International Journal of Research Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 03 Issue 5
March 2016

Wireless temperature monitoring system using RF communication for WSN Applications

Muralidhar.G[1], R Vyshnavi[2]

[1] B. Tech Scholar, Department of Electronics and Communication Engineering, Siddhartha Institute of Engineering and Technology, Vinobha Nagar, Ibrahimpatnam, Hyderabad, Telangana 501506.

[2] Asst. Prof., Department of Electronics and Communication Engineering, Siddhartha Institute of Engineering and Technology, Vinobha Nagar, Ibrahimpatnam, Hyderabad, Telangana 501506.

Abstract- This Project describes a design of an effective temperature monitoring system by using RF technology of wireless communication. Here the wireless communication between the remote areas takes place by using the RF modules called RF transmitter and RF receiver. The project is designed in such a way that we the temperature sensor to the microcontroller at the transmitter side using which we can monitor the temperature continuously. Here the temperature sensor will be interfaced to the controller through an ADC to convert the analog value to the digital as it will be fed to the controller. And the RF transmitter will also be interfaced to the controller through an RF encoder HT12E using which the 4 bit data receives by the controller will be encoded into a single line data and will be transmitted by the transmitter through the antenna. And at the receiver side, the RF receiver will be interfaced to the microcontroller via an RF decoder HT12D. So the transmitted data from the transmitter will be received by the RF receiver and will be decoded into a 4 bit digital data which will be fed to the controller, and the controller performs the pre defined tasks by monitoring the received data. The controller will be programmed in such a way that it alerts the buzzer, if the sensed temperature crosses the preset value and an LCD will also be provided to display the value of temperature on the transmitter side.

I. INTRODUCTION

Microcontroller Based Wireless Temperature Read Out suitable for operation in a small office/home environment. This system is easy to operate, with Visual LCD. Many individuals and organizations may, for various reasons, wish to use electronic surveillance techniques at some time or another. The idea is to use off-the-shelf RF Tx/Rx modules. The weather keeps us continually occupied. Some people have even made it their profession. At home too, we like to measure all kinds of things related to our climate. That is why weather stations are available in all types and sizes. If we want to know the temperature inside and outside then purpose-built indoor/outdoor thermometers are available. In the past the outside sensor of these weather stations was connected with a wire, it is now fairly standard to use RF transmission for this data. This Wireless transmitters units usually make use of the 315-MHz band. These modules, once a rare commodity, are now widely and cheaply available. In this particular discussion, we shall be using ASK (Amplitude Shift Keying) based TX/RX pair operating at 315 MHz. The transmitter module accepts serial data at a maximum of 2400bps. They are directly interfaced to a microcontroller. At the RX end, the receiver microcontroller receives the signal via the RF receiver module, decodes the serial data and reproduces the original data in the temperature format.

II. Methods and materials

With the view to develop sophisticated electronic instrument for temperature monitoring, it is proposed design for the Wireless Sensors Network. The block diagram of sensor node, at a glance, is depicted in Figure 1.

2.1 Wireless temperature monitoring

The heart of wireless sensor network (WSN) is the sensor node. AVR Atmega328 and the detail

International Journal of Research Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 03 Issue 5
March 2016

designed are described. This is a system which is basically used to monitoring the temperature parameter. It comprises k type thermocouple, microcontroller, display unit and power supply section. Moreover to ensure the wireless communication the RF module is employed. Through the design tool called Easily Applicable Graphical Layout Editor (EAGLE), we made a connection scheme in order to realize the connection over the test bed.

2.2 Thermocouple

Most practical temperature ranges, from cryogenics to jet-engine exhaust, can be served using thermocouples. Due to their low cost and ease of use, thermocouples are popular means for measuring temperature. In this prototype we use K type thermocouple having temperature range of -270 0C to 1370 0C by combination of Chromel (alloy of Nickel -Chromium) and Alumel (alloy of Nickel-Aluminium).

2.3 Microcontroller:

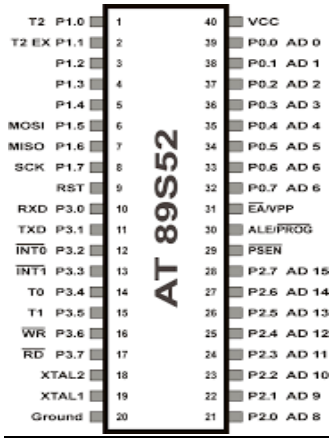


Fig2: Pin diagram of 8051 microcontroller

The generic 8051 architecture supports a Harvard architecture, which contains two separate buses for both program and data. So, it has two distinctive memory spaces of 64K X 8 size for both programmed and data. It is based on an 8 bit central processing unit with an 8 bit Accumulator and another 8 bit B register as main processing blocks. Other portions of the architecture include few 8 bit and 16 bit registers and 8 bit memory locations.

Each 8051 device has some amount of data RAM built in the device for internal processing. This area is used for stack operations and temporary storage of data.

This bus architecture is supported with on-chip peripheral functions like I/O ports, timers/counters, versatile serial communication port. So it is clear that this 8051 architecture was designed to cater many real time embedded needs.

AT89S52 Microcontroller Features

• Compatible with MCS®-51 Products
• 8K Bytes of In-System Programmable (ISP) Flash Memory
– Endurance: 10,000 Write/Erase Cycles
• 4.0V to 5.5V Operating Range
• Fully Static Operation: 0 Hz to 33 MHz
• Three-level Program Memory Lock
• 256 x 8-bit Internal RAM
• 32 Programmable I/O Lines
• Three 16-bit Timer/Counters
• Eight Interrupt Sources
• Full Duplex UART Serial Channel
• Low-power Idle and Power-down Modes
• Interrupt Recovery from Power-down Mode
• Watchdog Timer • Dual Data Pointer
• Power-off Flag • Fast Programming Time
• Flexible ISP Programming (Byte and Page Mode)
• Green (Pb/Halide-free) Packaging Option

Description

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level

International Journal of Research Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 03 Issue 5
March 2016

interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

2.4 RF module

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).

Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources.

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

2.5 LCD Pin diagram

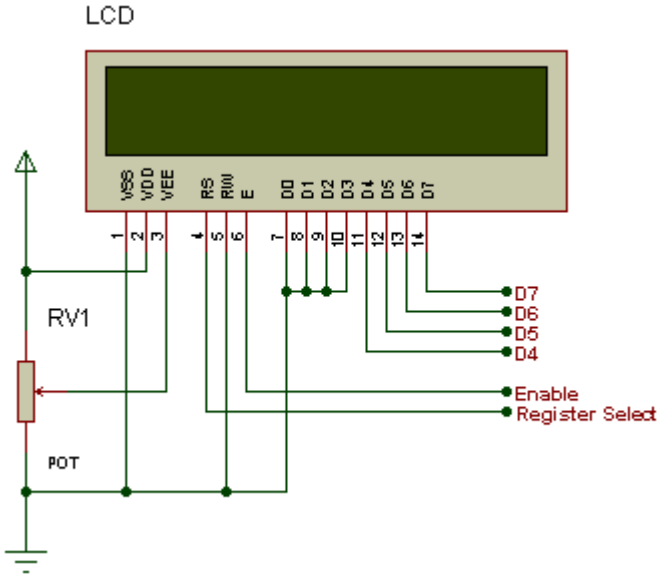
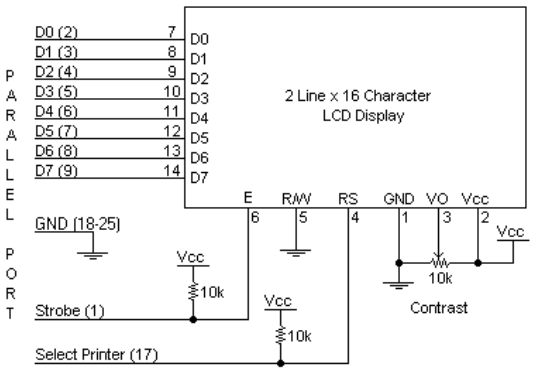


Fig: LCD pins description

The LCD requires 3 control lines as well as either 4 or 8 I/O lines for the data bus. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an 8-bit data bus is used the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus). The three control lines are referred to as **EN**, **RS**, and **RW**.



Schematic of 16*2 LCD display

2.6 BUZZER

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

Fig: picture of buzzer

RESULTS

Fig: Typical hardware setup

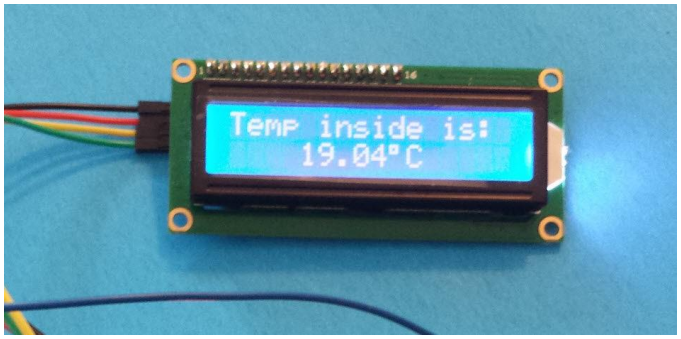


Fig: Temperature readings

ADVANTAGES & APPLICATIONS

Advantages:

1. Efficient and low cost design.
2. Wireless parameters monitoring system.
3. Low power consumption.
4. Easy to install the system.
5. Fast response.

Applications:

This system can be practically implemented in real time to monitor Weather conditions in places like Coal mines.

References

[1]"Development of a Low Cost Wireless Temperature Monitoring System for Industrial & Research Application" by Rashmi Singh and S.P Singh

[2] Adams, B.E. (1992). 'Optical Fibre Thermometry for Use at High Temperatures'. In Temperature: Its Measurement and Control in Science and Industry; Schooley, J.F., Ed.; American Institute of Physics: New York, NY, USA; Volume 6, pp. 739–743.

[3] Szajda, K.S.; Sodini, C.G.; Bowman, H.F. (1996) "A low noise, high resolution silicon temperature sensor" Solid-State Circuits', 31, 1308–1313.

[4] M. Kintner-Meyer, M.R. Brambley, T.A. Carlon, N.N. Bauman (2002), 'Wireless sensors: technology and cost-savings for commercial buildings, Teaming for Efficiency': Proceedings of the 2002 ACEEE Summer Study on Energy Efficiency in Buildings, vol. 7.

[5] Yang Wang, Jerome P. Lynch, Kincho H. Law (2005), 'Validation of an integrated network system for system for real-time wireless monitoring of civil structures', Proceedings of the 5th International Workshop on Structural Health Monitoring, Stanford, CA, September 12– 14, pp. 275–282.

[6] Luciano Boquete , Rafael Cambralla , J.M. Rodríguez-Ascariz , J.M. Miguel-Jiménez , J.J. Cantos-Frontela , J. Dongil (2010), 'Portable system for temperature monitoring in all phases of wine production', ISA Transactions 49 270-276.

Muralidhar.G is a student of b.tech forth year in electronics and communication from Siddhartha Institute of Engineering and Technology. His subjects of interest are Embedded systems and Wireless communication.

R.Vyshnavi,M.tech, Working as **Asst.Professor** in ECE Dept In Siddhartha Institute Of Engineering And Technology, Ibrahimpatnam. Her area of interests are Communication systems,Digital Image

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 03 Issue 5
March 2016

Processing and Digital Sigmal Processing,MATLAB.