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Smart Energy Meter Using Power Line Carrier Communication

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Abstract –There are various ways through which we will pay the electricity bill. Though there are various ways, an individual from electricity board has got to visit each one's house and write the reading. so as to scale back the person power and to scale back the errors created by man power, we are introducing a replacement idea of billing. power cable carrier communication presents new area for automatic meter reading, by equipped energy meter with power grid . During this power cable carrier communication based energy meter, we are implementing a replacement idea of sending the electricity bill to the electricity board through the facility line itself. the facility line is employed as a bidirectional medium. We are feeding all the knowledge regarding the tariff amount fixed by the govt within the micro- controller. The micro controller calculates and provides us the accurate amount. At the top of the day, the quantity of power consumed and price of it'll be announced by aLCD circuit. In month end, the entire amount are going to be send to the electricity board through the facility line. This is often very efficient and price effective. This also reduces the person power and therefore the errors caused thanks to manual calculations.

Key Words:Power line, bidirectional medium, cost effective, PLCC, tariff, reduces errors, micro controller. (key words)

1. INTRODUCTION

In the conventional system of knowledge transmission on billing, the calculation of power consumption and therefore the corresponding bill amount is calculated by energy meter. The manual calculation could also be inaccurate and just in case if nobody is within the house and therefore the door is locked when the info logger involves take reading, the concerned member won't be ready to take the reading. The intention of this paper is to beat these drawbacks on man power and inaccuracy and supply efficient billing. This involves upgrading electricity distribution and management by incorporating a two way digital communication and ubiquitous computing capabilities in to the facility grid for improved load estimation, control, efficiency, safety and reliability.

Designing the communication network for smart grid requires an honest understanding and detailed analysis of the communication requirements for applications and a scheme to tailor the communication network to ensure these requirements. power cable Carrier Communication (PLCC) is that the Utility and Grid operator's preferred choice for many SG related applications due to its many advantages PLC virtually allows every line- powered device within the electric grid to become the target of added value; PLCC is more of a generic term for each technology that uses power cable channel . power cable noise is understood to affect the performance of broad band power cable communication significantly. This paper presents a frequency domain approach to characterize and model the statistical variation of power cable noise. The model considers both the ground noise and therefore the impulsive noise. On the opposite hand the impulsive noise model is to get by direct measurements from the noise sources. the quantity of impulse noise reaching an influence line communication (PLC) receiver can then be determined considerately 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.

2. BLOCK DIAGRAM

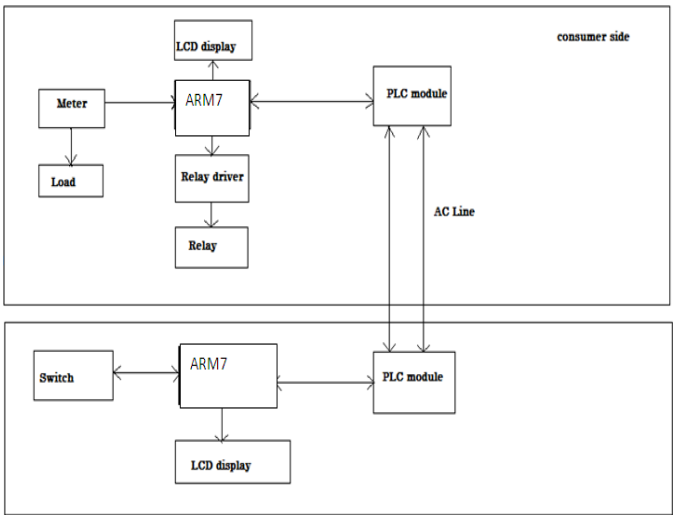

Fig.1 Block Diagram of PLCC based smart energy meter

2.1 Block Diagram Description

2.1.1 Microcontroller

Microcontroller may be a general purpose device, which integrates and no of components of microprocessor system on to single chip. it's in built CPU memory and peripherals to form it as a mini computer. ATMEGA 16F877A is that the microcontroller utilized in this process. The microcontroller that has been used for this project is from ATMEGA series. ATMEGA microcontroller is that 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 most advantage of CMOS and RISC combination is low power consumption leading to a really small chip size with a pin count. the most advantage of CMOS is that it's immunity to noise than other fabrication techniques.

2.1.2. LCD Display

Lcds are available to display arbitrary images (as during a general-purpose computer display) or fixed images which may be displayed or hidden, like preset words, digits, and 7-segment displays as during a digital clock. they use an equivalent basic technology, except that arbitrary images are made from an outsized number of small periods, while other displays have larger elements.

2.1.3. PLCC

A good range of power cable communication technologies are needed for various applications, starting from home automation to internet access which is usually called broadband over power lines (BPL). Most PLCC technologies limit themselves to at least one sort of wires (such as premises wiring within one building), but some can cross between two levels (for example, both the distribution network and premises wiring). TyATMEGAally transformers prevent propagating the signal, which needs multiple technologies to make very large networks. Various data rates and frequencies are utilized in different situations.

2.1.4 Digital Energy meter

An energy meter may be a device that measures the quantity of electrical energy consumed by a residents, business, or electrically powered device. they're tyATMEGAally calibrated in billing units, the foremost common one being the kW-hr (kWh). they're usually read once each billing period. Electric utilities use electric meters installed at customer premises to live electric energy delivered to their customers for billing purpose

2.1.5 RS232

In communications, RS-232 may be a standard for serial binary data interconnection between a DTE (Data terminal equipment) and a DCE (Data Circuit- terminating Equipment). it's commonly utilized in computer serial ports. Electrical signal characteristics like voltage levels, signaling rate, timing and slew-rate of signals, voltage withstand level, short-circuit behavior, maximum stray capacitance and cable . Interface mechanical characteristics, pluggable connectors and pin identification. Functions of every circuit within the interface connector. Standard subsets of interface circuits for selected telecom applications

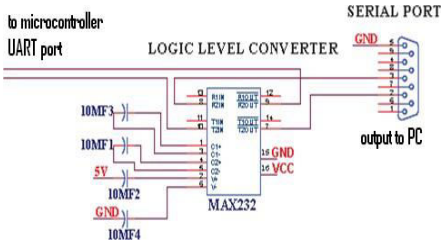

Fig 2: Pin Diagram of RS232

2.1.6 SWITCH

The WTV Switch module Board is meant to figure in parallel interface mode

2.1.7 Keypad

during a key pad it's a 1 or quite one keys are placed during a PCB. and every one the keys are commonly grounded. this is often the most difference to compared to matrix keypad. This key pads having maximum 8 numbers of keys. quite 8 keys can't be connected because it's not efficient one. If we'd like quite 8 keys means, then only we will operate it a matrix keypad.

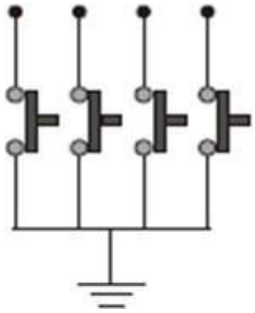

Fig 3: Logic Diagram of Keypad

2.1.8 Relay

This circuit is meant to regulate the load. The load could also be motor or the 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 within the Q2 transistor collector terminal. A Relay is nothing but electromagnetic switching device which consists of three pins. they're Common, Normally close (NC) and Normally open (NO).

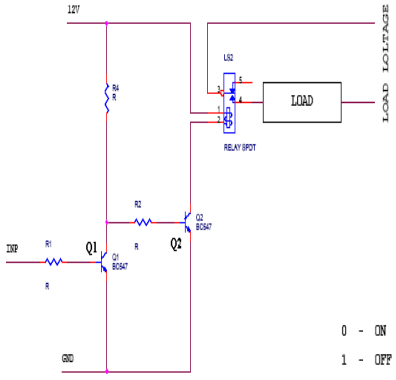

Fig 4: Circuit Diagram of Relay (12 V)

3.RESULT

The relay common pin is connected to provide 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 0 (0 Volt)signals is given to base of the Q2 transistor. therefore 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 therefore the transistor is conducting and relay is turned ON. Hence the common terminal and NO terminal of relay are shorted. Now load gets the availability voltage through relay.

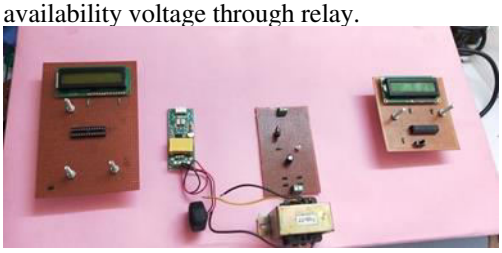

Fig-Hardware Setup

Result Table at Meter Side-

Sr No	Multimeter Voltage	Multimeter Current	Smart Meter Voltage	Smart Meter Voltage
1	235	1.09	235	1.09
2	235	1.09	235	1.09
3	229	1.1	229	1.1

Result Table at Substation Side-

Sr No	Multimeter Wattage	Smart Meter wattage	Substation Side Wattage
1	256	256	256
2	256	256	256
3	247	247	247

CONCLUSION

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

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