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DESIGN AND DEVELOPMENT OF ELECTRICAL LOAD DETECTOR AND CONTROL USING POWER LINE COMMUNICATION

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ABSTRACT

In our project we use PLC i.e. power line communication system used to detect and control electrical load. Implementation area of this system is a MSEB to distribution level of electrical power supply system In this project, we introduce a new 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 project, 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 .

Keywords: Energy Meter, Power Line, Communication.,System Logic Control, Microcontroller.

I. INTRODUCTION

Automating kilowatt-hour (kWh) meter reading has become a necessity for most energy suppliers as deregulation, freer customer choice and open market competition occur in the energy supply sector. Visual inspection of meters is time-consuming and labour intensive. A study, conducted by Eyre [1], had shown that a human meter reader could only achieve an equivalent average information rate of about 1bit/s, which is very slow. Moreover, some meters are located in places of poor accessibility that greatly increase the difficulty of reading such meters. The scope of this project is to make use of new modern technologies and implement them into more practical fields. Our project deals with the implementation of Power Line Communication networks in the field of electricity billing. We can make use of this technology to such an extent such that even complex problems can be handled in a easier way. This type of networks can also be used for creating emergency response network. Our project eliminates the need for employing EB meter readers and this set of employers can be used elsewhere. The amount of time spent in doing all these works manually can be reduced because of this kind of network implementation. Each household is allocated a particular id so that they can be uniquely identified. There is no chance of manipulation in our proposed system.The long queues in the billing counter and there is automatically stored in the back end database at the office module. So, all the data and statistics are stored in the central archives automatically just in case for future references in case of any discrepancies. This saves hours and hours of manual data entry needed for entering the data into the central system. So our module is useful in that aspect also. Though many technological innovations are taking place in this world, existing electricity consumption billing process seems in India to be very obsolete and does not meet the latest technology available. In this project, the above said process is totally automated and the communication is made possible entirely through the power line. This communication is bi-directional at a faster data rate through long distances. By digitizing, the currently used analogue energy meter has been completely transformed to a digital one. Hence it is beneficial to the customers as the system is made very user friendly. The automated EB billing procedure has the ability of fulfilling a set of needs for the user and the EB workers

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II. LITERATURE REVIEW

power-line communication (PLC) signal processing method based on wavelet packet analysis[1].

H. Meng Early PLCs were designed to replace relay logic systems. These PLCs were programmed in ladder logic, which strongly resembles a schematic diagram of relay logic. This program notation was chosen to reduce training demands for the based on a stack-based logic solver [2]. software in PC (system logic and control) interfaced with the microcontroller for process the information to the PLC Modem. Here PLC Modem will be act as a transmitting medium of communication via AC Medium**.[3].**

III. SYSTEM LOGIC CONROL:

Early SLCs were designed to replace relay logic systems. These SLCs were programmed in ladderlogic, which strongly resembles a schematic diagram of relay logic. This program notation was chosen to reduce training demands for the existing technicians. Other early SLCs used a form of instruction list programming, based on a stack- based logic solver. Modern PLCs can be programmed in a variety of ways, from the relay-derived ladder logic to programming languages such as specially adapted dialects of BASIC and C. Another method is State Logic, a very high-level programming language designed to program PLCs based on state transition diagrams. Many early SLCs did not have accompanying programming terminals that were capable of graphical representation of the logic, and so the logic was instead represented as a series of logic expressions in some version of Boolean format, similar to Boolean algebra. As programming terminals evolved, it became more common for ladder logic to be used, for the aforementioned reasons and because it was a familiar format used for electromechanical control panels. Newer formats such as State Logic and Function Block (which is similar to the way logic is depicted when using digital integrated logic circuits) exist, but they are still not as popular as ladder logic. A primary reason for this is that PLCs solve the logic in a predictable and repeating sequence, and ladder logic allows the programmer (the person writing the logic) to see any issues with the timing of the logic sequence more easily than would be possible in other formats.

The PLC is primarily used to control machinery. A program is written for PLC which operates the functionality of machines based on the input conditions and the internal program. A system Logic Controller i.e.SLC or Programmable Controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory. A PLC is an example of a hardreal-time system since output results must be produced in response to input conditions within a limited time, otherwise unintended operation will result. In this aspect PLC is similar to computer. However PLC is designed to programmed once and run repeatedly as needed. Infact a crafty programmer could use a PLC to control not only simple devices such as a garage door opener, but their whole house , including switching light on and off at certain times, monitoring a custom built security system etc.

Most commonly, a PLC is found inside of a machine in an industrial environment. A PLC can run an automatic machine for years with little human intervention. They are design to withstand most harsh environments. In this concept we will going to design and developed PLC concept using programming in embedded c, Dot Net languages which will be executed and run the machineries automatically in power line communication network.

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Flow Chart

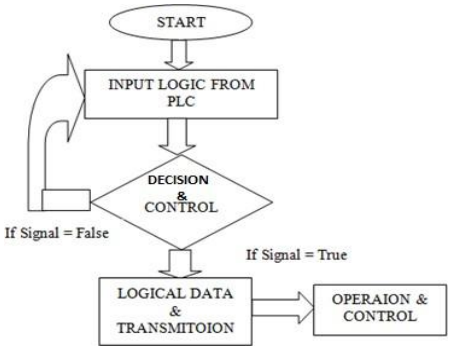


Fig.Flow chart of system logic control.

IV. POWER LINE COMMUNICATION:

Power line communication (PLC) carries data on a conductor that is also used simultaneously for AC electric power transmission or electric power distribution to consumers. It is also known as power line carrier, power line digital subscriber line (PDSL), mains communication, power line telecommunications, or power line networking (PLN).

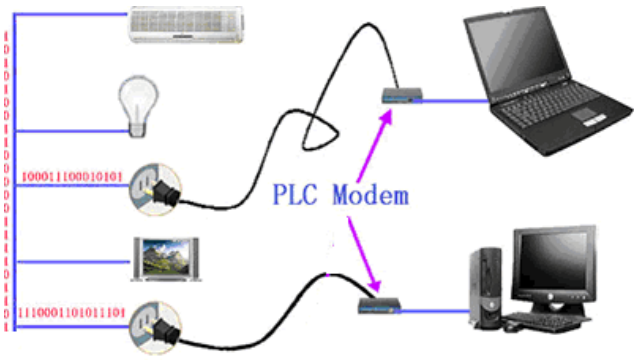
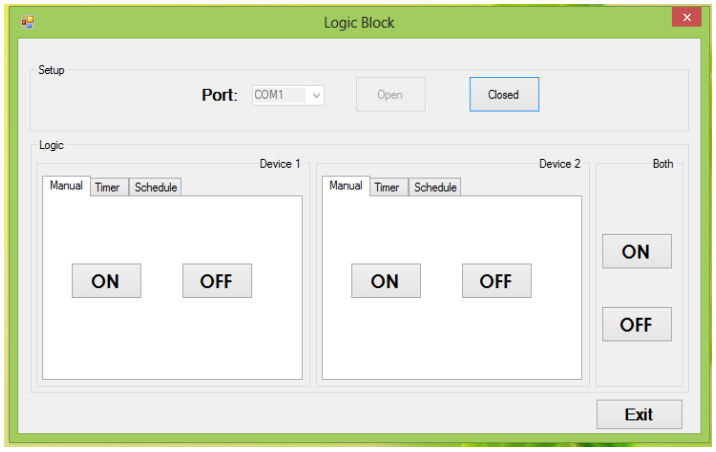


Fig. power line communication

System Logic Control User Interface



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Power line modem

Power line modem is useful to send and receive serial data over existing AC mains power lines of the building. It has high immunity to electrical noise persistence in the power line and built in error checking so it never gives out corrupt data. The modem is in form of a ready to use circuit module, which is capable of providing 9600 baud rate low rate bi-directional data communication. Due to its small size it can be integrated into and become part of the user's power line data communication system

V. BLOCK DIAGRAM

Transmitting End

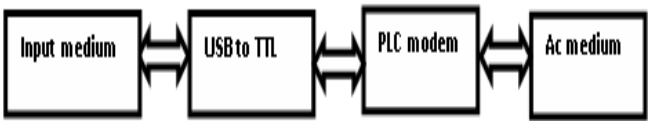

Fig. Transmitting end

In the transmitter case the input medium will be the software (system logic and control) interfaced with the the microcontroller for process the information to the PLC Modem. Here PLC Modem will be act as a transmitting medium of communication via AC Medium.

Receiver End

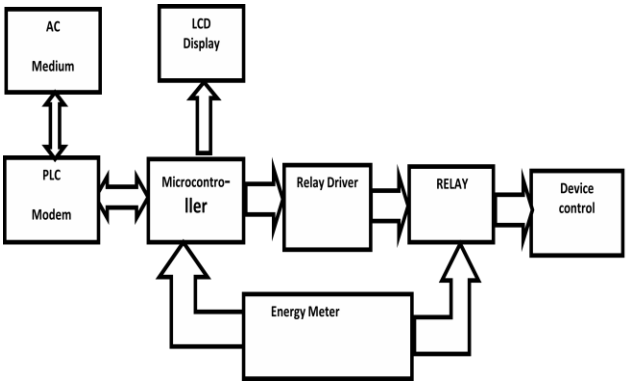

Fig. Receiver End

In the receiver end the PLC modem will receive the signal from the electrical lines and send it to the microcontroller for its further processing. Here the digital

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signal coming from the microcontroller will be directly given to the relay driver for driving the relay and switch on the machine as per the logic.

VI. CIRCUIT DIAGRA

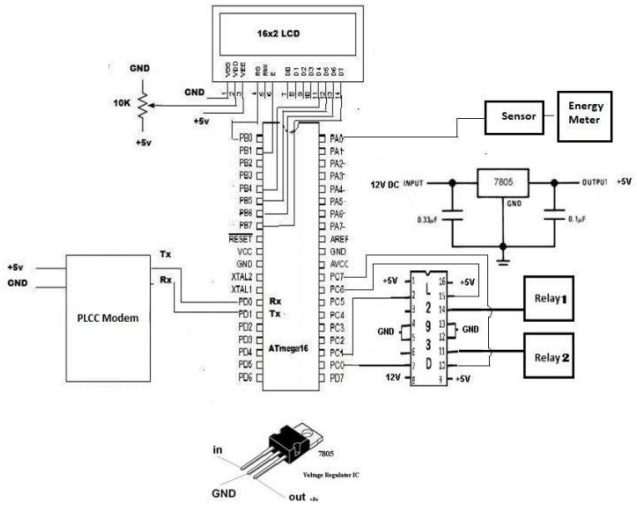

Fig . Circuit Diagram Of Project

VII. ADVANTAGES

- Ability to detect tamper events and outageoccurrences
- Monitor electrical load in real time.
- System has no running cost for data acquisition.
- Reduction in manual meter reading costs
- Improved meter accuracy & Reduced meter maintenance expenses.
- Reduction in Revenue Protection losses

VIII. APPLICATION

- Used Industrial
- Use for commercial
- Home aplication
- industrial automation
- Power Distribution Management

IX. CONCLUSION

In the transmitter case the input medium will be the software (system logic control) interfaced with the the microcontroller for process the information to the PLC Modem. Here PLC Modem will be act as a transmitting medium of communication via AC Medium. In the receiver end the PLC modem will receive the signal from the electrical lines and send it to the microcontroller for its further processing. Here the digital signal coming from the microcontroller will be directly given to the relay driver for driving the relay and switch on the machine as per the logic. In this way we are going to interface system logic control in power line communication so as to work efficiently and economically

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