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# POWER LINE CARRIER COMMUNICATION

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**Abstract:** The PLC refers to transferring the information using power-lines as the communication media or channel. The PLC has turned out to be a flexible approach to implement low cost & reliable network in home & industrial environment. Alternating current(AC) power line in a building work as communication channel by means information transfer over a same line.

**Keywords: Transmitter & receiver section using PIC16F877X , FSK Modem, Power supply with relay card, Energy meter, RTC.**

## Introduction:

Automation industry is raising edge these days. The dependency of people and industries on devices to control and organize their resources is on rise. Traditional approaches use wireless technologies like Bluetooth, infrared remote. LAN and Wi-Fi based automation.

These techniques are expensive and need extra resources such as new wires or spectrum in wireless type. Most of them suffer from one or more problems like high capital, limited working environments.

To overcome these 230v A.C. Mains is used to task. In these systems we are using the same power lines already laid to supply electricity to device. Due to this we overcome may problems like extra wiring or spectrum space. We will design a modem so that it can transfer commands to other devices through the power line.

This is a type of data transfer through power line communication by using RTC (real Time Clock).it is not necessary for the EB people to monitor or to check the data for each and every independent house regularly. Instead of that, by using a real time clock we can transmit the electricity bill data to the MC through PLCC (POWER LINE CARRIER COMMUNICATION) communication. This type of system reduces the burden of the electricity people. Moreover it's less time consuming. This type of communication system involves certain components like RTC, Energy Meter, Microcontroller, LCD display, FSK transmitter and FSK receiver.. When this data and time is arrived in RTC, the Microcontroller will send the Corresponding Signal. Before that the energy meter with

SCU and it gives to signal conditioning circuit. Number of units consumed is indicated in the display. If the particular data and time is reached, the microcontroller sends the signal for FSK Modulation. The Modulated signal is then transmitted to RF transmitter.

The RF receiver receives the transmitted signal and then it is given for FSK demodulation. The Demodulated original signal is now transferred to MC through max 232. This is PLCC type of communication. This system will be useful for the EB people to transmit the data from the consumer place to EB without going directly to the consumer place.

## Review of the relevant literature:

This technique basically refers to providing intelligence to the device. In the current scenario, automation is widely used to control various devices in industries and home. Current systems used wired technologies like LAN thro' twisted pair cable or wireless technologies like Bluetooth, zig-Bee, RFID & Infrared. In the wireless communication case, all the technologies are susceptible to interference due to the presence of other devices nearby.

Infrared case is high susceptible to the problem of reflection, besides the devices required to implement the automation system based on the require A power source to work which may need special arrangement in many cases. The current systems thus required a special care & attention & some time may require change in architecture of the area where it is used to install new wires or repeaters.

## Power Line Modeling:

The modeling of the power line channel is of fundamental importance, since the quality of transmission is highly influenced by characteristics of the channel. Several techniques to model transfer characteristics of indoor power line channel have been presented in literature.

## MULTIPLE ACCESS SCHEMES WITH PLCC

Today with the advent of technology , use of high speed applications like internet, voice and data has been increased that's why many researches has been done in last few years to expose the properties of power line channel at the frequencies up to 20 or 30 MHz for fixing power line channel as a communication system.

There have some researches been done for evaluating the performance of OFDM and CDMA systems in power lines. In [4] the comparison of OFDM and

CDMA for broadband power line communication has been made by simulation. Performance analysis model of OFDM under the effect of impulsive noise and multipath effects has been developed by close formulas and verified by simulation. The first direct sequence multiple access (DS-CDMA) [3] is being used with low frequencies of power line channel. In high frequency bands (1-40MHz) minimum output energy receivers (such as RAKE receiver) and multiuser detection techniques have been used. The receiver in the CDMA system is based on coherent receiver structure. Electricity producer and distributor cannot ignore standardization of power line channel, that about to be used worldwide in the field of telecommunication. Depending on the geographical areas, standardization work may be directly associated with an international level or first be developed at a regional level. The deployment of electrical networks, their interconnections and ever increasing number of electrical appliances have resulted in the emergence of the first network standardization bodies such as IEC (International Electro technical commission).There are three International organizations [1] that cover all the field of knowledge regarding the system, as IEC (International Electro technical commission, Europe), the ISO and the ITU. The IEC (International Electro technical commission, Europe) and the CENELECT (Europian committee for Electro technical standardization) are in charge of electrical engineering and the ETSI (European Telecommunication Standards Institute)is in charge of telecommunications. The ISO and CEN (Europian committee for Standardization) cover all the other areas of activity [1]. These International standards are aimed to limiting the interfering emissions of the wired networks. As Power line communication networks are simple and practical so can be quickly developed and can be sustained with the appearance of new PLC technology versions resulting in new applications and emergence of IEEE 1901 standard for PLCs in the very near future.

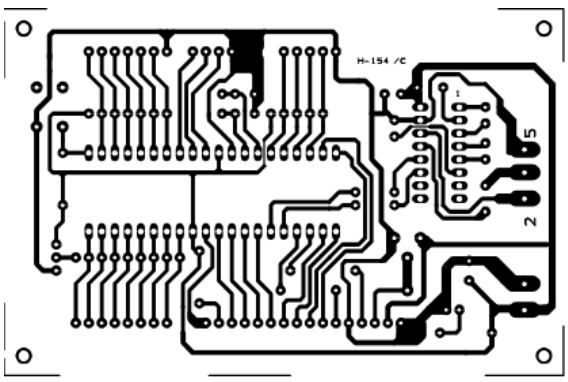

Fig: PCB layout of PIC Board

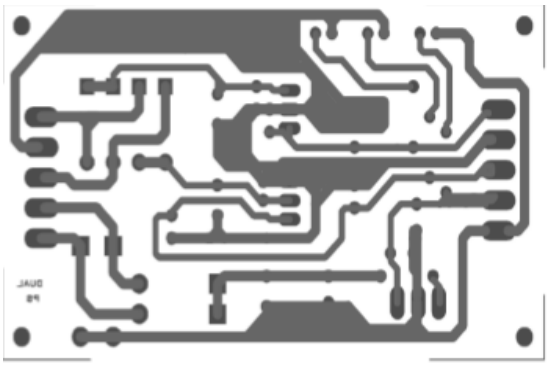

Fig: PCB Layout of Dual Power Supply

**Relay Circuit Operation Table:**

| Voltage signal from PIC | Transistor Q1 | Transistor Q2 | Relay |
|---|---|---|---|
| 1 | ON | OFF | OFF |
| 0 | OFF | ON | ON |

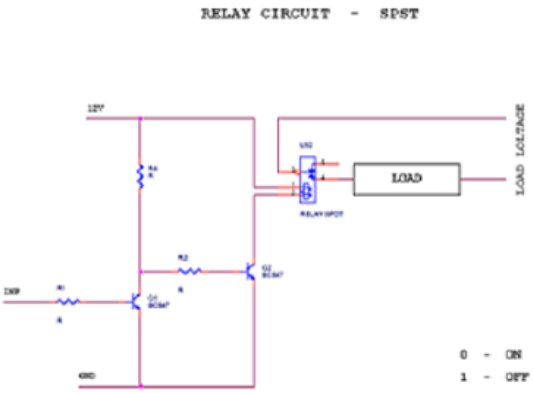


Fig: Relay Circuit SPST

## PIC

The microcontroller that has been used for this project is from PIC series. PIC microcontroller is the first RISC based microcontroller fabricated in CMOS (complementary metal oxide semiconductor) that uses separate bus for instruction and data allowing simultaneous access of program and data memory. The main advantage of CMOS and RISC combination is low power consumption resulting in a very small chip size with a small pin count. The main advantage of CMOS is that it has immunity to noise than other fabrication techniques.

Various microcontrollers offer different kinds of memories. EEPROM, EPROM, FLASH etc. are some of the memories of which FLASH is the most recently developed. Technology that is used in pic16F877 is flash technology, so that data is retained even when the power is switched off..

**CORE FEATURES:**

• High-performance RISC CPU

• Only 35 single word instructions to learn

• All single cycle instructions except for program branches which are two cycle

• Operating speed: DC - 20 MHz clock input

DC - 200 ns instruction cycle

• Up to 8K x 14 words of Flash Program Memory,

Up to 368 x 8 bytes of Data Memory (RAM)

Up to 256 x 8 bytes of EEPROM data memory

**BAUD RATE CALCULATION**

The main criteria for UART communication is its baud rate. Both the devices Rx/Tx should be set to same baud rate for successful communication. This can be achieved by SPBRG register. SPBRG is a 8-bit register which controls the baud rate generation. Given the desired baud rate and FOSC, the nearest integer value for the SPBRG register can be calculated using the below formula.

BRGH = 1 High Speed
$$SPBRG = (Fosc / (16 * BaudRate)) - 1$$
BRGH = 0 Low Speed
$$SPBRG = (Fosc / (64 * Baud rate)) - 1$$ .It may be advantageous to use the high baud rate (BRGH = 1) even for slower baud clocks. This is because the FOSC/(16 (X + 1)) equation can reduce the baud rate error in some case.

**UART REGISTERS:**

The below table shows the registers associated with PIC16F877A UART.

| Register | Description |
|---|---|
| TXSTA | Transmit Status And Control Register |
| RCSTA | Receive Status And Control Register |
| SPBRG | USART Baud Rate Generator |
| TXREG | USART Transmit Register. Holds the data to to be transmitted on UART |
| RCREG | USART Transmit Register. Holds the data received from UART |

**ADVANTAGES:**

- Most economical automation type.
- No change in infrastructure required.
- Can be used in any environment.

**DISADVANTAGES:**

- Noise of electrical appliances like grinders lead to be corruption of data.
- Loss of Power hence range is decrease.

**APLICATIONS:**

- Home, industrial appliance automation
- No need of physically to came for cameraman for capturing at energy meter.

**CONCLUSION:**

Automation has become a part of daily life. But the current systems available are costly, cumbersome & need extra arrangement with to change in infrastructure. Thus by proposing this system we are making a low cost &easily opera table system.

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