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ZIGBEE BASED MINE SECURITY

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Abstract: The main objective of the project “ZIGBEE BASED MINE SECURITY” is to detect the parameters such as LPG & CO gas. The industrial control system acquires the parameters values from the field and they are digitized using ADC and processed according to the program written in the microcontroller. The parameter values are sensed through the LPG gas sensor. This is interfaced to the microcontroller, and the comparisons are done and the data is transferred through the Zigbee transmitter. The receiver which is interfaced to LCD display receives the data and displays it. Our project is designed with 8051 family micro-controller, ADC, 16x2dotmatrix LCD display and ZIGBEE transceiver. We used the ZIGBEE protocol to transmit the detected signal, some sensor kit to base station. Both the transmitter and receivers are provided with 433 MHz Zigbee transceivers.

Keywords: Zig-bee, miner’s safety and health,,etc.

1.INTRODUCTION

In present scenario a miner is facing many problems in his daily activity. When mining is taking place many dangerous gases may evolve, so he must be aware of those gases. He must be warned before about those gases. Our project is one which warns the miner about those dangerous gases. The main application of this project is to save the life of miner from the dangerous situations. In this the signal received is given to ADC which gives out that digital signal which is given to the microcontroller, here this microcontroller is interfaced with the LCD, according to that a program is written in the microcontroller. Now with this signal LCD displays the message whether gas is detected or not. Here microcontroller plays a vital role. ADC also plays a vital role.

In this project we use a wireless protocol called

ZIGBEE for the transmission of signals. This zigbee uses the ASK signal transmission. In transmitter station ASK transmitter is used for transmitting the signals. In receiver station ASK receiver is used for receiving and showing the signals. This Zigbee is used in a wide variety of applications like home entertainment and control, commercial buildings, industrial applications and large applications where the wireless is to be employed.

Our project is designed with micro-controller, ADC, 16x2dotmatrix LCD display and ZIGBEE transceiver. We used the ZIGBEE protocol to transmit the detected signal, some sensor kit to base station. Both the transmitter and receivers are provided with 433 MHz Zigbee transceivers.

2 LITERATURE REVIEW

The sudden earth tremors (seismic events) and the accompanying ground falls constitute a major threat to underground mining operations in most underground mines in Zambia. Seismic monitoring is therefore a important exercise that ensures not only a safe working environment for workers but ensures the safety of communities living nearby the mines. This paper discusses seismic events monitoring at one of the biggest mines in Zambia called Mufulira Copper mine. A study on seismic monitoring was carried out at the mine through observations, interviews and record inspections. The study revealed the different methods used over a period of time and it also revealed some major causes of seismicity at the mine.

The paper then proposes the use of Wireless Underground Sensor Networks (WUSNs) to monitor seismic events in underground mines. Wireless sensor networks uses sensors that are capable of not only sensing, but processing and transmitting data, hence reducing on the wiring

that is characterized by the current- system.

3 THEROTICAL STUDY

3.1 AT89C52 Micro controller

The AT89C52 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.

		PDIP	
(T2) P1.0	1	40	VCC
(T2 EX) P1.1	2	39	P0.0 (AD0)
P1.2	3	38	P0.1 (AD1)
P1.3	4	37	P0.2 (AD2)
P1.4	5	36	P0.3 (AD3)
P1.5	6	35	P0.4 (AD4)
P1.6	7	34	P0.5 (AD5)
P1.7	8	33	P0.6 (AD6)
RST	9	32	P0.7 (AD7)
(RXD) P3.0	10	31	EA/VPP
(TXD) P3.1	11	30	ALE/PROG
(INT0) P3.2	12	29	PSEN
(INT1) P3.3	13	28	P2.7 (A15)
(T0) P3.4	14	27	P2.6 (A14)
(T1) P3.5	15	26	P2.5 (A13)
(WR) P3.6	16	25	P2.4 (A12)
(RD) P3.7	17	24	P2.3 (A11)
XTAL2	18	23	P2.2 (A10)
XTAL1	19	22	P2.1 (A9)
GND	20	21	P2.0 (A8)

Pin Description

VCC: Supply voltage.

GND: Ground.

Port 0: Port 0 is an 8-bit open drain bidirectional I/O port. As an output port each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as high impedance inputs. Port 0 may also be configured to be the multiplexed low order address data bus during accesses to external program and data memory. In this mode P0 has **Port 1:** Port 1 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 1 output buffers can sink/source four TTL inputs.

Port 2: Port 2 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 2 output buffers can sink/source four TTL inputs. When 1s are written to Port 2 pins they are pulled high by the internal pull-ups and can be used as inputs.

Port 3: Port 3 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs.

RST: Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device

PSEN: Program Store Enable is the read strobe to external program memory.

EA/VPP: External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory

locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset. EA should be strapped to VCC for internal program executions.

XTAL1: Input to the inverting oscillator amplifier and input to the internal clock operating circuit.

XTAL2: Output from the inverting oscillator amplifier.

3.2 ZIG-BEE S2C

ZIGBEE is a new wireless technology that looks have applications in a variety of fields. Zigbee technological standard based on IEEE 802.15.4 specification for low data rates. technology allows for devices to communicate with one another with very low power consumption, allowing the devices to run on simple batteries for several years.

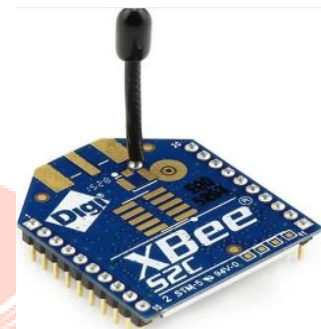


Fig-1: ZIG-BEE S2C

3.3 Methane Sensor (MQ6)

Gas sensor can activate when the gas is present at the window of the gas sensor. This sensor can give the analog data when the gas is present in the window of the gas sensor. This sensor requires the dc 5 for internal operation. When the gas is present at the window of the gas sensor then this sensor will gives the analog data to the ADC controller. If the gas is not present then this module will in the ideal state.

Fig-2: Methane Sensor(MQ6)

3.4 Piezo Buzzer

A buzzer or beeper is a signalling device, usually electronic, typically used in automobiles,



household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button

was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).



Fig-3: Piezo Buzzer

3.5 Temperature Sensor

The RTD is a temperature sensing device whose resistance changes with temperature. Typically built from platinum, though devices made from nickel or copper are not uncommon, RTDs can take many different shapes. To measure the resistance across an RTD, apply a constant current, measure the resulting voltage, and determine the RTD resistance.

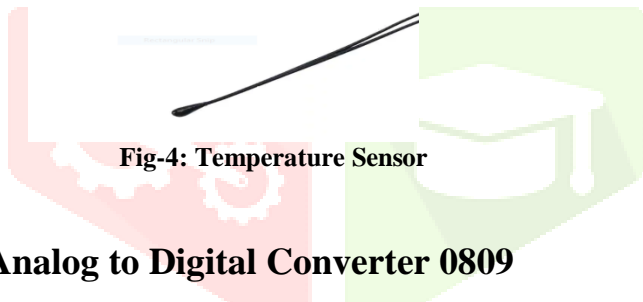
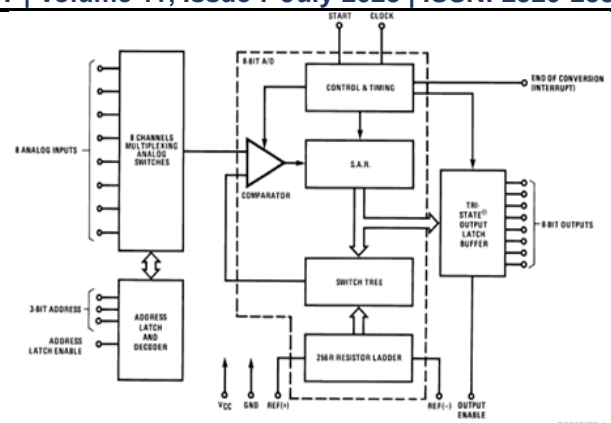


Fig-4: Temperature Sensor

3.6 Analog to Digital Converter 0809

The ADC0808, ADC0809 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible control logic. The ADC0808, ADC0809 offers high speed, high accuracy, minimal temperature dependence, excellent long-term accuracy and repeatability, and consumes minimal power. These features make this device ideally suited to applications from process and machine control to consumer and automotive applications.

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See Ordering Information

Fig 5 : Block diagram of ADC0809

3.7 Crystal Oscillator

A crystal oscillator (sometimes abbreviated to XTAL on schematic diagrams) is an electronic circuit that uses the mechanical resonance of a physical crystal of piezoelectric material along with an amplifier and feedback to create an electrical signal with a very precise frequency.



Fig 6: Crystal Oscillator

3.7 Liquid Crystal Display

Liquid crystal displays (LCD's) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in liquid, but are grouped together in an ordered form similar to a crystal. The LCD's are lightweight with only a few millimeters thickness. Since the LCD's consume less power they are compatible with low power electronic circuits and can be powered for long durations.

LCD's operate as a light "valve", blocking light or allowing it to pass through. An image in an LCD is formed by applying an electric field to alter the chemical properties of each LCC (Liquid Crystal Cell) in the display in order to change a pixel's light absorption properties. These LCC's modify the image produced by the backlight into the screen output requested by the controller.



Fig 7:16X2 LCD display

4 EXPERIMENTAL STUDY

4.1 Block Diagram

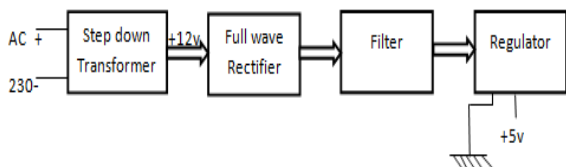


Fig 8: Block diagram of power supply

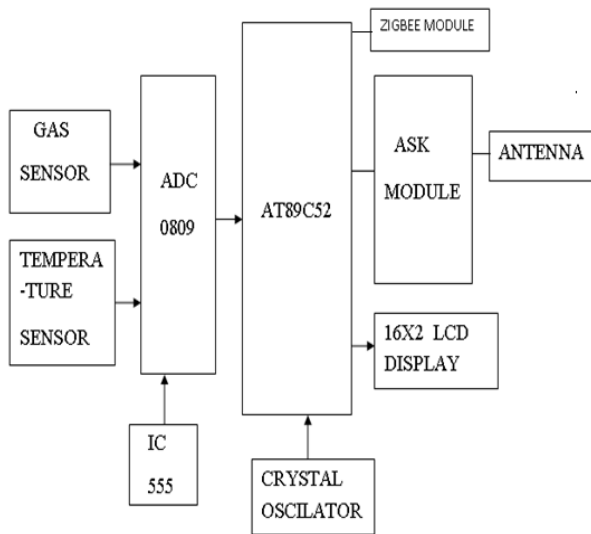


Fig 9: Block diagram of transmitter

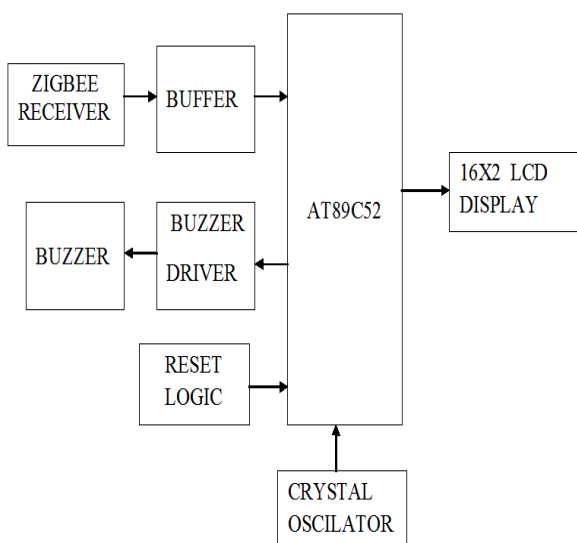


Fig10: Block diagram of receiver

4.2 Description of Block Diagram

From the above block diagram the gas sensor will sense the gas and the temperature sensor will sense the temperature and gives the resultant output to the ADC controller to control the analog signal into digital signal. Because of the micro controller cannot understand the analog signal. The converted digital signal is given to the micro controller the micro controller can gives the information to the ASK transmitter. This transmitter is used to transmit the data to the transmitter by using the ZIGBEE protocol with the ASK modulation.

The micro controller requires the basic blocks to operate the internal program. These are one is the oscillator. The oscillator produces the clock for the micro controller. And the reset logic is used to protect the internal memory of the micro controller when the power spikes are present.

This block is used to receive the data from the transmitter and display that information on the LCD display. The ZIGBEE receiver will receives the data in the form of ASK. Then that signal can demodulate into the original signal. Then this signal is given to the micro controller. The micro controller can display this information in the display if the mine leak will be appear in the gas sensor it gives the information to the transmitter section and at the same time blow the buzzer for indication of danger. This data will send to the receiver section to display the data information on the display for opto interface.

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4.3 Working of Proposed System

The different have been detected using our wireless ZIGBEE. In near future we can use this in remote areas also where the facility of cell network is not provided. It can also be used in home appliances, chemical industries. Wireless technology is developing rapidly in this modernization world. ZIGBEE has very useful characteristics to develop.

In our proposed system we used the AT89C52 micro controller .here we connect the various sensors like MQ7 (methane sensor), DS 18 temperature sensor and16*4 display the various signals are given to the signal pins of the controller. Zig-Bee module is used to transmit and

receive data according to sensors and act like Wi-Fi to establish the connection between hardware and software.

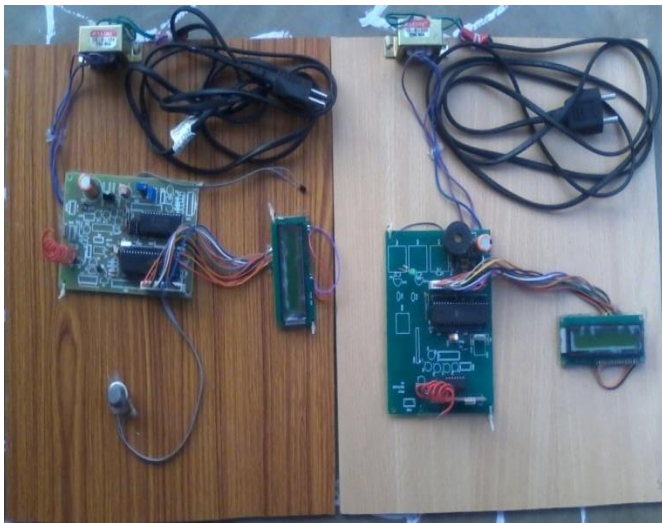


Fig 11: Hardware design for proposed system

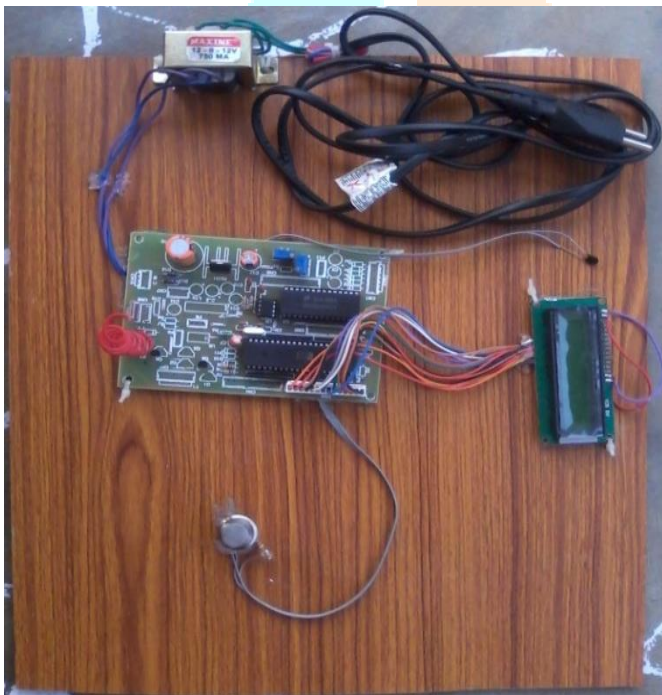


Fig 12: Hardware design for transmitter

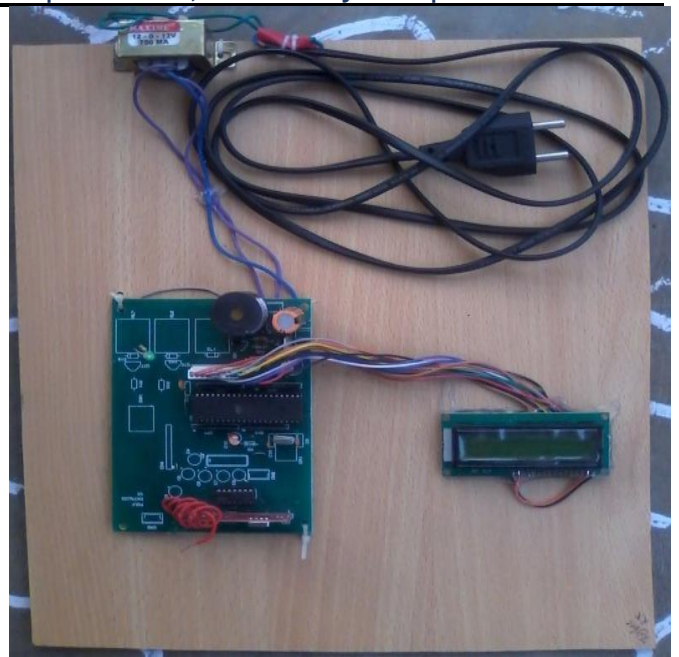


Fig 13: Hardware design for receiver



5 RESULT AND DISCUSSION

This protocol type of the mine security system is protecting the mines from the dangerous gas accidents. And also provide the individual protocol make the mine security even in the fade areas. This prototype is sends the data to the remote receiver by using personal protocol. This protocol is called zigbee protocol this protocol used the signal transmission by using the ASK modulation technique

This paper gives a system related to safety and security of underground mines. The system is reliable, faithful, uninterrupted, economical and user friendly. A larger area and more depth inside hazardous underground mines are now can be covered and potential accidents can be controlled effectively. The system combined the low power, low cost Zig-bee based high frequency wireless data transmission technology based small size sensors.

6 CONCLUTIONS

The system is designed to detect the LPG gas with the help of wireless protocol ZIGBEE technology. Likewise we can control and detect large number of parameters. This project is useful in the case of long distance communications where the field and the control room are at larger distance respectively.

The different have been detected using our wireless ZIGBEE. In near future we can use this in remote areas also where the facility of cell network is not provided. It can also be used in home appliances, chemical industries. Wireless technology is developing rapidly in this modernization world. ZIGBEE has very useful characteristics to developed. The study on real time monitoring of toxic gases and other parameters present in underground mine has analyzed using wireless network. A real time monitoring system is developed to provide clearer and more point to point perspective of the underground mine.

This system is displaying the parameters on the LCD at the underground section where sensor unit is installed as well as on the monitoring unit; it will be helpful to all miners present inside the mine to save their life before any casualty occurs.

REFERENCES

- [1] Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. Mc Kinlay The 8051 Microcontroller & Embedded Systems, Pearson Education Inc. 2nd Edition, 2008.
- [2] Myke Predko, Programming and Customizing the Microcontroller, TMH, 1999.
- [3] Zigbee Standards Organization, Zigbee Specification, Zigbee Document 053474r17, January 17, 2008.
- [4] D.Egan,"The Emergence of Zigbee in Building Automation and Industrial Controls",J.IEE Computing & Control Engineering, Vol 16(2),pp.14-19,2005.
- [5] Kenneth J Ayala, The 8051 Microcontroller Architecture, Programming & Applications Penram International, 2nd Edition, 1996.

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