Wireless Secured Real Time Supervision and Controlling For Industrial Utility

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Abstract— This paper is to represent an Embedded communication system developed to be used in any kind of industry who cannot spend more amount on their monitoring & data logging assets . The system having a master and several slave modules is the idea behind this work with introduction to online data logging mechanism simultaneous to the wireless communication for monitoring. The master is having a LCD display to indicate all real time parameters received through the communicating nodes, and also having alarm system whenever the process value crosses the safe line. In the slave node the transducers are connected to the wireless network via microcontroller, the microcontroller is interfaced with micro-SD card for onsite data logging and report generation purpose. Industrial parameters like Temperature, Pressure Level of Liquid etc., are converted to electrical parameters like voltage and current. This electrical signal is processed at the node itself and an actual value is generated. This is then processed in the microcontroller and the same is stored in the node memory space with the real time stamp, simultaneously the data processed is communicated to the wireless network and displayed on the LCD display board with the current time displayed on the same display unit..

Keywords— Real time data logging, supervisory control, online monitoring, low cost monitoring system, non-wire scada, time stamping, universal data logger

INTRODUCTION

The proposed supervisory and control system is an integrated system that is intended to allow the operators to monitor and control any industrial utility with data logging. It is very much essential in case of some industrial as well as experimental setup to monitor as well as control process parameters continuously in real time. Monitoring and controlling physical parameters by embedded systems using microcontrollers are very much effective in industrial and research oriented requirements.

The purpose of this work is to explore the possibility to continuously monitor parameter variations. This Project consists of industrial parameters monitoring and controlling. This unit or system can be installed in a room or in any industry where we need to monitor and control these variables. This work consists of two basic modules. First is the master situated at the control room and in access to the staff, the second is the remote node present the site having sensors and transducers interfaced at the microcontroller with micro-SD card for data logging.
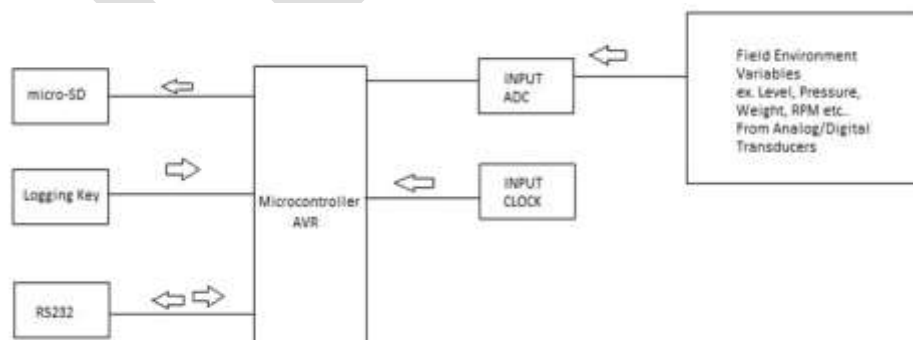

Fig. 1 : Remote Node

Various sensors are used to acquire the atmospheric data or the values of process parameters like pressure, temperature etc., which are connected to ADC of the ATMEGA32 microcontroller. Process parameters at the site are converted to electrical signals using transducers and sensors. The transducers used are pressure transducer, level sensor, load cell and RTD.

The supervisory and controlling mechanism implemented in this work is totally a low cost solution. The data inside remote node is stored locally in the micro-SD card for report generation and production chart purpose. The System is also equipped with necessary hardware to initiate control action for process parameters as soon as they reach higher than some particular set values. The result obtain from the project shows that the process parameters are logged with real time stamp and monitored as well as controlled effectively and more accurately.

DESIGN REQUIREMENTS AND SYSTEM ARCHITECTURE

Following design requirements were proposed to be met by the system.

- Compatible to any kind of industry process application having RF communication access area.
- Able to monitor remote site process in real time and the data should be logged into local memory as well as displayed on the LCD monitor present with the operator.
- Wireless data communication with each node avoiding the use of additional cables.
- Able to monitor as well as control all the parameters associated with the process.
- Support of a simple configuration mechanism to set time and date on hyper-terminal on a computer for easy user access.
- Low cost and simple to add and remove any new old parameter as per the process.

DATA LOGGING MECHANISM

The data logging system is developed using I2C bus IC DS1307 with standby battery interfaced to store and manage the date and time provided at the time of configuration process. This work consists of two basic modules. First is the master situated at the control room and in access to the staff, the second is the remote node, present the site having sensors and transducers interfaced at the microcontroller with micro-SD card for data logging. The circuit is shown below
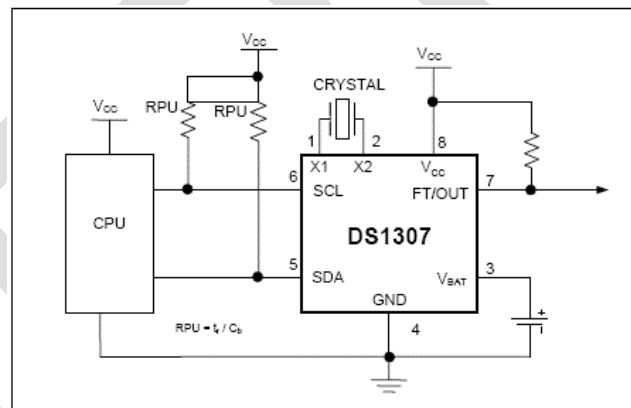

Fig. 2 : IC DS1307 - I2C

WIRELESS COMMUNICATION

In this work, we have used CC2500 as a RF communication transceiver, CC2500 is wireless transmitter receiver developed by Texas instruments which is used in 2400-2483.5 MHz ISM/SRD band systems. The input present at PORTA i.e. the ADC port of remote node atmega32 is transmitted wirelessly to the monitor atmega32. The CC2500 RF module is a low-cost 2.4 GHz transceiver used in very low power wireless applications. The RF transceiver is integrated with a highly configurable baseband modem. It support OOK, 2-FSK, GFSK, and MSK modulations. It works in voltage range of 1.8 - 3.6V. Two AA batteries are ENOUGH TO POWER IT. IT HAS 30Mrange with onboard antenna. It is always used with microcontroller having SPI communication support
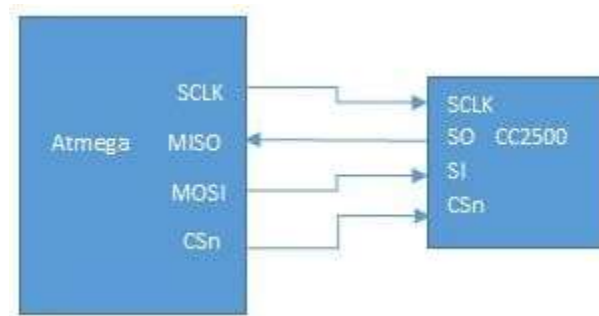
Fig. 3 : Atmega and CC2500 Connections

TRANSDUCERS INTERFACED

The system comprises of various sensors are used to acquire the atmospheric data or the values of process parameters like pressure, temperature etc., which are connected to ADC of the ATMEGA32 microcontroller. Process parameters at the site are converted to electrical signals using transducers and sensors. The transducers used are pressure transducer, level sensor, load cell, Ultrasonic distance sensor and RTD. The system is also having the ability to interface with any kind of process parameter sensors.

CONCLUSIONS

The work done in this system is just the initial step towards making the industry monitoring and control, wireless and a low cost solution, this system can also be upgraded to suit any type of application other than industrial utility such as home automation system and can be used with the wireless area network just by replacing the RF transceiver with a Wifi module.

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