ELECTRICITY BILLING BY USING POWER LINE CARRIER COMMUNCIATION

Abhishek Chavan, Sneha Bhoi, Amardeep Patil ,Yuvraj Bagdi ,Prof.S.S.Shingare

Amardeep Patil, Electrical Depatment , AISSM'S IOIT,Maharashtra,

INDIA

Abhishek Chavan, Electrical Depatment, AISSM'S IOIT,Maharashtra,

INDIA

Sneha Bhoi, Electrical Depatment, AISSM'S IOIT,Maharashtra,

INDIA

Yuvraj Bagadi, Electrical Depatment, AISSM'S IOIT,Maharashtra,

INDIA

Prof S.S.Shingare, Electrical Department, AISSM'S IOIT, Maharashtra,

INDIA

ABSTRACT

In this paper, we introduce a concept of Power line Communication. Here, we multiplex data into 240V power lines which provide electricity to our various devices. This method of communication opens up a broad spectrum of applications where this technology can prove useful. In this paper, we try to demonstrate one application of this technology. Here we automate the process of connection / disconnection of power supplies of various consumers, by developing intelligent power meters that are able to decode this data, which carries information about the supply status of the various consumers, based on which the intelligent power meter automatically connects or disconnects the power supplies of these customers.

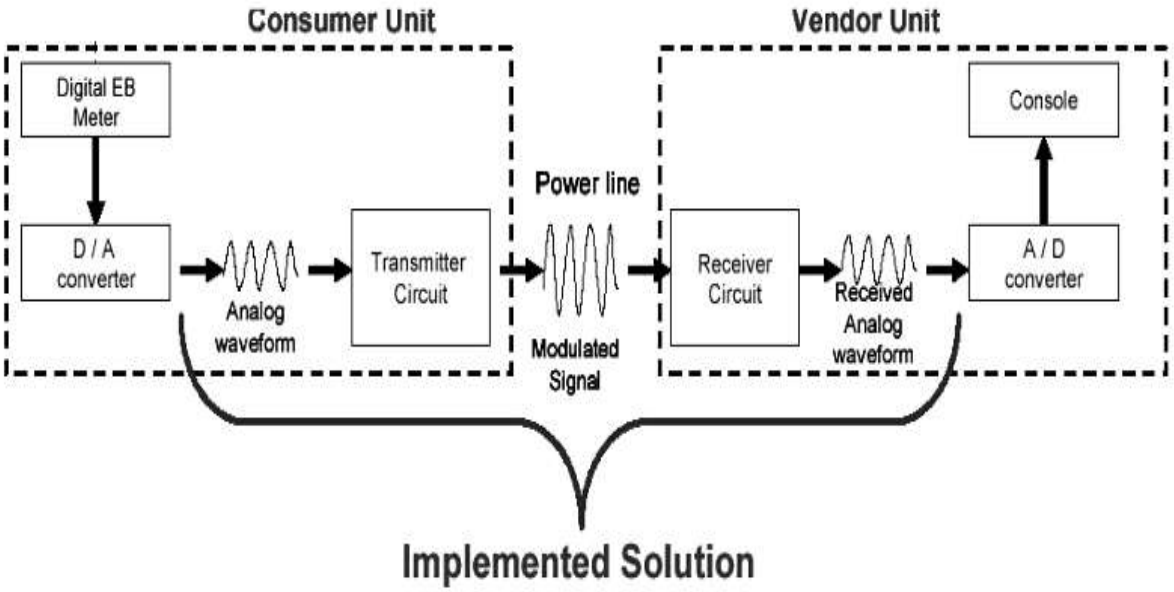
1 .INTRODUCTION

Though many technological innovations are taking place in this world, existing electricity consumption billing process scheme in India to be very obsolete and does not meet the latest technology available.

The communication is made possible entirely through the power line. Not only the billing, even the control of system is fully automated by this technique i.e. when a consumer fails to pay his consumption bill within a given

period of time the supply automatically gets cut off to his house and the restoration is done only when the bill is cleared. The currently prevailing system involves the user to go up to the Electricity Billing (EB) office to manually pay his bills. The readings are taken using the analog meter present in the customer's house and using an employee working at the EB office. This system has some disadvantages like erroneous readings, easy manipulation, manual labor and time consuming. In the proposed system, the analog energy meters are replaced by digital meters. The meter readings in the form of digital data are transferred from the customer end to the EB office through power line.

2. METHODOLOGY



The electricity consumption and automatic billing through power line essentially consists of three sections as shown in implemented solution.

The first section is the energy meter section where the energy consumed by the consumer is calculated digitally. A current transformer (CT) and voltage transformer (VT) of the specified rating are used. The output of the processor IC is a digital pulse, which depends upon, the load used. These pulses are given as the input to the second section through the optocoupler. The second section is the heart of the proposal, which consisting of the micro controller. For every 100 pulse the micro controller receives it increases the number of units consumed by the consumer by 1, which is stored in the EEPROM. This is then displayed on LCD.

The third section is EB end consists of the MODEM which is a transceiver i.e. it can receive as well as transmit data. The modem receives the input from the microcontroller and transmits it to the EB side. These are received by the modem placed in the EB side and sent to the PC. The tariffs are calculated using EB by the PC and sent to the micro controller through the same pair of MODEM. Hence the number of units consumed and the amount is displayed on the LCD.

3. Block Diagram

3.1 Block Diagram of Consumer End

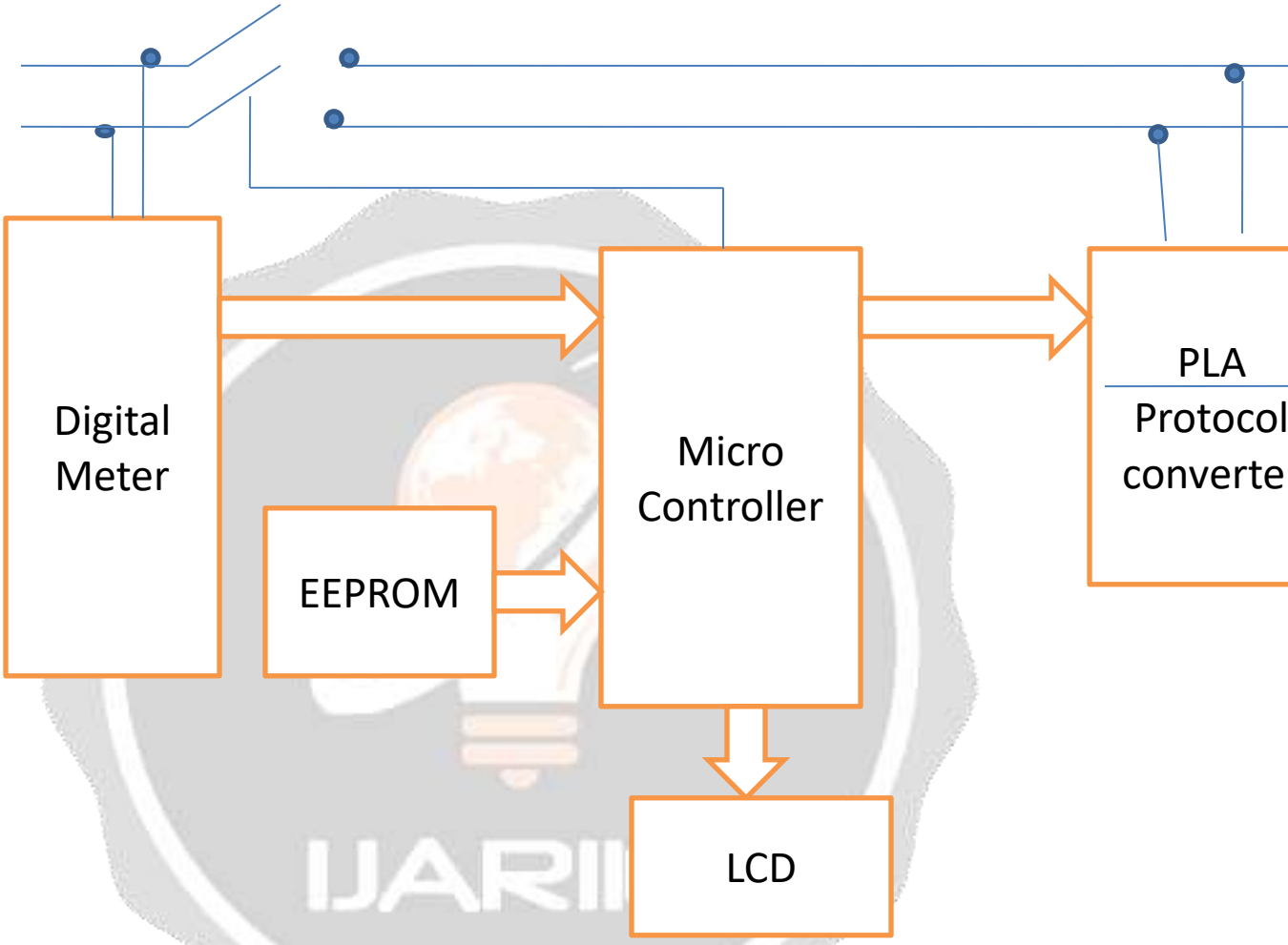


Fig. 3.1 Block Diagram of Consumer End

- The first section is the energy meter section where the energy consumed by the consumer is calculated digitally.
- The reading is given to the microcontroller.
- This data is stored in EEPROM, then it is displayed on LCD.
- The PLA is connected to the microcontroller and power lines .PLA will receive the data records and send it to the server through power lines.
- There is a facility of tripping OFF the circuit directly from the server side in case the subscriber fails to pay the bill.

- At the server side ,the modem(PLA) receives the input from power lines and send to the PC(server)
- At the server, depending on the data rates, the billing is done.

3.2 Block Diagram of Billing End

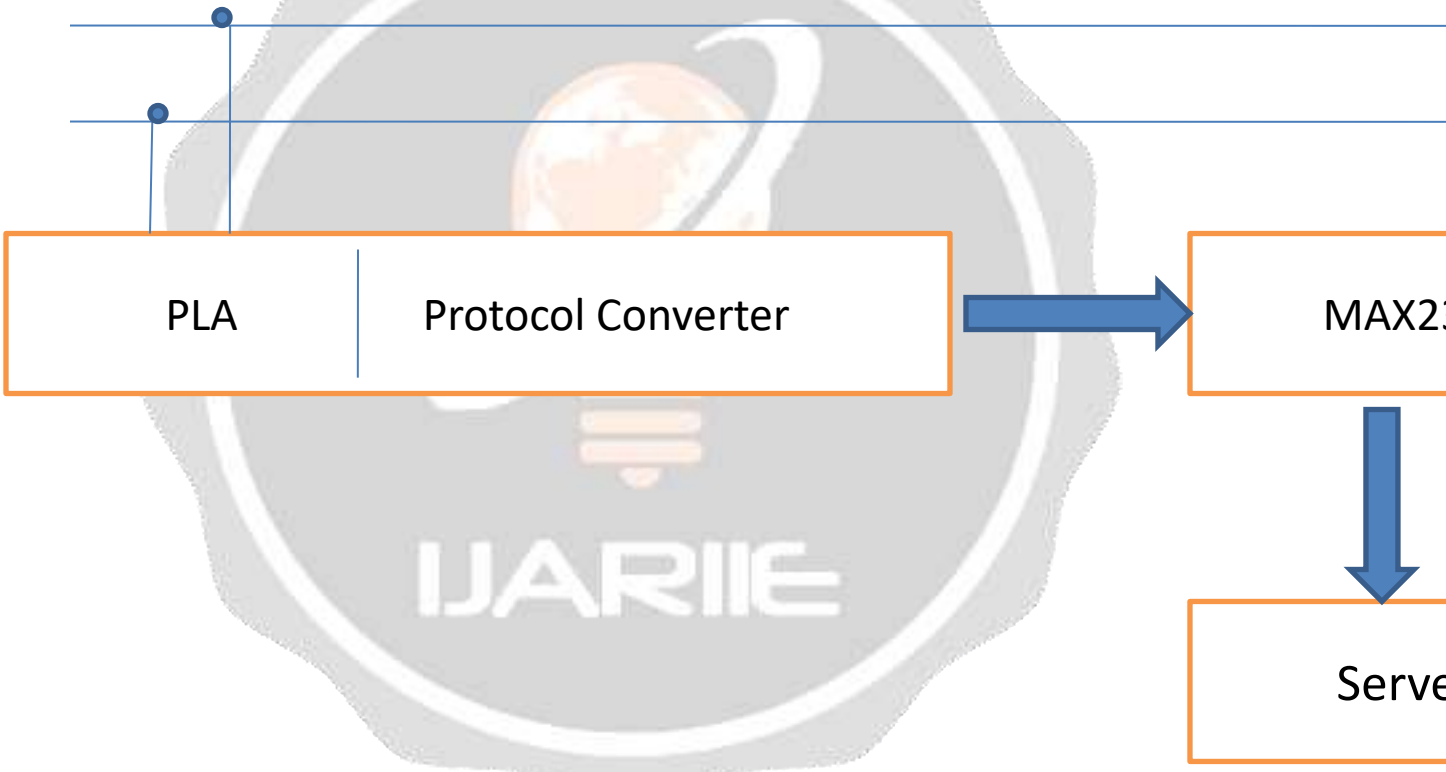


Fig 3.2 Block Diagram of Billing End

4. POWER LINE CARRIER COMMUNICATION (PLCC)

Fig 4. Power Line Carrier Communication Modem

Power line Modem is a communication module which sends data on the 230 Volt mains power lines. Power line communication module basically uses the existing power lines to transfer both AC power as well as data simultaneously. This form of communication is also known as power-line carrier, power-line digital subscriber line (PDSL), mains communication, power-line telecommunications, or power-line networking (PLN).

This module provides bi directional communication in half duplex mode i.e. it can either transmit or receive data at one time but cannot do both at the same time. If the module received data via power line it sends data via TX pin to your controller and if it receives data serially via your microcontroller it switches to transmit mode and sends data via the power line.

The communication is quite simple and any serial data at 9600 bps can be easily transmitted via power line. The interfacing is also quite simple just connect your controllers Tx line to Modules Rx line and the controllers Rx line to the Modules Tx line and you are ready to go. No need of any settings or anything just a simple plug and play module.

4.1 Specification and Rating

- Power Supply: DC 12-24 Volt (12 Volt recommended)
- Max current 200ma
- Default Baud rate of 96.
- Communication in half duplex mode.
- Working environment: 230V 50/60Hz
- Communication distance: 100m
- Power line carrier frequency: 72kHz
- Modulation and demodulation mode: FSK
- Unix Connector Provided for easy screwing of power line cable.
- Relegate connector provided for easy interfacing with your circuit.

5. CONCLUSION

The proposed automated system saves time and money, increases customer satisfaction, reduces complaints and can pay for itself in a handful of years. This proposed Automated EB model includes an office module which has a PC with its back end connected to a database. The other module is the customer home module which is present at the home this module is used to make note of the amount of power consumed by the customer and after a period of 1 month it sends to the PC in the EB office. This EB office module calculates the data and sends it to the customer along with the due date .Thus this system proves to be very advantageous as well as efficient, the one which might become the bench mark in the history of automation.

6. REFERANCES

1. Raja, G.T. "Electricity consumption and automatic billing through power line", Power Engineering Conference, 2007, PP. 1411 – 1415, 2007.

2. Bharath, P "Wireless automated digital energy meter", Sustainable energy technologies, International conference, 2008, PP. 564 – 567, 2008.

3. Al-Qatari, S.A. "Microcontroller – based automated billing system", Industrial automation and control: Emerging Technologies, 1995, PP. 517 – 523, 1995.

4. Anatory, J "Broadband Power line communications. The Channel capacity analysis", IEEE Tran. On Jan 2008, PP 164-170.

5. The 8051 Microcontroller and Embedded system using Assembly and C-Muhammad Ali Mazidi, Janice GillespieMazidi, RolinD.Mckinlay. Fourth Edition, Prentice Hall 2011
6. Microprocessor and Microcontroller-Gaonkar.R.S. First Edition, Prentice Hall 2011
7. Let Us C- Yashwant Kanetkar. 13th Edition, BPB Publication 2013