

Novel Approach Towards Automation Using Powerline Communication

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Abstract: The Power line communications make use of the existing power line infrastructure for communication purpose. Power communication preferred over other communication technologies like Satellite, Wireless and Optical fibre communications due to wide availabilities of power lines as Power lines are one of the most widely available communication medium for Power Line Controller technology. In this paper the details description of communication strategy that eventually could be used for information transfer over the power-line communication channel. The advance power line communication system is to establish communication in remote area with High data rate. Power Line Communication or Power Line Carrier is basically a technology that enables narrow or broad band speeds through power lines by varies advanced modulation technology. It is based on the principal of controlling each unit or specifically each electrical device connected to an AC power line in the houses, offices, industries, etc.

Keywords: PIC, LCD, PLC (power line controller).

I. INTRODUCTION

PLC(Power Line Controller) is used for transmitting (50/60 Hz 220/110 V) power signal. It is not designed to convey high frequency signal such as 20 MHz communication signals used in the home plug 1 protocol. A power line channel is somewhat wireless channel, both suffer from noise, fading, multipath, and interference. Power line noise is produced by operation of electrical device. Fading, multipath and interference are caused by the imperfection of power line channels. Also limits the available bandwidth for communication purposes. In compliance the usable bandwidth in the home plug standard is 25MHz. There an extensive going study of power line channel characteristic.

II. PROPOSED SYSTEM

Where power line communication module modulates the signal 120khz carrier and transmit it on AC transmission line. In receiver section we are going to control the appliances such as fan control, PC control, etc. Here we interface PLC module with PIC microcontroller using serial communication protocol where it is used to receive the transmitted signal decode that signal and send it to the controller then controller will act according to the commands, in receiver side we are going to use triac as a phase controller to vary the speed of fan which will change the speed of fan according to the duty cycles set by the controller. Then the second application is PC control in which we are going to use ENC28J60 module to interface LAN to controller by using this module we are going to send commands to PC through controller.

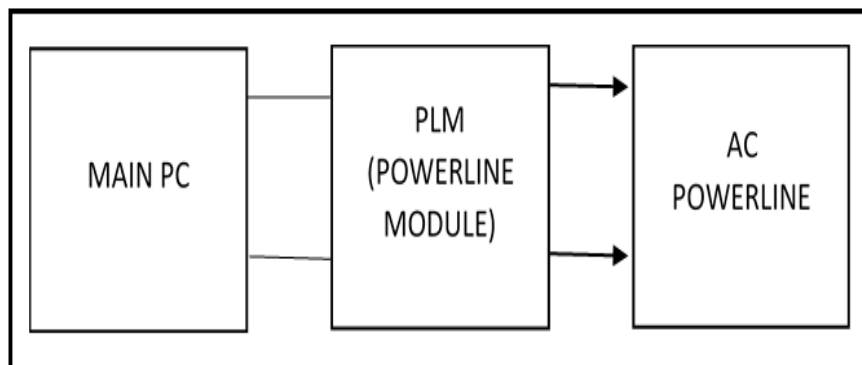


Figure 1: Transmitter Section

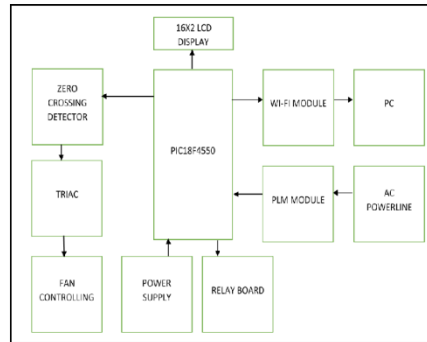


Fig. 2 Receiver Section

1. Microcontroller

One of the main advantages is that it can be write-erase as many times as possible because it use FLASH memory technology. It has a total number of 40 pins and there are 33 pins for input and output. PIC18F4550 is used. Communication Protocol: PIC18F4550 is remarked as advanced, as it uses well sophisticated protocols for communications. The modern protocols like USB, SPI, EUSART, are well supported in PIC18F4550. These technologies integrate with Nano Watt Technology (as mentioned before) to produce PIC18F4550, a well equipped, low power consuming microcontroller.

2. PLC(power line communication module)

The data given to PLC module will be encoded into a carrier frequency of 120 KHz and modulated with 50Hz AC signal. (Frequency Modulation) .The modulated signal can travel up to 1.5km through a live AC 230V power line. The modulated AC signal is given to this module at AC terminals. Capacitors allows only carrier frequency and blocks 50Hz signals, as $X_C = 1/2\pi fC$ (Capacitor allows high frequency signal and blocks low frequency signal) Two level capacitor based demodulation is done. Inductors / coils are used to block the high frequency signal, and bypasses the low frequency signals and derives 5V, 2A DC power source required for the module($X_L = 2\pi fL$).



Fig 3: PLC(Powerline Module)

3. ZERO crossing detector

Zero crossing detector circuit is design to detect zero crossing of sine wave. It is used for AC Power control circuits. If you are an electronics engineer and you are working on power_electronics projects, you may come across many situations where you have to read frequency_of_sine_wave or you want to detect zero crossing of sine wave. Whenever sine wave cross from positive cycle to negative cycle or negative cycle to positive cycle. You can also detect zero crossing of sine wave with the help of simple operational amplifier.

4. TRIAC switch

The AC power flow to load can be controlled by controlling_rms value of voltage appearing across load as shown in above figure. This method is also called AC voltage controller method. In AC voltage controller, rms value of voltage appearing across load is controlled by varying the firing angle of triac gate signal as shown in figure above. As you know power in AC circuits power (Active power) is calculated by using following formula:

$P = V \times I \times \cos(\theta)$ Where $\cos(\theta)$ is power factor

$\cos(\theta) = 1;$

$P = V \times I = V \times V / R = V^2/R$

$P = V^2 / R$

5. ESP8266 WI-FI MODULE

The ENC28J60 is a stand-alone Ethernet controller with an industry standard Serial Peripheral Interface (SPI). It is designed to serve as an Ethernet network interface for any controller equipped with SPI. The ENC28J60 meets all of the IEEE 802.3 specifications. It incorporates a number of packet filtering schemes to limit incoming packets. It also provides an internal DMA module for fast data throughput and hardware assisted IP checksum calculations. Communication with the host controller is implemented via two interrupt pins and the SPI, with data rates of up to 10 Mb/s. Two dedicated pins are used for LED link and network activity indication. It works with any PIC with integrated SPI and more than 4 Kb ROM memories. 38 to 40 MHz clock is recommended to get from 8 to 10 Mhz SPI clock, otherwise PIC should be clocked by ENC28J60 clock output due to its silicon bug in SPI hardware. If you try lower PIC clock speed, there might be board hang or miss some requests.

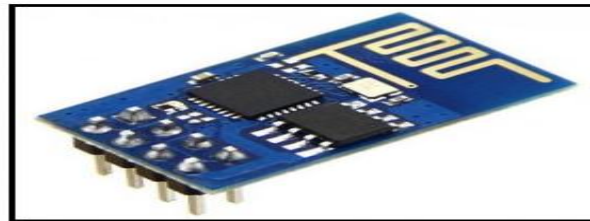


Fig 4: ENC28j60 Wi-Fi Module

6. LCD

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.

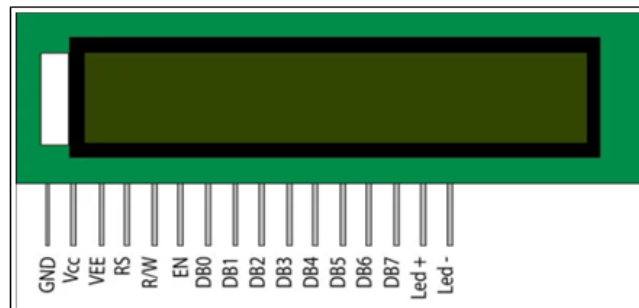


FIG 4: LCD

III. ADVANTAGES

- No. of electrical consumers are higher than telephone, cable or other wired communication customers. This will give a high potential market for the investors.
- The modern electric grids are well maintained & far superior to any of the wired communication networks.

IV. CONCLUSION

The Propose will results is the great area for the automation for life a human being with which small amount of investments will result in comfort.

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