RESEARCH ARTICLE   OPEN ACCESS

Smart Energy Meter Based On Power Line Carrier Communication with Voice Notification

S.Aravindharasu[1], J.Sivaraj[2], S.Vijay[3]

[1,2]*(Department Of Electrical And Electronics Engineering, Sasurie College Of Engineering, Vijayamangalam.)*
[3]*(Assistant Professer,Department Of Electrical And Electronics Engineering, Sasurie College Of Engineering, Vijayamangalam).*

ABSTRACT
The method of calculating the reading of power consumption in our home are more in number. Though there are various ways, a person from electricity board has to visit each one's house and note down the reading. In order to reduce the man power and to reduce the errors created by man power, we are introducing a new idea of billing and also creates awareness among people regarding energy consumption through voice circuit. Power line carrier communication presents new area for automatic meter reading, by equipped energy meter with power system. In this power line carrier communication based energy meter, we are implementing a new idea of sending the electricity bill to the electricity board through the power line itself. The power line is used as a bidirectional medium. We are feeding all the information regarding the tariff amount fixed by the government in the micro-controller. The micro controller calculates and gives us the accurate amount. At the end of the day, the amount of power consumed and cost of it will be announced by a voice circuit. In month end, the total amount will be send to the electricity board through the power line. This is very efficient and cost effective. This also reduces the man power and the errors caused due to manual calculations.
*Keywords-* Power line, bidirectional medium, cost effective, PLCC, tariff, reduces errors, micro controller

I. INTRODUCTION

In the conventional system of data transmission on billing, the calculation of power consumption and the corresponding bill amount is calculated by energy meter. The manual calculation may be inaccurate and in case if no one is in the house and the door is locked when the data logger comes to take reading, the concerned member will not be able to take the reading. The intention of this paper is to overcome these drawbacks on man power and inaccuracy and provide efficient billing. This involves upgrading electricity distribution and management by incorporating a two way data communication and ubiquitous computing capabilities in to the power grid for improved load estimation, control, efficiency, safety and reliability. Designing the communication network for smart grid requires a good understanding and detailed analysis of the communication requirements for applications and a scheme to tailor the communication network to guarantee these requirements. Power Line Carrier Communication (PLCC) is the Utility and Grid operator's preferred choice for most SG related applications because of its many advantages PLC virtually allows every line-powered device in the electric grid to become the target of added value; PLCC is more of a generic term for every communications technology that uses power line communication channel. Power line noise is known to affect the performance of broad band power line communication significantly. This paper

Presents a frequency domain approach to characterize and model the statistical variation of power line noise. The model considers both the background noise and the impulsive noise. On the other hand the impulsive noise model is to obtain by direct measurements from the noise sources. The amount of impulse noise reaching a power line communication (PLC) receiver can then be determined with consideration of the channel transfer characteristics between the noise sources and PLC receiver. Using this noise model, the performance of two major classes of digital modulations scheme, namely single carrier modulation and multi carrier modulation, are analyzed and compare.

II. BLOCK DIAGRAM
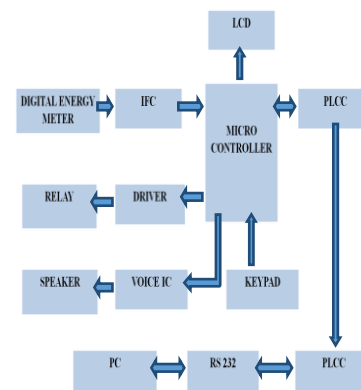
2.1 Block Diagram Description
2.1.1 Microcontroller

Microcontroller is a general purpose device, which integrates and no of components of microprocessor system on to single chip. It has in built CPU memory and peripherals to make it as a mini computer. PIC 16F877A is the microcontroller used in this process. 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 semi-conductor) 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 pin count. The main advantage of CMOS is that it has immunity to noise than other fabrication techniques.

2.1.2 LCD Display

LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small periods, while other displays have larger elements.
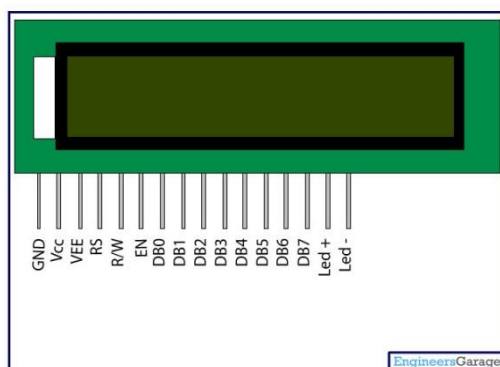

Fig 2 Pin Diagram of LCD Display

2.1.3 PLCC

A wide range of power line communication technologies are needed for different applications, ranging from home automation to internet access which is often called broadband over power lines (BPL). Most PLCC technologies limit themselves to one type of wires (such as premises wiring within a single building), but some can cross between two levels (for example, both the distribution network and premises wiring). Typically transformers prevent propagating the signal, which requires multiple technologies to form very large networks. Various data rates and frequencies are used in different situations.

2.1.4 Digital Energy meter

An energy meter is a device that measures the amount of electric energy consumed by a residents, business, or electrically powered device. They are typically calibrated in billing units, the most common one being the kilowatt hour (kWh). They are usually read once each billing period. Electric utilities use electric meters installed at customer premises to measure electric energy delivered to their customers for billing purpose

2.1.5 RS232

In communications, RS-232 is a standard for serial binary data interconnection between a *DTE* (Data terminal equipment) and a *DCE* (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. Electrical signal characteristics such as voltage levels, signaling rate, timing and slew-rate of signals, voltage withstand level, short-circuit behavior, maximum stray capacitance and cable length. Interface mechanical characteristics, pluggable connectors and pin identification. Functions of each circuit in the interface connector. Standard subsets of interface circuits for selected telecom applications
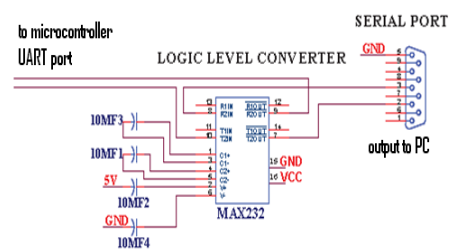

Fig 3: Pin Diagram of RS 232

2.1.6 Speaker

The WTV Voice module Board is designed to work in parallel port mode. In the Parallel Port Mode, Module can record 32 Group of voice.To record/playback the voice 8 pin DIP switch is used. Each pin in DIP switch has a different function which has been listed below.

2.1.7 Keypad

In a key pad it has a one or more than one keys are placed in a PCB. And all the keys are commonly grounded. This is the main difference to compared to matrix keypad. This key pads having maximum 8 numbers of keys. More than 8 keys cannot be connected because it is not efficient one. If we need more than 8 keys means, then only we can operate it a matrix keypad.
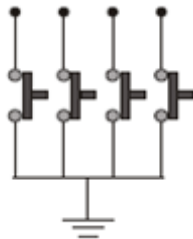
Fig 4: Logic Diagram of Keypad

2.1.8 Relay

This circuit is designed to control the load. The load may be motor or any other load. The load is turned ON and OFF through relay. The relay ON and OFF is controlled by the pair of switching transistors (BC 547). The relay is connected in the Q2 transistor collector terminal. A Relay is nothing but electromagnetic switching device which consists of three pins. They are Common, Normally close (NC) and Normally open (NO).
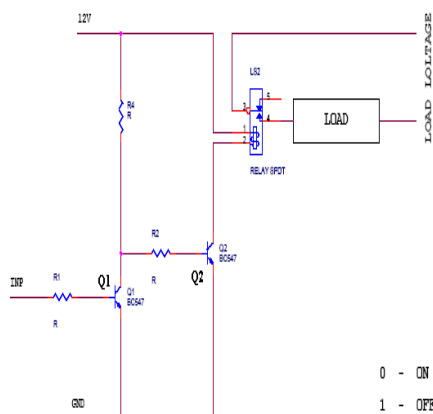

Fig 5: Circuit Diagram of Relay

The relay common pin is connected to supply voltage. The normally open (NO) pin connected to load. When high (5 Volt)pulse signal is given to base of the Q1 transistors, the transistor is conducting and shorts the collector and emitter terminal and zero (0 Volt)signals is given to base of the Q2 transistor. So the relay is turned OFF state.

When low pulse is given to base of transistor Q1 transistor, the transistor is turned OFF. Now 12v is given to base of Q2 transistor so the transistor is conducting and relay is turned ON. Hence the common terminal and NO terminal of relay are shorted. Now load gets the supply voltage through relay.

III.   CONCLUSION

This system helps us to meet the demand of energy in the future. This is cost effective and is an efficient one. Through voice circuit, we create awareness among the people to conserve energy. This also reduces man power and is also very accurate PLCs may need to interact with people for the purpose of configuration, alarm reporting or everyday control. A Human-Machine Interface (HMI) is employed for this purpose.

REFERENCES

[1].   MISUREC, J.: The Data Acquisition via PLC in Energetics, In 32nd International Conference on Telecommunications and Signal Processing – TSP'2013, pp. 1–4.

[2].   KRAJSA, O.SILHAVY, P.KOUTNY, M.: Half-Overlapped Filtered MultiTone Modulation for Power Line Communication Systems, In Proceedings of the 13th WSEAS International Conference on Systems, Rhodos, WSEAS Press, 2013, pp. 596–599.

[3].   ROKA, R.ORGON, M.: Moˇznosti novy´ch technolo´gi´ı vysokory´chlostn´eho prenosu multimedia´lnych signa´lov na pevny´ch prenosovy´ch m´edia´ch v pr´ıstupovej sieti, EE ˇcasopis pre elektrotechniku an energetiku **15** No. 3 (2011), 16–19.

[4].   KOUTNY, M.KRAJSA, O.MLYNEK, P.: Modelling of PLC Communication for Supply Networks, In Proceedings of the 13th WSEAS International Conference on Communication, Rhodos, WSEAS Press, 2010, pp. 185–189.

[5].   MLYNEK, P.MISUREC, J.KOUTNY, M. The Communication Unit for Remote Data Acquisition via the Internet: In Proceedings of the 7th WSEAS International Conference on Circuits, Systems, Electronics, Control and Signal Processing (CSES'08), Puerto de La Cruz, Spain, WSEAS Press, 2010 , pp. 168–173.

[6].   KRAJSA, O.SILHAVY, P.: Half-Overlapped Filtered MultiTone Modulation, its Implementation and Comparison with Non-Overlapped Filtered MultiTone Modulation, In Proceedings of The 7th WSEAS International Conference on Circuits, Systems, Electronics, Control & Signal Processing, 1, Puerto De La Cruz, Spain, WSEAS, 2008, pp. 272–27.

[7].   ORGON, M.: PLC/BPL and Next Generation Networks, In: POWER-COM – Conference Communication over MV and LV power lines, Praha, 2007.

[8].   BABIC, M.HAGENAU, M.DOSTERT, K.BAUSCH, J.: Theoretical Postulation of PLC Channel Model, Open PLC European Research Alliance (OPERA), 2005

[9].   ESMAILIAN, TKSCHISCHANG, FGULAK, G.: In-Building Power Lines as

High-Speed Communication Channels: Channel Characterization and a Test Channel Ensemble, International Journal of Communication Systems (2003).

[10]. MENG, H.CHEN, S.GUAN, L.LAW, C. L.SO, P. L.GUNAWAN, E.LIE, T. T.: A Transmission Line Model for High-Frequency Power Line Communication Channel, IEEE Transactions (2003), 1290–1295.

[11]. DOSTERT, K. M.: Power Lines as High Speed Data Transmission Channels - Modelling the Physical Limits, Proceedings of the 5th IEEE International Symposium on Spread Spectrum Techniques and Applications (ISSSTA 01), Sep. 2001, pp. 585–589.

[12]. FERREIRA, H. C.GROVE, H. M.HOOIJEN, O.VINCK, A. J.: Power Line Communications: an overview, Proc. of IEEE ISPLC, 2001, pp. 558–563.