

Wireless Data Access and Supervisory Control System

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Abstract: The analog and continuous time signals measured by the sensor and modified by the signal conditioning circuitry must convert into the form a computer can understand. This is what is referred to here as data acquisition. The continuous analog voltages could be directly used to control the analog mechanism. However, deals specifically with the sampling and quantization techniques for using the information from the user to control a digital computer. The effects of such a process on the waveform received from the signal conditioning circuitry must be clearly understood in order to design the best possible computer controller for the given application. Data acquisition is the sampling of the real world to generate data that can be manipulated by a computer, data acquisition typically involves acquisition of signals and waveforms and processing the signals to obtain desired information. The components of data acquisition systems include appropriate sensors that convert any measurement parameter to an electrical signal, then conditioning the electrical signal, which can then be acquired by data acquisition hardware.

This paper acquires two real world signals namely temperature and light intensity and passes on these information through wireless to a facility which has better human accessibility and processing capability. The application of this paper is in places where analog parameters of the surroundings have to be remotely acquired, monitored and controlled.

Keywords: Data Acquisition, Missile storage, hyper terminal, wireless technology, and Real time display

1. INTRODUCTION

Data acquisition typically involves acquisition of signals and waveforms and processing the signals to obtain desired information. Data acquisition is the sampling of the real world to generate data that can be manipulated by a computer. Sometimes abbreviated DAQ or DAS, The components of data acquisition systems include appropriate sensors that convert any measurement parameter to an electrical signal, then conditioning the electrical signal, which can then be acquired by data acquisition hardware.

The software part is made of the data acquisition logic and the analysis software. An example: Data logging carried out by a data acquisition system (DAS), can be used to measure parameters such as temperature, light, fire and humidity in nuclear storage facility; the measurement data are then stored for analysis.

Acquired data are displayed, analyzed, and stored on a computer, either using vendor supplied software, or custom displays and control can be developed using various general purpose programming languages such as BASIC, C, FORTRAN, Java, Lisp, Pascal. Specialized programming languages used for data acquisition include EPICS, used to build large-scale data acquisition systems, Visual basics, which offer a graphical programming environment optimized for data acquisition.

2. OVERVIEW

2.1. General Block Diagram

The main aim of the paper is to monitor the temperature, light intensity in a missile storage room using wireless and an auxiliary wired communication. The Figure 1 shows the general block diagram of the system.

DAS acquires data around the room using sensors and it sends to control module, where we can view on the LCD or hyper terminal of the computer. Communication designed

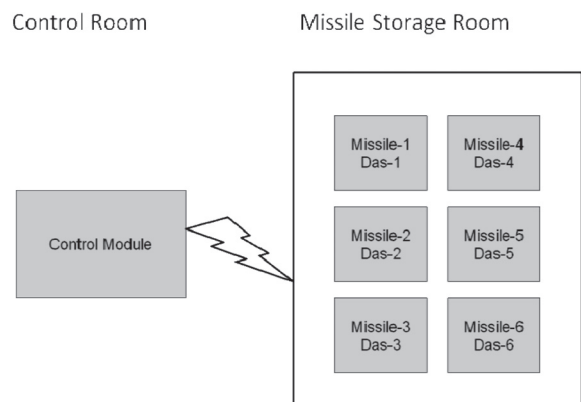


Figure 1: General Block Diagram

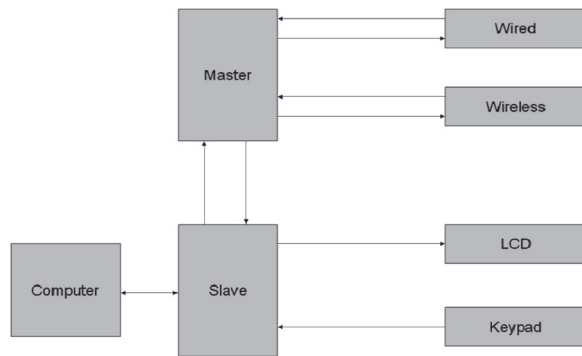


Figure 2: Control Module

is meant for wireless as our system is used in confined places in case of failure in wireless it can communicate also by means of wired communication using RS 485 protocol.

2.2. Control Module

The control module is the heart of our system. We can access all the DAS systems placed in the confined room by just selecting a particular DAS and we can view values. The Figure 2 shows the general block diagram of the control module. Control module has two microcontrollers a master and a slave. These two will communicate with serial peripheral interface called as SPI interface. Master is connected to the wireless and wired communication part. Slave is connected to the LCD, keypad and hyper terminal of computer. Master receives the values of the DAS, by SPI interface it is sent to slave, and hence it is displayed on LCD and hyper terminal of the computer.

As soon as the system is switched on, it asks for the password by typing correct password only one can get into the system. Further, it starts displaying the values of the temperature and light intensity on the LCD and hyper terminal of the computer. If there is any temperature or light intensity values cross the threshold a buzzer gives an alarm and it is switched off automatically only if values are under permissible limit. If there is any failure in wireless communication, values can be viewed by connecting wired communication manually.

2.3. Data acquisition System Module

The data acquisition system is the sensory module of the system in which sensors are mounted. This module is kept in the confined room and this is the module which acquires the data. The Figure 3 shows the general block diagram of the system.

Data acquisition system consists of microcontroller, sensors, ADC and a communication part. Sensors used are very sensitive and respond to the changes in the environment. Sensors, which are transducers, give out real time voltage values corresponding to the real world analog signals. The ADC samples these analog signals at a very high rate and feeds it to the controller. The ADC is an

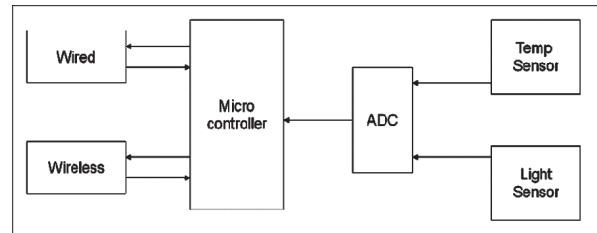


Figure 3: Data Acquisition System Module

8-channel, 8-bit IC with the channel selection controlled by three select lines from the controller. Only two of the 8-channels are used, one each for the temperature and light.

The controller forms packet containing the DAS address, temperature, light value, trail byte and sends it through its serial port and through RF module.

3. TEST RESULTS

The setup-both the modules can be kept at a distance of 10 feet for accurate reception.

Nomenclature-t-Temperature in degrees, l-Relative light intensity.

For daylight room light intensity, the system is programmed to show 20%-30%.

For absolute darkness it shows as 0%-10%. For a high intensity torch light it is 90%.

For intensities above 90%, the software is programmed to show a constant value of 90%.

The below screenshot shows the real time display of data on the computer screen on the windows function "hyper terminal". The top circled portion shows the sudden increase of light intensity when a torch is switched on. At this very instant an indicator LED is switched on the DAS board, indicating the crossing of the threshold value.

The temperature values can be seen to vary gradually from the room temperature of 28 deg, when a heated solder gun is kept in the vicinity of the temperature sensor. The bottom circled portion shows the crossing of the temperature limit. At this moment a different LED on the DAS board is switched on which remains on till the value comes below threshold. Also a buzzer is on the control module is switched on.

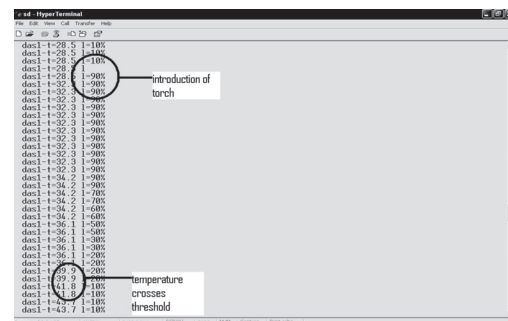


Figure 4: Screenshot of Real Time Display of Data

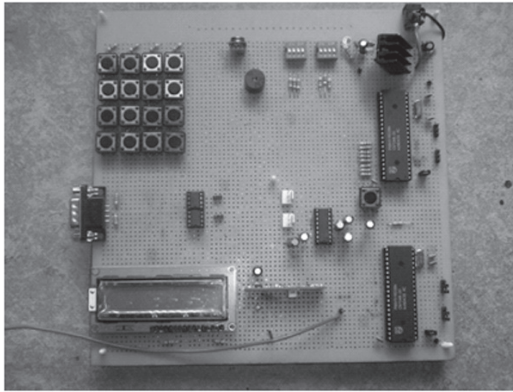


Figure 5: Prototype of Control Module

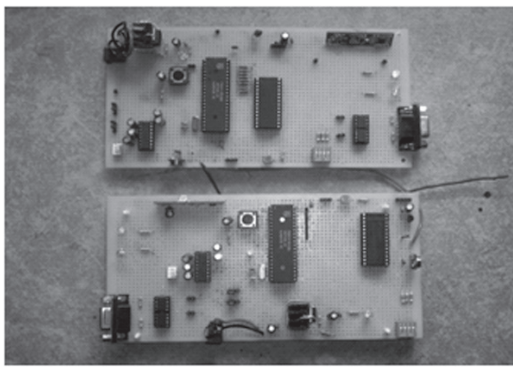


Figure 6: Prototype of Data Acquisition System

4. CONCLUSION AND FUTURE ENHANCEMENT

- The DAS module and efficient the temperature range can be measured from 2 degrees to 150 degrees for the given configurations.
 - Variation in light intensity can be detected from absolute darkness to a high intensity torch light.
 - Stand by wired communication is used in case of RF link failure. Hence the communication is reliable.
 - This paper finds application in missile storage and nuclear reactor where analog sensory inputs from confined compartments are required.
- More controlling options can be given at the operators end and hence make the data transfer more bidirectional. The processing capabilities of the controller can be utilized to the maximum so that all firmware can run parallel. Also interrupt mechanisms can be used. This paper can be upgraded to handle more DAS modules and higher number of analog inputs. Also the wireless technology can be upgraded to support higher data rates.

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