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# Industrial Automation through Wireless Remote Controller

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***Abstract:*** *Industrial automations which are mostly depend upon the power systems & which requires distance controlled and regulated systems. Wireless technology which meets to cost, speed and distance will always be a point of an interest for research. This research proposes microcontroller based wireless remote controlled for electric systems parameters like voltage and current using ZigBee technology. ATMEGA 16 microcontrollers is used, which controls the devices and sends the sensor values to the remote controller (control side) via ZigBee module. Positive point of using of ZigBee technology is its lower power consumption. So, ZigBee is generally used for 24 hours monitoring of communication transmission systems. Its main feature is its use of the ZigBee protocol as the communication medium between the transmitter and receiver modules. It illustrates that the new ZigBee standard performs well industrial environments.*

***Keywords:*** *Microcontroller; wireless control; transmitter; receiver; ZigBee.*

## I. INTRODUCTION

The goal of the paper is to achieve intelligent device control and secure environmental working conditions by interfacing various sensors and devices to the ATMEGA 16 microcontroller and ZigBee modules with the ATMEGA 16 controller for data transmission respectively. Wireless based industrial automation is a prime concern in our day-to-day life. Industrial automations depend on the power systems and which requires distance control and regulated systems. Wireless Control Networks have revolutionized the design of emerging embedded systems and triggered a new set of potential applications. In addition to building automation, environmental surveillance, or military operations Industrial automation is also expected to greatly benefit from WSNs in terms of faster installation and maintenance, cost savings, and easier plant reconfiguration. ZigBee is an emerging short-range, low rate wireless network technology. ZigBee also presents some potentially interesting features for supporting large-scale ubiquitous computing applications, namely power-efficiency, timeliness and scalability. In managing the move to wireless,

It is clear that common wireless protocols such as Wi-Fi and Bluetooth can be utilized on the factory floor. The challenge is to understand how to utilize wireless solutions, developed for IT applications, as replacements for wired systems in time-critical scenarios typical of factory floor domains. To date, most wireless systems in production systems are focused on applications that require polling frequencies on the order of seconds or longer. Standardization of technology again plays an important role for globalization of these profile developments. ZigBee due to its standardize operational and network management properties will be suitable wireless interface technique, ZigBee also have low data rates over a middle distance and properties which are again guaranteed for required communication system.

## II. BLOCK DIAGRAM

### A. Remote controller side

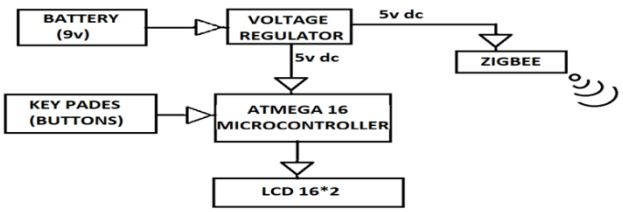


***Figure.1 Block diagram of remote controller unit***

### B. Field side

 

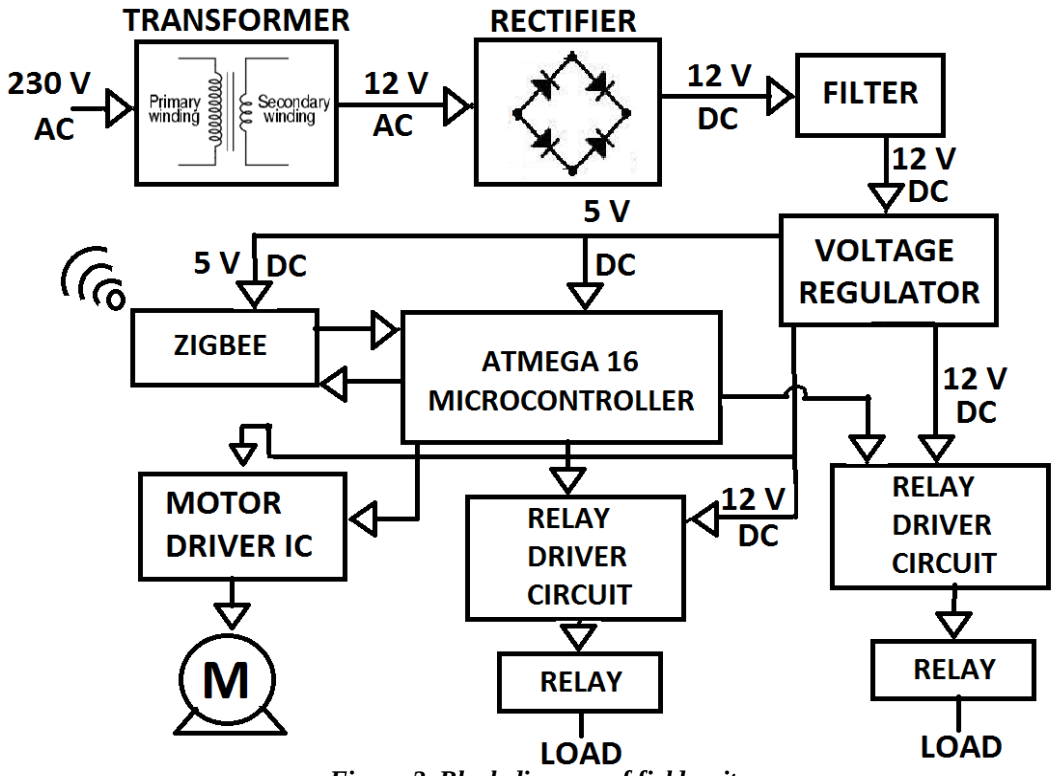


*Figure 2. Block diagram of field unit*

## III. MICROCONTROLLER

An Embedded system is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. Embedded systems are usually a part of larger, complex system. Dedicated applications, designed to execute specific activities, are implemented and embedded in systems. These embedded applications are required to collaborate with the other components of an enclosed system. Embedded application components interact mostly with the non-human external environment. They continuously collect data from sensors or other computer components and process data within real-time constraints.

Microcontrollers are "embedded" inside some other device (often a consumer product) so that they can control the features or actions of the product. Another name for a microcontroller, therefore, is "embedded controller." Microcontrollers are dedicated to one task and run one specific program. The program is stored in ROM and generally does not change. They are often low-power devices.

### A. ATMEGA 16 Microcontroller

The ATmega16A is a low-power CMOS 8-bit microcontroller based on the AtmelAVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega16A achieves throughputs approaching 1MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

 

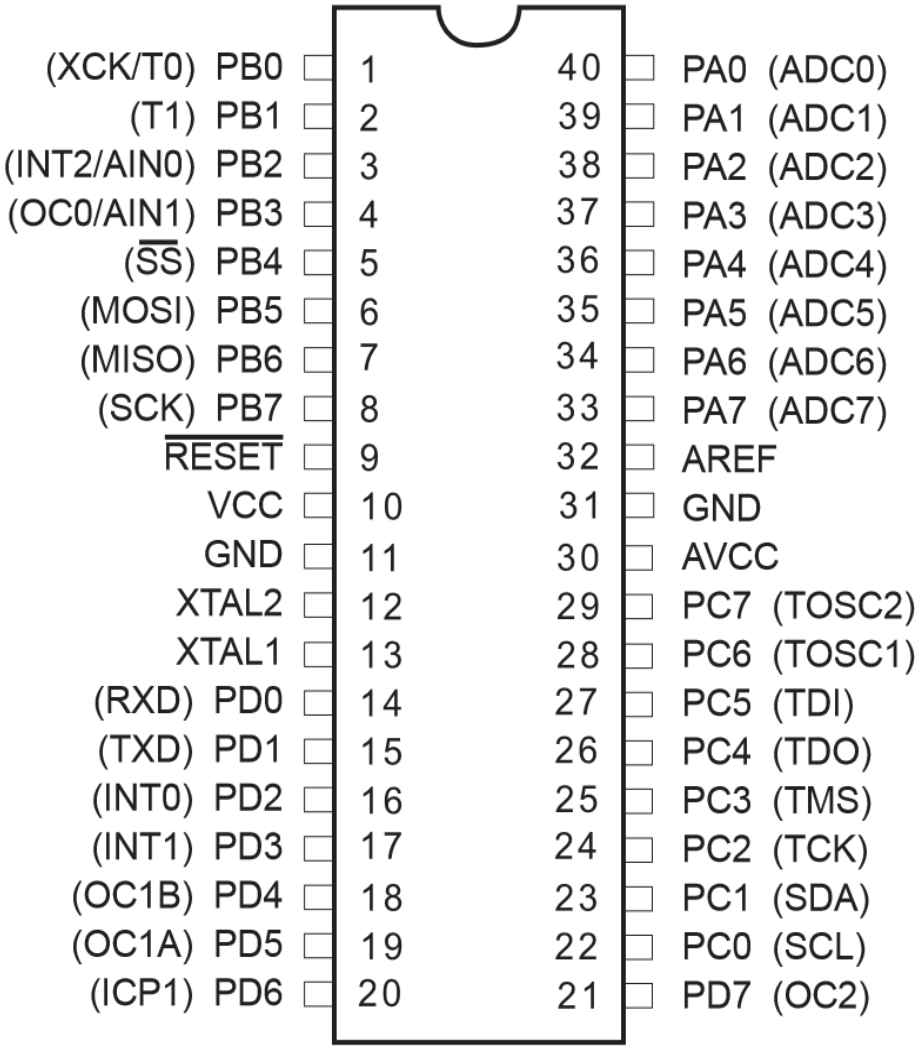


***Figure.3 Pin diagram of ATMEGA 16***

## IV. ABOUT ZIGBEE

ZigBee is the product of the ZigBee Alliance, an organization of manufacturers dedicated to developing a networking technology for small, ISM-band radios that could welcome even the simplest industrial and home end devices into wireless connectivity. The ZigBee specification was finalized in December 2004, and products supporting the ZigBee standard are just now beginning to enter the market. ZigBee is designed as a low-cost, low power, low-data rate wireless mesh technology. The ZigBee specification identifies three kinds of devices that incorporate ZigBee radios, with all three found in a typical ZigBee.

The ZigBee network layer (NWK) supports star, tree, and mesh topologies. In a star topology, the network is controlled by one single device called the ZigBee coordinator. The ZigBee coordinator is responsible for initiating and maintaining the devices on the network. All other devices, known as end devices, directly communicate with the ZigBee coordinator. In mesh and tree topologies, the ZigBee coordinator is responsible for starting the network and for choosing certain key network parameters, but the network may be extended through the use of ZigBee routers. In tree networks, routers move data and control messages through the network using a hierarchical routing strategy.

## V. Circuit diagram

 

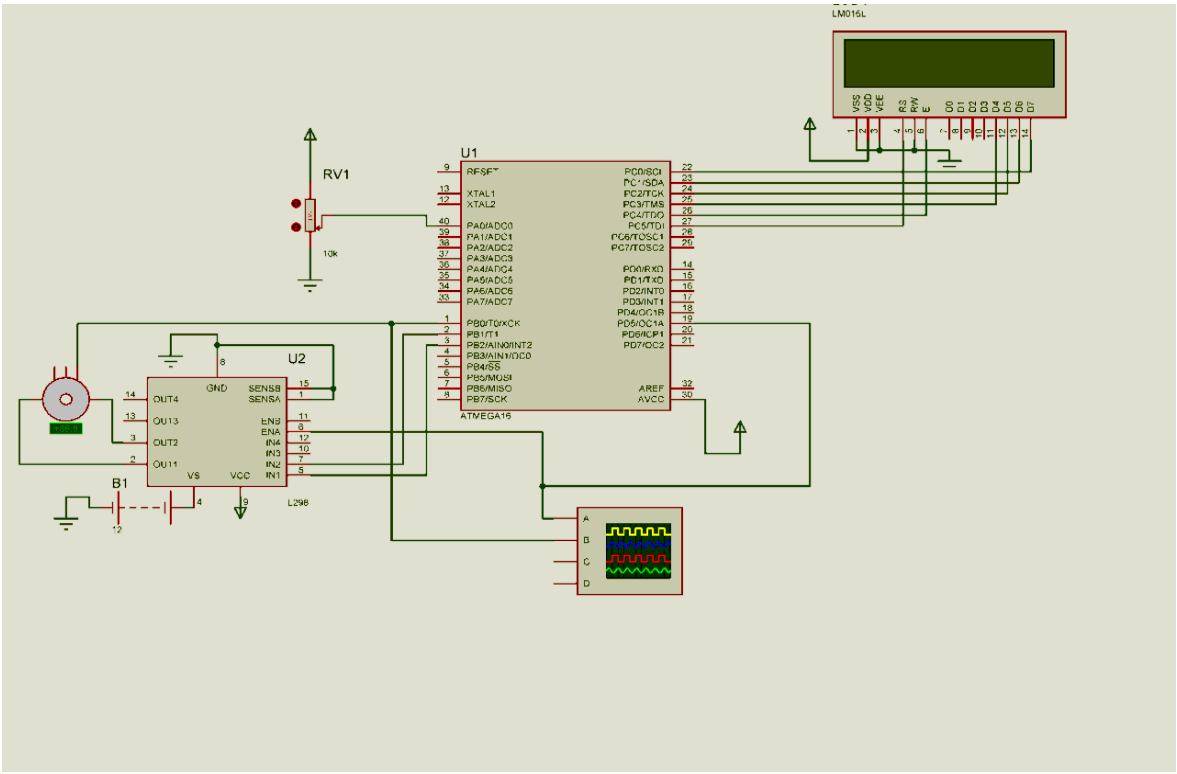


*Figure 4. Circuit Diagram in proteus*

## VI. Construction and discussion

The following figures are shown for design and construction of microcontroller based wireless remote controlled industrial electrical appliances using ZigBee technology for industrial automation.

### A. Construction Diagram

The following figures are shown for the construction of research.

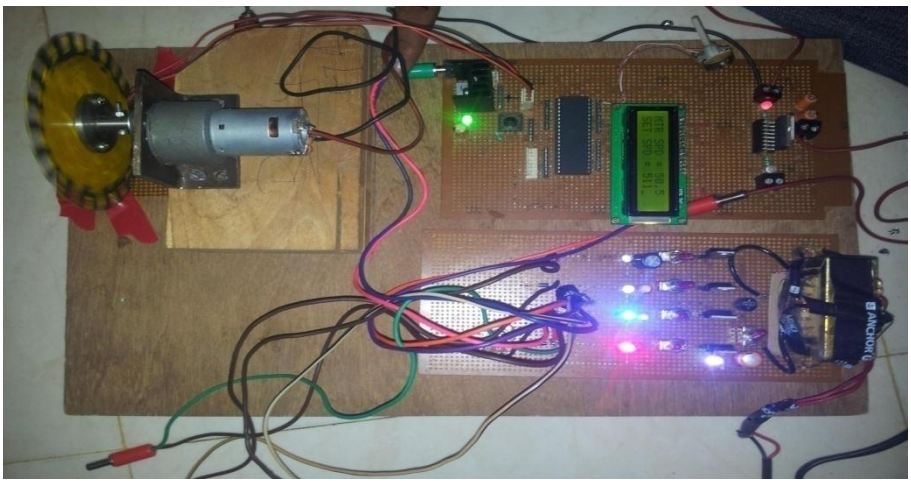

*Figure 5 Hardware ofProject*

## VII. CONCLUSION

Industrial automation with high degree of quality may be achieved using this project. Multiple devices may be connected and controlled with the help of single remote. Considering the dynamic market this project can provide a way to design intelligent and low-cost industrial automation systems to improve the productivity and efficiency of the systems. Traditionally, industrial automation systems are realized through wired communications.

However, the wired automation systems require expensive communication cables to be installed and regularly maintained, and thus, they are not widely implemented in industrial plants because of their high cost.In this design, the ZigBee provide low power consumption, low cost and simple wireless communication to allow remote control and

 

current measurement of industrial outlets in order to save power. ZigBee technology is suitable for the application in power monitoring system. It can provide reliable protection for the operation of electric power systems. The system is small, simple, cost effective and good for wireless control of equipment.

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