Automatic Railway Crossing System

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CERTIFICATE

This is to certify that the dissertation entitled "**AUTOMATIC RAILWAY CROSSING SYSTEM**" has been carried out by **Mr. Patel Nimeshkumar Rameshbhai** (Enrollment No. : - 080290109038) at **L. C. Institute of Technology, Bhandu** under my guidance in fulfillment of the degree of Bachelor of Engineering in ELECTRICAL ENGINEERING (7th Semester/8th Semester) of Gujarat Technological University, Ahmedabad during the academic year 2011-12.

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ABSTRACT

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 stationmaster 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 labor. 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 Automatic railway gate control is highly economical microcontroller based arrangement, designed for use in almost all the unmanned level crossings in the country.

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Chapter 1: INTRODUCTION

1.1:- Introduction

- Now a days, India is the country which having world's largest railway network. Over hundreds of railways running on track every day. As railway has straightway running as well as it has somewhat risky and dangerous as per as general public and traffic concern. As we know that it is surely impossible to stop the running train at instant is some critical situation or emergency arises. Therefore at the places of traffic density, suburban areas and crossings there is severe need to install a railway gate in view of protection purpose. Obviously at each and every gate there must be an attendant to operate and maintain it.

- But, India, our country is a progressive country. It has already enough economical problems which are ever been unsolved. So, to avoid all these things some sort of automatic and independent system comes in picture. Now a day's automatic system occupies each and every sector of applications as it is reliable, accurate and no need to pay high attention.

- So, keeping all these things and aspects and need of such system our project batch tries to make such type of system with the help of various electrical, electronic and mechanical components. The thorough and detail in formation as per as construction and working is concerned, it is discussed fatherly.

1.2:- Automatic control system

- An automatic control system is an arrangement of physical components connected in such a manner so as to direct or regular itself or some another system i.e. some controlled condition forming part of the system is maintained in a prescribed manner. Automatic control system has influenced the current way of life. In recent year automatic control systems have been rapidly increasing importance in all fields of engineering. Its application covers a very wide range from design of precision control devices to design of massive equipments used for manufacture of steel and other industries.

- Advantages of automatic control system:

  The need of automation is due to or advantages of automatic control system are:

  1. It results in economy of operation.
  2. Elimination of human error.
  3. If frees human beings from mental tasks.
  4. Saving in energy requirements.
  5. Increase in efficiency

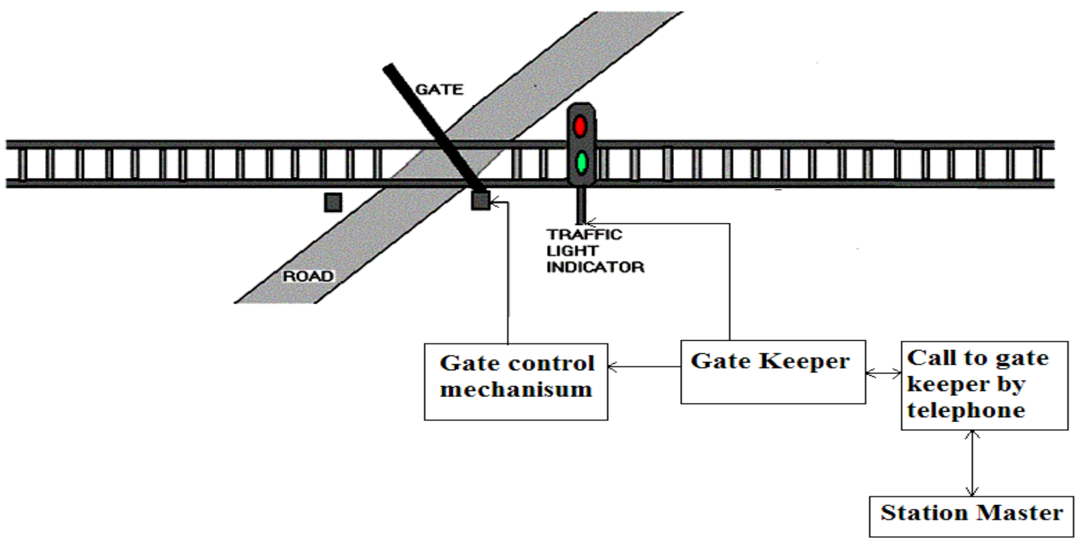
1.3:-Working of automatic rail control system

- In this project to lift the railway crossing gate D.C. series motor. Gear arrangement is used. The IR sensor at two points on the either side of railway crossing gate is used. The IR sensor transmitter transmit the signal which placed in engine and gard, and IR receiver is placed on track which received a data and complete the circuit when railway will pass through it and the gate will be closed and similarly when the rail will pass through the another receiver which is mounted on the other side of gate, the receiver take a signal to controller and get operated. Hence the motor will operate and with help of gear, and the gate will open. In this way the automatic operation of gate takes place. The gate which is unguarded, at such place the percentage of accidents is more. Therefore to overcome this problem this system is capable. As it is fully automatic there is no chance of failure due to human mistake.

Chapter 2: OVERVIEW OF PROJECT

2.1:- Introduction of oldest technique

- In this technique first arrival of train information, station master take to gate keeper which stand at near to railway crossing though telephone and then gate keeper take a signal to road users for closing of gate and then he close the gate and he again call to station master for closing information of gate and then station master take signal to train for passing. When train completely pass from railway crossing then gatekeeper call to again station master and take information of passing of train and station master say to him for opening of gate. Then after gate keeper open the gate. In this techniques more time is require there for at railway crossing more traffic will take place and different type of pollution will be occur for more type like noise pollution, air pollution etc. and more energy will be wastage. For above reason this technique is not safe and it totally depend upon man which work at railway gate crossing. Single line diagram of oldest railway crossing system is shown in fig 2.1. There for new techniques is invented it base on microcontroller and sensors for make automatic railway crossing system. In this new techniques no gate keeper is require.



(Fig 2.1:- Single line diagram oldest railway crossing technique)

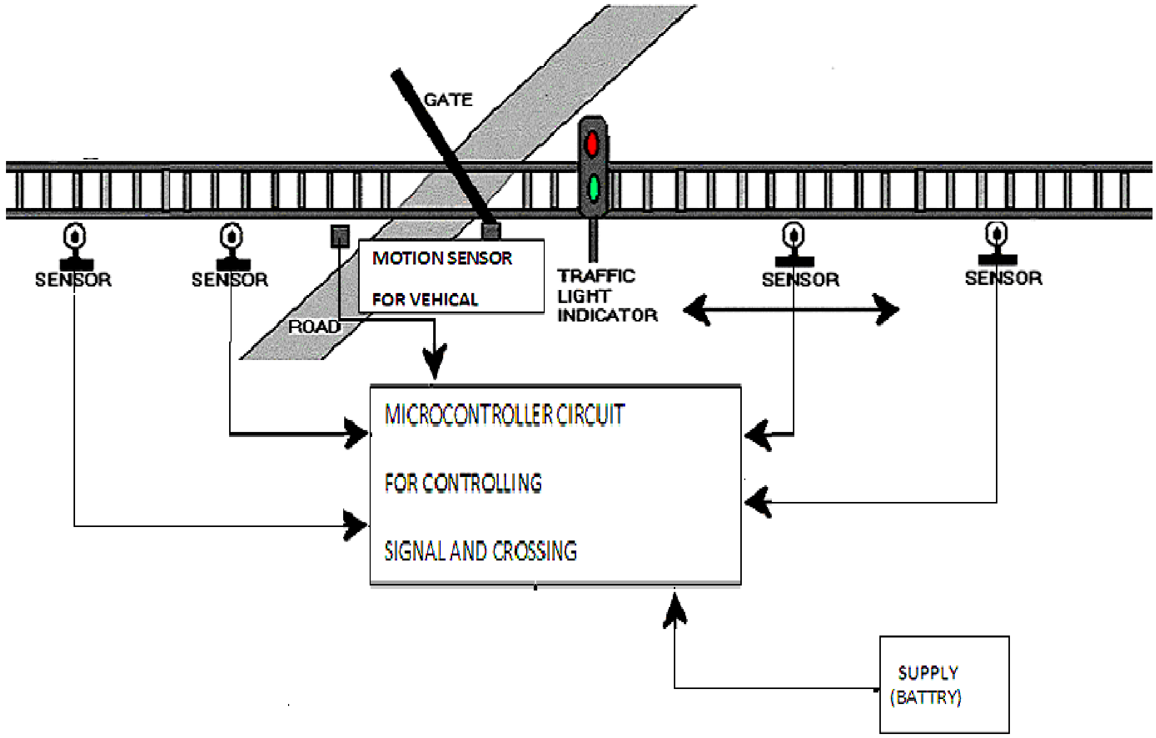
- Disadvantage**:-**
  1. This system totally depends on gate keeper.
  2. Accuracy of this system is not good.
  3. Low reliability.

2.2:- Introduction of automatic railway crossing system

- In this project we are concerned of providing an automatic railway gate control at unmanned level crossings replacing the gates operated by gate keepers and also the automatically operated gates. It good then older system with two things.
  - The reduction of time for which the gate is being kept closed. And
  - To provide safety to the road users by reducing the accidents that usually occur due to carelessness of road users and at times errors made by the gatekeeper.

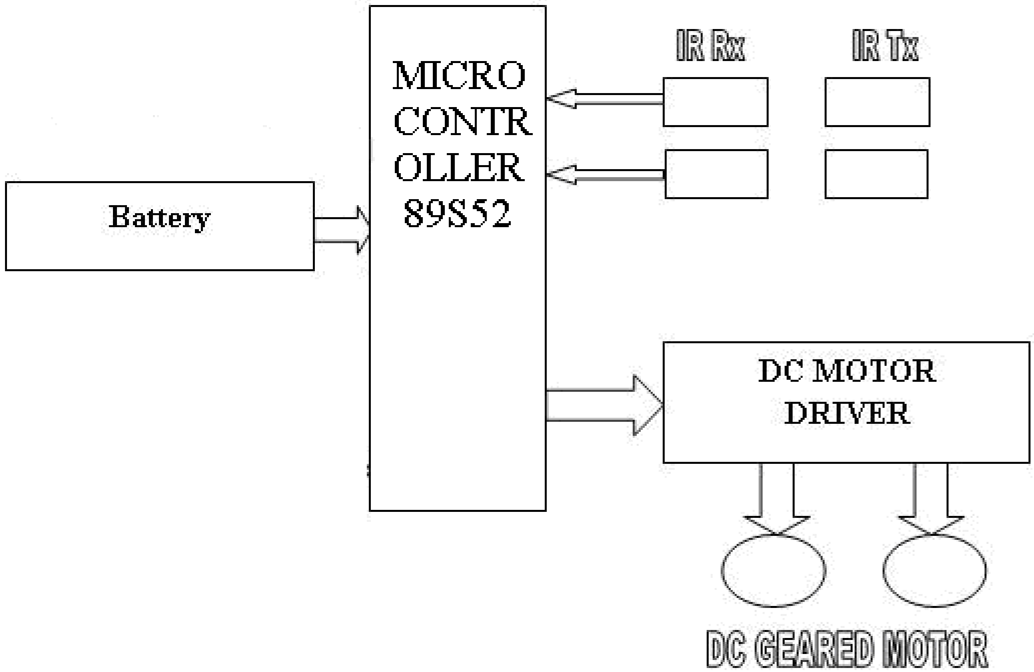
- By employing the automatic railway gate control at the level crossing the arrival of train is detected by the sensor placed on either side of the gate at about 5km from the level crossing. Once the arrival is sensed, the sensed signal is sent to the microcontroller and it checks for possible presence of vehicle between the gates, again using sensors. Subsequently, buzzer indication and light signals on either side are provided to the road users indicating the closure of gates. Once, no vehicle is sensed in between the gate the motor is activated and the gates are closed. But, for the worst case if any obstacle is sensed it is indicated to the train driver by signals (RED) placed at about 2km and 180m, so as to bring it to halt well before the level crossing. When no obstacle is sensed GREEN light is indicated and the train is to free to move. The departure of the train is detected by sensors placed at about 1km from the gate. The signal about the departure is sent to the microcontroller, which in turn operate the motor and opens the gate. Thus, the time for which the gate is closed is less compared to the manually operated gates since the gate is closed depending upon the telephone call from the previous station. Also reliability is high as it is not subjected to manual errors.

2.3:- Basic block diagram of automatic railway crossing system



(Fig. 2.2:- Basic block diagram of automatic railway crossing system)

Simple block diagram:-



(Fig 2.3:- Simple block diagram)

2.4:- Working of block diagram

1. Initial signal display:-

   Signals SG1, SG2, SG3 and SG4 are placed near the gate each at a specified distance. SG1 and SG4 are placed at 2Km on either side of the gate whereas SG2 and SG3 are placed at 180m from the gate. The train may be approaching the gate in either direction. So all four signals are made RED initially to indicate that gate is open and Vehicles are passing through the gate. The road user signals are made GREEN so that they can freely move through the gate buzzer is made 'OFF' since there is no approach of train and road users need not be warned.

2. Train arrival detections:-

   The Detection of a train total four R1, R2, R3 and R4 sensors required. R1 arrival and R3 departure of train by the sensors. In the same way, R4 senses the approach and R2 the departure respectively in the other direction of train arrival.

3. Warning for road users:-

   At the moment the train arrival is sensed on either side of the gate, road users are warned about the train approach by RED signals placed to caution the road users passing through the gate. RED signal appears for the road user once the train cuts the sensor placed 5Km before the gate. A buzzer is made ON as a precautionary measure for the road user and that nobody should enter the gate at that moment.

4. Sensing for vehicles:-

   For sensing the vehicle on railway crossing system uses a motion sensor. And these motion sensors take a signal to microcontroller AT89S52. Since there is no vehicle or obstacle, signal is made GREEN for the train to pass through the gate. The same is applied for in the other direction and SG3 and SG4 are made GREEN and gates are closed. Due to some unavoidable circumstances, if there is a sudden breakdown of a vehicle between the gates, then the motion sensor sense the availability of vehicle on the crossing system . It indicates the presence of vehicle and the signal for train should be made RED in order to slow down the train to avoid collision. Then the obstacle should be warned to clear the path.

5. Gate closing operation:-

   Once the microcontroller senses that there is no vehicle inside, then it automatically produces the signal to operate the motor through relay circuit and hence close the gate for the passage of train. When any presence of obstacle is sensed, AT89S52 controller gives signal for obstacle to clear the path and once the path is cleaned, motor is operated to close the gate. Actually rotary motion occurs in a motor. This rotary motion is converted to linear motion of the gate using a gear.

6. Signal for train:-

   When the path is clear inside the gate, GREEN signal is produced for the train when there is any obstacle; signal is made RED for the train in order to slow down its speed before 5 Km from the gate. Another signal placed at 180 m before the gate, when it is still RED when train approaches if then provisions if then provisions should be stopping the train.

7. Train Departure Detection:-

   Detection of train departure is also done using relay technique as explained under the head of train arrival detection. Train departure sensing is done by sensors R3 and R2 respectively considering the directions of train approach.

8. Gate operating:-

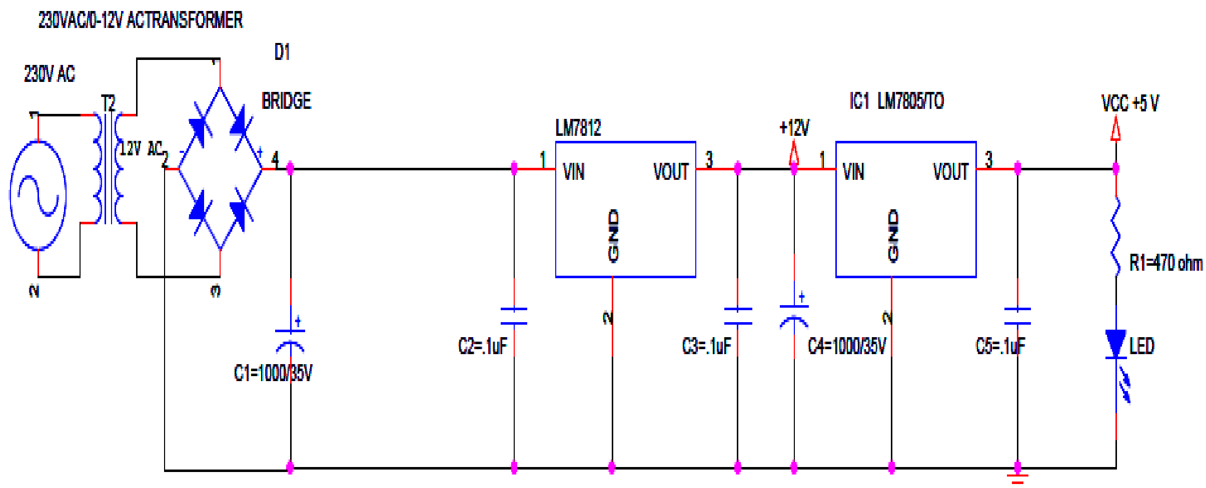
   When the train departure is sensed by the sensors, signal is given to the Microcontroller which operates the motor in reverse direction and the gates are opened. Once the gate is opened signal for road users are made GREEN so that the vehicles can pass through the gate.

2.5:- Application

- Railway gate controlling.
- Parking gate controlling.

Chapter 3: Basic Block Diagram Design

3.1:- Circuit diagram of power supply circuit



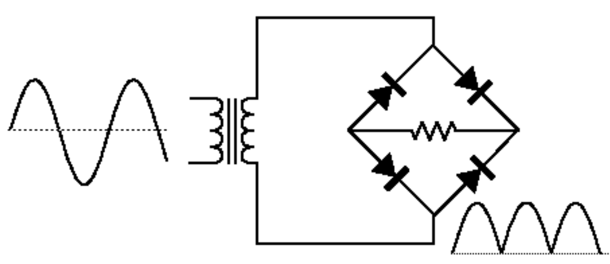
(Fig 3.1 Schematic diagram of power supply circuit)

3.2:- Description of Power Circuit Diagram

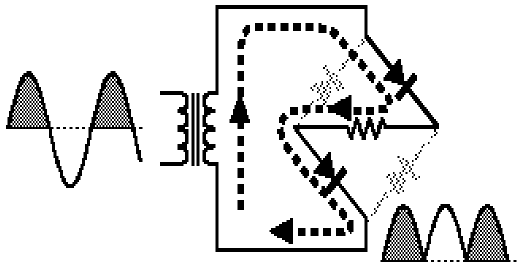
- Power circuit consists following equipment.
    1. Step-down transformer of 230/12V
    2. Bridge rectifier
    3. IC LM7812
    4. IC LM7805
    5. Filter capacitor (Electrolyte capacitor)
    6. Ceramic Capacitor

- The AC supply of 230V is step-downed to 12V by the step-down transformer. And the 12v is now given to bridge rectifier to convert the AC source to DC source. The bridge rectifier consists of four diodes, which two of them comprises forward bias and other two of them reverse bias during the positive half cycle of AC voltage. And vice versa during the negative half cycle of the AC source. After rectification, the 12v DC is given to regulator IC LM7812. The positive voltage regulator IC LM7812, provides a constant 12v DC to the load. This 12v DC supply is used for to drive the motor. Since the output may be pulsated DC, the filters capacitor filters the AC components present in the output to provide a pure DC. And ceramic capacitor used for to reduce the harmonic. Then after another regulated IC LM7805 Is connected which provide 5v DC to the load. 5v DC supply is used for to operate the microcontroller circuit.

- **Bridge Rectifier**
  - Rectification is a process of conversion of AC to DC. Here, the AC of transformer output is given to the rectifier input, which converts it to DC output. Basically, bridge rectifiers or diodes arranged in bridge called Diode arrangement are used for power supply design.
  - A bridge rectifier makes use of four diodes in a bridge arrangement to achieve full-wave rectification. This is a widely used configuration, both with individual diodes wired as shown and with single component bridges where the diode bridge is wired internally.

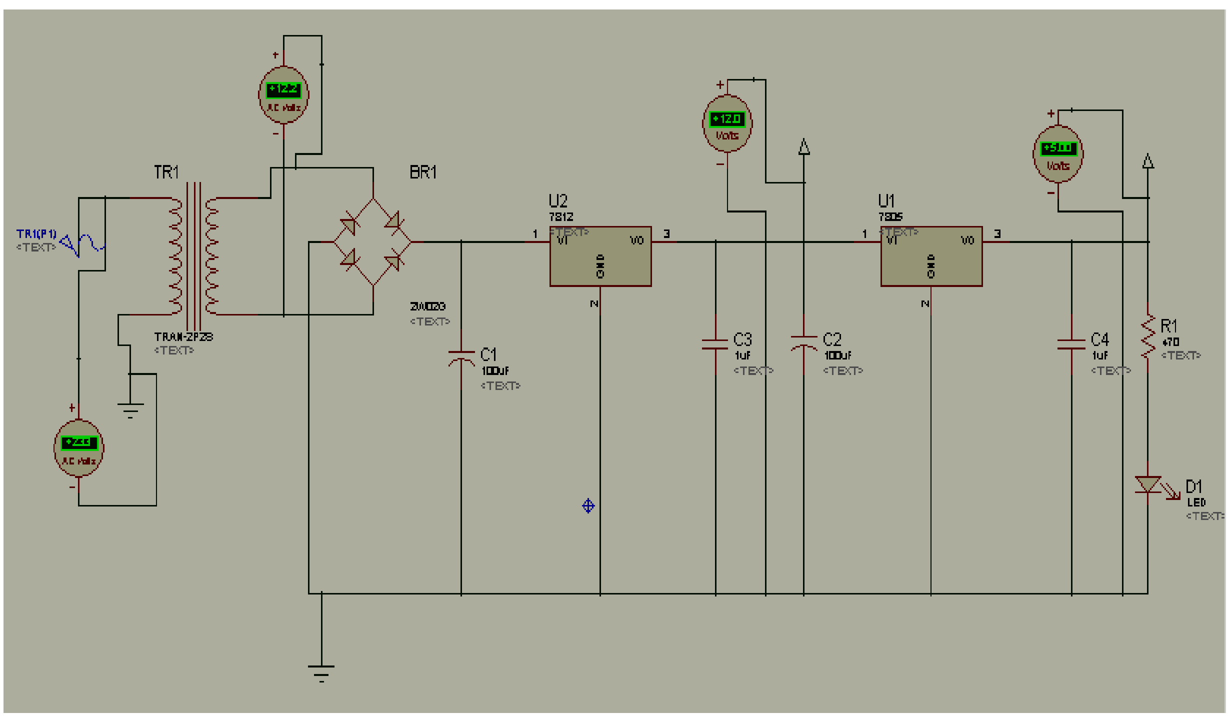


Current Flow in the Bridge Rectifier



- For both positive and negative swings of the transformer, there is a forward path through the diode bridge. Both conduction paths cause current to flow in the same direction through the load resistor, accomplishing full-wave rectification. While one set of diodes is forward biased, the other set is reverse biased and effectively eliminated from the circuit.

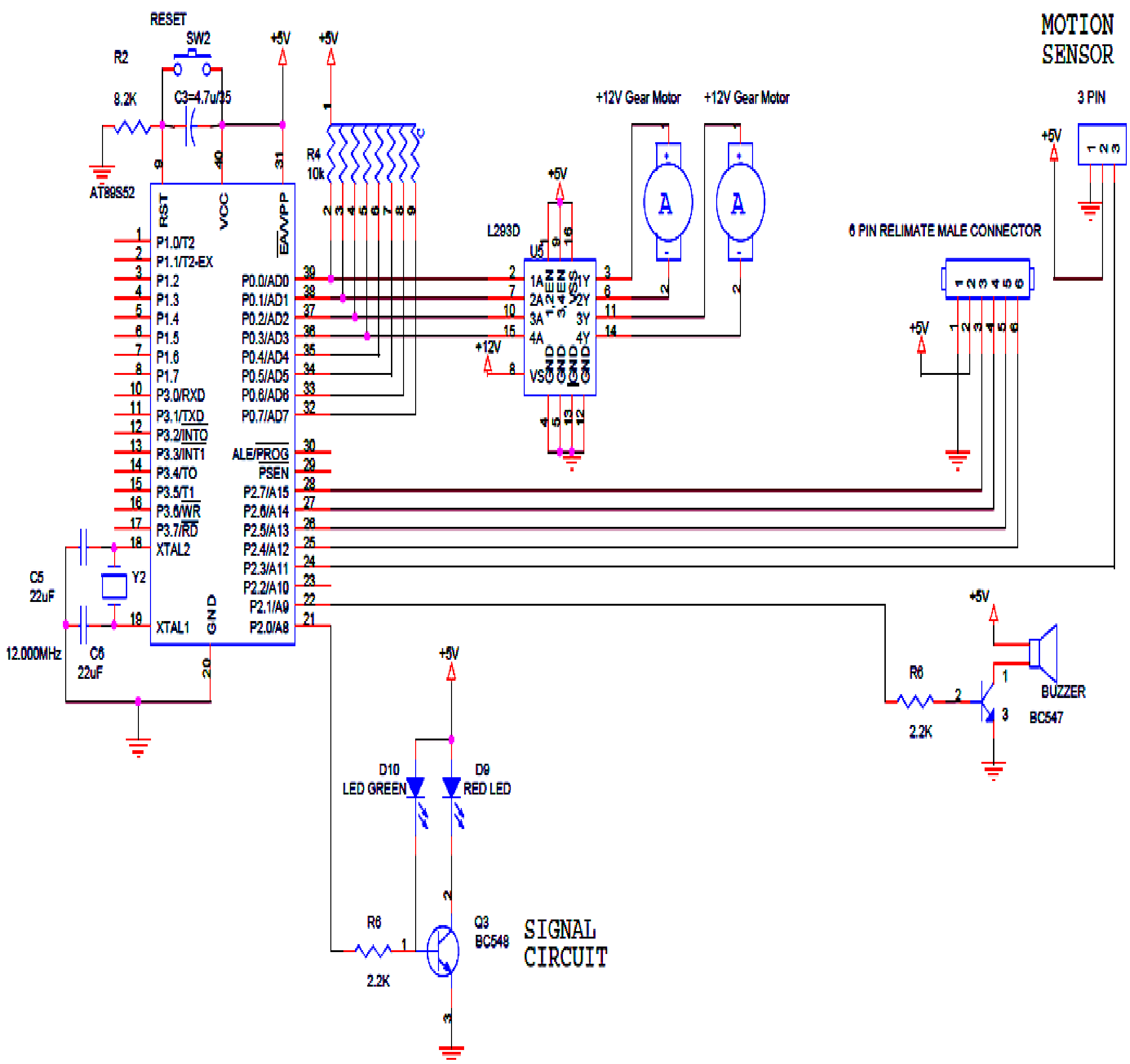
3.3:- Simulation of power circuit in Protious



(Fig 3.2:- Power simulation circuit in protious)

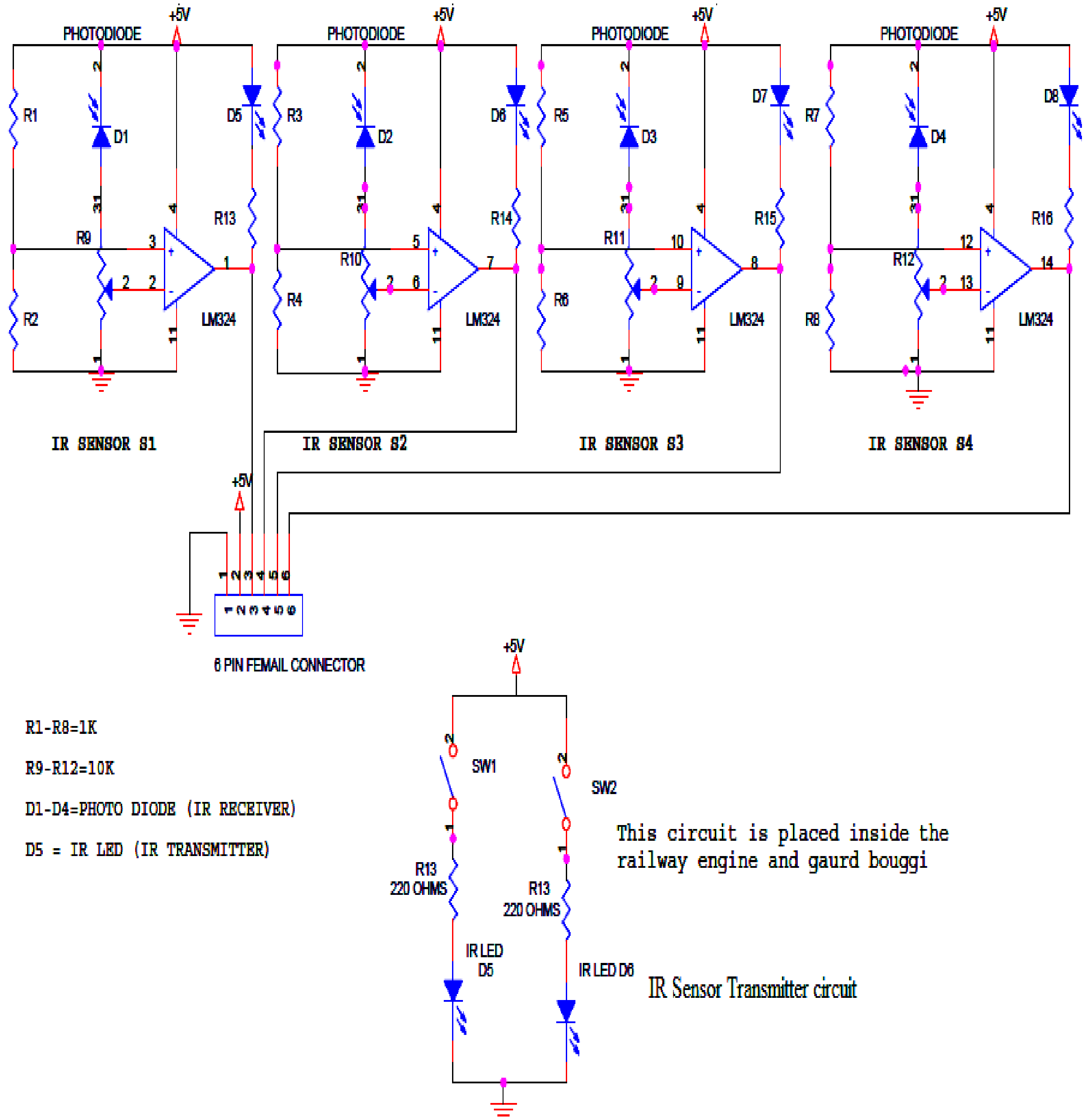
3.4:- Circuit diagram of automatic railway crossing system

➢ **Circuit diagram of main circuit**



(Fig. 3.3:- schematic diagram of main circuit of automatic railway crossing system)

- **Circuit diagram of sensor circuit**

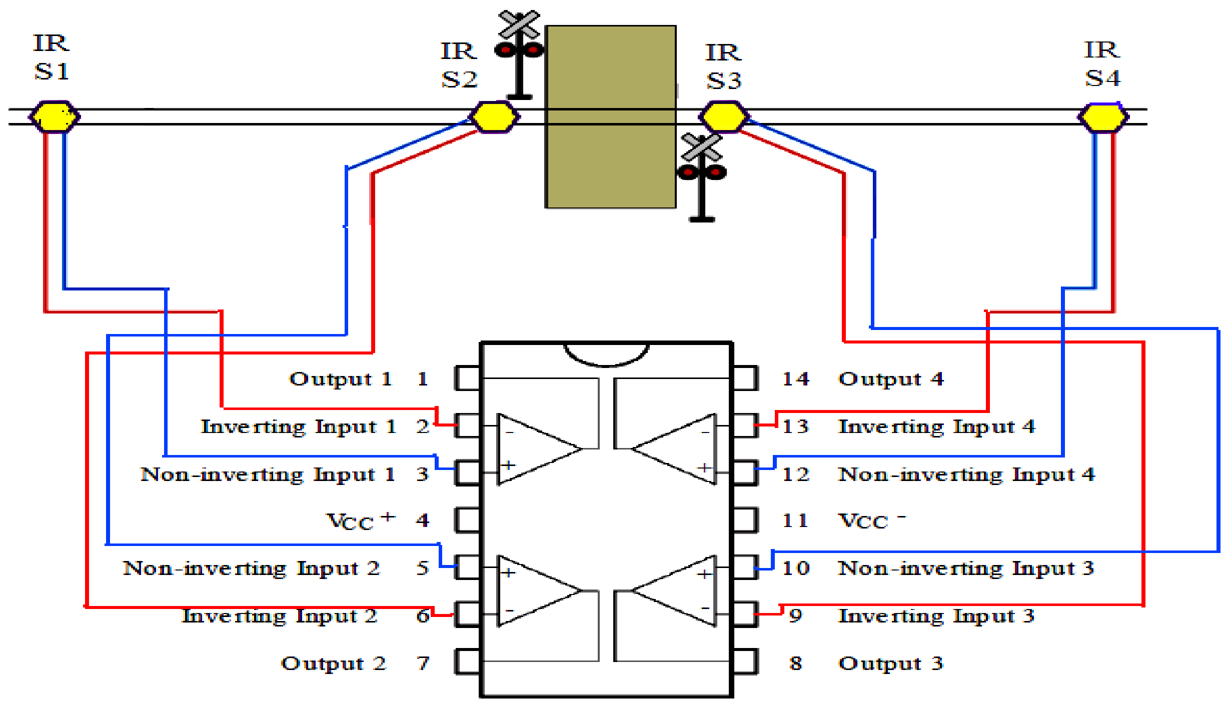


(Fig. 3.4:- schematic diagram for sensor circuit)

3.4.1:- Description of main circuit:-

- In main circuit microcontroller unit is connected it is 40 pin IC and it have four input output port are available. In my project we use port 0 for motor connection. IC L293D is used for rotate the motor in by directional.
- On port 2 IR sensor circuit, PIR motion sensor, buzzer and signal circuit for road user is connected.
- On XTAL1 and XTAL2 pin 12Mz crystal is connected.
- On port 1 signal circuit for train is connected.

3.4.2:- Sensor connection diagram on IC LM324



(Fig. 3.5:- Sensor connection diagram)

3.4.3:- Working of main circuit:-

- First IR sensor transmitter which are connected in railway engine and gard, and IR receiver which are connected on track. On track four receivers are connected tow receiver are in left side S1, S2 and another tow receiver are one right side S3, S4 of railway crossing. S1, S4 use for closing the gate and S2, S3 use for opening the gate. Train arrival in left side direction then sensor S1, S3 operates and for right side S4, S2 operate.

- If train is come from left side. When train engine come on receiver S1 and transmitter is transmit a signal to S1 and it take a signal to controller for arrival of train and buzzer and motor operate then DC motor close the gate. Buzzer is take a signal to road users which near to crossing for arrival of train. And red light of signal circuit is on which connected on road. For closing gate I use a16 step. In 8 steps any obstacle or vehicle in working condition on track is sense by PIR motion sensor and suddenly stop the closing of gate. After 2sec motion sensor again check and vehicle completely pass on track than after gate is completely closed. And then signal circuit take signal to train for pass from railway crossing.

- When train is pass from the crossing reviver S3 cont 1 when engine pass on S3 and when gard is pass from S3 then it count 2 and receiver take a signal to controller for passing of train and gate is open.

Chapter 4: Detail of equipment

4.1:- Introduction

- In the automatic railway crossing system circuit fooling equipment are uses.
  1) Microcontroller AT89S52
  2) Infrared sensor
  3) PIR Motion sensor
  4) 12v 300rpm D.C. gear motor
  5) 230v A.C./ 0-12v A.C. step down transformer
  6) IC LM324
  7) IC Lm7812
  8) IC LM 7805
  9) 12 MHz crystal
  10) IC L293D

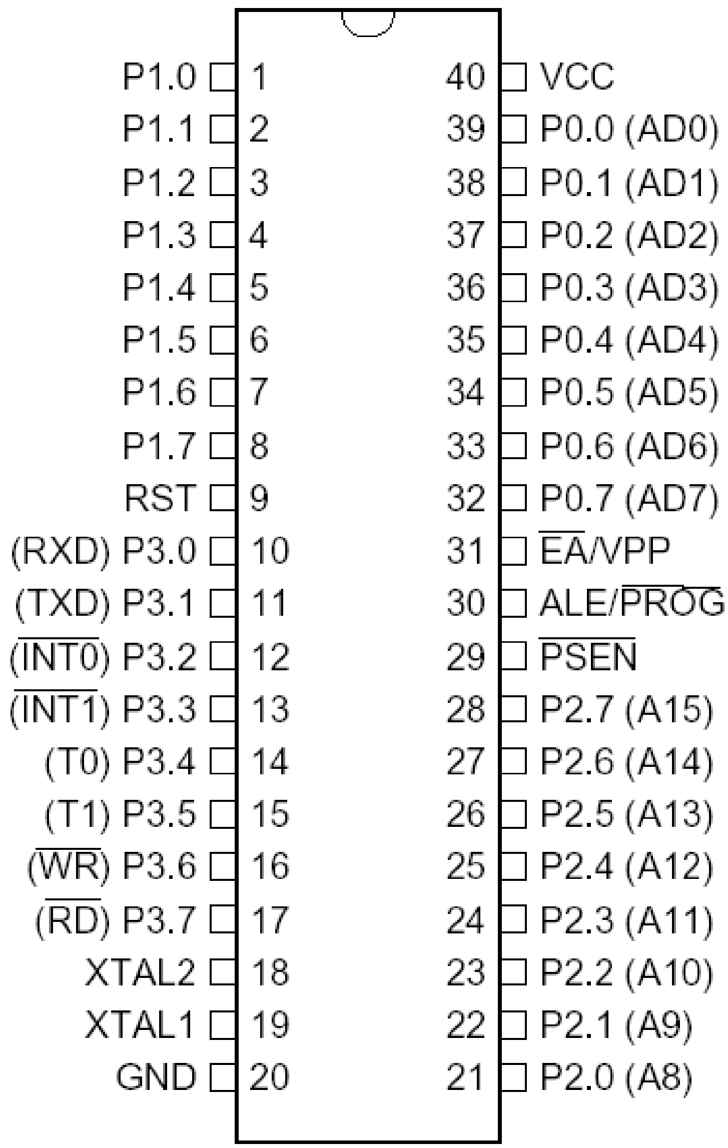
4.2:- Microcontroller AT89S52

4.2.1:- Description

- The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8Kbytes 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 pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. 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.

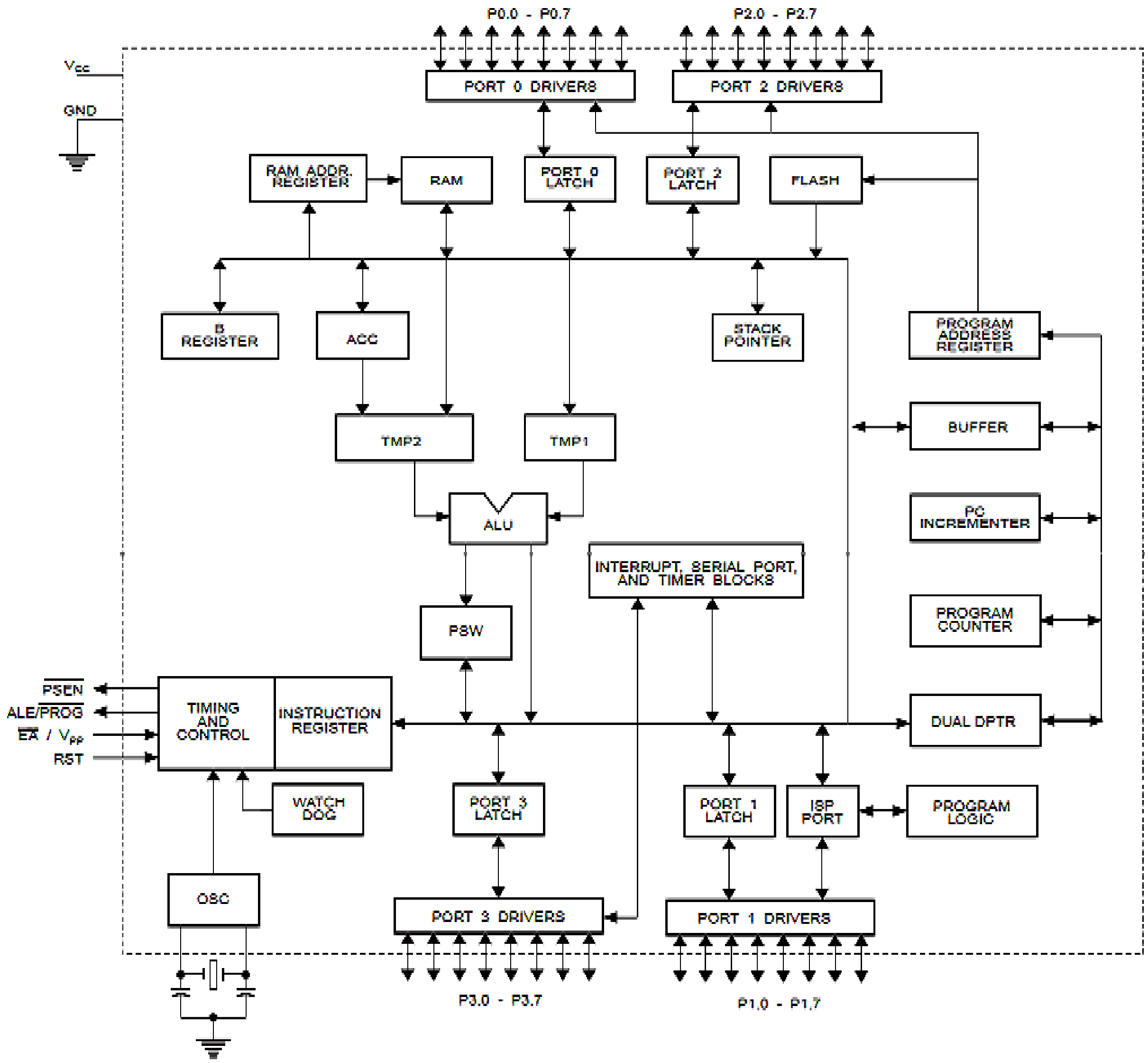
- The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the 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 contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

4.2.2:- Pin diagram of microcontroller AT89S52



(Fig. 4.1:- Pin diagram of microcontroller AT89S52)

4.2.3:- Block diagram of AT89S52



(Fig. 4.2:- Block diagram of microcontroller AT89S52)

4.2.4:- 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 0 also receives the code bytes during Flash programming and outputs the code bytes during program verification. External pull-ups are required during program verification.
- **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 1 also receives the low-order address bytes during Flash programming and verification.

Port Pin	Alternate Functions
P1.0	T2 (external count input to Timer/Counter 2), clock-out
P1.1	T2EX (Timer/Counter 2 capture/reload trigger and direction control)
P1.5	MOSI (used for In-System Programming)
P1.6	MISO (used for In-System Programming)
P1.7	SCK (used for In-System Programming)

(Table 4.1:- Alternating function of port 1)

- **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 uses 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 2 also receives the high-order address bits and some control signals during Flash programming and verification.
- **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 the pull-ups.

- Port 3 also serves the functions of various special features of the AT89S52, as shown in the following table.

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

Port Pin	Alternate Functions
P3.0	RXD (serial input port)
P3.1	TXD (serial output port)
P3.2	$\overline{\text{INT0}}$ (external interrupt 0)
P3.3	$\overline{\text{INT1}}$ (external interrupt 1)
P3.4	T0 (timer 0 external input)
P3.5	T1 (timer 1 external input)
P3.6	$\overline{\text{WR}}$ (external data memory write strobe)
P3.7	$\overline{\text{RD}}$ (external data memory read strobe)

(Table 4.2:- Alternate function of port 3)

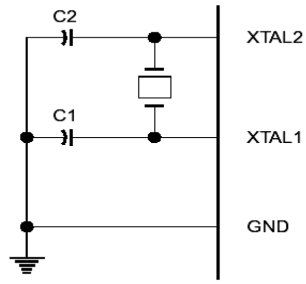
- **RST**
  - Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device. This pin drives High for 96 oscillator periods after the Watchdog times out.
- **ALE/PROG**
  - Address Latch Enable (ALE) is an output pulse for latching the low byte of the address 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.

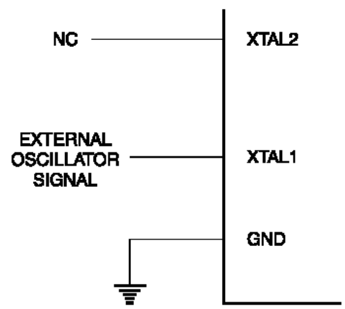
- If desired, ALE operation can be disabled by setting bit 0 of SFR location 8EH. With the bit set, ALE is active only during a MOVX or MOVC Instruction. Otherwise, the pin is weakly pulled high. Setting the ALE-disable bit has no effect if the microcontroller is in external execution mode.

- **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/VPP**
  - External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset.
  - EA should be strapped to VCC for internal program executions. 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.
- **Oscillator characteristics**
  - XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier which can be configured for use as an on-chip oscillator, as shown in Figure 1. Either a quartz crystal or ceramic resonator may be used.
  - To drive the device from an external clock source, XTAL2 should be left unconnected while XTAL1 is driven as shown in Figure 2. There are no requirements on the duty cycle of the external clock signal, since the input to the internal clocking

circuitry is through a divide-by-two flip-flop, but minimum and maximum voltage high and low time specifications must be observed.



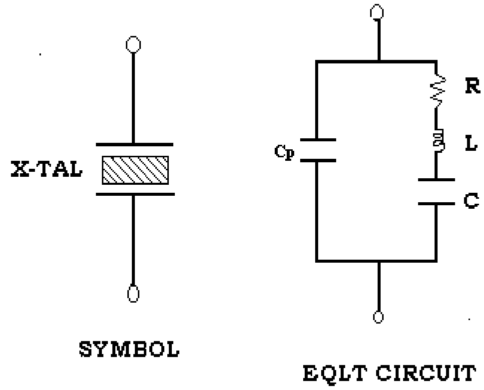
(Fig 4.3: Oscillator Connections)



(Fig 4.4: External Clock Drive Configuration)

- **How Oscillator works:-**

  - When quartz crystal is subjected to mechanical pressure, they produce a measurable electrical voltage conversely when an electric current is applied to a crystal, it will induce mechanical movement. If an ac is passed through the crystal plate the charges oscillate back and front at the resonant frequency of crystal.



(Fig 4.5:- Symbol and equivalent circuit of crystal)

- Quartz crystal exhibits a property called the piezo-electric effect that is they produce an electric voltage. When subjected to pressure along certain direction of the crystal because of this property quartz crystal has important application in electronics industry for controlling the frequency of radio waves. When piezo-electric crystal is used in place of LC circuit for higher frequency stability, the oscillator is called as crystal oscillator.

- Crystal oscillator is used for stability frequency for a long period of time. The resolution of 0.01 nm/s can be obtained. Crystal operates between f_p and fs frequency (a very narrow bandwidth).

4.2.5:- Special Function Registers

- A map of the on-chip memory area called the Special Function Register (SFR). Note that not all of the addresses are occupied, and unoccupied addresses may not be implemented on the chip. Read accesses to these addresses will in general return random data, and write accesses will have an indeterminate effect.

- User software should not write 1s to these unlisted locations, since they may be used in future products to invoke new features. In that case, the reset or inactive values of the new bits will always be 0.

1. Timer 2 Registers:-
   - Control and status bits are contained in registers T2CON (shown in Table II) and T2MOD for Timer 2. The register pair (RCAP2H, RCAP2L) is the Capture/Reload registers for Timer 2 in 16-bit capture mode or 16-bit auto-reload mode.

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

3. Dual Data Pointer Registers:-
   - To facilitate accessing both internal and external data memory, two banks of 16-bit Data Pointer Registers are provided: DP0 at SFR address locations 82H-83H and DP1 at 84H-85H. Bit DPS = 0 in SFR AUXR1 selects DP0 and DPS = 1 selects DP1. The user should ALWAYS initialize the DPS bit to the appropriate value before accessing the respective Data Pointer Register.

4. Power off Flag:-
   - The Power off Flag (POF) is located at bit 4 (PCON.4) in the PCON SFR. POF is set to “1” during power up. It can be set and rest under software control and is not affected by reset.

4.2.6:- Memory Organization

- MCS-51 devices have a separate address space for Program and Data Memory. Up to 64K bytes each of external Program and Data Memory can be addressed.

1. Program Memory
   - If the EA pin is connected to GND, all program fetches are directed to external memory.

- On the AT89S52, if EA is connected to VCC, program fetches to addresses 0000H through 1FFFH are directed to internal memory and fetches to addresses 2000H through FFFFH are to external memory.

2. <u>Data Memory</u>
   - The AT89S52 implements 256 bytes of on-chip RAM. The upper 128 bytes occupy a parallel address space to the Special Function Registers. This means that the upper 128 bytes have the same addresses as the SFR space but are physically separate from SFR space.

   - When an instruction accesses an internal location above address 7FH, the address mode used in the instruction specifies whether the CPU accesses the upper 128 bytes of RAM or the SFR space. Instructions which use direct addressing access the SFR space.

   - For example, the following direct addressing instruction accesses the SFR at location 0A0H (which is P2).

     MOV 0A0H, #data

   - Instructions that use indirect addressing access the upper 128 bytes of RAM. For example, the following indirect addressing instruction, where R0 contains 0A0H, accesses the data byte at address 0A0H, rather than P2 (whose address is 0A0H).

     MOV @R0, #data

   - Note that stack operations are examples of indirect addressing, so the upper 128 bytes of data RAM is available as stack space.

4.2.7:- Interrupts

- The AT89S52 has a total of six interrupt vectors: two external interrupts (INT0 and INT1), three timer interrupts (Timers 0, 1, and 2), and the serial port interrupt. These interrupts are all shown in Figure.

- Each of these interrupt sources can be individually enabled or disabled by setting or clearing a bit in Special Function Register IE. IE also contains a global disable bit, EA, which disables all interrupts at once.

- Note that Table I shows that bit position IE.6 is unimplemented. User software should not write a 1 to this bit position, since it may be used in future AT89 products.

- Timer 2 interrupt is generated by the logical OR of bits TF2 and EXF2 in register T2CON. Neither of these flags is cleared by hardware when the service routine is vectored to. In fact, the service routine may have to determine whether it was TF2 or EXF2 that generated the interrupt, and that bit will have to be cleared in software.

- The Timer 0 and Timer 1 flags, TF0 and TF1, are set at S5P2 of the cycle in which the timers overflow. The values are then polled by the circuitry in the next cycle. However, the Timer 2 flag, TF2, is set at S2P2 and is polled in the same cycle in which the timer overflows.

4.2.8:- Features:-

• 8K Bytes of In-System Programmable (ISP) Flash Memory
• 4.0V to 5.5V Operating Range
• Fully Static Operation: 0 Hz to 33 MHz
• Three-level Program Memory Lock
• 256 x 8-bit Internal RAM
• 32 Programmable I/O Lines
• Three 16-bit Timer/Counters
• Eight Interrupt Sources
• Full Duplex UART Serial Channel
• Low-power Idle and Power-down Modes
• Interrupt Recovery from Power-down Mode
• Dual Data Pointer
• Power-off Flag

4.3:- PIR Motion sensor

- **General Description**
  - The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. This motion can be detected by checking for a high signal on a single I/O pin.

- **Features**
  - Single bit output
  - Small size makes it easy to conceal
  - Compatible with all Parallax microcontrollers

- **Application**
  - Alarm Systems
  - Halloween Props
  - Robotics

- **Theory of Operation**
  - Pyroelectric devices, such as the PIR sensor, have elements made of a crystalline material that generates an electric charge when exposed to infrared radiation. The changes in the amount of infrared striking the element change the voltages generated, which are measured by an on-board amplifier. The device contains a special filter called a Fresnel lens, which focuses the infrared signals onto the element. As the ambient infrared signals change rapidly, the on-board amplifier trips the output to indicate motion.

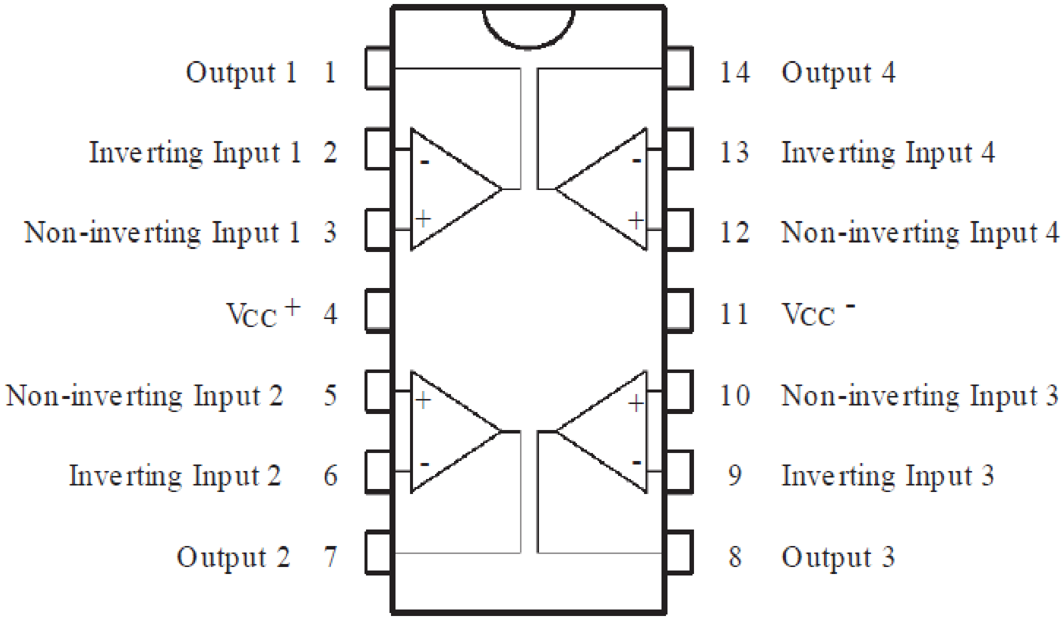
- **Pin Definitions and Ratings**

Pin	**Name**	**Function**
-	GND	Connect to ground or Vss
+	V+	Connect to +5 VDC or Vdd
Out	output	Connect to an I/o pin set to input mode

(Table 4.3 Pin configuration of PIR motion sensor)

(Fig. 4.6:- PIR motion sensor)

4.4:- IC LM324



(Fig 4.7:- Pin diagram of LM324 IC)

- The LM324 series are low–cost, quad operational amplifiers with true differential inputs. They have several distinct advantages over standard operational amplifier types in single supply applications. The quad amplifier can operate at supply voltages as low as 3.0 V or as high as 32 V with quiescent currents about one–fifth of those associated with the MC1741 (on a per amplifier basis). The common mode input range includes the negative supply, thereby eliminating the necessity for external biasing components in many applications. The output voltage range also includes the negative power supply voltage.
  - Short Circuited Protected Outputs
  - True Differential Input Stage
  - Single Supply Operation: 3.0 V to 32 V
  - Low Input Bias Currents: 100 nA Maximum
  - Four Amplifiers per Package
  - Internally Compensated

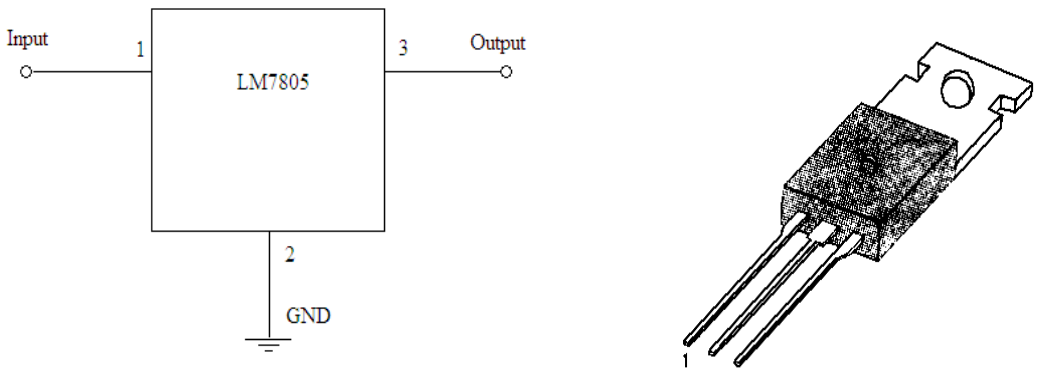
• Common Mode Range Extends to Negative Supply

• Industry Standard Pin outs

• ESD Clamps on the Inputs Increase Ruggedness without Affecting Device Operation

4.5:- IC LM7805

➢ **Pin diagram:-**



‘

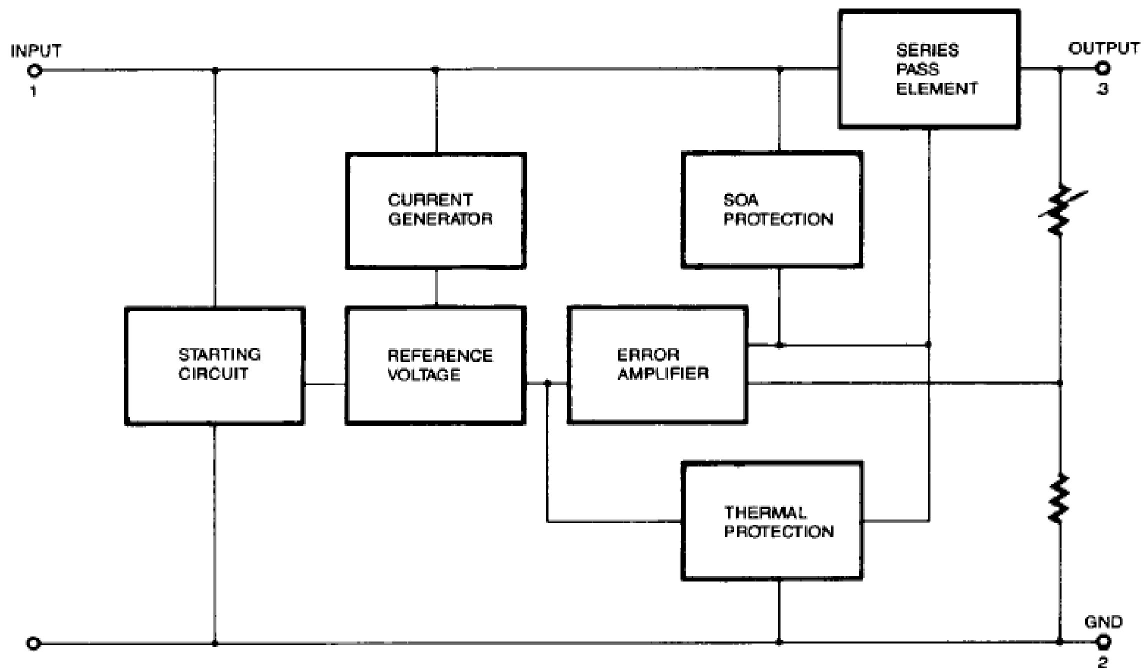
(Fig 4.8:- Pin diagram of LM7805 IC)

➢ **Description: -**

- The LM78XX series of three terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

- **Features:-**
  - Output current up to 1A
  - Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
  - Thermal Overload Protection
  - Short Circuit Protection
  - Output Transistor Safe Operating Area Protection

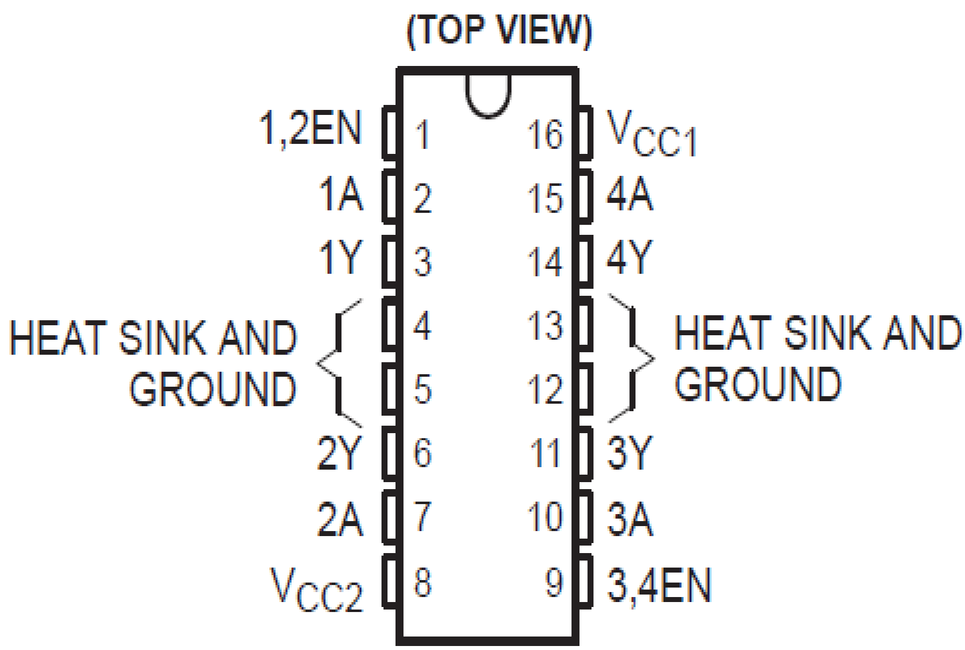
- **Internal block diagram:-**



(Fig 4.9:- Inter block diagram of IC LM7805)

4.6:- IC L293D

- **Pin diagram of IC**

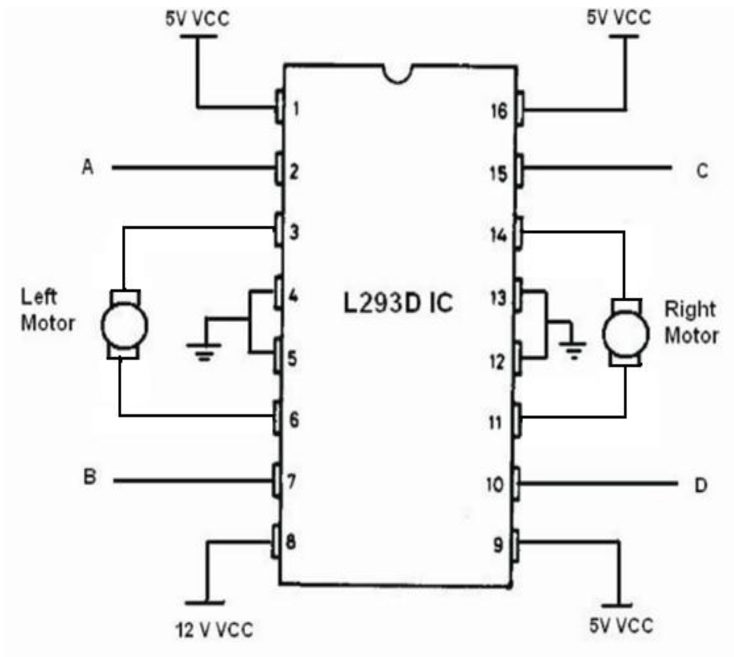


(Fig 4.10:- Pin diagram of IC L293D)

- **Description**:-
  - ➢ The L293D are quadruple high-current half-H drivers. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN.

- When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

- **Block Diagram:-**



(Fig 4.11:- H bridge connection diagram of motor driven IC)

- **Feature:-**
  - Wide Supply-Voltage Range: 4.5 V to 36 V
  - Separate Input-Logic Supply
  - Internal ESD Protection
  - Thermal Shutdown
  - High-Noise-Immunity Inputs
  - Output Current 600m A Per Channel

- Peak Output Current 1.2 A Per Channel
- Output Clamp Diodes for Inductive Transient Suppression

4.7:- Infrared sensor

- Infrared Radiation is electromagnetic radiation of a wavelength longer than a that of visible light, but shorter than that of micro-wave. The name means “below red” red being the red the color visible light with the longest wavelength. Infrared radiation has wavelengths between about 750 nm and 1 mm, spanning five orders of magnitudes. A longer wavelength means it has a lower frequency than red, hence “below”. Objects generally emit infrared radiation across a spectrum of wavelengths but only a specific region of the spectrum is of the spectrum is of interest because sensors are usually designed only to collect radiation within a specific bandwidth.
- Remote controls and IrDA device use infrared light-emitting diodes to emit infrared radiation which is focused by a plastic lens into a narrow beam. The receiver uses a silicon photodiode to convert the infrared radiation to an electric current. It responds only to the rapidly pulsing signal created by the transmitter, and filters out slowly charging infrared radiation from ambient light. IR does not penetrate walls and so does not interfere with other devices in adjoining rooms

Chapter 5: Conclusion

5.1:- Conclusion:-

- Using this project automatic railway crossing system we improve the rail road transportation facility and this technique has fast operation thane oldest system and we reduce the accident. This technique is most suitable in rural and suburban area. These techniques do not require any gatekeeper at the railway crossing.

APPENDIX A.: PROGRAMMING

Assembly Programming Language

```
#include <reg52.h>
unsigned char k;
sbit m1h=P0^0;                    //motor 1 high bit for crossing
sbit m1l=P0^1;                    //motor 1 low bit
sbit m2h=P0^2;                    //motor 2 high bit for crossing
sbit m2l=P0^3;                    //motor 2 low bit
sbit red=P2^1;                    //signal bit which shows red or green light
sbit green = P2^0;                //signal bit which shows red or green light
sbit buzzer=P2^3;                 //buzzer bit so when crossing is going
                                  to close than its start
sbit motion=P2^2;                 //motion sensor for when crossing is start
                                  to close at that time some one is coming
                                  then suddenly pause the crossing
sbit s4=P2^4;                     //south sensor far away from crossing for
                                  sense if train is coming from south side
sbit s3=P2^5;                     //south sensor near to crossing
sbit s2=P2^6;                     //north sensor far away from crossing for
                                  sense if train is coming from north side
sbit s1=P2^7;                     //north sensor near to crossing
sbit gr1=P1^1;
sbit rd1=P1^0;
sbit gr2=P1^4;
sbit rd2=P1^3;
unsigned char direction;
void delay (unsigned int);
void check_north();
void check_south();
void cr_open();
```

```
void cr_close();
void motion_intr (void) interrupt 0
{
if (k<=8)
{
        m1h=1;                      //stop motor 1 when crossing closed
        m1l=1;
        m2h=1;                      //stop motor 2 when crossing closed
        m2l=1;
        delay(100000);
        delay(100000);
        delay(100000);
}
}
void main()
{
        green=0;                    //crossing signal
        red=1;                      //crossing signal
        gr1=1;                      //railway signal
        rd1=0;                      //railway signal
        gr2=1;
        rd2=0;
        buzzer=0;
        while(1)                    //for check if train is coming or not
        {
        check_north();              //for if train is coming from north side
        check_south();              //for if train is coming from south side
        buzzer=0;
}
}
void check_north()
```

```
{
        if (s1==0)                          //check if train coming from north side if it
                                              is coming than it sense and start to close
                                              crossing
        {
        green=1;
        red=0;
        direction='n';                       //training is coming from north
        cr_close();
        while(s3!=0);                       //wait for 1st railway coach if it will pass
                                              so it will do nothing
        while(s3!=1);
        while(s3!=0);                       //wait for last guard if it will pass away
                                            than crossing will open
        cr_open();
        green=0;
        red=1;
        while(s4!=0);                       //if 1st coach will pass from south sensor
                                            then it will interrupted and will not order
                                            to close crossing
        while(s4!=1);
        while(s4!=0);                       //same as previous but for last guard
        while(s4!=1);                       // gaurd gone
        buzzer=1;
        delay(20000);
        buzzer=0;
        }
        else
        {
        }
}
```

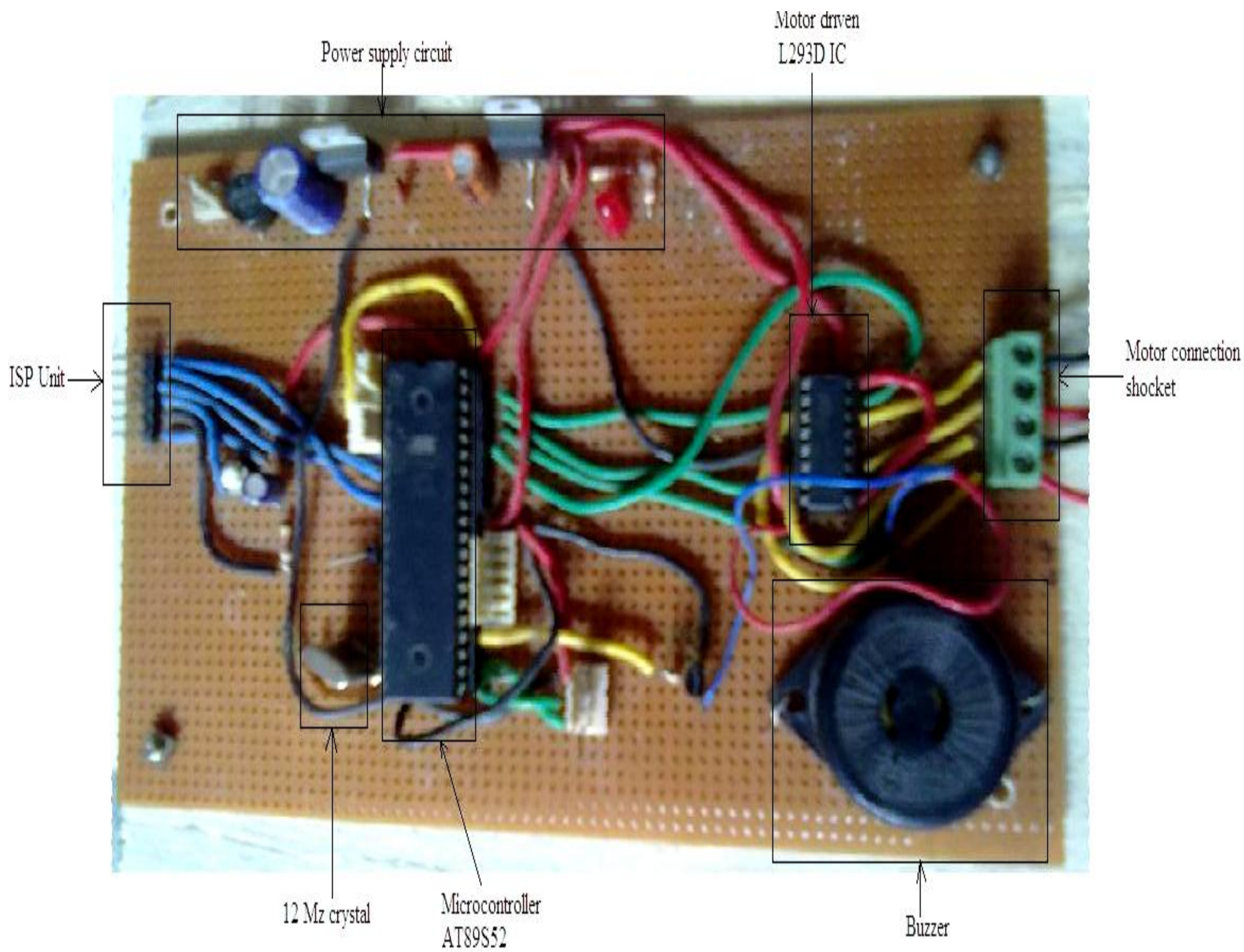
```
void check_south()
{
        if(s4==0)                    //check if train coming from south side if it
                                     coming than it sense and start to close crossing
        {
        green=1;
        red=0;
        direction='s';
        cr_close();
        while(s2!=0);                //wait for 1st railway coach if it will pass so it
                                     will do nothing
        while(s2!=1);
        while(s2!=0);                //wait for last guard if it will pass away than
                                     crossing will open
        cr_open();
        green=0;
        red=1;
        while(s1!=0);                //if 1st coach will pass from south sensor
                                     then it will  interrupted and will not order
                                     to close crossing
        while(s1!=1);
        while(s1!=0);                //same as previous but for last guard
        while(s1!=1);
        buzzer=1;
        delay(20000);
        buzzer=0;
        }
        else
        {
        }
}
```

```
void cr_open()
{
	for(k=0;k<=15;k++)
	{
	m1h=1;				//start motor 1 to close crossing when
					  north sensor sense that train is coming
	m1l=0;
	m2h=1;				//start motor 2 to close crossing when
					  north sensor sense that train is coming
	m2l=0;
	delay(1000);
	m1h=1;				//stop motor 1 when crossing closed
	m1l=1;
	m2h=1;				//stop motor 2 when crossing closed
	m2l=1;
	delay(100000);
	}
	gr1=1;				//railway signal
	rd1=0;				//railway signal
	gr2=1;
	rd2=0;
	buzzer=0;
}
void cr_close()
{
	buzzer=1;
	IE=0X81;
	for(k=0;k<=15;k++)
	{
	m1h=0;				//start motor 1 to close crossing when
					  north sensor sense that train is coming
```

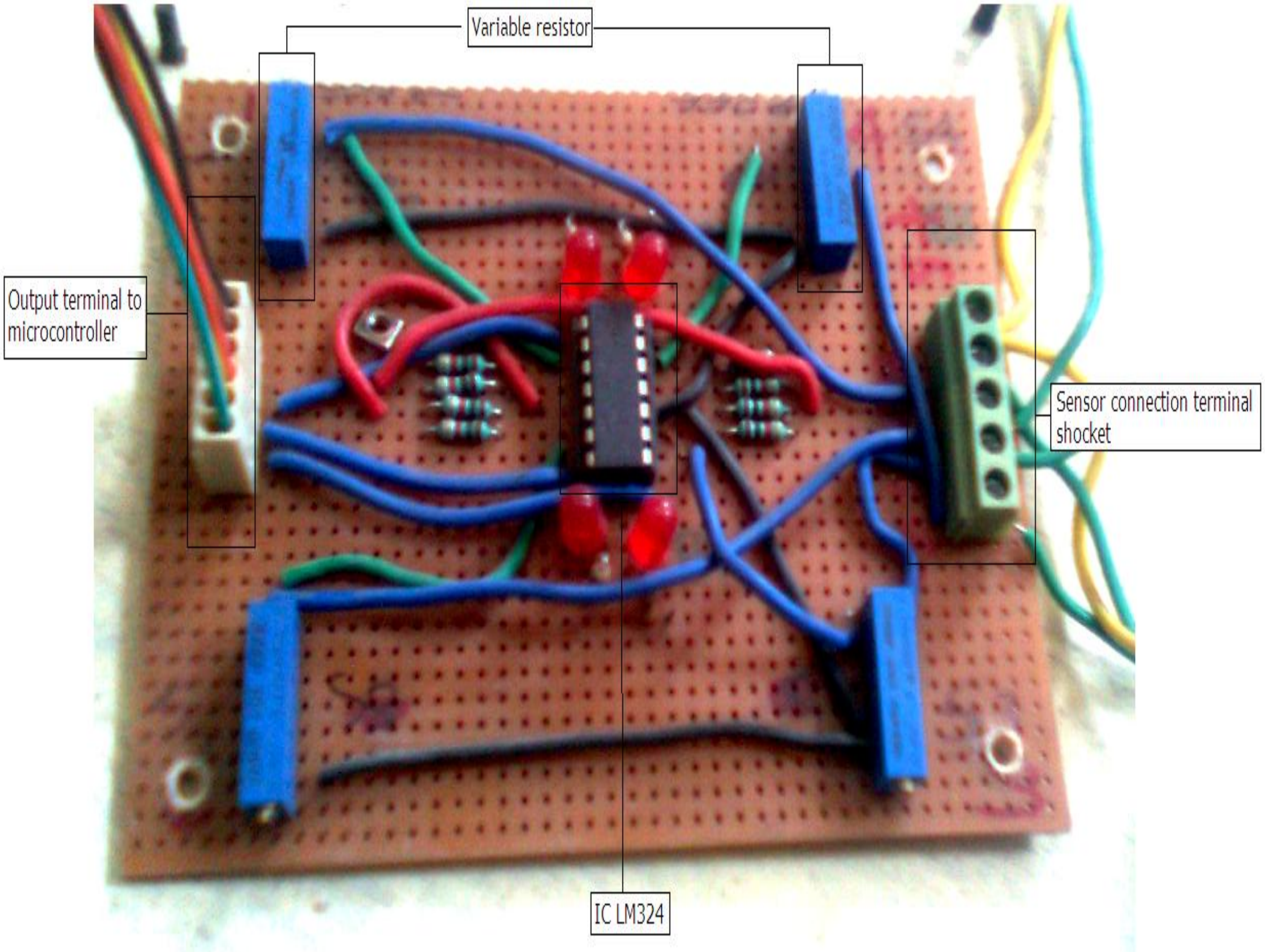
```
            m1l=1;
            m2h=0;                        //start motor 2 to close crossing when
                                            north sensor sense that train is coming
            m2l=1;
            delay(1000);
            m1h=1;                        //stop motor 1 when crossing closed
            m1l=1;
            m2h=1;                        //stop motor 2 when crossing closed
            m2l=1;
            delay(100000);
            }
IE=0;
If (direction=='n')
{
            gr1=0;                        //railway signal
            rd1=1;                        //railway signal
}
else
{
            gr2=0;
            rd2=1;
}
}
void delay(unsigned int itime)
{
            unsigned int i,j;
            for(i=0;i<itime;i++);
            {
            for(j=0;j<1275;j++);
            }
}
```

APPENDIX B: PHOTOGRAPHS OF HARDWARE

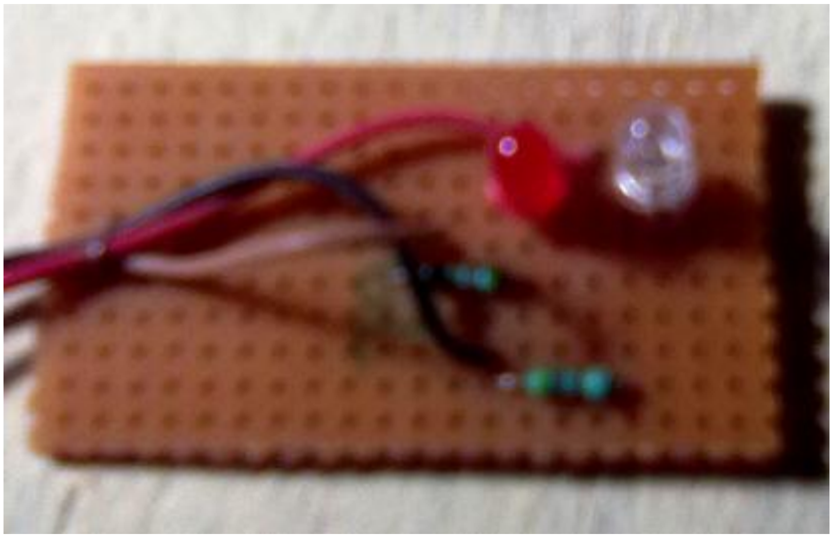
- **Main circuit of hardware (Microcontroller unit):-**



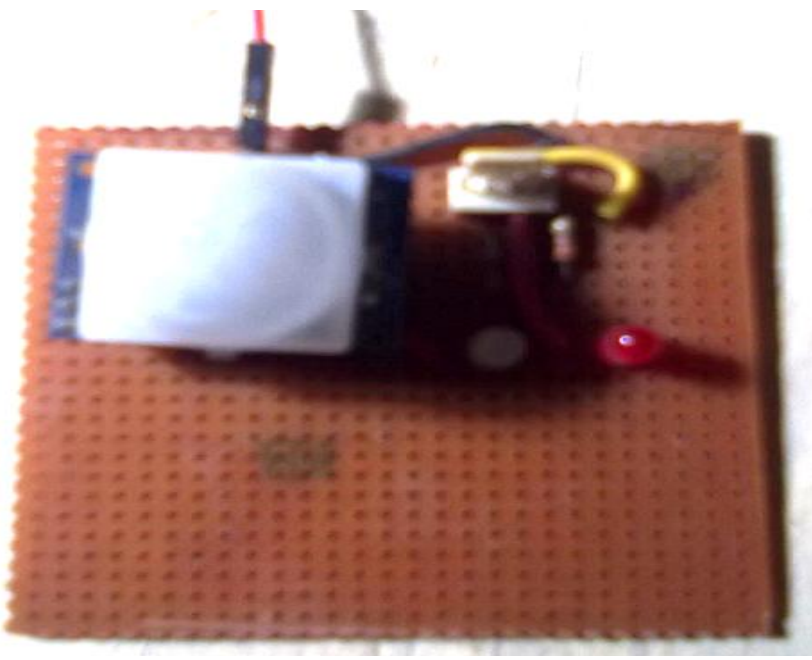
- **Sensor control circuit**



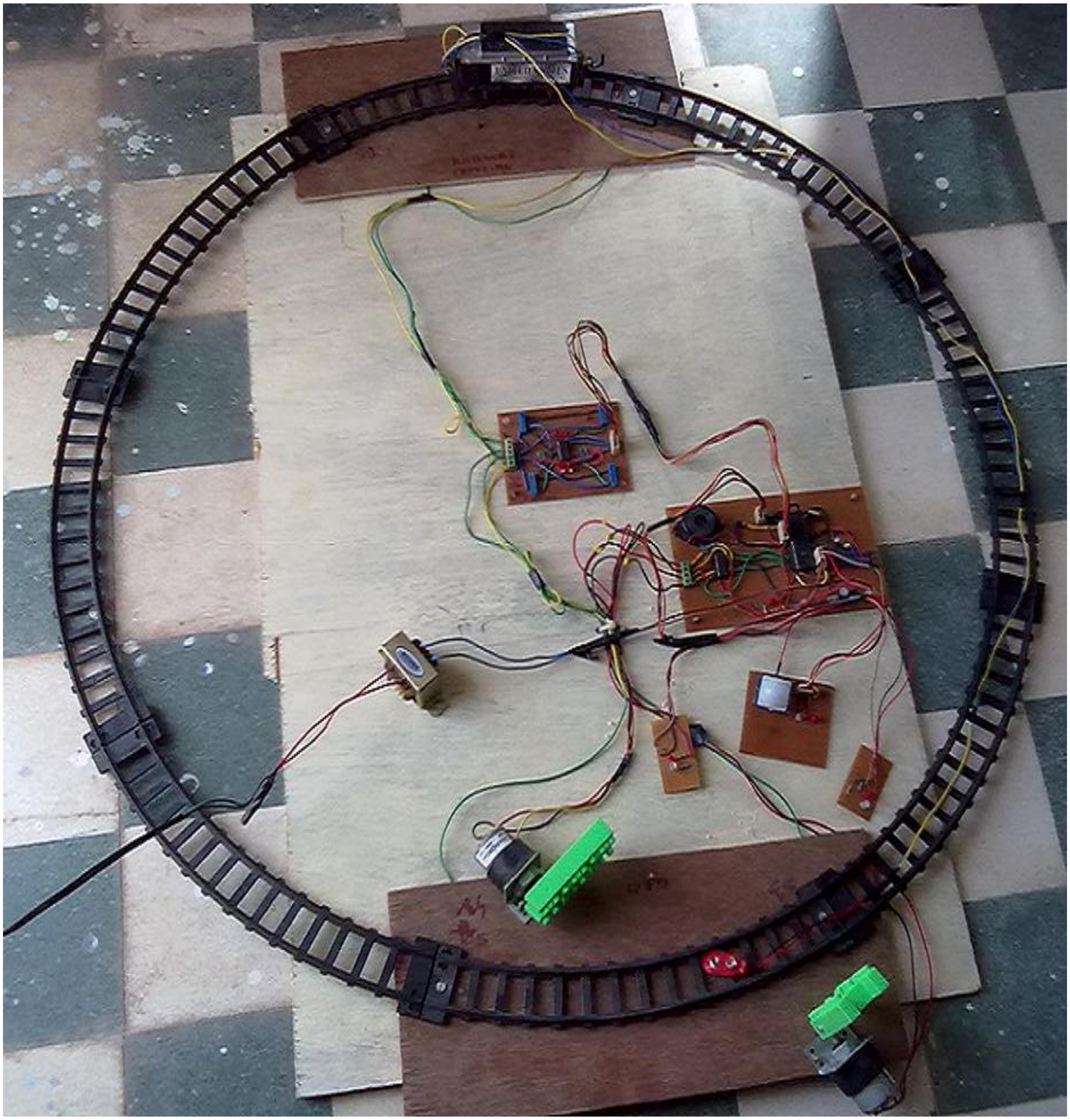
- **Signal circuit:-**



- **PIR Motion sensor circuit**



- **Complete model circuit**



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Following are some internet sites, books, magazines taken as reference for this project:

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3. http://indianengineer.wordpress.com/2009/08/03/automatic-railway-gate-control-track-switching/
4. http://www.nskelectronics.com/files/pirsensor-v11.pdf
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6. www.electronicstutotials.com/oscillators/crystal- oscillators.htm

Books:

1. Muhammad ali mazidi and robin D Mickinlay, “The 8051 microcontroller and embedded system using assembly and c” Pearson Eduction