

Electrical parameters monitoring and controlling using wireless Bluetooth Based MATLAB

Ananthoju Karthik¹, Maduri Praveen reddy², Pasula Akhil³, Pasula Nikhil⁴, CH.Rajasri⁵

(EEE Students ^{1,2,3,4}, Assistant professor⁵)

Department of Electrical and Electronics Engineering, Hyderabad Institute of Technology and Management
Dundigal – 500 043, Hyderabad, Telangana State

Abstract:

This project aims at building an efficient and automatic power survey system, which is capable of monitoring the electrical parameters such as voltage, current, temperature, frequency of high voltage devices, which are present in real time industrial environment. This project consists of a PIC microcontroller dedicated at electric parameters monitoring section. The controller at this display unit is also interfaced with a Bluetooth module. The Bluetooth connected to PC with MATLAB continuously receives the information and stored into the notepad.

Keywords:

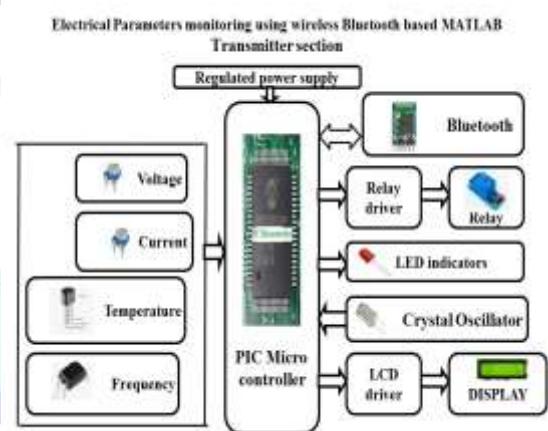
PIC Microcontroller, Bluetooth modules, Voltage sensor, Current Sensor, Frequency Sensors, Temperature Sensor, LCD display, MATLAB

1. Existing system:

In existing system electrical parameters such as voltage, current, temperature, frequency sensors, LCD module and buzzer is fed as input to the microcontroller. The microcontroller continuously read the data from sensors and monitor this data on LCD display. And also if the parameters values exceed threshold value then the microcontroller give the audible alerts through buzzer.

The main drawback of this existing system is there is no circuit break operation in this; so if the parameters data is exceed threshold value the devices are damaged which is connected to this system. To overcome this problem we developed a proposed system with circuit breaker and wireless communication Bluetooth along with parameters data plot on MATLAB.

2. proposed system:



Block Diagram of Electrical parameters monitoring and controlling using wireless Bluetooth based MATLAB

The main controlling device of the whole system is a Microcontroller. The proposed system monitoring the electrical parameters such as voltage, current, temperature, frequency. The controller at this display unit is also interfaced with a Bluetooth module. The Bluetooth connected to PC with MATLAB continuously receives the information and stored into the NOTEPAD along with date and time. And the system continuously read the data from electrical sensors and the system break the circuit through relay if the sensor data exceed threshold value. By using this project we reduce the damage of high voltage devices.

To perform this intelligent task, Microcontroller is loaded with an intelligent program written using embedded 'C' language.

The brief introduction of different modules used in this project is discussed below:

The PIC16F873 family of microcontrollers is based upon Microchip's Mid-Range core with an 8 level deep hardware stack and 35 instructions. These MCUs provide up to 5 MIPS, 3.5 Kbytes program memory, 128 bytes RAM and EEPROM of 64 bytes.

RAM	192
Memory Type	Flash
Program Memory K Bytes	7
I/O Pins	22
Pin count	28
Max. CPU Speed MHz	20
Timers :	2 - 8-bit & 1 - 16-bit
Temperature Range	-40 to 125

Diagram of the sensor module showing three pins: 2.7-5.5V in, Analog voltage out, and Ground.

The LM35 series are precision integrated-circuit LM35 temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 sensor thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to

3.3 Voltage sensor:

3.4 current sensor:

In the project we have made use of a potentiometer in place of a current sensor. A potentiometer (colloquially known as a "pot") is a three-terminal resistor with a sliding contact that forms an adjustable voltage divider. It is a measuring device which measures the voltage or current at the output by comparing it with the known input voltage. Varying the input current is a difficult process and requires advanced equipment's. In the potentiometer the input is fixed at some maximum and minimum value. By

turning the notch of the potentiometer the output current is varied, whenever the output current exceeds the bounds it indicates the occurrence of fault. After the fault is indicated the microcontroller gives trip signals to the relay which in turn operates the circuit breaker. In real time applications a potentiometer cannot be used, a current transformer should be used.

3.5 FREQUENCY:

In this project we are using optocoupler to measure the frequency.

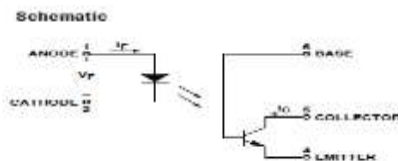


Fig: schematic of optocoupler

An opto-isolator contains a source (emitter) of light, almost always a near infrared light-emitting diode (LED), that converts electrical input signal into light, a closed optical channel (also called di electrical channel), and a photo sensor, which detects incoming light and either generates electric energy directly, or modulates electric current flowing from an external power supply.

3.6. Relay:



Relay is an electromagnetic switch. . It consists of a coil of wire surrounding a soft iron core, an iron yoke, which provides a low reluctance path for magnetic flux, a movable iron armature, and a set, or sets, of contacts; two in the relay pictured. The armature is hinged to the yoke and mechanically linked to a moving contact or contacts.

When an electric current is passed through the coil, the resulting magnetic field attracts the armature and the consequent movement of the movable contact or contacts either makes or breaks a connection with a fixed contact.

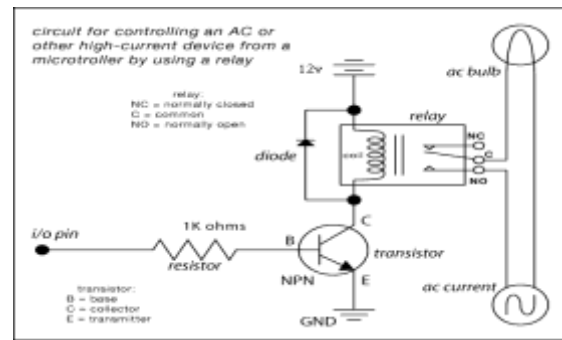


Fig: Relay circuit

In this project we are using relay to break the circuit when the sensor data exceed threshold value using microcontroller.

3.7 LCD display:

Liquid crystal display is very important device in embedded system. It offers high flexibility to user as he can display the required data on it. In this project LCD display is connected to the PIC microcontroller to display the status of the project and sensor data.

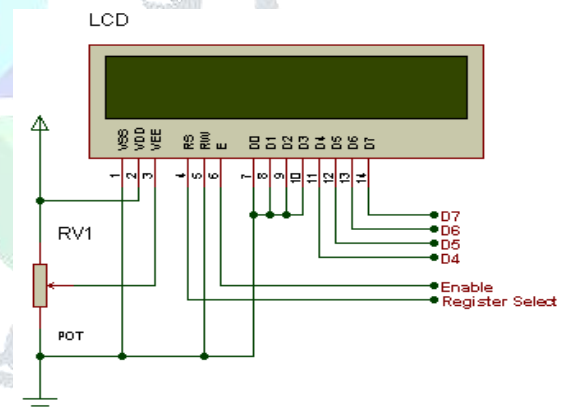


Fig: LCD display

3.8 HC-05 Bluetooth module:

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. In this project we are using two Bluetooth modules, one is connected to the pic microcontroller section and second one is connected at PC section for sending and receiving data of electrical parameters.

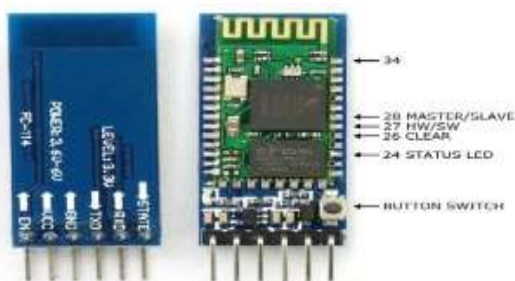


Fig: HC-05 Bluetooth module

3.9 MATLAB SOFTWARE:

MATLAB (matrix laboratory) is a computing numerical environment and fourth generation programming language. Developed by Math works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and FORTRAN.

In this project we are using 2018 version MATLAB software to store the electrical parameters data into the NOTEPAD along with date and time.

4. CONCLUSION:

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

5. ACKNOWLEDGEMENT

We would like to thank all the authors of different research papers referred during writing this paper. It was very knowledge gaining and helpful for the further research to be done in future.

6. RESULTS:

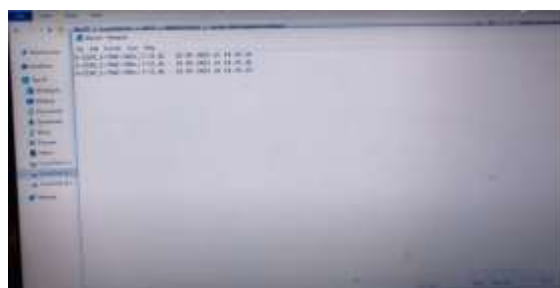


Fig: 7.1 parameters data stored into the notepad using MATLAB



Fig: 7.1 High voltage alerts



Fig: Voltage, current, temperature, frequency monitoring on LCD display.



Fig: circuit break.

REFERENCES:

1. Sungmo Jung, Jae-gu Song, Seoksoo Kim, "Design on SCADA Test-bed and Security Device," International Journal of Multimedia and Ubiquitous Engineering, Vol. 3, No. 4, October, 2008
2. Sandip C.Patel, Pritimoy Sanyal "Securing SCADA System" Information Management & Computer Security Journal Volume: 16 Issue: 4 Page: 398 – 414 Year: 2008
3. Gumbo, S, Muyingi, H, "Development of a web based interface for remote monitoring of a Long-distance power transmission overhead line", SATNAC 2007, Sugar Beach Resort, Mauritius, ISBN 978 0 620 39351 5
4. <http://www.embedtronics.com>. online details of frame format of NOKIA
5. Surve, V, 2006, "A wireless Communication Device for Short Messages", Masters Thesis, Available: www.certec.lth.se/doc/awireless.pdf.

6. Das, AN, Lewis, FL, Popa, DO, 2006, "Data-logging and Supervisory Control in Wireless Sensor Networks," Proceeding of the Seventh ACIS International Conference on Software Engineering, Artificial Intelligence, networking, and Parallel/Distributed Computing (SNPD'06), Volume 00, ISBN:0-7695-2611-X, pp 330- 338
7. Hildick-Smith, Andrew, "Security for Critical Infrastructure SCADA Systems," (SANS Reading Room, GSEC Practical Assignment, Version 1.4c, Option 1, February 2005), http://www.sans.org/reading_room/whitepapers/warfare/1644.php
8. Carlson, Rolf E. and Jeffrey E. Dagle, Shabbir A. Shamsuddin, Robert P. Evans, "A Summary of Control System Security Standards Activities in the Energy Sector," Department of Energy Office of Electricity Delivery and Energy Reliability, 66 National SCADA Test Bed, October 2005, http://www.sandia.gov/scada/documents/CISSWG_Report_1_Final.pdf
9. Technical Information Bulletin 04-1, Supervisory Control and Data Acquisition (SCADA) Systems, NCS TIB 04-1, Oct. 2004
10. I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "A Survey on Sensor Networks," IEEE Dr. Aditya Goel & Ravi Shankar Mishra International Journal of Engineering (IJE), Volume (3) : Issue (1) 65 Communications Magazine, Vol. 40, No. 8, pp. 102-114, August 2002; receives the IEEE Communications Society 2003 Best Tutorial Paper Award, April 2003.