modem (TDA5051A) operates by modulation using electricity since electricity to the socket is controlled and not the appliance directly. In this project Hardware are AT89C51 microcontroller, Plc modem, PC, Relay and relay driver and Software are Embedded C and Kiel microVision. This project advantages are we can receive data at any power terminals without loss and the power line communication was very advanced way of communication. Application this project, industrial applications and home appliances. This power line communication also used to save energy consumption in home. Industrial area, electricity infrastructure for data transmission and Ethernet communications.

**KEY WORDS:** *Embedded Processor AT89S52, amplitude shift keying, power line communication modem, RS232, MAX232 transceiver*



## INTRODUCTION:

One of the main communication system for saving energy in home appliances. *Power Line Communications* “basically means any technology that enables data transfer at narrow or broad band speeds through power lines by using advanced modulation technology.

Building automation is now a day very widespread in all the industrialized countries, meaning with the term the application of automation and information

technologies for the management of buildings like schools, hospitals, public edifices, private houses

## EXISTINGWORK

Implementation of Smart Home Control by Using Low Cost Arduino&Android design :This paper provides a low cost-effective and flexible home control and monitoring system with the aid of an integrated micro-web server with IP connectivity for access to and control of equipment and devices remotely using Android-based Smartphone app. The proposed system does not require a dedicated server PC with respect to similar systems and offers a new communication protocol for monitoring and controlling the home environment with more than just switching functionality. Smart home interfaces and device definitions to ensure interoperability between ZigBee devices from various manufacturers of electrical equipment, meters and Smart Energy enables products to allow manufactured. We introduced the proposed home energy control systems design intelligent services for users and provides, we show their implement .when communicating over AC power wiring. Various

and so on. A younger sister of building automation is demotic’s, which is actually the application of the same techniques and tools in a domestic scenario, instead of a very big building. The project with aim of designing .. To propose a low-cost tool for monitoring energy consumption in household equipment in a home or small business based on the Power Line Communication. Communicating high frequency control signals over a power lines is well known and getting popular day by day. It is used to demonstrate the speed and direction of the DC motor and also used for disable persons. While rainy seasons, the communications does not affect.

technologies which have been used to address these challenges such as spread spectrum and digital signal processing, are then examined in lightoftheknowchannelcondition of transmission of electrical signals over a grid. PLC technologies are used in advanced meter reading, home automation and Public street lighting. Several PLC technologies classified based on the operational frequency range, are explored in this paper. PRIME is a new NBPLC system, which uses OFDM in its physical layer, for power line communication in the last mile. This work also focused on PRIME’s physical specifications, which was modeled in MATLAB/SIMULINK. In this paper, the performance of PRIME when its data is modulated using DQPSK and 4-QAM in four (4) channel models.

## PROPOSED WORK:

Proposed system Presents communicative electrical outlet which can be controlled, and uses the existing power line in household as the Home Area Network, which makes power line not only supply the electricity but also be the communication

medium. To control Home Automation through Power line communication this saves Energy

consumption in home Power Line communication also used for Industrial application. To



Demonstrate DC motor Speed and direction control through Power Line Communication. Power Line Communication was a very advanced way of communication. Transmission Distance was longer

when compared to wireless modules. We can receive data at any power terminal without loss.

### BLOCK DIAGRAM:

The computer operates as a host station, connecting to the PLC modem serially using Recommended Standard 232 (RS232) and a transceiver MAX232.

The GUI is designed using the Visual Basic 6.0. The PLC modem (TDA5051A) operates by modulating in a carrier wave of between 20-200 kHz into the household wiring at the transmitter. The Power line communication modem has TDA5051 ASK modulation/Demodulation IC to convert the serial digital data to ASK modulated signal. The signal is added on the zero crossing of the AC signal. The IC will also demodulate the data on the power AC signal. This modem is plugged into regular power outlet. The carrier is modulated by digital signals (Amplitude Shift Keying). The receiver demodulates the carrier wave and sends the signal to the micro controller which is the MCS51. [4] presented a short overview on widely used microwave and RF applications and the denomination of frequency bands. The chapter starts with an illustrative case on wave propagation which will introduce fundamental aspects of high frequency technology.

The receiver has an address and can be commanded by the signals transmitted over the household wiring and decoded at the receiver. The Microcontroller output is connected to the PLC modem and passed it along with the home power wiring and the receiver PLC modem receive it and send the data's as TTL logic to the microcontroller where there is set of relays to ON/OFF the required device and control the speed of the motor.

### TRANSMITTER



### RECEIVER:



### BLOCK DIAGRAM EXPLAINATION

### POWER LINE COMMUNICATION MODEM:

Power line modem is useful to send and receive serial data over existing AC mains power lines of



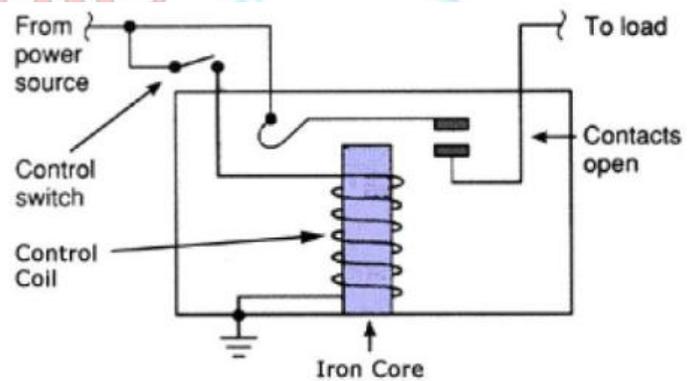
the building. It has high immunity to electrical noise persistence in the power line and built in error checking so it never gives out corrupt data. The modem is in form of a ready to use circuit module, which is capable of providing 9600 baud rate low rate bi-directional data communication. Due to its small size it can be integrated into and become part of the user's power line data communication system.

### Interfacing with microcontroller

You can interface the module with directly microcontroller pins since the level of module is at 5V level. You can use any microcontroller like 8051, AVR, PIC or such. Just configure your microcontroller to communicate at 9600 baud rate. The TXD pin of MCU will go to RX-IN pin of PLC modem The RXD pin of MCU will go to TX-OUT pin of PLC modem Ground & +5V Power Supply between PLC modem and MCU should be connected. This document below has remote control application notes below with source code.

consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination. After the invention of computers they were also used to perform Boolean and other logical operations. The high end applications of relays require high power to be driven by electric motors and so on. Such relays are called contactors.



The diagram shows an inner section diagram of a relay. An iron core is surrounded by a control coil. As shown, the power source is given to the electromagnet through a control switch and through contacts to the load. When current starts flowing through the control coil, the electromagnet starts energizing and thus intensifies the magnetic field. Thus the upper contact arm starts to be

### RELAY

We know that most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays



attracted to the lower fixed arm and thus closes the contacts causing a short circuit for the power to the load. On the other hand, if the relay was already de-energized when the contacts were closed, then the contact move oppositely and make an open circuit. As soon as the coil current is off, the movable armature will be returned by a force back to its initial position. This force will be almost equal to half the strength of the magnetic force. This force is mainly provided by two factors. They are the spring and also gravity. Relays are mainly made for two basic operations. One is low voltage application and the other is high voltage. For low voltage applications, more preference will be given to reduce the noise of the whole circuit. For high voltage applications, they are mainly designed to reduce a phenomenon called arcing.

## RESULT

### *Testing and Debugging*

After you've written a program, or a section of one, it's time to test it and as Necessary, find and correct mistakes to get it working properly. The process offerreting out and correcting mistakes is called debugging. Easy debugging and troubleshooting can make a big difference in how long it takes to get a system up and running. As with programming, you have several options here as well.

### **Testing in EPROM.**

One way is to burn your program into EPROM, install the EPROM in your system, run the program, and observe the results. If problems occur (as they usually will) you modify the program, erase and reburn the EPROM, and try again, repeating as many times as necessary until the system is operating properly.

### **Development systems.**

Another option is to use a development system. A typical development system consists of a monitor program, which is a program stored in EPROM or other memory in the microcontroller system, and a serial link to a personal computer. Using the abilities of the monitor program, you can load your program from a personal computer into RAM (instead of the more permanent EPROM) on the microcontroller system, then run the program, modify it, and retry as often as necessary until the program is working properly. Most development systems also allow single-stepping, setting breakpoints, and viewing and changing the data in memory. In single-stepping, you run the program one step at time, pausing after each step, so you can more easily monitor what the circuits and program are doing at each step. A breakpoint is a program location where the program stops executing and waits for a command to continue. You can set breakpoints at critical spots in your program. At any breakpoint, you can view or change the contents of memory or perform other tests.

### **The 8052-BASIC's development system**

The 8052-BASIC system and a personal computer form a complete development system for writing, testing, and storing programs. The personal computer's keyboard and screen make it easy to write and run programs and view the results. BASIC-52 has many built-in debugging features that make it easy to test programs. You can run a program immediately after writing it, without having to assemble, compile, or program an EPROM. You can use a STOP statement and CONT (continue) command to set breakpoints and resume executing your program. You can use PRINT statements to display variables as the program runs. And, if you wish, you can use your personal computer for writing programs off-line



and uploading and downloading them to the 8052-BASIC system.

### **Inside the 8052-BASIC**

This chapter introduces you to the 8052-BASIC chip, including the kinds of projects you can do with it, what equipment, materials, and skills you need in order to design and build an 8052-BASIC project, and a pin-by-pin look at the chip and its abilities.

### **Possibilities**

The 8052-BASIC microcontroller is an easy-to-use, low-cost, and versatile computer-on-a-chip. It's ideal for projects that require more than an assortment of logic gates, but less than a complete desktop computer system with a full keyboard, display, and disk drives. If you're interested in doing more with computers than simply running applications programs, the 8052-BASIC gives you a chance to design and build a system from the ground up. With a few support chips and a program stored in memory, you can use the 8052-BASIC to sense, measure, and control processes, events, or conditions.

The 8052-BASIC is actually two products in one: it's an 8052 microcontroller, with the BASIC-52 programming language on-chip. To begin using the 8052-BASIC, you need a minimum circuit consisting of the 8052-BASIC and some support components, plus a personal computer. This book contains specific instructions for use with "IBM-compatible," or MS-DOS, computers, but you can use any computer that has an RS-232 serial port and communications software to go with it.

### **FUTURE WORK**

The future work of this system is to implement the system for automotive domain.

### **CONCLUSION**

We have presented an optimized design before wake-up system used to reduce the power lost during the idleness in receiving mode of power line communication. The system has been conceived for home automations and the presented results permit to achieve better performance during the wake-up phase. The new design saves energy and reduces power consumption at home appliances and at the same time it protects the modem from possible overvoltage of the harvesting section. We have provided a simulation framework to find the most efficient routing structure to control the wake-up mechanism of the lamps by reducing the overall transmitted power.

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