

## A SAFETY SYSTEM FOR MINE WORKERS IN HEAVY INDUSTRIES

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**Abstract** - to keep an eye on the conditions in the coal mine and to shield the miners from accidents and dangerous leaks. One of the most important parts of business, especially the mining business, is industrial safety. Safety is a key concern in the mining sector. All mining industries adhere to some fundamental precautions and phenomena in order to prevent any undesirable occurrences. Today, communication is the primary aspect that allows every industry to monitor various metrics and take the required precautions to avoid potential problems.

**Key Words:** ARM Controller, buzzer, ZigBee, Temperature Sensor, LCD display, Voice IC

### 1. INTRODUCTION

An embedded system is a special-purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Unlike a general- purpose computer, such as a personal computer, an embedded system performs one or a few predefined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded systems are often mass-produced, benefiting from economies of scale.

Personal digital assistants (PDAs) or handheld computers are generally considered embedded devices because of the nature of their hardware design, even though they are more expandable in software terms. This line of definition continues to blur as devices expand. With the introduction of the OQO Model 2 with the Windows XP operating system and ports such as a USB port — both features usually belong to "general purpose computers", — the line of nomenclature blurs even more.

Embedded systems play major role in electronics varies from portable devices to large stationary installations like digital watches and MP3 players, trafficlighs, factory controllers, or the systems controlling nuclear power plants.

In terms of complexity embedded systems can range from very simple with a single microcontroller chip, to very complex with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

In a special-purpose system known as an embedded system, the computer is totally integrated into or dedicated to the system or device it operates. An embedded system, as opposed to a general-purpose computer like a personal computer, performs one or a few preset functions, typically with highly precise specifications. Because the system is dedicated to a certain activity, design engineers can optimize it to make the product smaller and less expensive. In order to take advantage of economies of scale, embedded systems are frequently mass-produced.

Even if they are more expandable in terms of software, personal digital assistants (PDAs) or handheld computers are typically considered embedded devices due to the nature of their hardware construction. As gadgets advance, this boundary becomes hazier. Upon helaunchofthe

Examples of Embedded Systems:

- Avionics, such as inertial guidance systems, flight control hardware/software and other integrated systems in aircraft and missiles
- Cellular telephones and telephone switches
- Engine controllers and antilock brake controllers for automobiles
- Home automation products, such as thermostats, air conditioners, sprinklers, and security monitoring systems
- Handheld calculators
- Handheld computers
- Household appliances, including microwave ovens, washing machines, television sets, DVD players and recorders
- Medical equipment
- Personal digital assistant
- Videogame consoles

- Computer peripherals such as routers and printers.
- Industrial controllers for remote machine operation.

## 2. ARM 7

ARM stands for Advanced RISC Machines. It is a 32 bit processor core, used for high end application. It is widely used in Advanced Robotic Applications.

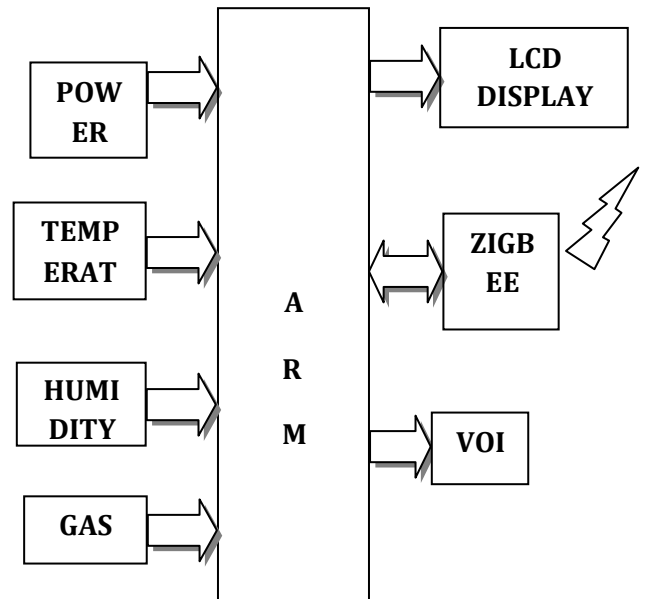
History and Development:

- ARM was developed at Acron Computers Ltd of Cambridge, England between 1983 and 1985.
- RISC concept was introduced in 1980 at Stanford and Berkley.
- ARM Ltd was found in 1990.
- ARM cores are licensed to partners so as to develop and fabricate new microcontrollers around same processor cores.

Key features:

- 16-bit/32-bit ARM7TDMI-S microcontroller in tiny LQFP64 package.
- 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory.
- 128-bit wide interface/accelerator enables high-speed 60 MHz operation.
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1 ms.
- Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high-speed tracing of instruction execution.
- USB 2.0 Full-speed compliant device controller with 2 kB of endpoint RAM.

3. In addition, the LPC2146/48 provides 8 kB of on-BLOCK DIAGRAM



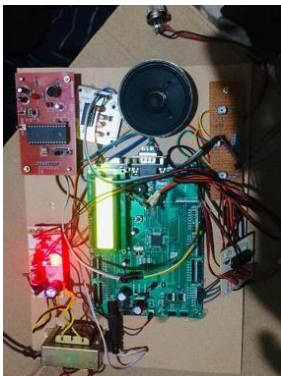
chip RAM accessible to USB by DMA.

- One or two (LPC2141/42 vs. LPC2144/46/48) 10-bit ADCs provide a total of 6/14 analog inputs, with conversion times as low as 2.44  $\mu$ s per channel.
- Single 10-bit DAC provides variable analog output (LPC2142/44/46/48 only).
- Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- Low power Real-Time Clock (RTC) with

independent power and 32 kHz clock input.

- Multiple serial interfaces including two UARTs(16C550), two Fast I2C-bus (400 kbit/s),
- SPI and SSP with buffering and variable datalength capabilities.
- Vectored Interrupt Controller (VIC) withconfigurable priorities and vector addresses.
- Up to 45 of 5 V tolerant fast general purpose I/Opins in a tiny LQFP64 package.
- Up to 21 external interrupt pins available.
- 60 MHz maximum CPU clock available from programmable on-chip PLL with settling time of100  $\mu$ s.
- On-chip integrated oscillator operates with an external crystal from 1 MHz to 25 MHz.
- Power saving modes include Idle and Power- down.
- Individual enable/disable of peripheral functions as well as peripheral clock scaling for additional power optimization.
- Processor wake-up from Power-down mode via external interrupt or BOD.
- Single power supply chip with POR and BOD circuits:

4. CPU operating voltage range of 3.0 V to 3.6 V ( $3.3 \text{ V} \pm 10 \%$ ) with 5 V tolerant I/O pads.RESULT



## 5. CONCLUSIONS

The paper ‘A Safety system for mine workers in heavy industries’ has been successfully designed and tested. Integrating features of all the hardware components used have developed 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 and with the help of growing technology the project has been successfully implemented.

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