A

#### Project Report On

#### WATER SURVEILLANCE ROBOT BASED ON IoT

Submitted in partial fulfillment of the requirement for the award of

#### BACHELOR OF TECHNOLOGY

In

#### ELECTRONICS AND COMMUNICATION ENGINEERING

**By**

**P . SAI ASHISH 16BJ1A0457**

**UNDER THE ESTIMATED GUIDENCE OF**

**D. SATYANARAYANA,** M. Tech (Ph.D.)

**ASSOC.PROF.**

#### DEPT. OF ECE



**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**ST. MARY'S GROUP OF INSTITUTIONS GUNTUR**

(Approved by AICTE, New Delhi & Affiliated to JNTU, Kakinada)

CHEBROLU (V&M), GUNTUR (DT), A.P., India -522212, Ph.: 9010455596/ 97

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**INTERNAL GUIDE HEAD OF THE DEPARTMENT**

**D. SATYANARAYANA M. TECH (Ph.D.) D.SATYANARAYANA M. TECH (Ph.D.) ASSOC. PROFESSOR ASSOC. PROFESSOR**

**External Examiner PRINCIPAL**

**Dr. B. PENCHALAIAH Ph.D.**

**ST. MARY'S GROUP OF INSTITUTIONS GUNTUR**

(Approved by AICTE, New Delhi & Affiliated to JNTU, Kakinada)

**CHEBROLU** (V&M), **GUNTUR** (DT). A.P. India-522212 Ph: 9010455596/ 97/ 98

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I, **P . SAI ASHISH** hereby declare that the Project Report entitled **“WATER SURVEILLANCE ROBOT BASED ON IoT”** is prepared by me, submitted in partial fulfillment of the requirements for the award of the degree in **Bachelor of Technology in DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING** for the year **2016-20**.

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|  |  |
| --- | --- |
| **P . SAI ASHISH** | **16BJ1A0457** |

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|  |  |
| --- | --- |
| **M. BHAGYA SANKAR** | **13BJ1A0459** |

## ABSTRACT

Now-a-days, fire and short circuit accidents are occurring very frequently in public transport system which causes the loss of most valuable human lives and the government property. There are a number of methods to avoid fire and short circuit accidents and to reduce the severity of loss in case of fire and short circuit accidents in public transport system. But the damage is catastrophic as a rescue service could not reach at right time due to improper communication. So, we can further reduce the loss caused by fire an short circuit accidents in trains and buses if we are able to inform the respective authorities immediately after the accidents along with the locations of the vehicle. The system which is proposed uses the modern technology to detect the fire and short circuit accidents and also to inform the respective authorities with minimum delay. In this we use Short circuit detection and fire detection sensors. The signals from these sensors will activate the microcontroller which in-turn activates the message transfer system, alarm system, GPS System in which the accident took place. The proposed system is designed by using GSM technology and AT89c52 microcontroller along with sensors. Whenever there is an accident due to Fire or short circuit the LCD display which is fixed at the driver’s cabin displays the detection of type of accident which allows the driver to stop it immediately. Also alarm system will be automatically on at that time. Then GPS module tracks the location of the vehicle approximately. After tracking the signals through GSM module it send the information and location to the higher authorities. So that the rescue operations will be held faster than the normal one and reduce the damage also.

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**LIST OF ABRIVATIONS**

|  |  |
| --- | --- |
| **EIA** | Electronics Industries Association |
| **LCD** | Liquid Crystal Display |
| **GSM** | Global System for Mobile Comm. |
| **LED** | Light emitting diode |
| **ADC** | Analog to Digital Converter |
| **DAC** | Digital to Analog Converter |
| **PCB** | Printed Circuit Board |
| **IP** | Interrupt priority |
| **OSS** | Operation and Support System |
| **HLR** | Home location register |
| **MSC** | Mobile services switching center |
| **VLR** | Visitor location registers |
| **GIWU** | GSM inter-working unit |
| **DSR** | Data set ready |
| **DTR** | Data terminal ready |
| **DCD** | Data carrier detect |
| **ALU** | Arithmetic and Logical Unit |
| **ROM** | Random Only Memory |
| **RAM** | Random access memory |
| **ISP** | In-System Programmable |
| **FPGA** | Field programmable gate array |
| **RTOS** | Real Time Operating System |
| **LDR** | Light Dependent Resistor |
| **DCC** | Debug Communication Channel |
| **OSS GPS** | Operation Of Support Systems Global Position System |

### CHAPTER 1 EMBEDDED SYSTEMS

**EMBEDDED SYSTEMS**

Security is the condition of being protected against danger or loss. In the general sense, security is a concept similar to safety. The nuance between the two is an added emphasis on being protected from dangers that originate from outside. Individuals or actions that encroach upon the condition of protection are responsible for the breach of security. The word "security" in general usage is synonymous with "safety," but as a technical term "security" means that something not only is secure but that it has been secured. One of the best options for providing good security is by using a technology named EMBEDDED SYSTEMS.

#### INTRODUCTION TO EMBEDDED SYSTEMS

Embedded systems are electronic devices that incorporate microprocessors with in Their implementations. The main purposes of the microprocessors are to simplify the system design and provide flexibility. Having a microprocessor in the device means that removing the bugs, making modifications, or adding new features are only matters of rewriting the software that controls the device. Or in other words embedded computer systems are electronic systems that include a microcomputer to perform a specific dedicated application. The computer is hidden inside these products. Embedded systems are ubiquitous. Every week millions of tiny computer chips come pouring out of factories finding their way into our everyday products.

Embedded systems are self-contained programs that are embedded within a piece of hardware. Whereas a regular computer has many different applications and software that can be applied to various tasks, embedded systems are usually set to a specific task that cannot be altered without physically manipulating the circuitry. Another way to think of an embedded system is as a computer system that is created with optimal efficiency, thereby allowing it to complete specific functions as quickly as possible.

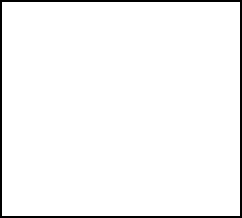
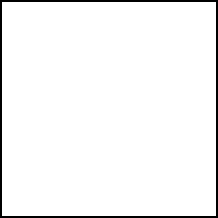
An embedded system is a system which is going to do a predefined specified task is the embedded system and is even defined as combination of both software and hardware. A general- purpose definition of embedded systems is that they are devices used to control, monitor or assist the operation of equipment, machinery or plant. "Embedded" reflects the fact that they are an

integral part of the system. At the other extreme a general-purpose computer may be used to control the operation of a large complex processing plant, and its presence will be obvious.

All embedded systems are including computers or microprocessors. Some of these computers are however very simple systems as compared with a personal computer. The very simplest embedded systems are capable of performing only a single function or set of functions to meet a single predetermined purpose. In more complex systems an application program that enables the embedded system to be used for a particular purpose in a specific application determines the functioning of the embedded system. The ability to have programs means that the same embedded system can be used for a variety of different purposes. In some cases, a microprocessor may be designed in such a way that application software for a particular purpose can be added to the basic software in a second process, after which it is not possible to make further changes. The applications software on such processors is sometimes referred to as firmware.

The simplest devices consist of a single microprocessor (often called a "chip”), which may itself be packaged with other chips in a hybrid system or Application Specific Integrated Circuit (ASIC). Its input comes from a detector or sensor and its output goes to a switch or activator which (for example) may start or stop the operation of a machine or, by operating a valve, may control the flow of fuel to an engine.

As the embedded system is the combination of both software and hardware



* **Processor**
* **Peripherals**
* **memory**

**ALP C VB**

**Etc.,**

o o

o

**Hardware**

**Software**

**Embedded**

**System**

**Figure 1.1: Block diagram of Embedded System**

Software deals with the languages like ALP, C, and VB etc., and Hardware deals with Processors, Peripherals, and Memory.

* + - **MEMORY:** It is used to store data or address.
    - **PERIPHERALS:** These are the external devices connected
    - **PROCESSOR:** It is an IC which is used to perform some task

#### APPLICATIONS OF EMBEDDED SYSTEMS

* + - Manufacturing and process control
    - Construction industry
    - Transport
    - Buildings and premises
    - Domestic service
    - Communications
    - Office systems and mobile equipment
    - Banking, finance and commercial
    - Medical diagnostics, monitoring and life support
    - Testing, monitoring and diagnostic systems

#### PROCESSORS CLASSIFICATION

* + - Micro Processor (µp)
    - Micro controller (µc)
    - Digital Signal Processor (DSP)
    - Application Specific Integrated Circuits (ASIC)
    1. MICRO PROCESSOR (µP)

A [Silicon](http://www.webopedia.com/TERM/M/silicon.html) [chip](http://www.webopedia.com/TERM/M/chip.html) that contains a [CPU](http://www.webopedia.com/TERM/M/CPU.html). In the world of [personal computers](http://www.webopedia.com/TERM/M/personal_computer.html), the terms microprocessor and [CPU](http://www.webopedia.com/TERM/M/microprocessor.html) are used interchangeably. At the heart of all personal computers and most

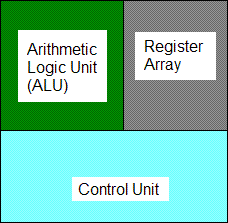
[workstations](http://www.webopedia.com/TERM/M/workstation.html) sits a microprocessor. Microprocessors also control the logic of almost all [digital](http://www.webopedia.com/TERM/M/digital.html) [devices,](http://www.webopedia.com/TERM/M/device.html) from clock radios to fuel-injection [systems](http://www.webopedia.com/TERM/M/system.html) for automobiles.

THREE BASIC CHARACTERISTICS DIFFERENTIATE MICROPROCESSORS

* [**INSTRUCTION SET**](http://www.webopedia.com/TERM/M/instruction.html): The set of instructions that the microprocessor can execute.
* [**BANDWIDTH**](http://www.webopedia.com/TERM/M/bandwidth.html) **:** The number of [bits](http://www.webopedia.com/TERM/M/bit.html) processed in a single instruction.
* [**CLOCK SPEED**](http://www.webopedia.com/TERM/M/clock_speed.html)**:** Given in megahertz ([MHz](http://www.webopedia.com/TERM/M/MHz.html)), the [clock speed](http://www.webopedia.com/TERM/M/microprocessor.html) determines how many instructions per second the [processor](http://www.webopedia.com/TERM/M/processor.html) can [execute](http://www.webopedia.com/TERM/M/execute.html). In both cases, the higher the value, the more powerful the CPU. For example, a [32-bit](http://www.webopedia.com/TERM/M/32_bit.html) microprocessor that [runs](http://www.webopedia.com/TERM/M/run.html) at 50MHz is more powerful than a 16-bit microprocessor that runs at 25MHz.

A microprocessor has three basic elements, as shown above. The ALU performs all arithmetic computations, such as addition, subtraction and logic operations (AND, OR, etc). The Register Array is a set of registers used for storing data.

These registers can be accessed by the ALU very quickly. The Control Unit controls the entire process. It provides the timing and a control signal for getting data into and out of the registers and the ALU and it synchronizes the execution of instructions



**Figure 1.2: Three Basic Elements of a Microprocessor**

* + 1. MICRO CONTROLLER (µC):

A microcontroller is a small computer on a single [integrated circuit](http://en.wikipedia.org/wiki/Integrated_circuit) containing a processor core, memory, and programmable [input/output](http://en.wikipedia.org/wiki/Input/output) peripherals.

The Program memory in the form of [NOR flash](http://en.wikipedia.org/wiki/NOR_flash) or [OTP ROM](http://en.wikipedia.org/wiki/Programmable_read-only_memory) is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications.

|  |
| --- |
| ALU |
| MU |
| CU |

**Figure 1.3: Block Diagram of Micro Controller (µc)**

Timer, Counter, serial communication ROM, ADC, DAC, Timers, USART, Oscillators etc.,

* + 1. DIGITAL SIGNAL PROCESSORS (DSPS):

Digital Signal Processors is one which performs scientific and mathematical operation. Digital Signal Processor chips - specialized microprocessors with architectures designed specifically for the types of operations required in digital signal processing.

Like a general-purpose microprocessor, a DSP is a programmable device, with its own native instruction code. DSP chips are capable of carrying out millions of floating point operations per second, and like their better-known general-purpose cousins, faster and more powerful versions are continually being introduced. DSPs can also be embedded within complex "system- on-chip" devices, often containing both analog and digital circuitry.

* + 1. APPLICATION SPECIFIC INTEGRATED CIRCUIT (ASIC)

ASIC is a combination of digital and analog circuits packed into an IC to achieve the desired control/computation function

ASIC TYPICALLY CONTAINS

* + - * CPU cores for computation and control
      * Peripherals to control timing critical functions
      * Memories to store data and program
      * Analog circuits to provide clocks and interface to the real world which is analog in nature.
      * I/O’s to connect to external components like LEDs, memories, monitors etc.

#### COMPUTER INSTRUCTION SET

There are two different types of computer instruction set there are:

* + - RISC (Reduced Instruction Set Computer) and
    - CISC (Complex Instruction Set computer)
    1. REDUCED INSTRUCTION SET COMPUTER (RISC)

A RISC (**Reduced instruction set computer**) is a microprocessor that is designed to perform a smaller number of types of computer instruction so that it can operate at a higher speed (perform more million instructions per second, or millions of instructions per second). Since each instruction type that a computer must perform requires additional transistors and circuitry, a larger list or set of computer instructions tends to make the microprocessor more complicated and slower in operation.

RISC CHARACTERISTICS

* + - * Simple instruction set
      * Same length instructions
      * 1machine-cycleinstructions
    1. COMPLEX INSTRUCTION SET COMPUTER (CISC)

CISC, which stands for Complex Instruction Set Computer**,** is a philosophy for designing chips that are easy to program and which make efficient use of memory. Each instruction in a CISC instruction set might perform a series of operations inside the processor. This reduces the number of instructions required to implement a given program.

ADVANTAGES

At the time of their initial development, CISC machines used available technologies to optimize computer performance.

* Microprogramming is as easy as assembly language to implement, and much less expensive than hardwiring a control unit.
* The ease of micro-coding new instructions allowed designers to make CISC machines upwardly compatible.

DISADVANTAGES

Still, designers soon realized that the CISC philosophy had its own problems, including:

* Earlier generations of a processor family generally were contained as a subset in every new version --- so instruction set & chip hardware become more complex with each generation of computers.
* So that as many instructions as possible could be stored in memory with the least possible wasted space, individual instructions could be of almost any length---this means that different instructions will take different amounts of clock time to execute, slowing down the overall performance of the machine.

#### MEMORY ARCHITECTURE

There two different type’s memory architectures there are:

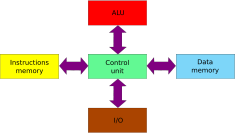
* + - Harvard Architecture
    - Von-Neumann Architecture
    1. HARVARD ARCHITECTURE

Computers have separate memory areas for program instructions and data. There are two or more internal data buses, which allow simultaneous access to both instructions and data. The CPU fetches program instructions on the program memory bus.

The Harvard architecture is a computer architecture with physically separate storage and signal pathways for instructions and data.

The term originated from the Harvard Mark I relay-based computer, which stored instructions on punched tape (24 bits wide) and data in electro-mechanical counters.

These early machines had limited data storage, entirely contained within the central processing unit, and provided no access to the instruction storage as data. Programs needed to be loaded by an operator, the processor could not boot itself.



**Figure 1.4: Harvard Architecture**

* + - 1. MODERN USES OF THE HARVARD ARCHITECTURE

The principal advantage of the pure Harvard architecture –

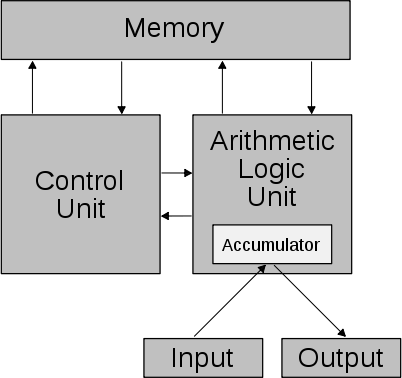
* + - * + Digital signal processors (DSPs) generally execute small, highly-optimized audio or video processing algorithms. They avoid caches because their behavior must be extremely reproducible. The difficulties of coping with multiple address spaces are of secondary concern to speed of execution. As a result, some DSPs have multiple data memories in distinct address spaces to facilitate SIMD and VLIW processing. Texas Instruments TMS320 C55x processors, as one example, have multiple parallel data busses (two write, three read) and one instruction bus.
        + simultaneous access to more than one memory system - has been reduced by modified Harvard processors using modern [CPU cache](http://en.wikipedia.org/wiki/CPU_cache) systems.
    1. VON-NEUMANN ARCHITECTURE

A computer has a single, common memory space in which both program instructions and data are stored. There is a single internal data bus that fetches both instructions and data. They cannot be performed at the same time

The von Neumann architecture is a design model for a stored-program [digital computer](http://en.wikipedia.org/wiki/Computer) that uses a [central processing unit](http://en.wikipedia.org/wiki/Central_processing_unit) (CPU) and a single separate [storage structure](http://en.wikipedia.org/wiki/Computer_data_storage) ("memory") to hold both instructions and [data.](http://en.wikipedia.org/wiki/Data_%28computing%29) It is named after the [mathematician](http://en.wikipedia.org/wiki/Mathematician) and early [computer scientist](http://en.wikipedia.org/wiki/Computer_scientist) [John von Neumann](http://en.wikipedia.org/wiki/John_von_Neumann). Such computers implement a [universal Turing machine](http://en.wikipedia.org/wiki/Universal_Turing_machine) and have a [sequential](http://en.wikipedia.org/wiki/SISD) [architecture.](http://en.wikipedia.org/wiki/SISD)

A stored-program [digital computer](http://en.wikipedia.org/wiki/Computer) is one that keeps its [programmed](http://en.wikipedia.org/wiki/Computer_program) instructions, as well as its data, in [read-write](http://en.wikipedia.org/wiki/Read-write_memory), [random-access memory](http://en.wikipedia.org/wiki/Random-access_memory) (RAM). The mechanisms for transferring the data and instructions between the CPU and memory are, however, considerably more complex than the original von Neumann architecture.

The terms "von Neumann architecture" and "stored-program computer" are generally used interchangeably, and that usage is followed in this article.



**Figure 1.5: Schematic of the Von-Neumann Architecture**

* + 1. **BASIC DIFFERENCE BETWEEN HARVARD AND VON-NEUMANN ARCHITECTURE**
* The primary difference between Harvard architecture and the Von Neumann architecture is in the Von Neumann architecture data and programs are stored in the same memory and managed by the same information handling system.
* Whereas the Harvard architecture stores data and programs in separate memory devices and they are handled by different subsystems.
* In a computer using the Von-Neumann architecture without cache; the central processing unit (CPU) can either be reading and instruction or writing/reading data to/from the memory.
  + 1. CHARACTERISTICS

Two major areas of differences are cost and power consumption.

Embedded systems are routinely expected to maintain 100% reliability while running continuously for long periods, sometimes measured in years. Firmware is usually developed and

tested too much stricter requirements than is general-purpose software, which can usually be easily restarted if a problem occurs.

* + 1. PLATFORM

There are many different CPU architectures used in embedded designs. This in contrast to the desktop computer market, which as of this writing (2003) is limited to just a few competing architectures, mainly the Intel/AMD x86, and the Apple/Motorola/IBM PowerPC, used in the Apple Macintosh. One common configuration for embedded systems is the system on a chip.

* + 1. TOOLS

Like a typical computer programmer, embedded system designers use compilers, assemblers and debuggers to develop an embedded system.

Those software tools can come from several sources:

Software companies that specialize in the embedded market Ported from the GNU software development tools. Sometimes, development tools for a personal computer can be used if the embedded processor is a close relative to a common PC processor. Embedded system designers also use a few software tools rarely used by typical computer programmers.

* + 1. OPERATING SYSTEM

They often have no operating system, or a specialized embedded operating system (often a real-time operating system), or the programmer is assigned to port one of these to the new system.

* + 1. DEBUGGING

Debugging is usually performed with an in-circuit emulator, or some type of debugger that can interrupt the micro controller’s internal microcode.

The microcode interrupt lets the debugger operate in hardware in which only the CPU works. The CPU-based debugger can be used to test and debug the electronics of the computer from the viewpoint of the CPU. This feature was pioneered on the PDP-11.

#### DESIGN OF EMBEDDED SYSTEMS

The electronics usually uses either a microprocessor or a micro controller. Some large or old systems use general-purpose mainframes computers or minicomputers.

* + 1. START - UP

All embedded systems have start-up code. Usually it disables interrupts, sets up the electronics, tests the computer (RAM, CPU and software), and then starts the application code.

* + 1. THE CONTROL LOOP

In this design, the software simply has a loop. The loop calls subroutines. Each subroutine manages a part of the hardware or software. Interrupts generally set flags, or update counters that are read by the rest of the software. A simple API disables and enables interrupts. Done right, it handles nested calls in nested subroutines, and restores the preceding interrupt state in the outermost enable. This is one of the simplest methods of creating an exokernel. Typically, there's some sort of subroutine in the loop to manage a list of software timers, using a periodic real time interrupt. When a timer expires, an associated subroutine is run, or flag is set. A software timer is a business disaster State machines may be implemented with a function-pointer per state-machine (in C++, C or assembly, anyway). A change of state stores a different function into the pointer. The function pointer is executed every time the loop runs. Many designers recommend reading each IO device once per loop, and storing the result so the logic acts on consistent values. Many designers prefer to design their state machines to check only one or two things per state. Usually this is a hardware event, and a software timer.

Thus interrupt code can run at very precise timings. Another major weakness of this system is that it can become complex to add new features. Algorithms that take a long time to run must be carefully broken down so only a little piece gets done each time through the main loop. This system's strength is its simplicity, and on small pieces of software the loop is usually so fast that nobody cares that it is not predictable. Another advantage is that this system guarantees that the software will run. There is no mysterious operating system to blame for bad behavior.

* + 1. USER INTERFACES

User interfaces for embedded systems vary wildly, and thus deserve some special comment. Designers recommend testing the user interface for usability at the earliest possible instant. A quick, dirty test is to ask an executive secretary to use cardboard models drawn with magic markers, and manipulated by an engineer. The videotaped result is likely to be both humorous and very educational. In the tapes, every time the engineer talk, the interface has failed: It would cause a service call.

Another basic trick is to minimize and simplify the type of output. Designs should consider using a status light for each interface plug, or failure condition, to tell what failed. A cheap variation is to have two light bars with a printed matrix of errors that they select- the user can glue on the labels for the language that she speaks. Designers use colors. Red means the users can get hurt- think of blood. Yellow means something might be wrong. Green means everything's OK. Another essential trick is to make any modes absolutely clear on the user's display.

If an interface has modes, they must be reversible in an obvious way.

A foreign organization should give the highest-volume distributor the duty to review and correct any translations in his native language. This stops critiques by other native speakers, who tend to believe that no foreign organization will ever know their language as well as they.

# CHAPTER 2 LITERATURE SURVEY

## LITERATURE SURVEY

#### EXISTING SYSTEM

The trains are moderate vehicles used for transporting people and goods. Mostly the people refers the train journey for long distance as it is cheaper. Since, induction of train for public transportation the fire accidents or not extended seriously by the Indian railways. The notices showing “don’t smoke, don’t carry inflammable materials” are the only precautionary warnings about the fire in each compartment. However, because of failuring routine maintainace system or by the activities of illegal social elements the fair accidents occur frequently. The fire accidents are among the most serious disastrous two human lives and the property of Govt.

MAIN PARAMETERS OF COACH FIRE

There are three factors comprising of fire. The factors are oxygen material and heat or ignition. A train fire usually occurs as a result of these three elements. Heat or ignition is being produced by the following.

* + - A deteriorated insulation on electrical wire occurring short circuit
    - Carelessness of smoker’s activity
    - Illegal usage of stoves used by the tea and coffee vendors
    - The anti-social activities

Because if these factors usually, fire accidents are happening in railways. No sensors or detectors or alarming devices are being used till now which makes the loco pilot lake of knowledge about the fire accidents in any coach of the train, therefore no measures can be taken to escape from the fire accident. They don’t know about the accident takes place in train until, they look at the coaches. If they see the accident at that time but there is no equipment to take quick actions.

#### PROPOSED SYSTEM

The growing concern about safety in underground transporting system exacetoated by the recent occurrence of accidents in rails at the world wide level, represents a great safety to most of the railway system. Among those accidents there is occurrence of fire in railway. It is just a great

challenge to be protected against fire in such conditions. And it is very important to have means to detect any signal of the fire as early as possible.

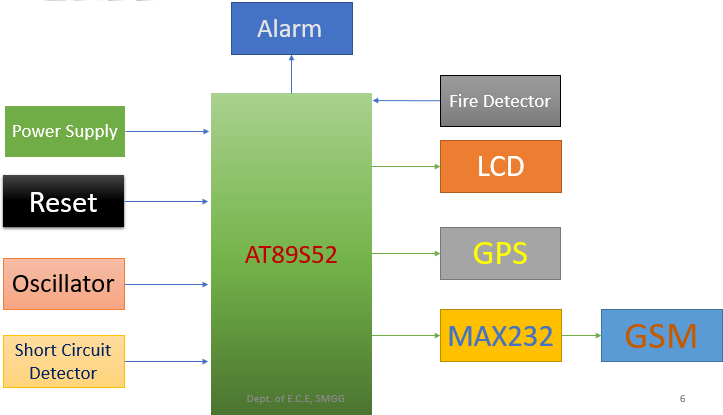
In order to provide safety for the railway transport different types of equipment are used that allow better super vision of the fire accidents occurs during its operation. A very important system is fire detection.

In this system, we are used a short circuit, fire detection systems were combined and placed in the coaches. When the fire takes place in the coaches it will simply gives the information about the coach number in the LCD display present at the Loco pilot cabin, also ranges the buzzer present in the loco piolet cabin and also sends the message about this to nearby station with the train geographical locations. By this we can easily identify the train position and also we have a chance to take quick actions.

## Chapter 3 HARDWARE TECHNOLOGY

**HARDWARE REQUIREMENTS**

#### BLOCK DIAGRAM



**Figure 3.1: Block Diagram**

#### BLOCK DIAGRAM DESCRIPTION

In our device, we are connecting Power Supply, Reset button, AT89S52, Oscillator, Short Circuit Detector, Fire Detector, LCD, GPS, GSM, Max232, Alarm. Power supply is used for supplying the power to the circuit. Reset button is used to reset the device. LCD is used for the displaying purpose, GPS is for tracking the location of the train. GSM is fixed for sending the track locations to the station. Max232 is used for the interface between AT89S52 and GSM. Alarm is is for altering with sound. AT89S52 is a Micro controller.

#### HARDWARE REQUIREMENTS

* + 1. Power Supply. 2. AT89S52.

1. GPS Device.
2. GSM Device.

5. MAX232.

1. LCD.
2. Short circuit detection.
3. Fire detection.

#### POWER SUPPLY

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others**.** This power supply section is required to convert AC signal to DC signal and also to reduce the amplitude of the signal. The available voltage signal from the mains is 230V/50Hz which is an AC voltage, but the required is DC voltage (no frequency) with the amplitude of +5V and +12V for various applications.

In this section we have Transformer, Bridge rectifier, are connected serially and voltage regulators for +5V and +12V (7805 and 7812) via a capacitor (1000µF) in parallel are connected parallel as shown in the circuit diagram below. Each voltage regulator output is again is connected to the capacitors of values (100µF, 10µF, 1 µF, 0.1 µF) are connected parallel through which the corresponding output (+5V or +12V) are taken into consideration.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | | | | | | | |
|  | | **230V AC**  **50Hz** | | |  | | | | | | **D.C**  **Output** | | | | |  |
|  | | | | | | | |  |  | | |
|  | | |  |  | | | | | | | | |
|  | **Step down transformer** | | | | |  | **Bridge Rectifier** |  | **Filter** |  | | **Regu lator** | | |  | |
|  |  |  | |
|  |  |  | |

**Figure 3.2: Block diagram of Power supply**



**Figure 3.3: Power supply circuit diagram**

CIRCUIT EXPLANATION

* + 1. **TRANSFORMER**

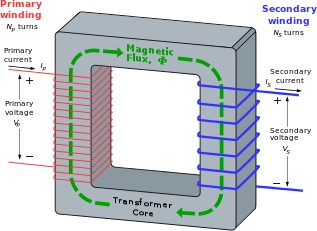
A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other. The secondary induced voltage VS, of an ideal transformer, is scaled from the primary VP by a factor equal to the ratio of the number of turns of wire in their respective windings:



BASIC PRINCIPLE

The transformer is based on two principles: firstly, that an electric current can produce a magnetic field (electromagnetism) and secondly that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction). By changing the current in the primary coil, it changes the strength of its magnetic field; since the changing magnetic field extends into the secondary coil, a voltage is induced across the secondary. A

simplified transformer design is shown below. A current passing through the primary coil creates a magnetic field. The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as iron; this ensures that most of the magnetic field lines produced by the primary current are within the iron and pass through the secondary coil as well as the primary coil.



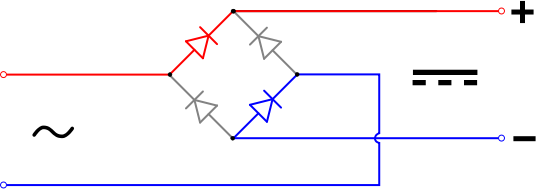
**Figure 3.4: An ideal step-down transformer showing magnetic flux in the core**

* + 1. BRIDGE RECTIFIER

A diode bridge or bridge rectifier is an arrangement of four diodes in a bridge configuration that provides the same polarity of output voltage for any polarity of input voltage. When used in its most common application, for conversion of alternating current (AC) input into direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a center-tapped transformer design, but has two diode drops rather than one, thus exhibiting reduced efficiency over a center-tapped design for the same output voltage.

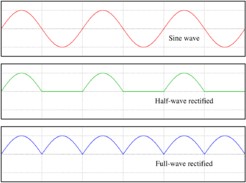
BASIC OPERATION

When the input connected at the left corner of the diamond is positive with respect to the one connected at the right-hand corner, current flows to the right along the upper colored path to the output, and returns to the input supply via the lower one.



**Figure 3.5: Bridge Rectifier Circuit**

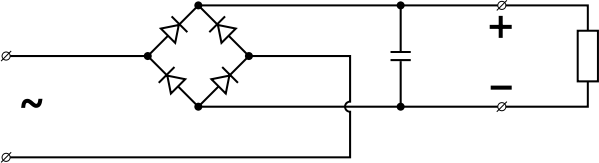
In each case, the upper right output remains positive with respect to the lower right one. Since this is true whether the input is AC or DC, this circuit not only produces DC power when supplied with AC power: it also can provide what is sometimes called "reverse polarity protection". That is, it permits normal functioning when batteries are installed backwards or DC input-power supply wiring "has its wires crossed" (and protects the circuitry it powers against damage that might occur without this circuit in place).



**Figure 3.6: Bridge Rectifier Circuit Output**

OUTPUT SMOOTHING (USING CAPACITOR)

For many applications, especially with single phase AC where the full-wave bridge serves to convert an AC input into a DC output, the addition of a capacitor may be important because the bridge alone supplies an output voltage of fixed polarity but pulsating magnitude (see diagram above).



**Figure 3.7: Bridge Rectifier with Capacitor Output**

The function of this capacitor, known as a reservoir capacitor (aka smoothing capacitor) is to lessen the variation in (or 'smooth') the rectified AC output voltage waveform from the bridge. One explanation of 'smoothing' is that the capacitor provides a low impedance path to the AC component of the output, reducing the AC voltage across, and AC current through, the resistive load. Also see rectifier output smoothing.

In a practical circuit, when a capacitor is directly connected to the output of a bridge, the bridge diodes must be sized to withstand the current surge that occurs when the power is turned on at the peak of the AC voltage and the capacitor is fully discharged. Sometimes a small series resistor is included before the capacitor to limit this current, though in most applications the power supply transformer's resistance is already sufficient. Output can also be smoothed using a choke and second capacitor. The choke tends to keep the current (rather than the voltage) more constant.

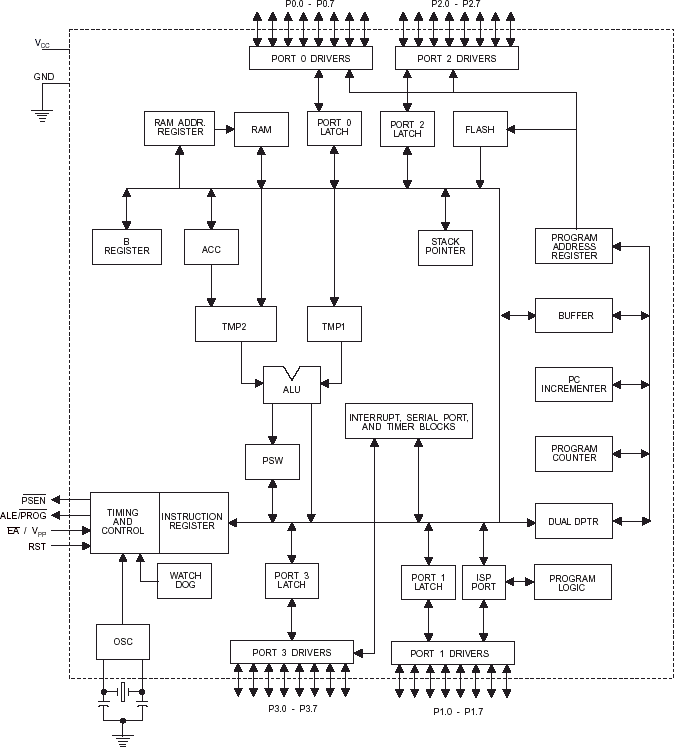
* + 1. VOLTAGE REGULATOR

A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level. The 78xx (also sometimes known as LM78xx) series of devices is a family of self- contained fixed linear voltage regulator integrated circuits. the xx is replaced with a two-digit number, which indicates the output voltage the particular device is designed to provide (for example, the 7805 has a 5 volt output, while the 7812 produces 12 volts).

#### 3.5 AT89S52

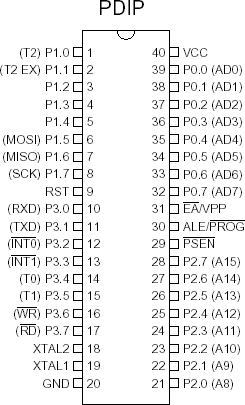
* + 1. FEATURES:
       - Compatible with MCS-51 Products
       - 8K Bytes of In-System Programmable (ISP) Flash Memory
       - 4.0V to 5.5V Operating Range
       - Fully Static Operation: 0 Hz to 33 MHz
       - 256K Internal RAM
       - 32 Programmable I/O Lines
       - 3 16-bit Timer/Counters
       - 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
    2. DESCRIPTION OF MICROCONTROLLER 89S52

The AT89S52 is a low-power, high-performance CMOS 8-bit micro controller with 8Kbytes of in-system programmable Flash memory. The device is manufactured which provides a highly flexible and cost-effective solution to many embedded control applications.



**Fig 3.8: Architecture of At89s52**

* + 1. Pin Diagram:



**Figure 3.9: Pin diagram of AT89S52**

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, full duplex serial port, on-chip oscillator, and clock circuitry.

* + 1. PIN DESCRIPTION OF MICROCONTROLLER 89S52 VCC

Supply voltage.

GND

Ground.

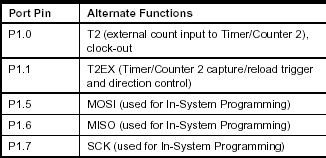
Port 0

Port 0 is an 8-bit open drain bi-directional I/O port. As an output port, each pin can sink eight TTL inputs. When 1 written to port 0 pins, the pins can be used as high impedance inputs.

Port 0 can also be configured to be the multiplexed low order address/data bus during accesses to external program and data memory.

Port 1

Port 1 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 1 Output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins, they are pulled high by the internal pull-ups and can be used as inputs. In addition, P1.0 and P1.1 can be configured to be the timer/counter 2.



**Table 3.1: Port1 Functions**

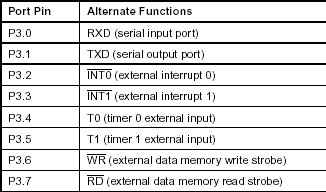
Port 2

Port 2 is an 8-bit bi-directional 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 2 emits the high-order address byte during fetches from external program memory and during accesses to external data memory that use 16-bit addresses (MOVX @DPTR).

Port 3

Port 3 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs. When 1s are writt 1s are written to Port 3 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (IIL) because of the pull-ups.

Port 3 also receives some control signals for Flash programming and verification.



**Table 3.2: Port3 Functions**

RST

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

ALE/PROG

Address Latch Enable (ALE) is an output pulse for latching the low byte of the address during accesses to external memory. This pin is also the program pulse input (PROG) during Flash programming. In normal operation, ALE is emitted at a constant rate of1/6 the oscillator frequency and may be used for external timing or clocking purposes. With the bit set, ALE is active only during a MOVX or MOVC instruction. Otherwise, the pin is weakly pulled high. Setting the ALE- disable bit has no effect if the micro controller is in external execution mode.

PSEN

Program Store Enable (PSEN) is the read strobe to external program memory. When the AT89S52 is executing code from external program memory, PSEN is activated twice each machine cycle, except that two PSEN activations are skipped during each access to external data 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. A should be strapped to

VCC for internal program executions. This pin also receives the 12-voltProgramming enables voltage (VPP) during Flash programming.

XTAL1

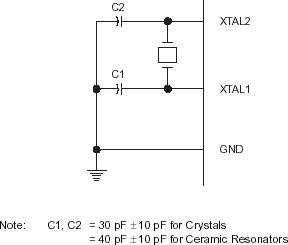
Input to the inverting oscillator amplifier and input to the internal clock operating circuit.

XTAL2

Output from the inverting oscillator amplifier.

OSCILLATOR CHARACTERISTICS

XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier that can be configured for use as an on-chip oscillator, as shown in Figure 1. Either a quartz crystal or ceramic resonator may be used as shown in Figure 2.



**Figure 3.10: Oscillator Connections**

SPECIAL FUNCTION REGISTER (SFR) MEMORY

Special Function Registers (SFR s) are areas of memory that control specific functionality of the 8051 processor. For example, four SFRs permit access to the 8051’s 32 input/output lines. Another SFR allows the user to set the serial baud rate, control and access timers, and configure the 8051’s interrupt system.

* + - * The Accumulator
      * The “R” registers
      * The “B” registers
      * The Data Pointer

THE PROGRAM COUNTER AND STACK POINTER

The program counter (PC) is a 2-byte address, which tells the 8051 where the next instruction to execute is found in memory. The stack pointer like all registers except DPTR and PC may hold an 8-bit (1-Byte) value

ADDRESSING MODES

An “addressing mode” refers that you are addressing a given memory location. In summary, the addressing modes are as follows, with an example of each:

Each of these addressing modes provides important flexibility.

Table3.3: Addressing Modes

|  |  |
| --- | --- |
| Immediate Addressing | MOV A, #20 H |
| Direct Addressing | MOV A, 30 H |
| Indirect Addressing | MOV A, @R0 |
| Indexed Addressing |  |
| 1.External Direct | MOVX A, @DPTR |
| 2.Code In direct | MOVC A, @A+DPTR |

**IMMEDIATE ADDRESSING:** Immediate addressing is so named because the value to be stored in memory immediately follows the operation code in memory. That is to say, the instruction itself dictates what value will be stored in memory. For example, the instruction:

MOV A, #20H

**DIRECT ADDRESSING:** Direct addressing is so named because the value to be stored in memory is obtained by directly retrieving it from another memory location. For example:

MOV A, 30H

Also it is important to note that when using direct addressing any instruction that refers to an address between 00h and 7Fh is referring to the SFR control registers that control the 8051 micro controller itself.

**INDIRECT ADDRESSING:** Indirect addressing is a very powerful addressing mode, which in many cases provides an exceptional level of flexibility. Indirect addressing is also the only way to access the extra 128 bytes of internal RAM found on the 8052. Indirect addressing appears as follows:

MOV A, @R0

Four SFRs permit access to the 8051’s 32 input/output lines. Another SFR allows the user to set the serial baud rate, control and access timers, and configure the 8051’s interrupt system.

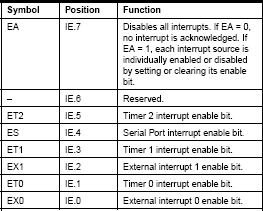
TIMER 2 REGISTERS

Control and status bits are contained in registers T2CON and T2MOD for Timer

2 .

INTERRUPT REGISTERS

The individual interrupt enable bits are in the IE register. Two priorities can be set for each of the six interrupt sources in the IP register.



**Table 3.4: Interrupt Table**

TIMER 2

Timer 2 is a 16-bit Timer / Counter that can operate as either a timer or an event counter. The type of operation is selected by bit C/T2 in the SFR T2CON. Timer 2 has three operating Modes are capture, auto-reload (up or down Counting ) , and baud rate generator.

CAPTURE MODE

In the capture mode , two options are selected by bit EXEN2 in T2CON . If EXEN2

= 0, Timer 2 is a 16-bit timer or counter. This bit can then be used to generate an interrupt

. If EXEN2 = 1 , Timer 2 performs the same operation , but a 1-to-0 transition at external input T2EX.

AUTO-RELOAD (UP OR DOWN COUNTER)

Timer 2 can be programmed to count up or down when configured in its 16-bit auto-reload mode. This feature is invoked by the DCEN (Down Counter Enable) bit located in the SFR T2MOD .If EXEN2 = 0 , Timer 2 counts up to 0FFFFH and then sets the TF2 bit upon overflow . If EXEN2 = 1 , a 16-bit reload can be triggered either by an overflow or by a 1-to-0 transition at external input T2EX.

BAUD RATE GENERATOR

Timer 2 is selected as the baud rate generator by setting TCLK and/or RCLK in T2CON . The baud rates in Modes 1 and 3 are determined by Timer 2’s overflow rate according to the following equation .

Modes 1 and 3 Baud Rates = Timer 2 Overflow Rate

16

The timer operation is different for Timer 2 when it is used as a baud rate generator

.Normally ,as a timer , it increments every machine cycle (at 1/12 the oscillator frequency).

TIMER 0

Timer 0 functions as either a timer or event counter in four modes of operation. Timer 0 is controlled by the four lower bits of the TMOD register and bits 0, 1, 4 and 5 of the TCON register

MODE 0 ( 13-BIT TIMER)

Mode 0 configures timer 0 as a 13-bit timer which is set up as an 8-bit timer (TH0 register) with a modulo 32 pre scalar implemented with the lower five bits of the TL0 register .

MODE 1 ( 16-BIT TIMER )

Mode 1 is the same as Mode 0, except that the Timer register is being run with all 16 bits . Mode 1 configures timer 0 as a 16-bit timer with the TH0 and TL0 registers connected in cascade . The selected input increments the TL0 register.

MODE 2 (8-BIT TIMER WITH AUTO-RELOAD)

Mode 2 configures timer 0 as an 8-bit timer ( TL0 register ) that automatically reloads from the TH0 register .

MODE 3 ( TWO 8-BIT TIMERS )

Mode 3 configures timer 0 so that registers TL0 and TH0 operate as separate 8- bit timers. This mode is provided for applications requiring an additional 8-bit timer or counter .

TIMER 1

Timer 1 is identical to timer 0 , except for mode 3 , which is a hold-count

mode .

MODE 3 ( HALT )

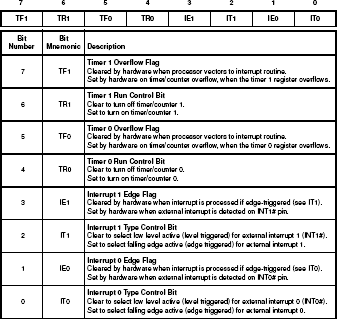
Placing Timer 1 in mode 3 causes it to halt and hold its count . This can be used to halt Timer 1 when TR1 run control bit is not available i.e. , when Timer 0 is in mode 3 .

Baud Rates

The baud rate in Mode 0 is fixed. The baud rate in Mode 2 depends on the value of bit SMOD in Special Function Register PCON. If SMOD = 0 (which is its value on reset), the baud rate is 1/64 the oscillator frequency . If SMOD = 1, the baud rate is 1/32 the oscillator frequency.

TCON REGISTER

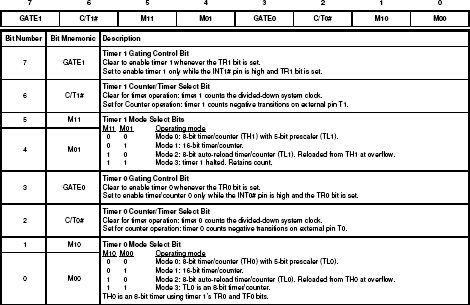
Timer/counter Control Register



**Table 3.5: TCON Register Table**

TMOD REGISTER

Timer/Counter 0 and 1 Modes



**Table 3.6: TMOD Register Table**

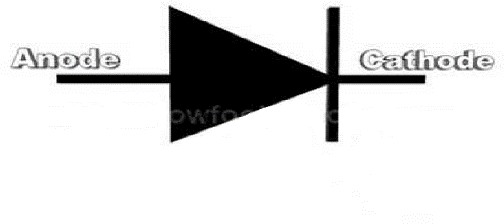
#### LIGHT-EMITTING DIODE (LED)

Light-emitting diodes are elements for light signalization in electronics. They are manufactured in different shapes, colors and sizes. For their low price, low consumption and simple use, they have almost completely pushed aside other light sources- bulbs at first place. They perform similar to common diodes with the difference that they emit light when current flows through them. Light emitting diodes (LEDs) are semiconductor light sources. The light emitted from LEDs varies from visible to infrared and ultraviolet regions. They operate on low voltage

and power. LEDs are one of the most common electronic components and are mostly used as indicators in circuits. They are also used for luminance and optoelectronic applications.

Based on semiconductor diode, LEDs emit photons when electrons recombine with holes on forward biasing. The two terminals of LEDs are anode (+) and cathode (-) and can be identified by their size. The longer leg is the positive terminal or anode and shorter one is negative terminal. The forward voltage of LED (1.7V-2.2V) is lower than the voltage supplied (5V) to drive it in a circuit. Using an LED as such would burn it because a high current would destroy its p-n gate. Therefore a current limiting resistor is used in series with LED. Without this resistor, either low input voltage (equal to forward voltage) or PWM (pulse width modulation) is used to drive the LED.

Symbol:

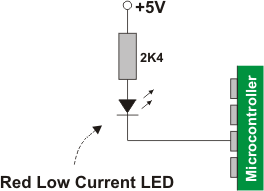


**Fig3.11: Symbol of LED**

It is important to know that each diode will be immediately destroyed unless its current is limited. This means that a conductor must be connected in parallel to a diode.

In order to correctly determine value of this conductor, it is necessary to know diode’s voltage drop in forward direction, which depends on what material a diode is made of and what colour it is.

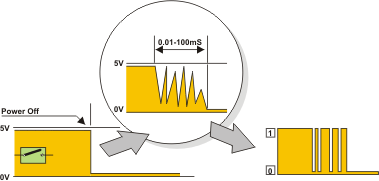
Values typical for the most frequently used diodes are shown in table below: There are three main types of LEDs. Standard ones get ful brightness at current of 20mA. Low Current diodes get full brightness at ten times lower current while Super Bright diodes produce more intensive light than Standard ones.



**Fig3.12: LED Connection to Microcontroller**

Since the 8051 microcontrollers can provide only low input current and since their pins are configured as outputs when voltage level on them is equal to 0, direct connecting to LEDs is carried out as it is shown on figure (Low current LED, cathode is connected to output pin).

#### SWITCHES AND PUSHBUTTONS

There is nothing simpler than this! This is the simplest way of controlling appearance of some voltage on microcontroller’s input pin. There is also no need for additional explanation of how these components operate. Nevertheless, it is not so simple in practice... This is about something commonly unnoticeable when using these components in everyday life. It is about contact bounce- a common problem with mechanical switches. If contact switching does not happen so quickly, several consecutive bounces can be noticed prior to maintain stable state.

**Fig3.13: Push Button**

The reasons for this are: vibrations, slight rough spots and dirt. Anyway, whole this process does not last long (a few micro- or milliseconds), but long enough to be registered by the microcontroller. Concerning pulse counter, error occurs in almost 100% of cases!

**Figure3.14: Push button operation**

The simplest solution is to connect simple RC circuit which will “suppress” each quick voltage change. Since the bouncing time is not defined, the values of elements are not strictly determined. In the most cases, the values shown on figure are sufficient.

If complete safety is needed, radical measures should be taken! The circuit, shown on the figure (RS flip-flop), changes logic state on its output with the first pulse triggered by contact bounce. Even though this is more expensive solution (SPDT switch), the problem is definitely resolved! Besides, since the compensator is not used, very short pulses can be also registered in this way.

In addition to these hardware solutions, a simple software solution is commonly applied too: when a program tests the state of some input pin and finds changes, the check should be done one more time after certain time delay. If the change is confirmed it means that switch (or pushbutton) has changed its position. The advantages of such solution are obvious: it is free of charge, effects of disturbances are eliminated too and it can be adjusted to the worst-quality contacts.

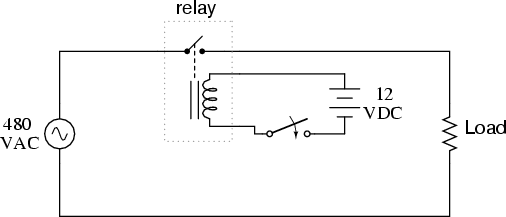
#### RELAY

A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or

many sets of contacts. A relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier. Relays are usually SPDT (single pole double through switch)or DPDT (double pole double through switch) but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available.

* + 1. BASIC OPERATION OF A RELAY:

An electric current through a conductor will produce a magnetic field at right angles to the direction of electron flow. If that conductor is wrapped into a coil shape, the magnetic field produced will be oriented along the length of the coil. The greater the current, the greater the strength of the magnetic field, all other factors being equal.



**Figure 3.15: open relay circuit**

Inductors react against changes in current because of the energy stored in this magnetic

field.

Relays can be categorized according to the magnetic system and operation:

NEUTRAL RELAYS

The neutral relays have a magnetic coil, which operates the relay at a specified current, regardless of the polarity of the voltage applied.

BIASED RELAYS

Biased relays have a permanent magnet above the armature. The relay operates if the current through the coil winding establishes a magneto-motive force that opposes the flux by the

permanent magnet. If the fluxes are in the same direction, the relay will not operate, even for a greater current through the coil.

POLARIZED RELAYS

Like the biased relays, the polarized relays operate only when the current through the coil in one direction. But there the principle is different. The relay coil has a diode connected in series with it. This blocks the current in the reverse direction.

RELAYS FOR AC

These are neutral relays and picked up for AC current through their coil. These are very fast in action and used on power circuits of the point motors, where high current flows through the contacts. A normal relay would be slow and make sparks which in turn may weld the contacts together.

* + 1. APPLICATIONS
       - To control a high-voltage circuit with a low-voltage signal, as in some types of modems or audio amplifiers,
       - To control a high-current circuit with a low-current signal, as in the starter solenoid of an automobile,
       - To perform logic functions.
       - To perform time delay functions.

#### RESISTORS:

Resistors (R) are the most commonly used of all electronic components, to the point where they are almost taken for granted. There are many different resistor types available with their principal job being to "resist" the flow of current through an electrical circuit, or to act as voltage droppers or voltage dividers. They are "Passive Devices", that is they contain no source of power or amplification but only attenuate or reduce the voltage signal passing through them. When used in DC circuits the voltage drop produced is measured across their terminals as the circuit current

flows through them while in AC circuits the voltage and current are both in-phase producing 0o phase shift.

Resistors produce a voltage drop across themselves when an electrical current flow through them because they obey Ohm's Law and different values of resistance produces different values of current or voltage.

OHM’S LAW:

To make a current flow through a resistance there must be a voltage across that resistance. Ohm's Law shows the relationship between the voltage (V), current (I) and resistance (R). It can be written in three ways:

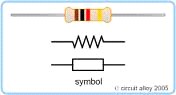
V = I × R I = V/ R R = V/ I

Where: V = voltage in volts (V)

I = current in amps (A) R = resistance in ohms ( )

Some of the common characteristics associated with the humble resistor are; Temperature Coefficient, Voltage Coefficient, Noise, Frequency Response, Power as well as Temperature Rating, Physical Size and Reliability.

RESISTOR SYMBOL :



**Fig3.16: Resistor symbol**

The symbol of Resistor and a resistor used in laboratory are shown.

#### CAPACITORS

The capacitor's function is to store electricity, or electrical energy. The capacitor also functions as a filter, passing alternating current (AC), and blocking direct current (DC). This

symbol ‘F’ is used to indicate a capacitor in a circuit diagram. The capacitor is constructed with two electrode plates facing each other, but separated by an insulator. When DC voltage is applied to the capacitor, an electric charge is stored on each electrode. While the capacitor is charging up, current flows. The current will stop flowing when the capacitor has fully charged.

SYMBOL

+ -



**Figure3.17: Symbol of Capacitor**

The symbol of capacitor is shown and the two terminals both positive and negative terminals are also shown in the diagram

CERAMIC CAPACITORS

Ceramic capacitors are constructed with materials such as titanium acid barium used as the dielectric. Internally, these capacitors are not constructed as a coil, so they can be used in high frequency applications. Typically, they are used in circuits which bypass high frequency signals to ground. These capacitors have the shape of a disk. Their capacitance is comparatively small. The capacitor on the left is a 100pF capacitor with a diameter of about 3 mm. The capacitor on the right side is printed with 103, so 10 x 103pF becomes 0.01 µF. The diameter of the disk is about 6 mm. Ceramic capacitors have no polarity. Ceramic capacitors should not be used for analog circuits, because they can distort the signal. Different types of ceramic capacitors used as shown

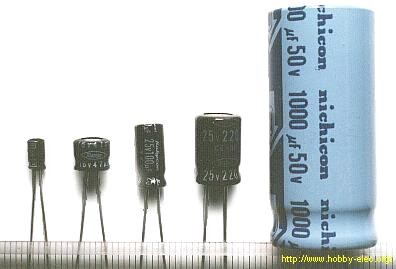


**Fig3.18: Ceramic capacitors**

Ceramic capacitors are normally used for radio frequency and some audio applications. Ceramic capacitors range in value from figures as low as a few picofarads to around 0.1 microfarads.

ELECTROLYTIC CAPACITORS (ELECTROCHEMICAL TYPE CAPACITORS):

Aluminum is used for the electrodes by using a thin oxidization membrane. Large values of capacitance can be obtained in comparison with the size of the capacitor, because the dielectric used is very thin. The most important characteristic of electrolytic capacitors is that they have polarity. They have a positive and a negative electrode. [Polarized] This means that it is very important which way round they are connected.



**Fig3.19: Electrolytic Capacitors**

If the capacitor is subjected to voltage exceeding its working voltage, or if it is connected with incorrect polarity, it may burst. It is extremely dangerous, because it can quite literally explode. Make absolutely no mistakes. Generally, in the circuit diagram, the positive side is indicated by a "+" (plus) symbol. Electrolytic capacitors range in value from about 1µF to thousands of µF. Mainly this type of capacitor is used as a ripple filter in a power supply circuit, or as a filter to bypass low frequency signals, etc. Because this type of capacitor is comparatively similar to the nature of a coil in construction, it isn't possible to use for high-frequency circuits. Different types of electrolytic capacitors used as shown.

#### TRANSISTOR

A Transistor is a semiconductor device used to amplify and switch electronic signals. It is made of a solid piece of semiconductor material, with at least three terminals for connection to an

external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals. Because the controlled (output) power can be much more than the controlling (input) power, the transistor provides amplification of a signal. The transistor is the fundamental building block of modern electronic devices. A transistor can control its output in proportion to the input signal; that is, it can act as an amplifier. Alternatively, the transistor can be used to turn current on or off in a circuit as an electrically controlled switch, where the amount of current is determined by other circuit elements. Modern transistor audio amplifiers of up to a few hundred watts are common and relatively inexpensive.



Fig3.20: Transistors

Transistors amplify current, for example they can be used to amplify the small output current from a logic IC so that it can operate a lamp, relay or other high current device.

In many circuits a resistor is used to convert the changing current to a changing voltage, so the transistor is being used to amplify voltage. A transistor may be used as a switch (either fully on with maximum current, or fully off with no current) and as an amplifier (always partly on).

#### GSM (GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS)

* + 1. 1NTRODUCTION

GSM (Global System for Mobile communications) is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. GSM networks operate in four different frequency ranges. Most GSM networks operate in the 900 MHz or 1800 MHz bands.

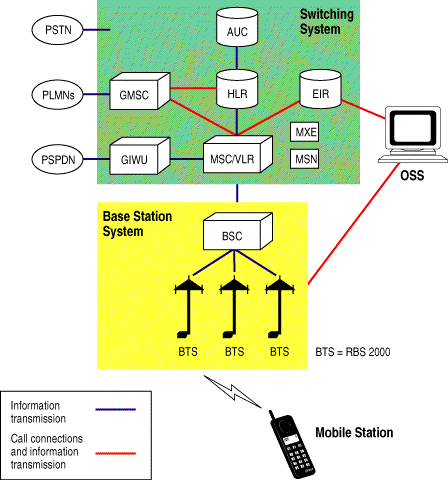
GSM-900 uses 890–915 MHz to send information from the mobile station to the base station (uplink) and 935–960 MHz for the other direction (downlink), providing 124 RF channels (channel numbers 1 to 124) spaced at 200 kHz. Duplex spacing of 45 MHz is used. It uses TDMA frame. Half rate channels use alternate frames in the same timeslot. The channel data rate is 270.833 k bit/s, and the frame duration is 4.615 ms.

* + 1. GSM ADVANTAGES

GSM also pioneered a low-cost, to the network carrier, alternative to voice calls, the Short message service (SMS, also called "text messaging"), which is now supported on other mobile standards as well.

* + 1. The GSM Network

The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS).



**Figure 3.21: The switching system**

* + 1. THE SWITCHING SYSTEM

The switching system (SS) is responsible for performing call processing and subscriber-related functions. The switching system includes the following functional units.

* + - * Home location register (HLR)
      * Mobile services switching center (MSC)
      * Visitor location register (VLR)
      * Authentication center (AUC)
      * Equipment identity register (EIR)

#### THE BASE STATION SYSTEM (BSS)

All radio-related functions are performed in the BSS, which consists of base station controllers (BSCs) and the base transceiver stations (BTSs).

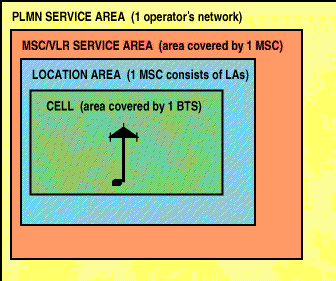
#### THE OPERATION AND SUPPORT SYSTEM

The operations and maintenance center (OMC) is connected to all equipment in the switching system and to the BSC. The implementation of OMC is called the operation and support system (OSS). The OSS is the functional entity from which the network operator monitors and controls the system.

* + - 1. ADDITIONAL FUNCTIONAL ELEMENTS
         * Message center (MXE)
         * Mobile service node (MSN)
         * Gateway mobile services switching center (GMSC)
         * GSM inter-working unit (GIWU)

#### GSM NETWORK AREAS

The GSM network is made up of geographic areas. As shown in bellow figure, these areas include cells, location areas (LAs), MSC/VLR service areas, and public land mobile network (PLMN) areas.



**Figure 3.22: GSM Network Areas**

**LOCATION AREAS:** The cell is the area given radio coverage by one base transceiver station. The GSM network identifies each cell via the cell global identity (CGI) number assigned to each cell. The location area is a group of cells.

**MSC/VLR SERVICE AREAS:** An MSC/VLR service area represents the part of the GSM network that is covered by one MSC and which is reachable, as it is registered in the VLR of the MSC.

**PLMN SERVICE AREAS:** The PLMN service area is an area served by one network operator.

#### GSM SPECIFICATIONS:

Specifications for different personal communication services (PCS) systems vary among the different PCS networks. Listed below is a description of the specifications and characteristics for GSM.

* + - * **FREQUENCY BAND**: The frequency range specified for GSM is 1,850 to 1,990 MHz (mobile station to base station).
      * **DUPLEX DISTANCE**: The duplex distance is 80 MHz A channel has two frequencies, 80 MHz apart.
      * **CHANNEL SEPARATION**: The separation between adjacent carrier frequencies. In GSM, this is 200 kHz.
      * **MODULATION**: Modulation is the process of sending a signal by changing the characteristics of a carrier frequency. This is done in GSM via Gaussian minimum shift keying (GMSK).
      * **TRANSMISSION RATE**: GSM is a digital system with an over-the-air bit rate of 270 kbps.
      * **ACCESS METHOD**: GSM utilizes the time division multiple access (TDMA) concept.
      * **SPEECH CODER**: GSM uses linear predictive coding (LPC). The purpose of LPC is to reduce the bit rate. Speech is encoded at 13 kbps.

#### GSM SUBSCRIBER SERVICES

* + - * **DUAL-TONE MULTI FREQUENCY (DTMF)**: DTMF is a tone signaling scheme often used for various control purposes via the telephone network, such as remote control of an answering machine. GSM supports full-originating DTMF.
      * **FACSIMILE GROUP III**—GSM supports CCITT Group 3 facsimile. As standard fax machines are designed to be connected to a telephone using analog signals.
      * **SHORT MESSAGE SERVICES**: A convenient facility of the GSM network is the short message service. A message consisting of a maximum of 160 alphanumeric characters can be sent to or from a mobile station.
      * **CELL BROADCAST**: A variation of the short message service is the cell broadcast facility. A message of a maximum of 93 characters can be broadcast to all mobile subscribers in a certain geographic area..
      * **VOICE MAIL**: This service is actually an answering machine within the network, which is controlled by the subscriber. Calls can be forwarded to the subscriber's voice- mail box and the subscriber checks for messages via a personal security code.
      * **FAX MAIL**: With this service, the subscriber can receive fax messages at any fax machine. The messages are stored in a service center from which they can be retrieved by the subscriber via a personal security code to the desired fax number.
    1. SUPPLEMENTARY SERVICES

GSM supports a comprehensive set of supplementary services that can complement and support both telephony and data services.

* + - * Call forwarding
      * Barring of outgoing calls
      * Barring of incoming calls
      * Advice of charge (AoC)
      * Call hold
      * Call waiting
    1. MAIN AT COMMANDS

"AT command set for GSM Mobile Equipment” describes the Main AT commands to communicate via a serial interface with the GSM subsystem of the phone. AT commands are instructions used to control a modem. AT is the abbreviation of Attention. Every command line starts with "AT" or "at". That's why modem commands are called AT commands. Many of the commands that are used to control wired dial-up modems, such as ATD (Dial), ATA (Answer), ATH (Hook control) and ATO (Return to online data state). GSM/GPRS modems and mobile phones support an AT command set that is specific to the GSM technology, which includes SMS- related commands like AT+CMGS (Send SMS message), AT+CMSS (Send SMS message from storage), AT+CMGL (List SMS messages) and AT+CMGR (Read SMS messages). Here are some of the tasks that can be done using AT commands with a GSM/GPRS modem or mobile phone:

* + - * Get basic information about the mobile phone or GSM/GPRS modem. For example, name of manufacturer (AT+CGMI), model number (AT+CGMM), IMEI number (International Mobile Equipment Identity) (AT+CGSN) and software version (AT+CGMR).
      * Get basic information about the subscriber. For example, MSISDN (AT+CNUM) and IMSI number (International Mobile Subscriber Identity) (AT+CIMI).
      * Send and receive fax (ATD, ATA, AT+F\*).
      * Send (AT+CMGS, AT+CMSS), read (AT+CMGR, AT+CMGL), write (AT+CMGW) or delete (AT+CMGD) SMS messages and obtain notifications of newly received SMS messages (AT+CNMI).
      * Read (AT+CPBR), write (AT+CPBW) or search (AT+CPBF) phonebook entries.
      * Get or change the configurations of the mobile phone or GSM/GPRS modem. For example, change the GSM network (AT+COPS), bearer service type (AT+CBST), radio link protocol parameters (AT+CRLP), SMS center address (AT+CSCA) and storage of SMS messages (AT+CPMS).

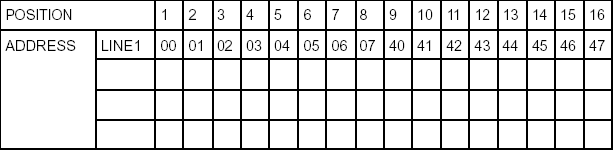
#### LCD (LIQUID CRISTAL DISPLAY)

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to a controller is an LCD display. Some of the most common LCDs connected to the controllers are 16X1, 16x2 and 20x2 displays.

Many microcontroller devices use 'smart LCD' displays to output visual information. They have a standard ASCII set of characters and mathematical symbols. For an 8-bit data bus, the display requires a +5V supply plus 10 I/O lines (RS RW D7 D6 D5 D4 D3 D2 D1 D0). For a 4- bit data bus it only requires the supply lines plus 6 extra lines(RS RW D7 D6 D5 D4).

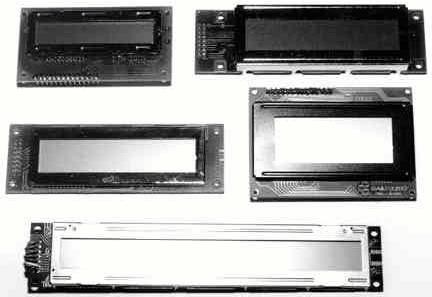
* + 1. FEATURES
       - Interface with either 4-bit or 8-bit microprocessor.
       - Display data RAM
       - 80x8 bits (80 characters).
       - Character generator ROM
       - 160 different 5 x 7 dot-matrix character patterns.
       - Numerous instructions
       - Built-in reset circuit is triggered at power ON.
       - Built-in oscillator.

Data can be placed at any location on the LCD. For 16×1 LCD, the address locations are:



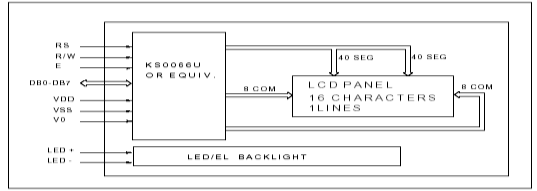
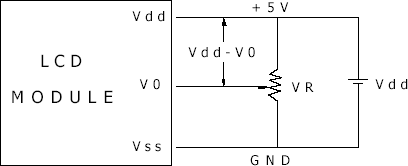
**Figure 3.23: Address locations for a 1x16 line LCD**

* + 1. SHAPES AND SIZES



**Figure 3.24: Different Shapes of LCD’S**

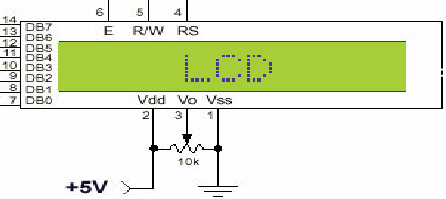
Even limited to character based modules, there is still a wide variety of shapes and sizes available. Line lengths of 8,16,20,24,32 and 40 characters are all standard, in one, two and four line versions. Several different LC technologies exists. “supertwist” types. The back lighting may be either “electro-luminescent”, requiring a high voltage inverter circuit, or simple LED illumination.



**Figure 3.25: power supply for LCD**

* + 1. PIN DESCRIPTION

Most LCDs with 1 controller has 14 Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for back-light LED connections).



**Figure 3.26: Pin Diagram Of 1x16 Lines LCD**



CONTROL LINES EN

Line is called "Enable." This control line is used to tell the LCD that you are sending it data. To send data to the LCD, your program should make sure this line is low (0). When the other lines are completely ready, bring EN high (1).

RS

Line is the "Register Select" line. When RS is low (0), the data is to be treated as a command or special instruction (such as clear screen). When RS is high (1), the data being sent is text data which sould be displayed on the screen.

RW

Line is the "Read/Write" control line. When RW is low (0), the information on the data bus is being written to the LCD. When RW is high (1), the program is effectively querying (or reading) the LCD. Finally, the data bus consists of 4 or 8 lines (depending on the mode of operation selected by the user). In the case of an 8-bit data bus, the lines are referred to as DB0, DB1, DB2, DB3, DB4, DB5, DB6, and DB7.

* + 1. LOGIC STATUS ON CONTROL LINES
       - E - 0 Access to LCD disabled- 1 Access to LCD enabled
       - R/W - 0 Writing data to LCD- 1 Reading data from LCD
       - RS - 0 Instructions -1 Character
    2. WRITING DATA TO THE LCD
       - Set R/W bit to low
       - Set RS bit to logic 0 or 1 (instruction or character)
       - Set data to data lines (if it is writing)
       - Set E line to high
       - Set E line to low
    3. READ DATA FROM DATA LINES (IF IT IS READING) ON LCD
       - Set R/W bit to high
       - Set RS bit to logic 0 or 1 (instruction or character)
       - Set data to data lines (if it is writing)
       - Set E line to high
       - Set E line to low
    4. ENTERING TEXT

Most of the characters conform to the ASCII standard, although the Japanese and Greek characters (and a few other things) are obvious exceptions. Using the switches, of whatever type, and referring to Table 3, enter a few characters onto the display, both letters and numbers. The RS switch (S10) must be “up” (logic 1) when sending the characters, and switch E (S9) must be pressed

for each of them. This is where these modules really start to show their potential, offering such capabilities as bar graphs, flashing symbols, even animated characters. Before the user-defined characters are set up, these codes will just bring up strange looking symbols.



**Figure 3.27: Equivalent number format of Hex programs**



**Figure 3.28: Command flow chart for LCD**

If the power conditions for the normal operation of the internal reset circuit are not satisfied, then executing a series of instructions must initialize LCD unit. The procedure for this initialization process is as above show.

#### GLOBAL POSITIONING SYSTEM

The Global Positioning System was conceived in 1960 under the auspices of the U.S. Air Force, but in 1974 the other branches of the U.S. military joined the effort. The first satellites were launched into space in 1978. The System was declared fully operational in April 1995.

The Global Positioning System consists of 24 satellites, that circle the globe once every 12 hours, to provide worldwide position, time and velocity information.

GPS makes it possible to precisely identify locations on the earth by measuring distance from the satellites. GPS allows you to record or create locations from places on the earth and help you navigate to and from those places.

Originally the System was designed only for military applications and it wasn’t until the 1980’s that it was made available for civilian use also.

* + 1. WORKING OF GPS

When a GPS receiver is turned on, it first downloads orbit information of all the satellites. This process, the first time, can take as long as 12.5 minutes, but once this information is downloaded, it is stored in the receivers memory for future use.

Even though the GPS receiver knows the precise location of the satellites in space, it still needs to know the distance from each satellite it is receiving a signal from.

That distance is calculated, by the receiver, by multiplying the velocity of the transmitted signal by the time it takes the signal to reach the receiver.

The receiver already knows the velocity, which is the speed of a radio wave or 186,000 miles per second (the speed of light).

To determine the time part of the formula, the receiver matches the satellites transmitted code to its own code, and by comparing them determines how much it needs to delay its code to match the satellites code. This delayed time is multiplied by the speed of light to get the distance.

The GPS receivers clock is less accurate than the atomic clock in the satellite, therefore, each distance measurement must be corrected to account for the GPS receivers internal clock error.

**Signal is picked up by receiver at time “X +**



**Signal leaves satellite at time “X”.It takes 3 seconds for the signal to reach the GPS unit.**

**X**

**X + 3**

**3”**

**SECONDS**

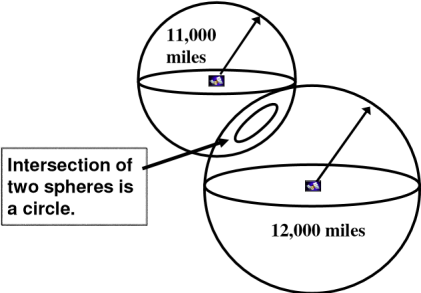
###### Distance between satellite and receiver = “3” (times the speed of light)

**TRIANGULATION**

Once both satellite and position are known for at least 4 satellites, the receiver can determine a position by triangulation.

**Second measurement narrows it down to the intersection of two spheres.**

**One measurement narrows down our position to the**



**surface of a sphere. .**le Navigation Trimble Navigation

**11,000 miles**

***We are somewhere on the surface***

***of this***

***sphere.***

***Third measurement narrows to justtwo points.***

**Fourth measurement will decide between the two points.**

**11,000 miles**

***Intersection ofthree spheres is only two points.***

**14,000 miles**

**11,000**

**miles**

**Fourth measurement will go through only one of the two points.**

**13,000 miles**

**12,000 miles**

**13,000 miles**

**12,000 miles**

Trimble Navigation

Trimble Navigation

#### GPS TERMINOLOGY

**2D POSITIONING**: In terms of a GPS receiver, this means that the receiver is only able to lock on to three satellites which only allows for a two dimensional position fix. Without an altitude, there may be a substantial error in the horizontal coordinate.

**3D POSITIONING:** Position calculations in three dimensions. The GPS receiver has locked on to 4 satellites. This provides an altitude in a addition to a horizontal coordinate, which means a much more accurate position fix.

**REAL TIME DIFFERENTIAL GPS**: Real-time DGPS employs a second, stationary GPS receiver at a precisely measured spot (usually established through traditional survey methods). This receiver corrects any errors found in the GPS signals, including atmospheric distortion, orbital anomalies, Selective Availability (when it existed), and other errors. A DGPS station is able to do this because its computer already knows its precise location, and can easily determine the amount of error provided by the GPS signals. DGPS corrects or reduces the effects of:

Orbital errors Atmospheric distortion Selective Availability Satellite clock errors Receiver clock errors

DGPS cannot correct for GPS receiver noise in the user’s receiver, multipath interference, and user mistakes. In order for DGPS to work properly, both the user’s receiver and the DGPS station receiver must be accessing the same satellite signals at the same time.

GPS NAVIGATION TERMINOLOGY



**Active GOTO**

**Waypoint**

**N(0000)**

**(DTK) (ºx)**

**(CMG) (ºx)**

**Desired Track**

**N(00)**

**Active Course Made Good (CMPGr)esent**

**From**

**Tracking (TRKº))(x**

**Waypoint**

**Location**

**Fig3.29 GPS Navigation Terminology**

#### GPS RECEIVER INPUTS

The following are inputs that are needed before you use your GPS receiver.

**POSITION FORMAT:** Input what units you want your position. Examples: Latitude and Longitude

Degrees – Minutes – Seconds (hddd mm’ ss.s”, N 43 - 40’- 55.8” E) UTM ( 11T 0557442m E 4836621m N)

MAP DATUM:

Make sure the map datum in your GPS receiver matches the map datum of the map you are using when you are going to plot points on that map.

Some common map datums used are WGS 84, NAD 27 and NAD 83.

DISTANCE:

Input distance units such as: Nautical or Statute miles, Metric, Yards

ELEVATION:

Input elevation units in feet or meters

**NORTH REFERENCE:** Input the North reference you want to use. Examples: True, Magnetic or Grid

**Time:** Input time format for 12 or 24 hour and input the correct time zone.



**Fig 3.30: Working of GPS**

#### TEMPERATURE SENSOR

Temperature sensor is a device which senses variations in temperature across it. LM35 is a basic temperature sensor that can be used for experimental purpose. It give the readings in centigrade(degree Celsius)since its output voltage is linearly proportional to temperature. It uses the fact that as temperature increases, the voltage across diode increases at known rate (actually the drop across base-emitter junction of transistor). Its disadvantage is its sluggish response. Temperature is the most often-measured environmental quantity.

This might be expected since most physical, electronic, chemical, mechanical, and biological systems are affected by temperature. Certain chemical reactions, biological processes, and even electronic circuits perform best within limited temperature ranges. Temperature is one of the most commonly measured variables and it is therefore not surprising that there are many ways of sensing [it. Temperature sensing](http://www.edgefxkits.com/industrial-temperature-controller) can be done either through direct contact with the heating source, or remotely, without direct contact with the source using radiated energy instead. There are a wide variety of temperature sensors on the market today, including Thermocouples, Resistance Temperature Detectors (RTDs), Thermistors, Infrared, and Semiconductor Sensors.



**Fig3.31: Temperature Sensor**

* + 1. Features:
       - calibrated directly in degree celsius(centigrade)
       - Linear +10.0 mV/ degree celsius
       - 0.5 degree celsius accuracy guaranteeable (at +25degree celsius)
       - Rated for full -55 to +150 degree celsius range
       - Suitable for remote applications
       - Low cost due to wafer-level trimming
       - Operates from 4 to 30 volts
       - Less than 60 Micro ampere current drain
       - Low self-heating, 0.08 degree celsius in still air
       - Nonlinearity only +/- 1/4 degree celsius typical
       - Low impedance output, 0.1 Ohm for 1mA load.

#### SHORT CIRCUIT DETECTION

A short circuit (sometimes abbreviated to short or s/c) is a[n electrical circuit](https://en.wikipedia.org/wiki/Electrical_network) that allows a [current](https://en.wikipedia.org/wiki/Electric_current) to travel along an unintended path with no or a very low [electrical impedance](https://en.wikipedia.org/wiki/Electrical_impedance). The electrical opposite of a short circuit is an "[open circuit](https://en.wikipedia.org/wiki/Open-circuit_voltage)", which is an infinite resistance between two nodes. It is common to misuse "short circuit" to describe any electrical malfunction, regardless of the actual problem.

A common type of short circuit occurs when the positive and negative terminals of a [battery](https://en.wikipedia.org/wiki/Battery_(electricity)) are connected with a low-[resistanceconductor](https://en.wikipedia.org/wiki/Electrical_resistance), like a [wire.](https://en.wikipedia.org/wiki/Wire) With low resistance in the connection, a high [current](https://en.wikipedia.org/wiki/Current_(electricity)) exists, causing the cell to deliver a large amount of [energy](https://en.wikipedia.org/wiki/Energy) in a short time.

A large current through a battery can cause the rapid buildup of heat, potentially resulting in an explosion or the release of [hydrogen](https://en.wikipedia.org/wiki/Hydrogen) gas and [electrolyte](https://en.wikipedia.org/wiki/Electrolyte) (an [acid](https://en.wikipedia.org/wiki/Acid) or a [base](https://en.wikipedia.org/wiki/Base_(chemistry))), which can burn tissue, cause blindness or even death. Overloaded wires can also [overheat](https://en.wikipedia.org/wiki/Overheating_(electricity)), sometimes causing damage to the wire's insulation, or a fire. High current conditions may also occur with [electric](https://en.wikipedia.org/wiki/Electric_motor) [motor](https://en.wikipedia.org/wiki/Electric_motor) loads under stalled conditions, such as when the impeller of an electrically driven [pump](https://en.wikipedia.org/wiki/Pump) is jammed by debris; this is not a short, though it may have some similar effects.

A short circuit fault current can, within milliseconds, be thousands of times larger than the normal operating current of the system. Damage from short circuits can be reduced or prevented by employing [fuses,](https://en.wikipedia.org/wiki/Fuse_(electrical)) [circuit breakers,](https://en.wikipedia.org/wiki/Circuit_breaker) or other [overload protection,](https://en.wikipedia.org/wiki/Overload_protection) which disconnect the power in reaction to excessive current.

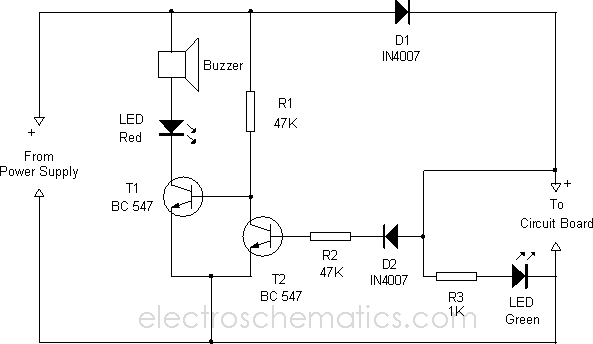
Overload protection must be chosen according to the current rating of the circuit. Circuits for large [home appliances](https://en.wikipedia.org/wiki/Home_appliance) require protective devices set or rated for higher currents than lighting circuits. [Wire gauges](https://en.wikipedia.org/wiki/Wire_gauge) specified in building and electrical [codes](https://en.wikipedia.org/wiki/Building_code) are chosen to ensure safe operation

in conjunction with the overload protection. An overcurrent protection device must be rated to safely interrupt the maximum [prospective short circuit current](https://en.wikipedia.org/wiki/Prospective_short_circuit_current).

In an improper installation, the overcurrent from a short circuit may cause [ohmic heating](https://en.wikipedia.org/wiki/Ohmic_heating) of the circuit parts with poor conductivity (faulty joints in wiring, faulty contacts in power sockets, or even the site of the short circuit itself).

Suc[h overheating](https://en.wikipedia.org/wiki/Overheating_(electricity)) is a common cause of [fires.](https://en.wikipedia.org/wiki/Fire) An electric arc, if it forms during the short circuit, produces high amount of heat and can cause ignition of combustible substances as well.

In industrial and utility distribution systems, dynamic forces generated by high short circuit currents cause conductors to spread apart. Busbars, cables, and apparatus can be damaged by the forces generated in a short circuit.



**Fig3.32: short circuit detection**

**CHAPTER 4 SOFTWARE REQUIREMENTS**

**4. SOFTWARE REQUIREMENTS & IMPLEMENTATIONS**

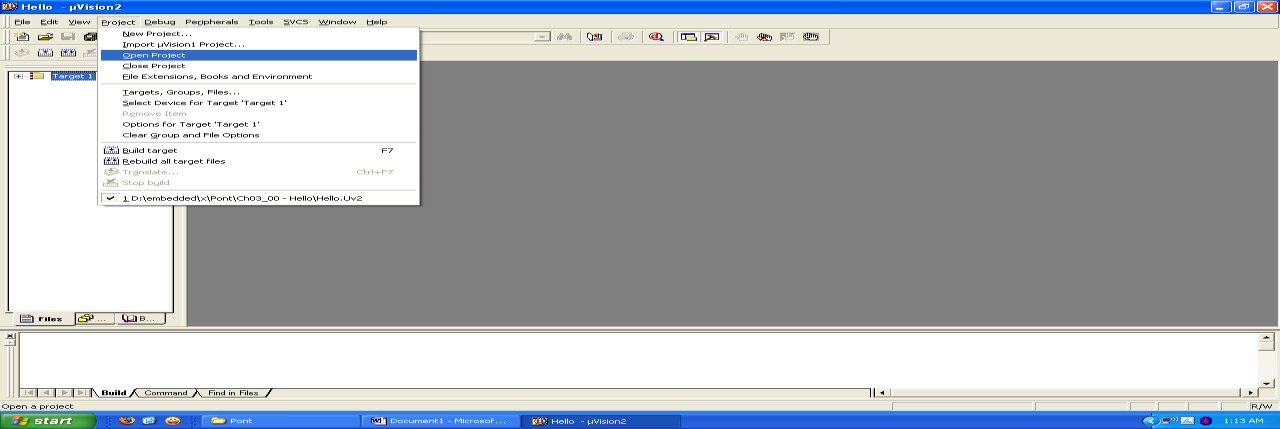
#### KEIL SOFTWARE

* + 1. INSTALLING THE KEIL SOFTWARE ON A WINDOWS PC
       - Insert the CD-ROM in your computer’s CD drive
       - On most computers, the CD will “auto run”, and you will see the Keil installation menu.
       - On the Keil menu, please select “Install Evaluation Software”. (You will not require a license number to install this software).
       - Follow the installation instructions as they appear.
    2. LOADING THE PROJECTS

The example projects for this book are NOT loaded automatically when you install the Keil compiler. These files are stored on the CD in a directory “/Pont”. The files are arranged by chapter: for example, the project discussed in Chapter 3 is in the directory “/Pont/Ch03\_00-Hello”. Rather than using the projects on the CD (where changes cannot be saved), please copy the files from CD onto an appropriate directory on your hard disk.

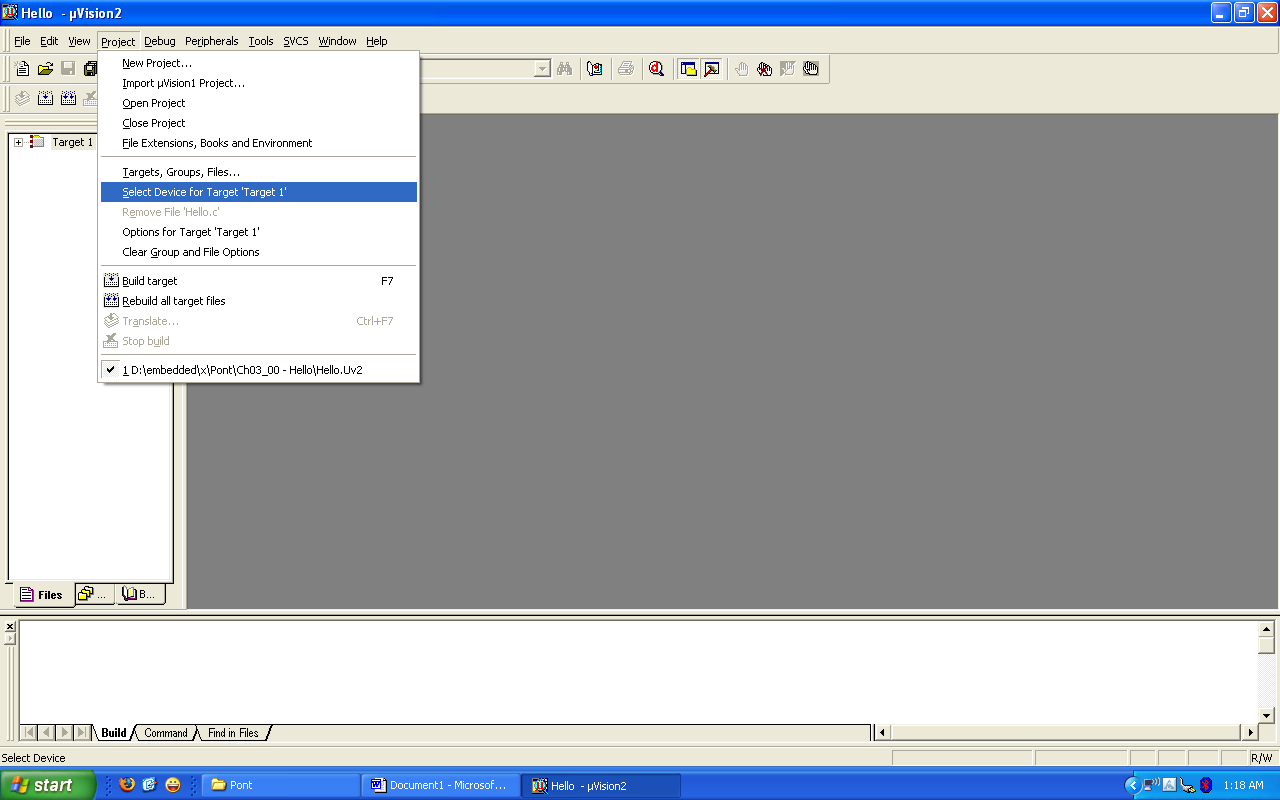
* + 1. CONFIGURING THE SIMULATOR

1. Open the Keil Vision2
2. Go to Project – Open Project and browse for Hello in Ch03\_00 in Pont and open it.

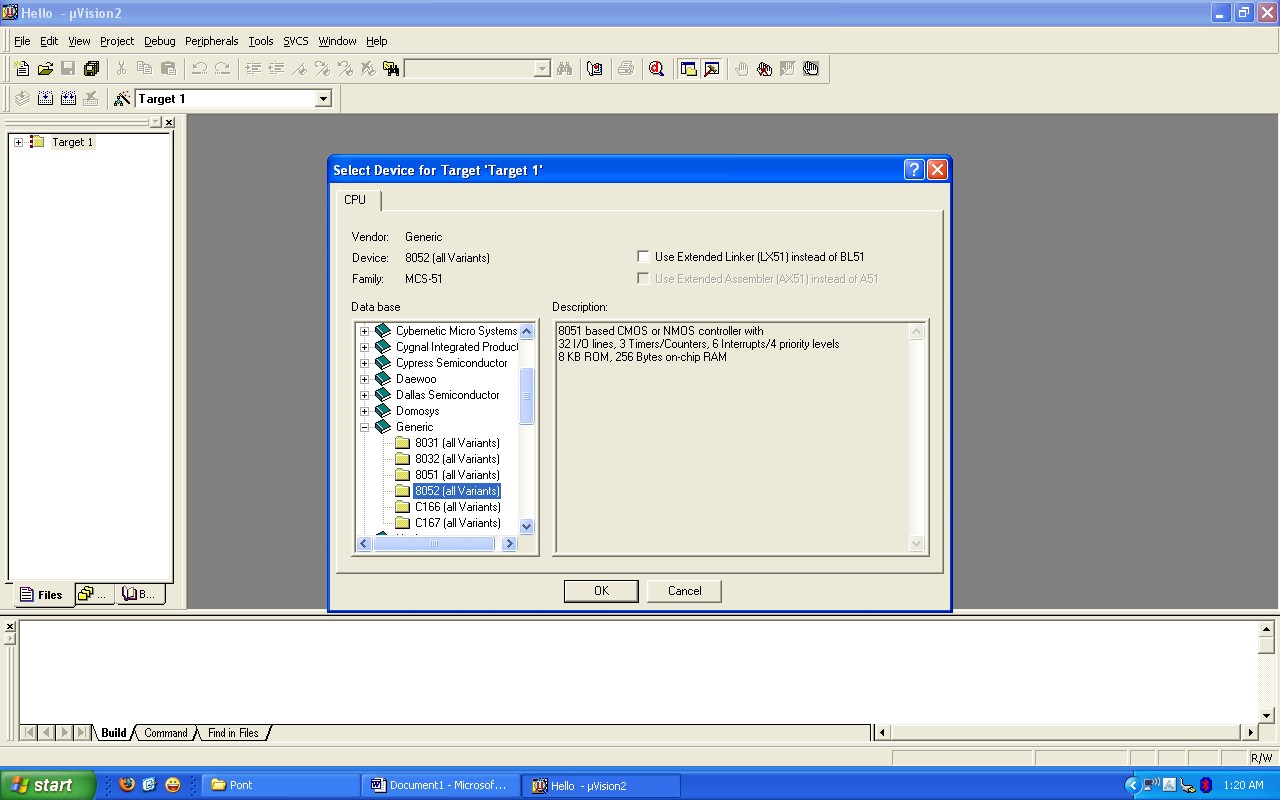


**Figure 4.1: Open Keil And Creating Project Window**

1. Go to Project – Select Device for Target ‘Target1’ Select 8052(all variants) and click OK

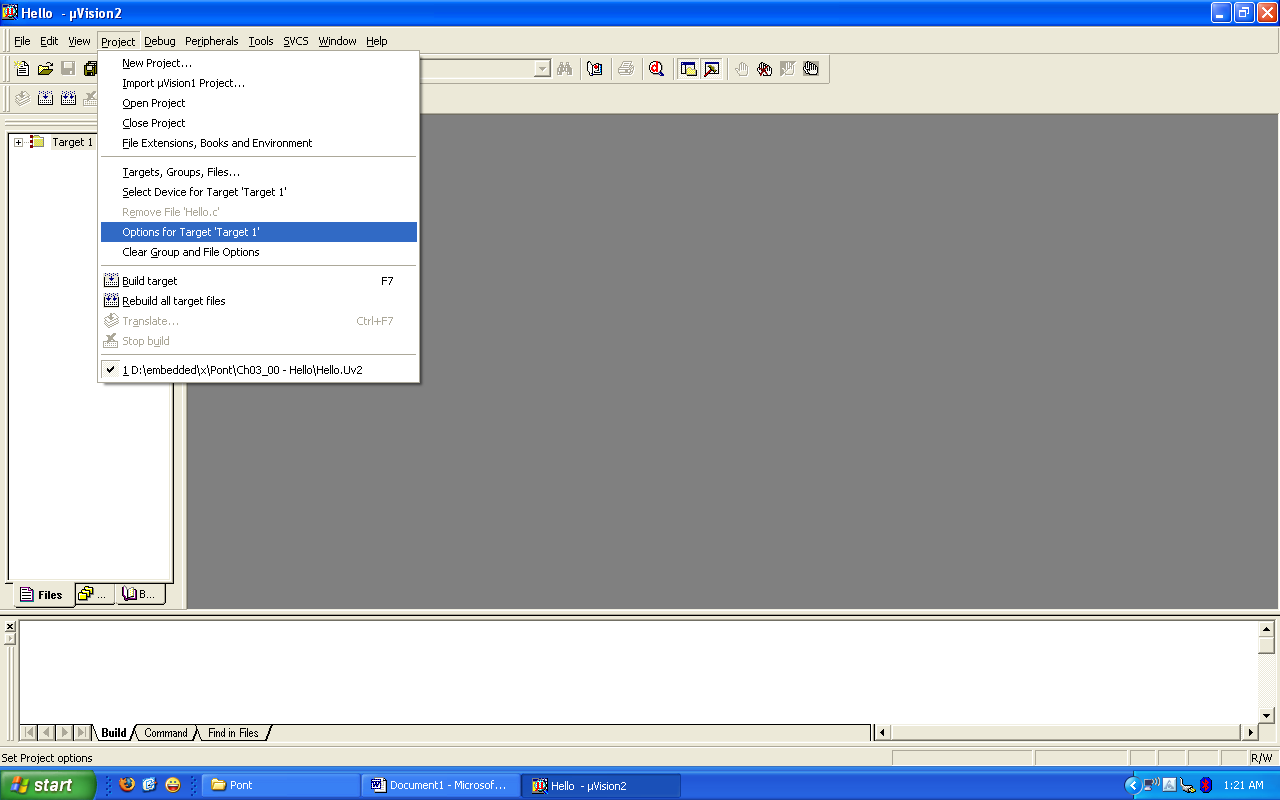


**Figure 4.2: Selecting And Setting Options For Target**



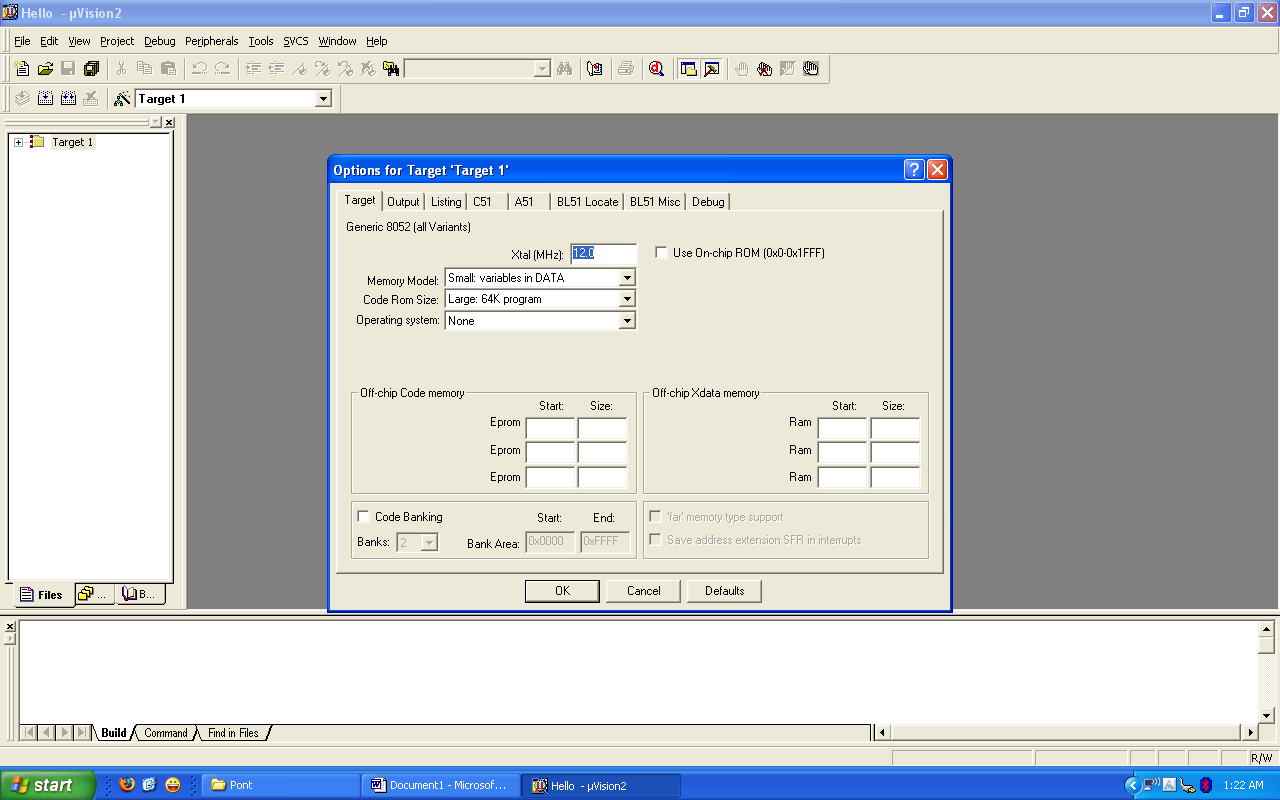
**Figure 4.3: Selecting Microcontroller**

1. Now we need to check the oscillator frequency: Go to project – Options for Target ‘Target1’



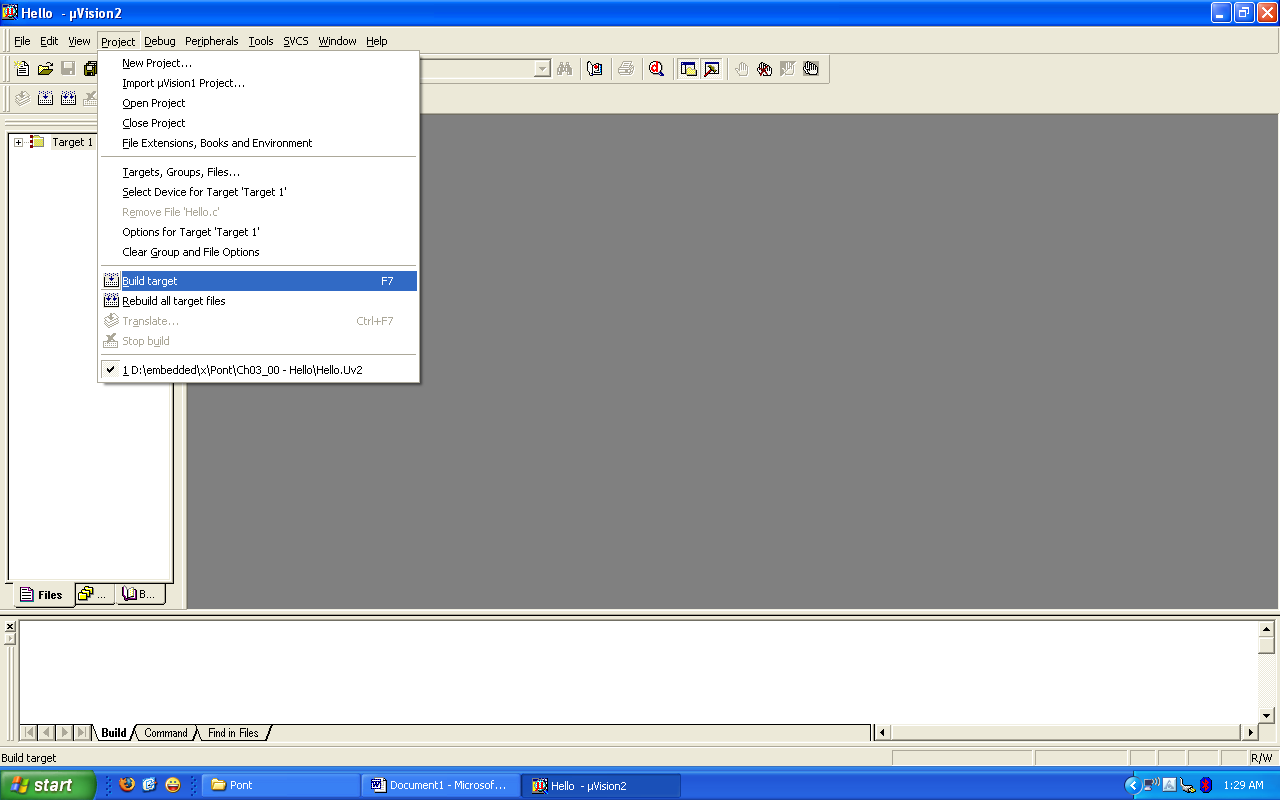
**Figure 4.4: Setting Options On Target**

1. Make sure that the oscillator frequency is 12MHz.



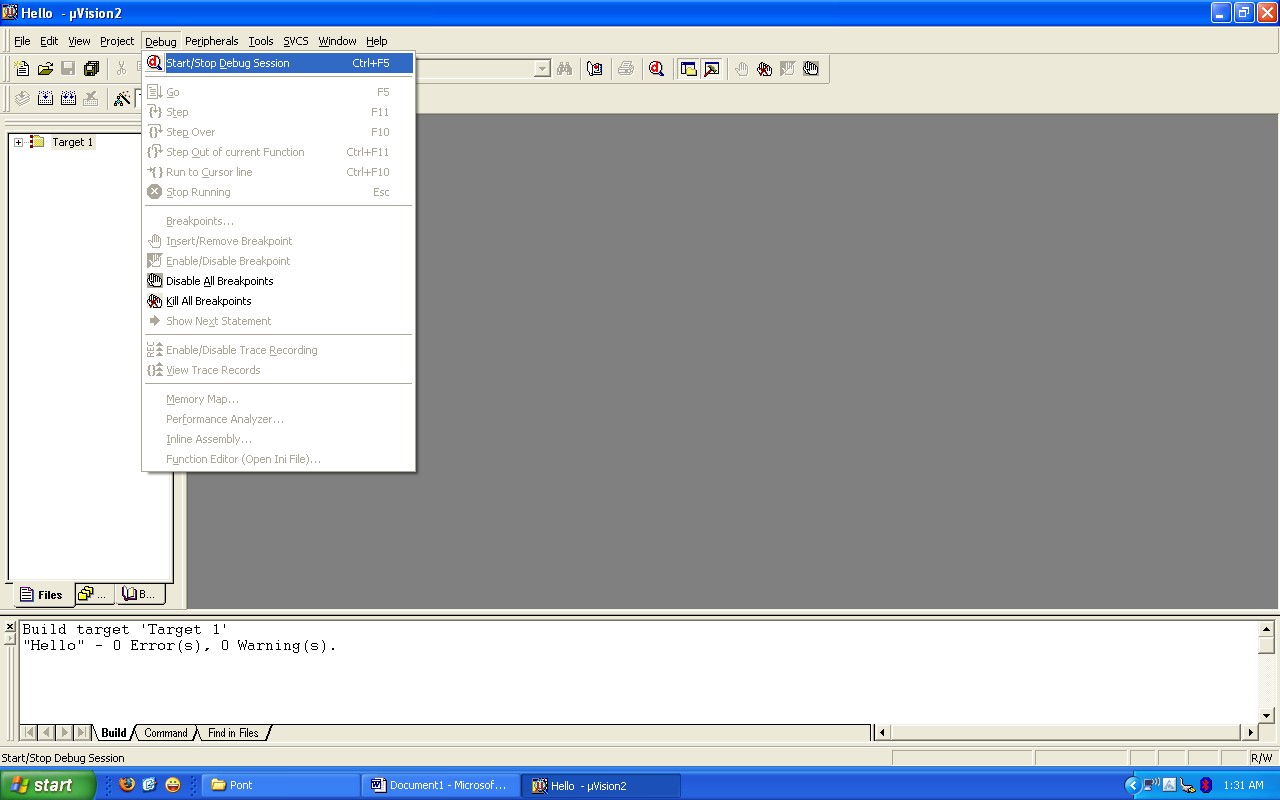
**Figure 4.5: Setting Oscillator Frequency**

1. Building the Target



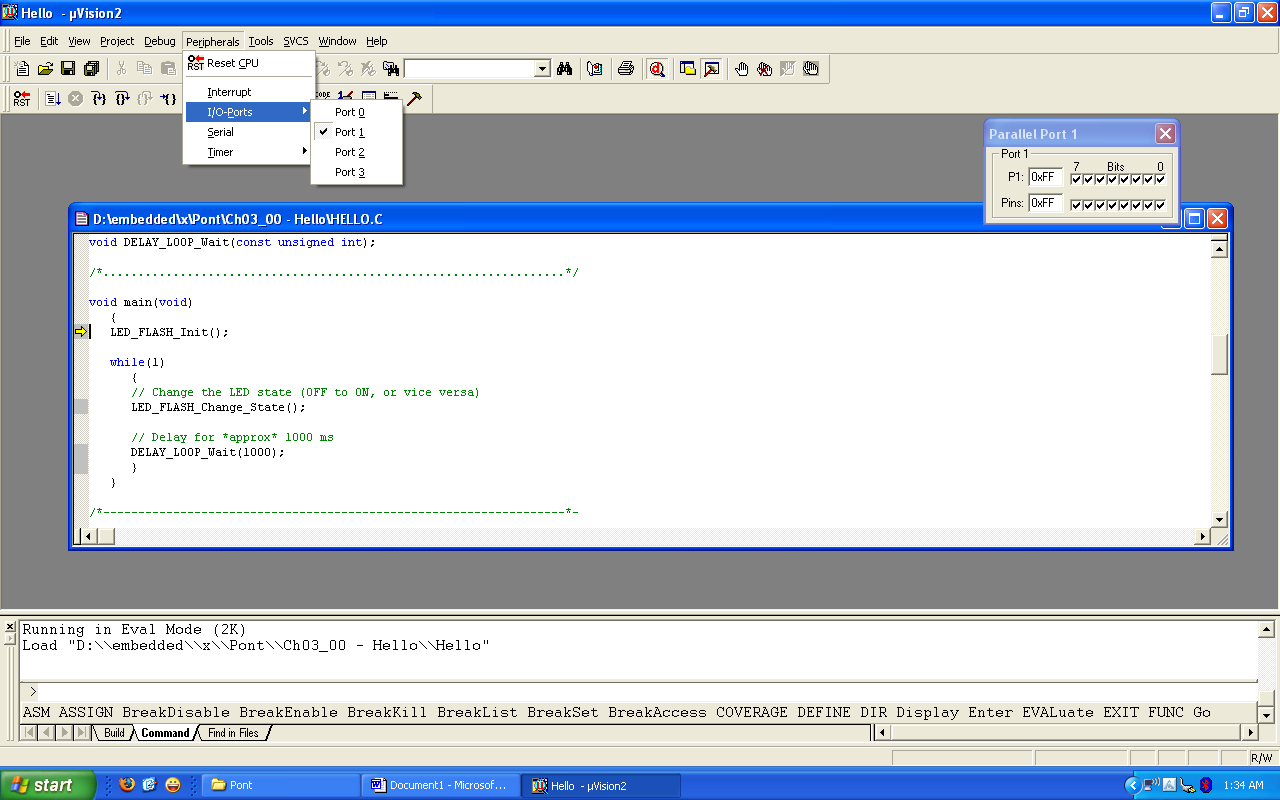
**Figure 4.6: Building The Target**

1. Running the Simulation: Having successfully built the target, we are now ready to start the debug session and run the simulator.
2. First start a debug session



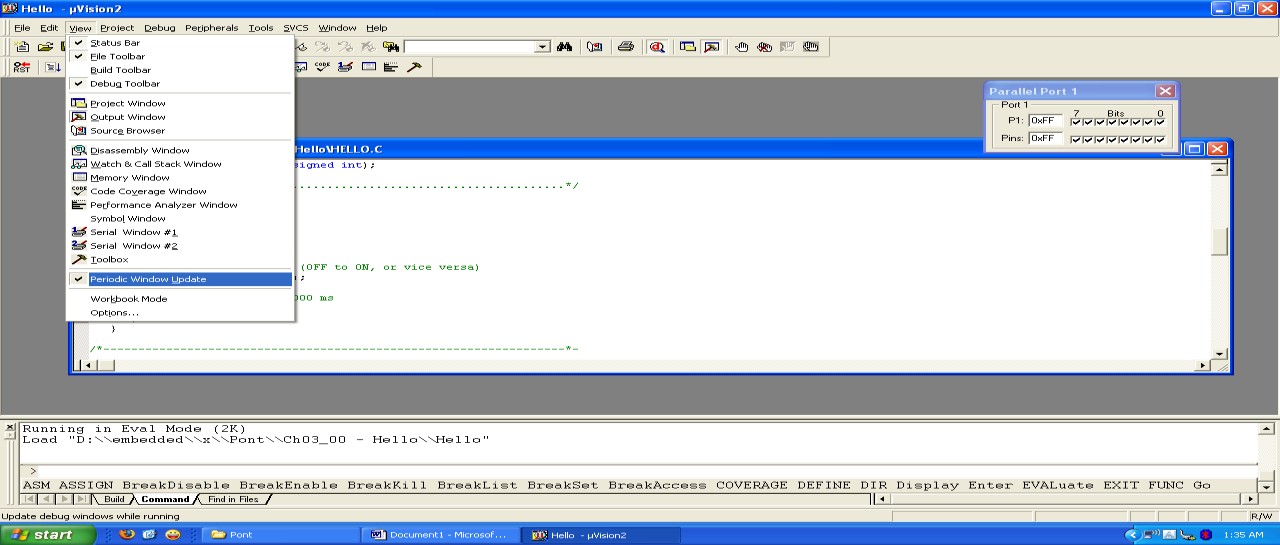
**Figure 4.7: Starting Debug Session**

1. The flashing LED we will view will be connected to Port 1. We therefore want to observe the activity on this port



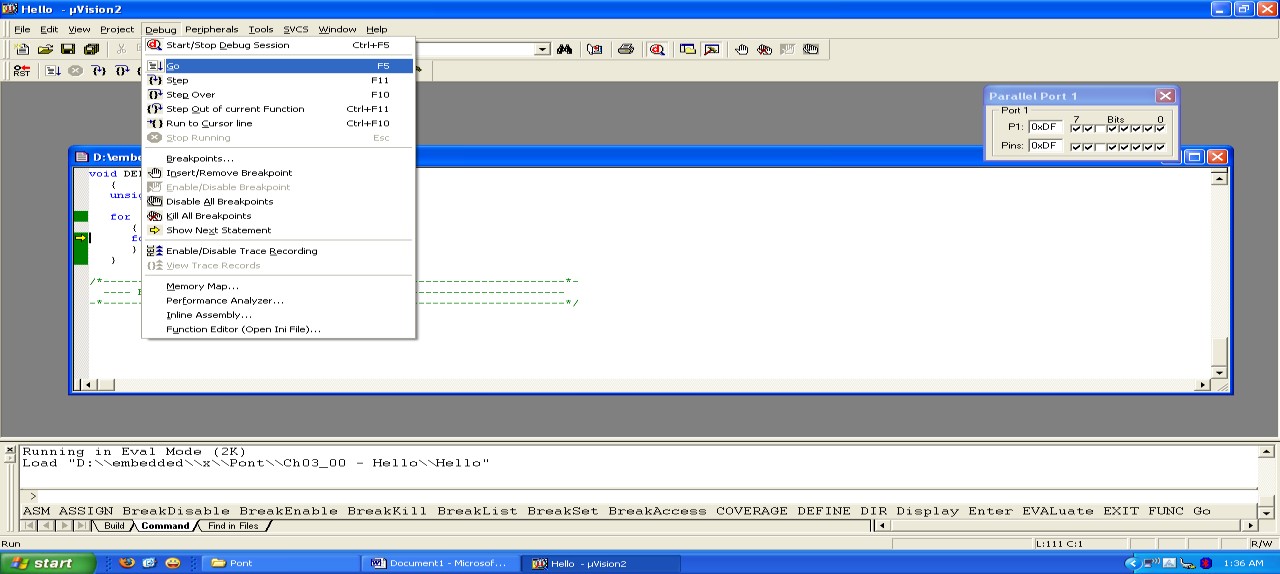
**Figure 4.8: Choosing Port**

1. To ensure that the port activity is visible, we need to start the ‘periodic window update’ flag



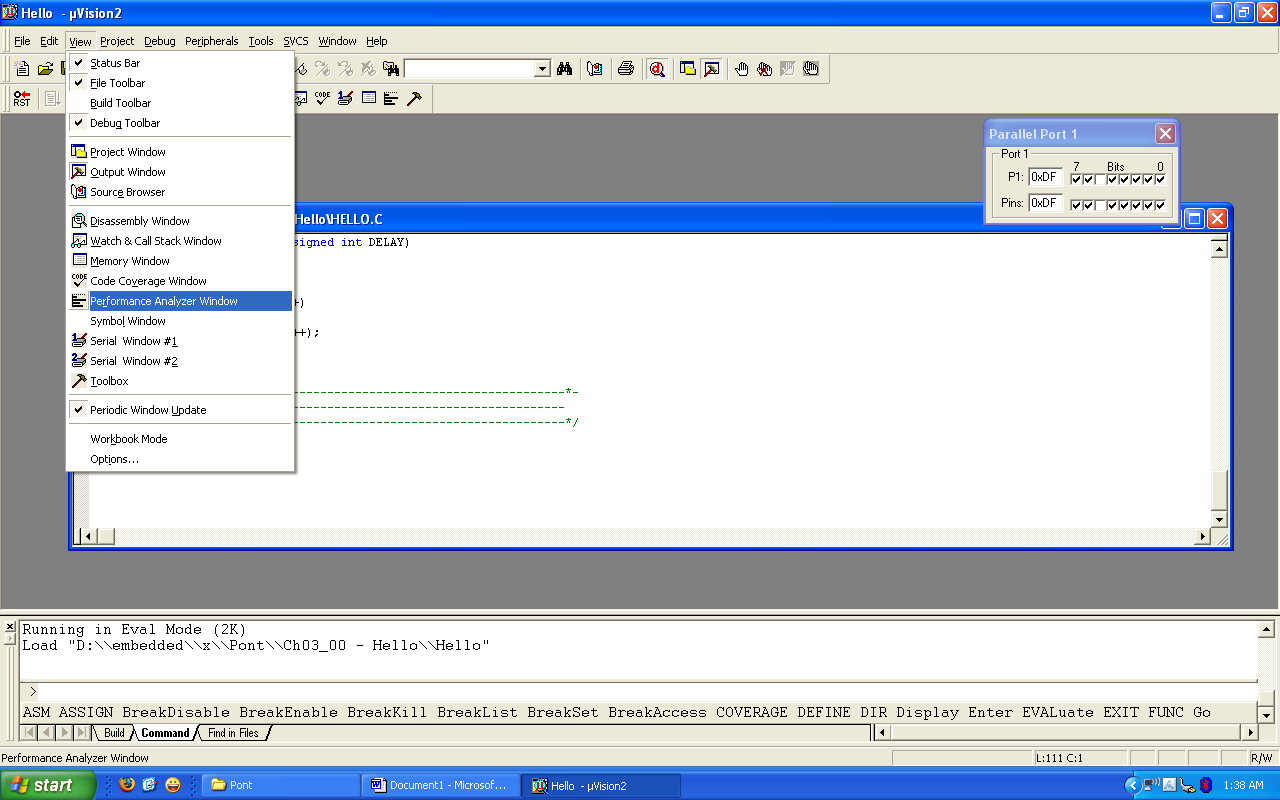
**Figure 4.9: Periodic Window Update**

1. Go to Debug - Go

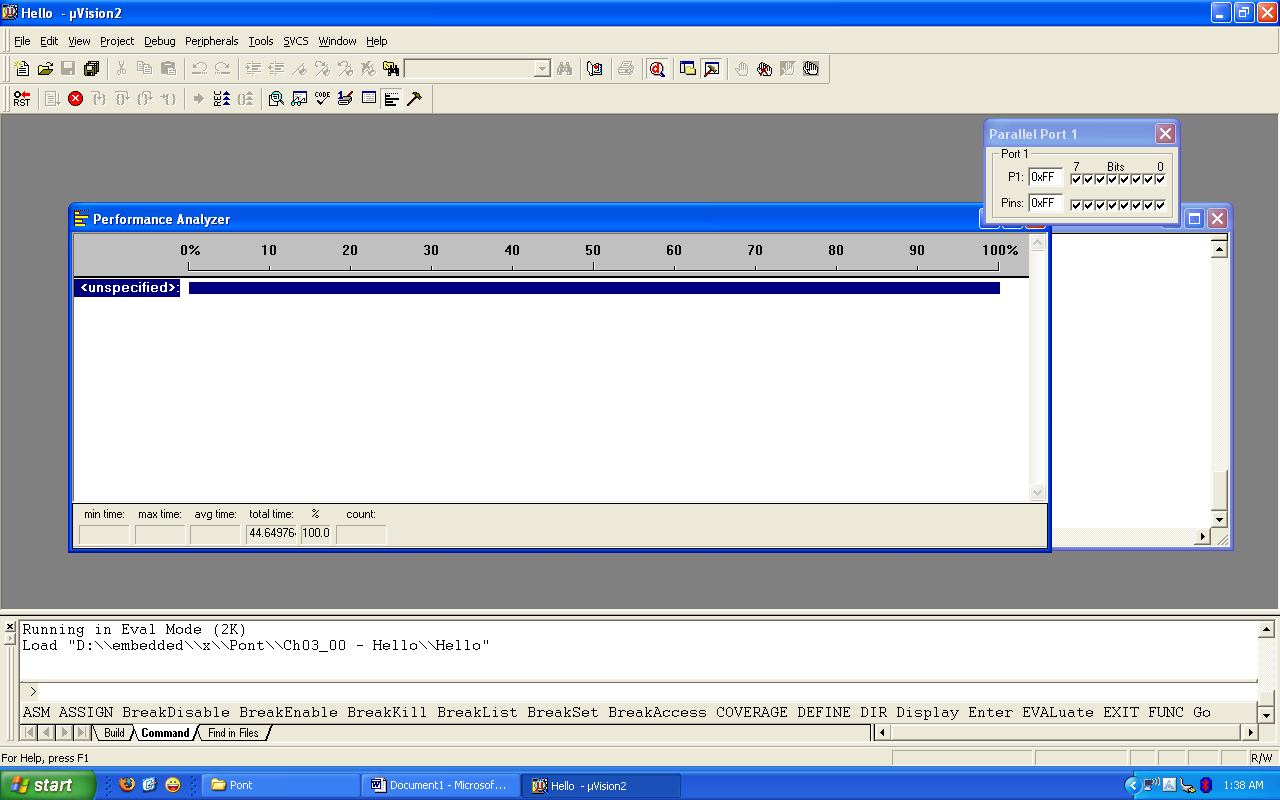


**Figure 4.10: Starting The Simulation**

1. While the simulation is running, view the performance analyzer to check the delay durations.

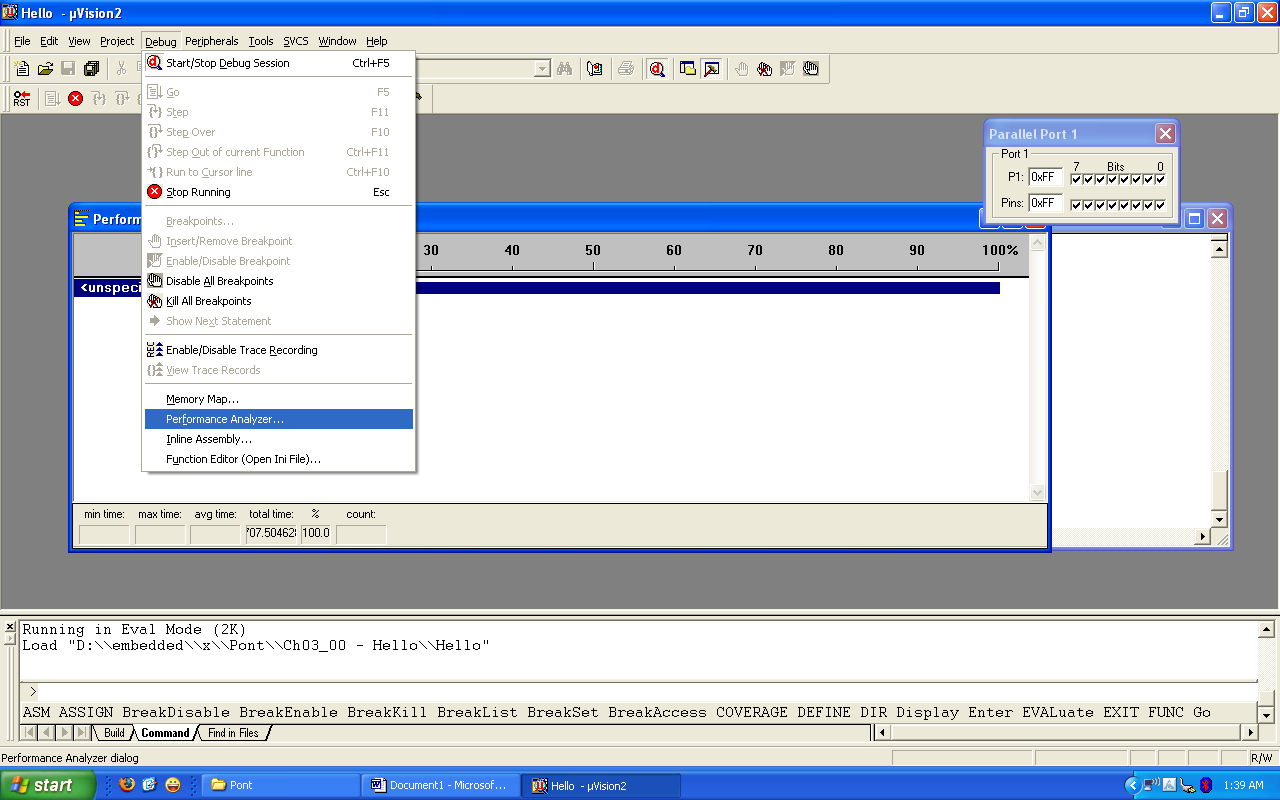


**Figure 4.11: Checking The Delay Duration**



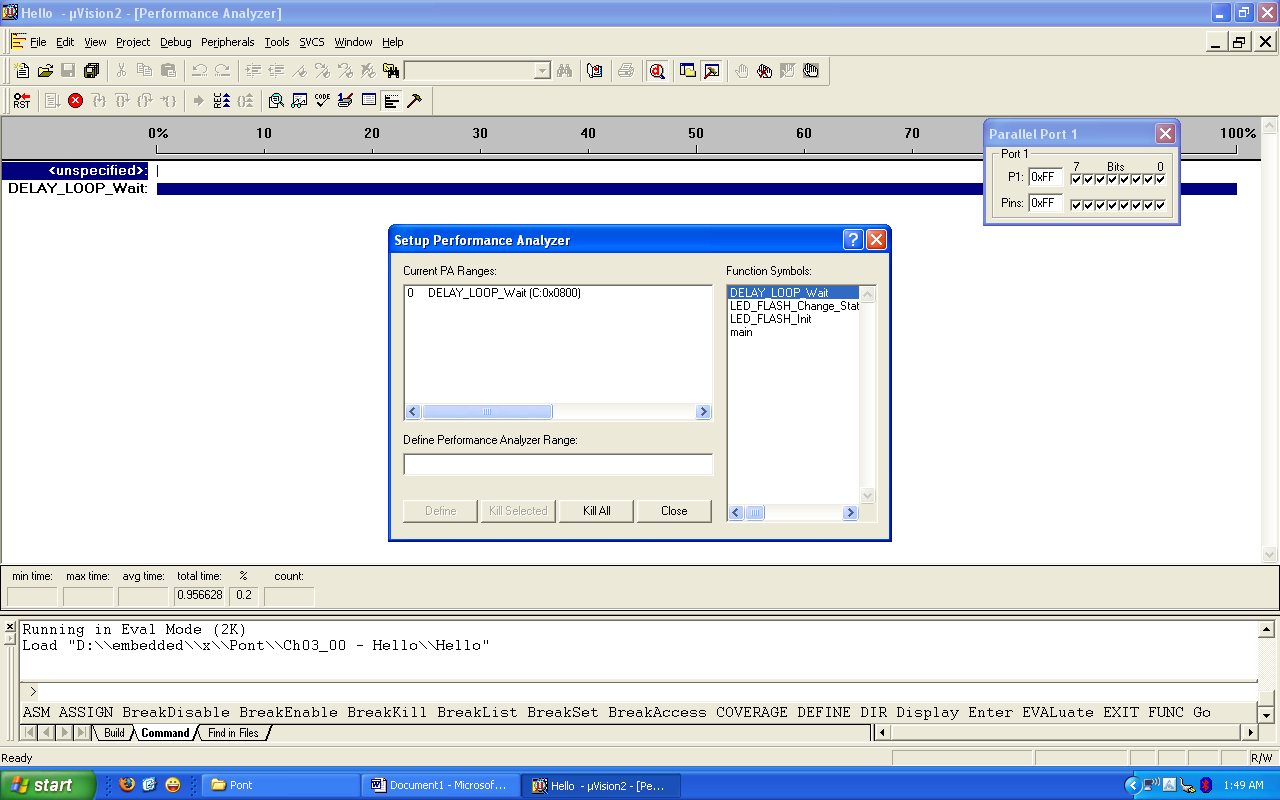
**Figure 4.12: Performance Analyzer**

1. Go to Debug – Performance Analyzer and click on it



**Figure 4.13: Selecting Performance Analyzer**

1. Double click on DELAY\_LOOP\_Wait in Function Symbols: and click Define button

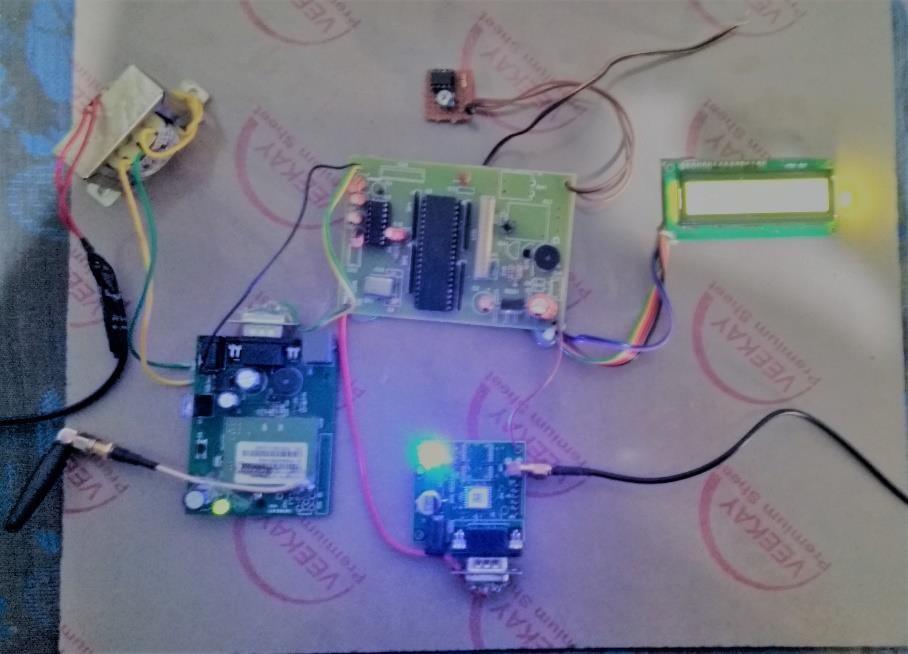
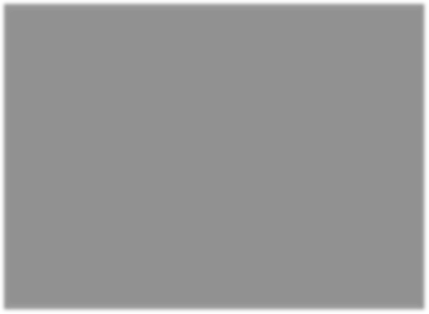


**Fig: 4.14 Selecting Delay Loop**

### CHAPTER 5 RESULTS AND DISCUSSIONS

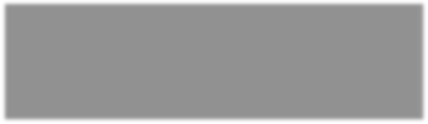
**RESULTS AND DISCUSSIONS**

This system is very helpful to the INDIAN RAILWAYS. As it is the most popular and using transport system throughout the country. Through this transportation many people reaches their destination. If any accident happens in this not one family or one town or city or state, entire Nation will suffer. By this proposal, it is easy to detect the type of accident weather Fire or Short circuit. And also it sends the information to the main station along with GPS locations of the train.



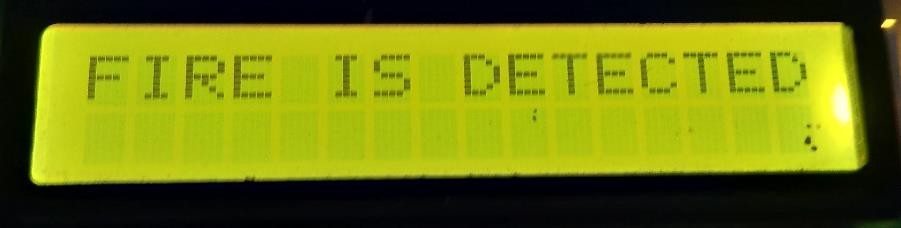
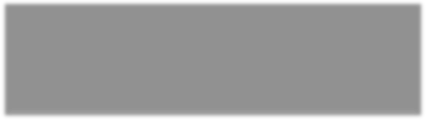
##### Fig6.1: Circuit on ON State

**F**irstly, we need to switch on the power supply for the circuit to come under working state. The entire kit will be on ON state. GSM module has two LED LIGHTs one is for indicating whether the circuits gets power supply or not. And the other indicates the connection and the signal strength of the sim. GPS module will be activated with in few minutes. Whenever the blue is blinking it indicates that the GPS is ready to track the locations.



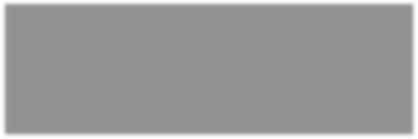
**Fig6.2 Display ON**

When the power is on ON state the display will be automatically ON State displaying the project name FIRE AND SHORT CIRCUIT DETECTION SYSTEM



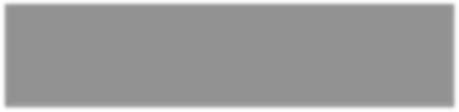
##### Fig6.3: Fire is Detected

When fire is detected through the fire detector it displays as fire detected.



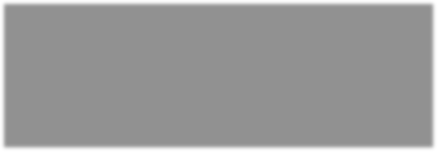
##### Fig6.4: Short Circuited

When Short circuit is detected by the short circuit detector then it displays as SHORT CIRCUITED.



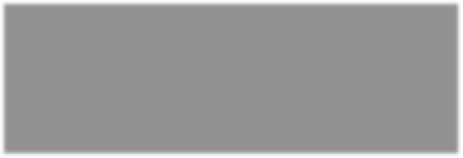
##### Fig6.5: Getting Locations

GPS tracks the location of the train at that time it displays as GETTING LOCATIONS.



##### Fig6.6: Location Tracked

After locations are tracked it displays the tracked locations as shown in the Fig 6.6



**Fig6.7: Sending Locations**

After getting the locations GSM Module sends the information to the higher authorities.

# CHAPTER 6 CONCLUSION AND FUTURE SCOPE

## CONCLUSION AND FUTURE SCOPE

Finally, my project is very cheap and it will be very helpful to the people and railway dept. to prevent the accidents. It is a small which will be placed in the place of railway coaches, when the fire accident takes place it will sends the message to nearby station and also gives the intimation to the driver on the display and it will stop the train. And the GPS device is connected to that train it will also sends the position values.

It can be extended in the fields of automotive industries, factories etc., and in this we can also employ the water sprinkler to it. And also extended to automatic doors open when accident occurs and water sprinklers.

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