Due Date	Due Date	Due Date

AUTOMATIC RAILWAY GATE CONTROL

AND

TRACK SWITCHING SYSTEM

Enrollment. No. - 071563,071149,071147

Name of Students - Ankush Thakur, Sidhant Chhabra, Chirag Doda

Name of supervisor - Dr. Vivek Sehgal

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY
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ABBREVIATIONS

1. ADC – Analog to Digital Converter
2. LCD – Liquid Crystal Display
3. AC – Alternating Current
4. LDR – Light Dependent Resistor
5. CDs – Cadmium Sulphide
6. GND - Ground

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CERTIFICATE

This is to certify that the work titled **"Automatic Railway Gate Control And Track Switching System"** submitted by " **Ankush Thakur, Sidhant Chhabra and Chirag Doda**" 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- Vivek Sehgal

Name of Supervisor- Dr.Vivek Sehgal

Designation- Assistant Professor

Date- 23rd May, 2011

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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.

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Signature of the student- Ankush Thakur Sidhant Chhabra Chirag Doda

Name of Student- Ankush Thakur, Sidhant Chhabra, Chirag Doda

Date- 23rd May, 2011

SUMMARY

The objective of this project is to provide an automatic railway gate at a level crossing replacing the gates operated by the gatekeeper. It deals with two things. Firstly, it deals with the reduction of time for which the gate is being kept closed. And secondly to provide safety to the road users by reducing the accidents.

By the presently existing system once the train leaves the station, the station master informs the gatekeeper about the arrival of the train through the telephone. Once the gatekeeper receives the information, he closes the gate depending on the timing at which the train arrives. Hence, if the train is late due to certain reasons, then gate remain closed for a long time causing traffic near the gates.

By employing the automatic railway gate control at the level crossing the arrival of the train is detected by the sensor placed near to the gate. Hence, the time for which it is closed is less compared to the manually operated gates and also reduces the human labour. This type of gates can be employed in an unmanned level crossing where the chances of accidents are higher and reliable operation is required. Since, the operation is automatic, error due to manual operation is prevented.

In track switching system where an express train and a local train are traveling in opposite directions on the same track; the express train is allowed to travel on the same track and the local train has to switch on to the other track. This system avoids the accidents between the two trains coming onto the same track in opposite direction. When train has passed the track is switched back to its original position, allowing the first train to pass without any interruption.

Automatic railway gate control and track switching system is highly economical microcontroller based arrangement, designed for use in almost all the unmanned level crossings in the country.

Signature of Student- Ankush Thakur Sidhant Chhabra

Name- Ankush Thakur, Sidhant Chhabra

Date 23rd May, 2011

Chirag Doda

Vivek Sehgal

Signature of Supervisor

Name-Dr.Vivek Sehgal

Date 23rd May, 2011

CHAPTER 1
INTRODUCTION

Railways being the cheapest mode of transportation are preferred over all the other means.When we go through the daily newspapers we come across many railway accidents occurring at unmanned railway crossings. This is mainly due to the carelessness in manual operations or lack of workers. We, in this project have come up with a solution for the same. Using simple electronic components we have tried to automate the control of railway gates. As a train approaches the railway crossing from either side, the sensors placed at a certain distance from the gate detects the approaching train and accordingly controls the operation of the gate. Also an indicator light and buzzer system has been provided to alert the motorists about the approaching train.

Using the same principle as that for gate control, we have developed a concept of automatic track switching. Considering a situation where in an express train and a local train are travelling in opposite directions on the same track; the express train is allowed to travel on the same track and the local train has to switch on to the other track. Indicator lights have been provided to avoid collisions. Here the switching operation is performed using a DC gear motor.

1.1 CURRENT SCENARIO

In today's railway system once the train leaves the station, the station guard informs the gatekeeper about the arrival of the train. To pass on this information about the arrival of train, telephonic system is used. Once the gatekeeper receives the information from the station guard , he closes the gate depending on the timing at which the train arrives. Hence, if the train is late due to certain reasons, then gate remain closed for a long time causing traffic near the gates.

In current track switching system, the tracks are switched manually. For switching one of the two trains coming onto the same track in opposite direction a lever to be moved by a human operator. When train has passed the track is switched back to its original position, allowing the first train to pass without any interruption.

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1.1.1 MANUAL SET-UP:

MANUAL RAILWAY GATE CONTROL

After the gatekeeper receives the information from the railway guard of previous station which is shared using telephones these days, the gatekeeper closes the gate using the motor. So this gate control operation is controlled manually by the gatekeeper using motor.

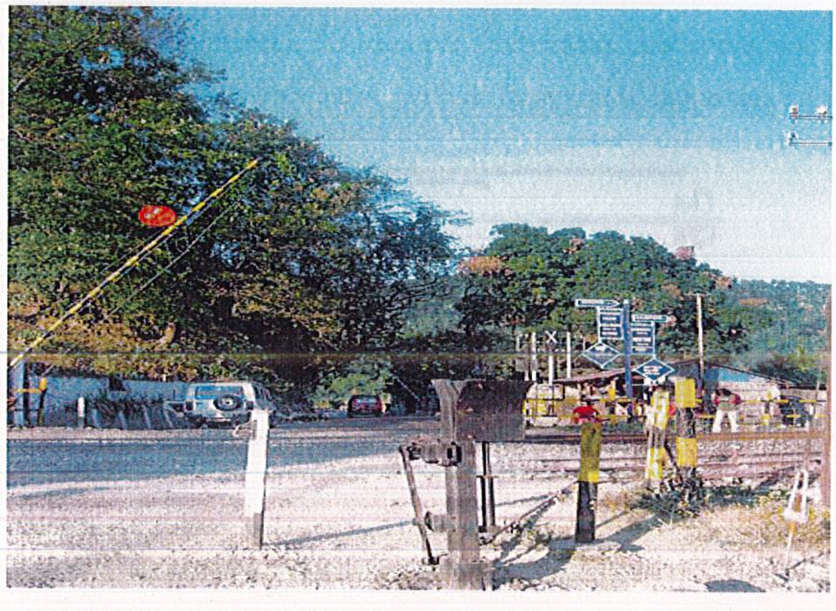


Fig.1.1 India Railway crossing

MANUAL TRACK SWITICHING SYSTEM

A railroad switch, turnout is a mechanical installation enabling railway trains to be guided from one_track to another at a railway junction.

The switch consists of the pair of linked tapering rails, known as points, lying between the diverging outer rails. These points can be moved laterally into one of two positions to direct a train coming from the narrow end toward the straight path or the diverging path. A train moving from the narrow end toward the point blades (i.e. it may go either left or right) is said to be executing a facing-point movement.

Unless the switch is locked, a train coming from either of the converging directs will pass through the points onto the narrow end, regardless of the position of the points, as the vehicle's wheels will force the points to move. Passage through a switch in this direction is known as a trailing-point movement.

A switch generally has a straight "through" track (such as the main-line) and a diverging route. The handedness of the installation is described by the side that the diverging track leaves. Right-hand switches have a diverging path to the right of the straight track, when coming from the narrow end and a left-handed switch has the diverging track leaving to the opposite side.

A straight track is not always present; for example, both tracks may curve, one to the left and one to the right or both tracks may curve, with differing radii, in the same direction.

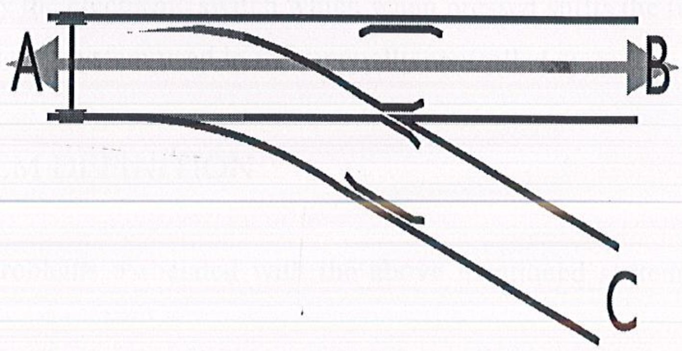


Fig1.2 Animated diagram of a right-hand railroad switch, rail track a divides into two: track B (the straight track) and track C (the diverging track)

Fig.1.3 A right-hand rail road switch with point indicator pointing to right.

1.1.2 PARTIALLY AUTOMATED SET-UP:

In partially automatic gate control system, when the railway guard sends the telephonic information to the railway keeper then the gatekeeper closes the railway gate by a switch attached to the motor and the gate closing operation will commence .After passing of the train the opposite process is also controlled by the switch attached to the motor instead of the lever.

Same principle is applied for the track switching system. The track switching operation is controlled by the electronic switch which when pressed shifts the track automatically instead of the lever system used in the manually controlled system.

1.2 PROBLEM DEFINITION

A number of problems associated with the above mentioned systems are enumerated as below:

1. The above mentioned systems are controlled manually by gatekeeper at the railway

crossings, so even a small carelessness can lead to many serious accidents.

2. Also in manually controlled railway systems the railway crossing gate is kept closed for a long time as train arrival may be delayed for some reason resulting in wastage of time.

3. It also requires manpower at all railway crossings for operating gate and switching of tracks.

Keeping these issues in view, a microcontroller based Railway System is designed to find implementation in the near future that will help Indian Railways..

1.3 PROPOSED MODEL FOR AUTOMATION OF RAILWAY SYSTEM

In the project "Automatic railway control System and track switching" we have shown the concept of an automatic closing and opening of railway crossing gate. As in the modern world everything is going automatic we have built a system which will automatically sense the entry and exit of trains and then according to it controls the opening and closing of gates. We have deployed a microcontroller which is used to sense the movement of trains and depending upon it either opens the gate or not.

Fig.1.4Automatic Railway Crossing

Also track switching system is made fully automatic by employing a system including sensors and motor which switch the track on the arrival of the trains coming on same track in opposite direction. When the train with higher priority passed, then the track shifts to its original position and all this procedure is controlled by the sensors.

CHAPTER 2

SYSTEM MODEL

2.1 BASIC MODEL OF THE SYSTEM

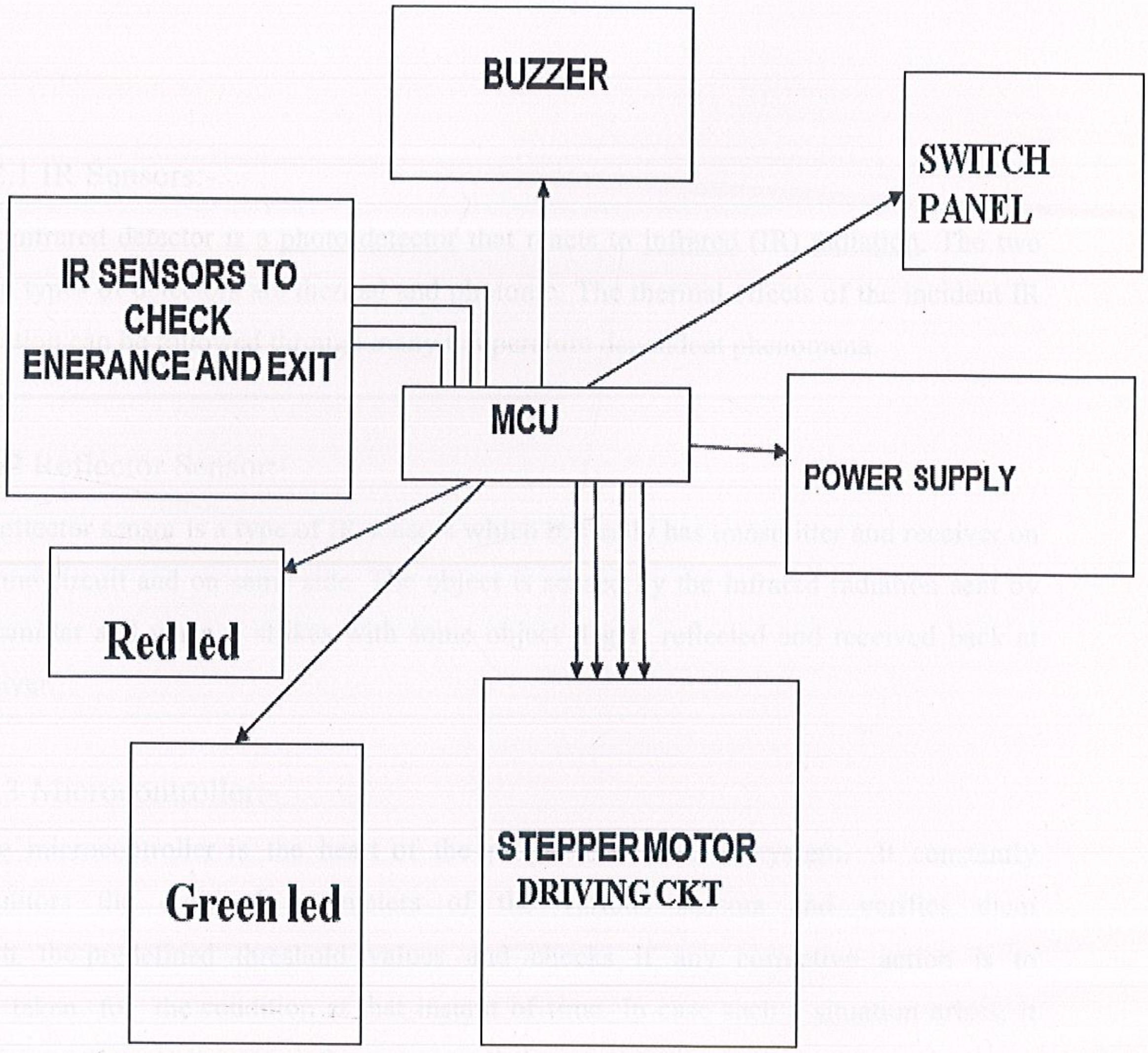


Fig. 2.1 Block diagram of the system

2.2 PARTS OF THE SYSTEM:

- Sensors :-

IR Sensors
Reflector Sensors

- Buzzer
- Microcontroller

2.2.1 IR Sensors:-

An infrared detector is a photo detector that reacts to infrared (IR) radiation. The two main types of detectors are thermal and photonic. The thermal effects of the incident IR radiation can be followed through many temperature dependent phenomena.

2.2.2 Reflector Sensor:-

A reflector sensor is a type of IR sensors which basically has transmitter and receiver on a same circuit and on same side. The object is sensed by the Infrared radiation sent by transmitter and when it strikes with some object it gets reflected and received back at receiver.

2.2.3 Microcontroller:-

The microcontroller is the heart of the proposed embedded system. It constantly monitors the digitized parameters of the various sensors and verifies them with the predefined threshold values and checks if any corrective action is to be taken for the condition at that instant of time. In case such a situation arises, it activates the actuators to perform a controlled operation.

2.2.4 Actuators:-

An array of actuators can be used in the system such as relays, contactors, and change over switches etc. They are used to turn on AC devices such as motors, coolers, pumps.

2.3 STEPS FOLLOWED IN DESIGNING THE SYSTEM:

Three general steps can be followed to appropriately select the control system:

Step 1: Detection of Train:-

For making the railway system fully automated Detection of train plays an important role. The detection of train is done by using IR sensors. The two IR sensors are programmed on the basis of AND logic to make the detection of train system more secure. As IR sensor can easily be interrupted by any means may be by a person or by any object because they are placed around the railway track. So to overcome this problem two IR sensors with AND logic is used.

Step 2: Gate Control:-

After the detection of train at either end the gate control operation will commence. The gate control operation totally depends upon IR sensors placed at entry and exit point. The gate control operation is achieved using the stepper motor which totally works according to the microcontroller. When the train is sensed at entry point means train is coming towards the station the gate close operation is started and when it is sensed at other end gate open operation will be started.

Step 3: Track Switching System:-

When two trains onto the same track is sensed by the sensors, one train has to be shifted to other track and this idea is implemented by track switching system. In this a DC gear motor is used to switch the tracks. The DC gear motor also works according to the microcontroller. When one train is moved to other track the track come back back to its original position to allow the other train to pass through the same track.

CHAPTER 3
HARDWARE DESCRIPTION

3.1 IR Sensor:-

An infrared detector is a photo detector that reacts to infrared (IR) radiation. The 555 timer is used in the Infrared transmitters and receivers.

Circuit:-

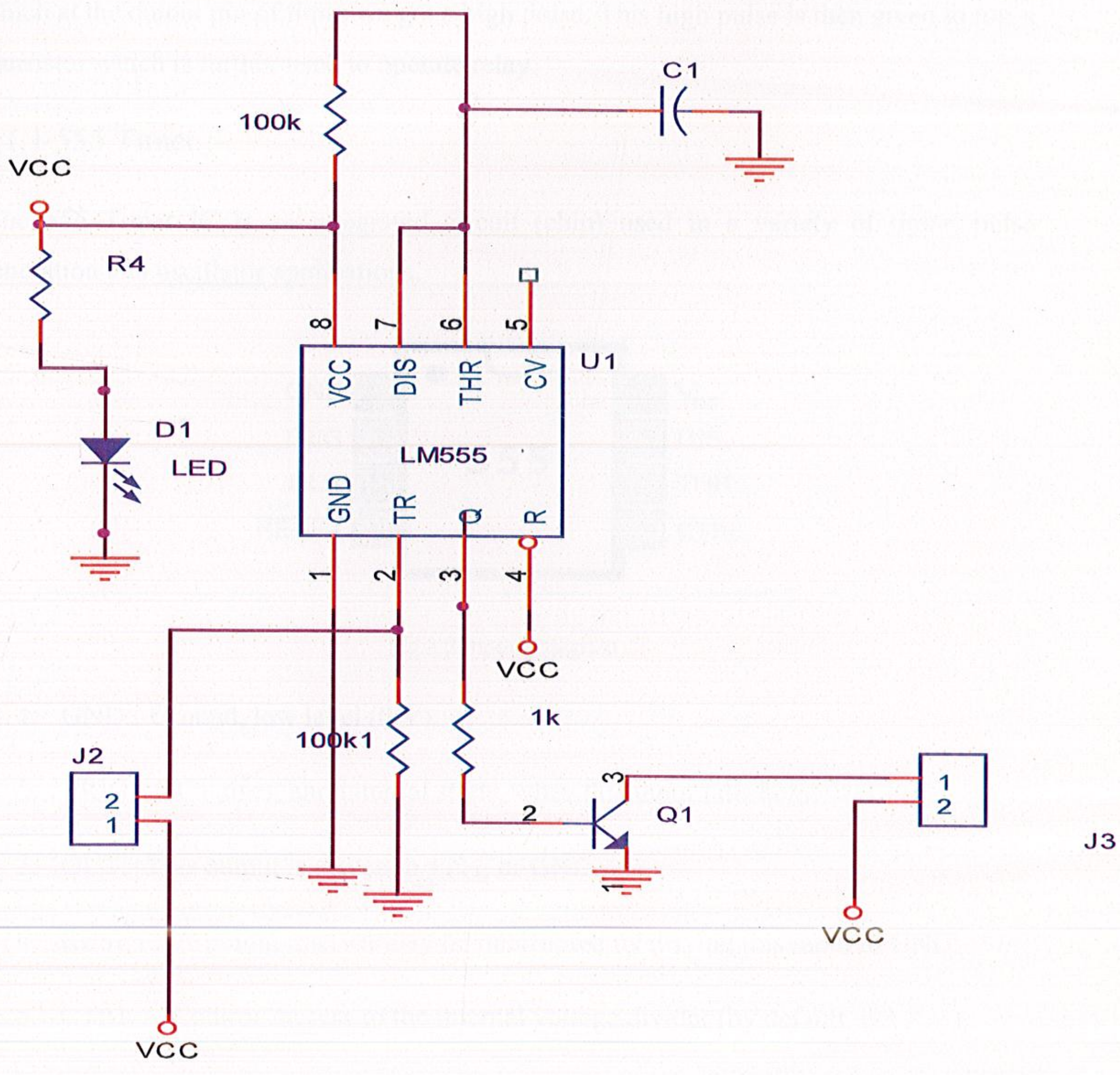


Fig.3.1 IR Sensor

At the transmitter it is used to produce a pulse of 38 kHz. This pulse is then fed to the Infrared LED so that it produces bursts of Infrared energy at the rate of 38 kHz.

The reason of transmitting frequency being this much particular value is that the Infrared receiver works at maximum efficiency when the Infrared rays falling on it, are of 38 kHz. At the receiver the 555 timer is used to pass the output of the Infrared receiver to the microcontroller. We are using the 555 timer in mono- stable operation where one external resistor and capacitor control the pulse width. The 555 timer has a number of features. When there is a car between receiver and transmitter then the trigger pin gets low due to which at the output pin of timer we get a high pulse. This high pulse is then given to n-p-n transistor which is further used to operate relay.

3.1.1 555 Timer :-

The 555 Timer IC is an integrated circuit (chip) used in a variety of timer, pulse generation and oscillator applications.

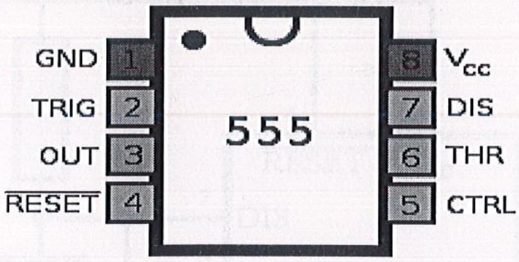


Fig.3.2 Pinout Diagram

1. GND :-Ground, low level (0 V)
2. TRIG:- OUT rises, and interval starts, when this input falls below 1/3 V_{CC}.
3. OUT:- This output is driven to $+V_{CC}$ or GND.
4. RESET :-A timing interval may be interrupted by driving this input to GND.
5. CTRL :-"Control" access to the internal voltage divider (by default, 2/3 V_{CC}).
6. THR:- The interval ends when the voltage at THR is greater than at CTRL.
7. DIS :-Open collector output; may discharge a capacitor between intervals.

8. $V+$, V_{CC} :-Positive supply voltage is usually between 3 and 15 V.

The 555 has three operating modes:

- Mono stable mode:- In this mode, the 555 functions as a "one-shot" pulse generator. Applications include timers, missing pulse detection, bounce free switches, touch switches, frequency divider, capacitance measurement, pulse-width modulation (PWM) and so on.

In the mono stable mode, the 555 timer acts as a “one-shot” pulse generator. The pulse begins when the 555 timer receives a signal at the trigger input that falls below a third of the voltage supply. The width of the output pulse is determined by the time constant of an RC network, which consists of a capacitor (C) and a resistor (R).

The output pulse ends when the charge on the C equals 2/3 of the supply voltage. The output pulse width can be lengthened or shortened to the need of the specific application by adjusting the values of R and C.

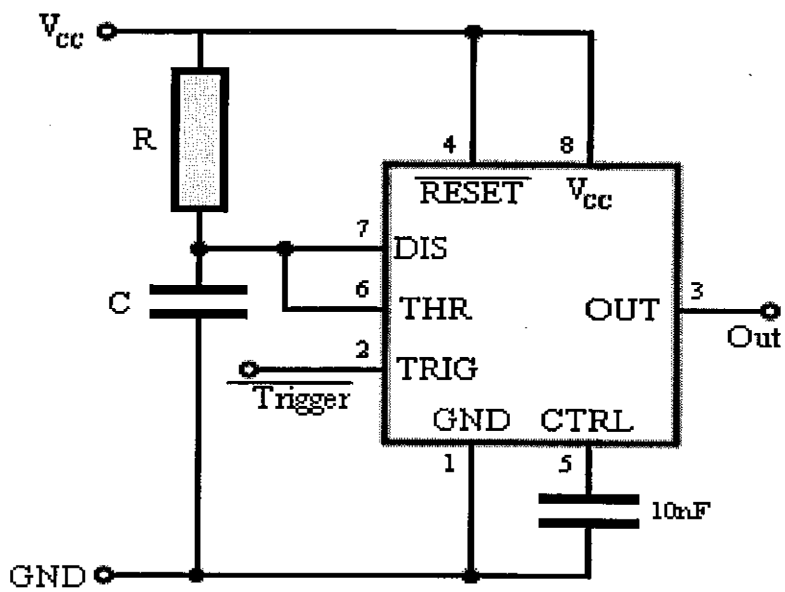


Fig.3.3 Schematic of a 555 in monostable mode

The output pulse width of time *t*, which is the time it takes to charge C to 2/3 of the supply voltage, is given by

$$t = RC\ln(3) \approx 1.1RC$$

where t is in seconds, R is in ohms and C is in farads.

Bistable Mode:-In bistable mode, the 555 timer acts as a basic flip-flop. The trigger and reset inputs (pins 2 and 4 respectively on a 555) are held high via Pull-up resistors while the threshold input (pin 6) is simply grounded.

Thus configured, pulling the trigger momentarily to ground acts as a 'set' and transitions the output pin (pin 3) to Vcc (high state). Pulling the reset input to ground acts as a 'reset' and transitions the output pin to ground (low state). No capacitors are required in a bistable configuration. Pins 5 and 7 (control and discharge) are left floating.

Astable Mode:-In astable mode, the 555 timer puts out a continuous stream of rectangular pulses having a specified frequency. Resistor R_1 is connected between V_{CC} and the discharge pin (pin 7) and another resistor (R_2) is connected between the discharge pin (pin 7), and the trigger (pin 2) and threshold (pin 6) pins that share a common node. Hence the capacitor is charged through R_1 and R_2, and discharged only through R_2, since pin 7 has low impedance to ground during output low intervals of the cycle, therefore discharging the capacitor.

In the astable mode, the frequency of the pulse stream depends on the values of R_1, R_2 and C:

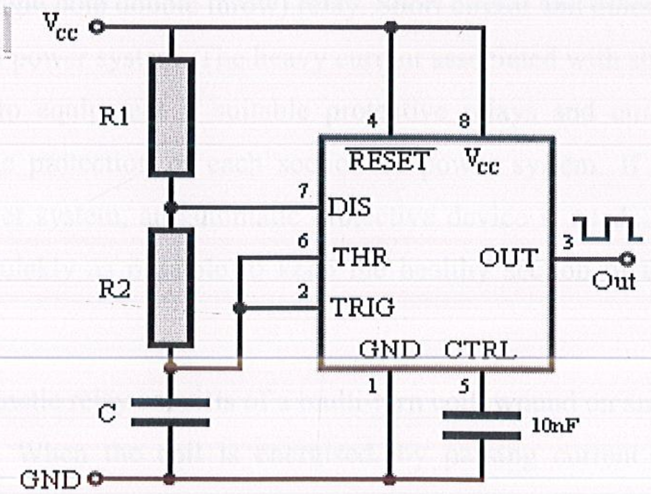


Fig.3.4 Standard 555 Astable Circuit

$$f = \frac{1}{\ln(2) \cdot C \cdot (R_1 + 2R_2)}$$

The high time from each pulse is given by

$$\text{high} = \ln(2) \cdot (R_1 + R_2) \cdot C$$

and the low time from each pulse is given by

$$\text{low} = \ln(2) \cdot R_2 \cdot C$$

where R_1 & R_2 are the values of the resistors in ohm and C is the value of the capacitor in farads.

Note: power of R_1 must be greater than $\frac{V_{cc}^2}{R_1}$

To achieve a duty cycle of less than 50% a diode can be added in parallel with R_2 towards the capacitor. This bypasses R_2 during the high part of the cycle so that the high interval depends only on R_1 and C.

3.1.2 Electromagnetic Relay:-

A relay is simply an electrically operated on/off switch. The relay used in this hardware ckt is SPDT (single pole double throw) relay. Short circuit and other abnormal conditions often occur on a power system. The heavy current associated with short circuit is likely to cause damage to equipment if suitable protective relays and circuit breakers are not provided for the protection of each section of power system. If a fault occurs in an element of power system, an automatic protective device is needed to isolate the faulty equipment as quickly as possible to keep the healthy section of the system in normal operation.

The electromagnetic relay consists of a multi-turn coil, wound on an iron core, to form an electromagnet. When the coil is energised, by passing current through it, the core becomes temporarily magnetised. The magnetized core attracts the iron armature. The armature is pivoted which causes it to operate one or more sets of contacts. When the coil is de-energised the armature and contacts are released.

The coil can be energised from a low power source such as a transistor while the contacts can switch high powers such as the mains supply. The relay can also be situated remotely from the control source. Relays can generate a very high voltage across the coil when switched off. This can damage other components in the circuit. To prevent this diode is connected across the coil. The cathode of the diode is connected to the most positive end of the coil.

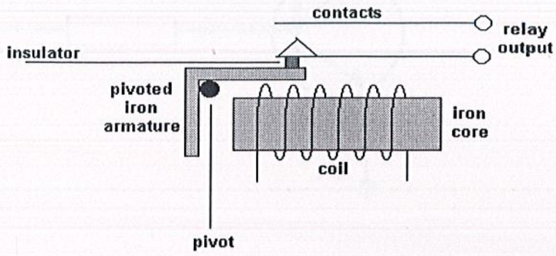


Fig.3.5 Electromagnetic Relay

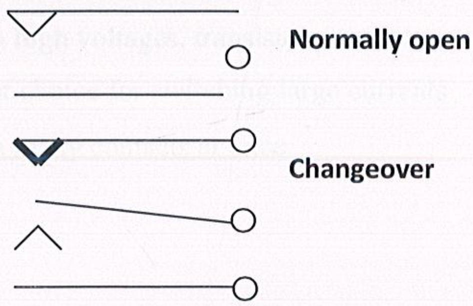


Fig.3.6 Relay Contact

NO normally open: The contacts are open until the coil of the relay is energised, whereupon they are closed to complete the outside circuit.

NC normally closed:- The contacts are closed until the coil of the relay is energised, whereupon they are opened to break the outside circuit, switching it off.

Many relays have multiple contacts, half of which are NO and half NC. Relays are electromagnetic devices which have a certain amount of inductance .

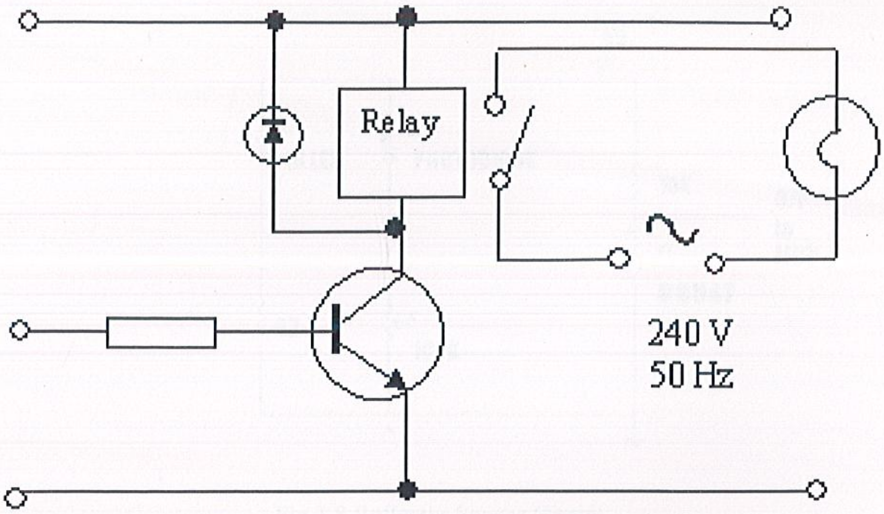


Fig.3.7 Diode Used As Protective Circuit

Advantages of Relays:-

1. Relays can switch AC and DC, transistors can only switch DC.
2. Relays can switch high voltages, transistors cannot.
3. Relays are a better choice for switching large currents
4. Relays can switch many contacts at once.

3.2 Reflector Sensor:-

Working: - This Circuit is works on reflection of white surface. There are two cases, In First case when IR LED emits IR rays and reflects from white surface then it is received by photodiode. When IR rays fall on photodiode then it passes 5V to base of transistor (BC 547).Transistor gets turn on and passes 5V from collector to emitter. The output of reflector circuit is 0.

This zero send to MCU then MCU take action according to condition which is written in program

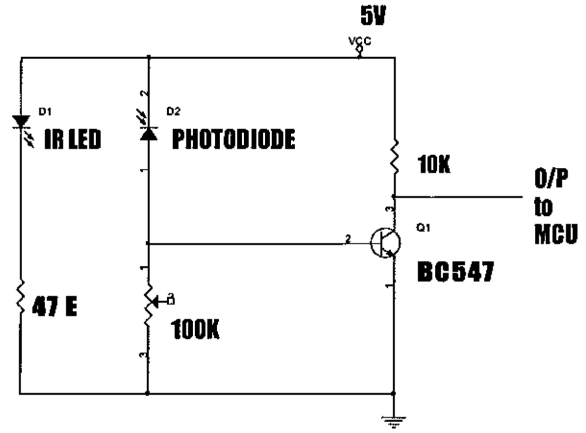


Fig 3.8 Reflector Sensor Circuit

3.3 Power Supply:-

The power supply circuit comprises of four basic parts :–

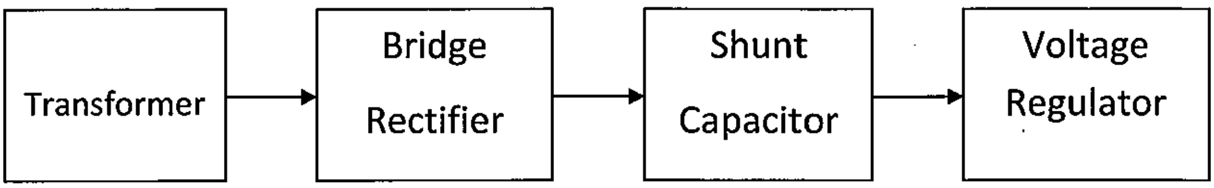


Fig. 3.9Block Diagram of Power Supply

The transformer steps down the 220 Va/c. into 12 Va/c. The transformer work on the principle of magnetic induction, 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 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. A filter capacitor is connected at the rectifier output and the d.c voltage is obtained across the capacitor. The capacitor must charge up fast, preferably with no discharge.

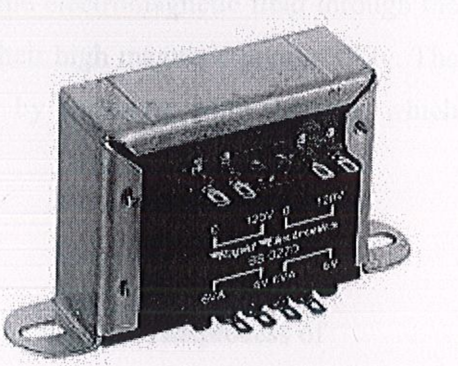
The voltage regulator regulates the supply if the line voltage increases or decreases. An unregulated input voltage is applied at the IC Input pin i.e. pin 1 which is filtered by capacitor. The out terminal of the IC i.e. pin 2 provides a regular output. The third terminal is connected to ground.

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.

3.3.1 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.

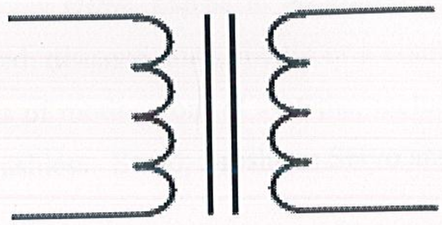


Fig.3.10 Symbol of Transformer

3.3.1.1 How does a Transformer Work?

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.

3.3.1.2 Uses of Transformers

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.

3.4 Stepper Motor:-

Motion Control, in electronic terms, means to accurately control the movement of an object based on either speed, distance, load, inertia or a combination of all these factors. There are numerous types of motion control systems, including; Stepper Motor, Linear Step Motor, DC Brush, Brushless, Servo, Brushless Servo and more.

A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements. Stepper motor is a form of ac. motor.

The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct relationships to these applied input pulses. The sequence of the applied pulses is directly related to the direction of motor shafts rotation. The speed of the motor shafts rotation is directly related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied [39].

For every input pulse, the motor shaft turns through a specified number of degrees, called a step. Its working principle is one step rotation for one input pulse. The range of step size may vary from 0.72 degree to 90 degree. In position control application, if the number of input pulses sent to the motor is known, the actual position of the driven job can be obtained.

A stepper motor differs from a conventional motor (CM) as under:

1. Input to SM is in the form of electric pulses whereas input to a CM is invariably from a constant voltage source.
2. A CM has a free running shaft whereas shaft of SM moves through angular steps.
3. In control system applications, no feedback loop is required when SM is used but a feedback loop is required when CM is used.
4. A SM is a digital electromechanical device whereas a CM is an analog electromechanical device

3.4.1 Open Loop Operation

One of the most significant advantages of a stepper motor is its ability to be accurately controlled in an open loop system. Open loop control means no feedback information about position is needed. This type of control eliminates the need for expensive sensing and feedback devices such as optical encoders. Control position is known simply by keeping track of the input step pulses.

Every stepper motor has a permanent magnet rotor (shaft) surrounded by a stator. The most common stepper motor has four stator windings that are paired with a center-tapped common. This type of stepper motor is commonly referred to as a four- phase stepper motor. The center tap allows a change of current direction in each of two coils when a winding is grounded, thereby resulting in a polarity change of the stator. Notice that while a conventional motor shaft runs freely, the stepper motor shaft moves in a fixed repeatable increment which allows one to move it to a precise position.

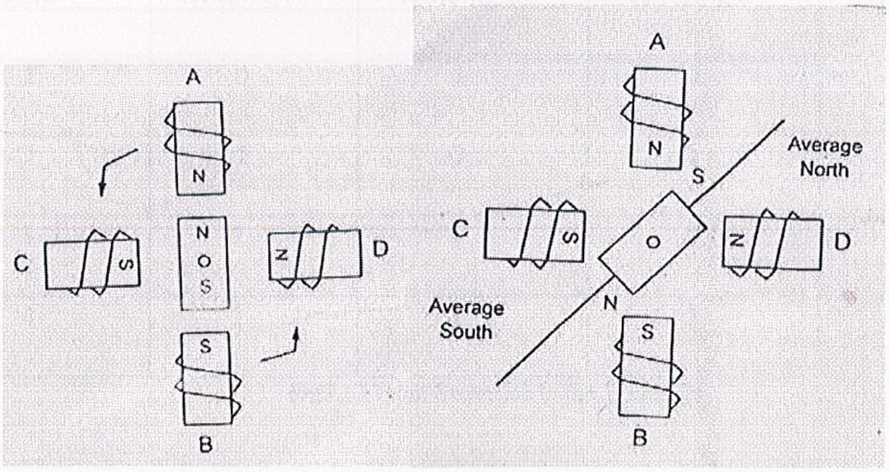


Fig.3.11 Open Loop Operation of stepper motor

This repeatable fixed movement is possible as a result of basic magnetic theory where poles of the same polarity repel and opposite poles attract. The direction of the rotation is dictated by the stator poles. The stator poles are determined by the current sent through the wire coils. As the direction of the current is changed, the polarity is also changed causing the reverse motion of the rotor. The stepper motor used here has a total of 5 leads: 4 leads representing the four stator windings and 1 common for the center tapped leads. As the sequence of power is applied to each stator winding, the rotor will rotate. There are several widely used sequences where each has a different degree of precision. Table shows the normal 4-step sequence. For clockwise go for step 1 to 4 & for counter clockwise go for step 4 to 1.

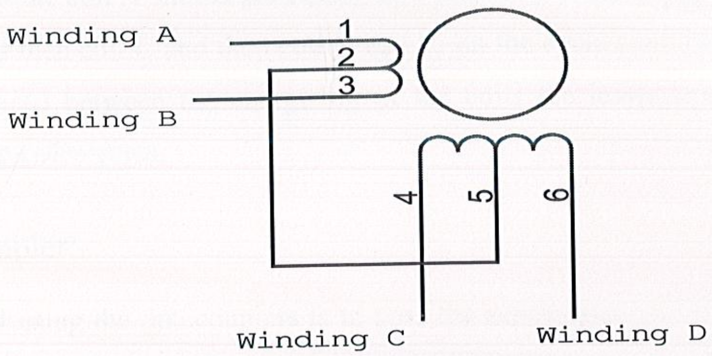


Fig.3.12 Stator Windings Configuration

Step	Winding A	Winding B	Winding C	Winding D
1	0	1	1	1
2	1	0	1	1
3	1	1	0	1
4	1	1	1	0

Fig3.13 Input Sequence to the Windings

3.4.2 Step Angle & Steps per Revolution

Movement associated with a single step, depends on the internal construction of the motor, in particular the number of teeth on the stator and the rotor. The step angle is the minimum degree of rotation associated with a single step.

Step per revolution is the total number of steps needed to rotate one complete rotation or 360 degrees (e.g., 180 steps * 2 degree = 360).

Since the stepper motor is not ordinary motor and has four separate coils, which have to be energized one by one in a stepwise fashion. We term them as coil A, B, C and D. At a particular instant the coil A should get supply and then after some delay the coil B should get a supply and then coil C and then coil D and so on the cycle continues. The more the delay is introduced between the energizing of the coils the lesser is the speed of the stepper motor and vice versa.

3.4.3 Optocoupler:-

The purpose of using the optocouplers is to pass the supply from the microcontroller to the stepper motor is for isolation of the port of the microcontroller from an external hardware. What happens is that the voltage signal from the microcontroller is being converted into light by the LED and then further converted into voltage by the phototransistor. This ensures that there is no physical connection between the microcontroller and the stepper motor. The signal from the microcontroller is coupled only through light so that if in any case the external hardware (in this case :stepper motor) produces an error voltage it will not be passed over to the port of the microcontroller and will not damage the internal circuitry of the microcontroller .

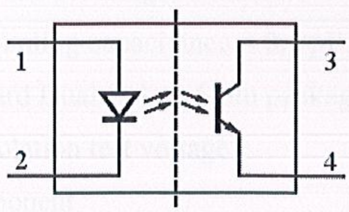


Fig.3.14 Schematic diagram of an opto-isolator showing source of light (LED) on the left, dielectric barrier in the center, and sensor (phototransistor) on the right

An opto-isolator contains a source (emitter) of light, almost always a near infrared light-emitting diode (LED), that converts electrical input signal into light, a closed optical channel (also called dielectrical channel), and a photo sensor, which detects incoming light and either generates electric energy directly, or modulates electric current flowing from an external power supply.

3.4.3.1 Optocoupler Operation :-

Optocouplers are good devices for conveying analog information across a power supply isolation barrier, they operate over a wide temperature range and are often safety agency approved they do, however, have many unique operating considerations.

Optocouplers are current input and current output devices. The input LED is excited by changes in drive current and maintains a relatively constant forward voltage. The output is a current which is proportional to the input current. The output current can easily be converted to a voltage through a pull-up or load resistor.

3.4.3.2 Applications:-

1. AC mains detection
2. Reed relay driving
3. Switch mode power supply feedback
4. Telephone ring detection
5. Logic ground isolation
6. Logic coupling with high frequency noise rejection

3.4.3.3 Features:-

1. Interfaces with common logic families
2. Input-output coupling capacitance < 0.5 pF
3. Industry Standard Dual-in line 6-pin package
4. 5300 VRMS isolation test voltage
5. Lead-free component

3.5 Buzzer:-

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

It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise). Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board. Another implementation with some AC-connected devices was to implement a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. Nowadays, it is more popular to use a ceramic-based piezoelectric sounder like a Sonalert which makes a high-pitched tone. Usually these were hooked up to "driver" circuits which varied the pitch of the sound or pulsed the sound on and off.

In game shows it is also known as a "lockout system," because when one person signals ("buzzes in"), all others are locked out from signalling. Several game shows have large buzzer buttons which are identified as "plungers".

The word "buzzer" comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped-down AC line voltage at 50 or 60 cycles. Other sounds commonly used to indicate that a button has been pressed are a ring or a beep.

For a self- drive buzzer (DC/ circuit- built), either pizeo or magnetic just apply the rated current and voltage.

For the external-drive buzzer, it depends on,

1. We should give magnetic buzzer 1/2 square wave, and provide it at least 3 times the amount of the rated consumptive current.

2. Otherwise, we give square wave to the peizo buzzer instead of 1/2 square wave, because the half wave might cause the buzzer does not work.

Therefore, voltage control is an important factor for a peizo buzzer which is driven by the voltage.

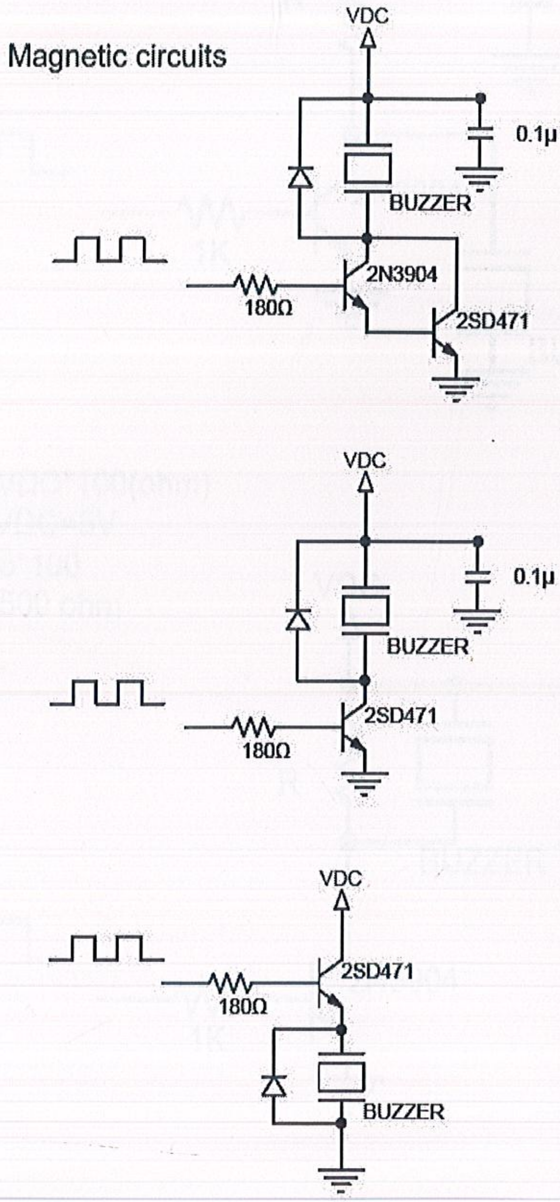


Fig.3.15 magnetic circuit of buzzer

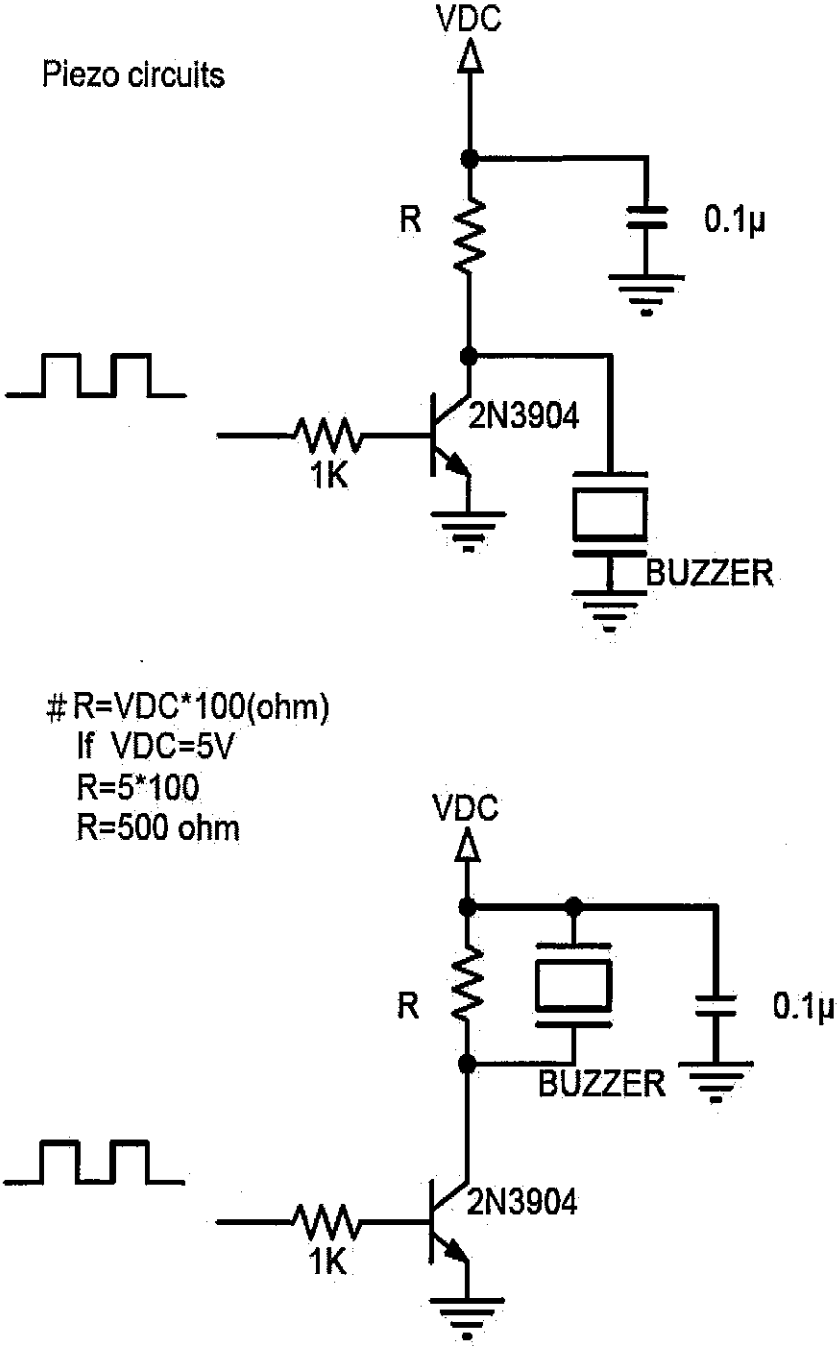


Fig.3.16 piezo circuits of buzzer

3.6 DC Gear Motor:-

There are 2 kinds of motors, AC motors and DC motors. In this course, we are going to focus on DC motors only. There are several kinds of DC motors; examples are stepper motors, servos, brushed/brush-less motors.

Stepper motors: The inputs of a stepper motor are signal pulses and the shaft of a stepper motor moves between discrete postions proportional to pulses. If the load of the motor is not too great, open-loop control is usually used to control the motor. Stepper motors are used in disk drive head positioning, plotters, and numerous other applications.

Servo motors: The input of a servo motor is a voltage value and the output shaft of the servo motor is commanded to a particular angular position according to the input voltage. Servo motors are used in radio control airplanes to control the position of wing flaps and similar devices.

DC motors: The input of a DC motor is current/voltage and its output is torque (speed).We can control a DC motor easily with microcontrollers. We can start it, stop it or make it go either in clockwise or anti clock wise direction. We can also control its speed but it will be covered in latter tutorials.

A DC motor is electromechanical device that converts electrical energy into mechanical energy that can be used to do many useful works. his shows how software controls a motor. DC motors comes in various ratings like 6V and 12V. It has two wires or pins. When connected with power supply the shaft rotates. You can reverse the direction of rotation by reversing the polarity of input.

3.6.1Control with MCUs:-

As the MCUs PORT are not powerful enough to drive DC motors directly so we need some kind of drivers. A very easy and safe is to use popular L293D chips. It is a 16 PIN chip. The pin configuation is as follows. This chip is designed to control 2 DC motors. There are 2 INPUT and 2 OUTPUT PINs for each motors. The connections is as follows

The behavior of motor for various input conditions are as follows

	A	B
Stop	Low	Low
Clockwise	Low	High
Anti Clockwise	High	Low
Stop	High	High

So you saw you just need to set appropriate levels at two PINs of the microcontroller to control the motor. Since this chip controls two DC motors there are two more output pins (output3 and output4) and two more input pins(input3and input4). The INPUT3 and INPUT4 controls second motor in the same way as listed above for input A and B. There are also two ENABLE pins they must be high (+5v) for operation, if they are pulled low (GND) motors will stop.

3.6.2 Assembling:-

Items Required:-
DC Motor 12V L293D chip
Breadboard.
Some wires

Insert the L293D chip into the breadboard. And connect as per the circuit diagram. Now connect the DC motor. Then connect the 9V supply to the breadboard this supply is used to run he motor. Also connect the 5V supply to the breadboard this is the logical supply i.e. it defines a "HIGH' or "1" is 5V. This 5V is available in the xBoard itself. Use a 2pin connector to access this. Then connect the PD4 and PD5 pins of the MCU to the breadboard. These will provide signals to control the motor. Use an 8 PIN connecter to get PD4 and PD5. Connect PD4 to 'A' and PD5 to 'B' now burn the program into the MCU and power on the system. The motor will rotate and will change directions after some times.

3.6.3 Speed Control:-

The speed of DC motor can also be controlled with MCU. PWM or pulse width modulation technique is used to digitally control speed of DC motors.

3.6.4 Gears:-

Now, let's look at a data sheet of a motor. On the data sheet, specifications such as voltage, no load speed, stall torque, starting current, efficienct of power conversion are shown.

From the data sheet, we can find that some of the motors run too fast with too little torque for robotic applications. To handle the problem, we can to gear down the motor.

There are lots of types of gears (e.g. planetory, spur, HD, worm, etc.) (Gears alone can cost 100's of dollars!) But our main concern is the Gear Ratio of the gear that we use. Let's take a look at the following diagram:

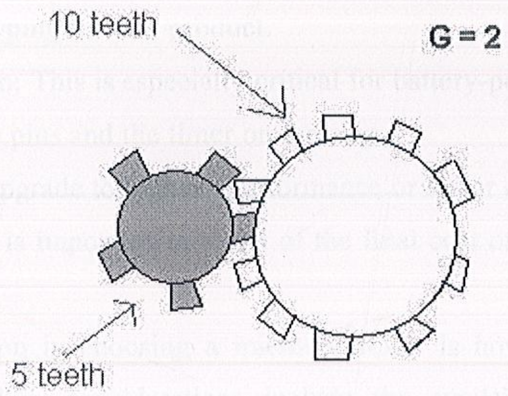


Fig.3.18 Gear ratio of Gear motor

In the above diagram, the output shaft of the motor is attached a 5-teeth gear and a 10-teeth gear is placed right next to the 5-teeth gear with their teeth touching each other. In this example, the gear ratio, *G*, is 2 (=10/5). Typically, higher gear ratios, such as 10:1, 50:1, are used in practice.

If we have a gear ratio of G, then

$T' = \mathrm{G}T$

$w' = w/\mathrm{G}$

3.7 MICROCONTROLLER (AT89C52)

3.7.1CRITERIA 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.

3.7.2

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 military equipment to automobiles to the keyboard. Second only to the Motorola 68HC11 in eight bit processors sales, the 8051 family of microcontrollers is available in a wide array of variations from manufacturers such as Intel, Philips, and Siemens. These manufacturers have added numerous features and peripherals to the 8051 such as I2C interfaces, analog to digital converters, watchdog timers, and pulse width modulated outputs. Variations of the 8051 with clock speeds up to 40MHz and voltage requirements down to 1.5 volts are available.

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry- standard 80C51 instruction set and pinout. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost- effective solution to many embedded control applications. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

3.7.3

FEATURES:

The basic architecture of AT89C51 consists of the following features:

1. Compatible with MCS-51 Products
2. 8K Bytes of In-System Programmable (ISP) Flash Memory
3. 4.0V to 5.5V Operating Range

4. Fully Static Operation: 0 Hz to 33 MHz

5. 256x 8-bit Internal RAM

6.32Programmable I/O Lines

7.Three 16-bit Timer/Counters

8.Eight Interrupt Sources

9.Full Duplex UART Serial Channel

10.Low-power Idle and Power-down Modes

3.7.4 PIN CONFIGURATION

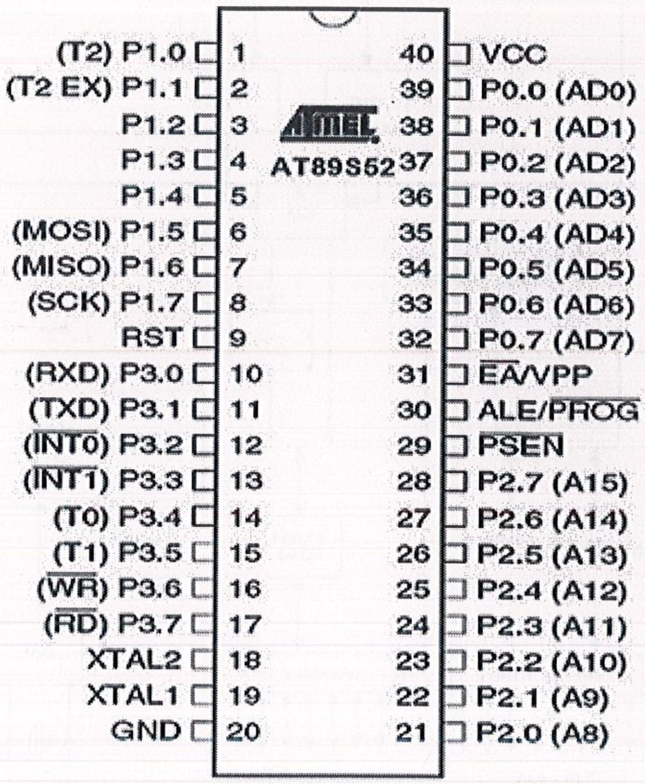


Fig. 3.8 Pin diagram of AT89S52

3.7.5 BLOCK DIAGRAM

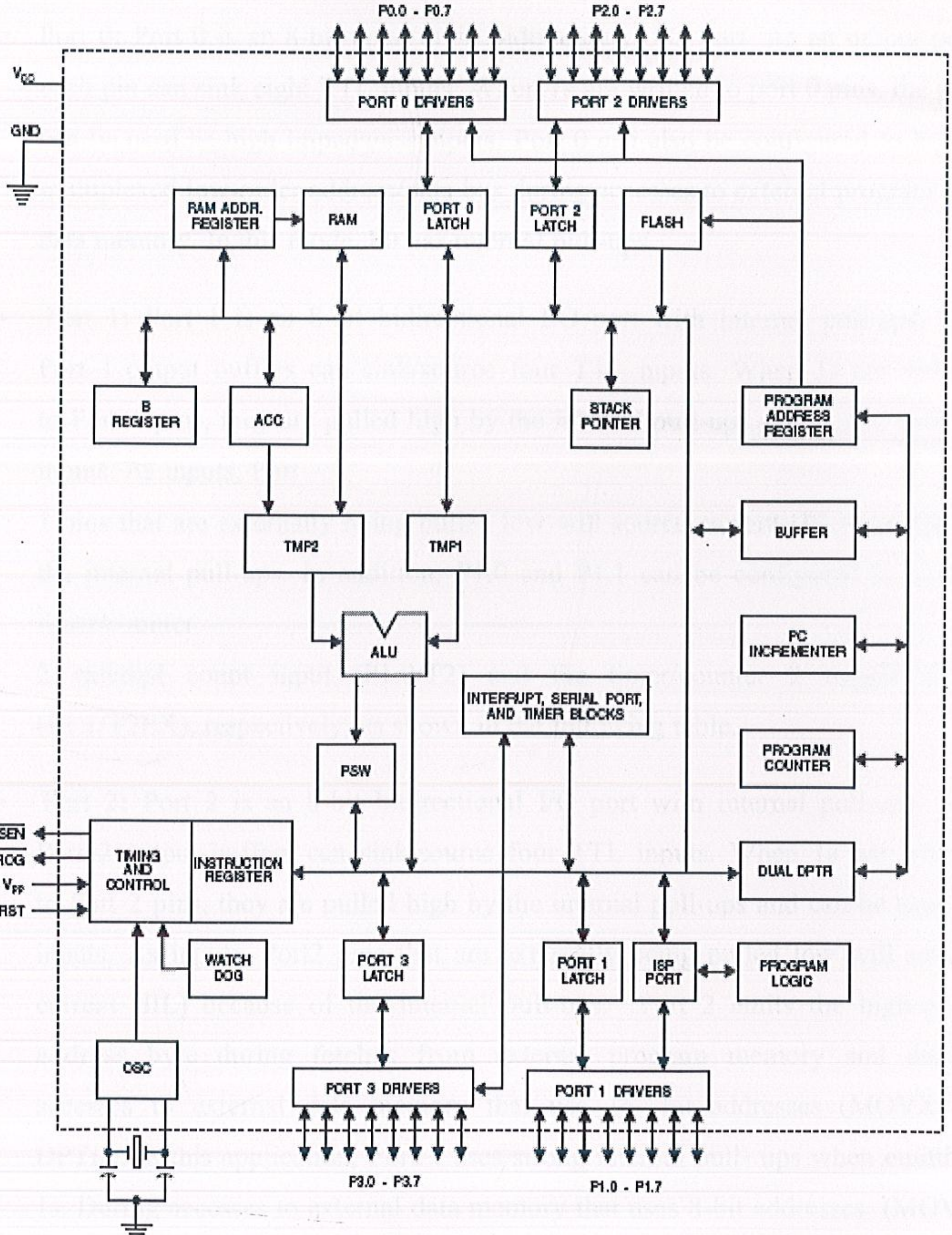


Fig. 3.20 Block diagram of the microcontroller

3.7.6 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, Port2 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.

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.

3.7.6.1 The AT89S52 oscillator clock circuit

- It uses a quartz crystal oscillator.
- We can observe the frequency on the XTAL2 pin.
- The crystal frequency is the basic internal frequency of the microcontroller.
- The internal counters must divide the basic clock rate to yield standard communication bit per second (baud) rates.
- An 11.0592 megahertz crystal, although seemingly an odd value, yields a crystal frequency of 921.6 kilohertz, which can be divided evenly by the standard communication baud rates of 19200, 9600, 4800, 2400, 1200, and 300 hertz.

3.7.7 SPECIAL FUNCTION REGISTERS

The Special Function Registers (SFRs) contain memory locations that are used for special tasks. Each SFR occupies internal RAM from 0x80 to 0xFF.They are 8-bits wide.

- The A (accumulator) register or accumulator is used for most ALU operations and Boolean Bit manipulations.
- Register B is used for multiplication & division and can also be used for general purpose storage.
- PSW (Program Status Word) is a bit addressable register
- PC or program counter is a special 16-bit register. It is not part of SFR. Program instruction bytes are fetched from locations in memory that are addressed by the PC.
- Stack Pointer (SP) register is eight bits wide. It is incremented before data is stored during PUSH and CALL executions. While the stack may reside anywhere in on-chip RAM, the Stack Pointer is initialized to 07H after a reset. This causes the stack to begin at location 08H.

CHAPTER 4

SOFTWARE

4.1 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.

4.1.1 What Is µVision3?

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

¾ A project manager.

¾ A make facility.

¾ Tool configuration.

¾ Editor.

¾ A powerful debugger.

4.1.2 Steps Followed In Creating An Application In µVision3:

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.
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

To create a new project, simply start MicroVision and select "Project"=>"New

Project" from the pull–down menus. In the file dialog that appears, choose a name and base

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".

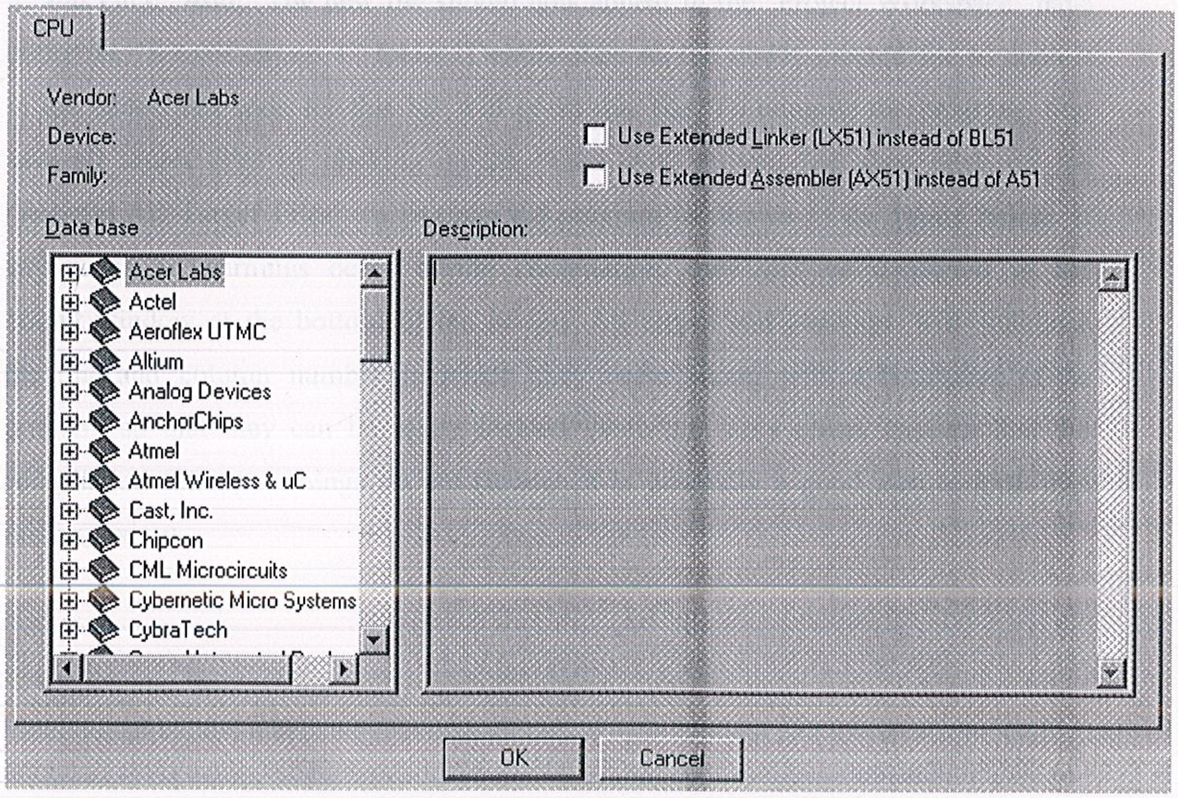
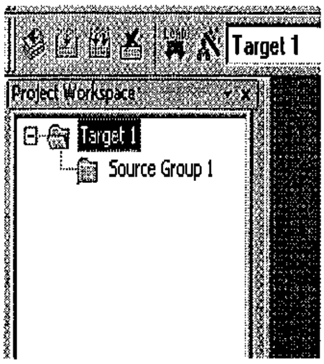


Fig. 4.1 Window for choosing the target device

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" as shown in the two figures below.



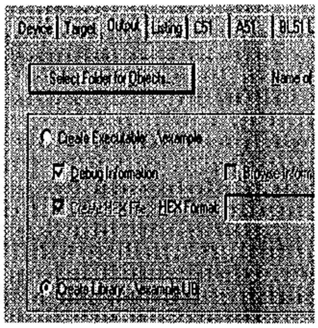


Fig. 4.2 Project Workspace Pane Fig. 4.3 Project Options Dialog

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. All errors and warnings will reference the line and column number in which they occur along with a description of the problem so that they can be easily located. Note that only errors indicate that the compilation failed, warnings do not (though it is generally a good idea to look into them anyway).

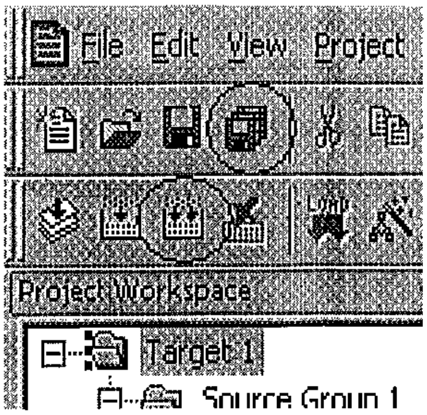


Fig. 4.4 "Save All" and "Build All Target Files" Buttons

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).

4.1.3 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.

4.1.4PeripherialSimulation

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.

4.2 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/from 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.

4.3 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.

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.

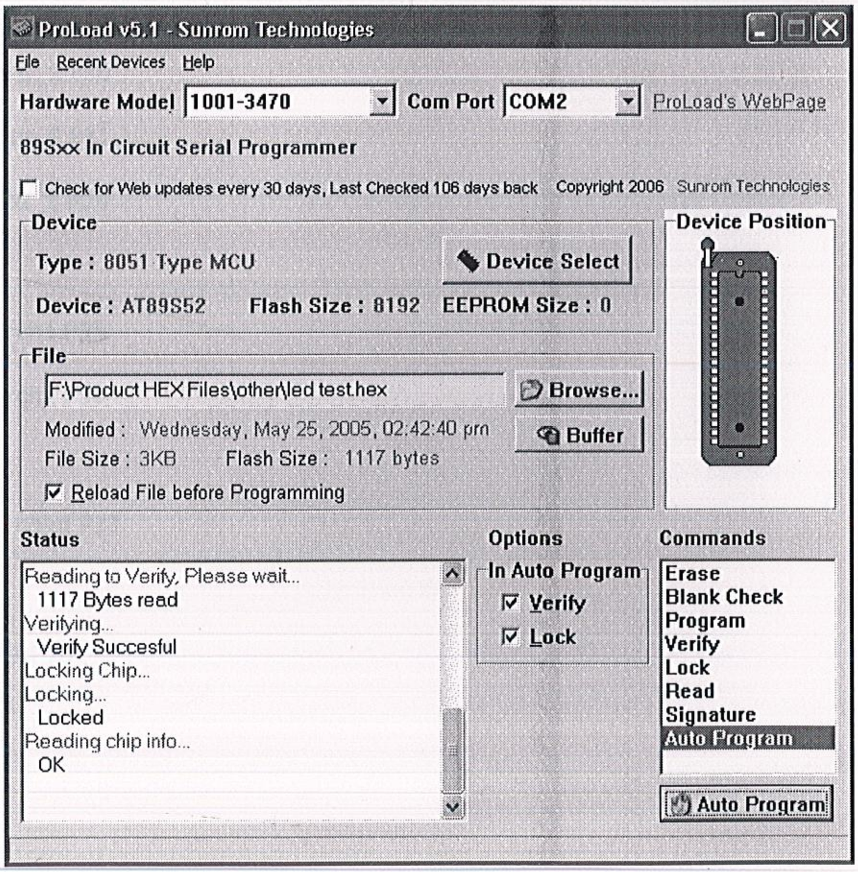


Fig. 4.7 Programming window

Source Code

```
#include<reg51.h>

#include<intrins.h>

#include<delay.h>


#define st1 P20

#define st2 P21

#define st3 P22

#define st4 P23


#define Ir_Ent_1 P30

#define Ir_Ent_2 P31

#define Ir_Ext_1 P26


#define Ir_trch1 P35

#define Ir_trch2 P36


#define Ir_trchinf P37


#define Mtr1 P10

#define Mtr2 P11



#define Switch_Ext P32

#define Leds_Pan_1 P33

#define Leds_Pan_2 P34
```

```
#define Buzz P25

mov_fwd (unsigned char Del)
        {

            st2=st3=st4=1;
            st1=0;
            ms_delay (Del);

            st3=st1=st4=1;
            st2=0;
            ms_delay (Del);

            st1=st2=st4=1;
            st3=0;
            ms_delay (Del);

            st1=st2=st3=st4=1;
            st4=0;
            ms_delay (Del);
        }

mov_bwd (unsigned char Del)
        {
            st4=0;
            st3=st2=st1=1;
```

```
                ms_delay (Del);
        st3=0;
        st4=st2=st1=1;
                ms_delay (Del);
        st2=0;
        st4=st3=st1=1;
                ms_delay (Del);
        st1=0;
        st4=st3=st2=1;
                ms_delay (Del);
    }

Void main ()
{
Mtr1=0; Mtr2=1;
    Leds_Pan_1=Leds_Pan_2=0;
    secdelay(1);
    Leds_Pan_1=Leds_Pan_2=1;
    secdelay(1);
    Leds_Pan_1=Leds_Pan_2=0;
    Buzz=0;
secdelay(1);
    Leds_Pan_1=Leds_Pan_2=1;
    Buzz=1;
    secdelay(1);
    Leds_Pan_1=Leds_Pan_2=0;
    Buzz=0;
```

```
secdelay(1);
Leds_Pan_1=Leds_Pan_2=1;
Buzz=1;
Mtr1=1; Mtr2=1;

secdelay(1);

mov_fwd(200);
mov_fwd(200);
mov_fwd(200);

mov_fwd(200);
mov_fwd(200);
mov_fwd(200);

mov_bwd(200);
mov_bwd(200);
mov_bwd(200);

mov_bwd(200);
mov_bwd(200);
mov_bwd(200);
```

```
while(1)
        {
            if(Ir_Ent_1==0 && Ir_Ent_2==0)
                {
                    Leds_Pan_1=Buzz=0;
                    Leds_Pan_2=1;

                            secdelay(3);

                        mov_fwd(200);
                        // mov_fwd(200);
                        // mov_fwd(200);
                while(Switch_Ext==1 && Ir_Ext_1==1);

                    Leds_Pan_1=Buzz=1;

                mov_bwd(200);
                        // mov_bwd(200);
                        // mov_bwd(200);
                Leds_Pan_2=0;
                }

        if(Ir_trch1==0 && Ir_trch2==0)
                {
                    Mtr1=1;
                    Mtr2=0;
```

```
//                              Buzz=0;
                                secdelay(1);
//                              Buzz=1;
                                Mtr1=1;
                                Mtr2=1;
                                while(Ir_trchinf==1);
                                        Mtr1=0;
                                        Mtr2=1;
                                        secdelay(1);
                                Mtr1=1;
                                Mtr2=1;

                            }
```

CHAPTER 5

ADVANTAGES AND DISADVANTAGES

5.1 ADVANTAGES

1. Sensors used have high sensitivity and are easy to handle.
2. Low cost system, providing maximum automation.
3. Can be easily modified for improving the setup and adding new features.
4. Labour saving.
5. Low maintenance and low power consumption.
6. The system is more compact compared to the existing ones, hence is easily portable.
7. Can be used at all railway crossings near villages.

5.2 DISADVANTAGES

1. Mal functioning of any one sensor can lead to failure of system which in turn can cause many serious accidents.
2. No self-test system to detect malfunction of sensors.
3. Requires uninterrupted power supply.

CHAPTER 6

FUTURE SCOPE

1) The performance of the system can be further improved in terms of the operating speed, memory capacity, instruction cycle period of the microcontroller by using other controllers such as AVRs and PICs. The number of channels can be increased to interface more number of sensors which is possible by using advanced versions of microcontrollers.

2) The system can be modified with the use of a datalogger and a graphical LCD panel showing the measured sensor data over a period of time.
3) A speaking voice alarm could be used instead of the normal buzzer.

4) This system can be connected to communication devices such as modems, cellular phones or satellite terminal to enable the remote collection of recorded data or alarming of certain parameters.
5) The device can be made to perform better by providing the power supply with the help of battery source which can be rechargeable or non-rechargeable, to reduce the requirement of main AC power.
6) Time bound administration of fertilizers, insecticides and pesticides can be introduced.
7) A multi-controller system can be developed that will enable a master controller along with its slave controllers to automate multiple greenhouses simultaneously.

CHAPTER 7
CONCLUSION

Automatic Railway Gate Control And Track Switching System proves to be of great importance to places where the traffic is to a large extent. This setup will help in reducing accidents in metropolitan cities. This type of gates can be employed in an unmanned level crossing where the chances of accidents are higher and reliable operation is required. Since, the operation is automatic, error due to manual operation is prevented. As a train approaches the railway crossing from either side, the sensors placed at a certain distance from the gate detects the approaching train and accordingly controls the operation of the gate. Also an indicator light and buzzer system has been provided to alert the motorists about the approaching train. This system can be used at all railway crossings near villages.

Track switching system avoids the accidents between the two trains coming onto the same track in opposite direction. When train has passed the track is switched back to its original position, allowing the first train to pass without any interruption. Automatic railway gate control and track switching system is highly economical microcontroller based arrangement, designed for use in almost all the unmanned level crossings in the country.

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