Microcontroller Based Automatic Phase Changer by using Zigbee

[1]Anbuchezhian.P [2]Dr.R.Sankarganesh [3]Dr.P.Selvam

1 M.E Student, 2 Research Guide 3 Head of the Department
Department of Electrical And Electronics Engineering
Vinayaka Missions Research Foundation, Salem

Abstract

Every system is automated in order to look latest challenges in the modern day situation. Automated systems have the reliabilities, flexibilities are high and precise because less manual operation so that each field desires automated control system. Particularly in the field of electrical and electronics automated systems are responsibility of superior performance. Now a day in electrical field, they change one phase (three phases) to other phase (single phase) manually. If there is low down voltage in any two phases and want to change over the phase from three phases into single phase automatically. So we proposed a system, which solve this problem and used to monitor and change over the phase by using wireless technology. This paper Embedded based automatic phase change and monitoring by using ZIGBEE maintain security, provide high reliability and are susceptible to a lot of error. The system has transmitter and receiver section which are controlled by microcontroller. The communications between those sections are made by ZIGBEE transmitter and receiver section. The present monitored phase is displayed in PC. If there is low voltage in any two phases and want to change over the phase from three phases into single phase automatically.

I. INTRODUCION

In 21st century, world is full of automation and it is the instance we should consider of microcontroller to manage. All automatic controllers like remote controller, handheld communication devices, automatic and semi-automatic machine, automobile signifying and measuring instruments have automation application. The project described at this time being also a microcontroller based embedded used for automatic phase changer. In this project, microcontroller is used to accumulate the data, process data and change data according to the user requirement. There are different types of microcontroller offered in market. The examples are Intel MCS-8051, PIC16

Family by microchip, Atmel 89cxx, 89cxx51. The microcontroller make use of this project is PIC16F877A. Now a day, several times out of three phases one of the phase cuts off manually. The day to day life of human being, the circumstances which occur due to power instability issues we decided to design such a system which would overcome this issue eventually and aid to reduce human efforts too. Secondly in order to overcome the various phase change issue and avoid damages. We can change the phase automatically and monitor the present phase electrical line through wireless sensor networks (WSN) provide self organization and local processing capability and will be displayed in PC (own Computer). ZIGBEE network is used at this point. These permit the configuration of a great network of sensors in different industrial segments. In evaluation with the other standards such as WI-FI and Bluetooth, the ZIGBEE standard has advantages related to power consumption, low cost and scalability. In our project, low voltage of phase is varied through potentiometer and then the results are displayed in LCD (Liquid Crystal Display).
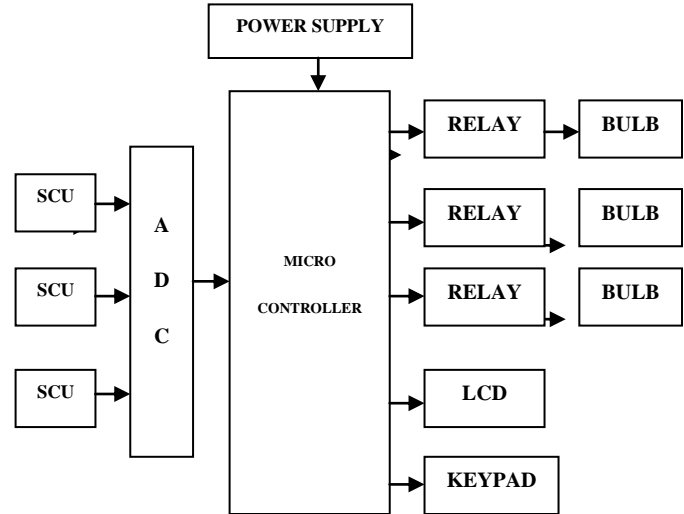
II. EXISTING SYSTEM

Fig 1: block diagram for existing system

In our daily life our focus was to modify the system which can minimize the circumstances in person life. So our thought of automatic phase changer was selected. This can be used in three phase application. In three phases equipments, if supply voltage is low in any one of the phase and you if you wish to run all the equipment properly. This equipment will assist you to save this situation. Still proper rating fuse need to be used in three phases i.e. R, Y, and B inputs lines. There the proper voltage is available that time. Other low voltage phase moves to correct voltage in equal manner, to run all the tools on the single phase in the building. The circuit consist of relay comparator, transformer.

III. PROPOSED SYSTEM

In our proposed a system, if there is short voltage in any two phases of three phases supply and want to change over the phase from three phases into single phase automatically. Our system used to monitor and change over the phase by using wireless technology. The automatic phase change and monitor the present phase electrical line through wireless sensor networks provide self organization and local processing capability and will be displayed in Personal Computer. The communications between transmitter and receiver section in the system are made by ZIGBEE transmitter and receiver. The present monitored phase is displayed in PC. MATLAB code is used to create Graphical user interface application in our personal computer. It is used to display the present phase in electrical line on laptop or computer and we can change the phase by using this GUI and ZIGBEE.
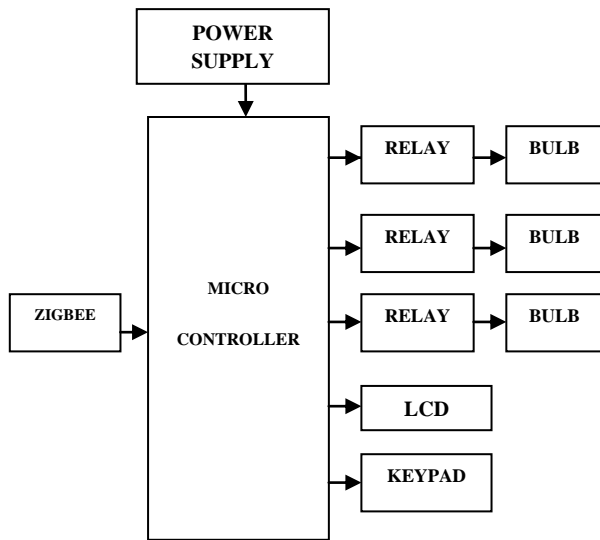
IV. WORKING PRINCIPLE

Fig 2: block diagram for proposed system

Fig 3: block diagram for proposed system

There are three different inputs & each phase has different transformers. Step down transformer used to decrease the voltage from 230v to 12v. Pot is used as a voltage divider which is given to ADC so that the voltage limit should be 0 to 5v. All three phases are same but we can vary the calibration by using the Pot. The ZIGBEE is used to wirelesses monitoring the phase present in the system and provide control signal to the microcontroller. In our system, Two ZIGBEE is used for Wireless communication. One ZIGBEE connect on hardware and other one is connected with PIC microcontroller's Transmitter/Receiver pin. Another ZIGBEE is connected to computer using USB cable.

When any parameter received by ZIGBEE goes beyond set value. MATLAB software used to monitor the phase present in electrical line. GUI (Graphical user interface) is created by using MATLAB code. which is given to microcontroller and then microcontroller decides whether which phase is off & it is display on LCD. The present monitored phase is displayed in PC.

V. HARDWARE DESCRIPTION
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A. Power supply

The major function of a power supply is used to convert the ac voltage from step down transformer to dc voltage by using bridge rectifier circuit. The voltage regulator gives regulated 5v and 12v to the microcontroller and relay. This consist step down transformer, bridge rectifier, and voltage regulator.
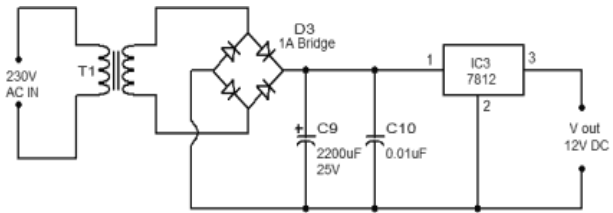

Fig 4: Circuit Diagram of Power Supply

B. Pic microcontroller

The PIC16F877A is one of the latest products from Microchip. The PIC primarily referred to peripheral interface controller. Then it is called programmable intelligent computer

The PIC microcontroller has 40 Pin. In which 33 pins are GPIO Pin. The GPIO pins are divided into 5 Port. They are Port A, Port B, Port C, Port D and Port

E. the oscillator frequency of PIC microcontroller is 0-20 Mhz. The operating voltage of PIC microcontroller is 5v dc. They have inbuilt hardware like I2C, SPI etc.

The 16F7877A is a capable microcontroller that can do many tasks because it has large programmable memory 8K in words and 365 Bytes of RAM. This is enough memory to do all the programs in different projects. The main advantage of the microcontroller is easy to write and erase as many times as possible because it use FLASH memory technology.

C. Lcd display

LCD is used to display the phase present in the system. In our system two 2x16 LCD is used. In which two rows and 16 characters per row we can display.16 pins are presented in the LCD display. They divided into three categories they are power supply pin, control pin, data pin.

It is an electronic display module and finds a wide range of applications. A 16x2 LCD display is a very basic module and it is very commonly used in various devices and circuits. These are preferred in seven segments.

LCD are easily programmable, it is economical and no limitations for display. It has two registers command and data. The command instructions store command instructions given to an LCD. The data register stores the data to be displayed in LCD. The ASCII value is to be displayed in a screen.
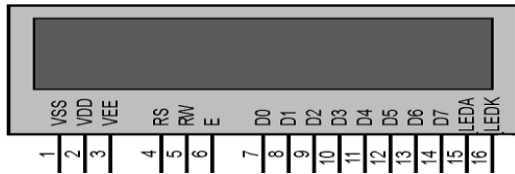

Fig 5: Schematic view of 16 x 2 LCD display

D. Uart

UART is universal asynchronous receiver and transmitter. That is a part of computer hardware. This is used to data transmission from computer to the microcontroller. A UART is inbuilt into the PIC16F877A microcontroller. A UART is usually an individual (or part of an) integrated circuit used for serial communications over a computer or peripheral device serial port.

E. Max 232

The MAX232 is a 16 pin integrated circuit, first formed by (MIP) Maxim Integrated Products. This is used to stabilize the voltage insaturation to the computer and microcontroller.which act as a voltage stabilizer.
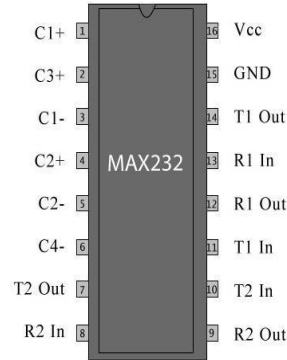

Fig 6: Pin diagram of MAX232

Applications

- Communicating with a PCs serial interface
- Serial communication
- Used to provide data transfer between any transmitters to system
- It also supports RTS, CTS mechanism.

F. Zigbee transciever

ZIGBEE is a requirement of a set of high level communication procedure using small, short power digital radios based on the IEEE 802.15.4-2003 standard for wireless personal area networks. The ZIGBEE standard has advantages related to energy consumption, low cost and scalability.

G. Relay

A relay is a electromagnetic switch. Operating voltage of relay is 12v dc. The coil and switched contact is present in the relay inner part. The current flow through the coil whenever the electromagnetic force generated around the coil. By using this EMF contact is tripper from normally closed to the normally open.

VI. RESULT

A. Hardware output

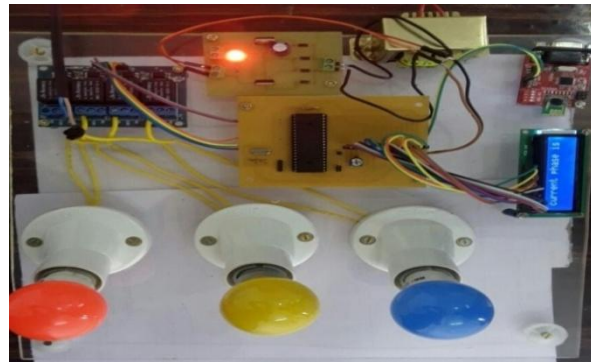The phase can be changed automatically and monitor the present phase line in LCD.

Fig 7: hardware output result

VII. CONCLUSION

Thus the proposed system for ZIGBEE based automatic phase changer, which is used to change over and monitoring phase by using wireless technology. Relay driver unit is used to change over the phase if the low voltage present in any phase condition exists. The low voltage of phase is varied through potentiometer and then the results are displayed in LCD (Liquid Crystal Display). The designs of the system maintain better security, provide high reliability and are susceptible to many faults. The software simulations are done by using Proteus 8 software and MATLAB for the phase monitoring and change over the phase.

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