

Advance Technology Base Domestic and Industrial Automation through AC Power Line Modem

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ABSTRACT: -The phenomenal growth of information and communication technology (ICT) sector has become the key enabler to the development of society through creation of wealth and improving quality of life. The Indian ICT and industrial sector has established its presence in world market and maintained its growth consistently in the last two decades[5]. An advance technology base automation system would be developed to remove the need for individual largest to physical read out the consumer data and its about increases the controlling activity through AC power line modem[1]. This technology improves the capabilities of fully automation which provided real power information on low frequency output and to reduce form factor for system of integration. The focus on this paper is some of the key challenge and promising technology to address energy consumption, signaling, system reliability and energy efficiency are the key term to evaluate the energy efficient performance[8].

Keywords: - AC power line modem, Cooperative technique, Selective approach, , system reliability.

INTRODUCTION

The power line modem is a dedicated device for transferring data over low voltage power line. Using extensive power line cable network in a region that is distributed by a single transformer, one can use a multiple modem to form data network among the various terminals. The power line modem uses the power line cable as a communication medium. It is convenient as it eliminates need to lay additional cable and data communication network infrastructure can be formed among all the data terminals[9].

This is the age of information leading to many wide technologies in this corporate world. The corporate world are expected to be integrated with a fully automation for reason like wide coverage, better power management

and disaster proof communication. The present working system is very complex to work as automation required an extra cable in long distance for a data transmission into a low frequency output through AC power line. The AC power line when used as communication channel exhibit a complex characteristic in multi -path propagation. This system needs an extra controlling device which increases the maintenance cost, high noise interference and more power consumption [11].

An advance technology base automation system used in centralized automatic electric energy meter, stage lighting and street lighting control application, remote monitoring of electric equipment, home

automation, intelligent building and energy meter, fire and security alarm system control, air conditioning and process control, heating and ventilation control, status monitoring and control, low speed data communication networks, power distribution management. information display and it can also play a role in the final leg of intended connection in special circumstances. The proposed design can be activated to suit specific regional requirement. This approach provided superior stability and excellent accuracy over a extreme environment condition and overtime. This technology can be extended and implemented by using FPGA circuit[5].

NEED OF POWER LINE CARRIER MODEM



Power line communication has been main focus of much research work since the liberalization of the telecommunication markets. With growing interest in power line communications the scope of possible applications also increased. Although many applications are in vogue, we wanted to concentrate on communication data pertaining to energy consumption to the main electricity office.

The power line carrier modem is a circuit module which can be integrated into

and become part of the user's system. It is device for transferring data over the power cable at low voltage end of the power of a 3-phase/ 4-wire distribution network. A pair of power line carrier modem connected on the same phase and neutral line of the power network can provided bi-directional data communication at the baud rate up to 1200 bps. The modem at the transmission end modulates the signal from data terminal through RS-232 interface into a carrier signal in the power line. At the receiving end, the modem recovers the data from the power line carrier signal by demodulation and sends the data to data terminals through RS-232 interface[4].

Main Features

- Power line carrier modem can be used for broadcasting in a one-to-many manner without the need to worry about handshaking.
- Power line carrier modem can be either master or slave, depending on the pin definition of RS-232. There is no prior classification of master-slave role of the modem.
- A power line carrier modem acting as master can be designed to work in a 3-phase manner.
- Operating environment:
Power : 85W-275V AC, 50/60 Hz ,
+/- 5 %
Temperature : -10 ~ +50 C
Relative humidity : < 95 %, non-condensation
- Small form factor for easy of system of integration.
- High noise immunity and reliable data communication.
- Built in industrial grade component for operation under harsh environment.
- Simple serial interface to user data devices to built-in carrier generation and detection.
- Built-in on board AC coupling circuit with direct connection to mains.
- Multiple units can be connected to the power line of the distribution transformer.

The main objectives to satisfy the requirement of high performance advanced technology based automation system:

There are various objective requirements to design high performance advance technology base automation system. The main objectives are given as follows:

- 1) To improve the capability of fully automation.
- 2) To provide a real power information on low frequency output.
- 3) To reduce form factor for easy system of integration.
- 4) To provide a physically compact, good speed and low power consuming chip.
- 5) To improve the stability over a temperature and time.
- 6) To built in on board AC coupling circuit with direct connection to mains supply.
- 7) To improve working efficiency and provide a reliable data communication.
- 8) To reduce susceptibility impulsive noise.
- 9) To built in carrier generation and detection.
- 10) To built with industrial grade components for operation under harsh environment.
- 11) To evaluate the partial product and accumulate of shifted partial product.
- 12) To provide a real power information on the low frequency output.

Design Objectives:

The factors driving the wider acceptance of advance technology base automation system are easy of design, easy of manufacturer, easy of upgrade, multi-functionality, compactness, power efficiency, fewer discrete component and use of advance signal processing.

Easy of design. The time required to develop a marketable product is a key consideration in modern engineering design. Advanced technology base automation system reduce the design cycles for new products, freeing the designer from the hard work associated with hardware designs.

Easy of manufacture. The components are hard to standardize, and may have varying performance characteristics. Optimization of the components intern of performance may

take a significant amount of time and thereby delay product information.

Easy of upgrades: A flexible hardware like advance technology base automation system allows for improvements and additional functionality without the expense of replacing all the old units.

Multi- functioning: The reconfigurable capability of automation system can support an almost infinite variety of services in a single system.

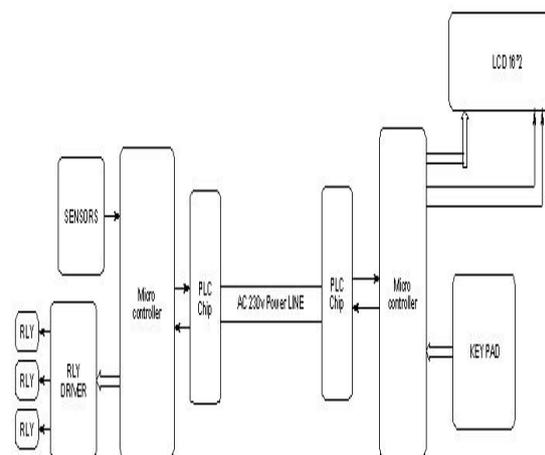
Compactness and power efficiency: The advance technology base automation system approach results in a compact and power efficient design; as the number of system increases, the same piece of hardware is reused to implement multiple system and interference.

Fewer discrete component: The design of advance technology base automation system in such a way that thereby reducing the number of components, size and cost.

Advance signal processing: The availability of high speed on board of automation system allows implementation of new hardware structure and signal processing techniques through DSPs, FPGAs and ASICs [9].

Our Proposed Model : (Advance Technology Based Automation System):

Block Diagram



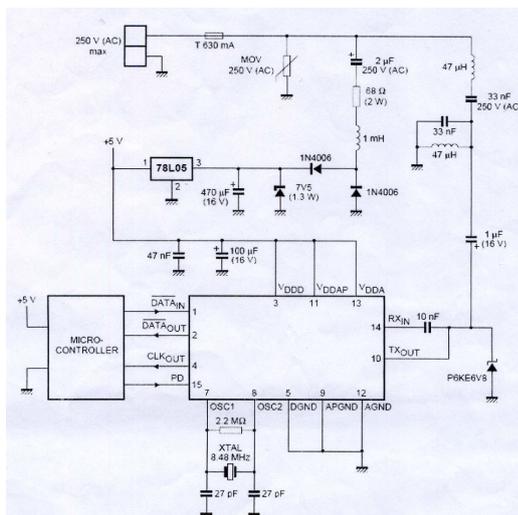
A typical block diagram of power line carrier control system used for domestic and industrial automation consists of a PC based

host station, a PLC transceiver and number of control interface units. The PC base host station with window base software is brain of advance technology base automation system can be operate independently , or it can be configured as a work station of local area network. It can also remotely control via the internet to monitor the any situation during the operation of automation system. The PLC transceiver is a communication device, supporting the communication between host station and appliance interface unit in a automation system. The appliance interfacing unit are used to control the appliance in a automation environment. The programmable controller and corresponding switch modules are configurable at the host station. You can program all the switch module over your AC wiring and you can remotely control the various appliances in automation system. An LCD screen shows the operating status of the module under control [5].

and the exact trimming of the digital filter, thus making the performance totally independent of application disturbances such as a component spread, temperature, and supply drift and so on. The interference with power network is made by means of a LC network. The device includes a power output stage able to feed a 120 dBmV (RMS) signal on a typical 30 ohm load. To reduce power consumption, the IC is disabling by a power down input (pin PD): in this mode, the on chip oscillator remains active and the clock continues to be supply at pin CLKOUT. For low power operation in reception mode, this pin can be dynamically controlled by the microcontroller (PD mode).

When the circuit is connected to an external clock generator, the clock signal must be apply at pin OSC1; OSC2 must be open. All the logic inputs and outputs are compatible with TTL/CMOS levels, providing an easy connection to a standard microcontroller I/O port. The digital part of the IC is fully scan-testable. Two digital inputs, SCANTEST and TEST1, are used for production test: these pin must be left open in functional mode (correct levels are internally defined by pull up/down resistor)[9].

Circuit Diagram



Functional Description

Both transmission and reception stages are controlled either by master clock of the microcontroller, or by the on chip reference oscillators connected to the crystal. This holds for the accuracy of the transmission carrier

Transmission Mode

The carrier frequency is generated by the scanning of a ROM memory under the control of the microcontroller clock or the reference frequency provided by the on chip oscillators, thus providing strict stability with respect to environmental conditions. High frequency clocking rejects the aliasing components to such an extent that they are filtered by the coupling LC network and do not cause any significant disturbance. The data modulation is applied through pin DATA-IN and smoothly applied by specific digital circuitry to the carrier (shaping). Harmonic components are limited in the process, thus avoiding unacceptable disturbance of the transmission channel (according to CISPR16 and EN50065-1 recommendations). A - 55 dB total harmonics distortion is reached when using the typical LC coupling network (or an equivalent filter). The D/A converter and the power stage are set in order to provided a

maximum signal level of 122 dBmV (RMS) at the output.

The output of the power stage (TX-OUT) always has to be connected to a decoupling capacitor, because of a DC level of 0.5 V_{dd} at this pin, present even when the device is not transmitting. This pin also has to be protected against overvoltage and negative transient signals. The DC level of TX-OUT can be used to bias an unipolar transient suppressor as shown in application diagram. Direct connection to the main is done through a LC network for low cost applications. However, a HF signal transformer could be used when power line insulation has to be performed[9].

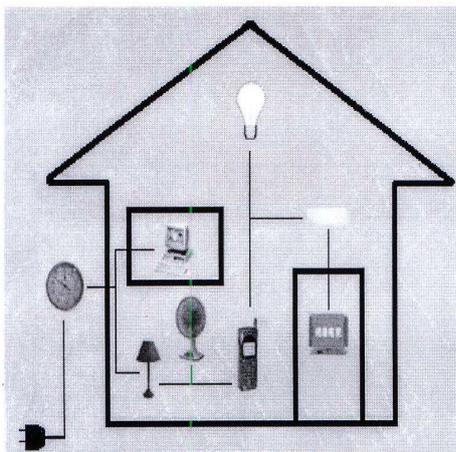
Applications of Advanced Technology Based Automation System:

The advance technology base automation system frequently occurs in

- . Home automation
- . Automatic meter reading
- . Stage light and street lighting control
- . Heating and ventilation control
- . Status monitoring control
- . Low speed data communication network
- . Intelligent building and energy meter
- . Power distribution system

Here, we try to focus home automation system

Home Automation



PC Based Host Station

The host station with the window based software is the brain of the home automation

system. It can operate independently, or it can be configured as a work station of existing local area network. It can also remotely control via the internet. Thus, you can turn on your security alarms or monitor the situation in your house even if you are on business trip overseas.

PLC Transceiver

The PLC transceiver is a communication device, supporting the communication between the host station and appliances interface units in a home automation system. It has a RS-232 or USB interface connecting to the host station end and on the other end, a PLC coupling interface connecting to the AIU via the power line.

Appliances Interface Unit

The appliances interface unit are used to control the appliances in a home automation environment. A number of application interface unit is available for different control and applications.

Programmable Controller

Plug the controller into any existing power socket and you can program it to control other module over your AC wiring. You can program all the switch module in the house in a single unit and you can remotely switch light, television, audio visual equipment and other appliances on and off with a touch of button....A handy controller in home automation. The unit comes with a key numeric keypad with ON, OFF, Dim, Bright and Status keys. The programmable controller and corresponding switch modules are configurable at the host station. An LCD screen shows the operating status of the modules under control.

CONCLUSION

The present working system is a very complex to work as automation into low frequency output through AC power line when used a communication channel exhibits a complex characteristics in multi-path propagation. This system needs a wastage of extra cable and other controlling devices, wastage time and power consumption and wastage of financial resources. The corporate

world are expected to be design an advance technology base automation system has been developed to remove the need of individual or agent to physical read consumer data and its ability increases controlling activities through AC power line[1]. However, not only must these systems provide exceptional performance, but due to the market and fiscal pressure, they must be flexible enough to allow rapid tracking of the evolving standards[9].

An advance technology base automation system is emerging as a viable solution for meeting the conflicting demands in corporate worlds. These support multi-functioning operation, allowing service providers an economics means of future-proofing their increasingly complex and costly system [8].

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