# BTS SECURITY SYSTEM

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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WAKNAGHAT

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# LIST OF ABBREVATIONS

| | | |
|---|---|---|
| DIP | - | Dual inline package |
| QFP | - | Quad flat package |
| GND | - | Ground |
| TTL | - | Transistor -Transistor logic |
| ALE | - | Address latch enable |
| PSEN | - | Program store enable |
| LED | - | Light emitting diode |
| IRED | - | Infrared emitting diode |
| GPS | - | Global positioning system |
| GSM | - | Global system for mobile communication |
| DTR | - | Data terminal ready |
| LCD | - | Liquid crystal display |
| IDE | - | Integrated development environment |

# CERTIFICATE

This is to certify that the work titled "**BTS security system**" submitted by "Abhey Sharma (071140), Anurag Khanna(071454), Ajay Laller(071151)." in partial fulfillment for the award of degree of B. Tech, of Jaypee University of Information Technology, Waknaghat has been carried out under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of this or any other degree or diploma.

Signature of Supervisor .....

Name of Supervisor .....S.V.R.K.Rao.....

Designation .....Sr. Lecturer.....

Date .....28/5/2011.....

# ACKNOWLEDGEMENT

The completion of any project brings with it a sense of satisfaction, but it is never complete without thanking those people who made it possible and whose constant support has crowned our efforts with success.

One cannot even imagine the power of the force that guides us all and neither can we succeed without acknowledging it. Our deepest gratitude to Almighty God for holding our hands and guiding us throughout our lives.

I would like to thank our guide, **Mr. S.V.R.K Rao** Dept. of Electronics and Communication for his expert guidance, encouragement and valuable suggestions at every step.

We are extremely happy to acknowledge and express our sincere gratitude to our parents for their constant support and encouragement and last but not the least, friends and well wishers for their help and cooperation and solutions to problems during the course of the project.

Also our friends at **8051projects.net** who provided solutions at times when we were against the wall in need of help.

Signature of the student .....

Name of Student ABHEY SHARMA, ANURAG KHANNA, AJAY LALLER

Date 23/5/11

# SUMMARY

The objective of this project is to design a simple, easy to install, microcontroller-based circuit that can sense any fire , intruder ,electrical failure.

If there is any fire or electrical failure or any person has entered the BTS. It will send SMS to higher authority person.The controller used is a low power, cost efficient chip manufactured by ATMEL having 8K bytes of on-chip flash memory. It communicates with the various sensor modules in real time and sets the buzzer on the detection of fire , intruder , electrical failure.Microcontroller is used to monitor all the operations in the project. It is 40 pins IC. It takes the information and performs operation according to present information

An integrated Liquid crystal display (LCD) is also used for real time display of data acquired from the various sensors and the status of the various devices. Also, the use of easily available components reduces the manufacturing and maintenance costs.The design is quite flexible as the software can be changed any time. It can thus be tailor-made to the specific requirements of the user.The ultra-sensitive GPS receiver can acquire GPS signals from 32 channels of satellites and generate fast position fixes with high accuracy in extremely challenging environments and under poor signal conditions due to its active antenna and high sensitivity.

# CHAPTER – 1

# INTRODUCTION

The objective of this project is to design a simple, easy to install, microcontroller-based circuit that can sense any fire , intruder ,electrical failure. There is a growing interest in intelligent network as a way to offer a comfortable, convenient and safe environment for occupants . In order to enhance the occupants' convenience and safety, security system is indispensable in the field of intelligent network. The requirements of a security system include low cost, low power consumption, easy installation and rapid response to alarm incidents. According to connecting mode, network can be divided into two kinds: wireless network and non-wireless network . The wireless technology has some remarkable benefits comparing with non-wireless technology. For example, it makes the installation and maintenance easier and reduces the system cost. Bluetooth , ZigBee and wireless USB are the most popular technologies in the field of home wireless network. This introduces a method to form a home network which provides flexible and dynamic services via Bluetooth. However, the system mentioned in is high power consumption and high cost so that it is not convenient to use in security system. and present how to apply to establish a home network that is costeffective and low power consumption.

How to inform user in real time when alarm incidents occur has become a crucial feature of security system. This can be done via internet or GSM/GPRS. GSM/GPRS is more convenient than internet. The main reason is that the GSM/GPRS network has wide spread coverage making the whole system available for almost all the time. Furthermore, GSM/GPRS network has high security infrastructure which makes sure that the information sent or received cannot be monitored. The network examples mentioned send the information to remote users via internet are examples of systems using GSM/GPRS network for remote controlling. However, only illustrates that GSM is communication method between remote user and home network server but doesn't apply it to home security system. The system in only applies GSM/GPRS technology to intrusion detecting and its communication is non-wireless.

In this project, a low cost GSM/GPRS based wireless security system is presented. The system includes two parts wireless security sensor nodes and a GSM/GPRS gateway.

## 1.1 BLOCK DIAGRAM

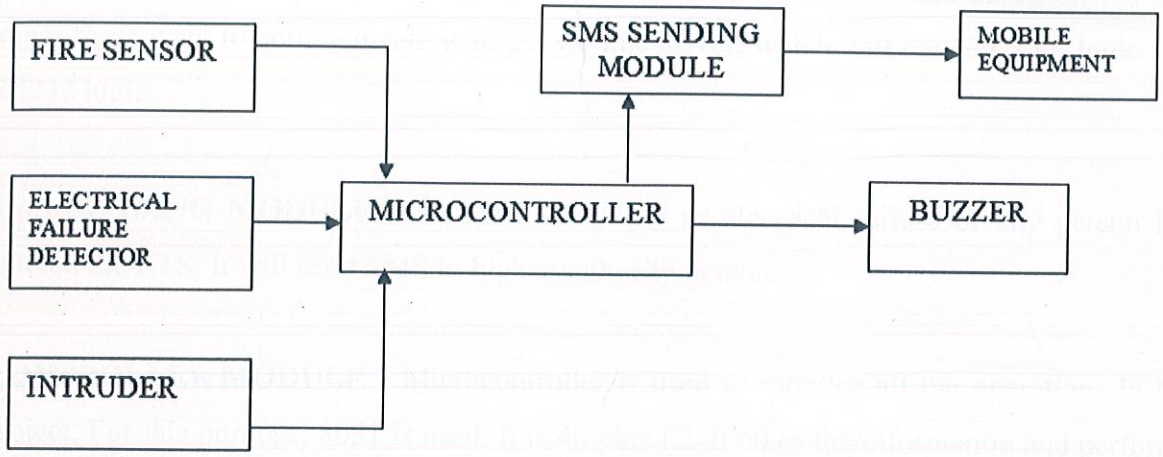



Fig 1.1

## 1.2 EXPLANATION OF BLOCK DIAGRAM

### 1.2.1 SENSOR MODULE

This unit detects the non electrical information into electrical quantity.

**FIRE SENSOR UNIT** - This unit will detect whether something has set on fire. If there will be any fire, fire sensor unit will send signal to the microcontroller unit. Microcontroller unit is continuously looking upon the fire sensor unit. When fire-alarming signal comes to microcontroller unit, it will send to buzzer to starts ringing

**ELECTRICAL FAILURE DETECTOR UNIT** - Unit will keep eye upon the whether there is any electrical failure.

As electrical fails, it will immediately send the signal to microcontroller. Microcontroller unit is continuously looking upon the fire sensor unit. When electrical signal comes to microcontroller unit, it will send to buzzer to starts ringing

**INTRUDER UNIT** - This unit is continuously detecting whether any person enter the BTS. If the person enters the BTS, it will immediately report to microcontroller unit. Microcontroller receives signal from the intruder unit. It sets the buzzer on.

**LINE DRIVER** - It converts the TTL logic into RS 232 logic. In pc connectors are used to get and send the information through pc's ports. All the connectors are based on RS 232 logic. If we want to communicate with pc, we line driver, which will convert TTL logic into RS232 logic.

**SMS SENDING MODULE** - If there is any fire or electrical failure or any person has entered the BTS. It will send SMS to higher authority person.

**CONTROLLER MODULE** - Microcontroller is used to monitor all the operations in the project. For this purpose, 8051 is used. It is 40 pins IC. It takes the information and performs operation according to present information.

## 1.3 CIRCUIT DIAGRAM

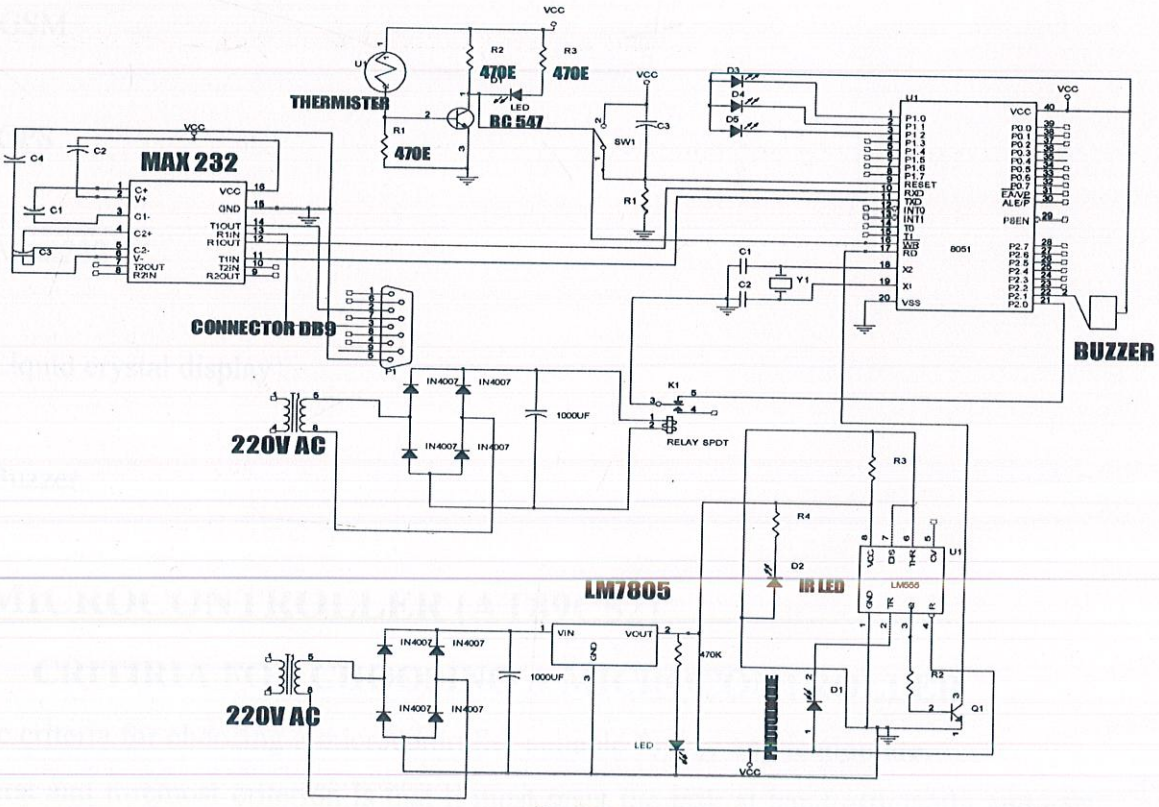



fig 1.2

# CHAPTER – 2

# HARDWARE DESCRIPTION

## 2.1 PARTS OF SYSTEM

1. Microcontroller
2. Fire sensor
3. Power failure alarm
4. Intruder circuit
5. Power supply
6. GSM
7. GPS
8. Max 232
9. Liquid crystal display
10. Buzzer

## 2.1.1 MICROCONTROLLER (AT89C52)

### 2.1.1.1 CRITIRIA FOR CHOOSING A MICROCONTROLLER

The basic criteria for choosing a microcontroller suitable for the application are:

1) The first and foremost criterion is that it must meet the task at hand efficiently and cost effectively. In analyzing the needs of a microcontroller-based project, it is seen whether an

8- bit, 16-bit or 32-bit microcontroller can best handle the computing needs of the task most effectively. Among the other considerations in this category are:

(a) **Speed:** The highest speed that the microcontroller supports.

(b) **Packaging:** It may be a 40-pin DIP (dual inline package) or a QFP (quad flat package), or some other packaging format. This is important in terms of space, assembling, and prototyping the end product.

(c) **Power consumption:** This is especially critical for battery-powered products.

(d) The number of I/O pins and the timer on the chip.

(e) How easy it is to upgrade to higher –performance or lower consumption versions.

(f) **Cost per unit:** This is important in terms of the final cost of the product in which a microcontroller is used.

2) The second criterion in choosing a microcontroller is how easy it is to develop products around it. Key considerations include the availability of an assembler, debugger, compiler, technical support.

3) The third criterion in choosing a microcontroller is its ready availability in needed quantities both now and in the future. Currently of the leading 8-bit microcontrollers, the 8051 family has the largest number of diversified suppliers. By supplier is meant a producer besides the originator of the microcontroller. In the case of the 8051, this has originated by Intel several companies also currently producing the 8051.

Thus the microcontroller AT89S52, satisfying the criterion necessary for the proposed application is chosen for the task.

### 2.1.1.2 DESCRIPTION

The 8051 family of microcontrollers is based on an architecture which is highly optimized for embedded control systems. It is used in a wide variety of applications from

- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Fast Programming Time

- Flexible ISP Programming (Byte and Page Mode)

### 2.1.1.3 PIN CONFIGURATION

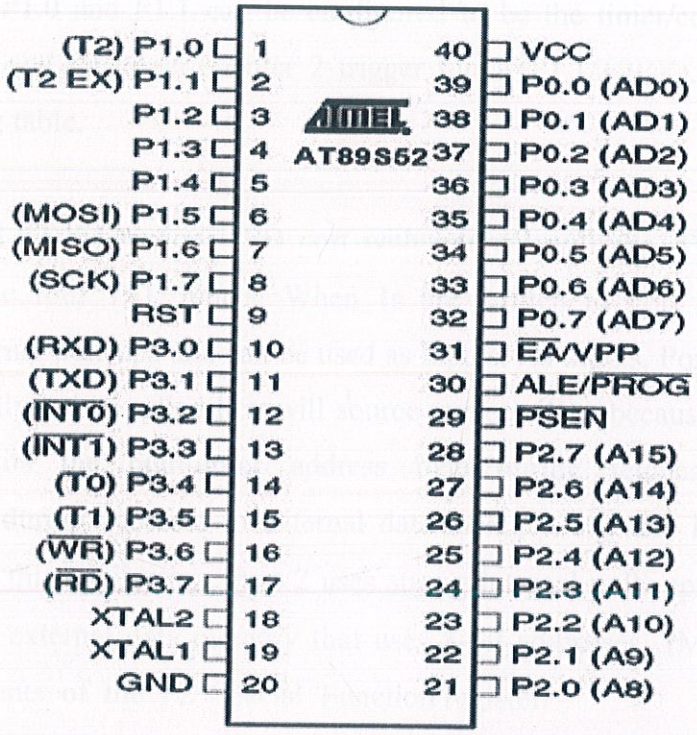



Fig 2.1

### 2.1.1.4 PIN DESCRIPTION

- **VCC:** Supply voltage.
- **GND:** Ground.

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

impedance inputs. Port 0 can also be configured to be the multiplexed low-order address/data bus during accesses to external program and data memory. In this mode, P0 has internal pull-ups.

- **Port 1:** Port 1 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 1 output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 1 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. In addition, P1.0 and P1.1 can be configured to be the timer/counter 2 external count input (P1.0/T2) and the timer/counter 2 trigger input (P1.1/T2EX), respectively, as shown in the following table.

- **Port 2:** Port 2 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 2 output buffers can sink/source four TTL inputs. When 1s are written to Port 2 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 2 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. 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). In this application, Port 2 uses strong internal pull- ups when emitting 1s. During accesses to external data memory that uses 8-bit addresses (MOVX @ RI), Port 2 emits the contents of the P2 Special Function register.

- **Port 3:** Port 3 is an 8-bit bidirectional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs. When 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 In order for the RESET input to be effective, it must have a minimum duration of two machine cycles.

- **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 of 1/6 the oscillator frequency and may be used for external timing or clocking purposes. Note, however, that one ALE pulse is skipped during each access to external

data memory. If desired, ALE operation can be disabled by setting bit 0 of SFR location 8EH. 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 microcontroller 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.

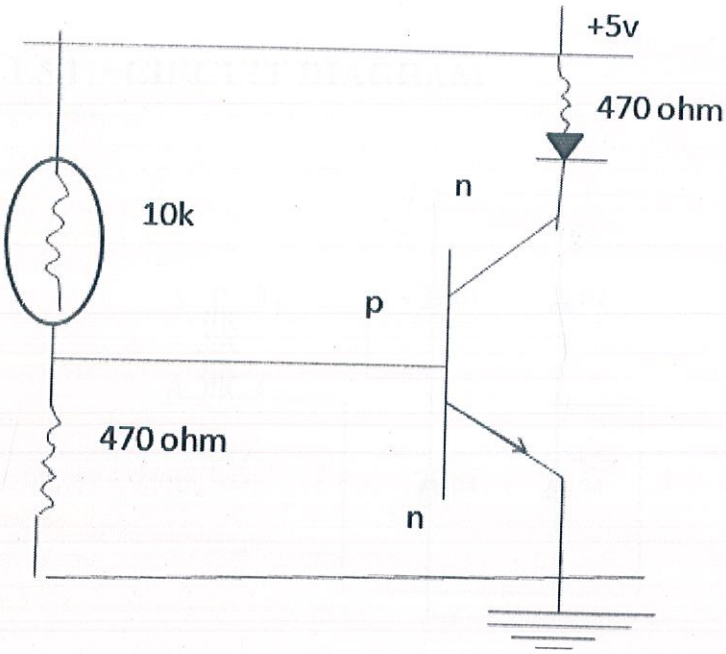
- **EA:** External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset. EA should be strapped to VCC for internal program executions. This pin also receives the 12-volt programming enable 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.

### 2.1.2 FIRE SENSOR

There is a metal plate and a pin with small gap. When sensor gets heated then metal plate of sensor expands and get in contact with the pin and circuit is completed and we get audio from Buzzer. For fast sensing we can use sensor without its glass body by carefully breaking glass cover.

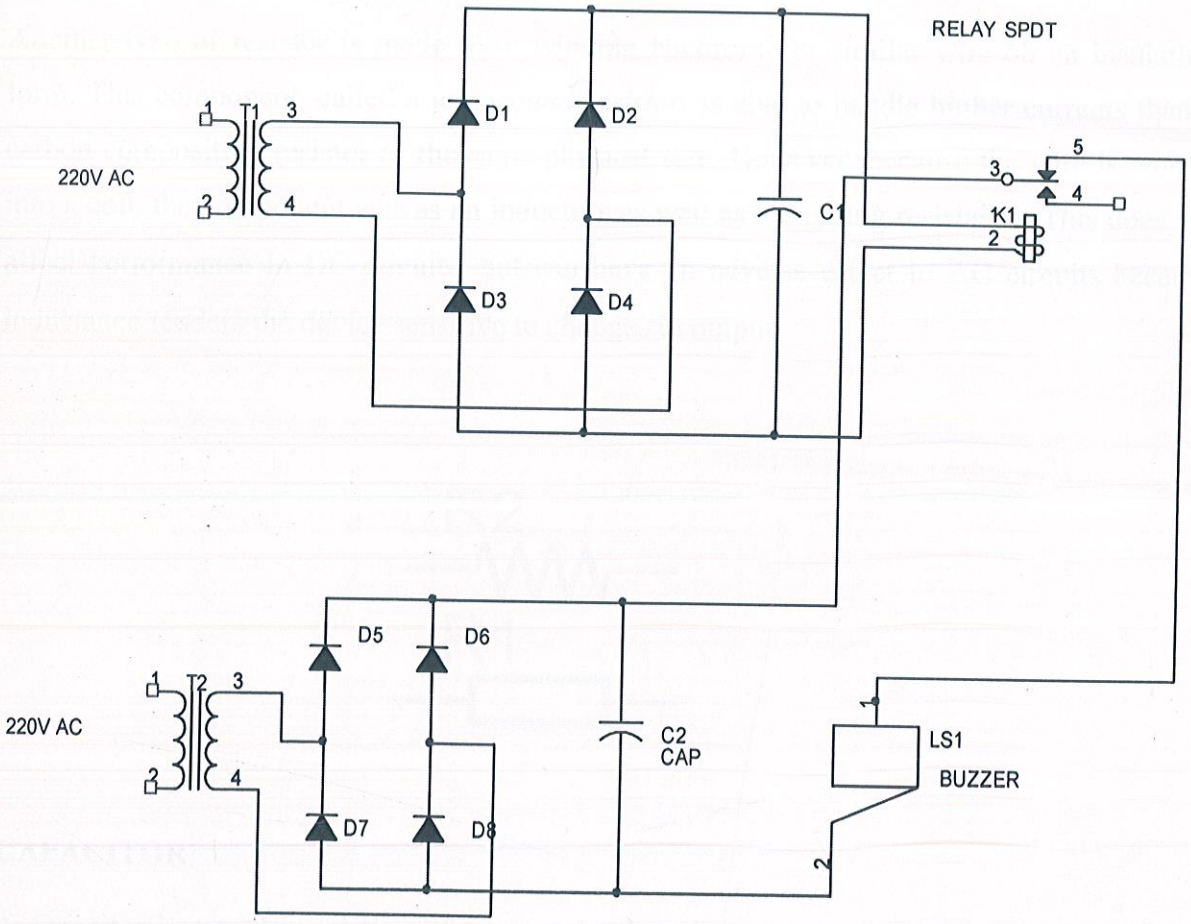



## 2.1.3 POWER FAILURE ALARM

Unit will keep eye upon the whether there is any electrical failure.

As electrical fails, it will immediately send the signal to microcontroller. Microcontroller unit is continuously looking upon the fire sensor unit. When electrical signal comes to microcontroller unit, it will send to buzzer to starts ringing.

### 2.1.3.1 CIRCUIT DIAGRAM




## 2.1.3.2 DESCRIPTION OF USED COMPONENTS

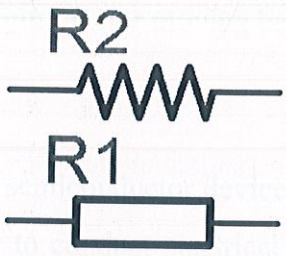
**RESISTORS**

A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit. Resistors can also be used to provide a specific voltage for an active device such as a transistor.

All other factors being equal, in a direct-current (DC) circuit, the current through a resistor is inversely proportional to its resistance, and directly proportional to the voltage across it. This is the well-known Ohm's Law. In alternating-current (AC) circuits, this rule also applies as long as the resistor does not contain inductance or capacitance.

Resistors can be fabricated in a variety of ways. The most common type in electronic devices and systems is the *carbon-composition resistor*. Fine granulated carbon (graphite) is mixed with clay and hardened. The resistance depends on the proportion of carbon to clay; the higher this ratio, the lower the resistance.

Another type of resistor is made from winding Nichrome or similar wire on an insulating form. This component, called a *wirewound resistor*, is able to handle higher currents than a carbon-composition resistor of the same physical size. However, because the wire is wound into a coil, the component acts as an inductors as well as exhibiting resistance. This does not affect performance in DC circuits, but can have an adverse effect in AC circuits because inductance renders the device sensitive to changes in output.

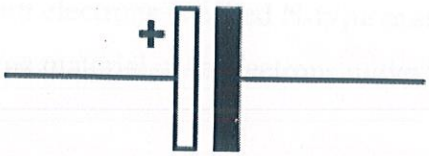



**CAPACITOR**

A capacitor is a tool consisting of two conductive plates, each of which hosts an opposite charge. These plates are separated by a dielectric or other form of insulator, which helps them maintain an electric charge. There are several types of insulators used in capacitors. Examples include ceramic, polyester, tantalum air, and polystyrene. Other common capacitor insulators include air, paper, and plastic. Each effectively prevents the plates from touching each other.

A capacitor is often used to store analogue signals and digital data. Another type of capacitor is used in the telecommunications equipment industry. This type of capacitor is able to adjust the frequency and tuning of telecommunications equipment and is often referred to a *variable capacitor*. A capacitor is also ideal for storing an electron. A capacitor cannot, however, make electrons.

SYMBOL



SYMBOL OF ELECTROLYTIC CAPACITOR

A capacitor measures in voltage, which differs on each of the two interior plates. Both plates of the capacitor are charged, but the current flows in opposite directions. A capacitor contains 1.5 volts, which is the same voltage found in a common AA battery. As voltage is used in a capacitor, one of the two plates becomes filled with a steady flow of current. At the same time, the current flows away from the other plate. To understand the flow of voltage in a capacitor, it is helpful to look at naturally occurring examples.Lightning, for example, is similar to a capacitor. The cloud represents one of the plates and the ground represents the other. The lightning is the charging factor moving between the ground and the cloud.

**DIODES**

A **diode** is the simplest sort of semiconductor device. Broadly speaking, a semiconductor is a material with a varying ability to conduct electrical current. Most semiconductors are made of a poor conductor that has had **impurities** (atoms of another material) added to it. The process of adding impurities is called **doping**.

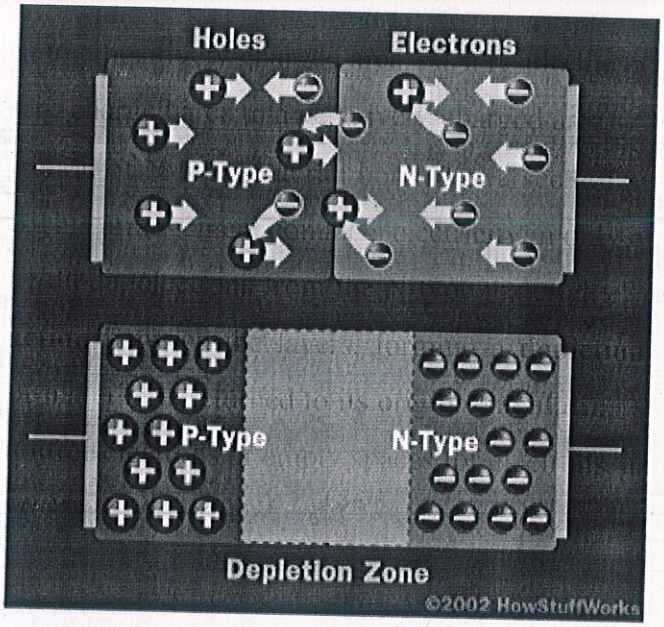
SYMBOL

In the case of LEDs, the conductor material is typically **aluminum-gallium-arsenide** (AlGaAs). In pure aluminum-gallium-arsenide, all of the atoms bond perfectly to their neighbors, leaving no free **electrons** (negatively-charged particles) to conduct electric current. In doped material, additional atoms change the balance, either adding free electrons or creating **holes** where electrons can go. Either of these additions make the material more conductive.

A semiconductor with extra electrons is called **N-type material**, since it has extra negatively-charged particles. In N-type material, free electrons move from a negatively-charged area to a positively charged area.

A semiconductor with extra holes is called **P-type material**, since it effectively has extra positively-charged particles. Electrons can jump from hole to hole, moving from a negatively-charged area to a positively-charged area. As a result, the holes themselves appear to move from a positively-charged area to a negatively-charged area.

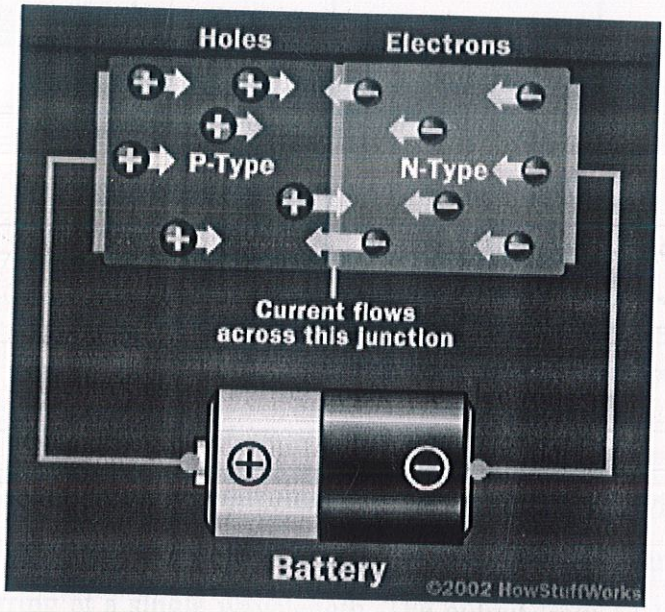
A diode comprises a section of N-type material bonded to a section of P-type material, with electrodes on each end. This arrangement conducts electricity in only one direction. When no voltage is applied to the diode, electrons from the N-type material fill holes from the P-type material along the **junction** between the layers, forming a **depletion zone**. In a depletion zone, the semiconductor material is returned to its original **insulating state** -- all of the holes are filled, so there are no free electrons or empty spaces for electrons, and charge can't flow.




**At the junction, free electrons from the N-type material fill holes from the P-type material. This creates an insulating layer in the middle of the diode called the depletion zone**

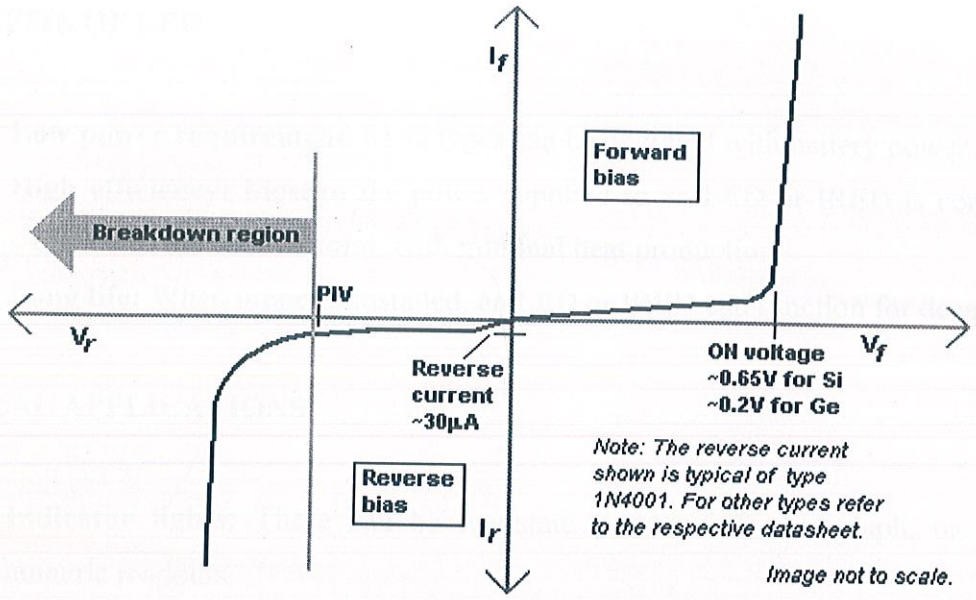
To get rid of the depletion zone, you have to get electrons moving from the N-type area to the P-type area and holes moving in the reverse direction. To do this, you connect the N-type side of the diode to the negative end of a circuit and the P-type side to the positive end. The free electrons in the N-type material are repelled by the negative electrode and drawn to the positive electrode. The holes in the P-type material move the other way. When the voltage

difference between the electrodes is high enough, the electrons in the depletion zone are boosted out of their holes and begin moving freely again. The depletion zone disappears, and charge moves across the diode.




If you try to run current the other way, with the P-type side connected to the negative end of the circuit and the N-type side connected to the positive end, current will not flow. The negative electrons in the N-type material are attracted to the positive electrode. The positive holes in the P-type material are attracted to the negative electrode. No current flows across the junction because the holes and the electrons are each moving in the wrong direction. The depletion zone increases.

## DIODE CHARACTERISTICS

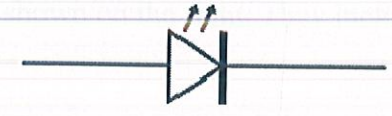



**LED**

A light-emitting diode (LED) is a semiconductor device that emits visible light when an electric current passes through it. The light is not particularly bright, but in most LEDs it is monochromatic, occurring at a single wavelength. The output from an LED can range from red (at a wavelength of approximately 700 nanometers) to blue-violet (about 400 nanometers). Some LEDs emit infrared (IR) energy (830 nanometers or longer); such a device is known as an *infrared-emitting diode* (IRED).

An LED or IRED consists of two elements of processed material called *P-type semiconductor*s and *N-type semiconductor*s. These two elements are placed in direct contact, forming a region called the *P-N junction*. In this respect, the LED or IRED resembles most other diode types, but there are important differences. The LED or IRED has a transparent package, allowing visible or IR energy to pass through. Also, the LED or IRED has a large PN-junction area whose shape is tailored to the application.

SYMBOL



## BENEFITS OF LED

- **Low power requirement**: Most types can be operated with battery power supplies.
- **High efficiency:** Most of the power supplied to an LED or IRED is converted into radiation in the desired form, with minimal heat production.
- **Long life:** When properly installed, an LED or IRED can function for decades.

## TYPICAL APPLICATIONS

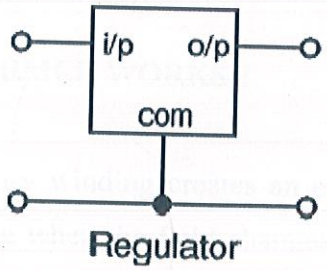
- **Indicator lights:** These can be two-state (i.e., on/off), bar-graph, or alphabetic-numeric readouts.
- LCD **panel backlighting:** Specialized white LEDs are used in flat-panel computer displays.
- **Fiber optic data transmission:** Ease of modulation allows wide communications bandwidth with minimal noise, resulting in high speed and accuracy.
- **Remote control:** Most home-entertainment "remotes" use IREDs to transmit data to the main unit.
- optoisolator: Stages in an electronic system can be connected together without unwanted interaction.

## REGULATORS

Voltage regulator ICs are available with fixed (typically 5, 12 and 15V) or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current ('overload protection') and overheating ('thermal protection').

Many of the fixed voltage regulator ICs have 3 leads and look like power transistors, such as the 7805 +5V 1A regulator shown on the right. They include a hole for attaching a heatsink if necessary.

SYMBOL




**TRANSFORMER**

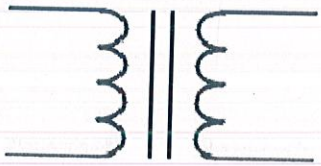
Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC. Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in UK) to a safer low voltage.

The input coil is called the **primary** and the output coil is called the **secondary**. There is no electrical connection between the two coils, instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core.

Transformers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down current is stepped up.

The ratio of the number of turns on each coil, called the **turns ratio**, determines the ratio of the voltages. A step-down transformer has a large number of turns on its primary (input) coil which is connected to the high voltage mains supply, and a small number of turns on its secondary (output) coil to give a low output voltage.

SYMBOL



## HOW DOES THE TRANSFORMER WORKS ?

Alternating current in the primary winding creates an electromagnetic field that induces a current in the secondary winding when the field changes. Small transformers use enameled wire for their windings, while large transformers use insulated copper strips. Transformers can be single winding, center-tap, or multi-tap. Center-taps have a terminal at the middle point of the secondary winding, which has half the voltage of the end terminal. Multi-taps have many terminals along the winding, whose voltages depend on their locations. The purpose of the core is to direct the electromagnetic field through the secondary winding. Silicon steel cores are used for their high magnetic permeability. The insulated laminations work better than solid cores, by confining eddy currents, which reduces their losses.

## USES OF TRANSFORMER

Transformers are mainly used to convert one voltage to another. The process of increasing the voltage is called "stepping up", while decreasing the voltage is called "stepping down". Most electronic equipments need a transformer to lower the mains voltage to a usable level. Transformers are also found in power adapters and battery chargers. Inverters are transformers which step-up a low voltage to a higher voltage, allowing a mains powered equipment to run on a battery. Additional circuitry is required to change the battery's direct current into alternating current. Transformers are used for electricity distribution to minimize energy loss over long distances. Higher voltages allow for lower currents, which reduces the losses caused by resistance

## 2.1.4 INTRUDER CIRCUIT

An electronic **motion detector** contains a motion sensor that transforms the detection of motion into an electric signal. This can be achieved by measuring optical or acoustical changes in the field of view. Most motion detectors can detect up to 15–25 meters (50–80 feet).

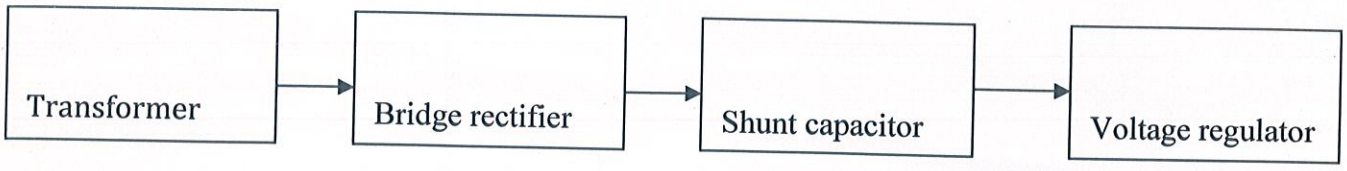
A motion detector may be connected to a burglar alarm that is used to alert the home owner or security service after it detects motion. Such a detector may also trigger a red light camera or outdoor lighting.

An occupancy sensor is a motion detector that is integrated with a timing device. It senses when motion has stopped for a specified time period in order to trigger a light extinguishing signal. These devices prevent illumination of unoccupied spaces like public toilets. They are widely used for security purposes.

This unit is continuously detecting weather any person enter the BTS. If the person enter the BTS, it will immediately report to microcontroller unit. Microcontroller receives signal from the intruder unit. It sets the buzzer on.

A **motion detector** is a device that contains a physical mechanism or electronic sensor that quantifies motion that can be either integrated with or connected to other devices that alert the user of the presence of a moving object within the field of view. They form a vital component of comprehensive security systems, for both homes and businesses

## 2.1.5 POWER SUPPLY




**The power supply circuit comprises of four basic parts:**

The transformer steps down the 220 V a/c. into 12 V a/c. The transformer work on the principle of magnetic induction, where two coils: primary and secondary are wound around an iron core. The two coils are physically insulated from each other in such a way that passing an a/c. current through the primary coil creates a changing voltage in the primary coil and a changing magnetic field in the core. This in turn induces a varying a/c. voltage in the secondary coil.

The a/c. voltage is then fed to the bridge rectifier. The rectifier circuit is used in most electronic power supplies is the single-phase bridge rectifier with capacitor filtering, usually followed by a linear voltage regulator. A rectifier circuit is necessary to convert a signal having zero average value into a non-zero average value. A rectifier transforms alternating current into direct current by limiting or regulating the direction of flow of current. The output resulting from a rectifier is a pulsating D.C. voltage. This voltage is not appropriate for the components that are going to work through it.

The ripple of the D.C. voltage is smoothened using a filter capacitor of 1000 microF 25V. The filter capacitor stores electrical charge. If it is large enough the capacitor will store charge as the voltage rises and give up the charge as the voltage falls. This has the effect of smoothing out the waveform and provides steadier voltage output. A filter capacitor is connected at the rectifier output and the d.c voltage is obtained across the capacitor. When this capacitor is used in this project, it should be twice the supply voltage. When the filter is used, the RC charge time of the filter capacitor must be short and the RC discharge time must

be long to eliminate ripple action. In other words the capacitor must charge up fast, preferably with no discharge.

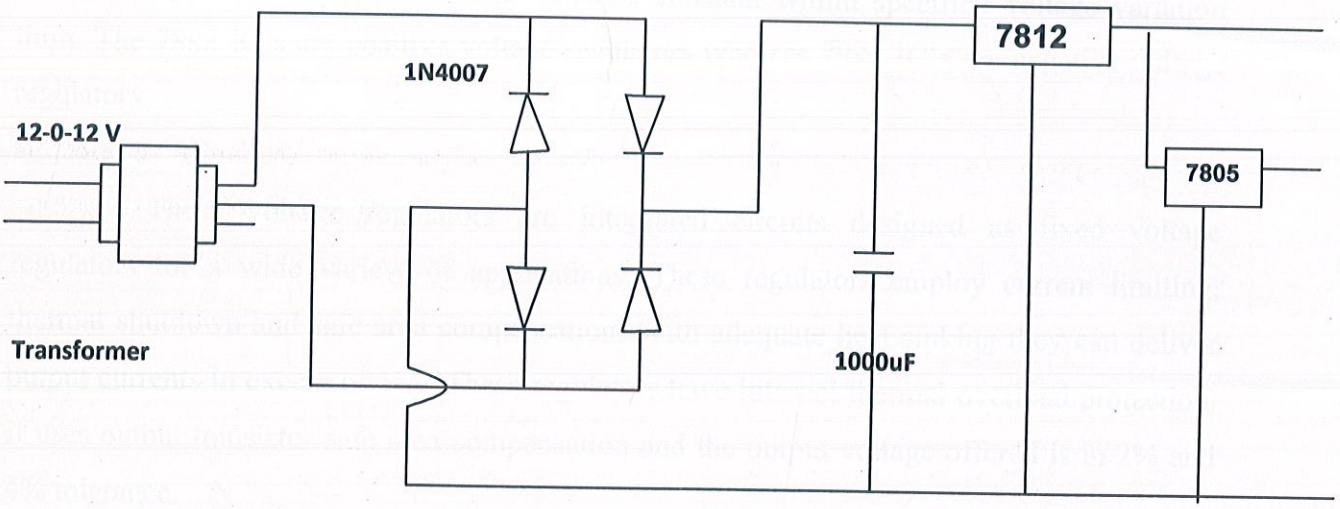



fig 2.2

When the rectifier output voltage is increasing, the capacitor charges to the peak voltage Vm. Just past the positive peak, the rectifier output voltage starts to fall but at this point the capacitor has +Vm voltage across it. Since the source voltage becomes slightly less than Vm, the capacitor will try to send current back through the diode of rectifier. This reverse biases the diode. The diode disconnects or separates the source the source form load. The capacitor starts to discharge through load. This prevents the load voltage from falling to zero. The capacitor continues to discharge until source voltage becomes more than capacitor voltage. The diode again starts conducting and the capacitor is again charged to peak value Vm. When capacitor is charging the rectifier supplies the charging through capacitor branch as well as load current, the capacitor sends currents through the load. The rate at which capacitor discharge depends upon time constant RC. The longer the time constant, the steadier is the output voltage. An increase in load current i.e. decrease in resistance makes time constant of discharge path smaller. The ripple increase and d.c output voltage V dc decreases. Maximum capacity cannot exceed a certain limit because the larger the capacitance the greater is the current required to charge the capacitor.

The voltage regulator regulates the supply if the supply if the line voltage increases or decreases. The series 78xx regulators provide fixed regulated voltages from 5 to 24 volts. An unregulated input voltage is applied at the IC Input pin i.e. pin 1 which is filtered by capacitor. The out terminal of the IC i.e. pin 3 provides a regular output. The third terminal is connected to ground. While the input voltage may vary over some permissible voltage range, and the output voltage remains constant within specified voltage variation limit. The 78xx IC's are positive voltage regulators whereas 79xx IC's are negative voltage regulators.

These voltage regulators are integrated circuits designed as fixed voltage regulators for a wide variety of applications. These regulators employ current limiting, thermal shutdown and safe area compensation. With adequate heat sinking they can deliver output currents in excess of 1 A. These regulators have internal thermal overload protection. It uses output transistor safe area compensation and the output voltage offered is in 2% and 4% tolerance.

## 2.1.6 GSM(Global System For Mobile Communication)

### 2.1.6.1 How To Connect Microcontroller to Mobile Phones

All mobile phones have F-BUS and M-BUS connections that can be used to connect a phone to a micro controller. The connection can be used for controlling just about all functions of the phone, as well as uploading new firmware etc. this bus will allow us to send and receive SMS messages. Mobile phone download cables are available.

**The differences of M-BUS and F-BUS**

**M-BUS** is a one pin bi-directional bus for both transmitting and receiving data from the phone. It is slow (9600bps) and only half-duplex. Only two pins on the phone are used. One ground and one data. M-BUS runs at9600bps, 8 data bits, odd parity, one stop bit. The data terminal ready (DTR) pin must be cleared with the request to send (RTS). In the thesis M-Bus concept has been used.

**F-BUS** is the later high speed full-duplex bus. It uses one pin for transmitting data and one pin for receiving data plus the ground pin. Very much like the standard serial port. It is fast 115,200bps, 8 data bits, no parity, one stop bit. For F-BUS the data terminal ready (DTR) pin must be set and the request to send (RTS) pin cleared.

**The F-BUS protocol and commands:**

The F-BUS is bi-directional serial type bus running at 115,200bps, 8 data bits. The serial cable contains electronics for level conversion and therefore requires power. The first thing to do is supply power to the cable electronics and this is done by setting the DTR (data terminal ready) pin and clearing the RTS (request to send) pin.

The next step is to synchronize the phone with the micro controller and send SMS by using T28 AT commands. This is done by sending a string. The bus is now ready to be used for sending frames. Before considering the AT commands,brief introduction about the SMS.

## 2.1.7 GPS(Global Positioning System)

### 2.1.7.1 GPS Receiver with Active Antenna, RS232

The ultra-sensitive GPS receiver can acquire GPS signals from 32 channels of satellites and generate fast position fixes with high accuracy in extremely challenging environments and under poor signal conditions due to its active antenna and high sensitivity. The bi-directional NMEA 0183 v3.0 protocol offers industry standard data messages and a command set for easy interface to mapping software and embedded devices.

### 2.1.7.2 FEATURES

- High sensitivity -159dBm
- Searching up to 32 Channel of satellites
- Fast Position Fix with LED indication of status
- Low power consumption
- RTCM- in ready
- Built-inWAAS/EGNOS/MSAS Demodulator
- Supports NMEA0183 V 3.01 data protocol
- Real time navigation for location based services
- For Car Navigation, Marine Navigation, Fleet Management, AVL and Location-Based Services, Auto Pilot, Personal Navigation or touring devices, Tracking devices/systems and Mapping devices application

### 2.1.7.3 APPLICATIONS

- Automotive and Marine Navigation
- Automotive Navigator Tracking
- Emergency Locator
- Geographic Surveying
- Personal Positioning
- Sporting and Recreation
- Embedded applications

### 2.1.7.4 SPECIFICATIONS

- **Parameter Value Unit**
- Operating Voltage 8-24 V (12V Typical) V DC
- Operating Current 150 mA
- Sensitivity -159 dBm
- Channels 32 32 channels all in view searching

### 2.1.7.5 NMEA PROTOCOL

This section provides a brief overview of the NMEA 0183 protocol, and describes both the standard and optional messages offered by the GPS Receiver. NMEA 0183 is a simple, yet comprehensive ASCII protocol which defines both the communication interface and the data format. The NMEA 0183 protocol was originally established to allow marine navigation equipment to share information. Since it is a well established industry standard, NMEA 0183 has also gained popularity for use in applications other than marine electronics. The GPS receiver supports the latest release of NMEA 0183, Version 3.0 (July 1, 2000). The primary change in release 3.0 is the addition of the mode indicators in the GLL, RMC, and VTG messages.

For those applications requiring output only from the GPS receiver, the standard NMEA 0183 sentences are a popular choice. Many standard application packages support the standard NMEA output messages. The standard NMEA output only messages are: GGA, GLL, GSA, GSV, RMC, VTC, and ZDA.

## 2.1.8 MAX 232

The **MAX232** is an electronic circuit that converts signals from a serial port to signals suitable for usage in e.g. microprocessor circuits.

When communicating with various micro processors one needs to convert the RS232 levels down to lower levels, typically 3.3 or 5.0 Volts. Serial RS-232 communication works with voltages -15V to +15V for high and low. On the other hand, TTL logic operates between 0V and +5V . Modern low power consumption logic operates in the range of 0V and +3.3V or even lower.

Thus the RS-232 signal levels are far too high TTL electronics, and the negative RS-232 voltage for high can't be handled at all by computer logic. To receive serial data from an RS-232 interface the voltage has to be reduced. Also the low and high voltage level has to be inverted. The level converter uses a Max232 and five capacitors.

### 2.1.8.1 FEATURES

- Meets or Exceeds TIA/EIA-232-F and ITU
- Recommendation V.28
- _ Operates From a Single 5-V Power Supply
- With 1.0-_F Charge-Pump Capacitors
- _ Operates Up To 120 kbit/s
- _ Two Drivers and Two Receivers
- _ ±30-V Input Levels
- _ Low Supply Current . . . 8 mA Typical
- _ ESD Protection Exceeds JESD 22

– 2000-V Human-Body Model (A114-A)

- _ Upgrade With Improved ESD (15-kV HBM)
- and 0.1-_F Charge-Pump Capacitors is
- Available With the MAX202

### 2.1.8.2 DESCRIPTION

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply TIA/EIA-232-F voltage levels from a single 5-V supply.Each receiver converts TIA/EIA-232-F inputs to 5-V TTL/CMOS levels. These receivers have a typical threshold of 1.3 V, a typical hysteresis of 0.5 V, and can accept ±30-V inputs.Each driver converts TTL/CMOS input levels into TIA/EIA-232-F levels. The driver, receiver, and voltage-generator functions are available as cells in the Texas Instruments LinASIC□ library.

## 2.1.9 LCD(Liquid Crystal 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. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

Many microcontroller devices use 'smart LCD' displays to output visual information. LCD displays designed around Hitachi's LCD HD44780 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 8x80 pixels of the display. They have a standard ASCII set of characters and mathematical symbols.

For an 8-bit data bus, the display requires a +5V supply plus 11 I/O lines. For a 4-bit data bus it only requires the supply lines plus seven extra lines. When the LCD display is not

enabled, data lines are tri-state and they do not interfere with the operation of the microcontroller.

Data can be placed at any location on the LCD. For 16×2 LCD, the address locations are:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **First line** | **80** | **81** | **82** | **83** | **84** | **85** | **86** | **through** | **8F** |
| **Second line** | **C0** | **C1** | **C2** | **C3** | **C4** | **C5** | **C6** | **through** | **CF** |

### 2.1.9.1 SIGNALS TO LCD

The LCD also requires 3 control lines from the microcontroller:

1) **Enable (E)**

This line allows access to the display through R/W and RS lines. When this line is low, the LCD is disabled and ignores signals from R/W and RS. When (E) line is high, the LCD checks the state of the two control lines and responds accordingly.

2) **Read/Write (R/W)**

This line determines the direction of data between the LCD and microcontroller.
When it is low, data is written to the LCD. When it is high, data is read from the LCD.

3) **Register select (RS)**

With the help of this line, the LCD interprets the type of data on data lines. When it is low, an instruction is being written to the LCD. When it is high, a character is being written to the LCD.

### 2.1.9.2 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 Instruction

1 Character

### 2.1.9.3 Writing And Reading The Data From LCD

Writing data to the LCD is done in several steps:

1) Set R/W bit to low
2) Set RS bit to logic 0 or 1 (instruction or character)
3) Set data to data lines (if it is writing)
4) Set E line to high
5) Set E line to low

Read data from data lines (if it is reading):

1) Set R/W bit to high
2) Set RS bit to logic 0 or 1 (instruction or character)
3) Set data to data lines (if it is writing)
4) Set E line to high
5) Set E line to low

### 2.1.9.4 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).

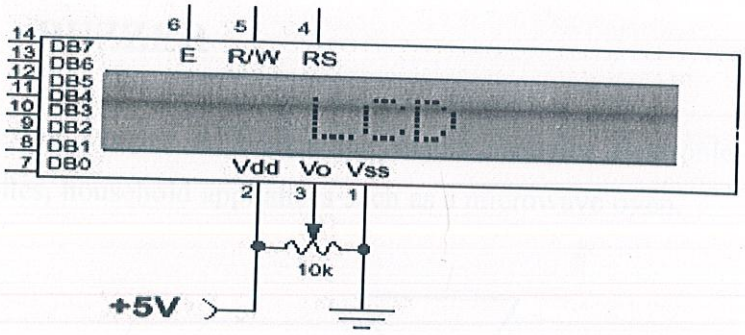
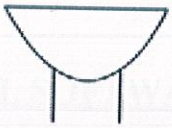



Fig 2.3 **Pin diagram of 2x16 line LCD**

| Pin No. | Name | Description |
|---|---|---|
| Pin no. 1 | **VSS** | Power supply (GND) |
| Pin no. 2 | **VCC** | Power supply (+5V) |
| Pin no. 3 | **VEE** | Contrast adjust |
| Pin no. 4 | **RS** | 0 = Instruction input<br>1 = Data input |
| Pin no. 5 | **R/W** | 0 = Write to LCD module<br>1 = Read from LCD module |
| Pin no. 6 | **EN** | Enable signal |
| Pin no. 7 | **D0** | Data bus line 0 (LSB) |
| Pin no. 8 | **D1** | Data bus line 1 |
| Pin no. 9 | **D2** | Data bus line 2 |
| Pin no. 10 | **D3** | Data bus line 3 |
| Pin no. 11 | **D4** | Data bus line 4 |
| Pin no. 12 | **D5** | Data bus line 5 |
| Pin no. 13 | **D6** | Data bus line 6 |
| Pin no. 14 | **D7** | Data bus line 7 (MSB) |

## 2.1.10 BUZZER

A **buzzer** or **beeper** is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven.



**Electrical symbol of a buzzer**

It is connected to the control unit through the transistor that acts as an electronic switch for it. When the switch forms a closed path to the buzzer, it sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.

The transistor acts as a normal controlled by the base connection. It switches ON when a positive voltage from the control unit is applied to the base. If the positive voltage is less than 0.6V, the transistor switches OFF. No current flows through the buzzer in this case and it will not buzz. As can be seen in the buzzer circuitry given below, a protection resistor of 10k ohm is used in order to protect the transistor from being damaged in case of excessive current flow. In our system, the buzzer is designed to give a small beep whenever one of the devices such as a cooler or a bulb turns on in order to alert the user.

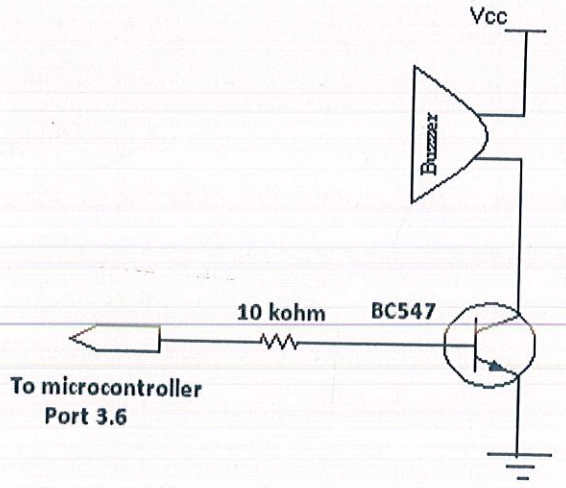



**Fig 2.4 Buzzer circuitry**

# CHAPTER – 3

# SOFTWARE

## 3.1 INTRODUCTION TO KEIL SOFTWARE

Keil MicroVision is an integrated development environment used to create software to be run on embedded systems (like a microcontroller). It allows for such software to be written either in assembly or C programming languages and for that software to be simulated on a computer before being loaded onto the microcontroller.

### 3.1.1 WHAT IS µVision3?

µVision3 is an IDE (Integrated Development Environment) that helps write, compile, and debug embedded programs. It encapsulates the following components:

- A project manager.
- A make facility.
- Tool configuration.
- Editor.
- A powerful debugger.

### 3.1.2 STEPS FOLLOWED IN CREATING AN APPLICATION IN uVision3:

To create a new project in uVision3:

1. Select Project - New Project.
2. Select a directory and enter the name of the project file.
3. Select Project –Select Device and select a device from Device Database.
4. Create source files to add to the project
5. Select Project - Targets, Groups, and Files. Add/Files, select Source Group1, and add the source files to the project.
6. Select Project - Options and set the tool options. Note that when the target device is selected from the Device Database™ all-special options are set automatically. Default memory model settings are optimal for most applications.
7. Select Project - Rebuild all target files or Build target.

directory for the project. It is recommended that a new directory be created for each project, as several files will be generated. Once the project has been named, the dialog shown in the figure below will appear, prompting the user to select a target device. In this lab, the chip being used is the "AT89S52," which is listed under the heading "Atmel".

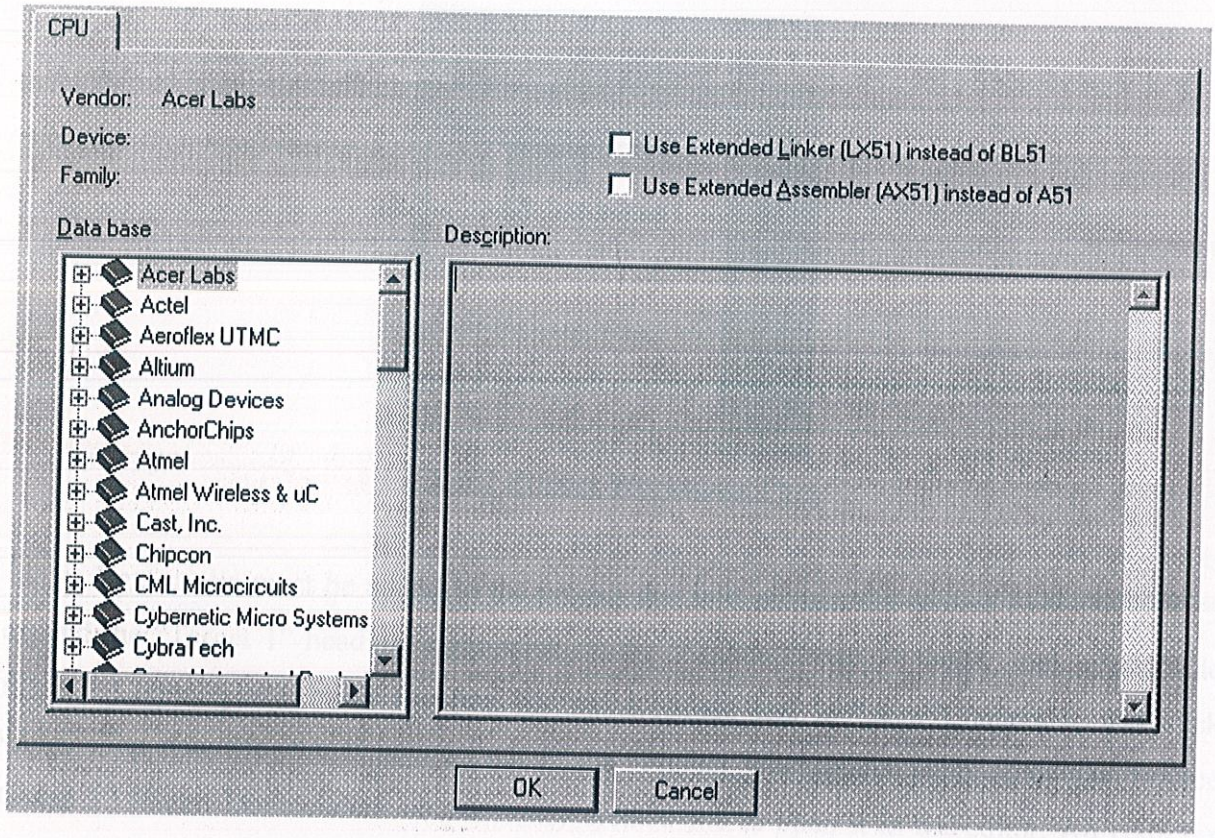



**Fig. 3.1 Window for choosing the target device**

Next, MicroVision must be instructed to generate a HEX file upon program compilation. A HEX file is a standard file format for storing executable code that is to be loaded onto the microcontroller.

In the "Project Workspace" pane at the left, right–click on "Target 1" and select "Options for 'Target 1' ".Under the "Output" tab of the resulting options dialog, ensure that both the "Create Executable" and "Create HEX File" options are checked. Then click "OK"

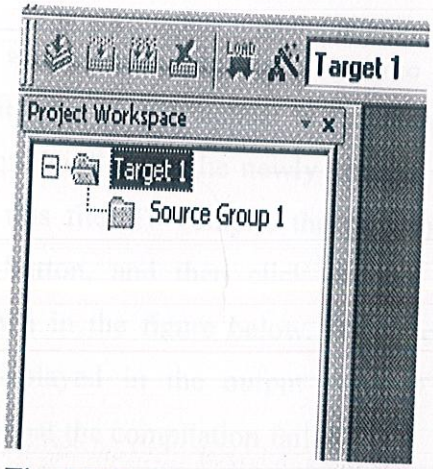



**Fig. 3.2 Project Workspace Pane**

Next, a file must be added to the project that will contain the project code. To do this, expand the "Target 1" heading, right–click on the "Source Group 1" folder, and select "Add files..." Create a new blank file (the file name should end in ".asm"), select it, and click "Add." The new file should now appear in the "Project Workspace" pane under the "Source Group 1" folder. Double-click on the newly created file to open it in the editor. All code for this lab will go in this file. To compile the program, first save all source files by clicking on the "Save All" button, and then click on the "Rebuild All Target Files" to compile the program as shown in the figure below. If any errors or warnings occur during compilation, they will be displayed in the output window at the bottom of the screen. Note that only errors indicate that the compilation failed.


**Fig. 3.4 "Save All" and "Build All Target Files" Buttons**

"Add files..." Create a new blank file (the file name should end in ".asm"), select it, and click "Add." The new file should now appear in the "Project Workspace" pane under the "Source Group 1" folder. Double-click on the newly created file to open it in the editor. All code for this lab will go in this file. To compile the program, first save all source files by clicking on the "Save All" button, and then click on the "Rebuild All Target Files" to compile the program as shown in the figure below. If any errors or warnings occur during compilation, they will be displayed in the output window at the bottom of the screen. Note that only errors indicate that the compilation failed.

At the left side of the debugger window, a table is displayed containing several key parameters about the simulated microcontroller, most notably the elapsed time (circled in the figure below). Just above that, there are several buttons that control code execution. The "Run" button will cause the program to run continuously until a breakpoint is reached, whereas the "Step Into" button will execute the next line of code and then pause (the current position in the program is indicated by a yellow arrow to the left of the code).

directory for the project. It is recommended that a new directory be created for each project, as several files will be generated. Once the project has been named, the dialog shown in the figure below will appear, prompting the user to select a target device.

When the program has been successfully compiled, it can be simulated using the integrated debugger in Keil MicroVision. To start the debugger, select "Debug"=>"Start/Stop Debug Session" from the pull–down menus.

At the left side of the debugger window, a table is displayed containing several key parameters about the simulated microcontroller, most notably the elapsed time (circled in the figure below). Just above that, there are several buttons that control code execution. The "Run" button will cause the program to run continuously until a breakpoint is reached, whereas the "Step Into" button will execute the next line of code and then pause (the current position in the program is indicated by a yellow arrow to the left of the code).

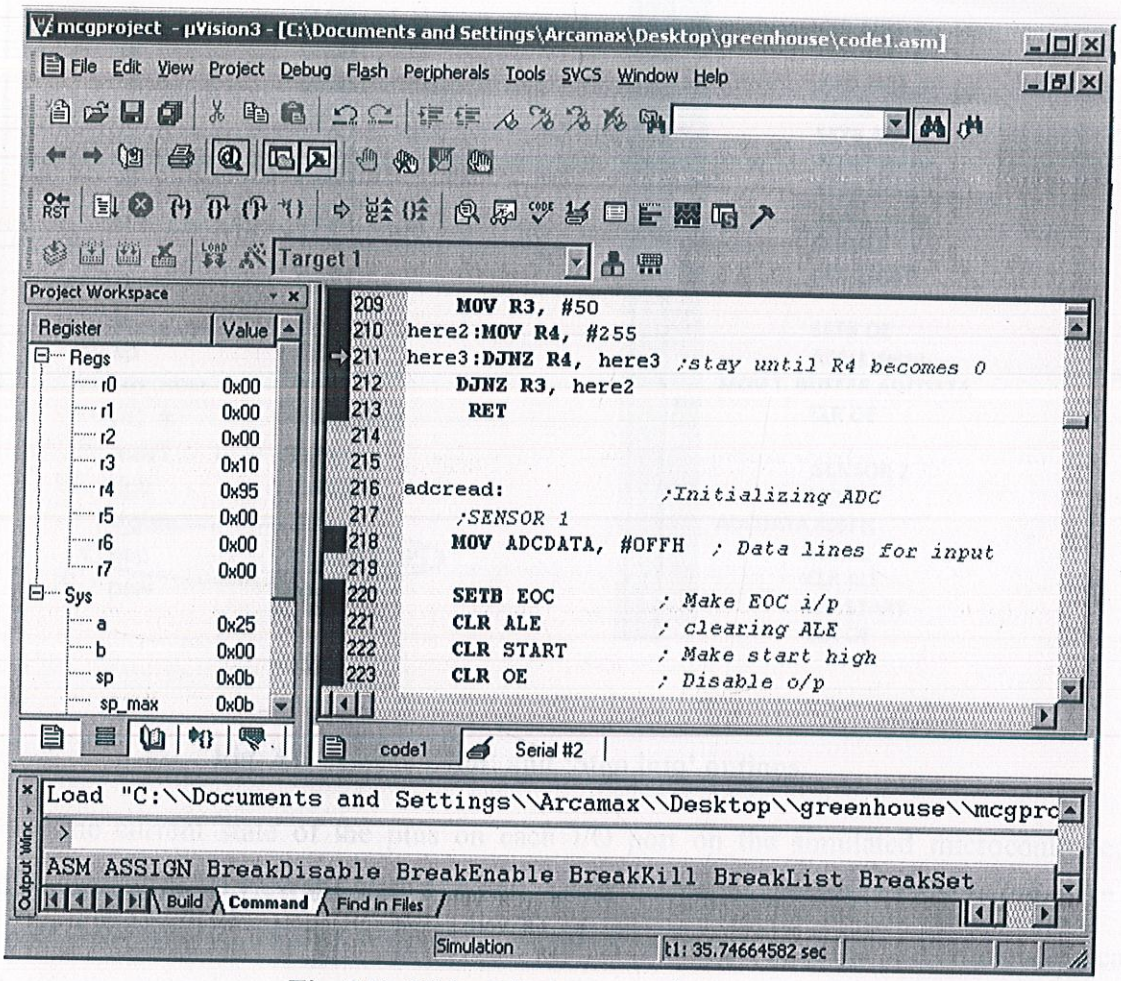



**Fig. 3.5 µVision3 Debugger window**

Breakpoints can be set by double–clicking on the grey bar on the left edge of the window containing the program code. A breakpoint is indicated by a red box next to the line of code.

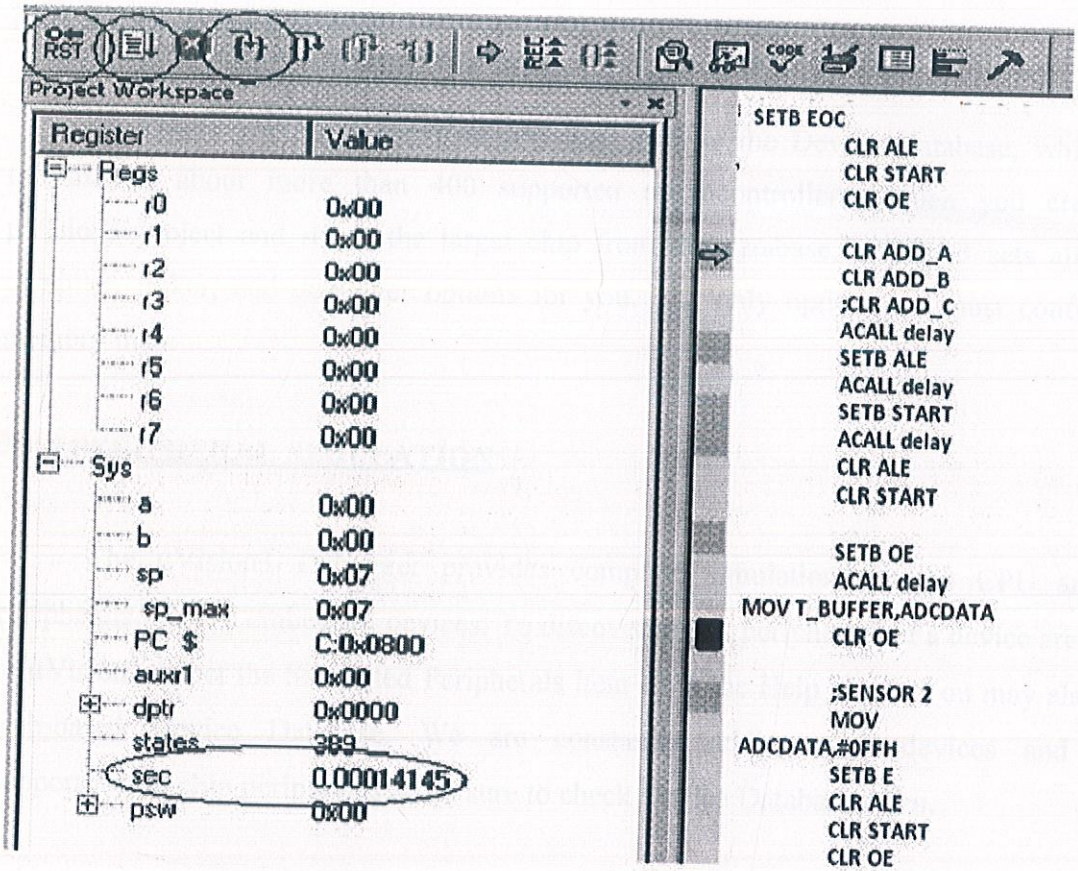



**Fig. 3.6 'Reset', 'Run' and 'Step into' options**

The current state of the pins on each I/O port on the simulated microcontroller can also be displayed. To view the state of a port, select "Peripherals"=>"I/O Ports"=>"Port *n*" from the pull–down menus, where *n* is the port number. A checked box in the port window indicates a high (1) pin, and an empty box indicates a low (0) pin. Both the I/O port data and the data at the left side of the screen are updated whenever the program is paused.

The debugger will help eliminate many programming errors, however the simulation is not perfect and code that executes properly in simulation may not always work on the actual microcontroller.

### 3.1.3 DEVICE DATABASE

A unique feature of the Keil µVision3 IDE is the Device Database, which contains information about more than 400 supported microcontrollers. When you create a new µVision3 project and select the target chip from the database, µVision3 sets all assembler, compiler, linker, and debugger options for you. The only option you must configure is the memory map.

### 3.1.4 PERIPHERAL SIMULATION

The µVision3 Debugger provides complete simulation for the CPU and on-chip peripherals of most embedded devices. To discover which peripherals of a device are supported, in µVision3 select the Simulated Peripherals item from the Help menu. You may also use the web-based Device Database. We are constantly adding new devices and simulation support for on-chip peripherals so be sure to check Device Database often.

## 3.2 PROGRAMMER

The programmer used is a powerful programmer for the Atmel 89 series of microcontrollers that includes 89C51/52/55, 89S51/52/55 and many more.

It is simple to use & low cost, yet powerful flash microcontroller programmer for the Atmel 89 series. It will Program, Read and Verify Code Data, Write Lock Bits, Erase and Blank Check. All fuse and lock bits are programmable. This programmer has intelligent onboard firmware and connects to the serial port. It can be used with any type of computer and requires no special hardware. All that is needed is a serial communication port which all computers have.

All devices also have a number of lock bits to provide various levels of software and programming protection. These lock bits are fully programmable using this programmer. Lock bits are useful to protect the progam to be read back from microcontroller only

allowing erase to reprogram the microcontroller.

Major parts of this programmer are Serial Port, Power Supply and Firmware microcontroller. Serial data is sent and received from 9 pin connector and converted to

TTL logic/RS232 signal levels by MAX232 chip. A Male to Female serial port cable, connects to the 9 pin connector of hardware and another side connects to back of computer.

All the programming 'intelligence' is built into the programmer so you do not need any special hardware to run it. Programmer comes with window based software for easy programming of the devices.

## 3.3 ProLoad PROGRAMMING SOFTWARE

'ProLoad' is a software working as a user friendly interface for programmer boards from Sunrom Technologies. Proload gets its name from "**Pro**gram **Load**er" term, because that is what it is supposed to do. It takes in compiled HEX file and loads it to the hardware. Any compiler can be used with it, Assembly or C, as all of them generate compiled HEX files. ProLoad accepts the Intel HEX format file generated from compiler to be sent to target microcontroller. It auto detects the hardware connected to the serial port. It also auto detects the chip inserted and bytes used. The software is developed in Delphi and requires no overhead of any external DLL.

The programmer connects to the computer's serial port (Comm 1, 2, 3 or 4) with a standard DB9 Male to DB9 Female cable. Baud Rate - 57600, COMx Automatically selected by window software. No PC Card Required.

After making the necessary selections, the 'Auto Program' button is clicked as shown in the figure below which burns the selected hex file onto the microcontroller.

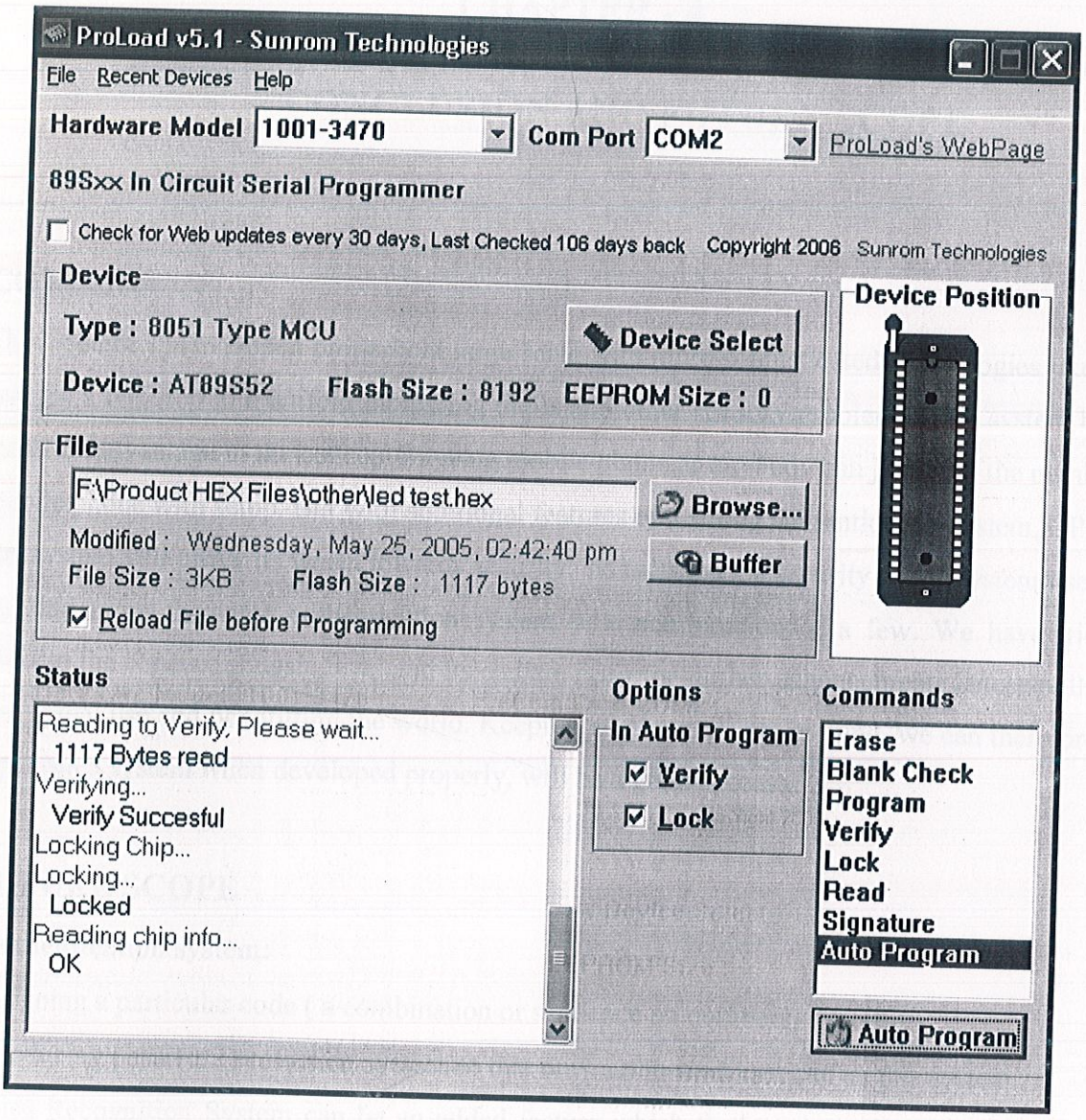



**Fig. 3.7 Programming window**

# CHAPTER - 4

# CONCLUSION AND FUTURE SCOPE

## CONCLUSION

This System, if developed properly at large scale with more sophisticated technologies like GPS can put a full stop to manifold increasing thefts and other security problems. This system has its major disadvantage in the concept of using mobile phone as anybody can just hack the number of mobile phone with setup. But with additional features of a strong authentication system, GPS etc. this system will prove its worth towards security. To enhance the security of the system itself we can add more than one authentication system or a combination of a few. We have tried to develop the concept at basic level and its end are open for further enhancements before pulling it into actual use and benefitting the world. Keeping all above points in mind, we can therefore say that such a system when developed properly, will be a great success.

## FUTURE SCOPE

**Authentication system:**

- Assigning a particular code ( a combination or sequence on numbers) for user.
- Introducing password protection system so that only authorized user can us this system.
- Voice Recognition System can be an added feature which further strengthens the security and hence reduces the chance of misuse.

**GPS (Global Positioning System):** This system can be used to actualize this project at the commercial level.

**IVR (Interactive Voice Response System):** This can be added as an enhancement feature wherein the control will be through voice command. It is a sort of voice recognition system.

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